HCT CO.,LTD.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383.Rep. of KOREA
TEL: +82-31-645-6300 **FAX: +82-31-645-6401**

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:
December 15, 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-1612-F050
HCT FRN: 0005866421

FCC ID	**: A3LSMA320FL**
APPLICANT	**: SAMSUNG Electronics Co., Ltd.**

According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : A3LSMA320F report.

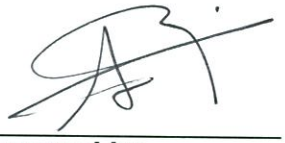
Model(s):	SM-A320FL
EUT Type:	Mobile Phone
Max. RF Output Power:	91.01 dBuV/m @3 m
Frequency Range:	2402 MHz -2480 MHz
Modulation type	GFSK
FCC Classification:	Low Power communication Device Transmitter(DXX)
FCC Rule Part(s):	Part 15.249

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
: Jong Seok Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1612-F050	December 15, 2016	- First Approval Report

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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:	A3LSMA320FL
EUT Type:	Mobile Phone
Model (s):	SM-A320FL
Date(s) of Tests:	October 17, 2016 ~ November 30, 2016
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

2. EUT DESCRIPTION

Model	SM-A320FL	
EUT Type	Mobile Phone	
Power Supply	DC 3.85 V	
Battery Infomation	Model: EB-BA320ABE Type: Li-ion Battery	
Frequency Range	TX: 2402 MHz ~ 2480 MHz RX: 2402 MHz ~ 2480 MHz	
Fundamental Field Strength Level	Peak	91.01 dBμV/m @3 m
	Average	41.76 dBμV/m @3 m
Operating Mode	ANT+	
Modulation Type	GFSK	
Number of Channels	79 Channels	
Antenna Specification	Manufacturer: GALTRONICS LTD. Antenna type: INTERNAL ANTENNA Peak Gain : -1.68 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 3.75 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.
Especially, all antenna for measurement is calibrated in accordance with the requirements of 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. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	6.07

8. 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

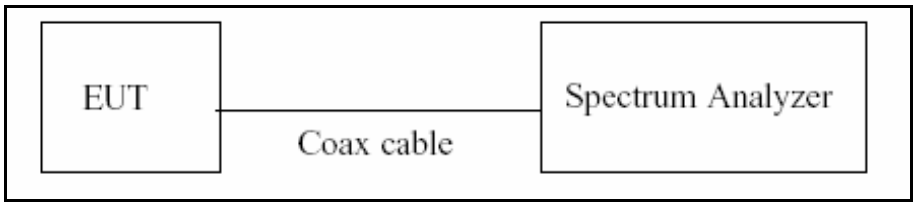
9. TEST RESULT

9.1 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

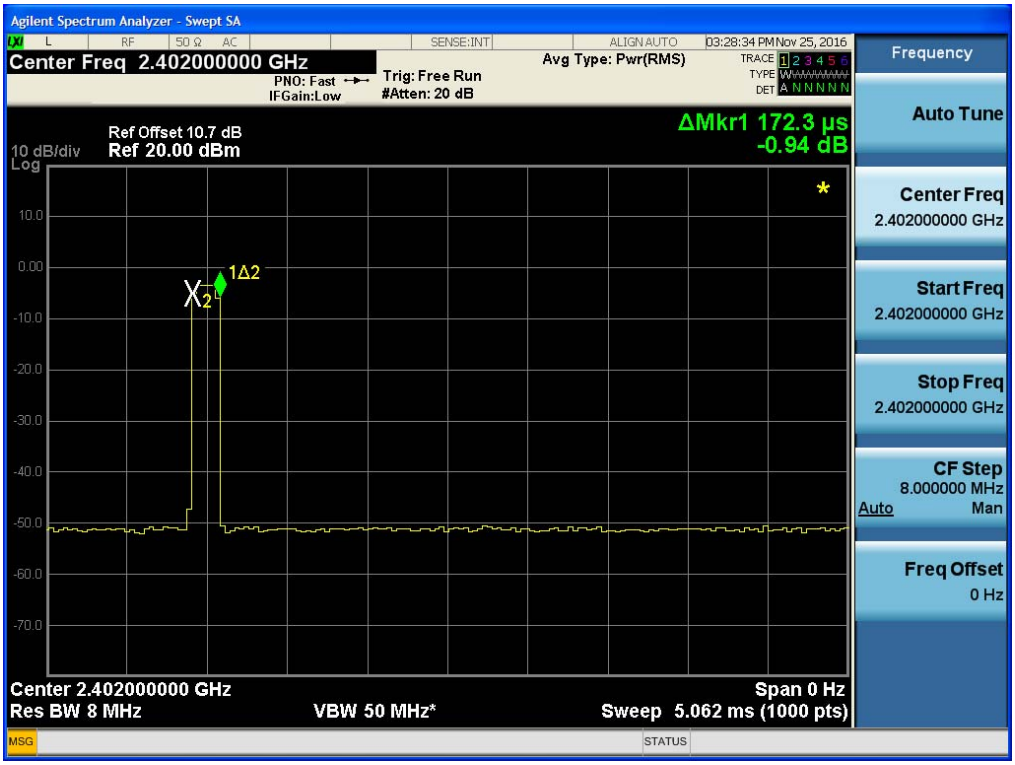
DCCF = $20*\log_{10}$(Pulse width / Period of the pulse train)

= $20*\log_{10}$(2 x 0.1723ms / 100 ms) = -49.25 dB

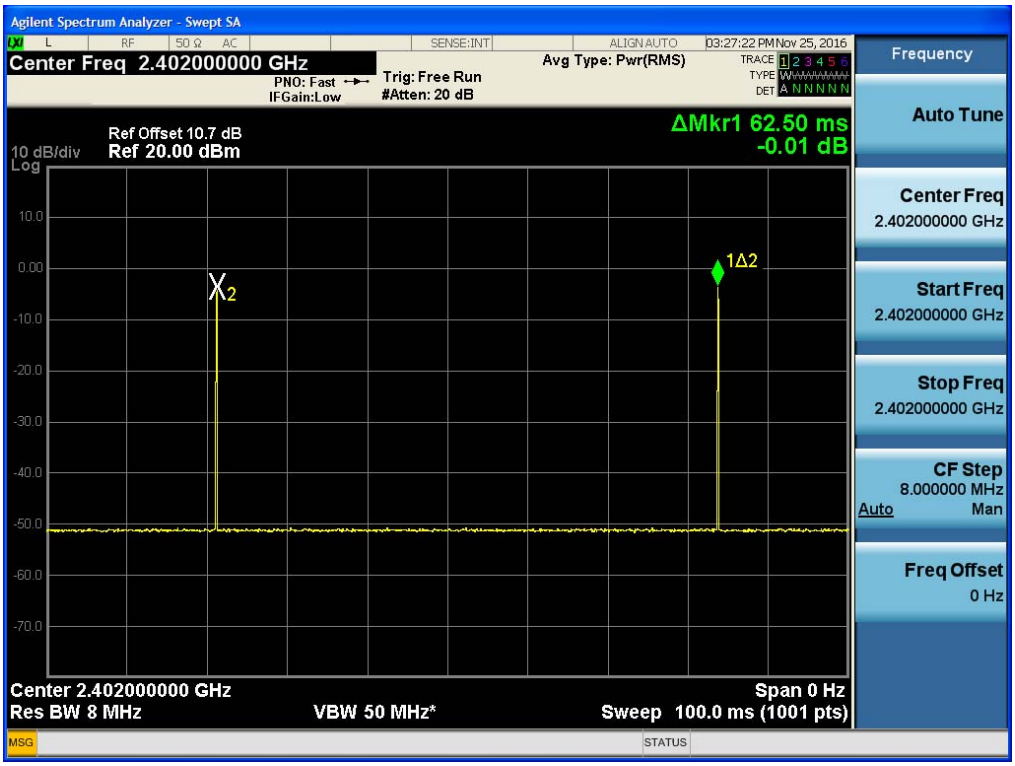
DCCF
-49.25 dB

▣ TEST RESULTS PLOTS

Pulse Width plot



Period of the Pulse Train

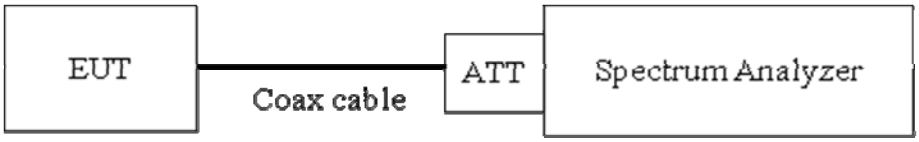


9.2 OCCUPIED BANDWIDTH MEASUREMENT

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 Frequency[MHz]	99% Bandwidth (kHz)
2402	824.26
2441	825.97
2480	822.22

▣ RESULT PLOTS

Occupied Bandwidth plot (Low)

Occupied Bandwidth plot (Mid)

Occupied Bandwidth plot (High)

9.3 RADIATED MEASUREMENT.

9.3.1 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

(c) Field strength limits are specified at a distance of 3 meters.

(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 3.75 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

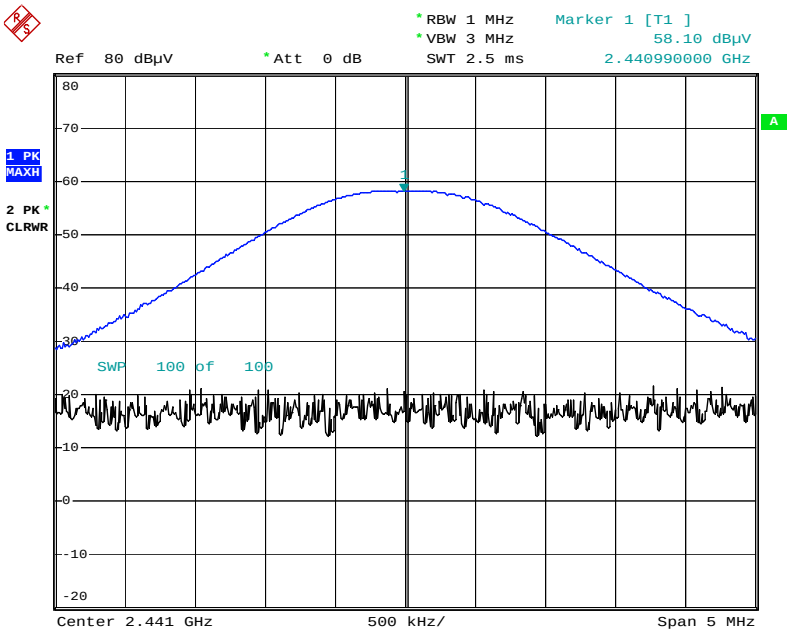
Frequency [MHz]	Reading [dBuV/m]	A.F.+C.L. +D.F. [dB]	Ant. Pol. [H/V]	D.C.C.F [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2402	56.81	32.73	V	0.00	89.54	113.98	24.44	PK
2402	56.81	32.73	V	-49.25	40.29	93.98	53.69	AV
2402	57.26	32.73	H	0.00	89.99	113.98	23.99	PK
2402	57.26	32.73	H	-49.25	40.74	93.98	53.24	AV
2441	57.63	32.91	V	0.00	90.54	113.98	23.44	PK
2441	57.63	32.91	V	-49.25	41.29	93.98	52.69	AV
2441	58.10	32.91	H	0.00	91.01	113.98	22.97	PK
2441	58.10	32.91	H	-49.25	41.76	93.98	52.22	AV
2480	55.78	33.06	V	0.00	88.84	113.98	25.14	PK
2480	55.78	33.06	V	-49.25	39.59	93.98	54.39	AV
2480	56.12	33.06	H	0.00	89.18	113.98	24.80	PK
2480	56.12	33.06	H	-49.25	39.93	93.98	54.05	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 + Distance Factor
   Average: Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor + Duty Cycle Correction Factor
3. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. Measurement distance : 3.75 m

▣ RESULT PLOTS (Worst case : X-H)

Fundamental Field Strength plot (Ch.39)



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Note : Only the worst case plots for Fundamental Field Strength

9.3.2 RADIATED SPURIOUS EMISSIONS.

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

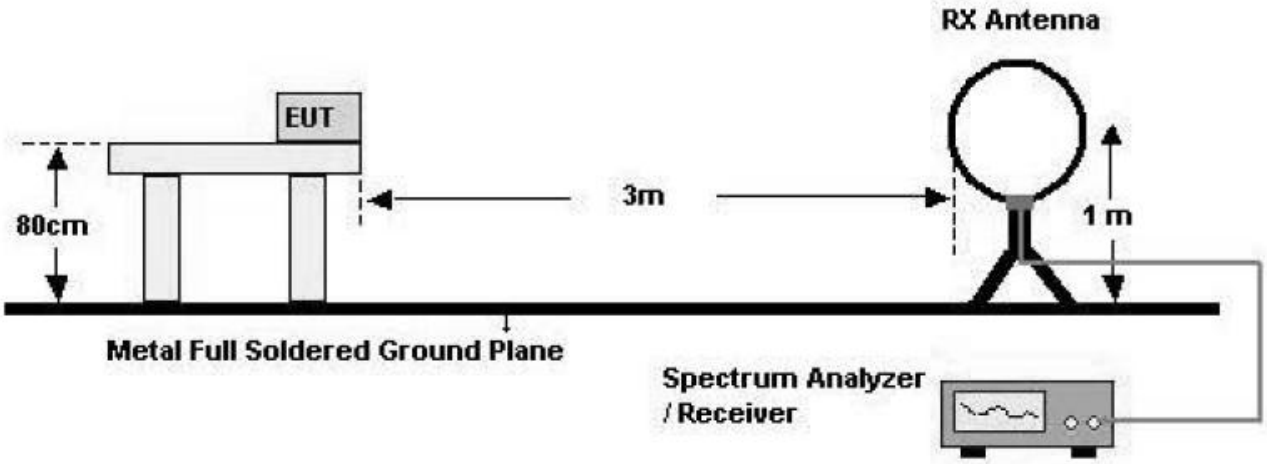
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

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

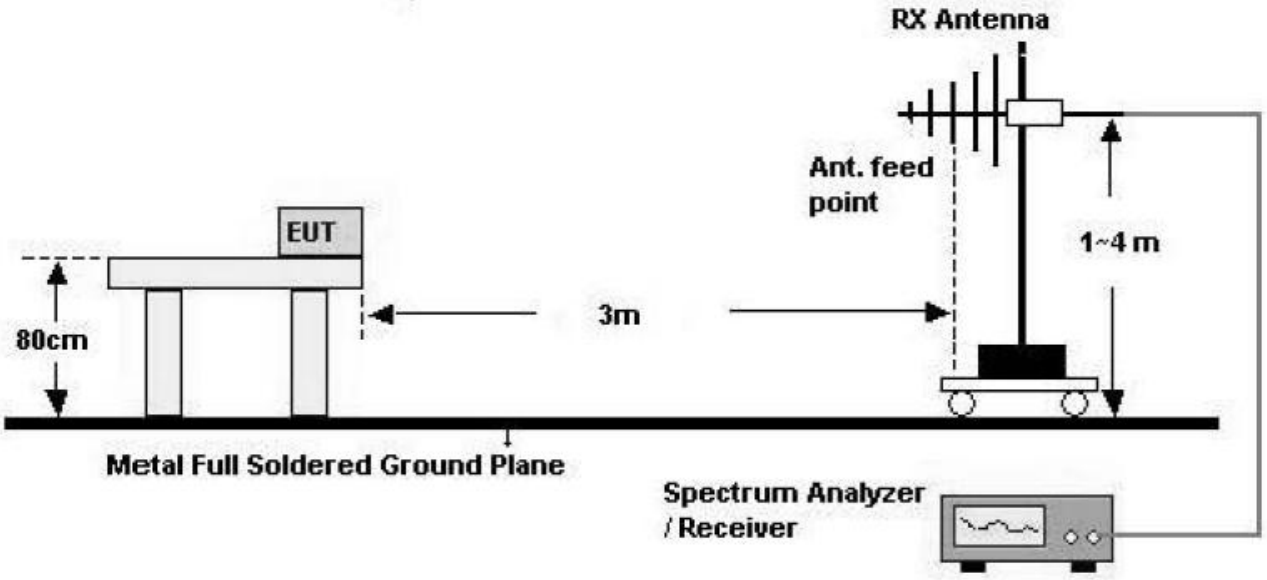
(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under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

Test Configuration

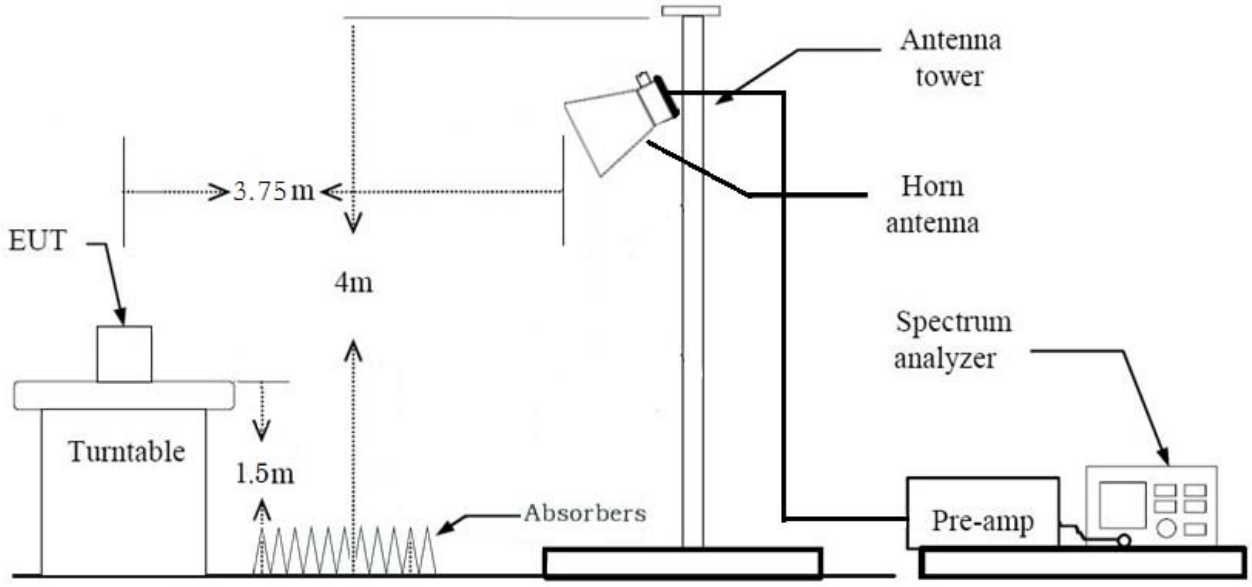
Below 30 MHz



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 3.75 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. 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. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
3. Below VBW is for RSE test

ANT+ Mode	T_{on} (ms)	VBW(1/T) (Hz)	The actual setting value of VBW (Hz)
	0.1723	5804	10000

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/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.
7. The test results for below 30 MHz is correlated to an open site.
   The result on OATS is about 2 dB higher than semi-anechoic chamber(10 m chamber)
8. Measurement distance : 3.75 m

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/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.
5. Measurement distance : 3.75 m

Above 1 GHz

Operation Frequency: 2402 MHz

Frequency [MHz]	Reading [dBuV/m]	A.F.+C.L.-AMP G +D.F. [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	49.82	-0.61	V	49.21	73.98	24.77	PK
4804	38.97	-0.61	V	38.36	53.98	15.62	AV
7206	45.46	8.78	V	54.24	73.98	19.74	PK
7206	34.24	8.78	V	43.02	53.98	10.96	AV
4804	50.49	-0.61	H	49.88	73.98	24.10	PK
4804	39.25	-0.61	H	38.64	53.98	15.34	AV
7206	46.07	8.78	H	54.85	73.98	19.13	PK
7206	34.48	8.78	H	43.26	53.98	10.72	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 + Distance Factor
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.
7. Measurement distance : 3.75 m

Operation Frequency: 2441 MHz

Frequency [MHz]	Reading [dBuV/m]	A.F.+C.L.-AMP G +D.F. [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	50.27	0.19	V	50.46	73.98	23.52	PK
4882	41.06	0.19	V	41.25	53.98	12.73	AV
7323	46.68	8.85	V	55.53	73.98	18.45	PK
7323	34.59	8.85	V	43.44	53.98	10.54	AV
4882	50.45	0.19	H	50.64	73.98	23.34	PK
4882	41.25	0.19	H	41.44	53.98	12.54	AV
7323	46.94	8.85	H	55.79	73.98	18.19	PK
7323	34.65	8.85	H	43.50	53.98	10.48	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 + Distance Factor
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.
7. Measurement distance : 3.75 m

Operation Frequency: 2480 MHz

Frequency [MHz]	Reading [dBuV/m]	A.F.+C.L.-AMP G +D.F. [dBm]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	50.42	0.92	V	51.34	73.98	22.64	PK
4960	42.13	0.92	V	43.05	53.98	10.93	AV
7440	46.09	9.03	V	55.12	73.98	18.86	PK
7440	34.60	9.03	V	43.63	53.98	10.35	AV
4960	50.90	0.92	H	51.82	73.98	22.16	PK
4960	42.38	0.92	H	43.30	53.98	10.68	AV
7440	46.47	9.03	H	55.50	73.98	18.48	PK
7440	34.71	9.03	H	43.74	53.98	10.24	AV

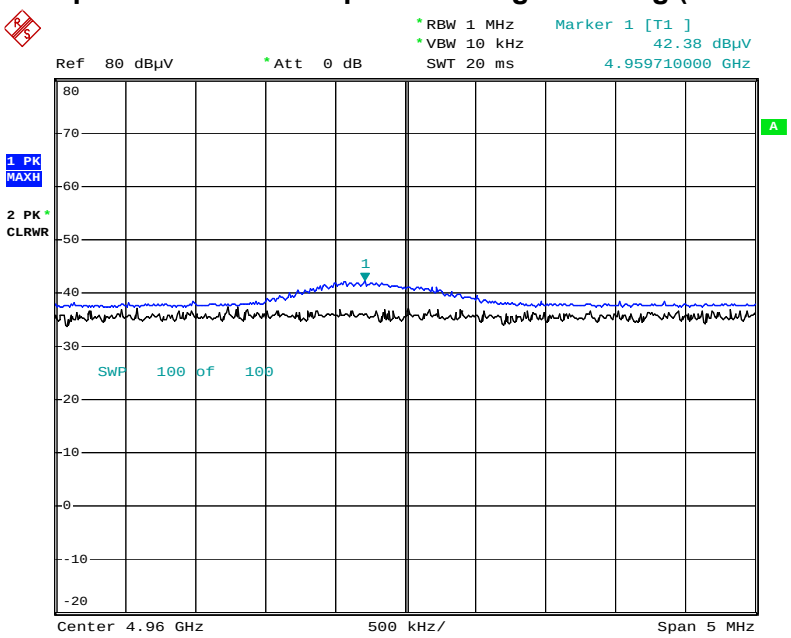
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP G: AMPLIFIER GAIN

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 + Distance Factor
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.
7. Measurement distance : 3.75 m

▣ RESULT PLOTS (Worst case : Y-H)

Radiated Spurious Emissions plot – Average Reading (Ch.78 2nd Harmonic)



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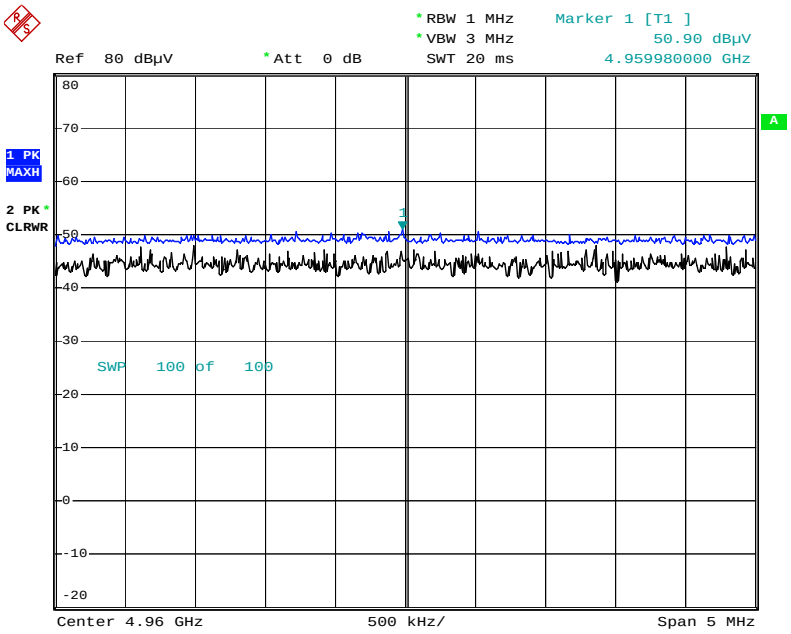
Radiated Spurious Emissions plot – Peak Reading (Ch.78 2nd Harmonic)



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

9.3.3 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 +D.F [dB]	Ant. Pol. [H/V]	D.C.C.F [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2400.0	34.26	32.73	H	0	66.99	73.98	6.99	PK
2400.0	31.12	32.73	H	-49.25	14.60	53.98	39.38	AV
2400.0	33.98	32.73	V	0	66.71	73.98	7.27	PK
2400.0	30.86	32.73	V	-49.25	14.34	53.98	39.64	AV

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS

Notes:

1. Frequency range of measurement = 2398 MHz ~ 2400 MHz
2. Total (Peak) = Reading Value + Antenna Factor + Cable Loss + Distance Factor
   Total (Average) = Reading Value + Antenna Factor + Cable Loss + Distance Factor
   + Duty Cycle Correction Factor
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 detemined by applying the duty cycle correction factor(DCCF) found in Section 8.1 to the measured peak field strength values.
6. Measurement distance : 3.75 m

Operation Mode	ANT+
Operating Frequency	2480 MHz

Frequency [MHz]	Reading [dBuV/m]	A.F.+CL +D.F [dB]	Ant. Pol. [H/V]	D.C.C.F [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	25.41	33.05	H	0	58.46	73.98	15.52	PK
2483.5	14.58	33.05	H	-49.25	-1.62	53.98	55.60	AV
2483.5	24.27	33.05	V	0	57.32	73.98	16.66	PK
2483.5	14.34	33.05	V	-49.25	-1.86	53.98	55.84	AV

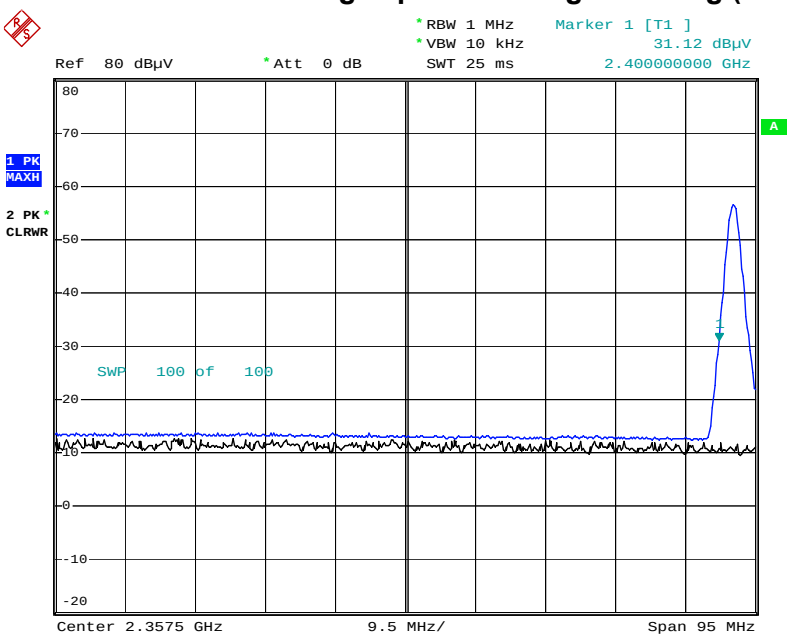
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS

Notes:

1. Frequency range of measurement = 2483.5 MHz ~ 2500 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Distance Factor + 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 detemined 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.
6. Measurement distance : 3.75 m

▣ RESULT PLOTS (Worst case : X-H)

Radiated Band Edges plot – Average Reading (Ch.0)



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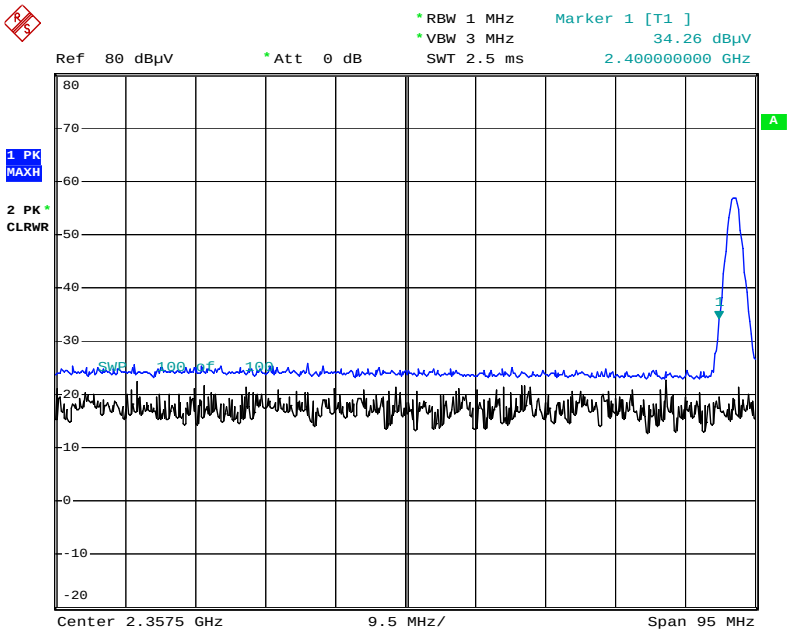
Radiated Band Edges plot – Peak Reading (Ch.0)



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

9.4 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)

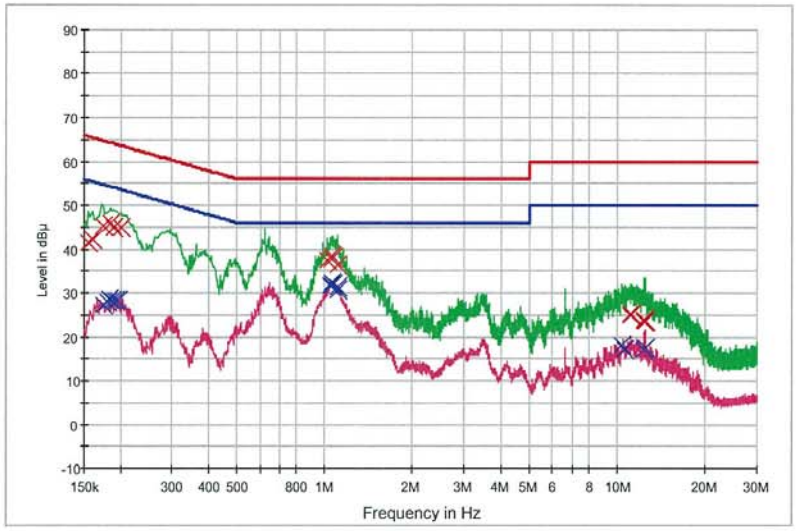
EMI Auto Test(4) 1 / 2

HCT TEST Report

Common Information

EUT:	SM-A320F/DS
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	ANT+ MODE

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.156000	41.6	9.000	Off	L1	9.7	24.1	65.7
0.160000	42.3	9.000	Off	L1	9.7	23.2	65.5
0.174000	45.2	9.000	Off	L1	9.7	19.6	64.8
0.186000	45.8	9.000	Off	L1	9.7	18.4	64.2
0.190000	45.0	9.000	Off	L1	9.7	19.0	64.0
0.202000	45.0	9.000	Off	L1	9.7	18.5	63.5
1.024000	37.3	9.000	Off	L1	9.8	18.7	56.0
1.054000	37.8	9.000	Off	L1	9.8	18.2	56.0
1.062000	38.4	9.000	Off	L1	9.8	17.6	56.0
1.070000	38.1	9.000	Off	L1	9.8	17.9	56.0
1.076000	38.1	9.000	Off	L1	9.8	17.9	56.0
1.108000	36.5	9.000	Off	L1	9.8	19.5	56.0
11.118000	24.8	9.000	Off	L1	10.1	35.2	60.0
11.138000	25.2	9.000	Off	L1	10.1	34.8	60.0
12.394000	24.1	9.000	Off	L1	10.1	35.9	60.0
12.398000	23.6	9.000	Off	L1	10.1	36.4	60.0
12.402000	24.0	9.000	Off	L1	10.1	36.0	60.0
12.416000	23.5	9.000	Off	L1	10.1	36.5	60.0

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EMI Auto Test(4) 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.174000	27.2	9.000	Off	L1	9.7	27.6	54.8
0.180000	28.1	9.000	Off	L1	9.7	26.4	54.5
0.184000	28.6	9.000	Off	L1	9.7	25.7	54.3
0.188000	28.4	9.000	Off	L1	9.7	25.8	54.1
0.192000	28.4	9.000	Off	L1	9.7	25.6	53.9
0.196000	28.4	9.000	Off	L1	9.7	25.4	53.8
1.046000	31.7	9.000	Off	L1	9.8	14.3	46.0
1.052000	31.6	9.000	Off	L1	9.8	14.4	46.0
1.062000	32.3	9.000	Off	L1	9.8	13.7	46.0
1.070000	32.0	9.000	Off	L1	9.8	14.0	46.0
1.102000	31.4	9.000	Off	L1	9.8	14.6	46.0
1.108000	30.6	9.000	Off	L1	9.8	15.4	46.0
10.404000	18.2	9.000	Off	L1	10.1	31.8	50.0
10.560000	17.2	9.000	Off	L1	10.1	32.8	50.0
12.396000	17.0	9.000	Off	L1	10.1	33.0	50.0
12.402000	17.2	9.000	Off	L1	10.1	32.8	50.0
12.408000	17.3	9.000	Off	L1	10.1	32.7	50.0
12.412000	17.3	9.000	Off	L1	10.1	32.7	50.0

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Conducted Emissions (Line 2)

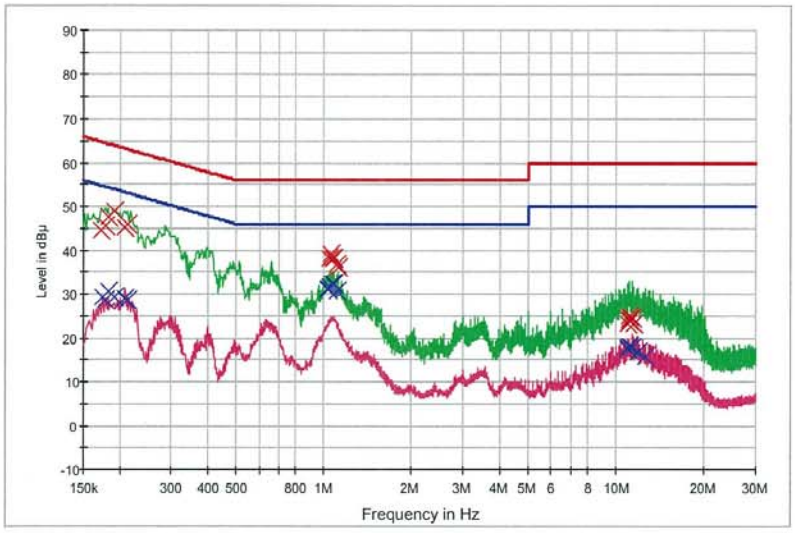
EMI Auto Test(3) 1 / 2

HCT TEST Report

Common Information

EUT:	SM-A320F/DS
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	ANT+ MODE

FCC CLASS B



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.172000	44.7	9.000	Off	N	9.7	20.1	64.9
0.178000	45.6	9.000	Off	N	9.7	19.0	64.6
0.182000	47.7	9.000	Off	N	9.7	16.7	64.4
0.192000	48.8	9.000	Off	N	9.7	15.1	63.9
0.208000	45.4	9.000	Off	N	9.7	17.9	63.3
0.214000	45.8	9.000	Off	N	9.7	17.2	63.0
1.048000	38.1	9.000	Off	N	9.7	17.9	56.0
1.062000	39.1	9.000	Off	N	9.7	16.9	56.0
1.076000	38.1	9.000	Off	N	9.7	17.9	56.0
1.082000	38.2	9.000	Off	N	9.7	17.8	56.0
1.110000	36.6	9.000	Off	N	9.7	19.4	56.0
1.120000	36.1	9.000	Off	N	9.7	19.9	56.0
10.944000	23.2	9.000	Off	N	10.1	36.8	60.0
11.138000	24.9	9.000	Off	N	10.1	35.1	60.0
11.142000	24.0	9.000	Off	N	10.1	36.0	60.0
11.148000	24.1	9.000	Off	N	10.1	35.9	60.0
11.326000	24.7	9.000	Off	N	10.1	35.3	60.0
11.522000	23.1	9.000	Off	N	10.1	36.9	60.0

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EMI Auto Test(3) 2 / 2

Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.174000	29.5	9.000	Off	N	9.7	25.3	54.8
0.178000	28.6	9.000	Off	N	9.7	25.9	54.6
0.182000	30.5	9.000	Off	N	9.7	23.9	54.4
0.192000	29.3	9.000	Off	N	9.7	24.6	53.9
0.208000	29.1	9.000	Off	N	9.7	24.2	53.3
0.212000	28.6	9.000	Off	N	9.7	24.5	53.1
1.030000	30.9	9.000	Off	N	9.7	15.1	46.0
1.034000	31.2	9.000	Off	N	9.7	14.8	46.0
1.050000	31.6	9.000	Off	N	9.7	14.4	46.0
1.072000	32.4	9.000	Off	N	9.7	13.6	46.0
1.082000	32.3	9.000	Off	N	9.7	13.7	46.0
1.110000	30.7	9.000	Off	N	9.7	15.3	46.0
10.944000	17.5	9.000	Off	N	10.1	32.5	50.0
10.948000	17.9	9.000	Off	N	10.1	32.1	50.0
11.142000	18.1	9.000	Off	N	10.1	31.9	50.0
11.332000	17.7	9.000	Off	N	10.1	32.3	50.0
11.906000	16.8	9.000	Off	N	10.1	33.2	50.0
12.672000	15.7	9.000	Off	N	10.1	34.3	50.0

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10.LIST OF TEST EQUIPMENT

10.1 LIST OF TEST EQUIPMENT (Conducted Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/28/2015	Annual	100073
Rohde & Schwarz	ESCI / Test Receiver	12/28/2015	Annual	100584
Agilent	N9020A / Signal Analyzer	06/24/2016	Annual	MY51110085
Agilent	N1911A / Power Meter	03/11/2016	Annual	MY45100523
Agilent	N1921A / Power Sensor	03/11/2016	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/23/2016	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/14/2016	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	03/09/2016	Annual	KR75303962
Agilent	8493C / Attenuator(10 dB)	07/15/2016	Annual	07560

10.2 LIST OF TEST EQUIPMENT (Radiated Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Audix	AM4000 / Antenna Position Tower	N/A	N/A	N/A
Audix	Turn Table	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Rohde & Schwarz	Loop Antenna	02/23/2016	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/15/2015	Biennial	255
Schwarzbeck	BBHA 9120D / Horn Antenna	05/07/2015	Biennial	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	09/03/2015	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	09/10/2016	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/23/2016	Annual	101068-SZ
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/24/2016	Annual	8
Wainwright Instruments	WHFX7.0/18G-8SS / High Pass Filter	05/13/2016	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	07/06/2016	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/26/2016	Annual	2
Agilent	8493C-10 / Attenuator(10 dB)	08/11/2016	Annual	76649
CERNEX	CBLU1183540 / Power Amplifier	07/15/2016	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	07/15/2016	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	07/11/2016	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	07/11/2016	Annual	25956