MEASUREMENT REPORT

FCC PART 15.247 Bluetooth

FCC ID:	2AQZ7-BTSF9
APPLICANT:	Shenzhen Xingfeiyang Electronic Co., Ltd
Application Type:	Certification
Product:	F9 BoomBox Speaker
Model No.:	BTS-F9
Serial No.:	YJP001, YEH001, YEH002
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15 Subpart C (Section 15.247)
Test Procedure(s):	ANSI C63.10-2013, KDB 558074 D01v04
Test Date:	August 17~ 22, 2018

Reviewed By : Sunny Sun
(Sunny Sun)

Approved By : Robin Wu
(Robin Wu)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 558074 D01v04. Test results reported herein relate only to the item(s) tested.

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

Revision History

Report No.	Version	Description	Issue Date	Note
1808RSU017-U1	Rev. 01	Initial Report	08-27-2018	Valid

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Appendix B – EUT Photograph 47

§2.1033 General Information

Applicant:	Shenzhen Xingfeiyang Electronic Co., Ltd
Applicant Address:	No. 612, Bldg. 1, Liangji Building, 1st Road East Central, Longhua District, Shenzhen, Guangdong, China (Mainland)
Manufacturer:	Guangdong Dongguan Mopo New Energy Technology Co., Ltd.
Manufacturer Address:	701, Building L, Fengzhimei Industrial Park, Jinfeng Avenue, Fenggang Town, Dongguan, Guangdong, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	893164
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ 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.**

Accredited Laboratory

A2LA has accredited

MRT TECHNOLOGY (SUZHOU) CO., LTD.

Suzhou, Jiangsu, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Presented this 24th day of July 2018.

President and CEO
For the Accreditation Council
Certificate Number 3628.01
Valid to August 31, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

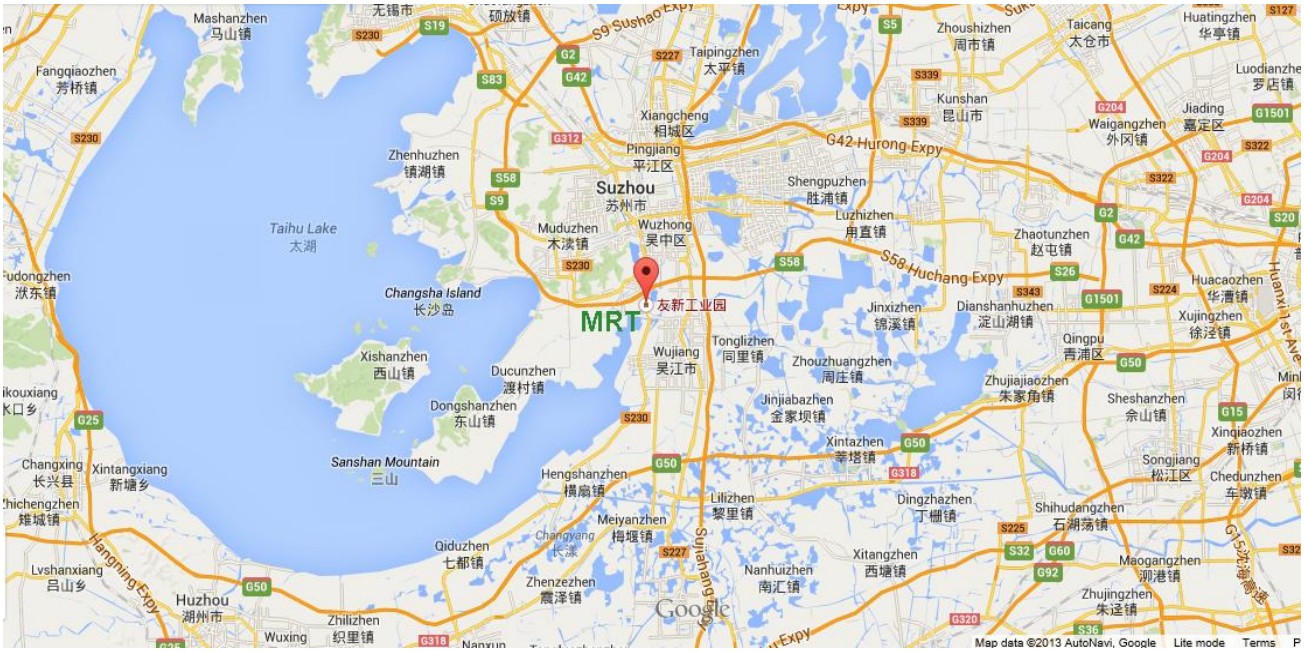
1. INTRODUCTION

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	F9 BoomBox Speaker
Model No.	BTS-F9
Serial No.	YJP001, YEH001, YEH002
Bluetooth Version	v4.2 dual mode
Voltage Type	Inside Polymer Battery

Note: The different models are only for marketing different clients. The other was the same. All the materials are the same.

2.2. Product Specification Subjective to this Report

Bluetooth Frequency	2402 ~ 2480MHz
Type of modulation	FHSS
Data Rate	1Mbps(GFSK)
Antenna Type	PCB Antenna
Antenna Gain	-5.47dBi

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

2.3. Working Frequencies for this report

Channel List for BLE

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

2.5. Test Software

The test utility software used during testing was “BT FCC TOOL”, and the version was “V1.02”.

2.6. Device Capabilities

This device contains the following capabilities:
Bluetooth (v4.2 dual mode)

2.7. Test Configuration

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

2.8. EMI Suppression Device(s)/Modifications

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

2.9. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

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

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 558074 D01v04 were used in the measurement of the EUT.

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

3.2. AC Line Conducted Emissions

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

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

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

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

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the Antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable. For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive Antenna height using a broadband Antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn Antennas were used. For frequencies below 30MHz, a calibrated loop Antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband Antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-40GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive Antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn Antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive Antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive Antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn Antenna, the horn Antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

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

- The antenna of the **F9 BoomBox Speaker** 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	ESR7	MRTSUE06001	1 year	2019/08/14
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2019/06/15
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2019/06/15
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2019/08/14

Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2018/09/13
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2019/08/14
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2018/11/17
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2018/11/20
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2018/11/18
Broad Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2018/10/21
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2018/12/14
Amplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2019/06/13
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/14
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2019/05/02

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2018/09/13
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2018/12/06
Thermohygrometer	Testo	608-H1	MRTSUE06401	1 year	2019/08/14

Software	Version	Function
e3	V8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

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

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Spurious Emissions, Conducted - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth - TR3
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

7. TEST RESULT

7.1. Summary

Company Name: **Shenzhen Xingfeiyang Electronic Co., Ltd**

FCC ID: **2AQZ7-BTSF9**

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	6dB Bandwidth	≥ 500kHz	Conducted	Pass	Section 7.2
15.247(b)(3)	Output Power	≤ 1Watt		Pass	Section 7.3
15.247(e)	Power Spectral Density	Refer to Section 7.4		Pass	Section 7.4
15.247(d)	Band Edge / Out-of-Band Emissions	≥ 20dBc(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) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

7.2. 6dB Bandwidth Measurement

7.2.1.Test Limit

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

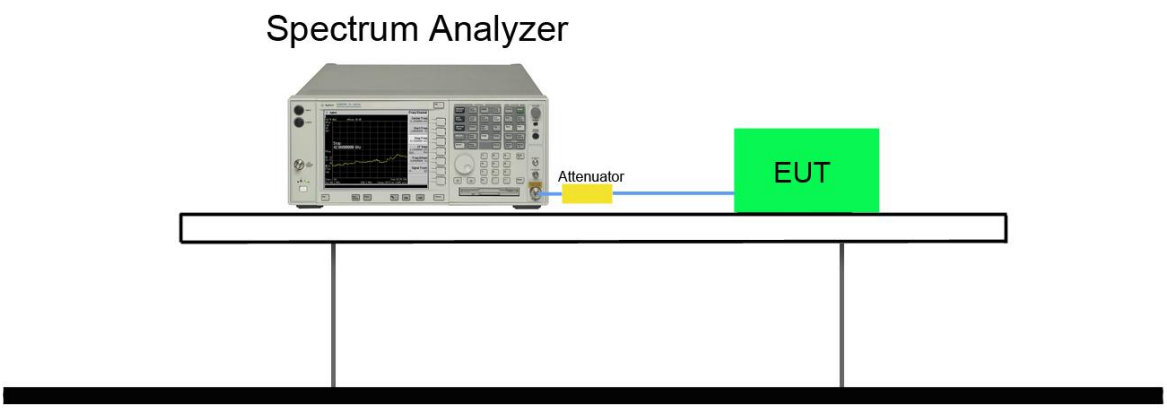
7.2.2.Test Procedure used

KDB 558074 D01v04 - Section 8.2 Option 2

7.2.3.Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW ≥ 3 × 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

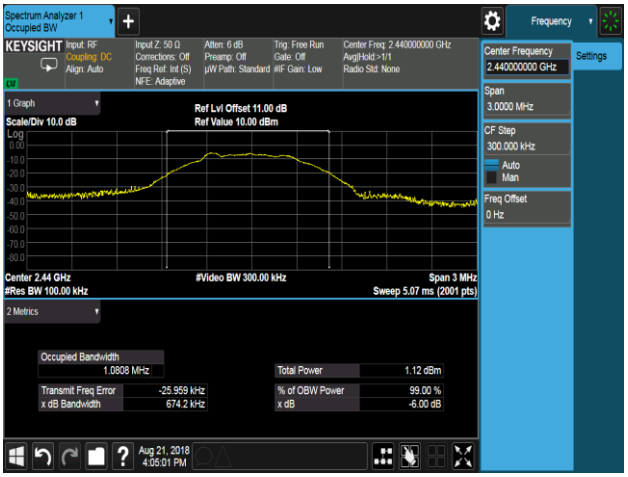
Product	F9 BoomBox Speaker	Temperature	24°C
Test Engineer	Will Yan	Relative Humidity	56%
Test Site	TR3	Test Date	2018/08/21

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
BLE	1	00	2402	0.68	≥ 0.5	Pass
BLE	1	19	2440	0.67	≥ 0.5	Pass
BLE	1	39	2480	0.66	≥ 0.5	Pass

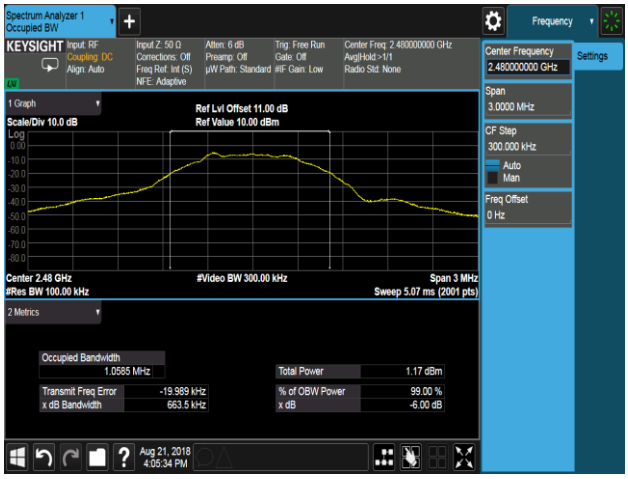
BLE 6dB Bandwidth

Channel 00 (2402MHz)

Channel 19 (2440MHz)



Channel 39 (2480MHz)



7.3. Output Power Measurement

7.3.1.Test Limit

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

7.3.2.Test Procedure Used

KDB 558074 D01v04 - Section 9.1.3 PKPM1 Peak-reading power meter method

KDB 558074 D01v04 - Section 9.2.3.2 AVGPM-G

7.3.3.Test Setting

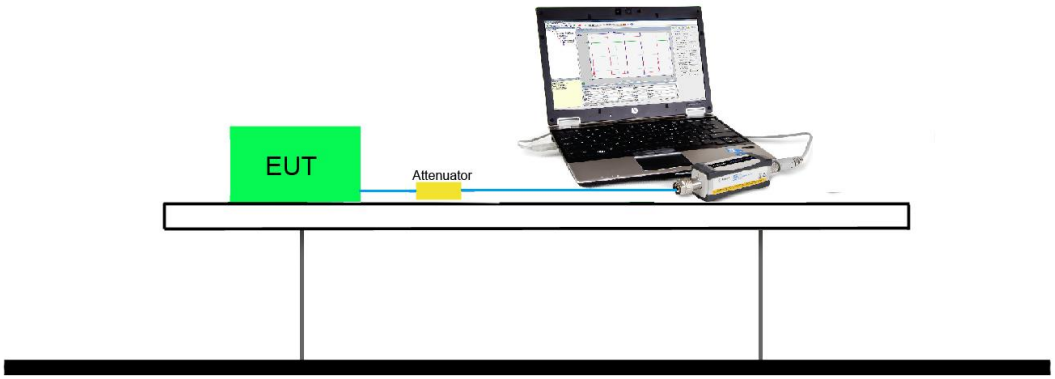
PKPM1 Peak-reading power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

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 of Output Power

Product	F9 BoomBox Speaker	Temperature	24°C
Test Engineer	Will Yan	Relative Humidity	56%
Test Site	TR3	Test Date	2018/08/22

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
Test Result of Peak Output Power						
BLE	1	00	2402	-4.52	≤ 30	Pass
BLE	1	19	2440	-3.67	≤ 30	Pass
BLE	1	39	2480	-3.12	≤ 30	Pass
Test Result of Average Output Power (Reporting Only)						
BLE	1	00	2402	-5.93	≤ 30	Pass
BLE	1	19	2440	-5.21	≤ 30	Pass
BLE	1	39	2480	-4.38	≤ 30	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.

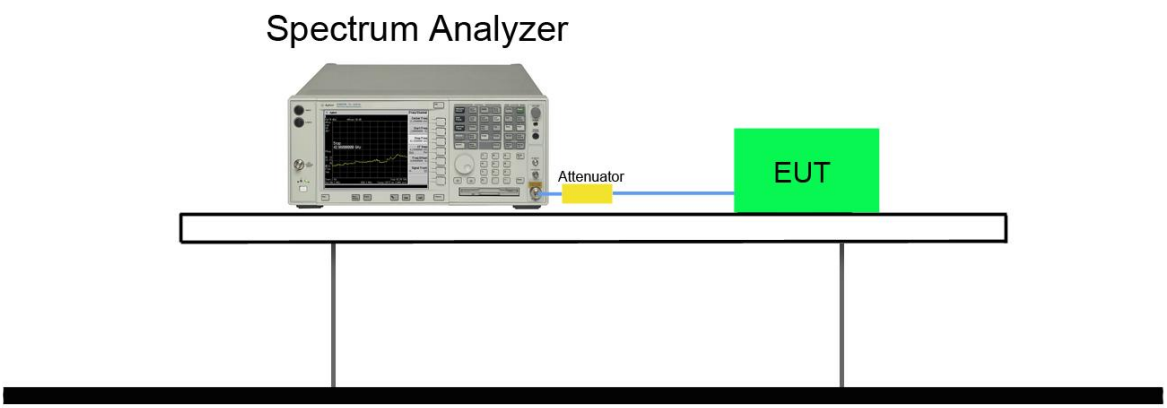
7.4.2.Test Procedure Used

KDB 558074 D01v04 - Section 10.2 Method (peak PSD)

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



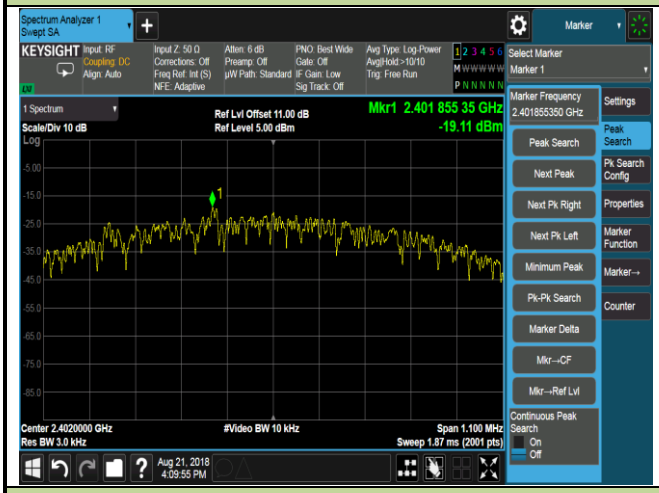
7.4.5.Test Result

Product	F9 BoomBox Speaker	Temperature	24°C
Test Engineer	Will Yan	Relative Humidity	56%
Test Site	TR3	Test Date	2018/08/21

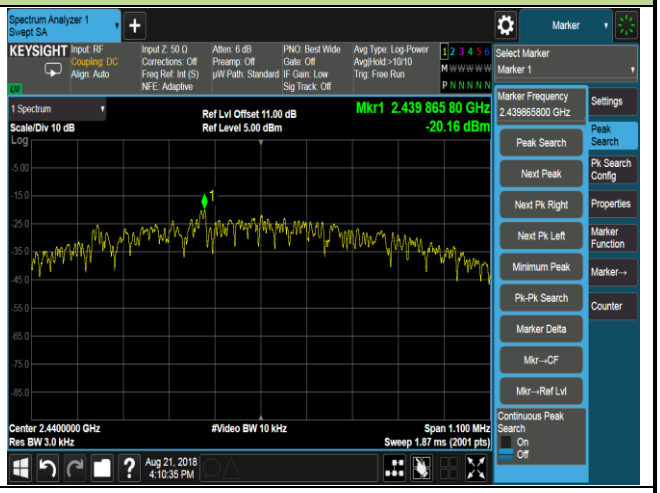
Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	1	00	2402	-19.11	≤ 8.00	Pass
BLE	1	19	2440	-20.16	≤ 8.00	Pass
BLE	1	39	2480	-20.11	≤ 8.00	Pass

BLE PSD

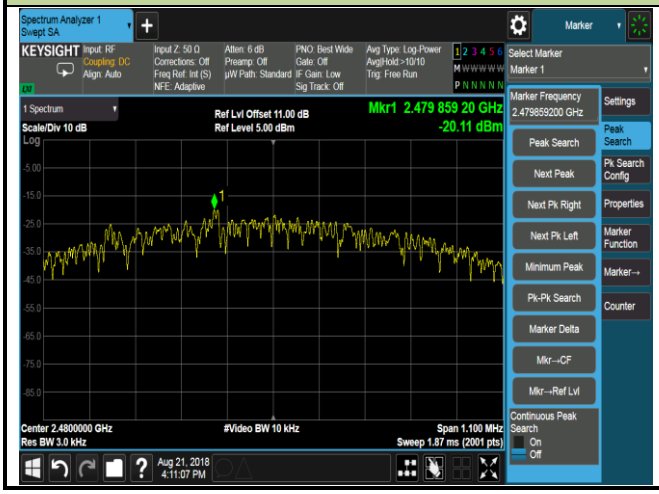
Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



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

7.5.1.Test Limit

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

7.5.2.Test Procedure Used

KDB 558074 D01v04 - Section 11.2 & Section 11.3

7.5.3.Test Settitng

1. Reference level measurement

a) Set instrument center frequency to DTS channel center frequency

b) Set the span to ≥ 1.5 times the DTS bandwidth

c) Set the RBW = 100 kHz

d) Set the VBW ≥ 3 x RBW

e) Detector = peak

f) Sweep time = auto couple

g) Trace mode = max hold

h) Allow trace to fully stabilize

2. Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured

b) RBW = 100kHz

c) VBW = 300kHz

d) Detector = Peak

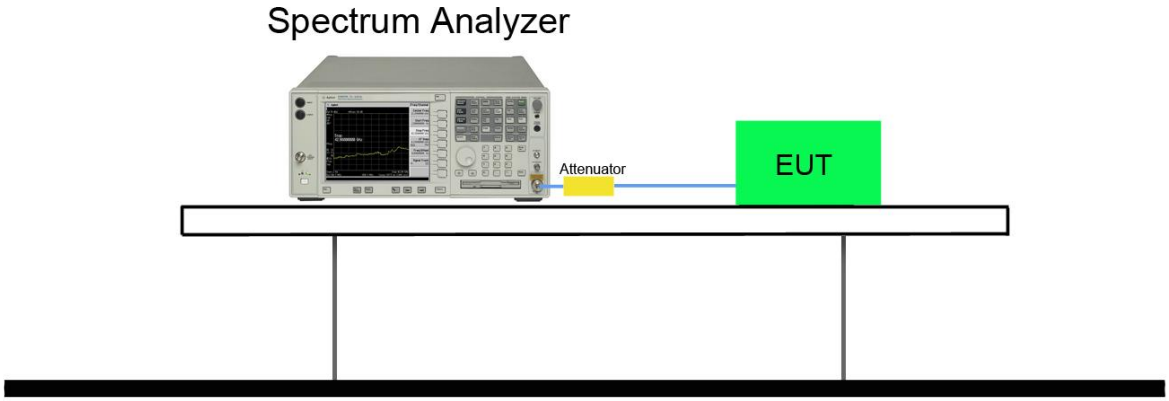
e) Number of sweep points ≥ 2 x Span/RBW

f) Trace mode = max hold

g) Sweep time = auto couple

h) The trace was allowed to stabilize

7.5.4.Test Setup



7.5.5.Test Result

Product	F9 BoomBox Speaker	Temperature	24°C
Test Engineer	Will Yan	Relative Humidity	56%
Test Site	TR3	Test Date	2018/08/21

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

BLE Out-of-Band Emissions	
Channel 00 (2402MHz)	
100kHz PSD reference Level	**Low Band Edge**
Spurious Emission	

Channel 19 (2440MHz)

100kHz PSD reference Level

Spurious Emission

Channel 39 (2480MHz)

100kHz PSD reference Level

High Band Edge

Spurious Emission

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 [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

7.6.2.Test Procedure Used

KDB 558074 D01v04 - Section 12.2.3 (quasi-peak measurements)

KDB 558074 D01v04 - Section 12.2.4 (peak power measurements)

KDB 558074 D01v04 - Section 12.2.5 (average power measurements)

7.6.3.Test Setting

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01v04

Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

1. RBW = as specified in Table 1
2. VBW = 3MHz
3. Detector = peak
4. Sweep time = auto couple

5. Trace mode = max hold
6. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

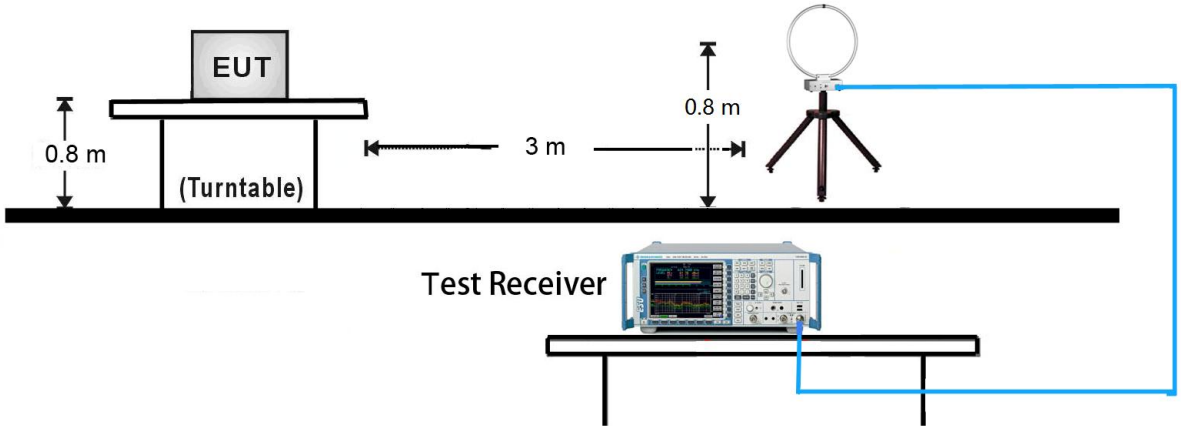
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements per Section 12.2.4 of KDB 558074 D01v04

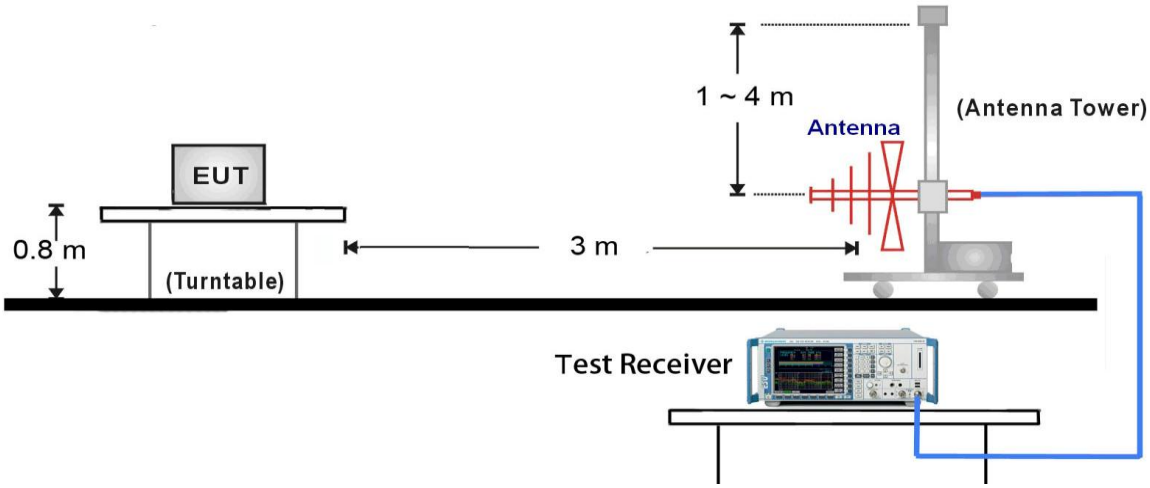
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW ≥ 1/T
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to “Voltage” regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

7.6.4.Test Setup

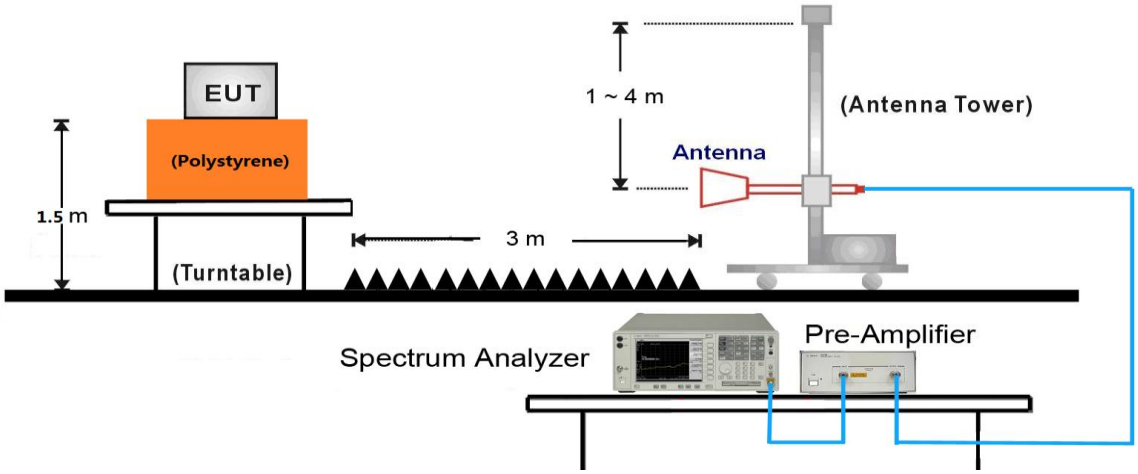
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 25GHz Test Setup:



7.6.5.Test Result

Test Mode:	BLE	Test Site:	AC1
Test Channel:	00	Test Engineer:	Bacon Dong
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
	4804.0	42.8	5.9	48.7	74.0	-25.3	Peak	Horizontal
	7579.0	37.3	12.8	50.2	74.0	-23.8	Peak	Horizontal
*	8718.0	35.6	13.0	48.6	79.9	-31.3	Peak	Horizontal
*	9865.5	33.9	16.7	50.7	79.9	-29.2	Peak	Horizontal
	4804.0	42.2	5.9	48.0	74.0	-26.0	Peak	Vertical
	7562.0	35.4	12.9	48.4	74.0	-25.6	Peak	Vertical
*	7893.5	36.6	13.4	50.0	79.9	-29.9	Peak	Vertical
*	9755.0	34.1	16.2	50.2	79.9	-29.8	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (99.9dBμV/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)

Test Mode:	BLE	Test Site:	AC1
Test Channel:	19	Test Engineer:	Bacon Dong
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
	4880.0	44.1	6.0	50.0	74.0	-24.0	Peak	Horizontal
	7545.0	36.3	13.0	49.2	74.0	-24.8	Peak	Horizontal
*	7970.0	35.4	13.6	48.9	80.5	-31.6	Peak	Horizontal
*	10027.0	35.6	16.6	52.2	80.5	-28.3	Peak	Horizontal
	4880.0	43.0	6.0	49.0	74.0	-25.0	Peak	Vertical
	7264.5	36.4	12.7	49.0	74.0	-25.0	Peak	Vertical
*	7961.5	35.9	13.5	49.5	80.5	-31.0	Peak	Vertical
*	10299.0	33.2	17.3	50.5	80.5	-30.0	Peak	Vertical

Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (100.5dBμV/m) or 15.209 which is higher.

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

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

Test Mode:	BLE	Test Site:	AC1
Test Channel:	39	Test Engineer:	Bacon Dong
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
	4960.0	40.8	6.1	46.9	74.0	-27.1	Peak	Horizontal
	7440.0	36.6	12.9	49.5	74.0	-24.5	Peak	Horizontal
*	9228.0	35.9	14.5	50.4	81.4	-31.0	Peak	Horizontal
*	10273.5	34.3	17.2	51.5	81.4	-29.9	Peak	Horizontal
	4960.0	38.3	6.1	44.4	74.0	-29.6	Peak	Vertical
	7451.5	36.3	12.9	49.2	74.0	-24.8	Peak	Vertical
*	8624.5	35.4	12.9	48.2	81.4	-33.2	Peak	Vertical
*	9636.0	34.3	15.5	49.8	81.4	-31.6	Peak	Vertical

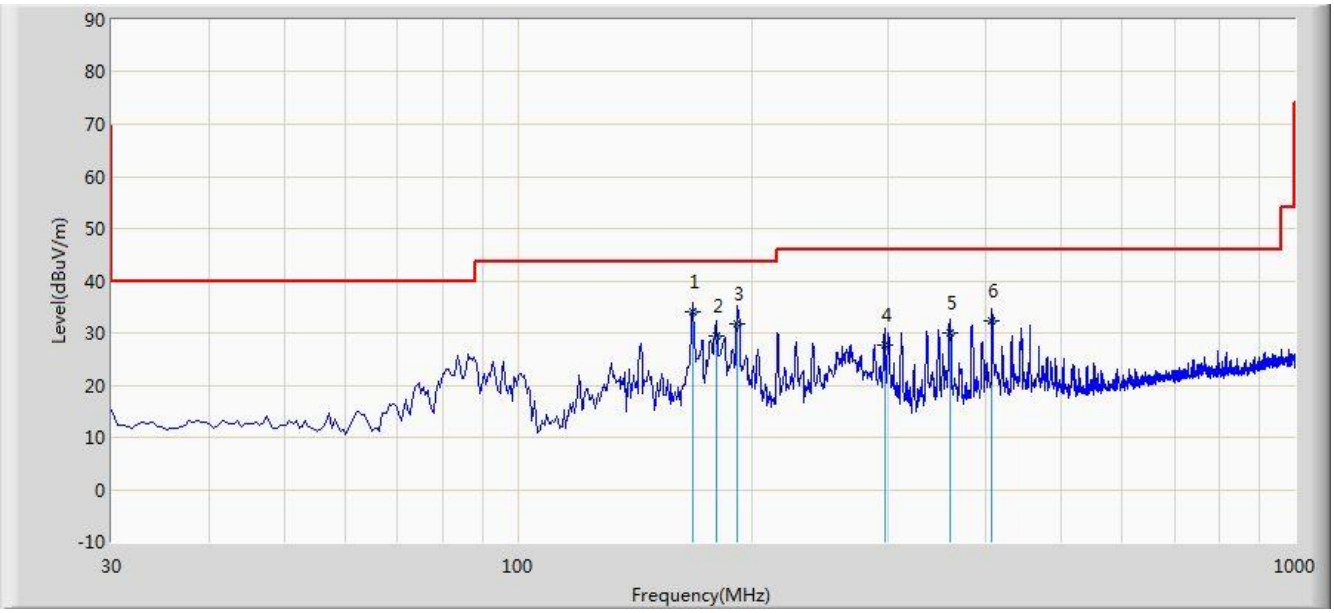
Note 1: "*" is not in restricted band, its limit is 20dBc of the fundamental emission level (101.4dBμV/m) or 15.209 which is higher.

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

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

The worst case of Radiated Emission below 1GHz:

Site: AC1	Time: 2018/08/19 - 11:59
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: F9 BoomBox Speaker	Power: AC 120V/60Hz
Worse Case Mode: Transmit by BLE at channel 2402MHz	



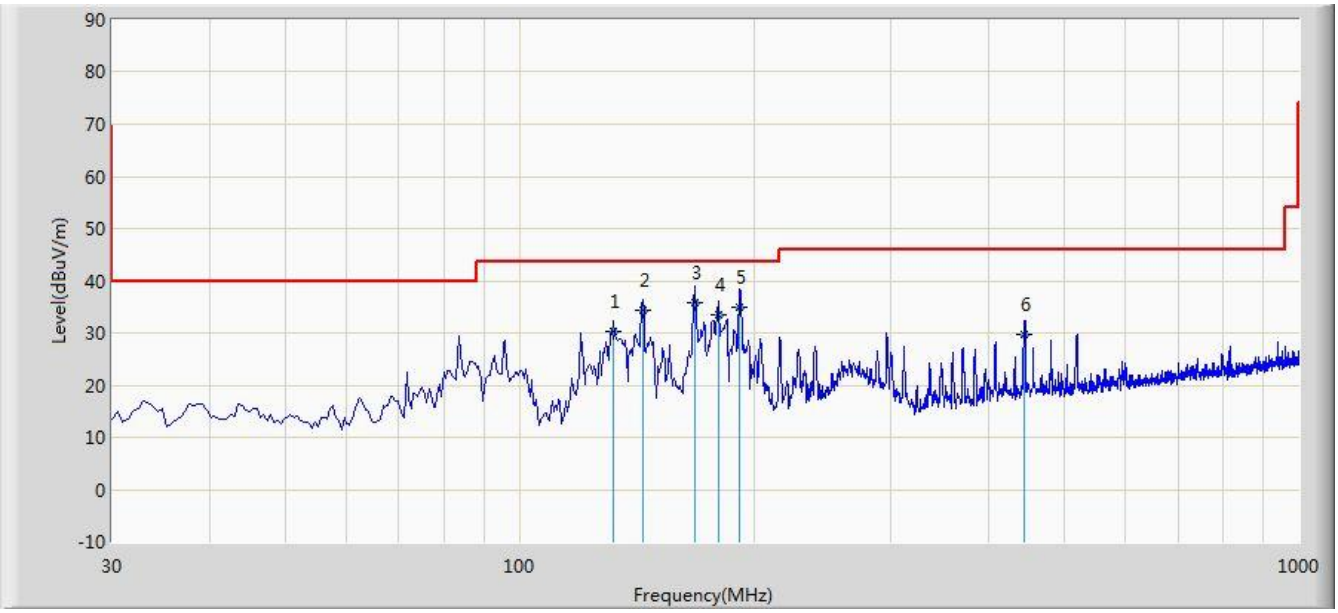
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	167.740	34.172	19.580	-9.328	43.500	14.592	QP
2			180.350	29.452	16.580	-14.048	43.500	12.872	QP
3			191.990	31.794	20.170	-11.706	43.500	11.624	QP
4			296.750	27.559	13.240	-18.441	46.000	14.319	QP
5			359.800	29.905	14.140	-16.095	46.000	15.765	QP
6			407.815	32.453	15.650	-13.547	46.000	16.803	QP

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

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

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

Site: AC1	Time: 2018/08/19 - 12:06
Limit: FCC_Part15.209_RE(3m)	Engineer: Will Yan
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: F9 BoomBox Speaker	Power: AC 120V/60Hz
Worse Case Mode: Transmit by BLE at channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			131.850	30.173	16.200	-13.327	43.500	13.973	QP
2			143.975	34.366	19.500	-9.134	43.500	14.866	QP
3		*	167.740	35.732	21.140	-7.768	43.500	14.592	QP
4			179.862	33.411	20.470	-10.089	43.500	12.941	QP
5			191.990	34.824	23.200	-8.676	43.500	11.624	QP
6			443.705	29.806	12.050	-16.194	46.000	17.757	QP

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

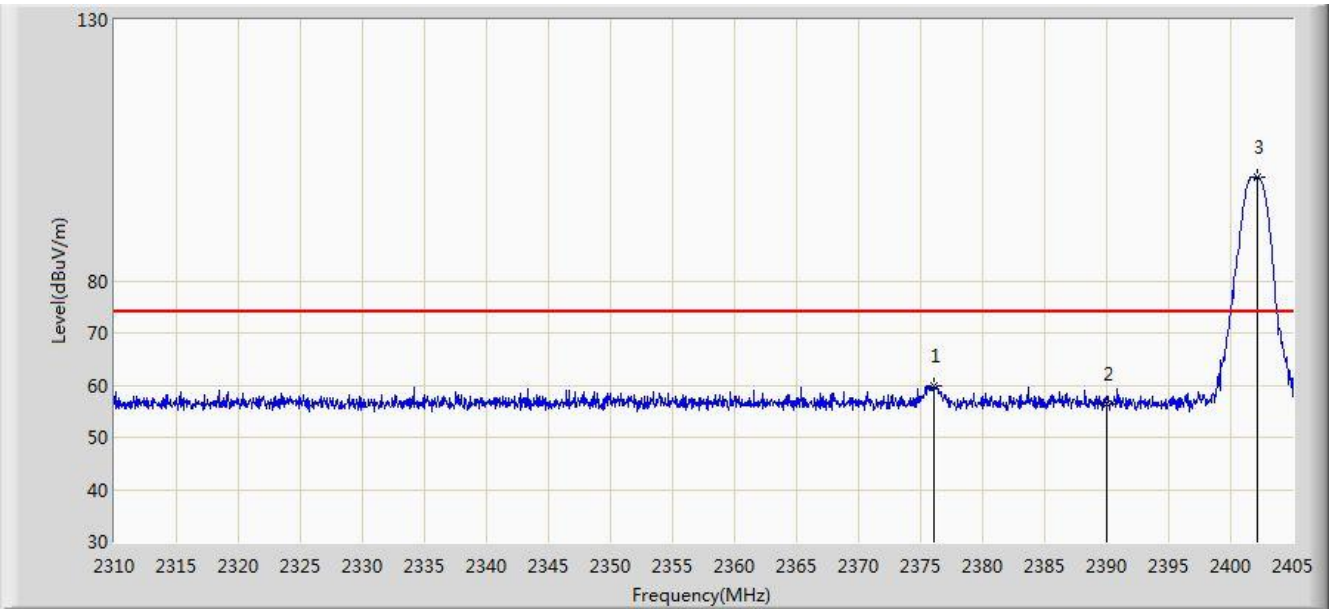
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

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

7.7. Radiated Restricted Band Edge Measurement

7.7.1.Test Result

Site: AC1	Time: 2018/08/21 - 06:05
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2402MHz	

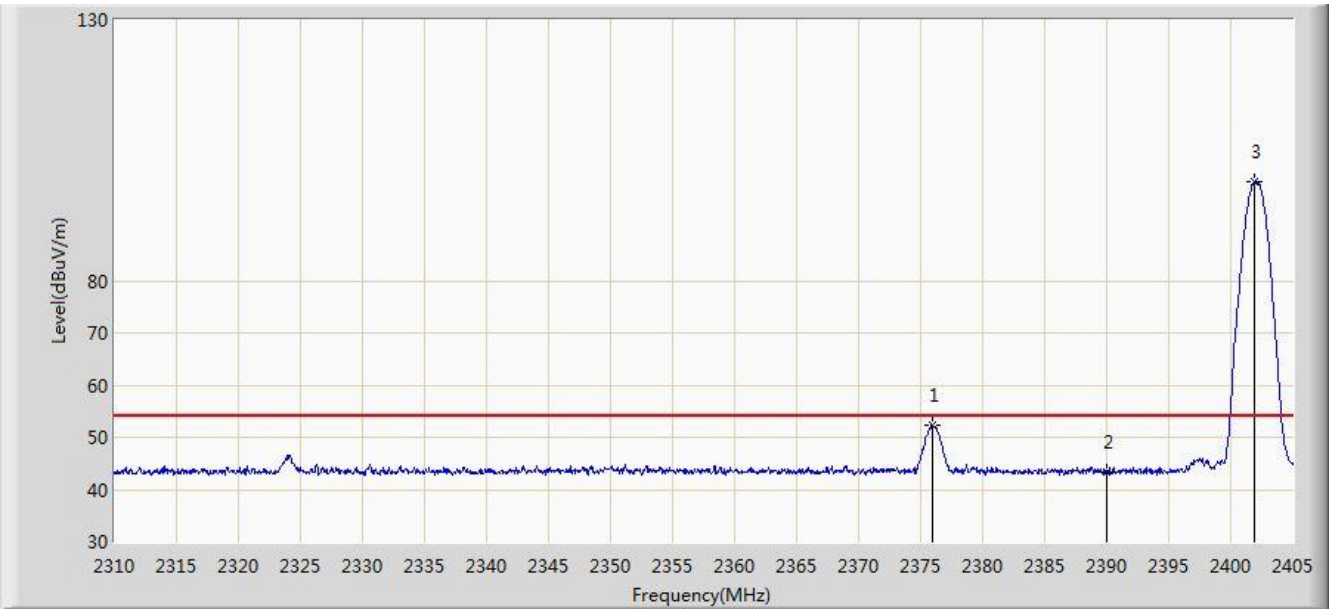


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2376.025	59.984	27.638	-14.016	74.000	32.346	PK
2		2390.000	56.334	24.007	-17.666	74.000	32.327	PK
3	*	2402.198	99.856	67.552	N/A	N/A	32.304	PK

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

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

Site: AC1	Time: 2018/08/21 - 06:03
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2402MHz	

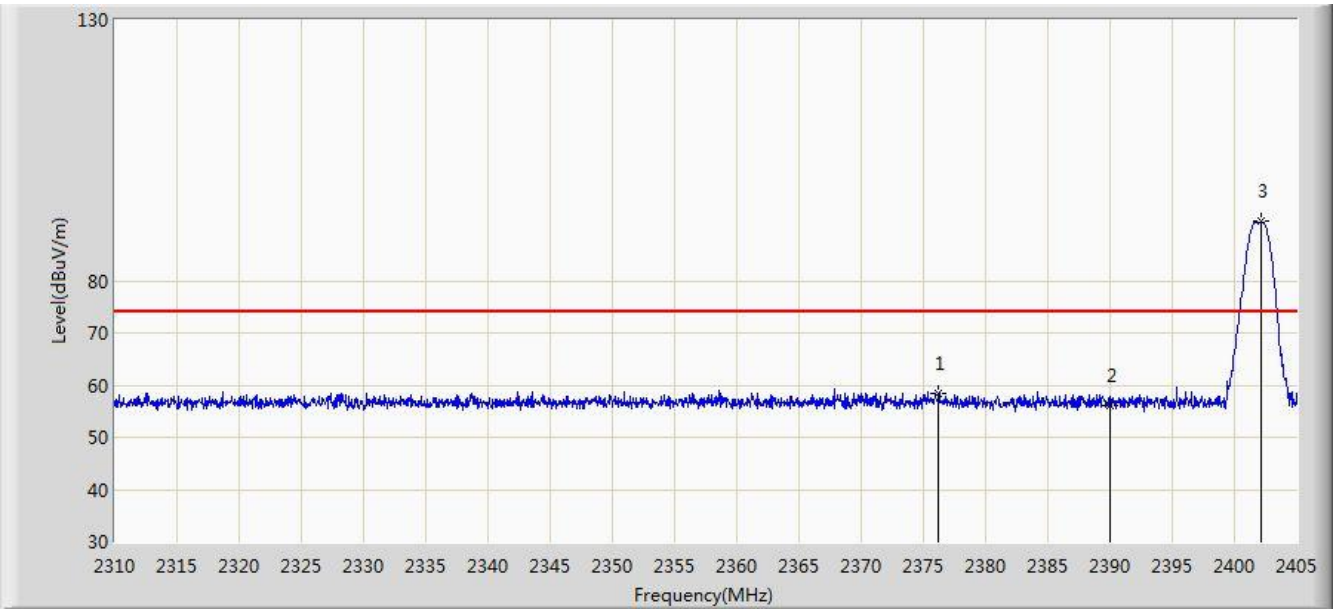


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2375.930	52.274	19.927	-1.726	54.000	32.346	AV
2		2390.000	43.475	11.148	-10.525	54.000	32.327	AV
3	*	2401.960	99.042	66.737	N/A	N/A	32.305	AV

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

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

Site: AC1	Time: 2018/08/21 - 06:06
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2402MHz	

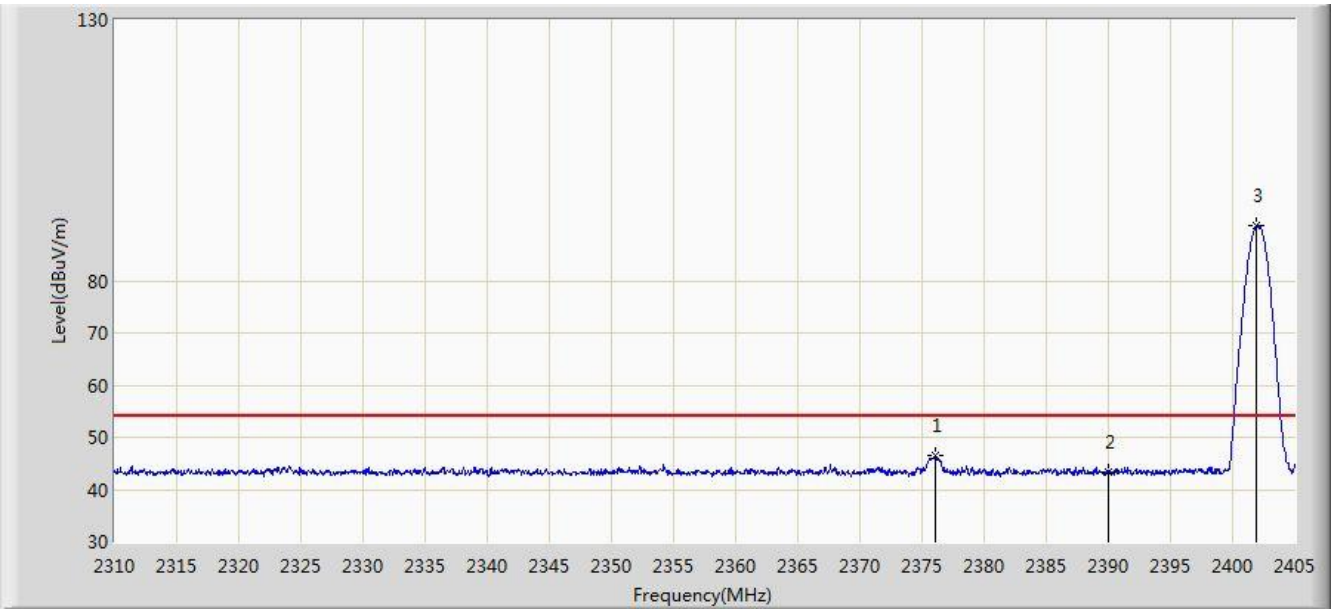


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2376.215	58.505	26.159	-15.495	74.000	32.346	PK
2		2390.000	55.949	23.622	-18.051	74.000	32.327	PK
3	*	2402.198	91.335	59.031	N/A	N/A	32.304	PK

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

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

Site: AC1	Time: 2018/08/21 - 06:07
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2402MHz	

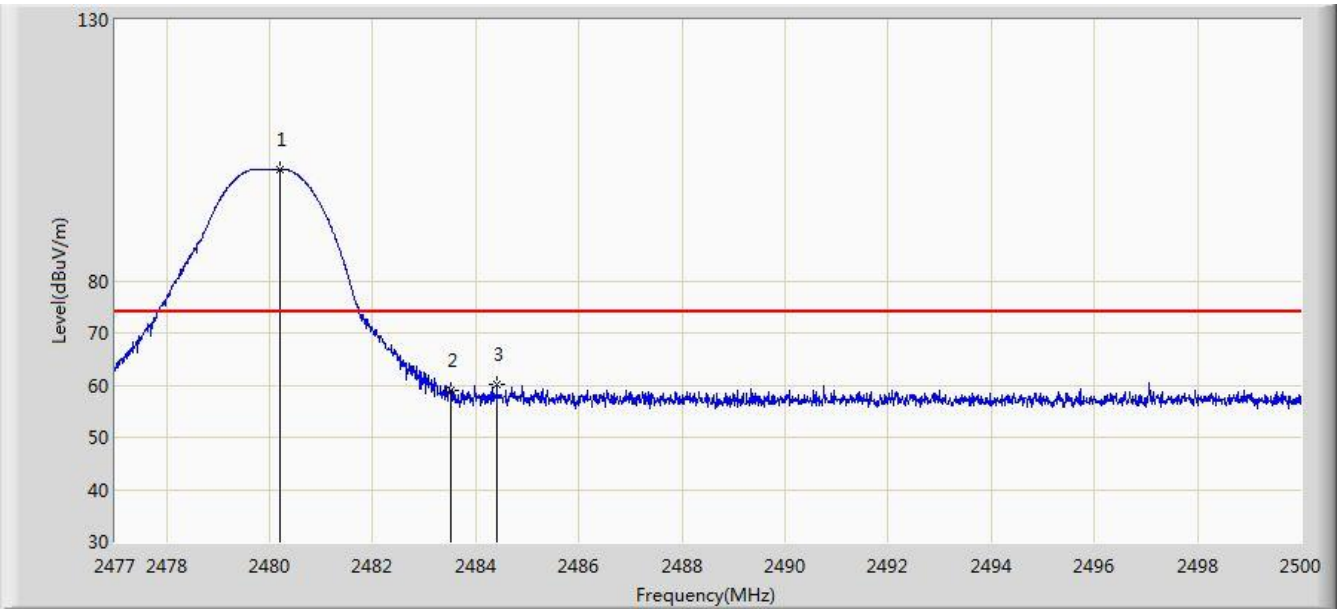


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2376.025	46.576	14.230	-7.424	54.000	32.346	AV
2		2390.000	43.448	11.121	-10.552	54.000	32.327	AV
3	*	2401.960	90.500	58.195	N/A	N/A	32.305	AV

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

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

Site: AC1	Time: 2018/08/21 - 06:09
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2480MHz	

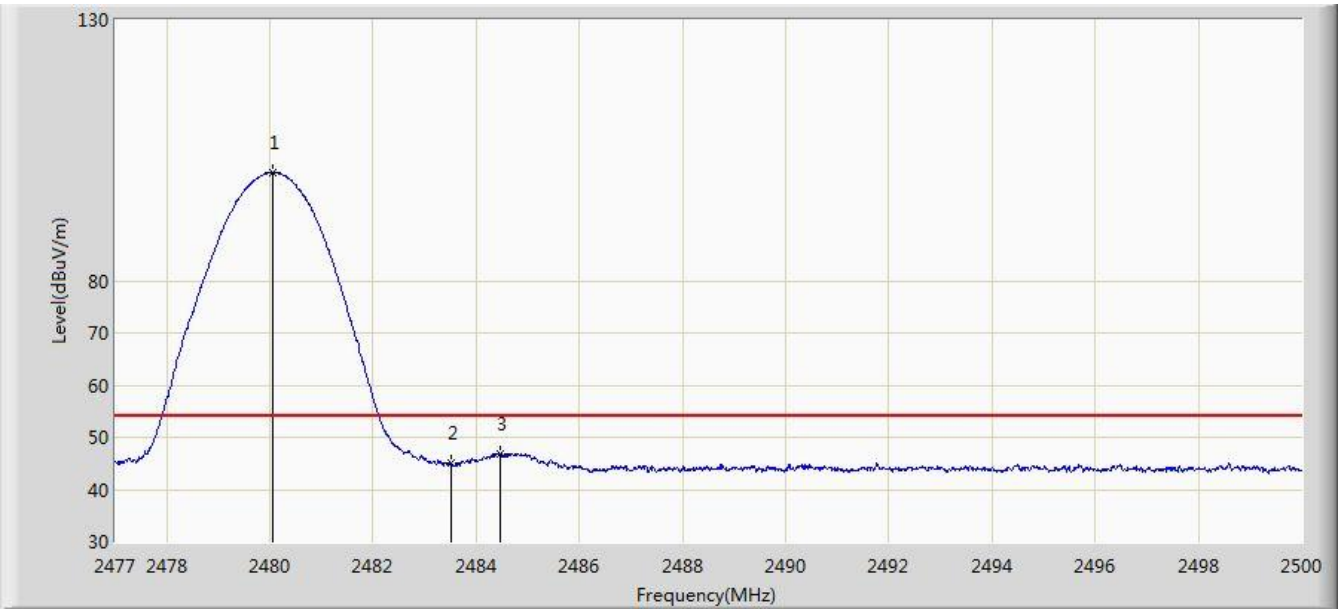


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.186	101.431	69.105	N/A	N/A	32.327	PK
2		2483.500	58.913	26.574	-15.087	74.000	32.340	PK
3		2484.406	60.114	27.771	-13.886	74.000	32.342	PK

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

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

Site: AC1	Time: 2018/08/21 - 06:11
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2480MHz	

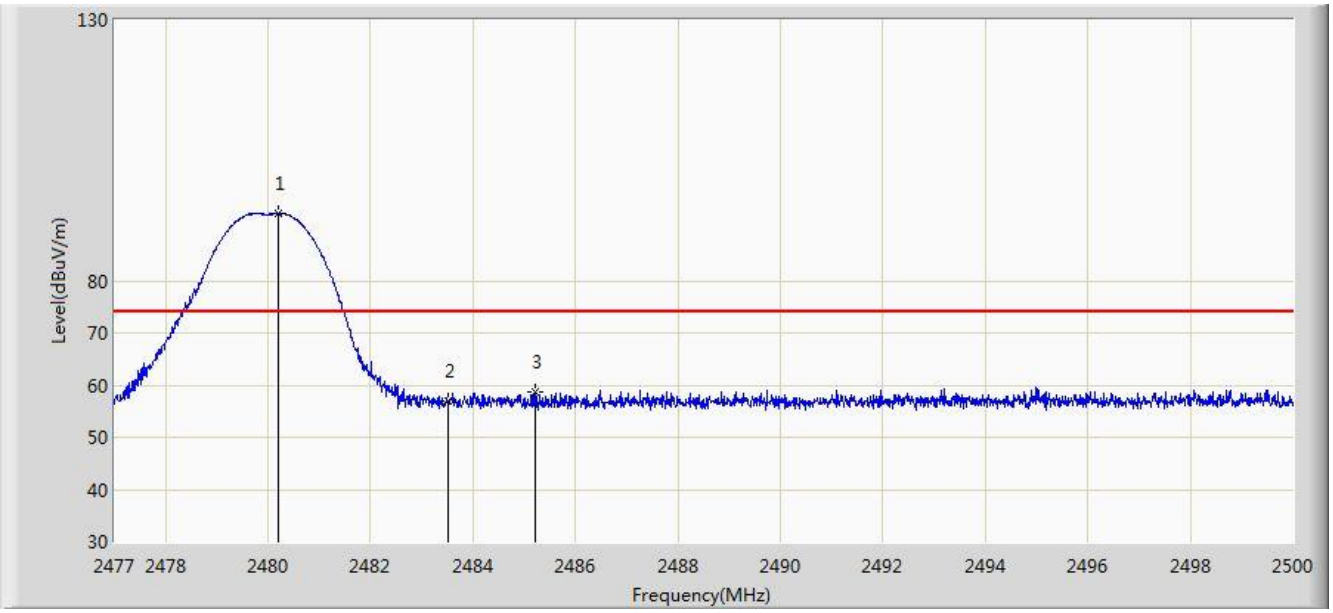


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.059	100.726	68.400	N/A	N/A	32.325	AV
2		2483.500	44.972	12.633	-9.028	54.000	32.340	AV
3		2484.475	46.948	14.605	-7.052	54.000	32.343	AV

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

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

Site: AC1	Time: 2018/08/21 - 06:13
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2480MHz	

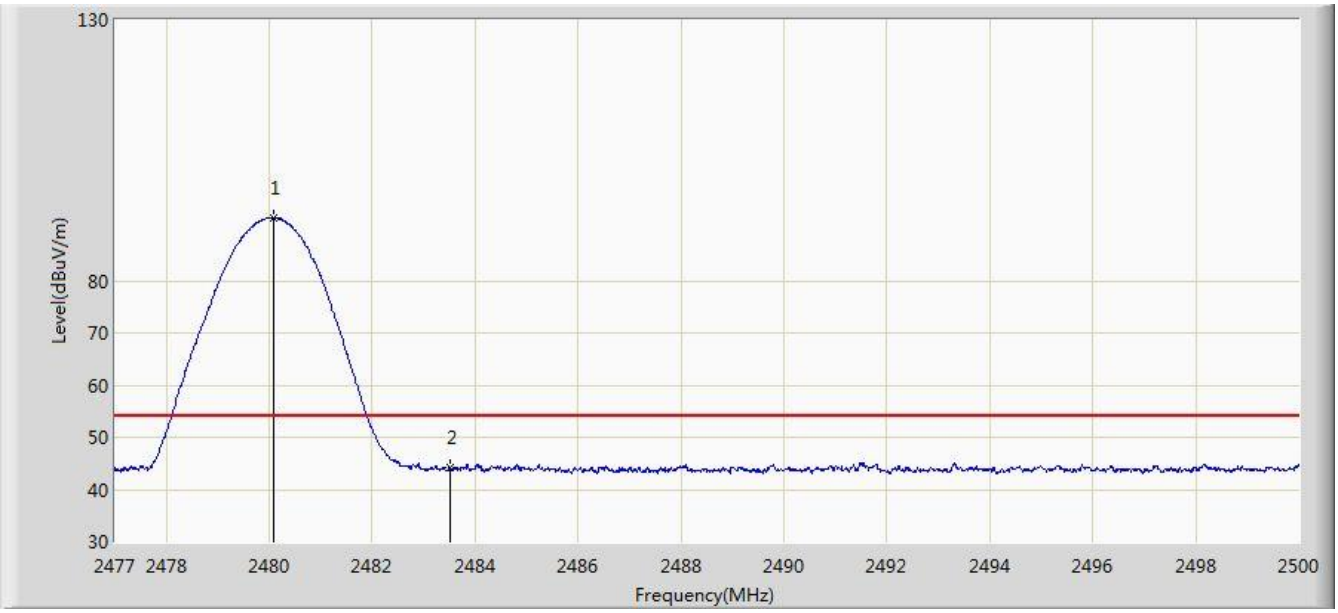


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.209	92.944	60.618	N/A	N/A	32.327	PK
2		2483.500	56.883	24.544	-17.117	74.000	32.340	PK
3		2485.211	58.765	26.419	-15.235	74.000	32.346	PK

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

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

Site: AC1	Time: 2018/08/21 - 06:15
Limit: FCC_Part15.209_RE(3m)_Bandedge	Engineer: Bacon Dong
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: F9 BoomBox Speaker	Power: DC 3.3V
Note: Transmit by BLE at Channel 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.082	92.079	59.753	N/A	N/A	32.325	AV
2		2483.500	44.222	11.883	-9.778	54.000	32.340	AV

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

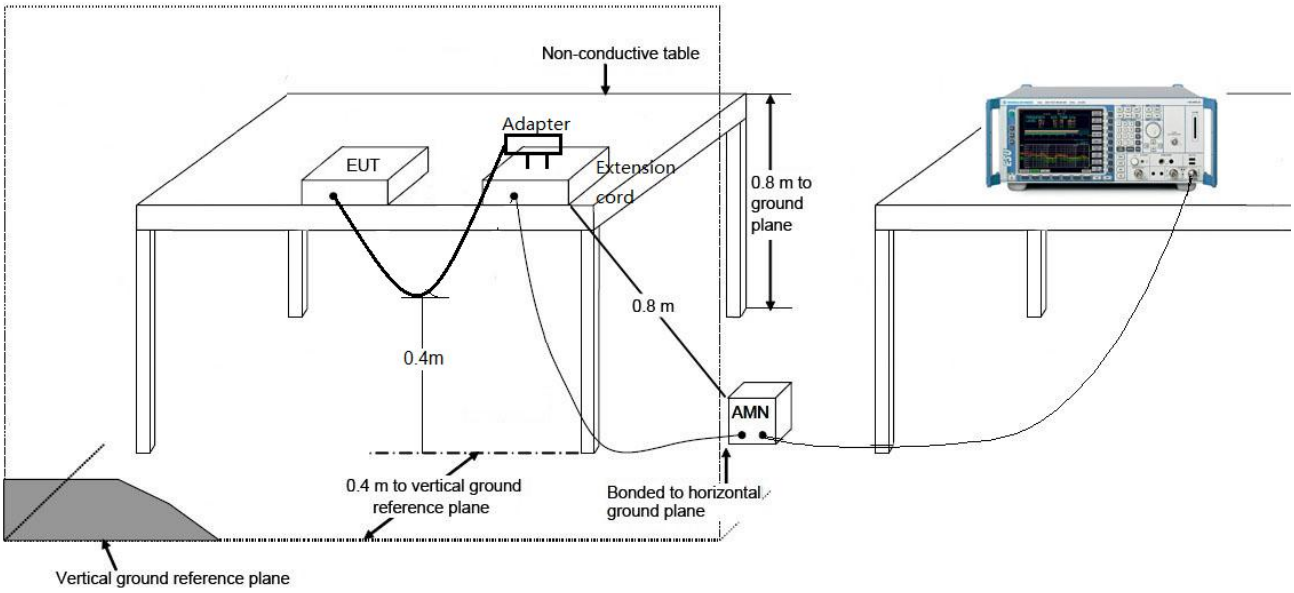
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

7.8. AC Conducted Emissions Measurement

7.8.1.Test Limit

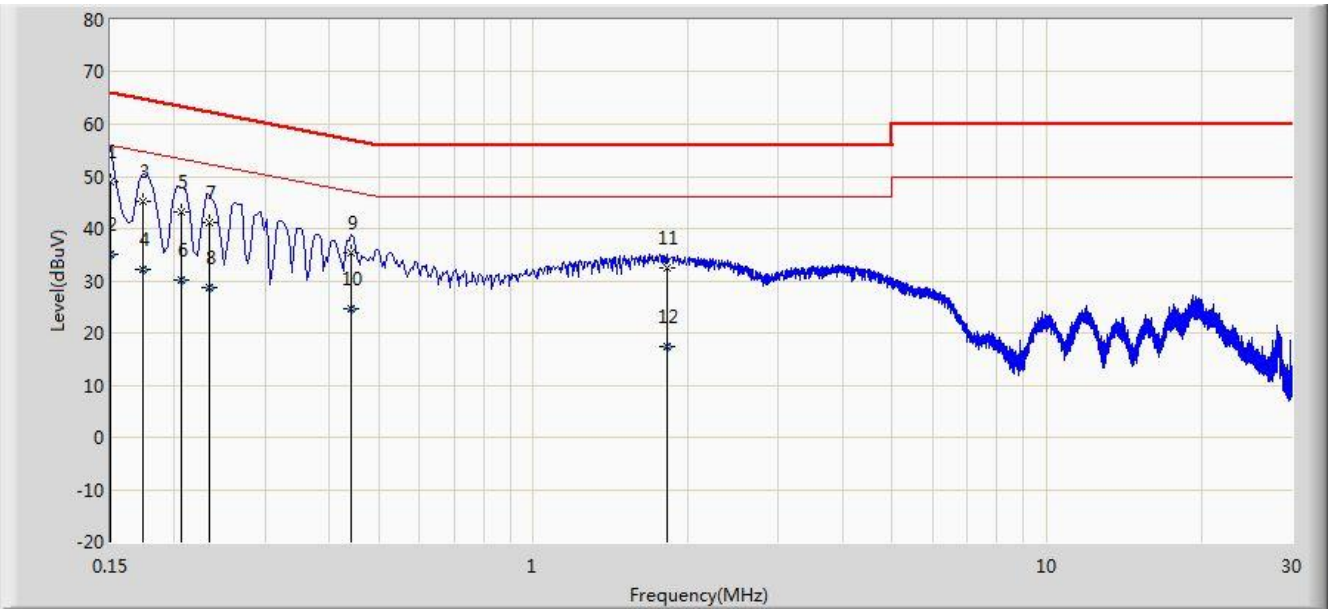
FCC 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 ~ 0.50	66 ~ 56	56 ~ 46
0.50 ~ 5.0	56	46
5.0 ~ 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

7.8.2.Test Setup



7.8.3.Test Result

Site: SR2	Time: 2018/08/22 - 09:49
Limit: FCC_Part15.207_CE_AC Power	Engineer: Messiah Li
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: F9 BoomBox Speaker	Power: AC 120V/60Hz
Test Mode: Worst case	

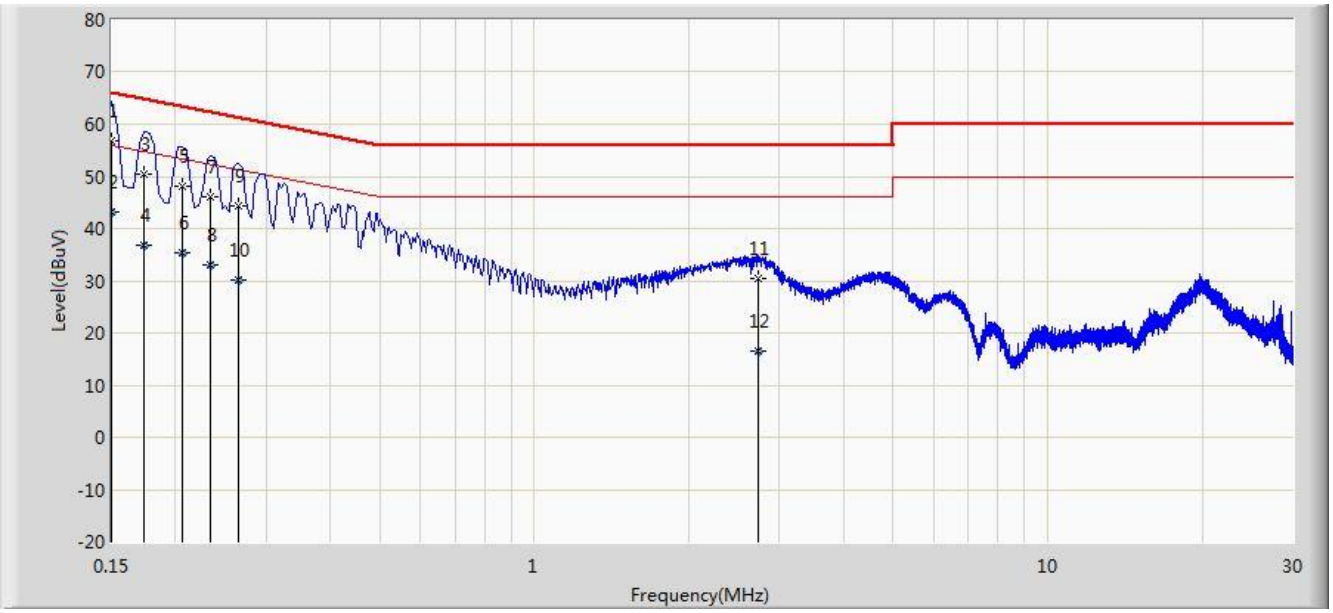


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	48.977	37.808	-17.023	66.000	11.168	QP
2			0.150	35.103	23.934	-20.897	56.000	11.168	AV
3			0.174	45.268	35.200	-19.499	64.767	10.068	QP
4			0.174	32.302	22.234	-22.465	54.767	10.068	AV
5			0.206	43.187	33.207	-20.178	63.365	9.981	QP
6			0.206	30.256	20.275	-23.109	53.365	9.981	AV
7			0.234	41.070	31.119	-21.237	62.307	9.951	QP
8			0.234	28.608	18.658	-23.698	52.307	9.951	AV
9			0.442	35.341	25.221	-21.684	57.024	10.120	QP
10			0.442	24.689	14.569	-22.335	47.024	10.120	AV
11			1.826	32.499	22.622	-23.501	56.000	9.877	QP
12			1.826	17.264	7.387	-28.736	46.000	9.877	AV

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

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

Site: SR2	Time: 2018/08/22 - 09:54
Limit: FCC_Part15.207_CE_AC Power	Engineer: Messiah Li
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: F9 BoomBox Speaker	Power: AC 120V/60Hz
Test Mode: Worst case	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1		*	0.150	56.687	45.545	-9.313	66.000	11.142	QP
2			0.150	43.302	32.160	-12.698	56.000	11.142	AV
3			0.174	50.387	40.330	-14.380	64.767	10.057	QP
4			0.174	36.804	26.747	-17.964	54.767	10.057	AV
5			0.206	48.232	38.231	-15.133	63.365	10.001	QP
6			0.206	35.224	25.223	-18.141	53.365	10.001	AV
7			0.234	46.019	36.030	-16.287	62.307	9.989	QP
8			0.234	33.004	23.015	-19.302	52.307	9.989	AV
9			0.266	44.298	34.285	-16.944	61.242	10.013	QP
10			0.266	30.287	20.274	-20.955	51.242	10.013	AV
11			2.730	30.322	20.468	-25.678	56.000	9.854	QP
12			2.730	16.616	6.762	-29.384	46.000	9.854	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 **F9 BoomBox Speaker** is in compliance with Part 15C of the FCC Rules.

The End

Appendix A – Test Setup Photograph

Refer to “1808RSU017-UT” file.

Appendix B – EUT Photograph

Refer to “1808RSU017-UE” file.