MEASUREMENT REPORT

FCC PART 15.249 / RSS-210

FCC ID:	BRWRVOS010001
IC:	6157A-RVOS010001
APPLICANT:	Horizon Hobby, LLC
Application Type:	Certification
Product:	Roguewave
Model No.:	RVOS010001
Brand Name:	Revolution
FCC Classification:	Low Power Communication Device Transmitter (DXX)
FCC Rule Part(s):	Part 15.249
IC Rule(s):	RSS-210 Issue 9, RSS-GEN Issue 4
Test Procedure(s):	ANSI C63.10 - 2013
Test Date:	December 14 ~ 23, 2017

Reviewed By : Jame Yuan
(Jame Yuan)

Approved By : Marlin Chen
(Marlin Chen)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
1712RSU00402	Rev. 01	Initial report	12-23-2017	Valid

CONTENTS

Description Page

§2.1033 General Information

Applicant:	Horizon Hobby, LLC
Applicant Address:	4105 Fieldstone Rd., Champaign, IL 61822 USA
Manufacturer:	Horizon Hobby, LLC
Manufacturer Address:	4105 Fieldstone Rd., Champaign, IL 61822 USA
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	893164
IC Registration No.:	11384A
FCC Rule Part(s):	Part 15.249
IC Rule:	RSS-210 Issue 9, RSS-GEN Issue 4
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC Classification:	Low Power Communication Device Transmitter (DXX)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

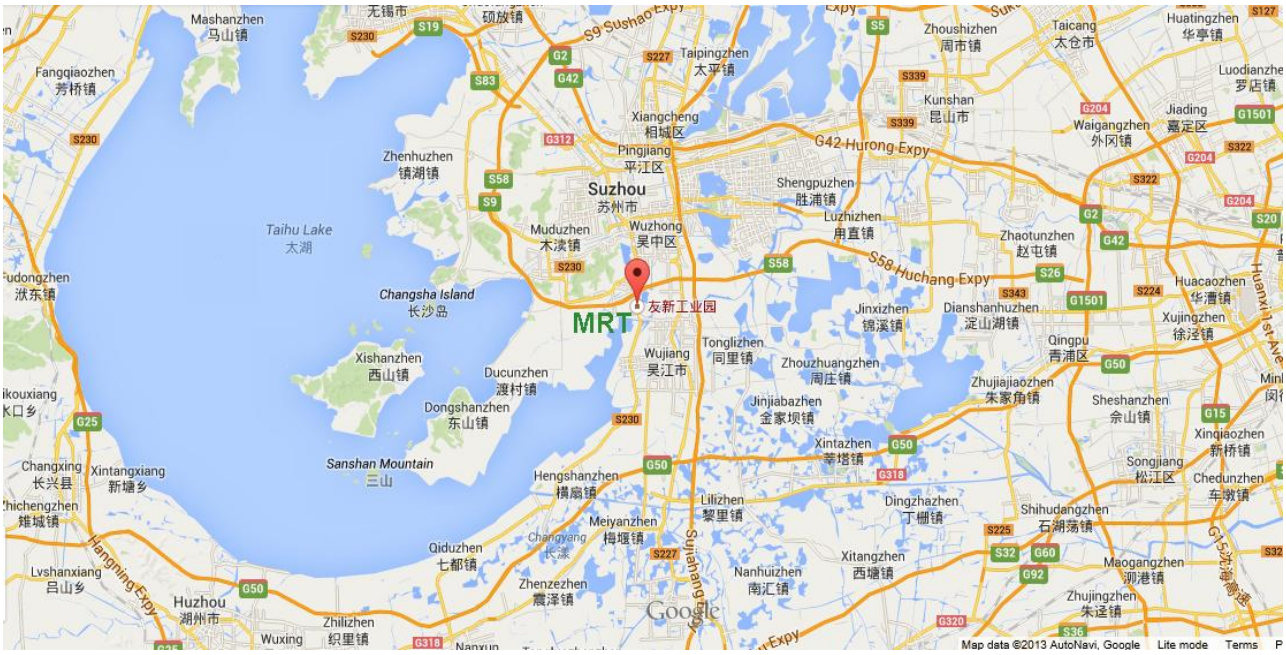
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Roguewave
Model No.	RVOS010001
Brand Name	Revolution
Frequency Range	2407 ~ 2467MHz
Type of Modulation	GFSK

2.2. Operation Frequency and Channel List

Channel	Frequency
01	2407 MHz
02	2437 MHz
03	2467 MHz

2.3. Test Configuration

The EUT was tested as described in this report is in compliance with the requirements limits of FCC Rules Part 15.207,15.209, 15.215 and 15.249. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.5. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

RSP-100 Issue 11 Section 3

The manufacturer, importer or distributor shall meet the labelling requirements set out in this section for every unit:

(i) prior to marketing in Canada, for products manufactured in Canada

(ii) prior to importation into Canada, for imported products

For information regarding the e-labelling option, see Notice 2014–DRS1003. The label for the certified product represents the manufacturer's or importer's compliance with Innovation, Science and Economic Development Canada's (ISED) regulatory requirements.

Please see attachment for IC label and label location.

2.6. Test Software

The test utility software used during testing was "RF Compliance Mode Setup", and the version was "1.0.0.0".

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the requirements provided in FCC 15.207, 15.209, 15.215 and 15.249 were performed in the report of the EUT.

Deviation from measurement procedure…….....None

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.
For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-25GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.
Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antenna of the EUT is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

This unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2018/06/20
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2018/06/20
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2018/06/20
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06181	1 year	2017/12/20
				1 year	2018/12/20
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	1 year	2018/05/10

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2018/08/03
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2018/12/10
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2018/11/21
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2018/10/22
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2018/10/21
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2018/01/04
Digitial Thermometer & Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2018/11/30
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2018/05/10
RF Cable	HUBER+SUHNER	Cable 01	MRTSUE06055-1	1 year	2018/03/29
RF Cable	HUBER+SUHNER	Cable 02	MRTSUE06055-2	1 year	2018/03/29

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2018/08/03
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06180	1 year	2017/12/20
				1 year	2018/12/20
RF Cable	HUBER+SUHNER	Cable 03	MRTSUE06055-3	1 year	2018/03/29
Attenuator	Woken	WATT-218FS-15	MRTSUE06220	1 year	2018/03/29
DC Block	Woken	00900A1A2A101A	MRTSUE06221	1 year	2018/03/29

Software	Version	Function
e3	V8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
20dB Spectrum Bandwidth - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

7. TEST RESULT

7.1. Summary

Company Name: **Horizon Hobby, LLC**

Product: **Roguewave**

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	N/A	Section 7.2
15.209 15.249	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.3 & 7.4
15.215(c)	20dB Spectrum Bandwidth	20 dB bandwidth of the emission in the specific band	Conducted	Pass	Section 7.5

RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
RSS-Gen Clause 8.8	AC Conducted Emissions 150kHz - 30MHz	< RSS-Gen Clause 8.8 limits	Line Conducted	N/A	Section 7.2
RSS-210 Clause 8.9 Annex A2.9	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in clause 8.10	Radiated	Pass	Section 7.3 & 7.4
RSS-GEN Clause 6.6	99% Occupied Bandwidth	N/A	Conducted	Pass	Section 7.6

Notes:

1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.

2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

7.2. Conducted Emission

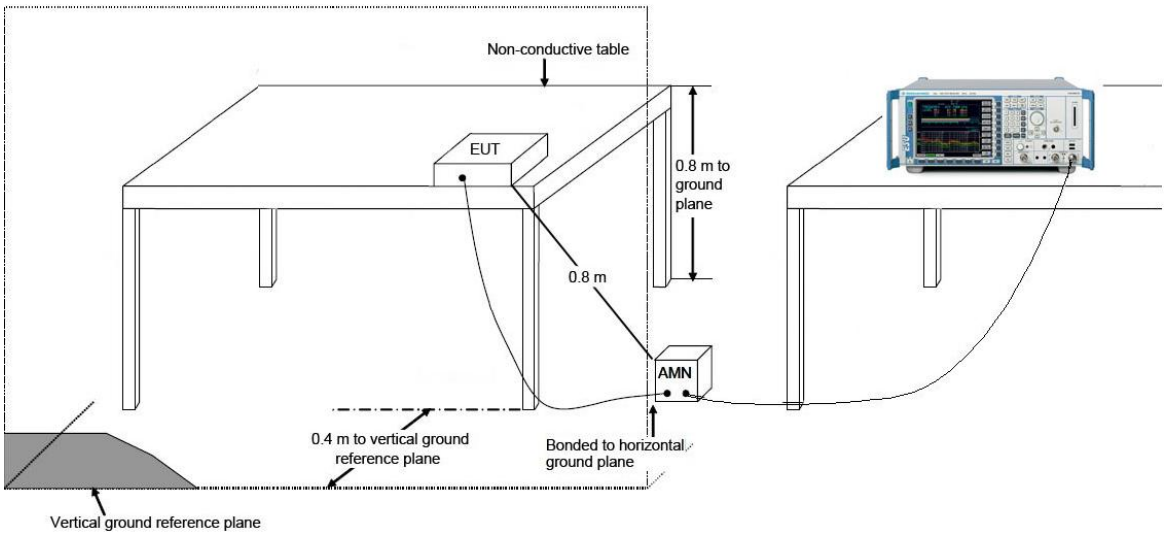
7.2.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

7.2.2. Test Setup



7.2.3. Test Result

The EUT is powered by battery, so this requirement does not apply.

7.3. Radiated Emission

7.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (uV/m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-80	100**	3
80-216	150**	3
216-960	200**	3
Above 960	500	3

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

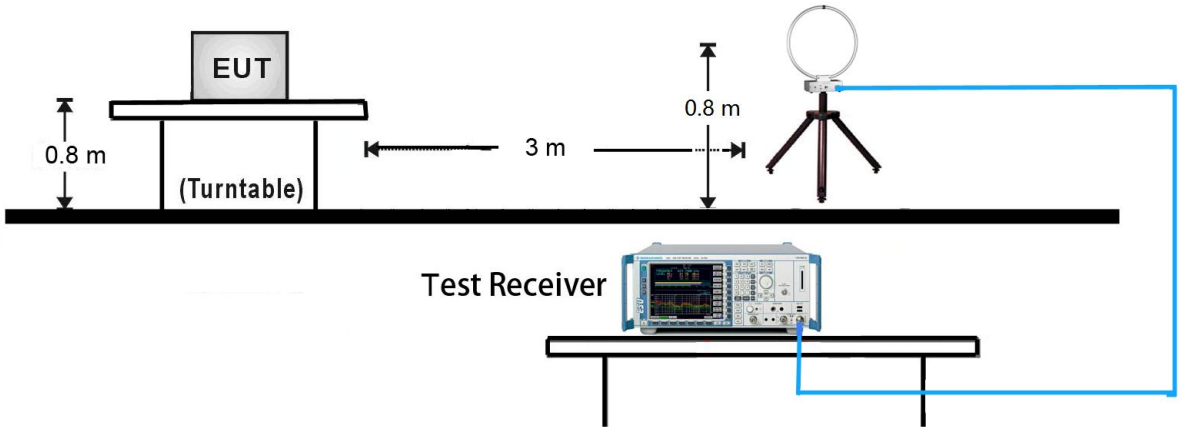
Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m).

FCC Part 15 Subpart C Paragraph 15.249		
Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928(MHz)	50	500
2400-2483.5(MHz)	50	500
5725-5875(MHz)	50	500
24.0-24.25(GHz)	250	2500

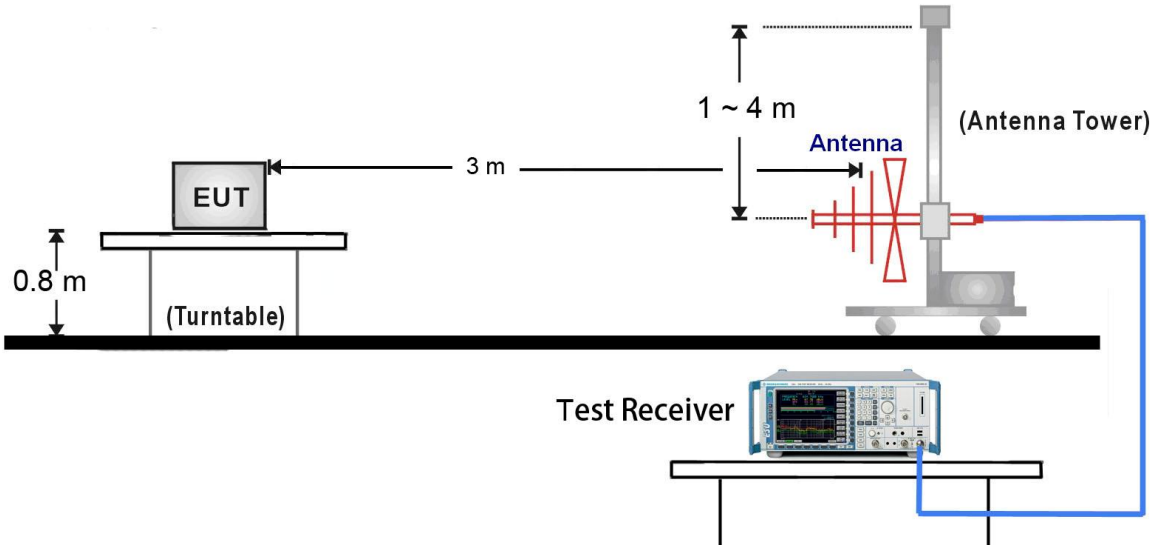
FCC Part 15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

7.3.2. Test Setup

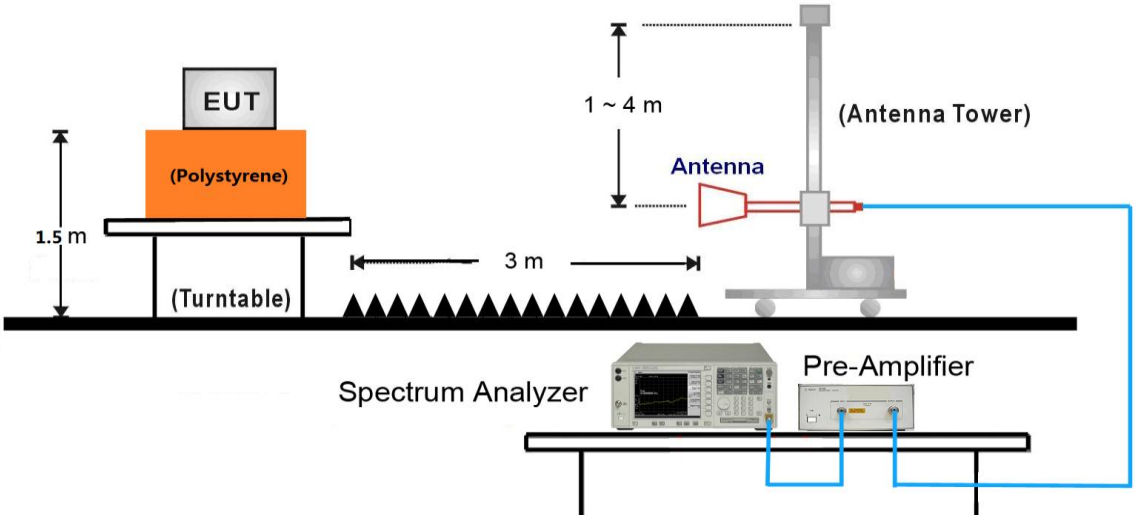
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



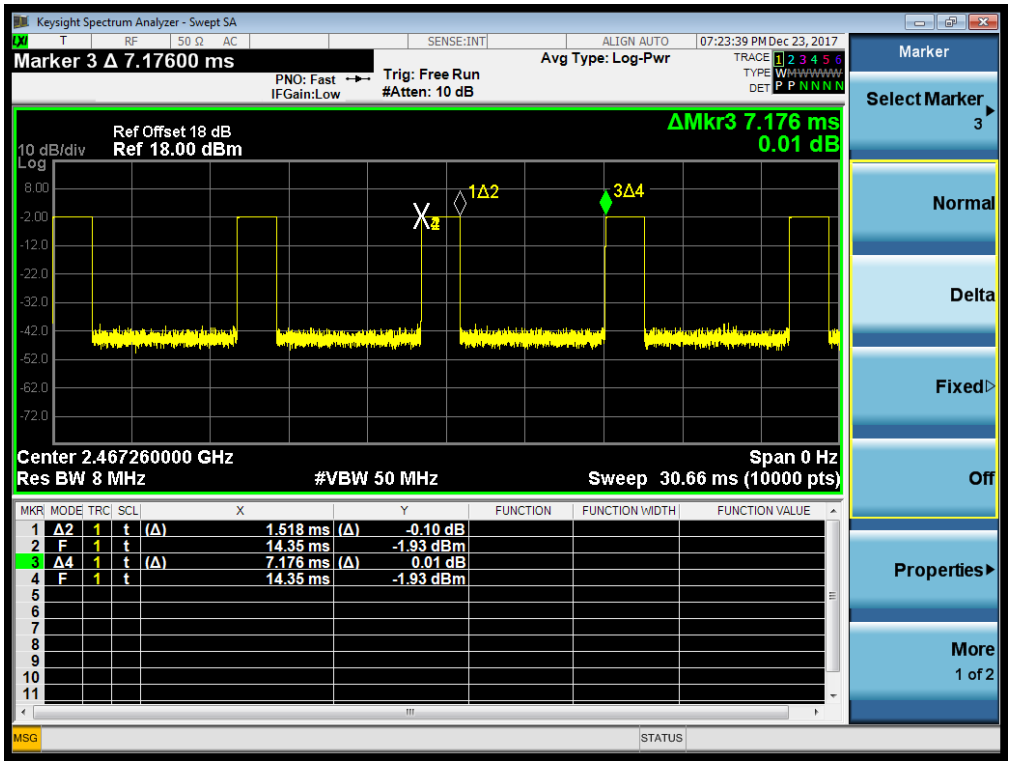
1GHz ~ 25GHz Test Setup:



7.3.3. Test Result

Time On (ms)	One Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
1.52	14.35	10.59	-19.50

Note: Duty Cycle Factor = 20*Log (Duty Cycle)



Test Mode:	Transmission	Test Site:	AC2
Remark:	**Fundamental** Radiated Emission	Test Engineer:	Vince Yu

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
2407	57.2	32.6	89.8	114.0 (Note 2)	-24.2	PK	Horizontal
	51.2	32.6	83.8	114.0 (Note 2)	-30.2	PK	Vertical
2437	57.5	32.5	90.0	114.0 (Note 2)	-24.0	PK	Horizontal
	50.7	32.5	83.2	114.0 (Note 2)	-30.8	PK	Vertical
2467	58.9	32.6	91.5	114.0 (Note 2)	-22.5	PK	Horizontal
	50.2	32.6	82.8	114.0 (Note 2)	-31.2	PK	Vertical

Note 1: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: Average measurement was not performed when the peak level lower than average limit.

Note 3: All readings below 1GHz are peak, above 1GHz are performed with peak and/or average measurements as necessary.

Test Mode:	Transmission	Test Site:	AC2
Frequency	2407MHz	Test Engineer:	Vince Yu
Remark:	**General Radiated Emission**		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
672.1	5.8	21.5	N/A	27.3	46.0	-18.7	QP	Horizontal
743.9	6.5	22.6	N/A	29.1	46.0	-16.9	QP	Horizontal
516.0	8.6	18.9	N/A	27.5	46.0	-18.5	QP	Vertical
528.1	8.5	19.1	N/A	27.6	46.0	-18.4	QP	Vertical
4814.5	56.6	5.5	N/A	62.1	74.0	-11.9	PK	Horizontal
4814.5	56.6	5.5	-19.5	42.6	54.0	-11.4	AV	Horizontal
7221.8	37.1	13.9	N/A	51.0	74.0	-23.0	PK	Horizontal
7221.8	37.1	13.9	-19.5	31.5	54.0	-22.5	AV	Horizontal
4814.5	55.7	5.5	N/A	61.2	74.0	-12.8	PK	Vertical
4814.5	55.7	5.5	-19.5	41.7	54.0	-12.3	AV	Vertical
7221.8	32.3	13.9	N/A	46.2	74.0	-27.8	PK	Vertical
7221.8	32.3	13.9	-19.5	26.7	54.0	-27.3	AV	Vertical

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Average Measure Level = Peak Measure Level + Duty Cycle Factor

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre Amplifier Gain (dB)

Note 2: The test trace is same as the ambient noise (the test frequency range: 9 kHz ~ 30 MHz and 18 GHz ~ 25 GHz), therefore no data appear in the report.

Test Mode:	Transmission	Test Site:	AC2
Frequency	2437MHz	Test Engineer:	Vince Yu
Remark:	**General Radiated Emission**		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
672.1	7.0	21.5	N/A	28.5	46.0	-17.5	QP	Horizontal
743.9	6.0	22.6	N/A	28.6	46.0	-17.4	QP	Horizontal
516.0	8.3	18.9	N/A	27.2	46.0	-18.8	QP	Vertical
528.1	8.0	19.1	N/A	27.1	46.0	-18.9	QP	Vertical
4874.5	58.4	5.6	N/A	64.0	74.0	-10.0	PK	Horizontal
4874.5	58.4	5.6	-19.5	44.5	54.0	-9.5	AV	Horizontal
7311.8	36.9	13.7	N/A	50.6	74.0	-23.4	PK	Horizontal
7311.8	36.9	13.7	-19.5	31.1	54.0	-22.9	AV	Horizontal
4874.5	56.8	5.6	N/A	62.4	74.0	-11.6	PK	Vertical
4874.5	56.8	5.6	-19.5	42.9	54.0	-11.1	AV	Vertical
7311.8	34.4	13.7	N/A	48.1	74.0	-25.9	PK	Vertical
7311.8	34.4	13.7	-19.5	28.6	54.0	-25.4	AV	Vertical

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Average Measure Level = Peak Measure Level + Duty Cycle Factor

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre Amplifier Gain (dB)

Note 2: The test trace is same as the ambient noise (the test frequency range: 9 kHz ~ 30 MHz and 18 GHz ~ 25 GHz), therefore no data appear in the report.

Test Mode:	Transmission	Test Site:	AC2
Frequency	2467MHz	Test Engineer:	Vince Yu
Remark:	**General Radiated Emission**		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
672.1	6.5	21.5	N/A	28.0	46.0	-18.0	QP	Horizontal
791.9	5.1	23.2	N/A	28.3	46.0	-17.7	QP	Horizontal
516.0	7.6	18.9	N/A	26.5	46.0	-19.5	QP	Vertical
730.8	5.4	22.4	N/A	27.8	46.0	-18.2	QP	Vertical
4934.5	57.8	5.7	N/A	63.5	74.0	-10.5	PK	Horizontal
4934.5	57.8	5.7	-19.5	44.0	54.0	-10.0	AV	Horizontal
7401.8	36.2	13.9	N/A	50.1	74.0	-23.9	PK	Horizontal
7401.8	36.2	13.9	-19.5	30.6	54.0	-23.4	AV	Horizontal
4934.5	57.6	5.7	N/A	63.3	74.0	-10.7	PK	Vertical
4934.5	57.6	5.7	-19.5	43.8	54.0	-10.2	AV	Vertical
7401.8	35.4	13.9	N/A	49.3	74.0	-24.7	PK	Vertical
7401.8	35.4	13.9	-19.5	29.8	54.0	-24.2	AV	Vertical

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Average Measure Level = Peak Measure Level + Duty Cycle Factor

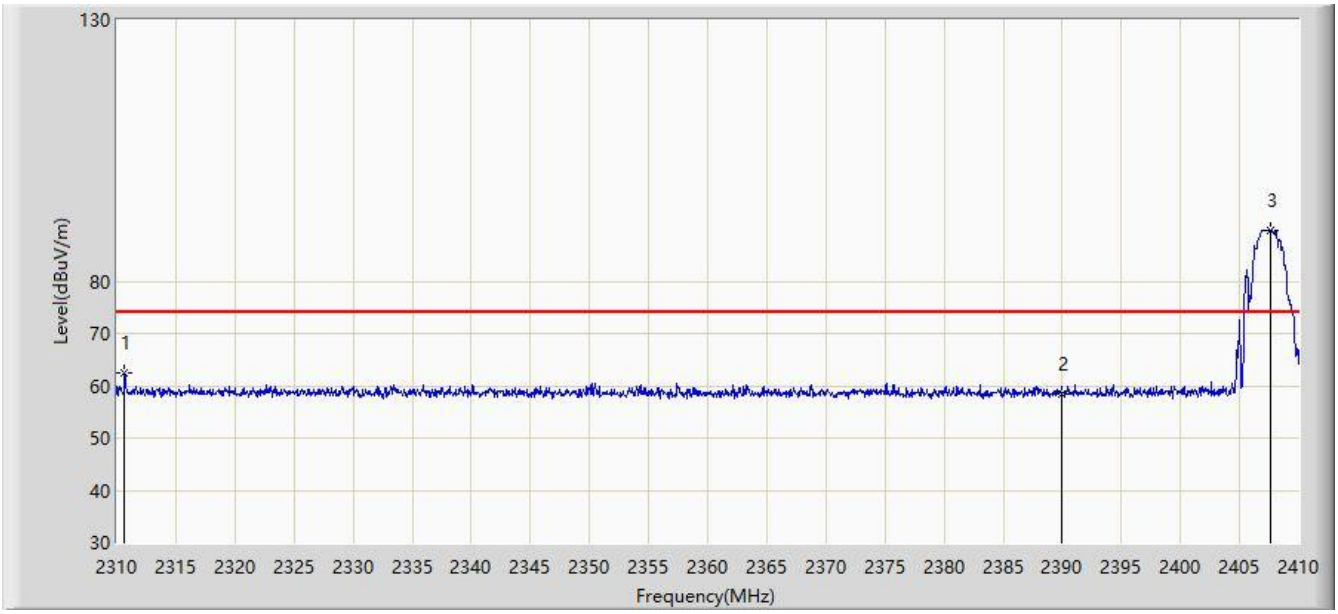
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre Amplifier Gain (dB)

Note 2: The test trace is same as the ambient noise (the test frequency range: 9 kHz ~ 30 MHz and 18 GHz ~ 25 GHz), therefore no data appear in the report.

7.4. Radiated Restricted Band Edge Measurement

7.4.1. Test Result

Site: AC2	Time: 2017/12/19 - 20:29
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at low channel 2407MHz	

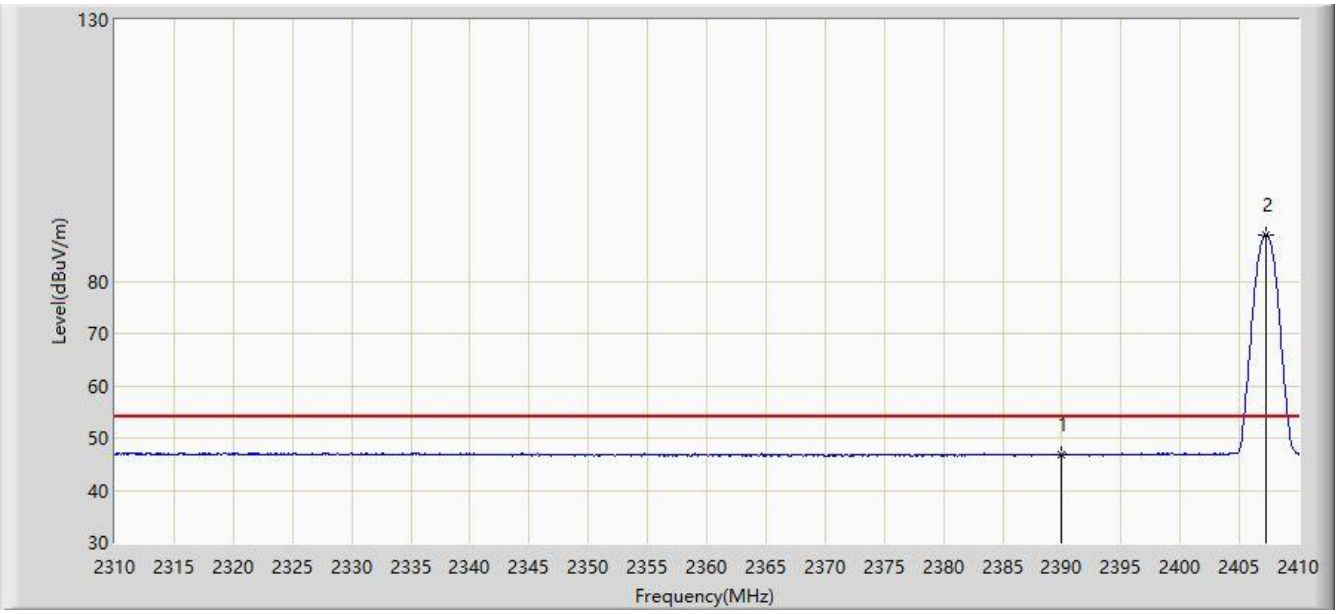


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2310.650	62.491	29.683	-11.509	74.000	32.809	PK
2			2390.000	58.319	25.744	-15.681	74.000	32.575	PK
3		*	2407.650	89.742	57.189	N/A	N/A	32.553	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/12/19 - 20:32
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at low channel 2407MHz	

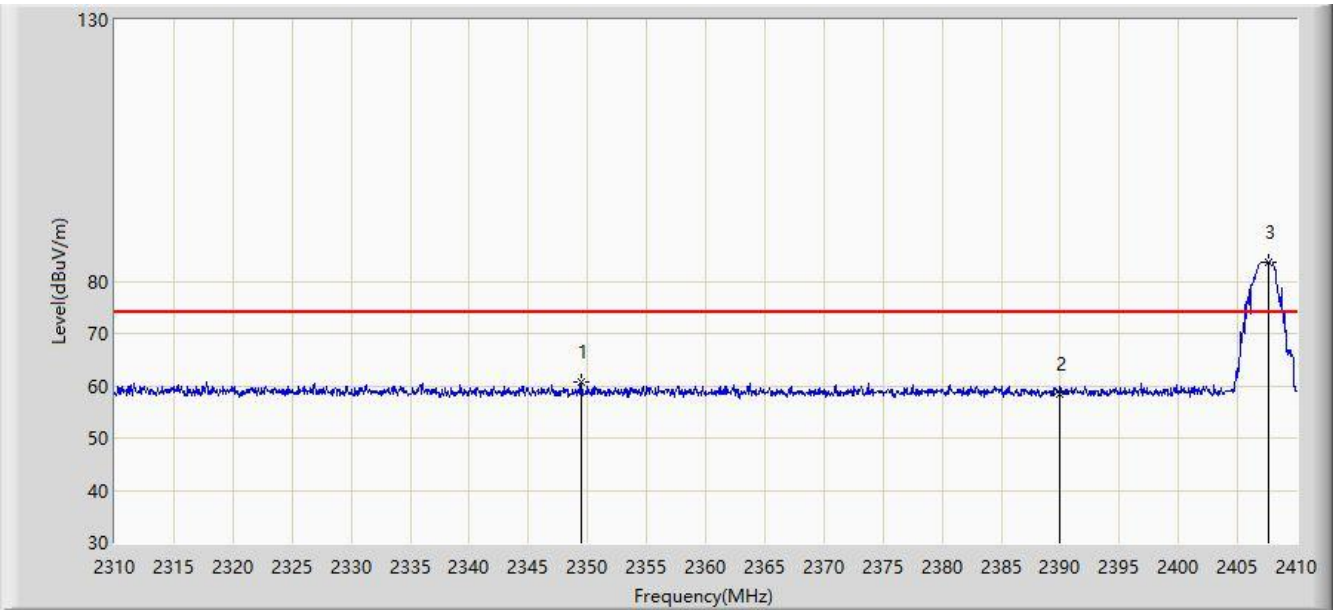


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	46.762	14.187	-7.238	54.000	32.575	AV
2		*	2407.250	88.858	56.305	N/A	N/A	32.554	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/12/19 - 20:33
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at low channel 2407MHz	

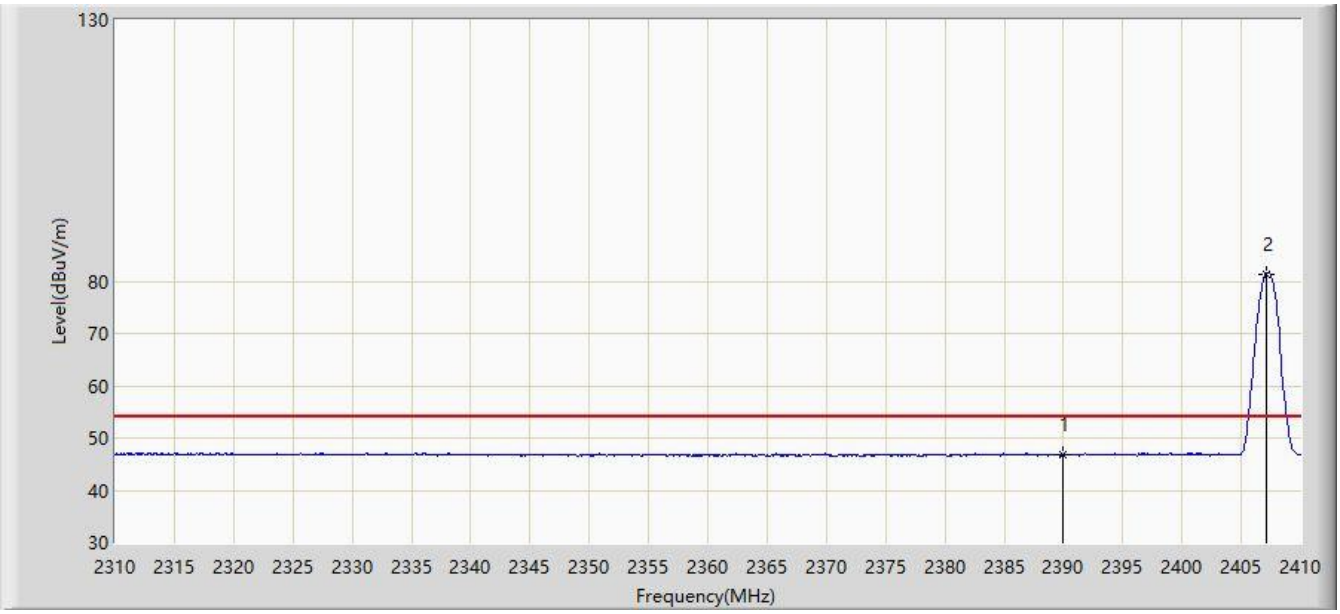


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2349.500	60.581	27.929	-13.419	74.000	32.651	PK
2			2390.000	58.519	25.944	-15.481	74.000	32.575	PK
3		*	2407.600	83.748	51.195	N/A	N/A	32.553	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/12/19 - 20:35
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at low channel 2407MHz	

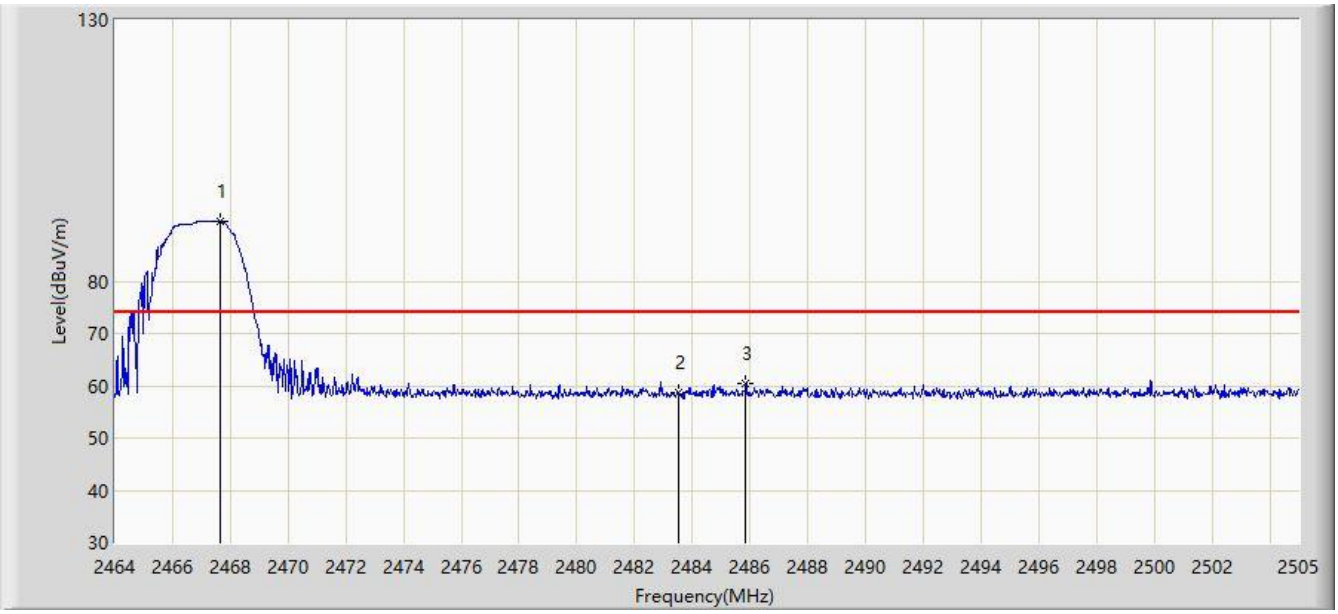


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	46.669	14.094	-7.331	54.000	32.575	AV
2		*	2407.100	81.447	48.894	N/A	N/A	32.553	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/12/19 - 21:10
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at high channel 2467MHz	

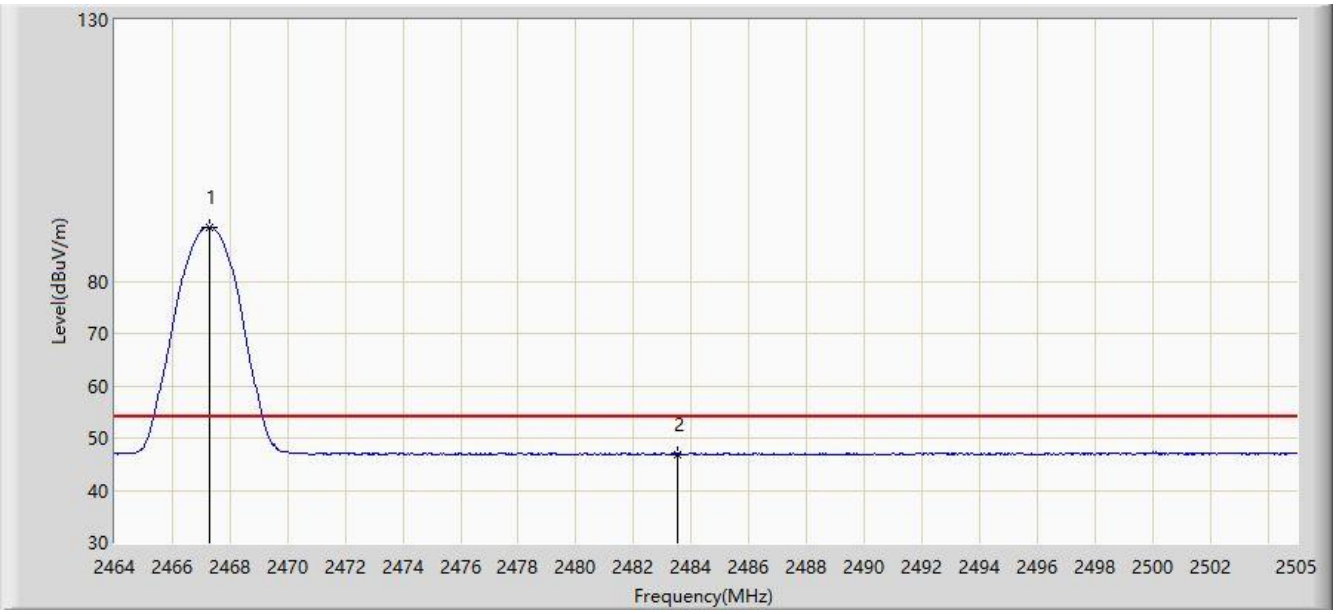


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2467.635	91.443	58.889	N/A	N/A	32.554	PK
2			2483.500	58.623	26.027	-15.377	74.000	32.596	PK
3			2485.841	60.556	27.954	-13.444	74.000	32.602	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/12/19 - 21:12
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at high channel 2467MHz	

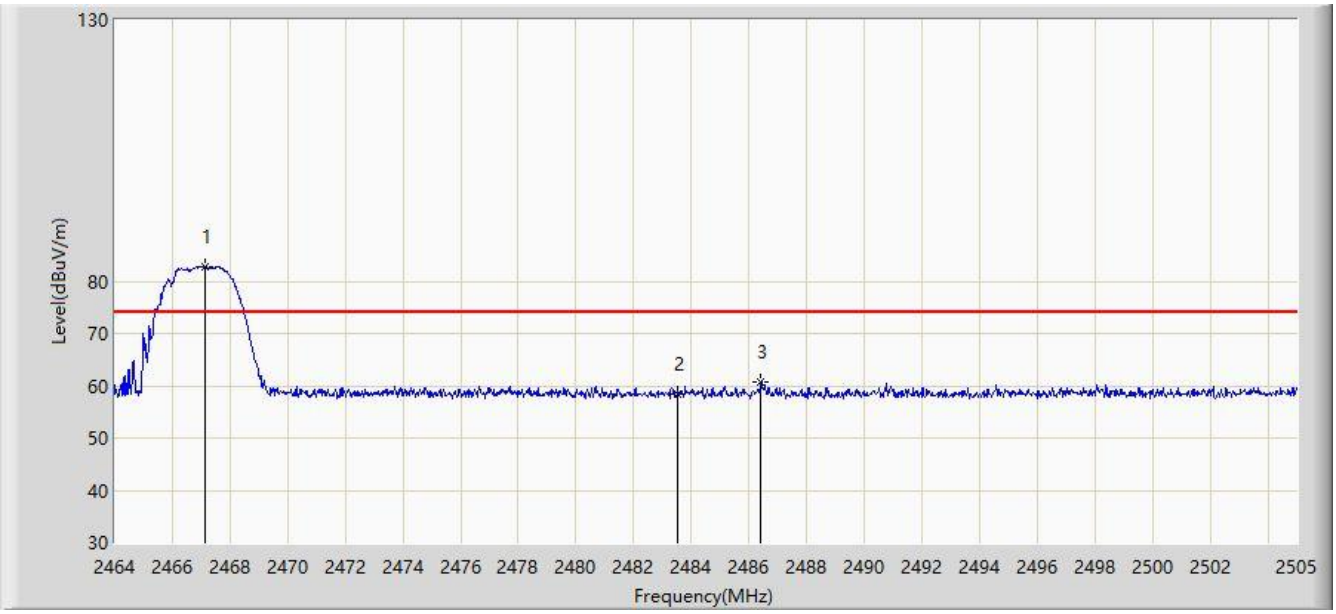


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2467.291	90.325	57.772	N/A	N/A	32.553	AV
2			2483.500	46.894	14.298	-7.106	54.000	32.596	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/12/19 - 21:13
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at high channel 2467MHz	

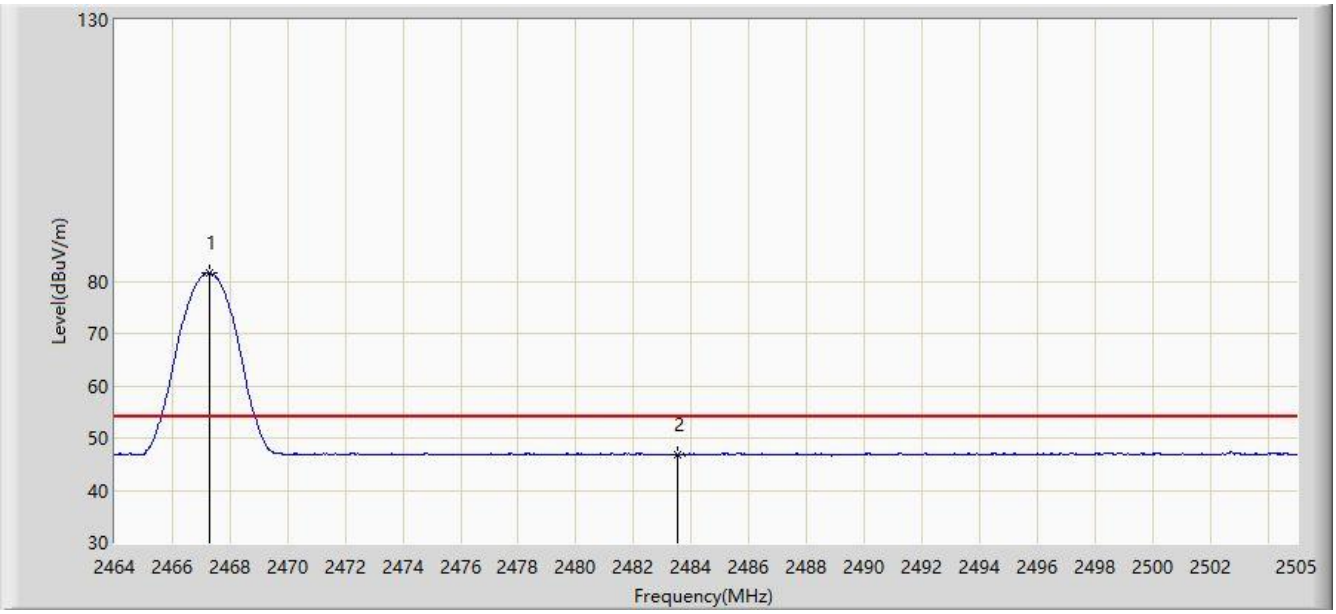


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2467.132	82.767	50.214	N/A	N/A	32.553	PK
2			2483.500	58.392	25.796	-15.608	74.000	32.596	PK
3			2486.424	60.697	28.094	-13.303	74.000	32.603	PK

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC2	Time: 2017/12/19 - 21:21
Limit: FCC_Part15.209_RE(3m)	Engineer: Dandy Li
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Roguewave	Power: By Battery
Test Mode: Transmit at high channel 2467MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2467.291	81.531	48.978	N/A	N/A	32.553	AV
2			2483.500	46.779	14.183	-7.221	54.000	32.596	AV

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

7.5. 20dB Spectrum Bandwidth Measurement

7.5.1. Test Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission in the specific band (2407 ~ 2467 MHz).

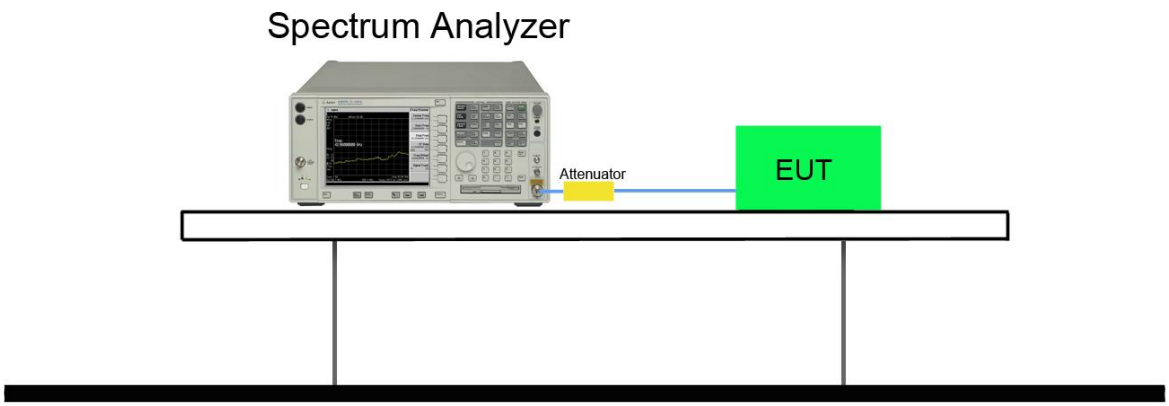
7.5.2. Test Procedure used

ANSI C63.10 Clause 6.9.2

7.5.3. Test Setting

1. Set the spectrum span range to overlap the nominal center frequency
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize and marker the highest level.
8. Determine the display level (the highest level - 20dB) and place two markers, one at the lowest frequency and the other at the highest frequency.

7.5.4. Test Setup



7.5.5. Test Result

Frequency (MHz)	Frequency Range (MHz)	Frequency Range (MHz)	Result
2407	2406.00	---	Pass
2467	---	2467.90	Pass

20dB Spectrum Bandwidth

2404 MHz

2476 MHz

7.6. 99% Bandwidth Measurement

7.6.1. Test Limit

N/A

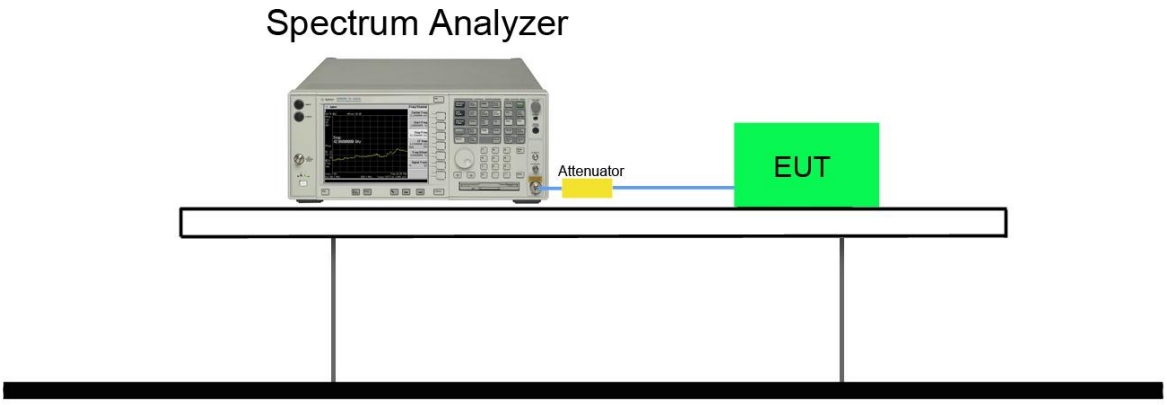
7.6.2. Test Procedure used

ANSI C63.10 Section 6.9

7.6.3. Test Setting

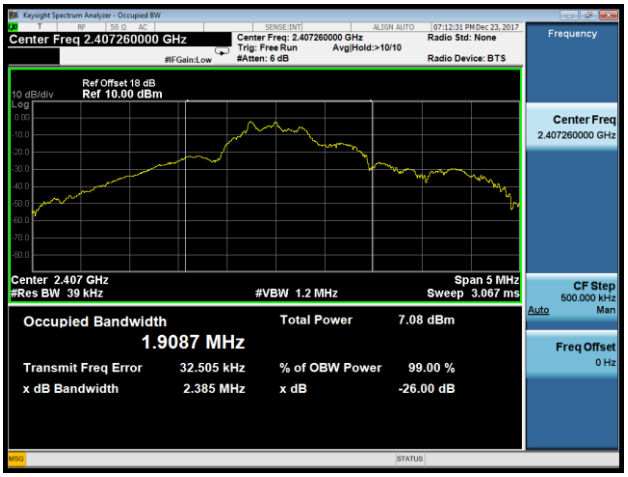
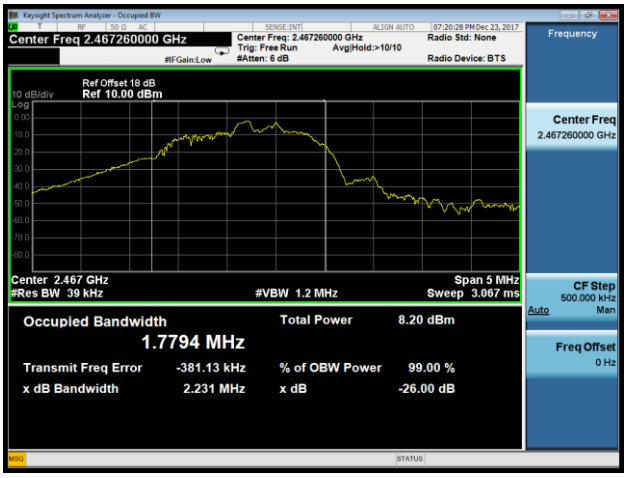
1. The analyzers' automatic bandwidth measurement capability was used to perform the 99% bandwidth measurement. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% to 5% of the OBW.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.

7.6.4. Test Setup



7.6.5. Test Result

Frequency (MHz)	99% Bandwidth (MHz)
2407	1.91
2437	1.99
2467	1.78

99% Occupied Bandwidth	
2407 MHz	**2437 MHz**
	
2467 MHz	
	

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Roguewave** is in compliance with Part 15C of the FCC Rules and RSS Rule.

The End