

# FCC / IC BT LE REPORT

## Certification

**FCC/ IC Applicant Name:**

Sena Technologies, Inc.

**Date of Issue:**

November 06, 2018

**FCC Address:**

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Korea

**Test Site/Location:**

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(Republic Of)

**Report No.:** HCT-RF-1810-FI019-R1

<b>FCC ID:</b>	<b>S7A-SP57</b>
<b>IC:</b>	<b>8154A-SP57</b>
<b>APPLICANT:</b>	<b>Sena Technologies, Inc.</b>

<b>Model:</b>	SP57
<b>EUT Type:</b>	Motorcycle Bluetooth Communication System with Mesh Intercom
<b>Frequency Range:</b>	2402 MHz -2480 MHz
<b>Modulation type</b>	GFSK
<b>FCC Classification:</b>	Digital Transmission System(DTS)
<b>FCC Rule Part(s):</b>	Part 15.247
<b>IC Rule Part(s):</b>	RSS-247 Issue 2, RSS-Gen Issue 5

**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)



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**Engineer of Telecommunication testing center**



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**Manager of Telecommunication testing center**

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## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1810-FI019	October 25, 2018	- First Approval Report
HCT-RF-1810-FI019-R1	November 06, 2018	- Revised the ISED Registration date on Page 6 - Revised the Antenna Peak gain on Page 4

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## 1. EUT DESCRIPTION

Model	SP57
EUT Type	Motorcycle Bluetooth Communication System with Mesh Intercom
Power Supply	DC 3.7 V
Frequency Range	2402 MHz - 2480 MHz
Modulation Type	GFSK
Bluetooth Version	4.1
Number of Channels	40 Channels
Antenna Specification	Antenna type: PCB Pattern Antenna Peak Gain : 0.41 dBi
Date(s) of Tests	October 19, 2018 ~ October 23, 2018

## 2. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas Guidance v04 dated April 5, 2017 entitled "Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) and the measurement procedure described in ANSI C63.10(Version : 2013) 'the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices'.

### 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 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C. / the RSS-GEN issue 5, RSS-247 issue 2.

## 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)

### **Conducted Antenna Terminal**

See Section from 9.1 to 9.2.(KDB 558074 v04)

## 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 equipment's, 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 ).

For ISED, test facility was accepted dated September 18, 2018(Registration Number: 5944A-6)

#### 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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ( $\pm$ 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

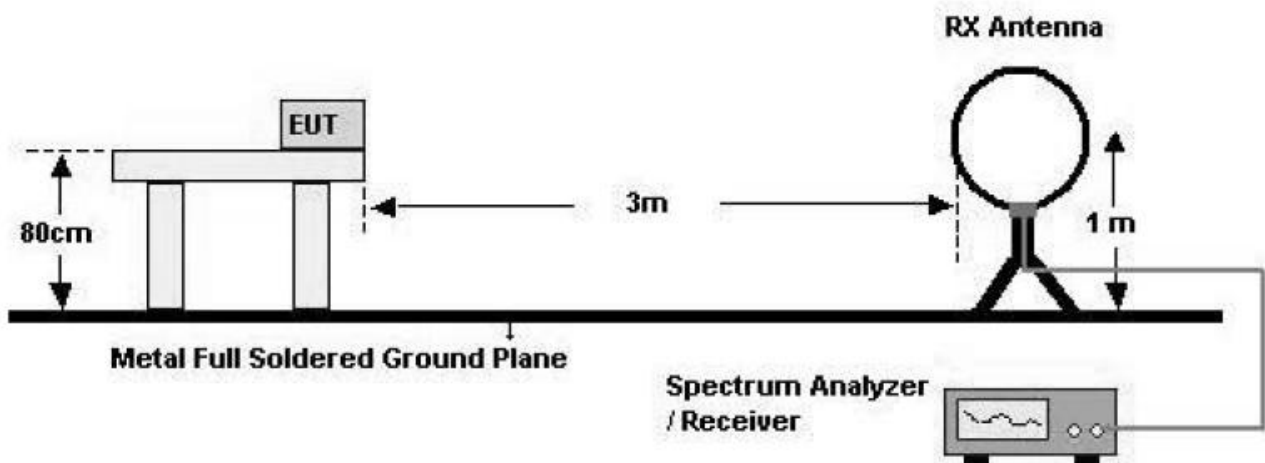
### 7.1. Radiated Test

#### Limit

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

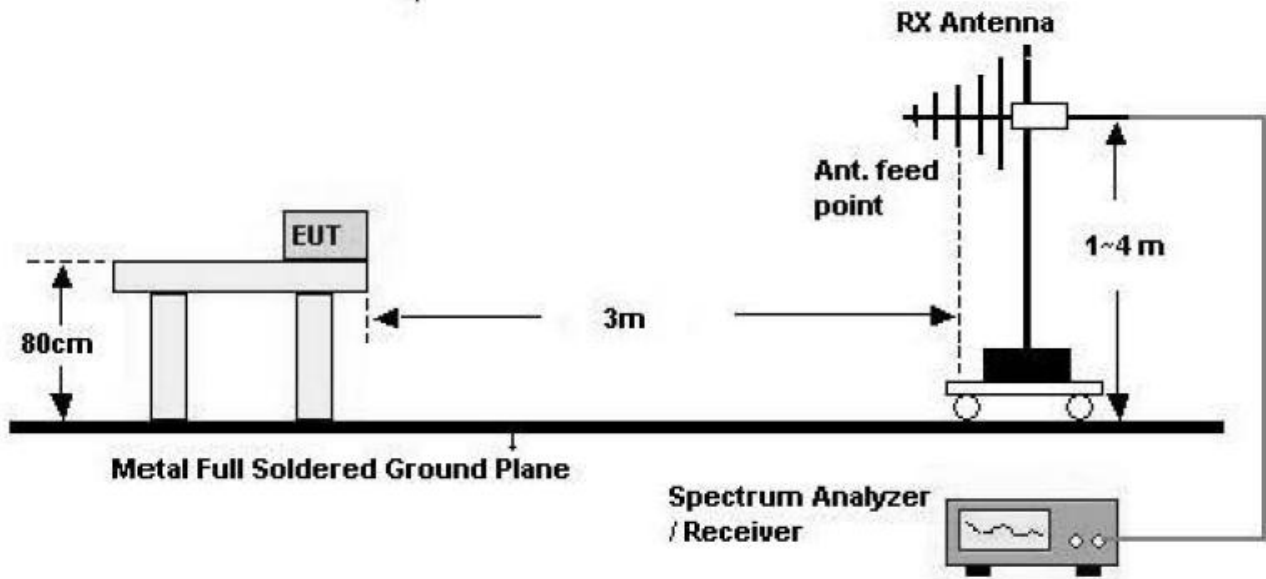
#### Test Configuration

Below 30 MHz

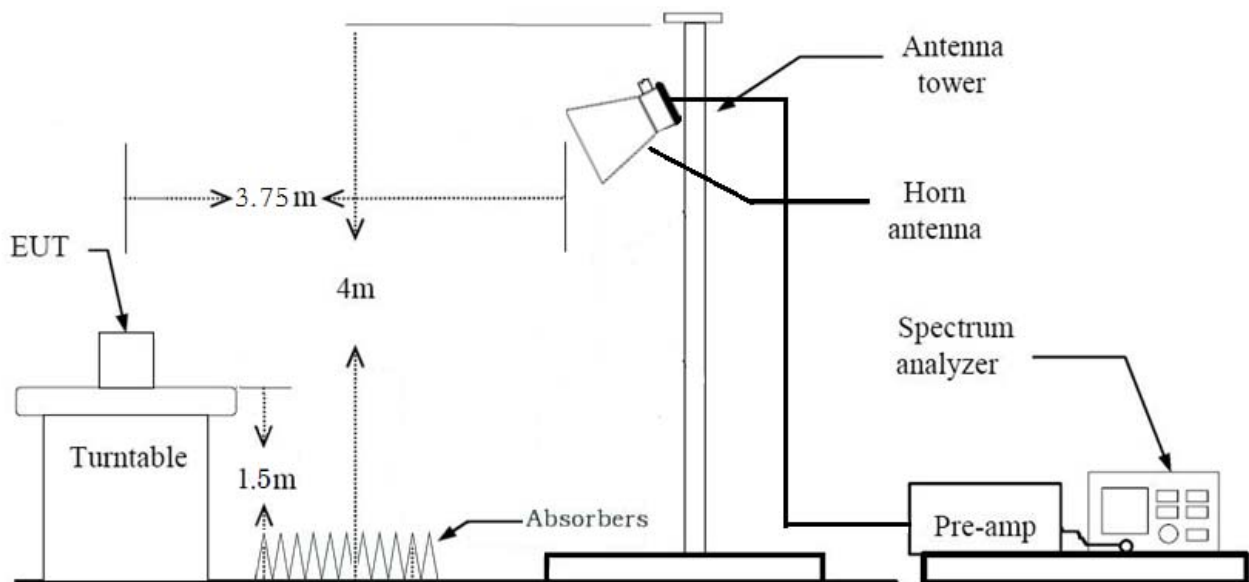




30 MHz - 1 GHz



Above 1 GHz



**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 =  $20 \cdot \log (\text{test distance} / \text{specific distance})$  (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 (Method 12.1 in KDB 558074 v04)

**(1) Measurement Type(Peak):**

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW  $\geq 3 \cdot \text{RBW}$

**(2) Measurement Type(Average):**

- Duty cycle  $< 98\%$ , duty cycle variations are less than  $\pm 2\%$
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \cdot \text{RBW}$
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

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(Measurement Type : Peak)

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

Total(Measurement Type : Average)

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

+ Duty Cycle Factor

**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 =  $20 \cdot \log (\text{test distance} / \text{specific distance})$  (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 : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW  $\geq 3 \cdot \text{RBW}$

**(2) Measurement Type(Average):**

- Duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$
- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \cdot \text{RBW}$
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

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(Measurement Type : Peak)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

Total(Measurement Type : Average)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty Cycle Factor

## 7.2. Receiver Spurious Emissions

### Limit

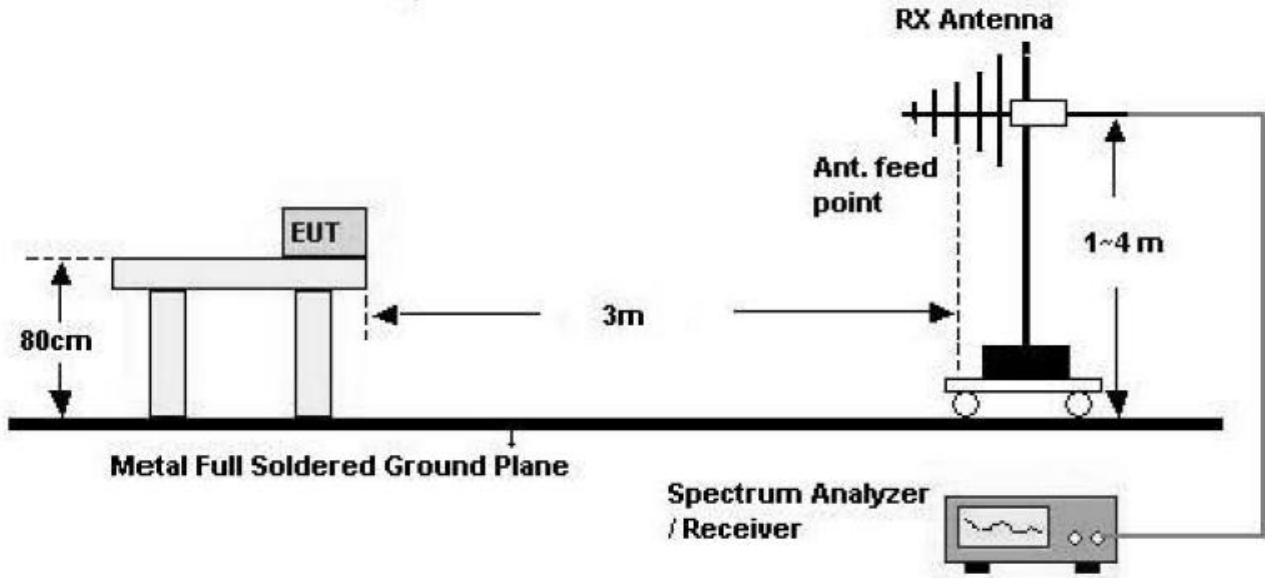
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

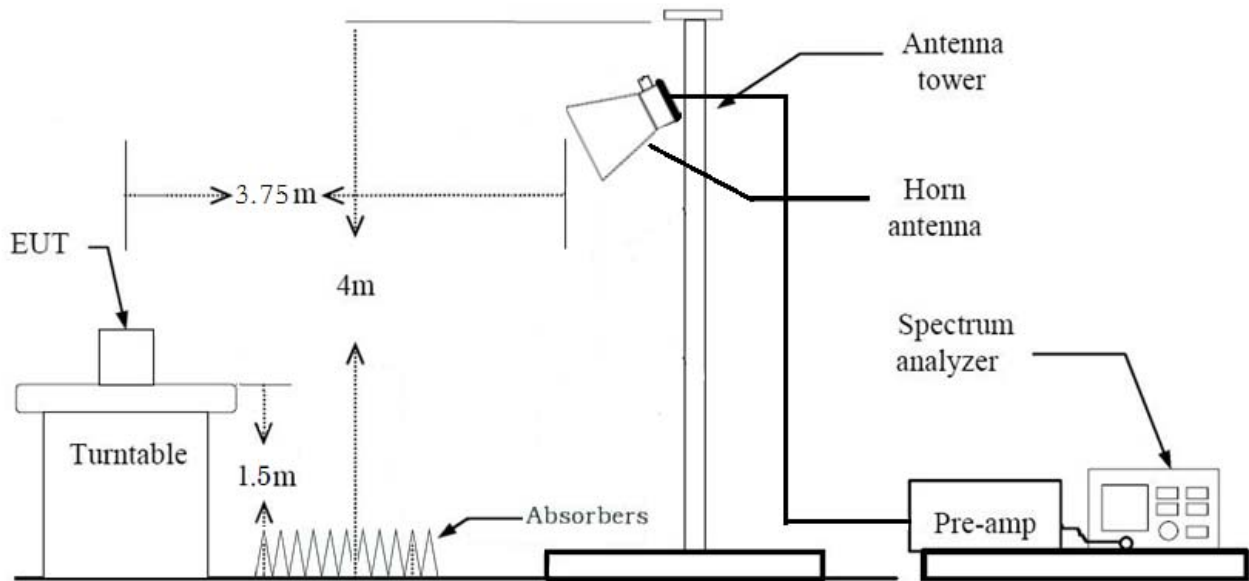
Measurements for compliance with the limits in table may be performed at distances other than 3 meters.

**Test Configuration**

30 MHz - 1 GHz



Above 1 GHz



**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 =  $20 \cdot \log (\text{test distance} / \text{specific distance})$  (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  $\geq 3 \cdot \text{RBW}$
  - (2) Measurement Type(Average):
    - We performed using a reduced video BW method was done with the analyzer in linear mode
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 1 MHz
    - VBW  $\geq 1/\tau$  Hz, where  $\tau$  = pulse width in seconds

The actual setting value of VBW = 1 kHz
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)



### **7.3. Worst case configuration and mode**

#### **Radiated test**

1. All modes of operation were investigated and the worst case configuration results are reported.
2. EUT Axis
  - Radiated Spurious Emissions : X
  - Radiated Restricted Band Edge : X
3. All packet length of operation were investigated and the test results are worst case in lowest packet length.

## 8. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	IC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	RSS-247, 5.2	> 500 kHz	Conducted	NT <sup>Note1</sup>
Occupied Bandwidth	N/A	RSS-GEN, 6.7	N/A		NT <sup>Note1</sup>
Conducted Maximum Peak Output Power	§15.247(b)(3)	RSS-247, 5.4	< 1 Watt		NT <sup>Note1</sup>
Power Spectral Density	§15.247(e)	RSS-247, 5.2	< 8 dBm / 3 kHz Band		NT <sup>Note1</sup>
Band Edge (Out of Band Emissions)	§15.247(d)	RSS-247, 5.5	Conducted > 20 dBc		NT <sup>Note1</sup>
AC Power line Conducted Emissions	§15.207	RSS-GEN, 8.8	<u>See Note1</u>		NT <sup>Note1</sup>
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	RSS-GEN, 8.9	cf. Section 7.1	Radiated	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	RSS-GEN, 8.9 RSS-GEN, 8.10	cf. Section 7.1		PASS
Receiver Spurious Emissions	N/A	RSS-GEN, 7.3	cf. Section 7.2		PASS

### Note:

1. NT = Not Tested, NA = Not Applicable

## 9. TEST RESULT

### 9.1 DUTY CYCLE

$T_{on}$ (ms)	$T_{total}$ (ms)	Duty Cycle	Duty Cycle Factor (dB)
0.3888	0.6485	0.5995	2.218

## 9.2 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:

- The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
- Distance extrapolation factor =  $40 \cdot \log(\text{specific distance} / \text{test distance})$  (dB)
- Limit line = specific Limits (dBuV) + Distance extrapolation factor
- Radiated test is performed with hopping off.
- 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)

### 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:

- 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 Mode: CH Low

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4804	54.31	0.00	0.62	V	54.93	73.98	19.05	PK
4804	44.64	2.22	0.62	V	47.478	53.98	6.50	AV
7206	47.17	0.00	10.05	V	57.22	73.98	16.76	PK
7206	33.56	2.22	10.05	V	45.828	53.98	8.15	AV
4804	53.95	0.00	0.62	H	54.57	73.98	19.41	PK
4804	43.90	2.22	0.62	H	46.738	53.98	7.24	AV
7206	47.05	0.00	10.05	H	57.1	73.98	16.88	PK
7206	33.41	2.22	10.05	H	45.678	53.98	8.30	AV

Operation Mode: CH Mid

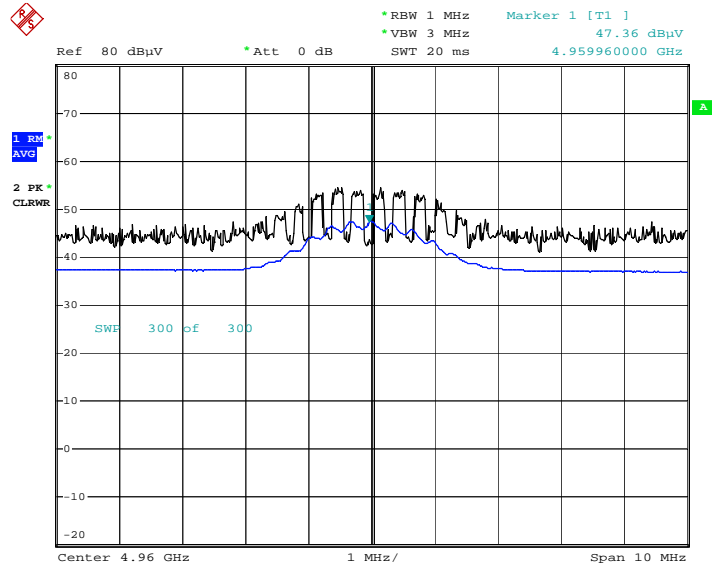
Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4880	55.07	0.00	1.61	V	56.68	73.98	17.30	PK
4880	47.02	2.22	1.61	V	50.848	53.98	3.13	AV
7320	47.46	0.00	10.02	V	57.48	73.98	16.50	PK
7320	33.49	2.22	10.02	V	45.728	53.98	8.25	AV
4880	54.56	0.00	1.61	H	56.17	73.98	17.81	PK
4880	46.13	2.22	1.61	H	49.958	53.98	4.02	AV
7320	47.51	0.00	10.02	H	57.53	73.98	16.45	PK
7320	33.50	2.22	10.02	H	45.738	53.98	8.24	AV

Operation Mode: CH High

Frequency [MHz]	Reading [dBuV]	Duty Cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
4960	55.63	0.00	1.69	V	57.32	73.98	16.66	PK
4960	47.36	2.22	1.69	V	51.27	53.98	2.71	AV
7440	48.12	0.00	11.43	V	59.55	73.98	14.43	PK
7440	34.00	2.22	11.43	V	47.648	53.98	6.33	AV
4960	54.80	0.00	1.69	H	56.49	73.98	17.49	PK
4960	46.98	2.22	1.69	H	50.888	53.98	3.09	AV
7440	47.97	0.00	11.43	H	59.4	73.98	14.58	PK
7440	33.94	2.22	11.43	H	47.588	53.98	6.39	AV

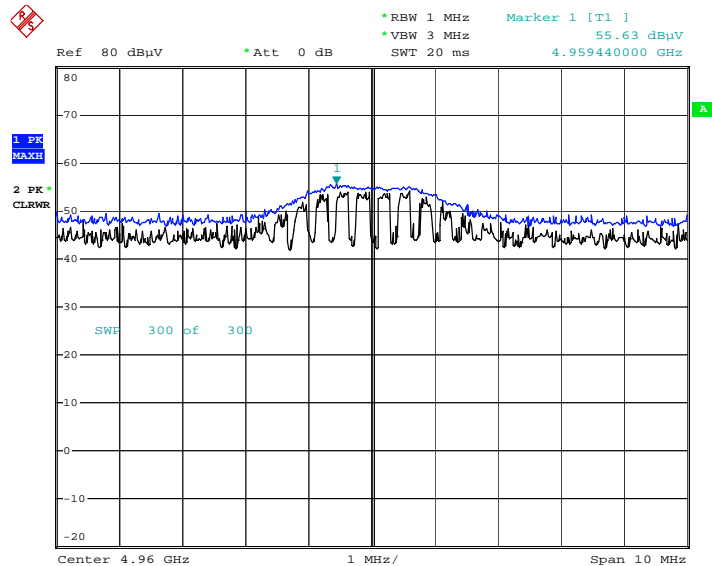
## Test Plots (Worst case : X-V)

Radiated Spurious Emissions plot – Average Reading (Ch.39 2nd Harmonic)



Date: 19.OCT.2018 16:40:10

Radiated Spurious Emissions plot – Peak Reading (Ch.39 2nd Harmonic)



Date: 19.OCT.2018 16:37:42

### Note:

Plot of worst case are only reported.

### 9.3 RADIATED RESTRICTED BAND EDGES

Operating Frequency 2402 MHz  
Channel No. 0

Frequency [MHz]	Reading [dBuV/m]	Duty Cycle Factor [dB]	A.F.+C.L.+D.F. [dB]	Ant. Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2390.0	15.91	0.00	33.30	H	49.21	73.98	24.78	PK
2390.0	4.78	2.22	33.30	H	40.30	53.98	13.68	AV
2390.0	15.74	0.00	33.30	V	49.04	73.98	24.94	PK
2390.0	4.68	2.22	33.30	V	40.20	53.98	13.78	AV

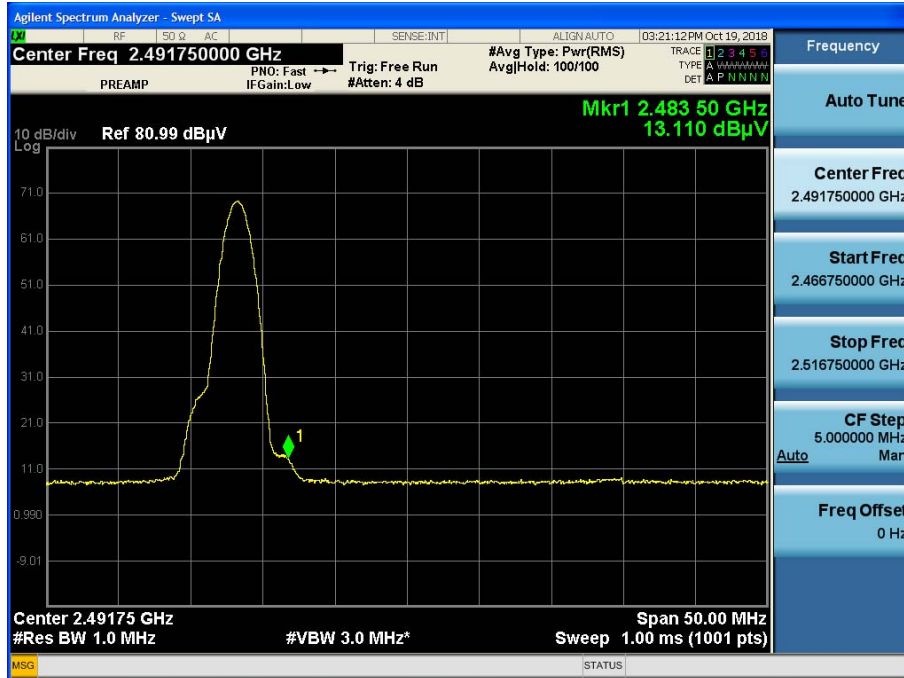
Operating Frequency 2480 MHz  
Channel No. 39

Frequency [MHz]	Reading [dBuV/m]	Duty Cycle Factor [dB]	A.F.+C.L.+D.F. [dB]	Ant. Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	24.78	0.00	33.41	H	58.19	73.98	15.79	PK
2483.5	13.11	2.22	33.41	H	48.74	53.98	5.24	AV
2483.5	23.88	0.00	33.41	V	57.29	73.98	16.69	PK
2483.5	12.97	2.22	33.41	V	48.60	53.98	5.38	AV

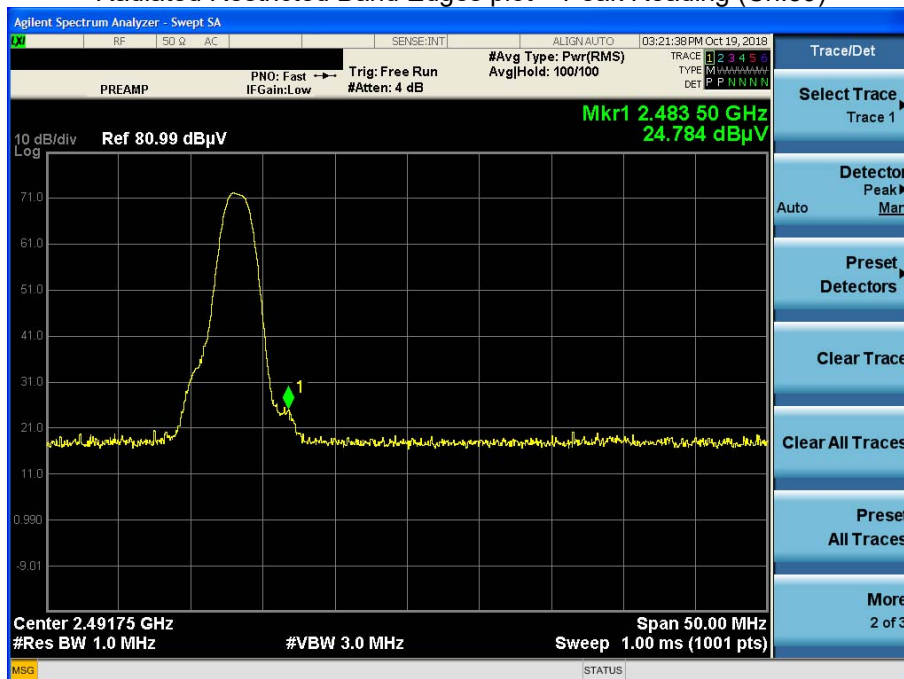


## Test Plots (Worst case : X-H)

Radiated Restricted Band Edges plot – Average Reading (Ch.39)



Radiated Restricted Band Edges plot – Peak Reading (Ch.39)



### Note:

Plot of worst case are only reported.

## 9.4 RECEIVER SPURIOUS EMISSIONS

### 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

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							

## 10. LIST OF TEST EQUIPMENT

### 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 9160 / Hybrid Antenna	08/09/2018	Biennial	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
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/07/2018	Annual	8
Wainwright Instruments	WHFX7.0/18G-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	01/03/2018	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	01/10/2018	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/29/2018	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/27/2018	Annual	3000C000276

### 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-1810-FI018-P
2	HCT-RF-1810-FI019-P
3	HCT-RF-1810-FI020-P