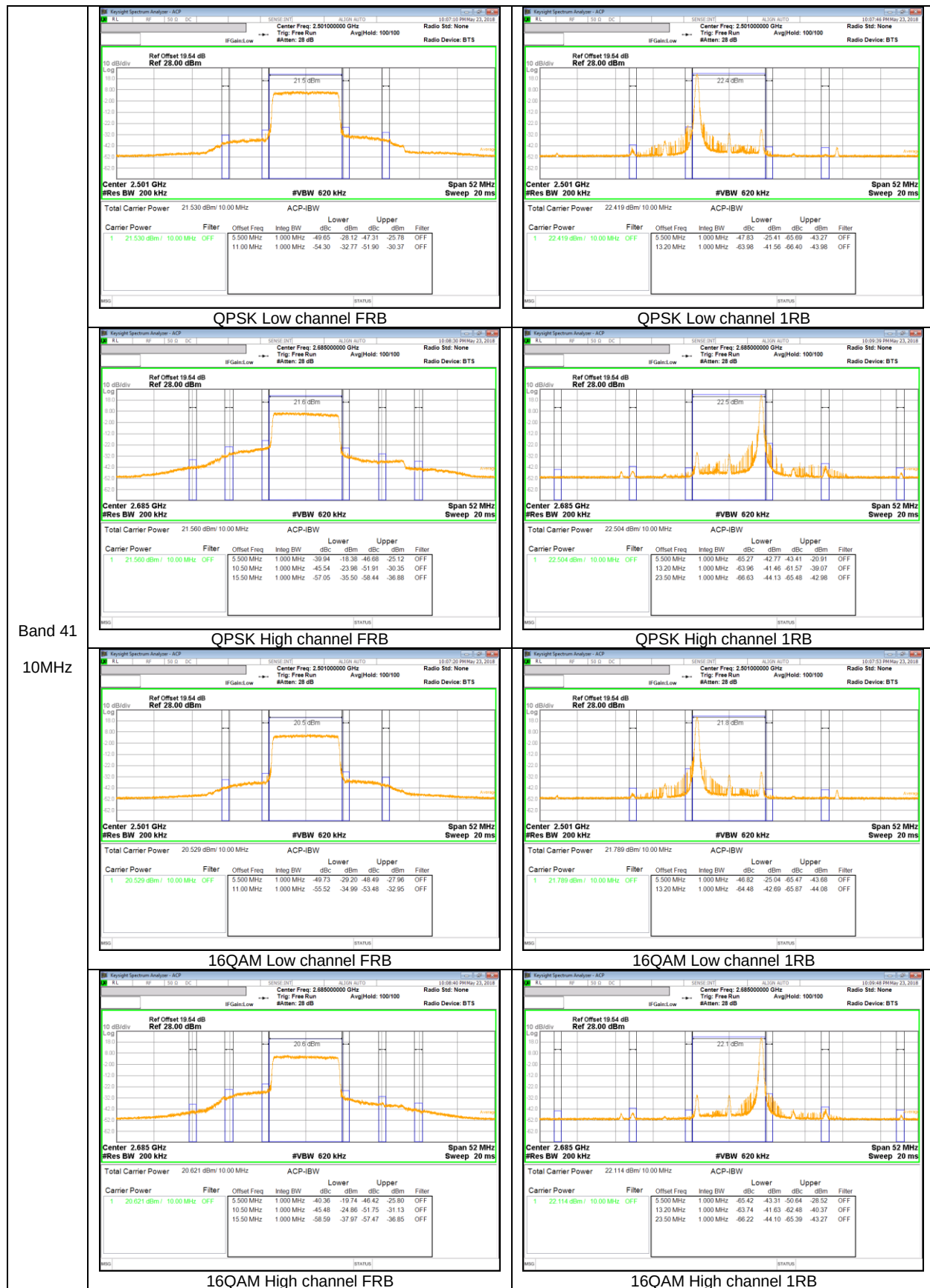
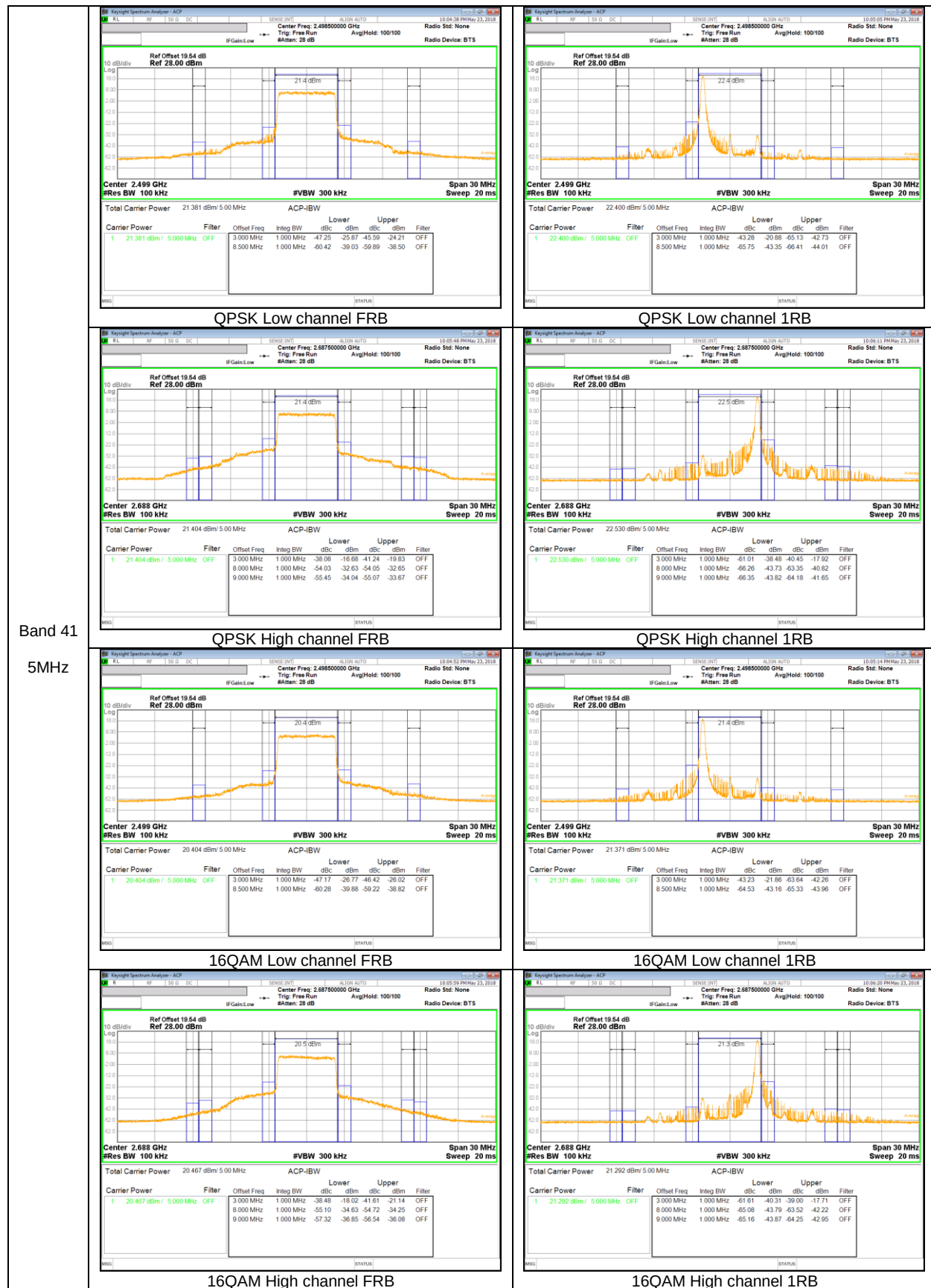






### 9.3. OUT OF BAND EMISSIONS

#### 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.

Part 27: (m)(4) For mobile station, the attenuation factor shall be not less than  $43 + 10 \log (P)$  dB at the channel edge and  $(55 + 10 \log (P))$  dB at the 5.5 MHz from the channel edges.

#### 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 = peak(WCDMA Band 5, LTE Band 5),  
rms(GSM1900, WCDMA Band 2, LTE Band17, Band41);
- f) Ensure that the number of measurement points = Max (40001);
- g) Trace mode = Maxhold(GSM, WCDMA Band 5, LTE Band 5, LTE Band41),  
Average(WCDMA Band2, LTE Band17);

## **RESULTS**

### **GSM**

| Band    | Mode  | f [MHz] | Spurious [dBm] | Limit [dBm] |
|---------|-------|---------|----------------|-------------|
| GSM1900 | GPRS  | 1850.2  | -24.24         | -13.00      |
|         |       | 1880.0  | -24.05         |             |
|         |       | 1909.8  | -24.09         |             |
|         | EGPRS | 1850.2  | -24.39         |             |
|         |       | 1880.0  | -24.13         |             |
|         |       | 1909.8  | -24.36         |             |

### **WCDMA**

| Band   | Mode  | f [MHz] | Spurious [dBm] | Limit [dBm] |
|--------|-------|---------|----------------|-------------|
| Band 5 | REL99 | 826.4   | -32.66         | -13.00      |
|        |       | 836.6   | -32.79         |             |
|        |       | 846.6   | -32.55         |             |
|        | HSDPA | 826.4   | -32.38         |             |
|        |       | 836.6   | -32.86         |             |
|        |       | 846.6   | -32.42         |             |
| Band 2 | REL99 | 1852.4  | -42.347        |             |
|        |       | 1880.0  | -42.426        |             |
|        |       | 1907.6  | -42.290        |             |
|        | HSDPA | 1852.4  | -42.336        |             |
|        |       | 1880.0  | -42.419        |             |
|        |       | 1907.6  | -42.480        |             |

**LTE 5**

| Bandwidth | Mode  | f [MHz] | Spurious [dBm] | Limit [dBm] |
|-----------|-------|---------|----------------|-------------|
| 10 MHz    | QPSK  | 829.0   | -30.88         | -13.00      |
|           |       | 836.5   | -31.13         |             |
|           |       | 844.0   | -30.65         |             |
|           | 16QAM | 829.0   | -31.12         |             |
|           |       | 836.5   | -31.18         |             |
|           |       | 844.0   | -31.51         |             |
| 5 MHz     | QPSK  | 826.5   | -31.07         |             |
|           |       | 836.5   | -30.38         |             |
|           |       | 846.5   | -30.49         |             |
|           | 16QAM | 826.5   | -30.86         |             |
|           |       | 836.5   | -30.82         |             |
|           |       | 846.5   | -31.15         |             |
| 3 MHz     | QPSK  | 825.5   | -31.17         |             |
|           |       | 836.5   | -30.65         |             |
|           |       | 847.5   | -31.64         |             |
|           | 16QAM | 825.5   | -31.14         |             |
|           |       | 836.5   | -31.42         |             |
|           |       | 847.5   | -30.43         |             |
| 1.4 MHz   | QPSK  | 824.7   | -31.76         |             |
|           |       | 836.5   | -29.54         |             |
|           |       | 848.3   | -30.50         |             |
|           | 16QAM | 824.7   | -31.49         |             |
|           |       | 836.5   | -30.76         |             |
|           |       | 848.3   | -30.68         |             |

**LTE 17**

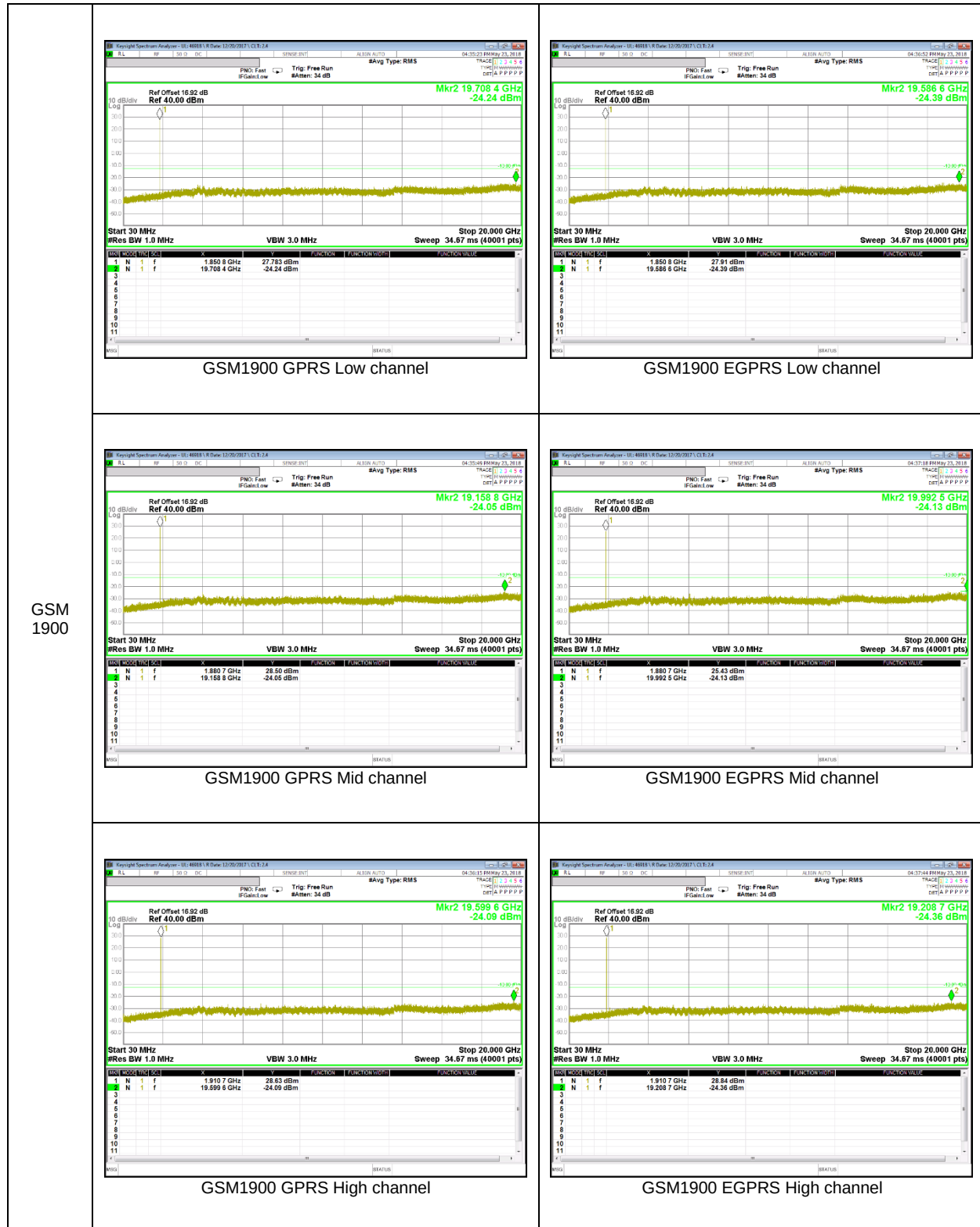
| Bandwidth | Mode  | f [MHz] | Spurious [dBm] | Limit [dBm] |
|-----------|-------|---------|----------------|-------------|
| 10 MHz    | QPSK  | 709.0   | -44.707        | -13.00      |
|           |       | 710.0   | -44.728        |             |
|           |       | 711.0   | -44.744        |             |
|           | 16QAM | 709.0   | -44.290        |             |
|           |       | 710.0   | -44.700        |             |
|           |       | 711.0   | -44.334        |             |
| 5 MHz     | QPSK  | 706.5   | -44.734        |             |
|           |       | 710.0   | -44.513        |             |
|           |       | 713.5   | -44.875        |             |
|           | 16QAM | 706.5   | -44.950        |             |
|           |       | 710.0   | -44.579        |             |
|           |       | 713.5   | -44.879        |             |

**LTE 41**

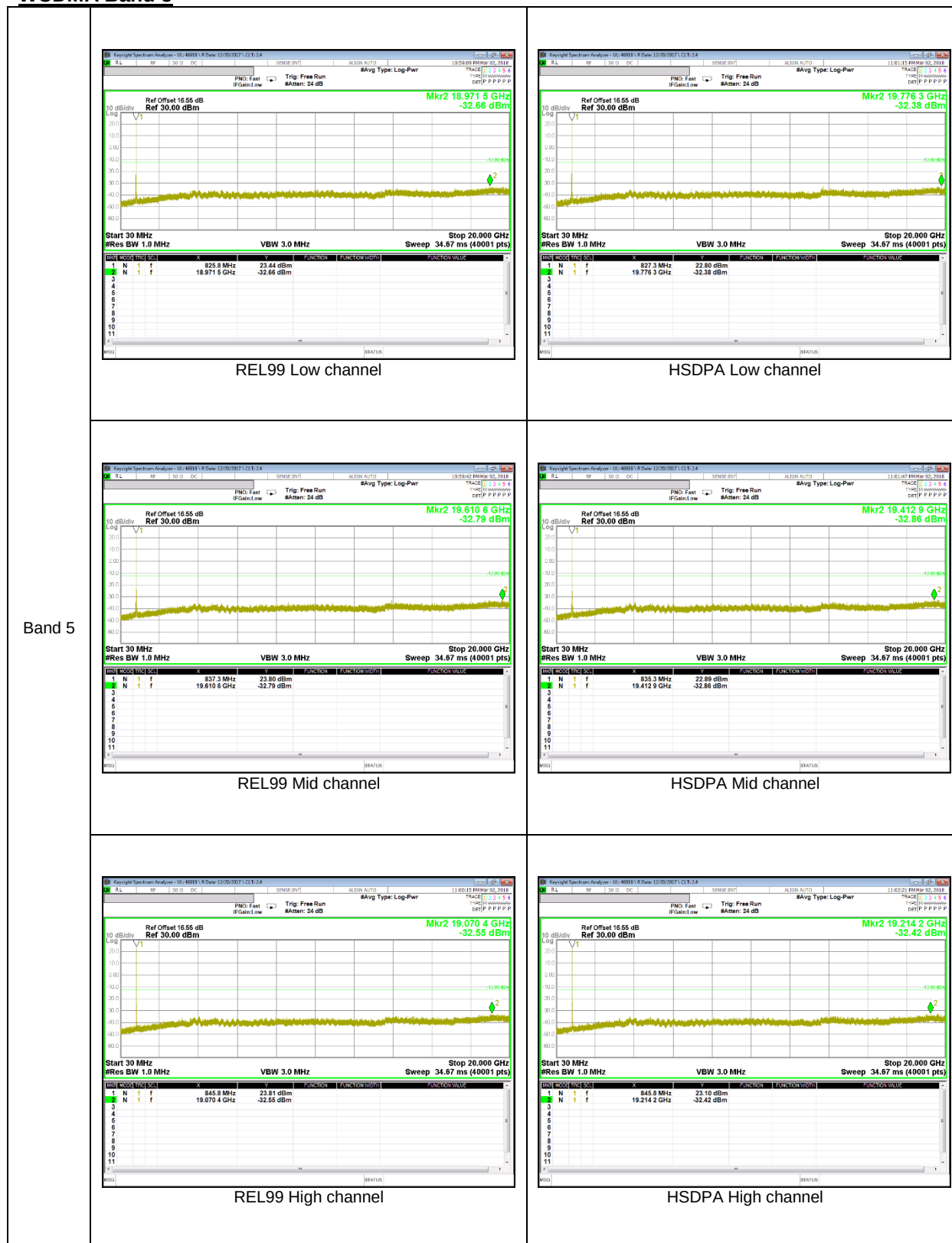
| Bandwidth | Mode  | f [MHz] | Spurious [dBm] | Limit [dBm] |
|-----------|-------|---------|----------------|-------------|
| 20 MHz    | QPSK  | 2506.0  | -33.027        | -25.00      |
|           |       | 2593.0  | -32.990        |             |
|           |       | 2680.0  | -33.065        |             |
|           | 16QAM | 2506.0  | -32.260        |             |
|           |       | 2593.0  | -32.958        |             |
|           |       | 2680.0  | -32.688        |             |
| 15 MHz    | QPSK  | 2503.5  | -31.790        |             |
|           |       | 2593.0  | -32.187        |             |
|           |       | 2682.5  | -33.031        |             |
|           | 16QAM | 2503.5  | -31.208        |             |
|           |       | 2593.0  | -32.090        |             |
|           |       | 2682.5  | -32.346        |             |
| 10 MHz    | QPSK  | 2501.0  | -31.609        |             |
|           |       | 2593.0  | -32.878        |             |
|           |       | 2685.0  | -32.028        |             |
|           | 16QAM | 2501.0  | -32.152        |             |
|           |       | 2593.0  | -32.643        |             |
|           |       | 2685.0  | -32.898        |             |
| 5 MHz     | QPSK  | 2498.5  | -32.388        |             |
|           |       | 2593.0  | -32.733        |             |
|           |       | 2687.5  | -38.257        |             |
|           | 16QAM | 2498.5  | -31.895        |             |
|           |       | 2593.0  | -32.919        |             |
|           |       | 2687.5  | -32.778        |             |

### 9.3.1. OUT OF BAND EMISSIONS PLOTS

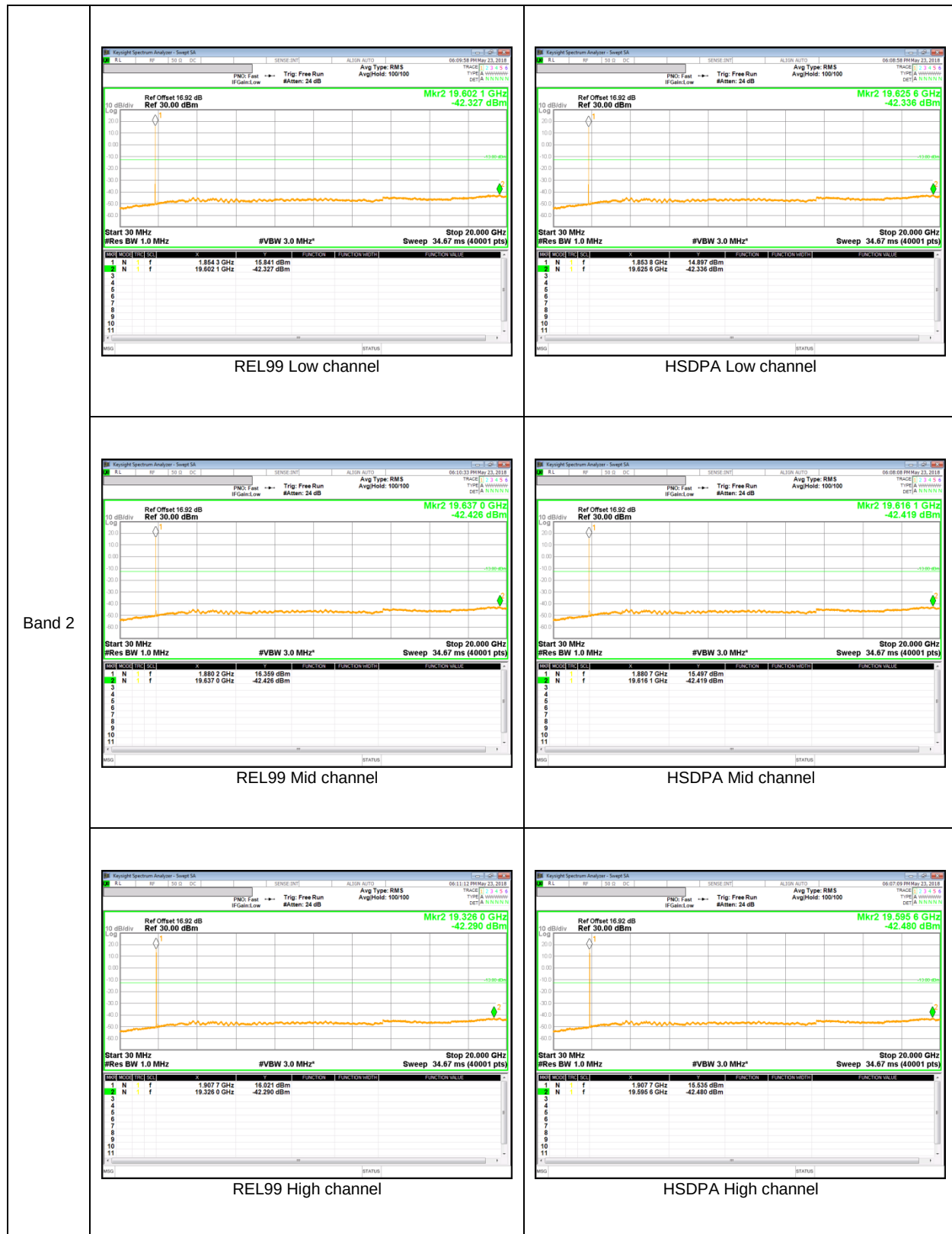
#### GSM 1900



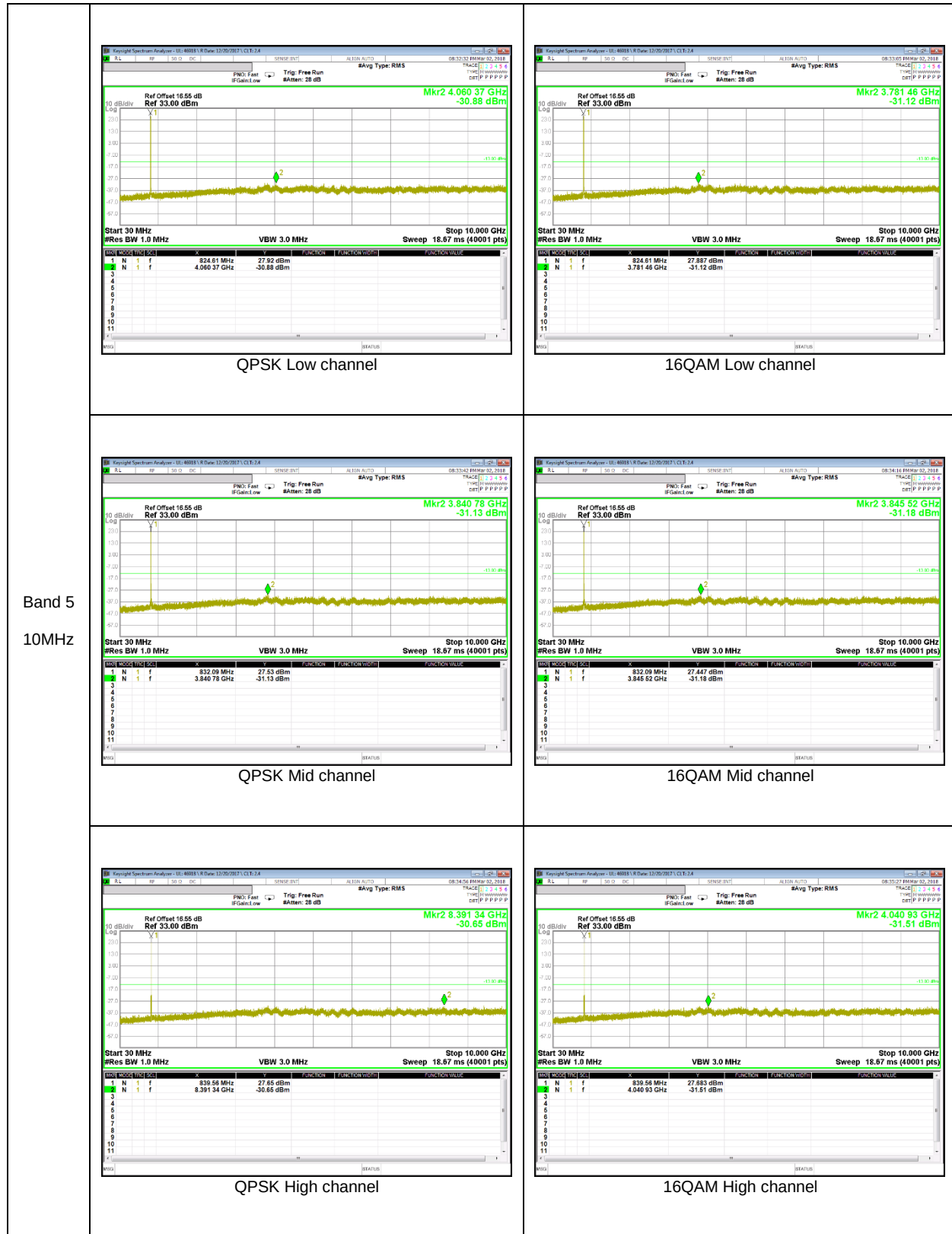
# WCDMA Band 5

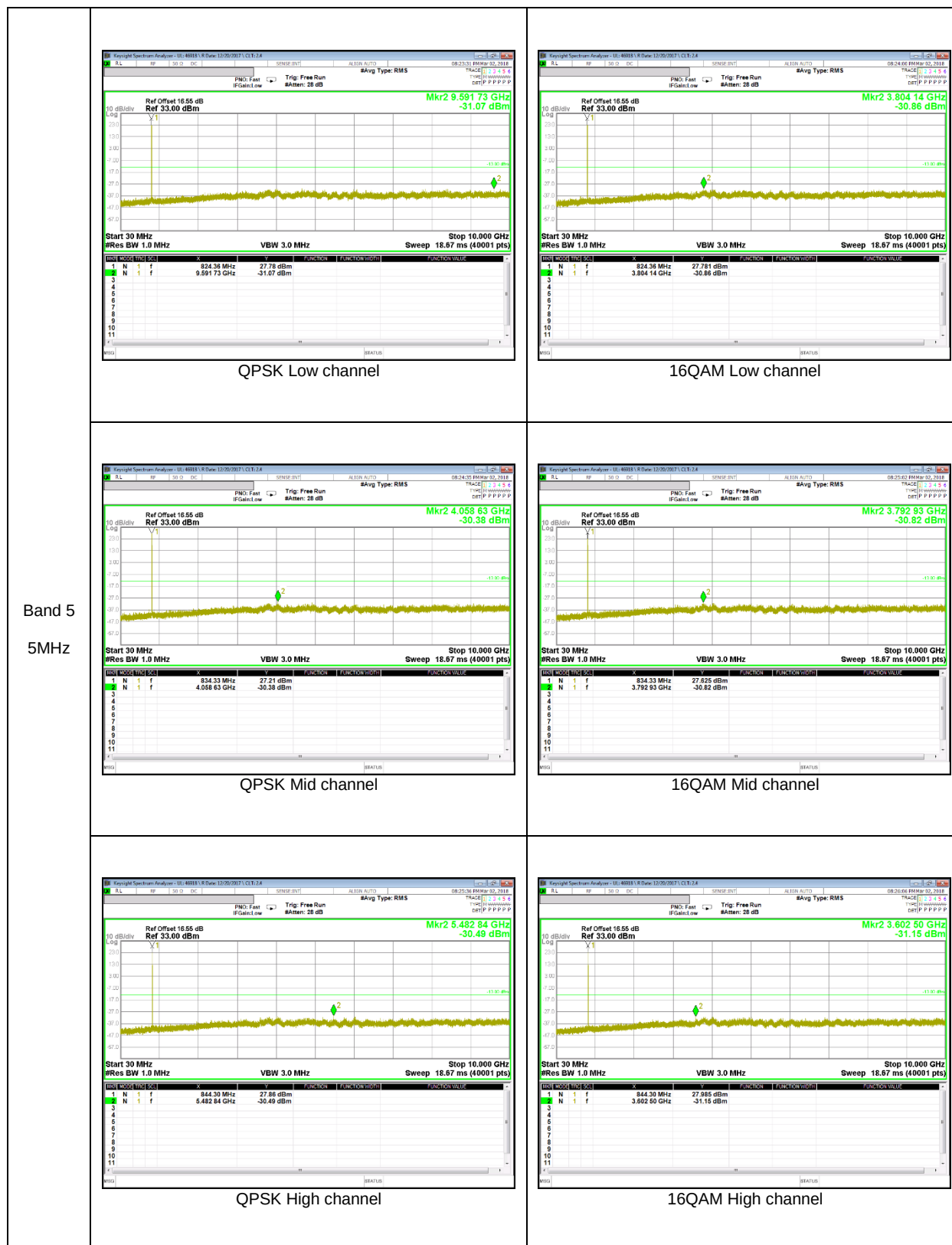


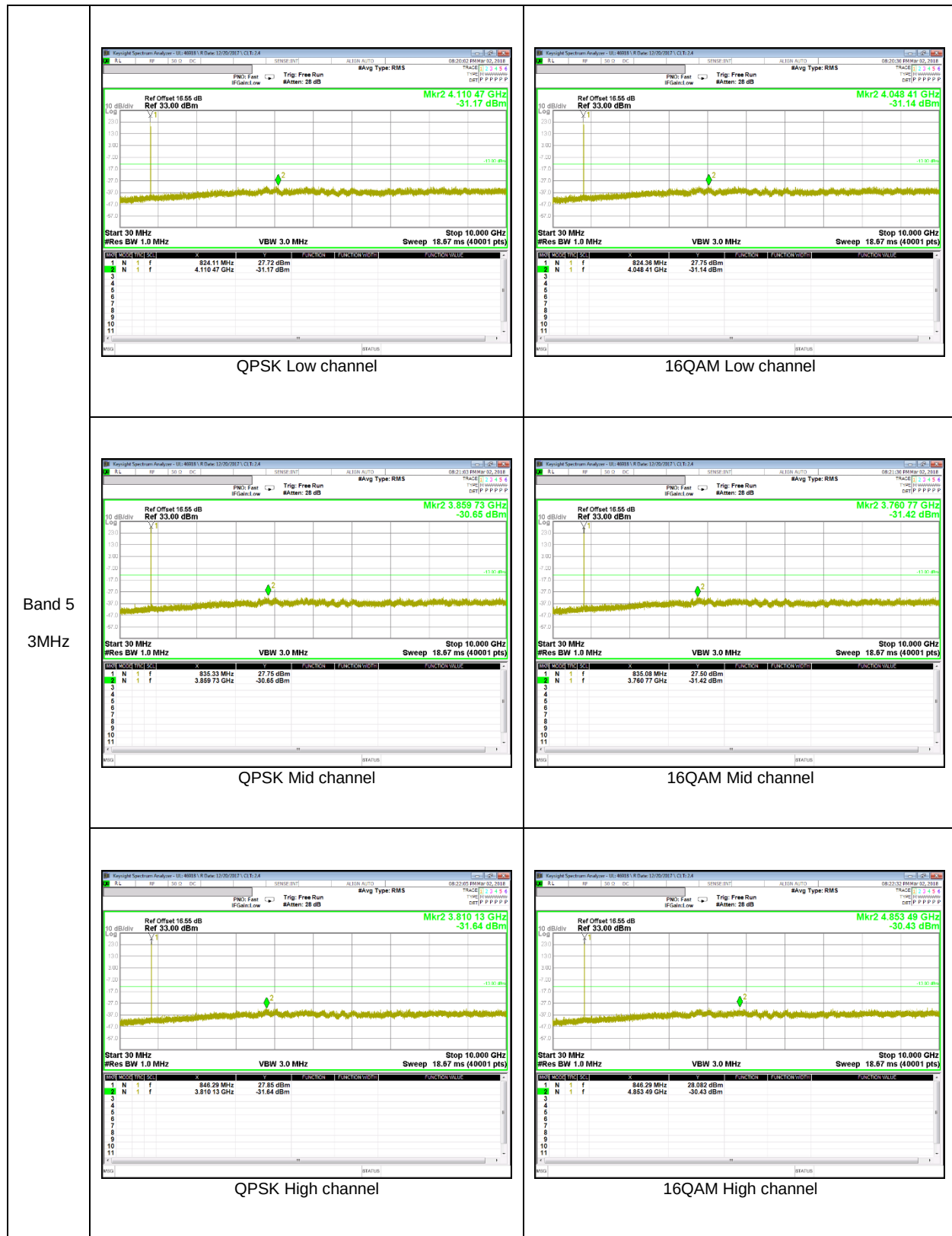
**WCDMA Band 2**

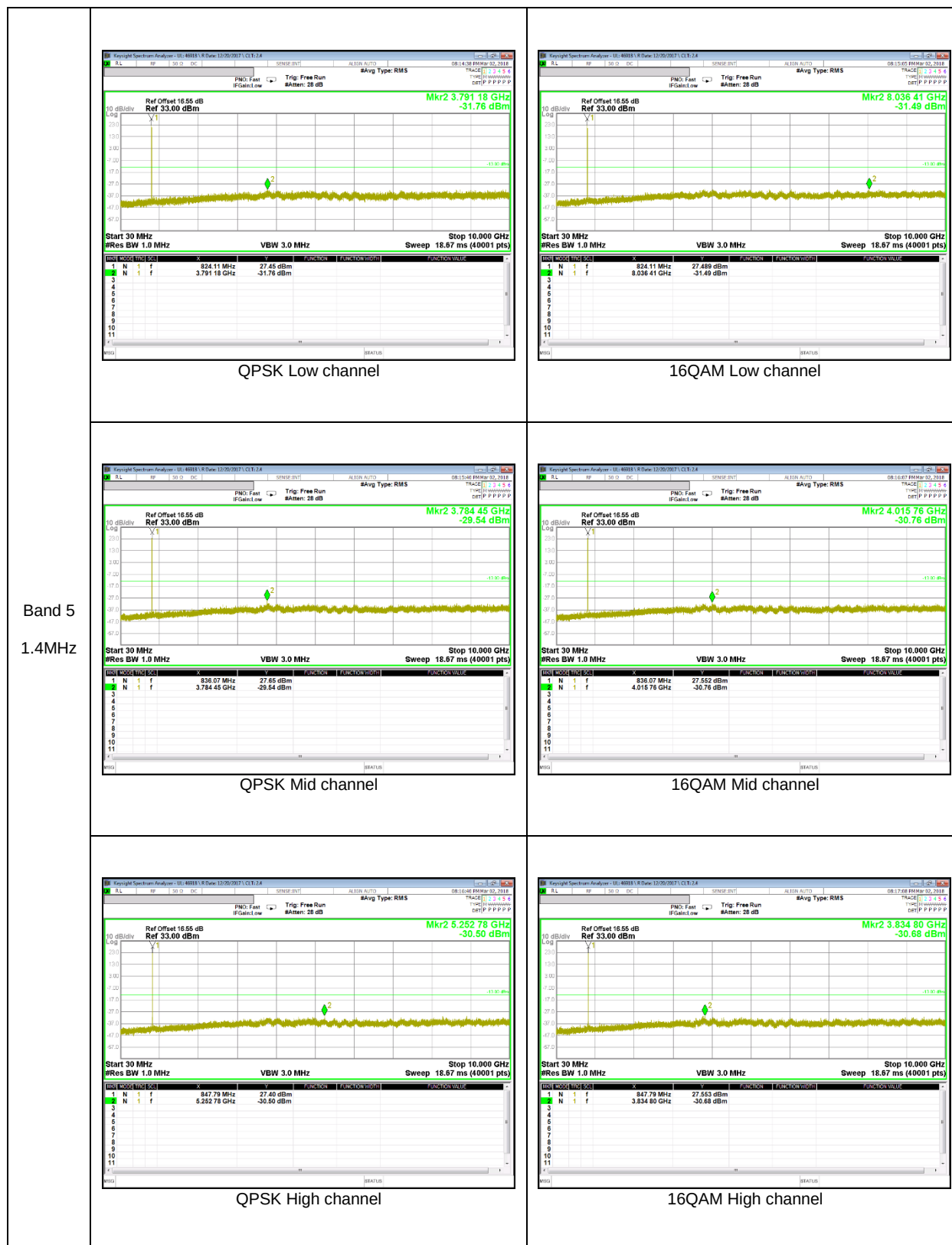


**LTE Band 5**

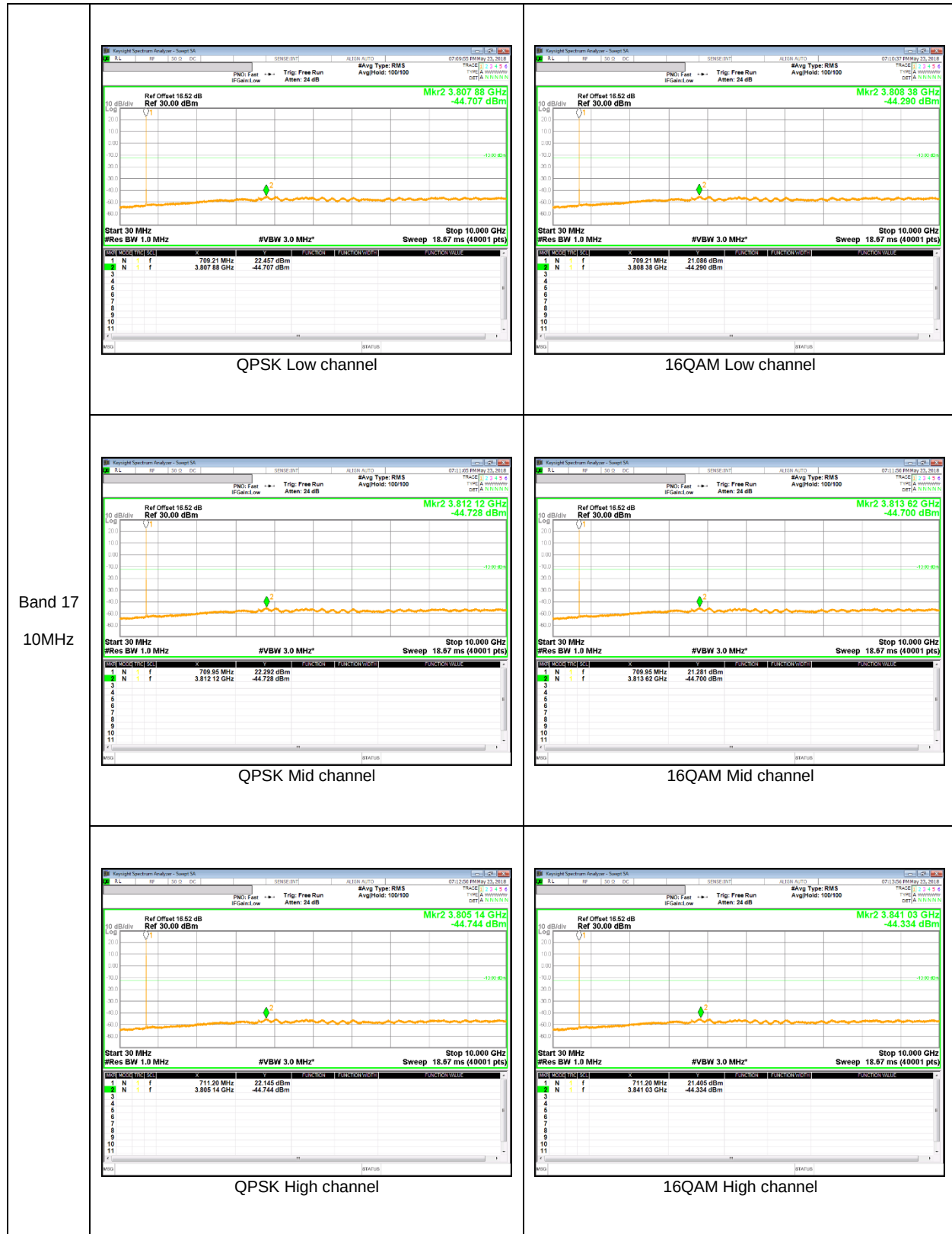


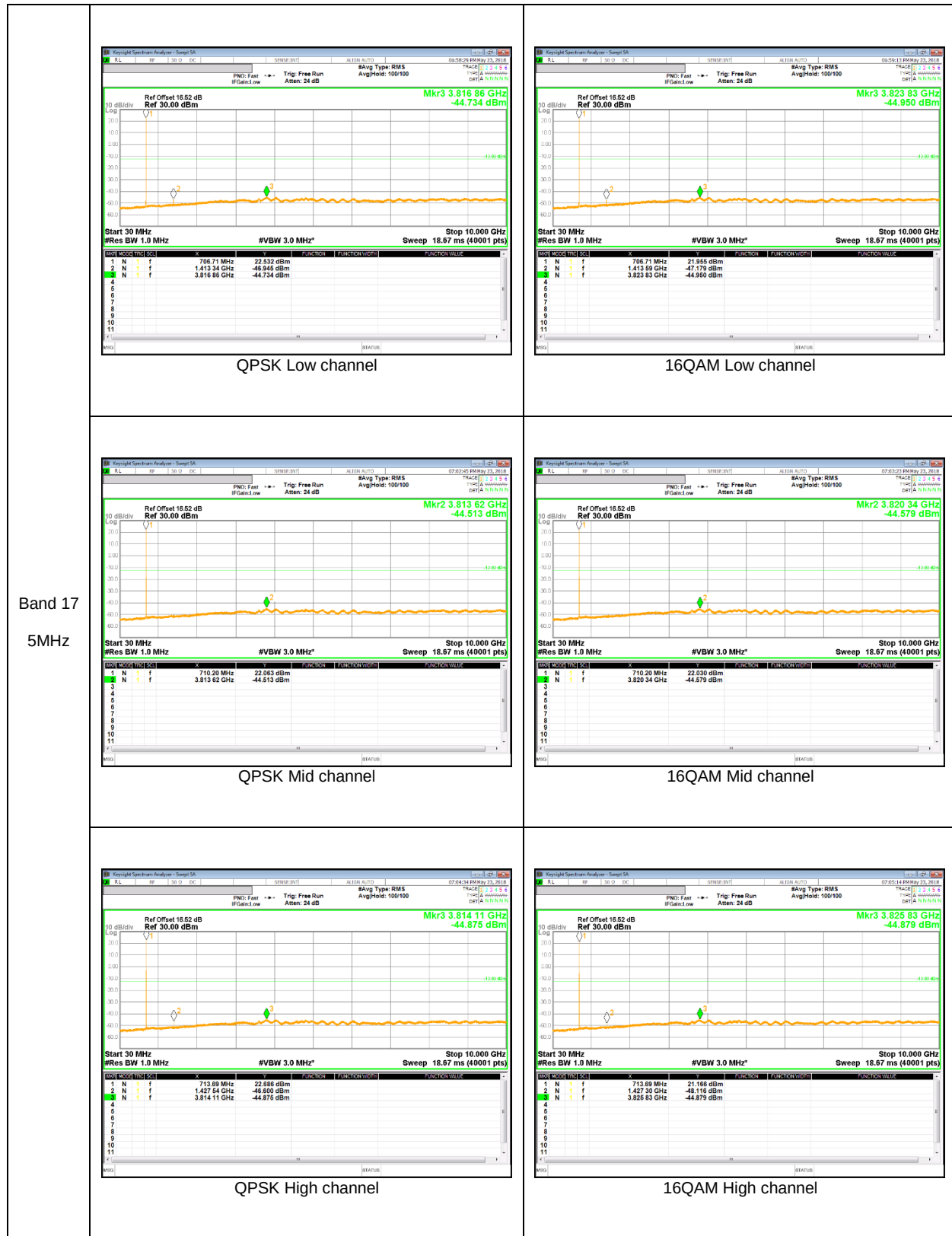




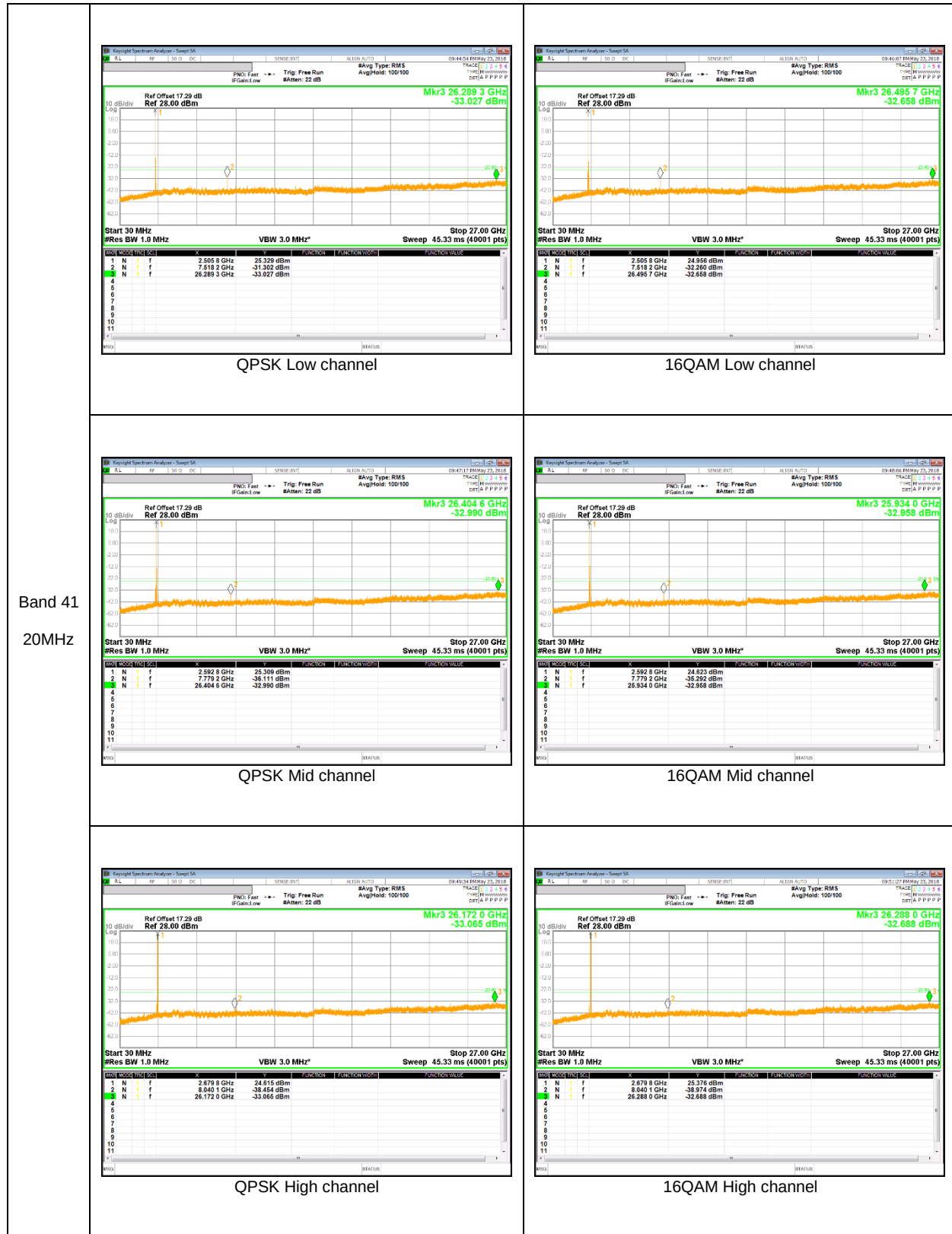


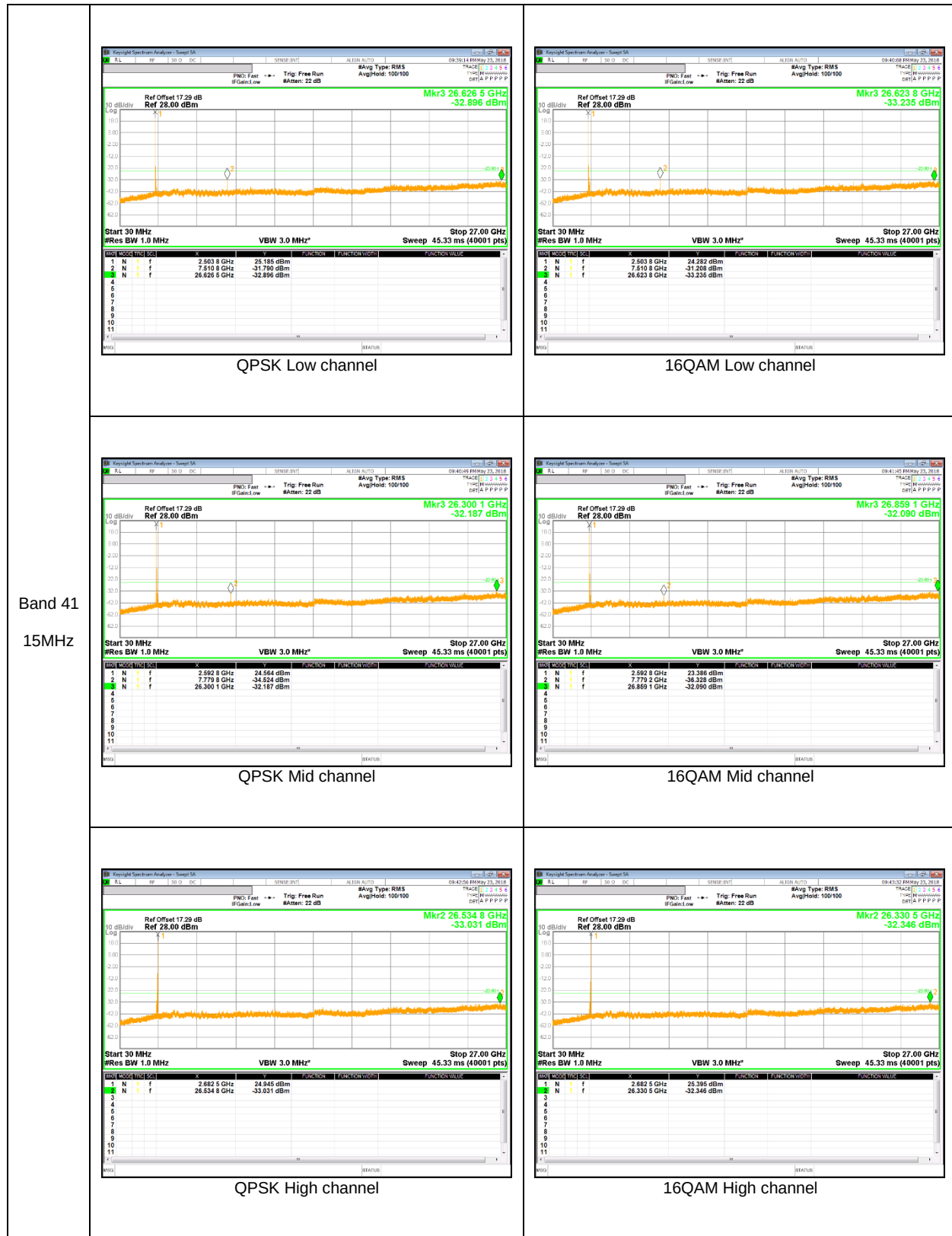
**LTE Band 17**

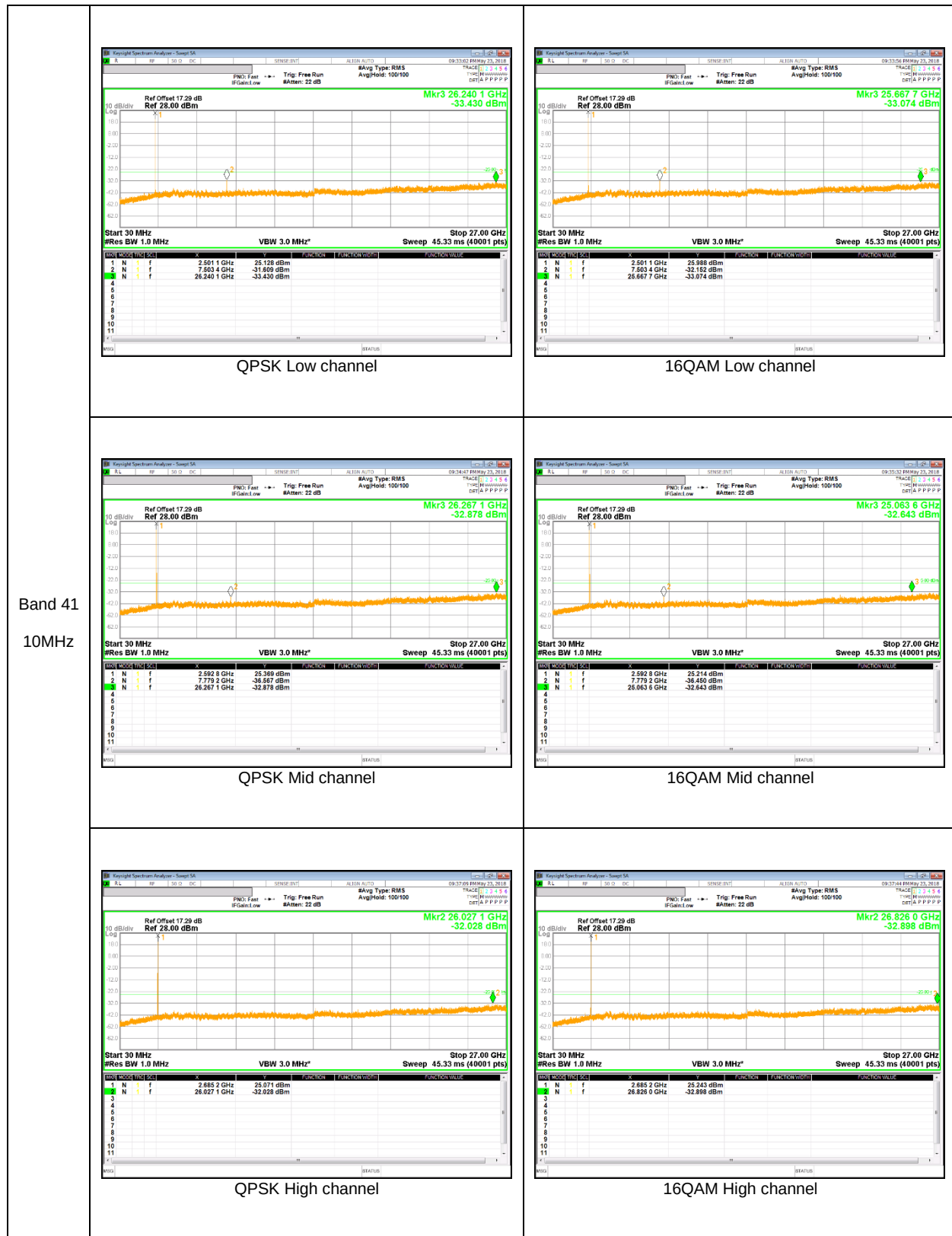


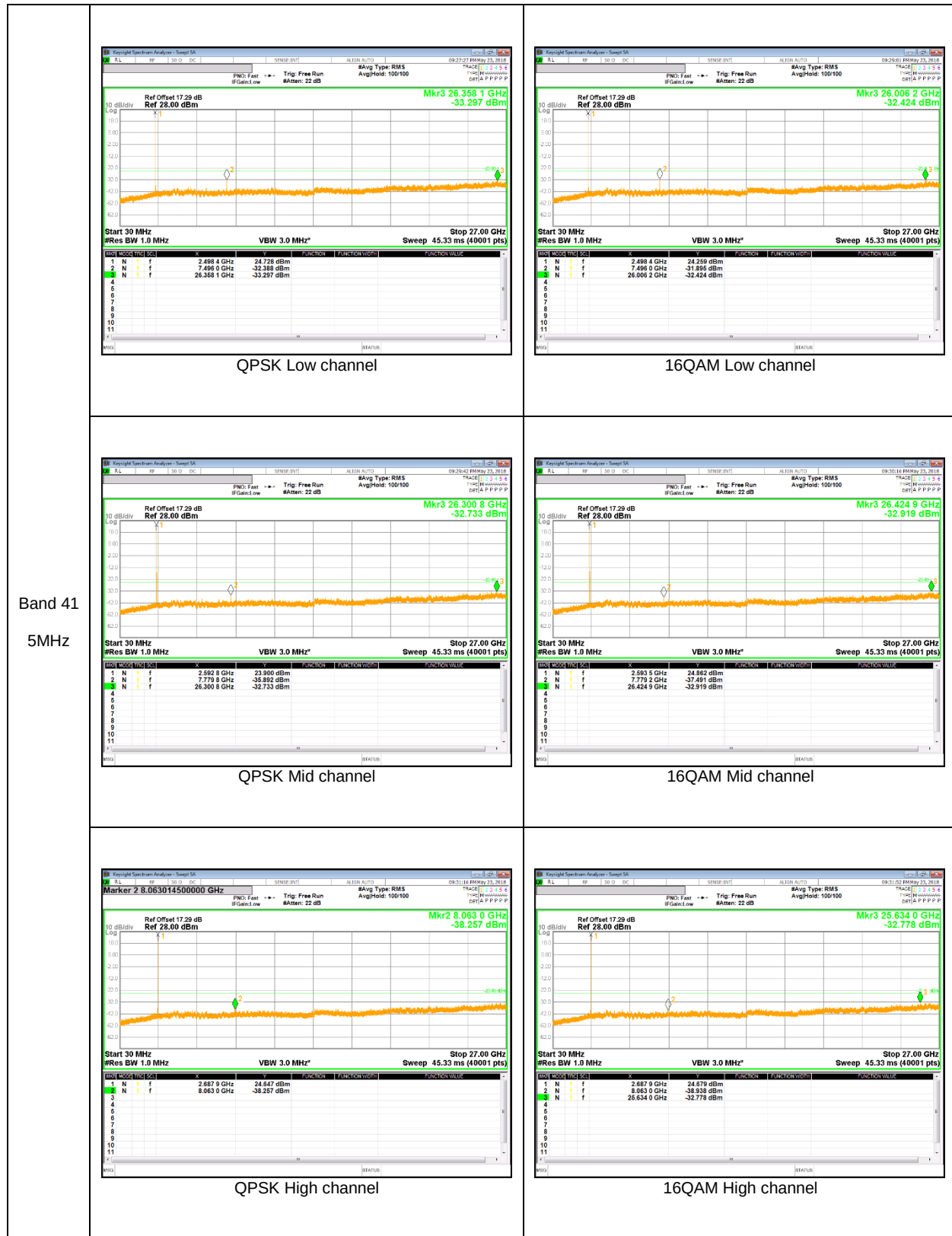


**LTE Band 41**









## **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.

### 9.4.1. FREQUENCY STABILITY RESULTS

#### GSM 1900, Channel 661, Frequency 1880.0 MHz

| Reference Frequency: GSM1900 Mid Channel 1880.0 MHz @ 20°C |                                 |                                               |             |             |
|------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                      | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                            |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                       | 50                              | 1879.99997991                                 | -0.001      | 2.5         |
| 3.85                                                       | 40                              | 1879.99997717                                 | 0.001       | 2.5         |
| 3.85                                                       | 30                              | 1879.99997796                                 | 0.000       | 2.5         |
| <b>3.85</b>                                                | <b>20</b>                       | 1879.99997825                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                       | 10                              | 1879.99998224                                 | -0.002      | 2.5         |
| 3.85                                                       | 0                               | 1879.99998135                                 | -0.002      | 2.5         |
| 3.85                                                       | -10                             | 1879.99998109                                 | -0.002      | 2.5         |
| 3.85                                                       | -20                             | 1879.99997992                                 | -0.001      | 2.5         |
| 3.85                                                       | -30                             | 1879.99998396                                 | -0.003      | 2.5         |

| Reference Frequency: GSM1900 Mid Channel 1880.0 MHz @ 20°C |                                 |                                               |             |             |
|------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                            |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                      | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                            |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                | <b>20</b>                       | <b>1879.99997825</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                       | 20                              | 1879.99997702                                 | 0.001       | 2.5         |
| 3.60                                                       | 20                              | 1879.99997581                                 | 0.001       | 2.5         |

**WCDMA Band 5 , Channel 4183, Frequency 836.6 MHz**

| Reference Frequency: WCDMA Band 5 Mid Channel 836.6 MHz @ 20°C |                                 |                                               |             |             |
|----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.500 Hz                                |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                          | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                           | 50                              | 836.60001509                                  | 0.001       | 2.5         |
| 3.85                                                           | 40                              | 836.60001702                                  | -0.002      | 2.5         |
| 3.85                                                           | 30                              | 836.60001061                                  | 0.006       | 2.5         |
| <b>3.85</b>                                                    | <b>20</b>                       | 836.60001558                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                           | 10                              | 836.60001471                                  | 0.001       | 2.5         |
| 3.85                                                           | 0                               | 836.60000956                                  | 0.007       | 2.5         |
| 3.85                                                           | -10                             | 836.60001194                                  | 0.004       | 2.5         |
| 3.85                                                           | -20                             | 836.60001620                                  | -0.001      | 2.5         |
| 3.85                                                           | -30                             | 836.60001574                                  | 0.000       | 2.5         |

| Reference Frequency: WCDMA Band 5 Mid Channel 836.6 MHz @ 20°C |                                 |                                               |             |             |
|----------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.500 Hz                                |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                          | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                                |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                    | <b>20</b>                       | <b>836.60001558</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                           | 20                              | 836.60001907                                  | -0.004      | 2.5         |
| 3.60                                                           | 20                              | 836.60001322                                  | 0.003       | 2.5         |

**WCDMA Band 2 , Channel 9400, Frequency 1880.0 MHz**

| Reference Frequency: WCDMA Band 2 Mid Channel 1880 MHz @ 20°C |                                 |                                               |             |             |
|---------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                               |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                         | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                               |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                          | 50                              | 1879.99998600                                 | -0.004      | 2.5         |
| 3.85                                                          | 40                              | 1879.99998004                                 | -0.001      | 2.5         |
| 3.85                                                          | 30                              | 1879.99998516                                 | -0.003      | 2.5         |
| <b>3.85</b>                                                   | <b>20</b>                       | 1879.99997858                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                          | 10                              | 1879.99998481                                 | -0.003      | 2.5         |
| 3.85                                                          | 0                               | 1879.99998475                                 | -0.003      | 2.5         |
| 3.85                                                          | -10                             | 1879.99998005                                 | -0.001      | 2.5         |
| 3.85                                                          | -20                             | 1879.99997974                                 | -0.001      | 2.5         |
| 3.85                                                          | -30                             | 1879.99998534                                 | -0.004      | 2.5         |

| Reference Frequency: WCDMA Band 2 Mid Channel 1880 MHz @ 20°C |                                 |                                               |             |             |
|---------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 4700.000 Hz                               |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                         | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                               |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                   | <b>20</b>                       | <b>1879.99997858</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                          | 20                              | 1879.99997648                                 | 0.001       | 2.5         |
| 3.60                                                          | 20                              | 1879.99997543                                 | 0.002       | 2.5         |

**LTE Band 5 , Channel 20524, Frequency 836.5 MHz**

| Reference Frequency: LTE Band 5 Mid Channel 836.5 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.250 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                         | 50                              | 836.49997515                                  | -0.001      | 2.5         |
| 3.85                                                         | 40                              | 836.49997189                                  | 0.003       | 2.5         |
| 3.85                                                         | 30                              | 836.49996726                                  | 0.009       | 2.5         |
| <b>3.85</b>                                                  | <b>20</b>                       | 836.49997463                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                         | 10                              | 836.49997574                                  | -0.001      | 2.5         |
| 3.85                                                         | 0                               | 836.49996854                                  | 0.007       | 2.5         |
| 3.85                                                         | -10                             | 836.49997573                                  | -0.001      | 2.5         |
| 3.85                                                         | -20                             | 836.49996624                                  | 0.010       | 2.5         |
| 3.85                                                         | -30                             | 836.49996737                                  | 0.009       | 2.5         |

| Reference Frequency: LTE Band 5 Mid Channel 836.5 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 2091.250 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                  | <b>20</b>                       | <b>836.49997463</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                         | 20                              | 836.49997578                                  | -0.001      | 2.5         |
| 3.60                                                         | 20                              | 836.49996556                                  | 0.011       | 2.5         |

**LTE Band 17 , Channel 23790, Frequency 710.0 MHz**

| Reference Frequency: LTE Band 17 Mid Channel 710 MHz @ 20°C |                                 |                                               |             |             |
|-------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 1775.000 Hz                             |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                       | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                             |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                        | 50                              | 709.99998077                                  | -0.007      | 2.5         |
| 3.85                                                        | 40                              | 709.99997301                                  | 0.004       | 2.5         |
| 3.85                                                        | 30                              | 709.99997290                                  | 0.004       | 2.5         |
| <b>3.85</b>                                                 | <b>20</b>                       | 709.99997550                                  | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                        | 10                              | 709.99997815                                  | -0.004      | 2.5         |
| 3.85                                                        | 0                               | 709.99997353                                  | 0.003       | 2.5         |
| 3.85                                                        | -10                             | 709.99998057                                  | -0.007      | 2.5         |
| 3.85                                                        | -20                             | 709.99997244                                  | 0.004       | 2.5         |
| 3.85                                                        | -30                             | 709.99997314                                  | 0.003       | 2.5         |

| Reference Frequency: LTE Band 17 Mid Channel 710 MHz @ 20°C |                                 |                                               |             |             |
|-------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 1775.000 Hz                             |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                       | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                             |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                 | <b>20</b>                       | <b>709.99997550</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                        | 20                              | 709.99997472                                  | 0.001       | 2.5         |
| 3.60                                                        | 20                              | 709.99997096                                  | 0.006       | 2.5         |

**LTE Band 41 , Channel 406230, Frequency 2593.0 MHz**

| Reference Frequency: LTE Band 41 Mid Channel 2593 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 6482.500 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| 3.85                                                         | 50                              | 2593.00002240                                 | -0.001      | 2.5         |
| 3.85                                                         | 40                              | 2593.00002476                                 | -0.002      | 2.5         |
| 3.85                                                         | 30                              | 2593.00002548                                 | -0.002      | 2.5         |
| <b>3.85</b>                                                  | <b>20</b>                       | 2593.00001926                                 | <b>0</b>    | <b>2.5</b>  |
| 3.85                                                         | 10                              | 2593.00001585                                 | 0.001       | 2.5         |
| 3.85                                                         | 0                               | 2593.00002142                                 | -0.001      | 2.5         |
| 3.85                                                         | -10                             | 2593.00002457                                 | -0.002      | 2.5         |
| 3.85                                                         | -20                             | 2593.00001739                                 | 0.001       | 2.5         |
| 3.85                                                         | -30                             | 2593.00001985                                 | 0.000       | 2.5         |

| Reference Frequency: LTE Band 41 Mid Channel 2593 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: +- 2.5 ppm = 6482.500 Hz                              |                                 |                                               |             |             |
| Power Supply<br>[Vdc]                                        | Environment<br>Temperature [°C] | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | [MHz]                                         | Delta [ppm] | Limit [ppm] |
| <b>3.85</b>                                                  | <b>20</b>                       | <b>2593.00001926</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.40                                                         | 20                              | 2593.00002375                                 | -0.002      | 2.5         |
| 3.60                                                         | 20                              | 2593.00001615                                 | 0.001       | 2.5         |

## 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(h) - (2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

#### TEST PROCEDURE

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

For radiated output power LTE B5 measurement with a ESU40:

a) Set span to at least 1.5 times the OBW; b) Set number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ ; c) Sweep time = auto-couple; d) Detector = RMS (power averaging); e) Use free run trigger If burst duty cycle  $\geq 98$ ; f) Use trigger to capture bursts If burst duty cycle  $< 98$ ; i) Trace average at least 100 traces in power averaging (i.e., RMS) mode. g) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function. (RBW/VBW are automatically set)

For radiated output power GSM/WCDMA/ LTE B17/LTE B41 measurement with a ESU40:

a) Set the RBW  $\geq$  OBW; b) Set VBW  $\geq 3 \times \text{RBW}$ ; c) Set span  $\geq 2 \times \text{RBW}$ ; d) Sweep time = auto couple; e) Detector = rms; f) Ensure that the number of measurement points  $\geq \text{span}/\text{RBW}$ ; 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]   |
| GSM1900 | GPRS  | 512     | 1850.2  | 28.50      | 707.95 |
|         |       | 661     | 1880.0  | 27.98      | 628.06 |
|         |       | 810     | 1909.8  | 27.71      | 590.20 |
|         | EGPRS | 512     | 1850.2  | 25.02      | 317.69 |
|         |       | 661     | 1880.0  | 24.09      | 256.45 |
|         |       | 810     | 1909.8  | 24.31      | 269.77 |

#### WCDMA

| Band   | Mode  | Channel | f [MHz] | ERP / EIRP |        |
|--------|-------|---------|---------|------------|--------|
|        |       |         |         | [dBm]      | [mW]   |
| Band 5 | REL99 | 4132    | 826.4   | 17.93      | 62.09  |
|        |       | 4183    | 836.6   | 17.48      | 55.98  |
|        |       | 4233    | 846.6   | 16.64      | 46.13  |
|        | HSDPA | 4132    | 826.4   | 17.43      | 55.34  |
|        |       | 4183    | 836.6   | 17.09      | 51.17  |
|        |       | 4233    | 846.6   | 16.35      | 43.15  |
| Band 2 | REL99 | 9262    | 1852.4  | 18.36      | 68.55  |
|        |       | 9400    | 1880.0  | 20.70      | 117.49 |
|        |       | 9538    | 1907.6  | 20.05      | 101.16 |
|        | HSDPA | 9262    | 1852.4  | 17.38      | 54.70  |
|        |       | 9400    | 1880.0  | 19.82      | 95.94  |
|        |       | 9538    | 1907.6  | 18.59      | 72.28  |

**LTE Band 5**

| Band   | BW [MHz] | Mode  | RB/RB Size | f [MHz] | ERP / EIRP |       |
|--------|----------|-------|------------|---------|------------|-------|
|        |          |       | Full RB    |         | [dBm]      | [mW]  |
| Band 5 | 10       | QPSK  | 50/0       | 829.0   | 16.32      | 42.85 |
|        |          |       | 50/0       | 836.5   | 16.02      | 39.99 |
|        |          |       | 50/0       | 844.0   | 15.57      | 36.06 |
|        |          | 16QAM | 50/0       | 829.0   | 15.50      | 35.48 |
|        |          |       | 50/0       | 836.5   | 15.05      | 31.99 |
|        |          |       | 50/0       | 844.0   | 14.39      | 27.48 |
|        | 5        | QPSK  | 25/0       | 826.5   | 16.08      | 40.55 |
|        |          |       | 25/0       | 836.5   | 15.69      | 37.07 |
|        |          |       | 25/0       | 846.5   | 14.76      | 29.92 |
|        |          | 16QAM | 25/0       | 826.5   | 15.07      | 32.14 |
|        |          |       | 25/0       | 836.5   | 14.77      | 29.99 |
|        |          |       | 25/0       | 846.5   | 13.83      | 24.15 |
|        | 3        | QPSK  | 15/0       | 825.5   | 16.45      | 44.16 |
|        |          |       | 15/0       | 836.5   | 15.57      | 36.06 |
|        |          |       | 15/0       | 847.5   | 14.48      | 28.05 |
|        |          | 16QAM | 15/0       | 825.5   | 15.42      | 34.83 |
|        |          |       | 15/0       | 836.5   | 14.59      | 28.77 |
|        |          |       | 15/0       | 847.5   | 13.51      | 22.44 |
|        | 1.4      | QPSK  | 6/0        | 824.7   | 13.98      | 25.00 |
|        |          |       | 6/0        | 836.5   | 12.45      | 17.58 |
|        |          |       | 6/0        | 848.3   | 12.33      | 17.10 |
|        |          | 16QAM | 6/0        | 824.7   | 13.14      | 20.61 |
|        |          |       | 6/0        | 836.5   | 11.51      | 14.16 |
|        |          |       | 6/0        | 848.3   | 11.40      | 13.80 |

**LTE Band 17**

| Band    | BW<br>[MHz] | Mode  | RB/RB Offset | f [MHz] | ERP / EIRP |       |
|---------|-------------|-------|--------------|---------|------------|-------|
|         |             |       | 1 RB         |         | [dBm]      | [mW]  |
| Band 17 | 10          | QPSK  | 1 / 0        | 709.0   | 17.33      | 54.08 |
|         |             |       | 1 / 0        | 710.0   | 17.55      | 56.89 |
|         |             |       | 1 / 0        | 711.0   | 16.46      | 44.26 |
|         |             | 16QAM | 1 / 0        | 709.0   | 16.26      | 42.27 |
|         |             |       | 1 / 49       | 710.0   | 16.62      | 45.92 |
|         |             |       | 1 / 0        | 711.0   | 15.51      | 35.56 |
|         | 5           | QPSK  | 1 / 0        | 706.5   | 17.17      | 52.12 |
|         |             |       | 1 / 0        | 710.0   | 17.38      | 54.70 |
|         |             |       | 1 / 0        | 713.5   | 17.73      | 59.29 |
|         |             | 16QAM | 1 / 0        | 706.5   | 16.25      | 42.17 |
|         |             |       | 1 / 12       | 710.0   | 16.61      | 45.81 |
|         |             |       | 1 / 12       | 713.5   | 16.26      | 42.27 |

**LTE Band 41**

| Band    | BW<br>[MHz] | Mode  | RB/RB Offset | f [MHz] | ERP / EIRP |        |
|---------|-------------|-------|--------------|---------|------------|--------|
|         |             |       | 1 RB         |         | [dBm]      | [mW]   |
| Band 41 | 20          | QPSK  | 1 / 49       | 2506.0  | 20.70      | 117.49 |
|         |             |       | 1 / 49       | 2593.0  | 21.63      | 145.55 |
|         |             |       | 1 / 99       | 2680.0  | 22.58      | 181.13 |
|         |             | 16QAM | 1 / 49       | 2506.0  | 19.31      | 85.31  |
|         |             |       | 1 / 99       | 2593.0  | 22.12      | 162.93 |
|         |             |       | 1 / 99       | 2680.0  | 21.44      | 139.32 |
|         | 15          | QPSK  | 1 / 0        | 2503.5  | 22.29      | 169.43 |
|         |             |       | 1 / 74       | 2593.0  | 21.15      | 130.32 |
|         |             |       | 1 / 74       | 2682.5  | 22.37      | 172.58 |
|         |             | 16QAM | 1 / 0        | 2503.5  | 20.86      | 121.90 |
|         |             |       | 1 / 0        | 2593.0  | 22.21      | 166.34 |
|         |             |       | 1 / 74       | 2682.5  | 21.74      | 149.28 |
|         | 10          | QPSK  | 1 / 0        | 2501.0  | 21.38      | 137.40 |
|         |             |       | 1 / 49       | 2593.0  | 23.03      | 200.91 |
|         |             |       | 1 / 49       | 2685.0  | 22.28      | 169.04 |
|         |             | 16QAM | 1 / 0        | 2501.0  | 21.46      | 139.96 |
|         |             |       | 1 / 49       | 2593.0  | 21.73      | 148.94 |
|         |             |       | 1 / 49       | 2685.0  | 22.43      | 174.98 |
|         | 5           | QPSK  | 1 / 24       | 2498.5  | 21.53      | 142.23 |
|         |             |       | 1 / 0        | 2593.0  | 23.20      | 208.93 |
|         |             |       | 1 / 0        | 2687.5  | 22.11      | 162.55 |
|         |             | 16QAM | 1 / 0        | 2498.5  | 21.20      | 131.83 |
|         |             |       | 1 / 0        | 2593.0  | 22.34      | 171.40 |
|         |             |       | 1 / 0        | 2687.5  | 21.44      | 139.32 |

## 10.1.2. ERP/EIRP DATA

### GSM 1900

| GSM<br><br>GSM1900<br>GPRS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL Verification Services, Inc.<br>High Frequency Substitution Measurement                                      |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------|-----------------------|---------------|----------------|---------------|-------|----------|---------------------|--------------------|--------------------|-----------------------|---------------|----------------|---------------|-------|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|--------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|---------|--|--|--|--|--|--|--|--|---------|-------|---|-----|-----|-------|------|-------|--|---------|-------|---|-----|-----|-------|------|------|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Company:                                                                                                       |                    | Samsung                     |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Project #:                                                                                                     |                    | 4788480738                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Date:                                                                                                          |                    | 2018-05-14                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Engineer:                                                                                                 |                    | 51072                       |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Configuration:                                                                                                 |                    | EUT                         |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Location:                                                                                                      |                    | Chamber 1                   |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Mode:                                                                                                          |                    | GPRS 1900 MHz Fundamentals  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Equipment:                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(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>1850.20</td><td>19.60</td><td>V</td><td>4.5</td><td>9.5</td><td>24.61</td><td>33.0</td><td>-8.4</td><td></td></tr><tr><td>1850.20</td><td>23.49</td><td>H</td><td>4.5</td><td>9.5</td><td>28.50</td><td>33.0</td><td>-4.5</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>1880.00</td><td>19.75</td><td>V</td><td>4.5</td><td>9.2</td><td>24.43</td><td>33.0</td><td>-8.6</td><td></td></tr><tr><td>1880.00</td><td>23.30</td><td>H</td><td>4.5</td><td>9.2</td><td>27.98</td><td>33.0</td><td>-5.0</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>1909.80</td><td>19.76</td><td>V</td><td>4.6</td><td>8.9</td><td>24.06</td><td>33.0</td><td>-8.9</td><td></td></tr><tr><td>1909.80</td><td>23.41</td><td>H</td><td>4.6</td><td>8.9</td><td>27.71</td><td>33.0</td><td>-5.3</td><td></td></tr></table>    |                                                                                                                |                    |                             |                       |               |                |               |       | 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 |  |  |  |  |  |  |  |  | 1850.20 | 19.60 | V | 4.5 | 9.5 | 24.61 | 33.0 | -8.4  |  | 1850.20 | 23.49 | H | 4.5 | 9.5 | 28.50 | 33.0 | -4.5 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 19.75 | V | 4.5 | 9.2 | 24.43 | 33.0 | -8.6  |  | 1880.00 | 23.30 | H | 4.5 | 9.2 | 27.98 | 33.0 | -5.0 |  | High Ch |  |  |  |  |  |  |  |  | 1909.80 | 19.76 | V | 4.6 | 8.9 | 24.06 | 33.0 | -8.9  |  | 1909.80 | 23.41 | H | 4.6 | 8.9 | 27.71 | 33.0 | -5.3 |  |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19.60                                                                                                          | V                  | 4.5                         | 9.5                   | 24.61         | 33.0           | -8.4          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.49                                                                                                          | H                  | 4.5                         | 9.5                   | 28.50         | 33.0           | -4.5          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19.75                                                                                                          | V                  | 4.5                         | 9.2                   | 24.43         | 33.0           | -8.6          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.30                                                                                                          | H                  | 4.5                         | 9.2                   | 27.98         | 33.0           | -5.0          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19.76                                                                                                          | V                  | 4.6                         | 8.9                   | 24.06         | 33.0           | -8.9          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23.41                                                                                                          | H                  | 4.6                         | 8.9                   | 27.71         | 33.0           | -5.3          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| GSM<br><br>GSM1900<br>EGPRS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UL Verification Services, Inc.<br>High Frequency Substitution Measurement                                      |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Company:                                                                                                       |                    | Samsung                     |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Project #:                                                                                                     |                    | 4788480738                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Date:                                                                                                          |                    | 2018-05-14                  |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Engineer:                                                                                                 |                    | 51072                       |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Configuration:                                                                                                 |                    | EUT                         |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Location:                                                                                                      |                    | Chamber 1                   |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Mode:                                                                                                          |                    | EGPRS 1900 MHz Fundamentals |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Test Equipment:                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Receiving: Horn 3117[00168717], and Chamber 1 SMA Cables<br>Substitution: Horn 3115[00161451], 3m N-type Cable |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| <table><tr><th>f<br/>MHz</th><th>SG reading<br/>(dBm)</th><th>Ant. Pol.<br/>(H/V)</th><th>Cable Loss<br/>(dB)</th><th>Antenna Gain<br/>(dBi)</th><th>EIRP<br/>(dBm)</th><th>Limit<br/>(dBm)</th><th>Delta<br/>(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>1850.20</td><td>15.92</td><td>V</td><td>4.5</td><td>9.5</td><td>20.93</td><td>33.0</td><td>-12.1</td><td></td></tr><tr><td>1850.20</td><td>20.01</td><td>H</td><td>4.5</td><td>9.5</td><td>25.02</td><td>33.0</td><td>-8.0</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>1880.00</td><td>17.27</td><td>V</td><td>4.5</td><td>9.2</td><td>21.95</td><td>33.0</td><td>-11.1</td><td></td></tr><tr><td>1880.00</td><td>19.41</td><td>H</td><td>4.5</td><td>9.2</td><td>24.09</td><td>33.0</td><td>-8.9</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>1909.80</td><td>16.55</td><td>V</td><td>4.6</td><td>8.9</td><td>20.85</td><td>33.0</td><td>-12.2</td><td></td></tr><tr><td>1909.80</td><td>20.01</td><td>H</td><td>4.6</td><td>8.9</td><td>24.31</td><td>33.0</td><td>-8.7</td><td></td></tr></table> |                                                                                                                |                    |                             |                       |               |                |               |       | 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 |  |  |  |  |  |  |  |  | 1850.20 | 15.92 | V | 4.5 | 9.5 | 20.93 | 33.0 | -12.1 |  | 1850.20 | 20.01 | H | 4.5 | 9.5 | 25.02 | 33.0 | -8.0 |  | Mid Ch |  |  |  |  |  |  |  |  | 1880.00 | 17.27 | V | 4.5 | 9.2 | 21.95 | 33.0 | -11.1 |  | 1880.00 | 19.41 | H | 4.5 | 9.2 | 24.09 | 33.0 | -8.9 |  | High Ch |  |  |  |  |  |  |  |  | 1909.80 | 16.55 | V | 4.6 | 8.9 | 20.85 | 33.0 | -12.2 |  | 1909.80 | 20.01 | H | 4.6 | 8.9 | 24.31 | 33.0 | -8.7 |  |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 15.92                                                                                                          | V                  | 4.5                         | 9.5                   | 20.93         | 33.0           | -12.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1850.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20.01                                                                                                          | H                  | 4.5                         | 9.5                   | 25.02         | 33.0           | -8.0          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| Mid Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 17.27                                                                                                          | V                  | 4.5                         | 9.2                   | 21.95         | 33.0           | -11.1         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1880.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19.41                                                                                                          | H                  | 4.5                         | 9.2                   | 24.09         | 33.0           | -8.9          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| High Ch                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                |                    |                             |                       |               |                |               |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 16.55                                                                                                          | V                  | 4.6                         | 8.9                   | 20.85         | 33.0           | -12.2         |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |
| 1909.80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20.01                                                                                                          | H                  | 4.6                         | 8.9                   | 24.31         | 33.0           | -8.7          |       |          |                     |                    |                    |                       |               |                |               |       |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |        |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |         |  |  |  |  |  |  |  |  |         |       |   |     |     |       |      |       |  |         |       |   |     |     |       |      |      |  |