RF Test Report

Applicant	:	Sound Land Corporation
Product Name	:	Sound Mixer
Trade Name	:	Maker hart
Model Number	:	Just Combo V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Received Date	:	Sep. 16, 2022
Test Period	:	Oct. 17 ~ Oct. 27, 2022
Issued Date	:	Nov. 23, 2022

Issued by

Eurofins E&E Wireless Taiwan Co., Ltd.
No. 140-1, Changan Street, Bade District,
Taoyuan City 334025, Taiwan (R.O.C.)
Tel：+886-3-2710188 / Fax：+886-3-2710190

Taiwan Accreditation Foundation accreditation number: 1330
Frequency Range: 9 kHz to 325 GHz (Bade test site)
Frequency Range: 9 kHz to 40 GHz (Wugu test site)
Test Firm MRA designation number: TW0010

Note:

1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
2.This report shall not be reproduced except in full, without the written approval of Eurofins E&E Wireless Taiwan Co., Ltd.
3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Revision History

Version	Issued Date	Revisions	Revised By
00	Nov. 23, 2022	Initial Issue	Snow Wang

Verification of Compliance

Applicant	:	Sound Land Corporation
Product Name	:	Sound Mixer
Trade Name	:	Maker hart
Model Number	:	Just Combo V
FCC ID	:	2AYQY-COMBO-V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Test Result	:	Complied
Performing Lab.	:	Eurofins E&E Wireless Taiwan Co., Ltd. No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.) Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330

Testing Laboratory 1330

Eurofins E&E Wireless Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Eurofins E&E Wireless Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By : Kai Yu Yang

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1 General Information

1.1. Summary of Test Result

Standard	Item	Result	Remark
15.207	AC Power Conducted Emission	PASS	-----
15.247(d)	Transmitter Radiated Emissions	PASS	-----
15.247(b)(3)	Max. Output Power	PASS	-----
15.247(a)(2)	6 dB RF Bandwidth	PASS	-----
15.247(e)	Maximum Power Spectral Density	PASS	-----
15.247(d)	Out of Band Conducted Spurious Emission	PASS	-----
15.203	Antenna Requirement	PASS	-----

Decision Rule

■ Uncertainty is not included.

□ Uncertainty is included.

Standard	Description
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63. 10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074 D01 15.247 Meas Guidance v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES

1.2. Testing Location

Lab Name: Eurofins E&E Wireless Taiwan Co., Ltd.

Site Address: ■ No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.)

Site Address: ☐ No. 2, Wuquan 5th Rd. Wugu Dist., New Taipei City, Taiwan (R.O.C.)

1.3. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conducted Emission	150 kHz ~ 30 MHz	2.7 dB
Radiated Emission	9 kHz ~ 30 MHz	2.2 dB
	30 MHz ~ 1000 MHz	5.1 dB
	1000 MHz ~ 18000 MHz	5.2 dB
	18000 MHz ~ 26500 MHz	4.6 dB
	26500 MHz ~ 40000 MHz	4.6 dB
Conducted Output Power	1.1 dB	
RF Bandwidth	4.7 %	
Power Spectral Density	1.1 dB	

2 EUT Description

Applicant	Sound Land Corporation No.32, Keji 1st Rd., Guishan Dist., Taoyuan City 33383, Taiwan	
Product Name	Sound Mixer	
Trade Name	Maker hart	
Model No.	Just Combo V	
FCC ID	2AYQY-COMBO-V	
Frequency Range	2402 ~ 2480 MHz	
Modulation Type	GFSK	
Operate Temp. Range	+5 ~ +40 ℃	
EUT Power Rating	5 Vdc, 1 A	
Module : ASE		
Antenna information	Type	Max. Gain (dBi)
	Ceramic Antenna	2
RF Output Power	LE, GFSK: 0.00177 W	
	2LE, GFSK: 0.00366 W	

3 Test Methodology

3.1. Mode of Operation

Decision of Test Eurofins has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Transmit Mode
BLE 1M
BLE 2M

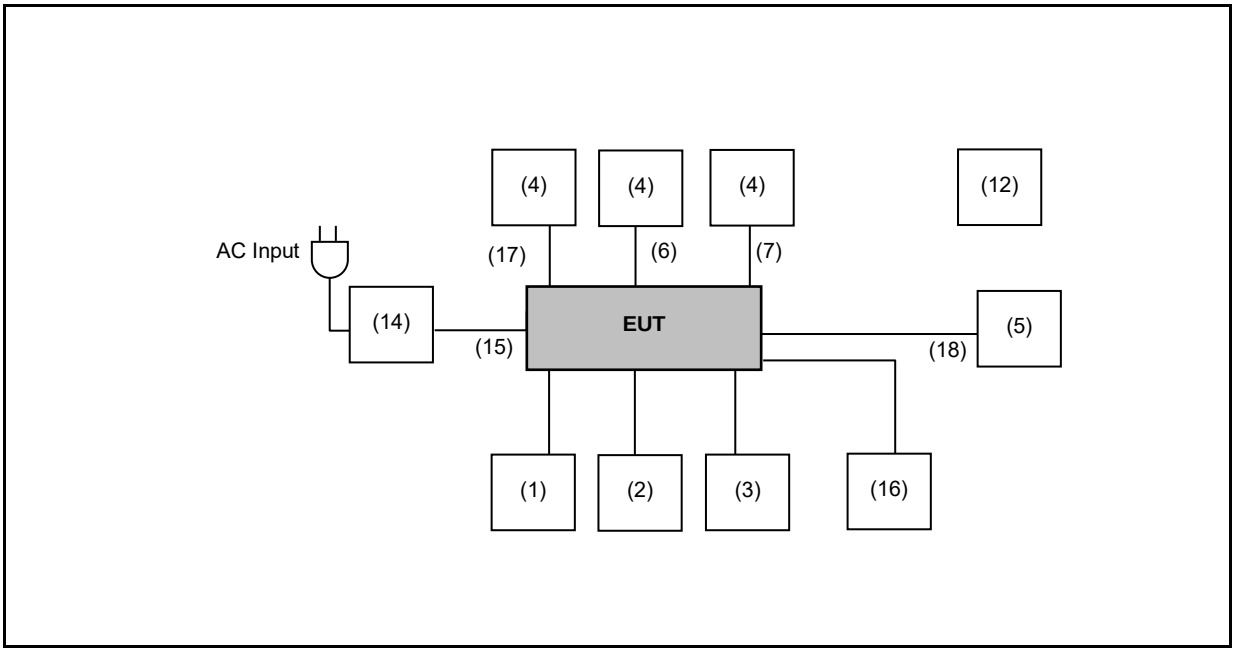
Software used to control the EUT for staying in continuous transmitting mode was programmed.
After verification, all tests were carried out with the worst case test modes.
By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

3.2. EUT Test Step

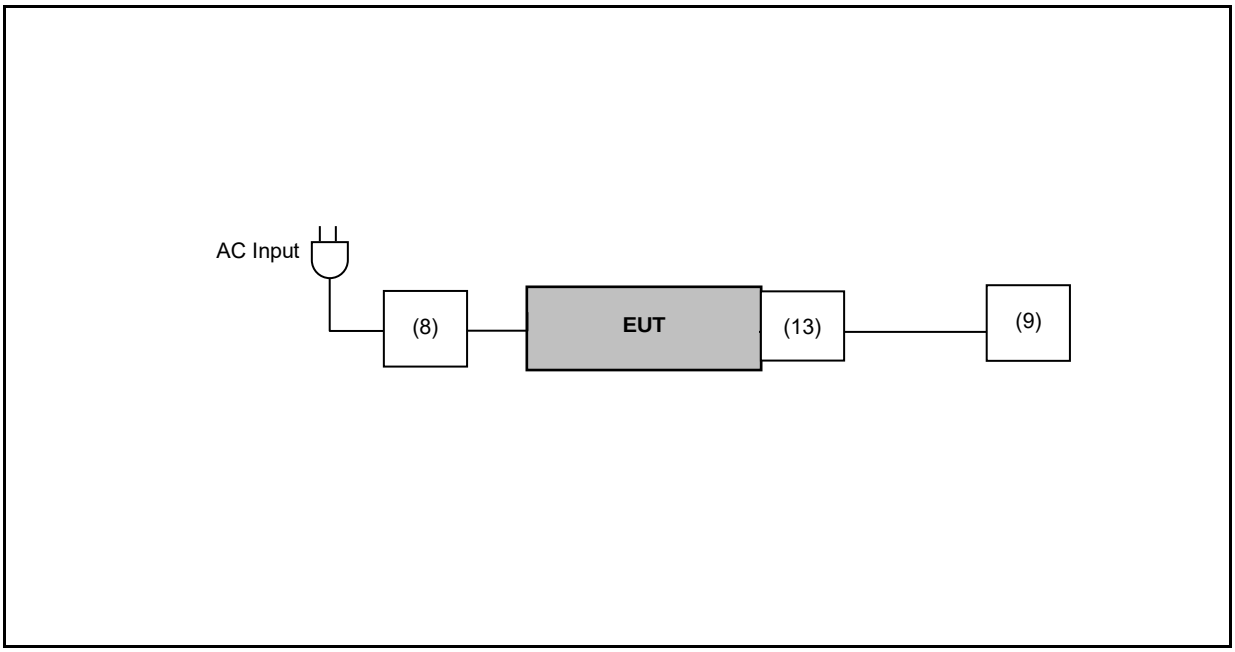
1	Setup the EUT shown on “Configuration of Test System Details”.
2	Turn on the power of all equipment.
3	Turn on TX function.
4	EUT run test program.

3.3. Configuration of Test System Details

Conducted Emission



Radiated Emissions



Devices Description					
Product		Manufacturer	Model Number	Serial Number	Power Cord
(1)	Speaker	KINYO	KY-490	---	---
(2)	Earphone & Microphone	INTOPIC	Jazz-218	---	---
(3)	Earphone & Microphone	HUAWEI	22040296	---	---
(4)	i-Pod	Apple	A1199	---	---
(5)	Smart phone	Samsung	SM-G9910	---	---
(6)	Audio Cable	Edifier	ATL-001	---	---
(7)	Audio Cable	ATake	AVC -3.5MM01	---	---
(8)	Adapter	HUAWEI	HW-050100U01	---	---
(9)	NB	HP	TPN-DA17	---	---
(10)	Fixture	CSR	usb-spi	---	---
(11)	USB Cable	ATL	TS-041-01	---	---
(12)	Portable Bluetooth Speaker	harman/kardon	HK NEO	---	---
(13)	Fixture	Maker hart	Just Combo V	---	---
(14)	AC ADAPTER	KPTEC	K05S050100U	---	---
(15)	L-shaped USB Power Cable	Maker hart	USB Cable	---	---
(16)	USB Mute Module	Maker hart	Mute Module	---	---
(17)	TRRS to TRRS audio cable	Maker hart	audio cable	---	---
(18)	TRS to TRS audio cable	Maker hart	audio cable	---	---

3.4. Test Instruments

For Conducted Emission
Test Period: Oct. 27, 2022
Testing Engineer: Jayson Hsieh

Test Site		Conduction01-BD				
Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
☒	Test Receiver	R&S	ESCI	100367	May 19, 2022	1 year
☐	Test Receiver	R&S	ESCI	100722	Nov. 02, 2021	1 year
☐	Test Receiver	R&S	ESCI	101000	Nov. 26, 2021	1 year
☒	LISN	R&S	ENV216	101040	Apr. 06, 2022	1 year
☐	LISN	R&S	ENV216	101140	Jan. 25, 2022	1 year
☒	RF Cable	Woken	00100D1380194M	TE-02-03	May 27, 2022	1 year
☒	Software	EZ EMC	1.1.4.3	N/A	N.C.R.	---

Note: N.C.R. = No Calibration Request.

For Conducted
Test Period: Oct. 20, 2022
Testing Engineer: Brian Lin

Test Site		RF01-BD				
Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
☐	Power Sensor	Anritsu	MA2411B	1126022	Sep. 04, 2022	1 year
☐	Power Meter	Anritsu	ML2495A	1135009	Sep. 04, 2022	1 year
☒	Power Sensor	Agilent	N1921A	MY45241957	Dec. 06, 2021	1 year
☒	Power Meter	Agilent	N1911A	MY45101619	Dec. 06, 2021	1 year
☒	Spectrum Analyzer (10 Hz~26.5 GHz)	Keysight	N9010B	MY59071418	Mar. 16, 2022	1 year
☐	Spectrum Analyzer (9 kHz~26.5 GHz)	Agilent	N9010A	MY48030518	Jul. 21, 2022	1 year
☐	Spectrum Analyzer (20 Hz~26.5 GHz)	Agilent	N9020A	US47520902	Sep. 01, 2022	1 year
☐	Spectrum Analyzer (3 Hz~50 GHz)	Agilent	N9030A	MY53120541	Jan. 05, 2022	1 year
☐	Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	Mar. 28, 2022	1 year
☐	Signal Generator	Keysight	N5182B	MY53052569	Apr. 16, 2022	1 year
☐	Signal Generator	Keysight	N5182BX07	MY59360221	Apr. 16, 2022	1 year
☒	Bluetooth Tester	R&S	CBT	100350	Mar. 17, 2021	2 years
☐	Wireless Connectivity Tester	R&S	CMW270	102208	Jun. 01, 2022	1 year
☐	Power Supply	KEITHLEY	2303	4045290	Jan. 19, 2022	1 year

Note: N.C.R. = No Calibration Request.

For Radiated Emissions
Test Period: Oct. 17, 2022
Testing Engineer: Kerry Xu, Andy Lu

Test Site		96603-BD				
Radiation test sites		Semi Anechoic Room				
Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
☐	Spectrum Analyzer (10 Hz~44 GHz)	Keysight	N9010A	MY52221312	Jan. 13, 2022	1 year
☐	Spectrum Analyzer (3 Hz~50 GHz)	Agilent	N9030A	MY53120541	Jan. 05, 2022	1 year
☒	Spectrum Analyzer (2 Hz~50 GHz)	Keysight	N9030B	MY57143537	Apr. 14, 2022	1 year
☐	Spectrum Analyzer (10 Hz~44 GHz)	Keysight	N9020B	MY60112363	Feb. 27, 2022	1 year
☒	Amplifier (100 kHz~1.3 GHz)	Agilent	8447D	2944A11119	Jan. 14, 2022	1 year
☐	Amplifier (100 kHz~1.3 GHz)	Agilent	8447D	2944A10961	Jul. 07, 2022	1 year
☐	Broadband Amplifier (100 kHz~1 GHz)	Titan	T0910E00014330 A1F	001	Jul. 21, 2022	1 year
☐	Amplifier (1 GHz~26.5 GHz)	Agilent	8449B	3008A02237	Oct. 21, 2021	1 year
☒	Broadband Amplifier (1 GHz~26.5 GHz)	Titan	T0912E01263025 A1F	002	Jul. 21, 2022	1 year
☐	Preamplifier (26.5 GHz~40 GHz)	EMCI	EMC2654045	980028	Sep. 02, 2022	1 year
☐	Loop Antenna (9 kHz~30 MHz)	COM-POWER CORPORATION	AL-130	121014	Mar. 28, 2022	1 year
☐	Active Loop Antenna (9 kHz~30 MHz)	Schwarzbeck Mess-Elektronik	FMZB 1513-60	1513-60-031	Feb. 17, 2022	1 year
☐	Trilog Broadband Antenna (30 kHz~1 GHz)	Schwarzbeck Mess-Elektronik	VULB9168	01146	Jul. 22, 2022	1 year
☒	Trilog Broadband Antenna (30 kHz~1 GHz)	Schwarzbeck Mess-Elektronik	VULB9168	416	Nov. 17, 2021	1 year
☒	Broadband Horn Antenna (1 GHz~18 GHz)	Schwarzbeck Mess-Elektronik	9120D	02207	Jul. 13, 2022	1 year
☐	Broadband Horn Antenna (1 GHz~18 GHz)	Schwarzbeck Mess-Elektronik	9120D	9120D-550	Aug. 25, 2022	1 year
☒	Broadband Horn Antenna (18 GHz~40 GHz)	Schwarzbeck Mess-Elektronik	9170	9170-320	Aug. 25, 2022	1 year
☐	Horn Antenna (18 GHz~40 GHz)	ETS	3116	00086467	Dec. 03, 2021	1 year

Note: N.C.R. = No Calibration Request.

Test Site		96603-BD				
Radiation test sites		Semi Anechoic Room				
Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
☐	RF Cable	EMCI	EMC104-N-N-6000	TE01-1	Feb. 18, 2022	1 year
☐	Microwave Cable	EMCI	EMC104-SM-SM-13000	170814	Feb. 18, 2022	1 year
☐	Microwave Cable	EMCI	EMC102-KM-KM-14000	151001	Feb. 18, 2022	1 year
☒	Coaxial Cable	Titan	T0710AT327A10A100	J11005	Aug. 04, 2022	1 year
☒	Coaxial Cable	Titan	T0710AT327A10A900	J11004	Aug. 04, 2022	1 year
☒	Coaxial Cable	Titan	CFD400NL-LW	001	Aug. 04, 2022	1 year
☒	Bluetooth Tester	R&S	CBT	100350	Mar. 17, 2021	2 years
☐	Wireless Connectivity Tester	R&S	CMW270	102208	Jun. 01, 2022	1 year
☐	Power Supply	KEITHLEY	2303	4045290	Jan. 19, 2022	1 year
☒	Software	EZ EMC	1.1.4.4	N/A	N.C.R.	---

Note: N.C.R. = No Calibration Request.

3.5. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	20-30
Humidity (%RH)	25-75	45-75

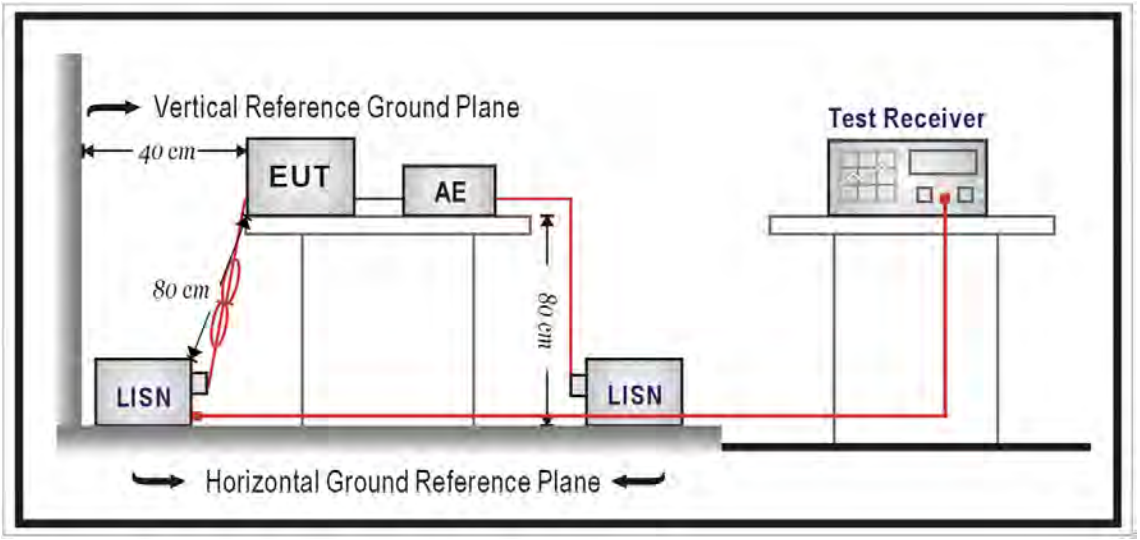
4 Measurement Procedure

4.1. AC Power Line Conducted Emission Measurement

■ **Limit**

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

■ **Test Setup**



■ **Test Procedure**

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 Ω// 50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 Ω// 50 uH coupling impedance with 50 ohm termination.

Tabletop device shall be placed on a non-conducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The wall of screened room shall be located 40 cm to the rear of the EUT. Other surfaces of tabletop or floor standing EUT shall be at least 80 cm from any other ground conducting surface including one or more LISNs. For floor-standing device shall be placed under the EUT with a 12 mm insulating material.

Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a resolution bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1, as applicable, including the average limit and the quasi-peak limit when using respectively, an average detector and quasi-peak detector measured in accordance with the methods described of related standard. When all of peak value were complied with quasi-peak and average limit from 150 kHz to 30 MHz then quasi-peak and average measurement was unnecessary.

The AMN shall be placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for AMNs mounted on top of the ground reference plane. This distance is between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8 m from the AMN. If the mains power cable is longer than 1 m then the cable shall be folded back and forth at the centre of the lead to form a bundle no longer than 0.4 m. All of 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 cm to 40 cm long. All of EUT and AE shall be separate place more than 0.1 m. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

4.2. Radiated Emission Measurement

■ **Limit**

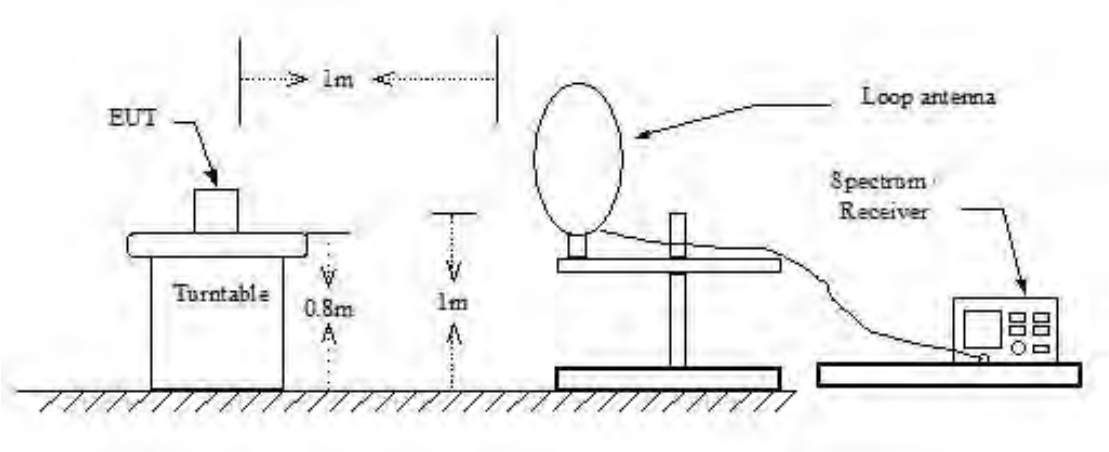
According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m at 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

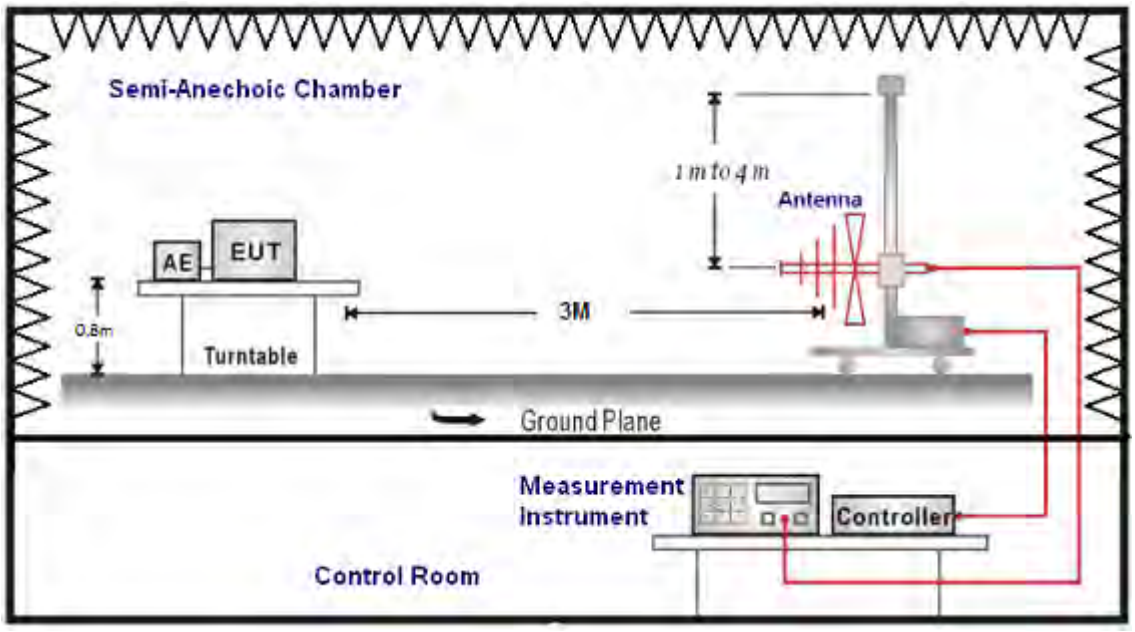
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

■ **Setup**

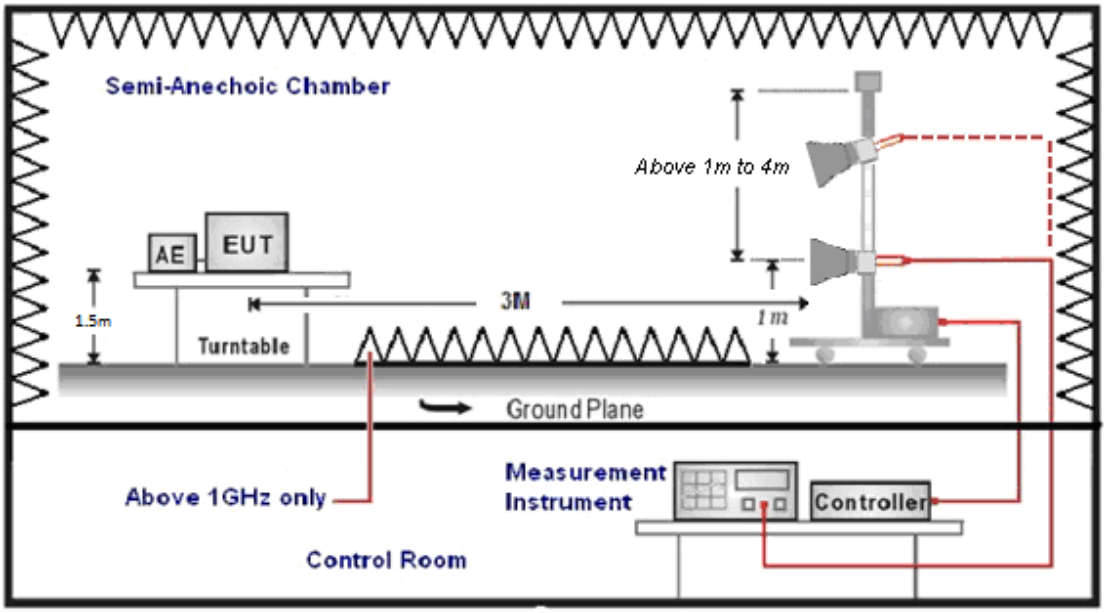
9 kHz ~ 30 MHz



Below 1 GHz



Above 1 GHz



■ **Test Procedure**

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 10 Hz for average measurements when Duty cycle >0.98 / 1/T for average measurements when Duty cycle <0.98. A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna was used in frequencies 1 –26.5 GHz at a distance of 3 meter. The antenna at an angle toward the source of the emission. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20 dB/decade).

For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30 dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

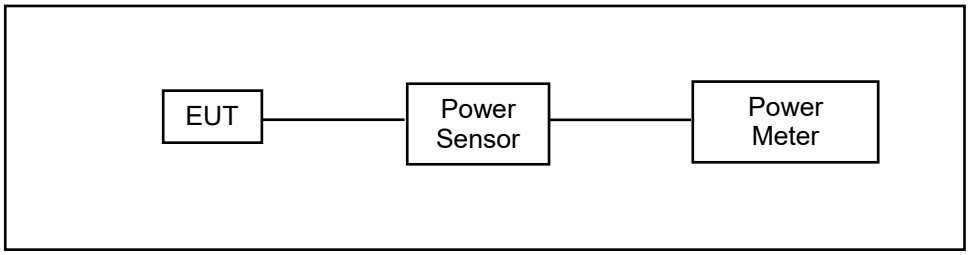
Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

4.3. Maximum Conducted Output Power Measurement

■ **Limit**

For systems using digital modulation in the 2400-2483.5 MHz, the limit for peak output power is 30 dBm.

■ **Test Setup**



■ **Test Procedure**

The testing follows the Measurement Procedure of ANSI C63.10:2013 section 11.9.2.3.2 Method AVGPM.

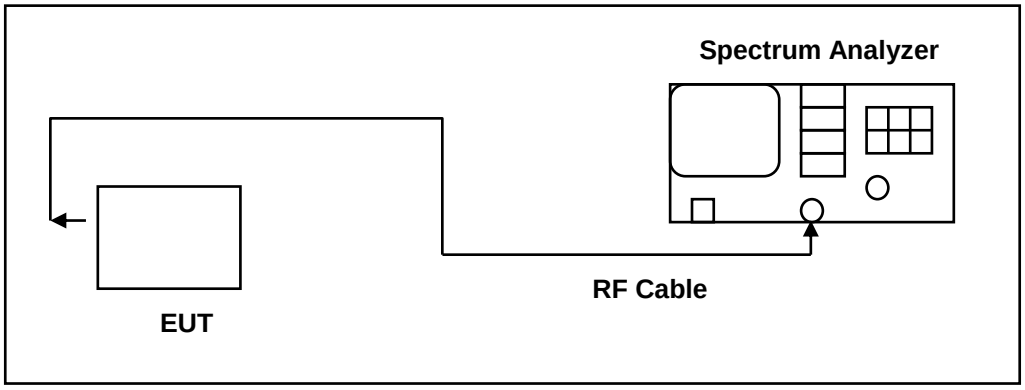
The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor..

4.4. 6 dB RF Bandwidth Measurement

■ **Limit**

6 dB RF Bandwidth: Systems using digital modulation techniques may operate in the 2400–2483.5 MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.
99 % Occupied Bandwidth: N/A

■ **Test Setup**



■ **Test Procedure**

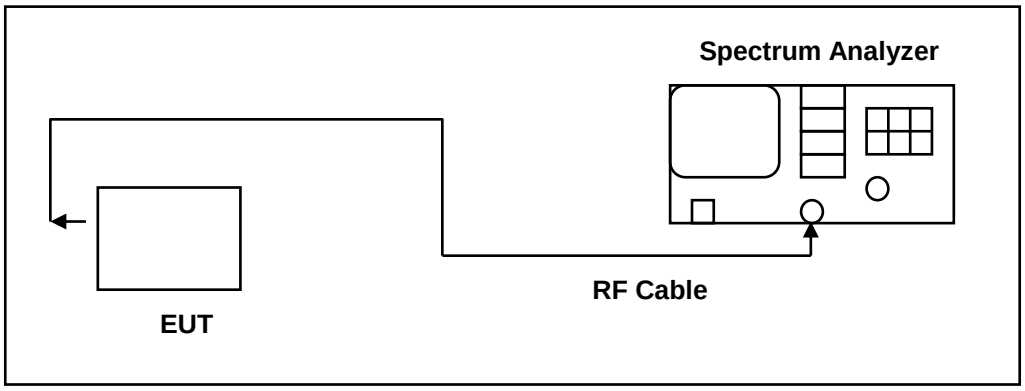
The EUT tested to DTS test procedure of ANSI C63.10:2013 section 11.8.2 option2 for compliance to FCC 47CFR 15.247 requirements.
6 dB RF Bandwidth: The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken, a DISPLAY line was drawn 6 dB lower than peak level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.
The test was performed at 3 channels (Channel low, middle, high)

4.5. Maximum Power Density Measurement

■ **Limit**

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

■ **Test Setup**



■ **Test Procedure**

The EUT tested to DTS test procedure of ANSI C63.10:2013 section 11.10.2 Method PKPSD.

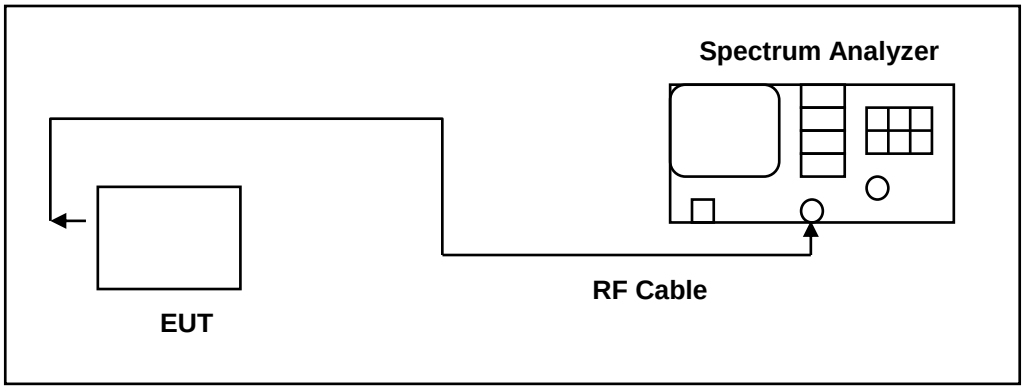
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 × RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the 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.

4.6. Out of Band Conducted Emissions Measurement

■ **Limit**

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

■ **Test Setup**



■ **Test Procedure**

In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band.
The test was performed at 3 channels.

4.7. Antenna Measurement

■ **Limit**

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.
And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

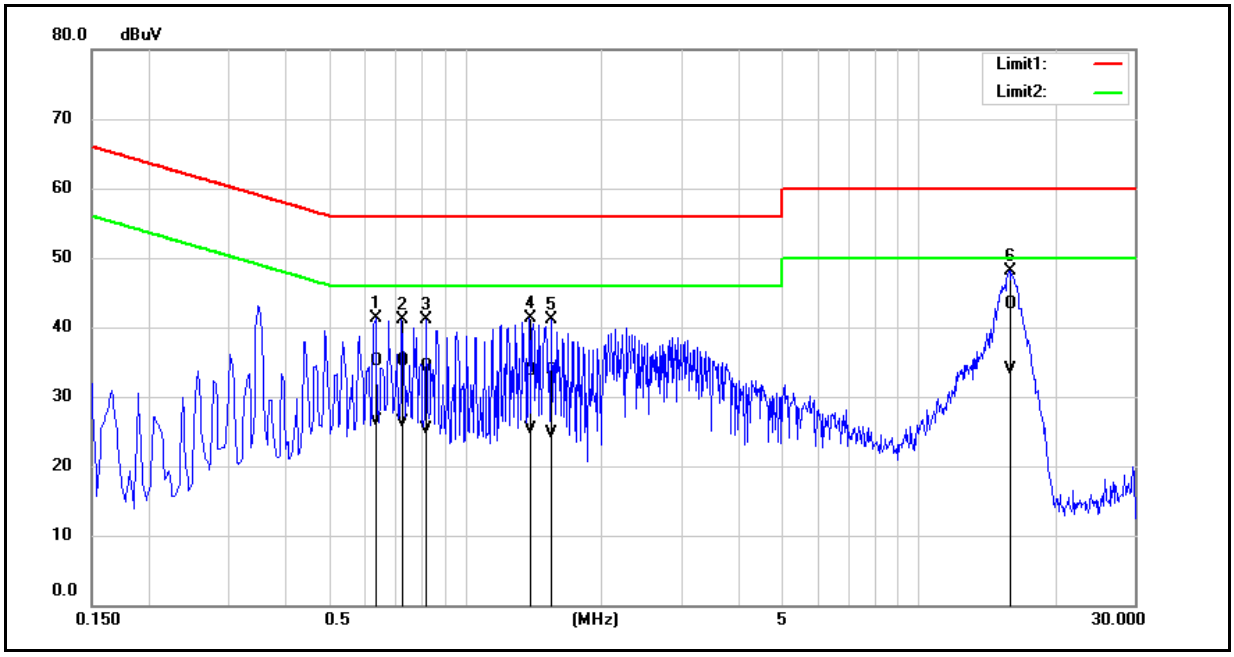
■ **Antenna Connector Construction**

See section 2 – antenna information.

5 Test Results

5.1. Conducted Emission

Standard:	Part 15C	Line:	L1
Test item:	Conducted Emission	Power:	AC 120 V/60 Hz
Mode:	Transmit Mode		
Description:			

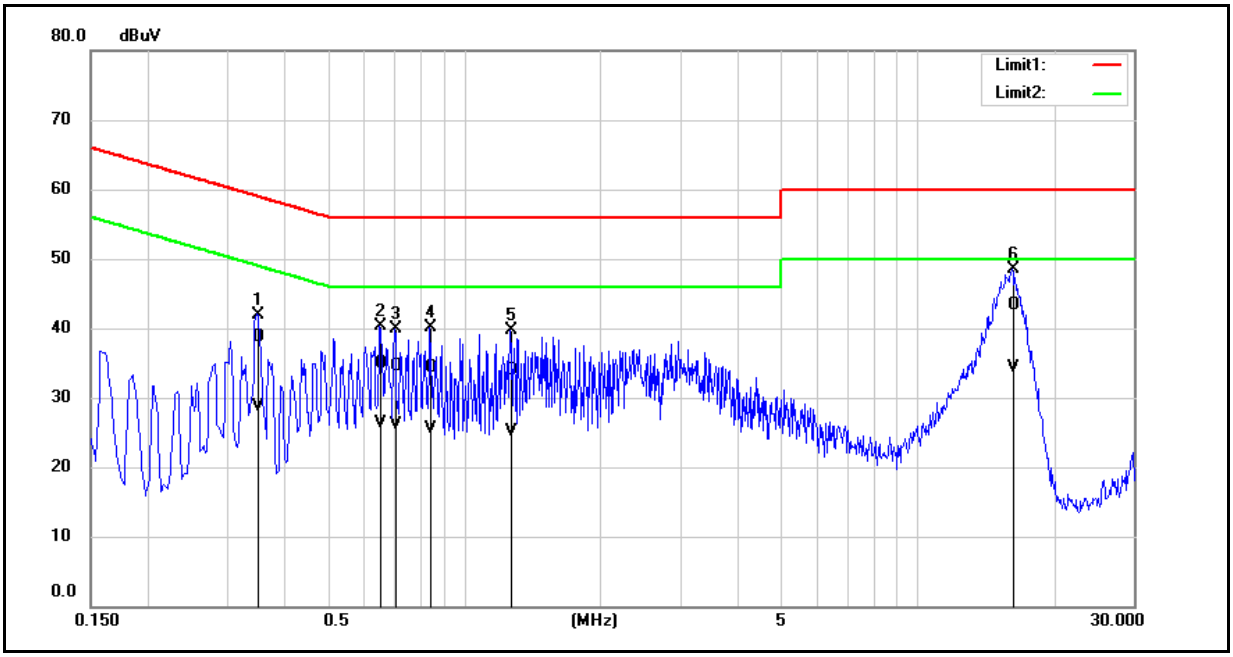


No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.6340	25.50	16.97	9.56	35.06	26.53	56.00	46.00	-20.94	-19.47	Pass
2	0.7260	25.51	16.77	9.57	35.08	26.34	56.00	46.00	-20.92	-19.66	Pass
3	0.8180	24.76	15.80	9.57	34.33	25.37	56.00	46.00	-21.67	-20.63	Pass
4	1.3860	24.20	15.78	9.59	33.79	25.37	56.00	46.00	-22.21	-20.63	Pass
5	1.5500	24.03	15.14	9.60	33.63	24.74	56.00	46.00	-22.37	-21.26	Pass
6	15.8700	33.49	24.16	9.83	43.32	33.99	60.00	50.00	-16.68	-16.01	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Standard:	Part 15C	Line:	N
Test item:	Conducted Emission	Power:	AC 120 V/60 Hz
Mode:	Transmit Mode		
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.3500	29.09	19.12	9.60	38.69	28.72	58.96	48.96	-20.27	-20.24	Pass
2	0.6540	25.28	16.67	9.62	34.90	26.29	56.00	46.00	-21.10	-19.71	Pass
3	0.7020	24.93	16.48	9.63	34.56	26.11	56.00	46.00	-21.44	-19.89	Pass
4	0.8420	24.64	15.80	9.63	34.27	25.43	56.00	46.00	-21.73	-20.57	Pass
5	1.2660	24.34	15.54	9.65	33.99	25.19	56.00	46.00	-22.01	-20.81	Pass
6	16.1900	33.34	24.28	9.98	43.32	34.26	60.00	50.00	-16.68	-15.74	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

5.2. Conducted Test Results

Duty Cycle						
Band	Frequency (MHz)	On time (ms)	On+off time (ms)	Duty cycle (%)	Duty Factor (dB)	1/T Minimun VBW (kHz)
BLE 1M	2402	0.440	0.626	70.288	1.531	0.010
BLE 2M	2402	0.264	0.630	41.905	3.777	0.010

BLE 1M	
On+off time	

BLE 2M	
On+off time	

Maximum Conducted Output Power Measurement								
Test Mode	Frequency (MHz)	Average Power		Peak Power		Power Limit	RF Power setting in Test Software	Test Software Version
		dBm	W	dBm	W	dBm		
BLE 1M	2402	-0.31	0.0009	-0.19	0.0010	30.00	0x04	AWBTRDLAB 1.0.9.21
	2440	0.08	0.0010	0.17	0.0010	30.00	0x04	
	2480	2.23	0.0017	2.48	0.0018	30.00	0x03	
BLE 2M	2402	3.05	0.0020	3.29	0.0021	30.00	0x02	
	2440	4.47	0.0028	4.67	0.0029	30.00	0x01	
	2480	5.44	0.0035	5.63	0.0037	30.00	0x00	

Note: The relevant measured result has the offset with cable loss already.

Test mode	Frequency	6dB Occupied Bandwidth	6 dB Limit
	(MHz)	(kHz)	(kHz)
BLE 1M	2402	683.9000	≧ 500
	2440	677.0000	≧ 500
	2480	679.9000	≧ 500
BLE 2M	2402	1217.0000	≧ 500
	2440	1218.0000	≧ 500
	2480	1220.0000	≧ 500

■ **Test Graphs**

BLE 1M	
2402 MHz	
2440 MHz	
2480 MHz	

BLE 2M	
2402 MHz	
2440 MHz	
2480 MHz	

Maximum Power Density Measurement			
Test mode	Frequency	Reading	Limit
	(MHz)	(dBm/3 kHz)	(dBm/3 kHz)
BLE 1M	2402	-13.730	≦ 8
	2440	-13.580	≦ 8
	2480	-10.980	≦ 8
BLE 2M	2402	-5.920	≦ 8
	2440	-4.850	≦ 8
	2480	-3.500	≦ 8

■ **Test Graphs**

BLE 1M	
2402 MHz	
2440 MHz	
2480 MHz	

BLE 2M	
2402 MHz	
2440 MHz	
2480 MHz	

Out of Band Conducted Emissions Measurement

■ **Test Graphs**

Reference level

BLE 1M	
2402 MHz	
2440 MHz	
2480 MHz	

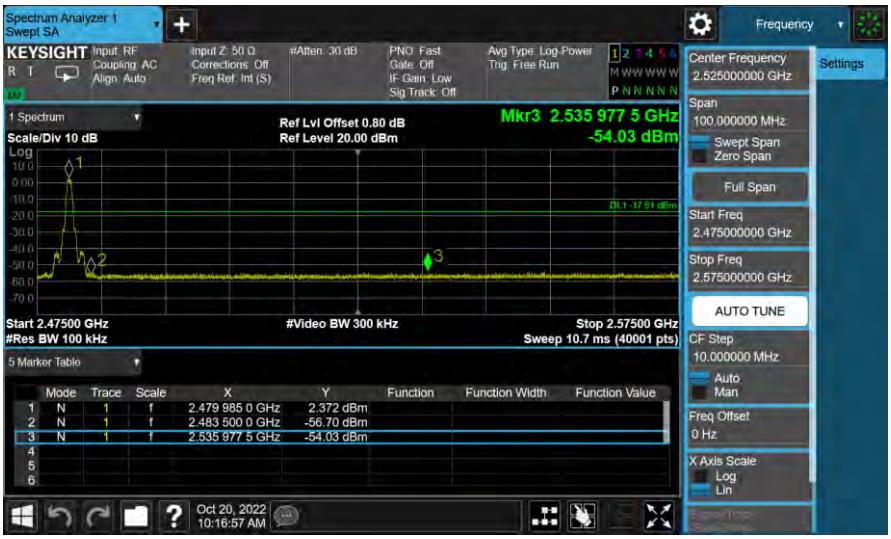
BLE 2M	
2402 MHz	
2440 MHz	
2480 MHz	

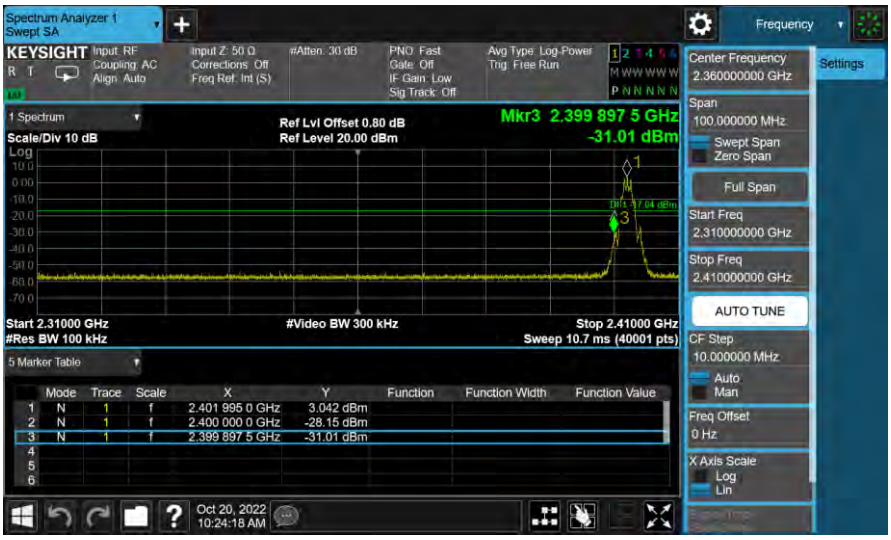
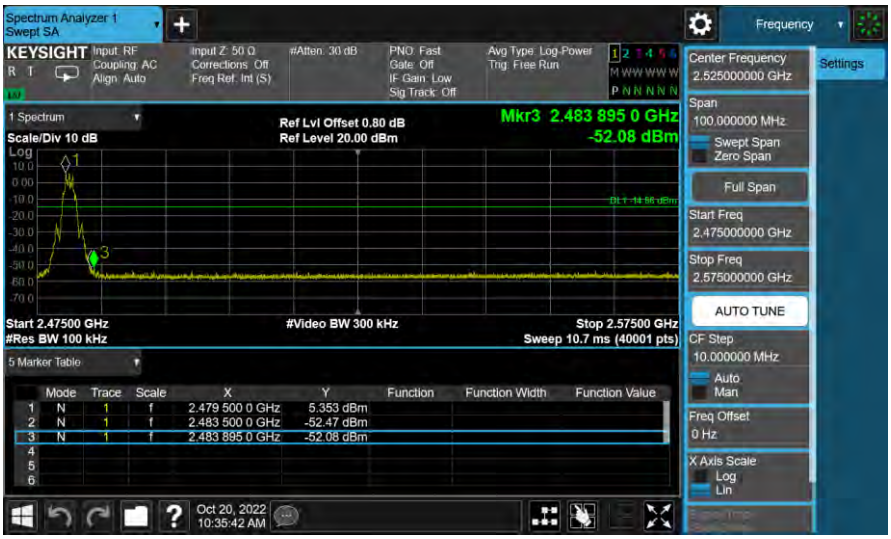
Out of Band Conducted Emissions

BLE 1M	
2402 MHz	
2440 MHz	
2480 MHz	

BLE 2M	
2402 MHz	
2440 MHz	
2480 MHz	

Conducted Band Edge

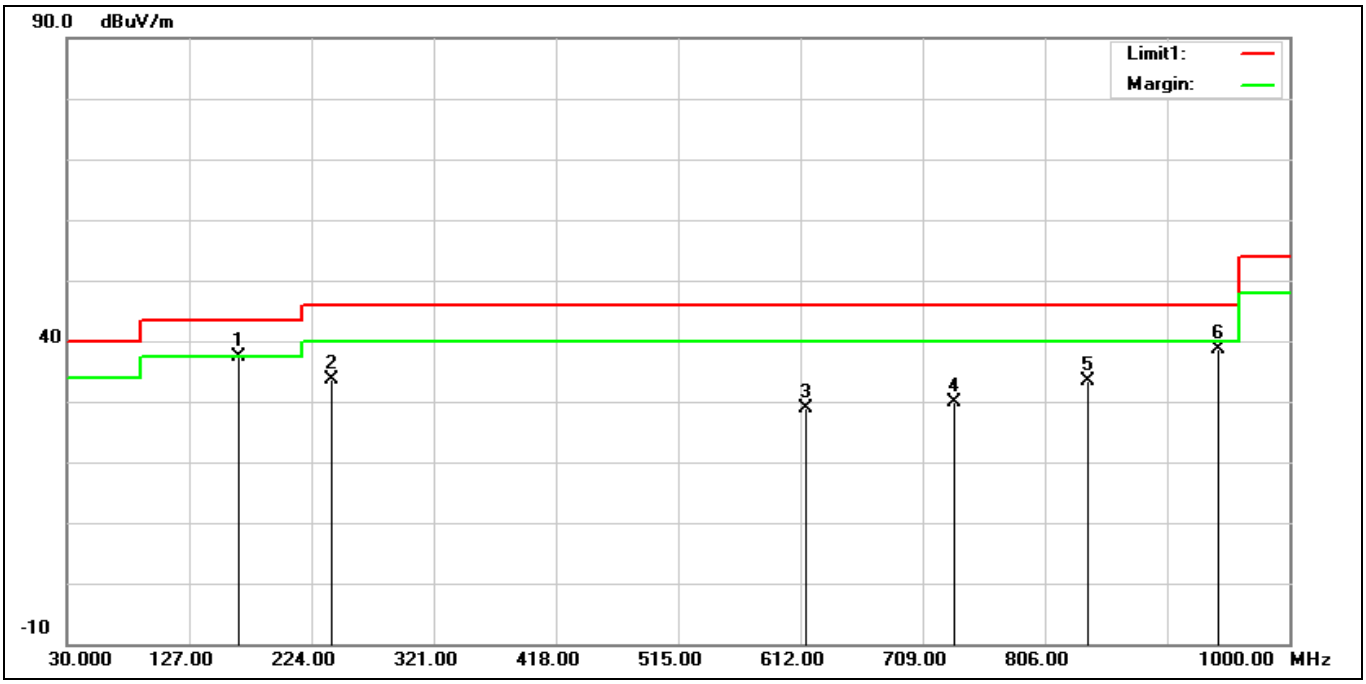
BLE 1M	
2402 MHz	
2480 MHz	

BLE 2M	
2402 MHz	
2480 MHz	

5.3. Radiated Emission Measurement

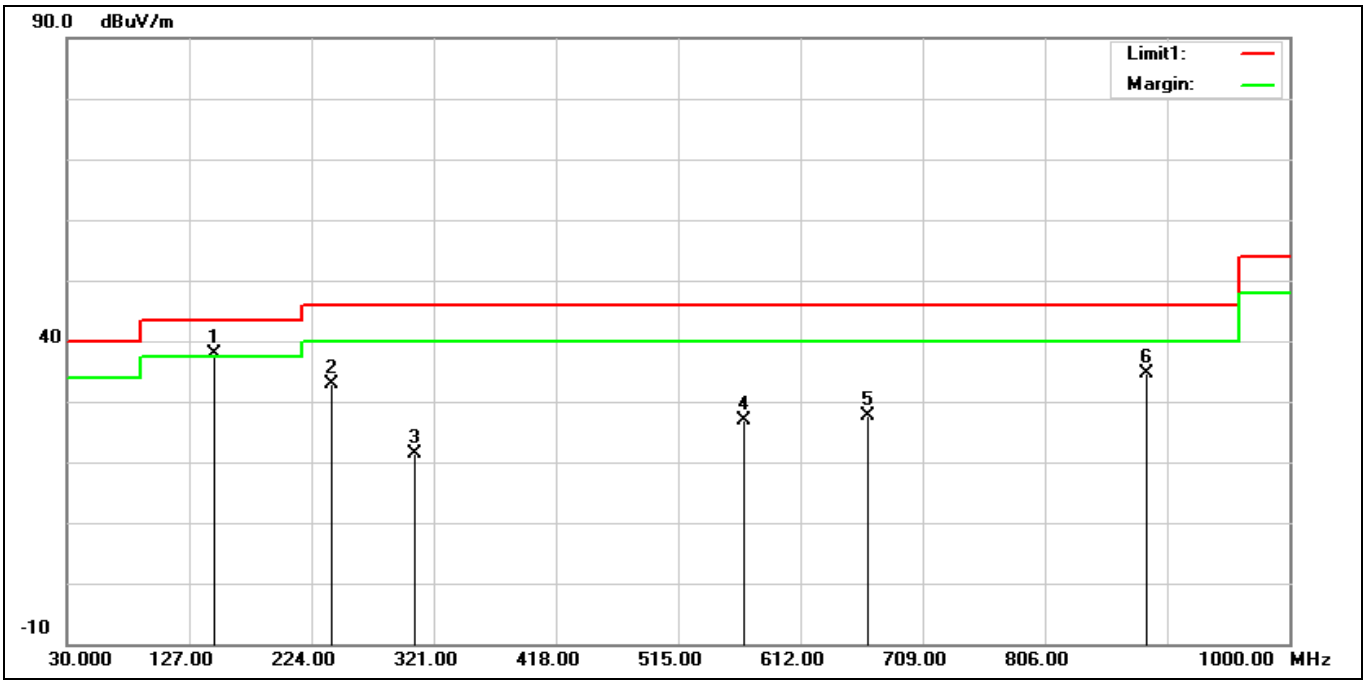
Below 1 GHz

Standard:	LP0002	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 1M 2402 MHz		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	166.7700	45.02	-7.74	37.28	43.50	-6.22	QP
2	240.4900	42.30	-8.64	33.66	46.00	-12.34	QP
3	616.8500	28.67	0.33	29.00	46.00	-17.00	QP
4	734.2200	27.24	2.52	29.76	46.00	-16.24	QP
5	839.9500	28.89	4.49	33.38	46.00	-12.62	QP
6	943.7400	32.55	6.13	38.68	46.00	-7.32	QP

Standard:	LP0002	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 1M 2402 MHz		
Remark:			

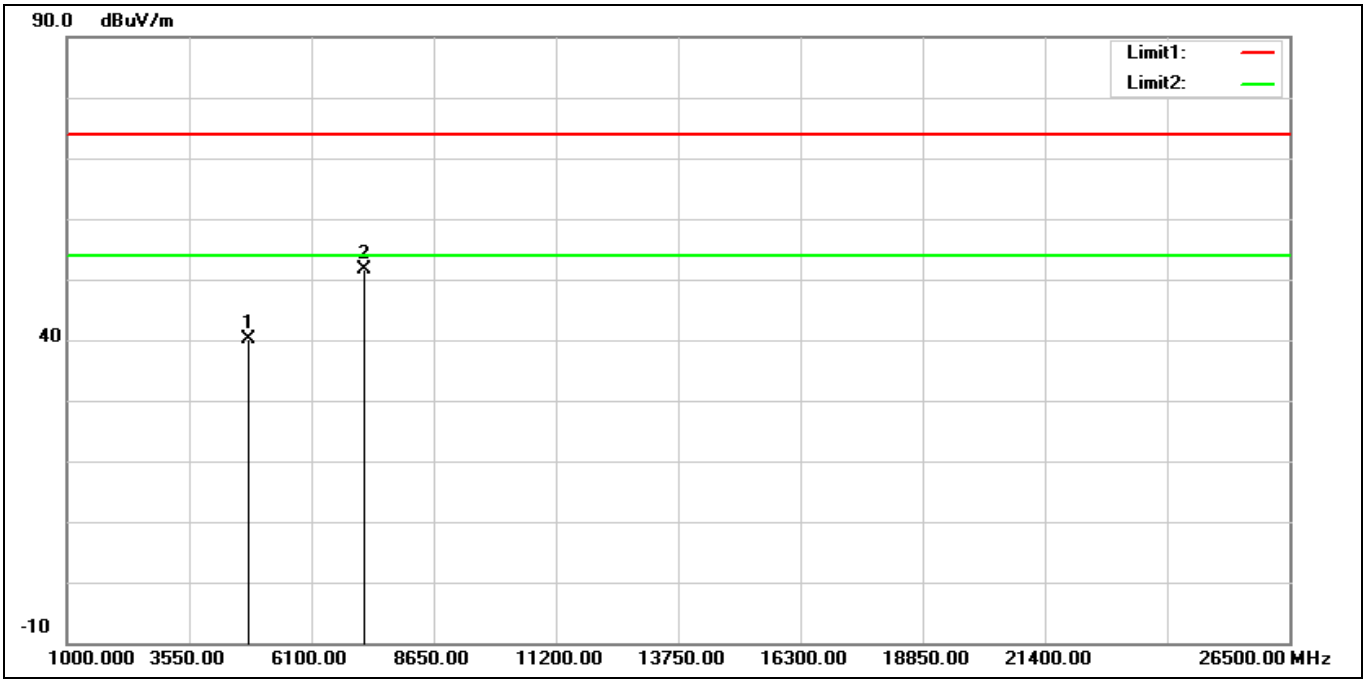


No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	147.3700	45.36	-7.40	37.96	43.50	-5.54	QP
2	240.4900	41.48	-8.64	32.84	46.00	-13.16	QP
3	306.4500	28.09	-6.61	21.48	46.00	-24.52	peak
4	567.3800	27.83	-0.92	26.91	46.00	-19.09	QP
5	665.3500	26.68	0.98	27.66	46.00	-18.34	QP
6	886.5100	29.49	5.24	34.73	46.00	-11.27	QP

Harmonic

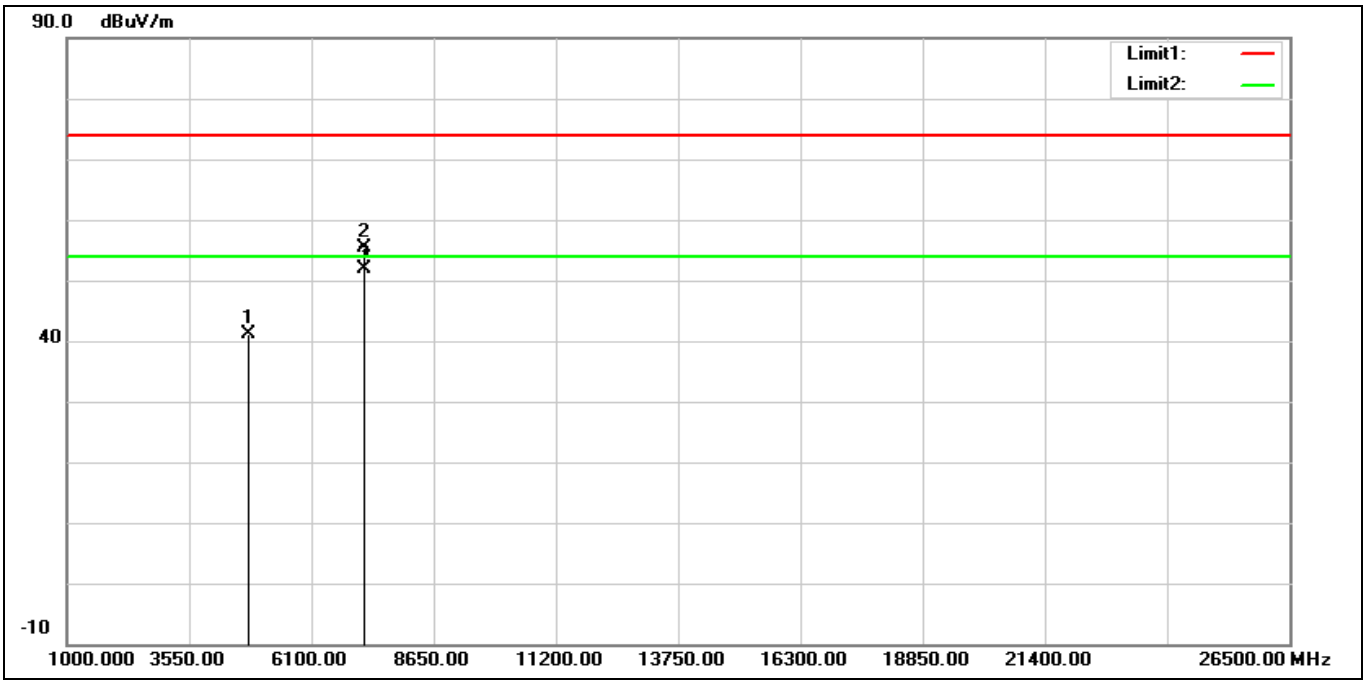
Above 1 GHz

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 1M 2402 MHz		
Remark:			



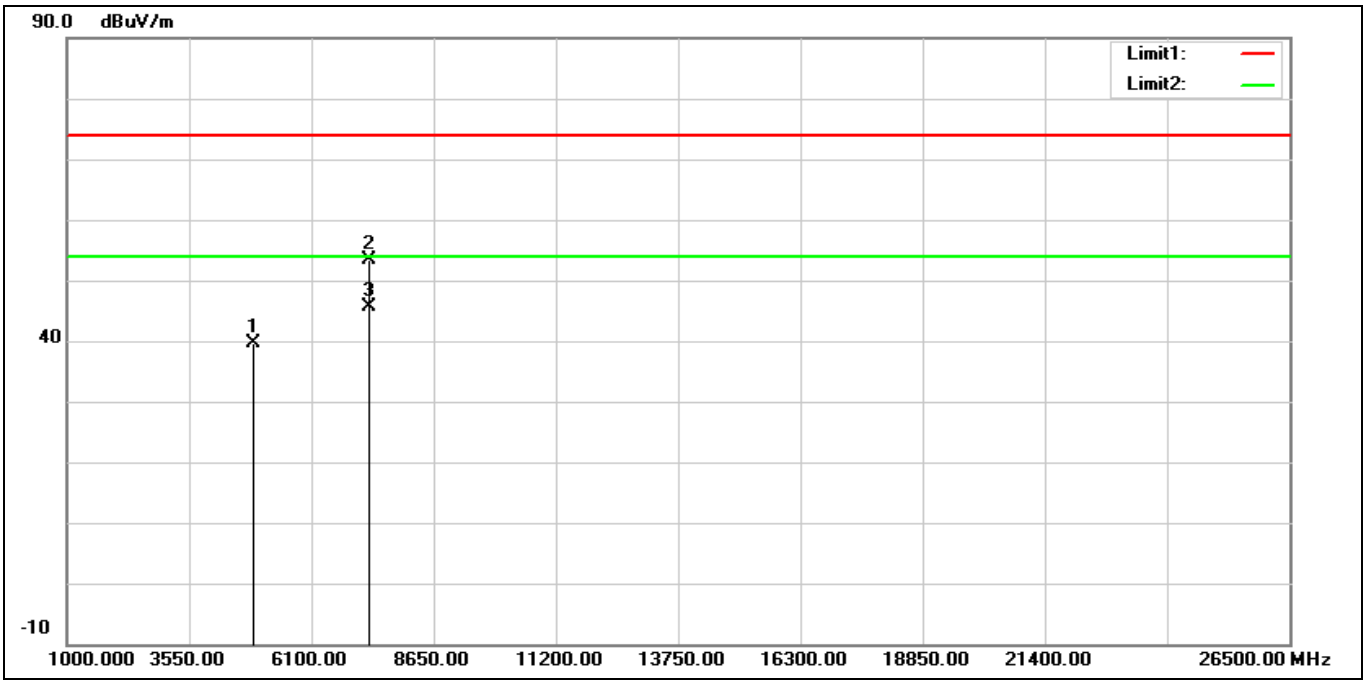
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.000	39.74	0.29	40.03	74.00	-33.97	peak
2*	7206.000	43.86	7.82	51.68	74.00	-22.32	peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 1M 2402 MHz		
Remark:			



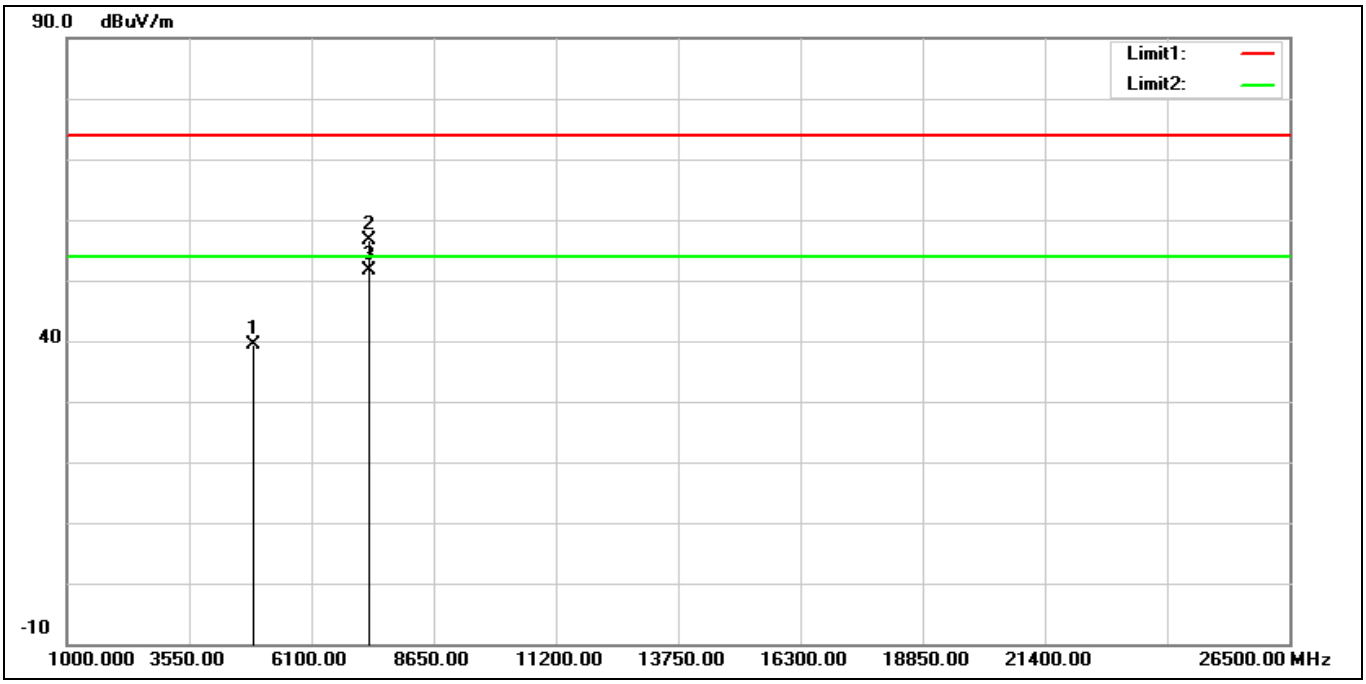
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.000	40.87	0.29	41.16	74.00	-32.84	peak
2	7206.000	47.58	7.82	55.40	74.00	-18.60	peak
3*	7206.000	44.04	7.82	51.86	54.00	-2.14	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 1M 2440 MHz		
Remark:			



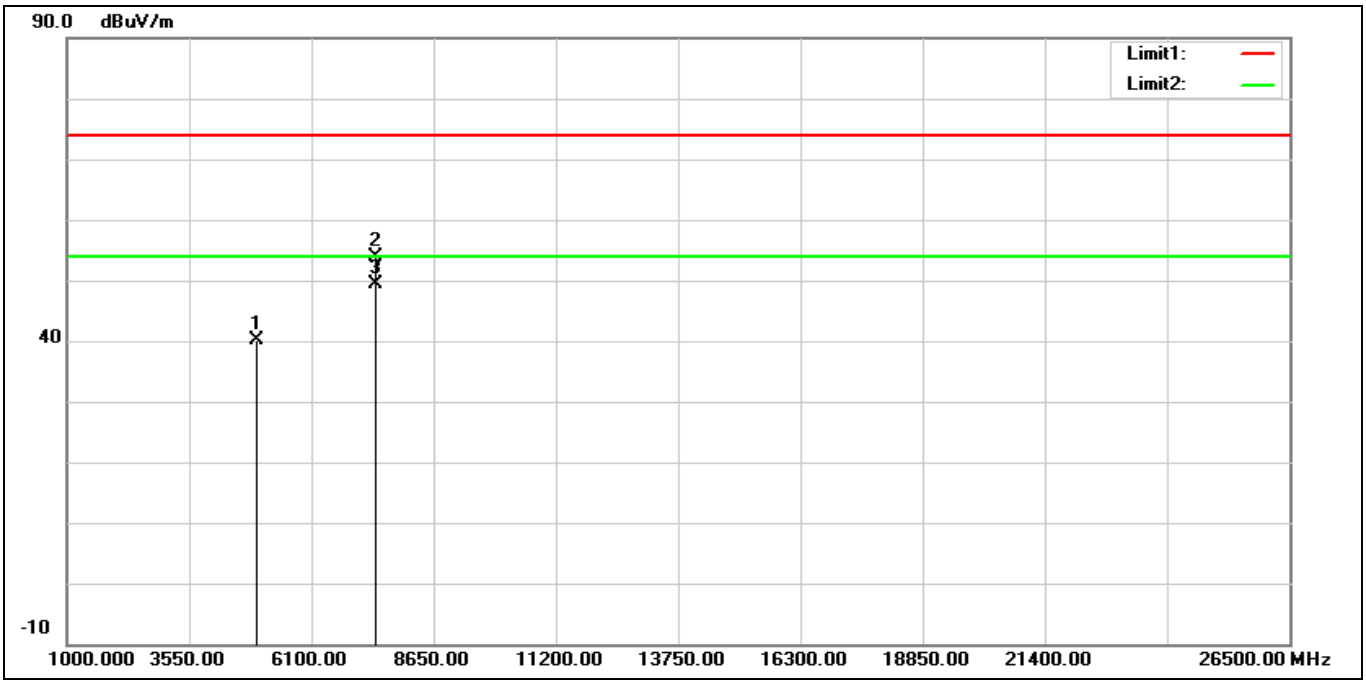
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	39.14	0.38	39.52	74.00	-34.48	peak
2	7320.000	45.49	7.99	53.48	74.00	-20.52	peak
3*	7320.000	37.66	7.99	45.65	54.00	-8.35	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 1M 2440 MHz		
Remark:			



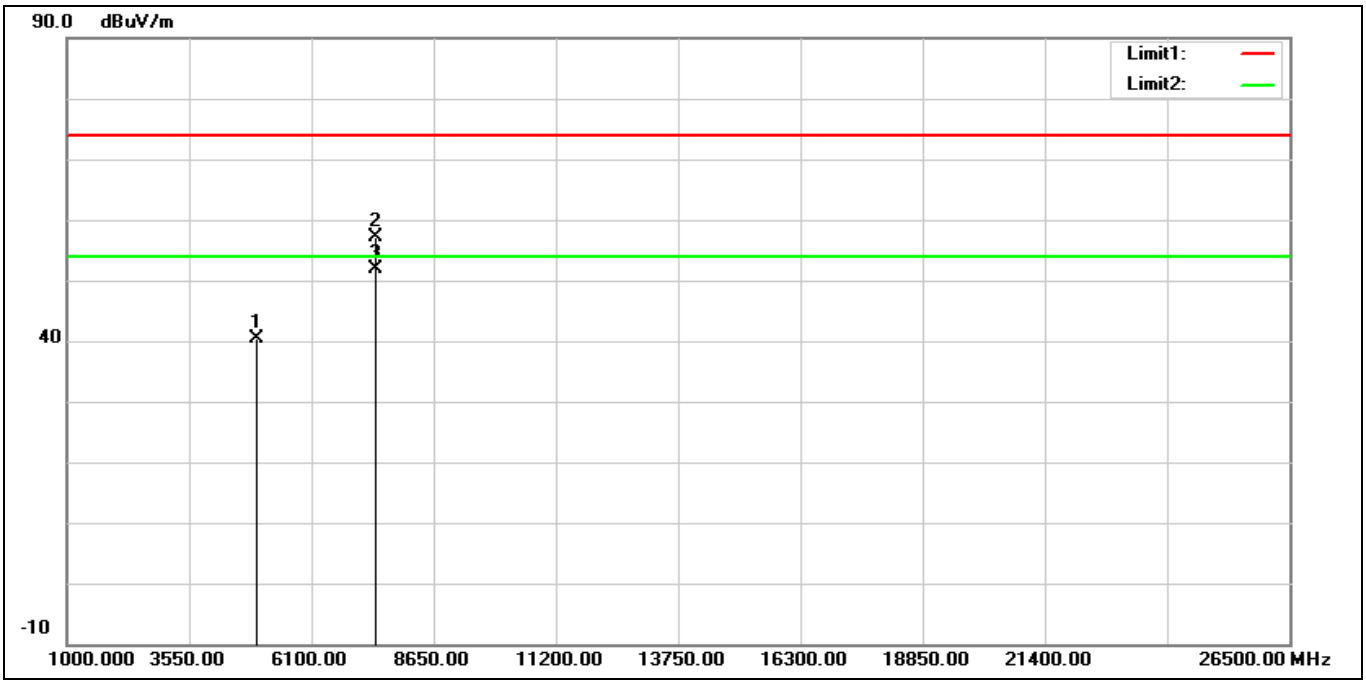
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	38.99	0.38	39.37	74.00	-34.63	peak
2	7320.000	48.58	7.99	56.57	74.00	-17.43	peak
3*	7320.000	43.62	7.99	51.61	54.00	-2.39	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 1M 2480 MHz		
Remark:			



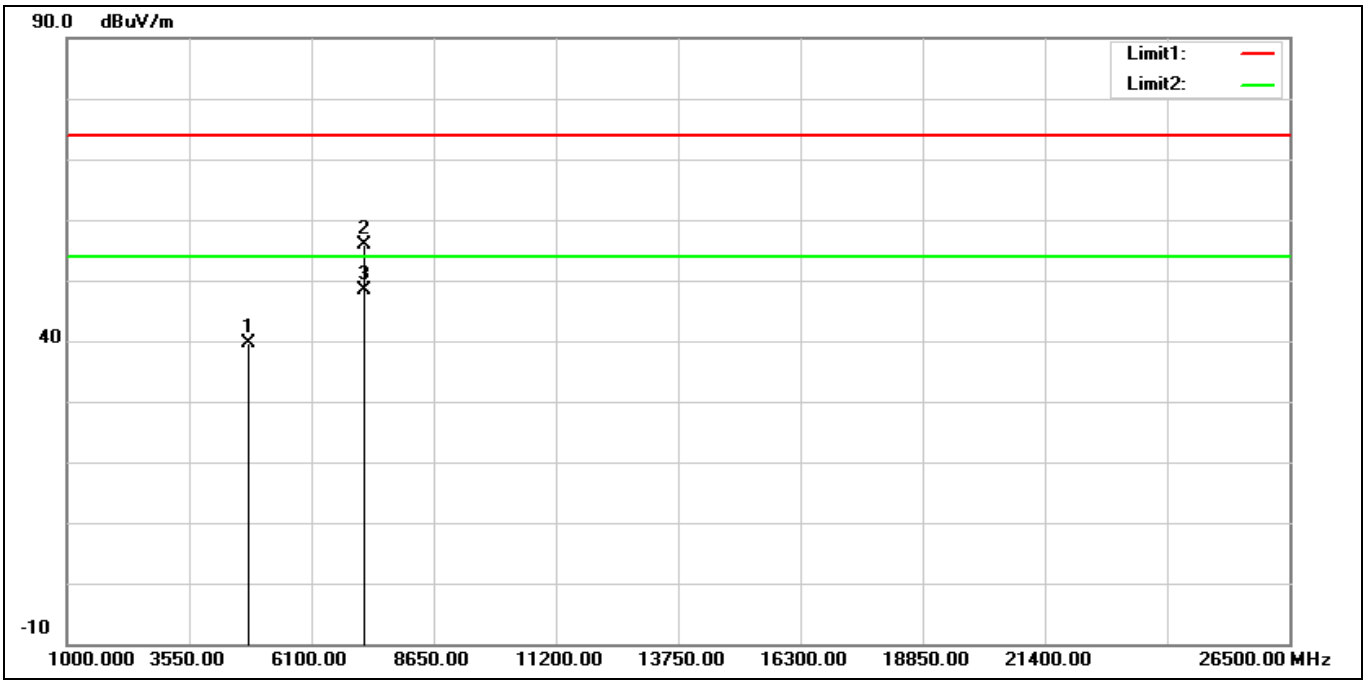
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	39.67	0.57	40.24	74.00	-33.76	peak
2	7440.000	45.63	8.34	53.97	74.00	-20.03	peak
3*	7440.000	41.02	8.34	49.36	54.00	-4.64	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 1M 2480 MHz		
Remark:			



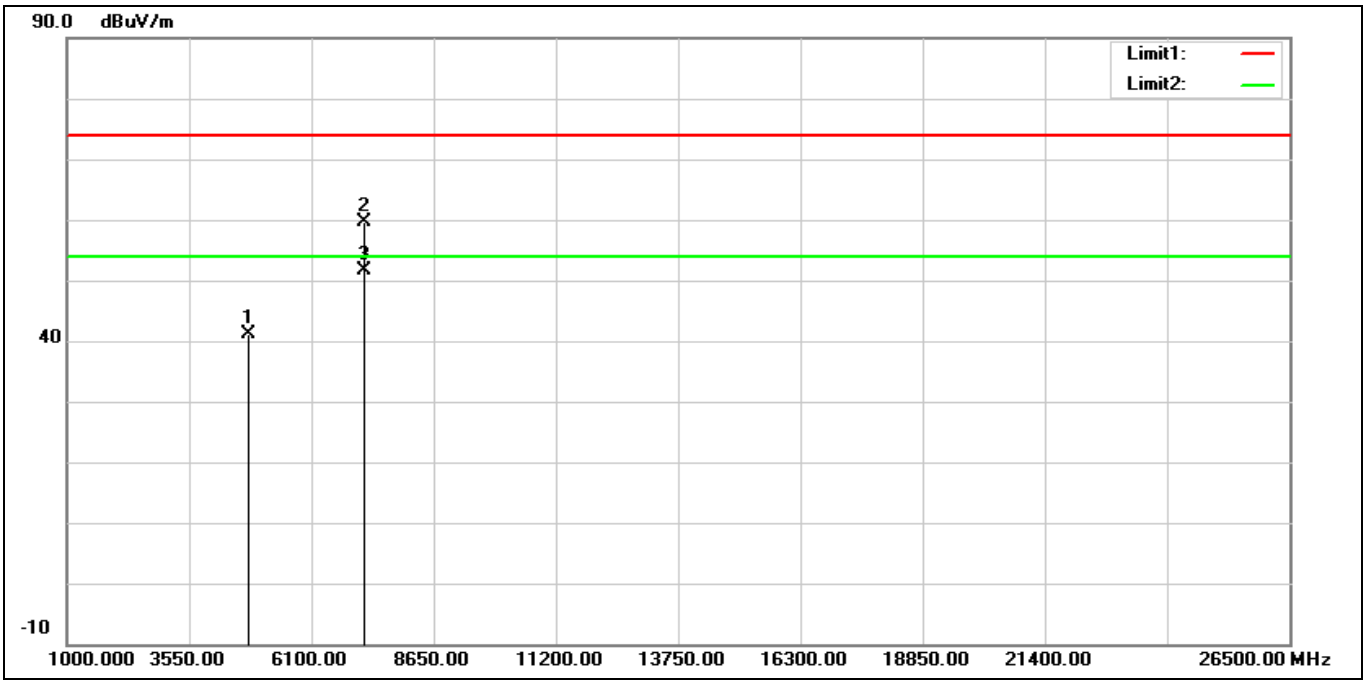
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	39.84	0.57	40.41	74.00	-33.59	peak
2	7440.000	48.90	8.34	57.24	74.00	-16.76	peak
3*	7440.000	43.63	8.34	51.97	54.00	-2.03	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 2M 2402 MHz		
Remark:			



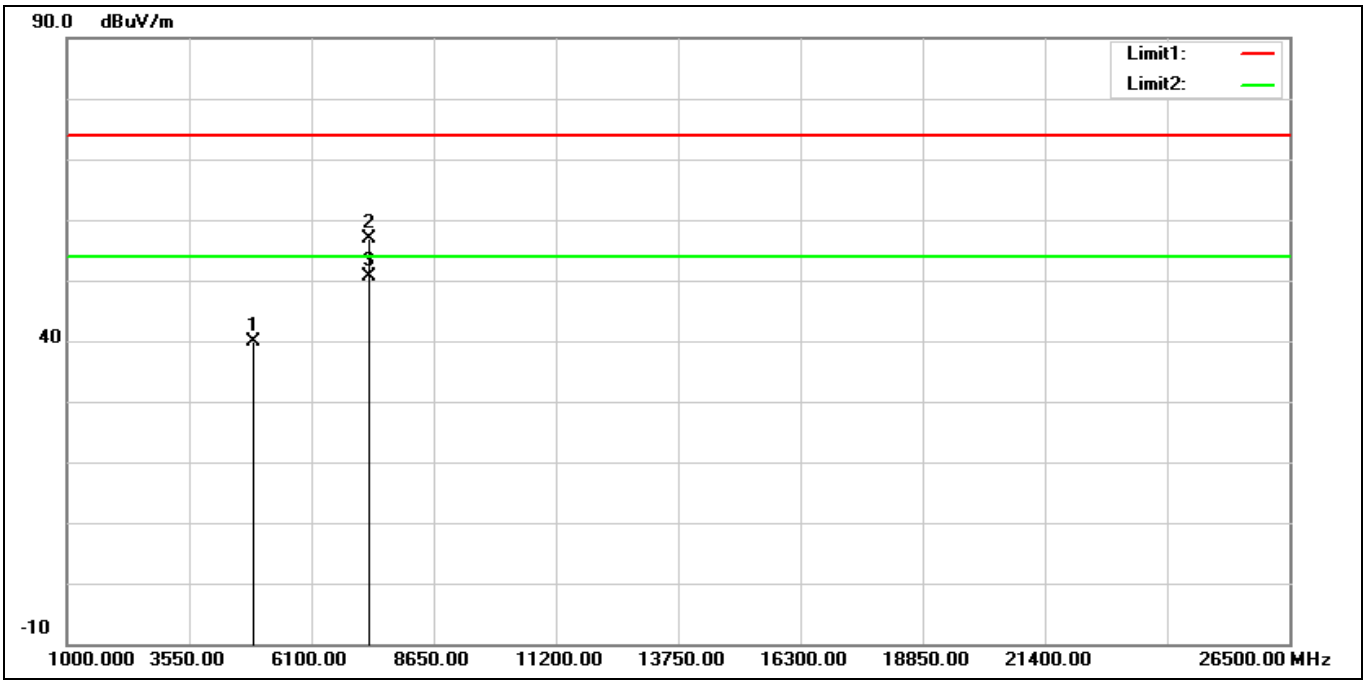
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.000	39.46	0.29	39.75	74.00	-34.25	peak
2	7206.000	48.08	7.82	55.90	74.00	-18.10	peak
3*	7206.000	40.64	7.82	48.46	54.00	-5.54	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 2M 2402 MHz		
Remark:			



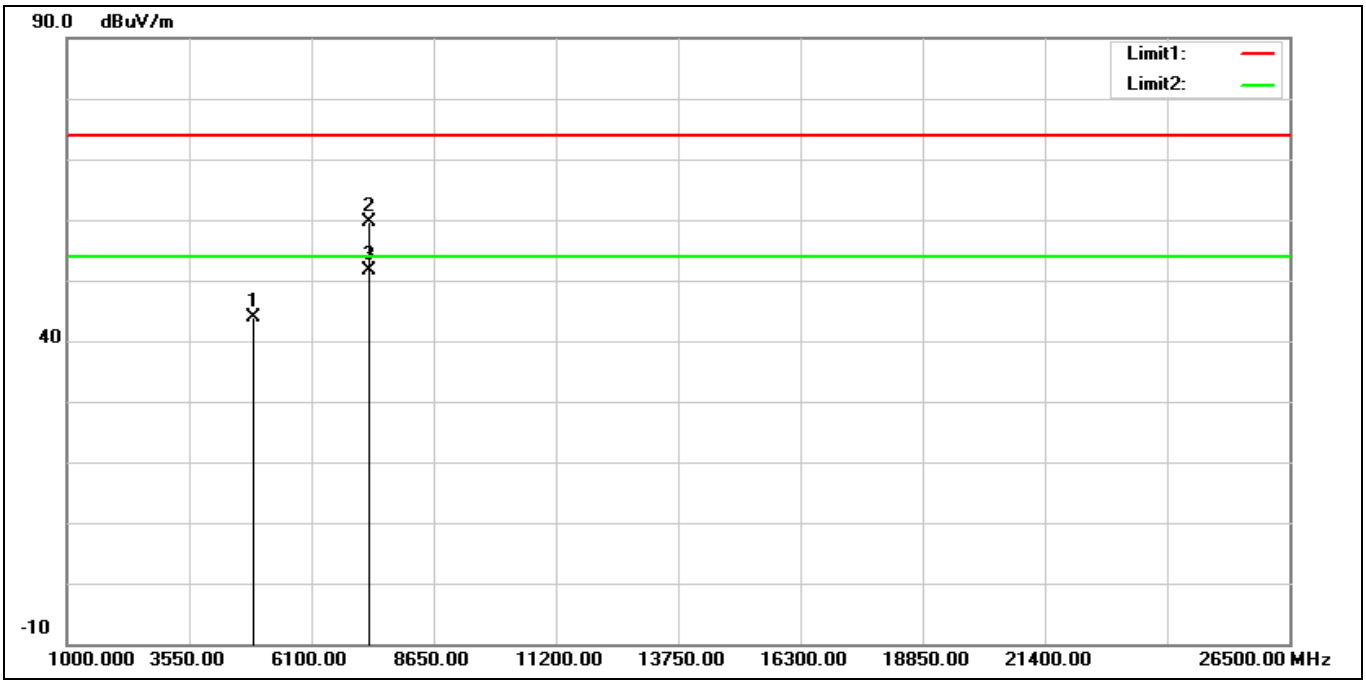
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4804.000	40.78	0.29	41.07	74.00	-32.93	peak
2	7206.000	51.74	7.82	59.56	74.00	-14.44	peak
3*	7206.000	43.84	7.82	51.66	54.00	-2.34	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 2M 2440 MHz		
Remark:			



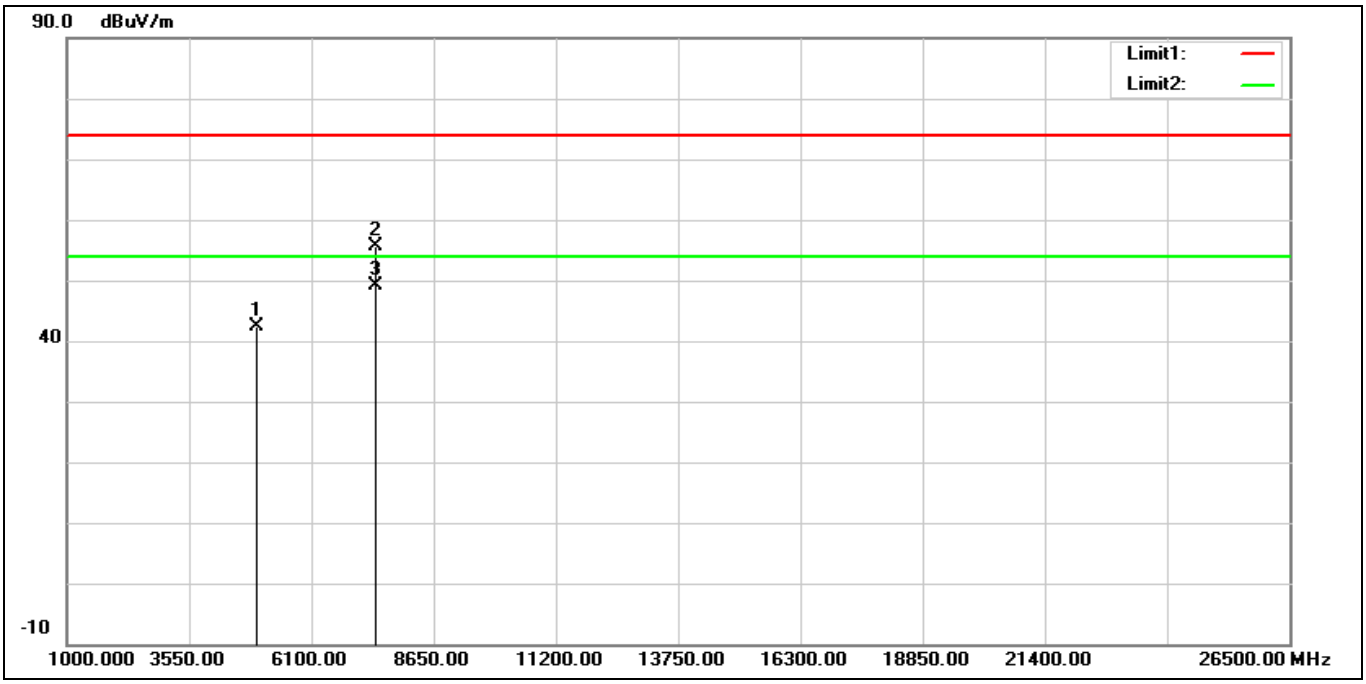
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	39.47	0.38	39.85	74.00	-34.15	peak
2	7320.000	48.96	7.99	56.95	74.00	-17.05	peak
3*	7320.000	42.57	7.99	50.56	54.00	-3.44	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 2M 2440 MHz		
Remark:			



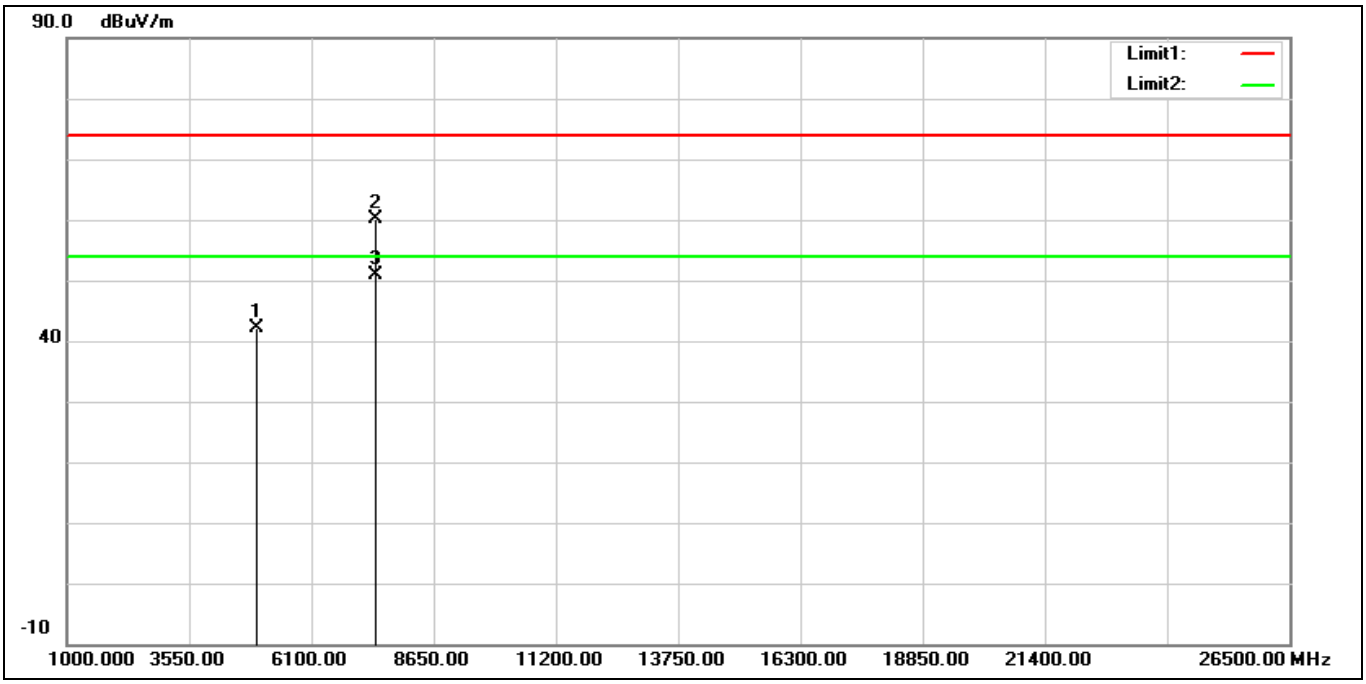
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	43.39	0.38	43.77	74.00	-30.23	peak
2	7320.000	51.63	7.99	59.62	74.00	-14.38	peak
3*	7320.000	43.69	7.99	51.68	54.00	-2.32	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 2M 2480 MHz		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	41.93	0.57	42.50	74.00	-31.50	peak
2	7440.000	47.33	8.34	55.67	74.00	-18.33	peak
3*	7440.000	40.76	8.34	49.10	54.00	-4.90	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 2M 2480 MHz		
Remark:			

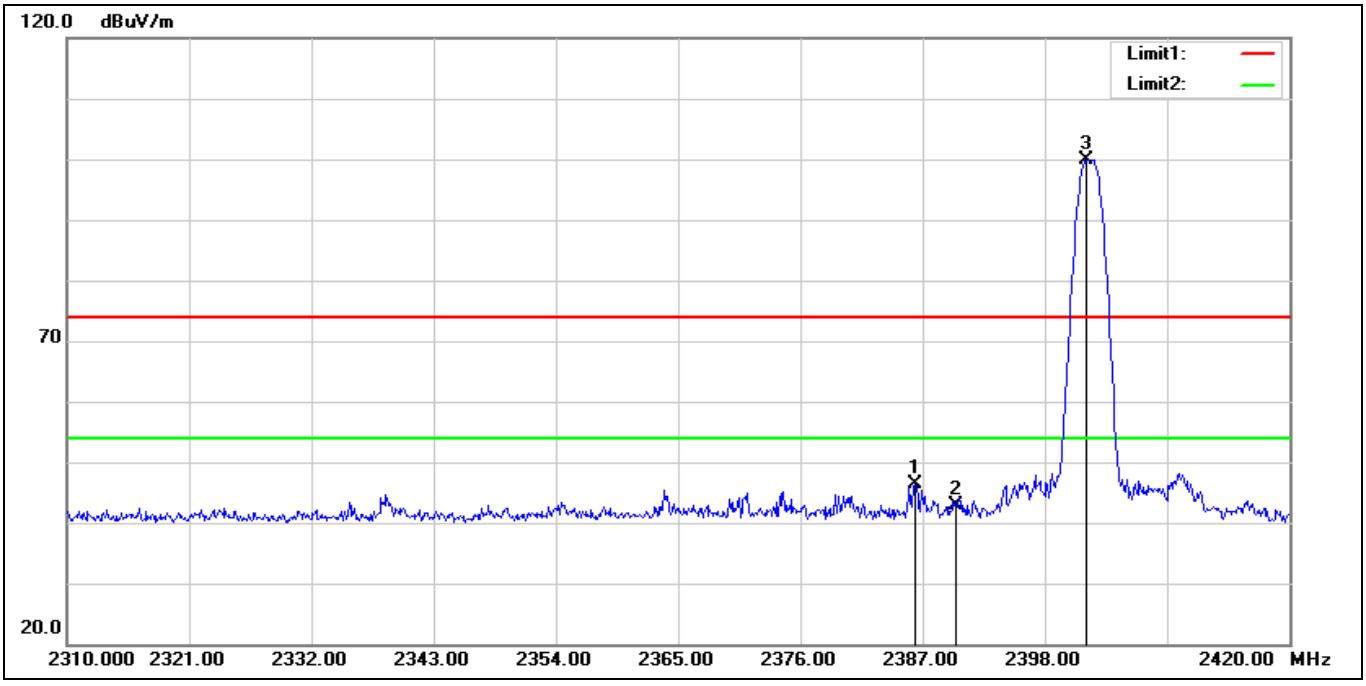


No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	41.45	0.57	42.02	74.00	-31.98	peak
2	7440.000	51.72	8.34	60.06	74.00	-13.94	peak
3*	7440.000	42.55	8.34	50.89	54.00	-3.11	AVG

Band Edge

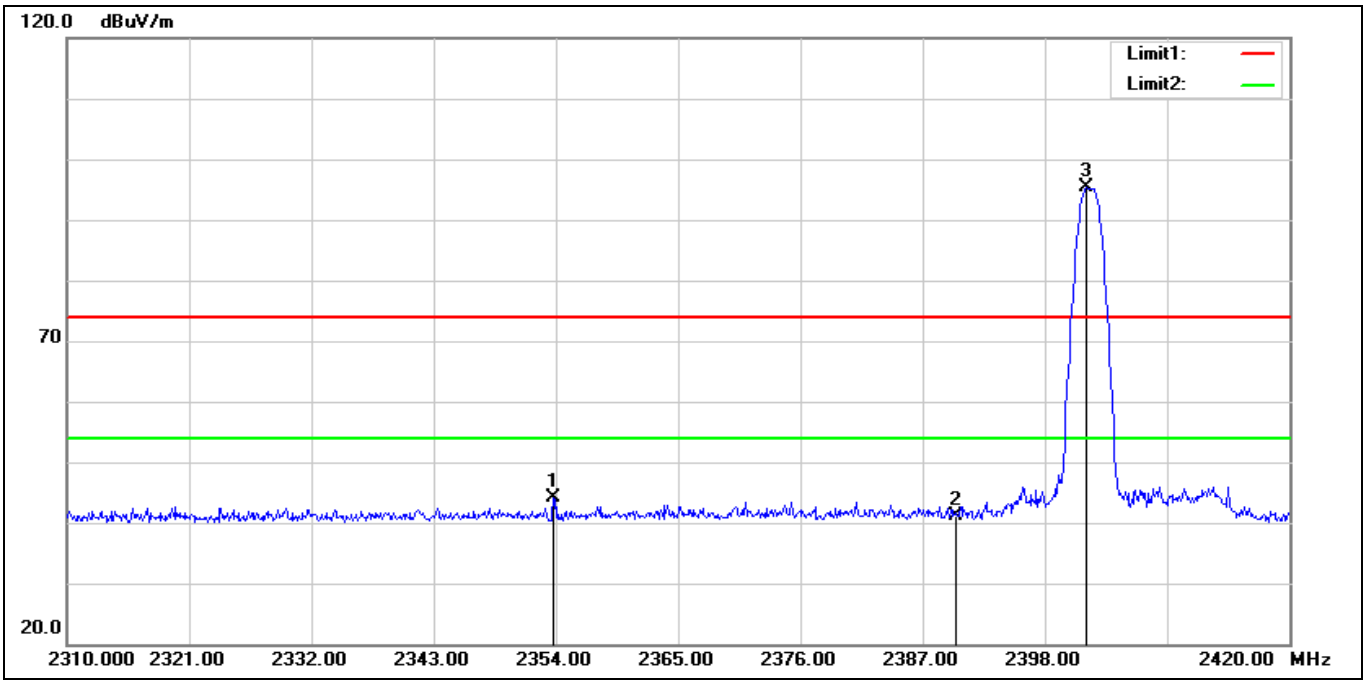
Peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 1M 2402 MHz		
Remark:			



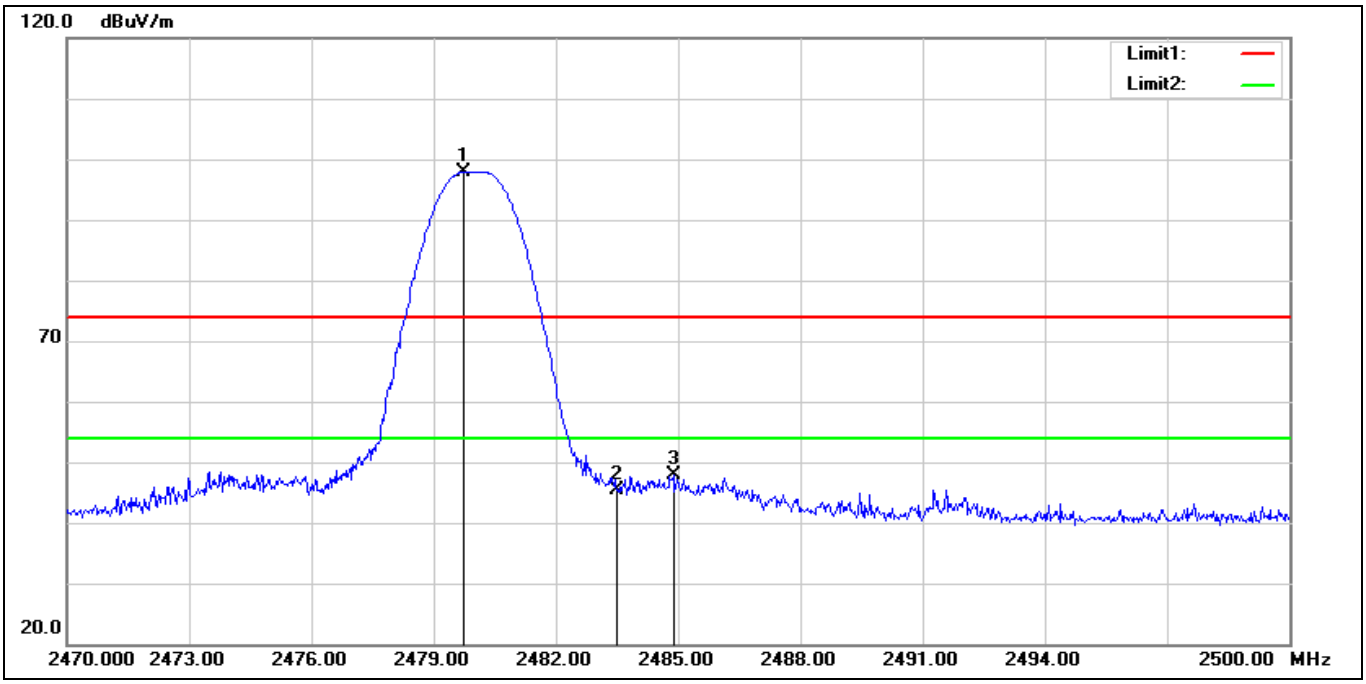
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2386.340	52.47	-6.17	46.30	74.00	-27.70	peak
2	2390.000	49.03	-6.19	42.84	74.00	-31.16	peak
3*	2401.740	106.15	-6.25	99.90	74.00	25.90	peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 1M 2402 MHz		
Remark:			



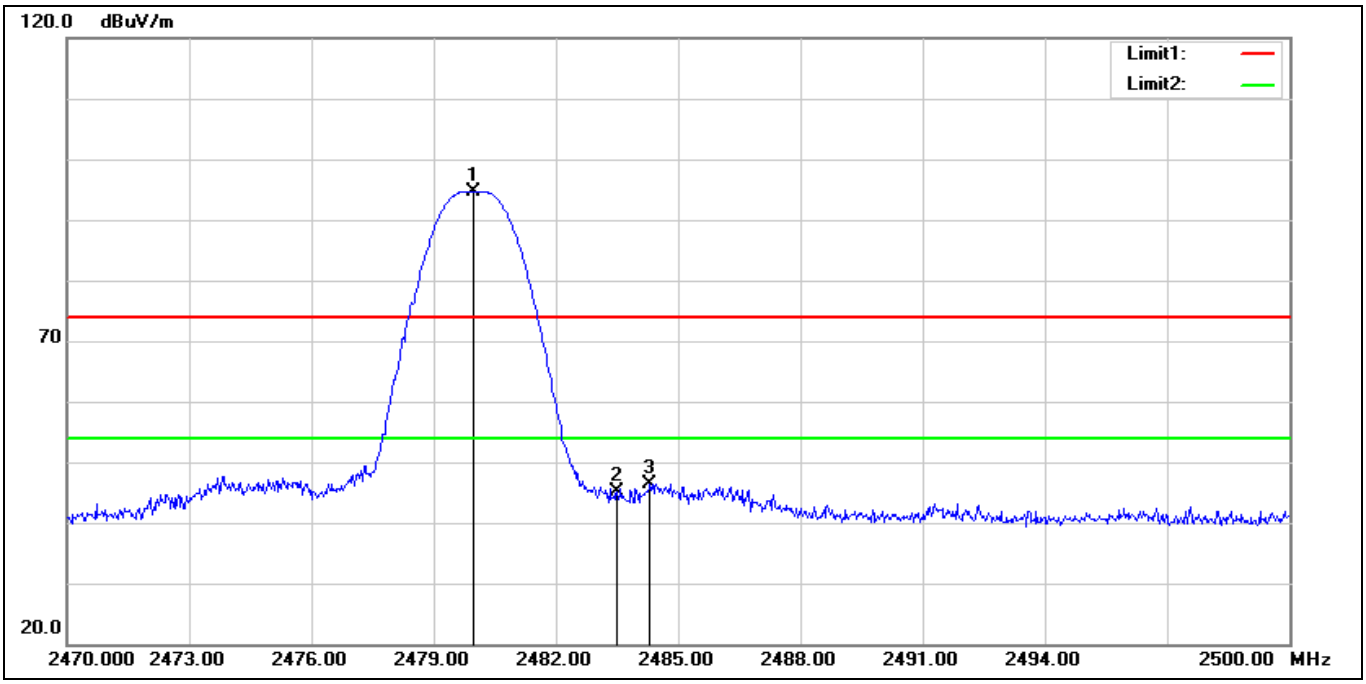
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2353.780	50.21	-6.02	44.19	74.00	-29.81	peak
2	2390.000	47.21	-6.19	41.02	74.00	-32.98	peak
3*	2401.740	101.53	-6.25	95.28	74.00	21.28	peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 1M 2480 MHz		
Remark:			



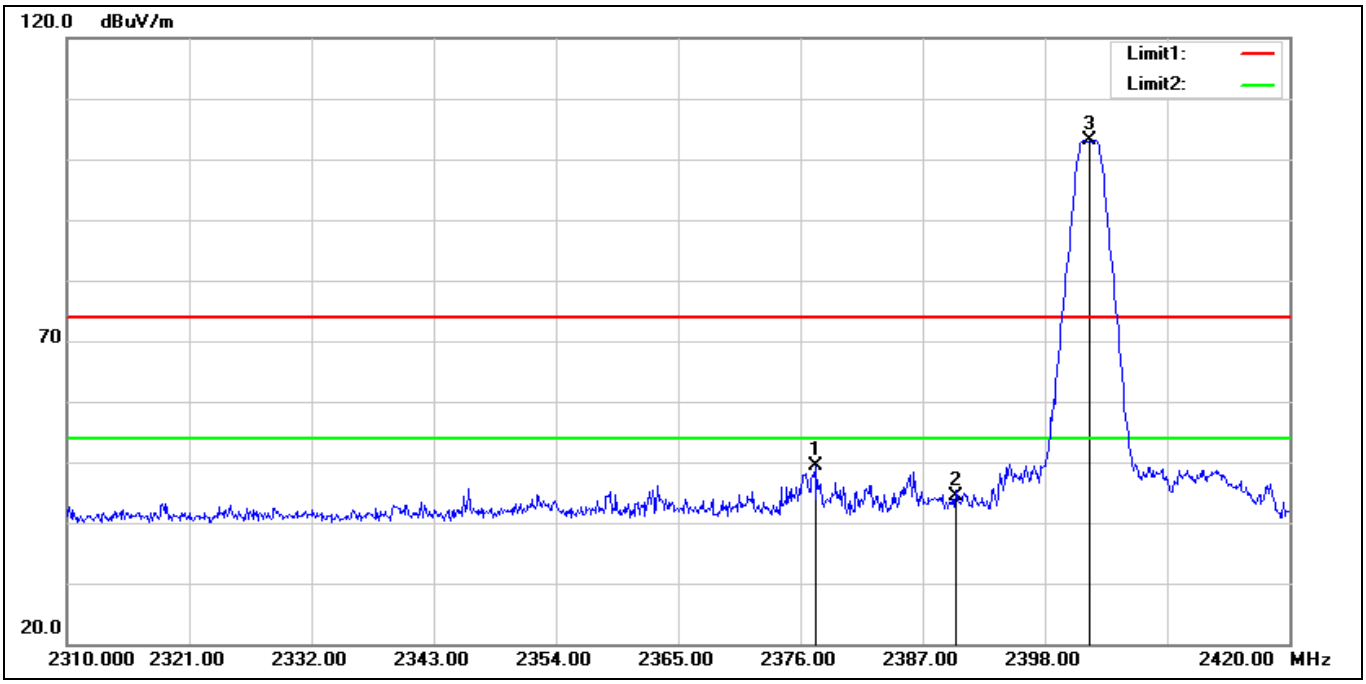
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	2479.720	104.36	-6.46	97.90	74.00	23.90	peak
2	2483.500	51.92	-6.46	45.46	74.00	-28.54	peak
3	2484.880	54.25	-6.47	47.78	74.00	-26.22	peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 1M 2480 MHz		
Remark:			



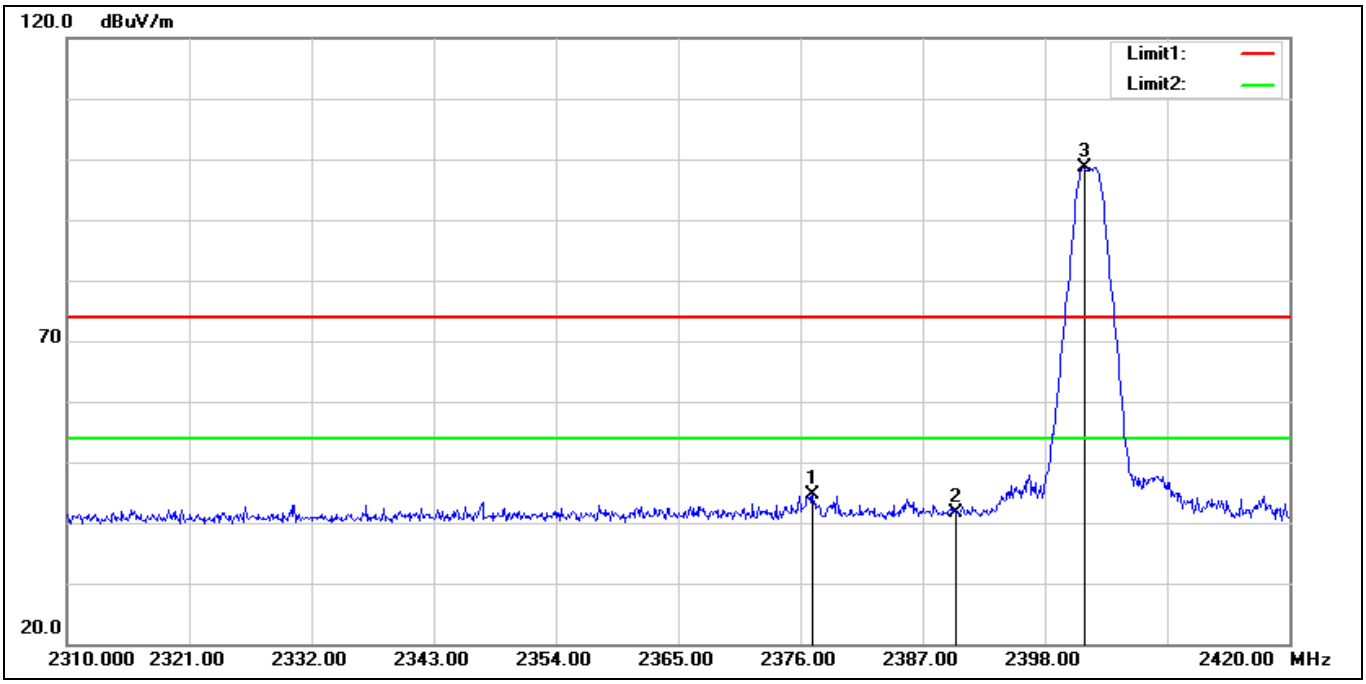
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	2479.960	101.13	-6.46	94.67	74.00	20.67	peak
2	2483.500	51.61	-6.46	45.15	74.00	-28.85	peak
3	2484.310	52.95	-6.47	46.48	74.00	-27.52	peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 2M 2402 MHz		
Remark:			



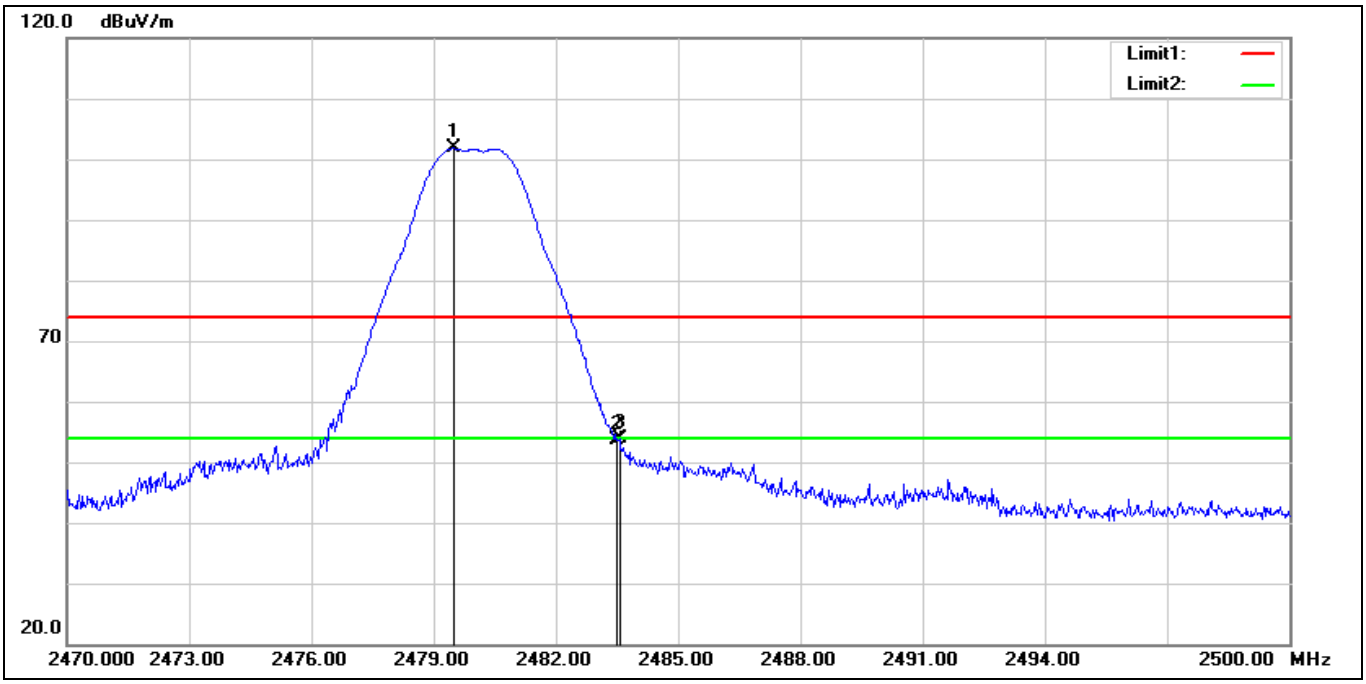
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2377.320	55.47	-6.12	49.35	74.00	-24.65	peak
2	2390.000	50.57	-6.19	44.38	74.00	-29.62	peak
3*	2401.960	109.39	-6.25	103.14	74.00	29.14	peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 2M 2402 MHz		
Remark:			



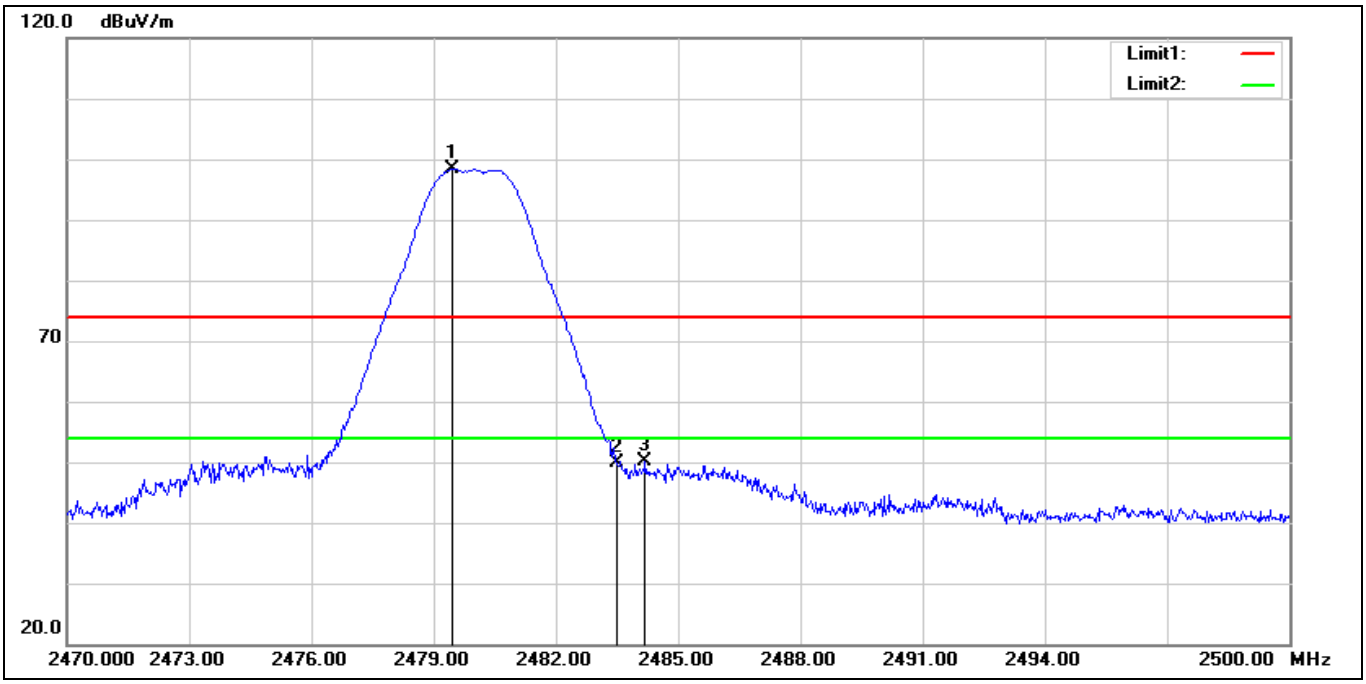
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2377.100	50.67	-6.12	44.55	74.00	-29.45	peak
2	2390.000	47.89	-6.19	41.70	74.00	-32.30	peak
3*	2401.520	104.86	-6.25	98.61	74.00	24.61	peak

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 2M 2480 MHz		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	2479.480	108.23	-6.46	101.77	74.00	27.77	peak
2	2483.500	60.08	-6.46	53.62	74.00	-20.38	peak
3	2483.560	60.24	-6.46	53.78	74.00	-20.22	peak

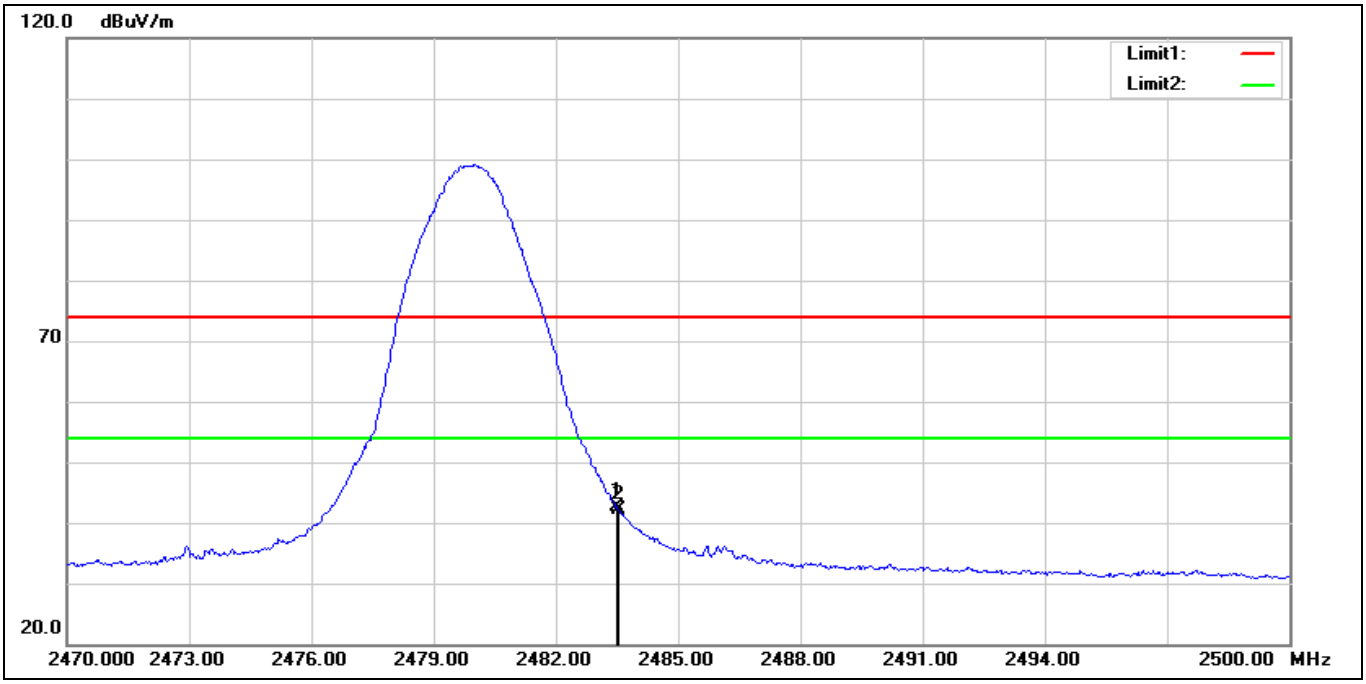
Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 2M 2480 MHz		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	2479.450	104.77	-6.46	98.31	74.00	24.31	peak
2	2483.500	56.39	-6.46	49.93	74.00	-24.07	peak
3	2484.190	56.65	-6.47	50.18	74.00	-23.82	peak

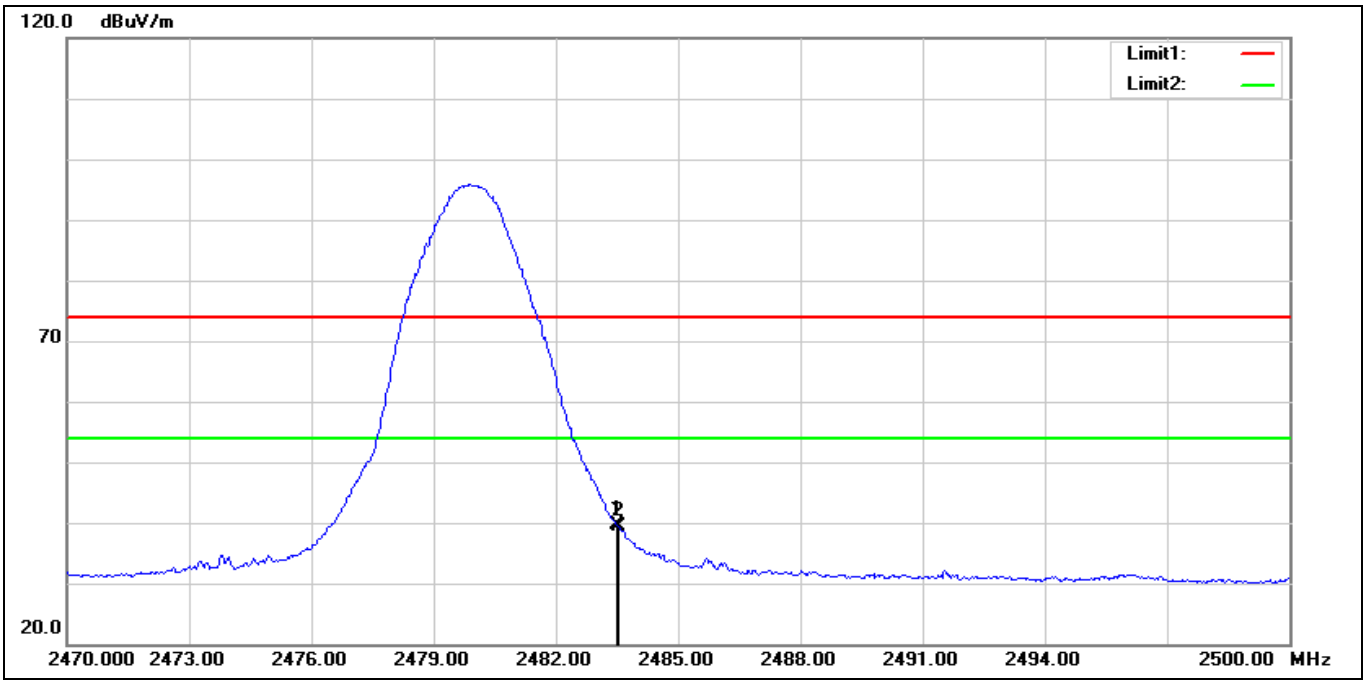
Average

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	BLE 2M 2480 MHz		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	2483.500	49.01	-6.46	42.55	54.00	-11.45	AVG
2	2483.530	48.56	-6.46	42.10	54.00	-11.90	AVG

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	BLE 2M 2480 MHz		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	2483.500	46.12	-6.46	39.66	54.00	-14.34	AVG
2	2483.530	45.89	-6.46	39.43	54.00	-14.57	AVG

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