RF Test Report

Applicant	:	AMA TECH CORP.
Product Name	:	Remote Control
Trade Name	:	AMA
Model Number	:	AMA-RF01
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Received Date	:	Dec. 23, 2022
Test Period	:	Apr. 30 ~ May 04, 2023
Issued Date	:	Jul. 18, 2023

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)
Test Firm MRA designation number: TW0010
Frequency Range: 9 kHz to 40 GHz (Wugu test site)
Test Firm MRA designation number: TW0034

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	Jul. 03, 2023	Initial Issue	Snow Wang
01	Jul. 18, 2023	Update chapter 2 (P.6) Update chapter 3.4 (P.9) Update Test Results (P.26~P.27)	Snow Wang

Verification of Compliance

Applicant	:	AMA TECH CORP.
Product Name	:	Remote Control
Trade Name	:	AMA
Model Number	:	AMA-RF01
FCC ID	:	2BBMLFN99D1050
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

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

TABLE OF CONTENTS

1 General Information

1.1. Summary of Test Result

Standard	Item	Results	Remark
15.207	AC Power Conducted Emission	N/A	This device use DC power source.
15.231(a)	Transmitter Deactivation Time	PASS	----
15.231(b)	Transmitter Radiated Emissions	PASS	----
15.231(c)	20 dB Bandwidth	PASS	----
15.203	Antenna Requirement	PASS	----
CFR 47 Part 15.231(2010) / ANSI C63.10:2013			

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

Decision Rule

■ Uncertainty is not included.

□ Uncertainty is included.

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 (dB)
Conducted Emission	150 kHz ~ 30 MHz	2.7 dB
Radiated Emission	30 MHz ~ 1000 MHz	4.9 dB
	1000 MHz ~ 18000 MHz	5.0 dB
	18000 MHz ~ 26500 MHz	4.4 dB
	26500 MHz ~ 40000 MHz	4.4 dB
RF Bandwidth	4.7 %	

2 EUT Description

Applicant	AMA TECH CORP. 1F., No. 101, Zhongcheng Rd., Tucheng Dist., New Taipei City 236658, Taiwan(R.O.C.)
Product Name	Remote Control
Trade Name	AMA
Model Number	AMA-RF01
FCC ID	2BBMLFN99D1050
Frequency Range	315 MHz
Modulation Type	ASK
Number of Channels	1 Channel
Antenna Type	PCB Antenna
Operate Temp. Range	10 ~ +45 ℃
EUT Power Rating	DC 3.0 V

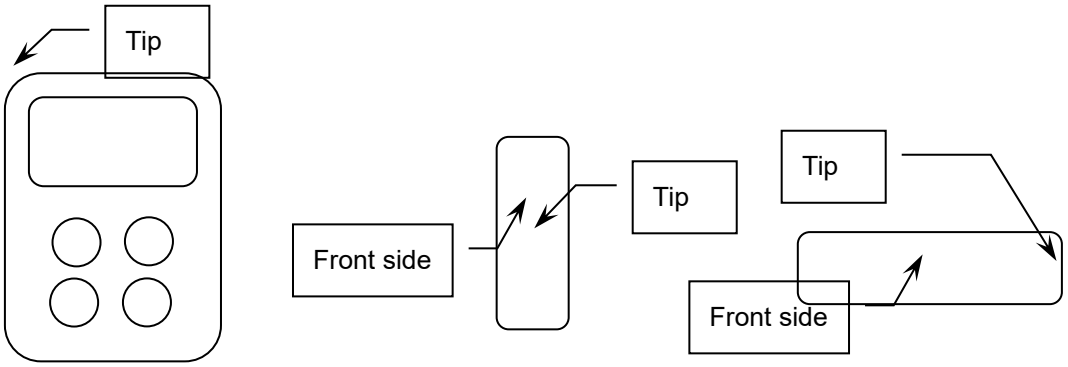
3 Test Methodology

3.1. Mode of Operation

Pre-Test Mode	Final-Test Mode
Transmit Mode	V
Continuous TX Mode	V

Then, the above highest fundamental level mode of the configuration of the EUT and antenna was chosen for all final test items.

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.

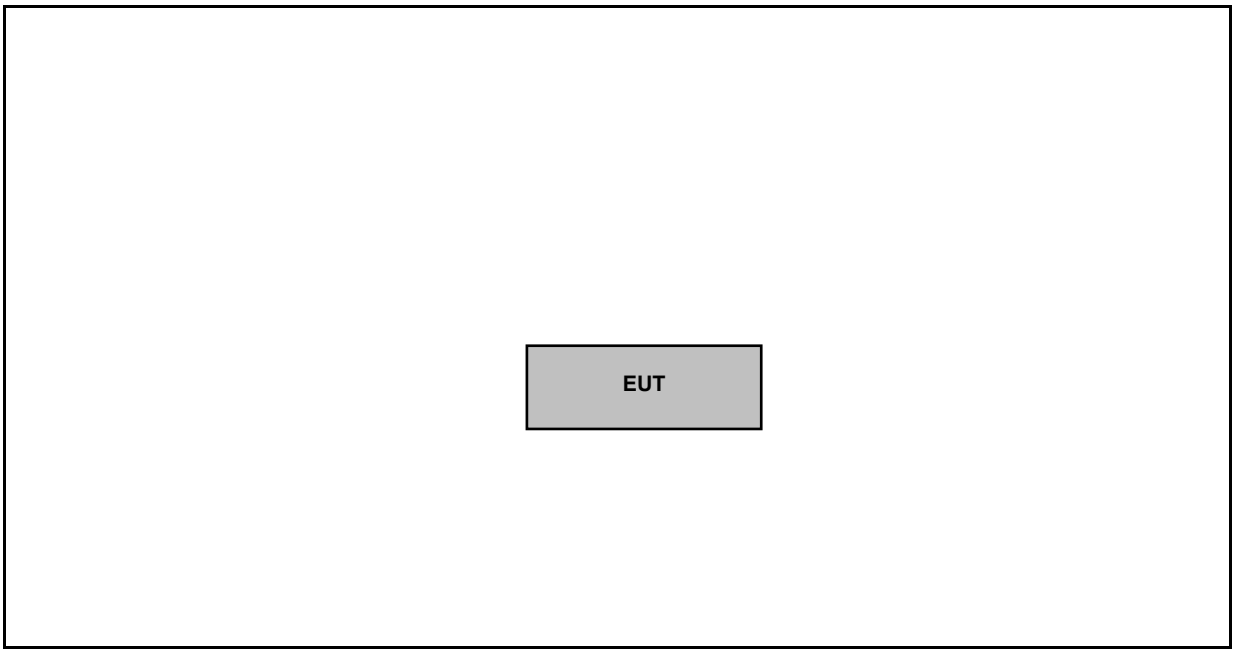


X axis mode　　Y axis mode　　Z axis mode

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.	The EUT will start to operate function.

3.3. Configuration of Test System Details



Devices Description					
Product		Manufacturer	Model Number	Serial Number	Power Cord
(1)	---	---	---	---	---

3.4. Test Instruments

For Conducted
Test Period: May 04, 2023
Testing Engineer: Brian Lin

Test Site		RF01-BD				
Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
☒	Spectrum Analyzer (10 Hz~26.5 GHz)	Keysight	N9010B	MY59071418	Mar. 20, 2023	1 year

For Radiated Emissions
Test Period: Apr. 30, 2023
Testing Engineer: Marc Yeh, ,

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	N9020B	MY60112363	Jan. 13, 2023	1 year
☒	Amplifier (100 kHz~1.3 GHz)	Agilent	8447D	2944A11119	Jan. 07, 2023	1 year
☒	Trilog Broadband Antenna (30 kHz~1 GHz)	Schwarzbeck Mess-Elektronik	VULB9168	01146	Jul. 22, 2022	1 year
☒	Loop Antenna (9 kHz~30 MHz)	COM-POWER CORPORATION	AL-130	121014	Mar. 23, 2023	1 year
☒	Coaxial Cable	Titan	T0710AT327A10A 100	J11005	Aug. 04, 2022	1 year
☒	Coaxial Cable	Titan	T0710AT327A10A 900	J11004	Aug. 04, 2022	1 year
☒	Coaxial Cable	Titan	CFD400NL-LW	001	Aug. 04, 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. Radiated Emissions Measurement

■ Limit

According to FCC Part 15.231(b) requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and harmonics emission limits

Frequency range	Average Field Strength of Fundamental	Peak Field Strength of Fundamental
(MHz)	(dBμV/m@3 m)	(dBμV/m@3 m)
315	75.62	95.62

General Radiated emission Limit

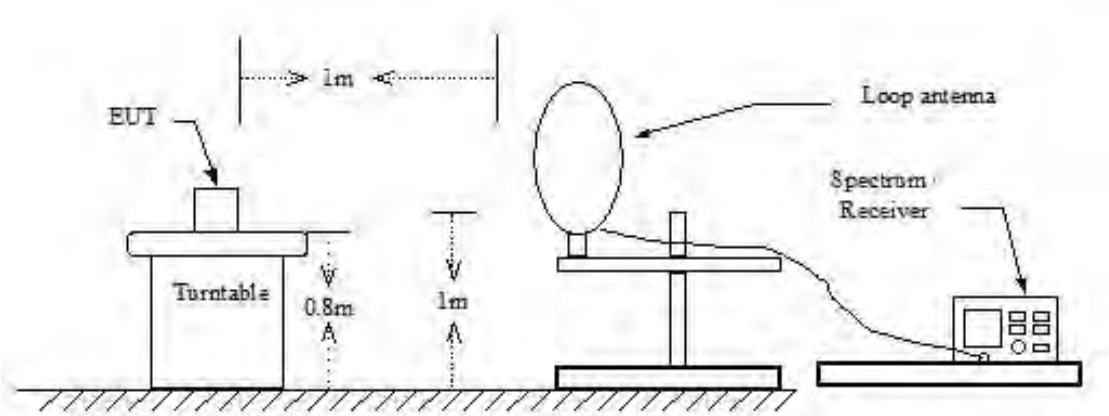
Frequency range	Field Strength of Fundamental	Field Strength of Harmonics
(MHz)	(uV/m at 3 m)	(uV/m at 3 m)
40.66 to 40.70	2250 (67.04 dBuV)	225 (47.04 dBuV)
70 to 130	1250 (61.94 dBuV)	125 (41.94 dBuV)
130 to 174	1250 (61.94 dBuV) to 3750 (71.48 dBuV)	125 (41.94 dBuV) to 375 (51.48 dBuV)
174 to 260	3750 (71.48 dBuV)	375 (51.48 dBuV)
260 to 470	3750 (71.48 dBuV) to 12500 (81.94 dBuV)	375 (51.48 dBuV) to 1250 (61.94 dBuV)
470 and above	12500 (81.94 dBuV)	1250 (61.94 dBuV)

Remark: 1. The table above tighter limit applies at the band edges.

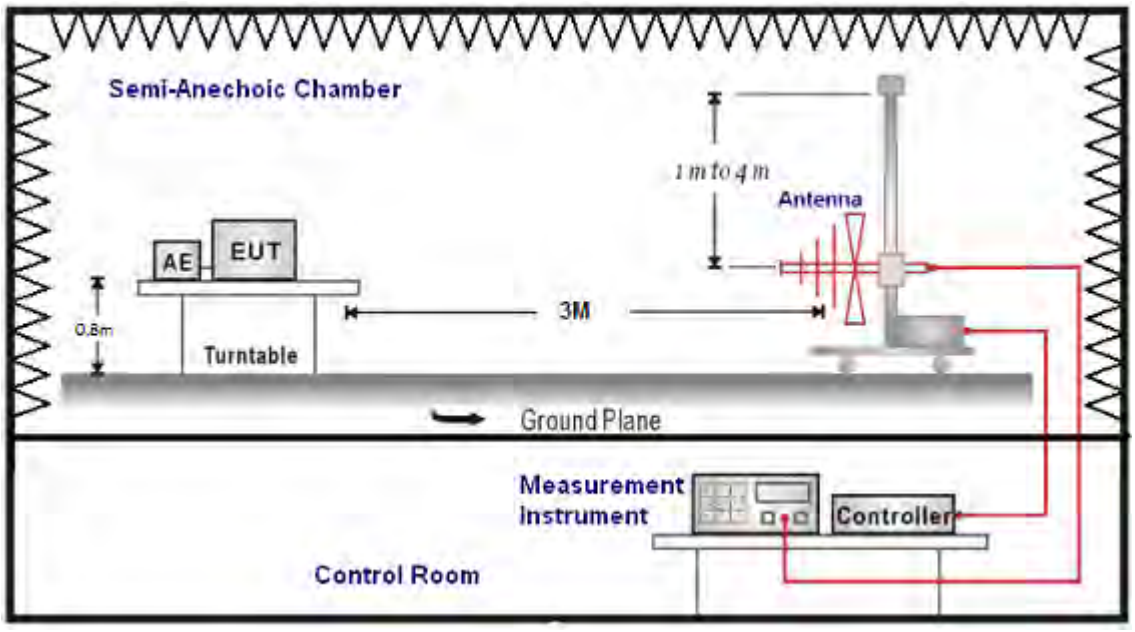
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

■ **Setup**

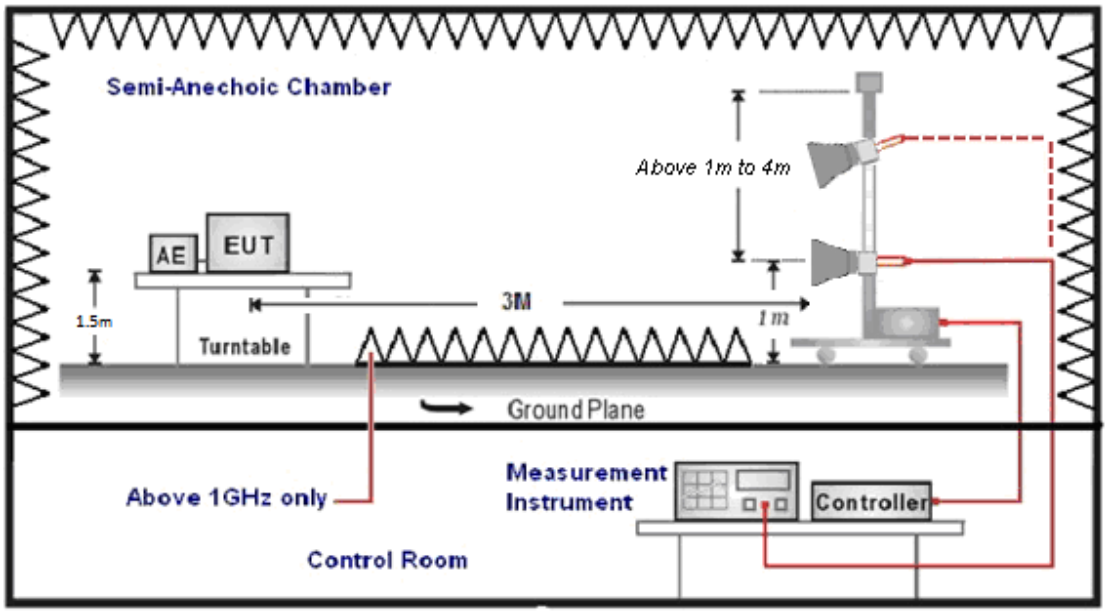
9 kHz ~ 30 MHz



Below 1 GHz



Above 1 GHz


Semi-Anechoic Chamber
Above 1m to 4m
AE
EUT
1.5m
Turntable
3M
1m
Ground Plane
Above 1GHz only
Measurement
Instrument
Controller
Control Room

■ 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 30 MHz to 26.5 GHz is investigated.
For measurements below 30 MHz the resolution bandwidth is set to 10 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements. The video bandwidth is 3 times of the resolution bandwidth.
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.
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 1 meter. 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.

■ Calculation of Average Factor

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.
Please see the diagrams below.

(*) When the field strength (or envelope power) is not constant or when it is in pulses, and an averaging detector is specified to be used, the value of field strength or power over one complete pulse train, excluding blanking intervals, shall be averaged as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

4.2. 20 dB Bandwidth Measurement

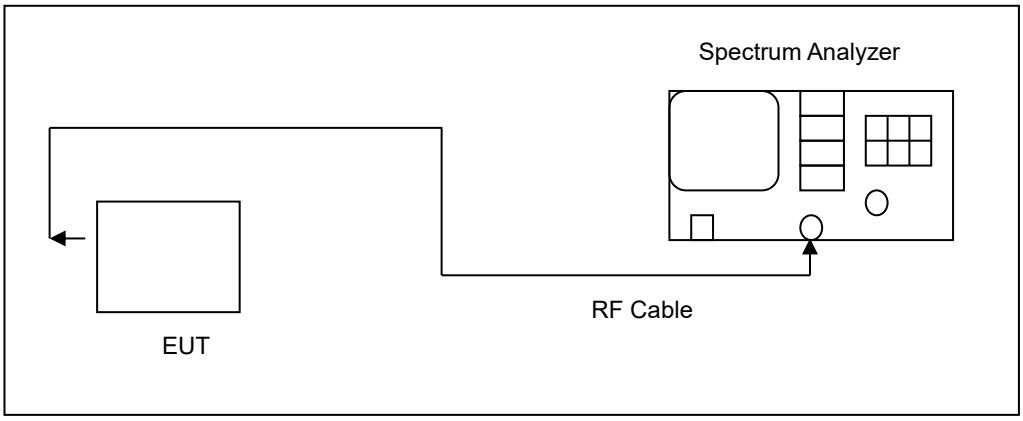
■ Limit

According to FCC Part 15.231(c) requirement:

The 20 dB

B.W Limit = 0.25 % * f (MHz) = 0.25 % * 315 MHz = 787.5 kHz

■ Test Setup



■ Test Procedure

The RF output port of the Equipment-Under-Test is directly coupled to the input of the analyzer through a specialized RF connector and a 10 dB passive attenuator. A fully charged battery was used for the supply voltage. The RF function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = 1 MHz
2. RBW ≥ 1 % of the 20 dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20 dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20 dB bandwidth of the emission.

4.3. Antenna Requirement

■ **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.

■ **Antenna Connector Construction**

See section 2 – antenna information.

5 Test Results

5.1 Conducted Test Results

20 dB Bandwidth Measurement

Test Mode	Continuous TX Mode	
Frequency (MHz)	Measurement Results (kHz)	Limited (kHz)
315.0075	3.86	787.51875

■ **Test Graphs**

Continuous TX Mode

5.2 Radiated Emissions Measurement

Duty Cycle Test Diagrams

Continuous TX Mode	
On time	
off time	

The EUT was complied with the requirement of FCC 15.231 (a) (1), which employed a switch that will automatically deactivate the transmitter within less than 5 seconds of being released.

Continuous TX Mode

Duty Cycle Results

Test Mode	Continuous TX Mode	
Item	Results	Note
Ton	68.9 ms	-----
Tp	203.2 ms	-----
Duty Cycle	0.339	-----
Averaging Factor (20 log * Duty Cycle)	-8.716	-----

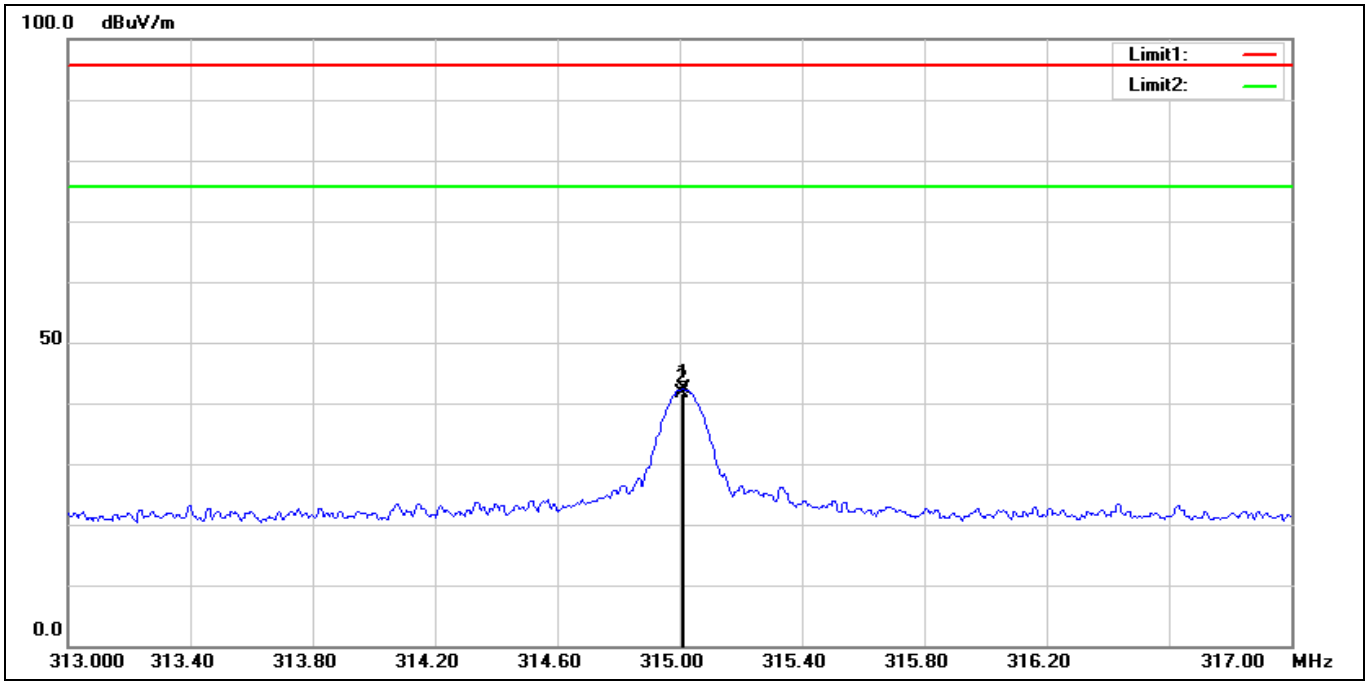
Please see the diagrams below.

Note:

1. RB=100 kHz, VB=300 kHz, SPAN=0
2. Duty Cycle= Ton/Tp

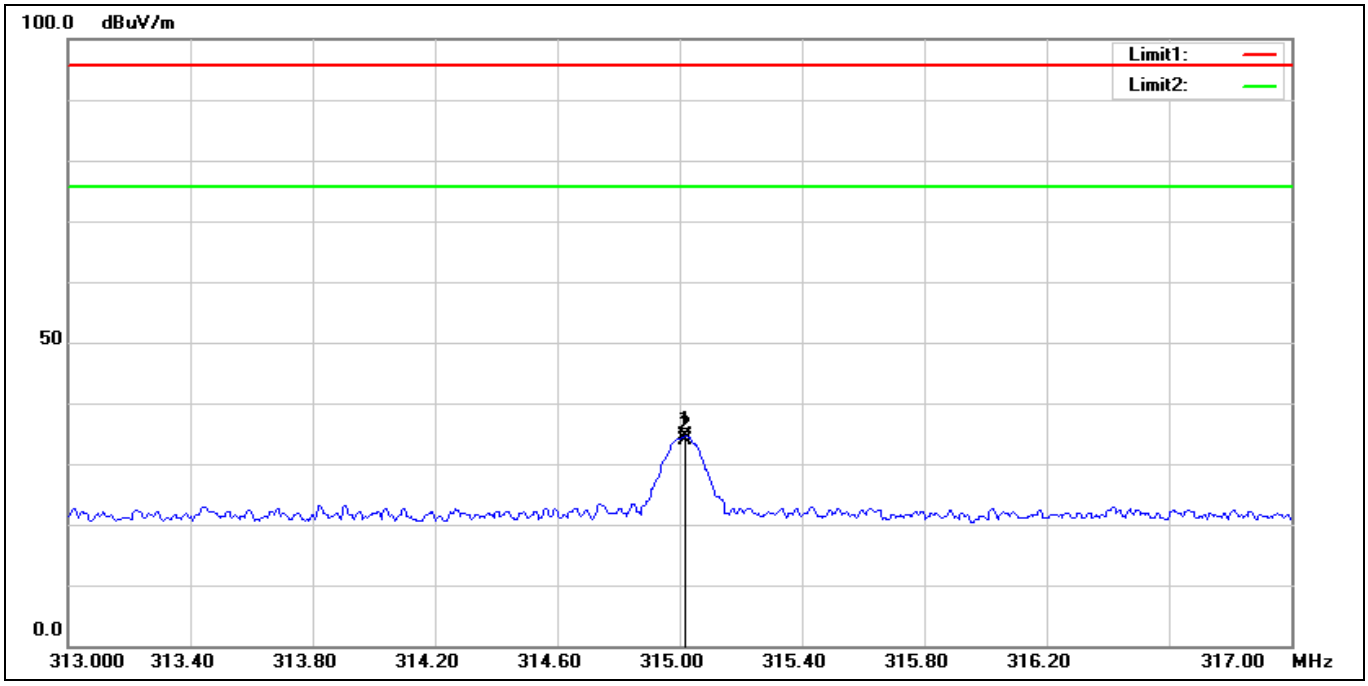
Fundamental

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	Continuous TX Mode		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	315.0120	47.75	-5.49	42.26	95.62	-53.36	peak
2*	315.0080	47.24	-5.49	41.75	75.62	-33.87	AVG

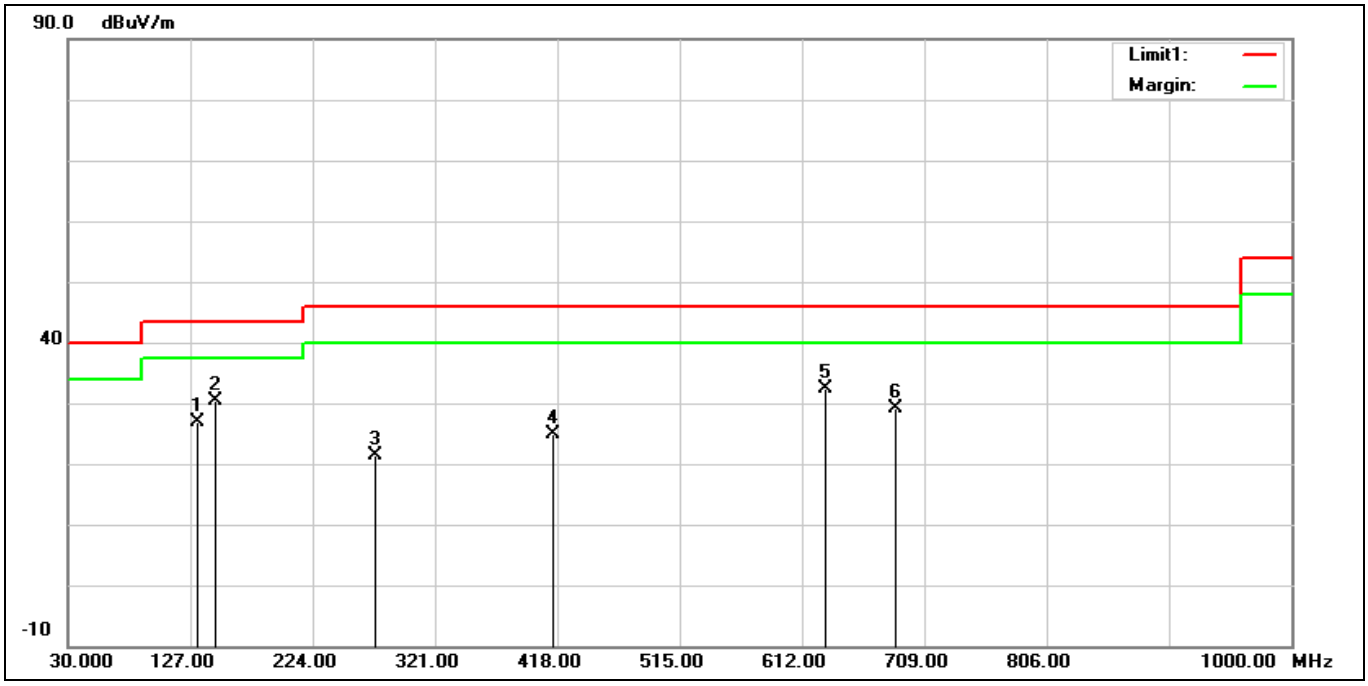
Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	Continuous TX Mode		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	315.0200	40.05	-5.49	34.56	95.62	-61.06	peak
2*	315.0200	39.26	-5.49	33.77	75.62	-41.85	AVG

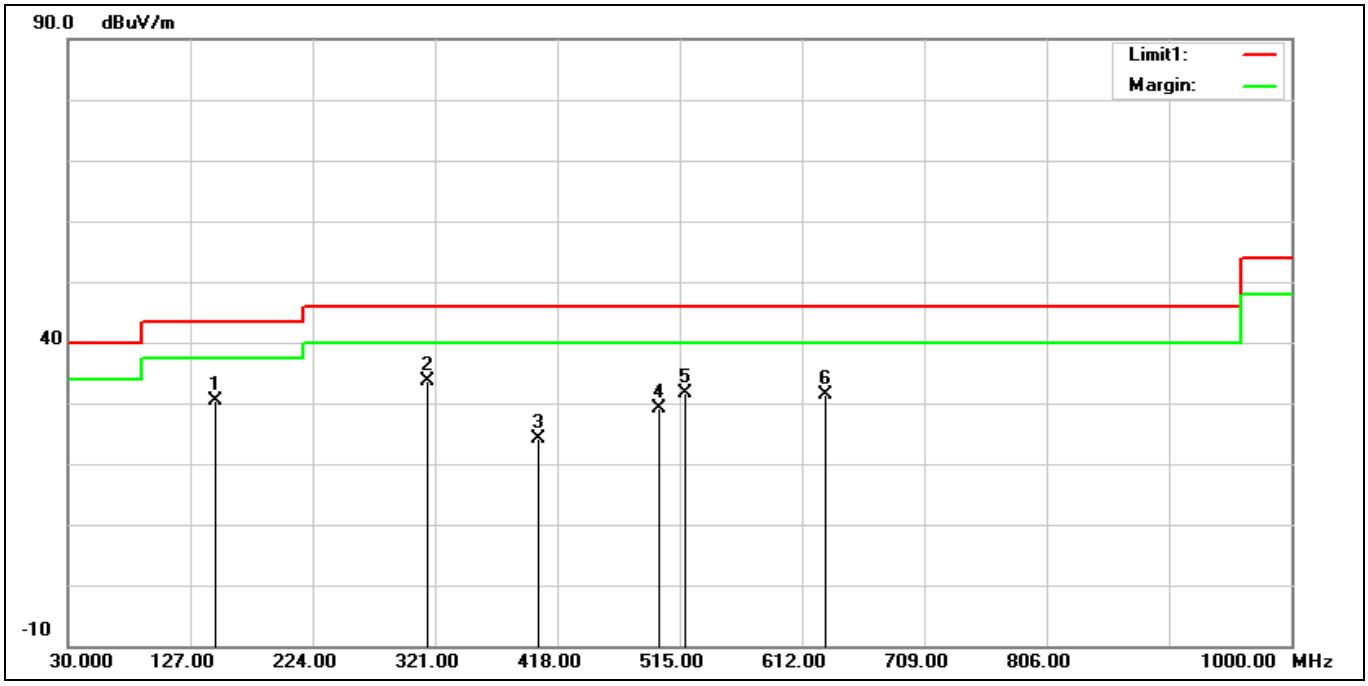
Below 1 GHz

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	Transmit Mode		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	132.8200	35.52	-8.63	26.89	43.50	-16.61	QP
2*	147.3700	37.52	-7.24	30.28	43.50	-13.22	QP
3	273.4700	27.97	-6.58	21.39	46.00	-24.61	QP
4	415.0900	28.13	-3.34	24.79	46.00	-21.21	QP
5	630.4300	32.03	0.34	32.37	46.00	-13.63	QP
6	686.6900	27.94	1.30	29.24	46.00	-16.76	QP

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	Transmit Mode		
Remark:			

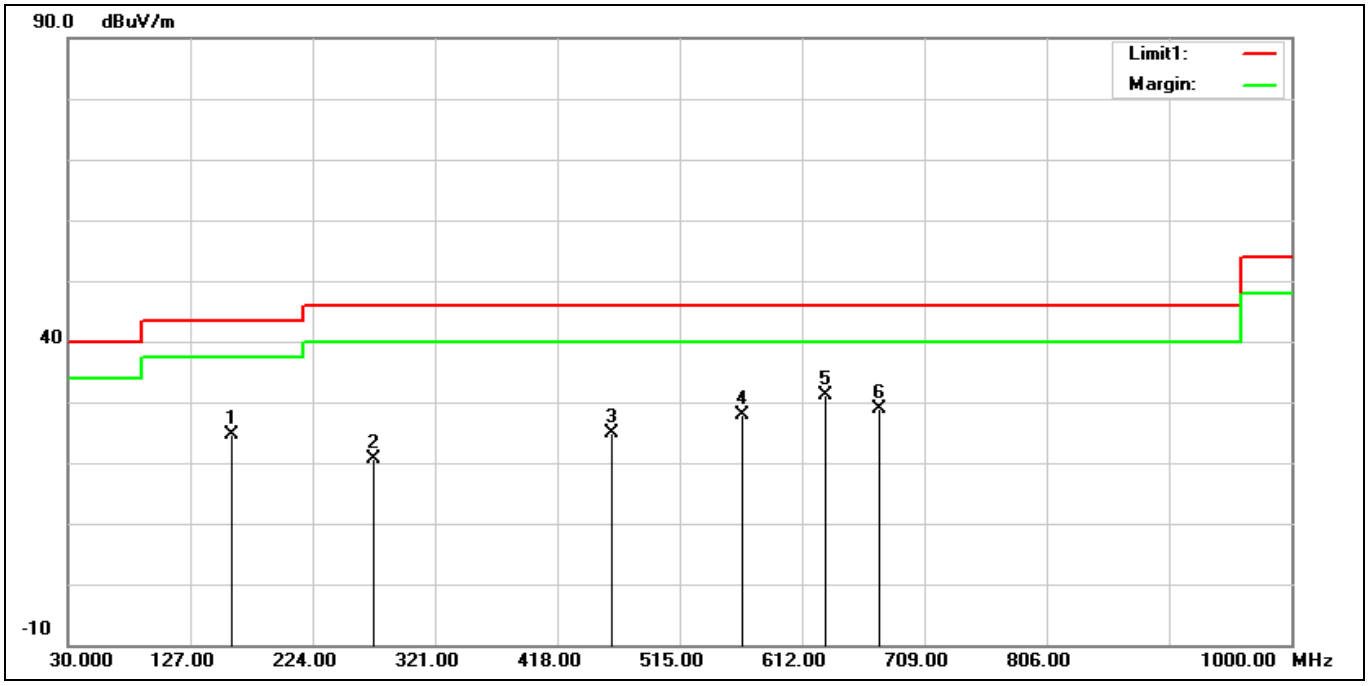


No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	147.3700	37.64	-7.24	30.40	43.50	-13.10	QP
2*	315.1800	39.17	-5.49	33.68	46.00	-12.32	QP
3	402.4800	27.82	-3.60	24.22	46.00	-21.78	QP
4	498.5100	31.11	-1.95	29.16	46.00	-16.84	QP
5	518.8800	33.26	-1.60	31.66	46.00	-14.34	QP
6	630.4300	30.93	0.34	31.27	46.00	-14.73	QP

Harmonic

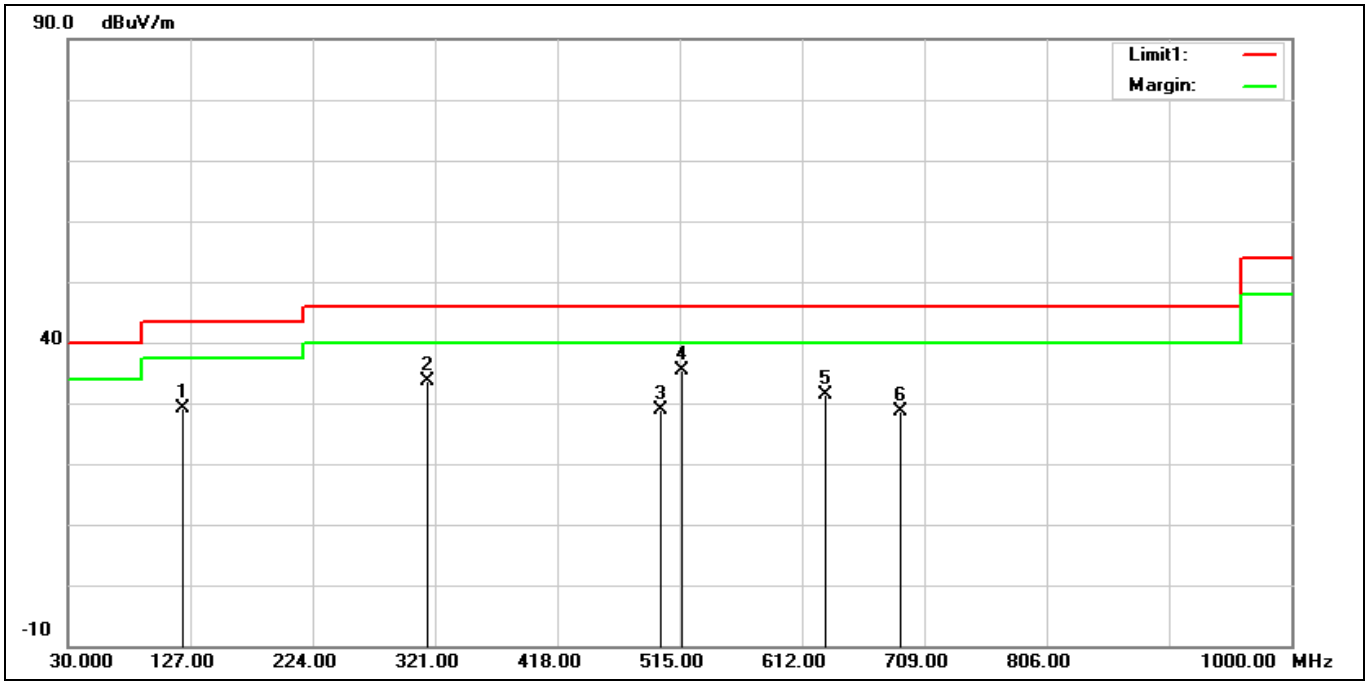
Above 1 GHz

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	Continuous TX Mode_30M-1G		
Remark:			



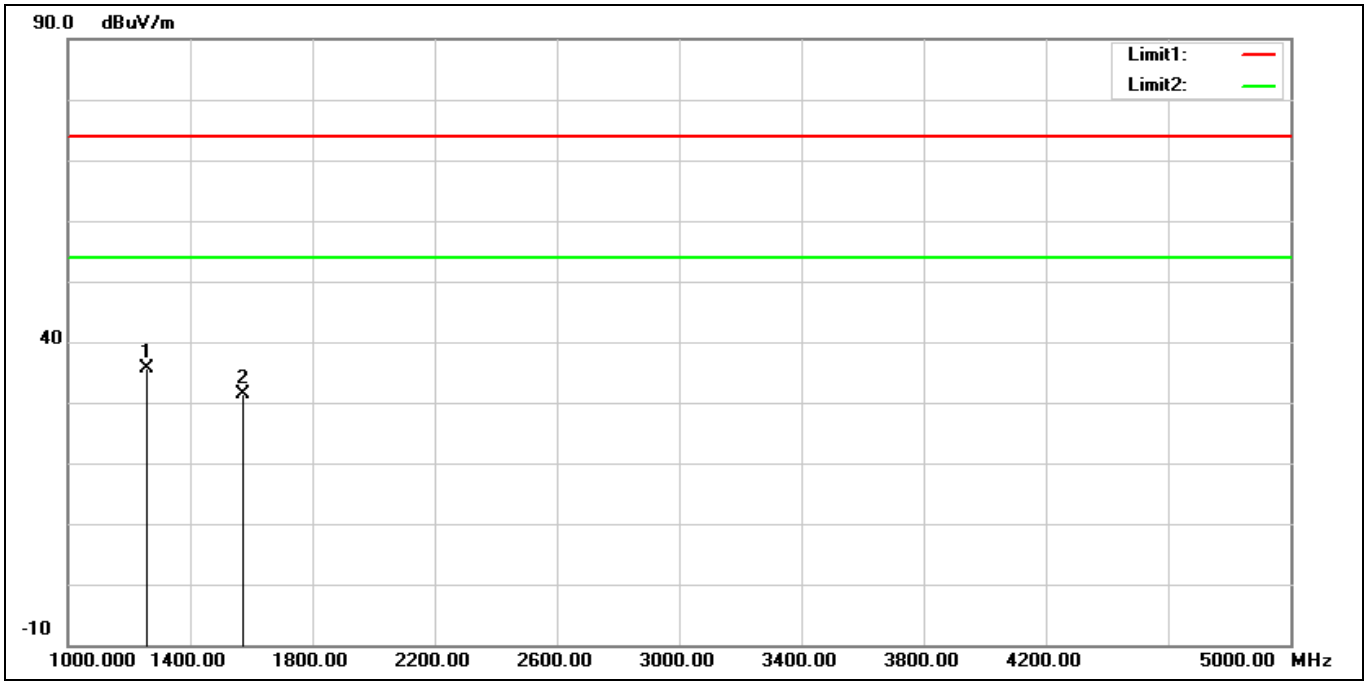
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	159.9800	31.46	-6.83	24.63	43.50	-18.87	QP
2	272.5000	27.24	-6.60	20.64	46.00	-25.36	QP
3	461.6500	27.22	-2.43	24.79	46.00	-21.21	QP
4	564.4700	28.51	-0.68	27.83	46.00	-18.17	QP
5*	630.4300	30.79	0.34	31.13	46.00	-14.87	QP
6	673.1100	27.86	0.97	28.83	46.00	-17.17	QP

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	Continuous TX Mode_30M-1G		
Remark:			



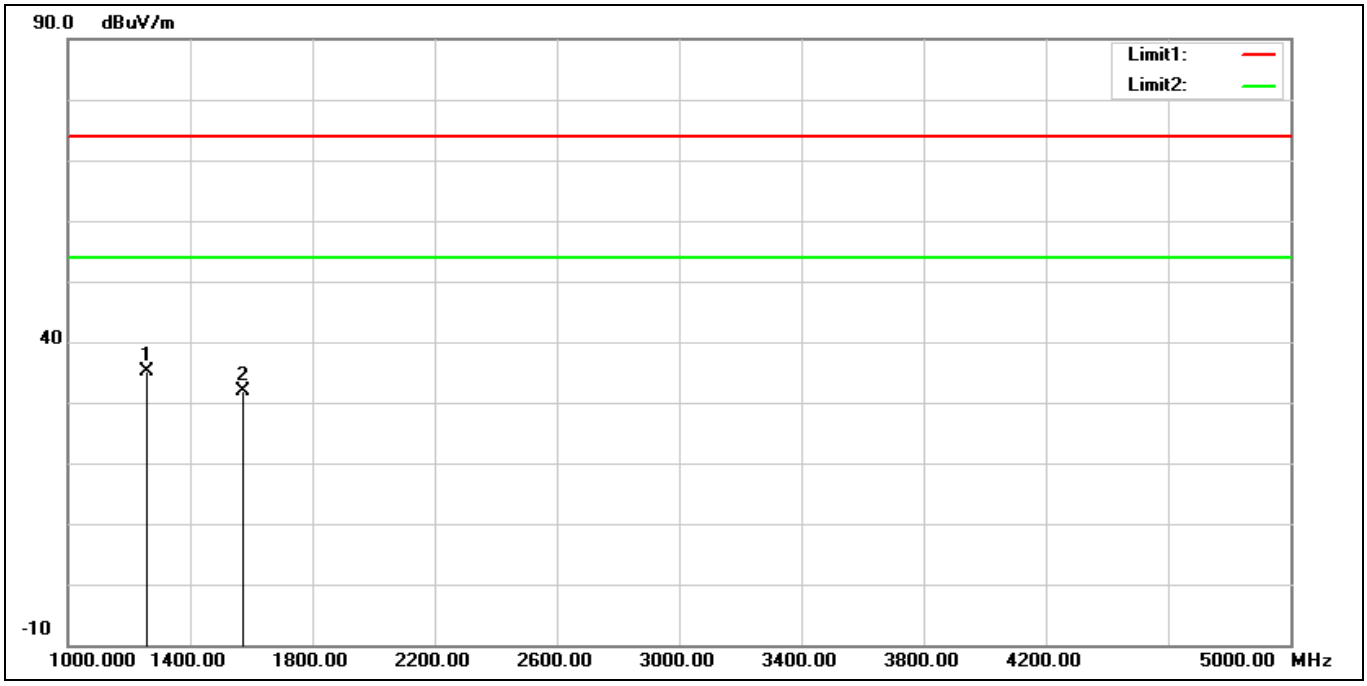
No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	121.1800	38.95	-9.77	29.18	43.50	-14.32	QP
2	315.1800	39.15	-5.49	33.66	46.00	-12.34	QP
3	499.4800	30.79	-1.95	28.84	46.00	-17.16	QP
4*	516.9400	37.11	-1.64	35.47	46.00	-10.53	QP
5	630.4300	30.92	0.34	31.26	46.00	-14.74	QP
6	689.6000	27.25	1.37	28.62	46.00	-17.38	QP

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	TX_1G-5G		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	1260.000	46.00	-10.41	35.59	74.00	-38.41	peak
2	1575.000	41.46	-10.10	31.36	74.00	-42.64	peak

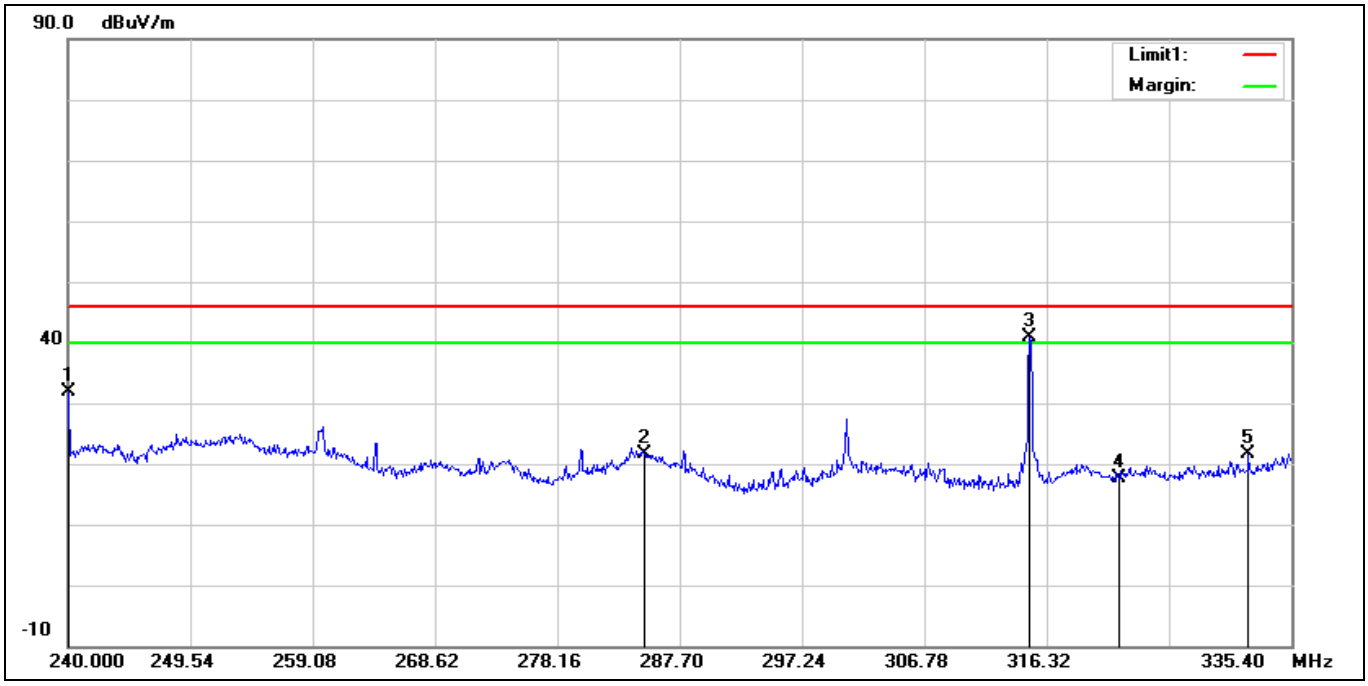
Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	TX_1G-5G		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	1260.000	45.63	-10.41	35.22	74.00	-38.78	peak
2	1575.000	42.03	-10.10	31.93	74.00	-42.07	peak

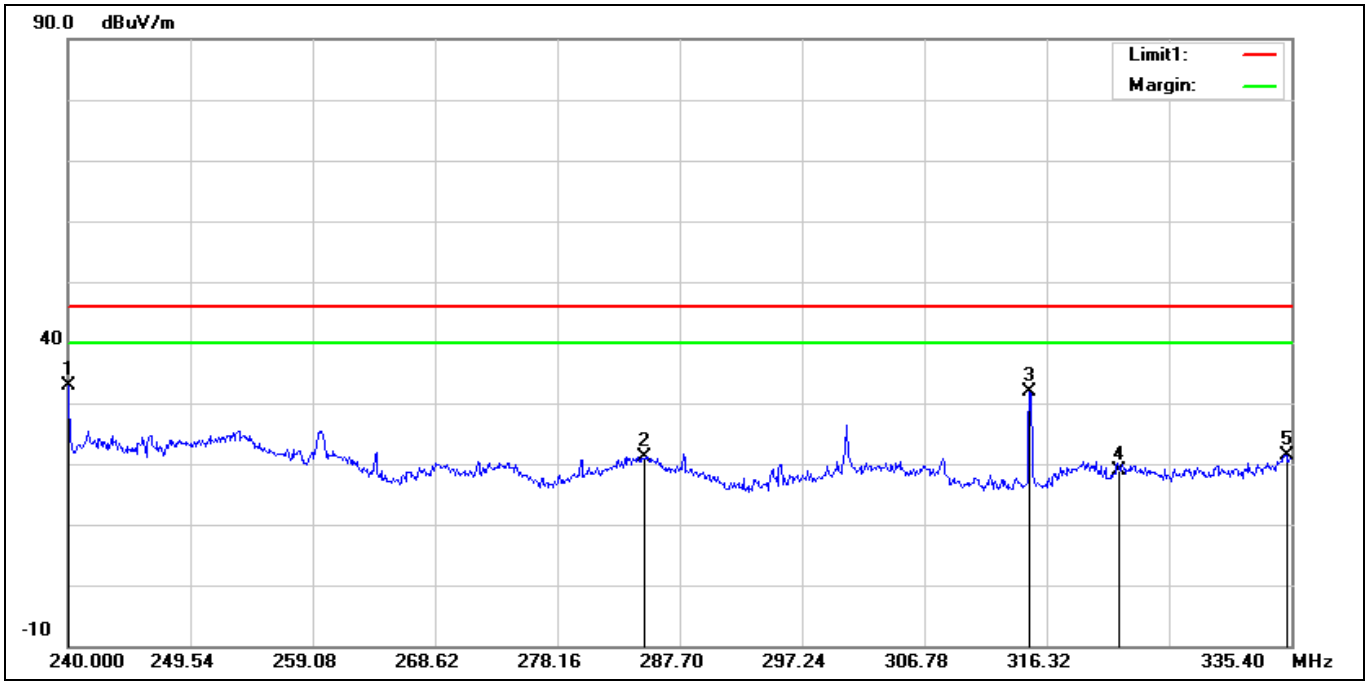
Band edge

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Horizontal		
Test Mode:	Continuous TX Mode		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	240.0000	39.58	-7.66	31.92	46.00	-14.08	QP
2	285.0000	27.75	-6.10	21.65	46.00	-24.35	QP
3*	314.9844	46.26	-5.49	40.77	46.00	-5.23	peak
4	322.0000	22.92	-5.34	17.58	46.00	-28.42	QP
5	332.0610	26.68	-5.13	21.55	46.00	-24.45	QP

Standard:	Part 15C	Test Site:	966 Chamber
Polarization:	Vertical		
Test Mode:	Continuous TX Mode		
Remark:			



No.	Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1*	240.0000	40.54	-7.66	32.88	46.00	-13.12	QP
2	285.0000	27.18	-6.10	21.08	46.00	-24.92	QP
3	314.9844	37.42	-5.49	31.93	46.00	-14.07	peak
4	322.0000	24.26	-5.34	18.92	46.00	-27.08	QP
5	335.0184	26.48	-5.06	21.42	46.00	-24.58	QP

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