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FCC ANT+ REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

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

Date of Issue:
February 28, 2019
Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-RF-1902-FC040-R1

FCC ID:	**A3LSMT515**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

Model:	SM-T515
Additional Model:	SM-T515N, SM-T517
EUT Type:	Tablet
Max. RF Output Power:	97.43 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 subpart C 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 : Jung Ki Lim
Engineer of Telecommunication testing center

Approved by : Jong Seok Lee
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1902-FC040	February 22, 2019	- First Approval Report
HCT-RF-1902-FC040-R1	February 28, 2019	- Revised 5 page and antenna gain

Table of Contents

1. EUT DESCRIPTION

Model	SM-T515
Additional Model	SM-T515N, SM-T517
EUT Type	Tablet
Power Supply	DC 3.85 V
Battery Information	Model: EB-0BT515ABU Type: Li-ion battery
Travel Adapter Information	Model : EP-TA50EWE Manufacture: DONGYANG
Frequency Range	2402 MHz - 2480 MHz
Max. RF Output Power	Peak : 97.43 dBuV/m @3 m Average : 65.55 dBuV/m @3 m
Modulation Type	GFSK
Number of Channels	79 Channels
Antenna Specification	Antenna type: LDS Peak Gain : 0.02 dBi
Date(s) of Tests	January 17, 2019 ~ February 21, 2019

2. 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.

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.

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.

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 6.6.5 of ANSI C63.10. (Version: 2013). To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120 kHz for frequencies below 1 GHz or 1 MHz for frequencies above 1 GHz. For average measurements above 1 GHz, the analyzer was set to peak detector with a reduced VBW setting(RBW = 1 MHz, VBW = 1/T Hz, where T = Pulse width).

Conducted Antenna Terminal

See Section from 7.8.2 to 7.8.8.(ANSI 63.10-2013)

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.

3. 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 : 2017).

4. FACILITIES AND ACCREDITATIONS

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, 17383, Rep. of 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 April 02, 2018 (Registration Number: KR0032).

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.”

5. 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

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

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)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.71

7. DESCRIPTION OF TESTS

7.1. Duty Cycle

Test overview

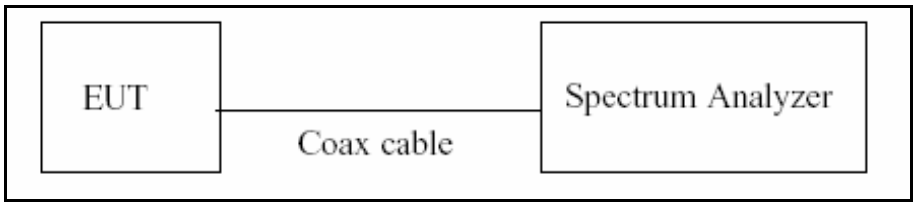
§15.35(c)

: 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

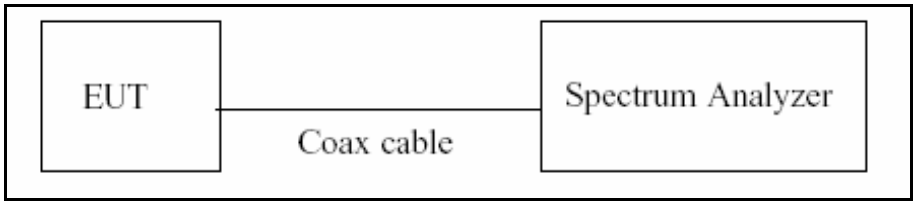


7.2. Occupied Bandwidth

Test overview

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.

1) RBW = 1% to 3% of the 99% bandwidth.
2) VBW ≥ 3 x RBW
3) Detector = Peak
4) Trace mode = max hold
5) Sweep = auto couple
6) Allow the trace to stabilize

Note :

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

7.3. Fundamental Field Strength Level

Limit

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
2400-2483.5 MHz	50	500

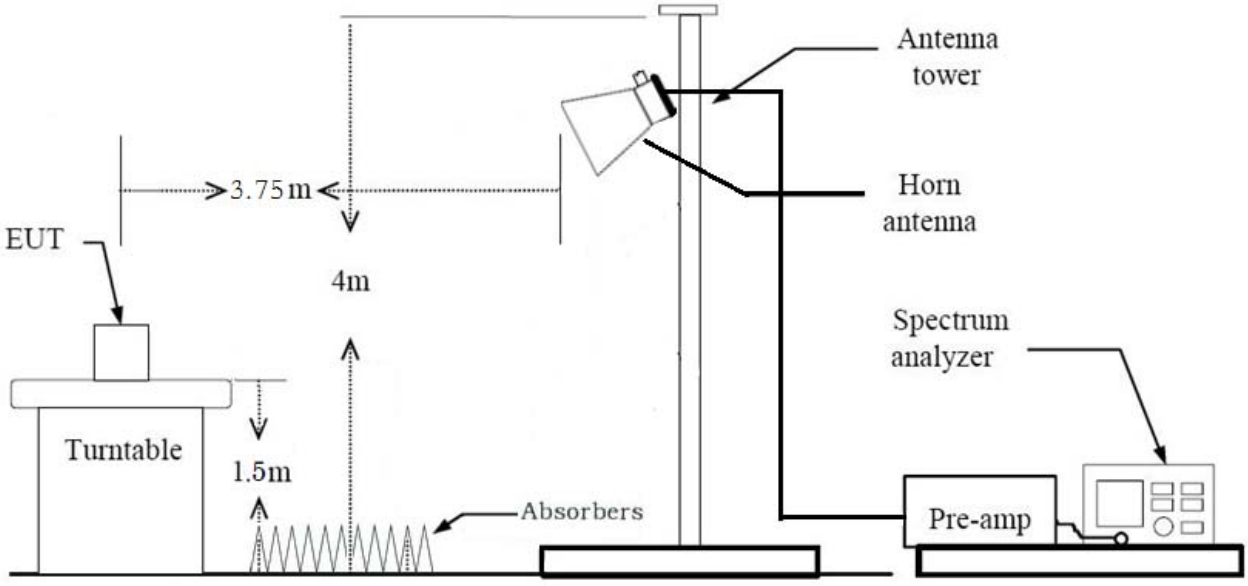
§15.249(e):

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 Configuration



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. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. 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).
   *Distance extrapolation factor = 20*log (test distance / specific distance) (dB)
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency : 2402MHz, 2441MHz, 2480MHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3*RBW
   (2) Measurement Type(Average):
      - 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 determined from the peak field strength after correcting for the worst-case duty cycle as described in section 9.1.
      - DCCF = $20*\log_{10}$(Pulse width / Period of the pulse train)

9. Total(Peak) = Peak Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
   Total(Average) = Peak Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty Cycle Correction Factor

7.4. Radiated Test

Limit

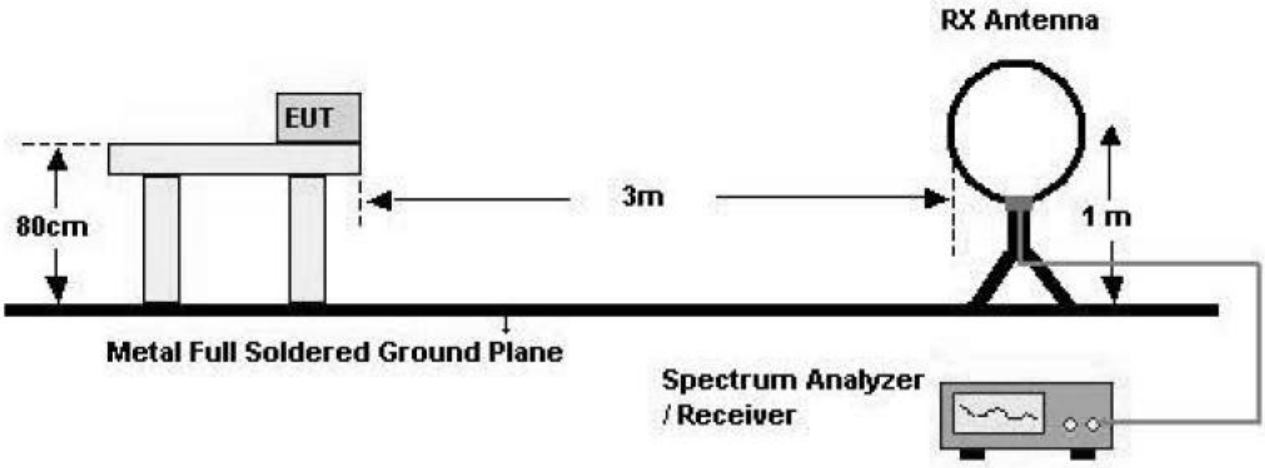
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

§15.249(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.

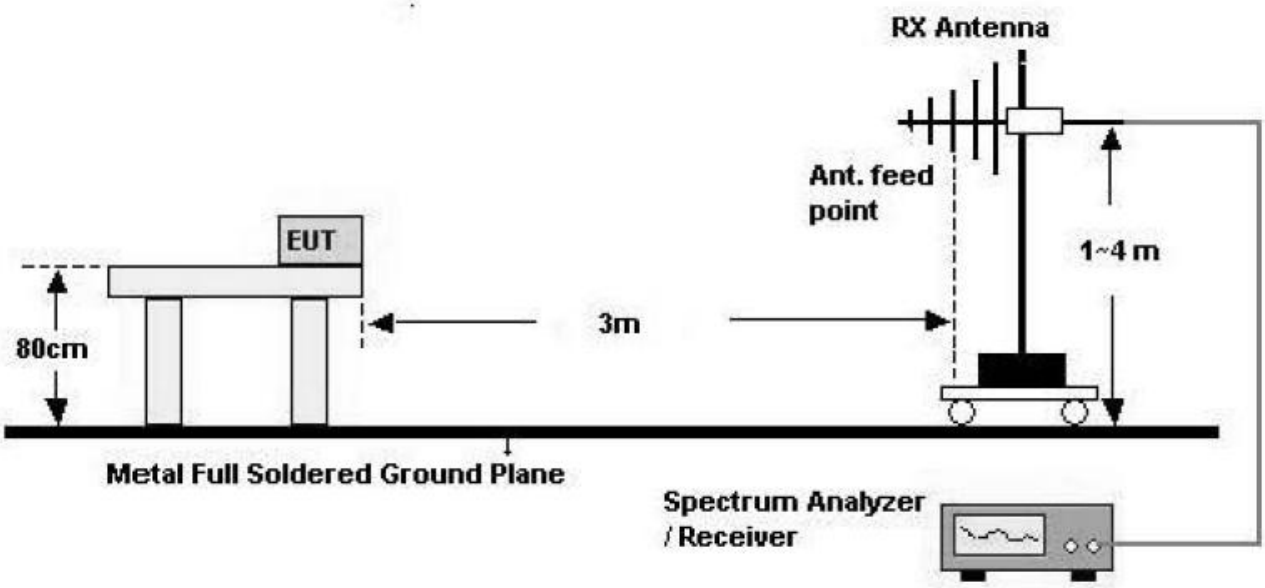
§15.249(e):
The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Test Configuration

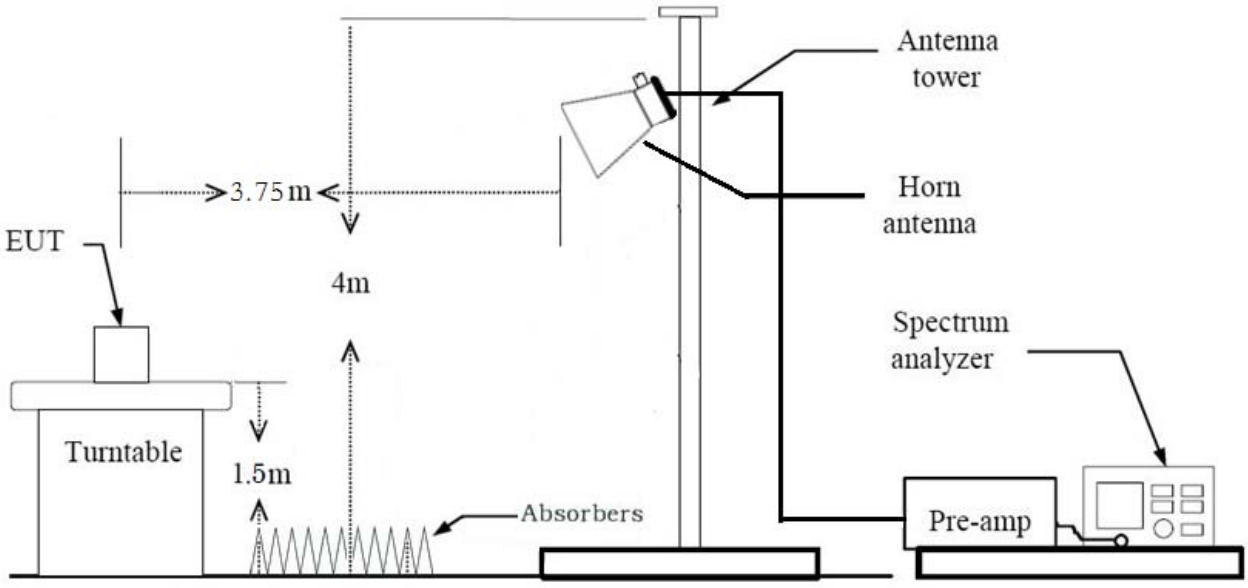
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz


Antenna
tower
Horn
antenna
3.75m
EUT
4m
Spectrum
analyzer
Turntable
1.5m
Absorbers
Pre-amp

Test Procedure of Radiated spurious emissions(Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = 40*log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40*log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3*RBW
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. The test results for below 30 MHz is correlated to an open site.
    The result on OFS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

Test Procedure of Radiated spurious emissions(Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
   (1) Measurement Type(Peak):
   - Measured Frequency Range : 30 MHz – 1 GHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 100 kHz
   - VBW ≥ 3*RBW

   (2) Measurement Type(Quasi-peak):
   - Measured Frequency Range : 30 MHz – 1 GHz
   - Detector = Quasi-Peak
   - RBW = 120 kHz

   *In general, (1) is used mainly
6. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. 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).
   *Distance extrapolation factor = 20*log (test distance / specific distance) (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3*RBW
   (2) Measurement Type(Average):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - 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 determined from the peak field strength after correcting for the worst-case duty cycle as described in section 9.1.
      - DCCF = $20*\log_{10}$(Pulse width / Period of the pulse train)

10. Measurement value 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.
11. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

Test Procedure of Radiated Restricted Band Edge

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. 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).
   *Distance extrapolation factor = 20*log (test distance / specific distance) (dB)
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
   (1) Measurement Type(Peak):
   - Measured Frequency Range = 2310 MHz ~ 2400 MHz/ 2483.5 MHz ~ 2500 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 1 MHz
   - VBW ≥ 3*RBW

   (2) Measurement Type(Average):
   - Measured Frequency Range = 2310 MHz ~ 2400 MHz/ 2483.5 MHz ~ 2500 MHz
   - 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 determined from the peak field strength after correcting for the worst-case duty cycle as described in section 9.1.
   - DCCF = $20*\log_{10}$(Pulse width / Period of the pulse train)

9. Total(Peak) = Peak Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
   Total(Average) = Peak Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty Cycle Correction Factor

7.5. AC Power line Conducted Emissions

Limit

For an intentional radiator that 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 the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

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

*Decreases with the logarithm of the frequency.

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 Annex A 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

7.6. Worst case configuration and mode

Fundamental Field Strength Level & Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone, Stand alone + external accessories(earphone, etc)
   - Worstcase : Stand alone
2. EUT Axis
   - Fundamental Field Strength Level : X
   - Radiated test : X
3. All period were investigated and the worst case period results are reported.

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone+Earphone+Travel Adapter, Stand alone+Travel Adapter
   - Worstcase : Stand alone+Travel Adapter

Duty Cycle & Occupied Bandwidth

All period were investigated and the worst case period results are reported.

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		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 7.5		PASS
Fundamental Field Strength Level	§15.249(a)(e)	< 50 mV/m	Radiated	PASS
Harmonic Field Strength Level	§15.249(a)(e)	< 500 uV/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

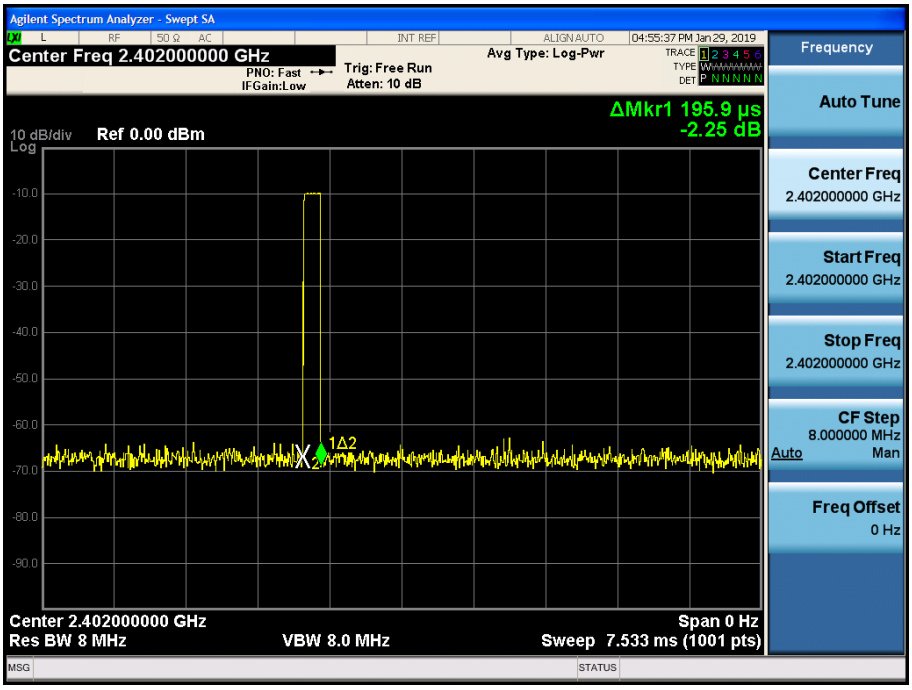
9.1 DUTY CYCLE

DCCF = 20*log10(Pulse width / Period of the pulse train)

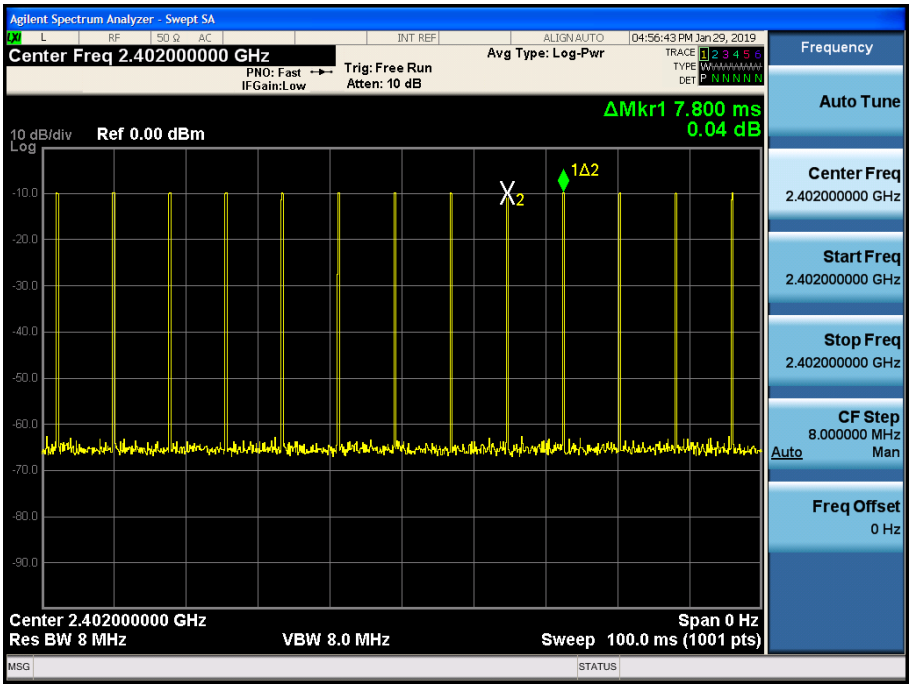
= 20*log10(13 x 0.1959 ms / 100 ms) = -31.88 dB

▣ Test Plots

Pulse Width Plot



Period of the Pulse Train

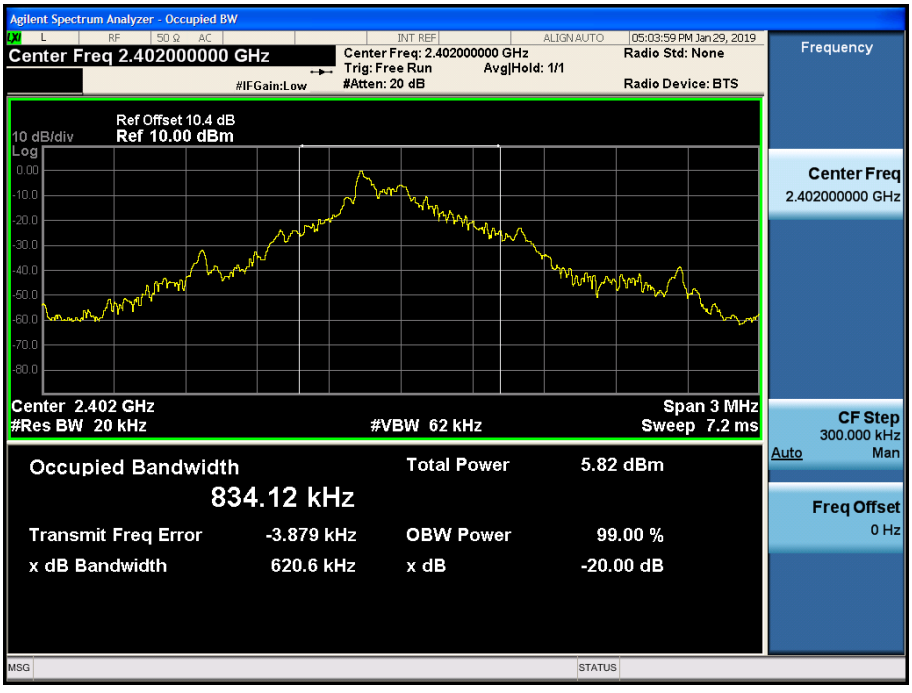


9.2 OCCUPIED BANDWIDTH

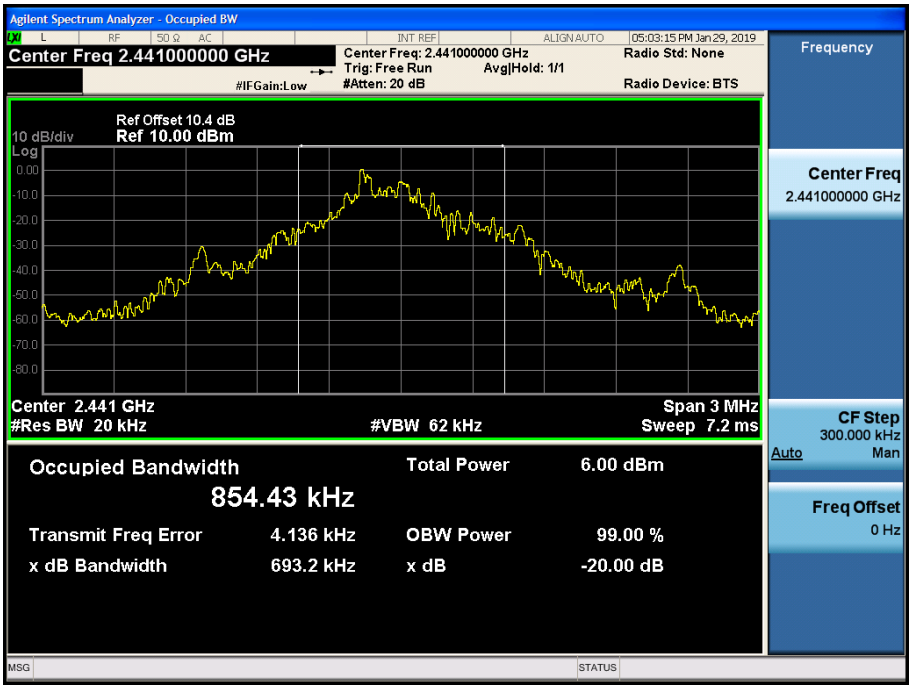
Frequency[MHz]	99% Bandwidth (kHz)
2402	834.12
2441	854.43
2480	818.64

▣ Test Plots

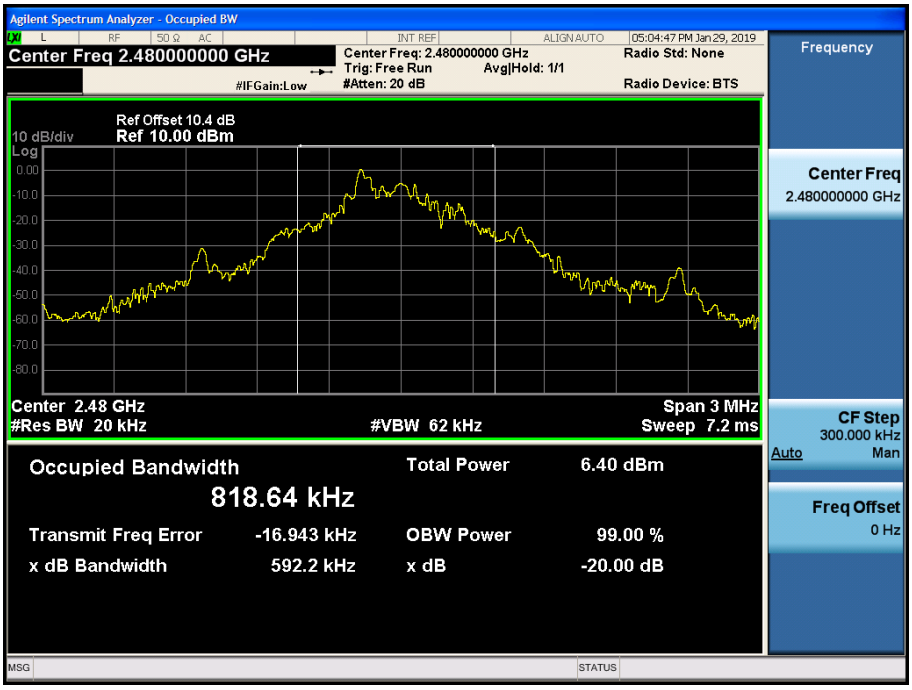
Occupied Bandwidth plot (Low)



Occupied Bandwidth plot (Mid)



Occupied Bandwidth plot (High)



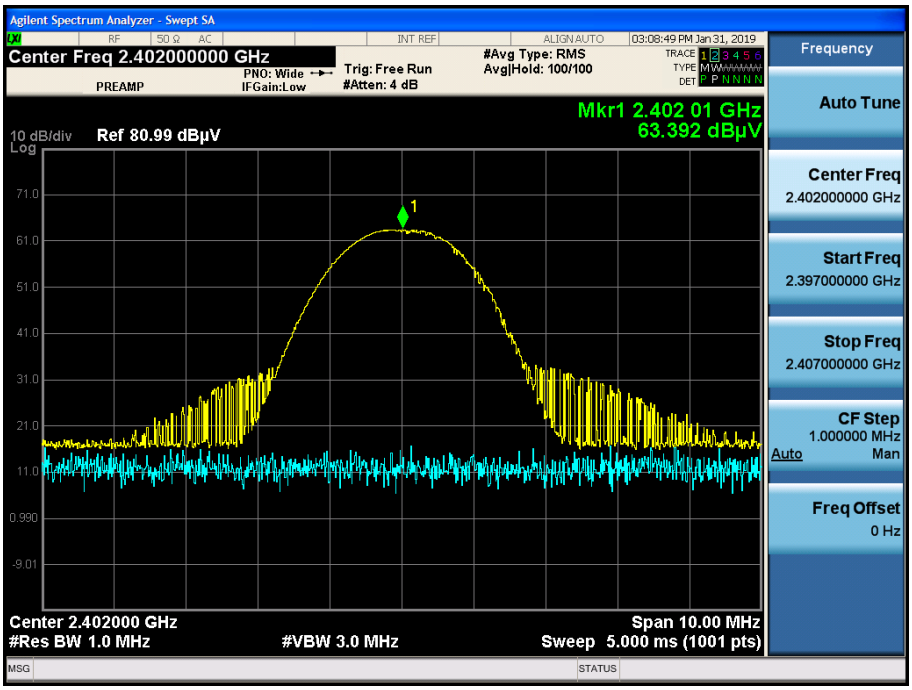
9.3 RADIATED MEASUREMENT.

9.3.1 FUNDAMENTAL FIELD STRENGTH LEVEL MEASUREMENT

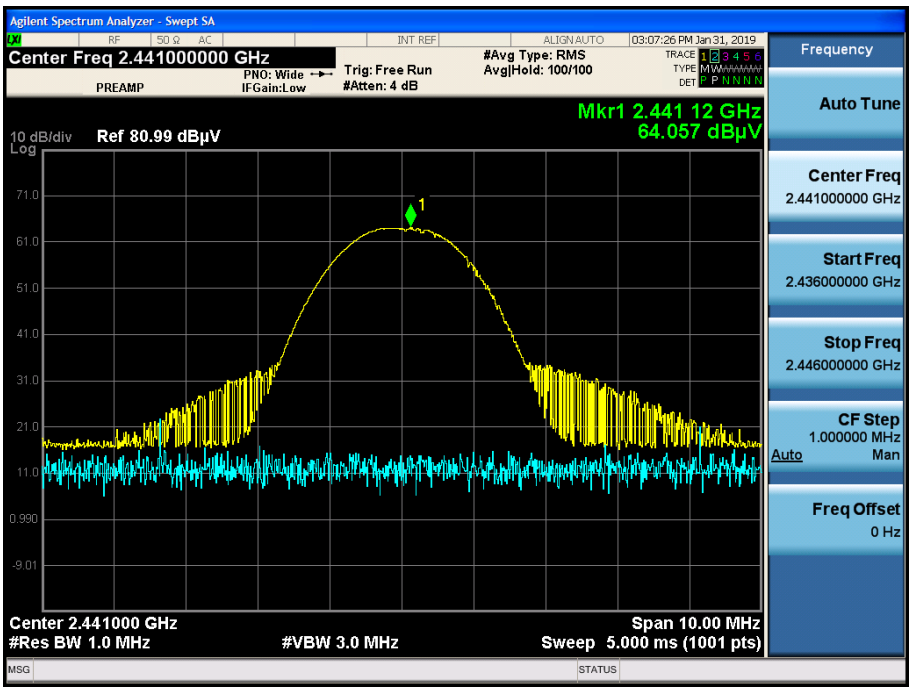
Frequency [MHz]	Reading [dBuV/m]	A.F.+C.L. +D.F. [dB]	Ant. Pol. [H/V]	D.C.C.F [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2402	63.12	33.35	V	0.00	96.47	113.98	17.51	PK
2402	63.12	33.35	V	-31.88	64.59	93.98	29.39	AV
2402	63.39	33.35	H	0.00	96.74	113.98	17.24	PK
2402	63.39	33.35	H	-31.88	64.86	93.98	29.12	AV
2441	63.95	33.37	V	0.00	97.32	113.98	16.66	PK
2441	63.95	33.37	V	-31.88	65.44	93.98	28.54	AV
2441	64.06	33.37	H	0.00	97.43	113.98	16.55	PK
2441	64.06	33.37	H	-31.88	65.55	93.98	28.43	AV
2480	62.96	33.39	V	0.00	96.35	113.98	17.63	PK
2480	62.96	33.39	V	-31.88	64.47	93.98	29.51	AV
2480	63.21	33.39	H	0.00	96.60	113.98	17.38	PK
2480	63.21	33.39	H	-31.88	64.72	93.98	29.26	AV

▣ Test Plots (Worst case : X-H)

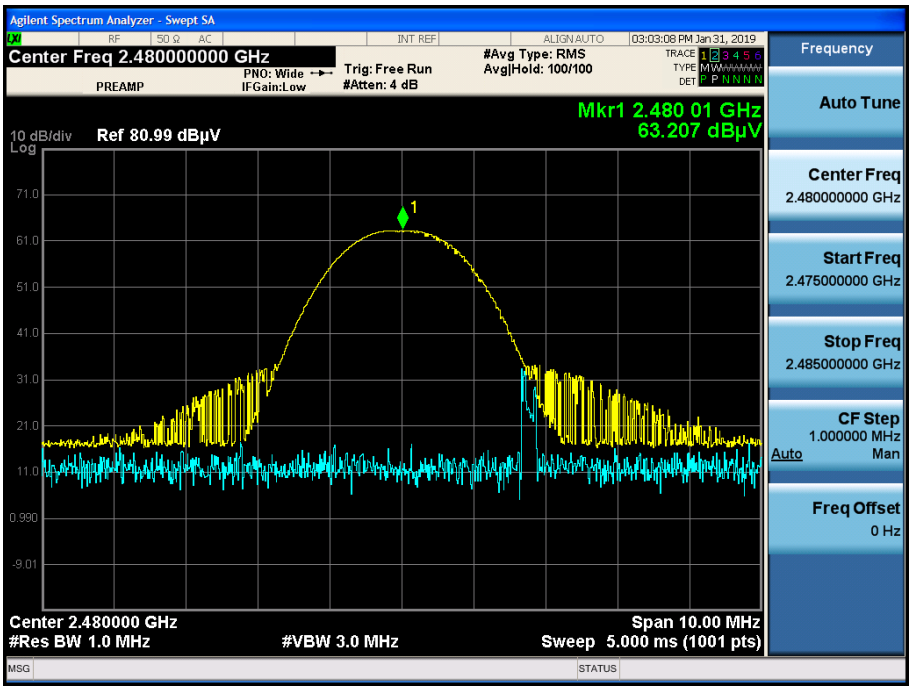
Fundamental Field Strength plot (Ch.0)



Fundamental Field Strength plot (Ch.39)



Fundamental Field Strength plot (Ch.78)



Note:

Plot of worst case are only reported.

9.3.2 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30MHz

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							

Note:

1. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = 40*log (specific distance / test distance) (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor
4. The test results for below 30 MHz is correlated to an open site.
   The result on OFS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

Frequency Range : Below 1 GHz

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							

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

Frequency Range : Above 1 GHz

Operation Frequency: 2402 MHz

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Duty Cycle Correction [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	48.36	0.74	0.00	V	49.10	73.98	24.88	PK
4804	48.36	0.74	-31.88	V	17.22	53.98	36.76	AV
7206	46.37	9.25	0.00	V	55.62	73.98	18.37	PK
7206	46.37	9.25	-31.88	V	23.73	53.98	30.25	AV
4804	49.00	0.74	0.00	H	49.74	73.98	24.24	PK
4804	49.00	0.74	-31.88	H	17.86	53.98	36.12	AV
7206	45.01	9.25	0.00	H	54.26	73.98	19.73	PK
7206	45.01	9.25	-31.88	H	22.37	53.98	31.61	AV

Operation Frequency: 2441 MHz

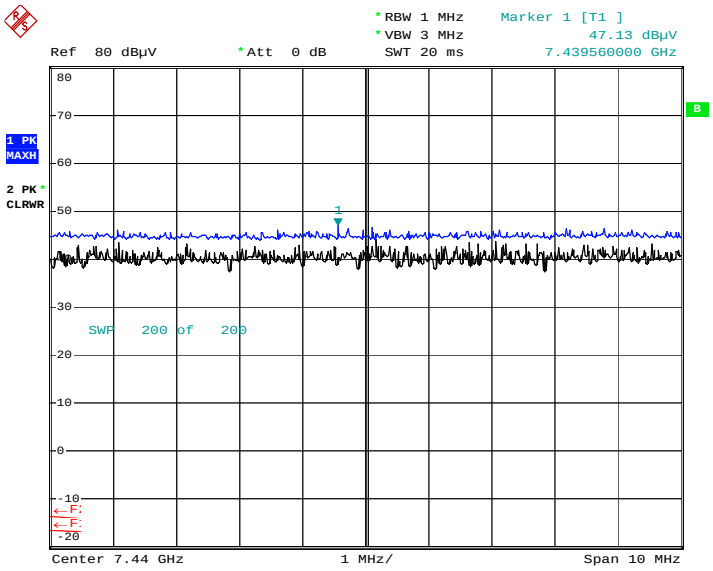
Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Duty Cycle Correction [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4882	48.16	1.16	0.00	V	49.32	73.98	24.66	PK
4882	48.16	1.16	-31.88	V	17.44	53.98	36.54	AV
7323	46.29	9.14	0.00	V	55.43	73.98	18.55	PK
7323	46.29	9.14	-31.88	V	23.55	53.98	30.43	AV
4882	48.00	1.16	0.00	H	49.16	73.98	24.82	PK
4882	48.00	1.16	-31.88	H	17.28	53.98	36.70	AV
7323	45.45	9.14	0.00	H	54.59	73.98	19.39	PK
7323	45.45	9.14	-31.88	H	22.71	53.98	31.27	AV

Operation Frequency: 2480 MHz

Frequency [MHz]	Reading [dBuV]	A.F + C.L - A.G + D.F [dB]	Duty Cycle Correction [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	49.63	0.76	0.00	V	50.39	73.98	23.59	PK
4960	49.63	0.76	-31.88	V	18.51	53.98	35.47	AV
7440	47.13	9.86	0.00	V	56.99	73.98	16.99	PK
7440	47.13	9.86	-31.88	V	25.11	53.98	28.87	AV
4960	49.08	0.76	0.00	H	49.84	73.98	24.14	PK
4960	49.08	0.76	-31.88	H	17.96	53.98	36.02	AV
7440	45.32	9.86	0.00	H	55.18	73.98	18.80	PK
7440	45.32	9.86	-31.88	H	23.30	53.98	30.68	AV

▣ Test Plots (Worst case : X-V)

Radiated Spurious Emissions plot – Average Reading (Ch.78 3rd Harmonic)



Note:

Plot of worst case are only reported.

9.3.3 RADIATED BAND EDGES MEASUREMENTS

Operating Mode ANT+

Test Frequency 2402 MHz

Frequency [MHz]	Reading [dBuV]	A.F + C.L + D.F [dB]	Pol. [H/V]	D.C.C.F [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2400.0	30.96	33.29	H	0	64.25	73.98	9.73	PK
2400.0	30.96	33.29	H	-31.88	32.37	53.98	21.61	AV
2400.0	30.51	33.29	V	0	63.80	73.98	10.18	PK
2400.0	30.51	33.29	V	-31.88	31.92	53.98	22.06	AV

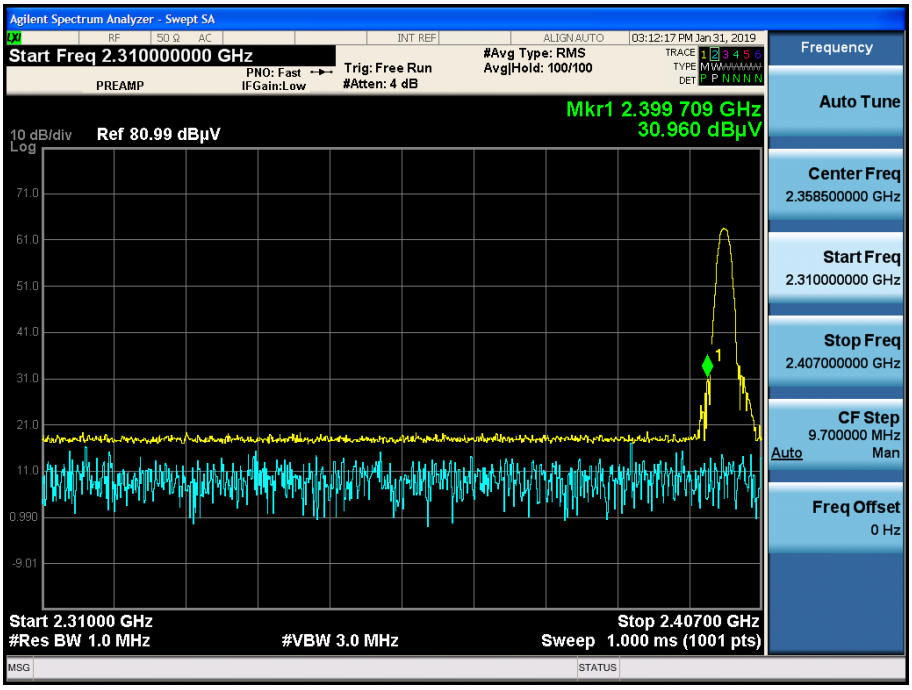
Operating Mode ANT+

Test Frequency 2480 MHz

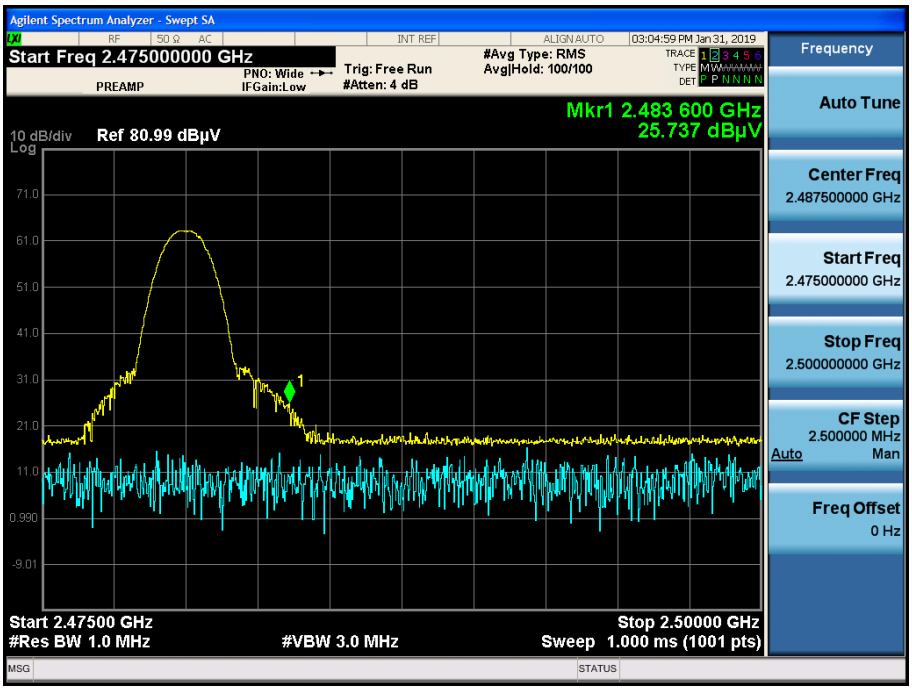
Frequency [MHz]	Reading [dBuV]	A.F + C.L + D.F [dB]	Pol. [H/V]	D.C.C.F [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	25.74	33.39	H	0	59.13	73.98	14.85	PK
2483.5	25.74	33.39	H	-31.88	27.25	53.98	26.73	AV
2483.5	24.87	33.39	V	0	58.26	73.98	15.72	PK
2483.5	24.87	33.39	V	-31.88	26.38	53.98	27.60	AV

▣ Test Plots (Worst case : X-H)

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



Radiated Band Edges plot – Peak Reading (Ch.78)



Note:

Plot of worst case are only reported.

9.4 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

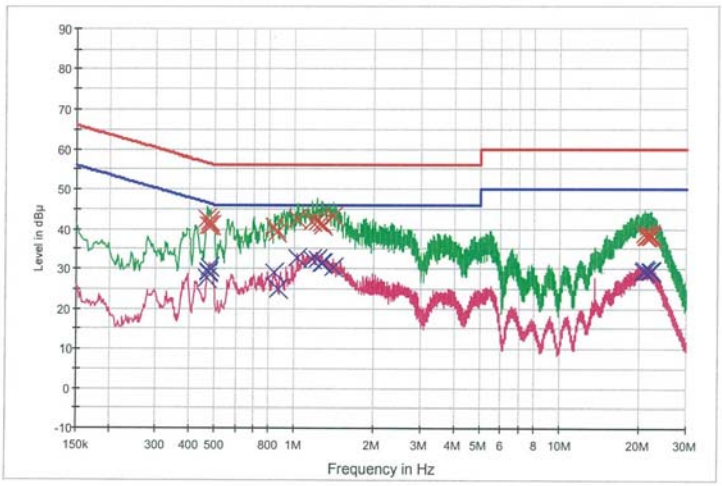
ANT+ L1 1 / 2

HCT TEST Report

Common Information

EUT:	SM-T515
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	ANT+ L1

FCC CLASS B_Exten Cable



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.468000	42.5	9.000	Off	L1	9.8	14.0	56.5
0.474000	40.8	9.000	Off	L1	9.8	15.7	56.4
0.478000	41.8	9.000	Off	L1	9.8	14.6	56.4
0.482000	40.8	9.000	Off	L1	9.8	15.6	56.3
0.840000	40.5	9.000	Off	L1	9.8	15.5	56.0
0.860000	39.1	9.000	Off	L1	9.8	16.9	56.0
1.026000	42.4	9.000	Off	L1	9.8	13.6	56.0
1.166000	41.9	9.000	Off	L1	9.8	14.1	56.0
1.214000	41.9	9.000	Off	L1	9.8	14.1	56.0
1.262000	41.4	9.000	Off	L1	9.9	14.6	56.0
1.274000	40.7	9.000	Off	L1	9.9	15.3	56.0
1.400000	43.1	9.000	Off	L1	9.9	12.9	56.0
20.840000	38.9	9.000	Off	L1	10.6	21.1	60.0
21.034000	38.2	9.000	Off	L1	10.6	21.8	60.0
21.262000	38.3	9.000	Off	L1	10.6	21.8	60.0
21.782000	38.3	9.000	Off	L1	10.6	21.7	60.0
21.868000	38.9	9.000	Off	L1	10.7	21.1	60.0
22.068000	38.2	9.000	Off	L1	10.7	21.8	60.0

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Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.466000	27.8	9.000	Off	L1	9.8	18.8	46.6
0.470000	28.9	9.000	Off	L1	9.8	17.6	46.5
0.474000	29.4	9.000	Off	L1	9.8	17.1	46.4
0.478000	30.3	9.000	Off	L1	9.8	16.1	46.4
0.840000	28.9	9.000	Off	L1	9.8	17.1	46.0
0.862000	24.8	9.000	Off	L1	9.8	21.2	46.0
1.026000	32.8	9.000	Off	L1	9.8	13.2	46.0
1.166000	32.2	9.000	Off	L1	9.8	13.8	46.0
1.214000	32.3	9.000	Off	L1	9.8	13.7	46.0
1.262000	31.3	9.000	Off	L1	9.9	14.7	46.0
1.274000	31.4	9.000	Off	L1	9.9	14.6	46.0
1.400000	30.4	9.000	Off	L1	9.9	15.6	46.0
20.648000	29.3	9.000	Off	L1	10.6	20.7	50.0
20.792000	29.6	9.000	Off	L1	10.6	20.4	50.0
21.034000	29.4	9.000	Off	L1	10.6	20.6	50.0
21.782000	29.5	9.000	Off	L1	10.6	20.5	50.0
21.868000	29.3	9.000	Off	L1	10.7	20.7	50.0
22.042000	29.4	9.000	Off	L1	10.7	20.6	50.0

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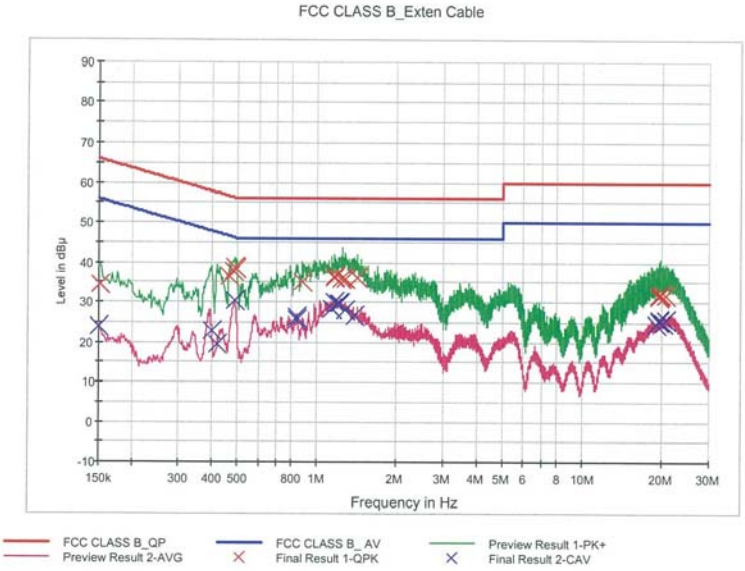
Conducted Emissions (Line 2)

ANT+ N 1 / 2

HCT TEST Report

Common Information

EUT:	SM-T515
Manufacturer:	SAMSUNG
Test Site:	SHIELD ROOM
Operating Conditions:	ANT+ N



Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	34.5	9.000	Off	N	9.8	31.4	65.9
0.468000	36.3	9.000	Off	N	9.9	20.3	56.5
0.484000	37.9	9.000	Off	N	9.9	18.3	56.3
0.488000	38.7	9.000	Off	N	9.9	17.5	56.2
0.496000	38.3	9.000	Off	N	9.9	17.7	56.1
0.882000	35.0	9.000	Off	N	10.0	21.0	56.0
1.164000	36.4	9.000	Off	N	10.0	19.6	56.0
1.168000	36.1	9.000	Off	N	10.0	19.9	56.0
1.232000	35.9	9.000	Off	N	10.0	20.1	56.0
1.244000	36.2	9.000	Off	N	10.0	19.8	56.0
1.282000	35.9	9.000	Off	N	10.0	20.1	56.0
1.412000	36.1	9.000	Off	N	10.1	19.9	56.0
19.436000	31.5	9.000	Off	N	10.9	28.5	60.0
19.530000	31.4	9.000	Off	N	10.9	28.6	60.0
19.550000	31.8	9.000	Off	N	10.9	28.2	60.0
19.606000	32.2	9.000	Off	N	10.9	27.8	60.0
19.668000	31.8	9.000	Off	N	10.9	28.2	60.0
20.646000	31.8	9.000	Off	N	10.9	28.2	60.0

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Final Result 2

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	24.0	9.000	Off	N	9.8	32.0	56.0
0.400000	23.0	9.000	Off	N	9.9	24.9	47.9
0.420000	19.6	9.000	Off	N	9.9	27.9	47.4
0.486000	30.4	9.000	Off	N	9.9	15.9	46.2
0.834000	26.2	9.000	Off	N	10.0	19.8	46.0
0.838000	25.7	9.000	Off	N	10.0	20.3	46.0
1.138000	28.5	9.000	Off	N	10.0	17.5	46.0
1.164000	30.0	9.000	Off	N	10.0	16.0	46.0
1.208000	29.6	9.000	Off	N	10.0	16.4	46.0
1.216000	29.7	9.000	Off	N	10.0	16.3	46.0
1.282000	28.0	9.000	Off	N	10.0	18.0	46.0
1.390000	26.6	9.000	Off	N	10.1	19.4	46.0
19.018000	24.4	9.000	Off	N	10.8	25.6	50.0
19.530000	25.1	9.000	Off	N	10.9	24.9	50.0
19.550000	25.5	9.000	Off	N	10.9	24.5	50.0
20.116000	24.9	9.000	Off	N	10.9	25.1	50.0
20.646000	25.5	9.000	Off	N	10.9	24.5	50.0
20.706000	25.7	9.000	Off	N	10.9	24.4	50.0

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10.LIST OF TEST EQUIPMENT

Conducted Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/12/2018	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/27/2018	Annual	100033
ESPAC	SU-642 /Temperature Chamber	03/30/2018	Annual	0093008124
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY52090906
Agilent	N9030A / Signal Analyzer	01/10/2019	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/26/2018	Annual	101231
Agilent	N1911A / Power Meter	04/16/2018	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/16/2018	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/20/2018	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/07/2018	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/26/2018	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	07/10/2018	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Radiated Test

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	08/23/2018	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/06/2017	Biennial	760
Schwarzbeck	VULB 9160 / TRILOG Antenna	08/09/2018	Biennial	9160-3368
Schwarzbeck	BBHA 9120D / Horn Antenna	05/02/2017	Biennial	9120D-937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	12/04/2017	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer	09/03/2018	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/28/2018	Annual	101068-SZ
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/07/2018	Annual	8
Wainwright Instruments	WHKX7.0/18G-8SS / High Pass Filter	05/09/2018	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/29/2018	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/03/2019	Annual	2
Api tech.	18B-03 / Attenuator (3 dB)	06/07/2018	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	07/17/2018	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	07/10/2018	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	07/10/2018	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	01/03/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/29/2018	Annual	25956

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

11. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-1902-FC037-P
2	HCT-RF-1902-FC038-P
3	HCT-RF-1902-FC039-P
4	HCT-RF-1902-FC040-P
5	HCT-RF-1902-FC041-P
6	HCT-RF-1902-FC042-P