



MEASUREMENT REPORT

FCC PART 15 Subpart C Bluetooth-LE

FCC ID: 2AD2MM1A

APPLICANT: TGI Technology Pte Ltd

Application Type: Certification

Product: PORTABLE BLUETOOTH SPEAKER

Model No.: M1, M2-MI10, M2-MI30, M3, M4, M5, M6

Brand Name: UB+

FCC Classification: Digital Transmission System (DTS)

FCC Rule Part(s): Part15 Subpart C (Section 15.247)

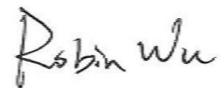
Test Procedure(s): ANSI C63.10-2013, KDB 558074 D01v05r02

Test Date: January 16 ~ February 19, 2019

Reviewed By:


(Kevin Guo)

Approved By:


(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
1901WSU007-U2	Rev. 01	Initial Report	04-24-2019	Valid

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§2.1033 General Information

Applicant:	TGI Technology Pte Ltd
Applicant Address:	140 Paya Lebar Road #06-25 AZ @ Paya Lebar Singapore 409015
Manufacturer:	TGI Technology Pte Ltd
Manufacturer Address:	140 Paya Lebar Road #06-25 AZ @ Paya Lebar Singapore 409015
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
Test Device Serial No.:	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 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 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, 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. Feature of Equipment under Test

Product Name:	PORTABLE BLUETOOTH SPEAKER
Model No.:	M1, M2-MI10, M2-MI30, M3, M4, M5, M6
Brand Name:	UB+
Bluetooth Specification:	Bluetooth v5.0

2.1. Model Differences

Model	Shape	Size	Speaker	PCBA	Battery	LED
M1	Spherosome	D200mm	5"+1" *2, 25W+25W+5W*2, 4Ω	Same	11.1V, 2.2Ah	Same
M2-MI10	Spherosome	D360mm	(6.5"+1") *2, (40W+10W)*2, 2Ω	Same	14.8V, 2.2Ah	Same
M2-MI30	Spherosome	D360mm	8"+1.5" *2, 10W+30W+10W* 2, 2.5Ω	Same	14.8V, 2.2Ah	Same
M3	Strip	L250mm H180mm W60mm	(3.5"+1") *2, (20W+5W)*2, 3Ω	Same	7.4V, 2.2Ah	Same
M4	Strip	L1000mm H120mm W60mm	(3.5"+1.5") *2, (40W+10W)*2, 3Ω	Same	14.8V, 2.2Ah	Same
M5	Spherosome	D250mm	5.25", 25W, 2Ω	Same	7.4V, 2.2Ah	Same
M6	Spherosome	D300mm	6.5", 25W, 2Ω	Same	11.1V, 2.2Ah	Same

Note: According to the above table, we select two models (**M2-MI10** and **M4**) for all RF testing, and **M4** as main sample to assess all RF test, **M2-MI10** as serial sample to assess Radiate Emission item only.

2.2. Product Specification Subjective to this Report

Bluetooth Frequency	2402~2480MHz
Type of modulation	GFSK
Data Rate	1Mbps
Antenna Type:	PCB Antenna
Antenna Gain:	0 dBi

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. Test Mode

Test Mode	Mode 1: Transmit by BLE
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2.5. Device Capabilities

This device contains the following capabilities:

Bluetooth BR/EDR/LE 1Mbps

Note: The maximum achievable duty cycles was determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
BLE	64.05%

Duty Cycle (T = Transmission Duration)

BLE (T = 0.399ms)

Keylight Spectrum Analyzer - Signal 1A

RF 1.50 GHz DC

SENSE INT

BLE ON AUTO

67.2134 MHz Jan 18, 2017

Marker 3 Δ 622.533 μ s

Trig: Free Run

Avg Type: Log-Pwr

Traces 3 1 4 5

Time 0.00000000

Set 2.50000000

10 dB/div

Log

Ref Offset 12 dB

Ref 20.00 dBm

Δ Mkr3 622.5 μ s

-1.04 dB

1.0

1.1

1.2

1.3

1.4

1.5

1.6

1.7

1.8

1.9

2.0

2.1

2.2

2.3

2.4

2.5

2.6

2.7

2.8

2.9

3.0

3.1

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9.0

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9.7

9.8

9.9

10.0

Center 2.402000000 GHz

#VBW 50 MHz

Sweep 3.067 ms (2001 pts)

Span 0 Hz

Res BW 8 MHz

MKT	MOD	TRC	SOL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	A2	1	L	(A)	398.7 μ s	(A)	-0.46 dB	
2	F	1	L	(A)	1.534 ms		6.90 dBm	
3	A4	1	L	(A)	622.5 μ s	(A)	-1.04 dB	
4	F	1	L		1.534 ms		6.96 dBm	
5								
6								
7								
8								
9								
10								
11								

Select Marker

3

Normal

Delta

Fixed

Off

Properties

More

1 of 2

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2.6. Test Configuration

The device was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.7. EMI Suppression Device(s)/Modifications

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

2.8. Description of Test Software

The test utility software used during testing was provided by the customer.

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.

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 was used in the measurement.

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 is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The 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	ESR3	MRTSUE06185	1 year	2020/04/15
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2019/06/14
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2019/06/14
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2019/08/14
Shielding Anechoic Chamber	Mikebang	Chamber-SR2	MRTSUE06214	N/A	N/A

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2019/08/13
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2019/09/25
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2020/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2019/10/19
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2019/12/17
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2019/11/16
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2019/06/12
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/14
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06213	1 year	2019/05/01

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2019/08/13
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2019/10/19
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2019/11/09
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2019/12/17
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2019/11/16
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2019/06/12
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2019/12/13
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2019/05/01

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2020/04/15
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2019/07/19
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2020/04/15
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2019/11/16
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2019/07/19
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2019/07/05
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2019/06/14
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2019/08/14
Modulation Analyzer	HP	8901A	MRTSUE06098	1 year	2019/10/18
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2019/11/16
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2019/11/16
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2019/08/14

Software	Version	Function
EMI Software	V3	EMI Test Software

6. MEASUREMENT UNCERTAINTY

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

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Radiated Emission Measurement - AC2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz ~ 1GHz: 3.86dB 1GHz ~ 25GHz: 4.33dB

7. TEST RESULT

7.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	$\geq 500\text{kHz}$	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	$\leq 1\text{Watt}$		Pass	Section 7.3
15.247(e)	Power Spectral Density	$\leq 8\text{dBm} / 3\text{kHz}$		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	$\geq 20\text{dBc (Peak)}$		Pass	Section 7.5
15.205 15.209	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	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.8

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. The test results shown in the following sections represent the worst case emissions.

7.2. 6dB Bandwidth Measurement

7.2.1. Test Limit

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

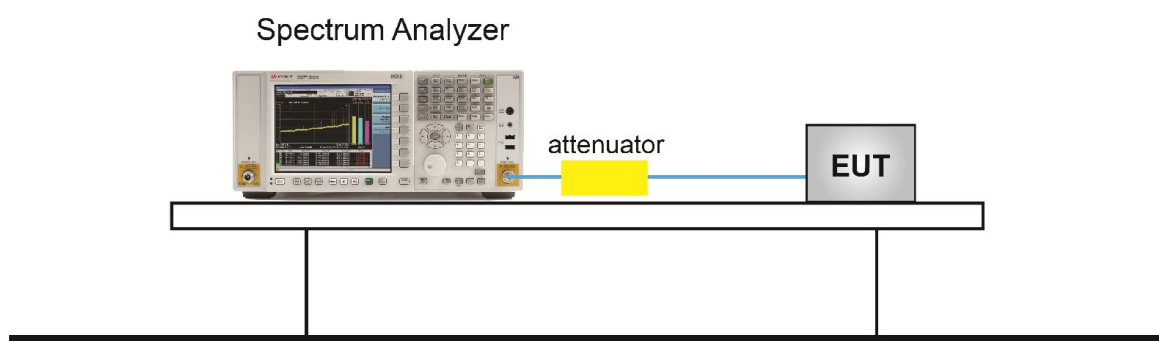
7.2.2. Test Procedure used

ANSI C63.10-2013 Section 11.8

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

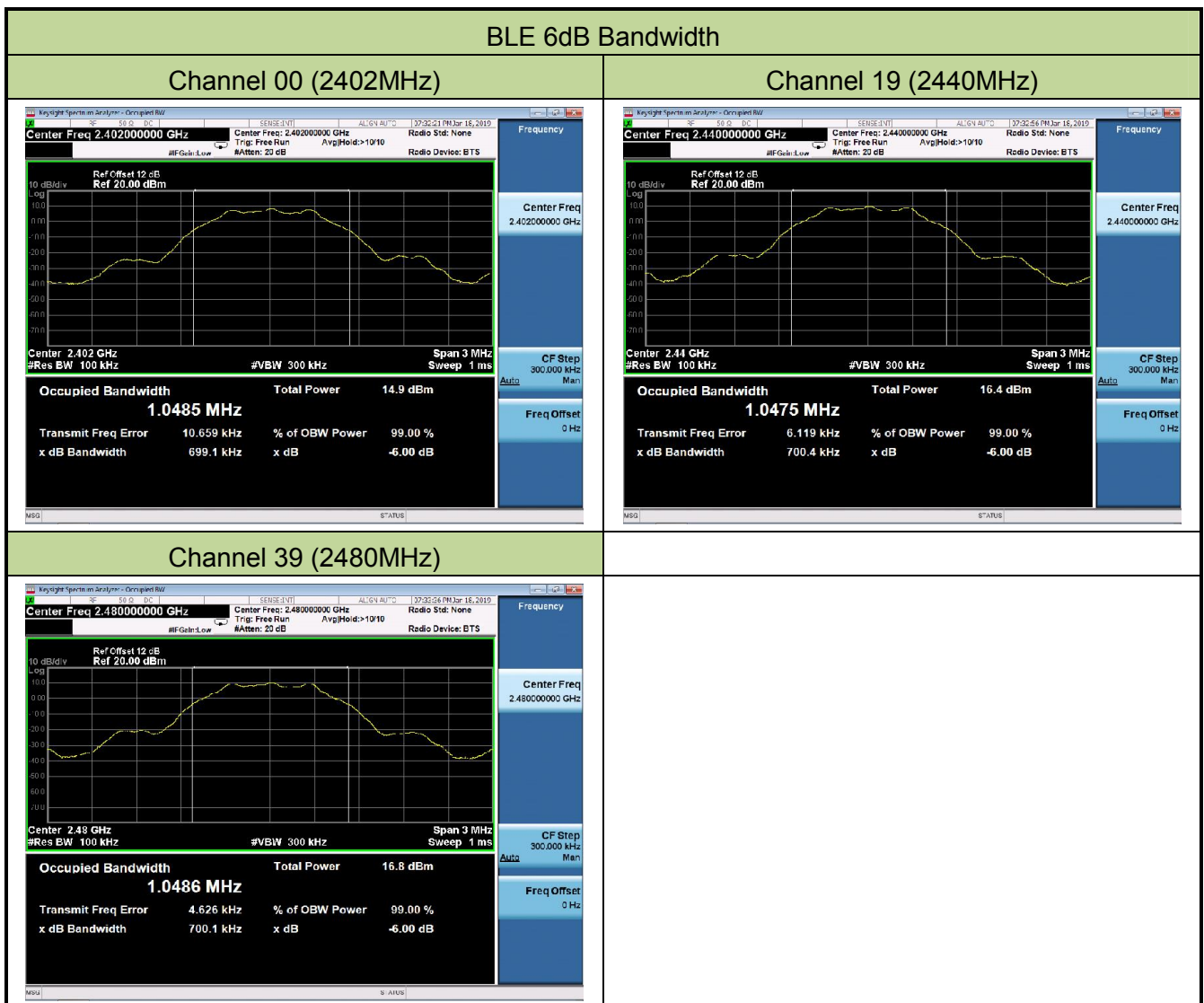
7.2.4. Test Setup



7.2.5. Test Result

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	56%
Test Site	TR3	Test Date	2019/01/18

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
BLE	1	00	2402	0.699	≥ 0.5	Pass
BLE	1	19	2440	0.700	≥ 0.5	Pass
BLE	1	39	2480	0.700	≥ 0.5	Pass



7.3. Output Power Measurement

7.3.1. Test Limit

The maximum out power shall be less 1 Watt (30dBm).

7.3.2. Test Procedure Used

ANSI C63.10 Section 11.9.1.3

ANSI C63.10 Section 11.9.2.3.2

7.3.3. Test Setting

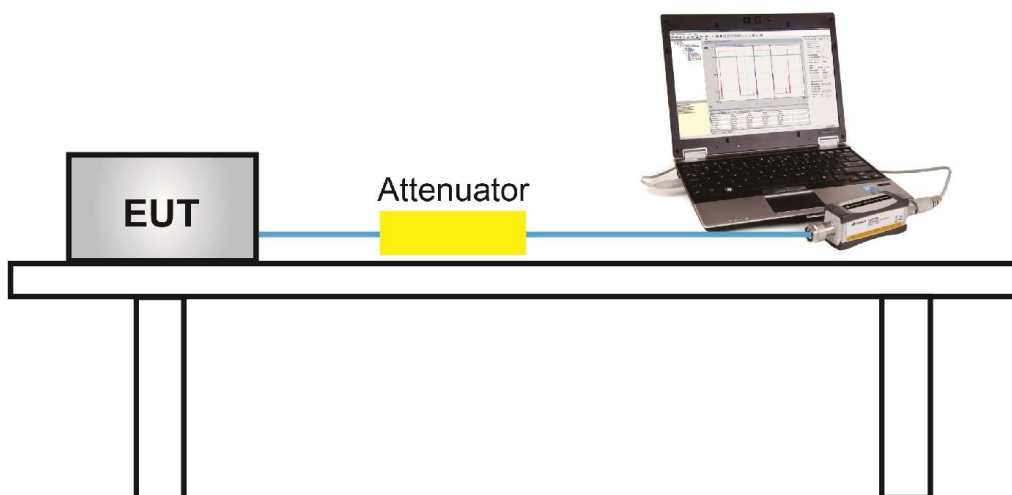
Method PKPM1 (Peak Power Measurement)

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.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

7.3.4. Test Setup



7.3.5. Test Result

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	56%
Test Site	TR3	Test Date	2019/01/18

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	6.53	≤ 30.00	Pass
BLE	1	19	2440	7.83	≤ 30.00	Pass
BLE	1	39	2480	8.42	≤ 30.00	Pass

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
BLE	1	00	2402	6.11	≤ 30.00	Pass
BLE	1	19	2440	7.44	≤ 30.00	Pass
BLE	1	39	2480	8.01	≤ 30.00	Pass

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

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

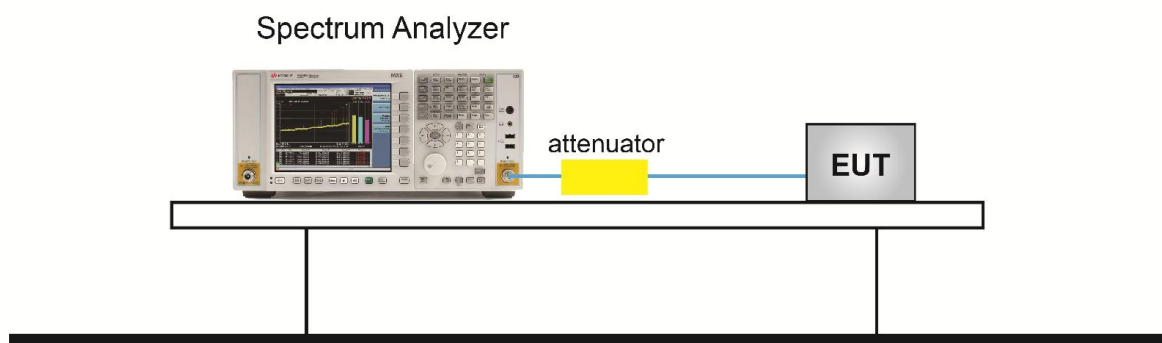
7.4.2. Test Procedure Used

ANSI C63.10 Section 11.10.6

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

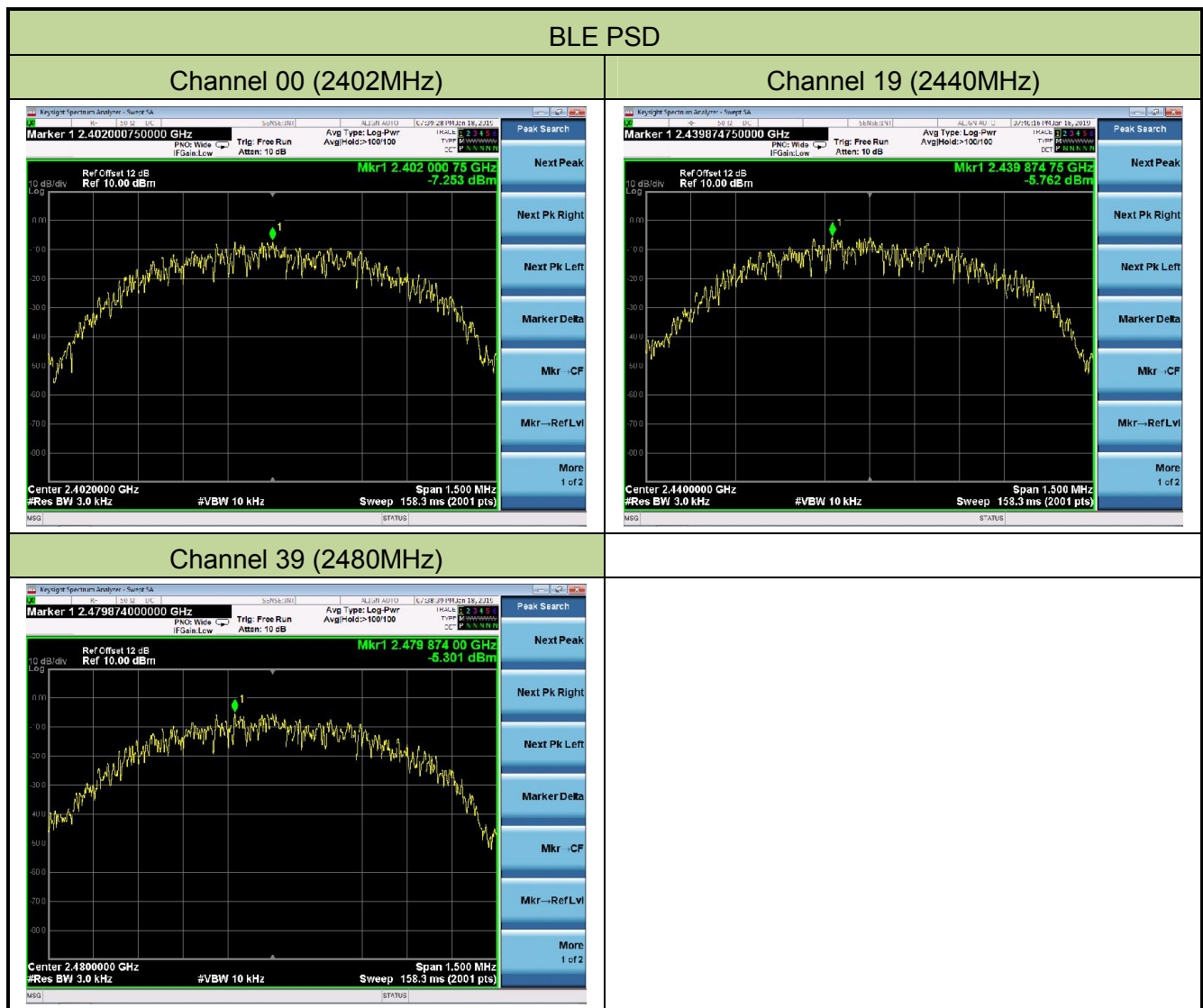
7.4.4. Test Setup



7.4.5. Test Result

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	56%
Test Site	TR3	Test Date	2019/01/18

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	1	00	2402	-7.25	≤ 8.00	Pass
BLE	1	19	2440	-5.76	≤ 8.00	Pass
BLE	1	39	2480	-5.30	≤ 8.00	Pass



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

ANSI C63.10 Section 11.11

7.5.3. Test Setting

Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 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

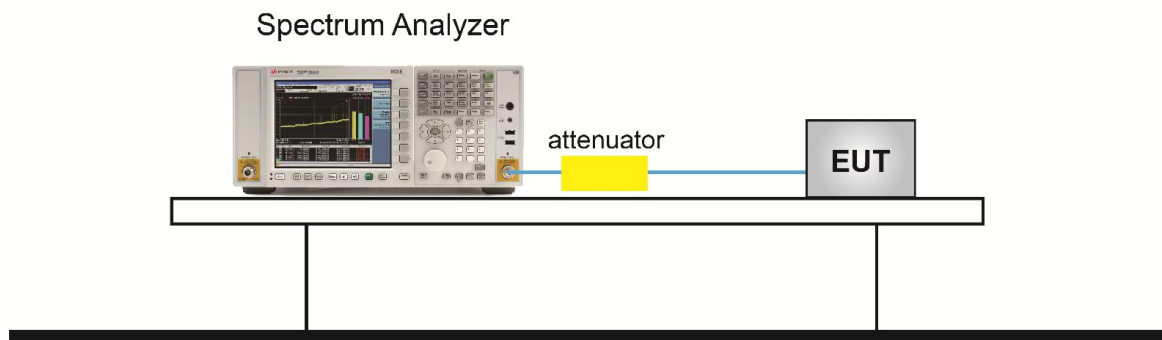
Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 1.3MHz
3. VBW = 4MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Notes

1. RBW was set to 1.3MHz rather than 100 kHz in order to increase the measurement speed.
2. The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100 kHz bandwidth. However, since the traces in the following plots are measured with a 1.3MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1.3MHz bandwidth.
3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

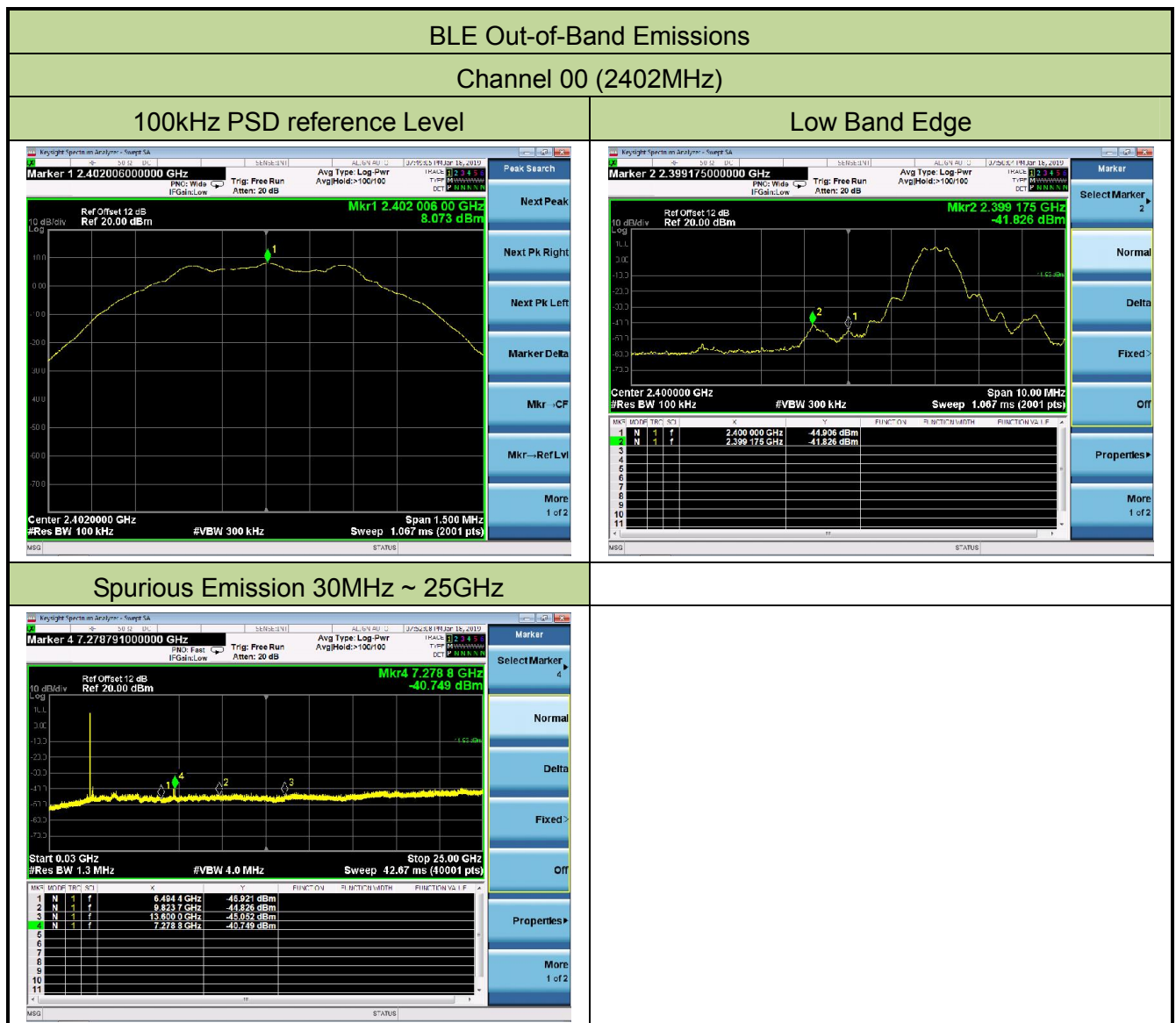
7.5.4.Test Setup



7.5.5. Test Result

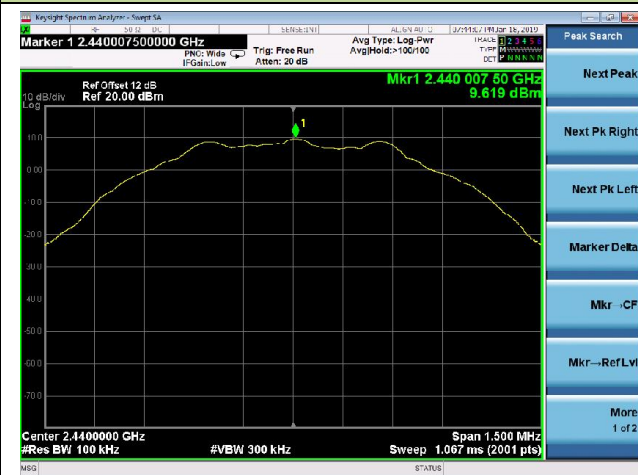
Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Snake Ni	Relative Humidity	56%
Test Site	SR2	Test Date	2019/01/18

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



Channel 19 (2440MHz)

100kHz PSD reference Level



Spurious Emission 30MHz ~ 25GHz

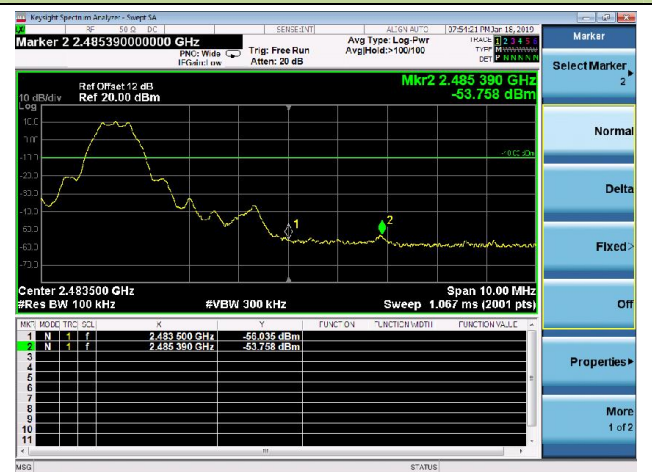


Channel 39 (2480MHz)

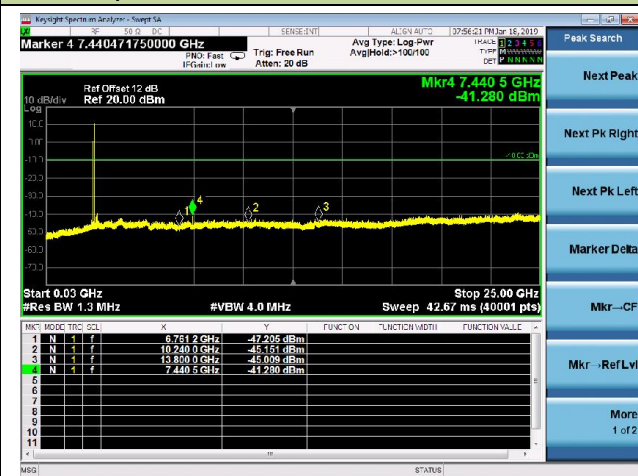
100kHz PSD reference Level



High Band Edge



Spurious Emission 30MHz ~ 25GHz



7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

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 [V/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

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
> 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 or average
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

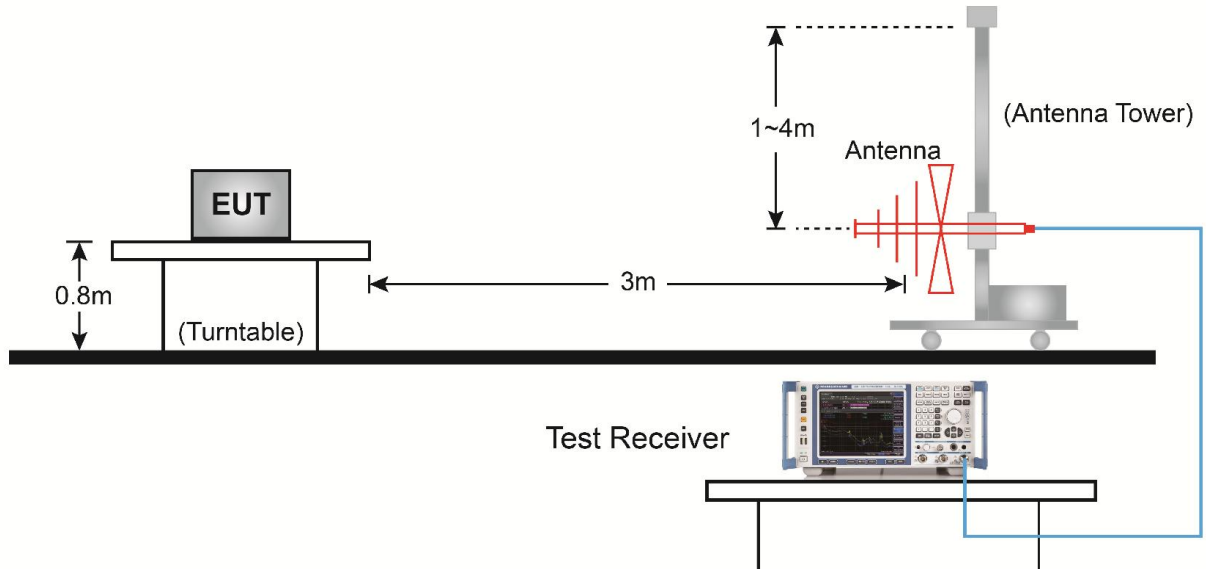
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

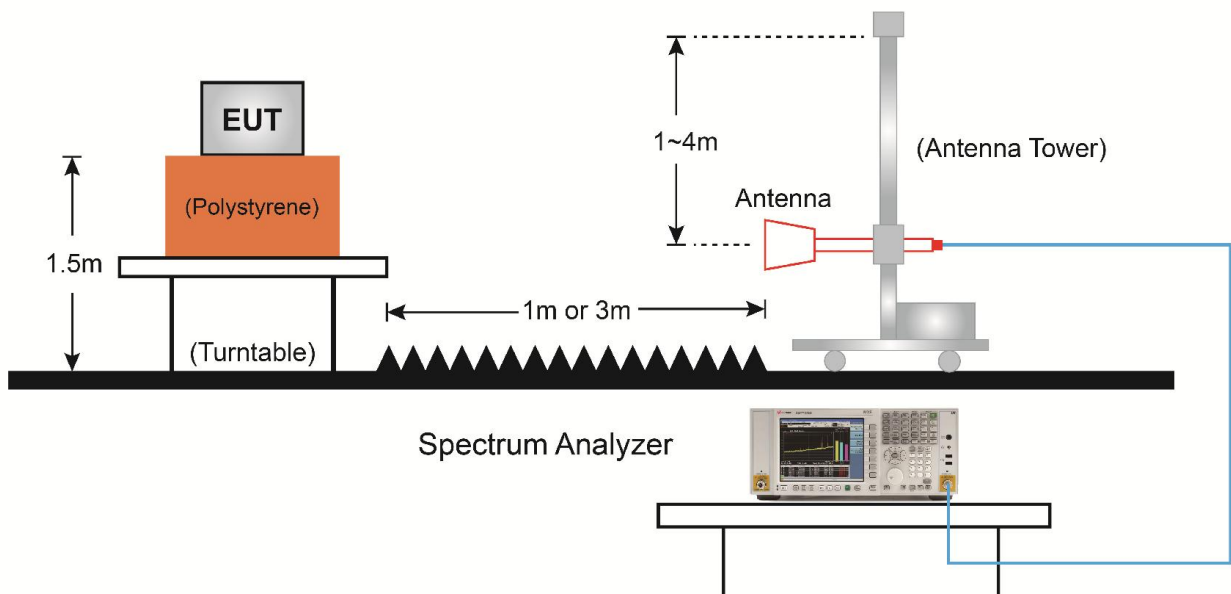
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4.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

7.6.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



7.6.5. Test Result

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Max Wang	Relative Humidity	54%
Test Site	AC1	Test Date	2019/01/18
Test Mode:	BLE (Model: M2-MI10)	Test Channel:	00
Remark:	1. Average measurement was not performed if peak level lower than average limit (54dBμV/m). 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
	4145.0	37.6	3.8	41.4	74.0	-32.6	Peak	Horizontal
	4808.0	39.4	5.9	45.2	74.0	-28.8	Peak	Horizontal
*	7205.0	39.4	12.6	52.0	84.7	-32.7	Peak	Horizontal
*	14455.5	36.1	21.1	57.2	84.7	-27.5	Peak	Horizontal
	4068.5	37.7	3.5	41.2	74.0	-32.8	Peak	Vertical
	4799.5	37.8	5.8	43.6	74.0	-30.4	Peak	Vertical
*	5955.5	35.5	7.9	43.4	84.7	-41.3	Peak	Vertical
*	7205.0	38.3	12.6	50.9	84.7	-33.8	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (104.7dBμV/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)

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Max Wang	Relative Humidity	54%
Test Site	AC1	Test Date	2019/01/18
Test Mode:	BLE (Model: M2-MI10)	Test Channel:	19
Remark:	1. Average measurement was not performed if peak level lower than average limit (54dBμV/m). 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	38.8	6.0	44.8	74.0	-29.2	Peak	Horizontal
	7315.5	40.7	12.6	53.2	74.0	-20.8	Peak	Horizontal
*	7876.5	34.3	13.3	47.7	85.3	-37.6	Peak	Horizontal
*	8820.0	33.8	13.3	47.2	85.3	-38.1	Peak	Horizontal
	4833.5	36.1	5.9	42.0	74.0	-32.0	Peak	Vertical
	7324.0	39.3	12.6	51.9	74.0	-22.1	Peak	Vertical
*	7851.0	33.6	13.3	47.0	85.3	-38.3	Peak	Vertical
*	8633.0	35.7	12.9	48.5	85.3	-36.8	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (105.3dBμV/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)

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Max Wang	Relative Humidity	54%
Test Site	AC1	Test Date	2019/01/18
Test Mode:	BLE (Model: M2-MI10)	Test Channel:	39
Remark:	1. Average measurement was not performed if peak level lower than average limit (54dBμV/m). 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
	4961.0	37.8	6.1	43.9	74.0	-30.1	Peak	Horizontal
	7440.1	35.1	12.9	48.0	54.0	-6.0	Average	Horizontal
	7443.0	41.5	12.9	54.4	74.0	-19.6	Peak	Horizontal
*	8616.0	34.0	12.9	46.8	85.9	-39.1	Peak	Horizontal
*	9729.5	34.9	15.8	50.7	85.9	-35.2	Peak	Horizontal
	4791.0	37.0	5.8	42.8	74.0	-31.2	Peak	Vertical
	7443.0	40.2	12.9	53.1	74.0	-20.9	Peak	Vertical
	7443.0	34.2	12.9	47.1	54.0	-6.9	Average	Vertical
*	8684.0	33.2	13.1	46.3	85.9	-39.6	Peak	Vertical
*	10001.5	34.8	16.7	51.5	85.9	-34.4	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (105.9dBμV/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)

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Max Wang	Relative Humidity	54%
Test Site	AC1	Test Date	2019/01/18
Test Mode:	BLE (Model: M4)	Test Channel:	00
Remark:	1. Average measurement was not performed if peak level lower than average limit (54dBμV/m). 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
	3822.0	38.7	2.8	41.5	74.0	-32.5	Peak	Horizontal
	4808.0	42.2	5.9	48.1	74.0	-26.0	Peak	Horizontal
*	6550.5	36.2	10.2	46.4	84.4	-38.0	Peak	Horizontal
*	7205.0	41.8	12.6	54.4	84.4	-30.0	Peak	Horizontal
	4247.0	37.1	4.1	41.2	74.0	-32.8	Peak	Vertical
	4808.0	38.2	5.9	44.1	74.0	-29.9	Peak	Vertical
*	6584.5	36.0	10.2	46.3	84.4	-38.1	Peak	Vertical
*	7205.0	39.1	12.6	51.7	84.4	-32.7	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (104.4dBμV/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)

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Max Wang	Relative Humidity	54%
Test Site	AC1	Test Date	2019/01/18
Test Mode:	BLE (Model: M4)	Test Channel:	19
Remark:	1. Average measurement was not performed if peak level lower than average limit (54dBμV/m). 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	40.7	6.0	46.7	74.0	-27.3	Peak	Horizontal
	7320.0	34.7	12.6	47.3	54.0	-6.7	Average	Horizontal
	7324.0	42.2	12.6	54.9	74.0	-19.1	Peak	Horizontal
*	7910.5	35.5	13.4	48.9	84.1	-35.2	Peak	Horizontal
*	8837.0	35.9	13.2	49.1	84.1	-35.0	Peak	Horizontal
	4876.0	38.8	6.0	44.8	74.0	-29.2	Peak	Vertical
	7315.5	42.1	12.6	54.7	74.0	-19.3	Peak	Vertical
*	7842.5	34.4	13.3	47.7	84.1	-36.4	Peak	Vertical
*	8658.5	36.3	13.0	49.2	84.1	-34.9	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (104.1dBμV/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)

Product	PORTABLE BLUETOOTH SPEAKER	Temperature	25°C
Test Engineer	Max Wang	Relative Humidity	54%
Test Site	AC1	Test Date	2019/01/18
Test Mode:	BLE (Model: M4)	Test Channel:	39
Remark:	1. Average measurement was not performed if peak level lower than average limit (54dBμV/m). 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
	4961.0	38.8	6.1	44.9	74.0	-29.1	Peak	Horizontal
	7440.1	34.1	12.9	47.0	54.0	-7.0	Average	Horizontal
	7443.0	42.7	12.9	55.6	74.0	-18.4	Peak	Horizontal
*	7910.5	34.9	13.4	48.3	84.2	-35.9	Peak	Horizontal
*	8743.5	34.5	13.1	47.6	84.2	-36.6	Peak	Horizontal
	4961.0	37.2	6.1	43.3	74.0	-30.7	Peak	Vertical
	7440.0	32.6	12.9	45.5	54.0	-8.5	Average	Vertical
	7443.0	41.8	12.9	54.7	74.0	-19.3	Peak	Vertical
*	7902.0	35.7	13.4	49.1	84.2	-35.1	Peak	Vertical
*	8811.5	35.1	13.3	48.4	84.2	-35.8	Peak	Vertical

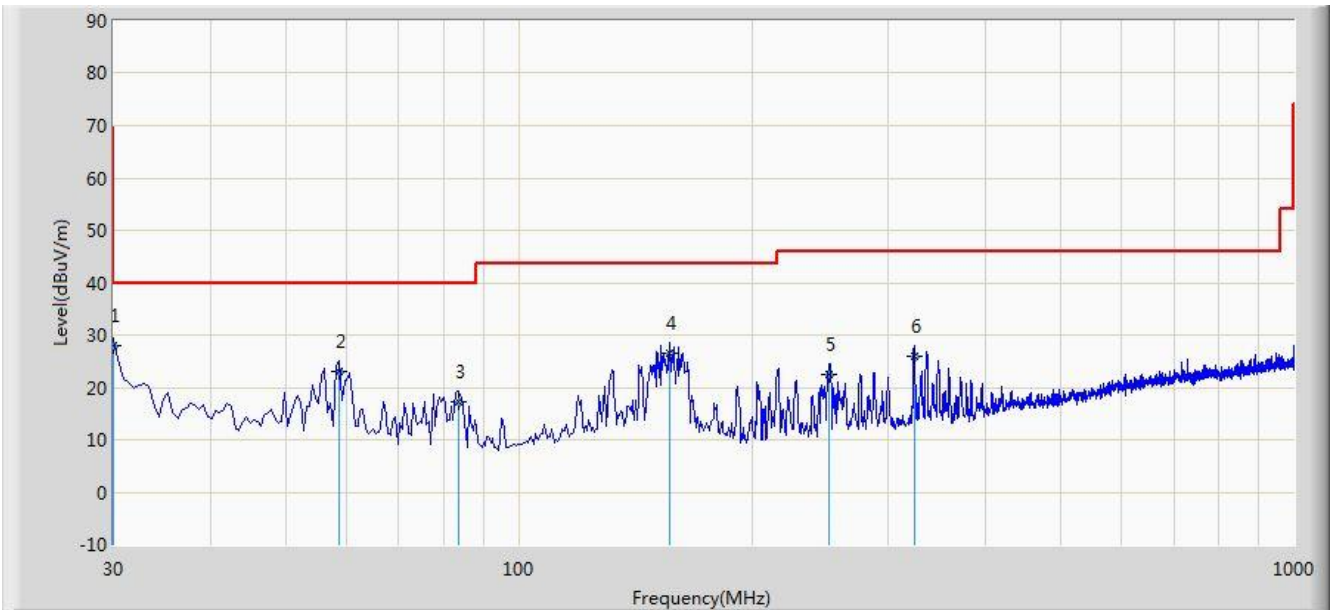
Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (104.2dBμV/m) or 15.209 which is higher.

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

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Worst Case of Radiated Emission below 1GHz:

Site: AC1	Time: 2019/01/18 - 23:14
Limit: FCC_Part15.209_RSE(3m)	Engineer: David Lv
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Worst Case (Model: M2-MI10)	



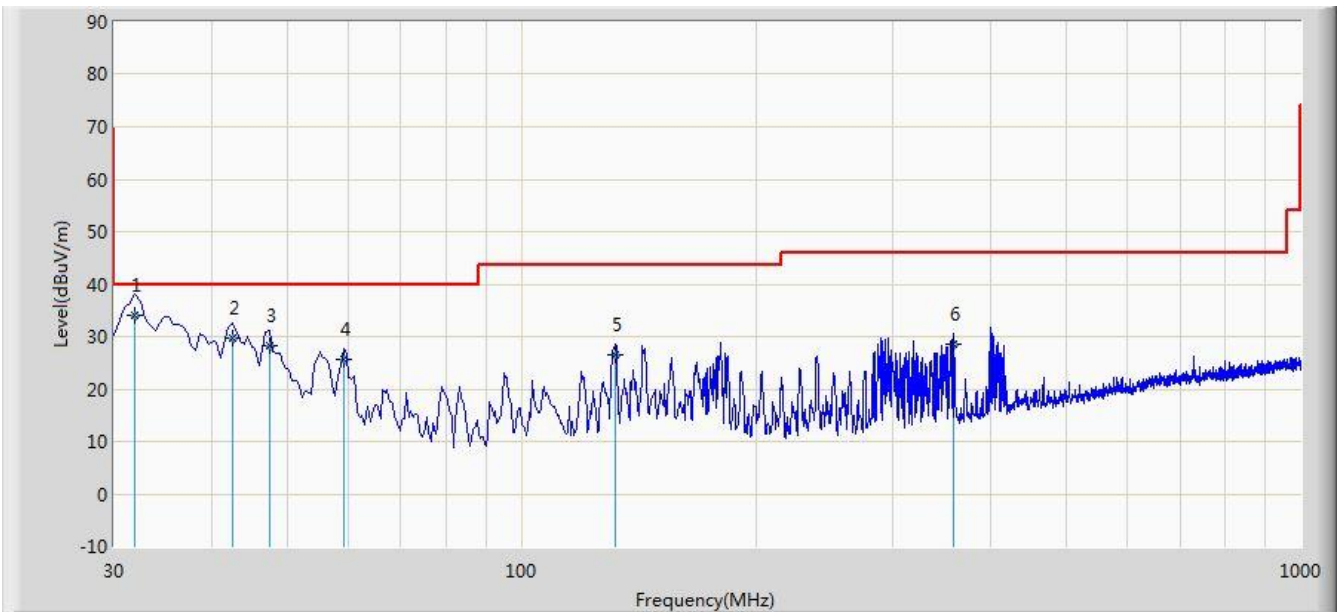
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			30.000	27.888	14.173	-12.112	40.000	13.715	QP
2			58.615	22.959	9.394	-17.041	40.000	13.565	QP
3			83.835	17.340	7.150	-22.660	40.000	10.190	QP
4		*	156.585	26.435	11.139	-17.065	43.500	15.296	QP
5			251.160	22.381	9.334	-23.619	46.000	13.047	QP
6			323.910	26.054	10.996	-19.946	46.000	15.058	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: 2019/01/18 - 23:15
Limit: FCC_Part15.209_RSE(3m)	Engineer: David Lv
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Worst Case (Model: M2-MI10)	



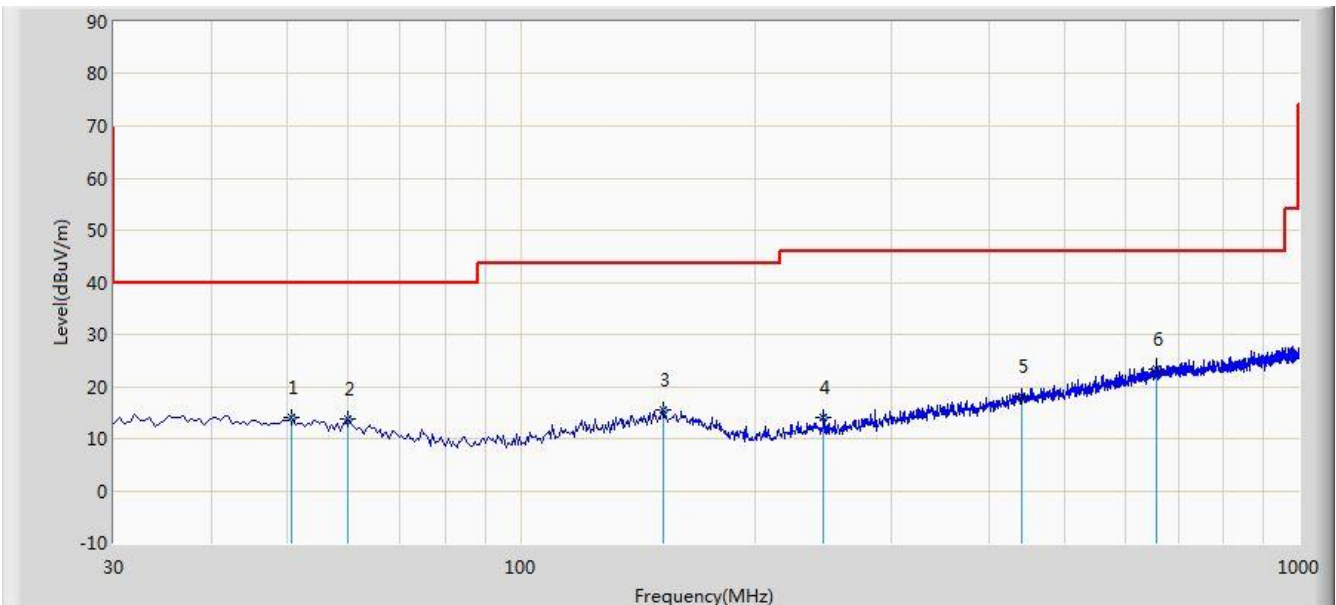
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			50.855	14.140	0.014	-25.860	40.000	14.126	QP
2			60.070	13.735	0.320	-26.265	40.000	13.415	QP
3		*	152.705	15.390	0.100	-28.110	43.500	15.290	QP
4			245.340	13.969	1.020	-32.031	46.000	12.949	QP
5			441.280	18.200	0.508	-27.800	46.000	17.692	QP
6			657.590	23.383	1.821	-22.617	46.000	21.562	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: 2019/02/12 - 17:10
Limit: FCC_Part15.209_RSE(3m)	Engineer: David Lv
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Worst Case (Model: M4)	



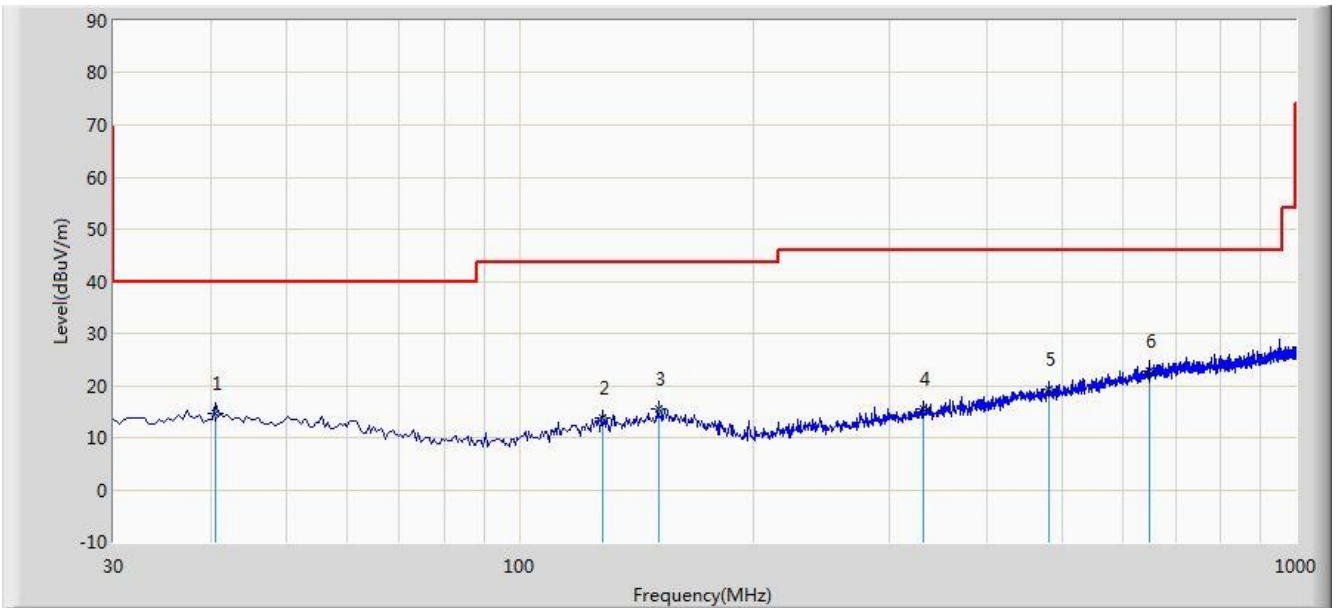
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			30.000	27.888	14.173	-12.112	40.000	13.715	QP
2			58.615	22.959	9.394	-17.041	40.000	13.565	QP
3			83.835	17.340	7.150	-22.660	40.000	10.190	QP
4		*	156.585	26.435	11.139	-17.065	43.500	15.296	QP
5			251.160	22.381	9.334	-23.619	46.000	13.047	QP
6			323.910	26.054	10.996	-19.946	46.000	15.058	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: 2019/02/12 - 17:11
Limit: FCC_Part15.209_RSE(3m)	Engineer: David Lv
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Worst Case (Model: M4)	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			40.670	14.594	0.014	-25.406	40.000	14.580	QP
2			127.970	13.854	0.140	-29.646	43.500	13.714	QP
3		*	151.250	15.605	0.320	-27.895	43.500	15.285	QP
4			331.185	15.380	0.175	-30.620	46.000	15.205	QP
5			481.535	19.313	1.010	-26.687	46.000	18.303	QP
6			648.860	22.791	1.351	-23.209	46.000	21.441	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.

7.7. Radiated Restricted Band Edge Measurement

7.7.1. 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
¹ 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 - 156.525	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	(²)
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 [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

7.7.2.Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

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

7.7.3.Test Setting

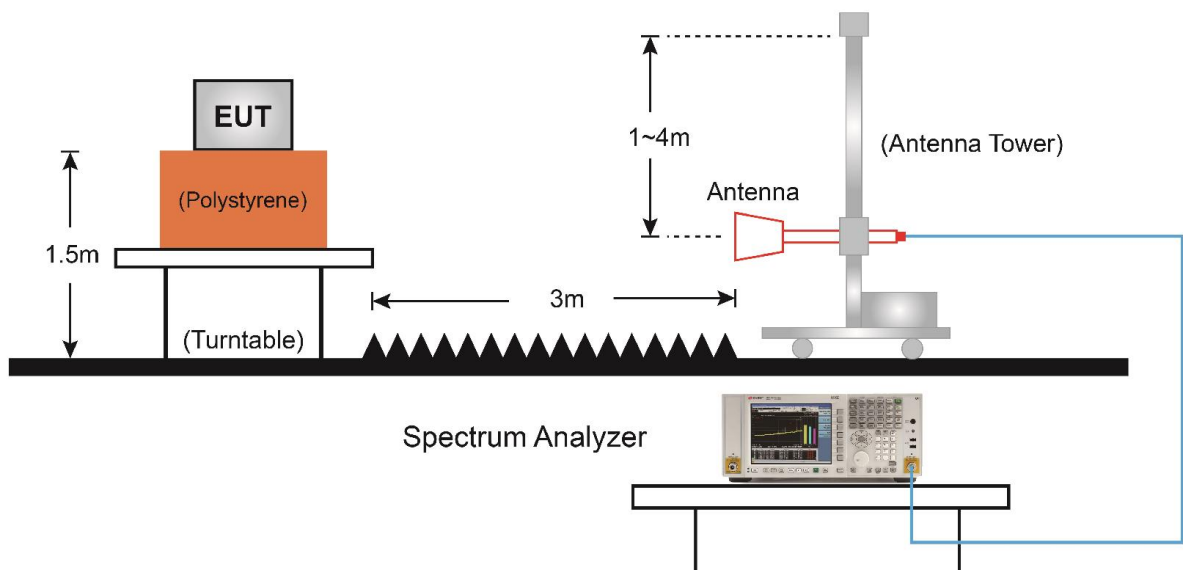
Peak Field Strength Measurements

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

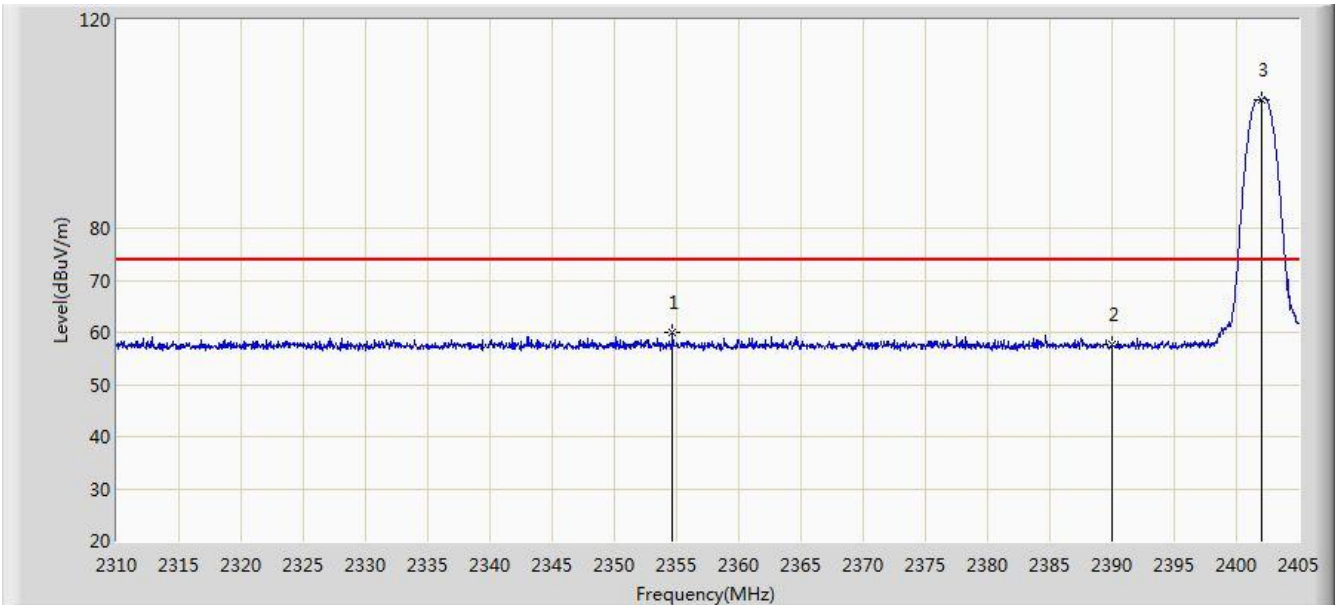
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4.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

7.7.4.Test Setup



7.7.5.Test Result

Site: AC1	Time: 2019/01/18 - 11:48
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz (Model: M2-MI10)	

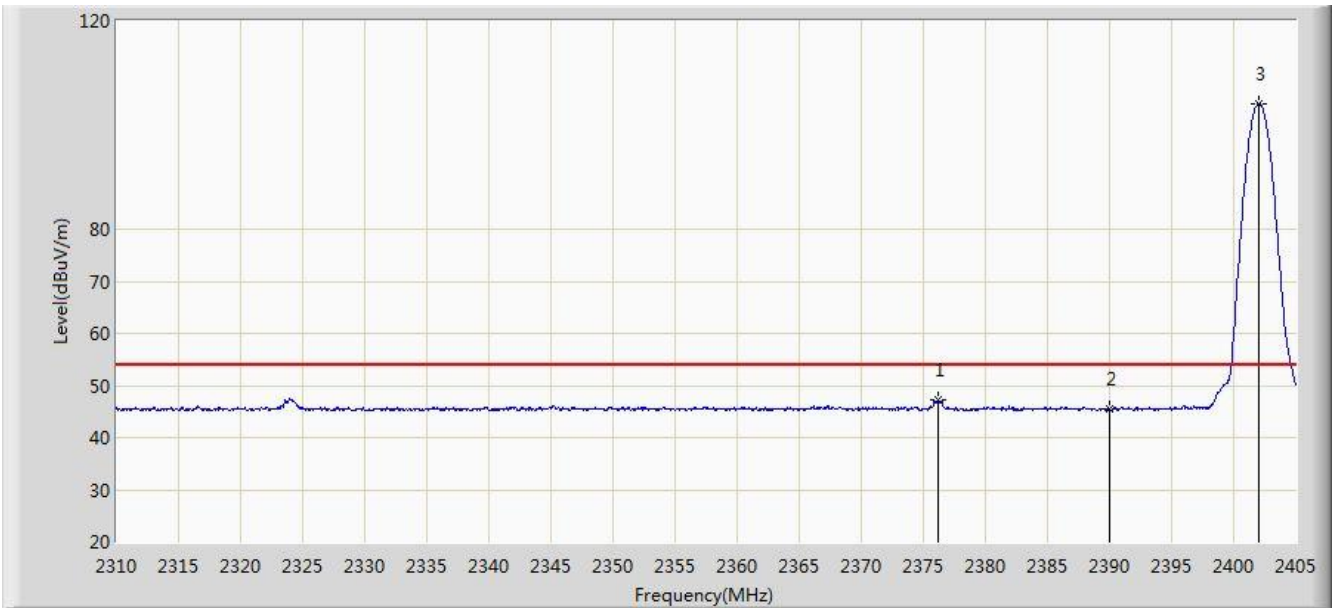


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2354.698	60.092	27.705	-13.908	74.000	32.387	PK
2			2390.000	57.705	25.378	-16.295	74.000	32.327	PK
3		*	2402.008	104.693	72.389	N/A	N/A	32.305	PK

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

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

Site: AC1	Time: 2019/01/18 - 11:58
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz (Model: M2-MI10)	

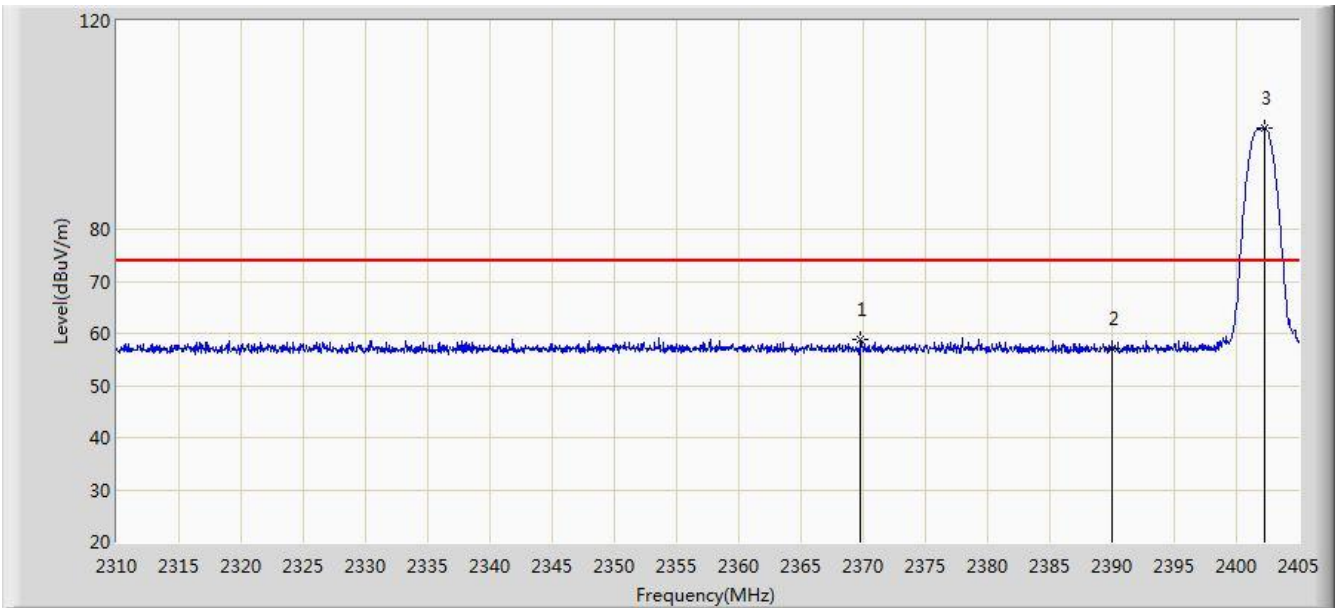


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2376.167	47.272	14.926	-6.728	54.000	32.346	AV
2			2390.000	45.470	13.143	-8.530	54.000	32.327	AV
3		*	2402.008	104.117	71.813	N/A	N/A	32.305	AV

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

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

Site: AC1	Time: 2019/01/18 - 12:00
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz (Model: M2-MI10)	

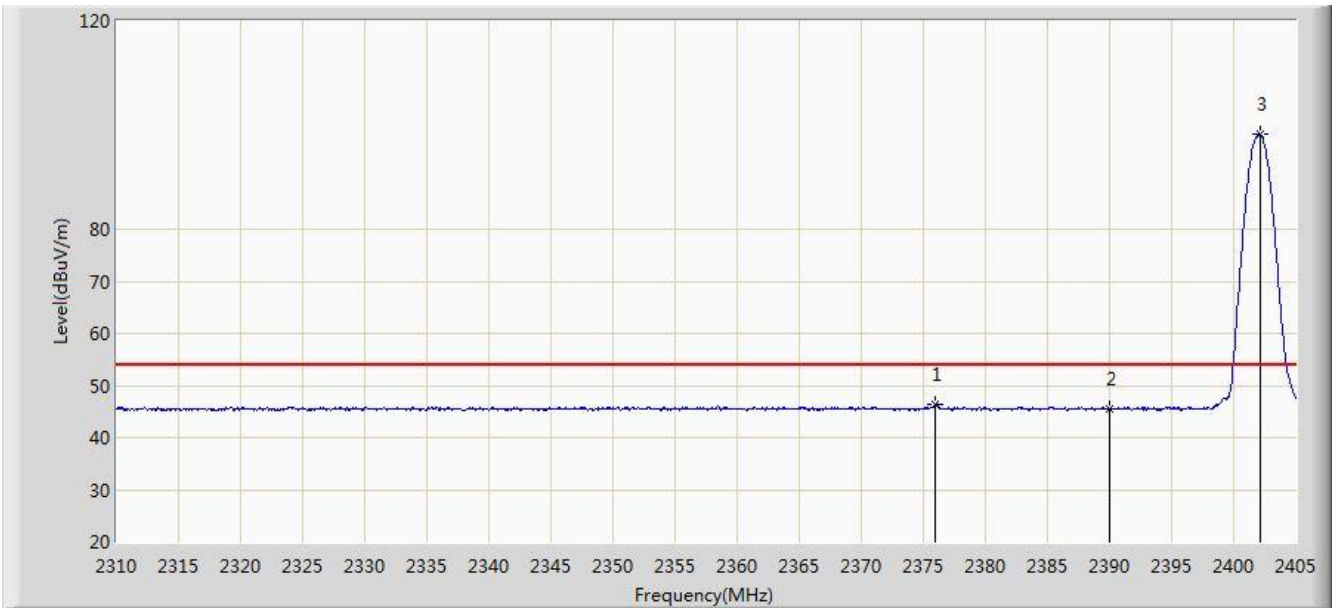


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2369.755	58.803	26.445	-15.197	74.000	32.358	PK
2			2390.000	57.216	24.889	-16.784	74.000	32.327	PK
3		*	2402.292	99.522	67.218	N/A	N/A	32.304	PK

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

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

Site: AC1	Time: 2019/01/18 - 13:07
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz (Model: M2-MI10)	

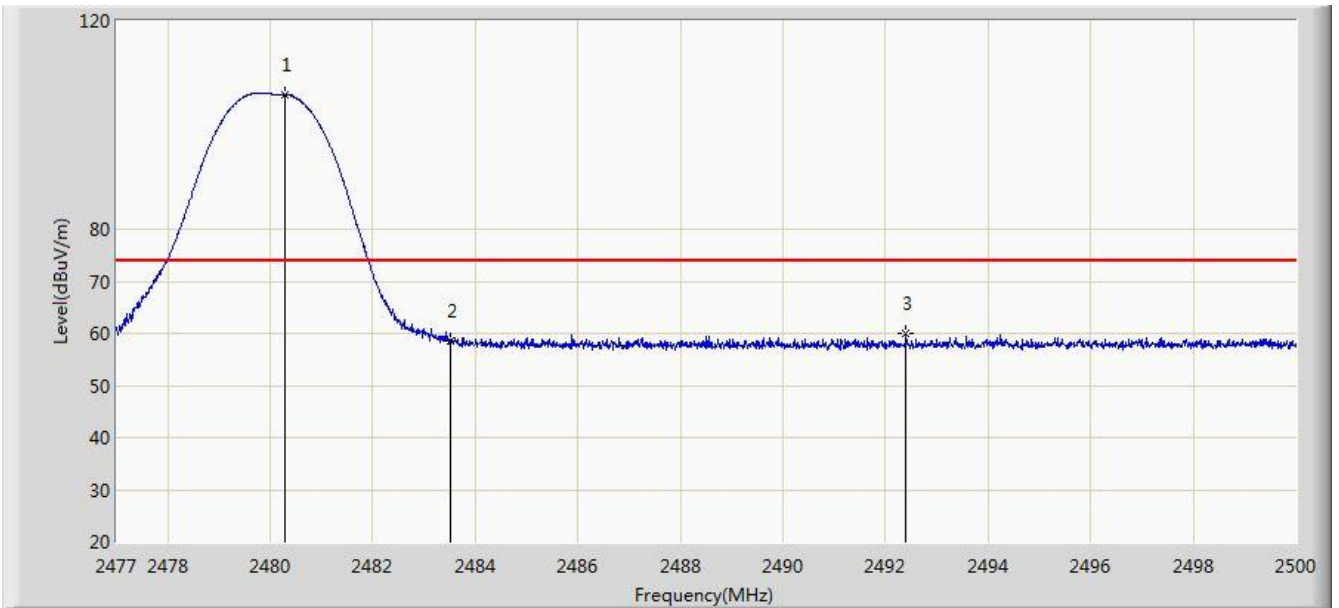


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2375.930	46.249	13.902	-7.751	54.000	32.346	AV
2			2390.000	45.607	13.280	-8.393	54.000	32.327	AV
3		*	2402.150	98.227	65.923	N/A	N/A	32.304	AV

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

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

Site: AC1	Time: 2019/01/18 - 13:08
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz (Model: M2-MI10)	

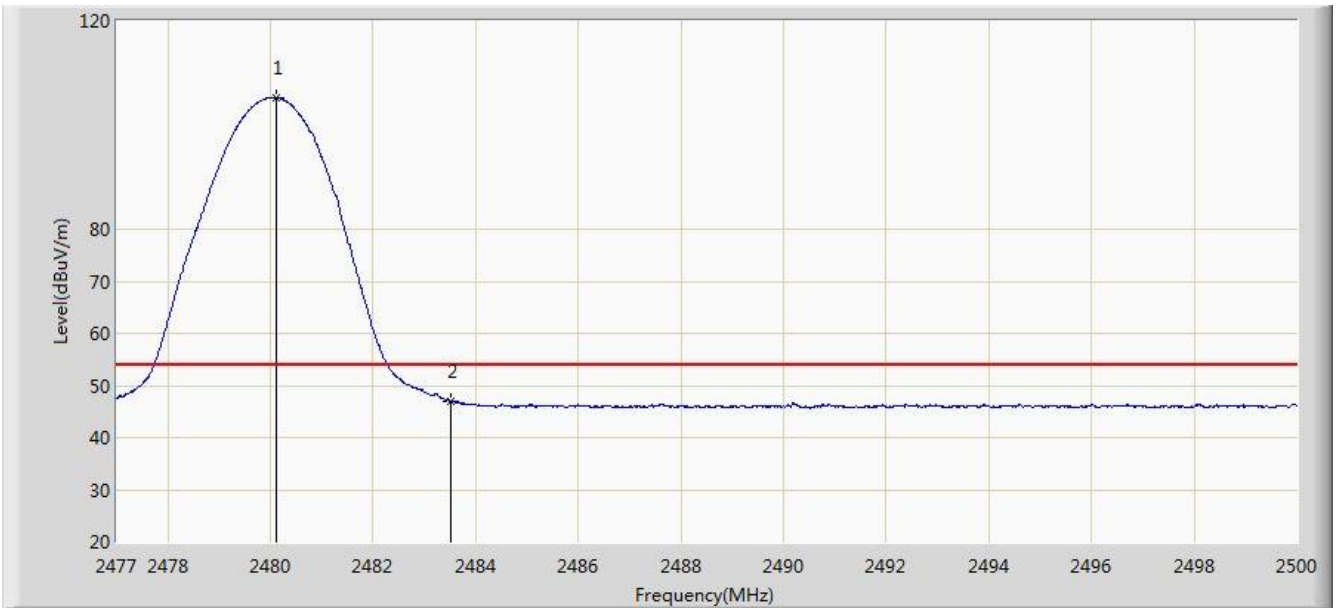


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.278	105.890	73.564	N/A	N/A	32.327	PK
2			2483.500	58.419	26.080	-15.581	74.000	32.340	PK
3			2492.398	60.038	27.664	-13.962	74.000	32.374	PK

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

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

Site: AC1	Time: 2019/01/18 - 13:10
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz (Model: M2-MI10)	

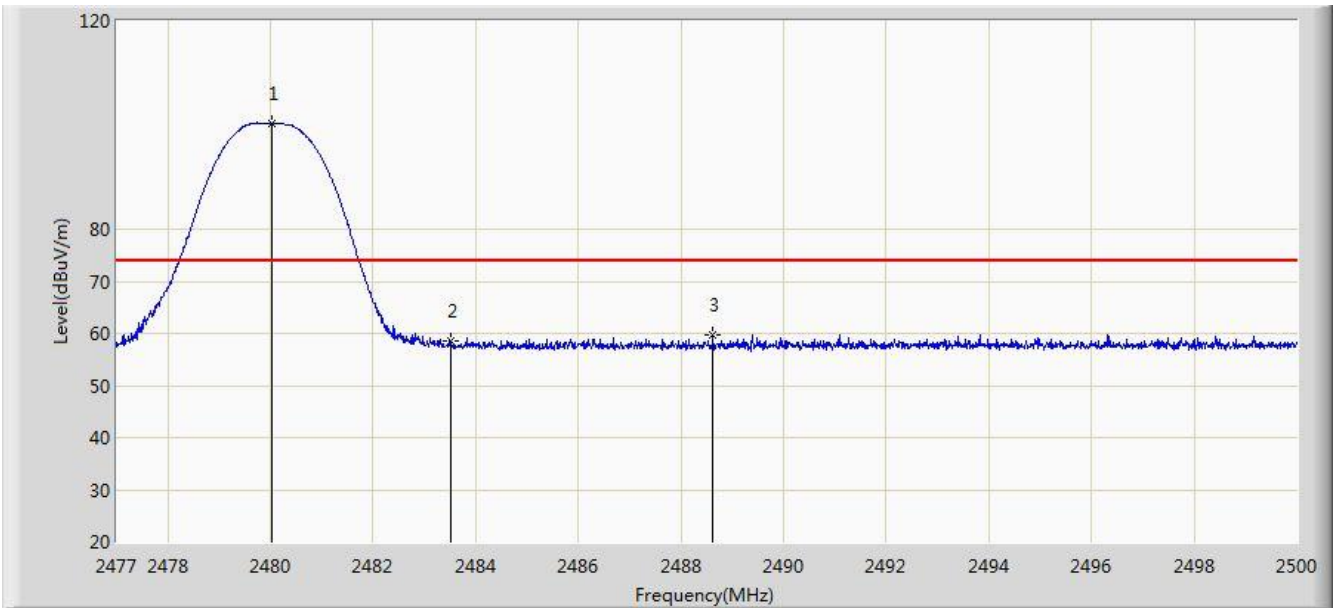


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.105	105.255	72.929	N/A	N/A	32.325	AV
2			2483.500	47.050	14.711	-6.950	54.000	32.340	AV

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

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

Site: AC1	Time: 2019/01/18 - 13:13
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz (Model: M2-MI10)	

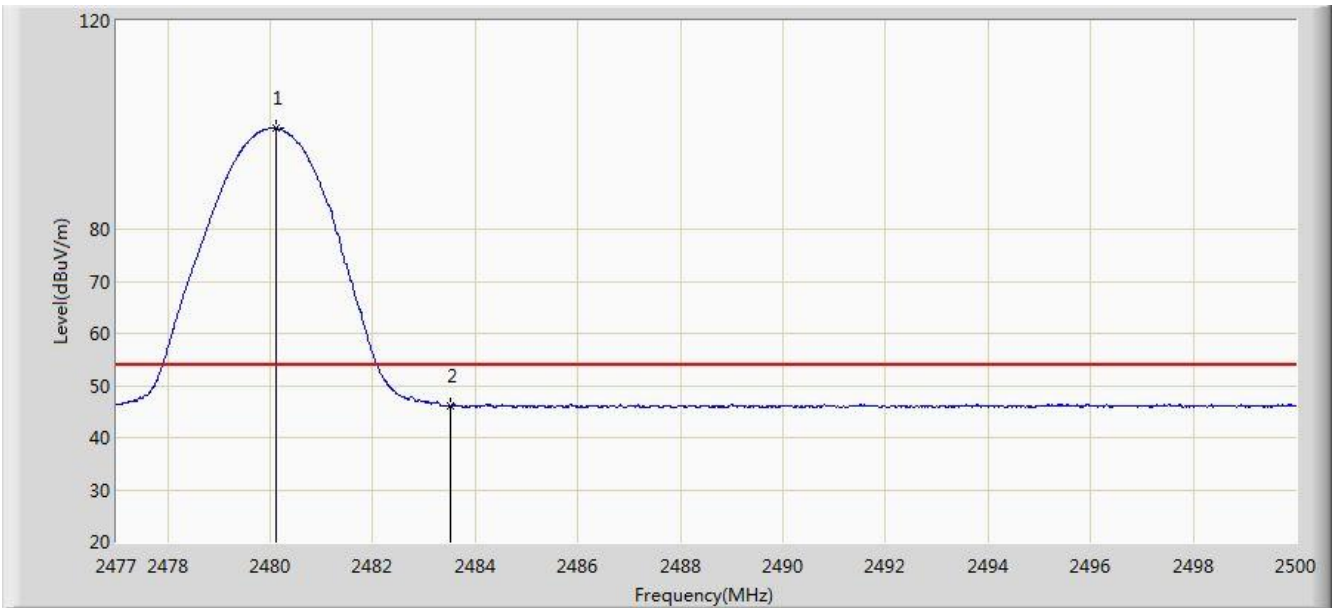


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.013	100.292	67.967	N/A	N/A	32.325	PK
2			2483.500	58.498	26.159	-15.502	74.000	32.340	PK
3			2488.626	59.702	27.343	-14.298	74.000	32.359	PK

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

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

Site: AC1	Time: 2019/01/18 - 13:14
Limit: FCC_Part15.209_RE(3m)	Engineer: Max Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz (Model: M2-MI10)	

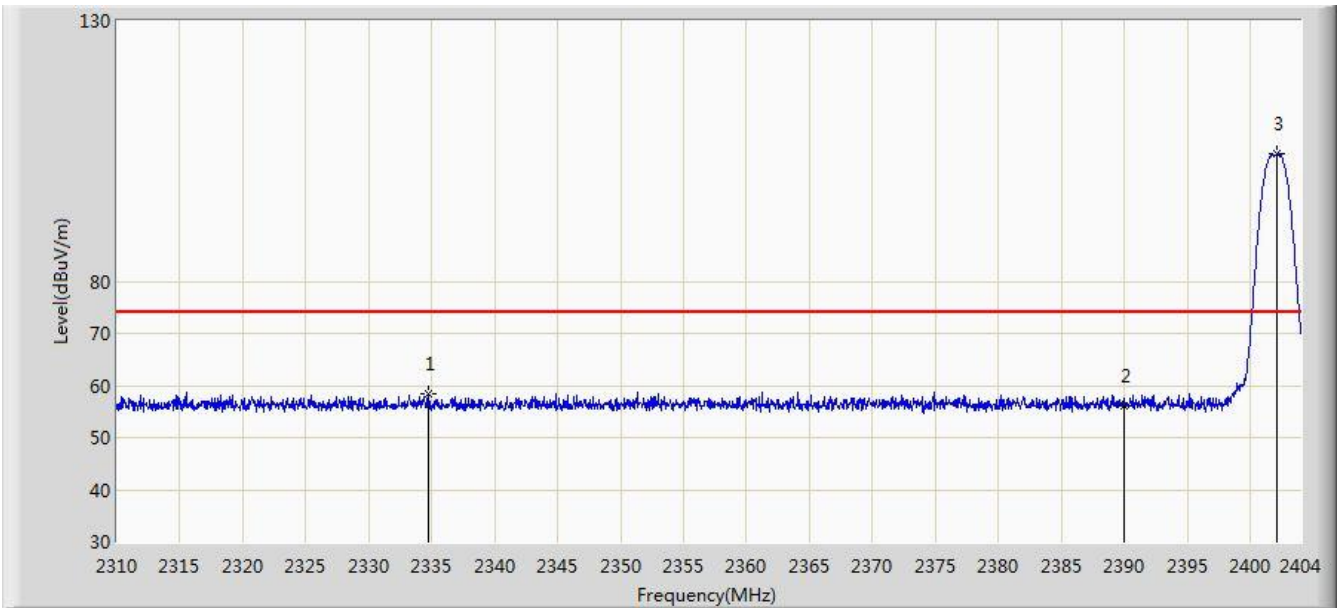


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.105	99.371	67.045	N/A	N/A	32.325	AV
2			2483.500	46.088	13.749	-7.912	54.000	32.340	AV

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

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

Site: AC1	Time: 2019/02/12 - 10:58
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz (Model: M4)	

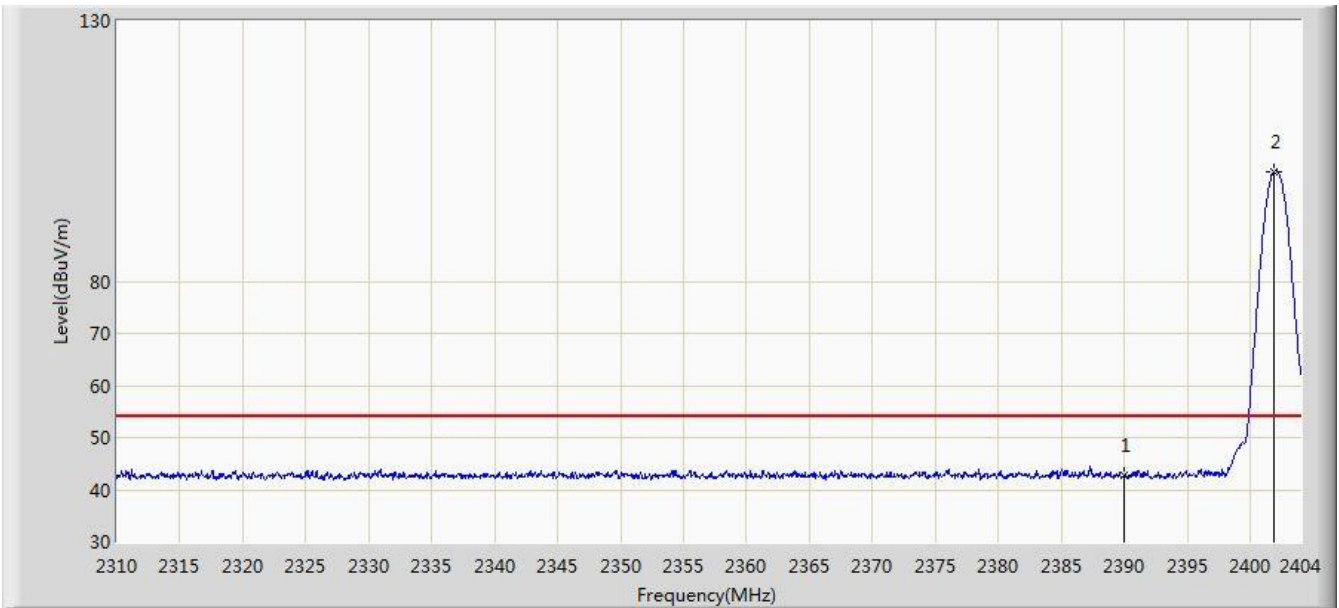


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2334.769	58.531	26.077	-15.469	74.000	32.454	PK
2			2390.000	56.156	23.829	-17.844	74.000	32.327	PK
3		*	2402.167	104.384	72.080	N/A	N/A	32.304	PK

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

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

Site: AC1	Time: 2019/02/12 - 11:04
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz (Model: M4)	

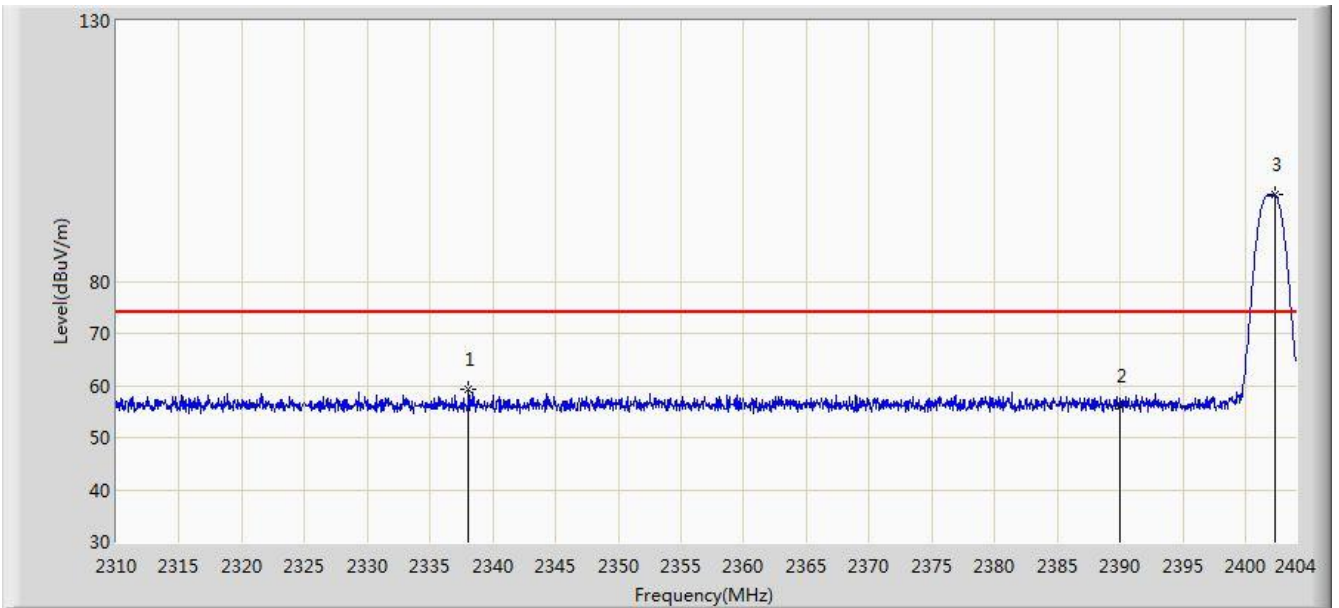


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	42.776	10.449	-11.224	54.000	32.327	AV
2		*	2401.885	100.977	68.672	N/A	N/A	32.305	AV

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

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

Site: AC1	Time: 2019/02/12 - 11:05
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz (Model: M4)	

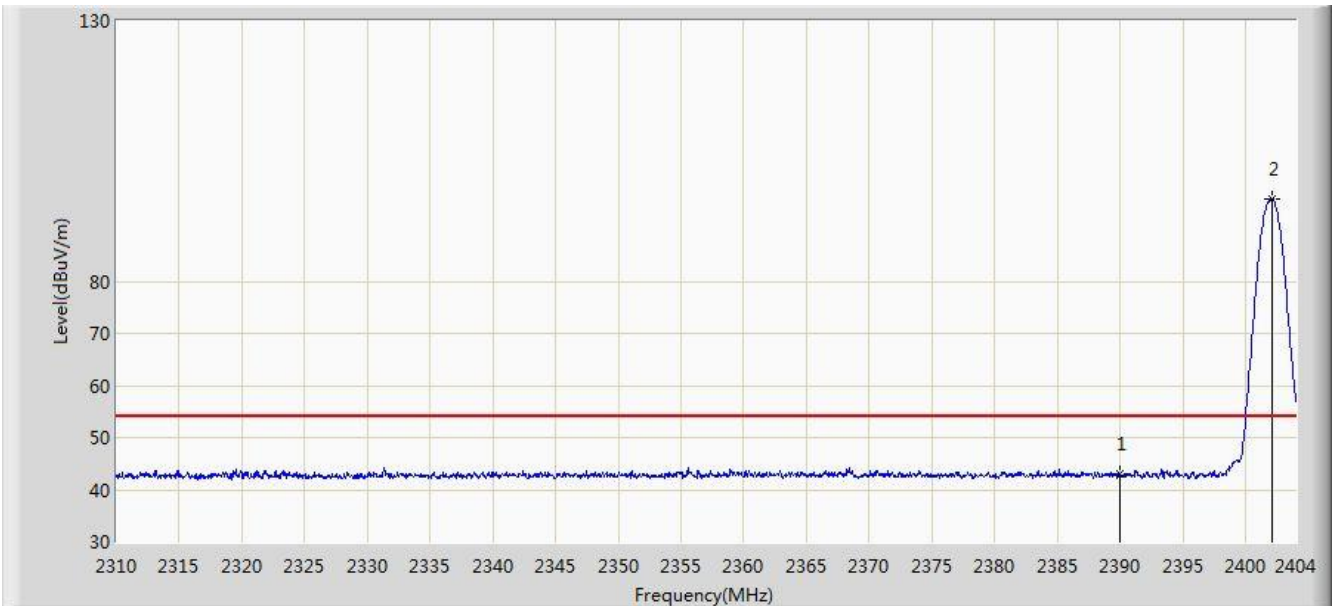


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2338.059	59.141	26.702	-14.859	74.000	32.439	PK
2			2390.000	56.130	23.803	-17.870	74.000	32.327	PK
3		*	2402.355	96.620	64.316	N/A	N/A	32.304	PK

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

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

Site: AC1	Time: 2019/02/12 - 11:06
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz (Model: M4)	

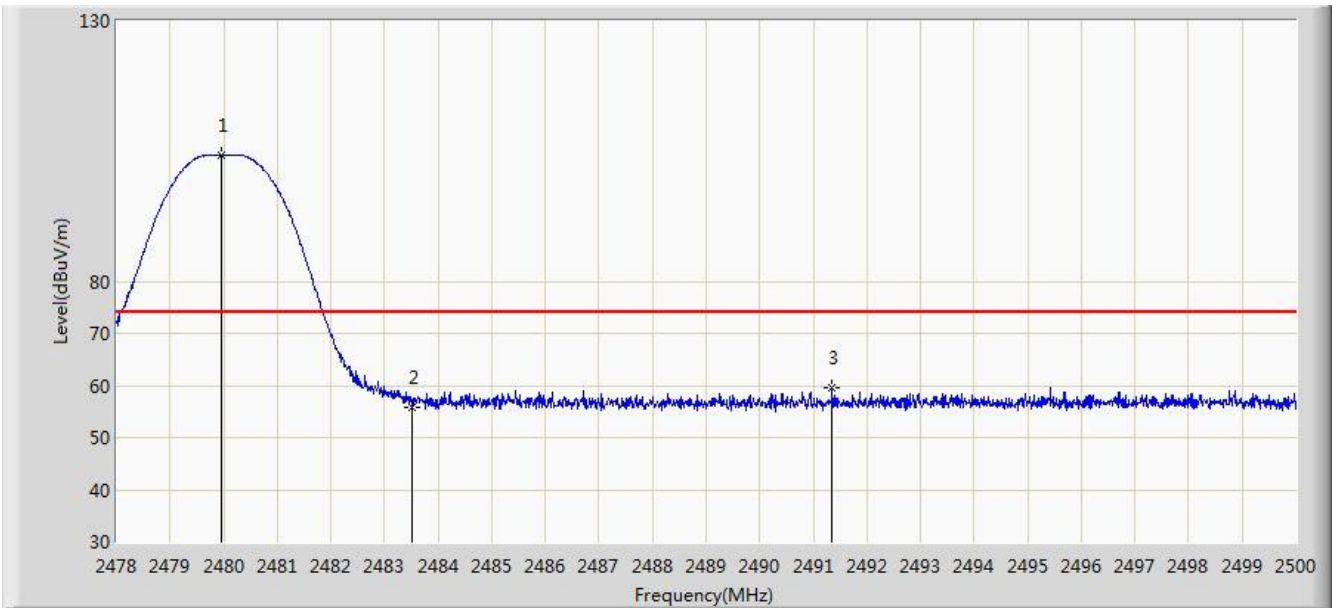


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2390.000	42.936	10.609	-11.064	54.000	32.327	AV
2		*	2402.073	95.933	63.629	N/A	N/A	32.304	AV

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

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

Site: AC1	Time: 2019/02/12 - 11:08
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2480MHz (Model: M4)	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.969	104.169	71.844	N/A	N/A	32.325	PK
2			2483.500	55.924	23.585	-18.076	74.000	32.340	PK
3			2491.354	59.466	27.096	-14.534	74.000	32.370	PK

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

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

Site: AC1	Time: 2019/02/12 - 11:09
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2480MHz (Model: M4)	

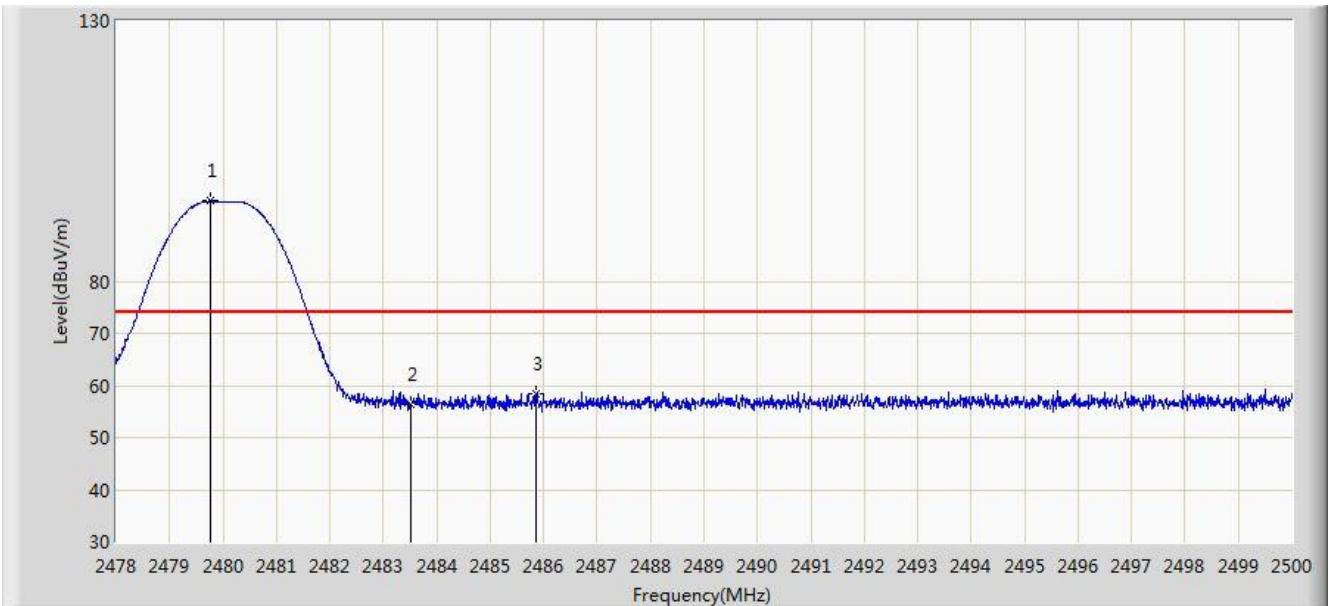


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.112	103.516	71.190	N/A	N/A	32.325	AV
2			2483.500	44.828	12.489	-9.172	54.000	32.340	AV

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

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

Site: AC1	Time: 2019/02/12 - 11:11
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2480MHz (Model: M4)	

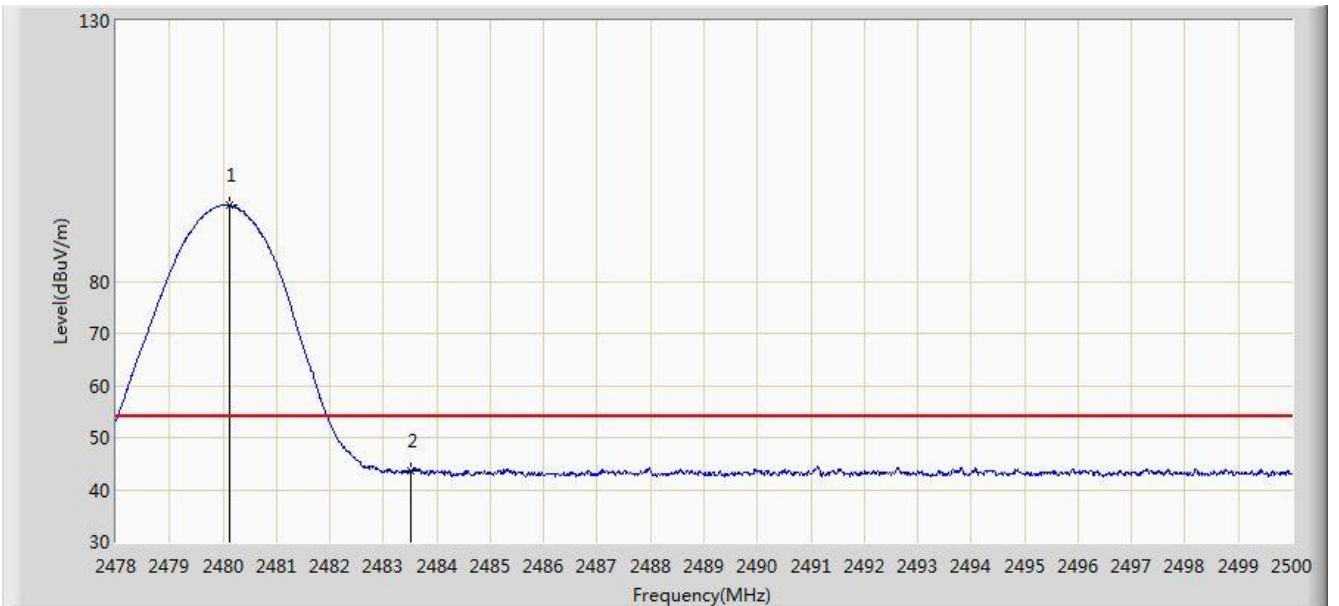


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.771	95.422	63.097	N/A	N/A	32.325	PK
2			2483.500	56.285	23.946	-17.715	74.000	32.340	PK
3			2485.854	58.462	26.114	-15.538	74.000	32.349	PK

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

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

Site: AC1	Time: 2019/02/12 - 11:12
Limit: FCC_Part15_Band Edge(3m)	Engineer: David Lv
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: PORTABLE BLUETOOTH SPEAKER	Power: By Battery
Test Mode: Transmit by BLE at channel 2480MHz (Model: M4)	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.112	94.556	62.230	N/A	N/A	32.325	AV
2			2483.500	43.523	11.184	-10.477	54.000	32.340	AV

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

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

7.8. AC Conducted Emissions Measurement

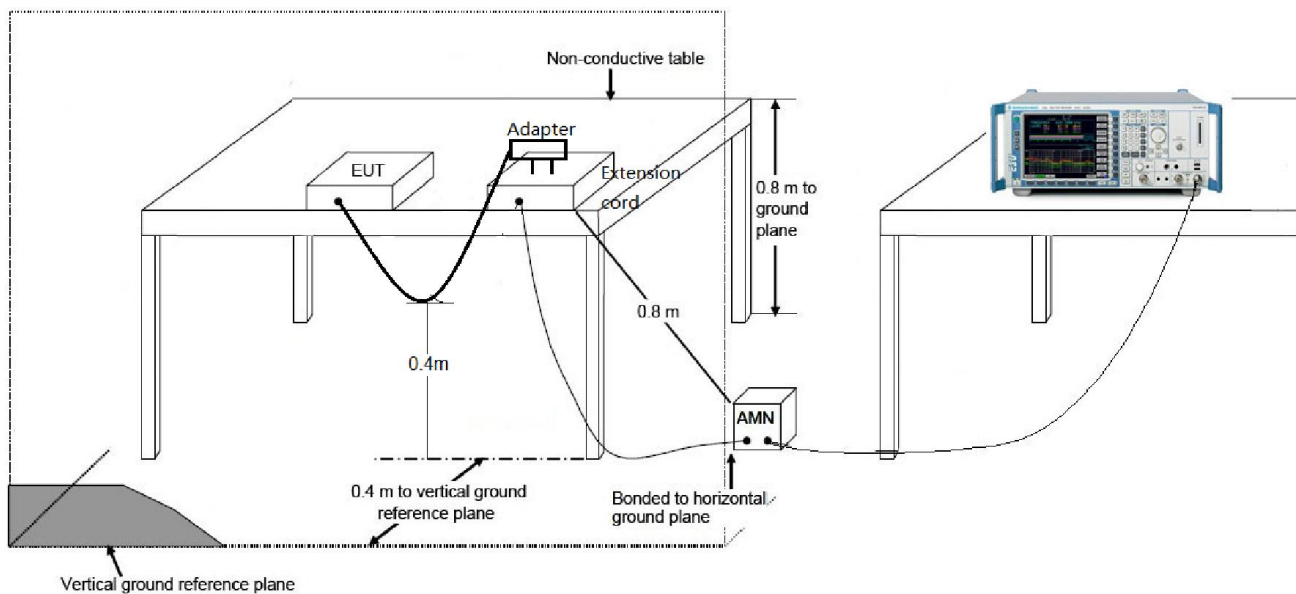
7.8.1. Test Limit

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.

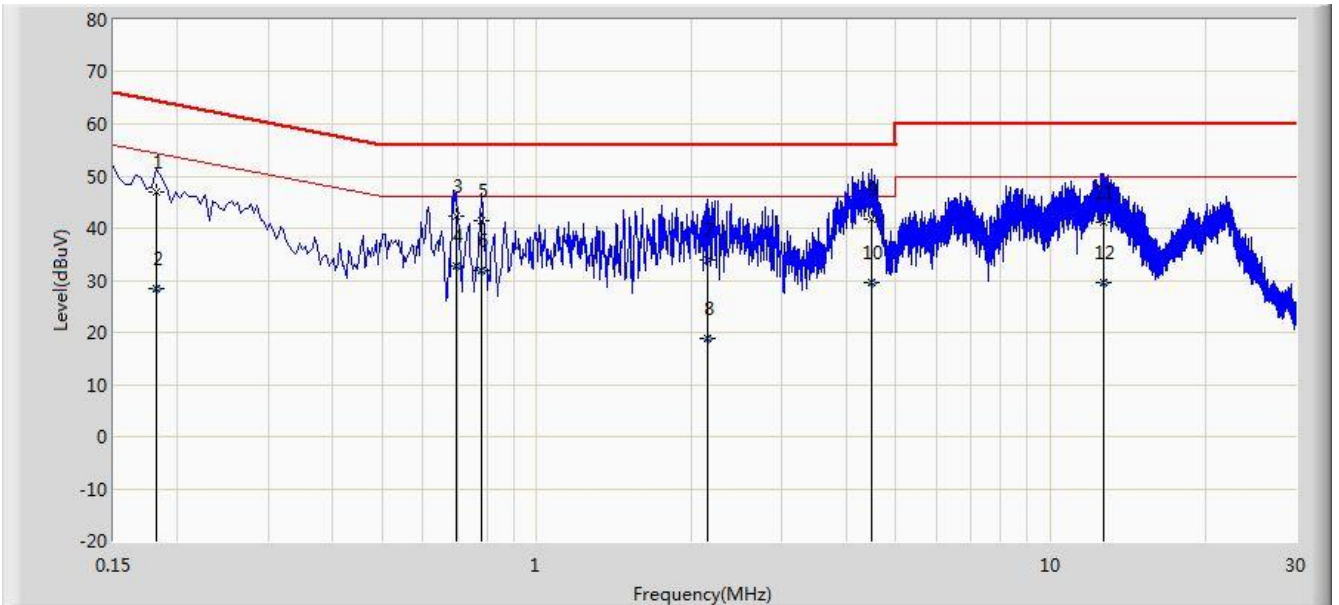
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

7.8.2. Test Setup



7.8.3.Test Result

Site: SR2	Time: 2019/02/19 - 15:46
Limit: FCC_Part15.107_CE_Class B	Engineer: Ternence Wang
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: PORTABLE BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Test Mode: Transmit at Channel 2402MHz By BLE (Model: M2-MI10)	

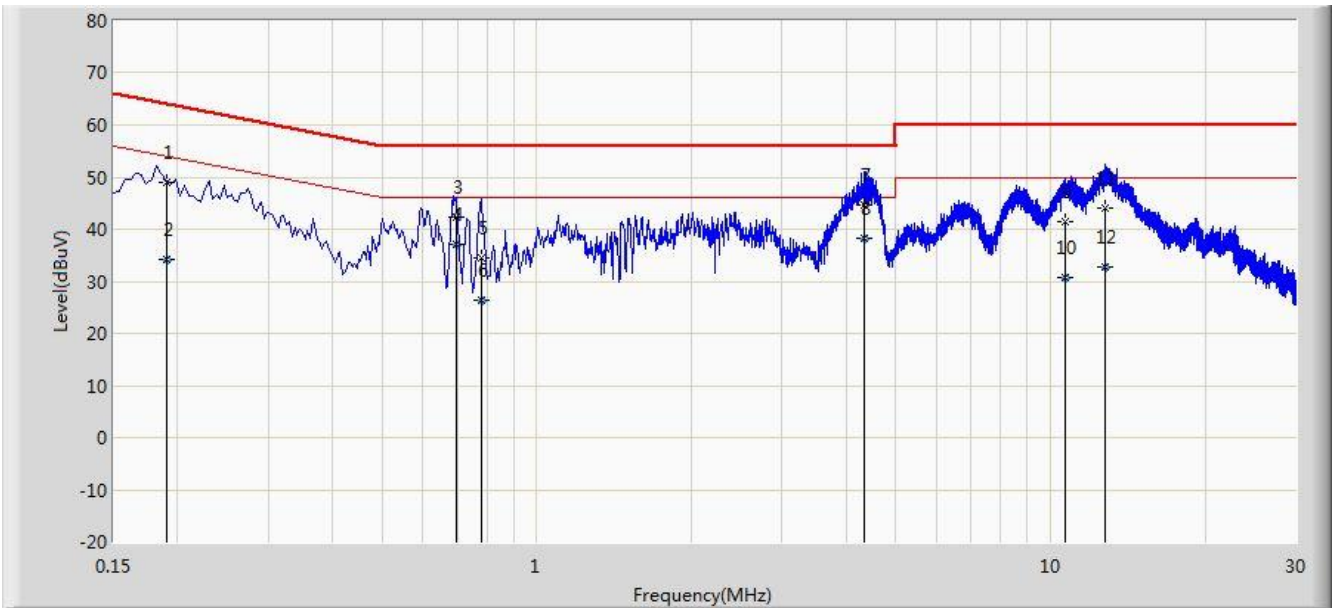


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor	Type
1			0.182	47.036	36.987	-17.358	64.394	10.048	QP
2			0.182	28.284	18.236	-26.110	54.394	10.048	AV
3			0.697	42.231	32.167	-13.769	56.000	10.064	QP
4		*	0.697	32.791	22.726	-13.209	46.000	10.064	AV
5			0.782	41.435	31.415	-14.565	56.000	10.020	QP
6			0.782	31.752	21.731	-14.248	46.000	10.020	AV
7			2.150	34.009	24.141	-21.991	56.000	9.867	QP
8			2.150	18.821	8.954	-27.179	46.000	9.867	AV
9			4.486	41.849	31.860	-14.151	56.000	9.990	QP
10			4.486	29.543	19.554	-16.457	46.000	9.990	AV
11			12.682	41.031	30.952	-18.969	60.000	10.079	QP
12			12.682	29.429	19.350	-20.571	50.000	10.079	AV

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

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

Site: SR2	Time: 2019/02/19 - 15:51
Limit: FCC_Part15.107_CE_Class B	Engineer: Ternence Wang
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: PORTABLE BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Test Mode: Transmit at Channel 2402MHz By BLE (Model: M2-MI10)	

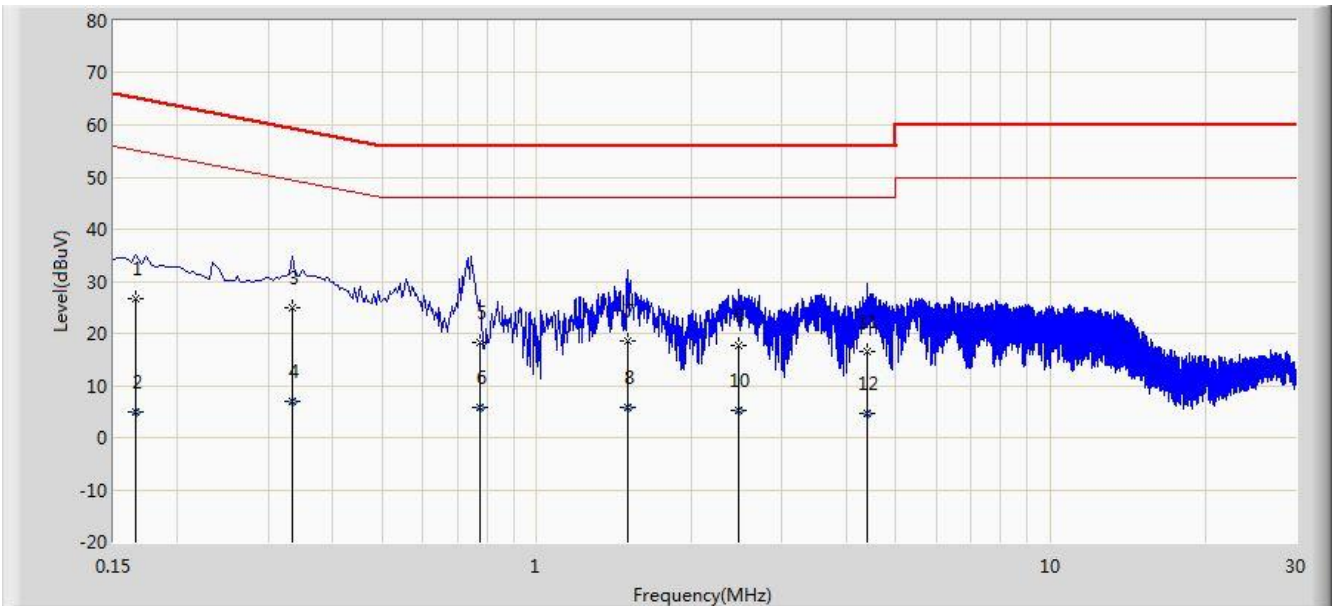


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor	Type
1			0.190	48.883	38.855	-15.139	64.021	10.027	QP
2			0.190	34.272	24.244	-19.750	54.021	10.027	AV
3			0.698	42.392	32.316	-13.608	56.000	10.076	QP
4			0.698	37.073	26.997	-8.927	46.000	10.076	AV
5			0.778	34.447	24.415	-21.553	56.000	10.032	QP
6			0.778	26.240	16.209	-19.760	46.000	10.032	AV
7			4.342	44.677	34.688	-11.323	56.000	9.989	QP
8		*	4.342	38.180	28.191	-7.820	46.000	9.989	AV
9			10.686	41.421	31.273	-18.579	60.000	10.148	QP
10			10.686	30.738	20.590	-19.262	50.000	10.148	AV
11			12.798	44.063	33.943	-15.937	60.000	10.120	QP
12			12.798	32.620	22.500	-17.380	50.000	10.120	AV

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

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

Site: SR2	Time: 2019/02/19 - 16:12
Limit: FCC_Part15.107_CE_Class B	Engineer: Ternence Wang
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: PORTABLE BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Test Mode: Transmit at Channel 2402MHz By BLE (Model: M4)	

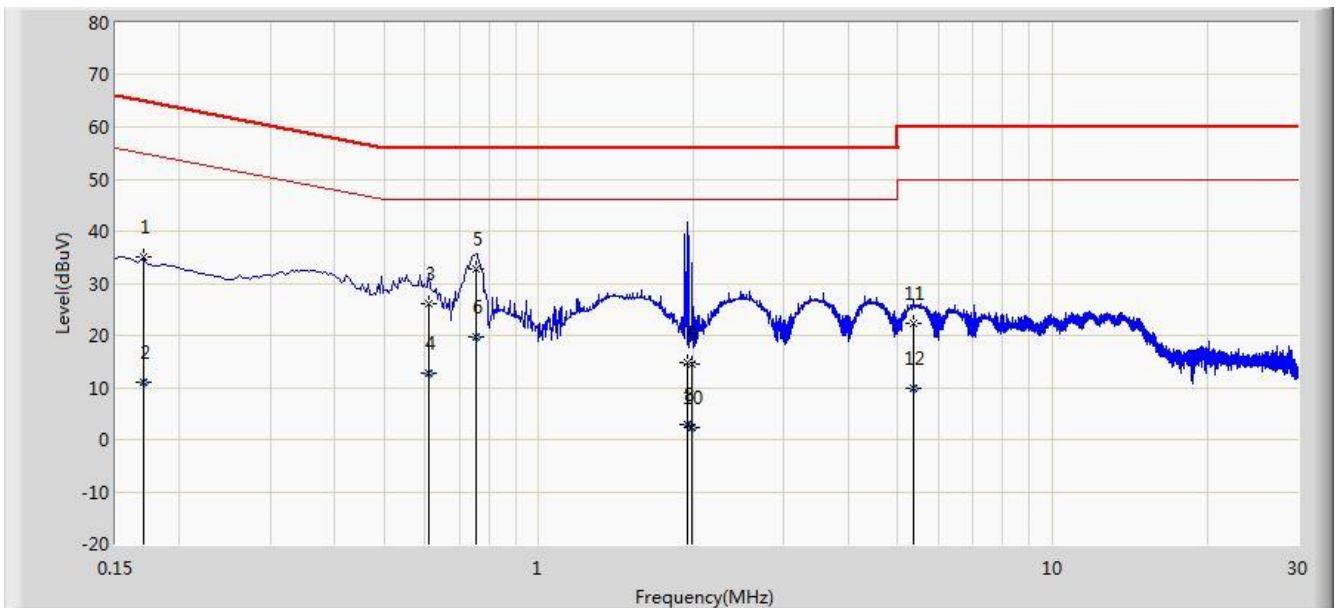


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor	Type
1			0.166	26.787	16.699	-38.371	65.158	10.087	QP
2			0.166	5.029	-5.058	-50.129	55.158	10.087	AV
3		*	0.334	24.822	14.790	-34.529	59.351	10.031	QP
4			0.334	7.028	-3.003	-42.323	49.351	10.031	AV
5			0.776	18.405	8.382	-37.595	56.000	10.024	QP
6			0.776	5.833	-4.190	-40.167	46.000	10.024	AV
7			1.502	18.537	8.649	-37.463	56.000	9.889	QP
8			1.502	5.742	-4.146	-40.258	46.000	9.889	AV
9			2.474	17.677	7.820	-38.323	56.000	9.858	QP
10			2.474	5.075	-4.783	-40.925	46.000	9.858	AV
11			4.390	16.624	6.642	-39.376	56.000	9.982	QP
12			4.390	4.560	-5.422	-41.440	46.000	9.982	AV

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

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

Site: SR2	Time: 2019/02/19 - 16:18
Limit: FCC_Part15.107_CE_Class B	Engineer: Ternence Wang
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: PORTABLE BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Test Mode: Transmit at Channel 2402MHz By BLE (Model: M4)	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor	Type
1			0.170	34.991	24.913	-29.970	64.960	10.078	QP
2			0.170	11.061	0.984	-43.899	54.960	10.078	AV
3			0.610	26.071	15.961	-29.929	56.000	10.110	QP
4			0.610	12.880	2.770	-33.120	46.000	10.110	AV
5		*	0.754	32.878	22.843	-23.122	56.000	10.035	QP
6			0.754	19.635	9.600	-26.365	46.000	10.035	AV
7			1.942	14.761	4.888	-41.239	56.000	9.873	QP
8			1.942	3.040	-6.834	-42.960	46.000	9.873	AV
9			1.990	14.533	4.662	-41.467	56.000	9.871	QP
10			1.990	2.213	-7.658	-43.787	46.000	9.871	AV
11			5.350	22.434	12.373	-37.566	60.000	10.061	QP
12			5.350	9.764	-0.297	-40.236	50.000	10.061	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 **PORTABLE BLUETOOTH SPEAKER** is in compliance with Part 15C of the FCC rules.

The End

Appendix A - Test Setup Photograph

Refer to “1901WSU007-UT” file.