

# FCC ANT+ REPORT

## FCC Certification

**Applicant Name:**  
SAMSUNG Electronics Co.,Ltd.

**Address:**  
129, Samsung-ro, Yeongtong-gu, Suwon-si,  
Gyeonggi-do, 16677, Rep. of Korea

**Date of Issue:**  
March 04, 2016  
**Test Site/Location:**  
HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,Majang-  
myeo,Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA  
**Report No.:** HCT-R-1602-F060-1  
**HCT FRN:** 0005866421  
**IC Recognition No.:** 5944A-5

**FCC ID** : **A3LSMJ5108**

**APPLICANT** : **SAMSUNG Electronics Co., Ltd.**

**FCC Model(s):** SM-J5108  
**EUT Type:** Mobile Phone  
**Max. RF Output Power:** 96.33 dB $\mu$ V/m  
**Frequency Range:** 2402 MHz -2480 MHz  
**Modulation type** GFSK  
**FCC Classification:** Low Power communication Device Transmitter(DXX)  
**FCC Rule Part(s):** Part 15.249

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)



**Report prepared by**  
**: Se Wook Park**  
**Test Engineer of RF Team**



**Approved by**  
**: Jong Seok Lee**  
**Manager of RF Team**

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## Version

| TEST REPORT NO.   | DATE              | DESCRIPTION   |
|-------------------|-------------------|---|
| HCT-R-1602-F060   | February 29, 2016 | - First Approval Report   |
| HCT-R-1602-F060-1 | March 04, 2016    | - Revised band edge test result using average value of pulsed emission method<br>- Add the worst case orientation on Page 17, 27 and 31<br>- Additional test for 20 dB BW |
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## 1. GENERAL INFORMATION

**Applicant:** SAMSUNG Electronics Co.,Ltd.  
**Address:** 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea  
**FCC ID:** A3LSMJ5108  
**EUT Type:** Mobile Phone  
**Model name(s):** SM-J5108  
**Date(s) of Tests:** January 25, 2016 ~ March 04, 2016  
**Place of Tests:** HCT Co., Ltd.  
 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea  
 (IC Recognition No. : 5944A-3)

## 2. EUT DESCRIPTION

|   |  |                    |
|---|--|--------------------|
| <b>FCC Model Name</b>                   | SM-J5108   |                    |
| <b>EUT Type</b>                         | Mobile Phone   |                    |
| <b>Power Supply</b>                     | DC 3.85 V  |                    |
| <b>Battery Infomation</b>               | Model: EB-BJ510CBC<br>Type: Li-ion Battery                                     |                    |
| <b>Frequency Range</b>                  | TX: 2402 MHz ~ 2480 MHz<br>RX: 2402 MHz ~ 2480 MHz                             |                    |
| <b>Fundamental Field Strength Level</b> | Peak   | 96.33 dB $\mu$ V/m |
|   | Average  | 47.41 dB $\mu$ V/m |
| <b>Operating Mode</b>                   | ANT+   |                    |
| <b>Modulation Type</b>                  | GFSK   |                    |
| <b>Number of Channels</b>               | 79 Channels  |                    |
| <b>Antenna Specification</b>            | Manufacturer: Partron<br>Antenna type: INTERNAL ANTENNA<br>Peak Gain : 0.2 dBi |                    |

### **3. TEST METHODOLOGY**

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) Operating Under §15.249” were used in the measurement.

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.249 under the FCC Rules Part 15 Subpart C.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

#### **3.4 DESCRIPTION OF TEST MODES**

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

## 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

All equipments(spectrum, antenna, accessory, etc.) for measurement is calibrated in accordance with the requirements of ANSI C63.5 (version : 2006).

## 5. FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661)

### 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 6. ANTENNA REQUIREMENTS

### According to FCC 47 CFR §15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

\* The antennas of this E.U.T are permanently attached.

\*The E.U.T Complies with the requirement of §15.203

## 7. SUMMARY TEST OF RESULTS

| Test Description   | FCC Part Section(s)              | Test Limit   | Test Condition | Test Result |
|--|----------------------------------|--|----------------|-------------|
| 20 dB Bandwidth  | §15.215                          | N/A  | CONDUCTED      | PASS        |
| Duty Cycle   | §15.35(c)                        | N/A  |                | N/A         |
| AC Power line Conducted Emissions  | §15.207                          | cf. Section 8.4  |                | PASS        |
| Fundamental Field Strength Level   | §15.249(a)(e)                    | < 50 mV/m  | RADIATED       | PASS        |
| Harmonic Field Strength Level  | §15.249(a)(e)                    | < 500 mV/m   |                | PASS        |
| General Field Strength Limits<br>(Restricted Bands and Radiated Emission Limits) | §15.205, 15.209,<br>15.249(d)(e) | < 15.209 limits or 50dB<br>below the level of the<br>fundamental |                | PASS        |

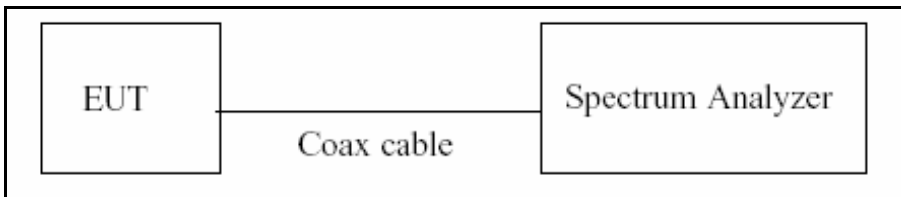
## 8. TEST RESULT

### 8.1 DUTY CYCLE

#### Test Requirements §15.35(c)

(c) Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification

#### ■ TEST CONFIGURATION



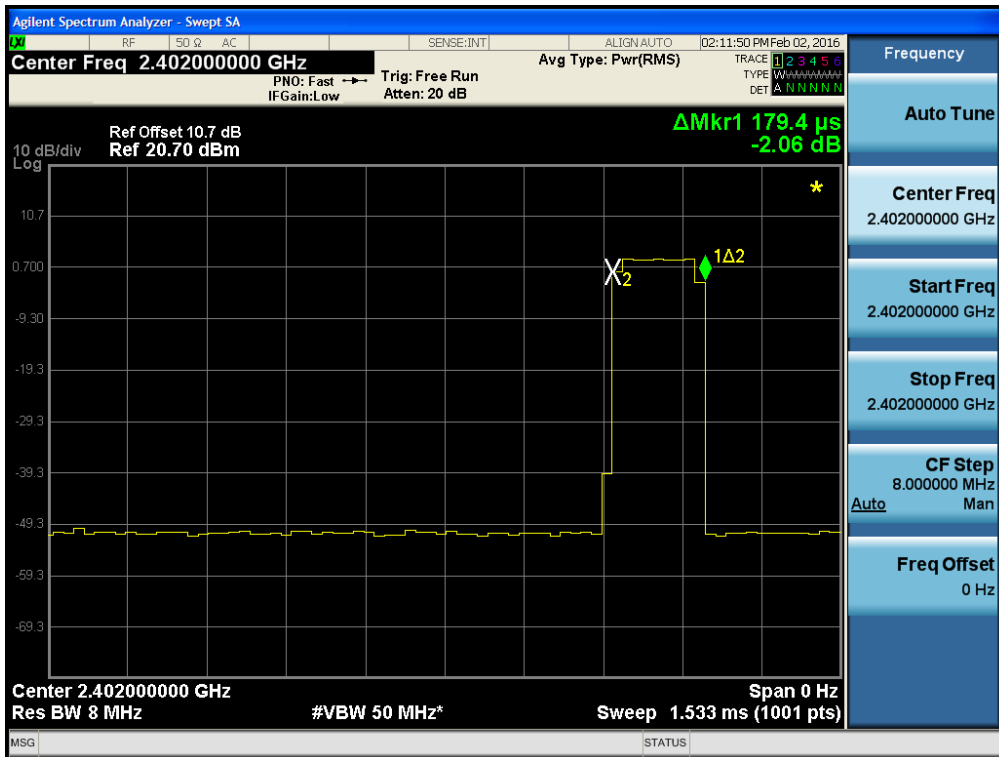
#### ■ TEST RESULTS

$$\begin{aligned}
 \text{DCCF} &= 20 \cdot \log_{10}(\text{Pulse width} / \text{Period of the pulse train}) \\
 &= 20 \cdot \log_{10}(2 \times 0.179 \text{ ms} / 100 \text{ ms}) = -48.922\text{dB}
 \end{aligned}$$

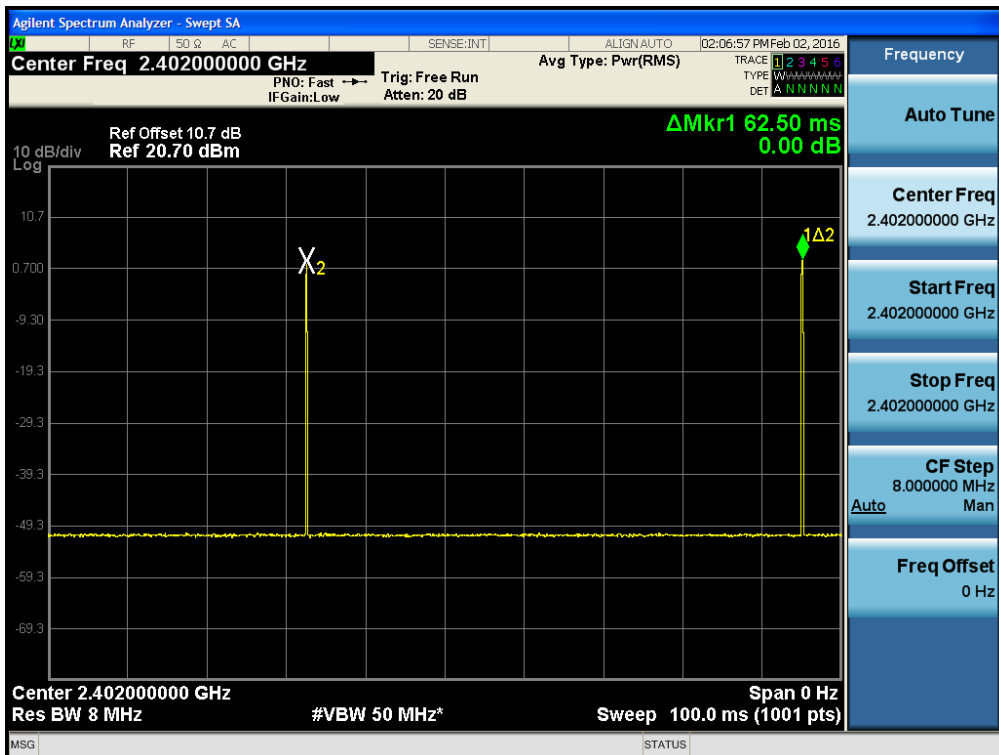
|                  |
|------------------|
| <b>DCCF</b>      |
| <b>-48.92 dB</b> |

▣ TEST RESULTS PLOTS

Pulse Width plot



Period of the Pulse Train

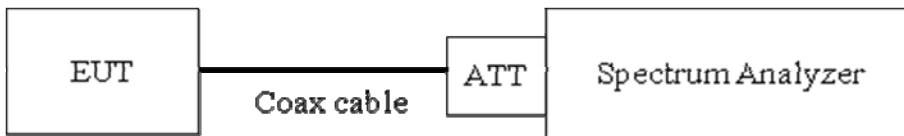


## 8.2 20 dB BANDWIDTH MEASUREMENT

### Test Requirements and limit, §15.215

The 20 dB bandwidth is measured as the width of the spectral envelop of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio( or in decibels, a 20 dB down from the reference value). And 20 dB bandwidth is contained within the frequency band.

#### ■ TEST CONFIGURATION



#### ■ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

RBW = 1% to 3% of the 99% bandwidth.

VBW ≥ 3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

Note : We tested 20 dB Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

#### ■ TEST RESULTS

| ANT+ Mode      | 20 dB Bandwidth |
|----------------|-----------------|
| Frequency[MHz] | [kHz]           |
| 2402           | 634.2           |
| 2441           | 591.5           |
| 2480           | 544.3           |

▣ RESULT PLOTS

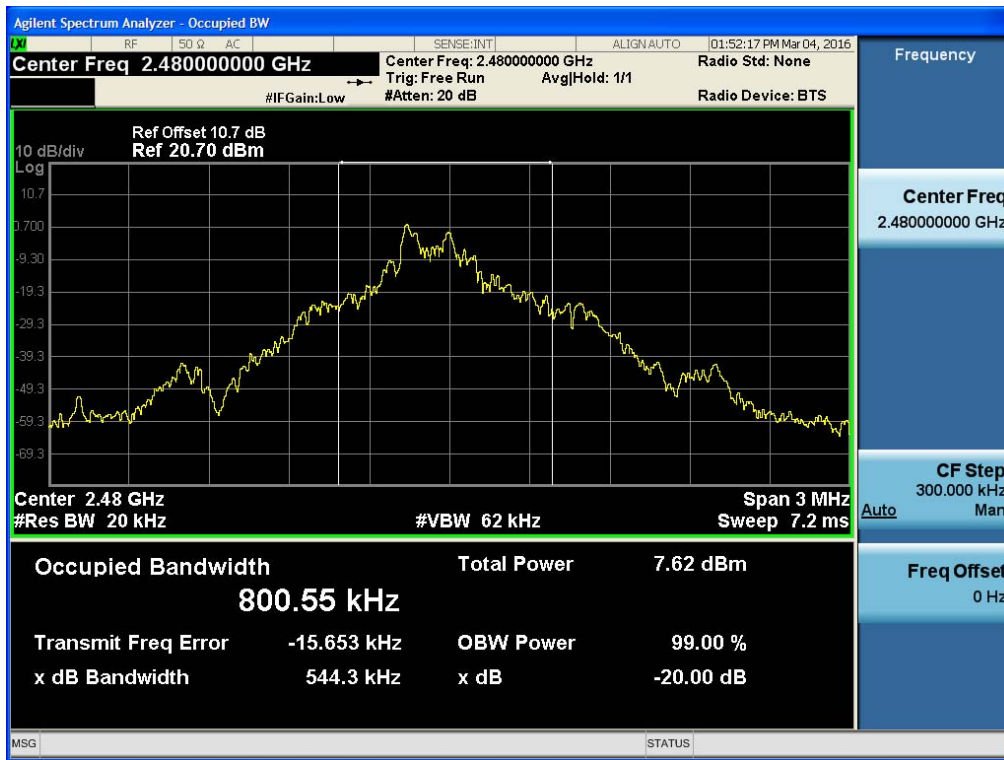
20 dB Bandwidth plot (Low)



20 dB Bandwidth plot (Mid)



### 20 dB Bandwidth plot (High)



**8.3 RADIATED MEASUREMENT.**

**8.3.1 FUNDAMENTAL FIELD STRENGTH LEVEL MEASUREMENT**

**Test Requirements and limit, §15.249(a)(e)**

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency  | Field strength of fundamental (millivolts meter) | Field strength of harmonics (millivolts meter) |
|------------------------|--|--|
| <b>902-928 MHz</b>     | <b>50</b>  | <b>500</b>                                     |
| <b>2400-2483.5 MHz</b> | <b>50</b>  | <b>500</b>                                     |
| <b>5725-5875 MHz</b>   | <b>50</b>  | <b>500</b>                                     |
| <b>24.0-24.25 GHz</b>  | <b>250</b>                                       | <b>2500</b>                                    |

(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

**The maximum permissible average field strength level is 50 mV/m (93.98 dBuV/m).**

**The maximum permissible peak field strength level is 500 mV/m (113.98 dBuV/m).**

**TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Spectrum Setting
  - a. Peak: 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥3\*RBW
8. Average value of pulsed emissions

Unless otherwise specified, when the radiated emission limits are expressed in terms of the

average value of the emission and pulsed operation is employed, the average measurement shall be determined from the peak field strength after correcting for the worst-case duty cycle as described in section 8.1.

■ TEST RESULTS

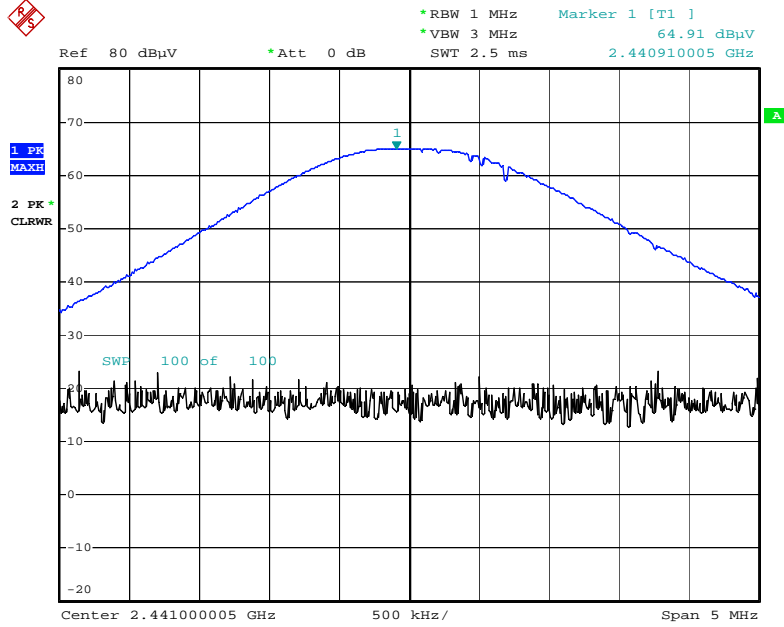
| Frequency<br>[MHz] | Reading<br>[dBuV/m] | A.F.+CL<br>[dB] | Ant. Pol.<br>[H/V] | Duty Cycle<br>Correction<br>[dB] | Total<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Measurement<br>Type |
|--------------------|---------------------|-----------------|--------------------|----------------------------------|-------------------|-------------------|----------------|---------------------|
| 2402               | 63.04               | 31.31           | V                  | 0.00                             | 94.35             | 113.98            | 19.63          | PK                  |
| 2402               | 63.04               | 31.31           | V                  | -48.92                           | 45.43             | 93.98             | 48.55          | AV                  |
| 2402               | 63.82               | 31.31           | H                  | 0.00                             | 95.13             | 113.98            | 18.85          | PK                  |
| 2402               | 63.82               | 31.31           | H                  | -48.92                           | 46.21             | 93.98             | 47.77          | AV                  |
| 2441               | 63.87               | 31.42           | V                  | 0.00                             | 95.29             | 113.98            | 18.69          | PK                  |
| 2441               | 63.87               | 31.42           | V                  | -48.92                           | 46.37             | 93.98             | 47.61          | AV                  |
| 2441               | 64.91               | 31.42           | H                  | 0.00                             | 96.33             | 113.98            | 17.65          | PK                  |
| 2441               | 64.91               | 31.42           | H                  | -48.92                           | 47.41             | 93.98             | 46.57          | AV                  |
| 2480               | 63.49               | 31.30           | V                  | 0.00                             | 94.79             | 113.98            | 19.19          | PK                  |
| 2480               | 63.49               | 31.30           | V                  | -48.92                           | 45.87             | 93.98             | 48.11          | AV                  |
| 2480               | 64.46               | 31.30           | H                  | 0.00                             | 95.76             | 113.98            | 18.22          | PK                  |
| 2480               | 64.46               | 31.30           | H                  | -48.92                           | 46.84             | 93.98             | 47.14          | AV                  |

Note :

1. Average field strength data is determined by applying the duty cycle correction factor(DCCF) found in Section 8.1 to the measured peak field strength values.
2. Peak: Total = Reading Value + Antenna Factor + Cable Loss  
Average: Total = Reading Value + Antenna Factor + Cable Loss + Duty Cycle Correction
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

■ RESULT PLOTS(Worst case : x-H)

Fundamental Field Strength plot (Ch. Mid)



Date: 4.FEB.2016 10:29:37

Note : Only the worst case plots for Fundamental Field Strength

**8.3.2 RADIATED SPURIOUS EMISSIONS.**

**Test Requirements and limit, §15.205, §15.209, §15.249(d)(e)**

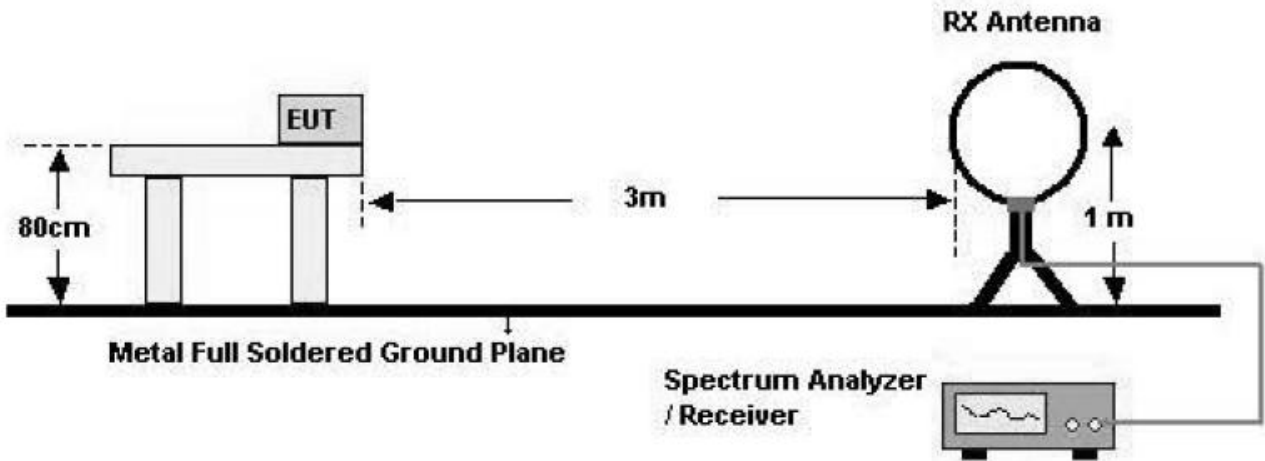
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 0.009 – 0.490   | 2400/F(kHz)           | 300                      |
| 0.490 – 1.705   | 24000/F(kHz)          | 30                       |
| 1.705 – 30      | 30                    | 30                       |
| 30-88           | 100                   | 3                        |
| 88-216          | 150                   | 3                        |
| 216-960         | 200                   | 3                        |
| Above 960       | 500                   | 3                        |

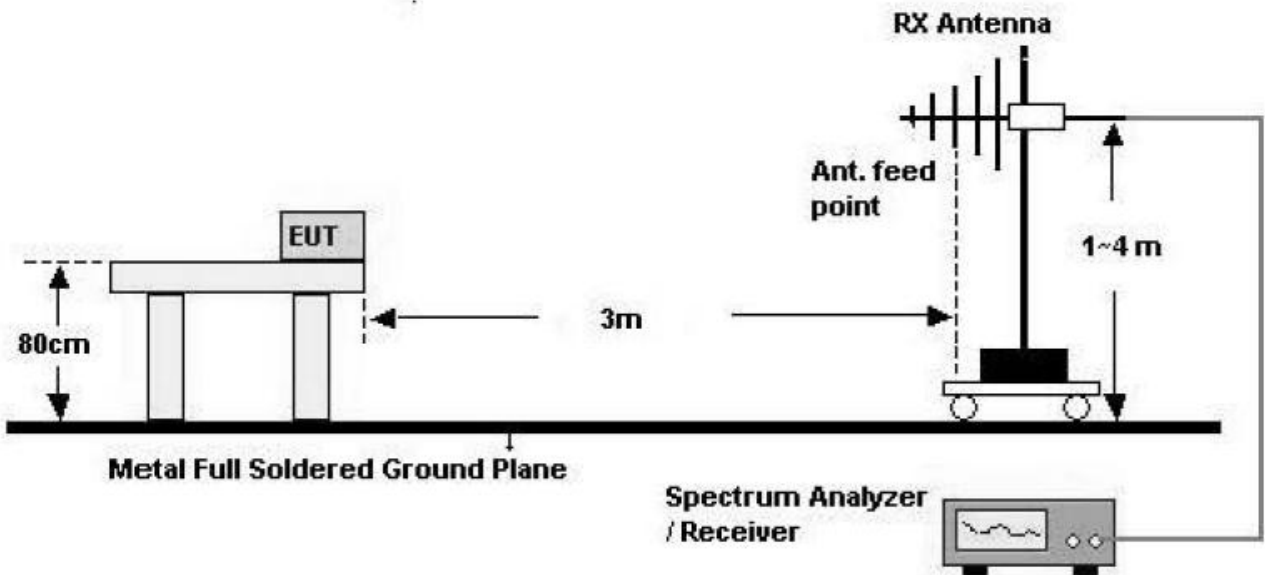
(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

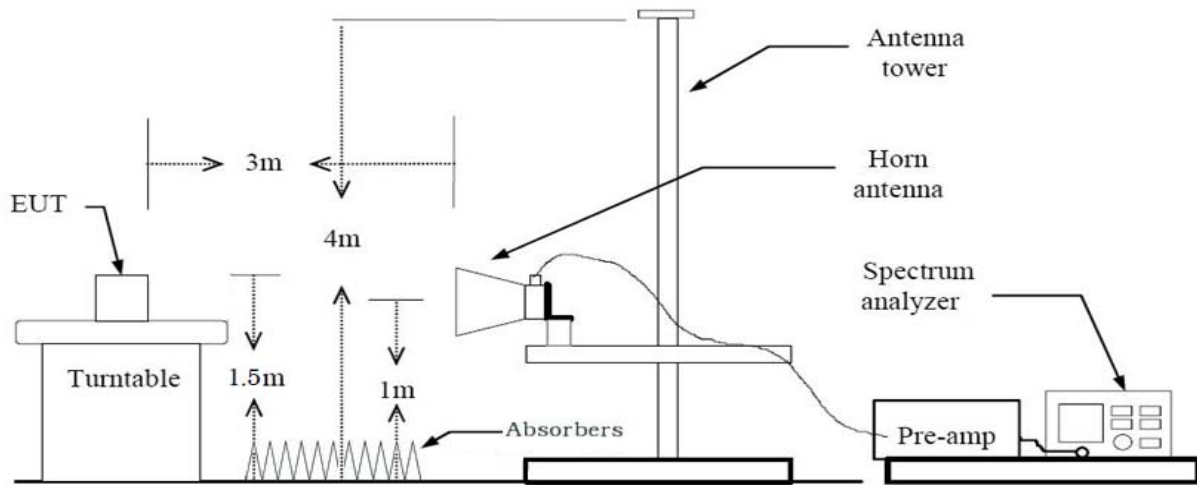
### Test Configuration

#### Below 30 MHz



#### 30 MHz - 1 GHz



**Above 1 GHz****TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Spectrum Setting
  - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz
  - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds.
8. Average value of pulsed emissions

Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall be determined from the peak field strength after correcting for the worst-case duty cycle as described in section 8.1.
9. Marker-delta method (Section 6.10.6 in ANSI C63.10: 2013)

The following procedure shall be used for the marker-delta method:

  - a) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function required for the frequency being measured. For example, for a device operating in the 902 MHz to 928 MHz band, use a 120 kHz RBW with a CISPR QP detector (a peak detector with 100 kHz RBW

- alternatively may be used). For transmitters operating above 1 GHz, use a 1 MHz RBW, a 3 MHz VBW, and a peak detector, as required. Repeat the measurement with an average detector (or alternatively, a peak detector and reduced VBW). For pulsed emissions, other factors shall be included; see 4.1.4.2.6.
- b) Choose an EMI receiver or spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the instrument RBW to 1% of the total span (but never less than 30 kHz), with a VBW equal to or greater than three times the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission(i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not an absolute field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.
- c) Subtract the delta measured in step b) from the field strengths measured in step a). The resulting field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge emissions compliance, where required.

Note :

1. We used the standard radiated method for RSE and used the average value of pulsed emission and delta marker method for band edge.
2. Below VBW is for RSE test

| <b>ANT+ Mode</b> | <b>T<sub>on</sub></b><br>(ms) | <b>VBW(1/T)</b><br>(Hz) | <b>The actual setting value of VBW</b><br>(Hz) |
|------------------|-------------------------------|-------------------------|--|
|                  | <b>0.179</b>                  | <b>5587</b>             | <b>10000</b>                                   |

**TEST RESULTS**

**9 kHz – 30MHz**

**Operation Mode:** Normal Mode

| Frequency               | Reading      | Ant. factor | Cable loss | Ant. POL | Total        | Limit        | Margin |
|-------------------------|--------------|-------------|------------|----------|--------------|--------------|--------|
| MHz                     | dB $\mu$ V/m | dBm /m      | dBm        | (H/V)    | dB $\mu$ V/m | dB $\mu$ V/m | dB     |
| No Critical peaks found |              |             |            |          |              |              |        |

**Notes:**

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. This test is performed with hopping off.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

**TEST RESULTS****Below 1 GHz****Operation Mode:** Normal Mode

| Frequency               | Reading                         | Ant. factor           | Cable loss   | Ant. POL | Total                           | Limit                           | Margin      |
|-------------------------|---------------------------------|-----------------------|--------------|----------|---------------------------------|---------------------------------|-------------|
| MHz                     | $\text{dB}\mu\text{V}/\text{m}$ | $\text{dBm}/\text{m}$ | $\text{dBm}$ | (H/V)    | $\text{dB}\mu\text{V}/\text{m}$ | $\text{dB}\mu\text{V}/\text{m}$ | $\text{dB}$ |
| No Critical peaks found |                                 |                       |              |          |                                 |                                 |             |

**Notes:**

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. This test is performed with hopping off.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

**Above 1 GHz**

**Operation Frequency: 2402 MHz**

| Frequency<br>[MHz] | Reading<br>[dBuV/m] | A.F.+C.L.-AMP G<br>[dBm] | ANT. POL<br>[H/V] | Total<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Measurement<br>Type |
|--------------------|---------------------|--------------------------|-------------------|-------------------|-------------------|----------------|---------------------|
| 4804               | 49.74               | -2.96                    | V                 | 46.78             | 73.98             | 27.20          | PK                  |
| 4804               | 42.09               | -2.96                    | V                 | 39.13             | 53.98             | 14.85          | AV                  |
| 7206               | 46.40               | 6.88                     | V                 | 53.28             | 73.98             | 20.70          | PK                  |
| 7206               | 35.93               | 6.88                     | V                 | 42.81             | 53.98             | 11.17          | AV                  |
| 4804               | 50.48               | -2.96                    | H                 | 47.52             | 73.98             | 26.46          | PK                  |
| 4804               | 42.96               | -2.96                    | H                 | 40.00             | 53.98             | 13.98          | AV                  |
| 7206               | 47.18               | 6.88                     | H                 | 54.06             | 73.98             | 19.92          | PK                  |
| 7206               | 36.40               | 6.88                     | H                 | 43.28             | 53.98             | 10.70          | AV                  |

※ A:F: ANTENNA FACTOR  
 C:L: CABLE LOSS  
 AMP G: AMPLIFIER GAIN

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain
5. Spectrum setting:
  - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
  - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.  
 We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

**Operation Frequency: 2441 MHz**

| Frequency<br>[MHz] | Reading<br>[dBuV/m] | A.F.+C.L.-AMP G<br>[dBm] | ANT. POL<br>[H/V] | Total<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Measurement<br>Type |
|--------------------|---------------------|--------------------------|-------------------|-------------------|-------------------|----------------|---------------------|
| 4882               | 50.88               | -2.60                    | V                 | 48.28             | 73.98             | 25.70          | PK                  |
| 4882               | 43.13               | -2.60                    | V                 | 40.53             | 53.98             | 13.45          | AV                  |
| 7323               | 46.55               | 6.11                     | V                 | 52.66             | 73.98             | 21.32          | PK                  |
| 7323               | 35.02               | 6.11                     | V                 | 41.13             | 53.98             | 12.85          | AV                  |
| 4882               | 51.59               | -2.60                    | H                 | 48.99             | 73.98             | 24.99          | PK                  |
| 4882               | 43.88               | -2.60                    | H                 | 41.28             | 53.98             | 12.70          | AV                  |
| 7323               | 47.31               | 6.11                     | H                 | 53.42             | 73.98             | 20.56          | PK                  |
| 7323               | 35.30               | 6.11                     | H                 | 41.41             | 53.98             | 12.57          | AV                  |

※ A.F: ANTENNA FACTOR  
 C.L: CABLE LOSS  
 AMP G: AMPLIFIER GAIN

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain
5. Spectrum setting:
  - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
  - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.  
 We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

**Operation Frequency: 2480 MHz**

| Frequency [MHz] | Reading [dBuV/m] | A.F.+C.L.-AMP G [dBm] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|-----------------|------------------|-----------------------|----------------|----------------|----------------|-------------|------------------|
| 4960            | 50.69            | -2.53                 | V              | 48.16          | 73.98          | 25.82       | PK               |
| 4960            | 42.38            | -2.53                 | V              | 39.85          | 53.98          | 14.13       | AV               |
| 7440            | 47.08            | 5.73                  | V              | 52.81          | 73.98          | 21.17       | PK               |
| 7440            | 35.22            | 5.73                  | V              | 40.95          | 53.98          | 13.03       | AV               |
| 4960            | 51.28            | -2.53                 | H              | 48.75          | 73.98          | 25.23       | PK               |
| 4960            | 44.50            | -2.53                 | H              | 41.97          | 53.98          | 12.01       | AV               |
| 7440            | 46.65            | 5.73                  | H              | 52.38          | 73.98          | 21.60       | PK               |
| 7440            | 35.07            | 5.73                  | H              | 40.80          | 53.98          | 13.18       | AV               |

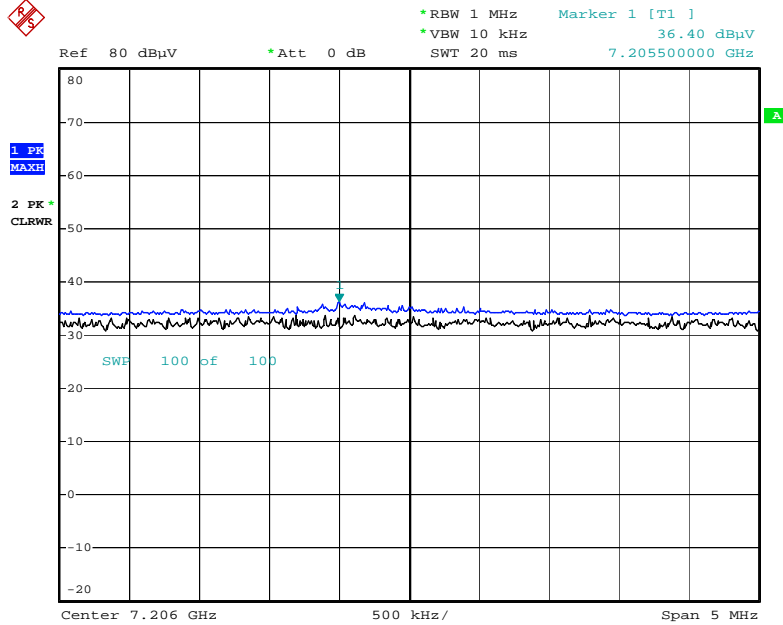
※ A:F: ANTENNA FACTOR  
 C:L: CABLE LOSS  
 AMP G: AMPLIFIER GAIN

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss – Amplifier Gain
5. Spectrum setting:
  - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
  - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.  
 We performed using a reduced video BW method was done with the analyzer in linear mode.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

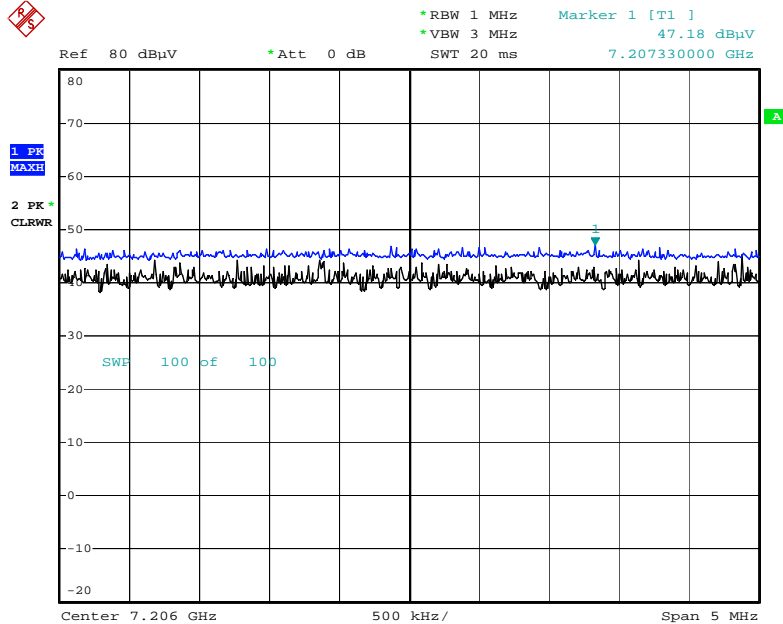
■ **RESULT PLOTS(Worst case : y-H)**

**Radiated Spurious Emissions plot – Average Reading (Ch. Low 3rd Harmonic)**



Date: 4.FEB.2016 10:49:18

**Radiated Spurious Emissions plot – Peak Reading (Ch. Low 3rd Harmonic)**



Date: 4.FEB.2016 10:51:43

**Note : Only the worst case plots for Radiated Spurious Emissions.**

### 8.3.3 RADIATED BAND EDGES MEASUREMENTS

#### Test Requirements and limit, §15.205, §15.209, §15.249

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or tho the general radiated emission limits in §15.209, whichever is the lesser attenuation.

|                     |          |
|---------------------|----------|
| Operation Mode      | ANT+     |
| Operating Frequency | 2402 MHz |

| Frequency<br>[MHz] | Reading<br>[dBuV/m] | A.F.+CL<br>[dB] | Ant. Pol.<br>[H/V] | Total<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Measurement<br>Type |
|--------------------|---------------------|-----------------|--------------------|-------------------|-------------------|----------------|---------------------|
| 2398.0             | 25.53               | 31.31           | H                  | 56.84             | 73.98             | 17.14          | PK                  |
| 2398.0             | 14.94               | 31.31           | H                  | 46.25             | 53.98             | 7.73           | AV                  |
| 2398.0             | 25.37               | 31.31           | V                  | 56.68             | 73.98             | 17.30          | PK                  |
| 2398.0             | 14.33               | 31.31           | V                  | 45.64             | 53.98             | 8.34           | AV                  |

※ A:F: ANTENNA FACTOR  
C:L: CABLE LOSS

#### Notes:

1. Frequency range of measurement = 2310 MHz ~ 2398 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss
3. Spectrum setting:
  - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
  - b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.  
We performed using a reduced video BW method was done with the analyzer in linear mode.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna

Operation Mode ANT+  
 Operating Frequency 2402 MHz

| Frequency<br>[MHz] | Reading<br>[dBuV/m] | A.F.+CL<br>[dB] | Ant.<br>Pol.<br>[H/V] | Fundamental<br>[dBuV/m] | Delta<br>Value<br>[dBuV/m] | Duty<br>Cycle<br>Correction<br>[dB] | Total<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Measurement<br>Type |
|--------------------|---------------------|-----------------|-----------------------|-------------------------|----------------------------|-------------------------------------|-------------------|-------------------|----------------|---------------------|
| 2400.0             | 63.75               | 31.31           | H                     | 95.06                   | 47.25                      | 0                                   | 47.81             | 73.98             | 26.17          | PK                  |
| 2400.0             | 63.75               | 31.31           | H                     | 95.06                   | 47.25                      | -46.09                              | 1.72              | 53.98             | 52.26          | AV                  |
| 2400.0             | 63.74               | 31.31           | V                     | 95.05                   | 47.35                      | 0                                   | 47.70             | 73.98             | 26.28          | PK                  |
| 2400.0             | 63.74               | 31.31           | V                     | 95.05                   | 47.35                      | -46.09                              | 1.61              | 53.98             | 52.37          | AV                  |

※ A:F: ANTENNA FACTOR  
 C:L: CABLE LOSS

**Notes:**

1. Frequency range of measurement = 2398 MHz ~ 2400 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss - Delta Value + D.C.C.F
3. Marker-delta method
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna
5. Average field strength data is determined by applying the duty cycle correction factor(DCCF) found in Section 8.1 to the measured peak field strength values.

Operation Mode ANT+  
 Operating Frequency 2480 MHz

| Frequency<br>[MHz] | Reading<br>dBuV | ※ A.F.+CL<br>[dB] | Ant. Pol.<br>[H/V] | D.C.C.F.<br>[dB] | Total<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Measurement<br>Type |
|--------------------|-----------------|-------------------|--------------------|------------------|-------------------|-------------------|----------------|---------------------|
| 2483.5             | 27.05           | 31.37             | H                  | 0                | 58.42             | 73.98             | 15.56          | PK                  |
| 2483.5             | 27.05           | 31.37             | H                  | -48.92           | 9.50              | 53.98             | 44.48          | AV                  |
| 2483.5             | 25.34           | 31.37             | V                  | 0                | 56.71             | 73.98             | 17.27          | PK                  |
| 2483.5             | 25.34           | 31.37             | V                  | -48.92           | 7.79              | 53.98             | 46.19          | AV                  |

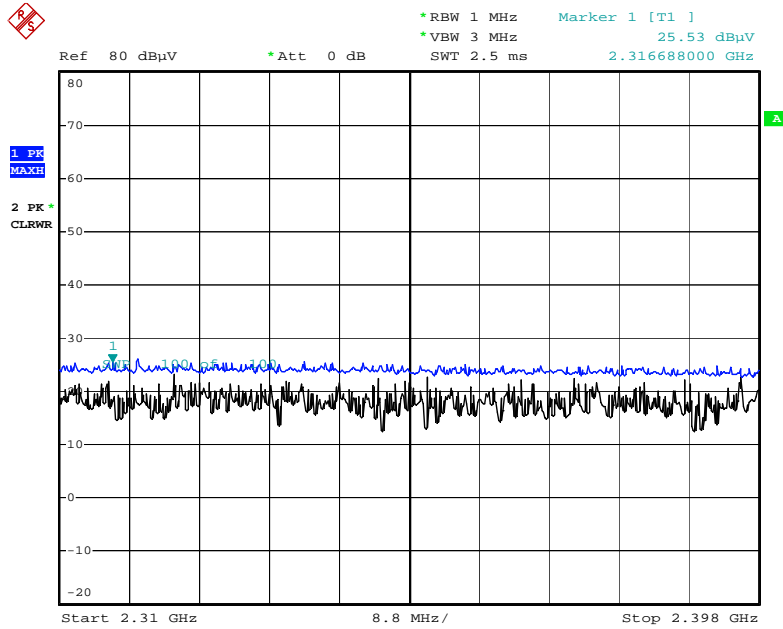
※ A.F: ANTENNA FACTOR  
 C.L: CABLE LOSS

**Notes:**

1. Frequency range of measurement = 2483.5 MHz ~ 2500 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Duty Cycle Correction Factor
3. Spectrum setting:
  - a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
4. Average field strength data is determined by applying the duty cycle correction factor(DCCF) found in Section 8.1 to the measured peak field strength values.
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

■ **RESULT PLOTS (Worst case : x-H)**

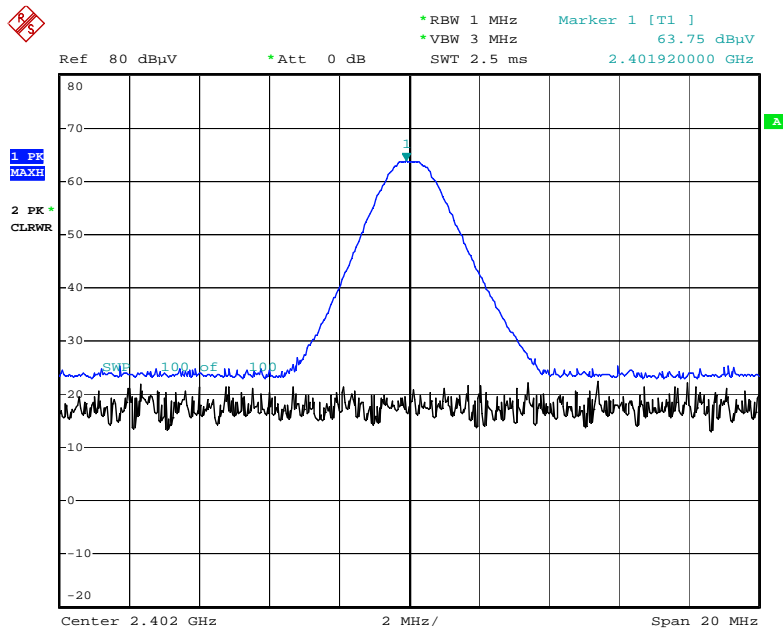
**Radiated Band Edges plot – Peak Reading (Low Ch.)**



Date: 4.FEB.2016 15:52:44

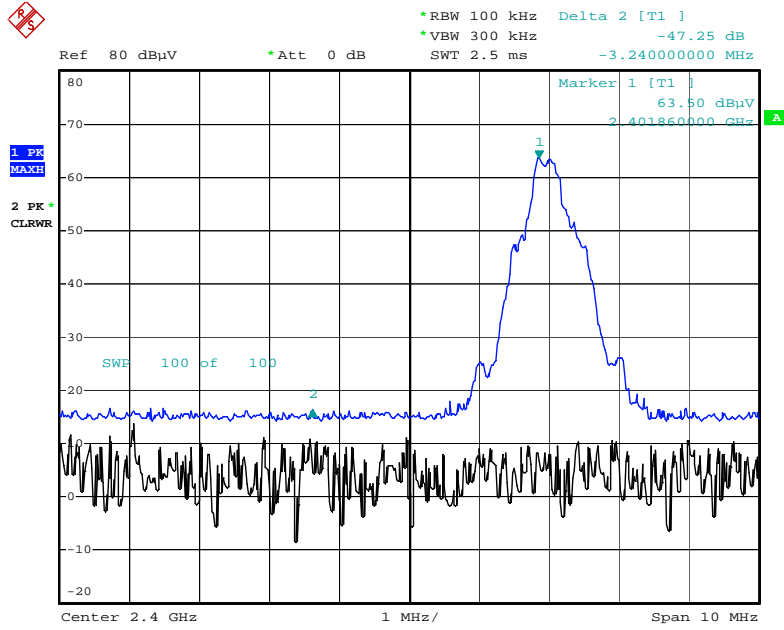
■ **Marker-delta method**

**Radiated Band Edges plot – Peak Reading (Low Ch.)**



Date: 4.FEB.2016 15:56:07

**Radiated Band Edges plot – Delta(Low Ch.)**



Date: 4.FEB.2016 14:56:59

**Note : We only attached the worst case plots for Radiated Band Edges.**

## 8.4 POWERLINE CONDUCTED EMISSIONS

### Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBµV) |          |
|-----------------------|---------------|----------|
|                       | Quasi-peak    | Average  |
| 0.15 to 0.50          | 66 to 56      | 56 to 46 |
| 0.50 to 5             | 56            | 46       |
| 5 to 30               | 60            | 50       |

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

### Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

■ RESULT PLOTS

Conducted Emissions (Line 1)

EMI Auto Test(15)

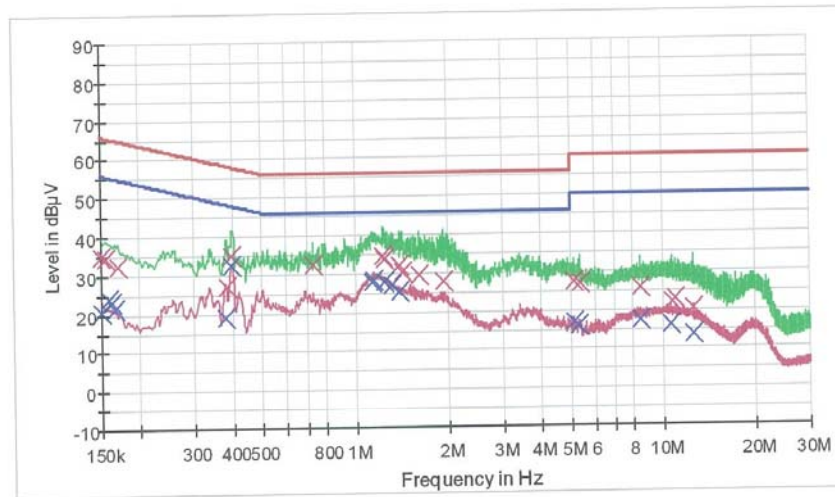
1 / 2

## HCT TEST Report

### Common Information

|                       |             |
|-----------------------|-------------|
| EUT:                  | SM-J5108    |
| Manufacturer:         | SAMSUNG     |
| Test Site:            | SHIELD ROOM |
| Operating Conditions: | ANT+ MODE   |
| Operator Name:        | SK LEE      |

FCC CLASS B



|   |   |  |
|---|---|--|
| <span style="color:red">—</span> FCCCLASS B_QP        | <span style="color:blue">—</span> FCCCLASS B_AV     | <span style="color:green">—</span> Preview Result 1-PK |
| <span style="color:red">—</span> Preview Result 2-AVG | <span style="color:red">X</span> Final Result 1-QPK | <span style="color:green">X</span> Final Result 2-CAV  |

### Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|--------|------|------------|-------------|--------------|
| 0.150000        | 35.0             | 9.000           | Off    | N    | 9.6        | 31.0        | 66.0         |
| 0.156000        | 34.7             | 9.000           | Off    | N    | 9.6        | 31.0        | 65.7         |
| 0.170000        | 32.6             | 9.000           | Off    | N    | 9.6        | 32.4        | 65.0         |
| 0.382000        | 27.1             | 9.000           | Off    | N    | 9.6        | 31.1        | 58.2         |
| 0.398000        | 35.2             | 9.000           | Off    | N    | 9.6        | 22.7        | 57.9         |
| 0.734000        | 32.5             | 9.000           | Off    | N    | 9.7        | 23.5        | 56.0         |
| 1.230000        | 34.4             | 9.000           | Off    | N    | 9.7        | 21.6        | 56.0         |
| 1.246000        | 33.6             | 9.000           | Off    | N    | 9.7        | 22.4        | 56.0         |
| 1.400000        | 31.9             | 9.000           | Off    | N    | 9.7        | 24.1        | 56.0         |
| 1.428000        | 30.4             | 9.000           | Off    | N    | 9.7        | 25.6        | 56.0         |
| 1.614000        | 29.6             | 9.000           | Off    | N    | 9.7        | 26.4        | 56.0         |
| 1.928000        | 27.8             | 9.000           | Off    | N    | 9.7        | 28.2        | 56.0         |
| 5.156000        | 27.3             | 9.000           | Off    | N    | 9.8        | 32.7        | 60.0         |
| 5.340000        | 26.9             | 9.000           | Off    | N    | 9.8        | 33.1        | 60.0         |
| 8.472000        | 25.7             | 9.000           | Off    | N    | 9.9        | 34.3        | 60.0         |
| 10.766000       | 21.9             | 9.000           | Off    | N    | 10.0       | 38.1        | 60.0         |

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EMI Auto Test(15)

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| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|--------|------|------------|-------------|--------------|
| 10.952000       | 22.7             | 9.000           | Off    | N    | 10.0       | 37.3        | 60.0         |
| 12.498000       | 20.2             | 9.000           | Off    | N    | 10.1       | 39.8        | 60.0         |

**Final Result 2**

| Frequency (MHz) | CAverage (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|
| 0.150000        | 20.6            | 9.000           | Off    | N    | 9.6        | 35.4        | 56.0         |
| 0.158000        | 23.9            | 9.000           | Off    | N    | 9.6        | 31.7        | 55.6         |
| 0.162000        | 23.1            | 9.000           | Off    | N    | 9.6        | 32.3        | 55.4         |
| 0.166000        | 21.6            | 9.000           | Off    | N    | 9.6        | 33.6        | 55.2         |
| 0.380000        | 19.2            | 9.000           | Off    | N    | 9.6        | 29.1        | 48.3         |
| 0.398000        | 32.5            | 9.000           | Off    | N    | 9.6        | 15.4        | 47.9         |
| 1.134000        | 28.0            | 9.000           | Off    | N    | 9.7        | 18.0        | 46.0         |
| 1.156000        | 28.1            | 9.000           | Off    | N    | 9.7        | 17.9        | 46.0         |
| 1.248000        | 27.8            | 9.000           | Off    | N    | 9.7        | 18.2        | 46.0         |
| 1.312000        | 26.9            | 9.000           | Off    | N    | 9.7        | 19.1        | 46.0         |
| 1.318000        | 27.1            | 9.000           | Off    | N    | 9.7        | 18.9        | 46.0         |
| 1.400000        | 25.3            | 9.000           | Off    | N    | 9.7        | 20.7        | 46.0         |
| 5.134000        | 17.0            | 9.000           | Off    | N    | 9.8        | 33.0        | 50.0         |
| 5.152000        | 16.7            | 9.000           | Off    | N    | 9.8        | 33.3        | 50.0         |
| 5.324000        | 16.0            | 9.000           | Off    | N    | 9.8        | 34.0        | 50.0         |
| 8.472000        | 17.4            | 9.000           | Off    | N    | 9.9        | 32.6        | 50.0         |
| 10.604000       | 16.3            | 9.000           | Off    | N    | 10.0       | 33.7        | 50.0         |
| 12.498000       | 13.3            | 9.000           | Off    | N    | 10.1       | 36.7        | 50.0         |

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**Conducted Emissions (Line 2)**

EMI Auto Test(15)

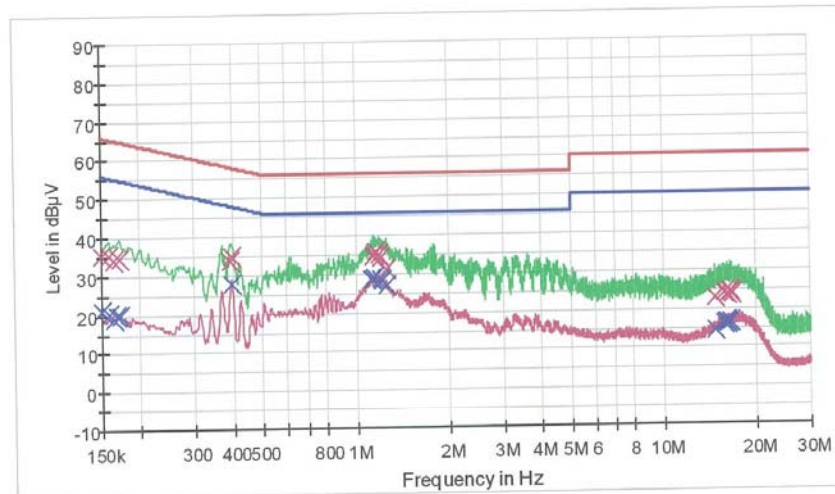
1 / 2

**HCT TEST Report**

**Common Information**

EUT: SM-J5108  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: ANT+ MODE  
 Operator Name: SK LEE

FCC CLASS B



— FCCCLASS B\_QP      — FCCCLASS B\_AV      — Preview Result 1-PK+  
— Preview Result 2-AVG      X Final Result 1-GPK      X Final Result 2-CAV

**Final Result 1**

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|--------|------|------------|-------------|--------------|
| 0.150000        | 35.5             | 9.000           | Off    | L1   | 9.7        | 30.5        | 66.0         |
| 0.158000        | 35.2             | 9.000           | Off    | L1   | 9.6        | 30.4        | 65.6         |
| 0.164000        | 34.1             | 9.000           | Off    | L1   | 9.6        | 31.2        | 65.3         |
| 0.172000        | 34.5             | 9.000           | Off    | L1   | 9.6        | 30.4        | 64.9         |
| 0.392000        | 33.7             | 9.000           | Off    | L1   | 9.7        | 24.3        | 58.0         |
| 0.396000        | 34.9             | 9.000           | Off    | L1   | 9.7        | 23.0        | 57.9         |
| 1.140000        | 34.7             | 9.000           | Off    | L1   | 9.7        | 21.3        | 56.0         |
| 1.160000        | 34.8             | 9.000           | Off    | L1   | 9.7        | 21.2        | 56.0         |
| 1.164000        | 35.9             | 9.000           | Off    | L1   | 9.7        | 20.1        | 56.0         |
| 1.188000        | 34.9             | 9.000           | Off    | L1   | 9.7        | 21.1        | 56.0         |
| 1.208000        | 34.1             | 9.000           | Off    | L1   | 9.7        | 21.9        | 56.0         |
| 1.254000        | 31.3             | 9.000           | Off    | L1   | 9.7        | 24.7        | 56.0         |
| 14.644000       | 22.6             | 9.000           | Off    | L1   | 10.1       | 37.4        | 60.0         |
| 15.804000       | 24.0             | 9.000           | Off    | L1   | 10.2       | 36.0        | 60.0         |
| 16.180000       | 23.5             | 9.000           | Off    | L1   | 10.2       | 36.5        | 60.0         |
| 16.380000       | 24.1             | 9.000           | Off    | L1   | 10.2       | 35.9        | 60.0         |

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EMI Auto Test(15)

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| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|-----------------|--------|------|------------|-------------|--------------|
| 16.394000       | 24.5             | 9.000           | Off    | L1   | 10.2       | 35.5        | 60.0         |
| 16.562000       | 23.6             | 9.000           | Off    | L1   | 10.2       | 36.4        | 60.0         |

**Final Result 2**

| Frequency (MHz) | CAverage (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|
| 0.150000        | 20.9            | 9.000           | Off    | L1   | 9.7        | 35.1        | 56.0         |
| 0.158000        | 20.2            | 9.000           | Off    | L1   | 9.6        | 35.4        | 55.6         |
| 0.164000        | 18.9            | 9.000           | Off    | L1   | 9.6        | 36.4        | 55.3         |
| 0.168000        | 19.8            | 9.000           | Off    | L1   | 9.6        | 35.3        | 55.1         |
| 0.172000        | 20.0            | 9.000           | Off    | L1   | 9.6        | 34.9        | 54.9         |
| 0.396000        | 28.0            | 9.000           | Off    | L1   | 9.7        | 19.9        | 47.9         |
| 1.126000        | 28.5            | 9.000           | Off    | L1   | 9.7        | 17.5        | 46.0         |
| 1.140000        | 28.5            | 9.000           | Off    | L1   | 9.7        | 17.5        | 46.0         |
| 1.150000        | 29.1            | 9.000           | Off    | L1   | 9.7        | 16.9        | 46.0         |
| 1.210000        | 28.7            | 9.000           | Off    | L1   | 9.7        | 17.3        | 46.0         |
| 1.222000        | 28.3            | 9.000           | Off    | L1   | 9.7        | 17.7        | 46.0         |
| 1.254000        | 26.8            | 9.000           | Off    | L1   | 9.7        | 19.2        | 46.0         |
| 14.644000       | 14.4            | 9.000           | Off    | L1   | 10.1       | 35.6        | 50.0         |
| 15.796000       | 16.2            | 9.000           | Off    | L1   | 10.2       | 33.8        | 50.0         |
| 15.894000       | 16.6            | 9.000           | Off    | L1   | 10.2       | 33.4        | 50.0         |
| 16.176000       | 16.3            | 9.000           | Off    | L1   | 10.2       | 33.7        | 50.0         |
| 16.180000       | 16.0            | 9.000           | Off    | L1   | 10.2       | 34.0        | 50.0         |
| 16.394000       | 16.5            | 9.000           | Off    | L1   | 10.2       | 33.5        | 50.0         |

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## 9.LIST OF TEST EQUIPMENT

### 9.1 LIST OF TEST EQUIPMENT (Conducted Test)

| Manufacturer    | Model / Equipment           | Calibration Date | Calibration Interval | Serial No. |
|-----------------|-----------------------------|------------------|----------------------|------------|
| Rohde & Schwarz | ENV216/ LISN                | 12/28/2015       | Annual               | 100073     |
| Agilent         | E4440A/ Spectrum Analyzer   | 03/18/2015       | Annual               | US45303008 |
| Agilent         | N9020A / SIGNAL ANALYZER    | 06/30/2015       | Annual               | MY51110085 |
| Agilent         | N9020A / SIGNAL ANALYZER    | 07/02/2015       | Annual               | MY50510304 |
| Agilent         | N1911A/Power Meter          | 07/09/2015       | Annual               | MY45100523 |
| Agilent         | N1921A /POWER SENSOR        | 07/09/2015       | Annual               | MY45241059 |
| *Agilent        | *87300B/Directional Coupler | 11/30/2015       | Annual               | 3116A03621 |
| Hewlett Packard | 11667B / Power Splitter     | 06/15/2015       | Annual               | 5001       |
| Hewlett Packard | E3632A / DC POWER SUPPLY    | 03/11/2015       | Annual               | KR75303962 |
| Agilent         | 8493C / Attenuator(10 dB)   | 07/21/2015       | Annual               | 07560      |

## 9.2 LIST OF TEST EQUIPMENT (Radiated Test)

| Manufacturer          | Model / Equipment                                      | Calibration Date | Calibration Interval | Serial No.  |
|-----------------------|--|------------------|----------------------|-------------|
| Schwarzbeck           | VULB 9160/ TRILOG Antenna                              | 10/10/2014       | Biennial             | 3368        |
| HD                    | MA240/ Antenna Position Tower                          | N/A              | N/A                  | 556         |
| EMCO                  | 1050/ Turn Table                                       | N/A              | N/A                  | 114         |
| HD GmbH               | HD 100/ Controller                                     | N/A              | N/A                  | 13          |
| HD GmbH               | KMS 560/ SlideBar                                      | N/A              | N/A                  | 12          |
| Schwarzbeck           | BBHA 9120D/ Horn Antenna                               | 05/07/2015       | Biennial             | 937         |
| Schwarzbeck           | BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)               | 04/30/2015       | Biennial             | BBHA9170124 |
| Rohde & Schwarz       | FSP / Spectrum Analyzer                                | 01/15/2016       | Annual               | 839117/011  |
| Wainwright Instrument | WHF3.0/18G-10EF / High Pass Filter                     | 06/29/2015       | Annual               | 8           |
| Wainwright Instrument | WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter | 06/15/2015       | Annual               | 1           |
| Rohde & Schwarz       | LOOP ANTENNA   | 02/04/2016       | Biennial             | 100179      |
| CERNEX                | CBL18265035 / POWER AMP                                | 07/27/2015       | Annual               | 22966       |
| CERNEX                | CBL06185030 / POWER AMP                                | 07/21/2015       | Annual               | 22965       |
| CERNEX                | CBLU1183540 / POWER AMP                                | 07/21/2015       | Annual               | 22964       |