

TEST REPORT

Product Name : LED Bluetooth Beanie Hat
Brand Mark : N/A
Model No. : Z1
Extension model : ZA; ZB; ZC; ZD; ZE; ZF
Report Number : BLA-EMC-202206-A8402
FCC ID : 2A7MSZNLZ1
Date of Sample Receipt : 2022/6/22
Date of Test : 2022/6/22 to 2022/7/4
Date of Issue : 2022/7/4
Test Standard : 47 CFR Part 15, Subpart C 15.247
Test Result : Pass

Prepared for:

Shenzhenshi Zhonghuijia Technology Co., LTD
603, No.38, Zone 1, Yangtaishan Village, Tongsheng Community, Dalang
Street, Longhua District, Shenzhen

Prepared by:

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

Compiled by: *Charlie*
Approved by: *Blue Zhong*

Review by: *Sueels*
Date: 2022/7/4



REPORT REVISE RECORD

Version No.	Date	Description
00	2022/7/4	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	13
10.1	CONCLUSION	13
11	CONDUCTED SPURIOUS EMISSIONS	14
11.1	LIMITS	14
11.2	BLOCK DIAGRAM OF TEST SETUP	14
11.3	TEST DATA	15
12	20DB BANDWIDTH	16
12.1	BLOCK DIAGRAM OF TEST SETUP	16
12.2	TEST DATA	16
13	CONDUCTED PEAK OUTPUT POWER	17
13.1	LIMITS	17
13.2	BLOCK DIAGRAM OF TEST SETUP	17
13.3	TEST DATA	18
14	CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)	19
14.1	LIMITS	19
14.2	BLOCK DIAGRAM OF TEST SETUP	19
14.3	PROCEDURE	19
14.4	TEST DATA	21
15	RADIATED SPURIOUS EMISSIONS	23
15.1	LIMITS	23

15.2	BLOCK DIAGRAM OF TEST SETUP	24
15.3	PROCEDURE	24
15.4	TEST DATA	26
16	RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	34
16.1	LIMITS	34
16.2	BLOCK DIAGRAM OF TEST SETUP	35
16.3	PROCEDURE	35
16.4	TEST DATA	37
17	CONDUCTED BAND EDGES MEASUREMENT	41
17.1	LIMITS	41
17.2	BLOCK DIAGRAM OF TEST SETUP	41
17.3	TEST DATA	42
18	DWELL TIME	43
18.1	LIMITS	43
18.2	BLOCK DIAGRAM OF TEST SETUP	43
18.3	TEST DATA	44
19	HOPPING CHANNEL NUMBER	45
19.1	LIMITS	45
19.2	BLOCK DIAGRAM OF TEST SETUP	45
19.3	TEST DATA	45
20	CARRIER FREQUENCIES SEPARATION	46
20.1	LIMITS	46
20.2	BLOCK DIAGRAM OF TEST SETUP	46
20.3	TEST DATA	46
21	APPENDIX	47
APPENDIX A: PHOTOGRAPHS OF TEST SETUP		94
APPENDIX B: PHOTOGRAPHS OF EUT		96

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
20dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	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
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
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass

2 GENERAL INFORMATION

Applicant	Shenzhenshi Zhonghuijia Technology Co., LTD
Address	603, No.38, Zone 1, Yangtaishan Village, Tongsheng Community, Dalang Street, Longhua District, Shenzhen
Manufacturer	Shenzhenshi Zhonghuijia Technology Co., LTD
Address	603, No.38, Zone 1, Yangtaishan Village, Tongsheng Community, Dalang Street, Longhua District, Shenzhen
Factory	Shenzhenshi Zhonghuijia Technology Co., LTD
Address	603, No.38, Zone 1, Yangtaishan Village, Tongsheng Community, Dalang Street, Longhua District, Shenzhen
Product Name	LED Bluetooth Beanie Hat
Test Model No.	Z1
Extension Model	ZA; ZB; ZC; ZD; ZE; ZF
Remark	All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are model name for commercial purpose

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	SST263_V07
Software Version	V003
Operation Frequency:	2402MHz-2480MHz
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Channel Spacing:	1MHz
Number of Channels:	79
Antenna Type:	PCB Antenna
Antenna Gain:	-0.68dBi(Provided by the applicant)

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	3.7Vdc

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation. (hopping and non hopping mode all have been tested, non hopping mode is worse case for RE)
Remark: Full battery is used during all test except ac conducted emission, DH1,DH3, DH5 all have been tested, during the test, GFSK, Pi/4QPSK, 8-DPSK modulation were all pre-scanned only 8-DPSK worse case is reported.	

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-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
AC Adapter	UGREEN	CD112	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 Conducted Spurious Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of 20dB Bandwidth					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Conducted Peak Output Power					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

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	25/11/2020	24/11/2023
Receiver	R&S	ESPI3	101082	24/9/2021	23/9/2022
LISN	R&S	ENV216	3560.6550.15	24/9/2021	23/9/2022
LISN	AT	AT166-2	AKK1806000003	26/9/2021	25/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A

Test Equipment Of Radiated Spurious Emissions

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	10/11/2020	9/11/2023
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Receiver	R&S	ESR7	101199	24/9/2021	23/9/2022
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	26/9/2020	25/9/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	26/9/2020	25/9/2022
Amplifier	SKET	LNPA-0118-45	N/A	24/9/2021	23/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	26/9/2020	25/9/2022

Test Equipment Of Radiated Emissions which fall in the restricted bands

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	10/11/2020	9/11/2023
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Receiver	R&S	ESR7	101199	24/9/2021	23/9/2022

broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	26/9/2020	25/9/2022
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	26/9/2020	25/9/2022
Amplifier	SKET	LNPA-0118-45	N/A	24/9/2021	23/9/2022
EMI software	EZ	EZ-EMC	N/A	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	26/9/2020	25/9/2022

Test Equipment Of Conducted Band Edges Measurement

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Dwell Time

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Hopping Channel Number

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022

Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

Test Equipment Of Carrier Frequencies Separation

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	24/9/2021	23/9/2022
Spectrum	Agilent	N9020A	MY49100060	24/9/2021	23/9/2022
Signal Generator	Agilent	N5182A	MY49060650	24/9/2021	23/9/2022
Signal Generator	Agilent	E8257D	MY44320250	24/9/2021	23/9/2022

10 ANTENNA REQUIREMENT

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

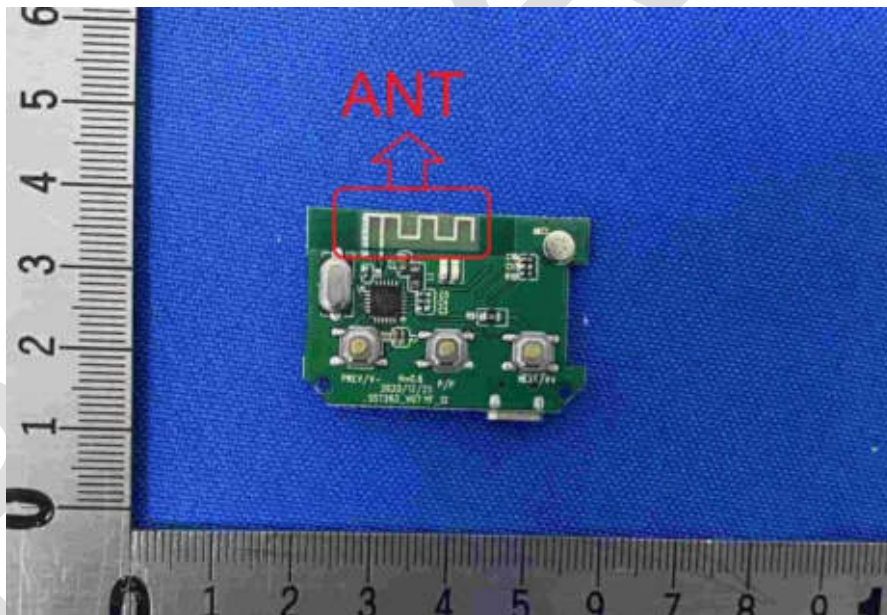
10.1 CONCLUSION

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 an 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 -0.68dBi.



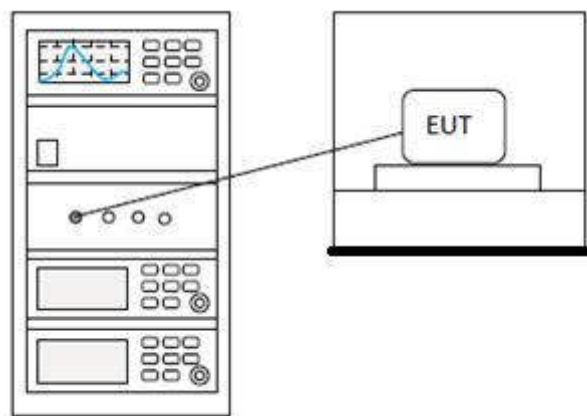
11 CONDUCTED SPURIOUS EMISSIONS

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	Jozu
Temperature	25°C
Humidity	60%

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

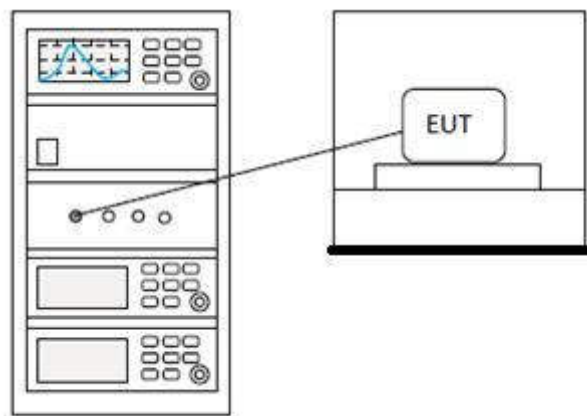
Pass: Please Refer To Appendix: Appendix1 For Details

BlueAsia

12 20DB 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	Jozu
Temperature	25℃
Humidity	60%

12.1 BLOCK DIAGRAM OF TEST SETUP



12.2 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

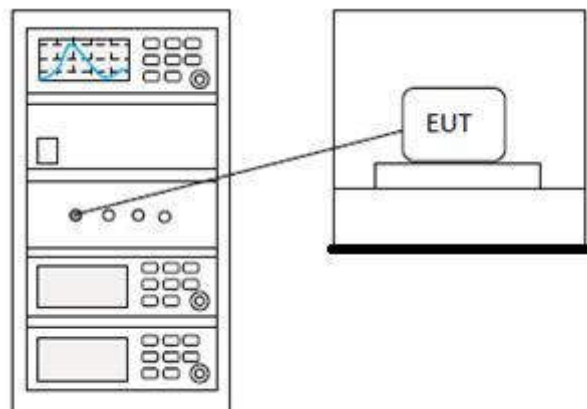
13 CONDUCTED PEAK OUTPUT POWER

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	Jozu
Temperature	25°C
Humidity	60%

13.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq \text{hopping channels} < 50$
	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

13.2 BLOCK DIAGRAM OF TEST SETUP



13.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

BlueAsia

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

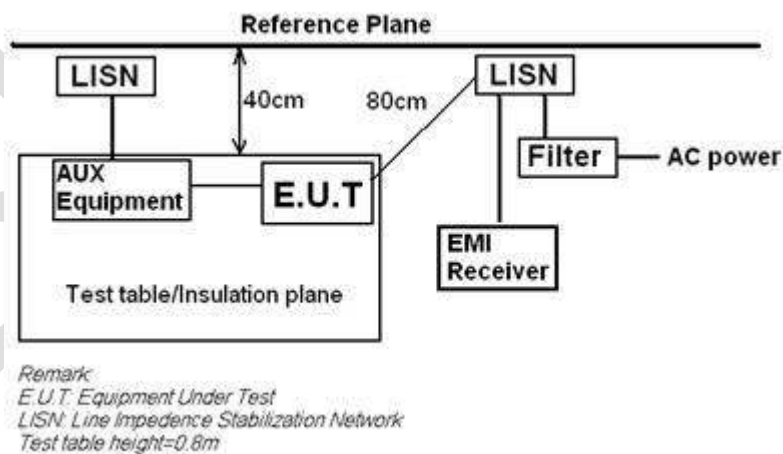
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	BT mode
Test Mode (Final Test)	BT mode
Tester	Jozu
Temperature	25℃
Humidity	60%

14.1 LIMITS

Frequency of emission(MHz)	Conducted limit(dBμV)	
	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.

14.2 BLOCK DIAGRAM OF TEST SETUP



14.3 PROCEDURE

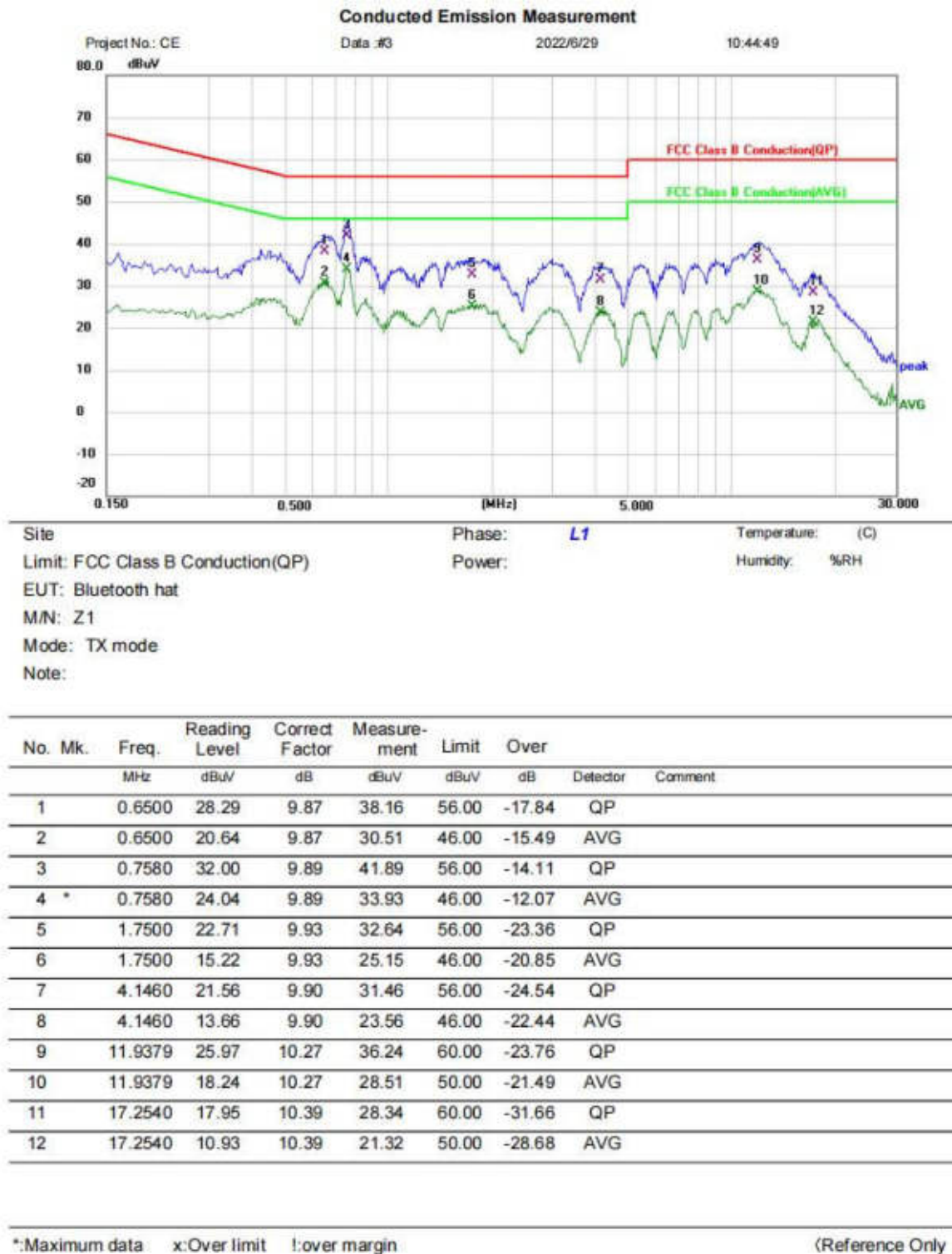
- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50H + 5ohm linear impedance. The power cables of all other units of the EUT were connected to 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: $LISN = Read\ Level + Cable\ Loss + LISN\ Factor$

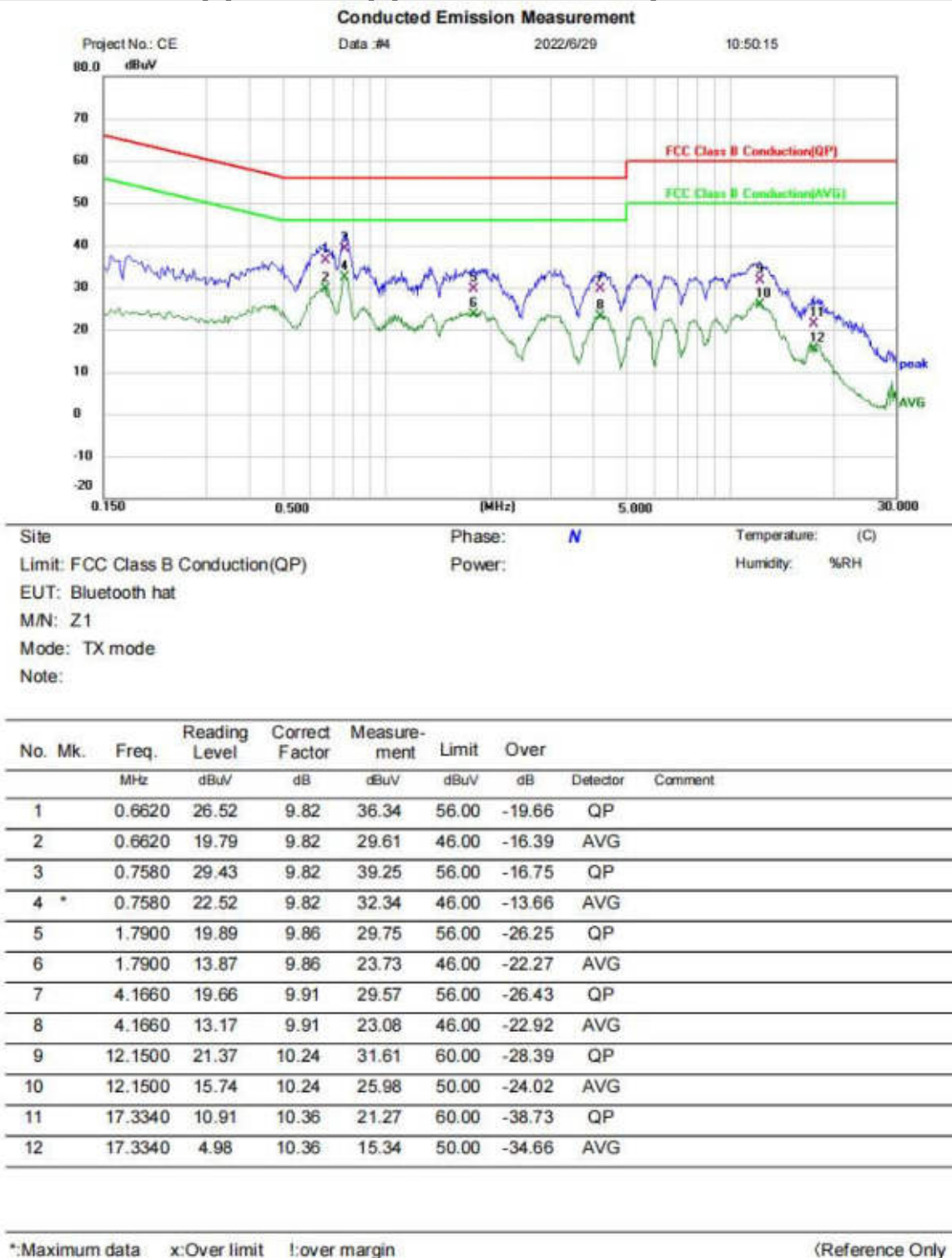
14.4 TEST DATA

[TestMode: BT mode]; [Line: Line] ;[Power:AC120V/60Hz]



Test Result: Pass

[TestMode: BT mode]; [Line: Nutral] ;[Power:AC120V/60Hz]



Test Result: Pass

15 RADIATED SPURIOUS EMISSIONS

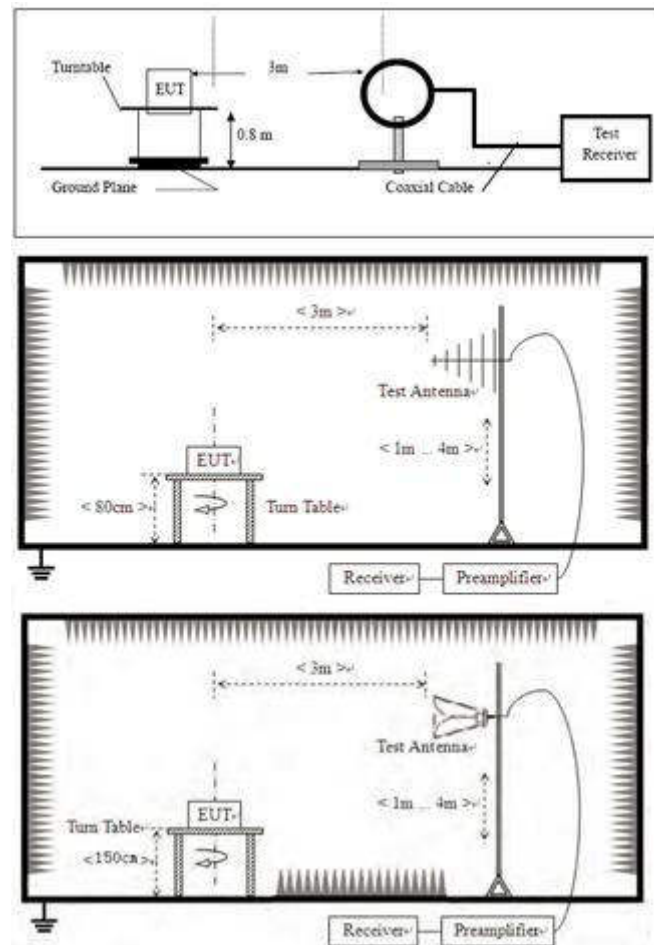
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25℃
Humidity	60%

15.1 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.

15.2 BLOCK DIAGRAM OF TEST SETUP



15.3 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.

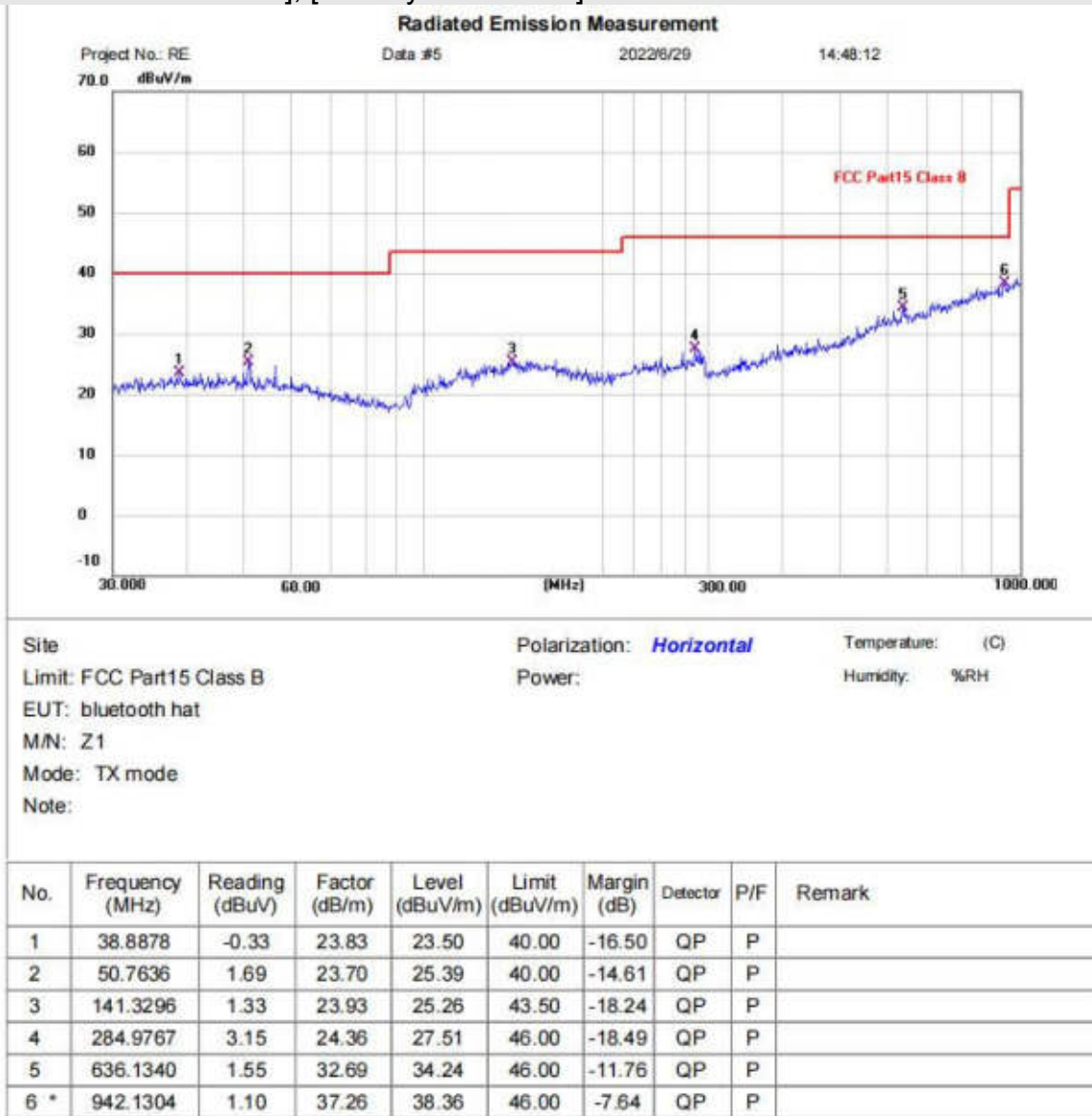
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was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

15.4 TEST DATA

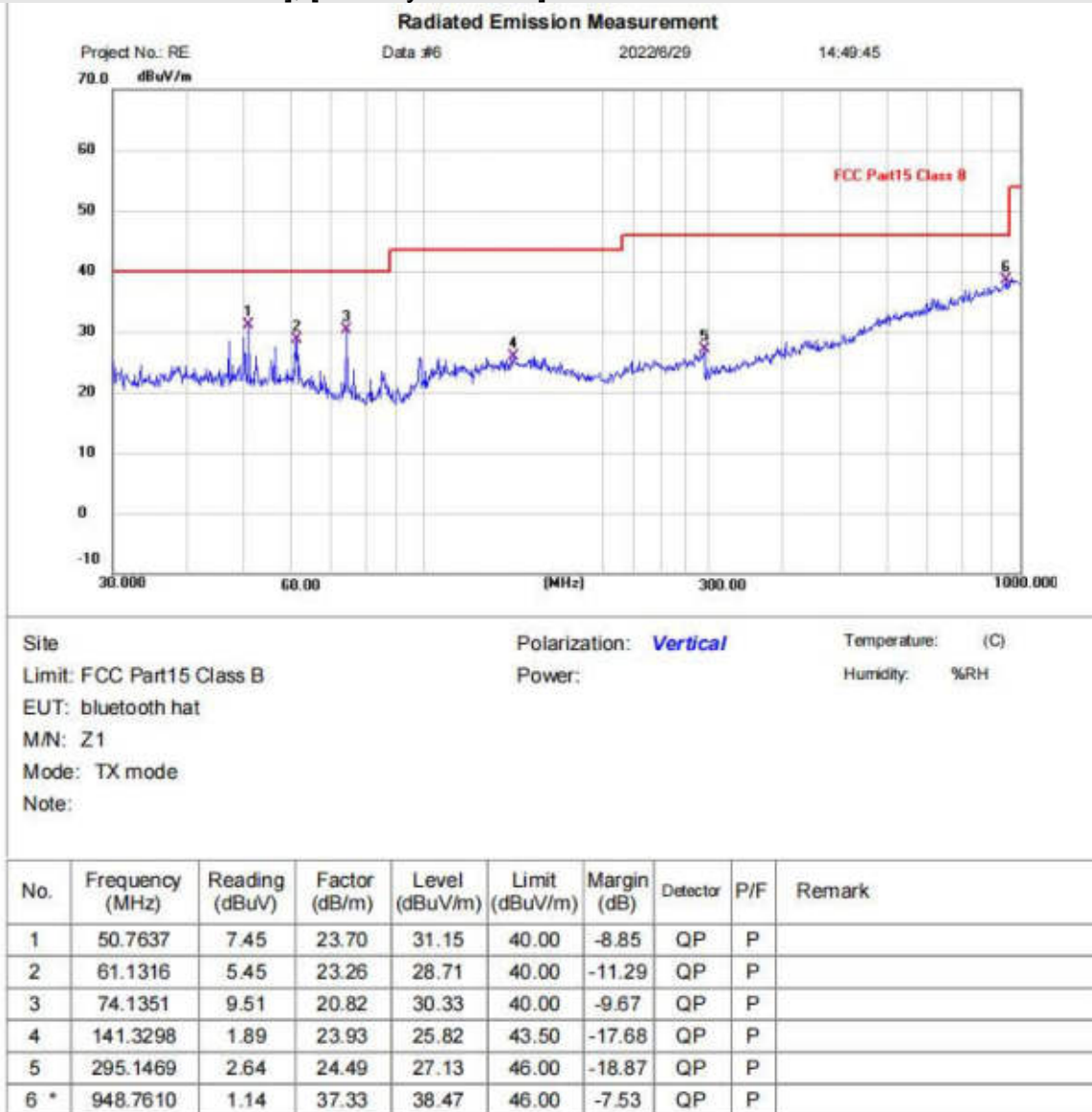
[TestMode: TX below 1G]; [Polarity: Horizontal]



*:Maximum data x:Over limit !:over margin

Test Result: Pass

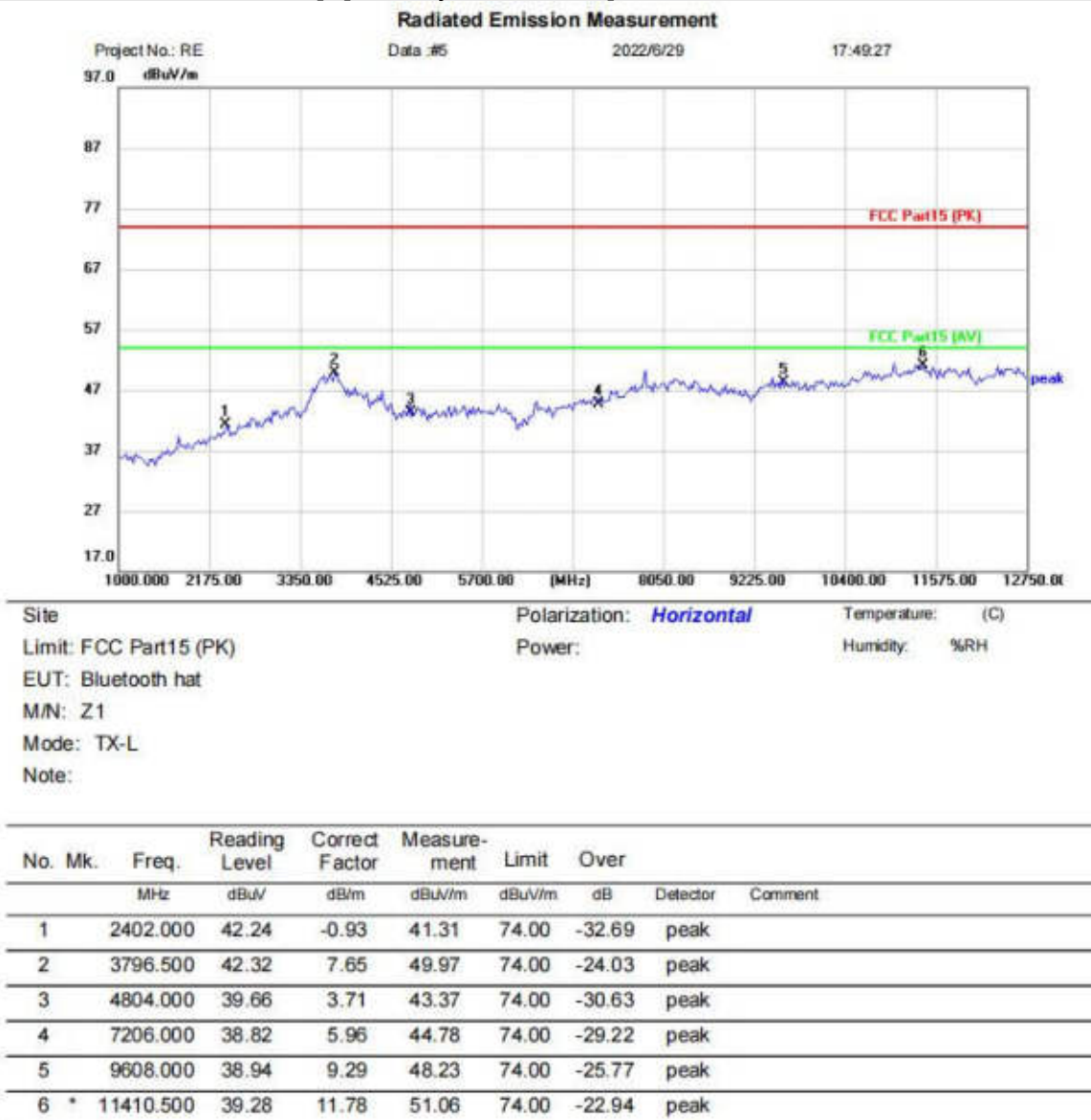
[TestMode: TX below 1G]; [Polarity: Vertical]



*:Maximum data x:Over limit !:over margin

Test Result: Pass

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

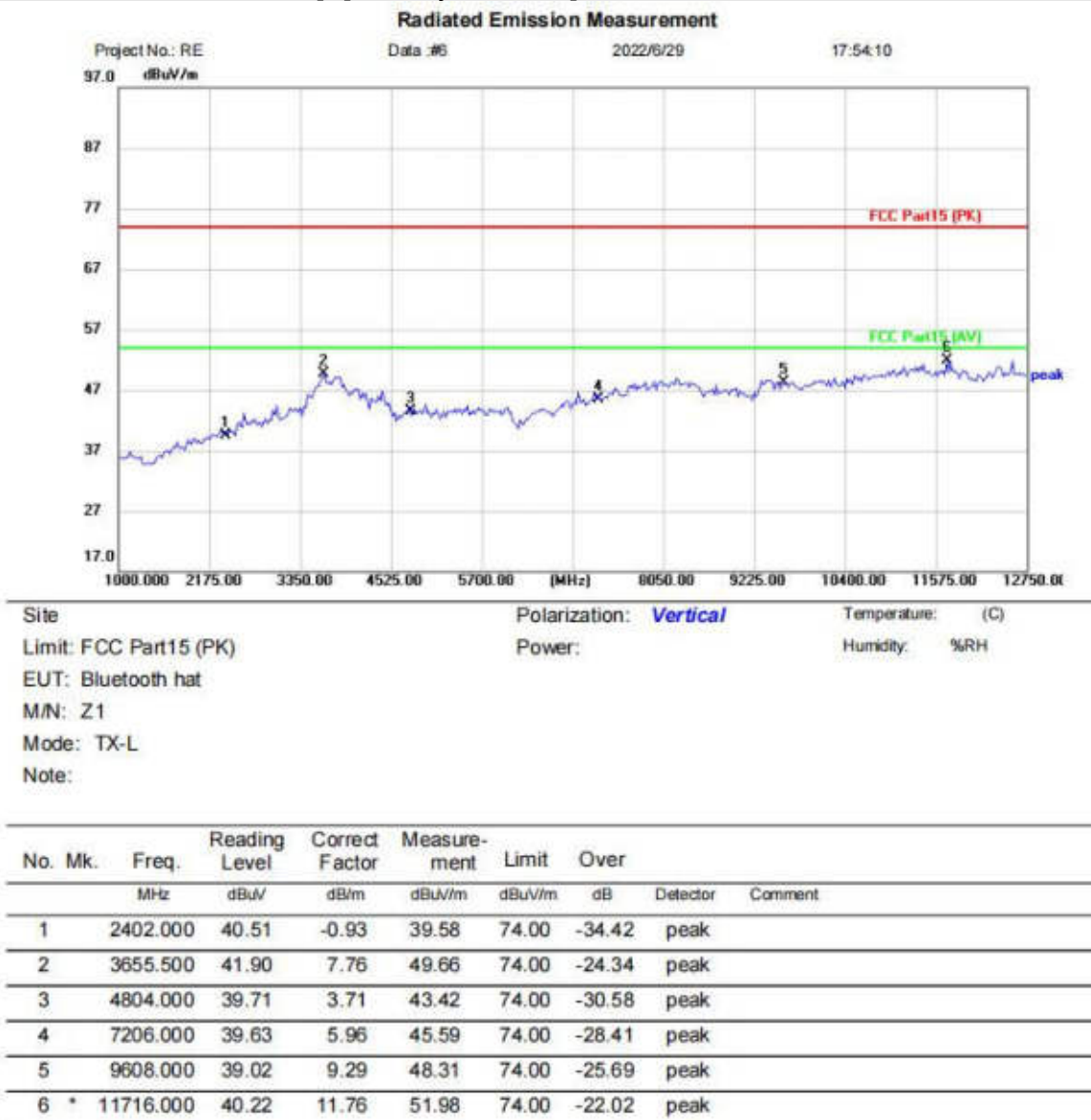


*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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

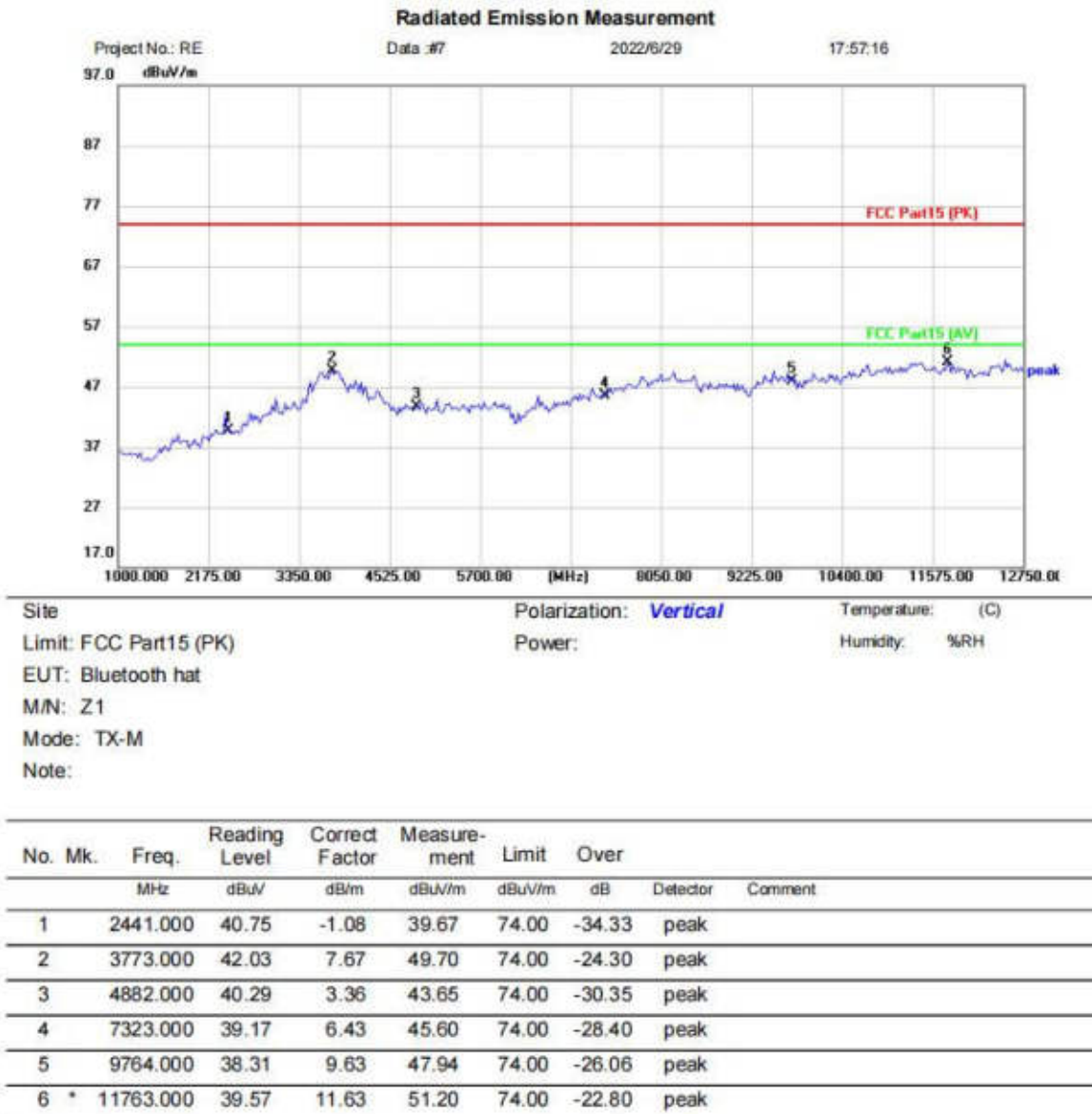


*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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

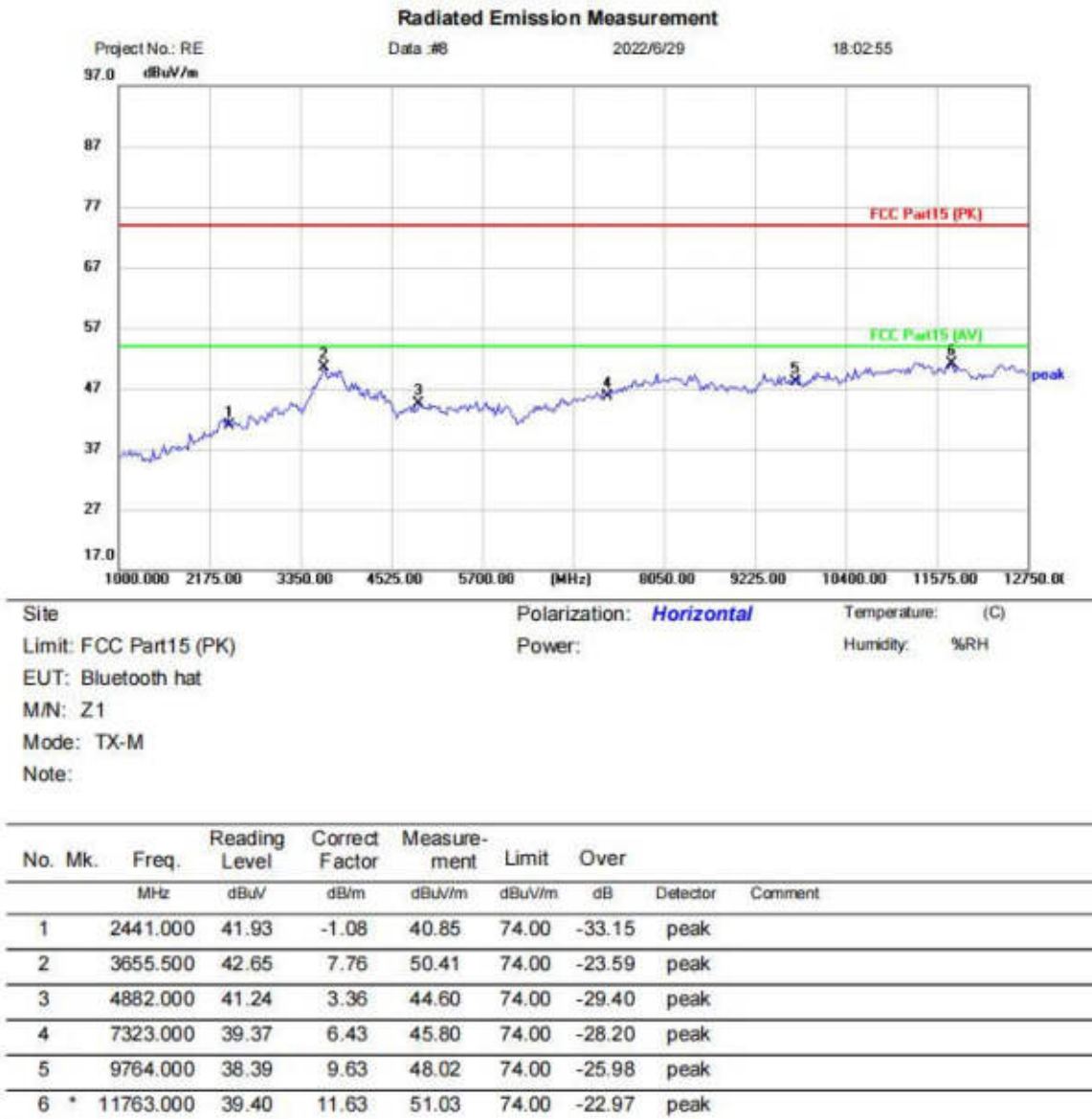


*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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

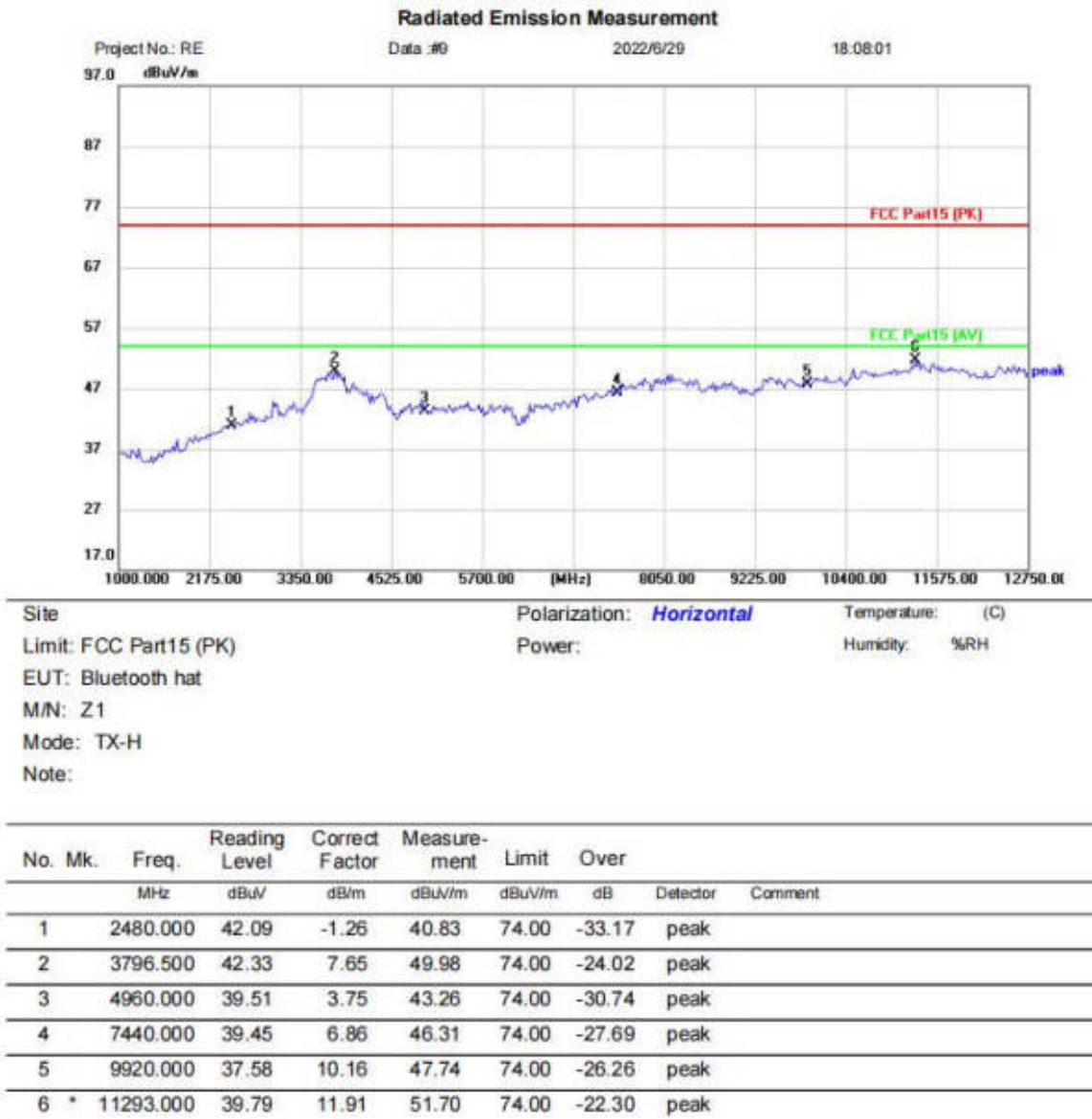


*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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



*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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



*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

16 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

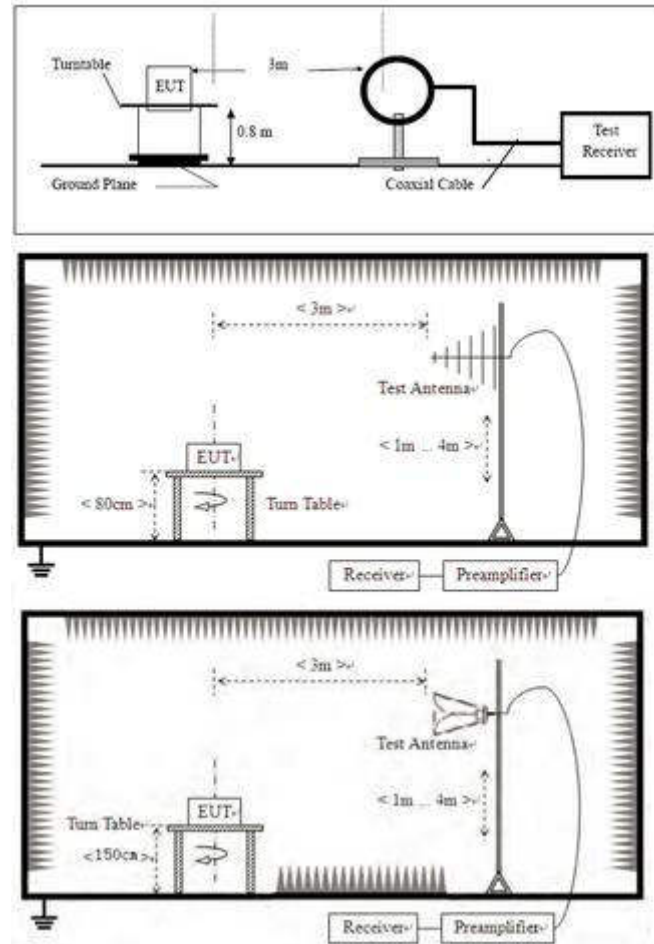
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25℃
Humidity	60%

16.1 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.

16.2 BLOCK DIAGRAM OF TEST SETUP



16.3 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.

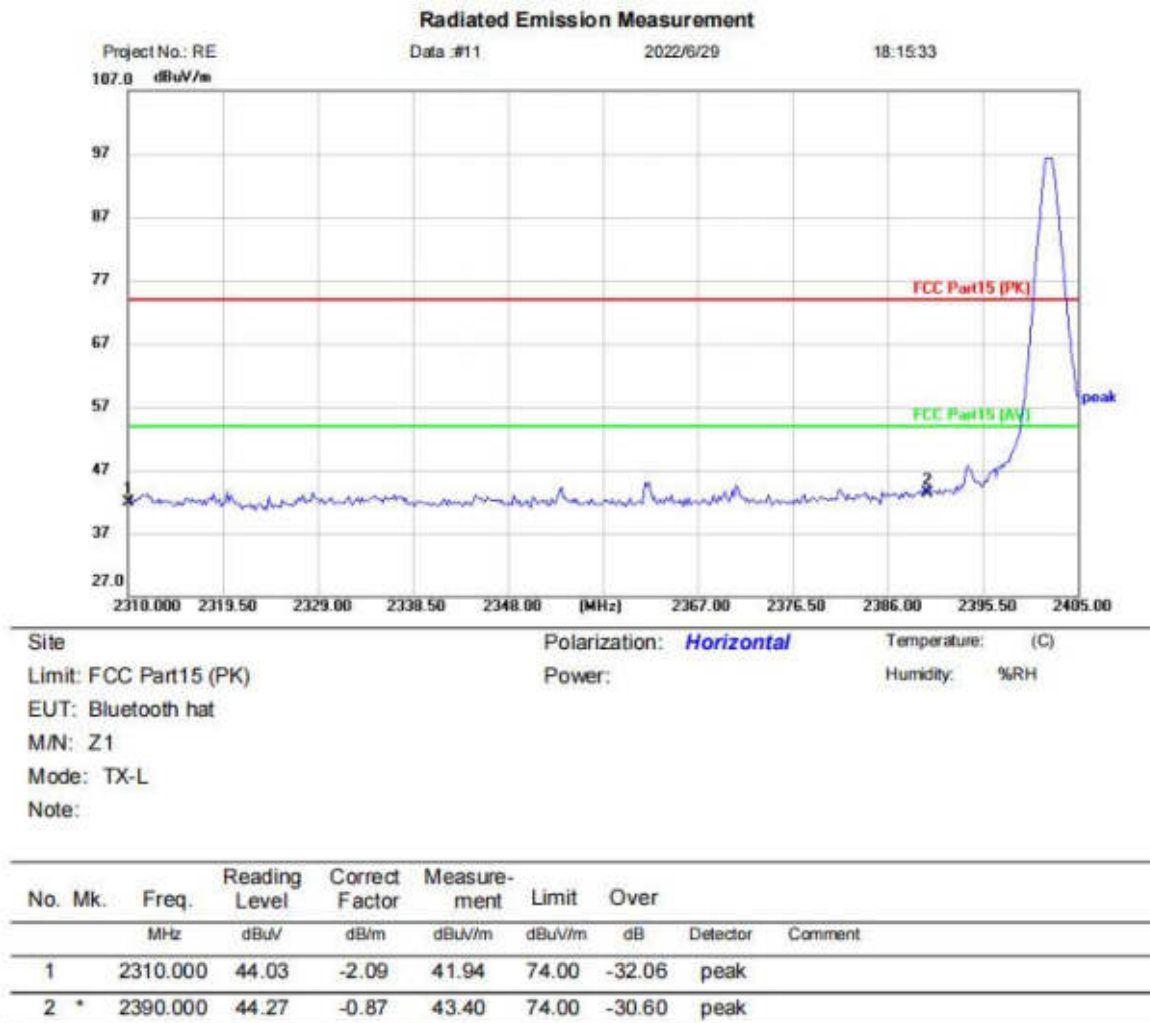
Remark 1: $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamp Factor}$

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

16.4 TEST DATA

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

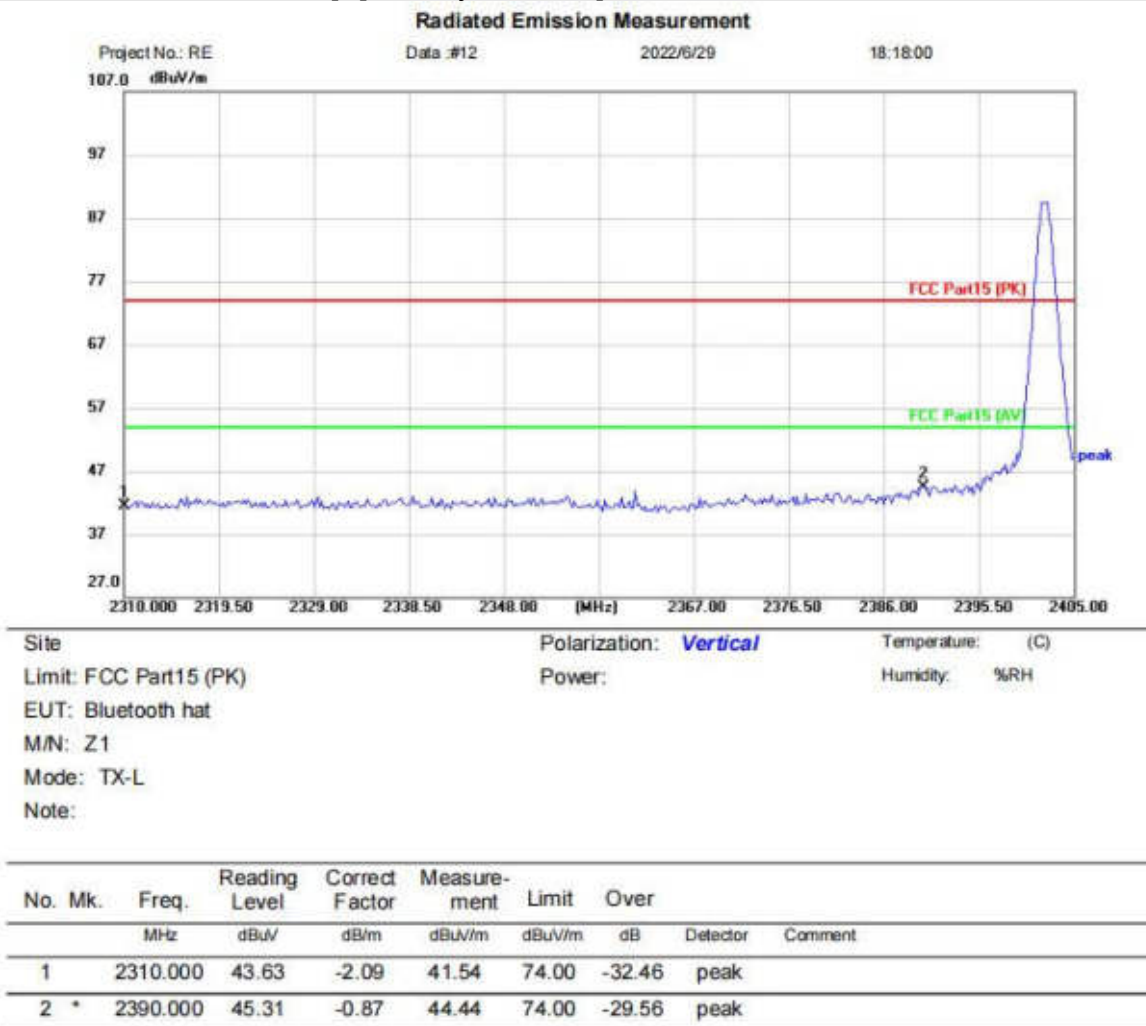


*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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

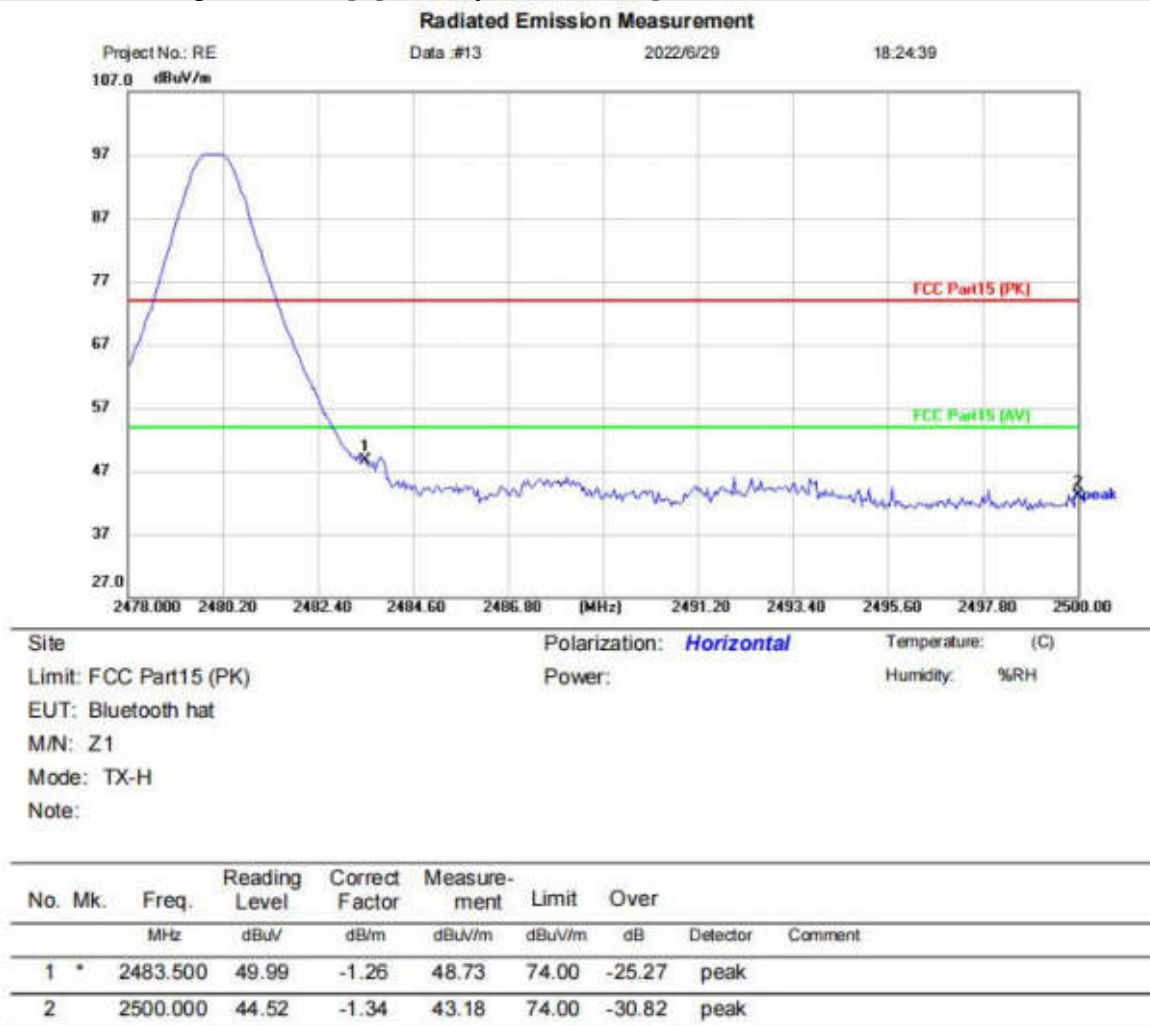


*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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

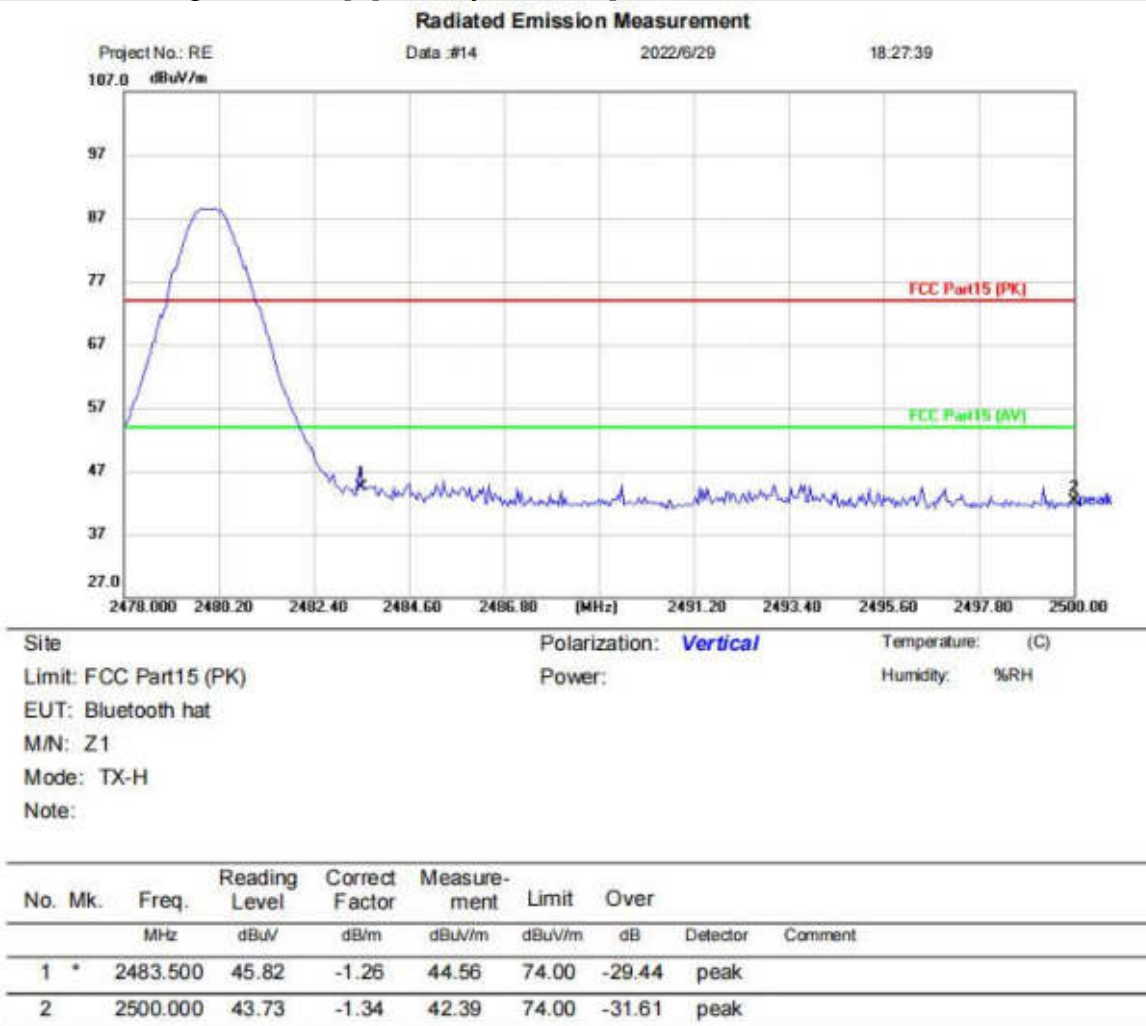


*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

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



*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

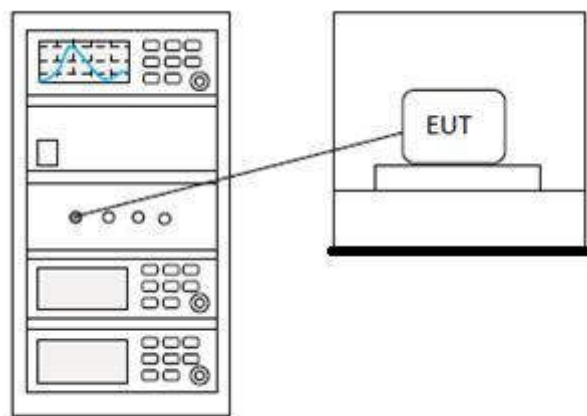
17 CONDUCTED BAND EDGES MEASUREMENT

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	Jozu
Temperature	25°C
Humidity	60%

17.1 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)).
---------------	--

17.2 BLOCK DIAGRAM OF TEST SETUP



17.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

BlueAsia

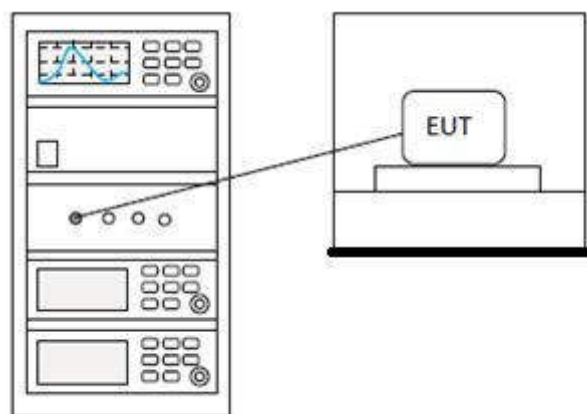
18 DWELL TIME

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.4
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25℃
Humidity	60%

18.1 LIMITS

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

18.2 BLOCK DIAGRAM OF TEST SETUP



18.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

BlueAsia

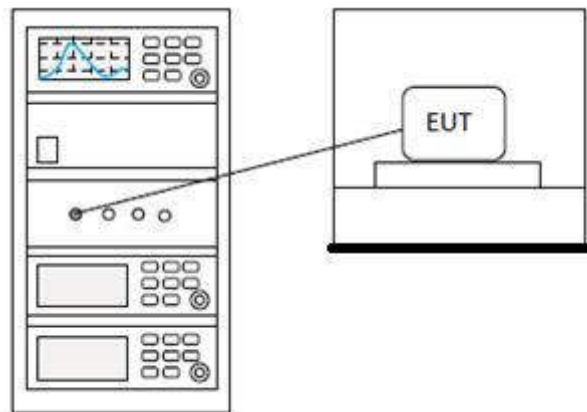
19 HOPPING CHANNEL NUMBER

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.3
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25℃
Humidity	60%

19.1 LIMITS

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

19.2 BLOCK DIAGRAM OF TEST SETUP



19.3 TEST DATA

Pass: Please Refer To Appendix: Appendix1 For Details

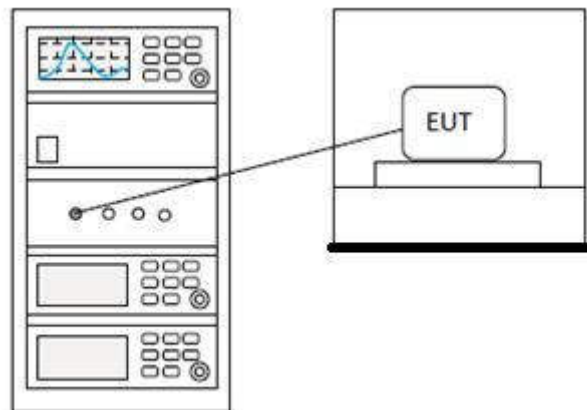
20 CARRIER FREQUENCIES SEPARATION

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25°C
Humidity	60%

20.1 LIMITS

Limit:	2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W
---------------	--

20.2 BLOCK DIAGRAM OF TEST SETUP



20.3 TEST DATA

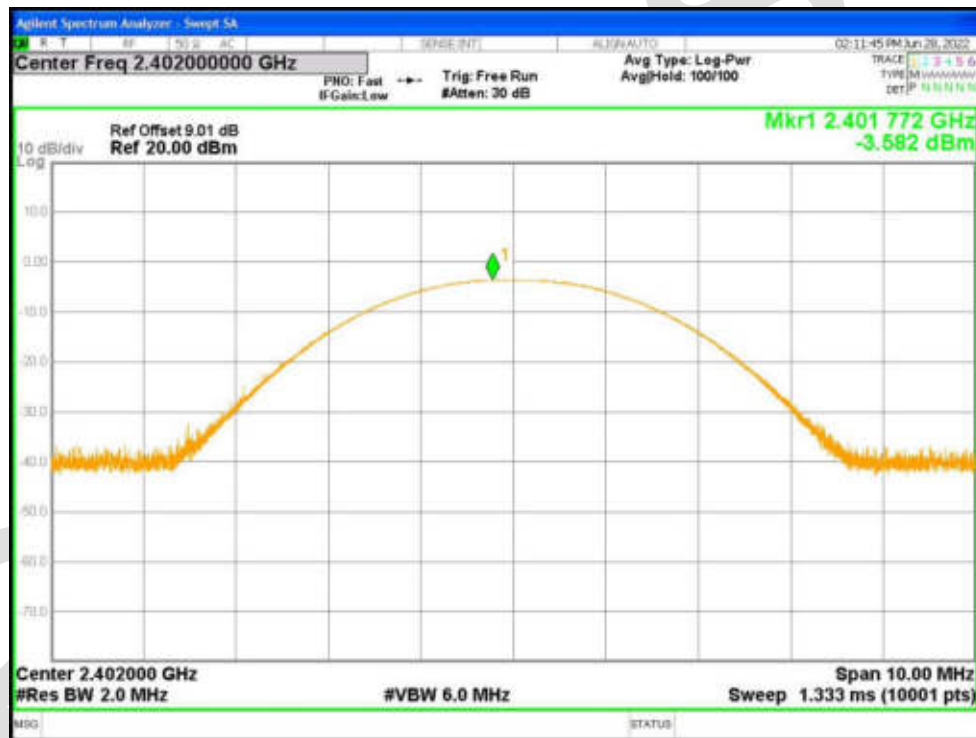
Pass: Please Refer To Appendix: Appendix1 For Details
--

21 APPENDIX

Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	Ant1	-3.582	21	Pass
NVNT	1-DH1	2441	Ant1	-3.523	21	Pass
NVNT	1-DH1	2480	Ant1	-6.854	21	Pass
NVNT	2-DH1	2402	Ant1	-2.983	21	Pass
NVNT	2-DH1	2441	Ant1	-2.838	21	Pass
NVNT	2-DH1	2480	Ant1	-6.136	21	Pass
NVNT	3-DH1	2402	Ant1	-2.368	21	Pass
NVNT	3-DH1	2441	Ant1	-2.334	21	Pass
NVNT	3-DH1	2480	Ant1	-5.632	21	Pass

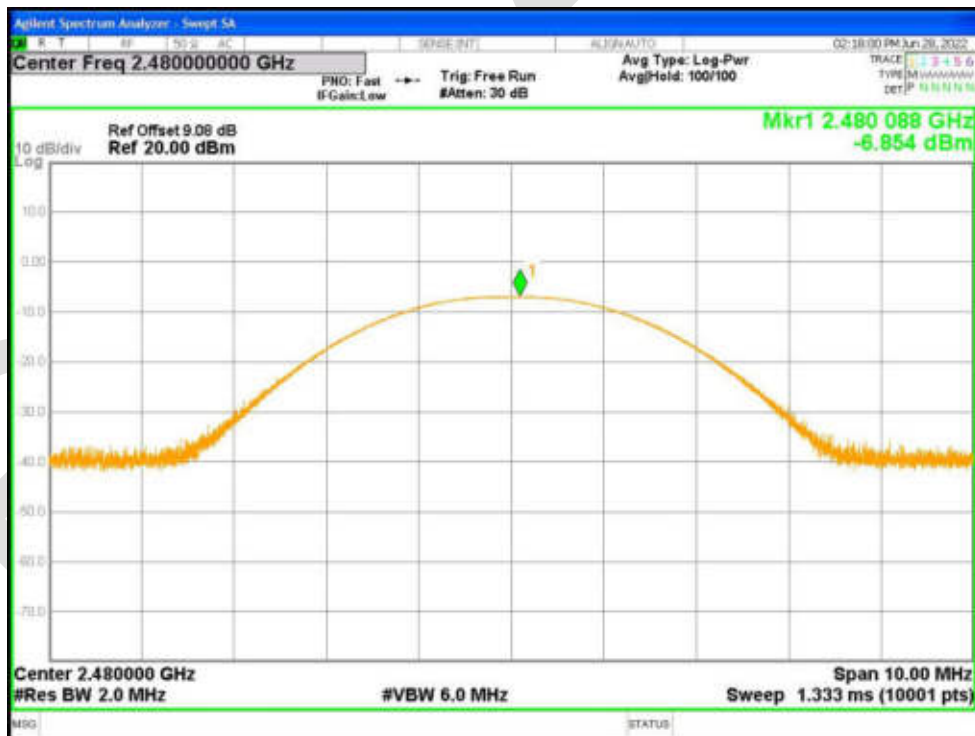
Power NVNT 1-DH1 2402MHz Ant1



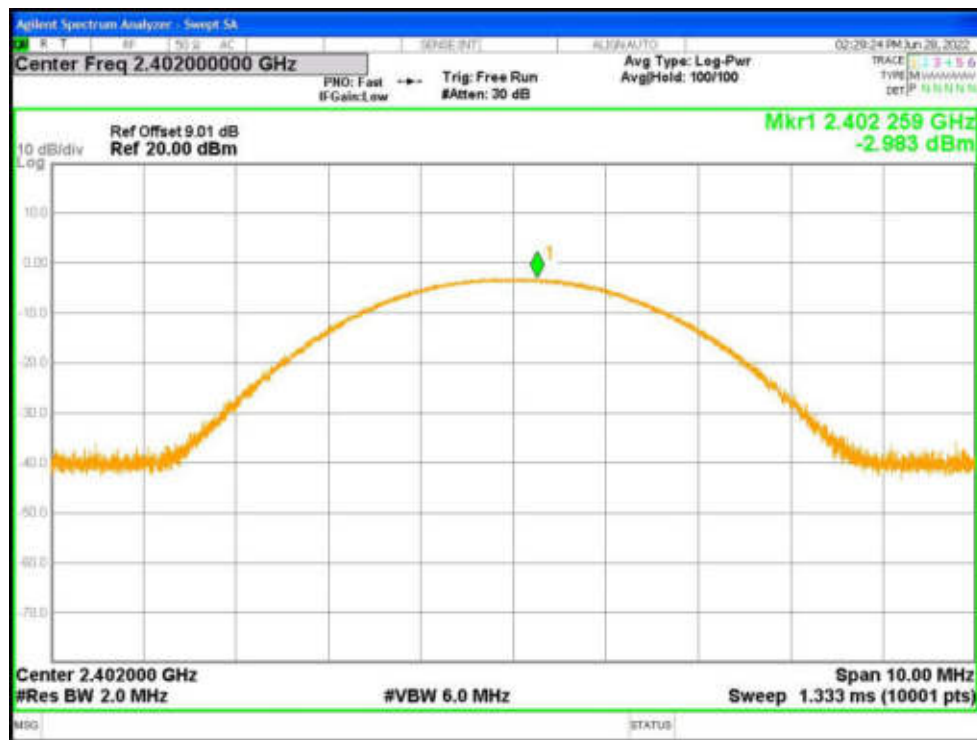
Power NVNT 1-DH1 2441MHz Ant1



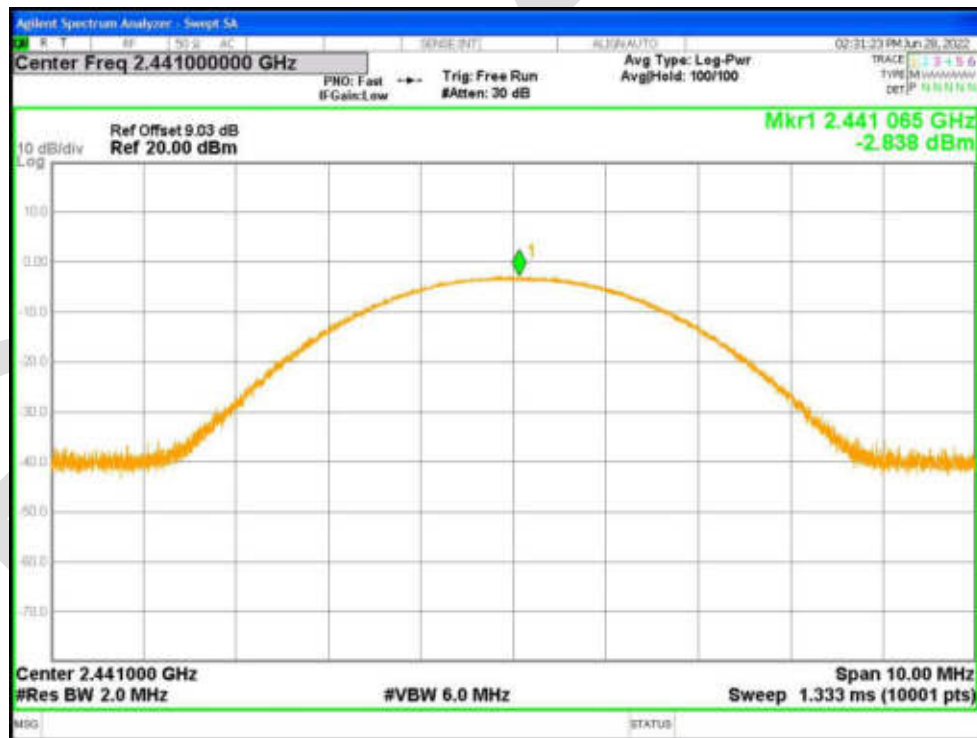
Power NVNT 1-DH1 2480MHz Ant1



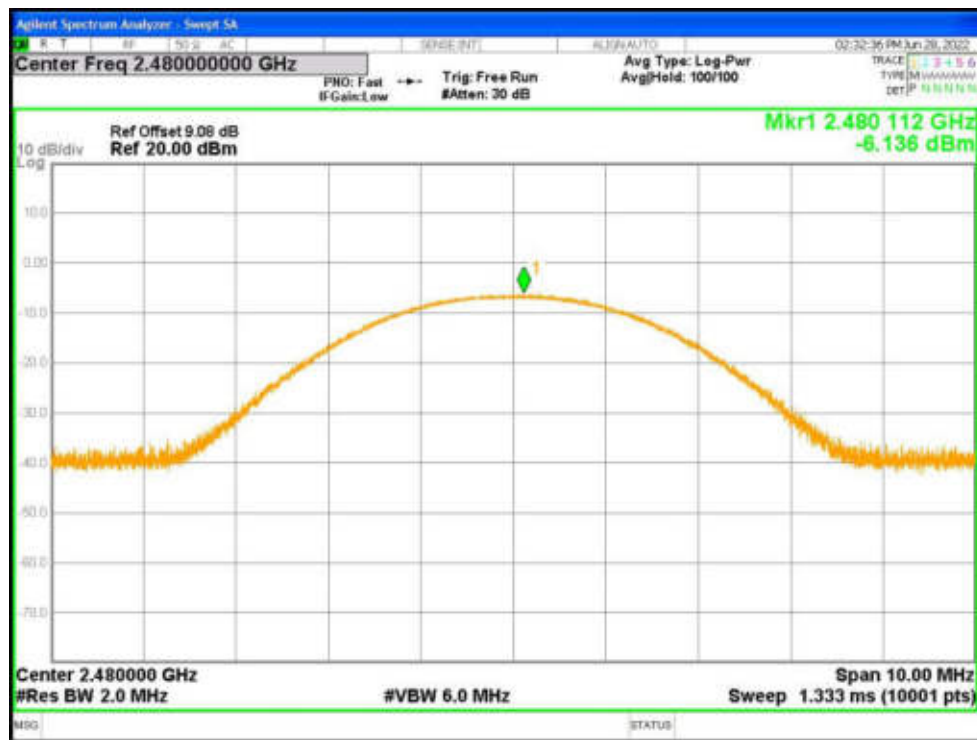
Power NVNT 2-DH1 2402MHz Ant1



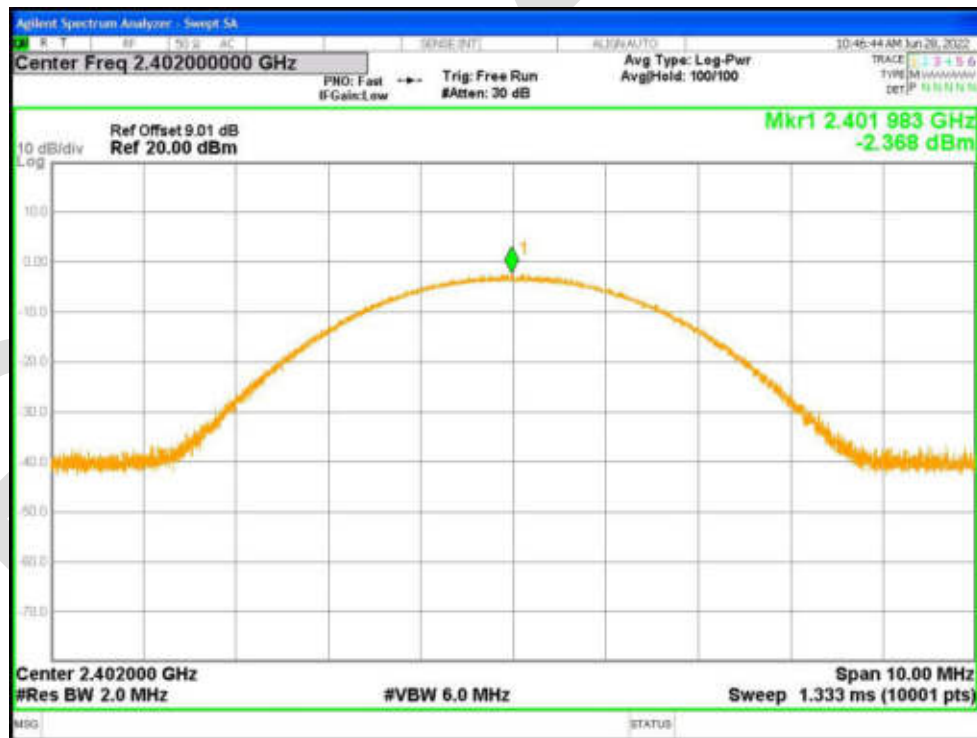
Power NVNT 2-DH1 2441MHz Ant1



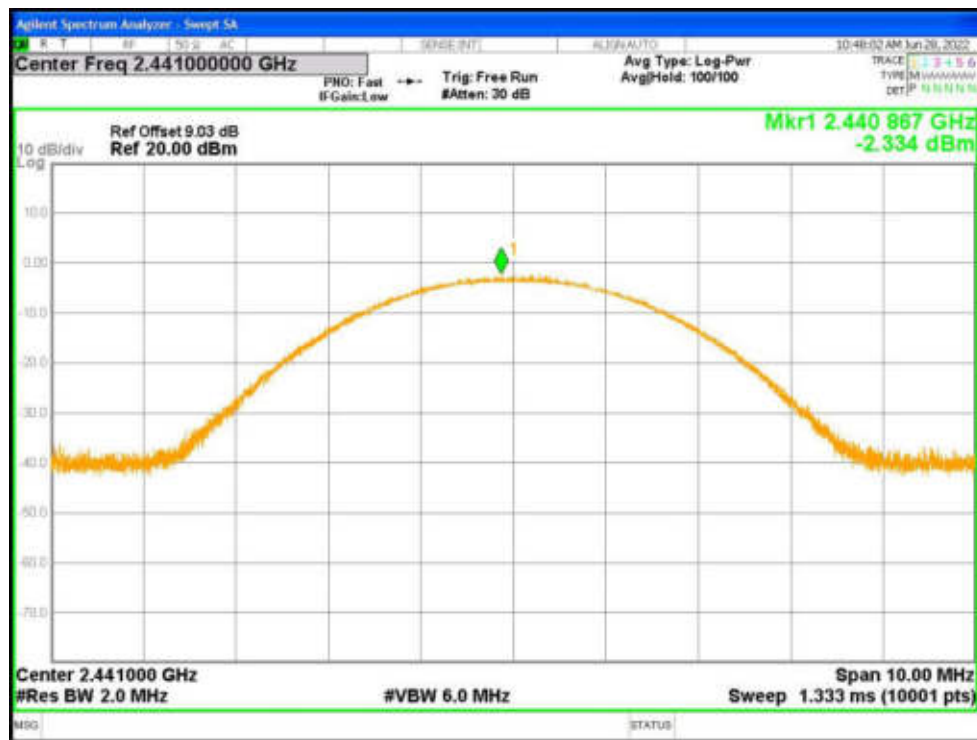
Power NVNT 2-DH1 2480MHz Ant1



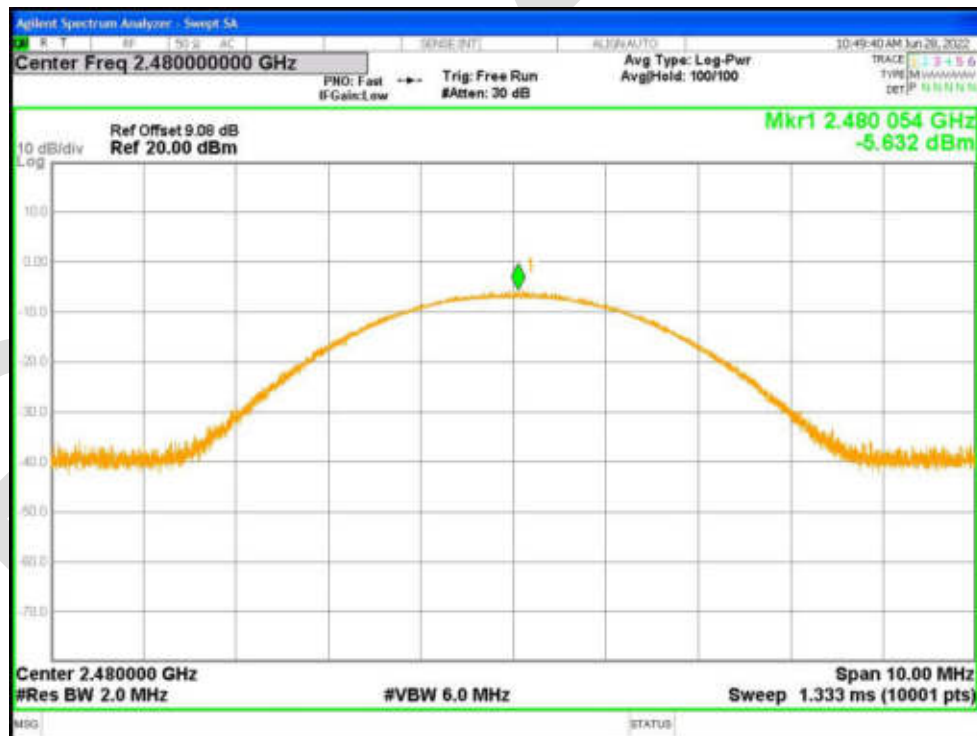
Power NVNT 3-DH1 2402MHz Ant1



Power NVNT 3-DH1 2441MHz Ant1



Power NVNT 3-DH1 2480MHz Ant1



-20dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant1	0.888	0	Pass
NVNT	1-DH1	2441	Ant1	0.888	0	Pass
NVNT	1-DH1	2480	Ant1	0.881	0	Pass
NVNT	2-DH1	2402	Ant1	1.221	0	Pass
NVNT	2-DH1	2441	Ant1	1.229	0	Pass
NVNT	2-DH1	2480	Ant1	1.212	0	Pass
NVNT	3-DH1	2402	Ant1	1.21	0	Pass
NVNT	3-DH1	2441	Ant1	1.225	0	Pass
NVNT	3-DH1	2480	Ant1	1.215	0	Pass

-20dB Bandwidth NVNT 1-DH1 2402MHz Ant1



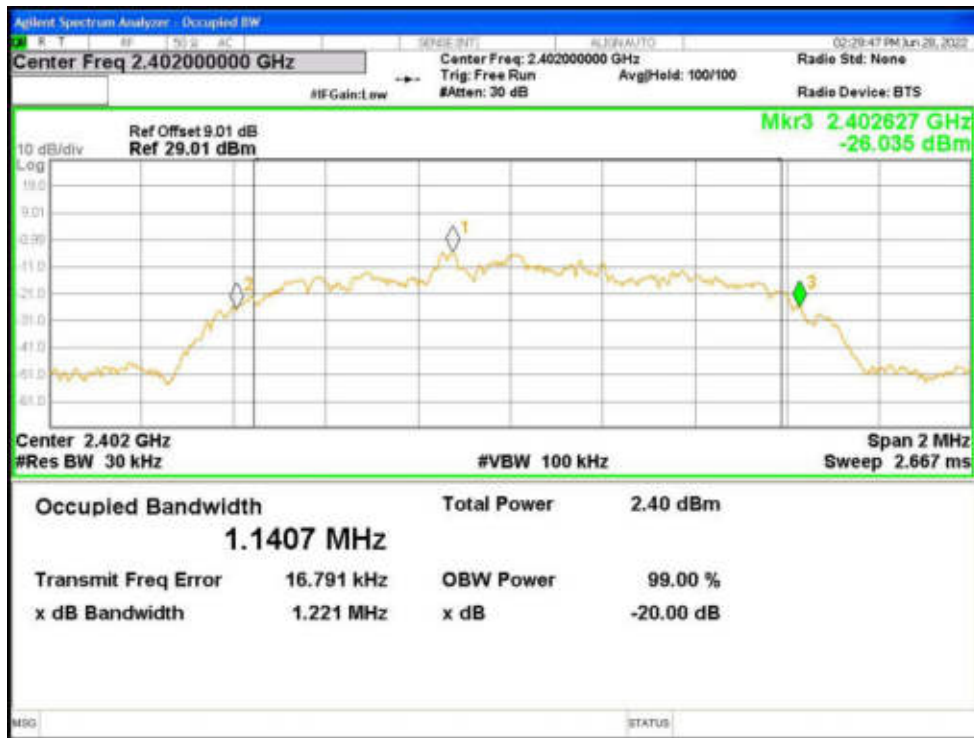
-20dB Bandwidth NVNT 1-DH1 2441MHz Ant1



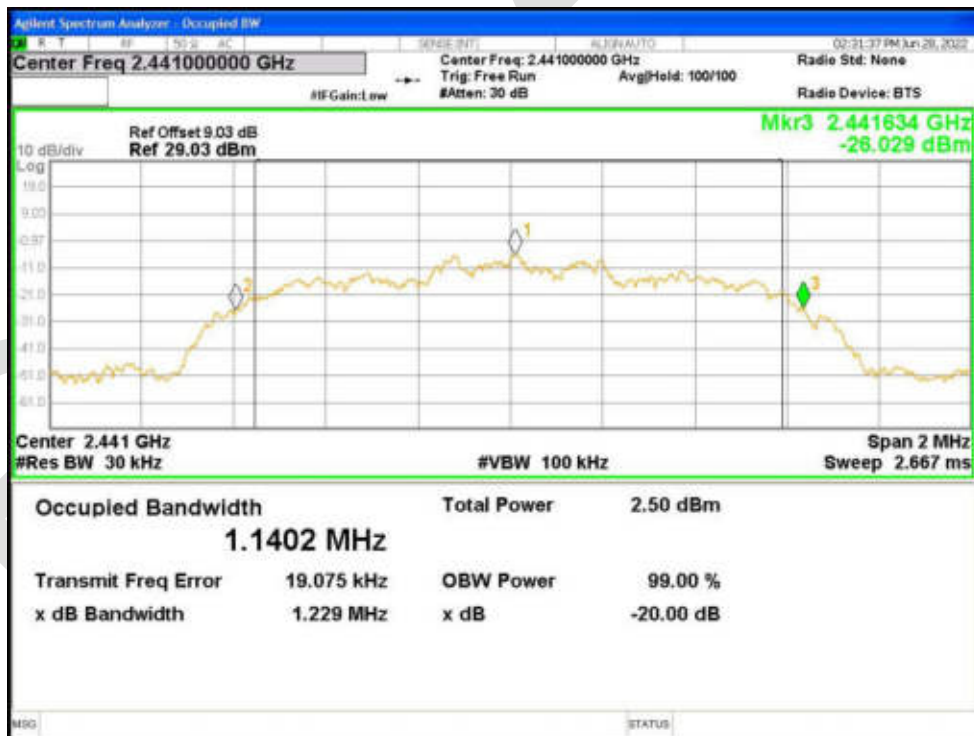
-20dB Bandwidth NVNT 1-DH1 2480MHz Ant1



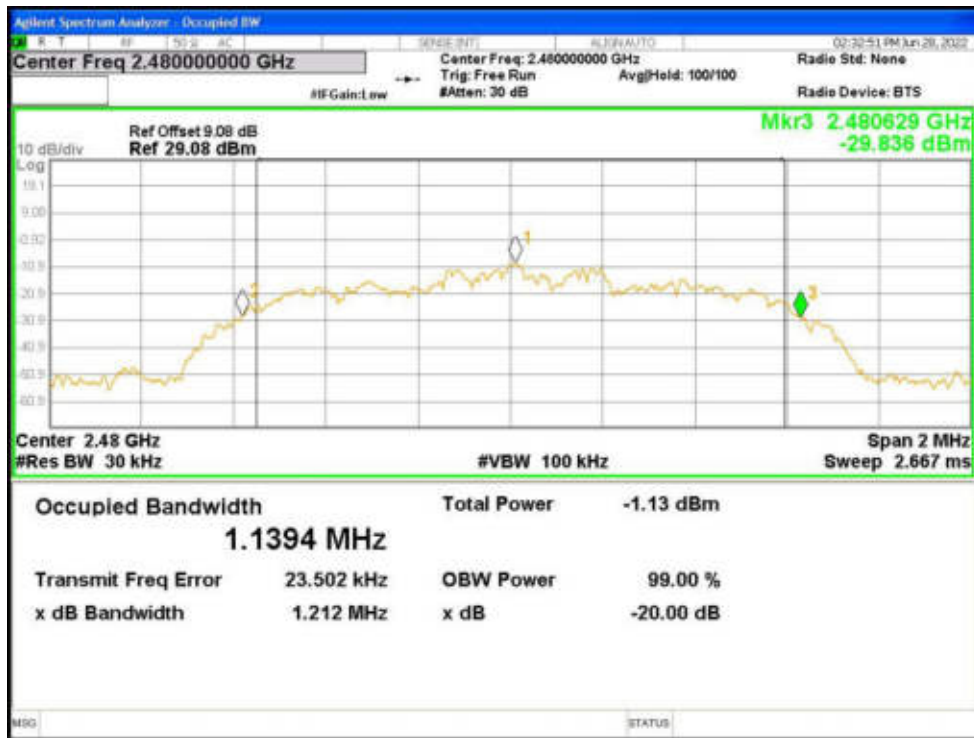
-20dB Bandwidth NVNT 2-DH1 2402MHz Ant1



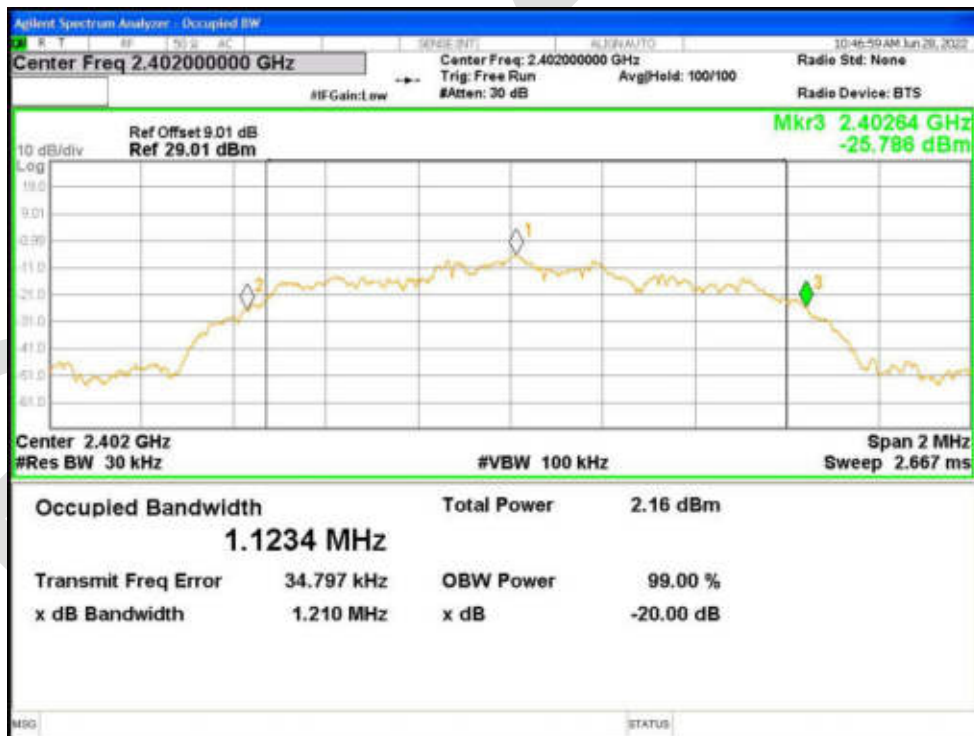
-20dB Bandwidth NVNT 2-DH1 2441MHz Ant1



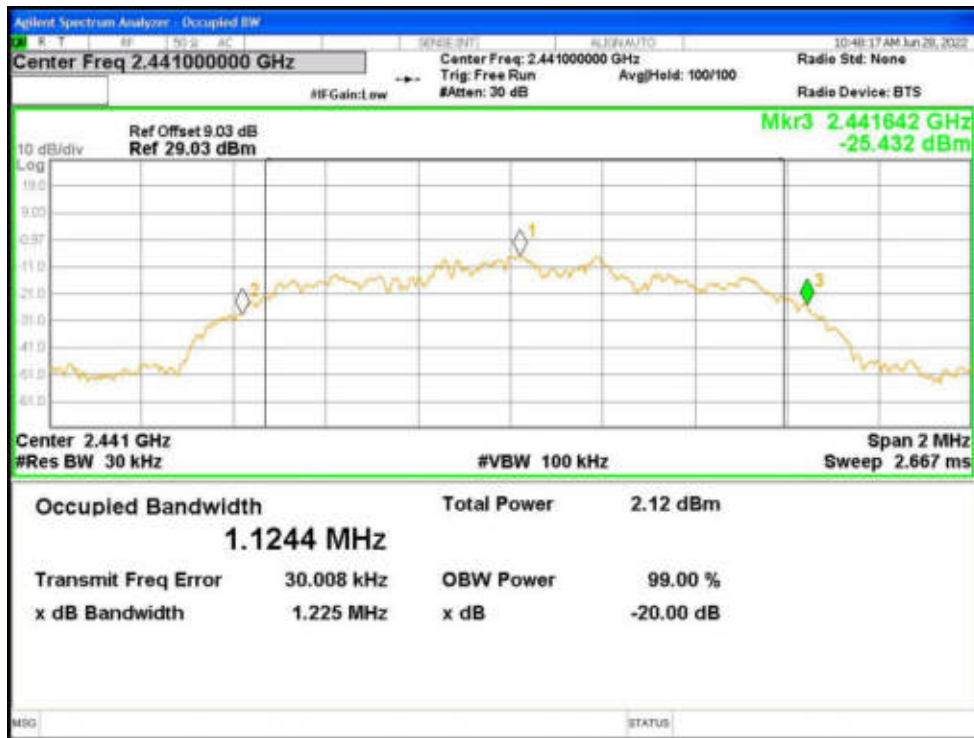
-20dB Bandwidth NVNT 2-DH1 2480MHz Ant1



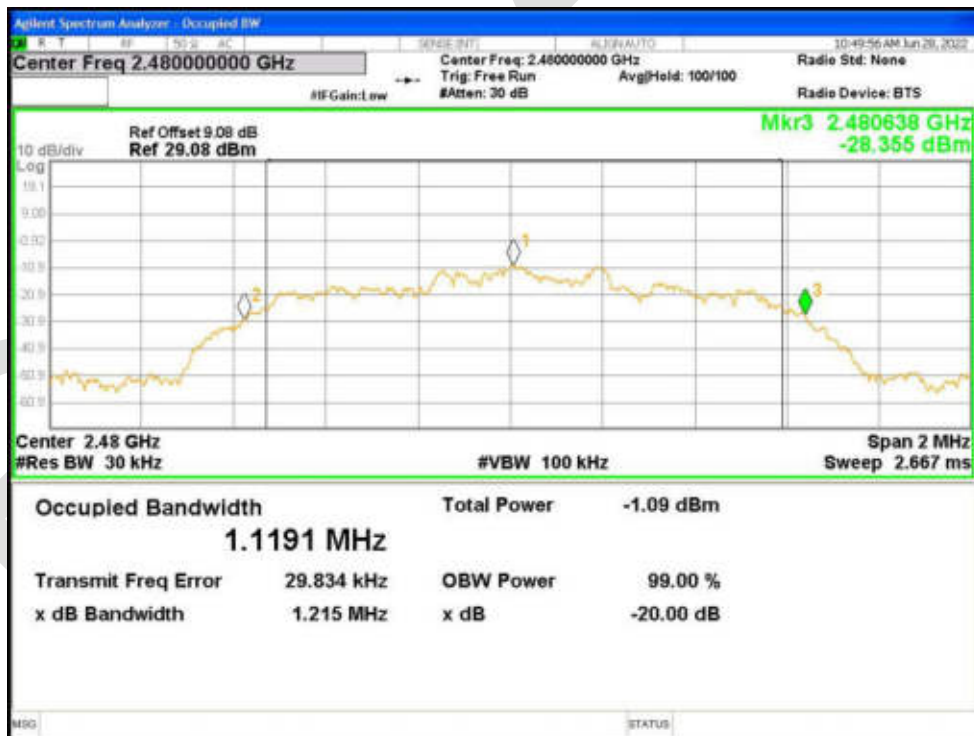
-20dB Bandwidth NVNT 3-DH1 2402MHz Ant1



-20dB Bandwidth NVNT 3-DH1 2441MHz Ant1



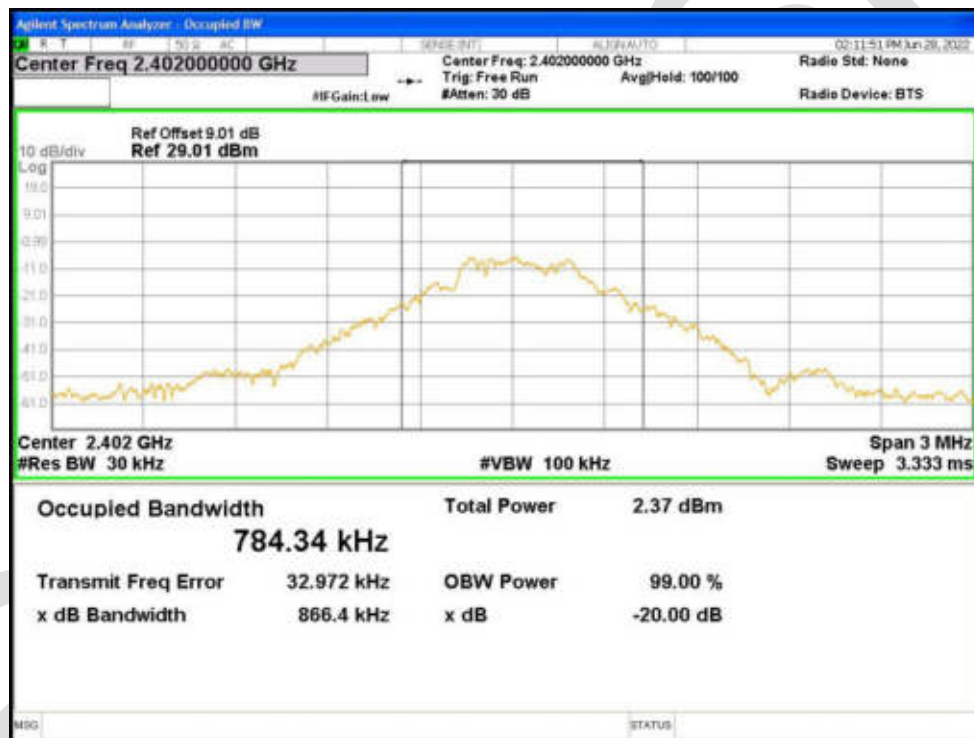
-20dB Bandwidth NVNT 3-DH1 2480MHz Ant1



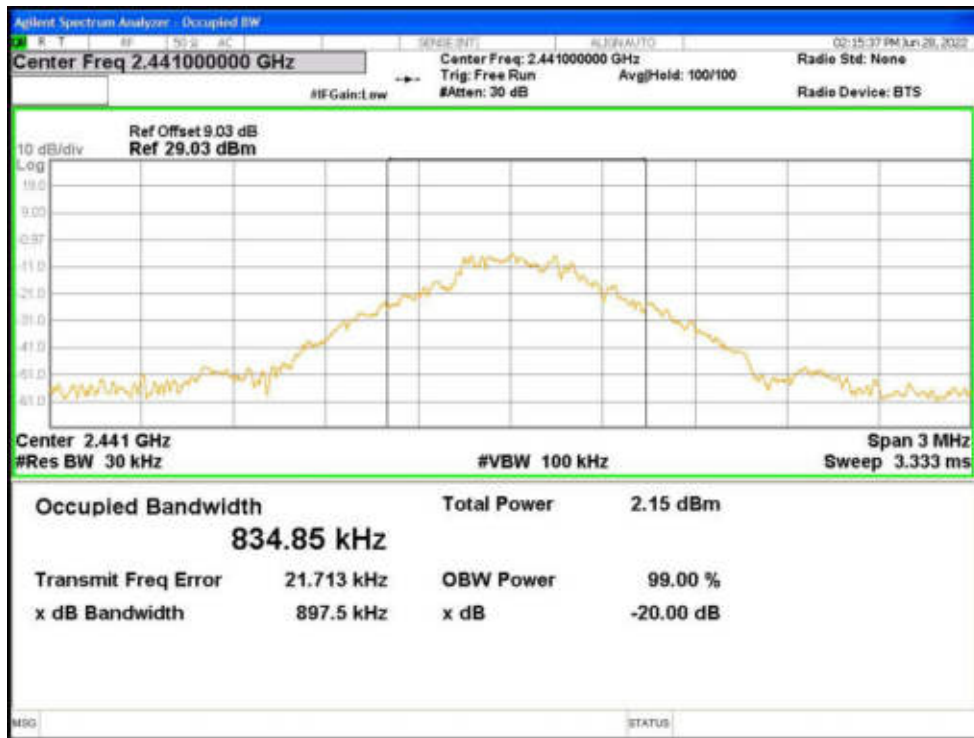
Occupied Channel Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH1	2402	Ant1	0.78434
NVNT	1-DH1	2441	Ant1	0.83485
NVNT	1-DH1	2480	Ant1	0.78505
NVNT	2-DH1	2402	Ant1	1.1451
NVNT	2-DH1	2441	Ant1	1.1445
NVNT	2-DH1	2480	Ant1	1.1441
NVNT	3-DH1	2402	Ant1	1.1291
NVNT	3-DH1	2441	Ant1	1.1206
NVNT	3-DH1	2480	Ant1	1.1341

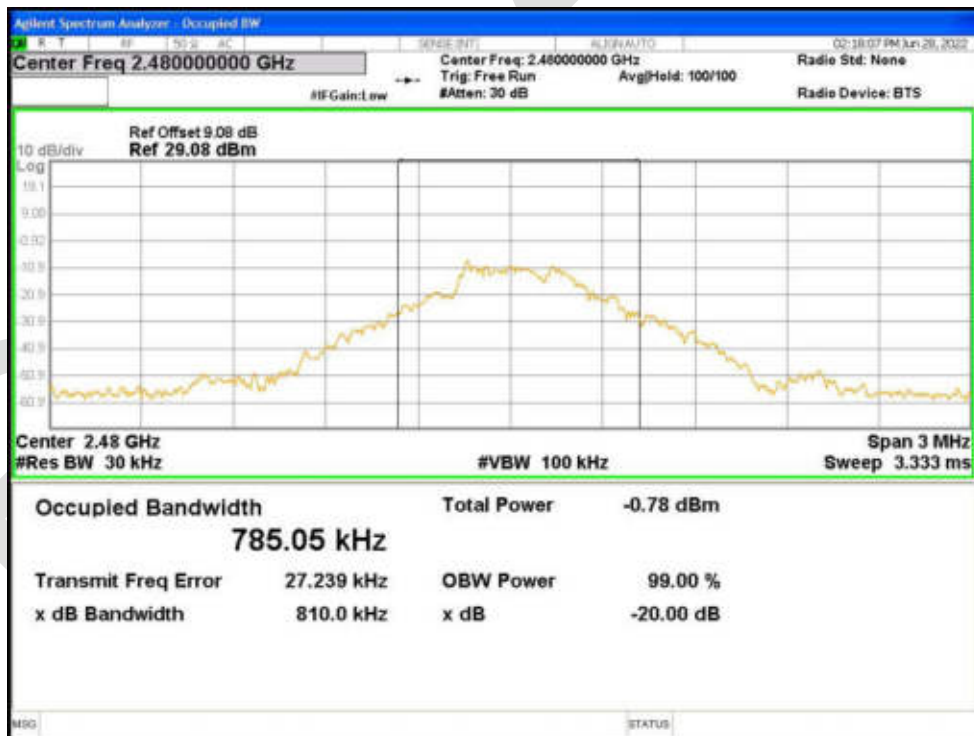
OBW NVNT 1-DH1 2402MHz Ant1



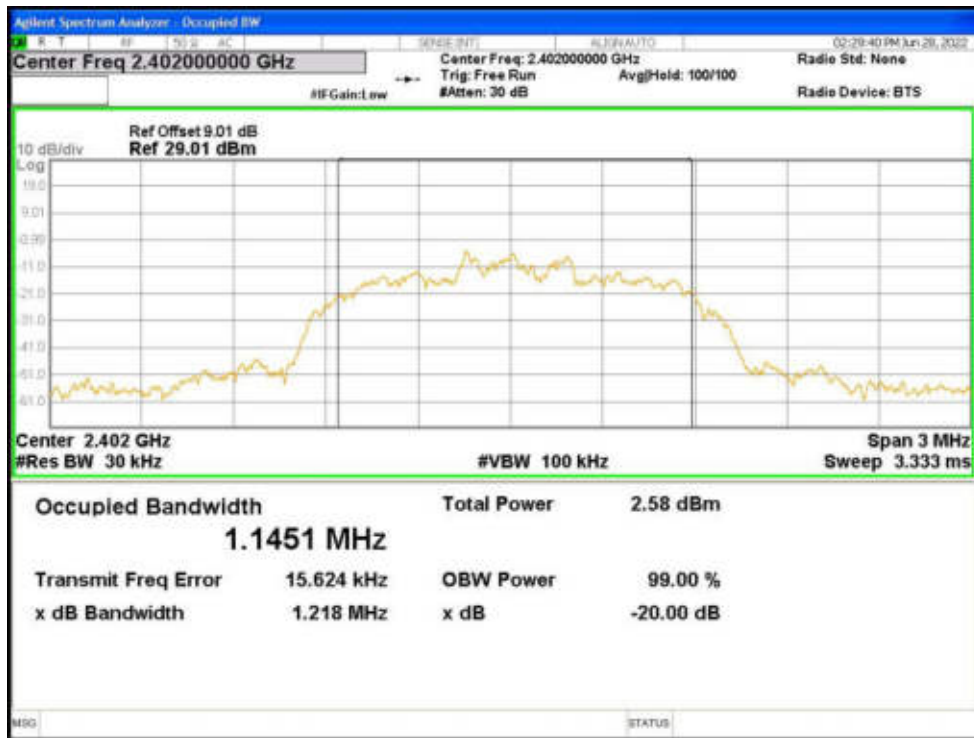
OBW NVNT 1-DH1 2441MHz Ant1



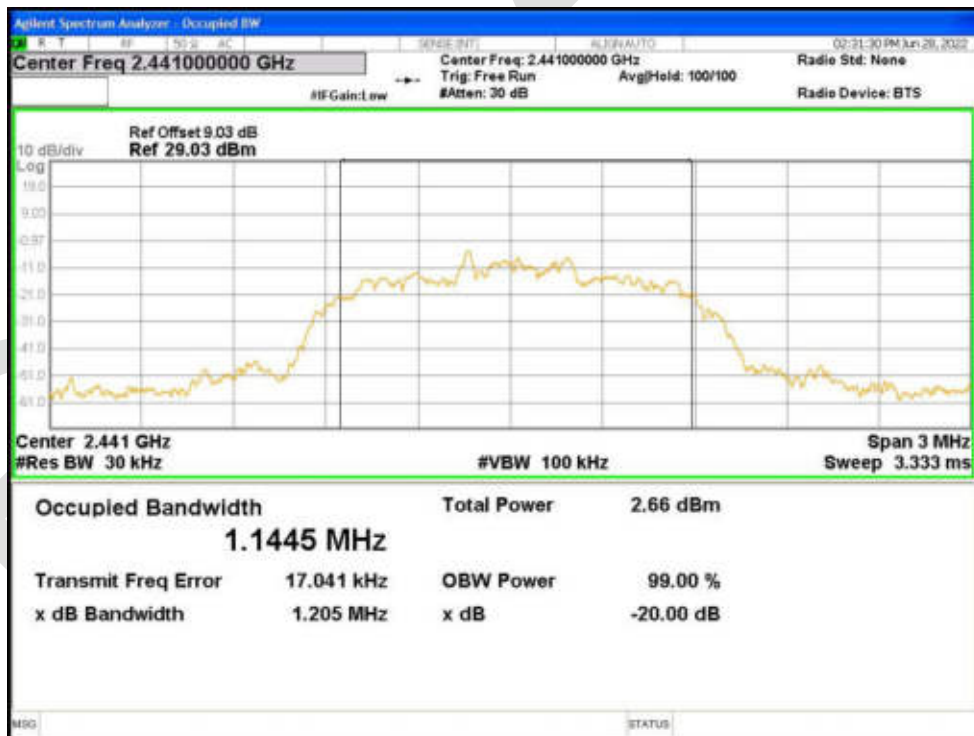
OBW NVNT 1-DH1 2480MHz Ant1



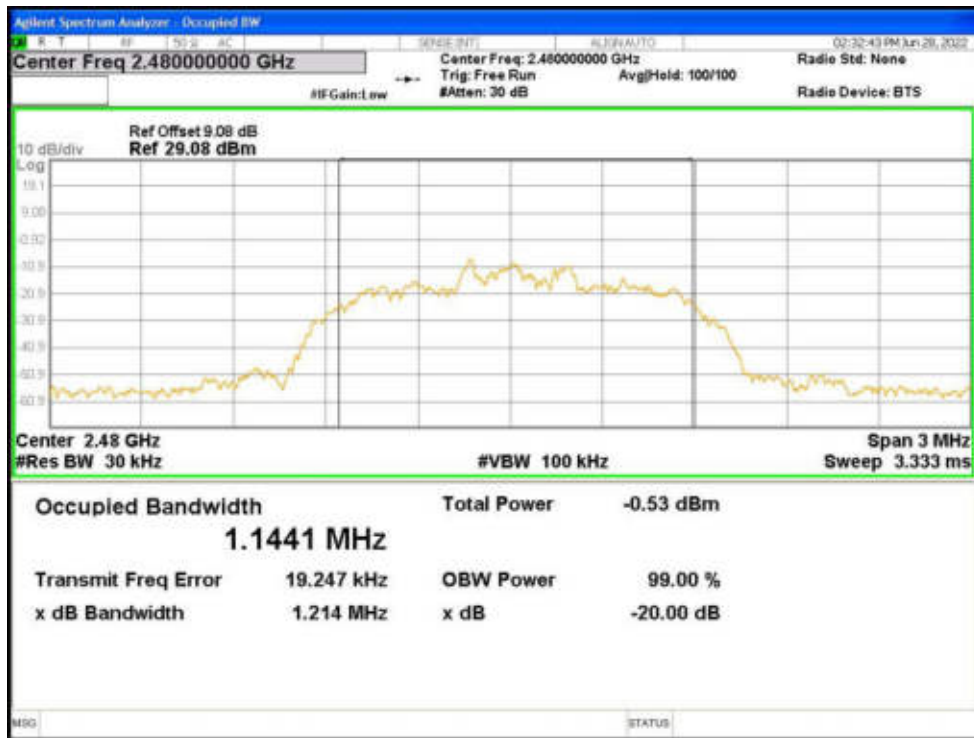
OBW NVNT 2-DH1 2402MHz Ant1



OBW NVNT 2-DH1 2441MHz Ant1



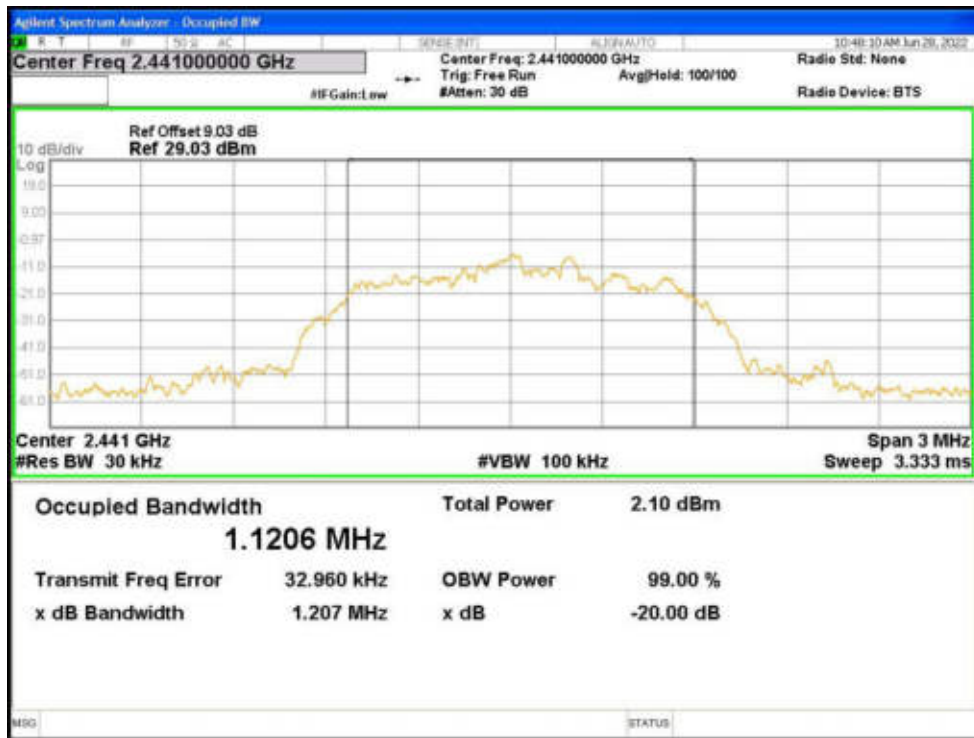
OBW NVNT 2-DH1 2480MHz Ant1



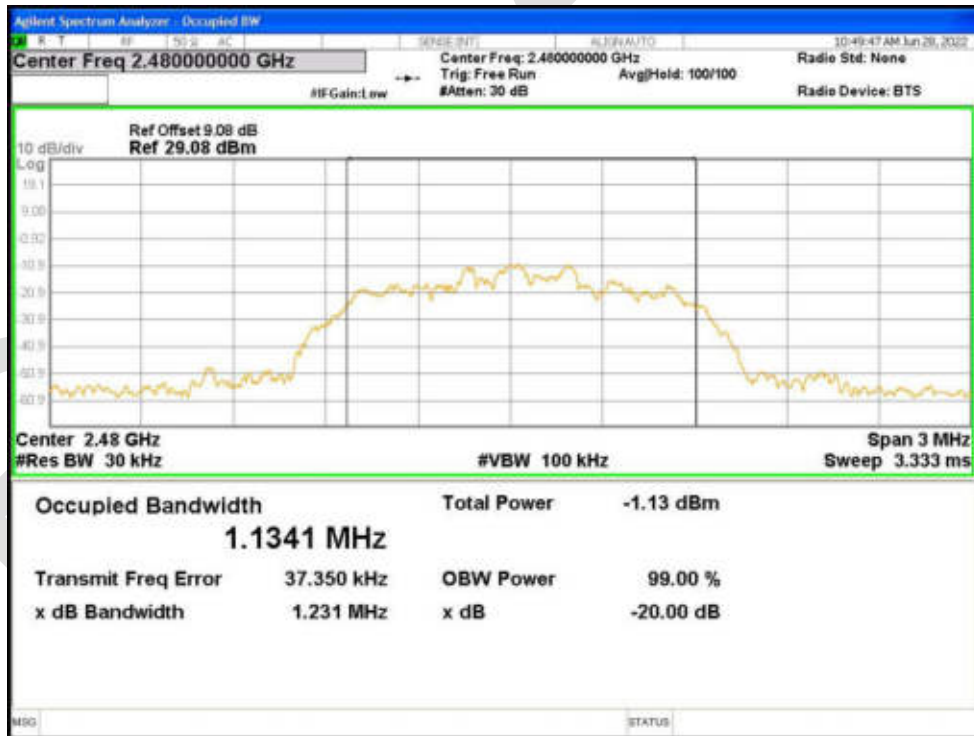
OBW NVNT 3-DH1 2402MHz Ant1



OBW NVNT 3-DH1 2441MHz Ant1



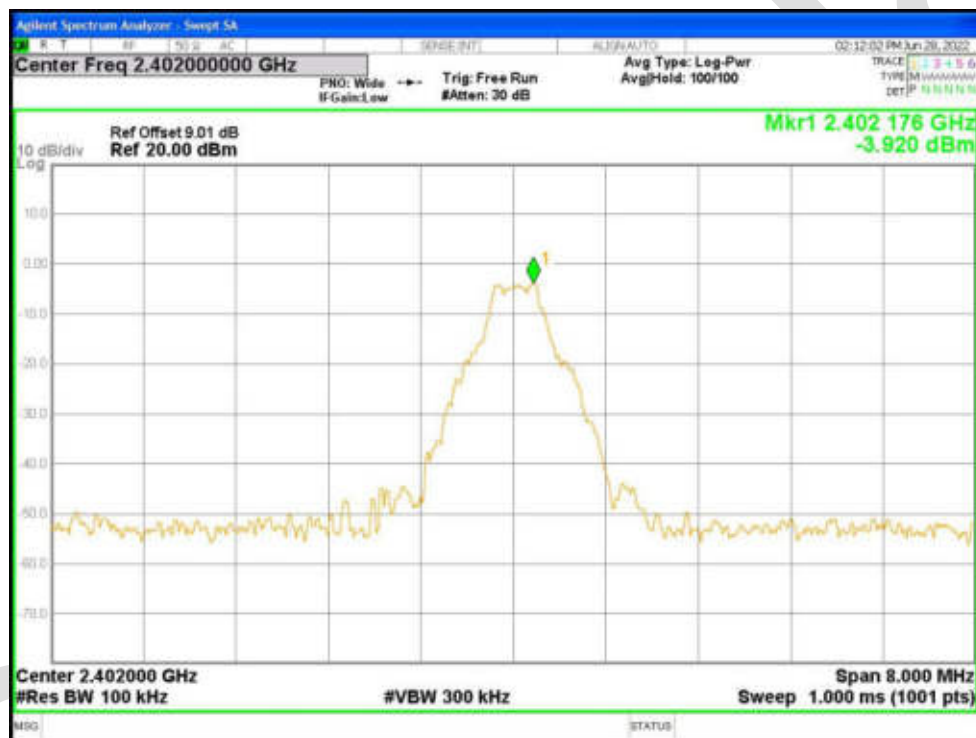
OBW NVNT 3-DH1 2480MHz Ant1



Band Edge

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant1	No-Hopping	-45.28	-20	Pass
NVNT	1-DH1	2480	Ant1	No-Hopping	-41.96	-20	Pass
NVNT	2-DH1	2402	Ant1	No-Hopping	-45.61	-20	Pass
NVNT	2-DH1	2480	Ant1	No-Hopping	-40.79	-20	Pass
NVNT	3-DH1	2402	Ant1	No-Hopping	-44.52	-20	Pass
NVNT	3-DH1	2480	Ant1	No-Hopping	-40.83	-20	Pass

Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Ref



Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Emission



Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Ref



Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Emission



Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Ref



Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Emission



Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Ref



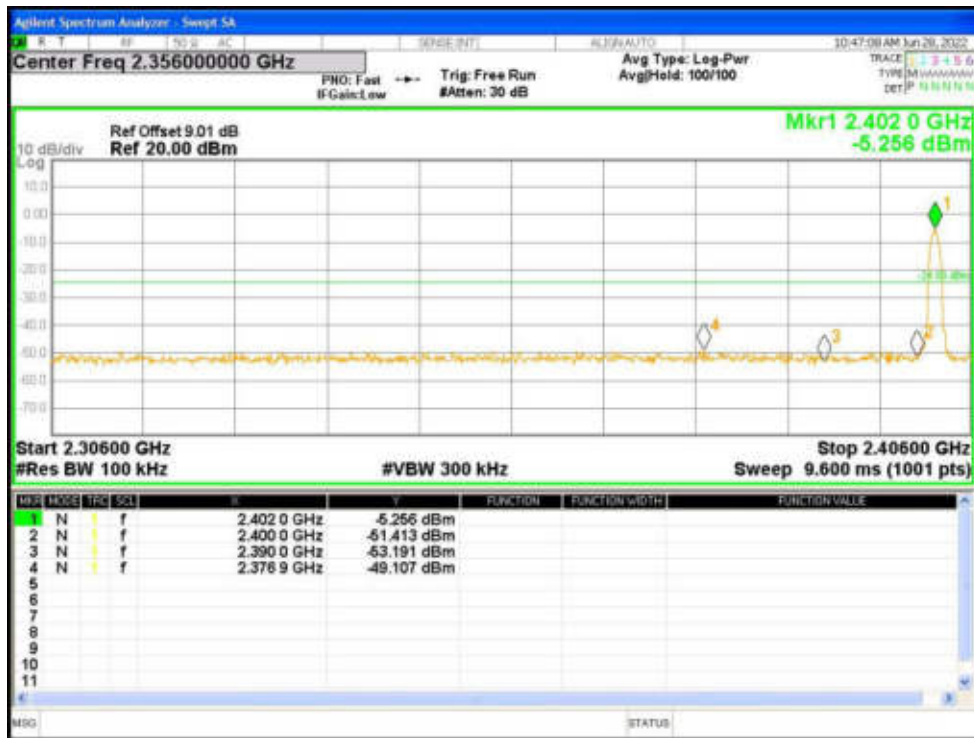
Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Emission



Band Edge NVNT 3-DH1 2402MHz Ant1 No-Hopping Ref



Band Edge NVNT 3-DH1 2402MHz Ant1 No-Hopping Emission



Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Ref



Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Emission



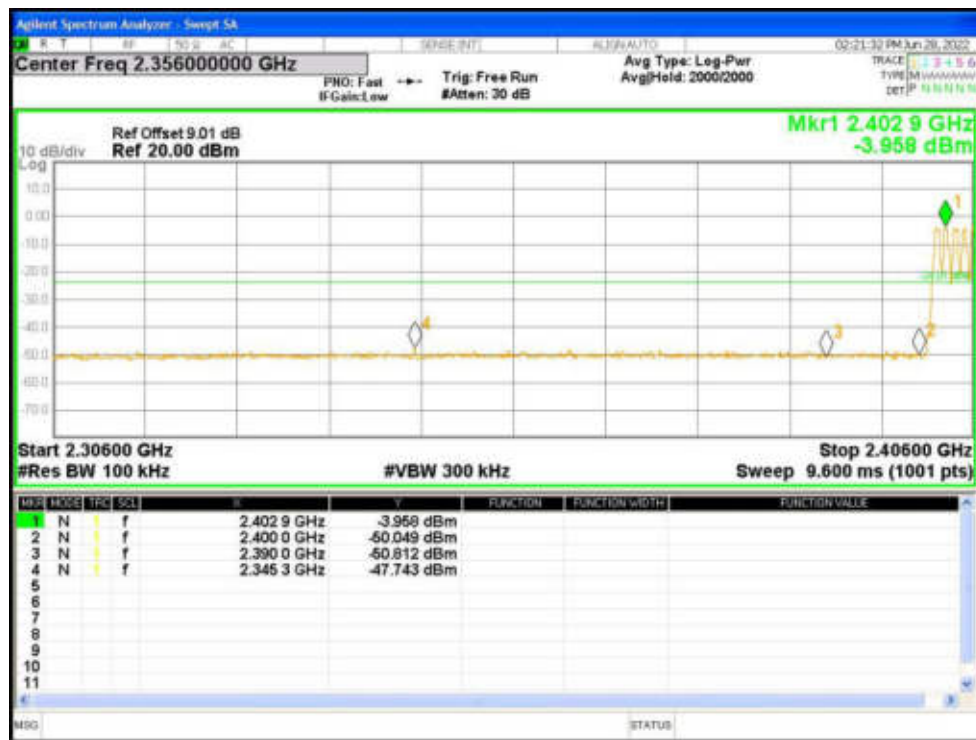
Band Edge(Hopping)

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant1	Hopping	-43.74	-20	Pass
NVNT	1-DH1	2480	Ant1	Hopping	-40.63	-20	Pass
NVNT	2-DH1	2402	Ant1	Hopping	-42.92	-20	Pass
NVNT	2-DH1	2480	Ant1	Hopping	-41.14	-20	Pass
NVNT	3-DH1	2402	Ant1	Hopping	-43.97	-20	Pass
NVNT	3-DH1	2480	Ant1	Hopping	-40.70	-20	Pass

Band Edge(Hopping) NVNT 1-DH1 2402MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT 1-DH1 2402MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT 1-DH1 2480MHz Ant1 Hopping Ref



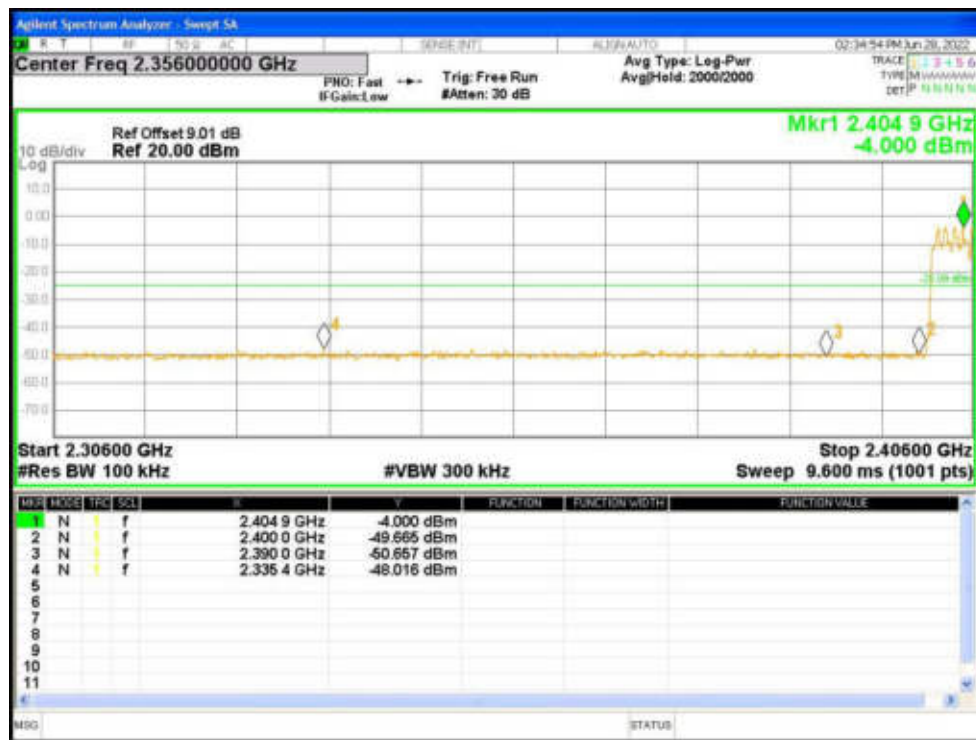
Band Edge(Hopping) NVNT 1-DH1 2480MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT 2-DH1 2402MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT 2-DH1 2402MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT 2-DH1 2480MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT 2-DH1 2480MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT 3-DH1 2402MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT 3-DH1 2402MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT 3-DH1 2480MHz Ant1 Hopping Ref



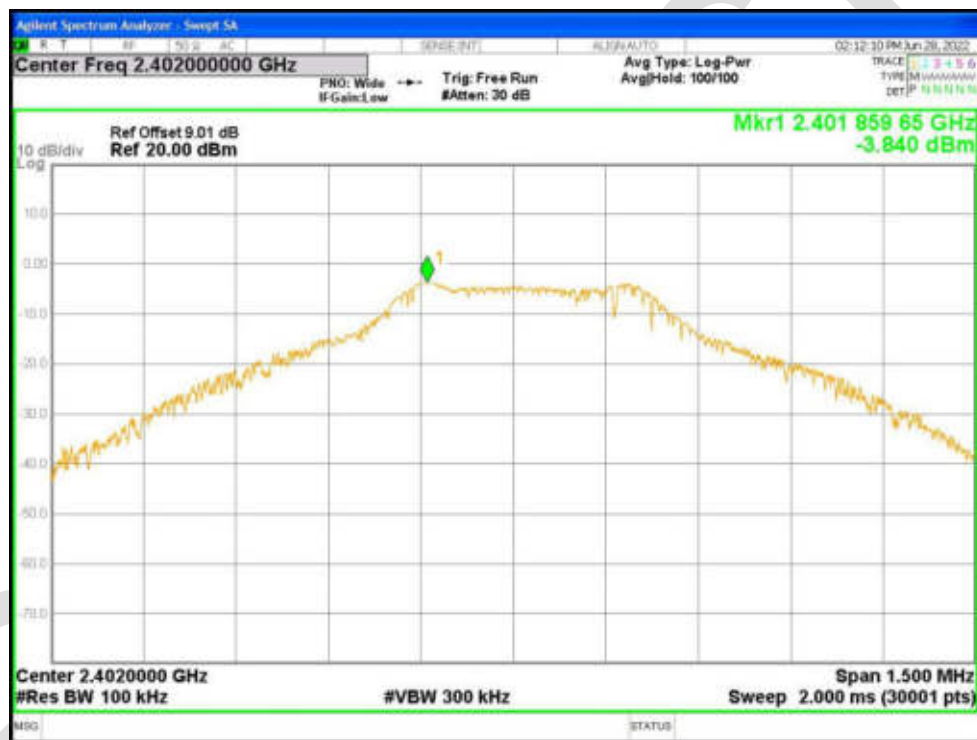
Band Edge(Hopping) NVNT 3-DH1 2480MHz Ant1 Hopping Emission



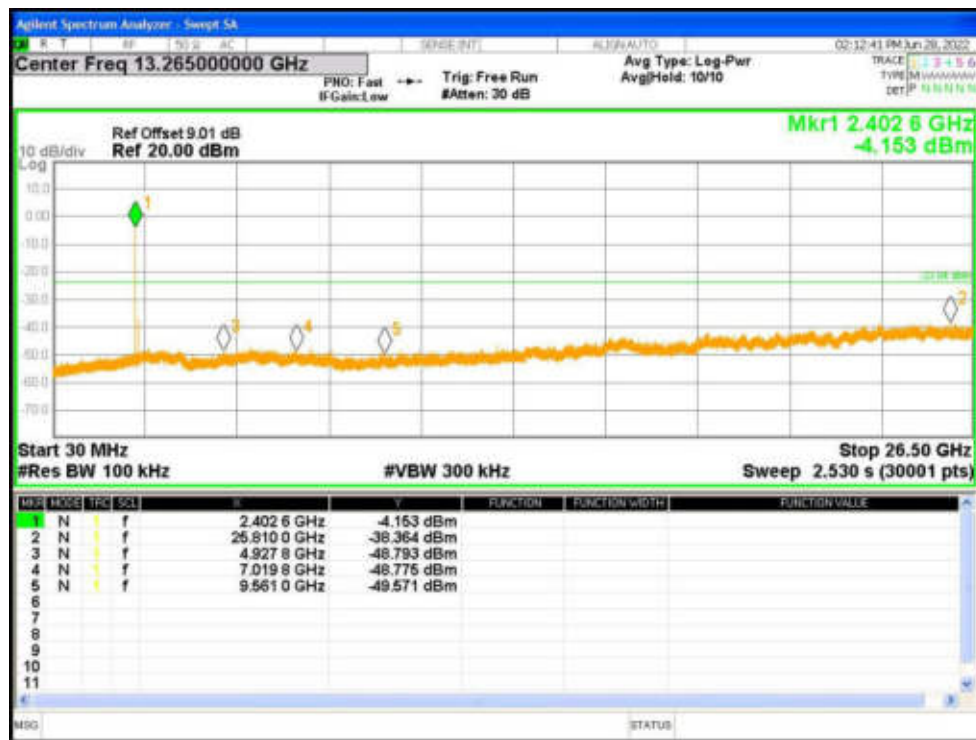
Conducted RF Spurious Emission

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant1	-34.52	-20	Pass
NVNT	1-DH1	2441	Ant1	-34.55	-20	Pass
NVNT	1-DH1	2480	Ant1	-31.12	-20	Pass
NVNT	2-DH1	2402	Ant1	-34.70	-20	Pass
NVNT	2-DH1	2441	Ant1	-34.02	-20	Pass
NVNT	2-DH1	2480	Ant1	-31.25	-20	Pass
NVNT	3-DH1	2402	Ant1	-33.79	-20	Pass
NVNT	3-DH1	2441	Ant1	-34.88	-20	Pass
NVNT	3-DH1	2480	Ant1	-30.67	-20	Pass

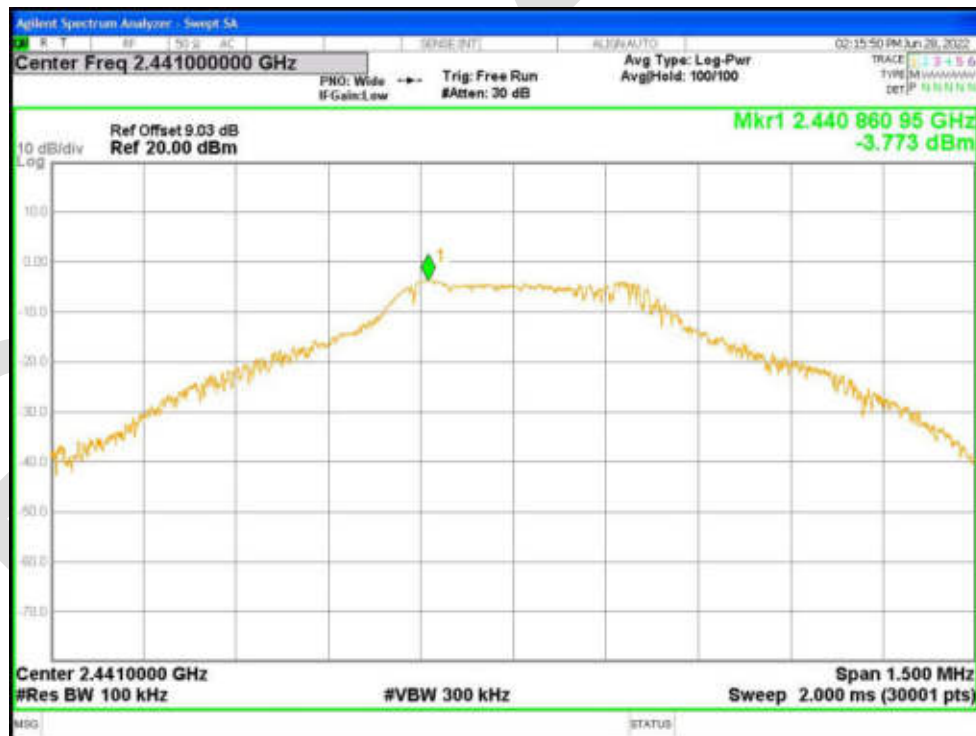
Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Ref



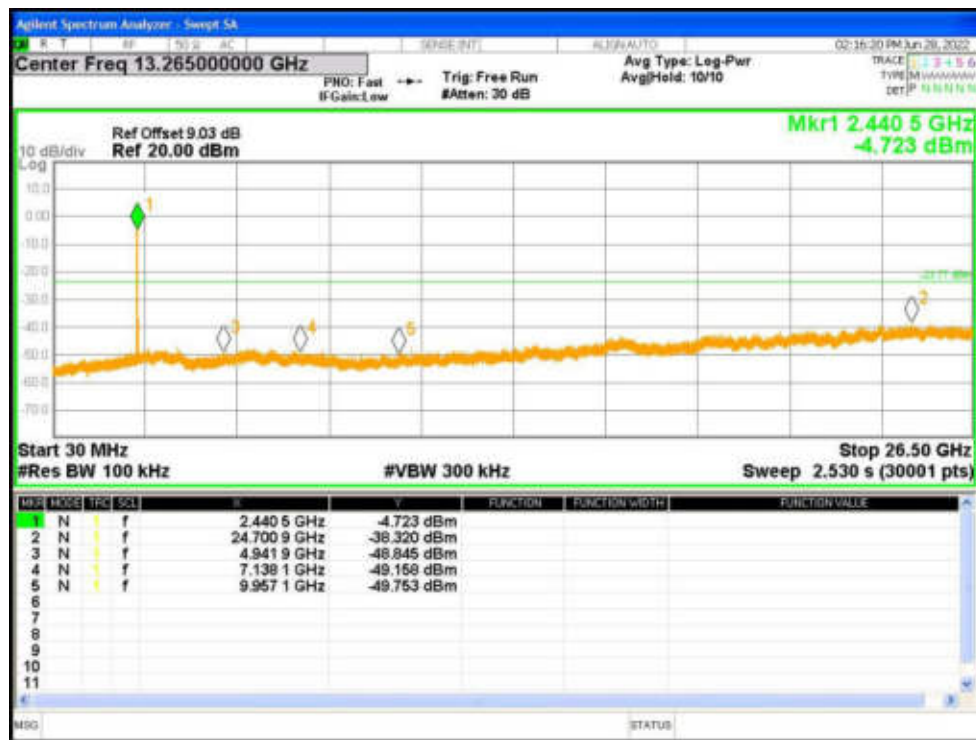
Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission



Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Ref



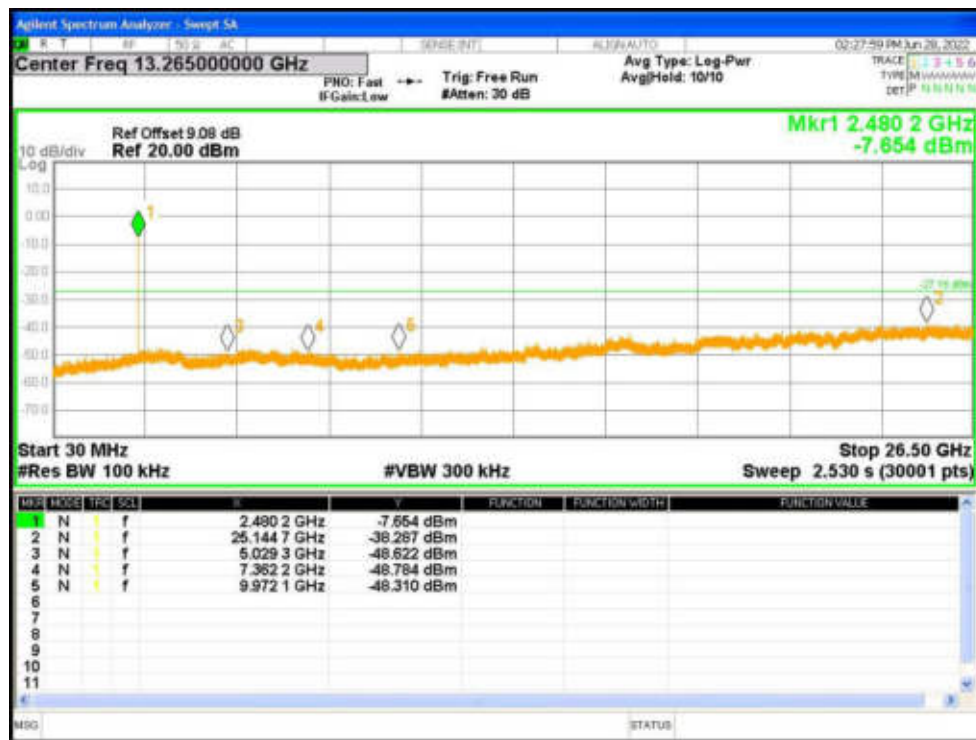
Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission



Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Ref



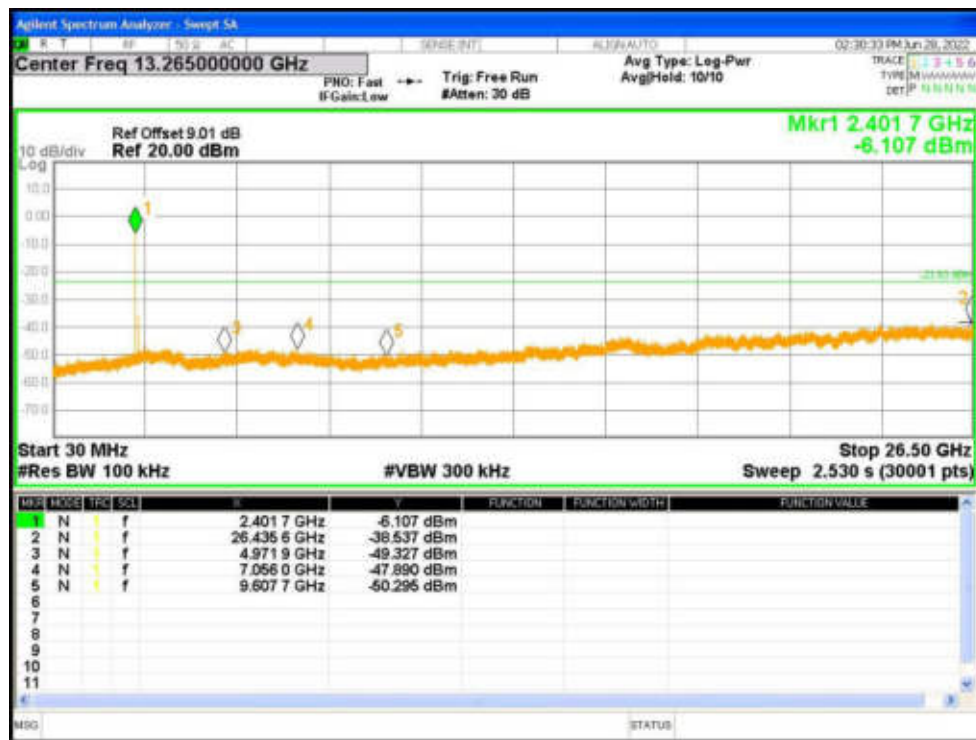
Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission



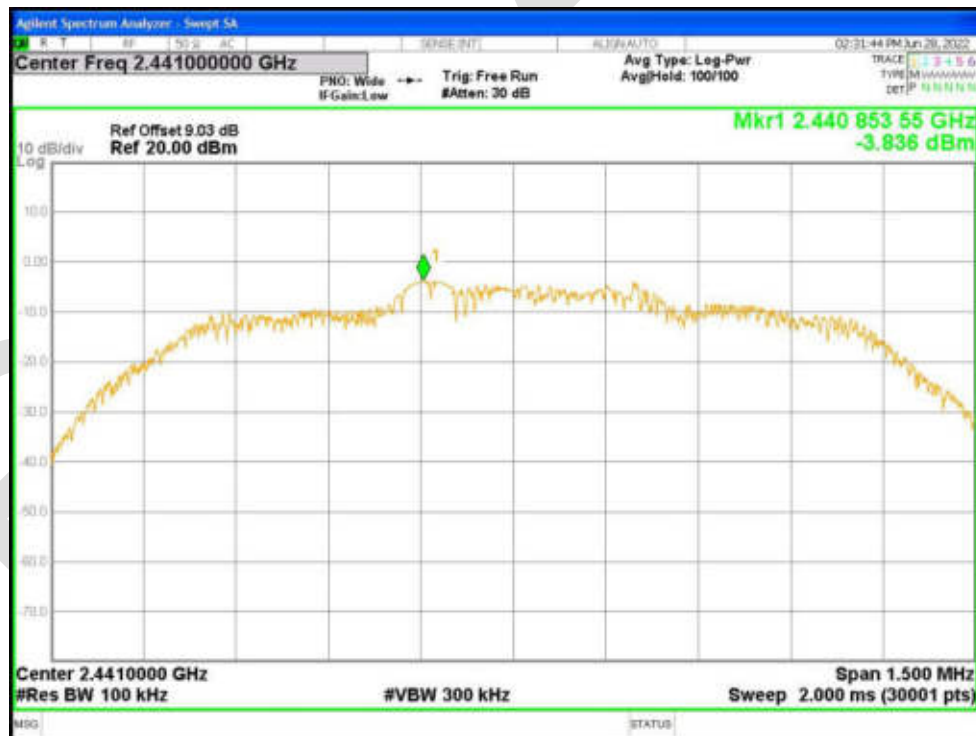
Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Ref



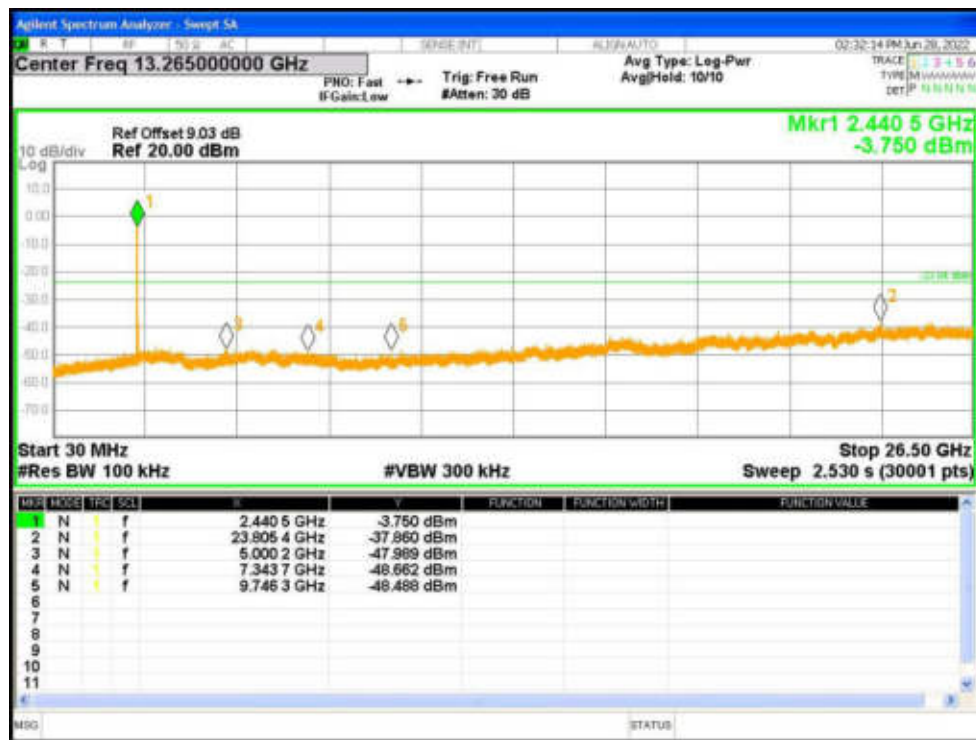
Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission



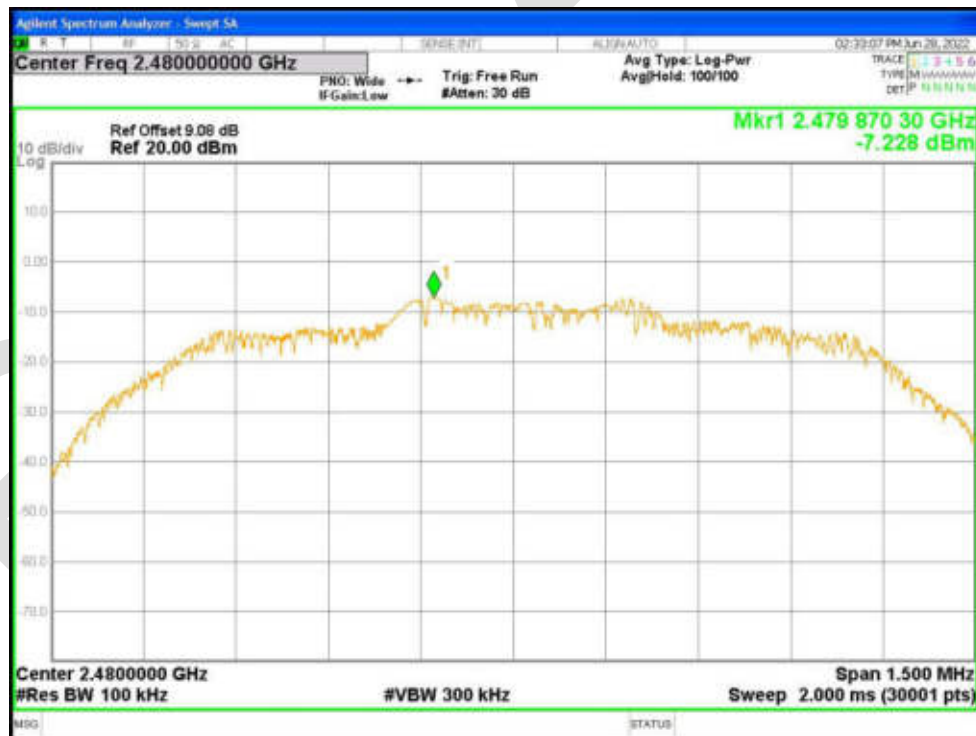
Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Ref



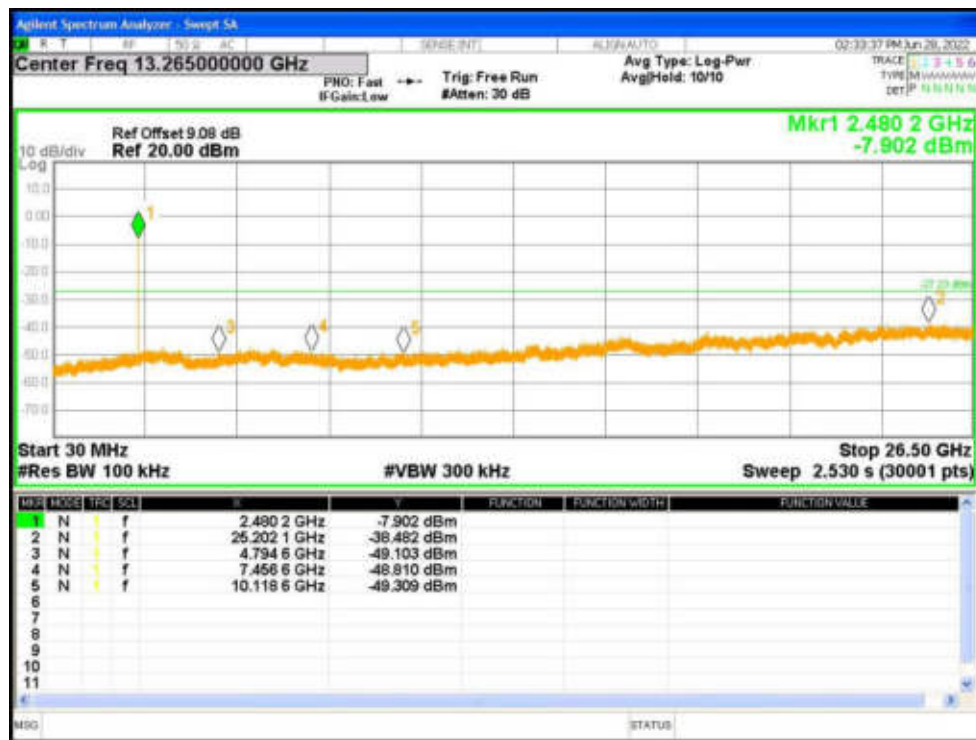
Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission



Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Ref



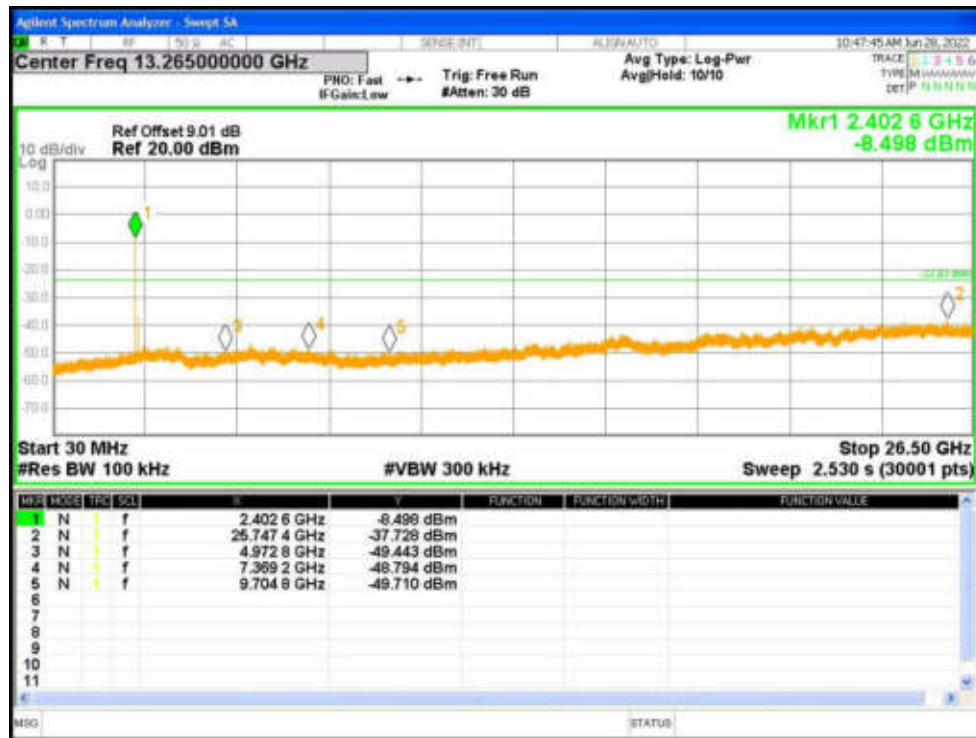
Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission



Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Ref



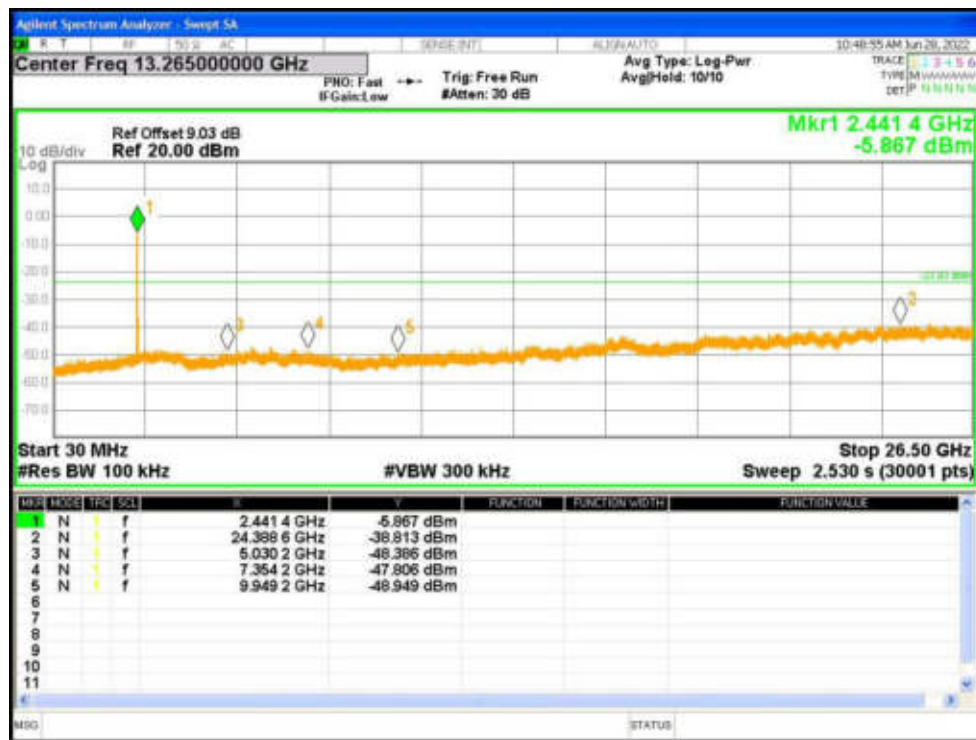
Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission



Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Ref



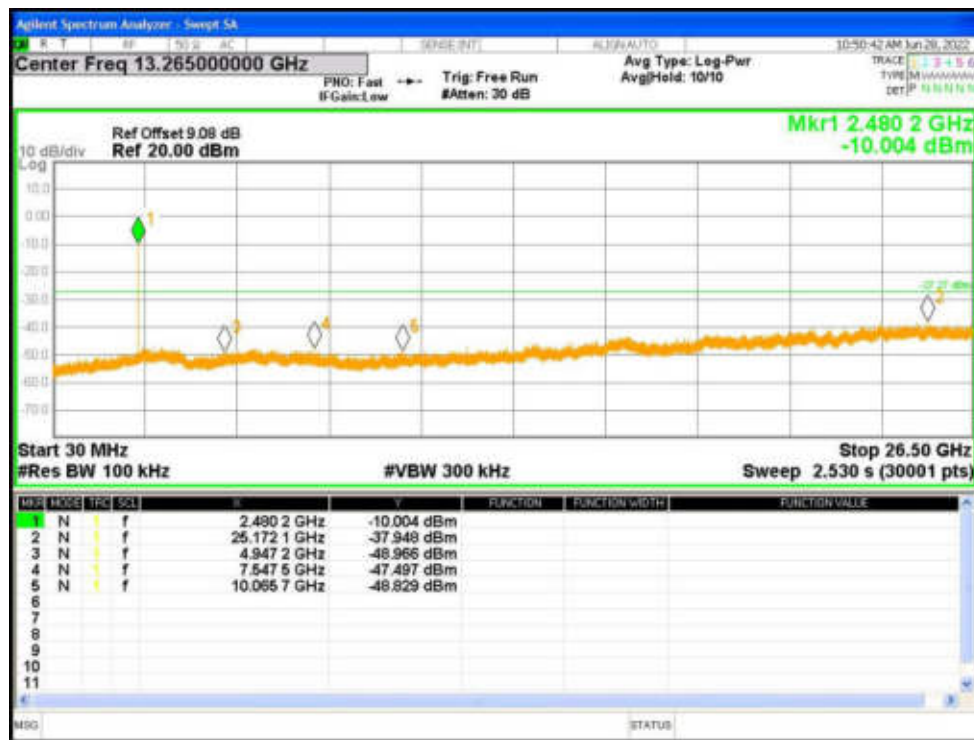
Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission



Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Ref



Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Emission



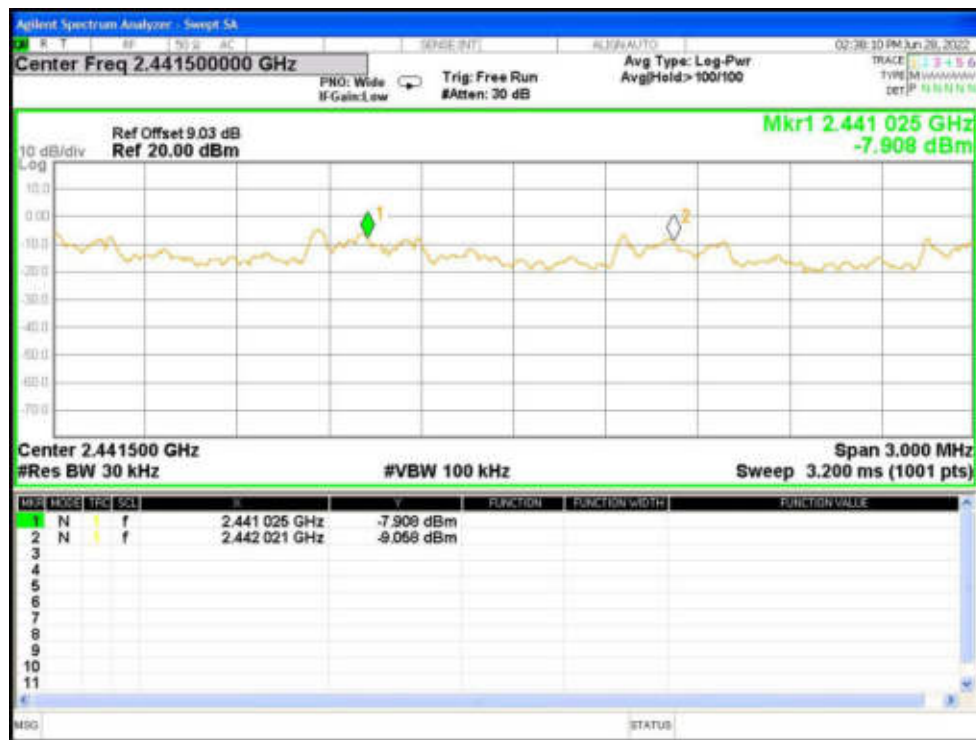
Carrier Frequencies Separation

Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	Ant1	2441.0365	2442.022	0.9855	0.888	Pass
NVNT	2-DH1	Ant1	2441.0245	2442.0205	0.996	0.819	Pass
NVNT	3-DH1	Ant1	2441.0365	2442.0535	1.017	0.817	Pass

CFS NVNT 1-DH1 2441MHz Ant1



CFS NVNT 2-DH1 2441MHz Ant1



CFS NVNT 3-DH1 2441MHz Ant1



Number of Hopping Channel

Condition	Mode	Antenna	Hopping Number	Limit	Verdict
NVNT	1-DH1	Ant1	79	15	Pass
NVNT	2-DH1	Ant1	79	15	Pass
NVNT	3-DH1	Ant1	79	15	Pass

Hopping No. NVNT 1-DH1 2441MHz Ant1



Hopping No. NVNT 2-DH1 2441MHz Ant1



Hopping No. NVNT 3-DH1 2441MHz Ant1



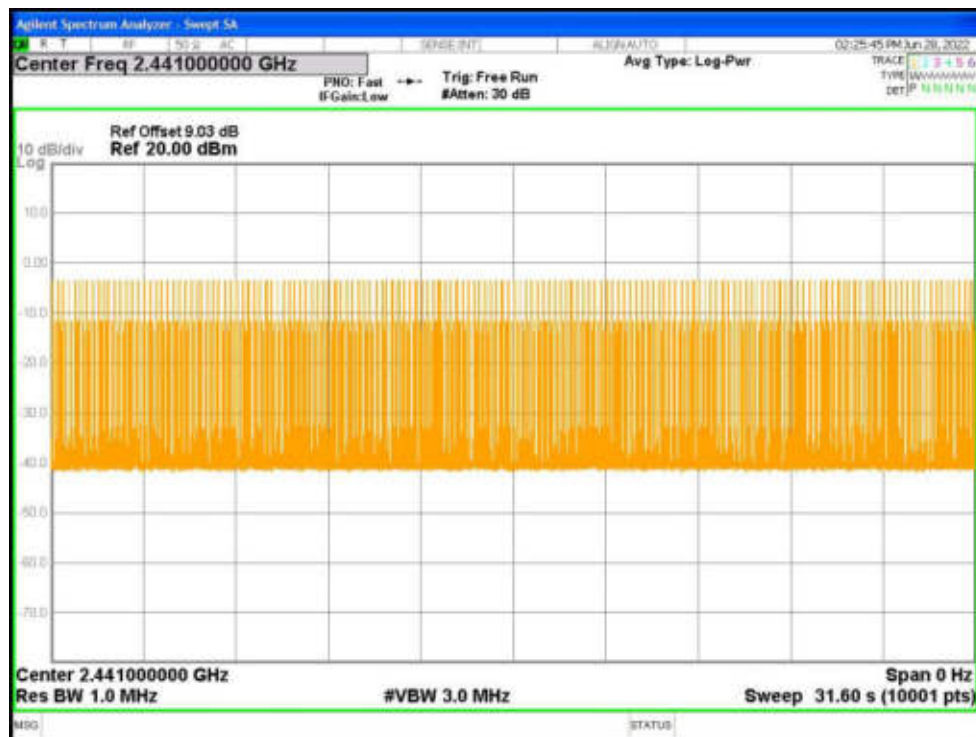
Dwell Time

Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH1	2441	Ant1	0.39	124.41	319	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.645	195.755	119	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.894	188.11	65	31600	400	Pass

Dwell NVNT 1-DH1 2441MHz Ant1 One Burst



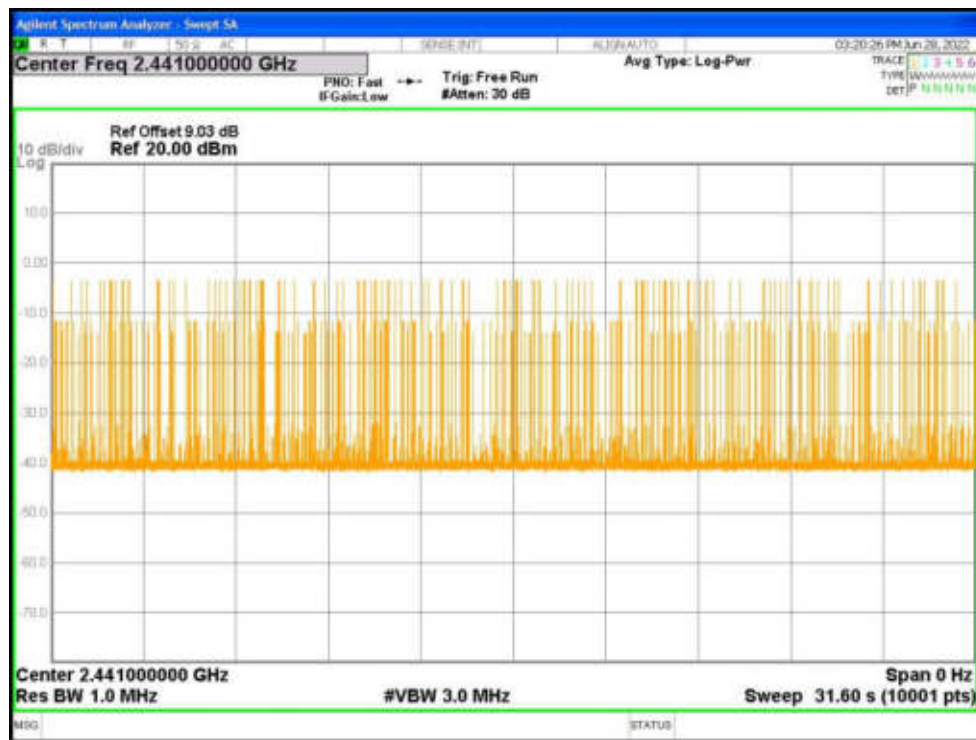
Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated



Dwell NVNT 1-DH3 2441MHz Ant1 One Burst



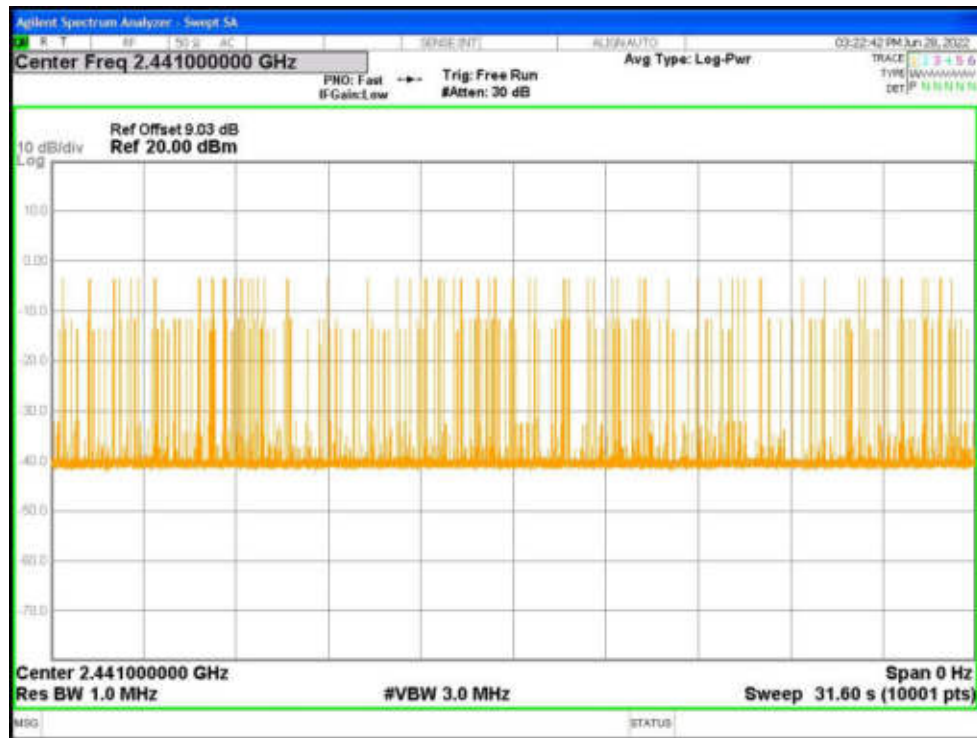
Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated



Dwell NVNT 1-DH5 2441MHz Ant1 One Burst



Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated

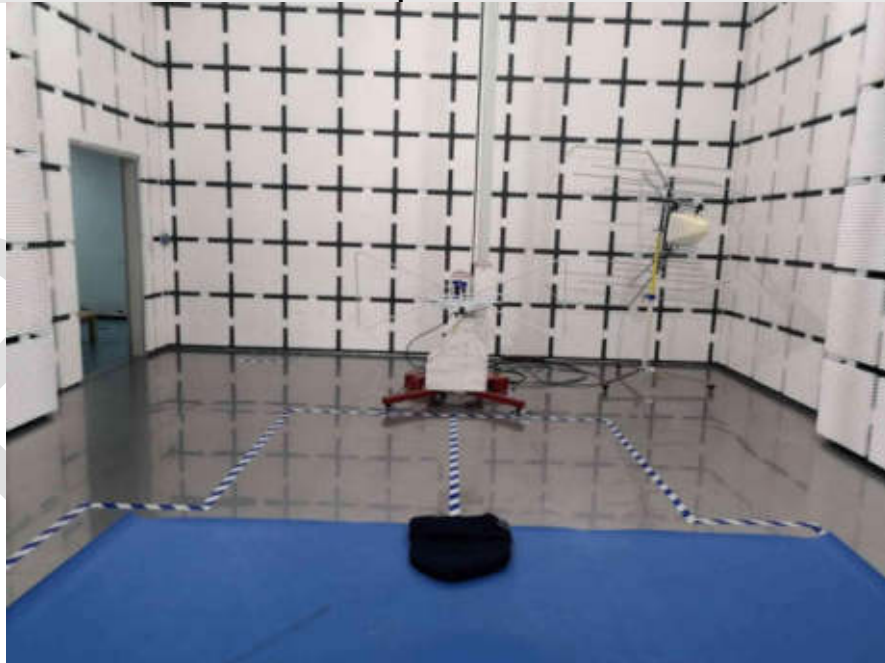


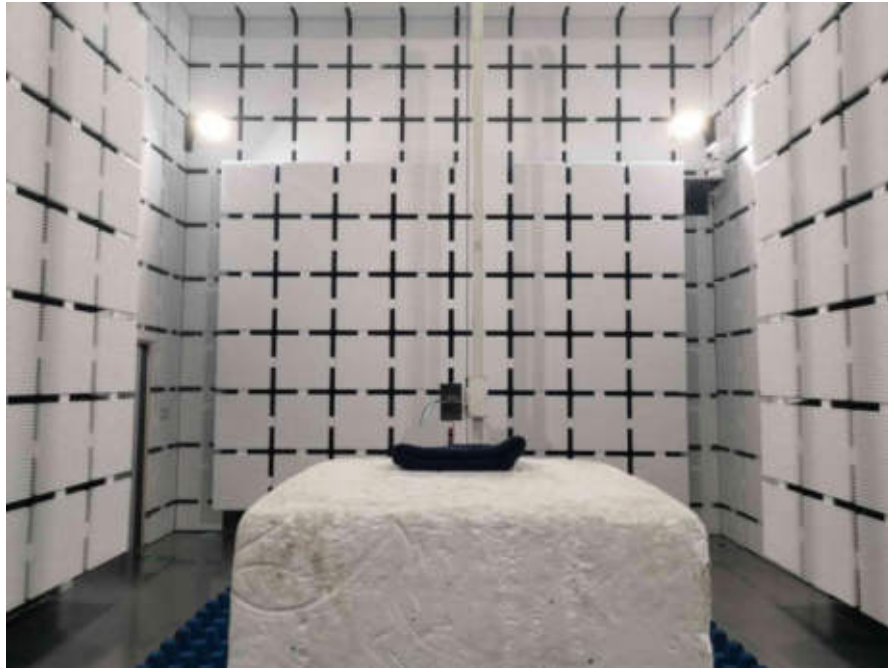
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

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



Radiated Spurious Emissions





APPENDIX B: PHOTOGRAPHS OF EUT

Reference to the test report No. BLA-EMC-202206-A8401

----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.