



RF Test Report

For

Applicant Name: Xwireless LLC
Address: 11565 Old Georgetown Road, Rockville, MD, USA
EUT Name: Mobile Phone
Brand Name: Vortex
Model Number: HD65Plus

Issued By

Company Name: BTF Testing Lab (Shenzhen) Co., Ltd.
Address: F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park,
Tantou Community, Songgang Street, Bao'an District, Shenzhen,
China

Report Number: BTF230713R00602
Test Standards: 47 CFR Part 15.247

Test Conclusion: Pass
FCC ID: 2ADLJ-HD65PLUS
Test Date: 2023-07-13 to 2023-07-27
Date of Issue: 2023-07-31

Prepared By:

Elma Yang

Date:

elma.yang / Project Engineer
2023-07-31

Approved By:

Ryan CJ

Date:

Ryan.CJ / EMC Manager
2023-07-31



Note: All the test results in this report only related to the testing samples. Which can be duplicated completely for the legal use with approval of applicant; it shall not be reproduced except in full without the written approval of BTF Testing Lab (Shenzhen) Co., Ltd., All the objections should be raised within thirty days from the date of issue. To validate the report, you can contact us.

Revision History		
Version	Issue Date	Revisions Content
R_V0	2023-07-31	Original

Note: Once the revision has been made, then previous versions reports are invalid.

Table of Contents

1	INTRODUCTION	5
1.1	Identification of Testing Laboratory	5
1.2	Identification of the Responsible Testing Location	5
1.3	Announcement	5
2	PRODUCT INFORMATION	6
2.1	Application Information	6
2.2	Manufacturer Information	6
2.3	Factory Information	6
2.4	General Description of Equipment under Test (EUT)	6
2.5	Technical Information	6
3	SUMMARY OF TEST RESULTS	7
3.1	Test Standards	7
3.2	Uncertainty of Test	7
3.3	Summary of Test Result	7
4	TEST CONFIGURATION	8
4.1	Test Equipment List	8
4.2	Test Auxiliary Equipment	10
4.3	Test Modes	10
5	EVALUATION RESULTS (EVALUATION)	11
5.1	Antenna requirement	11
6	RADIO SPECTRUM MATTER TEST RESULTS (RF)	11
6.1	Conducted Emission at AC power line	11
6.1.1	E.U.T. Operation:	11
6.1.2	Test Setup Diagram:	12
6.1.3	Test Data:	13
6.2	Occupied Bandwidth	15
6.2.1	E.U.T. Operation:	15
6.2.2	Test Setup Diagram:	15
6.2.3	Test Data:	16
6.3	Maximum Conducted Output Power	17
6.3.1	E.U.T. Operation:	17
6.3.2	Test Setup Diagram:	17
6.3.3	Test Data:	17
6.4	Power Spectral Density	18
6.4.1	E.U.T. Operation:	18
6.4.2	Test Setup Diagram:	18
6.4.3	Test Data:	18
6.5	Emissions in non-restricted frequency bands	19
6.5.1	E.U.T. Operation:	19
6.5.2	Test Setup Diagram:	19
6.5.3	Test Data:	19
6.6	Band edge emissions (Radiated)	20
6.6.1	E.U.T. Operation:	20
6.6.2	Test Data:	21
6.7	Emissions in restricted frequency bands (below 1GHz)	23
6.7.1	E.U.T. Operation:	23
6.7.2	Test Data:	24

6.8	Emissions in restricted frequency bands (above 1GHz).....	26
6.8.1	E.U.T. Operation:.....	26
6.8.2	Test Data:.....	27
7	TEST SETUP PHOTOS.....	30
8	EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS).....	32
	APPENDIX.....	33

1 Introduction

1.1 Identification of Testing Laboratory

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130

1.2 Identification of the Responsible Testing Location

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130
FCC Registration Number:	518915
Designation Number:	CN1330

1.3 Announcement

- (1) The test report reference to the report template version v0.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
- (5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 Product Information

2.1 Application Information

Company Name:	Xwireless LLC
Address:	11565 Old Georgetown Road, Rockville, MD, USA

2.2 Manufacturer Information

Company Name:	Xwireless LLC
Address:	11565 Old Georgetown Road, Rockville, MD, USA

2.3 Factory Information

Company Name:	ZTECH COMMUNICATION(SZ) CO LTD
Address:	FL 7 BLOCK D BAO'AN ZHIGU INNOVATION PARK YIN'TIAN ROAD NO.4 XI'XIANG STR' BAO'AN DISTRICT SZ CHINA

2.4 General Description of Equipment under Test (EUT)

EUT Name:	Mobile Phone
Test Model Number:	HD65Plus

2.5 Technical Information

Power Supply:	DC 5V from adapter
Power Adaptor:	Input: 100-240V 50/60Hz 0.3 Output: 5.0V 2.0A 10.0W
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	40
Modulation Type:	GFSK
Antenna Type:	PIFA ANT
Antenna Gain#:	1.14 dBi
Note:	#: The antenna gain provided by the applicant, and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.

3 Summary of Test Results

3.1 Test Standards

The tests were performed according to following standards:
47 CFR Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Uncertainty of Test

Item	Measurement Uncertainty
Conducted Emission (150 kHz-30 MHz)	±2.64dB

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.3 Summary of Test Result

Item	Standard	Requirement	Result
Antenna requirement	47 CFR Part 15.247	47 CFR 15.203	Pass
Conducted Emission at AC power line	47 CFR Part 15.247	47 CFR 15.207(a)	Pass
Occupied Bandwidth	47 CFR Part 15.247	47 CFR 15.247(a)(2)	Pass
Maximum Conducted Output Power	47 CFR Part 15.247	47 CFR 15.247(b)(3)	Pass
Power Spectral Density	47 CFR Part 15.247	47 CFR 15.247(e)	Pass
Emissions in non-restricted frequency bands	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Band edge emissions (Radiated)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (below 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (above 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass

4 Test Configuration

4.1 Test Equipment List

Emissions in restricted frequency bands (below 1GHz)					
Emissions in restricted frequency bands (above 1GHz)					
Band edge emissions (Radiated)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2023-03-24	2024-03-23
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1m	21101568	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2021-11-28	2023-11-27
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESC17	101032	2022-11-24	2023-11-23
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplifier	SCHWARZBECK	BBV9718D	00008	2023-03-24	2024-03-23
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27

Occupied Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in non-restricted frequency bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Conducted Emission at AC power line					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Pulse Limiter	SCHWARZBECK	VTSD 9561-F	00953	2022-11-24	2023-11-23
Coaxial Switcher	SCHWARZBECK	CX210	CX210	2022-11-24	2023-11-23
V-LISN	SCHWARZBECK	NSLK 8127	01073	2022-11-24	2023-11-23
LISN	AFJ	LS16/110VAC	16010020076	2023-02-23	2024-02-22
EMI Receiver	ROHDE&SCHWARZ	ESCI3	101422	2022-11-24	2023-11-23

4.2 Test Auxiliary Equipment

The EUT was tested as an independent device.

4.3 Test Modes

No.	Test Modes	Description
TM1	TX mode	Keep the EUT connect to AC power line and works in continuously transmitting mode with GFSK modulation.

5 Evaluation Results (Evaluation)

5.1 Antenna requirement

Test 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 shall be considered sufficient to comply with the provisions of this section.
-------------------	--

6 Radio Spectrum Matter Test Results (RF)

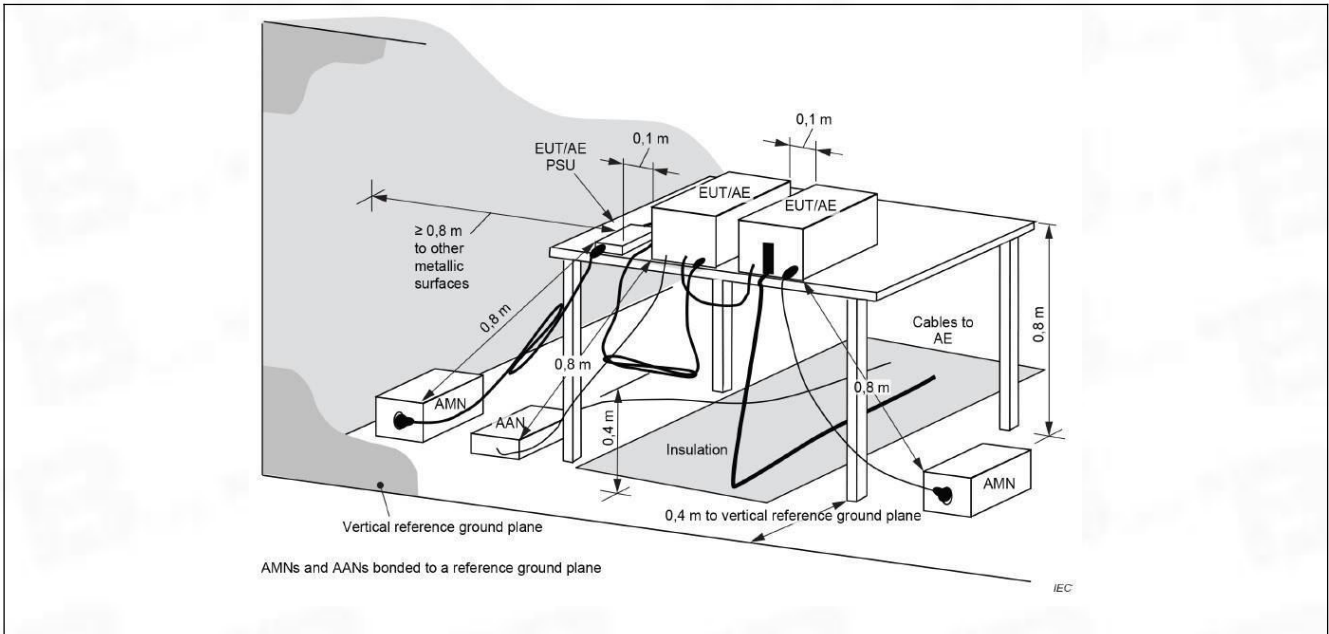
6.1 Conducted Emission at AC power line

Test Requirement:	Refer to 47 CFR 15.207(a), Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).		
Test Method:	ANSI C63.10-2013 section 6.2 ANSI C63.10-2020 section 6.2		
Test Limit:	Frequency of emission (MHz)	Conducted limit (dB μ V)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	*Decreases with the logarithm of the frequency.		
Procedure:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices Refer to ANSI C63.10-2020 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices		

6.1.1 E.U.T. Operation:

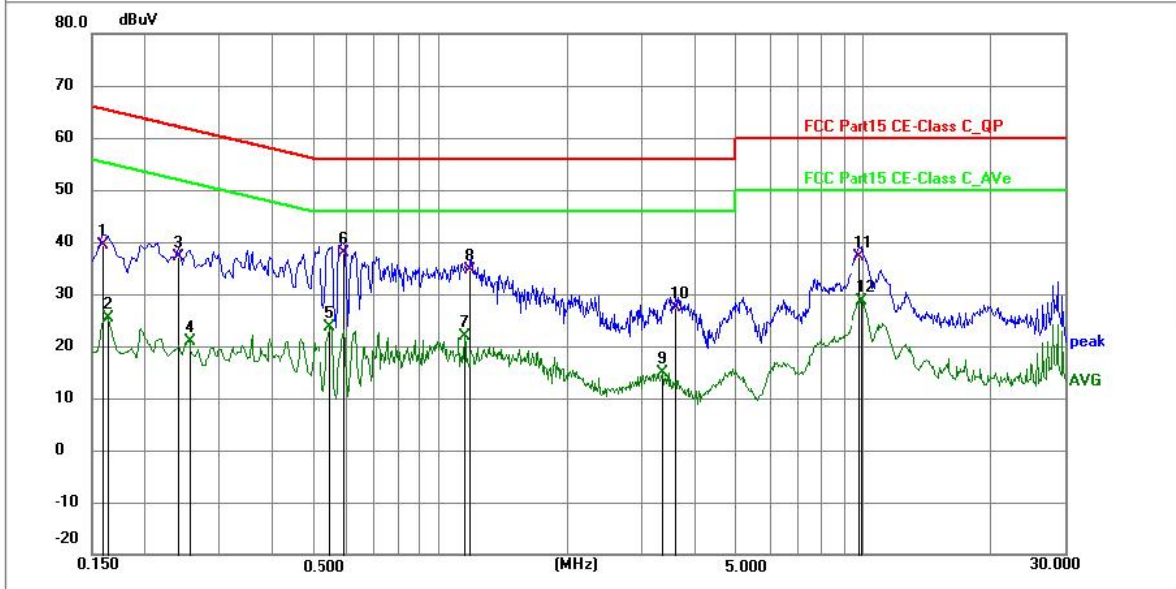
Operating Environment:	
Temperature:	24 °C
Humidity:	49.8 %
Atmospheric Pressure:	1010 mbar

6.1.2 Test Setup Diagram:



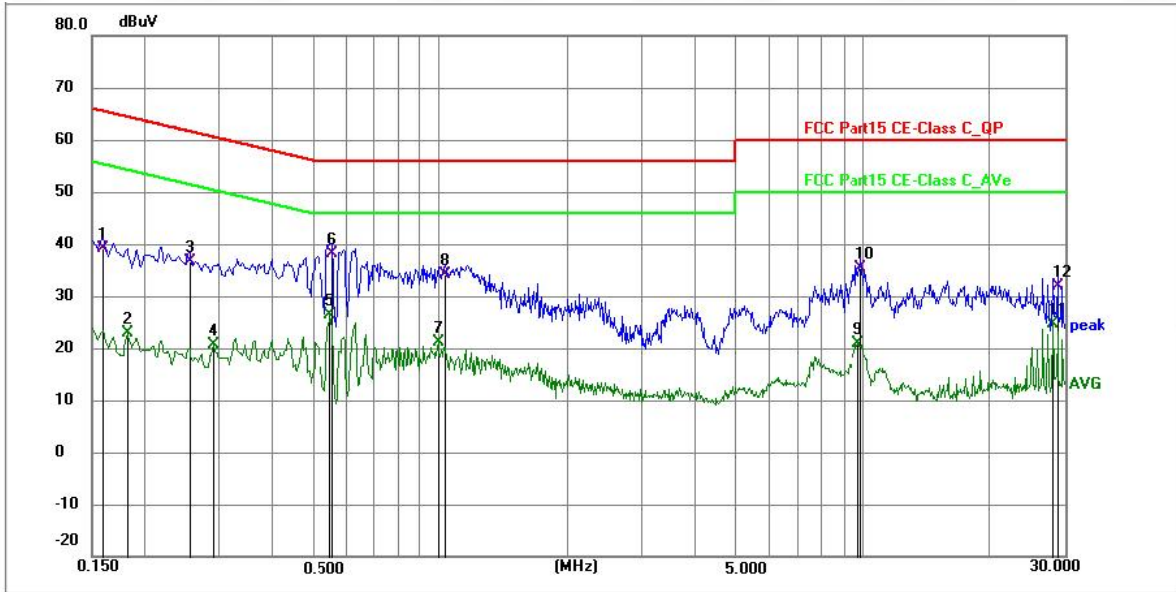
6.1.3 Test Data:

TM1 / Line: Line / Band: 2.4G / BW: 1 / CH: M



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1590	28.95	10.55	39.50	65.52	-26.02	QP	P	
2	0.1635	14.84	10.56	25.40	55.28	-29.88	AVG	P	
3	0.2400	26.51	10.59	37.10	62.10	-25.00	QP	P	
4	0.2535	10.39	10.59	20.98	51.64	-30.66	AVG	P	
5	0.5503	13.00	10.64	23.64	46.00	-22.36	AVG	P	
6 *	0.5910	27.23	10.67	37.90	56.00	-18.10	QP	P	
7	1.1445	11.13	10.77	21.90	46.00	-24.10	AVG	P	
8	1.1849	23.94	10.76	34.70	56.00	-21.30	QP	P	
9	3.3630	4.16	10.72	14.88	46.00	-31.12	AVG	P	
10	3.5970	16.68	10.72	27.40	56.00	-28.60	QP	P	
11	9.8475	26.17	10.93	37.10	60.00	-22.90	QP	P	
12	9.9194	17.80	10.95	28.75	50.00	-21.25	AVG	P	

TM1 / Line: Neutral / Band: 2.4G / BW: 1 / CH: M



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1590	28.65	10.55	39.20	65.52	-26.32	QP	P	
2	0.1814	12.40	10.57	22.97	54.42	-31.45	AVG	P	
3	0.2535	26.01	10.59	36.60	61.64	-25.04	QP	P	
4	0.2894	10.06	10.60	20.66	50.54	-29.88	AVG	P	
5	0.5503	15.76	10.64	26.40	46.00	-19.60	AVG	P	
6 *	0.5550	27.45	10.65	38.10	56.00	-17.90	QP	P	
7	0.9915	10.33	10.78	21.11	46.00	-24.89	AVG	P	
8	1.0275	23.32	10.78	34.10	56.00	-21.90	QP	P	
9	9.7440	9.87	10.93	20.80	50.00	-29.20	AVG	P	
10	9.8790	24.45	10.95	35.40	60.00	-24.60	QP	P	
11	28.1174	13.50	11.07	24.57	50.00	-25.43	AVG	P	
12	28.8780	20.83	11.07	31.90	60.00	-28.10	QP	P	

6.2 Occupied Bandwidth

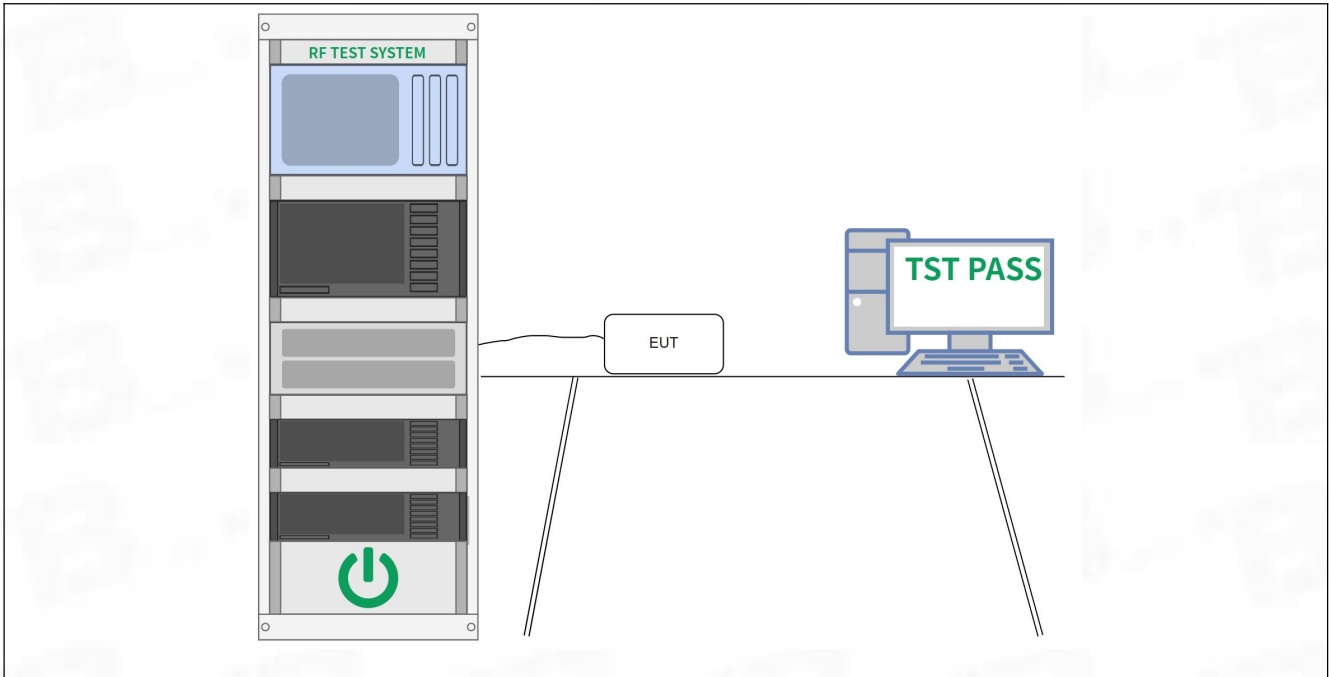
Test Requirement:	47 CFR 15.247(a)(2)
Test Method:	ANSI C63.10-2013, section 11.8 ANSI C63.10-2020, section 11.8 KDB 558074 D01 15.247 Meas Guidance v05r02
Test Limit:	Refer to 47 CFR 15.247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Procedure:	<p>a) Set RBW = 100 kHz. b) Set the VBW $\geq [3 \times \text{RBW}]$. c) Detector = peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.</p> <p>11.8.1 Option 1 The steps for the first option are as follows: a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz. b) Set the VBW $\geq [3 \times \text{RBW}]$. c) Detector = peak. d) Trace mode = max-hold. e) Sweep = No faster than coupled (auto) time. f) Allow the trace to stabilize. g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “-6 dB down amplitude”. If a marker is below this “-6 dB down amplitude” value, then it shall be as close as possible to this value.</p> <p>11.8.2 Option 2 The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW $\geq 3 \times \text{RBW}$, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.</p>

6.2.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.4 °C
Humidity:	49.6 %
Atmospheric Pressure:	1010 mbar

6.2.2 Test Setup Diagram:

--



6.2.3 Test Data:

Please Refer to Appendix for Details.

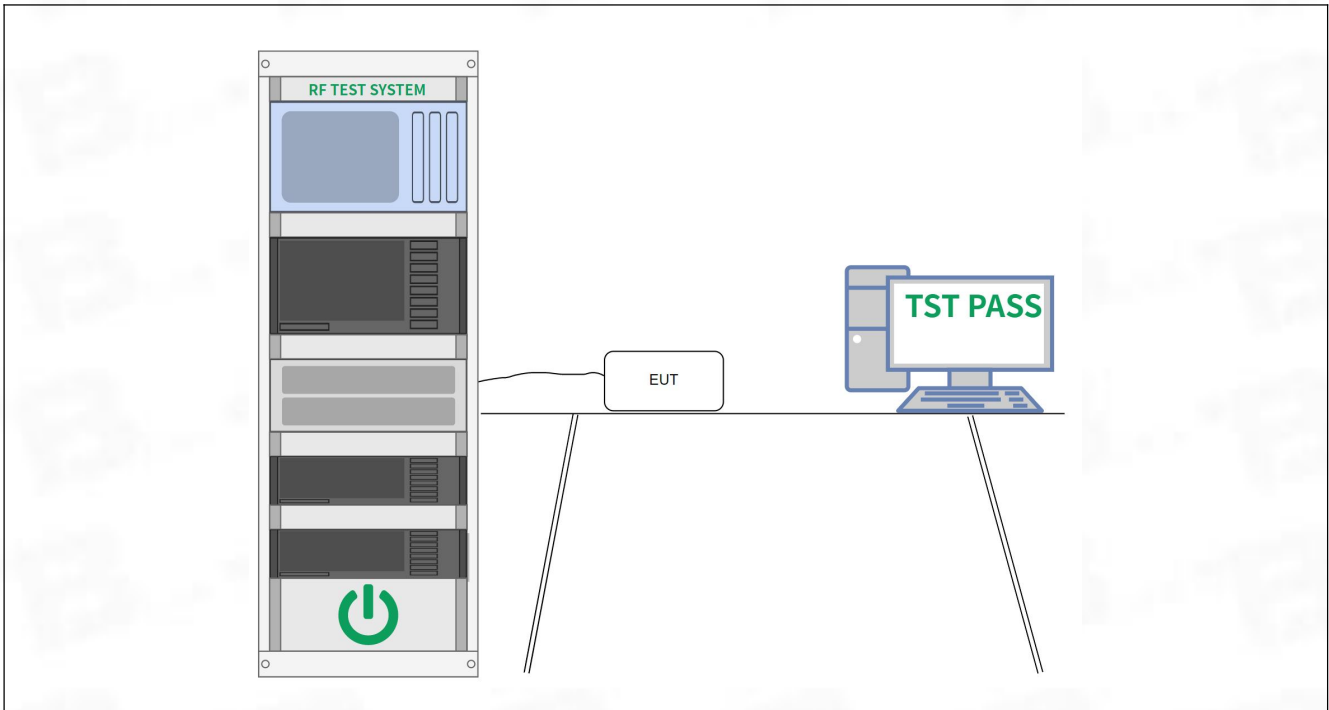
6.3 Maximum Conducted Output Power

Test Requirement:	47 CFR 15.247(b)(3)
Test Method:	ANSI C63.10-2013, section 11.9.1 ANSI C63.10-2020 section 11.9.1 KDB 558074 D01 15.247 Meas Guidance v05r02
Test Limit:	Refer to 47 CFR 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Procedure:	ANSI C63.10-2013, section 11.9.1 Maximum peak conducted output power ANSI C63.10-2020, section 11.9.1 Maximum peak conducted output power

6.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.4 °C
Humidity:	49.6 %
Atmospheric Pressure:	1010 mbar

6.3.2 Test Setup Diagram:



6.3.3 Test Data:

Please Refer to Appendix for Details.

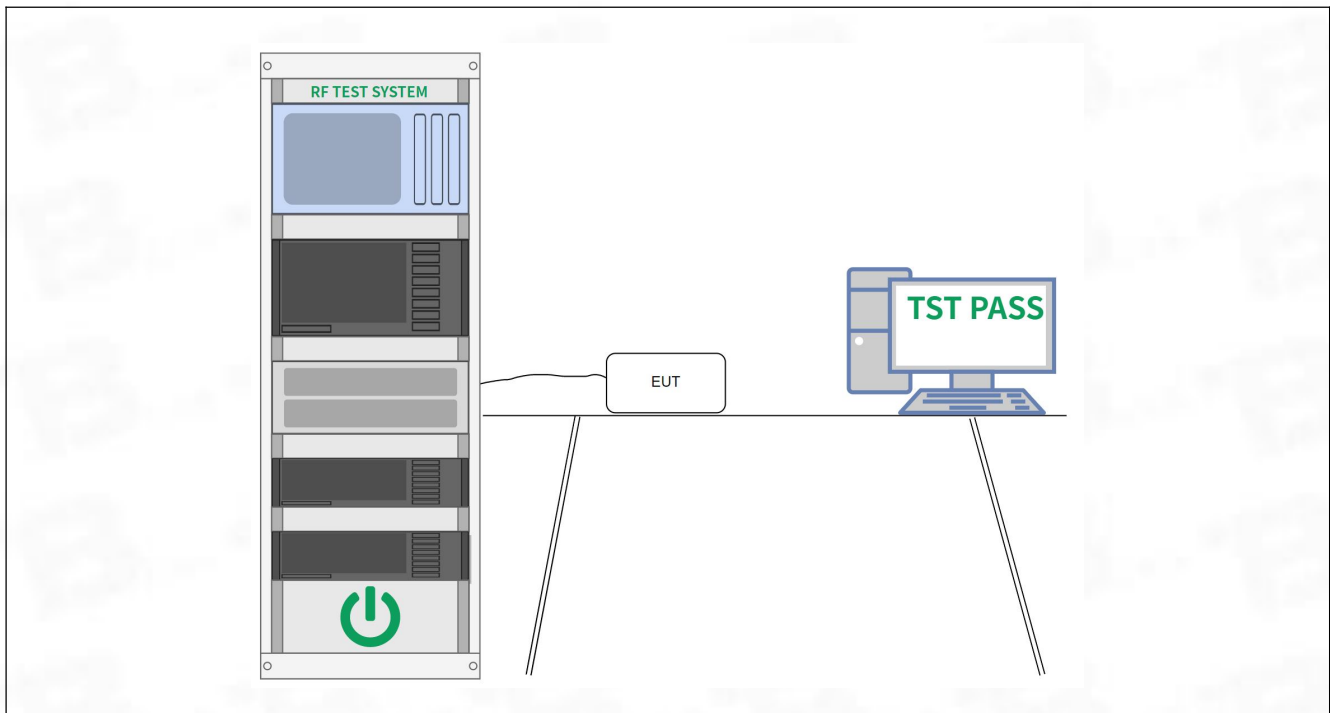
6.4 Power Spectral Density

Test Requirement:	47 CFR 15.247(e)
Test Method:	ANSI C63.10-2013, section 11.10 ANSI C63.10-2020, section 11.10 KDB 558074 D01 15.247 Meas Guidance v05r02
Test Limit:	Refer to 47 CFR 15.247(e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Procedure:	ANSI C63.10-2013, section 11.10, Maximum power spectral density level in the fundamental emission ANSI C63.10-2020, section 11.10, Maximum power spectral density level in the fundamental emission

6.4.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.4 °C
Humidity:	49.6 %
Atmospheric Pressure:	1010 mbar

6.4.2 Test Setup Diagram:



6.4.3 Test Data:

Please Refer to Appendix for Details.

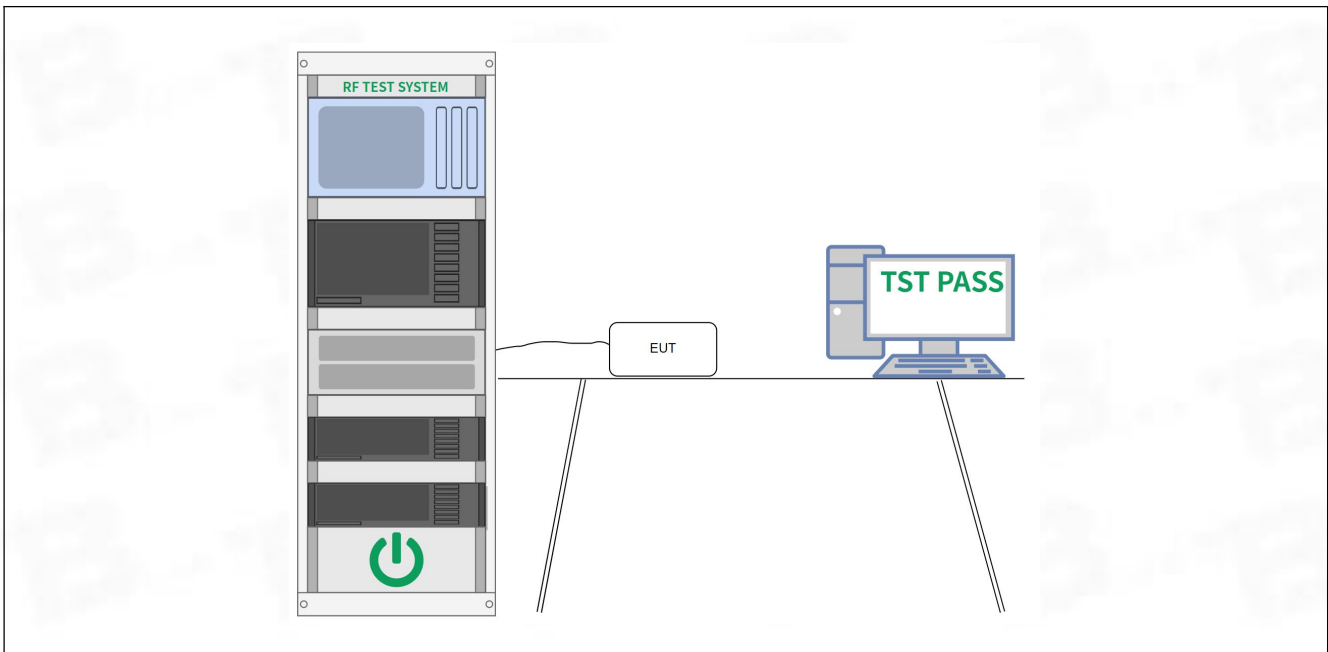
6.5 Emissions in non-restricted frequency bands

Test Requirement:	47 CFR 15.247(d)
Test Method:	ANSI C63.10-2013 section 11.11 ANSI C63.10-2020 section 11.11 KDB 558074 D01 15.247 Meas Guidance v05r02
Test Limit:	Refer to 47 CFR 15.247(d), 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.
Procedure:	ANSI C63.10-2013 Section 11.11.1, Section 11.11.2, Section 11.11.3 ANSI C63.10-2020 Section 11.11.1, Section 11.11.2, Section 11.11.3

6.5.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.4 °C
Humidity:	49.6 %
Atmospheric Pressure:	1010 mbar

6.5.2 Test Setup Diagram:



6.5.3 Test Data:

Please Refer to Appendix for Details.

6.6 Band edge emissions (Radiated)

Test Requirement:	Refer to 47 CFR 15.247(d), 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)).		
Test Method:	ANSI C63.10-2013 section 6.10 ANSI C63.10-2020 section 6.10 KDB 558074 D01 15.247 Meas Guidance v05r02		
Test Limit:	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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.			
Procedure:	ANSI C63.10-2013 section 6.10.5.2 ANSI C63.10-2020 section 6.10.5.2		

6.6.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24 °C
Humidity:	49.8 %
Atmospheric Pressure:	1010 mbar

6.6.2 Test Data:

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2310.000	69.12	-30.59	38.53	74.00	-35.47	peak	P
2	2390.000	70.50	-30.49	40.01	74.00	-33.99	peak	P
3 *	2400.000	79.16	-30.48	48.68	74.00	-25.32	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2310.000	68.20	-30.59	37.61	74.00	-36.39	peak	P
2	2390.000	69.66	-30.49	39.17	74.00	-34.83	peak	P
3 *	2400.000	83.25	-30.48	52.77	74.00	-21.23	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1 *	2483.500	71.37	-30.39	40.98	74.00	-33.02	peak	P
2	2500.000	71.19	-30.37	40.82	74.00	-33.18	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1 *	2483.500	71.87	-30.39	41.48	74.00	-32.52	peak	P
2	2500.000	71.69	-30.37	41.32	74.00	-32.68	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 2 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2310.000	71.99	-30.59	41.40	74.00	-32.60	peak	P
2	2390.000	70.71	-30.49	40.22	74.00	-33.78	peak	P
3 *	2400.000	81.20	-30.48	50.72	74.00	-23.28	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 2 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	2310.000	69.99	-30.59	39.40	74.00	-34.60	peak	P
2	2390.000	69.21	-30.49	38.72	74.00	-35.28	peak	P
3 *	2400.000	79.20	-30.48	48.72	74.00	-25.28	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 2 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1 *	2483.500	73.66	-30.39	43.27	74.00	-30.73	peak	P
2	2500.000	68.99	-30.37	38.62	74.00	-35.38	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 2 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1 *	2483.500	71.66	-30.39	41.27	74.00	-32.73	peak	P
2	2500.000	70.48	-30.37	40.11	74.00	-33.89	peak	P

6.7 Emissions in restricted frequency bands (below 1GHz)

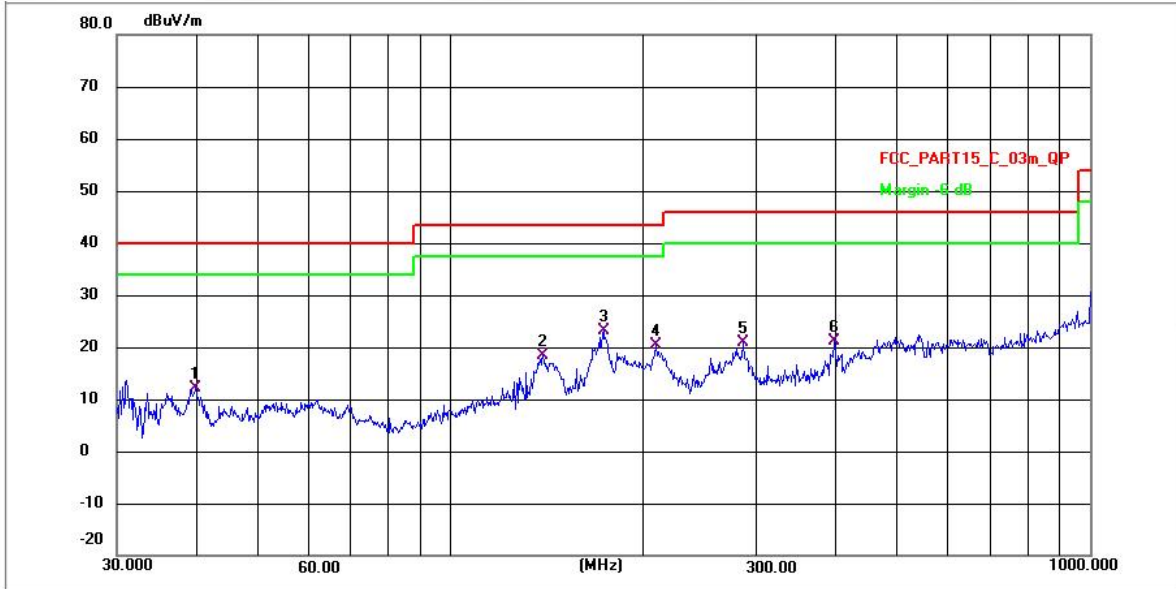
Test Requirement:	Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).		
Test Method:	ANSI C63.10-2013 section 6.6.4 ANSI C63.10-2020 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Test Limit:	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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.			
Procedure:	ANSI C63.10-2013 section 6.6.4 ANSI C63.10-2020 section 6.6.4		

6.7.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24 °C
Humidity:	49.8 %
Atmospheric Pressure:	1010 mbar

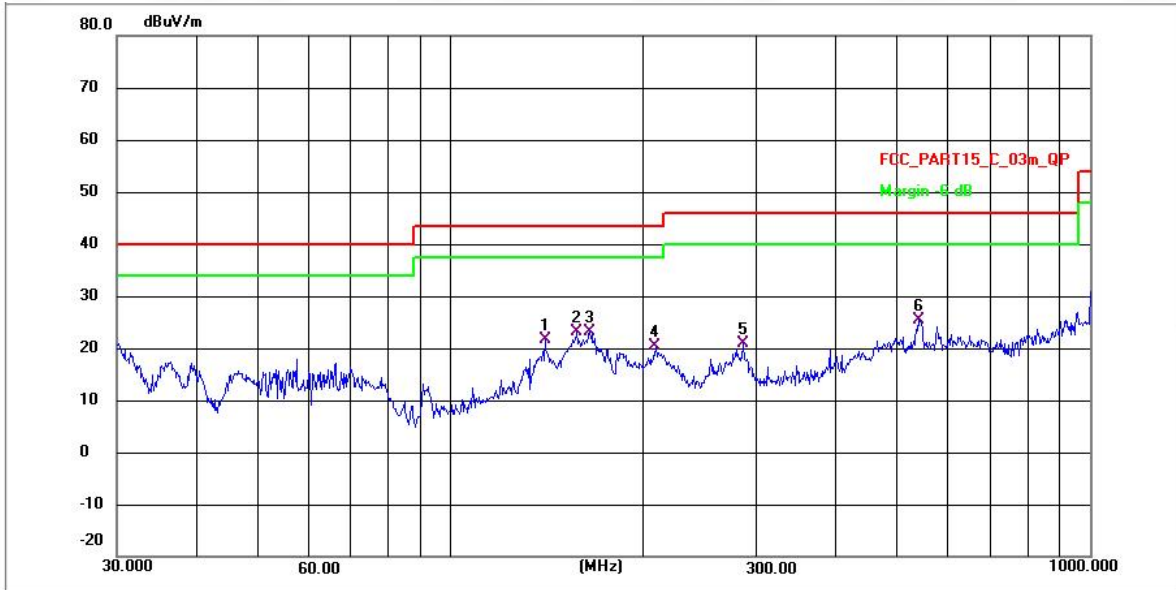
6.7.2 Test Data:

Note: All the mode have been tested, and only the worst case of 1M mode are in the report
 TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	39.8542	30.50	-18.40	12.10	40.00	-27.90	QP	P
2	139.3611	46.23	-27.87	18.36	43.50	-25.14	QP	P
3 *	173.2050	50.66	-27.57	23.09	43.50	-20.41	QP	P
4	209.3130	47.20	-26.92	20.28	43.50	-23.22	QP	P
5	285.9777	46.35	-25.55	20.80	46.00	-25.20	QP	P
6	397.6334	45.67	-24.65	21.02	46.00	-24.98	QP	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	140.3421	49.62	-27.87	21.75	43.50	-21.75	QP	P
2 *	157.5588	50.80	-27.71	23.09	43.50	-20.41	QP	P
3	164.9075	50.72	-27.65	23.07	43.50	-20.43	QP	P
4	209.3129	47.20	-26.92	20.28	43.50	-23.22	QP	P
5	285.9778	46.35	-25.55	20.80	46.00	-25.20	QP	P
6	539.4775	46.99	-21.55	25.44	46.00	-20.56	QP	P

6.8 Emissions in restricted frequency bands (above 1GHz)

Test Requirement:	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)).		
Test Method:	ANSI C63.10-2013 section 6.6.4 ANSI C63.10-2020 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Test Limit:	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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.			
Procedure:	ANSI C63.10-2013 section 6.6.4 ANSI C63.10-2020 section 6.6.4		

6.8.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24 °C
Humidity:	49.8 %
Atmospheric Pressure:	1010 mbar

6.8.2 Test Data:

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	4288.257	68.04	-28.88	39.16	74.00	-34.84	peak	P
2	5076.784	67.51	-27.30	40.21	74.00	-33.79	peak	P
3	7879.808	69.13	-25.35	43.78	74.00	-30.22	peak	P
4	10658.390	68.89	-24.18	44.71	74.00	-29.29	peak	P
5	13817.042	69.71	-21.05	48.66	74.00	-25.34	peak	P
6 *	17301.162	68.14	-17.10	51.04	74.00	-22.96	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	3261.418	66.63	-29.27	37.36	74.00	-36.64	peak	P
2	4644.364	62.61	-28.37	34.24	74.00	-39.76	peak	P
3	6231.426	61.58	-25.35	36.23	74.00	-37.77	peak	P
4	9120.789	65.10	-24.04	41.06	74.00	-32.94	peak	P
5	12607.325	68.85	-21.56	47.29	74.00	-26.71	peak	P
6 *	16357.728	68.17	-19.87	48.30	74.00	-25.70	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	4002.024	63.80	-29.00	34.80	74.00	-39.20	peak	P
2	5218.116	66.95	-27.19	39.76	74.00	-34.24	peak	P
3	6878.881	68.98	-25.04	43.94	74.00	-30.06	peak	P
4	8288.633	69.69	-25.41	44.28	74.00	-29.72	peak	P
5	12440.811	68.62	-21.68	46.94	74.00	-27.06	peak	P
6 *	15877.923	72.58	-21.57	51.01	74.00	-22.99	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	3640.045	63.15	-29.04	34.11	74.00	-39.89	peak	P
2	5480.919	68.02	-26.96	41.06	74.00	-32.94	peak	P
3	6894.806	67.43	-25.02	42.41	74.00	-31.59	peak	P
4	8089.815	70.54	-25.49	45.05	74.00	-28.95	peak	P
5	10679.976	68.46	-24.13	44.33	74.00	-29.67	peak	P
6 *	15709.023	69.37	-21.54	47.83	74.00	-26.17	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	3790.361	65.98	-29.02	36.96	74.00	-37.04	peak	P
2	5213.594	67.02	-27.19	39.83	74.00	-34.17	peak	P
3	6760.614	67.09	-25.14	41.95	74.00	-32.05	peak	P
4	9102.354	68.53	-24.09	44.44	74.00	-29.56	peak	P
5	12455.202	68.01	-21.66	46.35	74.00	-27.65	peak	P
6 *	17593.646	67.81	-16.42	51.39	74.00	-22.61	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	4162.473	64.05	-28.93	35.12	74.00	-38.88	peak	P
2	5840.760	64.26	-25.84	38.42	74.00	-35.58	peak	P
3	7311.459	68.44	-24.84	43.60	74.00	-30.40	peak	P
4	9824.103	68.95	-23.90	45.05	74.00	-28.95	peak	P
5	13059.822	69.91	-21.29	48.62	74.00	-25.38	peak	P
6 *	16438.302	69.04	-19.48	49.56	74.00	-24.44	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 2 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	3515.957	64.01	-29.05	34.96	74.00	-39.04	peak	P
2	5309.399	63.50	-27.11	36.39	74.00	-37.61	peak	P
3	6817.521	69.31	-25.09	44.22	74.00	-29.78	peak	P
4	8198.093	71.09	-25.45	45.64	74.00	-28.36	peak	P
5	11657.490	69.89	-22.79	47.10	74.00	-26.90	peak	P
6 *	16146.346	70.60	-20.89	49.71	74.00	-24.29	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 2 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	4462.760	63.33	-28.80	34.53	74.00	-39.47	peak	P
2	5751.968	64.32	-26.13	38.19	74.00	-35.81	peak	P
3	7606.788	64.37	-24.94	39.43	74.00	-34.57	peak	P
4	9829.784	66.00	-23.92	42.08	74.00	-31.92	peak	P
5	13276.766	66.10	-21.13	44.97	74.00	-29.03	peak	P
6 *	16915.473	67.12	-18.43	48.69	74.00	-25.31	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 2 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	5335.552	66.20	-27.09	39.11	74.00	-34.89	peak	P
2	6756.708	64.28	-25.15	39.13	74.00	-34.87	peak	P
3	7911.758	68.03	-25.40	42.63	74.00	-31.37	peak	P
4	9304.516	68.91	-23.63	45.28	74.00	-28.72	peak	P
5	12361.953	71.49	-21.78	49.71	74.00	-24.29	peak	P
6 *	15169.120	71.54	-20.77	50.77	74.00	-23.23	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 2 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	3945.744	64.53	-29.01	35.52	74.00	-38.48	peak	P
2	5355.638	64.35	-27.07	37.28	74.00	-36.72	peak	P
3	6721.646	66.28	-25.18	41.10	74.00	-32.90	peak	P
4	8360.817	66.73	-25.38	41.35	74.00	-32.65	peak	P
5	12556.412	70.82	-21.59	49.23	74.00	-24.77	peak	P
6 *	16006.944	71.63	-21.56	50.07	74.00	-23.93	peak	P

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 2 / CH: H

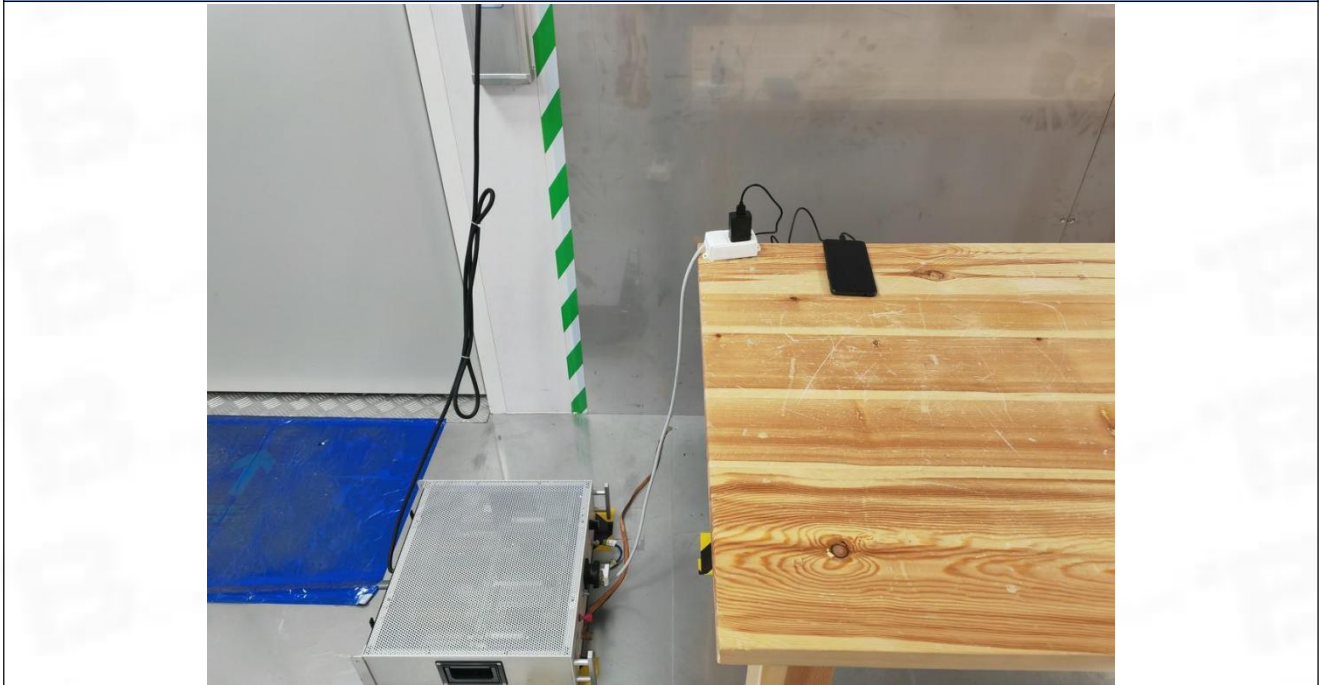
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	3581.602	65.78	-29.05	36.73	74.00	-37.27	peak	P
2	4900.883	65.85	-27.65	38.20	74.00	-35.80	peak	P
3	6625.204	68.20	-25.26	42.94	74.00	-31.06	peak	P
4	9652.410	69.22	-23.54	45.68	74.00	-28.32	peak	P
5	13745.343	69.26	-21.03	48.23	74.00	-25.77	peak	P
6 *	17028.299	70.47	-18.17	52.30	74.00	-21.70	peak	P

TM1 / Polarization: Vertical / Band: 2.4G / BW: 2 / CH: H

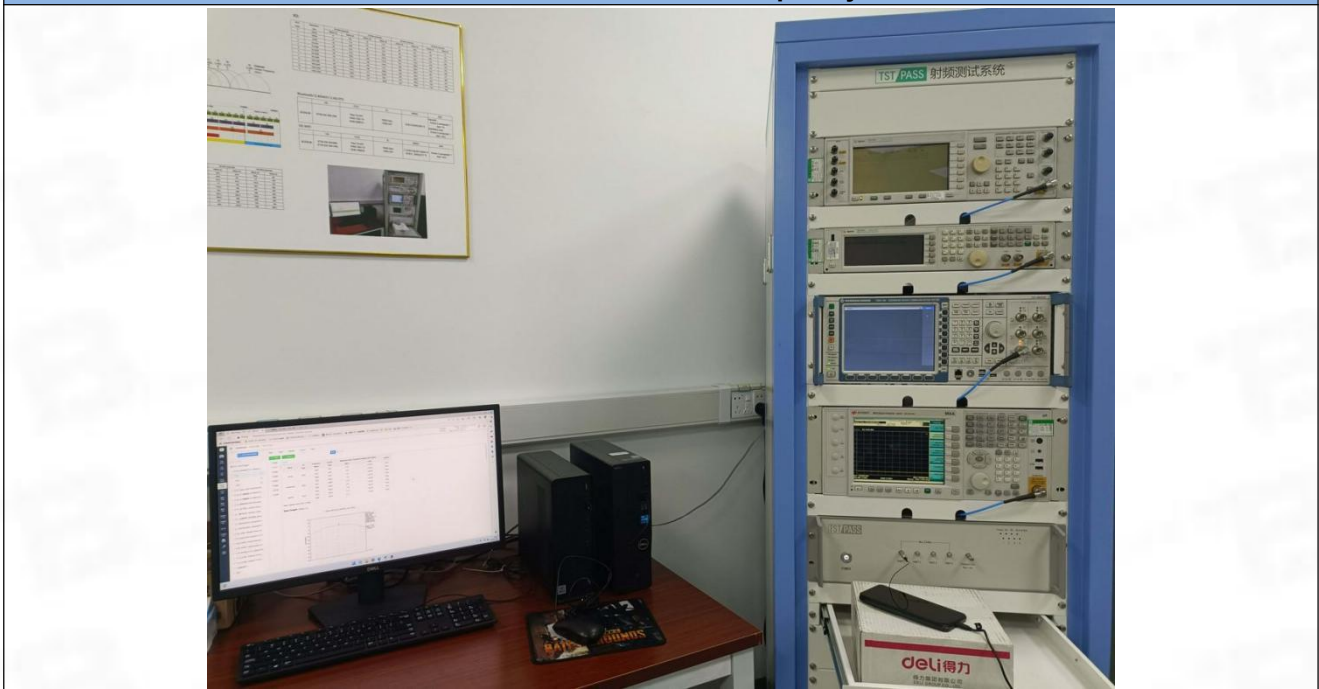
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	4374.638	66.60	-28.83	37.77	74.00	-36.23	peak	P
2	5625.367	63.63	-26.54	37.09	74.00	-36.91	peak	P
3	8558.870	70.47	-25.21	45.26	74.00	-28.74	peak	P
4	11117.793	70.75	-23.36	47.39	74.00	-26.61	peak	P
5	14022.226	71.20	-21.09	50.11	74.00	-23.89	peak	P
6 *	17047.998	68.50	-18.10	50.40	74.00	-23.60	peak	P

7 Test Setup Photos

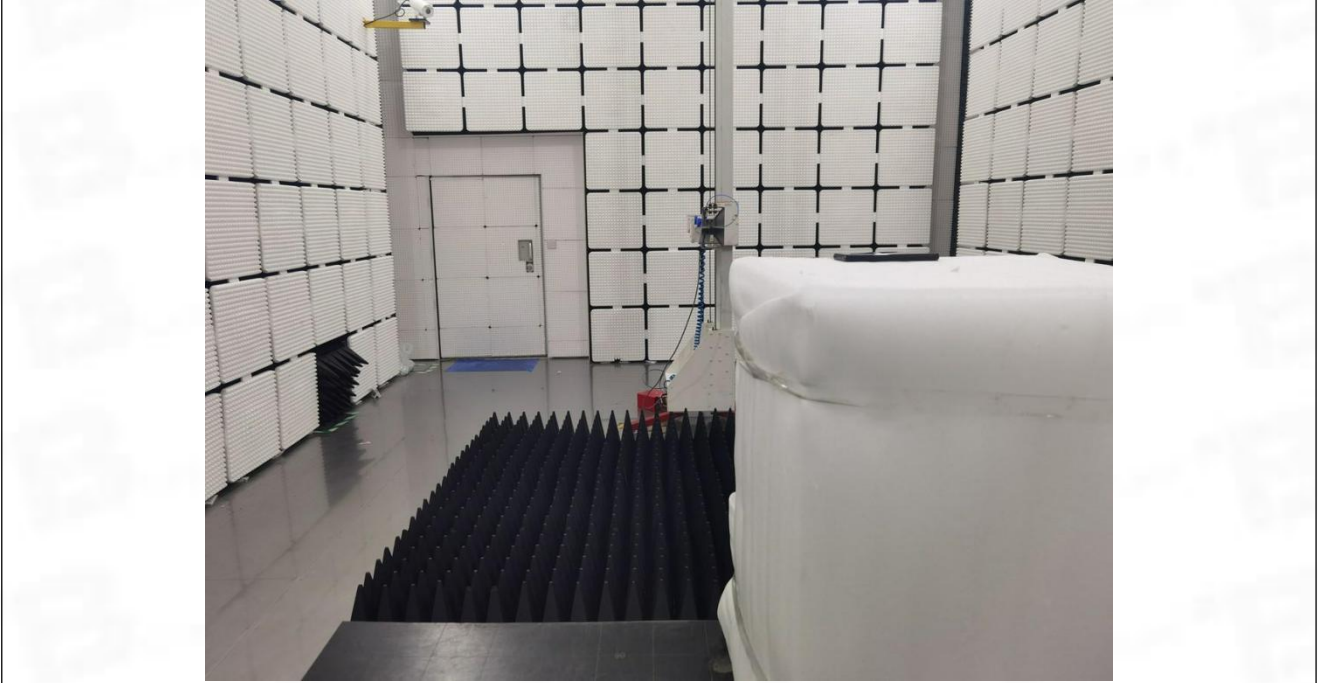
Conducted Emission at AC power line



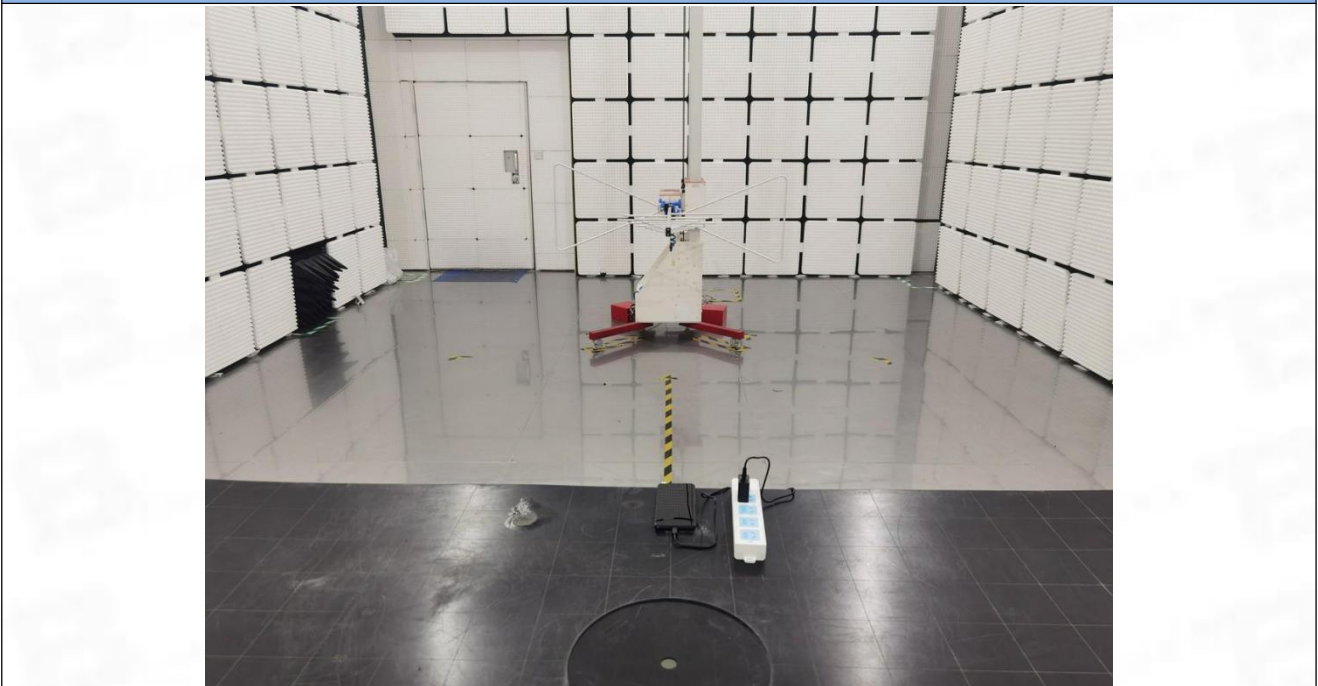
Occupied Bandwidth
Maximum Conducted Output Power
Power Spectral Density
Emissions in non-restricted frequency bands



Band edge emissions (Radiated)
Emissions in restricted frequency bands (above 1GHz)



Emissions in restricted frequency bands (below 1GHz)



8 EUT Constructional Details (EUT Photos)

Please refer to Report BTF230713R00601

Appendix

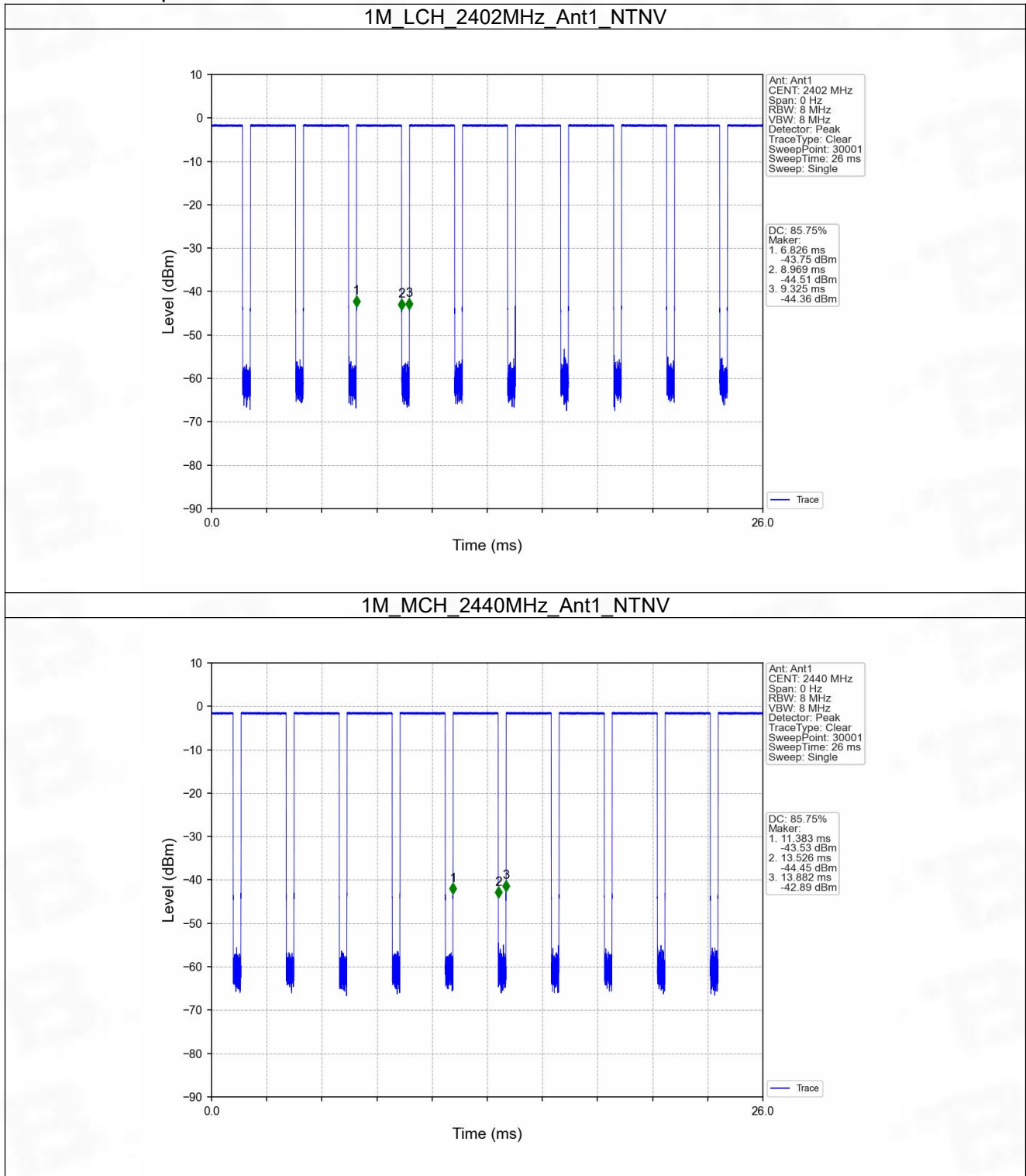
1. Duty Cycle

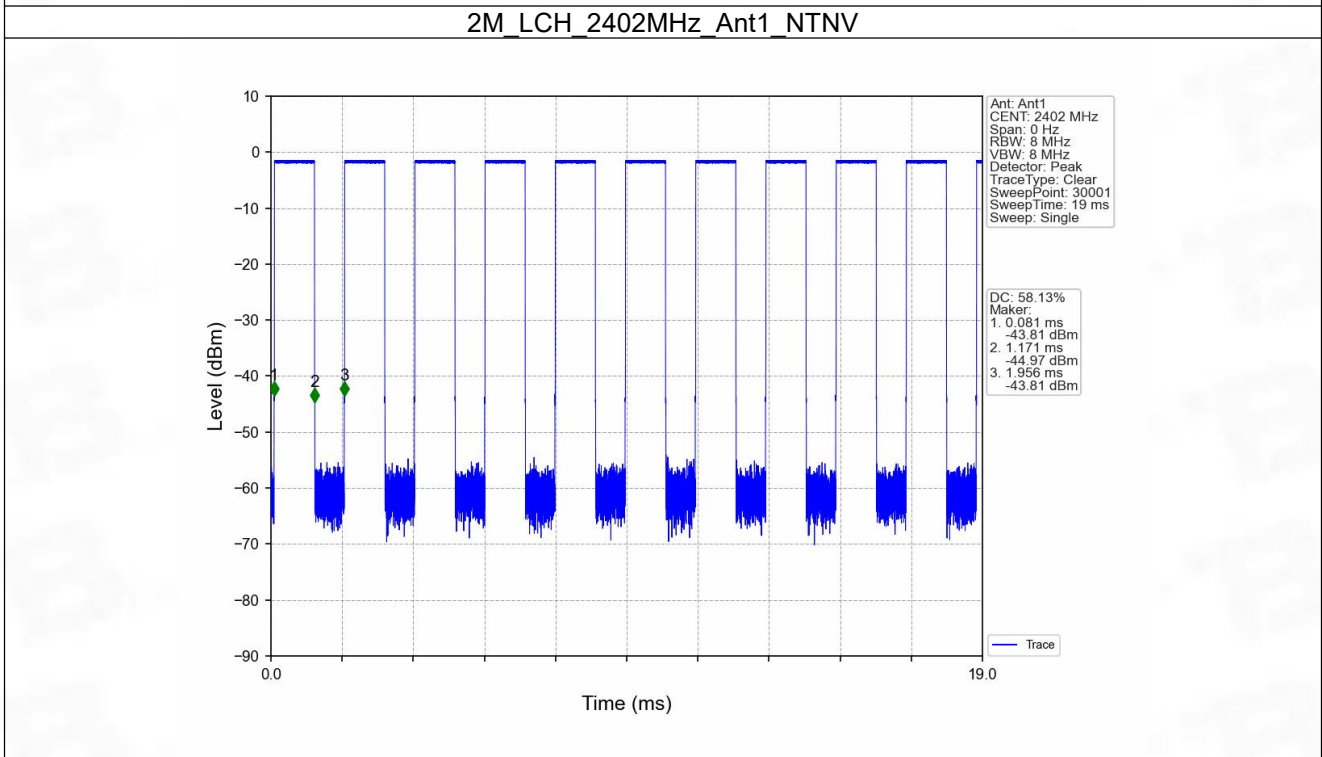
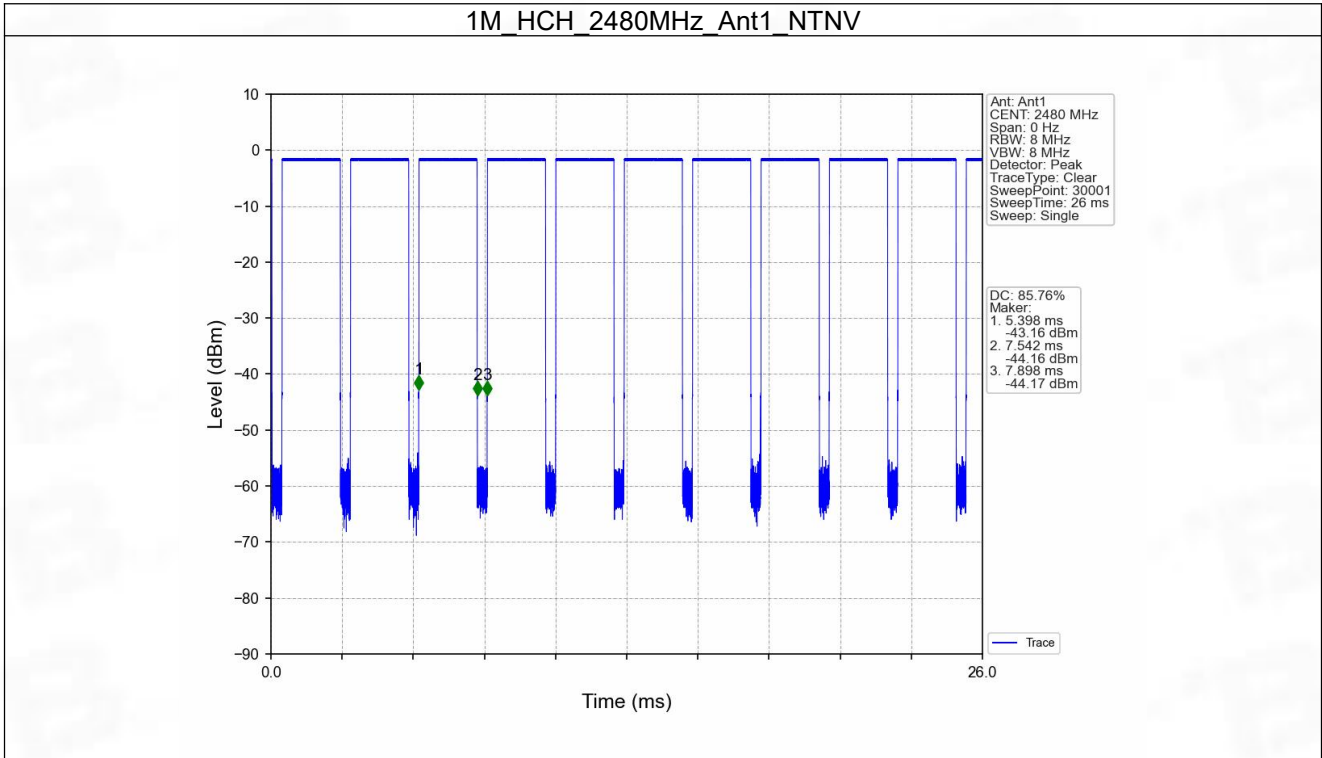
1.1 Ant1

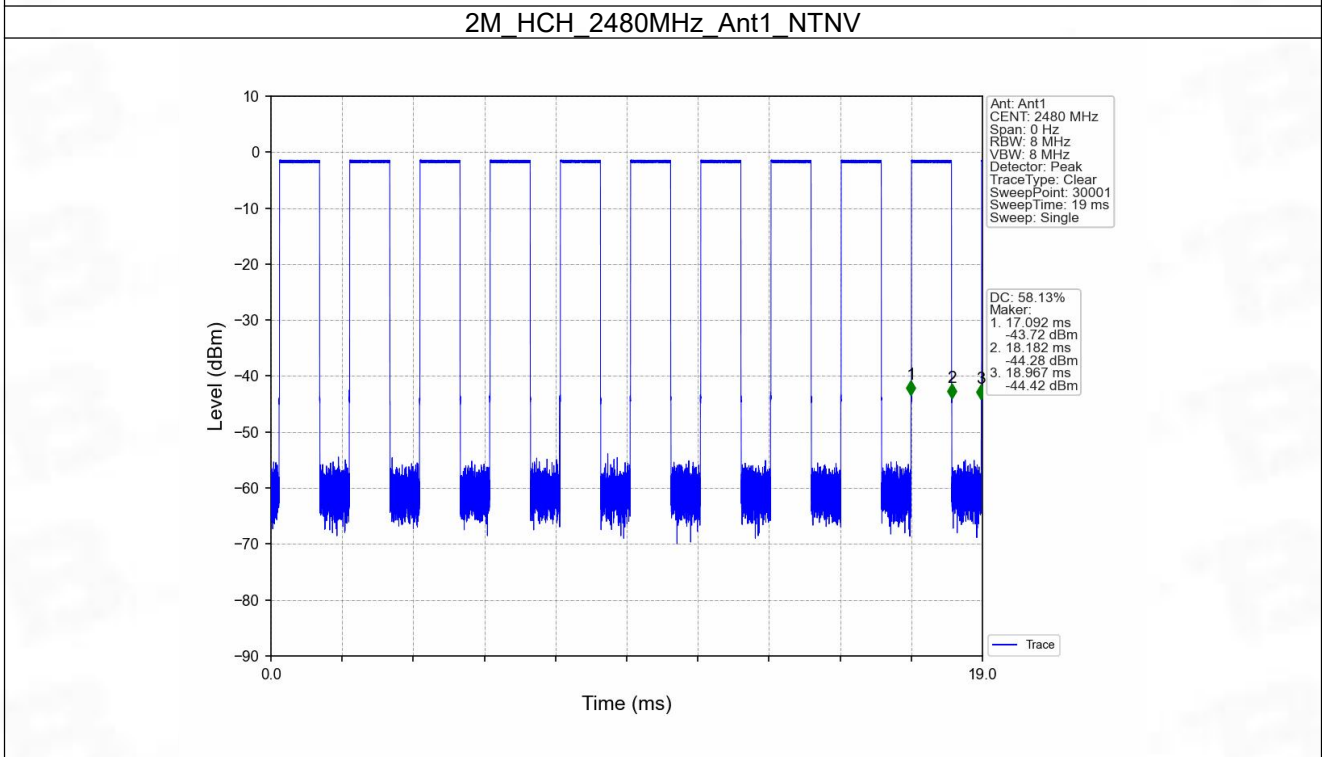
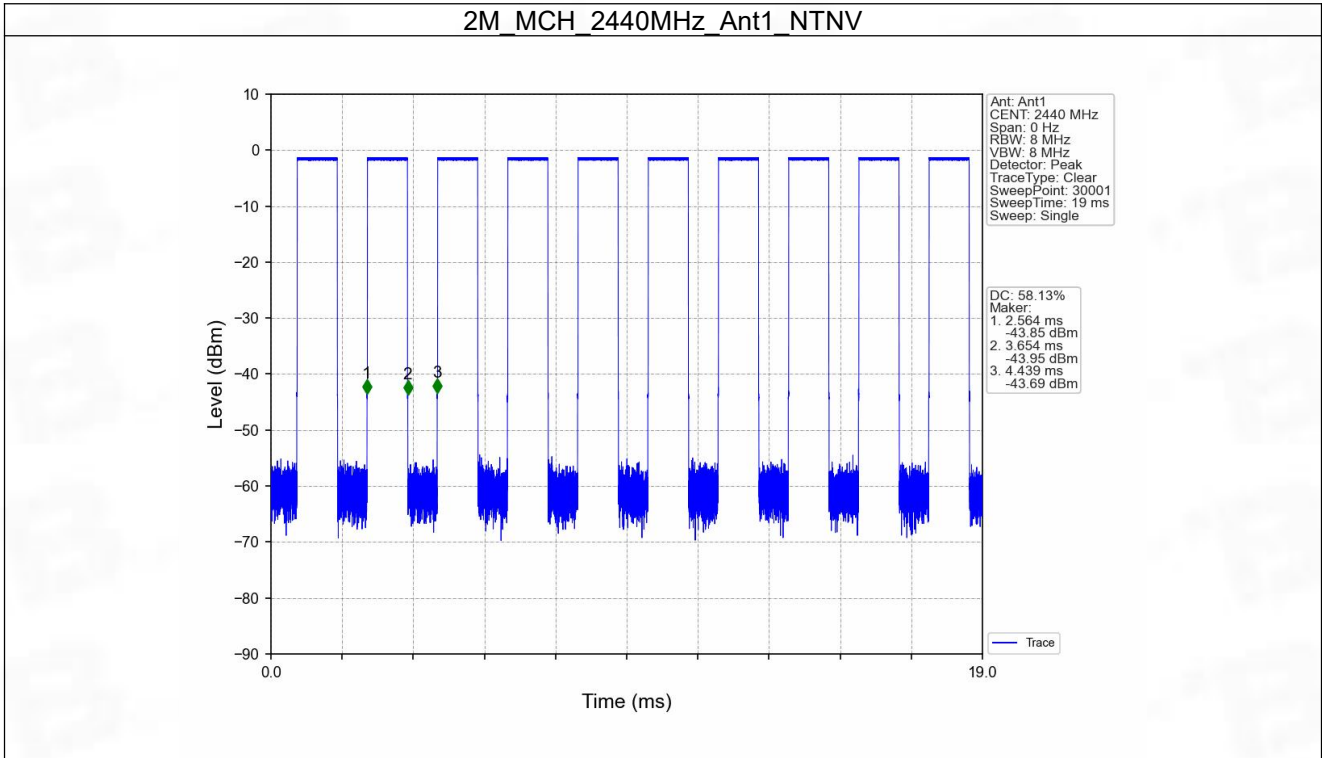
1.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	2.143	2.499	85.75	0.67	0.03
		2440	2.143	2.499	85.75	0.67	0.03
		2480	2.144	2.500	85.76	0.67	0.03
2M	SISO	2402	1.090	1.875	58.13	2.36	0.02
		2440	1.090	1.875	58.13	2.36	0.03
		2480	1.090	1.875	58.13	2.36	0.03

1.1.2 Test Graph







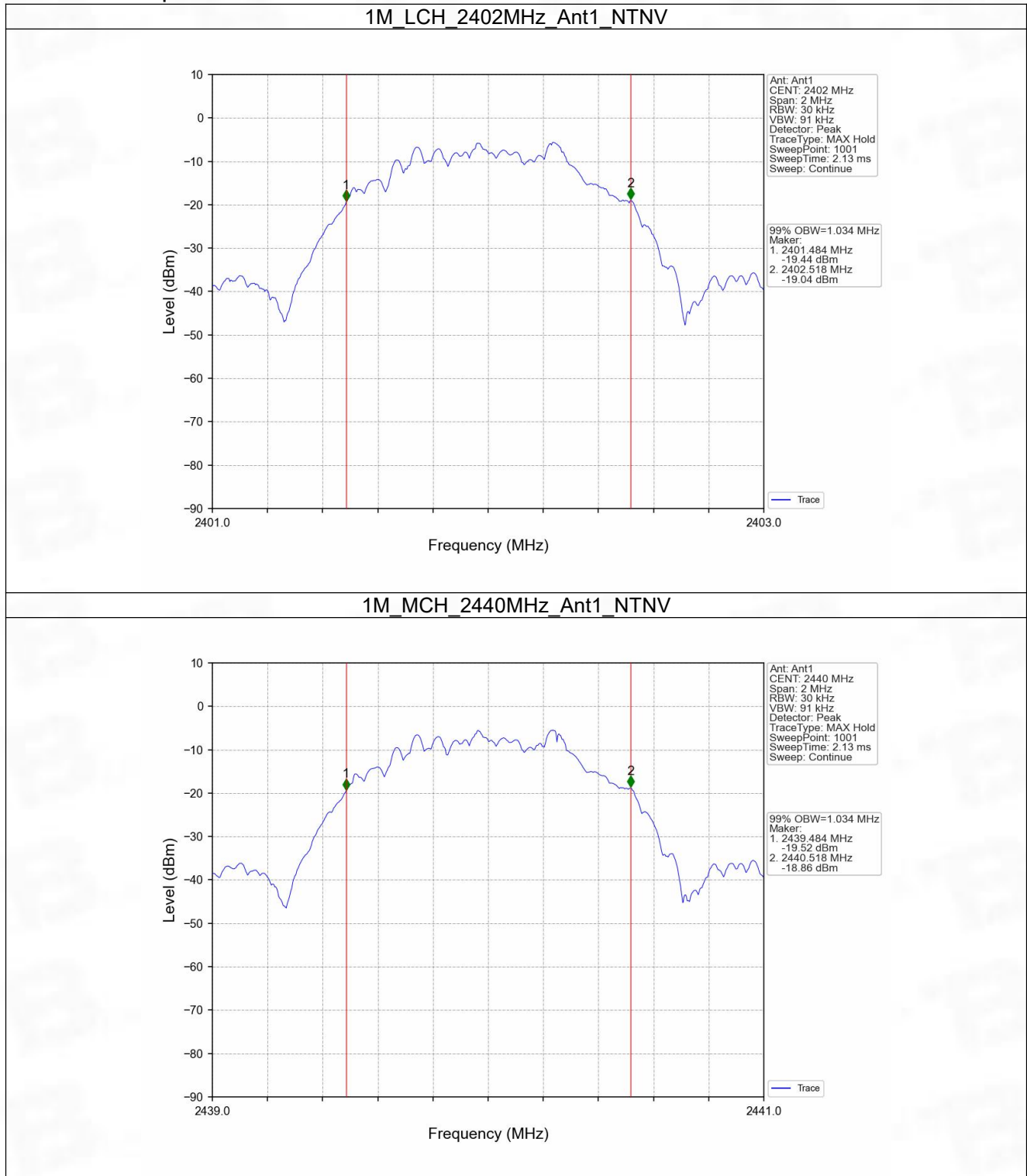
2. Bandwidth

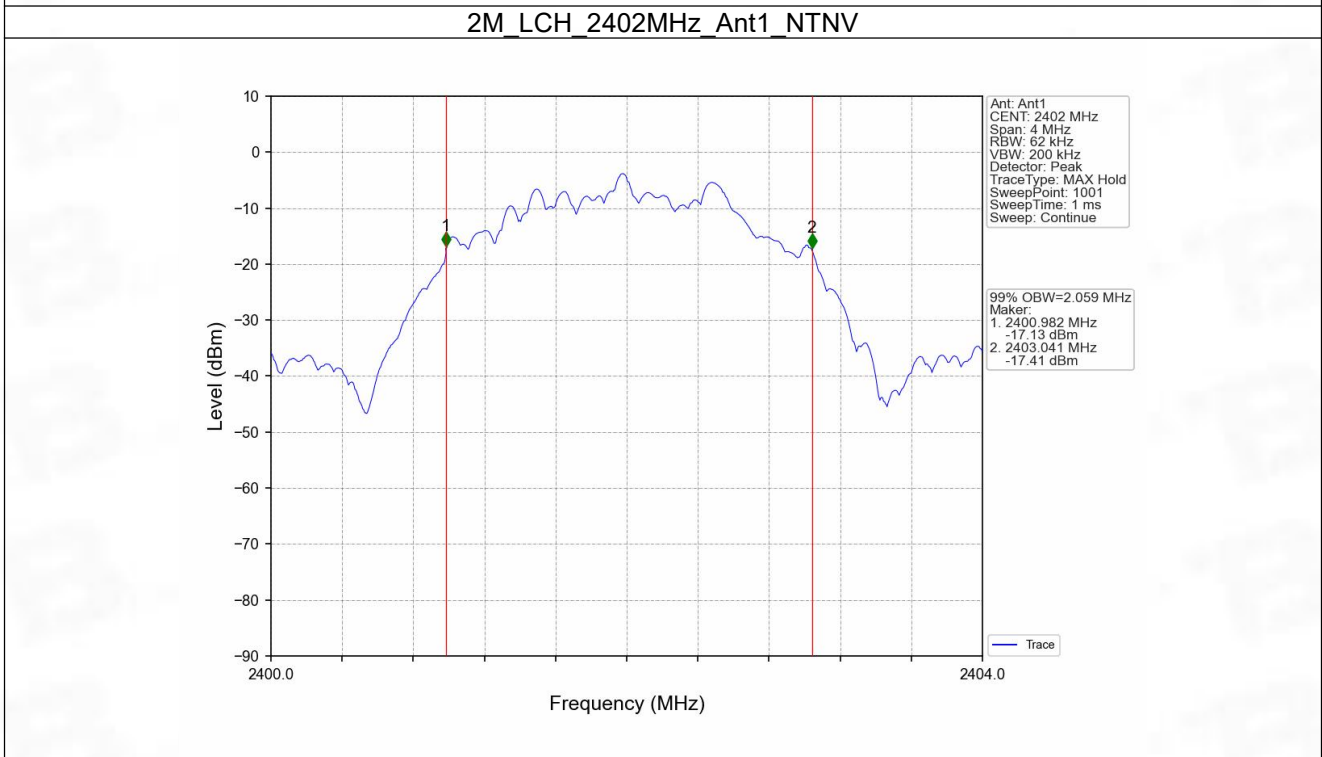
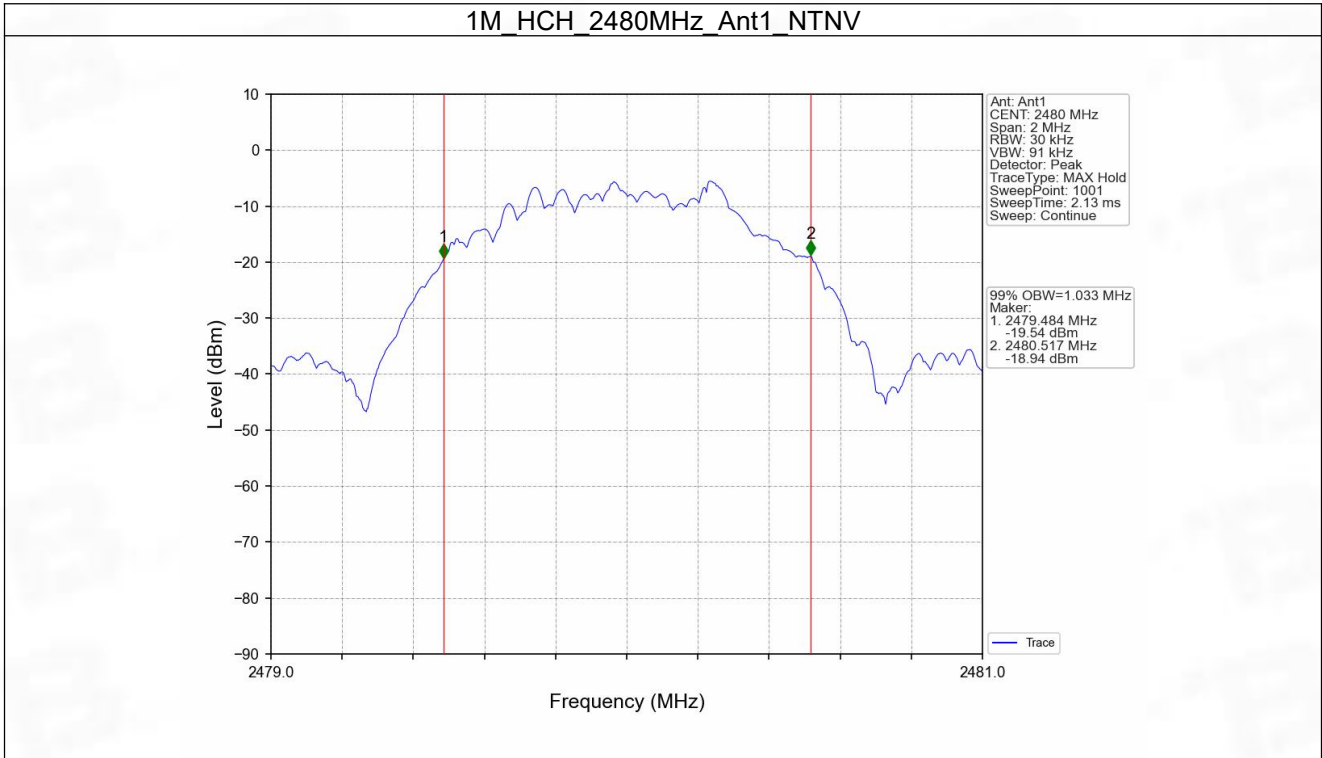
2.1 OBW

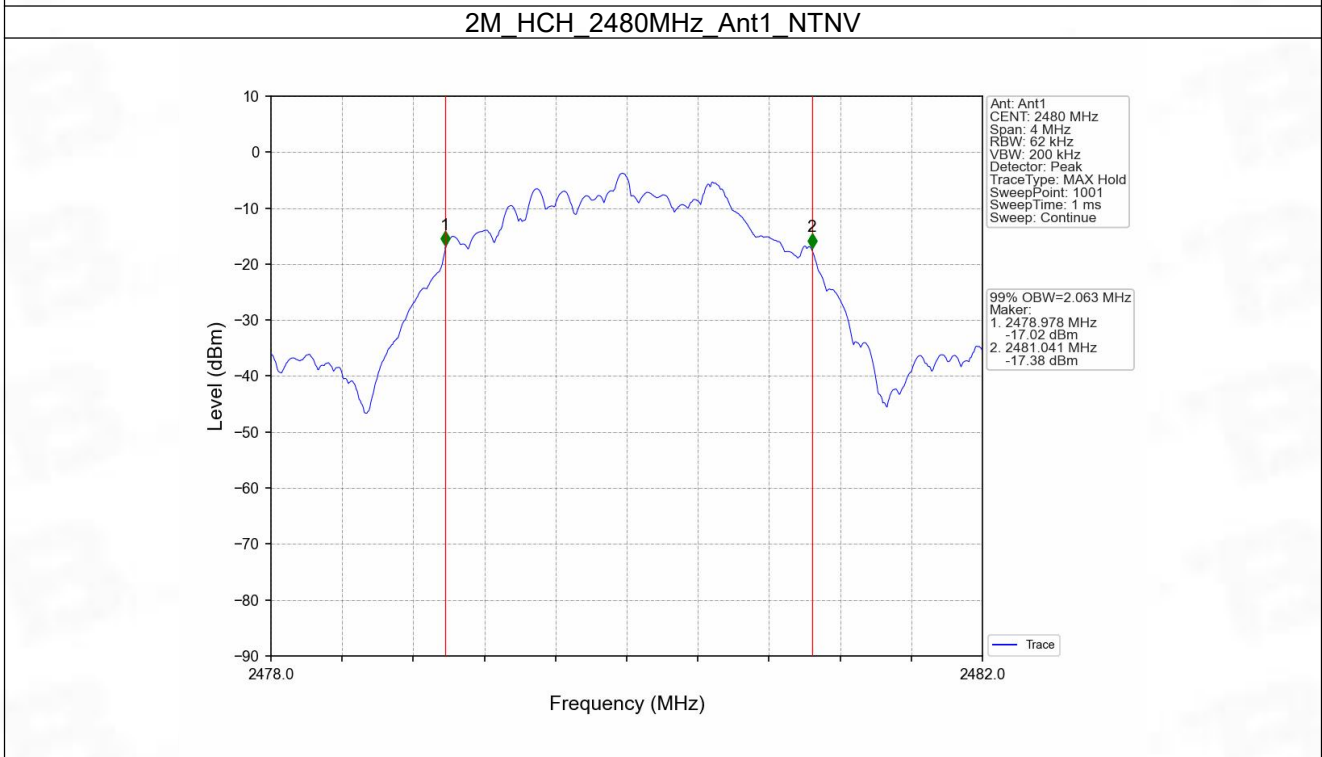
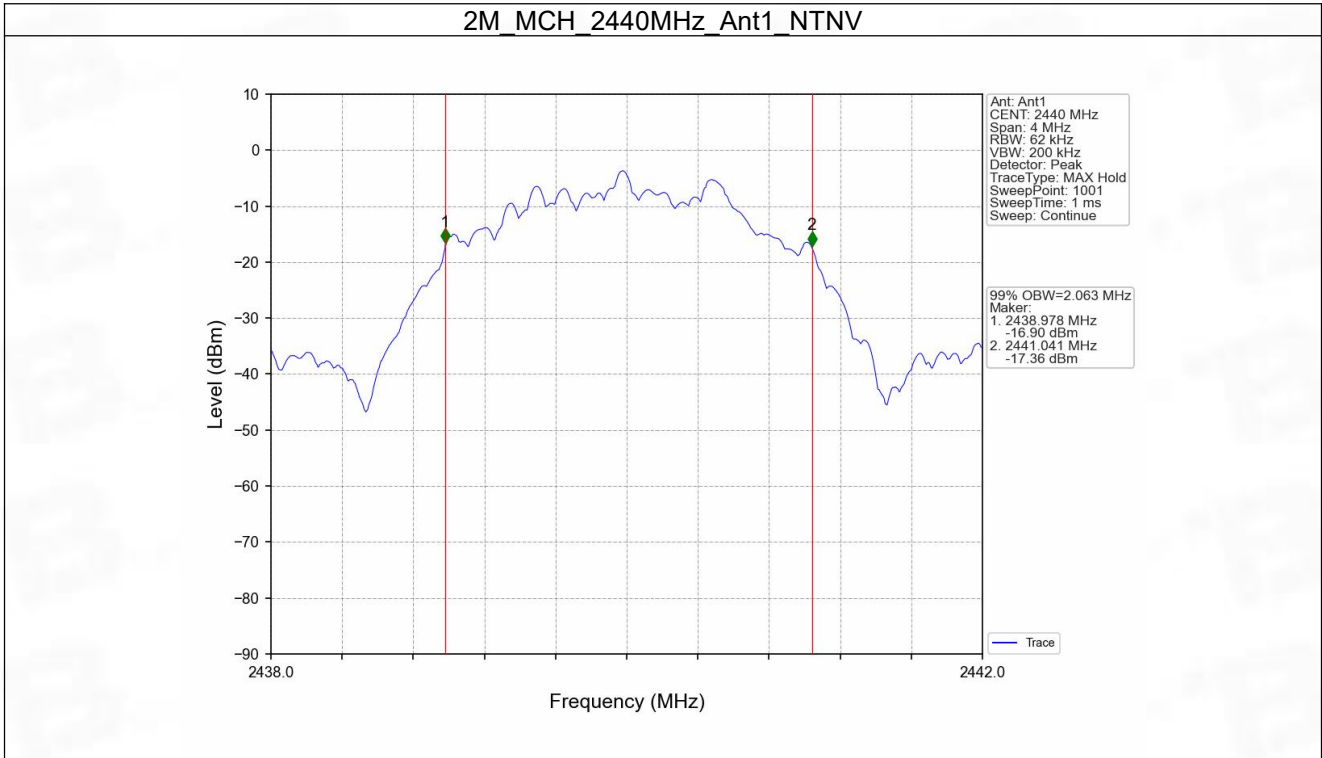
2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)	Verdict
				Result	
1M	SISO	2402	1	1.034	Pass
		2440	1	1.034	Pass
		2480	1	1.033	Pass
2M	SISO	2402	1	2.059	Pass
		2440	1	2.063	Pass
		2480	1	2.063	Pass

2.1.2 Test Graph





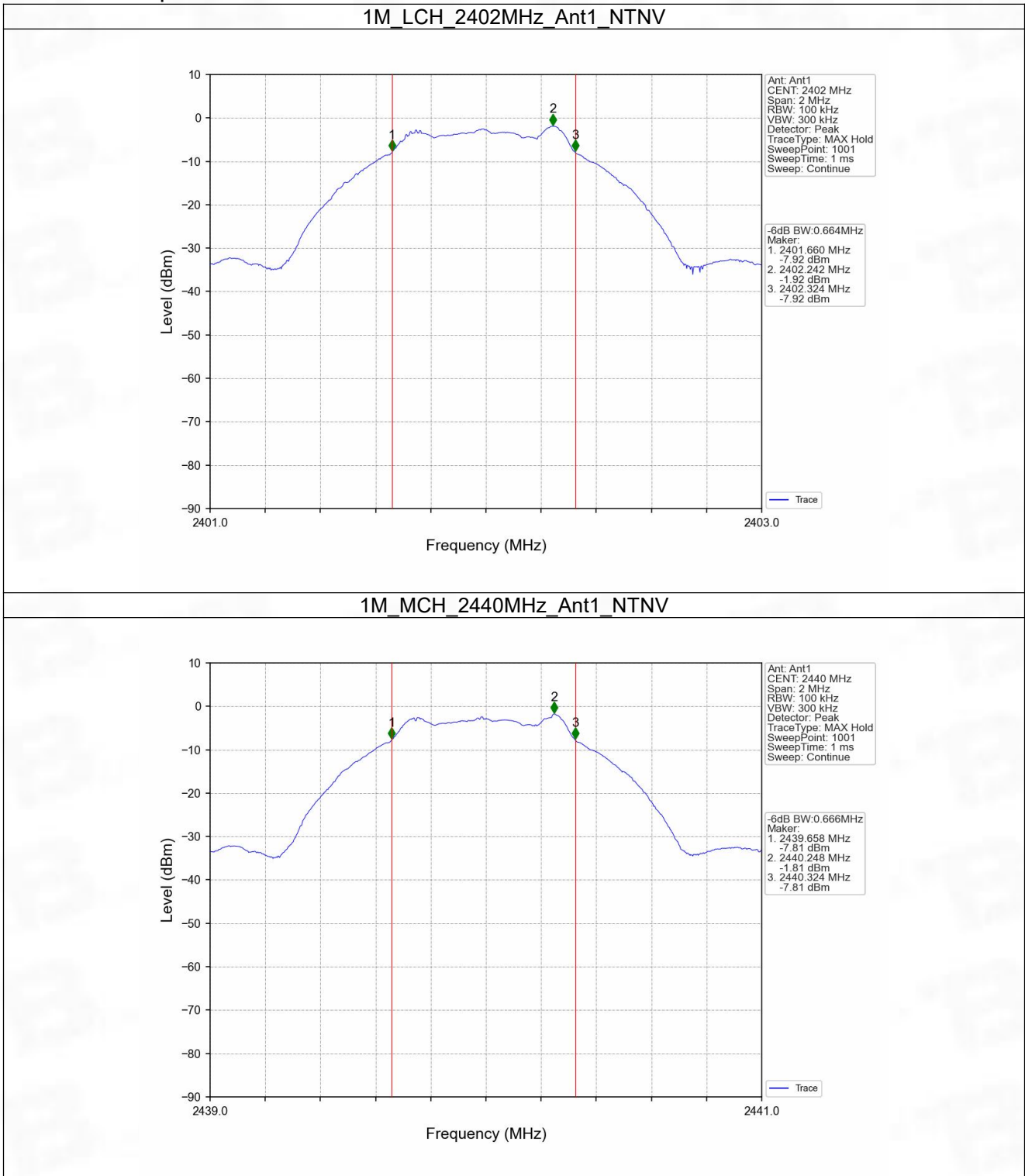


2.2 6dB BW

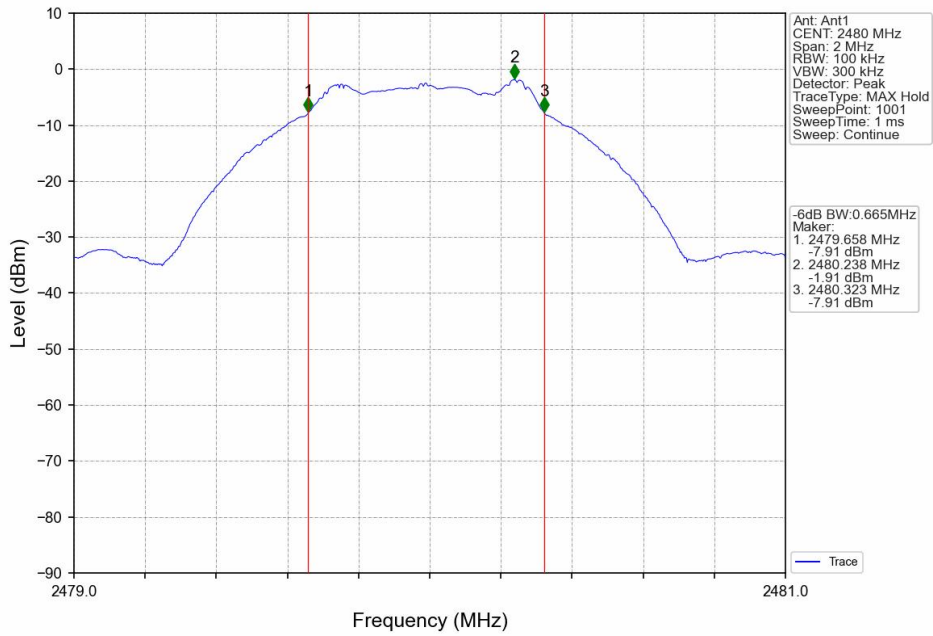
2.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.664	≥ 0.5	Pass
		2440	1	0.666	≥ 0.5	Pass
		2480	1	0.665	≥ 0.5	Pass
2M	SISO	2402	1	1.173	≥ 0.5	Pass
		2440	1	1.183	≥ 0.5	Pass
		2480	1	1.178	≥ 0.5	Pass

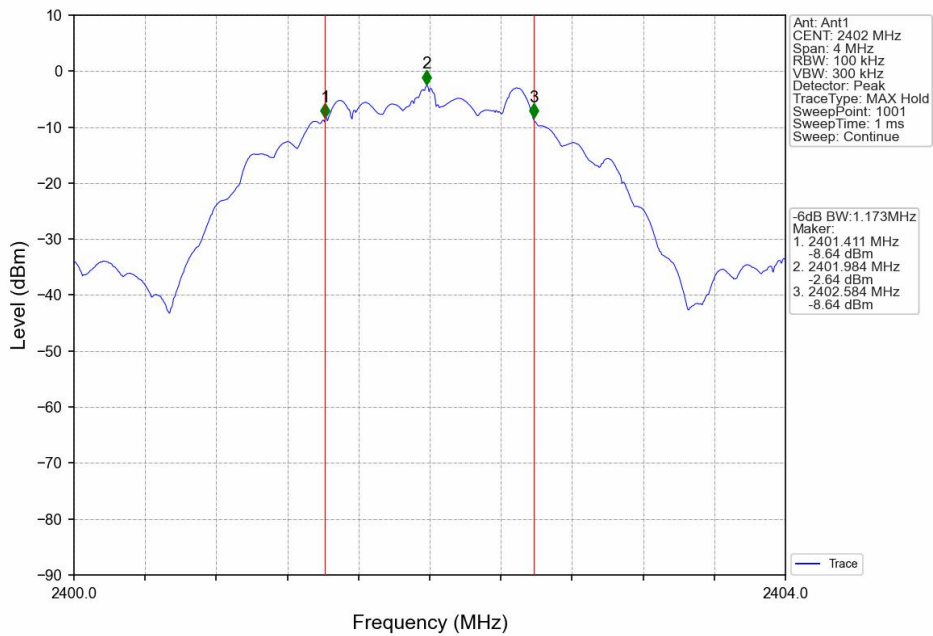
2.2.2 Test Graph

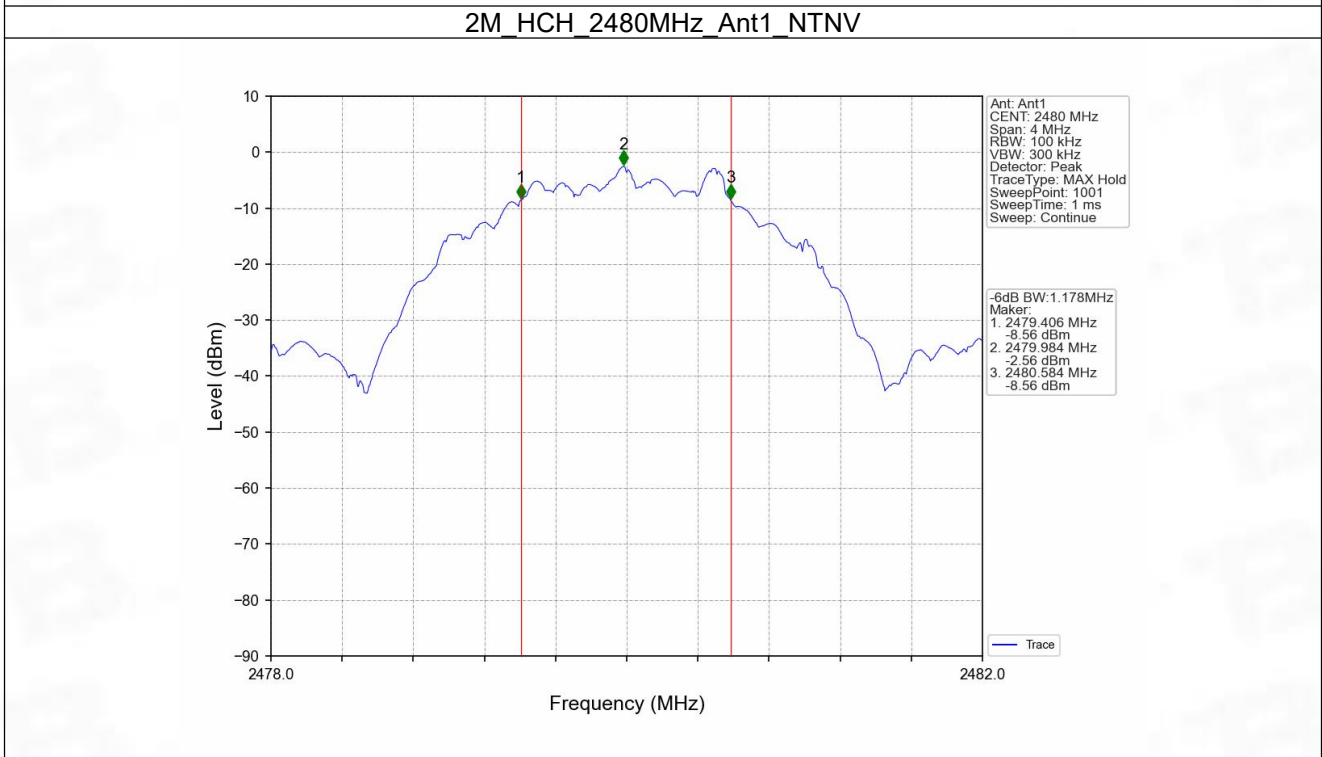
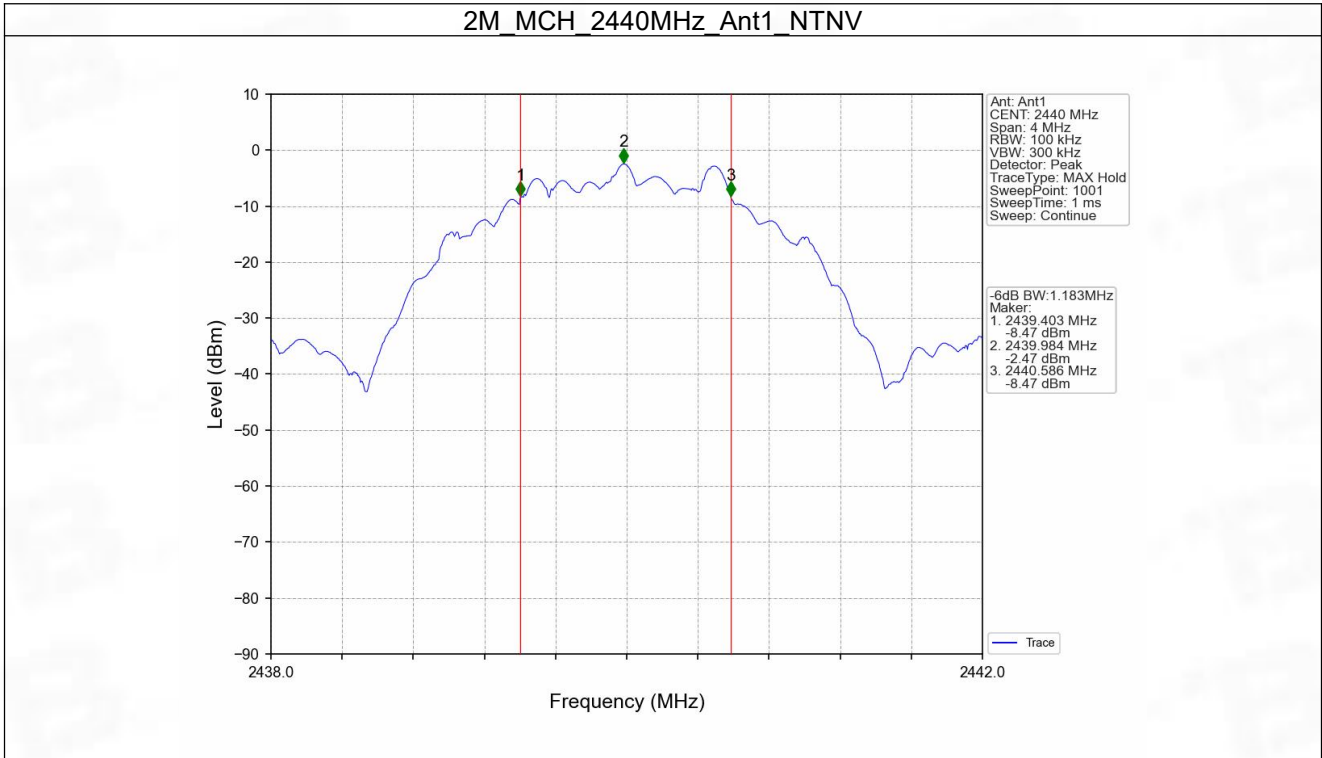


1M_HCH_2480MHz_Ant1_NTNV



2M_LCH_2402MHz_Ant1_NTNV





3. Maximum Conducted Output Power

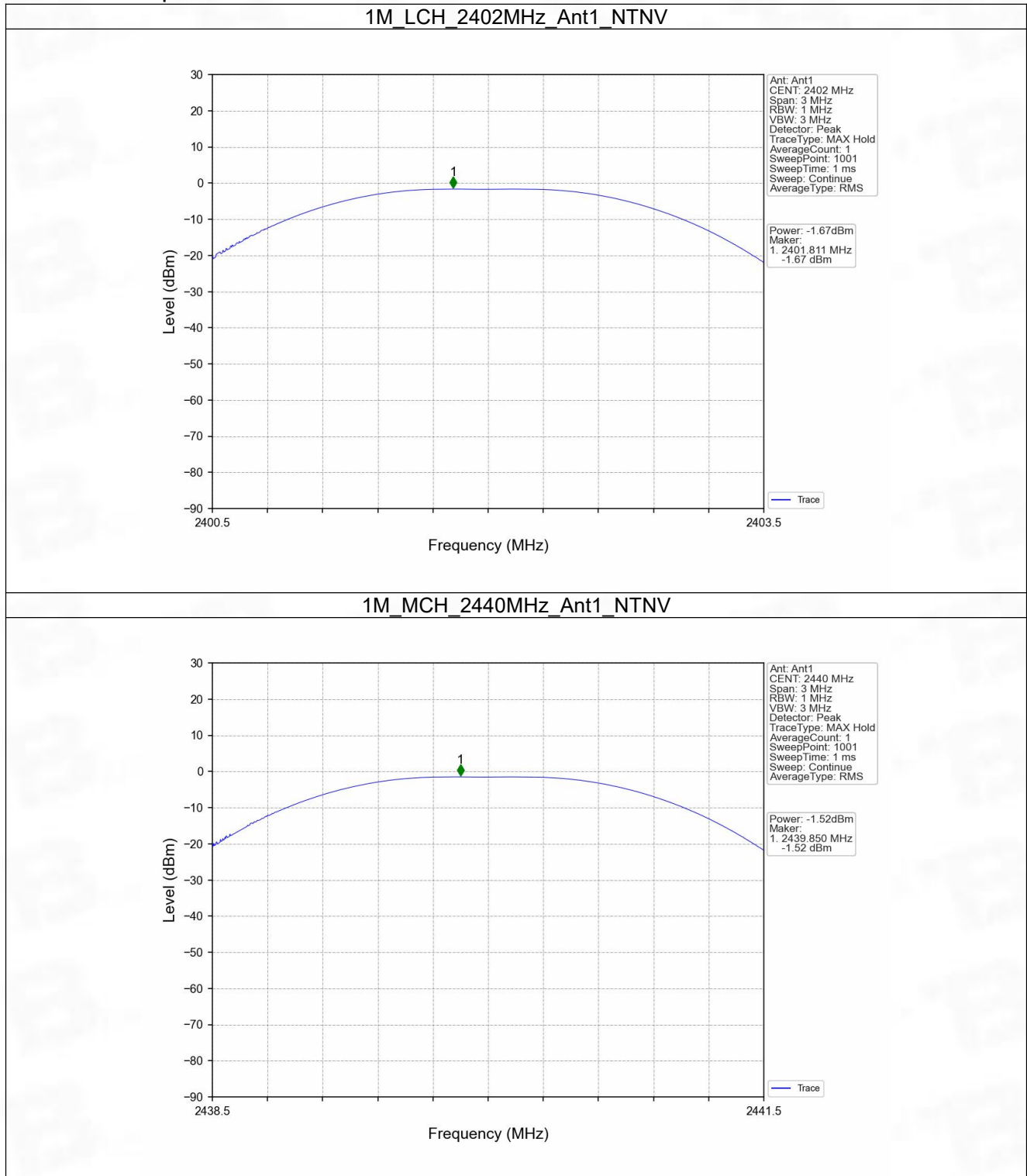
3.1 Power

3.1.1 Test Result

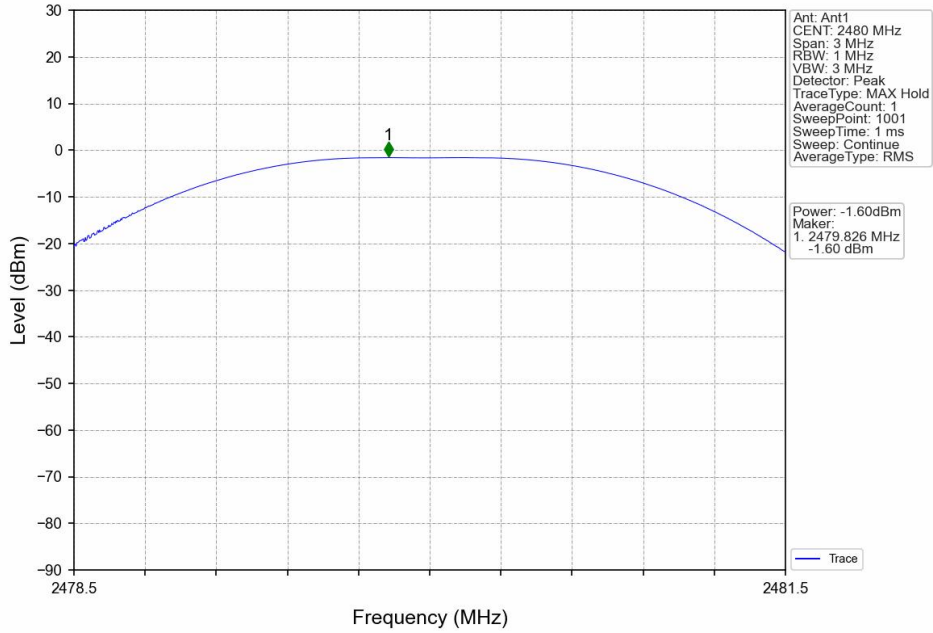
Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	-1.67	<=30	Pass
		2440	-1.52	<=30	Pass
		2480	-1.60	<=30	Pass
2M	SISO	2402	-1.63	<=30	Pass
		2440	-1.16	<=30	Pass
		2480	-1.55	<=30	Pass

Note1: Antenna Gain: Ant1: 1.14dBi;

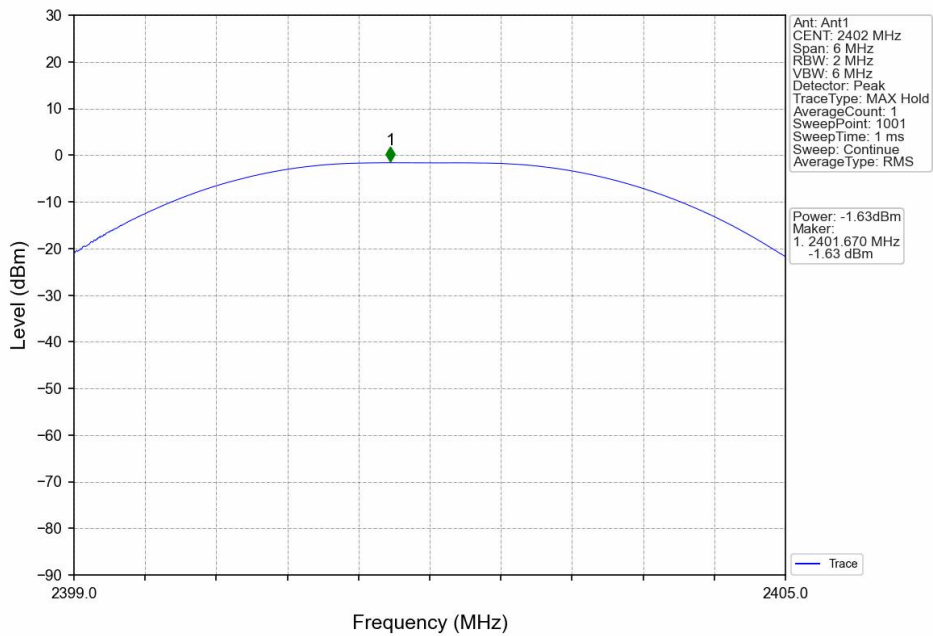
3.1.2 Test Graph



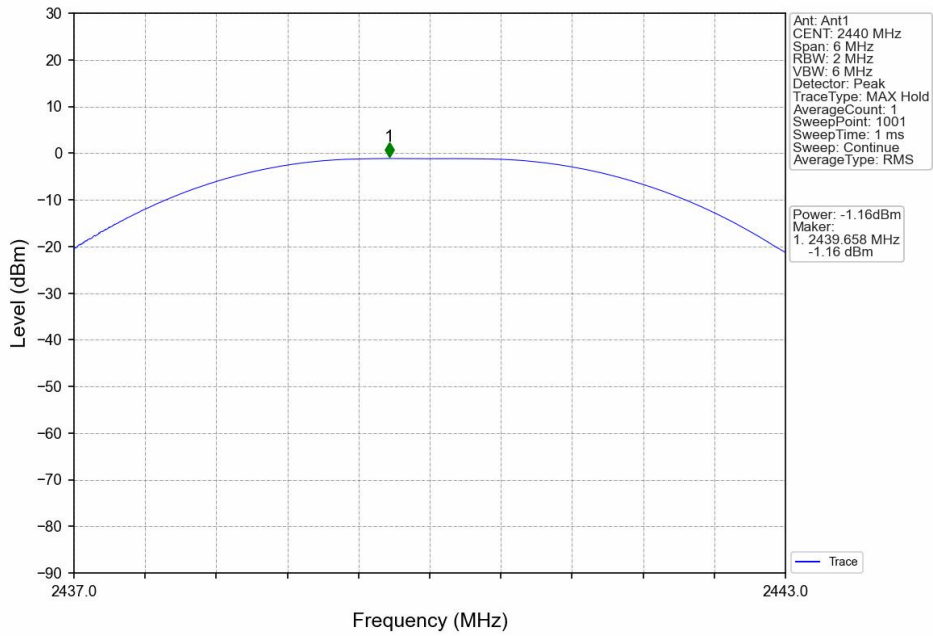
1M_HCH_2480MHz_Ant1_NTNV



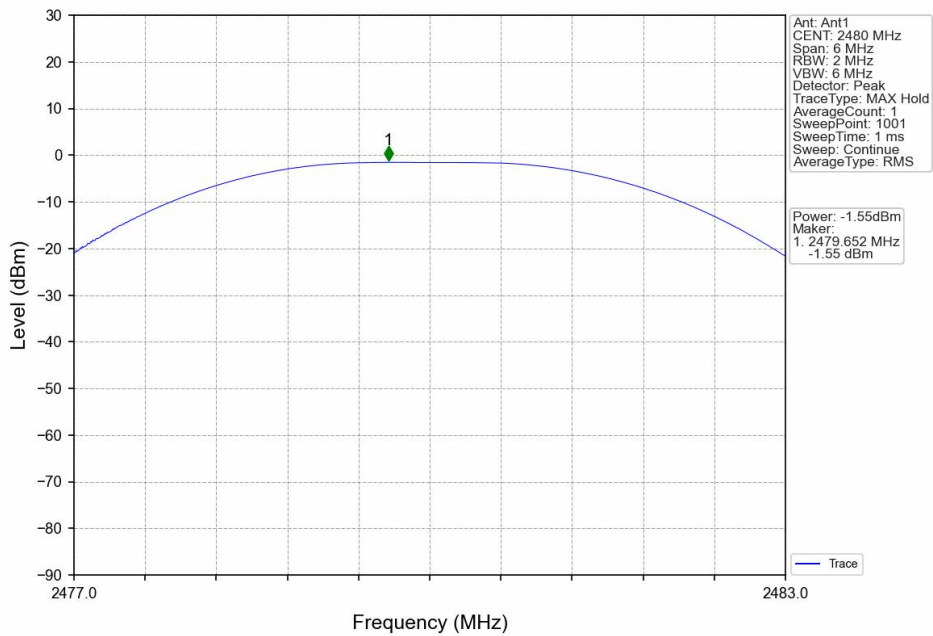
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



4. Maximum Power Spectral Density

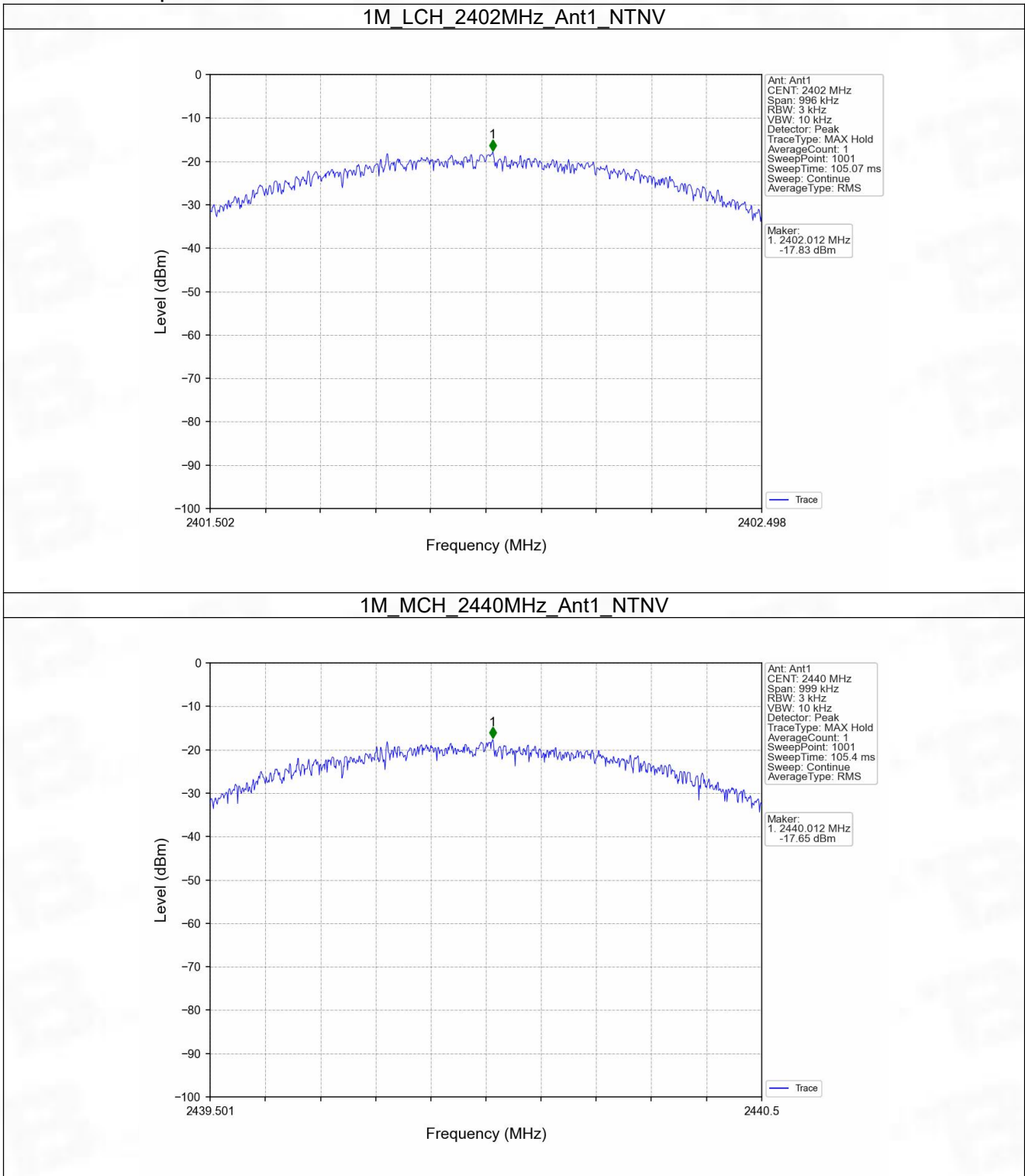
4.1 PSD

4.1.1 Test Result

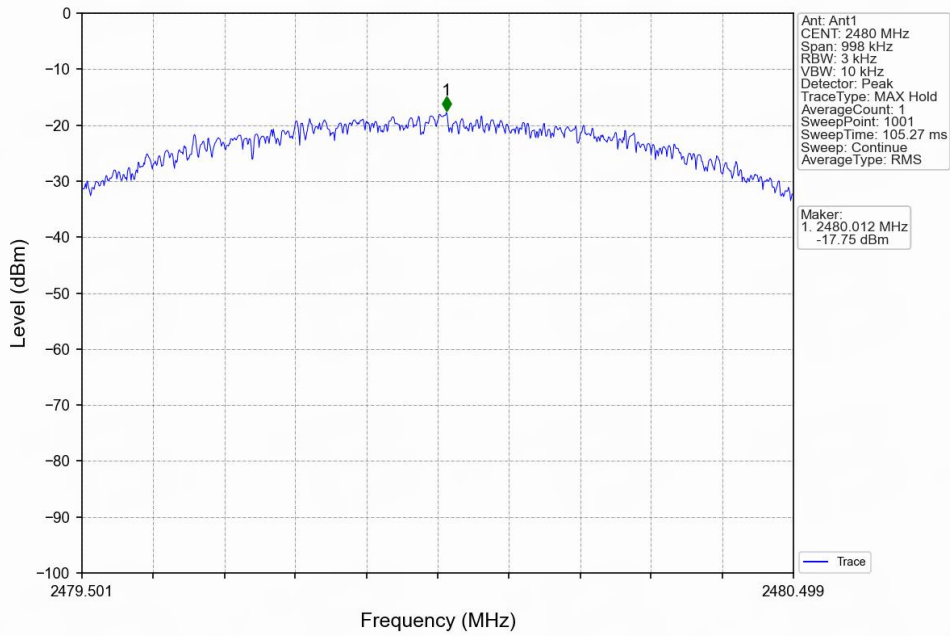
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
1M	SISO	2402	-17.83	<=8	Pass
		2440	-17.65	<=8	Pass
		2480	-17.75	<=8	Pass
2M	SISO	2402	-20.23	<=8	Pass
		2440	-20.67	<=8	Pass
		2480	-20.75	<=8	Pass

Note1: Antenna Gain: Ant1: 1.14dB;

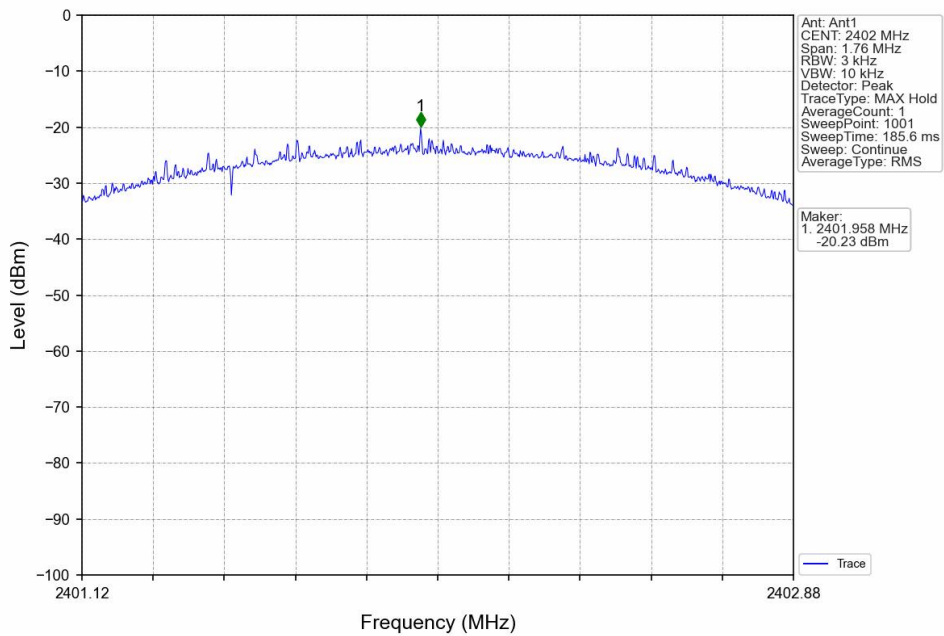
4.1.2 Test Graph



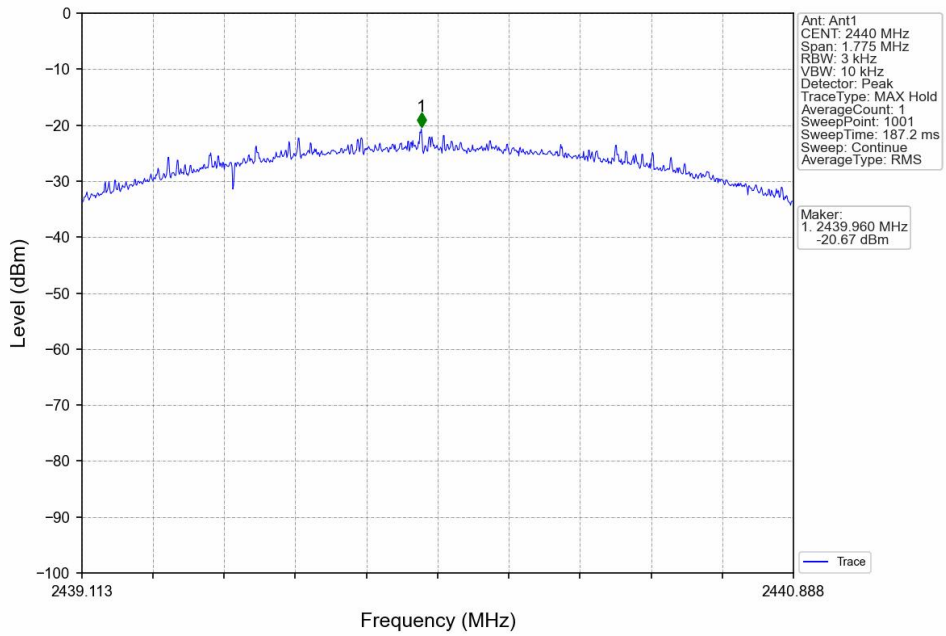
1M_HCH_2480MHz_Ant1_NTNV



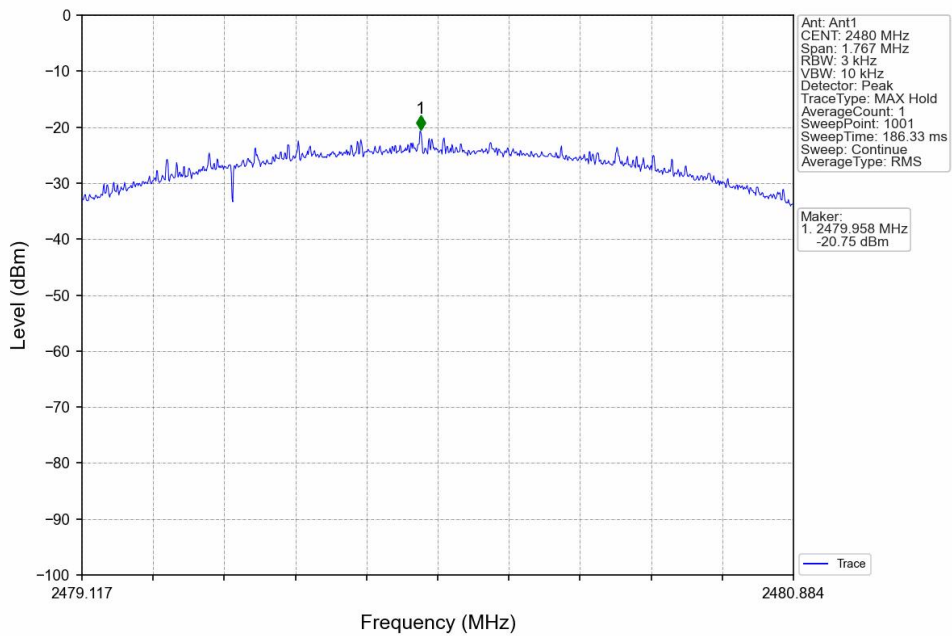
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	-1.79
		2440	1	-1.64
		2480	1	-1.71
2M	SISO	2402	1	-2.51
		2440	1	-2.33
		2480	1	-2.35

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.