

TEST REPORT

Product Name : Bluetooth module
Brand Mark : N.E.T
Model No. : QZBT628-2
FCC ID : 2BAMT-QZBT628-2
Report Number : BLA-EMC-202306-A2301
Date of Sample Receipt : 2023/6/5
Date of Test : 2023/6/6 to 2023/7/7
Date of Issue : 2023/7/10
Test Standard : 47 CFR Part 15, Subpart C 15.247
Test Result : Pass

Prepared for:

Nebula Electronic Technology Corporation
Room 1002, No.570 ShengXia RD, Pudong district, Shanghai, China

Prepared by:

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.
Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District,
Shenzhen, Guangdong Province, China
TEL: +86-755-23059481

Compiled by: Lucas

Review by: Sueela

Approved by: Blue.Zheng

Date: 2023/7/10



REPORT REVISE RECORD

Version No.	Date	Description
00	2023/7/10	Original

BlueAsia

TABLE OF CONTENTS

1 TEST SUMMARY	5
2 GENERAL INFORMATION	6
3 GENERAL DESCRIPTION OF E.U.T.....	6
4 TEST ENVIRONMENT	7
5 TEST MODE.....	7
6 MEASUREMENT UNCERTAINTY	7
7 DESCRIPTION OF SUPPORT UNIT	8
8 LABORATORY LOCATION	8
9 TEST INSTRUMENTS LIST.....	9
10 ANTENNA REQUIREMENT	11
10.1 CONCLUSION	11
11 CONDUCTED SPURIOUS EMISSIONS	12
11.1 LIMITS.....	12
11.2 BLOCK DIAGRAM OF TEST SETUP	13
11.3 TEST DATA	13
12 RADIATED SPURIOUS EMISSIONS	14
12.1 LIMITS.....	14
12.2 BLOCK DIAGRAM OF TEST SETUP	15
12.3 PROCEDURE.....	15
12.4 TEST DATA	17
13 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	25
13.1 LIMITS.....	25
13.2 BLOCK DIAGRAM OF TEST SETUP	26
13.3 PROCEDURE.....	26
13.4 TEST DATA	28
14 CONDUCTED BAND EDGES MEASUREMENT	32
14.1 LIMITS.....	32
14.2 BLOCK DIAGRAM OF TEST SETUP	33
14.3 TEST DATA	33

15 MINIMUM 6DB BANDWIDTH	34
15.1 BLOCK DIAGRAM OF TEST SETUP	34
15.2 TEST DATA	34
16 CONDUCTED PEAK OUTPUT POWER	35
16.1 LIMITS	35
16.2 BLOCK DIAGRAM OF TEST SETUP	35
16.3 EST DATA	36
17 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)	37
17.1 LIMITS	37
17.2 BLOCK DIAGRAM OF TEST SETUP	37
17.3 PROCEDURE	37
17.4 TEST DATA	39
18 POWER SPECTRUM DENSITY	41
18.1 LIMITS	41
18.2 BLOCK DIAGRAM OF TEST SETUP	41
18.3 TEST DATA	41
19 APPENDIX	42
19.1 MAXIMUM CONDUCTED OUTPUT POWER	42
19.2 -6DB BANDWIDTH	44
19.3 OCCUPIED CHANNEL BANDWIDTH	46
19.4 MAXIMUM POWER SPECTRAL DENSITY LEVEL	48
19.5 BAND EDGE	50
19.6 CONDUCTED RF SPURIOUS EMISSION	53
APPENDIX A: PHOTOGRAPHS OF TEST SETUP	57
APPENDIX B: PHOTOGRAPHS OF EUT	59

1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass

2 GENERAL INFORMATION

Applicant	Nebula Electronic Technology Corporation
Address	Room 1002, No.570 ShengXia RD, Pudong district, Shanghai, China
Manufacturer	Nebula Electronic Technology Corporation
Address	Room 1002, No.570 ShengXia RD, Pudong district, Shanghai, China
Factory	Nebula Electronic Technology Corporation
Address	Room 1002, No.570 ShengXia RD, Pudong district, Shanghai, China
Product Name	Bluetooth module
Test Model No.	QZBT628-2

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	N/A
Software Version	N/A
Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	PCB Antenna
Antenna Gain:	-6.25 dBi(Provided by the customer)

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	24°C	3.3Vdc

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX	Keep the EUT in transmitting mode with modulation

Remark: Only the data of the worst mode would be recorded in this report.

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30MHz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB

7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
PC	HASEE	K610D	N/A	N/A

8 LABORATORY LOCATION

All tests were performed at:

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.

Building C, No. 107, Shihuan Road, Shiyan Sub-District, Baoan District, Shenzhen, Guangdong Province,
China

Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673

No tests were sub-contracted.

9 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber 1	SKET	966	N/A	2020/11/10	2023/11/9
Chamber 2	SKET	966	N/A	2021/07/20	2024/07/19
Spectrum	R&S	FSP40	100817	2022/09/15	2023/09/14
Receiver	R&S	ESR7	101199	2022/09/15	2023/09/14
Receiver	R&S	ESPI7	101477	2022/07/16	2023/07/15
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2022/09/15	2023/09/14
Horn Antenna	Schwarzbeck	BBHA9120D	01892 P:00331	2022/09/13	2025/09/12
Amplifier	SKET	LNPA_30M01G-30	SK2021060801	2022/07/16	2023/07/15
Amplifier	SKET	PA-000318G-45	N/A	2022/09/13	2023/09/12
Amplifier	SKET	LNPA_18G40G-50	SK2022071301	2022/07/14	2023/07/13
Filter group	SKET	2.4G/5G Filter group r	N/A	2022/07/16	2023/07/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2022/9/14	2025/9/13
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Shield room	SKET	833	N/A	2020/11/25	2023/11/24
Receiver	R&S	ESPI3	101082	2022/09/14	2023/09/13
LISN	R&S	ENV216	3560.6550.15	2022/09/14	2023/09/13
LISN	AT	AT166-2	AKK1806000003	2022/09/14	2023/09/13

ISN	TESEQ	ISNT8-cat6	53580	2022/09/14	2023/09/13
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01045	2022/08/17	2023/08/16
Single-channel vehicle artificial power network	Schwarzbeck	NNBM 8124	01075	2022/08/17	2023/08/16
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A

Test Equipment Of RF Conducted Test					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2022/09/15	2023/09/14
Spectrum	Agilent	N9020A	MY49100060	2022/09/07	2023/09/06
Spectrum	KEYSIGHT	N9030A	MY52350152	2023/07/07	2024/07/06
Spectrum	KEYSIGHT	N9010A	MY54330814	2023/07/07	2024/07/06
Signal Generator	Agilent	N5182A	MY47420955	2022/09/07	2023/09/06
Signal Generator	Agilent	E8257D	MY44320250	2023/07/07	2024/07/06
Signal Generator	Agilent	N5181A	MY46240904	2022/08/02	2023/08/01
Signal Generator	R&S	CMW500	132429	2022/09/07	2023/09/06
BluetoothTester	Anritsu	MT8852B	06262047872	2022/09/07	2023/09/06
Power probe	DARE	RPR3006W	14I00889SN042	2022/09/07	2023/09/06
DCPowersupply	zhaoxin	KXN-305D	20K305D1221363	2022/09/14	2023/09/13
DCPowersupply	zhaoxin	RXN-1505D	19R1505D050168	2022/09/14	2023/09/13
Audio Analyzer	Audioprecision	N/A	ATSI-41094	2023/7/7	2024/7/6
2.4GHz/5GHz RF Test software	MTS	MTS 8310	Version 2.0.0.0	N/A	N/A

10 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	N/A

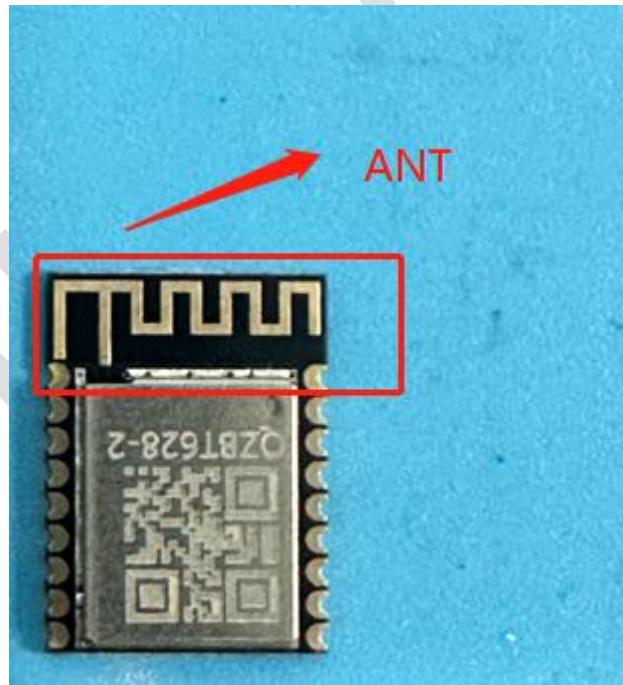
10.1 CONCLUSION

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -6.25dBi.



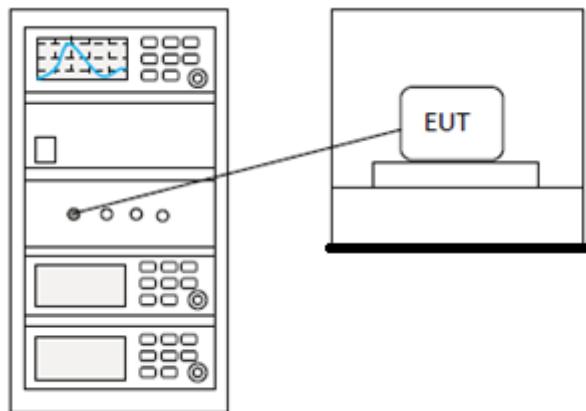
11 CONDUCTED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

11.1 LIMITS

Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
---------------	--

11.2 BLOCK DIAGRAM OF TEST SETUP



11.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

BlueAsia

12 RADIATED SPURIOUS EMISSIONS

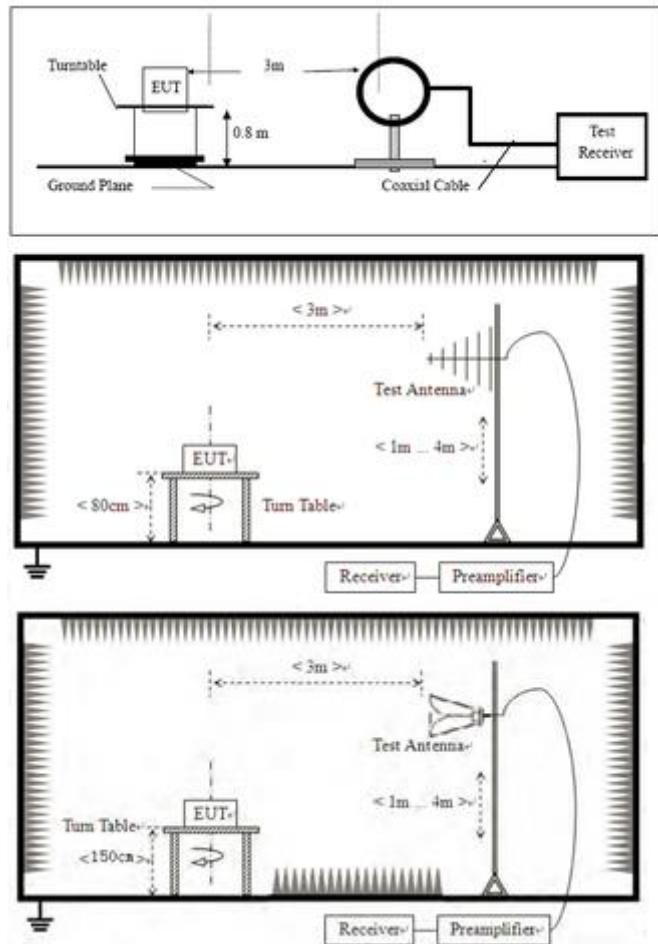
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

12.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

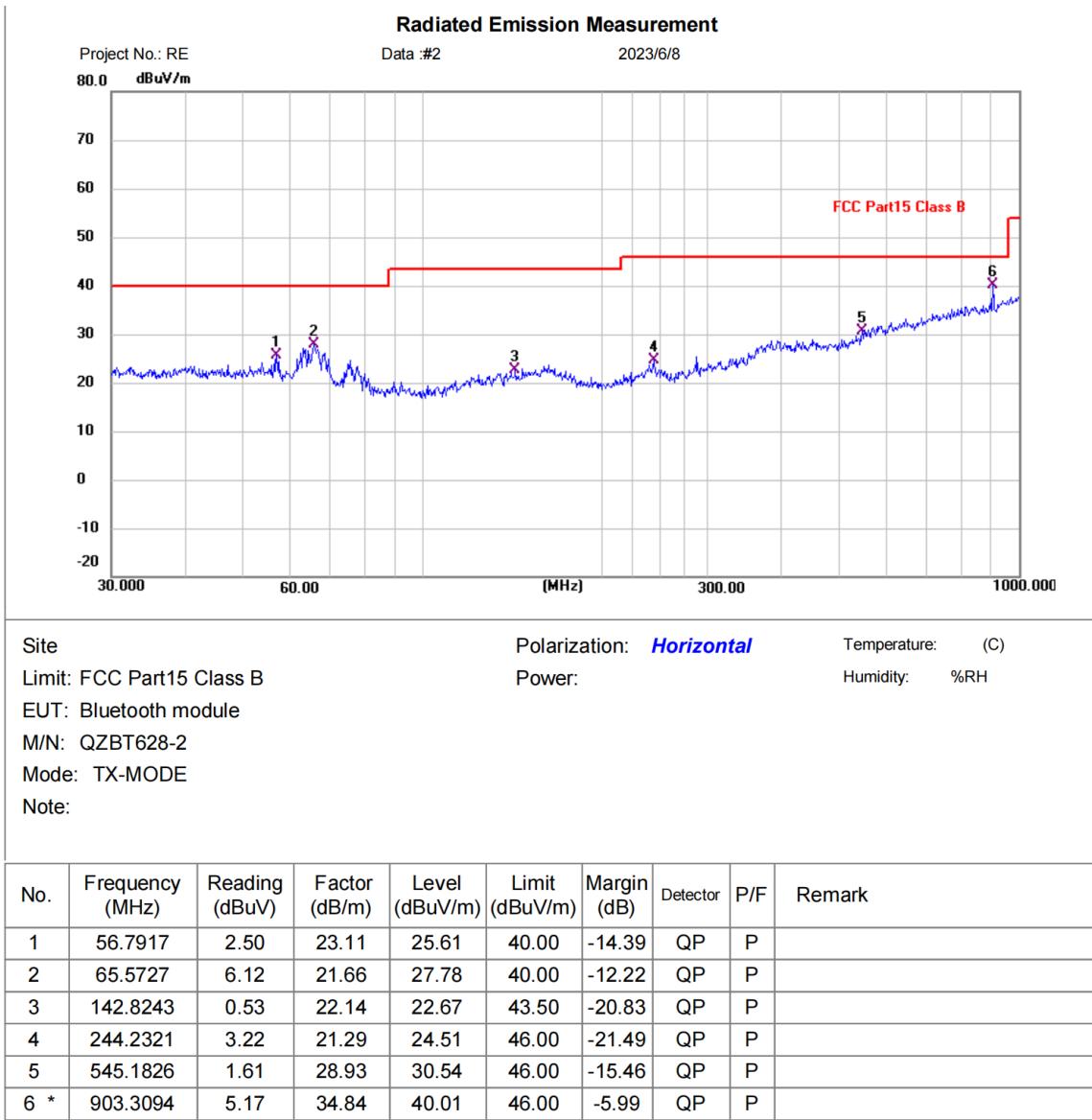
Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor
- 3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. fundamental frequency is blocked by filter, and only spurious emission is shown.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

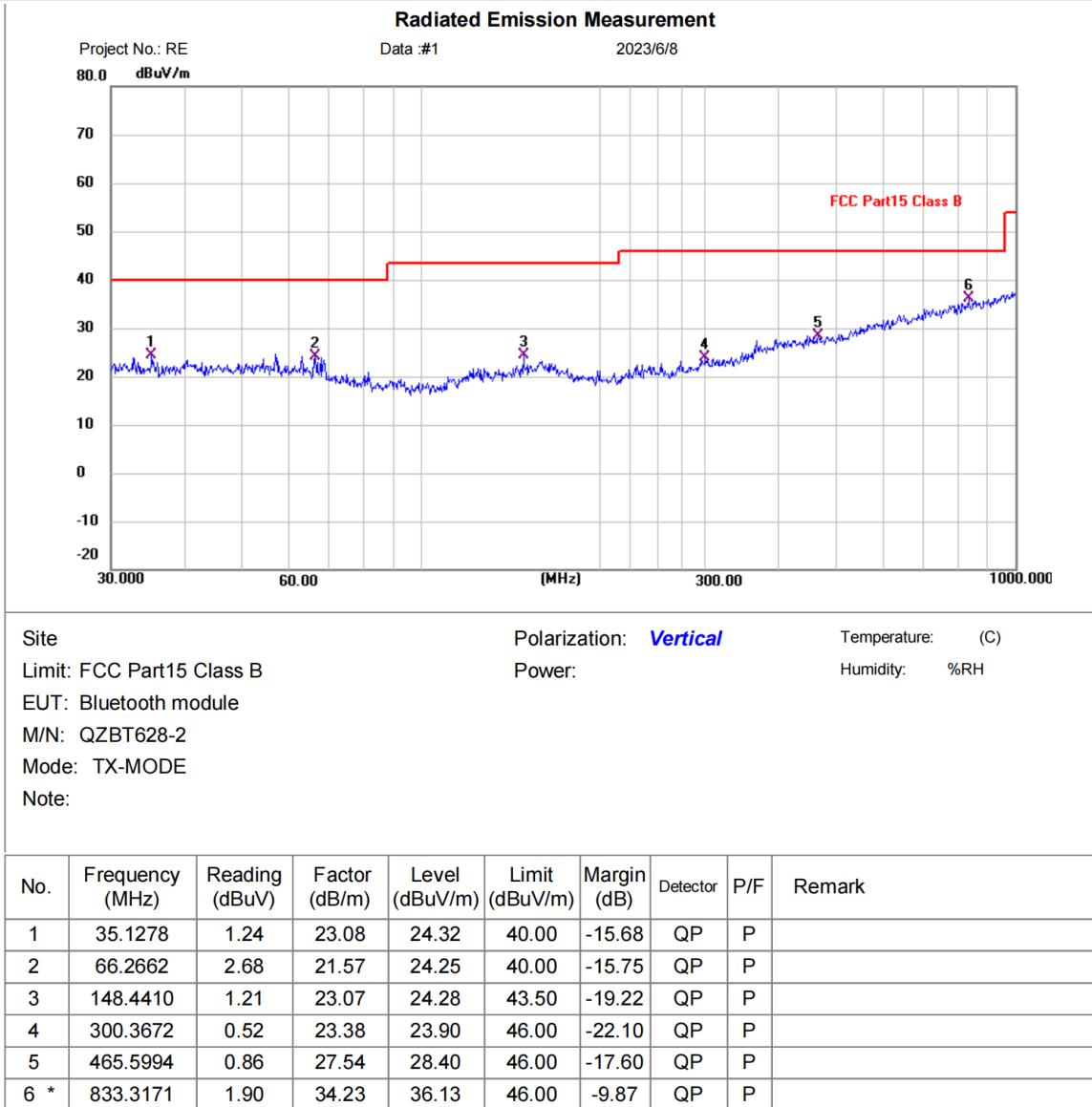
12.4 TEST DATA

Below 1GHz

[TestMode: TX]; [Polarity: Horizontal]

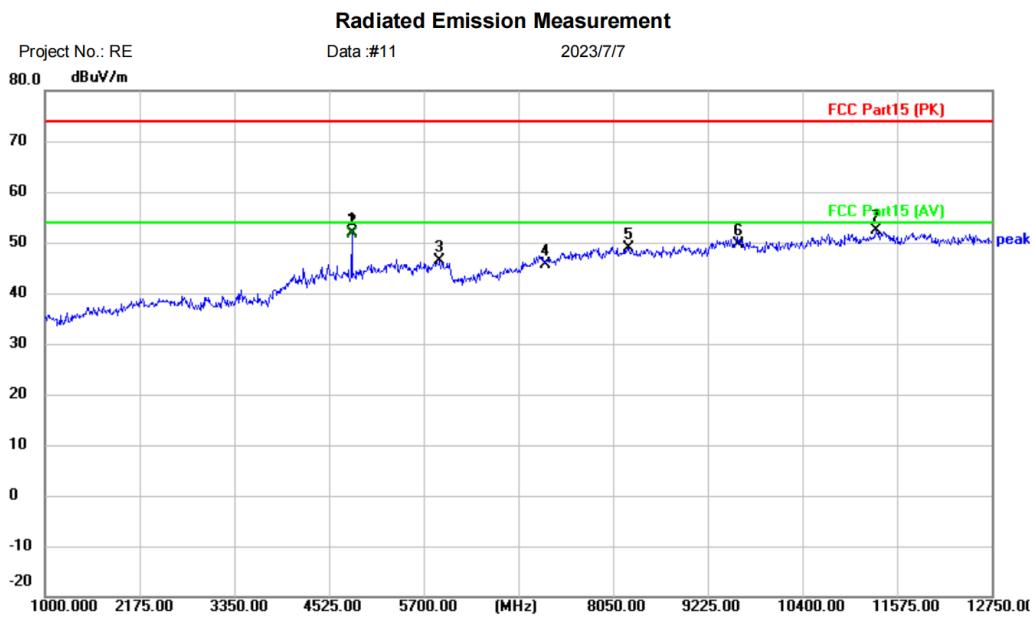


Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]

Test Result: Pass

Above 1GHz

[TestMode: TX lowest channel]; [Polarity: Horizontal]



Site

Polarization: **Horizontal**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth module

M/N: QZBT628-2

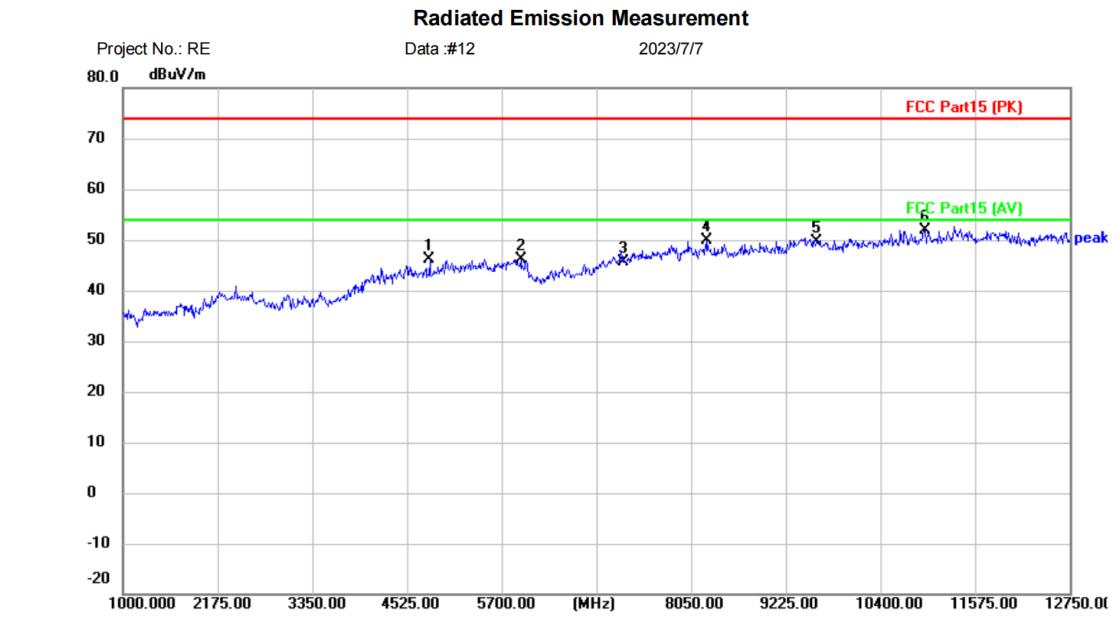
Mode: TX-L

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		4807.000	47.31	4.51	51.82	74.00	-22.18	peak	
2	*	4807.000	47.05	4.51	51.56	54.00	-2.44	AVG	
3		5899.750	39.71	6.75	46.46	74.00	-27.54	peak	
4		7206.000	38.34	7.41	45.75	74.00	-28.25	peak	
5		8249.750	40.24	8.54	48.78	74.00	-25.22	peak	
6		9608.000	38.06	11.59	49.65	74.00	-24.35	peak	
7		11316.50	38.93	13.39	52.32	74.00	-21.68	peak	

Test Result: Pass

[TestMode: TX lowest channel]; [Polarity: Vertical]



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth module

M/N: QZBT628-2

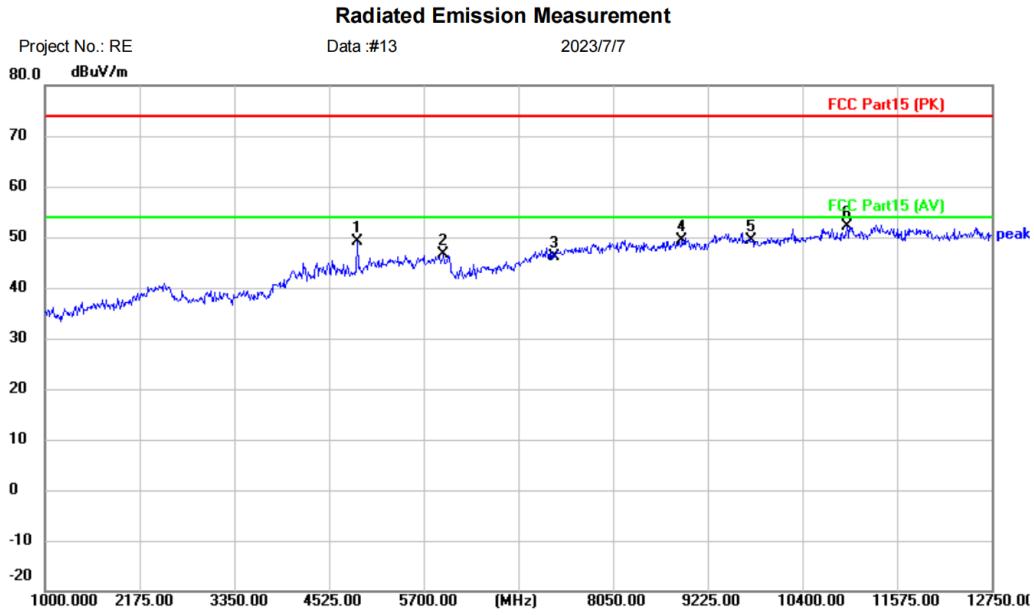
Mode: TX-L

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment		Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		4804.000	41.72	4.51	46.23	74.00	-27.77	peak
2		5935.000	39.46	6.74	46.20	74.00	-27.80	peak
3		7206.000	38.13	7.41	45.54	74.00	-28.46	peak
4		8249.750	41.31	8.54	49.85	74.00	-24.15	peak
5		9608.000	37.98	11.59	49.57	74.00	-24.43	peak
6	*	10952.25	38.38	13.62	52.00	74.00	-22.00	peak

Test Result: Pass

[TestMode: TX middle channel]; [Polarity: Horizontal]

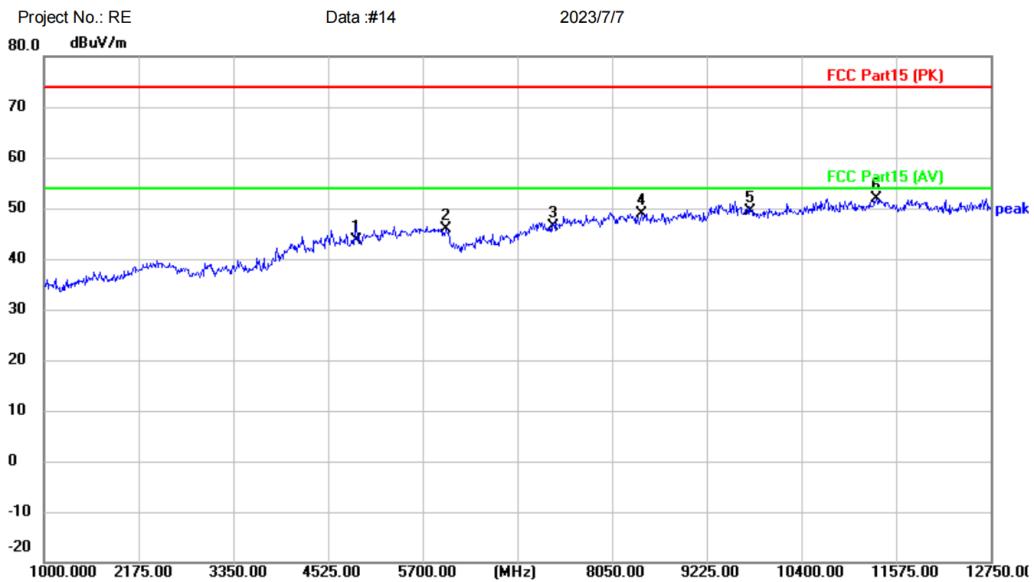


Site	Polarization: <i>Horizontal</i>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth module		
M/N: QZBT628-2		
Mode: TX-M		
Note:		

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
			Level	Factor	ment		dBuV/m	dBuV/m	dB
			MHz	dBuV	dB				
1		4877.500	44.43	4.59	49.02	74.00	-24.98	peak	
2		5946.750	39.96	6.73	46.69	74.00	-27.31	peak	
3		7326.000	38.25	7.82	46.07	74.00	-27.93	peak	
4		8907.750	38.90	10.37	49.27	74.00	-24.73	peak	
5		9768.000	37.54	11.77	49.31	74.00	-24.69	peak	
6	*	10952.25	38.57	13.62	52.19	74.00	-21.81	peak	

Test Result: Pass

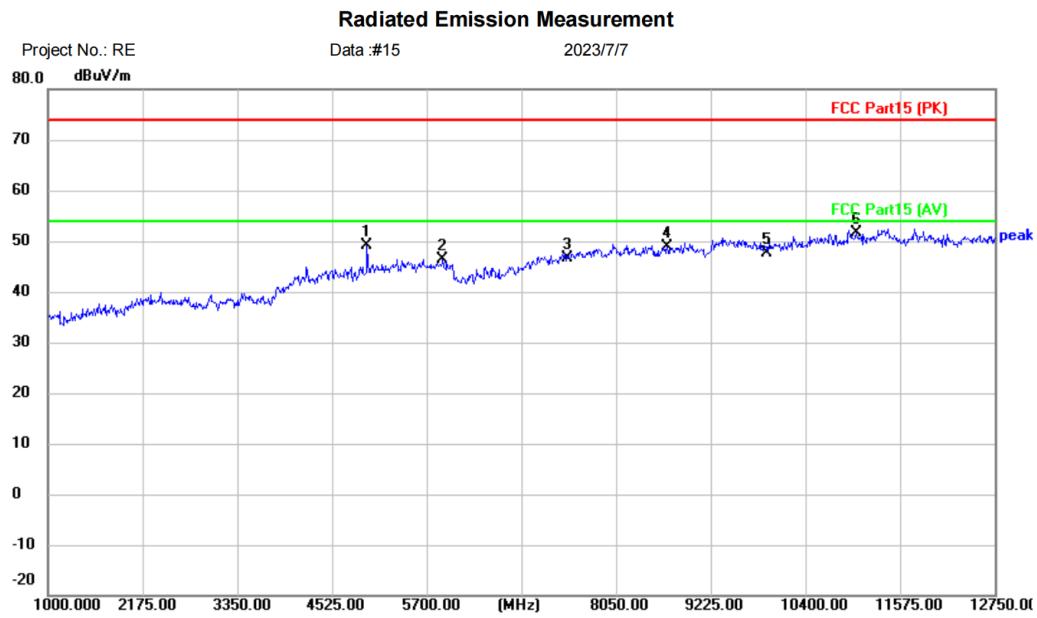
[TestMode: TX middle channel]; [Polarity: Vertical]

Radiated Emission Measurement


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1		4884.000	38.95	4.62	43.57	74.00	-30.43	peak
2		5982.000	39.11	6.71	45.82	74.00	-28.18	peak
3		7326.000	38.65	7.82	46.47	74.00	-27.53	peak
4		8414.250	39.94	8.92	48.86	74.00	-25.14	peak
5		9768.000	37.60	11.77	49.37	74.00	-24.63	peak
6	*	11328.25	38.46	13.39	51.85	74.00	-22.15	peak

Test Result: Pass

[TestMode: TX highest channel]; [Polarity: Horizontal]



Site

Polarization: **Horizontal**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth module

M/N: QZBT628-2

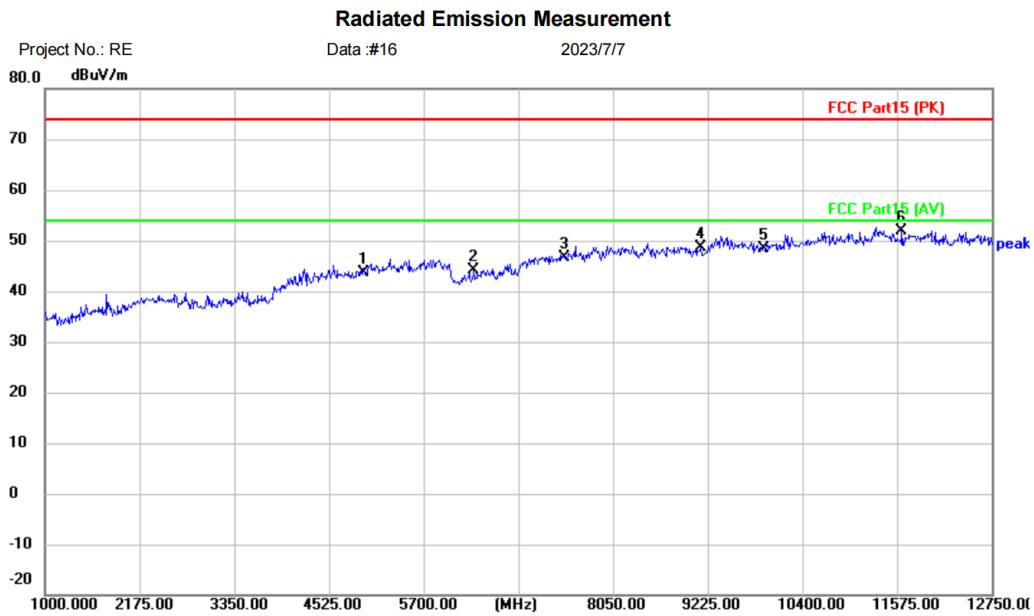
Mode: TX-H

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1		4959.750	43.62	5.47	49.09	74.00	-24.91	peak
2		5899.750	39.55	6.75	46.30	74.00	-27.70	peak
3		7440.000	38.34	8.24	46.58	74.00	-27.42	peak
4		8684.500	38.93	9.84	48.77	74.00	-25.23	peak
5		9920.000	35.78	11.96	47.74	74.00	-26.26	peak
6	*	11034.50	38.05	13.62	51.67	74.00	-22.33	peak

Test Result: Pass

[TestMode: TX highest channel]; [Polarity: Vertical]



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth module

M/N: QZBT628-2

Mode: TX-H

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	38.13	5.47	43.60	74.00	-30.40	peak	
2		6322.750	39.72	4.32	44.04	74.00	-29.96	peak	
3		7440.000	38.41	8.24	46.65	74.00	-27.35	peak	
4		9142.750	37.76	10.98	48.74	74.00	-25.26	peak	
5		9920.000	36.44	11.96	48.40	74.00	-25.60	peak	
6	*	11633.75	38.87	13.09	51.96	74.00	-22.04	peak	

Test Result: Pass

13 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

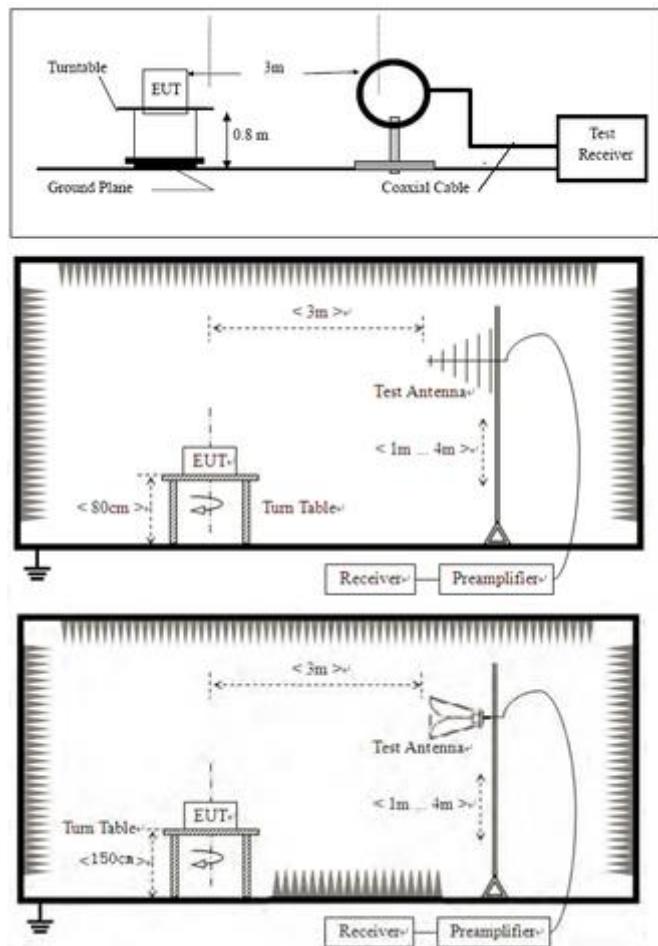
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

13.1 LIMITS

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

13.2 BLOCK DIAGRAM OF TEST SETUP



13.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

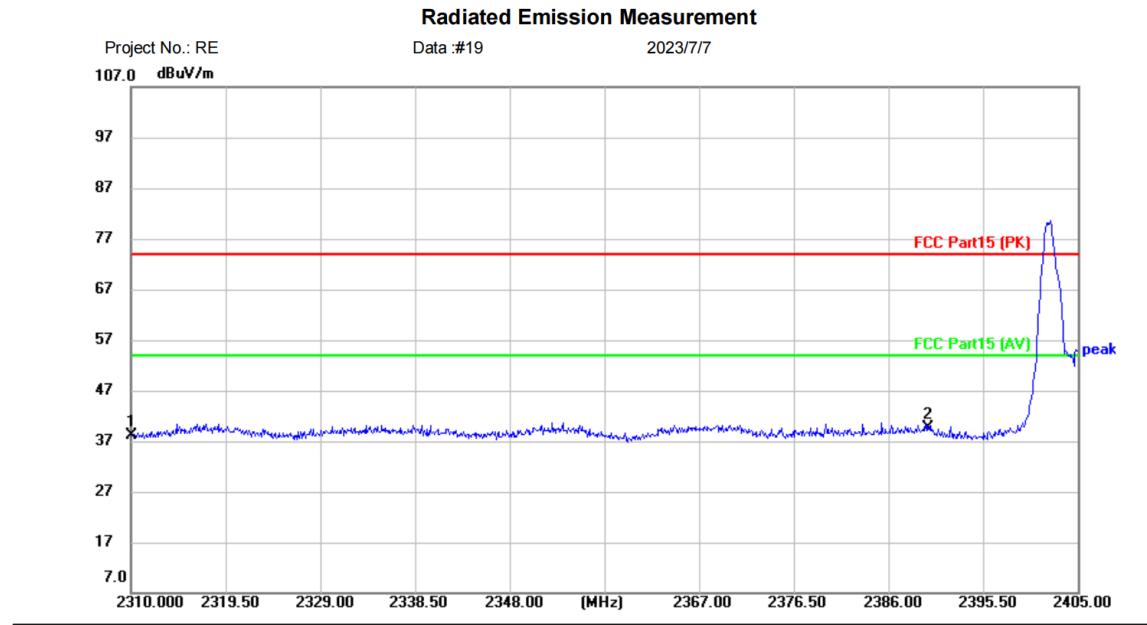
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

BlueAsia

13.4 TEST DATA

[TestMode: TX lowest channel]; [Polarity: Horizontal]



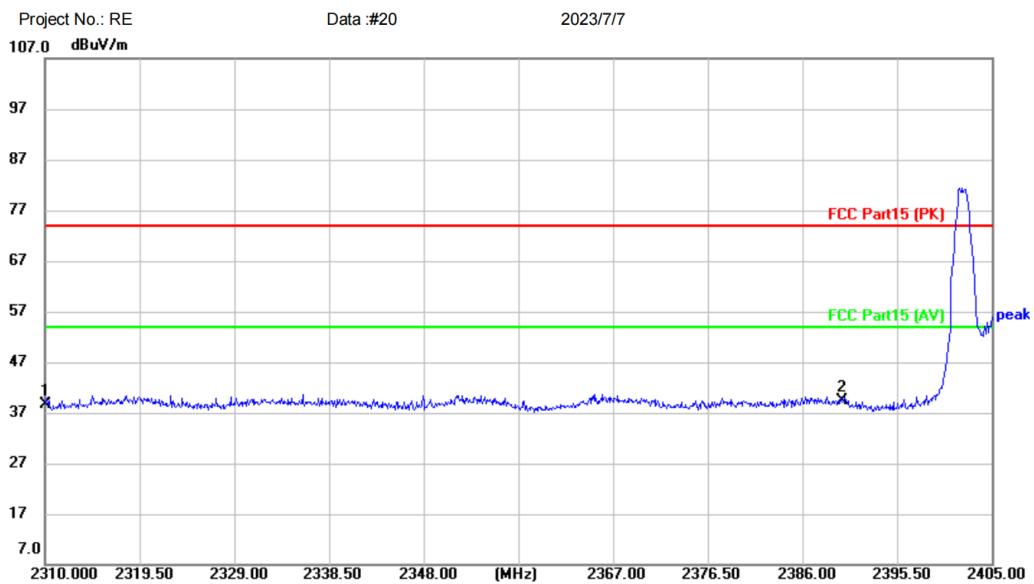
Site	Polarization: <i>Horizontal</i>	Temperature: (C)
Limit: FCC Part15 (PK)	Power:	Humidity: %RH
EUT: Bluetooth module		
M/N: QZBT628-2		
Mode: TX-L		
Note:		

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
1		2310.000	42.64	-4.40	38.24	74.00	-35.76	peak
2	*	2390.000	44.06	-4.31	39.75	74.00	-34.25	peak

Test Result: Pass

[TestMode: TX lowest channel]; [Polarity: Vertical]

Radiated Emission Measurement



Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth module

M/N: QZBT628-2

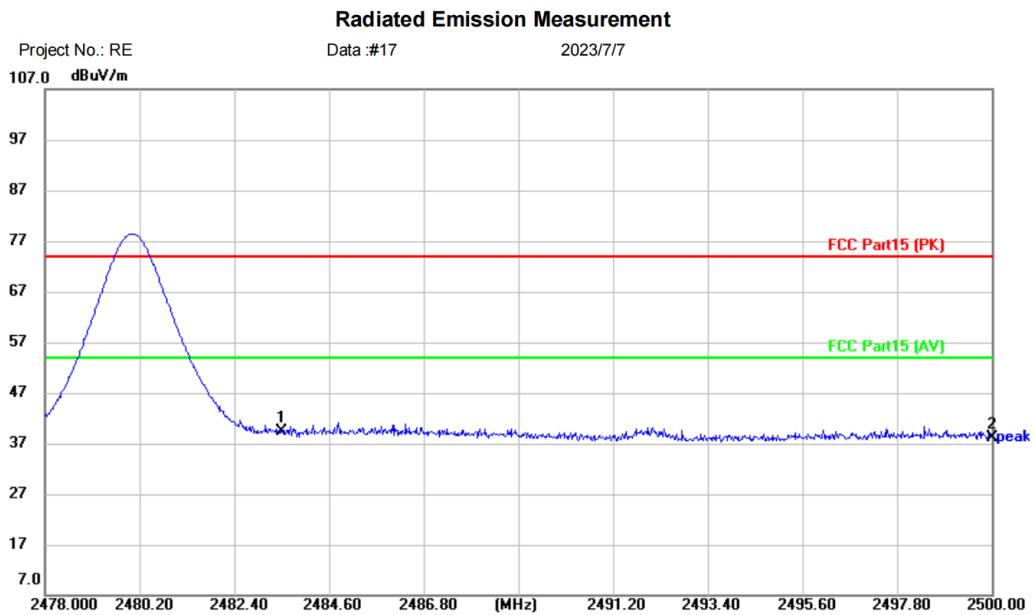
Mode: TX-L

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		2310.000	43.15	-4.40	38.75	74.00	-35.25	peak	
2	*	2390.000	43.62	-4.31	39.31	74.00	-34.69	peak	

Test Result: Pass

[TestMode: TX highest channel]; [Polarity: Horizontal]



Site

Polarization: **Horizontal**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: 00000000000000000000000000000000 %RH

EUT: Bluetooth module

M/N: QZBT628-2

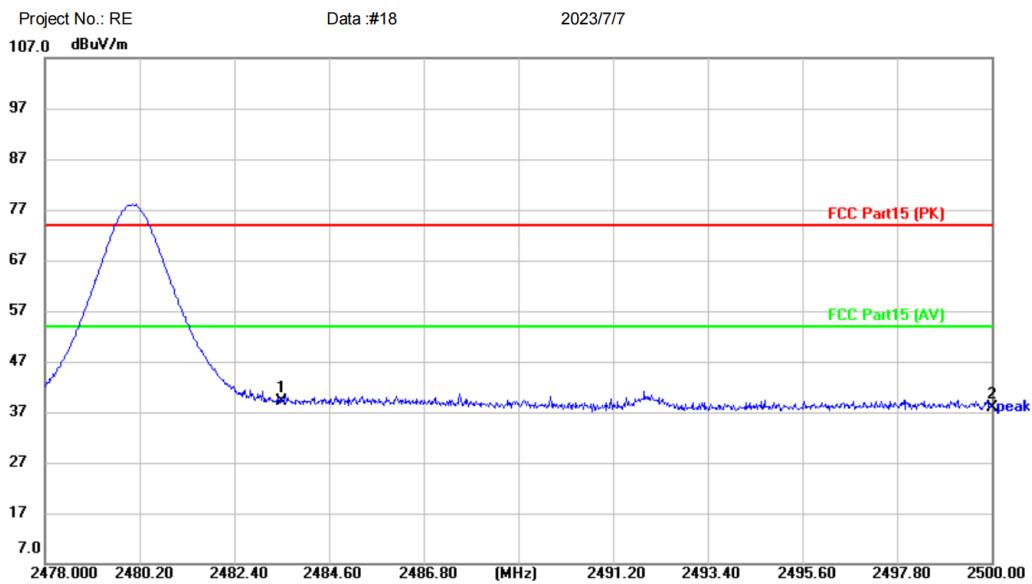
Mode: TX-H

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit			Over
						MHz	dBuV	dB	
1	*	2483.500	43.92	-4.64	39.28	74.00	-34.72	peak	
2		2500.000	42.80	-4.75	38.05	74.00	-35.95	peak	

Test Result: Pass

[TestMode: TX highest channel]; [Polarity: Vertical]

Radiated Emission Measurement


Site

Polarization: **Vertical**

Temperature: (C)

Limit: FCC Part15 (PK)

Power:

Humidity: %RH

EUT: Bluetooth module

M/N: QZBT628-2

Mode: TX-H

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
			MHz	dBuV	dB	dBuV/m	dB		
1	*	2483.500	43.84	-4.64	39.20	74.00	-34.80	peak	
2		2500.000	42.59	-4.75	37.84	74.00	-36.16	peak	

Test Result: Pass

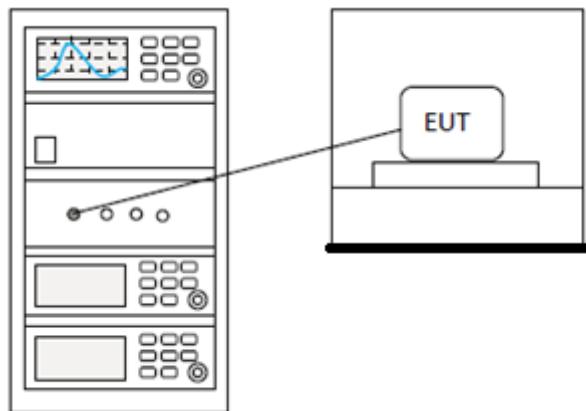
14 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

14.1 LIMITS

Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
---------------	--

14.2 BLOCK DIAGRAM OF TEST SETUP



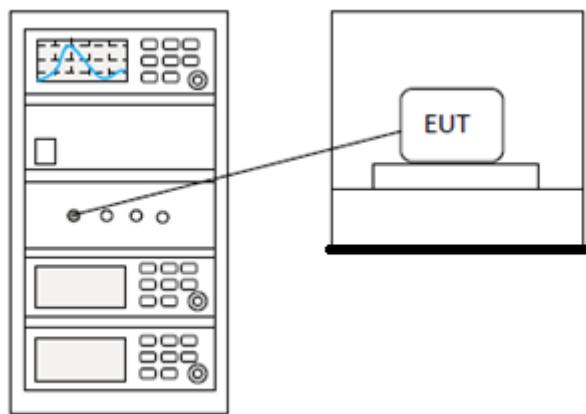
14.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

15 MINIMUM 6DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.7
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

15.1 BLOCK DIAGRAM OF TEST SETUP



15.2 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

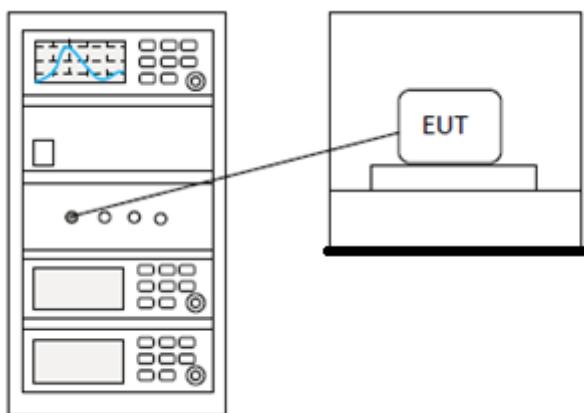
16 CONDUCTED PEAK OUTPUT POWER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

16.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

16.2 BLOCK DIAGRAM OF TEST SETUP



16.3 EST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

BlueAsia

17 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

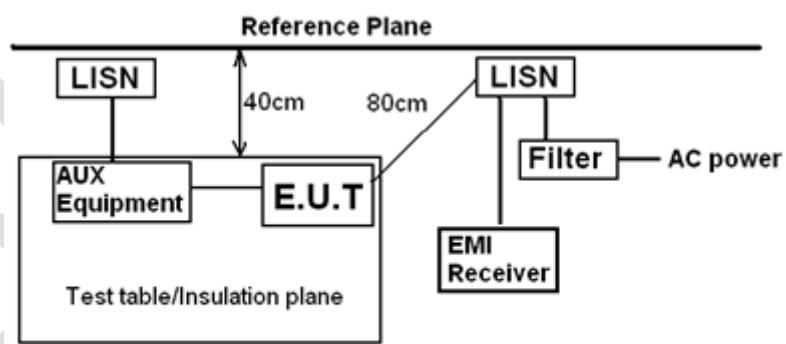
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

17.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

17.2 BLOCK DIAGRAM OF TEST SETUP



Remark
E.U.T. Equipment Under Test
LISN Line Impedance Stabilization Network
Test table height=0.8m

17.3 PROCEDURE

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50H + 50hm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

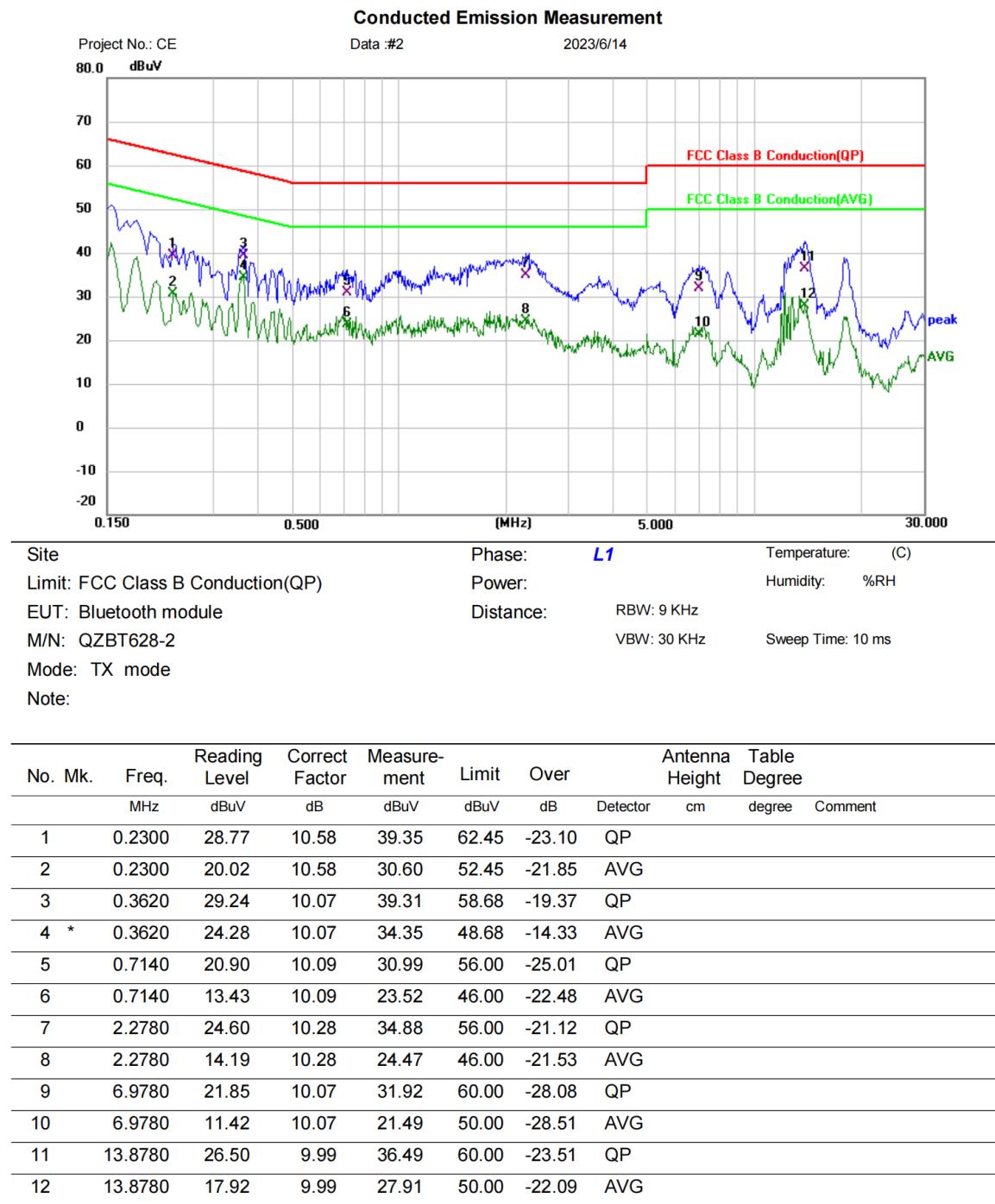
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

BlueAsia

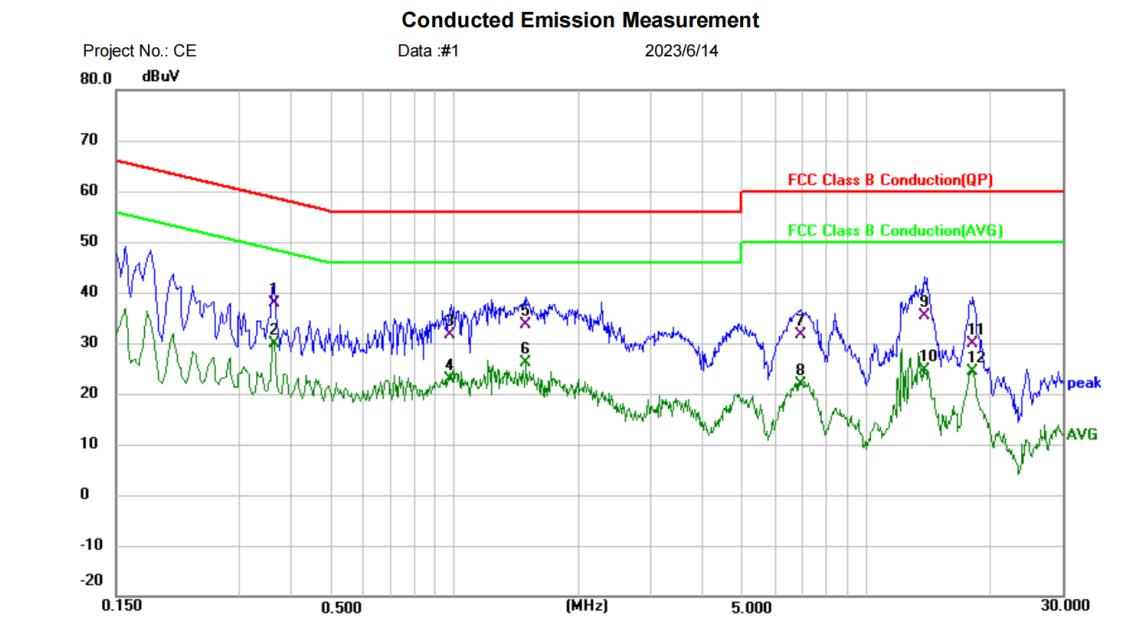
17.4 TEST DATA

[TestMode: TX mode]; [Line: Line];[Power:120V/60Hz]



Test Result: Pass

[TestMode: TX mode]; [Line: Nutral];[Power:120V/60Hz]



Site: Phase: **N** Temperature: (C)
 Limit: FCC Class B Conduction(QP) Power: Humidity: %RH
 EUT: Bluetooth module Distance: RBW: 9 KHz
 M/N: QZBT628-2 VBW: 30 KHz Sweep Time: 10 ms
 Mode: TX mode
 Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	Degree
			Level	Factor	ment					
		MHz	dBuV	dB	dBuV					
1		0.3620	27.80	10.06	37.86	58.68	-20.82	QP		
2 *		0.3620	19.71	10.06	29.77	48.68	-18.91	AVG		
3		0.9740	21.74	10.01	31.75	56.00	-24.25	QP		
4		0.9740	12.89	10.01	22.90	46.00	-23.10	AVG		
5		1.4900	23.65	10.06	33.71	56.00	-22.29	QP		
6		1.4900	16.05	10.06	26.11	46.00	-19.89	AVG		
7		6.9500	21.79	9.87	31.66	60.00	-28.34	QP		
8		6.9500	11.99	9.87	21.86	50.00	-28.14	AVG		
9		13.9100	25.25	10.03	35.28	60.00	-24.72	QP		
10		13.9100	14.69	10.03	24.72	50.00	-25.28	AVG		
11		18.1580	19.73	10.03	29.76	60.00	-30.24	QP		
12		18.1580	14.26	10.03	24.29	50.00	-25.71	AVG		

Test Result: Pass

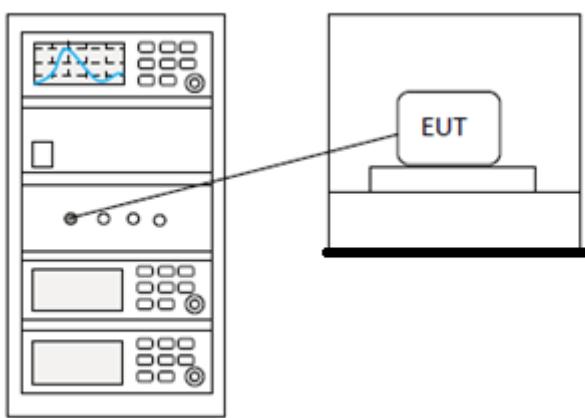
18 POWER SPECTRUM DENSITY

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.10.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Aiden
Temperature	25 °C
Humidity	51%

18.1 LIMITS

Limit: $\leq 8\text{dBm}$ in any 3 kHz band during any time interval of continuous transmission

18.2 BLOCK DIAGRAM OF TEST SETUP



18.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

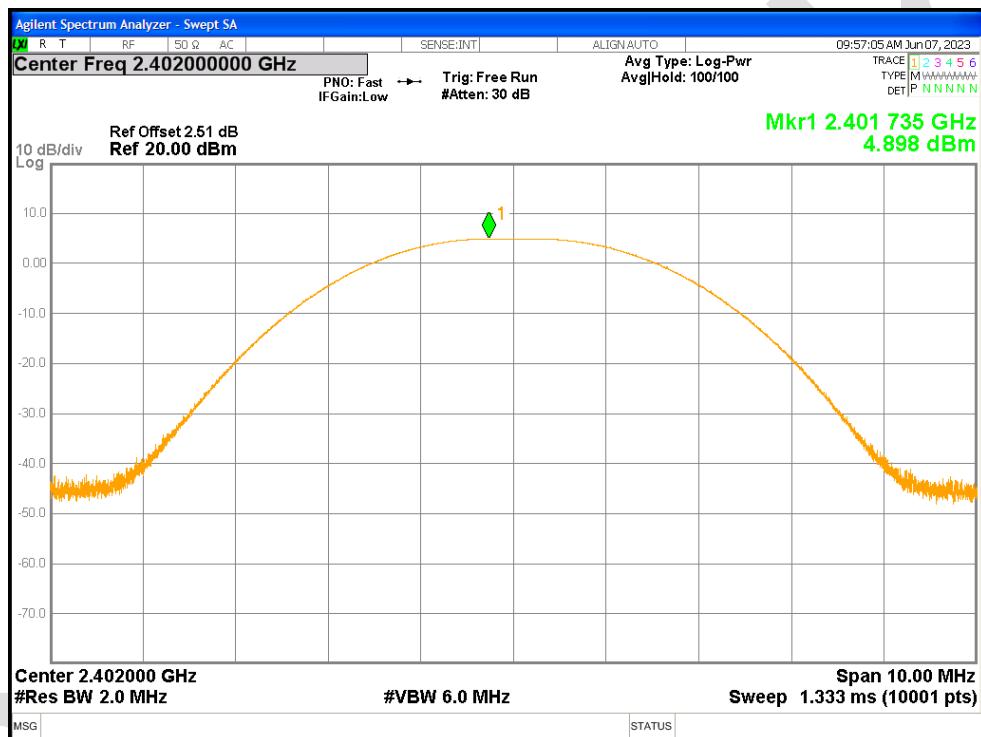
19 APPENDIX

Appendix1

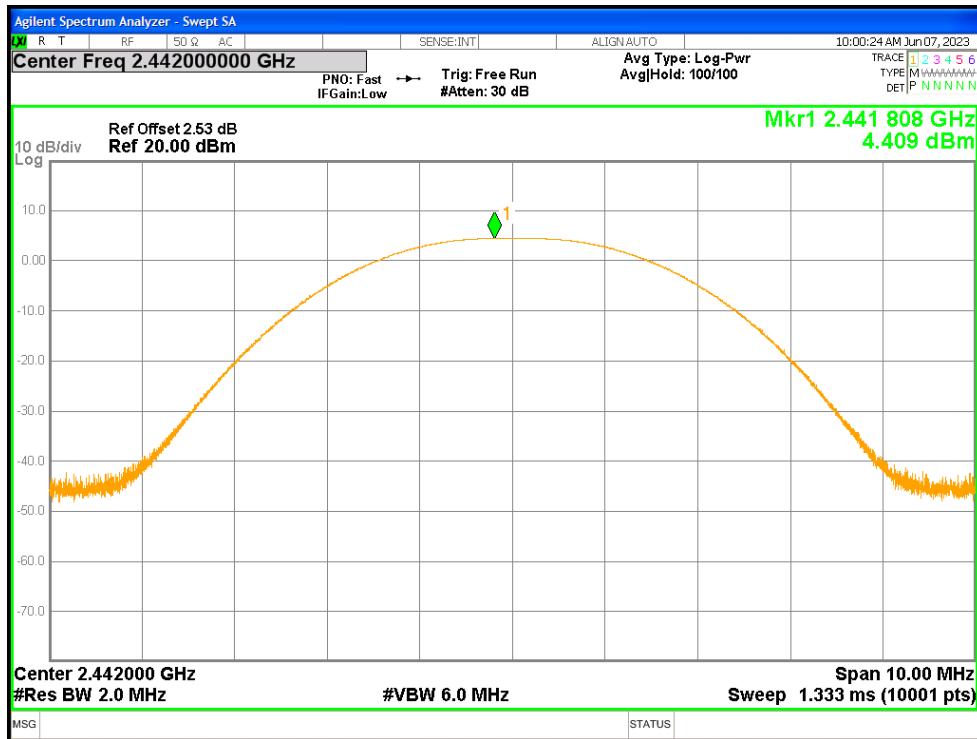
19.1 MAXIMUM CONDUCTED OUTPUT POWER

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE	2402	Ant1	4.898	30	Pass
NVNT	BLE	2442	Ant1	4.409	30	Pass
NVNT	BLE	2480	Ant1	5.048	30	Pass

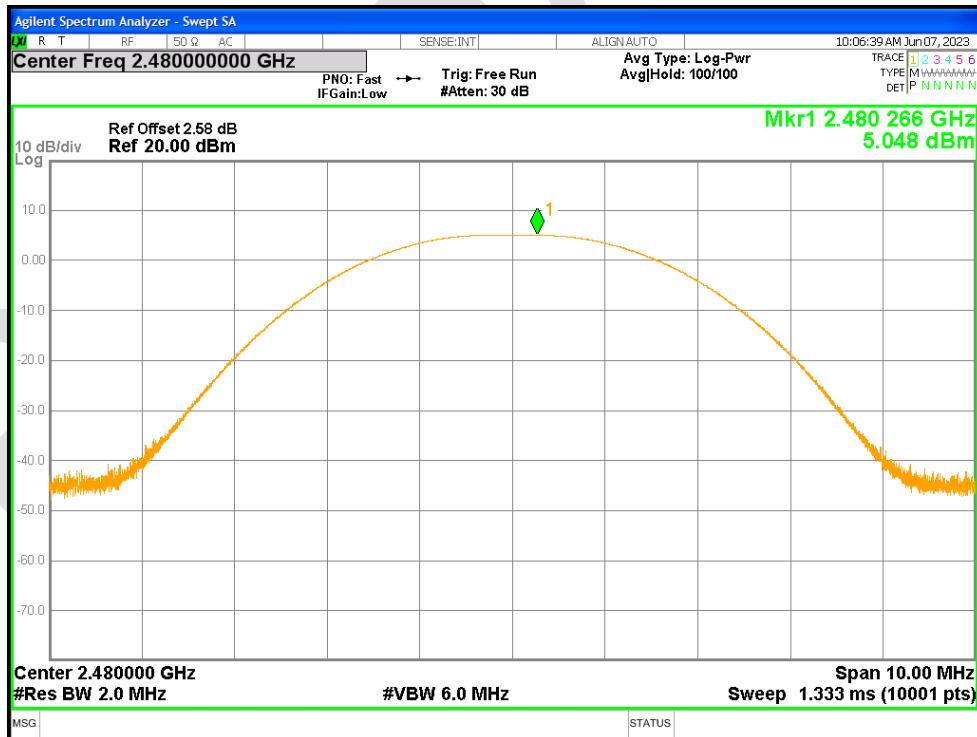
Power NVNT BLE 1M 2402MHz Ant1



Power NVNT BLE 1M 2442MHz Ant1



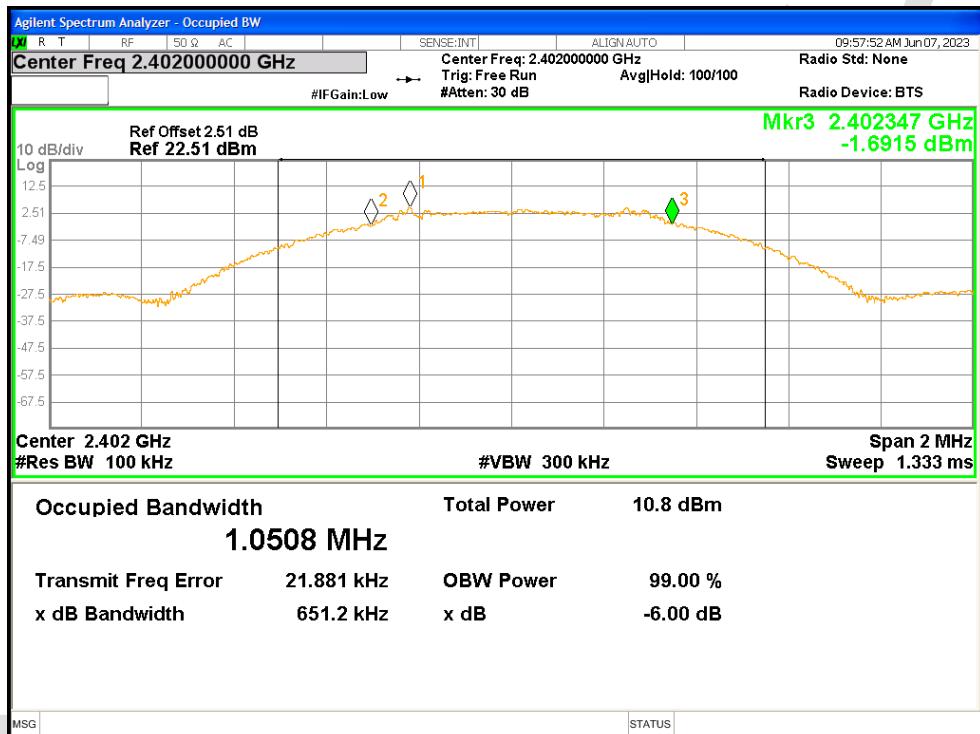
Power NVNT BLE 1M 2480MHz Ant1



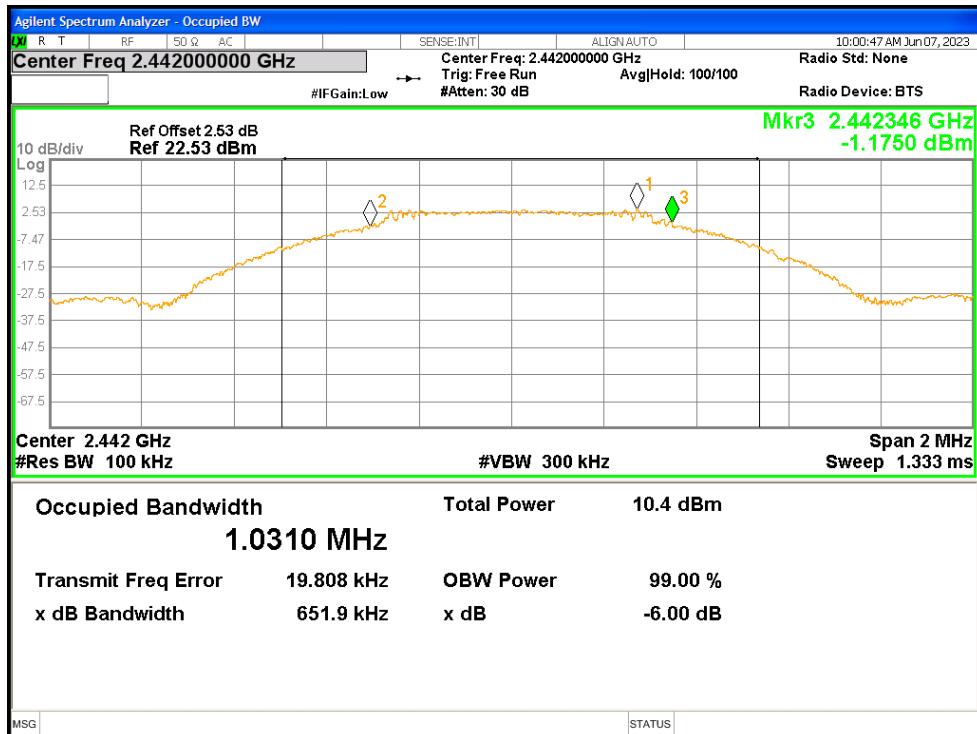
19.2 -6DB BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	Ant1	0.6512	0.5	Pass
NVNT	BLE 1M	2442	Ant1	0.6519	0.5	Pass
NVNT	BLE 1M	2480	Ant1	0.6626	0.5	Pass

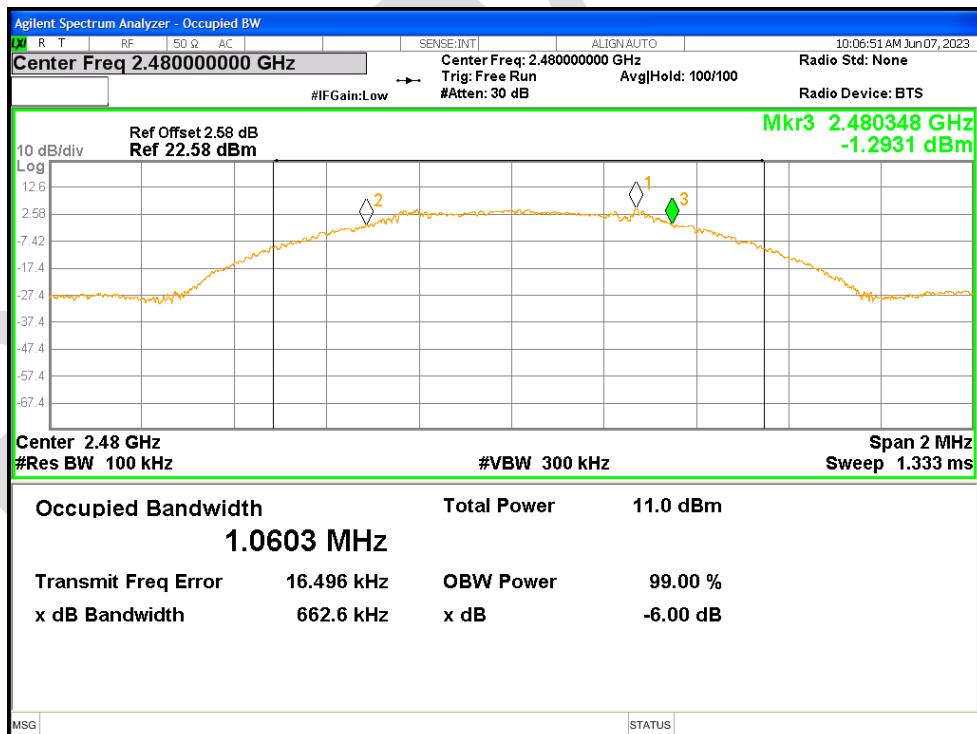
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 1M 2442MHz Ant1



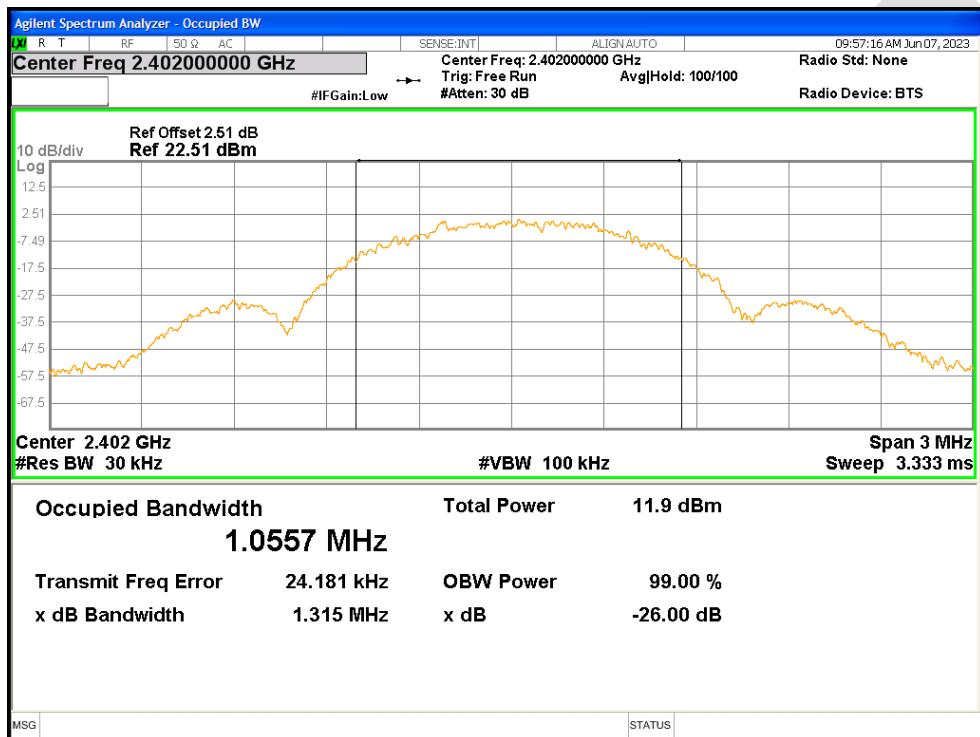
-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1

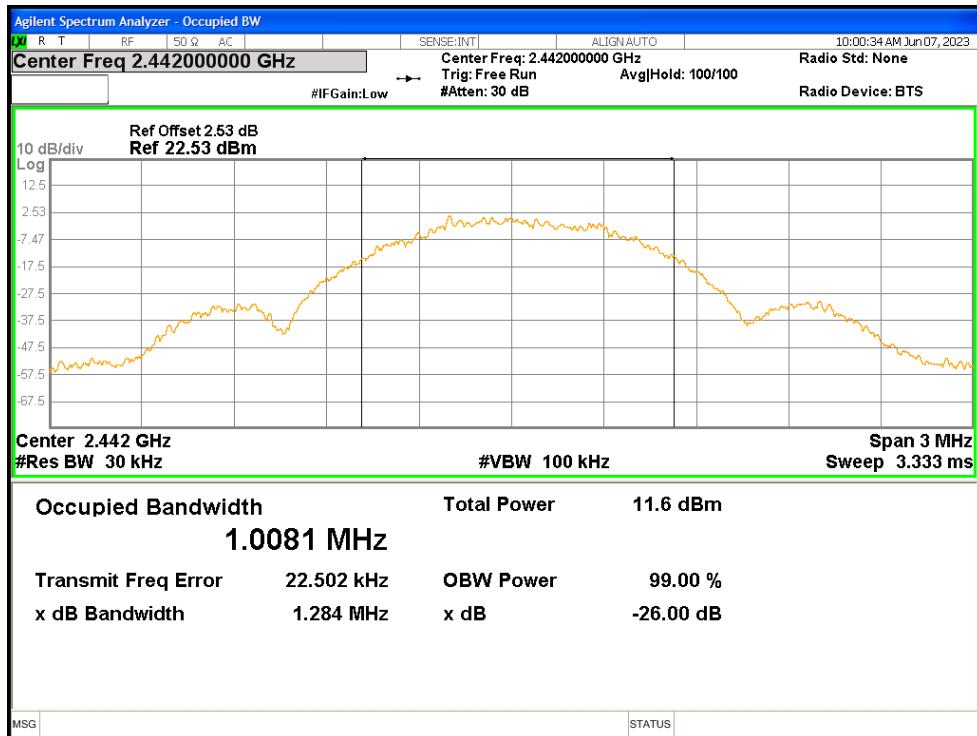
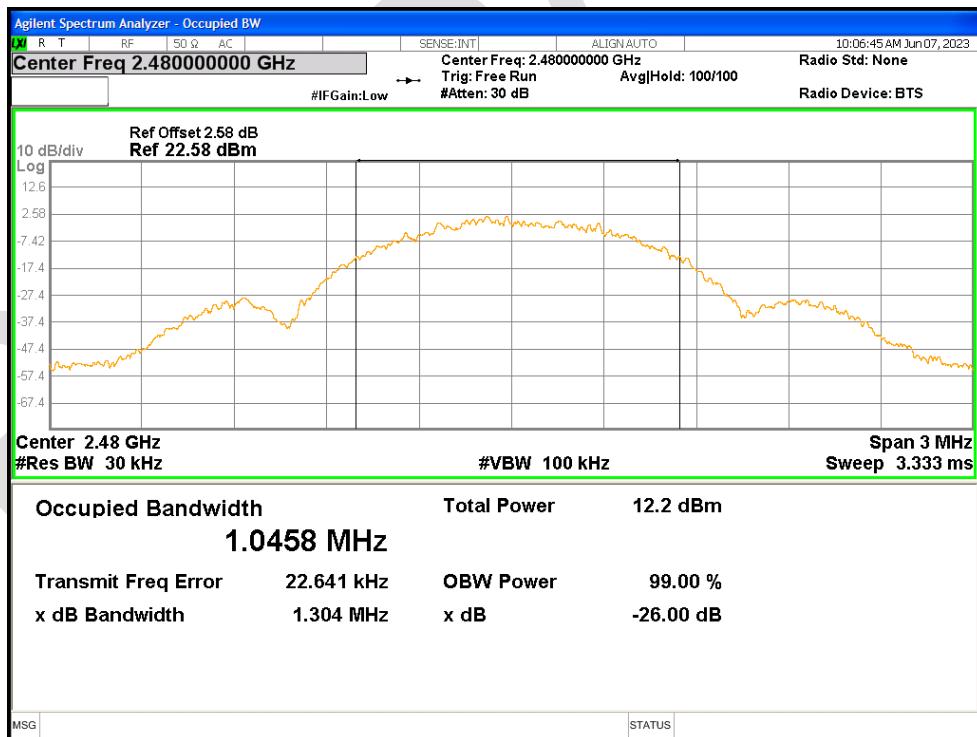


19.3 OCCUPIED CHANNEL BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE 1M	2402	Ant1	1.0557
NVNT	BLE 1M	2442	Ant1	1.0081
NVNT	BLE 1M	2480	Ant1	1.0458

OBW NVNT BLE 1M 2402MHz Ant1

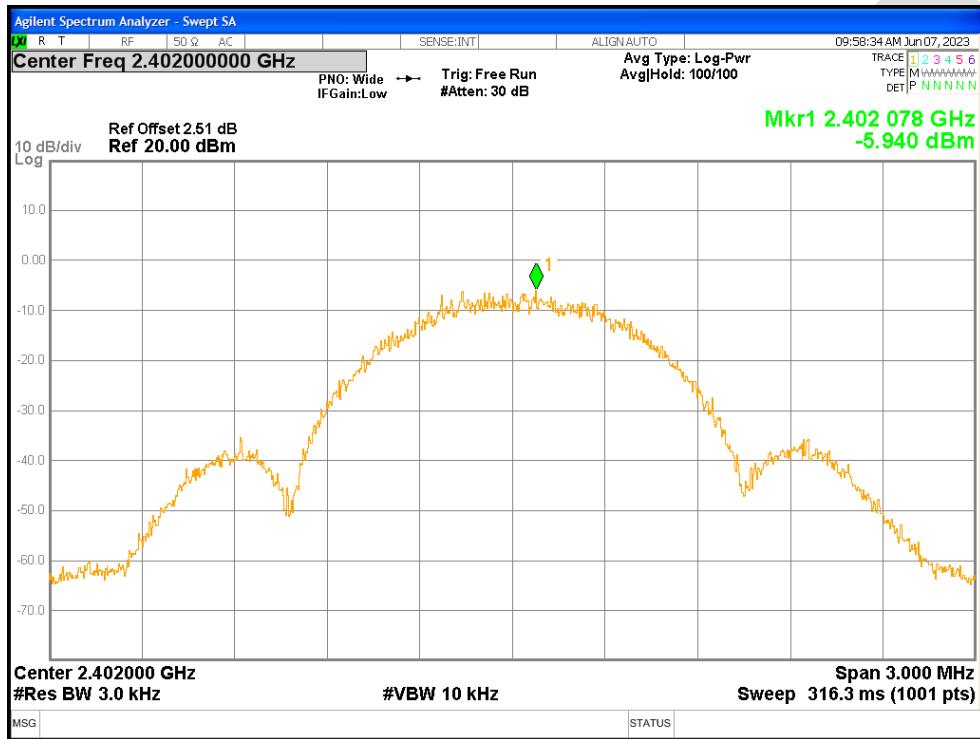


OBW NVNT BLE 1M 2442MHz Ant1

OBW NVNT BLE 1M 2480MHz Ant1


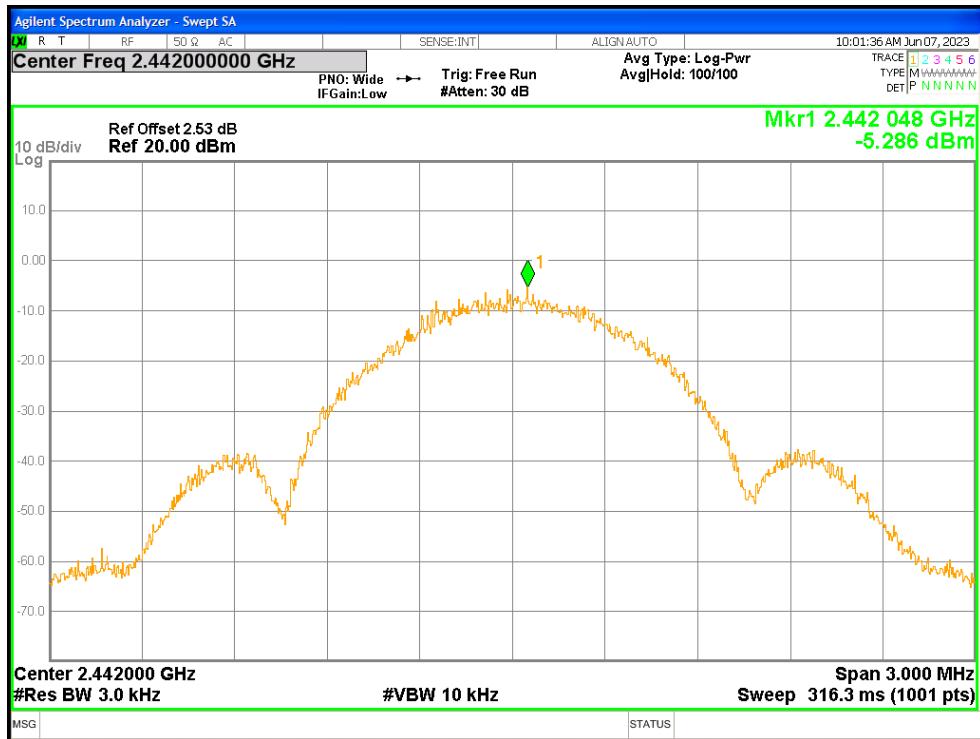
19.4 MAXIMUM POWER SPECTRAL DENSITY LEVEL

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-5.940	8	Pass
NVNT	BLE 1M	2442	Ant1	-5.286	8	Pass
NVNT	BLE 1M	2480	Ant1	-5.130	8	Pass

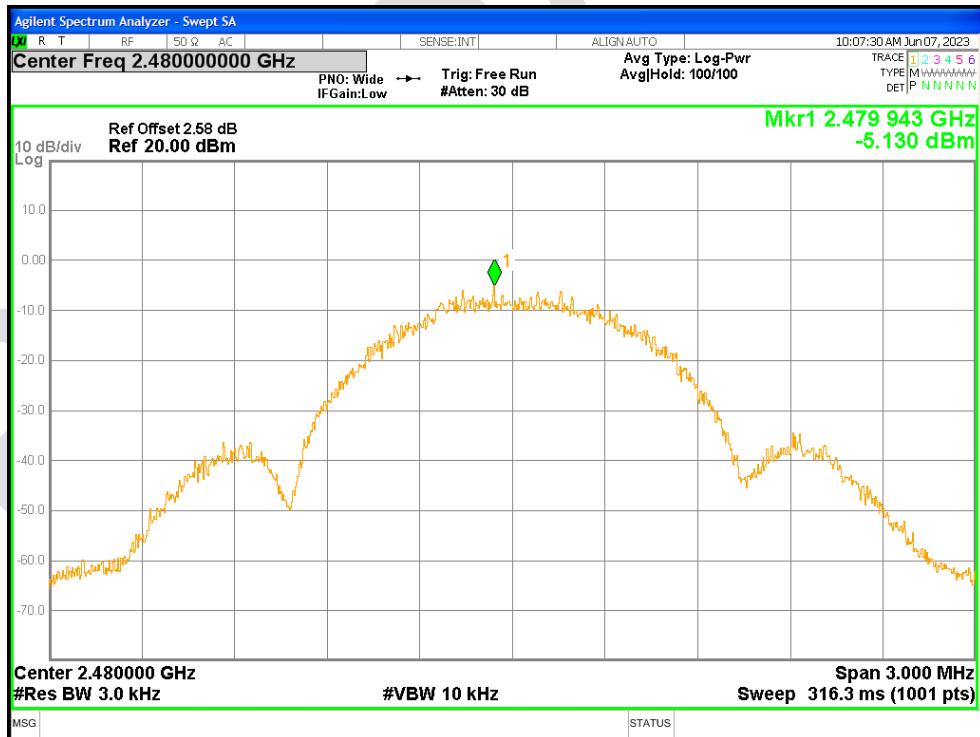
PSD NVNT BLE 1M 2402MHz Ant1



PSD NVNT BLE 1M 2442MHz Ant1



PSD NVNT BLE 1M 2480MHz Ant1



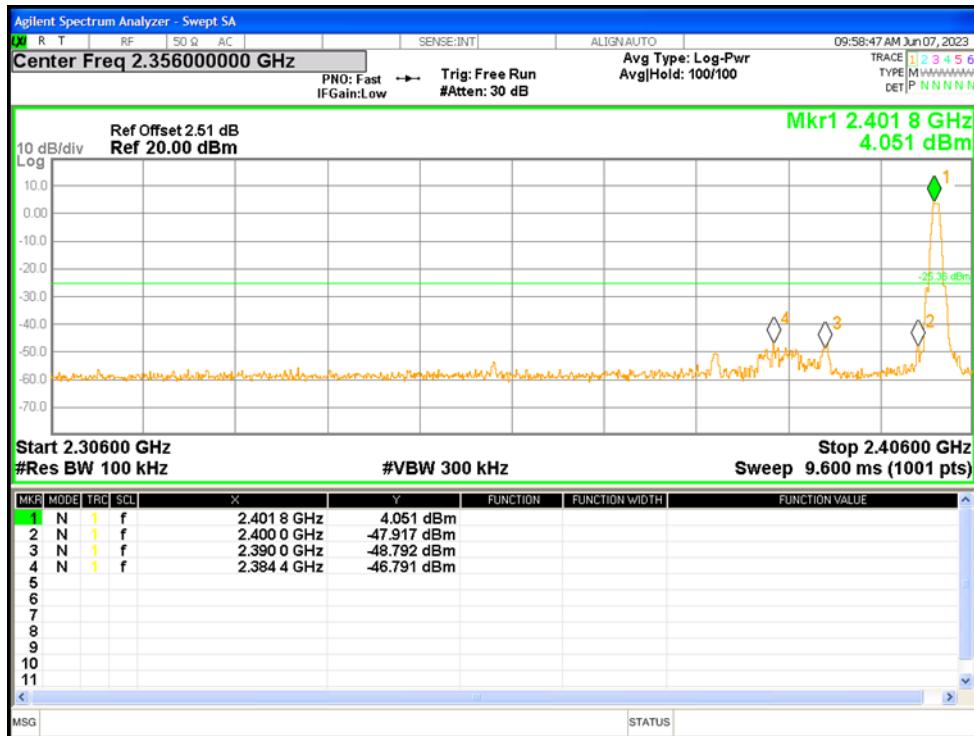
19.5 BAND EDGE

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-51.43	-30	Pass
NVNT	BLE 1M	2480	Ant1	-49.62	-30	Pass

Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



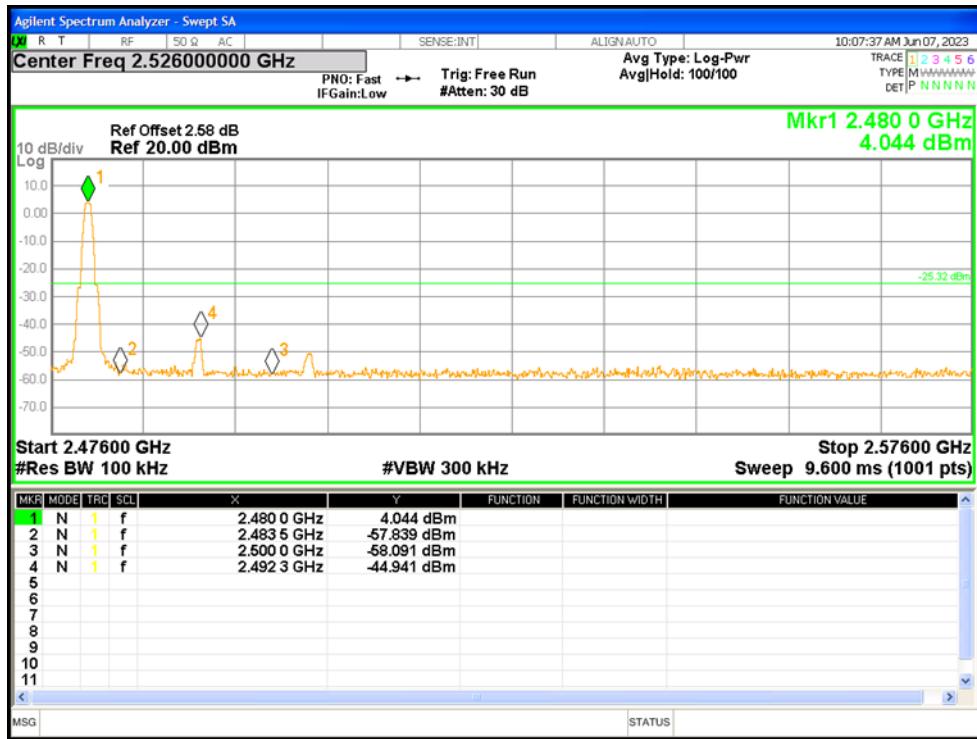
Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



Band Edge NVNT BLE 1M 2480MHz Ant1 Ref



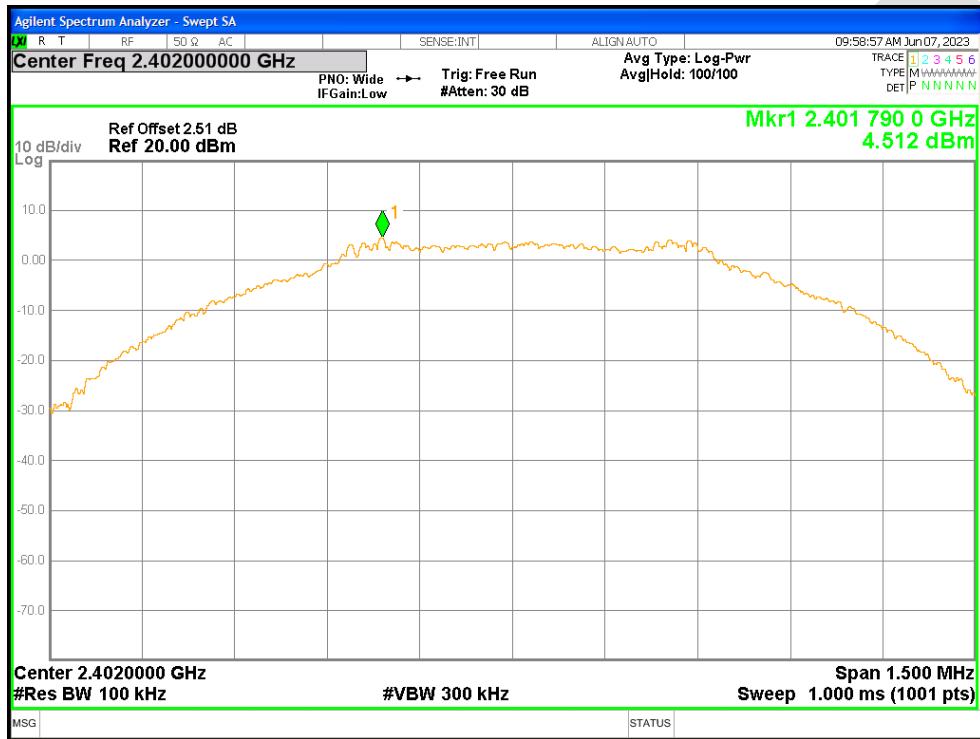
Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



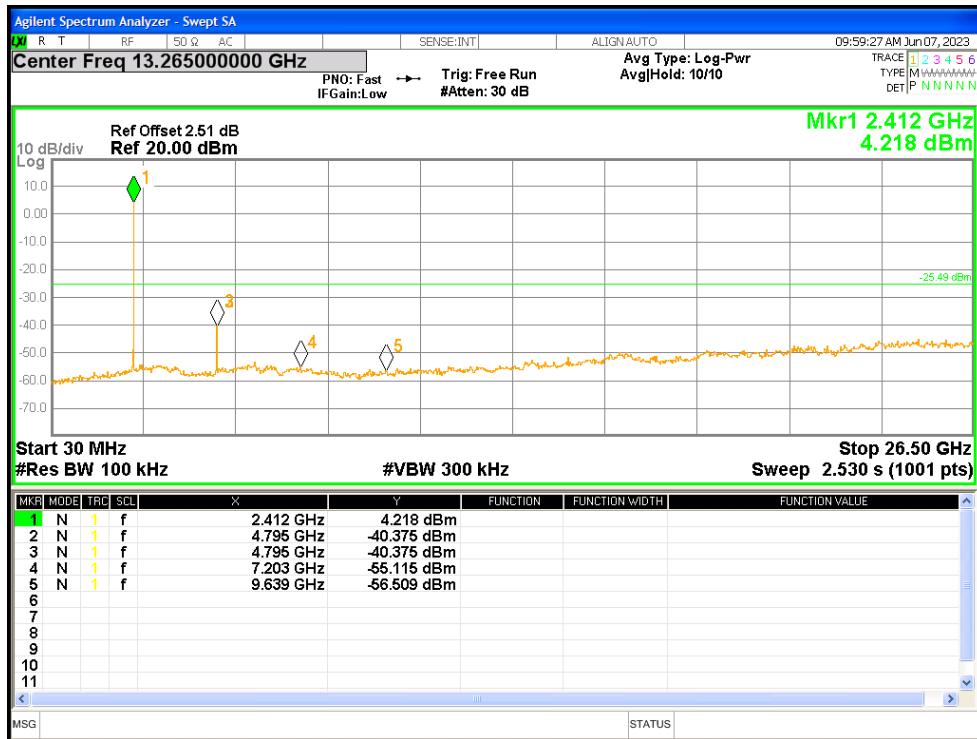
19.6 CONDUCTED RF SPURIOUS EMISSION

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-44.88	-30	Pass
NVNT	BLE 1M	2442	Ant1	-44.44	-30	Pass
NVNT	BLE 1M	2480	Ant1	-45.39	-30	Pass

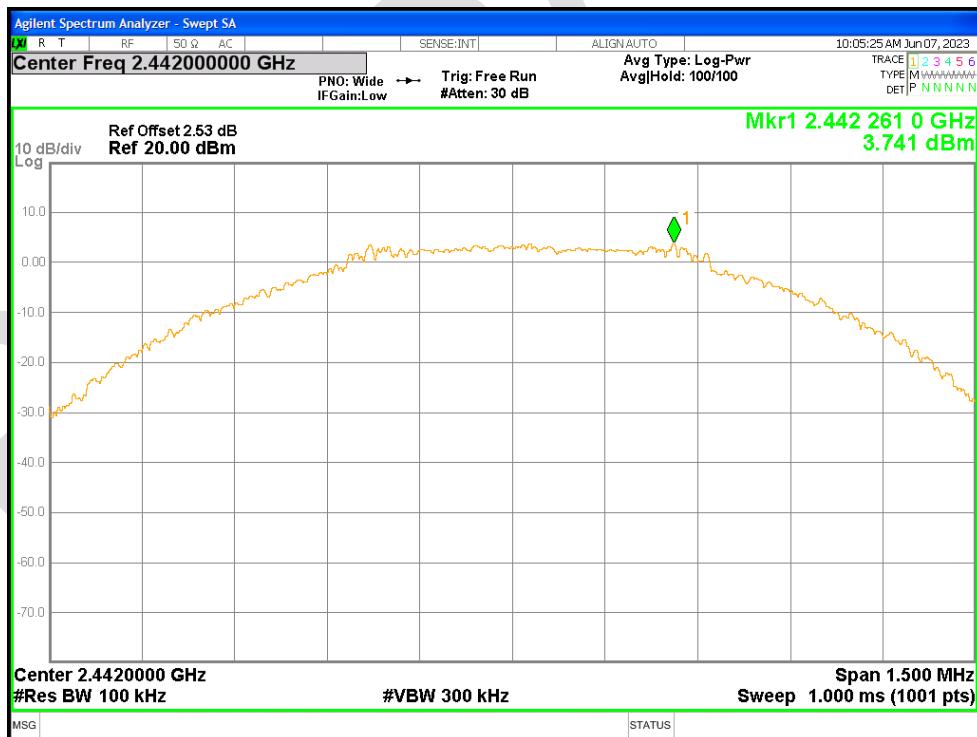
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref



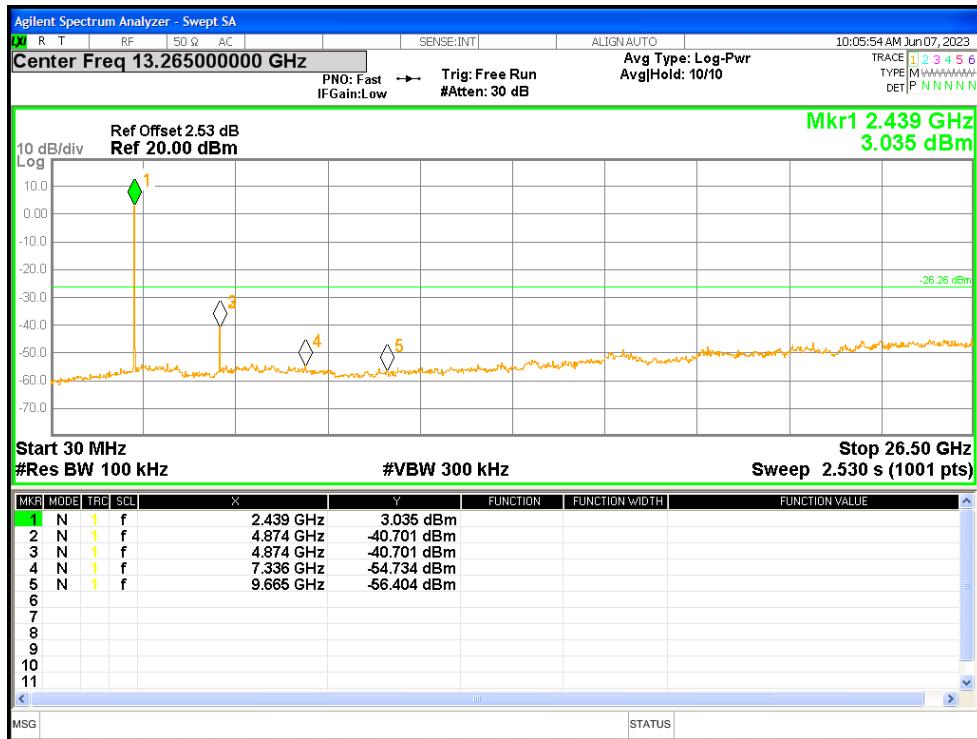
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



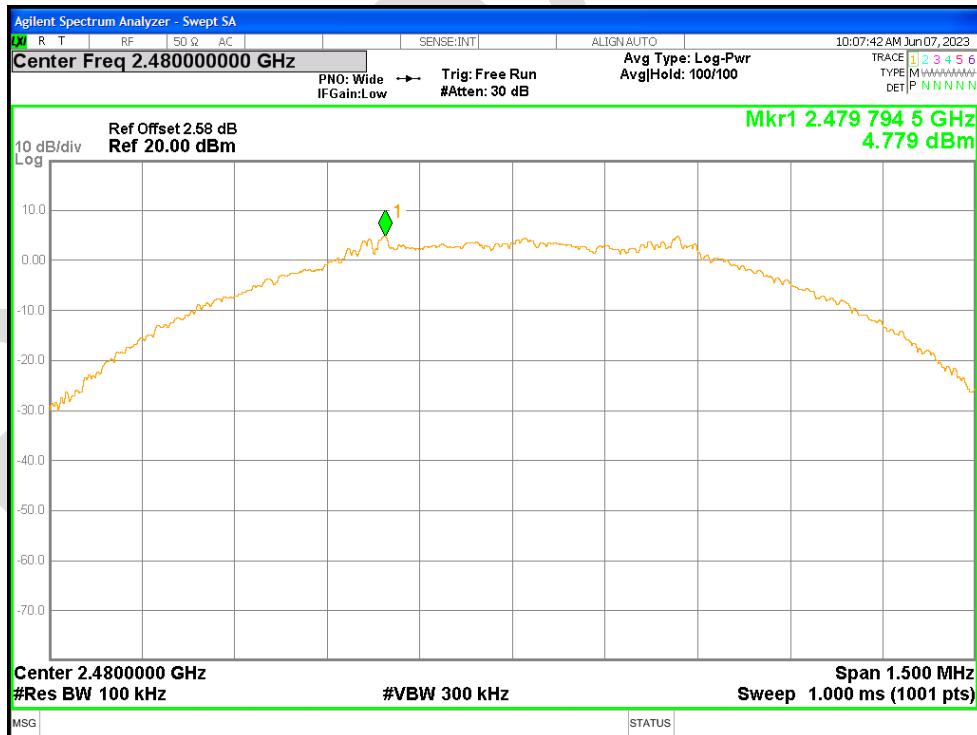
Tx. Spurious NVNT BLE 1M 2442MHz Ant1 Ref



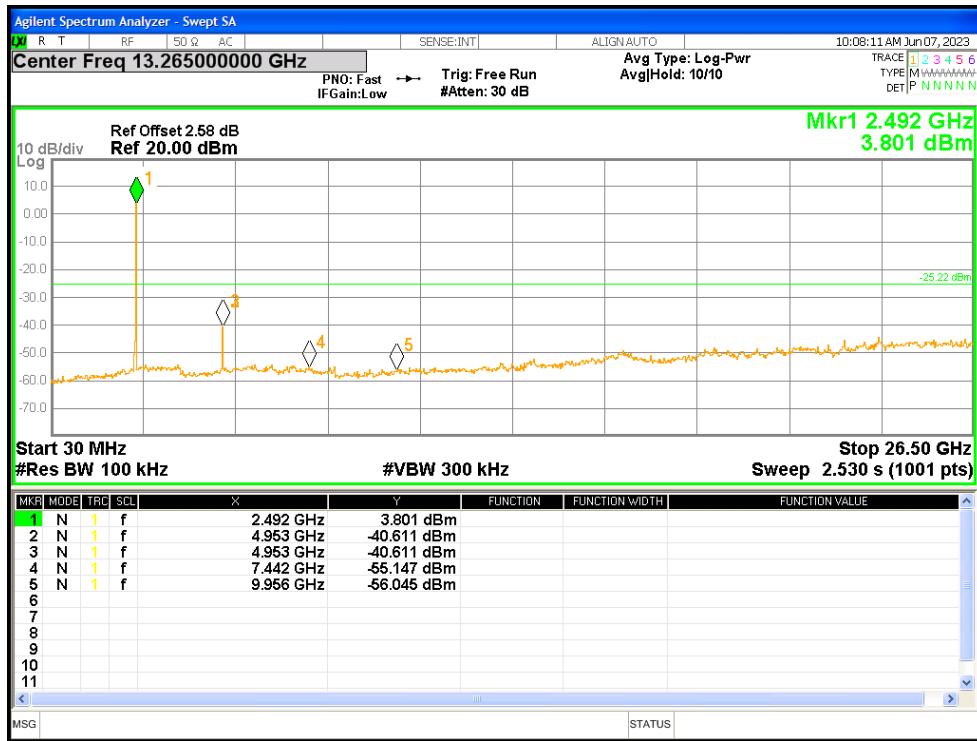
Tx. Spurious NVNT BLE 1M 2442MHz Ant1 Emission



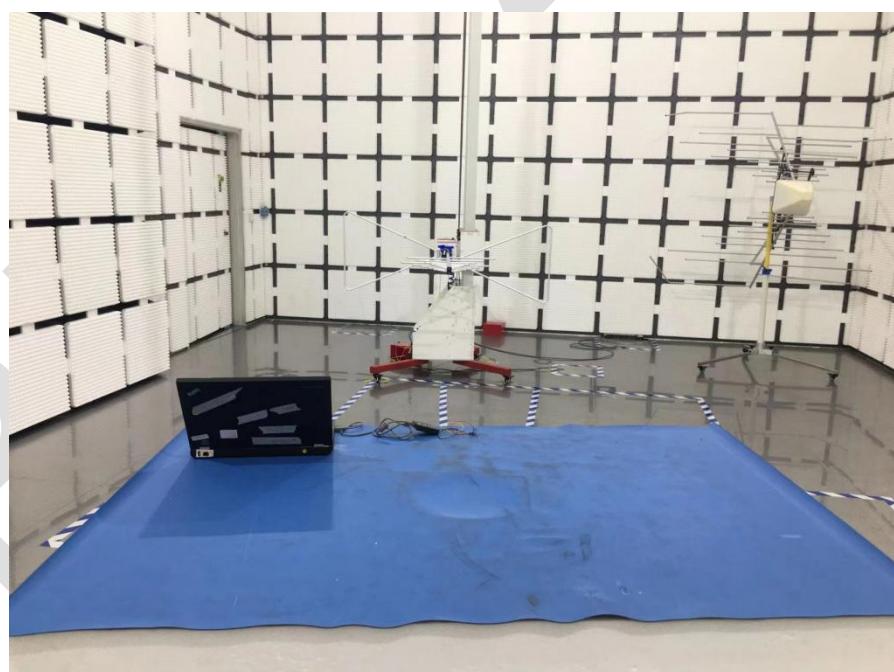
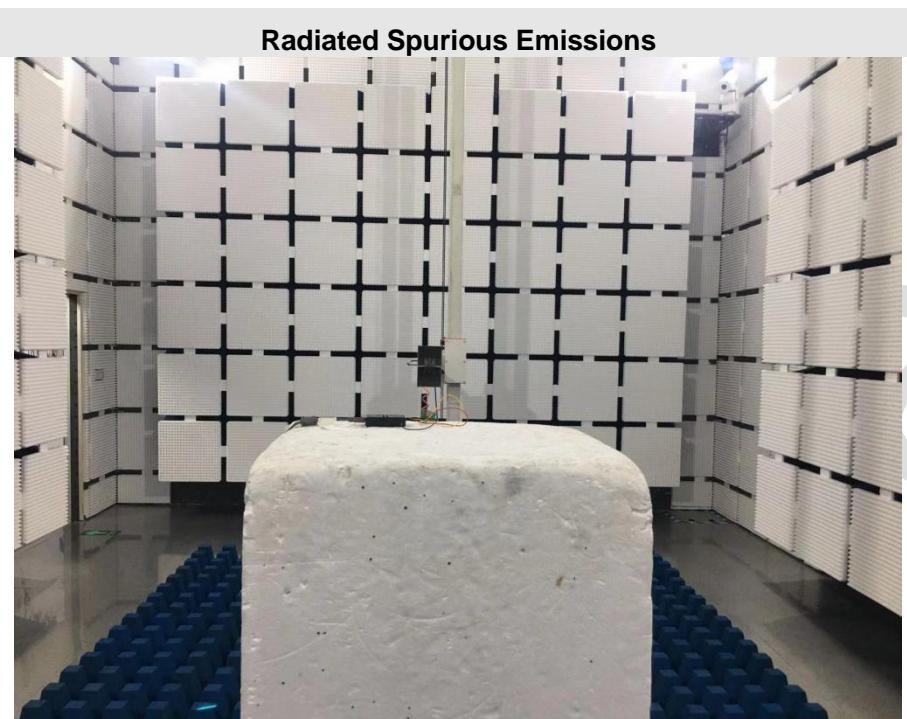
Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



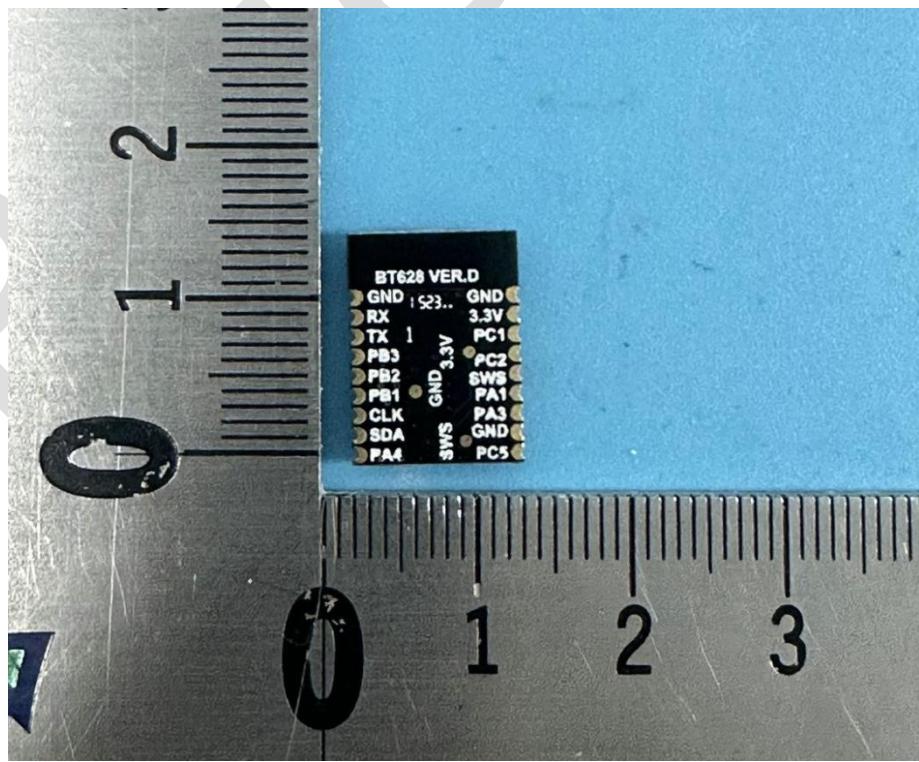
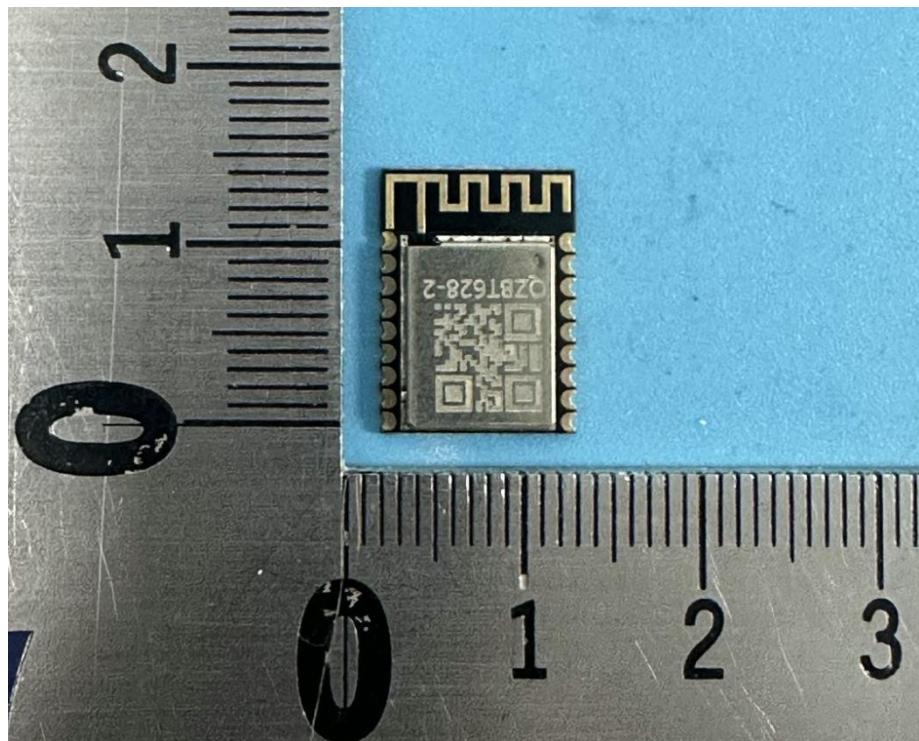
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

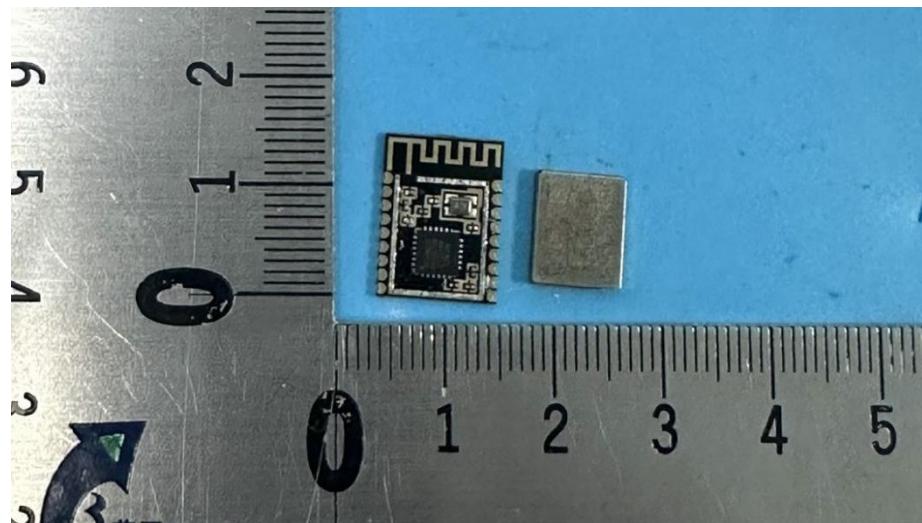


Conducted Emissions at AC Power Line (150kHz-30MHz)



APPENDIX B: PHOTOGRAPHS OF EUT





----END OF REPORT----

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of BlueAsia, this report can't be reproduced except in full.