



MEASUREMENT REPORT

FCC PART 15.247 / RSS-247 Bluetooth LE

FCC ID: 2AYDL-RS0001
IC: 26754-RS0001
Applicant: 66 Studios Co., Ltd
Application Type: Certification
Product: EnigmaBot
Model No.: EnigmaBot-E1
FCC Classification: Digital Transmission System (DTS)
FCC Rule Part(s): Part 15 Subpart C (Section 15.247)
ISED Rule Part(s): RSS-247 Issue 2, RSS-GEN Issue 5
Test Procedure(s): ANSI C63.10-2013
Test Date: November 26 ~ December 26, 2020

Reviewed By:

Vincent Yu

Vincent Yu

Approved By:

Robin Wu

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

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

Revision History

Report No.	Version	Description	Issue Date	Note
2011RSU059-U1	Rev. 01	Initial Report	03-02-2021	Valid

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1.1. Applicant

Room 301C, C-2 Bldg., No. 66, Xixiaokou Rd, Haidian Dist., Beijing, China.

Room 301C, C-2 Bldg., No. 66, Xixiaokou Rd, Haidian Dist., Beijing, China.

1.3. Testing Facility

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2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

Product Name	EnigmaBot
Model No.	EnigmaBot-E1
HVIN	EnigmaBot-E1
PMN	EnigmaBot-E1
Sample ID	20201123Sample#07 (Conducted) 20201123Sample#10 (Radiated)

2.2. Product Specification Subjective to this report

Bluetooth Specification	v5.1 (BLE Only)
Frequency Range	2402 ~ 2480MHz
Data Rate	1Mbps
Modulation	GFSK
Antenna Type	Chip Antenna
Antenna Gain	0.44dBi

Note: Above information is declared by manufacturer.

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. Test Environment Condition

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

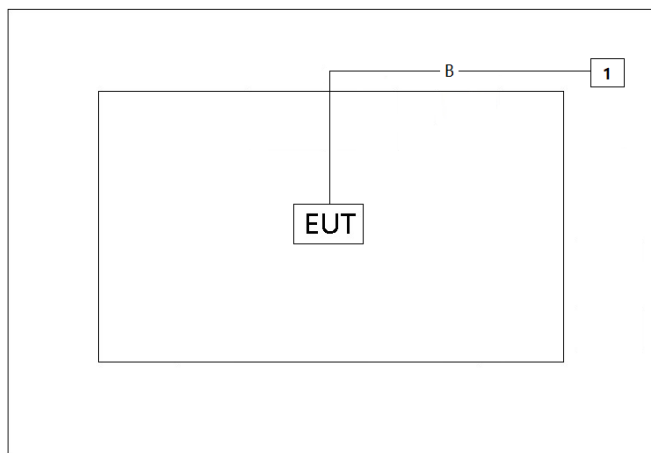
2.6. Test Software

The test utility software used during testing was “smartsnippets_studio”, and the version was v2.0.14.1748.

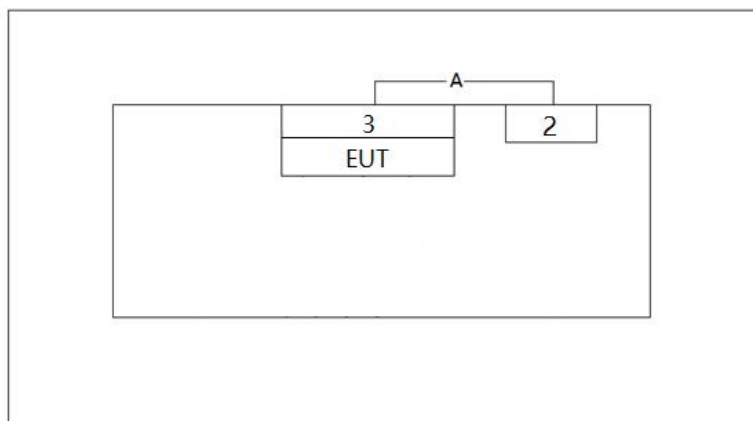
2.7. Description of Test Configuration

The ANSI C63.10: 2013 was used to reference the appropriate EUT setup for testing.

Connection Diagram for Radiated Emissions Measurement



Connection Diagram for AC Conducted Emission Measurement



Cable Type		Signal Cable Description
A	USB Cable	Shielding, < 0.5 m
B	Control Cable	Non-Shielded, > 5 m

2.8. Test System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

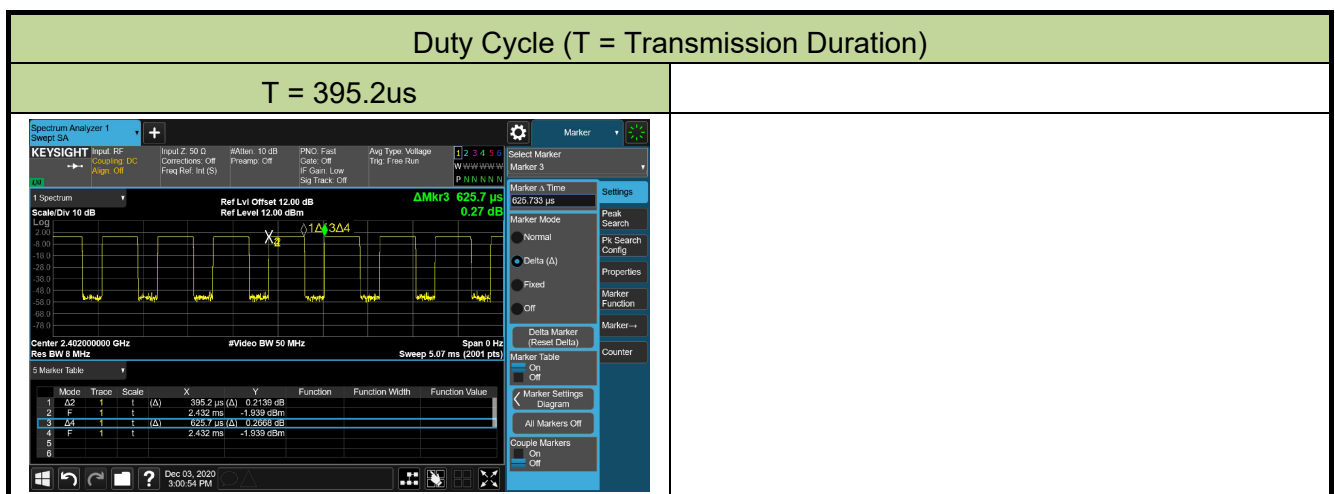
Product	Manufacturer	Model No.
1 Notebook	Lenovo	E495
2 USB Adapter	KEYU	KA06E-0501000US
3 EnigmaBot	66 Studios Co., Ltd	EnigmaBot-M1

Note: The Adapter used during the test was provided by MRT.

2.9. Duty Cycle

The maximum achievable duty cycles for all modes were 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	63.16%



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 device unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions (WZ-SR2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2021/01/18
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2021/06/11
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2021/06/11
Thermal Hygrometer	testo	608-H1	MRTSUE06404	1 year	2021/07/26

Radiated Emissions (WZ-AC1)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/01/18
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2021/08/30
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/04/03
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2021/09/27
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermal Hygrometer	testo	608-H1	MRTSUE06403	1 year	2021/07/26
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission (WZ-AC2)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Keysight	N9038A	MRTSUE06125	1 year	2021/07/02
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2021/11/08
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2021/05/26
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2021/10/25
Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06597	1 year	2021/12/14
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2021/11/14
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermal Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2021/12/08
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Conducted Test Equipment (WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2021/01/08
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/10/22
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2021/06/11
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2021/06/11
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2021/06/11
Modulation Analyzer	HP	HP8901A	MRTSUE06098	1 year	2021/09/26
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/10/20
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/10/22
Thermal Hygrometer	testo	608-H1	MRTSUE06401	1 year	2021/07/26

Software	Version	Function
EMI Software	V3	EMI Test Software

5. MEASUREMENT UNCERTAINTY

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

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 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
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.78dB
Output Power
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.13dB
Power Spectrum Density
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.15dB
Occupied Bandwidth
Measurement Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.28%

6. TEST RESULT

6.1. Summary

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	$\geq 500\text{kHz}$	Conducted	Pass	Section 6.2
N/A	RSS-Gen [6.7]	99% Bandwidth	N/A		Pass	
15.247(b)(3)	RSS-247 [5.4(d)]	Output Power	$\leq 1\text{Watt}$ & $\text{EIRP} \leq 4\text{Watt}$		Pass	Section 6.3
15.247(e)	RSS-247 [5.2]	Power Spectral Density	$\leq 8\text{dBm} / 3\text{kHz}$		Pass	Section 6.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	$\leq 20\text{dBc}$ (Peak)		Pass	Section 6.5
15.205 15.209	RSS-247 [5.5]	General Field Strength (Restricted Bands and Radiated Emission)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 6.6 & 6.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 6.8

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.

6.2. Occupied Bandwidth Measurement

6.2.1. Test Limit

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

6.2.2. Test Procedure used

ANSI C63.10-2013 - Section 11.8 (6dB bandwidth)

ANSI C63.10-2013 - Section 6.9.3 (99% bandwidth)

6.2.3. Test Setting

For 6dB bandwidth

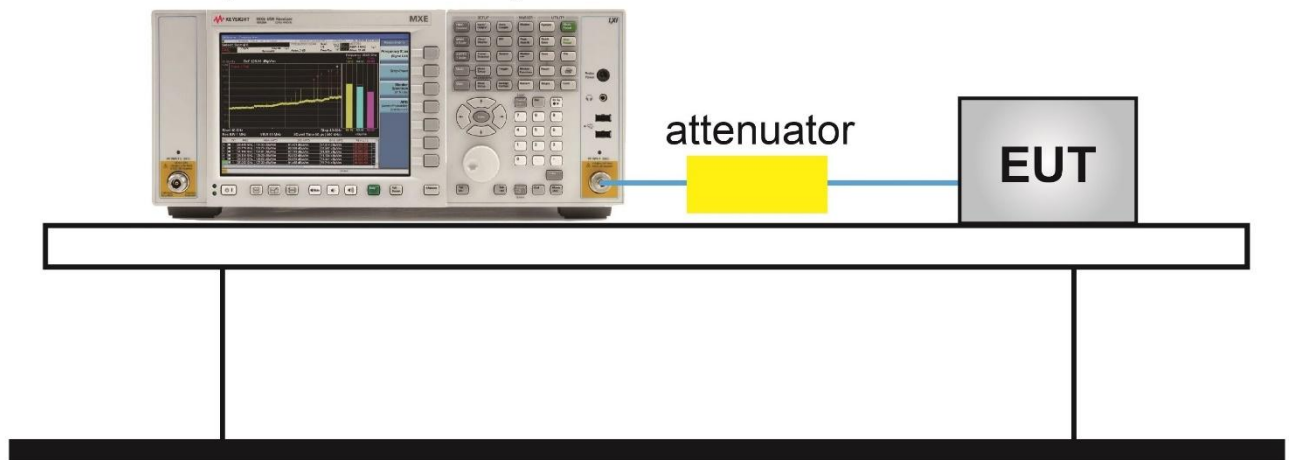
1. Set RBW = 100 kHz
2. VBW $\geq 3 \times$ RBW
3. Detector = Peak
4. Trace mode = Max hold
5. Sweep = Auto couple
6. Allow the trace to stabilize
7. Use the X dB bandwidth mode with X set to 6 dB

For 99% bandwidth

1. Span = 1.5 times to 5 times the OBW
2. Set RBW = 1% to 5% the OBW
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

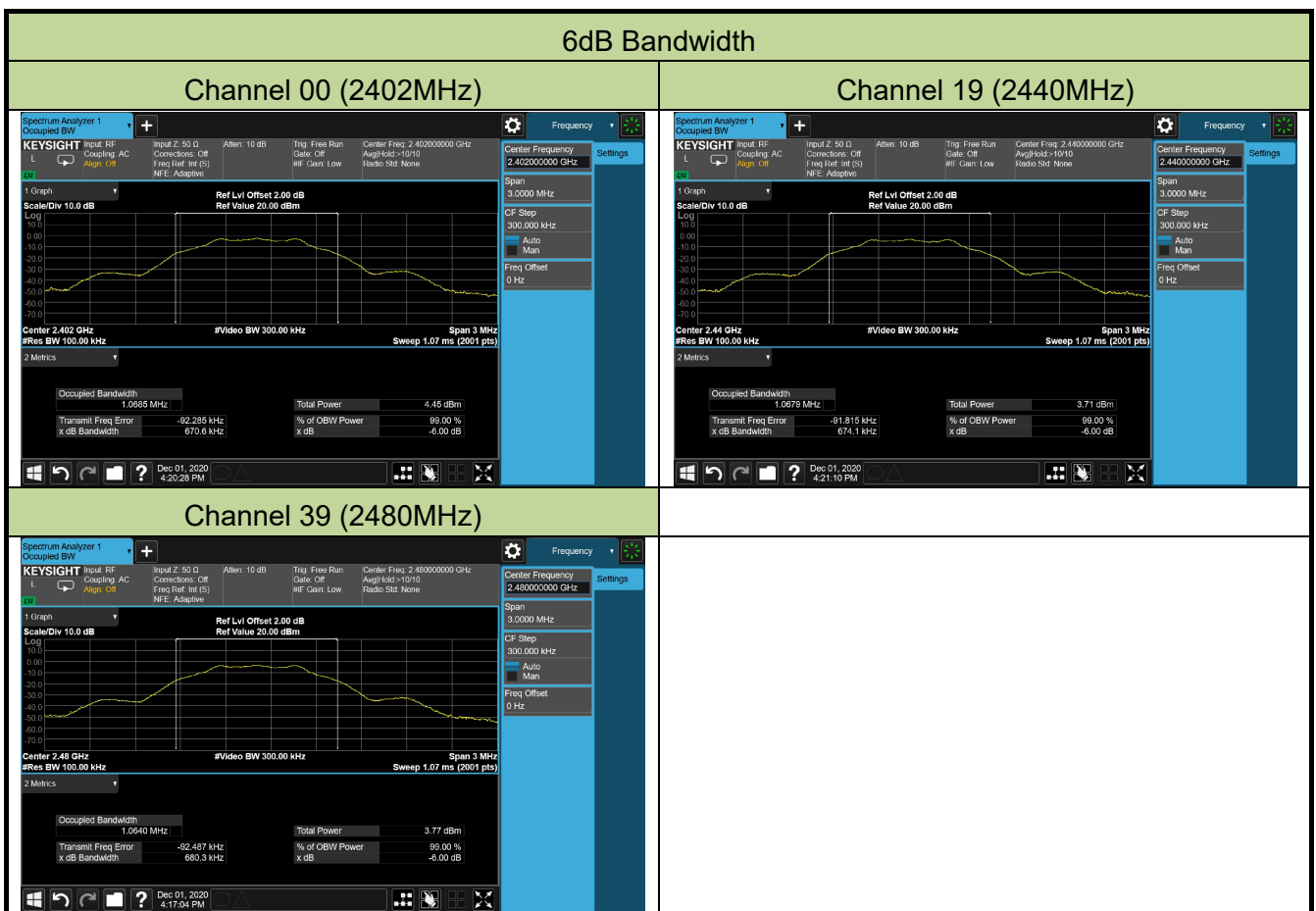
Spectrum Analyzer



6.2.5. Test Result

Product	EnigmaBot	Test Engineer	Bruce Wang
Test Site	WZ-TR3	Test Date	2020/12/01~2020/12/13

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	99% Bandwidth (MHz)	Result
BLE	1	00	2402	0.671	≥ 0.5	1.048	Pass
BLE	1	19	2440	0.674	≥ 0.5	1.047	Pass
BLE	1	39	2480	0.680	≥ 0.5	1.042	Pass

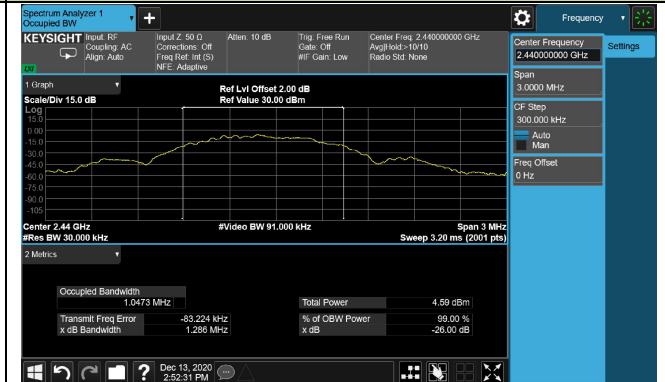


99% Bandwidth

Channel 00 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



6.3. Output Power Measurement

6.3.1. Test Limit

The maximum out power shall be less 1 Watt (30dBm) and the E.I.R.P shall not exceed 4 Watt (36dBm).

6.3.2. Test Procedure Used

ANSI C63.10-2013 Section 11.9.1.3

ANSI C63.10-2013 Section 11.9.2.3.2

6.3.3. Test Setting

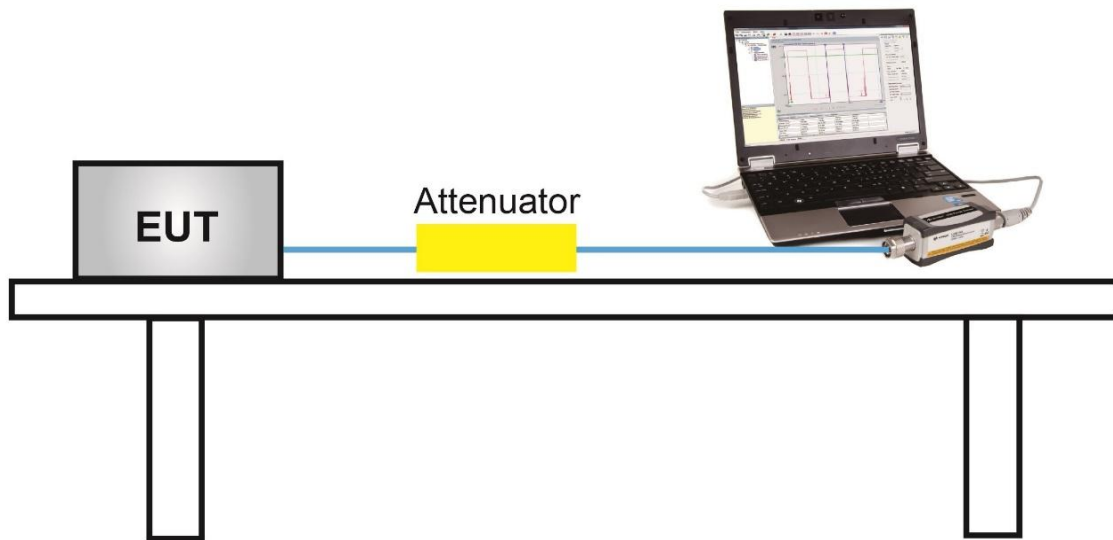
PKPM1 Peak-reading power meter method

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.

6.3.4. Test Setup



6.3.5. Test Result of Output Power

Product	EnigmaBot	Test Engineer	Yuri Li
Test Site	WZ-TR3	Test Date	2020/12/01

Test Result of Peak Output Power

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Max EIRP (dBm)	EIRP Limit (dBm)	Result
BLE	1	00	2402	0.74	≤ 30.00	1.18	≤ 36.00	Pass
BLE	1	19	2440	0.23	≤ 30.00	0.67	≤ 36.00	Pass
BLE	1	39	2480	0.15	≤ 30.00	0.59	≤ 36.00	Pass

Note: Max EIRP (dBm) = Peak Power (dBm) + Antenna Gain (dBi), Antenna Gain = 0.44 dBi.

Test Result of Average Output Power (Reporting Only)

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Max EIRP (dBm)	EIRP Limit (dBm)	Result
BLE	1	00	2402	-1.25	≤ 30.00	-0.81	≤ 36.00	Pass
BLE	1	19	2440	-1.75	≤ 30.00	-1.31	≤ 36.00	Pass
BLE	1	39	2480	-1.90	≤ 30.00	-1.46	≤ 36.00	Pass

Note: Max EIRP (dBm) = Average Power (dBm) + Antenna Gain (dBi), Antenna Gain = 0.44 dBi.

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.

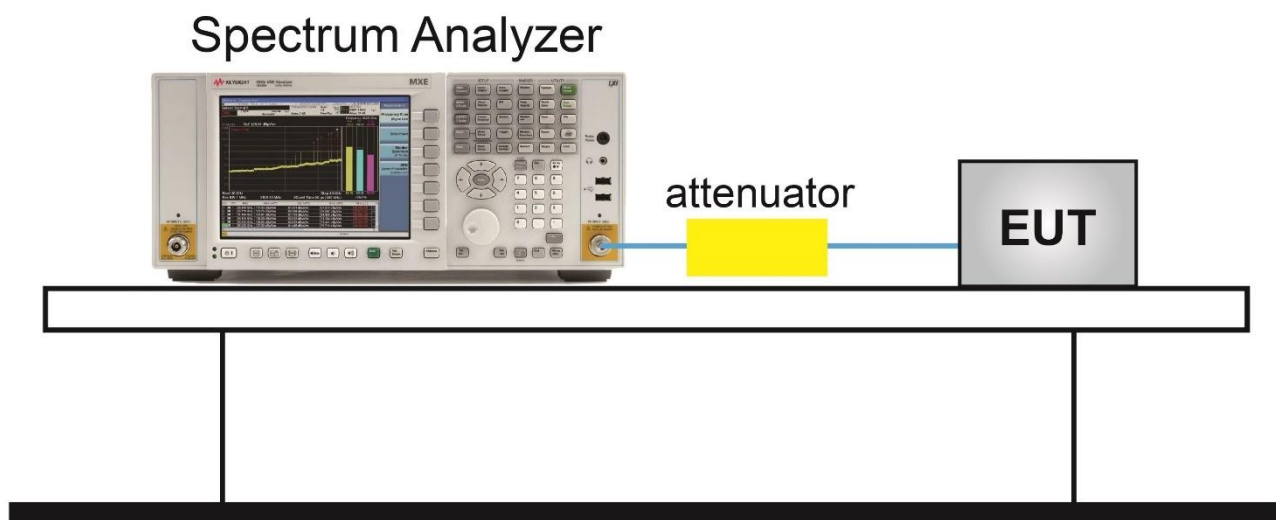
6.4.2. Test Procedure Used

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

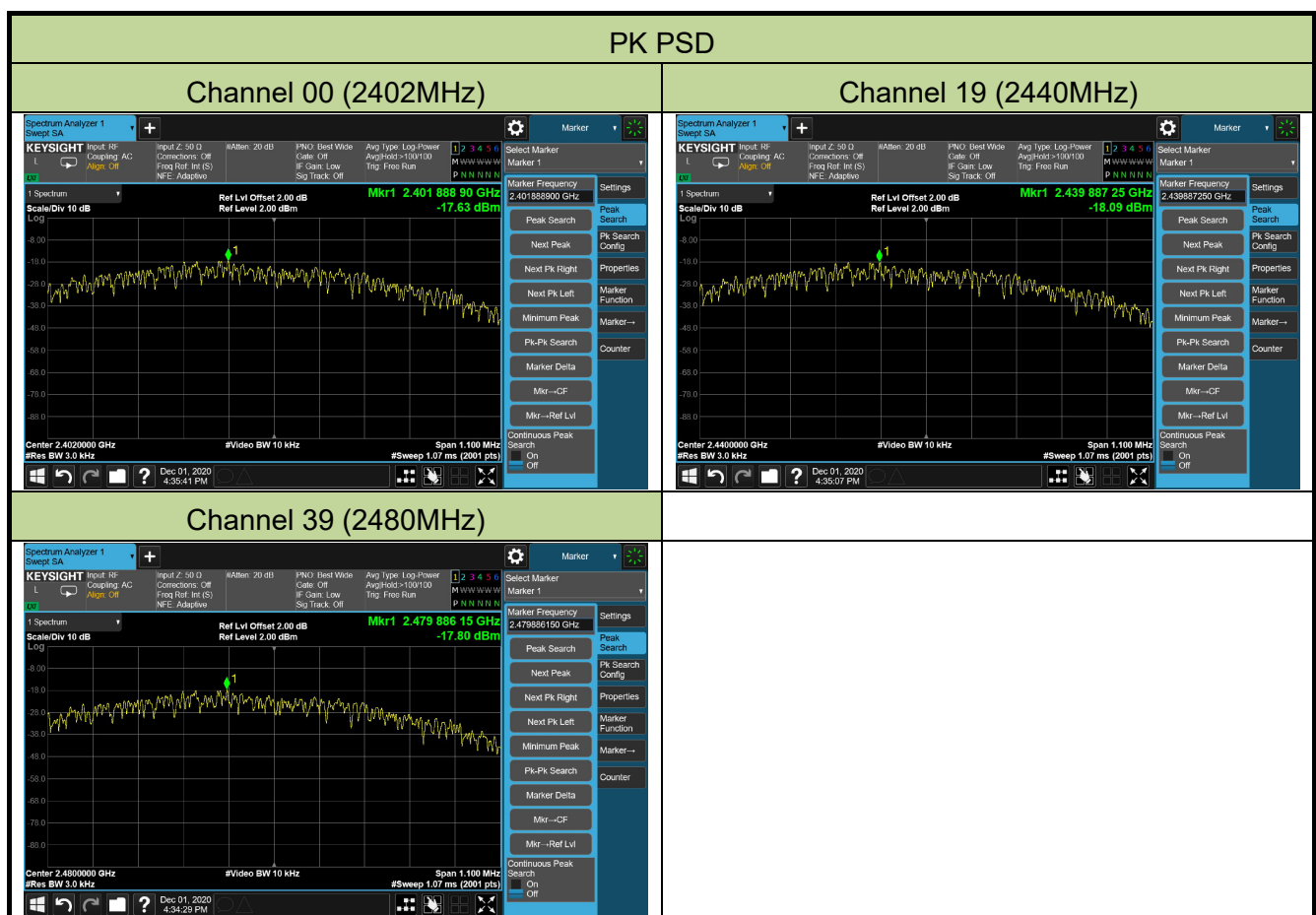
6.4.4. Test Setup



6.4.5. Test Result

Product	EnigmaBot	Test Engineer	Yuri Li
Test Site	WZ-TR3	Test Date	2020/12/01

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	1	00	2402	-17.63	≤ 8.00	Pass
BLE	1	19	2440	-18.09	≤ 8.00	Pass
BLE	1	39	2480	-17.80	≤ 8.00	Pass



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

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 100kHz bandwidth per the PSD procedure.

6.5.2. Test Procedure Used

ANSI C63.10-2013 Section 11.11

6.5.3. Test Setting

Reference level measurement

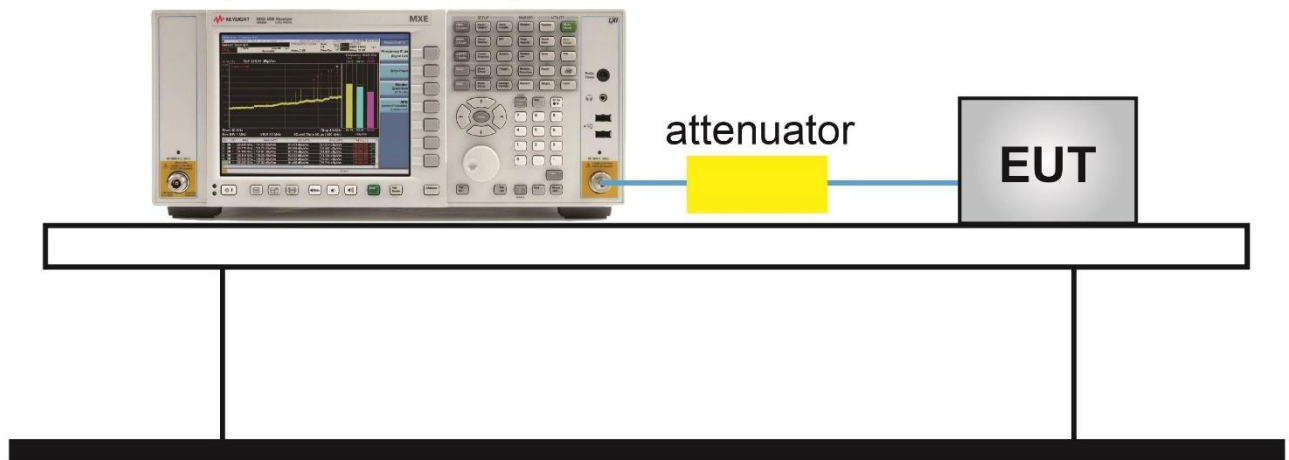
1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW $\geq 3 \times$ RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
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

Spectrum Analyzer

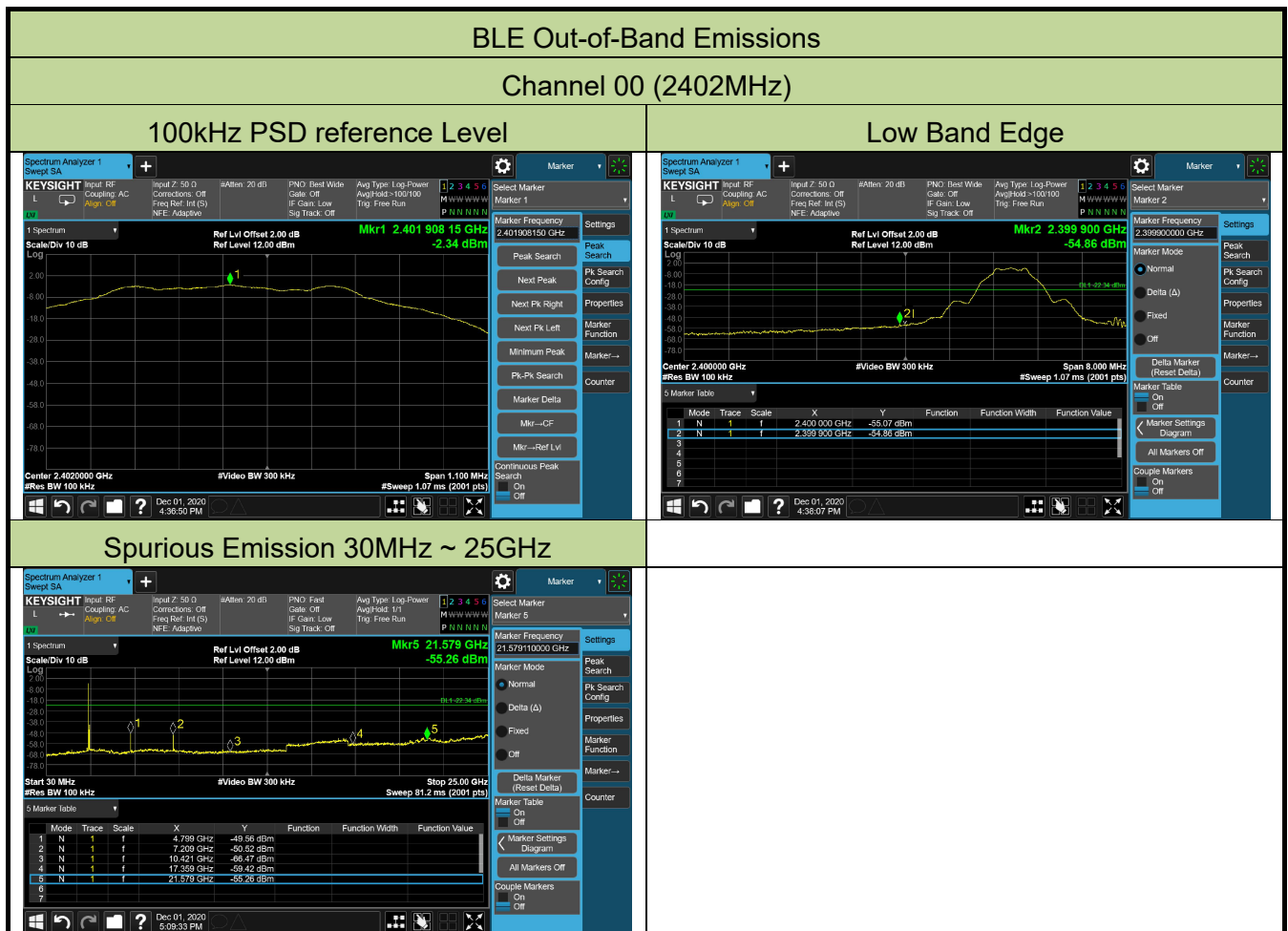


6.5.5. Test Result

Product	EnigmaBot	Test Engineer	Bruce Wang
Test Site	WZ-TR3	Test Date	2020/12/01

Test Mode	Data Rate (Mbps)	Channel No.	Frequency (MHz)	Limit (dBm)	Result
BLE	1	00	2402	-22.34	Pass
BLE	1	19	2440	-23.03	Pass
BLE	1	39	2480	-23.02	Pass

Note: The limit is 20dB below the fundamental emission level.

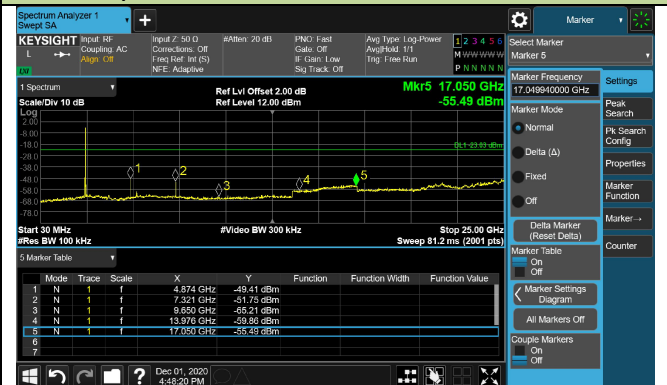


Channel 19 (2440MHz)

100kHz PSD reference Level



Spurious Emission 30MHz ~ 25GHz

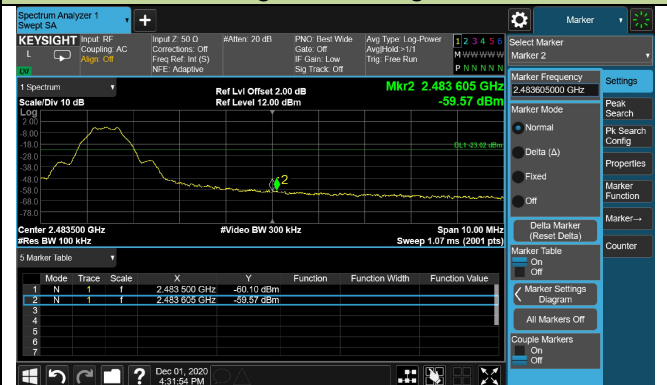


Channel 39 (2480MHz)

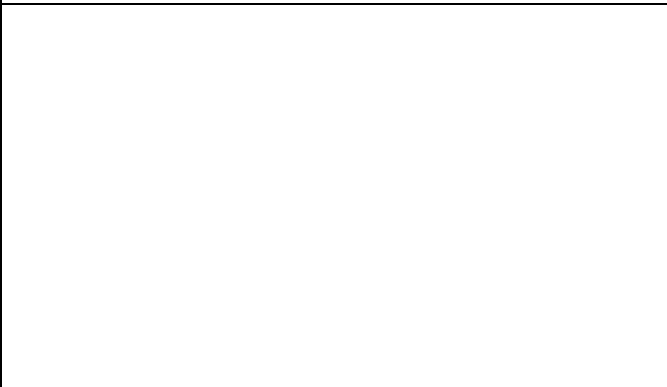
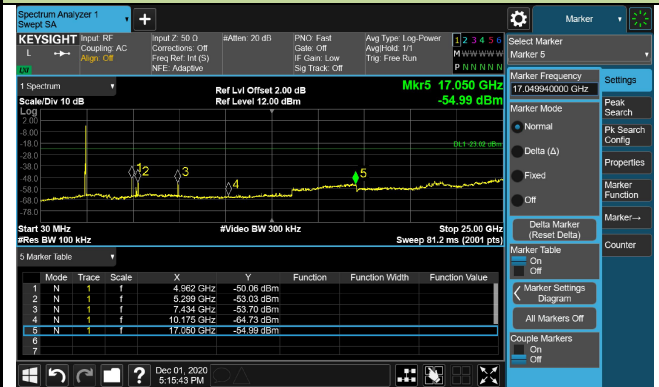
100kHz PSD reference Level



High Band Edge



Spurious Emission 30MHz ~ 25GHz



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 [$\mu\text{V/m}$]	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

All out of band emissions appearing in a restricted band as specified in Section 8.10 of the RSS-Gen must not exceed the limits shown in Table per Section 8.9.

RSS-Gen Section 8.9			
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Magnetic Field Strength (H-Field) ($\mu\text{A/m}$)	Measured Distance (m)
0.009 - 0.490	--	6.37/F (F in kHz)	300
0.490 - 1.705	--	6.37/F (F in kHz)	30
1.705 - 30	--	0.08	30
30 - 88	100	--	3
88 - 216	150	--	3
216 - 960	200	--	3
Above 960	500	--	3

6.6.2. Test Procedure Used

ANSI C63.10-2013 Section 6.3

ANSI C63.10-2013 Section 6.4

ANSI C63.10-2013 Section 6.5

ANSI C63.10-2013 Section 6.6

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

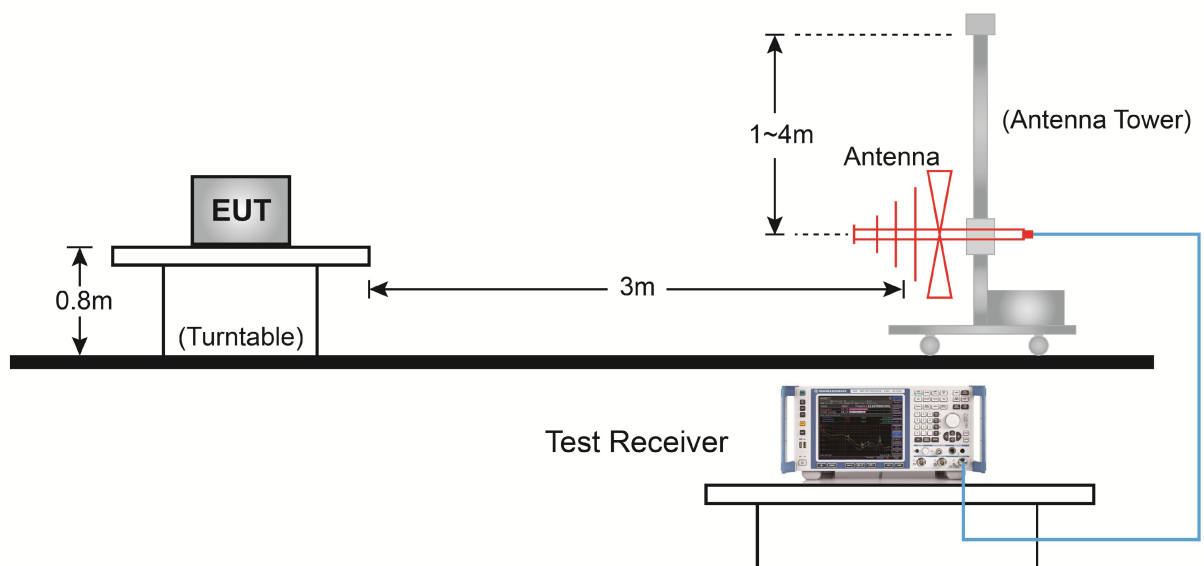
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

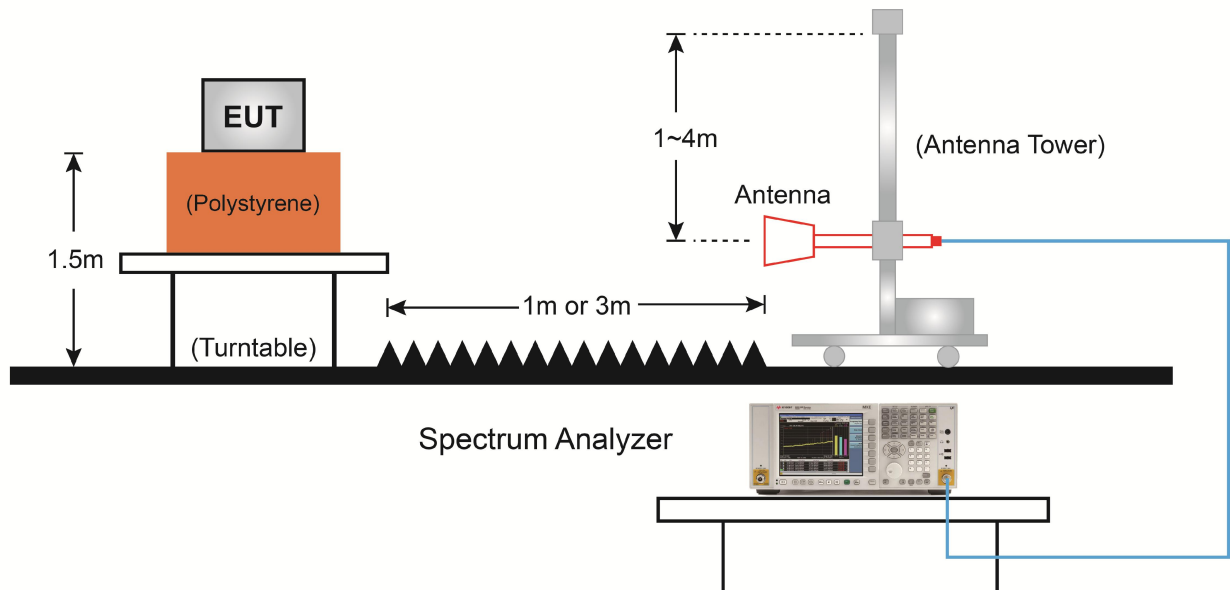
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4.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

6.6.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.6.5. Test Result

Product	EnigmaBot	Test Engineer	Buter Shi
Test Site	WZ-AC2	Test Date	2020/11/26
Test Mode:	BLE	Test Channel:	00
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
	3966.5	38.8	0.7	39.5	74.0	-34.5	Peak	Horizontal
	4808.0	35.3	3.8	39.1	74.0	-34.9	Peak	Horizontal
*	5998.0	32.7	5.7	38.4	74.0	-35.6	Peak	Horizontal
*	7876.5	31.6	10.6	42.2	74.0	-31.8	Peak	Horizontal
	4009.0	36.8	1.2	38.0	74.0	-36.0	Peak	Vertical
	5037.5	35.5	4.0	39.5	74.0	-34.5	Peak	Vertical
*	6006.5	35.2	5.8	41.0	74.0	-33.0	Peak	Vertical
*	8616.0	31.0	12.0	43.0	74.0	-31.0	Peak	Vertical

Note 1: "*" means test frequency did not fall into restricted band.

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	EnigmaBot	Test Engineer	Buter Shi
Test Site	WZ-AC2	Test Date	2020/11/26
Test Mode:	BLE	Test Channel:	19
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
	4017.5	36.4	1.3	37.7	74.0	-36.3	Peak	Horizontal
	4876.0	35.4	3.1	38.5	74.0	-35.5	Peak	Horizontal
*	5989.5	33.6	5.6	39.2	74.0	-34.8	Peak	Horizontal
*	7851.0	32.5	10.6	43.1	74.0	-30.9	Peak	Horizontal
	4094.0	35.0	1.1	36.1	74.0	-37.9	Peak	Vertical
	4859.0	34.5	3.2	37.7	74.0	-36.3	Peak	Vertical
*	5972.5	32.5	5.5	38.0	74.0	-36.0	Peak	Vertical
*	7859.5	31.6	10.6	42.2	74.0	-31.8	Peak	Vertical

Note 1: “*” means test frequency did not fall into restricted band.

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	EnigmaBot	Test Engineer	Buter Shi
Test Site	WZ-AC2	Test Date	2020/11/26
Test Mode:	BLE	Test Channel:	39
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
	4170.5	34.5	1.6	36.1	74.0	-37.9	Peak	Horizontal
	4740.0	33.6	3.1	36.7	74.0	-37.3	Peak	Horizontal
*	6278.5	32.5	6.0	38.5	74.0	-35.5	Peak	Horizontal
*	7868.0	31.6	10.6	42.2	74.0	-31.8	Peak	Horizontal
	3958.0	37.5	0.7	38.2	74.0	-35.8	Peak	Vertical
	4553.0	37.1	2.9	40.0	74.0	-34.0	Peak	Vertical
*	6882.0	31.8	8.6	40.4	74.0	-33.6	Peak	Vertical
*	7953.0	32.2	11.0	43.2	74.0	-30.8	Peak	Vertical

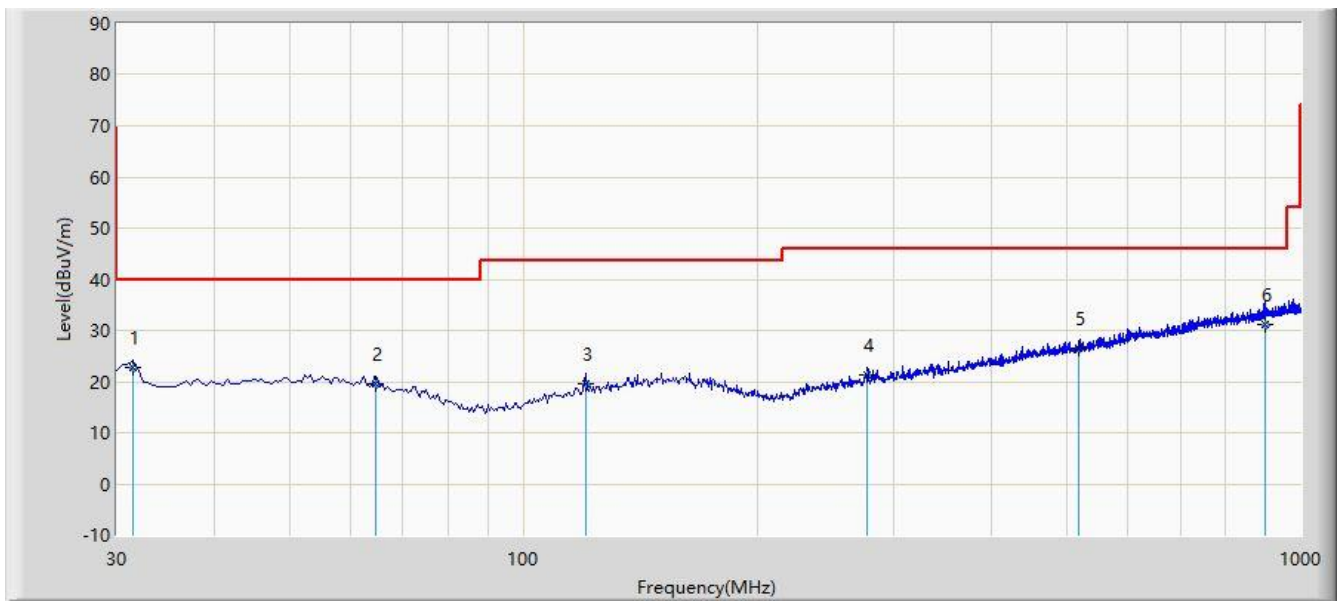
Note 1: “*” means test frequency did not fall into restricted band.

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: WZ-AC1	Test Date: 2020/12/12
Limit: FCC_Part15.209_RE(3m)	Engineer: Dillon Diao
Probe: WZ-AC1_VULB 9168 _30-1000MHz	Polarity: Horizontal
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			31.450	22.883	6.250	-17.117	40.000	16.633	QP
2			64.550	19.575	2.650	-20.425	40.000	16.925	QP
3			120.210	19.671	3.750	-23.829	43.500	15.921	QP
4			277.440	21.184	3.150	-24.816	46.000	18.034	QP
5			519.120	26.510	2.540	-19.490	46.000	23.969	QP
6		*	899.200	31.178	1.240	-14.822	46.000	29.938	QP

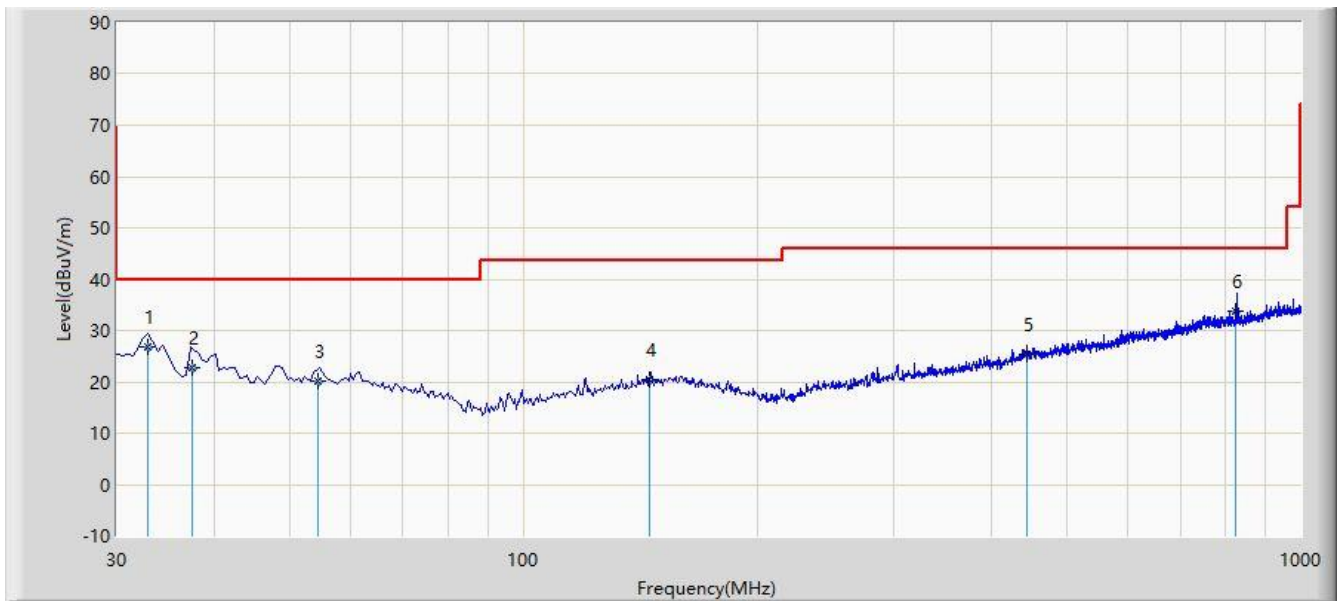
Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

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

Note 2: 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: WZ-AC1	Test Date: 2020/12/12
Limit: FCC_Part15.209_RE(3m)	Engineer: Dillon Diao
Probe: WZ-AC1_VULB 9168 _30-1000MHz	Polarity: Vertical
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			32.910	26.902	10.210	-13.098	40.000	16.692	QP
2			37.540	22.869	5.690	-17.131	40.000	17.180	QP
3			54.540	20.167	2.160	-19.833	40.000	18.007	QP
4			145.150	20.529	2.490	-22.971	43.500	18.039	QP
5			445.160	25.340	2.690	-20.660	46.000	22.650	QP
6		*	826.150	33.720	4.590	-12.280	46.000	29.130	QP

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

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

Note 2: 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.

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 [μ 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

For RSS-Gen Section 8.10 Requirement

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

Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	--
8.37625 - 8.38675	1718.8 -1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 -2390	
12.51975 - 12.52025	2483.5 -2500	
12.57675 - 12.57725	2655 - 2900	
13.36 -13.41	3260 - 3267	
16.42 - 16.423	3332 -3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR and in Section 8.10 of the RSS-Gen must not exceed the limits shown in Table.

RSS-Gen Section 8.9			
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Magnetic Field Strength (H-Field) ($\mu\text{A/m}$)	Measured Distance (m)
0.009 - 0.490	--	6.37/F (F in kHz)	300
0.490 - 1.705	--	6.37/F (F in kHz)	30
1.705 - 30	--	0.08	30
30 - 88	100	--	3
88 - 216	150	--	3
216 - 960	200	--	3
Above 960	500	--	3

6.7.2.Test Procedure Used

ANSI C63.10-2013 Section 6.3

ANSI C63.10-2013 Section 6.6

ANSI C63.10-2013 Section 6.10

6.7.3.Test Setting

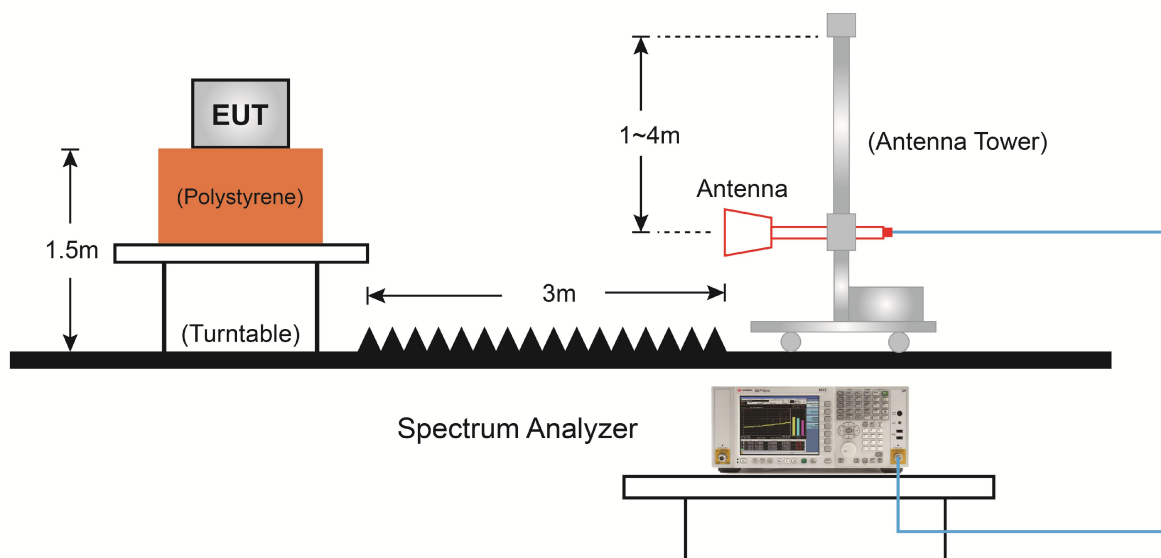
Peak Field Strength Measurements

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

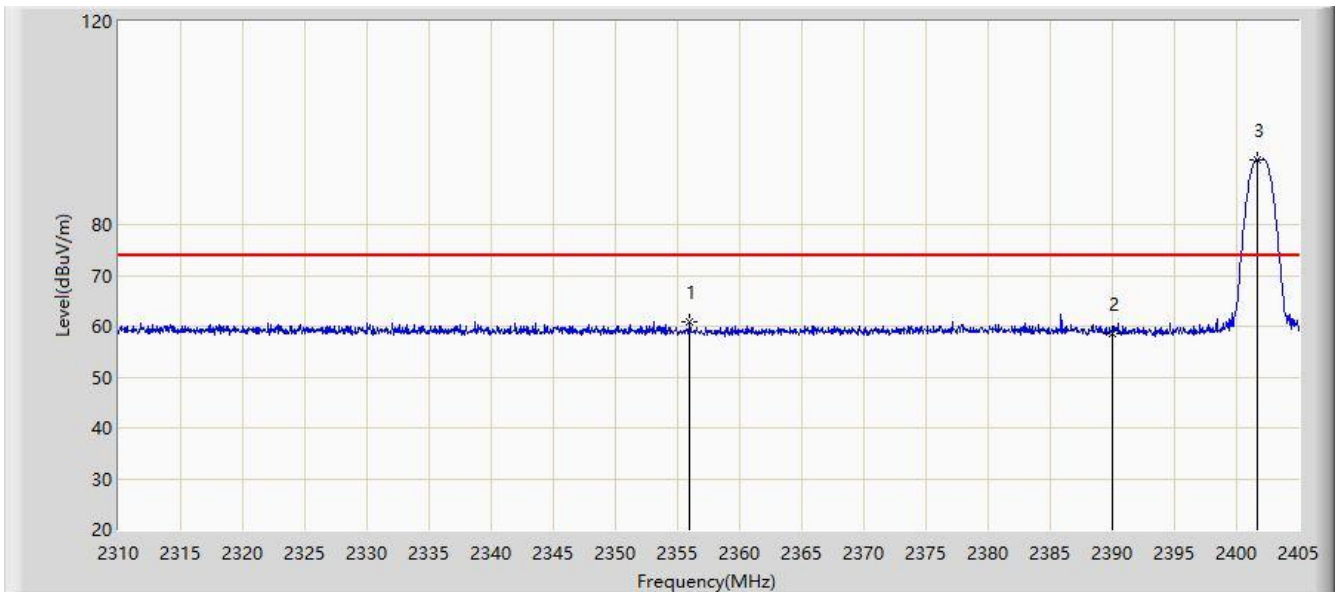
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW $\geq 1/T$
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). 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

6.7.4.Test Setup



6.7.5. Test Result

Site: WZ-AC2	Test Date: 2020/11/26 - 10:35
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz	

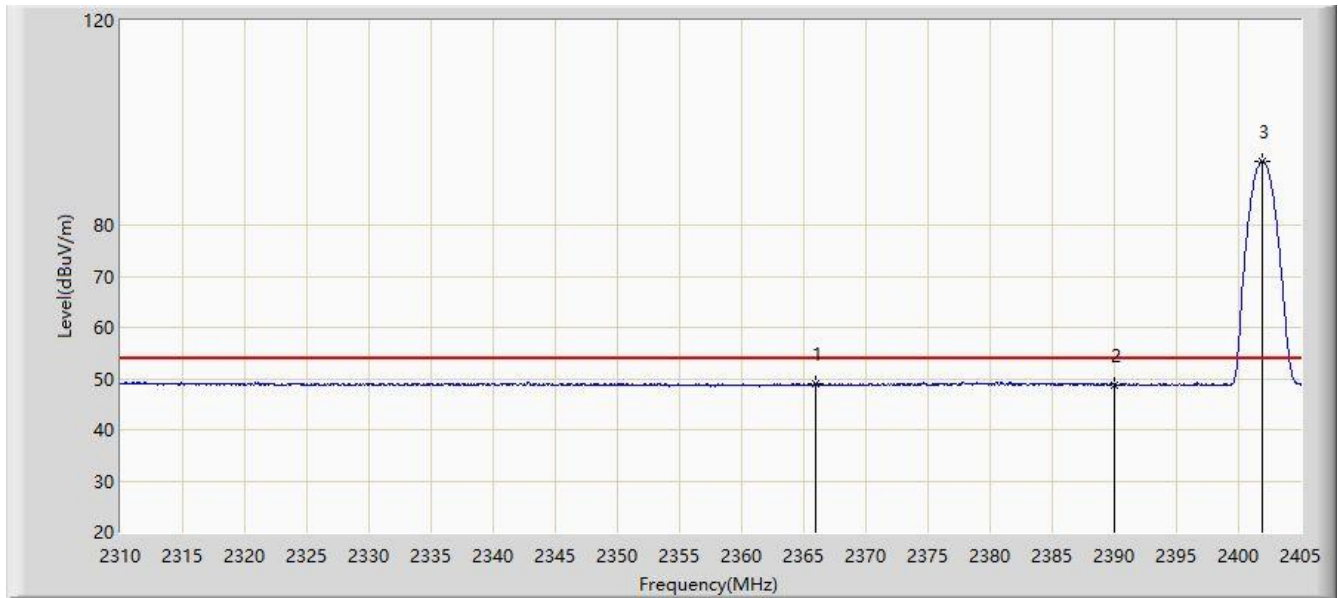


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2355.980	60.815	28.131	-13.185	74.000	32.684	PK
2			2390.000	58.690	26.029	-15.310	74.000	32.660	PK
3		*	2401.675	92.828	60.266	NA	NA	32.561	PK

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

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

Site: WZ-AC2	Test Date: 2020/11/26 - 10:36
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz	

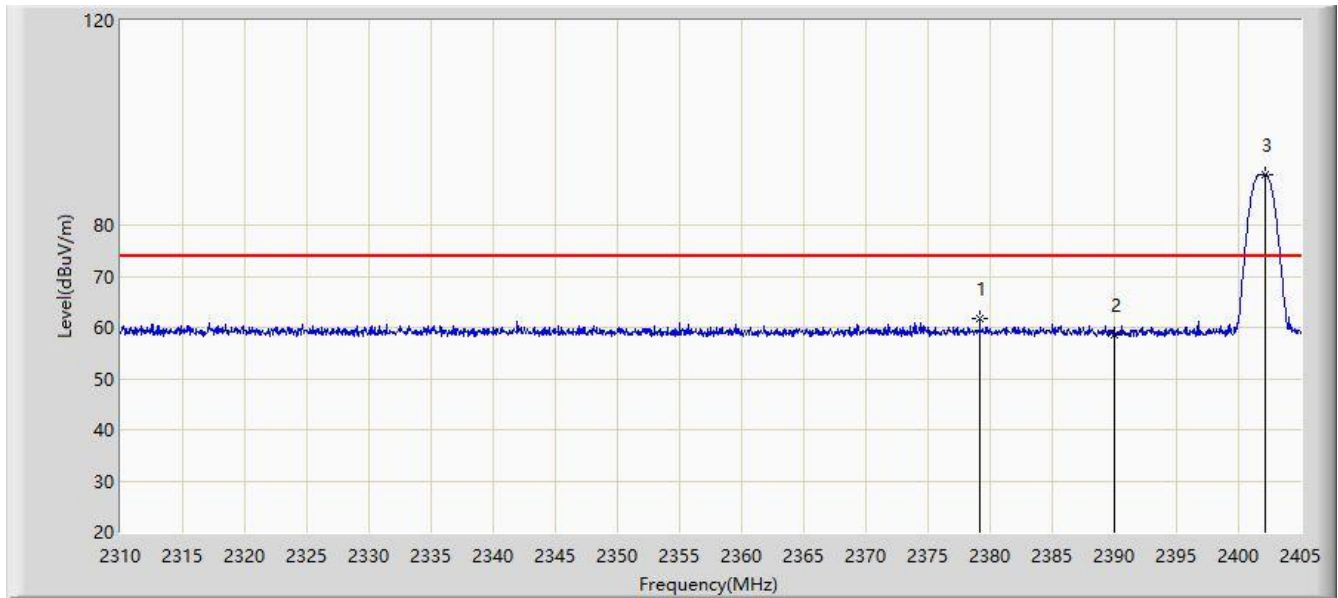


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2365.907	49.130	16.437	-4.870	54.000	32.694	AV
2			2390.000	48.818	16.157	-5.182	54.000	32.660	AV
3		*	2401.913	92.545	59.980	NA	NA	32.565	AV

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

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

Site: WZ-AC2	Test Date: 2020/11/26 - 10:38
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Vertical
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz	

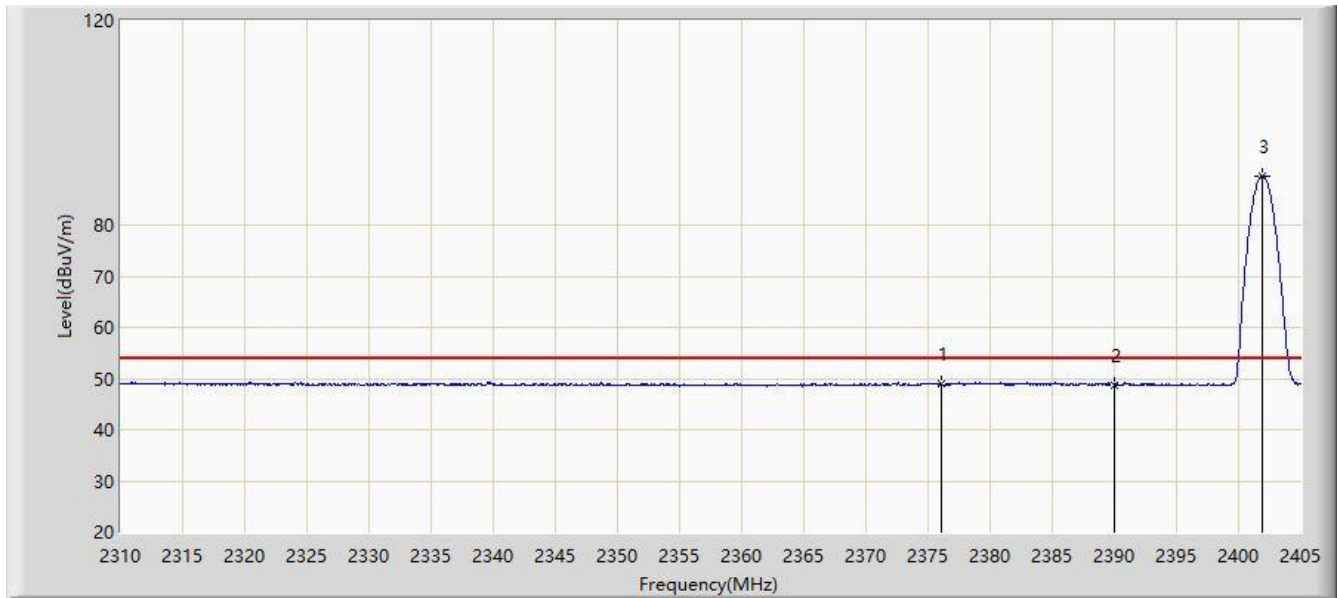


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2379.160	61.749	28.884	-12.251	74.000	32.865	PK
2			2390.000	58.627	25.966	-15.373	74.000	32.660	PK
3		*	2402.103	89.927	57.359	NA	NA	32.568	PK

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

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

Site: WZ-AC2	Test Date: 2020/11/26 - 10:40
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Vertical
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2402MHz	

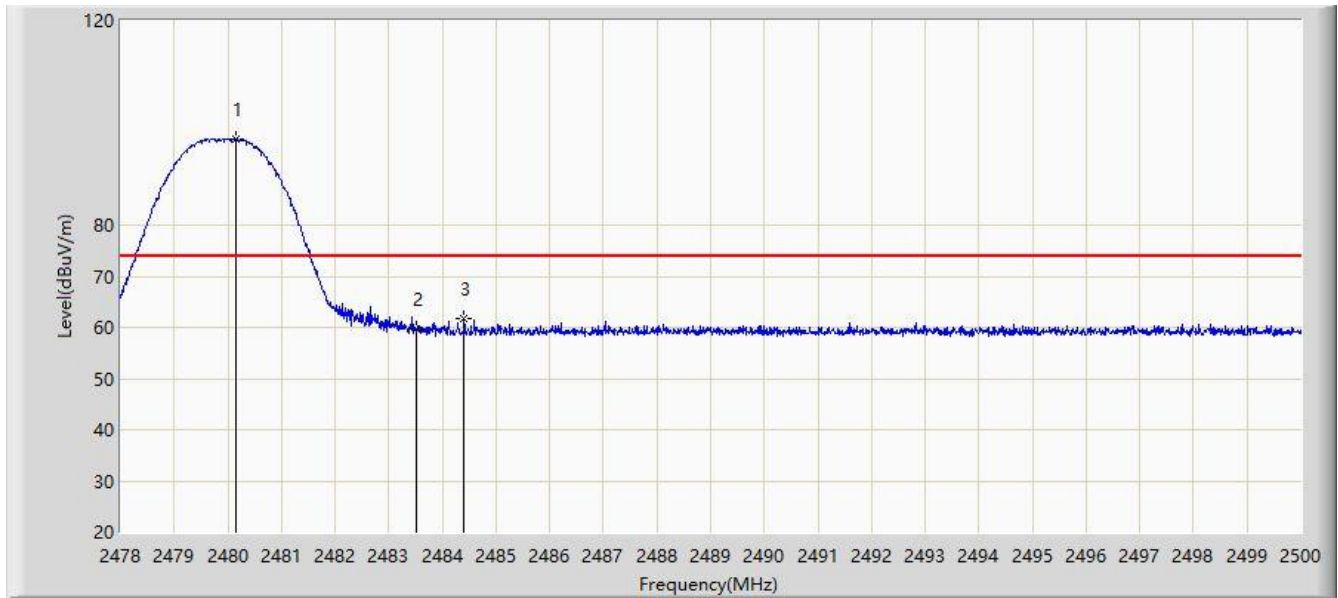


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			2376.025	49.120	16.297	-4.880	54.000	32.823	AV
2			2390.000	48.808	16.147	-5.192	54.000	32.660	AV
3		*	2401.913	89.645	57.080	NA	NA	32.565	AV

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

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

Site: WZ-AC2	Test Date: 2020/11/26 - 10:41
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz	

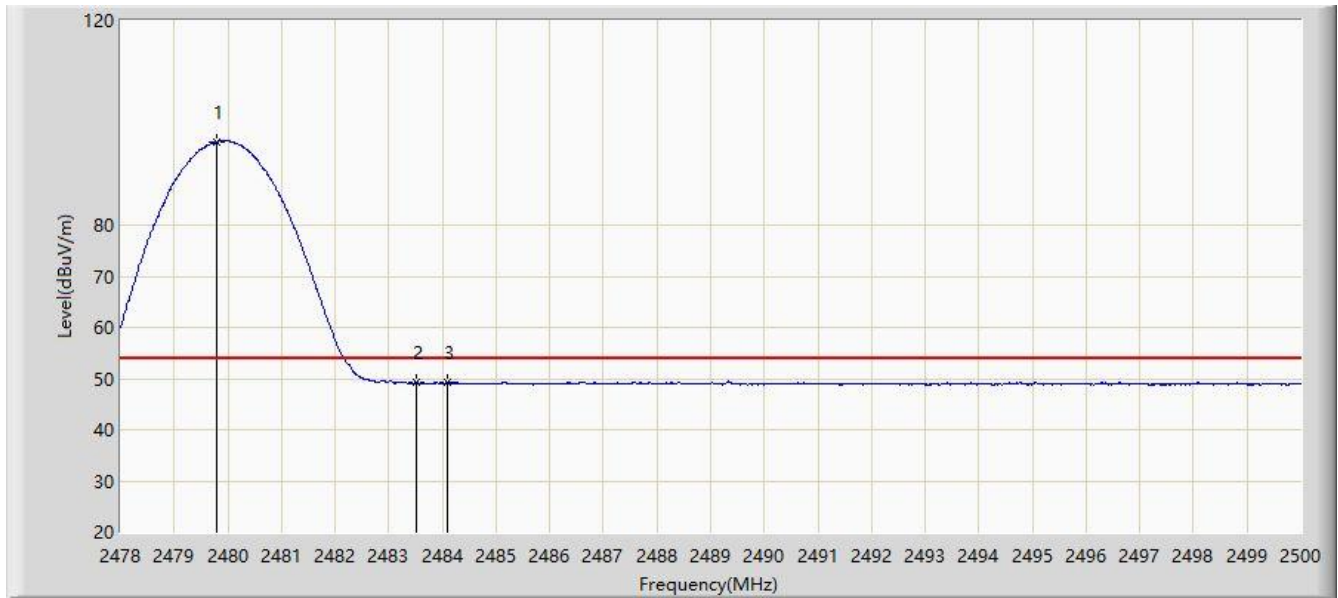


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.156	96.807	64.153	NA	NA	32.654	PK
2			2483.500	59.579	26.878	-14.421	74.000	32.701	PK
3			2484.402	61.604	28.891	-12.396	74.000	32.714	PK

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

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

Site: WZ-AC2	Test Date: 2020/11/26 - 10:43
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz	

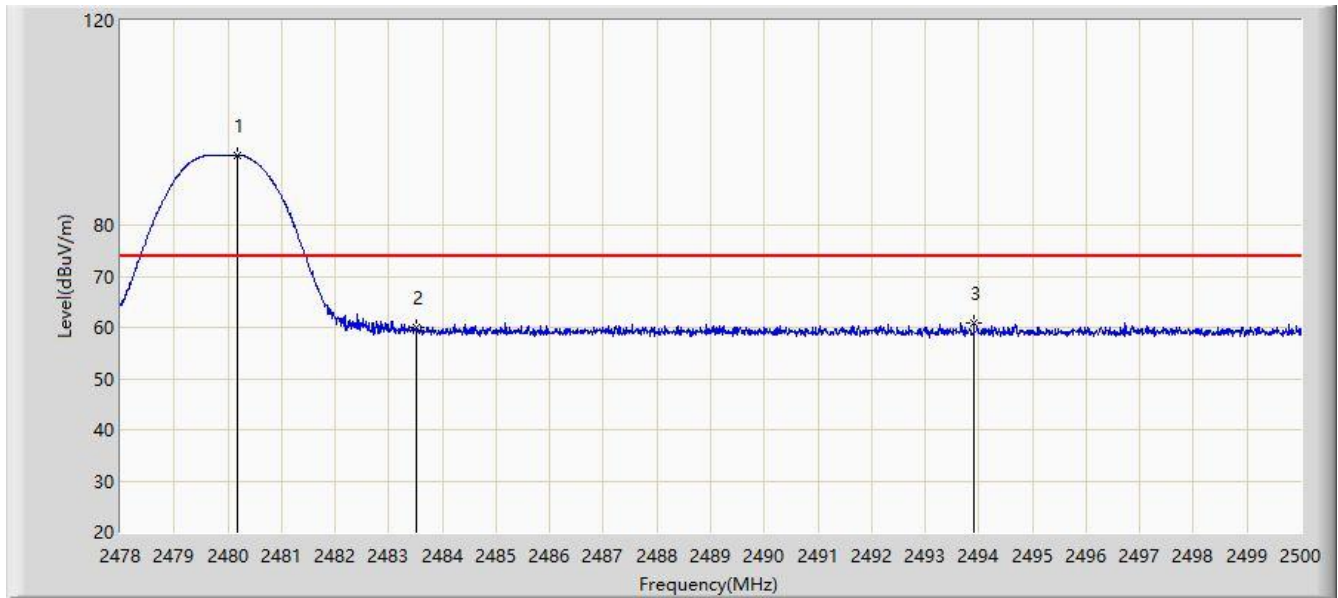


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.804	96.285	63.636	NA	NA	32.649	AV
2			2483.500	49.178	16.477	-4.822	54.000	32.701	AV
3			2484.094	49.323	16.614	-4.677	54.000	32.709	AV

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

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

Site: WZ-AC2	Test Date: 2020/11/26 - 10:45
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Vertical
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz	

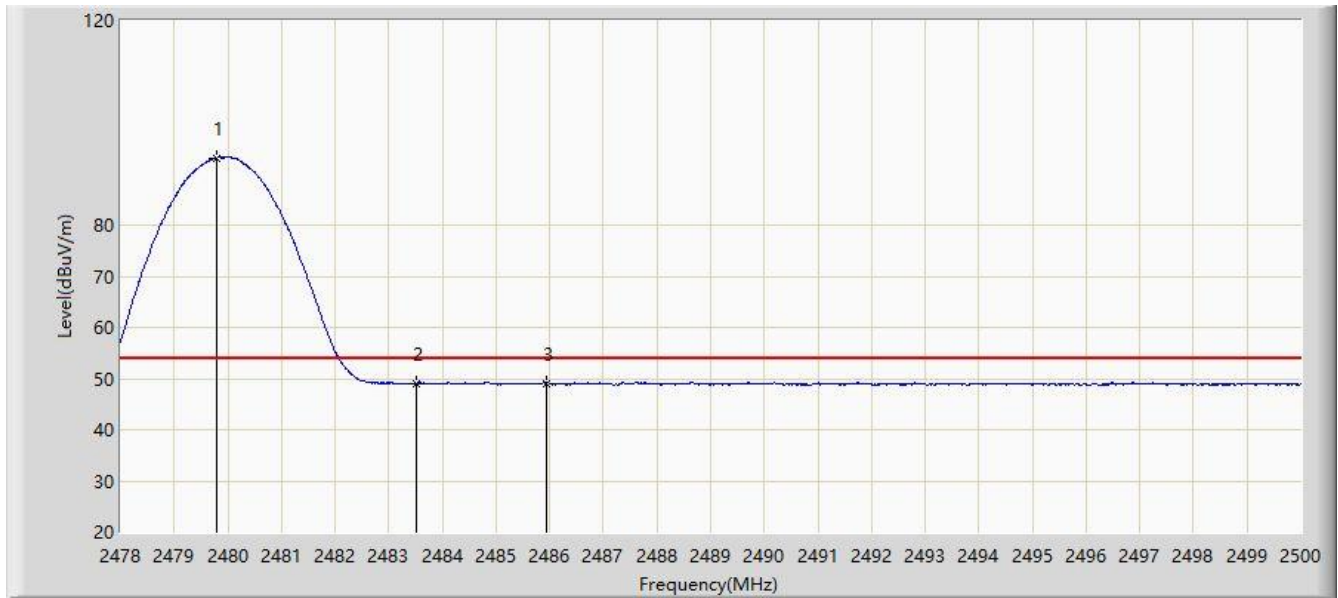


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2480.178	93.751	61.097	NA	NA	32.654	PK
2			2483.500	59.907	27.206	-14.093	74.000	32.701	PK
3			2493.906	60.963	28.256	-13.037	74.000	32.707	PK

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

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

Site: WZ-AC2	Test Date: 2020/11/26 - 10:46
Limit: FCC_Part15.209_RE(3m)	Engineer: Antony Yang
Probe: WZ-AC2_BBHA9120D_1-18GHz	Polarity: Vertical
EUT: EnigmaBot	Power: By Battery
Test Mode: Transmit by BLE at Channel 2480MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	2479.804	93.169	60.520	NA	NA	32.649	AV
2			2483.500	49.088	16.387	-4.912	54.000	32.701	AV
3			2485.931	49.126	16.392	-4.874	54.000	32.734	AV

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

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

6.8. AC Conducted Emissions Measurement

6.8.1. Test Limit

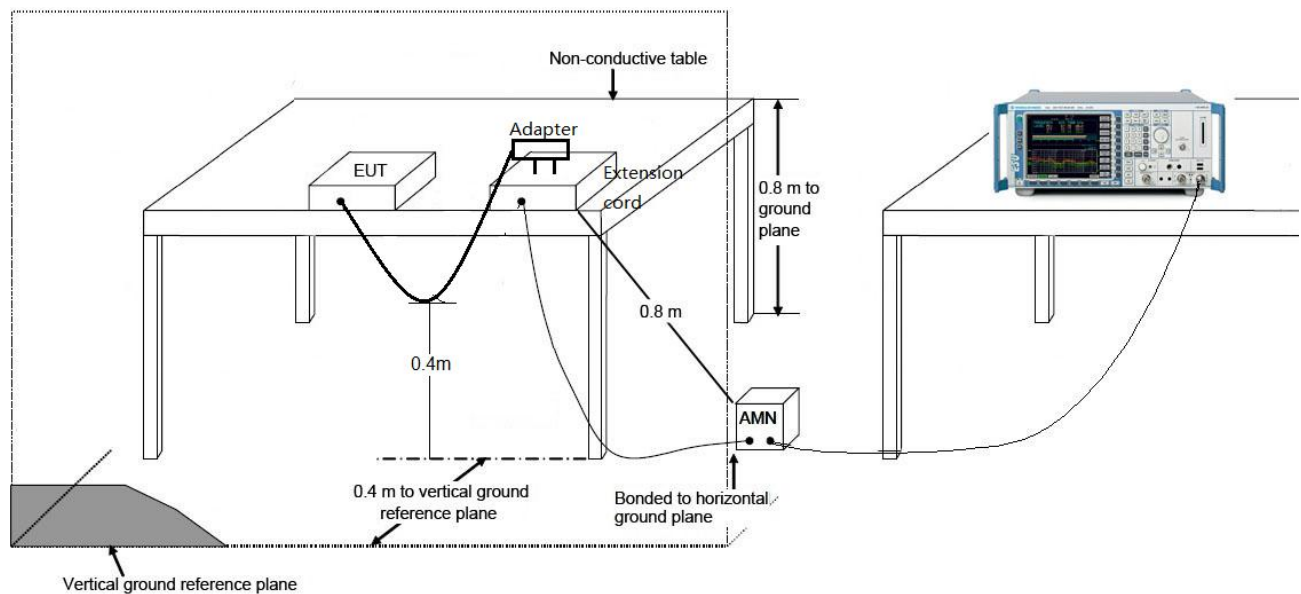
FCC Part 15 Subpart C Paragraph 15.207 Limits & RSS-Gen Issue 5 Section 8.8 Limits

Frequency (MHz)	QP (dB μ V)	AV (dB μ V)
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.

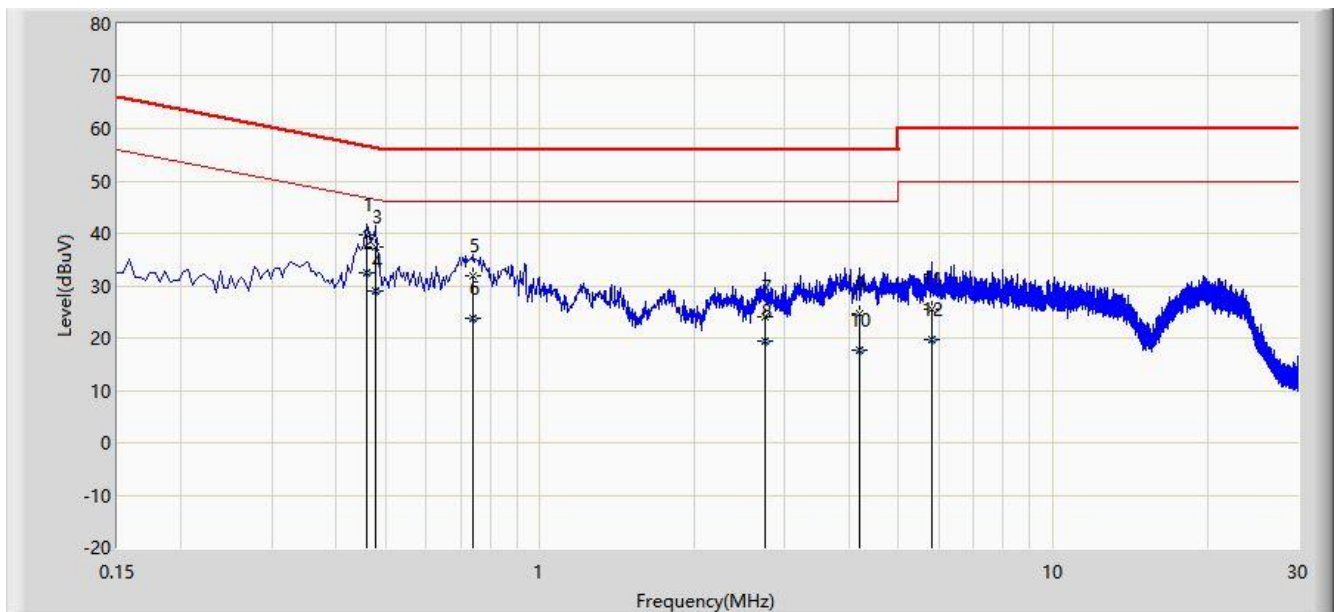
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.8.2. Test Setup



6.8.3.Test Result

Site: WZ-SR2	Test Date: 2020/12/07 - 13:20
Limit: FCC_Part15.207_CE_AC Power	Engineer: Dillon Diao
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: EnigmaBot	Power: AC 120V/60Hz
Test Mode: Transmit by BLE at Channel 2402MHz	

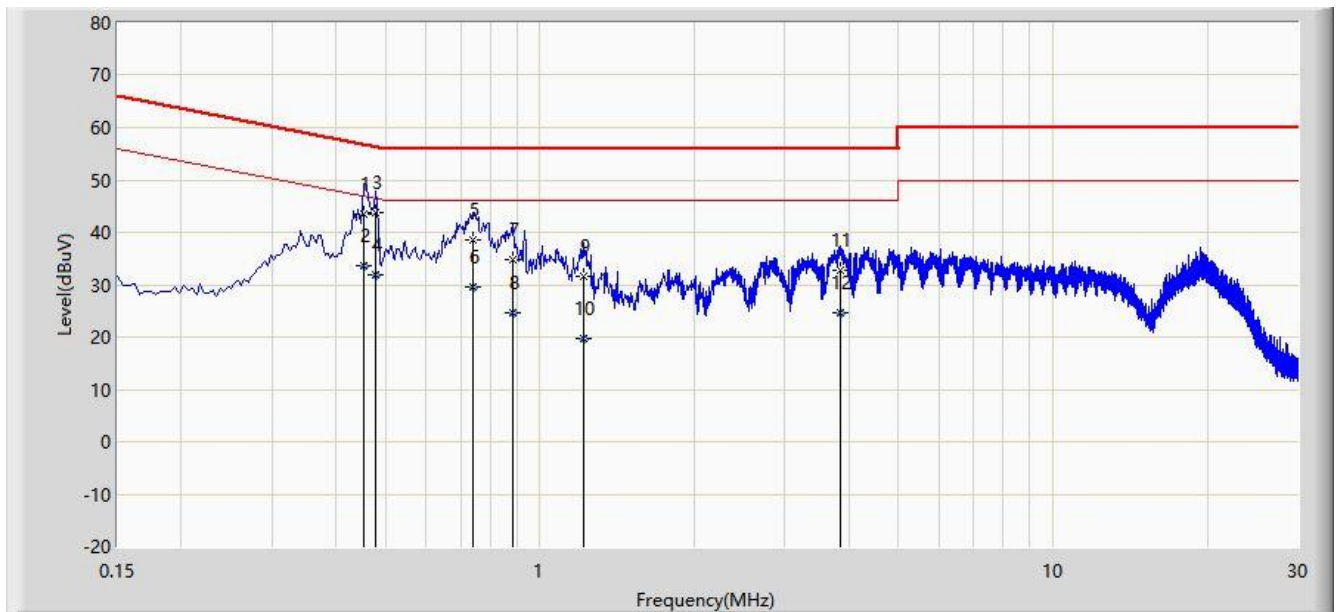


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.458	39.745	30.055	-16.984	56.729	9.690	QP
2		*	0.458	32.536	22.846	-14.193	46.729	9.690	AV
3			0.478	37.400	27.703	-18.974	56.374	9.696	QP
4			0.478	28.910	19.213	-17.464	46.374	9.696	AV
5			0.742	31.771	22.041	-24.229	56.000	9.730	QP
6			0.742	23.626	13.896	-22.374	46.000	9.730	AV
7			2.738	23.994	14.204	-32.006	56.000	9.790	QP
8			2.738	19.299	9.509	-26.701	46.000	9.790	AV
9			4.190	24.748	14.914	-31.252	56.000	9.834	QP
10			4.190	17.668	7.834	-28.332	46.000	9.834	AV
11			5.794	25.411	15.510	-34.589	60.000	9.901	QP
12			5.794	19.846	9.945	-30.154	50.000	9.901	AV

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

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

Site: WZ-SR2	Test Date: 2020/12/07 - 13:27
Limit: FCC_Part15.207_CE_AC Power	Engineer: Dillon Diaio
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: EnigmaBot	Power: AC 120V/60Hz
Test Mode: Transmit by BLE at Channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Margin (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.454	43.565	33.885	-13.237	56.802	9.680	QP
2			0.454	33.553	23.873	-13.249	46.802	9.680	AV
3		*	0.478	43.884	34.198	-12.489	56.374	9.686	QP
4			0.478	31.916	22.230	-14.457	46.374	9.686	AV
5			0.742	38.439	28.719	-17.561	56.000	9.720	QP
6			0.742	29.593	19.873	-16.407	46.000	9.720	AV
7			0.886	34.775	25.045	-21.225	56.000	9.730	QP
8			0.886	24.630	14.900	-21.370	46.000	9.730	AV
9			1.214	31.724	21.984	-24.276	56.000	9.740	QP
10			1.214	19.715	9.975	-26.285	46.000	9.740	AV
11			3.858	32.610	22.790	-23.390	56.000	9.820	QP
12			3.858	24.605	14.786	-21.395	46.000	9.820	AV

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

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

7. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15.247 of the FCC Rules and RSS-247 Section 5 of the ISED Rules.

Appendix A - Test Setup Photograph

Refer to “2011RSU059-UT” file.

Appendix B - EUT Photograph

Refer to "2011RSU059-UE" file.