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Report Template Version: V02
Report Template Revision Date: 2021-06-01

FCC Test Report

Applicant:	Huizhou Jinghao Medical Technology Co.,Ltd
Address of Applicant:	Floor6, Huicheng Industry Building,No.9 Huifeng Dong’er Road, ZhongKai High tech Zone,Huizhou City, Guangdong Province, 516000, P.R.China
Manufacturer:	Huizhou Jinghao Medical Technology Co.,Ltd
Address of Manufacturer:	Floor6, Huicheng Industry Building,No.9 Huifeng Dong’er Road, ZhongKai High tech Zone,Huizhou City, Guangdong Province, 516000, P.R.China
Factory:	Dongguan Chengyue Electronic Technology Co., Ltd
Address of Factory:	NO.15, Yinhu Road, Yinhu industrial estate, jiaoyitang, Tangxia Town, Dongguan, Guangdong, China
Equipment Under Test (EUT):	
Product:	HEARING AIDS/hearing amplifier
Model No.:	JH-W3, JH-A32C, JH-A61H, JH-AW6A, JH-D59, JH-W5, JH-W6, JH-D60A, JH-D70A (All models are identical to each other except for the model name.)
Brand Name:	JINGHAO
FCC ID:	2A39M-W3HEARING
Standards:	47 CFR Part 15, Subpart C
Date of Test:	2021-12-23 to 2022-01-13
Date of Issue:	2022-01-13
Report No. :	D211210005-2
Test Result :	**PASS***

Tested By: Damon

(Damon Deng)

Reviewed By: Chivas

(Chivas Zeng)

Approved By: Victor

(Victor Meng)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
D211210005-2	Rev.01	Initial report	2022-01-13

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10 2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10 2013	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10 2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS

3 Contents

4 General Information

4.1 Client Information

Applicant:	Huizhou Jinghao Medical Technology Co.,Ltd
Address of Applicant:	Floor6, Huicheng Industry Building,No.9 Huifeng Dong’ er Road, ZhongKai High tech Zone,Huizhou City, Guangdong Province, 516000, P.R.China
Manufacturer:	Huizhou Jinghao Medical Technology Co.,Ltd
Address of Manufacturer:	Floor6, Huicheng Industry Building,No.9 Huifeng Dong’ er Road, ZhongKai High tech Zone,Huizhou City, Guangdong Province, 516000, P.R.China
Factory:	Dongguan Chengyue Electronic Technology Co., Ltd
Address of Factory:	Floor6, Huicheng Industry Building,No.9 Huifeng Dong’ er Road, ZhongKai High tech Zone,Huizhou City, Guangdong Province, 516000, P.R.China

4.2 General Description of EUT

Product Name:	HEARING AIDS/hearing amplifier
Model No.:	JH-W3, JH-A32C, JH-A61H, JH-AW6A, JH-D59, JH-W5, JH-W6, JH-D60A, JH-D70A (All models are identical to each other except for the model name.) All tests were performed on the model JH-W3 as representative.
Trade Mark:	JINGHAO
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V5.0 BLE
Modulation Type:	GFSK
Number of Channel:	40
Sample Type:	Portable production
Sample number:	2021211001
Test Software of EUT:	BT Tool _V1.1.0 (manufacturer declare)
Antenna Type:	Chip antenna
Antenna Gain:	4.08 dBi
Power Supply:	Hearing aids capacity: 40mAH Input: 4.5V⎓ 80mA × 2 Charging case capacity: 3.7V 550mAh(2.04Wh) Input: 5V⎓ 1A

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
2	2406MHz	12	2426MHz	22	2446MHz	32	2466MHz
3	2408MHz	13	2428MHz	23	2448MHz	33	2468MHz
4	2410MHz	14	2430MHz	24	2450MHz	34	2470MHz
5	2412MHz	15	2432MHz	25	2452MHz	35	2472MHz
6	2414MHz	16	2434MHz	26	2454MHz	36	2474MHz
7	2416MHz	17	2436MHz	27	2456MHz	37	2476MHz
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel (CH0)	2402MHz
The middle channel (CH19)	2440MHz
The highest channel (CH39)	2480MHz

4.3 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar
Test Mode:	Use test software (RF test) to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT. Note: In the process of transmitting of EUT, the duty cycle ＞98%.

4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
PC	Lenovo	ThinkPad E450c	/	DOC

4.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **ITL Co., LTD.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for **ITL** laboratory is reported:

Test	Range	Uncertainty	Notes
Radiated Emission	Below 1GHz	±4.54dB	(1)
Radiated Emission	Above 1GHz	±4.10dB	(1)
Conducted Disturbance	0.15~30MHz	±3.58dB	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.6 Test Location

ITL Co., Ltd

No.8, JinQianLing street 5, Huangjiang Town, Dongguan,

Guangdong, 523757 P.R.C

4.7 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS(Lab code: L9342)**
- **NVLAP LAB CODE 600199-0**
- **FCC Designation Number: CN5035**
- **FCC Test Firm Registration Number: 239076**

4.8 Deviation from Standards

None.

4.9 Abnormalities from Standard Conditions

None.

4.10 Other Information Requested by the Customer

None.

4.11 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Radiated Emission:

Temperature:	25 ° C
Humidity:	48%
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	25° C
Humidity:	42 %
Atmospheric pressure:	950-1050mbar

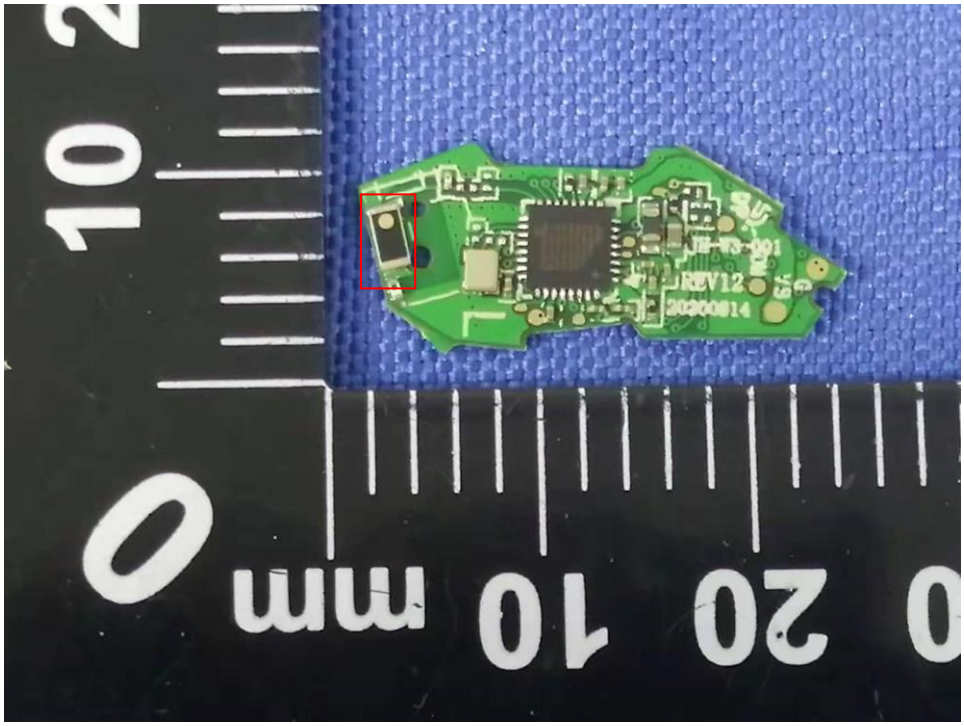
4.12 Equipment List

No.	Test Equipment	Manufacturer	Model	Serial No.	Cal Data	Due Date
DGITL-301	Semi-Anechoic chamber	ETS•Lindgren	9*6*6	CT000874-1181	2021.08.02	2022.08.01
DGITL-307	EMI test receiver	SCHWARZBECK	ESVS10	833616 /003	2021.05.11	2022.05.10
DGITL-376	Wideband Radio Communication Tester	SCHWARZBECK	CMW500	LR114195	2021.05.11	2022.05.10
DGITL-349	MXG Vector Signal Generator	Agilent Technologies	N5182A	MY47071034	2021.05.11	2022.05.10
DGITL-306	Spectrum Analyzer	Agilent Technologies	N9010A	MY54200334	2021.05.11	2022.05.10
DGITL-352	Pre Amplifier	Mlnl-Clrcuits	ZFC-1000HX	SN292801110	2021.05.11	2022.05.10
DGITL-375	Spectrum Analyzer	SCHWARZBECK	FSV40-N	6625-01-588-5515	2021.05.11	2022.05.10
DGITL-309	Horn Antenna	ETS Lindgren	3117	SN00152265	2021.05.11	2024.05.10
DGITL-308	Bilog Antenna	ETS· Lindgren	3142E	156975	2020.06.20	2023.06.19
DGITL-350	Wideband Amplifier Super Ultra	Mlnl-Clrcuits	ZVA-183X-S+	SN986401426	2021.05.11	2022.05.10
DGITL-365	Broad-band Horn Antenna	SCHWARZBECK	9170	795	2020.07.04	2022.07.04
DGITL-371	Pre Amplifier	teramicrowave	TALA-0040G35	18081001	2021.05.11	2022.05.10
DGITL-363	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	062	2020.07.04	2022.07.03

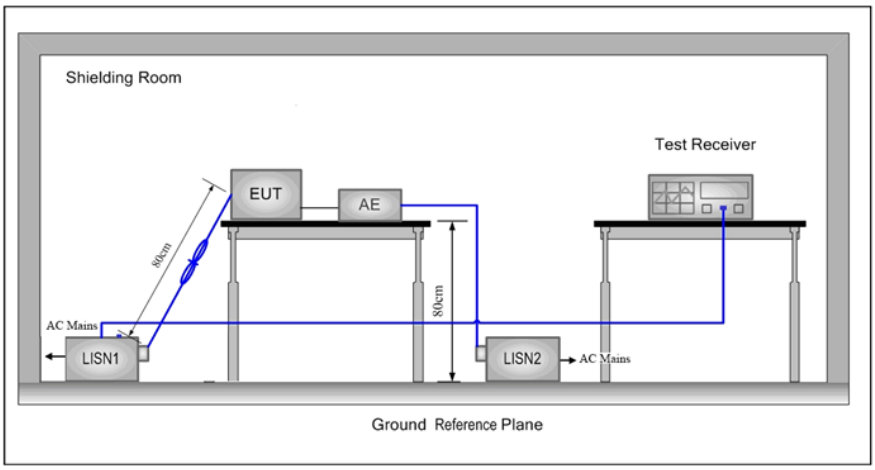
Software list			
Testing software	**Manufacturer**	**Model**	**Version number**
e3	AUDIX	e3.Ink	Version:6.2009-11-3c(itl)
MTS	MWRFTEST	MTS 8310	Version:2.0

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 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 permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is Chip antenna, The best case gain of the antenna is 4.08 dBi.	

5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Limit:	Frequency range (MHz) / Limit (dBuV): 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.
Test 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 50Ω/50μH + 5Ω 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: 2013 on conducted measurement.
Test Setup:	
Test Mode:	Transmitting with GFSK modulation. Charge +Transmitting mode.
Final Test Mode:	Found the Charge + Transmitting mode（The highest channel:2480MHz）which it is worse case. Only the worst case is recorded in the report.

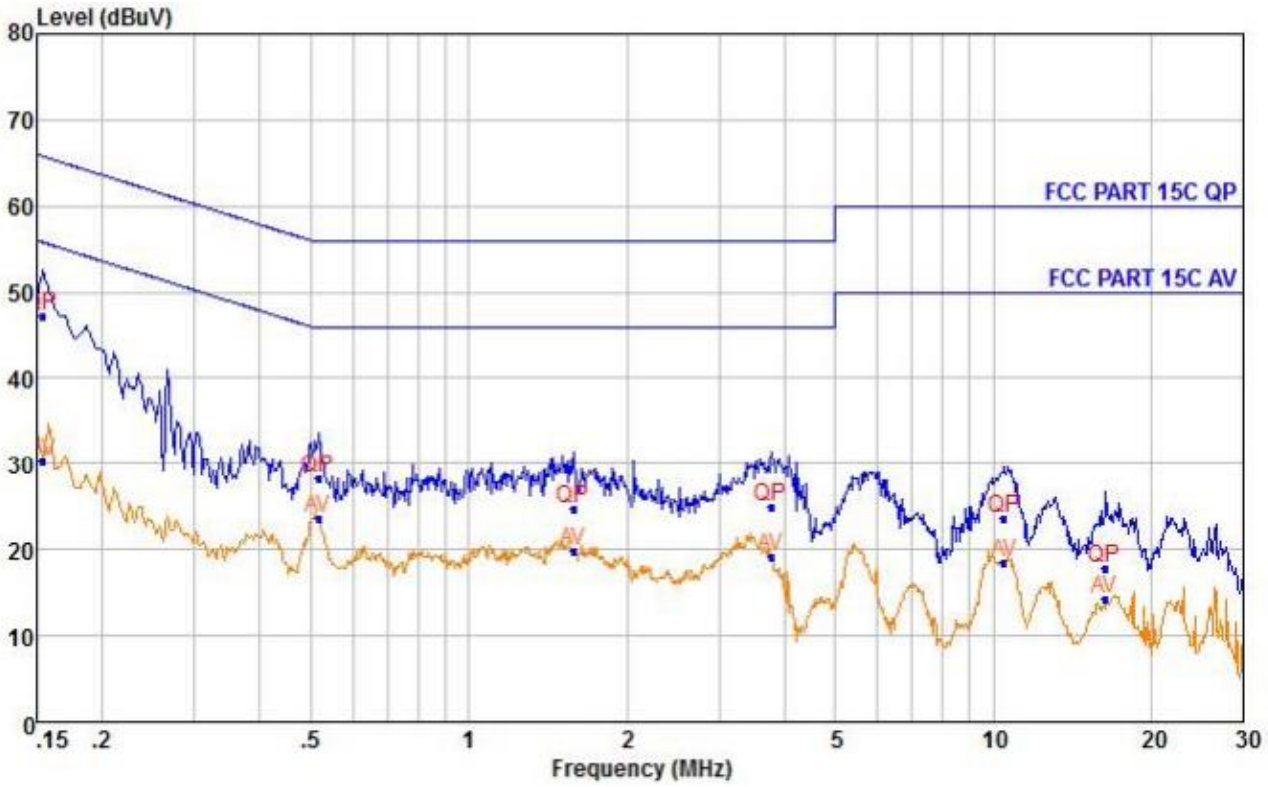
Instruments Used:	Refer to section 5.10 for details.
Test Voltage:	AC 120V/60Hz
Test Results:	Pass

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

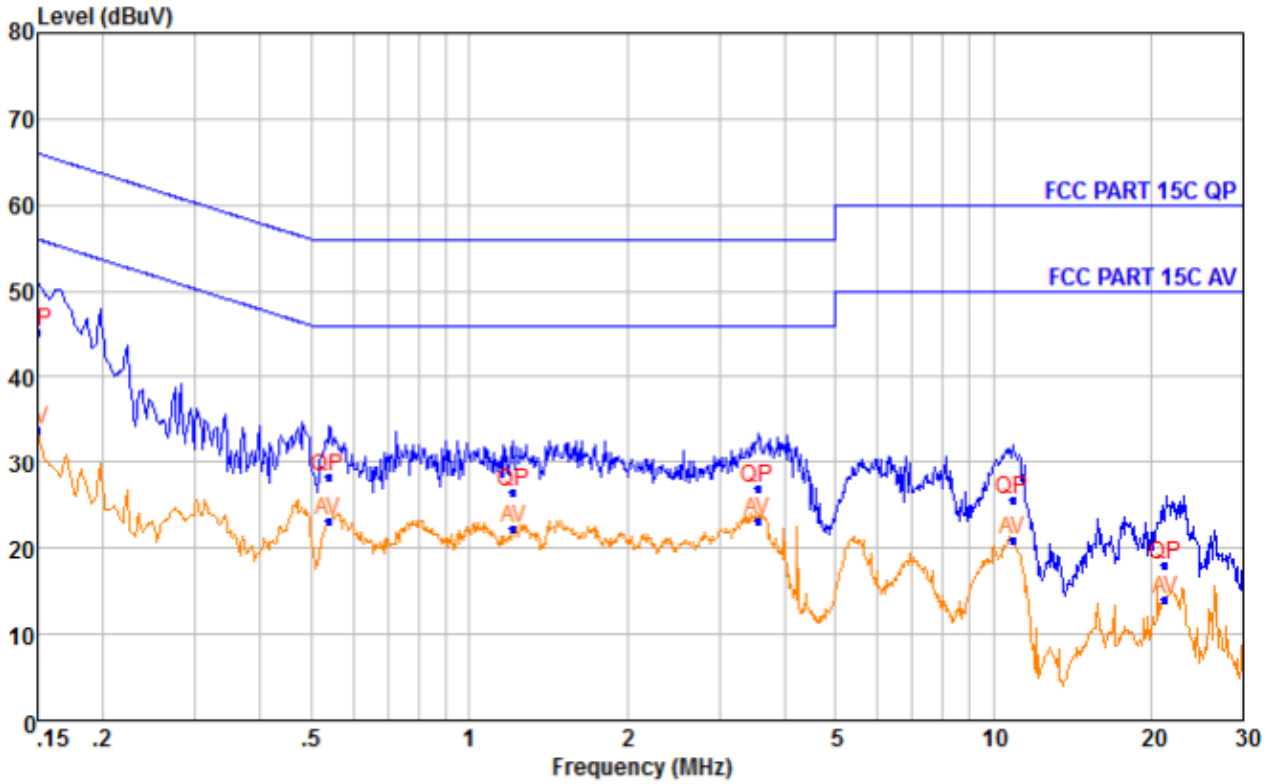
Live line:



NO.	Freq MHz	Reading dBuV	LISN Factor dB	Cable Loss dB	Measured dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.154	37.59	9.70	0.02	47.31	65.80	-18.49	QP
2	0.154	20.67	9.70	0.02	30.39	55.78	-25.39	Average
3	0.517	13.97	9.66	0.03	23.66	46.00	-22.34	Average
4	0.517	18.59	9.66	0.03	28.28	56.00	-27.72	QP
5	1.582	10.21	9.66	0.06	19.93	46.00	-26.07	Average
6	1.582	15.11	9.66	0.06	24.83	56.00	-31.17	QP
7	3.771	9.48	9.62	0.09	19.19	46.00	-26.81	Average
8	3.771	15.21	9.62	0.09	24.92	56.00	-31.08	QP
9	10.485	8.73	9.66	0.14	18.53	50.00	-31.47	Average
10	10.485	13.90	9.66	0.14	23.70	60.00	-36.30	QP
11	16.358	4.35	9.70	0.17	14.22	50.00	-35.78	Average
12	16.358	8.03	9.70	0.17	17.90	60.00	-42.10	QP

1:Measured=Reading + LISN Factor + Cable Loss

Neutral line:



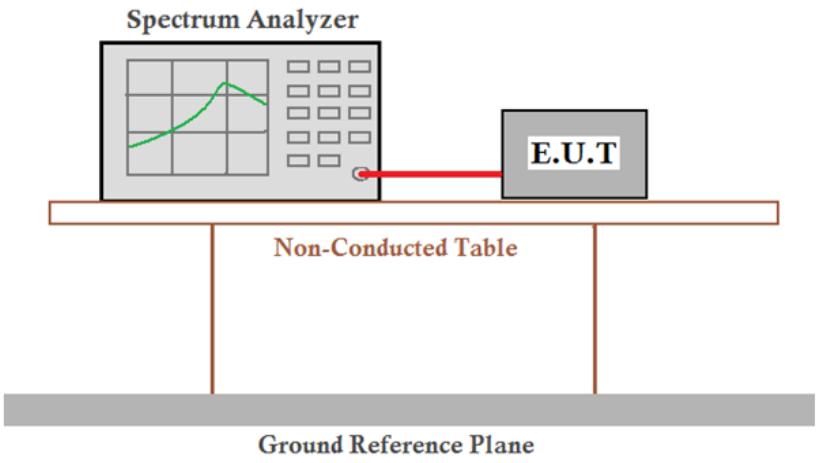
NO.	Freq MHz	Reading dBuV	LISN Factor dB	Cable Loss dB	Measured dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.150	24.11	9.71	0.02	33.84	56.00	-22.16	Average
2	0.150	35.44	9.71	0.02	45.17	66.00	-20.83	QP
3	0.539	13.51	9.66	0.03	23.20	46.00	-22.80	Average
4	0.539	18.70	9.66	0.03	28.39	56.00	-27.61	QP
5	1.214	12.67	9.63	0.06	22.36	46.00	-23.64	Average
6	1.214	16.88	9.63	0.06	26.57	56.00	-29.43	QP
7	3.559	13.51	9.62	0.09	23.22	46.00	-22.78	Average
8	3.559	17.18	9.62	0.09	26.89	56.00	-29.11	QP
9	10.884	11.19	9.62	0.15	20.96	50.00	-29.04	Average
10	10.884	15.86	9.62	0.15	25.63	60.00	-34.37	QP
11	21.316	4.15	9.62	0.20	13.97	50.00	-36.03	Average
12	21.316	8.28	9.62	0.20	18.10	60.00	-41.90	QP

1:Measured=Reading + LISN Factor + Cable Loss

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

5.3 Conducted Peak Output Power

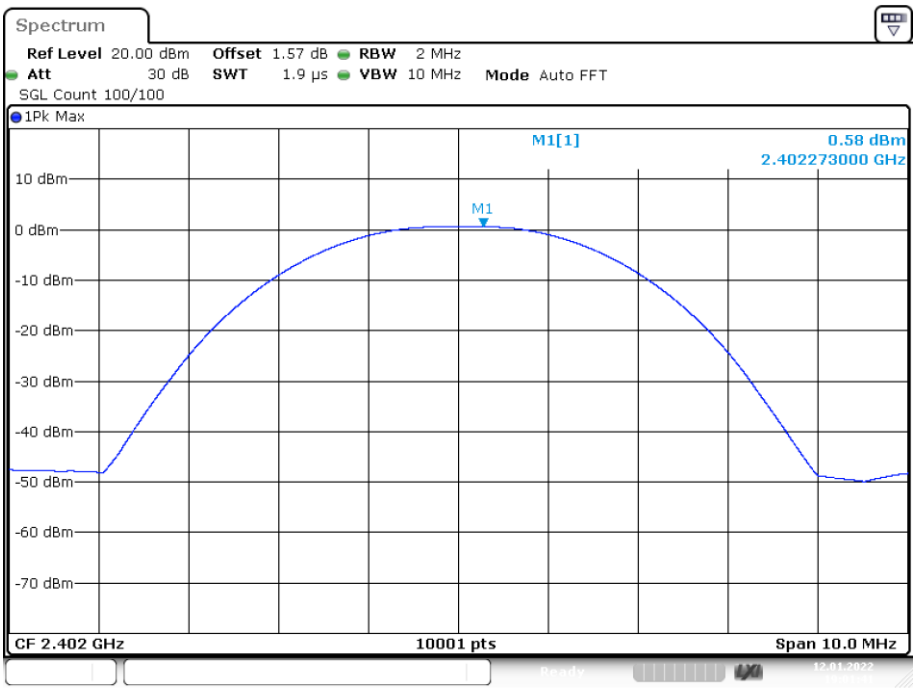
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10 2013
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Limit:	30dBm
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

Measurement Data

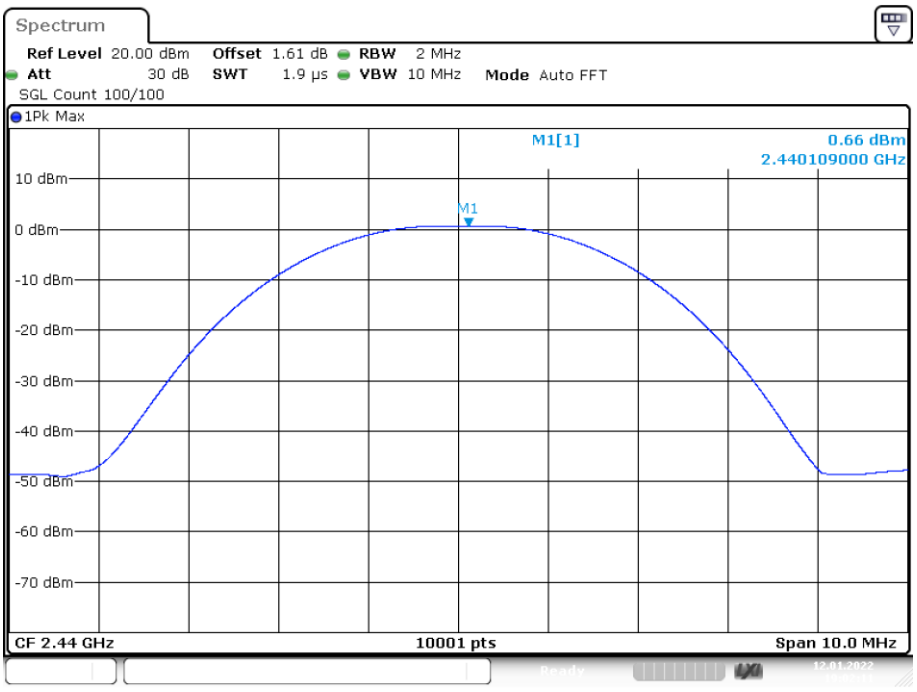
1M			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.581	30.00	Pass
Middle	0.656	30.00	Pass
Highest	0.411	30.00	Pass

2M			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.639	30.00	Pass
Middle	0.708	30.00	Pass
Highest	0.434	30.00	Pass

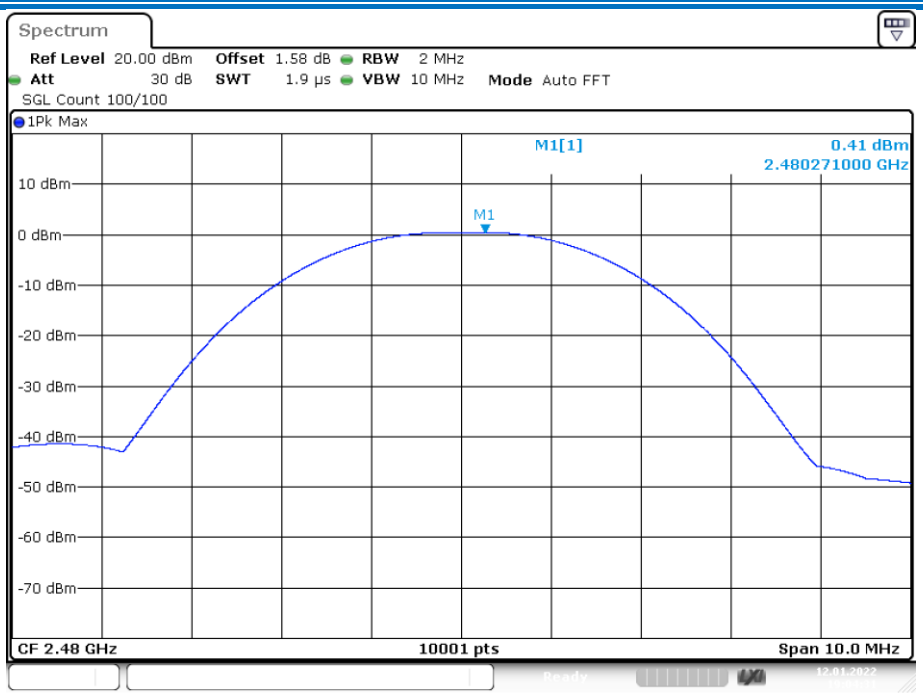
Test plot as follows：



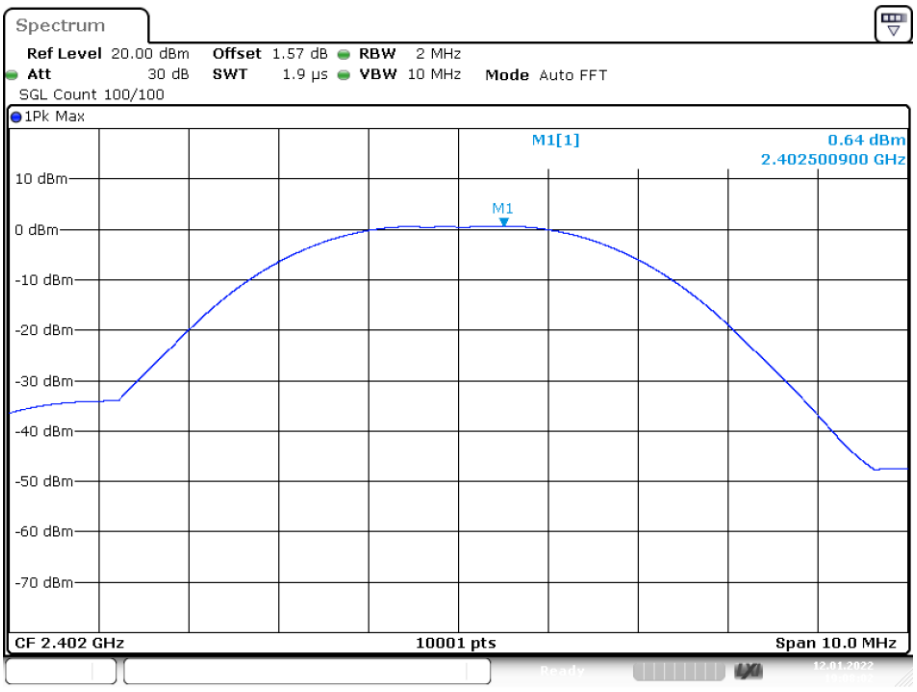
Power NVNT BLE 1M 2402MHz



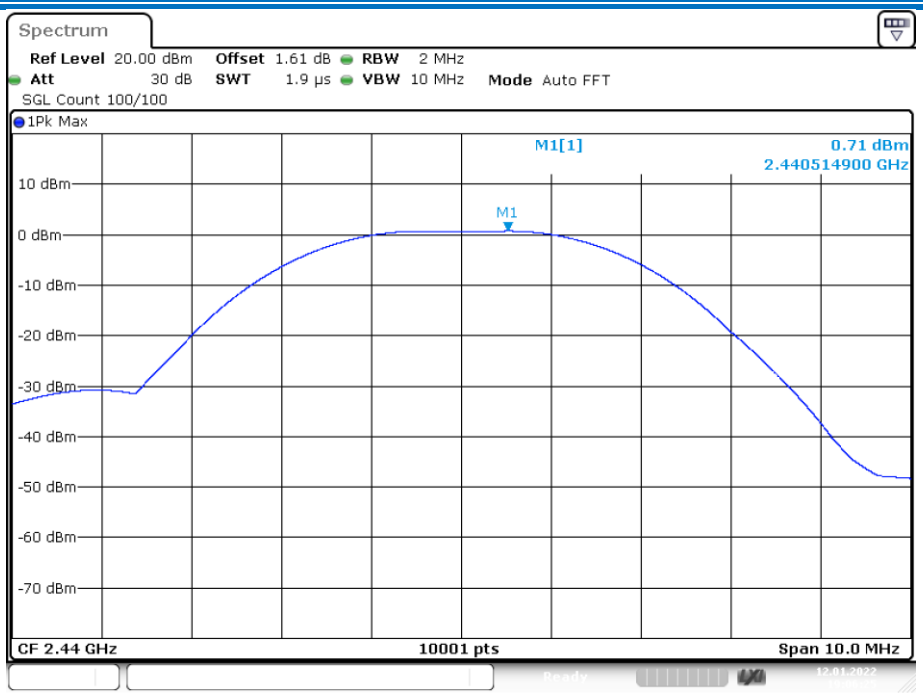
Power NVNT BLE 1M 2440MHz



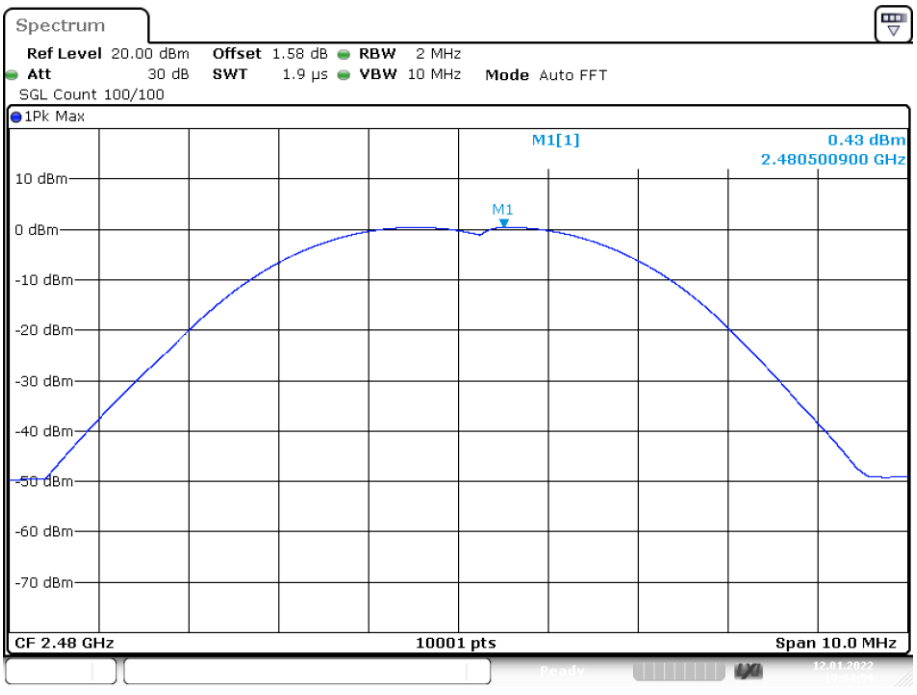
Power NVNT BLE 1M 2480MHz



Power NVNT BLE 2M 2402MHz

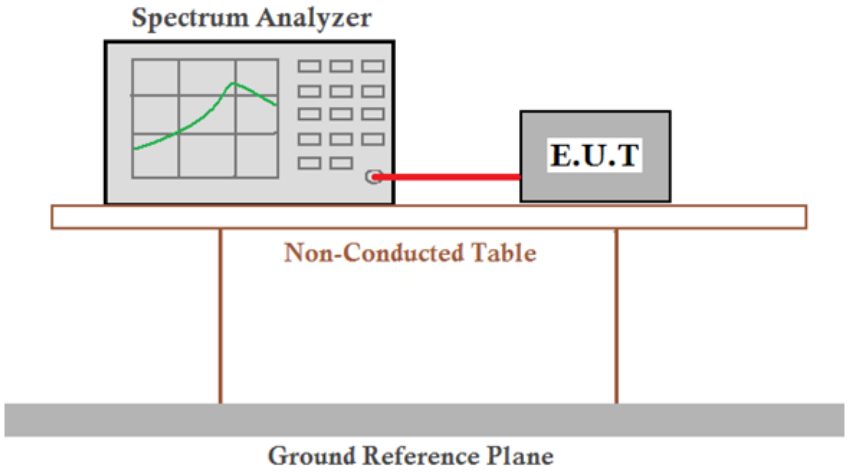


Power NVNT BLE 2M 2440MHz



Power NVNT BLE 2M 2480MHz

5.4 6dB Occupy Bandwidth

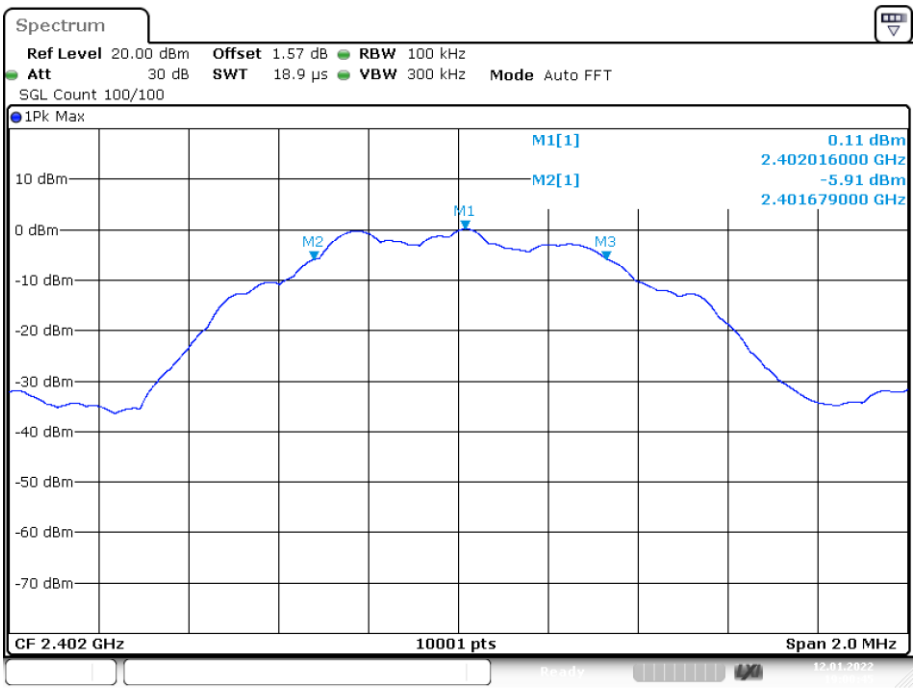
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10 2013
Test Setup:	
Limit:	≥ 500 kHz
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

Measurement Data

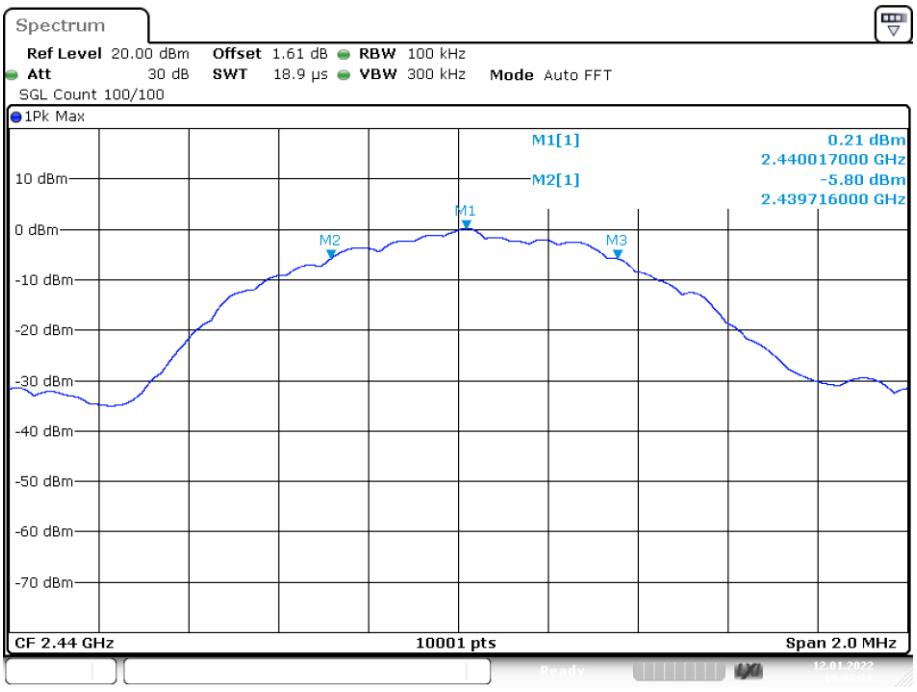
1M mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
Lowest	0.651	≥500	Pass
Middle	0.638	≥500	Pass
Highest	0.649	≥500	Pass

2M mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
Lowest	1.208	≥500	Pass
Middle	1.213	≥500	Pass
Highest	1.092	≥500	Pass

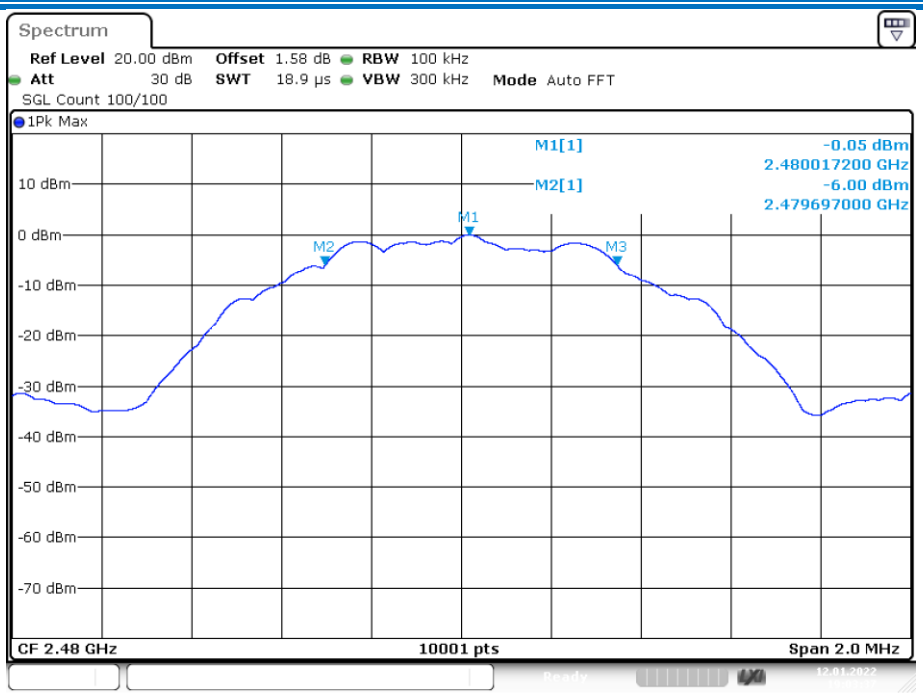
Test plot as follows:



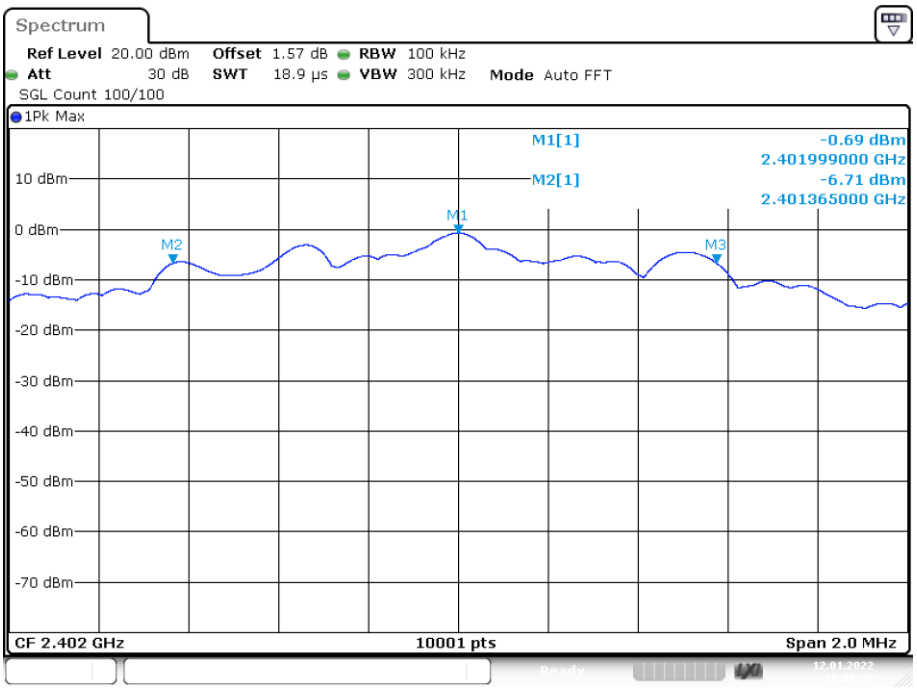
-6dB Bandwidth NVNT BLE 1M 2402MHz



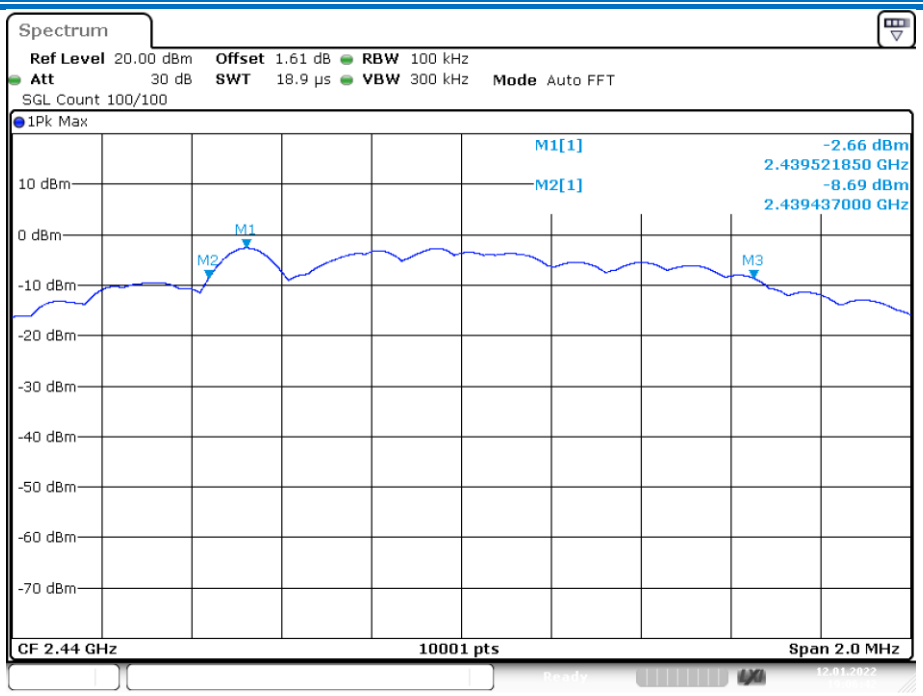
-6dB Bandwidth NVNT BLE 1M 2440MHz



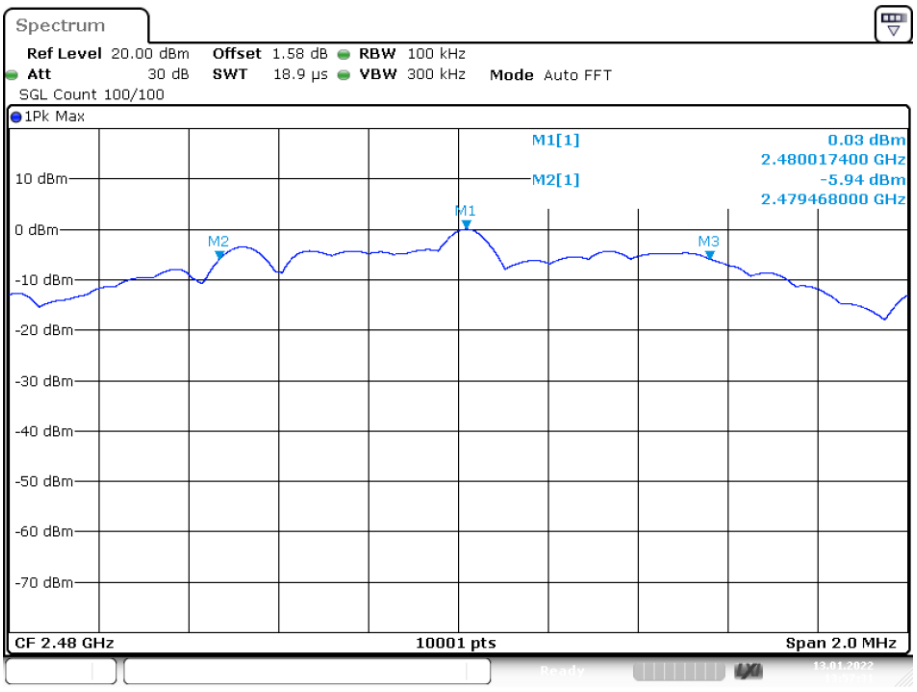
-6dB Bandwidth NVNT BLE 1M 2480MHz



-6dB Bandwidth NVNT BLE 2M 2402MHz

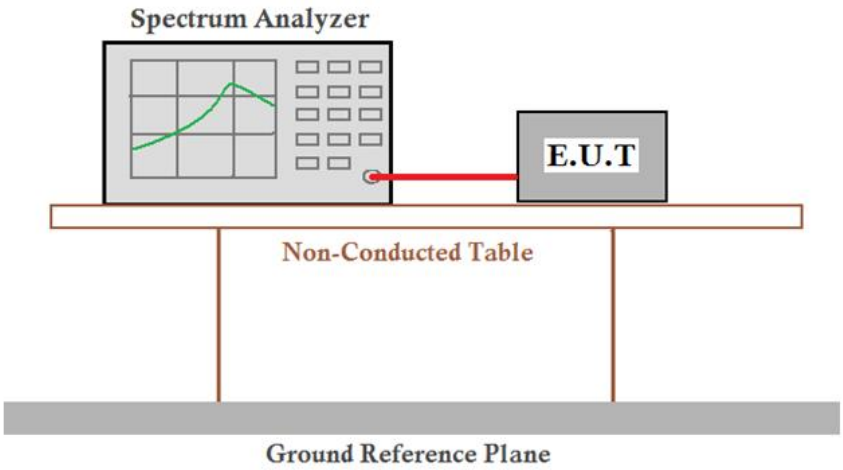


-6dB Bandwidth NVNT BLE 2M 2440MHz



-6dB Bandwidth NVNT BLE 2M 2480MHz

5.5 Power Spectral Density

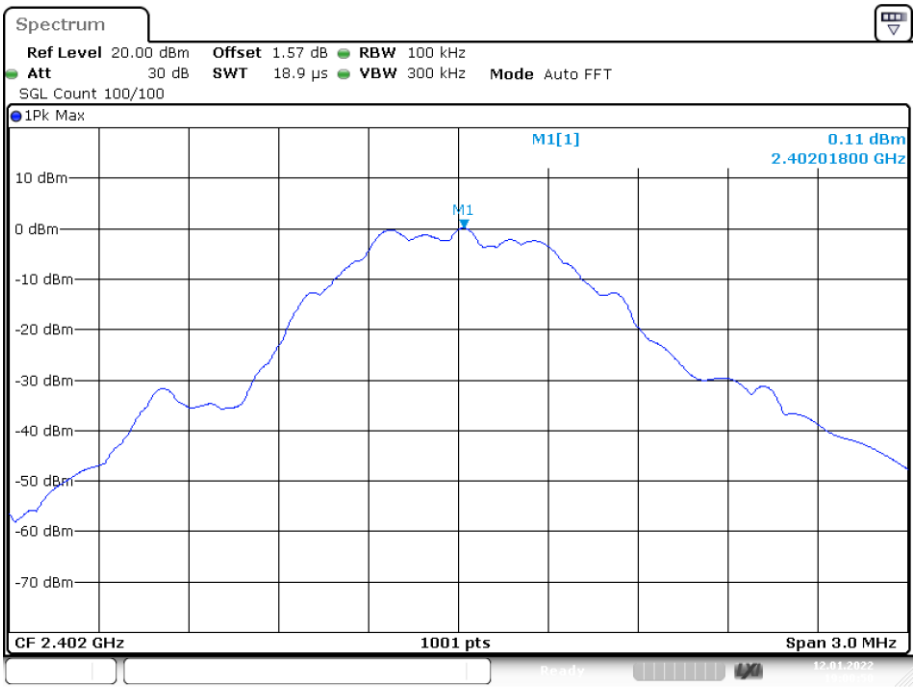
Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 2013
Test Setup:	
Limit:	≤8.00dBm/3kHz
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

Measurement Data

1M mode			
Test channel	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
Lowest	0.112	≤8.00	Pass
Middle	0.212	≤8.00	Pass
Highest	-0.051	≤8.00	Pass

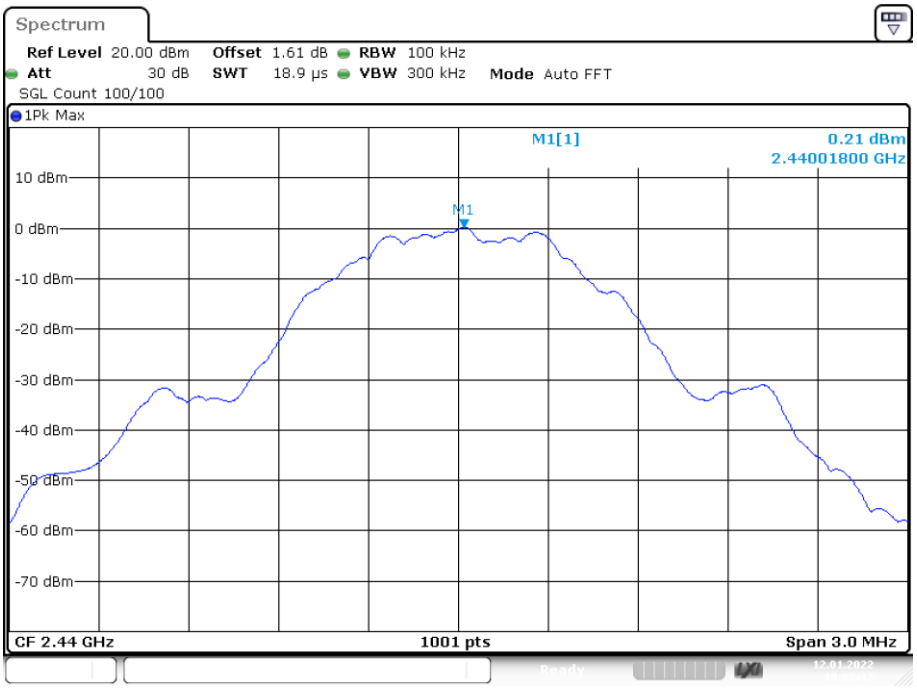
2M mode			
Test channel	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
Lowest	0.152	≤8.00	Pass
Middle	0.227	≤8.00	Pass
Highest	-0.048	≤8.00	Pass

Test plot as follows:



Date: 12.JAN.2022 19:00:50

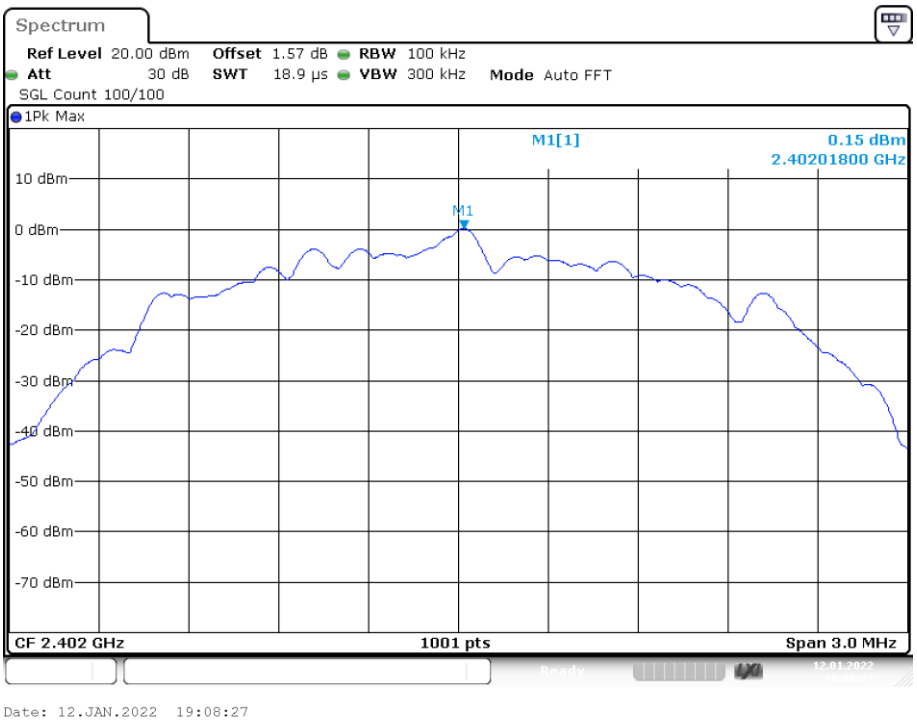
PSD NVNT BLE 1M 2402MHz



Date: 12.JAN.2022 19:02:32

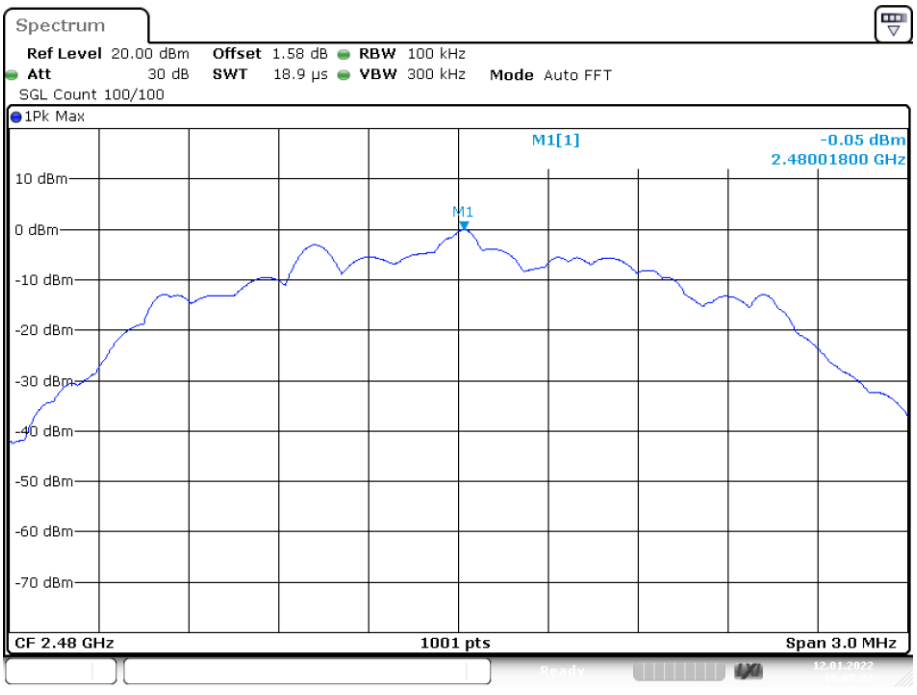
PSD NVNT BLE 1M 2440MHz

PSD NVNT BLE 1M 2480MHz



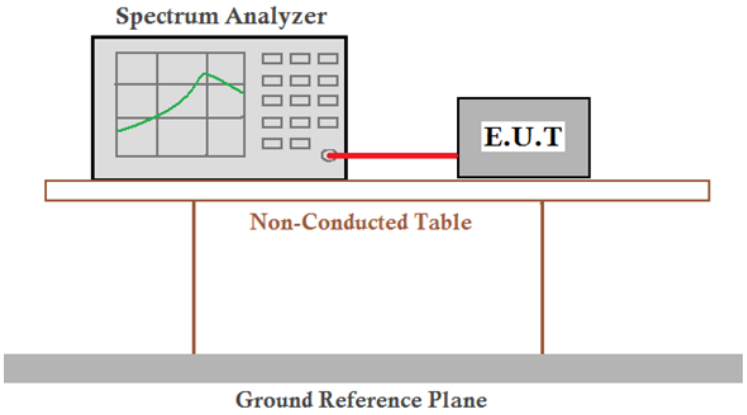
PSD NVNT BLE 2M 2402MHz

PSD NVNT BLE 2M 2440MHz



PSD NVNT BLE 2M 2480MHz

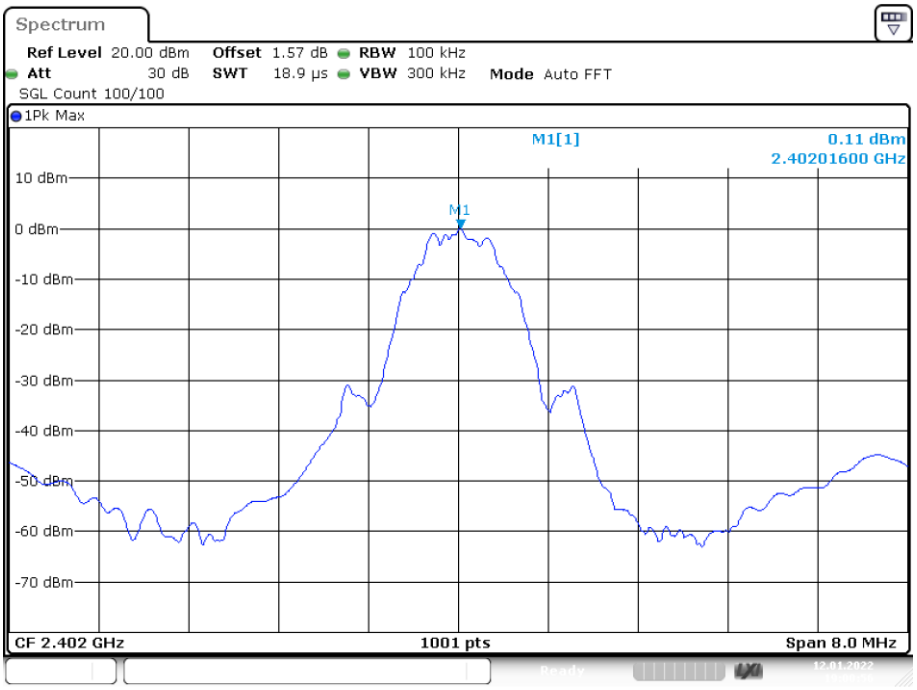
5.6 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

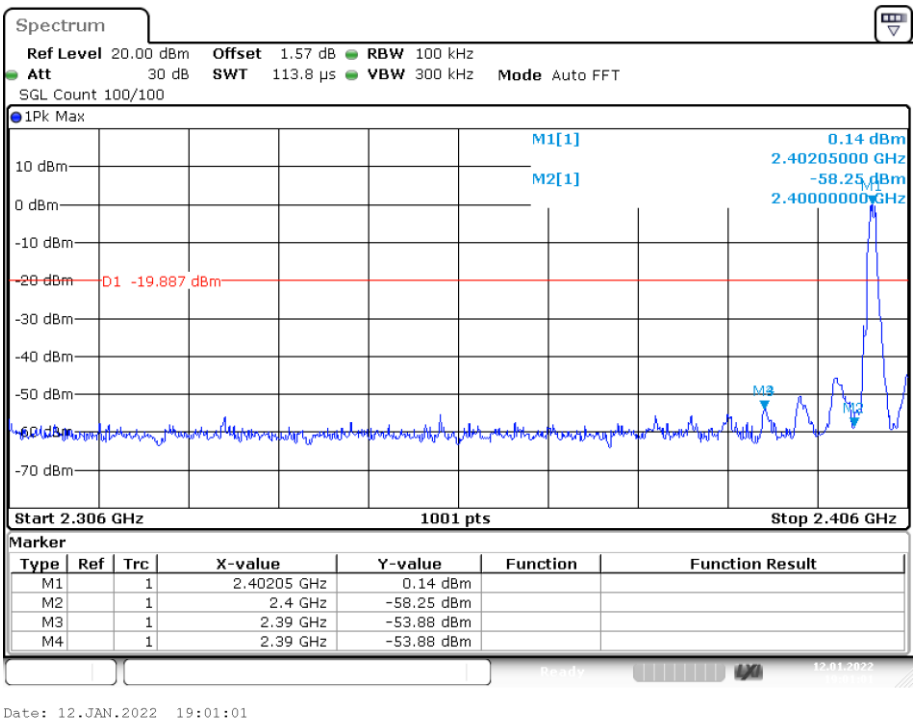
1M mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass

1M mode				
Test channel	Frequency(MHz)	Emission Level(dBc)	Limit(dBc)	Result
Lowest	2400	<-20	-20	Pass
Highest	2483.5	<-20	-20	Pass

Test plot as follows:

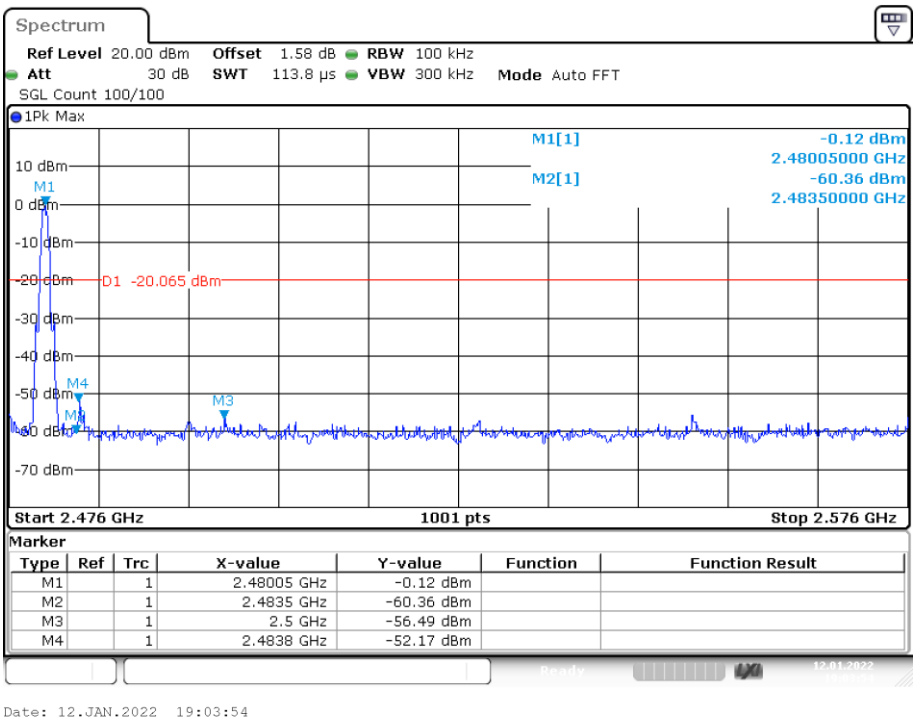


Band Edge NVNT BLE 1M 2402MHz Ref



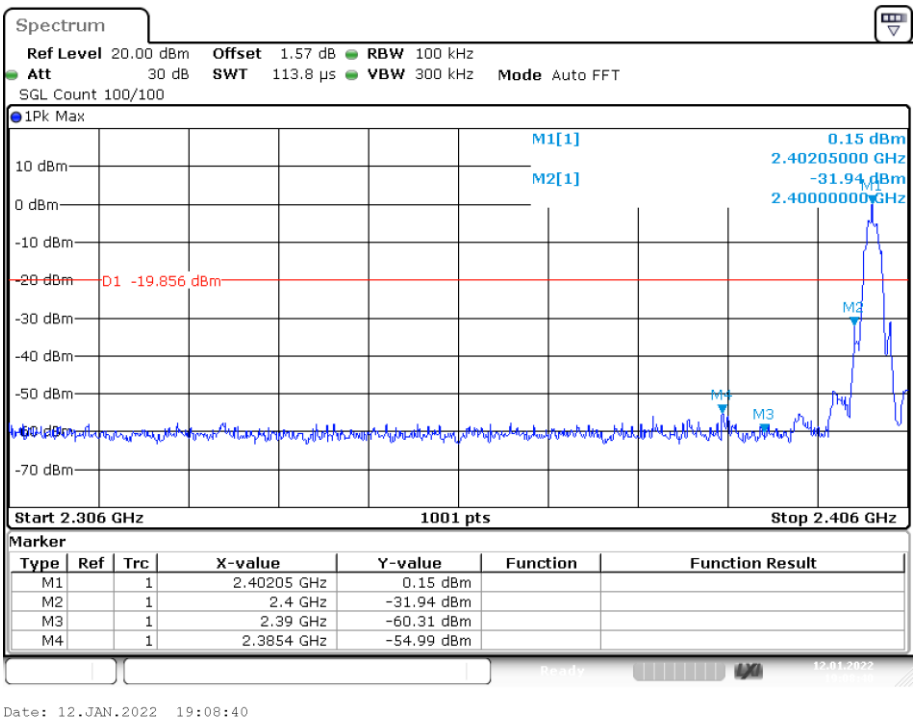
Band Edge NVNT BLE 1M 2402MHz Emission

Band Edge NVNT BLE 1M 2480MHz Ref



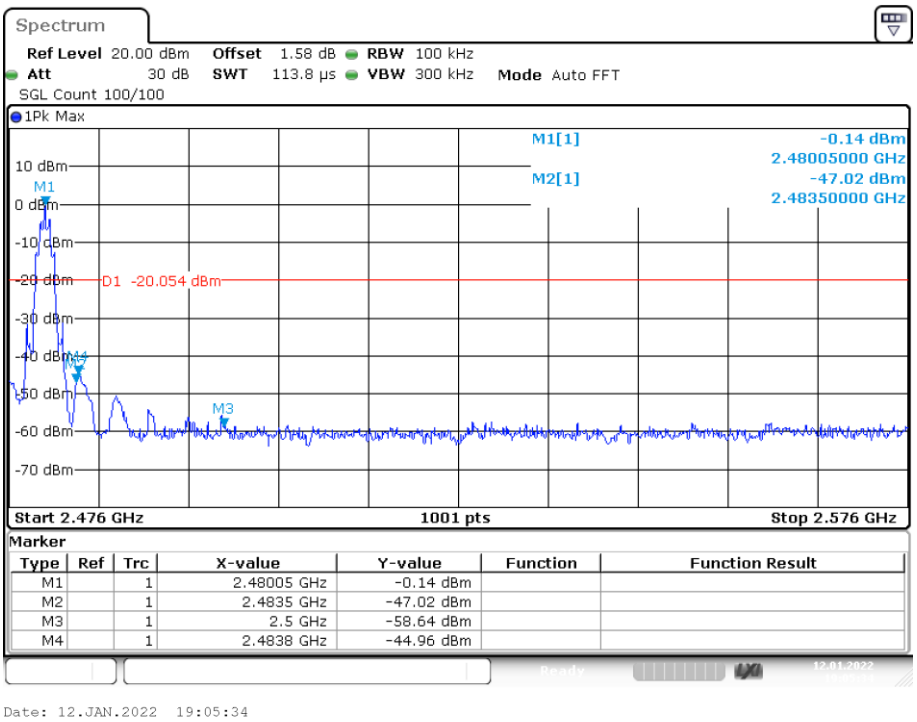
Band Edge NVNT BLE 1M 2480MHz Emission

Band Edge NVNT BLE 2M 2402MHz Ref



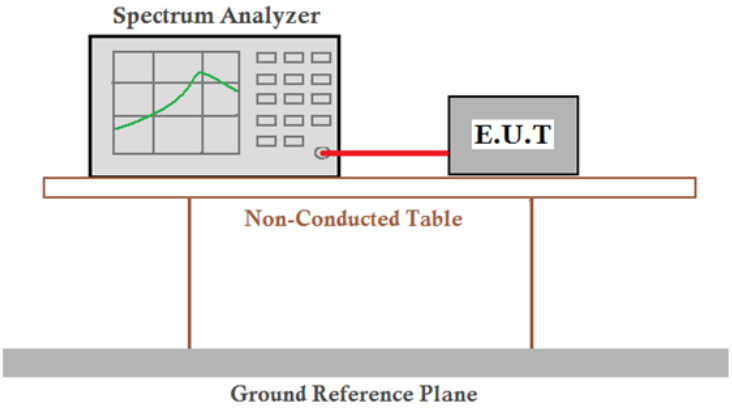
Band Edge NVNT BLE 2M 2402MHz Emission

Band Edge NVNT BLE 2M 2480MHz Ref

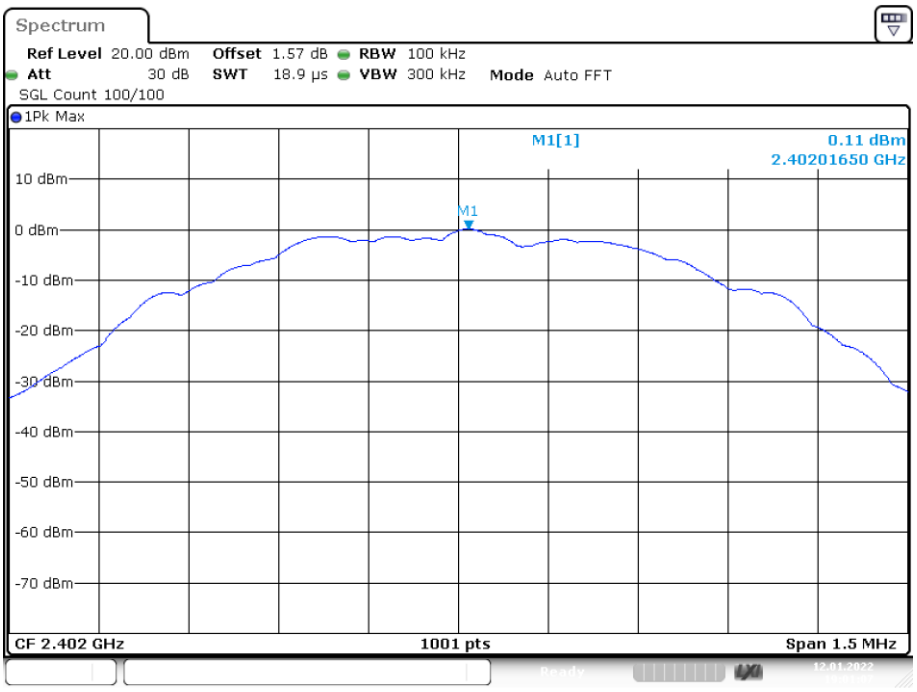


Band Edge NVNT BLE 2M 2480MHz Emission

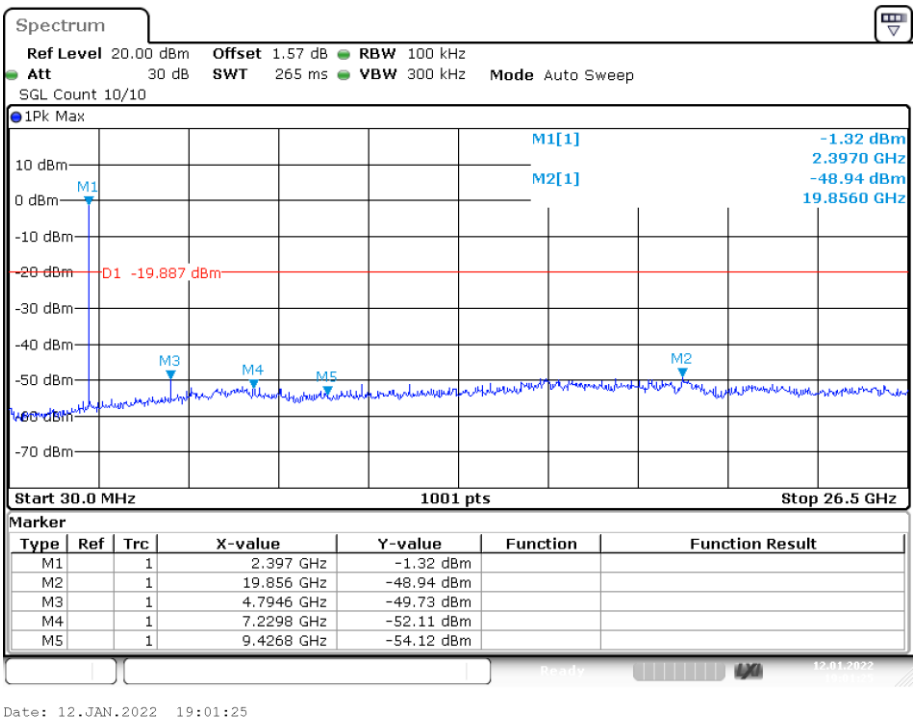
5.7 Spurious RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Mode:	Transmitting with GFSK modulation.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

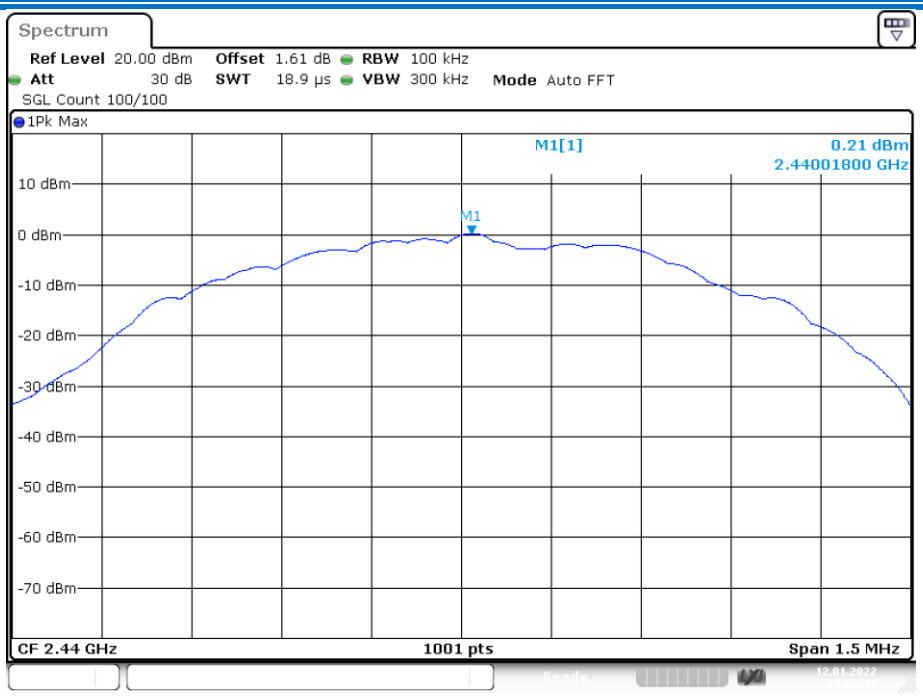
Test plot as follows:



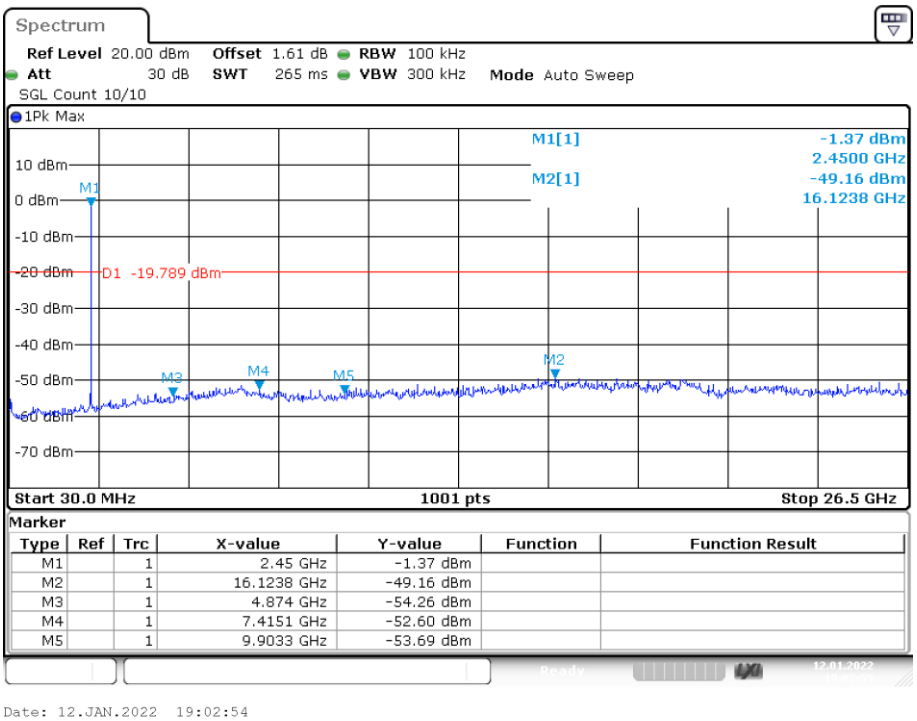
Tx. Spurious NVNT BLE 1M 2402MHz Ref



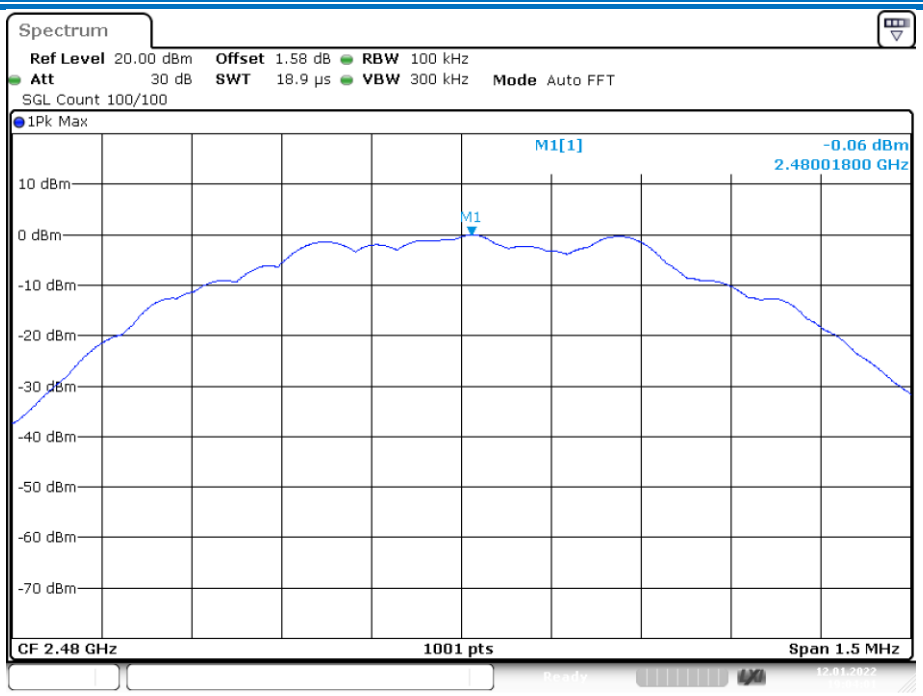
Tx. Spurious NVNT BLE 1M 2402MHz Emission



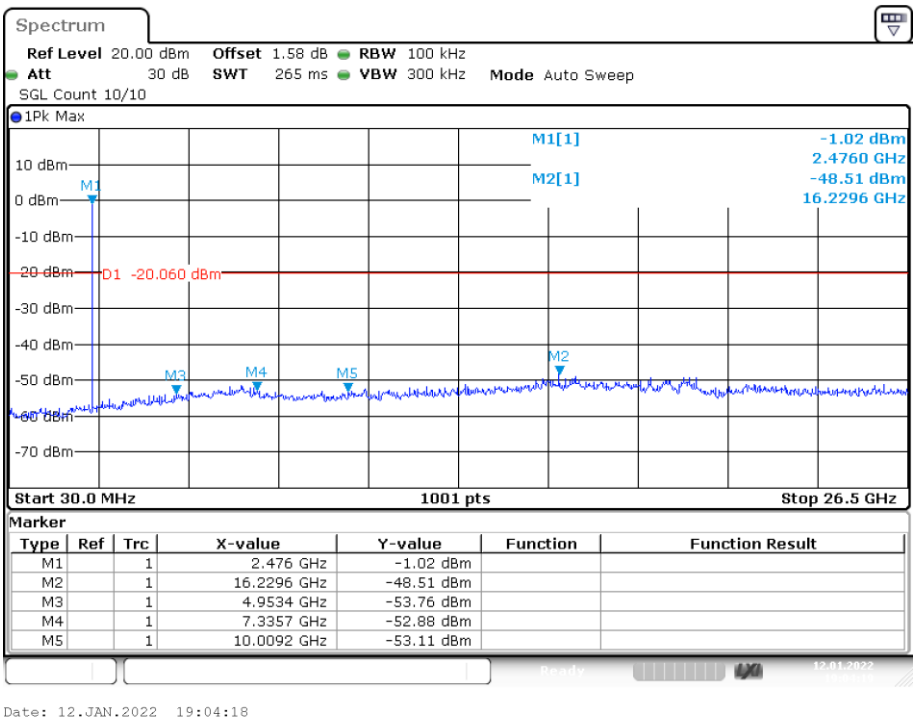
Tx. Spurious NVNT BLE 1M 2440MHz Ref



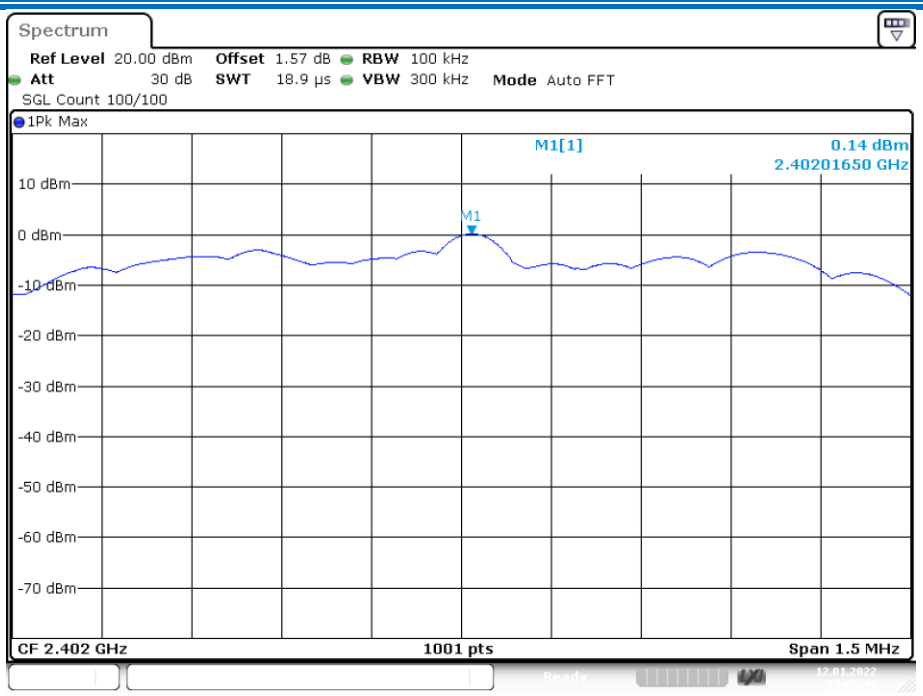
Tx. Spurious NVNT BLE 1M 2440MHz Emission



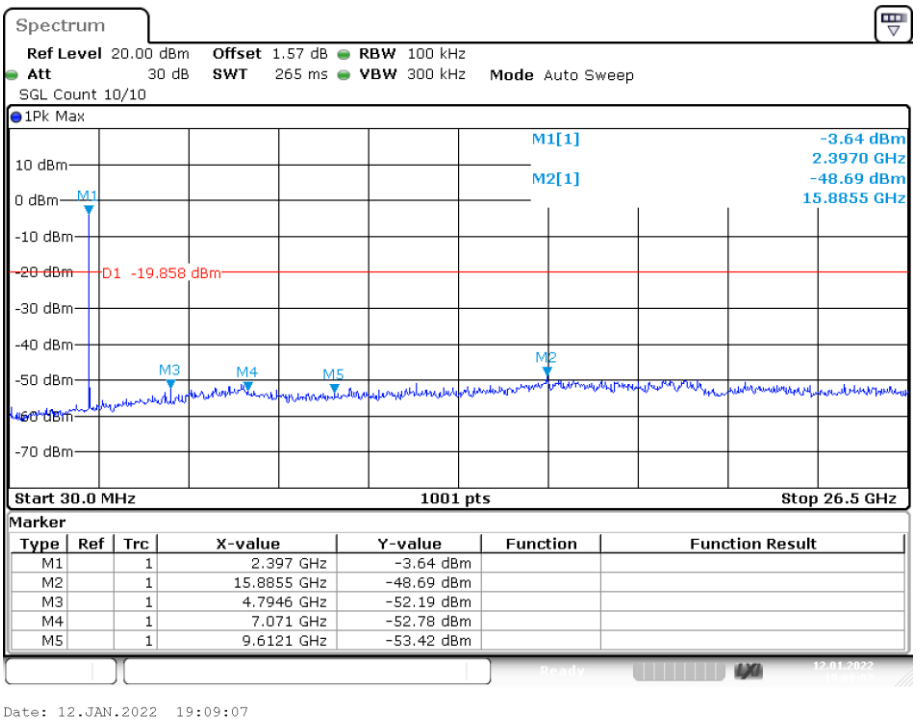
Tx. Spurious NVNT BLE 1M 2480MHz Ref



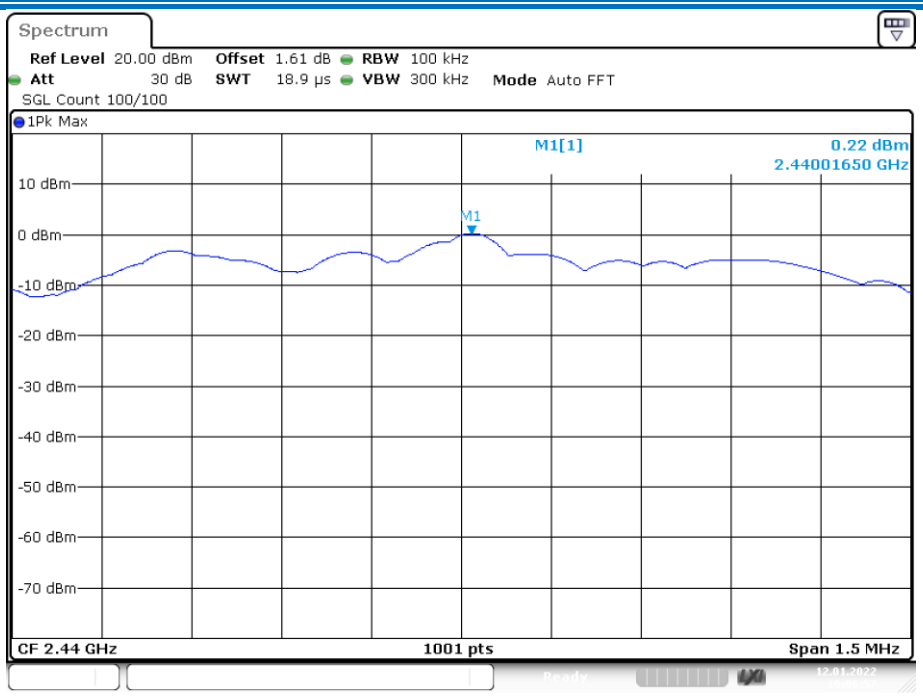
Tx. Spurious NVNT BLE 1M 2480MHz Emission



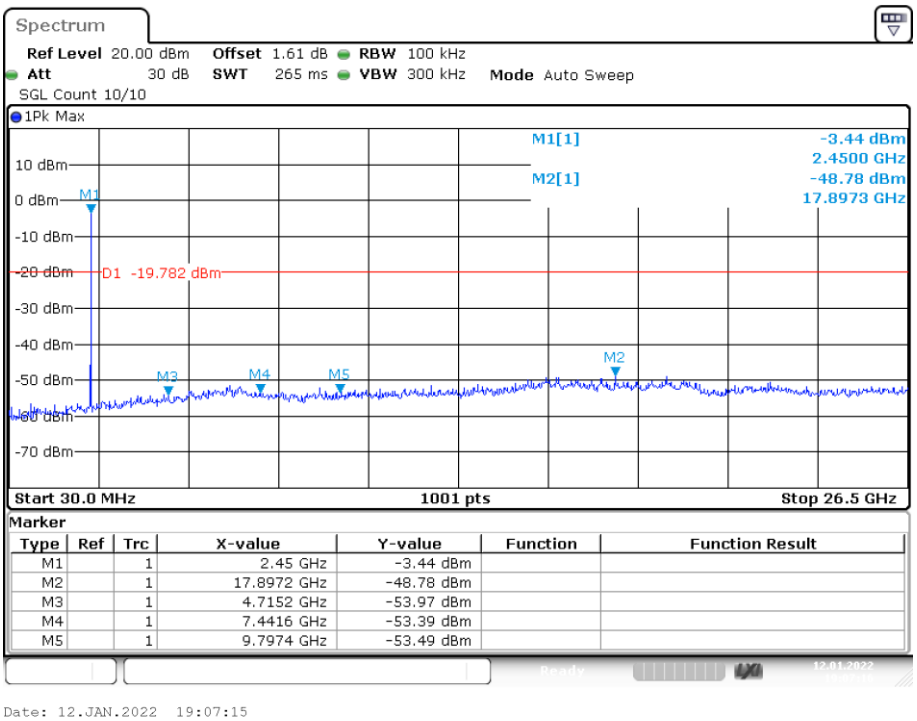
Tx. Spurious NVNT BLE 2M 2402MHz Ref



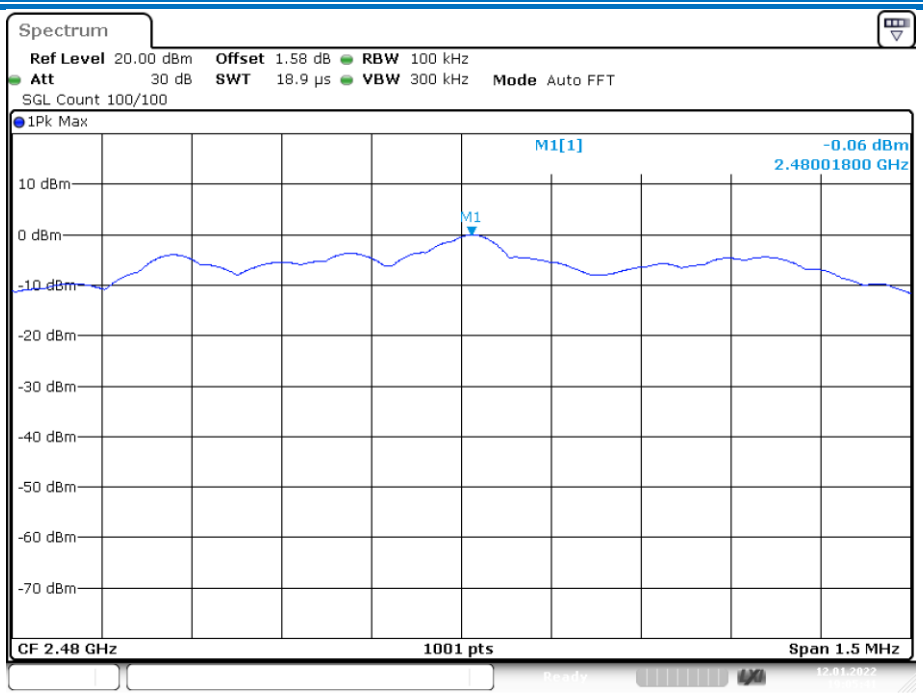
Tx. Spurious NVNT BLE 2M 2402MHz Emission



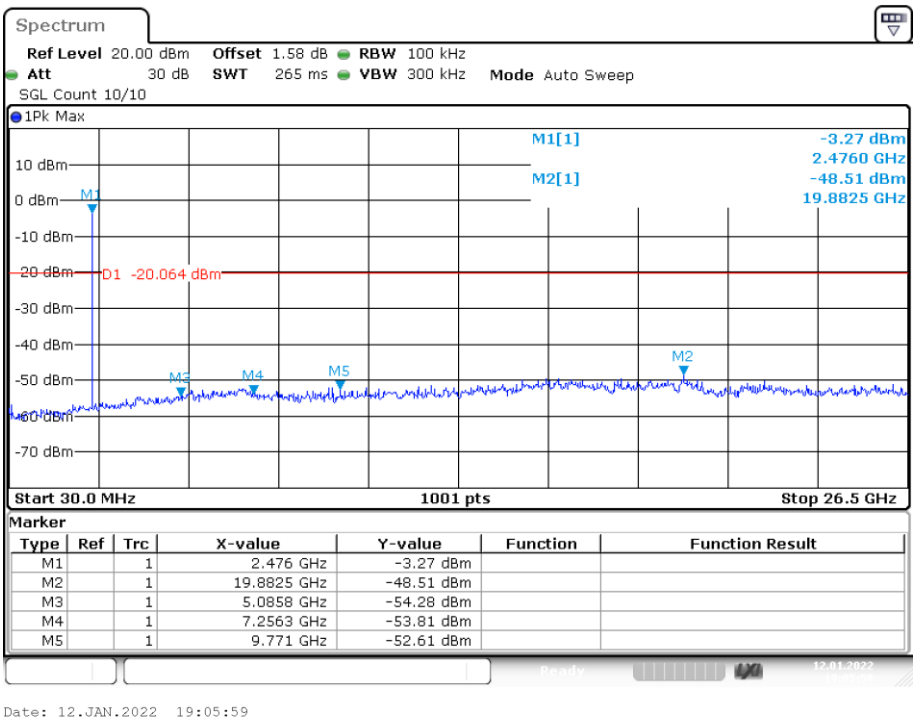
Tx. Spurious NVNT BLE 2M 2440MHz Ref



Tx. Spurious NVNT BLE 2M 2440MHz Emission



Tx. Spurious NVNT BLE 2M 2480MHz Ref



Tx. Spurious NVNT BLE 2M 2480MHz Emission

Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

5.8 Radiated Spurious Emission

5.8.1 Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Setup:	

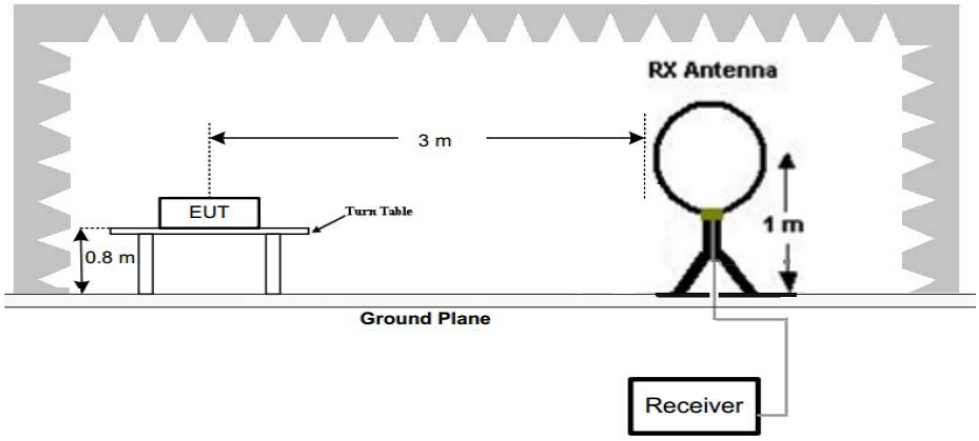


Figure 1. Below 30MHz

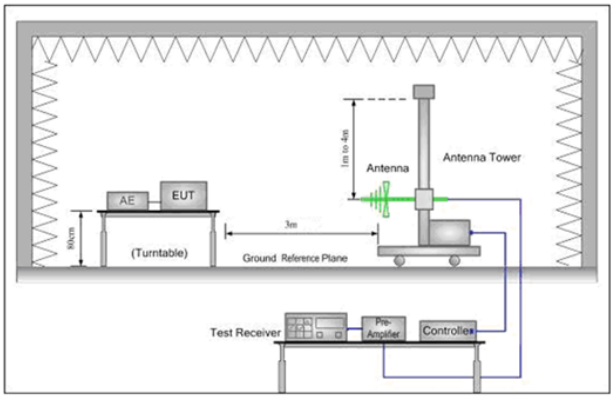


Figure 2. 30MHz to 1GHz

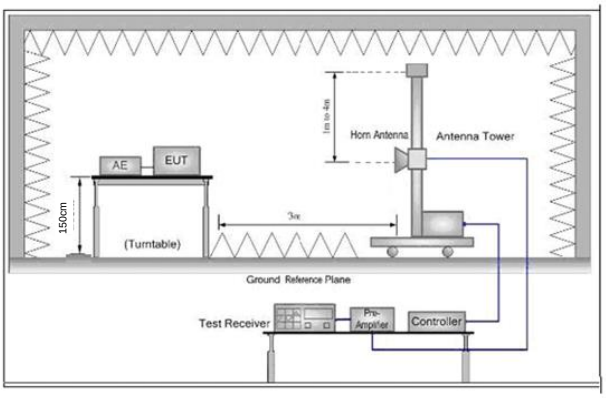


Figure 3. Above 1 GHz

Test Procedure:	a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. Note: For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. 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. d. 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. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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. g. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz) h. 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. i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with GFSK modulation. Transmitting mode, Charge + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation. Pretest the EUT at Transmitting mode and Charge + Transmitting mode, found the Charge + Transmitting mode which it is worse case. For below 1GHz part, through pre-scan, the worst case is the lowest channel. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

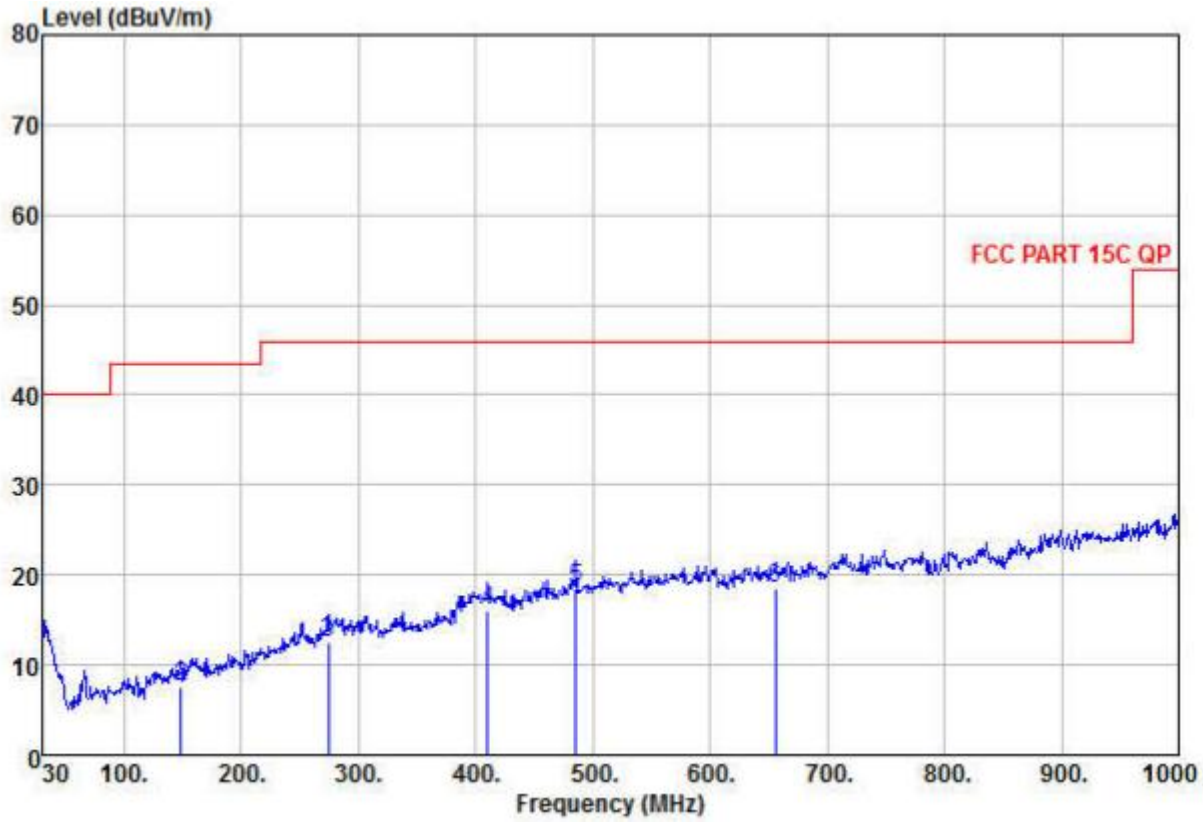
Radiated Emission below 1GHz

9KHz~30MHz (PEAK)		
Test mode:	Transmitting	Vertical

9kHz~30MHz Test result

The Low frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not report

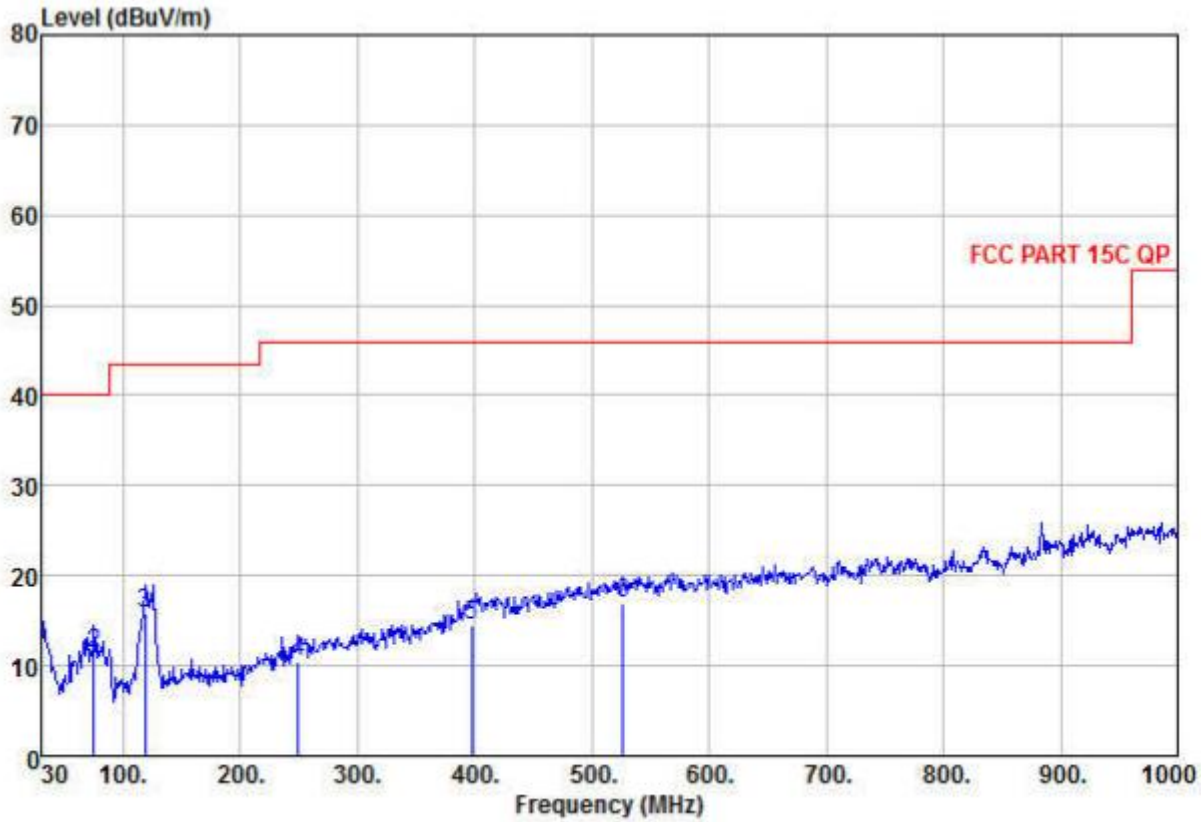
Radiated Emission below 1GHz		
30MHz~1GHz (QP)		
Test mode:	Charge + Transmitting mode	Vertical



No.	Freq	Reading	Antenna Factor	Cable Loss	Measured	Limit Line	Preamp Factor	Over limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	dB	
1	30.00	27.36	17.20	0.12	12.28	40.00	32.40	-27.72	QP
2	148.34	29.26	10.10	0.25	7.51	43.50	32.10	-35.99	QP
3	274.44	30.07	13.38	0.37	12.56	46.00	31.26	-33.44	QP
4	410.24	28.66	18.01	0.45	16.12	46.00	31.00	-29.88	QP
5	485.90	29.94	19.09	0.49	18.52	46.00	31.00	-27.48	QP
6	655.65	27.31	21.35	0.57	18.39	46.00	30.84	-27.61	QP

Note: 1. Standards need to read Quasi-peak values.
2. Measured= Antenna Factor + Cable Loss + Reading - Preamp Factor

Test mode:	Transmitting	Horizontal



No.	Freq	Reading	Antenna Factor	Cable Loss	Measured	Limit Line	Preamp Factor	Over limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	dB	
1	30.00	27.43	17.20	0.12	12.35	40.00	32.40	-27.65	QP
2	74.62	35.64	8.12	0.16	11.47	40.00	32.45	-28.53	QP
3	118.27	39.46	8.38	0.22	15.90	43.50	32.16	-27.60	QP
4	249.22	29.14	12.47	0.36	10.46	46.00	31.51	-35.54	QP
5	397.63	26.94	18.05	0.44	14.43	46.00	31.00	-31.57	QP
6	526.64	27.57	19.73	0.51	16.84	46.00	30.97	-29.16	QP

Note: 1. Standards need to read Quasi-peak values.
2. Measured= Antenna Factor + Cable Loss + Reading - Preamp Factor

Transmitter Emission above 1-26.5GHz

Worse case mode:	GFSK	Test channel:	Lowest

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4804	54.09	-5.18	48.91	74	-25.09	peak	H
4804	39.85	-5.18	34.67	54	-19.33	AVG	H
7206	51.52	-6.45	45.07	74	-28.93	peak	H
7206	36.05	-6.45	29.6	54	-24.4	AVG	H
4804	48.08	-5.18	42.9	74	-31.1	peak	V
4804	39.53	-5.18	34.35	54	-19.65	AVG	V
7206	54.5	-6.45	48.05	74	-25.95	peak	V
7206	38.53	-6.45	32.08	54	-21.92	AVG	V

Worse case mode:	GFSK	Test channel:	Middle

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4880	51.66	-5.19	46.47	74	-27.53	peak	H
4880	40.13	-5.19	34.94	54	-19.06	AVG	H
7320	50.94	-6.47	44.47	74	-29.53	peak	H
7320	36.65	-6.47	30.18	54	-23.82	AVG	H
4880	46.71	-5.19	41.52	74	-32.48	peak	V
4880	38.21	-5.19	33.02	54	-20.98	AVG	V
7320	54.76	-6.47	48.29	74	-25.71	peak	V
7320	38.18	-6.47	31.71	54	-22.29	AVG	V

Worse case mode:	GFSK	Test channel:	Highest

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4960	47.63	-5.2	42.43	74	-31.57	peak	H
4960	37.04	-5.2	31.84	54	-22.16	AVG	H
7440	49.42	-6.47	42.95	74	-31.05	peak	H
7440	36.79	-6.47	30.32	54	-23.68	AVG	H
4960	48.27	-5.2	43.07	74	-30.93	peak	V
4960	36.54	-5.2	31.34	54	-22.66	AVG	V
7440	49.18	-6.47	42.71	74	-31.29	peak	V
7440	36.14	-6.47	29.67	54	-24.33	AVG	V

Remark:

1) 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

2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

5.9 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

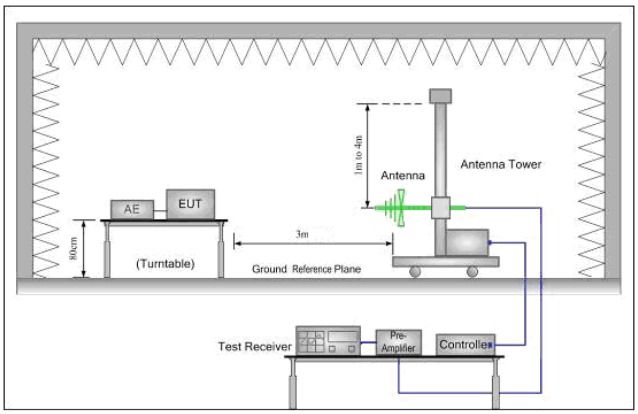


Figure 1. 30MHz to 1GHz

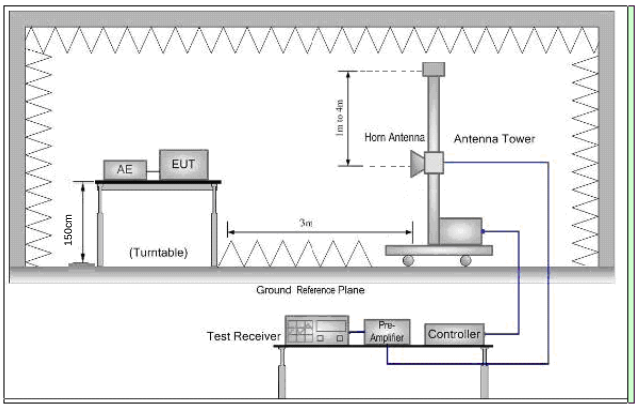


Figure 2. Above 1 GHz

Test Procedure:

a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

b. 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.

	c. 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. e. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel f. Test the EUT in the lowest channel , the Highest channel g. 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. h. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with GFSK modulation. Transmitting mode, Charge + Transmitting mode.
Final Test Mode:	Transmitting with GFSK modulation. Pretest the EUT at Transmitting mode and Charge + Transmitting mode, found the Charge + Transmitting mode which it is worse case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

Worse case mode:	GFSK(	Test channel:	Lowest

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390	52.29	-4.36	47.93	74	-26.07	peak	H
2390	39.28	-4.36	34.92	54	-19.08	AVG	H
2400	56.53	-4.36	52.17	74	-21.83	peak	H
2400	41.28	-4.36	36.92	54	-17.08	AVG	H
2390	47.05	-4.36	42.69	74	-31.31	peak	V
2390	38.4	-4.36	34.04	54	-19.96	AVG	V
2400	61.06	-4.36	56.7	74	-17.3	peak	V
2400	43.83	-4.36	39.47	54	-14.53	AVG	V

Worse case mode:	GFSK	Test channel:	Highest

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2483.5	59.11	-4.22	54.89	74	-19.11	peak	H
2483.5	45.91	-4.22	41.69	54	-12.31	AVG	H
2483.5	59.97	-4.22	55.75	74	-18.25	peak	V
2483.5	45.63	-4.22	41.41	54	-12.59	AVG	V

Note:
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

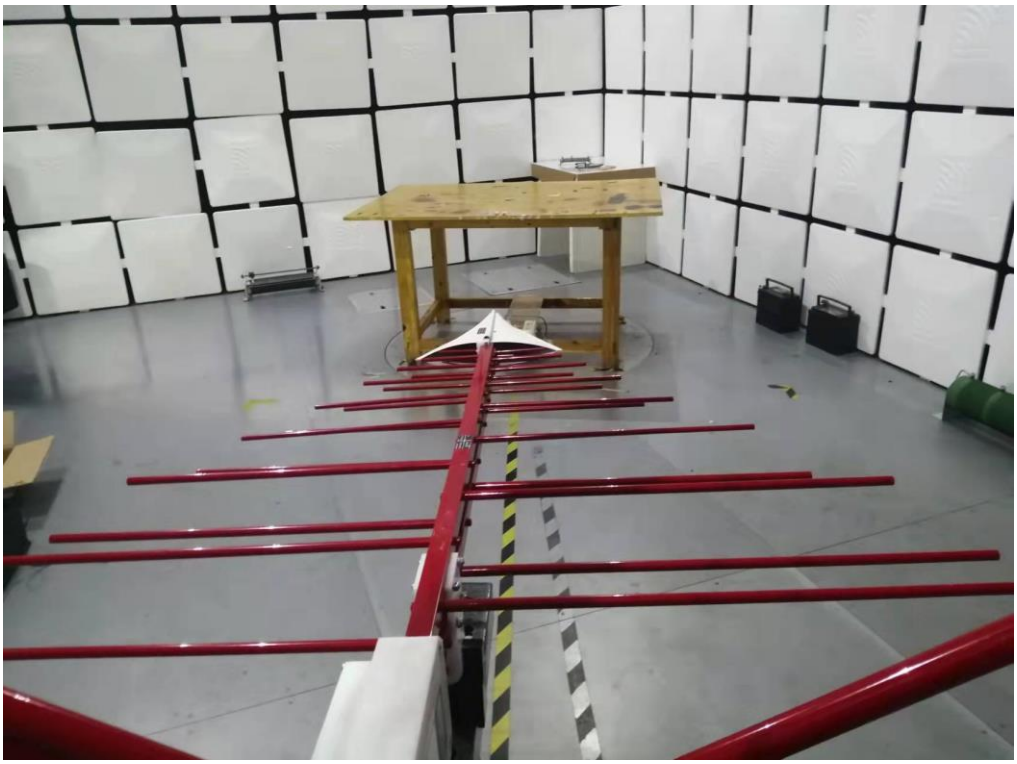
6 Photographs - EUT Test Setup

Test model No.:

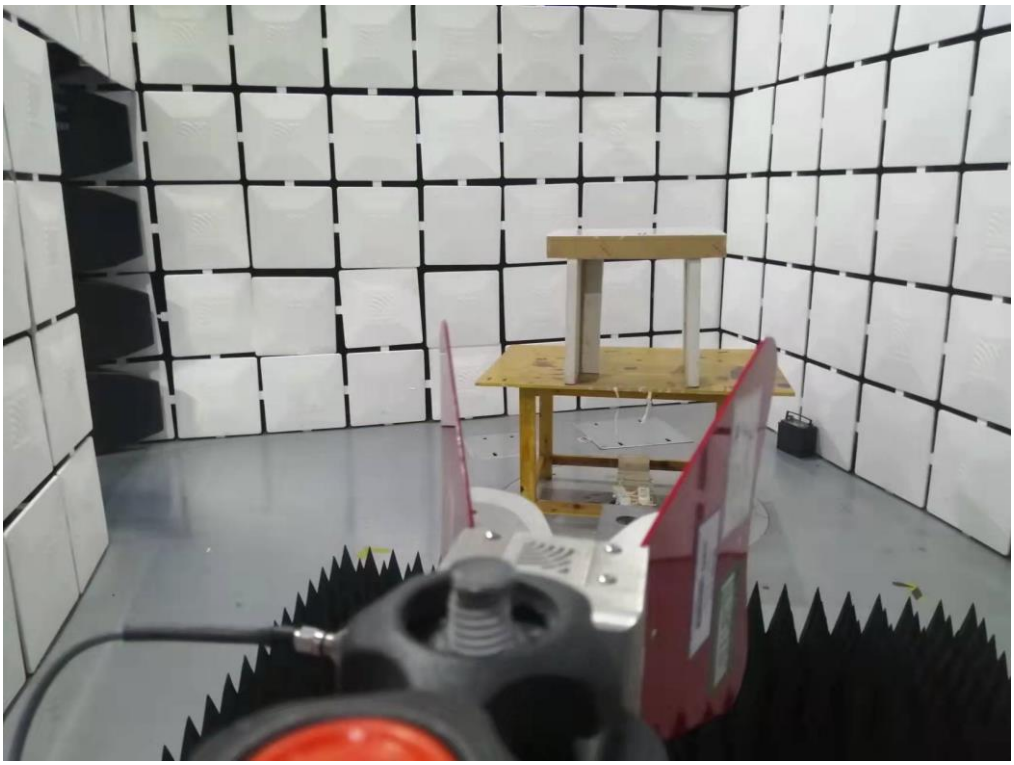
6.1 Conducted Emission

6.2 Radiated Spurious Emission

Below 1GHz:

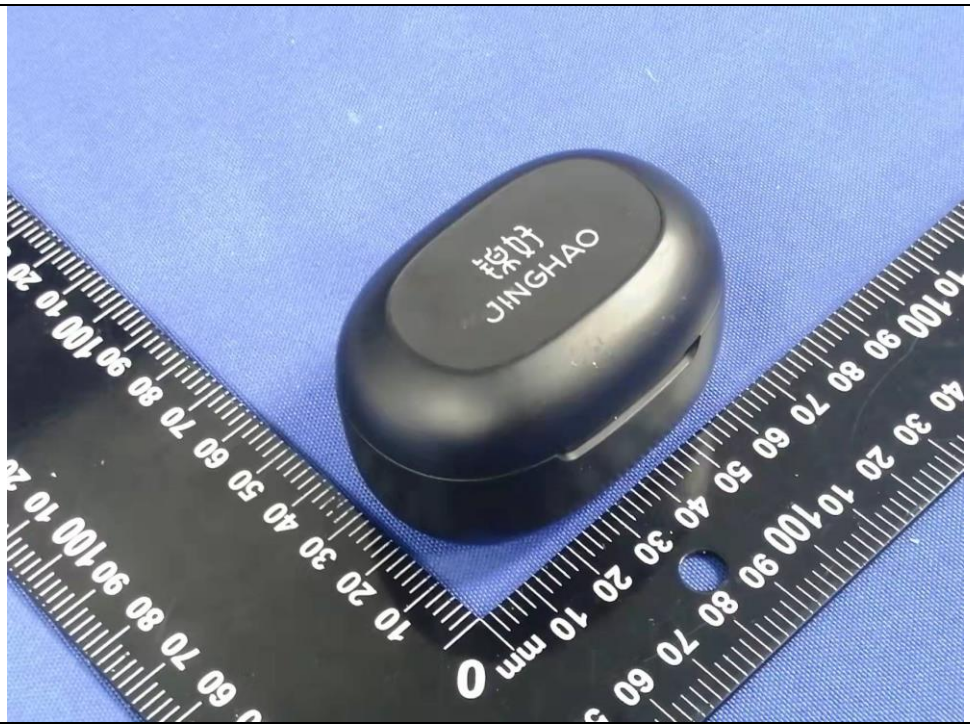


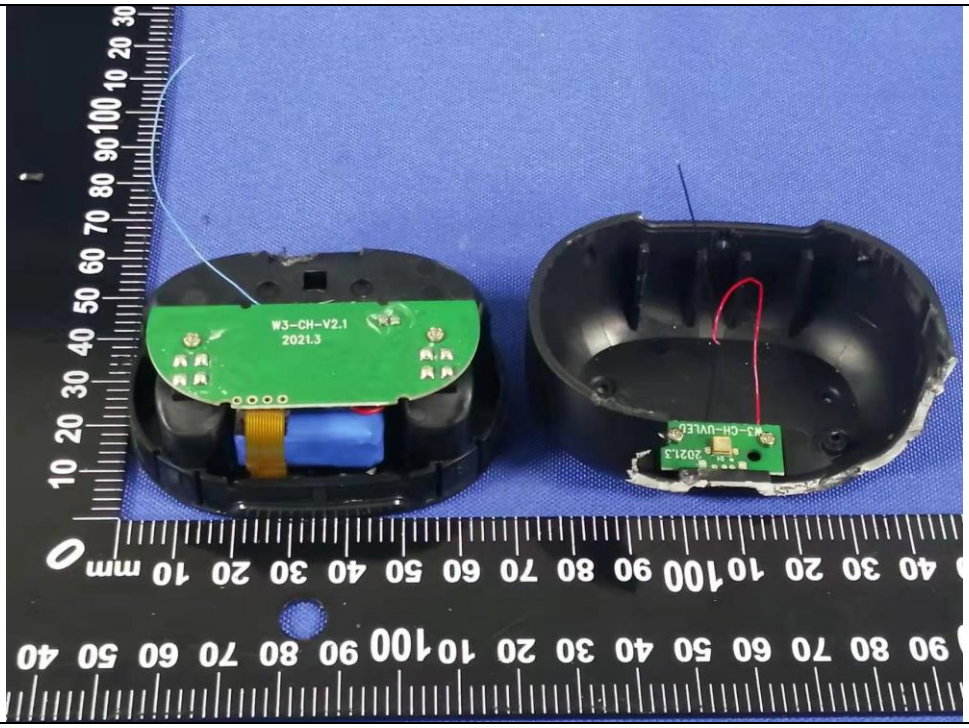
Above 1GHz:

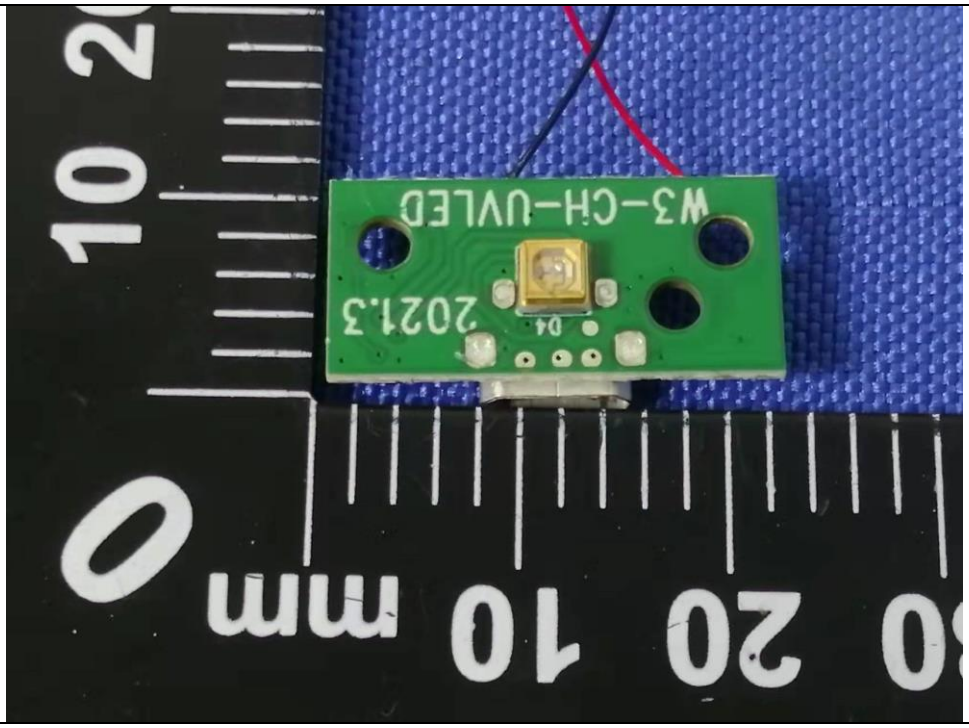


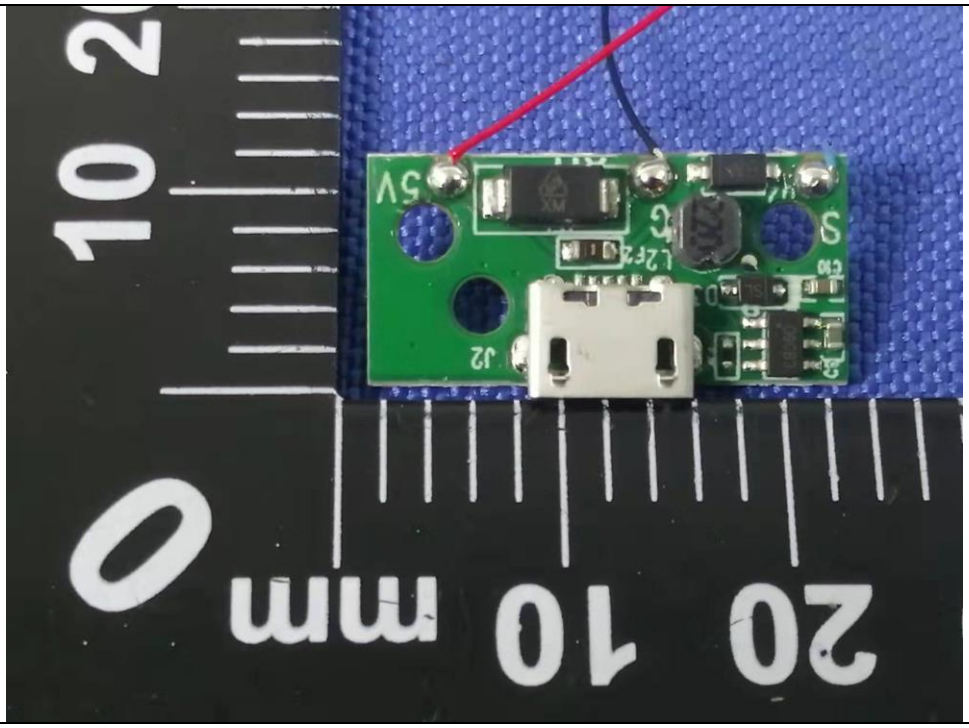
Conducted Emissions

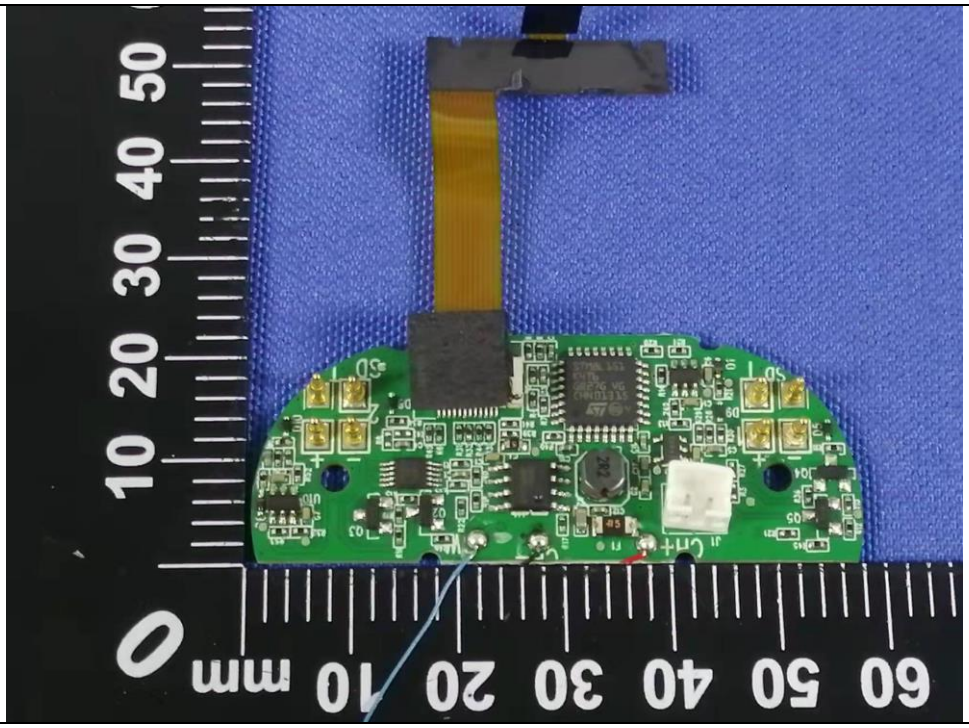
7 Photographs–EUT Constructional Details

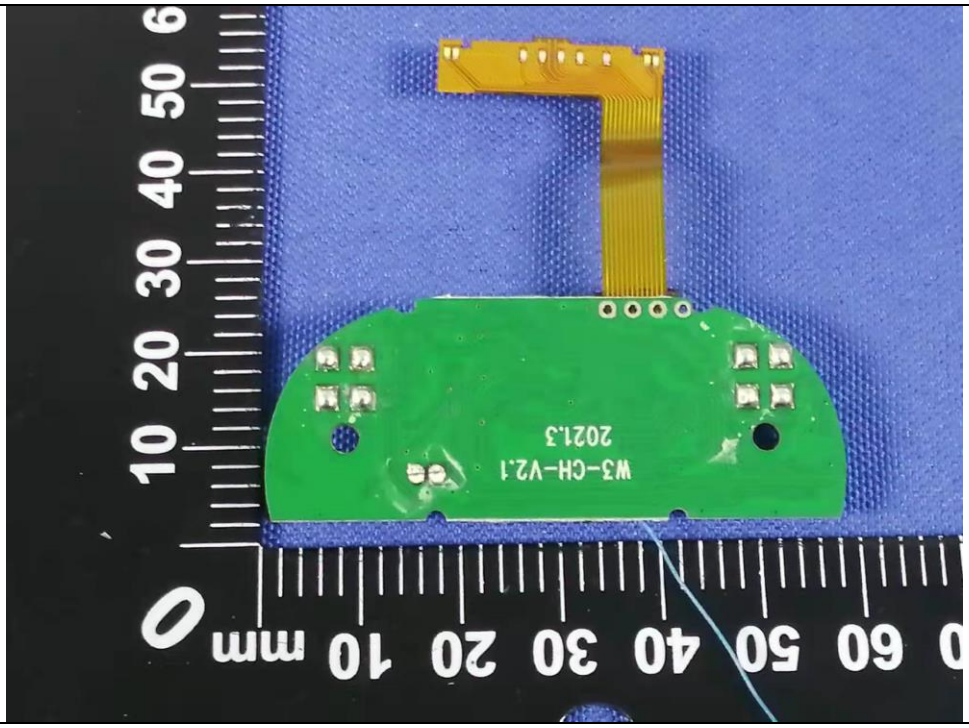


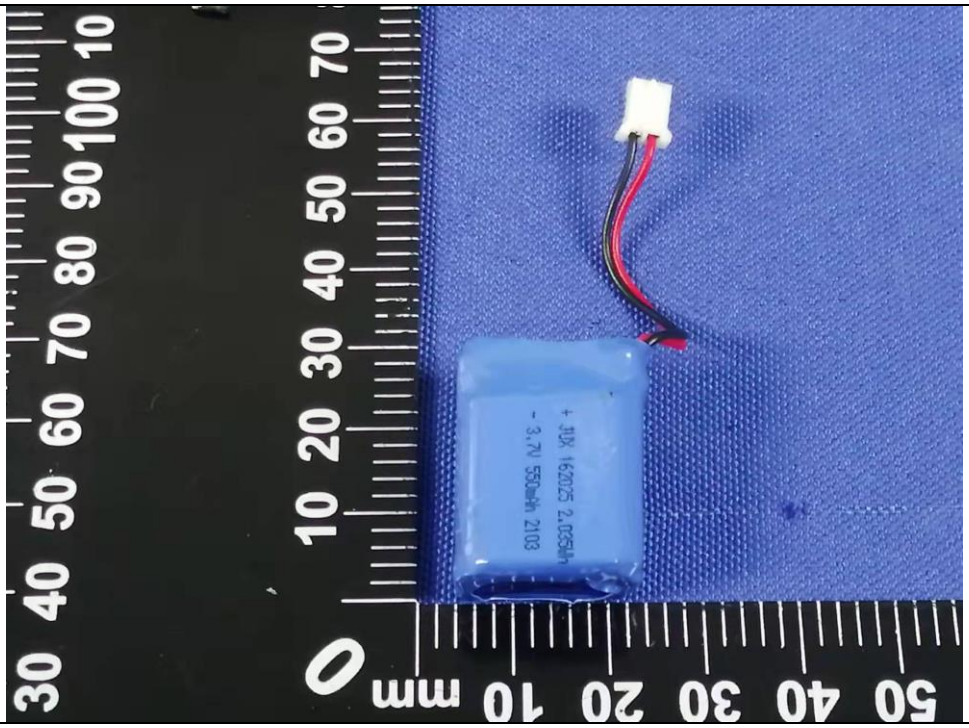

W3-CH-V2.1
2021.3

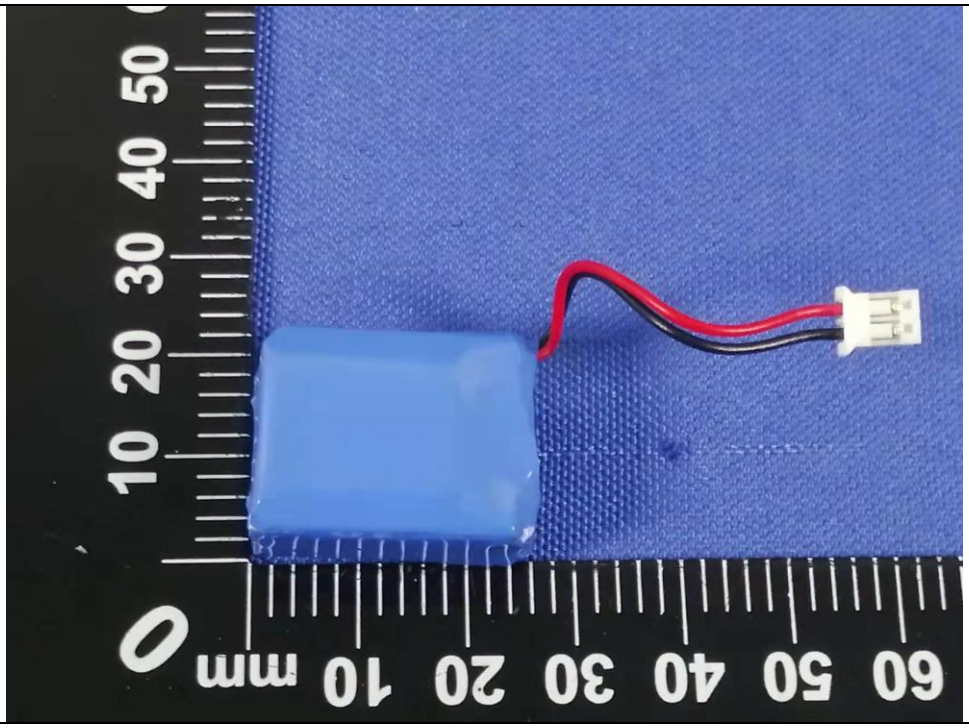

W3-CH-UVLED
2021.3
D4
mm
0
10
20

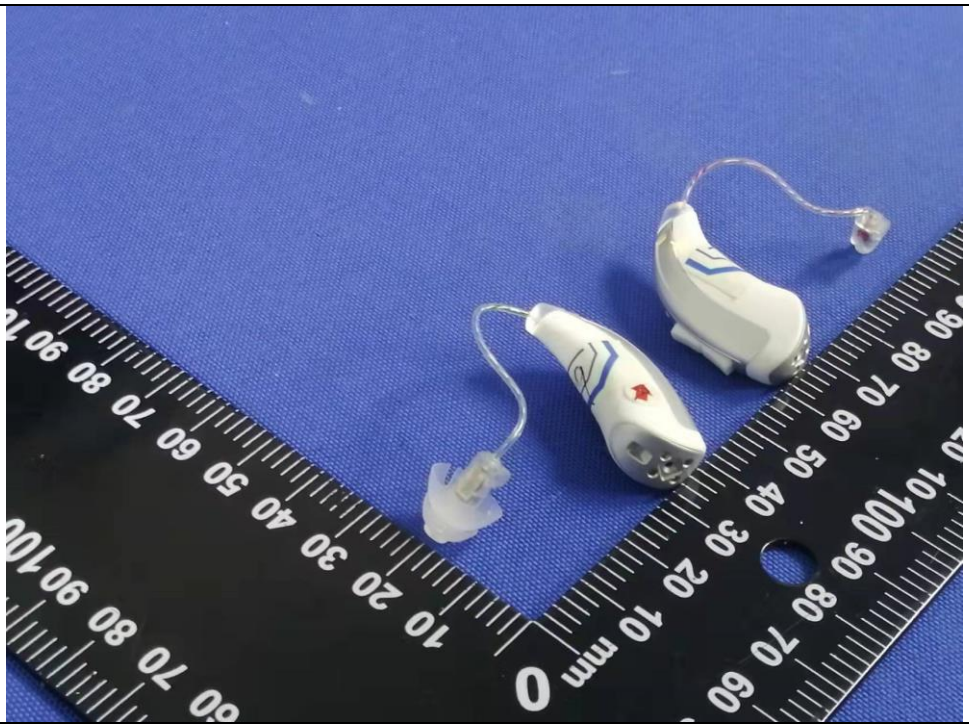

5V
J2
mm
0
10
20

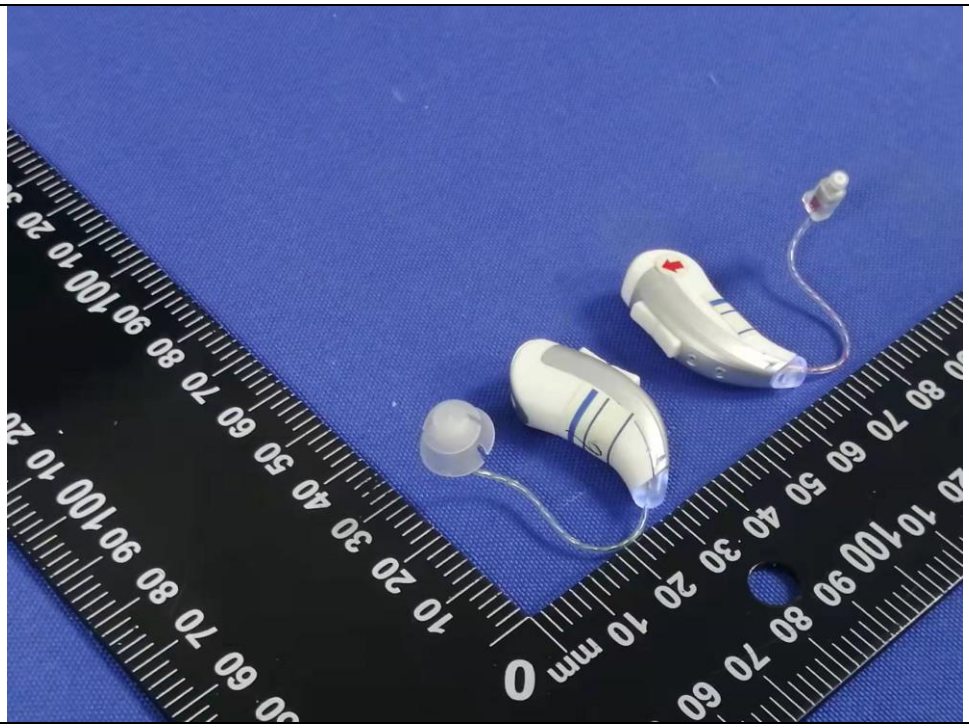


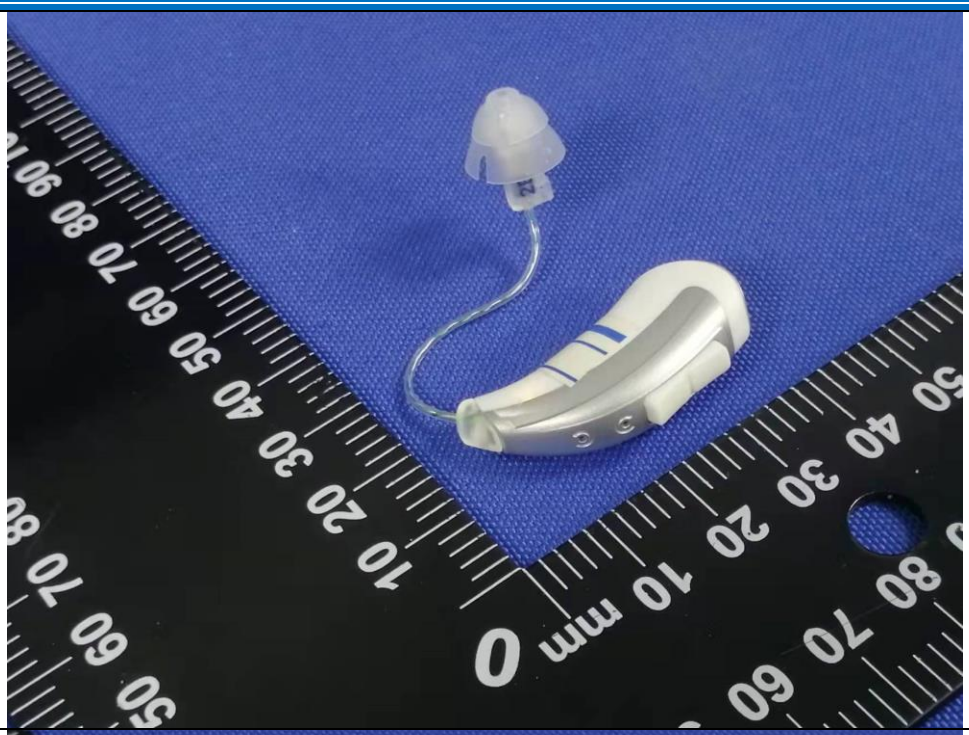

W3-CH-V2.1
2021.3

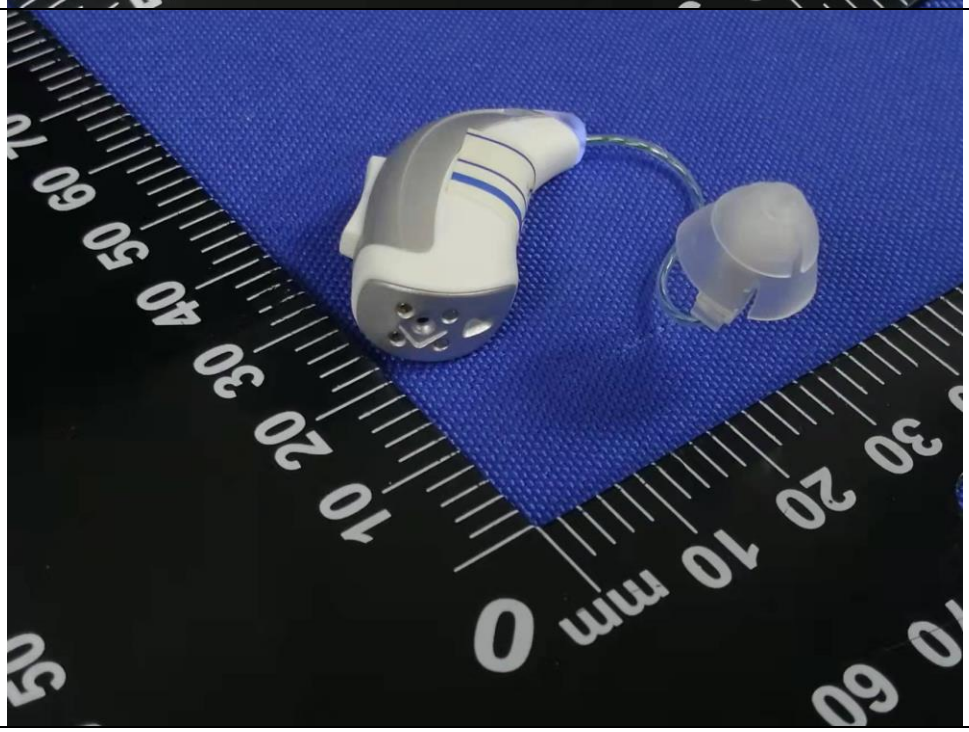

+ JUX 162025 2.0Wh
- 3.7V 550mAh 2103
mm

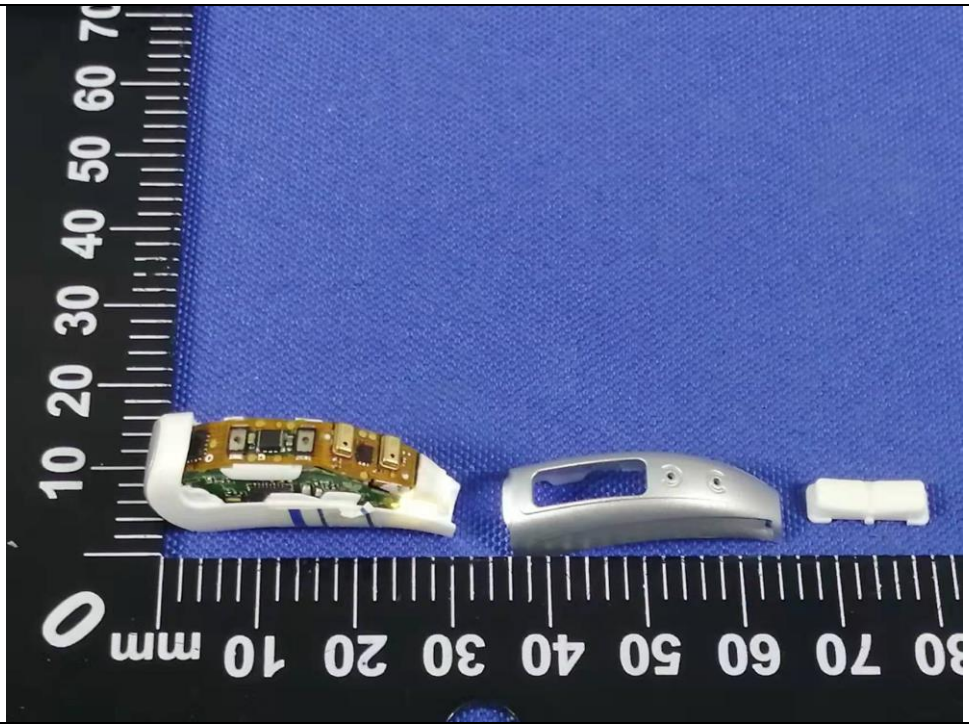

mm

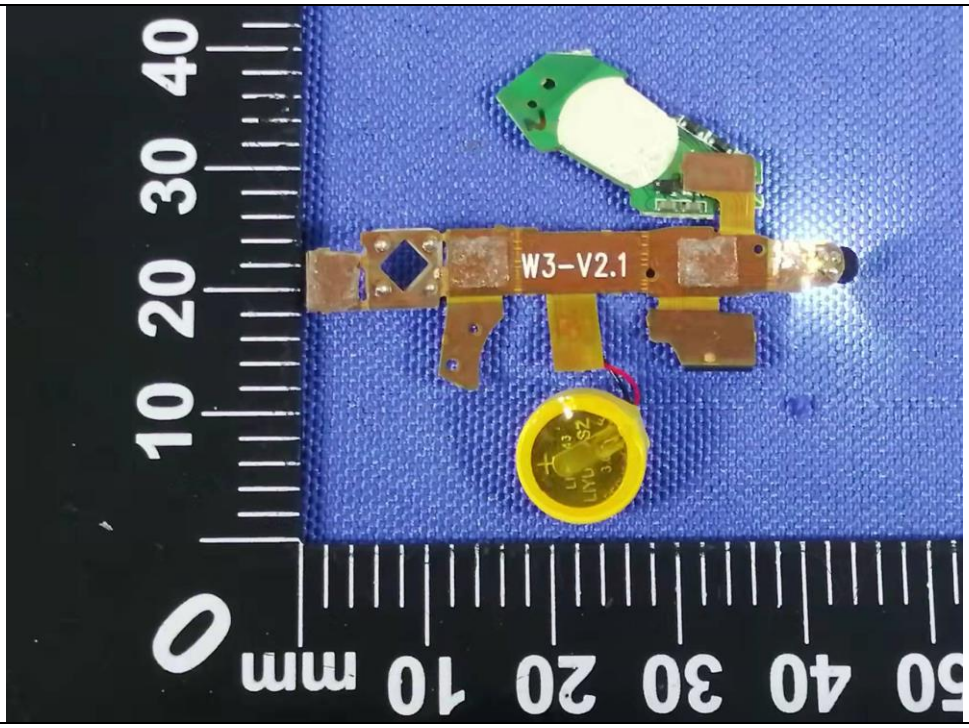


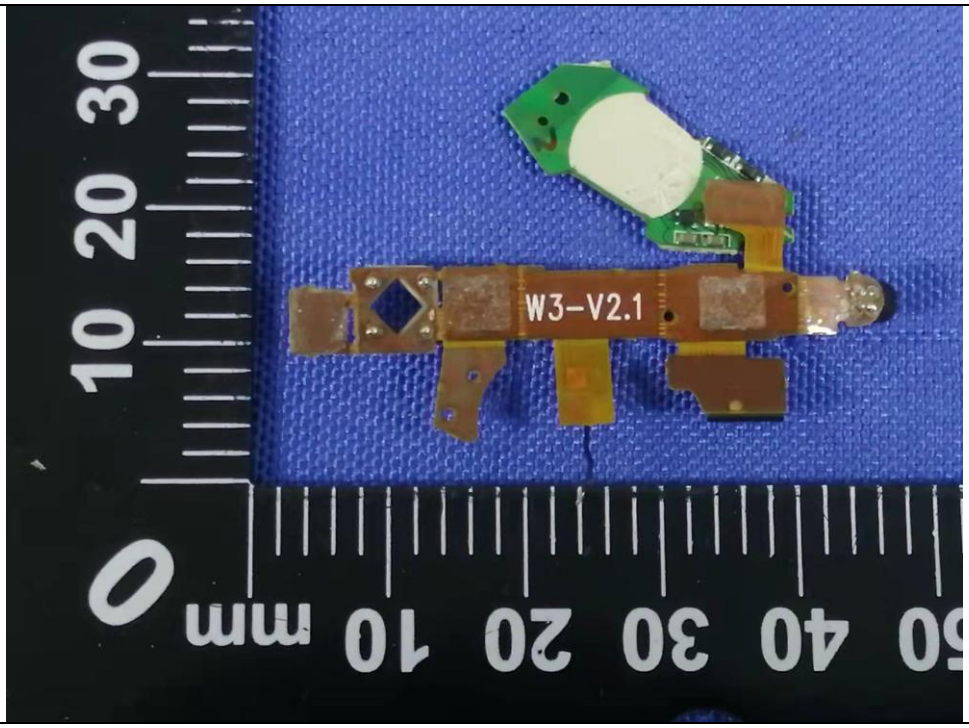


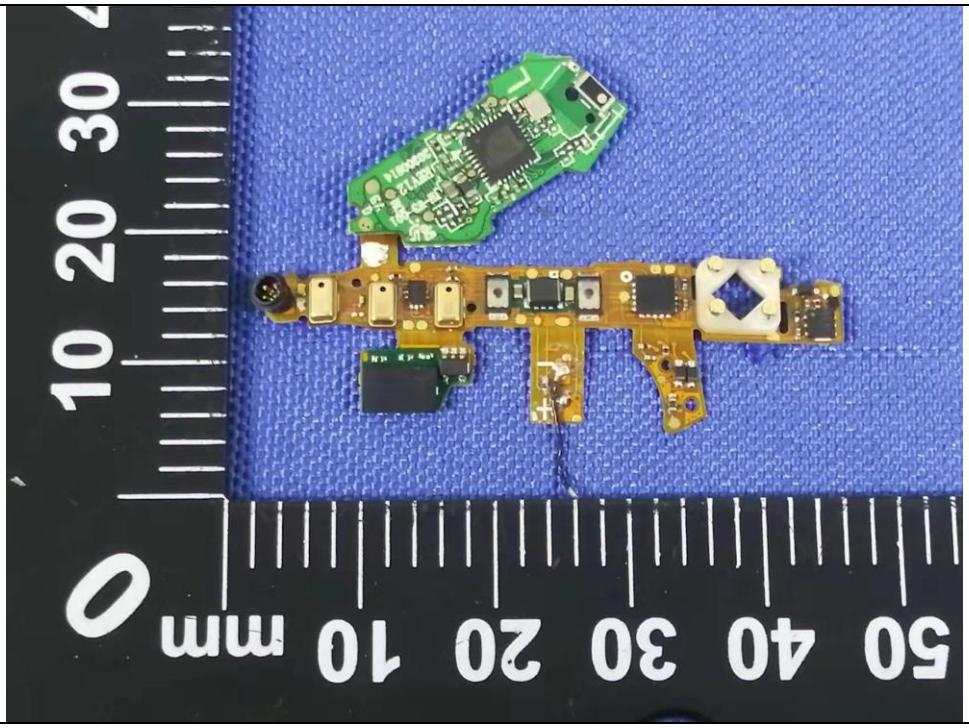


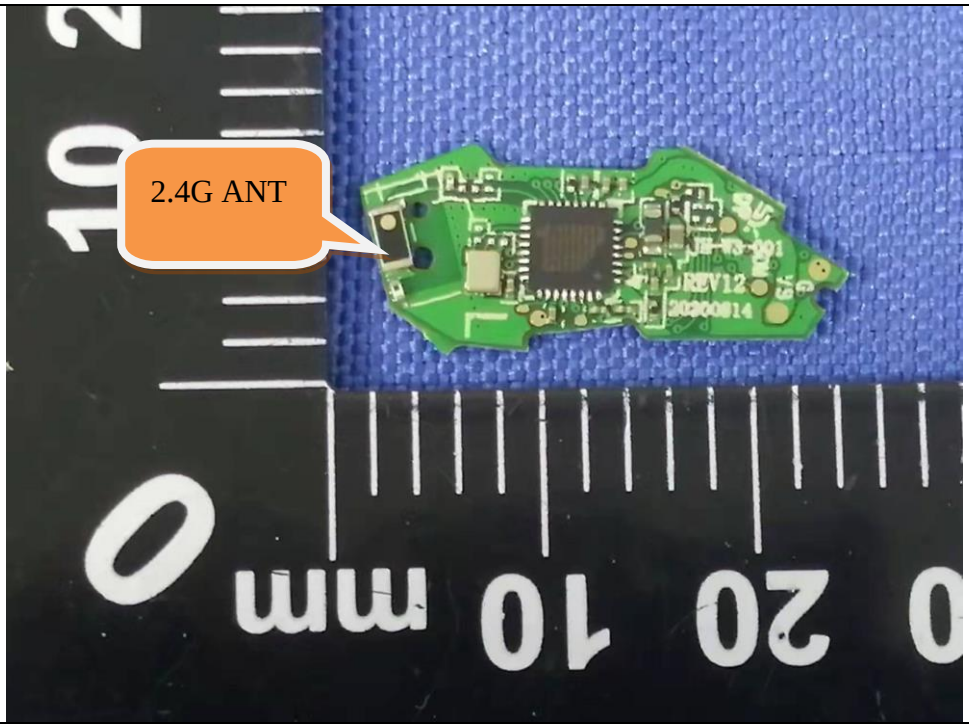


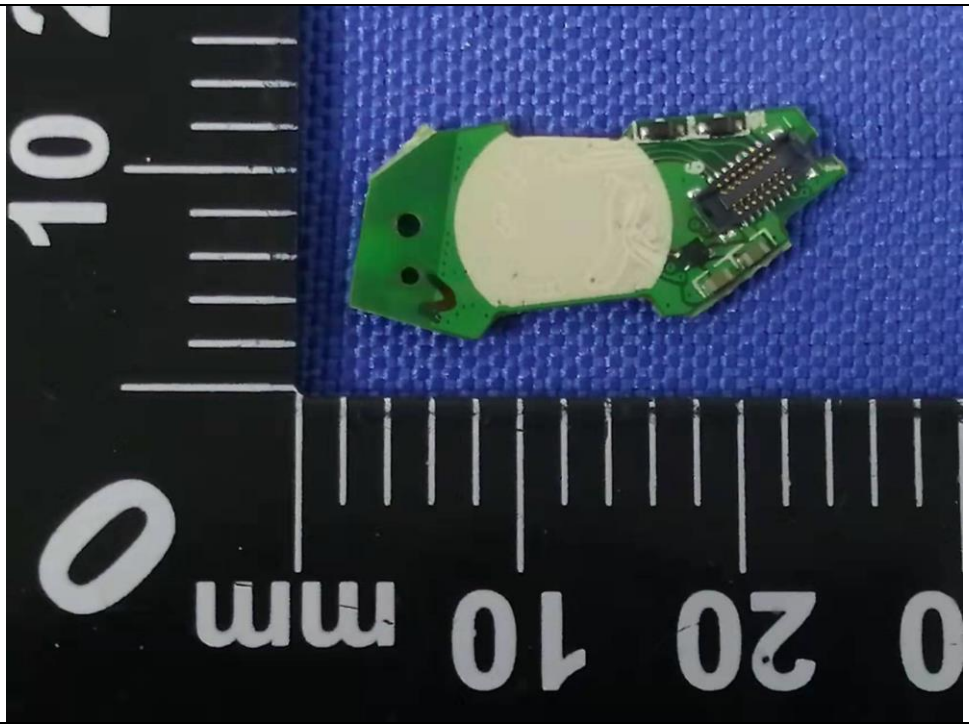



W3-V2.1


W3-V2.1
mm


mm





*** End of Report ***