RF Test Report

For

Applicant Name:	**SHENZHEN RANVOO DIGITAL TECHNOLOGY CO., LTD.**
Address:	RM1215, BLK C, Zhantao Technology BLDG, Minzhi Avenue, Minzhi ST, Longhua DIST, Shenzhen, China
EUT Name:	Wearable Smart Air Conditioner
Brand Name:	RANVOO
Model Number:	FG7

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:	BTF-SZ230216R-003
Test Standards:	47 CFR Part 15.247
Test Conclusion:	Pass
FCC ID:	2AN4X-FG7
Test Date:	2023-03-18 to 2023-03-20
Date of Issue:	2023-03-20
Prepared By:	Chris Liu / Project Engineer
Date:	2023-03-20
Approved By:	Ryan.CJ / EMC Manager
Date:	2023-03-20

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	2023-03-20	Original
Note: Once the revision has been made, then previous versions reports are invalid.		

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

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F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

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

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:	SHENZHEN RANVOO DIGITAL TECHNOLOGY CO., LTD.
Address:	RM1215, BLK C, Zhantao Technology BLDG, Minzhi Avenue, Minzhi ST, Longhua DIST, Shenzhen, China

2.2 Manufacturer Information

Company Name:	SHENZHEN RANVOO DIGITAL TECHNOLOGY CO., LTD.
Address:	RM1215, BLK C, Zhantao Technology BLDG, Minzhi Avenue, Minzhi ST, Longhua DIST, Shenzhen, China

2.3 Factory Information

Company Name:	SHENZHEN RANVOO DIGITAL TECHNOLOGY CO., LTD.
Address:	RM1215, BLK C, Zhantao Technology BLDG, Minzhi Avenue, Minzhi ST, Longhua DIST, Shenzhen, China

2.4 General Description of Equipment under Test (EUT)

EUT Name:	Wearable Smart Air Conditioner
Test Model Number:	FG7

2.5 Technical Information

Power Supply:	DC 3.85V from battery
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	79
Modulation Type:	GFSK, π/4 DQPSK, 8DPSK
Antenna Type:	Ceramic Antenna
Antenna Gain:	0.39dBi
Bluetooth Version:	5.0

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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	Part 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 15.215(c)	Pass
Maximum Conducted Output Power	47 CFR Part 15.247	47 CFR 15.247(b)(1)	Pass
Channel Separation	47 CFR Part 15.247	47 CFR 15.247(a)(1)	Pass
Number of Hopping Frequencies	47 CFR Part 15.247	47 CFR 15.247(a)(1)(iii)	Pass
Dwell Time	47 CFR Part 15.247	47 CFR 15.247(a)(1)(iii)	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

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4 Test Configuration

4.1 Test Equipment List

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

Occupied Bandwidth					
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 COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Maximum Conducted Output Power					
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 COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Channel Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
RFTest software	/	V1.00	/	/	/

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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 COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Number of Hopping Frequencies					
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 COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Dwell Time					
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 COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Emissions in non-restricted frequency bands

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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 COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

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	2022-03-26	2023-03-25
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	ESCI7	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 Preamplilifier	SCHWARZBECK	BBV9718D	00008	2022-03-26	2023-03-25
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

Emissions in restricted frequency bands (below 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2022-03-26	2023-03-25
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23

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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	ESCI7	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 Preamplilifier	SCHWARZBECK	BBV9718D	00008	2022-03-26	2023-03-25
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

Emissions in restricted frequency bands (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2022-03-26	2023-03-25
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	ESCI7	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 Preamplilifier	SCHWARZBECK	BBV9718D	00008	2022-03-26	2023-03-25
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ_EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/

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Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27

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4.2 Test Auxiliary Equipment

The EUT was tested as an independent device.

4.3 Test Modes

No.	Test Modes	Description
TM1	TX-GFSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with GFSK modulation.
TM2	TX-Pi/4DQPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with Pi/4DQPSK modulation.
TM3	TX-8DPSK (Non-Hopping)	Keep the EUT in continuously transmitting mode (non-hopping) with 8DPSK modulation.
TM4	TX-GFSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with GFSK modulation,.
TM5	TX-Pi/4DQPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with Pi/4DQPSK modulation.
TM6	TX-8DPSK (Hopping)	Keep the EUT in continuously transmitting mode (hopping) with 8DPSK modulation.

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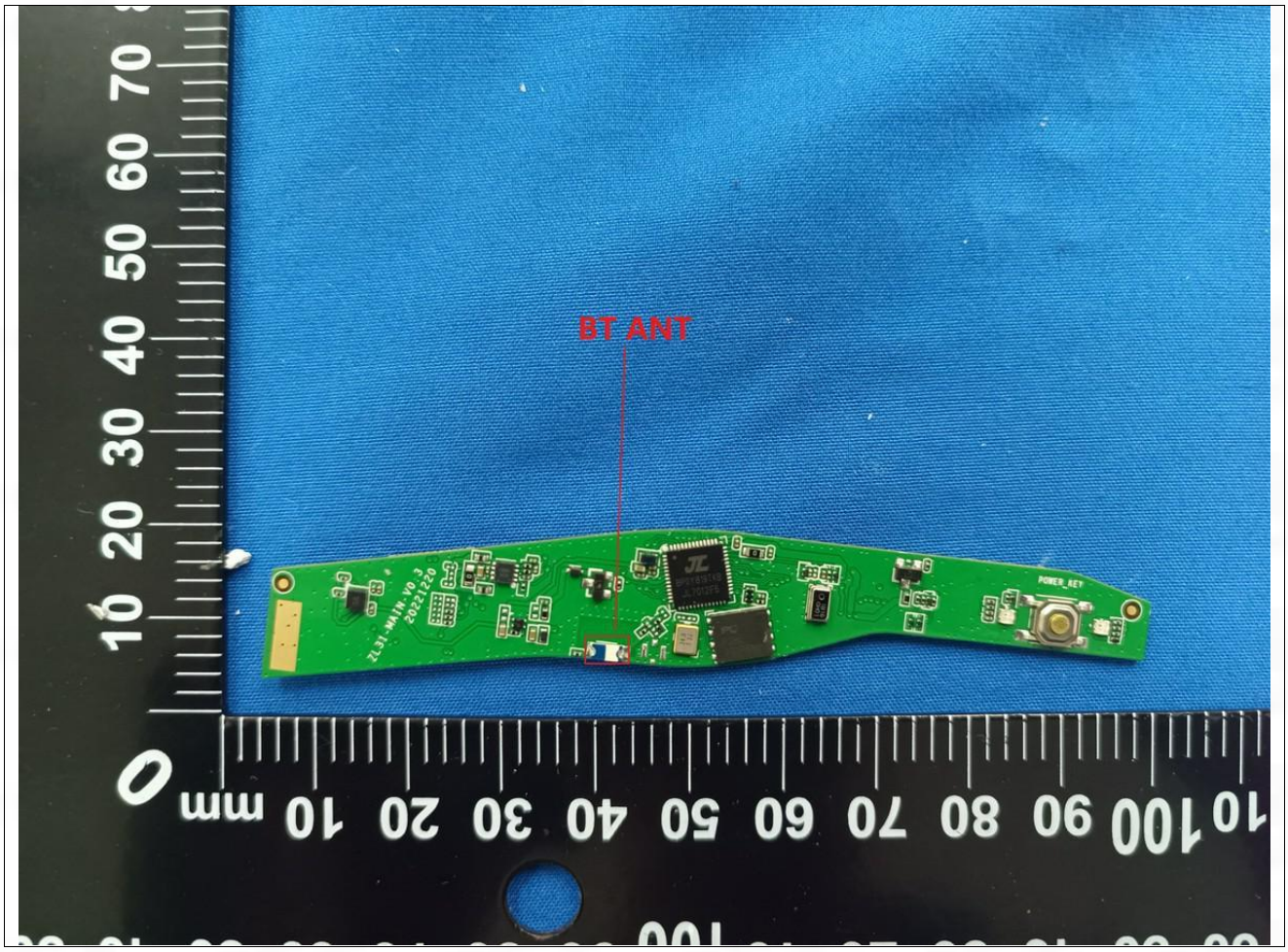
5 Evaluation Results (Evaluation)

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.

5.1.1 Conclusion:



6 Radio Spectrum Matter Test Results (RF)

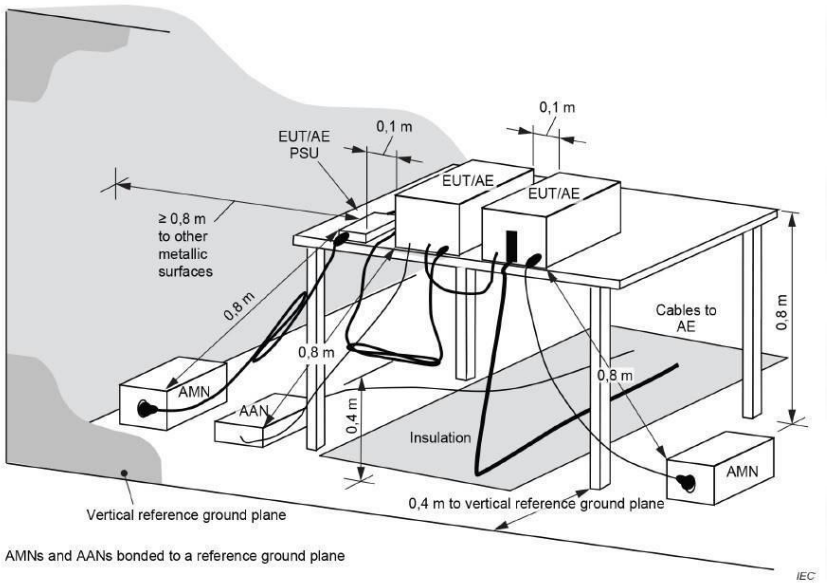
6.1 Conducted Emission at AC power line

Test Requirement:	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 μH/50 ohms line impedance stabilization network (LISN).
Test Method:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices
Test Limit:	Frequency of emission (MHz) / Conducted limit (dBμV): Quasi-peak / Average 0.15-0.5: 66 to 56* / 56 to 46* 0.5-5: 56 / 46 5-30: 60 / 50 *Decreases with the logarithm of the frequency.

6.1.1 E.U.T. Operation:

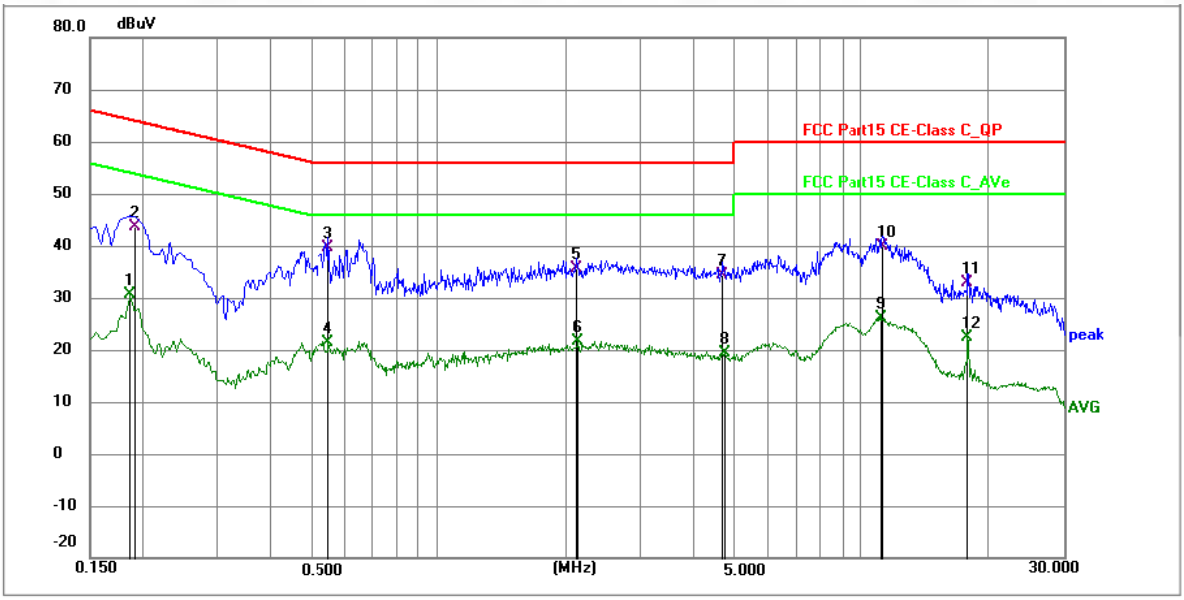
Operating Environment:	
Temperature:	23.9 °C
Humidity:	50.2 %
Atmospheric Pressure:	1010 mbar

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	0.1860	20.32	10.21	30.53	54.21	-23.68	AVG	P	
2	0.1905	33.44	10.21	43.65	64.01	-20.36	QP	P	
3 *	0.5503	29.27	10.26	39.53	56.00	-16.47	QP	P	
4	0.5503	11.23	10.26	21.49	46.00	-24.51	AVG	P	
5	2.1164	25.28	10.24	35.52	56.00	-20.48	QP	P	
6	2.1433	11.29	10.25	21.54	46.00	-24.46	AVG	P	
7	4.6725	24.26	10.23	34.49	56.00	-21.51	QP	P	
8	4.7264	9.18	10.23	19.41	46.00	-26.59	AVG	P	
9	11.1795	15.93	10.28	26.21	50.00	-23.79	AVG	P	
10	11.2380	29.59	10.27	39.86	60.00	-20.14	QP	P	
11	17.7990	22.91	9.88	32.79	60.00	-27.21	QP	P	
12	17.7990	12.48	9.88	22.36	50.00	-27.64	AVG	P	

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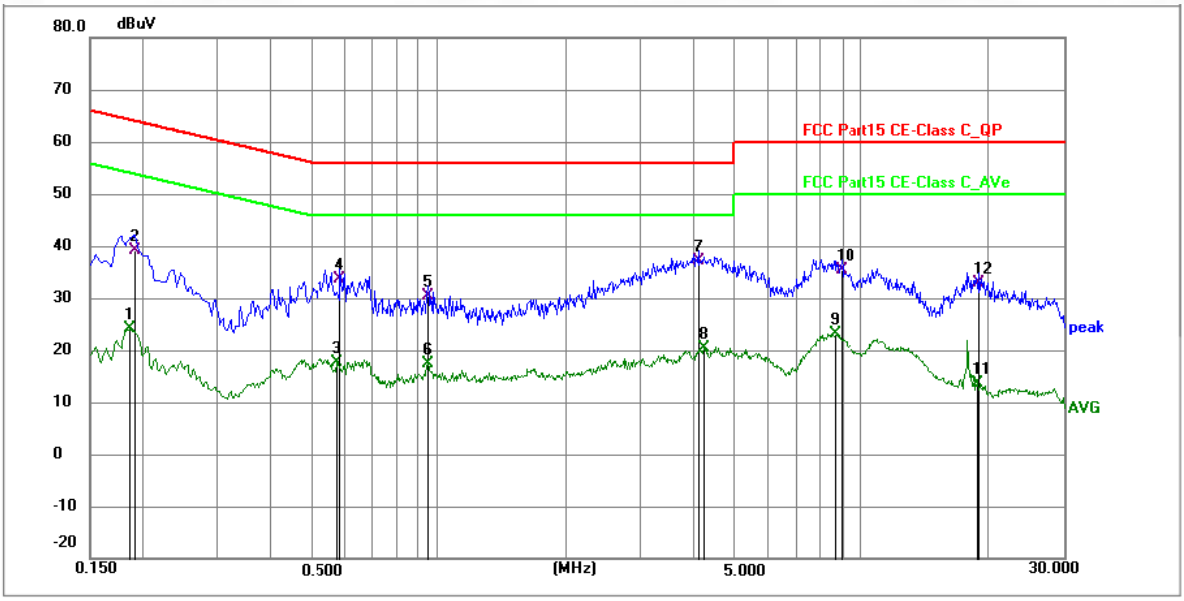
TM1 / Line: Neutral / Band: 2.4G / BW: 1 / CH: M



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1860	13.84	10.17	24.01	54.21	-30.20	AVG	P	
2	0.1905	28.85	10.18	39.03	64.01	-24.98	QP	P	
3	0.5775	7.47	10.26	17.73	46.00	-28.27	AVG	P	
4	0.5865	23.40	10.26	33.66	56.00	-22.34	QP	P	
5	0.9465	20.20	10.26	30.46	56.00	-25.54	QP	P	
6	0.9465	7.11	10.26	17.37	46.00	-28.63	AVG	P	
7 *	4.1055	26.83	10.22	37.05	56.00	-18.95	QP	P	
8	4.2313	10.13	10.22	20.35	46.00	-25.65	AVG	P	
9	8.6909	12.76	10.36	23.12	50.00	-26.88	AVG	P	
10	8.9205	25.12	10.38	35.50	60.00	-24.50	QP	P	
11	18.7665	3.82	9.89	13.71	50.00	-36.29	AVG	P	
12	18.9465	23.03	9.89	32.92	60.00	-27.08	QP	P	

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6.2 Occupied Bandwidth

Test Requirement:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Method:	Occupied bandwidth—relative measurement procedure
Test Limit:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Procedure:	a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW. b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement. c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2. d) Steps a) through c) might require iteration to adjust within the specified tolerances. e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “−xx dB down” requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value. f) Set detection mode to peak and trace mode to max hold. g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value). h) Determine the “−xx dB down amplitude” using [(reference value) − xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument. i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j). j) Place 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 “-xx dB down amplitude” determined in step h). If a marker is below this “−xx dB down amplitude” value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “-xx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.

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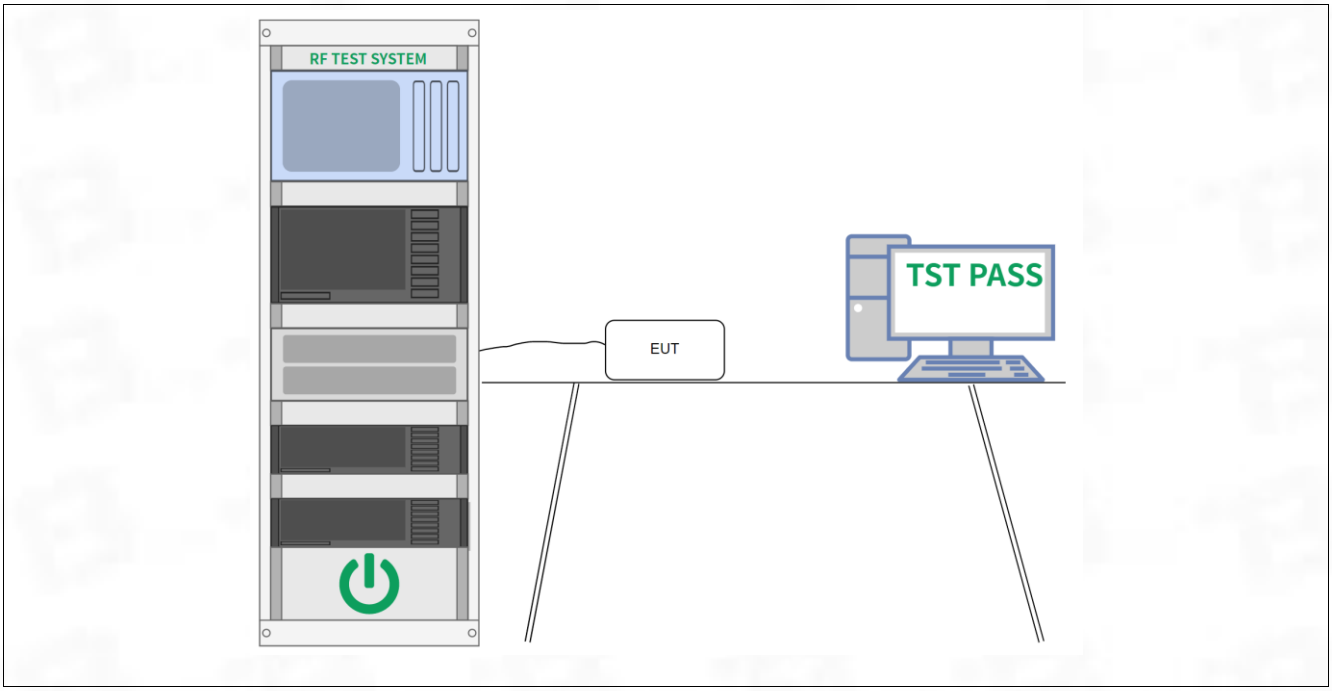
	k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

6.2.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
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:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Method:	Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices
Test Limit:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Procedure:	This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test: a) Use the following spectrum analyzer settings: 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel. 2) RBW > 20 dB bandwidth of the emission being measured. 3) VBW >= RBW. 4) Sweep: Auto. 5) Detector function: Peak. 6) Trace: Max hold. b) Allow trace to stabilize. c) Use the marker-to-peak function to set the marker to the peak of the emission. d) The indicated level is the peak output power, after any corrections for external attenuators and cables. e) A plot of the test results and setup description shall be included in the test report. NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

6.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
Atmospheric Pressure:	1010 mbar

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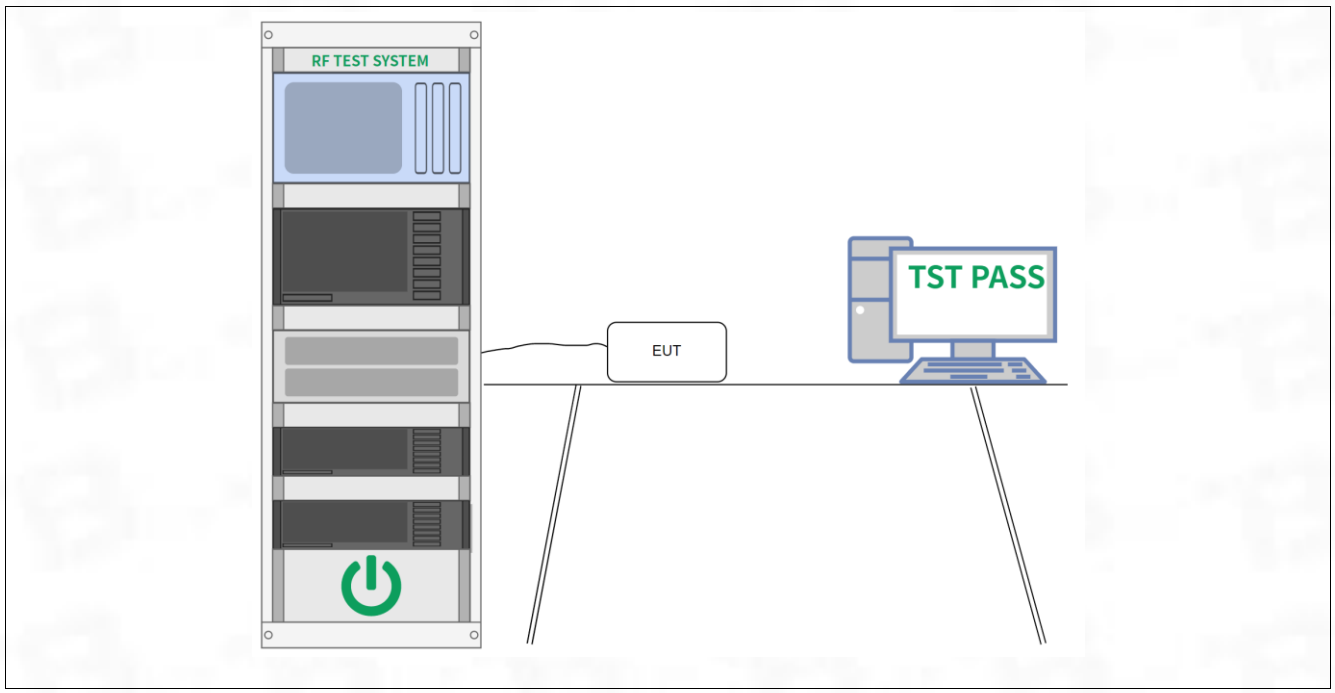
6.3.2 Test Setup Diagram:



6.3.3 Test Data:

Please Refer to Appendix for Details.

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6.4 Channel Separation

Test Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Test Method:	Carrier frequency separation
Test Limit:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Wide enough to capture the peaks of two adjacent channels. b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. c) Video (or average) bandwidth (VBW) ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

6.4.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
Atmospheric Pressure:	1010 mbar

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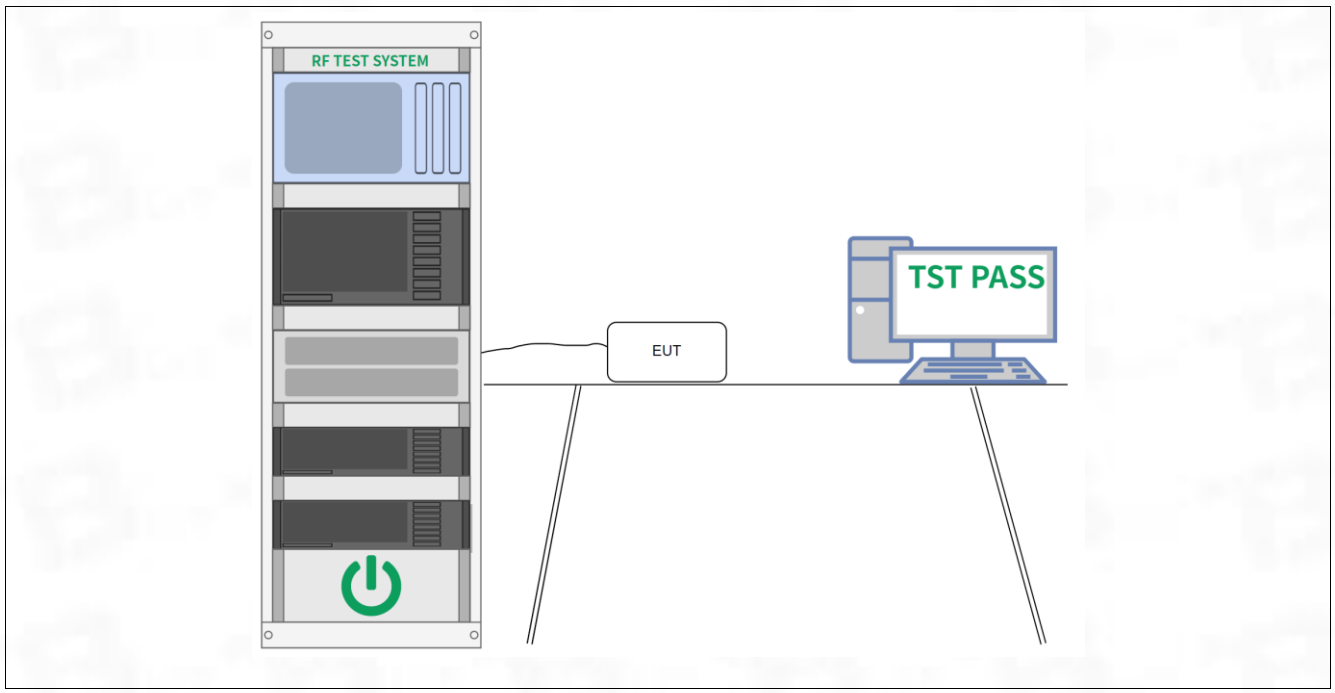
6.4.2 Test Setup Diagram:



6.4.3 Test Data:

Please Refer to Appendix for Details.

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6.5 Number of Hopping Frequencies

Test Requirement:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	Number of hopping frequencies
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen. b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller. c) VBW ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

6.5.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
Atmospheric Pressure:	1010 mbar

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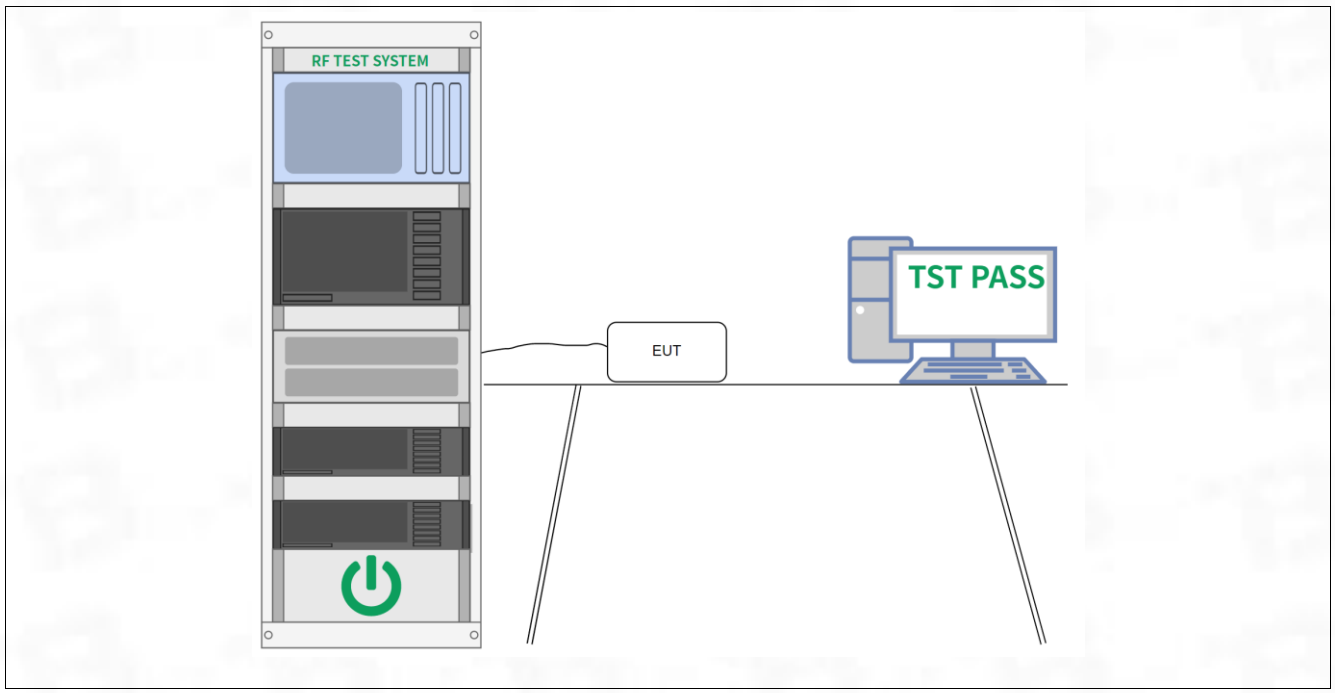
6.5.2 Test Setup Diagram:



6.5.3 Test Data:

Please Refer to Appendix for Details.

6.6 Dwell Time

Test Requirement:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	Time of occupancy (dwell time)
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Zero span, centered on a hopping channel. b) RBW shall be <= channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel. c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel. d) Detector function: Peak. e) Trace: Max hold. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation: (Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time) The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation. The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

6.6.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
Atmospheric Pressure:	1010 mbar

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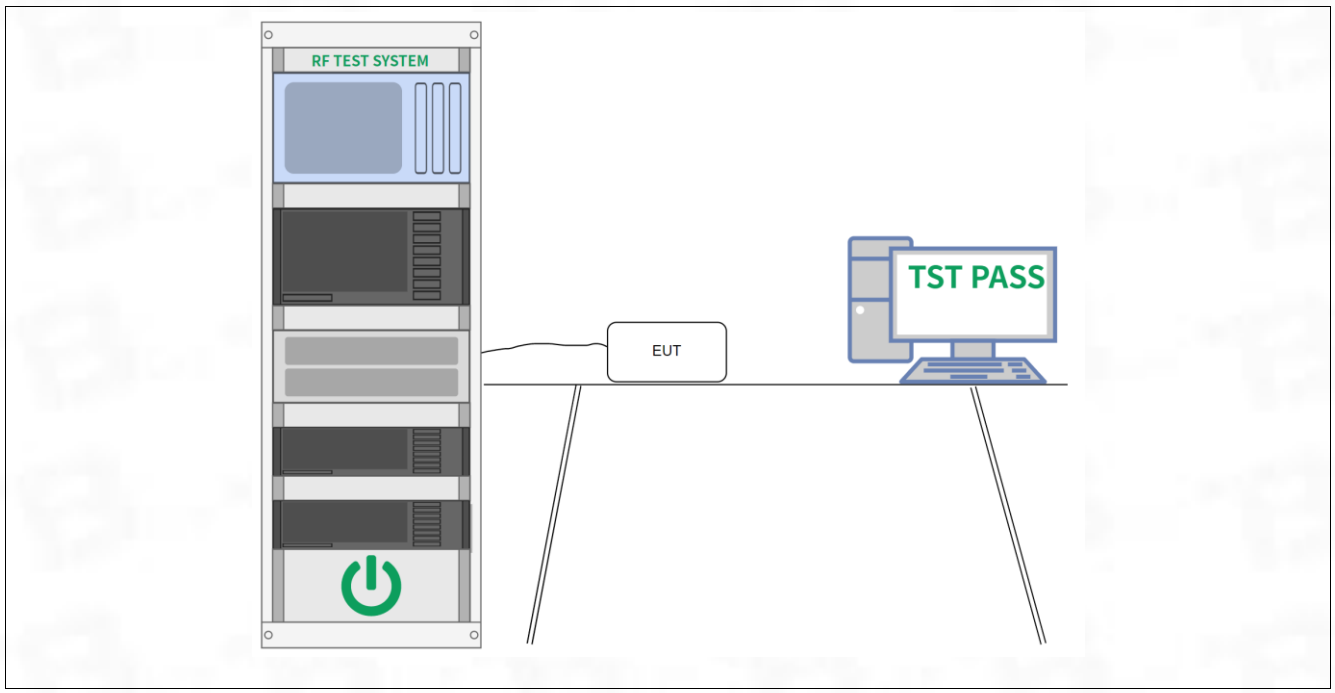
6.6.2 Test Setup Diagram:



6.6.3 Test Data:

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6.7 Emissions in non-restricted frequency bands

Test Requirement:	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.
Test Method:	Conducted spurious emissions test methodology
Test Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Procedure:	Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers. Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

6.7.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
Atmospheric Pressure:	1010 mbar

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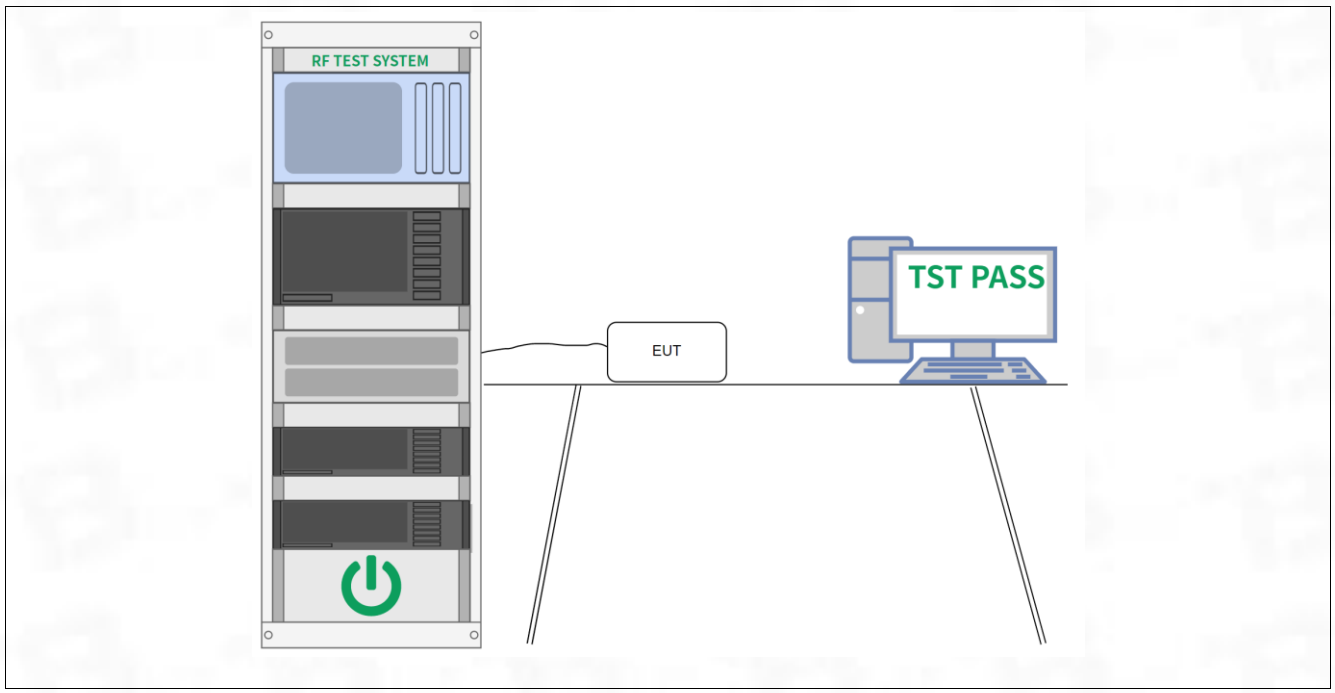
6.7.2 Test Setup Diagram:



6.7.3 Test Data:

Please Refer to Appendix for Details.

6.8 Band edge emissions (Radiated)

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:	Radiated emissions tests
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

6.8.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
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	2310.000	42.37	-4.39	37.98	74.00	-36.02	peak	P
2	2390.000	42.17	-4.29	37.88	74.00	-36.12	peak	P
3 *	2400.000	55.98	-4.28	51.70	74.00	-22.30	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	70.03	-30.49	39.54	74.00	-34.46	peak	P
3 *	2400.000	83.33	-30.48	52.85	74.00	-21.15	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	79.57	-30.39	49.18	74.00	-24.82	peak	P
2	2500.000	69.21	-30.37	38.84	74.00	-35.16	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	77.37	-30.39	46.98	74.00	-27.02	peak	P
2	2500.000	68.75	-30.37	38.38	74.00	-35.62	peak	P

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TM2 / 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	67.71	-30.59	37.12	74.00	-36.88	peak	P
2	2390.000	68.59	-30.49	38.10	74.00	-35.90	peak	P
3 *	2400.000	83.49	-30.48	53.01	74.00	-20.99	peak	P

TM2 / 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	42.91	-5.79	37.12	74.00	-36.88	peak	P
2	2390.000	43.79	-5.69	38.10	74.00	-35.90	peak	P
3 *	2400.000	56.19	-5.68	50.51	74.00	-23.49	peak	P

TM2 / 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	78.86	-30.39	48.47	74.00	-25.53	peak	P
2	2500.000	69.21	-30.37	38.84	74.00	-35.16	peak	P

TM2 / 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	76.93	-30.39	46.54	74.00	-27.46	peak	P
2	2500.000	67.92	-30.37	37.55	74.00	-36.45	peak	P

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TM3 / 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	67.51	-30.59	36.92	74.00	-37.08	peak	P
2	2390.000	68.74	-30.49	38.25	74.00	-35.75	peak	P
3 *	2400.000	82.37	-30.48	51.89	74.00	-22.11	peak	P

TM3 / 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	68.21	-30.59	37.62	74.00	-36.38	peak	P
2	2390.000	68.67	-30.49	38.18	74.00	-35.82	peak	P
3 *	2400.000	80.59	-30.48	50.11	74.00	-23.89	peak	P

TM3 / 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	78.45	-30.39	48.06	74.00	-25.94	peak	P
2	2500.000	68.59	-30.37	38.22	74.00	-35.78	peak	P

TM3 / 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	76.43	-30.39	46.04	74.00	-27.96	peak	P
2	2500.000	69.07	-30.37	38.70	74.00	-35.30	peak	P

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6.9 Emissions in restricted frequency bands (below 1GHz)

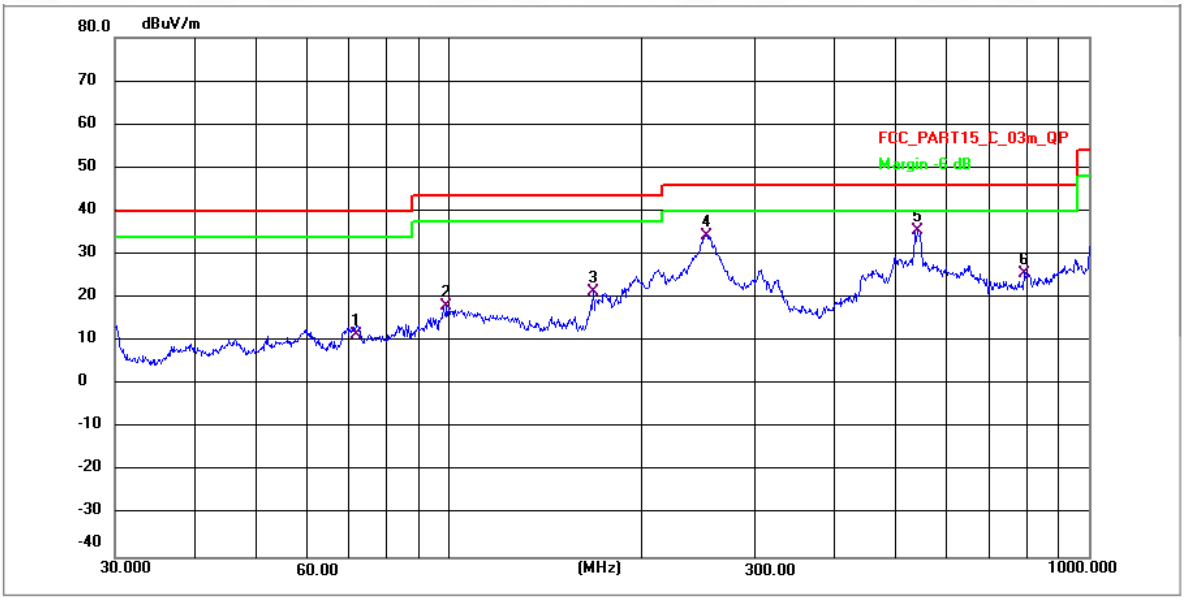
Test Requirement:	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`
Test Method:	Radiated emissions tests
Test Limit:	Frequency (MHz) / Field strength (microvolts/meter) / 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

6.9.1 E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
Atmospheric Pressure:	1010 mbar

6.9.2 Test Data:

TM3 / 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	71.8320	31.59	-20.04	11.55	40.00	-28.45	QP	P
2	99.1797	46.28	-28.36	17.92	43.50	-25.58	QP	P
3	167.8243	49.12	-27.62	21.50	43.50	-22.00	QP	P
4	253.0627	60.22	-25.84	34.38	46.00	-11.62	QP	P
5 *	540.4775	57.00	-21.55	35.45	46.00	-10.55	QP	P
6	793.3960	49.45	-23.75	25.70	46.00	-20.30	QP	P

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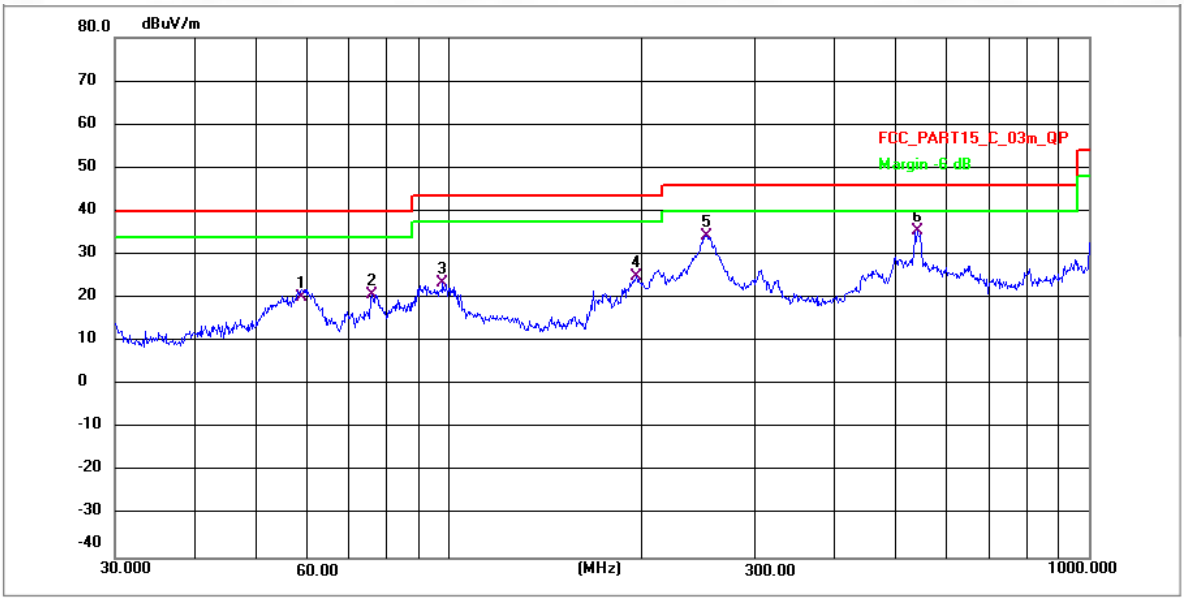
TM3 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	58.6126	40.19	-20.18	20.01	40.00	-19.99	QP	P
2	75.9773	40.58	-19.89	20.69	40.00	-19.31	QP	P
3	97.7983	52.01	-28.59	23.42	43.50	-20.08	QP	P
4	195.8220	52.32	-27.37	24.95	43.50	-18.55	QP	P
5	252.0627	60.22	-25.84	34.38	46.00	-11.62	QP	P
6 *	539.4775	57.00	-21.55	35.45	46.00	-10.55	QP	P

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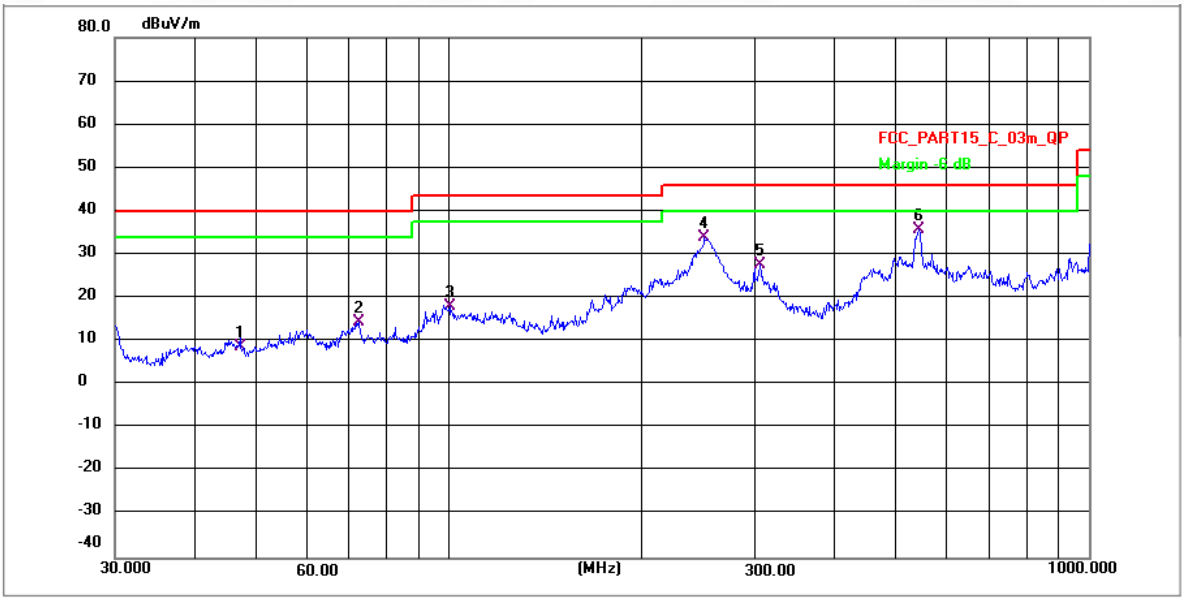
TM3 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: M



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	46.9948	29.26	-20.42	8.84	40.00	-31.16	QP	P
2	72.3376	34.41	-20.03	14.38	40.00	-25.62	QP	P
3	100.2283	46.32	-28.23	18.09	43.50	-25.41	QP	P
4	251.3012	59.81	-25.85	33.96	46.00	-12.04	QP	P
5	305.6800	52.99	-25.38	27.61	46.00	-18.39	QP	P
6 *	544.2742	57.21	-21.59	35.62	46.00	-10.38	QP	P

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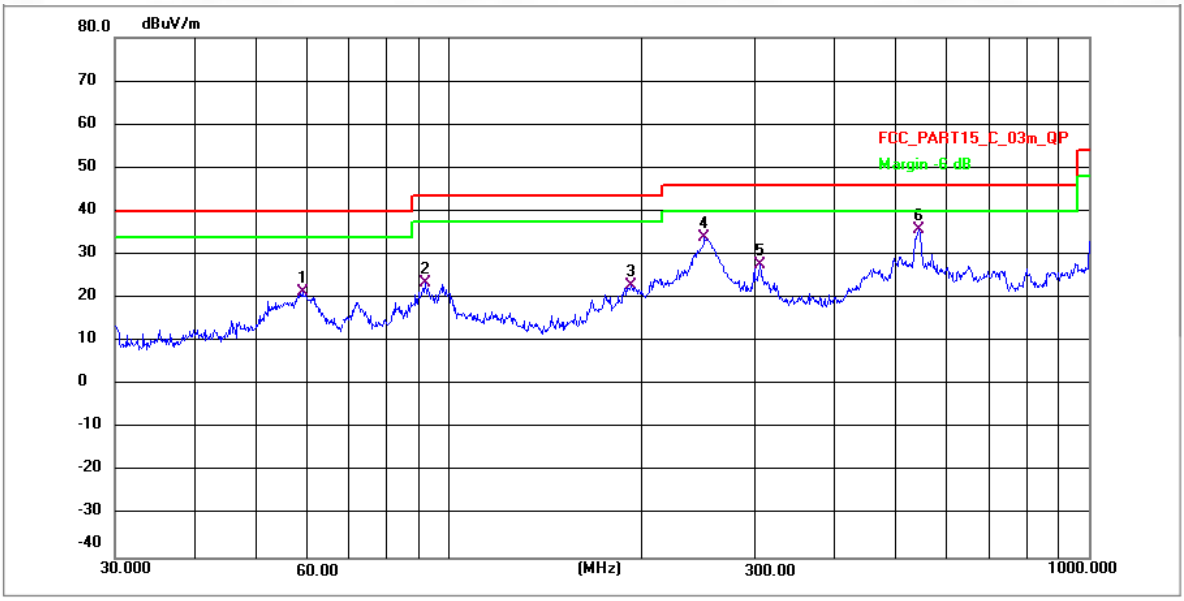
TM3 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: M



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	58.8185	41.56	-20.17	21.39	40.00	-18.61	QP	P
2	91.8163	53.01	-29.58	23.43	43.50	-20.07	QP	P
3	192.4186	50.28	-27.40	22.88	43.50	-20.62	QP	P
4	250.3012	59.81	-25.85	33.96	46.00	-12.04	QP	P
5	306.6800	52.99	-25.38	27.61	46.00	-18.39	QP	P
6 *	543.3742	57.21	-21.59	35.62	46.00	-10.38	QP	P

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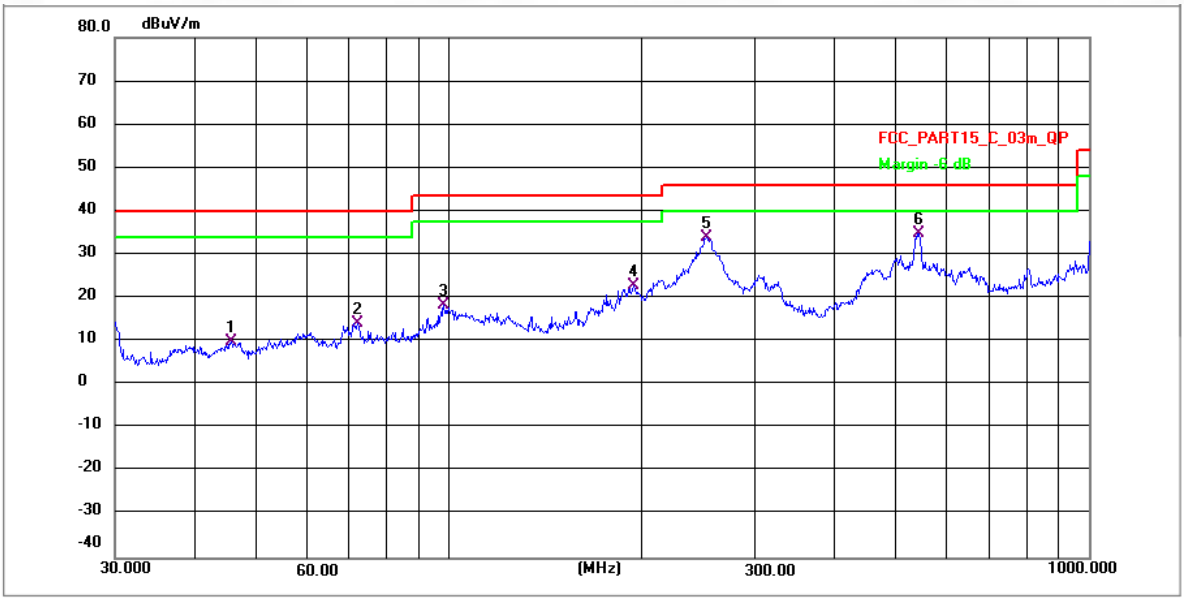
TM3 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	45.5348	30.44	-20.44	10.00	40.00	-30.00	QP	P
2	72.0843	34.12	-20.04	14.08	40.00	-25.92	QP	P
3	98.1419	46.81	-28.54	18.27	43.50	-25.23	QP	P
4	193.7728	50.25	-27.38	22.87	43.50	-20.63	QP	P
5	252.0627	59.71	-25.84	33.87	46.00	-12.13	QP	P
6 *	543.2742	56.52	-21.59	34.93	46.00	-11.07	QP	P

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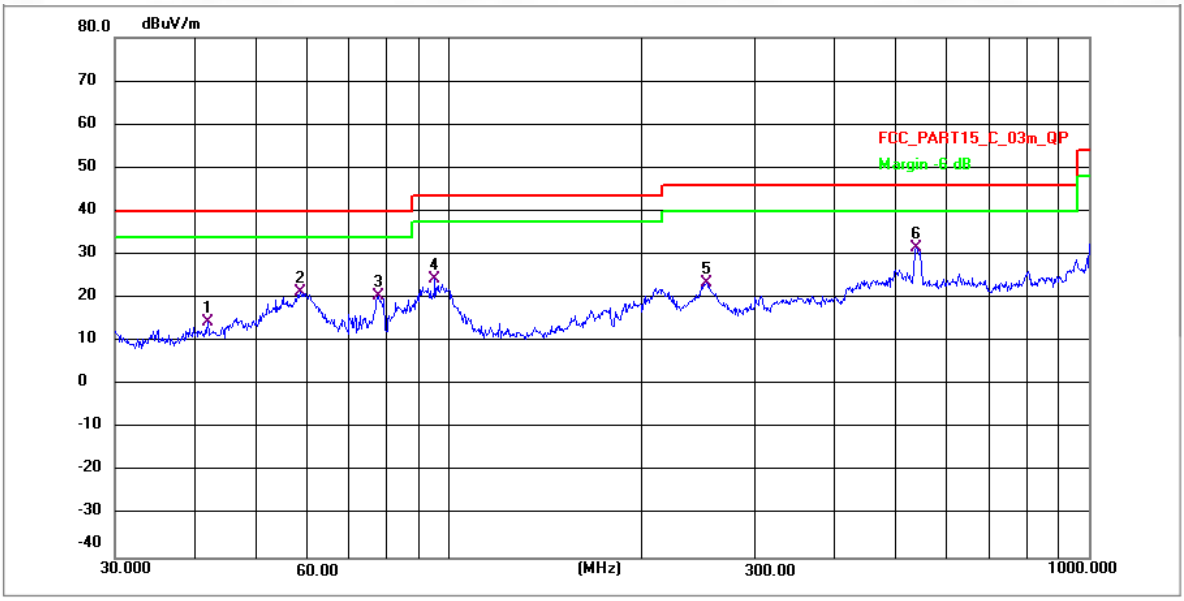
TM3 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F
1	41.8596	35.06	-20.49	14.57	40.00	-25.43	QP	P
2	58.4074	41.48	-20.19	21.29	40.00	-18.71	QP	P
3	77.5926	40.28	-19.87	20.41	40.00	-19.59	QP	P
4	95.0930	53.25	-29.04	24.21	43.50	-19.29	QP	P
5	252.1627	49.17	-25.84	23.33	46.00	-22.67	QP	P
6 *	537.5891	53.08	-21.53	31.55	46.00	-14.45	QP	P

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6.10 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:	Radiated emissions tests
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

6.10.1E.U.T. Operation:

Operating Environment:	
Temperature:	23.1 °C
Humidity:	50.1 %
Atmospheric Pressure:	1010 mbar

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6.10.2Test 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	1953.649	67.14	-31.00	36.14	74.00	-37.86	peak	P
2	2876.919	70.56	-29.72	40.84	74.00	-33.16	peak	P
3	3872.306	67.60	-29.01	38.59	74.00	-35.41	peak	P
4	5795.356	68.87	-25.99	42.88	74.00	-31.12	peak	P
5	7775.734	73.85	-25.20	48.65	74.00	-25.35	peak	P
6 *	11060.101	74.96	-23.40	51.56	74.00	-22.44	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	1923.950	67.49	-31.05	36.44	74.00	-37.56	peak	P
2	2563.553	63.27	-30.26	33.01	74.00	-40.99	peak	P
3	3602.366	67.97	-29.04	38.93	74.00	-35.07	peak	P
4	4805.499	71.99	-27.92	44.07	74.00	-29.93	peak	P
5	7508.489	72.53	-24.80	47.73	74.00	-26.27	peak	P
6 *	9627.333	74.28	-23.48	50.80	74.00	-23.20	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	3045.485	68.44	-29.47	38.97	74.00	-35.03	peak	P
2	3933.219	68.42	-29.01	39.41	74.00	-34.59	peak	P
3	5280.322	70.51	-27.13	43.38	74.00	-30.62	peak	P
4	7920.911	72.08	-25.41	46.67	74.00	-27.33	peak	P
5 *	12340.533	74.54	-21.80	52.74	74.00	-21.26	peak	P
6	16414.563	68.85	-19.60	49.25	74.00	-24.75	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	2838.101	69.19	-29.79	39.40	74.00	-34.60	peak	P
2	4106.309	68.73	-28.95	39.78	74.00	-34.22	peak	P
3	5979.118	70.98	-25.39	45.59	74.00	-28.41	peak	P
4	8655.895	73.48	-25.00	48.48	74.00	-25.52	peak	P
5 *	11490.229	73.82	-23.07	50.75	74.00	-23.25	peak	P
6	16062.560	68.43	-21.28	47.15	74.00	-26.85	peak	P

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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	3037.573	68.22	-29.47	38.75	74.00	-35.25	peak	P
2	5171.570	69.93	-27.23	42.70	74.00	-31.30	peak	P
3	6336.772	71.70	-25.36	46.34	74.00	-27.66	peak	P
4	8544.040	73.37	-25.23	48.14	74.00	-25.86	peak	P
5 *	11460.378	74.08	-23.10	50.98	74.00	-23.02	peak	P
6	13757.267	70.24	-21.03	49.21	74.00	-24.79	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	2802.236	63.47	-29.85	33.62	74.00	-40.38	peak	P
2	3546.577	68.27	-29.05	39.22	74.00	-34.78	peak	P
3	5979.118	68.48	-25.39	43.09	74.00	-30.91	peak	P
4	7324.150	72.17	-24.83	47.34	74.00	-26.66	peak	P
5	9399.121	71.62	-23.42	48.20	74.00	-25.80	peak	P
6 *	14148.432	69.72	-21.12	48.60	74.00	-25.40	peak	P

TM2 / 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	1343.270	68.30	-30.85	37.45	74.00	-36.55	peak	P
2	1891.418	73.63	-31.10	42.53	74.00	-31.47	peak	P
3	2727.125	68.84	-29.98	38.86	74.00	-35.14	peak	P
4	3266.135	71.65	-29.27	42.38	74.00	-31.62	peak	P
5	4770.900	67.94	-28.01	39.93	74.00	-34.07	peak	P
6 *	7704.146	75.12	-25.09	50.03	74.00	-23.97	peak	P

TM2 / 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	1404.006	68.01	-31.19	36.82	74.00	-37.18	peak	P
2	1959.304	73.25	-30.99	42.26	74.00	-31.74	peak	P
3	2782.864	70.28	-29.89	40.39	74.00	-33.61	peak	P
4	4449.879	71.83	-28.81	43.02	74.00	-30.98	peak	P
5 *	6677.110	74.10	-25.22	48.88	74.00	-25.12	peak	P
6	14354.388	69.05	-21.16	47.89	74.00	-26.11	peak	P

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TM2 / 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	2695.777	65.58	-30.03	35.55	74.00	-38.45	peak	P
2	3943.464	70.84	-29.01	41.83	74.00	-32.17	peak	P
3	5539.849	68.76	-26.82	41.94	74.00	-32.06	peak	P
4	7882.086	71.42	-25.36	46.06	74.00	-27.94	peak	P
5	12505.705	69.82	-21.61	48.21	74.00	-25.79	peak	P
6 *	17968.811	69.26	-16.83	52.43	74.00	-21.57	peak	P

TM2 / 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	2098.831	75.27	-30.82	44.45	74.00	-29.55	peak	P
2	3546.577	70.77	-29.05	41.72	74.00	-32.28	peak	P
3 *	7413.604	75.85	-24.81	51.04	74.00	-22.96	peak	P
4	9291.079	73.80	-23.67	50.13	74.00	-23.87	peak	P
5	12198.680	70.61	-21.96	48.65	74.00	-25.35	peak	P
6	16165.025	67.04	-20.79	46.25	74.00	-27.75	peak	P

TM2 / 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	1532.955	67.63	-31.65	35.98	74.00	-38.02	peak	P
2	2558.371	70.50	-30.27	40.23	74.00	-33.77	peak	P
3	4114.626	71.30	-28.95	42.35	74.00	-31.65	peak	P
4 *	6464.418	72.15	-25.38	46.77	74.00	-27.23	peak	P
5	9610.652	69.24	-23.44	45.80	74.00	-28.20	peak	P
6	13670.064	66.44	-21.01	45.43	74.00	-28.57	peak	P

TM2 / 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	1280.712	63.69	-30.51	33.18	74.00	-40.82	peak	P
2	2034.326	70.07	-30.90	39.17	74.00	-34.83	peak	P
3	4331.858	66.56	-28.86	37.70	74.00	-36.30	peak	P
4 *	8015.336	72.06	-25.52	46.54	74.00	-27.46	peak	P
5	12717.119	65.10	-21.49	43.61	74.00	-30.39	peak	P
6	16338.827	65.79	-19.96	45.83	74.00	-28.17	peak	P

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TM3 / 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	1548.541	64.60	-31.63	32.97	74.00	-41.03	peak	P
2	2072.907	71.56	-30.85	40.71	74.00	-33.29	peak	P
3	3401.993	74.06	-29.14	44.92	74.00	-29.08	peak	P
4	4802.722	74.84	-27.92	46.92	74.00	-27.08	peak	P
5 *	7521.522	71.76	-24.81	46.95	74.00	-27.05	peak	P
6	10713.986	69.89	-24.06	45.83	74.00	-28.17	peak	P

TM3 / 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	3132.079	73.65	-29.39	44.26	74.00	-29.74	peak	P
2	4047.392	76.16	-28.98	47.18	74.00	-26.82	peak	P
3	6018.998	67.04	-25.33	41.71	74.00	-32.29	peak	P
4	7973.743	72.97	-25.49	47.48	74.00	-26.52	peak	P
5 *	11755.615	72.99	-22.61	50.38	74.00	-23.62	peak	P
6	15421.103	70.12	-21.32	48.80	74.00	-25.20	peak	P

TM3 / 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	2639.493	63.50	-30.13	33.37	74.00	-40.63	peak	P
2	3603.407	71.87	-29.04	42.83	74.00	-31.17	peak	P
3	5727.084	68.79	-26.21	42.58	74.00	-31.42	peak	P
4	7771.240	70.06	-25.19	44.87	74.00	-29.13	peak	P
5	11490.229	69.82	-23.07	46.75	74.00	-27.25	peak	P
6 *	15573.397	72.06	-21.51	50.55	74.00	-23.45	peak	P

TM3 / 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	2848.785	68.60	-29.77	38.83	74.00	-35.17	peak	P
2	3999.712	73.15	-29.00	44.15	74.00	-29.85	peak	P
3	5996.425	69.20	-25.34	43.86	74.00	-30.14	peak	P
4	8331.868	72.50	-25.39	47.11	74.00	-26.89	peak	P
5	11224.344	71.55	-23.28	48.27	74.00	-25.73	peak	P
6 *	14050.625	71.18	-21.10	50.08	74.00	-23.92	peak	P

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TM3 / 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	3603.407	74.37	-29.04	45.33	74.00	-28.67	peak	P
2	4367.058	78.48	-28.84	49.64	74.00	-24.36	peak	P
3	6294.786	70.37	-25.36	45.01	74.00	-28.99	peak	P
4	8368.070	73.33	-25.38	47.95	74.00	-26.05	peak	P
5	12444.407	72.99	-21.68	51.31	74.00	-22.69	peak	P
6 *	15292.382	72.60	-21.04	51.56	74.00	-22.44	peak	P

TM3 / 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	3978.957	75.35	-29.01	46.34	74.00	-27.66	peak	P
2	4829.170	68.64	-27.86	40.78	74.00	-33.22	peak	P
3	6294.786	69.87	-25.36	44.51	74.00	-29.49	peak	P
4	7973.743	72.97	-25.49	47.48	74.00	-26.52	peak	P
5	10621.486	70.99	-24.26	46.73	74.00	-27.27	peak	P
6 *	14317.096	70.74	-21.16	49.58	74.00	-24.42	peak	P

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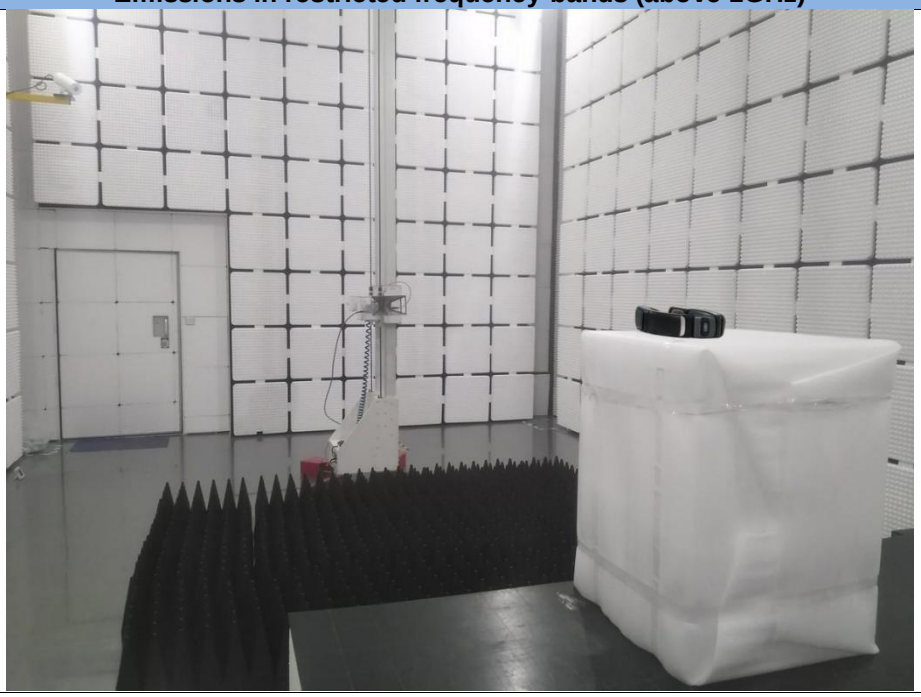
7 Test Setup Photos

Conducted Emission at AC power line


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


Emissions in restricted frequency bands (below 1GHz)


8 EUT Constructional Details (EUT Photos)

External

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Internal

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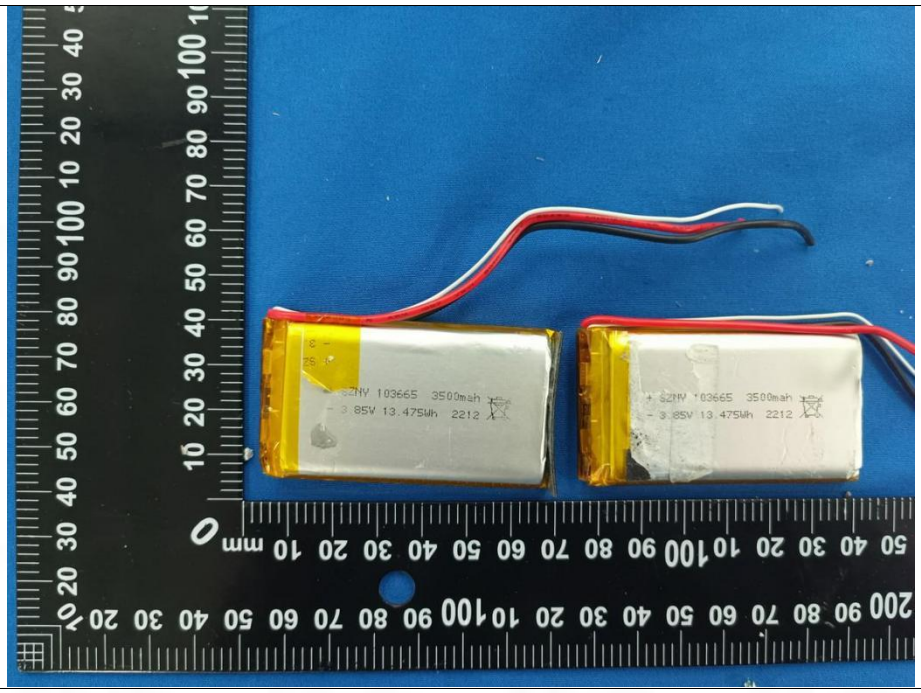
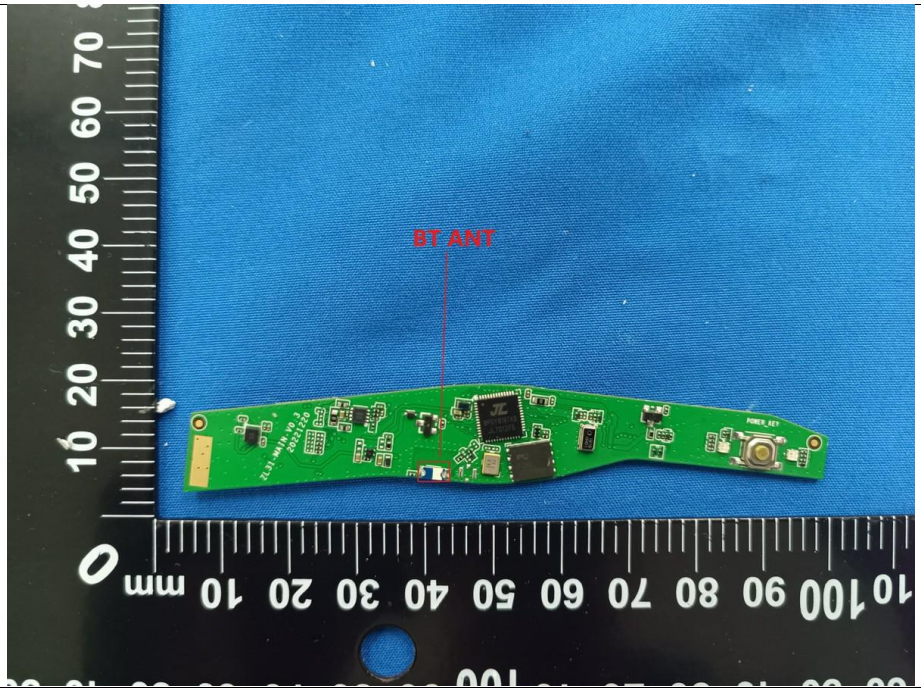
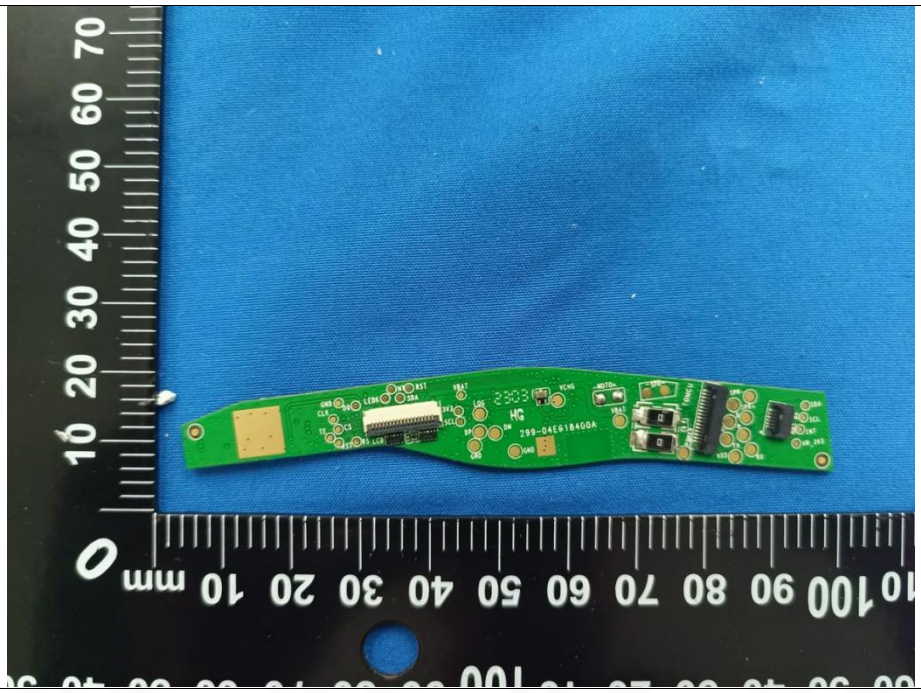
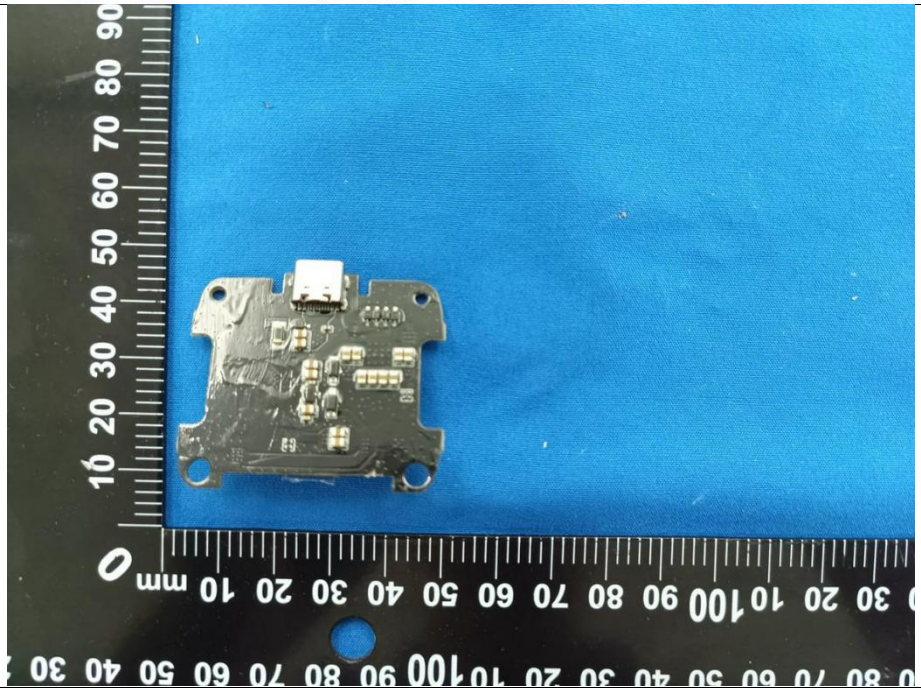



BT ANT





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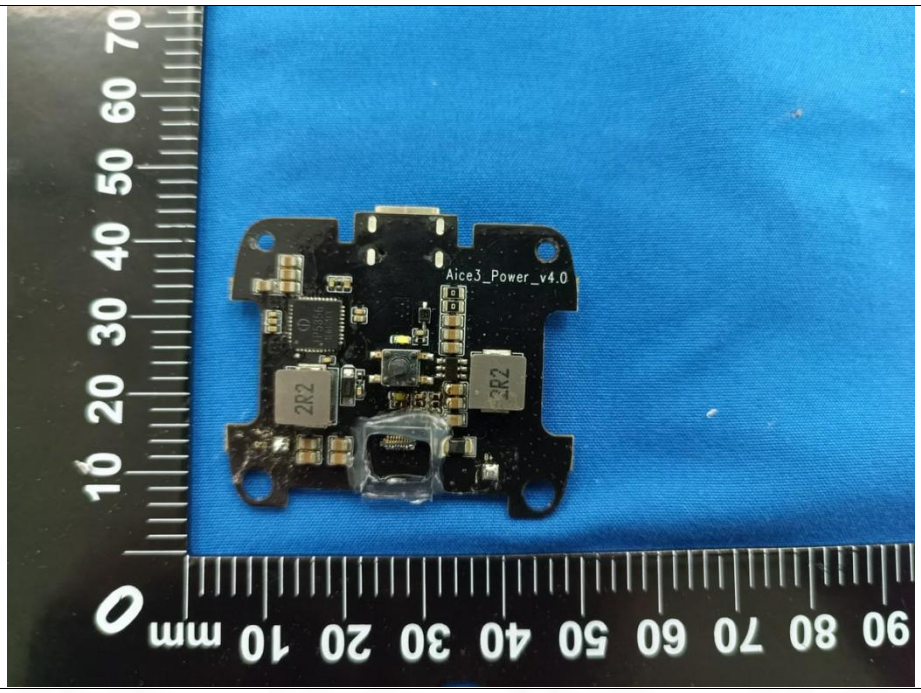

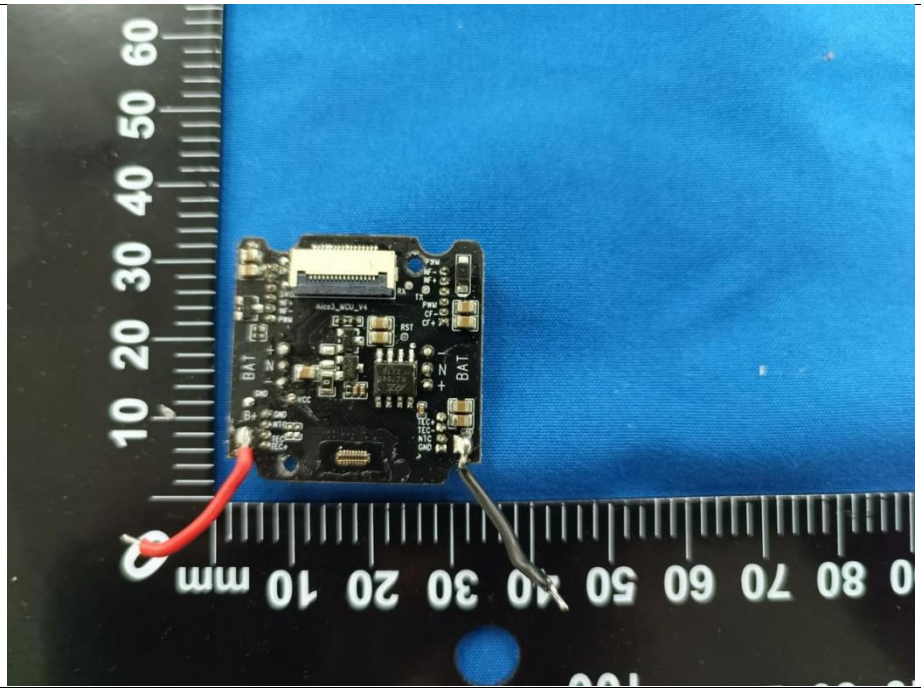

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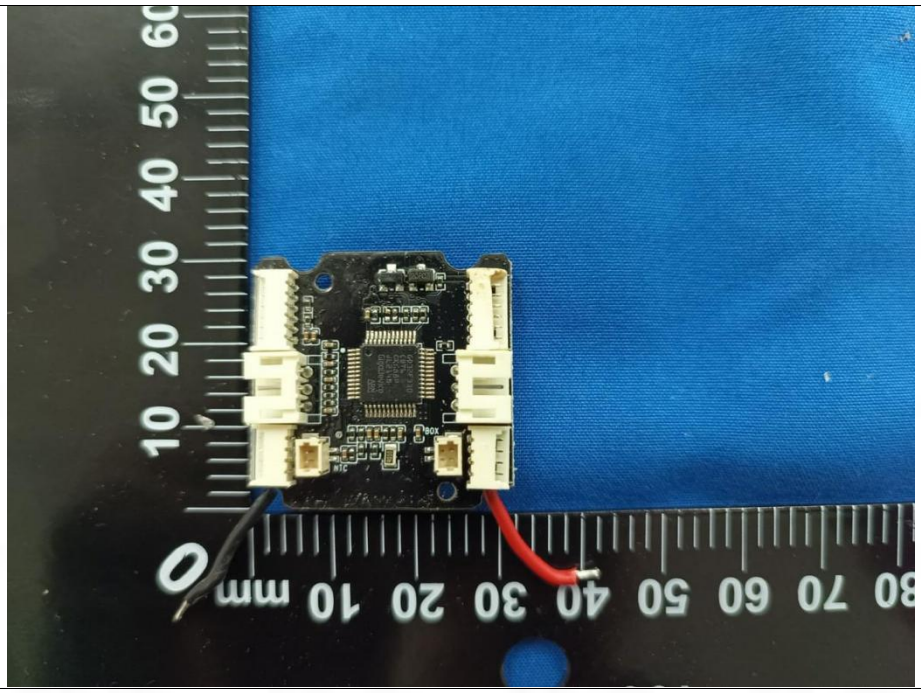

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Appendix

BTF Testing Lab (Shenzhen) Co., Ltd.
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1. Bandwidth

1.1 OBW

1.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz) Result	Verdict
GFSK	SISO	2402	DH5	1	0.856	Pass
		2441	DH5	1	0.854	Pass
		2480	DH5	1	0.856	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.169	Pass
		2441	2DH5	1	1.171	Pass
		2480	2DH5	1	1.173	Pass
8DPSK	SISO	2402	3DH5	1	1.180	Pass
		2441	3DH5	1	1.178	Pass
		2480	3DH5	1	1.185	Pass

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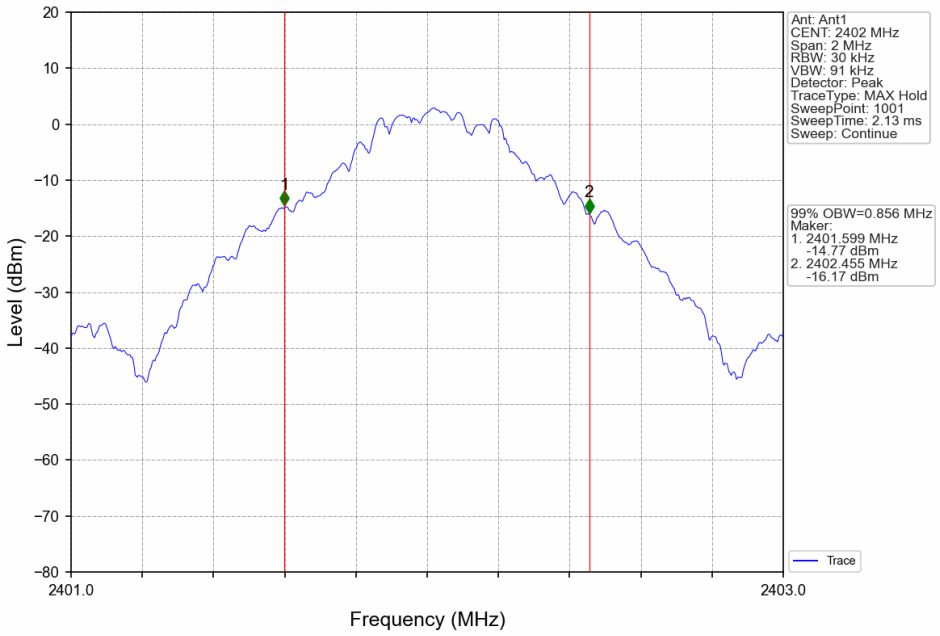
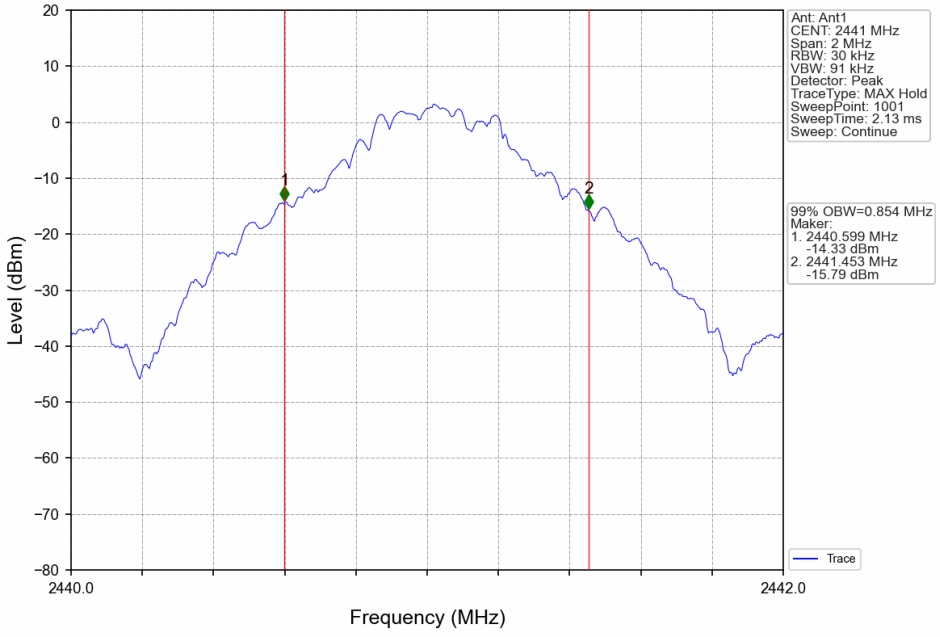
1.1.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



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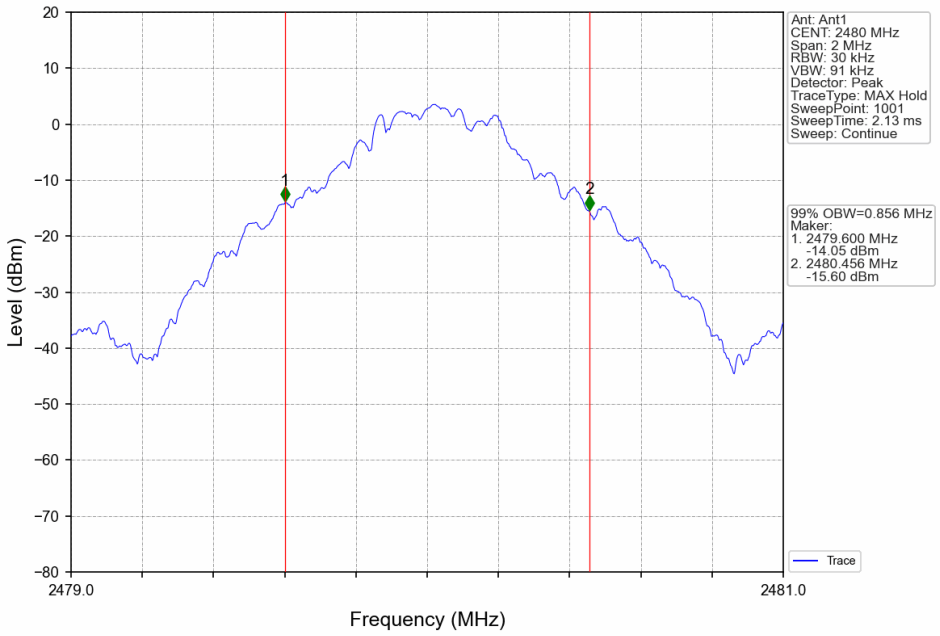
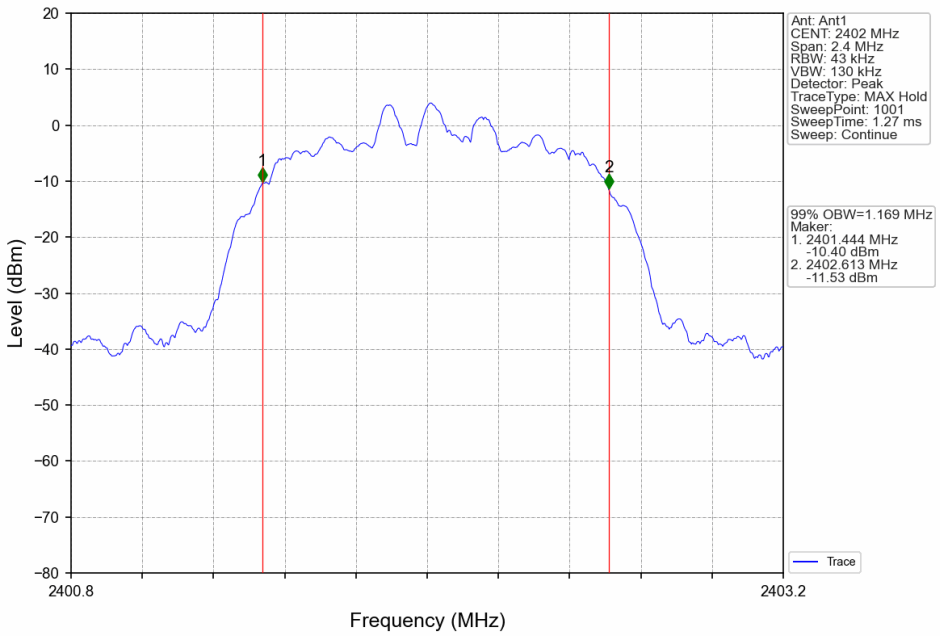
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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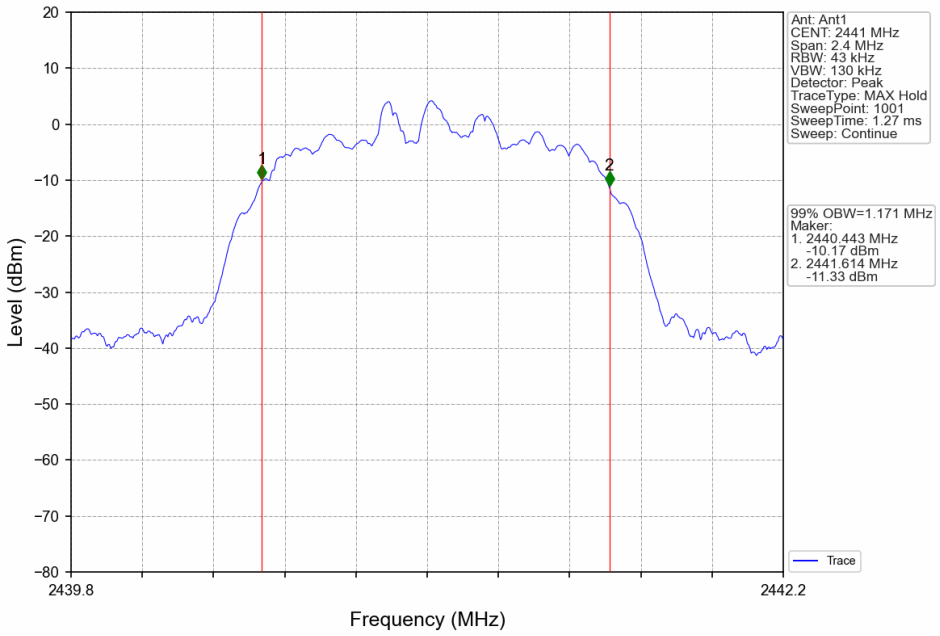
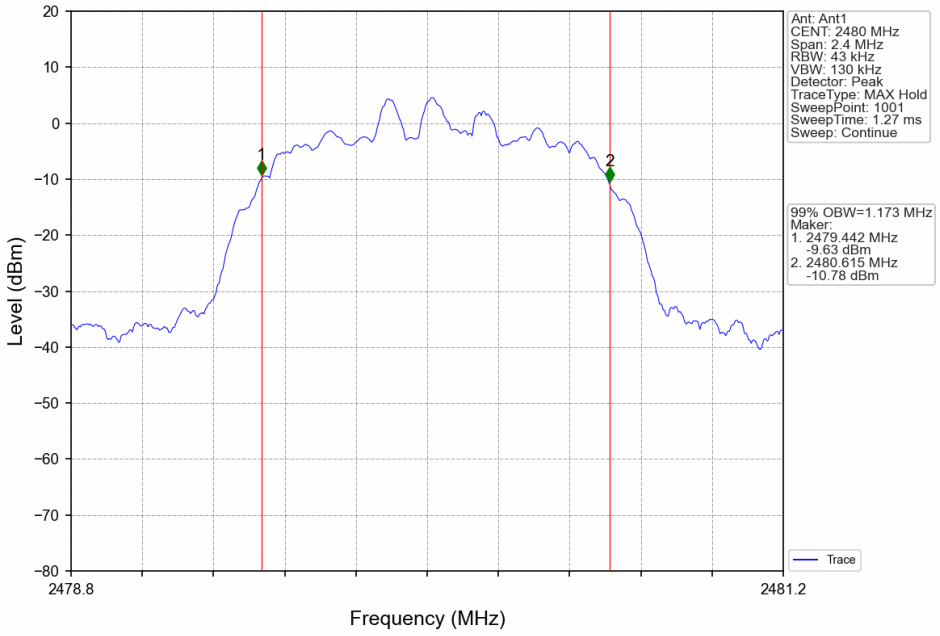
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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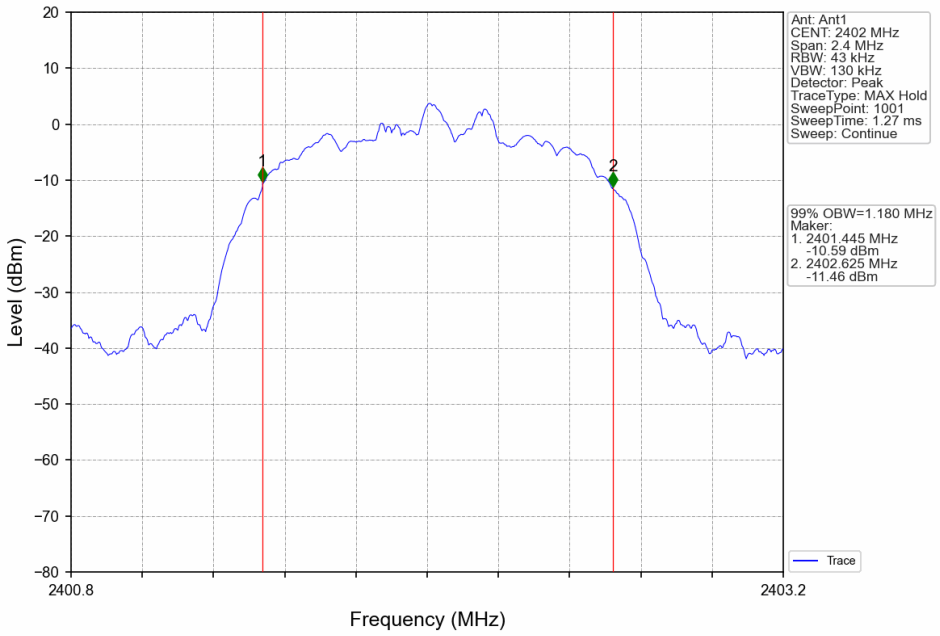
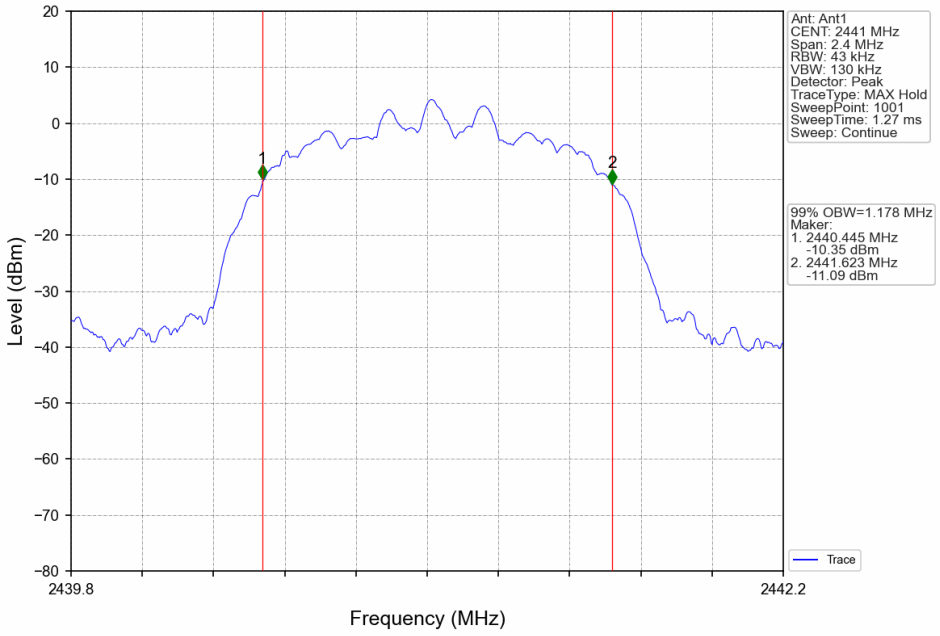
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



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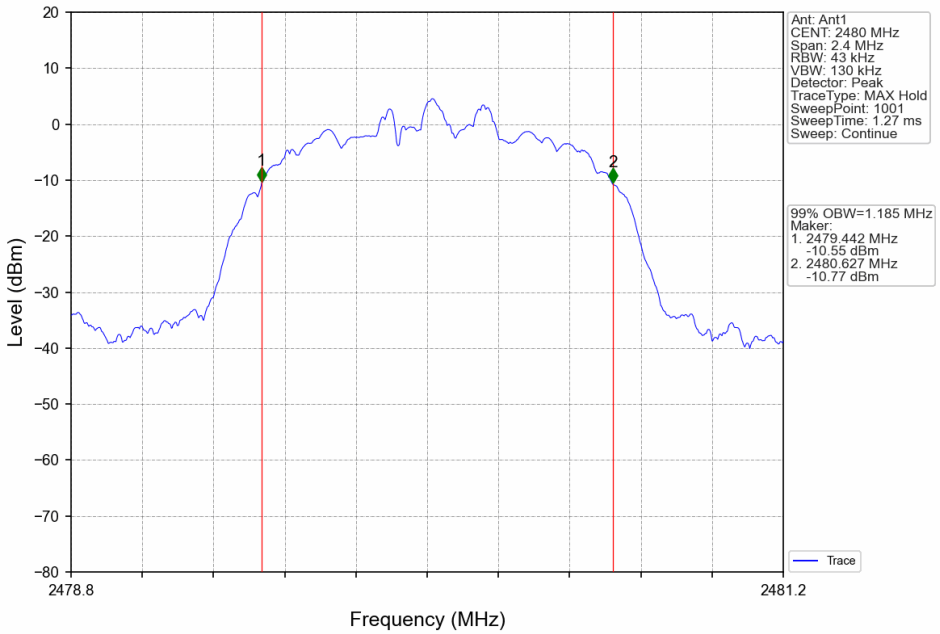
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



1.2 20dB BW

1.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz) Result	Verdict
GFSK	SISO	2402	DH5	1	0.954	Pass
		2441	DH5	1	0.951	Pass
		2480	DH5	1	0.951	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.316	Pass
		2441	2DH5	1	1.295	Pass
		2480	2DH5	1	1.314	Pass
8DPSK	SISO	2402	3DH5	1	1.307	Pass
		2441	3DH5	1	1.308	Pass
		2480	3DH5	1	1.309	Pass

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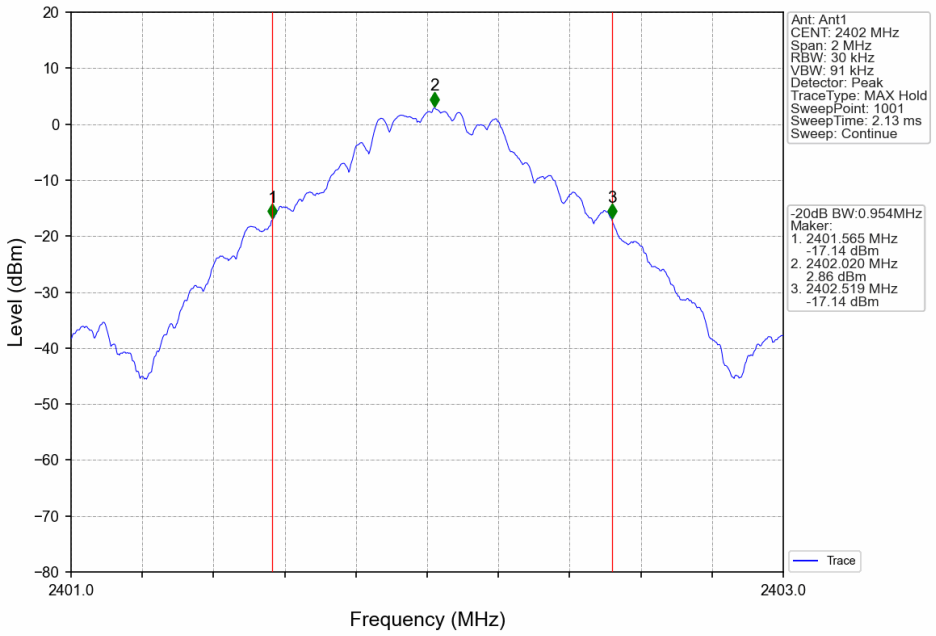
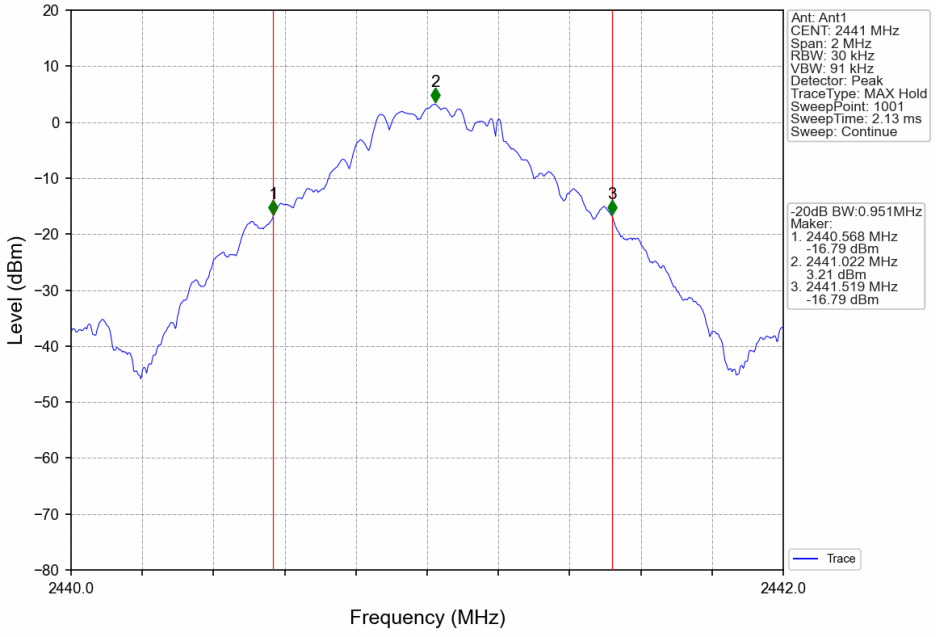
1.2.2 Test Graph

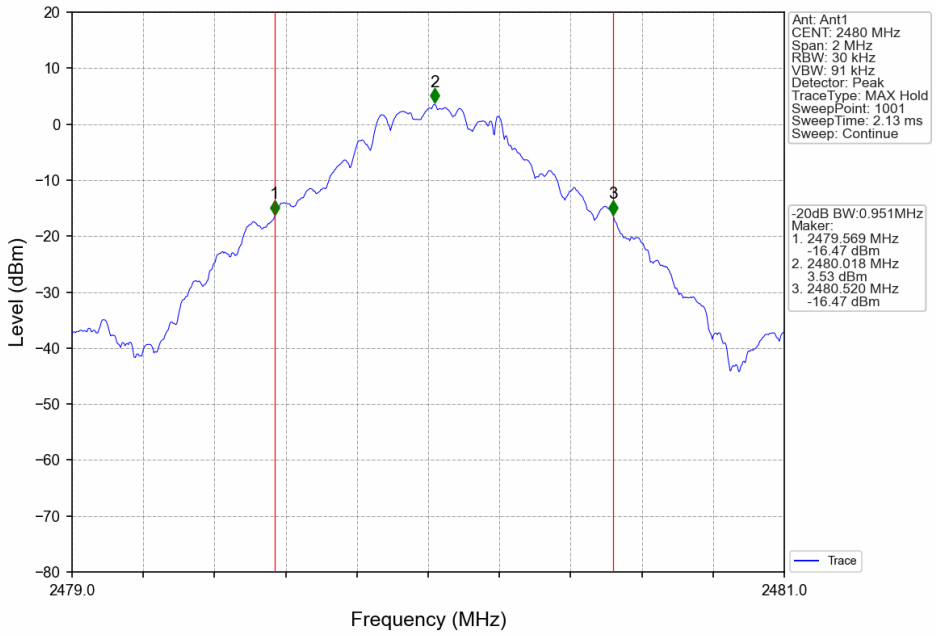
GFSK_DH5_LCH_2402MHz_Ant1_NTNV



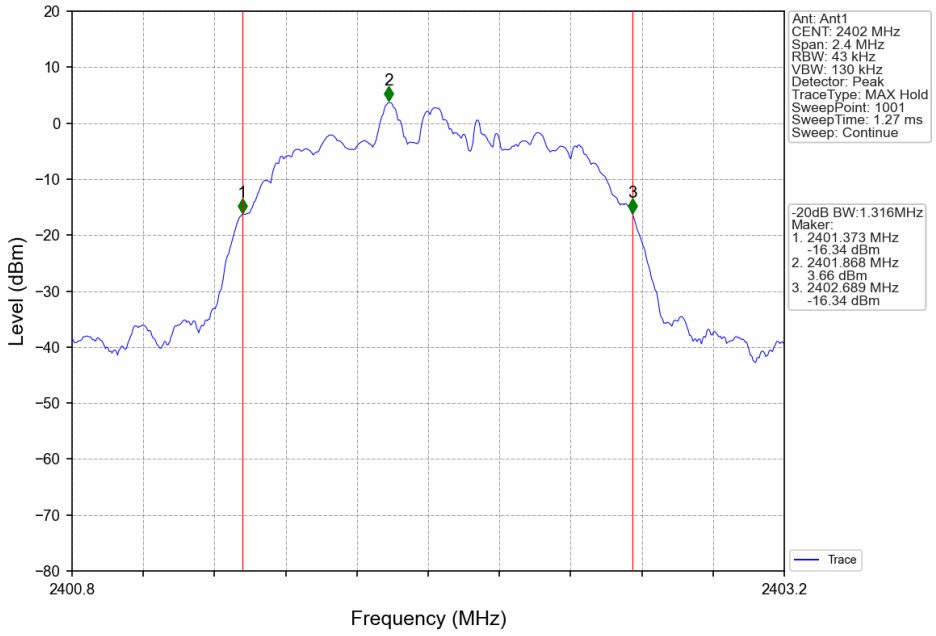
GFSK_DH5_MCH_2441MHz_Ant1_NTNV



GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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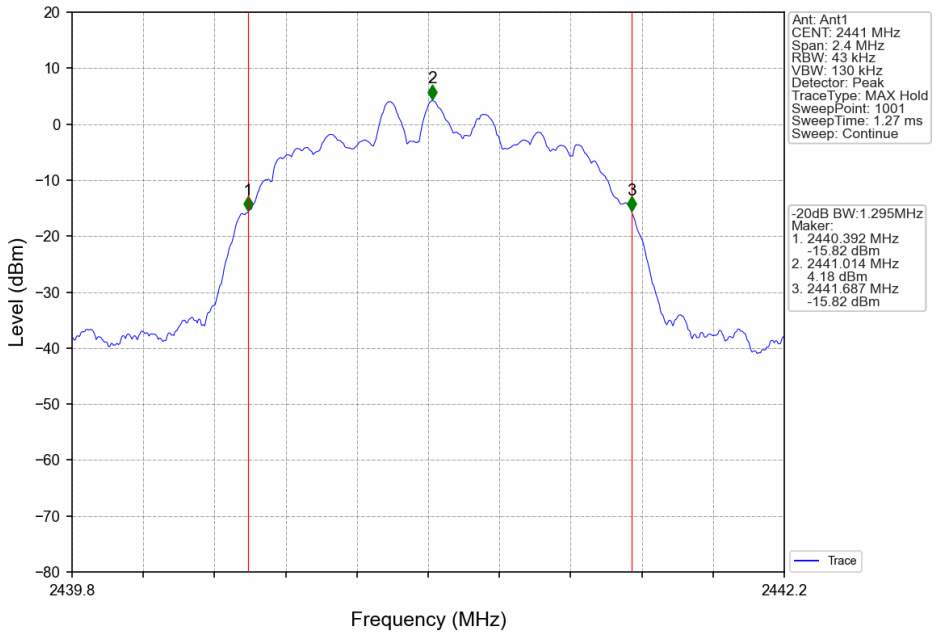
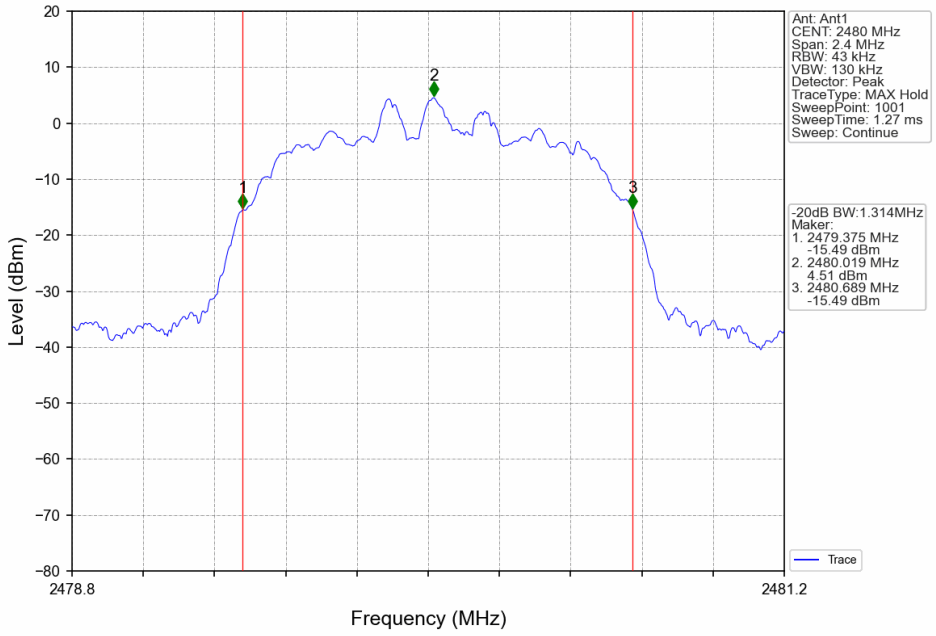
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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