



RF MEASUREMENT REPORT

FCC ID: 2A348SPARK40
Applicant: Positive LLC
Product: Guitar Speaker
Model No.: Spark 40
Brand Name: Positive Grid
FCC Classification: Digital Transmission System (DTS)
FCC Rule Part(s): Part 15 Subpart C (Section 15.247)
Result: Complies
Received Date: 2023-07-21
Test Date: 2023-07-26 ~ 2023-08-03

Reviewed By:

Sunny Sun

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 (Shenzhen) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2307RSU056-U2	V01	Initial Report	2023-09-01	Valid

CONTENTS

Description	Page
1. General Information	5
1.1. Applicant	5
1.2. Manufacturer	5
1.3. Testing Facility	5
1.4. Product Information.....	6
1.5. Radio Specification under Test	6
1.6. Working Frequencies	7
2. Test Configuration	8
2.1. Test Mode.....	8
2.2. Test System Connection Diagram.....	8
2.3. Test Software	9
2.4. Applied Standards.....	9
2.5. Test Environment Condition	9
3. Antenna Requirements	10
4. Measuring Instrument	11
5. Decision Rules and Measurement Uncertainty	12
5.1. Decision Rules	12
5.2. Measurement Uncertainty	12
6. Test Result.....	13
6.1. Summary	13
6.2. 6dB Bandwidth Measurement.....	14
6.2.1. Test Limit	14
6.2.2. Test Procedure	14
6.2.3. Test Setting	14
6.2.4. Test Setup	14
6.2.5. Test Result	14
6.3. Output Power Measurement	15
6.3.1. Test Limit	15
6.3.2. Test Procedure	15
6.3.3. Test Setting	15
6.3.4. Test Setup	15
6.3.5. Test Result	15
6.4. Power Spectral Density Measurement	16
6.4.1. Test Limit	16
6.4.2. Test Procedure	16

6.4.3.	Test Setting	16
6.4.4.	Test Setup	16
6.4.5.	Test Result	16
6.5.	Conducted Band Edge and Out-of-Band Emissions Measurement	17
6.5.1.	Test Limit	17
6.5.2.	Test Procedure	17
6.5.3.	Test Settintg	17
6.5.4.	Test Setup	18
6.5.5.	Test Result	18
6.6.	Radiated Spurious Emission Measurement.....	19
6.6.1.	Test Limit	19
6.6.2.	Test Procedure	19
6.6.3.	Test Setting	19
6.6.4.	Test Setup	21
6.6.5.	Test Result	22
6.7.	Radiated Restricted Band Edge Measurement	23
6.7.1.	Test Limit	23
6.7.2.	Test Procedure	24
6.7.3.	Test Setting	24
6.7.4.	Test Setup	25
6.7.5.	Test Result	25
6.8.	AC Conducted Emissions Measurement	26
6.8.1.	Test Limit	26
6.8.2.	Test Setup	26
6.8.3.	Test Result	26
Appendix A - Test Result.....		27
A.1	Duty Cycle Test Result	27
A.2	6dB Bandwidth Test Result	28
A.3	Output Power Test Result	29
A.4	Power Spectral Density Test Result	30
A.5	Conducted Band Edge and Out-of-Band Emissions Test Result.....	31
A.6	Radiated Spurious Emission Test Result.....	33
A.7	Radiated Restricted Band Edge Test Result.....	36
A.8	AC Conducted Emissions Test Result	44
Appendix B - Test Setup Photograph		46
Appendix C - EUT Photograph		47

1. General Information

1.1. Applicant

Positive LLC

2820 S Alma School Rd Suite 18 PMB 2011 Chandler, AZ 85286, USA

1.2. Manufacturer

Jia Ge Digital Technology Co. Ltd.

11F., No. 176, Changchun Rd., Zhongshan Dist., Taipei City 104082, Taiwan (R.O.C.)

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China Laboratory Accreditations A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104
☒	Test Site – MRT Shenzhen Laboratory Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China Laboratory Accreditations A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) Laboratory Accreditations TAF: 3261 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	Guitar Speaker
Model No.	Spark 40
Sample No.	20230721Sample#01
Bluetooth Specification	V4.2 Dual mode
Accessories	
Adapter #1	Model: DYS850-190250R Input: 100-240V ~ 50/60Hz 1.3A MAX Output: 19.0VDC 2.5A 47.5W
Adapter #2	Model: DYS850-190250R INPUT: 100-240V ~ 50/60Hz 1.3A MAX OUTPUT: 19.0VDC 2.5A 47.5W
Adapter #3	Model: MSA-Z2500IC19.0-48W-Q Input: 100-240V ~ 50/60Hz 1.2A MAX Output: 19.0VDC 2.5A
Note:	
1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	
2. All tests in this document were performed using adapter #1.	

1.5. Radio Specification under Test

Bluetooth Frequency	2402 ~ 2480MHz
Channel Number	40
Type of modulation	GFSK
Data Rate	1Mbps
Antenna Type	PCB Antenna
Antenna Gain	1.35dBi

1.6. Working Frequencies

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. Test Configuration

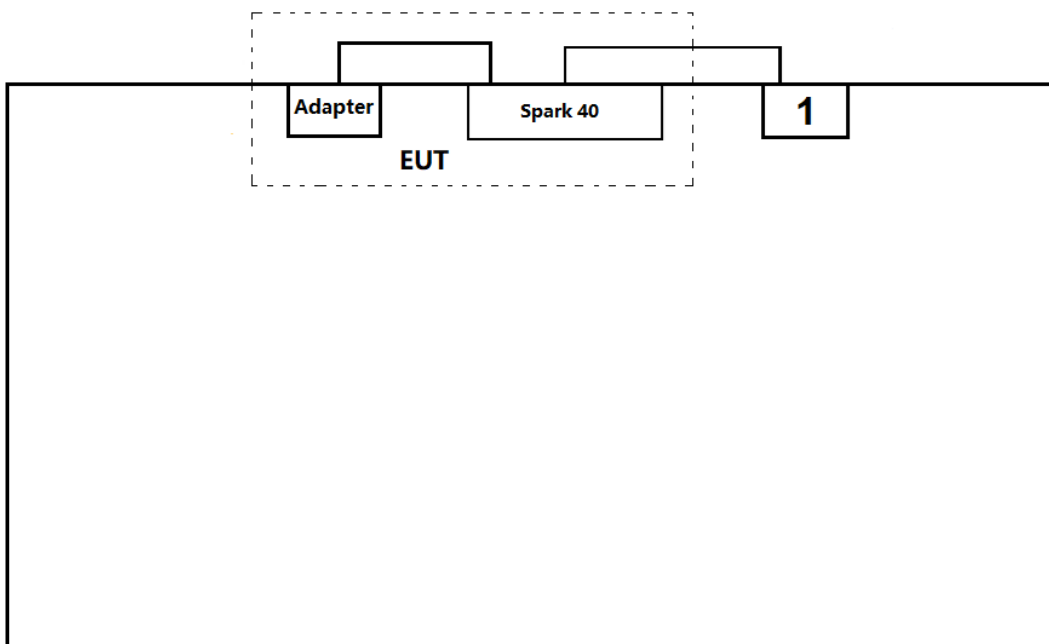
2.1. Test Mode

Mode 1: Transmit by BLE-1Mbps

2.2. Test System Connection Diagram

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

Connection Diagram



Product		Manufacturer	Model No.
1	Notebook (for RF Test)	Hp	TPN-W139

2.3. Test Software

The test utility software used during testing was “FCC Test tools”, and the version was 1.09.

2.4. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.247
- KDB 558074 D01v05r02
- ANSI C63.10-2013

2.5. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~75%RH

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

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06572	1 year	2024-03-31	NS-AC1
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06292	1 year	2023-10-18	NS-AC1
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06573	1 year	2024-06-09	NS-AC1
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06574	1 year	2024-07-07	NS-AC1
EMI Test Receiver	R&S	ESR3	MRTSUE06575	1 year	2024-06-18	NS-AC1
EMI Test Receiver	R&S	ESL3	MRTSUE06576	1 year	2024-06-18	NS-SR2
Two-Line V-Network	R&S	ENV216	MRTSUE06577	1 year	2024-04-25	NS-SR2
Two-Line V-Network	R&S	ENV216	MRTSUE06578	1 year	2024-04-25	NS-SR2
ISN	R&S	ENY81	MRTSUE06579	1 year	2024-06-12	NS-SR2
ISN	R&S	ENY81-CA6	MRTSUE06580	1 year	2024-05-24	NS-SR2
USB Power Sensor	Keysight	U2021XA	MRTSUE06581	1 year	2024-06-30	NS-TR2
Preamplifier	EMCI	EMC184045SE	MRTSUE06641	1 year	2024-01-12	NS-AC1
Shielding Room	BOOMWAVE	NS-SR2	MRTSUE06551	1 year	2024-01-12	NS-SR2
Thermohygrometer	DELI	NO.8813	MRTSUE06783	1 year	2023-12-28	NS-TR2
Temperature Chamber	OUKE	OK-TH-100C	MRTSUE06899	1 year	2024-04-25	NS-TR2
Signal Analyzer	Keysight	N9020A	MRTSUE10065	1 year	2023-12-20	NS-AC1/NS-TR2
Thermohygrometer	testo	608-H1	MRTSUE11020	1 year	2024-05-03	NS-AC1
Thermohygrometer	testo	608-H1	MRTSUE11104	1 year	2024-05-03	NS-AC1
Thermohygrometer	testo	608-H1	MRTSUE11106	1 year	2024-05-03	NS-SR2
Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2024-02-26	WZ-AC1
Signal Analyzer	Agilent	N9010A	MRTSUE06195	1 year	2023-12-20	NS-AC1/NS-TR2
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2023-12-28	WZ-AC1
Attenuator	MVE	MVE2213	MRTSUE11062	1 year	2024-06-08	NS
Attenuator	MVE	MVE2213	MRTSUE11063	1 year	2024-06-08	NS
Attenuator	MVE	MVE2213	MRTSUE11064	1 year	2024-06-08	NS
Attenuator	MVE	MVE2213	MRTSUE11065	1 year	2024-06-08	NS
Thermohygrometer	testo	608-H1	MRTSUE11106	1 year	2024-05-03	NS-SR2

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
EMI Software	V3.0.0	EMI Test Software
Controller_T-E-TAC-2	1.02	RE Antenna & Turntable
Agilent Power Panel	V 3.9	Power

5. Decision Rules and Measurement Uncertainty

5.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2.
(Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.2. 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
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.28%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.247(a)(2)	6dB Bandwidth	Conducted	Pass
15.247(b)(3)	Output Power		Pass
15.247(e)	Power Spectral Density		Pass
15.247(d)	Band Edge / Out-of-Band Emissions		Pass
15.205 15.209	General Field Strength (Restricted Bands and Radiated Emission)	Radiated	Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

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. For radiated emission test, typical placement of the device is used.

6.2. 6dB Bandwidth Measurement

6.2.1. Test Limit

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

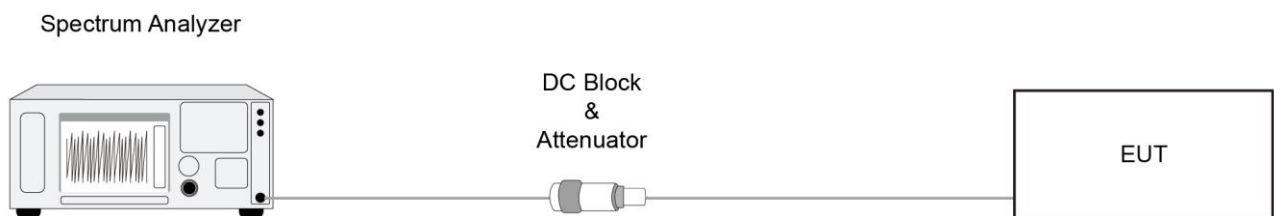
6.2.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.8

6.2.3. 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 to stabilize

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.2.

6.3. Output Power Measurement

6.3.1. Test Limit

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

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.3.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.9.1.3

ANSI C63.10 - 2013 - Section 11.9.2.3.2

6.3.3. Test Setting

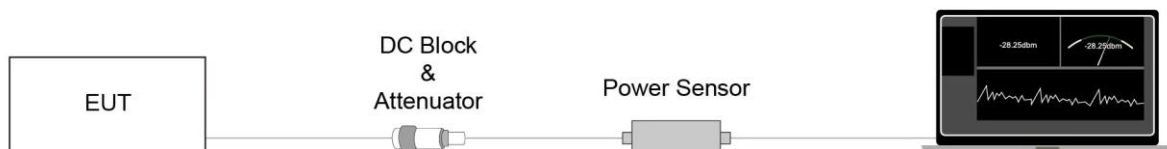
Method PKPM1 (Peak Power Measurement of Signals with DTS BW $\leq$ 50MHz)

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

Average Power Measurement

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

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Power Spectral Density Measurement

6.4.1. Test Limit

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

The same method of determining the conducted output power shall be used to determine the power spectral density.

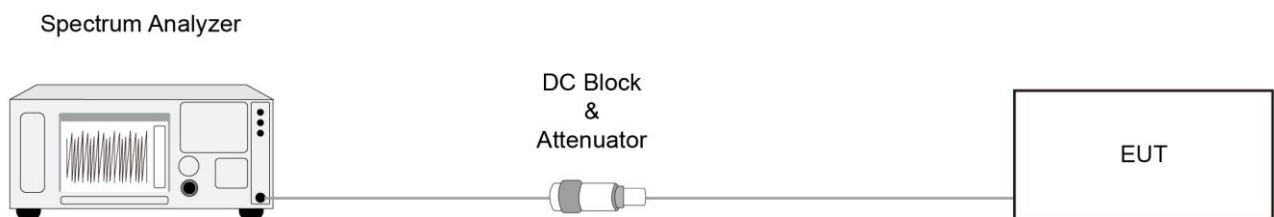
6.4.2. Test Procedure

ANSI C63.10-2013 Section 11.10.2

6.4.3. 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

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. Conducted Band Edge and Out-of-Band Emissions Measurement

6.5.1. 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 100 kHz bandwidth per the PSD procedure.

6.5.2. Test Procedure

ANSI C63.10-2013 - Section 11.11

6.5.3. Test Setting

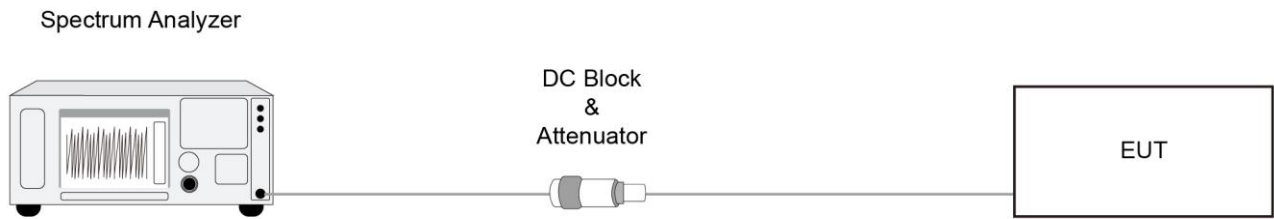
Reference level measurement

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 = 100kHz
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.5.

6.6. Radiated Spurious Emission Measurement

6.6.1. 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

6.6.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.11 & 11.12

ANSI C63.10 - 2013 - Section 6.3 (General Requirements)

ANSI C63.10 - 2013 - Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 - 2013 - Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 - 2013 - Section 6.6 (Standard test method above 1GHz)

6.6.3. 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
> 1000MHz	1MHz

Quasi-Peak Measurements below 1GHz

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

Peak Measurements above 1GHz

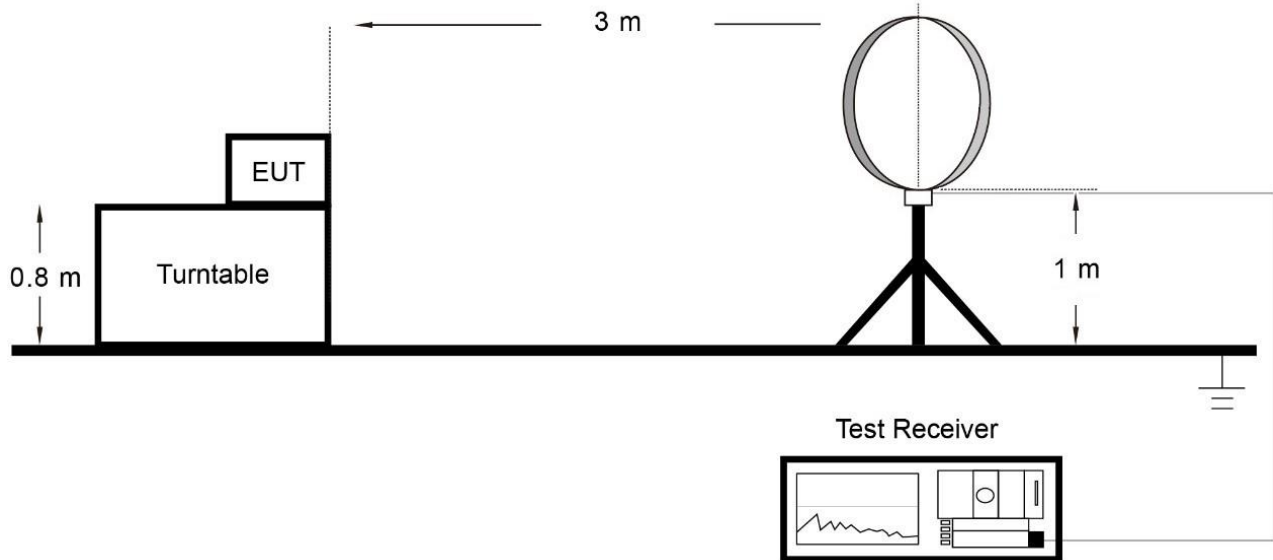
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

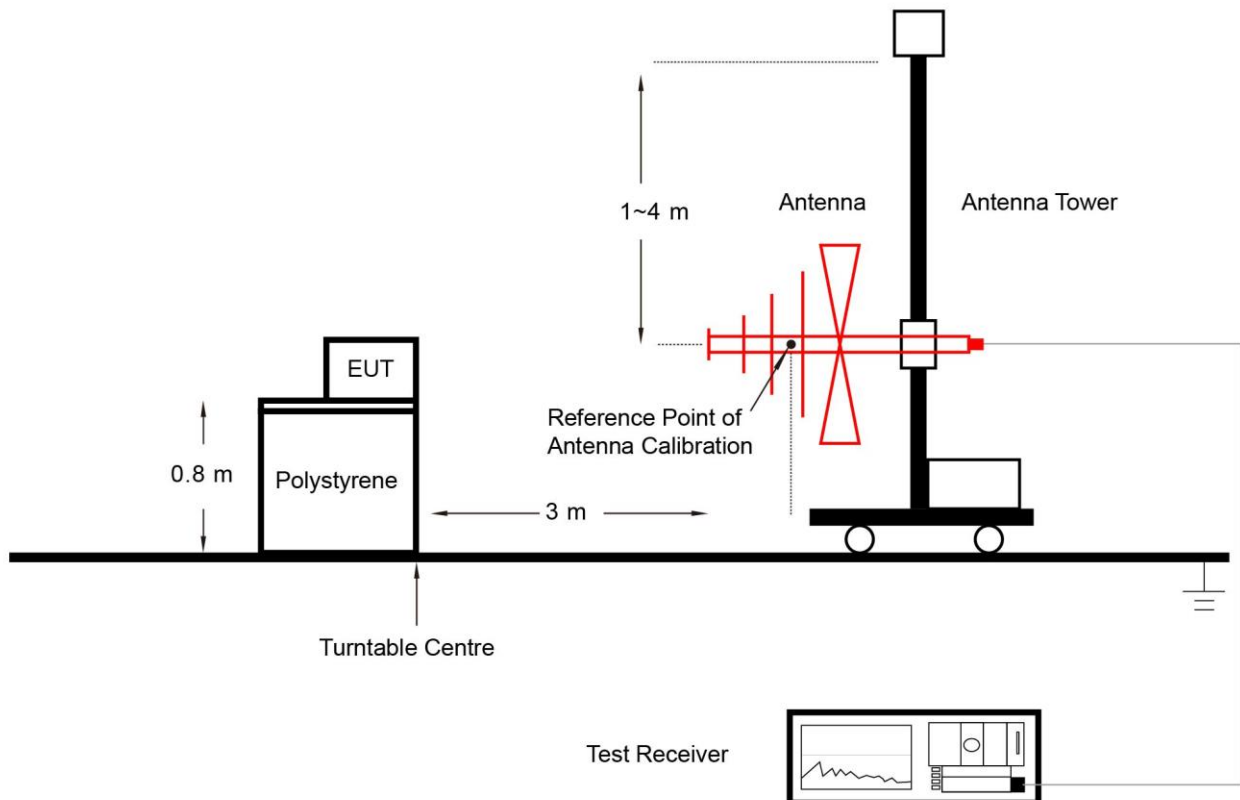
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4.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

6.6.4. Test Setup

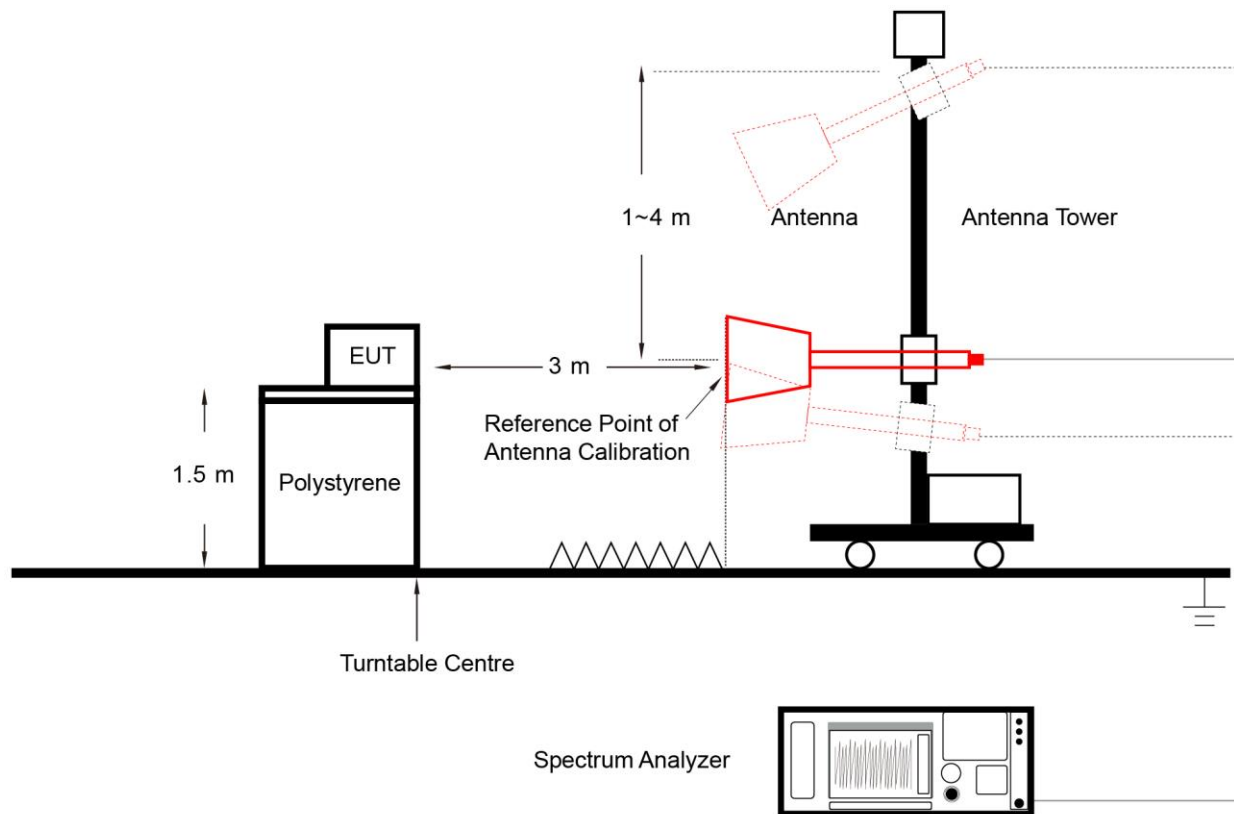
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.6.5. Test Result

Refer to Appendix A.6.

6.7. Radiated Restricted Band Edge Measurement

6.7.1. 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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(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

6.7.2. Test Procedure

ANSI C63.10-2013 Section 6.3 & 6.6 & 11.13

6.7.3. Test Setting

Peak Field Strength Measurements

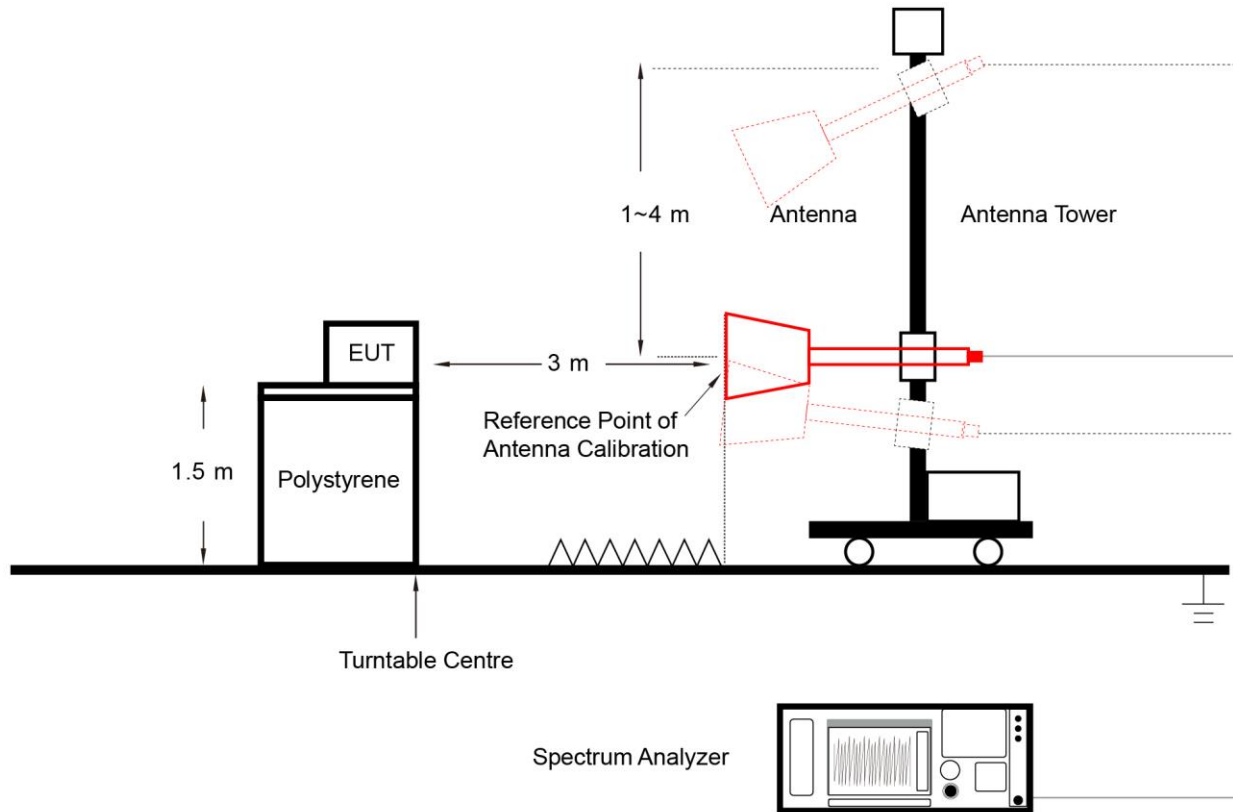
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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 $\geq 1/T$
4. 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

6.7.4. Test Setup



6.7.5. Test Result

Refer to Appendix A.7.

6.8. AC Conducted Emissions Measurement

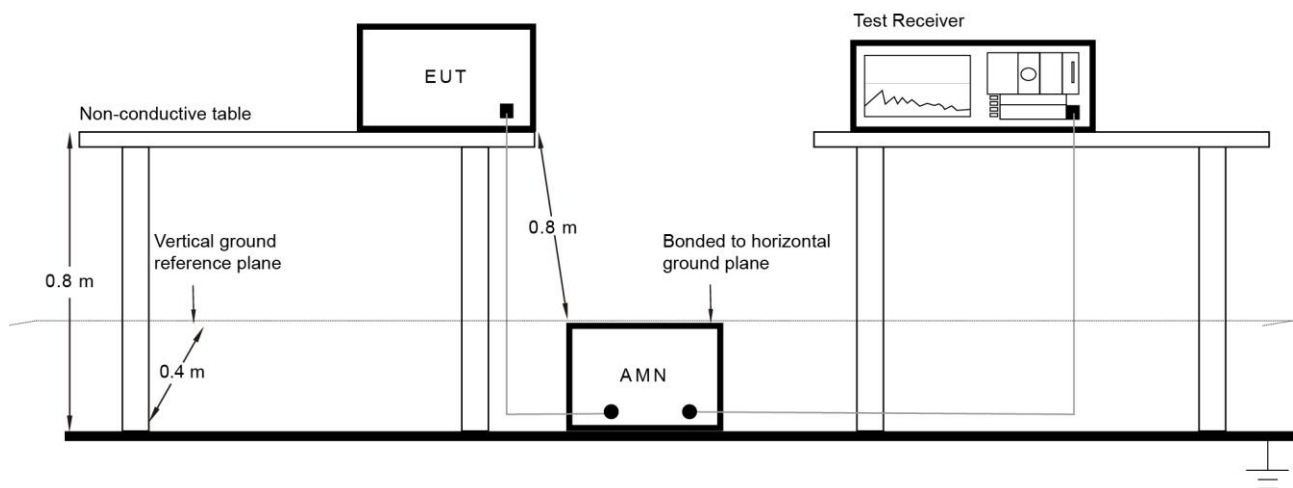
6.8.1. Test Limit

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.

6.8.2. Test Setup



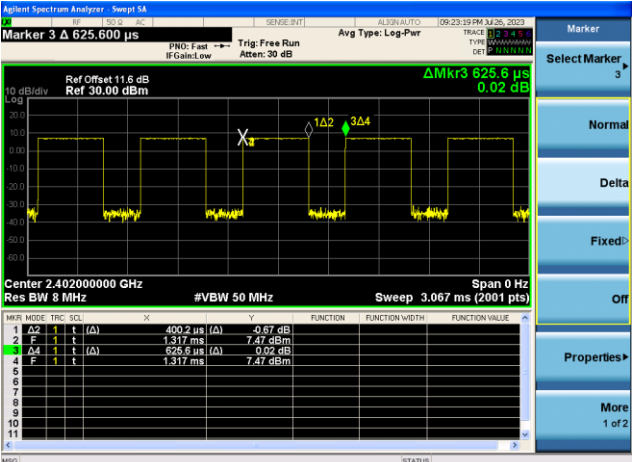
6.8.3. Test Result

Refer to Appendix A.8.

Appendix A - Test Result

A.1 Duty Cycle Test Result

Test Site	NS-TR2	Test Engineer	Flag Yang
Test Date	2023-07-26		

Test Mode	Duty Cycle
BLE-1Mbps	63.97%
Duty Cycle (T = Transmission Duration)	
BLE-1Mbps (T = 400.2µs)	
 The screenshot shows a square wave signal on a spectrum analyzer. The signal is centered at 2.402000000 GHz with a resolution bandwidth of 8 MHz. The signal level is approximately -0.67 dBm. The duty cycle is 63.97%.	

A.2 6dB Bandwidth Test Result

Test Site	NS-TR2	Test Engineer	Flag Yang
Test Date	2023-07-26		

Test Mode	Data Rate	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
BLE	1Mbps	00	2402	0.745	≥ 0.5
BLE	1Mbps	19	2440	0.744	≥ 0.5
BLE	1Mbps	39	2480	0.753	≥ 0.5



A.3 Output Power Test Result

Test Site	NS-TR2	Test Engineer	Flag Yang
Test Date	2023-07-26		

Test Result of Peak Output Power

Test Mode	Data Rate	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
BLE	1Mbps	00	2402	6.74	≤ 30.00	Pass
BLE	1Mbps	19	2440	7.38	≤ 30.00	Pass
BLE	1Mbps	39	2480	7.44	≤ 30.00	Pass

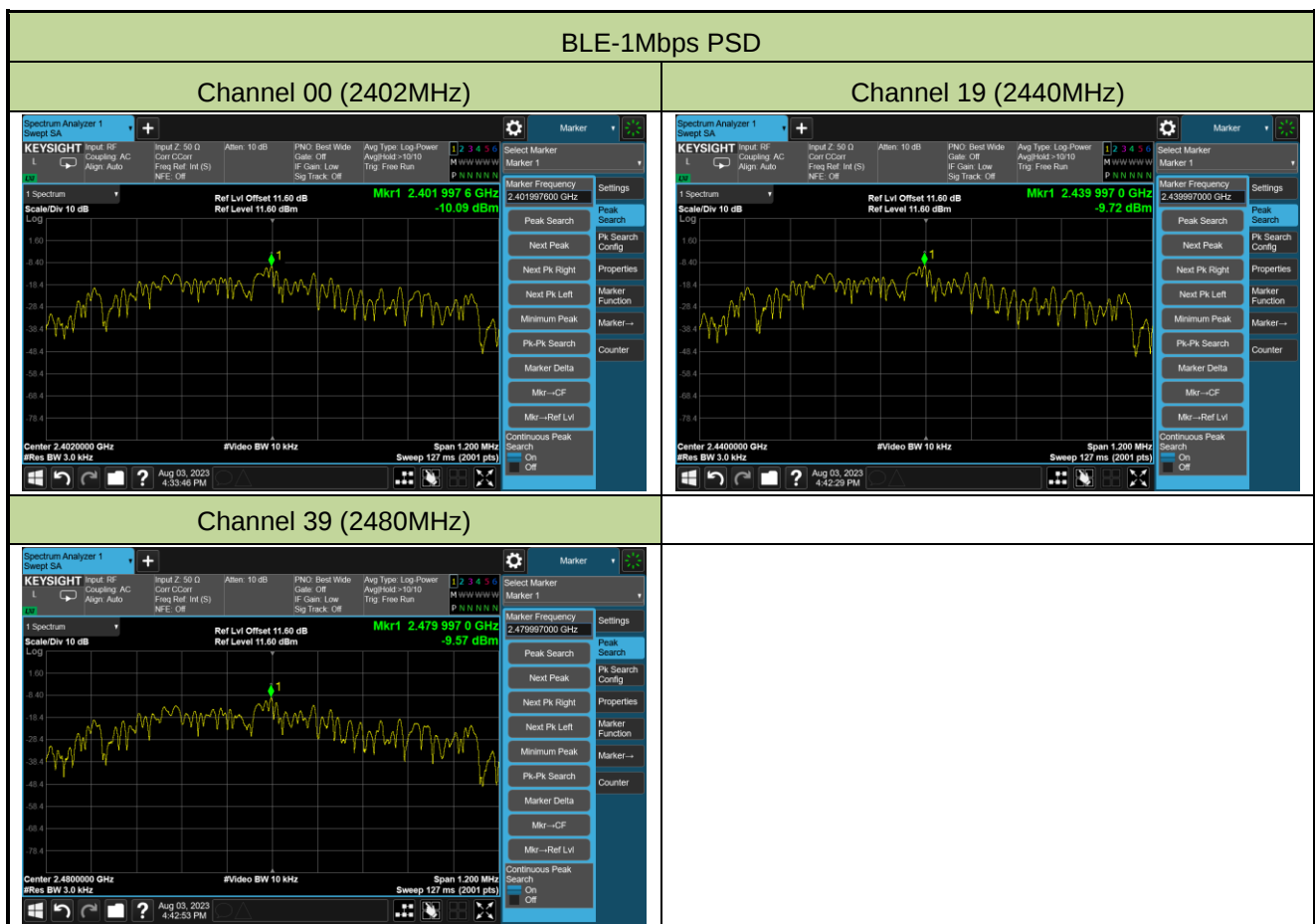
Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
BLE	1Mbps	00	2402	6.30	≤ 30.00	Pass
BLE	1Mbps	19	2440	7.00	≤ 30.00	Pass
BLE	1Mbps	39	2480	7.03	≤ 30.00	Pass

A.4 Power Spectral Density Test Result

Test Site	WZ-SR4	Test Engineer	Jeff Yang
Test Date	2023-08-03		

Test Mode	Data Rate	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	1Mbps	00	2402	-10.09	≤ 8.00	Pass
BLE	1Mbps	19	2440	-9.72	≤ 8.00	Pass
BLE	1Mbps	39	2480	-9.57	≤ 8.00	Pass



A.5 Conducted Band Edge and Out-of-Band Emissions Test Result

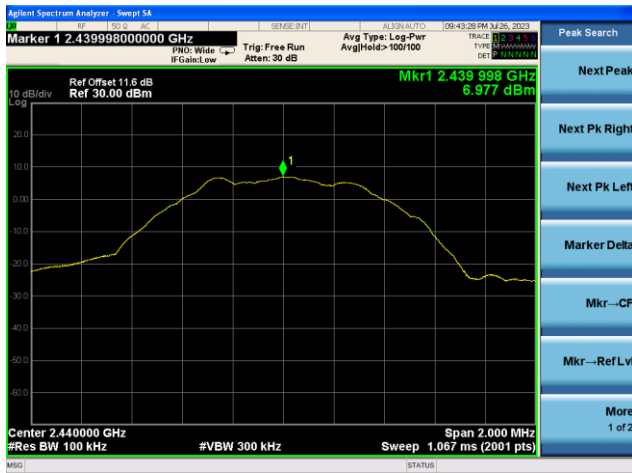
Test Site	NS-TR2	Test Engineer	Flag Yang
Test Date	2023-07-26		

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

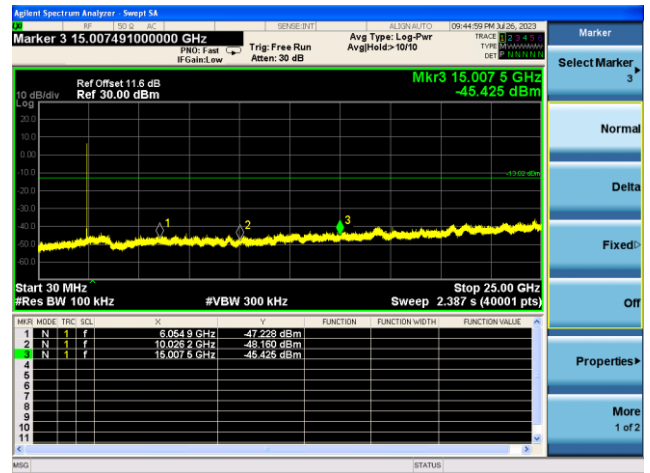


Channel 19 (2440MHz)

100kHz PSD Reference Level

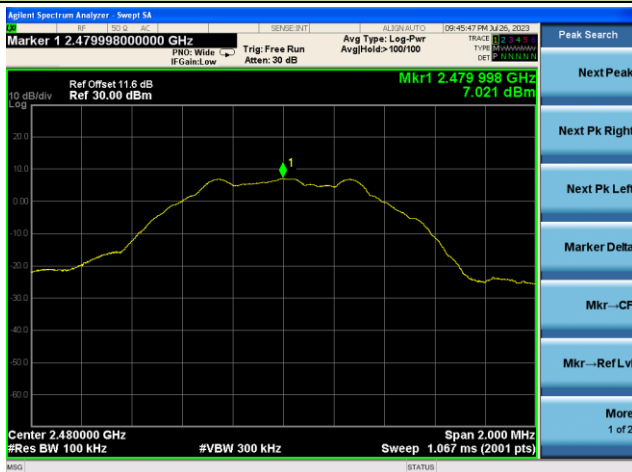


Spurious Emission 30MHz ~ 25GHz

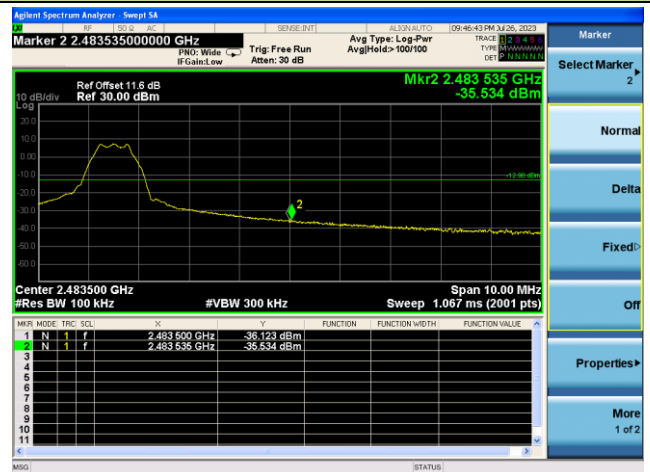


Channel 39 (2480MHz)

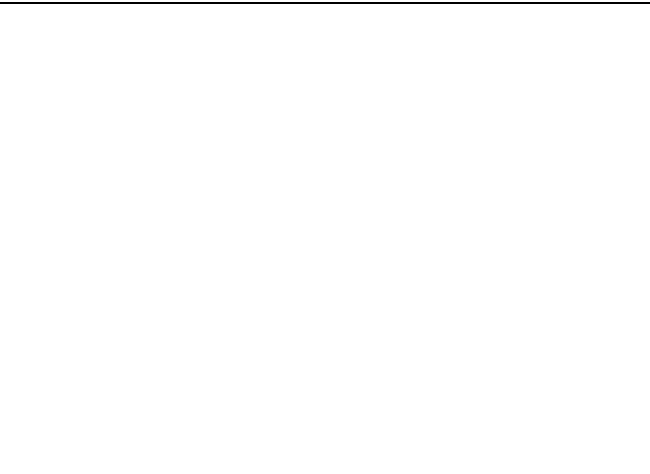
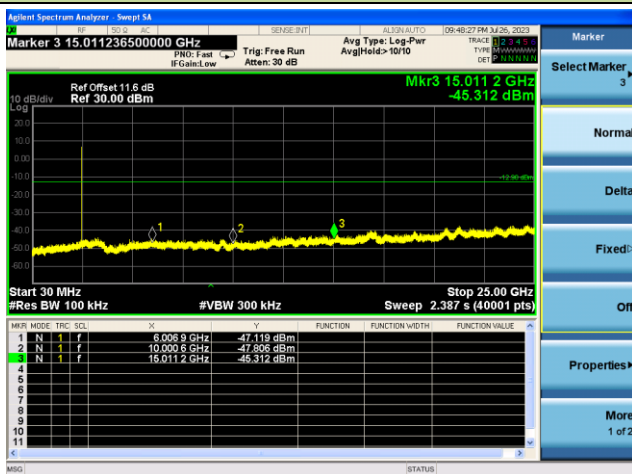
100kHz PSD Reference Level



High Band Edge



Spurious Emission 30MHz ~ 25GHz



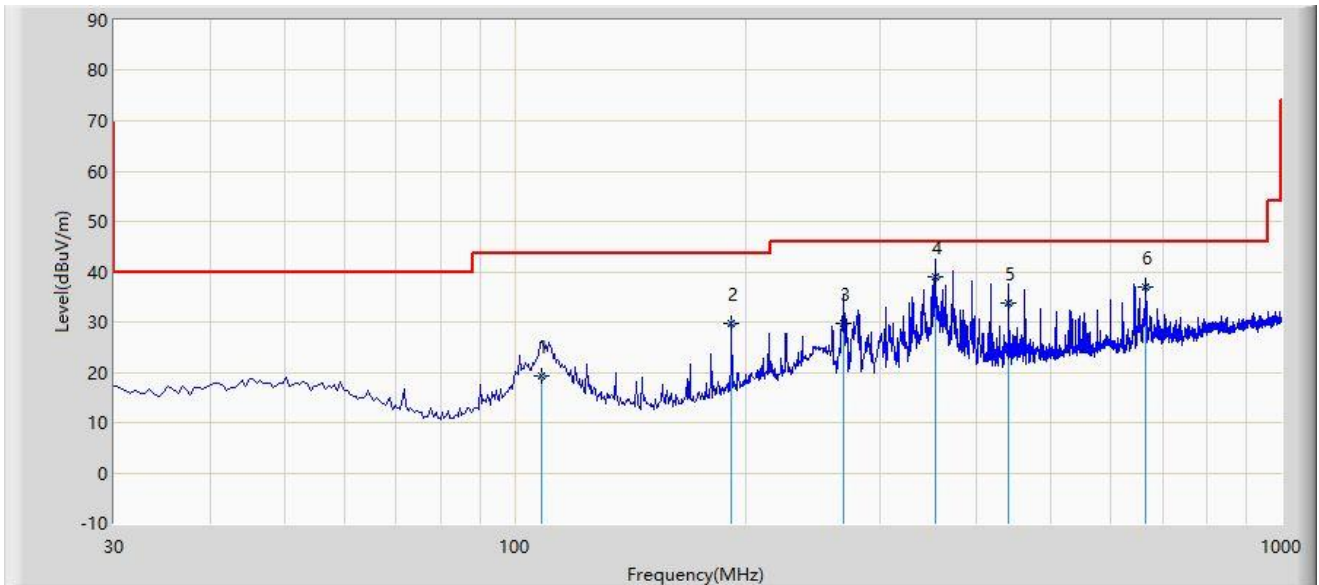
A.6 Radiated Spurious Emission Test Result

Test Site	NS-AC1	Test Engineer	Flag Yang
Test Date	2023-07-27	Test Mode:	BLE-1Mbps
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.		

Test Channel	Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
00	5122.500	38.1	2.2	40.3	74.0	-33.7	Peak	Horizontal
	7485.500	35.8	10.1	45.9	74.0	-28.1	Peak	Horizontal
	11072.500	34.1	15.9	50.0	74.0	-24.0	Peak	Horizontal
	4808.000	40.7	1.4	42.1	74.0	-31.9	Peak	Vertical
	7723.500	36.7	8.9	45.6	74.0	-28.4	Peak	Vertical
	11081.000	34.8	16.1	50.9	74.0	-23.1	Peak	Vertical
19	4910.000	38.4	1.5	39.9	74.0	-34.1	Peak	Horizontal
	7681.000	35.8	9.5	45.3	74.0	-28.7	Peak	Horizontal
	11667.500	34.6	15.5	50.1	74.0	-23.9	Peak	Horizontal
	4808.000	39.0	1.4	40.4	74.0	-33.6	Peak	Vertical
	7426.000	35.6	10.4	46.0	74.0	-28.0	Peak	Vertical
	11217.000	33.8	16.0	49.8	74.0	-24.2	Peak	Vertical
39	4825.000	38.7	1.7	40.4	74.0	-33.6	Peak	Horizontal
	8080.500	36.6	9.3	45.9	74.0	-28.1	Peak	Horizontal
	11166.000	35.2	15.5	50.7	74.0	-23.3	Peak	Horizontal
	4825.000	38.7	1.7	40.4	74.0	-33.6	Peak	Vertical
	7740.500	35.6	9.0	44.6	74.0	-29.4	Peak	Vertical
	11038.500	36.4	15.1	51.5	74.0	-22.5	Peak	Vertical
Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m) Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)								

The Result of Radiated Emission below 1GHz:

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_Part15.209_RSE(3m)	Engineer: Flag Yang
Probe: NS-AC1_VULB9162	Polarity: Horizontal
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		108.570	19.247	3.460	-24.253	43.500	15.787	QP
2		191.990	29.784	14.050	-13.716	43.500	15.734	QP
3		268.620	29.757	12.156	-16.243	46.000	17.601	QP
4	*	353.495	38.952	19.140	-7.048	46.000	19.812	QP
5		440.310	33.785	12.300	-12.215	46.000	21.485	QP
6		666.320	36.990	11.400	-9.010	46.000	25.590	QP

Note 1: " * ", means this data is the worst emission level.

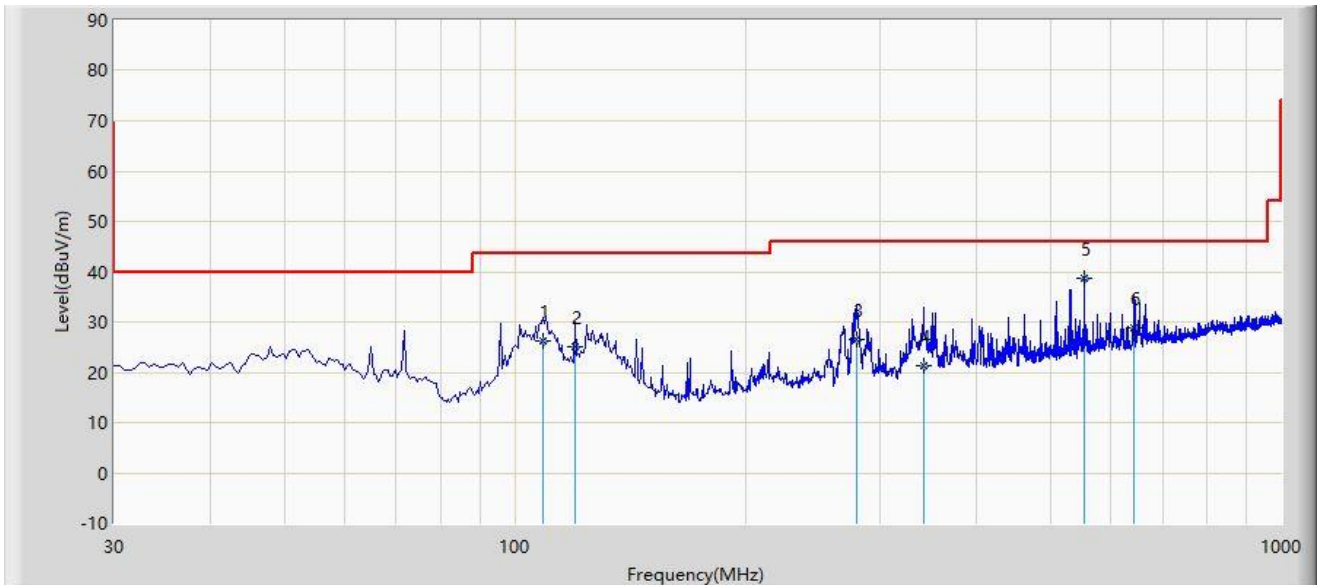
Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value.

Therefore, the data is not presented in the report.

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_Part15.209_RSE(3m)	Engineer: Flag Yang
Probe: NS-AC1_VULB9162	Polarity: Vertical
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB/m)	Type
1		109.055	26.153	10.400	-17.347	43.500	15.753	QP
2		119.725	25.104	10.500	-18.396	43.500	14.604	QP
3		278.805	26.435	8.600	-19.565	46.000	17.835	QP
4		341.855	21.389	1.600	-24.611	46.000	19.789	QP
5	*	553.315	38.589	15.100	-7.411	46.000	23.489	QP
6		643.525	28.806	4.100	-17.194	46.000	24.706	QP

Note 1: " * ", means this data is the worst emission level.

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

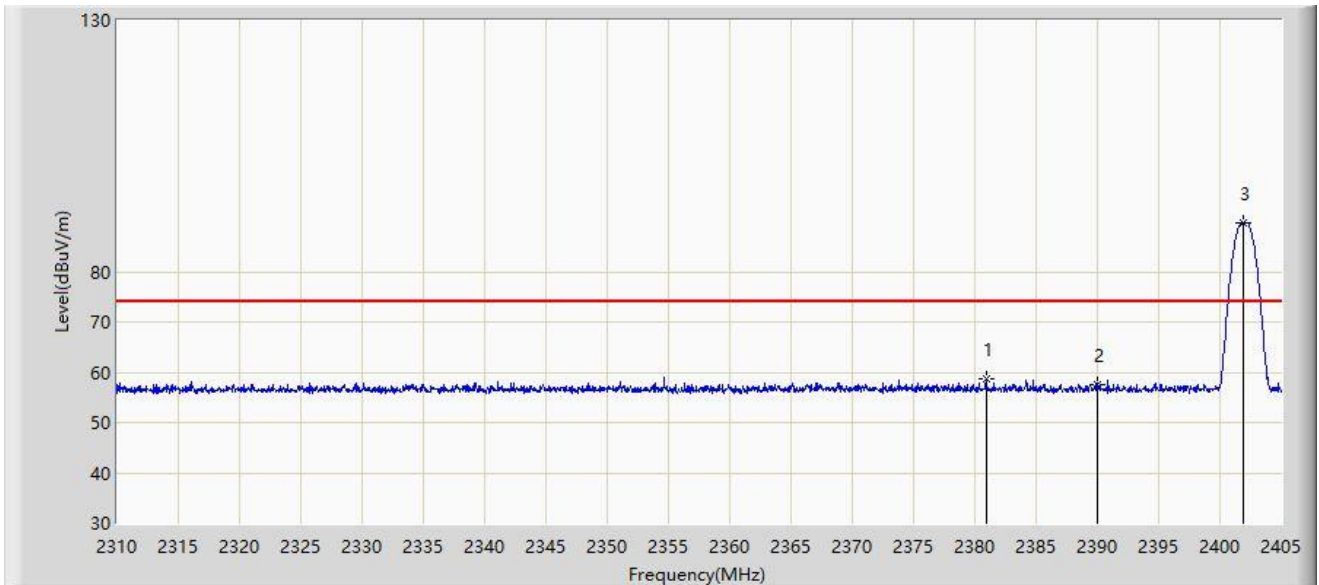
Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Note 4: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value.

Therefore, the data is not presented in the report.

A.7 Radiated Restricted Band Edge Test Result

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Horizontal
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2402MHz	



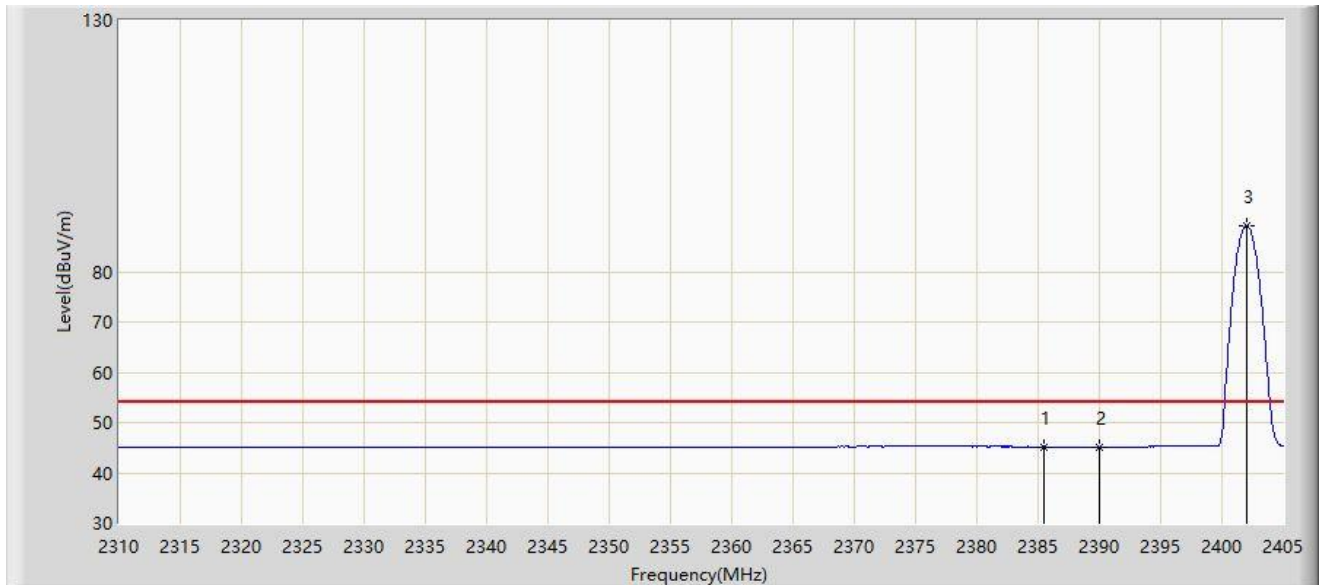
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2380.917	58.676	27.746	-15.324	74.000	30.930	PK
2		2390.000	57.517	26.666	-16.483	74.000	30.850	PK
3		2401.865	89.751	58.913	N/A	N/A	30.838	PK

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Horizontal
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2402MHz	



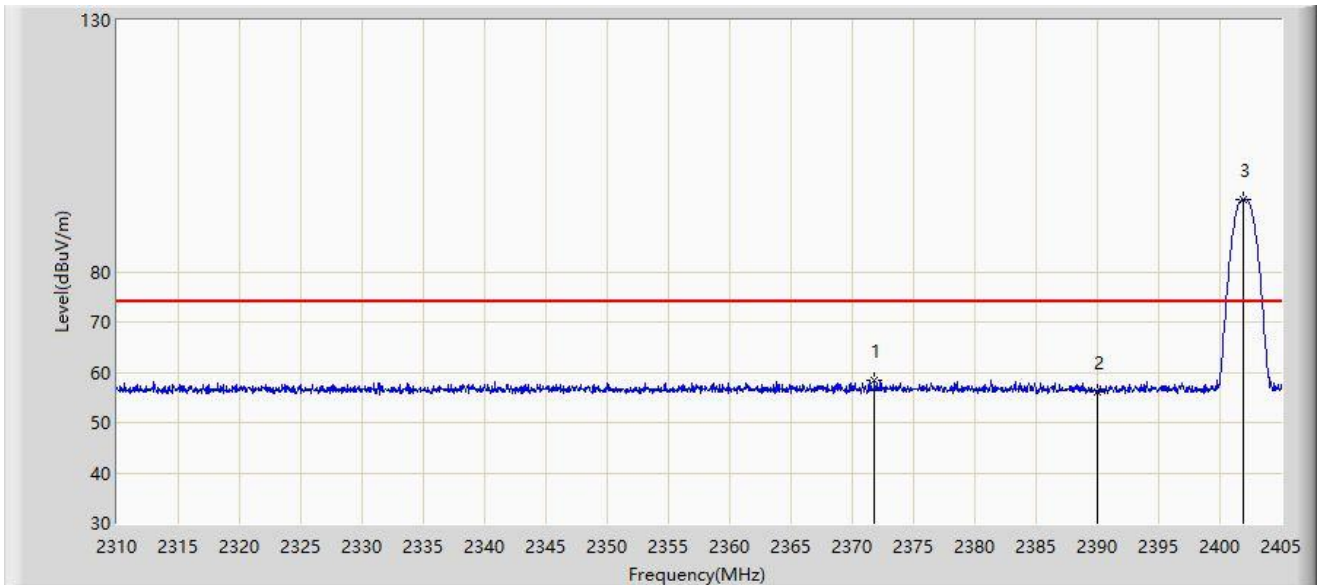
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2385.478	45.217	14.327	-8.783	54.000	30.890	AV
2		2390.000	45.145	14.294	-8.855	54.000	30.850	AV
3		2402.008	89.161	58.322	N/A	N/A	30.839	AV

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Vertical
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2402MHz	



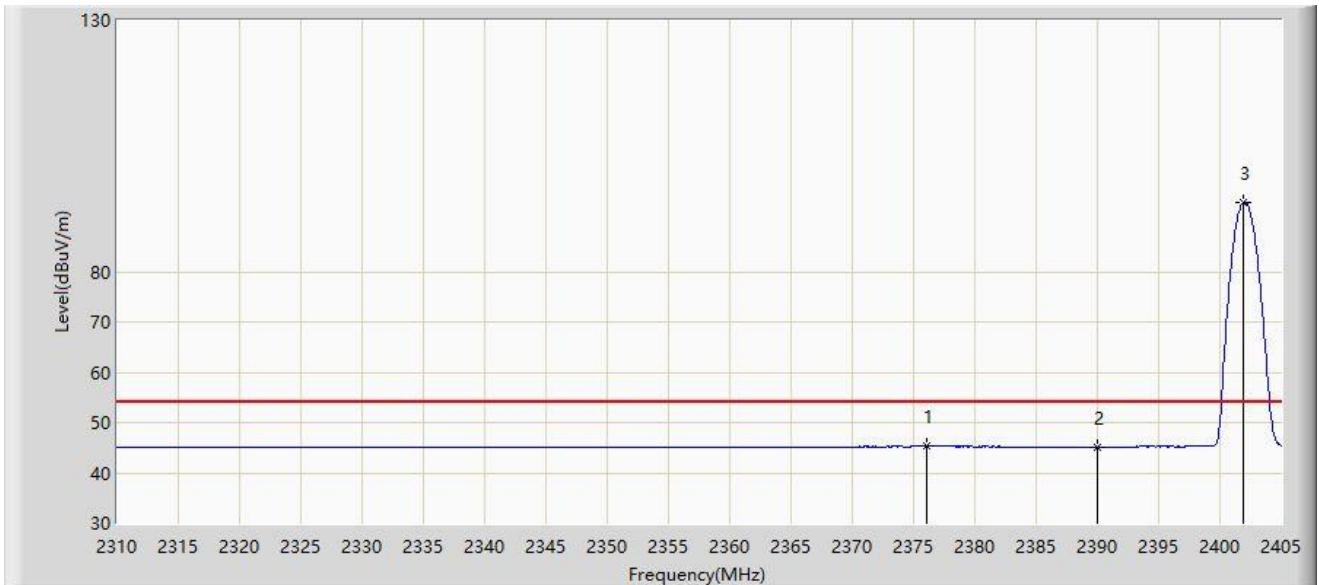
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2371.845	58.534	27.609	-15.466	74.000	30.925	PK
2		2390.000	56.159	25.308	-17.841	74.000	30.850	PK
3		2401.865	94.277	63.439	N/A	N/A	30.838	PK

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Vertical
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2402MHz	



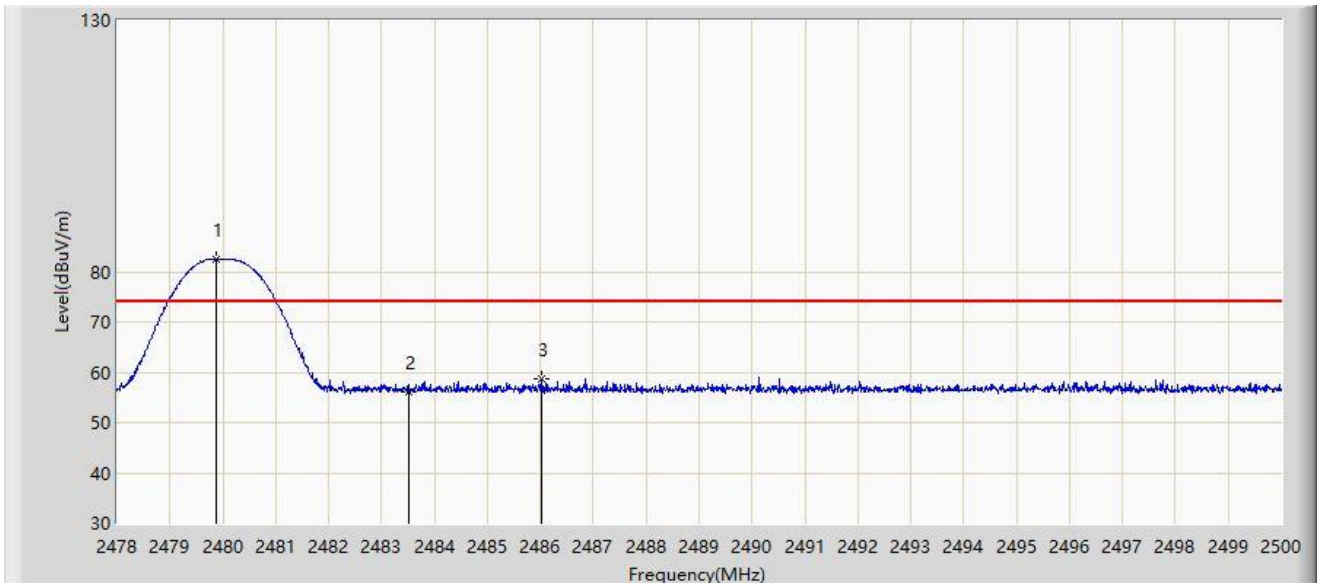
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2376.120	45.334	14.377	-8.666	54.000	30.957	AV
2		2390.000	45.108	14.257	-8.892	54.000	30.850	AV
3		2401.960	93.866	63.028	N/A	N/A	30.839	AV

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Horizontal
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2480MHz	



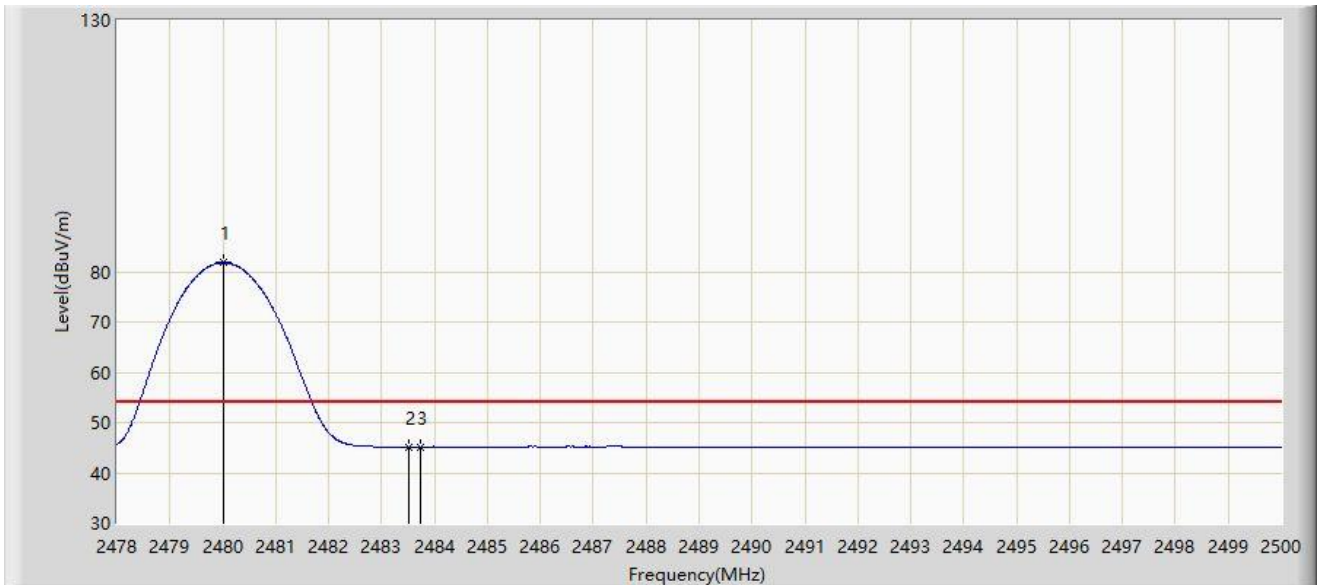
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2479.870	82.606	51.846	N/A	N/A	30.760	PK
2		2483.500	55.977	25.215	-18.023	74.000	30.761	PK
3	*	2486.019	58.569	27.806	-15.431	74.000	30.763	PK

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Horizontal
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2480MHz	



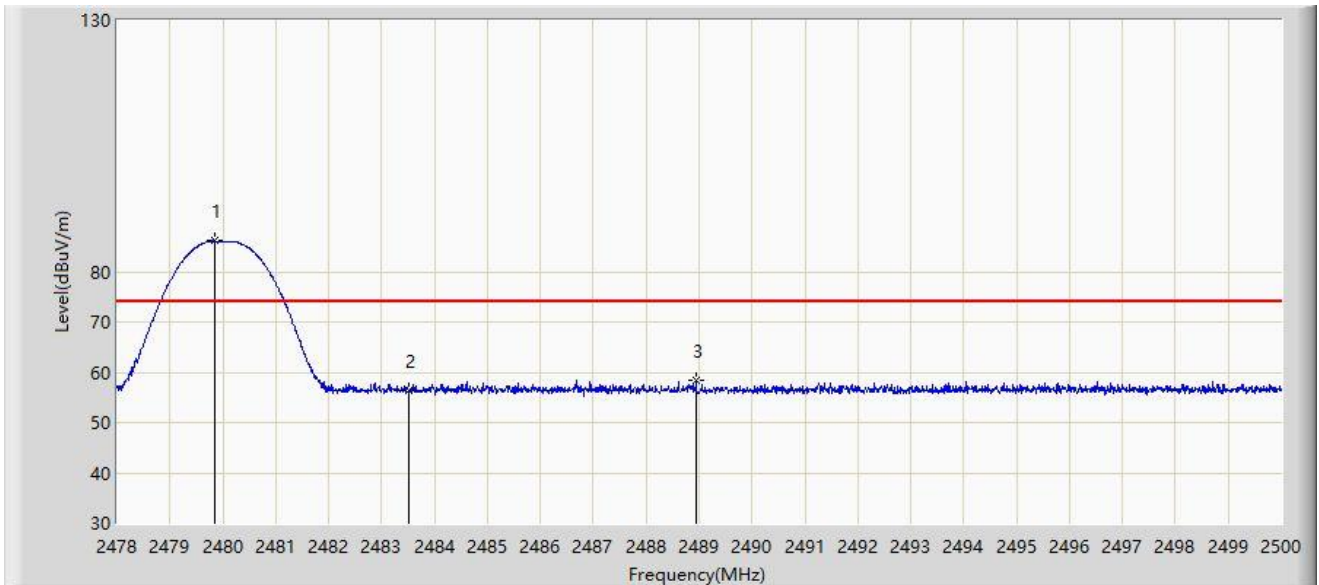
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2480.013	81.767	51.007	N/A	N/A	30.760	AV
2		2483.500	45.181	14.419	-8.819	54.000	30.761	AV
3	*	2483.742	45.190	14.428	-8.810	54.000	30.762	AV

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Vertical
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2480MHz	



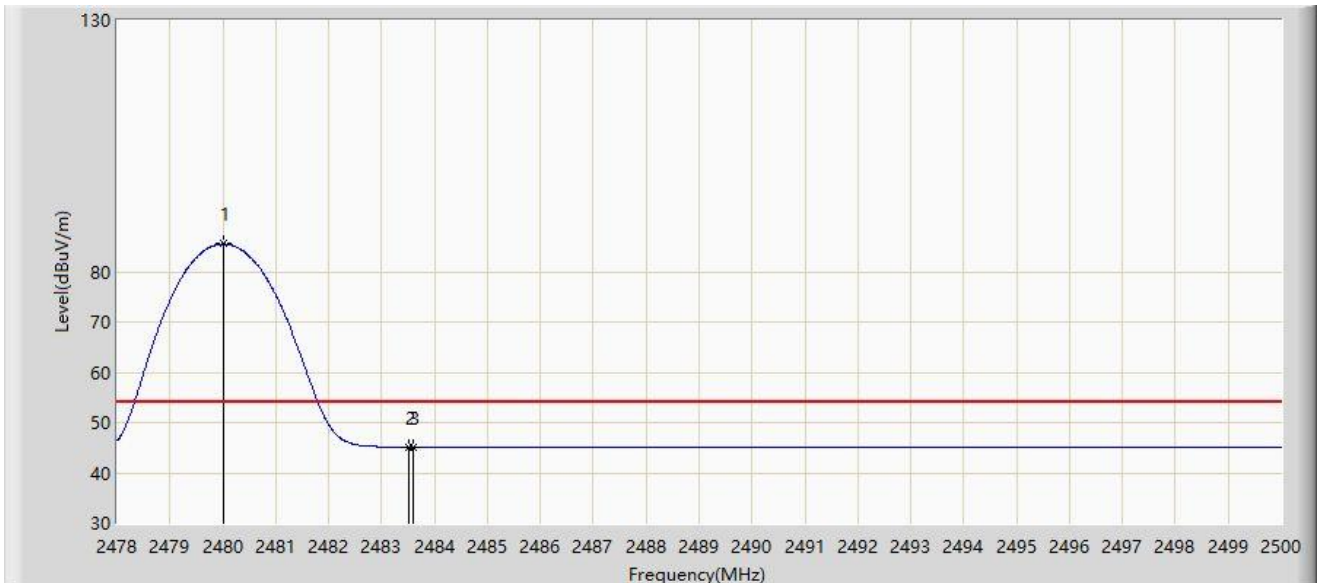
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2479.848	86.121	55.361	N/A	N/A	30.761	PK
2		2483.500	56.267	25.505	-17.733	74.000	30.761	PK
3	*	2488.945	58.485	27.721	-15.515	74.000	30.764	PK

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: NS-AC1	Test Data: 2023-07-27
Limit: FCC_2.4G_RE(3m)	Engineer: Flag Yang
Probe: NS-AC1_BBHA9120D_2111_1-18GHz	Polarity: Vertical
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE 1M at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2480.002	85.515	54.755	N/A	N/A	30.760	AV
2		2483.500	45.156	14.394	-8.844	54.000	30.761	AV
3	*	2483.599	45.170	14.408	-8.830	54.000	30.762	AV

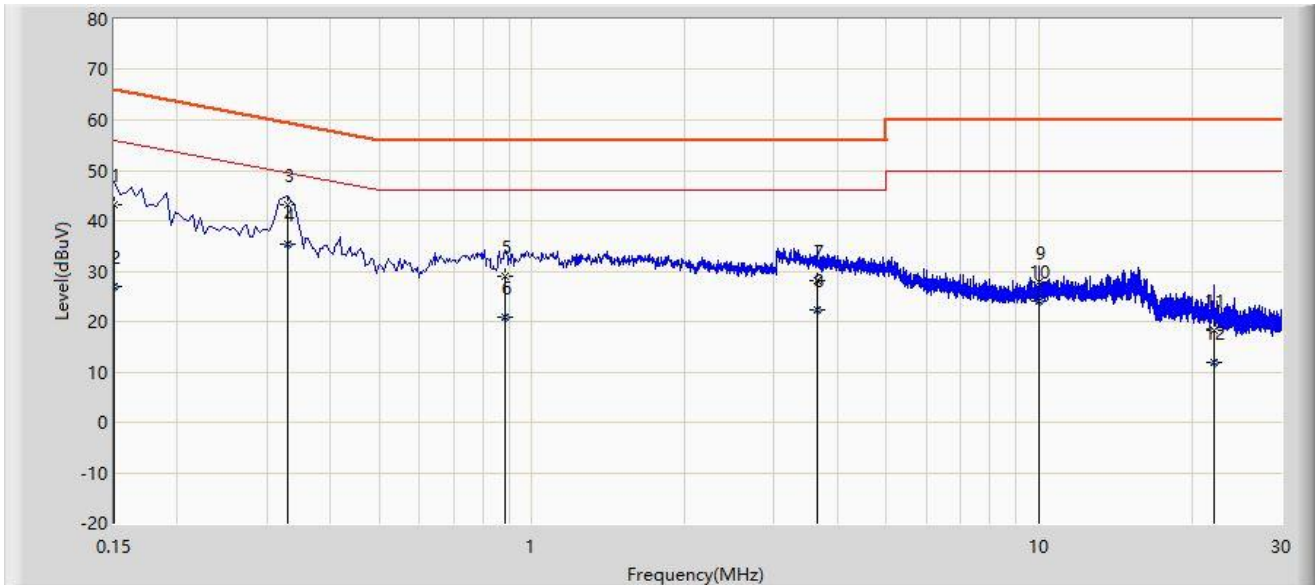
Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m).

A.8 AC Conducted Emissions Test Result

Site: NS-SR2	Test Data: 2023-07-26
Temperature: 25.6°C	Humidity: 49.1%
Limit: FCC_Part15.207_CE_AC Power	Engineer: Flag Yang
Probe: ENV216_102493_0.15MHz~30MHz-C-2023	Polarity: Line
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE at 2480MHz	



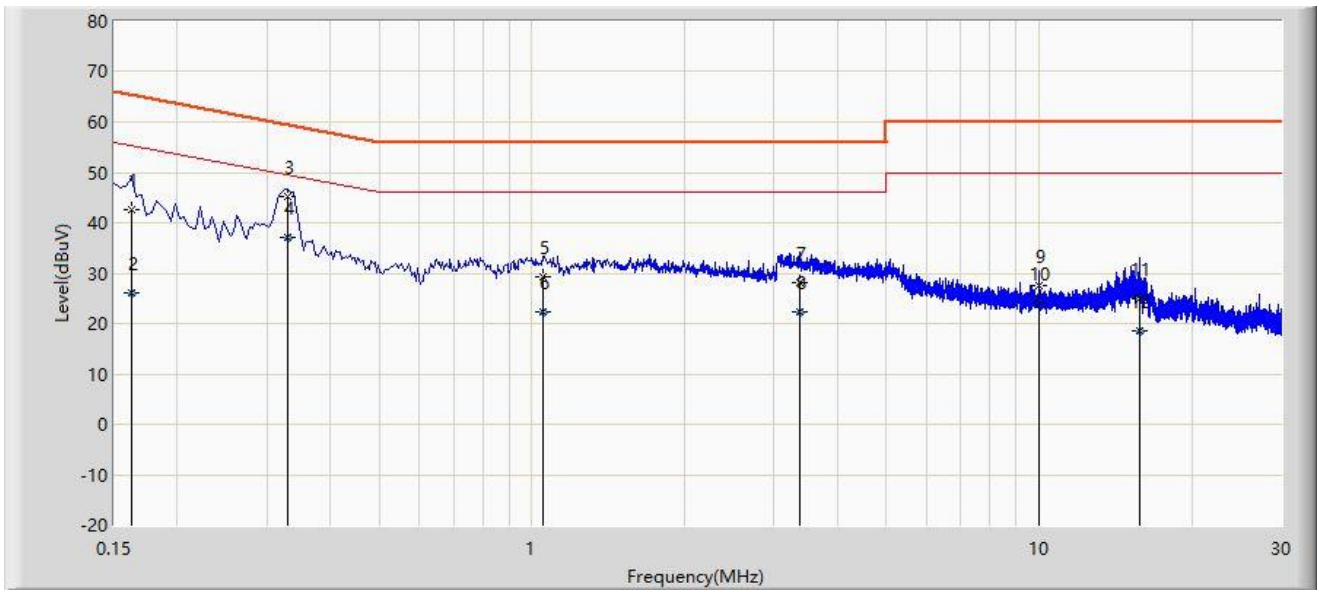
No	Mark	Frequency (MHz)	Measure Level (dBμV)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV)	Factor (dB)	Type
1		0.150	43.148	33.461	-22.852	66.000	9.687	QP
2		0.150	26.896	17.209	-29.104	56.000	9.687	AV
3		0.330	43.320	33.630	-16.132	59.451	9.690	QP
4	*	0.330	35.271	25.581	-14.180	49.451	9.690	AV
5		0.886	29.058	19.273	-26.942	56.000	9.785	QP
6		0.886	21.013	11.227	-24.987	46.000	9.785	AV
7		3.642	28.080	18.267	-27.920	56.000	9.813	QP
8		3.642	22.204	12.391	-23.796	46.000	9.813	AV
9		9.998	27.687	17.697	-32.313	60.000	9.990	QP
10		9.998	24.041	14.052	-25.959	50.000	9.990	AV
11		22.190	18.172	7.981	-41.828	60.000	10.190	QP
12		22.190	11.886	1.696	-38.114	50.000	10.190	AV

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Site: NS-SR2	Test Data: 2023-07-26
Temperature: 25.6°C	Humidity: 49.1%
Limit: FCC_Part15.207_CE_AC Power	Engineer: Flag Yang
Probe: ENV216_102493_0.15MHz~30MHz-C-2023	Polarity: Neutral
EUT: Guitar Speaker	Power: AC 120V/60Hz
Test Mode: Transmit by BLE at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBμV)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV)	Factor (dB)	Type
1		0.162	42.624	32.971	-22.736	65.361	9.653	QP
2		0.162	26.105	16.452	-29.256	55.361	9.653	AV
3		0.330	45.150	35.500	-14.301	59.451	9.650	QP
4	*	0.330	37.156	27.506	-12.295	49.451	9.650	AV
5		1.054	29.199	19.511	-26.801	56.000	9.688	QP
6		1.054	22.266	12.579	-23.734	46.000	9.688	AV
7		3.366	28.166	18.388	-27.834	56.000	9.778	QP
8		3.366	22.246	12.468	-23.754	46.000	9.778	AV
9		9.998	27.404	17.364	-32.596	60.000	10.040	QP
10		9.998	24.008	13.969	-25.992	50.000	10.040	AV
11		15.742	24.913	14.700	-35.087	60.000	10.212	QP
12		15.742	18.510	8.298	-31.490	50.000	10.212	AV

Note 1: " * ", means this data is the worst emission level.

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

Note 3: Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Appendix B - Test Setup Photograph

Refer to “2307RSU056-UT” file.

Appendix C - EUT Photograph

Refer to “2307RSU056-UE” file.

The End
