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

# CERTIFICATION TEST REPORT

**FOR**

**GSM Phone + Bluetooth, WLAN 2.4GHz b/g/n & NFC**

**MODEL NUMBER: SM-G313HN**

**FCC ID: A3LSMG313HN**

**REPORT NUMBER: 14I17791-1 REVISION A**

**ISSUE DATE: JUNE 11, 2014**

*Prepared for*

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**416, MAETAN 3-DONG, YEONGTONG-GU**
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*Prepared by*

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NVLAP LAB CODE 200065-0

# Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 6/3/14 | Initial issue | P. Zhang |
| A | 6/9/14 | Updated FCC ID; EUT photo; Antenna information | P. Zhang |



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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.

**EUT DESCRIPTION:** GSM Phone + Bluetooth, WLAN 2.4GHz b/g/n & NFC

**MODEL:** SM-G313HN

**SERIAL NUMBER:** FL-187-A (Radiated) & FL-187-D (Conducted)

**DATE TESTED:** May 20 – June 3, 2014

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULTS** |
| FCC PART 22H, 24E | PASS |

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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# 2. TEST METHODOLOGY

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

# 3. FACILITIES AND ACCREDITATION

Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 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.

| 47173 Benicia Street | 47266 Benicia Street |
|---|---|
| ☒ Chamber A | ☐ Chamber D |
| ☐ Chamber B | ☐ Chamber E |
| ☐ Chamber C | ☐ Chamber F |

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

# 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:

EIRP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss( between the SG and substitution antenna) + Substitution Antenna Factor (dBi)

ERP = PSA reading with EUT worst orientation (dBm) + Path loss (dB) – cable loss( between the SG and substitution antenna)

(Path loss = Signal generator output – PSA reading with substitution antenna)



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## 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 | 3.52 dB |
| Radiated Disturbance, 30 to 18000 MHz | 4.94 dB |

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



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# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is a GSM Phone + Bluetooth, WLAN 2.4GHz b/g/n & NFC

## 5.2. MAXIMUM OUTPUT POWER

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

| FCC Part 22/24 | | | | | | |
|---|---|---|---|---|---|---|
| Band | Frequency Range(MHz) | Modulation | Conducted | | Radiated | |
| | | Peak | Peak(dBm) | Peak (mW) | Peak (dBm) | Peak (mW) |
| GSM850 | 824~849 | GMSK | 31.9 | 1548.82 | | |
| | 824~849 | GPRS | 31.9 | 1548.82 | 28.584 | 721.77 |
| GSM1900 | 1850~1910 | GMSK | 29.5 | 891.25 | | |
| | 1850~1910 | GPRS | 29.5 | 891.25 | 27.826 | 606.18 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

| Frequency (MHz) | Peak Gain (dBi) |
|---|---|
| GSM850, 824~849MHz | -0.68 |
| GSM1900, 1850~1910MHz | 2.55 |



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## 5.4. DESCRIPTION OF TEST SETUP

**SUPPORT EQUIPMENT**

| Support Equipment List | | | | |
|---|---|---|---|---|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| AC Adapter | Samsung | ETA-U90CBC | N/A | N/A |
| Earphone | Samsung | GH59 | N/A | N/A |

**I/O CABLES (CONDUCTED SETUP)**

| I/O Cable List | | | | | | |
|---|---|---|---|---|---|---|
| Cable No | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1 | RF Out | 1 | Spectrum Analyzer | Shielded | None | NA |
| 2 | Antenna Port | 1 | EUT | Shielded | 0.1m | NA |
| 3 | RF In/Out | 1 | Communication Test Set | Shielded | 1m | NA |

**I/O CABLES (RADIATED SETUP)**

| I/O CABLE LIST | | | | | | |
|---|---|---|---|---|---|---|
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
| 1 | USB | 1 | AC Adapter | Un-shielded | 1.2m | No |
| 2 | Jack | 1 | Headset | Shielded | 1m | No |
| 3 | RF In/out | 1 | Communication Test Set | Un-shielded | 2m | Yes |

**TEST SETUP**

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



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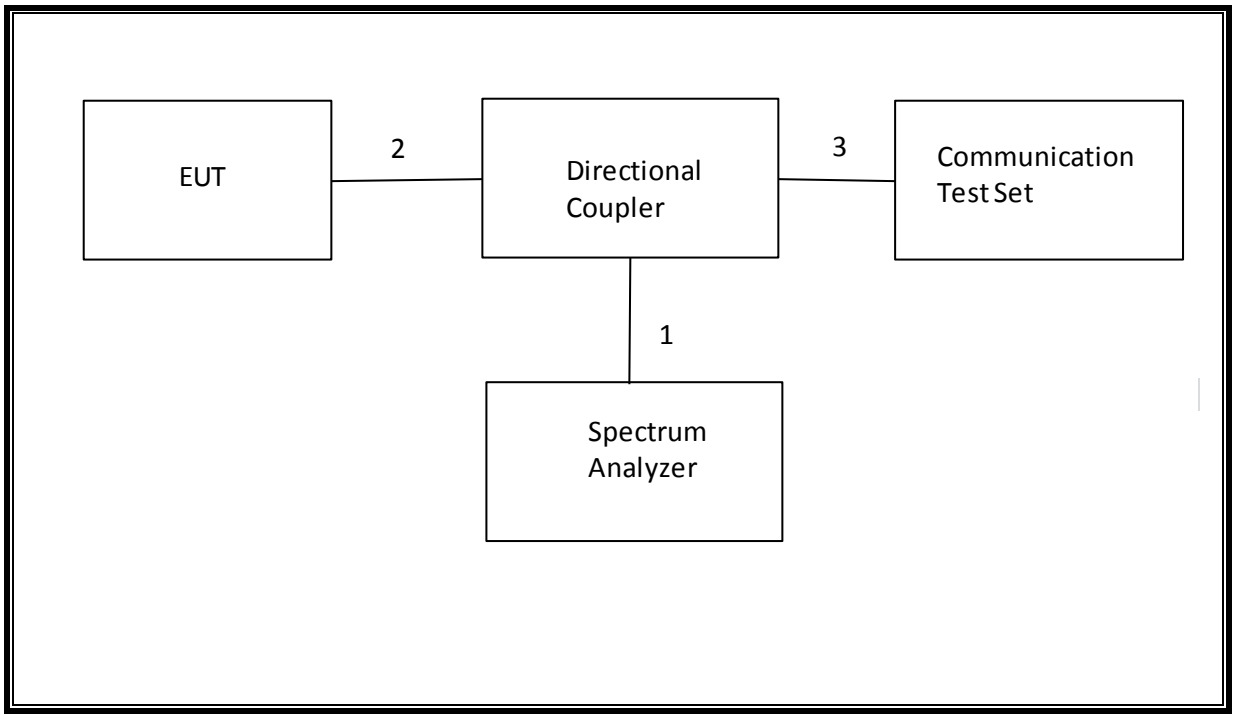
**SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)**



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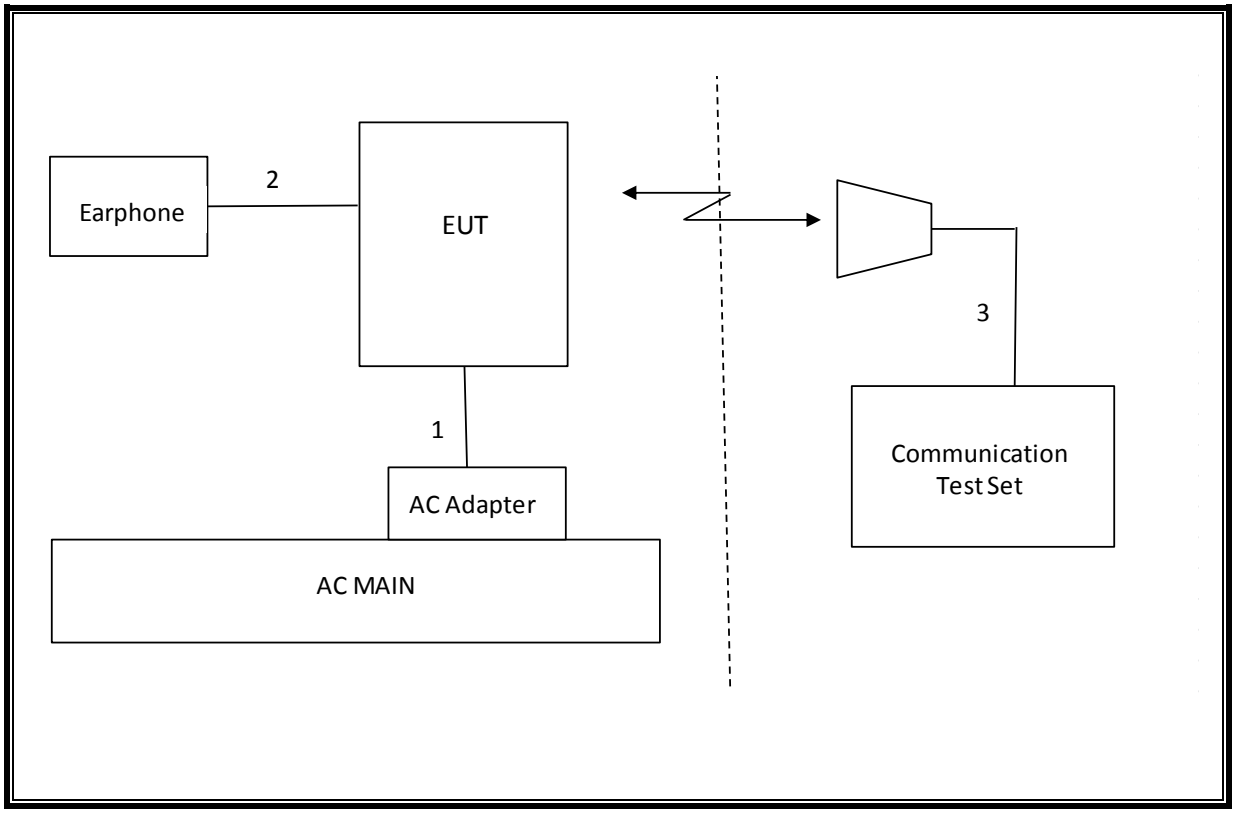
**SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)**



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# 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** | **Asset** | **Cal Due** |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01179 | 02/26/15 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01011 | 08/14/14 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00783 | 10/25/14 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00784 | 09/25/14 |
| Highpass Filter, 2.7 GHz | Micro-Tronics | HPM13194 | N02687 | CNR |
| Highpass Filter, 1.5 GHz | Micro-Tronics | HPM13193 | N02688 | CNR |
| Temperature / Humidity Chamber | Thermotron | SE 600-10-10 | C00930 | 01/09/15 |
| Communications Test Set | R&S | CMW500 | T159 | 07/02/14 |
| DC power supply, 8 V @ 3 A or 15 V | Agilent / HP | E3610A | None | CNR |
| Vector signal generator, 6 GHz | Agilent / HP | E4438C | None | 07/06/14 |
| Antenna, Tuned Dipole 400~1000 | ETS | 3121C DB4 | C00993 | 02/14/15 |
| Directional Coupler | RF-Lambda | RFDC5M06G15 | None | CNR |
| Antenna, Horn,18- 26 GHz | ARA | MWH-1826/B | C00946 | 11/12/14 |



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# 7. Summary Table

| FCC Part Section | RSS Section(s) | Test Description | Test Limit | Test Condition | Test Result | Worst case |
|---|---|---|---|---|---|---|
| 2.1049 | N/A | Occupied Band width (99%) | N/A | Conducted | Pass | 252KHz |
| 22.917(a)<br>24.238(a) | RSS-132(4.5.1)<br>RSS-133(6.5.1) | Band Edge / Conducted Spurious Emission | -13dBm | | Pass | -18.32dBm |
| 2.1046 | N/A | Conducted output power | N/A | | Pass | 31.9dBm |
| 22.355<br>24.235<br>90.213 | RSS-132(4.3)<br>RSS-133(6.3)<br>RSS-199(4.3) | Frequency Stability | 2.5PPM | | Pass | 0.08PPM |
| 22.913(a)(2) | RSS-132(4.4) | Effective Radiated Power | 38 dBm | Radiated | Pass | 28.584dBm |
| 24.232(c ) | RSS-133(6.4) | Equivalent Isotropic Radiated Power | 33dBm | | Pass | 27.826dBm |
| 22.917(a)<br>24.238(a) | RSS-132(4.5.1)<br>RSS-133(6.5.1) | Radiated Spurious Emission | -13dBm | | Pass | -35.4dBm |



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# 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



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### 8.1.1. GSM OUTPUT POWER RESULT

| Band | Mode | Ch. | f(MHz) | 1 time slot | 2 time slot | 3 time slot | 4 time slot |
|---|---|---|---|---|---|---|---|
| | | | | Peak (dBm) | Peak (dBm) | Peak (dBm) | Peak (dBm) |
| GSM850 | GMSK | 128 | 824.2 | 31.8 | | | |
| | | 190 | 836.6 | 31.9 | | | |
| | | 251 | 848.8 | 31.9 | | | |
| | GPRS | 128 | 824.2 | 31.9 | 29.3 | 28.2 | 26.1 |
| | | 190 | 836.6 | 31.9 | 29.3 | 28.2 | 26.2 |
| | | 251 | 848.8 | 31.9 | 29.3 | 28.2 | 26.2 |
| GSM1900 | GMSK | 512 | 1850.2 | 29.5 | | | |
| | | 661 | 1880 | 29.5 | | | |
| | | 810 | 1909.8 | 29.3 | | | |
| | GPRS | 512 | 1850.2 | 29.5 | 26.5 | 25.4 | 23.4 |
| | | 661 | 1880 | 29.5 | 26.5 | 25.5 | 23.5 |
| | | 810 | 1909.8 | 29.3 | 26.6 | 25.6 | 23.6 |



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# 9. LIMITS AND CONDUCTED RESULTS

## 9.1. OCCUPIED BANDWIDTH

**RULE PART(S)**

FCC: §2.1049
IC: RSS-132, 4.5; RSS-133, 6.5

**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 v02r01 - 06/07/2013)



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### 9.1.1. OCCUPIED BANDWIDTH RESULTS

| Band | Mode | Channel | f (MHz) | 99% BW (KHz) | -26dB BW (KHz) |
|---|---|---|---|---|---|
| GSM850 | GPRS | 128 | 824.2 | 245 | 326 |
| | | 190 | 836.6 | 246 | 326 |
| | | 251 | 848.8 | 248 | 331 |
| GSM1900 | GPRS | 512 | 1850.2 | 249 | 329 |
| | | 661 | 1880 | 250 | 333 |
| | | 810 | 1909.8 | 252 | 327 |



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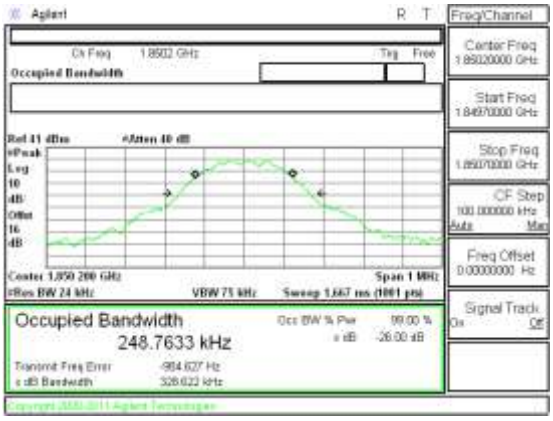
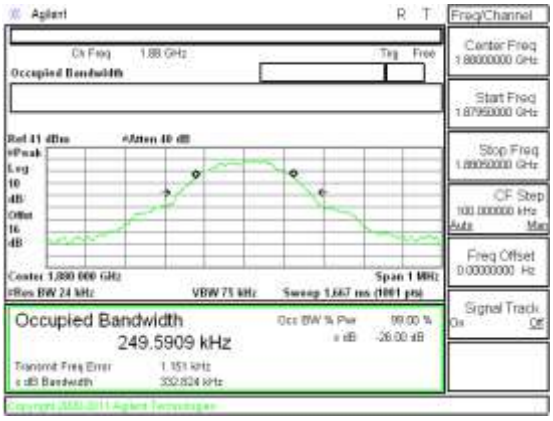
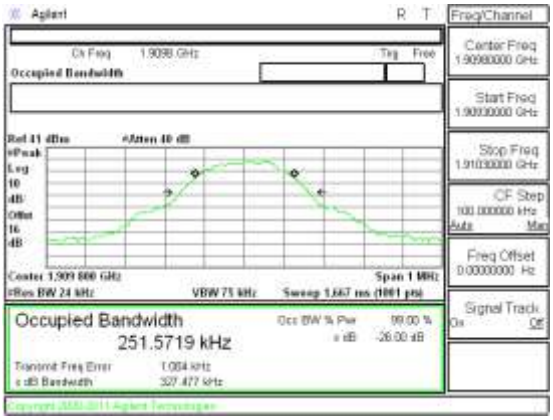
## 9.1.2. OCCUPIED BANDWIDTH PLOTS

| | | |
|---|---|---|
| Band<br><br>GSM1900<br><br>GPRS |  <br>Band GSM1900 GPRS OBW Low channel |  <br>Band GSM1900 GPRS OBW Mid channel |
| Band<br><br>GSM1900<br><br>GPRS |  <br>Band GSM1900 GPRS OBW High channel | |





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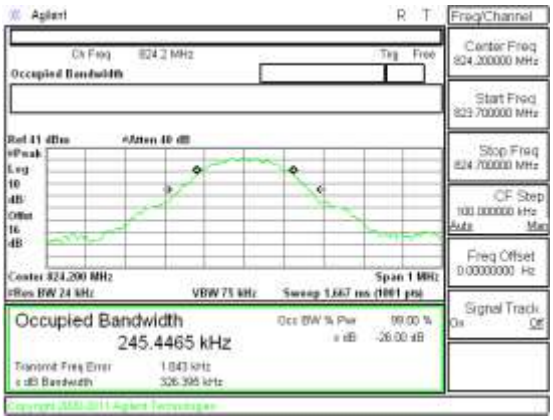
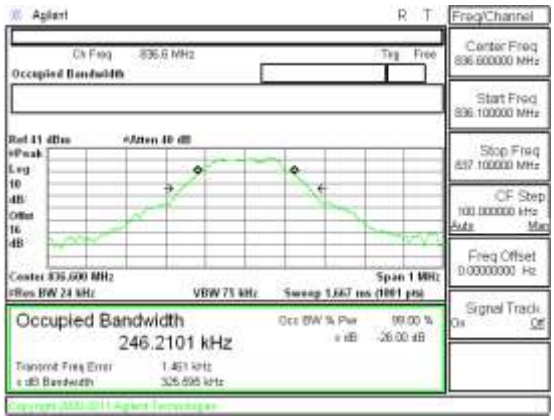
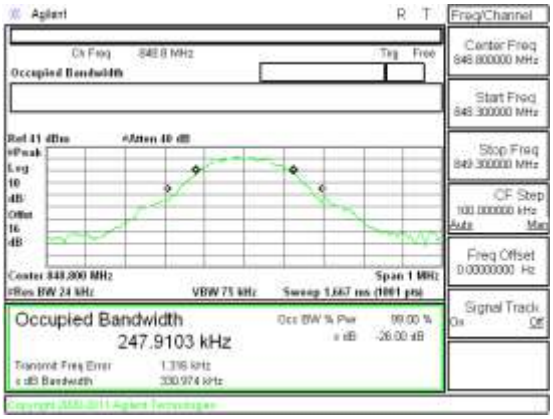
| | | |
|---|---|---|
| Band<br><br>GSM850<br><br>GPRS |  <br>Band GSM850 GPRS OBW Low channel |  <br>Band GSM850 GPRS OBW Mid channel |
| Band<br><br>GSM850<br><br>GPRS |  <br>Band GSM850 GPRS OBW High channel | |



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## 9.2. BAND EDGE EMISSIONS

**RULE PART(S)**

FCC: §22.359, §24.238

**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 v02r01
The transmitter output was connected to an Agilent 8960 or 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**



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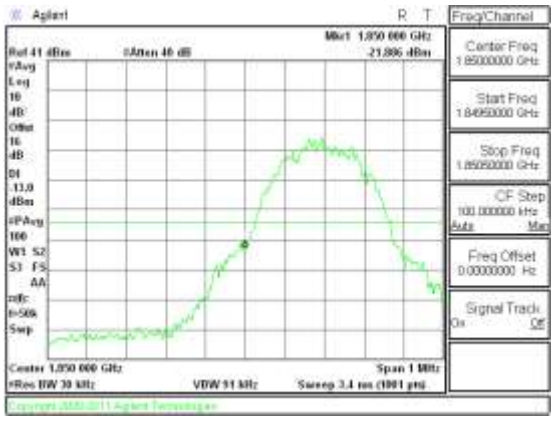
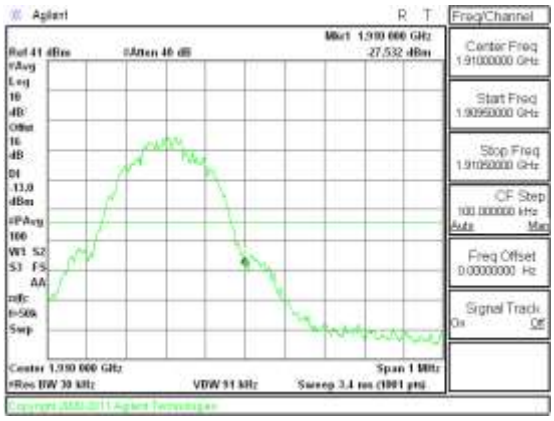
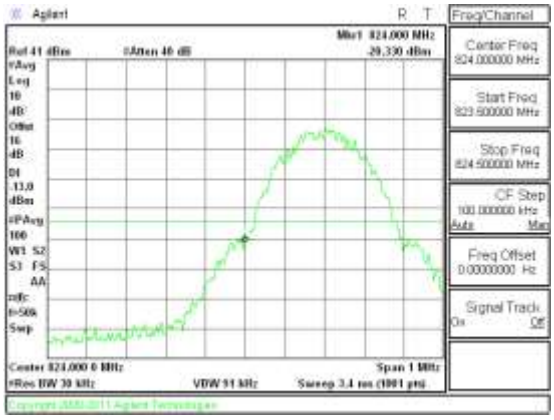
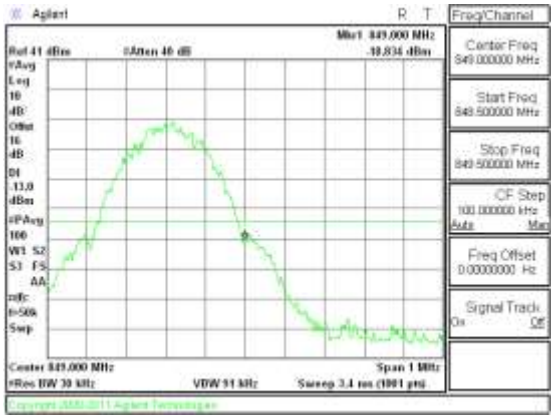
### 9.2.1. BAND EDGE PLOTS

| | | |
|---|---|---|
| Band<br><br>GSM1900<br><br>GPRS |  <br>Band GSM1900 GPRS CBE Low channel |  <br>Band GSM1900 GPRS CBE High channel |
| Band<br><br>GSM850<br><br>GPRS |  <br>Band GSM850 GPRS CBE Low channel |  <br>Band GSM850 GPRS CBE High channel |



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## 9.3. OUT OF BAND EMISSIONS

**RULE PART(S)**

FCC: §2.1051, §22.901, §22.917, §24.238

**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 v02r01

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**



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### 9.3.1. OUT OF BAND EMISSIONS RESULT

| Band | Mode | f (MHz) | Spur (dBm) | Spec (dBm) | Delta (dB) |
|---|---|---|---|---|---|
| GSM850 | GPRS | 824.2 | -19.51 | -13 | -6.51 |
| | | 836.6 | -18.32 | -13 | -5.32 |
| | | 848.8 | -20.23 | -13 | -7.23 |
| GSM1900 | GPRS | 1850.2 | -19.88 | -13 | -6.88 |
| | | 1880 | -20.37 | -13 | -7.37 |
| | | 1909.8 | -19.54 | -13 | -6.54 |



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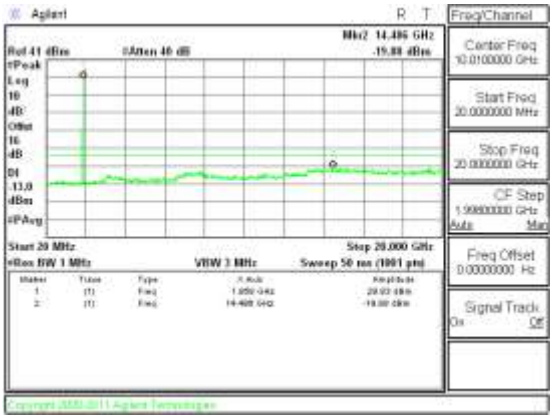
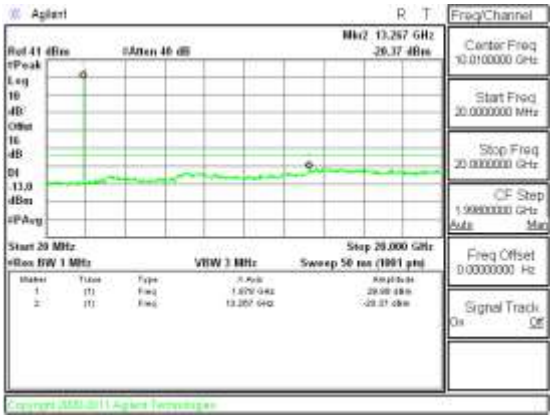
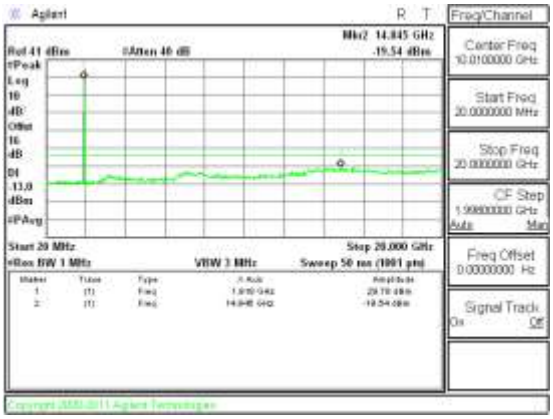
## 9.3.2. OUT OF BAND EMISSIONS PLOTS

| | | |
|---|---|---|
| Band<br><br>GSM1900<br><br>GPRS |  <br>Band GSM1900 GPRS CSE Low channel |  <br>Band GSM1900 GPRS CSE Mid channel |
| Band<br><br>GSM1900<br><br>GPRS |  <br>Band GSM1900 GPRS CSE High channel | |





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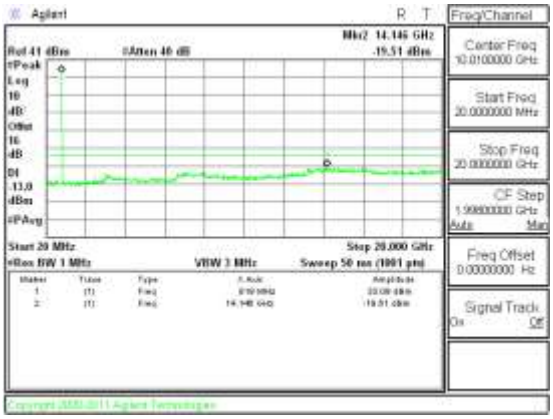
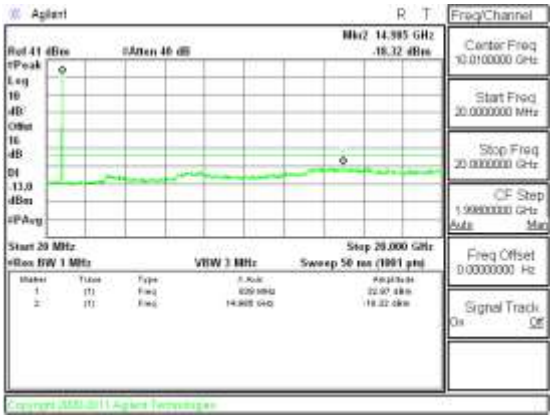
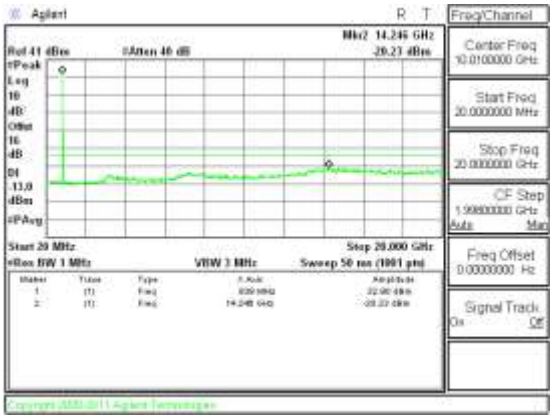
| | | |
|---|---|---|
| Band<br><br>GSM850<br><br>GPRS |  <br>Band GSM850 GPRS CSE Low channel |  <br>Band GSM850 GPRS CSE Mid channel |
| Band<br><br>GSM850<br><br>GPRS |  <br>Band GSM850 GPRS CSE High channel | |





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## 9.4. 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 ±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 v02r01

**RESULTS**

See the following pages.



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## 9.4.1. FREQUENCY STABILITY RESULTS

**GPRS 1900, Channel 661 Freq: 1880MHz– MID CHANNEL**

| Limit: to stay +- 2.5 ppm = 4700.000 Hz | | | | |
|---|---|---|---|---|
| Power Supply (Vdc) | Environment Temperature (°C) | Frequency Deviation Measureed with Time Elapse (MHz) | Delta (ppm) | Limit (ppm) |
| 3.80 | 50 | 1879.999949 | -0.002 | 2.5 |
| 3.80 | 40 | 1879.999955 | -0.005 | 2.5 |
| 3.80 | 30 | 1879.999955 | -0.005 | 2.5 |
| ***3.80*** | ***20*** | ***1879.999945*** | ***0*** | ***2.5*** |
| 3.80 | 10 | 1879.999947 | -0.001 | 2.5 |
| 3.80 | 0 | 1879.999954 | -0.005 | 2.5 |
| 3.80 | -10 | 1879.999934 | 0.006 | 2.5 |
| 3.80 | -20 | 1879.999936 | 0.005 | 2.5 |
| 3.80 | -30 | 1879.999942 | 0.002 | 2.5 |

| Reference Frequency: PCS Mid Channel 1880 MHz @ 20°C<br>Limit: to stay +- 2.5 ppm = 4700.000 Hz | | | | |
|---|---|---|---|---|
| Power Supply (Vdc) | Environment Temperature (°C) | Frequency Deviation Measureed with Time Elapse (MHz) | Delta (ppm) | Limit (ppm) |
| ***3.80*** | ***20*** | ***1879.999946*** | ***0*** | ***2.5*** |
| 4.30 | 20 | 1879.999948 | *-0.001* | 2.5 |
| 3.20 | 20 | 1879.999958 | *-0.006* | 2.5 |



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**GPRS 850 CELL BAND, – MID CHANNEL190, Frequency 836.6MHz**

| Reference Frequency: Cell Mid Channel 836.6 MHz @ 20ºC<br>Limit: +- 2.5 ppm = 2091.500 Hz | | | | |
|---|---|---|---|---|
| Power Supply (Vdc) | Environment Temperature (*C) | Frequency Deviation Measureed with Time Elapse | | |
| | | (MHz) | Delta (ppm) | Limit (ppm) |
| 3.80 | 50 | 836.599951 | 0.020 | 2.5 |
| 3.80 | 40 | 836.599950 | 0.021 | 2.5 |
| 3.80 | 30 | 836.599952 | 0.019 | 2.5 |
| 3.80 | ***20*** | ***836.599968*** | ***0*** | ***2.5*** |
| 3.80 | 10 | 836.599947 | 0.025 | 2.5 |
| 3.80 | 0 | 836.599949 | 0.023 | 2.5 |
| 3.80 | -10 | 836.599955 | 0.016 | 2.5 |
| 3.80 | -20 | 836.599958 | 0.012 | 2.5 |
| 3.80 | -30 | 836.599962 | 0.008 | 2.5 |

| Reference Frequency: Cell Mid Channel 836.6 MHz @ 20ºC<br>Limit: +- 2.5 ppm = 2091.500 Hz | | | | |
|---|---|---|---|---|
| Power Supply (Vdc) | Environment Temperature (*C) | Frequency Deviation Measureed with Time Elapse | | |
| | | | Delta (ppm) | Limit (ppm) |
| ***3.80*** | ***20*** | ***836.599968*** | ***0.00000*** | ***2.5*** |
| 4.30 | 20 | 836.599963 | *0.00598* | 2.5 |
| 3.20 | 20 | 836.599900 | *0.08128* | 2.5 |



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# 10. RADIATED TEST RESULTS

## 10.1. 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

**TEST RESULTS**

### 10.1.1. ERP/EIRP Results

| Band | Mode | Channel | f(MHz) | ERP / EIRP | |
|---|---|---|---|---|---|
| | | | | dBm | mW |
| GSM1900 | GPRS | 512 | 1850.2 | 27.826 | 606.18 |
| | | 661 | 1880 | 27.713 | 590.61 |
| | | 810 | 1909.8 | 27.2756 | 534.02 |

| Band | Mode | Channel | f(MHz) | ERP / EIRP | |
|---|---|---|---|---|---|
| | | | | dBm | mW |
| GSM850 | GPRS | 128 | 824.2 | 28.098 | 645.36 |
| | | 190 | 836.6 | 28.584 | 721.77 |
| | | 251 | 848.8 | 28.411 | 693.59 |



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## 10.1.2. ERP/EIRP DATA

Band

GSM1900

GPRS

**High Frequency Fundamental Measurement**
**Compliance Certification Services Chamber A**

**Company:** Samsung
**Project #:** 14I17791
**Date:** 05/29/14
**Test Engineer:** O. Stoelting
**Configuration:** EUT, X Position
**Mode:** GRPS 1900MHz

**Test Equipment:**
**Receiving: T136, and Chamber A SMA Cables**
**Substitution: Horn T60 Substitution, 5ft SMA Cable (16795) Warehouse**

| f GHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBi) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---|---|---|---|---|---|---|---|---|
| Low Ch | | | | | | | | |
| 1.850 | 19.3 | V | 0.85 | 8.49 | 26.91 | 33.0 | -6.1 | |
| 1.850 | 20.2 | H | 0.85 | 8.49 | 27.83 | 33.0 | -5.2 | |
| Mid Ch | | | | | | | | |
| 1.880 | 17.4 | V | 0.85 | 8.34 | 24.84 | 33.0 | -8.2 | |
| 1.880 | 20.2 | H | 0.85 | 8.34 | 27.71 | 33.0 | -5.3 | |
| High Ch | | | | | | | | |
| 1.910 | 18.5 | V | 0.85 | 8.21 | 25.83 | 33.0 | -7.2 | |
| 1.910 | 19.9 | H | 0.85 | 8.21 | 27.28 | 33.0 | -5.7 | |

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Band

GSM850

GPRS

**High Frequency Substitution Measurement**
**Compliance Certification Services Chamber A**

**Company:** Samsung
**Project #:** 14I17791
**Date:** 05/29/14
**Test Engineer:** O. Stoelting
**Configuration:** EUT, X Position
**Mode:** GRPS 850MHz

**Test Equipment:**
**Receiving: T130, and Chamber A N-type Cable.**
**Substitution: Dipole S/N: T416, 5ft SMA Cable.**

| f MHz | SG reading (dBm) | Ant. Pol. (H/V) | Cable Loss (dB) | Antenna Gain (dBd) | ERP (dBm) | Limit (dBm) | Margin (dB) | Notes |
|---|---|---|---|---|---|---|---|---|
| Low Ch | | | | | | | | |
| 824.20 | 20.56 | V | 0.5 | 0.0 | 20.06 | 38.5 | -18.4 | |
| 824.20 | 28.60 | H | 0.5 | 0.0 | 28.10 | 38.5 | -10.4 | |
| Mid Ch | | | | | | | | |
| 836.60 | 22.01 | V | 0.5 | 0.0 | 21.51 | 38.5 | -16.9 | |
| 836.60 | 29.08 | H | 0.5 | 0.0 | 28.58 | 38.5 | -9.9 | |
| High Ch | | | | | | | | |
| 848.80 | 22.86 | V | 0.5 | 0.0 | 22.36 | 38.5 | -16.1 | |
| 848.80 | 28.91 | H | 0.5 | 0.0 | 28.41 | 38.5 | -10.0 | |

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## 10.2. FIELD STRENGTH OF SPURIOUS RADIATION

### RULE PART(S)

FCC: §2.1053, §22.917, §24.238

**LIMIT**

§22.917 (e) and §24.238 (a): Out of band emissions. 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**



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## 10.2.1. SPURIOUS RADIATION DATA

**Compliance Certification Services**
**Above 1GHz High Frequency Substitution Measurement**

**Company:** Samsung
**Project #:** 14I17791
**Date:** 05/30/14
**Test Engineer:** O. Stoelting
**Configuration:** EUT X Position, AC Charger and headphone
**Mode:** GPRS 1900

| Chamber | Pre-amplifer | Filter | Limit |
|---|---|---|---|
| 5m Chamber A | T343 8449B | Filter 1 | Part 24 |

Band

GSM1900

GPRS

| f GHz | SG reading (dBm) | Ant. Pol. (H/V) | Distance (m) | Preamp (dB) | Filter (dB) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Low Ch, 1850MHz | | | | | | | | | |
| 3.700 | -14.9 | V | 3.0 | 35.4 | 1.0 | -49.3 | -13.0 | -36.3 | |
| 5.550 | -18.7 | V | 3.0 | 34.7 | 1.0 | -52.5 | -13.0 | -39.5 | |
| 7.400 | -17.1 | V | 3.0 | 34.9 | 1.0 | -51.0 | -13.0 | -38.0 | |
| 3.700 | -13.6 | H | 3.0 | 35.4 | 1.0 | -48.0 | -13.0 | -35.0 | |
| 5.550 | -19.1 | H | 3.0 | 34.7 | 1.0 | -52.8 | -13.0 | -39.8 | |
| 7.400 | -15.0 | H | 3.0 | 34.9 | 1.0 | -48.9 | -13.0 | -35.9 | |
| | | | | | | | | | |
| Mid Ch, 1880.0MHz | | | | | | | | | |
| 3.760 | -9.7 | V | 3.0 | 35.3 | 1.0 | -44.0 | -13.0 | -31.0 | |
| 5.640 | -22.6 | V | 3.0 | 34.7 | 1.0 | -56.3 | -13.0 | -43.3 | |
| 7.520 | -17.0 | V | 3.0 | 34.9 | 1.0 | -51.0 | -13.0 | -38.0 | |
| 3.760 | -7.4 | H | 3.0 | 35.3 | 1.0 | -41.7 | -13.0 | -28.7 | |
| 5.640 | -20.4 | H | 3.0 | 34.7 | 1.0 | -54.1 | -13.0 | -41.1 | |
| 7.520 | -18.5 | H | 3.0 | 34.9 | 1.0 | -52.4 | -13.0 | -39.4 | |
| | | | | | | | | | |
| High Ch, 1909.8 MHz | | | | | | | | | |
| 3.820 | -9.1 | V | 3.0 | 35.3 | 1.0 | -43.3 | -13.0 | -30.3 | |
| 5.729 | -21.5 | V | 3.0 | 34.7 | 1.0 | -55.3 | -13.0 | -42.3 | |
| 7.639 | -18.1 | V | 3.0 | 35.0 | 1.0 | -52.1 | -13.0 | -39.1 | |
| 3.820 | -6.0 | H | 3.0 | 35.3 | 1.0 | -40.2 | -13.0 | -27.2 | |
| 5.729 | -15.4 | H | 3.0 | 34.7 | 1.0 | -49.1 | -13.0 | -36.1 | |
| 7.639 | -17.1 | H | 3.0 | 35.0 | 1.0 | -51.1 | -13.0 | -38.1 | |

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**Compliance Certification Services**
**Above 1GHz High Frequency Substitution Measurement**

**Company:** Samsung
**Project #:** 14I17791
**Date:** 05/30/14
**Test Engineer:** O. Stoelting
**Configuration:** EUT X Position, AC Charger and headphone
**Mode:** GPRS 850

| Chamber | Pre-amplifer | Filter | Limit |
|---|---|---|---|
| 5m Chamber A | T34 8449B | Filter 1 | Part 22 |

Band

GSM850

GPRS

| f GHz | SG reading (dBm) | Ant. Pol. (H/V) | Distance (m) | Preamp (dB) | Filter (dB) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Low Ch, 824.2MHz | | | | | | | | | |
| 1.648 | -0.2 | V | 3.0 | 37.4 | 1.0 | -36.5 | -13.0 | -23.5 | |
| 2.473 | -23.8 | V | 3.0 | 36.4 | 1.0 | -59.2 | -13.0 | -46.2 | |
| 3.297 | -27.6 | V | 3.0 | 35.8 | 1.0 | -62.4 | -13.0 | -49.4 | |
| 1.648 | -14.4 | H | 3.0 | 37.4 | 1.0 | -50.8 | -13.0 | -37.8 | |
| 2.473 | -25.0 | H | 3.0 | 36.4 | 1.0 | -60.4 | -13.0 | -47.4 | |
| 3.297 | -24.2 | H | 3.0 | 35.8 | 1.0 | -59.0 | -13.0 | -46.0 | |
| Mid Ch, 836.6MHz | | | | | | | | | |
| 1.673 | 0.9 | V | 3.0 | 37.3 | 1.0 | -35.4 | -13.0 | -22.4 | |
| 2.510 | -23.5 | V | 3.0 | 36.4 | 1.0 | -58.9 | -13.0 | -45.9 | |
| 3.346 | -28.1 | V | 3.0 | 35.8 | 1.0 | -62.8 | -13.0 | -49.8 | |
| 1.673 | -3.8 | H | 3.0 | 37.3 | 1.0 | -40.1 | -13.0 | -27.1 | |
| 2.510 | -24.7 | H | 3.0 | 36.4 | 1.0 | -60.0 | -13.0 | -47.0 | |
| 3.346 | -27.4 | H | 3.0 | 35.8 | 1.0 | -62.1 | -13.0 | -49.1 | |
| High Ch, 848.8MHz | | | | | | | | | |
| 1.698 | -8.2 | V | 3.0 | 37.3 | 1.0 | -44.5 | -13.0 | -31.5 | |
| 2.547 | -22.7 | V | 3.0 | 36.3 | 1.0 | -58.0 | -13.0 | -45.0 | |
| 3.395 | -21.9 | V | 3.0 | 35.7 | 1.0 | -56.6 | -13.0 | -43.6 | |
| 1.698 | -1.5 | H | 3.0 | 37.3 | 1.0 | -37.8 | -13.0 | -24.8 | |
| 2.547 | -10.6 | H | 3.0 | 36.3 | 1.0 | -46.0 | -13.0 | -33.0 | |
| 3.395 | -27.3 | H | 3.0 | 35.7 | 1.0 | -62.0 | -13.0 | -49.0 | |

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Note: No other emissions were detected above the system noise floor.



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