



**FCC CFR47 PART 22 SUBPART H  
FCC CFR47 PART 24 SUBPART E**

**CERTIFICATION TEST REPORT**

**FOR**

**GSM Phone + Bluetooth/BLE and DTS b/g/n**

**MODEL NUMBER : SM-G361H, SM-G361H/DS**

**FCC ID: A3LSMG361H**

**REPORT NUMBER: 15K20822-E4**

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Revision History

| Rev. | Issue Date | Revisions                         | Revised By |
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| --   | 05/21/15   | Initial issue                     | CY Choi    |
| A    | 05/27/15   | Revised form of summary table     | CY Choi    |
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## TABLE OF CONTENTS

|                                                |           |
|------------------------------------------------|-----------|
| <b>1. ATTESTATION OF TEST RESULTS .....</b>    | <b>5</b>  |
| <b>2. TEST METHODOLOGY .....</b>               | <b>6</b>  |
| <b>3. FACILITIES AND ACCREDITATION .....</b>   | <b>6</b>  |
| <b>4. CALIBRATION AND UNCERTAINTY .....</b>    | <b>6</b>  |
| 4.1. MEASURING INSTRUMENT CALIBRATION .....    | 6         |
| 4.2. SAMPLE CALCULATION .....                  | 6         |
| 4.3. MEASUREMENT UNCERTAINTY.....              | 6         |
| <b>5. EQUIPMENT UNDER TEST .....</b>           | <b>7</b>  |
| 5.1. DESCRIPTION OF EUT .....                  | 7         |
| 5.2. MAXIMUM OUTPUT POWER (GSM) .....          | 7         |
| 5.3. DESCRIPTION OF AVAILABLE ANTENNAS .....   | 7         |
| 5.4. DESCRIPTION OF TEST SETUP.....            | 8         |
| <b>6. TEST AND MEASUREMENT EQUIPMENT .....</b> | <b>10</b> |
| <b>7. Summary Table .....</b>                  | <b>11</b> |
| <b>8. RF POWER OUTPUT VERIFICATION .....</b>   | <b>12</b> |
| 8.1. GSM/GPRS/EDGE .....                       | 12        |
| 8.1.1. GSM OUTPUT POWER RESULT.....            | 13        |
| <b>9. PEAK TO AVERAGE RATIO .....</b>          | <b>14</b> |
| 9.1. CONDUCTED PEAK TO AVERAGE RESULT.....     | 14        |
| 9.2. CONDUCTED PEAK TO AVERAGE PLOTS.....      | 15        |
| <b>10. LIMITS AND CONDUCTED RESULTS.....</b>   | <b>16</b> |
| 10.1. OCCUPIED BANDWIDTH.....                  | 16        |
| 10.1.1. OCCUPIED BANDWIDTH RESULTS.....        | 16        |
| 10.1.2. OCCUPIED BANDWIDTH PLOTS .....         | 17        |
| 10.2. BAND EDGE EMISSIONS .....                | 19        |
| 10.2.1. BAND EDGE PLOTS .....                  | 20        |
| 10.3. OUT OF BAND EMISSIONS.....               | 22        |
| 10.3.1. OUT OF BAND EMISSIONS RESULT .....     | 22        |
| 10.3.2. OUT OF BAND EMISSIONS PLOTS.....       | 23        |
| 10.1. FREQUENCY STABILITY.....                 | 25        |
| 10.1.1. FREQUENCY STABILITY RESULTS.....       | 26        |
| <b>11. RADIATED TEST RESULTS .....</b>         | <b>28</b> |

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|         |                                                   |    |
|---------|---------------------------------------------------|----|
| 11.1.   | <i>RADIATED POWER (ERP &amp; EIRP)</i> .....      | 28 |
| 11.1.1. | ERP/EIRP Results.....                             | 28 |
| 11.1.2. | ERP/EIRP DATA.....                                | 29 |
| 11.2.   | <i>FIELD STRENGTH OF SPURIOUS RADIATION</i> ..... | 30 |
| 11.2.1. | SPURIOUS RADIATION PLOTS.....                     | 31 |
| 12.     | <b>SETUP PHOTOS</b> .....                         | 32 |

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM Phone + Bluetooth/BLE and DTS b/g/n  
**MODEL NUMBER:** SM-G361H, SM-G361H/DS  
**SERIAL NUMBER:** R31G401L8VT (RADIATED); R31G401LD7E (CONDUCTED)  
**DATE TESTED:** MAY 11 - MAY 20, 2015

| APPLICABLE STANDARDS  |              |
|-----------------------|--------------|
| STANDARD              | TEST RESULTS |
| FCC PART 22H, 24E, 27 | Pass         |

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL Korea, Ltd. By:



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UL Korea, Ltd.

Tested By:



CY Choi  
Suwon Lab Engineer  
UL Korea, Ltd.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 22 and FCC CFR Part 24.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-823, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 218 Maeyeong-ro                               |
|-----------------------------------------------|
| <input checked="" type="checkbox"/> Chamber 1 |
| <input type="checkbox"/> Chamber 2            |

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\text{EIRP} = \text{PSA reading with EUT worst orientation (dBm)} + \text{Path loss (dB)} - \text{cable loss (between the SG and substitution antenna)} + \text{Substitution Antenna Factor (dBi)}$$

$$\text{ERP} = \text{PSA reading with EUT worst orientation (dBm)} + \text{Path loss (dB)} - \text{cable loss (between the SG and substitution antenna)}$$
  
(Path loss = Signal generator output – PSA reading with substitution antenna)

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                             | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 2.32 dB     |
| Radiated Disturbance, Below 1GHz      | 4.14 dB     |
| Radiated Disturbance, Above 1 GHz     | 5.97 dB     |

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a GSM Phone + Bluetooth/BLE, DTS b/g/n.

SM-G361H and SM-G361H/DS are same hardware but for different number of SIM card slot. SM-G361H has one slot. SM-G361H/DS is dual SIM version.

### 5.2. MAXIMUM OUTPUT POWER (GSM)

The transmitter has a maximum peak conducted and radiated ERP / EIRP output powers as follows:

| FCC Part 22/24 |                       |                 |           |          |           |          |
|----------------|-----------------------|-----------------|-----------|----------|-----------|----------|
| Band           | Frequency Range [MHz] | Modulation Peak | Conducted |          | Radiated  |          |
|                |                       |                 | Avg [dBm] | Avg [mW] | Avg [dBm] | Avg [mW] |
| GSM850         | 824~849               | GMSK            | 32.66     | 1845.02  |           |          |
|                |                       | GPRS            | 32.68     | 1853.53  | 30.00     | 1000.00  |
|                |                       | EGPRS           | RX Only   |          |           |          |
| GSM1900        | 1850~1910             | GMSK            | 29.22     | 835.60   |           |          |
|                |                       | GPRS            | 29.24     | 839.46   | 31.58     | 1438.80  |
|                |                       | EGPRS           | RX Only   |          |           |          |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a FPCB antenna for the [List the bands supported] with a maximum peak gain as follow:

| Frequency (MHz)             | Peak Gain (dBi) |
|-----------------------------|-----------------|
| GSM 850<br>824 ~ 849 MHz    | -2.15           |
| GSM 1900<br>1850 ~ 1910 MHz | 0.87            |

## 5.4. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |            |               |        |
|------------------------|--------------|------------|---------------|--------|
| Description            | Manufacturer | Model      | Serial Number | FCC ID |
| Charger                | SAMSUNG      | ETA0U10EWE | N/A           | N/A    |
| Data Cable             | SAMSUNG      | ECB-DU28WE | N/A           | N/A    |
| Earphone               | SAMSUNG      | EHS61ASFWE | N/A           | N/A    |

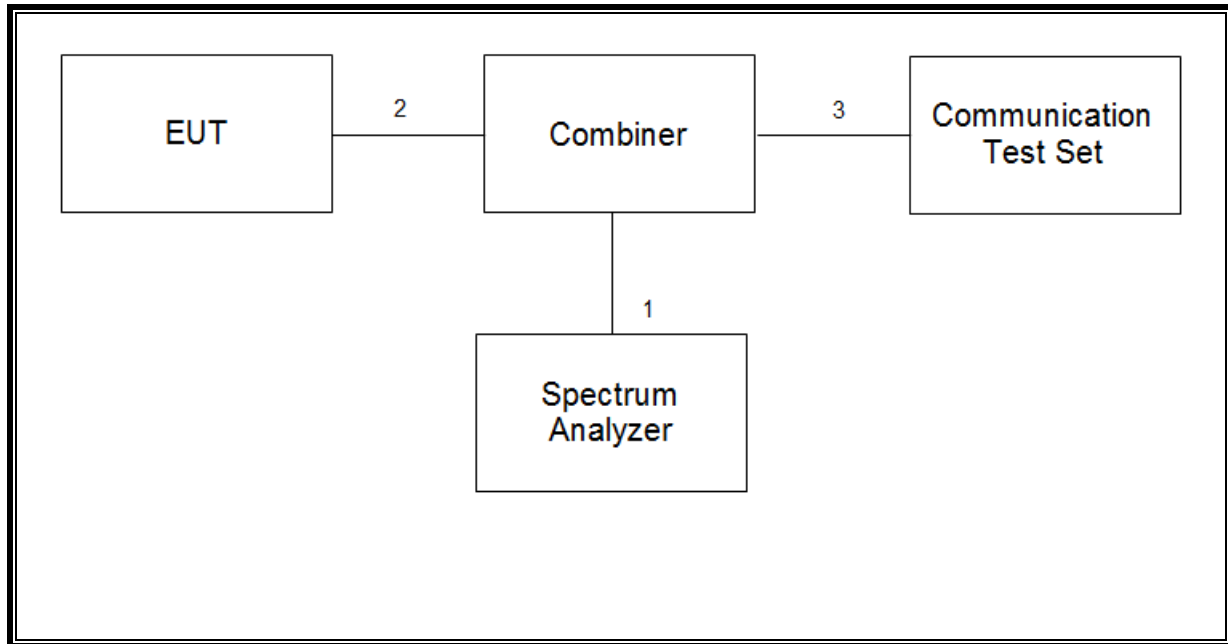
### I/O CABLES

| I/O Cable List |          |                      |                |            |                  |         |
|----------------|----------|----------------------|----------------|------------|------------------|---------|
| Cable No       | Port     | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1              | DC Power | 1                    | Mini-USB       | Shielded   | 0.8m             | N/A     |
| 2              | Audio    | 1                    | Mini-Jack      | Unshielded | 1.0m             | N/A     |

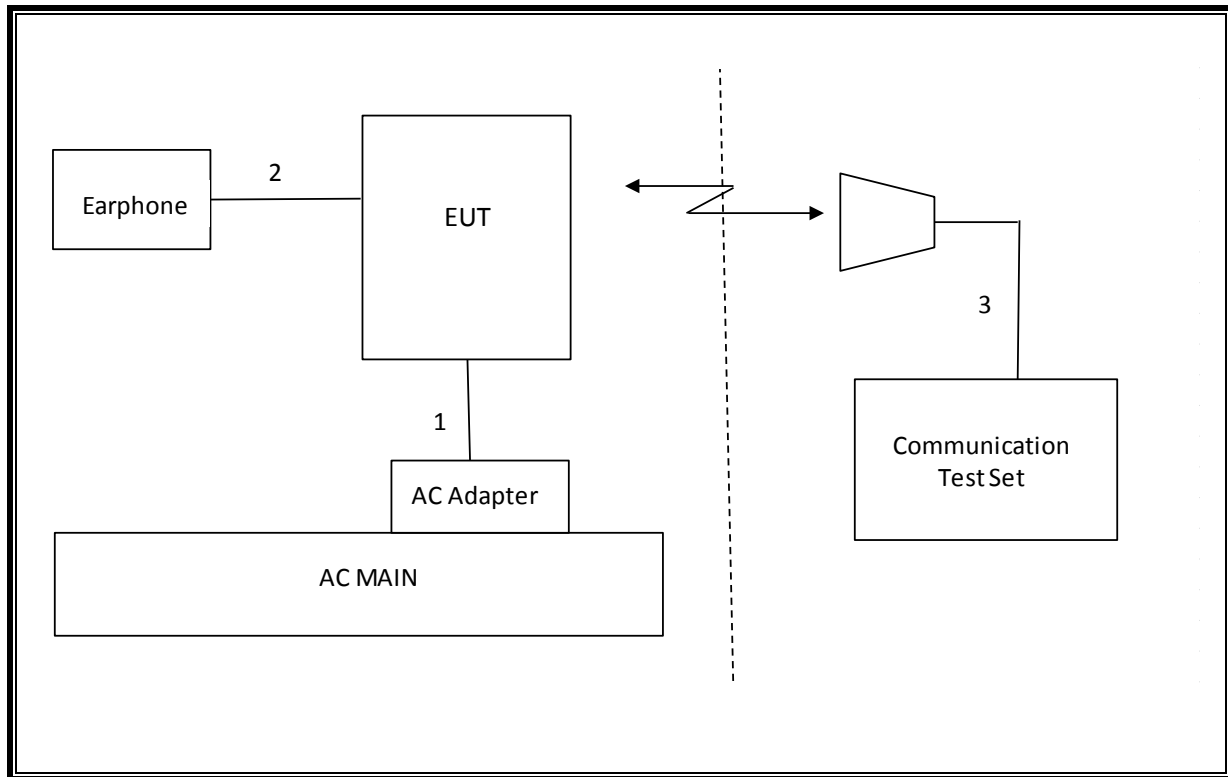
### TEST SETUP

The EUT is continuously communicated to the call box during the tests.

**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**



**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List                |               |                        |            |          |
|------------------------------------|---------------|------------------------|------------|----------|
| Description                        | Manufacturer  | Model                  | S/N        | Cal Due  |
| Antenna, Tuned Dipole 400~1000 MHz | ETS           | 3121D DB4              | 00164753   | 07-29-15 |
| Antenna, Bilog, 30MHz-1GHz         | SCHWARZBECK   | VULB9163               | 950        | 11-17-15 |
| Antenna, Horn, 18 GHz              | ETS           | 3115                   | 00167211   | 09-20-15 |
| Antenna, Horn, 40 GHz              | ETS           | 3116C                  | 00166255   | 09-23-15 |
| Antenna, Horn, 40 GHz              | ETS           | 3116C-PA               | 00168841   | 09-29-15 |
| Preamplifier, 1000 MHz             | Sonoma        | 310N                   | 341282     | 11-17-15 |
| Preamplifier, 18 GHz               | Miteq         | AFS42-00101800-25-S-42 | 1876511    | 11-18-15 |
| Spectrum Analyzer, 44 GHz          | Agilent / HP  | N9030A                 | MY54170614 | 09-23-15 |
| Communications Test Set            | R&S           | CMW500                 | 150312     | 08-13-15 |
| Average Power Sensor               | R&S           | NRZ-Z91                | 102681     | 11-17-15 |
| Average Power Sensor               | Agilent / HP  | U2000                  | MY54270007 | 09-23-15 |
| EMI Test Receive, 40 GHz           | R&S           | ESU40                  | 100439     | 11-17-15 |
| EMI Test Receive, 3 GHz            | R&S           | ESR3                   | 101832     | 11-17-15 |
| Attenuator / Switch driver         | HP            | 11713A                 | 3748A04272 | N/A      |
| Low Pass Filter 3GHz               | Micro-Tronics | LPS17541               | 009        | 11-17-15 |
| High Pass Filter 5GHz              | Micro-Tronics | HPS17542               | 009        | 11-17-15 |
| High Pass Filter 6GHz              | Micro-Tronics | HPM17543               | 010        | 11-17-15 |
| Combiner                           | WEINSCHEL     | 1575                   | 2153       | 11-17-15 |
| Temperature Chamber                | ESPEC         | SH-642                 | 93001109   | 11-13-15 |
| DC Power Supply                    | Agilent / HP  | E3640A                 | MY54226395 | 09-23-15 |

## 7. Summary Table

| FCC Part Section       | Test Description                        | Test Limit | Test Condition | Test Result | Note       |
|------------------------|-----------------------------------------|------------|----------------|-------------|------------|
| 2.1049                 | Occupied Band width (99%)               | N/A        | Conducted      | Pass        | 244.24 kHz |
| 22.917(a)<br>24.238(a) | Band Edge / Conducted Spurious Emission | -13dBm     |                | Pass        | -22.24 dBm |
| 2.1046                 | Conducted output power                  | N/A        |                | Pass        | 32.68 dBm  |
| 22.355<br>24.235       | Frequency Stability                     | 2.5PPM     |                | Pass        | 0.081PPM   |
| 22.913(a)(2)           | Effective Radiated Power                | 38 dBm     | Radiated       | Pass        | 30.00 dBm  |
| 24.232(c)              | Equivalent Isotropic Radiated Power     | 33 dBm     |                | Pass        | 31.58 dBm  |
| 22.917(a)<br>24.238(a) | Radiated Spurious Emission              | -13dBm     |                | Pass        | -39.7 dBm  |

| FCC Rule Part | Frequency Range [MHz] | Output Power [W] | Frequency Tolerance | Emission Designator | Emission Bandwidth [MHz] | Communication Type |
|---------------|-----------------------|------------------|---------------------|---------------------|--------------------------|--------------------|
| GSM           |                       |                  |                     |                     |                          |                    |
| 22H           | 824.2 - 848.8         | 1.000            | 2.5 ppm             | 244KGXW             | 244 kHz                  | GSM850             |
| 24E           | 1850.2 - 1909.8       | 1.439            | 2.5 ppm             | 244KGXW             | 244 kHz                  | GSM1900            |

## 8. RF POWER OUTPUT VERIFICATION

### 8.1. GSM/GPRS/EDGE

Function: Menu select > GSM Mobile Station > GSM 850/900/1800/1900  
Press Connection control to choose the different menus  
Press RESET > choose all to reset all settings  
Connection Press Signal Off to turn off the signal and change settings  
Network Support > GSM+GPRS or GSM+EGPRS  
Main Service > Packet Data  
Service selection > Test Mode A – Auto Slot Config. off  
MS Signal Press Slot Config bottom on the right twice to select and change the number of time slots and power setting  
    > Slot configuration      > Uplink/Gamma  
    > 33 dBm for GPRS 850/900  
    > 30 dBm for GPRS1800/1900  
BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel  
Frequency Offset > + 0 Hz  
Mode > BCCH and TCH  
BCCH Level > -85 dBm (May need to adjust if link is not stable)  
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]  
Channel Type > Off  
P0> 4 dB  
Slot Config > Unchanged (if already set under MS Signal)  
TCH > choose desired test channel  
Hopping > Off  
Main Timeslot > 3 (Default)  
Network Coding Scheme > CS4 (GPRS) and MCS5 ~ MCS9 (EGPRS)  
Bit Stream > 2E9-1PSR Bit Pattern  
AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input  
Connection Press Signal On to turn on the signal and change settings

### 8.1.1. GSM OUTPUT POWER RESULT

#### GSM850 Measured Results

| Band | Mode        | Coding Scheme | Time Slots | Ch No. | Freq. [MHz] | Max. Power      |                 |
|------|-------------|---------------|------------|--------|-------------|-----------------|-----------------|
|      |             |               |            |        |             | Burst Pwr [dBm] | Frame Pwr [dBm] |
| 850  | GSM (Voice) | CS1           | 1          | 128    | 824.2       | 32.65           | 23.62           |
|      |             |               |            | 190    | 836.6       | 32.56           | 23.53           |
|      |             |               |            | 251    | 848.8       | 32.66           | 23.63           |
|      | GPRS (GMSK) | CS1           | 1          | 128    | 824.2       | 32.68           | 23.65           |
|      |             |               |            | 190    | 836.6       | 32.57           | 23.54           |
|      |             |               |            | 251    | 848.8       | 32.68           | 23.65           |
|      |             |               | 2          | 128    | 824.2       | 30.08           | 24.06           |
|      |             |               |            | 190    | 836.6       | 30.13           | 24.10           |
|      |             |               |            | 251    | 848.8       | 30.19           | 24.17           |
|      |             |               | 3          | 128    | 824.2       | 28.09           | 23.83           |
|      |             |               |            | 190    | 836.6       | 28.11           | 23.85           |
|      |             |               |            | 251    | 848.8       | 28.14           | 23.88           |
|      |             |               | 4          | 128    | 824.2       | 26.06           | 23.05           |
|      |             |               |            | 190    | 836.6       | 26.05           | 23.04           |
|      |             |               |            | 251    | 848.8       | 26.08           | 23.07           |

#### GSM1900 Measured Results

| Band | Mode        | Coding Scheme | Time Slots | Ch No. | Freq. [MHz] | Max. Power      |                 |
|------|-------------|---------------|------------|--------|-------------|-----------------|-----------------|
|      |             |               |            |        |             | Burst Pwr [dBm] | Frame Pwr [dBm] |
| 1900 | GSM (Voice) | CS1           | 1          | 512    | 1850.2      | 29.22           | 20.19           |
|      |             |               |            | 661    | 1880.0      | 29.14           | 20.10           |
|      |             |               |            | 810    | 1909.8      | 29.11           | 20.08           |
|      | GPRS (GMSK) | CS1           | 1          | 512    | 1850.2      | 29.24           | 20.21           |
|      |             |               |            | 661    | 1880.0      | 29.15           | 20.12           |
|      |             |               |            | 810    | 1909.8      | 29.13           | 20.10           |
|      |             |               | 2          | 512    | 1850.2      | 28.13           | 22.11           |
|      |             |               |            | 661    | 1880.0      | 27.98           | 21.96           |
|      |             |               |            | 810    | 1909.8      | 27.72           | 21.70           |
|      |             |               | 3          | 512    | 1850.2      | 26.43           | 22.17           |
|      |             |               |            | 661    | 1880.0      | 26.22           | 21.96           |
|      |             |               |            | 810    | 1909.8      | 25.93           | 21.67           |
|      |             |               | 4          | 512    | 1850.2      | 24.46           | 21.45           |
|      |             |               |            | 661    | 1880.0      | 24.23           | 21.22           |
|      |             |               |            | 810    | 1909.8      | 23.88           | 20.87           |

## 9. PEAK TO AVERAGE RATIO

### Test Procedure

Per KDB 971168 D01 Power Meas License Digital Systems v02r02;

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The PAR were measured on the Spectrum Analyzer.

### Test Spec

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

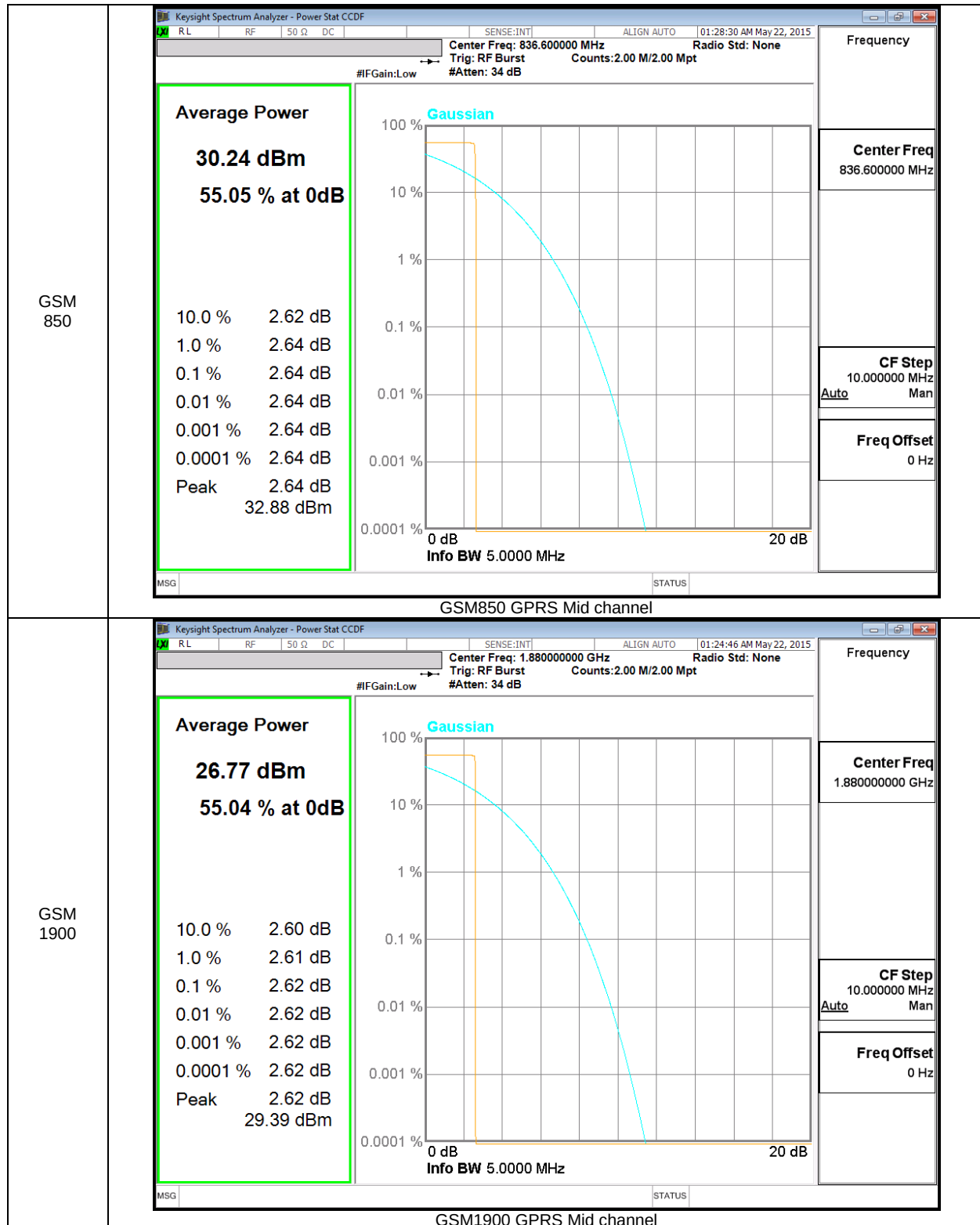
### 9.1. CONDUCTED PEAK TO AVERAGE RESULT

#### GSM

| Band    | Channel | f [MHz] | Mode | Ratio [dB] | Limit [dB] |
|---------|---------|---------|------|------------|------------|
| GSM850  | 190     | 836.6   | GPRS | 2.64       | 13.00      |
| GSM1900 | 661     | 1880.0  | GPRS | 2.62       |            |

## 9.2. CONDUCTED PEAK TO AVERAGE PLOTS

### GSM



## 10. LIMITS AND CONDUCTED RESULTS

### 10.1. OCCUPIED BANDWIDTH

#### RULE PART(S)

FCC: §2.1049

#### LIMITS

For reporting purposes only

#### TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

(KDB 971168 D01 Power Meas License Digital Systems v02r02)

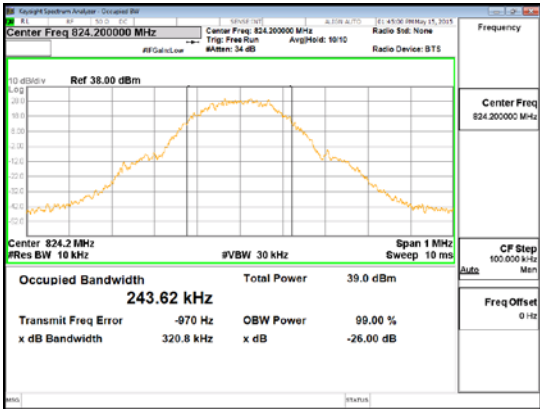
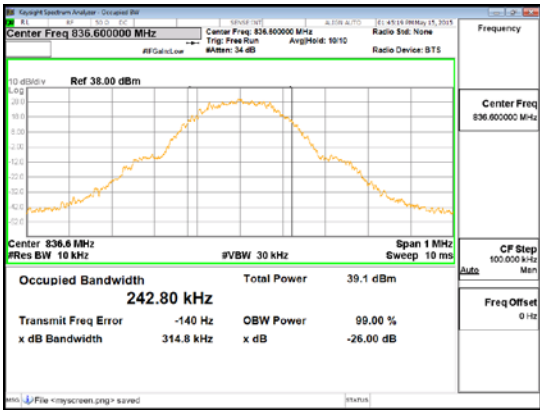
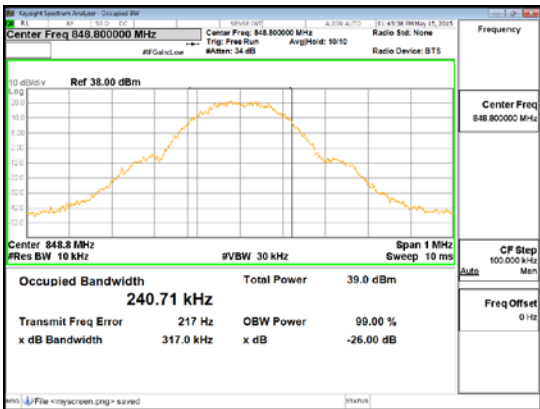
#### 10.1.1. OCCUPIED BANDWIDTH RESULTS

##### GSM

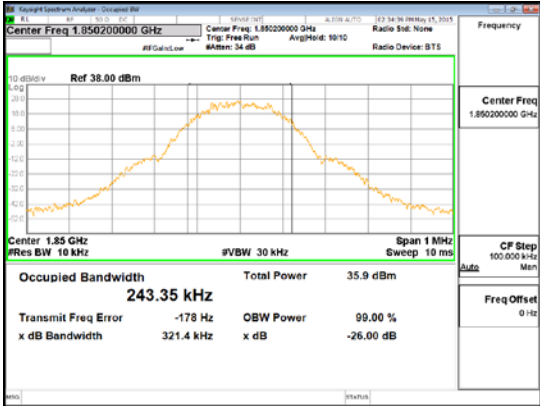
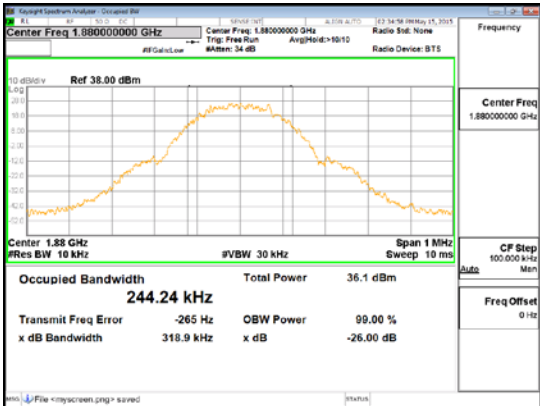
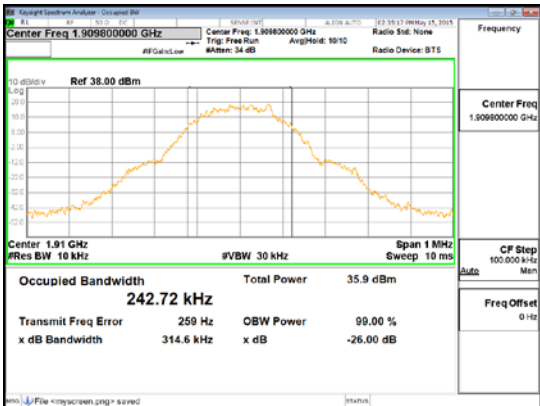
| Band    | Mode | Channel | f [MHz] | 99% BW [KHz] | 26dB BW [KHz] |
|---------|------|---------|---------|--------------|---------------|
| GSM850  | GPRS | 128     | 824.2   | 243.62       | 320.80        |
|         |      | 190     | 836.6   | 242.80       | 314.80        |
|         |      | 251     | 848.8   | 240.71       | 317.00        |
| GSM1900 | GPRS | 512     | 1850.2  | 243.35       | 321.40        |
|         |      | 661     | 1880.0  | 244.24       | 318.90        |
|         |      | 810     | 1909.8  | 242.72       | 314.60        |

## 10.1.2. OCCUPIED BANDWIDTH PLOTS

### GSM 850

|     |                                                                                                                      |
|-----|----------------------------------------------------------------------------------------------------------------------|
|     |  <p>GSM850 GPRS Low channel</p>    |
| GSM |  <p>GSM850 GPRS Mid channel</p>   |
|     |  <p>GSM850 GPRS High channel</p> |

**GSM 1900**

|            |                                                                                                                       |
|------------|-----------------------------------------------------------------------------------------------------------------------|
|            |  <p>GSM1900 GPRS Low channel</p>    |
| <p>GSM</p> |  <p>GSM1900 GPRS Mid channel</p>   |
|            |  <p>GSM1900 GPRS High channel</p> |

## 10.2. BAND EDGE EMISSIONS

### RULE PART(S)

FCC: §22.359, §24.238, §27.53 (g)

### LIMITS

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

### TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

The transmitter output was connected to a CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

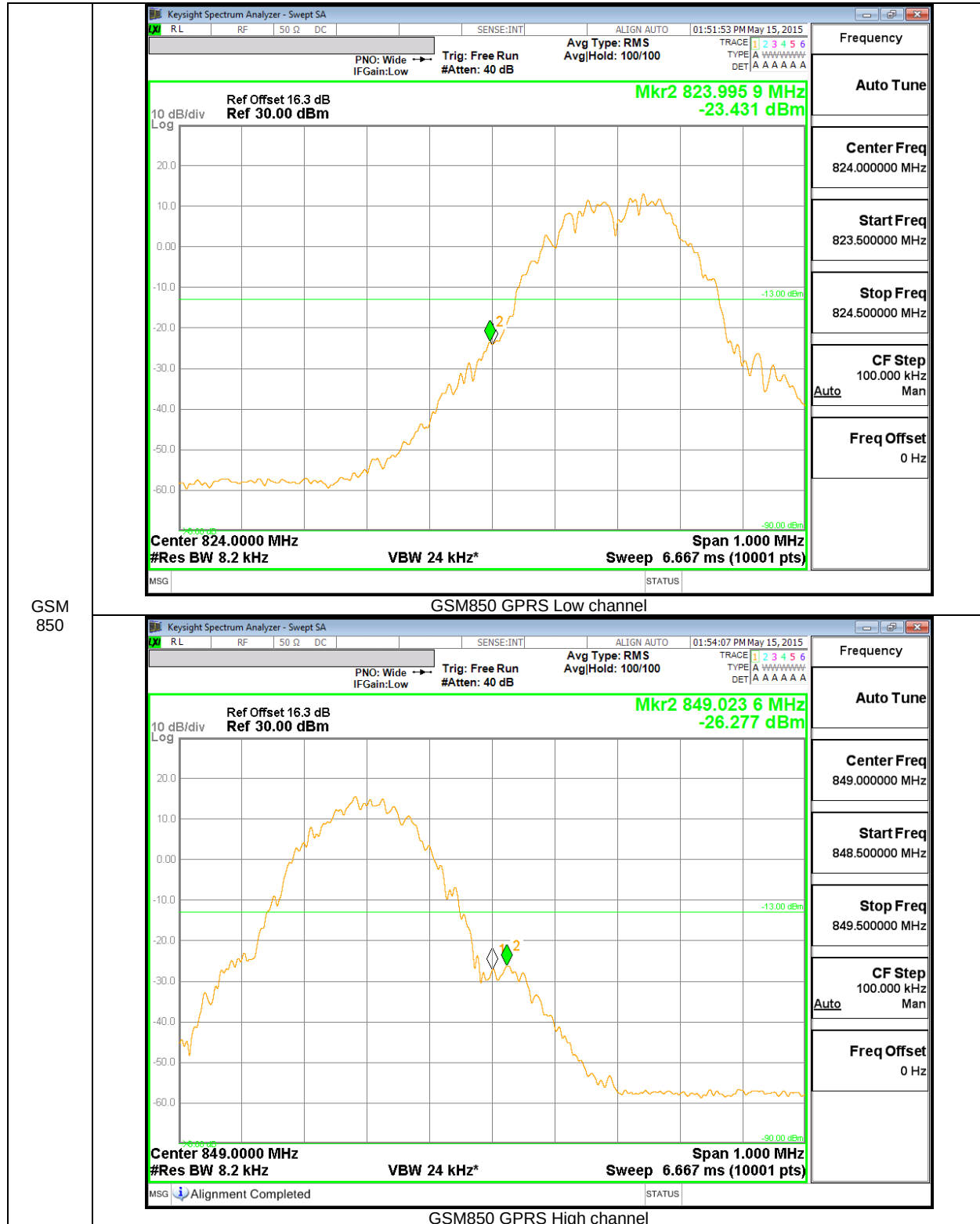
### RESULTS

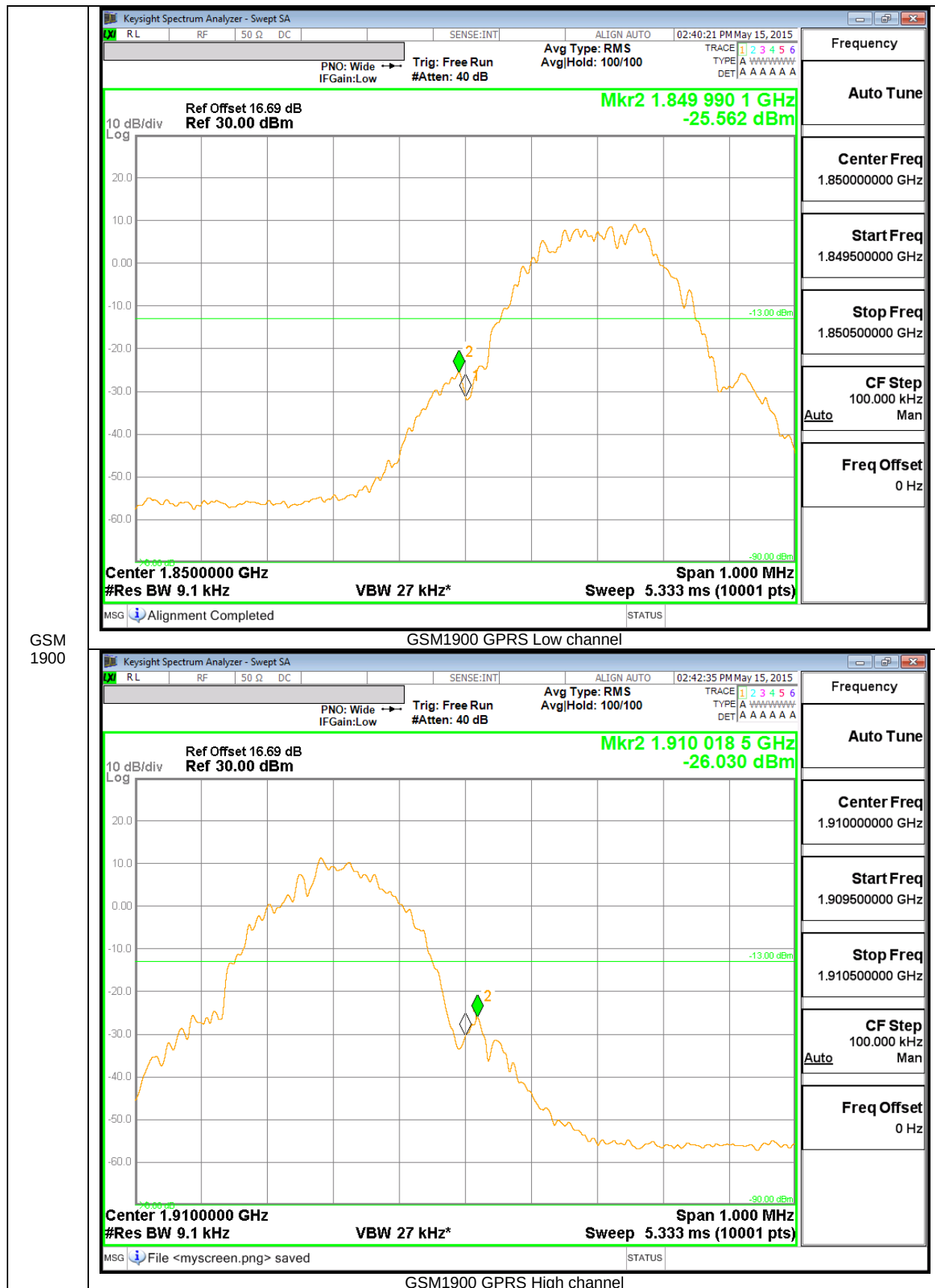
#### GSM

| Band    | Mode | Side  | f [MHz]   | Level [dBm] | Limit [dBm] |
|---------|------|-------|-----------|-------------|-------------|
| GSM850  | GPRS | Lower | 823.9959  | -23.431     | -13.000     |
|         |      | Upper | 849.0236  | -26.277     |             |
| GSM1900 | GPRS | Lower | 1849.9901 | -25.562     |             |
|         |      | Upper | 1910.0185 | -26.030     |             |

## 10.2.1. BAND EDGE PLOTS

### GSM





### 10.3. OUT OF BAND EMISSIONS

#### RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238, §27.53 (g)

#### LIMITS

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

#### TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

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.

#### RESULTS

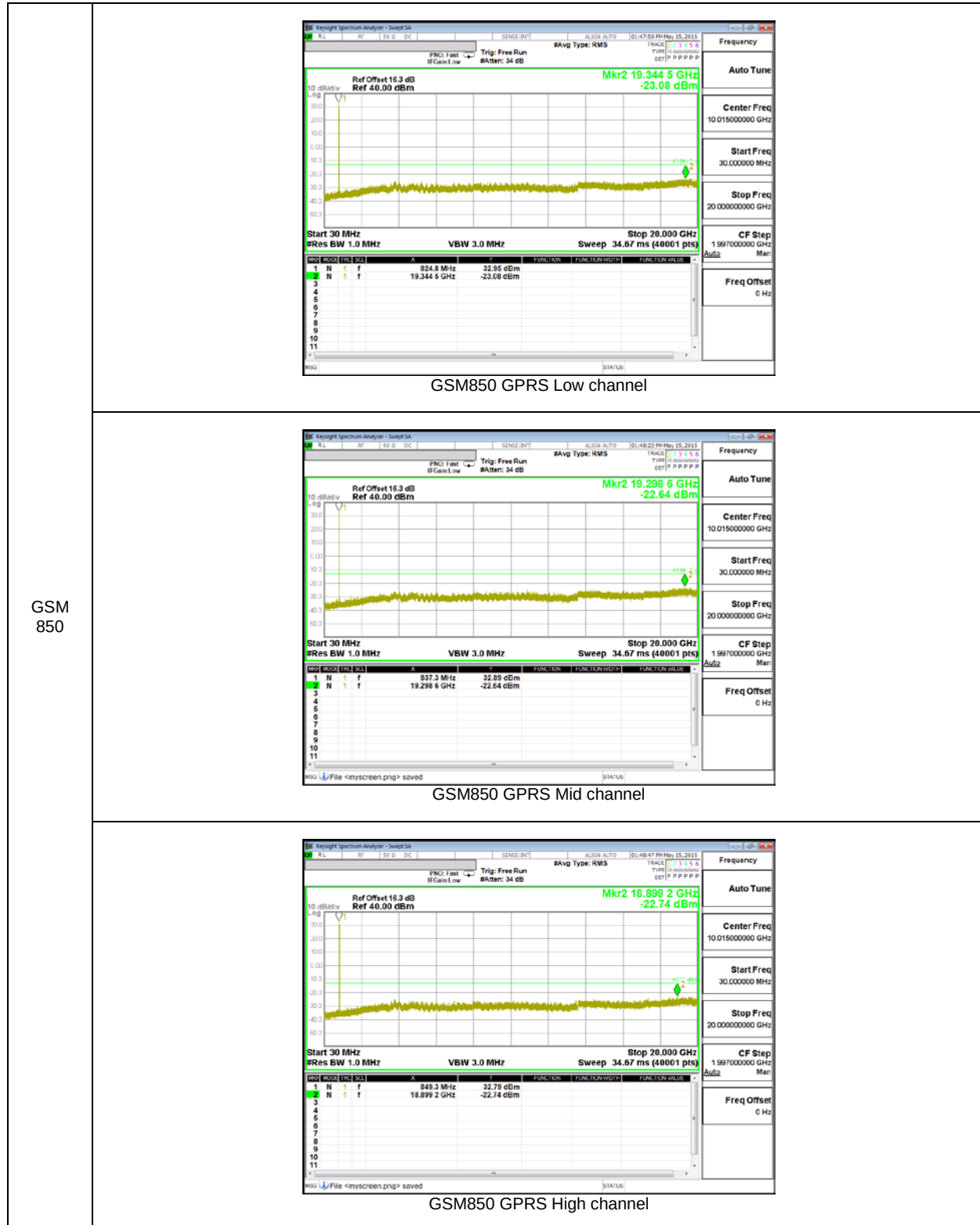
##### 10.3.1. OUT OF BAND EMISSIONS RESULT

#### GSM

| Band    | Mode | f [MHz] | Spurious [dBm] | Limit [dBm] | Margin [dB] |
|---------|------|---------|----------------|-------------|-------------|
| GSM850  | GPRS | 824.2   | -23.08         | -13.00      | 10.08       |
|         |      | 836.6   | -22.64         |             | 9.64        |
|         |      | 848.8   | -22.74         |             | 9.74        |
| GSM1900 | GPRS | 1850.2  | -22.25         |             | 9.25        |
|         |      | 1880.0  | -22.24         |             | 9.24        |
|         |      | 1909.8  | -22.29         |             | 9.29        |

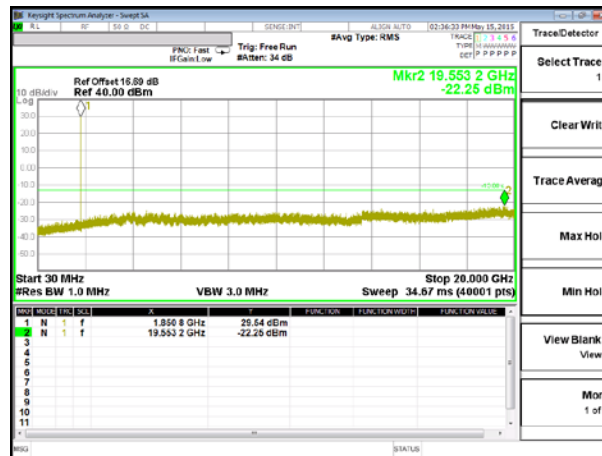
## 10.3.2. OUT OF BAND EMISSIONS PLOTS

### GSM 850

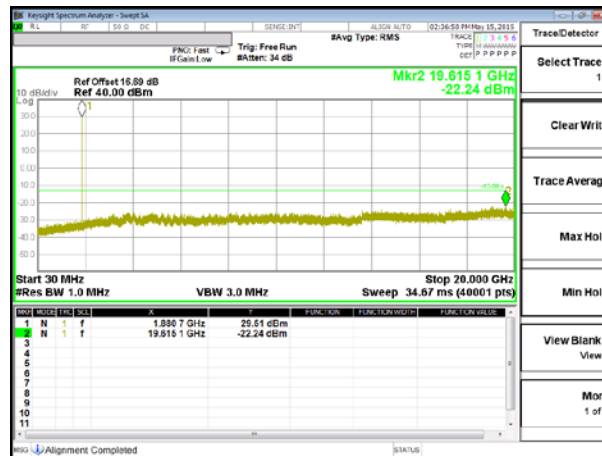


# **GSM 1900**

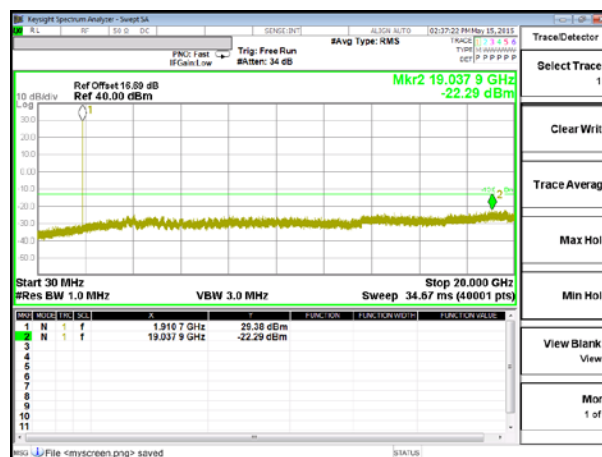
GSM  
1900



GSM1900 GPRS Low channel



GSM1900 GPRS Mid channel



GSM1900 GPRS High channel

## **10.1. FREQUENCY STABILITY**

### **RULE PART(S)**

FCC: §2.1055, §22.355, §24.235

### **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.

### **TEST PROCEDURE**

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

### **RESULTS**

See the following pages.

### 10.1.1. FREQUENCY STABILITY RESULTS

#### GSM 850, Channel 190, Frequency 836.6 MHz

| Reference Frequency: Cell Mid Channel 836.6 MHz @ 20°C |                              |                                               |             |             |
|--------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: $\pm 2.5$ ppm = 2091.500 Hz                     |                              |                                               |             |             |
| Power Supply (Vdc)                                     | Environment Temperature (*C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                        |                              | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                   | 50                           | 836.59995223                                  | 0.029       | 2.5         |
| 3.80                                                   | 40                           | 836.59995119                                  | 0.030       | 2.5         |
| 3.80                                                   | 30                           | 836.59993824                                  | 0.045       | 2.5         |
| <b>3.80</b>                                            | <b>20</b>                    | <b>836.59997617</b>                           | <b>0</b>    | <b>2.5</b>  |
| 3.80                                                   | 10                           | 836.59998156                                  | -0.006      | 2.5         |
| 3.80                                                   | 0                            | 836.60004070                                  | -0.077      | 2.5         |
| 3.80                                                   | -10                          | 836.60004226                                  | -0.079      | 2.5         |
| 3.80                                                   | -20                          | 836.60004384                                  | -0.081      | 2.5         |
| 3.80                                                   | -30                          | 836.60004155                                  | -0.078      | 2.5         |

| Reference Frequency: WCDMA Band5 Mid Channel 836.6 MHz @ 20°C |                              |                                               |             |             |
|---------------------------------------------------------------|------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: $\pm 2.5$ ppm = 2091.500 Hz                            |                              |                                               |             |             |
| Power Supply (Vdc)                                            | Environment Temperature (*C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                               |                              | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.80</b>                                                   | <b>20</b>                    | <b>836.59997617</b>                           | <b>0</b>    | <b>2.5</b>  |
| 4.20                                                          | 20                           | 836.59996652                                  | 0.012       | 2.5         |
| 3.40                                                          | 20                           | 836.59996578                                  | 0.012       | 2.5         |

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

| Reference Frequency: PCS Mid Channel 1880 MHz @ 20°C |                                 |                                               |             |             |
|------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: $\pm 2.5$ ppm = 4700.000 Hz                   |                                 |                                               |             |             |
| Power Supply<br>(Vdc)                                | Environment<br>Temperature (*C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                      |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| 3.80                                                 | 50                              | 1879.99993921                                 | 0.007       | 2.5         |
| 3.80                                                 | 40                              | 1879.99993337                                 | 0.010       | 2.5         |
| 3.80                                                 | 30                              | 1879.99994660                                 | 0.003       | 2.5         |
| <b>3.80</b>                                          | <b>20</b>                       | <b>1879.99995180</b>                          | <b>0</b>    | <b>2.5</b>  |
| 3.80                                                 | 10                              | 1880.00002776                                 | -0.040      | 2.5         |
| 3.80                                                 | 0                               | 1880.00003681                                 | -0.045      | 2.5         |
| 3.80                                                 | -10                             | 1880.00002015                                 | -0.036      | 2.5         |
| 3.80                                                 | -20                             | 1880.00004770                                 | -0.051      | 2.5         |
| 3.80                                                 | -30                             | 1879.99998676                                 | -0.019      | 2.5         |

| Reference Frequency: WCDMA Band2 Mid Channel 1880 MHz @ 20°C |                                 |                                               |             |             |
|--------------------------------------------------------------|---------------------------------|-----------------------------------------------|-------------|-------------|
| Limit: $\pm 2.5$ ppm = 4700.000 Hz                           |                                 |                                               |             |             |
| Power Supply<br>(Vdc)                                        | Environment<br>Temperature (*C) | Frequency Deviation Measured with Time Elapse |             |             |
|                                                              |                                 | (MHz)                                         | Delta (ppm) | Limit (ppm) |
| <b>3.80</b>                                                  | <b>20</b>                       | <b>1879.99995180</b>                          | <b>0</b>    | <b>2.5</b>  |
| 4.20                                                         | 20                              | 1879.99994079                                 | 0.006       | 2.5         |
| 3.40                                                         | 20                              | 1879.99995665                                 | -0.003      | 2.5         |

## 11. RADIATED TEST RESULTS

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

#### RULE PART(S)

FCC: §2.1046, §22.913, §24.232

#### 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.

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

#### TEST PROCEDURE

ANSI / TIA / EIA 603C Clause 2.2.17; MXA setting reference to 971168 D01 v02r02

For peak power measurement with a MXA:

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

For average power measurement with a MXA:

a) Set span to at least 1.5 times the OBW; b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz; c) Set VBW  $\geq 3 \times$  RBW; d) Set number of points in sweep  $\geq 2 \times$  span / RBW; e) Sweep time = auto-couple; f) Detector = RMS (power averaging); g) Use free run trigger If burst duty cycle  $\geq 98$ ; h) Use trigger to capture bursts If burst duty cycle  $< 98$ ; i) Trace average at least 100 traces in power averaging (i.e., RMS) mode. j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function.

#### TEST RESULTS

##### 11.1.1. ERP/EIRP Results

#### GSM

| Band    | Mode | Channel | f [MHz] | ERP / EIRP |        |
|---------|------|---------|---------|------------|--------|
|         |      |         |         | [dBm]      | [mW]   |
| GSM850  | GPRS | 512     | 824.2   | 25.19      | 330.0  |
|         |      | 661     | 836.6   | 30.00      | 1000.0 |
|         |      | 810     | 848.8   | 26.43      | 439.2  |
| GSM1900 | GPRS | 512     | 1850.2  | 31.58      | 1438.1 |
|         |      | 661     | 1880.0  | 31.16      | 1306.2 |
|         |      | 810     | 1909.8  | 30.45      | 1109.9 |

## 11.1.2. ERP/EIRP DATA

GSM

GSM850

GPRS

High Frequency Substitution Measurement

UL Korea, Ltd. Suwon Laboratory Chamber 1

Company:

Samsung

Project #:

15K20822

Date:

05-18-15

Test Engineer:

Steven Kim

Configuration:

EUT / adapter / earphone / Z-Position

Mode:

GPRS 850 MHz

Test Equipment:

Receiving: VULB9163-750, and 3m Chamber N-type Cable (Setup this one for testing EUT)

Substitution: Dipole S/N: 00164753, 3m SMA Cable Warehouse.

| f<br>MHz | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | ERP<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Notes |
|----------|---------------------|--------------------|--------------------|-----------------------|--------------|----------------|----------------|-------|
| Low Ch   |                     |                    |                    |                       |              |                |                |       |
| 824.20   | 27.81               | V                  | 1.1                | -1.6                  | 25.19        | 38.5           | -13.3          |       |
| 824.20   | 25.06               | H                  | 1.1                | -1.6                  | 22.44        | 38.5           | -16.0          |       |
| Mid Ch   |                     |                    |                    |                       |              |                |                |       |
| 836.60   | 32.49               | V                  | 1.1                | -1.4                  | 30.00        | 38.5           | -8.5           |       |
| 836.60   | 24.91               | H                  | 1.1                | -1.4                  | 22.42        | 38.5           | -16.0          |       |
| High Ch  |                     |                    |                    |                       |              |                |                |       |
| 848.80   | 28.79               | V                  | 1.1                | -1.3                  | 26.43        | 38.5           | -12.0          |       |
| 848.80   | 22.56               | H                  | 1.1                | -1.3                  | 20.20        | 38.5           | -18.3          |       |

Rev. 3.17.11

Note: For Band 13/17 ERP limit is 34.77dBm; For Band 26 limit is 50dBm

GSM

GSM1900

GPRS

High Frequency Substitution Measurement

UL Korea, Ltd. Suwon Laboratory Chamber 1

Company:

Samsung

Project #:

15K20822

Date:

05-19-15

Test Engineer:

Steven Kim

Configuration:

EUT ONLY, X Position

Mode:

GPRS 1900MHz

Test Equipment:

Receiving: 3117, and Chamber 1 SMA Cables

Substitution: 3115 Substitution, 3m SMA Cable Warehouse

| f<br>GHz | 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  | 14.8                | V                  | 1.60               | 9.12                  | 22.32         | 33.0           | -10.7         |       |
| 1850.20  | 24.1                | H                  | 1.60               | 9.12                  | 31.58         | 33.0           | -1.4          |       |
| Mid Ch   |                     |                    |                    |                       |               |                |               |       |
| 1880.00  | 16.0                | V                  | 1.62               | 8.98                  | 23.35         | 33.0           | -9.7          |       |
| 1880.00  | 23.8                | H                  | 1.62               | 8.98                  | 31.16         | 33.0           | -1.8          |       |
| High Ch  |                     |                    |                    |                       |               |                |               |       |
| 1909.80  | 20.7                | V                  | 1.63               | 8.83                  | 27.87         | 33.0           | -5.1          |       |
| 1909.80  | 23.3                | H                  | 1.63               | 8.83                  | 30.45         | 33.0           | -2.5          |       |

Rev. 3.17.11

## **11.2. FIELD STRENGTH OF SPURIOUS RADIATION**

### **RULE PART(S)**

FCC: §2.1053, §22.917, §24.238

### **LIMIT**

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

### **TEST PROCEDURE**

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

### **RESULTS**

# 11.2.1. SPURIOUS RADIATION PLOTS

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                    |                 |                |                |               |                |               |       |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|-----------------|----------------|----------------|---------------|----------------|---------------|-------|
| GSM<br>GSM850<br>GPRS  | <div> <div>UL Korea, Ltd Suwon Laboratory</div> <div>Above 1GHz High Frequency Substitution Measurement</div> <div> <div>Company:</div>Samsung <div>Project #:</div>15K20822 <div>Date:</div>05-19-15 <div>Test Engineer:</div>Steven Kim <div>Configuration:</div>EUT / AC Adapter / Earphone, Z Position <div>Mode:</div>GPRS 850 MHz </div> <div> <div>Chamber</div>Chamber 1 <div>Pre-amplifier</div>AFS42 <div>Filter</div>Filter 1 <div>Limit</div>Part 22 </div> </div> |                     |                    |                 |                |                |               |                |               |       |
|                        | f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| GSM<br>GSM1900<br>GPRS | Low Ch, 824.2MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                    |                 |                |                |               |                |               |       |
|                        | 1.6484                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -1.3                | V                  | 3.0             | 40.2           | 1.0            | -40.5         | -13.0          | -27.5         |       |
|                        | 2.4726                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -5.4                | V                  | 3.0             | 40.1           | 1.0            | -44.5         | -13.0          | -31.5         |       |
|                        | 3.2968                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -16.2               | V                  | 3.0             | 39.6           | 1.0            | -54.8         | -13.0          | -41.8         |       |
|                        | 1.6484                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -2.3                | H                  | 3.0             | 40.2           | 1.0            | -41.5         | -13.0          | -28.5         |       |
|                        | 2.4726                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -7.3                | H                  | 3.0             | 40.1           | 1.0            | -46.4         | -13.0          | -33.4         |       |
|                        | 3.2968                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -19.4               | H                  | 3.0             | 39.6           | 1.0            | -58.0         | -13.0          | -45.0         |       |
|                        | Mid Ch, 836.6MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                    |                 |                |                |               |                |               |       |
|                        | 1.6730                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -3.3                | V                  | 3.0             | 40.2           | 1.0            | -42.4         | -13.0          | -29.4         |       |
|                        | 2.5098                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -14.9               | V                  | 3.0             | 40.1           | 1.0            | -53.9         | -13.0          | -40.9         |       |
|                        | 3.3464                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -22.4               | V                  | 3.0             | 39.6           | 1.0            | -61.0         | -13.0          | -48.0         |       |
|                        | 1.6730                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -2.2                | H                  | 3.0             | 40.2           | 1.0            | -41.4         | -13.0          | -28.4         |       |
|                        | 2.5098                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -14.6               | H                  | 3.0             | 40.1           | 1.0            | -53.7         | -13.0          | -40.7         |       |
|                        | 3.3464                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -22.6               | H                  | 3.0             | 39.6           | 1.0            | -61.2         | -13.0          | -48.2         |       |
|                        | High Ch, 848.8MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                 |                |                |               |                |               |       |
|                        | 1.6976                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -5.3                | V                  | 3.0             | 40.2           | 1.0            | -44.5         | -13.0          | -31.5         |       |
|                        | 2.5466                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -13.1               | V                  | 3.0             | 40.1           | 1.0            | -52.1         | -13.0          | -39.1         |       |
|                        | 3.3952                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -14.2               | V                  | 3.0             | 39.5           | 1.0            | -52.7         | -13.0          | -39.7         |       |
|                        | 1.6976                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -2.0                | H                  | 3.0             | 40.2           | 1.0            | -41.2         | -13.0          | -28.2         |       |
|                        | 2.5466                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -10.2               | H                  | 3.0             | 40.1           | 1.0            | -49.2         | -13.0          | -36.2         |       |
|                        | 3.3952                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -12.6               | H                  | 3.0             | 39.5           | 1.0            | -51.1         | -13.0          | -38.1         |       |
|                        | Rev. 03.03.09                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                    |                 |                |                |               |                |               |       |
|                        | Note: No other emissions were detected above the system noise floor.                                                                                                                                                                                                                                                                                                                                                                                                           |                     |                    |                 |                |                |               |                |               |       |
| GSM<br>GSM1900<br>GPRS | <div> <div>UL Korea, Ltd Suwon Laboratory</div> <div>Above 1GHz High Frequency Substitution Measurement</div> <div> <div>Company:</div>Samsung <div>Project #:</div>15K20822 <div>Date:</div>05-19-15 <div>Test Engineer:</div>Steven Kim <div>Configuration:</div>EUT / AC Adapter / Earphone, X Position <div>Mode:</div>GPRS 1900 </div> <div> <div>Chamber</div>Chamber 1 <div>Pre-amplifier</div>AFS42 <div>Filter</div>Filter 1 <div>Limit</div>Part 24 </div> </div>    |                     |                    |                 |                |                |               |                |               |       |
|                        | f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SG reading<br>(dBm) | Ant. Pol.<br>(H/V) | Distance<br>(m) | Preamp<br>(dB) | Filter<br>(dB) | EIRP<br>(dBm) | Limit<br>(dBm) | Delta<br>(dB) | Notes |
| GSM<br>GSM1900<br>GPRS | Low Ch, 1850.2MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                 |                |                |               |                |               |       |
|                        | 3.7004                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -1.6                | V                  | 3.0             | 39.2           | 1.0            | -39.7         | -13.0          | -26.7         |       |
|                        | 5.5506                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -11.1               | V                  | 3.0             | 40.0           | 1.0            | -50.0         | -13.0          | -37.0         |       |
|                        | 7.4008                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -9.5                | V                  | 3.0             | 39.2           | 1.0            | -47.7         | -13.0          | -34.7         |       |
|                        | 3.7004                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -13.8               | H                  | 3.0             | 39.2           | 1.0            | -52.0         | -13.0          | -39.0         |       |
|                        | 5.5506                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -11.3               | H                  | 3.0             | 40.0           | 1.0            | -50.3         | -13.0          | -37.3         |       |
|                        | 7.4008                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -11.4               | H                  | 3.0             | 39.2           | 1.0            | -49.6         | -13.0          | -36.6         |       |
|                        | Mid Ch, 1880.0MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                    |                 |                |                |               |                |               |       |
|                        | 3.7600                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -9.9                | V                  | 3.0             | 39.1           | 1.0            | -47.9         | -13.0          | -34.9         |       |
|                        | 5.6400                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -12.3               | V                  | 3.0             | 39.9           | 1.0            | -51.2         | -13.0          | -38.2         |       |
|                        | 7.5200                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -11.7               | V                  | 3.0             | 39.1           | 1.0            | -49.8         | -13.0          | -36.8         |       |
|                        | 3.7600                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -13.6               | H                  | 3.0             | 39.1           | 1.0            | -51.7         | -13.0          | -38.7         |       |
|                        | 5.6400                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -12.1               | H                  | 3.0             | 39.9           | 1.0            | -51.0         | -13.0          | -38.0         |       |
|                        | 7.5200                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -10.8               | H                  | 3.0             | 39.1           | 1.0            | -49.0         | -13.0          | -36.0         |       |
|                        | High Ch, 1909.8 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                    |                 |                |                |               |                |               |       |
|                        | 3.8196                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -10.8               | V                  | 3.0             | 39.0           | 1.0            | -48.8         | -13.0          | -35.8         |       |
|                        | 5.7294                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -11.3               | V                  | 3.0             | 39.9           | 1.0            | -50.2         | -13.0          | -37.2         |       |
|                        | 7.6392                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -10.2               | V                  | 3.0             | 39.1           | 1.0            | -48.3         | -13.0          | -35.3         |       |
|                        | 3.8196                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -9.4                | H                  | 3.0             | 39.0           | 1.0            | -47.4         | -13.0          | -34.4         |       |
|                        | 5.7294                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -12.1               | H                  | 3.0             | 39.9           | 1.0            | -51.0         | -13.0          | -38.0         |       |
|                        | 7.6392                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -11.0               | H                  | 3.0             | 39.1           | 1.0            | -49.1         | -13.0          | -36.1         |       |
|                        | Rev. 03.03.09                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                    |                 |                |                |               |                |               |       |
|                        | Note: No other emissions were detected above the system noise floor.                                                                                                                                                                                                                                                                                                                                                                                                           |                     |                    |                 |                |                |               |                |               |       |