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74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea
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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 4, 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-F042-1
HCT FRN: 0005866421
IC Recognition No.: 5944A-5

FCC ID	**: A3LSMA9100**
APPLICANT	**: SAMSUNG Electronics Co., Ltd.**

FCC Model(s):	SM-A9100
EUT Type:	Mobile Phone
Max. RF Output Power:	93.83 dBμN/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
: Seul Ki Lee
Test Engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1602-F042	February 26, 2016	- First Approval Report
HCT-R-1602-F042-1	March 4, 2016	- Retest 20dB Bandwidth

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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:	A3LSMA9100
EUT Type:	Mobile Phone
Model name(s):	SM-A9100
Date(s) of Tests:	February 04 ~ February 26, 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

FCC Model Name	SM-A9100	
EUT Type	**Mobile Phone**	
Power Supply	DC 3.85 V	
Battery Infomation	Model: EB-BA910ABE Type: Li-ion Battery	
Frequency Range	TX: 2402 MHz ~ 2480 MHz RX: 2402 MHz ~ 2480 MHz	
Fundamental Field Strength Level	Peak	93.83 dBμV/m
	Average	46.17 dBμV/m
Operating Mode	ANT+	
Modulation Type	GFSK	
Number of Channels	79 Channels	
Antenna Specification	Manufacturer: Partron Antenna type: INTERNAL ANTENNA Peak Gain : - 4.07 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 C63.5 (latest edition).

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
Occupied Bandwidth	§2.1049	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 (Restricted Bands and Radiated Emission Limits)	§15.205, 15.209, 15.249(d)(e)	< 15.209 limits or 50dB below the level of the fundamental		PASS

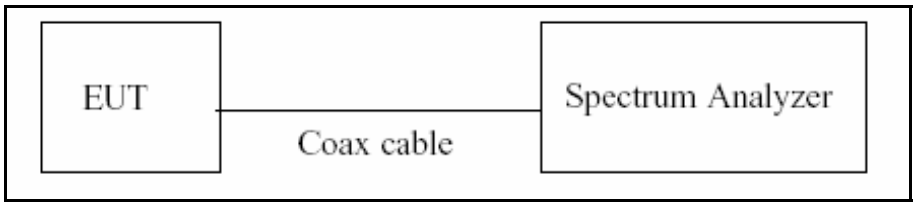
8. TEST RESULT

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

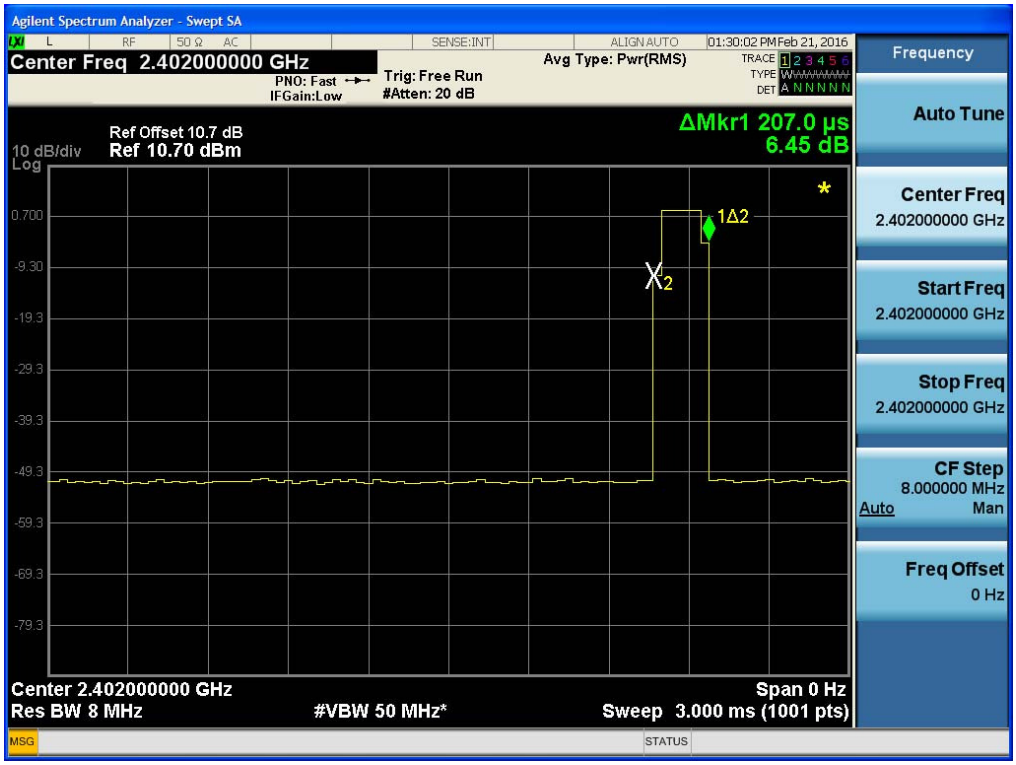
DCCF = 20*$\log_{10}$(Pulse width / Period of the pulse train)

= 20*$\log_{10}$(2 x 0.207 ms / 100 ms) = -47.660 dB

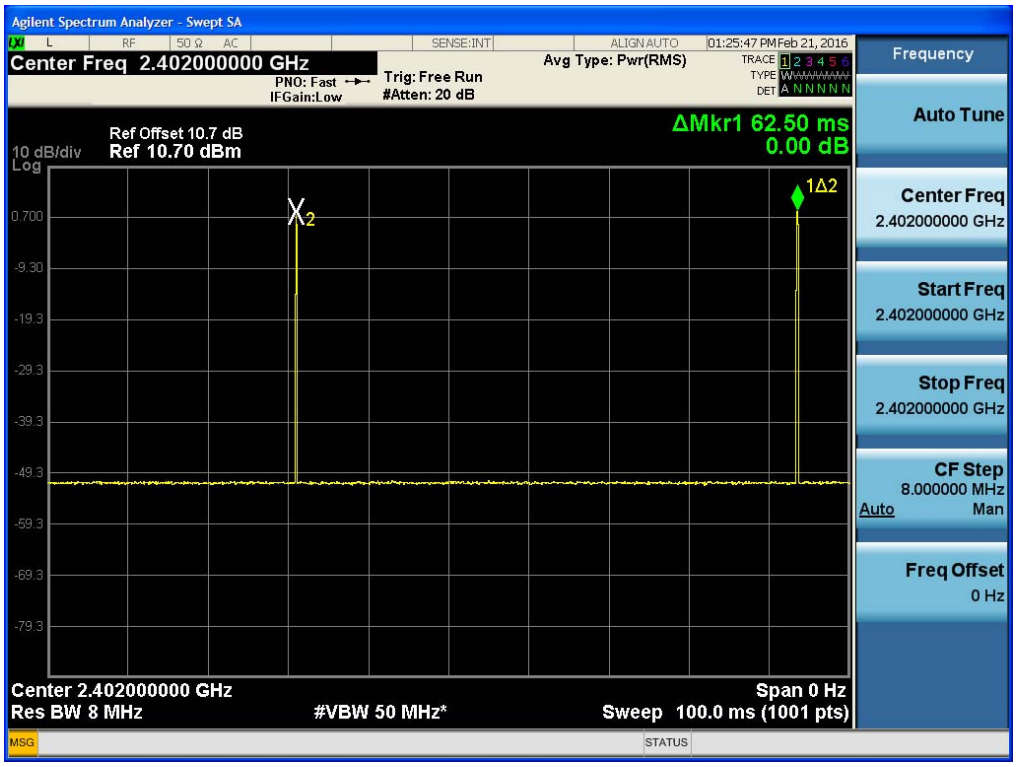
DCCF
-47.66 dB

▣ TEST RESULTS PLOTS

Pulse Width plot



Period of the Pulse Train

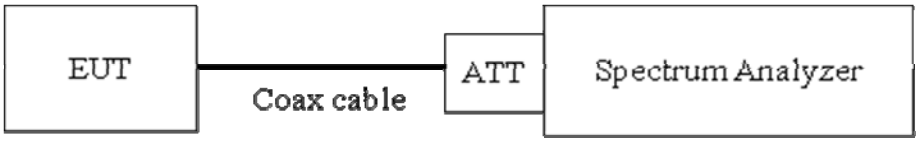


8.2 OCCUPIED BANDWIDTH MEASUREMENT

Test Requirements and limit, §2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

▣ 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

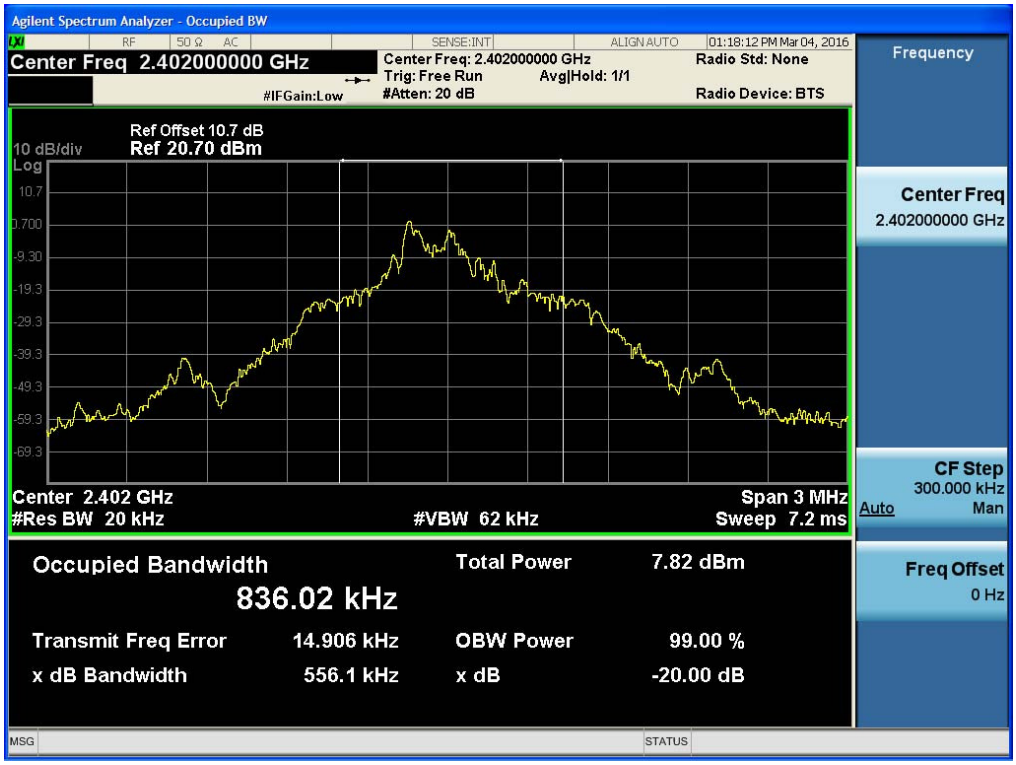
Note : We tested Occupied Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

▣ TEST RESULTS

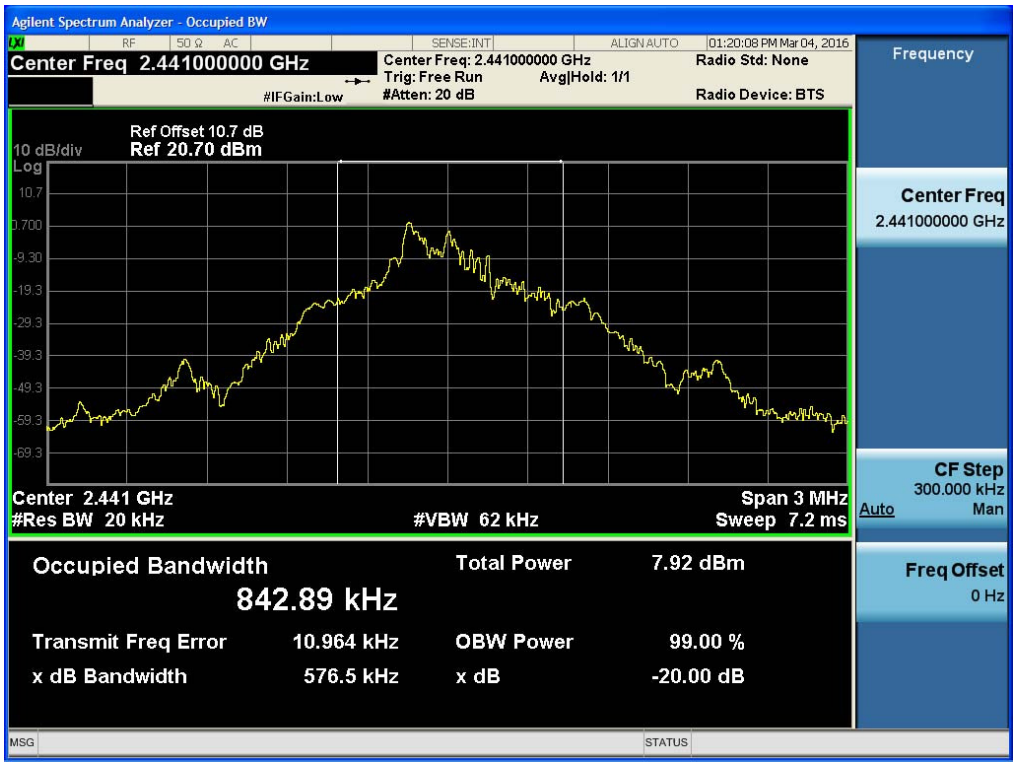
ANT+ Mode	99% Bandwidth
Frequency[MHz]	(kHz)
2402	836.02
2441	842.89
2480	823.19

▣ RESULT PLOTS

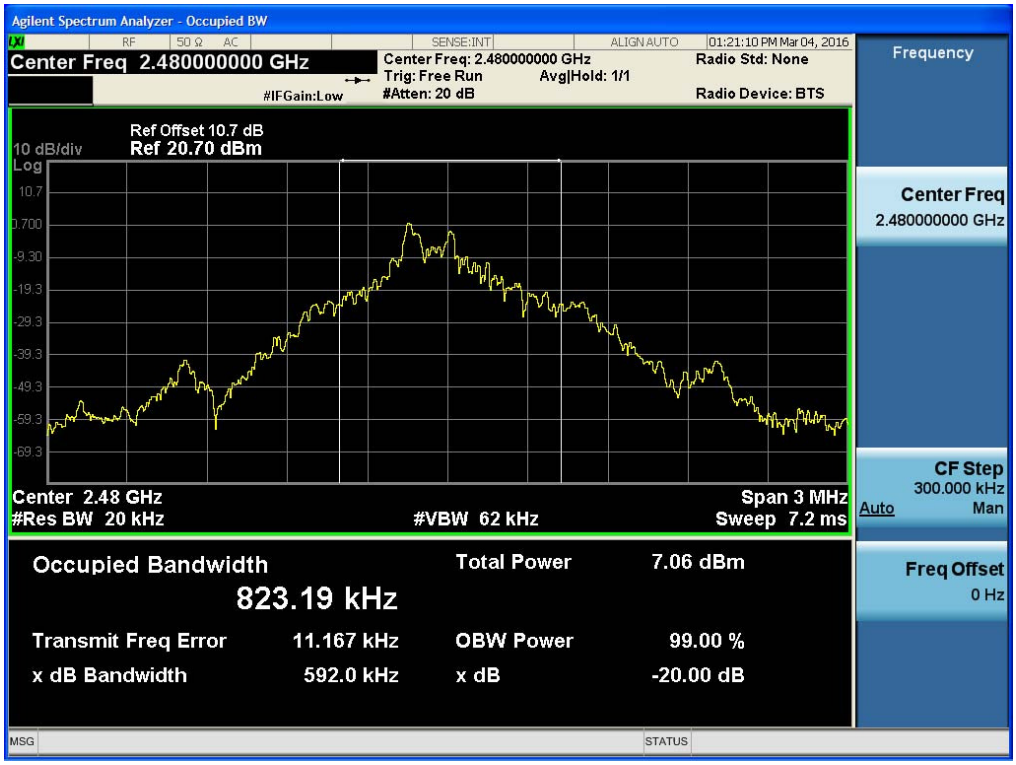
Occupied Bandwidth plot (Low)



Occupied Bandwidth plot (Mid)



Occupied 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)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(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 7.5. The exact method of calculating the average field strength shall be included in the test report.

▣ TEST RESULTS

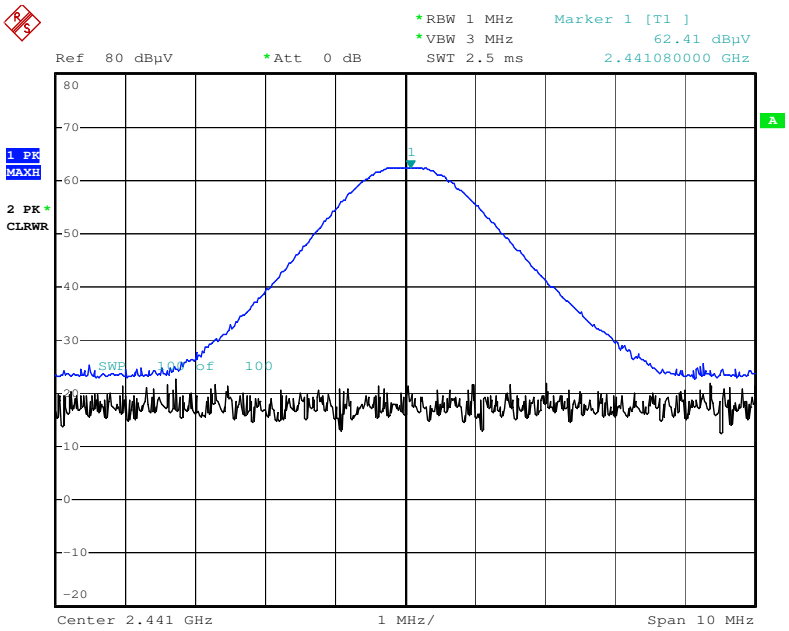
Frequency [MHz]	Reading [dBuV/m]	A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2402	60.72	31.31	V	0.00	92.03	113.98	21.95	PK
2402	60.72	31.31	V	-47.66	44.37	93.98	49.61	AV
2402	60.56	31.31	H	0.00	91.87	113.98	22.11	PK
2402	60.56	31.31	H	-47.66	44.21	93.98	49.77	AV
2441	62.41	31.42	V	0.00	93.83	113.98	20.15	PK
2441	62.41	31.42	V	-47.66	46.17	93.98	47.81	AV
2441	62.28	31.42	H	0.00	93.70	113.98	20.28	PK
2441	62.28	31.42	H	-47.66	46.04	93.98	47.94	AV
2480	61.77	31.30	V	0.00	93.07	113.98	20.91	PK
2480	61.77	31.30	V	-47.66	45.41	93.98	48.57	AV
2480	61.40	31.30	H	0.00	92.70	113.98	21.28	PK
2480	61.40	31.30	H	-47.66	45.04	93.98	48.94	AV

Note :

1. Average field strength data is detemined 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

Fundamental Field Strength plot (Ch.Mid)



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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)

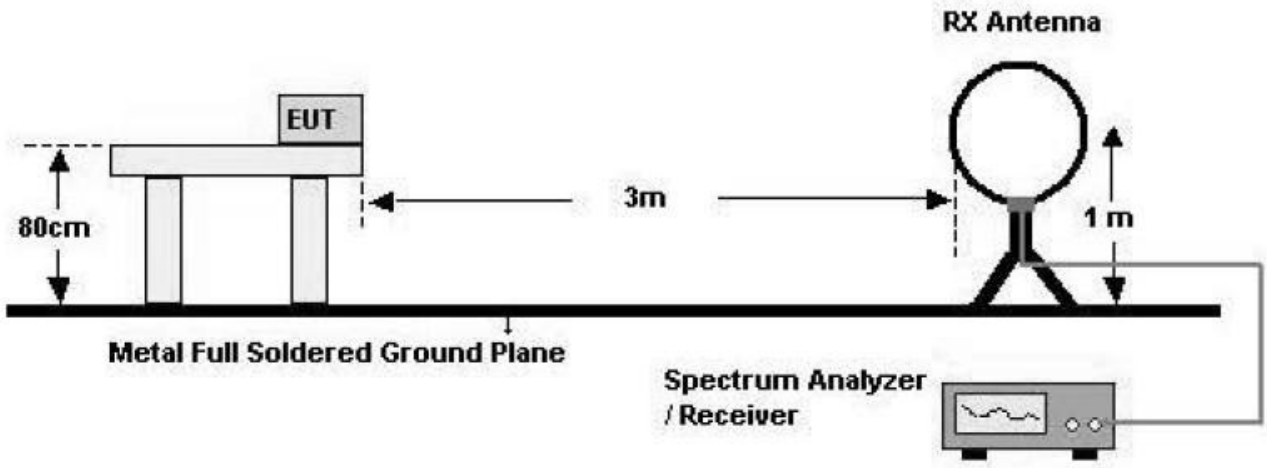
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

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

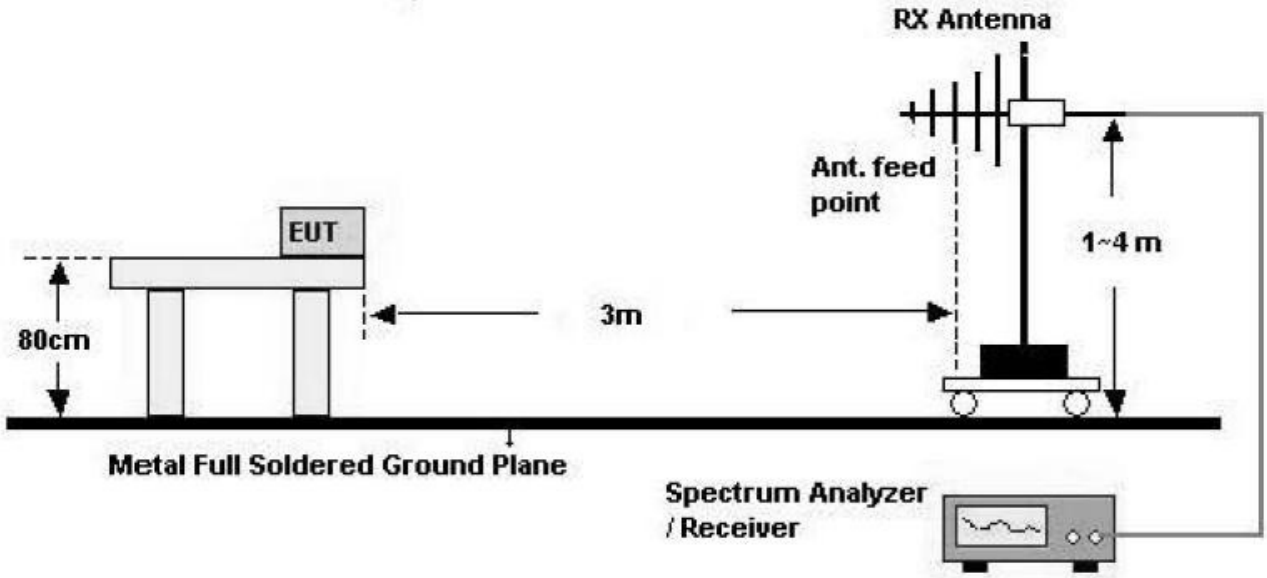
(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under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

Test Configuration

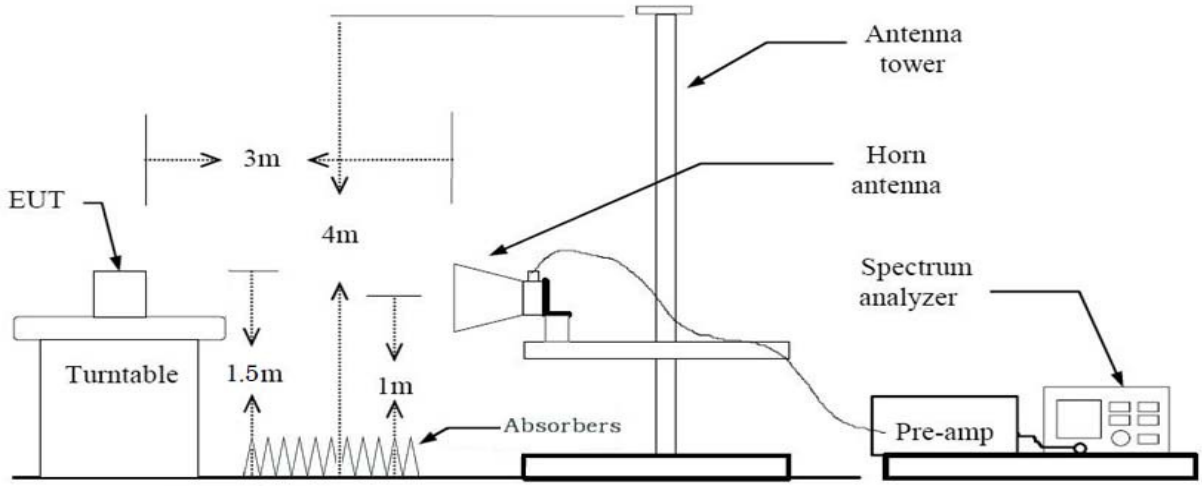
Below 30 MHz



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 ≥ 1/τ Hz, where τ = pulse width in seconds.
8. 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 standard radiated method and delta marker method for band edge.
2. The duty cycle factor for ANT+ mode.

ANT+ Mode	T_{on} (ms)	VBW(1/T) (Hz)	The actual setting value of VBW (Hz)
	0.207	4830	10000

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBμV/m	dBm /m	dBm	(H/V)	dBμV/m	dBμV/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	dBμV/m	dBm /m	dBm	(H/V)	dBμV/m	dBμV/m	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 [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
4804	50.24	-2.96	V	47.28	73.98	26.70	PK
4804	39.38	-2.96	V	36.42	53.98	17.56	AV
7206	45.82	6.88	V	52.70	73.98	21.28	PK
7206	34.38	6.88	V	41.26	53.98	12.72	AV
4804	50.40	-2.96	H	47.44	73.98	26.54	PK
4804	39.46	-2.96	H	36.50	53.98	17.48	AV
7206	45.84	6.88	H	52.72	73.98	21.26	PK
7206	34.40	6.88	H	41.28	53.98	12.70	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 [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
4882	50.14	-2.60	V	47.54	73.98	26.44	PK
4882	38.76	-2.60	V	36.16	53.98	17.82	AV
7323	46.77	6.11	V	52.88	73.98	21.10	PK
7323	35.20	6.11	V	41.31	53.98	12.67	AV
4882	50.25	-2.60	H	47.65	73.98	26.33	PK
4882	38.81	-2.60	H	36.21	53.98	17.77	AV
7323	46.82	6.11	H	52.93	73.98	21.05	PK
7323	35.25	6.11	H	41.36	53.98	12.62	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	49.87	-2.53	V	47.34	73.98	26.64	PK
4960	38.63	-2.53	V	36.10	53.98	17.88	AV
7440	46.98	5.73	V	52.71	73.98	21.27	PK
7440	35.05	5.73	V	40.78	53.98	13.20	AV
4960	50.06	-2.53	H	47.53	73.98	26.45	PK
4960	38.74	-2.53	H	36.21	53.98	17.77	AV
7440	47.05	5.73	H	52.78	73.98	21.20	PK
7440	35.10	5.73	H	40.83	53.98	13.15	AV

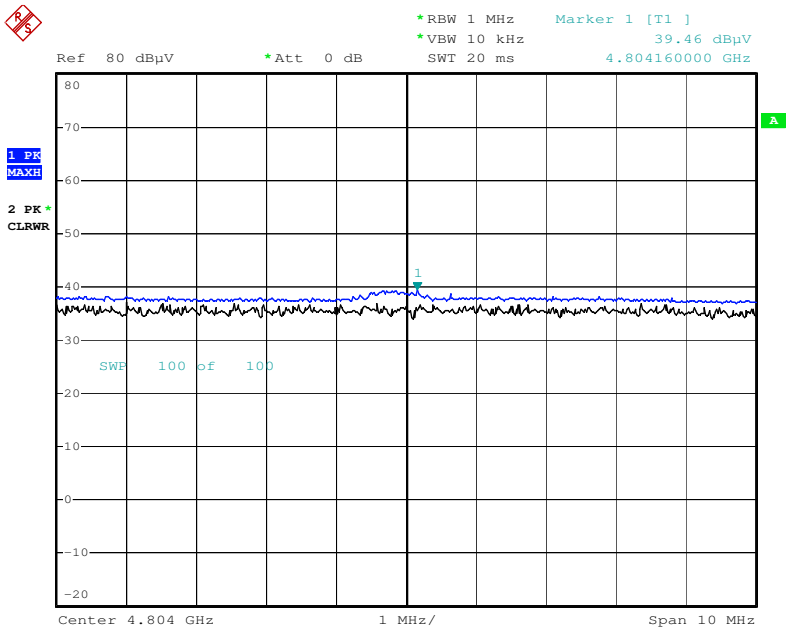
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP G: AMPLIFIER GAIN

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.

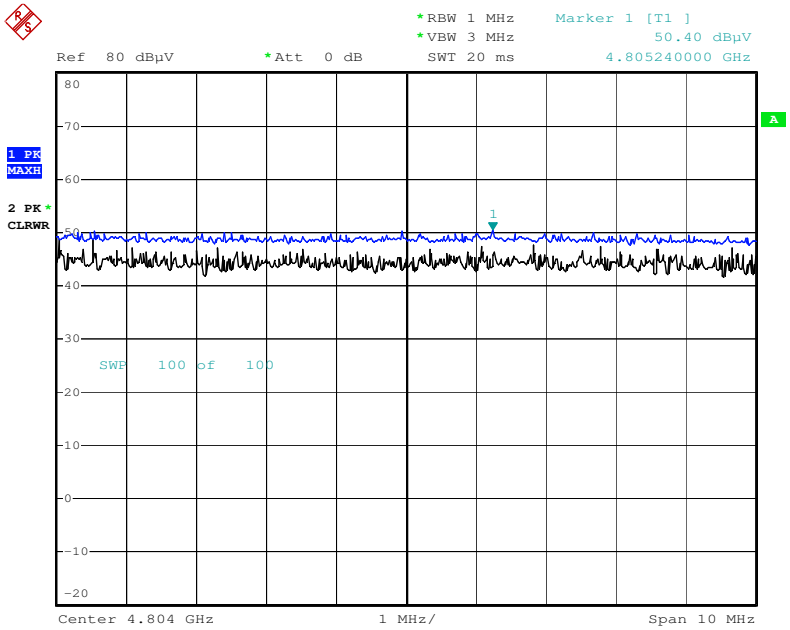
▣ RESULT PLOTS

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



Date: 21.FEB.2016 15:15:54

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



Date: 21.FEB.2016 15:21:05

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 [MHz]	Reading [dBuV/m]	A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2398.0	25.39	31.31	H	0	56.70	73.98	17.28	PK
2398.0	14.21	31.31	H	-46.09	-0.57	53.98	54.55	AV
2398.0	25.55	31.31	V	0	56.86	73.98	17.12	PK
2398.0	14.23	31.31	V	-46.09	-0.55	53.98	54.53	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 + D.C.C.F
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 [MHz]	Reading [dBuV/m]	A.F.+CL [dB]	Ant. Pol. [H/V]	Fundamental [dBuV/m]	Delta Value [dBuV/m]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2400.0	60.63	31.31	H	91.94	43.37	0	48.57	73.98	25.41	PK
2400.0	60.05	31.31	H	91.36	43.37	-46.09	1.90	53.98	52.08	AV
2400.0	60.84	31.31	V	92.15	43.75	0	48.40	73.98	25.58	PK
2400.0	60.18	31.31	V	91.49	43.75	-46.09	1.65	53.98	52.33	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

Operation Mode ANT+

Operating Frequency 2480 MHz

Frequency [MHz]	Reading [dBuV/m]	A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	25.14	31.37	H	0	56.51	73.98	17.47	PK
2483.5	20.13	31.37	H	-47.66	3.84	53.98	50.14	AV
2483.5	25.21	31.37	V	0	56.58	73.98	17.40	PK
2483.5	20.26	31.37	V	-47.66	3.97	53.98	50.01	AV

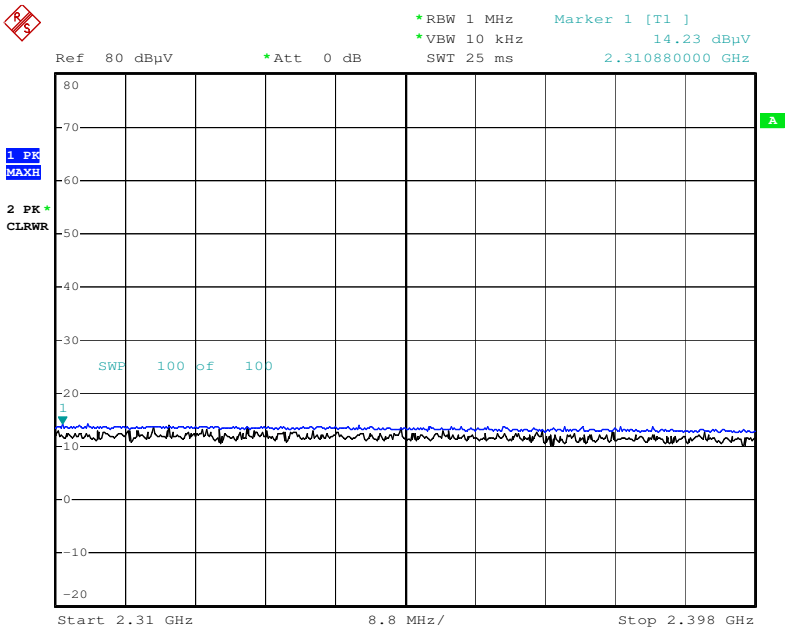
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS

Notes:

1. Frequency range of measurement = 2483.5 MHz ~ 2500 MHz
2. Total = Fundamental 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.

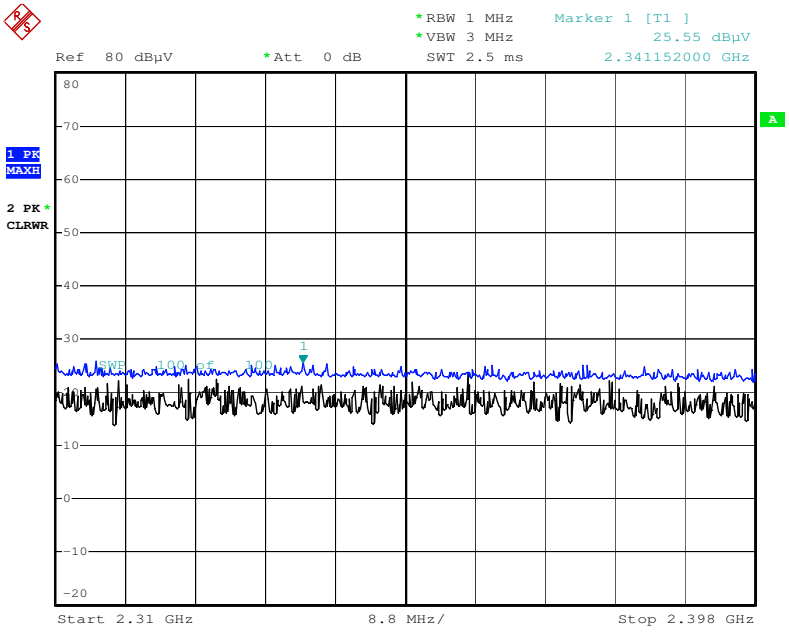
▣ RESULT PLOTS (Standard method)

Radiated Band Edges plot – Average Reading (Low Ch.)



Date: 23.FEB.2016 21:19:40

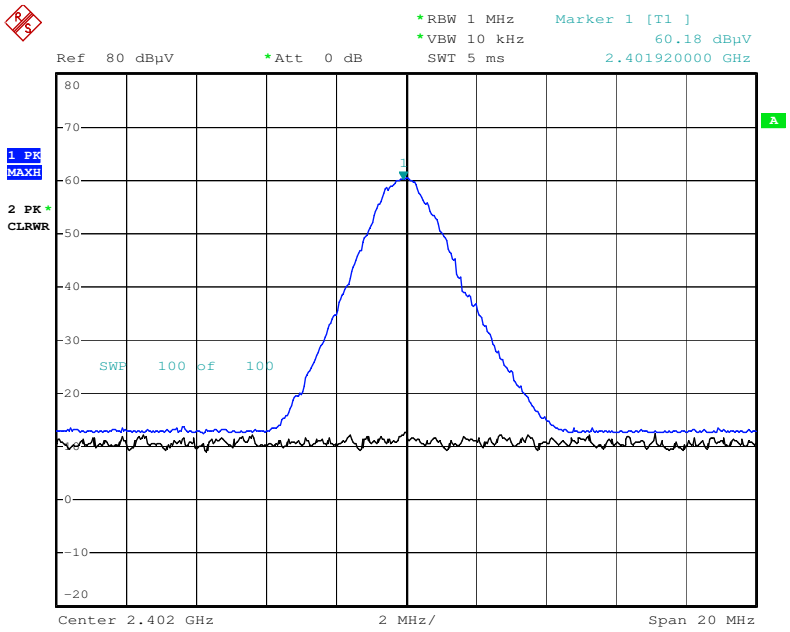
Radiated Band Edges plot – Peak Reading (Low Ch.)



Date: 23.FEB.2016 21:20:02

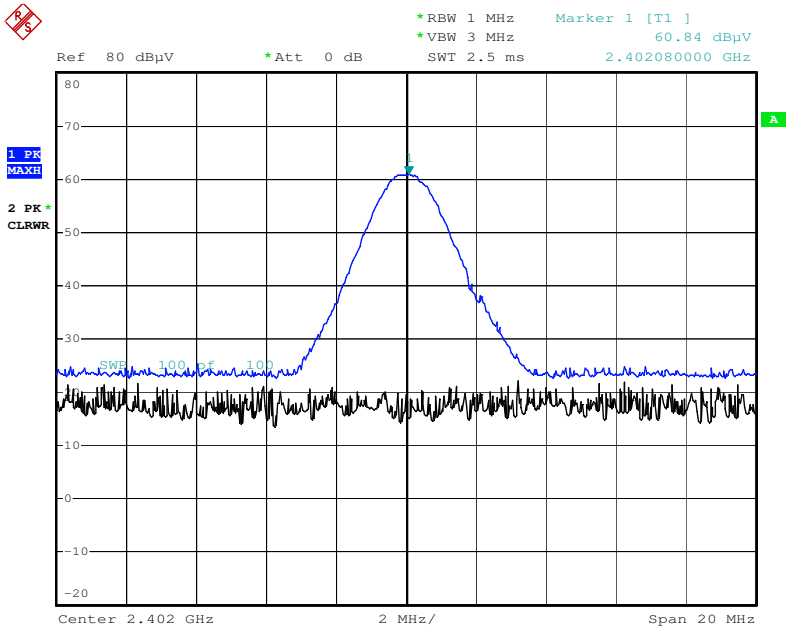
▣ RESULT PLOTS (Marker-delta method)

Radiated Band Edges plot – Average Reading (Low Ch.)



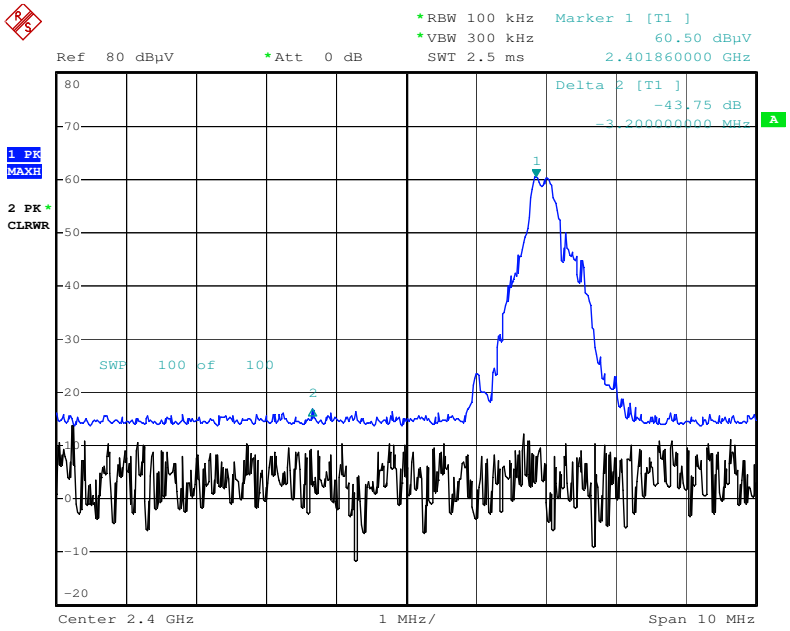
Date: 23.FEB.2016 21:19:07

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



Date: 23.FEB.2016 21:17:52

Radiated Band Edges plot – Delta(Low Ch.)



Date: 23.FEB.2016 21:25:24

Note : We attached Only 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)

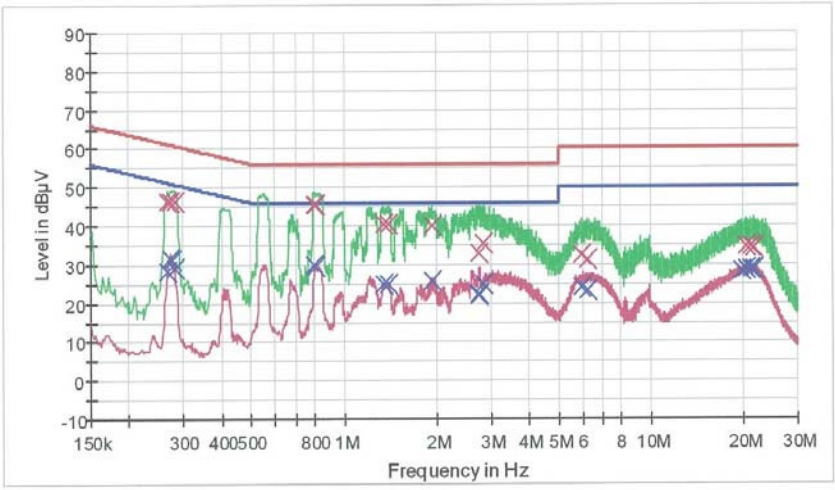
EMI Auto Test(16) 1 / 2

HCT TEST Report

Common Information

EUT:	SM-A9100
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	ANT+

FCC CLASS B



FCC CLASS B_QP
Preview Result 2-AVG
FCC CLASS B_ AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.266000	46.2	9.000	Off	N	9.6	15.0	61.2
0.274000	46.3	9.000	Off	N	9.6	14.7	61.0
0.282000	46.4	9.000	Off	N	9.6	14.4	60.8
0.798000	45.5	9.000	Off	N	9.7	10.5	56.0
0.804000	45.5	9.000	Off	N	9.7	10.5	56.0
0.810000	45.6	9.000	Off	N	9.7	10.4	56.0
1.348000	40.5	9.000	Off	N	9.7	15.5	56.0
1.396000	40.5	9.000	Off	N	9.7	15.5	56.0
1.938000	40.0	9.000	Off	N	9.7	16.0	56.0
2.760000	32.9	9.000	Off	N	9.7	23.1	56.0
2.764000	32.9	9.000	Off	N	9.7	23.1	56.0
2.834000	35.3	9.000	Off	N	9.8	20.7	56.0
5.928000	32.3	9.000	Off	N	9.9	27.7	60.0
6.222000	31.3	9.000	Off	N	9.9	28.7	60.0
20.380000	34.5	9.000	Off	N	10.3	25.5	60.0
20.452000	34.4	9.000	Off	N	10.3	25.6	60.0
21.092000	34.4	9.000	Off	N	10.3	25.6	60.0
21.574000	34.3	9.000	Off	N	10.3	25.7	60.0

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EMI Auto Test(16) 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.266000	28.2	9.000	Off	N	9.6	23.0	51.2
0.274000	31.5	9.000	Off	N	9.6	19.5	51.0
0.278000	31.1	9.000	Off	N	9.6	19.8	50.9
0.282000	28.9	9.000	Off	N	9.6	21.9	50.8
0.804000	29.7	9.000	Off	N	9.7	16.3	46.0
0.812000	29.3	9.000	Off	N	9.7	16.7	46.0
1.348000	25.0	9.000	Off	N	9.7	21.0	46.0
1.396000	24.9	9.000	Off	N	9.7	21.1	46.0
1.938000	25.9	9.000	Off	N	9.7	20.1	46.0
2.760000	21.9	9.000	Off	N	9.7	24.1	46.0
2.764000	22.4	9.000	Off	N	9.7	23.6	46.0
2.834000	24.9	9.000	Off	N	9.8	21.1	46.0
5.928000	24.2	9.000	Off	N	9.9	25.8	50.0
6.222000	23.3	9.000	Off	N	9.9	26.7	50.0
19.810000	28.4	9.000	Off	N	10.3	21.6	50.0
20.452000	28.5	9.000	Off	N	10.3	21.5	50.0
21.092000	28.5	9.000	Off	N	10.3	21.5	50.0
21.574000	28.5	9.000	Off	N	10.3	21.5	50.0

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Conducted Emissions (Line 2)

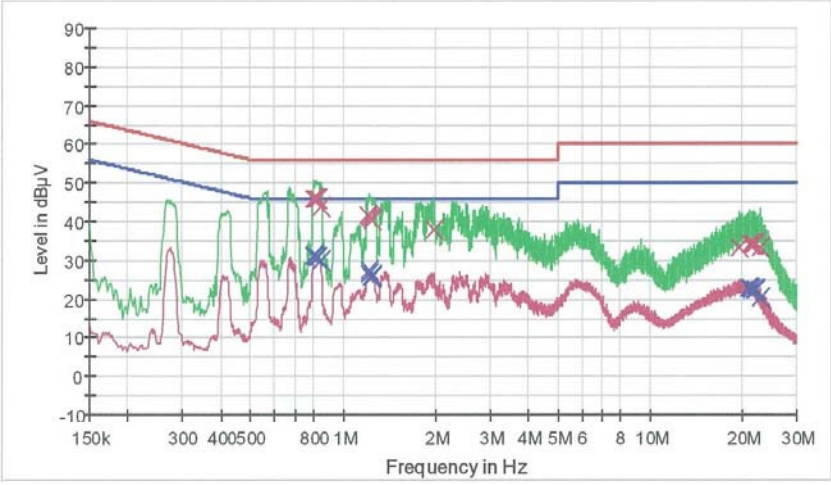
EMI Auto Test(16) 1 / 2

HCT TEST Report

Common Information

EUT:	SM-A9100
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	ANT+

FCC CLASS B



FCC CLASS B_QP
Preview Result 2-AVG
FCC CLASS B_ AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.800000	45.8	9.000	Off	L1	9.7	10.2	56.0
0.804000	45.8	9.000	Off	L1	9.7	10.2	56.0
0.810000	45.9	9.000	Off	L1	9.7	10.1	56.0
0.818000	45.8	9.000	Off	L1	9.7	10.2	56.0
0.832000	45.8	9.000	Off	L1	9.7	10.2	56.0
0.852000	43.9	9.000	Off	L1	9.7	12.1	56.0
1.206000	41.5	9.000	Off	L1	9.7	14.5	56.0
1.214000	41.2	9.000	Off	L1	9.7	14.8	56.0
1.224000	41.1	9.000	Off	L1	9.7	14.9	56.0
1.234000	40.6	9.000	Off	L1	9.7	15.4	56.0
1.240000	40.3	9.000	Off	L1	9.7	15.7	56.0
1.986000	37.9	9.000	Off	L1	9.7	18.1	56.0
19.418000	33.1	9.000	Off	L1	10.2	26.9	60.0
21.226000	34.2	9.000	Off	L1	10.3	25.8	60.0
21.394000	34.3	9.000	Off	L1	10.3	25.7	60.0
21.512000	34.3	9.000	Off	L1	10.3	25.7	60.0
21.956000	34.3	9.000	Off	L1	10.3	25.7	60.0
22.798000	33.2	9.000	Off	L1	10.3	26.8	60.0

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EMI Auto Test(16) 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.804000	31.2	9.000	Off	L1	9.7	14.8	46.0
0.810000	31.2	9.000	Off	L1	9.7	14.8	46.0
0.818000	30.5	9.000	Off	L1	9.7	15.5	46.0
0.826000	30.8	9.000	Off	L1	9.7	15.2	46.0
0.830000	30.9	9.000	Off	L1	9.7	15.1	46.0
0.846000	29.7	9.000	Off	L1	9.7	16.3	46.0
1.212000	27.2	9.000	Off	L1	9.7	18.8	46.0
1.216000	26.4	9.000	Off	L1	9.7	19.6	46.0
1.224000	26.4	9.000	Off	L1	9.7	19.6	46.0
1.236000	25.9	9.000	Off	L1	9.7	20.1	46.0
1.240000	25.9	9.000	Off	L1	9.7	20.1	46.0
1.248000	26.1	9.000	Off	L1	9.7	19.9	46.0
20.996000	22.9	9.000	Off	L1	10.3	27.1	50.0
21.226000	22.8	9.000	Off	L1	10.3	27.2	50.0
21.394000	22.5	9.000	Off	L1	10.3	27.5	50.0
21.956000	22.2	9.000	Off	L1	10.3	27.8	50.0
22.060000	22.2	9.000	Off	L1	10.3	27.8	50.0
22.798000	20.1	9.000	Off	L1	10.3	29.9	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