

Radio Test Report

Report No.: STS2312157W08

Issued for

Shenzhen NuPhy Technology Co., LTD

Room 215, Internet of Things Demonstration Park, No. 6
Minhuan Road, Longhua District, Shenzhen, 518109, China

Product Name: Keyboard

Brand Name: NuPhy

Model Name: Air60 V2

Series Model(s): N/A

FCC ID: 2BE3O-AIR60V2

Test Standards: FCC Part 15.249

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Shenzhen STS Test Services Co., Ltd.

TEST REPORT

Applicant's Name: Shenzhen NuPhy Technology Co., LTD
Address: Room 215, Internet of Things Demonstration Park, No. 6 Minhuan Road, Longhua District, Shenzhen, 518109, China
Manufacturer's Name: SHENZHEN ARBITER TECHNOLOGY CO.,LTD
Address: Floor 2, 3 and 4, Bldg. A, Meisheng Industrial Park, Chongqing Rd., Fuhai St., Baoan Dist., Shenzhen, Guangdong

Product Description

Product Name: Keyboard
Brand Name: NuPhy
Model Name: Air60 V2
Series Model(s): N/A

Test Standards.....: FCC Part 15.249
Test Procedure: ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test:
Date of receipt of test item: 21 Dec. 2023
Date of performance of tests ..: 21 Dec. 2023 ~ 08 Jan. 2024
Date of Issue: 08 Jan. 2024
Test Result.....: **Pass**

Testing Engineer :

Aaron Bu

(Aaron Bu)

Technical Manager :

Chris Chen

(Chris Chen)

Authorized Signatory :

Bovey Yang

(Bovey Yang)



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Revision History

Rev.	Issue Date	Report No.	Effect Page	Contents
00	08 Jan. 2024	STS2312157W08	ALL	Initial Issue



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part 15.249 , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	Pass	
15.203	Antenna Requirement	Pass	
15.249	Radiated Spurious Emission	Pass	
15.249	Radiated Band Edge Emission	Pass	
15.249	Field Strength of fundamental	Pass	
15.215(c)	20dB Bandwidth	Pass	

NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report.
- (2) All tests are according to ANSI C63.10-2013.

1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. :101, Building B, Zhuoke Science Park, No.190 Chongqing Road, ZhanChengShequ, Fuhai Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, 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	RF output power, conducted	$\pm 0.755\text{dB}$
2	Unwanted Emissions, conducted	$\pm 2.874\text{dB}$
3	All emissions, radiated 9K-30MHz	$\pm 3.80\text{dB}$
4	All emissions, radiated 30M-1GHz	$\pm 4.18\text{dB}$
5	All emissions, radiated 1G-6GHz	$\pm 4.90\text{dB}$
6	All emissions, radiated >6G	$\pm 5.24\text{dB}$
7	Conducted Emission (9KHz-150KHz)	$\pm 2.19\text{dB}$
8	Conducted Emission (150KHz-30MHz)	$\pm 2.53\text{dB}$
9	Occupied Channel Bandwidth	$\pm 3.5\%$
10	Power Spectral Density, conducted	$\pm 1.245\text{dB}$
11	Duty Cycle	$\pm 3.2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	Keyboard								
Brand Name	NuPhy								
Model Name	Air60 V2								
Series Model(s)	N/A								
Model Difference	N/A								
Product Description	The EUT is a Keyboard. <table border="1"> <tr> <td>Operation Frequency:</td><td>2402-2480MHz</td></tr> <tr> <td>Modulation Type:</td><td>GFSK</td></tr> <tr> <td>Antenna Designation:</td><td>PCB</td></tr> <tr> <td>Antenna Gain(Peak):</td><td>0dBi</td></tr> </table> Based on the application, features, or specification exhibited in User Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User Manual.	Operation Frequency:	2402-2480MHz	Modulation Type:	GFSK	Antenna Designation:	PCB	Antenna Gain(Peak):	0dBi
Operation Frequency:	2402-2480MHz								
Modulation Type:	GFSK								
Antenna Designation:	PCB								
Antenna Gain(Peak):	0dBi								
Power Rating	Input: DC 5V								
Battery	Rated Voltage:3.85V Charge Limit Voltage:4.35V Capacity: 2500mAH								
Connecting I/O Port(s)	Please refer to the Note 1.								
Hardware version number	N/A								
Software version number	N/A								

Note:

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

2.

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

3.

Test Channel	EUT Channel	Test Frequency (MHz)
lowest	CH00	2402
middle	CH19	2440
highest	CH39	2480

Note: The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report.

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.

Pretest Mode	Description	Data/Modulation
Mode 1	TX/CH00	GFSK
Mode 2	TX/CH19	GFSK
Mode 3	TX/CH39	GFSK

Note:

(1) All above mode have been measurement, only worst data was reported.

For AC Conducted Emission

Test Case	
AC Conducted Emission	Mode 4 : Keeping TX

2.3 TEST SOFTWARE AND POWER LEVEL

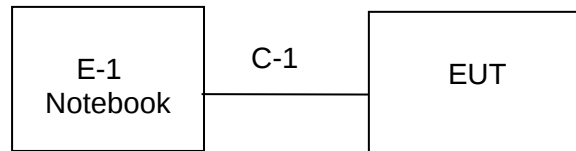
During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

RF Function	Type	Mode Or Modulation type	ANT Gain(dBi)	Power Class	Software For Testing
2.4G	2.4G	GFSK	0	3	nRF Connect for Desktop v4.2.0

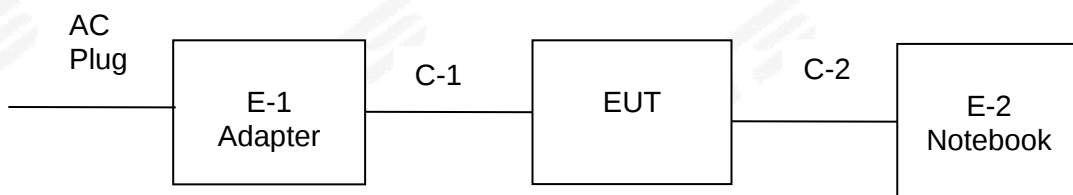
2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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 firmware of the final end product power parameters.

Radiated Spurious Emission Test



Conducted Emission Test



2.5 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.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
E-2	Notebook	LENOVO	ADLX45DLC3A	N/A	N/A
E-1	Adapter	LENOVO	Think Pad E470	N/A	N/A
C-1	USB Cable	N/A	N/A	150cm	N/A

Note:

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

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

RF Radiation Test Equipment					
Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
Temperature & Humidity	SW-108	SuWei	N/A	2023.03.03	2024.03.02
Pre-Amplifier(0.1M-3GHz)	EM	EM330	060665	2023.02.28	2024.02.27
Pre-Amplifier(1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2023.09.26	2024.09.25
Pre-Amplifier(18G-40GHz)	SKET	LNPA_1840-50	SK2018101801	2023.03.06	2024.03.05
Active loop Antenna	ZHINAN	ZN30900C	16035	2023.02.28	2024.02.27
Bilog Antenna	TESEQ	CBL6111D	34678	2022.09.30	2024.09.29
Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2023.09.24	2025.09.23
Horn Antenna	A-INFOMW	LB-180400-KF	J211020657	2023.10.10	2025.10.09
Positioning Controller	MF	MF-7802	MF-780208587	N/A	N/A
Signal Analyzer	R&S	FSV 40-N	101823	2023.09.26	2024.09.25
Switch Control Box	N/A	N/A	N/A	N/A	N/A
Filter Box	BALUN Technology	SU319E	BL-SZ1530051	N/A	N/A
Antenna Mast	MF	MFA-440H	N/A	N/A	N/A
Turn Table	MF	SC100_1	60531	N/A	N/A
AC Power Source	APC	KDF-11010G	F214050035	N/A	N/A
DC power supply	HONGSHENGFENG	DPS-305AF	17064939	2023.09.26	2024.09.25
Test SW	EZ-EMC	Ver.STSLAB-03A1 RE			
Conduction Test equipment					
Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2023.09.25	2024.09.24
LISN	R&S	ENV216	101242	2023.09.25	2024.09.24
LISN	EMCO	3810/2NM	23625	2023.09.25	2024.09.24
Temperature & Humidity	SW-108	SuWei	N/A	2023.03.03	2024.03.02
Test SW	EZ-EMC	Ver.STSLAB-03A1 CE			
RF Connected Test					
Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Signal Analyzer	Agilent	N9020A	MY51510623	2023.03.01	2024.02.28
Temperature & Humidity	SW-108	SuWei	N/A	2023.03.03	2024.03.02

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)	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.

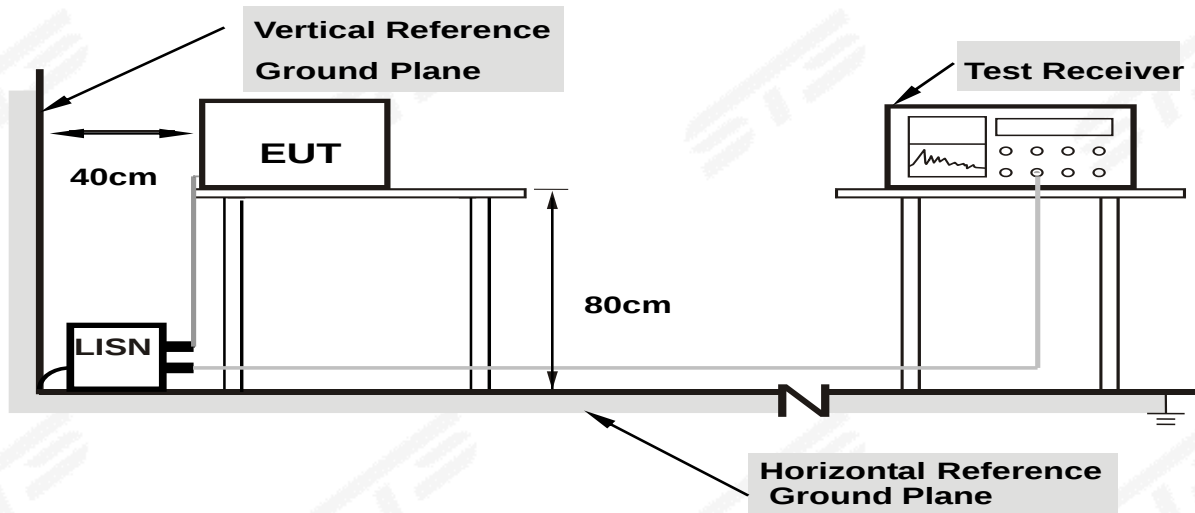
The following table is the setting of the receiver

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

3.1.2 TEST PROCEDURE

- 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.
- 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.
- 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.
- LISN is at least 80 cm from the nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 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 cm from other units and other metal planes support.

3.1.4 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.

3.1.5 TEST RESULT

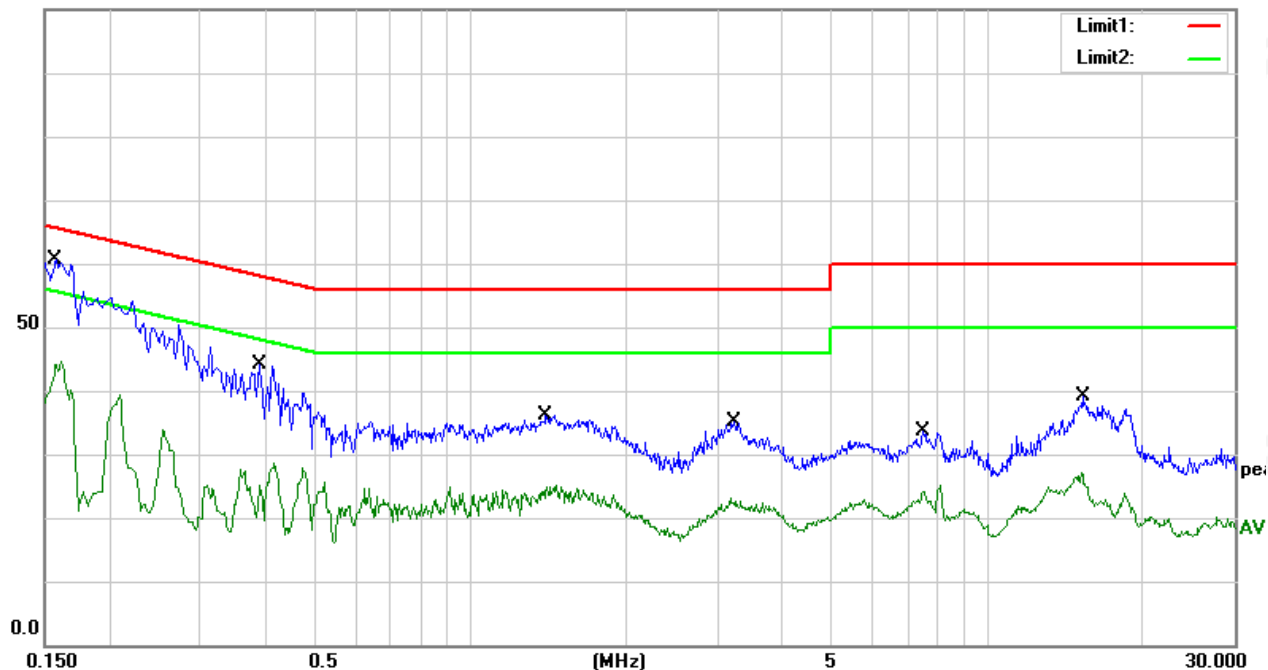
Temperature:	24.3(C)	Relative Humidity:	41%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 4		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1582	40.79	19.77	60.56	65.56	-5.00	QP
2	0.1582	24.75	19.77	44.52	55.56	-11.04	AVG
3	0.3900	24.18	20.02	44.20	58.06	-13.86	QP
4	0.3900	8.72	20.02	28.74	48.06	-19.32	AVG
5	1.3980	16.45	19.75	36.20	56.00	-19.80	QP
6	1.3980	5.42	19.75	25.17	46.00	-20.83	AVG
7	3.2260	15.36	19.78	35.14	56.00	-20.86	QP
8	3.2260	3.32	19.78	23.10	46.00	-22.90	AVG
9	7.5060	13.66	19.97	33.63	60.00	-26.37	QP
10	7.5060	5.03	19.97	25.00	50.00	-25.00	AVG
11	15.2940	18.87	20.34	39.21	60.00	-20.79	QP
12	15.2940	6.66	20.34	27.00	50.00	-23.00	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result = Reading + Factor) – Limit

100.0 dBuV

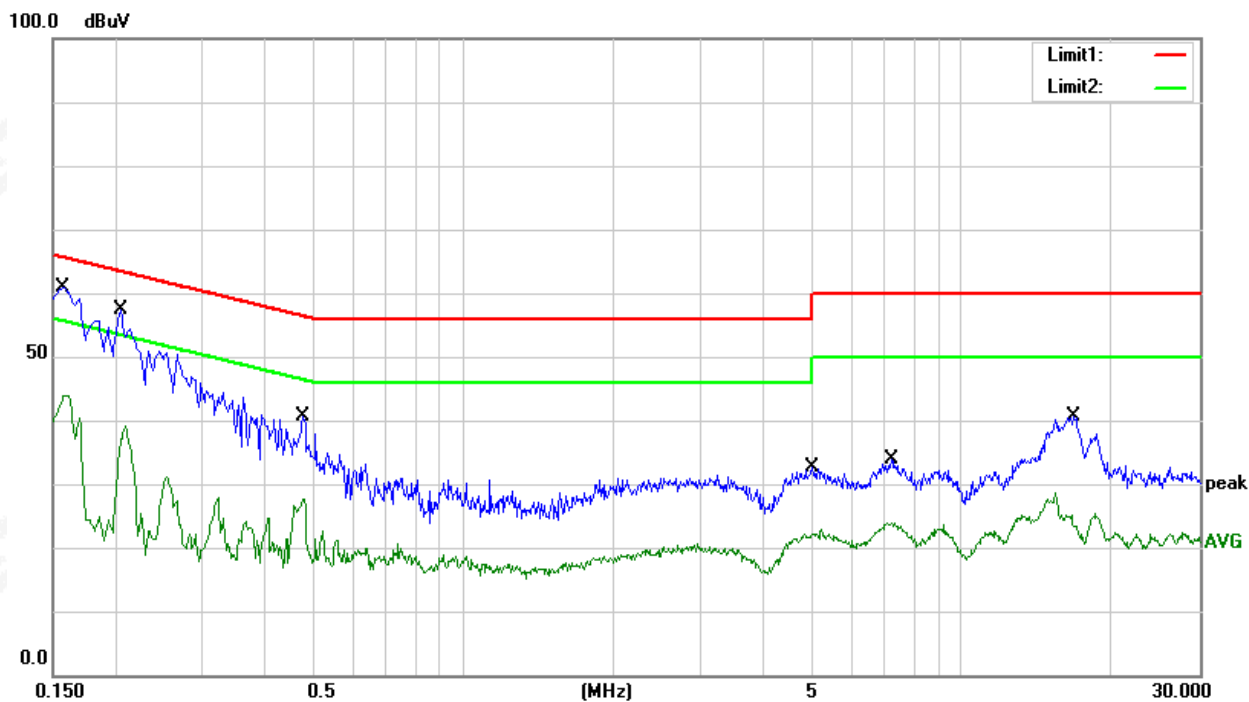


Temperature:	24.3(C)	Relative Humidity:	41%RH
Test Voltage:	AC 120V/60Hz	Phase:	N
Test Mode:	Mode 4		

No.	Frequency (MHz)	Reading (dBUV)	Correct Factor(dB)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Remark
1	0.1580	41.23	19.77	61.00	65.57	-4.57	QP
2	0.1580	24.21	19.77	43.98	55.57	-11.59	AVG
3	0.2060	37.53	19.79	57.32	63.37	-6.05	QP
4	0.2060	19.38	19.79	39.17	53.37	-14.20	AVG
5	0.4780	20.72	20.00	40.72	56.37	-15.65	QP
6	0.4780	7.66	20.00	27.66	46.37	-18.71	AVG
7	5.0060	12.80	19.83	32.63	60.00	-27.37	QP
8	5.0060	3.02	19.83	22.85	50.00	-27.15	AVG
9	7.2380	13.86	19.91	33.77	60.00	-26.23	QP
10	7.2380	4.09	19.91	24.00	50.00	-26.00	AVG
11	16.8300	20.13	20.38	40.51	60.00	-19.49	QP
12	16.8300	8.26	20.38	28.64	50.00	-21.36	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on Part 15.249 and the Part 15.209(a) limit in the table below has to be followed.

Standard FCC 15.209

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
960~1000	500	3
Above 1000	Other:74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	3

Standard FCC 15.249

Frequency of Emission (MHz)	Field Strength of fundamental (millivolts /meter)	Field Strength of Harmonics (microvolts/meter)
900~928	50	500
2400~2483.5	50	500
5725~5875	50	500
24000~242500	250	2500

Notes:

- (1) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.
- (2) 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			

Spectrum Parameter	Setting
Detector	Peak/AV
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB (emission in restricted band)	>20BW
VB (emission in restricted band)	=3xRB

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

3.2.2 TEST PROCEDURE

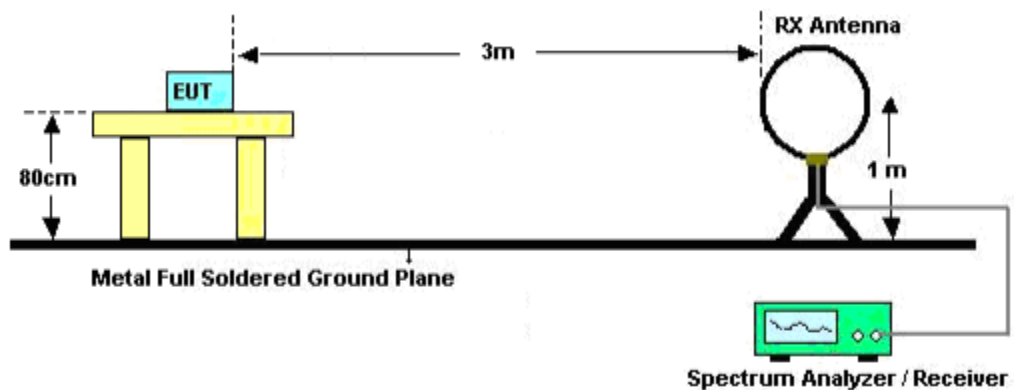
- a. The measuring distance of 3m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation (Below 1GHz)
- b. The measuring distance of 3m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation (Above 1GHz)
- c. The height of the test antenna shall vary between 1m to 4m. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. The initial step in collecting radiated emission data is a receive peak detector mode. Pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. All readings are peak unless otherwise stated QP in column of Note. Peak denoted that the Peak reading complies with the QP limits and then QP Mode measurement didn't perform (Below 1GHz)
- f. All readings are Peak mode value unless otherwise stated AVG in column of Note. If the Peak mode measured value complies with the Peak limits and lower than AVG Limits, the EUT shall be deemed to meet Peak & AVG limits and then only Peak mode was measured, but AVG mode didn't perform. (Above 1GHz)
- g. 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 axes. The worst case emissions were reported.

3.2.3 DEVIATION FROM TEST STANDARD

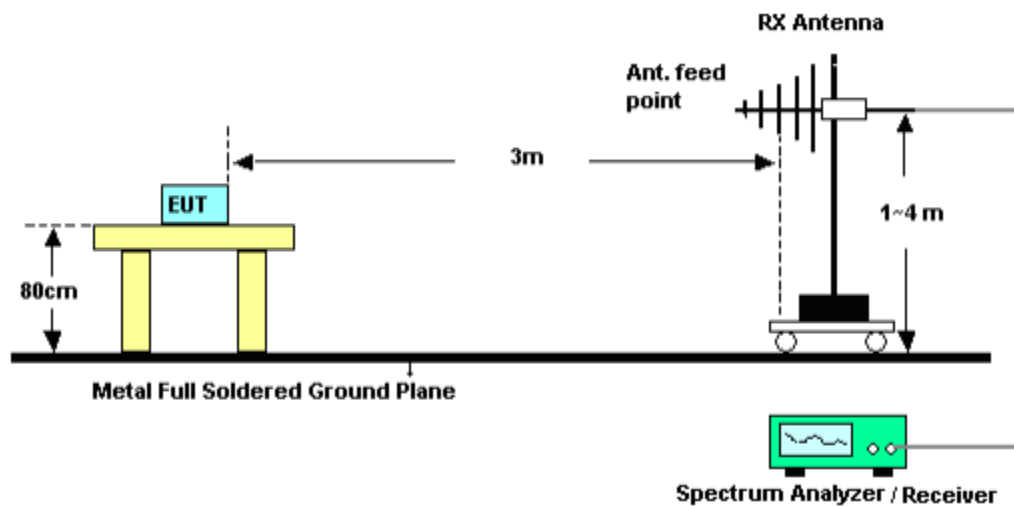
No deviation

3.2.4 TEST SETUP

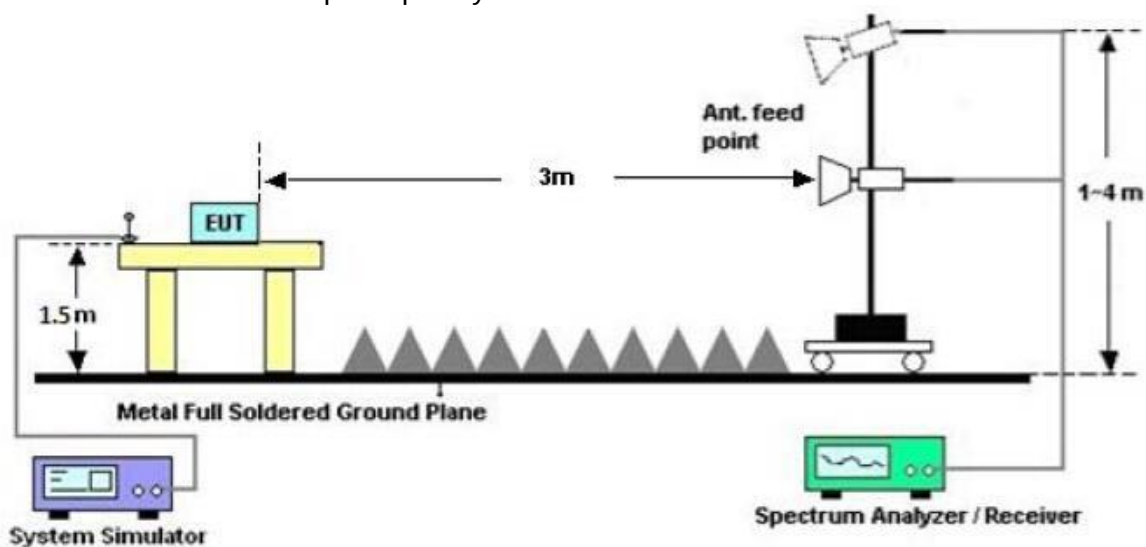
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



3.2.5 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:

Margin=PL-PK L or AL- AV L; Margin only shown the worst case.

Where

PR = Peak Reading

AR = Average Reading

PL = Peak Level

AL = Average Level

AF = Antenna Factor

PK L = Peak Limit

AV L = AV Limit

For example

Frequency	PR	AR	AF	PL	AL	PK L	AV L	Margin
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)
2178	40.23	30.31	9.83	50.06	40.14	74.00	54.00	-13.86

3.2.6 EUT OPERATING 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.

Below 30 MHz

Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	DC 3.85V	Polarization:	---
Test Mode:	TX Mode		

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 = $40 \log (\text{specific distance/test distance})$ (dB);

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

Between 30MHz – 1000 MHz Radiation Spurious

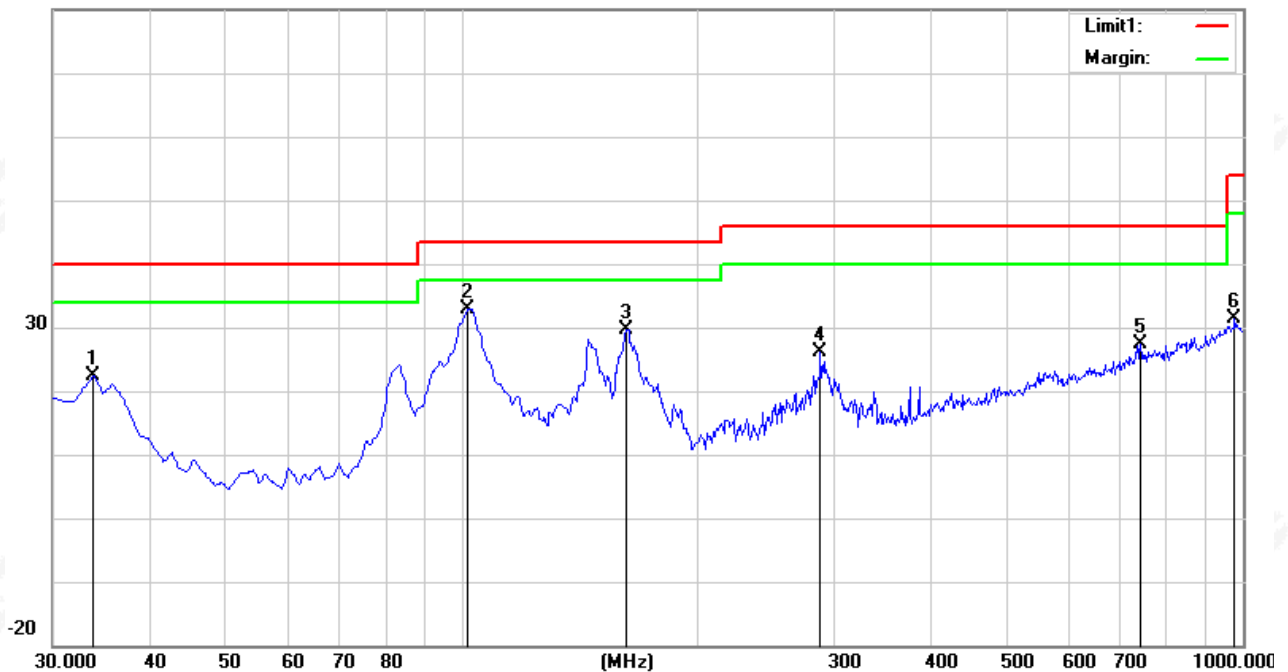
Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	DC 3.85V	Phase:	Horizontal
Test Mode:	Mode 1		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	33.8800	37.17	-14.80	22.37	40.00	-17.63	peak
2	101.7800	52.80	-19.94	32.86	43.50	-10.64	peak
3	162.8900	48.83	-19.12	29.71	43.50	-13.79	peak
4	288.9900	41.36	-15.21	26.15	46.00	-19.85	peak
5	741.9800	29.60	-2.12	27.48	46.00	-18.52	peak
6	976.7200	28.85	2.45	31.30	54.00	-22.70	peak

Remark:

1. Margin = Result (Result =Reading + Factor)–Limit
2. Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain

80.0 dBuV/m



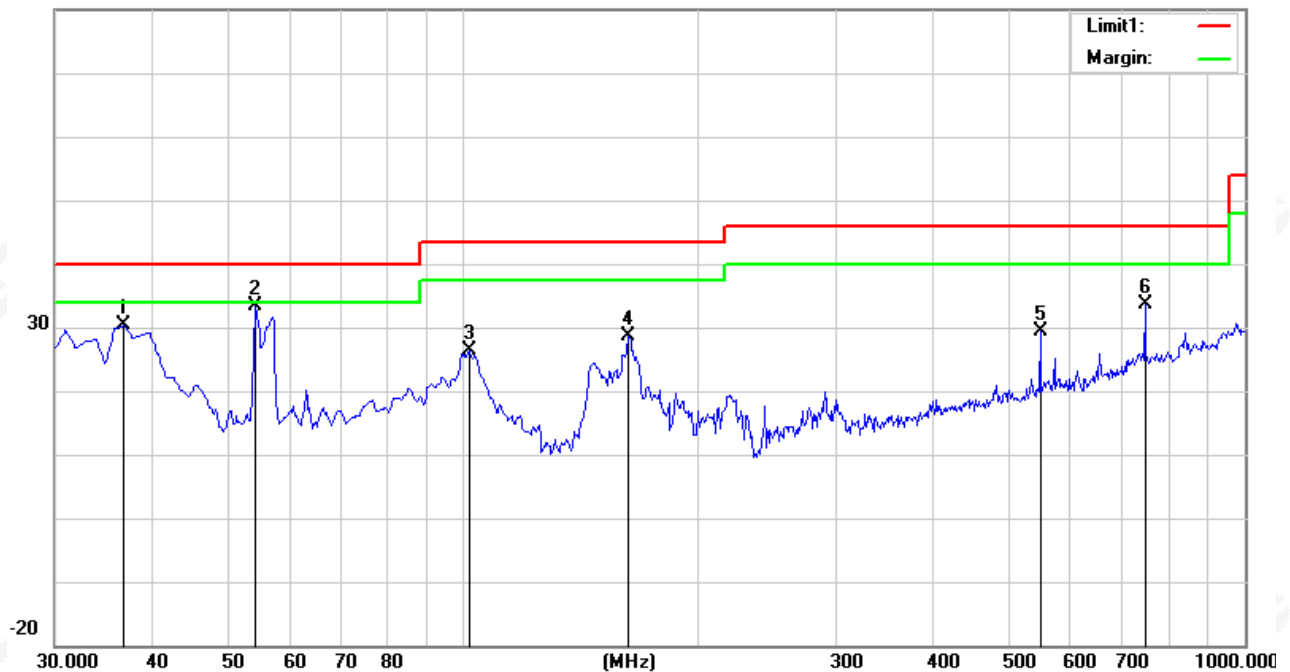
Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	DC 3.85V	Phase:	Vertical
Test Mode:	Mode 1		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	36.7900	46.70	-16.39	30.31	40.00	-9.69	peak
2	54.2500	58.15	-24.75	33.40	40.00	-6.60	peak
3	101.7800	46.36	-19.94	26.42	43.50	-17.08	peak
4	162.8900	47.68	-19.12	28.56	43.50	-14.94	peak
5	548.9500	35.29	-5.88	29.41	46.00	-16.59	peak
6	745.8600	35.70	-2.14	33.56	46.00	-12.44	peak

Remark:

1. Margin = Result (Result = Reading + Factor) – Limit
2. Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain

80.0 dBuV/m

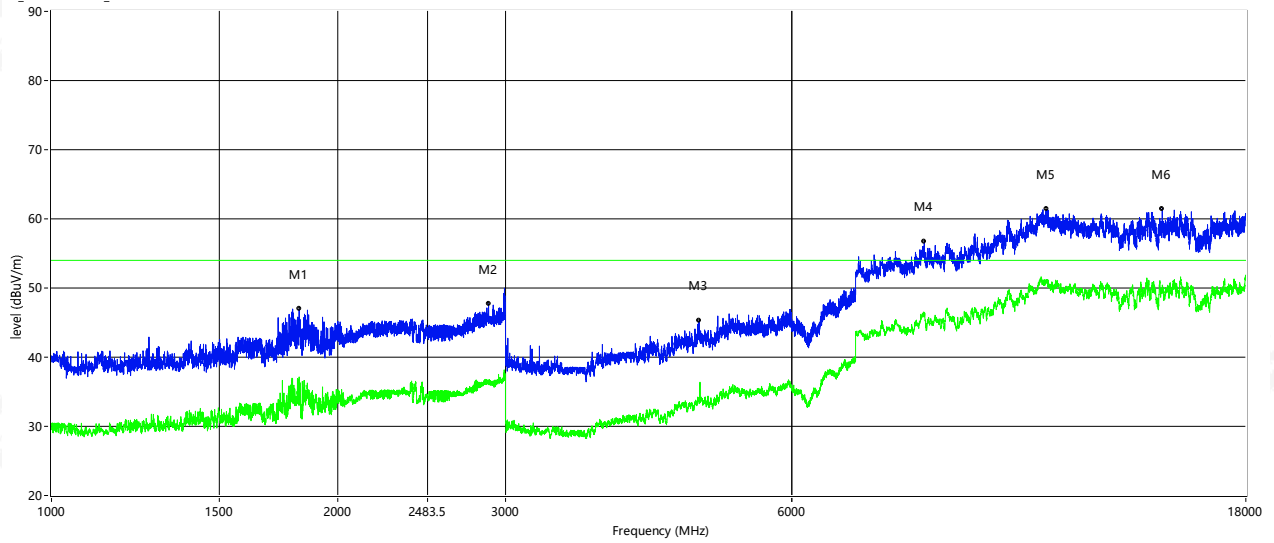


Above 1G Radiation Spurious

2402MHz-L

Horizontal

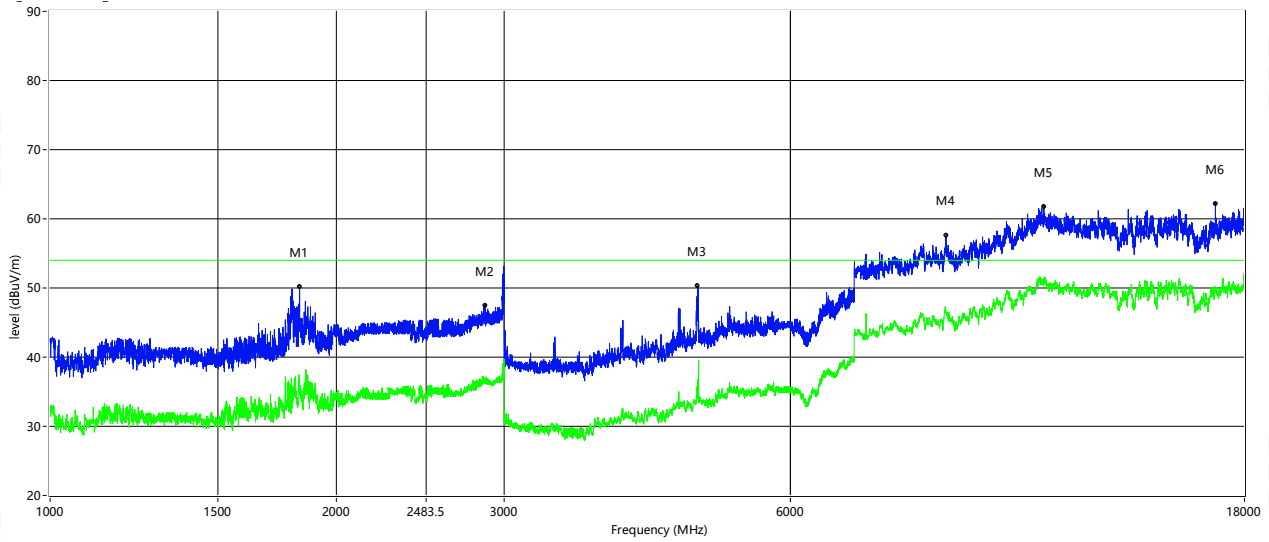
RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Table (o)	Height (cm)	Verdict
1821.000	46.97	37.14	0.28	74.0	54.0	-16.86	166.40	100	Pass
2880.000	47.72	36.40	5.61	74.0	54.0	-17.60	299.00	100	Pass
4797.000	45.28	33.49	-6.99	74.0	54.0	-20.51	331.80	100	Pass
8265.000	56.72	45.99	4.23	74.0	54.0	-8.01	58.40	100	Pass
11122.250	61.37	50.86	9.66	74.0	54.0	-3.14	238.60	100	Pass
14702.750	61.48	50.06	11.23	74.0	54.0	-3.94	67.00	100	Pass

Vertical

RE_FCC Test Case_FCC 15C 1GHz-18GHz

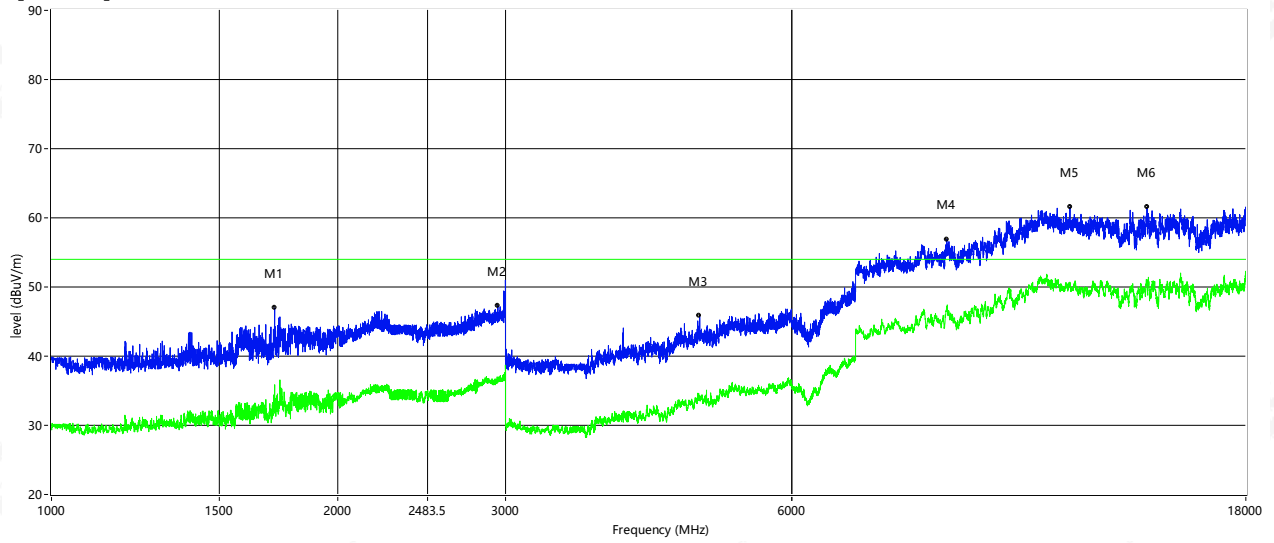


Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Table (o)	Height (cm)	Verdict
1829.000	50.09	36.86	0.41	74.0	54.0	-17.14	179.60	100	Pass
2866.000	47.48	36.52	5.61	74.0	54.0	-17.48	118.80	100	Pass
4798.000	50.24	35.56	-6.99	74.0	54.0	-18.44	242.30	100	Pass
8740.750	57.51	46.83	5.03	74.0	54.0	-7.17	0.60	100	Pass
11078.250	61.77	50.77	9.80	74.0	54.0	-3.23	203.00	100	Pass
16779.000	62.20	50.24	9.37	74.0	54.0	-3.76	69.60	100	Pass

2440MHz-M

Horizontal

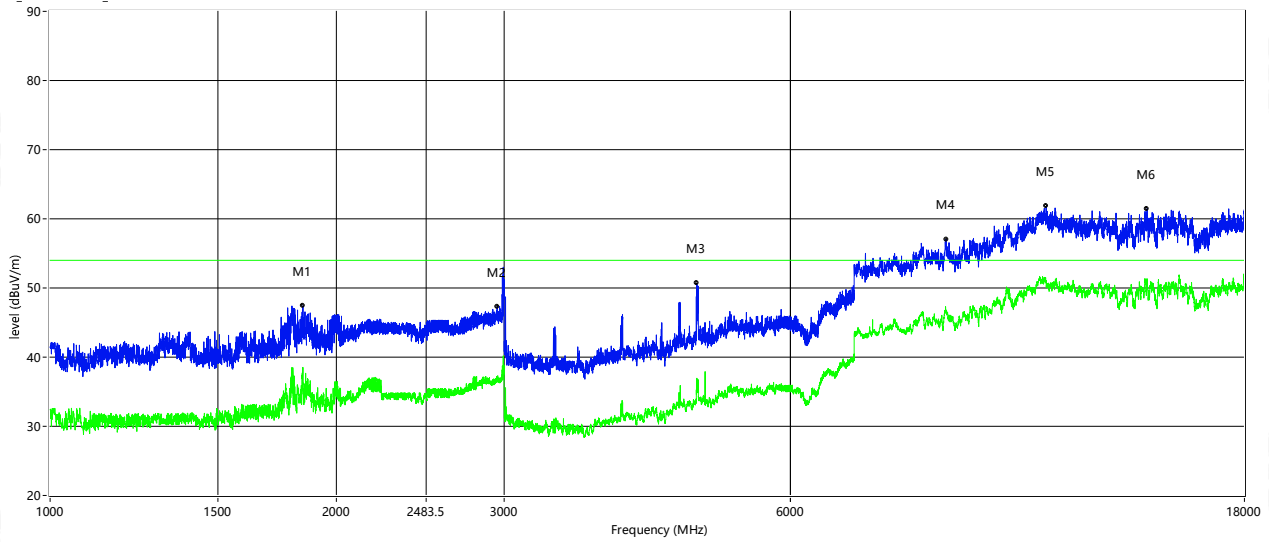
RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Table (o)	Height (cm)	Verdict
1716.000	46.99	35.87	-0.32	74.0	54.0	-18.13	163.80	100	Pass
2945.500	47.34	36.45	5.87	74.0	54.0	-17.55	322.50	100	Pass
4798.000	45.82	34.22	-6.99	74.0	54.0	-19.78	330.60	100	Pass
8729.750	56.90	47.11	5.07	74.0	54.0	-6.89	63.80	100	Pass
11760.250	61.56	50.50	9.43	74.0	54.0	-3.50	147.50	100	Pass
14172.000	61.50	51.05	11.13	74.0	54.0	-2.95	346.00	100	Pass

Vertical

RE_FCC Test Case_FCC 15C 1GHz-18GHz

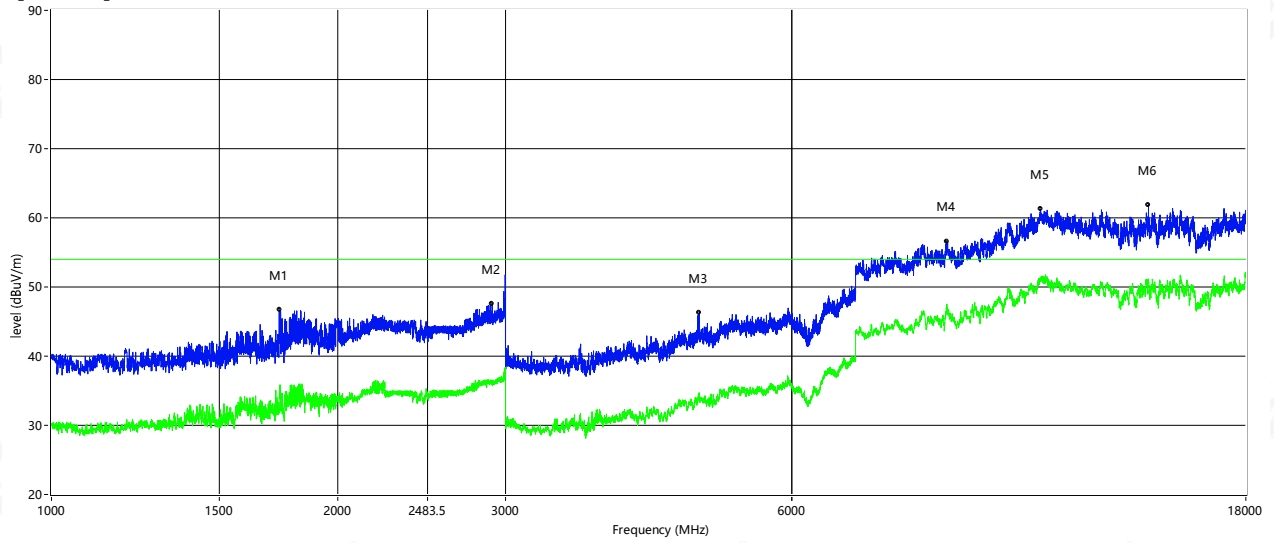


Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Table (o)	Height (cm)	Verdict
1843.500	47.42	38.53	0.67	74.0	54.0	-15.47	185.50	100	Pass
2950.000	47.32	36.39	5.90	74.0	54.0	-17.61	359.00	100	Pass
4784.000	50.68	36.95	-7.05	74.0	54.0	-17.05	164.10	100	Pass
8740.750	57.05	46.67	5.03	74.0	54.0	-7.33	3.20	100	Pass
11138.750	61.83	51.09	9.65	74.0	54.0	-2.91	184.70	100	Pass
14224.250	61.47	50.76	11.41	74.0	54.0	-3.24	211.50	100	Pass

24480MHz-H

Horizontal

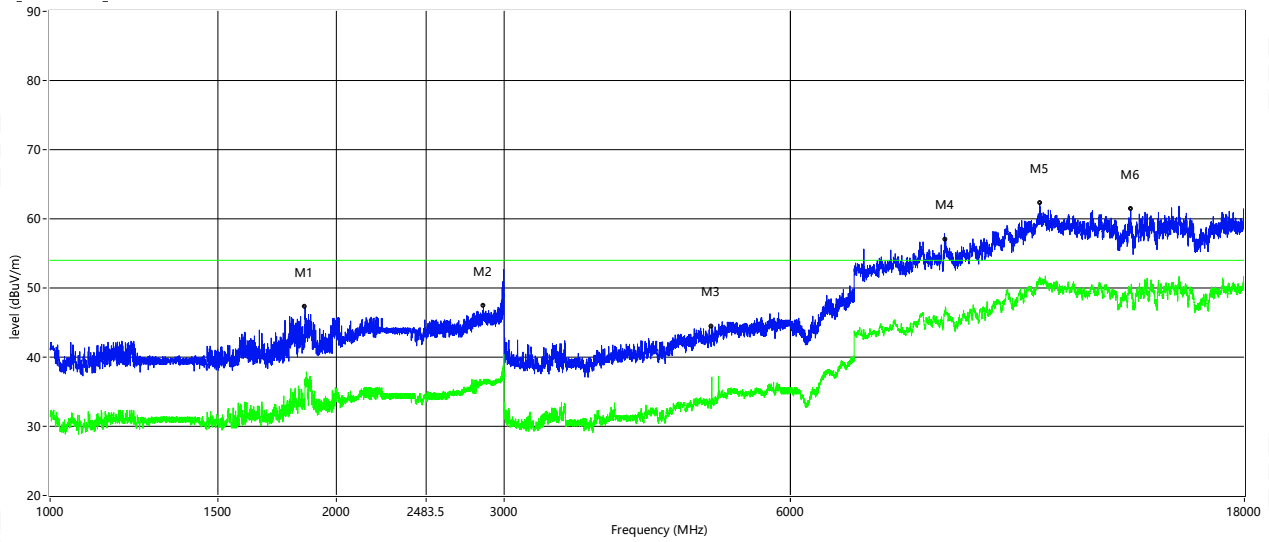
RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Table (o)	Height (cm)	Verdict
1735.000	46.67	34.12	-0.11	74.0	54.0	-19.88	166.40	100	Pass
2905.000	47.61	36.15	5.64	74.0	54.0	-17.85	237.90	100	Pass
4795.000	46.27	33.66	-7.00	74.0	54.0	-20.34	129.80	100	Pass
8718.750	56.56	46.97	5.10	74.0	54.0	-7.03	26.30	100	Pass
10949.000	61.26	50.76	9.83	74.0	54.0	-3.24	254.80	100	Pass
14221.500	61.80	50.74	11.43	74.0	54.0	-3.26	343.70	100	Pass

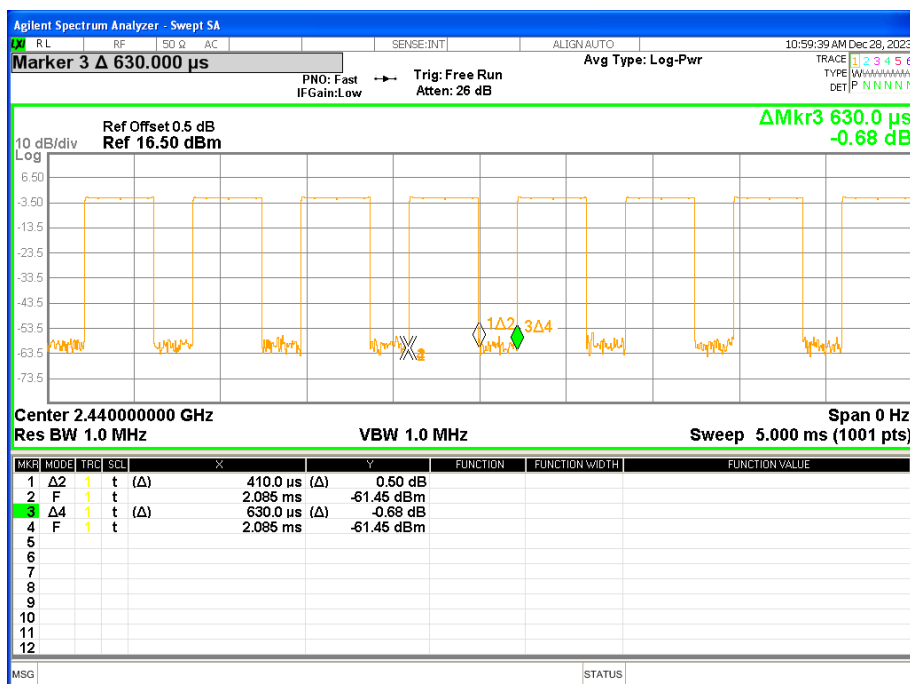
Vertical

RE_FCC Test Case_FCC 15C 1GHz-18GHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	Table (o)	Height (cm)	Verdict
1853.500	47.32	36.38	0.78	74.0	54.0	-17.62	182.00	100	Pass
2854.000	47.37	36.21	5.61	74.0	54.0	-17.79	160.40	100	Pass
4961.000	44.40	34.43	-6.38	74.0	54.0	-19.57	79.40	100	Pass
8735.250	56.98	46.90	5.05	74.0	54.0	-7.10	360.00	100	Pass
10968.250	62.22	51.60	9.98	74.0	54.0	-2.40	289.80	100	Pass
13668.750	61.40	49.41	10.14	74.0	54.0	-4.59	193.10	100	Pass

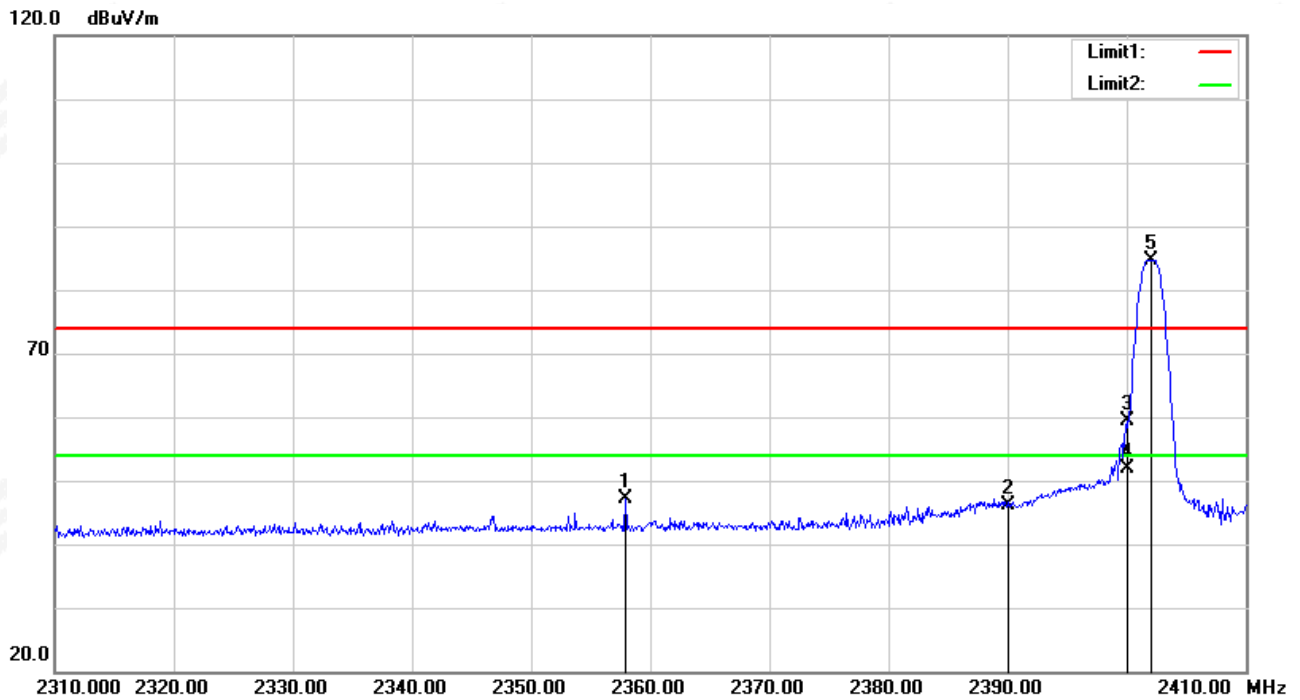
Duty cycle



Ton (μs)	Tp (μs)	Duty Factor
0.41	0.63	3.73

Note: Duty Factor=20*LOG10(1/(Ton/Tp))

(Radiation Band edge)

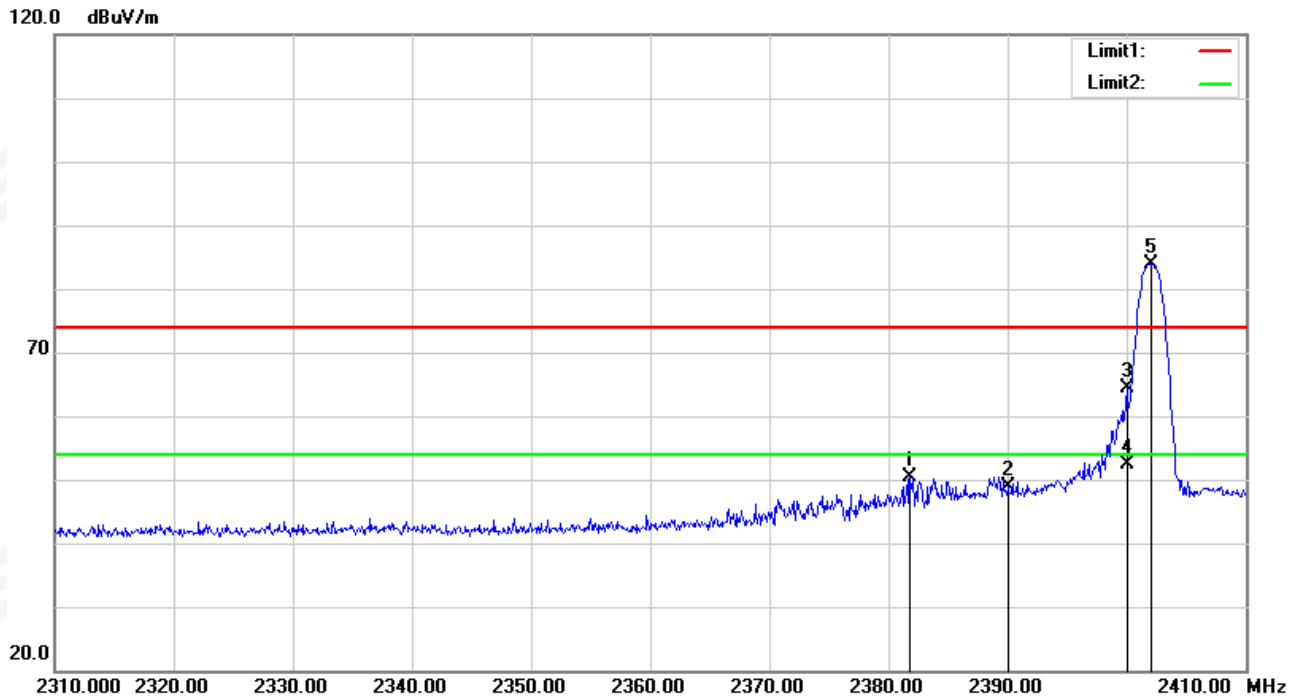
2402MHz
Horizontal


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2357.900	43.24	3.86	47.10	74.00	-26.90	peak
2	2390.000	41.76	4.34	46.10	74.00	-27.90	peak
3	2400.000	54.96	4.49	59.45	74.00	-14.55	peak
4	2400.000	47.35	4.49	51.84	54.00	-2.16	AVG

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
5	2402.000	80.07	4.49	-	84.56	114	-29.44	peak
6	2402.000	80.07	4.49	3.73	80.83	94	-12.81	AVG

Vertical

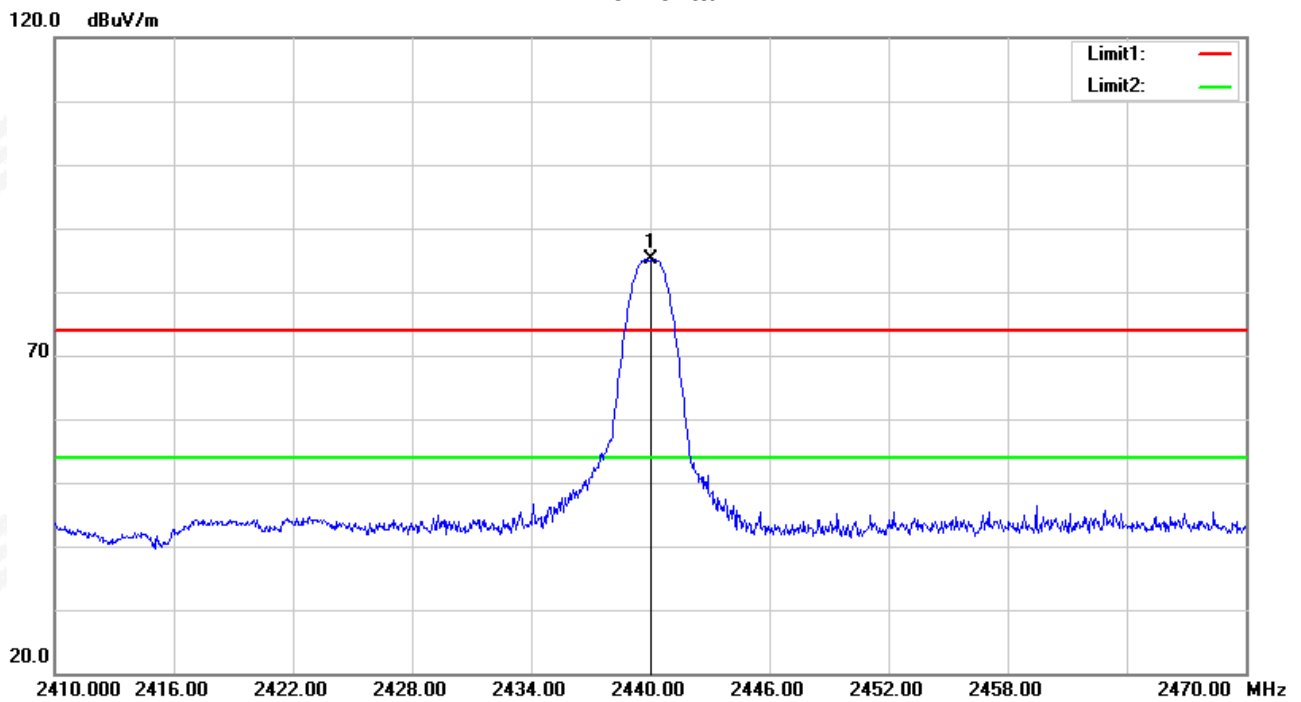


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2381.800	46.23	4.22	50.45	74.00	-23.55	peak
2	2390.000	44.43	4.34	48.77	74.00	-25.23	peak
3	2400.000	60.00	4.49	64.49	74.00	-9.51	peak
4	2400.000	47.87	4.49	52.36	54.00	-1.64	AVG

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4	2402.000	79.28	4.49	-	83.77	114	-30.23	peak
5	2402.000	79.28	4.49	3.73	80.04	94	-13.60	AVG

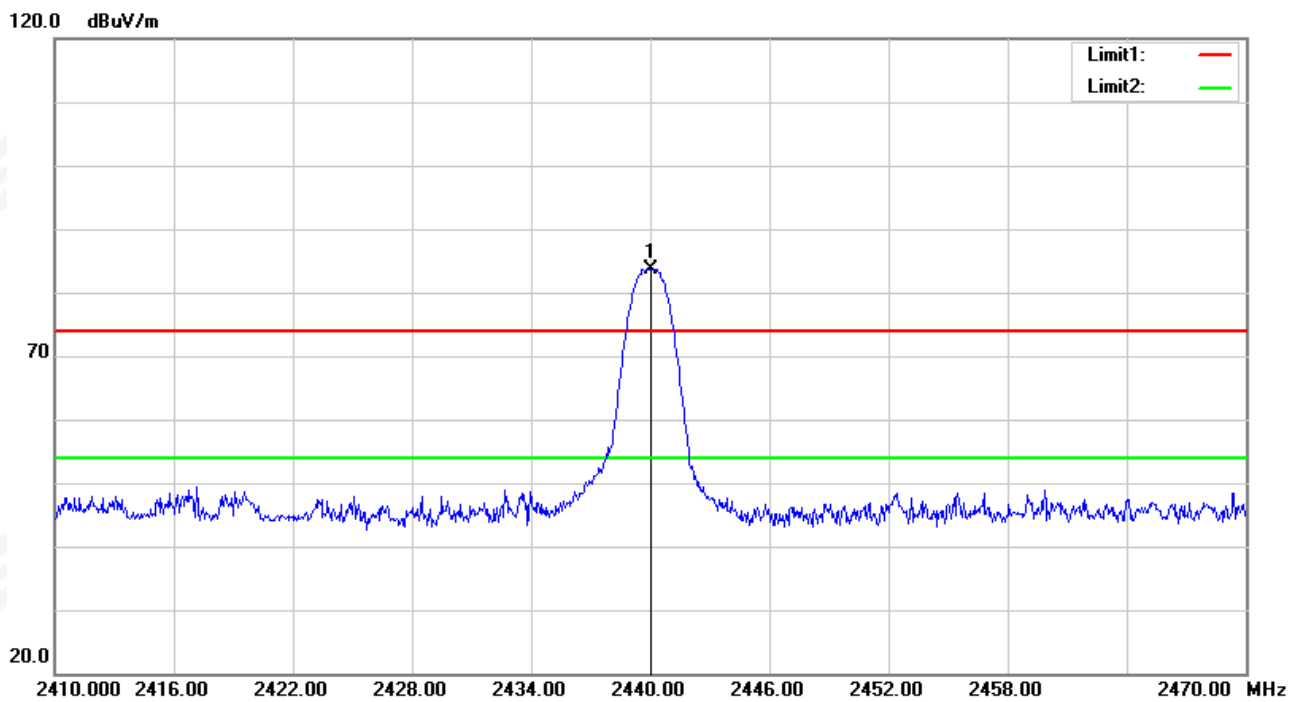
2440MHz
Horizontal



Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2440.000	80.50	4.52	-	85.02	114	-28.98	peak
2	2440.000	80.50	4.52	3.73	81.29	94	-12.35	AVG

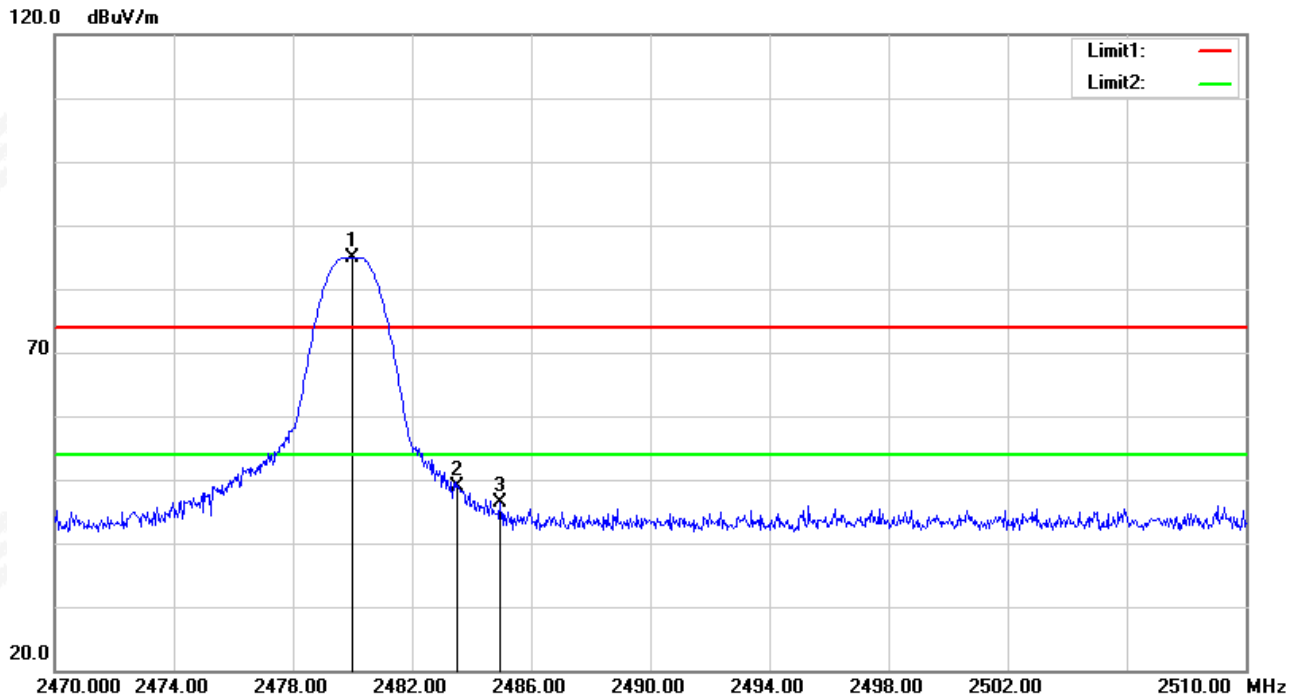
Vertical



Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2440.000	79.10	4.52	-	83.62	114	-30.38	peak
2	2440.000	79.10	4.52	3.73	79.89	94	-13.75	AVG

2480MHz
Horizontal

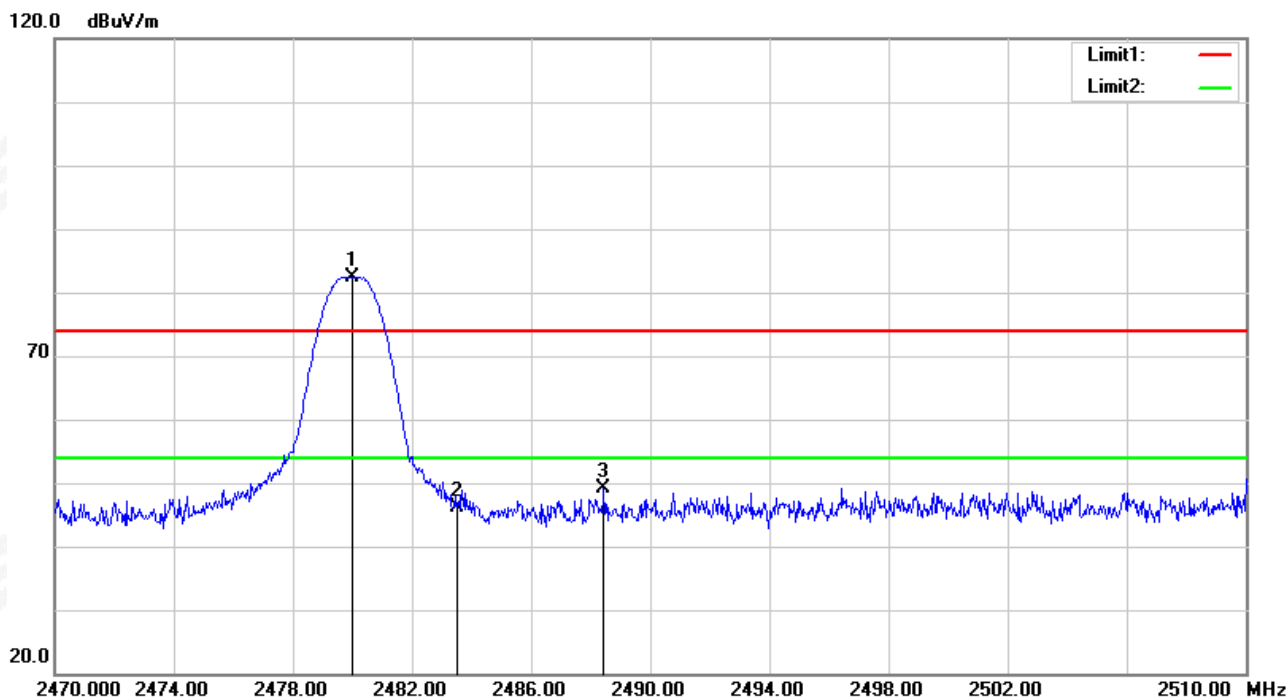


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2483.500	44.20	4.60	48.80	74.00	-25.20	peak
3	2484.960	41.74	4.61	46.35	74.00	-27.65	peak

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	80.19	4.60	-	84.79	114	-29.21	peak
4	2480.000	80.19	4.60	3.73	81.06	94	-12.94	AVG

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2483.500	41.58	4.60	46.18	74.00	-27.82	peak
3	2488.440	44.63	4.62	49.25	74.00	-24.75	peak

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	77.72	4.60	-	82.32	114	-31.68	peak
4	2480.000	77.72	4.60	3.73	78.59	94	-15.05	AVG

4. BANDWIDTH TEST

4.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting : RBW= 1% to 5% OBW, VBW $\geq$ RBW, Sweep time = Auto.

4.2 TEST SETUP



4.3 EUT OPERATION CONDITIONS

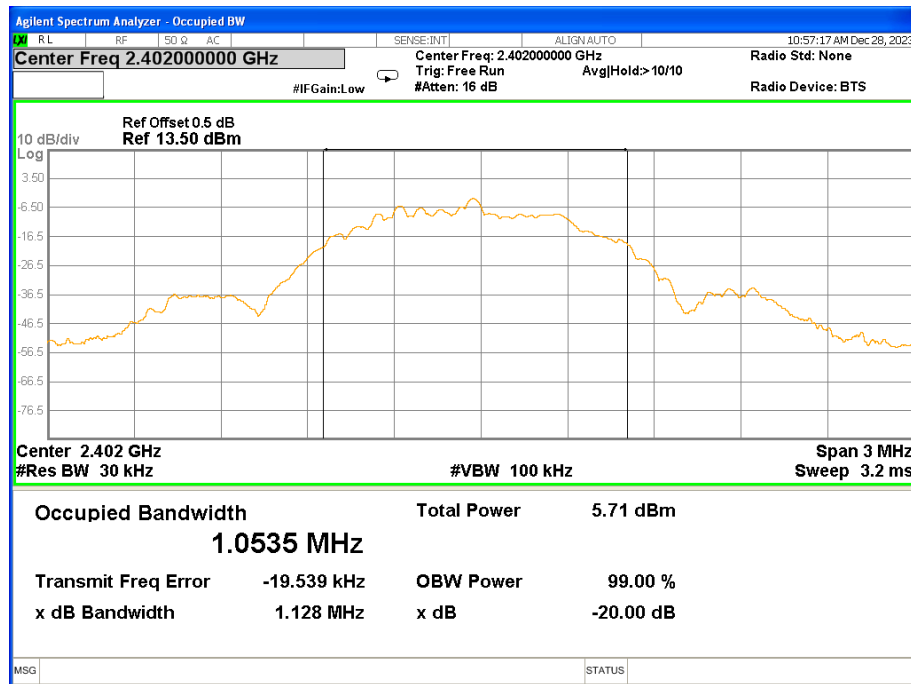
TX mode.

4.4 TEST RESULTS

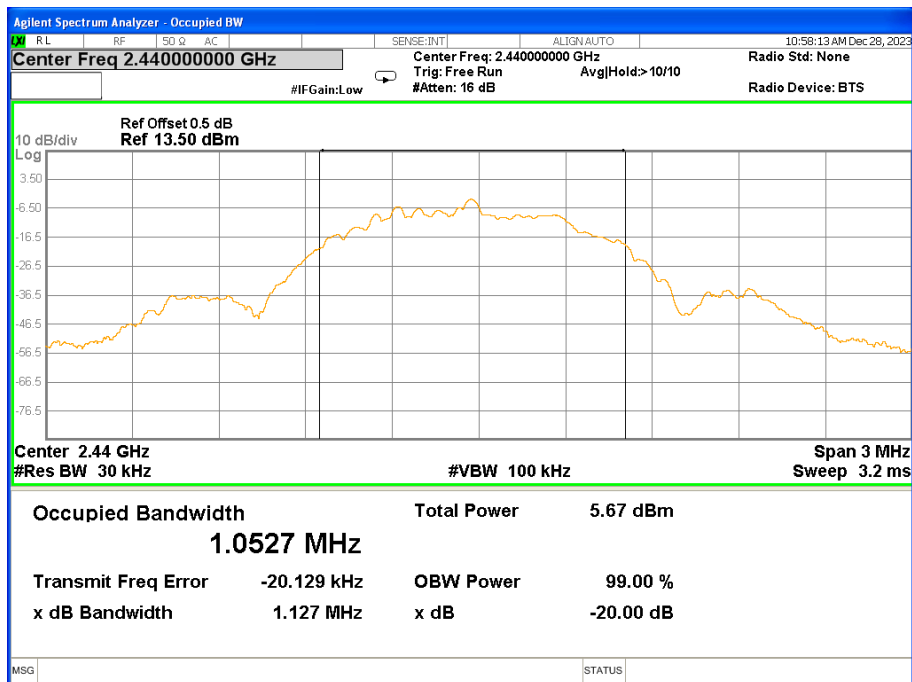
Temperature:	23.4°C	Relative Humidity:	50%
Test Voltage:	DC3.85V		

Test Channel	Frequency(MHz)	20 dB Bandwidth(MHz)
CH00	2402	1.128
CH19	2440	1.127
CH39	2480	1.128

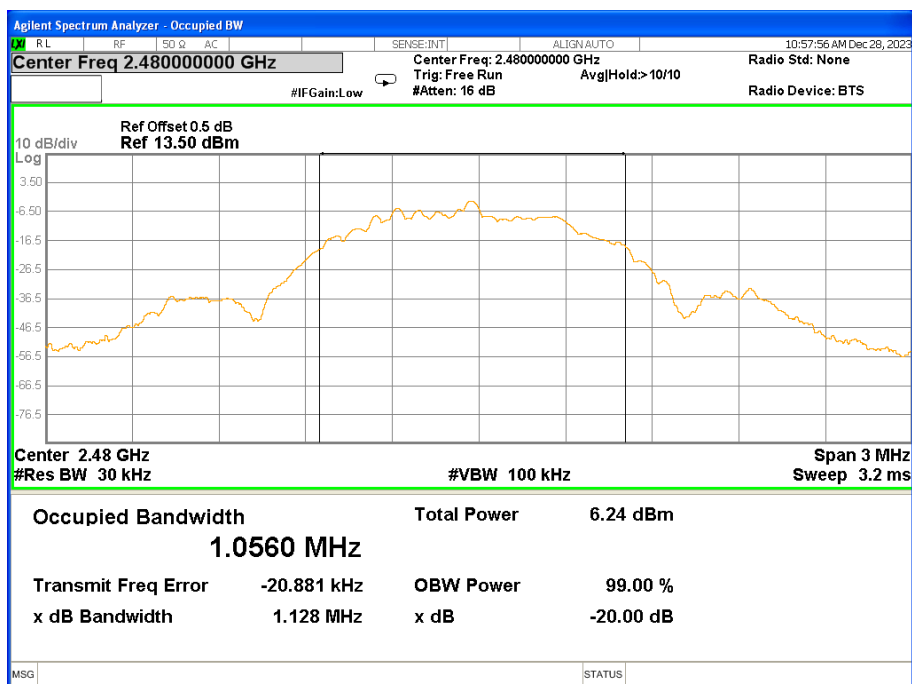
CH00



CH19



CH039



5. ANTENNA REQUIREMENT

5.1 STANDARD REQUIREMENT

According to the FCC Part 15 Paragraph 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.

5.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It conforms to the standard requirements.



APPENDIX- PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

*****END OF THE REPORT*****