

# MEASUREMENT REPORT

## FCC PART 15C / RSS-247 WLAN 802.11b/g/n

---

**Applicant:** Redpine Signals Inc  
**Address:** 2107 N.First Street, Suite 540, San Jose, CA  
95131-2019, USA  
**Product:** Single Band SIP Module, Small Form Factor Single  
Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module  
**Model No.:** M4SB  
**Brand Name:** Redpine Signals  
**FCC Rule Part(s):** Part15 Subpart C (Section 15.247)  
**Test Procedure(s):** ANSI C63.10-2013  
**Test Date:** February 28 ~ March 03, 2020

Reviewed By:

*Jame Yuan*

( Jame Yuan )

Approved By:

*Robin Wu*

( Robin Wu )



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.

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
1912RSU024-U5	Rev. 01	Initial Report	03-19-2020	Valid

Note: This module was used in portable host and changed the antenna, so we only evaluated the radiated spurious emissions item.

---

## CONTENTS

Description	Page
<b>General Information.....</b>	<b>5</b>
<b>1. INTRODUCTION.....</b>	<b>6</b>
1.1. Scope.....	6
1.2. MRT Test Location.....	6
<b>2. PRODUCT INFORMATION.....</b>	<b>7</b>
2.1. Equipment Description.....	7
2.2. Product Specification Subjective to this Report.....	7
2.3. Description of Host.....	7
2.4. Working Frequencies for this report.....	8
2.5. Test Mode.....	8
2.6. Description of Test Software.....	8
<b>3. DESCRIPTION of TEST.....</b>	<b>9</b>
3.1. Evaluation Procedure.....	9
3.2. Radiated Emissions.....	10
<b>4. TEST EQUIPMENT CALIBRATION DATE.....</b>	<b>11</b>
<b>5. MEASUREMENT UNCERTAINTY.....</b>	<b>12</b>
<b>6. TEST RESULT.....</b>	<b>13</b>
6.1. Summary.....	13
6.2. Radiated Spurious Emission Measurement.....	14
6.2.1. Test Limit.....	14
6.2.2. Test Procedure Used.....	14
6.2.3. Test Setting.....	14
6.2.4. Test Setup.....	16
6.2.5. Test Result.....	17
6.3. Radiated Restricted Band Edge Measurement.....	28
6.3.1. Test Limit.....	28
6.3.2. Test Procedure Used.....	29
6.3.3. Test Setting.....	29
6.3.4. Test Setup.....	30
6.3.5. Test Result.....	31
<b>7. CONCLUSION.....</b>	<b>55</b>
<b>Appendix A - Test Setup Photograph.....</b>	<b>56</b>

**Appendix B - EUT Photograph.....57**

## General Information

<b>Applicant:</b>	Redpine Signals Inc
<b>Applicant Address:</b>	2107 N.First Street, Suite 540, San Jose, CA 95131-2019, USA
<b>Manufacturer:</b>	Redpine Signals Inc
<b>Manufacturer Address:</b>	2107 N.First Street, Suite 540, San Jose, CA 95131-2019, USA
<b>Test Site:</b>	MRT Technology (Suzhou) Co., Ltd
<b>Test Site Address:</b>	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

## Test Facility / Accreditations

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

- MRT facility is a FCC registered (MRT Designation No. CN1166) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.
- 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-20025, G-20034, C-20020, T-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, Radio and SAR testing.



# 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 Innovation, Science and Economic Development Canada and 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, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.



## 2. PRODUCT INFORMATION

### 2.1. Equipment Description

Product Name:	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module
Model No.:	M4SB
Brand Name:	Redpine Signals
Wi-Fi Specification:	802.11b/g/n
Bluetooth Version:	v5.0 (single mode only for BLE)

### 2.2. Product Specification Subjective to this Report

Frequency Range:	802.11b/g/n-HT20: 2412 ~ 2462MHz
Channel Number:	802.11b/g/n-HT20: 11
Type of Modulation:	802.11b: DSSS 802.11g/n: OFDM
Data Rate:	802.11b: 1/2/5.5/11Mbps 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 72.2Mbps
Antenna Type:	Copper Antenna
Antenna Gain:	-1.78dBi

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

### 2.3. Description of Host

Host Name.:	Kanega Watch
Model No.:	KANEGA002
Brand Name:	UnaliWear
Contain two modules	
Module 1#:	FCC ID: 2AM4C-HL7800M IC: 25867-HL7800M
Module 2#:	FCC ID: XF6-M4SB IC: 8407A-M4SB

## 2.4. Working Frequencies for this report

802.11b/g/n-HT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	02	2417 MHz	03	2422 MHz
04	2427 MHz	05	2432 MHz	06	2437 MHz
07	2442 MHz	08	2447 MHz	09	2452 MHz
10	2457 MHz	11	2462 MHz	--	--

## 2.5. Test Mode

Test Mode	Mode 1: Transmit by 802.11b (1Mbps)
	Mode 2: Transmit by 802.11g (6Mbps)
	Mode 3: Transmit by 802.11n-HT20 (MCS0)

## 2.6. Description of Test Software

N/A



### **3. DESCRIPTION of TEST**

#### **3.1. Evaluation Procedure**

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in ANSI C63.10-2013 were used in the measurement.

**Deviation from measurement procedure.....None**

### 3.2. 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, which 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. TEST EQUIPMENT CALIBRATION DATE

##### Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2020/08/01
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2020/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/13
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2020/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2020/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2020/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2020/06/11
Thermohyrometer	Testo	608-H1	MRTSUE06403	1 year	2020/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2020/04/30

##### Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2020/08/01
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/13
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2020/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2020/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2020/12/17
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2020/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2020/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2020/04/30

Software	Version	Function
EMI Software	V3	EMI Test Software

## 5. 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	
Measurement Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):	
9kHz~150kHz: 3.84dB	
150kHz~30MHz: 3.46dB	
Radiated Emission Measurement - AC1	
Measurement Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):	
Horizontal:	30MHz~300MHz: 4.07dB
	300MHz~1GHz: 3.63dB
	1GHz~25GHz: 4.16dB
Vertical:	30MHz~300MHz: 4.18dB
	300MHz~1GHz: 3.60dB
	1GHz~25GHz: 4.76dB
Radiated Emission Measurement - AC2	
Measurement Uncertainty for a Level of Confidence of 95% ( $U=2Uc(y)$ ):	
Horizontal:	30MHz~300MHz: 3.75dB
	300MHz~1GHz: 3.53dB
	1GHz~25GHz: 4.28dB
Vertical:	30MHz~300MHz: 3.86dB
	300MHz~1GHz: 3.53dB
	1GHz~25GHz: 4.33dB

## 6. TEST RESULT

### 6.1. Summary

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
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 6.2 Section 6.3

**Notes:**

- 1) 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.
- 2) 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.

## 6.2. Radiated Spurious Emission Measurement

### 6.2.1. Test Limit

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 ( $\mu\text{V/m}$ )	Measured Distance (m)
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

### 6.2.2. 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)

### 6.2.3. 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
> 1000 MHz	1 MHz

**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**

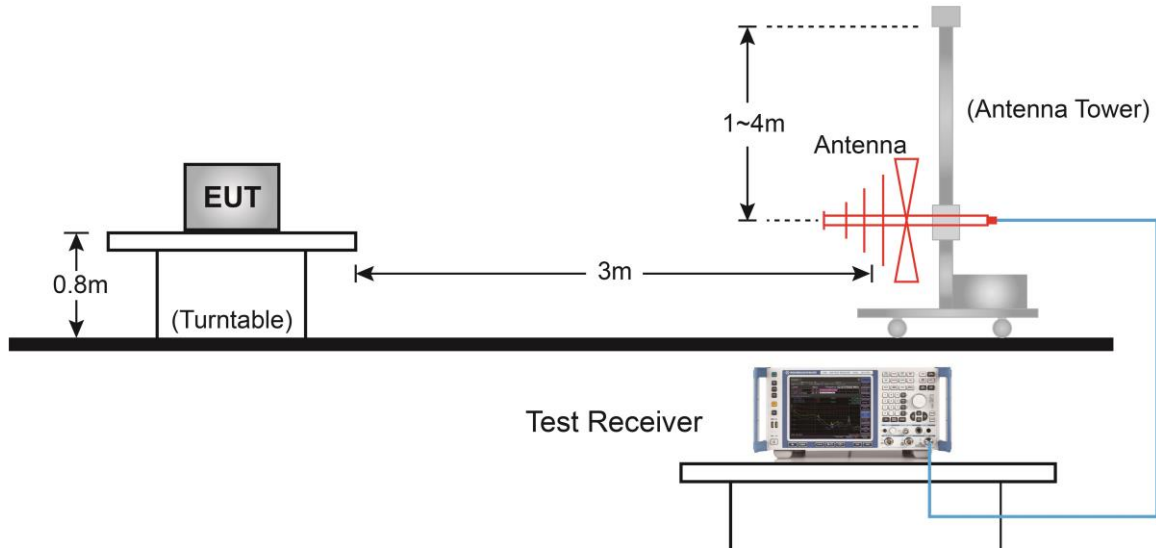
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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

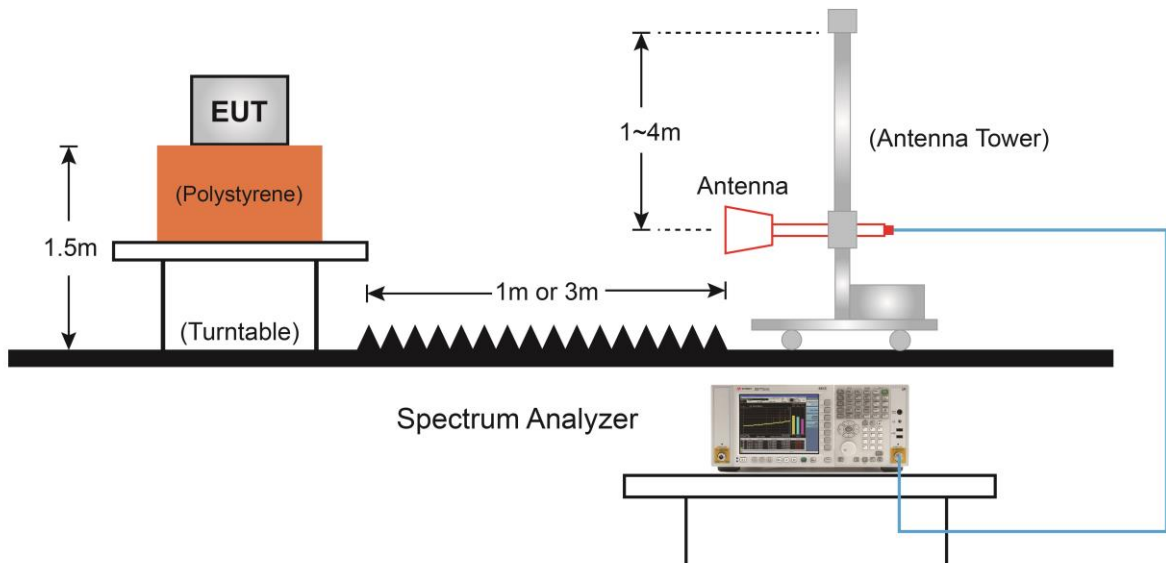
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10Hz  
If the EUT duty cycle is  $< 98\%$ , set VBW  $\geq 1/T$ . T is the minimum transmission duration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

### 6.2.4. Test Setup

#### Below 1GHz Test Setup:



#### Above 1GHz Test Setup:





### 6.2.5. Test Result

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11b	Test Channel	01
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
	4825.0	38.5	4.0	42.5	74.0	-31.5	Peak	Horizontal
	4935.5	38.3	4.2	42.5	74.0	-31.5	Peak	Horizontal
*	5743.0	37.4	5.6	43.0	77.8	-34.8	Peak	Horizontal
*	7145.5	33.4	11.6	45.0	77.8	-32.8	Peak	Horizontal
	4825.0	38.4	4.0	42.4	74.0	-31.6	Peak	Vertical
	4910.0	37.9	4.2	42.1	74.0	-31.9	Peak	Vertical
*	6542.0	34.7	8.8	43.5	77.8	-34.3	Peak	Vertical
*	6958.5	34.0	10.6	44.6	77.8	-33.2	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (97.8dBμV/m) or FCC 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)

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11b	Test Channel	06
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 (dB $\mu$ V)	Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
	4706.0	37.0	4.2	41.2	74.0	-32.8	Peak	Horizontal
	4876.0	38.5	3.7	42.2	74.0	-31.8	Peak	Horizontal
*	6508.0	35.8	8.6	44.4	76.2	-31.8	Peak	Horizontal
*	7086.0	32.6	11.9	44.5	76.2	-31.7	Peak	Horizontal
	4893.0	41.9	0.0	41.9	74.0	-32.1	Peak	Vertical
*	6049.0	43.9	0.0	43.9	76.2	-32.3	Peak	Vertical
*	6499.5	43.6	0.0	43.6	76.2	-32.6	Peak	Vertical
	7451.5	45.7	0.0	45.7	74.0	-28.3	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (96.6dB $\mu$ V/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11b	Test Channel	11
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 (dB $\mu$ V)	Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
	4986.5	38.5	4.0	42.5	74.0	-31.5	Peak	Horizontal
*	5998.0	37.1	6.4	43.5	75.3	-31.8	Peak	Horizontal
*	6499.5	34.7	8.6	43.3	75.3	-32.0	Peak	Horizontal
	8293.0	33.8	12.2	46.0	74.0	-28.0	Peak	Horizontal
	4799.5	37.5	4.3	41.8	74.0	-32.2	Peak	Vertical
	4927.0	37.2	4.3	41.5	74.0	-32.5	Peak	Vertical
*	6491.0	34.7	8.6	43.3	75.3	-32.0	Peak	Vertical
*	7137.0	33.1	11.7	44.8	75.3	-30.5	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (95.4dB $\mu$ V/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11g	Test Channel	01
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
	4910.0	37.6	4.2	41.8	74.0	-32.2	Peak	Horizontal
	5105.5	37.7	4.4	42.1	74.0	-31.9	Peak	Horizontal
*	6117.0	36.1	7.0	43.1	74.0	-30.9	Peak	Horizontal
*	6559.0	35.5	8.7	44.2	74.0	-29.8	Peak	Horizontal
	4825.0	37.7	4.0	41.7	74.0	-32.3	Peak	Vertical
	5114.0	37.9	4.5	42.4	74.0	-31.6	Peak	Vertical
*	6015.0	37.0	6.5	43.5	74.0	-30.5	Peak	Vertical
*	6661.0	34.8	8.9	43.7	74.0	-30.3	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (87.9dBμV/m) or FCC 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)

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11g	Test Channel	06
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
	4757.0	37.2	4.1	41.3	74.0	-32.7	Peak	Horizontal
	4986.5	38.2	4.0	42.2	74.0	-31.8	Peak	Horizontal
*	6134.0	36.0	6.9	42.9	74.0	-31.1	Peak	Horizontal
*	6703.5	34.3	9.3	43.6	74.0	-30.4	Peak	Horizontal
	4816.5	37.4	4.1	41.5	74.0	-32.5	Peak	Vertical
	5063.0	37.3	4.7	42.0	74.0	-32.0	Peak	Vertical
*	6074.5	36.1	6.8	42.9	74.0	-31.1	Peak	Vertical
*	6678.0	34.2	9.3	43.5	74.0	-30.5	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (88.0dBμV/m) or FCC 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)

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11g	Test Channel	11
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 (dB $\mu$ V)	Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
	4757.0	36.6	4.1	40.7	74.0	-33.3	Peak	Horizontal
	4910.0	37.0	4.2	41.2	74.0	-32.8	Peak	Horizontal
*	6508.0	36.0	8.6	44.6	74.0	-29.4	Peak	Horizontal
*	7077.5	33.2	11.7	44.9	74.0	-29.1	Peak	Horizontal
	4825.0	38.3	4.0	42.3	74.0	-31.7	Peak	Vertical
	4876.0	38.1	3.7	41.8	74.0	-32.2	Peak	Vertical
*	6440.0	34.8	8.3	43.1	74.0	-30.9	Peak	Vertical
*	7154.0	33.0	11.6	44.6	74.0	-29.4	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (88.2dB $\mu$ V/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11n-HT20	Test Channel	01
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
	4748.5	38.0	3.9	41.9	74.0	-32.1	Peak	Horizontal
	4935.5	37.9	4.2	42.1	74.0	-31.9	Peak	Horizontal
*	6253.0	35.5	7.2	42.7	74.0	-31.3	Peak	Horizontal
*	6678.0	35.3	9.3	44.6	74.0	-29.4	Peak	Horizontal
	4782.5	36.9	4.2	41.1	74.0	-32.9	Peak	Vertical
	5063.0	36.6	4.7	41.3	74.0	-32.7	Peak	Vertical
*	6508.0	34.5	8.6	43.1	74.0	-30.9	Peak	Vertical
*	7026.5	32.8	10.8	43.6	74.0	-30.4	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (90.8dBμV/m) or FCC 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)

Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11n-HT20	Test Channel	06
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 (dB $\mu$ V)	Factor (dB)	Measure Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Polarization
	4706.0	37.3	4.2	41.5	74.0	-32.5	Peak	Horizontal
	5071.5	37.3	4.5	41.8	74.0	-32.2	Peak	Horizontal
*	6091.5	36.1	6.9	43.0	74.0	-31.0	Peak	Horizontal
*	6406.0	36.2	7.9	44.1	74.0	-29.9	Peak	Horizontal
	4791.0	37.2	4.4	41.6	74.0	-32.4	Peak	Vertical
	4935.5	37.1	4.2	41.3	74.0	-32.7	Peak	Vertical
*	6499.5	34.8	8.6	43.4	74.0	-30.6	Peak	Vertical
*	7060.5	32.2	11.4	43.6	74.0	-30.4	Peak	Vertical

Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (88.2dB $\mu$ V/m) or FCC 15.209 which is higher.

Note 2: Measure Level (dB $\mu$ V/m) = Reading Level (dB $\mu$ V) + Factor (dB)

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



Product	Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Temperature	25°C
Test Engineer	Tyler Yuan	Relative Humidity	54%
Test Site	AC1	Test Date	2020/02/29
Test Mode	802.11n-HT20	Test Channel	11
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
	4697.5	36.8	4.2	41.0	74.0	-33.0	Peak	Horizontal
	4910.0	37.5	4.2	41.7	74.0	-32.3	Peak	Horizontal
*	6321.0	35.8	7.2	43.0	74.0	-31.0	Peak	Horizontal
*	6695.0	34.3	9.2	43.5	74.0	-30.5	Peak	Horizontal
	4765.5	37.4	4.0	41.4	74.0	-32.6	Peak	Vertical
	4944.0	37.6	4.1	41.7	74.0	-32.3	Peak	Vertical
*	6210.5	36.3	7.2	43.5	74.0	-30.5	Peak	Vertical
*	6516.5	35.6	8.6	44.2	74.0	-29.8	Peak	Vertical

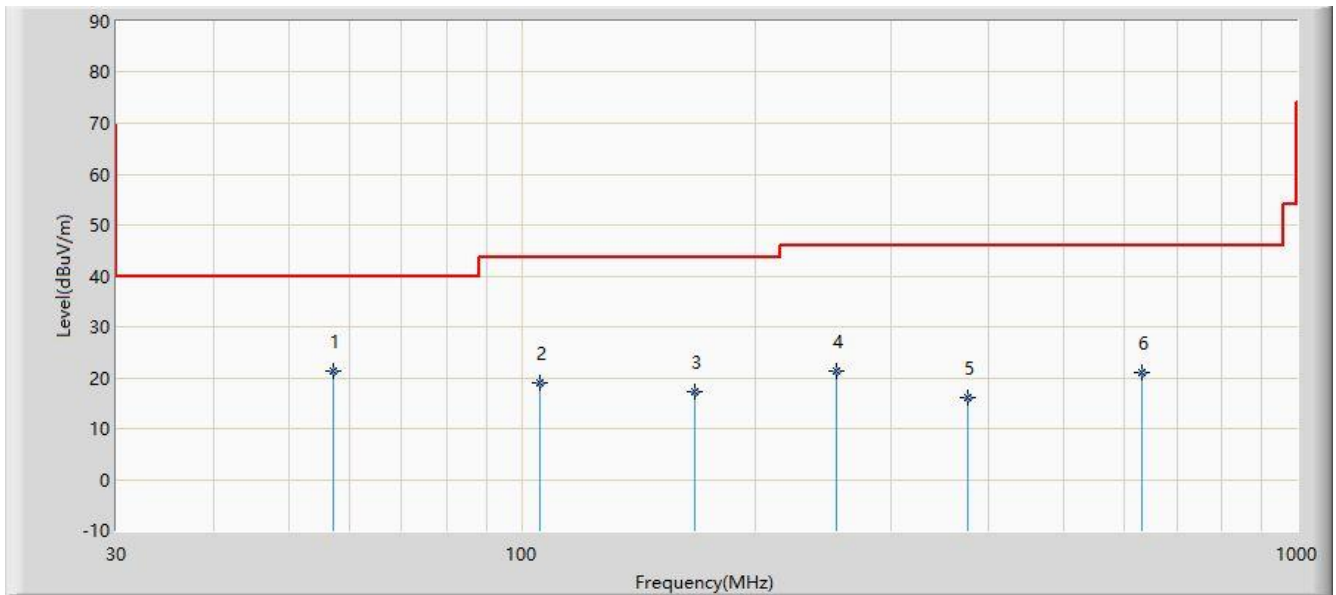
Note 1: "\*" is not in restricted band, its limit is 20dBc of the fundamental emission level (87.9dBμV/m) or FCC 15.209 which is higher.

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: 2020/03/03 - 09:38
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kyrie Xie
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11g at Channel 2412MHz	



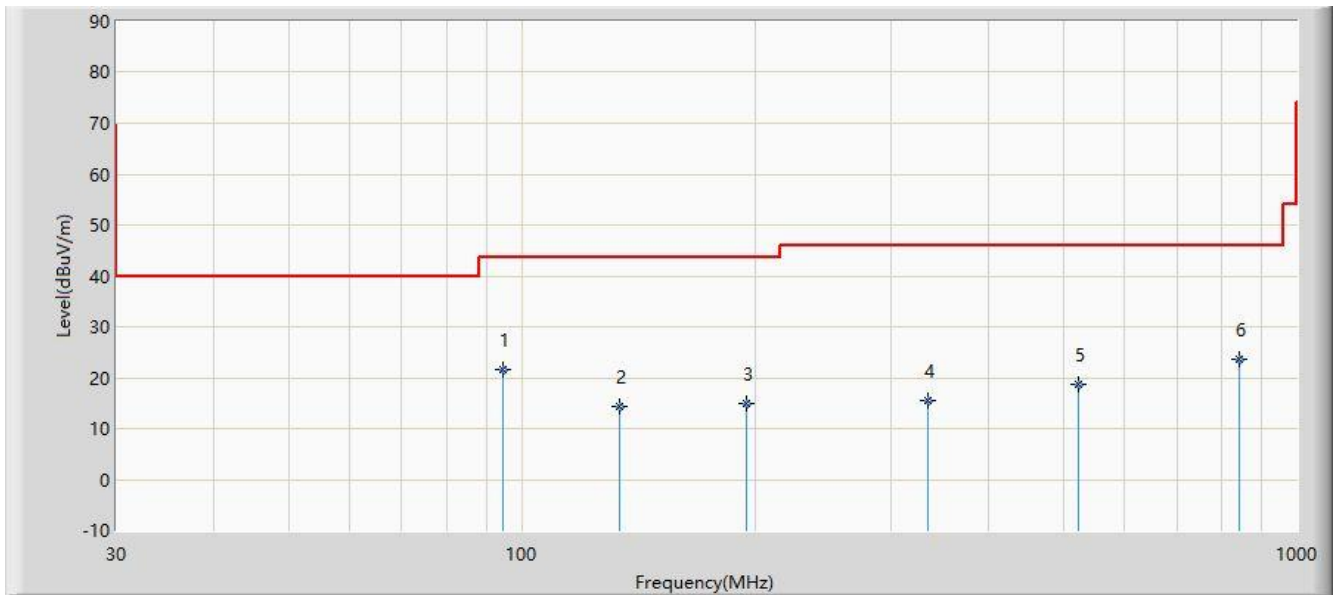
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	57.160	21.378	7.588	-18.622	40.000	13.790	QP
2		105.660	18.938	7.062	-24.562	43.500	11.876	QP
3		167.255	17.376	2.427	-26.124	43.500	14.949	QP
4		255.040	21.332	7.809	-24.668	46.000	13.524	QP
5		376.775	16.111	-0.521	-29.889	46.000	16.631	QP
6		632.370	21.147	-0.687	-24.853	46.000	21.834	QP

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + 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: 2019/07/18 - 09:47
Limit: FCC_Part15.209_RSE(3m)	Engineer: Kyrie Xie
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: AC 120V/60Hz
Test Mode: Transmit by 802.11g at Channel 2412MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	94.505	21.529	10.666	-21.971	43.500	10.864	QP
2		133.790	14.417	0.021	-29.083	43.500	14.396	QP
3		195.385	14.824	3.026	-28.676	43.500	11.798	QP
4		333.610	15.546	-0.151	-30.454	46.000	15.697	QP
5		522.275	18.705	-0.925	-27.295	46.000	19.630	QP
6		844.315	23.534	-0.890	-22.466	46.000	24.424	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.

### 6.3. Radiated Restricted Band Edge Measurement

#### 6.3.1. 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	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <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 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ )	Measured Distance (m)
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

**6.3.2. Test Procedure Used**

ANSI C63.10 - Section 6.3 (General Requirements)

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

**6.3.3. Test Setting**

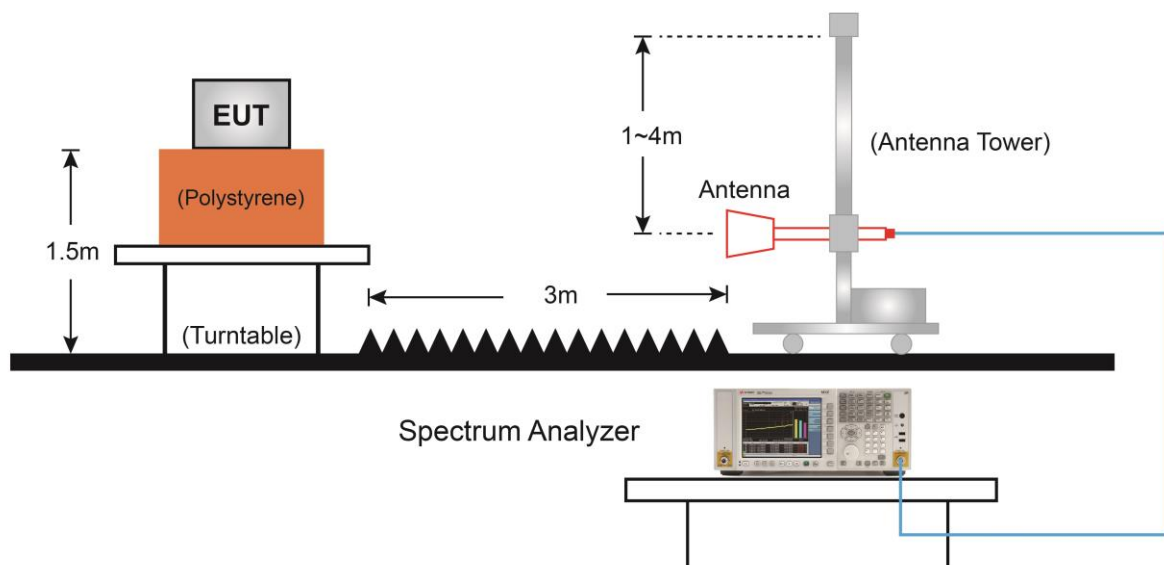
**Peak Field Strength Measurements**

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 Field Strength Measurements

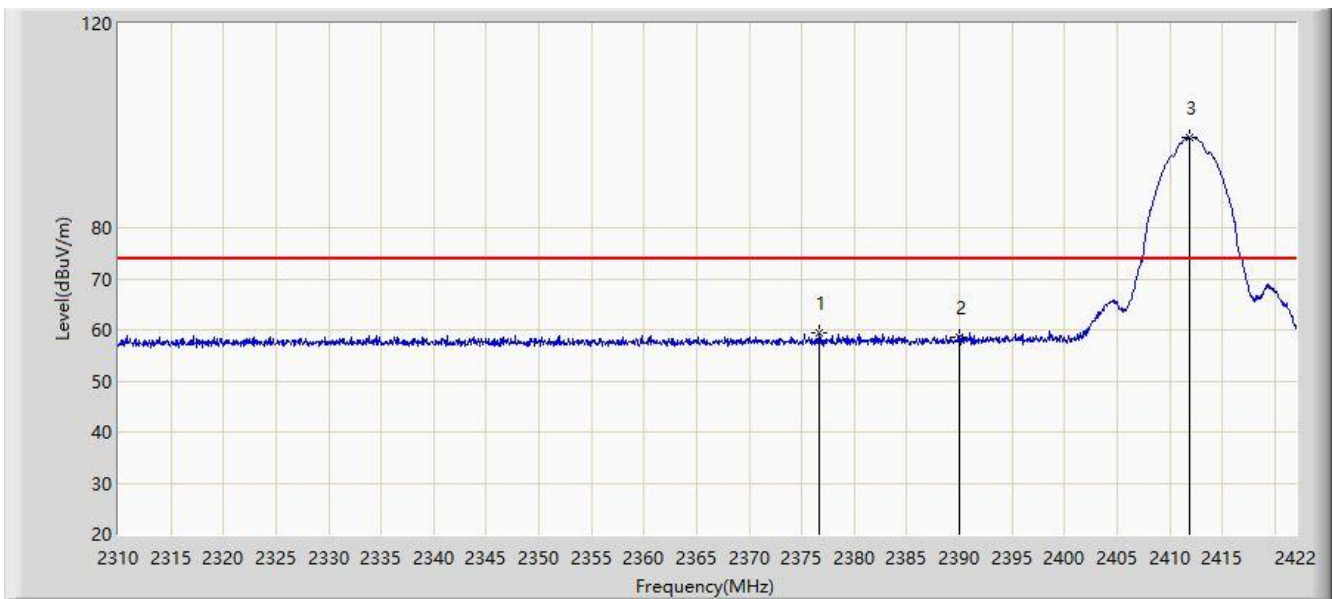
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
  2. RBW = 1MHz
  3. VBW; If the EUT is configured to transmit with duty cycle  $\geq 98\%$ , set VBW = 10Hz
  4. If the EUT duty cycle is  $< 98\%$ , set VBW  $\geq 1/T$ . T is the minimum transmission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

#### 6.3.4. Test Setup



### 6.3.5. Test Result

Site: AC1	Time: 2020/02/28 - 14:12
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2412MHz	

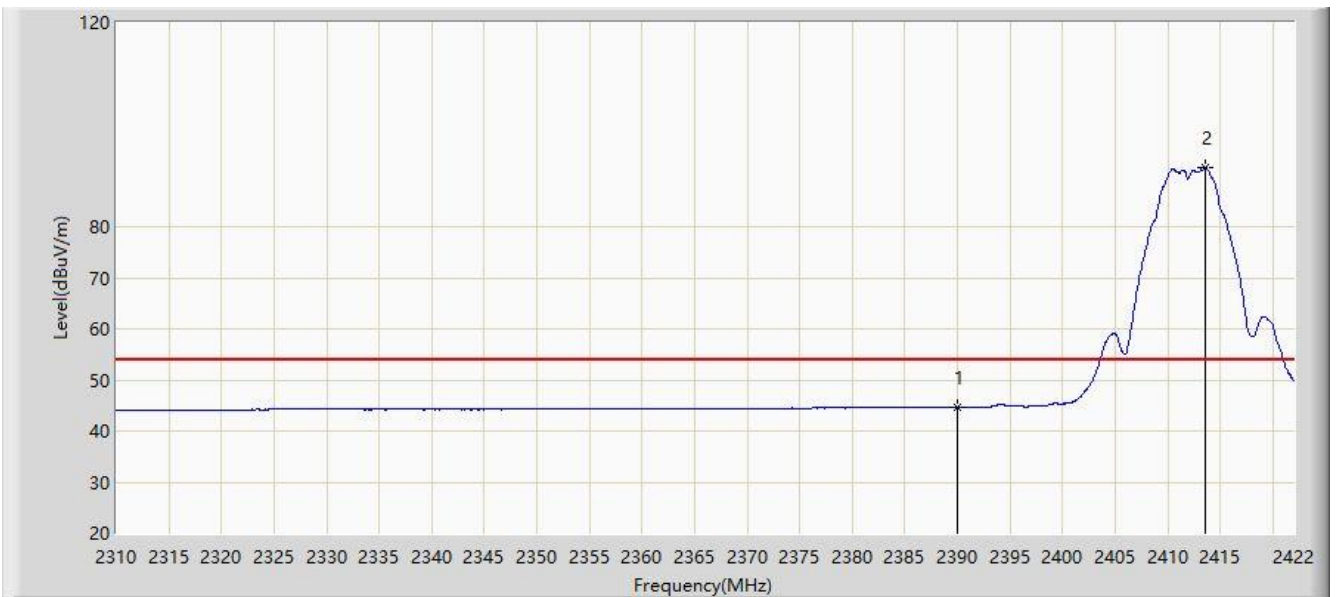


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2376.696	59.492	27.018	-14.508	74.000	32.474	PK
2			2390.000	58.490	26.005	-15.510	74.000	32.485	PK
3		*	2411.864	97.808	65.274	N/A	N/A	32.534	PK

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: 2020/02/28 - 14:19
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2412MHz	



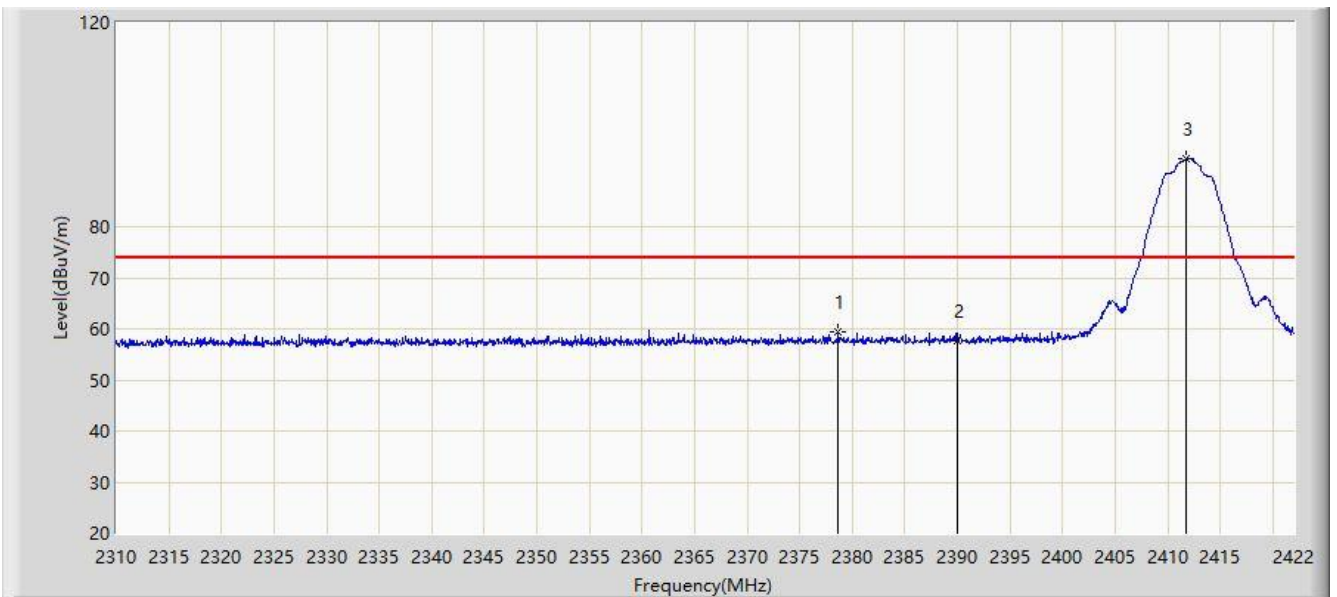
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	44.681	12.196	-9.319	54.000	32.485	AV
2		*	2413.600	91.613	59.094	N/A	N/A	32.519	AV

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: 2020/02/28 - 14:28
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2412MHz	

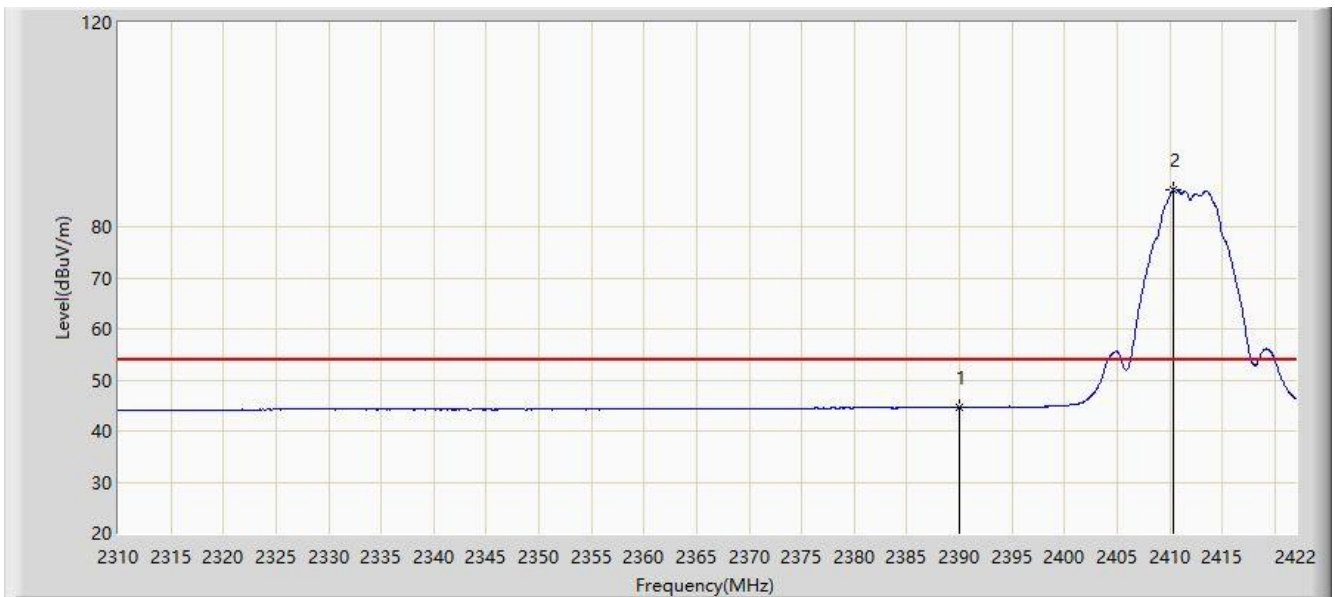


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2378.656	59.562	27.088	-14.438	74.000	32.474	PK
2			2390.000	57.819	25.334	-16.181	74.000	32.485	PK
3		*	2411.696	93.197	60.662	N/A	N/A	32.536	PK

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: 2020/02/28 - 14:54
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2412MHz	

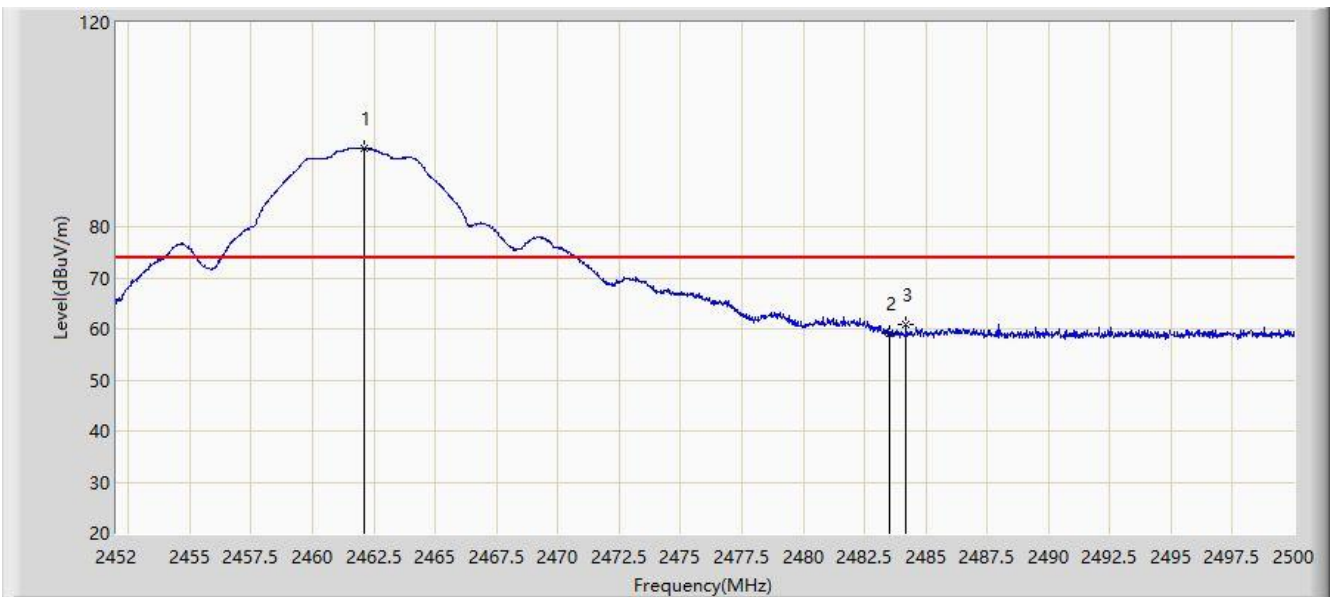


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	44.610	12.125	-9.390	54.000	32.485	AV
2		*	2410.352	87.320	54.781	N/A	N/A	32.539	AV

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

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

Site: AC1	Time: 2020/02/28 - 14:56
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2462MHz	

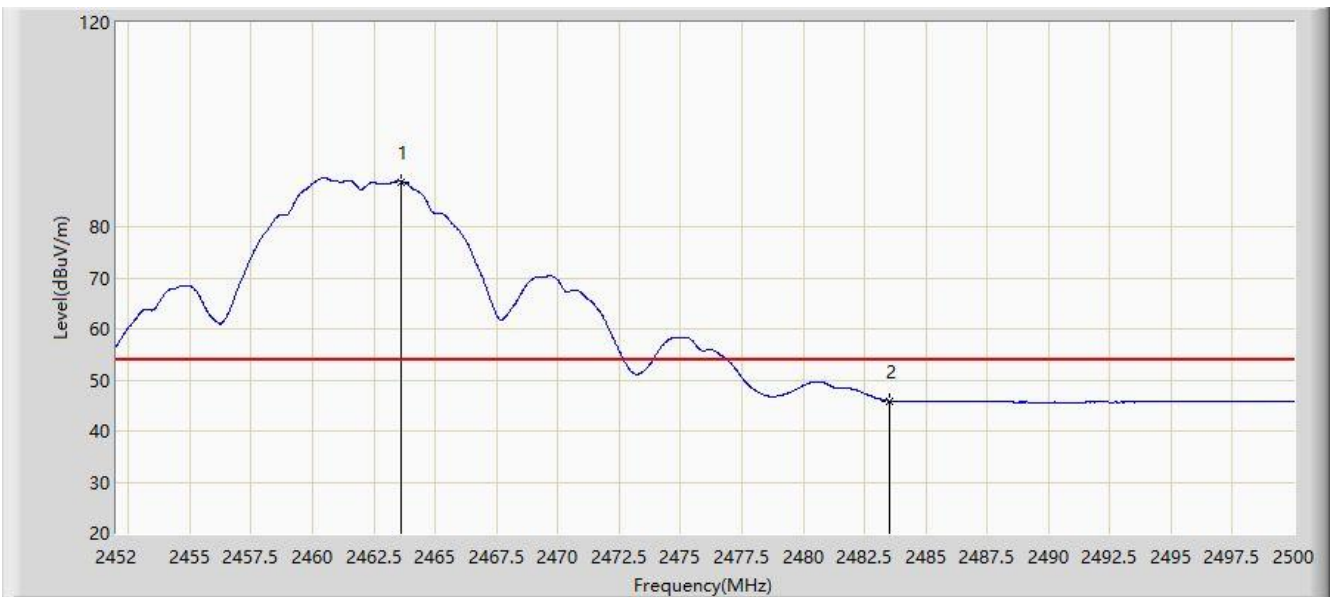


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2462.128	95.370	63.051	N/A	N/A	32.319	PK
2			2483.500	59.117	26.742	-14.883	74.000	32.375	PK
3			2484.208	60.878	28.505	-13.122	74.000	32.373	PK

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: 2020/02/28 - 15:12
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2462MHz	

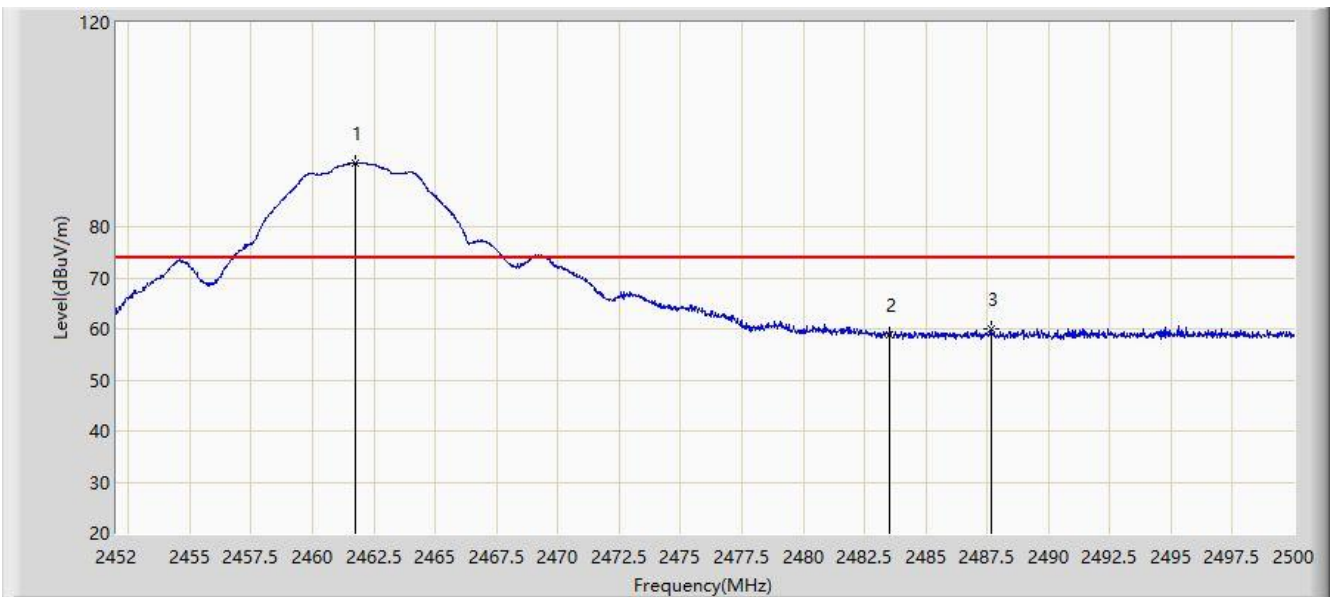


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2463.616	88.815	56.491	N/A	N/A	32.324	AV
2			2483.500	45.922	13.547	-8.078	54.000	32.375	AV

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

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

Site: AC1	Time: 2020/02/28 - 15:14
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2462MHz	

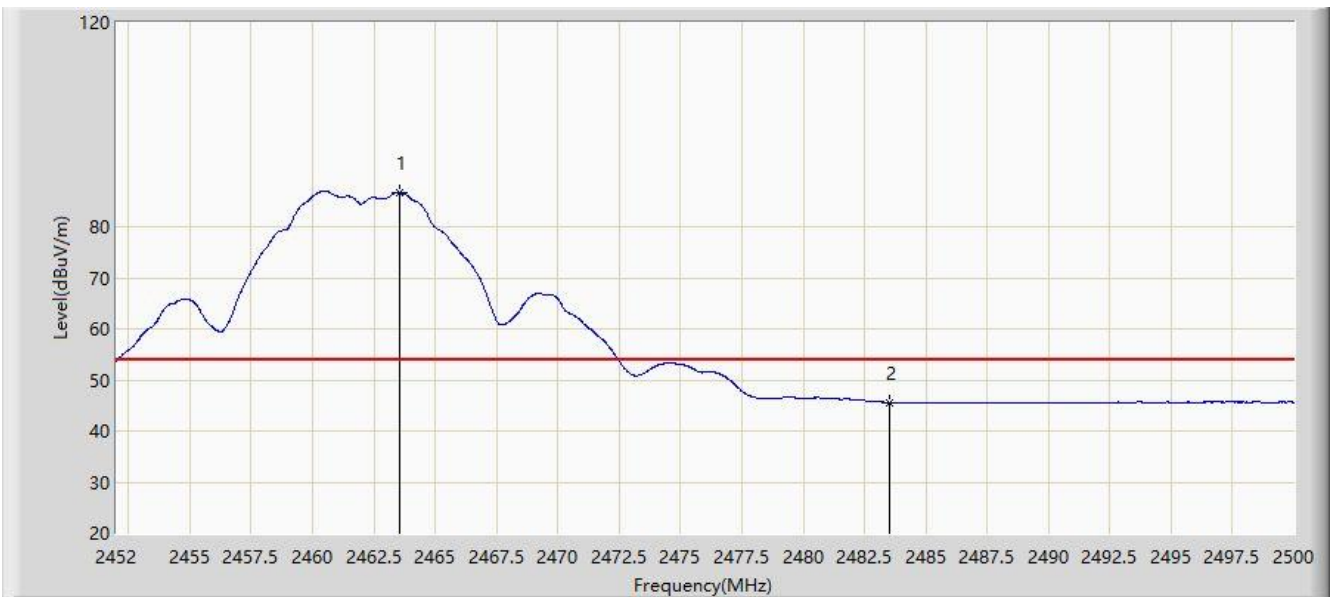


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2461.768	92.524	60.206	N/A	N/A	32.318	PK
2			2483.500	58.900	26.525	-15.100	74.000	32.375	PK
3			2487.640	60.065	27.700	-13.935	74.000	32.365	PK

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

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

Site: AC1	Time: 2020/02/28 - 15:18
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11b at channel 2462MHz	

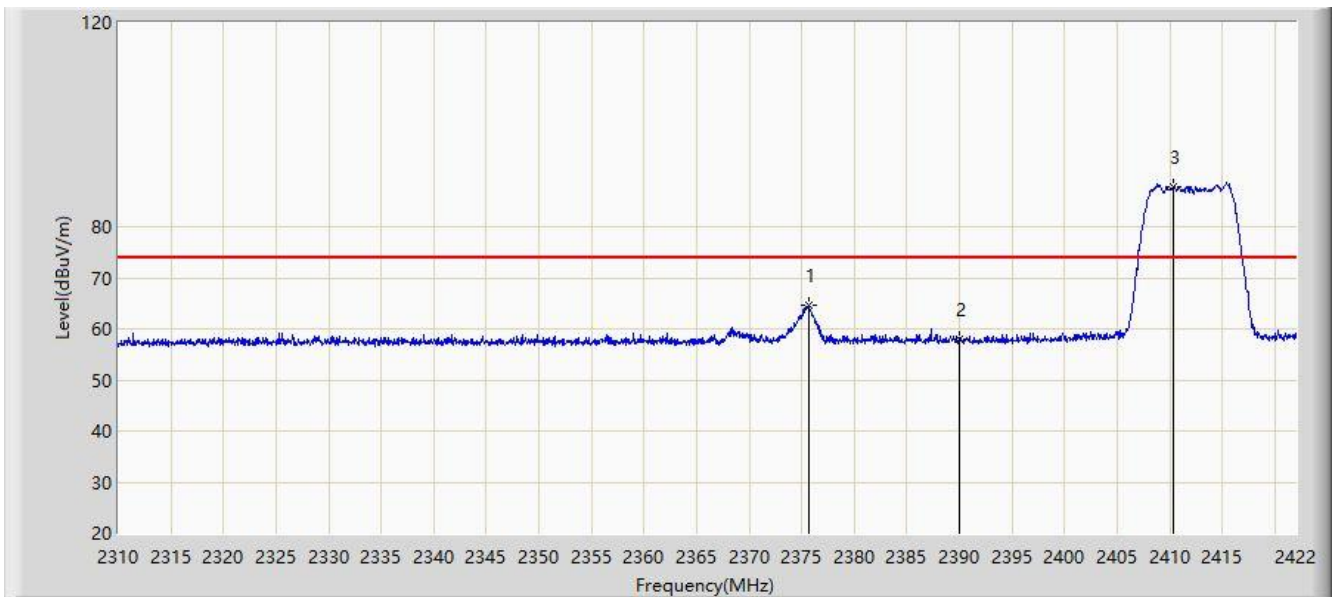


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2463.544	86.663	54.339	N/A	N/A	32.324	AV
2			2483.500	45.591	13.216	-8.409	54.000	32.375	AV

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: 2020/02/28 - 15:20
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2412MHz	

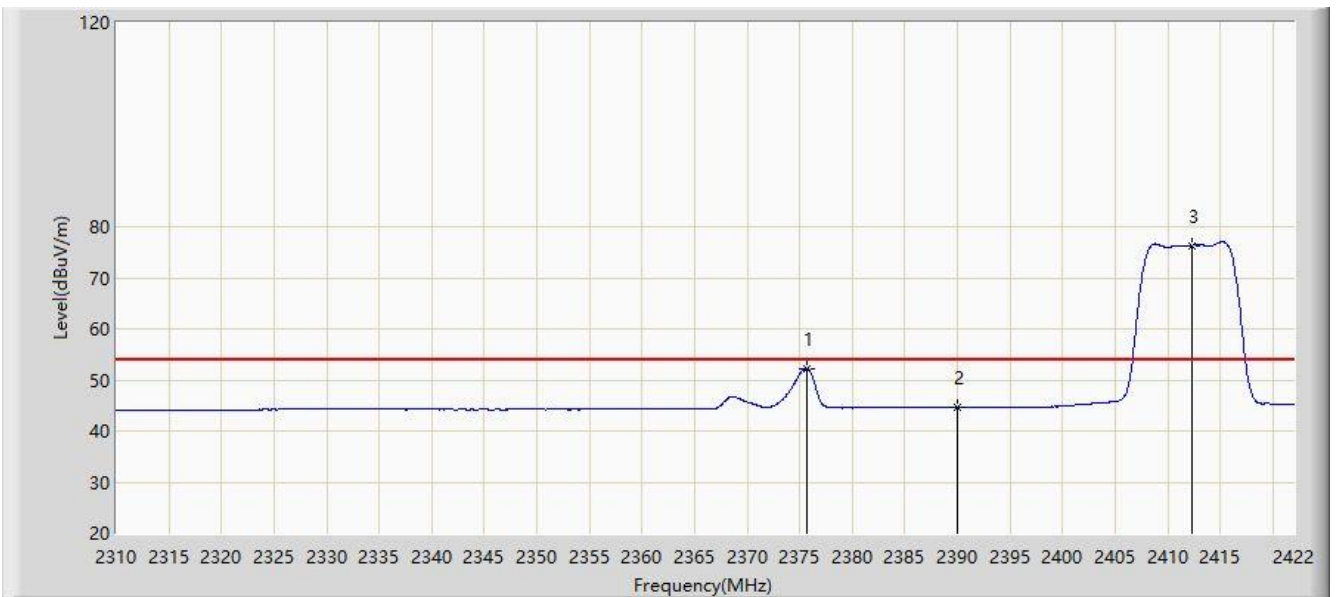


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.632	64.686	32.205	-9.314	74.000	32.481	PK
2			2390.000	57.970	25.485	-16.030	74.000	32.485	PK
3		*	2410.408	87.884	55.345	N/A	N/A	32.539	PK

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: 2020/02/28 - 15:25
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2412MHz	



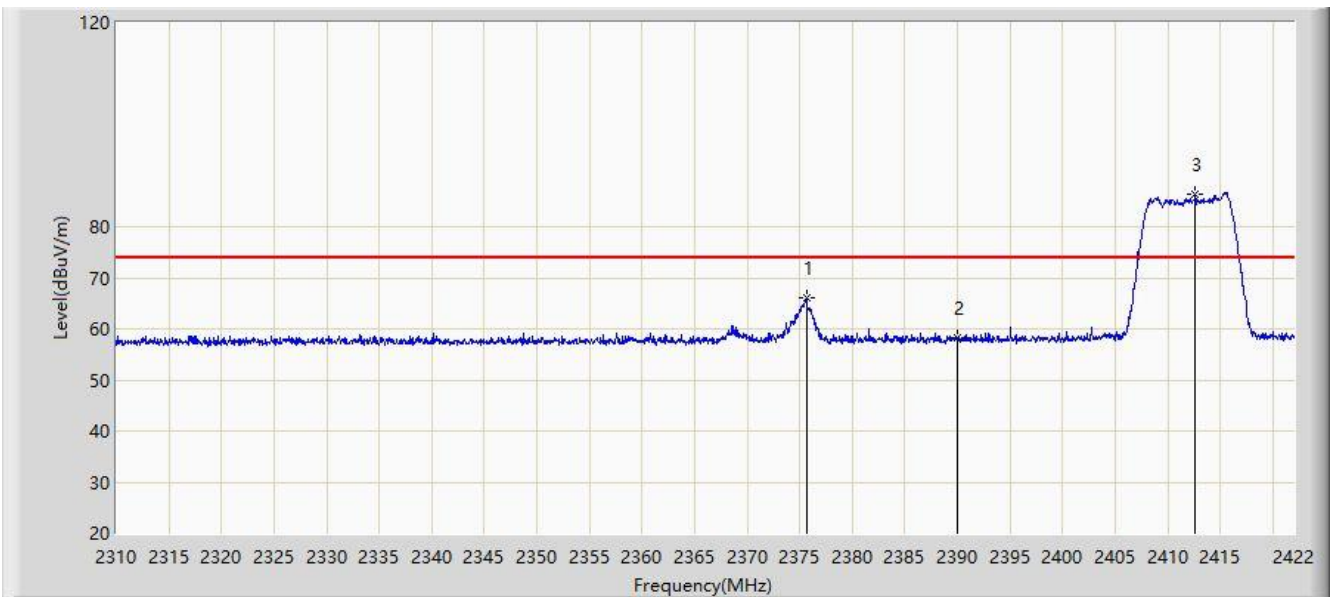
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.632	52.208	19.727	-1.792	54.000	32.481	AV
2			2390.000	44.561	12.076	-9.439	54.000	32.485	AV
3		*	2412.368	76.374	43.845	N/A	N/A	32.529	AV

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

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



Site: AC1	Time: 2020/02/28 - 15:34
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2412MHz	

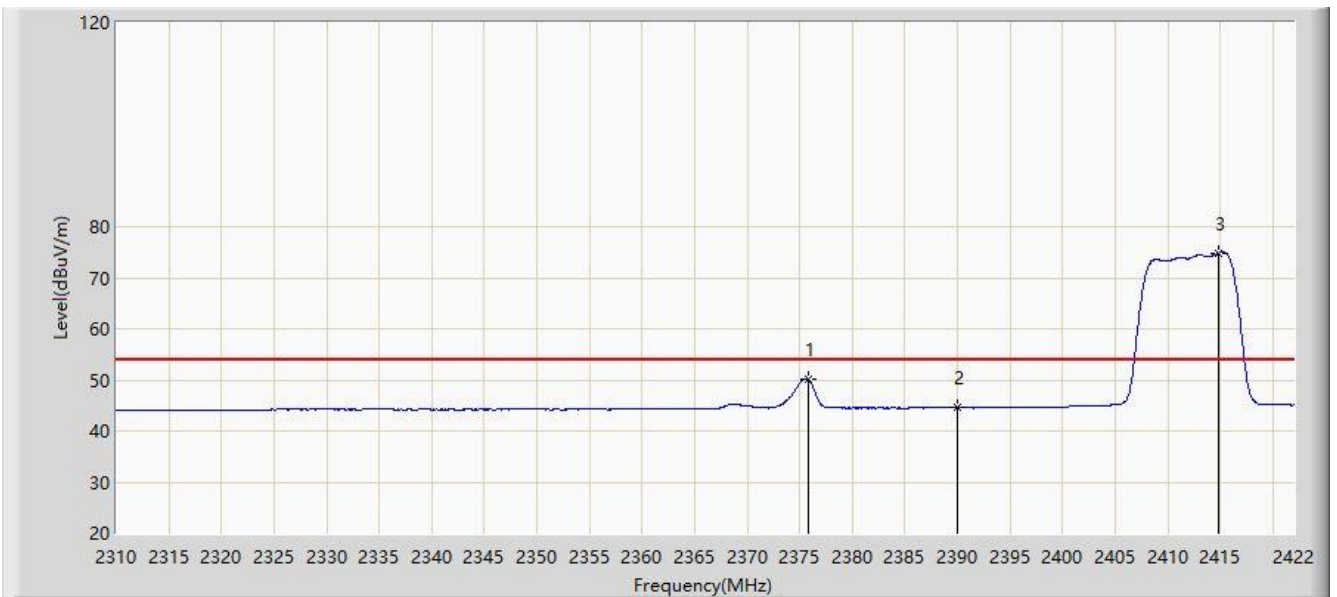


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.632	66.038	33.557	-7.962	74.000	32.481	PK
2			2390.000	58.130	25.645	-15.870	74.000	32.485	PK
3		*	2412.648	86.298	53.771	N/A	N/A	32.527	PK

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: 2020/02/28 - 15:38
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2412MHz	

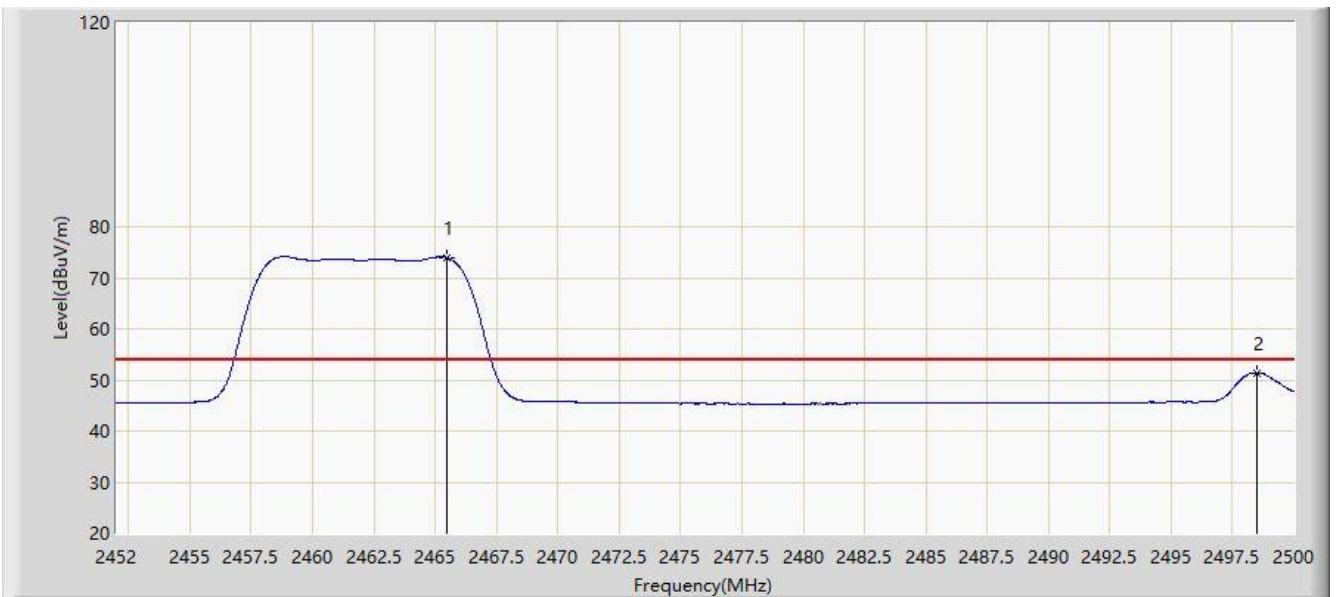


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.800	50.146	17.666	-3.854	54.000	32.480	AV
2			2390.000	44.520	12.035	-9.480	54.000	32.485	AV
3		*	2414.832	74.853	42.345	N/A	N/A	32.508	AV

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

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

Site: AC1	Time: 2020/02/28 - 20:49
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2462MHz	

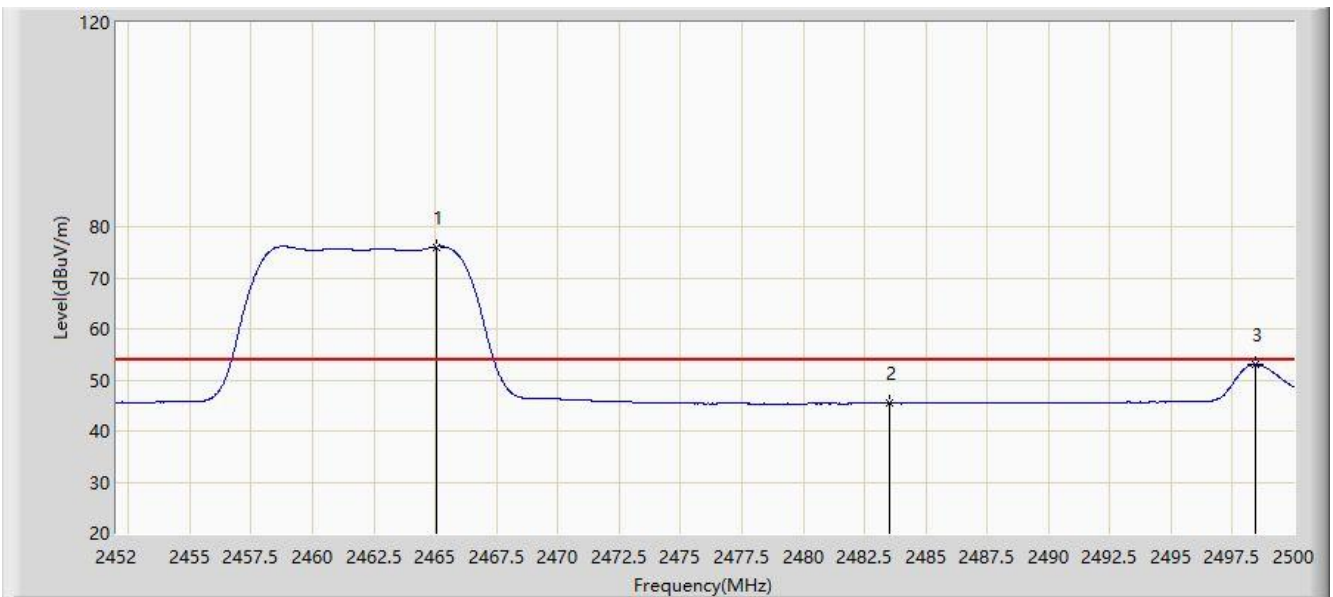


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2465.488	73.924	41.592	N/A	N/A	32.332	AV
2			2498.488	51.434	19.078	-2.566	54.000	32.356	AV

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: 2020/02/28 - 20:50
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2462MHz	

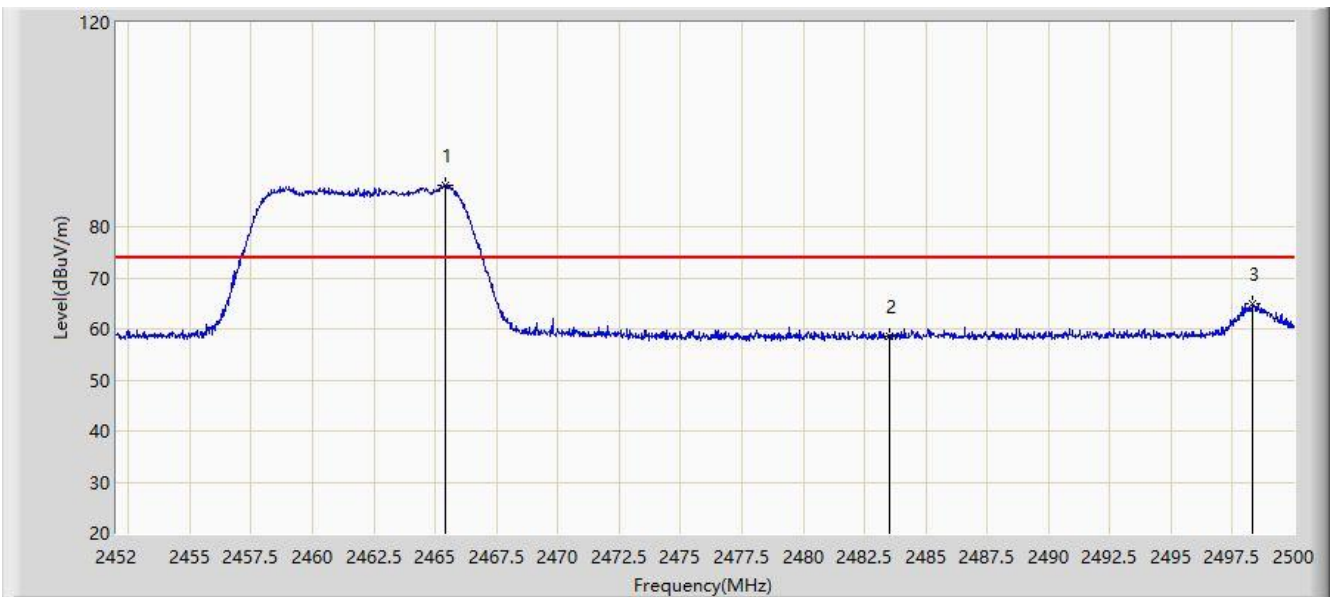


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2465.056	76.078	43.748	N/A	N/A	32.330	AV
2			2483.500	45.378	13.003	-8.622	54.000	32.375	AV
3			2498.416	52.948	20.592	-1.052	54.000	32.356	AV

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: 2020/02/28 - 20:52
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2462MHz	

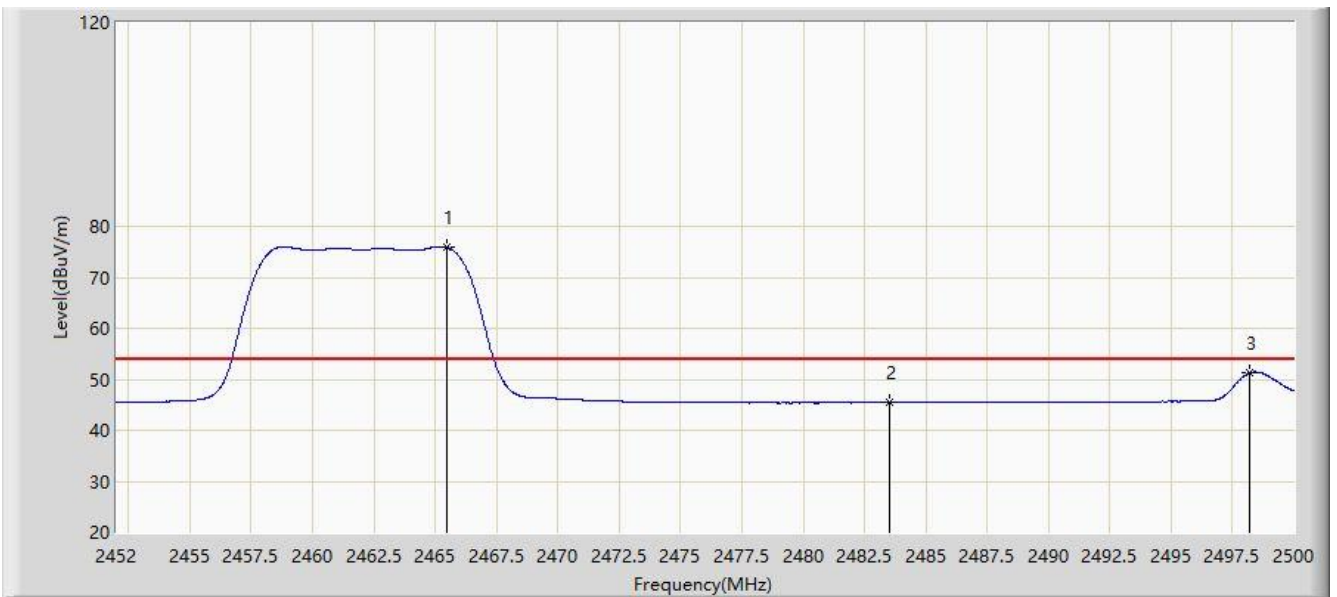


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2465.440	88.174	55.842	N/A	N/A	32.332	PK
2			2483.500	58.685	26.310	-15.315	74.000	32.375	PK
3			2498.296	65.006	32.650	-8.994	74.000	32.356	PK

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

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

Site: AC1	Time: 2020/02/28 - 20:56
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11g at channel 2462MHz	

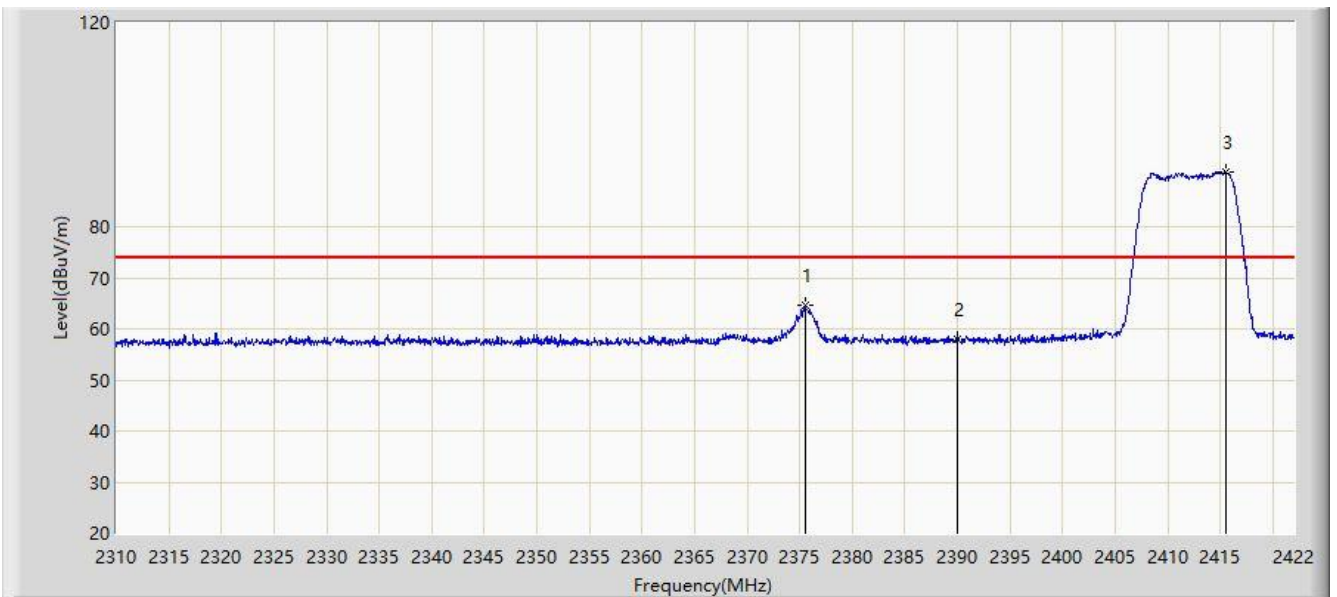


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2465.488	75.843	43.511	N/A	N/A	32.332	AV
2			2483.500	45.449	13.074	-8.551	54.000	32.375	AV
3			2498.176	51.226	18.871	-2.774	54.000	32.355	AV

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

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

Site: AC1	Time: 2020/02/28 - 16:01
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	

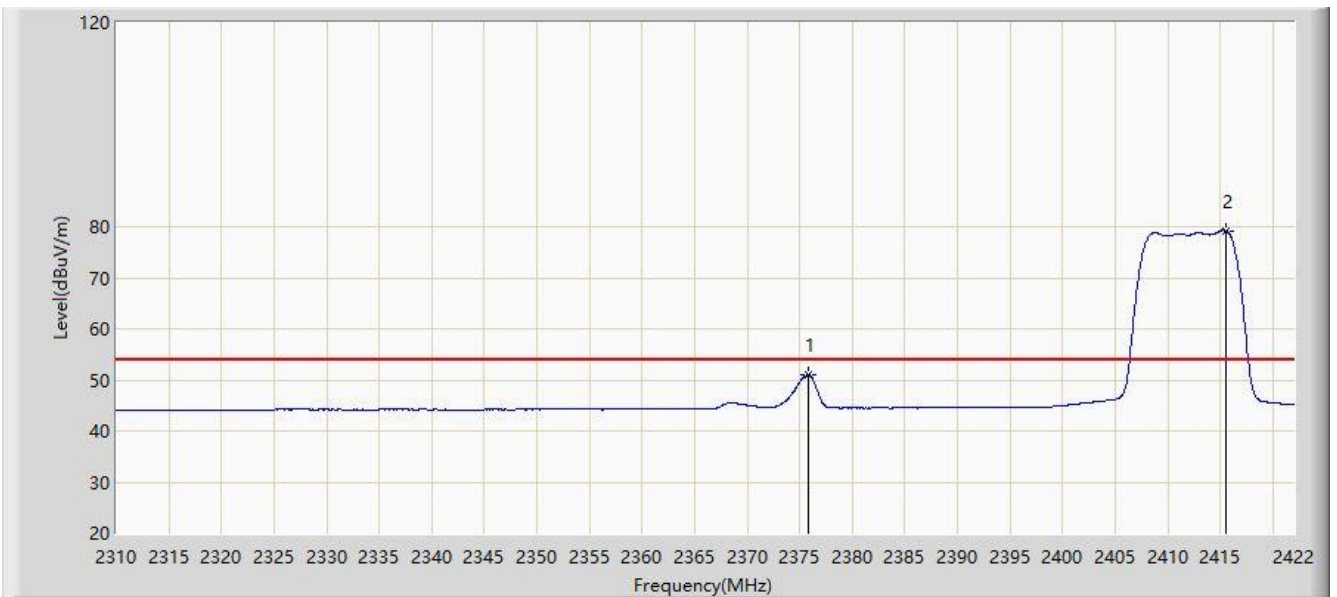


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.520	64.521	32.040	-9.479	74.000	32.481	PK
2			2390.000	57.956	25.471	-16.044	74.000	32.485	PK
3		*	2415.560	90.841	58.339	N/A	N/A	32.502	PK

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: 2020/02/28 - 16:07
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	



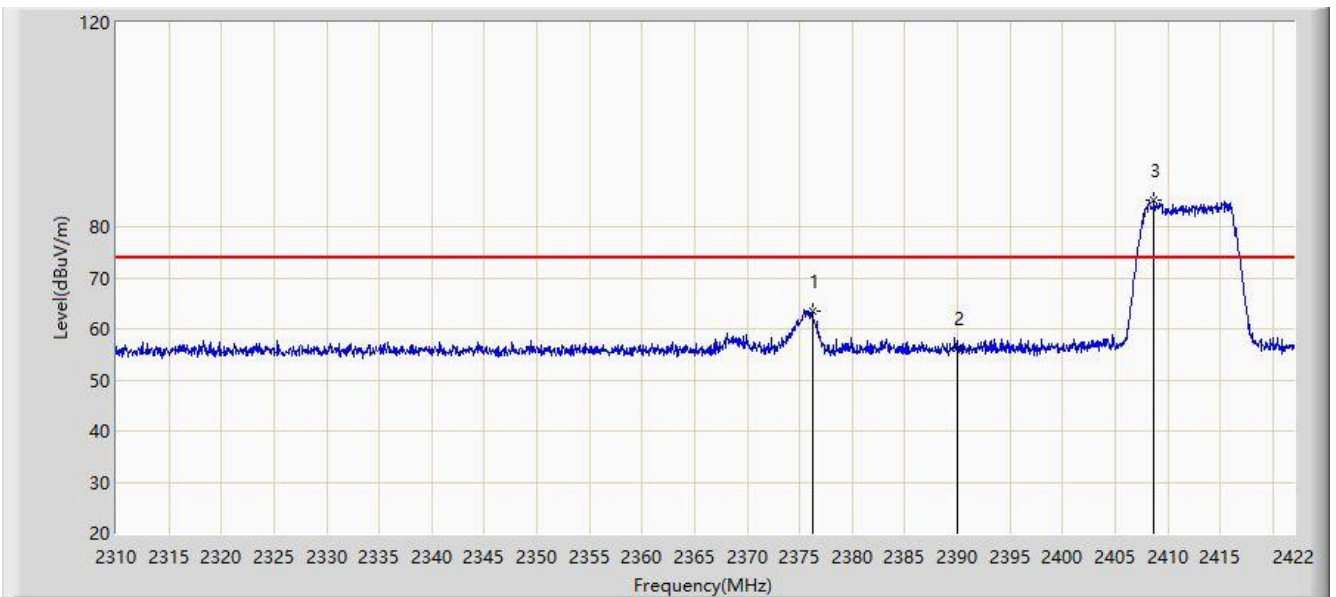
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.800	50.903	18.423	-3.097	54.000	32.480	AV
2		*	2415.504	79.245	46.743	N/A	N/A	32.502	AV

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: 2020/02/28 - 16:10
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	

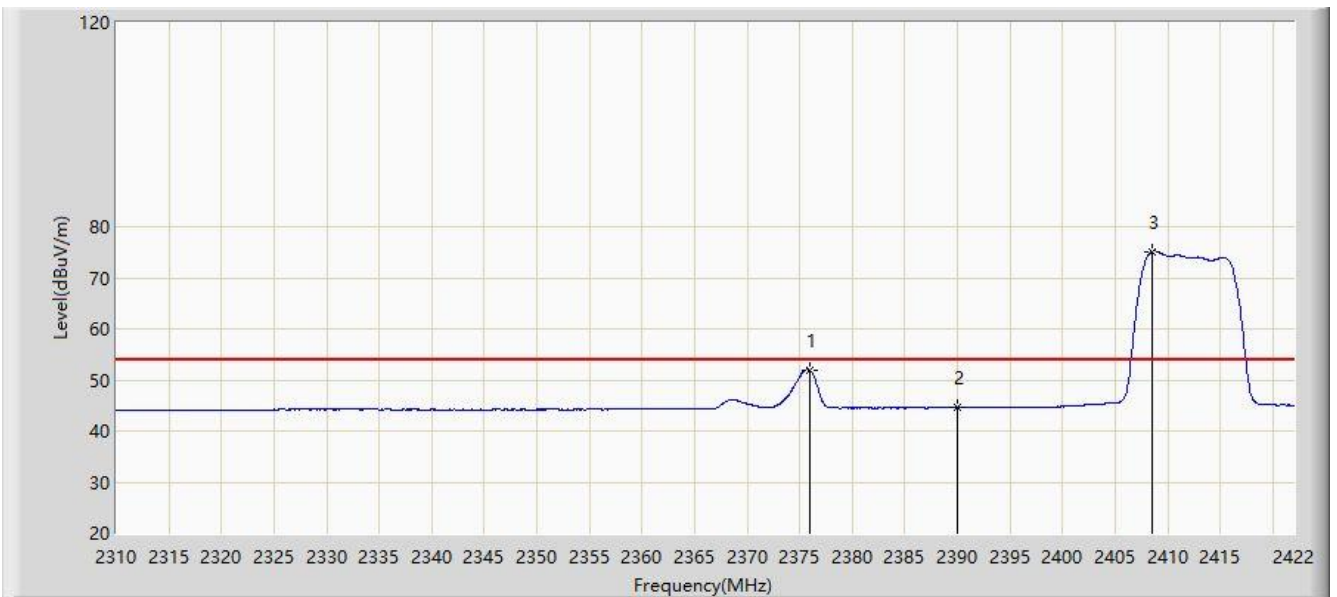


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2376.192	63.419	30.942	-10.581	74.000	32.477	PK
2			2390.000	56.285	23.800	-17.715	74.000	32.485	PK
3		*	2408.672	85.243	52.709	N/A	N/A	32.534	PK

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

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

Site: AC1	Time: 2020/02/28 - 16:14
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2412MHz	

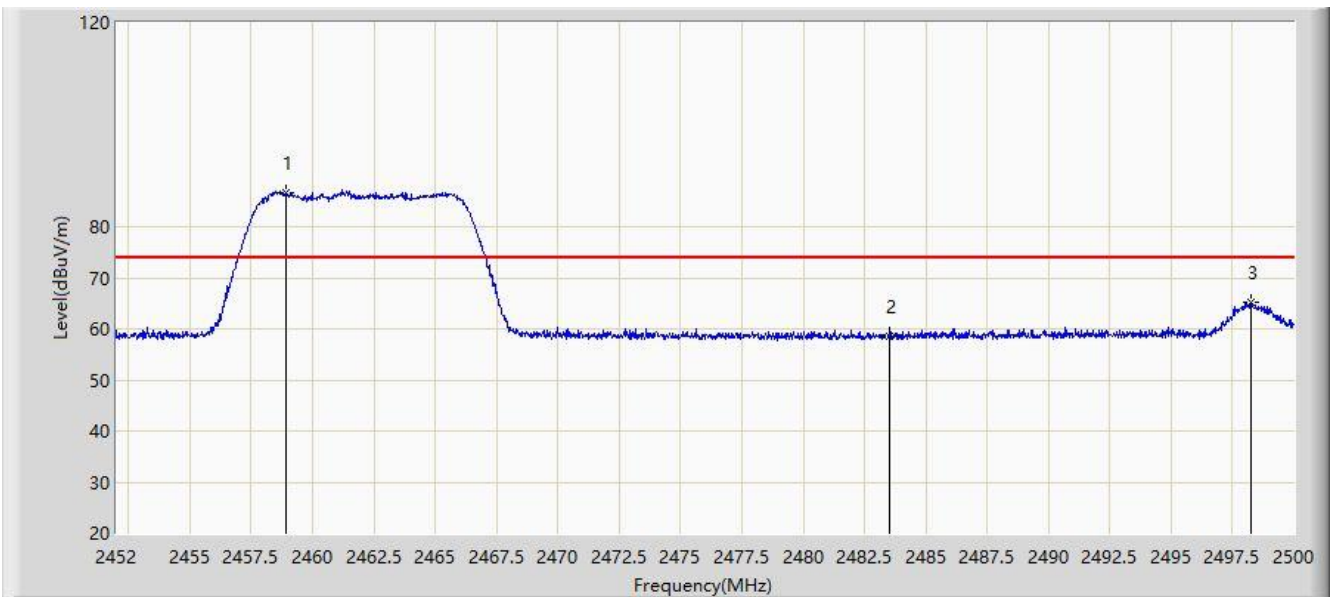


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.968	51.948	19.469	-2.052	54.000	32.478	AV
2			2390.000	44.546	12.061	-9.454	54.000	32.485	AV
3		*	2408.504	75.161	42.628	N/A	N/A	32.533	AV

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

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

Site: AC1	Time: 2020/02/28 - 20:16
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	

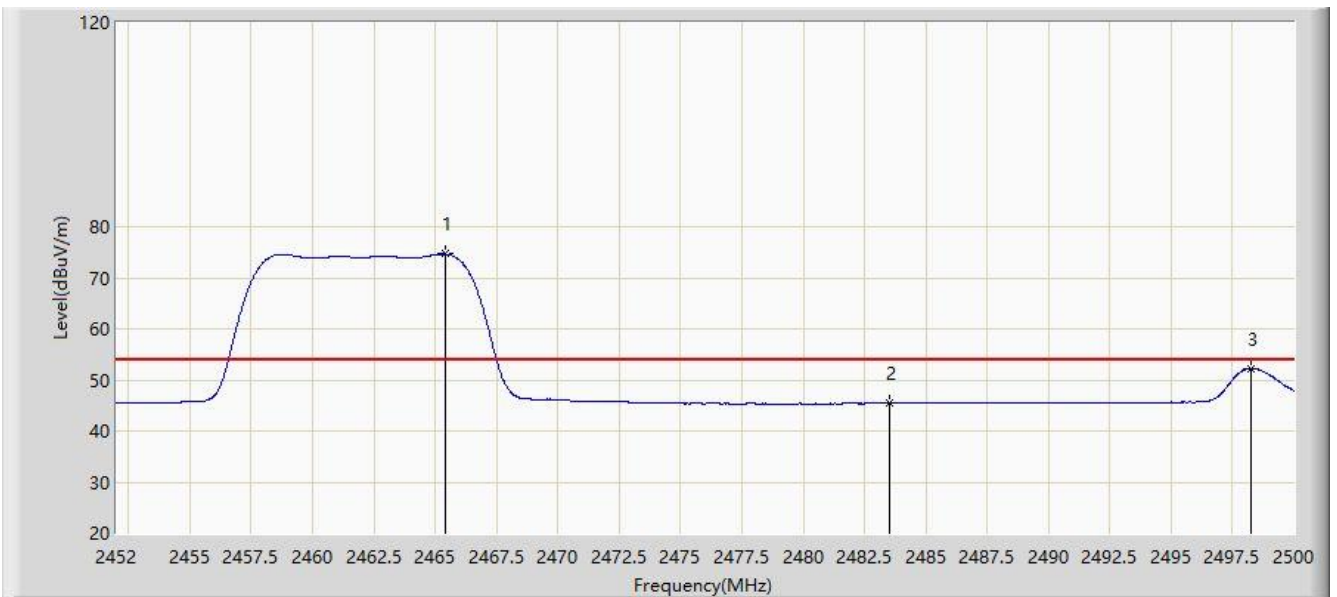


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2458.888	86.635	54.315	N/A	N/A	32.320	PK
2			2483.500	58.462	26.087	-15.538	74.000	32.375	PK
3			2498.272	65.146	32.791	-8.854	74.000	32.355	PK

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

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

Site: AC1	Time: 2020/02/28 - 20:22
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	

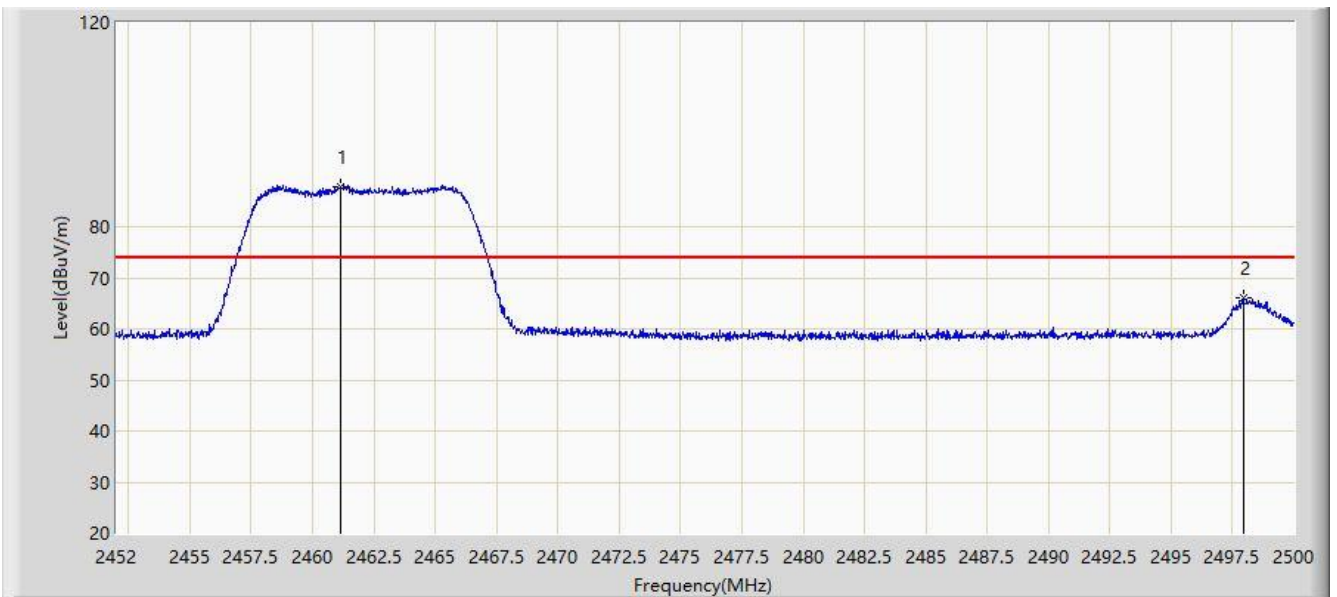


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2465.416	74.643	42.312	N/A	N/A	32.331	AV
2			2483.500	45.422	13.047	-8.578	54.000	32.375	AV
3			2498.248	52.242	19.887	-1.758	54.000	32.355	AV

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: 2020/02/28 - 20:34
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	

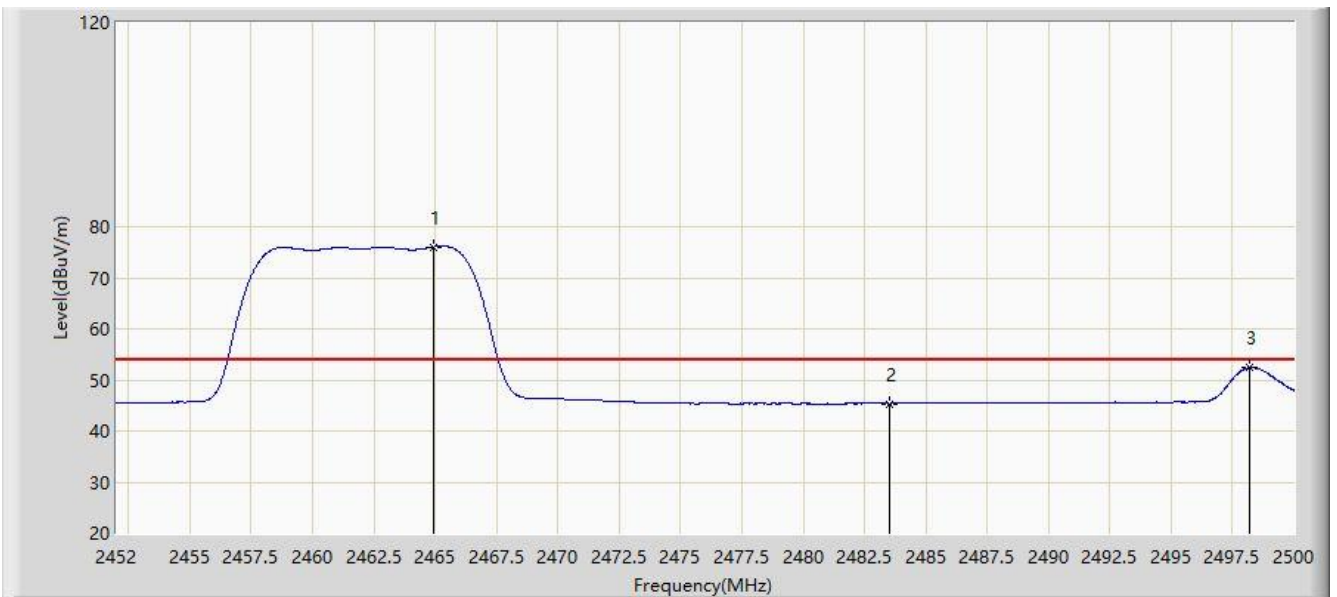


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2461.168	87.922	55.604	N/A	N/A	32.318	PK
2			2497.936	65.990	33.636	-8.010	74.000	32.354	PK

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: 2020/02/28 - 20:38
Limit: FCC_Part15.209_RE(3m)	Engineer: Tyler Yuan
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: Single Band SIP Module, Small Form Factor Single Band 802.11b/g/n, Bluetooth 5.0, Zigbee Module	Power: By Battery
Test Mode: Transmit by 802.11n-HT20 at channel 2462MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2464.960	76.075	43.745	N/A	N/A	32.330	AV
2			2483.500	45.358	12.983	-8.642	54.000	32.375	AV
3			2498.176	52.364	20.009	-1.636	54.000	32.355	AV

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

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

## 7. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15C of the FCC and RSS-247 rules.

————— The End —————

## **Appendix A - Test Setup Photograph**

Refer to "1912RSU024-UT" file.



## **Appendix B - EUT Photograph**

Refer to "1912RSU024-UE" file.