RF Test Report

For

Applicant Name:	**Zhongshan Firefly Image Technology CO., LTD**
Address:	3rd Floor, Building A, No.101 Qianjin fourth Road, Third Industrial Zone, Tanzhou, Zhongshan, Guangdong, China
EUT Name:	Remote Control
Brand Name:	N/A
Model Number:	BT-2
Series Model Number:	Refer to section 2

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
FCC ID:	2BDHV-BT-2
Report Number:	BTF231107R00701
Test Standards:	47 CFR Part 15.247
Test Conclusion:	Pass
Test Date:	2023-10-30 to 2023-11-07
Date of Issue:	2023-11-07
Prepared By:	Chris Liu / Project Engineer
Date:	2023-11-07
Approved By:	Ryan.CJ / EMC Manager
Date:	2023-11-07

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Revision History		
Version	Issue Date	Revisions Content
R_V0	2023-11-07	Original
Note: Once the revision has been made, then previous versions reports are invalid.		

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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 12
4.3 Test Modes 12
5 EVALUATION RESULTS (EVALUATION) 13
5.1 Antenna requirement 13
5.1.1 Conclusion: 13
6 RADIO SPECTRUM MATTER TEST RESULTS (RF) 14
6.1 Conducted Emission at AC power line 14
6.1.1 E.U.T. Operation: 14
6.1.2 Test Setup Diagram: 14
6.1.3 Test Data: 14
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: 15
6.3 Maximum Conducted Output Power 16
6.3.1 E.U.T. Operation: 16
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: 20
6.5.3 Test Data: 20
6.6 Band edge emissions (Radiated) 21
6.6.1 E.U.T. Operation: 21
6.6.2 Test Setup Diagram: 21
6.6.3 Test Data: 22
6.7 Emissions in restricted frequency bands (below 1GHz) 23

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6.7.1 E.U.T. Operation:.....23
6.7.2 Test Setup Diagram:.....23
6.7.3 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 Setup Diagram:.....26
6.8.3 Test Data:.....27
7 TEST SETUP PHOTOS.....30
8 EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS).....31
APPENDIX.....36

BTF Testing Lab (Shenzhen) Co., Ltd.
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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:	Zhongshan Firefly Image Technology CO., LTD
Address:	3rd Floor, Building A, No.101 Qianjin fourth Road, Third Industrial Zone, Tanzhou, Zhongshan, Guangdong, China

2.2 Manufacturer Information

Company Name:	Zhongshan Firefly Image Technology CO., LTD
Address:	3rd Floor, Building A, No.101 Qianjin fourth Road, Third Industrial Zone, Tanzhou, Zhongshan, Guangdong, China

2.3 Factory Information

Company Name:	Zhongshan Firefly Image Technology CO., LTD
Address:	3rd Floor, Building A, No.101 Qianjin fourth Road, Third Industrial Zone, Tanzhou, Zhongshan, Guangdong, China

2.4 General Description of Equipment under Test (EUT)

EUT Name:	Remote Control
Test Model Number:	BT-2
Series Model Number:	N/A
Description of Model name differentiation:	N/A
Hardware Version	N/A
Software and Firmware Version	N/A

2.5 Technical Information

Power Supply:	DC 3V button battery
Sample ID.:	S01, S02
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	40
Modulation Type:	GFSK
Antenna Type:	PCB antenna
Antenna Gain#:	4.41dBi
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.	
Bluetooth Version:	4.2

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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)	N/A
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

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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

Power Spectral Density					
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

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 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	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	ESCI7	101032	2022-11-24	2023-11-23
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2022-11-24	2023-11-23

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POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplilifier	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

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	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	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	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

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	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

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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	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

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4.2 Test Auxiliary Equipment

Title	Manufacturer	Model No.	Serial No.
N/A	N/A	N/A	/

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.

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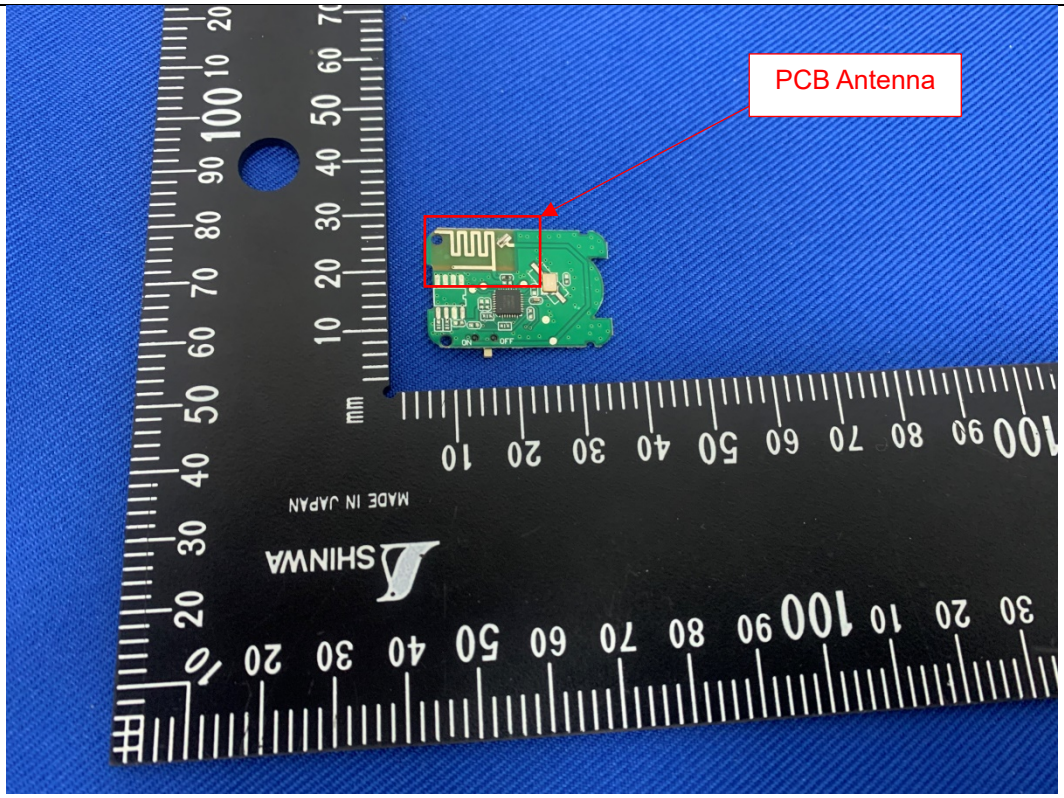
5 Evaluation Results (Evaluation)

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)

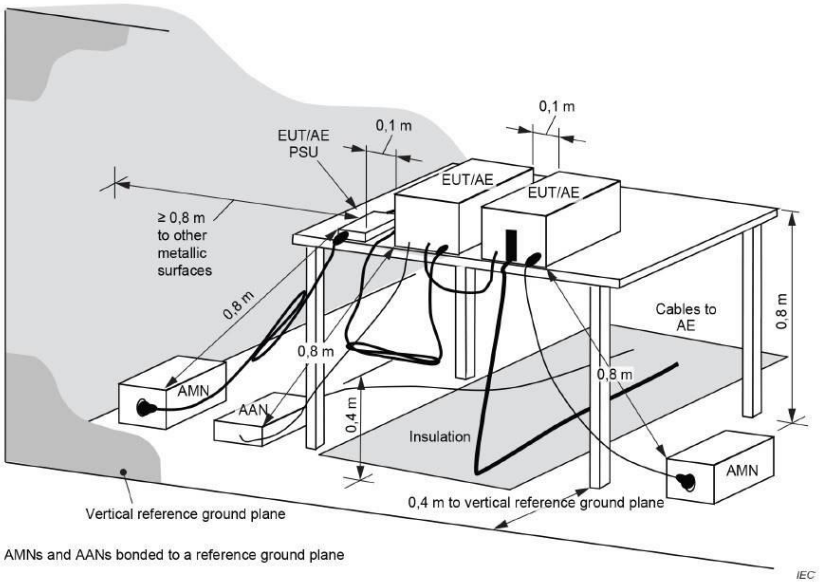
6.1 Conducted Emission at AC power line

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:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

6.1.2 Test Setup Diagram:



6.1.3 Test Data:

Not applicable.

The EUT can't be connected to AC power line, so there is no need to conduct this test item.

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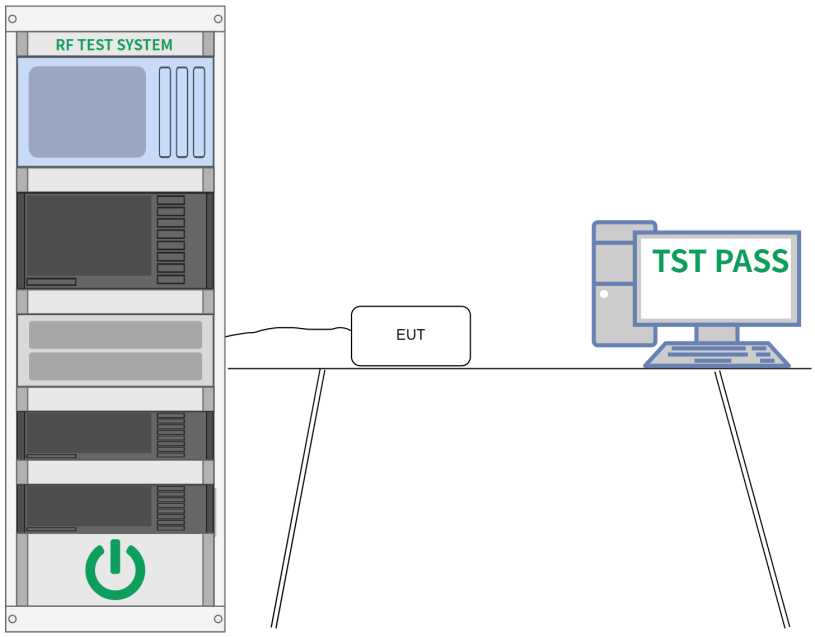
6.2 Occupied Bandwidth

Test Requirement:	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.
Test Method:	DTS bandwidth
Test Limit:	Section (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:	a) Set RBW = 100 kHz. b) Set the VBW >= [3 × 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.

6.2.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

6.2.2 Test Setup Diagram:



6.2.3 Test Data:

Please Refer to Appendix for Details.

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6.3 Maximum Conducted Output Power

Test Requirement:	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.
Test Method:	Maximum peak conducted output power
Test Limit:	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

6.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

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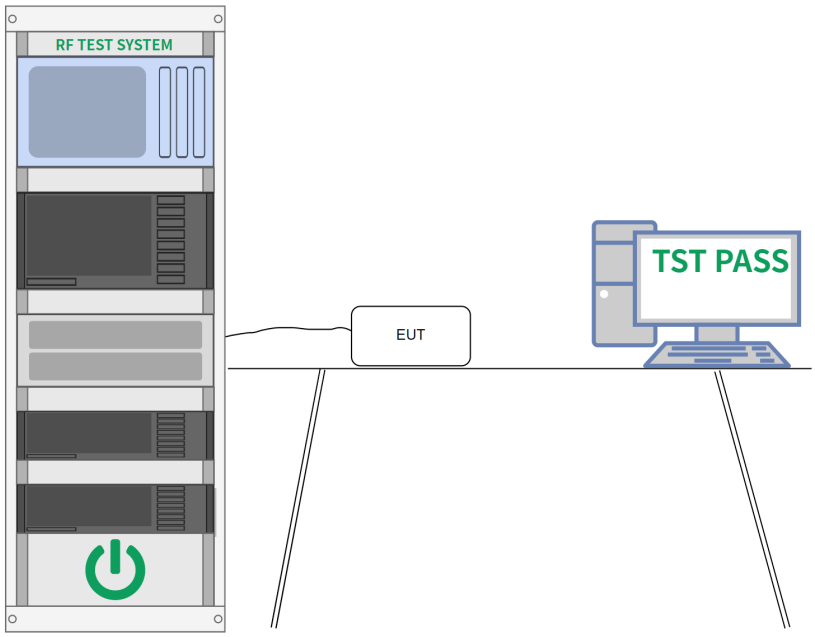
6.3.2 Test Setup Diagram:



6.3.3 Test Data:

Please Refer to Appendix for Details.

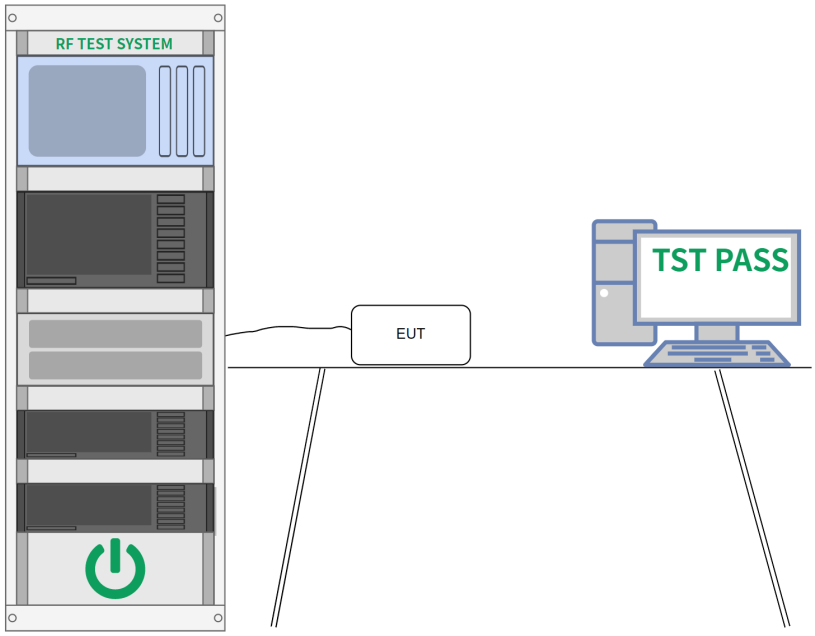
6.4 Power Spectral Density

Test Requirement:	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.
Test Method:	Maximum power spectral density level in the fundamental emission
Test Limit:	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.

6.4.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

6.4.2 Test Setup Diagram:



6.4.3 Test Data:

Please Refer to Appendix for Details.

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6.5 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:	Emissions in nonrestricted frequency bands
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:	ANSI C63.10-2013 Section 11.11.1, Section 11.11.2, Section 11.11.3

6.5.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

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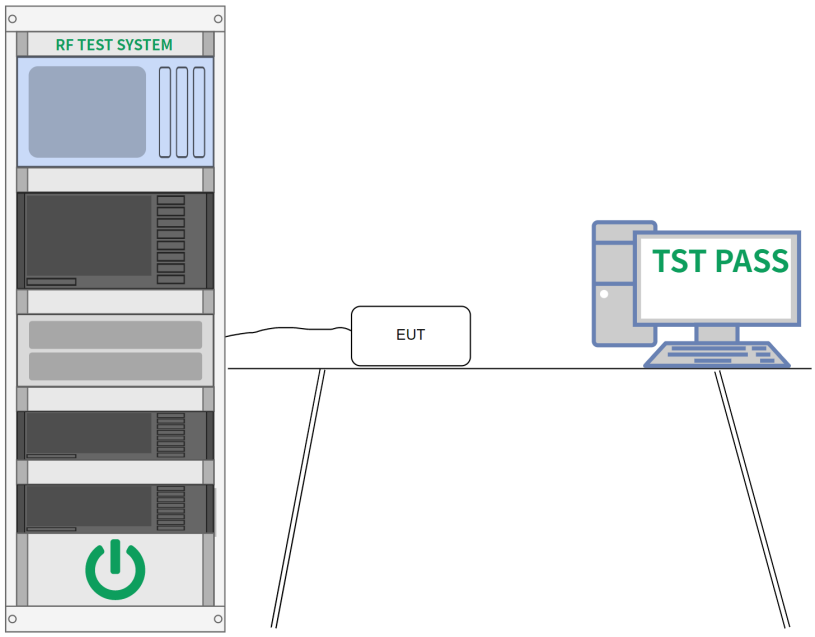
6.5.2 Test Setup Diagram:



6.5.3 Test Data:

Please Refer to Appendix for Details.

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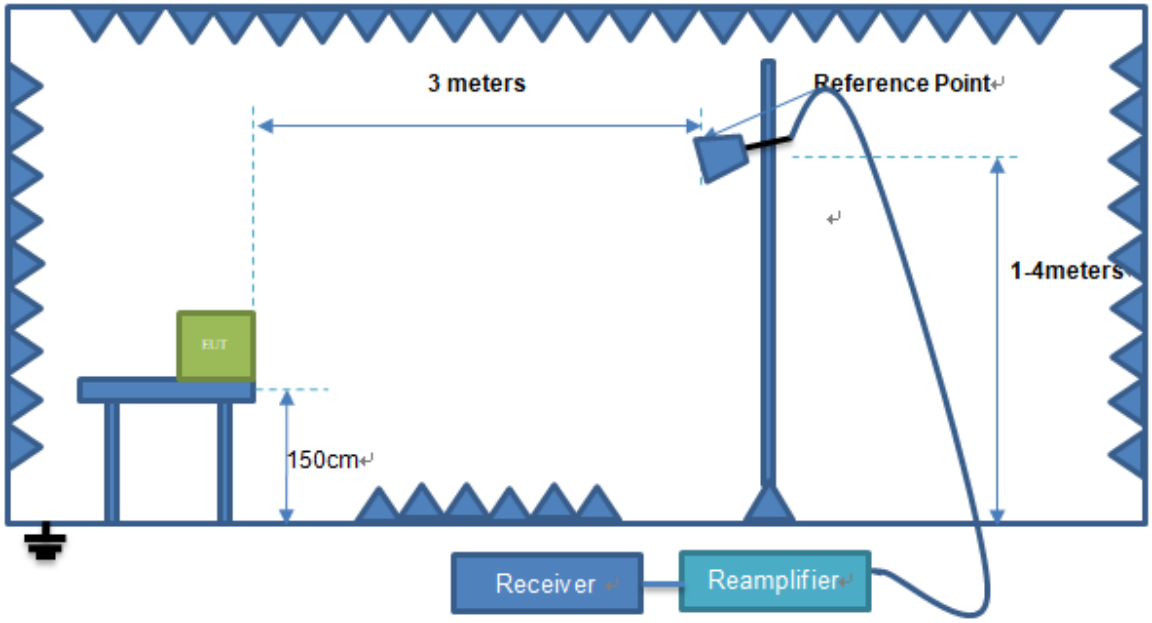
6.6 Band edge emissions (Radiated)

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

6.6.1 E.U.T. Operation:

Operating Environment:	
Temperature:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

6.6.2 Test Setup Diagram:



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6.6.3 Test Data:

Test Mode: GFSK										
Pol.	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
Low Channel: 2402MHz										
H	2390.00	45.83	29.15	3.41	34.01	44.38	74.00	-29.62	PK	PASS
H	2400.00	63.04	29.16	3.43	34.01	61.62	74.00	-12.38	PK	PASS
V	2390.00	46.66	29.15	3.41	34.01	45.21	74.00	-28.79	PK	PASS
V	2400.00	65.39	29.16	3.43	34.01	63.97	74.00	-10.03	PK	PASS
H	2390.00	35.71	29.15	3.41	34.01	34.26	54.00	-19.74	AV	PASS
H	2400.00	47.13	29.16	3.43	34.01	45.71	54.00	-8.30	AV	PASS
V	2390.00	35.87	29.15	3.41	34.01	34.42	54.00	-19.58	AV	PASS
V	2400.00	44.06	29.16	3.43	34.01	42.64	54.00	-11.37	AV	PASS
High Channel: 2480MHz										
H	2483.50	48.29	29.28	3.53	34.03	47.07	74.00	-26.94	PK	PASS
H	2500.00	46.90	29.30	3.56	34.03	45.73	74.00	-28.28	PK	PASS
V	2483.50	49.62	29.28	3.53	34.03	48.40	74.00	-25.60	PK	PASS
V	2500.00	48.18	29.30	3.56	34.03	47.01	74.00	-27.00	PK	PASS
H	2483.50	38.58	29.28	3.53	34.03	37.36	54.00	-16.65	AV	PASS
H	2500.00	36.16	29.30	3.56	34.03	34.99	54.00	-19.02	AV	PASS
V	2483.50	40.03	29.28	3.53	34.03	38.81	54.00	-15.19	AV	PASS
V	2500.00	36.32	29.30	3.56	34.03	35.15	54.00	-18.85	AV	PASS

Remark:
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit

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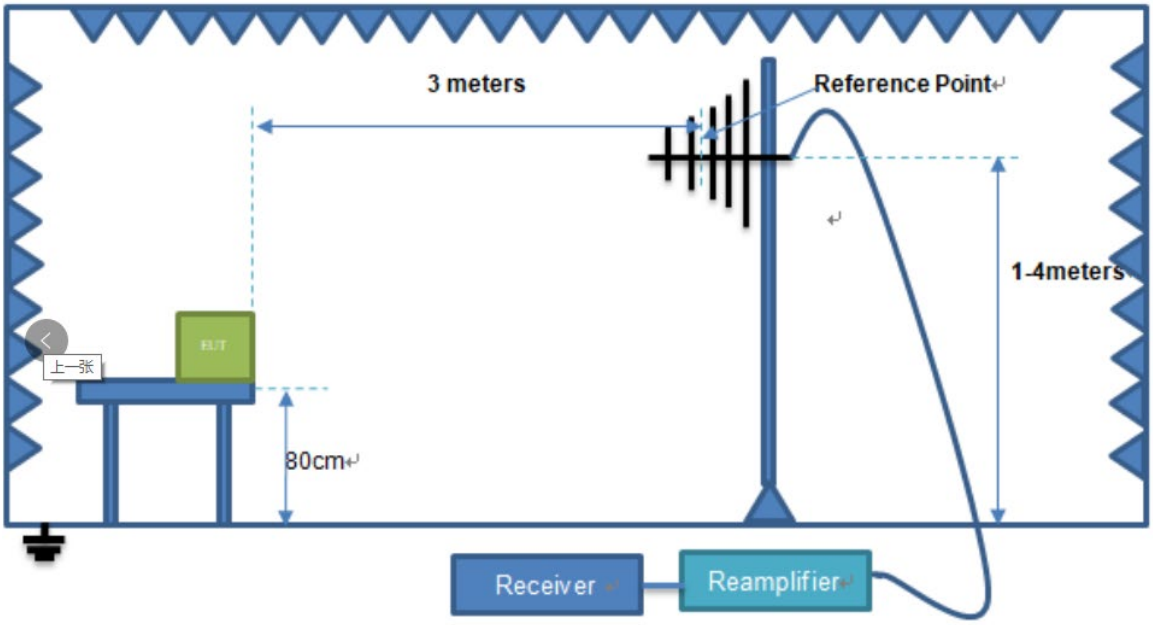
6.7 Emissions in restricted frequency bands (below 1GHz)

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

6.7.1 E.U.T. Operation:

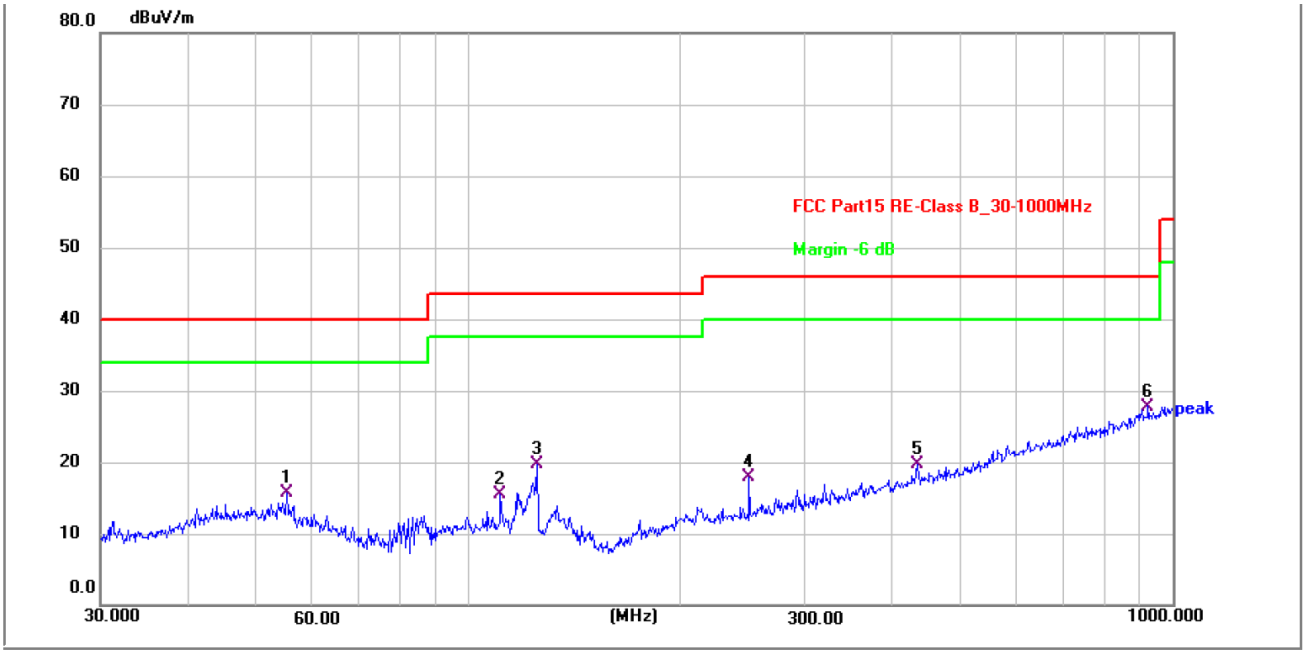
Operating Environment:	
Temperature:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

6.7.2 Test Setup Diagram:



6.7.3 Test Data:

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	Remark
1	55.2207	29.71	-14.06	15.65	40.00	-24.35	QP	P	
2	110.9571	31.37	-15.90	15.47	43.50	-28.03	QP	P	
3	125.0066	36.39	-16.74	19.65	43.50	-23.85	QP	P	
4	250.3012	30.90	-12.97	17.93	46.00	-28.07	QP	P	
5	434.0651	28.90	-9.23	19.67	46.00	-26.33	QP	P	
6 *	922.5157	27.94	-0.14	27.80	46.00	-18.20	QP	P	

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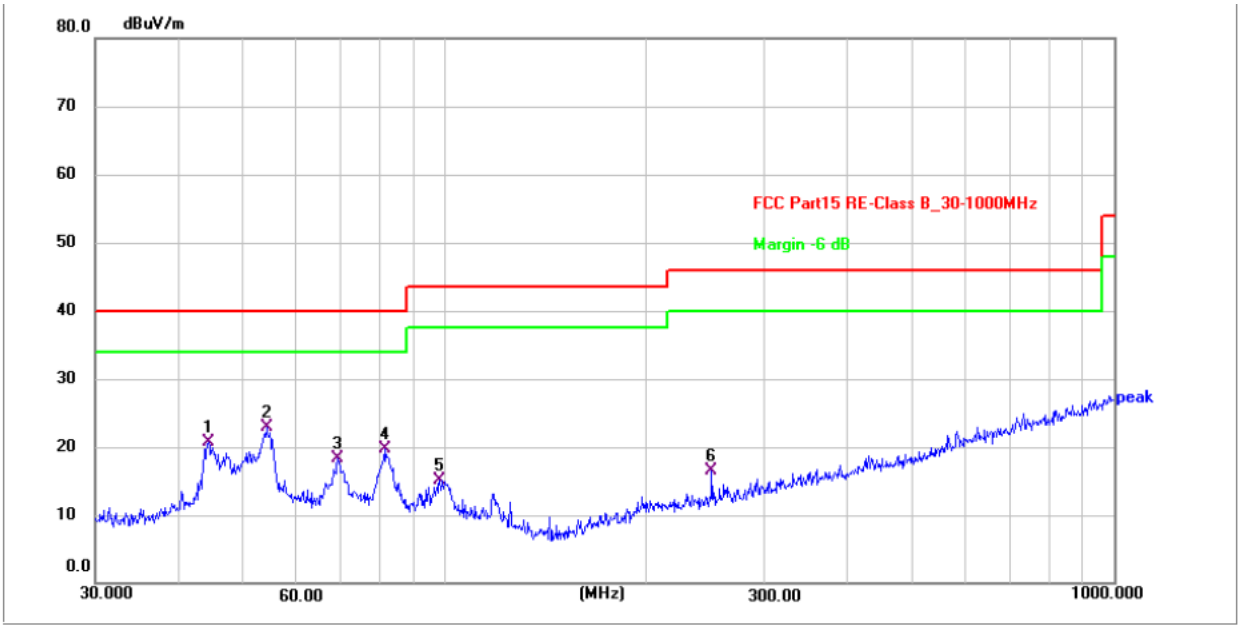
TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: M



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	44.2752	34.45	-13.84	20.61	40.00	-19.39	QP	P	
2 *	54.0711	36.76	-13.95	22.81	40.00	-17.19	QP	P	
3	69.1141	35.63	-17.29	18.34	40.00	-21.66	QP	P	
4	81.2117	38.76	-19.12	19.64	40.00	-20.36	QP	P	
5	98.1419	30.82	-15.62	15.20	43.50	-28.30	QP	P	
6	250.3012	29.63	-13.15	16.48	46.00	-29.52	QP	P	

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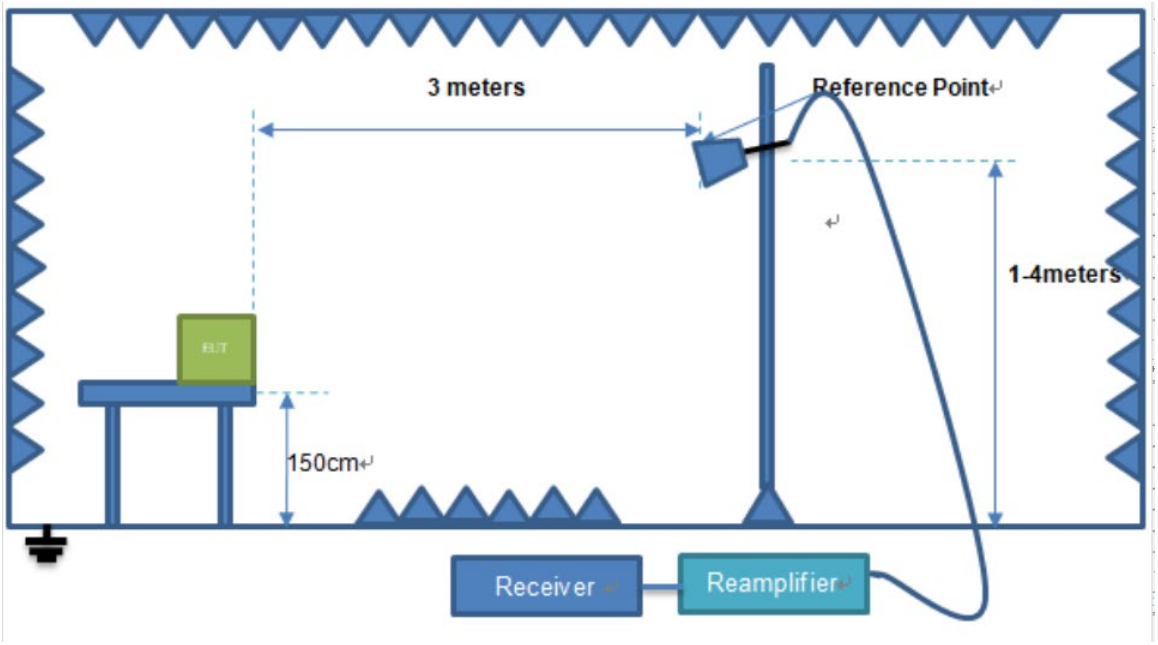
6.8 Emissions in restricted frequency bands (above 1GHz)

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:	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:	24.8 °C
Humidity:	46.7 %
Atmospheric Pressure:	1010 mbar

6.8.2 Test Setup Diagram:



6.8.3 Test Data:

Test Mode: CH00					Test channel: Lowest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4804.00	37.75	34.04	6.58	34.09	44.28	74.00	-29.72	V
7206.00	32.12	37.11	7.73	34.50	42.46	74.00	-31.54	V
9608.00	31.73	39.31	9.23	34.79	45.48	74.00	-28.52	V
12010.00	*					74.00		V
14412.00	*					74.00		V
4804.00	42.13	34.04	6.58	34.09	48.66	74.00	-25.34	H
7206.00	33.92	37.11	7.73	34.50	44.26	74.00	-29.74	H
9608.00	31.20	39.31	9.23	34.79	44.95	74.00	-29.05	H
12010.00	*					74.00		H
14412.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4804.00	26.48	34.04	6.58	34.09	33.01	54.00	-20.99	V
7206.00	20.76	37.11	7.73	34.50	31.10	54.00	-22.90	V
9608.00	19.81	39.31	9.23	34.79	33.56	54.00	-20.44	V
12010.00	*					54.00		V
14412.00	*					54.00		V
4804.00	30.76	34.04	6.58	34.09	37.29	54.00	-16.71	H
7206.00	22.96	37.11	7.73	34.50	33.30	54.00	-20.70	H
9608.00	19.58	39.31	9.23	34.79	33.33	54.00	-20.67	H
12010.00	*					54.00		H
14412.00	*					54.00		H

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Test Results (1GHz-25GHz)

Test Mode: CH19				Test channel: Middle				
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880.00	36.84	34.38	6.69	34.09	43.82	74.00	-30.18	V
7320.00	31.52	37.22	7.78	34.53	41.99	74.00	-32.01	V
9760.00	31.20	39.46	9.35	34.80	45.21	74.00	-28.79	V
12200.00	*					74.00		V
14640.00	*					74.00		V
4880.00	41.04	34.38	6.69	34.09	48.02	74.00	-25.98	H
7320.00	33.24	37.22	7.78	34.53	43.71	74.00	-30.29	H
9760.00	30.58	39.46	9.35	34.80	44.59	74.00	-29.41	H
12200.00	*					74.00		H
14640.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880.00	25.76	34.38	6.69	34.09	32.74	54.00	-21.26	V
7320.00	20.27	37.22	7.78	34.53	30.74	54.00	-23.26	V
9760.00	19.38	39.46	9.35	34.80	33.39	54.00	-20.61	V
12200.00	*					54.00		V
14640.00	*					54.00		V
4880.00	29.94	34.38	6.69	34.09	36.92	54.00	-17.08	H
7320.00	22.41	37.22	7.78	34.53	32.88	54.00	-21.12	H
9760.00	19.07	39.46	9.35	34.80	33.08	54.00	-20.92	H
12200.00	*					54.00		H
14640.00	*					54.00		H

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Test Results (1GHz-25GHz)

Test Mode: CH39				Test channel: Highest				
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960.00	35.96	34.72	6.79	34.09	43.38	74.00	-30.62	V
7440.00	30.94	37.34	7.82	34.57	41.53	74.00	-32.47	V
9920.00	30.67	39.62	9.46	34.81	44.94	74.00	-29.06	V
12400.00	*					74.00		V
14880.00	*					74.00		V
4960.00	39.97	34.72	6.79	34.09	47.39	74.00	-26.61	H
7440.00	32.57	37.34	7.82	34.57	43.16	74.00	-30.84	H
9920.00	29.97	39.62	9.46	34.81	44.24	74.00	-29.76	H
12400.00	*					74.00		H
14880.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960.00	25.07	34.72	6.79	34.09	32.49	54.00	-21.51	V
7440.00	19.81	37.34	7.82	34.57	30.40	54.00	-23.60	V
9920.00	18.96	39.62	9.46	34.81	33.23	54.00	-20.77	V
12400.00	*					54.00		V
14880.00	*					54.00		V
4960.00	29.16	34.72	6.79	34.09	36.58	54.00	-17.42	H
7440.00	21.89	37.34	7.82	34.57	32.48	54.00	-21.52	H
9920.00	18.59	39.62	9.46	34.81	32.86	54.00	-21.14	H
12400.00	*					54.00		H
14880.00	*					54.00		H

Remark:
1. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

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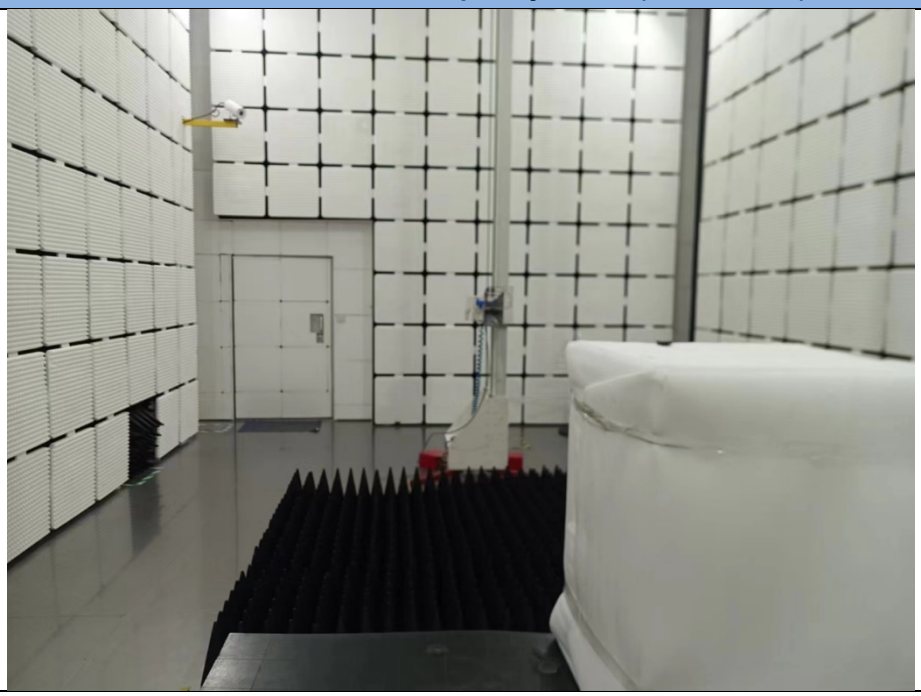
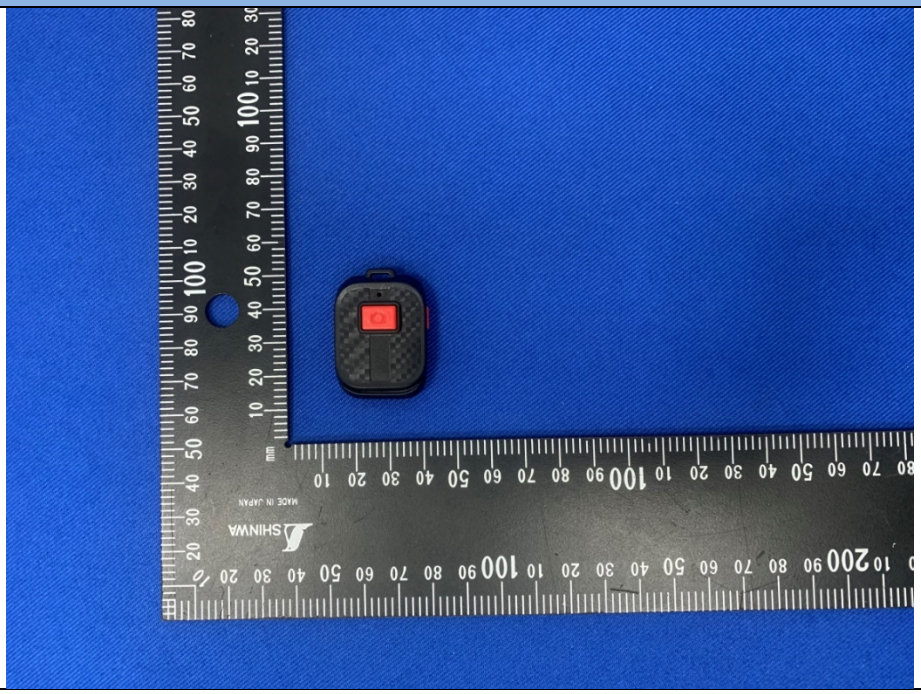
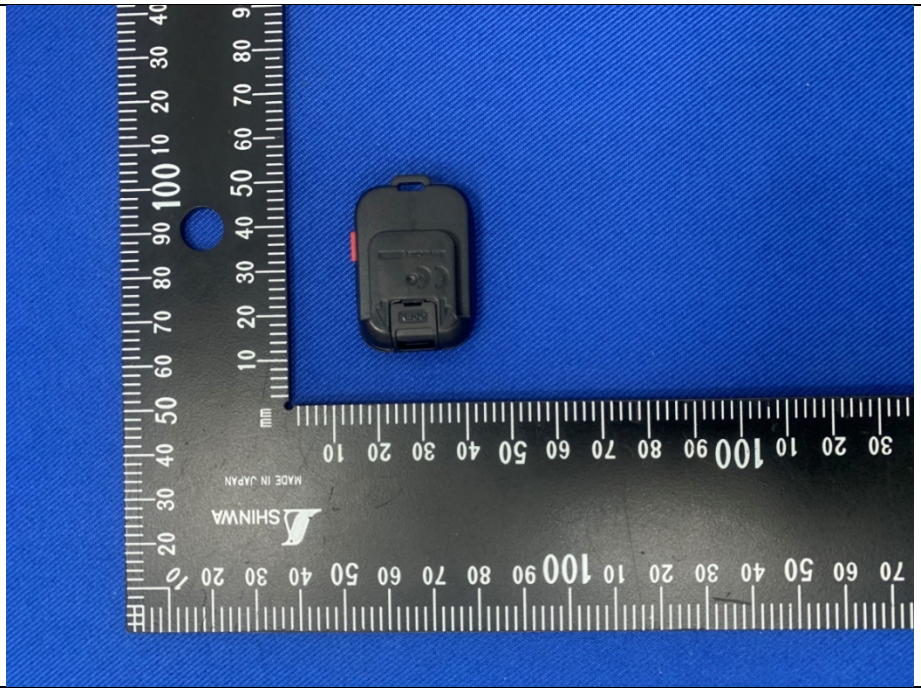
7 Test Setup Photos

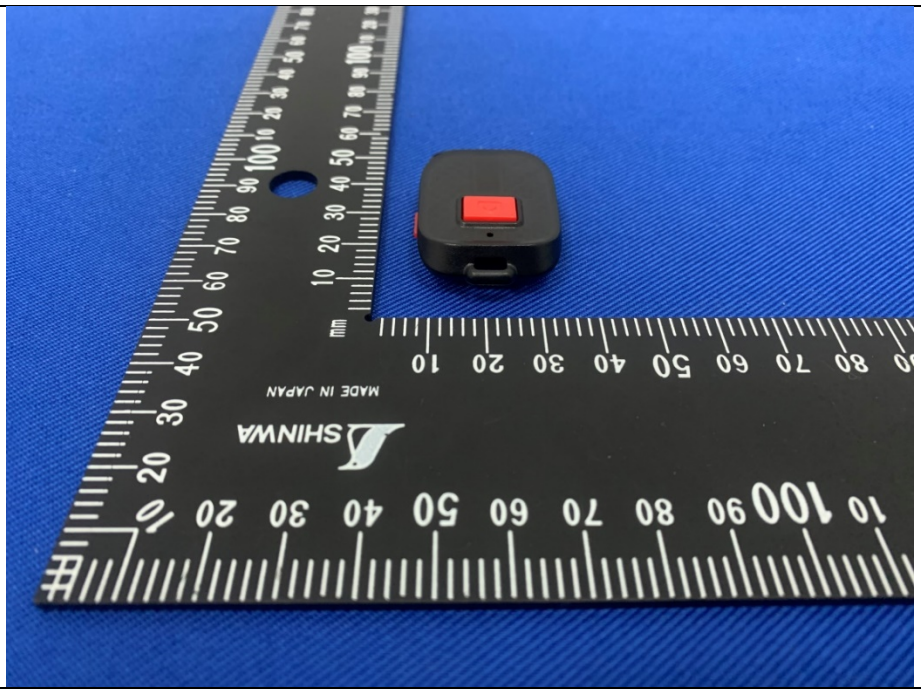
Emissions in restricted frequency bands (below 1GHz)

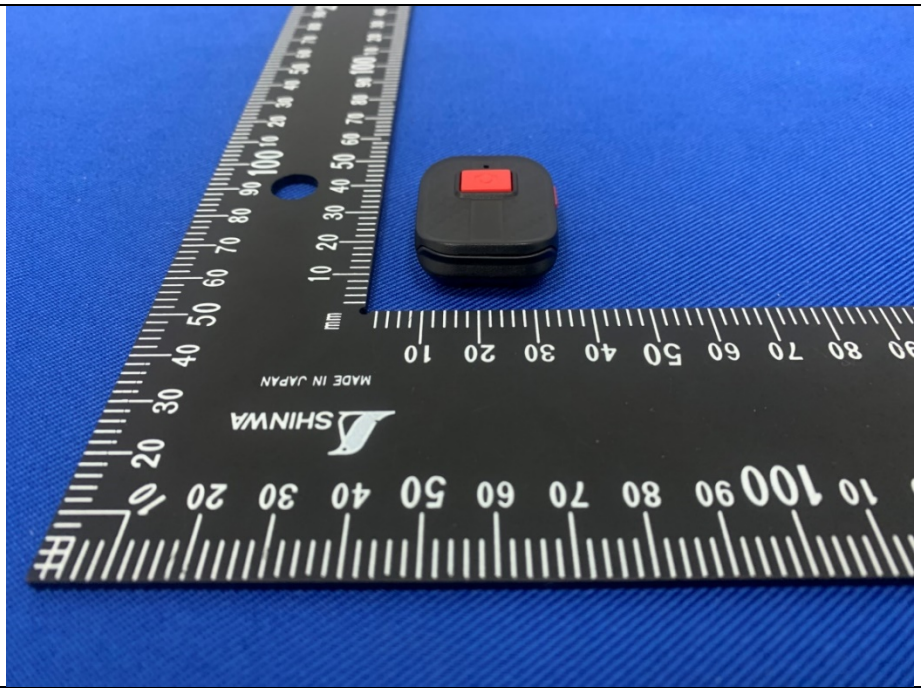

Emissions in restricted frequency bands (above 1GHz)


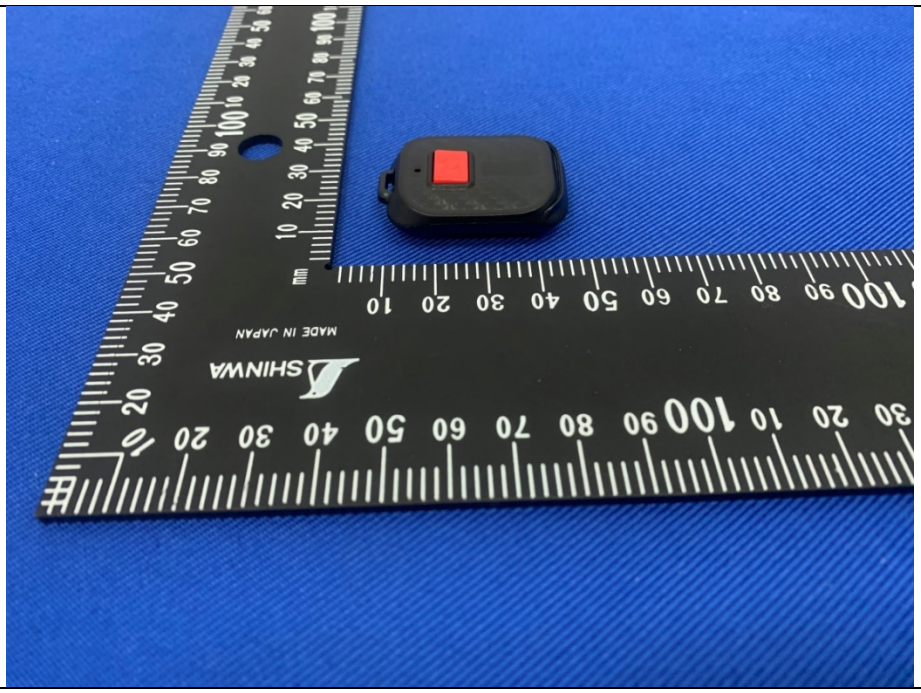
8 EUT Constructional Details (EUT Photos)

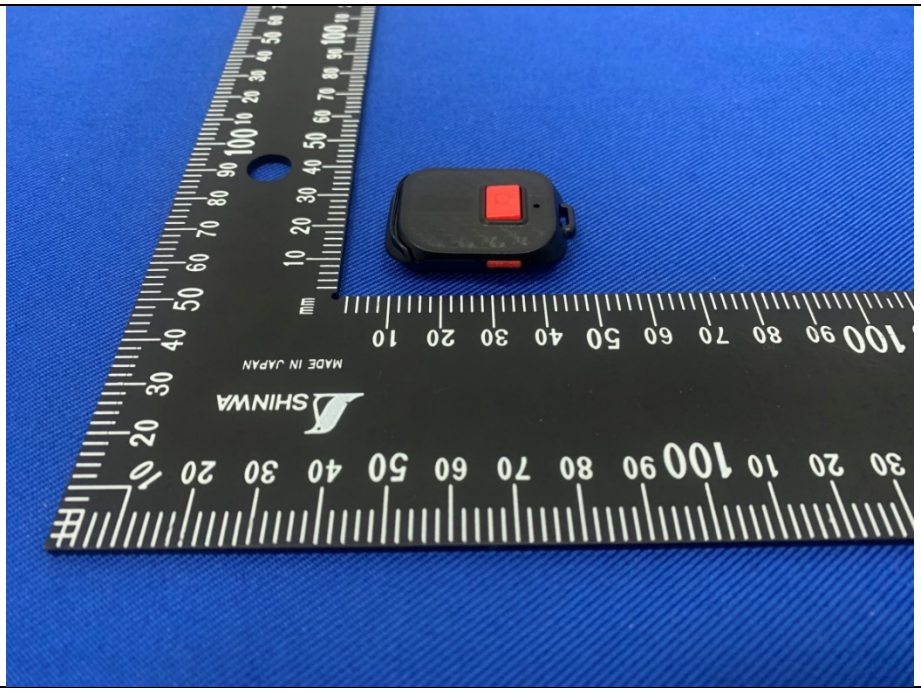
External


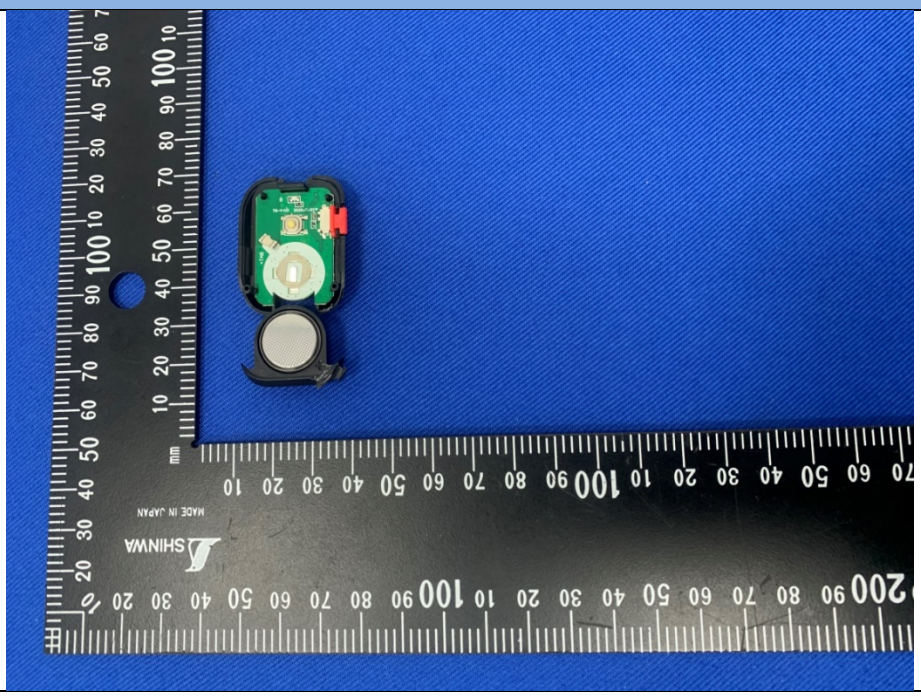


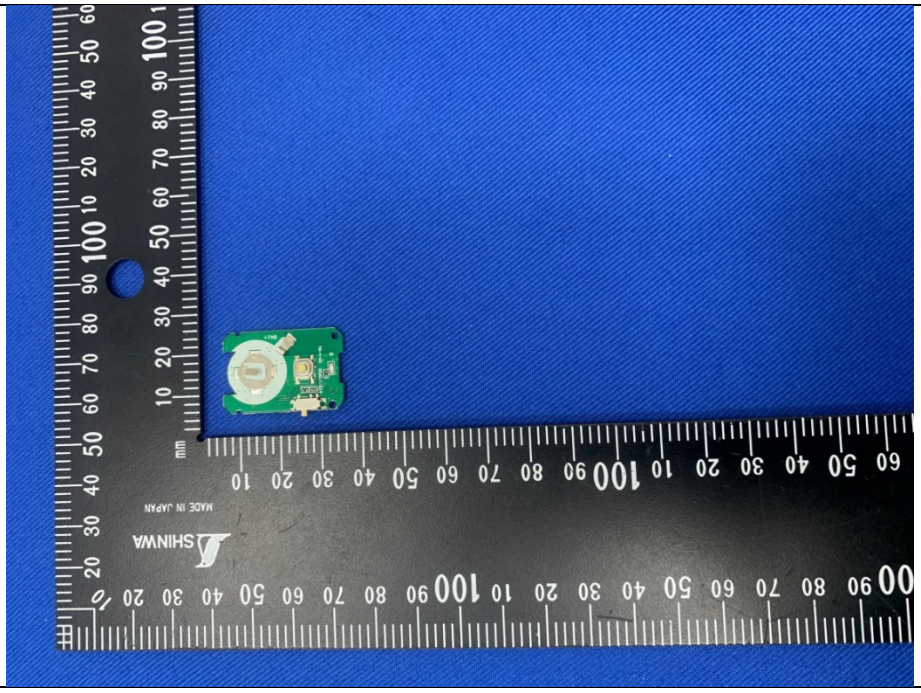

MADE IN JAPAN
SHINWA

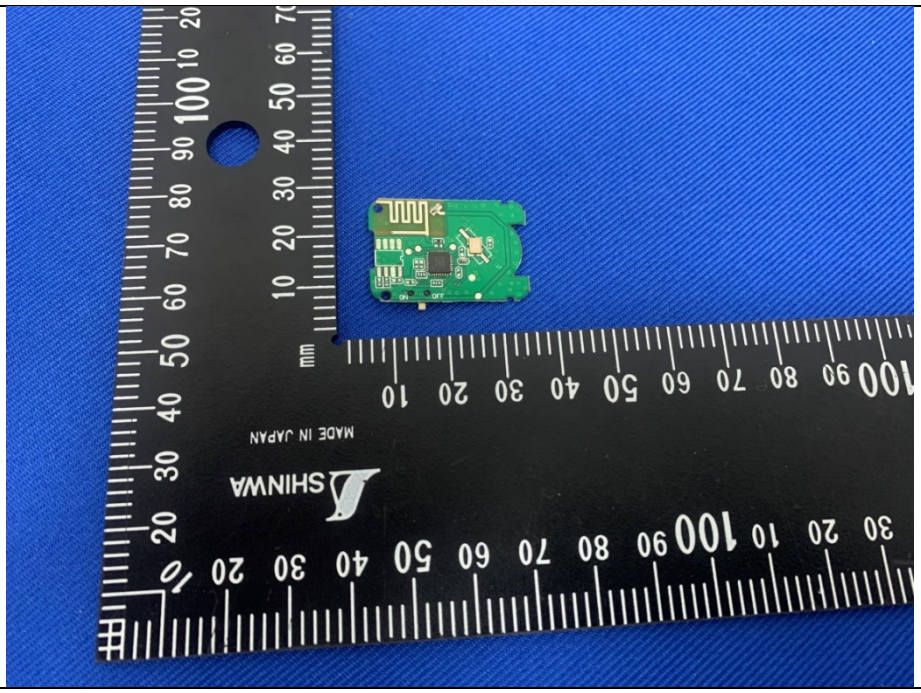

MADE IN JAPAN
SHINWA


SHINWA
MADE IN JAPAN


SHINWA
MADE IN JAPAN

Internal





SHINWA
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Appendix

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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	2.094	3.125	67.01	1.74	16.78
		2440	2.094	3.124	67.03	1.74	16.78
		2480	2.094	3.125	67.01	1.74	16.78

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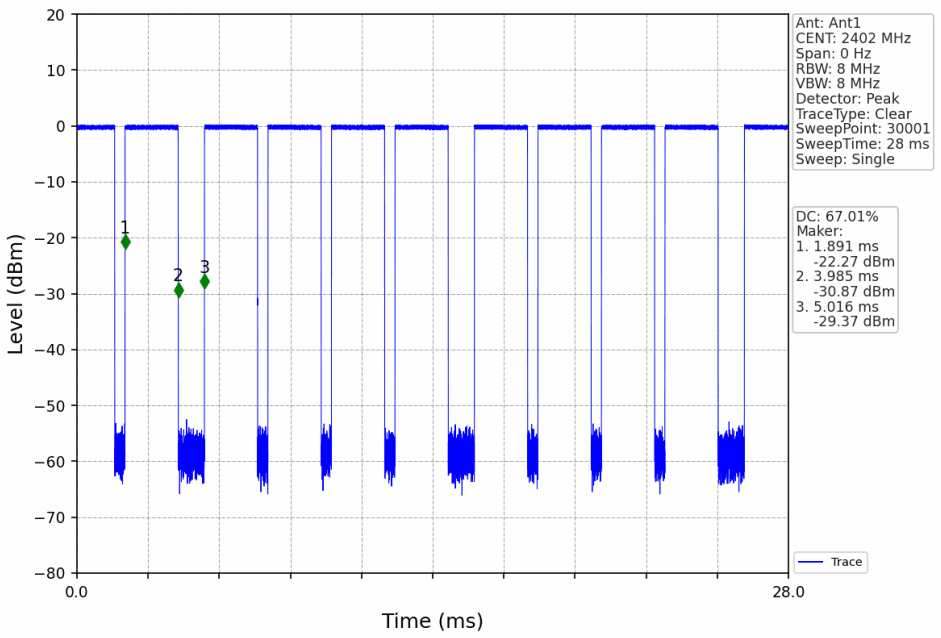
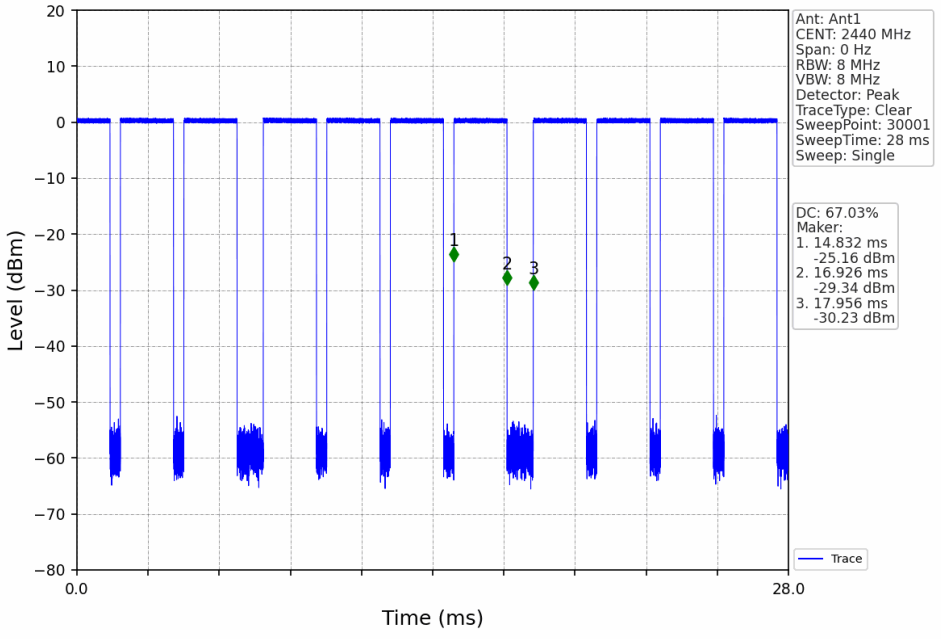
1.1.2 Test Graph

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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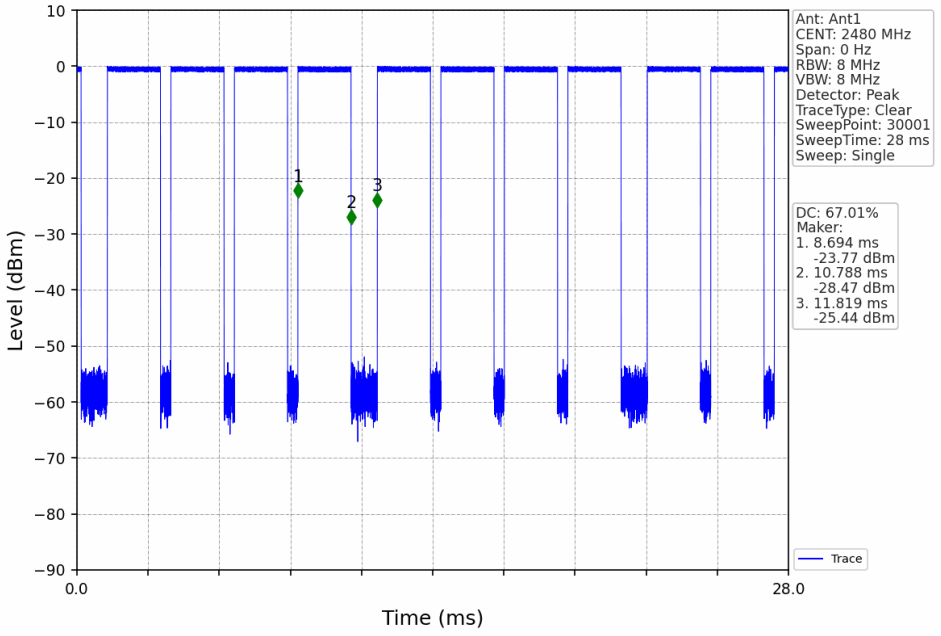
1M_HCH_2480MHz_Ant1_NTNV



2. Bandwidth
2.1 OBW
2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz) Result	Verdict
1M	SISO	2402	1	1.015	Pass
		2440	1	1.017	Pass
		2480	1	1.016	Pass

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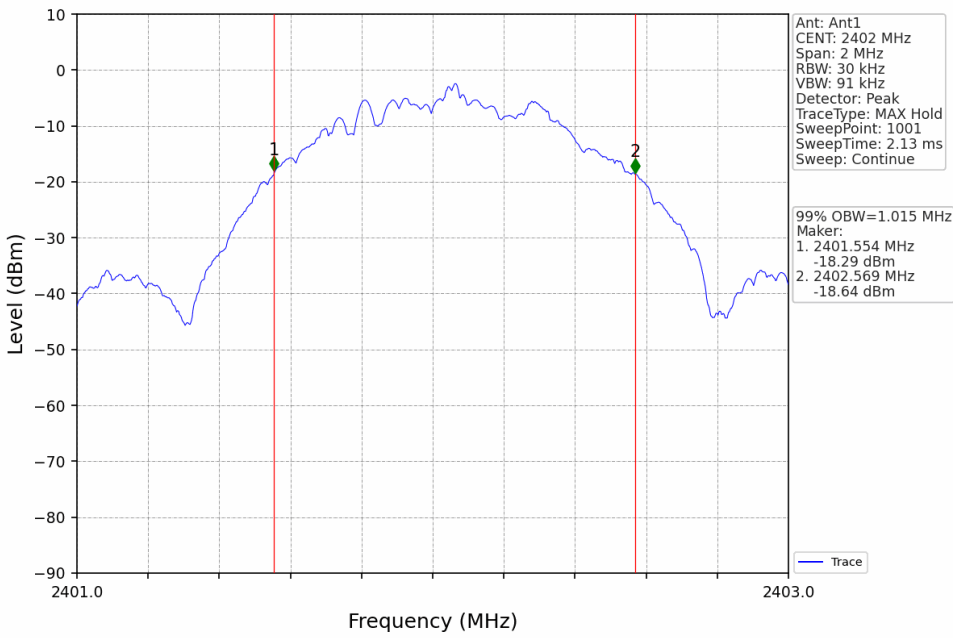
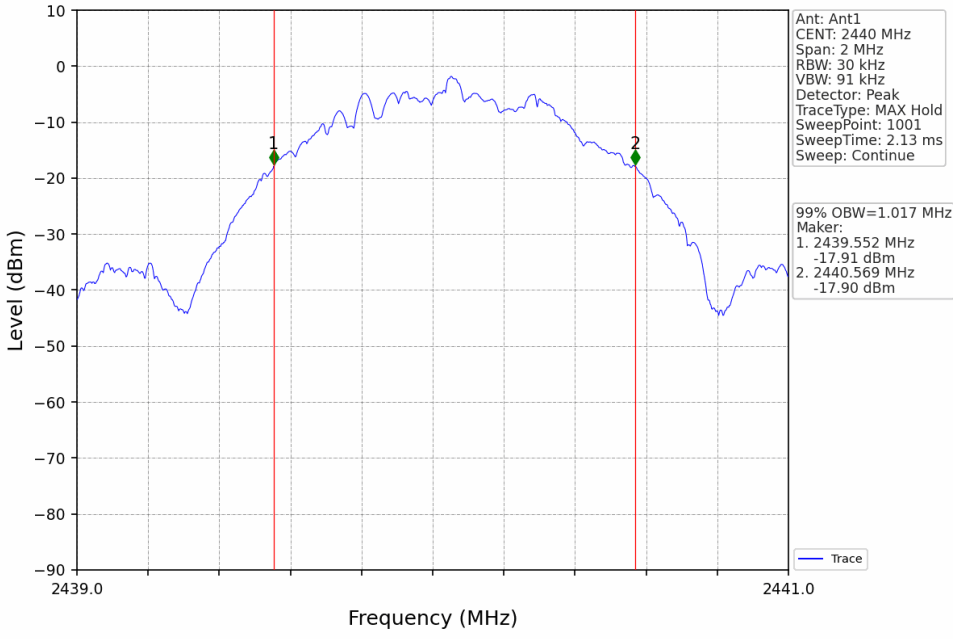
2.1.2 Test Graph

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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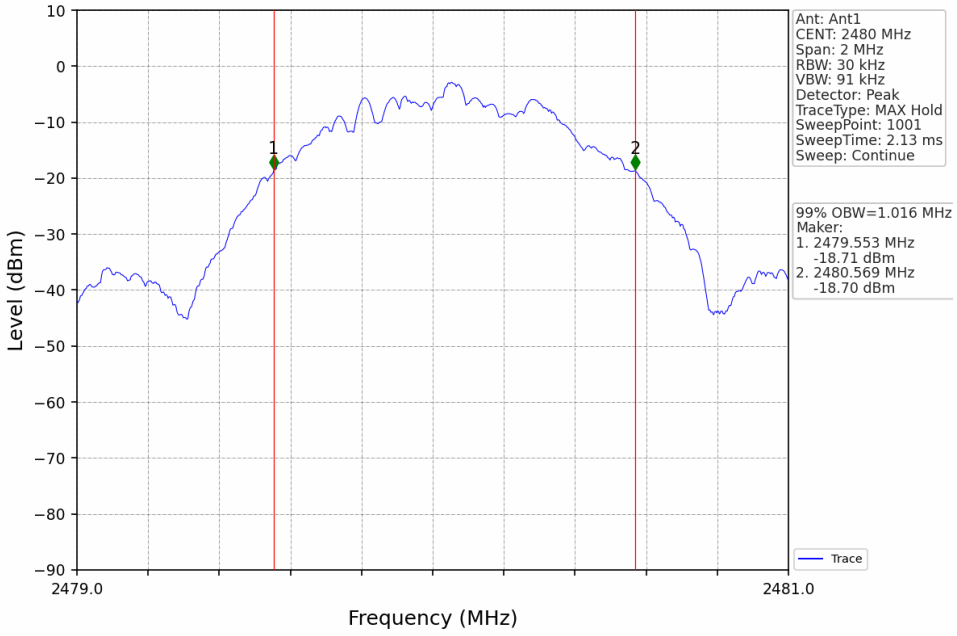
1M_HCH_2480MHz_Ant1_NTNV



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	0.638	>=0.5	Pass
		2440	1	0.640	>=0.5	Pass
		2480	1	0.641	>=0.5	Pass

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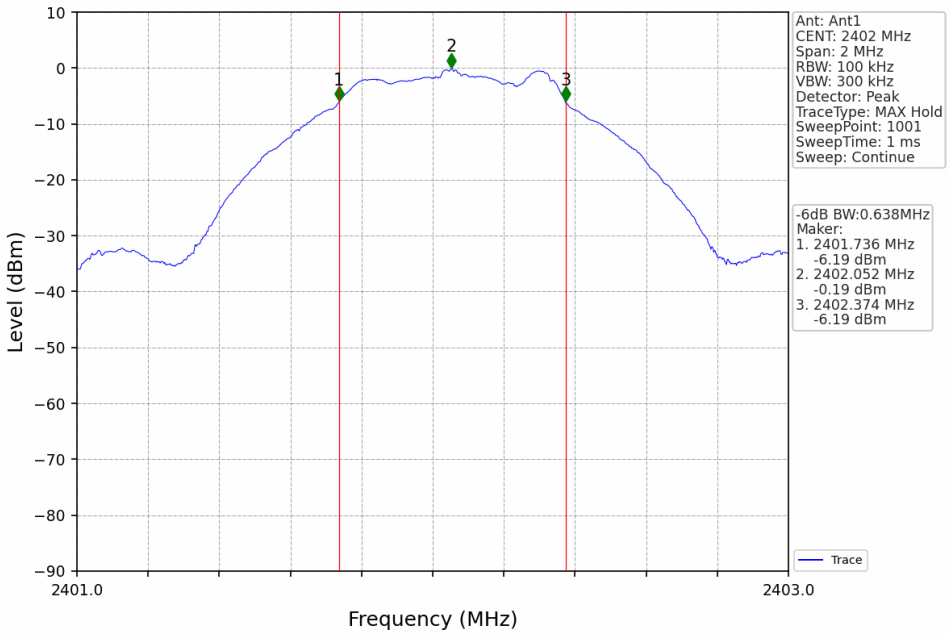
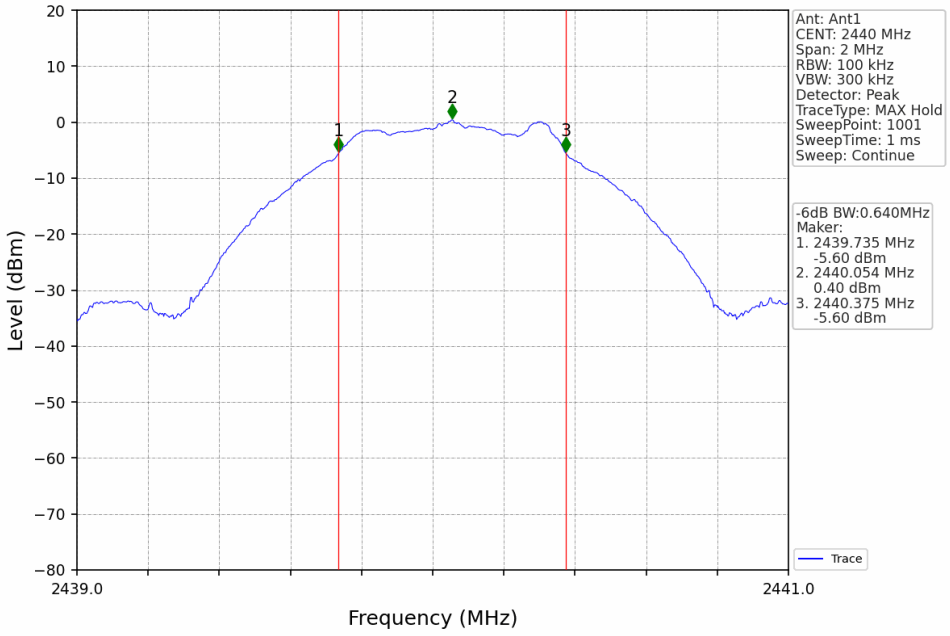
2.2.2 Test Graph

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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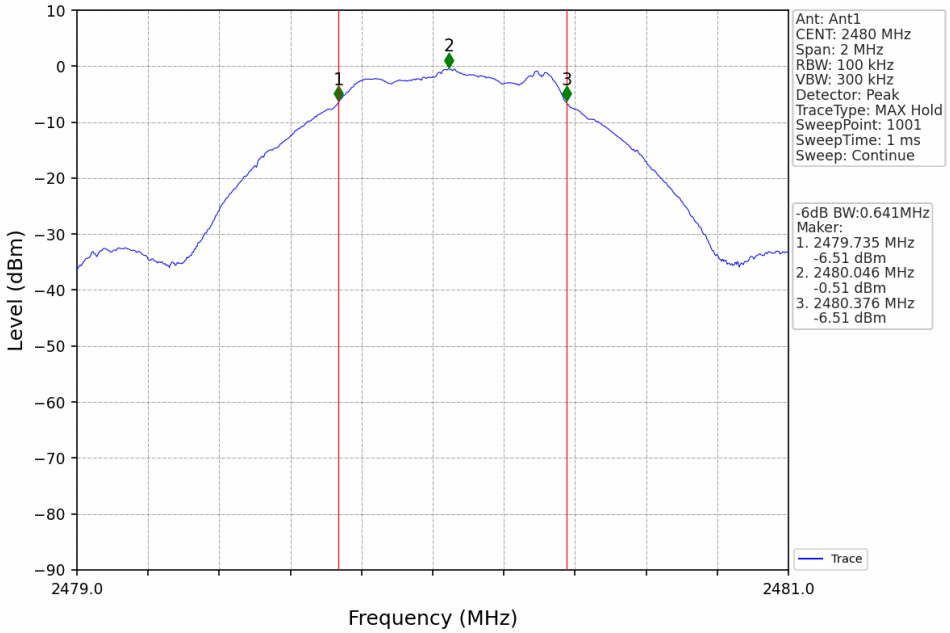
1M_HCH_2480MHz_Ant1_NTNV



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	0.30	<=30	Pass
		2440	0.76	<=30	Pass
		2480	-0.15	<=30	Pass

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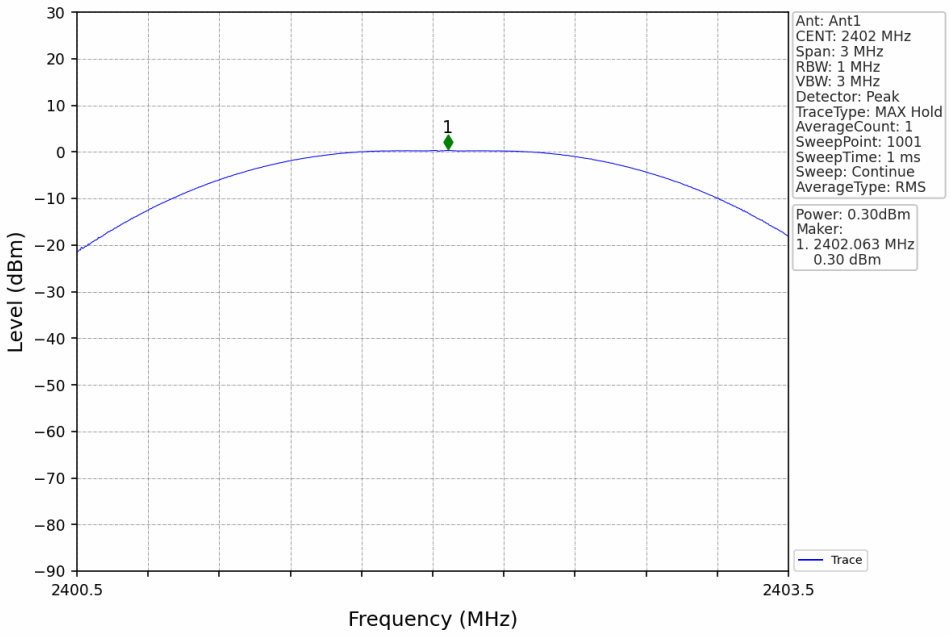
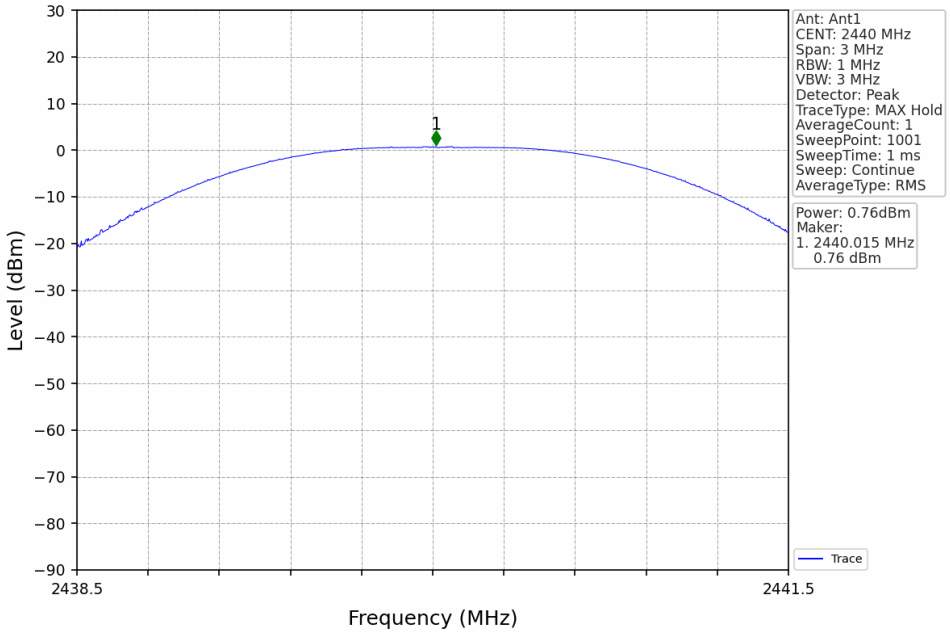
3.1.2 Test Graph

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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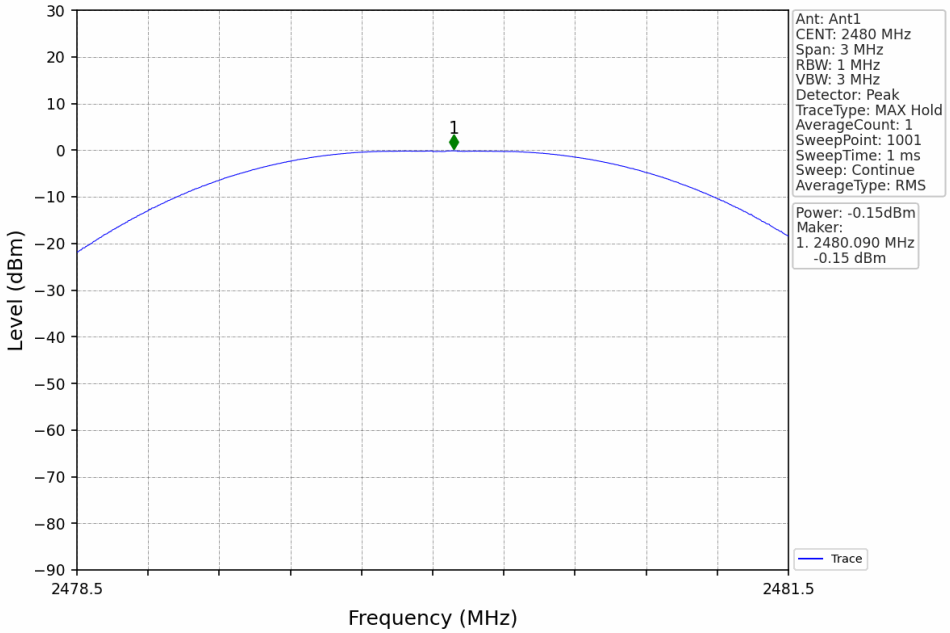
1M_HCH_2480MHz_Ant1_NTNV



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	-14.79	<=8	Pass
		2440	-14.71	<=8	Pass
		2480	-15.18	<=8	Pass

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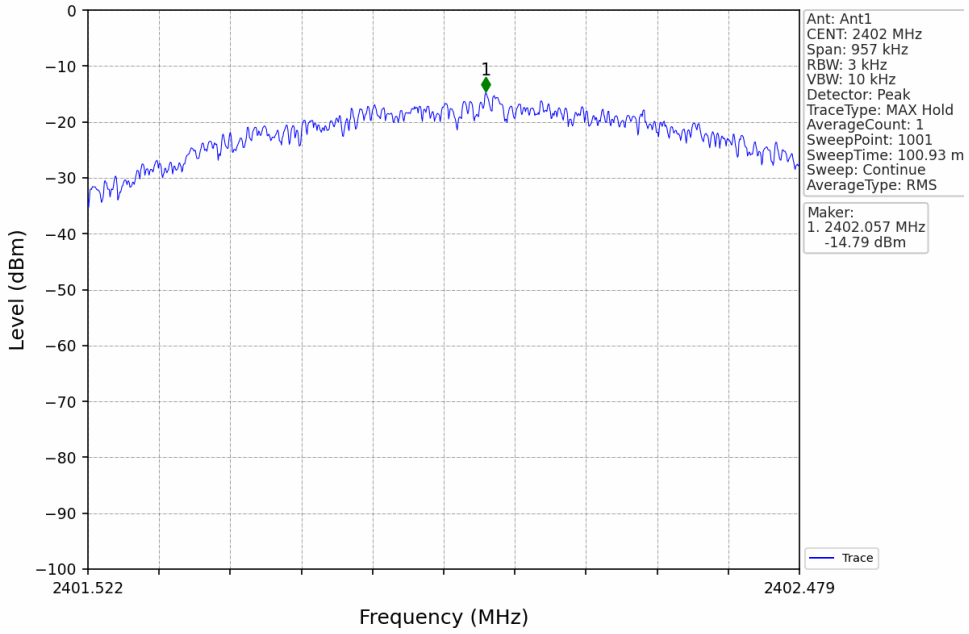
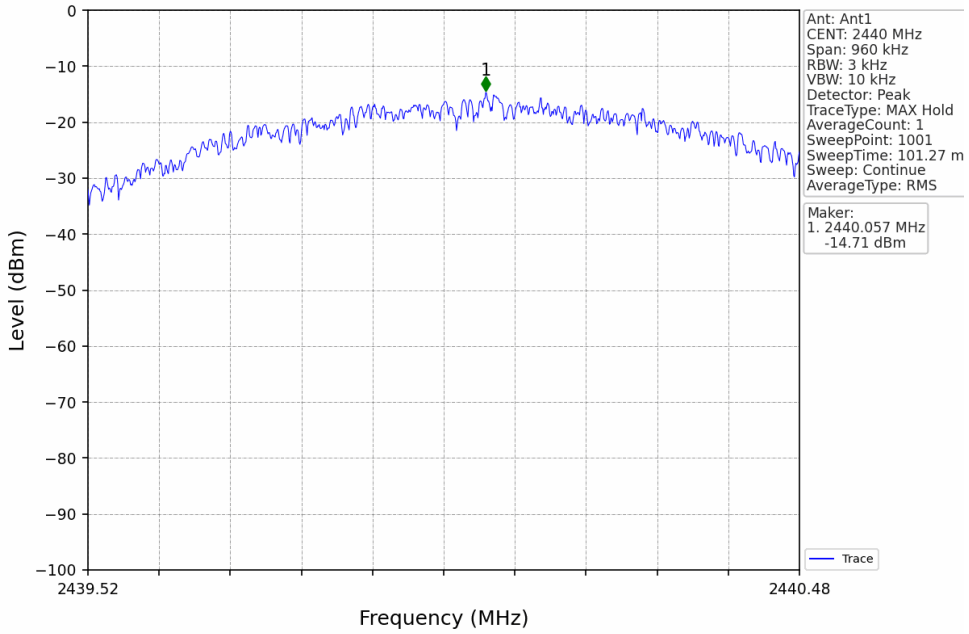
4.1.2 Test Graph

1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



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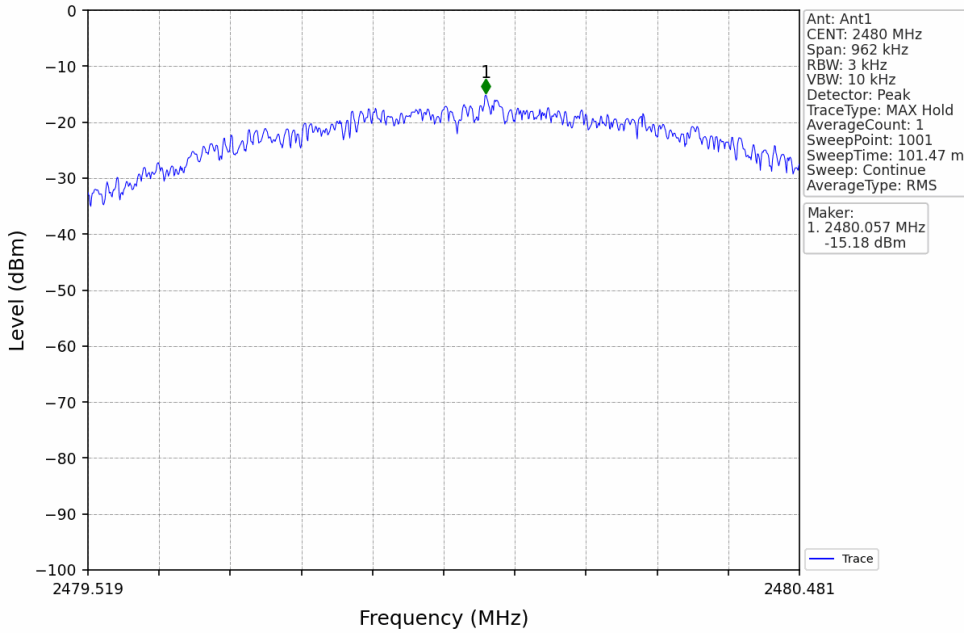
1M_HCH_2480MHz_Ant1_NTNV



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	-0.11
		2440	1	0.32
		2480	1	-0.39
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.				

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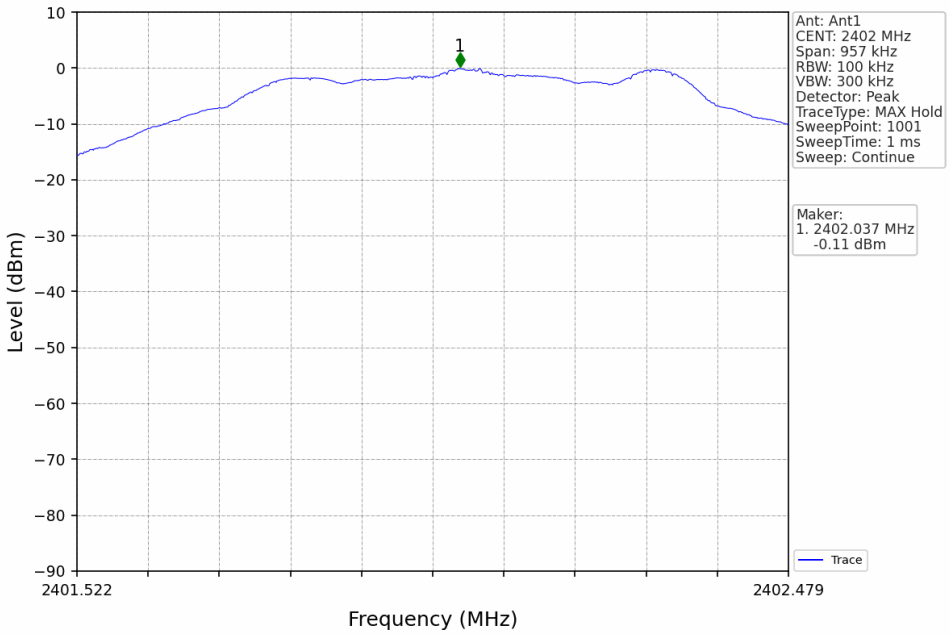
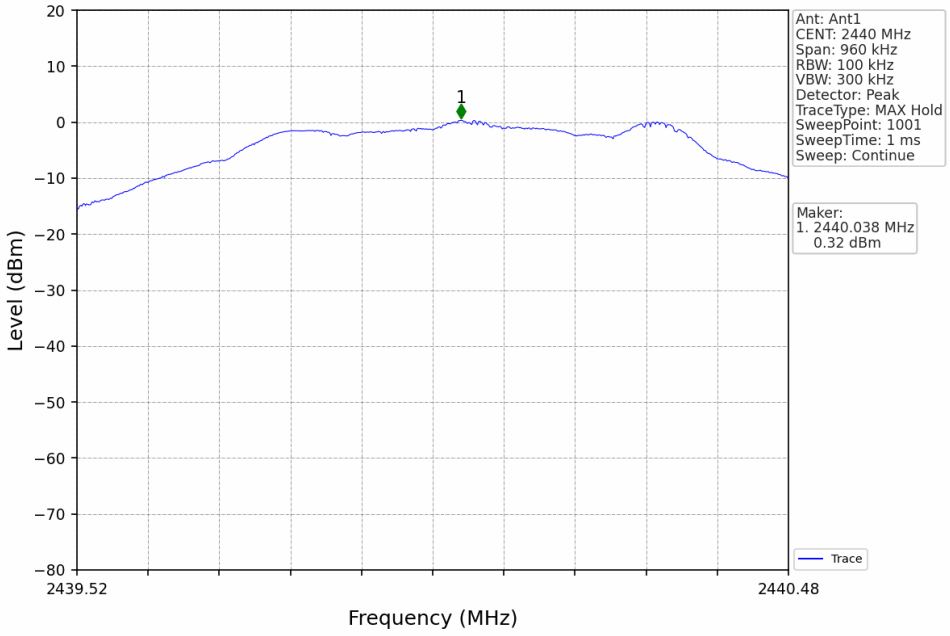
5.1.2 Test Graph

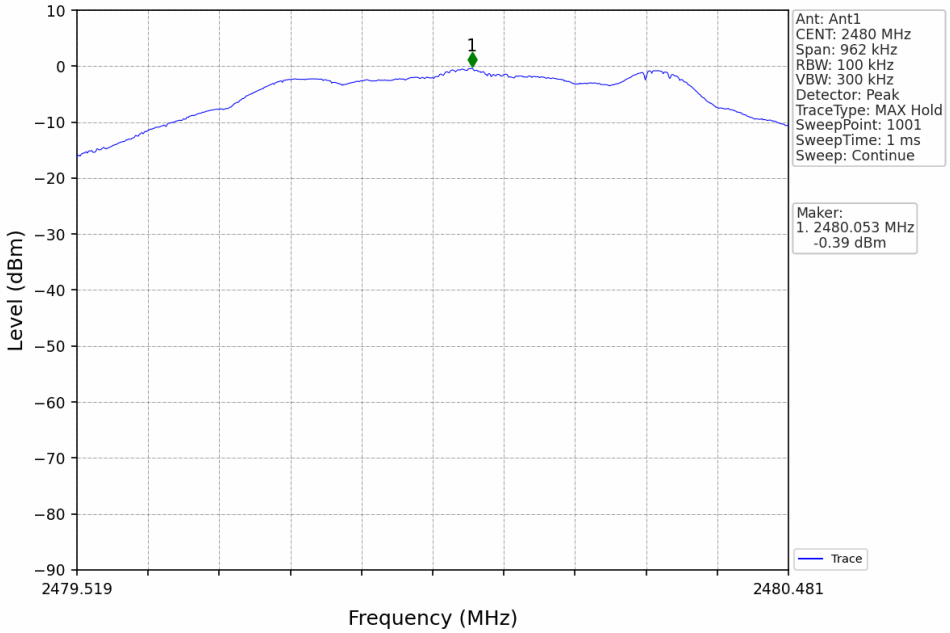
1M_LCH_2402MHz_Ant1_NTNV



1M_MCH_2440MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



5.2 CSE

5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	0.32	-19.68	Pass
		2440	1	0.32	-19.68	Pass
		2480	1	0.32	-19.68	Pass
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.						

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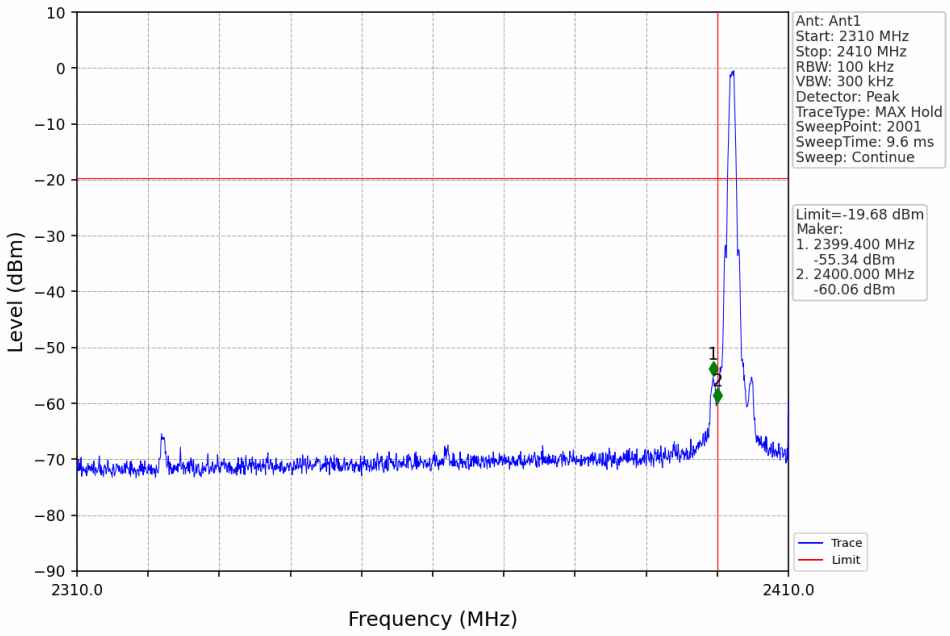
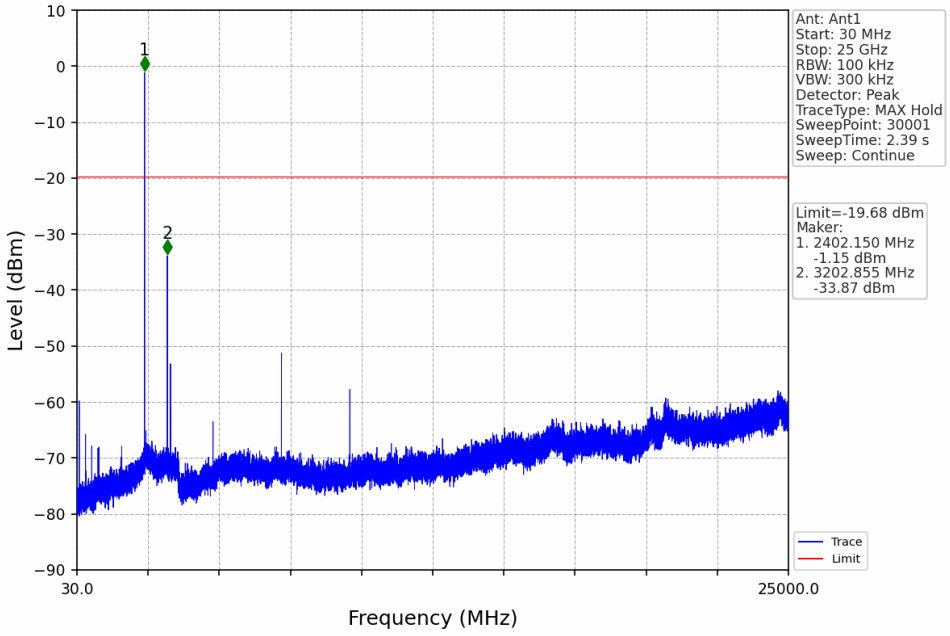
5.2.2 Test Graph

1M_LCH_2402MHz_Ant1_NTNV



1M_LCH_2402MHz_Ant1_NTNV



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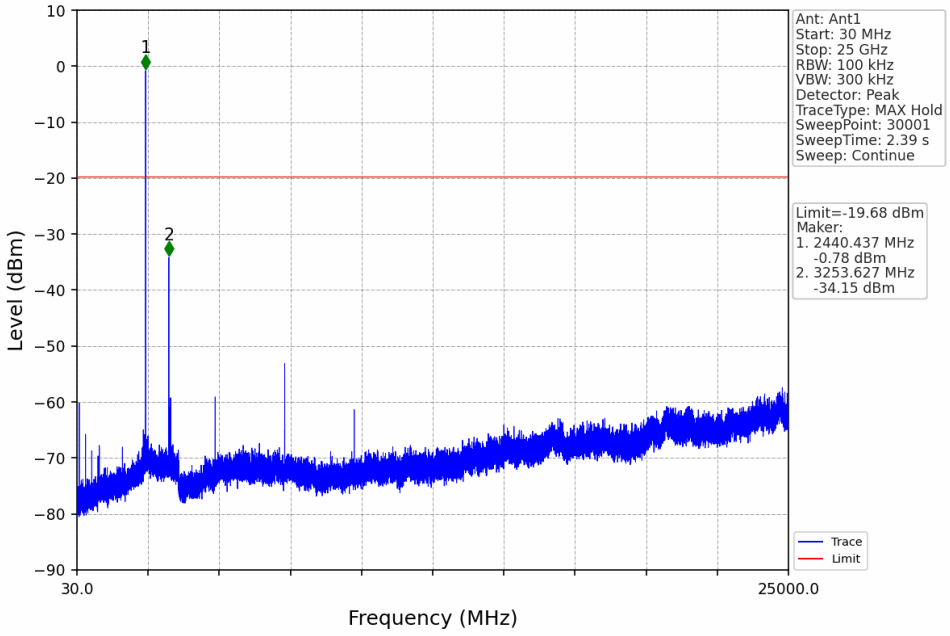
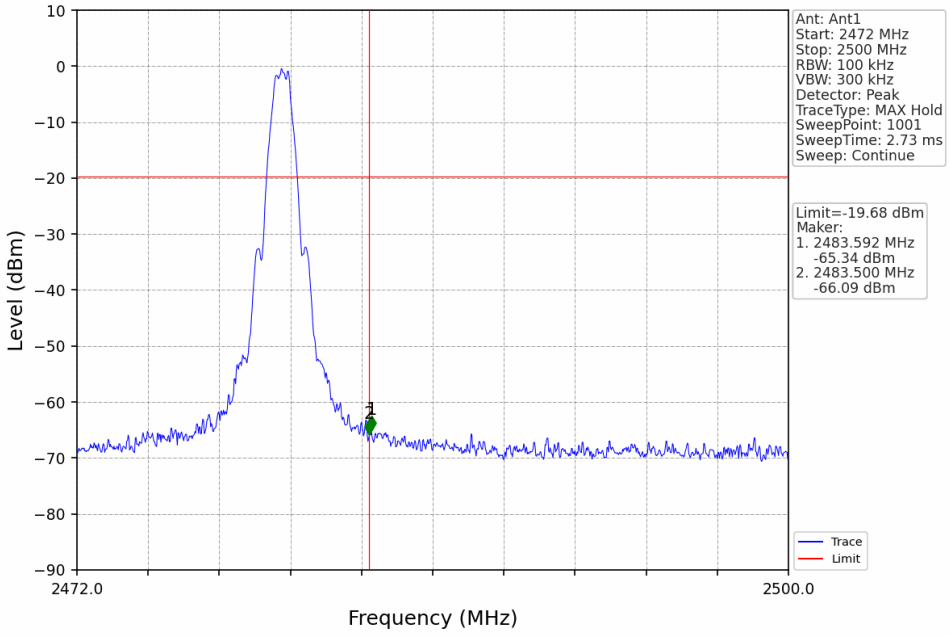
1M_MCH_2440MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



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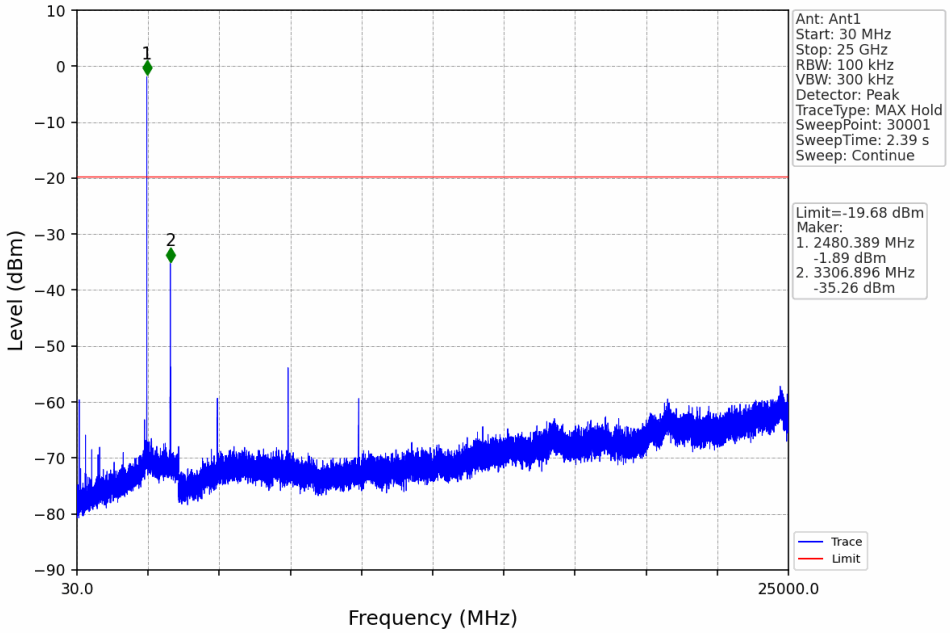
1M_HCH_2480MHz_Ant1_NTNV



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