TEST REPORT

Product Name	:	Remote control
Brand Mark	:	N/A
Model No.	:	RF439A
FCC ID	:	S4X-RF439A
Report Number	:	BLA-EMC-202103-A11301
Date of Sample Receipt	:	2021/3/26
Date of Test	:	2021/3/26 to 2021/4/9
Date of Issue	:	2021/4/9
Test Standard	:	47 CFR Part 15, Subpart C 15.247
Test Result	:	Pass

Prepared for:

Shenzhen C&D Electronics Co., Ltd.

Building 2, Xia You Song Mountaintop Industrial Di YouSong Village, Longhua Town, Bao'an District Shenzhen Guangdong China

Prepared by:

BlueAsia of Technical Services(Shenzhen) Co.,Ltd.
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Compiled by: Ben Zong

Review by: Sweet. Liang

Approved by: Tomen Li

Date: 2021/4/9

REPORT REVISE RECORD

Version No.	Date	Description
00	2021/4/9	Original
01	2021/4/14	Change the model

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1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
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 Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	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
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 15.247 a(2)	Pass
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass

2 GENERAL INFORMATION

Applicant	Shenzhen C&D Electronics Co., Ltd.
Address	Building 2, Xia You Song Mountaintop Industrial Di YouSong Village, Longhua Town, Bao'an District Shenzhen Guangdong China
Manufacturer	Shenzhen C&D Electronics Co., Ltd.
Address	Building 2, Xia You Song Mountaintop Industrial Di YouSong Village, Longhua Town, Bao'an District Shenzhen Guangdong China
Factory	Shenzhen C&D Electronics Co., Ltd.
Address	Building 2, Xia You Song Mountaintop Industrial Di YouSong Village, Longhua Town, Bao'an District Shenzhen Guangdong China
Product Name	Remote control
Test Model No.	RF439A

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	V1.1
Software Version	V0.6

Operation Frequency:	2402MHz~2480MHz
Modulation Type:	GFSK
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	PCB Antenna
Antenna Gain:	2 dBi(Provided by customer)

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	+25℃	3.0Vdc

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
TX mode	Keep the EUT in continuously TX mode with modulation
Remark:New battery is used during all test	

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
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	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25
Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
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 Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25

Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
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 Spurious Emissions					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Power Spectrum Density					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11

Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Minimum 6dB Bandwidth					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal.Date**	**Cal.Due**
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

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	2020/10/12	2021/10/11
LISN	R&S	ENV216	3560.6550.15	2020/10/12	2021/10/11
LISN	AT	AT166-2	AKK1806000003	2020/10/12	2021/10/11
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A

1 RADIATED SPURIOUS EMISSIONS

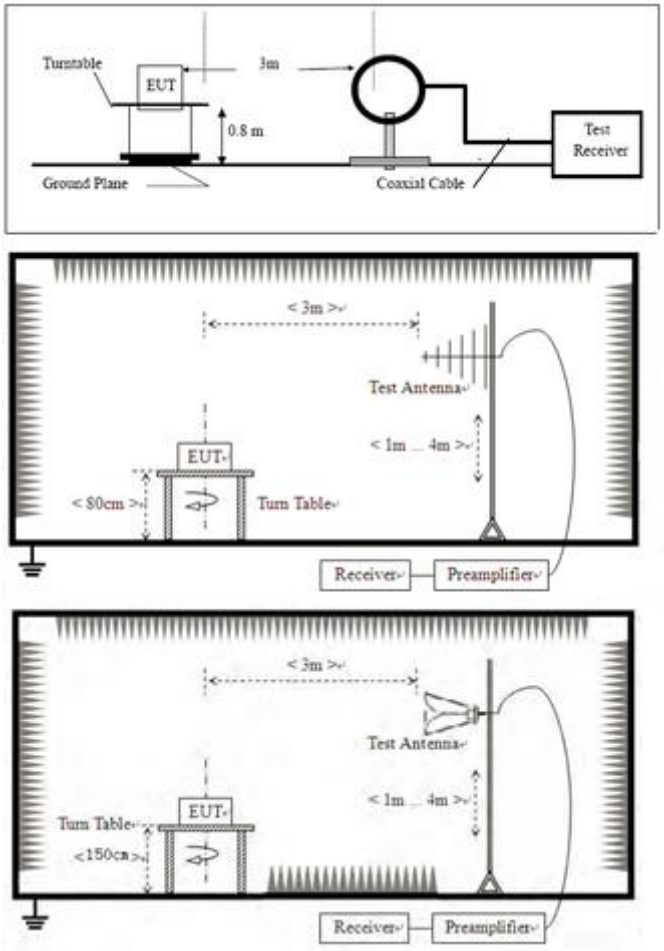
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.4,6.5,6.6
Test Mode (Pre-Scan)	TX Low channel;TX middle channel;TX high channel;TX mode (SE)
Test Mode (Final Test)	TX Low channel;TX middle channel;TX high channel;TX mode (SE)
Tester	Ben
Temperature	25℃
Humidity	60%

1.1 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.

1.2 BLOCK DIAGRAM OF TEST SETUP



1.3 PROCEDURE

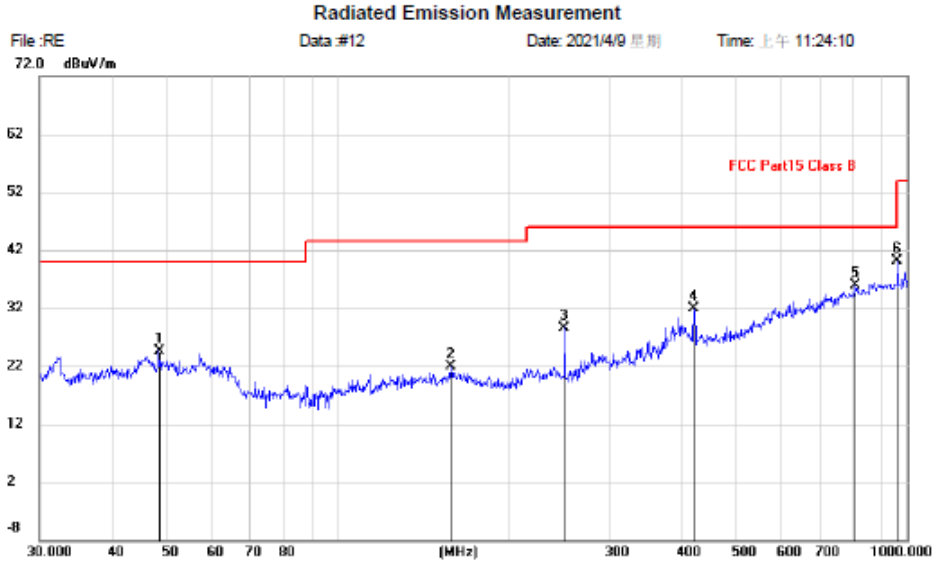
a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
c. 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.
d. 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.
e. 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.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. 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 TX 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.

1.4 TEST DATA

[TestMode: TX]; [Polarity: Horizontal]



Site
Limit: FCC Part15 Class B
EUT:
M/N:
Mode: RF402A mode
Note:

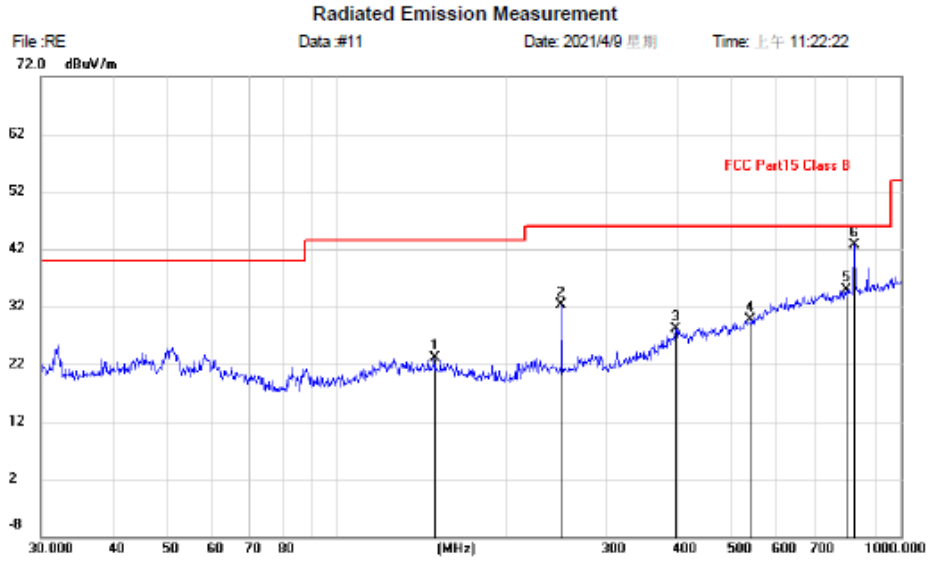
Polarization: *Horizontal*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		48.5016	0.79	23.81	24.60	40.00	-15.40	QP			
2		158.1123	-1.29	23.20	21.91	43.50	-21.59	QP			
3		250.3009	5.76	22.84	28.60	46.00	-17.40	QP			
4		422.0577	4.17	27.81	31.98	46.00	-14.02	QP			
5	*	813.1114	1.07	34.83	35.90	46.00	-10.10	QP			
6		962.1621	3.81	36.30	40.11	54.00	-13.89	QP			

Test Result: Pass

[TestMode: TX]; [Polarity: Vertical]



Site
Limit: FCC Part15 Class B
EUT:
M/N:
Mode: RF402A
Note:

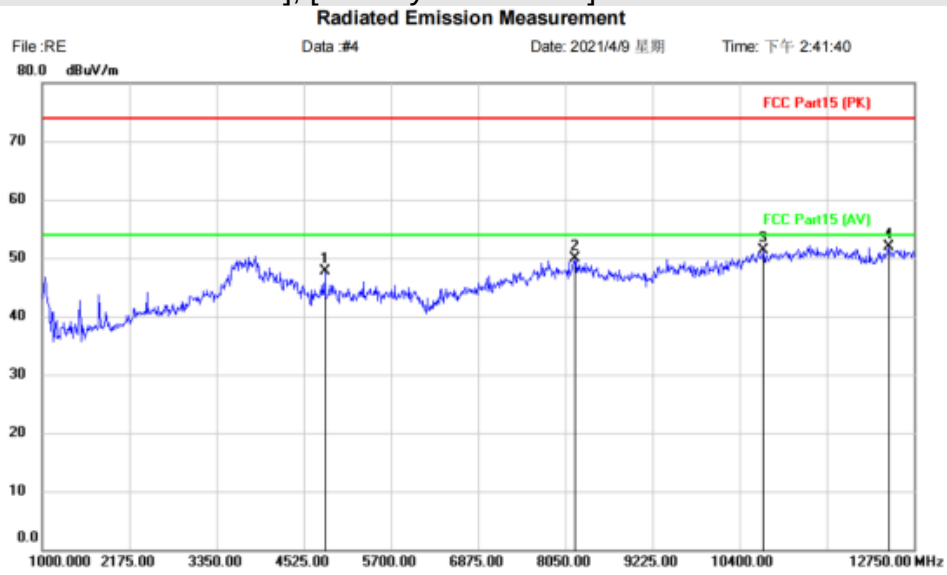
Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		148.9625	-0.21	23.31	23.10	43.50	-20.40	QP			
2		250.3009	9.40	22.84	32.24	46.00	-13.76	QP			
3		399.0300	0.46	27.56	28.02	46.00	-17.98	QP			
4		541.3721	-0.02	29.63	29.61	46.00	-16.39	QP			
5		801.7862	0.14	34.69	34.83	46.00	-11.17	QP			
6	*	827.4932	7.88	34.83	42.71	46.00	-3.29	QP			

Test Result: Pass

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



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-L mode
Note:

Polarization: *Horizontal*
Power:
Distance: 3m

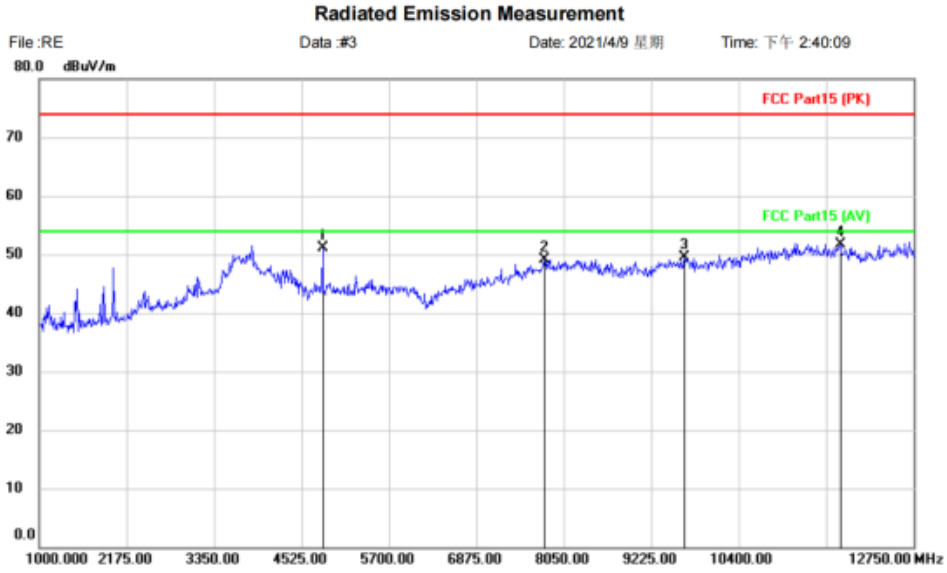
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4807.000	43.99	3.71	47.70	74.00	-26.30	peak			
2		8179.250	41.81	8.18	49.99	74.00	-24.01	peak			
3		10717.250	39.81	11.52	51.33	74.00	-22.67	peak			
4	*	12409.250	40.09	11.80	51.89	74.00	-22.11	peak			

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

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



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-L mode
Note:

Polarization: *Vertical*
Power:
Distance: 3m

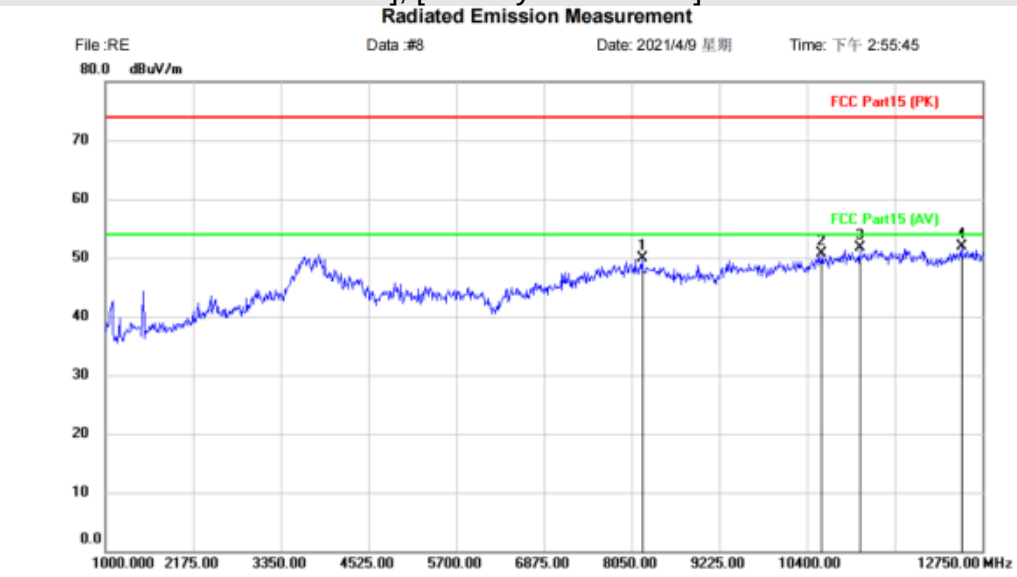
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4807.000	47.41	3.71	51.12	74.00	-22.88	peak			
2		7791.500	41.49	7.68	49.17	74.00	-24.83	peak			
3		9671.500	40.15	9.42	49.57	74.00	-24.43	peak			
4	*	11763.000	40.16	11.63	51.79	74.00	-22.21	peak			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

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



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-M mode
Note:

Polarization: *Horizontal*
Power:
Distance: 3m

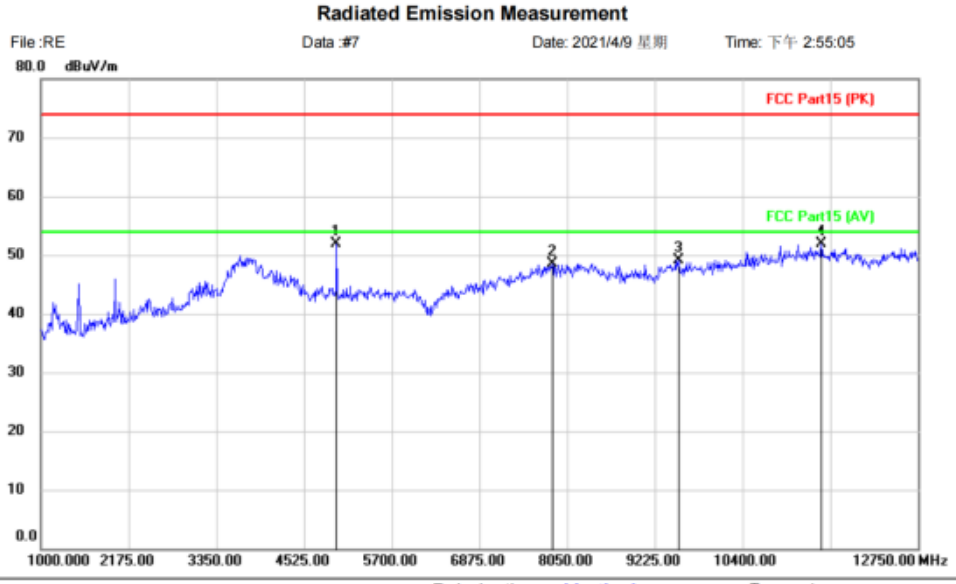
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		8191.000	41.72	8.20	49.92	74.00	-24.08	peak			
2		10599.750	39.50	11.13	50.63	74.00	-23.37	peak			
3		11105.000	39.67	12.02	51.69	74.00	-22.31	peak			
4	*	12468.000	40.03	11.80	51.83	74.00	-22.17	peak			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

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



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-M mode
Note:

Polarization: *Vertical*
Power:
Distance: 3m

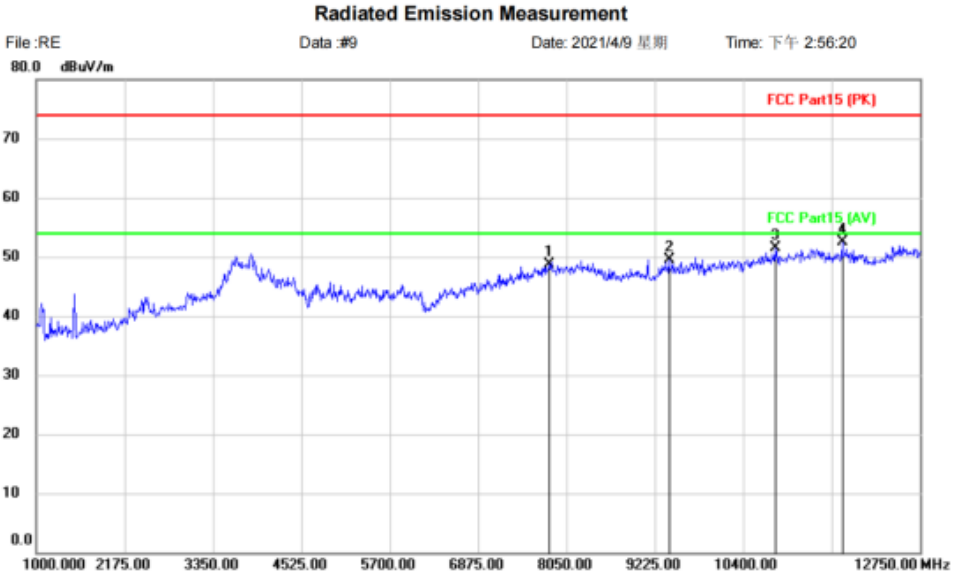
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	4959.750	48.14	3.75	51.89	74.00	-22.11	peak			
2		7850.250	40.79	7.76	48.55	74.00	-25.45	peak			
3		9542.250	39.97	9.14	49.11	74.00	-24.89	peak			
4		11457.500	39.99	11.84	51.83	74.00	-22.17	peak			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

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



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-H mode
Note:

Polarization: *Horizontal*
Power:
Distance: 3m

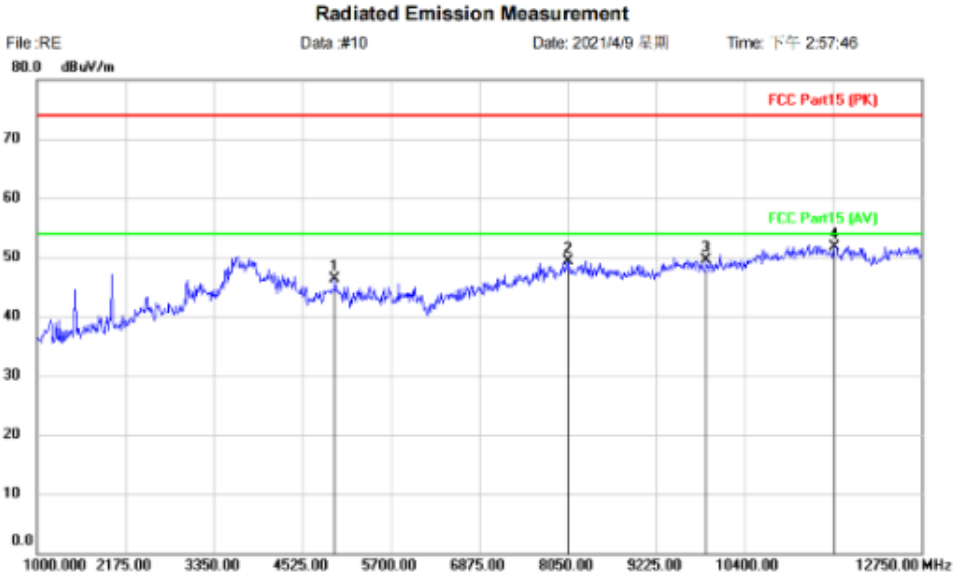
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		7826.750	41.07	7.73	48.80	74.00	-25.20	peak			
2		9413.000	40.59	8.86	49.45	74.00	-24.55	peak			
3		10823.000	39.67	11.80	51.47	74.00	-22.53	peak			
4	*	11716.000	40.68	11.76	52.44	74.00	-21.56	peak			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

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



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-H mode
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		4959.750	42.49	3.75	46.24	74.00	-27.76	peak			
2		8050.000	41.26	8.01	49.27	74.00	-24.73	peak			
3		9894.750	39.40	10.06	49.46	74.00	-24.54	peak			
4	*	11598.500	39.55	12.06	51.61	74.00	-22.39	peak			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

2 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

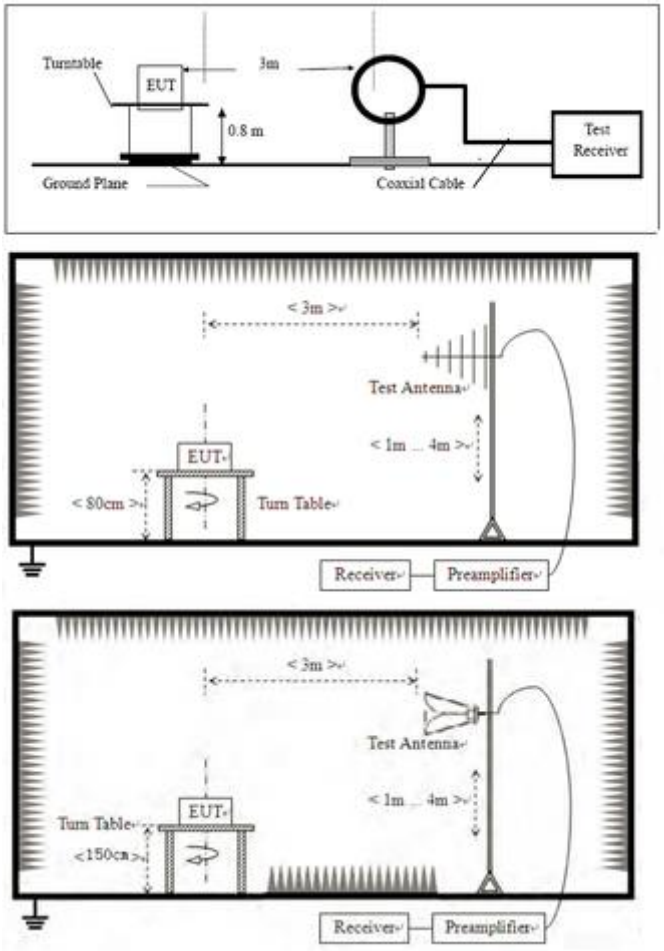
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX Low channel;TX high channel
Test Mode (Final Test)	TX Low channel;TX high channel
Tester	Ben
Temperature	25℃
Humidity	60%

2.1 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.

2.2 BLOCK DIAGRAM OF TEST SETUP



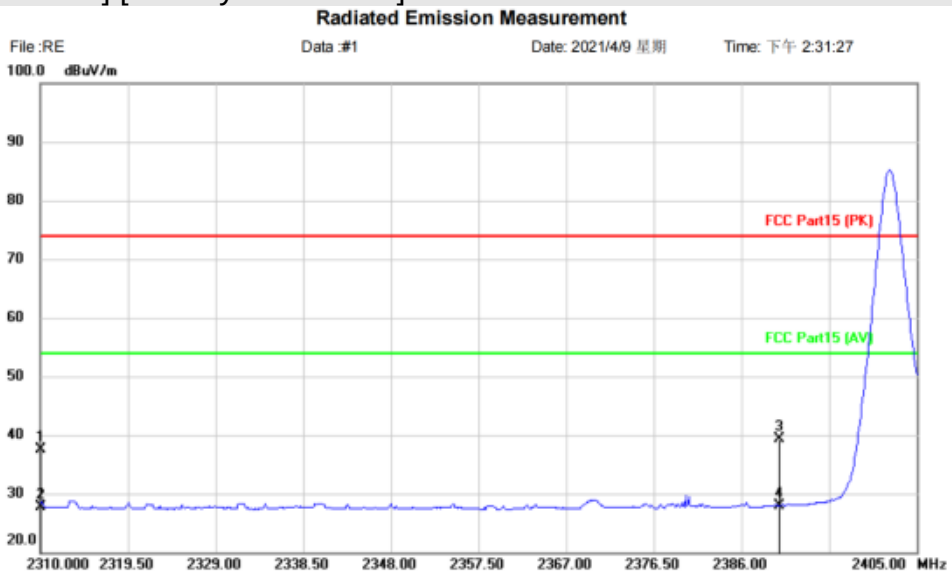
2.3 PROCEDURE

a. 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.
b. 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.
c. 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.
d. 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.
e. 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.
f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
g. 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 TX 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.

2.4 TEST DATA

[Test channel:lowest] [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-L mode
Note:

Polarization: *Horizontal*
Power:
Distance: 3m

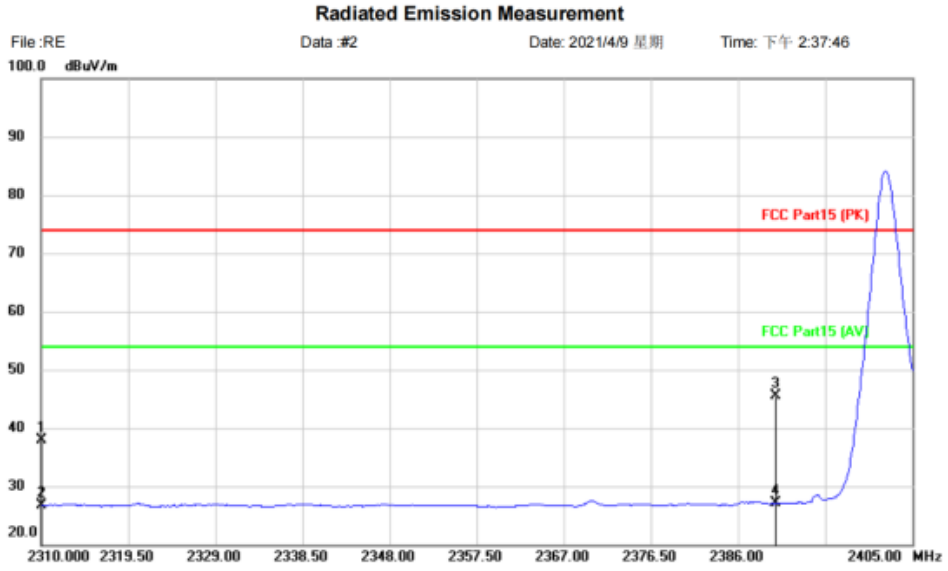
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2310.000	42.08	-4.61	37.47	74.00	-36.53	peak	100	360	
2		2310.000	32.35	-4.61	27.74	54.00	-26.26	AVG			
3		2390.000	43.49	-4.27	39.22	74.00	-34.78	peak	100	360	
4	*	2390.000	32.26	-4.27	27.99	54.00	-26.01	AVG			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[Test channel:lowest] [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-L mode
Note:

Polarization: *Vertical*
Power:
Distance: 3m

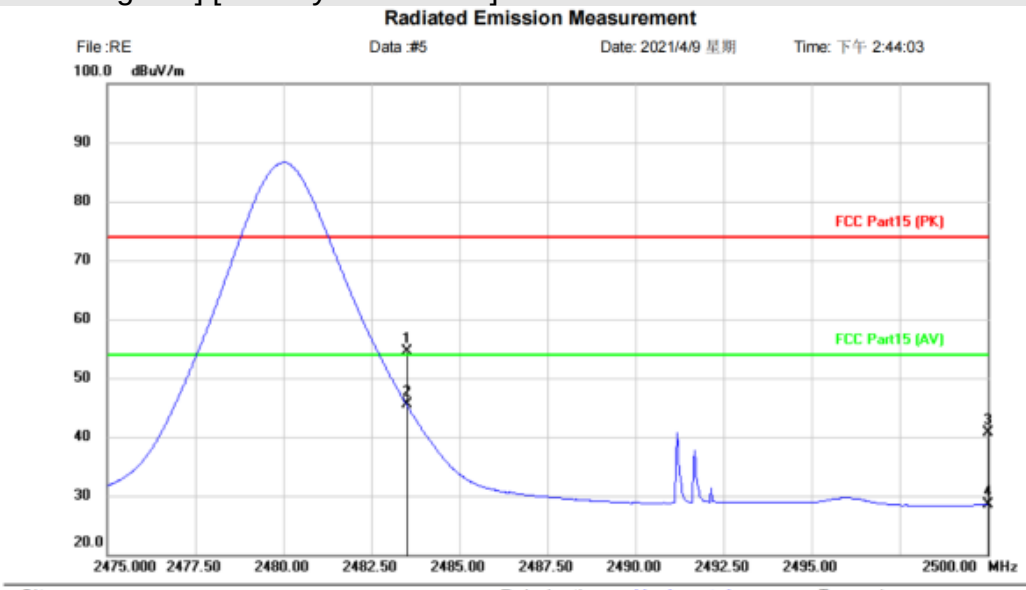
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2310.000	42.53	-4.61	37.92	74.00	-36.08	peak	100	59	
2		2310.000	31.31	-4.61	26.70	54.00	-27.30	AVG			
3		2390.000	49.84	-4.27	45.57	74.00	-28.43	peak	100	59	
4	*	2390.000	31.28	-4.27	27.01	54.00	-26.99	AVG			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

[Test channel:Highest] [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-H mode
Note:

Polarization: *Horizontal*
Power:
Distance: 3m

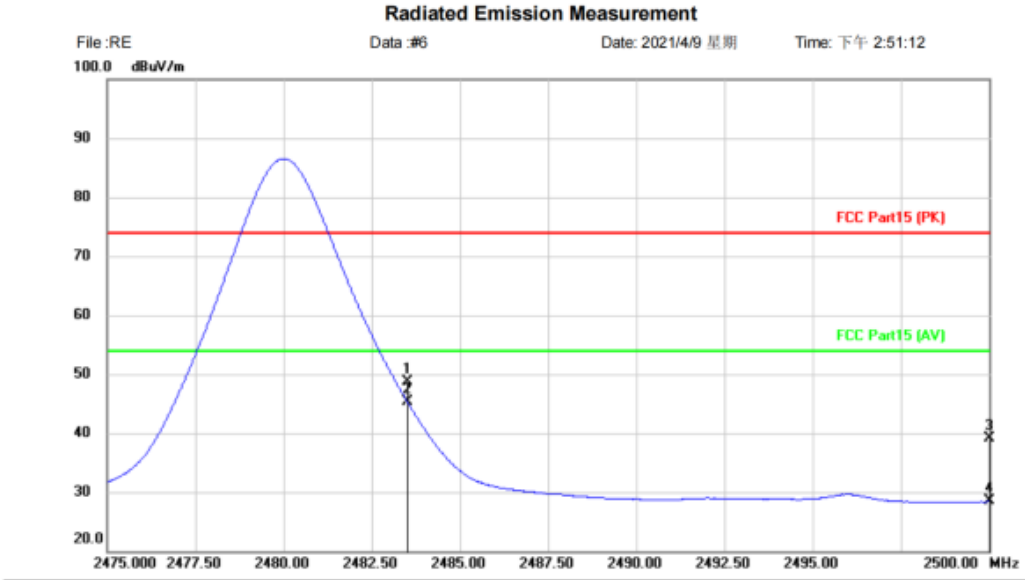
Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2483.500	58.34	-3.84	54.50	74.00	-19.50	peak	100	0	
2	*	2483.500	49.32	-3.84	45.48	54.00	-8.52	AVG			
3		2500.000	44.50	-3.78	40.72	74.00	-33.28	peak	100	0	
4		2500.000	32.26	-3.78	28.48	54.00	-25.52	AVG			

*:Maximum data x:Over limit !:over margin 〈Reference Only

Test Result: Pass

[Test channel:Highest] [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT:
M/N:
Mode: TX-H mode
Note:

Polarization: *Vertical*
Power:
Distance: 3m

Temperature:
Humidity: %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2483.500	52.55	-3.84	48.71	74.00	-25.29	peak	100	0	
2	*	2483.500	49.22	-3.84	45.38	54.00	-8.62	AVG			
3		2500.000	42.87	-3.78	39.09	74.00	-34.91	peak	100	0	
4		2500.000	32.23	-3.78	28.45	54.00	-25.55	AVG			

*:Maximum data x:Over limit !:over margin (Reference Only

Test Result: Pass

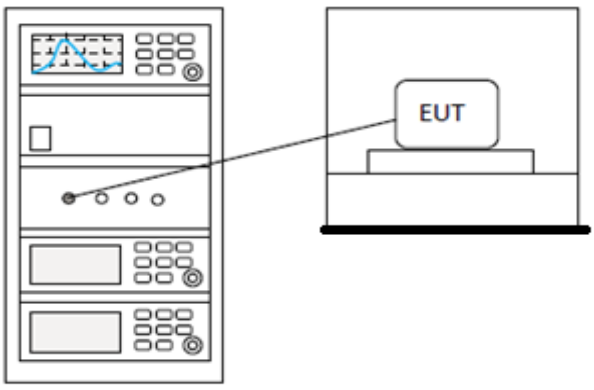
3 CONDUCTED SPURIOUS EMISSIONS

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.8
Test Mode (Pre-Scan)	TX mode
Test Mode (Final Test)	TX mode
Tester	Ben
Temperature	25℃
Humidity	60%

3.1 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)).

3.2 BLOCK DIAGRAM OF TEST SETUP



3.3 TEST DATA

Pass: Please Refer To Appendix: For Details

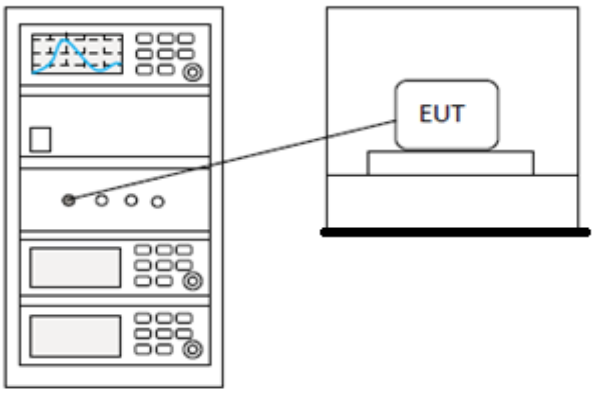
4 CONDUCTED BAND EDGES MEASUREMENT

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 7.8.6
Test Mode (Pre-Scan)	TX mode
Test Mode (Final Test)	TX mode
Tester	Ben
Temperature	25℃
Humidity	60%

4.1 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)).

4.2 BLOCK DIAGRAM OF TEST SETUP



4.3 TEST DATA

Pass: Please Refer To Appendix: For Details

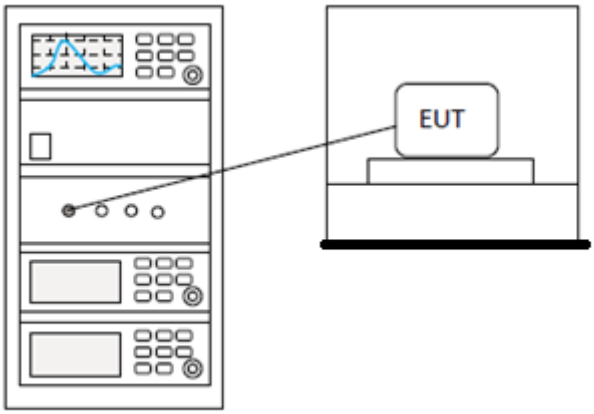
5 POWER SPECTRUM DENSITY

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 mode
Test Mode (Final Test)	TX mode
Tester	Ben
Temperature	25℃
Humidity	60%

5.1 LIMITS

Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

5.2 BLOCK DIAGRAM OF TEST SETUP



5.3 TEST DATA

Pass: Please Refer To Appendix: For Details

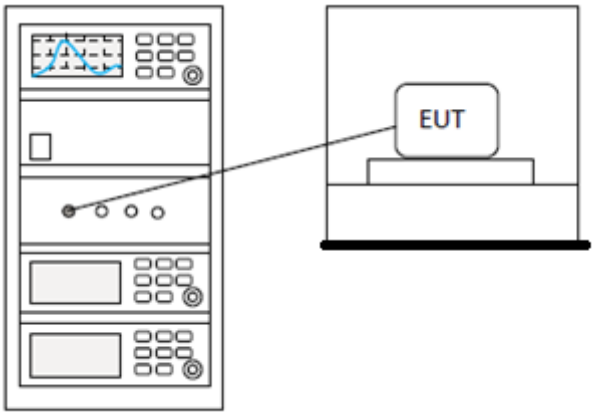
6 CONDUCTED PEAK OUTPUT POWER

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 mode
Test Mode (Final Test)	TX mode
Tester	Ben
Temperature	25℃
Humidity	60%

6.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ 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

6.2 BLOCK DIAGRAM OF TEST SETUP



6.3 TEST DATA

Pass: Please Refer To Appendix: For Details

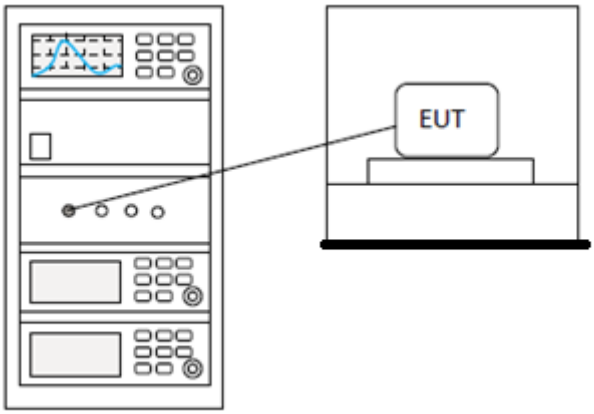
7 MINIMUM 6DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 11.8.1
Test Mode (Pre-Scan)	TX mode
Test Mode (Final Test)	TX mode
Tester	Ben
Temperature	25℃
Humidity	60%

7.1 LIMITS

Limit:	≥500 kHz

7.2 BLOCK DIAGRAM OF TEST SETUP



7.3 TEST DATA

Pass: Please Refer To Appendix: For Details

8 ANTENNA REQUIREMENT

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

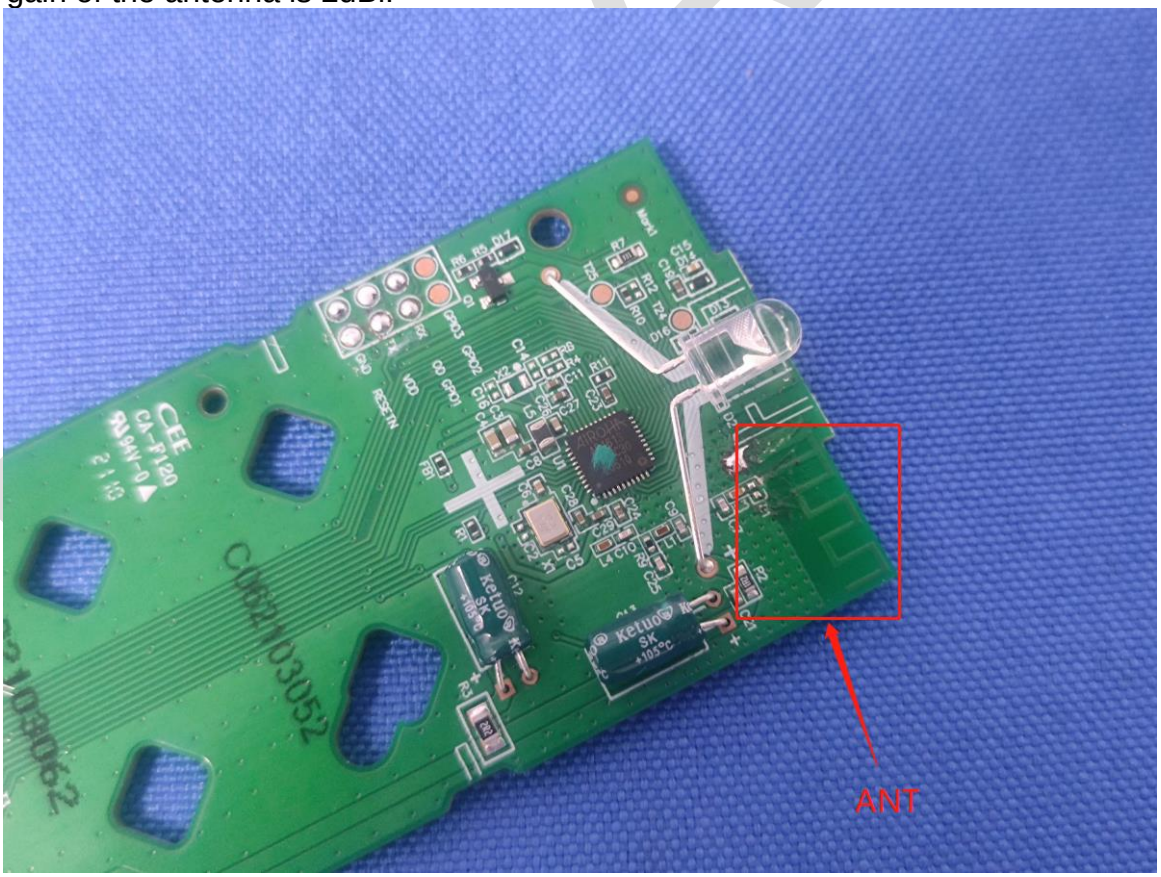
8.1 CONCLUSION

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 2dBi.

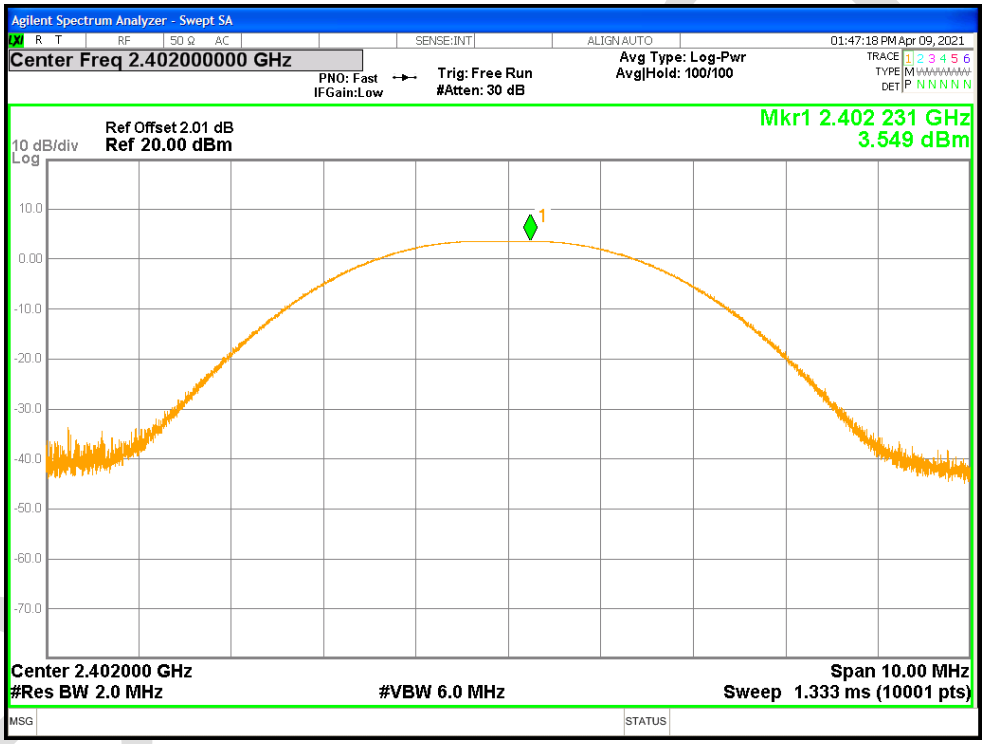


10 APPENDIX

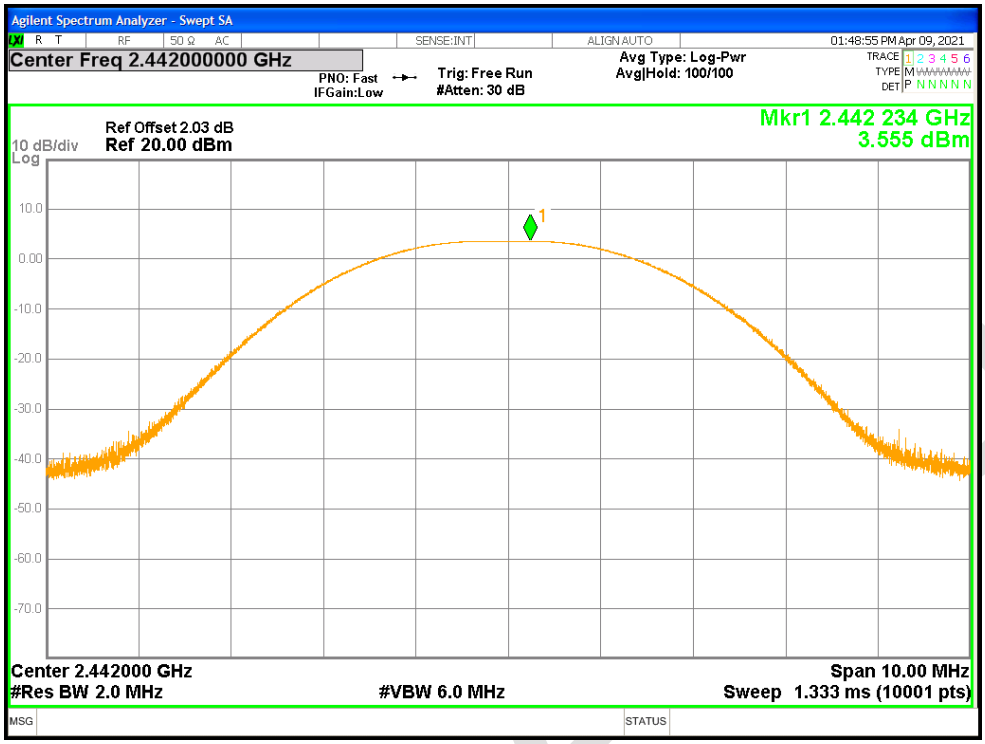
10.1 MAXIMUM CONDUCTED OUTPUT POWER

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	3.549	0	3.549	30	Pass
NVNT	BLE 1M	2442	Ant1	3.555	0	3.555	30	Pass
NVNT	BLE 1M	2480	Ant1	3.985	0	3.985	30	Pass

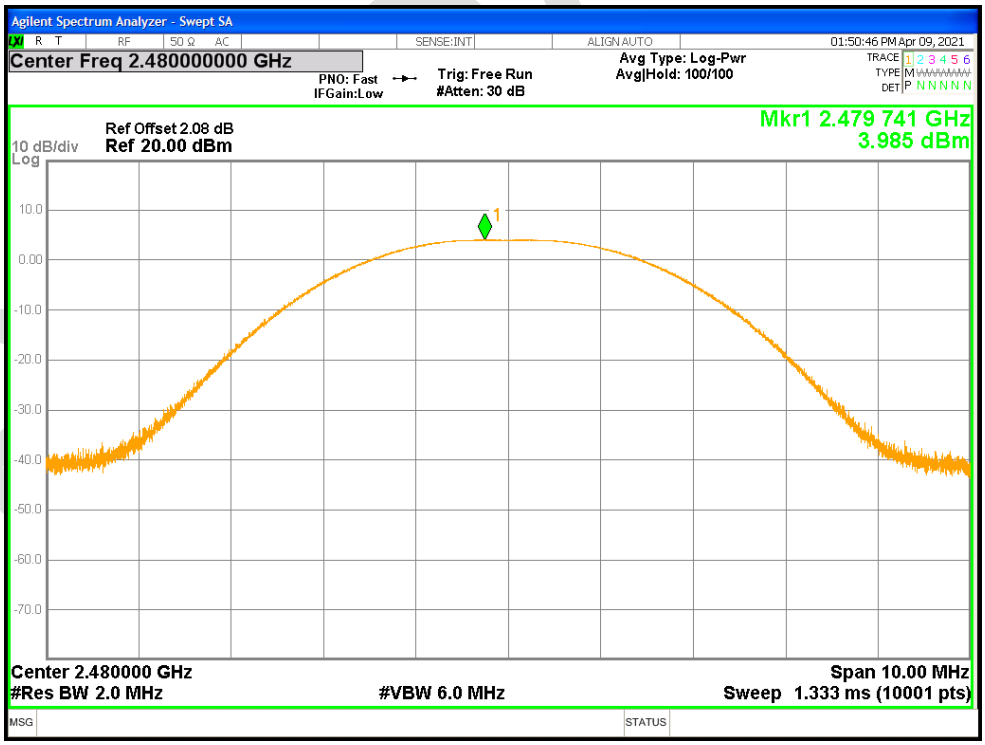
Power NVNT BLE 1M 2402MHz Ant1



Power NVNT BLE 1M 2442MHz Ant1



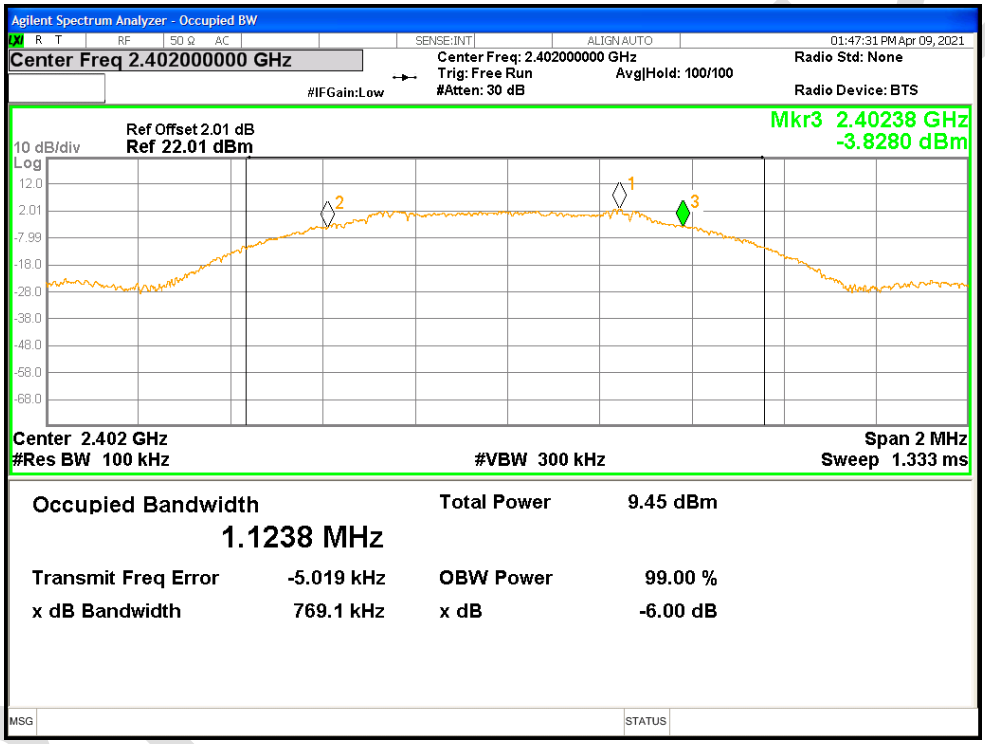
Power NVNT BLE 1M 2480MHz Ant1



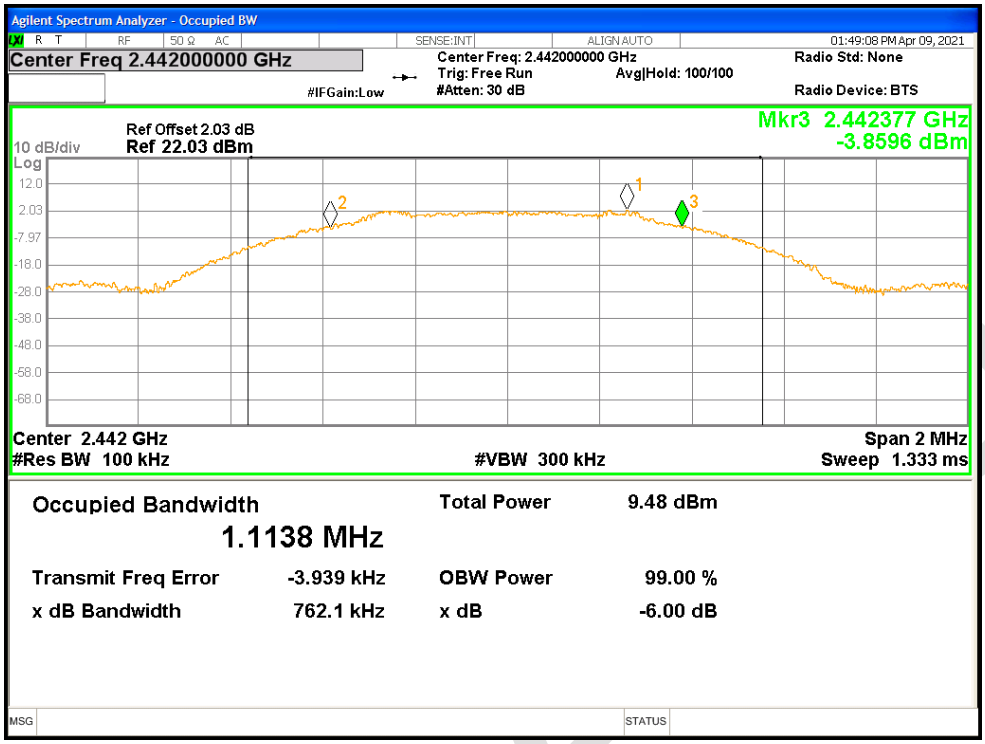
10.2 -6DB BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	Ant1	0.769	0.5	Pass
NVNT	BLE 1M	2442	Ant1	0.762	**0**.5	Pass
NVNT	BLE 1M	2480	Ant1	0.78	0.5	Pass

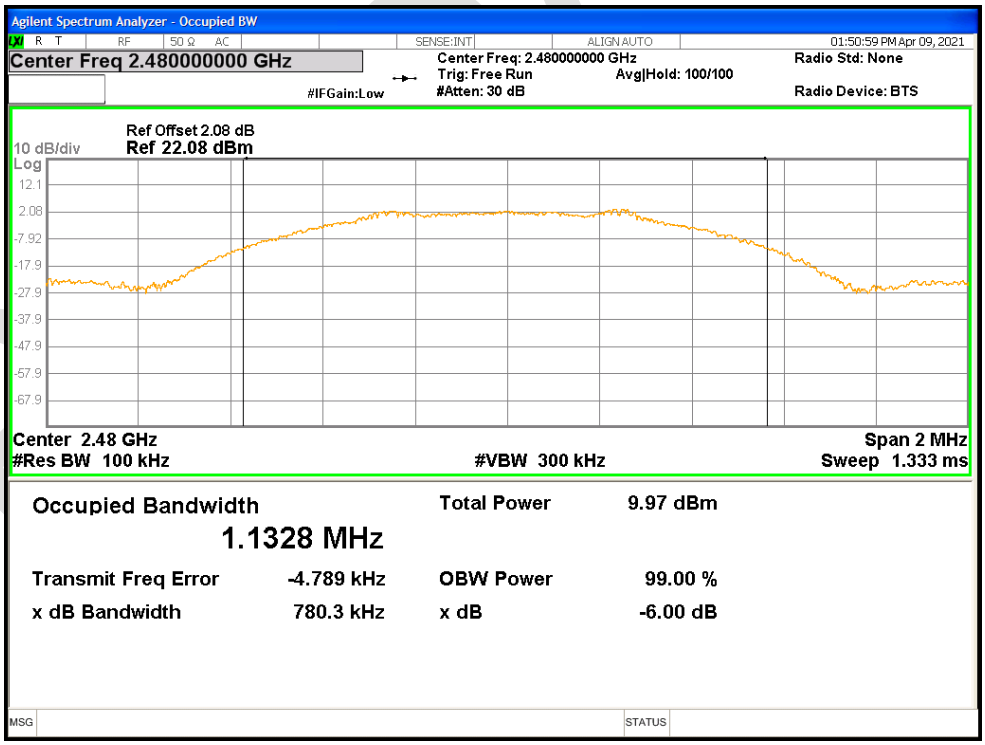
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 1M 2442MHz Ant1



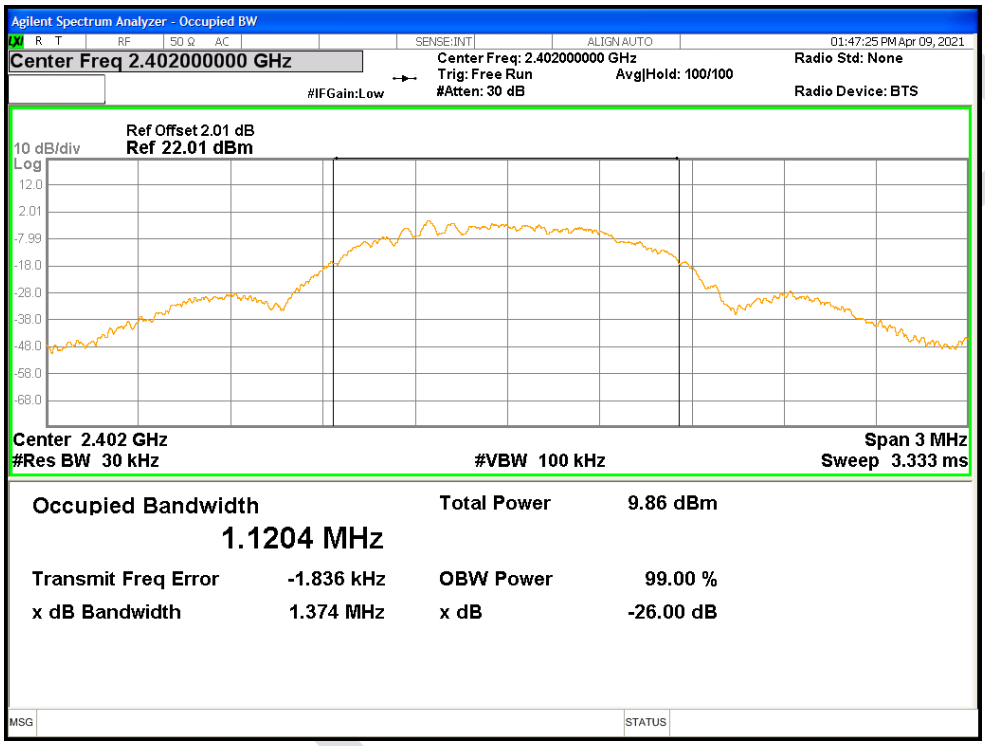
-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



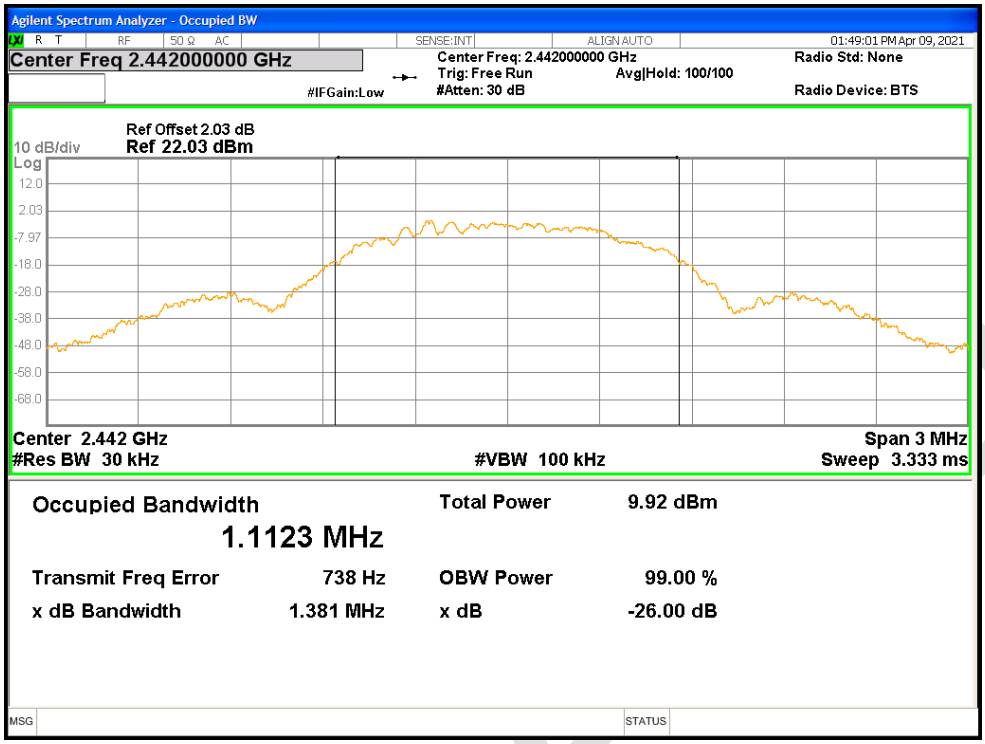
10.3 OCCUPIED CHANNEL BANDWIDTH

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE 1M	2402	Ant1	1.120419512
NVNT	BLE 1M	2442	Ant1	1.112313724
NVNT	BLE 1M	2480	Ant1	1.135722142

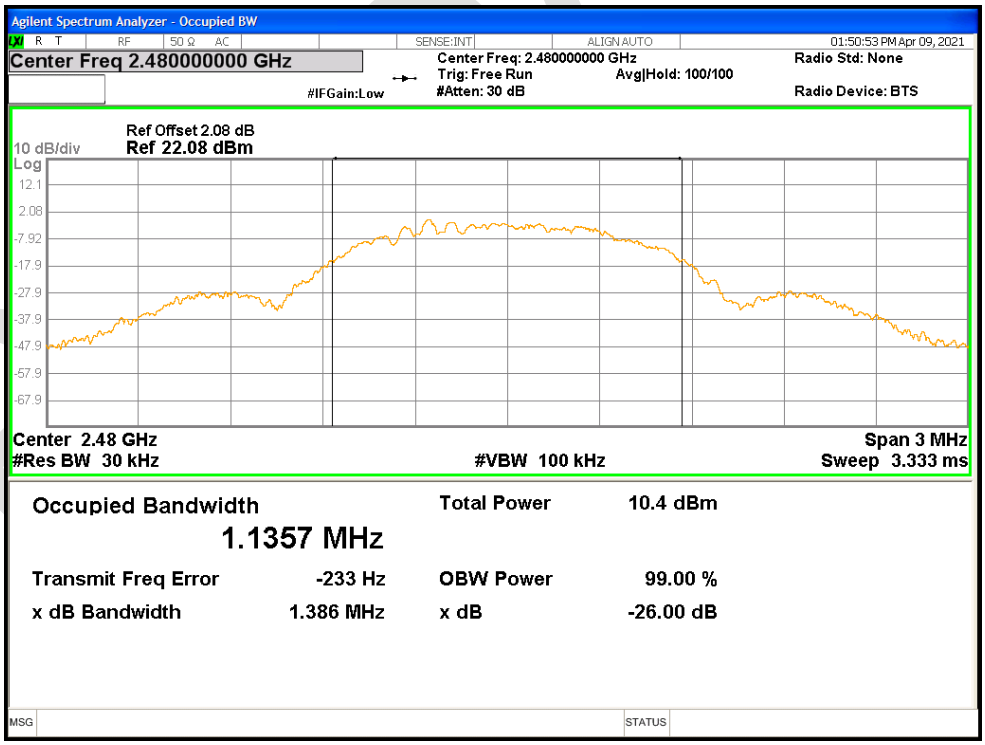
OBW NVNT BLE 1M 2402MHz Ant1



OBW NVNT BLE 1M 2442MHz Ant1



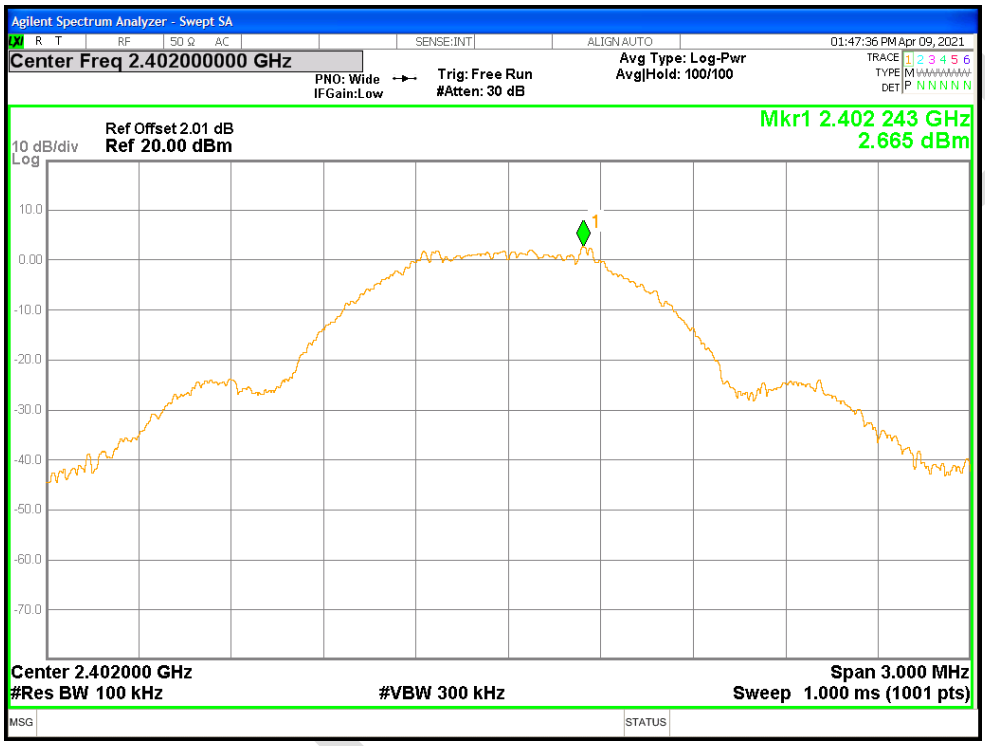
OBW NVNT BLE 1M 2480MHz Ant1



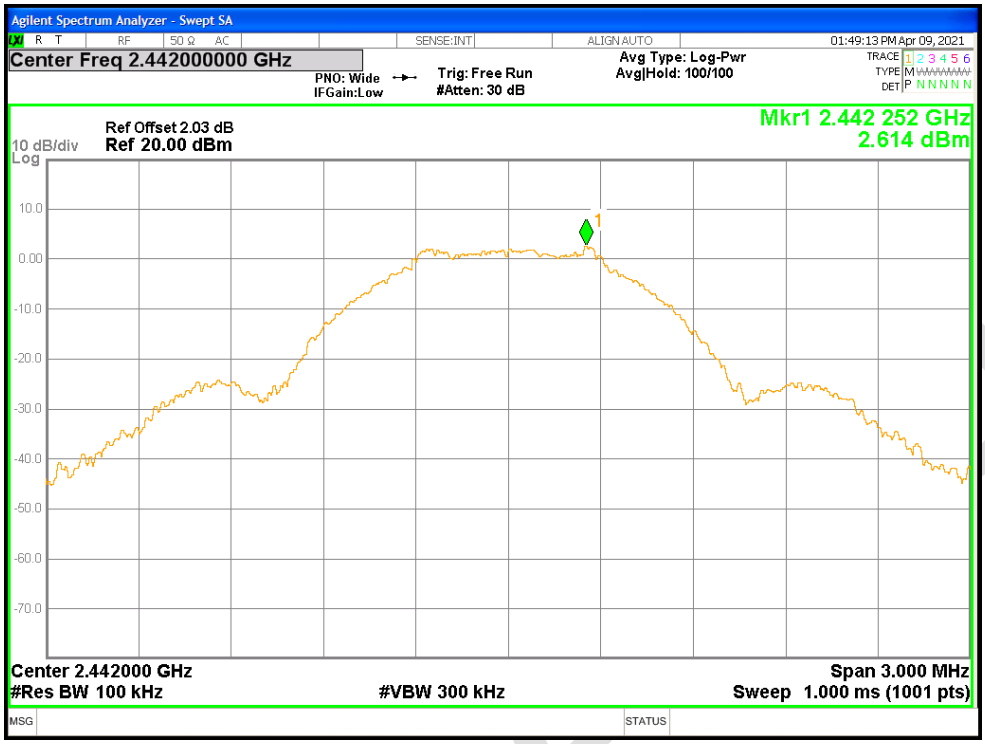
10.4 MAXIMUM POWER SPECTRAL DENSITY LEVEL

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	2.665	8	Pass
NVNT	BLE 1M	2442	Ant1	2.614	8	Pass
NVNT	BLE 1M	2480	Ant1	3.12	8	Pass

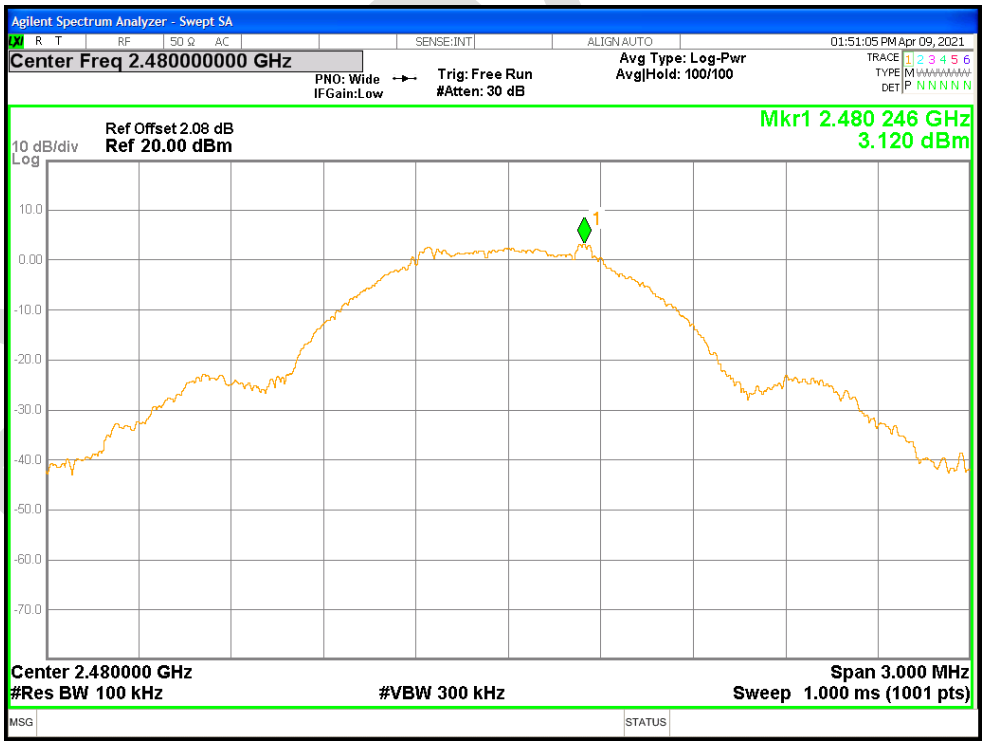
PSD NVNT BLE 1M 2402MHz Ant1



PSD NVNT BLE 1M 2442MHz Ant1



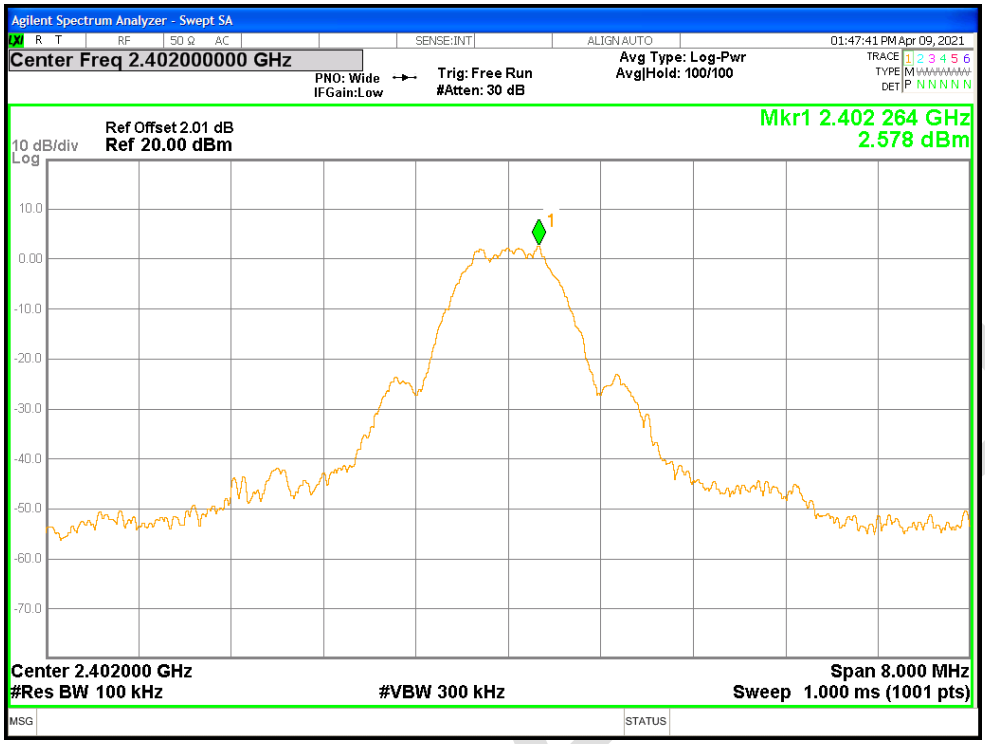
PSD NVNT BLE 1M 2480MHz Ant1



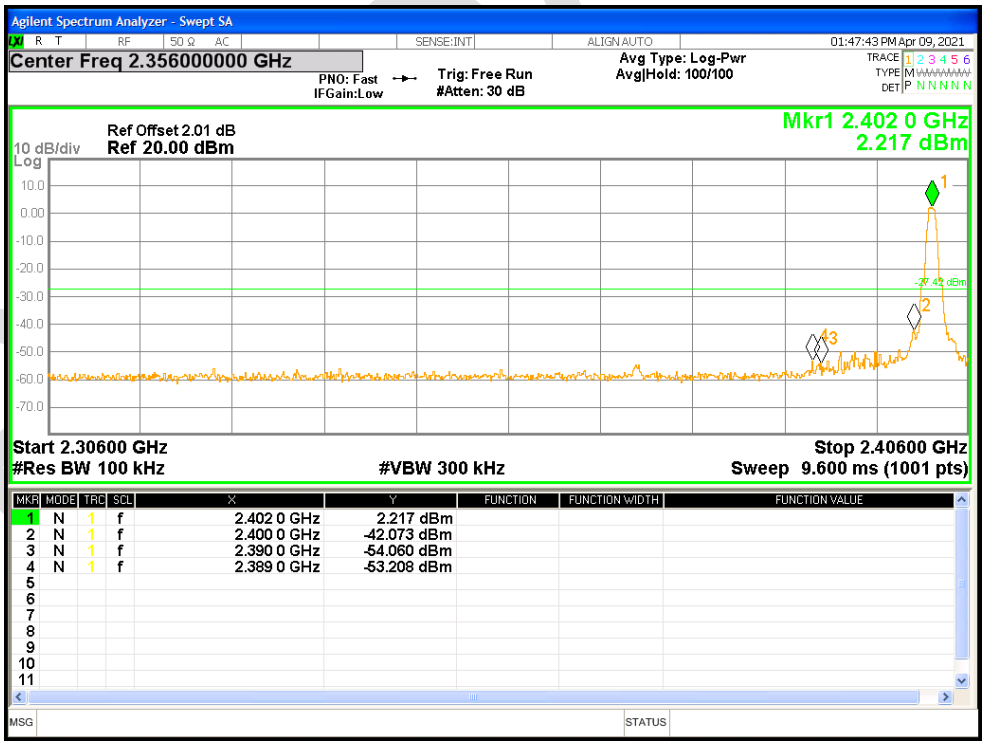
10.5 BAND EDGE

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-55.78	-30	Pass
NVNT	BLE 1M	2480	Ant1	-53.42	-30	Pass

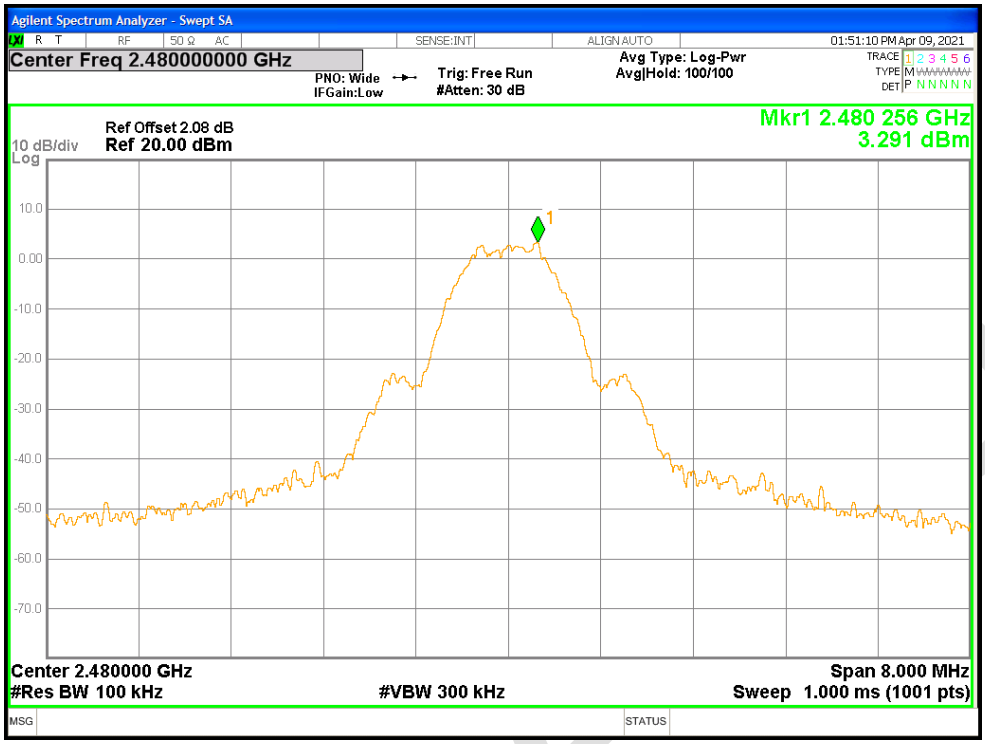
Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



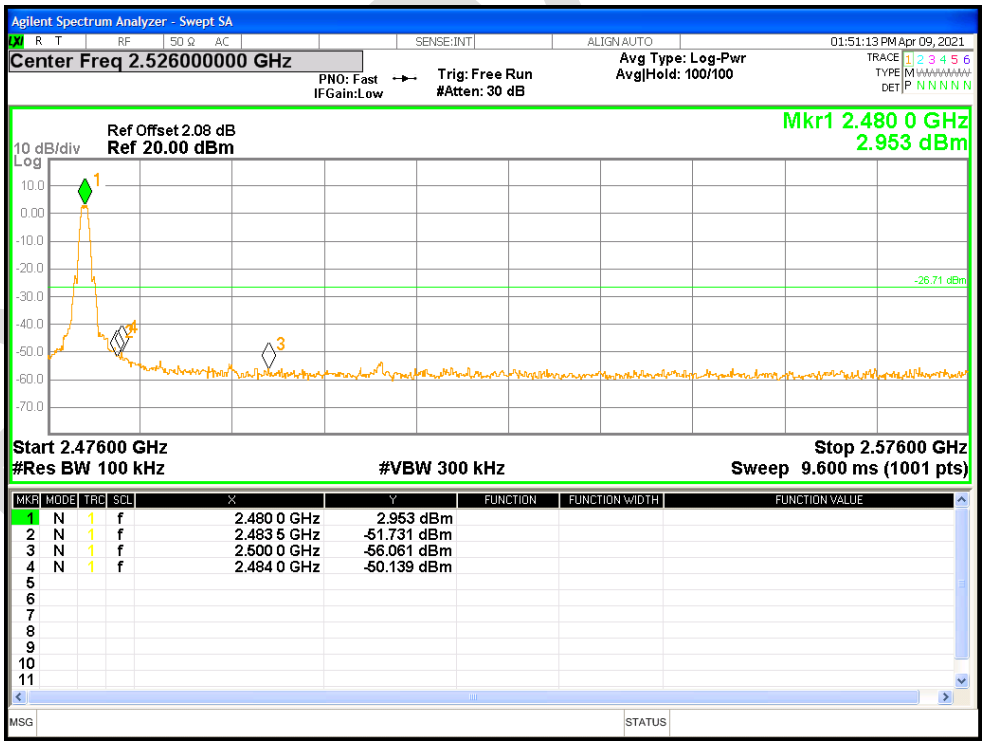
Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



Band Edge NVNT BLE 1M 2480MHz Ant1 Ref



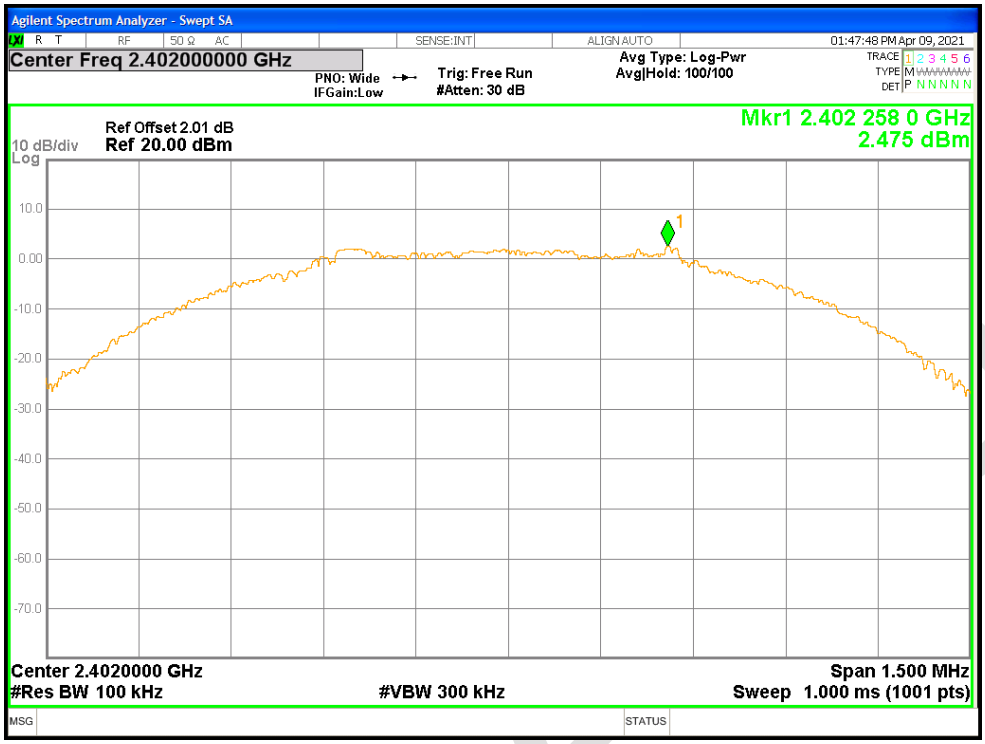
Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



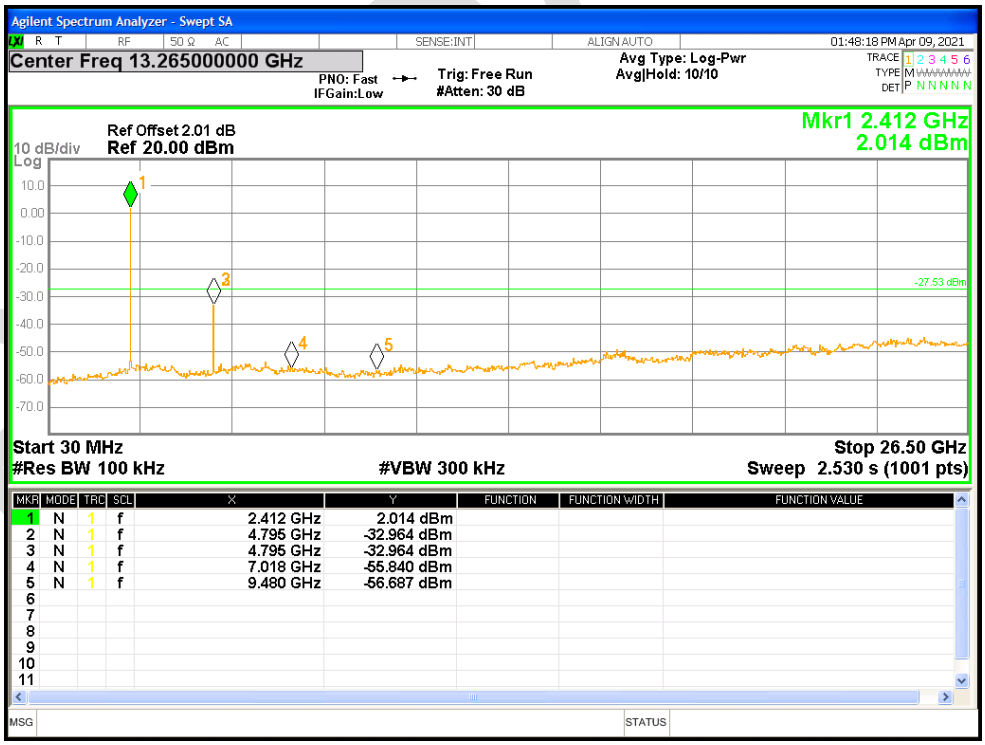
10.6 CONDUCTED RF SPURIOUS EMISSION

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE 1M	2402	Ant1	-35.44	-30	Pass
NVNT	BLE 1M	2442	Ant1	-37.37	-30	Pass
NVNT	BLE 1M	2480	Ant1	-36.35	-30	Pass

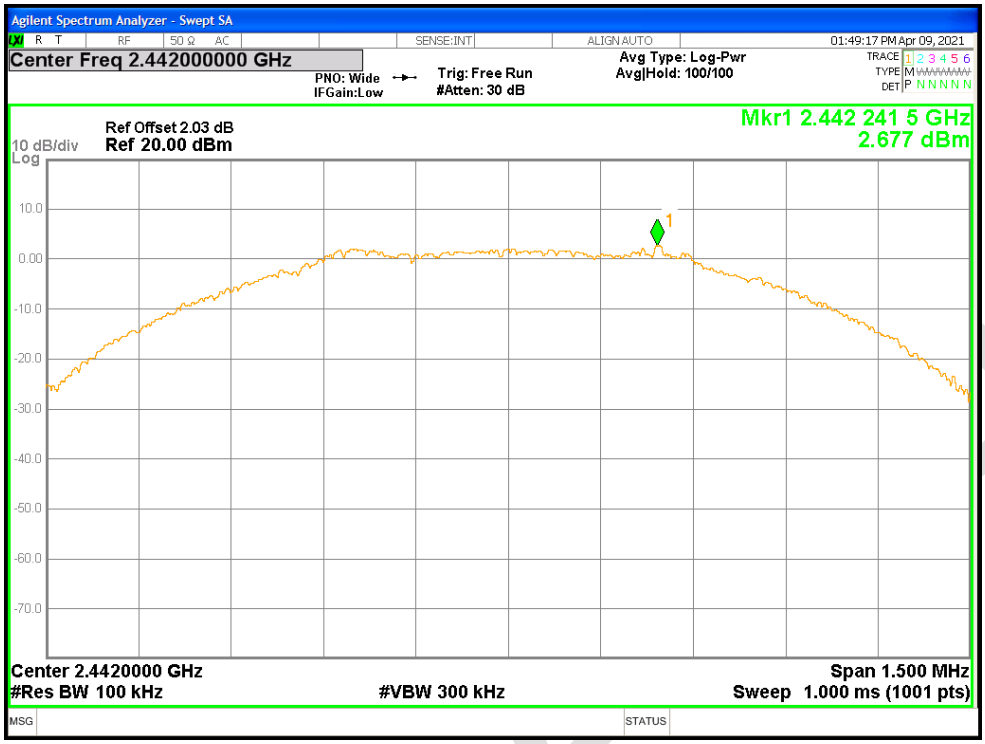
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref



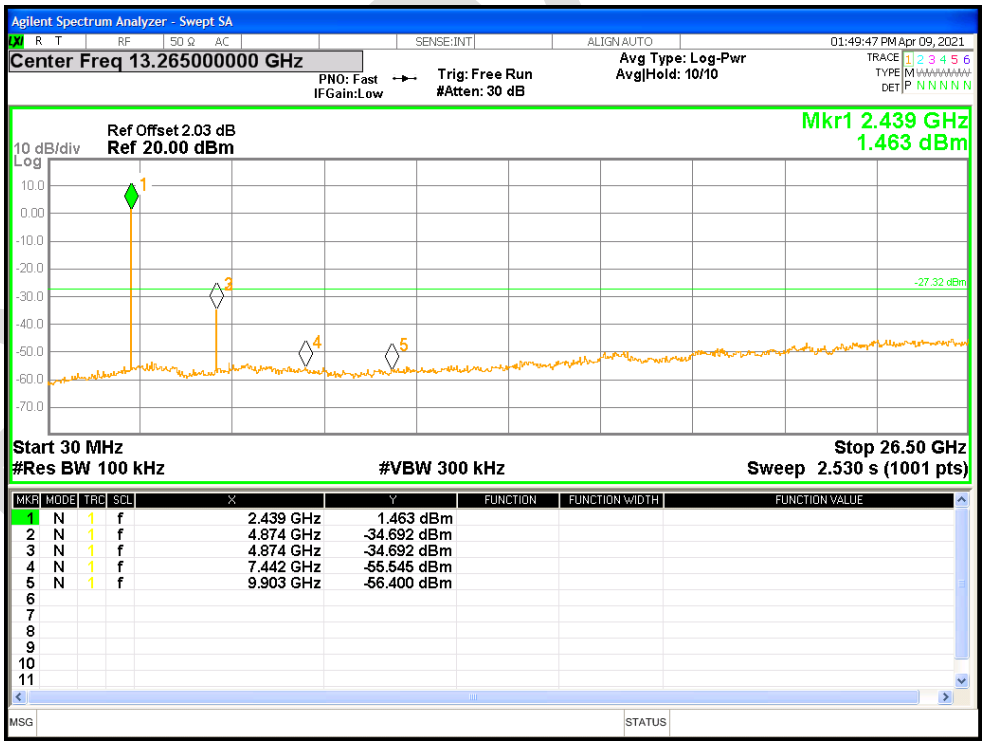
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



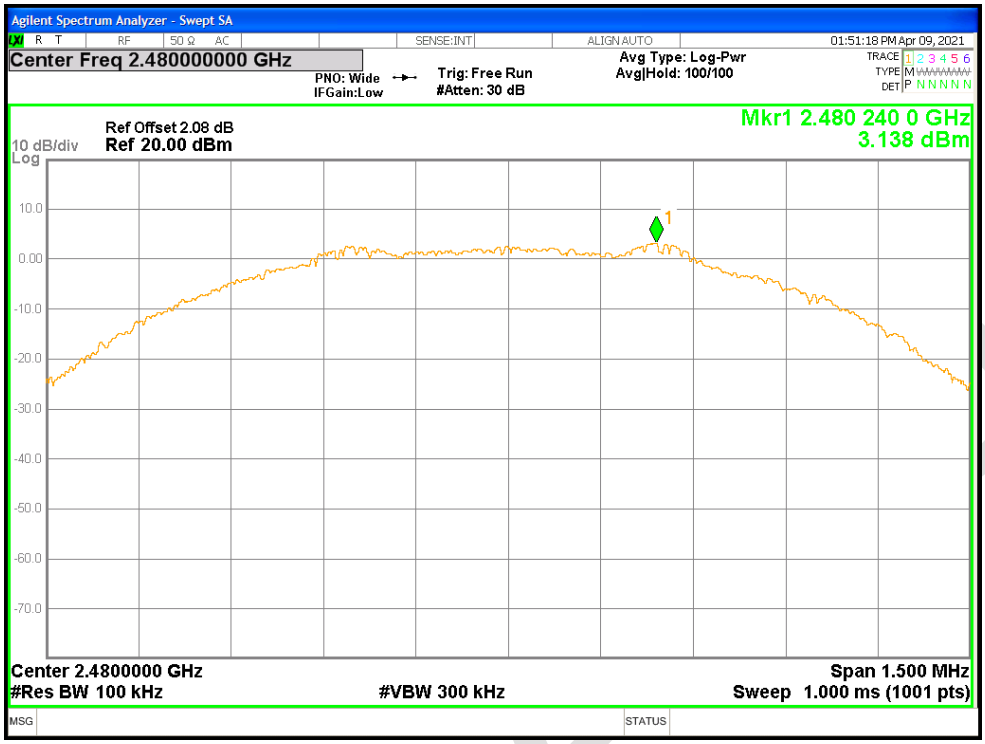
Tx. Spurious NVNT BLE 1M 2442MHz Ant1 Ref



Tx. Spurious NVNT BLE 1M 2442MHz Ant1 Emission



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



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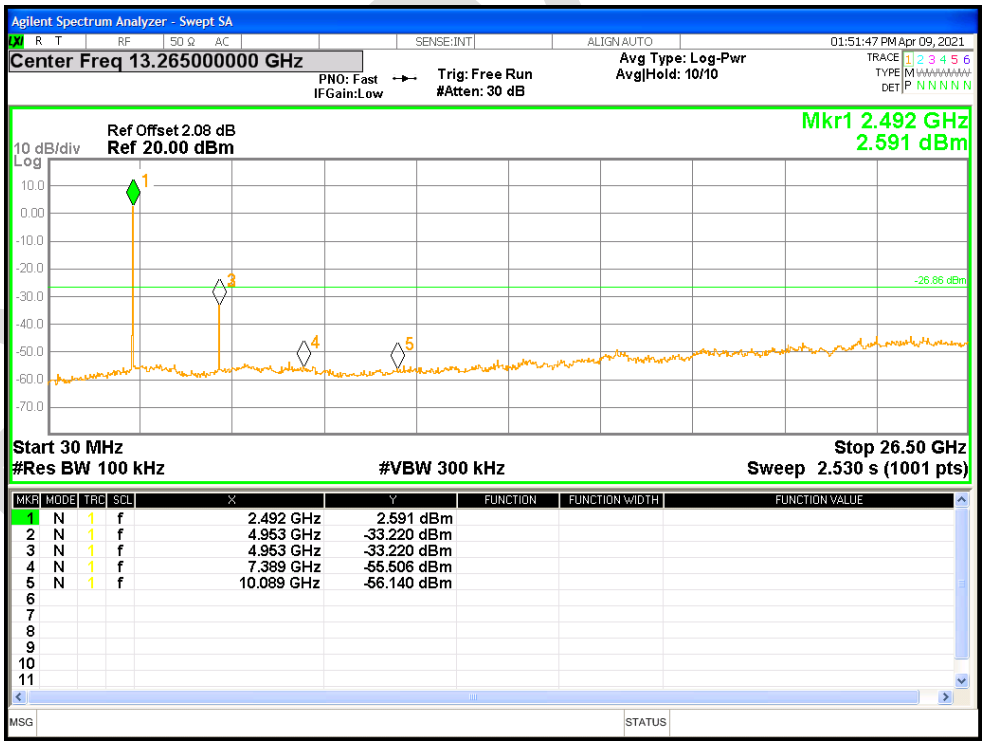
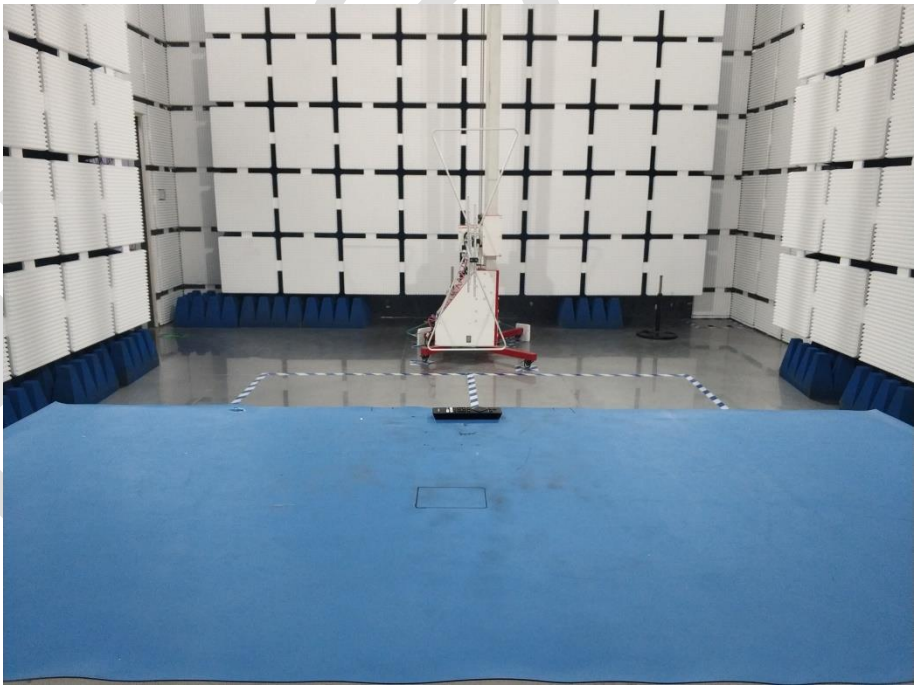
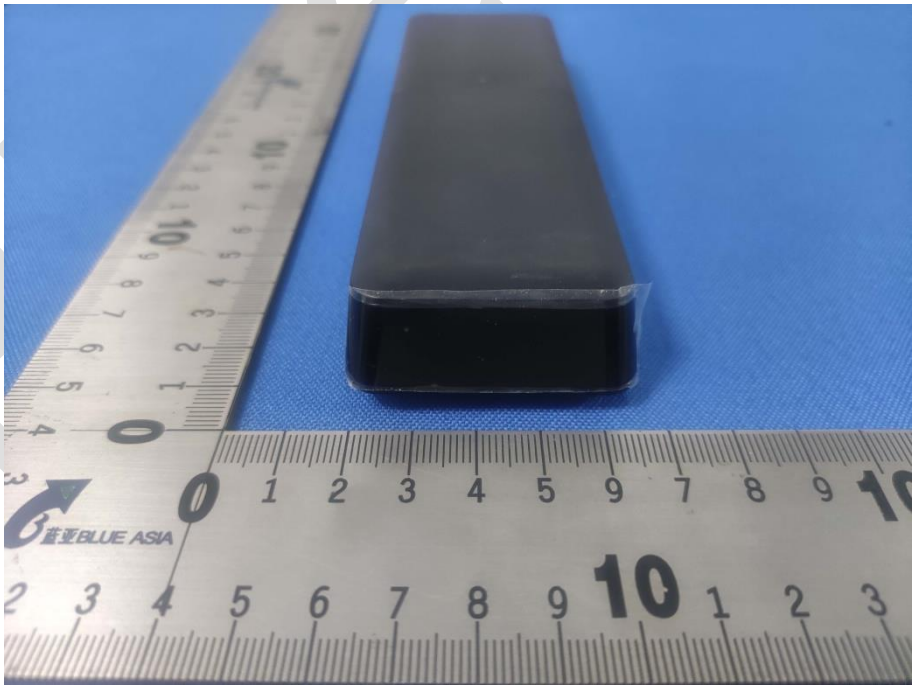
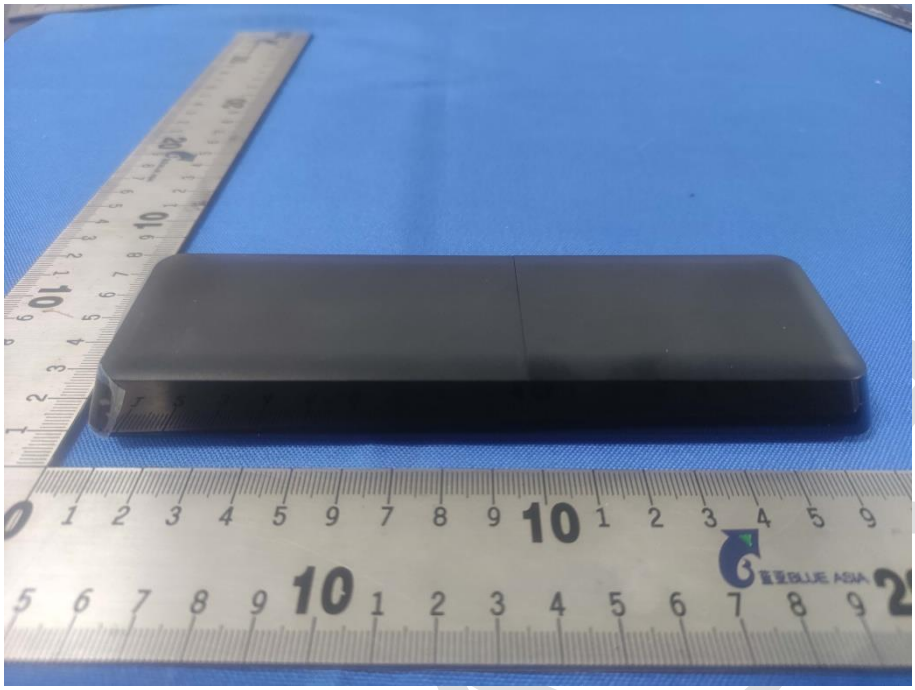


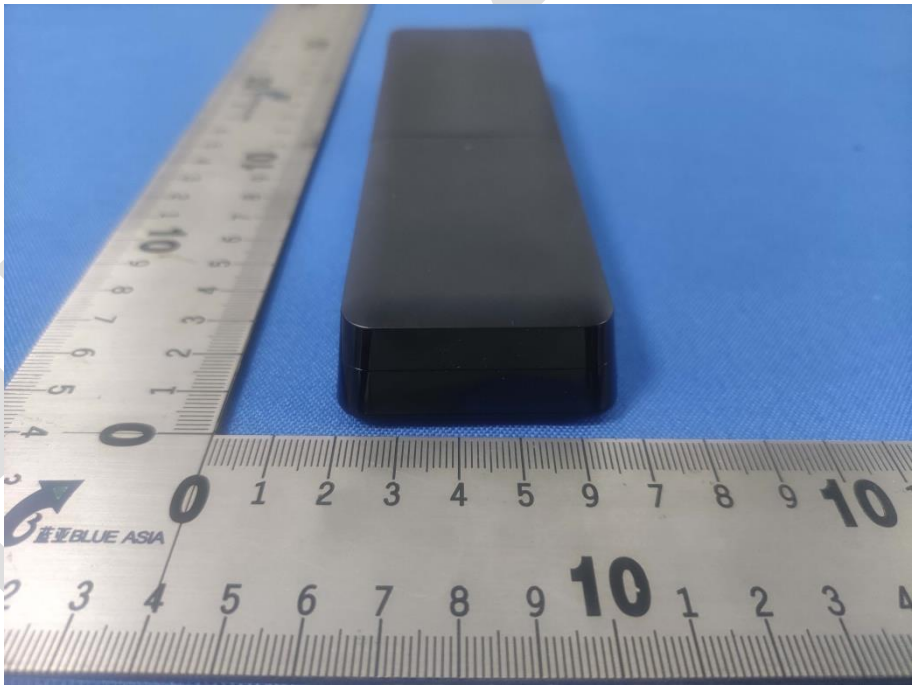
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

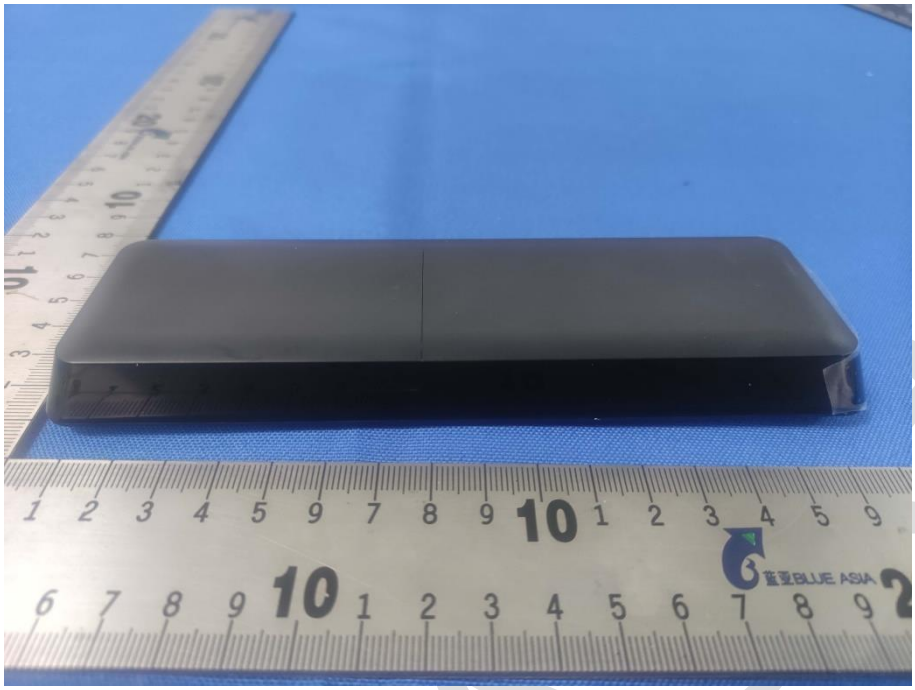


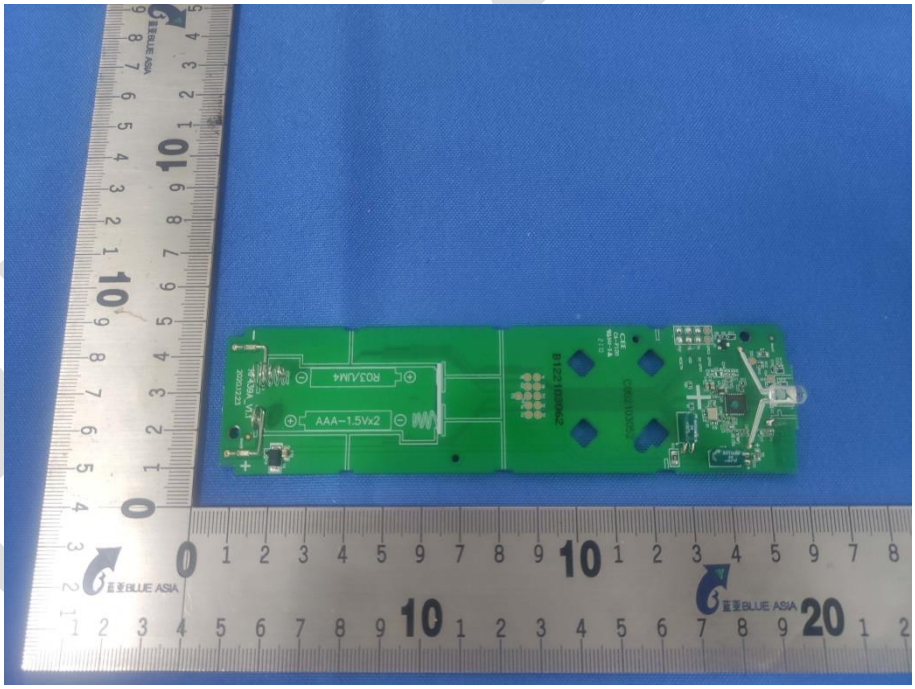
APPENDIX B: PHOTOGRAPHS OF EUT

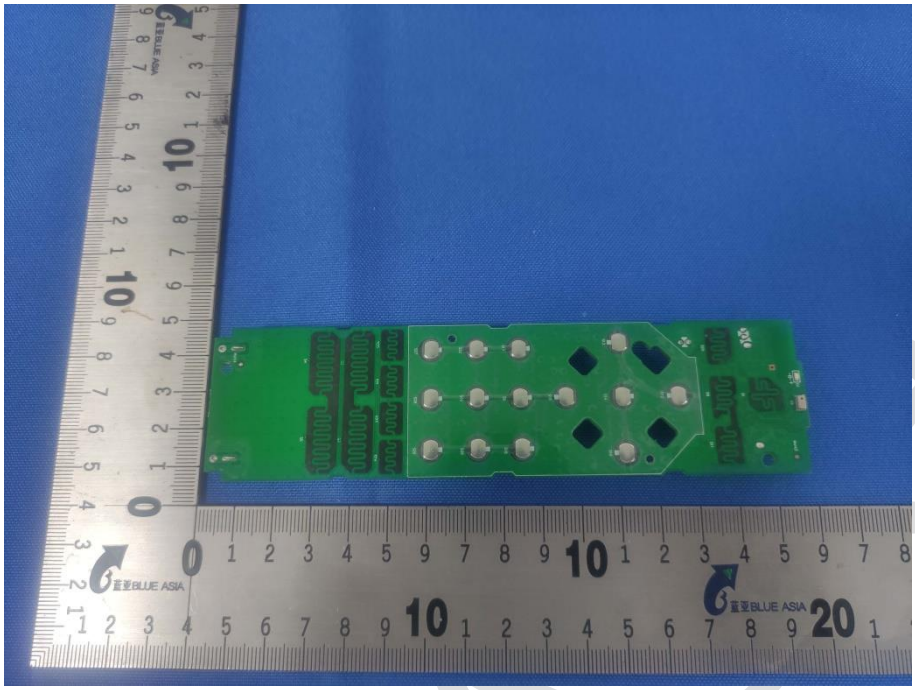


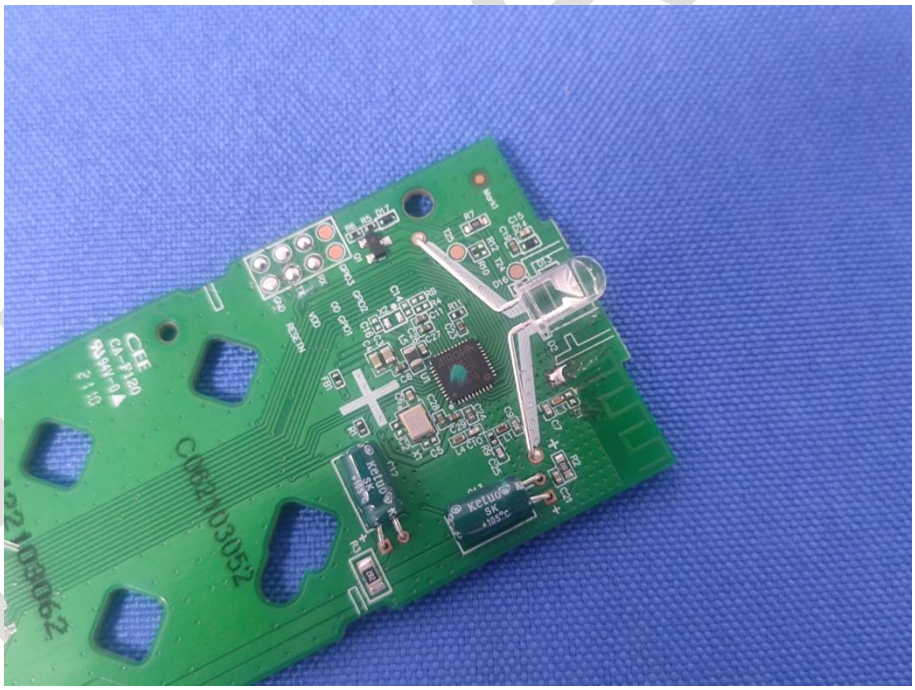







R03/UM4
AAA-1.5Vx2





----END OF REPORT----

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