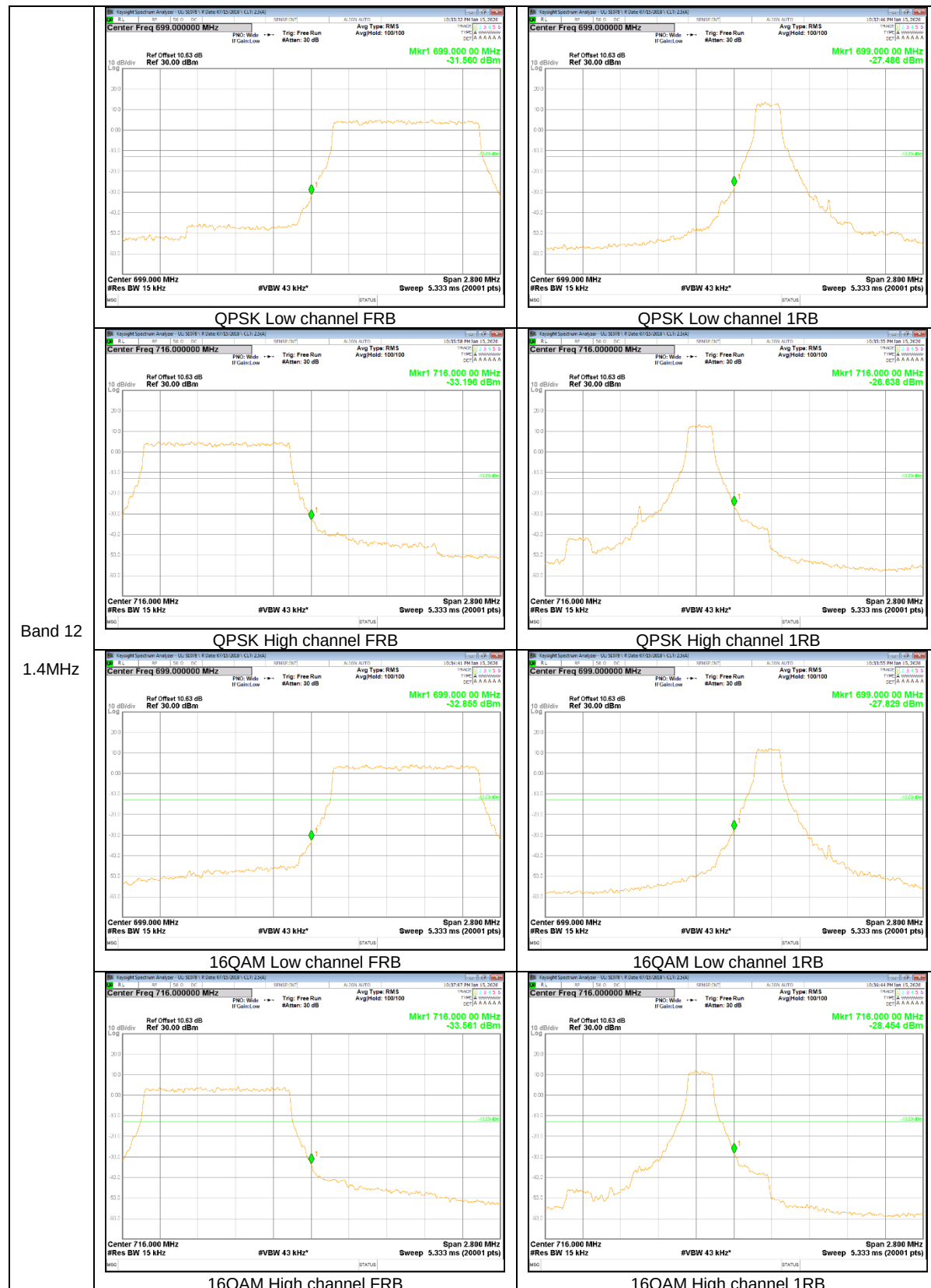




**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

### 9.3. OUT OF BAND EMISSIONS

#### RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238 and §27. 53

#### LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

#### TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

- a) Set the RBW = 100KHz for emission below 1GHz and 1MHz for emissions above 1GHz  
(Tests were performed 1MHz [Worst case], to sweep 1 time for all frequency range)
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points = Max (40001);
- g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);

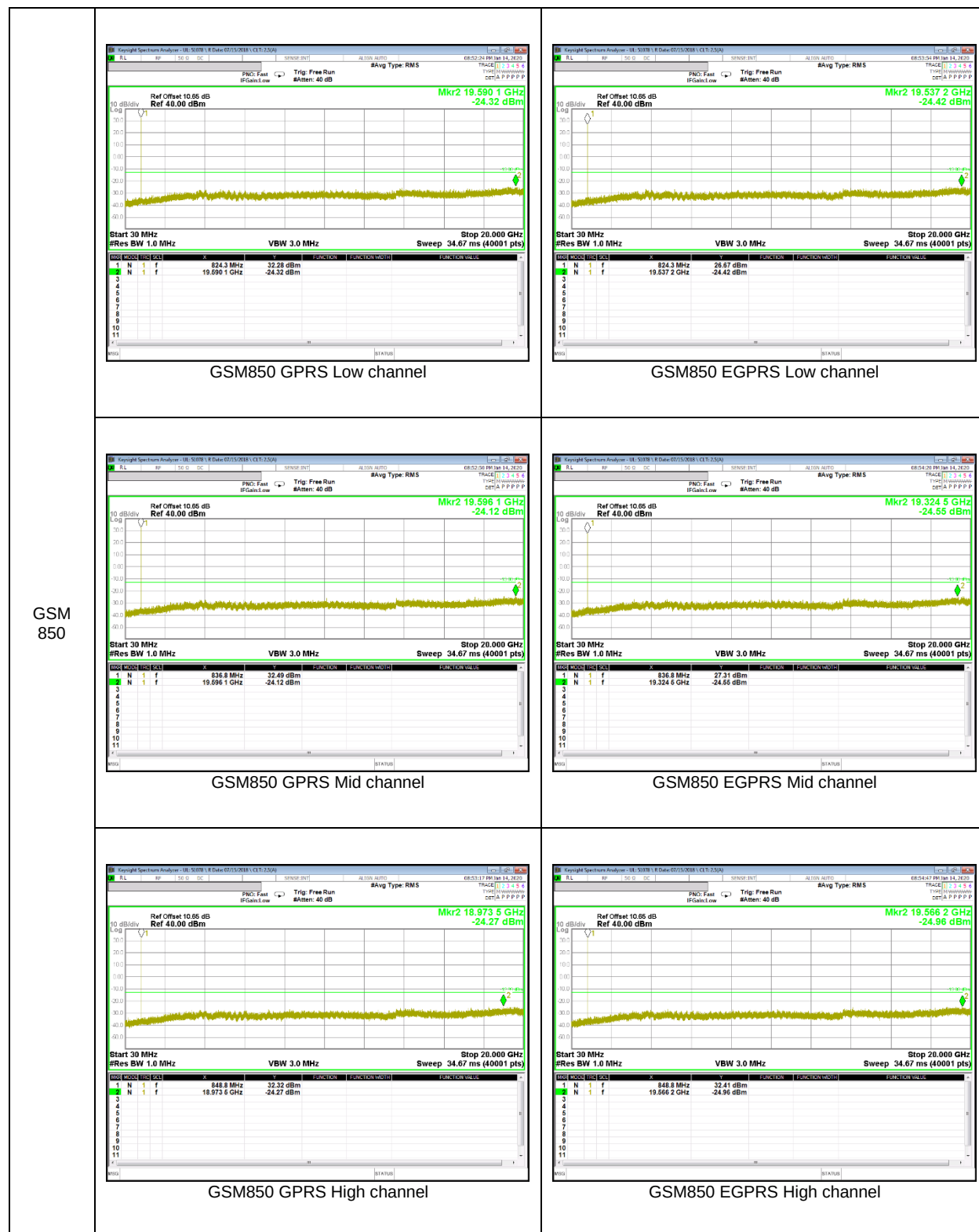
#### RESULTS

See the following pages.

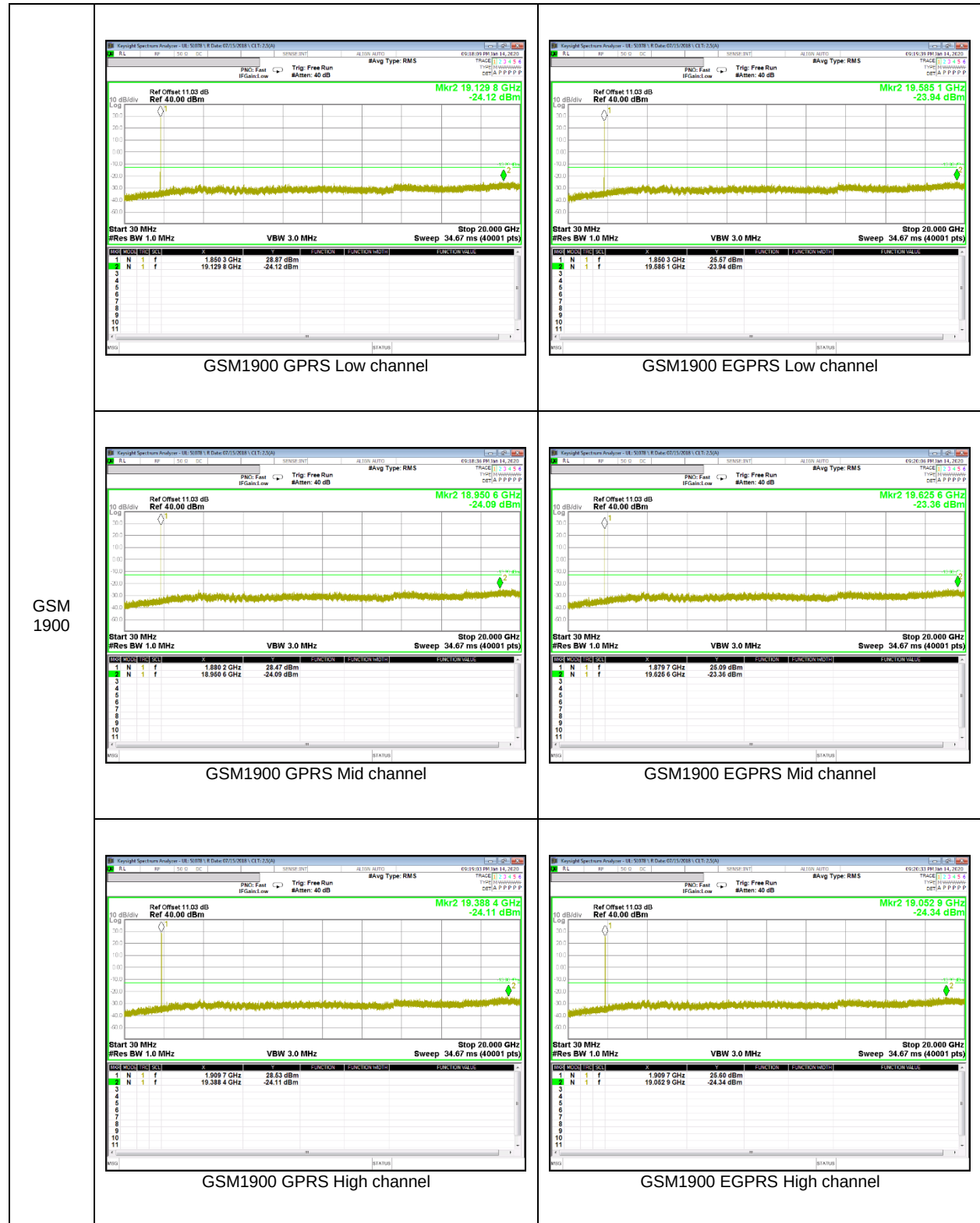
NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

### 9.3.1. OUT OF BAND EMISSIONS RESULT

#### GSM 850



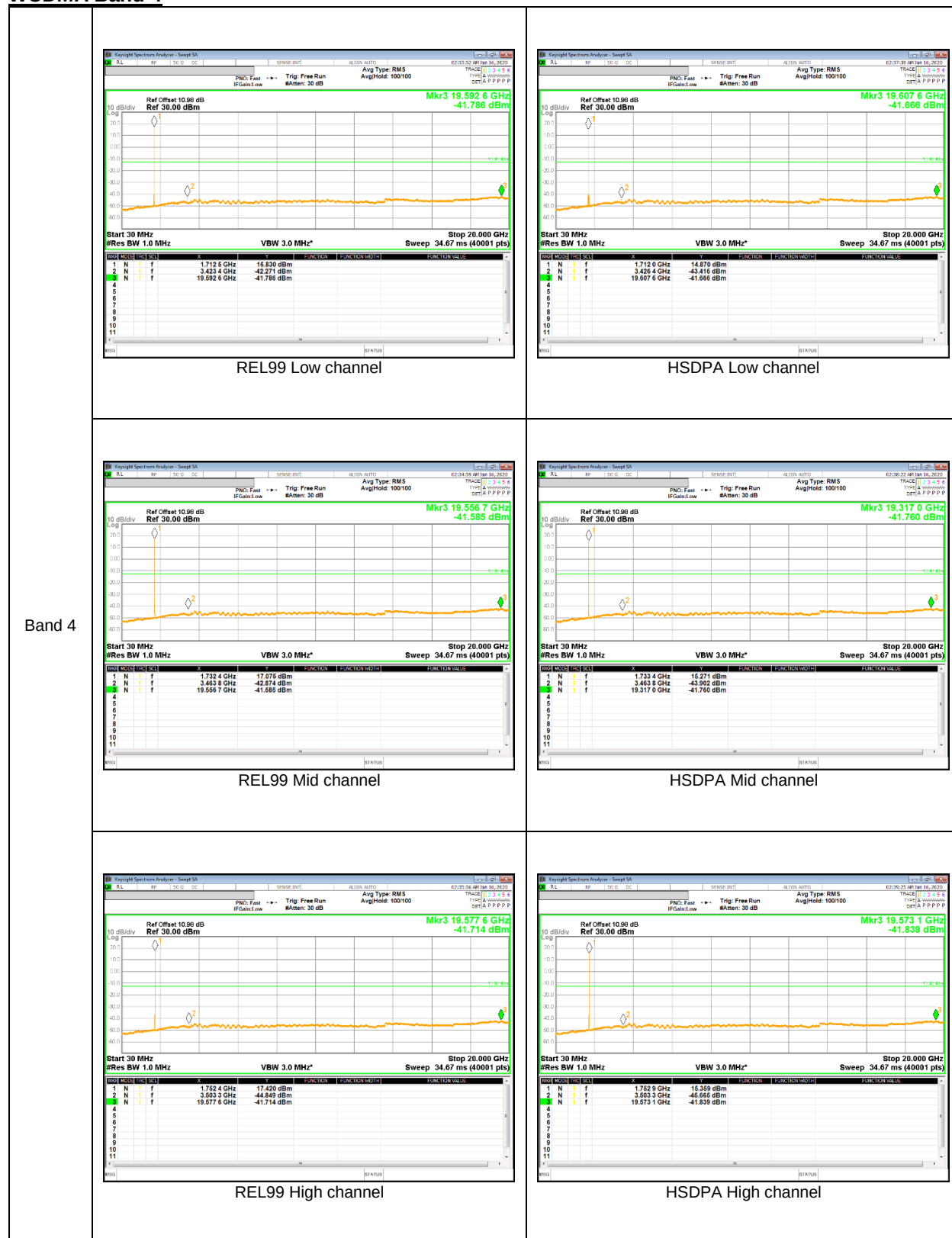
**GSM 1900**



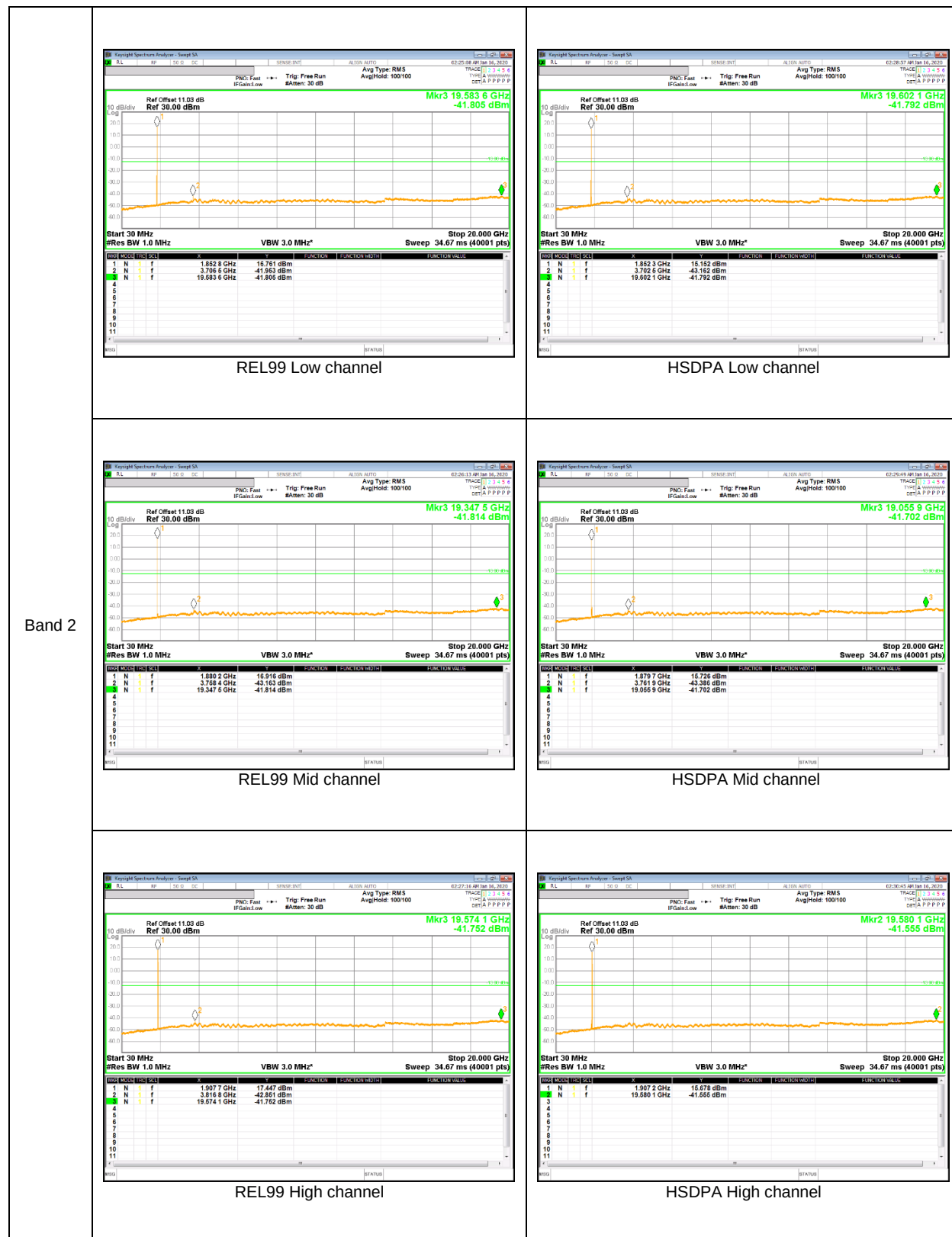
# WCDMA Band 5



# WCDMA Band 4



# WCDMA Band 2



## LTE Band 2



# **LTE Band 4**



# **LTE Band 5**



# **LTE Band 12**



**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

## 9.4. FREQUENCY STABILITY

### RULE PART(S)

FCC: §2.1055, §22.355, §24.235 and §27.54.

### LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

§27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

### RESULTS

See the following pages.

**NOTE** : Test were performed each lowest or highest frequency on the modulation condition of more wide bandwidth.(Please refer to section 9.1.1 OBW results)

### 9.4.1. FREQUENCY STABILITY RESULTS

#### GSM 850, Channel 128/251, Frequency 824.2/848.8 MHz

| Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20°C |                              |                                               |              |                     |              |             |
|------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|---------------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                               |                              | Low Channel                                   | 2060.500     | Hz                  | High Channel | 2122.000    |
|                                                                                    |                              | Frequency Deviation Measured with Time Elapse |              |                     |              |             |
| Power Supply [Vdc]                                                                 | Environment Temperature [°C] | Low Channel                                   |              | High Channel        |              | Limit [ppm] |
|                                                                                    |                              | [MHz]                                         | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.80                                                                               | 50                           | 824.20003506                                  | -0.002       | 848.80003254        | -0.001       | 2.5         |
| 3.80                                                                               | 40                           | 824.20003422                                  | -0.001       | 848.80003211        | -0.001       | 2.5         |
| 3.80                                                                               | 30                           | 824.20003405                                  | -0.001       | 848.80003196        | 0.000        | 2.5         |
| <b>3.80</b>                                                                        | <b>20</b>                    | <b>824.20003309</b>                           | <b>0.000</b> | <b>848.80003164</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.80                                                                               | 10                           | 824.20003403                                  | -0.001       | 848.80003149        | 0.000        | 2.5         |
| 3.80                                                                               | 0                            | 824.20003404                                  | -0.001       | 848.80003152        | 0.000        | 2.5         |
| 3.80                                                                               | -10                          | 824.20003408                                  | -0.001       | 848.80003151        | 0.000        | 2.5         |
| 3.80                                                                               | -20                          | 824.20003403                                  | -0.001       | 848.80003154        | 0.000        | 2.5         |
| 3.80                                                                               | -30                          | 824.20003497                                  | -0.002       | 848.80003135        | 0.000        | 2.5         |

| Reference Frequency : GSM850 Low Channel 824.2 MHz / High Channel 848.8 MHz @ 20°C |                              |                                               |             |              |              |             |
|------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                               |                              | Low Channel                                   | 2060.500    | Hz           | High Channel | 2122.000    |
|                                                                                    |                              | Frequency Deviation Measured with Time Elapse |             |              |              |             |
| Power Supply [Vdc]                                                                 | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                    |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.80                                                                               | 20                           | 824.20003309                                  | 0           | 848.80003164 | 0            | 2.5         |
| 4.30                                                                               | 20                           | 824.20003407                                  | -0.001      | 848.80003146 | 0.000        | 2.5         |
| 3.60                                                                               | 20                           | 824.20003400                                  | -0.001      | 848.80003145 | 0.000        | 2.5         |

#### GSM 1900, Channel 512/810, Frequency 1850.0/1910.0 MHz (Lowest Frequency:GPRS / Highest Frequency: EGPRS)

| Limit          |           | 1850                  | 1910                   | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 1850.0762             | 1909.9220              |               |                                 |
| Extreme (50C)  |           | 1850.0762             | 1909.9221              | 37.1          | 0.020                           |
| Extreme (40C)  |           | 1850.0762             | 1909.9221              | 36.2          | 0.019                           |
| Extreme (30C)  |           | 1850.0762             | 1909.9221              | 33.8          | 0.018                           |
| Extreme (10C)  |           | 1850.0762             | 1909.9221              | 33.1          | 0.018                           |
| Extreme (0C)   |           | 1850.0762             | 1909.9221              | 33.0          | 0.018                           |
| Extreme (-10C) |           | 1850.0762             | 1909.9221              | 32.7          | 0.017                           |
| Extreme (-20C) |           | 1850.0762             | 1909.9221              | 32.6          | 0.017                           |
| Extreme (-30C) |           | 1850.0762             | 1909.9221              | 32.3          | 0.017                           |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 1850.0762             | 1909.9221              | 33.0          | 0.018                           |
|                | -15%      | 1850.0762             | 1909.9221              | 32.6          | 0.017                           |
|                | End Point | 1850.0762             | 1909.9221              | 32.8          | 0.017                           |

## WCDMA Band 5

| Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C |                              |                                               |              |                     |              |             |
|------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|--------------|---------------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                     |                              | Low Channel                                   | 2066.000     | Hz                  | High Channel | 2116.500    |
|                                                                                          |                              | Frequency Deviation Measured with Time Elapse |              |                     |              |             |
| Power Supply [Vdc]                                                                       | Environment Temperature [°C] | Low Channel                                   |              | High Channel        |              | Limit [ppm] |
|                                                                                          |                              | [MHz]                                         | Delta [ppm]  | [MHz]               | Delta [ppm]  |             |
| 3.80                                                                                     | 50                           | 826.40000512                                  | -0.010       | 846.59999469        | 0.003        | 2.5         |
| 3.80                                                                                     | 40                           | 826.40000226                                  | -0.007       | 846.59999545        | 0.002        | 2.5         |
| 3.80                                                                                     | 30                           | 826.40000048                                  | -0.004       | 846.59999683        | 0.001        | 2.5         |
| <b>3.80</b>                                                                              | <b>20</b>                    | <b>826.39999686</b>                           | <b>0.000</b> | <b>846.59999747</b> | <b>0.000</b> | <b>2.5</b>  |
| 3.80                                                                                     | 10                           | 826.39999722                                  | 0.000        | 846.59999779        | 0.000        | 2.5         |
| 3.80                                                                                     | 0                            | 826.39999688                                  | 0.000        | 846.59999894        | -0.002       | 2.5         |
| 3.80                                                                                     | -10                          | 826.39999712                                  | 0.000        | 846.59999996        | -0.003       | 2.5         |
| 3.80                                                                                     | -20                          | 826.39999702                                  | 0.000        | 846.60000136        | -0.005       | 2.5         |
| 3.80                                                                                     | -30                          | 826.39999733                                  | -0.001       | 846.60000223        | -0.006       | 2.5         |

| Reference Frequency : WCDMA Band 5 Low Channel 826.4 MHz / High Channel 846.6 MHz @ 20°C |                              |                                               |             |              |              |             |
|------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|
| Limit: +/- 2.5 ppm =                                                                     |                              | Low Channel                                   | 2066.000    | Hz           | High Channel | 2116.500    |
|                                                                                          |                              | Frequency Deviation Measured with Time Elapse |             |              |              |             |
| Power Supply [Vdc]                                                                       | Environment Temperature [°C] | Low Channel                                   |             | High Channel |              | Limit [ppm] |
|                                                                                          |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |
| 3.80                                                                                     | 20                           | 826.39999686                                  | 0           | 846.59999747 | 0            | 2.5         |
| 4.30                                                                                     | 20                           | 826.39999689                                  | 0.000       | 846.59999758 | 0.000        | 2.5         |
| 3.60                                                                                     | 20                           | 826.39999684                                  | 0.000       | 846.59999754 | 0.000        | 2.5         |

## WCDMA Band 4 (Lowest Frequency:Rel99 / Highest Frequency: HSDPA)

| Limit          |           | 1710               | 1755                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1710.3325          | 1754.6607           |            |                           |
| Extreme (50C)  |           | 1710.3325          | 1754.6607           | 19.3       | 0.011                     |
| Extreme (40C)  |           | 1710.3325          | 1754.6607           | 12.4       | 0.007                     |
| Extreme (30C)  |           | 1710.3325          | 1754.6607           | 3.7        | 0.002                     |
| Extreme (10C)  |           | 1710.3324          | 1754.6606           | -4.1       | -0.002                    |
| Extreme (0C)   |           | 1710.3324          | 1754.6606           | -4.5       | -0.003                    |
| Extreme (-10C) |           | 1710.3324          | 1754.6606           | -5.9       | -0.003                    |
| Extreme (-20C) |           | 1710.3324          | 1754.6606           | -7.3       | -0.004                    |
| Extreme (-30C) |           | 1710.3324          | 1754.6606           | -10.6      | -0.006                    |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1710.3325          | 1754.6606           | -3.9       | -0.002                    |
|                | -15%      | 1710.3325          | 1754.6606           | -4.0       | -0.002                    |
|                | End Point | 1710.3325          | 1754.6606           | -3.9       | -0.002                    |

**WCDMA Band 2 (Lowest Frequency: Rel99 / Highest Frequency: HSDPA)**

| Limit          |           | 1850               | 1910                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1850.3385          | 1909.6635           |            |                           |
| Extreme (50C)  |           | 1850.3384          | 1909.6635           | -3.6       | -0.002                    |
| Extreme (40C)  |           | 1850.3384          | 1909.6635           | -4.4       | -0.002                    |
| Extreme (30C)  |           | 1850.3384          | 1909.6635           | -4.2       | -0.002                    |
| Extreme (10C)  |           | 1850.3384          | 1909.6635           | -5.7       | -0.003                    |
| Extreme (0C)   |           | 1850.3384          | 1909.6635           | -3.3       | -0.002                    |
| Extreme (-10C) |           | 1850.3384          | 1909.6635           | -0.9       | 0.000                     |
| Extreme (-20C) |           | 1850.3385          | 1909.6635           | 1.4        | 0.001                     |
| Extreme (-30C) |           | 1850.3385          | 1909.6635           | 3.8        | 0.002                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1850.3384          | 1909.6635           | -4.5       | -0.002                    |
|                | -15%      | 1850.3384          | 1909.6635           | -4.7       | -0.003                    |
|                | End Point | 1850.3384          | 1909.6635           | -4.3       | -0.002                    |

**LTE Band 2 (Lowest Frequency: 16QAM / Highest Frequency: 16QAM)**

| Limit          |           | 1850               | 1910                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1850.6995          | 1909.3005           |            |                           |
| Extreme (50C)  |           | 1850.6994          | 1909.3005           | -7.6       | -0.004                    |
| Extreme (40C)  |           | 1850.6994          | 1909.3005           | -7.9       | -0.004                    |
| Extreme (30C)  |           | 1850.6994          | 1909.3005           | -8.4       | -0.004                    |
| Extreme (10C)  |           | 1850.6994          | 1909.3005           | -10.0      | -0.005                    |
| Extreme (0C)   |           | 1850.6994          | 1909.3005           | -10.0      | -0.005                    |
| Extreme (-10C) |           | 1850.6994          | 1909.3005           | -9.1       | -0.005                    |
| Extreme (-20C) |           | 1850.6994          | 1909.3005           | -8.6       | -0.005                    |
| Extreme (-30C) |           | 1850.6994          | 1909.3005           | -7.6       | -0.004                    |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1850.6994          | 1909.3005           | -10.2      | -0.005                    |
|                | -15%      | 1850.6994          | 1909.3005           | -10.3      | -0.005                    |
|                | End Point | 1850.6994          | 1909.3005           | -10.1      | -0.005                    |

**LTE Band 4 (Lowest Frequency: 16QAM / Highest Frequency: QPSK)**

| Limit          |           | 1710               | 1755                | Delta (Hz) | Frequency Stability (ppm) |
|----------------|-----------|--------------------|---------------------|------------|---------------------------|
| Condition      |           | F low @ End of OBW | F high @ End of OBW |            |                           |
| Temperature    | Voltage   | (MHz)              | (MHz)               |            |                           |
| Normal (20C)   | Normal    | 1852.3995          | 1907.6005           |            |                           |
| Extreme (50C)  |           | 1852.3995          | 1907.6006           | 4.9        | 0.003                     |
| Extreme (40C)  |           | 1852.3995          | 1907.6006           | 1.7        | 0.001                     |
| Extreme (30C)  |           | 1852.3995          | 1907.6005           | -2.4       | -0.001                    |
| Extreme (10C)  |           | 1852.3995          | 1907.6005           | -6.4       | -0.004                    |
| Extreme (0C)   |           | 1852.3995          | 1907.6005           | -4.8       | -0.003                    |
| Extreme (-10C) |           | 1852.3995          | 1907.6005           | -2.2       | -0.001                    |
| Extreme (-20C) |           | 1852.3995          | 1907.6006           | 2.8        | 0.002                     |
| Extreme (-30C) |           | 1852.3995          | 1907.6006           | 5.1        | 0.003                     |
|                |           |                    |                     |            |                           |
| 20C            | 15%       | 1852.3995          | 1907.6005           | -6.7       | -0.004                    |
|                | -15%      | 1852.3995          | 1907.6005           | -6.8       | -0.004                    |
|                | End Point | 1852.3995          | 1907.6005           | -6.1       | -0.004                    |

**LTE Band 5 (Lowest Frequency: 16QAM / Highest Frequency: QPSK)**

| Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20°C |                              |                                               |             |              |              |             |             |
|----------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|-------------|
| Limit: +/- 2.5 ppm =                                                                   |                              | Low Channel                                   | 2061.750    | Hz           | High Channel | 2120.750    | Hz          |
| Power Supply [Vdc]                                                                     | Environment Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |              |              |             | Limit [ppm] |
|                                                                                        |                              | Low Channel                                   |             | High Channel |              | Limit [ppm] |             |
|                                                                                        |                              | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |             |
| 3.80                                                                                   | 50                           | 824.69999524                                  | 0.000       | 848.29999677 | 0.000        | 2.5         |             |
| 3.80                                                                                   | 40                           | 824.69999512                                  | 0.000       | 848.29999674 | 0.000        | 2.5         |             |
| 3.80                                                                                   | 30                           | 824.69999521                                  | 0.000       | 848.29999687 | 0.000        | 2.5         |             |
| 3.80                                                                                   | 20                           | 824.69999494                                  | 0.000       | 848.29999665 | 0.000        | 2.5         |             |
| 3.80                                                                                   | 10                           | 824.69999489                                  | 0.000       | 848.29999614 | 0.001        | 2.5         |             |
| 3.80                                                                                   | 0                            | 824.69999616                                  | -0.001      | 848.29999656 | 0.000        | 2.5         |             |
| 3.80                                                                                   | -10                          | 824.69999578                                  | -0.001      | 848.29999604 | 0.001        | 2.5         |             |
| 3.80                                                                                   | -20                          | 824.69999588                                  | -0.001      | 848.29999600 | 0.001        | 2.5         |             |
| 3.80                                                                                   | -30                          | 824.69999640                                  | -0.002      | 848.29999587 | 0.001        | 2.5         |             |

| Reference Frequency : LTE Band 5 Low Channel 824.7 MHz / High Channel 848.3 MHz @ 20°C |                                 |                                               |             |              |              |             |    |
|----------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|--------------|--------------|-------------|----|
| Limit: +/- 2.5 ppm =                                                                   |                                 | Low Channel                                   | 2061.750    | Hz           | High Channel | 2120.750    | Hz |
| Power Supply<br>[Vdc]                                                                  | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |              |              |             |    |
|                                                                                        |                                 | Low Channel                                   |             | High Channel |              | Limit [ppm] |    |
|                                                                                        |                                 | [MHz]                                         | Delta [ppm] | [MHz]        | Delta [ppm]  |             |    |
| 3.80                                                                                   | 20                              | 824.69999494                                  | 0           | 848.29999665 | 0            | 2.5         |    |
| 4.30                                                                                   | 20                              | 824.69999489                                  | 0.000       | 848.29999678 | 0.000        | 2.5         |    |
| 3.60                                                                                   | 20                              | 824.69999492                                  | 0.000       | 848.29999652 | 0.000        | 2.5         |    |

**LTE Band 12 (Lowest Frequency:16QAM / Highest Frequency: 16QAM)**

| Limit          |           | 699                   | 716                    | Delta<br>(Hz) | Frequency<br>Stability<br>(ppm) |
|----------------|-----------|-----------------------|------------------------|---------------|---------------------------------|
| Condition      |           | F low @<br>End of OBW | F high @<br>End of OBW |               |                                 |
| Temperature    | Voltage   | (MHz)                 | (MHz)                  |               |                                 |
| Normal (20C)   | Normal    | 699.1551              | 715.8423               |               |                                 |
| Extreme (50C)  |           | 699.1550              | 715.8423               | -3.4          | -0.005                          |
| Extreme (40C)  |           | 699.1550              | 715.8423               | -3.4          | -0.005                          |
| Extreme (30C)  |           | 699.1550              | 715.8423               | -3.6          | -0.005                          |
| Extreme (10C)  |           | 699.1550              | 715.8423               | -3.8          | -0.005                          |
| Extreme (0C)   |           | 699.1550              | 715.8423               | -3.7          | -0.005                          |
| Extreme (-10C) |           | 699.1550              | 715.8423               | -3.7          | -0.005                          |
| Extreme (-20C) |           | 699.1550              | 715.8423               | -3.8          | -0.005                          |
| Extreme (-30C) |           | 699.1550              | 715.8423               | -3.9          | -0.005                          |
|                |           |                       |                        |               |                                 |
| 20C            | 15%       | 699.1550              | 715.8423               | -3.8          | -0.005                          |
|                | -15%      | 699.1550              | 715.8423               | -3.9          | -0.006                          |
|                | End Point | 699.1550              | 715.8423               | -3.8          | -0.005                          |

**LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

## 10. RADIATED TEST RESULTS

### 10.1. RADIATED POWER (ERP & EIRP)

#### RULE PART(S)

FCC: §2.1046, §22.913, §24.232 and §27.50

#### LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50(c) (10) - Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

27.50(d) - (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.(Band 4)

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

#### TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03r01

For radiated output power measurement with a ESU40:

a) Set the RBW  $\geq$  OBW; b) Set VBW  $\geq 3 \times$  RBW; c) Set span  $\geq 2 \times$  RBW; d) Sweep time = auto couple; e) Detector = rms; f) Ensure that the number of measurement points  $\geq$  span/RBW; g) Trace mode = max hold(GSM, WCDMA), average(LTE);

#### TEST RESULTS

### 10.1.1. ERP/EIRP Results

#### GSM

| Band    | Mode  | Channel | f [MHz] | ERP / EIRP   |                |
|---------|-------|---------|---------|--------------|----------------|
|         |       |         |         | [dBm]        | [mW]           |
| GSM850  | GPRS  | 512     | 824.2   | 26.59        | 456.04         |
|         |       | 661     | 836.6   | 29.27        | 845.28         |
|         |       | 810     | 848.8   | <b>29.82</b> | <b>959.40</b>  |
|         | EGPRS | 512     | 824.2   | 18.82        | 76.21          |
|         |       | 661     | 836.6   | 21.65        | 146.22         |
|         |       | 810     | 848.8   | <b>22.47</b> | <b>176.60</b>  |
| GSM1900 | GPRS  | 512     | 1850.2  | 28.29        | 674.53         |
|         |       | 661     | 1880    | <b>30.02</b> | <b>1004.62</b> |
|         |       | 810     | 1909.8  | 29.54        | 899.50         |
|         | EGPRS | 512     | 1850.2  | 23.81        | 240.44         |
|         |       | 661     | 1880    | 23.39        | 218.27         |
|         |       | 810     | 1909.8  | <b>25.35</b> | <b>342.77</b>  |

#### WCDMA

| Band   | Mode  | Channel | f [MHz] | ERP / EIRP   |               |
|--------|-------|---------|---------|--------------|---------------|
|        |       |         |         | [dBm]        | [mW]          |
| Band 5 | REL99 | 4132    | 826.4   | 18.27        | 67.14         |
|        |       | 4183    | 836.6   | 19.39        | 86.90         |
|        |       | 4233    | 846.6   | <b>20.27</b> | <b>106.41</b> |
|        | HSDPA | 4132    | 826.4   | 16.63        | 46.03         |
|        |       | 4183    | 836.6   | 17.63        | 57.94         |
|        |       | 4233    | 846.6   | <b>18.41</b> | <b>69.34</b>  |
| Band 4 | REL99 | 1312    | 1712.4  | 19.70        | 93.33         |
|        |       | 1413    | 1732.6  | 20.00        | 100.00        |
|        |       | 1513    | 1752.6  | <b>20.01</b> | <b>100.23</b> |
|        | HSDPA | 1312    | 1712.4  | 18.21        | 66.22         |
|        |       | 1413    | 1732.6  | 18.34        | 68.23         |
|        |       | 1513    | 1752.6  | <b>18.55</b> | <b>71.61</b>  |
| Band 2 | REL99 | 9262    | 1852.4  | 19.95        | 98.86         |
|        |       | 9400    | 1880.0  | 20.66        | 116.41        |
|        |       | 9538    | 1907.6  | <b>20.73</b> | <b>118.30</b> |
|        | HSDPA | 9262    | 1852.4  | 18.71        | 74.30         |
|        |       | 9400    | 1880.0  | <b>19.86</b> | <b>96.83</b>  |
|        |       | 9538    | 1907.6  | 19.45        | 88.10         |

**LTE Band 2**

| Band   | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|--------|-------------|-------|-----------------------|---------|--------------|---------------|
|        |             |       |                       |         | [dBm]        | [mW]          |
| Band 2 | 20          | QPSK  | 1 / 49                | 1860.0  | 20.64        | 115.88        |
|        |             |       | 1 / 49                | 1880.0  | 22.23        | 167.11        |
|        |             |       | 1 / 99                | 1900.0  | <b>22.50</b> | <b>177.83</b> |
|        |             | 16QAM | 1 / 49                | 1860.0  | 19.90        | 97.72         |
|        |             |       | 1 / 0                 | 1880.0  | 20.61        | 115.08        |
|        |             |       | 1 / 0                 | 1900.0  | <b>22.61</b> | <b>182.39</b> |
|        | 15          | QPSK  | 1 / 37                | 1857.5  | 20.67        | 116.68        |
|        |             |       | 1 / 0                 | 1880.0  | 22.21        | 166.34        |
|        |             |       | 1 / 37                | 1902.5  | <b>24.19</b> | <b>262.42</b> |
|        |             | 16QAM | 1 / 74                | 1857.5  | 20.18        | 104.23        |
|        |             |       | 1 / 37                | 1880.0  | 20.43        | 110.41        |
|        |             |       | 1 / 37                | 1902.5  | <b>22.68</b> | <b>185.35</b> |
|        | 10          | QPSK  | 1 / 49                | 1855.0  | 20.63        | 115.61        |
|        |             |       | 1 / 25                | 1880.0  | 22.14        | 163.68        |
|        |             |       | 1 / 25                | 1905.0  | <b>24.18</b> | <b>261.82</b> |
|        |             | 16QAM | 1 / 49                | 1855.0  | 19.30        | 85.11         |
|        |             |       | 1 / 25                | 1880.0  | 21.71        | 148.25        |
|        |             |       | 1 / 0                 | 1905.0  | <b>22.78</b> | <b>189.67</b> |
|        | 5           | QPSK  | 1 / 12                | 1852.5  | 19.95        | 98.86         |
|        |             |       | 1 / 12                | 1880.0  | 21.64        | 145.88        |
|        |             |       | 1 / 12                | 1907.5  | <b>23.16</b> | <b>207.01</b> |
|        |             | 16QAM | 1 / 24                | 1852.5  | 19.70        | 93.33         |
|        |             |       | 1 / 0                 | 1880.0  | 20.14        | 103.28        |
|        |             |       | 1 / 12                | 1907.5  | <b>22.39</b> | <b>173.38</b> |
|        | 3           | QPSK  | 1 / 14                | 1851.5  | 21.00        | 125.89        |
|        |             |       | 1 / 8                 | 1880.0  | 21.12        | 129.42        |
|        |             |       | 1 / 14                | 1908.5  | <b>21.98</b> | <b>157.76</b> |
|        |             | 16QAM | 1 / 0                 | 1851.5  | 19.55        | 90.16         |
|        |             |       | 1 / 8                 | 1880.0  | 19.61        | 91.41         |
|        |             |       | 1 / 8                 | 1908.5  | <b>21.13</b> | <b>129.72</b> |
|        | 1.4         | QPSK  | 1 / 3                 | 1850.7  | 20.68        | 116.95        |
|        |             |       | 1 / 3                 | 1880.0  | 21.51        | 141.58        |
|        |             |       | 1 / 3                 | 1909.3  | <b>23.22</b> | <b>209.89</b> |
|        |             | 16QAM | 1 / 3                 | 1850.7  | 20.02        | 100.46        |
|        |             |       | 1 / 3                 | 1880.0  | 20.33        | 107.89        |
|        |             |       | 1 / 0                 | 1909.3  | <b>21.43</b> | <b>139.00</b> |

**LTE Band 4**

| Band   | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|--------|-------------|-------|-----------------------|---------|--------------|---------------|
|        |             |       |                       |         | [dBm]        | [mW]          |
| Band 4 | 20          | QPSK  | 1 / 49                | 1720.0  | <b>21.50</b> | <b>141.25</b> |
|        |             |       | 1 / 49                | 1732.5  | 20.39        | 109.40        |
|        |             |       | 1 / 0                 | 1745.0  | 21.19        | 131.52        |
|        |             | 16QAM | 1 / 0                 | 1720.0  | 19.78        | 95.06         |
|        |             |       | 1 / 49                | 1732.5  | 18.92        | 77.98         |
|        |             |       | 1 / 99                | 1745.0  | <b>19.92</b> | <b>98.17</b>  |
|        | 15          | QPSK  | 1 / 0                 | 1717.5  | 20.71        | 117.76        |
|        |             |       | 1 / 37                | 1732.5  | 20.71        | 117.76        |
|        |             |       | 1 / 0                 | 1747.5  | <b>21.06</b> | <b>127.64</b> |
|        |             | 16QAM | 1 / 37                | 1717.5  | <b>19.75</b> | <b>94.41</b>  |
|        |             |       | 1 / 37                | 1732.5  | 19.59        | 90.99         |
|        |             |       | 1 / 74                | 1747.5  | 19.26        | 84.33         |
|        | 10          | QPSK  | 1 / 0                 | 1715.0  | 20.43        | 110.41        |
|        |             |       | 1 / 25                | 1732.5  | 20.55        | 113.50        |
|        |             |       | 1 / 25                | 1750.0  | <b>21.55</b> | <b>142.89</b> |
|        |             | 16QAM | 1 / 25                | 1715.0  | <b>20.29</b> | <b>106.91</b> |
|        |             |       | 1 / 25                | 1732.5  | 19.15        | 82.22         |
|        |             |       | 1 / 49                | 1750.0  | 19.38        | 86.70         |
|        | 5           | QPSK  | 1 / 24                | 1712.5  | 20.48        | 111.69        |
|        |             |       | 1 / 24                | 1732.5  | 20.32        | 107.65        |
|        |             |       | 1 / 12                | 1752.5  | <b>21.42</b> | <b>138.68</b> |
|        |             | 16QAM | 1 / 0                 | 1712.5  | 19.21        | 83.37         |
|        |             |       | 1 / 12                | 1732.5  | <b>19.37</b> | <b>86.50</b>  |
|        |             |       | 1 / 12                | 1752.5  | 19.19        | 82.99         |
|        | 3           | QPSK  | 1 / 14                | 1711.5  | 20.42        | 110.15        |
|        |             |       | 1 / 8                 | 1732.5  | 20.17        | 103.99        |
|        |             |       | 1 / 8                 | 1753.5  | <b>21.27</b> | <b>133.97</b> |
|        |             | 16QAM | 1 / 8                 | 1711.5  | <b>19.50</b> | <b>89.13</b>  |
|        |             |       | 1 / 8                 | 1732.5  | 18.99        | 79.25         |
|        |             |       | 1 / 8                 | 1753.5  | 19.48        | 88.72         |
|        | 1.4         | QPSK  | 1 / 3                 | 1710.7  | 20.32        | 107.65        |
|        |             |       | 1 / 3                 | 1732.5  | 20.56        | 113.76        |
|        |             |       | 1 / 3                 | 1754.3  | <b>21.19</b> | <b>131.52</b> |
|        |             | 16QAM | 1 / 3                 | 1710.7  | 19.33        | 85.70         |
|        |             |       | 1 / 5                 | 1732.5  | 19.65        | 92.26         |
|        |             |       | 1 / 3                 | 1754.3  | <b>20.13</b> | <b>103.04</b> |

**LTE Band 5**

| Band   | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |               |
|--------|-------------|-------|-----------------------|---------|--------------|---------------|
|        |             |       |                       |         | [dBm]        | [mW]          |
| Band 5 | 10          | QPSK  | 1 / 25                | 829.0   | 18.36        | 68.55         |
|        |             |       | 1 / 25                | 836.5   | 19.73        | 93.97         |
|        |             |       | 1 / 25                | 844.0   | <b>20.34</b> | <b>108.14</b> |
|        |             | 16QAM | 1 / 25                | 829.0   | 17.17        | 52.12         |
|        |             |       | 1 / 25                | 836.5   | <b>18.83</b> | <b>76.38</b>  |
|        |             |       | 1 / 0                 | 844.0   | 18.73        | 74.64         |
|        | 5           | QPSK  | 1 / 24                | 826.5   | 17.92        | 61.94         |
|        |             |       | 1 / 12                | 836.5   | 19.35        | 86.10         |
|        |             |       | 1 / 12                | 846.5   | <b>19.77</b> | <b>94.84</b>  |
|        |             | 16QAM | 1 / 12                | 826.5   | 16.22        | 41.88         |
|        |             |       | 1 / 12                | 836.5   | 18.02        | 63.39         |
|        |             |       | 1 / 0                 | 846.5   | <b>18.98</b> | <b>79.07</b>  |
|        | 3           | QPSK  | 1 / 8                 | 825.5   | 17.53        | 56.62         |
|        |             |       | 1 / 8                 | 836.5   | <b>19.61</b> | <b>91.41</b>  |
|        |             |       | 1 / 14                | 847.5   | 19.59        | 90.99         |
|        |             | 16QAM | 1 / 0                 | 825.5   | 16.39        | 43.55         |
|        |             |       | 1 / 14                | 836.5   | 18.65        | 73.28         |
|        |             |       | 1 / 8                 | 847.5   | <b>18.90</b> | <b>77.62</b>  |
|        | 1.4         | QPSK  | 1 / 3                 | 824.7   | 17.78        | 59.98         |
|        |             |       | 1 / 3                 | 836.5   | 19.60        | 91.20         |
|        |             |       | 1 / 5                 | 848.3   | <b>20.17</b> | <b>103.99</b> |
|        |             | 16QAM | 1 / 3                 | 824.7   | 16.87        | 48.64         |
|        |             |       | 1 / 5                 | 836.5   | <b>19.06</b> | <b>80.54</b>  |
|        |             |       | 1 / 0                 | 848.3   | 18.29        | 67.45         |

### LTE Band 12

| Band    | BW<br>[MHz] | Mode  | RB Size/<br>RB Offset | f [MHz] | ERP / EIRP   |              |
|---------|-------------|-------|-----------------------|---------|--------------|--------------|
|         |             |       |                       |         | [dBm]        | [mW]         |
| Band 12 | 10          | QPSK  | 1 / 25                | 704.0   | 16.71        | 46.88        |
|         |             |       | 1 / 25                | 707.5   | 16.86        | 48.53        |
|         |             |       | 1 / 0                 | 711.0   | <b>17.17</b> | <b>52.12</b> |
|         |             | 16QAM | 1 / 25                | 704.0   | 15.40        | 34.67        |
|         |             |       | 1 / 25                | 707.5   | <b>16.06</b> | <b>40.36</b> |
|         |             |       | 1 / 25                | 711.0   | 15.90        | 38.90        |
|         | 5           | QPSK  | 1 / 24                | 701.5   | 16.55        | 45.19        |
|         |             |       | 1 / 12                | 707.5   | 16.90        | 48.98        |
|         |             |       | 1 / 12                | 713.5   | <b>17.01</b> | <b>50.23</b> |
|         |             | 16QAM | 1 / 24                | 701.5   | 15.67        | 36.90        |
|         |             |       | 1 / 12                | 707.5   | 15.33        | 34.12        |
|         |             |       | 1 / 12                | 713.5   | <b>15.72</b> | <b>37.33</b> |
|         | 3           | QPSK  | 1 / 8                 | 700.5   | 16.79        | 47.75        |
|         |             |       | 1 / 0                 | 707.5   | 16.84        | 48.31        |
|         |             |       | 1 / 8                 | 714.5   | <b>17.22</b> | <b>52.72</b> |
|         |             | 16QAM | 1 / 8                 | 700.5   | 15.87        | 38.64        |
|         |             |       | 1 / 8                 | 707.5   | 15.80        | 38.02        |
|         |             |       | 1 / 0                 | 714.5   | <b>15.91</b> | <b>38.99</b> |
|         | 1.4         | QPSK  | 1 / 3                 | 699.7   | 16.73        | 47.10        |
|         |             |       | 1 / 3                 | 707.5   | 17.03        | 50.47        |
|         |             |       | 1 / 3                 | 715.3   | <b>17.25</b> | <b>53.09</b> |
|         |             | 16QAM | 1 / 3                 | 699.7   | 15.82        | 38.19        |
|         |             |       | 1 / 3                 | 707.5   | 16.10        | 40.74        |
|         |             |       | 1 / 3                 | 715.3   | <b>16.30</b> | <b>42.66</b> |

### LTE Band 17

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

## 10.1.2. ERP/EIRP DATA

### GSM850

GSM850

GPRS

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-15

Test Engineer: 20890

Configuration: EUT, Z-Position

Location: Chamber 1

Mode: GPRS 850 MHz Fundamentals

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 824.20  | 30.56            | V               | 3.0             | -1.0               | 26.59     | 38.5        | -11.9      |       |
| 824.20  | 19.63            | H               | 3.0             | -1.0               | 15.66     | 38.5        | -22.8      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 836.60  | 33.21            | V               | 3.0             | -0.9               | 29.27     | 38.5        | -9.2       |       |
| 836.60  | 21.49            | H               | 3.0             | -0.9               | 17.55     | 38.5        | -20.9      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 848.80  | 33.73            | V               | 3.1             | -0.9               | 29.82     | 38.5        | -8.7       |       |
| 848.80  | 22.49            | H               | 3.1             | -0.9               | 18.58     | 38.5        | -19.9      |       |

GSM850

EGPRS

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-15

Test Engineer: 20890

Configuration: EUT, Z-Position

Location: Chamber 1

Mode: EGPRS 850 MHz Fundamentals

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 824.20  | 22.79            | V               | 3.0             | -1.0               | 18.82     | 38.5        | -19.7      |       |
| 824.20  | 12.29            | H               | 3.0             | -1.0               | 8.32      | 38.5        | -30.2      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 836.60  | 25.59            | V               | 3.0             | -0.9               | 21.65     | 38.5        | -16.8      |       |
| 836.60  | 13.73            | H               | 3.0             | -0.9               | 9.79      | 38.5        | -28.7      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 848.80  | 26.38            | V               | 3.1             | -0.9               | 22.47     | 38.5        | -16.0      |       |
| 848.80  | 15.35            | H               | 3.1             | -0.9               | 11.44     | 38.5        | -27.1      |       |

**GSM1900**

GSM1900

GPRS

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4789294522

Date:

2020-01-15

Test Engineer:

20896

Configuration:

EUT / X-Position

Location:

Chamber 1

Mode:

GPRS 1900 MHz Fundamentals

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1850.20 | 20.63            | V               | 4.5             | 9.5                | 25.64      | 33.0        | -7.4       |       |
| 1850.20 | 23.28            | H               | 4.5             | 9.5                | 28.29      | 33.0        | -4.7       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 22.13            | V               | 4.5             | 9.3                | 26.90      | 33.0        | -6.1       |       |
| 1880.00 | 25.25            | H               | 4.5             | 9.3                | 30.02      | 33.0        | -3.0       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1909.80 | 21.33            | V               | 4.6             | 9.1                | 25.82      | 33.0        | -7.2       |       |
| 1909.80 | 25.06            | H               | 4.6             | 9.1                | 29.54      | 33.0        | -3.5       |       |

GSM1900

EGPRS

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4789294522

Date:

2020-01-15

Test Engineer:

20896

Configuration:

EUT / X-Position

Location:

Chamber 1

Mode:

EGPRS 1900 MHz Fundamentals

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1850.20 | 16.64            | V               | 4.5             | 9.5                | 21.65      | 33.0        | -11.4      |       |
| 1850.20 | 18.80            | H               | 4.5             | 9.5                | 23.81      | 33.0        | -9.2       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 17.85            | V               | 4.5             | 9.3                | 22.62      | 33.0        | -10.4      |       |
| 1880.00 | 18.62            | H               | 4.5             | 9.3                | 23.39      | 33.0        | -9.6       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1909.80 | 17.43            | V               | 4.6             | 9.1                | 21.92      | 33.0        | -11.1      |       |
| 1909.80 | 20.87            | H               | 4.6             | 9.1                | 25.35      | 33.0        | -7.6       |       |

**WCDMA Band 5**

WCDMA

Band 5

REL99

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789294522  
Date: 2020-01-16  
Test Engineer: 20896  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: Rel99 Band 5 Fundamentals

Test Equipment:  
Receiving: VULB9163-750, and Chamber 1 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 826.40  | 22.23            | V               | 3.0             | -0.9               | 18.27     | 38.5        | -20.2      |       |
| 826.40  | 9.43             | H               | 3.0             | -0.9               | 5.47      | 38.5        | -33.0      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 836.60  | 23.33            | V               | 3.0             | -0.9               | 19.39     | 38.5        | -19.1      |       |
| 836.60  | 9.89             | H               | 3.0             | -0.9               | 5.95      | 38.5        | -32.5      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 846.60  | 24.19            | V               | 3.1             | -0.9               | 20.27     | 38.5        | -18.2      |       |
| 846.60  | 10.71            | H               | 3.1             | -0.9               | 6.80      | 38.5        | -31.7      |       |

WCDMA

Band 5

HSDPA

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789294522  
Date: 2020-01-16  
Test Engineer: 20896  
Configuration: EUT, Z-Position  
Location: Chamber 1  
Mode: HSDPA Band 5 Fundamentals

Test Equipment:  
Receiving: VULB9163-750, and Chamber 1 SMA Cables  
Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 826.40  | 20.59            | V               | 3.0             | -0.9               | 16.63     | 38.5        | -21.9      |       |
| 826.40  | 7.97             | H               | 3.0             | -0.9               | 4.01      | 38.5        | -34.5      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 836.60  | 21.57            | V               | 3.0             | -0.9               | 17.63     | 38.5        | -20.9      |       |
| 836.60  | 8.65             | H               | 3.0             | -0.9               | 4.71      | 38.5        | -33.8      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 846.60  | 22.33            | V               | 3.1             | -0.9               | 18.41     | 38.5        | -20.1      |       |
| 846.60  | 9.45             | H               | 3.1             | -0.9               | 5.54      | 38.5        | -33.0      |       |

**WCDMA Band 4**

WCDMA

Band 4  
REL99

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789294522  
Date: 2020-01-16  
Test Engineer: 20896  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: Rel99 Band 4 Fundamentals

Test Equipment:  
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |               |                |               |       |
| 1712.40  | 10.71               | V                  | 4.3                | 9.4                   | 15.79         | 30.0           | -14.2         |       |
| 1712.40  | 14.62               | H                  | 4.3                | 9.4                   | 19.70         | 30.0           | -10.3         |       |
| Mid Ch   |                     |                    |                    |                       |               |                |               |       |
| 1732.60  | 11.20               | V                  | 4.3                | 9.5                   | 16.33         | 30.0           | -13.7         |       |
| 1732.60  | 14.87               | H                  | 4.3                | 9.5                   | 20.00         | 30.0           | -10.0         |       |
| High Ch  |                     |                    |                    |                       |               |                |               |       |
| 1752.60  | 11.80               | V                  | 4.4                | 9.5                   | 16.98         | 30.0           | -13.0         |       |
| 1752.60  | 14.83               | H                  | 4.4                | 9.5                   | 20.01         | 30.0           | -10.0         |       |

WCDMA

Band 4  
HSDPA

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789294522  
Date: 2020-01-16  
Test Engineer: 20896  
Configuration: EUT, X-Position  
Location: Chamber 1  
Mode: HSDPA Band 4 Fundamentals

Test Equipment:  
Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBi) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|
| Low Ch   |                     |                    |                    |                       |               |                |               |       |
| 1712.40  | 9.14                | V                  | 4.3                | 9.4                   | 14.22         | 30.0           | -15.8         |       |
| 1712.40  | 13.13               | H                  | 4.3                | 9.4                   | 18.21         | 30.0           | -11.8         |       |
| Mid Ch   |                     |                    |                    |                       |               |                |               |       |
| 1732.60  | 9.44                | V                  | 4.3                | 9.5                   | 14.57         | 30.0           | -15.4         |       |
| 1732.60  | 13.21               | H                  | 4.3                | 9.5                   | 18.34         | 30.0           | -11.7         |       |
| High Ch  |                     |                    |                    |                       |               |                |               |       |
| 1752.60  | 10.03               | V                  | 4.4                | 9.5                   | 15.21         | 30.0           | -14.8         |       |
| 1752.60  | 13.37               | H                  | 4.4                | 9.5                   | 18.55         | 30.0           | -11.4         |       |

**WCDMA Band 2**

| WCDMA<br><br>Band 2<br>REL99 | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-15<br/>Test Engineer: 20882<br/>Configuration: EUT, X-Position<br/>Location: Chamber 2<br/>Mode: Rel99 Band 2 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1852.40</td><td>12.52</td><td>V</td><td>4.5</td><td>9.4</td><td>17.42</td><td>33.0</td><td>-15.6</td><td></td></tr><tr><td>1852.40</td><td>15.05</td><td>H</td><td>4.5</td><td>9.4</td><td>19.95</td><td>33.0</td><td>-13.1</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1880.00</td><td>12.54</td><td>V</td><td>4.5</td><td>9.2</td><td>17.20</td><td>33.0</td><td>-15.8</td><td></td></tr><tr><td>1880.00</td><td>16.00</td><td>H</td><td>4.5</td><td>9.2</td><td>20.66</td><td>33.0</td><td>-12.3</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1907.60</td><td>14.15</td><td>V</td><td>4.6</td><td>9.0</td><td>18.54</td><td>33.0</td><td>-14.5</td><td></td></tr><tr><td>1907.60</td><td>16.34</td><td>H</td><td>4.6</td><td>9.0</td><td>20.73</td><td>33.0</td><td>-12.3</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1852.40 | 12.52 | V | 4.5 | 9.4 | 17.42 | 33.0 | -15.6 |  | 1852.40 | 15.05 | H | 4.5 | 9.4 | 19.95 | 33.0 | -13.1 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 12.54 | V | 4.5 | 9.2 | 17.20 | 33.0 | -15.8 |  | 1880.00 | 16.00 | H | 4.5 | 9.2 | 20.66 | 33.0 | -12.3 |  | High Ch |  |  |  |  |  |  |  |  | 1907.60 | 14.15 | V | 4.6 | 9.0 | 18.54 | 33.0 | -14.5 |  | 1907.60 | 16.34 | H | 4.6 | 9.0 | 20.73 | 33.0 | -12.3 |  |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12.52            | V               | 4.5             | 9.4                | 17.42      | 33.0        | -15.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 15.05            | H               | 4.5             | 9.4                | 19.95      | 33.0        | -13.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12.54            | V               | 4.5             | 9.2                | 17.20      | 33.0        | -15.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 16.00            | H               | 4.5             | 9.2                | 20.66      | 33.0        | -12.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1907.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 14.15            | V               | 4.6             | 9.0                | 18.54      | 33.0        | -14.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1907.60                      | 16.34                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H                | 4.6             | 9.0             | 20.73              | 33.0       | -12.3       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| WCDMA<br><br>Band 2<br>HSDPA | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-15<br/>Test Engineer: 20882<br/>Configuration: EUT, X-Position<br/>Location: Chamber 2<br/>Mode: HSDPA Band 2 Fundamentals</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1852.40</td><td>11.87</td><td>V</td><td>4.5</td><td>9.4</td><td>16.77</td><td>33.0</td><td>-16.2</td><td></td></tr><tr><td>1852.40</td><td>13.81</td><td>H</td><td>4.5</td><td>9.4</td><td>18.71</td><td>33.0</td><td>-14.3</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1880.00</td><td>12.57</td><td>V</td><td>4.5</td><td>9.2</td><td>17.23</td><td>33.0</td><td>-15.8</td><td></td></tr><tr><td>1880.00</td><td>15.20</td><td>H</td><td>4.5</td><td>9.2</td><td>19.86</td><td>33.0</td><td>-13.1</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1907.60</td><td>12.92</td><td>V</td><td>4.6</td><td>9.0</td><td>17.31</td><td>33.0</td><td>-15.7</td><td></td></tr><tr><td>1907.60</td><td>15.06</td><td>H</td><td>4.6</td><td>9.0</td><td>19.45</td><td>33.0</td><td>-13.6</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1852.40 | 11.87 | V | 4.5 | 9.4 | 16.77 | 33.0 | -16.2 |  | 1852.40 | 13.81 | H | 4.5 | 9.4 | 18.71 | 33.0 | -14.3 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 12.57 | V | 4.5 | 9.2 | 17.23 | 33.0 | -15.8 |  | 1880.00 | 15.20 | H | 4.5 | 9.2 | 19.86 | 33.0 | -13.1 |  | High Ch |  |  |  |  |  |  |  |  | 1907.60 | 12.92 | V | 4.6 | 9.0 | 17.31 | 33.0 | -15.7 |  | 1907.60 | 15.06 | H | 4.6 | 9.0 | 19.45 | 33.0 | -13.6 |  |
|                              | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 11.87            | V               | 4.5             | 9.4                | 16.77      | 33.0        | -16.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1852.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 13.81            | H               | 4.5             | 9.4                | 18.71      | 33.0        | -14.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12.57            | V               | 4.5             | 9.2                | 17.23      | 33.0        | -15.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 15.20            | H               | 4.5             | 9.2                | 19.86      | 33.0        | -13.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                              | 1907.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12.92            | V               | 4.6             | 9.0                | 17.31      | 33.0        | -15.7      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1907.60                      | 15.06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H                | 4.6             | 9.0             | 19.45              | 33.0       | -13.6       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |

**LTE Band 2**

LTE

Band 2

20MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-09

20890

EUT / X-Position

Chamber 1

LTE\_QPSK Band 2 Fundamentals, 20MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1860.00 | 8.21             | V               | 4.5             | 9.4                | 13.14      | 33.0        | -19.9      |       |
| 1860.00 | 15.72            | H               | 4.5             | 9.4                | 20.64      | 33.0        | -12.4      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 14.56            | V               | 4.5             | 9.3                | 19.33      | 33.0        | -13.7      |       |
| 1880.00 | 17.46            | H               | 4.5             | 9.3                | 22.23      | 33.0        | -10.8      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1900.00 | 14.44            | V               | 4.6             | 9.2                | 19.06      | 33.0        | -13.9      |       |
| 1900.00 | 17.88            | H               | 4.6             | 9.2                | 22.50      | 33.0        | -10.5      |       |

LTE

Band 2

20MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-09

20890

EUT / X-Position

Chamber 1

LTE\_16QAM Band 2 Fundamentals, 20MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1860.00 | 7.33             | V               | 4.5             | 9.4                | 12.26      | 33.0        | -20.7      |       |
| 1860.00 | 14.98            | H               | 4.5             | 9.4                | 19.90      | 33.0        | -13.1      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 12.62            | V               | 4.5             | 9.3                | 17.39      | 33.0        | -15.6      |       |
| 1880.00 | 15.84            | H               | 4.5             | 9.3                | 20.61      | 33.0        | -12.4      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1900.00 | 13.76            | V               | 4.6             | 9.2                | 18.38      | 33.0        | -14.6      |       |
| 1900.00 | 17.99            | H               | 4.6             | 9.2                | 22.61      | 33.0        | -10.4      |       |

LTE

Band 2

15MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-09

20890

EUT / X-Position

Chamber 1

LTE\_QPSK Band 2 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1857.50 | 13.67            | V               | 4.5             | 9.5                | 18.62      | 33.0        | -14.4      |       |
| 1857.50 | 15.72            | H               | 4.5             | 9.5                | 20.67      | 33.0        | -12.3      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 14.98            | V               | 4.5             | 9.3                | 19.75      | 33.0        | -13.2      |       |
| 1880.00 | 17.44            | H               | 4.5             | 9.3                | 22.21      | 33.0        | -10.8      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1902.50 | 15.43            | V               | 4.6             | 9.1                | 20.01      | 33.0        | -13.0      |       |
| 1902.50 | 19.60            | H               | 4.6             | 9.1                | 24.19      | 33.0        | -8.8       |       |

LTE

Band 2

15MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-09

20890

EUT / X-Position

Chamber 1

LTE\_16QAM Band 2 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1857.50 | 13.06            | V               | 4.5             | 9.5                | 18.01      | 33.0        | -15.0      |       |
| 1857.50 | 15.23            | H               | 4.5             | 9.5                | 20.18      | 33.0        | -12.8      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 12.91            | V               | 4.5             | 9.3                | 17.68      | 33.0        | -15.3      |       |
| 1880.00 | 15.66            | H               | 4.5             | 9.3                | 20.43      | 33.0        | -12.6      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1902.50 | 13.92            | V               | 4.6             | 9.1                | 18.50      | 33.0        | -14.5      |       |
| 1902.50 | 18.09            | H               | 4.6             | 9.1                | 22.68      | 33.0        | -10.3      |       |

LTE

Band 2

10MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

202-01-09

20890

EUT / X-Position

Chamber 1

LTE\_QPSK Band 2 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1855.00 | 7.29             | V               | 4.5             | 9.5                | 12.26      | 33.0        | -20.7      |       |
| 1855.00 | 15.66            | H               | 4.5             | 9.5                | 20.63      | 33.0        | -12.4      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 14.42            | V               | 4.5             | 9.3                | 19.19      | 33.0        | -13.8      |       |
| 1880.00 | 17.37            | H               | 4.5             | 9.3                | 22.14      | 33.0        | -10.9      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1905.00 | 15.18            | V               | 4.6             | 9.1                | 19.73      | 33.0        | -13.3      |       |
| 1905.00 | 19.63            | H               | 4.6             | 9.1                | 24.18      | 33.0        | -8.8       |       |

LTE

Band 2

10MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-09

20890

EUT / X-Position

Chamber 1

LTE\_16QAM Band 2 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1855.00 | 6.11             | V               | 4.5             | 9.5                | 11.08      | 33.0        | -21.9      |       |
| 1855.00 | 14.33            | H               | 4.5             | 9.5                | 19.30      | 33.0        | -13.7      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 13.48            | V               | 4.5             | 9.3                | 18.25      | 33.0        | -14.7      |       |
| 1880.00 | 16.94            | H               | 4.5             | 9.3                | 21.71      | 33.0        | -11.3      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1905.00 | 13.66            | V               | 4.6             | 9.1                | 18.21      | 33.0        | -14.8      |       |
| 1905.00 | 18.23            | H               | 4.6             | 9.1                | 22.78      | 33.0        | -10.2      |       |

LTE

Band 2

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1852.50 | 13.70            | V               | 4.5             | 9.5                | 18.69      | 33.0        | -14.3      |       |
| 1852.50 | 14.96            | H               | 4.5             | 9.5                | 19.95      | 33.0        | -13.1      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 13.37            | V               | 4.5             | 9.3                | 18.14      | 33.0        | -14.9      |       |
| 1880.00 | 16.87            | H               | 4.5             | 9.3                | 21.64      | 33.0        | -11.4      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1907.50 | 13.92            | V               | 4.6             | 9.1                | 18.44      | 33.0        | -14.6      |       |
| 1907.50 | 18.64            | H               | 4.6             | 9.1                | 23.16      | 33.0        | -9.8       |       |

LTE

Band 2

5MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1852.50 | 11.99            | V               | 4.5             | 9.5                | 16.98      | 33.0        | -16.0      |       |
| 1852.50 | 14.71            | H               | 4.5             | 9.5                | 19.70      | 33.0        | -13.3      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 12.54            | V               | 4.5             | 9.3                | 17.31      | 33.0        | -15.7      |       |
| 1880.00 | 15.37            | H               | 4.5             | 9.3                | 20.14      | 33.0        | -12.9      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1907.50 | 13.15            | V               | 4.6             | 9.1                | 17.67      | 33.0        | -15.3      |       |
| 1907.50 | 17.87            | H               | 4.6             | 9.1                | 22.39      | 33.0        | -10.6      |       |

LTE  
Band 2  
3MHz  
QPSK

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789294522  
Date: 2020-01-10  
Test Engineer: 20896  
Configuration: EUT / X-Position  
Location: Chamber 1  
Mode: LTE\_QPSK Band 2 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1851.50 | 13.61            | V               | 4.5             | 9.5                | 18.61      | 33.0        | -14.4      |       |
| 1851.50 | 16.00            | H               | 4.5             | 9.5                | 21.00      | 33.0        | -12.0      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 13.95            | V               | 4.5             | 9.3                | 18.72      | 33.0        | -14.3      |       |
| 1880.00 | 16.35            | H               | 4.5             | 9.3                | 21.12      | 33.0        | -11.9      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1908.50 | 14.12            | V               | 4.6             | 9.1                | 18.63      | 33.0        | -14.4      |       |
| 1908.50 | 17.47            | H               | 4.6             | 9.1                | 21.98      | 33.0        | -11.0      |       |

LTE  
Band 2  
3MHz  
16QAM

UL Verification Services, Inc.  
High Frequency Substitution Measurement

Company: Samsung  
Project #: 4789294522  
Date: 2020-01-10  
Test Engineer: 20896  
Configuration: EUT / X-Position  
Location: Chamber 1  
Mode: LTE\_16QAM Band 2 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables  
Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1851.50 | 12.11            | V               | 4.5             | 9.5                | 17.11      | 33.0        | -15.9      |       |
| 1851.50 | 14.55            | H               | 4.5             | 9.5                | 19.55      | 33.0        | -13.5      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 12.64            | V               | 4.5             | 9.3                | 17.41      | 33.0        | -15.6      |       |
| 1880.00 | 14.84            | H               | 4.5             | 9.3                | 19.61      | 33.0        | -13.4      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1908.50 | 12.83            | V               | 4.6             | 9.1                | 17.34      | 33.0        | -15.7      |       |
| 1908.50 | 16.62            | H               | 4.6             | 9.1                | 21.13      | 33.0        | -11.9      |       |

LTE

Band 2

1.4MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4789294522

Date:

2020-01-10

Test Engineer:

20896

Configuration:

EUT / X-Position

Location:

Chamber 1

Mode:

LTE\_QPSK Band 2 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1850.70 | 12.69            | V               | 4.5             | 9.5                | 17.69      | 33.0        | -15.3      |       |
| 1850.70 | 15.68            | H               | 4.5             | 9.5                | 20.68      | 33.0        | -12.3      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 13.63            | V               | 4.5             | 9.3                | 18.40      | 33.0        | -14.6      |       |
| 1880.00 | 16.74            | H               | 4.5             | 9.3                | 21.51      | 33.0        | -11.5      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1909.30 | 14.21            | V               | 4.6             | 9.1                | 18.70      | 33.0        | -14.3      |       |
| 1909.30 | 18.72            | H               | 4.6             | 9.1                | 23.22      | 33.0        | -9.8       |       |

LTE

Band 2

1.4MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4789294522

Date:

2020-01-10

Test Engineer:

20896

Configuration:

EUT / X-Position

Location:

Chamber 1

Mode:

LTE\_16QAM Band 2 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables

Substitution: Horn 3115[00167211], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1850.70 | 11.80            | V               | 4.5             | 9.5                | 16.80      | 33.0        | -16.2      |       |
| 1850.70 | 15.02            | H               | 4.5             | 9.5                | 20.02      | 33.0        | -13.0      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1880.00 | 12.71            | V               | 4.5             | 9.3                | 17.48      | 33.0        | -15.5      |       |
| 1880.00 | 15.56            | H               | 4.5             | 9.3                | 20.33      | 33.0        | -12.7      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1909.30 | 13.13            | V               | 4.6             | 9.1                | 17.62      | 33.0        | -15.4      |       |
| 1909.30 | 16.93            | H               | 4.6             | 9.1                | 21.43      | 33.0        | -11.6      |       |

**LTE Band 4**

| LTE<br><br>Band 4<br><br>20MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 4 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1720.00</td><td>12.38</td><td>V</td><td>4.3</td><td>9.4</td><td>17.40</td><td>30.0</td><td>-12.6</td><td></td></tr><tr><td>1720.00</td><td>16.48</td><td>H</td><td>4.3</td><td>9.4</td><td>21.50</td><td>30.0</td><td>-8.5</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.50</td><td>11.95</td><td>V</td><td>4.3</td><td>9.4</td><td>17.00</td><td>30.0</td><td>-13.0</td><td></td></tr><tr><td>1732.50</td><td>15.34</td><td>H</td><td>4.3</td><td>9.4</td><td>20.39</td><td>30.0</td><td>-9.6</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>13.05</td><td>V</td><td>4.4</td><td>9.4</td><td>18.14</td><td>30.0</td><td>-11.9</td><td></td></tr><tr><td>1745.00</td><td>16.10</td><td>H</td><td>4.4</td><td>9.4</td><td>21.19</td><td>30.0</td><td>-8.8</td><td></td></tr></table>     |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1720.00 | 12.38 | V | 4.3 | 9.4 | 17.40 | 30.0 | -12.6 |  | 1720.00 | 16.48 | H | 4.3 | 9.4 | 21.50 | 30.0 | -8.5  |  | Mid Ch |  |  |  |  |  |  |  |  | 1732.50 | 11.95 | V | 4.3 | 9.4 | 17.00 | 30.0 | -13.0 |  | 1732.50 | 15.34 | H | 4.3 | 9.4 | 20.39 | 30.0 | -9.6  |  | High Ch |  |  |  |  |  |  |  |  | 1745.00 | 13.05 | V | 4.4 | 9.4 | 18.14 | 30.0 | -11.9 |  | 1745.00 | 16.10 | H | 4.4 | 9.4 | 21.19 | 30.0 | -8.8  |  |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                             | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 12.38            | V               | 4.3             | 9.4                | 17.40      | 30.0        | -12.6      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 16.48            | H               | 4.3             | 9.4                | 21.50      | 30.0        | -8.5       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 11.95            | V               | 4.3             | 9.4                | 17.00      | 30.0        | -13.0      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 15.34            | H               | 4.3             | 9.4                | 20.39      | 30.0        | -9.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 13.05            | V               | 4.4             | 9.4                | 18.14      | 30.0        | -11.9      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1745.00                                     | 16.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 4.4             | 9.4             | 21.19              | 30.0       | -8.8        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| LTE<br><br>Band 4<br><br>20MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 4 Fundamentals, 20MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td>Low Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1720.00</td><td>10.77</td><td>V</td><td>4.3</td><td>9.4</td><td>15.79</td><td>30.0</td><td>-14.2</td><td></td></tr><tr><td>1720.00</td><td>14.76</td><td>H</td><td>4.3</td><td>9.4</td><td>19.78</td><td>30.0</td><td>-10.2</td><td></td></tr><tr><td>Mid Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1732.50</td><td>10.62</td><td>V</td><td>4.3</td><td>9.4</td><td>15.67</td><td>30.0</td><td>-14.3</td><td></td></tr><tr><td>1732.50</td><td>13.87</td><td>H</td><td>4.3</td><td>9.4</td><td>18.92</td><td>30.0</td><td>-11.1</td><td></td></tr><tr><td>High Ch</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1745.00</td><td>10.10</td><td>V</td><td>4.4</td><td>9.4</td><td>15.19</td><td>30.0</td><td>-14.8</td><td></td></tr><tr><td>1745.00</td><td>14.83</td><td>H</td><td>4.4</td><td>9.4</td><td>19.92</td><td>30.0</td><td>-10.1</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1720.00 | 10.77 | V | 4.3 | 9.4 | 15.79 | 30.0 | -14.2 |  | 1720.00 | 14.76 | H | 4.3 | 9.4 | 19.78 | 30.0 | -10.2 |  | Mid Ch |  |  |  |  |  |  |  |  | 1732.50 | 10.62 | V | 4.3 | 9.4 | 15.67 | 30.0 | -14.3 |  | 1732.50 | 13.87 | H | 4.3 | 9.4 | 18.92 | 30.0 | -11.1 |  | High Ch |  |  |  |  |  |  |  |  | 1745.00 | 10.10 | V | 4.4 | 9.4 | 15.19 | 30.0 | -14.8 |  | 1745.00 | 14.83 | H | 4.4 | 9.4 | 19.92 | 30.0 | -10.1 |  |
|                                             | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10.77            | V               | 4.3             | 9.4                | 15.79      | 30.0        | -14.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1720.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 14.76            | H               | 4.3             | 9.4                | 19.78      | 30.0        | -10.2      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10.62            | V               | 4.3             | 9.4                | 15.67      | 30.0        | -14.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 13.87            | H               | 4.3             | 9.4                | 18.92      | 30.0        | -11.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                             | 1745.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10.10            | V               | 4.4             | 9.4                | 15.19      | 30.0        | -14.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1745.00                                     | 14.83                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | H                | 4.4             | 9.4             | 19.92              | 30.0       | -10.1       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |

LTE

Band 4

15MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-13

Test Engineer: 20890

Configuration: EUT / X-Position

Location: Chamber 2

Mode: LTE\_QPSK Band 4 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1717.50 | 11.66            | V               | 4.3             | 9.3                | 16.68      | 30.0        | -13.3      |       |
| 1717.50 | 15.69            | H               | 4.3             | 9.3                | 20.71      | 30.0        | -9.3       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 11.50            | V               | 4.3             | 9.4                | 16.55      | 30.0        | -13.4      |       |
| 1732.50 | 15.66            | H               | 4.3             | 9.4                | 20.71      | 30.0        | -9.3       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1747.50 | 12.75            | V               | 4.4             | 9.5                | 17.85      | 30.0        | -12.2      |       |
| 1747.50 | 15.96            | H               | 4.4             | 9.5                | 21.06      | 30.0        | -8.9       |       |

LTE

Band 4

15MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-13

Test Engineer: 20890

Configuration: EUT / X-Position

Location: Chamber 2

Mode: LTE\_16QAM Band 4 Fundamentals, 15MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1717.50 | 10.66            | V               | 4.3             | 9.3                | 15.68      | 30.0        | -14.3      |       |
| 1717.50 | 14.73            | H               | 4.3             | 9.3                | 19.75      | 30.0        | -10.3      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 10.65            | V               | 4.3             | 9.4                | 15.70      | 30.0        | -14.3      |       |
| 1732.50 | 14.54            | H               | 4.3             | 9.4                | 19.59      | 30.0        | -10.4      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1747.50 | 10.00            | V               | 4.4             | 9.5                | 15.10      | 30.0        | -14.9      |       |
| 1747.50 | 14.16            | H               | 4.4             | 9.5                | 19.26      | 30.0        | -10.7      |       |

| LTE<br>Band 4<br>10MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_QPSK Band 4 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1715.00</td><td>11.53</td><td>V</td><td>4.3</td><td>9.3</td><td>16.54</td><td>30.0</td><td>-13.5</td><td></td></tr><tr><td>1715.00</td><td>15.42</td><td>H</td><td>4.3</td><td>9.3</td><td>20.43</td><td>30.0</td><td>-9.6</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1732.50</td><td>11.15</td><td>V</td><td>4.3</td><td>9.4</td><td>16.20</td><td>30.0</td><td>-13.8</td><td></td></tr><tr><td>1732.50</td><td>15.50</td><td>H</td><td>4.3</td><td>9.4</td><td>20.55</td><td>30.0</td><td>-9.4</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1750.00</td><td>12.38</td><td>V</td><td>4.4</td><td>9.5</td><td>17.48</td><td>30.0</td><td>-12.5</td><td></td></tr><tr><td>1750.00</td><td>16.44</td><td>H</td><td>4.4</td><td>9.5</td><td>21.55</td><td>30.0</td><td>-8.5</td><td></td></tr></table>   |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1715.00 | 11.53 | V | 4.3 | 9.3 | 16.54 | 30.0 | -13.5 |  | 1715.00 | 15.42 | H | 4.3 | 9.3 | 20.43 | 30.0 | -9.6 |  | Mid Ch |  |  |  |  |  |  |  |  | 1732.50 | 11.15 | V | 4.3 | 9.4 | 16.20 | 30.0 | -13.8 |  | 1732.50 | 15.50 | H | 4.3 | 9.4 | 20.55 | 30.0 | -9.4  |  | High Ch |  |  |  |  |  |  |  |  | 1750.00 | 12.38 | V | 4.4 | 9.5 | 17.48 | 30.0 | -12.5 |  | 1750.00 | 16.44 | H | 4.4 | 9.5 | 21.55 | 30.0 | -8.5  |  |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|-------|--|
|                                 | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11.53            | V               | 4.3             | 9.3                | 16.54      | 30.0        | -13.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15.42            | H               | 4.3             | 9.3                | 20.43      | 30.0        | -9.6       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 11.15            | V               | 4.3             | 9.4                | 16.20      | 30.0        | -13.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15.50            | H               | 4.3             | 9.4                | 20.55      | 30.0        | -9.4       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1750.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12.38            | V               | 4.4             | 9.5                | 17.48      | 30.0        | -12.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1750.00                         | 16.44                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 4.4             | 9.5             | 21.55              | 30.0       | -8.5        |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| LTE<br>Band 4<br>10MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20890<br/>Configuration: EUT / X-Position<br/>Location: Chamber 2<br/>Mode: LTE_16QAM Band 4 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables<br/>Substitution: Horn 3115[00167451], 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBi)</th><th>EIRP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>1715.00</td><td>10.70</td><td>V</td><td>4.3</td><td>9.3</td><td>15.71</td><td>30.0</td><td>-14.3</td><td></td></tr><tr><td>1715.00</td><td>15.28</td><td>H</td><td>4.3</td><td>9.3</td><td>20.29</td><td>30.0</td><td>-9.7</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>1732.50</td><td>10.48</td><td>V</td><td>4.3</td><td>9.4</td><td>15.53</td><td>30.0</td><td>-14.5</td><td></td></tr><tr><td>1732.50</td><td>14.10</td><td>H</td><td>4.3</td><td>9.4</td><td>19.15</td><td>30.0</td><td>-10.8</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>1750.00</td><td>9.84</td><td>V</td><td>4.4</td><td>9.5</td><td>14.94</td><td>30.0</td><td>-15.1</td><td></td></tr><tr><td>1750.00</td><td>14.27</td><td>H</td><td>4.4</td><td>9.5</td><td>19.38</td><td>30.0</td><td>-10.6</td><td></td></tr></table> |                  |                 |                 |                    |            |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 1715.00 | 10.70 | V | 4.3 | 9.3 | 15.71 | 30.0 | -14.3 |  | 1715.00 | 15.28 | H | 4.3 | 9.3 | 20.29 | 30.0 | -9.7 |  | Mid Ch |  |  |  |  |  |  |  |  | 1732.50 | 10.48 | V | 4.3 | 9.4 | 15.53 | 30.0 | -14.5 |  | 1732.50 | 14.10 | H | 4.3 | 9.4 | 19.15 | 30.0 | -10.8 |  | High Ch |  |  |  |  |  |  |  |  | 1750.00 | 9.84  | V | 4.4 | 9.5 | 14.94 | 30.0 | -15.1 |  | 1750.00 | 14.27 | H | 4.4 | 9.5 | 19.38 | 30.0 | -10.6 |  |
|                                 | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10.70            | V               | 4.3             | 9.3                | 15.71      | 30.0        | -14.3      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1715.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15.28            | H               | 4.3             | 9.3                | 20.29      | 30.0        | -9.7       |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10.48            | V               | 4.3             | 9.4                | 15.53      | 30.0        | -14.5      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1732.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 14.10            | H               | 4.3             | 9.4                | 19.15      | 30.0        | -10.8      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |            |             |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
|                                 | 1750.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 9.84             | V               | 4.4             | 9.5                | 14.94      | 30.0        | -15.1      |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |
| 1750.00                         | 14.27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 4.4             | 9.5             | 19.38              | 30.0       | -10.6       |            |       |       |                  |                 |                 |                    |            |             |            |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |       |  |

LTE

Band 4

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-13

Test Engineer: 20890

Configuration: EUT / X-Position

Location: Chamber 2

Mode: LTE\_QPSK Band 4 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1712.50 | 11.53            | V               | 4.3             | 9.3                | 16.53      | 30.0        | -13.5      |       |
| 1712.50 | 15.48            | H               | 4.3             | 9.3                | 20.48      | 30.0        | -9.5       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 11.79            | V               | 4.3             | 9.4                | 16.84      | 30.0        | -13.2      |       |
| 1732.50 | 15.27            | H               | 4.3             | 9.4                | 20.32      | 30.0        | -9.7       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1752.50 | 12.16            | V               | 4.4             | 9.5                | 17.27      | 30.0        | -12.7      |       |
| 1752.50 | 16.32            | H               | 4.4             | 9.5                | 21.42      | 30.0        | -8.6       |       |

LTE

Band 4

5MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-13

Test Engineer: 20890

Configuration: EUT / X-Position

Location: Chamber 2

Mode: LTE\_16QAM Band 4 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1712.50 | 10.42            | V               | 4.3             | 9.3                | 15.42      | 30.0        | -14.6      |       |
| 1712.50 | 14.21            | H               | 4.3             | 9.3                | 19.21      | 30.0        | -10.8      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 10.17            | V               | 4.3             | 9.4                | 15.22      | 30.0        | -14.8      |       |
| 1732.50 | 14.32            | H               | 4.3             | 9.4                | 19.37      | 30.0        | -10.6      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1752.50 | 10.59            | V               | 4.4             | 9.5                | 15.70      | 30.0        | -14.3      |       |
| 1752.50 | 14.09            | H               | 4.4             | 9.5                | 19.19      | 30.0        | -10.8      |       |

LTE

Band 4

3MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4789294522

Date:

2020-01-16

Test Engineer:

20896

Configuration:

EUT, X-Position

Location:

Chamber 2

Mode:

LTE\_QPSK Band 4 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1711.50 | 10.42            | V               | 4.3             | 9.3                | 15.43      | 30.0        | -14.6      |       |
| 1711.50 | 15.41            | H               | 4.3             | 9.3                | 20.42      | 30.0        | -9.6       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 11.32            | V               | 4.3             | 9.4                | 16.37      | 30.0        | -13.6      |       |
| 1732.50 | 15.12            | H               | 4.3             | 9.4                | 20.17      | 30.0        | -9.8       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1753.50 | 10.40            | V               | 4.4             | 9.5                | 15.50      | 30.0        | -14.5      |       |
| 1753.50 | 16.17            | H               | 4.4             | 9.5                | 21.27      | 30.0        | -8.7       |       |

LTE

Band 4

3MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Samsung

Project #:

4789294522

Date:

2020-01-16

Test Engineer:

20896

Configuration:

EUT, X-Position

Location:

Chamber 2

Mode:

LTE\_16QAM Band 4 Fundamentals, 3MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1711.50 | 9.39             | V               | 4.3             | 9.3                | 14.40      | 30.0        | -15.6      |       |
| 1711.50 | 14.49            | H               | 4.3             | 9.3                | 19.50      | 30.0        | -10.5      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 9.76             | V               | 4.3             | 9.4                | 14.81      | 30.0        | -15.2      |       |
| 1732.50 | 13.94            | H               | 4.3             | 9.4                | 18.99      | 30.0        | -11.0      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1753.50 | 9.43             | V               | 4.4             | 9.5                | 14.53      | 30.0        | -15.5      |       |
| 1753.50 | 14.38            | H               | 4.4             | 9.5                | 19.48      | 30.0        | -10.5      |       |

LTE

Band 4

1.4MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-16

Test Engineer: 20896

Configuration: EUT, X-Position

Location: Chamber 2

Mode: LTE\_QPSK Band 4 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1710.70 | 10.37            | V               | 4.3             | 9.3                | 15.37      | 30.0        | -14.6      |       |
| 1710.70 | 15.32            | H               | 4.3             | 9.3                | 20.32      | 30.0        | -9.7       |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 11.28            | V               | 4.3             | 9.4                | 16.33      | 30.0        | -13.7      |       |
| 1732.50 | 15.51            | H               | 4.3             | 9.4                | 20.56      | 30.0        | -9.4       |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1754.30 | 12.19            | V               | 4.4             | 9.5                | 17.30      | 30.0        | -12.7      |       |
| 1754.30 | 16.08            | H               | 4.4             | 9.5                | 21.19      | 30.0        | -8.8       |       |

LTE

Band 4

1.4MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company: Samsung

Project #: 4789294522

Date: 2020-01-16

Test Engineer: 20896

Configuration: EUT, X-Position

Location: Chamber 2

Mode: LTE\_16QAM Band 4 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: Horn 3117[00168724], and Chamber 2 SMA Cables

Substitution: Horn 3115[00167451], 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|------------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |            |             |            |       |
| 1710.70 | 9.31             | V               | 4.3             | 9.3                | 14.31      | 30.0        | -15.7      |       |
| 1710.70 | 14.33            | H               | 4.3             | 9.3                | 19.33      | 30.0        | -10.7      |       |
| Mid Ch  |                  |                 |                 |                    |            |             |            |       |
| 1732.50 | 10.36            | V               | 4.3             | 9.4                | 15.41      | 30.0        | -14.6      |       |
| 1732.50 | 14.60            | H               | 4.3             | 9.4                | 19.65      | 30.0        | -10.3      |       |
| High Ch |                  |                 |                 |                    |            |             |            |       |
| 1754.30 | 10.71            | V               | 4.4             | 9.5                | 15.82      | 30.0        | -14.2      |       |
| 1754.30 | 15.02            | H               | 4.4             | 9.5                | 20.13      | 30.0        | -9.9       |       |

**LTE Band 5**

| LTE<br><br>Band 5<br><br>10MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-10<br/>Test Engineer: 20896<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 5 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>829.00</td><td>22.32</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.36</td><td>38.5</td><td>-20.1</td><td></td></tr><tr><td>829.00</td><td>10.77</td><td>H</td><td>3.0</td><td>-0.9</td><td>6.82</td><td>38.5</td><td>-31.7</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>836.50</td><td>23.67</td><td>V</td><td>3.0</td><td>-0.9</td><td>19.73</td><td>38.5</td><td>-18.8</td><td></td></tr><tr><td>836.50</td><td>11.10</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.16</td><td>38.5</td><td>-31.3</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>844.00</td><td>24.26</td><td>V</td><td>3.0</td><td>-0.9</td><td>20.34</td><td>38.5</td><td>-18.2</td><td></td></tr><tr><td>844.00</td><td>11.64</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.72</td><td>38.5</td><td>-30.8</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 829.00 | 22.32 | V | 3.0 | -0.9 | 18.36 | 38.5 | -20.1 |  | 829.00 | 10.77 | H | 3.0 | -0.9 | 6.82 | 38.5 | -31.7 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 23.67 | V | 3.0 | -0.9 | 19.73 | 38.5 | -18.8 |  | 836.50 | 11.10 | H | 3.0 | -0.9 | 7.16 | 38.5 | -31.3 |  | High Ch |  |  |  |  |  |  |  |  | 844.00 | 24.26 | V | 3.0 | -0.9 | 20.34 | 38.5 | -18.2 |  | 844.00 | 11.64 | H | 3.0 | -0.9 | 7.72 | 38.5 | -30.8 |  |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|
|                                             | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 22.32            | V               | 3.0             | -0.9               | 18.36     | 38.5        | -20.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.77            | H               | 3.0             | -0.9               | 6.82      | 38.5        | -31.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 23.67            | V               | 3.0             | -0.9               | 19.73     | 38.5        | -18.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 11.10            | H               | 3.0             | -0.9               | 7.16      | 38.5        | -31.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 844.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 24.26            | V               | 3.0             | -0.9               | 20.34     | 38.5        | -18.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 844.00                                      | 11.64                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                | 3.0             | -0.9            | 7.72               | 38.5      | -30.8       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| LTE<br><br>Band 5<br><br>10MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-10<br/>Test Engineer: 20896<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 5 Fundamentals, 10MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>829.00</td><td>21.13</td><td>V</td><td>3.0</td><td>-0.9</td><td>17.17</td><td>38.5</td><td>-21.3</td><td></td></tr><tr><td>829.00</td><td>9.53</td><td>H</td><td>3.0</td><td>-0.9</td><td>5.58</td><td>38.5</td><td>-32.9</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>836.50</td><td>22.77</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.83</td><td>38.5</td><td>-19.7</td><td></td></tr><tr><td>836.50</td><td>10.20</td><td>H</td><td>3.0</td><td>-0.9</td><td>6.26</td><td>38.5</td><td>-32.2</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>844.00</td><td>22.65</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.73</td><td>38.5</td><td>-19.8</td><td></td></tr><tr><td>844.00</td><td>10.29</td><td>H</td><td>3.0</td><td>-0.9</td><td>6.37</td><td>38.5</td><td>-32.1</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 829.00 | 21.13 | V | 3.0 | -0.9 | 17.17 | 38.5 | -21.3 |  | 829.00 | 9.53  | H | 3.0 | -0.9 | 5.58 | 38.5 | -32.9 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 22.77 | V | 3.0 | -0.9 | 18.83 | 38.5 | -19.7 |  | 836.50 | 10.20 | H | 3.0 | -0.9 | 6.26 | 38.5 | -32.2 |  | High Ch |  |  |  |  |  |  |  |  | 844.00 | 22.65 | V | 3.0 | -0.9 | 18.73 | 38.5 | -19.8 |  | 844.00 | 10.29 | H | 3.0 | -0.9 | 6.37 | 38.5 | -32.1 |  |
|                                             | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 21.13            | V               | 3.0             | -0.9               | 17.17     | 38.5        | -21.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 829.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 9.53             | H               | 3.0             | -0.9               | 5.58      | 38.5        | -32.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 22.77            | V               | 3.0             | -0.9               | 18.83     | 38.5        | -19.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.20            | H               | 3.0             | -0.9               | 6.26      | 38.5        | -32.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                             | 844.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 22.65            | V               | 3.0             | -0.9               | 18.73     | 38.5        | -19.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 844.00                                      | 10.29                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | H                | 3.0             | -0.9            | 6.37               | 38.5      | -32.1       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |

| LTE<br>Band 5<br>5MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-10<br/>Test Engineer: 20896<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 5 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>826.50</td><td>21.88</td><td>V</td><td>3.0</td><td>-0.9</td><td>17.92</td><td>38.5</td><td>-20.6</td><td></td></tr><tr><td>826.50</td><td>10.37</td><td>H</td><td>3.0</td><td>-0.9</td><td>6.41</td><td>38.5</td><td>-32.1</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>836.50</td><td>23.29</td><td>V</td><td>3.0</td><td>-0.9</td><td>19.35</td><td>38.5</td><td>-19.1</td><td></td></tr><tr><td>836.50</td><td>11.02</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.08</td><td>38.5</td><td>-31.4</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>846.50</td><td>23.69</td><td>V</td><td>3.0</td><td>-0.9</td><td>19.77</td><td>38.5</td><td>-18.7</td><td></td></tr><tr><td>846.50</td><td>12.31</td><td>H</td><td>3.0</td><td>-0.9</td><td>8.39</td><td>38.5</td><td>-30.1</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 826.50 | 21.88 | V | 3.0 | -0.9 | 17.92 | 38.5 | -20.6 |  | 826.50 | 10.37 | H | 3.0 | -0.9 | 6.41 | 38.5 | -32.1 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 23.29 | V | 3.0 | -0.9 | 19.35 | 38.5 | -19.1 |  | 836.50 | 11.02 | H | 3.0 | -0.9 | 7.08 | 38.5 | -31.4 |  | High Ch |  |  |  |  |  |  |  |  | 846.50 | 23.69 | V | 3.0 | -0.9 | 19.77 | 38.5 | -18.7 |  | 846.50 | 12.31 | H | 3.0 | -0.9 | 8.39 | 38.5 | -30.1 |  |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|
|                                | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 826.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.88            | V               | 3.0             | -0.9               | 17.92     | 38.5        | -20.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 826.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10.37            | H               | 3.0             | -0.9               | 6.41      | 38.5        | -32.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.29            | V               | 3.0             | -0.9               | 19.35     | 38.5        | -19.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.02            | H               | 3.0             | -0.9               | 7.08      | 38.5        | -31.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 846.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.69            | V               | 3.0             | -0.9               | 19.77     | 38.5        | -18.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 846.50                         | 12.31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 3.0             | -0.9            | 8.39               | 38.5      | -30.1       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| LTE<br>Band 5<br>5MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-10<br/>Test Engineer: 20896<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 5 Fundamentals, 5MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>826.50</td><td>20.18</td><td>V</td><td>3.0</td><td>-0.9</td><td>16.22</td><td>38.5</td><td>-22.3</td><td></td></tr><tr><td>826.50</td><td>8.69</td><td>H</td><td>3.0</td><td>-0.9</td><td>4.73</td><td>38.5</td><td>-33.8</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>836.50</td><td>21.96</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.02</td><td>38.5</td><td>-20.5</td><td></td></tr><tr><td>836.50</td><td>10.05</td><td>H</td><td>3.0</td><td>-0.9</td><td>6.11</td><td>38.5</td><td>-32.4</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>846.50</td><td>22.90</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.98</td><td>38.5</td><td>-19.5</td><td></td></tr><tr><td>846.50</td><td>10.26</td><td>H</td><td>3.0</td><td>-0.9</td><td>6.34</td><td>38.5</td><td>-32.2</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 826.50 | 20.18 | V | 3.0 | -0.9 | 16.22 | 38.5 | -22.3 |  | 826.50 | 8.69  | H | 3.0 | -0.9 | 4.73 | 38.5 | -33.8 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 21.96 | V | 3.0 | -0.9 | 18.02 | 38.5 | -20.5 |  | 836.50 | 10.05 | H | 3.0 | -0.9 | 6.11 | 38.5 | -32.4 |  | High Ch |  |  |  |  |  |  |  |  | 846.50 | 22.90 | V | 3.0 | -0.9 | 18.98 | 38.5 | -19.5 |  | 846.50 | 10.26 | H | 3.0 | -0.9 | 6.34 | 38.5 | -32.2 |  |
|                                | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 826.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20.18            | V               | 3.0             | -0.9               | 16.22     | 38.5        | -22.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 826.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 8.69             | H               | 3.0             | -0.9               | 4.73      | 38.5        | -33.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.96            | V               | 3.0             | -0.9               | 18.02     | 38.5        | -20.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10.05            | H               | 3.0             | -0.9               | 6.11      | 38.5        | -32.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                | 846.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.90            | V               | 3.0             | -0.9               | 18.98     | 38.5        | -19.5      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 846.50                         | 10.26                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 3.0             | -0.9            | 6.34               | 38.5      | -32.2       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |

| LTE<br>Band 5<br><br>3MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-10<br/>Test Engineer: 20896<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 5 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>825.50</td><td>21.49</td><td>V</td><td>3.0</td><td>-0.9</td><td>17.53</td><td>38.5</td><td>-21.0</td><td></td></tr><tr><td>825.50</td><td>10.45</td><td>H</td><td>3.0</td><td>-0.9</td><td>6.49</td><td>38.5</td><td>-32.0</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>836.50</td><td>23.55</td><td>V</td><td>3.0</td><td>-0.9</td><td>19.61</td><td>38.5</td><td>-18.9</td><td></td></tr><tr><td>836.50</td><td>11.22</td><td>H</td><td>3.0</td><td>-0.9</td><td>7.28</td><td>38.5</td><td>-31.2</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>847.50</td><td>23.50</td><td>V</td><td>3.1</td><td>-0.9</td><td>19.59</td><td>38.5</td><td>-18.9</td><td></td></tr><tr><td>847.50</td><td>11.40</td><td>H</td><td>3.1</td><td>-0.9</td><td>7.49</td><td>38.5</td><td>-31.0</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 825.50 | 21.49 | V | 3.0 | -0.9 | 17.53 | 38.5 | -21.0 |  | 825.50 | 10.45 | H | 3.0 | -0.9 | 6.49 | 38.5 | -32.0 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 23.55 | V | 3.0 | -0.9 | 19.61 | 38.5 | -18.9 |  | 836.50 | 11.22 | H | 3.0 | -0.9 | 7.28 | 38.5 | -31.2 |  | High Ch |  |  |  |  |  |  |  |  | 847.50 | 23.50 | V | 3.1 | -0.9 | 19.59 | 38.5 | -18.9 |  | 847.50 | 11.40 | H | 3.1 | -0.9 | 7.49 | 38.5 | -31.0 |  |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|-------|------|-------|--|--------|-------|---|-----|------|------|------|-------|--|
|                                        | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 825.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 21.49            | V               | 3.0             | -0.9               | 17.53     | 38.5        | -21.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 825.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10.45            | H               | 3.0             | -0.9               | 6.49      | 38.5        | -32.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.55            | V               | 3.0             | -0.9               | 19.61     | 38.5        | -18.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11.22            | H               | 3.0             | -0.9               | 7.28      | 38.5        | -31.2      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 847.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.50            | V               | 3.1             | -0.9               | 19.59     | 38.5        | -18.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 847.50                                 | 11.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 3.1             | -0.9            | 7.49               | 38.5      | -31.0       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| LTE<br>Band 5<br><br>3MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-10<br/>Test Engineer: 20896<br/>Configuration: EUT, Z-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 5 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>825.50</td><td>20.35</td><td>V</td><td>3.0</td><td>-0.9</td><td>16.39</td><td>38.5</td><td>-22.1</td><td></td></tr><tr><td>825.50</td><td>9.37</td><td>H</td><td>3.0</td><td>-0.9</td><td>5.41</td><td>38.5</td><td>-33.1</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>836.50</td><td>22.59</td><td>V</td><td>3.0</td><td>-0.9</td><td>18.65</td><td>38.5</td><td>-19.8</td><td></td></tr><tr><td>836.50</td><td>9.76</td><td>H</td><td>3.0</td><td>-0.9</td><td>5.82</td><td>38.5</td><td>-32.7</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>847.50</td><td>22.81</td><td>V</td><td>3.1</td><td>-0.9</td><td>18.90</td><td>38.5</td><td>-19.6</td><td></td></tr><tr><td>847.50</td><td>11.88</td><td>H</td><td>3.1</td><td>-0.9</td><td>7.97</td><td>38.5</td><td>-30.5</td><td></td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 825.50 | 20.35 | V | 3.0 | -0.9 | 16.39 | 38.5 | -22.1 |  | 825.50 | 9.37  | H | 3.0 | -0.9 | 5.41 | 38.5 | -33.1 |  | Mid Ch |  |  |  |  |  |  |  |  | 836.50 | 22.59 | V | 3.0 | -0.9 | 18.65 | 38.5 | -19.8 |  | 836.50 | 9.76  | H | 3.0 | -0.9 | 5.82 | 38.5 | -32.7 |  | High Ch |  |  |  |  |  |  |  |  | 847.50 | 22.81 | V | 3.1 | -0.9 | 18.90 | 38.5 | -19.6 |  | 847.50 | 11.88 | H | 3.1 | -0.9 | 7.97 | 38.5 | -30.5 |  |
|                                        | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 825.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20.35            | V               | 3.0             | -0.9               | 16.39     | 38.5        | -22.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 825.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 9.37             | H               | 3.0             | -0.9               | 5.41      | 38.5        | -33.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.59            | V               | 3.0             | -0.9               | 18.65     | 38.5        | -19.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 836.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 9.76             | H               | 3.0             | -0.9               | 5.82      | 38.5        | -32.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
|                                        | 847.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 22.81            | V               | 3.1             | -0.9               | 18.90     | 38.5        | -19.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |
| 847.50                                 | 11.88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | H                | 3.1             | -0.9            | 7.97               | 38.5      | -30.5       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |       |      |       |  |        |       |   |     |      |      |      |       |  |

LTE

Band 5

1.4MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-10

20896

EUT, Z-Position

Chamber 1

LTE\_QPSK Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 824.70  | 21.75            | V               | 3.0             | -1.0               | 17.78     | 38.5        | -20.7      |       |
| 824.70  | 10.42            | H               | 3.0             | -1.0               | 6.46      | 38.5        | -32.0      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 836.50  | 23.54            | V               | 3.0             | -0.9               | 19.60     | 38.5        | -18.9      |       |
| 836.50  | 11.09            | H               | 3.0             | -0.9               | 7.15      | 38.5        | -31.4      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 848.30  | 24.08            | V               | 3.0             | -0.9               | 20.17     | 38.5        | -18.3      |       |
| 848.30  | 11.83            | H               | 3.0             | -0.9               | 7.92      | 38.5        | -30.6      |       |

LTE

Band 5

1.4MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-10

20896

EUT, Z-Position

Chamber 1

LTE\_16QAM Band 5 Fundamentals, 1.4MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 824.70  | 20.84            | V               | 3.0             | -1.0               | 16.87     | 38.5        | -21.6      |       |
| 824.70  | 9.75             | H               | 3.0             | -1.0               | 5.79      | 38.5        | -32.7      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 836.50  | 23.00            | V               | 3.0             | -0.9               | 19.06     | 38.5        | -19.4      |       |
| 836.50  | 10.79            | H               | 3.0             | -0.9               | 6.85      | 38.5        | -31.7      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 848.30  | 22.20            | V               | 3.0             | -0.9               | 18.29     | 38.5        | -20.2      |       |
| 848.30  | 10.48            | H               | 3.0             | -0.9               | 6.57      | 38.5        | -31.9      |       |

**LTE Band 12**

LTE

Band 12

10MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-13

20896

EUT, X-Position

Chamber 1

LTE\_QPSK Band 12 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 704.00  | 12.56            | V               | 2.8             | -1.1               | 8.72      | 34.8        | -26.1      |       |
| 704.00  | 20.55            | H               | 2.8             | -1.1               | 16.71     | 34.8        | -18.1      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 12.40            | V               | 2.8             | -1.1               | 8.56      | 34.8        | -26.2      |       |
| 707.50  | 20.71            | H               | 2.8             | -1.1               | 16.86     | 34.8        | -17.9      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 711.00  | 12.70            | V               | 2.8             | -1.1               | 8.84      | 34.8        | -26.0      |       |
| 711.00  | 21.03            | H               | 2.8             | -1.1               | 17.17     | 34.8        | -17.6      |       |

LTE

Band 12

10MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-13

20896

EUT, X-Position

Chamber 1

LTE\_16QAM Band 12 Fundamentals, 10MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 704.00  | 11.34            | V               | 2.8             | -1.1               | 7.50      | 34.8        | -27.3      |       |
| 704.00  | 19.24            | H               | 2.8             | -1.1               | 15.40     | 34.8        | -19.4      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 11.70            | V               | 2.8             | -1.1               | 7.86      | 34.8        | -26.9      |       |
| 707.50  | 19.91            | H               | 2.8             | -1.1               | 16.06     | 34.8        | -18.7      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 711.00  | 11.05            | V               | 2.8             | -1.1               | 7.19      | 34.8        | -27.6      |       |
| 711.00  | 19.76            | H               | 2.8             | -1.1               | 15.90     | 34.8        | -18.9      |       |

LTE

Band 12

5MHz

QPSK

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-13

20896

EUT, X-Position

Chamber 1

LTE\_QPSK Band 12 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 701.50  | 12.39            | V               | 2.8             | -1.1               | 8.56      | 34.8        | -26.2      |       |
| 701.50  | 20.39            | H               | 2.8             | -1.1               | 16.55     | 34.8        | -18.3      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 12.49            | V               | 2.8             | -1.1               | 8.65      | 34.8        | -26.2      |       |
| 707.50  | 20.75            | H               | 2.8             | -1.1               | 16.90     | 34.8        | -17.9      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 713.50  | 12.25            | V               | 2.8             | -1.1               | 8.38      | 34.8        | -26.4      |       |
| 713.50  | 20.87            | H               | 2.8             | -1.1               | 17.01     | 34.8        | -17.8      |       |

LTE

Band 12

5MHz

16QAM

UL Verification Services, Inc.

High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-13

20896

EUT, X-Position

Chamber 1

LTE\_16QAM Band 12 Fundamentals, 5MHz Bandwidth

Test Equipment:

Receiving: VULB9163-750, and Chamber 1 SMA Cables

Substitution: Dipole 3121\_DB4, 8.5m SMA-type Cable

| f MHz   | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|
| Low Ch  |                  |                 |                 |                    |           |             |            |       |
| 701.50  | 11.45            | V               | 2.8             | -1.1               | 7.62      | 34.8        | -27.2      |       |
| 701.50  | 19.51            | H               | 2.8             | -1.1               | 15.67     | 34.8        | -19.1      |       |
| Mid Ch  |                  |                 |                 |                    |           |             |            |       |
| 707.50  | 10.97            | V               | 2.8             | -1.1               | 7.13      | 34.8        | -27.7      |       |
| 707.50  | 19.18            | H               | 2.8             | -1.1               | 15.33     | 34.8        | -19.5      |       |
| High Ch |                  |                 |                 |                    |           |             |            |       |
| 713.50  | 11.30            | V               | 2.8             | -1.1               | 7.43      | 34.8        | -27.4      |       |
| 713.50  | 19.58            | H               | 2.8             | -1.1               | 15.72     | 34.8        | -19.1      |       |

| LTE<br>Band 12<br><br>3MHz<br><br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20896<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>700.50</td><td>12.25</td><td>V</td><td>2.8</td><td>-1.1</td><td>8.42</td><td>34.8</td><td>-26.4</td><td></td></tr><tr><td>700.50</td><td>20.62</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.79</td><td>34.8</td><td>-18.0</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>12.50</td><td>V</td><td>2.8</td><td>-1.1</td><td>8.66</td><td>34.8</td><td>-26.1</td><td></td></tr><tr><td>707.50</td><td>20.69</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.84</td><td>34.8</td><td>-18.0</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>714.50</td><td>12.95</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.09</td><td>34.8</td><td>-25.7</td><td></td></tr><tr><td>714.50</td><td>21.08</td><td>H</td><td>2.8</td><td>-1.1</td><td>17.22</td><td>34.8</td><td>-17.6</td><td></td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 700.50 | 12.25 | V | 2.8 | -1.1 | 8.42 | 34.8 | -26.4 |  | 700.50 | 20.62 | H | 2.8 | -1.1 | 16.79 | 34.8 | -18.0 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 12.50 | V | 2.8 | -1.1 | 8.66 | 34.8 | -26.1 |  | 707.50 | 20.69 | H | 2.8 | -1.1 | 16.84 | 34.8 | -18.0 |  | High Ch |  |  |  |  |  |  |  |  | 714.50 | 12.95 | V | 2.8 | -1.1 | 9.09 | 34.8 | -25.7 |  | 714.50 | 21.08 | H | 2.8 | -1.1 | 17.22 | 34.8 | -17.6 |  |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.25            | V               | 2.8             | -1.1               | 8.42      | 34.8        | -26.4      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.62            | H               | 2.8             | -1.1               | 16.79     | 34.8        | -18.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.50            | V               | 2.8             | -1.1               | 8.66      | 34.8        | -26.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20.69            | H               | 2.8             | -1.1               | 16.84     | 34.8        | -18.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 714.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 12.95            | V               | 2.8             | -1.1               | 9.09      | 34.8        | -25.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 714.50                                  | 21.08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                | 2.8             | -1.1            | 17.22              | 34.8      | -17.6       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| LTE<br>Band 12<br><br>3MHz<br><br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20896<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 3MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>700.50</td><td>11.32</td><td>V</td><td>2.8</td><td>-1.1</td><td>7.49</td><td>34.8</td><td>-27.3</td><td></td></tr><tr><td>700.50</td><td>19.70</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.87</td><td>34.8</td><td>-18.9</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>11.04</td><td>V</td><td>2.8</td><td>-1.1</td><td>7.20</td><td>34.8</td><td>-27.6</td><td></td></tr><tr><td>707.50</td><td>19.65</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.80</td><td>34.8</td><td>-19.0</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>714.50</td><td>11.73</td><td>V</td><td>2.8</td><td>-1.1</td><td>7.87</td><td>34.8</td><td>-26.9</td><td></td></tr><tr><td>714.50</td><td>19.77</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.91</td><td>34.8</td><td>-18.9</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 700.50 | 11.32 | V | 2.8 | -1.1 | 7.49 | 34.8 | -27.3 |  | 700.50 | 19.70 | H | 2.8 | -1.1 | 15.87 | 34.8 | -18.9 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 11.04 | V | 2.8 | -1.1 | 7.20 | 34.8 | -27.6 |  | 707.50 | 19.65 | H | 2.8 | -1.1 | 15.80 | 34.8 | -19.0 |  | High Ch |  |  |  |  |  |  |  |  | 714.50 | 11.73 | V | 2.8 | -1.1 | 7.87 | 34.8 | -26.9 |  | 714.50 | 19.77 | H | 2.8 | -1.1 | 15.91 | 34.8 | -18.9 |  |
|                                         | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.32            | V               | 2.8             | -1.1               | 7.49      | 34.8        | -27.3      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 700.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 19.70            | H               | 2.8             | -1.1               | 15.87     | 34.8        | -18.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.04            | V               | 2.8             | -1.1               | 7.20      | 34.8        | -27.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 19.65            | H               | 2.8             | -1.1               | 15.80     | 34.8        | -19.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                         | 714.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 11.73            | V               | 2.8             | -1.1               | 7.87      | 34.8        | -26.9      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 714.50                                  | 19.77                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | H                | 2.8             | -1.1            | 15.91              | 34.8      | -18.9       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |

| LTE<br>Band 12<br>1.4MHz<br>QPSK  | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20896<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_QPSK Band 12 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>699.70</td><td>11.99</td><td>V</td><td>2.8</td><td>-1.1</td><td>8.16</td><td>34.8</td><td>-26.6</td><td></td></tr><tr><td>699.70</td><td>20.57</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.73</td><td>34.8</td><td>-18.1</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>12.90</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.06</td><td>34.8</td><td>-25.7</td><td></td></tr><tr><td>707.50</td><td>20.88</td><td>H</td><td>2.8</td><td>-1.1</td><td>17.03</td><td>34.8</td><td>-17.8</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>715.30</td><td>12.87</td><td>V</td><td>2.8</td><td>-1.1</td><td>9.01</td><td>34.8</td><td>-25.8</td><td></td></tr><tr><td>715.30</td><td>21.11</td><td>H</td><td>2.8</td><td>-1.1</td><td>17.25</td><td>34.8</td><td>-17.6</td><td></td></tr></table>  |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 699.70 | 11.99 | V | 2.8 | -1.1 | 8.16 | 34.8 | -26.6 |  | 699.70 | 20.57 | H | 2.8 | -1.1 | 16.73 | 34.8 | -18.1 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 12.90 | V | 2.8 | -1.1 | 9.06 | 34.8 | -25.7 |  | 707.50 | 20.88 | H | 2.8 | -1.1 | 17.03 | 34.8 | -17.8 |  | High Ch |  |  |  |  |  |  |  |  | 715.30 | 12.87 | V | 2.8 | -1.1 | 9.01 | 34.8 | -25.8 |  | 715.30 | 21.11 | H | 2.8 | -1.1 | 17.25 | 34.8 | -17.6 |  |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|-------|------------------|-----------------|-----------------|--------------------|-----------|-------------|------------|-------|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|--------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|---------|--|--|--|--|--|--|--|--|--------|-------|---|-----|------|------|------|-------|--|--------|-------|---|-----|------|-------|------|-------|--|
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11.99            | V               | 2.8             | -1.1               | 8.16      | 34.8        | -26.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.57            | H               | 2.8             | -1.1               | 16.73     | 34.8        | -18.1      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 12.90            | V               | 2.8             | -1.1               | 9.06      | 34.8        | -25.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20.88            | H               | 2.8             | -1.1               | 17.03     | 34.8        | -17.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 715.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 12.87            | V               | 2.8             | -1.1               | 9.01      | 34.8        | -25.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 715.30                            | 21.11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | H                | 2.8             | -1.1            | 17.25              | 34.8      | -17.6       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| LTE<br>Band 12<br>1.4MHz<br>16QAM | <div>UL Verification Services, Inc.<br/>High Frequency Substitution Measurement</div> <div>Company: Samsung<br/>Project #: 4789294522<br/>Date: 2020-01-13<br/>Test Engineer: 20896<br/>Configuration: EUT, X-Position<br/>Location: Chamber 1<br/>Mode: LTE_16QAM Band 12 Fundamentals, 1.4MHz Bandwidth</div> <div>Test Equipment:<br/>Receiving: VULB9163-750, and Chamber 1 SMA Cables<br/>Substitution: Dipole 3121_DB4, 8.5m SMA-type Cable</div> <table><tr><th>f MHz</th><th>SG reading (dBm)</th><th>Ant. Pol. (H/V)</th><th>Cable Loss (dB)</th><th>Antenna Gain (dBd)</th><th>ERP (dBm)</th><th>Limit (dBm)</th><th>Delta (dB)</th><th>Notes</th></tr><tr><td colspan="9">Low Ch</td></tr><tr><td>699.70</td><td>11.03</td><td>V</td><td>2.8</td><td>-1.1</td><td>7.20</td><td>34.8</td><td>-27.6</td><td></td></tr><tr><td>699.70</td><td>19.66</td><td>H</td><td>2.8</td><td>-1.1</td><td>15.82</td><td>34.8</td><td>-19.0</td><td></td></tr><tr><td colspan="9">Mid Ch</td></tr><tr><td>707.50</td><td>11.95</td><td>V</td><td>2.8</td><td>-1.1</td><td>8.11</td><td>34.8</td><td>-26.7</td><td></td></tr><tr><td>707.50</td><td>19.95</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.10</td><td>34.8</td><td>-18.7</td><td></td></tr><tr><td colspan="9">High Ch</td></tr><tr><td>715.30</td><td>11.86</td><td>V</td><td>2.8</td><td>-1.1</td><td>8.00</td><td>34.8</td><td>-26.8</td><td></td></tr><tr><td>715.30</td><td>20.16</td><td>H</td><td>2.8</td><td>-1.1</td><td>16.30</td><td>34.8</td><td>-18.5</td><td></td></tr></table> |                  |                 |                 |                    |           |             |            |       | f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes | Low Ch |  |  |  |  |  |  |  |  | 699.70 | 11.03 | V | 2.8 | -1.1 | 7.20 | 34.8 | -27.6 |  | 699.70 | 19.66 | H | 2.8 | -1.1 | 15.82 | 34.8 | -19.0 |  | Mid Ch |  |  |  |  |  |  |  |  | 707.50 | 11.95 | V | 2.8 | -1.1 | 8.11 | 34.8 | -26.7 |  | 707.50 | 19.95 | H | 2.8 | -1.1 | 16.10 | 34.8 | -18.7 |  | High Ch |  |  |  |  |  |  |  |  | 715.30 | 11.86 | V | 2.8 | -1.1 | 8.00 | 34.8 | -26.8 |  | 715.30 | 20.16 | H | 2.8 | -1.1 | 16.30 | 34.8 | -18.5 |  |
|                                   | f MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Low Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11.03            | V               | 2.8             | -1.1               | 7.20      | 34.8        | -27.6      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 699.70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 19.66            | H               | 2.8             | -1.1               | 15.82     | 34.8        | -19.0      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11.95            | V               | 2.8             | -1.1               | 8.11      | 34.8        | -26.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 707.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 19.95            | H               | 2.8             | -1.1               | 16.10     | 34.8        | -18.7      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                 |                 |                    |           |             |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
|                                   | 715.30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11.86            | V               | 2.8             | -1.1               | 8.00      | 34.8        | -26.8      |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |
| 715.30                            | 20.16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | H                | 2.8             | -1.1            | 16.30              | 34.8      | -18.5       |            |       |       |                  |                 |                 |                    |           |             |            |       |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |        |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |         |  |  |  |  |  |  |  |  |        |       |   |     |      |      |      |       |  |        |       |   |     |      |       |      |       |  |

## 10.2. FIELD STRENGTH OF SPURIOUS RADIATION

### RULE PART(S)

FCC: §2.1053, §22.917, §24.238 and §27. 53

### LIMIT

Part 22.917(a) & Part 24.238(a) & Part 27.53(h) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43 + 10 \log (P)$  dB.

Part 27.53 (h) AWS emission limits—the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

### TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01

For peak power measurement with a ESU40:

- a) Set the RBW = 100 KHz for emission below 1GHz and 1MHz for emissions above 1GHz
- b) Set VBW  $\geq 3 \times$  RBW;
- c) Set span  $\geq 1.5$  times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points  $\geq$  span/RBW;
- g) Trace mode = average(WCDMA, LTE), Maxhold(GSM, LTE Band41);;

### RESULTS

See the following pages.

NOTE : Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

## 10.2.1. SPURIOUS RADIATION PLOTS

### GSM850

|                     |                                                                                      |                     |                    |                 |                |                |               |                |               |       |
|---------------------|--------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| GSM850<br><br>GPRS  | UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                     |                    |                 |                |                |               |                |               |       |
|                     | Company: Samsung                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | Project #: 4789294522                                                                |                     |                    |                 |                |                |               |                |               |       |
|                     | Date: 2020-01-15                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | Test Engineer: 20896                                                                 |                     |                    |                 |                |                |               |                |               |       |
|                     | Configuration: EUT / AC Adapter / Earphone, X-Position                               |                     |                    |                 |                |                |               |                |               |       |
|                     | Location: Chamber 1                                                                  |                     |                    |                 |                |                |               |                |               |       |
|                     | Mode: GPRS 850 MHz Harmonics                                                         |                     |                    |                 |                |                |               |                |               |       |
|                     |                                                                                      |                     |                    |                 |                |                |               |                |               |       |
|                     | f<br>MHz                                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                     | Low Ch, 824.2MHz                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | 1648.40                                                                              | -5.2                | V                  | 3.0             | 45.2           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|                     | 2472.60                                                                              | -8.7                | V                  | 3.0             | 45.0           | 1.0            | -52.7         | -13.0          | -39.7         |       |
|                     | 3296.80                                                                              | -8.2                | V                  | 3.0             | 45.3           | 1.0            | -52.4         | -13.0          | -39.4         |       |
|                     | 1648.40                                                                              | 0.5                 | H                  | 3.0             | 45.2           | 1.0            | -43.7         | -13.0          | -30.7         |       |
|                     | 2472.60                                                                              | -6.8                | H                  | 3.0             | 45.0           | 1.0            | -50.8         | -13.0          | -37.8         |       |
|                     | 3296.80                                                                              | -8.3                | H                  | 3.0             | 45.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                     | Mid Ch, 836.6MHz                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | 1673.20                                                                              | -5.4                | V                  | 3.0             | 45.2           | 1.0            | -49.6         | -13.0          | -36.6         |       |
|                     | 2509.80                                                                              | -2.3                | V                  | 3.0             | 45.0           | 1.0            | -46.3         | -13.0          | -33.3         |       |
|                     | 3346.40                                                                              | -5.1                | V                  | 3.0             | 45.3           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|                     | 1673.20                                                                              | -0.3                | H                  | 3.0             | 45.2           | 1.0            | -44.5         | -13.0          | -31.5         |       |
|                     | 2509.80                                                                              | 0.9                 | H                  | 3.0             | 45.0           | 1.0            | -43.2         | -13.0          | -30.2         |       |
| 3346.40             | -5.5                                                                                 | H                   | 3.0                | 45.3            | 1.0            | -49.8          | -13.0         | -36.8          |               |       |
| High Ch, 848.8MHz   |                                                                                      |                     |                    |                 |                |                |               |                |               |       |
| 1697.60             | -4.0                                                                                 | V                   | 3.0                | 45.2            | 1.0            | -48.1          | -13.0         | -35.1          |               |       |
| 2546.40             | 5.6                                                                                  | V                   | 3.0                | 45.1            | 1.0            | -38.5          | -13.0         | -25.5          |               |       |
| 3395.20             | -8.0                                                                                 | V                   | 3.0                | 45.3            | 1.0            | -52.3          | -13.0         | -39.3          |               |       |
| 1697.60             | -0.1                                                                                 | H                   | 3.0                | 45.2            | 1.0            | -44.3          | -13.0         | -31.3          |               |       |
| 2546.40             | 7.3                                                                                  | H                   | 3.0                | 45.1            | 1.0            | -36.7          | -13.0         | -23.7          |               |       |
| 3395.20             | -8.2                                                                                 | H                   | 3.0                | 45.3            | 1.0            | -52.5          | -13.0         | -39.5          |               |       |
|                     |                                                                                      |                     |                    |                 |                |                |               |                |               |       |
| GSM850<br><br>EGPRS | UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                     |                    |                 |                |                |               |                |               |       |
|                     | Company: Samsung                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | Project #: 4789294522                                                                |                     |                    |                 |                |                |               |                |               |       |
|                     | Date: 2020-01-15                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | Test Engineer: 20890                                                                 |                     |                    |                 |                |                |               |                |               |       |
|                     | Configuration: EUT / AC Adapter / Earphone, X-Position                               |                     |                    |                 |                |                |               |                |               |       |
|                     | Location: Chamber 1                                                                  |                     |                    |                 |                |                |               |                |               |       |
|                     | Mode: EGPRS 850 MHz Harmonics                                                        |                     |                    |                 |                |                |               |                |               |       |
|                     |                                                                                      |                     |                    |                 |                |                |               |                |               |       |
|                     | f<br>MHz                                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                     | Low Ch, 824.2MHz                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | 1648.40                                                                              | -15.3               | V                  | 3.0             | 45.2           | 1.0            | -59.5         | -13.0          | -46.5         |       |
|                     | 2472.60                                                                              | -11.8               | V                  | 3.0             | 45.0           | 1.0            | -55.9         | -13.0          | -42.9         |       |
|                     | 3296.80                                                                              | -9.6                | V                  | 3.0             | 45.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
|                     | 1648.40                                                                              | -14.2               | H                  | 3.0             | 45.2           | 1.0            | -58.5         | -13.0          | -45.5         |       |
|                     | 2472.60                                                                              | -11.1               | H                  | 3.0             | 45.0           | 1.0            | -55.1         | -13.0          | -42.1         |       |
|                     | 3296.80                                                                              | -9.6                | H                  | 3.0             | 45.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
|                     | Mid Ch, 836.6MHz                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                     | 1673.20                                                                              | -14.1               | V                  | 3.0             | 45.2           | 1.0            | -58.3         | -13.0          | -45.3         |       |
|                     | 2509.80                                                                              | -11.8               | V                  | 3.0             | 45.0           | 1.0            | -55.8         | -13.0          | -42.8         |       |
|                     | 3346.40                                                                              | -9.4                | V                  | 3.0             | 45.3           | 1.0            | -53.7         | -13.0          | -40.7         |       |
|                     | 1673.20                                                                              | -14.0               | H                  | 3.0             | 45.2           | 1.0            | -58.2         | -13.0          | -45.2         |       |
|                     | 2509.80                                                                              | -11.4               | H                  | 3.0             | 45.0           | 1.0            | -55.5         | -13.0          | -42.5         |       |
| 3346.40             | -9.6                                                                                 | H                   | 3.0                | 45.3            | 1.0            | -53.9          | -13.0         | -40.9          |               |       |
| High Ch, 848.8MHz   |                                                                                      |                     |                    |                 |                |                |               |                |               |       |
| 1697.60             | -11.6                                                                                | V                   | 3.0                | 45.2            | 1.0            | -55.8          | -13.0         | -42.8          |               |       |
| 2546.40             | -10.9                                                                                | V                   | 3.0                | 45.1            | 1.0            | -55.0          | -13.0         | -42.0          |               |       |
| 3395.20             | -8.0                                                                                 | V                   | 3.0                | 45.3            | 1.0            | -52.3          | -13.0         | -39.3          |               |       |
| 1697.60             | -11.9                                                                                | H                   | 3.0                | 45.2            | 1.0            | -56.1          | -13.0         | -43.1          |               |       |
| 2546.40             | -10.5                                                                                | H                   | 3.0                | 45.1            | 1.0            | -54.6          | -13.0         | -41.6          |               |       |
| 3395.20             | -9.1                                                                                 | H                   | 3.0                | 45.3            | 1.0            | -53.4          | -13.0         | -40.4          |               |       |

**GSM1900**

|         |                                                                                                                                                                                                                                                                                                                                                                                                          |                     |                    |                 |                |                |               |                |               |       |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| GSM1900 | <p align="center"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-15<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, X-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> GPRS 1900 MHz Harmonics </p>  |                     |                    |                 |                |                |               |                |               |       |
|         | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| GPRS    | <b>Low Ch, 1850.2MHz</b>                                                                                                                                                                                                                                                                                                                                                                                 |                     |                    |                 |                |                |               |                |               |       |
|         | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                  | -8.0                | V                  | 3.0             | 45.4           | 1.0            | -52.4         | -13.0          | -39.4         |       |
|         | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                  | -5.7                | V                  | 3.0             | 45.3           | 1.0            | -50.0         | -13.0          | -37.0         |       |
|         | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                  | -3.0                | V                  | 3.0             | 44.1           | 1.0            | -46.2         | -13.0          | -33.2         |       |
|         | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                  | -8.4                | H                  | 3.0             | 45.4           | 1.0            | -52.8         | -13.0          | -39.8         |       |
|         | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                  | -5.4                | H                  | 3.0             | 45.3           | 1.0            | -49.7         | -13.0          | -36.7         |       |
|         | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                  | -3.0                | H                  | 3.0             | 44.1           | 1.0            | -46.1         | -13.0          | -33.1         |       |
|         | <b>Mid Ch, 1880MHz</b>                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                 |                |                |               |                |               |       |
|         | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                  | -7.8                | V                  | 3.0             | 45.4           | 1.0            | -52.2         | -13.0          | -39.2         |       |
|         | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                  | -4.8                | V                  | 3.0             | 45.3           | 1.0            | -49.1         | -13.0          | -36.1         |       |
|         | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                  | -2.6                | V                  | 3.0             | 44.1           | 1.0            | -45.7         | -13.0          | -32.7         |       |
|         | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                  | -8.4                | H                  | 3.0             | 45.4           | 1.0            | -52.8         | -13.0          | -39.8         |       |
|         | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                  | -5.1                | H                  | 3.0             | 45.3           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|         | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                  | -2.4                | H                  | 3.0             | 44.1           | 1.0            | -45.5         | -13.0          | -32.5         |       |
|         | <b>High Ch, 1909.8MHz</b>                                                                                                                                                                                                                                                                                                                                                                                |                     |                    |                 |                |                |               |                |               |       |
|         | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                  | -8.0                | V                  | 3.0             | 45.4           | 1.0            | -52.4         | -13.0          | -39.4         |       |
|         | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                  | -5.1                | V                  | 3.0             | 45.3           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|         | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                  | -2.6                | V                  | 3.0             | 44.0           | 1.0            | -45.6         | -13.0          | -32.6         |       |
|         | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                  | -8.5                | H                  | 3.0             | 45.4           | 1.0            | -53.0         | -13.0          | -40.0         |       |
|         | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                  | -5.2                | H                  | 3.0             | 45.3           | 1.0            | -49.5         | -13.0          | -36.5         |       |
|         | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                  | -2.7                | H                  | 3.0             | 44.0           | 1.0            | -45.7         | -13.0          | -32.7         |       |
| GSM1900 | <p align="center"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-15<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, X-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> EGPRS 1900 MHz Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|         | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                 | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|         | <b>Low Ch, 1850.2MHz</b>                                                                                                                                                                                                                                                                                                                                                                                 |                     |                    |                 |                |                |               |                |               |       |
|         | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                  | -7.9                | V                  | 3.0             | 45.4           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|         | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                  | -5.5                | V                  | 3.0             | 45.3           | 1.0            | -49.8         | -13.0          | -36.8         |       |
|         | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                  | -2.5                | V                  | 3.0             | 44.1           | 1.0            | -45.6         | -13.0          | -32.6         |       |
|         | 3700.40                                                                                                                                                                                                                                                                                                                                                                                                  | -8.2                | H                  | 3.0             | 45.4           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|         | 5550.60                                                                                                                                                                                                                                                                                                                                                                                                  | -5.9                | H                  | 3.0             | 45.3           | 1.0            | -50.2         | -13.0          | -37.2         |       |
|         | 7400.80                                                                                                                                                                                                                                                                                                                                                                                                  | -2.9                | H                  | 3.0             | 44.1           | 1.0            | -46.1         | -13.0          | -33.1         |       |
|         | <b>Mid Ch, 1880MHz</b>                                                                                                                                                                                                                                                                                                                                                                                   |                     |                    |                 |                |                |               |                |               |       |
|         | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                  | -8.0                | V                  | 3.0             | 45.4           | 1.0            | -52.5         | -13.0          | -39.5         |       |
|         | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                  | -4.9                | V                  | 3.0             | 45.3           | 1.0            | -49.2         | -13.0          | -36.2         |       |
|         | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                  | -2.8                | V                  | 3.0             | 44.1           | 1.0            | -45.8         | -13.0          | -32.8         |       |
|         | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                  | -8.5                | H                  | 3.0             | 45.4           | 1.0            | -52.9         | -13.0          | -39.9         |       |
|         | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                  | -5.3                | H                  | 3.0             | 45.3           | 1.0            | -49.6         | -13.0          | -36.6         |       |
|         | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                  | -2.8                | H                  | 3.0             | 44.1           | 1.0            | -45.9         | -13.0          | -32.9         |       |
|         | <b>High Ch, 1909.8MHz</b>                                                                                                                                                                                                                                                                                                                                                                                |                     |                    |                 |                |                |               |                |               |       |
|         | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                  | -8.3                | V                  | 3.0             | 45.4           | 1.0            | -52.7         | -13.0          | -39.7         |       |
|         | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                  | -5.3                | V                  | 3.0             | 45.3           | 1.0            | -49.6         | -13.0          | -36.6         |       |
|         | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                  | -2.8                | V                  | 3.0             | 44.0           | 1.0            | -45.9         | -13.0          | -32.9         |       |
|         | 3819.60                                                                                                                                                                                                                                                                                                                                                                                                  | -8.4                | H                  | 3.0             | 45.4           | 1.0            | -52.8         | -13.0          | -39.8         |       |
|         | 5729.40                                                                                                                                                                                                                                                                                                                                                                                                  | -5.6                | H                  | 3.0             | 45.3           | 1.0            | -49.8         | -13.0          | -36.8         |       |
|         | 7639.20                                                                                                                                                                                                                                                                                                                                                                                                  | -2.5                | H                  | 3.0             | 44.0           | 1.0            | -45.5         | -13.0          | -32.5         |       |

**WCDMA Band 5**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |                           |                        |                        |                       |                      |                       |                      |              |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|------------------------|------------------------|-----------------------|----------------------|-----------------------|----------------------|--------------|
| WCDMA<br>Band 5<br>REL99 | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-16<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, Z-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> Rel99 Band 5 Harmonics </p> |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | <b>f</b><br>MHz                                                                                                                                                                                                                                                                                                                                                                                                     | <b>SG reading</b><br>(dBm) | <b>Ant. Pol.</b><br>(H/V) | <b>Distance</b><br>(m) | <b>Preampl</b><br>(dB) | <b>Filter</b><br>(dB) | <b>EIRP</b><br>(dBm) | <b>Limit</b><br>(dBm) | <b>Delta</b><br>(dB) | <b>Notes</b> |
|                          | <b>Low Ch, 826.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                             |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                             | -14.8                      | V                         | 3.0                    | 45.2                   | 1.0                   | -59.0                | -13.0                 | -46.0                |              |
|                          | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                             | -11.6                      | V                         | 3.0                    | 45.0                   | 1.0                   | -55.6                | -13.0                 | -42.6                |              |
|                          | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                             | -9.3                       | V                         | 3.0                    | 45.3                   | 1.0                   | -53.6                | -13.0                 | -40.6                |              |
|                          | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                             | -13.8                      | H                         | 3.0                    | 45.2                   | 1.0                   | -58.0                | -13.0                 | -45.0                |              |
|                          | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                             | -11.0                      | H                         | 3.0                    | 45.0                   | 1.0                   | -55.0                | -13.0                 | -42.0                |              |
|                          | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                             | -9.5                       | H                         | 3.0                    | 45.3                   | 1.0                   | -53.7                | -13.0                 | -40.7                |              |
|                          | <b>Mid Ch, 836.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                             |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                             | -14.8                      | V                         | 3.0                    | 45.2                   | 1.0                   | -59.0                | -13.0                 | -46.0                |              |
|                          | 2509.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.7                      | V                         | 3.0                    | 45.0                   | 1.0                   | -55.7                | -13.0                 | -42.7                |              |
|                          | 3346.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.3                       | V                         | 3.0                    | 45.3                   | 1.0                   | -53.5                | -13.0                 | -40.5                |              |
|                          | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                             | -13.8                      | H                         | 3.0                    | 45.2                   | 1.0                   | -58.0                | -13.0                 | -45.0                |              |
|                          | 2509.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.1                      | H                         | 3.0                    | 45.0                   | 1.0                   | -55.2                | -13.0                 | -42.2                |              |
|                          | 3346.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.4                       | H                         | 3.0                    | 45.3                   | 1.0                   | -53.7                | -13.0                 | -40.7                |              |
|                          | <b>High Ch, 846.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | 1693.20                                                                                                                                                                                                                                                                                                                                                                                                             | -14.6                      | V                         | 3.0                    | 45.2                   | 1.0                   | -58.8                | -13.0                 | -45.8                |              |
|                          | 2539.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.6                      | V                         | 3.0                    | 45.0                   | 1.0                   | -55.7                | -13.0                 | -42.7                |              |
|                          | 3386.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.1                       | V                         | 3.0                    | 45.3                   | 1.0                   | -53.3                | -13.0                 | -40.3                |              |
|                          | 1693.20                                                                                                                                                                                                                                                                                                                                                                                                             | -13.4                      | H                         | 3.0                    | 45.2                   | 1.0                   | -57.6                | -13.0                 | -44.6                |              |
|                          | 2539.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.1                      | H                         | 3.0                    | 45.0                   | 1.0                   | -55.1                | -13.0                 | -42.1                |              |
|                          | 3386.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.2                       | H                         | 3.0                    | 45.3                   | 1.0                   | -53.5                | -13.0                 | -40.5                |              |
| WCDMA<br>Band 5<br>HSDPA | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-16<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, Z-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> HSDPA Band 5 Harmonics </p> |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | <b>f</b><br>MHz                                                                                                                                                                                                                                                                                                                                                                                                     | <b>SG reading</b><br>(dBm) | <b>Ant. Pol.</b><br>(H/V) | <b>Distance</b><br>(m) | <b>Preampl</b><br>(dB) | <b>Filter</b><br>(dB) | <b>EIRP</b><br>(dBm) | <b>Limit</b><br>(dBm) | <b>Delta</b><br>(dB) | <b>Notes</b> |
|                          | <b>Low Ch, 826.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                             |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                             | -14.8                      | V                         | 3.0                    | 45.2                   | 1.0                   | -59.0                | -13.0                 | -46.0                |              |
|                          | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                             | -11.5                      | V                         | 3.0                    | 45.0                   | 1.0                   | -55.6                | -13.0                 | -42.6                |              |
|                          | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                             | -9.3                       | V                         | 3.0                    | 45.3                   | 1.0                   | -53.6                | -13.0                 | -40.6                |              |
|                          | 1652.80                                                                                                                                                                                                                                                                                                                                                                                                             | -13.5                      | H                         | 3.0                    | 45.2                   | 1.0                   | -57.7                | -13.0                 | -44.7                |              |
|                          | 2479.20                                                                                                                                                                                                                                                                                                                                                                                                             | -10.9                      | H                         | 3.0                    | 45.0                   | 1.0                   | -55.0                | -13.0                 | -42.0                |              |
|                          | 3305.60                                                                                                                                                                                                                                                                                                                                                                                                             | -9.5                       | H                         | 3.0                    | 45.3                   | 1.0                   | -53.7                | -13.0                 | -40.7                |              |
|                          | <b>Mid Ch, 836.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                             |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                             | -14.9                      | V                         | 3.0                    | 45.2                   | 1.0                   | -59.1                | -13.0                 | -46.1                |              |
|                          | 2509.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.7                      | V                         | 3.0                    | 45.0                   | 1.0                   | -55.7                | -13.0                 | -42.7                |              |
|                          | 3346.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.3                       | V                         | 3.0                    | 45.3                   | 1.0                   | -53.5                | -13.0                 | -40.5                |              |
|                          | 1673.20                                                                                                                                                                                                                                                                                                                                                                                                             | -13.7                      | H                         | 3.0                    | 45.2                   | 1.0                   | -57.9                | -13.0                 | -44.9                |              |
|                          | 2509.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.1                      | H                         | 3.0                    | 45.0                   | 1.0                   | -55.2                | -13.0                 | -42.2                |              |
|                          | 3346.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.4                       | H                         | 3.0                    | 45.3                   | 1.0                   | -53.7                | -13.0                 | -40.7                |              |
|                          | <b>High Ch, 846.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                            |                           |                        |                        |                       |                      |                       |                      |              |
|                          | 1693.20                                                                                                                                                                                                                                                                                                                                                                                                             | -14.6                      | V                         | 3.0                    | 45.2                   | 1.0                   | -58.7                | -13.0                 | -45.7                |              |
|                          | 2539.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.6                      | V                         | 3.0                    | 45.0                   | 1.0                   | -55.7                | -13.0                 | -42.7                |              |
|                          | 3386.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.1                       | V                         | 3.0                    | 45.3                   | 1.0                   | -53.4                | -13.0                 | -40.4                |              |
|                          | 1693.20                                                                                                                                                                                                                                                                                                                                                                                                             | -12.9                      | H                         | 3.0                    | 45.2                   | 1.0                   | -57.1                | -13.0                 | -44.1                |              |
|                          | 2539.80                                                                                                                                                                                                                                                                                                                                                                                                             | -11.1                      | H                         | 3.0                    | 45.0                   | 1.0                   | -55.1                | -13.0                 | -42.1                |              |
|                          | 3386.40                                                                                                                                                                                                                                                                                                                                                                                                             | -9.2                       | H                         | 3.0                    | 45.3                   | 1.0                   | -53.5                | -13.0                 | -40.5                |              |

**WCDMA Band 4**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                    |                 |                |                |               |                |               |       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| WCDMA<br>Band 4<br>REL99 | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-16<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, Y-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> Rel99 Band 4 Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| WCDMA<br>Band 4<br>HSDPA | <b>Low Ch, 1712.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                             | -2.5                | V                  | 3.0             | 45.3           | 1.0            | -46.8         | -13.0          | -33.8         |       |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.3                | V                  | 3.0             | 45.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                             | -6.0                | V                  | 3.0             | 44.5           | 1.0            | -49.5         | -13.0          | -36.5         |       |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                             | -1.3                | H                  | 3.0             | 45.3           | 1.0            | -45.6         | -13.0          | -32.6         |       |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.7                | H                  | 3.0             | 45.3           | 1.0            | -52.9         | -13.0          | -39.9         |       |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                             | -5.9                | H                  | 3.0             | 44.5           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|                          | <b>Mid Ch, 1732.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                             | -1.8                | V                  | 3.0             | 45.3           | 1.0            | -46.1         | -13.0          | -33.1         |       |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.0                | V                  | 3.0             | 45.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                             | -6.0                | V                  | 3.0             | 44.4           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                             | -0.6                | H                  | 3.0             | 45.3           | 1.0            | -44.9         | -13.0          | -31.9         |       |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.3                | H                  | 3.0             | 45.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                             | -6.0                | H                  | 3.0             | 44.4           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|                          | <b>High Ch, 1752.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                           |                     |                    |                 |                |                |               |                |               |       |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                             | -4.9                | V                  | 3.0             | 45.3           | 1.0            | -49.2         | -13.0          | -36.2         |       |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.0                | V                  | 3.0             | 45.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                             | -5.6                | V                  | 3.0             | 44.4           | 1.0            | -48.9         | -13.0          | -35.9         |       |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                             | -3.9                | H                  | 3.0             | 45.3           | 1.0            | -48.2         | -13.0          | -35.2         |       |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.4                | H                  | 3.0             | 45.3           | 1.0            | -52.7         | -13.0          | -39.7         |       |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                             | -5.6                | H                  | 3.0             | 44.4           | 1.0            | -48.9         | -13.0          | -35.9         |       |
| WCDMA<br>Band 4<br>HSDPA | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-16<br/> <b>Test Engineer:</b> 20896<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, Y-Position<br/> <b>Location:</b> Chamber 1<br/> <b>Mode:</b> HSDPA Band 4 Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                          | <b>Low Ch, 1712.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                             | -3.6                | V                  | 3.0             | 45.3           | 1.0            | -47.9         | -13.0          | -34.9         |       |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.4                | V                  | 3.0             | 45.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                             | -6.0                | V                  | 3.0             | 44.5           | 1.0            | -49.5         | -13.0          | -36.5         |       |
|                          | 3424.80                                                                                                                                                                                                                                                                                                                                                                                                             | -2.4                | H                  | 3.0             | 45.3           | 1.0            | -46.7         | -13.0          | -33.7         |       |
|                          | 5137.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.7                | H                  | 3.0             | 45.3           | 1.0            | -52.9         | -13.0          | -39.9         |       |
|                          | 6849.60                                                                                                                                                                                                                                                                                                                                                                                                             | -6.0                | H                  | 3.0             | 44.5           | 1.0            | -49.5         | -13.0          | -36.5         |       |
|                          | <b>Mid Ch, 1732.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                             | -3.2                | V                  | 3.0             | 45.3           | 1.0            | -47.5         | -13.0          | -34.5         |       |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.0                | V                  | 3.0             | 45.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                             | -5.9                | V                  | 3.0             | 44.4           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|                          | 3465.20                                                                                                                                                                                                                                                                                                                                                                                                             | -2.0                | H                  | 3.0             | 45.3           | 1.0            | -46.3         | -13.0          | -33.3         |       |
|                          | 5197.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.3                | H                  | 3.0             | 45.3           | 1.0            | -52.6         | -13.0          | -39.6         |       |
|                          | 6930.40                                                                                                                                                                                                                                                                                                                                                                                                             | -6.0                | H                  | 3.0             | 44.4           | 1.0            | -49.4         | -13.0          | -36.4         |       |
|                          | <b>High Ch, 1752.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                           |                     |                    |                 |                |                |               |                |               |       |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                             | -5.4                | V                  | 3.0             | 45.3           | 1.0            | -49.7         | -13.0          | -36.7         |       |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.0                | V                  | 3.0             | 45.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                             | -5.6                | V                  | 3.0             | 44.4           | 1.0            | -49.0         | -13.0          | -36.0         |       |
|                          | 3505.20                                                                                                                                                                                                                                                                                                                                                                                                             | -4.7                | H                  | 3.0             | 45.3           | 1.0            | -49.0         | -13.0          | -36.0         |       |
|                          | 5257.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.4                | H                  | 3.0             | 45.3           | 1.0            | -52.7         | -13.0          | -39.7         |       |
|                          | 7010.40                                                                                                                                                                                                                                                                                                                                                                                                             | -5.7                | H                  | 3.0             | 44.4           | 1.0            | -49.0         | -13.0          | -36.0         |       |

**WCDMA Band 2**

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                    |                 |                |                |               |                |               |       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| WCDMA<br>Band 2<br>REL99 | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-15<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, Y-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> Rel99 Band 2 Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| WCDMA<br>Band 2<br>HSDPA | <b>Low Ch, 1852.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                          | 3704.80                                                                                                                                                                                                                                                                                                                                                                                                             | -9.9                | V                  | 3.0             | 42.0           | 1.0            | -50.9         | -13.0          | -37.9         |       |
|                          | 5557.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.3                | V                  | 3.0             | 42.9           | 1.0            | -50.2         | -13.0          | -37.2         |       |
|                          | 7409.60                                                                                                                                                                                                                                                                                                                                                                                                             | -6.7                | V                  | 3.0             | 42.5           | 1.0            | -48.1         | -13.0          | -35.1         |       |
|                          | 3704.80                                                                                                                                                                                                                                                                                                                                                                                                             | -6.0                | H                  | 3.0             | 42.0           | 1.0            | -47.1         | -13.0          | -34.1         |       |
|                          | 5557.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.2                | H                  | 3.0             | 42.9           | 1.0            | -50.1         | -13.0          | -37.1         |       |
|                          | 7409.60                                                                                                                                                                                                                                                                                                                                                                                                             | -6.6                | H                  | 3.0             | 42.5           | 1.0            | -48.1         | -13.0          | -35.1         |       |
|                          | <b>Mid Ch, 1880MHz</b>                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                 |                |                |               |                |               |       |
|                          | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                             | -11.2               | V                  | 3.0             | 42.1           | 1.0            | -52.2         | -13.0          | -39.2         |       |
|                          | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                             | -7.9                | V                  | 3.0             | 42.9           | 1.0            | -49.8         | -13.0          | -36.8         |       |
|                          | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                             | -6.7                | V                  | 3.0             | 42.4           | 1.0            | -48.1         | -13.0          | -35.1         |       |
|                          | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                             | -8.9                | H                  | 3.0             | 42.1           | 1.0            | -49.9         | -13.0          | -36.9         |       |
|                          | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                             | -8.2                | H                  | 3.0             | 42.9           | 1.0            | -50.0         | -13.0          | -37.0         |       |
|                          | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                             | -6.6                | H                  | 3.0             | 42.4           | 1.0            | -48.0         | -13.0          | -35.0         |       |
|                          | <b>High Ch, 1907.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                           |                     |                    |                 |                |                |               |                |               |       |
|                          | 3815.20                                                                                                                                                                                                                                                                                                                                                                                                             | -11.3               | V                  | 3.0             | 42.1           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                          | 5722.80                                                                                                                                                                                                                                                                                                                                                                                                             | -7.7                | V                  | 3.0             | 42.9           | 1.0            | -49.6         | -13.0          | -36.6         |       |
|                          | 7630.40                                                                                                                                                                                                                                                                                                                                                                                                             | -6.6                | V                  | 3.0             | 42.4           | 1.0            | -48.0         | -13.0          | -35.0         |       |
|                          | 3815.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.6                | H                  | 3.0             | 42.1           | 1.0            | -49.7         | -13.0          | -36.7         |       |
|                          | 5722.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.0                | H                  | 3.0             | 42.9           | 1.0            | -49.9         | -13.0          | -36.9         |       |
|                          | 7630.40                                                                                                                                                                                                                                                                                                                                                                                                             | -6.8                | H                  | 3.0             | 42.4           | 1.0            | -48.2         | -13.0          | -35.2         |       |
| WCDMA<br>Band 2<br>HSDPA | <p style="text-align: center;"><b>UL Verification Services, Inc.</b><br/><b>Above 1GHz High Frequency Substitution Measurement</b></p> <p> <b>Company:</b> Samsung<br/> <b>Project #:</b> 4789294522<br/> <b>Date:</b> 2020-01-15<br/> <b>Test Engineer:</b> 20882<br/> <b>Configuration:</b> EUT / AC Adapter / Earphone, Y-Position<br/> <b>Location:</b> Chamber 2<br/> <b>Mode:</b> HSDPA Band 2 Harmonics </p> |                     |                    |                 |                |                |               |                |               |       |
|                          | f<br>MHz                                                                                                                                                                                                                                                                                                                                                                                                            | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                          | <b>Low Ch, 1852.4MHz</b>                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                          | 3704.80                                                                                                                                                                                                                                                                                                                                                                                                             | -10.2               | V                  | 3.0             | 42.0           | 1.0            | -51.2         | -13.0          | -38.2         |       |
|                          | 5557.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.4                | V                  | 3.0             | 42.9           | 1.0            | -50.3         | -13.0          | -37.3         |       |
|                          | 7409.60                                                                                                                                                                                                                                                                                                                                                                                                             | -6.8                | V                  | 3.0             | 42.5           | 1.0            | -48.2         | -13.0          | -35.2         |       |
|                          | 3704.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.0                | H                  | 3.0             | 42.0           | 1.0            | -49.1         | -13.0          | -36.1         |       |
|                          | 5557.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.4                | H                  | 3.0             | 42.9           | 1.0            | -50.2         | -13.0          | -37.2         |       |
|                          | 7409.60                                                                                                                                                                                                                                                                                                                                                                                                             | -6.6                | H                  | 3.0             | 42.5           | 1.0            | -48.1         | -13.0          | -35.1         |       |
|                          | <b>Mid Ch, 1880MHz</b>                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                 |                |                |               |                |               |       |
|                          | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                             | -11.3               | V                  | 3.0             | 42.1           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                          | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                             | -8.2                | V                  | 3.0             | 42.9           | 1.0            | -50.1         | -13.0          | -37.1         |       |
|                          | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                             | -6.7                | V                  | 3.0             | 42.4           | 1.0            | -48.1         | -13.0          | -35.1         |       |
|                          | 3760.00                                                                                                                                                                                                                                                                                                                                                                                                             | -9.9                | H                  | 3.0             | 42.1           | 1.0            | -51.0         | -13.0          | -38.0         |       |
|                          | 5640.00                                                                                                                                                                                                                                                                                                                                                                                                             | -8.3                | H                  | 3.0             | 42.9           | 1.0            | -50.2         | -13.0          | -37.2         |       |
|                          | 7520.00                                                                                                                                                                                                                                                                                                                                                                                                             | -6.8                | H                  | 3.0             | 42.4           | 1.0            | -48.2         | -13.0          | -35.2         |       |
|                          | <b>High Ch, 1907.6MHz</b>                                                                                                                                                                                                                                                                                                                                                                                           |                     |                    |                 |                |                |               |                |               |       |
|                          | 3815.20                                                                                                                                                                                                                                                                                                                                                                                                             | -11.2               | V                  | 3.0             | 42.1           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                          | 5722.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.3                | V                  | 3.0             | 42.9           | 1.0            | -50.2         | -13.0          | -37.2         |       |
|                          | 7630.40                                                                                                                                                                                                                                                                                                                                                                                                             | -6.9                | V                  | 3.0             | 42.4           | 1.0            | -48.2         | -13.0          | -35.2         |       |
|                          | 3815.20                                                                                                                                                                                                                                                                                                                                                                                                             | -8.8                | H                  | 3.0             | 42.1           | 1.0            | -49.9         | -13.0          | -36.9         |       |
|                          | 5722.80                                                                                                                                                                                                                                                                                                                                                                                                             | -8.1                | H                  | 3.0             | 42.9           | 1.0            | -50.0         | -13.0          | -37.0         |       |
|                          | 7630.40                                                                                                                                                                                                                                                                                                                                                                                                             | -6.8                | H                  | 3.0             | 42.4           | 1.0            | -48.2         | -13.0          | -35.2         |       |

**LTE Band 2**

| LTE<br>Band 2<br>15MHz<br>QPSK | UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                     |                    |                 |                |                |               |                |               |       |
|--------------------------------|--------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
|                                | f<br>MHz                                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                                | Company: Samsung                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                                | Project #: 4789294522                                                                |                     |                    |                 |                |                |               |                |               |       |
|                                | Date: 2020-01-09                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                                | Test Engineer: 20890                                                                 |                     |                    |                 |                |                |               |                |               |       |
|                                | Configuration: EUT / AC Adapter / Earphone, Y-Position                               |                     |                    |                 |                |                |               |                |               |       |
|                                | Location: Chamber 1                                                                  |                     |                    |                 |                |                |               |                |               |       |
|                                | Mode: LTE_QPSK Band 2 Harmonics, 15MHz Bandwidth                                     |                     |                    |                 |                |                |               |                |               |       |
|                                | Low Ch, 1857.5MHz                                                                    |                     |                    |                 |                |                |               |                |               |       |
|                                | 3715.00                                                                              | -1.3                | V                  | 3.0             | 45.4           | 1.0            | -45.7         | -13.0          | -32.7         |       |
|                                | 5572.50                                                                              | -7.6                | V                  | 3.0             | 45.3           | 1.0            | -51.8         | -13.0          | -38.8         |       |
|                                | 7430.00                                                                              | -5.6                | V                  | 3.0             | 44.1           | 1.0            | -48.7         | -13.0          | -35.7         |       |
|                                | 3715.00                                                                              | 0.2                 | H                  | 3.0             | 45.4           | 1.0            | -44.2         | -13.0          | -31.2         |       |
|                                | 5572.50                                                                              | -8.0                | H                  | 3.0             | 45.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                                | 7430.00                                                                              | -5.3                | H                  | 3.0             | 44.1           | 1.0            | -48.5         | -13.0          | -35.5         |       |
|                                | Mid Ch, 1880MHz                                                                      |                     |                    |                 |                |                |               |                |               |       |
|                                | 3760.00                                                                              | -6.1                | V                  | 3.0             | 45.4           | 1.0            | -50.5         | -13.0          | -37.5         |       |
|                                | 5640.00                                                                              | -7.8                | V                  | 3.0             | 45.3           | 1.0            | -52.1         | -13.0          | -39.1         |       |
|                                | 7520.00                                                                              | -5.6                | V                  | 3.0             | 44.1           | 1.0            | -48.7         | -13.0          | -35.7         |       |
|                                | 3760.00                                                                              | -2.9                | H                  | 3.0             | 45.4           | 1.0            | -47.4         | -13.0          | -34.4         |       |
|                                | 5640.00                                                                              | -8.1                | H                  | 3.0             | 45.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                                | 7520.00                                                                              | -5.5                | H                  | 3.0             | 44.1           | 1.0            | -48.6         | -13.0          | -35.6         |       |
|                                | High Ch, 1902.5MHz                                                                   |                     |                    |                 |                |                |               |                |               |       |
|                                | 3805.00                                                                              | -4.9                | V                  | 3.0             | 45.4           | 1.0            | -49.3         | -13.0          | -36.3         |       |
|                                | 5707.50                                                                              | -7.5                | V                  | 3.0             | 45.3           | 1.0            | -51.8         | -13.0          | -38.8         |       |
|                                | 7610.00                                                                              | -5.5                | V                  | 3.0             | 44.0           | 1.0            | -48.5         | -13.0          | -35.5         |       |
|                                | 3805.00                                                                              | -2.5                | H                  | 3.0             | 45.4           | 1.0            | -47.0         | -13.0          | -34.0         |       |
|                                | 5707.50                                                                              | -8.0                | H                  | 3.0             | 45.3           | 1.0            | -52.3         | -13.0          | -39.3         |       |
|                                | 7610.00                                                                              | -5.4                | H                  | 3.0             | 44.0           | 1.0            | -48.4         | -13.0          | -35.4         |       |

**LTE Band 4**

| LTE<br>Band 4<br>10MHz<br>QPSK | UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement |                     |                    |                 |                |                |               |                |               |       |
|--------------------------------|--------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
|                                | f<br>MHz                                                                             | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                                | Company: Samsung                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                                | Project #: 4789294522                                                                |                     |                    |                 |                |                |               |                |               |       |
|                                | Date: 2020-01-13                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                                | Test Engineer: 20890                                                                 |                     |                    |                 |                |                |               |                |               |       |
|                                | Configuration: EUT / AC Adapter / Earphone, Y-Position                               |                     |                    |                 |                |                |               |                |               |       |
|                                | Location: Chamber 2                                                                  |                     |                    |                 |                |                |               |                |               |       |
|                                | Mode: LTE_QPSK Band 4 Harmonics, 10MHz Bandwidth                                     |                     |                    |                 |                |                |               |                |               |       |
|                                | Low Ch, 1715MHz                                                                      |                     |                    |                 |                |                |               |                |               |       |
|                                | 3430.00                                                                              | -1.4                | V                  | 3.0             | 42.0           | 1.0            | -42.5         | -13.0          | -29.5         |       |
|                                | 5145.00                                                                              | -8.6                | V                  | 3.0             | 42.8           | 1.0            | -50.4         | -13.0          | -37.4         |       |
|                                | 6860.00                                                                              | -6.2                | V                  | 3.0             | 42.7           | 1.0            | -47.9         | -13.0          | -34.9         |       |
|                                | 3430.00                                                                              | -0.7                | H                  | 3.0             | 42.0           | 1.0            | -41.7         | -13.0          | -28.7         |       |
|                                | 5145.00                                                                              | -8.7                | H                  | 3.0             | 42.8           | 1.0            | -50.4         | -13.0          | -37.4         |       |
|                                | 6860.00                                                                              | -6.2                | H                  | 3.0             | 42.7           | 1.0            | -47.9         | -13.0          | -34.9         |       |
|                                | Mid Ch, 1732.5MHz                                                                    |                     |                    |                 |                |                |               |                |               |       |
|                                | 3465.00                                                                              | -0.6                | V                  | 3.0             | 42.0           | 1.0            | -41.6         | -13.0          | -28.6         |       |
|                                | 5197.50                                                                              | -8.3                | V                  | 3.0             | 42.8           | 1.0            | -50.1         | -13.0          | -37.1         |       |
|                                | 6930.00                                                                              | -6.3                | V                  | 3.0             | 42.7           | 1.0            | -48.0         | -13.0          | -35.0         |       |
|                                | 3465.00                                                                              | 0.7                 | H                  | 3.0             | 42.0           | 1.0            | -40.3         | -13.0          | -27.3         |       |
|                                | 5197.50                                                                              | -8.3                | H                  | 3.0             | 42.8           | 1.0            | -50.1         | -13.0          | -37.1         |       |
|                                | 6930.00                                                                              | -6.3                | H                  | 3.0             | 42.7           | 1.0            | -48.0         | -13.0          | -35.0         |       |
|                                | High Ch, 1750MHz                                                                     |                     |                    |                 |                |                |               |                |               |       |
|                                | 3500.00                                                                              | -3.3                | V                  | 3.0             | 42.0           | 1.0            | -44.3         | -13.0          | -31.3         |       |
|                                | 5250.00                                                                              | -8.7                | V                  | 3.0             | 42.8           | 1.0            | -50.5         | -13.0          | -37.5         |       |
|                                | 7000.00                                                                              | -6.3                | V                  | 3.0             | 42.7           | 1.0            | -47.9         | -13.0          | -34.9         |       |
|                                | 3500.00                                                                              | -1.9                | H                  | 3.0             | 42.0           | 1.0            | -43.0         | -13.0          | -30.0         |       |
|                                | 5250.00                                                                              | -8.6                | H                  | 3.0             | 42.8           | 1.0            | -50.4         | -13.0          | -37.4         |       |
|                                | 7000.00                                                                              | -6.1                | H                  | 3.0             | 42.7           | 1.0            | -47.8         | -13.0          | -34.8         |       |

**LTE Band 5**

|                                |                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| LTE<br>Band 5<br>10MHz<br>QPSK | UL Verification Services, Inc.<br>Above 1GHz High Frequency Substitution Measurement                                                                                                                                       |                     |                    |                 |                |                |               |                |               |       |
|                                | Company: Samsung<br>Project #: 4789294522<br>Date: 2020-01-10<br>Test Engineer: 20890<br>Configuration: EUT / AC Adapter / Earphone, Z-Position<br>Location: Chamber 1<br>Mode: LTE_QPSK Band 5 Harmonics, 10MHz Bandwidth |                     |                    |                 |                |                |               |                |               |       |
|                                | f<br>MHz                                                                                                                                                                                                                   | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|                                | Low Ch, 829MHz                                                                                                                                                                                                             |                     |                    |                 |                |                |               |                |               |       |
|                                | 1658.00                                                                                                                                                                                                                    | -11.1               | V                  | 3.0             | 45.2           | 1.0            | -55.3         | -13.0          | -42.3         |       |
|                                | 2487.00                                                                                                                                                                                                                    | -11.7               | V                  | 3.0             | 45.0           | 1.0            | -55.7         | -13.0          | -42.7         |       |
|                                | 3316.00                                                                                                                                                                                                                    | -9.2                | V                  | 3.0             | 45.3           | 1.0            | -53.5         | -13.0          | -40.5         |       |
|                                | 1658.00                                                                                                                                                                                                                    | -11.0               | H                  | 3.0             | 45.2           | 1.0            | -55.2         | -13.0          | -42.2         |       |
|                                | 2487.00                                                                                                                                                                                                                    | -11.1               | H                  | 3.0             | 45.0           | 1.0            | -55.1         | -13.0          | -42.1         |       |
|                                | 3316.00                                                                                                                                                                                                                    | -9.5                | H                  | 3.0             | 45.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
|                                | Mid Ch, 836.5MHz                                                                                                                                                                                                           |                     |                    |                 |                |                |               |                |               |       |
|                                | 1673.00                                                                                                                                                                                                                    | -13.5               | V                  | 3.0             | 45.2           | 1.0            | -57.7         | -13.0          | -44.7         |       |
|                                | 2509.50                                                                                                                                                                                                                    | -11.8               | V                  | 3.0             | 45.0           | 1.0            | -55.8         | -13.0          | -42.8         |       |
|                                | 3346.00                                                                                                                                                                                                                    | -9.5                | V                  | 3.0             | 45.3           | 1.0            | -53.7         | -13.0          | -40.7         |       |
|                                | 1673.00                                                                                                                                                                                                                    | -11.3               | H                  | 3.0             | 45.2           | 1.0            | -55.5         | -13.0          | -42.5         |       |
|                                | 2509.50                                                                                                                                                                                                                    | -11.2               | H                  | 3.0             | 45.0           | 1.0            | -55.3         | -13.0          | -42.3         |       |
|                                | 3346.00                                                                                                                                                                                                                    | -9.5                | H                  | 3.0             | 45.3           | 1.0            | -53.8         | -13.0          | -40.8         |       |
|                                | High Ch, 844MHz                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                                | 1688.00                                                                                                                                                                                                                    | -10.9               | V                  | 3.0             | 45.2           | 1.0            | -55.1         | -13.0          | -42.1         |       |
|                                | 2532.00                                                                                                                                                                                                                    | -11.7               | V                  | 3.0             | 45.0           | 1.0            | -55.7         | -13.0          | -42.7         |       |
|                                | 3376.00                                                                                                                                                                                                                    | -9.0                | V                  | 3.0             | 45.3           | 1.0            | -53.2         | -13.0          | -40.2         |       |
|                                | 1688.00                                                                                                                                                                                                                    | -8.8                | H                  | 3.0             | 45.2           | 1.0            | -53.0         | -13.0          | -40.0         |       |
|                                | 2532.00                                                                                                                                                                                                                    | -11.0               | H                  | 3.0             | 45.0           | 1.0            | -55.0         | -13.0          | -42.0         |       |
|                                | 3376.00                                                                                                                                                                                                                    | -9.2                | H                  | 3.0             | 45.3           | 1.0            | -53.5         | -13.0          | -40.5         |       |

# **LTE Band 12**

LTE

Band 12

5MHz

QPSK

UL Verification Services, Inc.

Above 1GHz High Frequency Substitution Measurement

Company:

Project #:

Date:

Test Engineer:

Configuration:

Location:

Mode:

Samsung

4789294522

2020-01-13

20896

EUT / AC Adapter / Earphone, X-Position

Chamber 1

LTE\_QPSK Band 12 Harmonics, 5MHz Bandwidth

| f<br>MHz          | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
|-------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| Low Ch, 701.5MHz  |                     |                    |                 |                |                |               |                |               |       |
| 1403.00           | -15.4               | V                  | 3.0             | 45.4           | 1.0            | -59.8         | -13.0          | -46.8         |       |
| 2104.50           | -12.1               | V                  | 3.0             | 45.0           | 1.0            | -56.1         | -13.0          | -43.1         |       |
| 2806.00           | -10.8               | V                  | 3.0             | 45.1           | 1.0            | -54.9         | -13.0          | -41.9         |       |
| 1403.00           | -12.5               | H                  | 3.0             | 45.4           | 1.0            | -56.9         | -13.0          | -43.9         |       |
| 2104.50           | -10.7               | H                  | 3.0             | 45.0           | 1.0            | -54.6         | -13.0          | -41.6         |       |
| 2806.00           | -10.7               | H                  | 3.0             | 45.1           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| Mid Ch, 707.5MHz  |                     |                    |                 |                |                |               |                |               |       |
| 1415.00           | -11.2               | V                  | 3.0             | 45.4           | 1.0            | -55.6         | -13.0          | -42.6         |       |
| 2122.50           | -12.3               | V                  | 3.0             | 45.0           | 1.0            | -56.2         | -13.0          | -43.2         |       |
| 2830.00           | -10.9               | V                  | 3.0             | 45.1           | 1.0            | -55.0         | -13.0          | -42.0         |       |
| 1415.00           | -11.3               | H                  | 3.0             | 45.4           | 1.0            | -55.7         | -13.0          | -42.7         |       |
| 2122.50           | -10.8               | H                  | 3.0             | 45.0           | 1.0            | -54.7         | -13.0          | -41.7         |       |
| 2830.00           | -10.8               | H                  | 3.0             | 45.1           | 1.0            | -54.9         | -13.0          | -41.9         |       |
| High Ch, 713.5MHz |                     |                    |                 |                |                |               |                |               |       |
| 1427.00           | -15.6               | V                  | 3.0             | 45.4           | 1.0            | -59.9         | -13.0          | -46.9         |       |
| 2140.50           | -12.1               | V                  | 3.0             | 45.0           | 1.0            | -56.1         | -13.0          | -43.1         |       |
| 2854.00           | -10.8               | V                  | 3.0             | 45.1           | 1.0            | -54.9         | -13.0          | -41.9         |       |
| 1427.00           | -13.5               | H                  | 3.0             | 45.4           | 1.0            | -57.9         | -13.0          | -44.9         |       |
| 2140.50           | -10.8               | H                  | 3.0             | 45.0           | 1.0            | -54.8         | -13.0          | -41.8         |       |
| 2854.00           | -10.7               | H                  | 3.0             | 45.1           | 1.0            | -54.9         | -13.0          | -41.9         |       |

# **LTE Band 17**

LTE Band 17 (Frequency range: 704-716 MHz) is covered by LTE Band 12 (Frequency range: 699-716 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**END OF REPORT**