



RF MEASUREMENT REPORT

FCC ID: 2A4JS80203900
Applicant: Xtel Wireless ApS
Product: XT2039
Model No.: XT2039
Brand Name: Xtellio Gateway
FCC Classification: Digital Transmission System (DTS)
FCC Rule Part(s): Part 15 Subpart C (Section 15.247)
Result: Complies
Test Date: 2022-03-15 ~ 2022-09-28

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 (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2203RSU035-U1	Rev. 01	Initial Report	2022-10-20	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 System Connection Diagram.....	8
2.2. Test Software	9
2.3. Applied Standards.....	9
2.4. 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.....	17
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.....		45
Appendix C - EUT Photograph		46

1. General Information

1.1. Applicant

Xtel Wireless ApS

Gasvaerksvej 32E, 9000, Aalborg, Denmark.

1.2. Manufacturer

Xtel Wireless ApS

Gasvaerksvej 32E, 9000, Aalborg, Denmark.

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: L3261-190725		FCC: 291082, TW3261		
ISED: TW3261					

1.4. Product Information

Product Name	XT2039
Model No.	XT2039
Brand Name	Xtello Gateway
Bluetooth Version	V4.2 single mode, BLE only
Cat-M Single Band	Band 2, 4, 12, 66
NB-IoT Single Band	Band 2, 4, 12, 66
Operating Temperature	-30 ~ 85 °C
Integrated Modular Information (Cellular Module)	
Model No.	BG77
FCC ID	XMR201912BG77
Brand Name	Quectel
Accessories	
Lithium Battery	Model: CR17500EP Output: 3.0V
Remark:	
1. This device is based on Quectel “BG77” module to assessing the radiated spurious emission.	
2. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

Bluetooth Specification	
Frequency Range	2402 ~ 2480MHz
Channel Number	40
Type of modulation	GFSK
Data Rate	1Mbps
Antenna Information	Chip Antenna, 1.0dBi

1.6. Working Frequencies

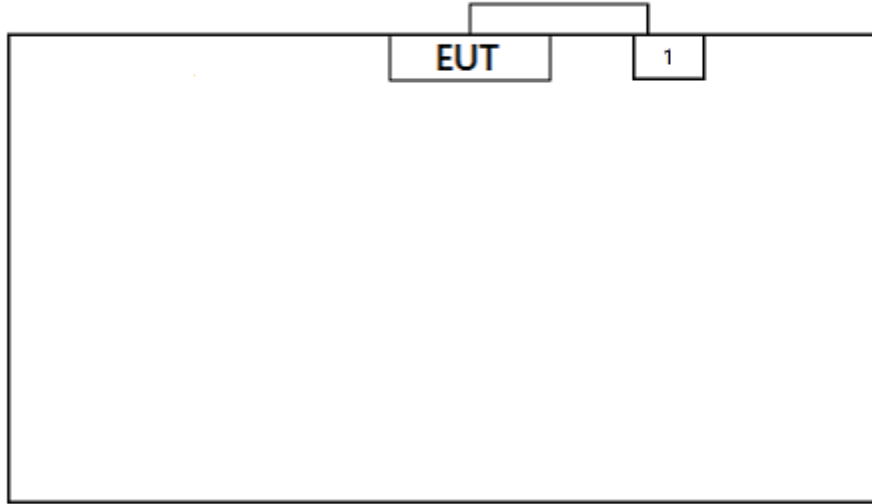
Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz
03	2408 MHz	04	2410 MHz	05	2412 MHz
06	2414 MHz	07	2416 MHz	08	2418 MHz
09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz
15	2432 MHz	16	2434 MHz	17	2436 MHz
18	2438 MHz	19	2440 MHz	20	2442 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 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 – Radiated Emission testing



Product	Manufacturer	Model No.
1	Notebook (for RF Test)	Lenovo
		E431

2.2. Test Software

The test utility software used during testing was “SmartSnippets Toolbox”, and the version was 5.0.16.3720.

2.3. 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

2.4. 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
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2022-12-29	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2023-08-22	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2022-08-21	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2022-11-12	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2023-06-21	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2022-06-20	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2023-04-21	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2022-04-20	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2023-06-06	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2022-06-05	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2022-12-29	WZ-AC1
Thermohygrometer	testo	Testo 608-H1	MRTSUE11039	1 year	2022-11-11	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2023-05-20	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2023-06-04	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2022-12-01	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2022-10-21	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2022-11-12	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2023-04-21	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11038	1 year	2022-11-11	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE06402	1 year	2023-06-06	WZ-SR5
Shielding Room	HUAMING	WZ-SR5	MRTSUE06442	N/A	N/A	WZ-SR5
USB Power Sensor	Keysight	U2021XA	MRTSUE06447	1 year	2023-06-04	WZ-SR5
Signal Analyzer	Keysight	N9020B	MRTSUE07037	1 year	2023-03-29	WZ-SR5
Attenuator	MVE	MVE2213	MRTSUE11079	1 year	2023-06-09	WZ-SR5

Software	Version	Function
EMI V3	V 3.0.0	EMI Test Software
Controller_MF 7802	1.02	RE Antenna & Turntable
BenchVue Power Meter	2018.1	Power
Controller_MF 7802	2.03C	RE Antenna & Turntable

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

Remark:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.

6.2. 6dB Bandwidth Measurement

6.2.1. Test Limit

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

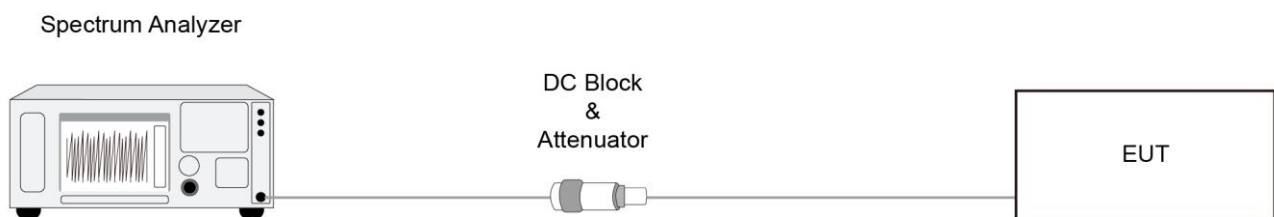
6.2.2. Test Procedure

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.

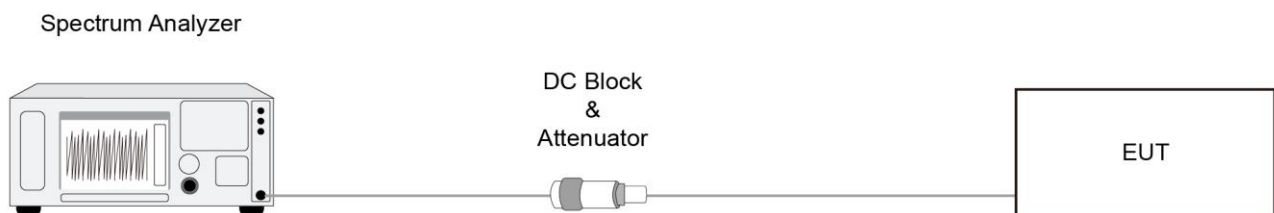
6.4.2. Test Procedure

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 30dB 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

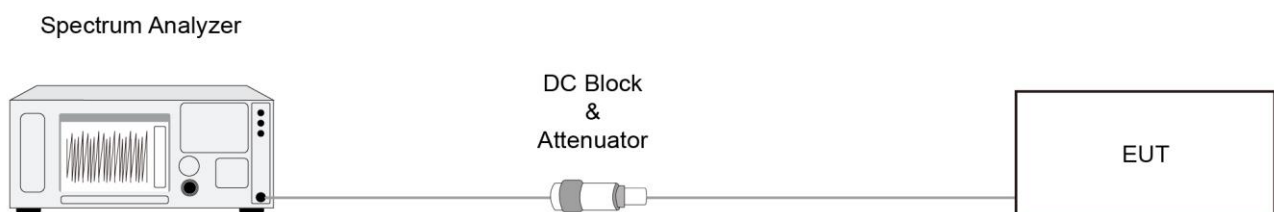
Reference level measurement

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 = 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



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

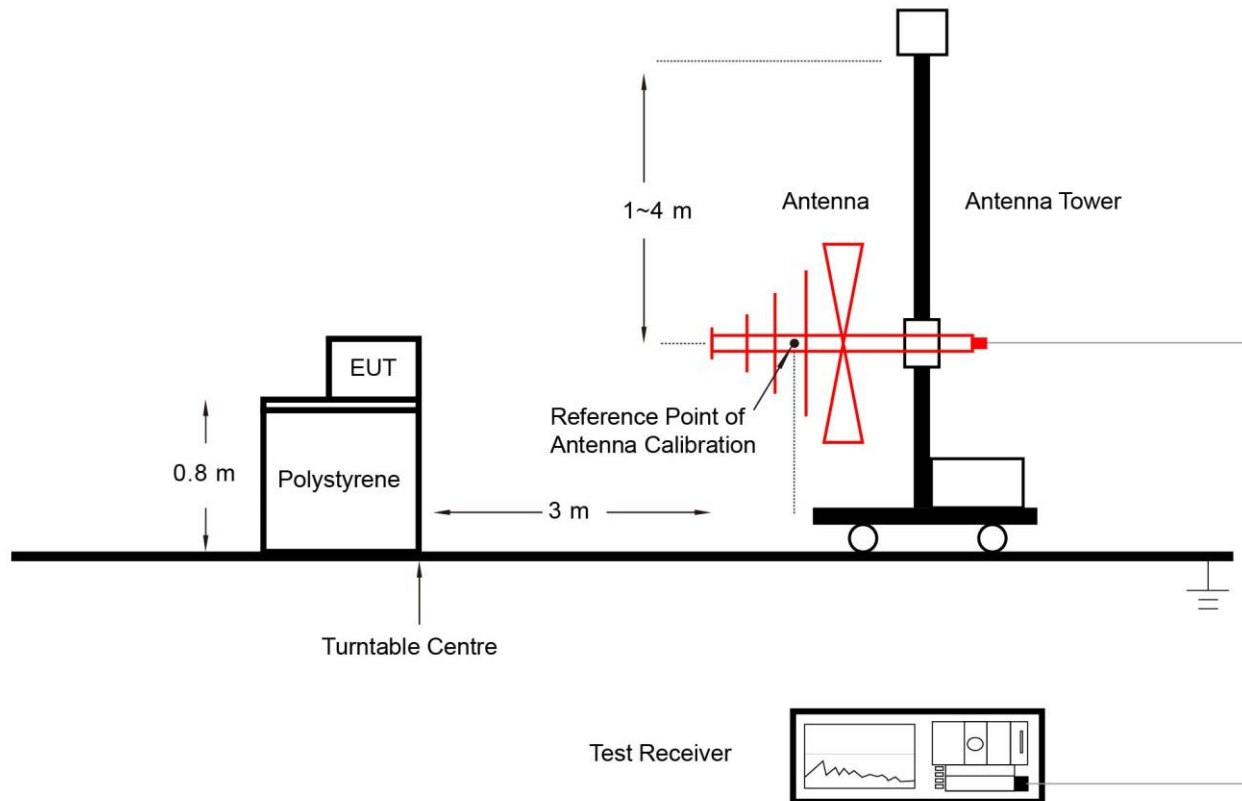
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

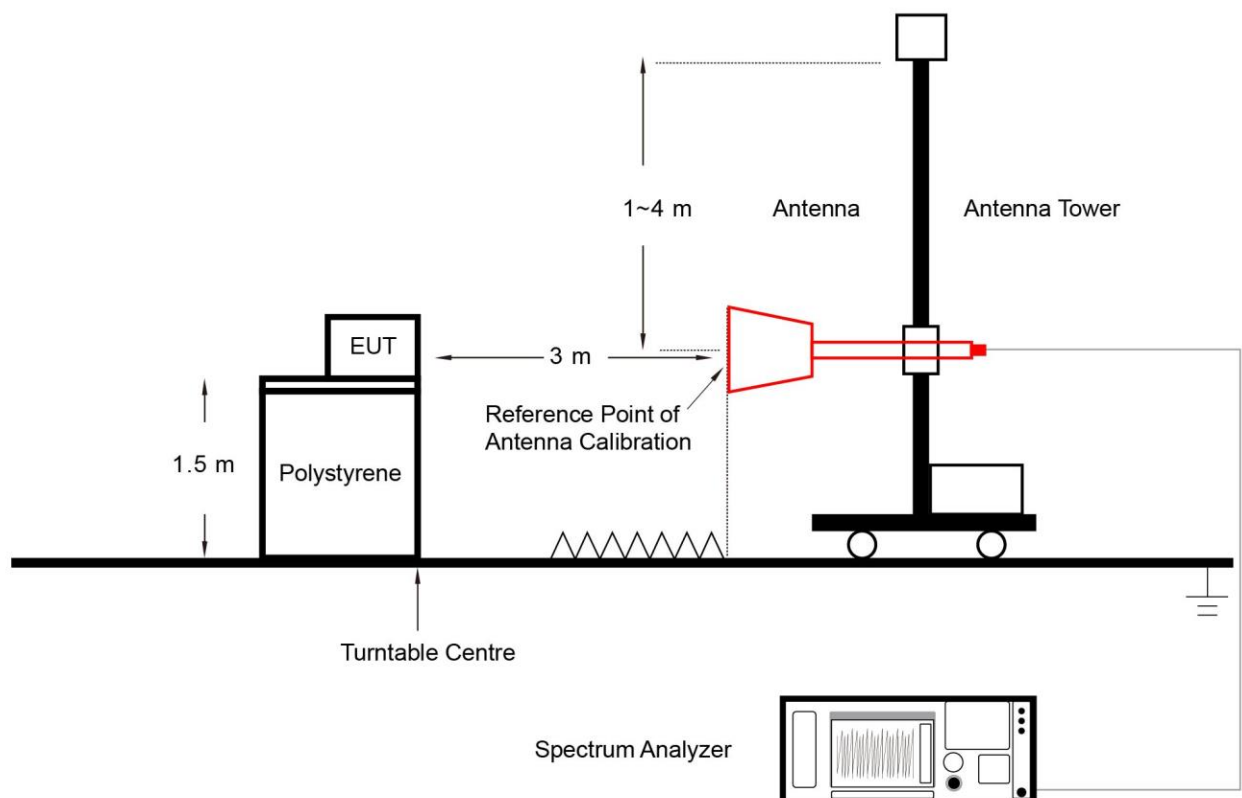
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4.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

6.6.4. Test Setup

Below 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

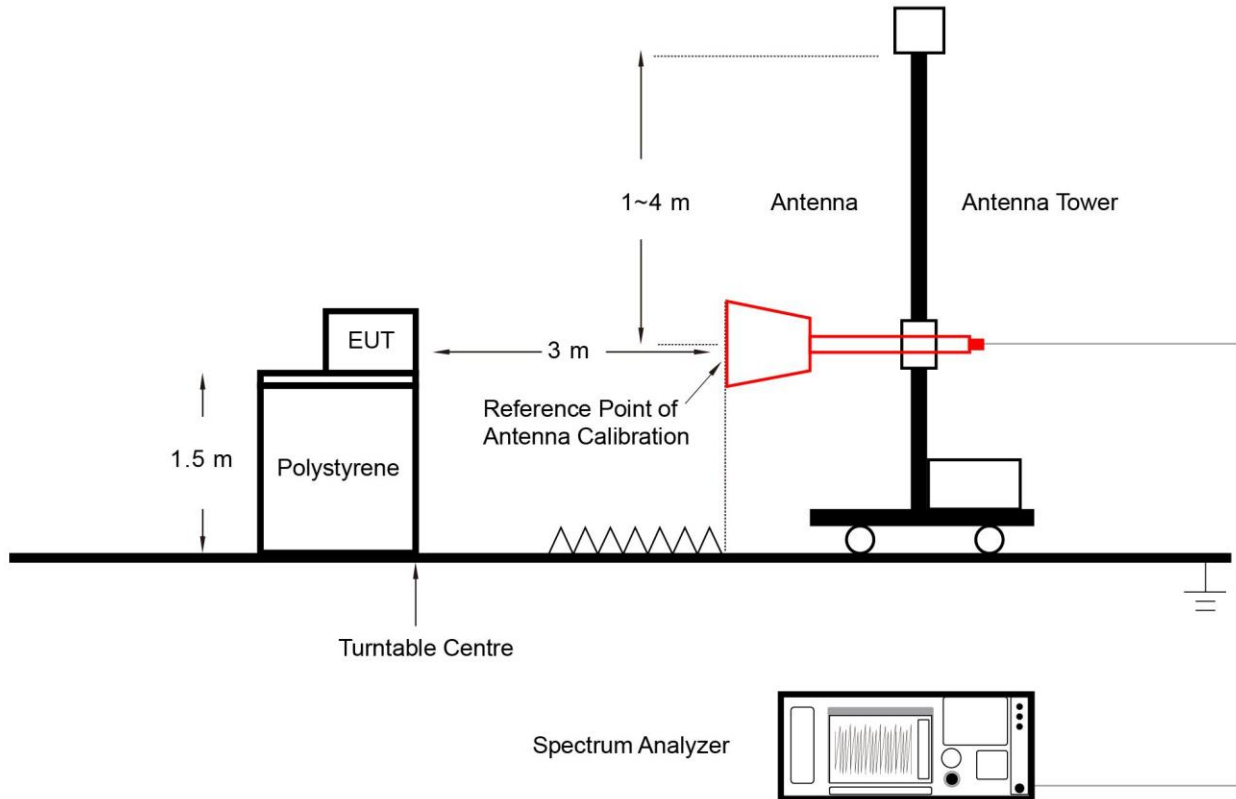
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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

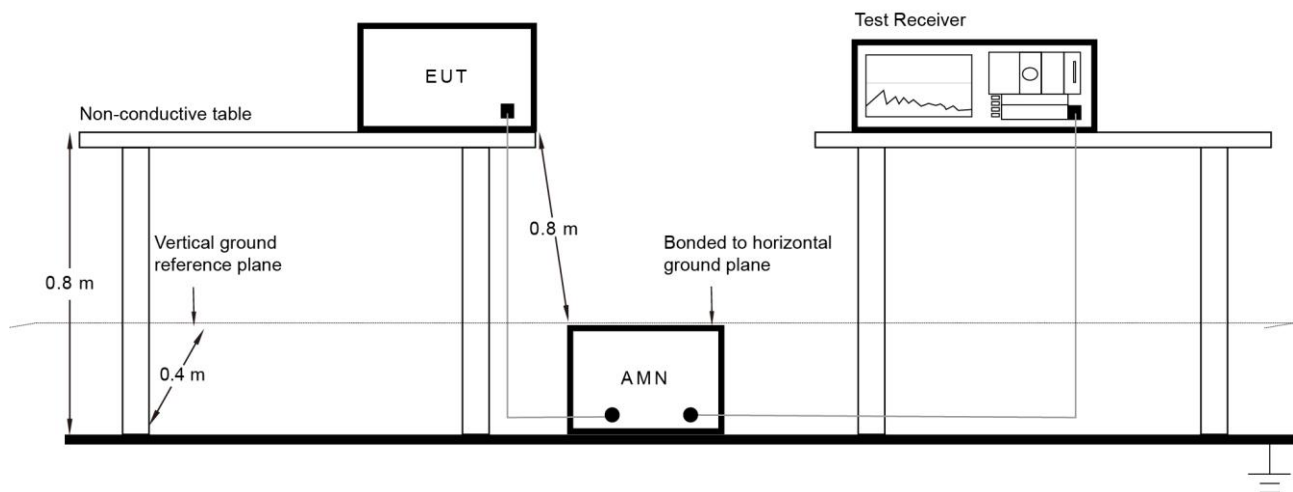
6.8.1. Test Limit

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



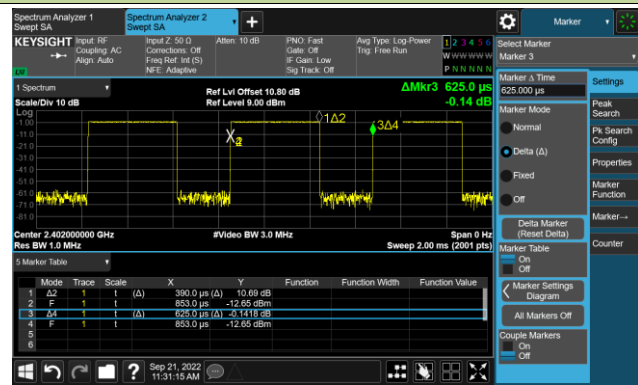
6.8.3. Test Result

Refer to Appendix A.8.

Appendix A - Test Result

A.1 Duty Cycle Test Result

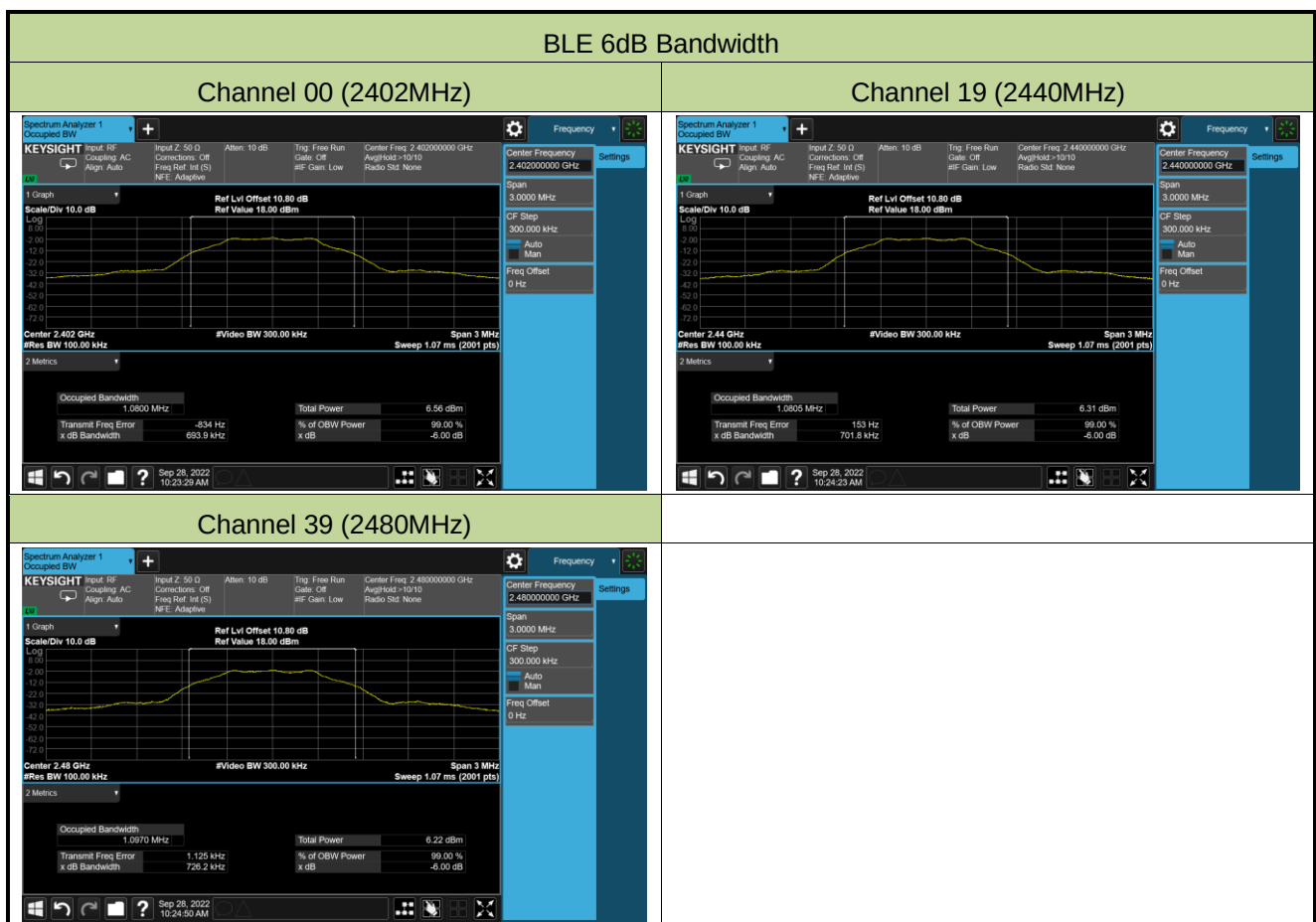
Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-09-21		

Test Mode	Duty Cycle
BLE	62.4%
Duty Cycle (T = Transmission Duration)	
BLE (T = 390.0μs)	
	

A.2 6dB Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-09-28		

Test Mode	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
BLE	00	2402	0.6939	≥ 0.5
BLE	19	2440	0.7018	≥ 0.5
BLE	39	2480	0.7262	≥ 0.5



A.3 Output Power Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-09-21		

Test Result of Peak Output Power

Test Mode	Channel No.	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result
BLE	00	2402	0.03	≤ 30.00	Pass
BLE	19	2440	-0.07	≤ 30.00	Pass
BLE	39	2480	-0.35	≤ 30.00	Pass

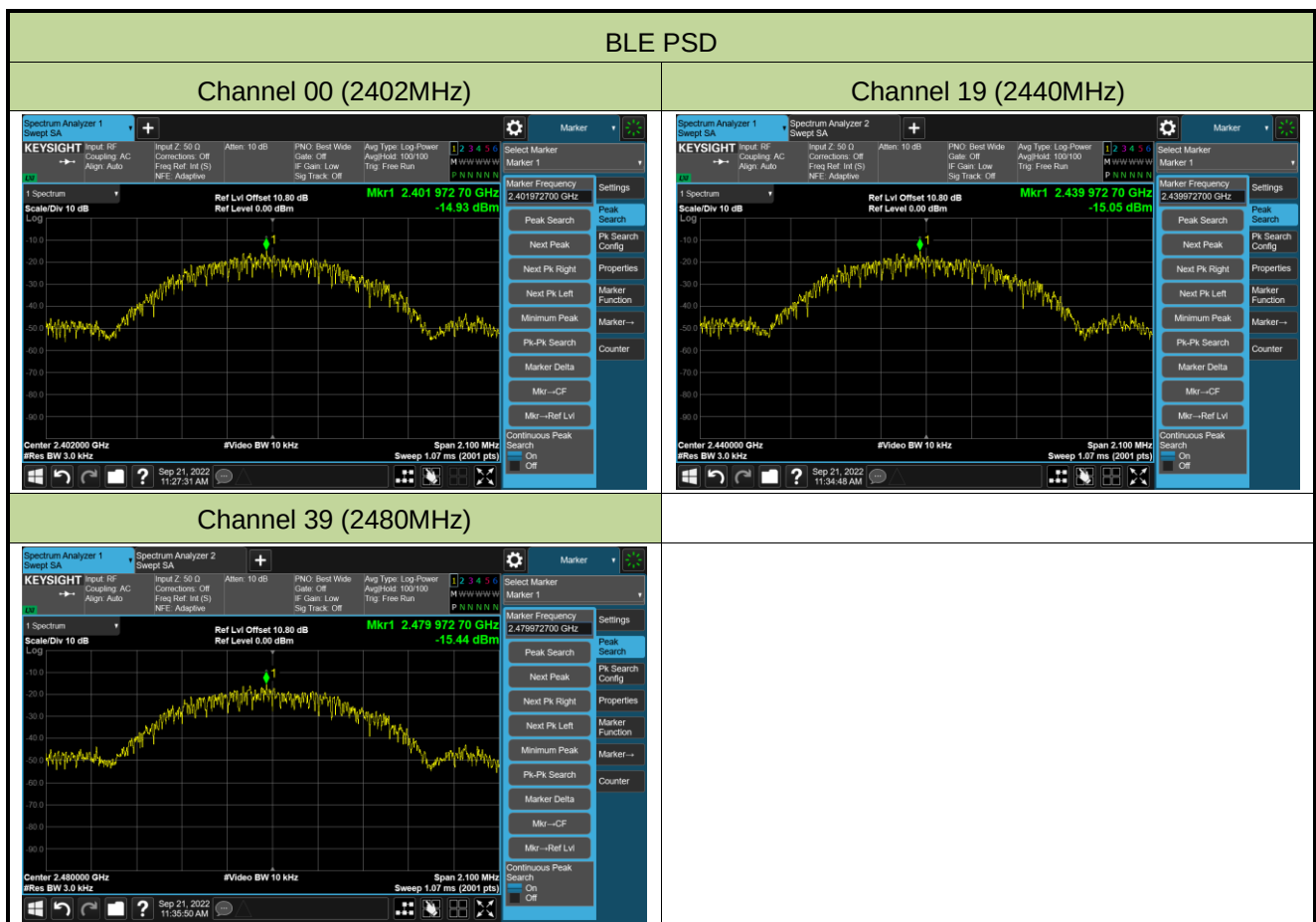
Test Result of Average Output Power (Reporting Only)

Test Mode	Channel No.	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Result
BLE	00	2402	-0.19	≤ 30.00	Pass
BLE	19	2440	-0.28	≤ 30.00	Pass
BLE	39	2480	-0.58	≤ 30.00	Pass

A.4 Power Spectral Density Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-09-21		

Test Mode	Channel No.	Frequency (MHz)	PSD Result (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
BLE	00	2402	-14.93	≤ 8.00	Pass
BLE	19	2440	-15.05	≤ 8.00	Pass
BLE	39	2480	-15.44	≤ 8.00	Pass



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

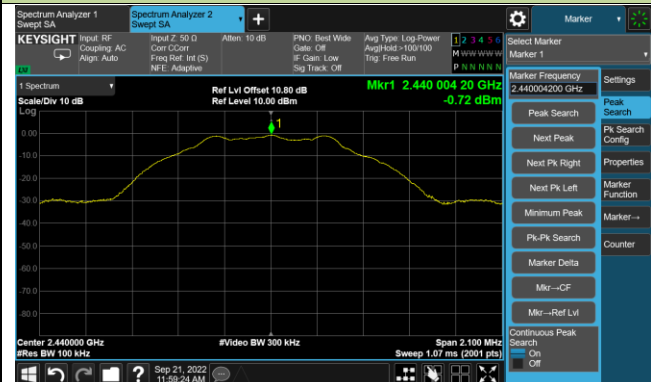
Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-09-21		

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

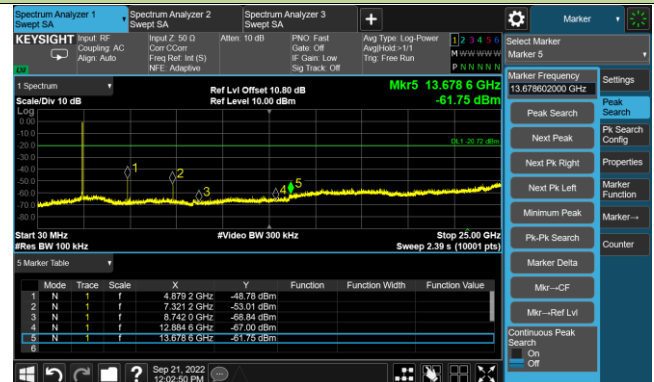


Channel 19 (2440MHz)

100kHz PSD reference Level

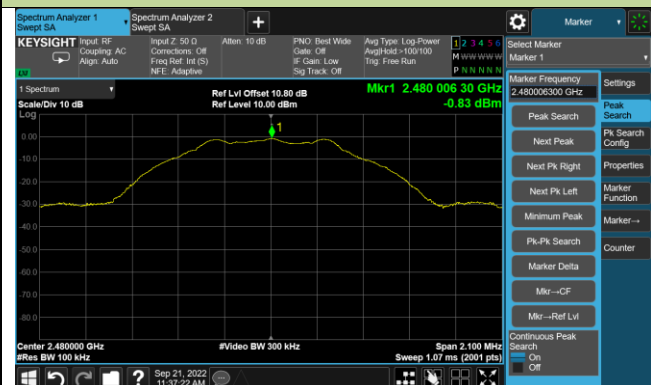


Spurious Emission 30MHz ~ 25GHz

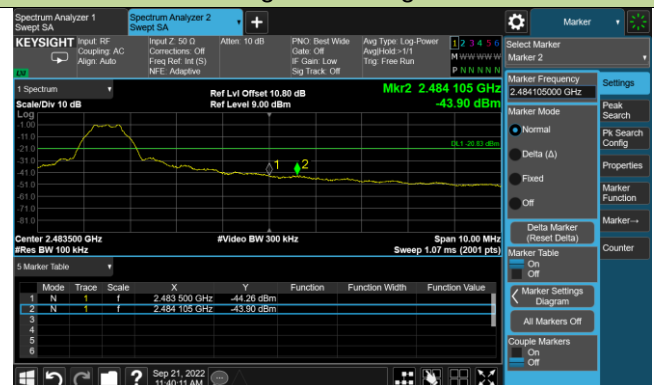


Channel 39 (2480MHz)

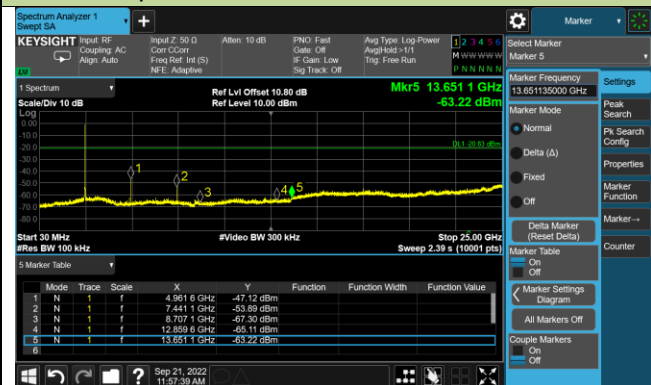
100kHz PSD reference Level



High Band Edge



Spurious Emission 30MHz ~ 25GHz



A.6 Radiated Spurious Emission Test Result

Test Site	WZ-AC1	Test Engineer	Kin Xia
Test Date	2022-03-15	Test Mode:	BLE
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.		

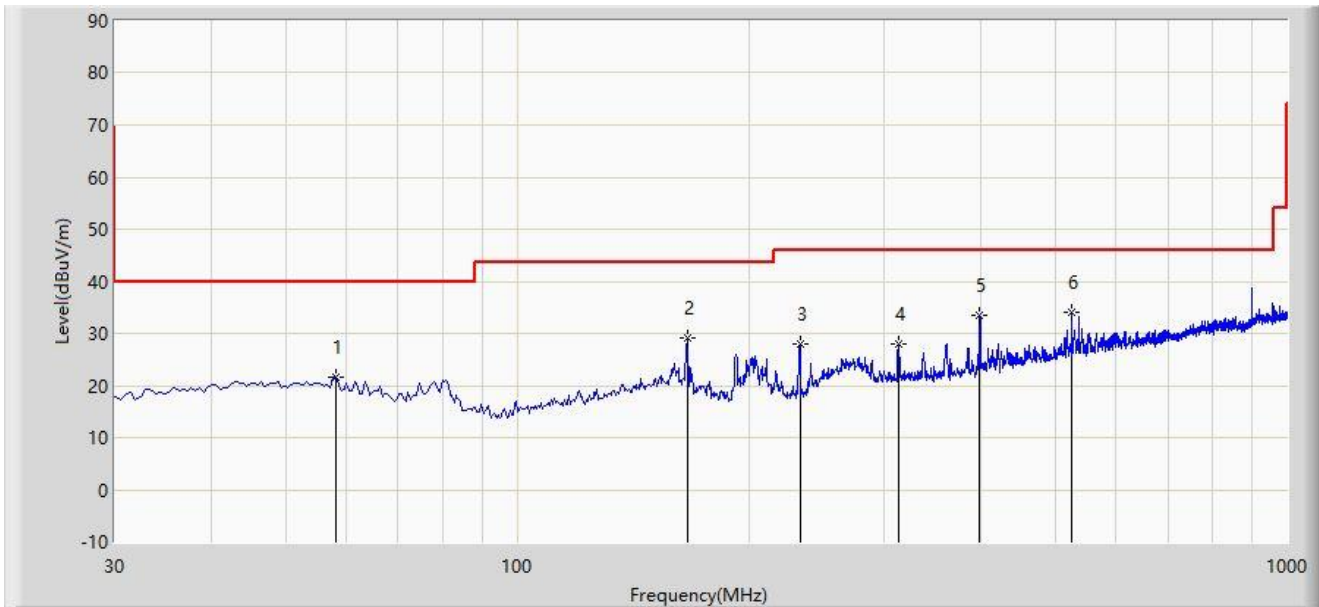
Test Channel	Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
00	4808.0	41.7	3.8	45.5	74.0	-28.5	Peak	Horizontal
	8123.0	36.9	9.6	46.5	74.0	-27.5	Peak	Horizontal
	11574.0	36.7	12.8	49.5	74.0	-24.5	Peak	Horizontal
	4808.0	43.6	3.8	47.4	74.0	-26.6	Peak	Vertical
	8055.0	37.3	9.7	47.0	74.0	-27.0	Peak	Vertical
	11234.0	36.7	13.2	49.9	74.0	-24.1	Peak	Vertical
19	4880.0	40.5	4.1	44.6	74.0	-29.4	Peak	Horizontal
	7324.0	41.2	9.2	50.4	74.0	-23.6	Peak	Horizontal
	11230.0	38.1	13.2	51.3	74.0	-22.7	Peak	Horizontal
	4880.0	41.7	4.1	45.8	74.0	-28.2	Peak	Vertical
	8118.0	36.5	9.8	46.3	74.0	-27.7	Peak	Vertical
	11356.0	37.4	13.4	50.8	74.0	-23.2	Peak	Vertical
39	4960.0	41.6	4.3	45.9	74.0	-28.1	Peak	Horizontal
	7984.0	35.8	9.2	45.0	74.0	-29.0	Peak	Horizontal
	11559.0	34.1	12.5	46.6	74.0	-27.4	Peak	Horizontal
	4960.0	44.1	4.3	48.4	74.0	-25.6	Peak	Vertical
	8115.0	37.5	9.8	47.3	74.0	-26.7	Peak	Vertical
	11267.0	34.7	13.3	48.0	74.0	-26.0	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: WZ-AC1	Test Data: 2022-03-15
Limit: FCC_2.4G_RE(3m)	Engineer: Kin Xia
Probe: WZ-AC1_VULB 9168 _30-1000MHz	Polarity: Horizontal
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1			58.130	21.579	3.660	-18.421	40.000	17.919	PK
2			166.285	29.066	11.260	-14.434	43.500	17.806	PK
3			233.215	28.074	12.952	-17.926	46.000	15.122	PK
4			312.755	28.000	9.389	-18.000	46.000	18.611	PK
5			398.600	33.553	12.904	-12.447	46.000	20.649	PK
6		*	525.185	34.066	10.408	-11.934	46.000	23.658	PK

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

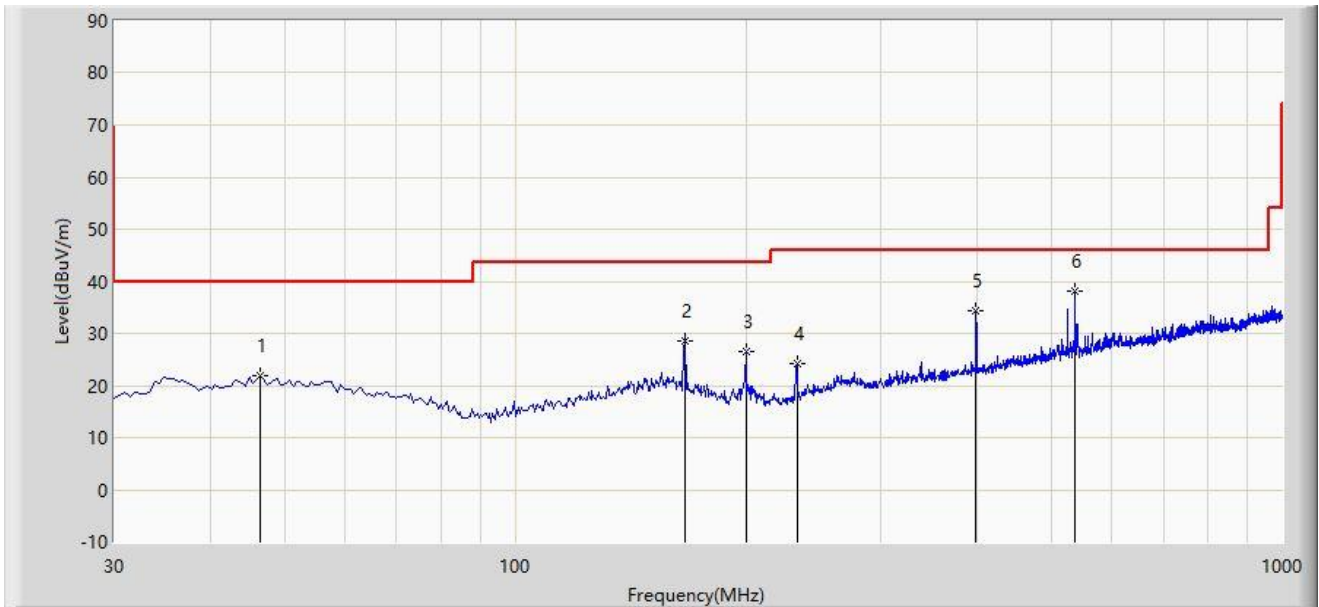
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: QP measurement was not performed when peak measure level was lower than the QP limit.

Note 3: 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 Data: 2022-03-15
Limit: FCC_2.4G_RE(3m)	Engineer: Kin Xia
Probe: WZ-AC1_VULB 9168 _30-1000MHz	Polarity: Vertical
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1			46.490	21.952	3.159	-18.048	40.000	18.793	PK
2			166.285	28.621	10.815	-14.879	43.500	17.806	PK
3			199.750	26.448	12.136	-17.052	43.500	14.312	PK
4			233.215	24.303	9.181	-21.697	46.000	15.122	PK
5			399.085	34.359	13.702	-11.641	46.000	20.656	PK
6		*	537.310	38.038	14.140	-7.962	46.000	23.898	PK

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

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

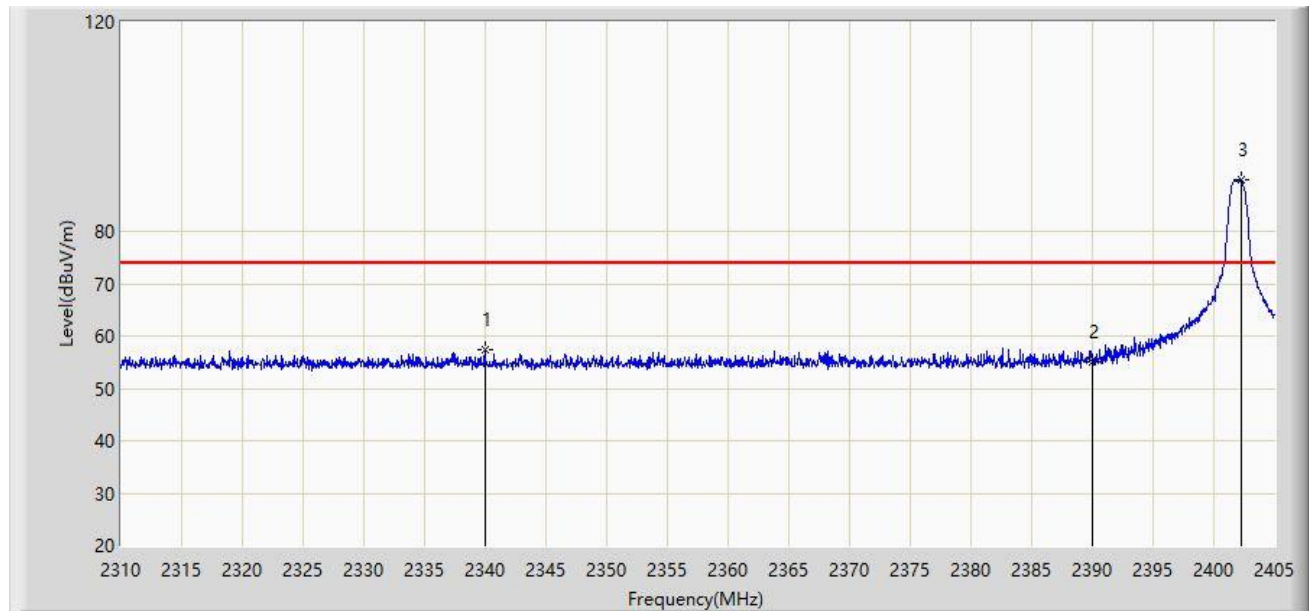
Note 2: QP measurement was not performed when peak measure level was lower than the QP limit.

Note 3: 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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Horizontal
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at 2402MHz	



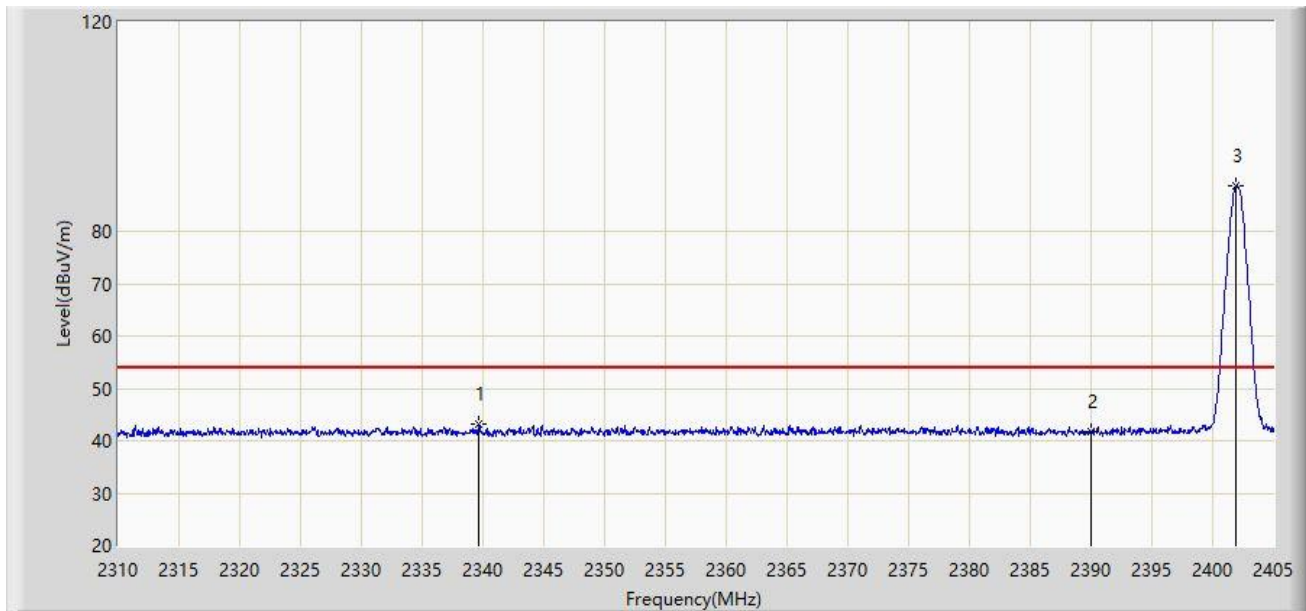
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2339.972	57.301	25.758	-16.699	74.000	31.544	PK
2		2390.000	55.059	23.626	-18.941	74.000	31.433	PK
3		2402.245	89.792	58.409	N/A	N/A	31.383	PK

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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Horizontal
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at 2402MHz	



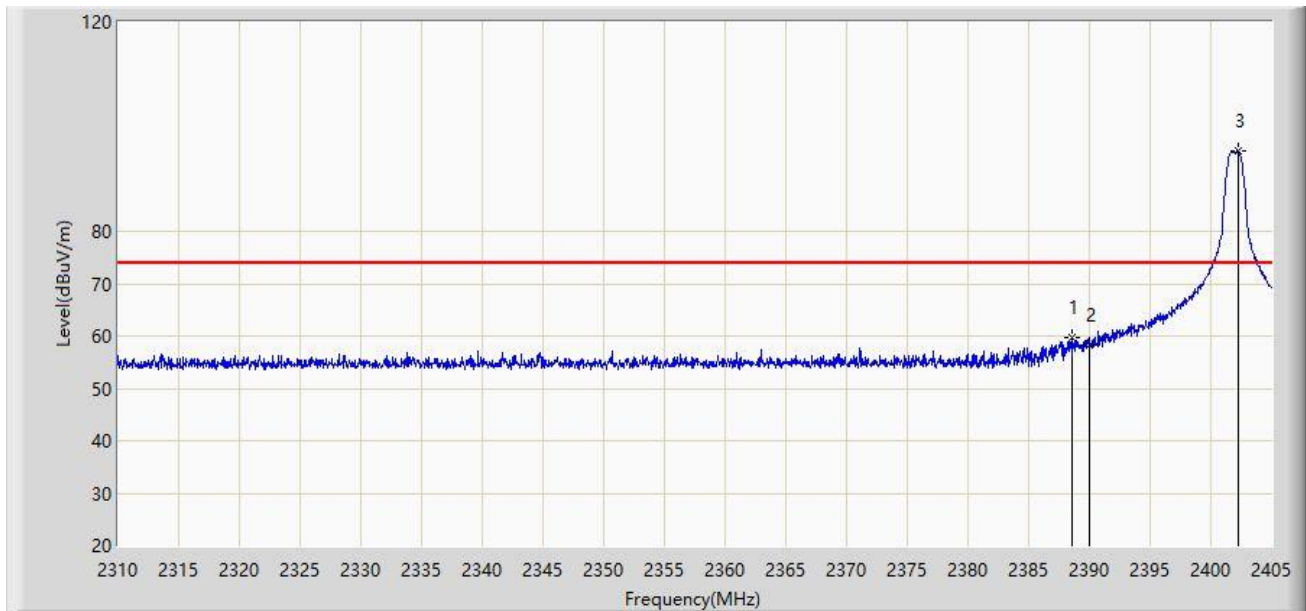
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2339.640	43.269	11.724	-10.731	54.000	31.545	AV
2		2390.000	41.655	10.222	-12.345	54.000	31.433	AV
3		2401.913	88.626	57.242	N/A	N/A	31.384	AV

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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Vertical
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at 2402MHz	



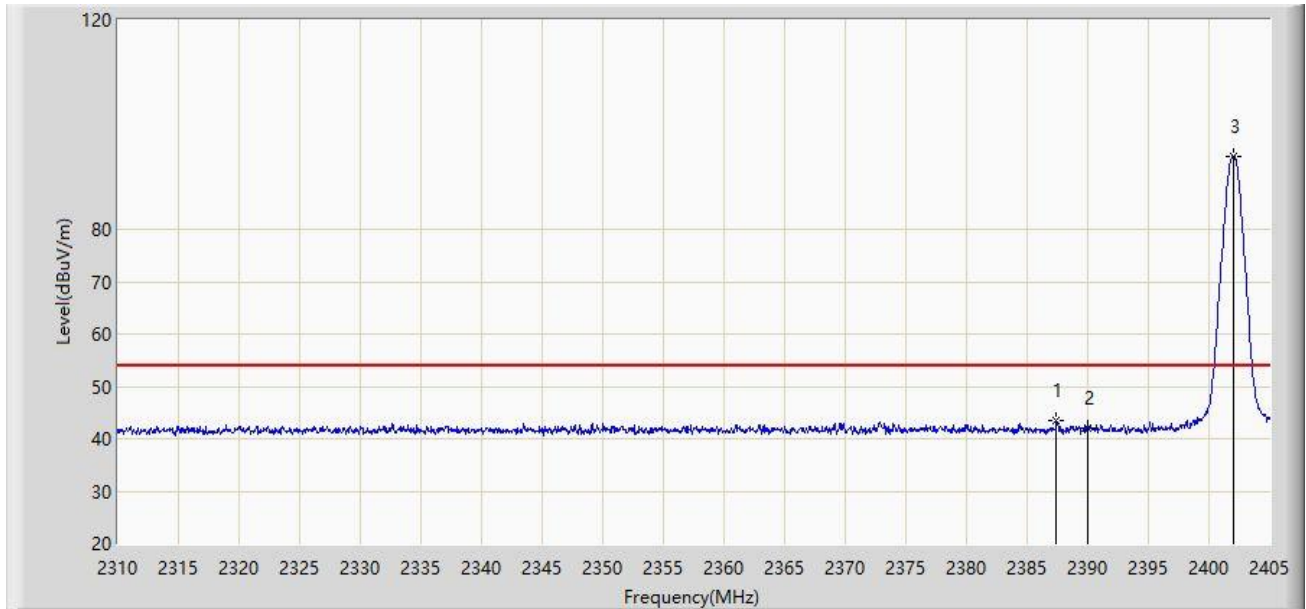
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2388.565	59.586	28.146	-14.414	74.000	31.441	PK
2		2390.000	58.216	26.783	-15.784	74.000	31.433	PK
3		2402.245	95.270	63.887	N/A	N/A	31.383	PK

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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Vertical
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at 2402MHz	



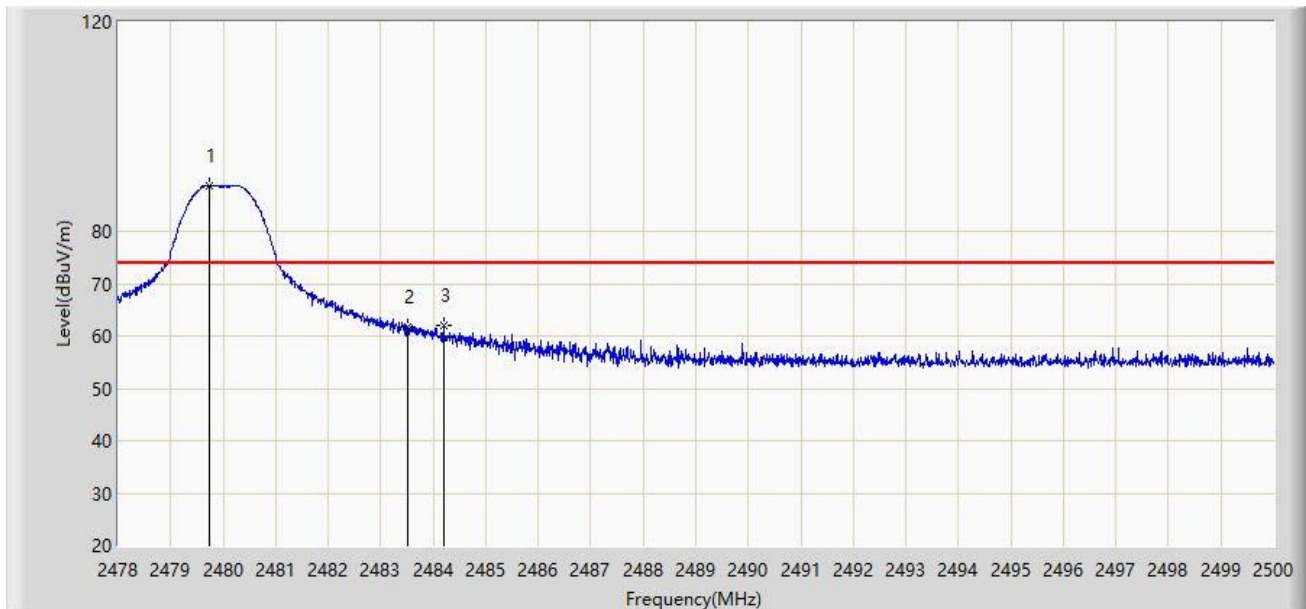
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1	*	2387.425	43.380	11.934	-10.620	54.000	31.446	AV
2		2390.000	42.054	10.621	-11.946	54.000	31.433	AV
3		2402.008	93.972	62.588	N/A	N/A	31.384	AV

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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Horizontal
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at 2480MHz	



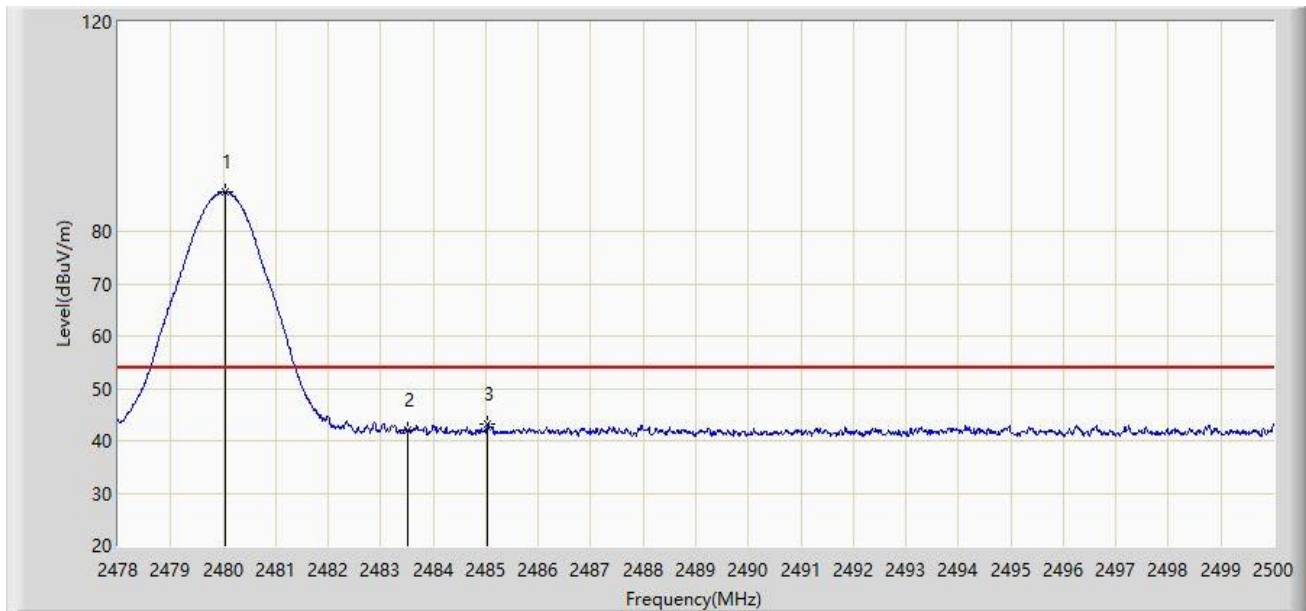
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2479.749	88.814	57.506	N/A	N/A	31.308	PK
2		2483.500	61.883	30.568	-12.117	74.000	31.315	PK
3	*	2484.193	61.999	30.683	-12.001	74.000	31.316	PK

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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Horizontal
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at 2480MHz	



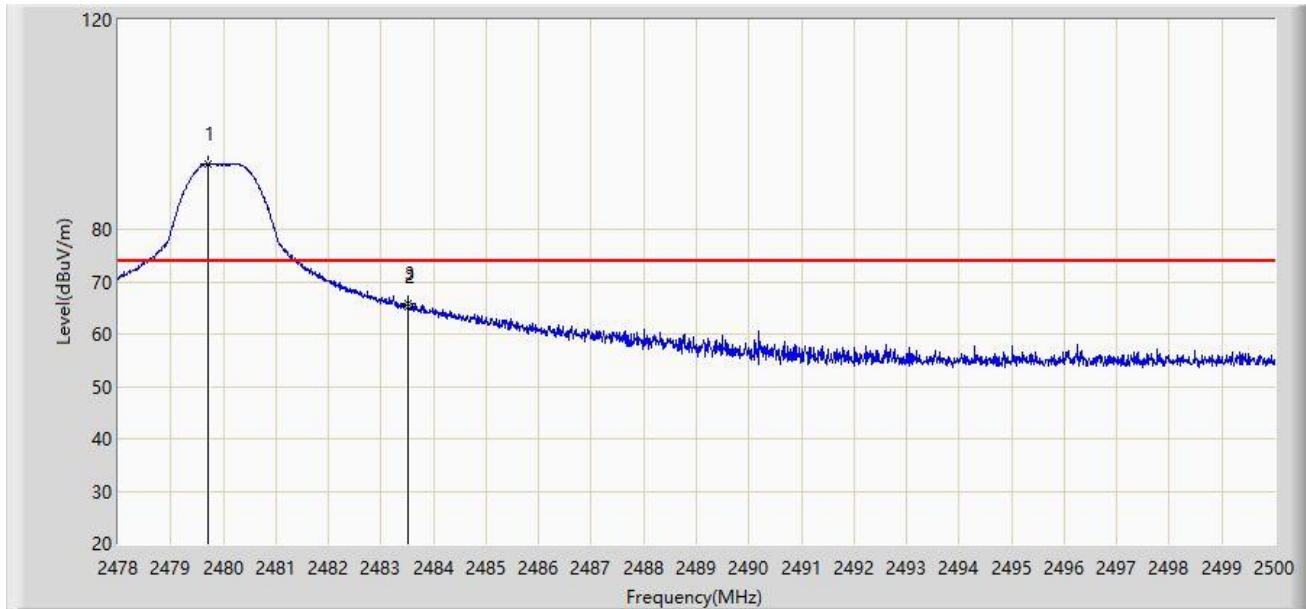
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2480.046	87.563	56.255	N/A	N/A	31.308	AV
2		2483.500	42.129	10.814	-11.871	54.000	31.315	AV
3	*	2485.029	43.157	11.840	-10.843	54.000	31.317	AV

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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Vertical
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE at 2480MHz	



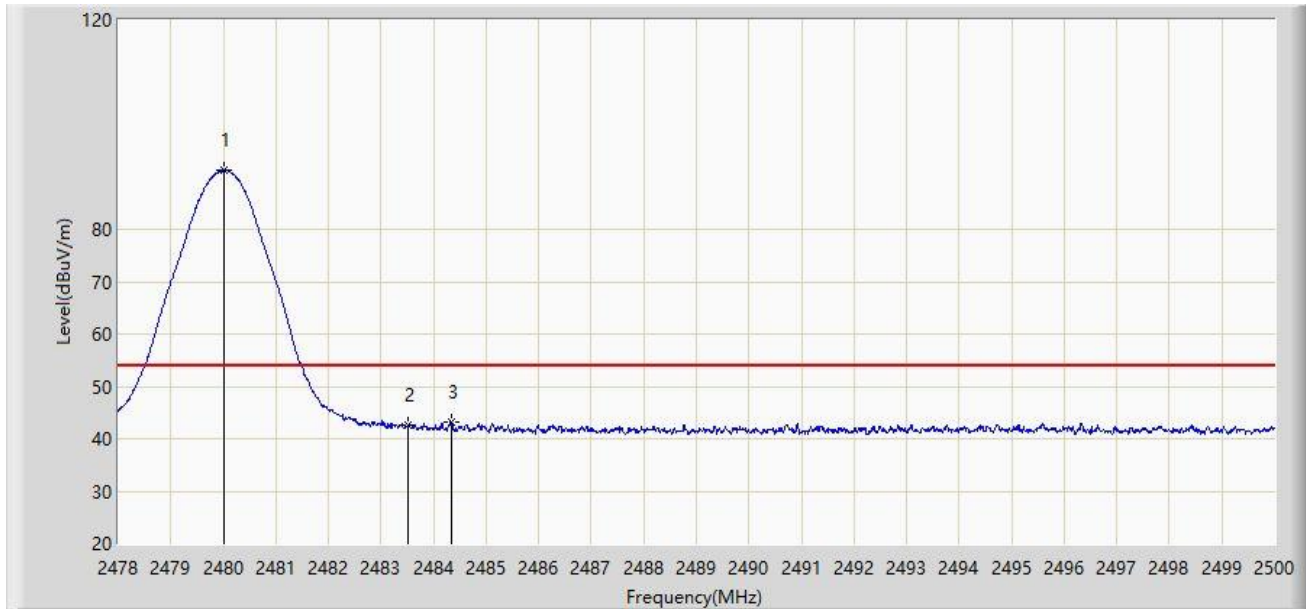
No	Mark	Frequency (MHz)	Measure Level (dBμV/m)	Reading Level (dBμV)	Margin (dB)	Limit (dBμV/m)	Factor (dB/m)	Type
1		2479.716	92.559	61.251	N/A	N/A	31.308	PK
2		2483.500	65.328	34.013	-8.672	74.000	31.315	PK
3	*	2483.511	65.905	34.590	-8.095	74.000	31.315	PK

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: WZ-AC2	Test Date: 2022-09-20
Limit: FCC_2.4G_RE(3m)	Engineer: Lucas Wang
Probe: BBHA9120D_1457_1-18GHz	Polarity: Vertical
EUT: XT2039	Power: By Battery
Test Mode: Transmit by BLE 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	91.263	59.955	N/A	N/A	31.308	AV
2		2483.500	42.508	11.193	-11.492	54.000	31.315	AV
3	*	2484.336	43.062	11.746	-10.938	54.000	31.316	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

This device is powered by battery, so this item is not applicable.

Appendix B - Test Setup Photograph

Refer to “2203RSU035-UT” file.

Appendix C - EUT Photograph

Refer to “2203RSU035-UE” file.

The End
