

TEST REPORT

Product Name : HaritoraX Wireless
Model Number : SVP-MC3S
FCC ID : 2A4GC-SVPMC3S

Prepared for : Shiftall Inc.
Address : 4F TokyoDaiwa Bldg., 2-6-10 Nihonbashibakurocho, Chuo,
Tokyo, Japan

Prepared by : EMTEK (SHENZHEN) CO., LTD.
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Report Number : ENS2308010104E00402R
Date(s) of Tests : June 28, 2023 to August 08, 2023
Date of issue : August 08, 2023

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1 TEST RESULT CERTIFICATION

Applicant : Shiftall Inc.
Address : 4F TokyoDaiwa Bldg., 2-6-10 Nihonbashibakurocho, Chuo, Tokyo, Japan
Manufacturer : Shiftall Inc.
Address : 4F TokyoDaiwa Bldg., 2-6-10 Nihonbashibakurocho, Chuo, Tokyo, Japan
Factory : P. IMES Corporation
Address : Block 16 Phase IV, Cavite Economic Zone, Rosario, Cavite PHILIPPINES
EUT : HaritoraX Wireless
Model Name : SVP-MC3S
Trademark : HaritoraX Wireless

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C	PASS
IC RSS-GEN, Issue 5, March 2021 IC RSS-210, Issue 10, April 2020	PASS

The above equipment was tested by EMTEK(SHENZHEN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2, Part 15.249, IC RSS-GEN Issue 5 and IC RSS-210 Issue 10. The test results of this report relate only to the tested sample identified in this report.

Date of Test : June 28, 2023 to August 08, 2023

Prepared by : Una Yu /Editor

Reviewer : Joe Xia/Supervisor

Approved & Authorized Signer : Lisa Wang/Manager



Modified History

Version	Report No.	Revision Date	Summary
	ENS2308010104E00402R	/	Original Report



2 EUT TECHNICAL DESCRIPTION

Product:	HaritoraX Wireless
Model Number:	SVP-MC3S
Sample number:	2#
Device Type:	SRD
Data Rate :	1Mbps, 2Mbps
Modulation:	GFSK
Frequency Range:	2402MHz-2480MHz
Number of Channels:	11 channels and 40 frequencies
Max Transmit Power:	79.08 dBuV@3m
Antenna Gain:	-2.52 dBi
Antenna:	PCB Antenna
Power supply:	DC 5V from Speaker, DC 3.7V from battery
Product SW/HW version:	HW: V1.0 SW: V1.0
Radio SW/HW version:	HW: V1.0 SW: V1.0
Temperature Range:	10°C ~ +30°C

Note: for more details, please refer to the User's manual of the EUT.

3 SUMMARY OF TEST RESULT

FCC Part Clause	IC Part Clause	Test Parameter	Verdict	Remark
15.207	RSS-GEN Clause 8.8	Conducted Emission	PASS	
15.209	RSS-Gen.8.9 RSS-210 Annex B.10(a)	Radiated Emission	PASS	
15.249	RSS-210 Annex B.10(a)	Radiated Spurious Emission	PASS	
15.249	RSS-210 Annex B.10(a)	Band edge test	PASS	
15.249	RSS-GEN Clause 6.7 RSS-210 Annex B.10 (b)	Emission Bandwidth	PASS	
15.203	RSS-GEN Clause 6.8	Antenna Requirement	PASS	
NOTE1: N/A (Not Applicable)				
NOTE2: The report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.				

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for **FCC ID: 2A4GC-SVPMC3S** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 2, Subpart J
FCC 47 CFR Part 15, Subpart C
IC RSS-GEN, Issue 5, March 2021
IC RSS-210, Issue 10, April 2020

4.2 MEASUREMENT EQUIPMENT USED

For Conducted Emission Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Test Receiver	Rohde & Schwarz	ESCI	101384	2023/5/13	1 Year
L.I.S.N.	Rohde & Schwarz	ENV216	5	2023/5/13	1 Year
L.I.S.N.	Kyoritsu	KNW-407	8-1492-9	2023/5/11	1 Year

For Spurious Emissions Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	Rohde & Schwarz	ESU 26	100154	2023/5/13	1Year
Pre-Amplifier	Lunar EM	LNA30M3G-25	J10100000070	2023/5/13	1Year
Bilog Antenna	Schwarzbeck	VULB9163	661	2021/8/22	2 Year
Horn antenna	Schwarzbeck	BBHA9120D	9120D-1177	2023/5/12	2 Year
Pre-Amplifier	SKET	LNPA_0118G-45	SK2019051801	2023/5/10	1Year
Loop Antenna	Schwarzbeck	FMZB1519	1519-012	2023/5/12	2 Year
Spectrum Analyzer	Rohde & Schwarz	FSV40	100967	2023/5/10	1Year
Horn antenna	Schwarzbeck	BBHA9120D	9120D-1178	2023/5/10	1Year
Band reject Filter(50dB)	WI/DE	WRCGV-2400(2400-2485MHz)	2	2023/5/10	1Year
Horn antenna	Schwarzbeck	BBHA9170	9170-399	2023/5/12	2 Year

For other test items:

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Wireless Connectivity Tester	R&S	CMW270	102543	2023/5/13	1Year
Automatic Control Unit	Tonscend	JS0806-2	21I8060480	2023/5/13	1Year
Signal Analyzer	KEYSIGHT	N9010B	MY60242456	2023/5/13	1Year
Analog Signal Generator	KEYSIGHT	N5173B	MY61252625	2023/5/13	1Year
UP/DOWN-Converter	R&S	CMW-Z800A	100274	2023/5/13	1Year
Vector Signal Generator	KEYSIGHT	N5182B	MY61252674	2023/5/13	1Year
Frequency Extender	KEYSIGHT	N5182BX07	MY59362541	2023/5/13	1Year
Temperature&Humidity test chamber	ESPEC	EL-02KA	12107166	2023/5/13	1 Year

Remark: Each piece of equipment is scheduled for calibration once a year.

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

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

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

The EUT has been tested under its typical operating condition so those modulation and channel were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

The product is specially treated and the rating is used in the form of a channel collection. Samples of fixed frequency and rate are provided by the applicant for testing

Frequency and Channel list:

Channel	Frequency (MHz)			
1	2402	2422	2442	2462
2	2404	2424	2444	2464
3	2406	2426	2446	2466
4	2408	2428	2448	2468
5	2410	2430	2450	2470
6	2412	2432	2452	2472
7	2414	2434	2454	2474
8	2416	2456	2476	
9	2418	2438	2478	
10	2420	2440	2460	
11	2436	2458	2480	

Test Frequency and Channel list:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	10	2440	11	2480

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

EMTEK (SHENZHEN) CO., LTD.

Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab. : **Accredited by CNAS**
The Certificate Registration Number is L2291.
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01 (identical to ISO/IEC 17025:2017)

Accredited by FCC
Designation Number: CN1204
Test Firm Registration Number: 882943

Accredited by A2LA
The Certificate Number is 4321.01.

Accredited by Industry Canada
The Conformity Assessment Body Identifier is CN0008

Name of Firm : EMTEK (SHENZHEN) CO., LTD.
Site Location : Building 69, Majialong Industry Zone,
Nanshan District, Shenzhen, Guangdong, China

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

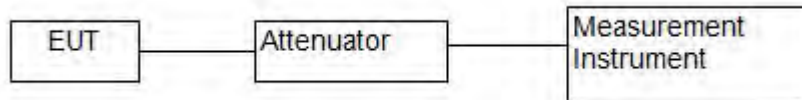
Measurement Uncertainty for a level of Confidence of 95%



7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP 1

The EUT wireless component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the the specified distance from the EUT.

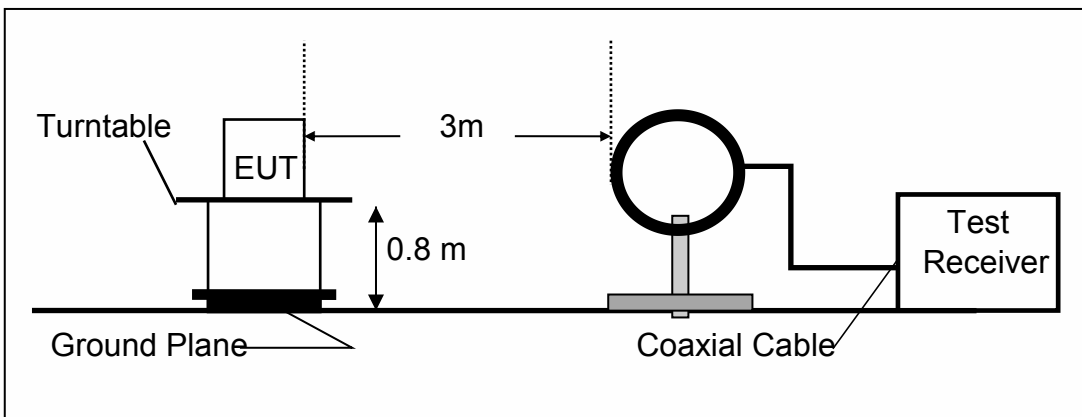
30MHz-1GHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

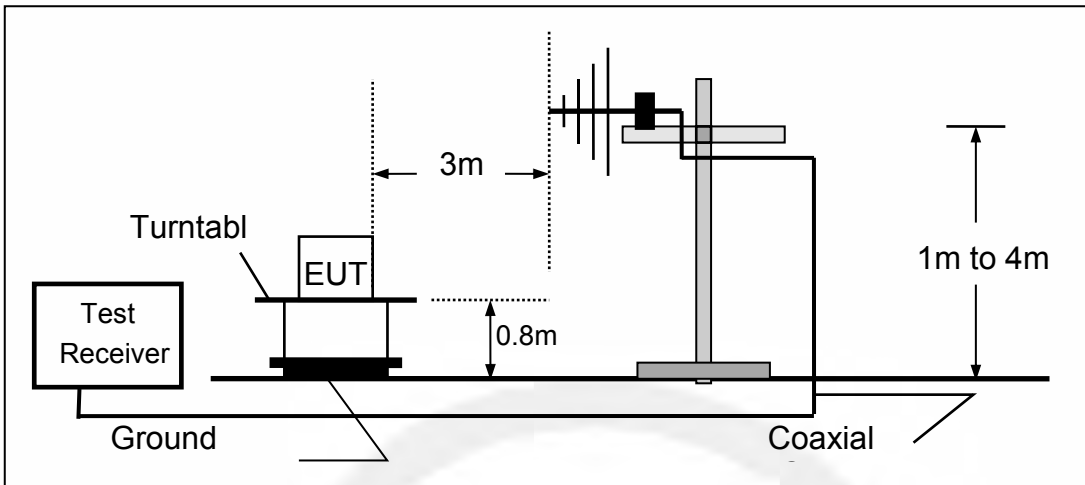
Above 1GHz:

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

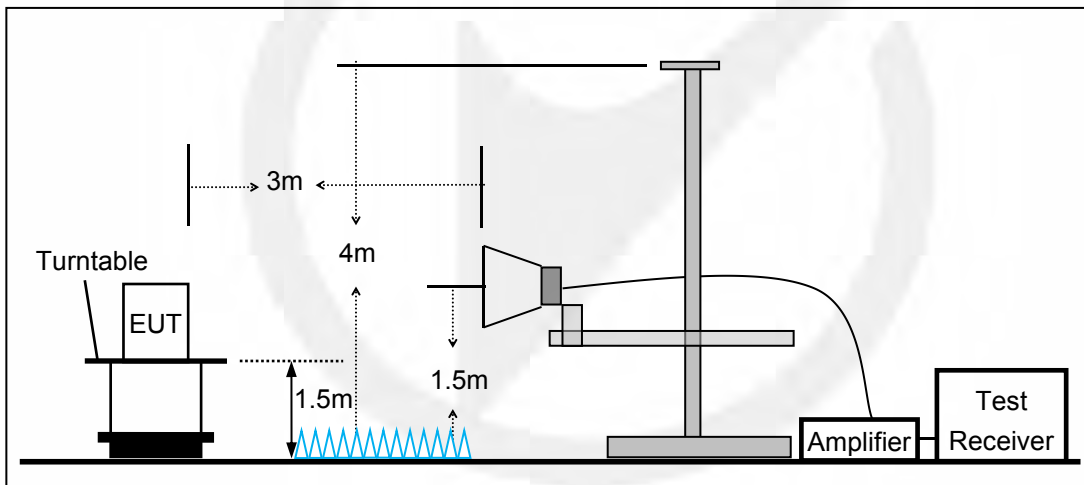
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz



7.3 CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	E46L	11S168003748Z0LR06E0HG
Adaptor	Apple	/	/
/	/	/	/

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

8 TEST REQUIREMENTS

8.1 BANDWIDTH TEST

8.1.1 Applicable Standard

According to FCC Part 15.249
According to RSS-GEN Clause 6.7

8.1.2 Conformance Limit

N/A

8.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.1.4 Test Procedure

The EUT was operating in controlled its channel. Printed out the test result from the spectrum by hard copy function. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW $\geq 1\%$ of the 20 dB bandwidth(30KHz)

Set the video bandwidth (VBW) $\geq$ RBW(100KHz).

Set Span= approximately 2 to 3 times the 20 dB bandwidth

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

Measure and record the results in the test report.

Test Results

Temperature:	25°C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

Note: N/A

TestMode	Antenna	Frequency[MHz]	20DB BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
GFSK_1M	Ant1	2402	1.056	2401.448	2402.504	0.5	PASS
GFSK_1M	Ant1	2440	1.096	2439.448	2440.544	0.5	PASS
GFSK_1M	Ant1	2480	1.044	2479.444	2480.488	0.5	PASS
GFSK_2M	Ant1	2402	2.136	2400.912	2403.048	0.5	PASS
GFSK_2M	Ant1	2440	2.088	2438.916	2441.004	0.5	PASS
GFSK_2M	Ant1	2480	2.060	2478.924	2480.984	0.5	PASS



GFSK_1M-Ant1-2402



GFSK_1M-Ant1-2440



GFSK 1M-Ant1-2480



GFSK 2M-Ant1-2402



GFSK_2M-Ant1-2440



GFSK_2M-Ant1-2480

8.2 99% BANDWIDTH

8.2.1 Applicable Standard

According to RSS-GEN Clause 6.7

8.2.2 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.2.3 Test Procedure

The EUT was operating in Bluetooth mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 1%-5% OBW(30 KHz).

Set the video bandwidth (VBW) =100 kHz.

Set Span=3 MHz

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Allow the trace to stabilize.

Use the 99 % power bandwidth function of the instrument

Measure the maximum width of the emission.

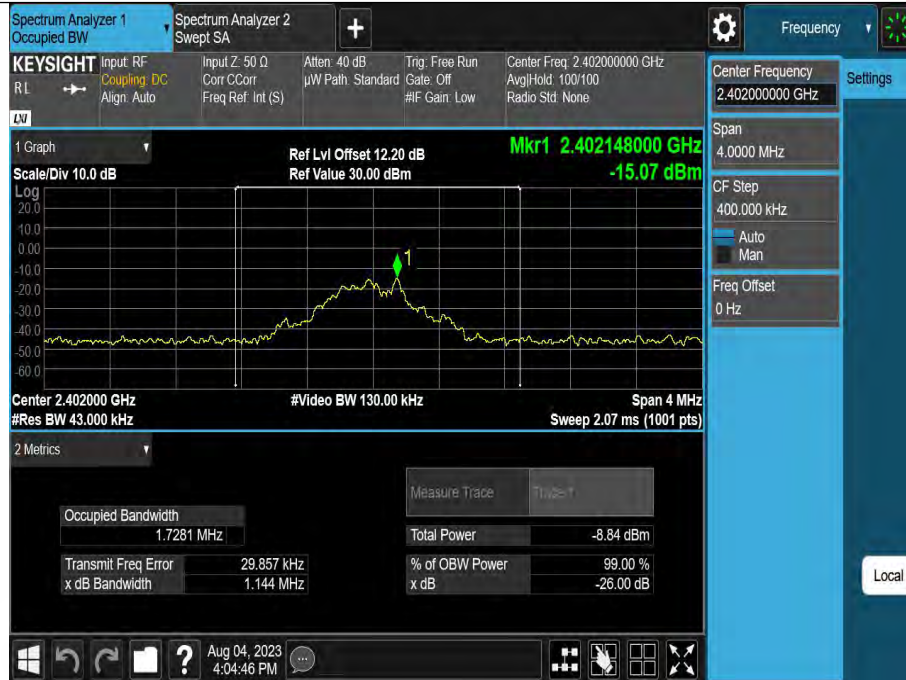
Measure and record the results in the test report.

8.2.4 Test Results

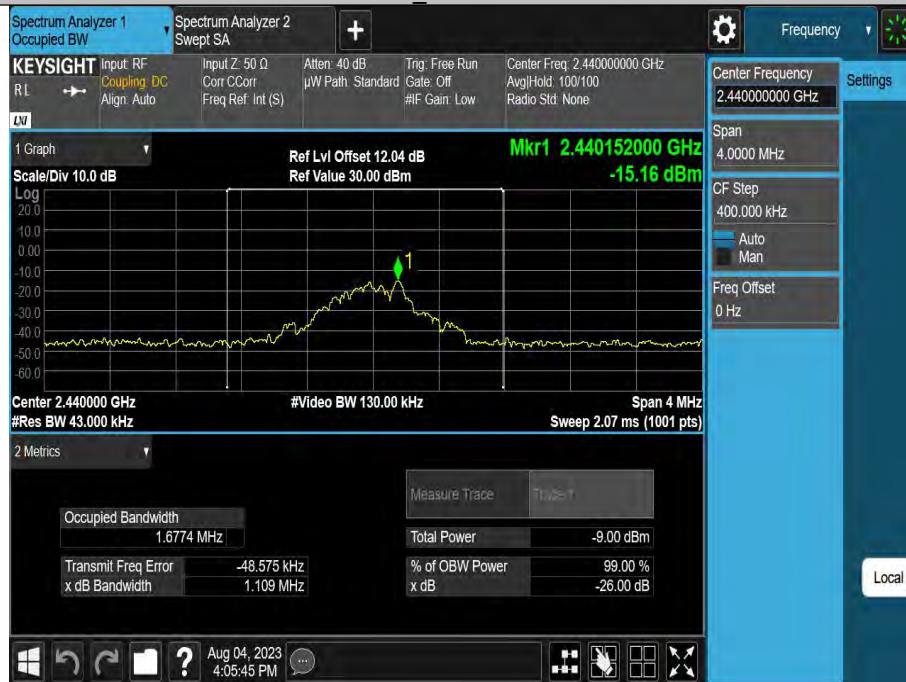
Temperature:	25°C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

Note: N/A

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
GFSK_1M	Ant1	2402	1.7281	2401.1658	2402.8939	---	---
GFSK_1M	Ant1	2440	1.6774	2439.1127	2440.7901	---	---
GFSK_1M	Ant1	2480	1.0948	2479.4280	2480.5228	---	---
GFSK_2M	Ant1	2402	2.0566	2400.9470	2403.0036	---	---
GFSK_2M	Ant1	2440	1.9419	2439.0147	2440.9566	---	---
GFSK_2M	Ant1	2480	1.8931	2479.0299	2480.9230	---	---



GFSK_1M-Ant1-2402



GFSK_1M-Ant1-2440



GFSK_1M-Ant1-2480



GFSK_2M-Ant1-2402



GFSK_2M-Ant1-2440



GFSK_2M-Ant1-2480

8.3 RADIATED SPURIOUS EMISSION

8.3.1 Applicable Standard

According to FCC Part 15.249 and 15.209

According to RSS-Gen.8.9, RSS-Gen 8.10 and RSS-210 Annex B.10

8.3.2 Conformance Limit

According to FCC Part 15.249 and RSS-210 Annex B.10(a): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part15.205 and RSS-Gen.8.10, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part15.205 and RSS-Gen.8.9, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	24000/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remark : 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB);

Limit line=Specific limits(dBuV) + distance extrapolation factor.

for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*lg(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

Field strength of fundamental and Field strength of harmonics Limit:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50(94 dBV/m)	500(54 dBV/m)
2400-2483.5 MHz	50(94 dBV/m)	500(54 dBV/m)
5725-5875 MHz	50(94 dBV/m)	500(54 dBV/m)
24.0-24.25 GHz	250(108 dBV/m)	2500(68 dBV/m)

As shown in §15.35(b) and RSS-210 Annex B.10, 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

For this report

Fundamental Frequency	Field Strength Of Fundamental	Field Strength of Spurious Emissions
2400-2483.5 MHz	AV:94 dBuV/m at 3m distance	AV:54 dBuV/m at 3m distance
	PK:114 dBuV/m at 3m distance	PK:74 dBuV/m at 3m distance

8.3.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

8.3.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz(1GHz to 25GHz), 100 kHz for $f < 1$ GHz(30MHz to 1GHz)

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

8.3.5 Test Results

Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

■ Spurious Emission below 30MHz (9KHz to 30MHz)

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})(\text{dB})$;

Limit line = Specific limits(dBuV) + distance extrapolation factor

■ Field Strength of the fundamental signal

All modes have been tested, and the worst result(GFSK_1Mbps) recorded was report as below:

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2402	V	71.31	59.05	114	94	-42.69	-34.95
2402	H	75.65	60.92	114	94	-38.35	-33.08
2440	V	76.66	64.14	114	94	-37.34	-29.86
2440	H	79.08	66.51	114	94	-34.92	-27.49
2480	V	78.74	65.43	114	94	-35.26	-28.57
2480	H	74.76	59.35	114	94	-39.24	-34.65

Note: (1) Correct Factor= Antenna Factor +Cable Loss- Amplifier Gain

(2) Emission Level= Reading Level+Probe Factor +Cable Loss

■ Out of Band Emissions

All modes have been tested, and the worst result(GFSK_2Mbps) recorded was report as below:

Test mode: GFSK Frequency: Channel 1: 2402MHz

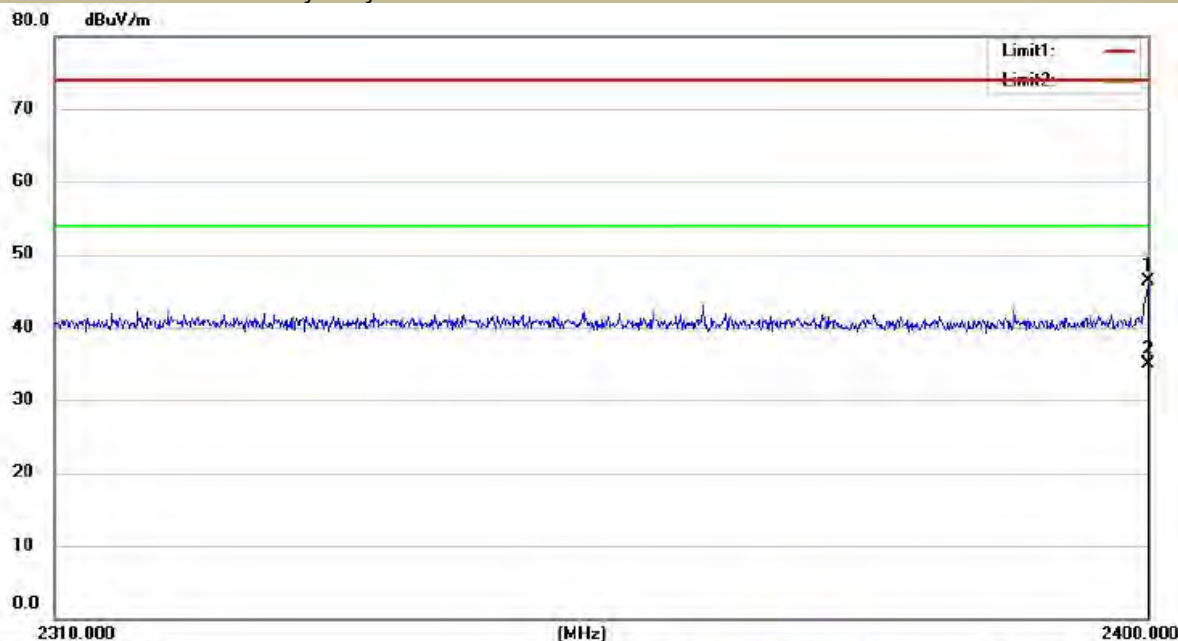
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
2400.00	H	46.36	74	34.94	54
2400.00	V	47.30	74	35.82	54

Test mode: GFSK Frequency: Channel 11: 2480MHz

Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
2484.556	H	42.65	74	30.50	54
2483.863	V	43.18	74	31.63	54

- Note:**
- (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
 - (2) Emission Level= Reading Level+Correct Factor +Cable Loss.
 - (3) Correct Factor= Ant_F + Cab_L - Preamp
 - (4)Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Test Model	Band Emissions
	Low
Test By: Ccyf	GFSK H

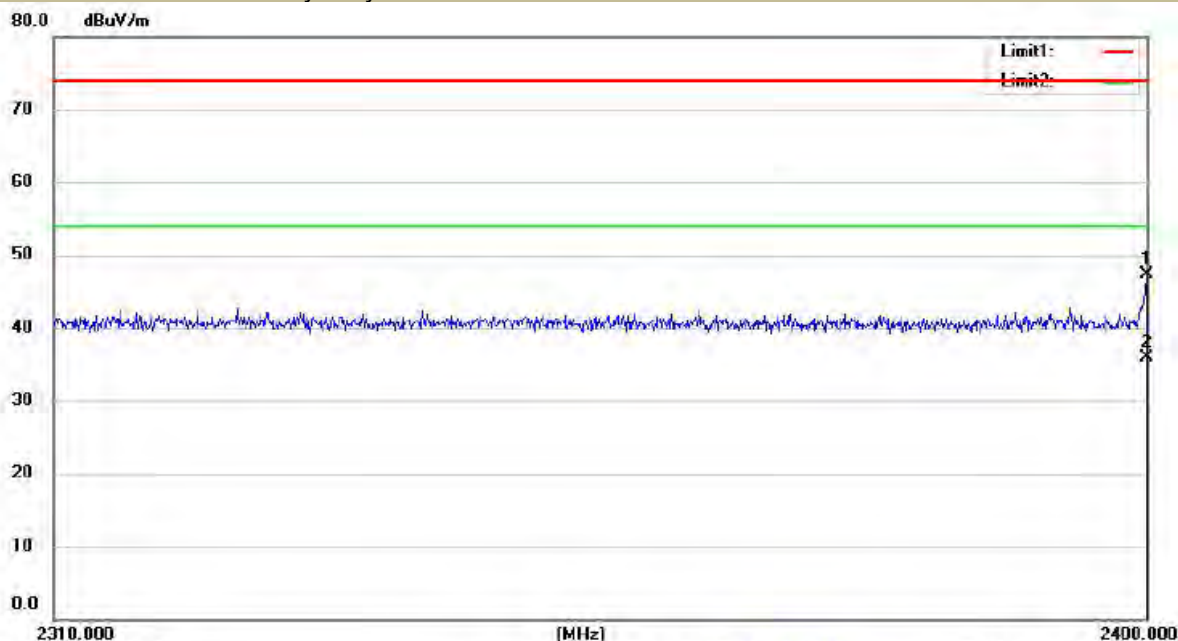


Site Chamber #1

Polarization: **Horizontal**

Temperature: 24.2 C

Test Model	Band Emissions
	Low
Test By: Ccyf	GFSK V

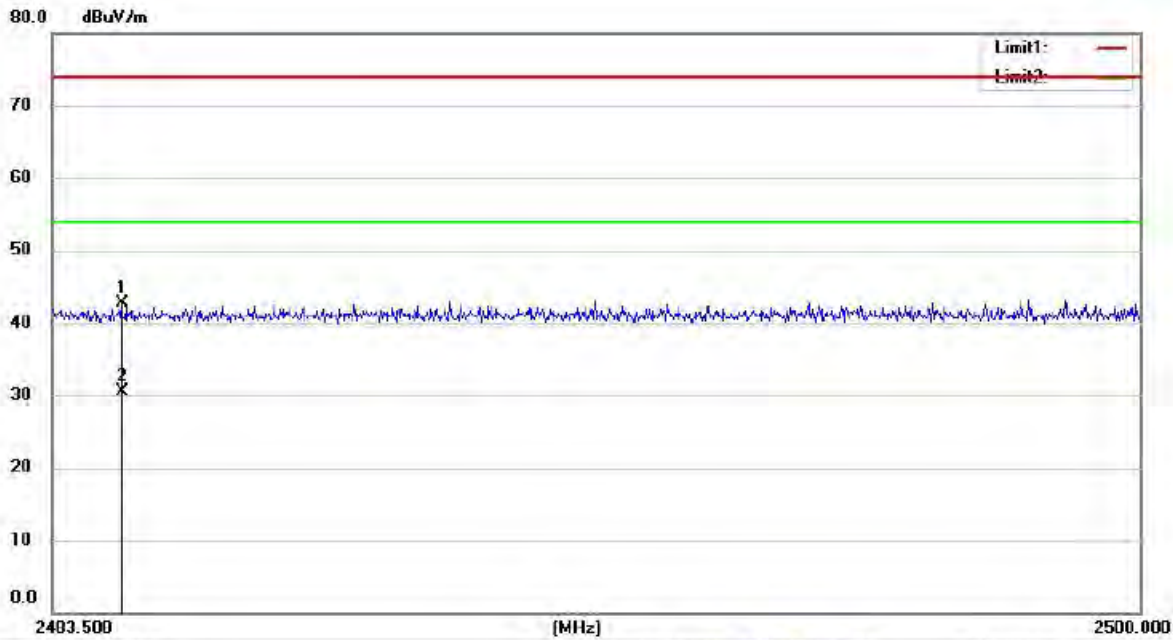


Site Chamber #1

Polarization: **Vertical**

Temperature: 24.2 C

Test Model	Band Emissions
	High
Test By: Ccyf	GFSK H

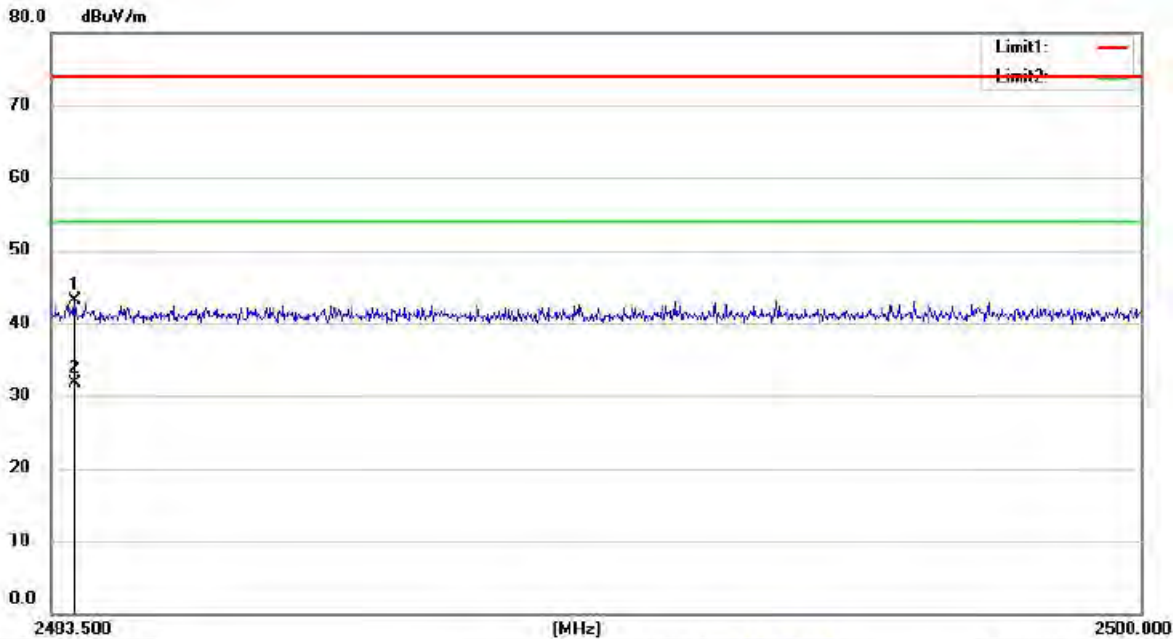


Site Chamber #1

Polarization: *Horizontal*

Temperature: 24.2 C

Test Model	Band Emissions
	High
Test By: Ccyf	GFSK V



Site Chamber #1

Polarization: *Vertical*

Temperature: 24.2 C

■ Spurious Emission Above 1GHz (1GHz to 25GHz)

All modes have been tested, and the worst result(GFSK_1Mbps) recorded was report as below:

Test mode: GFSK Frequency: Channel 1: 2402MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
7619.991	V	58.41	44.48	74.00	54.00	-15.59	-9.52
10989.99	V	57.71	43.94	74.00	54.00	-16.29	-10.06
13272.92	V	58.38	44.34	74.00	54.00	-15.62	-9.66
7777.981	H	58.85	44.67	74.00	54.00	-15.15	-9.33
12344.1	H	58.59	44.63	74.00	54.00	-15.41	-9.37
14107.59	H	58.27	44.46	74.00	54.00	-15.73	-9.54

Test mode: GFSK Frequency: Channel 10: 2440MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
7782.479	V	59.38	45.14	74.00	54.00	-14.62	-8.86
12531.03	V	58.60	44.71	74.00	54.00	-15.40	-9.29
14366.84	V	57.61	43.78	74.00	54.00	-16.39	-10.22
7753.291	H	59.03	44.72	74.00	54.00	-14.97	-9.28
11345.02	H	58.59	44.50	74.00	54.00	-15.41	-9.50
13993.88	H	58.42	44.54	74.00	54.00	-15.58	-9.46

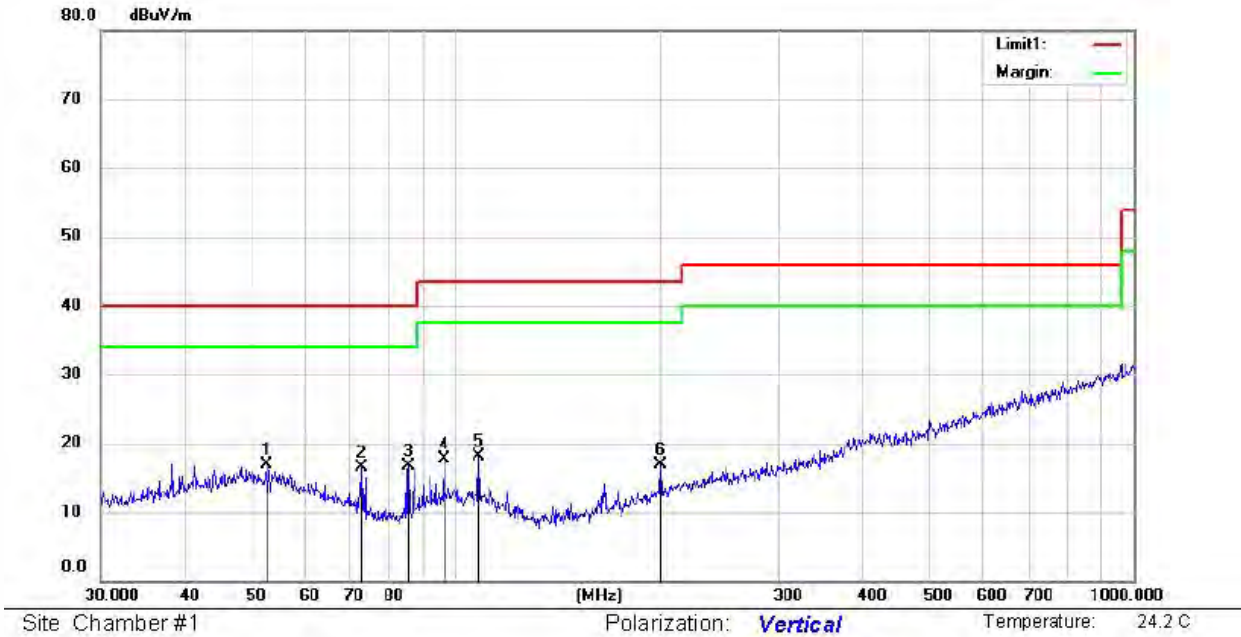
Test mode: GFSK Frequency: Channel 11: 2480MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
7816.293	V	59.42	45.30	74.00	54.00	-14.58	-8.70
11322.09	V	58.71	44.56	74.00	54.00	-15.29	-9.44
13207.87	V	59.05	44.83	74.00	54.00	-14.95	-9.17
7724.213	H	59.04	44.79	74.00	54.00	-14.96	-9.21
11335.19	H	58.01	43.92	74.00	54.00	-15.99	-10.08
14030.33	H	58.45	44.33	74.00	54.00	-15.55	-9.67

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
 (2) Emission Level= Reading Level+Correct Factor +Cable Loss.
 (3) Correct Factor= Ant_F + Cab_L - Preamp
 (4)Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission below 1GHz (30MHz to 1GHz)

All modes have been tested, and the worst result(GFSK_1Mbps) recorded was report as below:



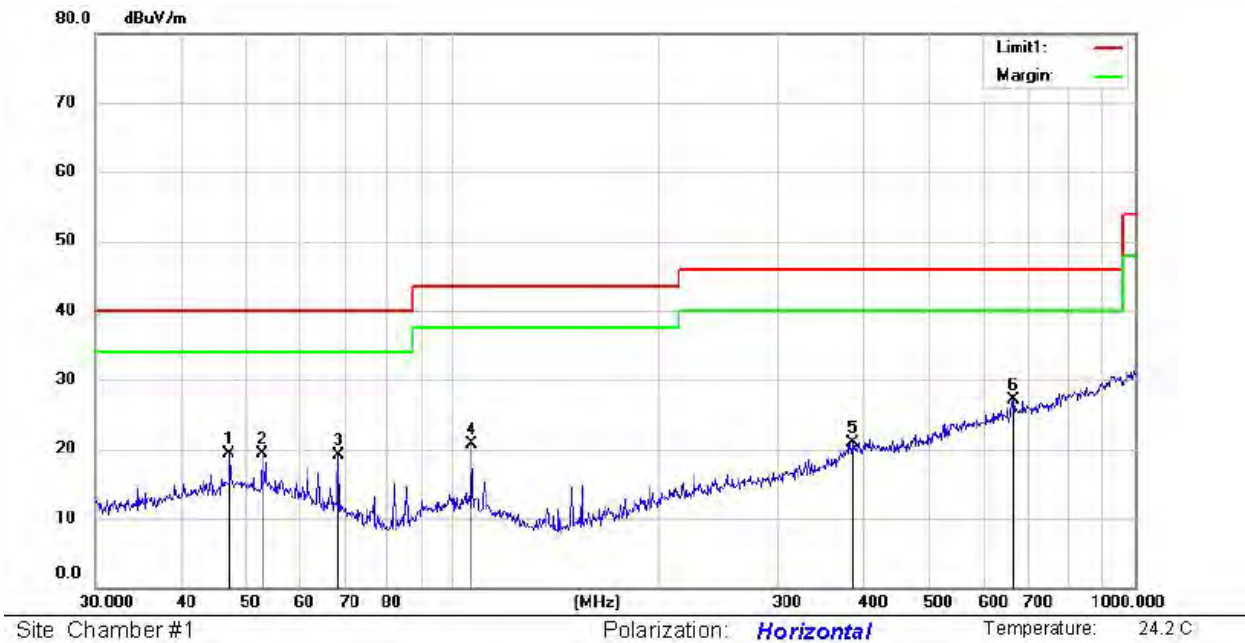
Mode:TX 2.4G 1M

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	HI	Degree	Comment
1	*	52.5753	32.82	13.74	30.49	0.85	16.92	40.00	-23.08	QP		
2		72.8466	36.97	9.1	30.56	1.09	16.60	40.00	-23.40	QP		
3		85.2980	37.71	8.68	30.67	1.06	16.78	40.00	-23.22	QP		
4		96.0986	36.52	10.98	30.83	1.08	17.75	43.50	-25.75	QP		
5		108.2667	36.29	11.5	30.85	1.14	18.08	43.50	-25.42	QP		
6		200.6880	33.95	11.62	30.36	1.71	16.92	43.50	-26.58	QP		

*:Maximum data x:Over limit l:over margin

Operator: Ccyf



Mode: TX 2.4G 1M

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Ant. Factor dB/m	Pre Amp Gain dB	Cable loss dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	HI cm	Degree deg.	Comment
1		47.1600	35.13	13.89	30.49	0.73	19.26	40.00	-20.74	QP			
2		52.5753	35.20	13.74	30.49	0.85	19.30	40.00	-20.70	QP			
3		68.1514	38.37	10.27	30.55	1.1	19.19	40.00	-20.81	QP			
4		106.7587	38.90	11.5	30.85	1.13	20.68	43.50	-22.82	QP			
5		385.2805	31.49	15.92	29.82	3.31	20.90	46.00	-25.10	QP			
6	*	663.4730	32.49	21.14	30.05	3.47	27.05	46.00	-18.95	QP			

*:Maximum data x:Over limit !:over margin

Operator: Ccyf

Remark:

1. Measurement (dBμV/m) = Antenna Factor(dB) -Amp Factor(dB) +Cable Loss(dB) + Reading(dBμV/m)

2. Over (dB) = Measurement (dBμV/m) - Limit (dBμV/m)

8.4 CONDUCTED EMISSIONS TEST

8.4.1 Applicable Standard

According to FCC Part 15.207(a)

8.4.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

8.4.3 Test Configuration

Test according to clause 7.3 conducted emission test setup

8.4.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.

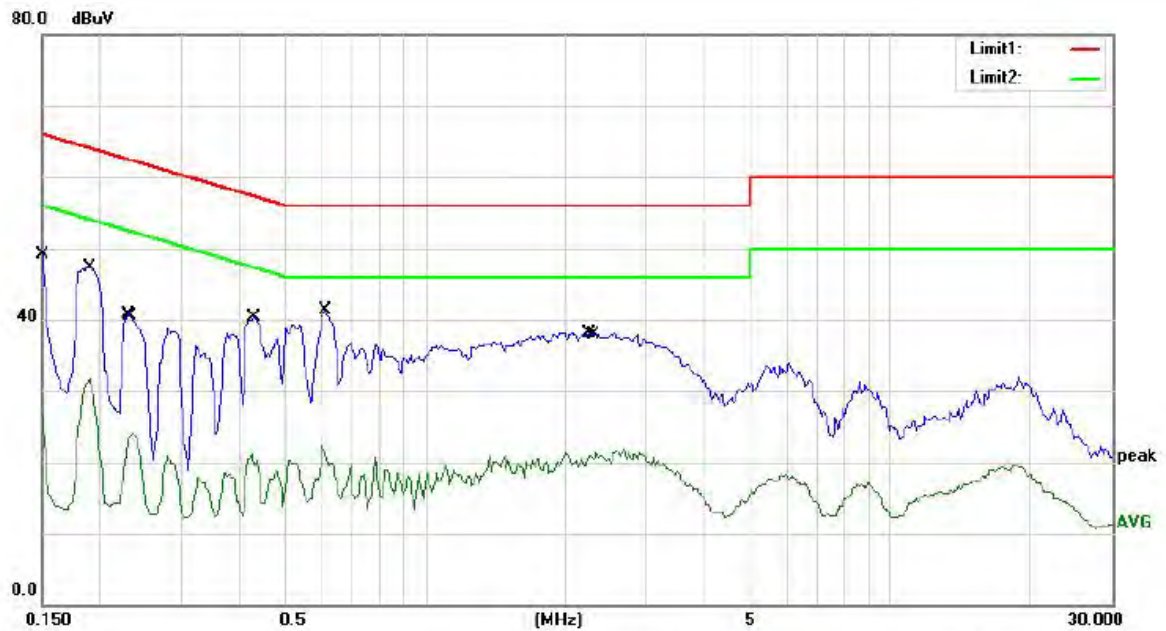
Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Repeat above procedures until all frequency measured were complete.

8.4.5 Test Results

Pass

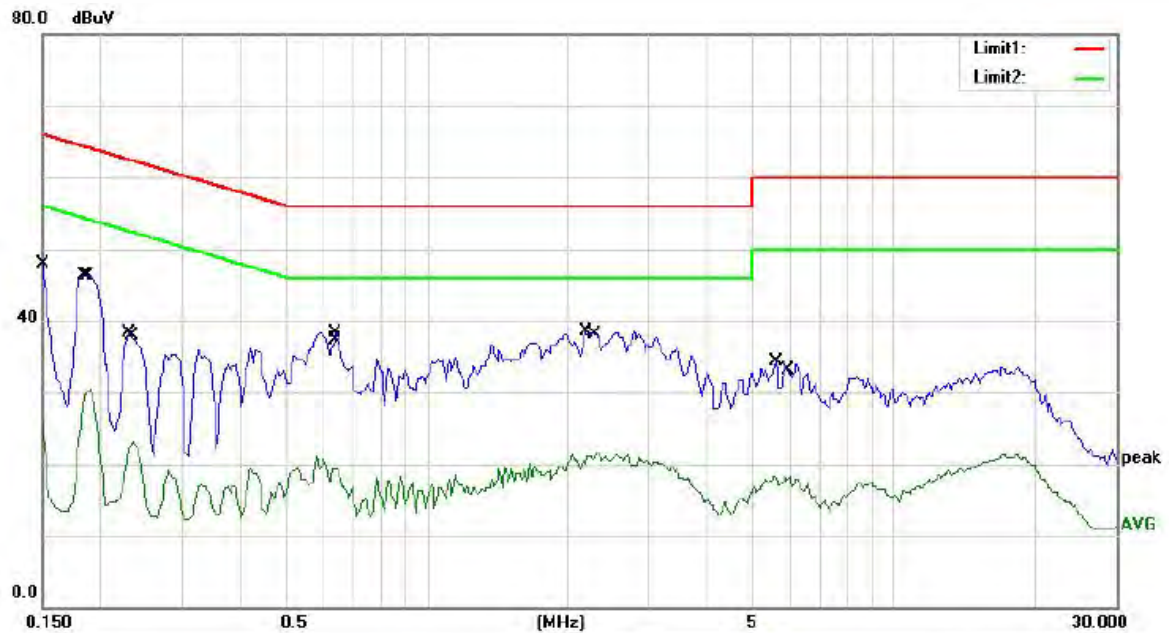
The AC120V &240V voltage have been tested, and the worst result recorded was report as below:



Site: site #1 Phase: **N** Temperature: 26
 Mode: Charging
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	49.05	0.00	49.05	66.00	-16.95	QP	
2		0.1500	26.68	0.00	26.68	56.00	-29.32	AVG	
3		0.1900	47.38	0.00	47.38	64.04	-16.66	QP	
4		0.1904	31.35	0.00	31.35	54.02	-22.67	AVG	
5		0.2300	40.61	0.00	40.61	62.45	-21.84	QP	
6		0.2350	24.09	0.00	24.09	52.27	-28.18	AVG	
7		0.4260	20.75	0.00	20.75	47.33	-26.58	AVG	
8		0.4300	40.27	0.00	40.27	57.25	-16.98	QP	
9		0.6011	22.35	0.00	22.35	46.00	-23.65	AVG	
10	*	0.6100	41.25	0.00	41.25	56.00	-14.75	QP	
11		2.2600	38.02	0.00	38.02	56.00	-17.98	QP	
12		2.3300	21.21	0.00	21.21	46.00	-24.79	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: Chen li



Site site #1

Phase: **L1**

Temperature: 26

Mode: Charging

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1500	47.93	0.00	47.93	66.00	-18.07	QP	
2		0.1500	25.72	0.00	25.72	56.00	-30.28	AVG	
3		0.1864	46.29	0.00	46.29	64.20	-17.91	QP	
4		0.1900	30.49	0.00	30.49	54.04	-23.55	AVG	
5		0.2300	38.21	0.00	38.21	62.45	-24.24	QP	
6		0.2353	22.97	0.00	22.97	52.26	-29.29	AVG	
7		0.6300	19.38	0.00	19.38	46.00	-26.62	AVG	
8		0.6400	38.33	0.00	38.33	56.00	-17.67	QP	
9	*	2.2000	38.47	0.00	38.47	56.00	-17.53	QP	
10		2.3200	21.76	0.00	21.76	46.00	-24.24	AVG	
11		5.8000	34.21	0.00	34.21	60.00	-25.79	QP	
12		6.0000	18.26	0.00	18.26	50.00	-31.74	AVG	

*:Maximum data x:Over limit l:over margin Comment: Factor build in receiver. Operator: Chen li

Remark:

1. Measurement (dBuV) = AMN Factor (dB) + Cable Loss (dB) + Reading (dBuV)

2. Over (dB) = Measurement (dBuV) - Limit (dBuV)

8.5 ANTENNA APPLICATION

8.5.1 Antenna Requirement

Standard	Requirement
FCC CRF Part 15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.
RSS-GEN Clause 6.8	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of RSS-GEN Clause 6.8. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with RSS-GEN Clause 6.8, must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

8.5.2 Result

PASS.

- The EUT has 1 antennas: an PCB Antenna for 2.4G, antenna has a gain of -2.52 dBi ;
- Note:
- ☒ Antenna use a permanently attached antenna which is not replaceable.
 - ☐ Not using a standard antenna jack or electrical connector for antenna replacement
 - ☐ The antenna has to be professionally installed (please provide method of installation)

which in accordance to section 15.203 and RSS-GEN Clause 6.8, please refer to the internal photos.

Detail of factor for radiated emission

Frequency(MHz)	Ant_F(dB)	Cab_L(dB)	Preamp(dB)	Correct Factor(dB)
0.009	20.6	0.03	\	20.63
0.15	20.7	0.1	\	20.8
1	20.9	0.15	\	21.05
10	20.1	0.28	\	20.38
30	18.8	0.45	\	19.25
30	11.7	0.62	27.9	-15.58
100	12.5	1.02	27.8	-14.28
300	12.9	1.91	27.5	-12.69
600	19.2	2.92	27	-4.88
800	21.1	3.54	26.6	-1.96
1000	22.3	4.17	26.2	0.27
1000	25.6	1.76	41.4	-14.04
3000	28.9	3.27	43.2	-11.03
5000	31.1	4.2	44.6	-9.3
8000	36.2	5.95	44.7	-2.55
10000	38.4	6.3	43.9	0.8
12000	38.5	7.14	42.3	3.34
15000	40.2	8.15	41.4	6.95
18000	45.4	9.02	41.3	13.12
18000	37.9	1.81	47.9	-8.19
21000	37.9	1.95	48.7	-8.85
25000	39.3	2.01	42.8	-1.49
28000	39.6	2.16	46.0	-4.24
31000	41.2	2.24	44.5	-1.06
34000	41.5	2.29	46.6	-2.81
37000	43.8	2.30	46.4	-0.3
40000	43.2	2.50	42.2	3.5

*** End of Report ***