FCC Part 15C&RSS-247 Test Report
FCC ID: 2AUVN-TGLBCHHPS
IC:29648-TGLBCHHPS

Applicant:	HERMES SELLIER
Address:	24 rue du Fg Saint-Honore 75008 Paris FRANCE
Manufacturer:	CC LAB
Address:	269 Chemin Mentaberrikoborda 64480 Ustaritz FRANCE
EUT:	Active Speaker
Trade Mark:	HERMÈS , LA BOITE CONCEPT
Model Number:	TG-LBC-HH PS(Music Box ; TO/GO)
Date of Receipt:	Aug. 20, 2022
Test Date:	Aug. 22, 2022 - Oct. 20, 2022
Date of Report:	Oct. 25, 2022
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
Address:	101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Applicable Standards:	FCC PART 15 C 15.247 RSS-247 Issue 2: February 2017 RSS-GEN, Issue 5: March 2019 ANSI C63.10:2013
Test Result:	Pass
Report Number:	DL-20221104018E-2

Prepared (Test Engineer):	Pxing Huang
Reviewer (Supervisor):	Jack Bu
Approved (Manager):	Jade Yang

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207 RSS-Gen 8.8	Conducted Emission	Pass	
15.205/15.209 RSS-Gen 8.8	Radiated Emission and Restricted Bands	PASS	
15.247(b)(3) RSS-247.5.4(4)	Conducted Peak Output Power	PASS	
15.247 (d) RSS-247 5.5	Conducted Unwanted Emission and Bandedge	PASS	
15.247(a)(2) RSS-247 [5.2(1)]	6dB Bandwidth& 99% OCB	PASS	
15.247 (e) RSS-247 [5.2(2)]	Power Spectral Density	PASS	
15.203/15.247 (c) RSS-Gen 6.8	Antenna Requirement	PASS	

NOTE:

(1)” N/A” denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen DL Testing Technology Co., Ltd.
Add. : 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China

FCC Test Firm Registration Number: 854456
Designation Number: CN1307
ISED Registration number: 27485
IC Registered No.:CN0118

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**,providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	Conducted Emission Test	±2.56dB
2	RF power,conducted	±0.42dB
3	Spurious emissions,conducted	±2.76dB
4	All emissions,radiated(<1G)	±3.65dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	Active Speaker
Model No.:	TG-LBC-HH PS(Music Box ; TO/GO)
Sample ID:	DL-20221104018E-1#
HVIN:	TG-LBC-HH PS(Music Box ; TO/GO)
Serial No.:	N/A
Model Difference	N/A
Operation Frequency:	2402~2480MHz
Channel numbers:	40 Channels
Channel separation:	2M
Modulation technology:	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	0dBi
Power supply:	DC14.8V from battery and wireless charging
Power:	30W

Note:

1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.The EUT's all information provided by client.

2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	23	2444
02	2404	12	2424	24	2446
~	~	~	~		
9	2418	20	2440	39	2478
10	2420	21	2442	40	2480

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

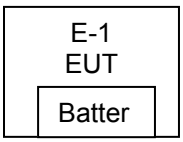
Pretest Mode	Description	
Mode 1	CH01	GFSK
Mode 2	CH20	
Mode 3	CH40	
Mode 4	Link Mode	
For Conducted & Radiated Emission		
Final Test Mode	Description	
Mode 1	CH01	GFSK
Mode 2	CH20	
Mode 3	CH40	
Mode 4	Link Mode	

Note:

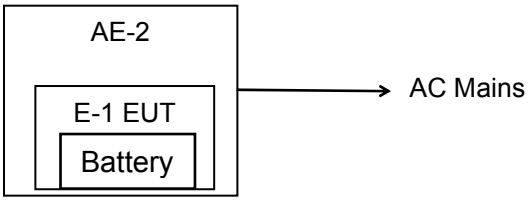
(1) The measurements are performed at the highest, middle, lowest available channels.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model/Type No.	Series No.	Note
E-1	Active Speaker	TG-LBC-HH PS(Music Box ; TO/GO)	N/A	EUT
AE-2	Active Speaker	TG-LBC-HH DS(Music Box ; TO/GO)	N/A	AE
AE	Notebook	B40-80	MP07F6JD	AE

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

Test software Version	Test program: Bluetest 3		
Frequency	2402 MHz	2440MHz	2480 MHz
Power Setting of Softwave	5	5	5

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 20db bandwidth test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4408B	MY50140780	Nov. 06, 2021	Nov. 05, 2022
2	Test Receiver (9kHz-7GHz)	R&S	ESRP7	101393	Nov. 06, 2021	Nov. 05, 2022
3	Bilog Antenna (30MHz-1GHz)	R&S	VULB9162	00306	Nov. 06, 2021	Nov. 05, 2022
4	Horn Antenna (1GHz-18GHz)	Schwarzbeck	BBHA9120D	02139	Nov. 06, 2021	Nov. 05, 2022
5	Horn Antenna (18GHz-40GHz)	A.H. Systems	SAS-574	588	Nov. 06, 2021	Nov. 05, 2022
6	Amplifier (9KHz-6GHz)	Schwarzbeck	BBV9743B	00153	Nov. 06, 2021	Nov. 05, 2022
7	Amplifier (1GHz-18GHz)	EMEC	EM01G8GA	00270	Nov. 06, 2021	Nov. 05, 2022
8	Amplifier (18GHz-40GHz)	Quanjuda	DLE-161	97	Nov. 06, 2021	Nov. 05, 2022
9	Loop Antenna (9KHz-30MHz)	Schwarzbeck	FMZB1519B	00014	Nov. 06, 2021	Nov. 05, 2022
10	RF cables1 (9kHz-1GHz)	ChengYu	966	004	Nov. 06, 2021	Nov. 05, 2022
11	RF cables2 (1GHz-40GHz)	ChengYu	966	003	Nov. 06, 2021	Nov. 05, 2022
12	Antenna connector	Florida RF Labs	N/A	RF 01#	Nov. 06, 2021	Nov. 05, 2022
13	Power probe	KEYSIGHT	U2021XA	MY55210018	Nov. 06, 2021	Nov. 05, 2022
14	Signal Analyzer 9kHz-26.5GHz	Agilent	N9020A	MY55370280	Nov. 06, 2021	Nov. 05, 2022
15	Test Receiver 20kHz-40GHz	R&S	ESU 40	100376	Nov. 06, 2021	Nov. 05, 2022
16	D.C. Power Supply	LongWei	PS-305D	010964729	Nov. 06, 2021	Nov. 05, 2022

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	843 Shielded Room	ChengYu	843 Room	843	Nov. 25, 2019	Nov. 24, 2022
2	EMI Receiver	R&S	ESR	101421	Nov. 06, 2021	Nov. 05, 2022
3	LISN	R&S	ENV216	102417	Nov. 06, 2021	Nov. 05, 2022
4	843 Cable 1#	ChengYu	CE Cable	001	Nov. 06, 2021	Nov. 05, 2022

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ_EMC	EMC-CON 3A1.1
2	EMC radiation test system	FALA	EZ_EMC	FA-03A2
3	RF test system	MAIWEI	MTS8310	2.0.0.0
4	RF communication test system	MAIWEI	MTS8200	2.0.0.0

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

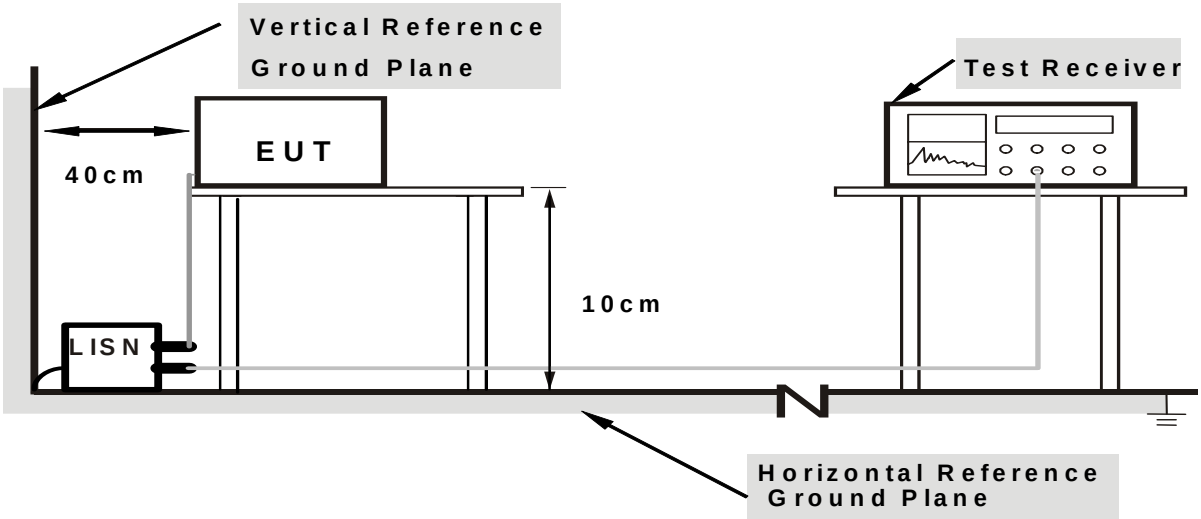
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

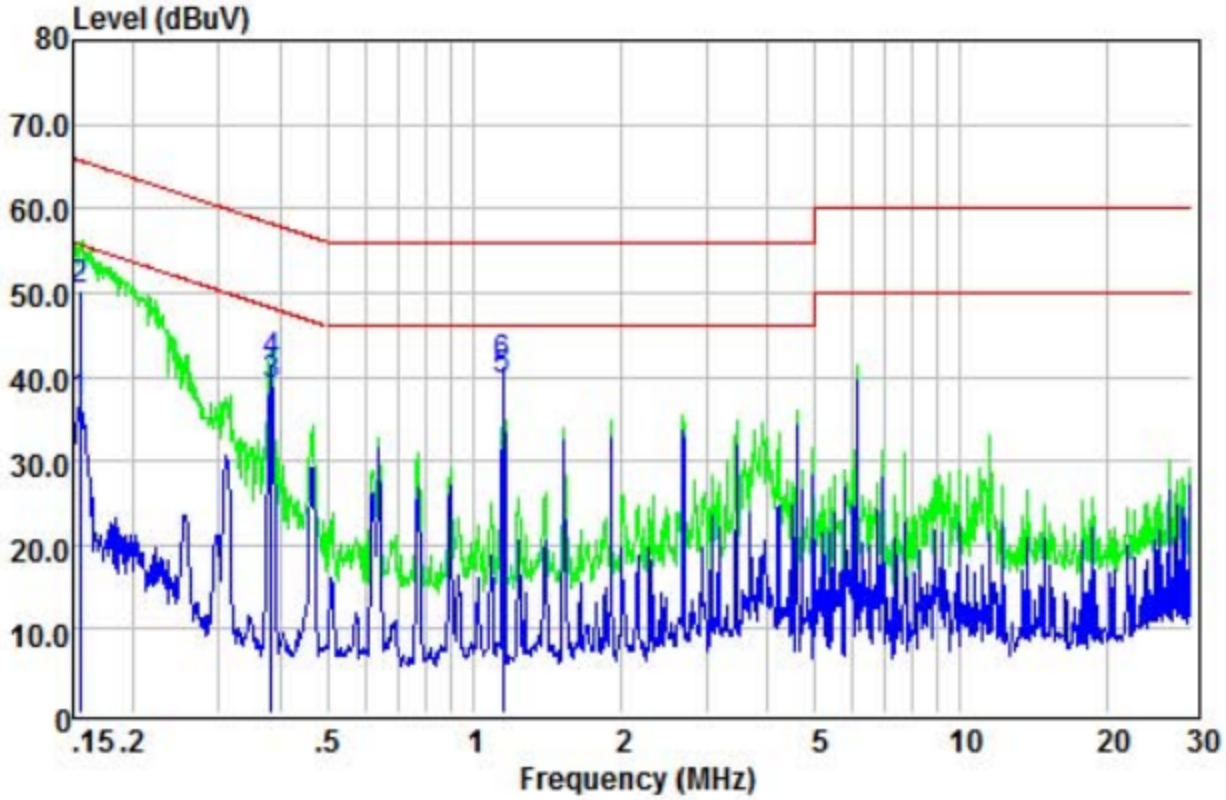
3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

We pretest AC 120V and AC 230V, the worst voltage was AC 120V and the data recording in the report.

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4

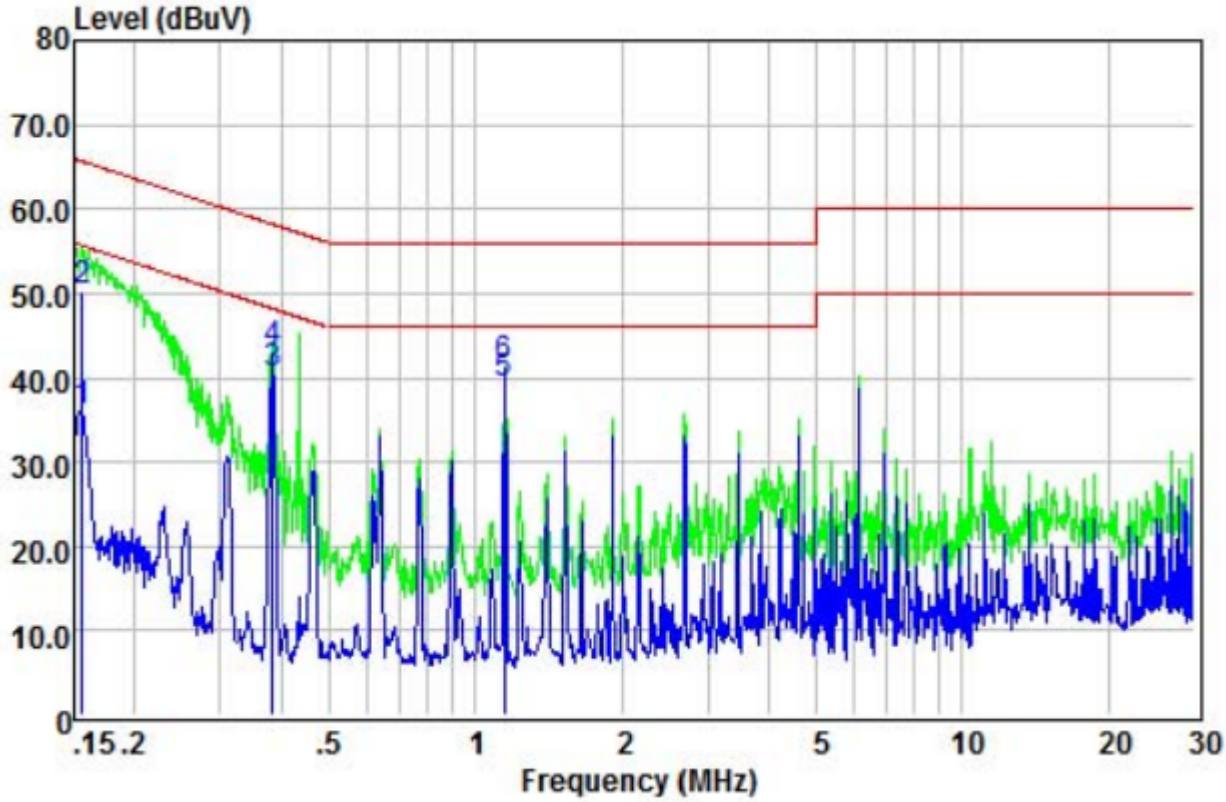


Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.15	27.11	9.63	0.05	36.79	55.74	-18.95	Average
2	0.15	40.52	9.63	0.05	50.20	65.74	-15.54	QP
3	0.38	29.16	9.66	0.05	38.87	48.21	-9.34	Average
4	0.38	31.79	9.66	0.05	41.50	58.21	-16.71	QP
5	1.15	29.80	9.61	0.06	39.47	46.00	-6.53	Average
6	1.15	31.53	9.61	0.06	41.20	56.00	-14.80	QP

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4



Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.16	26.30	9.60	0.05	35.95	55.69	-19.74	Average
2	0.16	40.65	9.60	0.05	50.30	65.69	-15.39	QP
3	0.38	30.73	9.61	0.05	40.39	48.21	-7.82	Average
4	0.38	33.54	9.61	0.05	43.20	58.21	-15.01	QP
5	1.15	29.64	9.62	0.06	39.32	46.00	-6.68	Average
6	1.15	31.52	9.62	0.06	41.20	56.00	-14.80	QP

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216-230	180	3
230~960	200	3
Above 960	500	3

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902 - 928 MHz	50	500
2400 - 2483.5 MHz	50	500
5725 - 5875 MHz	50	500
24.0 - 24.25 GHz	250	2500

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Receiver setup:

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel

Note:

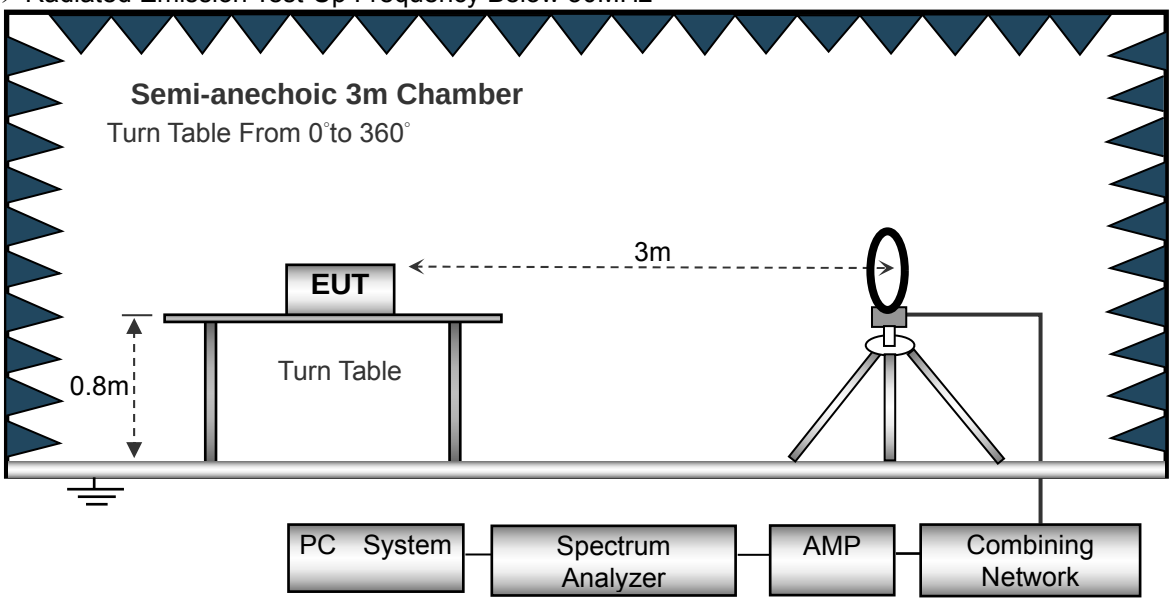
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

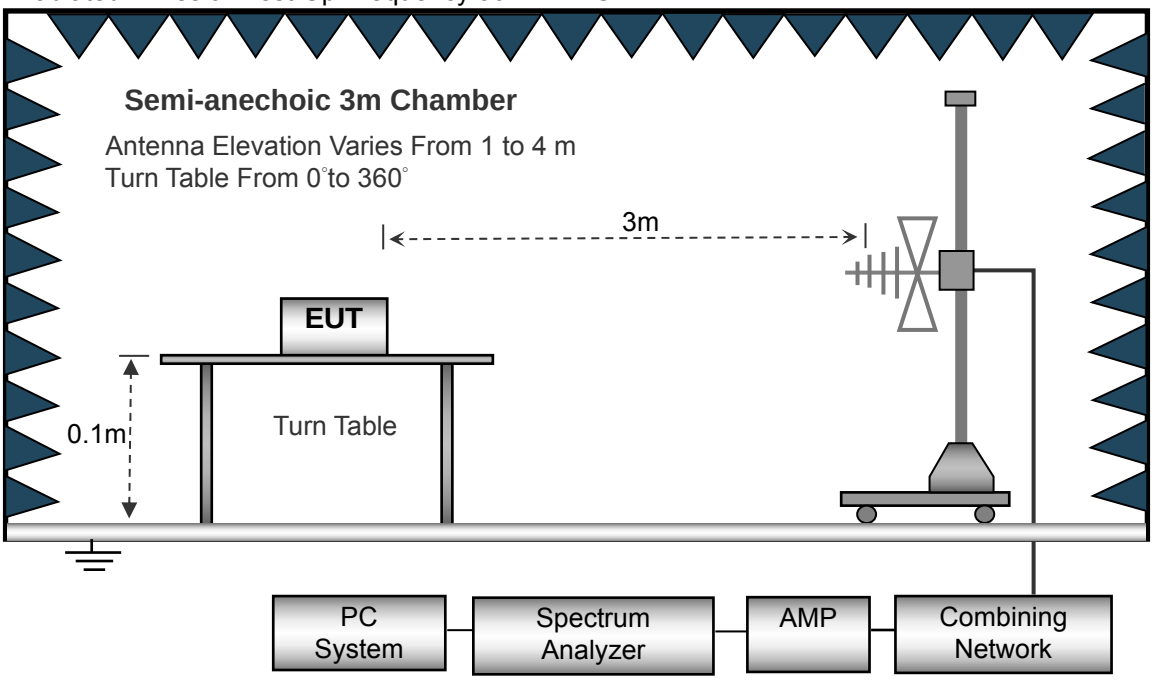
No deviation

3.2.4 TEST SETUP

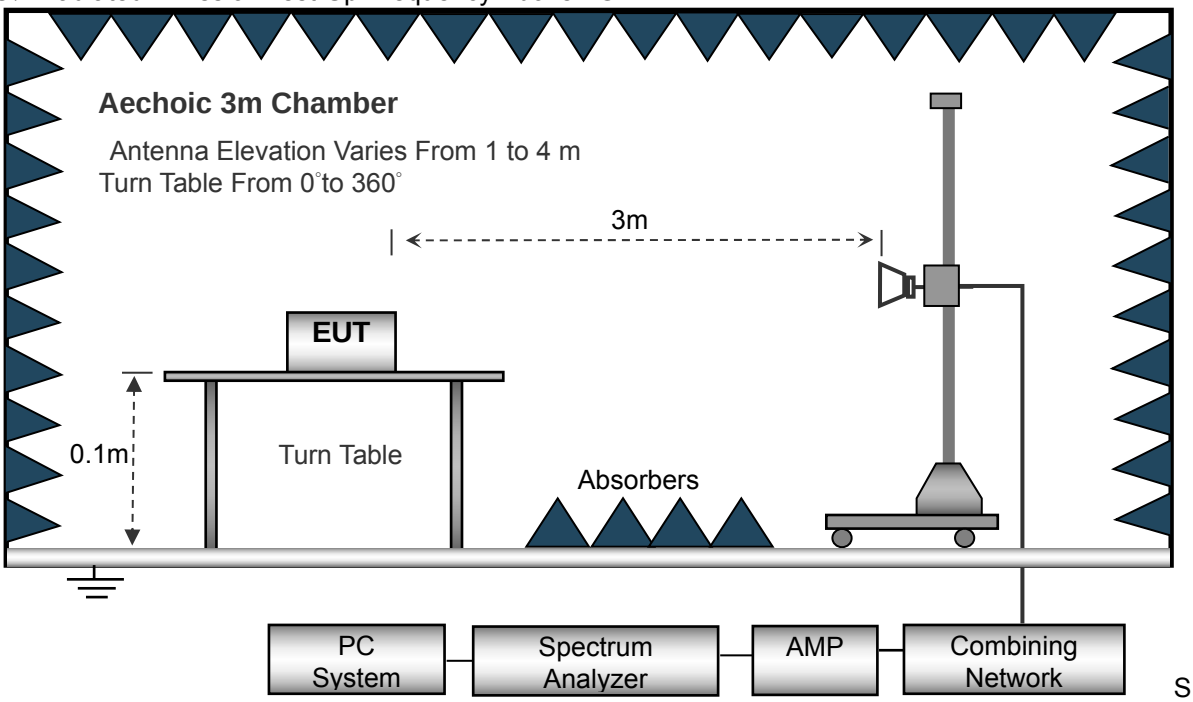
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



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3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature:	20℃	Relative Humidtity:	48%
Pressure:	1010 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	Mode 4	Polarization :	--

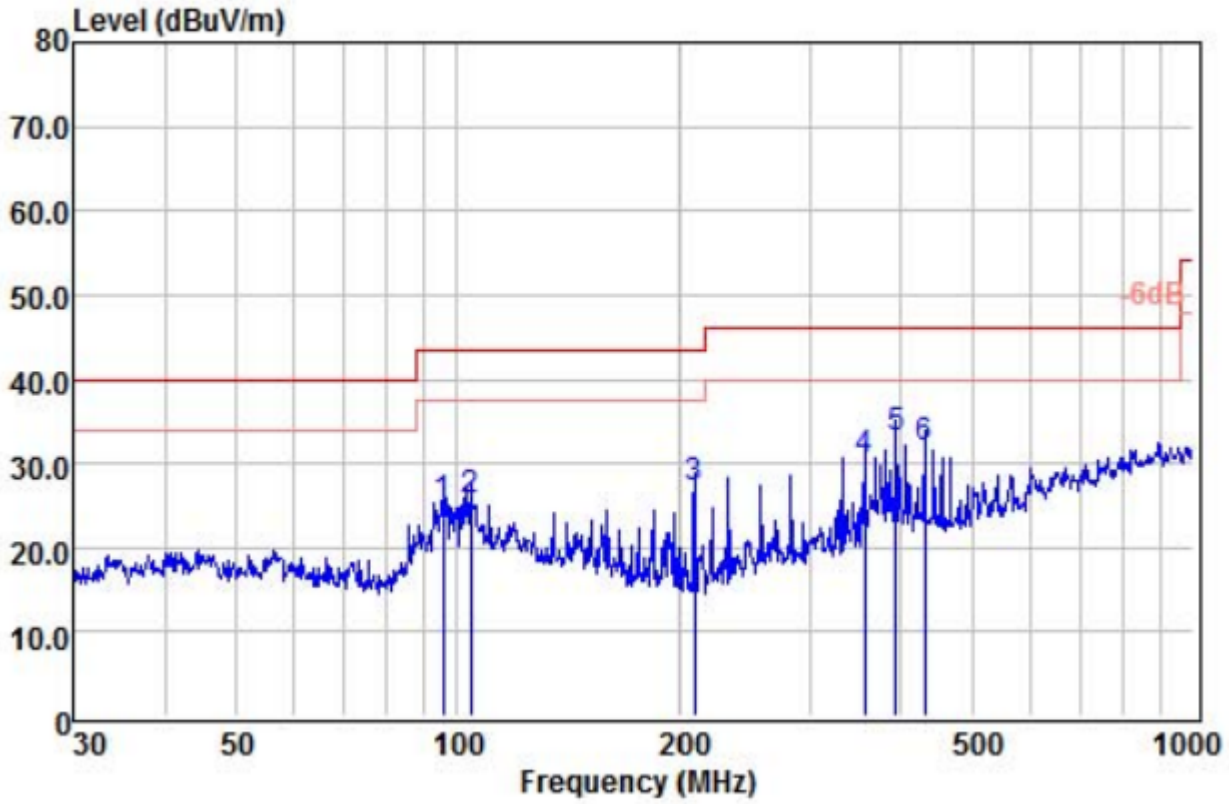
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 14.8V from battery		
Test Mode :	Mode 4		



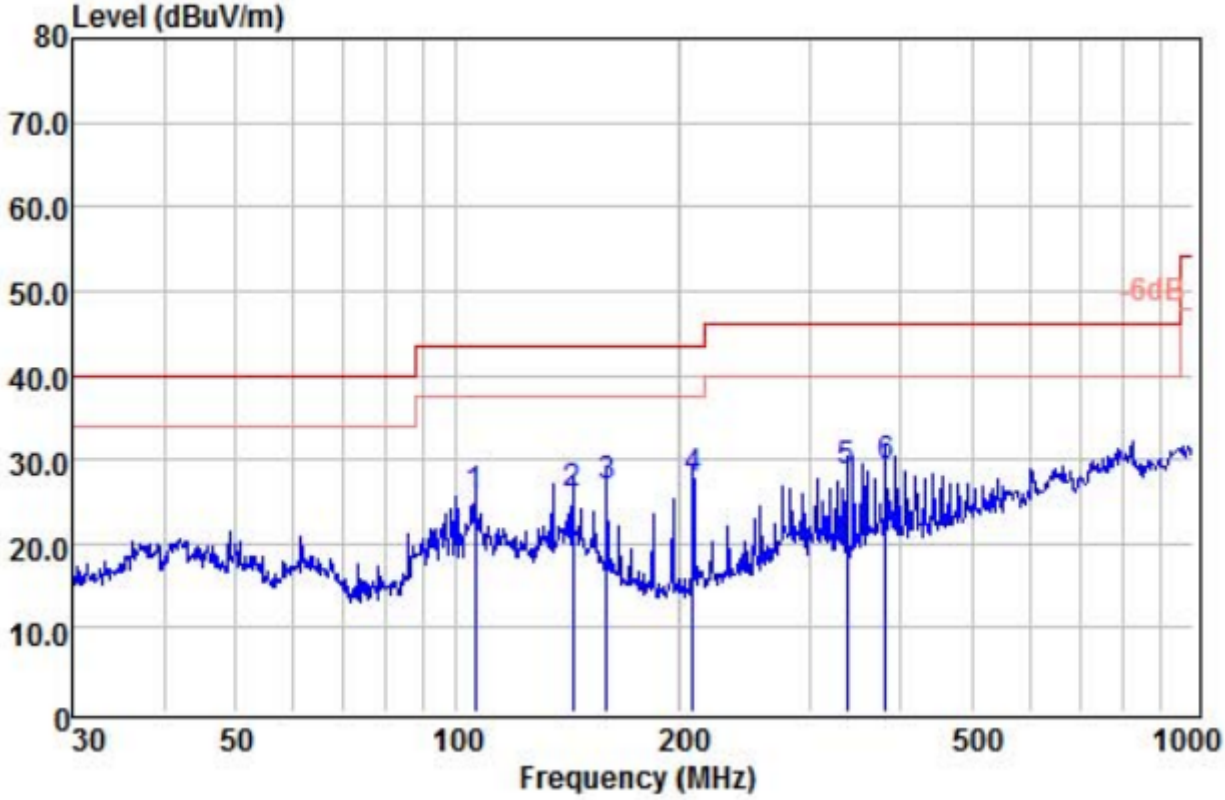
	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	95.43	14.63	9.60	0.83	25.06	43.50	-18.44	QP
2	104.17	15.31	9.45	0.82	25.58	43.50	-17.92	QP
3	209.31	14.47	11.60	0.88	26.95	43.50	-16.55	QP
4	356.68	13.25	16.10	1.12	30.47	46.00	-15.53	QP
5	393.47	15.36	16.25	1.27	32.88	46.00	-13.12	QP
6	431.03	13.19	17.23	1.42	31.84	46.00	-14.16	QP

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 14.8V from battery		
Test Mode :	Mode 4		



	Freq	Read Level	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	106.01	15.18	9.42	0.83	25.43	43.50	-18.07	QP
2	143.83	16.33	8.63	0.85	25.81	43.50	-17.69	QP
3	159.78	16.75	9.20	0.86	26.81	43.50	-16.69	QP
4	208.58	15.26	11.41	0.88	27.55	43.50	-15.95	QP
5	338.40	12.33	15.04	1.04	28.41	46.00	-17.59	QP
6	381.25	11.62	16.21	1.23	29.06	46.00	-16.94	QP

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

3.2.8 TEST RESULTS (1GHZ~25GHZ)

GFSK

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	4804.00	56.32	30.55	5.77	24.66	56.2	74.00	-17.8	PK
V	4804.00	45.66	30.55	5.77	24.66	45.54	54.00	-8.46	AV
V	7206.00	54.97	30.33	6.32	24.55	55.51	74.00	-18.49	PK
V	7206.00	43.78	30.33	6.32	24.55	44.32	54.00	-9.68	AV
V	12010.00	51.23	30.85	7.45	24.69	52.52	74.00	-21.48	PK
H	4804.00	56.57	30.55	5.77	24.66	56.45	74.00	-17.55	PK
H	4804.00	45.69	30.55	5.77	24.66	45.57	54.00	-8.43	AV
H	7206.00	54.39	30.33	6.32	24.55	54.93	74.00	-19.07	PK
H	7206.00	43.68	30.33	6.32	24.55	44.22	54.00	-9.78	AV
H	12010.00	51.82	30.85	7.45	24.69	53.11	74.00	-20.89	PK
operation frequency:2440									
V	4880.00	57.36	30.55	5.77	24.66	57.24	74.00	-16.76	PK
V	4880.00	46.96	30.55	5.77	24.66	46.84	54.00	-7.16	AV
V	7320.00	56.43	30.33	6.32	24.55	56.97	74.00	-17.03	PK
V	7320.00	46.87	30.33	6.32	24.55	47.41	54.00	-6.59	AV
V	12200.00	52.63	30.85	7.45	24.69	53.92	74.00	-20.08	PK
H	4880.00	57.63	30.55	5.77	24.66	57.51	74.00	-16.49	PK
H	4880.00	46.74	30.55	5.77	24.66	46.62	54.00	-7.38	AV
H	7320.00	56.32	30.33	6.32	24.55	56.86	74.00	-17.14	PK
H	7320.00	45.29	30.33	6.32	24.55	45.83	54.00	-8.17	AV
H	12200.00	52.46	30.85	7.45	24.69	53.75	74.00	-20.25	PK
operation frequency:2480									
V	4960.00	58.43	30.55	5.77	24.66	58.31	74.00	-15.69	PK
V	4960.00	47.69	30.55	5.77	24.66	47.57	54.00	-6.43	AV
V	7440.00	56.35	30.33	6.32	24.55	56.89	74.00	-17.11	PK
V	7440.00	45.36	30.33	6.32	24.55	45.9	54.00	-8.1	AV
V	12400.00	53.68	30.85	7.45	24.69	54.97	74.00	-19.03	PK
H	4960.00	57.44	30.55	5.77	24.66	57.32	74.00	-16.68	PK
H	4960.00	46.99	30.55	5.77	24.66	46.87	54.00	-7.13	AV
H	7440.00	56.31	30.33	6.32	24.55	56.85	74.00	-17.15	PK
H	7440.00	45.03	30.33	6.32	24.55	45.57	54.00	-8.43	AV
H	12400.00	53.41	30.85	7.45	24.69	54.7	74.00	-19.3	PK

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205, RSS-Gen 8.9, RSS-Gen 8.10

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel,the Highest channel

Note:

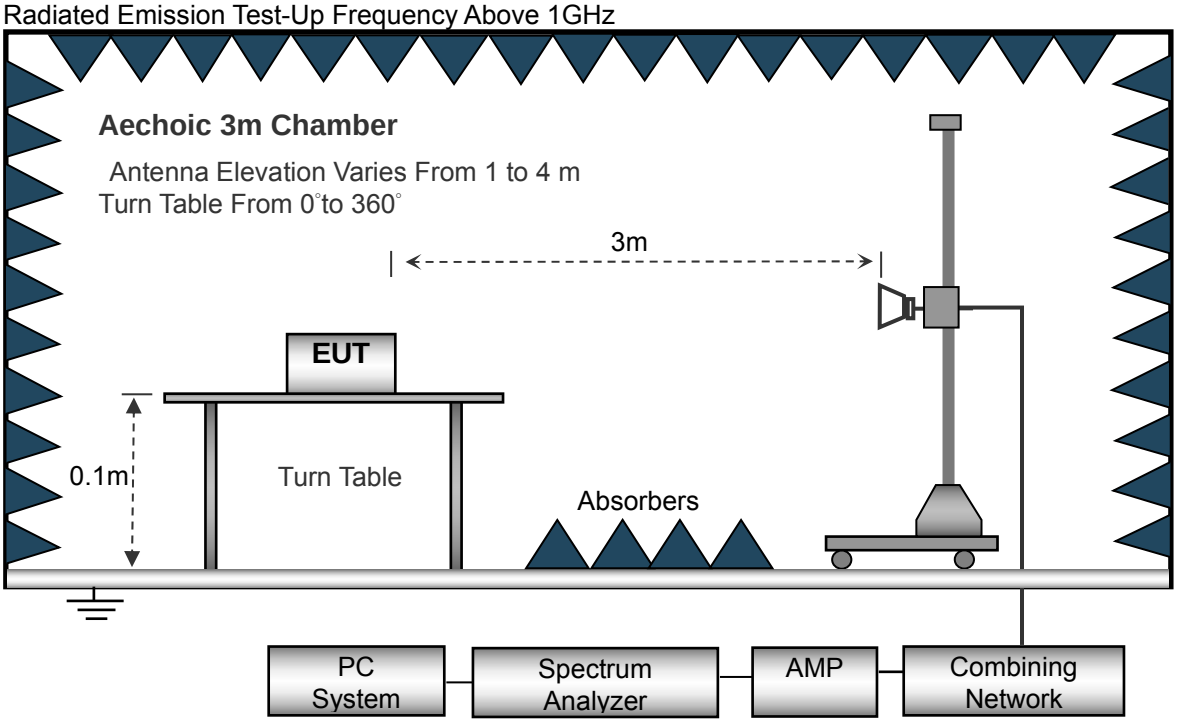
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.6 TEST RESULT

GFSK

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	2390.00	56.93	30.22	4.85	23.98	55.54	74.00	-18.46	PK
V	2390.00	45.69	30.22	4.85	23.98	44.3	54.00	-9.7	AV
V	2400.00	55.43	30.22	4.85	23.98	54.04	74.00	-19.96	PK
V	2400.00	44.62	30.22	4.85	23.98	43.23	54.00	-10.77	AV
H	2390.00	56.93	30.22	4.85	23.98	55.54	74.00	-18.46	PK
H	2390.00	45.68	30.22	4.85	23.98	44.29	54.00	-9.71	AV
H	2400.00	55.63	30.22	4.85	23.98	54.24	74.00	-19.76	PK
H	2400.00	45.82	30.22	4.85	23.98	44.43	54.00	-9.57	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2480									
V	2483.50	57.93	30.22	4.85	23.98	56.54	74.00	-17.46	PK
V	2483.50	46.85	30.22	4.85	23.98	45.46	54.00	-8.54	AV
V	2500.00	56.34	30.22	4.85	23.98	54.95	74.00	-19.05	PK
V	2500.00	45.76	30.22	4.85	23.98	44.37	54.00	-9.63	AV
H	2483.50	56.38	30.22	4.85	23.98	54.99	74.00	-19.01	PK
H	2483.50	45.49	30.22	4.85	23.98	44.1	54.00	-9.9	AV
H	2500.00	55.83	30.22	4.85	23.98	54.44	74.00	-19.56	PK
H	2500.00	45.16	30.22	4.85	23.98	43.77	54.00	-10.23	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

4.POWER SPECTRAL DENSITY TEST

Test Requirement:	FCC Part15 C Section 15.247 (e)&RSS-247 [5.2(2)]
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02 and RSS-Gen

4.1.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (e)	Power Spectral Density	8dBm/3kHz	2400-2483.5	PASS

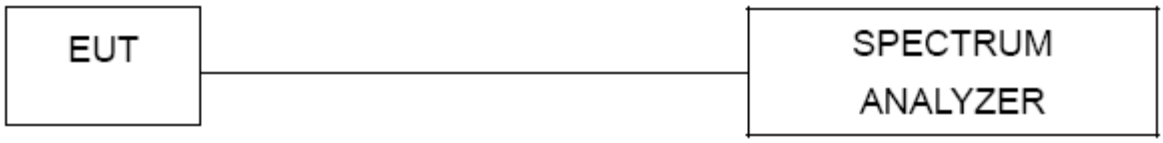
4.1.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

4.1.3DEVIATION FROM STANDARD

No deviation.

4.1.4TEST SETUP



4.1.5 EUT OPERATION CONDITIONS

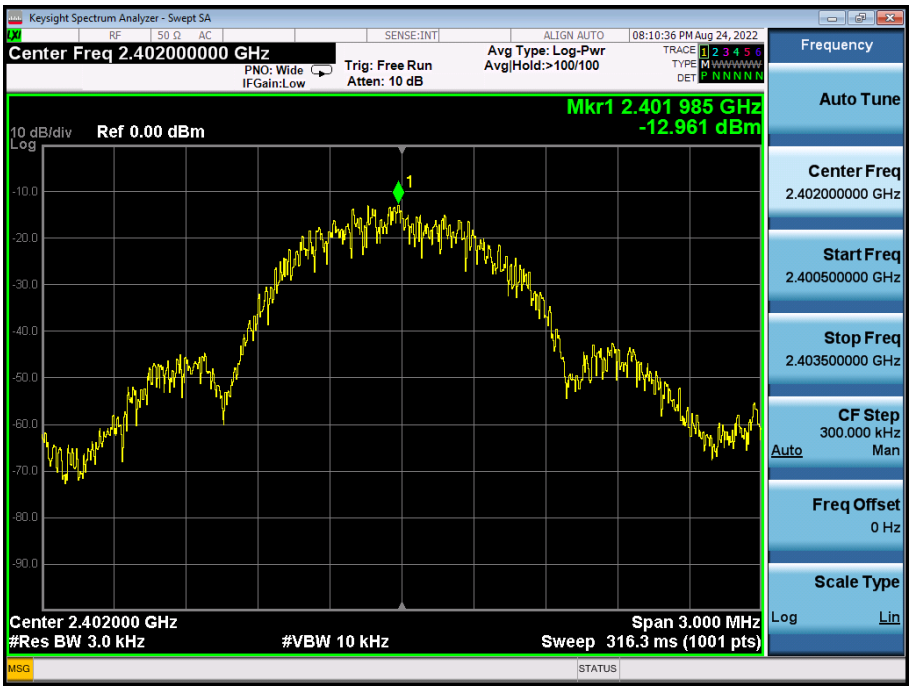
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.6 TEST RESULTS

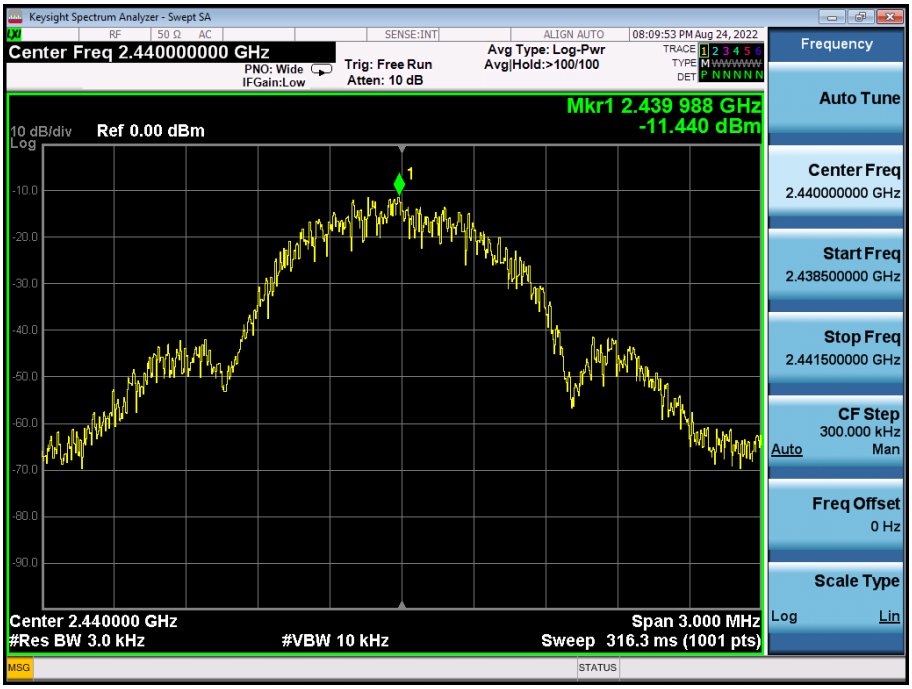
Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	GFSK	Test Voltage ：	DC 14.8V from battery

Frequency	Power Spectral Density(dBm)	Limit (dBm)	Result
2402 MHz	-12.961	8	PASS
2440 MHz	-11.440	8	PASS
2480 MHz	-10.177	8	PASS

CH01



CH20


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.440000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
08:09:53 PM Aug 24, 2022
Mkr1 2.439 988 GHz
-11.440 dBm
10 dB/div
Ref 0.00 dBm
Log
Center 2.440000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316.3 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.440000000 GHz
Start Freq
2.438500000 GHz
Stop Freq
2.441500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

CH40

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.479985000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
08:08:46 PM Aug 24, 2022
Mkr1 2.479 985 GHz
-10.177 dBm
10 dB/div
Ref 0.00 dBm
Log
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316.3 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

5. CHANNEL BANDWIDTH

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)&RSS-247[5.2(1)]
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02 and RSS-Gen

5.1.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

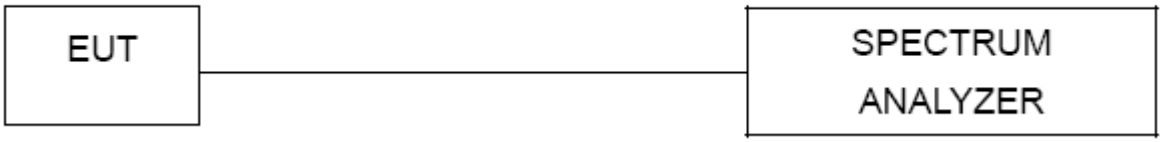
5.1.2 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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 6 dB relative to the maximum level measured in the fundamental emission.

5.1.3 DEVIATION FROM STANDARD

No deviation.

5.1.4 TEST SETUP



5.1.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

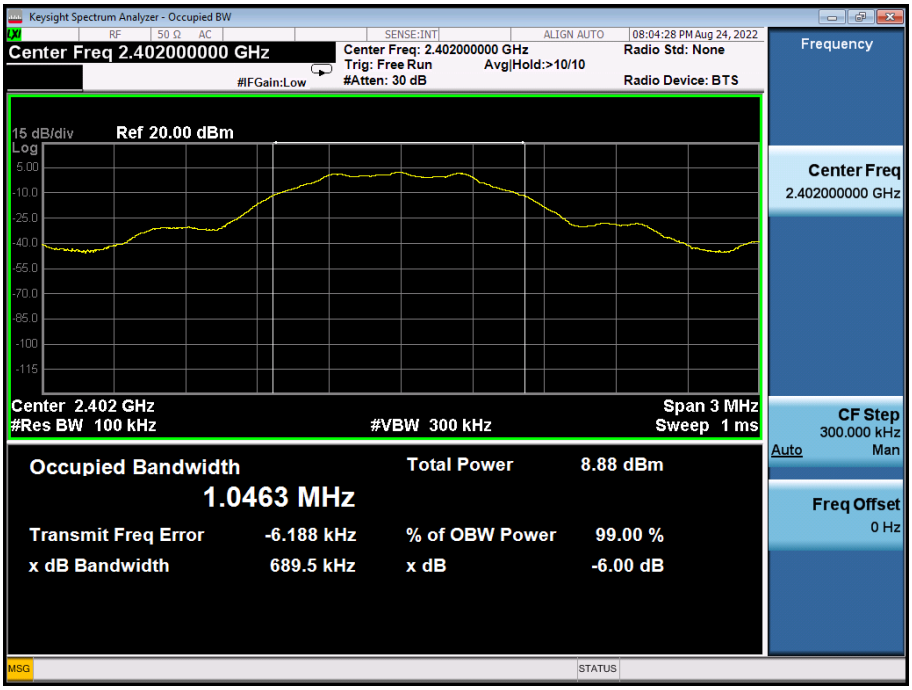
5.1.6 TEST RESULTS

Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	GFSK	Test Voltage ：	DC 14.8V from battery

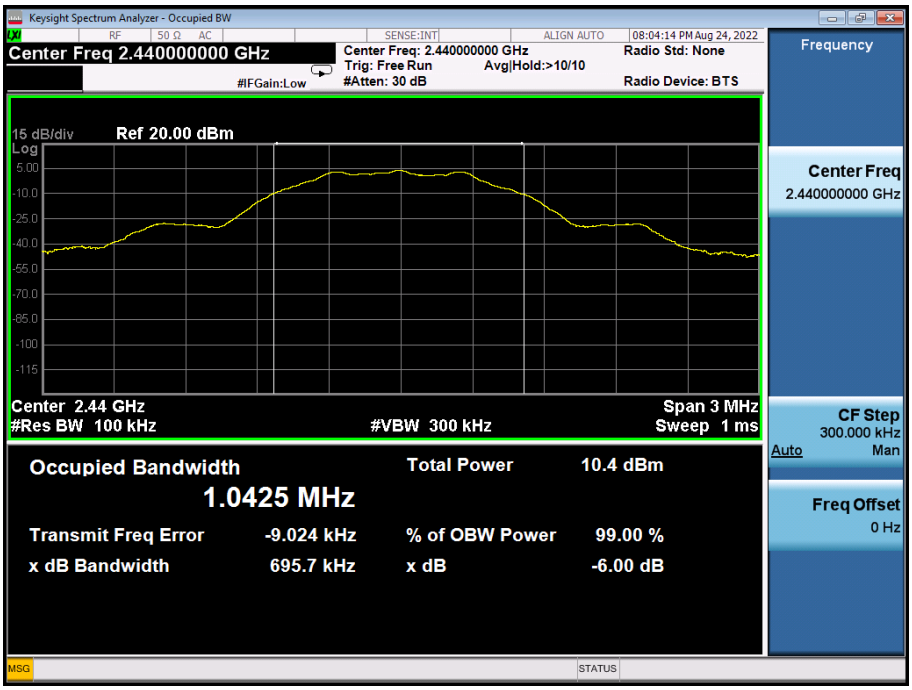
Test channel	6dB Bandwidth (MHz)	99% Occupied bandwidth(MHz)	Limit(KHz)	Result
Lowest	0.696	1.026	>500	Pass
Middle	0.696	1.022		
Highest	0.696	1.022		

6dB Bandwidth

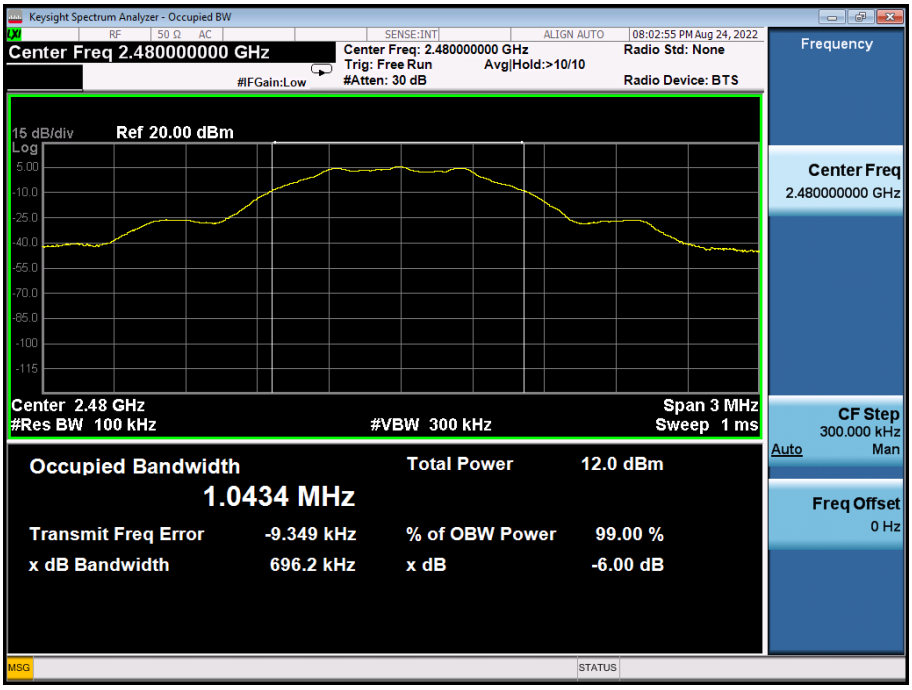
CH01



CH20

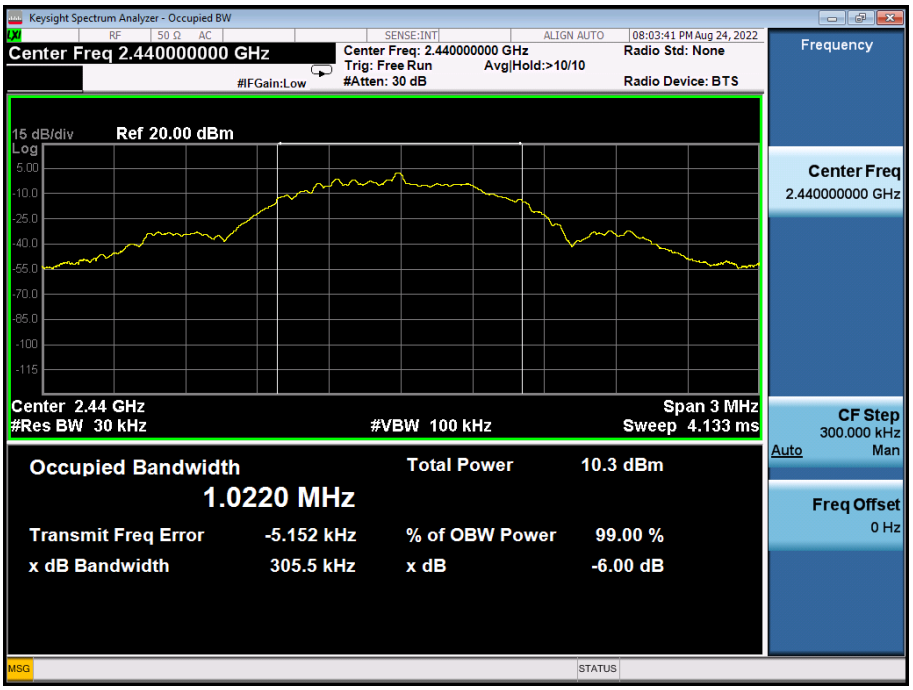

Keysight Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
08:04:14 PM Aug 24, 2022
Center Freq 2.440000000 GHz
#IFGain:Low
Center Freq: 2.440000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center Freq
2.440000000 GHz
Center 2.44 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.0425 MHz
Total Power 10.4 dBm
Freq Offset
0 Hz
Transmit Freq Error -9.024 kHz
% of OBW Power 99.00 %
x dB Bandwidth 695.7 kHz
x dB -6.00 dB
MSG
STATUS

CH40

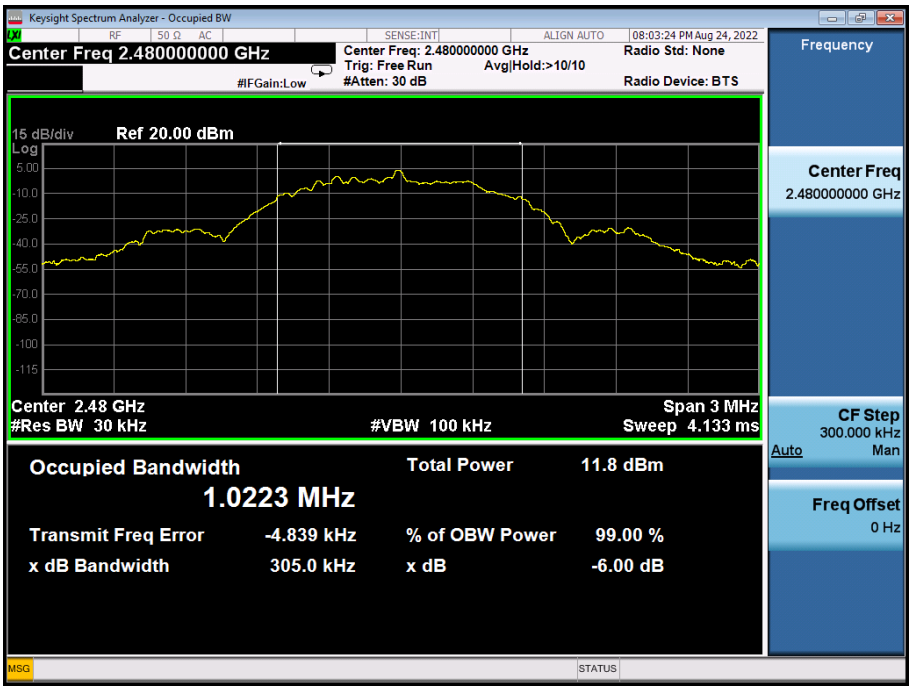

Keysight Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
08:02:55 PM Aug 24, 2022
Center Freq 2.480000000 GHz
#IFGain:Low
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.0434 MHz
Total Power 12.0 dBm
Freq Offset
0 Hz
Transmit Freq Error -9.349 kHz
% of OBW Power 99.00 %
x dB Bandwidth 696.2 kHz
x dB -6.00 dB
MSG
STATUS

99% Bandwidth
CH01

CH20



CH40


Keysight Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
08:03:24 PM Aug 24, 2022
Center Freq 2.480000000 GHz
#IFGain:Low
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Center Freq
2.480000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
Occupied Bandwidth
1.0223 MHz
Total Power 11.8 dBm
Transmit Freq Error -4.839 kHz
% of OBW Power 99.00 %
x dB Bandwidth 305.0 kHz
x dB -6.00 dB
MSG
STATUS

6.PEAK OUTPUT POWER TEST

Test Requirement:	FCC Part15 C Section 15.247(b)(3)&RSS-247 5.4(4)
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02 RSS-Gen

6.1.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

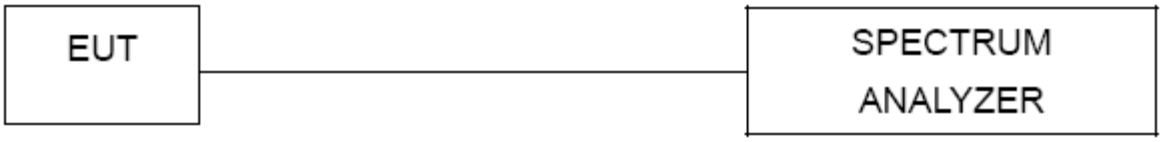
6.1.2 TEST PROCEDURE

a. The EUT was directly connected to the SPECTRUM ANLYZER

6.1.3 DEVIATION FROM STANDARD

No deviation.

6.1.4 TEST SETUP



6.1.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

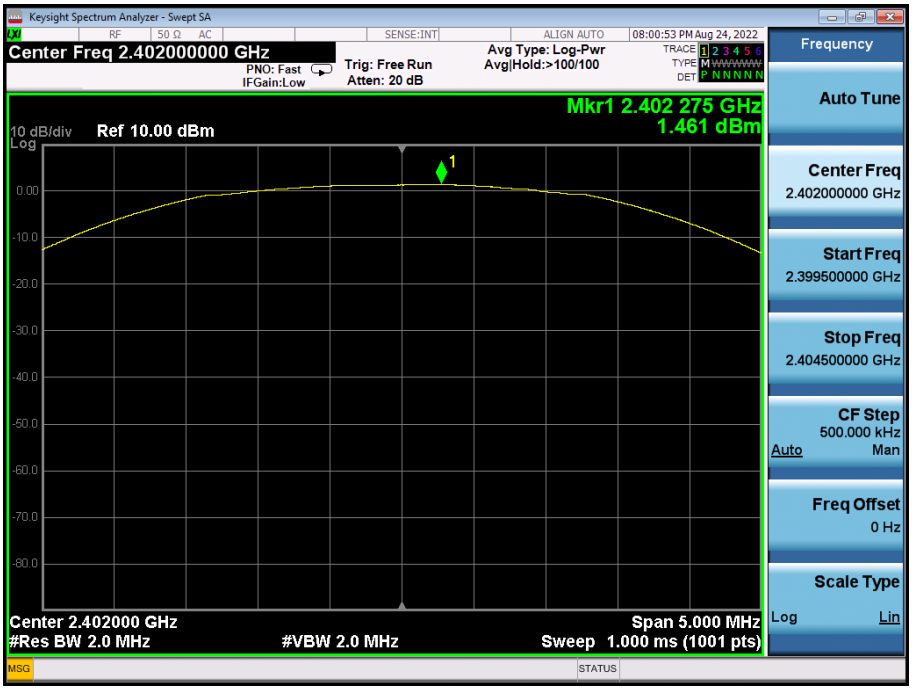
6.1.6 TEST RESULTS

Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	GFSK	Test Voltage ：	DC 14.8V from battery

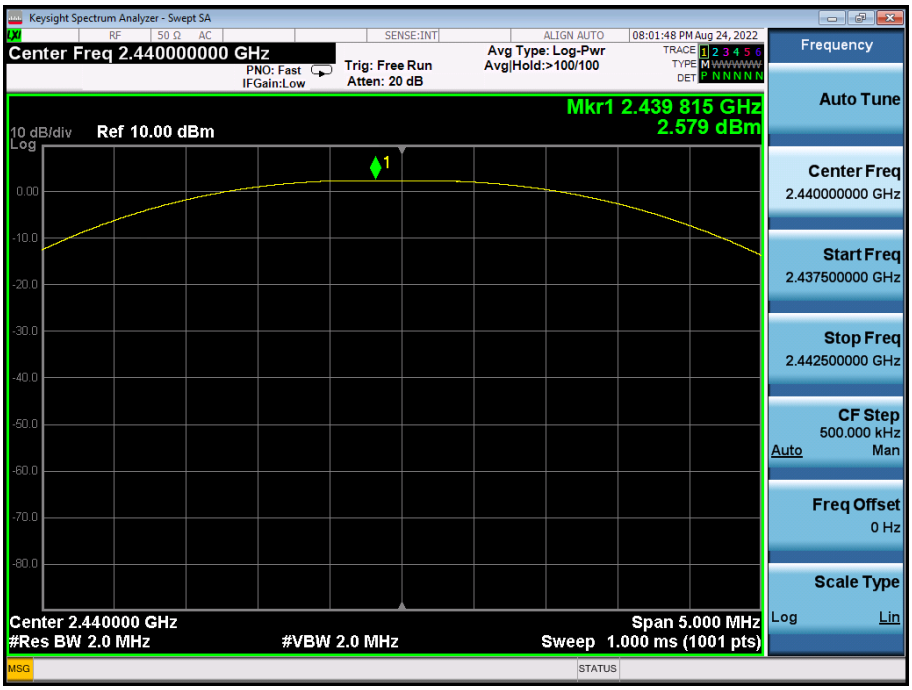
Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	1.461	30.00	Pass
Middle	2.579		
Highest	3.050		

Mode	Test Channel	Conducted Output Power (dBm)	Antenna Gain	EIRP output power (dBm)	LIMIT (dBm)
GFSK	CH00	1.461	0	1.461	36.00
	CH19	2.579	0	2.579	36.00
	CH39	3.050	0	3.050	36.00

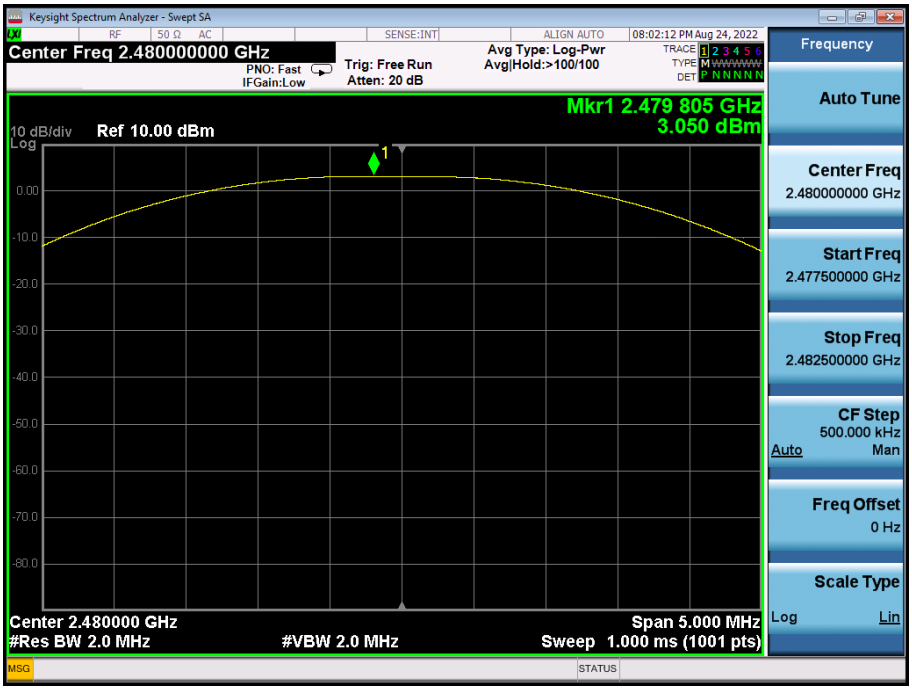
CH 01



CH 20


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.440000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
08:01:48 PM Aug 24, 2022
Mkr1 2.439 815 GHz
2.579 dBm
10 dB/div
Ref 10.00 dBm
Log
Center 2.440000 GHz
#Res BW 2.0 MHz
#VBW 2.0 MHz
Span 5.000 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.440000000 GHz
Start Freq
2.437500000 GHz
Stop Freq
2.442500000 GHz
CF Step
500.000 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

CH 40


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
08:02:12 PM Aug 24, 2022
Mkr1 2.479 805 GHz
3.050 dBm
10 dB/div
Ref 10.00 dBm
Log
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 2.0 MHz
Span 5.000 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.477500000 GHz
Stop Freq
2.482500000 GHz
CF Step
500.000 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

7. CONDUCTED BAND EDGE AND SPURIOUS EMISSION

Test Requirement:	FCC Part15 C Section 15.247 (d)&RSS-247 5.5
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02 and RSS-Gen

7.1.1 APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

7.1.2 TEST PROCEDURE

Using the following spectrum analyzer setting:

A) Set the RBW = 100KHz.
B) Set the VBW = 300KHz.
C) Sweep time = auto couple.
D) Detector function = peak.
E) Trace mode = max hold.
F) Allow trace to fully stabilize.

7.1.3 DEVIATION FROM STANDARD

No deviation.

7.1.4 TEST SETUP

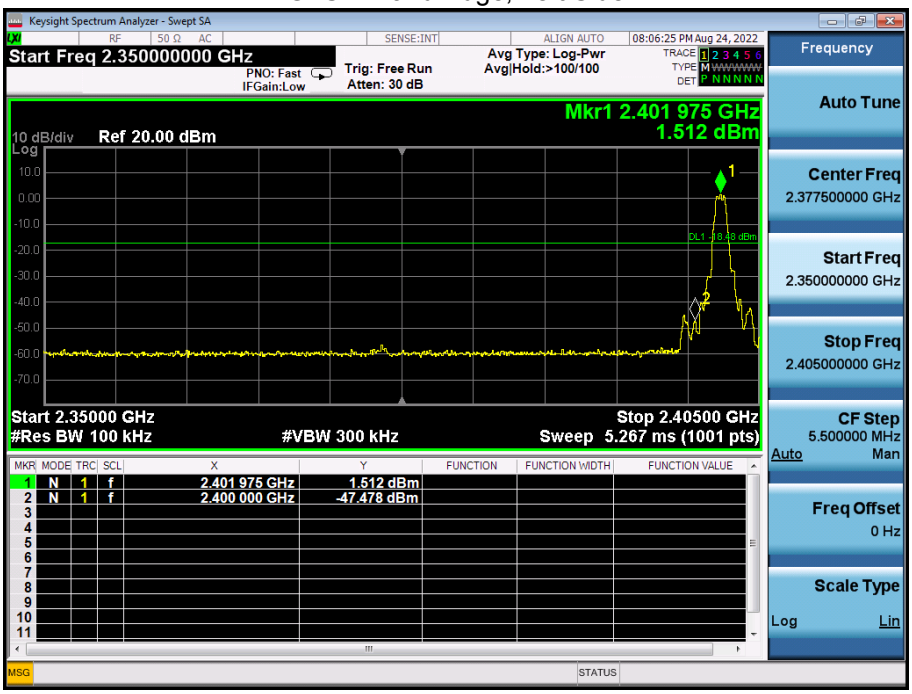
7.1.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

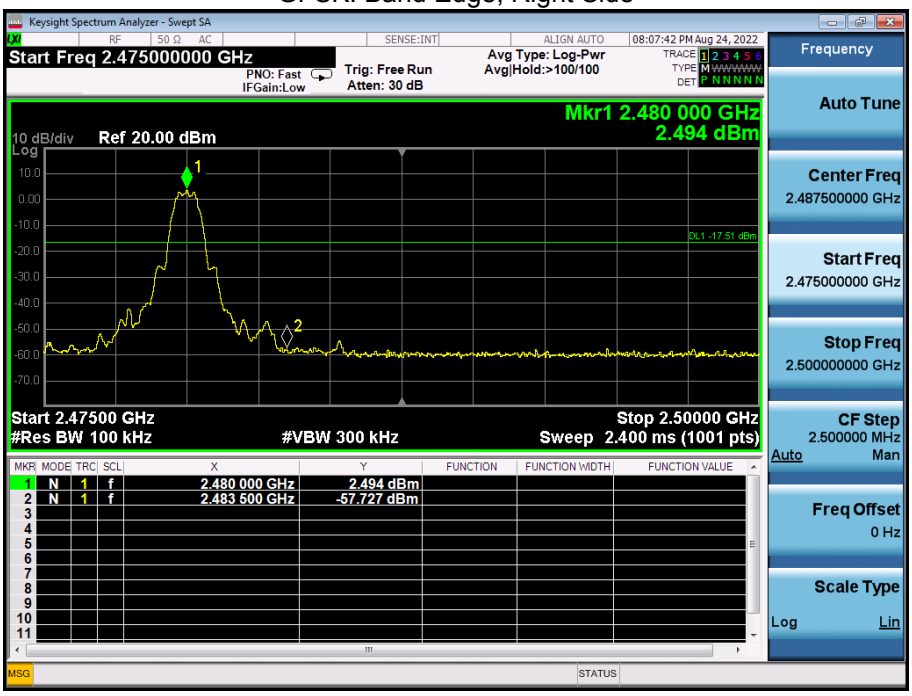
7.1.6 TEST RESULTS

Frequency Band	Delta Peak to band emission(dBc)	＞Limit (dBc)	Result
Left-band	48.99	20	Pass
Right-band	60.221	20	Pass

GFSK: Band Edge, Left Side

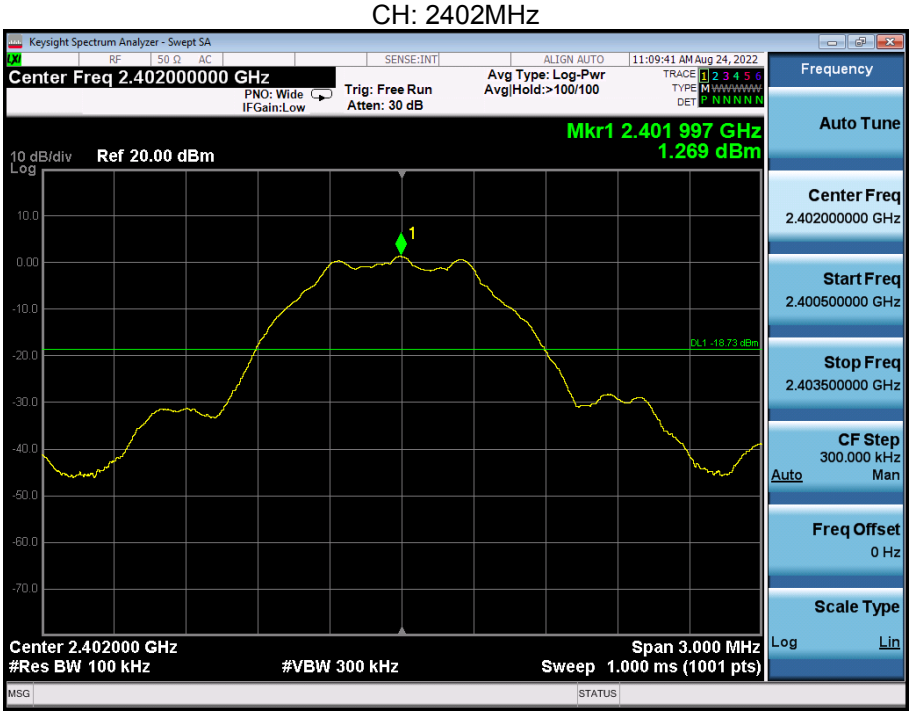


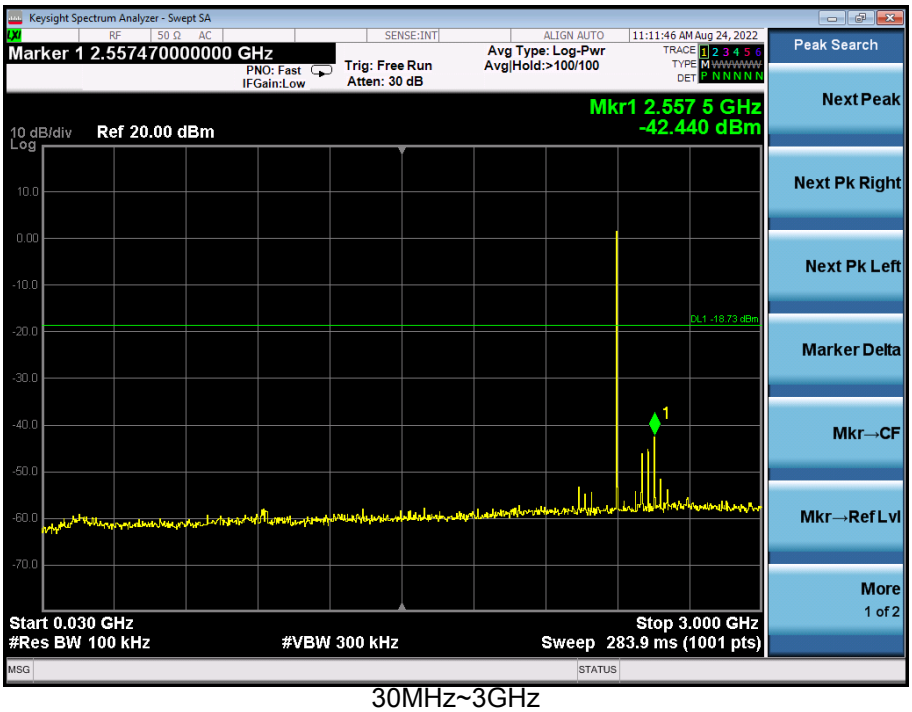
GFSK: Band Edge, Right Side



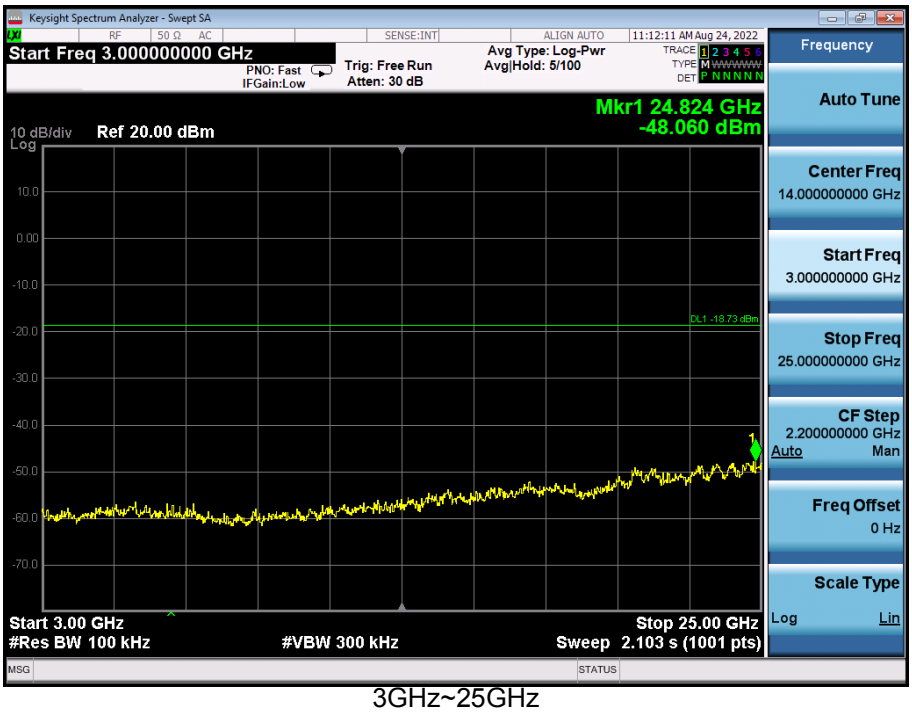
SPURIOUS RF CONDUCTED EMISSION TEST RESULT

CH: 2402MHz



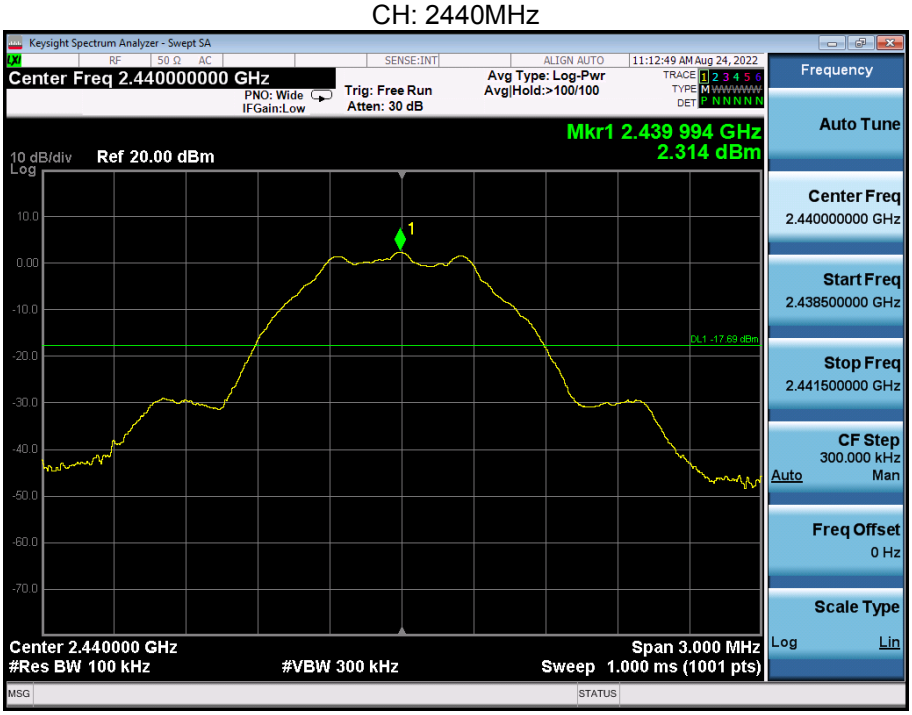


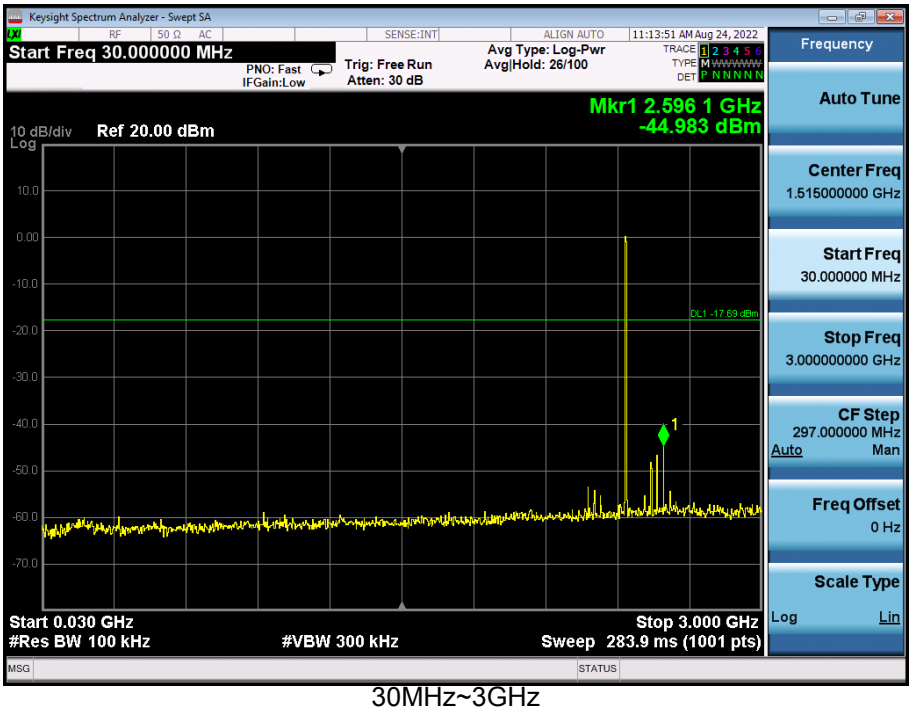
30MHz~3GHz



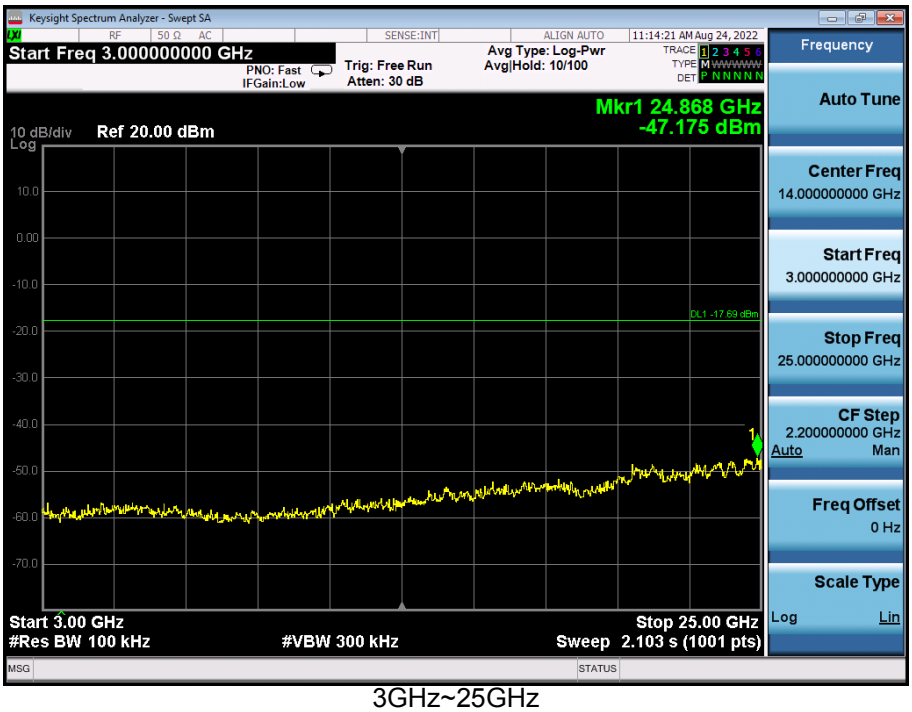
3GHz~25GHz

CH: 2440MHz



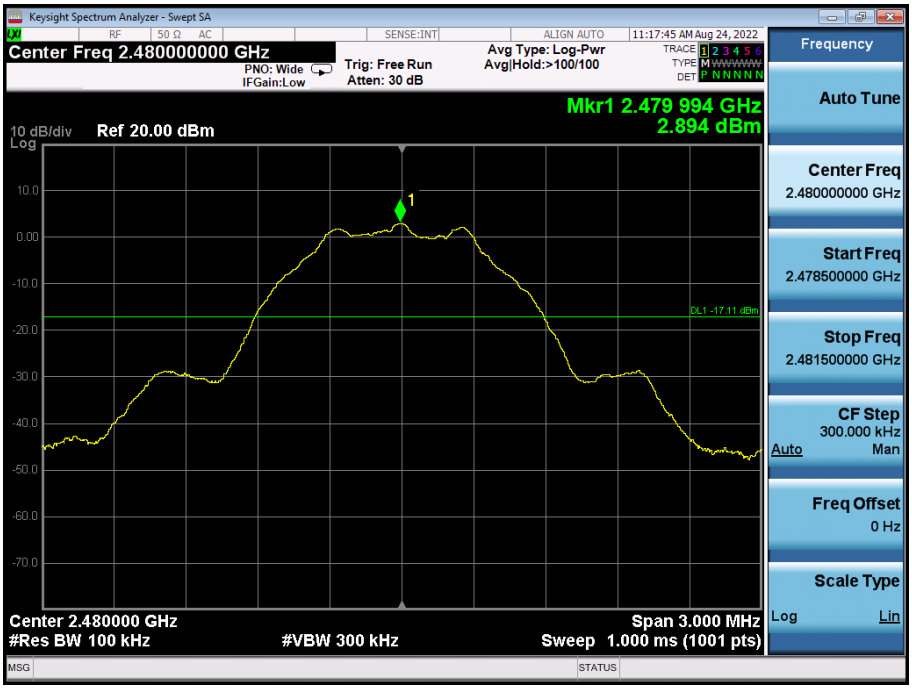


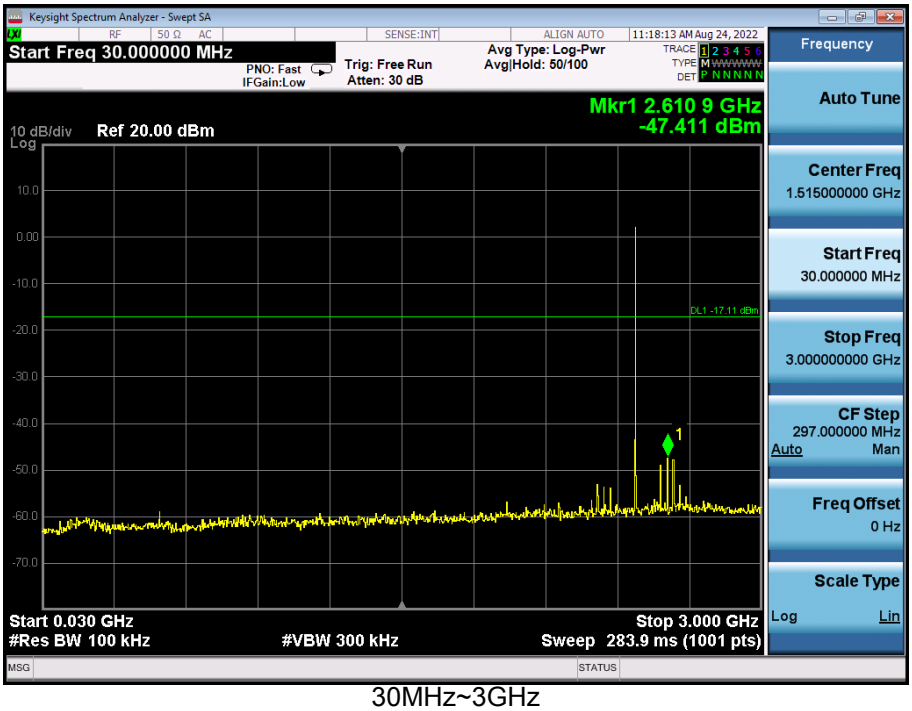
30MHz~3GHz



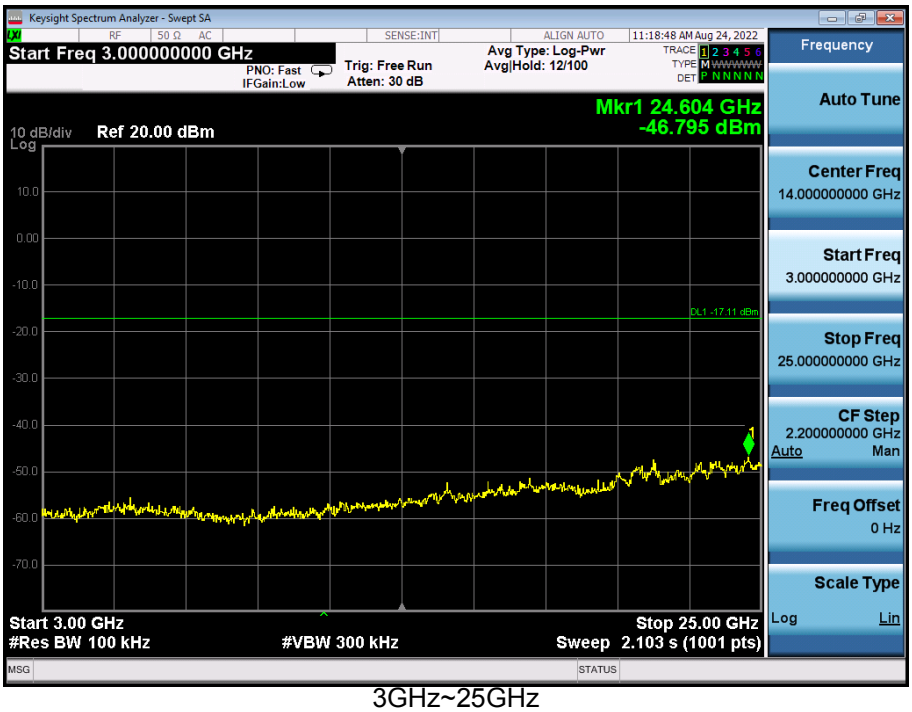
3GHz~25GHz

CH: 2480MHz





30MHz~3GHz


Keysight Spectrum Analyzer - Swept SA
Start Freq 3.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 12/100
11:18:48 AM Aug 24, 2022
Mkr1 24.604 GHz
-46.795 dBm
10 dB/div
Log
Ref 20.00 dBm
DL1 -17.11 dBm
Start 3.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.103 s (1001 pts)
Frequency
Auto Tune
Center Freq
14.000000000 GHz
Start Freq
3.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
2.200000000 GHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

3GHz~25GHz

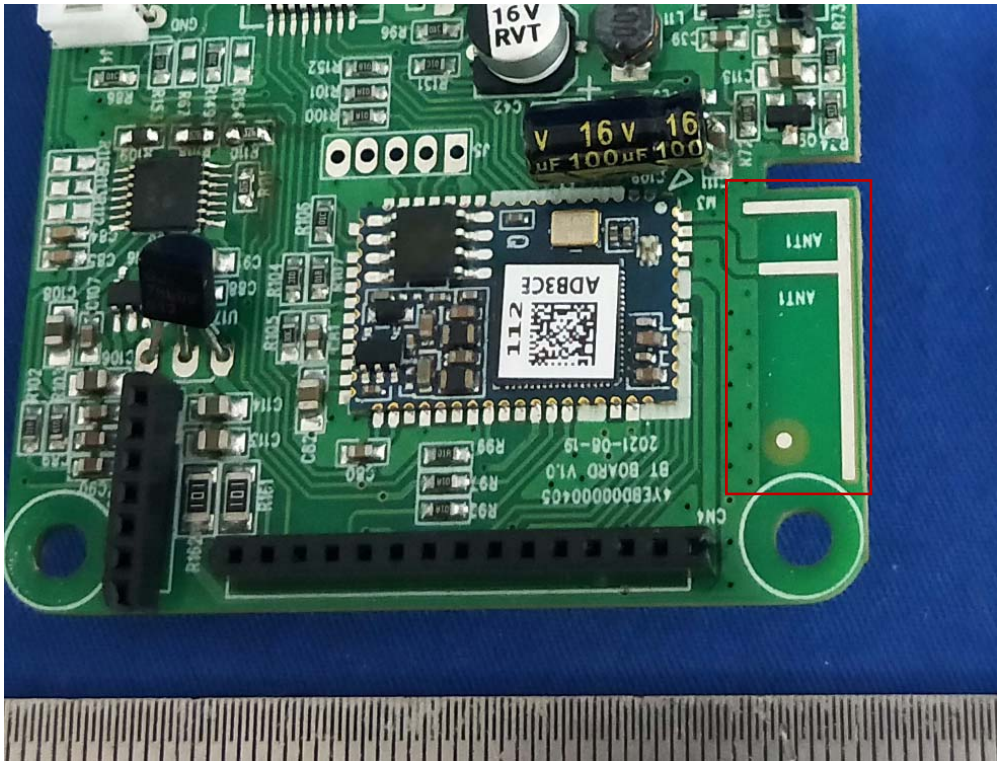
8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible partyshall be used with the device.

8.2 EUT ANTENNA

The EUT antenna is PCB antenna, It comply with the standard requirement.



9. TEST SEUUP PHOTO

Reference to the appendix I for details.

10. EUT PHOTO

Reference to the appendix II for details.

※※※※※ **END OF REPORT** ※※※※※