

# TEST REPORT

**Product Name** : Animal tag reader  
**Brand Mark** : SYCREADER  
**Model No.** : W90  
**Extension model** : W90A, W90B, W90C, W90D, W90H,  
W91A, W91B, W91C, W91D, W91H,  
W70, W80, W81, W82, W86, R16, R17,  
R58B, R58C, R58D, R58BC, R58BD,  
R58H, S10, S20, U1, U2, U3, U4, U6, U8,  
U10, V1, V2, V3, V4, V5, V6, V8, V10  
**FCC ID** : 2A5HC-W90  
**Report Number** : BLA-EMC-202203-A7603  
**Date of Sample Receipt** : 2022/3/21  
**Date of Test** : 2022/3/21 to 2022/4/20  
**Date of Issue** : 2022/4/20  
**Test Standard** : 47 CFR Part 15, Subpart C 15.247  
**Test Result** : Pass

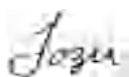
Prepared for:

**Sycreader Guangzhou Co., Ltd.**  
**Room 502, Building 15, Xincheng Venture Center, Zengcheng**  
**Low-Carbon Headquarters Park, 400 Xincheng Avenue, Zengcheng**  
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Prepared by:

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**Shenzhen, Guangdong Province, China**  
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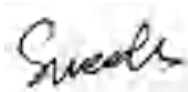
Compiled by:



Approved by:



Review by:



Date:

2022/4/20



## REPORT REVISE RECORD

Version No.	Date	Description
00	2022/4/20	Original

BlueAsia

**TABLE OF CONTENTS**

<b>1</b>	<b>TEST SUMMARY.....</b>	<b>5</b>
<b>2</b>	<b>GENERAL INFORMATION.....</b>	<b>6</b>
<b>3</b>	<b>GENERAL DESCRIPTION OF E.U.T.....</b>	<b>6</b>
<b>4</b>	<b>TEST ENVIRONMENT.....</b>	<b>7</b>
<b>5</b>	<b>TEST MODE.....</b>	<b>7</b>
<b>6</b>	<b>MEASUREMENT UNCERTAINTY.....</b>	<b>7</b>
<b>7</b>	<b>DESCRIPTION OF SUPPORT UNIT.....</b>	<b>8</b>
<b>8</b>	<b>LABORATORY LOCATION.....</b>	<b>8</b>
<b>9</b>	<b>TEST INSTRUMENTS LIST.....</b>	<b>9</b>
<b>10</b>	<b>CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ).....</b>	<b>12</b>
10.1	LIMITS.....	12
10.2	BLOCK DIAGRAM OF TEST SETUP.....	12
10.3	PROCEDURE.....	12
10.4	TEST DATA.....	14
<b>11</b>	<b>CONDUCTED BAND EDGES MEASUREMENT.....</b>	<b>16</b>
11.1	LIMITS.....	16
11.2	BLOCK DIAGRAM OF TEST SETUP.....	16
11.3	TEST DATA.....	17
<b>12</b>	<b>RADIATED SPURIOUS EMISSIONS.....</b>	<b>18</b>
12.1	LIMITS.....	18
12.2	BLOCK DIAGRAM OF TEST SETUP.....	19
12.3	PROCEDURE.....	19
12.4	TEST DATA.....	21
<b>13</b>	<b>RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS.....</b>	<b>29</b>
13.1	LIMITS.....	29
13.2	BLOCK DIAGRAM OF TEST SETUP.....	30
13.3	PROCEDURE.....	30
13.4	TEST DATA.....	32
<b>14</b>	<b>CONDUCTED SPURIOUS EMISSIONS.....</b>	<b>36</b>
14.1	LIMITS.....	36

14.2	BLOCK DIAGRAM OF TEST SETUP.....	36
14.3	TEST DATA.....	37
<b>15</b>	<b>POWER SPECTRUM DENSITY.....</b>	<b>38</b>
15.1	LIMITS.....	38
15.2	BLOCK DIAGRAM OF TEST SETUP.....	38
15.3	TEST DATA.....	38
<b>16</b>	<b>CONDUCTED PEAK OUTPUT POWER.....</b>	<b>39</b>
16.1	LIMITS.....	39
16.2	BLOCK DIAGRAM OF TEST SETUP.....	39
16.3	TEST DATA.....	40
<b>17</b>	<b>MINIMUM 6DB BANDWIDTH.....</b>	<b>41</b>
17.1	LIMITS.....	41
17.2	BLOCK DIAGRAM OF TEST SETUP.....	41
17.3	TEST DATA.....	41
<b>18</b>	<b>ANTENNA REQUIREMENT.....</b>	<b>42</b>
18.1	CONCLUSION.....	42
<b>19</b>	<b>APPENDIX.....</b>	<b>43</b>
<b>APPENDIX A: PHOTOGRAPHS OF TEST SETUP.....</b>		<b>58</b>
<b>APPENDIX B: PHOTOGRAPHS OF EUT.....</b>		<b>60</b>

## 1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
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
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
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 7.8.6 & Section 11.11	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 15.247a(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

<b>Applicant</b>	Sycreader Guangzhou Co., Ltd.
<b>Address</b>	Room 502, Building 15, Xincheng Venture Center, Zengcheng Low-Carbon Headquarters Park, 400 Xincheng Avenue, Zengcheng District, Guangzhou
<b>Manufacturer</b>	Sycreader Guangzhou Co., Ltd.
<b>Address</b>	Room 502, Building 15, Xincheng Venture Center, Zengcheng Low-Carbon Headquarters Park, 400 Xincheng Avenue, Zengcheng District, Guangzhou
<b>Factory</b>	Sycreader Guangzhou Co., Ltd.
<b>Address</b>	Room 502, Building 15, Xincheng Venture Center, Zengcheng Low-Carbon Headquarters Park, 400 Xincheng Avenue, Zengcheng District, Guangzhou
<b>Product Name</b>	Animal tag reader
<b>Test Model No.</b>	W90
<b>Extension model</b>	W90A, W90B, W90C, W90D, W90H, W91A, W91B, W91C, W91D, W91H, W70, W80, W81, W82, W86, R16, R17, R58B, R58C, R58D, R58BC, R58BD, R58H, S10, S20, U1, U2, U3, U4, U6, U8, U10, V1, V2, V3, V4, V5, V6, V8, V10
<b>Note</b>	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.

<b>Hardware Version</b>	N/A
<b>Software Version</b>	N/A
<b>Operation Frequency:</b>	2402MHz-2480MHz
<b>Modulation Type:</b>	GFSK
<b>Channel Spacing:</b>	2MHz
<b>Number of Channels:</b>	40
<b>Antenna Type:</b>	PCB Antenna
<b>Antenna Gain:</b>	3 dBi(Provided by the applicant)

#### 4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	DC3.7V

#### 5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation.
Remark: Full battery is used during all test except ac conducted emission	

#### 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)	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 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 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 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 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 Power Spectrum Density**

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
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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 Minimum 6dB 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

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

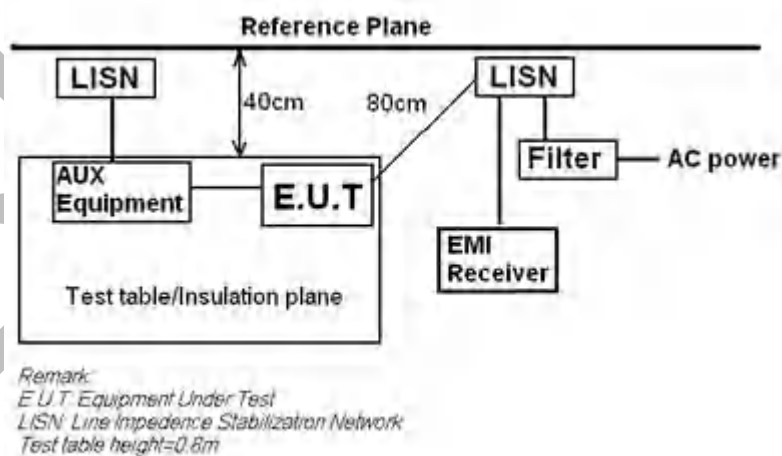
Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25℃
Humidity	60%

### 10.1 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.

### 10.2 BLOCK DIAGRAM OF TEST SETUP



### 10.3 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,

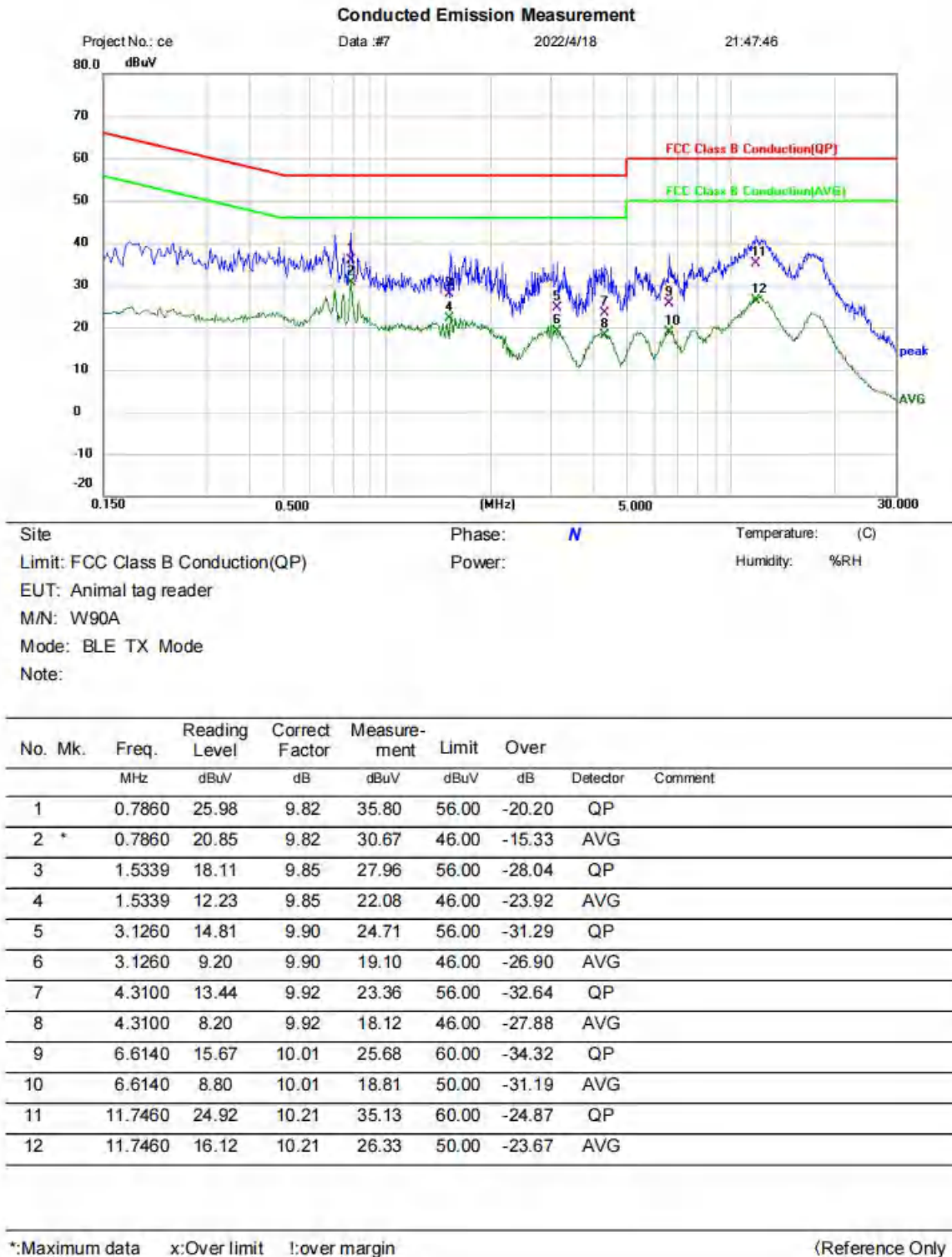
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test 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:  $LISN = Read\ Level + Cable\ Loss + LISN\ Factor$

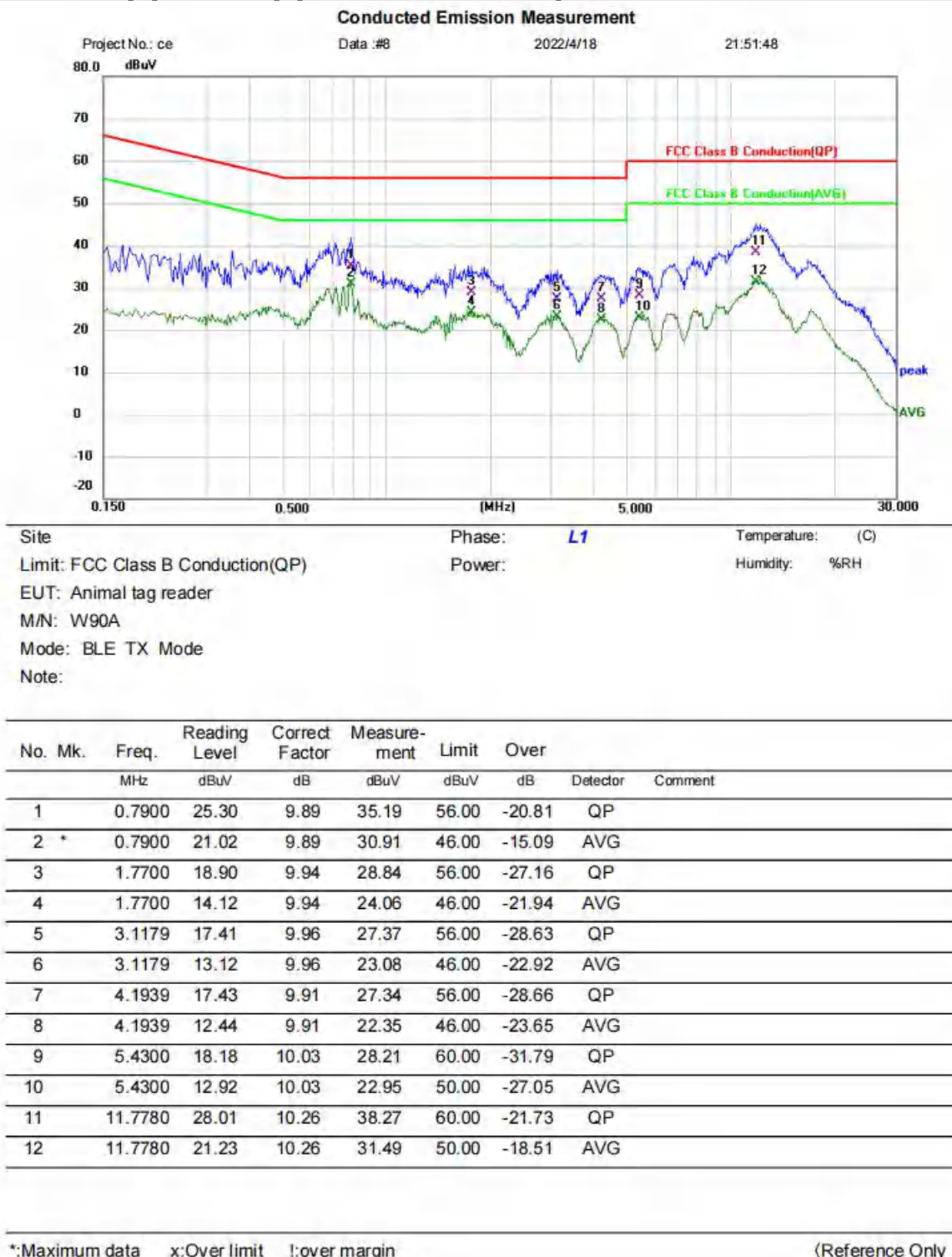
## 10.4 TEST DATA

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



**Test Result: Pass**

[TestMode: TX]; [Line: Line] ;[Power:AC120V/60Hz]



**Test Result: Pass**



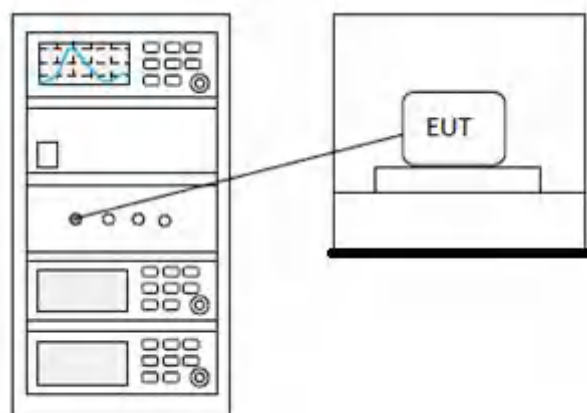
## 11 CONDUCTED BAND EDGES MEASUREMENT

<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX
<b>Tester</b>	Jozu
<b>Temperature</b>	25°C
<b>Humidity</b>	60%

### 11.1 LIMITS

<b>Limit:</b>	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)).
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### 11.2 BLOCK DIAGRAM OF TEST SETUP





**11.3 TEST DATA**

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

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## 12 RADIATED SPURIOUS EMISSIONS

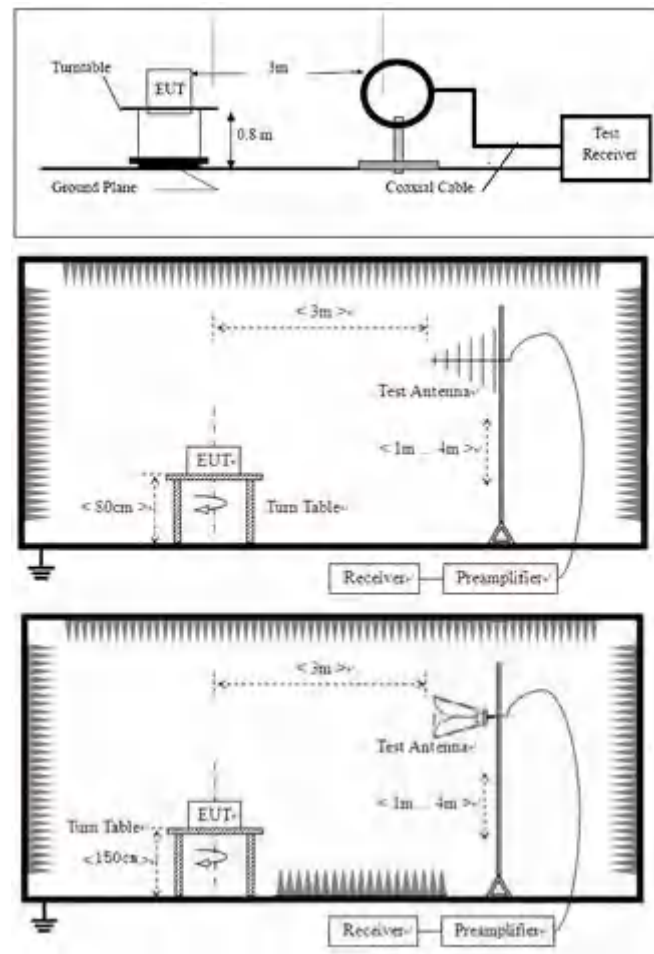
<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 6.4,6.5,6.6
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX
<b>Tester</b>	Jozu
<b>Temperature</b>	25℃
<b>Humidity</b>	60%

### 12.1 LIMITS

<b>Frequency(MHz)</b>	<b>Field strength(microvolts/meter)</b>	<b>Measurement distance(meters)</b>
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.

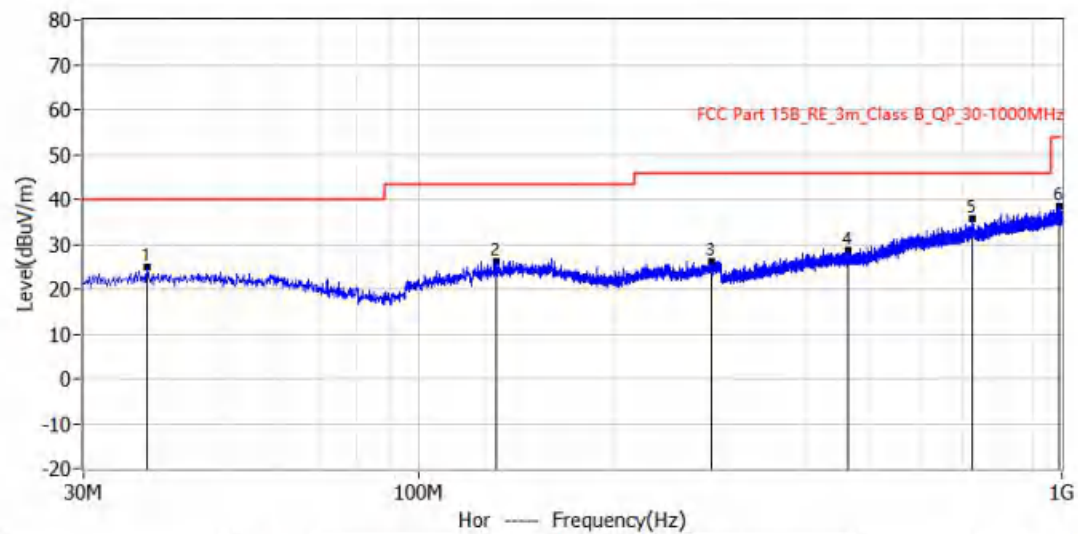
Remark:

- 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

[TestMode: TX mode (SE) below 1G]; [Polarity: Horizontal]

Test Lab: BlueAsia EMC Lab ( RE #1 )	Project: BLA-EMC-202203-A76
EUT: Animal tag reader	Test Engineer: York
M/N: W90A	Temperature:
S/N:	Humidity:
Test Mode: BLE TX mode	Test Voltage:
Note:	Test Data: 2022-04-19 19:53:28

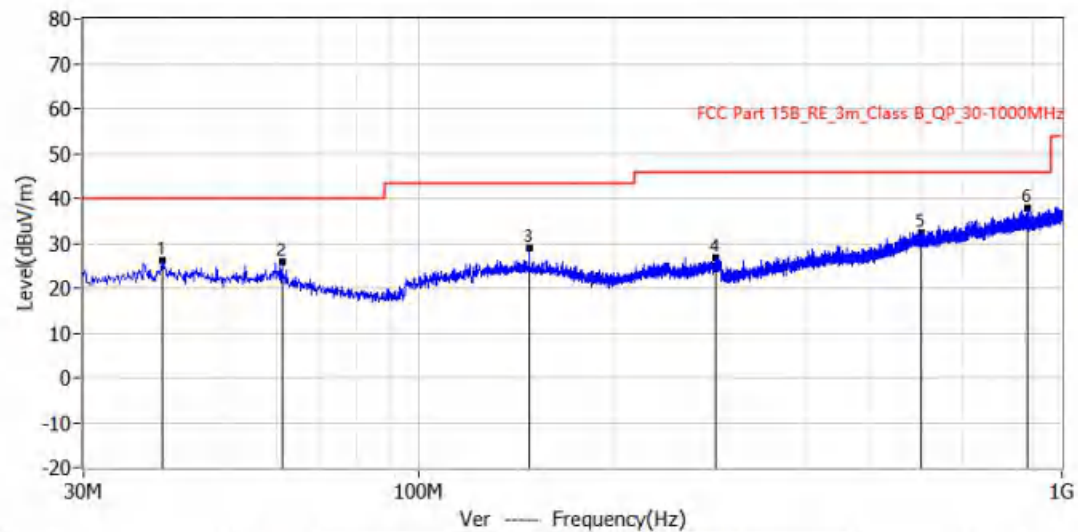


No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	37.639MHz	40.0	24.9	-15.1	1.0	23.9	QP	Hor	100.0	0.0
2*	131.486MHz	43.5	26.2	-17.3	2.9	23.3	QP	Hor	100.0	0.0
3*	284.140MHz	46.0	26.2	-19.8	2.5	23.7	QP	Hor	100.0	0.0
4*	463.469MHz	46.0	28.6	-17.4	0.6	28.0	QP	Hor	100.0	0.0
5*	726.824MHz	46.0	35.7	-10.3	3.2	32.5	QP	Hor	100.0	0.0
6*	987.875MHz	54.0	38.5	-15.5	2.5	36.0	QP	Hor	100.0	0.0

**Test Result: Pass**

[TestMode: TX mode (SE) below 1G]; [Polarity: Vertical]

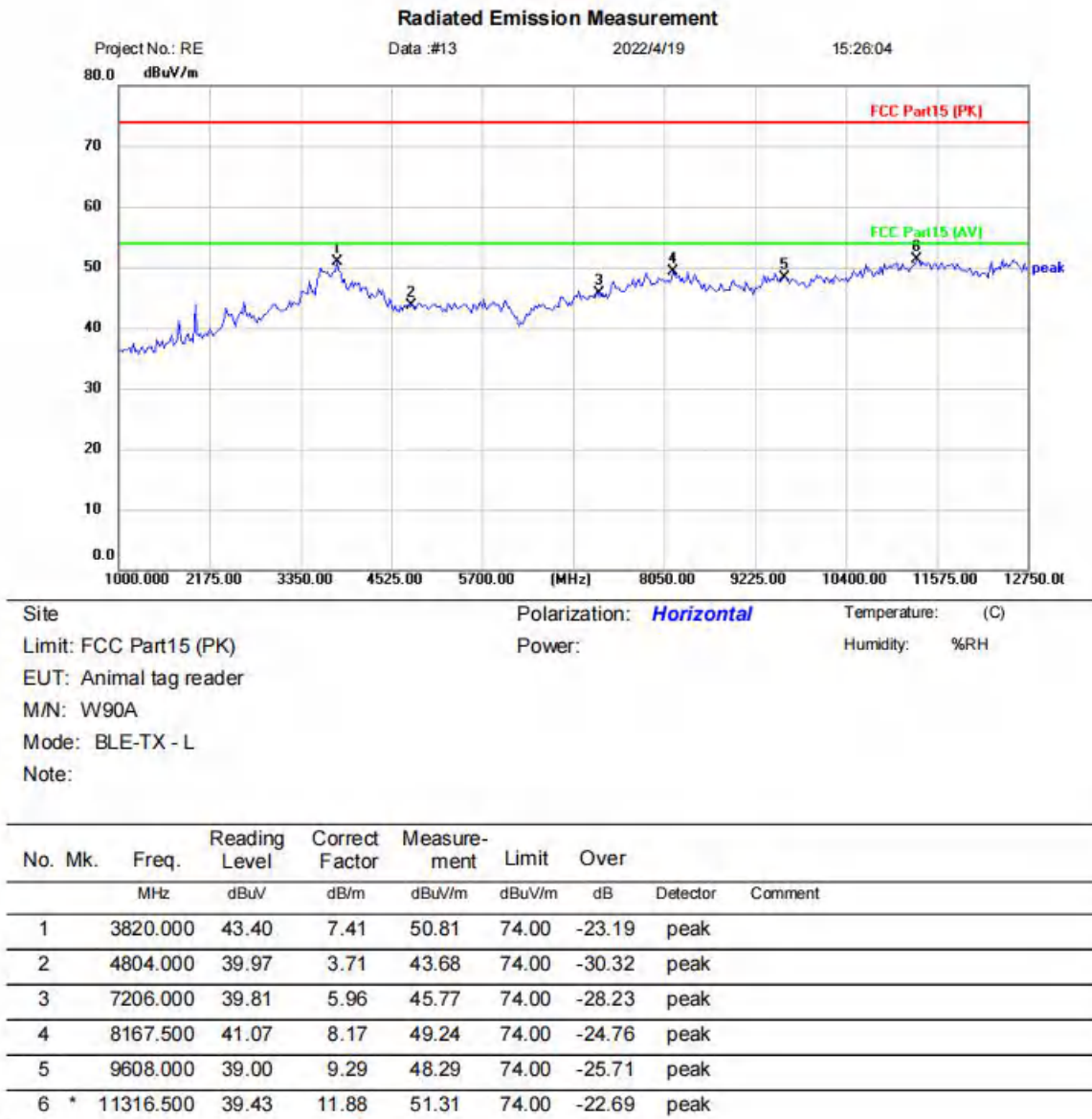
Test Lab: BlueAsia EMC Lab (RE #1)	Project: BLA-EMC-202203-A76
EUT: Animal tag reader	Test Engineer: York
M/N: W90A	Temperature:
S/N:	Humidity:
Test Mode: BLE TX mode	Test Voltage:
Note:	Test Data: 2022-04-19 19:55:27



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	39.821MHz	40.0	26.2	-13.8	2.1	24.1	QP	Ver	100.0	0.0
2*	61.040MHz	40.0	25.9	-14.1	2.6	23.3	QP	Ver	100.0	289.0
3*	148.340MHz	43.5	28.9	-14.6	5.4	23.5	QP	Ver	100.0	197.0
4*	289.111MHz	46.0	26.7	-19.3	2.9	23.8	QP	Ver	100.0	45.0
5*	602.664MHz	46.0	32.4	-13.6	1.1	31.3	QP	Ver	100.0	125.0
6*	882.024MHz	46.0	37.8	-8.2	3.0	34.8	QP	Ver	100.0	5.0

**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]



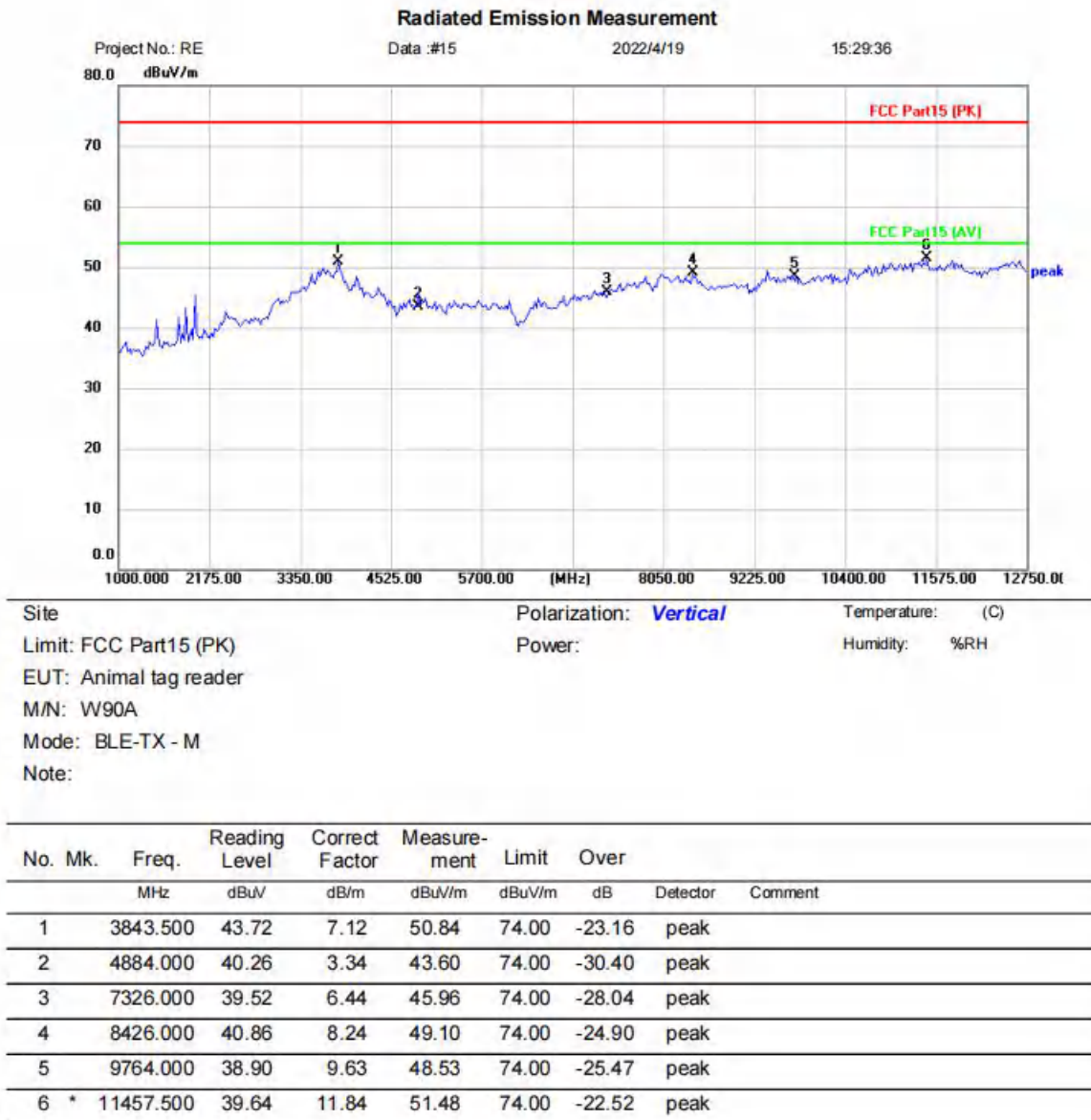
\*:Maximum data    x:Over limit    !:over margin

(Reference Only)

**Test Result: Pass**



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

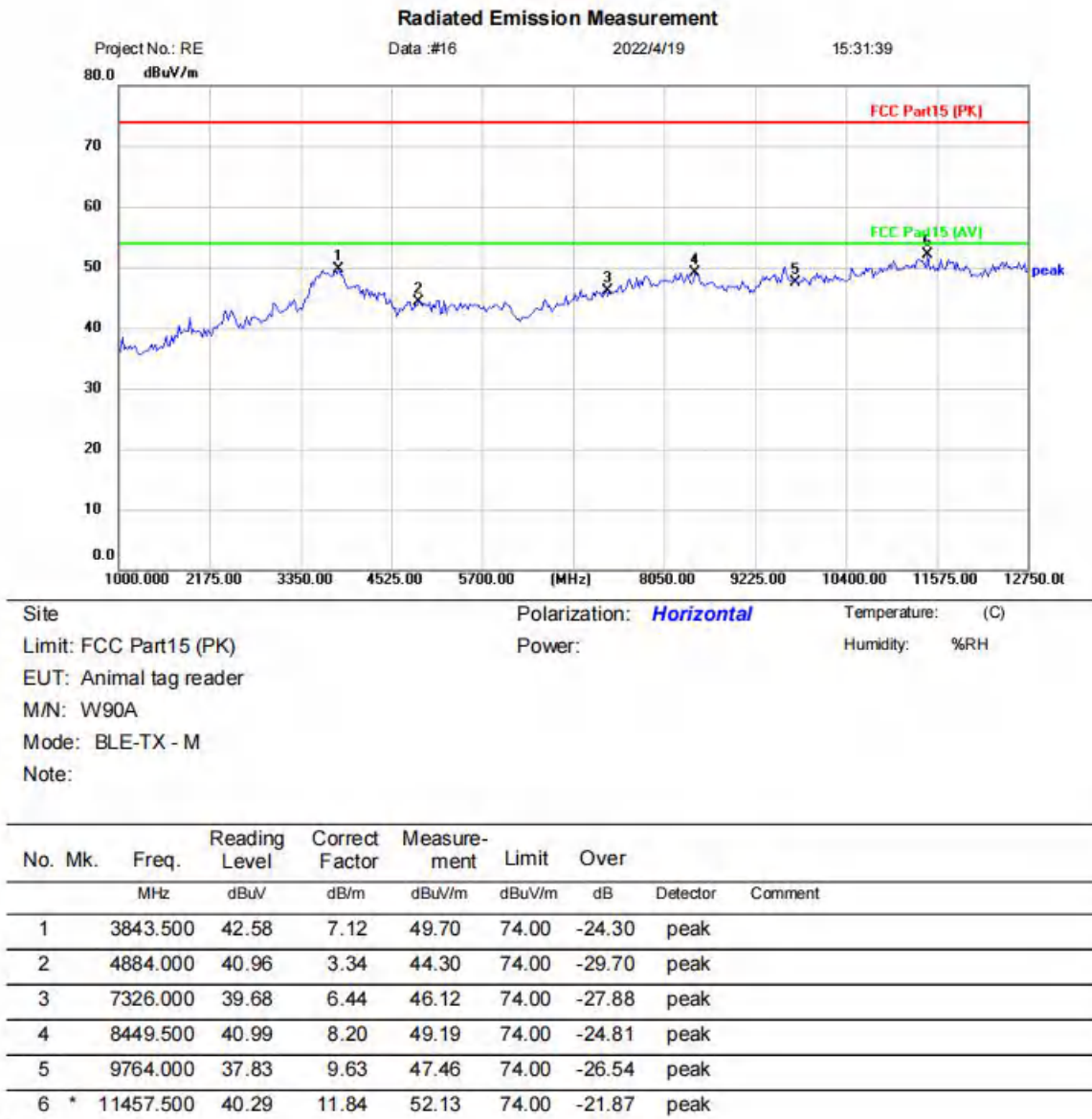


\*:Maximum data    x:Over limit    !:over margin

(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**

### 13 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

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

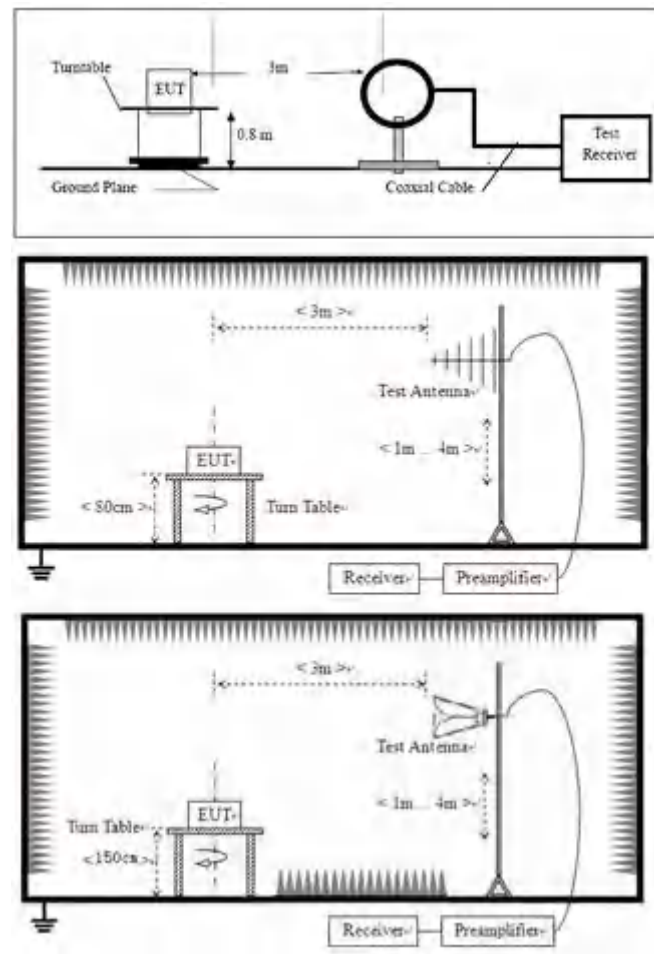
#### 13.1 LIMITS

<b>Frequency(MHz)</b>	<b>Field strength(microvolts/meter)</b>	<b>Measurement distance(meters)</b>
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.

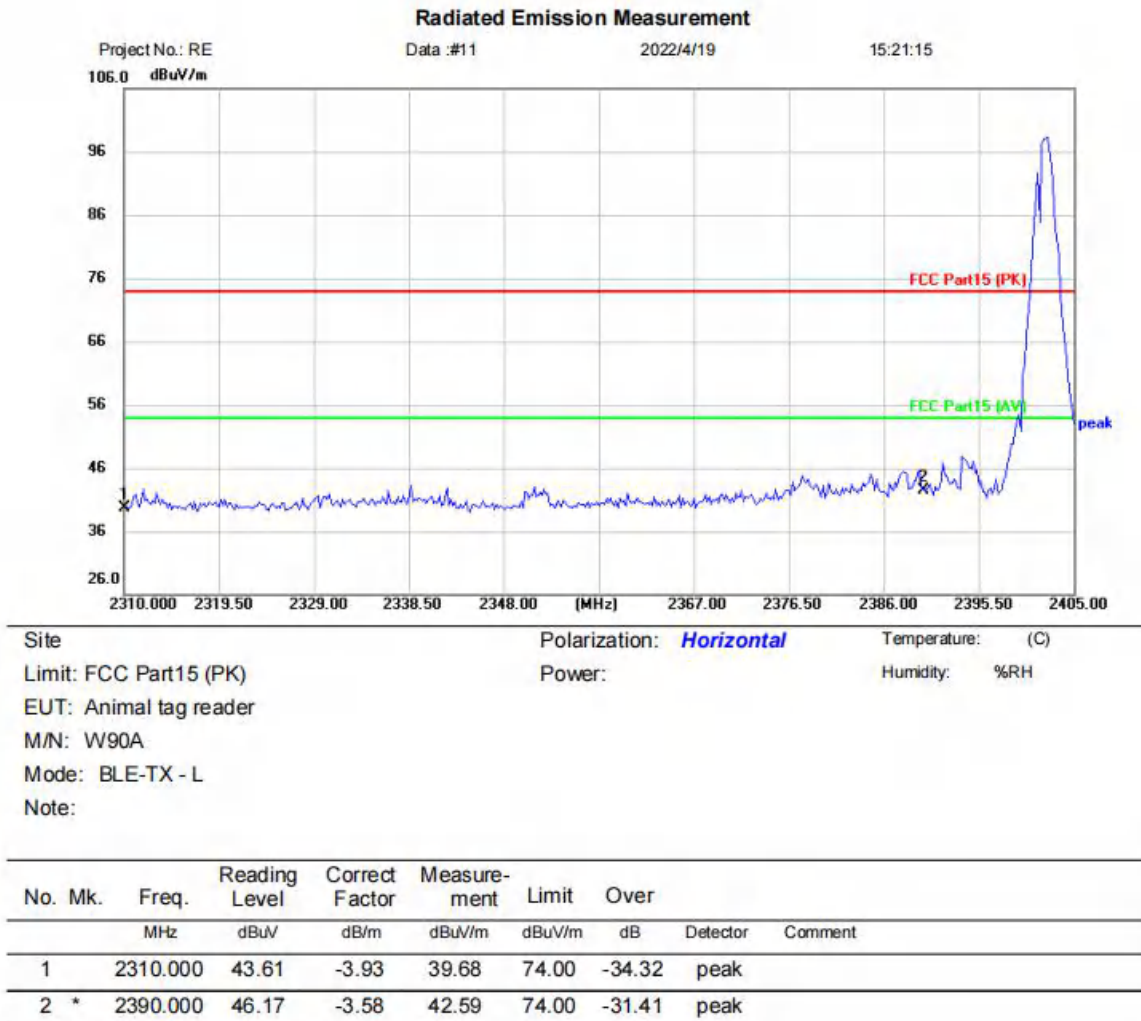
Remark 1:  $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamp Factor}$

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.

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### 13.4 TEST DATA

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



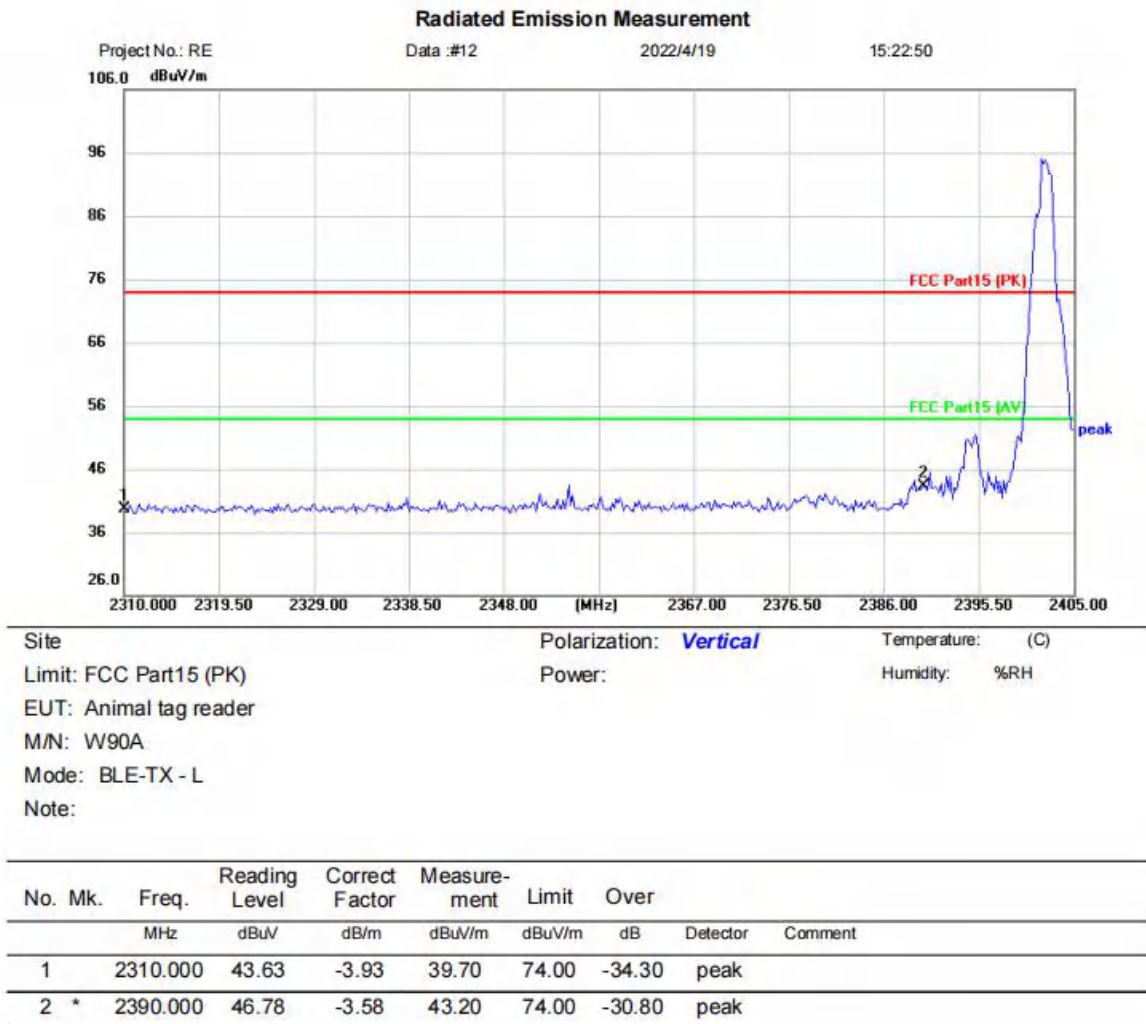
\*:Maximum data    x:Over limit    !:over margin

(Reference Only)

**Test Result: Pass**



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

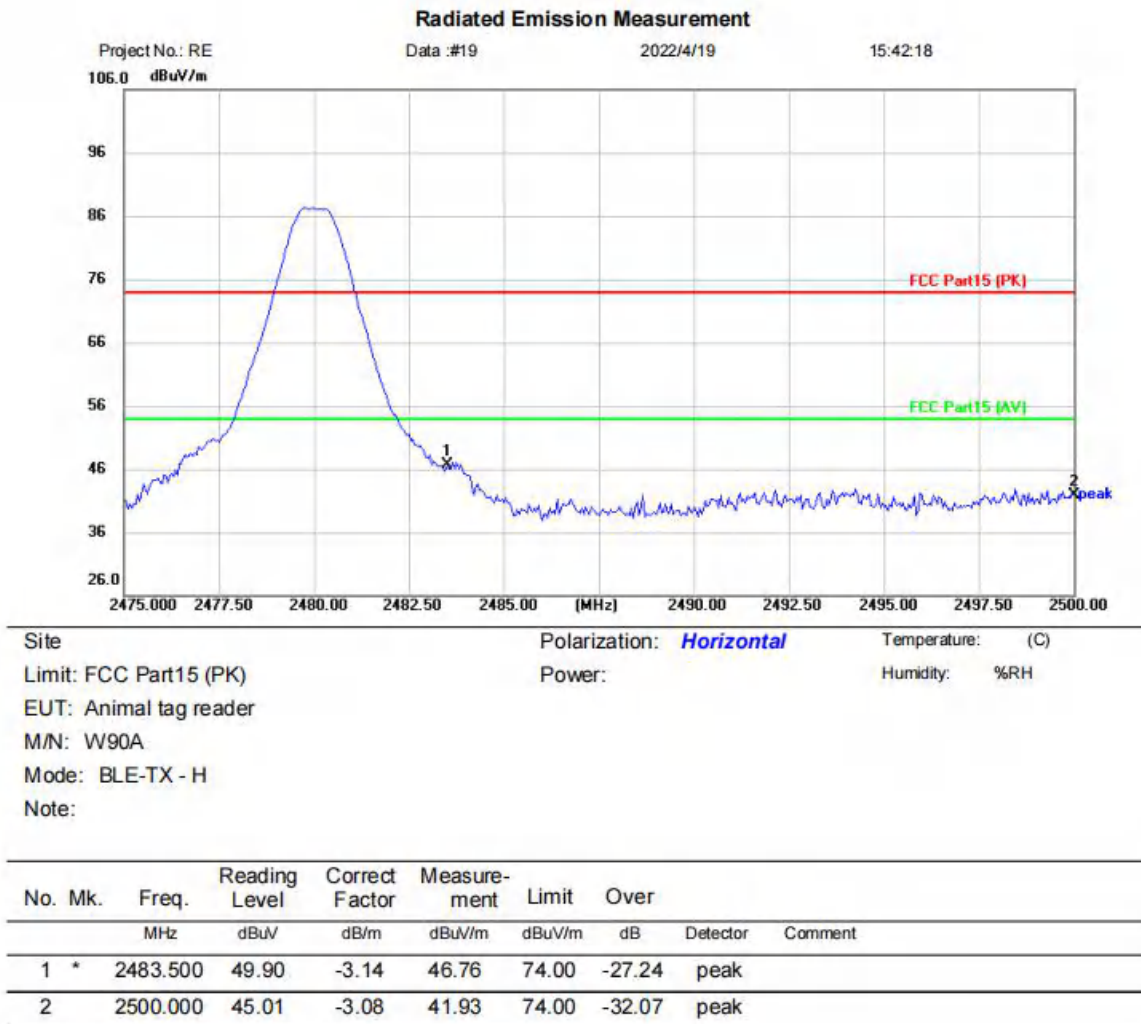


\*:Maximum data    x:Over limit    !:over margin

(Reference Only)

**Test Result: Pass**

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

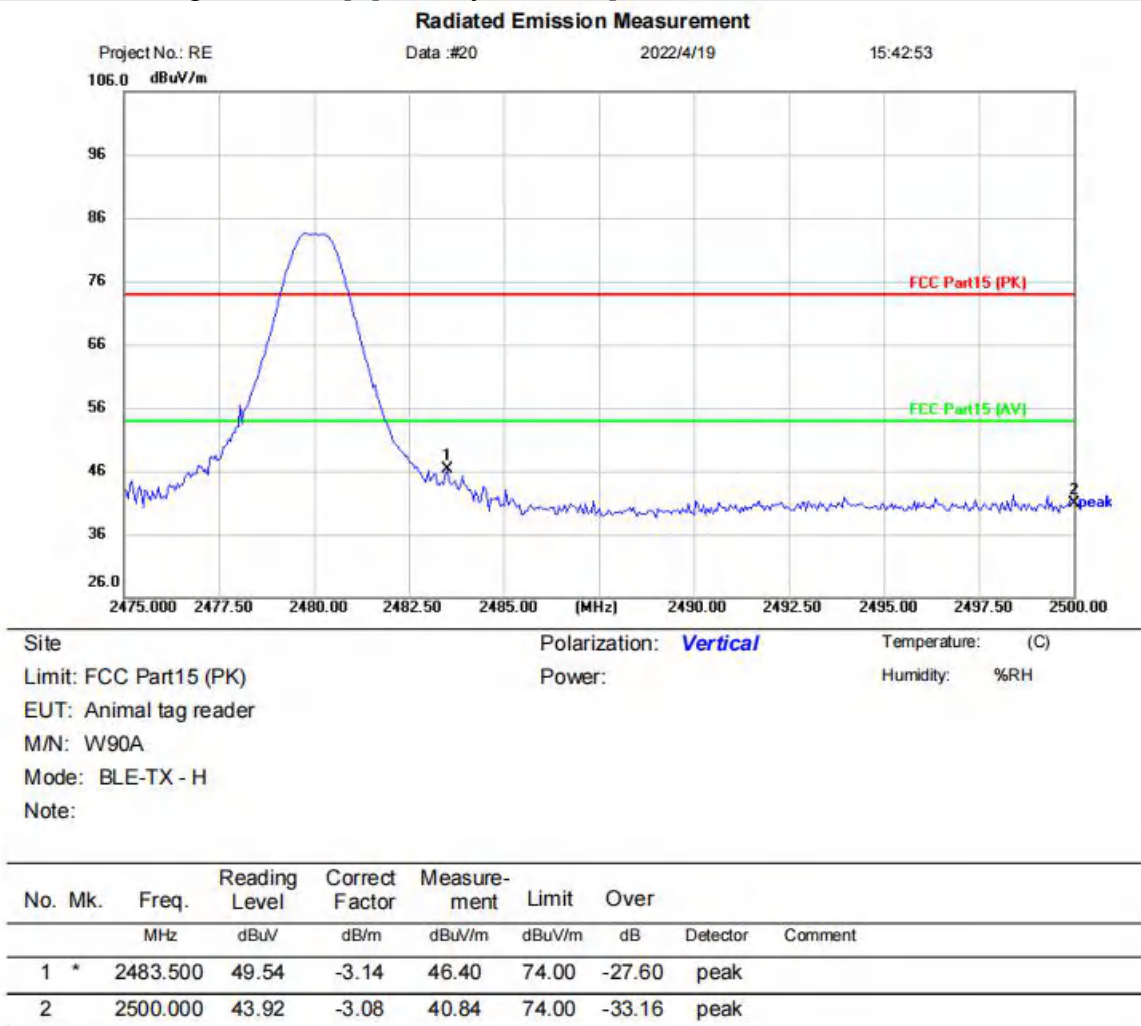


\*:Maximum data    x:Over limit    !:over margin

(Reference Only)

**Test Result: Pass**

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



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

(Reference Only)

**Test Result: Pass**

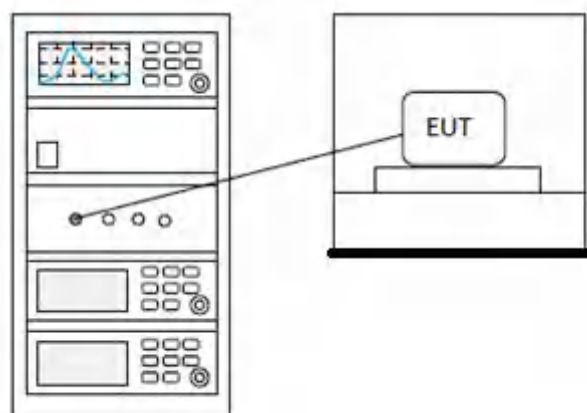
## 14 CONDUCTED SPURIOUS EMISSIONS

<b>Test Standard</b>	47 CFR Part 15, Subpart C 15.247
<b>Test Method</b>	ANSI C63.10 (2013) Section 7.8.6 & Section 11.11
<b>Test Mode (Pre-Scan)</b>	TX
<b>Test Mode (Final Test)</b>	TX;TX
<b>Tester</b>	Jozu
<b>Temperature</b>	25°C
<b>Humidity</b>	60%

### 14.1 LIMITS

<b>Limit:</b>	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)).
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### 14.2 BLOCK DIAGRAM OF TEST SETUP



**14.3 TEST DATA****Pass: Please Refer To Appendix: Appendix1 For Details**

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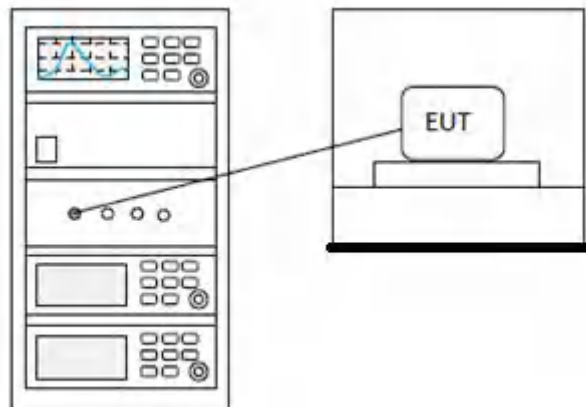
## 15 POWER SPECTRUM DENSITY

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	Jozu
Temperature	25°C
Humidity	60%

### 15.1 LIMITS

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

### 15.2 BLOCK DIAGRAM OF TEST SETUP



### 15.3 TEST DATA

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

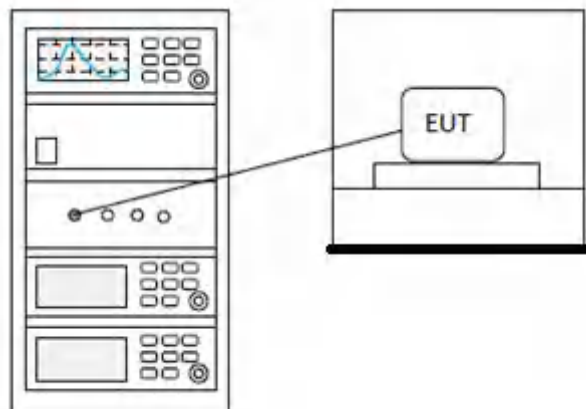
## 16 CONDUCTED PEAK OUTPUT POWER

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	Jozu
Temperature	25°C
Humidity	60%

### 16.1 LIMITS

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for $\geq 50$ hopping channels
	0.25 for $25 \leq \text{hopping channels} < 50$
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ 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 TEST DATA**

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

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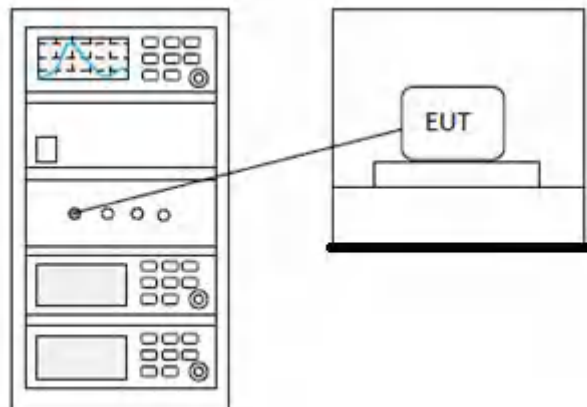
## 17 MINIMUM 6DB BANDWIDTH

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
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25°C
Humidity	60%

### 17.1 LIMITS

Limit:	$\geq 500$ kHz
--------	----------------

### 17.2 BLOCK DIAGRAM OF TEST SETUP



### 17.3 TEST DATA

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

## 18 ANTENNA REQUIREMENT

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

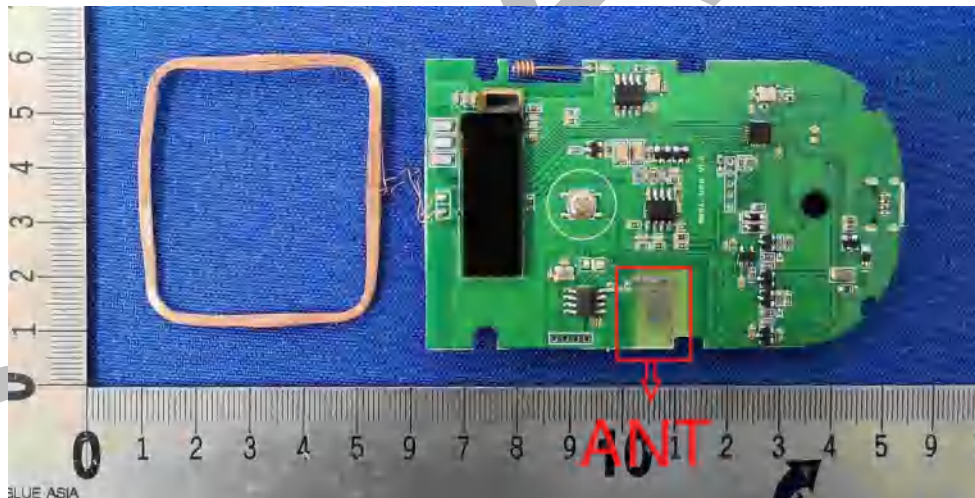
### 18.1 CONCLUSION

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 3dBi.

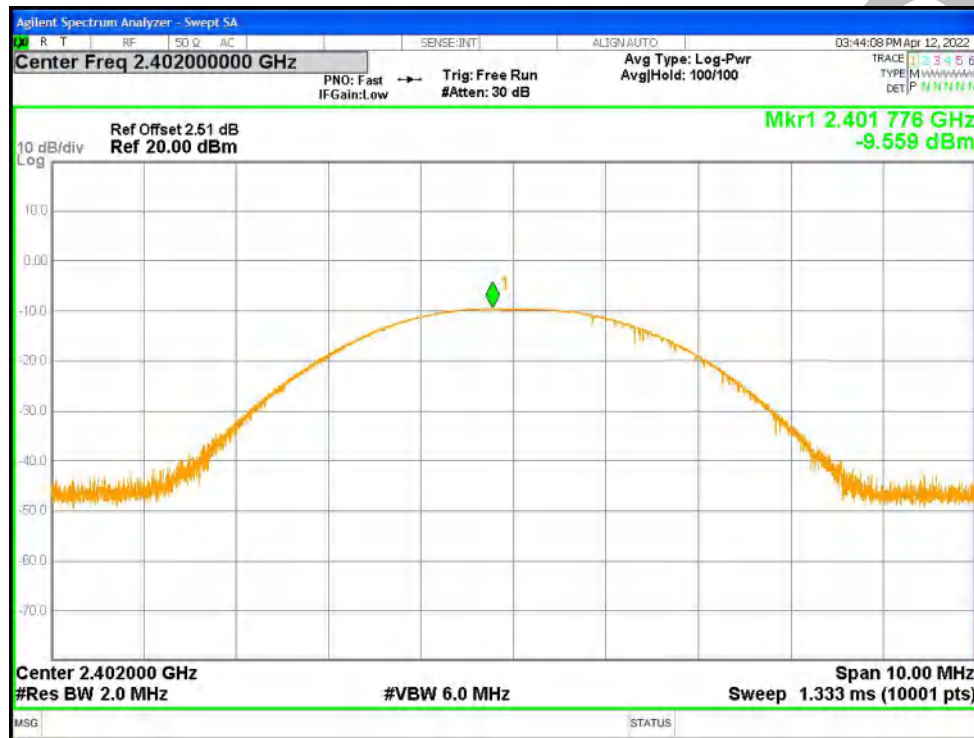


## 19 APPENDIX

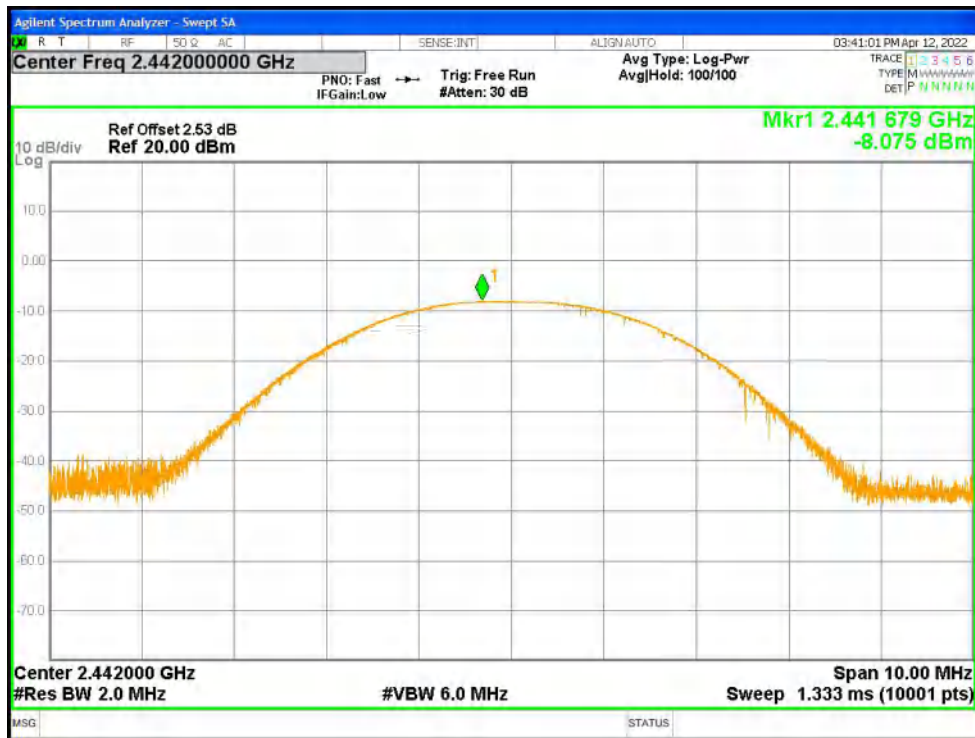
### Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE	2402	Ant1	-9.559	30	Pass
NVNT	BLE	2442	Ant1	-8.075	30	Pass
NVNT	BLE	2480	Ant1	-5.4	30	Pass

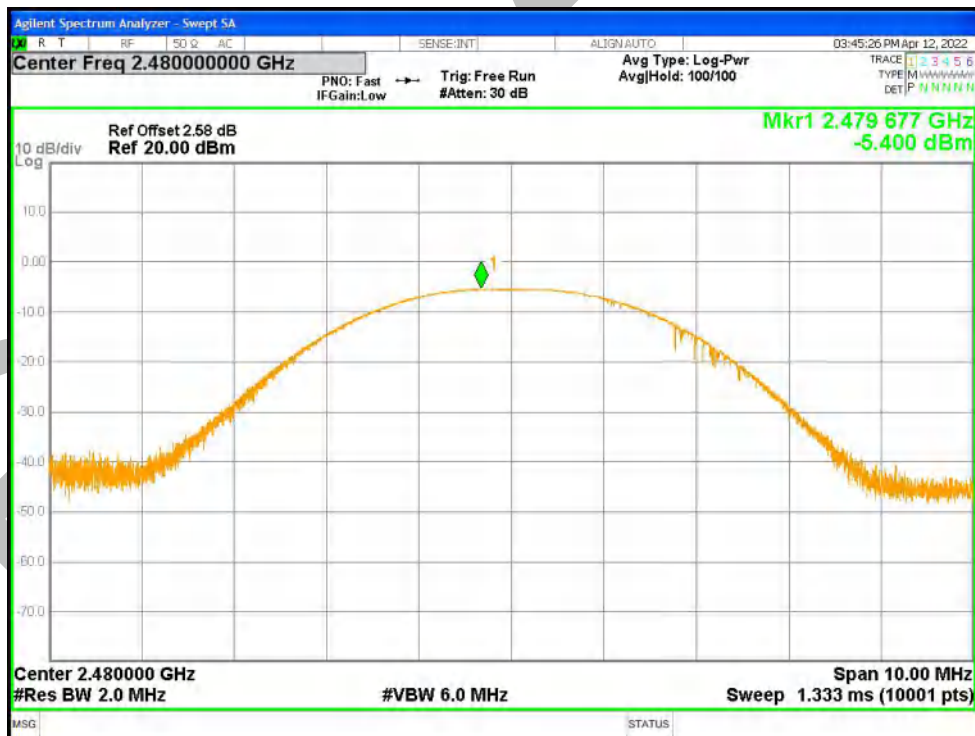
Power NVNT BLE 2402MHz Ant1



Power NVNT BLE 2442MHz Ant1



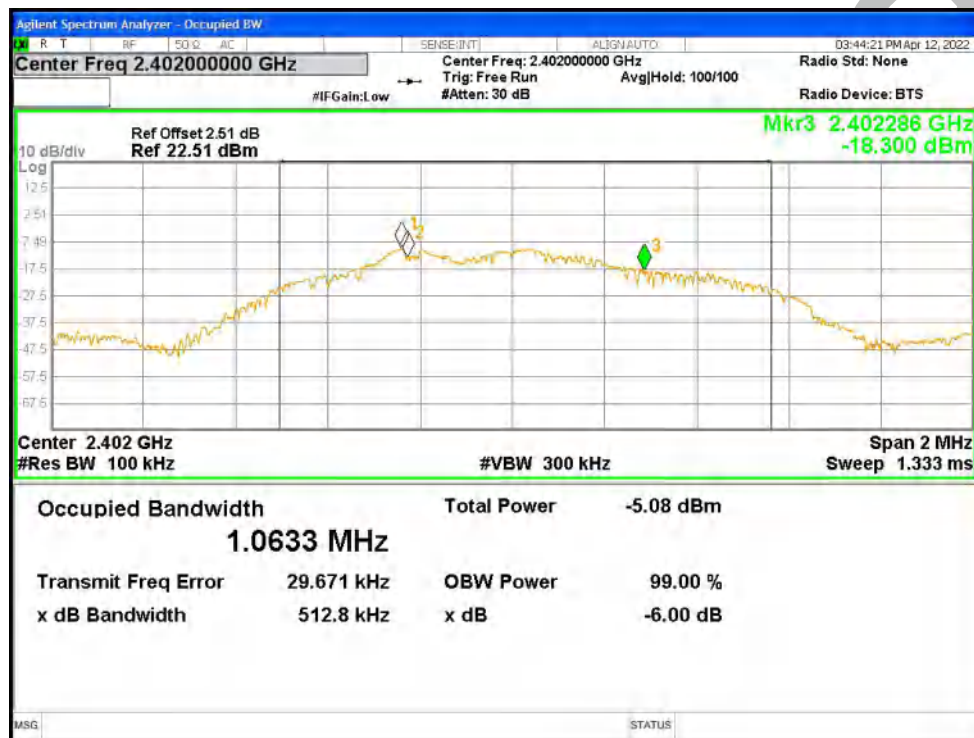
Power NVNT BLE 2480MHz Ant1



### -6dB Bandwidth

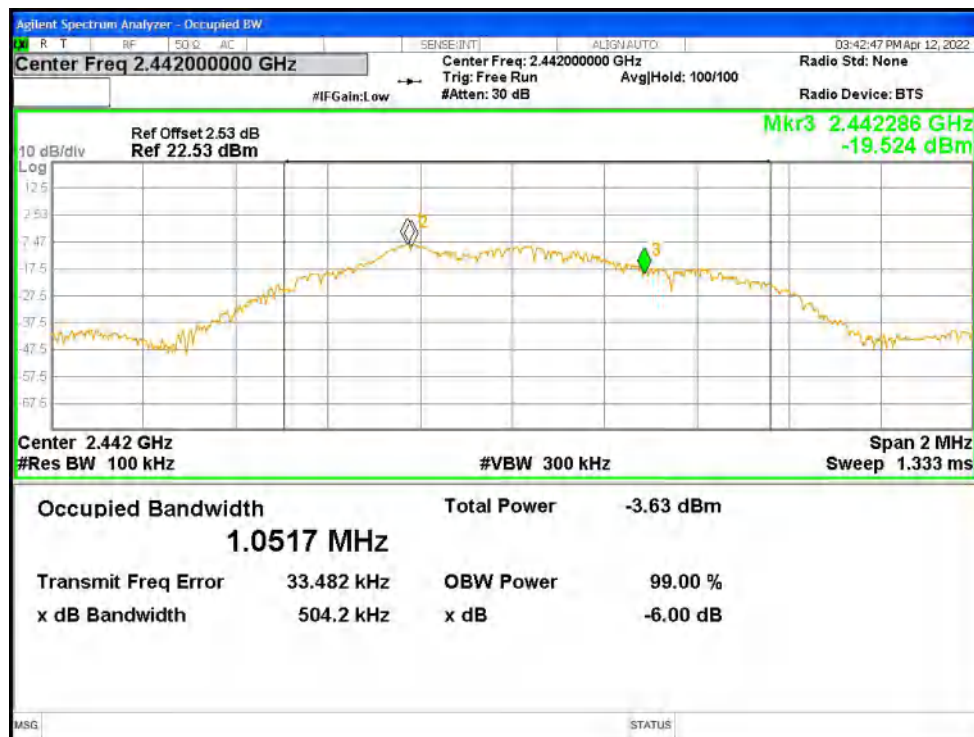
Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE	2402	Ant1	0.513	0.5	Pass
NVNT	BLE	2442	Ant1	0.504	0.5	Pass
NVNT	BLE	2480	Ant1	0.502	0.5	Pass

### -6dB Bandwidth NVNT BLE 2402MHz Ant1

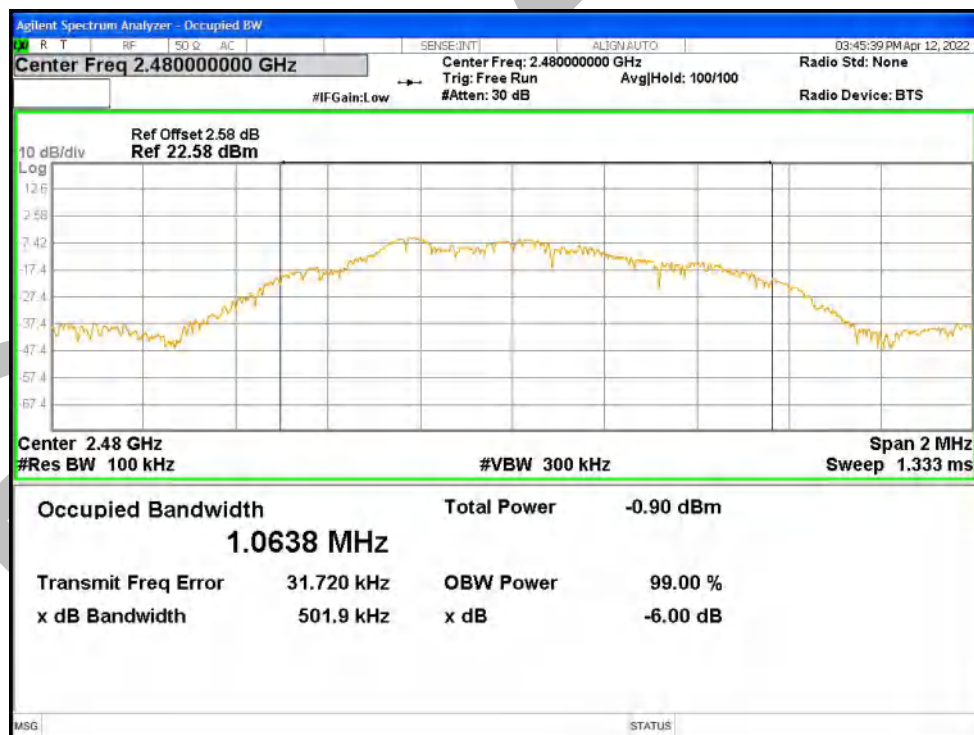


### -6dB Bandwidth NVNT BLE 2442MHz Ant1





-6dB Bandwidth NVNT BLE 2480MHz Ant1



### Occupied Channel Bandwidth

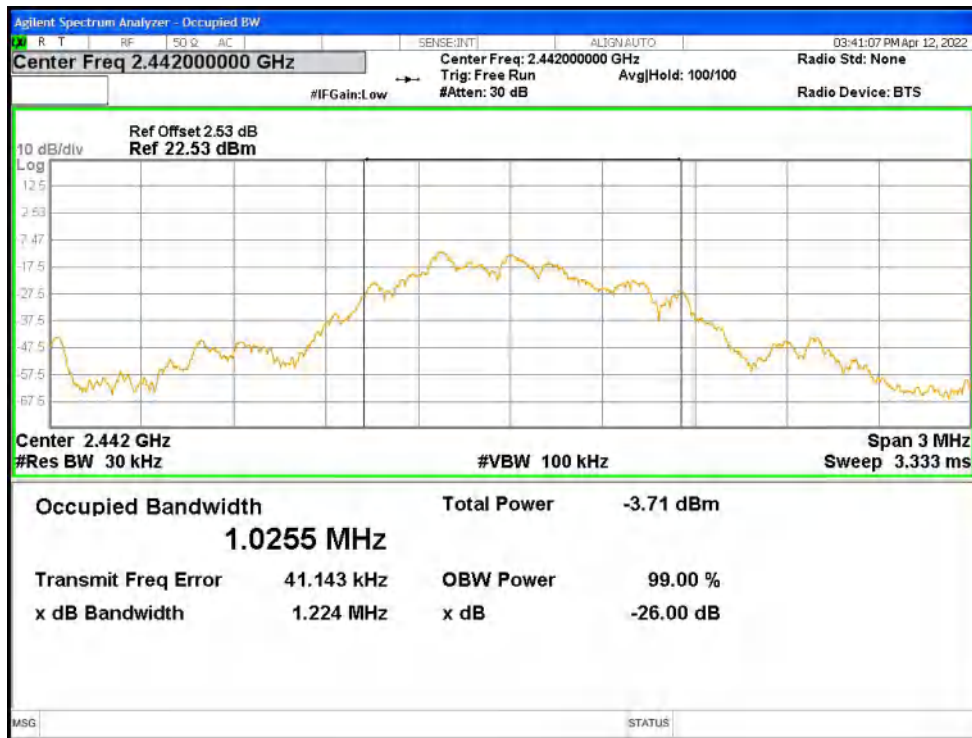
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE	2402	Ant1	1.022740497
NVNT	BLE	2442	Ant1	1.025503415
NVNT	BLE	2480	Ant1	1.028605495

OBW NVNT BLE 2402MHz Ant1

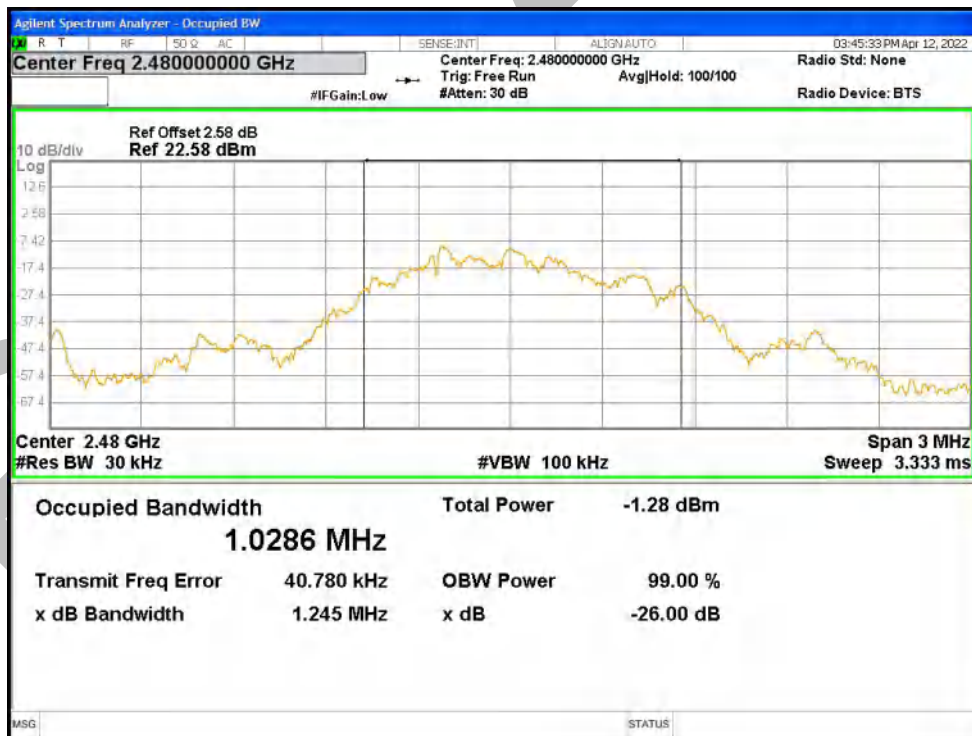


OBW NVNT BLE 2442MHz Ant1





OBW NVNT BLE 2480MHz Ant1



### Maximum Power Spectral Density Level

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE	2402	Ant1	-9.679	8	Pass
NVNT	BLE	2442	Ant1	-8.309	8	Pass
NVNT	BLE	2480	Ant1	-6.421	8	Pass

PSD NVNT BLE 2402MHz Ant1



PSD NVNT BLE 2442MHz Ant1



PSD NVNT BLE 2480MHz Ant1



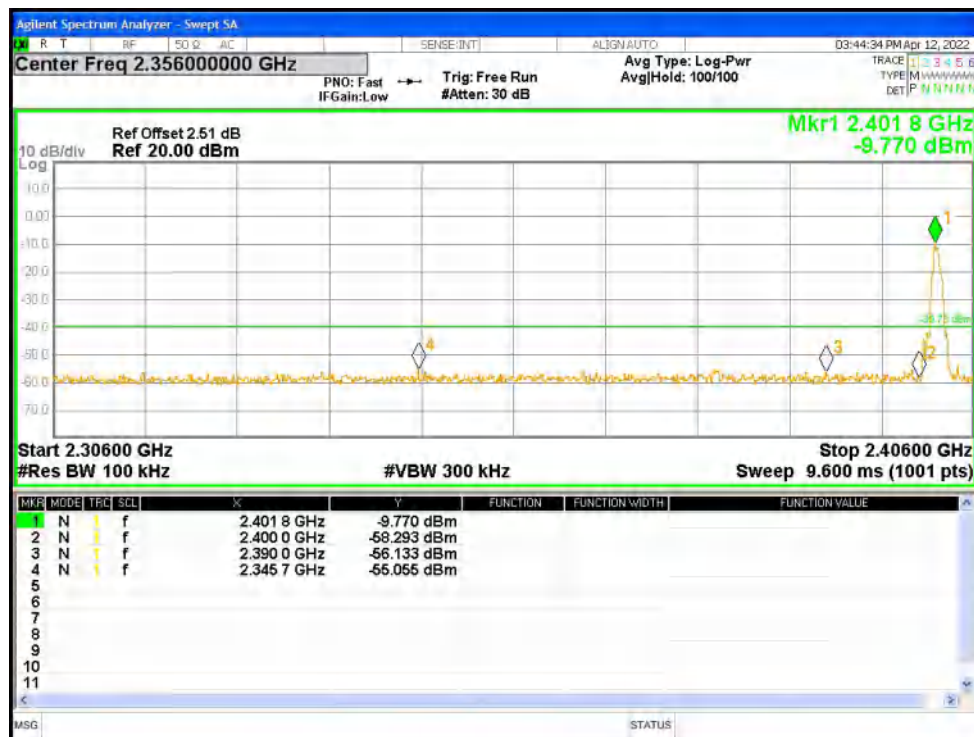
### Band Edge

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE	2402	Ant1	-45.32	-30	Pass
NVNT	BLE	2480	Ant1	-47.28	-30	Pass

Band Edge NVNT BLE 2402MHz Ant1 Ref



Band Edge NVNT BLE 2402MHz Ant1 Emission

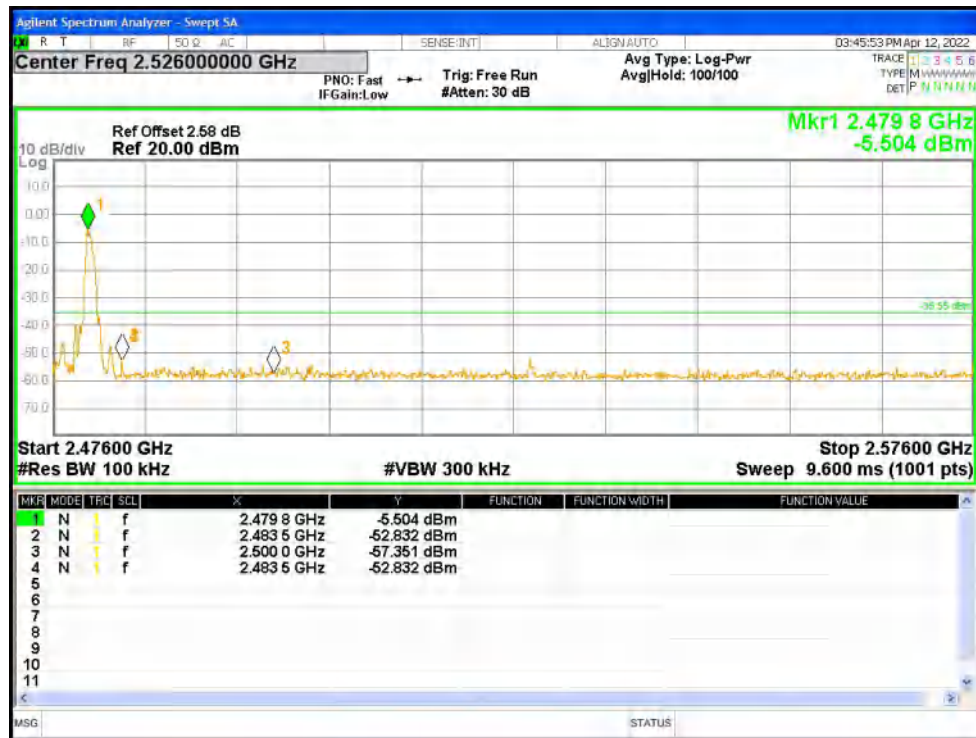


Band Edge NVNT BLE 2480MHz Ant1 Ref



Band Edge NVNT BLE 2480MHz Ant1 Emission

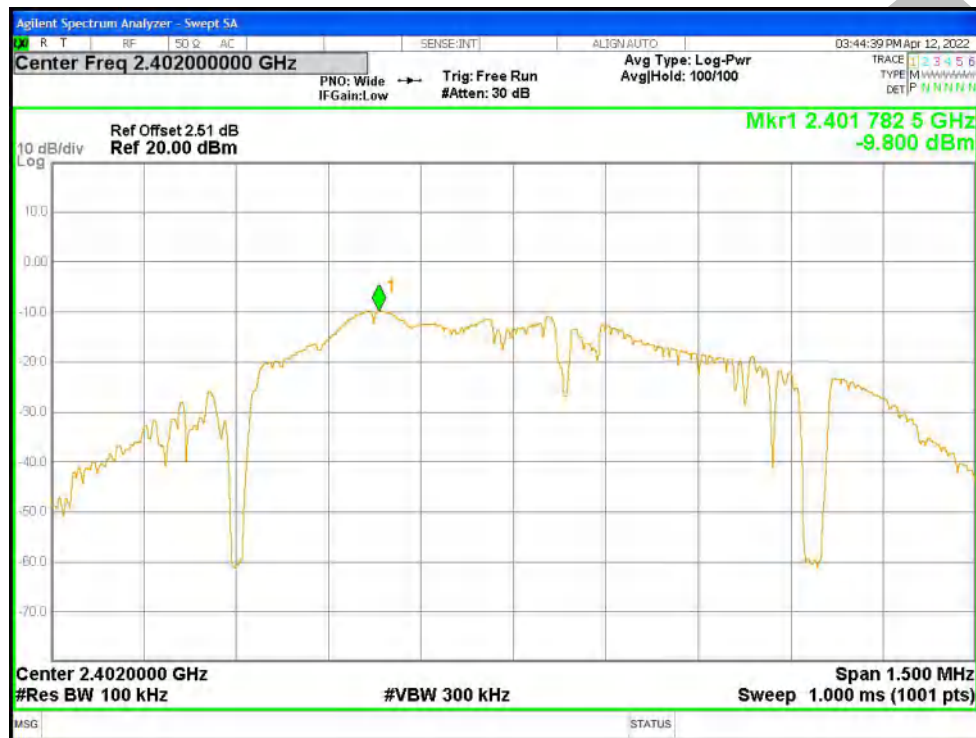




### Conducted RF Spurious Emission

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	BLE	2402	Ant1	-34.92	-30	Pass
NVNT	BLE	2442	Ant1	-36.41	-30	Pass
NVNT	BLE	2480	Ant1	-39.54	-30	Pass

### Tx. Spurious NVNT BLE 2402MHz Ant1 Ref



### Tx. Spurious NVNT BLE 2402MHz Ant1 Emission

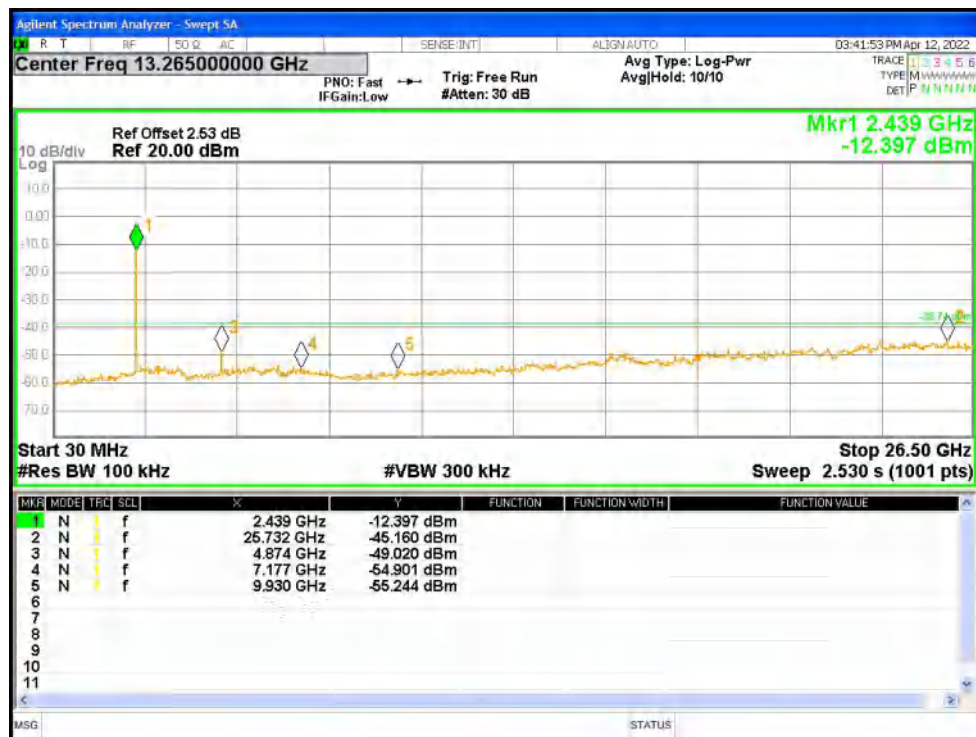




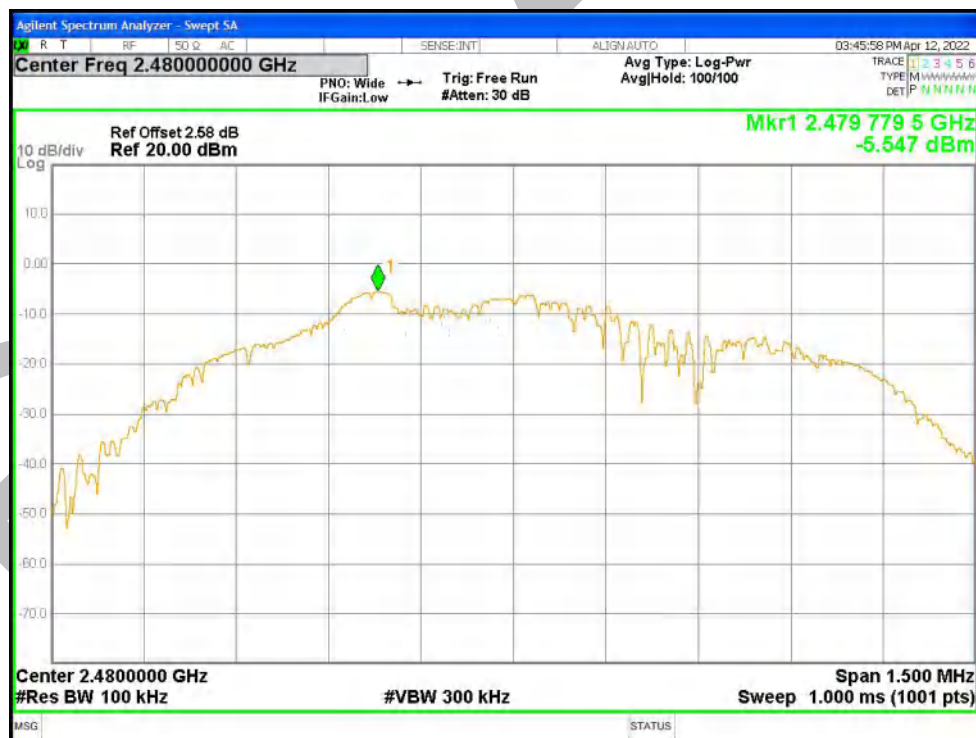
Tx. Spurious NVNT BLE 2442MHz Ant1 Ref



Tx. Spurious NVNT BLE 2442MHz Ant1 Emission



Tx. Spurious NVNT BLE 2480MHz Ant1 Ref

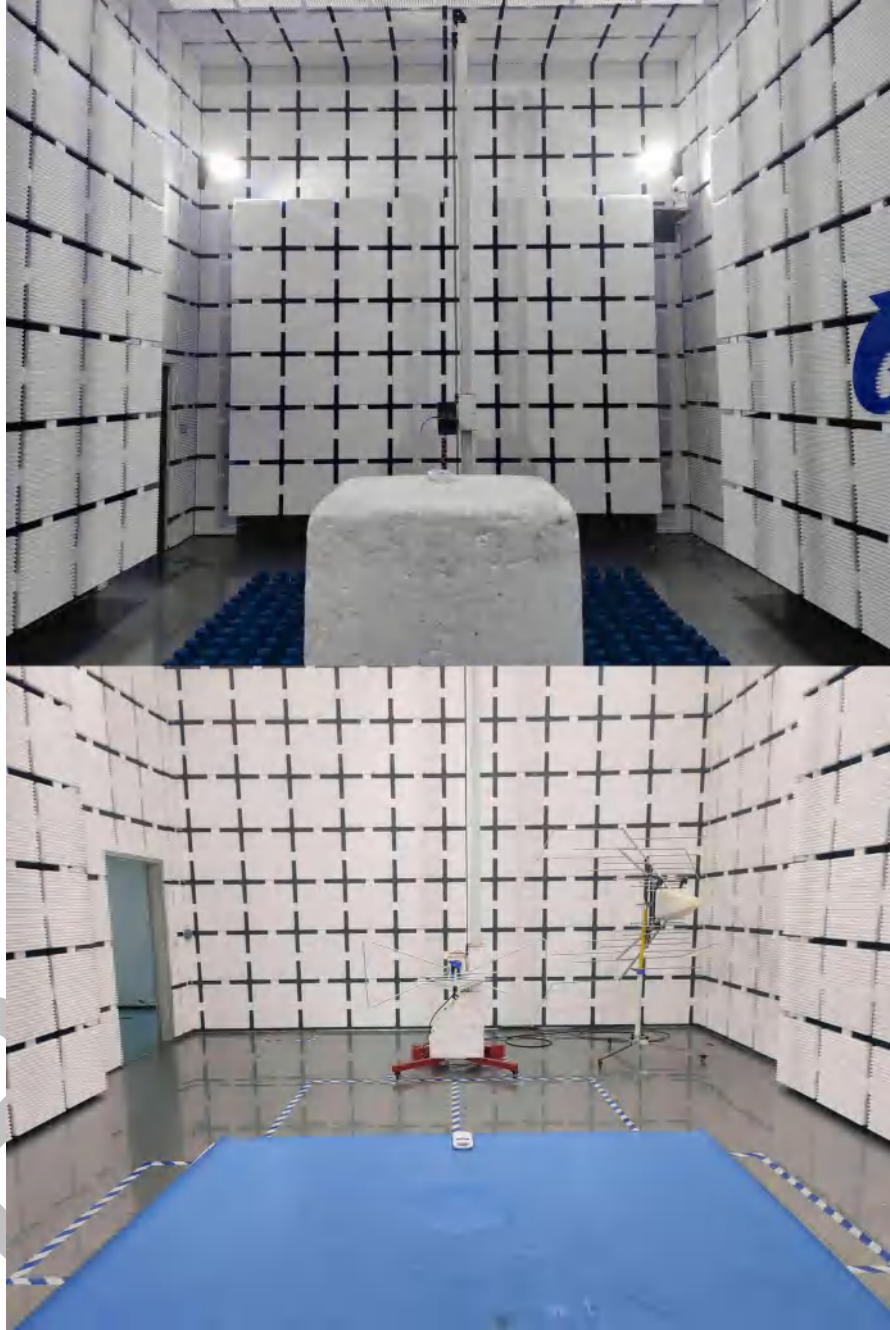


Tx. Spurious NVNT BLE 2480MHz Ant1 Emission



## APPENDIX A: PHOTOGRAPHS OF TEST SETUP

**Radiated Spurious Emissions**



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





**APPENDIX B: PHOTOGRAPHS OF EUT**

Reference to the test report No. BLA-EMC-202203-A7601

**----END OF REPORT----**

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