RF TEST REPORT

Product Name: Powered Subwoofer

Model Number: SPL-X 12, SPL-X 10

FCC ID: 2BESN-SPL-X12

Issued For : Velodyne Acoustics GmbH

Alsterkrugchaussee 435, 22335 Hamburg, Germany

Issued By : Shenzhen LGT Test Service Co., Ltd.

Room 205, Building 13, Zone B, Zhenxiong Industrial Park, No.177, Renmin West Road, Jinsha, Kengzi Street, Pingshan District, Shenzhen, Guangdong, China

Report Number:	LGT26A012RF06
Sample Received Date:	Dec. 29, 2025
Date of Test:	Dec. 29, 2025 ~ Feb. 10, 2026
Date of Issue:	Feb. 10, 2026

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TEST REPORT CERTIFICATION

Applicant:	Velodyne Acoustics GmbH
Address:	Alsterkrugchaussee 435, 22335 Hamburg, Germany
Manufacturer:	Dongguan Tristar Electronic Co., Ltd.
Address:	Building 1&2, No. 196, Tangxia Dongxing Road, Tangxia Town, Dongguan City, Guangdong Province, China. Zip code: 523710
Product Name:	Powered Subwoofer
Trademark:	Velodyne Acoustics
Model Number:	SPL-X 12, SPL-X 10
Sample Status:	Normal

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC Part 15.247, Subpart C ANSI C63.10-2020	PASS

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Technical Director

SHENZHEN LGT TEST SERVICE CO., LTD. LGT 领冠检测

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Revision History

Rev.	Issue Date	Revisions
00	Feb. 10, 2026	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 Part 15.247 Meas Guidance v05r02.

FCC Part 15.247, Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	--
15.247 (a)(2)	6dB Bandwidth	PASS	--
15.247 (b)(3)	Output Power	PASS	--
15.209	Radiated Spurious Emission	PASS	--
15.247 (d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247 (e)	Power Spectral Density	PASS	--
15.205	Restricted Band Edge Emission	PASS	--
Part 15.247(d)/ Part 15.209(a)	Band Edge Emission	PASS	--
15.203	Antenna Requirement	PASS	--

NOTE:

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

(2) All tests are according to ANSI C63.10-2020.

1.1 TEST LABORATORY

Company Name:	Shenzhen LGT Test Service Co., Ltd.
Address:	Room 205, Building 13, Zone B, Zhenxiong Industrial Park, No.177, Renmin West Road, Jinsha, Kengzi Street, Pingshan District, Shenzhen, Guangdong, China
Accreditation Certificate:	FCC Registration No.: 746540
	CAB ID: CN0136

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	Occupied Channel Bandwidth	±0.46%
2	RF Output Power, Conducted	±0.71dB
3	Power Spectral Density, Conducted	±1.57dB
4	Unwanted Emission, Conducted	±0.63dB
5	Conducted emission	±2.80dB
6	All Emissions, Radiated (0.009-30MHz)	±2.16dB
7	All Emissions, Radiated (30MHz-1GHz)	±4.61dB
8	All Emissions, Radiated (1GHz-18GHz)	±5.49dB
9	Temperature	±0.5°C
10	Humidity	±2%
11	Duty Cycle	±2.3%

Note: The measurement uncertainty is not included in the test result.

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name:	Powered Subwoofer
Test Model Number:	SPL-X 12
Series Number:	SPL-X 10
Model Difference:	Same back panel for SPL-X 10 and SPL-X 12 · There are differences in the size.
Product Description:	

Operation Frequency:	2402~2480 MHz
Modulation Type:	GFSK
Radio Technology:	BLE
Bluetooth Configuration:	BLE (1M PHY, 2M PHY)
Number Of Channel:	40
Antenna Designation:	PCB
Antenna Gain (dBi)	0dBi

Channel List:	Please refer to the Note 3.
Rating:	Input: AC 100-240V 50/60Hz 1250W
Hardware Version:	N/A
Software Version:	N/A
Connecting I/O Port(s):	Please refer to the Note 1.

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.
2. The antenna information refers to the manufacturer provide report, applicable only to the tested sample identified in the report. Due to the incorrect antenna information, a series of problems such as the accuracy of the test results will be borne by the customer.
3.

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	10	2422	20	2442	30	2462
01	2404	11	2424	21	2444	31	2464
02	2406	12	2426	22	2446	32	2466
03	2408	13	2428	23	2448	33	2468
04	2410	14	2430	24	2450	34	2470
05	2412	15	2432	25	2452	35	2472
06	2414	16	2434	26	2454	36	2474
07	2416	17	2436	27	2456	37	2476
08	2418	18	2438	28	2458	38	2478
09	2420	19	2440	29	2460	39	2480

2.2 DESCRIPTION OF THE TEST MODES

For conducted test items and radiated spurious emissions
Each of these EUT operation mode(s) or test configuration mode(s) mentioned below was evaluated respectively.

Worst Mode	Description	Data/Modulation
Mode 1	TX CH00(2402MHz)	1 Mbps/GFSK
Mode 2	TX CH19(2440MHz)	1 Mbps/GFSK
Mode 3	TX CH39(2480MHz)	1 Mbps/GFSK
Mode 4	TX CH00(2402MHz)	2 Mbps/GFSK
Mode 5	TX CH19(2440MHz)	2 Mbps/GFSK
Mode 6	TX CH39(2480MHz)	2 Mbps/GFSK

Note:
(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.
(2) We have be tested for all avaiable U.S. voltage and frequency (For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/60Hz is shown in the report.
(3) The battery is fully-charged during the radited and RF conducted test.

For AC Conducted Emission

Test Case	
AC Conducted Emission	Mode 7: Keeping BLE TX

2.3 TEST SOFTWARE AND POWER LEVEL

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

Test software Version	Test program: BLE	
FCC_assist1.0.4	Mode Or Modulation type	Power setting
	1M	Default
	2M	Default

2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

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.

Accessories Equipment

Description	Manufacturer	Model	S/N	Rating

Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Laptop	ASUS	UX3407Q	N/A	N/A
Receiver	N/A	N/A	N/A	N/A
loudspeaker	N/A	N/A	N/A	N/A

Note:

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

(2) “YES” is means “with core”; “NO” is means “without core”.

2.5 EQUIPMENTS LIST

Conducted Emission					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Until**
EMI Test Receiver	R&S	ESU8	100372	2025.03.06	2026.03.05
LISN	COM-POWER	LI-115	02032	2025.03.05	2026.03.04
LISN	SCHWARZBECK	NNLK 8122	00160	2025.03.05	2026.03.04
Transient Limiter	CYBERTEK	EM5010A	E2250100049	2025.03.05	2026.03.04
Coaxial cables (9kHz-30MHz)	Juncoax	JMR600 -NMNM-2M	N.A	2025.03.06	2026.03.05
Temperature & Humidity	JINGCHUANG	BT-3	N.A	2025.03.10	2026.03.09
Testing Software	EMC-I_V1.4.0.3_SKET				

Radiated Test equipment					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Until**
EMI Test Receiver	R&S	ESU8	100372	2025.03.06	2026.03.05
Active loop Antenna	ETS	6502	00049544	2025.03.11	2028.03.10
Spectrum Analyzer	Keysight	N9010B	MY60242508	2025.03.05	2026.03.04
Trilog Broadband Antenna (30M-1G)	SCHWARZBECK	VULB 9168	2705	2024.05.17	2027.05.16
Horn Antenna(1-18G)	SCHWARZBECK	3115	10SL0060	2025.03.10	2028.03.09
Horn Antenna(18-40G)	SCHWARZBECK	BBHA 9170	685	2023.10.23	2026.10.22
Pre-amplifier(30M-1G)	EMtrace	RP01A	02019	2025.03.06	2026.03.05
Pre-amplifier(1-26.5G)	Agilent	8449B	3008A4722	2025.03.06	2026.03.05
Pre-amplifier(18-40G)	SCHWARZBECK	BBV 9721	9721-019	2025.10.20	2026.10.19
Coaxial cables (9kHz-1GHz)	Juncoax	JMR600 -NMNM-8M	N.A	2025.03.06	2026.03.05
Coaxial cables (1GHz-18GHz)	TaiHe	UCD460B -NMSM-1M9	N.A	2025.03.06	2026.03.05
Coaxial cables (18GHz-40GHz)	Junkosha Inc.	MWX241 -05000KMSKMS	N.A	2025.03.08	2026.03.07
Temperature& Humidity test chamber	AISRY	LX-1000L	171200018	2025.07.30	2026.07.29
Antenna Tower	SAEMC	BK-4AT-BS-D	SK2021093008	N.A	N.A
Temperature & Humidity	JINGCHUANG	BT-3	N.A	2025.03.10	2026.03.09
Testing Software	EMC-I_V1.4.0.3_SKET				

RF Conducted Test equipment					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Until**
Signal Analyzer	Keysight	N9020A	MY50530994	2025.03.05	2026.03.04
Power Sensor	R&S	NRP8S	104963	2025.03.06	2026.03.05
RF Automatic Test system	TST	TST PASS	293	2025.07.15	2026.07.14
MXG Vector Signal Generator	Keysight	N5182B	MY59100717	2025.03.05	2026.03.04
Temperature& Humidity test chamber	AISRY	LX-1000L	171200018	2025.07.30	2026.07.29
Attenuator	eastsheep	90db	N.A	2025.03.06	2026.03.05
Temperature & Humidity	JINGCHUANG	BT-3	N.A	2025.03.10	2026.03.09

Digital multimeter	MASTECH	MS8261	MBGBC83053	2025.03.05	2026.03.04
DC source	Keysight	E3634A	MY58036468	2025.03.06	2026.03.05
Testing Software	TST Pass_2.0.2				

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

FREQUENCY (MHz)	Conducted Emission limit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

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.

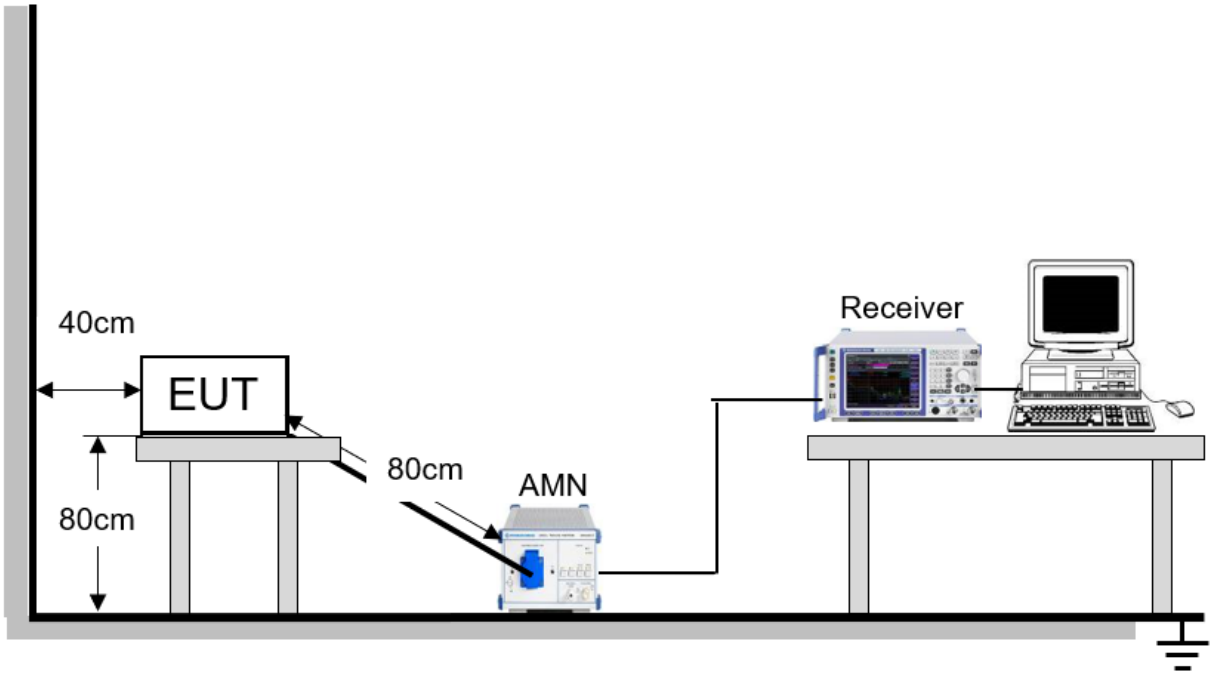
The following table is the setting of the receiver

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

3.2 TEST PROCEDURE

a. The EUT is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 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 is at least 80 cm from the nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 TEST SETUP

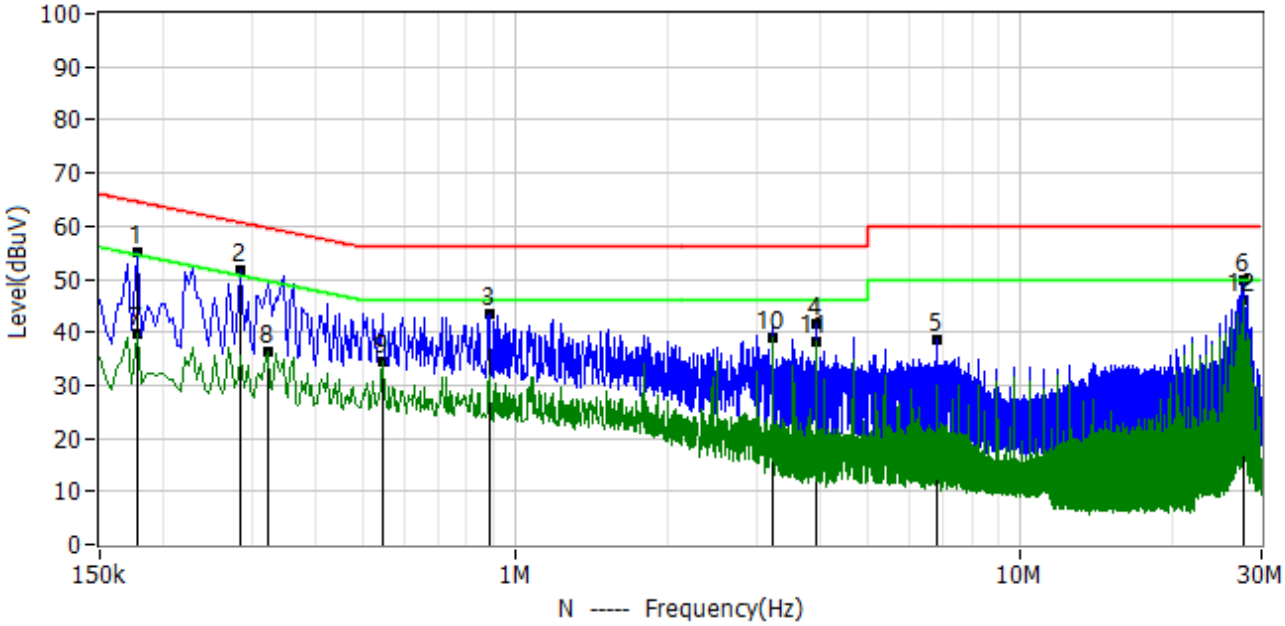


3.4 EUT OPERATING CONDITIONS

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.

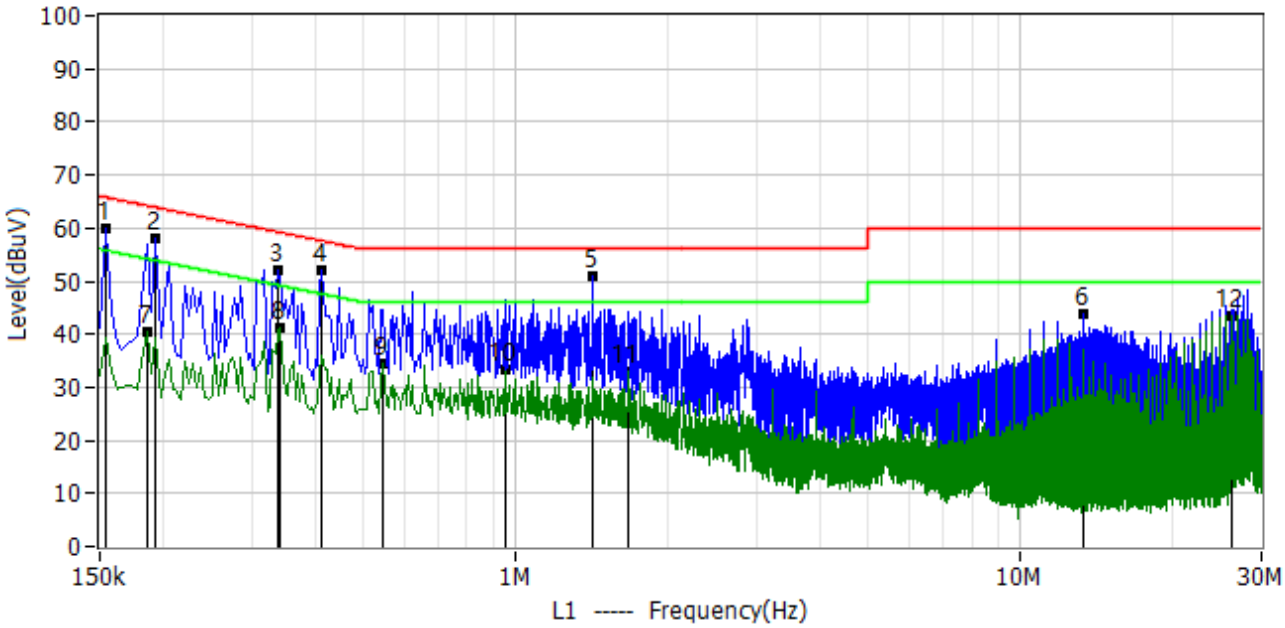
3.5 TEST RESULTS
Note: Level = Reading + Factor
Margin = Level – Limit

Project: LGT26A012	Test Engineer: LiuH
EUT: Powered Subwoofer	Temperature: 17.1℃
M/N: SPL-X 12	Humidity: 53%RH
Test Voltage: AC 120V/60Hz	Test Data: 2026-02-09
Test Mode: TX BLE 1M 2402	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB	Result dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	0.178	44.40	10.64	55.04	64.58	-9.54	QP	N
2*	0.286	41.10	10.74	51.84	60.64	-8.80	QP	N
3*	0.886	32.60	10.84	43.44	56.00	-12.56	QP	N
4*	3.946	30.48	11.27	41.75	56.00	-14.25	QP	N
5*	6.814	27.10	11.40	38.50	60.00	-21.50	QP	N
6*	27.542	38.14	11.81	49.95	60.00	-10.05	QP	N
7*	0.178	29.15	10.64	39.79	54.58	-14.79	AV	N
8*	0.322	25.50	10.79	36.29	49.66	-13.37	AV	N
9*	0.546	23.42	10.85	34.27	46.00	-11.73	AV	N
10*	3.226	27.62	11.24	38.86	46.00	-7.14	AV	N
11*	3.946	26.89	11.27	38.16	46.00	-7.84	AV	N
12*	27.606	34.35	11.81	46.16	50.00	-3.84	AV	N

Project: LGT26A012	Test Engineer: LiuH
EUT: Powered Subwoofer	Temperature: 17.1℃
M/N: SPL-X 12	Humidity: 53%RH
Test Voltage: DC 3.7V	Test Data: 2026-02-09
Test Mode: On, operating	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB	Result dBuV	Limit dBuV	Margin dB	Detector	Polar
1*	0.154	49.29	10.78	60.07	65.78	-5.71	QP	L1
2*	0.194	47.27	10.70	57.97	63.86	-5.89	QP	L1
3*	0.338	41.31	10.88	52.19	59.25	-7.06	QP	L1
4*	0.414	41.03	10.87	51.90	57.57	-5.67	QP	L1
5*	1.418	39.67	11.11	50.78	56.00	-5.22	QP	L1
6*	13.266	32.22	11.64	43.86	60.00	-16.14	QP	L1
7*	0.186	29.80	10.68	40.48	54.21	-13.73	AV	L1
8*	0.342	30.15	10.89	41.04	49.15	-8.11	AV	L1
9*	0.546	23.33	10.94	34.27	46.00	-11.73	AV	L1
10*	0.954	22.30	10.85	33.15	46.00	-12.85	AV	L1
11*	1.670	21.87	11.13	33.00	46.00	-13.00	AV	L1
12*	26.166	31.75	11.83	43.58	50.00	-6.42	AV	L1

4. RADIATED EMISSION MEASUREMENT

4.1 RADIATED EMISSION LIMITS

In case the emission fall within the Restricted band specified on Part15.205 (a)&209(a) limit in the table and according to ANSI C63.10-2020 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (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
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(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).

LIMITS OF RESTRICTED FREQUENCY BANDS

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	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	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	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	Above 38.6
13.36-13.41			

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP/AV
Start Frequency	9 KHz/150KHz (Peak/QP/AV)
Stop Frequency	150KHz/30MHz (Peak/QP/AV)
RB / VB (emission in restricted band)	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz); 200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP
Start Frequency	30 MHz (Peak/QP)
Stop Frequency	1000 MHz (Peak/QP)
RB / VB (emission in restricted band)	120 KHz / 300 KHz

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak
Start Frequency	1000 MHz (Peak/AV)
Stop Frequency	10th carrier hamonic (Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

For Restricted band

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2310 to 2410 MHz Upper Band Edge: 2475 to 2500 MHz
RB / VB	1 MHz / 3 MHz(Peak) 1 MHz/1/T MHz(AVG)

Receiver Parameter	**Setting**
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2 TEST PROCEDURE

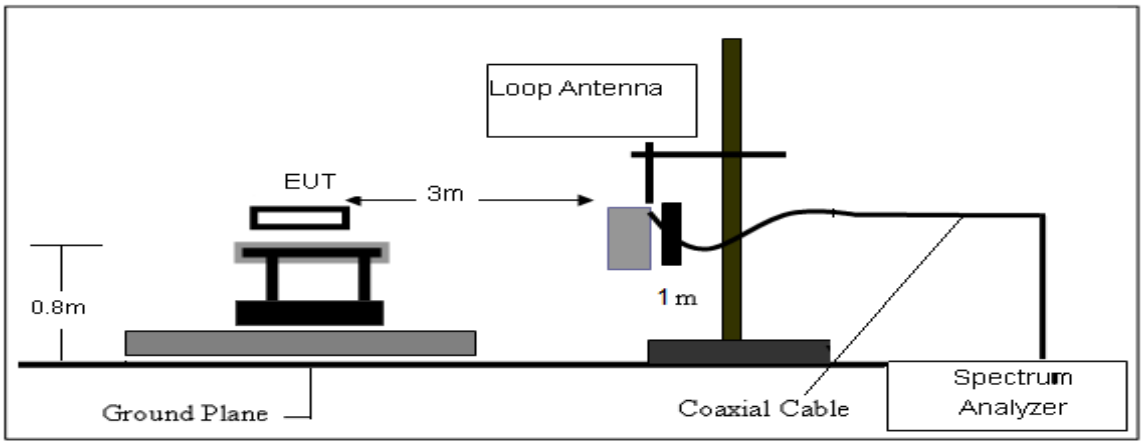
a. The measuring distance at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarization of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and QuasiPeak detector mode will be re-measured.
e. If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

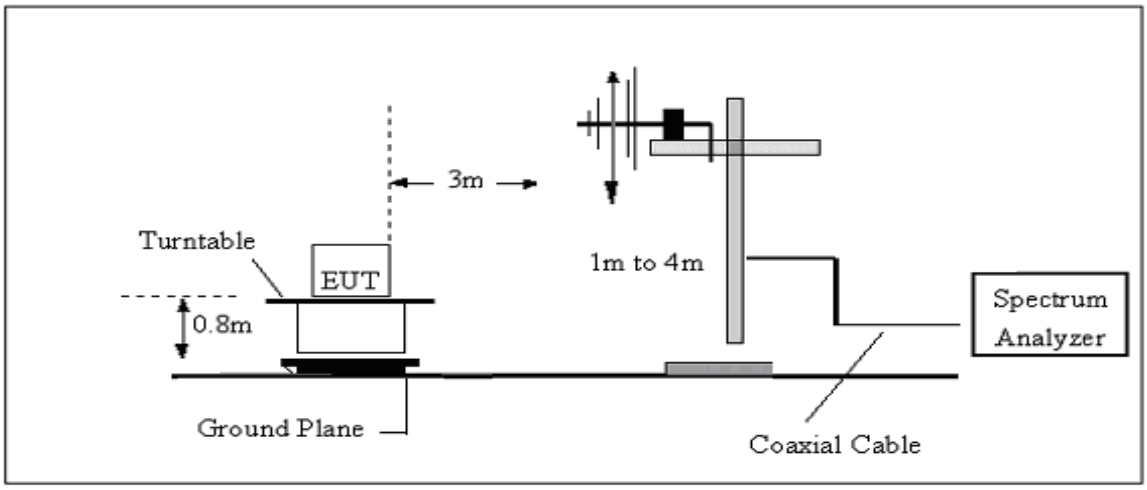
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

4.3 TEST SETUP

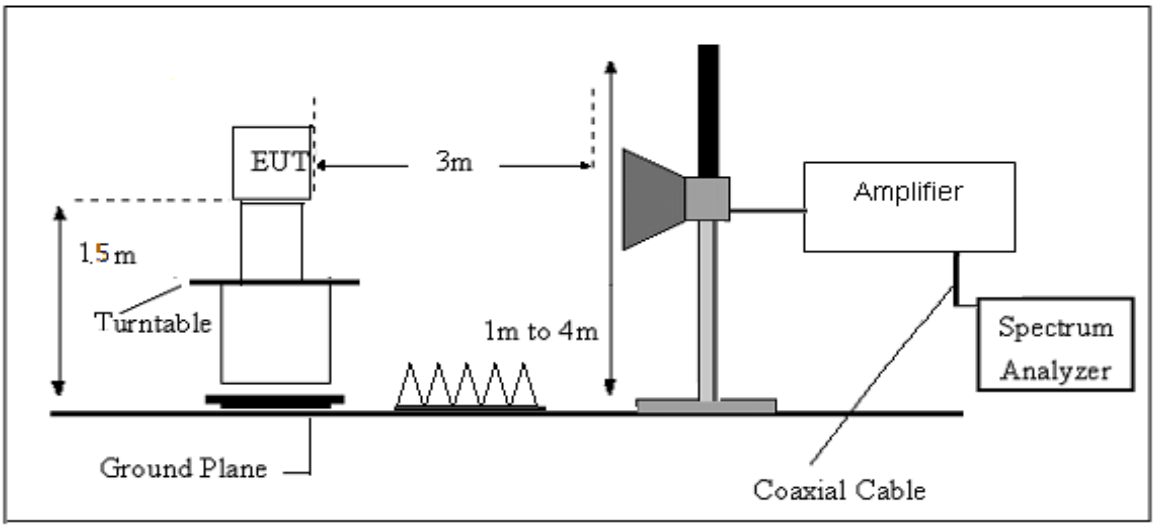
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



4.4 EUT OPERATING CONDITIONS

Please refer to section 3.4 of this report.

4.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

Factor=AF+CL-AG

4.6 TEST RESULTS

Results of Radiated Emissions (9 KHz~30MHz)

No.	Frequency	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Detector	Remark
1*	-	-	-	-	-	-	-	See Note

Note:

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and 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.

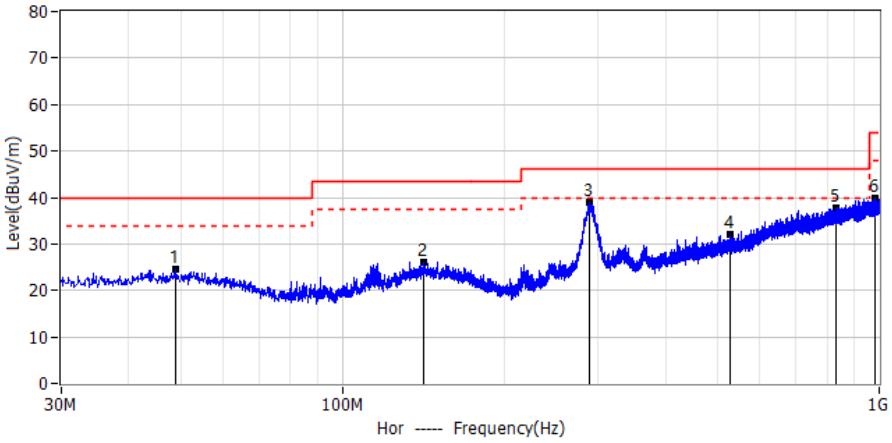
Results of Radiated Emissions (30MHz~1000MHz)

Note:1. All mode has been tested, only shown the worst case data.

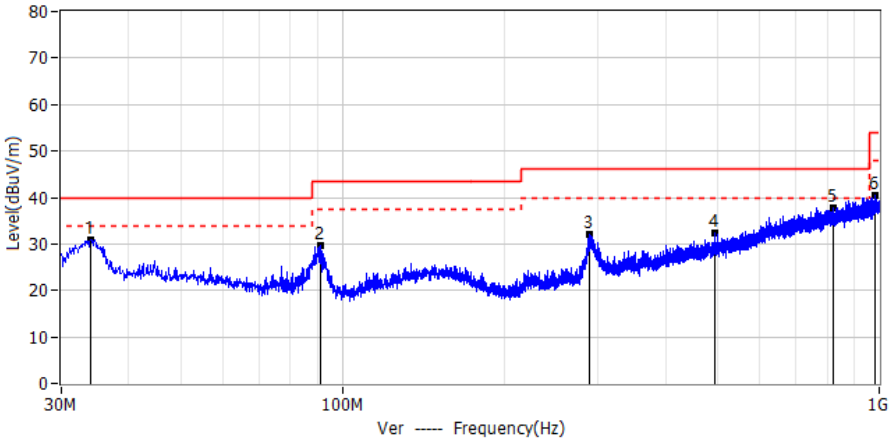
2. Note: Level = Reading + Factor

Margin = Level – Limit

Project: LGT26A012	Test Engineer: zhangyangda
EUT: Powered Subwoofer	Temperature: 20.2℃
M/N: SPL-X 12	Humidity: 62%RH
Test Voltage: AC 230V/50Hz	Test Data: 2026-02-10
Test Mode: TX BLE 1M 2402	
Note:	



No.	Frequency MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	49.036	3.57	21.02	24.59	40.00	-15.41	QP	Hor
2*	142.156	4.74	21.40	26.14	43.50	-17.36	QP	Hor
3*	288.626	17.10	21.76	38.86	46.00	-7.14	QP	Hor
4*	527.489	3.97	27.95	31.92	46.00	-14.08	QP	Hor
5*	829.159	4.65	33.22	37.87	46.00	-8.13	QP	Hor
6*	985.086	4.37	35.51	39.88	54.00	-14.12	QP	Hor



No.	Frequency MHz	Reading dBuV	Factor dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Detector	Polar
1*	34.001	11.08	19.85	30.93	40.00	-9.07	QP	Ver
2*	91.353	12.98	16.68	29.66	43.50	-13.84	QP	Ver
3*	288.263	10.28	21.73	32.01	46.00	-13.99	QP	Ver
4*	493.175	4.94	27.35	32.29	46.00	-13.71	QP	Ver
5*	821.641	4.79	33.11	37.90	46.00	-8.10	QP	Ver
6*	983.389	5.15	35.38	40.53	54.00	-13.47	QP	Ver

Results of Radiated Emissions (Above 1000MHz)

Frequency (MHz)	Reading (dBμV)	Corrected Factor (dB)	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector	Polarity
Low Channel (2M PHY-2402 MHz)							
3264.82	56.48	-8.45	48.03	74.00	-25.97	PK	Vertical
3264.82	45.09	-8.45	36.64	54.00	-17.36	AV	Vertical
3264.66	55.87	-8.45	47.42	74.00	-26.58	PK	Horizontal
3264.66	45.30	-8.45	36.85	54.00	-17.15	AV	Horizontal
4804.32	54.30	-6.09	48.21	74.00	-25.79	PK	Vertical
4804.32	45.41	-6.09	39.32	54.00	-14.68	AV	Vertical
4804.57	54.82	-6.09	48.73	74.00	-25.27	PK	Horizontal
4804.57	44.42	-6.09	38.33	54.00	-15.67	AV	Horizontal
5359.66	57.27	-6.68	50.59	74.00	-23.41	PK	Vertical
5359.66	48.25	-6.68	41.57	54.00	-12.43	AV	Vertical
5359.68	57.83	-6.68	51.15	74.00	-22.85	PK	Horizontal
5359.68	47.56	-6.68	40.88	54.00	-13.12	AV	Horizontal
7205.94	59.52	-8.13	51.39	74.00	-22.61	PK	Vertical
7205.94	50.03	-8.13	41.90	54.00	-12.10	AV	Vertical
7205.70	59.92	-8.13	51.79	74.00	-22.21	PK	Horizontal
7205.70	50.79	-8.13	42.66	54.00	-11.34	AV	Horizontal
Middle Channel (2M PHY-2440 MHz)							
3264.62	56.11	-8.45	47.66	74.00	-26.34	PK	Vertical
3264.62	46.49	-8.45	38.04	54.00	-15.96	AV	Vertical
3264.56	55.05	-8.45	46.60	74.00	-27.40	PK	Horizontal
3264.56	45.70	-8.45	37.25	54.00	-16.75	AV	Horizontal
4880.47	54.88	-6.09	48.79	74.00	-25.21	PK	Vertical
4880.47	44.89	-6.09	38.80	54.00	-15.20	AV	Vertical
4880.56	54.27	-6.09	48.18	74.00	-25.82	PK	Horizontal
4880.56	44.91	-6.09	38.82	54.00	-15.18	AV	Horizontal
5359.64	56.56	-6.68	49.88	74.00	-24.12	PK	Vertical
5359.64	47.98	-6.68	41.30	54.00	-12.70	AV	Vertical
5359.86	56.88	-6.68	50.20	74.00	-23.80	PK	Horizontal
5359.86	46.94	-6.68	40.26	54.00	-13.74	AV	Horizontal
7310.73	60.43	-8.13	52.30	74.00	-21.70	PK	Vertical
7310.73	50.64	-8.13	42.51	54.00	-11.49	AV	Vertical
7310.73	60.93	-8.13	52.80	74.00	-21.20	PK	Horizontal
7310.73	50.51	-8.13	42.38	54.00	-11.62	AV	Horizontal
High Channel (2M PHY-2480 MHz)							
3264.65	55.83	-8.45	47.38	74.00	-26.62	PK	Vertical

3264.65	45.12	-8.45	36.67	54.00	-17.33	AV	Vertical
3264.76	55.73	-8.45	47.28	74.00	-26.72	PK	Horizontal
3264.76	45.44	-8.45	36.99	54.00	-17.01	AV	Horizontal
4960.44	55.24	-6.09	49.15	74.00	-24.85	PK	Vertical
4960.44	44.13	-6.09	38.04	54.00	-15.96	AV	Vertical
4960.32	54.01	-6.09	47.92	74.00	-26.08	PK	Horizontal
4960.32	44.32	-6.09	38.23	54.00	-15.77	AV	Horizontal
5359.64	56.84	-6.68	50.16	74.00	-23.84	PK	Vertical
5359.64	47.36	-6.68	40.68	54.00	-13.32	AV	Vertical
5359.74	56.57	-6.68	49.89	74.00	-24.11	PK	Horizontal
5359.74	47.77	-6.68	41.09	54.00	-12.91	AV	Horizontal
7439.97	59.72	-8.13	51.59	74.00	-22.41	PK	Vertical
7439.97	49.93	-8.13	41.80	54.00	-12.20	AV	Vertical
7439.79	61.02	-8.13	52.89	74.00	-21.11	PK	Horizontal
7439.79	49.92	-8.13	41.79	54.00	-12.21	AV	Horizontal

Remark:

In frequency ranges 18~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.

4.6 TEST RESULTS (BAND EDGE REQUIREMENTS)

Frequency (MHz)	Reading (dBμV)	Corrected Factor (dB）	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector	Polarity
GFSK-1M PHY							
2390.00	13.17	34.10	47.27	74.00	-26.73	PK	Vertical
2390.00	2.27	34.10	36.37	54.00	-17.63	AV	Vertical
2400.00	12.94	34.11	47.05	74.00	-26.95	PK	Vertical
2400.00	1.27	34.11	35.38	54.00	-18.62	AV	Vertical
2390.00	13.80	34.10	47.90	74.00	-26.10	PK	Horizontal
2390.00	1.99	34.10	36.09	54.00	-17.91	AV	Horizontal
2400.00	13.65	34.11	47.76	74.00	-26.24	PK	Horizontal
2400.00	1.85	34.11	35.96	54.00	-18.04	AV	Horizontal
2483.50	12.84	34.44	47.28	74.00	-26.72	PK	Vertical
2483.50	1.87	34.44	36.31	54.00	-17.69	AV	Vertical
2500.00	13.57	34.46	48.03	74.00	-25.97	PK	Vertical
2500.00	1.94	34.46	36.40	54.00	-17.60	AV	Vertical
2483.50	12.65	34.44	47.09	74.00	-26.91	PK	Horizontal
2483.50	1.69	34.44	36.13	54.00	-17.87	AV	Horizontal
2500.00	13.80	34.46	48.26	74.00	-25.74	PK	Horizontal
2500.00	1.88	34.46	36.34	54.00	-17.66	AV	Horizontal
GFSK-2M PHY							
2390.00	13.22	34.10	47.32	74.00	-26.68	PK	Vertical
2390.00	1.24	34.10	35.34	54.00	-18.66	AV	Vertical
2400.00	12.20	34.11	46.31	74.00	-27.69	PK	Vertical
2400.00	2.09	34.11	36.20	54.00	-17.80	AV	Vertical
2390.00	12.53	34.10	46.63	74.00	-27.37	PK	Horizontal
2390.00	1.13	34.10	35.23	54.00	-18.77	AV	Horizontal
2400.00	13.66	34.11	47.77	74.00	-26.23	PK	Horizontal
2400.00	2.31	34.11	36.42	54.00	-17.58	AV	Horizontal
2483.50	13.43	34.44	47.87	74.00	-26.13	PK	Vertical
2483.50	2.21	34.44	36.65	54.00	-17.35	AV	Vertical
2500.00	13.16	34.46	47.62	74.00	-26.38	PK	Vertical
2500.00	1.62	34.46	36.08	54.00	-17.92	AV	Vertical
2483.50	13.41	34.44	47.85	74.00	-26.15	PK	Horizontal
2483.50	1.10	34.44	35.54	54.00	-18.46	AV	Horizontal
2500.00	13.60	34.46	48.06	74.00	-25.94	PK	Horizontal
2500.00	1.39	34.46	35.85	54.00	-18.15	AV	Horizontal

Low measurement frequencies is range from 2310 to 2404 MHz, high measurement frequencies is range from 2478 to 2500 MHz.

5. CONDUCTED SPURIOUS & BAND EDGE EMISSION

5.1 LIMIT

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

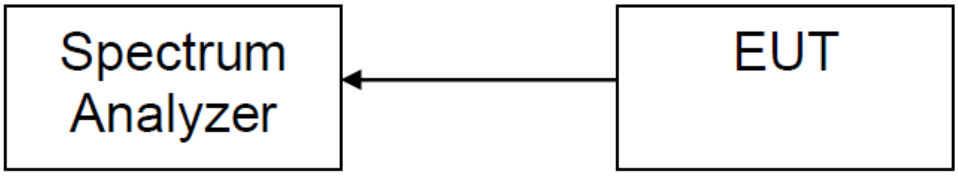
5.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300 – 2407 MHz Upper Band Edge: 2475 – 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

5.3 TEST SETUP



The EUT is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

5.4 EUT OPERATION CONDITIONS

Please refer to section 3.4 of this report.

5.5 TEST RESULTS

For the measurement records, refer to the appendix I.

Note: Not recorded emission from 9 KHz to 30 MHz as emission level at least 20dBc lower than emission limit.

6. POWER SPECTRAL DENSITY TEST

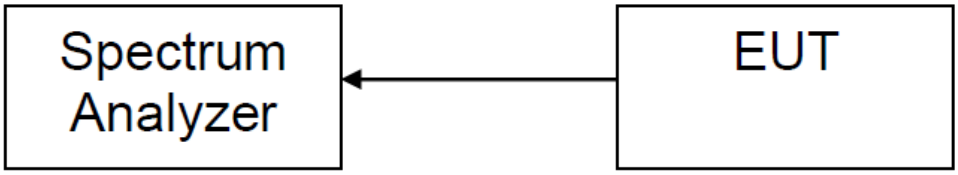
6.1 LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	≤8 dBm (RBW≥3KHz)	2400-2483.5	PASS

6.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to: 100 kHz ≥ RBW ≥ 3 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.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

Please refer to section 3.4 of this report.

6.5 TEST RESULTS

For the measurement records, refer to the appendix I.

7. BANDWIDTH TEST

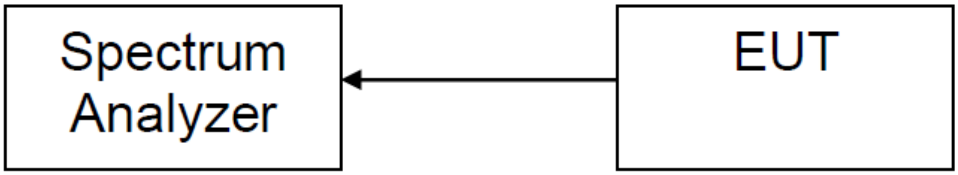
7.1 LIMIT

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

7.2 TEST PROCEDURE

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW≥3RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be≥6 dB.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

Please refer to section 3.4 of this report.

7.5 TEST RESULTS

For the measurement records, refer to the appendix I.

8. PEAK OUTPUT POWER TEST

8.1 LIMIT

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

8.2 TEST PROCEDURE

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

RBW ≥ DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ [3 × RBW].
c) Set span ≥ [3 × RBW].
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

Integrated band power method:

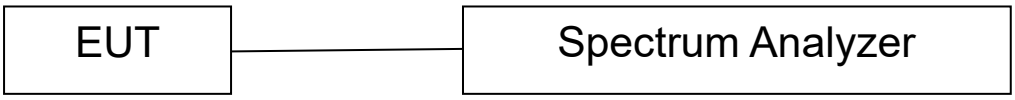
The following procedure can be used when the maximum available RBW of the instrument is less than the
DTS bandwidth:

a) Set the RBW = 1 MHz.
b) Set the VBW ≥ [3 × RBW].
c) Set the span ≥ [1.5 × DTS bandwidth].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

PKPM1 Peak power sensor method:

The maximum peak conducted output power may be measured using a broadband peak RF power sensor. The power sensor shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

Please refer to section 3.4 of this report.

8.5 TEST RESULTS

For the measurement records, refer to the appendix I.

9. ANTENNA REQUIREMENT

9.1 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 party shall be used with the device.

9.2 EUT ANTENNA

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

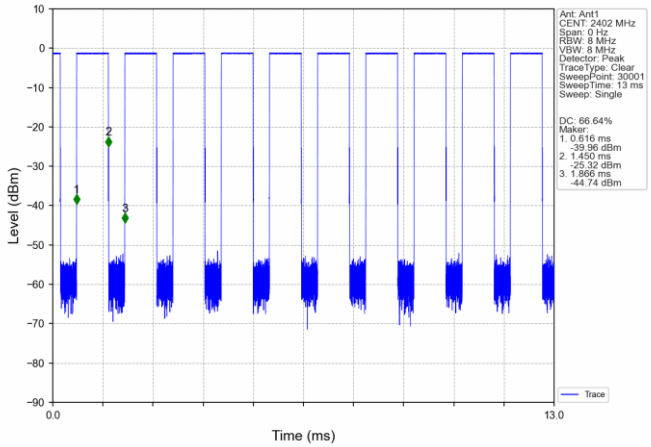
APPENDIX I - TEST RESULTS

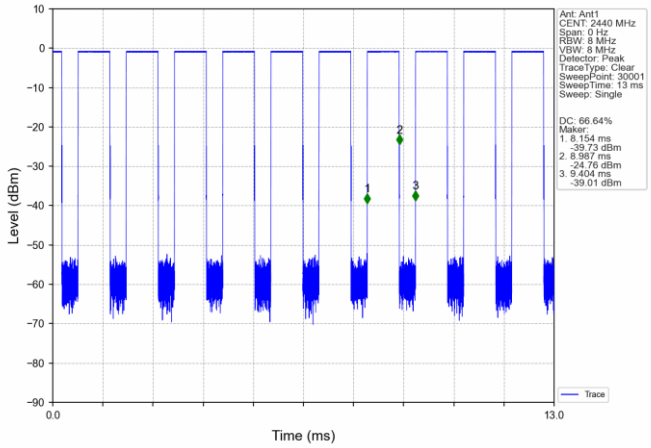
1. Duty Cycle
1.1 Test Result
1.1.1 Ant1

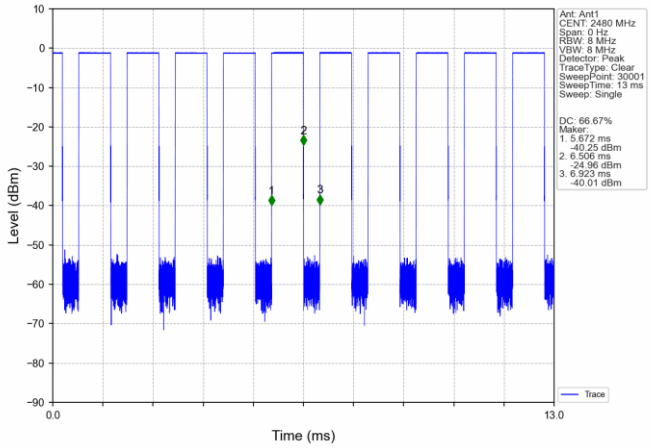
Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	0.833	1.250	66.64	1.76	0.01
		2440	0.833	1.250	66.64	1.76	0.03
		2480	0.834	1.251	66.67	1.76	0.03
2M	SISO	2402	0.433	1.250	34.64	4.60	0.02
		2440	0.433	1.250	34.64	4.60	0.02
		2480	0.433	1.250	34.64	4.60	0.03

1.2 Test Graph

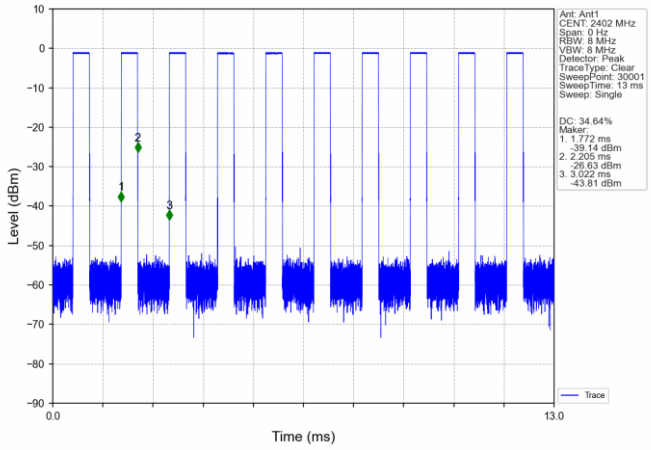
1.2.1 Ant1

1M_LCH_2402MHz_Ant1_NTNV


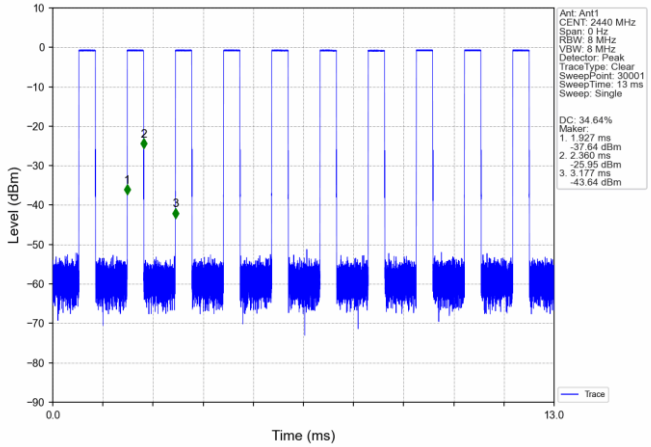
1M_MCH_2440MHz_Ant1_NTNV


1M_HCH_2480MHz_Ant1_NTNV


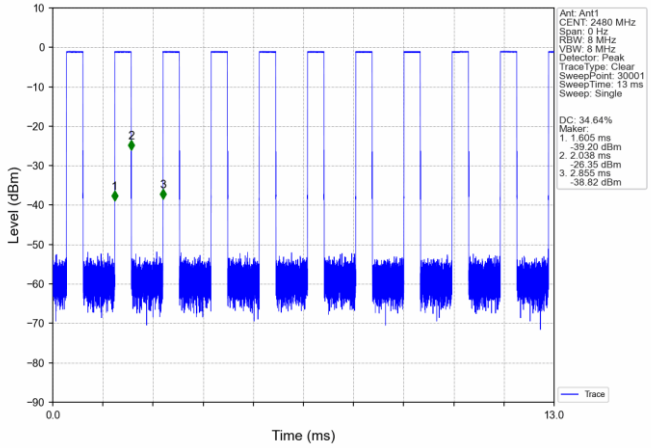
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



2. Bandwidth
2.1 Test Result
2.1.1 OBW

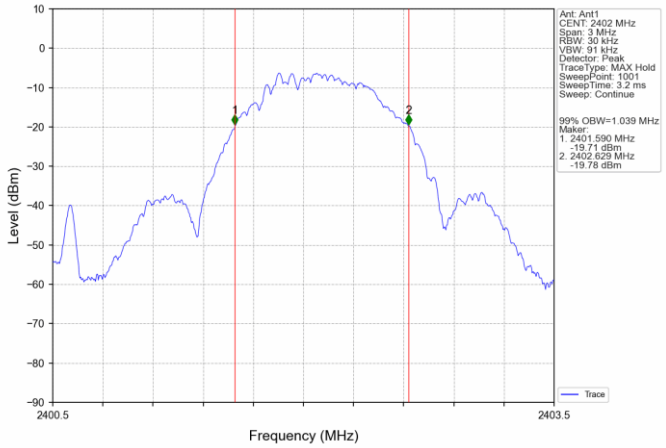
Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	1.039	/	Pass
		2440	1	1.039	/	Pass
		2480	1	1.040	/	Pass
2M	SISO	2402	1	2.063	/	Pass
		2440	1	2.070	/	Pass
		2480	1	2.073	/	Pass

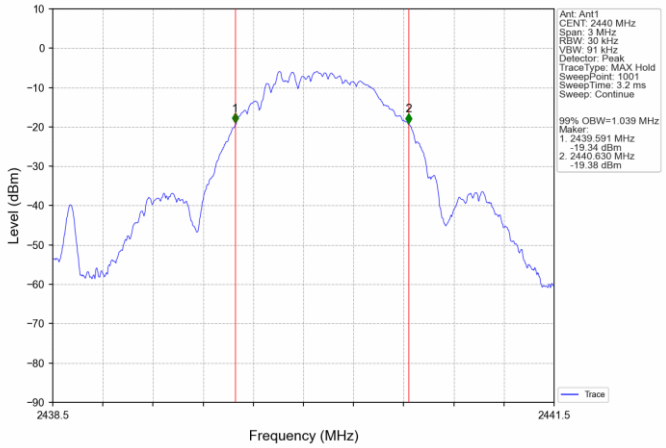
2.1.2 6dB BW

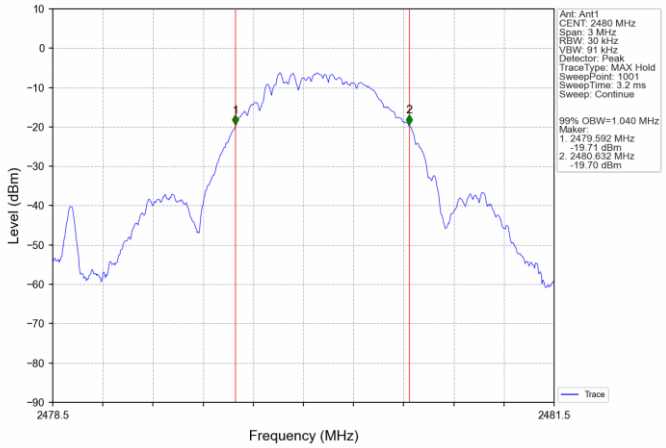
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.671	>=0.5	Pass
		2440	1	0.671	>=0.5	Pass
		2480	1	0.672	>=0.5	Pass
2M	SISO	2402	1	1.209	>=0.5	Pass
		2440	1	1.236	>=0.5	Pass
		2480	1	1.187	>=0.5	Pass

2.2 Test Graph

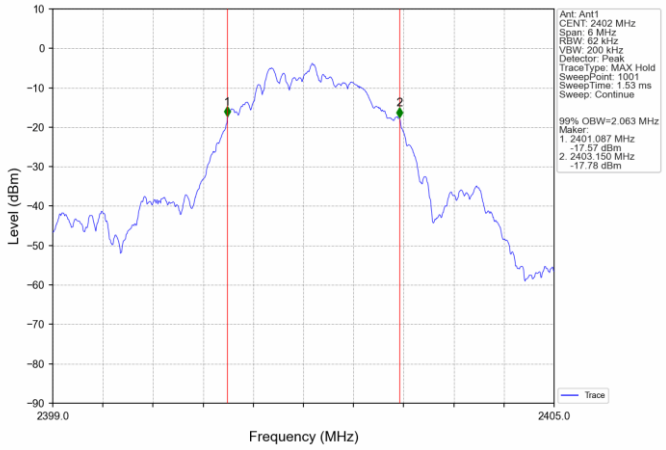
2.2.1 OBW

1M_LCH_2402MHz_Ant1_NTNV


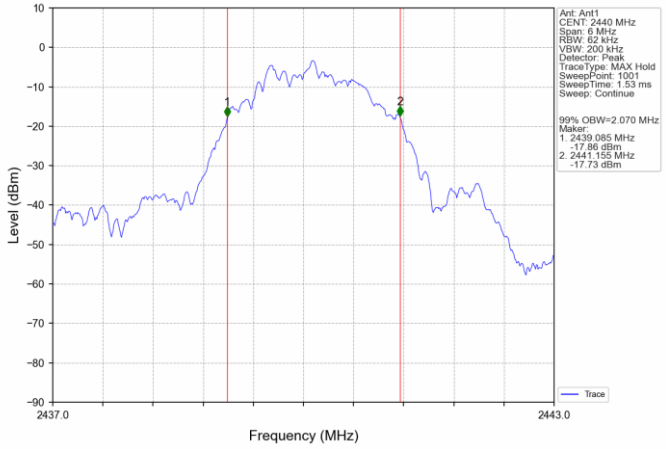
1M_MCH_2440MHz_Ant1_NTNV


1M_HCH_2480MHz_Ant1_NTNV


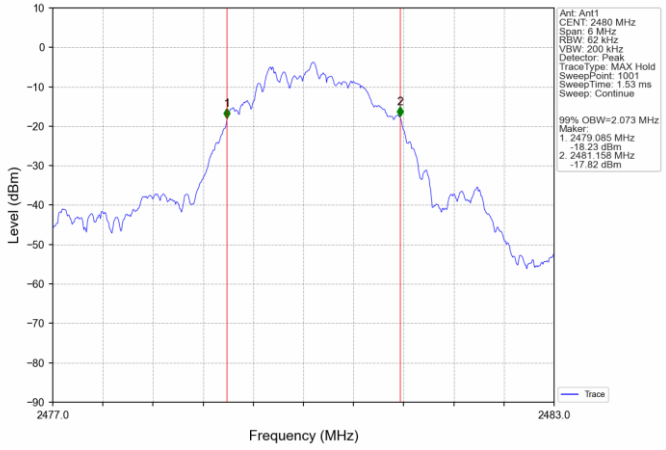
2M_LCH_2402MHz_Ant1_NTNV



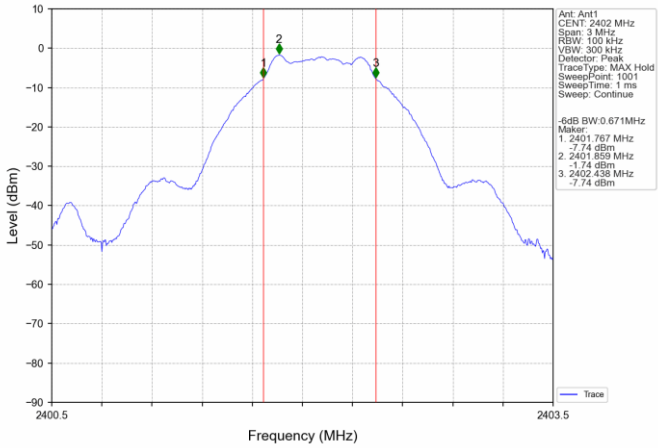
2M_MCH_2440MHz_Ant1_NTNV

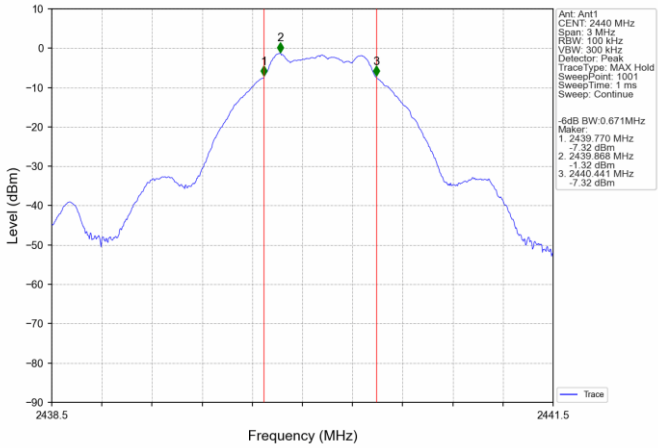


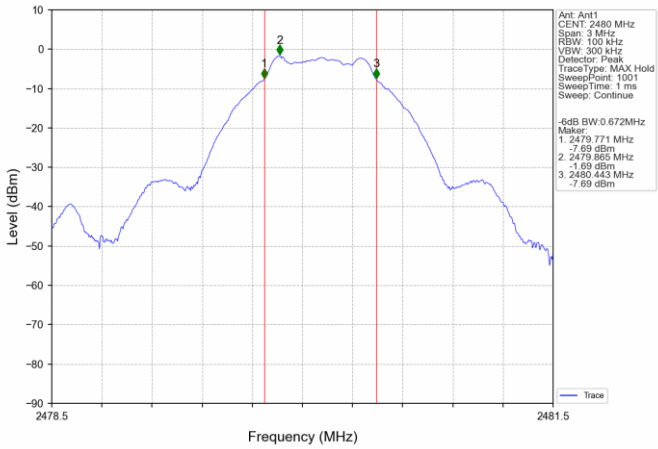
2M_HCH_2480MHz_Ant1_NTNV



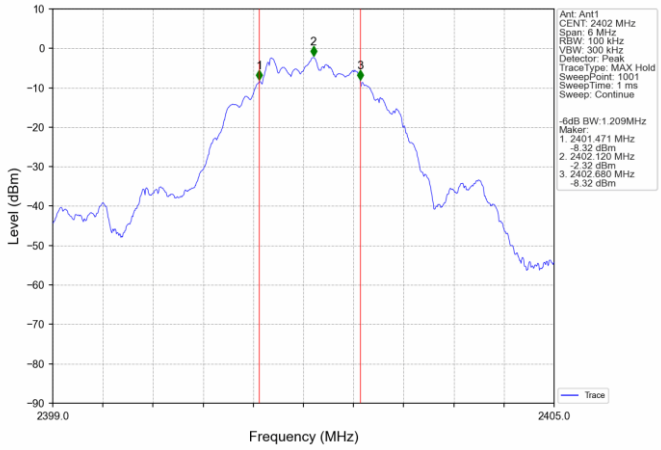
2.2.2 6dB BW

1M_LCH_2402MHz_Ant1_NTNV


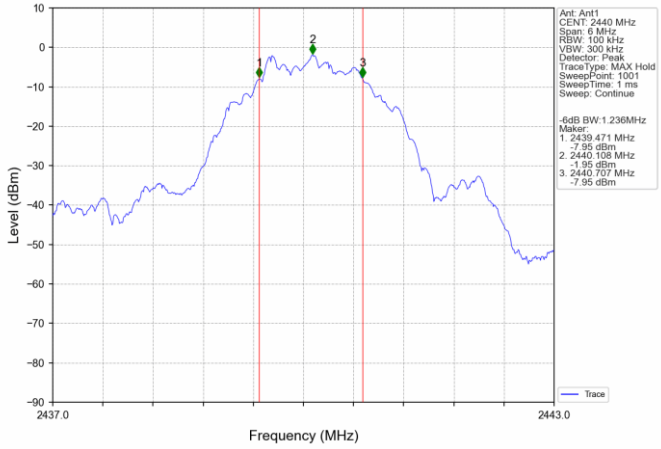
1M_MCH_2440MHz_Ant1_NTNV


1M_HCH_2480MHz_Ant1_NTNV


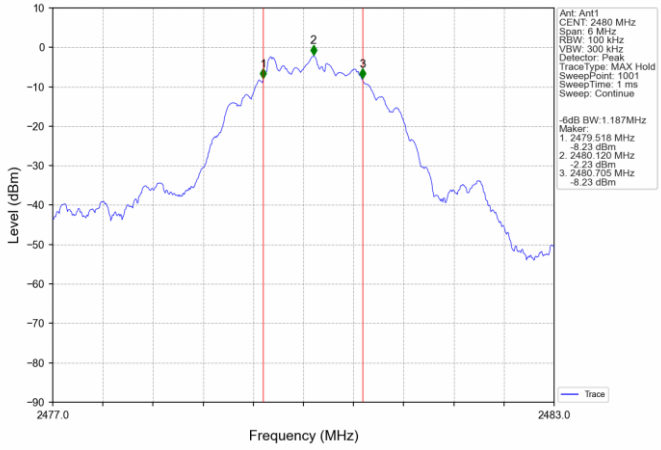
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV

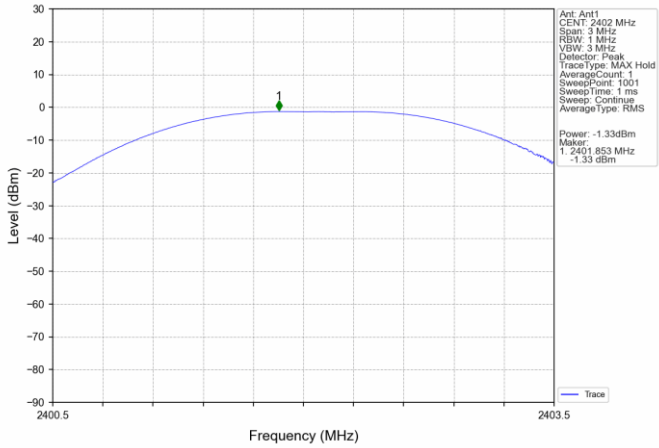


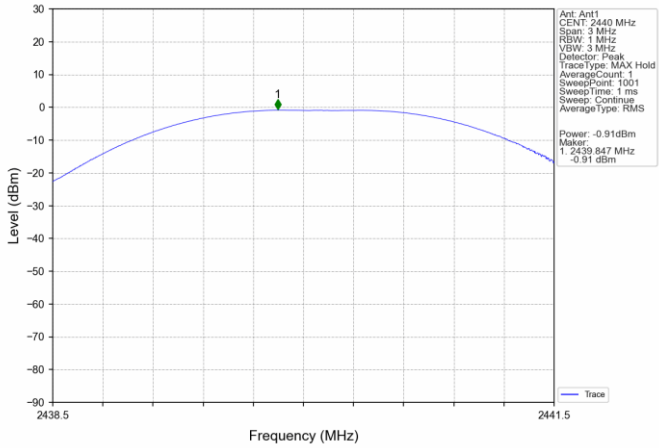
3. Maximum Conducted Output Power
3.1 Test Result
3.1.1 Power

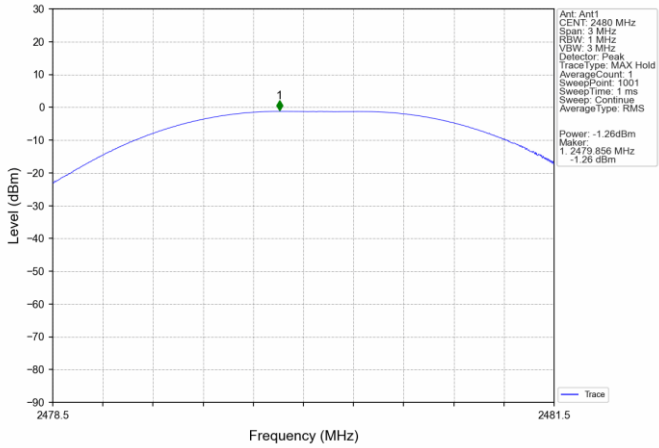
Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	-1.33	<=30	Pass
		2440	-0.91	<=30	Pass
		2480	-1.26	<=30	Pass
2M	SISO	2402	-1.16	<=30	Pass
		2440	-0.74	<=30	Pass
		2480	-1.07	<=30	Pass
Note1: Antenna Gain: Ant1: 0.00dBi;					

3.2 Test Graph

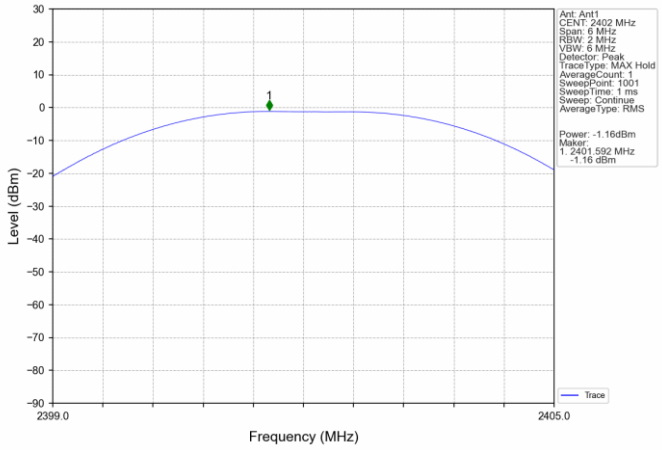
3.2.1 Power

1M_LCH_2402MHz_Ant1_NTNV


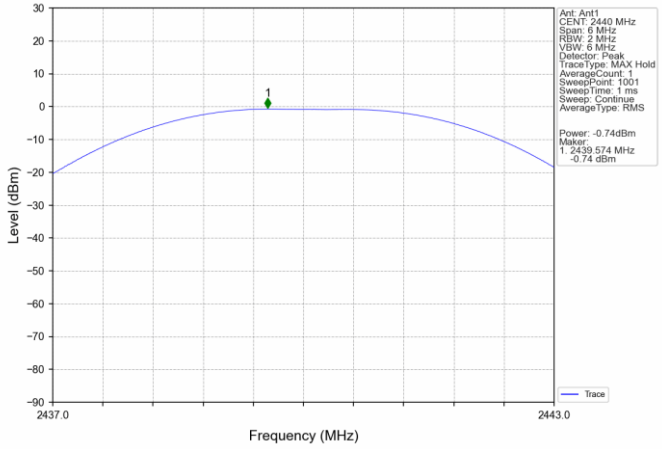
1M_MCH_2440MHz_Ant1_NTNV


1M_HCH_2480MHz_Ant1_NTNV


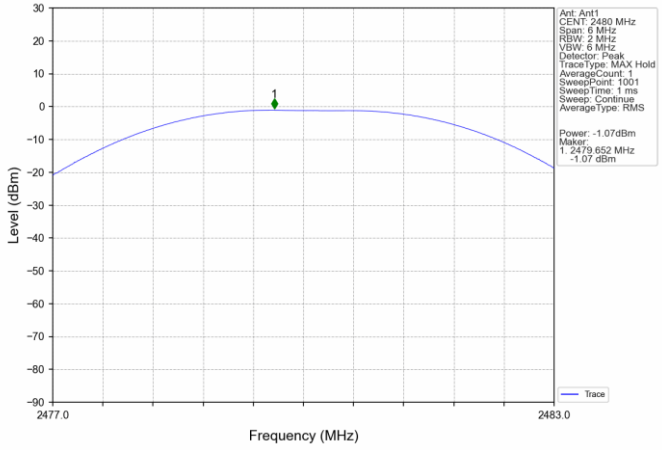
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



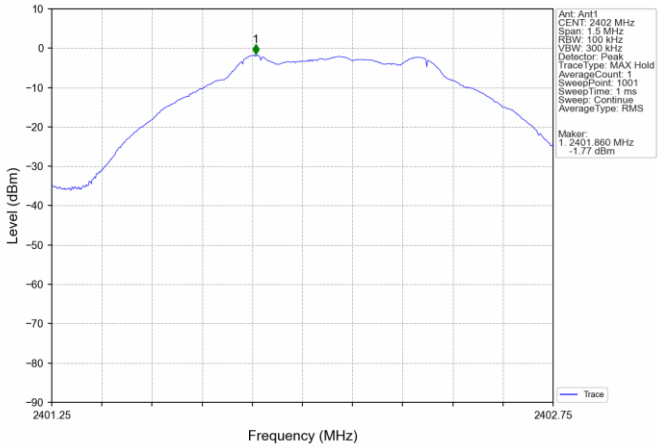
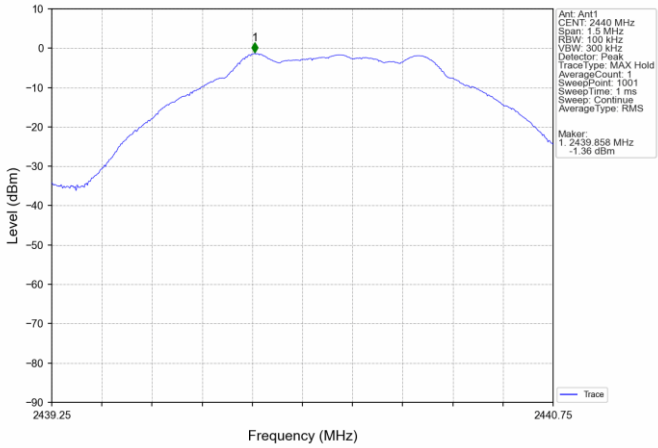
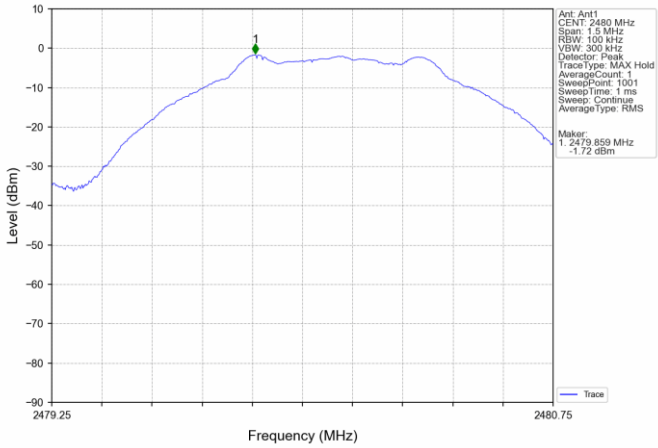
2M_HCH_2480MHz_Ant1_NTNV



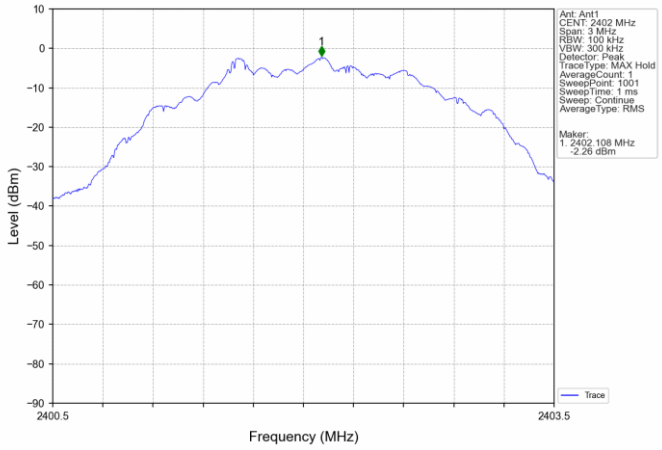
4. Maximum Power Spectral Density
4.1 Test Result
4.1.1 PSD

Mode	TX Type	Frequency (MHz)	Maximum PSD		Verdict
			ANT1 (dBm/100kHz)	Limit (dBm/3kHz)	
1M	SISO	2402	-1.77	<=8	Pass
		2440	-1.36	<=8	Pass
		2480	-1.72	<=8	Pass
2M	SISO	2402	-2.26	<=8	Pass
		2440	-1.86	<=8	Pass
		2480	-2.18	<=8	Pass
Note1: Antenna Gain: Ant1: 0.00dBi;					

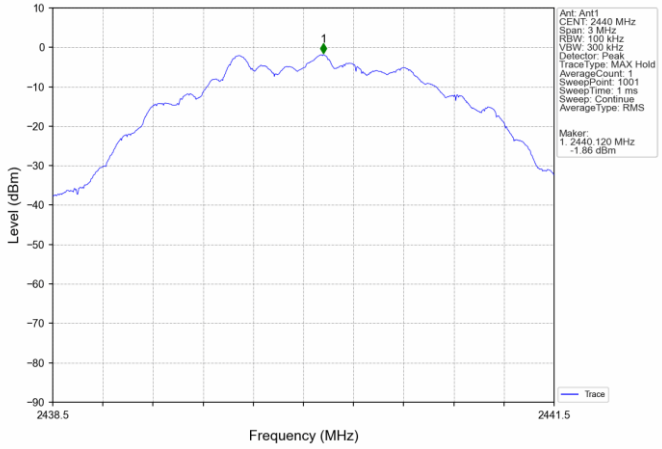
4.2 Test Graph
4.2.1 PSD

1M_LCH_2402MHz_Ant1_NTNV

1M_MCH_2440MHz_Ant1_NTNV

1M_HCH_2480MHz_Ant1_NTNV


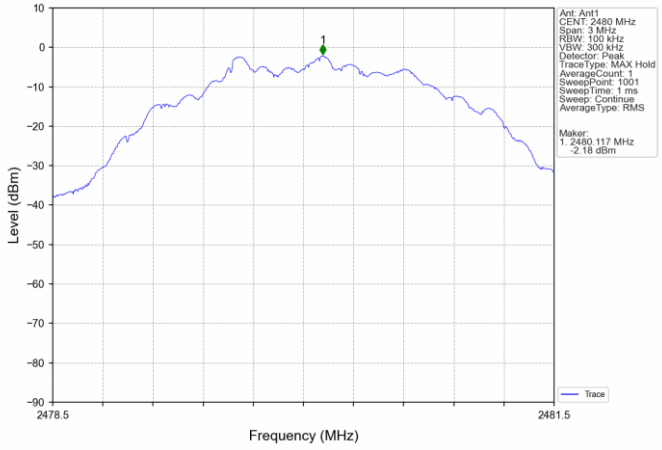
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



5. Unwanted Emissions In Non-restricted Frequency Bands
5.1 Test Result
5.1.1 Ref

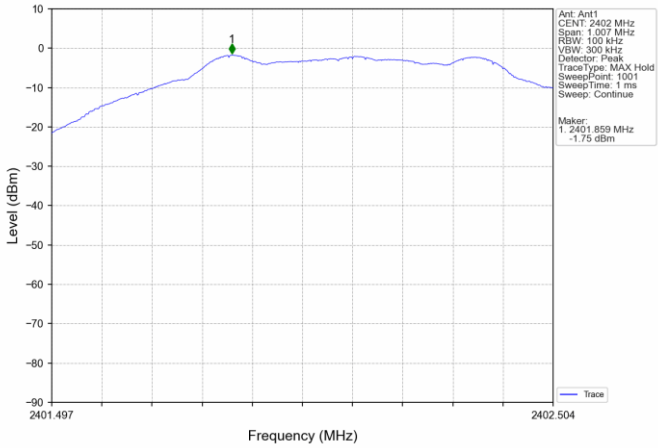
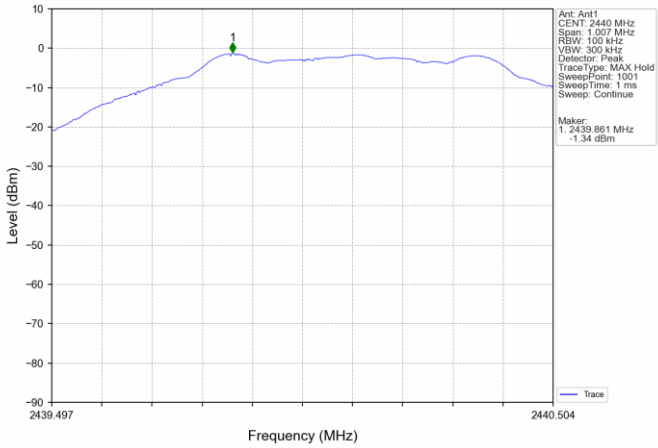
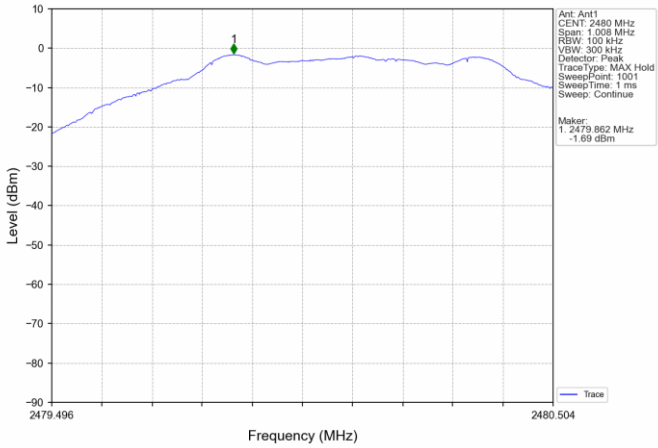
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	-1.75
		2440	1	-1.34
		2480	1	-1.69
2M	SISO	2402	1	-2.22
		2440	1	-1.78
		2480	1	-2.13
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.				

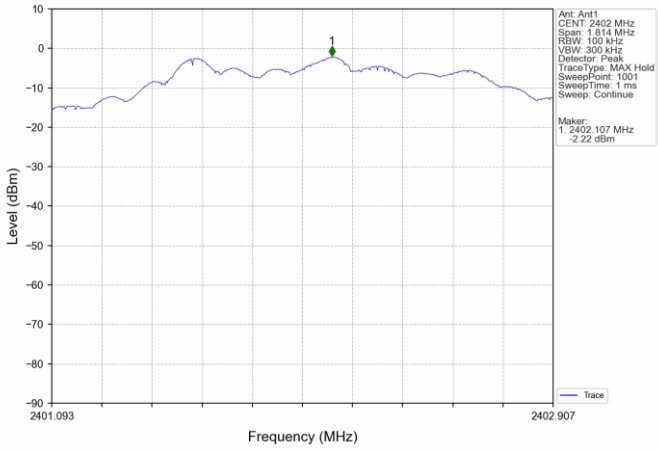
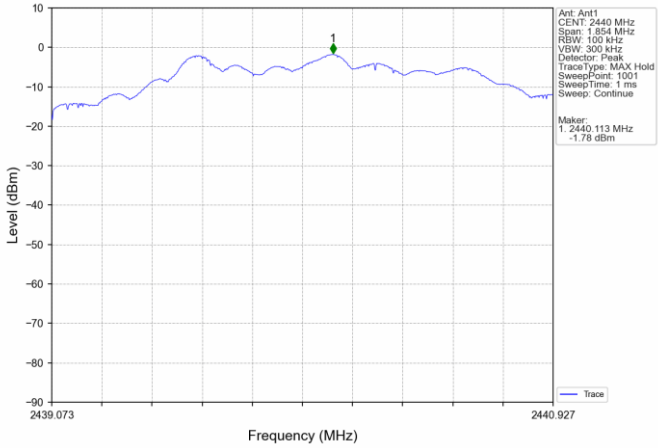
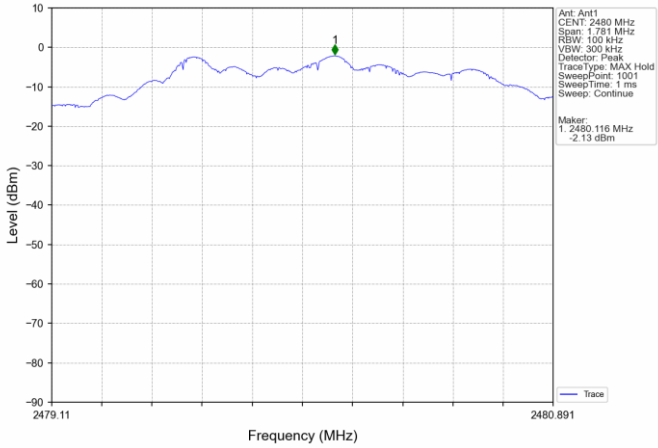
5.1.2 CSE

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	-1.75	-21.75	Pass
		2440	1	-1.34	-21.34	Pass
		2480	1	-1.69	-21.69	Pass
2M	SISO	2402	1	-2.22	-22.22	Pass
		2440	1	-1.78	-21.78	Pass
		2480	1	-2.13	-22.13	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2020, the channel contains the maximum PSD level was used to establish the reference level.						

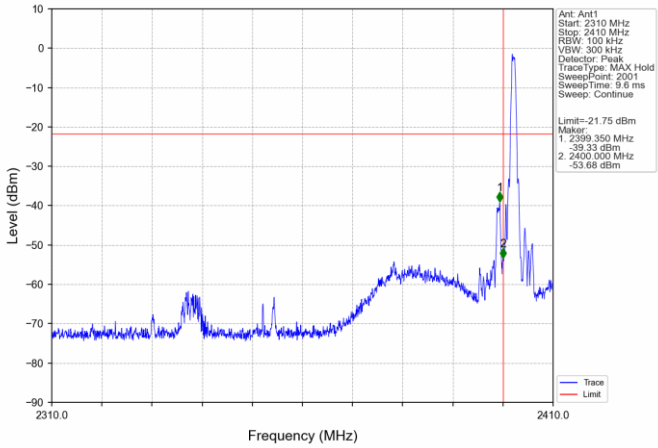
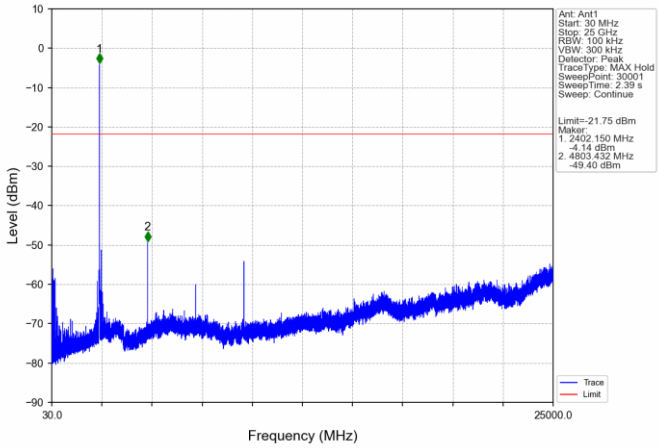
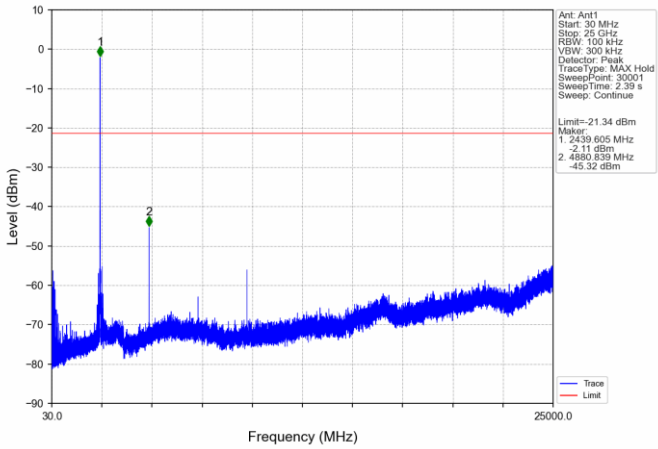
5.2 Test Graph

5.2.1 Ref

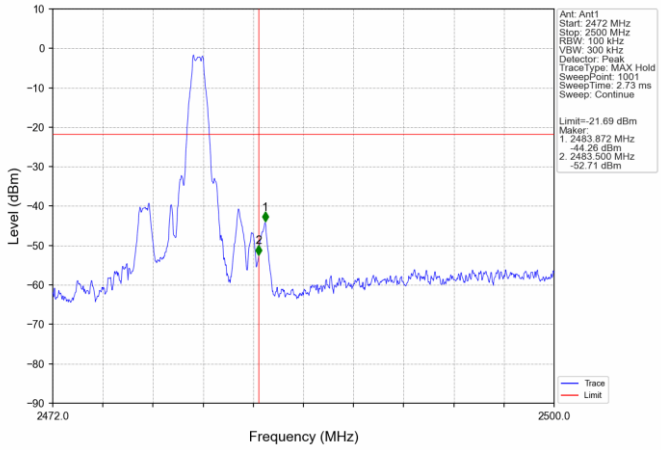
1M_LCH_2402MHz_Ant1_NTNV

1M_MCH_2440MHz_Ant1_NTNV

1M_HCH_2480MHz_Ant1_NTNV


2M_LCH_2402MHz_Ant1_NTNV

2M_MCH_2440MHz_Ant1_NTNV

2M_HCH_2480MHz_Ant1_NTNV


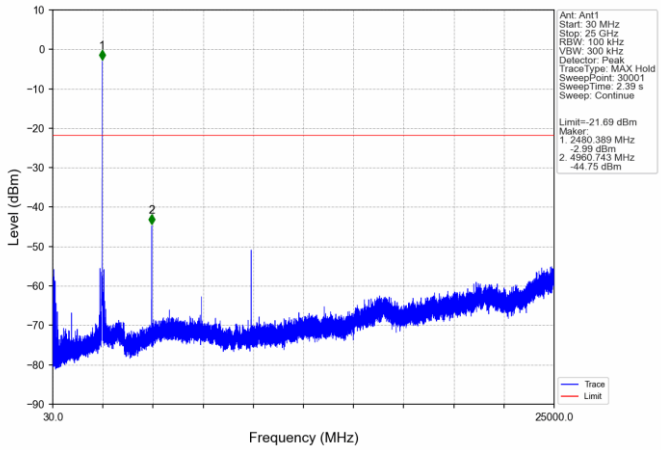
5.2.2 CSE

1M_LCH_2402MHz_Ant1_NTNV

1M_LCH_2402MHz_Ant1_NTNV

1M_MCH_2440MHz_Ant1_NTNV


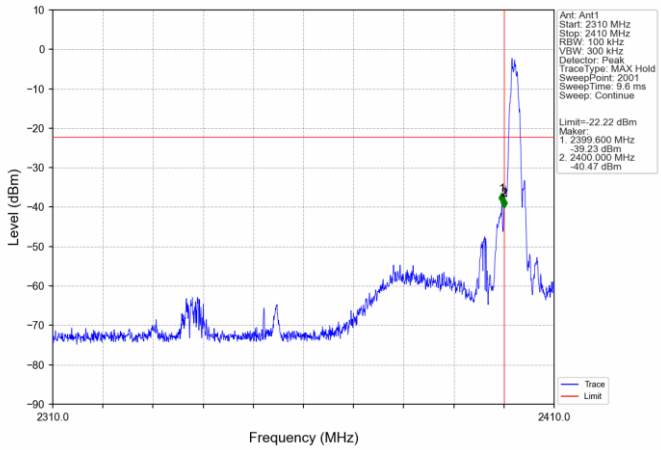
1M_HCH_2480MHz_Ant1_NTNV



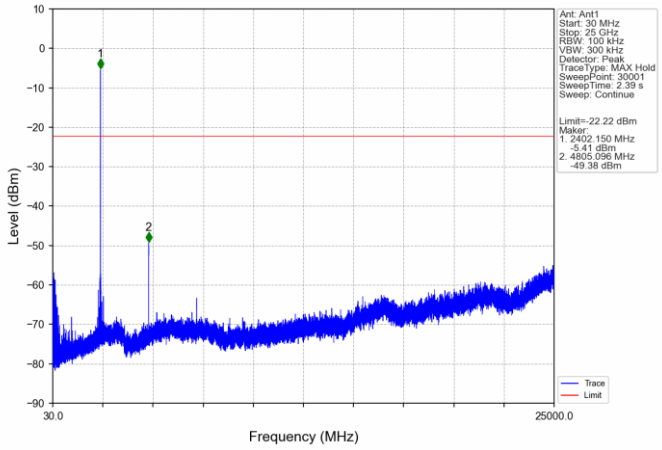
1M_HCH_2480MHz_Ant1_NTNV



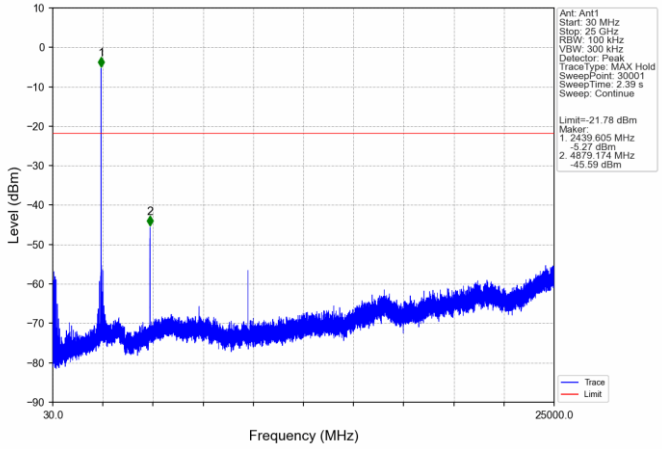
2M_LCH_2402MHz_Ant1_NTNV



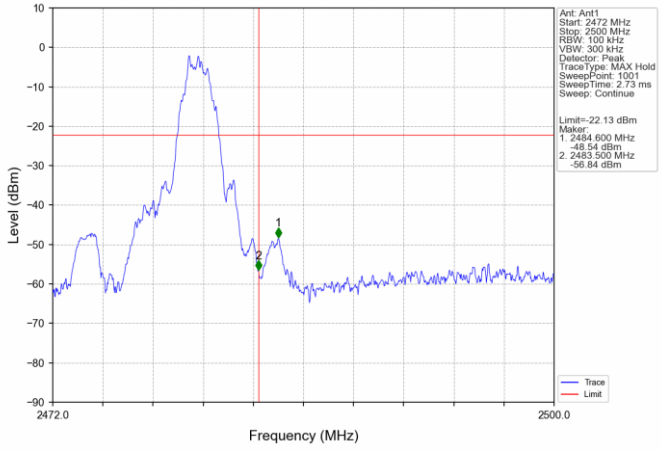
2M_LCH_2402MHz_Ant1_NTNV

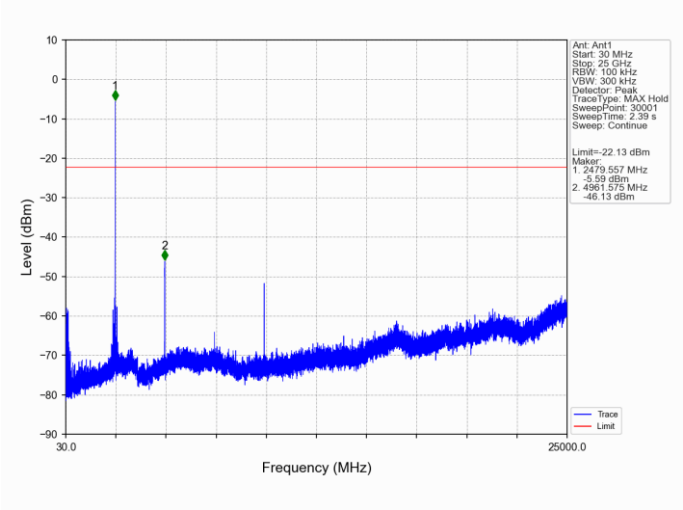


2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV


APPENDIX II - MEASUREMENT PHOTOS

Note: Please see the attached RF_Test Setup photos for FCC ID.

※※※※※END OF THE REPORT※※※※※