

# MEASUREMENT REPORT

## FCC PART 15.247 & IC RSS-247 Bluetooth

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**FCC ID:** 2ALGLE1000  
**IC:** 22505-E1000  
**APPLICANT:** Cassia Networks Inc.

**Application Type:** Certification  
**Product:** Cassia Bluetooth Router  
**Model No.:** E1000, E1000-10, E1000-20  
**Brand Name:** CASSIA  
**FCC Classification:** Digital Transmission System (DTS)  
**FCC Rule Part(s):** Part15 Subpart C (Section 15.247)  
**IC Rule(s):** RSS-247 Issue 2, RSS-GEN Issue 4  
**Test Procedure(s):** ANSI C63.10-2013, KDB 558074 D01v04  
**Test Date:** November 24 ~ December 13, 2017

Reviewed By : Jame Yuan  
( Jame Yuan )

Approved By : Marlin Chen  
( Marlin Chen )



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 KDB 558074 D01v04. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

### Revision History

Report No.	Version	Description	Issue Date	Note
1711RSU04002	Rev. 01	Initial report	12-13-2017	Valid

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## §2.1033 General Information

<b>Applicant:</b>	Cassia Networks Inc.
<b>Applicant Address:</b>	1840 Majestic Way, San Jose, CA 95132
<b>Manufacturer:</b>	Cassia Networks Inc.
<b>Manufacturer Address:</b>	1840 Majestic Way, San Jose, CA 95132
<b>Test Site:</b>	MRT Technology (Suzhou) Co., Ltd
<b>Test Site Address:</b>	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
<b>FCC Registration No.:</b>	893164
<b>IC Registration No.:</b>	11384A-1
<b>Test Device Serial No.:</b>	N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering

### 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 (G20034, R-20025, T-20020, C-20020) 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. Feature of Equipment under Test

Product Name:	Cassia Bluetooth Router
Model No.:	E1000, E1000-10, E1000-20
Brand Name:	CASSIA
Wi-Fi Specification:	802.11a/b/g/n/ac
Bluetooth Version:	v4.2 single mode
Power Type:	POE input or AC adapter input
<b>Components</b>	
Adapter	M/N: A8A-050200U-US1 INPUT: 100-240V ~ 50/60Hz, 0.35A OUTPUT: 5Vdc, 2.0A

### 2.2. Product Specification Subjective to this Report

<b>Bluetooth Specification</b>	
Bluetooth Frequency	2402~2480MHz
Bluetooth Version	v4.2
Modulation Type:	GFSK
Data Rate	1Mbps

Note: For other features of this EUT, test report will be issued separately.

### 2.3. Working Frequencies for this report

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



## 2.4. Description of Available Antennas

Antenna	Frequency Band (MHz)	Ant Gain (dBi)	Tx Paths
	2400 ~ 2483.5 (Wi-Fi)	3.7	1
	2400 ~ 2483.5 (BLE)	5.0	1
	5150 ~ 5250	6.6	1
	5745 ~ 5825	7.3	1

## 2.5. Description of Antenna RF Port

Antenna RF Port			
---	2.4GHz&5GHz Wi-Fi RF Port	2.4GHz BLE RF Port	
Software Control Port	--	Ant 0	Ant 1

## 2.6. Device Capabilities

This device contains the following capabilities:

2.4GHz WLAN (DTS), 5GHzWLAN (NII) and Bluetooth (v4.2)

## 2.7. Test Configuration

The **Cassia Bluetooth Router** was tested per the guidance of KDB 558074 D01v04. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

## 2.8. EMI Suppression Device(s)/Modifications

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

## 2.9. 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.

## 2.10. Test Software

The test utility software used during testing was “engineering order” provided by the applicant.

### 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 guidance provided in KDB 558074 D01v04 were used in the measurement of the **Cassia Bluetooth Router**.

**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 were 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 1-40GHz 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 **Cassia** is **permanently attached**.
- There are no provisions of connects to an external antenna.

### **Conclusion:**

The **Cassia** 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	2018/04/24
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
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	1 year	2018/05/10

### Radiated Disturbance - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2018/08/03
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2017/12/21
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2018/04/16
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2018/11/19
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2018/03/28
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2018/04/25
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06183	1 year	2018/10/21
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2018/05/10

### Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2018/04/25
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2018/04/25
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06184	1 year	2017/12/22

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  $k = 2$ .

<b>AC Conducted Emission Measurement - SR2</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 150kHz~30MHz: 3.46dB
<b>Radiated Emission Measurement - AC1</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
<b>Spurious Emissions, Conducted - SR1</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 0.78dB
<b>Output Power - SR1</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 1.13dB
<b>Power Spectrum Density - SR1</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 1.15dB
<b>Occupied Bandwidth - SR1</b>
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ): 0.28%

## 7. TEST RESULT

### 7.1. Summary

**Company Name:** **Cassia Networks Inc.**  
**FCC ID:** **2ALGLE1000**  
**IC:** **22505-E1000**

FCC Section(s)	IC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	$\geq 500\text{kHz}$	Conducted	Pass	Section 7.2
15.247(b)(3)	RSS-247 [5.4(d)]	Output Power EIRP	$\leq 30\text{dBm}$ $\leq 36\text{dBm}$		Pass	Section 7.3
15.247(e)	RSS-247 [5.2]	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$		Pass	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	$\geq 20\text{dBc(Peak)}$		Pass	Section 7.5
15.205 15.209	RSS-247 [5.5]	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 7.6 & 7.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

#### 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.
- 3) Due to the last channel 2480MHz reduced the power to satisfy the radiated band edge requirement, so we also have accessed the other adjacent channels testing again and make sure that they can pass the rule, the detail power setting value see the operation description.



## 7.2. 6dB Bandwidth Measurement

### 7.2.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

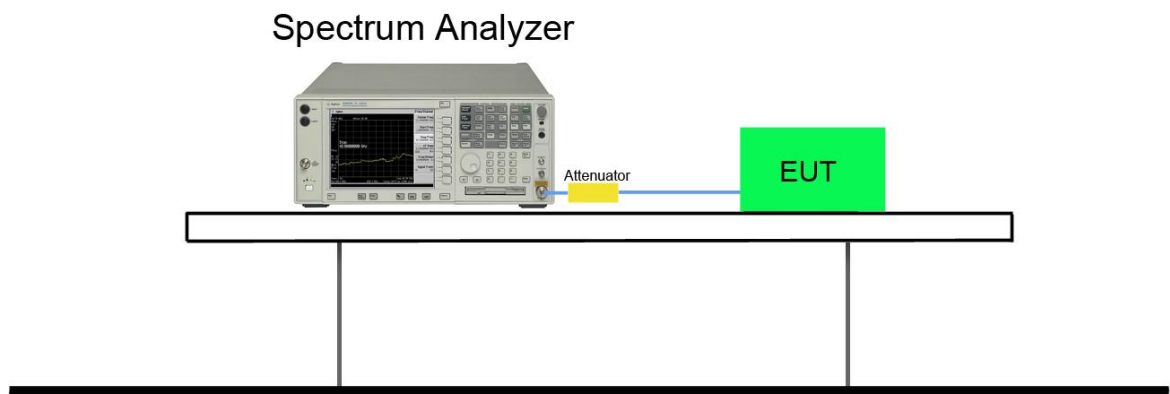
### 7.2.2. Test Procedure used

KDB 558074 D01v04 - Section 8.2 Option 2

### 7.2.3. Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to  $X = 6$ . The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

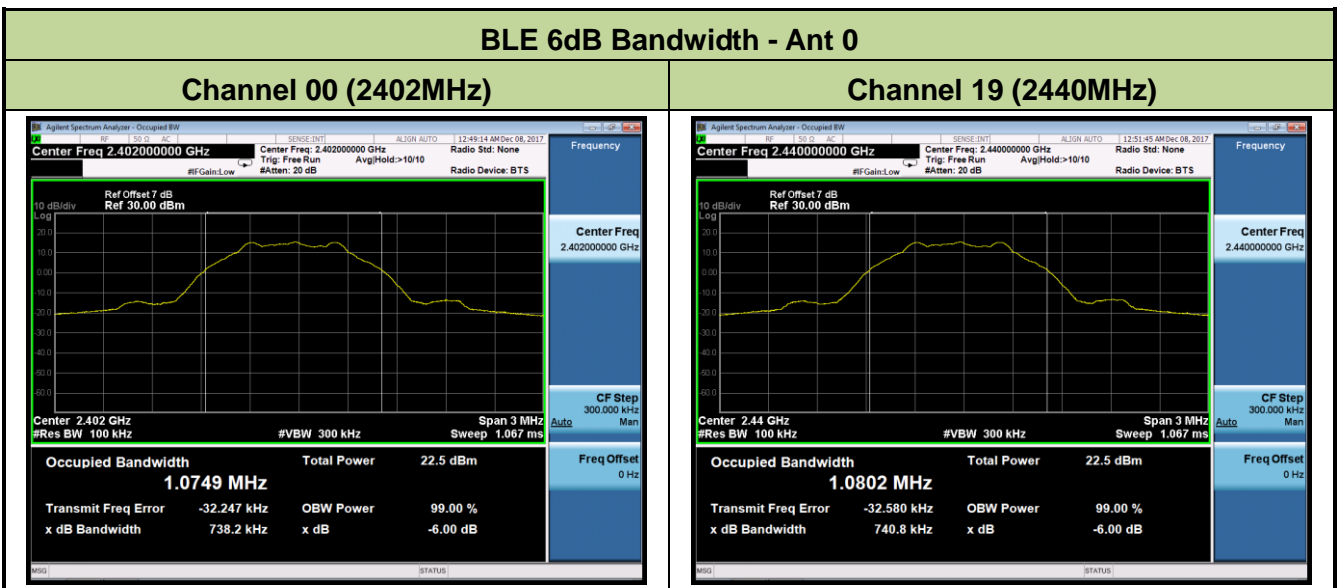
### 7.2.4. Test Setup



**7.2.5. Test Result**

Product	Cassia	Temperature	27°C
Test Engineer	Ben Zhu	Relative Humidity	57%
Test Site	TR3	Test Date	2017/12/08

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
<b>Ant 0</b>						
BLE	1	00	2402	0.74	≥ 0.5	Pass
BLE	1	19	2440	0.74	≥ 0.5	Pass
BLE	1	39	2480	0.74	≥ 0.5	Pass
<b>Ant 1</b>						
BLE	1	00	2402	0.74	≥ 0.5	Pass
BLE	1	19	2440	0.74	≥ 0.5	Pass
BLE	1	39	2480	0.74	≥ 0.5	Pass

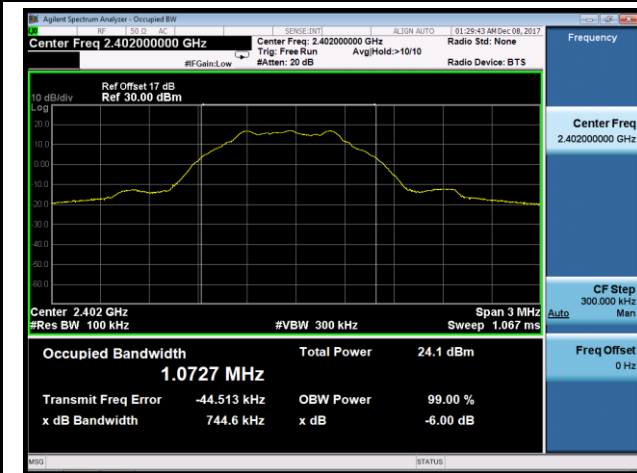


### Channel 39 (2480MHz)

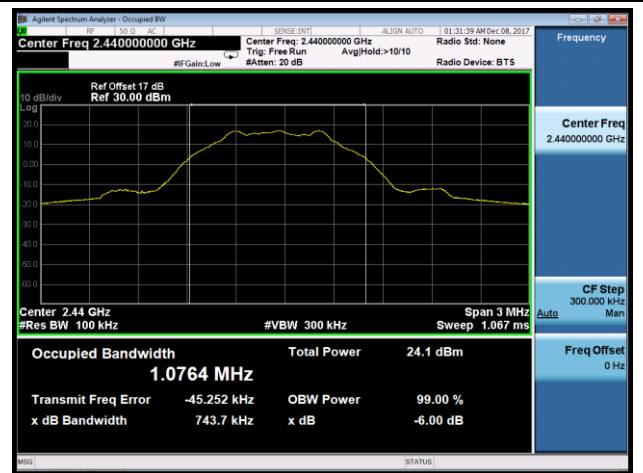


### BLE 6dB Bandwidth - Ant 1

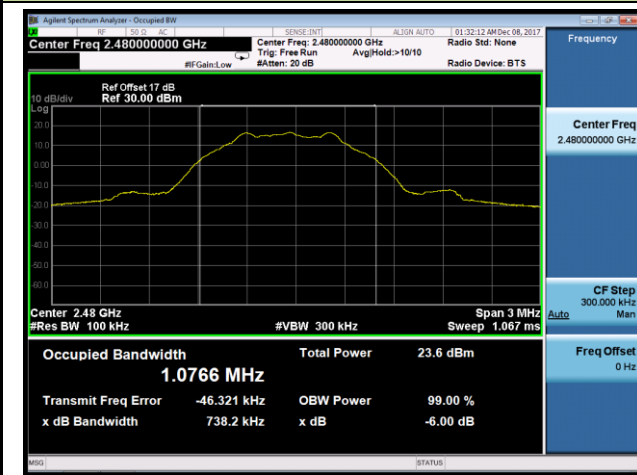
#### Channel 00 (2402MHz)



#### Channel 19 (2440MHz)



#### Channel 39 (2480MHz)



### 7.3. Output Power Measurement

#### 7.3.1. Test Limit

The maximum out power shall be less 1 Watt and the E.I.R.P shall not exceed 4 Watt.

#### 7.3.2. Test Procedure Used

KDB 558074 D01v04 - Section 9.1.3 PKPM1 Peak Power Method (for signals with  $BW \leq 50\text{MHz}$ )

KDB 558074 D01v04 - Section 9.2.3.2 AVGP-G Average Power Method

#### 7.3.3. Test Setting

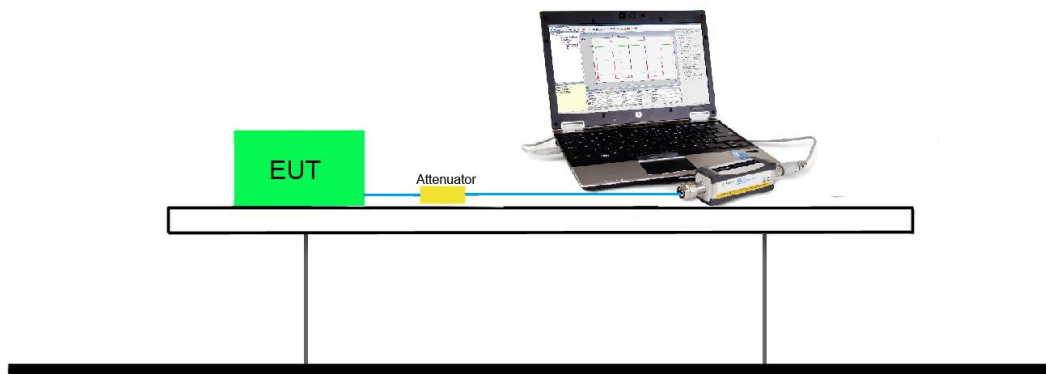
##### Method PKPM1

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

##### Average Power Measurement

Average power measurements were perform only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

#### 7.3.4. Test Setup



### 7.3.5. Test Result of Output Power

Product	Cassia	Temperature	27°C
Test Engineer	Ben Zhu	Relative Humidity	57%
Test Site	TR3	Test Date	2017/11/29

### Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
<b>Ant 0</b>						
BLE	1	00	2402	11.64	≤ 30	Pass
BLE	1	19	2440	11.67	≤ 30	Pass
BLE	1	39	2480	4.02	≤ 30	Pass
<b>Ant 1</b>						
BLE	1	00	2402	12.86	≤ 30	Pass
BLE	1	19	2440	12.88	≤ 30	Pass
BLE	1	39	2480	4.73	≤ 30	Pass

Note: EIRP (dBm) = Max Conducted Power (dBm) + Antenna Gain (dBi) = 17.88 dBm + 5.0 dBi = 22.88 dBm.

### Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
<b>Ant 0</b>						
BLE	1	00	2402	11.43	≤ 30	Pass
BLE	1	19	2440	11.49	≤ 30	Pass
BLE	1	39	2480	3.20	≤ 30	Pass
<b>Ant 1</b>						
BLE	1	00	2402	12.71	≤ 30	Pass
BLE	1	19	2440	12.74	≤ 30	Pass
BLE	1	39	2480	4.02	≤ 30	Pass

Note: EIRP (dBm) = Max Conducted Power (dBm) + Antenna Gain (dBi) = 12.74 dBm + 5.0 dBi = 17.74 dBm.

## 7.4. Power Spectral Density Measurement

### 7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

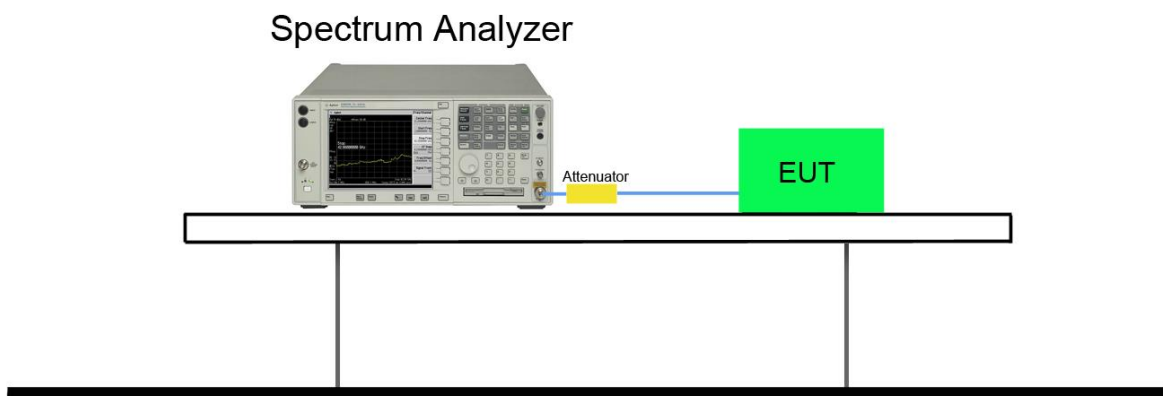
### 7.4.2. Test Procedure Used

KDB 558074 D01v04 - Section 10.2 Method PKPSD

### 7.4.3. Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

### 7.4.4. Test Setup



**7.4.5. Test Result**

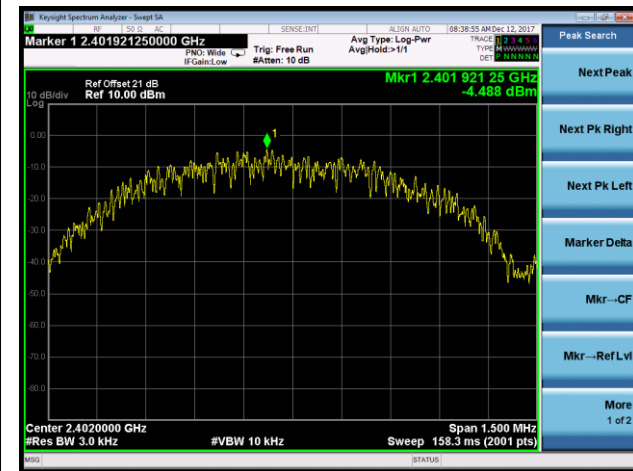
Product	Cassia	Temperature	27°C
Test Engineer	Ben Zhu	Relative Humidity	57%
Test Site	TR3	Test Date	2017/12/12

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
<b>Ant 0</b>						
BLE	1	00	2402	-4.49	≤ 8	Pass
BLE	1	19	2440	-4.42	≤ 8	Pass
BLE	1	39	2480	-12.84	≤ 8	Pass
<b>Ant 1</b>						
BLE	1	00	2402	-3.22	≤ 8	Pass
BLE	1	19	2440	-3.35	≤ 8	Pass
BLE	1	39	2480	-12.24	≤ 8	Pass



BLE PSD - Ant 0

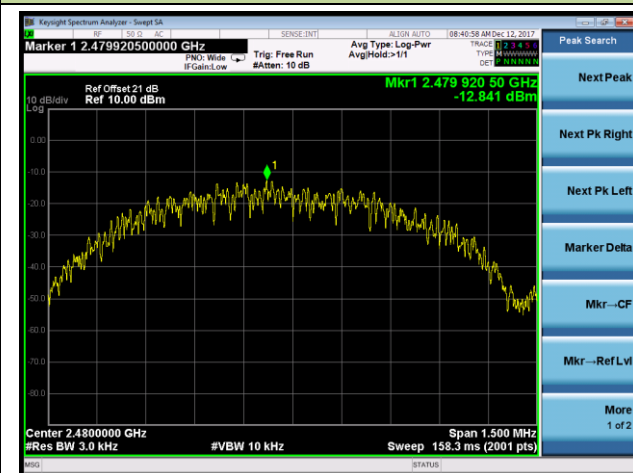
Channel 00 (2402MHz)



Channel 19 (2440MHz)

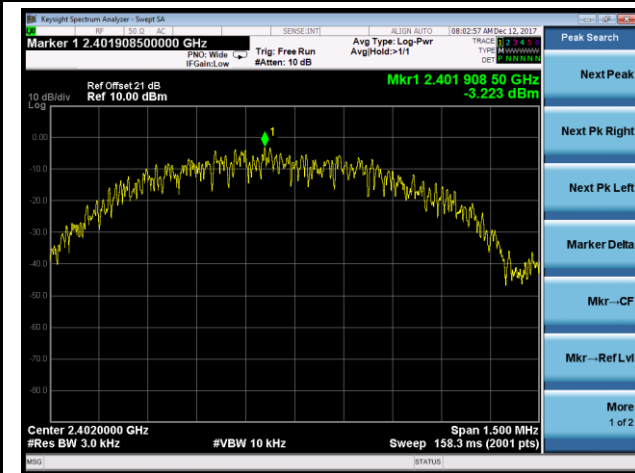


Channel 39 (2480MHz)

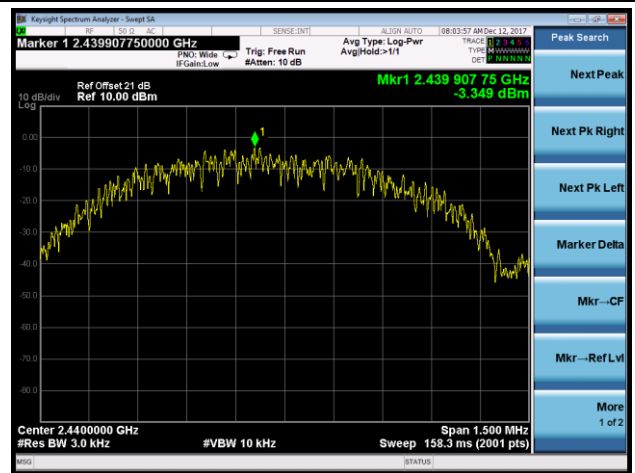


BLE PSD - Ant 1

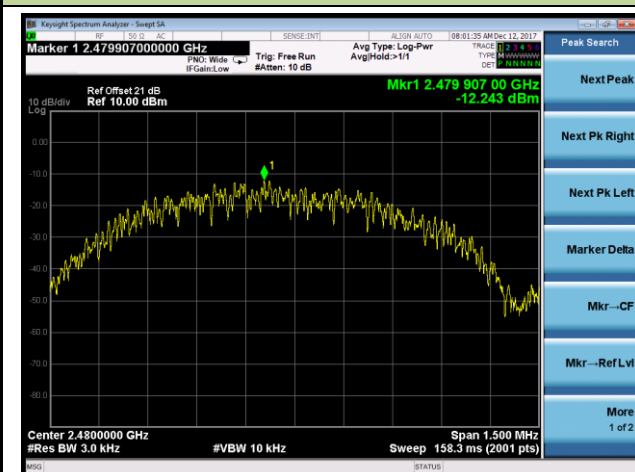
Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



## **7.5. Conducted Band Edge and Out-of-Band Emissions**

### **7.5.1. Test Limit**

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure.

### **7.5.2. Test Procedure Used**

KDB 558074 D01v04 - Section 11.2 & Section 11.3

### **7.5.3. Test Setting**

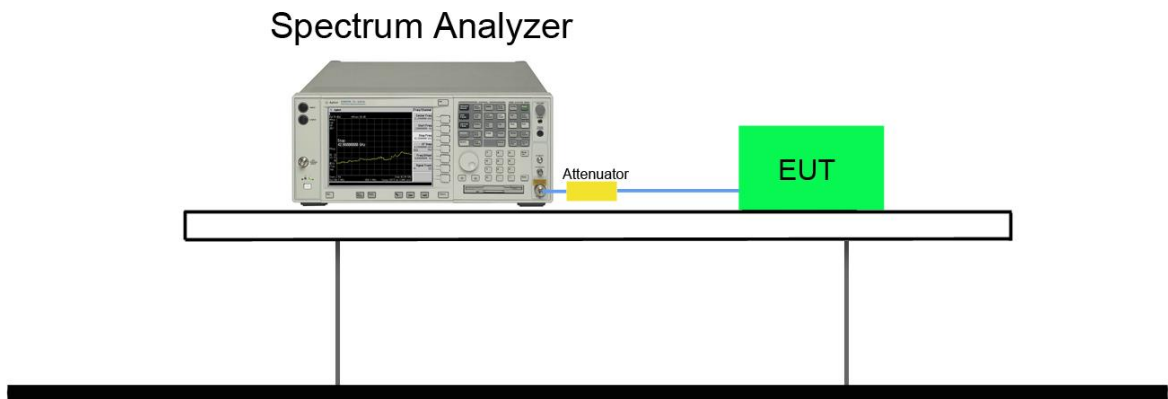
#### **Reference level measurement**

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to  $\geq 1.5$  times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW  $\geq 3 \times$  RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

#### **Emission level measurement**

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

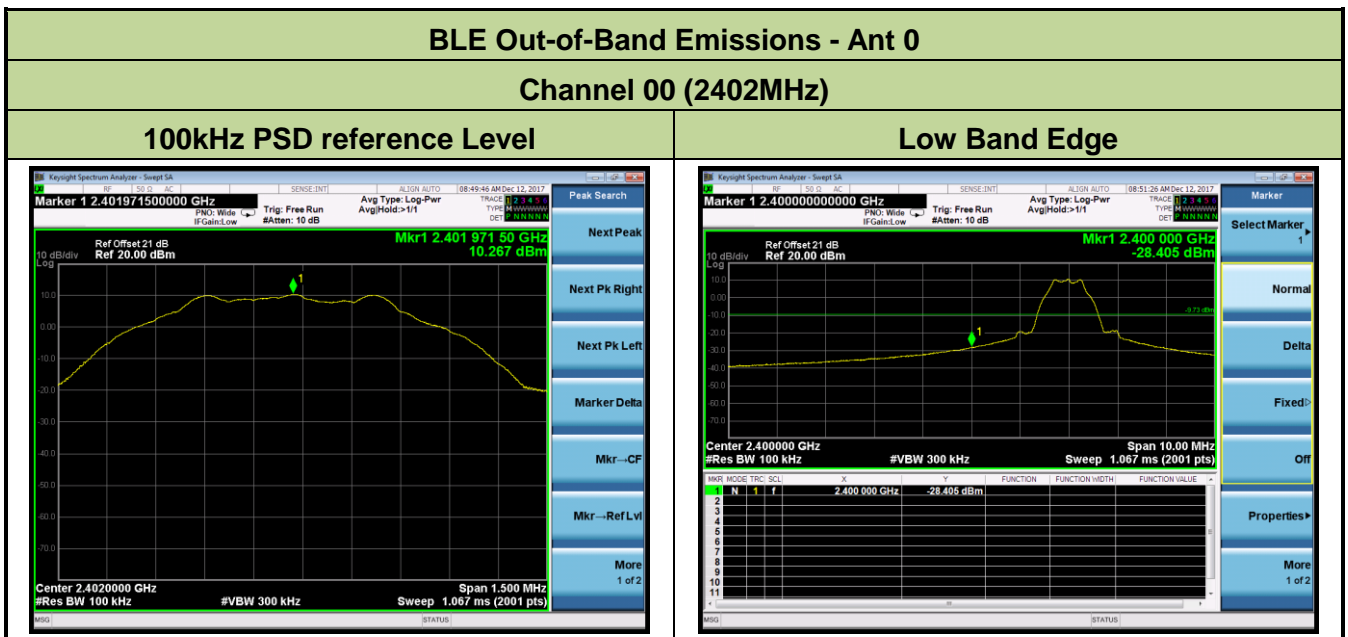
### 7.5.4. Test Setup



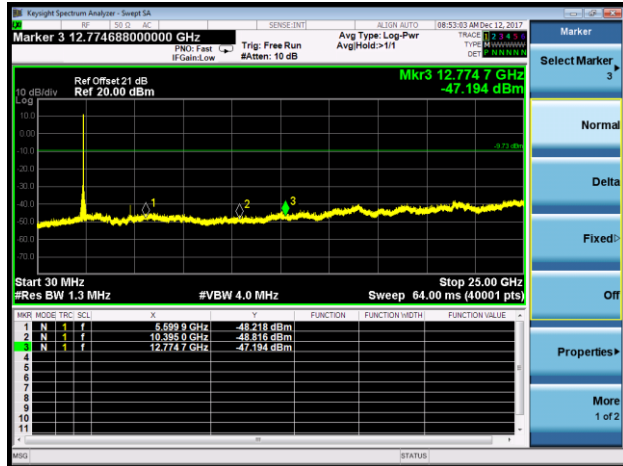
7.5.5. Test Result

Product	Cassia	Temperature	27°C
Test Engineer	Bruce Wang	Relative Humidity	57%
Test Site	TR3	Test Date	2017/12/12

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit	Result
<b>Ant 0</b>					
BLE	1	00	2402	20dBc	Pass
BLE	1	19	2440	20dBc	Pass
BLE	1	39	2480	20dBc	Pass
<b>Ant 1</b>					
BLE	1	00	2402	20dBc	Pass
BLE	1	19	2440	20dBc	Pass
BLE	1	39	2480	20dBc	Pass

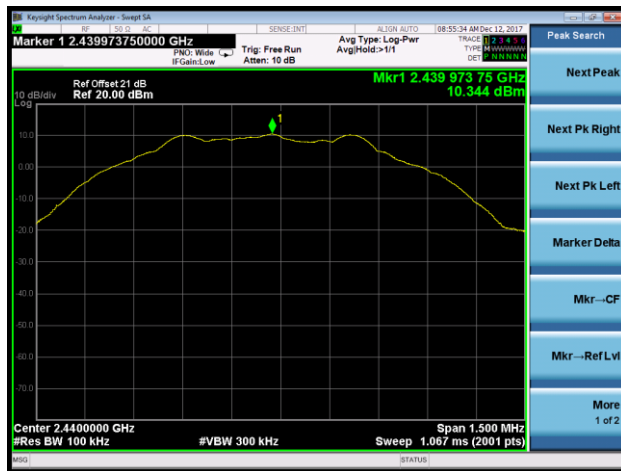


### Spurious Emission 30MHz ~ 25GHz

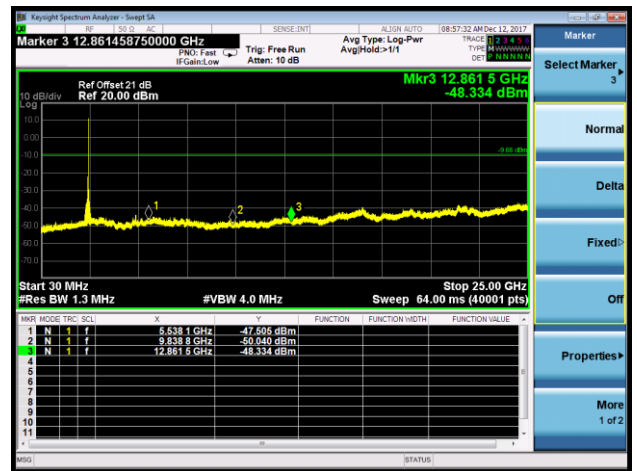


### Channel 19 (2440MHz)

#### 100kHz PSD reference Level

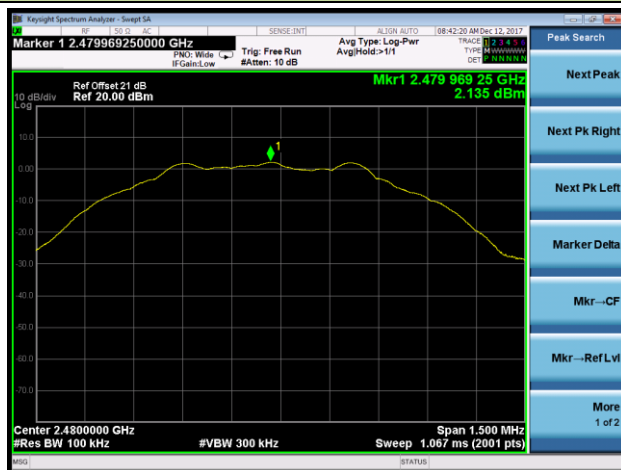


#### Spurious Emission 30MHz ~ 25GHz

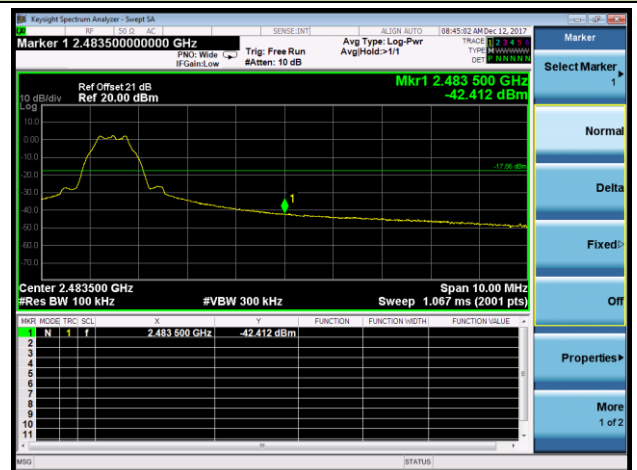


### Channel 39 (2480MHz)

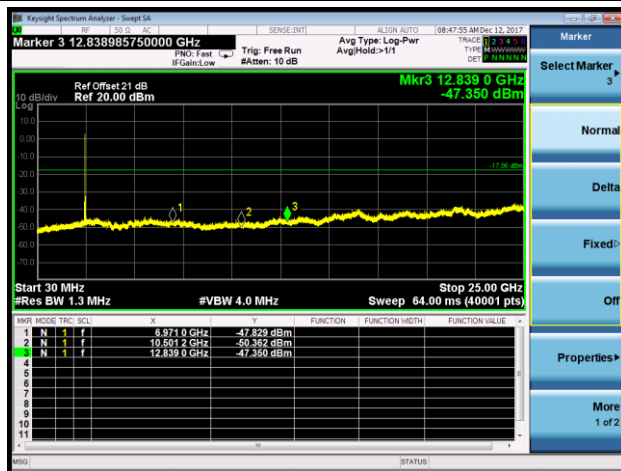
#### 100kHz PSD reference Level



#### High Band Edge



#### Spurious Emission 30MHz ~ 25GHz



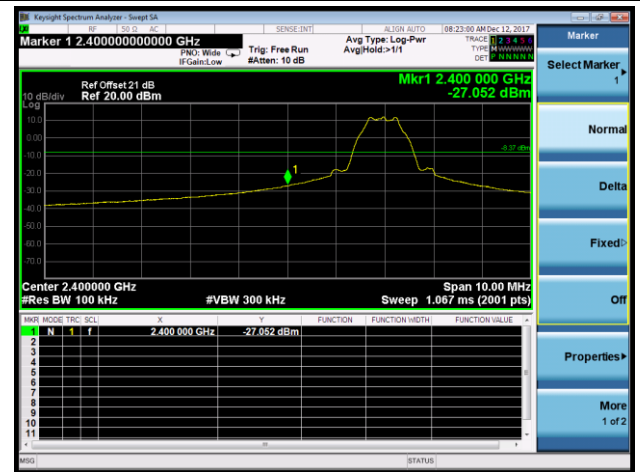
### BLE Out-of-Band Emissions - Ant 1

#### Channel 00 (2402MHz)

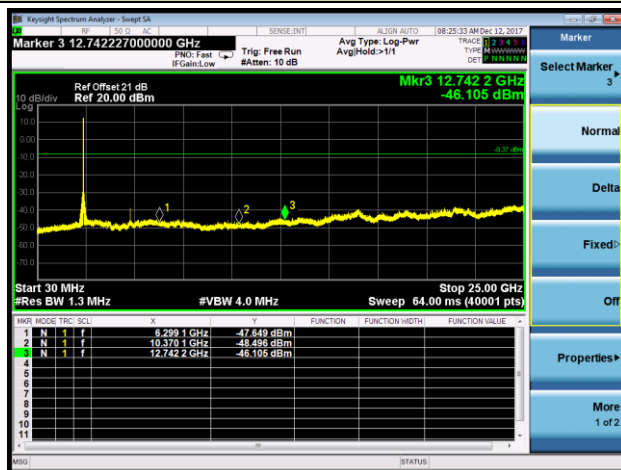
##### 100kHz PSD Reference Level



##### Low Band Edge



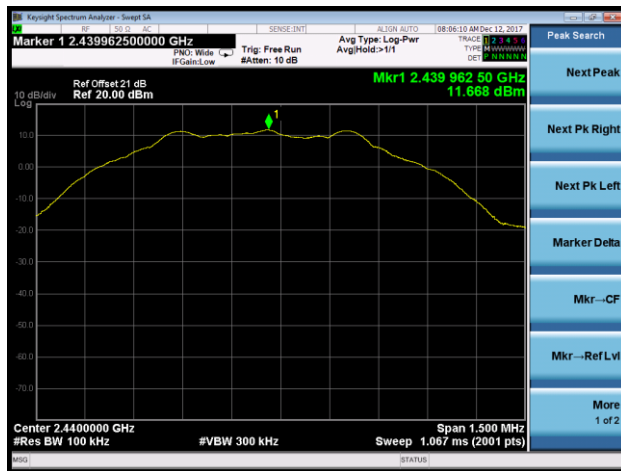
##### Spurious Emission 30MHz ~ 25GHz



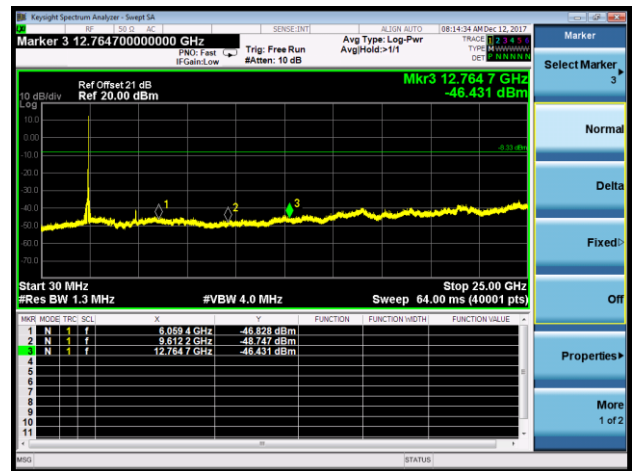


### Channel 19 (2440MHz)

#### 100kHz PSD Reference Level

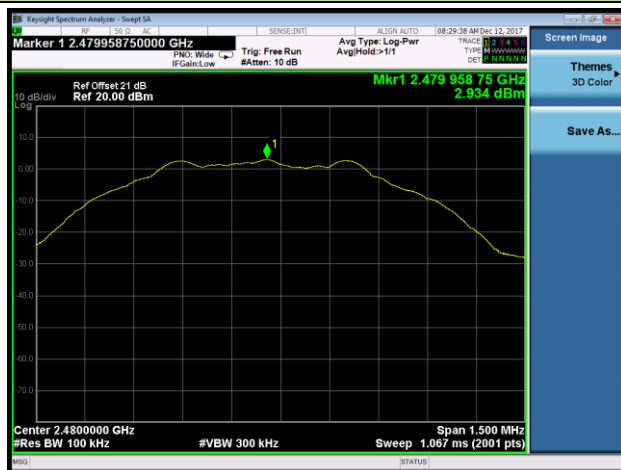


#### Spurious Emission 30MHz ~ 25GHz

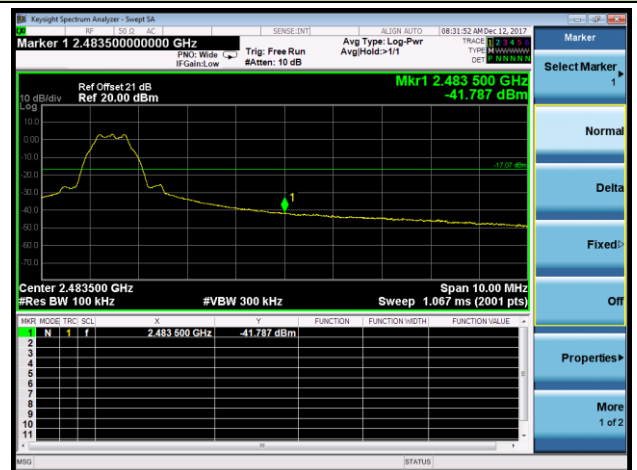


### Channel 39 (2480MHz)

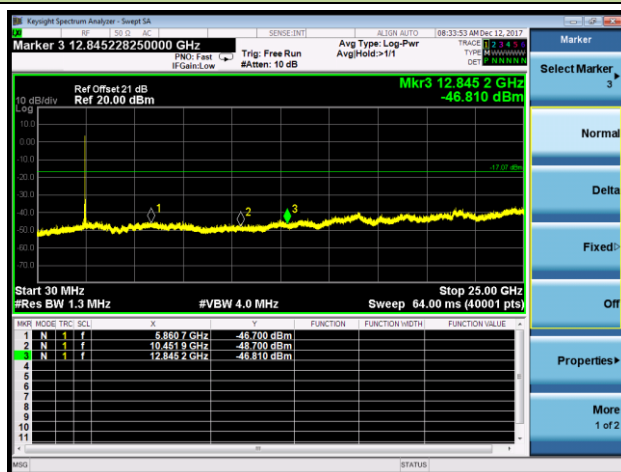
#### 100kHz PSD Reference Level



#### High Band Edge



#### Spurious Emission 30MHz ~ 25GHz



## 7.6. Radiated Spurious Emission Measurement

### 7.6.1. Test Limit

#### **For 15.205 requirement:**

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42-16.423	399.9 - 410	4.5-5.15
<sup>1</sup> 0.495 - 0.505	16.69475-16.69525	608 - 614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960 - 1240	7.25-7.75
4.125-4.128	25.5 -25.67	1300 - 1427	8.25 - 8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660 - 1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123 - 138	2200 - 2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.525	2483.5 - 2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690 - 2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260 - 3267	23.6-24.0
12.29-12.293	167.72-173.2	3332 - 3339	31.2-31.8
12.51975-12.52025	240 - 285	3345.8 - 3358	36.43-36.5
12.57675-12.57725	322-335.4	3600 - 4400	( <sup>2</sup> )
13.36-13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

**For RSS-Gen Section 8.10 Requirement:**

Radiated emissions which fall in the restricted bands, as defined in Section 8.10 of RSS-Gen, must also comply with the radiated emission limits specified in Section 8.9.

Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.009 ~ 0.110	240 ~ 285	9.0 ~ 9.2
2.1735 ~ 2.1905	322 ~ 335.4	9.3 ~ 9.5
3.020 ~ 3.026	399.9 ~ 410	10.6 ~ 12.7
4.125 ~ 4.128	608 ~ 614	13.25 ~ 13.4
4.17725 ~ 4.17775	960 ~ 1427	14.47 ~ 14.5
4.20725 ~ 4.20775	1435 ~ 1626.5	15.35 ~ 16.2
5.677 ~ 5.683	1645.5 ~ 1646.5	17.7 ~ 21.4
6.215 ~ 6.218	1660 ~ 1710	22.01 ~ 23.12
6.26775 ~ 6.26825	1718.8 ~ 1722.2	23.6 ~ 24.0
6.31175 ~ 6.31225	2200 ~ 2300	31.2 ~ 31.8
8.291 ~ 8.294	2310 ~ 2390	36.43 ~ 36.5
8.362 ~ 8.366	2655 ~ 2900	Above 38.6
8.37625 ~ 8.38675	3260 ~ 3267	--
8.41425 ~ 8.41475	3332 ~ 3339	
12.29 ~ 12.293	334.5 ~ 3358	
12.51975 ~ 12.52025	3500 ~ 4400	
12.57675 ~ 12.57725	4500 ~ 5150	
13.36 ~ 13.41	5350 ~ 5460	
16.42 ~ 16.423	7250 ~ 7750	
16.69475 ~ 16.69525	8025 ~ 8500	
16.80425 ~ 16.80475	--	
25.5 ~ 25.67		
37.5 ~ 38.25		
73 ~ 74.6		
74.8 ~ 75.2		
108 ~ 138		
156.52475 ~ 156.525225		
156.7 ~ 156.9		

**7.6.2. Test Procedure Used**

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

**7.6.3. Test Setting**

**Table 1 - RBW as a function of frequency**

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz

**Quasi-Peak Measurements below 1GHz**

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

**Peak Measurements above 1GHz**

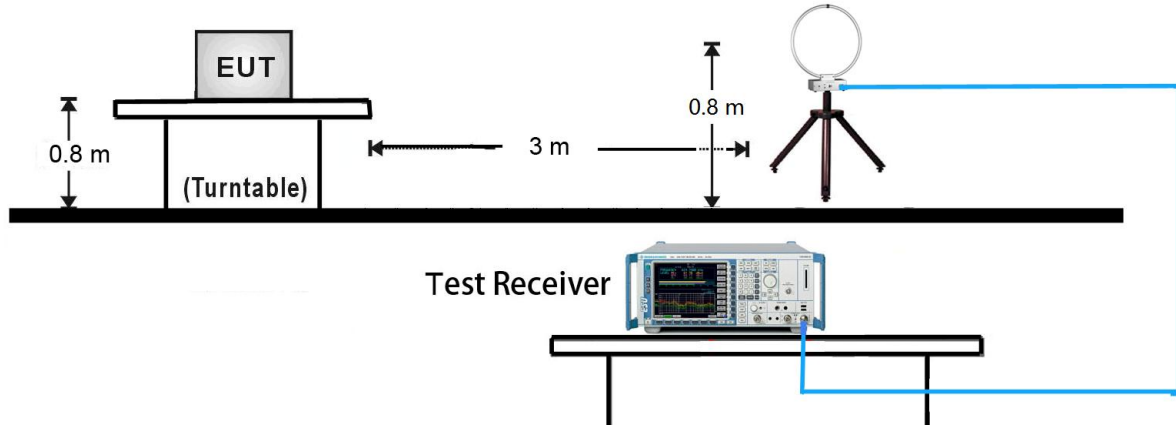
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

**Average Measurements above 1GHz (Method VB)**

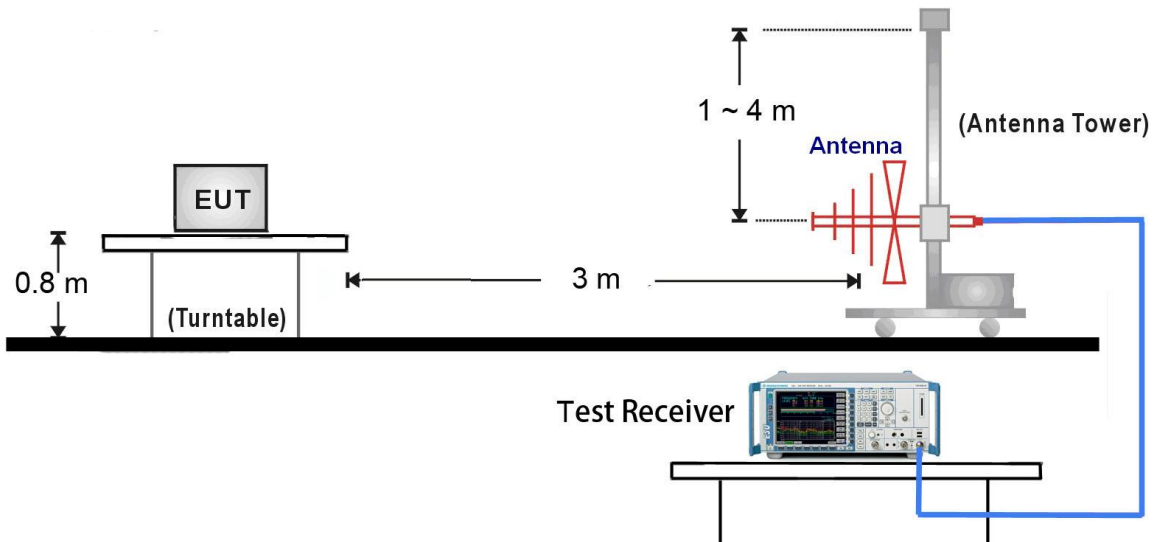
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10 Hz. If the EUT duty cycle is  $< 98\%$ , set  $VBW \geq 1/T$ . T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

### 7.6.4. Test Setup

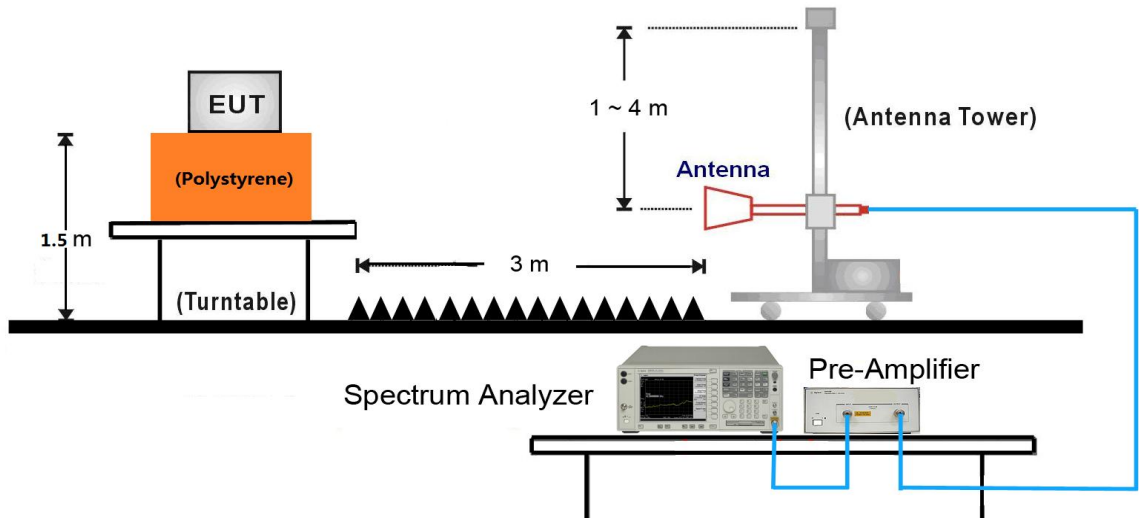
#### 9kHz ~ 30MHz Test Setup:



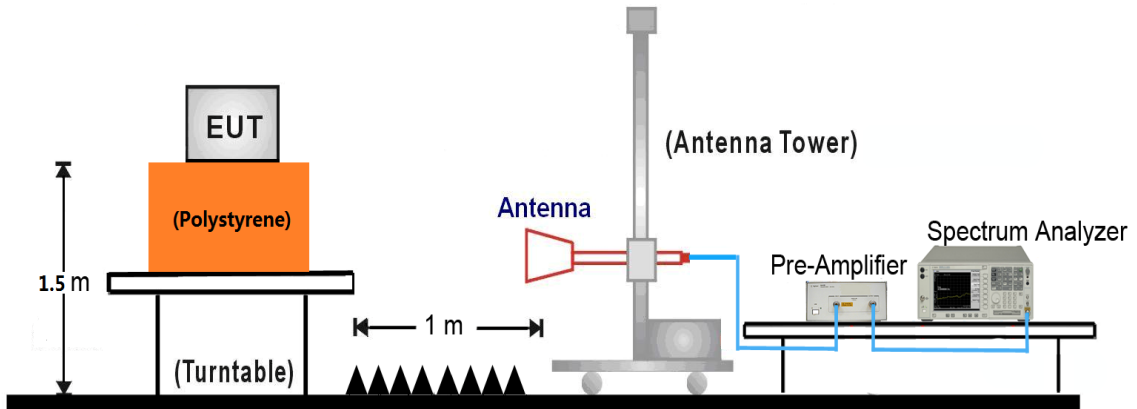
#### 30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



18GHz ~25GHz Test Setup:





### 7.6.5. Test Result

Test Mode:	BLE - Ant 0	Test Site:	AC1
Test Channel:	00	Test Engineer:	Bruce Wang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4808.0	46.0	2.7	48.7	74.0	-25.3	Peak	Horizontal
*	6542.0	36.3	5.9	42.2	89.0	-46.8	Peak	Horizontal
	9126.0	35.3	9.7	45.0	74.0	-29.0	Peak	Horizontal
*	13095.5	35.0	12.5	47.5	89.0	-41.5	Peak	Horizontal
	4803.8	52.2	2.7	54.9	74.0	-19.1	Peak	Vertical
	4803.8	47.8	2.7	50.5	54.0	-3.5	Average	Vertical
*	6516.5	35.2	6.0	41.2	89.0	-47.8	Peak	Vertical
	8029.5	36.2	8.7	44.9	74.0	-29.1	Peak	Vertical
*	9891.0	34.6	11.6	46.2	89.0	-42.8	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (109.0dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Test Mode:	BLE - Ant 0	Test Site:	AC1
Test Channel:	19	Test Engineer:	Bruce Wang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	42.4	2.7	45.1	74.0	-28.9	Peak	Horizontal
*	7154.0	34.2	7.7	41.9	90.4	-48.5	Peak	Horizontal
	9177.0	35.0	10.0	45.0	74.0	-29.0	Peak	Horizontal
*	12900.0	35.1	12.1	47.2	90.4	-43.2	Peak	Horizontal
	4879.8	49.0	2.7	51.7	74.0	-22.3	Peak	Vertical
	4879.8	45.3	2.7	48.0	54.0	-6.0	Average	Vertical
*	6627.0	35.4	6.0	41.4	90.4	-49.0	Peak	Vertical
	8046.5	35.6	8.8	44.4	74.0	-29.6	Peak	Vertical
*	10528.5	34.2	12.5	46.7	90.4	-43.7	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (110.4dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Test Mode:	BLE - Ant 0	Test Site:	AC1
Test Channel:	39	Test Engineer:	Bruce Wang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4829.3	35.5	2.7	38.2	74.0	-35.8	Peak	Horizontal
*	6283.3	34.0	4.9	38.9	76.7	-37.8	Peak	Horizontal
	9182.4	34.2	10.0	44.2	74.0	-29.8	Peak	Horizontal
*	9763.3	34.2	11.4	45.6	76.7	-31.1	Peak	Horizontal
	4829.3	34.9	2.7	37.6	74.0	-36.4	Peak	Vertical
*	6382.4	34.8	5.3	40.1	76.7	-36.6	Peak	Vertical
	9182.9	34.3	10.0	44.3	74.0	-29.7	Peak	Vertical
*	12738.0	33.5	11.7	45.2	76.7	-31.5	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (96.7dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Test Mode:	BLE - Ant 1	Test Site:	AC1
Test Channel:	00	Test Engineer:	Bruce Wang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4808.0	44.8	5.9	50.7	74.0	-23.3	Peak	Horizontal
*	6272.3	10.9	33.4	44.3	89.2	-44.9	Peak	Horizontal
	8472.3	11.8	36.5	48.3	74.0	-25.7	Peak	Horizontal
*	9638.2	12.5	38.1	50.6	89.2	-38.6	Peak	Horizontal
	4803.9	48.3	5.8	54.1	74.0	-19.9	Peak	Vertical
	4803.9	43.5	5.9	49.4	54.0	-4.6	Average	Vertical
*	6728.3	11.6	34.4	46.0	89.2	-43.2	Peak	Vertical
	8172.3	12.1	36.9	49.0	74.0	-25.0	Peak	Vertical
*	9628.3	12.2	38.1	50.3	89.2	-38.9	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (109.2dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Test Mode:	BLE - Ant 1	Test Site:	AC1
Test Channel:	19	Test Engineer:	Bruce Wang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4876.0	42.4	6.0	48.4	74.0	-25.6	Peak	Horizontal
*	6273.3	10.5	33.4	43.9	90.5	-46.6	Peak	Horizontal
	9128.4	12.0	37.3	49.3	74.0	-24.7	Peak	Horizontal
*	9638.3	11.9	38.1	50.0	90.5	-40.5	Peak	Horizontal
	4879.9	48.2	6.0	54.2	74.0	-19.8	Peak	Vertical
	4879.9	42.5	6.0	48.5	54.0	-5.5	Average	Vertical
*	6273.3	11.0	33.4	44.4	90.5	-46.1	Peak	Vertical
	9182.4	11.9	37.6	49.5	74.0	-24.5	Peak	Vertical
*	12738.4	13.6	39.0	52.6	90.5	-37.9	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (110.5dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

Test Mode:	BLE - Ant 1	Test Site:	AC1
Test Channel:	39	Test Engineer:	Bruce Wang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dBμV)	Factor (dB)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
	4823.3	10.5	31.5	42.0	74.0	-32.0	Peak	Horizontal
*	6372.4	10.4	33.8	44.2	76.1	-31.9	Peak	Horizontal
	9182.4	11.7	37.6	49.3	74.0	-24.7	Peak	Horizontal
*	12732.9	13.6	39.0	52.6	76.1	-23.5	Peak	Horizontal
	4928.3	10.3	31.6	41.9	74.0	-32.1	Peak	Vertical
*	6382.2	11.1	33.8	44.9	76.1	-31.2	Peak	Vertical
	9129.4	11.9	37.3	49.2	74.0	-24.8	Peak	Vertical
*	12729.3	12.9	39.0	51.9	76.1	-24.2	Peak	Vertical

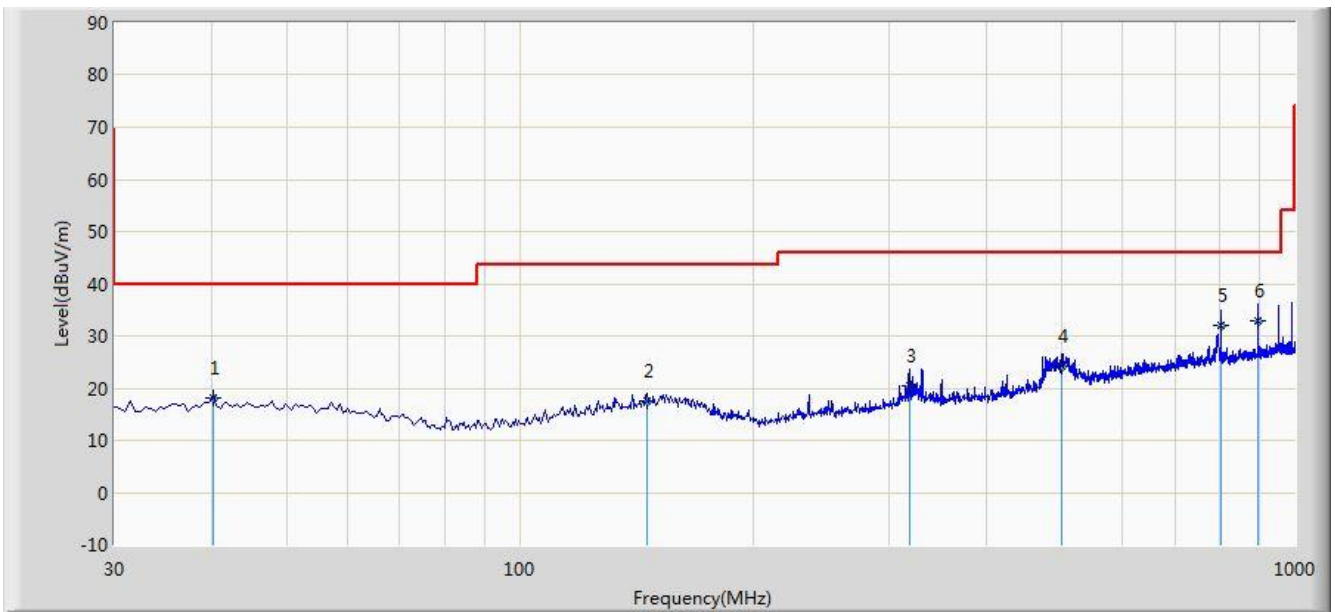
Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (96.1dBμV/m) or 15.209 which is higher.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre\_Amplifier Gain (dB)

**The worst case of Radiated Emission below 1GHz:**

Site: AC1	Time: 2017/12/13 - 00:14
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
<b>Worse Case Mode:</b> Transmit by BLE at channel 2402MHz Ant 1	



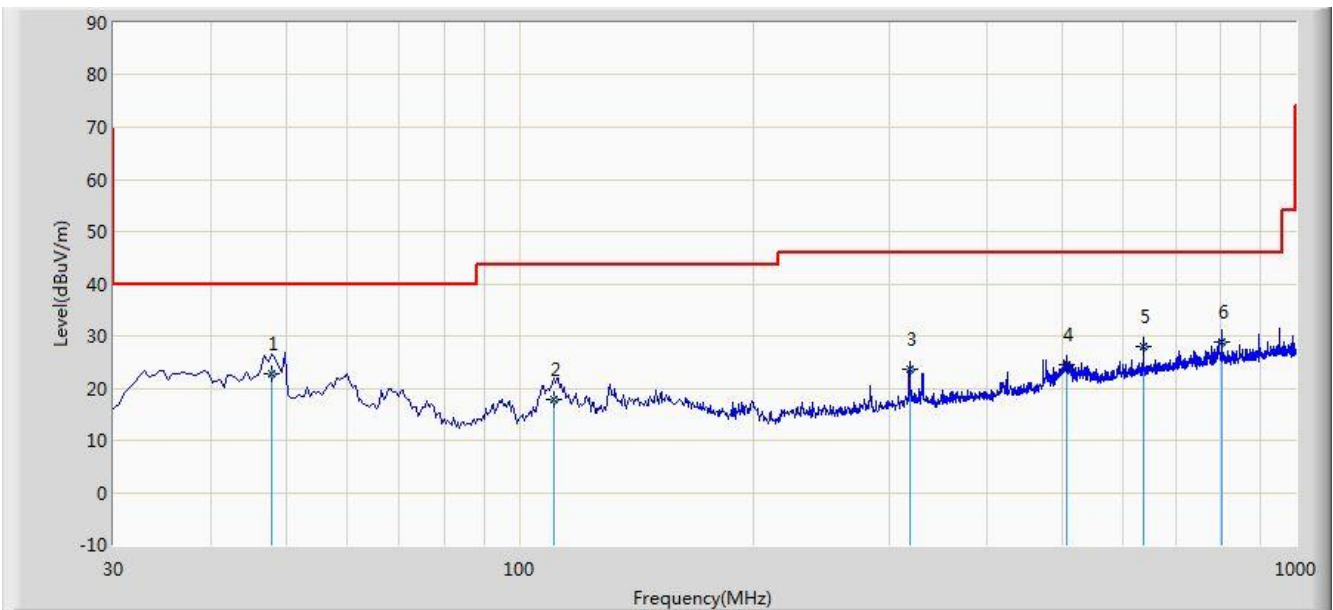
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			40.185	18.257	3.650	-21.743	40.000	14.607	QP
2			145.940	17.651	2.650	-25.849	43.500	15.001	QP
3			318.090	20.530	5.638	-25.470	46.000	14.893	QP
4			500.450	24.232	5.655	-21.768	46.000	18.576	QP
5			803.090	31.997	8.655	-14.003	46.000	23.342	QP
6		*	897.180	33.041	8.655	-12.959	46.000	24.387	QP

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

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

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

Site: AC1	Time: 2017/12/13 - 00:17
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
<b>Worse Case Mode:</b> Transmit by BLE at channel 2402MHz Ant 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			47.945	22.861	8.635	-17.139	40.000	14.226	QP
2			110.995	17.886	5.680	-25.614	43.500	12.206	QP
3			318.090	23.530	8.638	-22.470	46.000	14.893	QP
4			507.725	24.359	5.635	-21.641	46.000	18.724	QP
5			636.250	27.889	6.625	-18.111	46.000	21.264	QP
6		*	803.090	28.974	5.632	-17.026	46.000	23.342	QP

Note 1: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

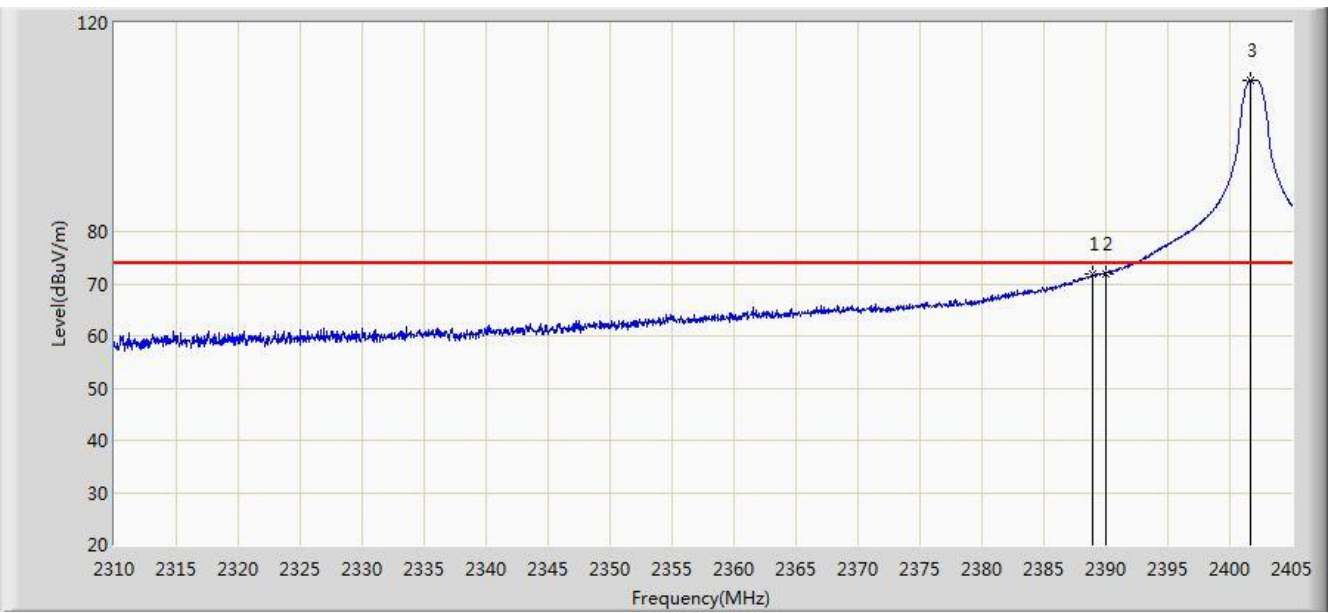
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.



## 7.7. Radiated Restricted Band Edge Measurement

### 7.7.1. Test Result

Site: AC1	Time: 2017/12/01 - 00:01
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2402MHz Ant 0	

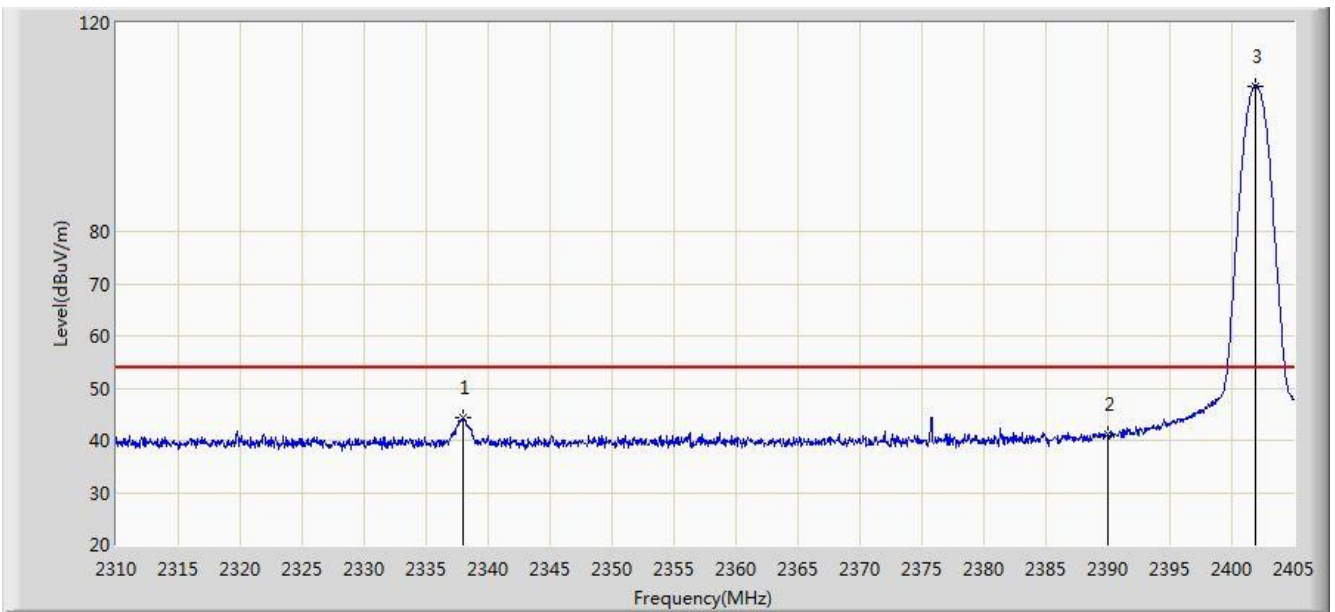


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2388.897	71.830	40.625	-2.170	74.000	31.205	PK
2			2390.000	72.018	40.815	-1.982	74.000	31.203	PK
3		*	2401.722	108.954	77.770	N/A	N/A	31.184	PK

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/01 - 00:04
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2402MHz Ant 0	

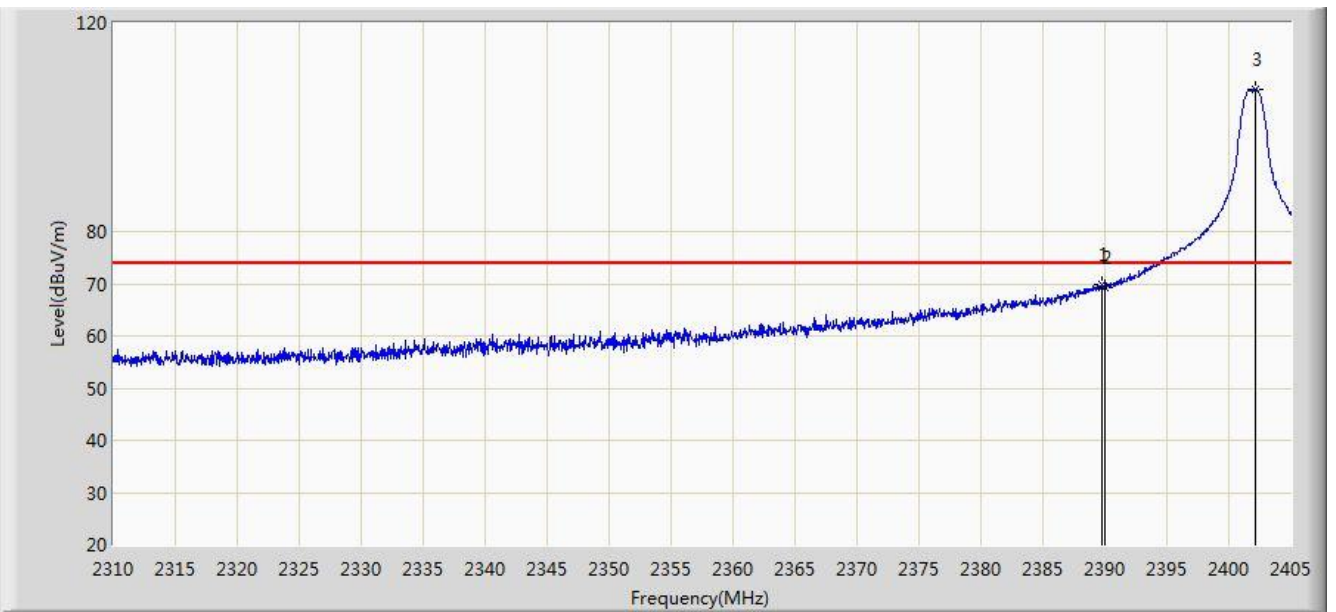


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2338.025	44.253	12.914	-9.747	54.000	31.338	AV
2			2390.000	41.026	9.823	-12.974	54.000	31.203	AV
3		*	2401.865	107.949	76.765	N/A	N/A	31.184	AV

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

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

Site: AC1	Time: 2017/12/01 - 00:07
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2402MHz Ant 0	

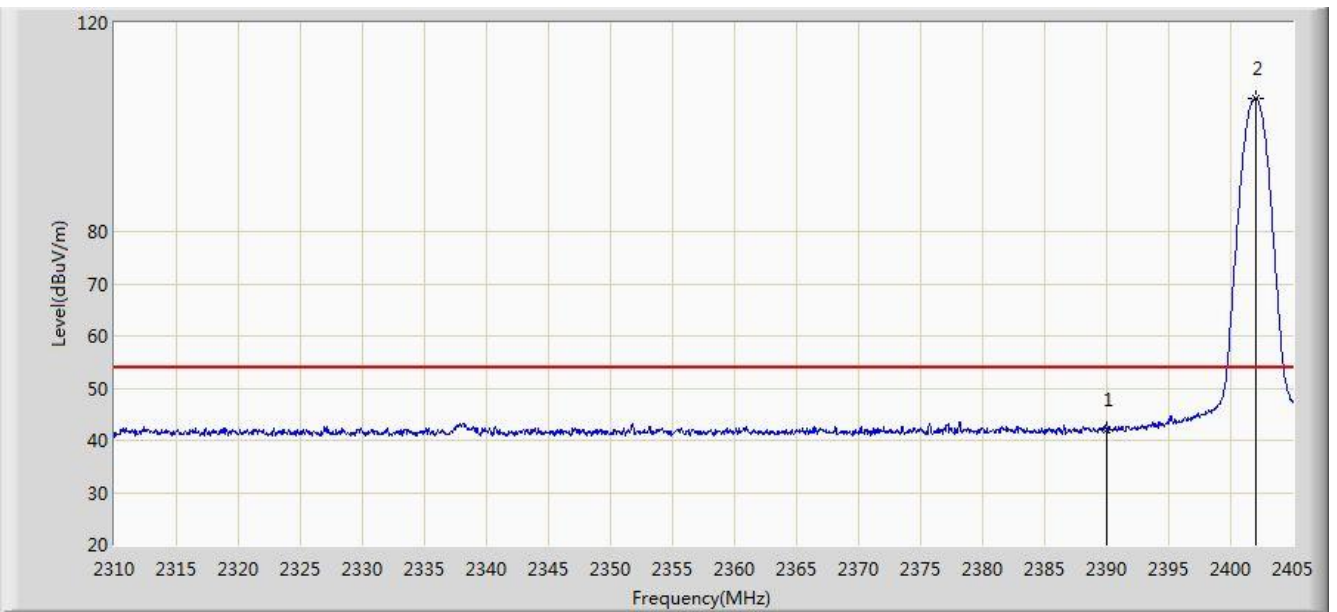


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2389.705	69.901	38.698	-4.099	74.000	31.204	PK
2			2390.000	69.351	38.148	-4.649	74.000	31.203	PK
3		*	2402.198	107.138	75.954	N/A	N/A	31.184	PK

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

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

Site: AC1	Time: 2017/12/01 - 00:08
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2402MHz Ant 0	

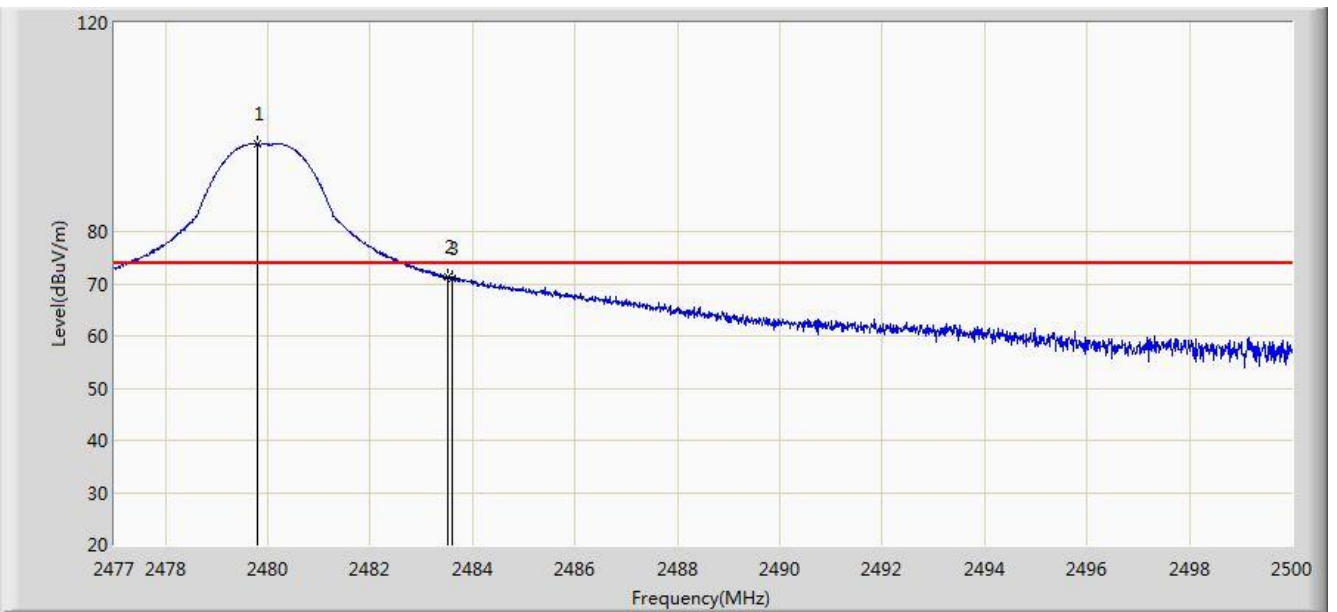


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	41.910	10.707	-12.090	54.000	31.203	AV
2		*	2402.008	105.577	74.393	N/A	N/A	31.184	AV

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/01 - 00:19
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2480MHz Ant 0	

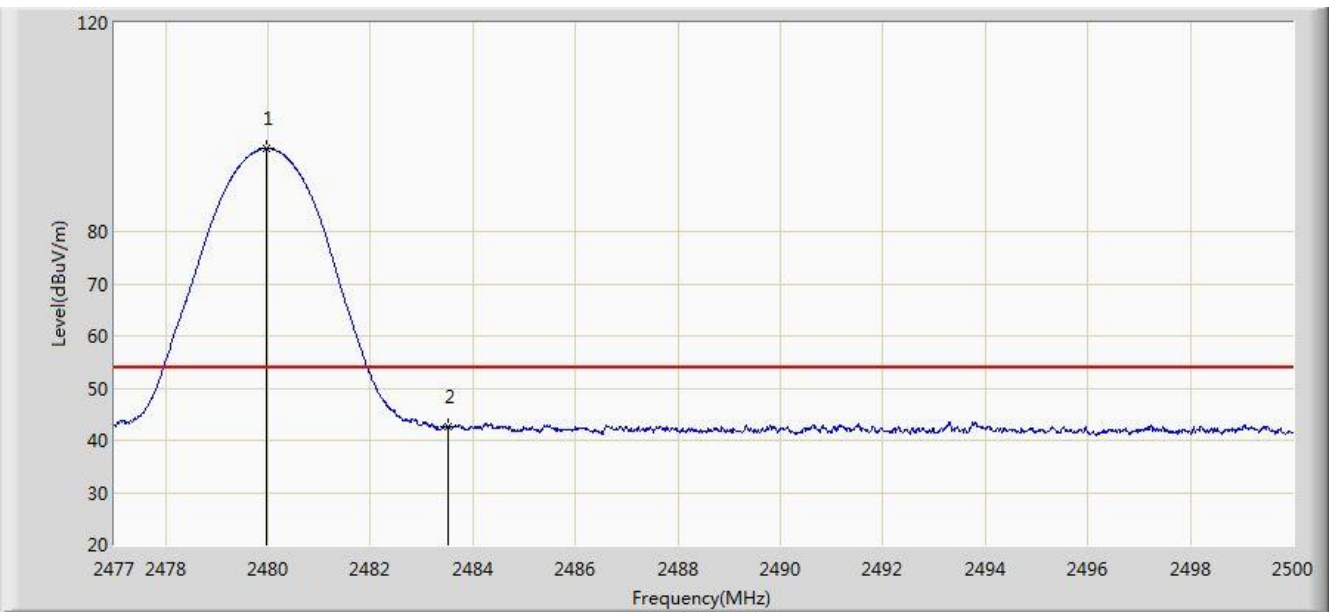


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.783	96.697	65.513	N/A	N/A	31.184	PK
2			2483.500	71.269	40.076	-2.731	74.000	31.194	PK
3			2483.601	70.880	39.686	-3.120	74.000	31.194	PK

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/01 - 00:20
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2480MHz Ant 0	

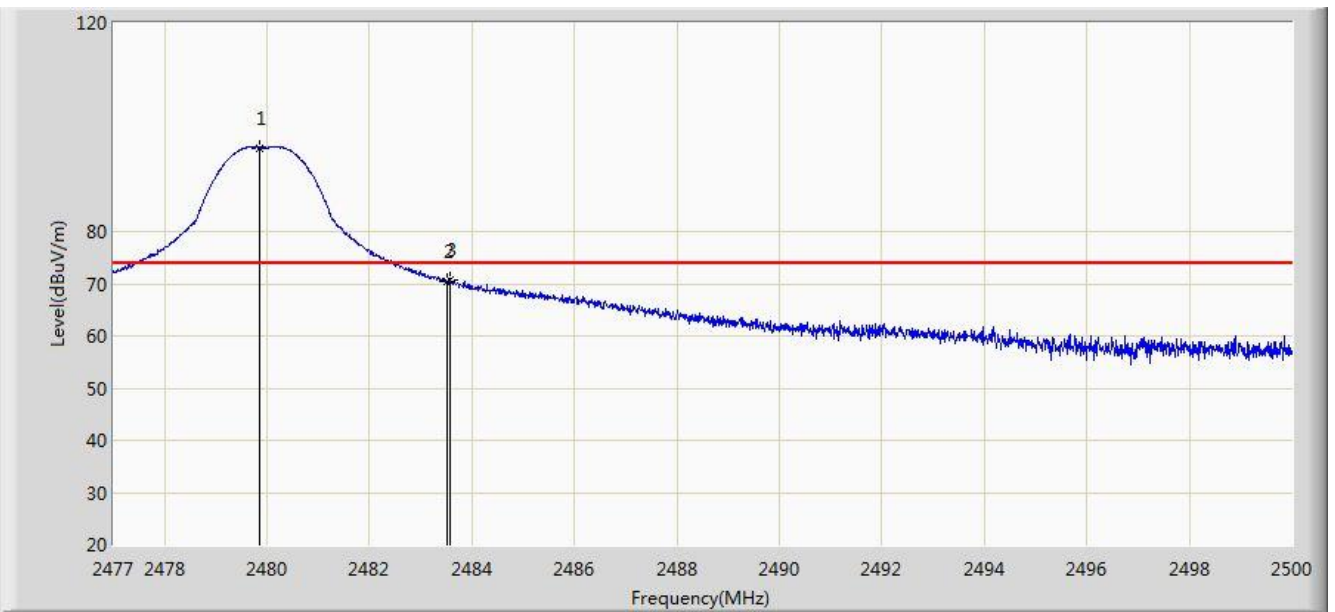


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.956	95.903	64.719	N/A	N/A	31.184	AV
2			2483.500	42.672	11.479	-11.328	54.000	31.194	AV

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/01 - 00:21
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2480MHz Ant 0	

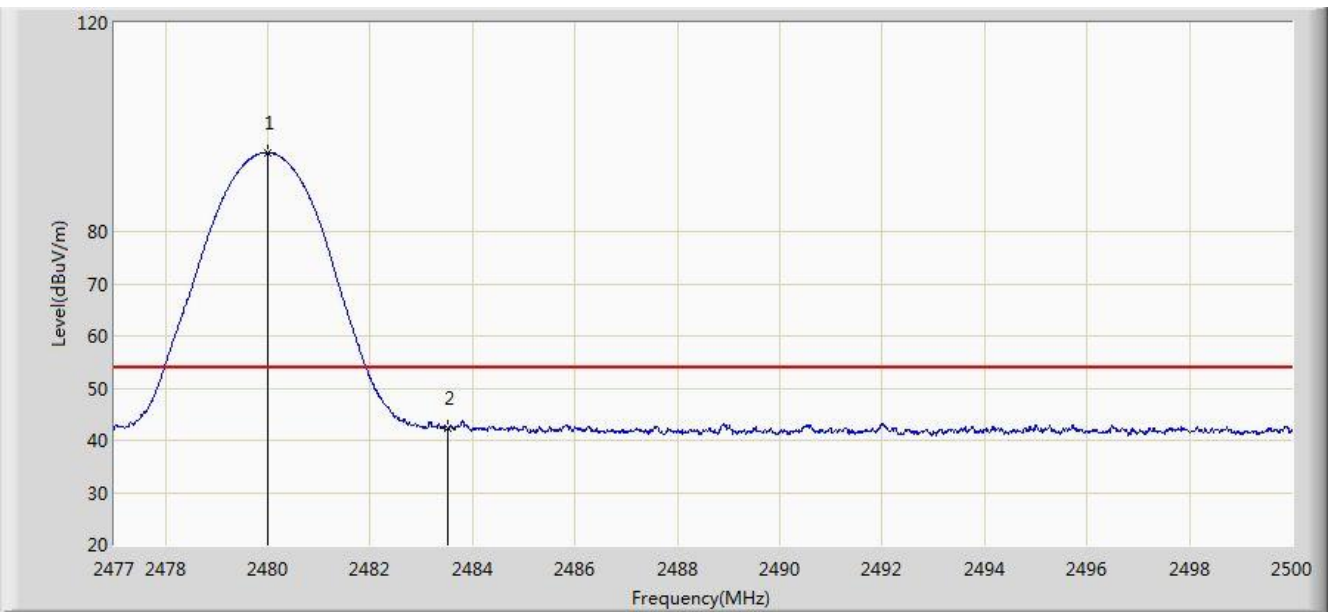


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.852	96.080	64.896	N/A	N/A	31.184	PK
2			2483.500	70.317	39.124	-3.683	74.000	31.194	PK
3			2483.566	70.734	39.541	-3.266	74.000	31.194	PK

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

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

Site: AC1	Time: 2017/12/01 - 00:22
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at channel 2480MHz Ant 0	



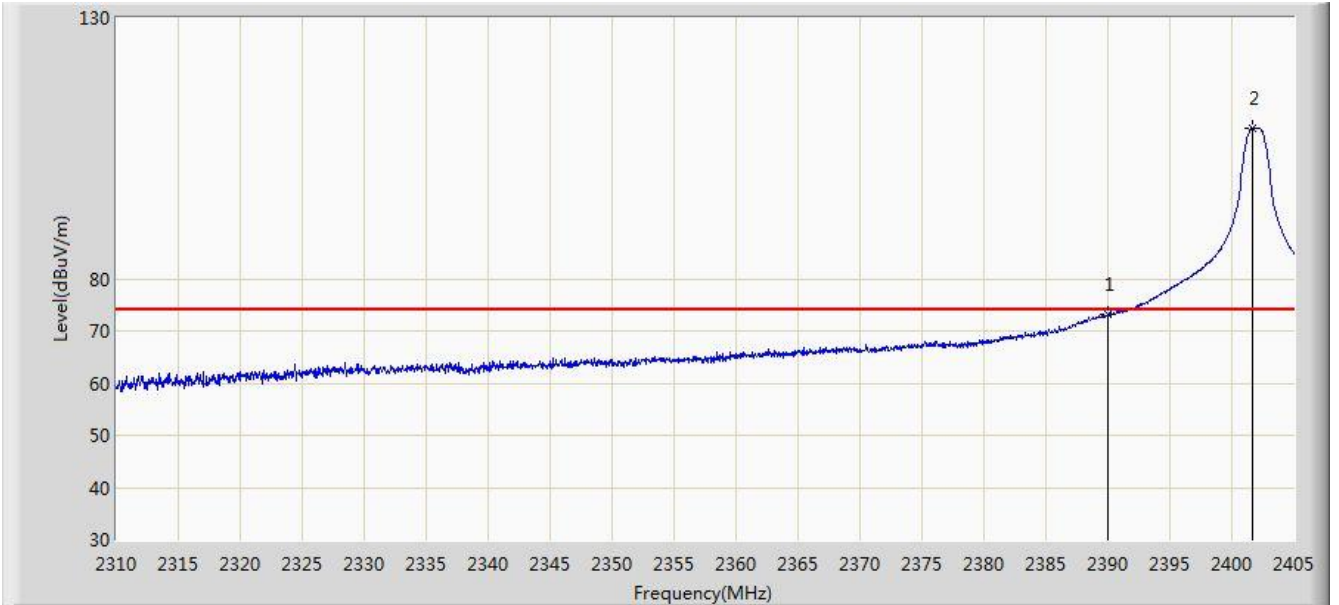
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.990	95.114	63.930	N/A	N/A	31.184	AV
2			2483.500	42.185	10.992	-11.815	54.000	31.194	AV

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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



Site: AC1	Time: 2017/12/12 - 01:24
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2402MHz Ant 1	

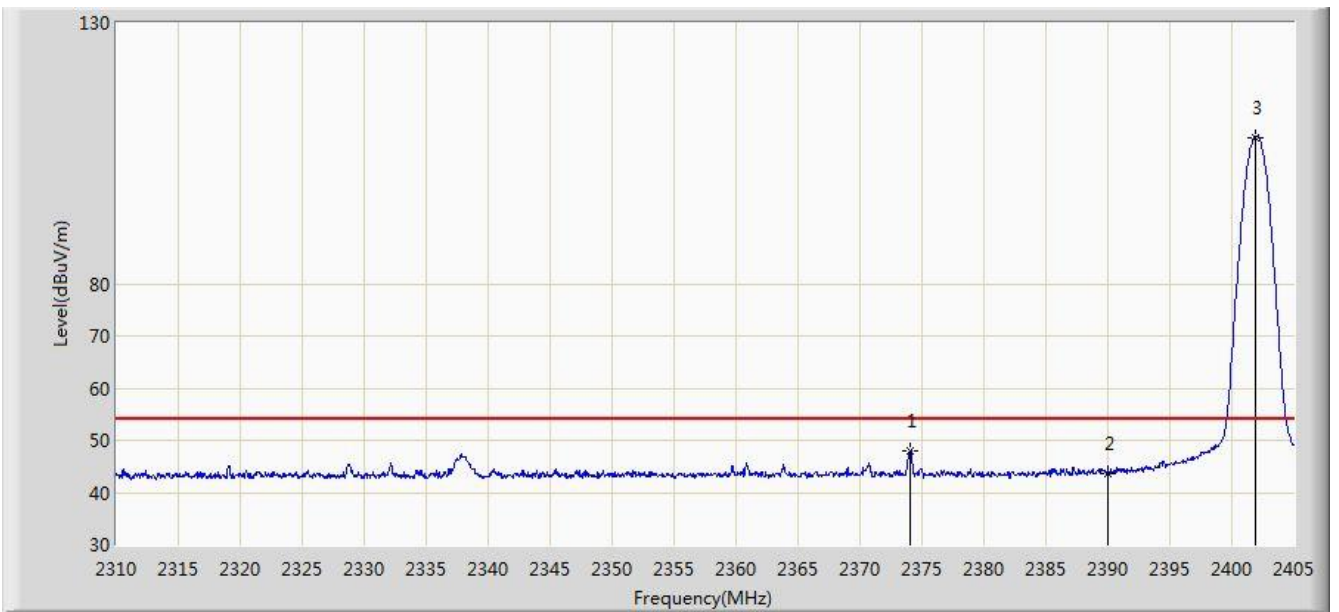


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	73.068	40.741	-0.932	74.000	32.327	PK
2		*	2401.675	108.846	76.541	N/A	N/A	32.305	PK

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/12 - 01:25
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2402MHz Ant 1	

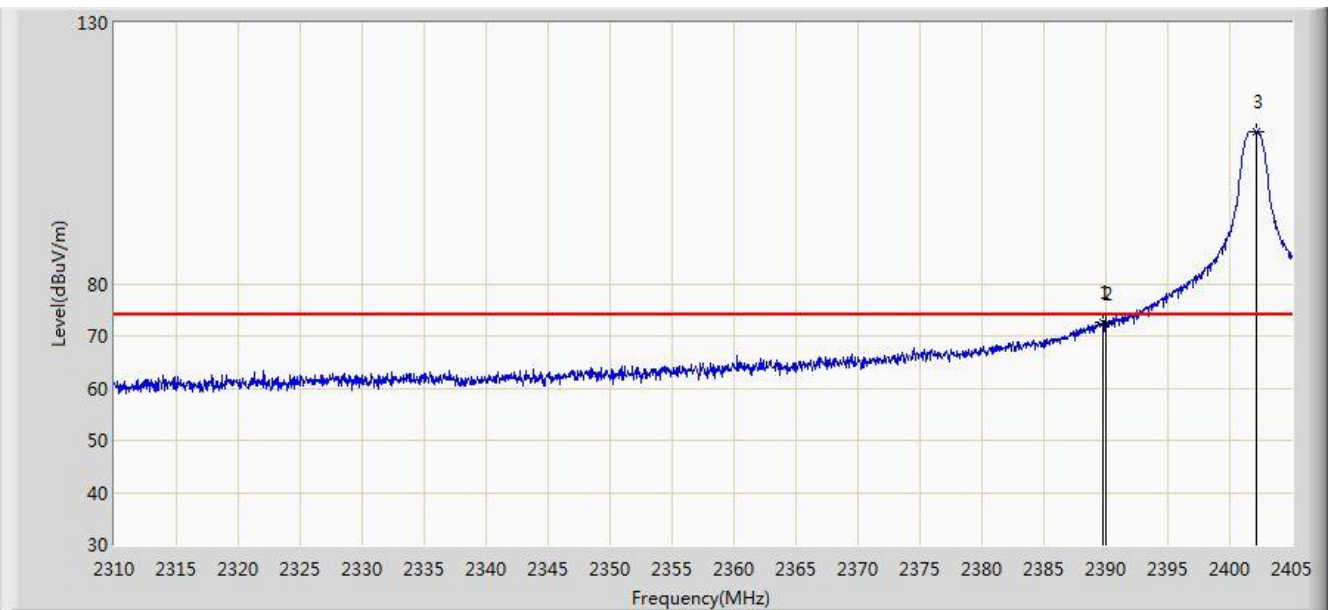


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2374.077	47.892	15.542	-6.108	54.000	32.350	AV
2			2390.000	43.739	11.412	-10.261	54.000	32.327	AV
3		*	2401.865	108.115	75.810	N/A	N/A	32.305	AV

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

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

Site: AC1	Time: 2017/12/12 - 01:29
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2402MHz Ant 1	

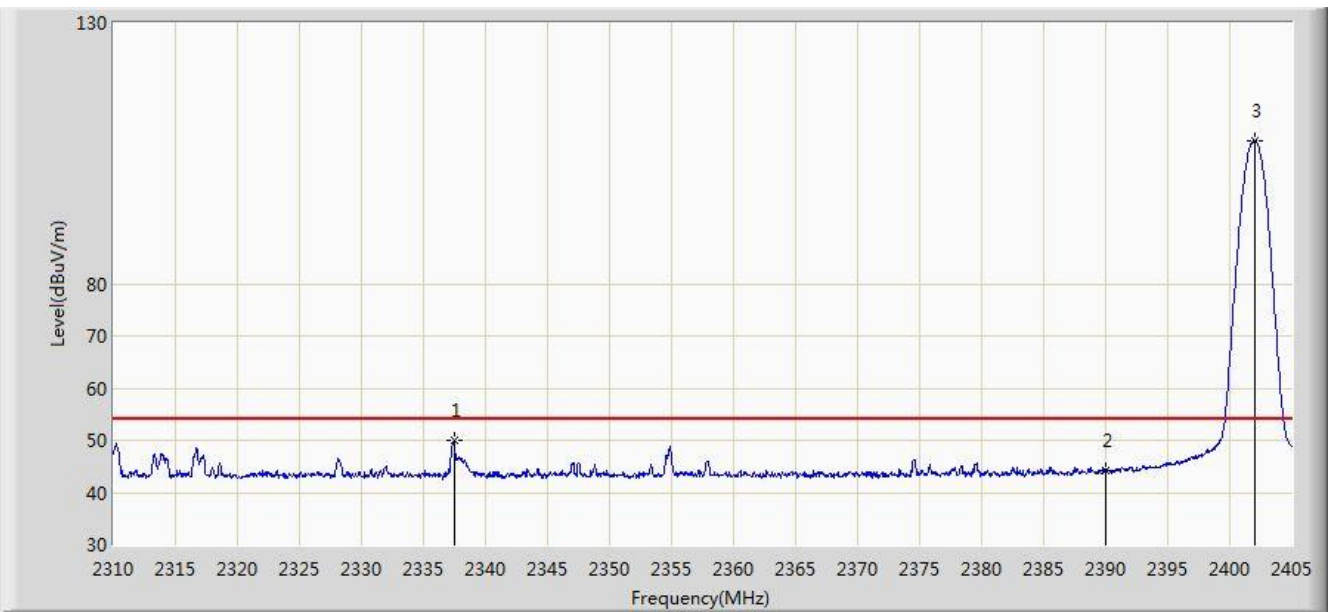


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2389.800	72.549	40.222	-1.451	74.000	32.327	PK
2			2390.000	72.285	39.958	-1.715	74.000	32.327	PK
3		*	2402.198	109.216	76.912	N/A	N/A	32.304	PK

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/12 - 01:32
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2402MHz Ant 1	

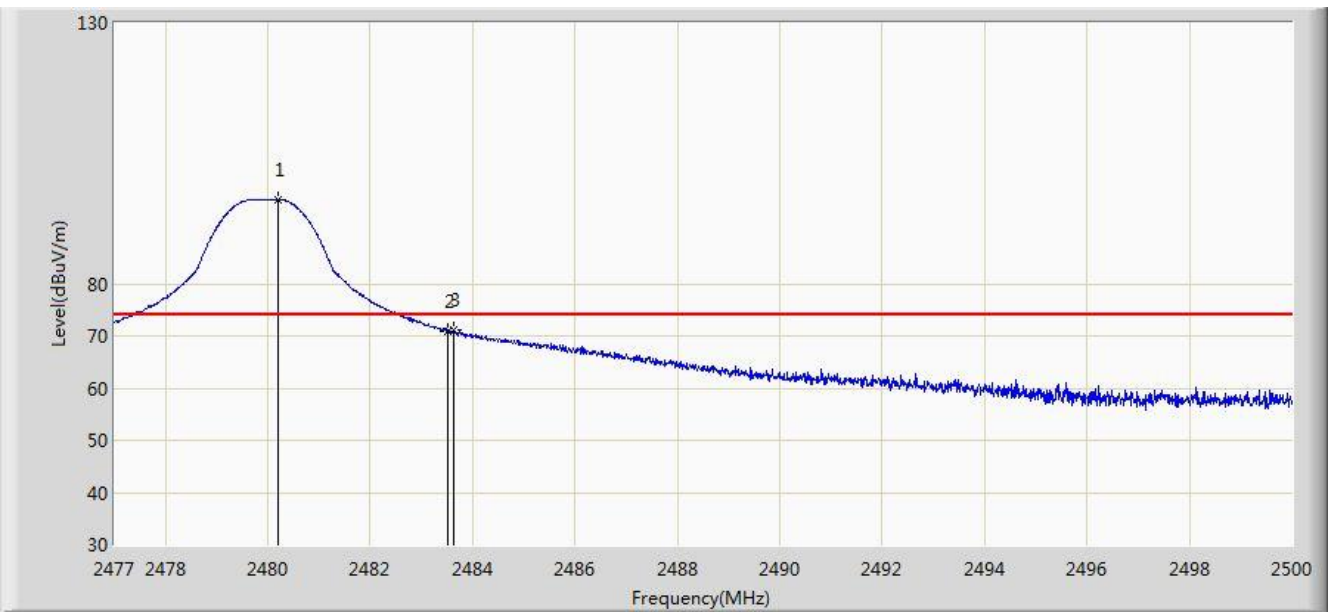


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2337.455	49.861	17.419	-4.139	54.000	32.441	AV
2			2390.000	44.309	11.982	-9.691	54.000	32.327	AV
3		*	2402.008	107.422	75.118	N/A	N/A	32.305	AV

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

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

Site: AC1	Time: 2017/12/12 - 01:54
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2480MHz Ant 1	

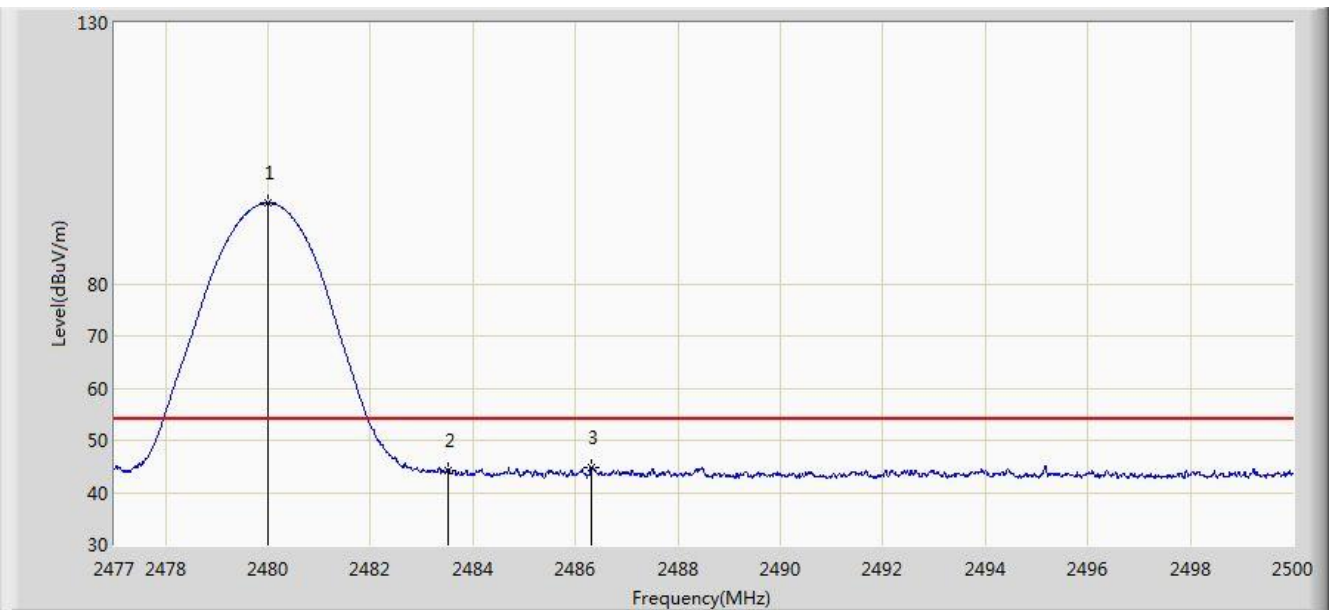


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.186	96.141	63.815	N/A	N/A	32.327	PK
2			2483.500	70.762	38.423	-3.238	74.000	32.340	PK
3			2483.635	71.142	38.802	-2.858	74.000	32.340	PK

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/12 - 01:56
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2480MHz Ant 1	

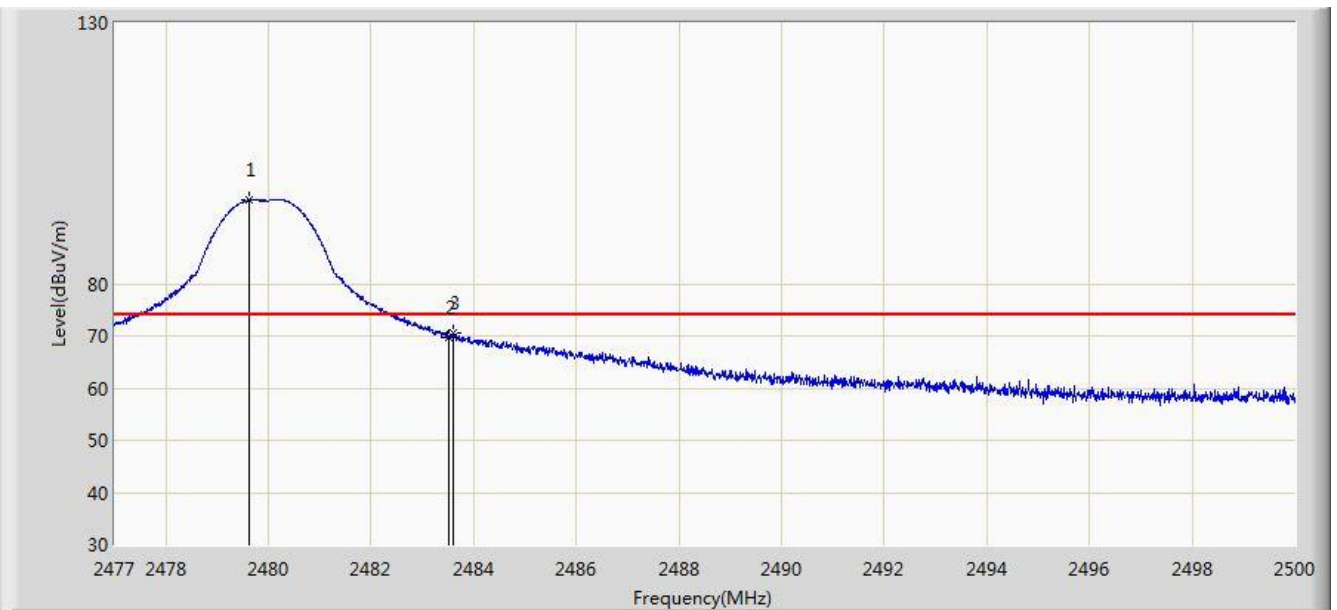


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.001	95.453	63.128	N/A	N/A	32.325	AV
2			2483.500	44.083	11.744	-9.917	54.000	32.340	AV
3			2486.303	44.852	12.502	-9.148	54.000	32.350	AV

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/12 - 01:56
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2480MHz Ant 1	

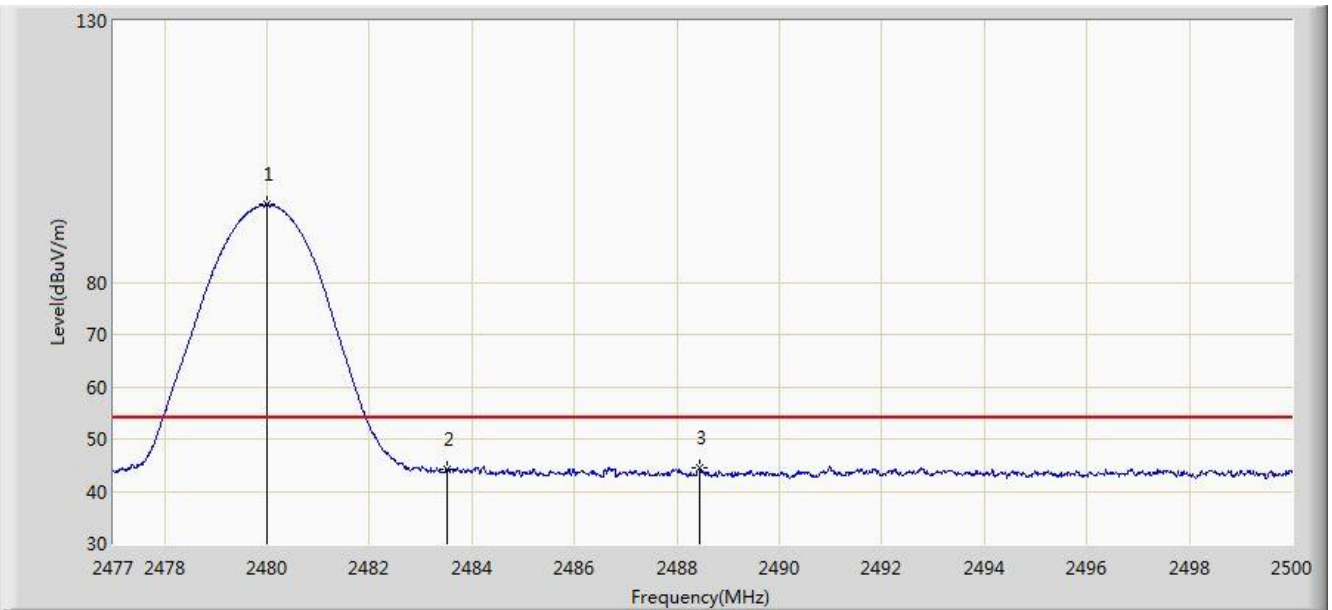


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.634	96.005	63.681	N/A	N/A	32.324	PK
2			2483.500	69.623	37.284	-4.377	74.000	32.340	PK
3			2483.590	70.451	38.112	-3.549	74.000	32.340	PK

Note: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Site: AC1	Time: 2017/12/12 - 02:02
Limit: FCC_Part15.209_RE(3m)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
Note: Transmit by BLE at Channel 2480MHz Ant 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.990	94.792	62.467	N/A	N/A	32.325	AV
2			2483.500	44.078	11.739	-9.922	54.000	32.340	AV
3			2488.454	44.476	12.117	-9.524	54.000	32.359	AV

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

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



## 7.8. AC Conducted Emissions Measurement

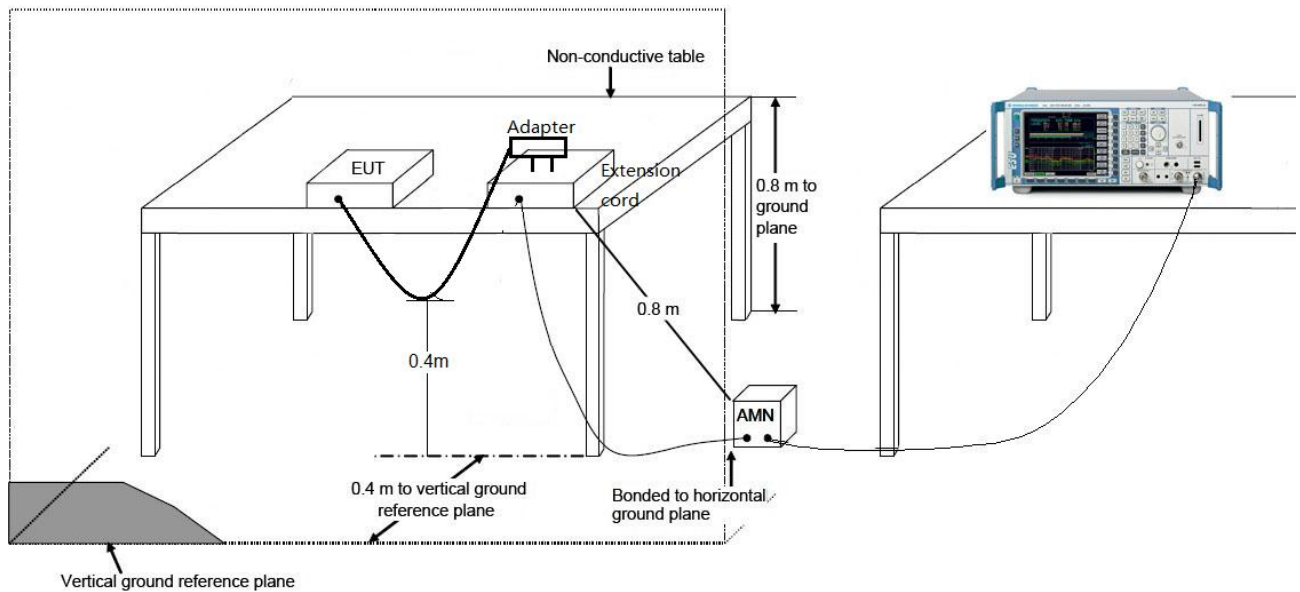
### 7.8.1. Test Limit

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.

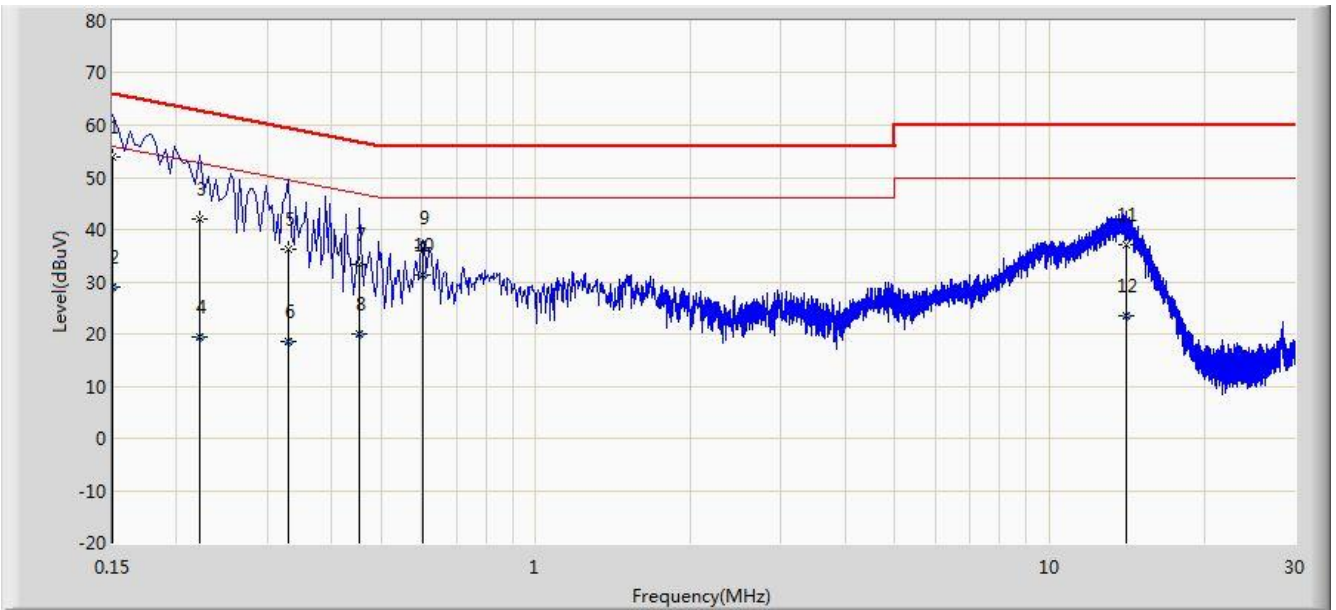
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

### 7.8.2. Test Setup



### 7.8.3. Test Result

Site: SR2	Time: 2017/12/13 - 15:41
Limit: FCC_Part15.207_CE_AC Power	Engineer: Polly Zong
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
<b>Worst Case Mode:</b> Transmit by BLE at Channel 2402MHz	

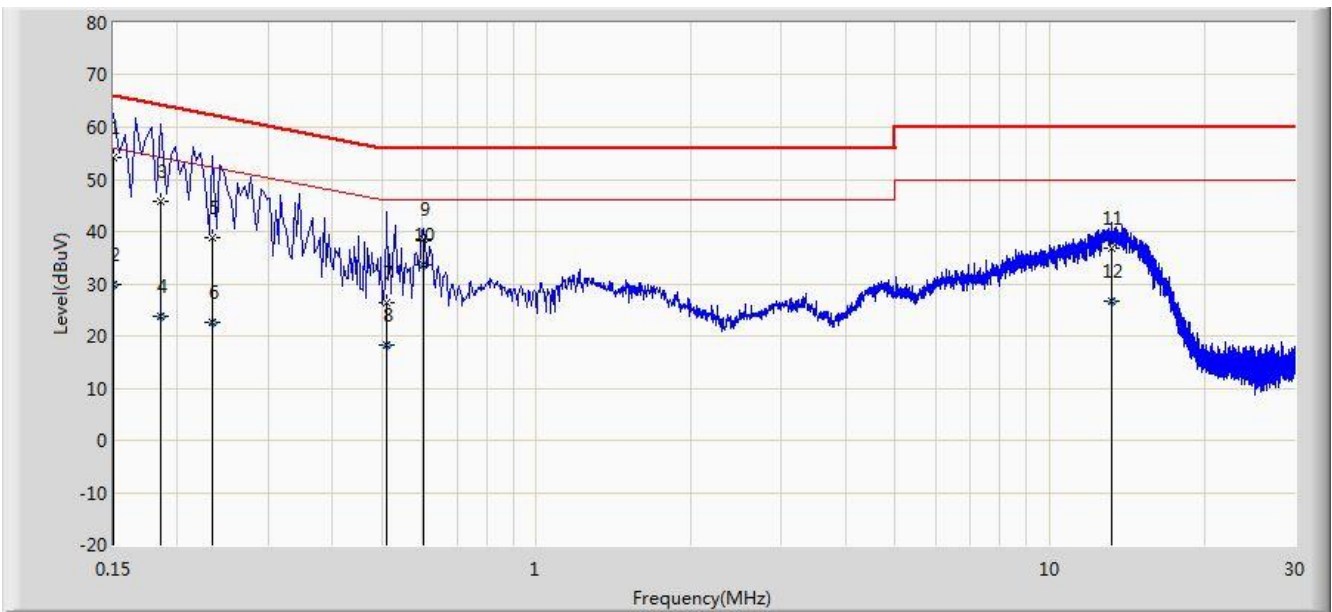


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	53.855	42.686	-12.145	66.000	11.168	QP
2			0.150	28.842	17.673	-27.158	56.000	11.168	AV
3			0.222	41.967	32.027	-20.776	62.744	9.941	QP
4			0.222	19.487	9.546	-33.257	52.744	9.941	AV
5			0.330	36.144	26.116	-23.307	59.451	10.028	QP
6			0.330	18.512	8.484	-30.939	49.451	10.028	AV
7			0.454	33.370	23.240	-23.432	56.802	10.129	QP
8			0.454	19.873	9.743	-26.929	46.802	10.129	AV
9			0.602	36.627	26.513	-19.373	56.000	10.114	QP
10			0.602	31.210	21.096	-14.790	46.000	10.114	AV
11			14.070	37.230	27.167	-22.770	60.000	10.063	QP
12			14.070	23.383	13.319	-26.617	50.000	10.063	AV

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

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SR2	Time: 2017/12/13 - 15:44
Limit: FCC_Part15.207_CE_AC Power	Engineer: Polly Zong
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Cassia Bluetooth Router	Power: AC 120V/60Hz
<b>Worst Case Mode:</b> Transmit by BLE at Channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	54.060	42.918	-11.940	66.000	11.142	QP
2			0.150	29.786	18.644	-26.214	56.000	11.142	AV
3			0.186	45.776	35.741	-18.437	64.213	10.035	QP
4			0.186	23.865	13.830	-30.348	54.213	10.035	AV
5			0.234	38.963	28.974	-23.344	62.307	9.989	QP
6			0.234	22.608	12.620	-29.698	52.307	9.989	AV
7			0.510	26.446	16.269	-29.554	56.000	10.176	QP
8			0.510	18.363	8.187	-27.637	46.000	10.176	AV
9			0.602	38.575	28.445	-17.425	56.000	10.130	QP
10			0.602	33.616	23.486	-12.384	46.000	10.130	AV
11			13.230	36.858	26.763	-23.142	60.000	10.095	QP
12			13.230	26.555	16.459	-23.445	50.000	10.095	AV

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

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

## 8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Cassia Bluetooth Router** is in compliance with Part 15C of the FCC Rules and IC Rules.

————— The End —————