

TEST REPORT

Application No.:	GZCR2401000026HS
Applicant:	American Accessories International, LLC
Address of Applicant:	550 W. Main St. Suite 825 Knoxville, TN 37902
Manufacturer:	SHENZHEN BOTO ELECTRONIC TECHNOLOGY CO., LTD
Address of Manufacturer:	5th Floor, Building 4, Hanhai High tech Industrial Park, Tianliao Tenth Industrial Zone, Yutang Street, Guangming New District, Shenzhen, Guangdong Province, China
Factory:	SHENZHEN BOTO ELECTRONIC TECHNOLOGY CO., LTD
Address of Factory:	5th Floor, Building 4, Hanhai High tech Industrial Park, Tianliao Tenth Industrial Zone, Yutang Street, Guangming New District, Shenzhen, Guangdong Province, China
Product Name:	Surface
Model No.:	S23178B, S23179B, S23180A, S23181A *
*	Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2024-01-03
Date of Test:	2024-01-10 to 2024-01-12
Date of Issue:	2024-01-18

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Ricky Liu
Manager

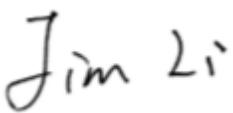
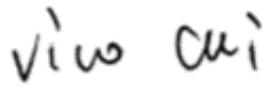


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Revision Record			
Version	Report No.	Date	Remark
01	GZCR240100002602	2024-01-18	Original

Authorized for issue by			
		 Jim Li/Project Engineer	
		 Vico Cui/Reviewer	

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 11.12	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

◆ Declaration of EUT Family Grouping:

Model No.: S23178B, S23179B, S23180A, S23181A

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on model name and outer decoration.

Therefore only one model S23180A was tested in this report.



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3 Contents

	Page
1 Cover Page	1
2 Test Summary.....	3
3 Contents	4
4 General Information.....	6
4.1 Details of E.U.T.....	6
4.2 Description of Support Units.....	6
4.3 Measurement Uncertainty	6
4.4 Test Location	7
4.5 Test Facility.....	7
4.6 Deviation from Standards	7
4.7 Abnormalities from Standard Conditions	7
5 Equipment List	8
6 Radio Spectrum Technical Requirement.....	11
6.1 Antenna Requirement	11
6.1.1 Test Requirement:.....	11
6.1.2 Conclusion.....	11
7 Radio Spectrum Matter Test Results.....	12
7.1 Conducted Peak Output Power	12
7.1.1 E.U.T. Operation.....	12
7.1.2 Test Mode Description	12
7.1.3 Test Setup Diagram	12
7.1.4 Measurement Procedure and Data.....	12
7.2 Minimum 6dB Bandwidth.....	13
7.2.1 E.U.T. Operation.....	13
7.2.2 Test Mode Description	13
7.2.3 Test Setup Diagram	13
7.2.4 Measurement Procedure and Data.....	13
7.3 Power Spectrum Density	14
7.3.1 E.U.T. Operation.....	14
7.3.2 Test Mode Description	14
7.3.3 Test Setup Diagram	14
7.3.4 Measurement Procedure and Data.....	14
7.4 Conducted Band Edges Measurement	15
7.4.1 E.U.T. Operation.....	15
7.4.2 Test Mode Description	15
7.4.3 Test Setup Diagram	15
7.4.4 Measurement Procedure and Data.....	15
7.5 Conducted Spurious Emissions	16
7.5.1 E.U.T. Operation.....	16
7.5.2 Test Mode Description	16
7.5.3 Test Setup Diagram	16

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7.5.4	Measurement Procedure and Data.....	16
7.6	Radiated Emissions which fall in the restricted bands	17
7.6.1	E.U.T. Operation.....	17
7.6.2	Test Mode Description	17
7.6.3	Test Setup Diagram	18
7.6.4	Measurement Procedure and Data.....	18
7.7	Radiated Spurious Emissions Below 1GHz.....	23
7.7.1	E.U.T. Operation.....	23
7.7.2	Test Mode Description	23
7.7.3	Test Setup Diagram	23
7.7.4	Measurement Procedure and Data.....	24
7.8	Radiated Spurious Emissions Above 1GHz	27
7.8.1	E.U.T. Operation.....	27
7.8.2	Test Mode Description	27
7.8.3	Test Setup Diagram	27
7.8.4	Measurement Procedure and Data.....	28
8	Test Setup Photo	35
9	EUT Constructional Details (EUT Photos).....	36
10	Appendix.....	37



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 6V= size 'CR2450' 3V x2pcs paralleling x2pcs series connection
Test voltage:	DC 6V
Cable(s):	N/A
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	Integral Antenna
Antenna Gain:	2.62 dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
Power Spectrum Density	± 2.84dB
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Radiated Emissions which fall in the restricted bands	±5.00dB (30MHz-1GHz; 3m); ±4.38dB (30MHz-1GHz; 10m); ± 5.12dB (1GHz-6GHz); ±5.38dB (6GHz-18GHz); ±5.61dB(18GHz-40GHz)
Radiated Spurious Emissions Below 1GHz	±5.00dB (3m); ±4.38dB (10m)
Radiated Spurious Emissions Above 1GHz	±5.12dB (1GHz-6GHz); ±5.38dB (6GHz-18GHz); ±5.61dB(18GHz-40GHz)
Remark:	
The U_{lab} (lab Uncertainty) is less than U_{ETSI} (ETSI Uncertainty), so the test results	
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;	
– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.	



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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Scitech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

4.5 Test Facility

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

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

- **ISED (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IEC600 01 and Rules of procedure IEC600 02, and the relevant IEC600 CB-Scheme Operational documents.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

The EUT passed the Radiated Spurious Emissions Below 1GHz test after modifications.

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5 Equipment List

Conducted Peak Output Power					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2023-08-23	2024-08-22
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2023-08-23	2024-08-22
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Power Spectrum Density					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2023-08-23	2024-08-22
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2023-08-23	2024-08-22
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2023-08-23	2024-08-22
Test Software	TST	V2.0	GZE100-78	N/A	N/A



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Radiated Emissions which fall in the restricted bands

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2023-11-10	2024-11-09
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2023-12-15	2024-12-14
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2022-08-24	2024-08-23
Horn Antenna (1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2022-09-23	2025-09-22
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2023-06-18	2026-06-17
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2023-10-20	2024-10-19
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2023-12-20	2026-12-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

Radiated Spurious Emissions Below 1GHz

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
966 Anechoic Chamber	Shenzhen C.R.T	CRTSGSSAC966	EMC2230	2022-04-12	2025-04-11
EMI Test Receiver(1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2229	2023-02-20	2024-02-19
Amplifier(9k-1000MHz)	SONOMA	310	EMC2237	2023-04-13	2024-04-12
TRILOG Broadband Antenna (25M-2GHz)	SCHWRZBECK	VULB 9168	EMC2238	2022-04-20	2025-04-19
Coaxial Cable	Mirco-COAX UTIFLEX ve	LA2-C125-8000	EMC2239	2023-06-14	2025-06-13
Test Software E3	Audix	Ver.6.191211	GZE100-81	N/A	N/A
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2022-04-06	2024-04-05

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Radiated Spurious Emissions Above 1GHz						
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date	
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2023-11-10	2024-11-09	
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2023-12-15	2024-12-14	
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2022-08-24	2024-08-23	
Horn Antenna (1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2022-09-23	2025-09-22	
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2023-06-18	2026-06-17	
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2023-11-10	2024-11-09	
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2023-08-23	2024-08-22	
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2023-10-20	2024-10-19	
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2023-12-20	2026-12-19	
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A	

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2023-06-11	2024-06-10

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.62 dBi.

Antenna location: Refer to internal photo.



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t (86-20) 82155555 sgs.china@sgs.com

7 Radio Spectrum Matter Test Results

7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.1

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.1.1 E.U.T. Operation

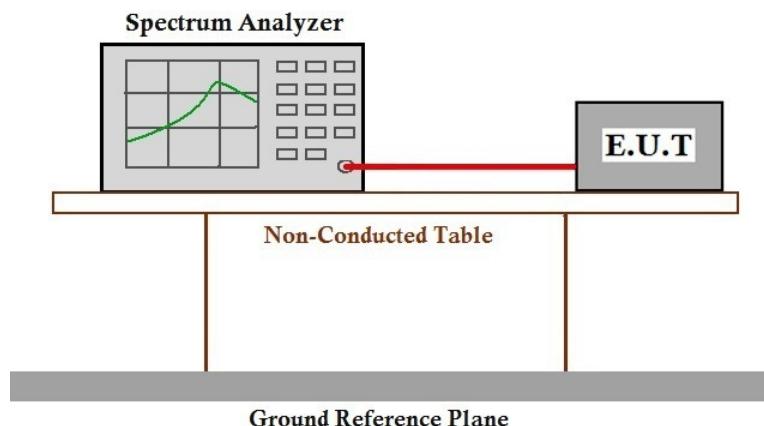
Operating Environment:

Temperature: 22.0 °C Humidity: 53.7 % RH Atmospheric Pressure: 1021 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Note: Since the verify power the same operating range bandwidth and smaller power can be covered by the higher power.

Please Refer to Appendix for Details



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7.2 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)

Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit: ≥ 500 kHz

7.2.1 E.U.T. Operation

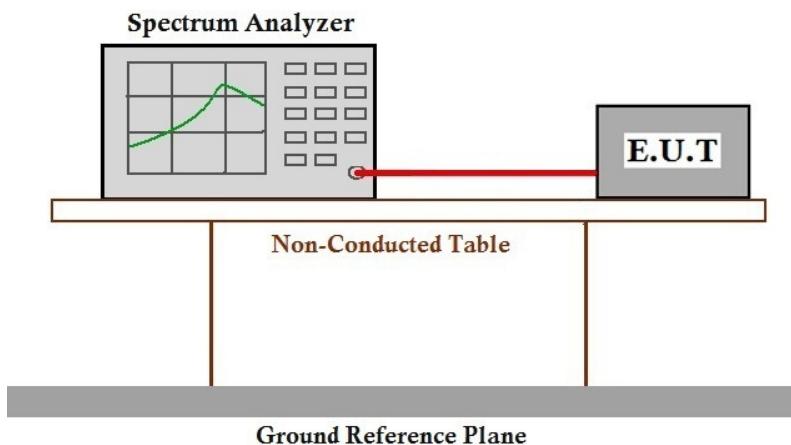
Operating Environment:

Temperature: 22.0 °C Humidity: 53.7 % RH Atmospheric Pressure: 1021 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.3 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)
Test Method: ANSI C63.10 (2013) Section 11.10.2
Limit: ≤8dBm in any 3 kHz band during any time interval of continuous transmission

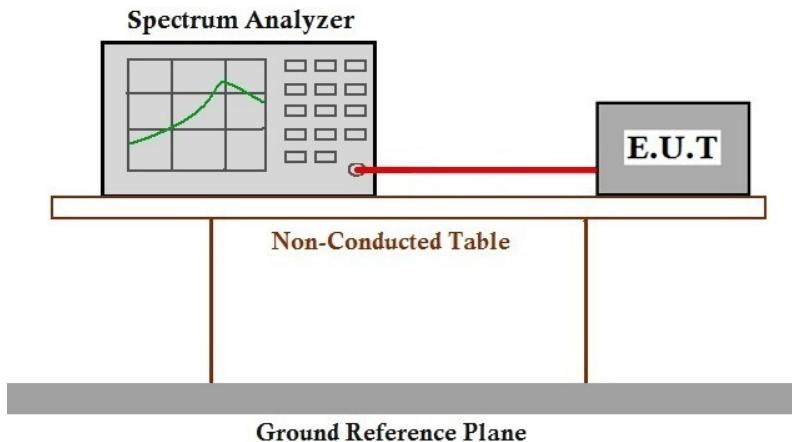
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 22.0 °C Humidity: 53.7 % RH Atmospheric Pressure: 1021 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.4 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 11.13.3.2

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. 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)).

7.4.1 E.U.T. Operation

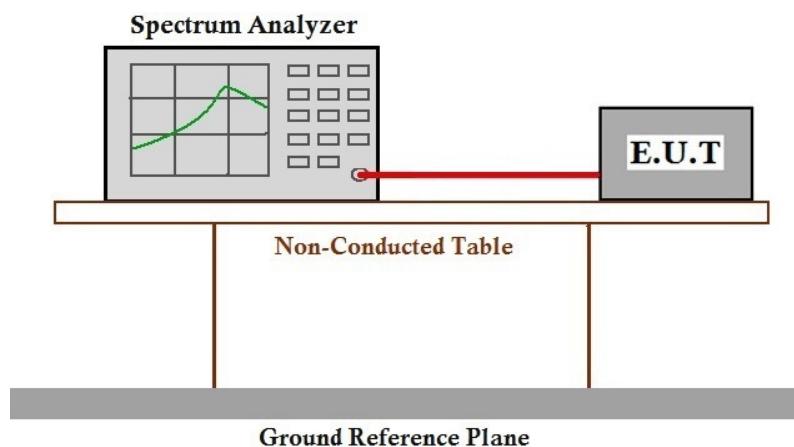
Operating Environment:

Temperature: 22.0 °C Humidity: 53.7 % RH Atmospheric Pressure: 1021 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.5 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 11.11

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. 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)).

7.5.1 E.U.T. Operation

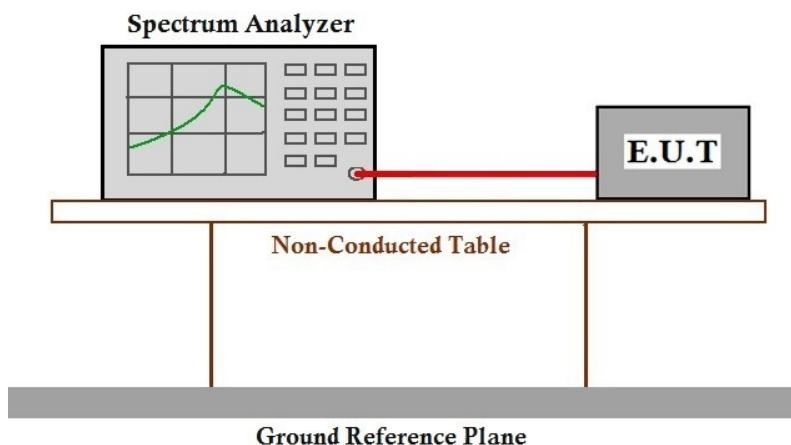
Operating Environment:

Temperature: 22.0 °C Humidity: 53.7 % RH Atmospheric Pressure: 1021 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.6 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 11.12

Limit:

Test Distance: 3 m

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.9 °C Humidity: 62.2 % RH Atmospheric Pressure: 1021 mbar

7.6.2 Test Mode Description

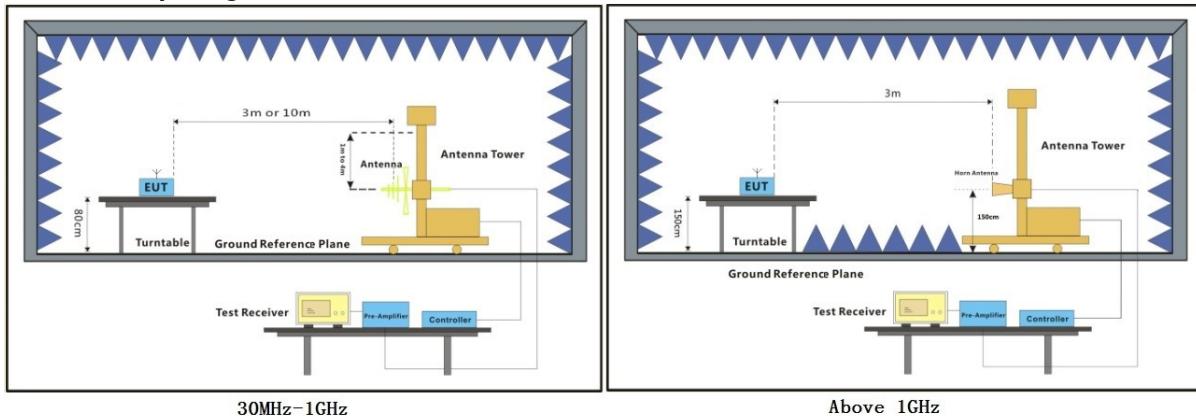
Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

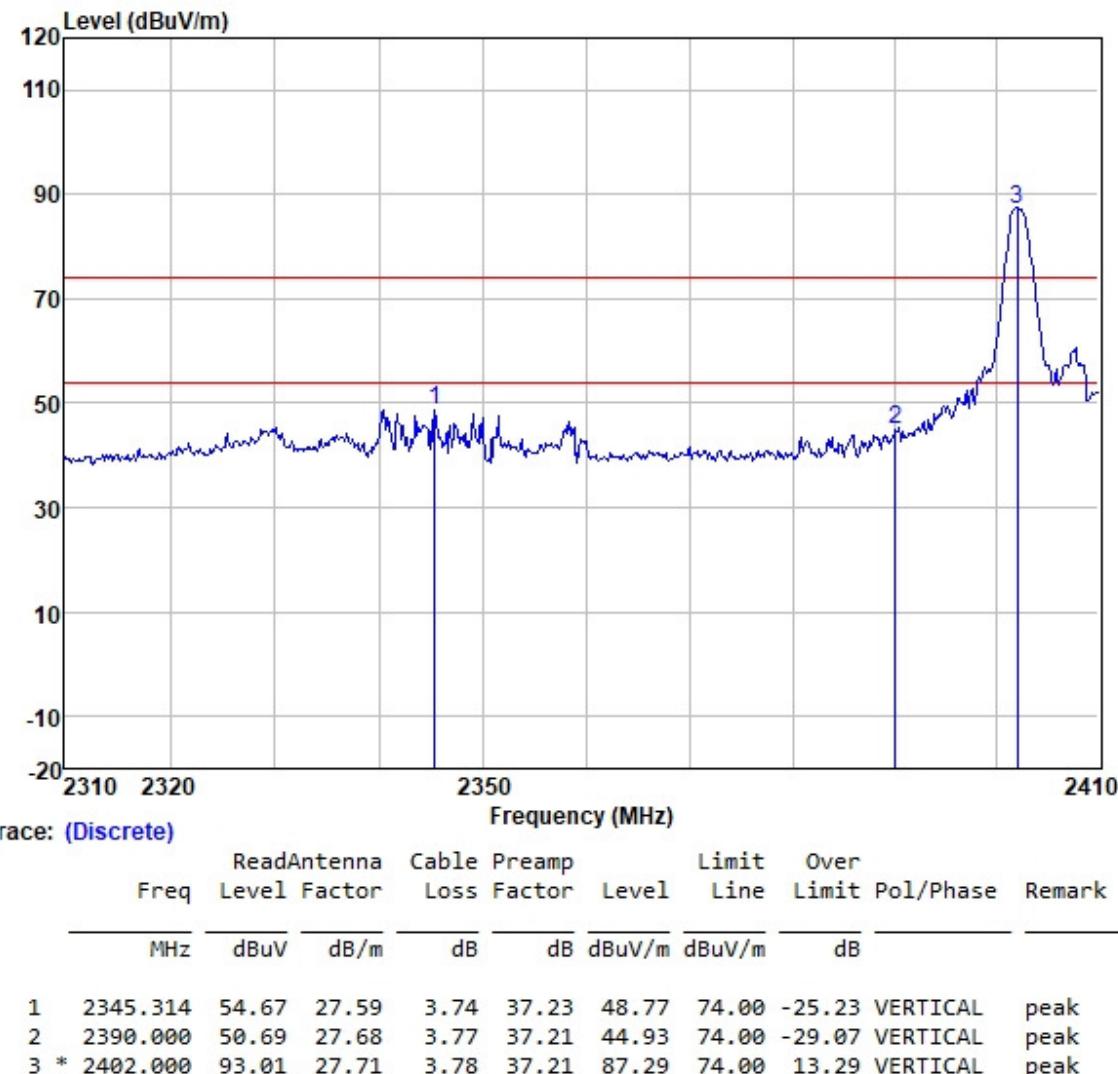
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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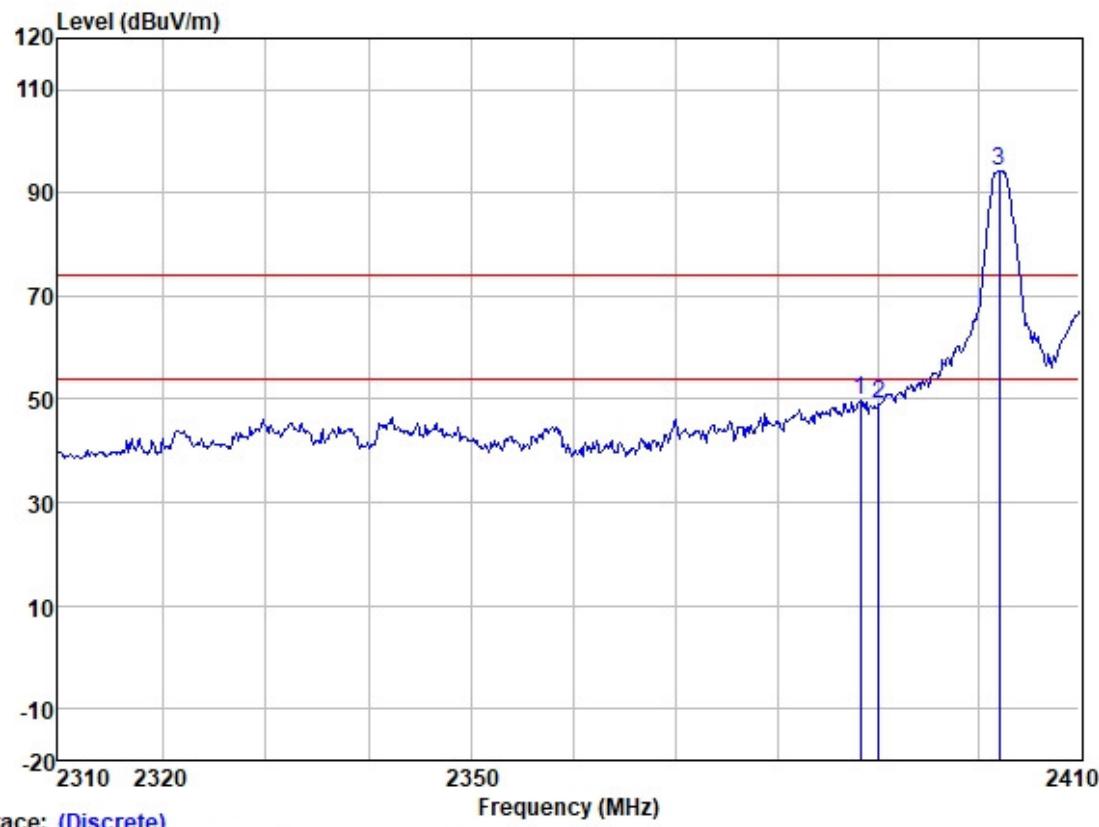
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Race: (Discrete)

	ReadAntenna		Cable		Preamp		Limit	Over	Over	Pol/Phase	Remark
	Freq	Level	Factor	Loss	Factor	Level					
	MHz	dBuV	dB/m		dB	dB	dBuV/m	dBuV/m			
1	2388.141	55.57	27.68	3.77	37.22	49.80	74.00	-24.20	HORIZONTAL	peak	
2	2390.000	54.86	27.68	3.77	37.21	49.10	74.00	-24.90	HORIZONTAL	peak	
3 *	2402.000	99.87	27.71	3.78	37.21	94.15	74.00	20.15	HORIZONTAL	peak	

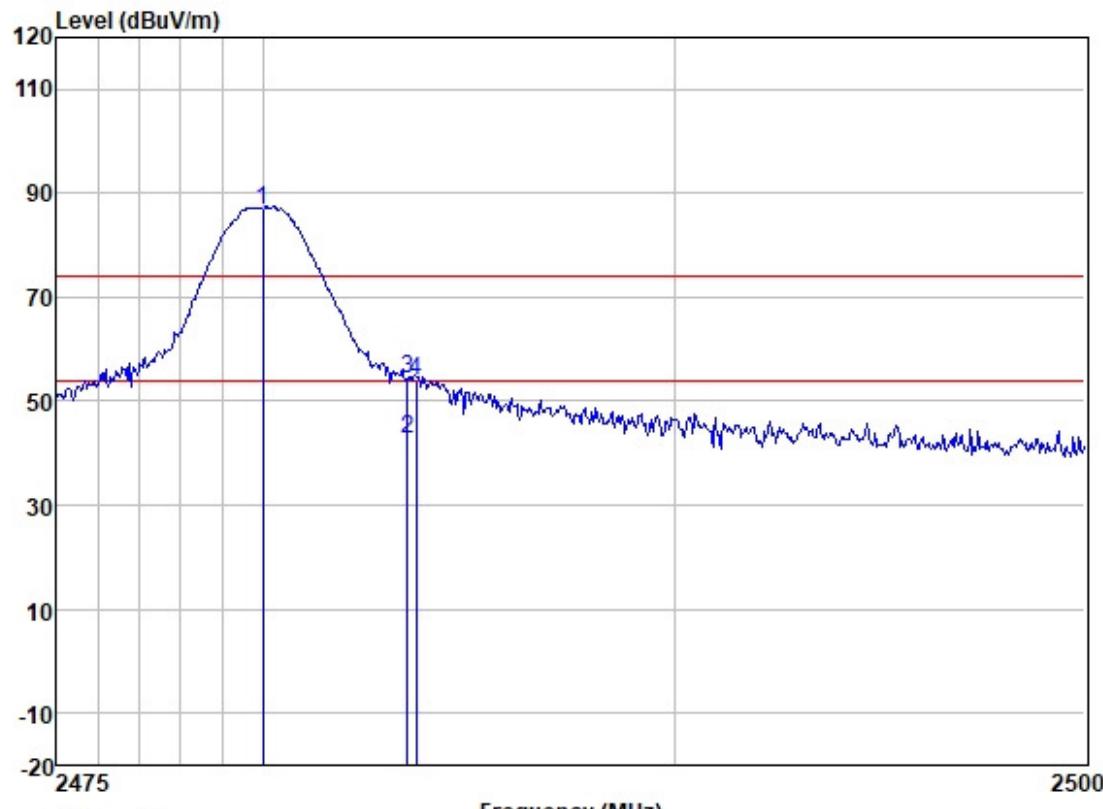


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Race: (Discrete)

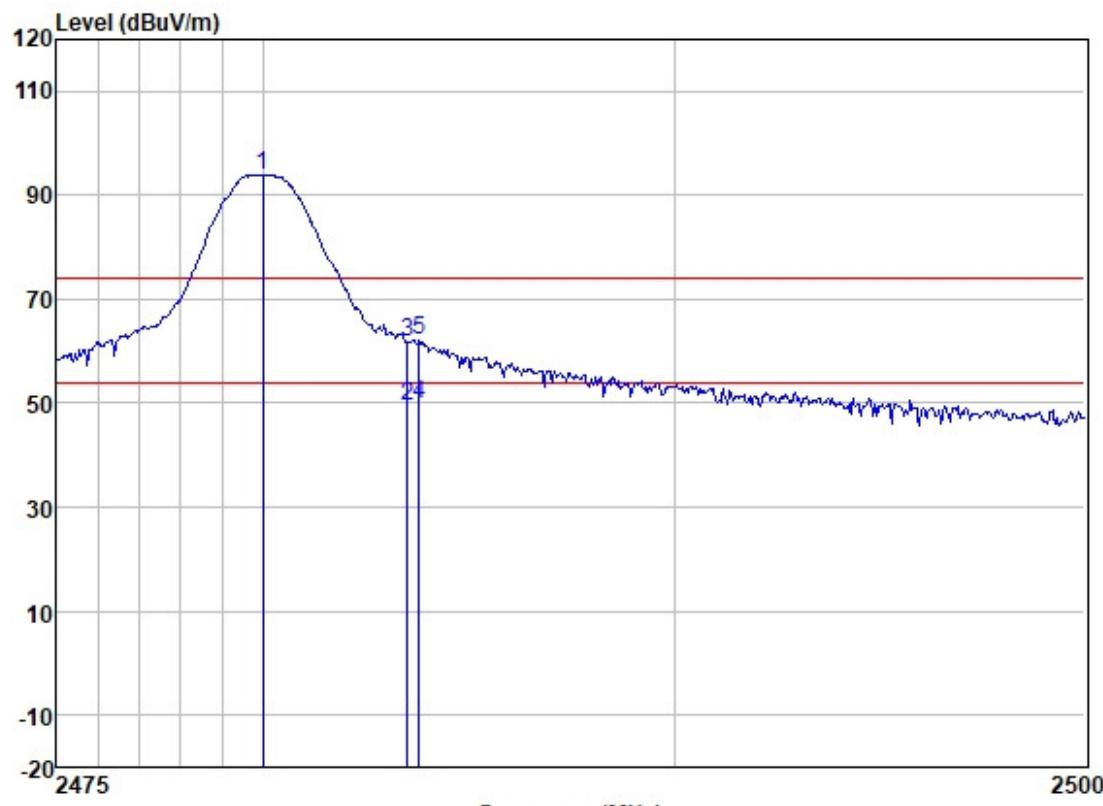
Freq	Read	Antenna	Cable	Preamp	Limit	Over	Pol/Phase	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 * 2480.000	92.41	27.84	3.82	37.19	86.88	74.00	12.88	VERTICAL peak
2 2483.500	48.41	27.85	3.82	37.19	42.89	54.00	-11.11	VERTICAL Average
3 2483.500	59.91	27.85	3.82	37.19	54.39	74.00	-19.61	VERTICAL peak
4 2483.721	59.31	27.85	3.82	37.19	53.79	74.00	-20.21	VERTICAL peak



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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Race: (Discrete)

Freq	Read	Antenna	Cable	Preamp	Limit	Over	Pol/Phase	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 * 2480.000	99.49	27.84	3.82	37.19	93.96	74.00	19.96	HORIZONTAL peak
2 2483.500	54.83	27.85	3.82	37.19	49.31	54.00	-4.69	HORIZONTAL Average
3 2483.500	67.27	27.85	3.82	37.19	61.75	74.00	-12.25	HORIZONTAL peak
4 2483.771	55.31	27.85	3.82	37.19	49.79	54.00	-4.21	HORIZONTAL Average
5 2483.771	67.52	27.85	3.82	37.19	62.00	74.00	-12.00	HORIZONTAL peak

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7.7 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5

Limit:

Test Distance: 3 m

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
960-1000	500	3

7.7.1 E.U.T. Operation

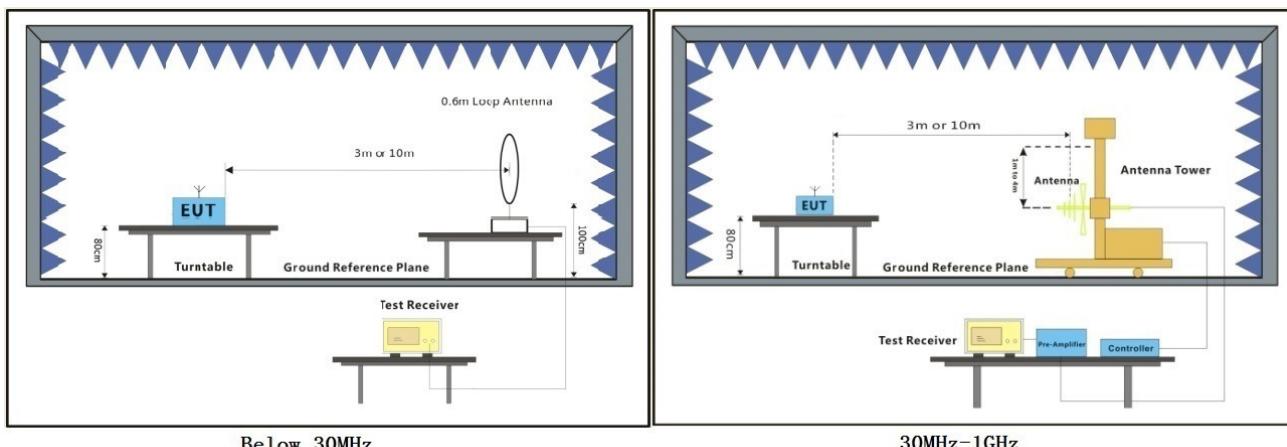
Operating Environment:

Temperature: 24.9 °C Humidity: 48.7 % RH Atmospheric Pressure: 1021 mbar

7.7.2 Test Mode Description

Pre-scan / Mode Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.3 Test Setup Diagram



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7.7.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

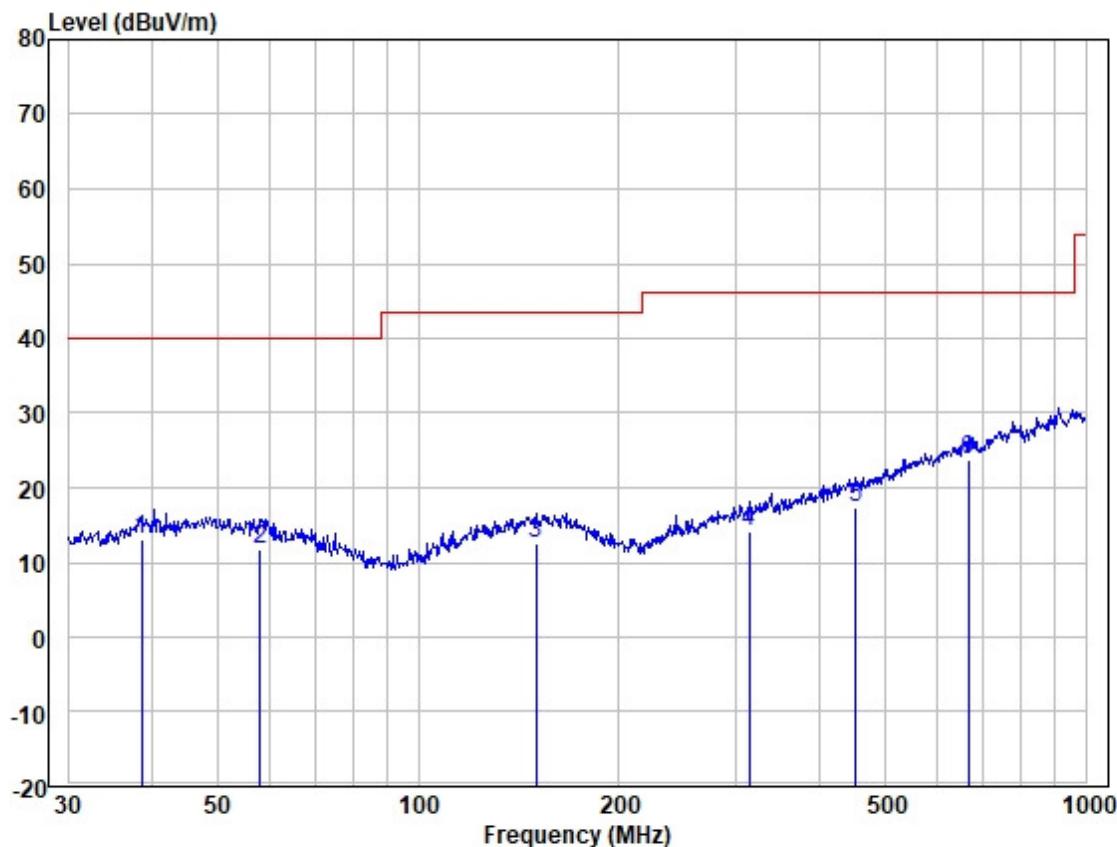
1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



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Test Mode: 00; Polarity: Horizontal



Site : 966 Chamber
Job :
Model :
Power :
Test Mode :

Freq	Read	Antena	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1 38.616	26.51	18.93	0.35	32.83	12.96	40.00	-27.04	HORIZONTAL	QP
2 57.999	25.10	18.99	0.41	32.80	11.70	40.00	-28.30	HORIZONTAL	QP
3 150.011	25.54	19.04	0.67	32.80	12.45	43.52	-31.07	HORIZONTAL	QP
4 313.276	26.49	19.58	0.99	32.80	14.26	46.02	-31.76	HORIZONTAL	QP
5 452.720	26.18	22.79	1.23	32.86	17.34	46.02	-28.68	HORIZONTAL	QP
6 665.804	28.44	26.62	1.51	32.75	23.82	46.02	-22.20	HORIZONTAL	QP

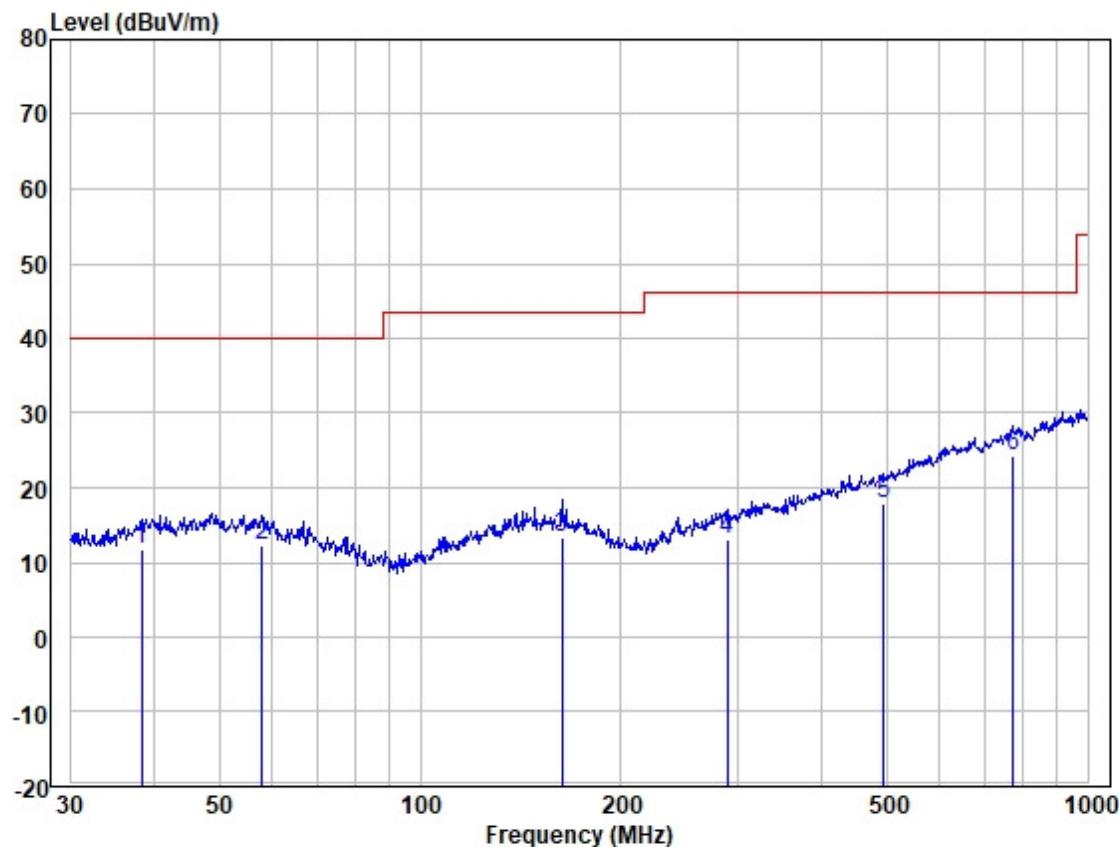
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Test Mode: 00; Polarity: Vertical



Site : 966 Chamber
Job :
Model :
Power :
Test Mode :

Freq	Read	Antena	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1 38.346	25.22	18.93	0.34	32.84	11.65	40.00	-28.35	VERTICAL	QP
2 57.999	25.58	18.99	0.41	32.80	12.18	40.00	-27.82	VERTICAL	QP
3 163.182	26.30	19.11	0.71	32.80	13.32	43.52	-30.20	VERTICAL	QP
4 287.990	25.80	19.03	0.97	32.80	13.00	46.02	-33.02	VERTICAL	QP
5 494.199	25.99	23.43	1.29	32.90	17.81	46.02	-28.21	VERTICAL	QP
6 771.449	26.69	28.34	1.64	32.37	24.30	46.02	-21.72	VERTICAL	QP

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7.8 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.8.1 E.U.T. Operation

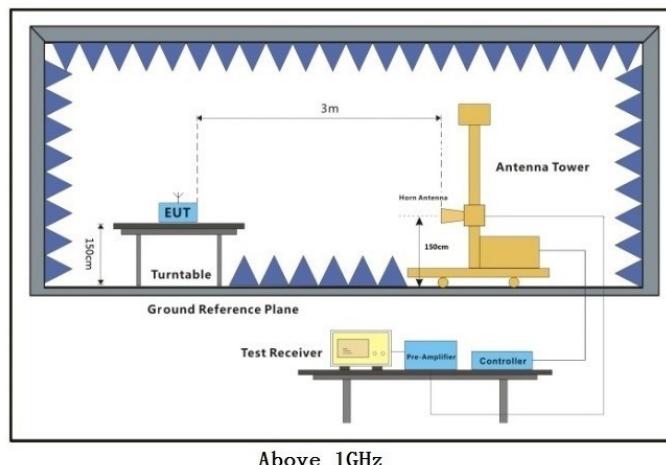
Operating Environment:

Temperature: 22.9 °C Humidity: 62.2 % RH Atmospheric Pressure: 1021 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode / Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



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7.8.4 Measurement Procedure and Data

- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

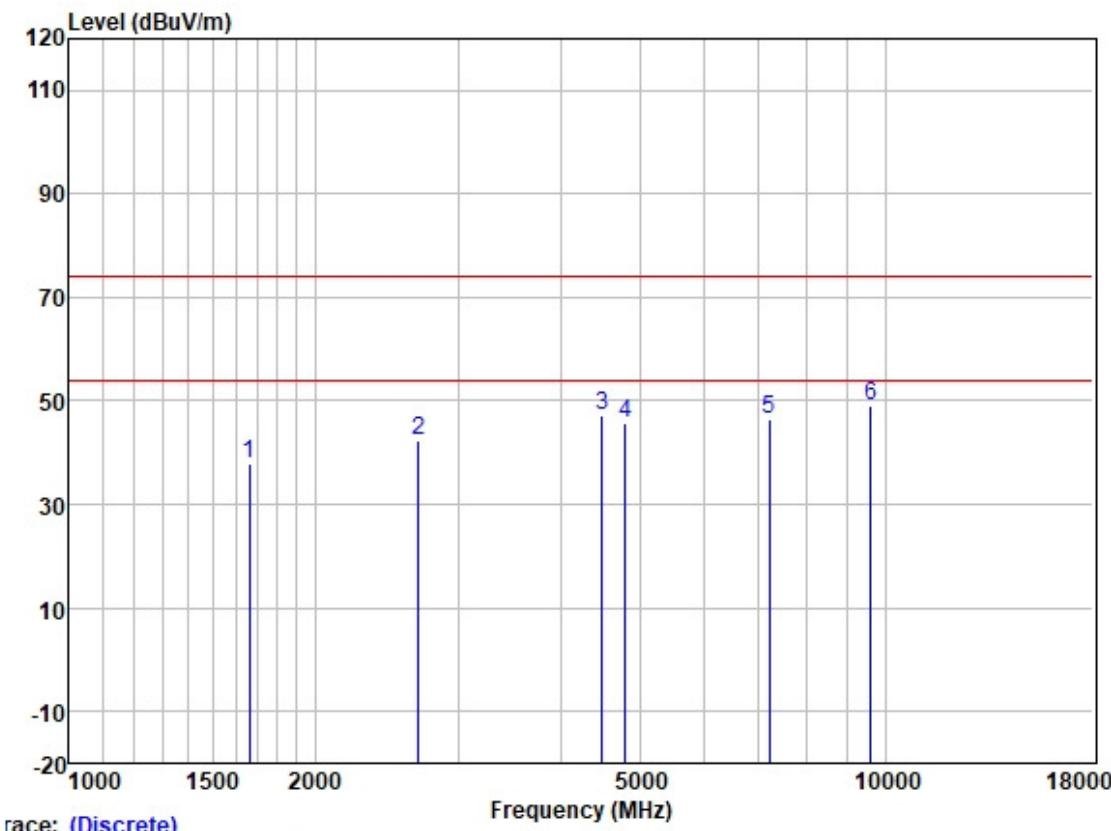
1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Point	Frequency (MHz)	ReadAntenna		Cable		Preamp		Limit Line	Over Limit	Over Limit Pol/Phase	Remark
		Freq	Level	Antenna Factor	Loss	Preamp Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1	1663.137	47.22	24.93	3.04	37.41	37.78	74.00	-36.22	VERTICAL	peak	
2	2679.464	47.40	28.12	3.97	37.12	42.37	74.00	-31.63	VERTICAL	peak	
3	4495.125	44.74	34.17	4.78	36.63	47.06	74.00	-26.94	VERTICAL	peak	
4	4804.000	42.93	34.16	5.15	36.66	45.58	74.00	-28.42	VERTICAL	peak	
5	7206.000	40.74	35.63	6.96	36.93	46.40	74.00	-27.60	VERTICAL	peak	
6	9608.000	39.71	38.68	7.65	36.82	49.22	74.00	-24.78	VERTICAL	peak	

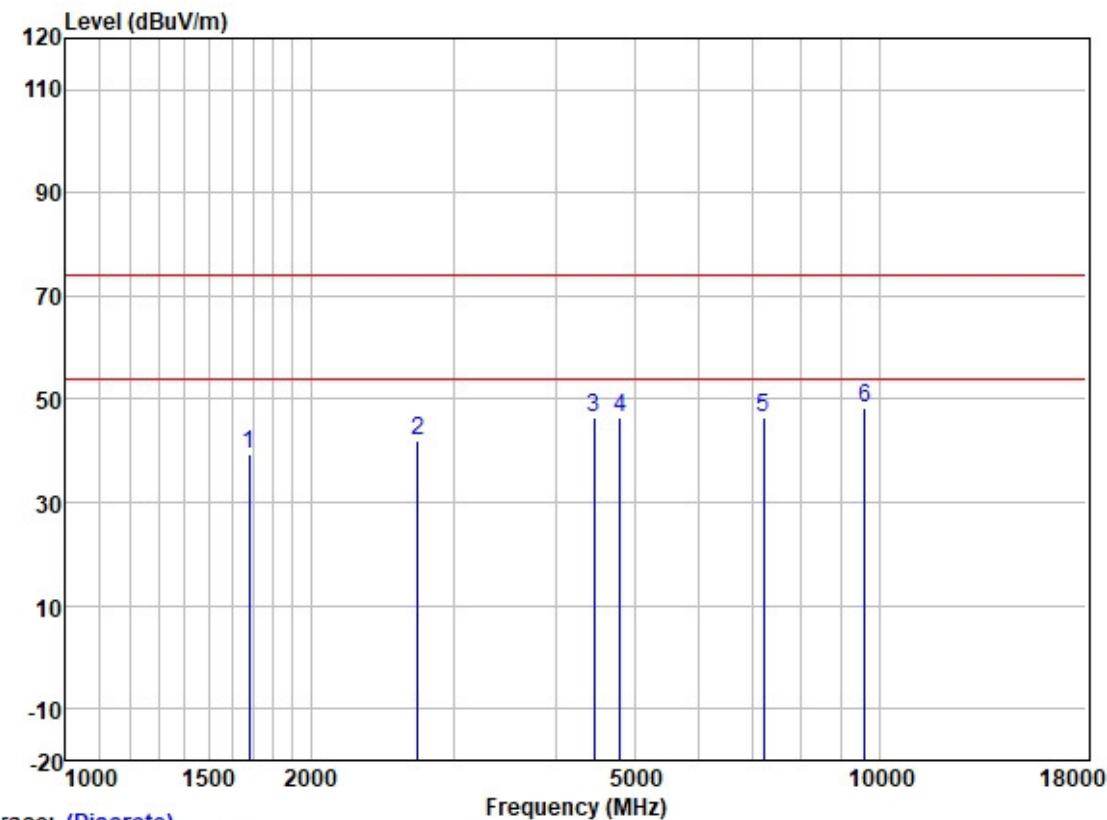
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Type: (Discrete)

Race	Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Pol/Phase	Remark
		Level	Factor	Loss	Factor	Level	dBuV/m					
	MHz	dBuV	dB/m		dB							
1	1682.477	48.80	25.03	3.06	37.40	39.49	74.00	-34.51	HORIZONTAL	peak		
2	2710.622	46.93	28.20	4.02	37.11	42.04	74.00	-31.96	HORIZONTAL	peak		
3	4456.315	44.14	34.00	4.79	36.63	46.30	74.00	-27.70	HORIZONTAL	peak		
4	4804.000	43.94	34.16	5.15	36.66	46.59	74.00	-27.41	HORIZONTAL	peak		
5	7206.000	40.76	35.63	6.96	36.93	46.42	74.00	-27.58	HORIZONTAL	peak		
6	9608.000	38.64	38.68	7.65	36.82	48.15	74.00	-25.85	HORIZONTAL	peak		

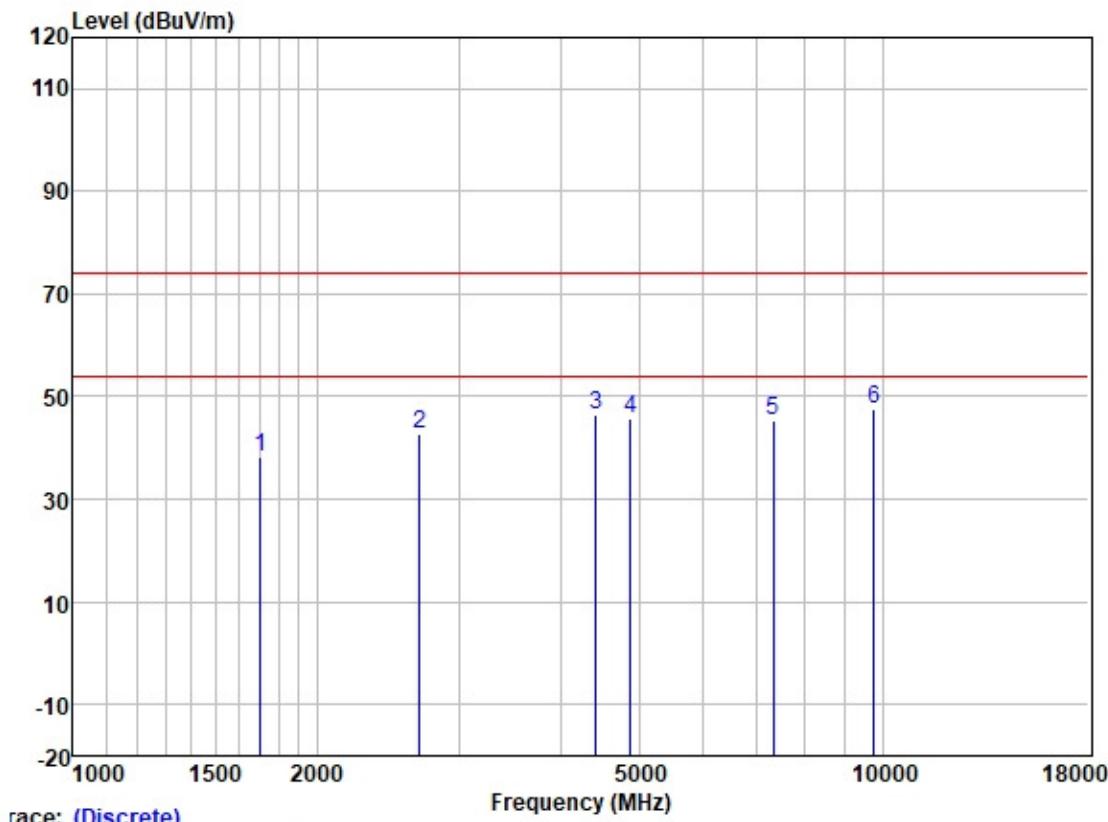
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Race	Freq	ReadAntenna		Cable		Preamp		Limit Line	Over Limit	Pol/Phase	Remark
		Level	Factor	Loss	Factor	Level	dBuV/m				
	MHz	dBuV	dB/m		dB						
1	1702.042	47.26	25.15	3.09	37.39	38.11	74.00	-35.89	VERTICAL	peak	
2	2679.464	47.81	28.12	3.97	37.12	42.78	74.00	-31.22	VERTICAL	peak	
3	4430.628	44.39	33.87	4.79	36.63	46.42	74.00	-27.58	VERTICAL	peak	
4	4880.000	42.99	34.15	5.22	36.67	45.69	74.00	-28.31	VERTICAL	peak	
5	7320.000	39.54	36.07	6.81	36.95	45.47	74.00	-28.53	VERTICAL	peak	
6	9760.000	37.77	38.81	7.65	36.81	47.42	74.00	-26.58	VERTICAL	peak	

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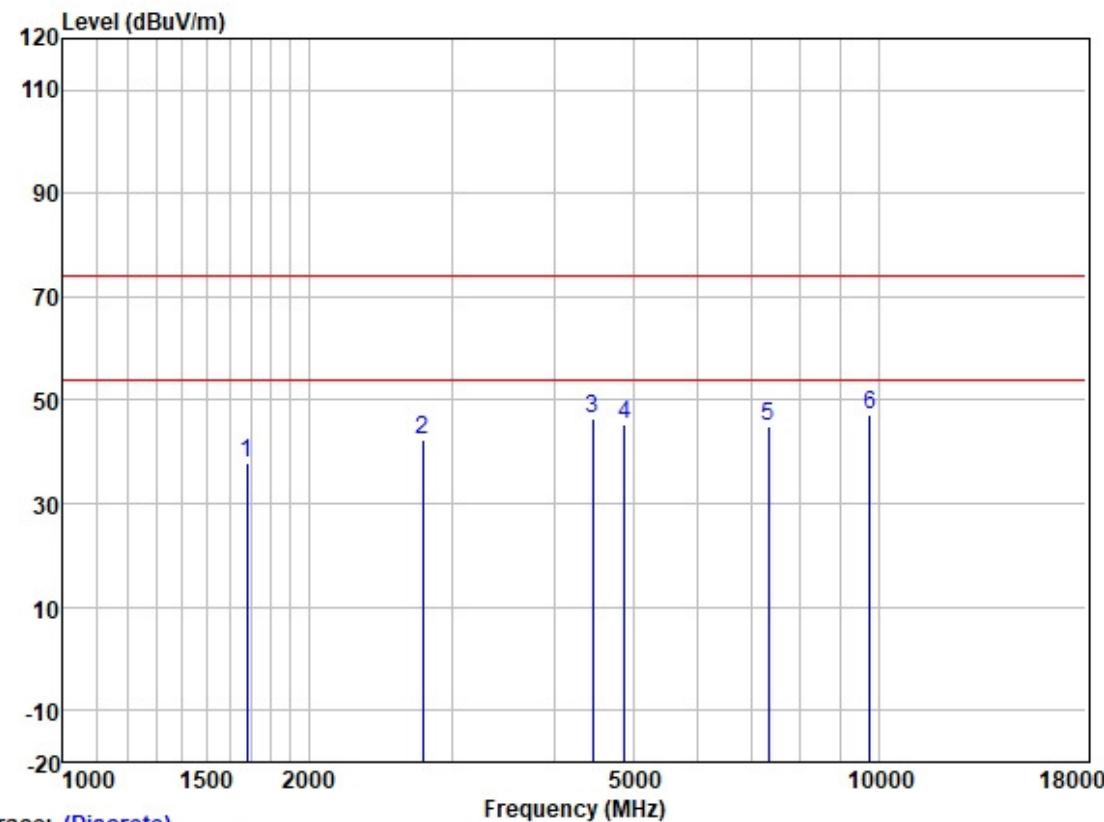


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Guangzhou Branch, Testing & EEC Laboratory, No.198, Kezhu Road, Science City, Economic & Technological Development Area, Guangzhou, Guangdong, China 510663

t (86-20) 82155555 www.sgsgroup.com.cn

t (86-20) 82155555 sgs.china@sgs.com

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Trace: (Discrete)	ReadAntenna		Cable		Preamp		Limit	Over	Over	Remark
	Freq	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1682.477	46.99	25.03	3.06	37.40	37.68	74.00	-36.32	HORIZONTAL	peak
2	2758.041	46.84	28.35	4.10	37.09	42.20	74.00	-31.80	HORIZONTAL	peak
3	4456.315	44.19	34.00	4.79	36.63	46.35	74.00	-27.65	HORIZONTAL	peak
4	4880.000	42.53	34.15	5.22	36.67	45.23	74.00	-28.77	HORIZONTAL	peak
5	7320.000	39.05	36.07	6.81	36.95	44.98	74.00	-29.02	HORIZONTAL	peak
6	9760.000	37.45	38.81	7.65	36.81	47.10	74.00	-26.90	HORIZONTAL	peak

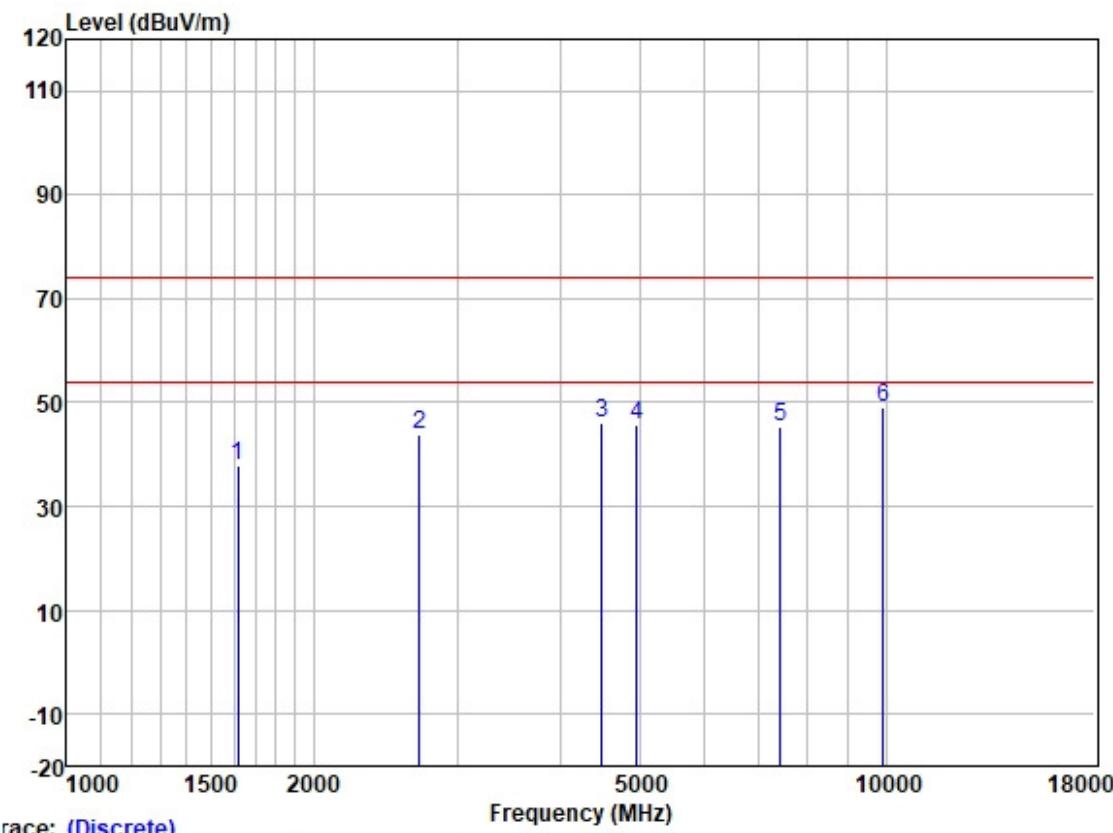
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



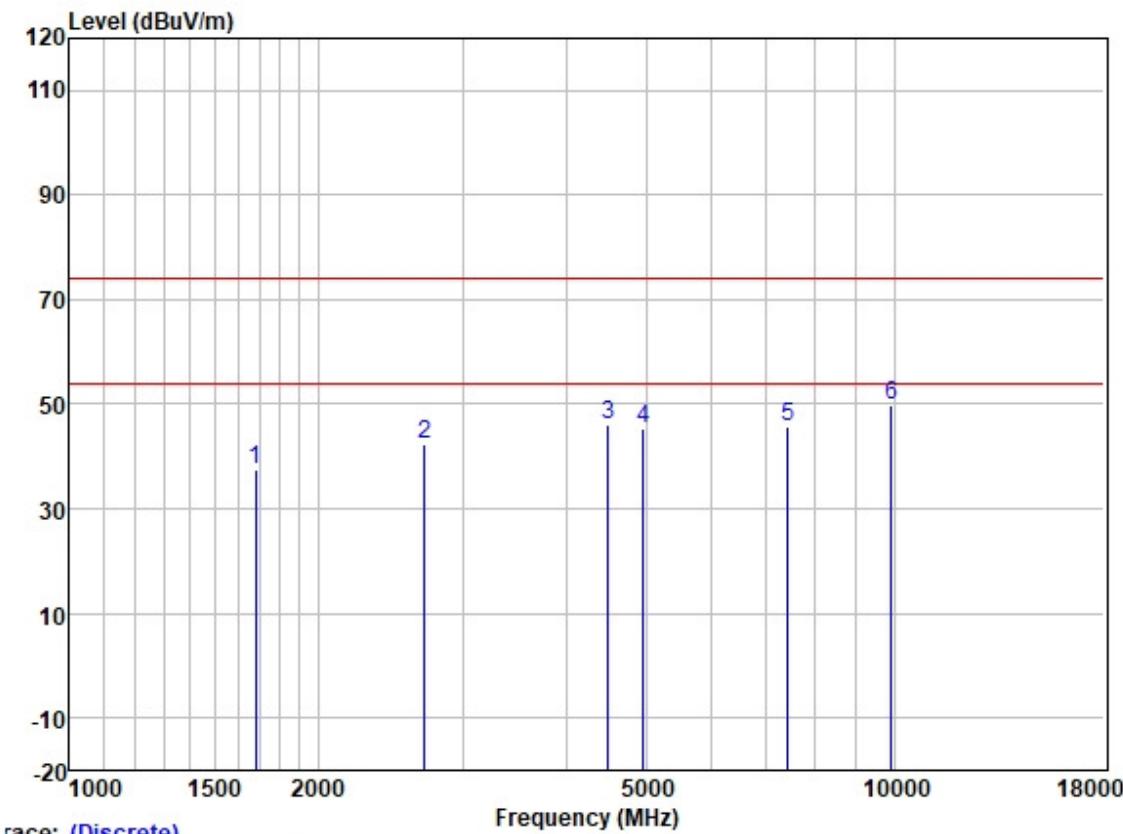
Race: (Discrete)	ReadAntenna								Limit	Over	Remark
	Freq	Level	Antenna	Cable	Preamp	Loss	Factor	Level			
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	Line	Limit	Pol/Phase
1	1615.754	47.68	24.74	3.00	37.44	37.98	74.00	-36.02	VERTICAL		peak
2	2694.998	48.67	28.16	3.99	37.12	43.70	74.00	-30.30	VERTICAL		peak
3	4495.125	43.70	34.17	4.78	36.63	46.02	74.00	-27.98	VERTICAL		peak
4	4960.000	42.83	34.15	5.28	36.69	45.57	74.00	-28.43	VERTICAL		peak
5	7440.000	39.31	36.33	6.72	36.96	45.40	74.00	-28.60	VERTICAL		peak
6	9920.000	39.36	38.95	7.67	36.80	49.18	74.00	-24.82	VERTICAL		peak

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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Index	Freq	ReadAntenna		Cable		Preamp		Limit Line	Over Limit	Pol/Phase	Remark
		Level	Factor	Loss	Factor	Level	dBuV/m				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1	1682.477	46.78	25.03	3.06	37.40	37.47	74.00	-36.53	HORIZONTAL	peak	
2	2694.998	47.42	28.16	3.99	37.12	42.45	74.00	-31.55	HORIZONTAL	peak	
3	4495.125	43.91	34.17	4.78	36.63	46.23	74.00	-27.77	HORIZONTAL	peak	
4	4960.000	42.48	34.15	5.28	36.69	45.22	74.00	-28.78	HORIZONTAL	peak	
5	7440.000	39.70	36.33	6.72	36.96	45.79	74.00	-28.21	HORIZONTAL	peak	
6	9920.000	39.83	38.95	7.67	36.80	49.65	74.00	-24.35	HORIZONTAL	peak	

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for GZCR240100002602



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9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2401000026HS



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10 Appendix

1. Duty Cycle

1.1 Ant1

1.1.1 Test Result

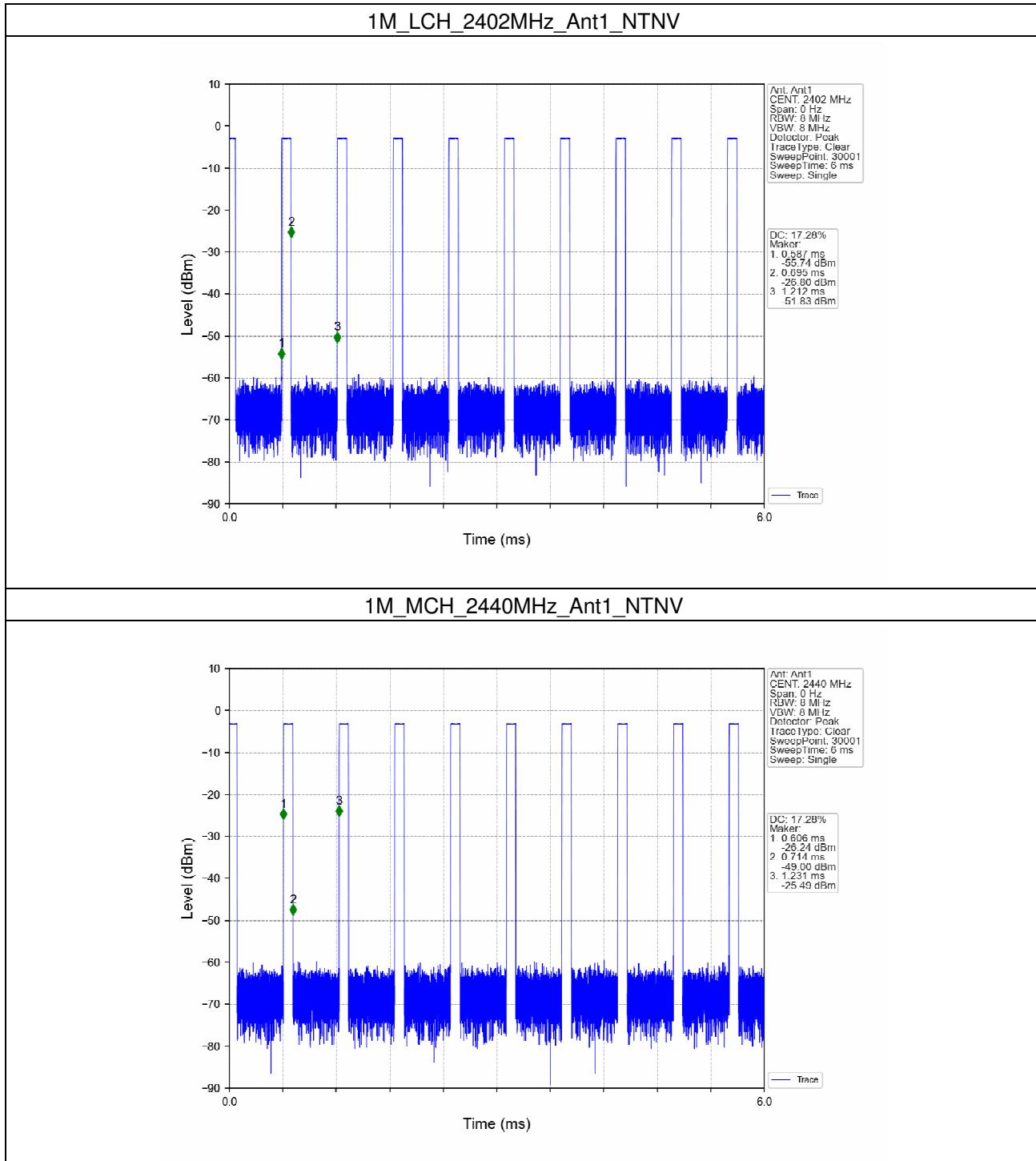
Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	0.108	0.625	17.28	7.62	0.03
		2440	0.108	0.625	17.28	7.62	0.00
		2480	0.108	0.625	17.28	7.62	0.00
2M	SISO	2402	0.065	0.625	10.40	9.83	0.00
		2440	0.065	0.625	10.40	9.83	0.00
		2480	0.065	0.625	10.40	9.83	0.03



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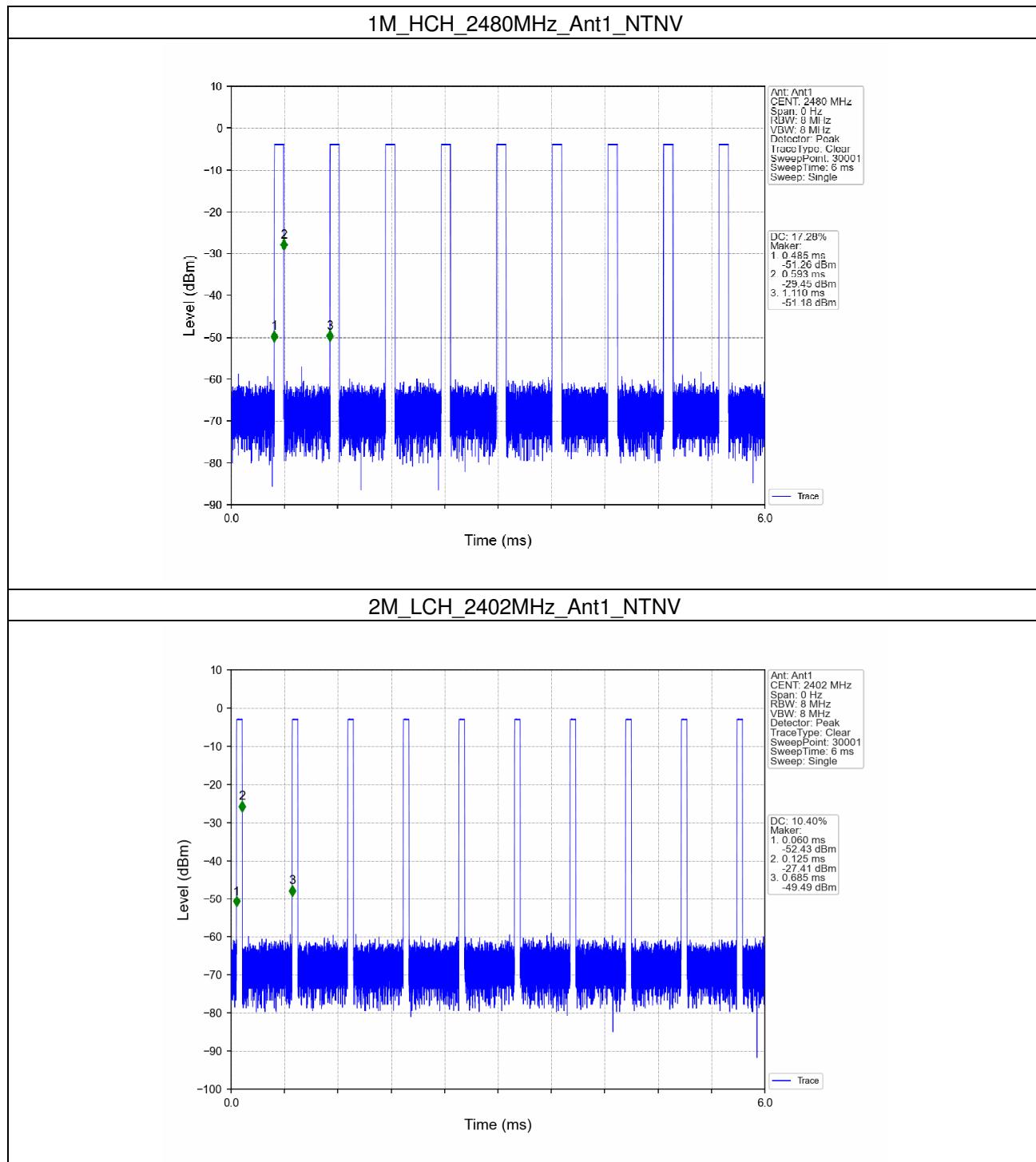
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1.1.2 Test Graph



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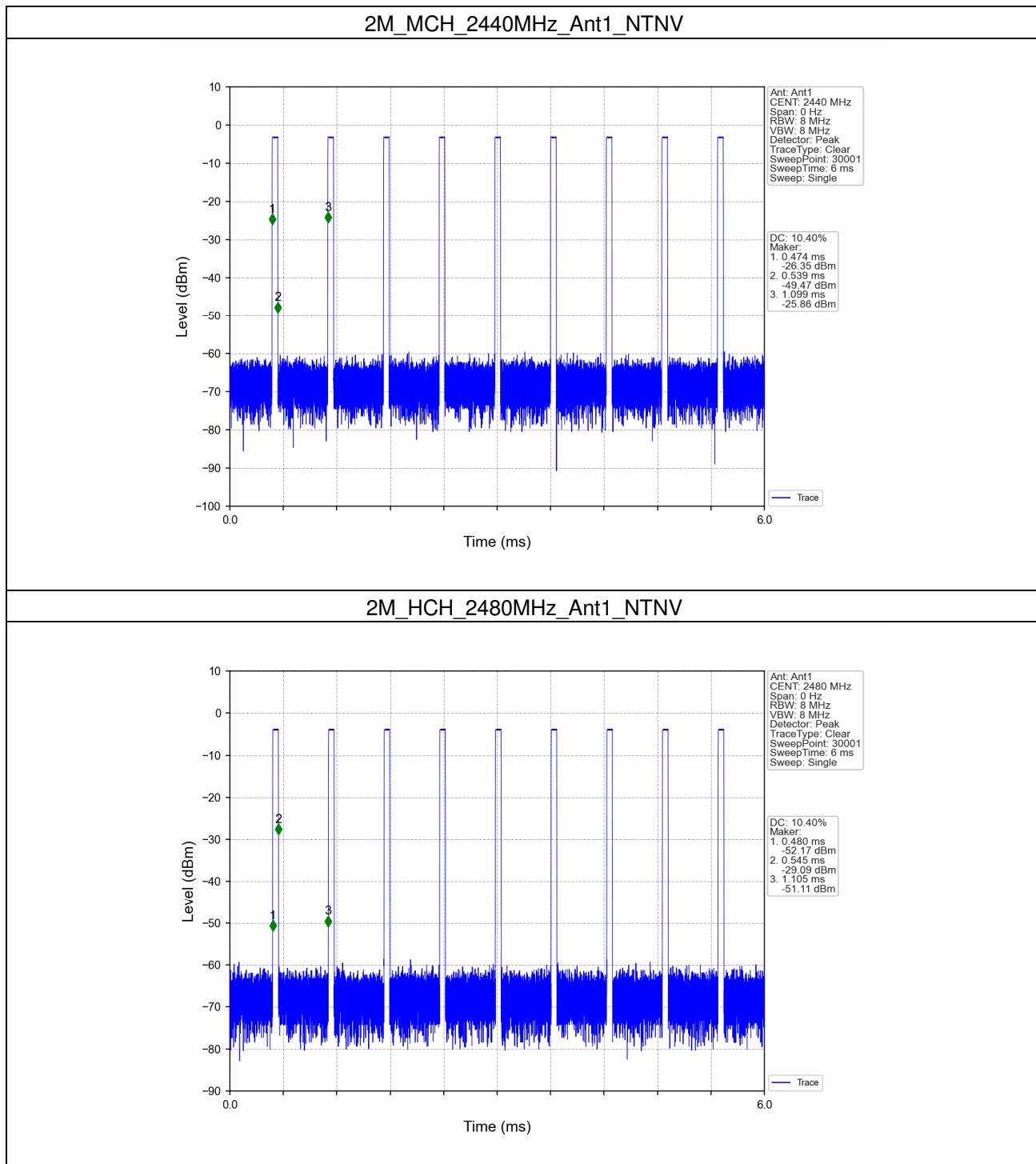
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2. Bandwidth

2.1 6dB BW

2.1.1 Test Result

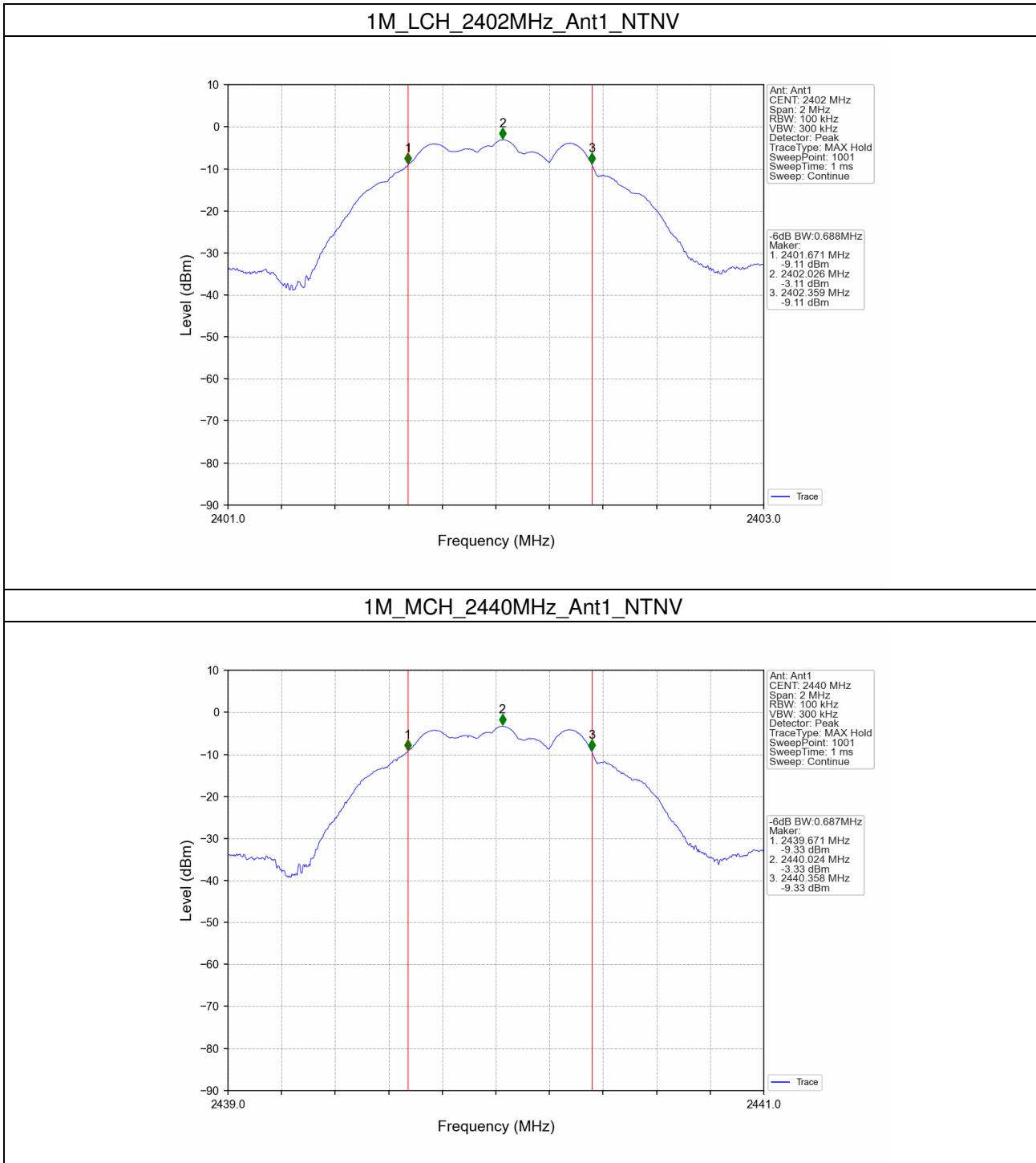
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.688	>=0.5	Pass
		2440	1	0.687	>=0.5	Pass
		2480	1	0.685	>=0.5	Pass
2M	SISO	2402	1	1.185	>=0.5	Pass
		2440	1	1.179	>=0.5	Pass
		2480	1	1.182	>=0.5	Pass



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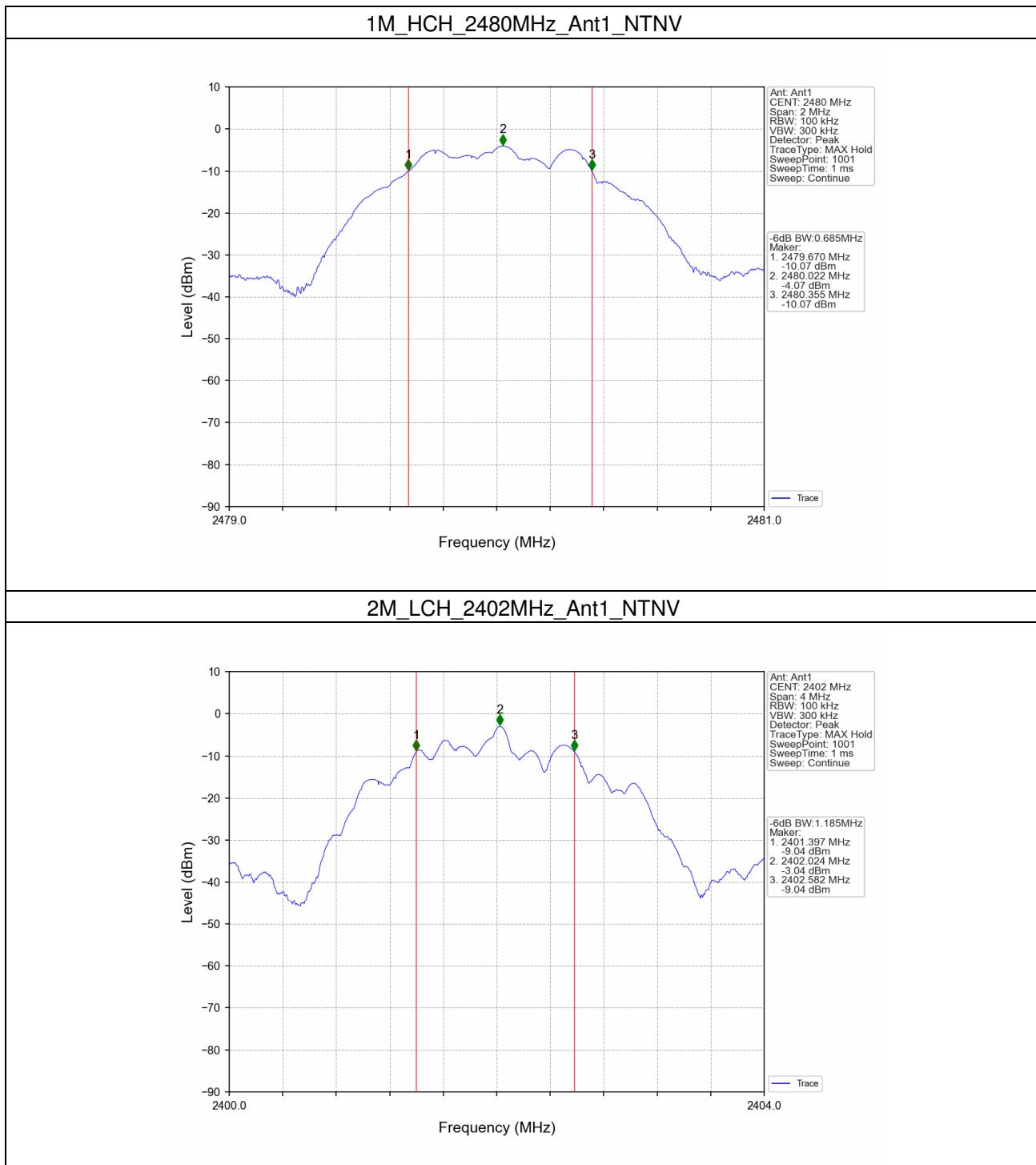
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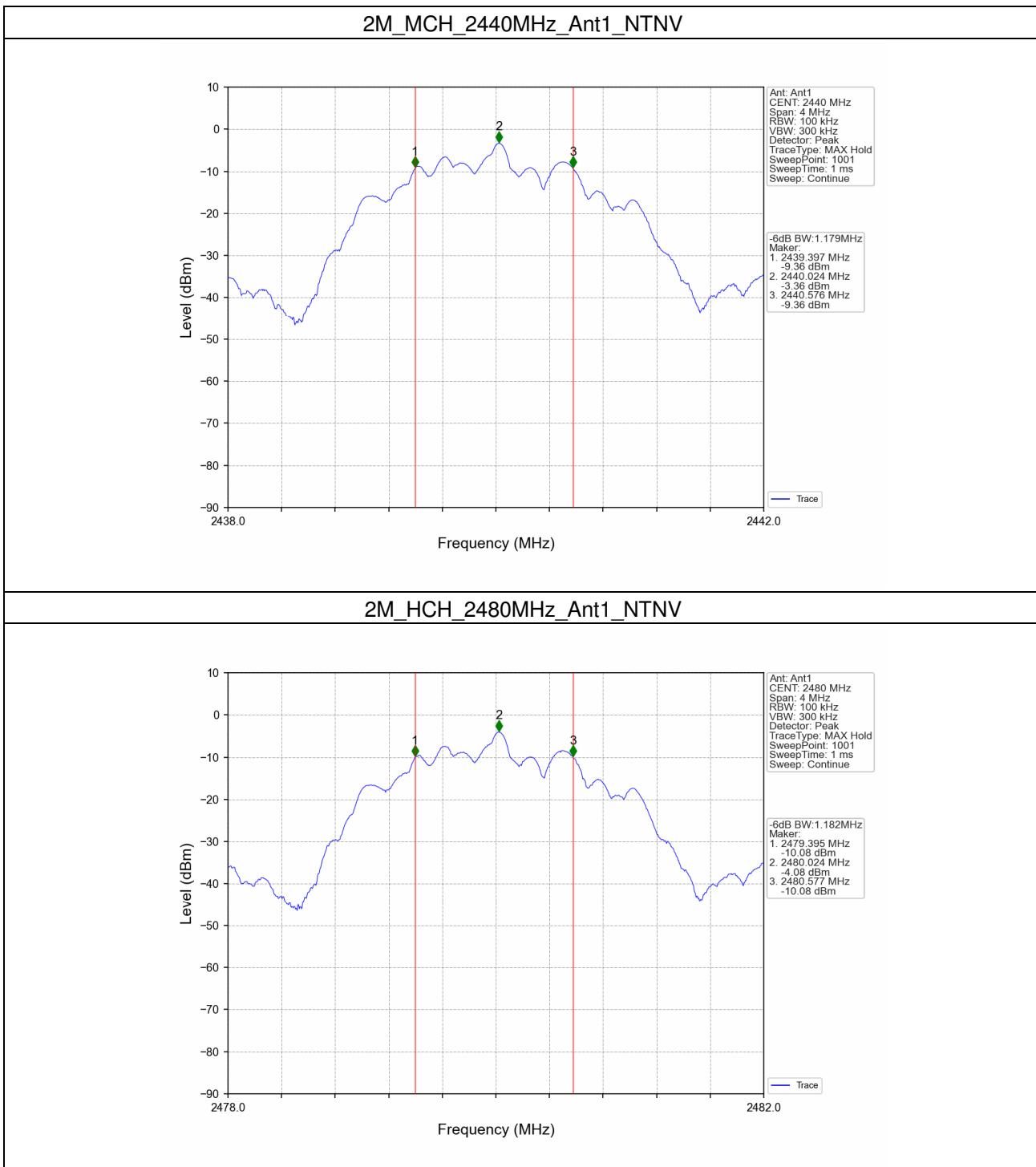
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3. Maximum Conducted Output Power

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	-2.93	<=30	Pass
		2440	-3.15	<=30	Pass
		2480	-3.89	<=30	Pass
2M	SISO	2402	-2.85	<=30	Pass
		2440	-3.17	<=30	Pass
		2480	-3.89	<=30	Pass

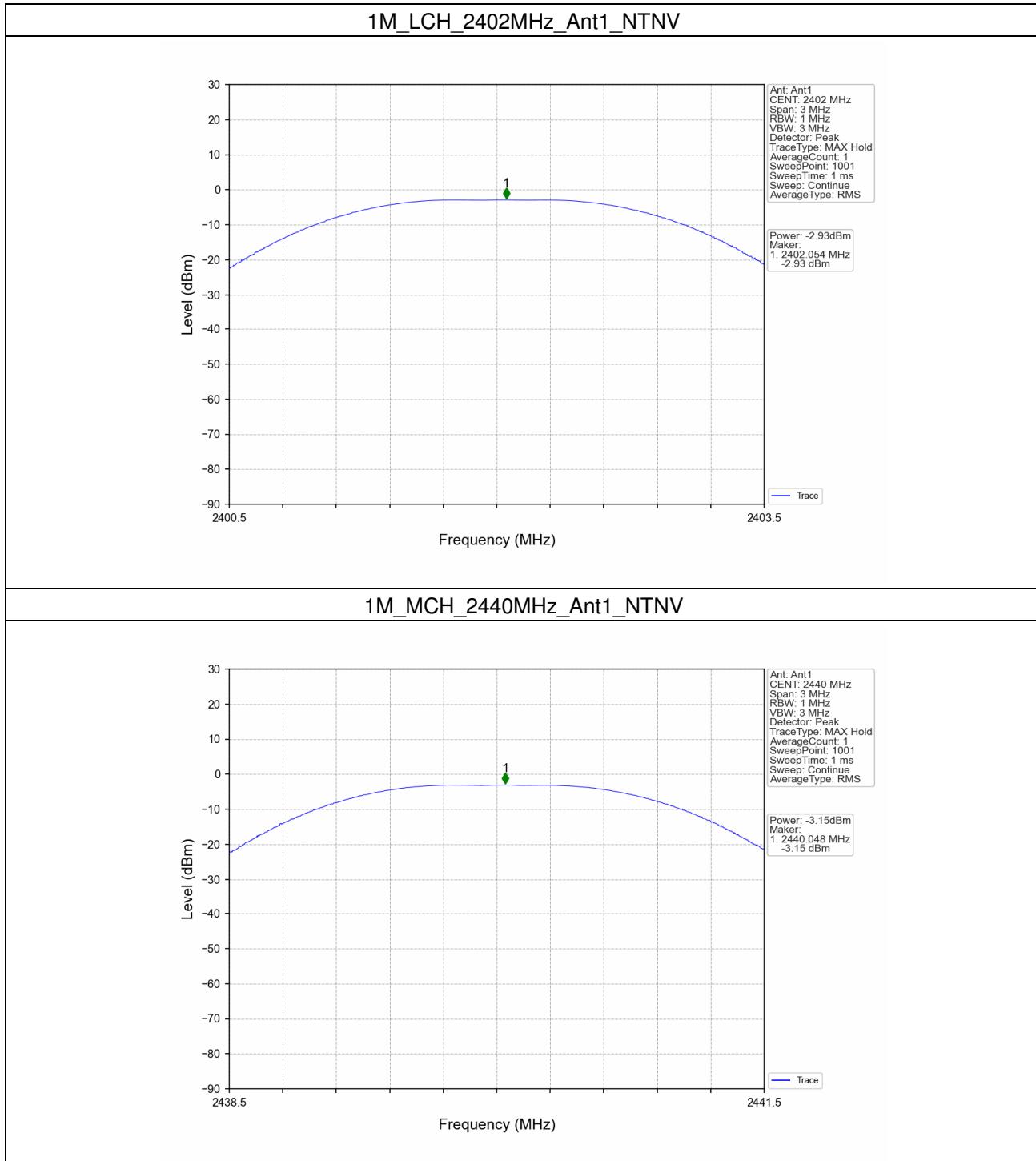
Note1: Antenna Gain: Ant1: 2.62 dBi;



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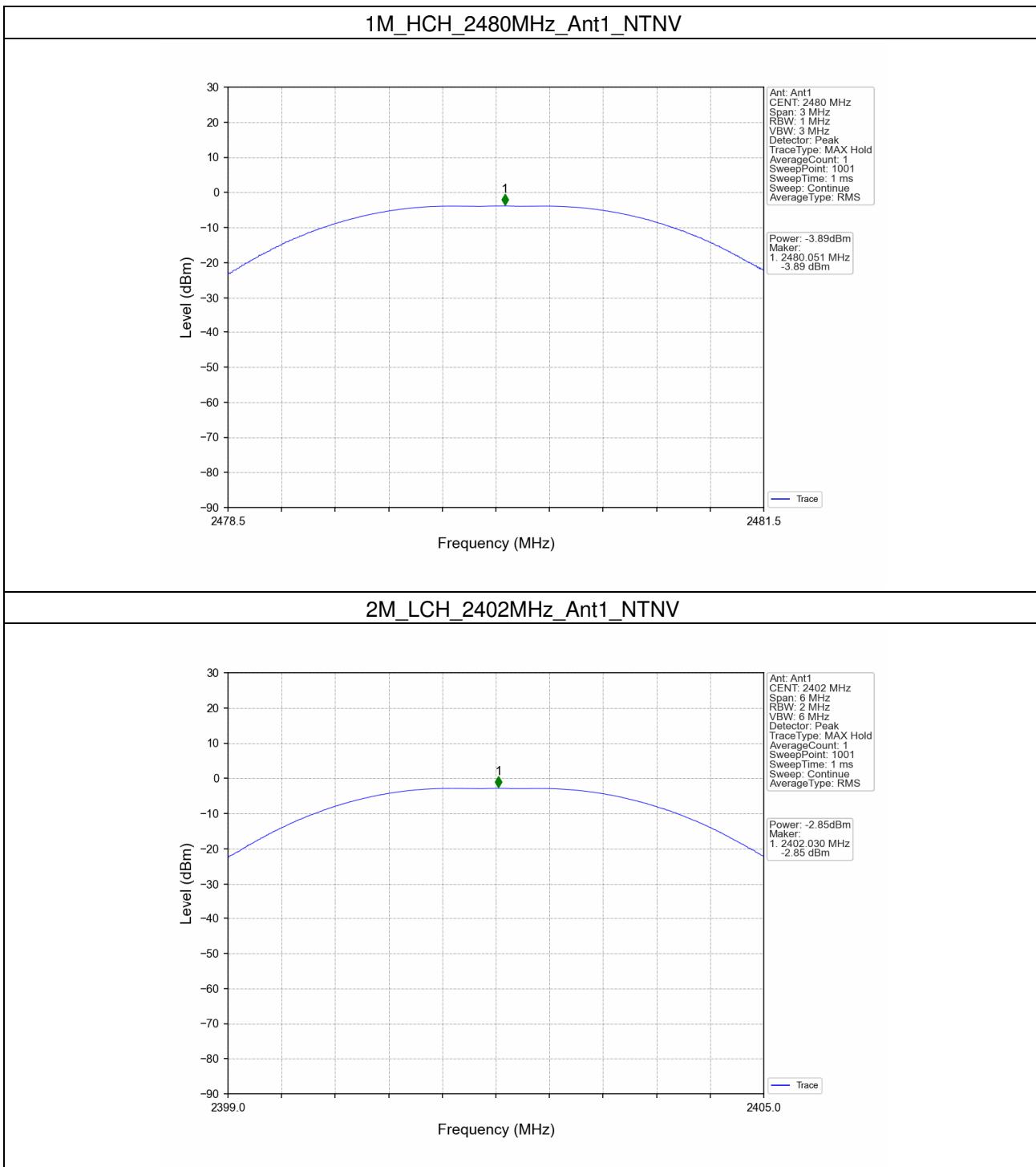
3.1.2 Test Graph



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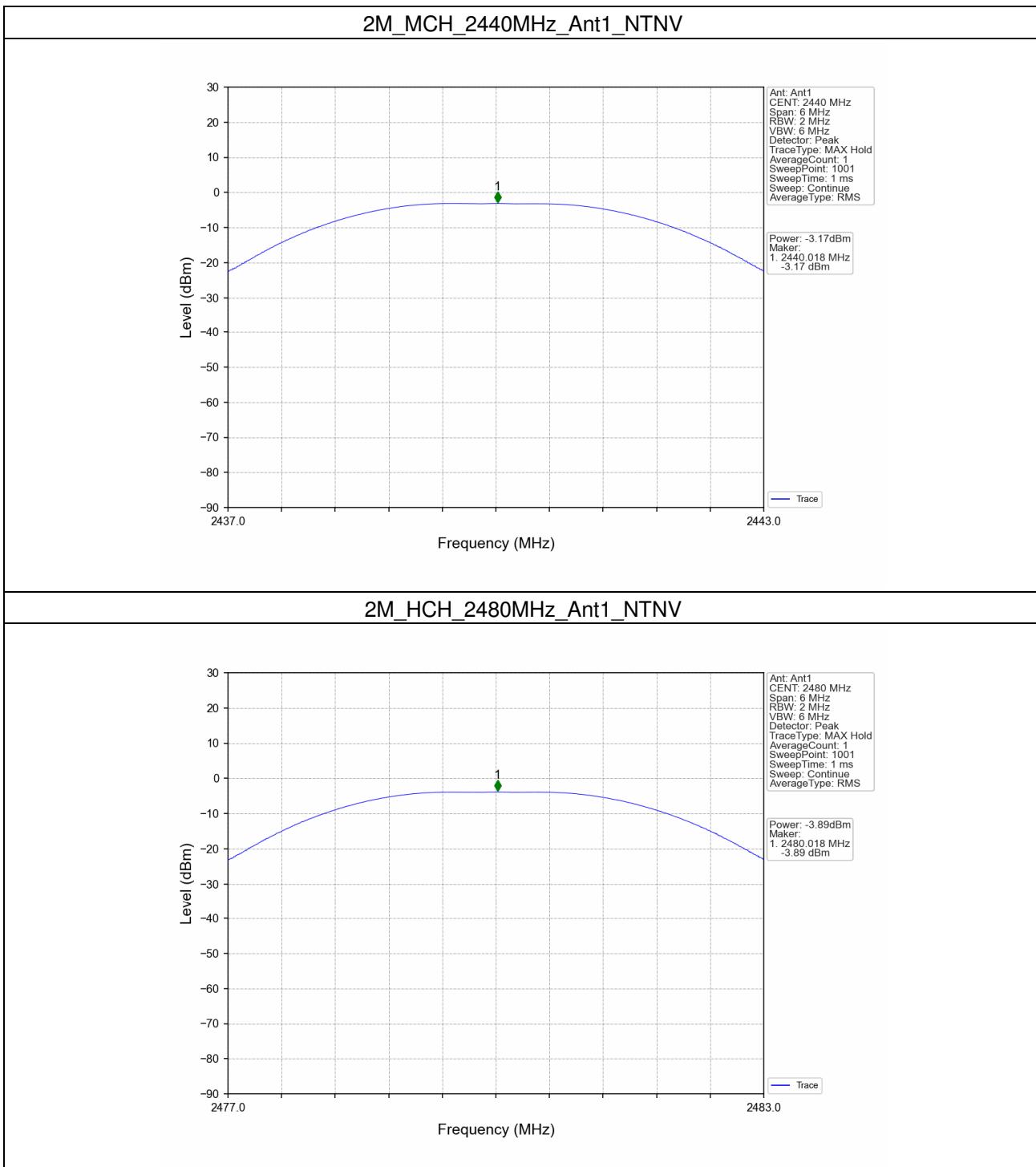
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4. Maximum Power Spectral Density

4.1 PSD

4.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
1M	SISO	2402	-20.32	<=8	Pass
		2440	-20.49	<=8	Pass
		2480	-21.36	<=8	Pass
2M	SISO	2402	-22.41	<=8	Pass
		2440	-22.72	<=8	Pass
		2480	-23.40	<=8	Pass

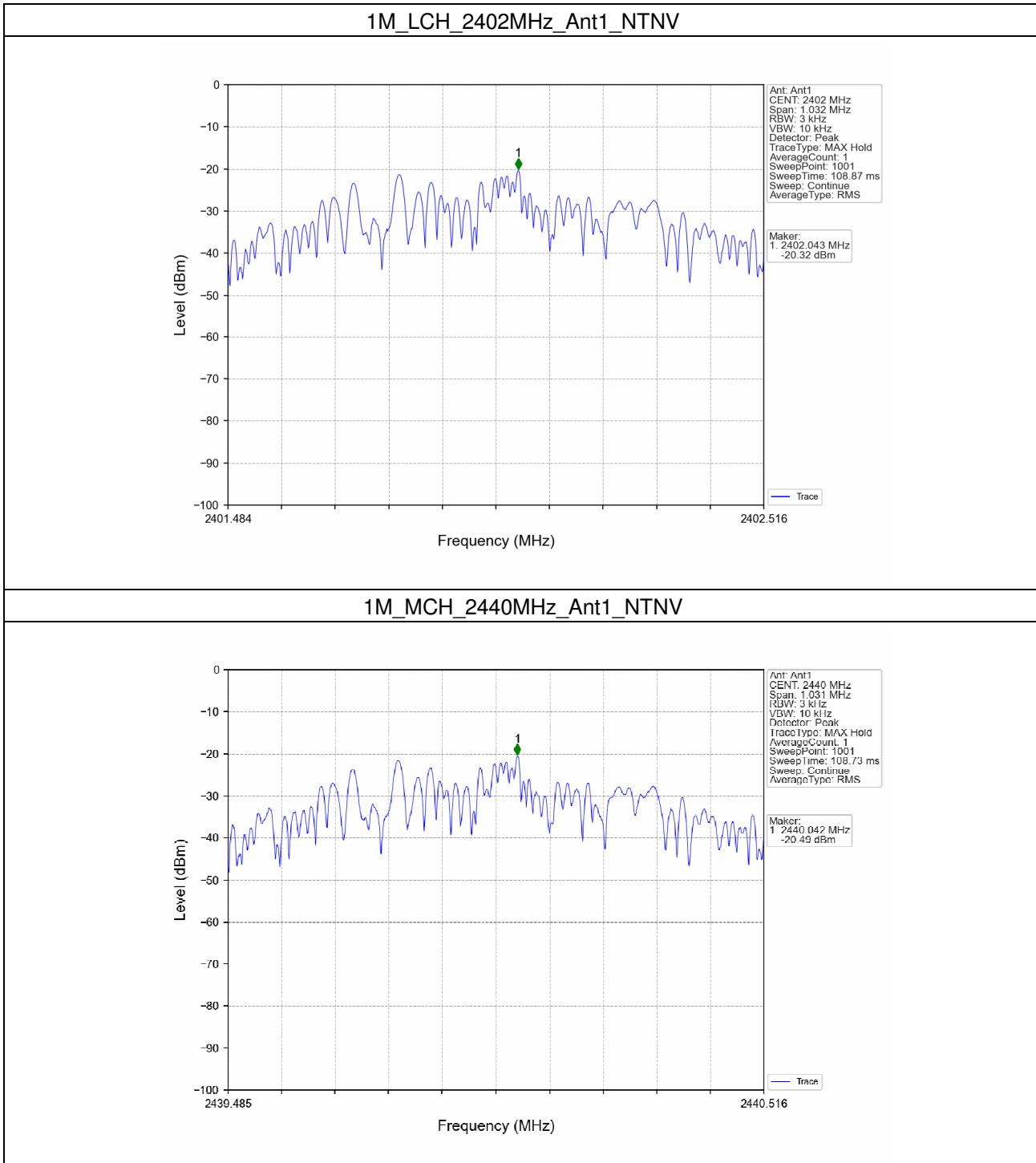
Note1: Antenna Gain: Ant1: 2.62 dBi;



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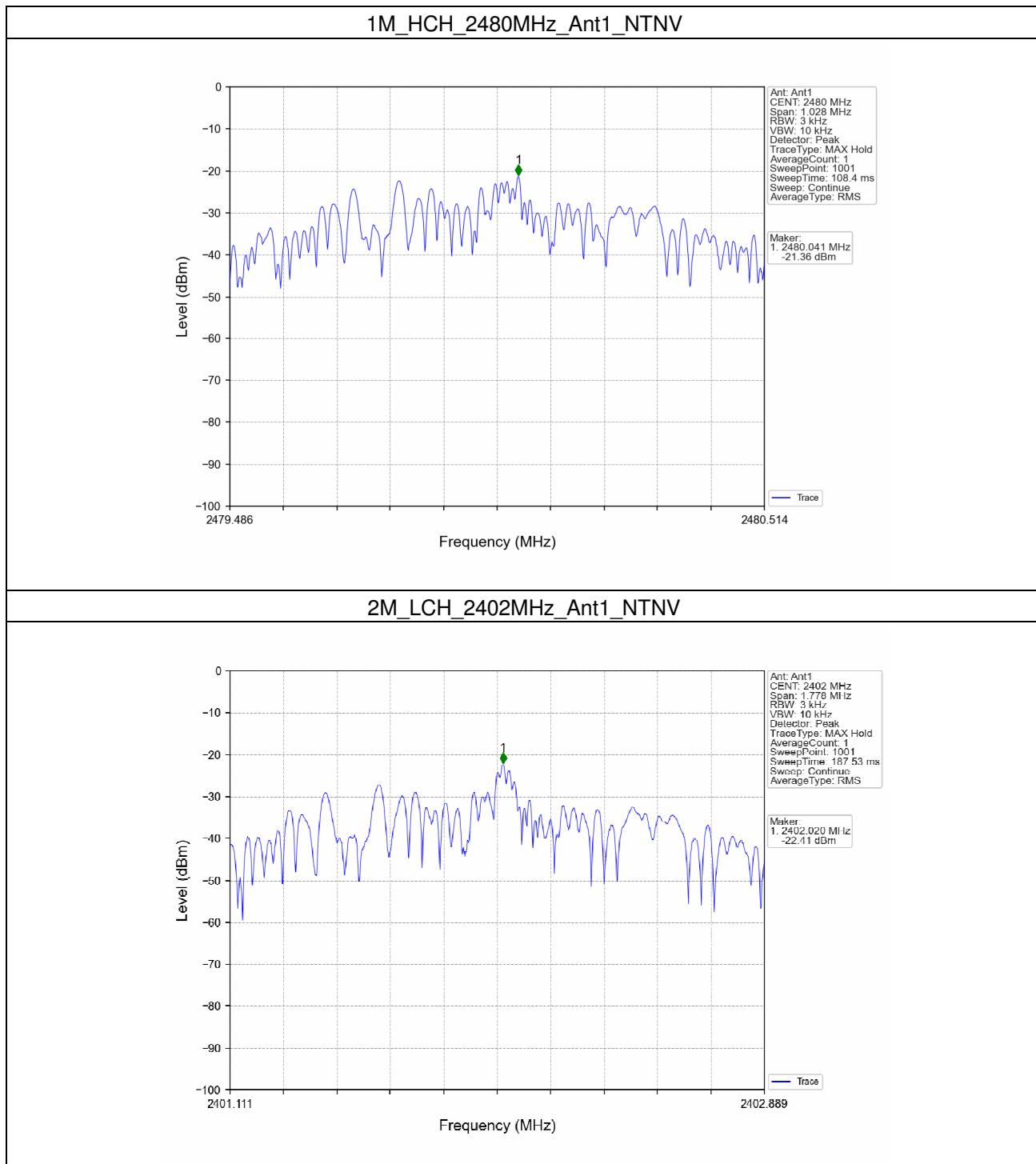
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4.1.2 Test Graph



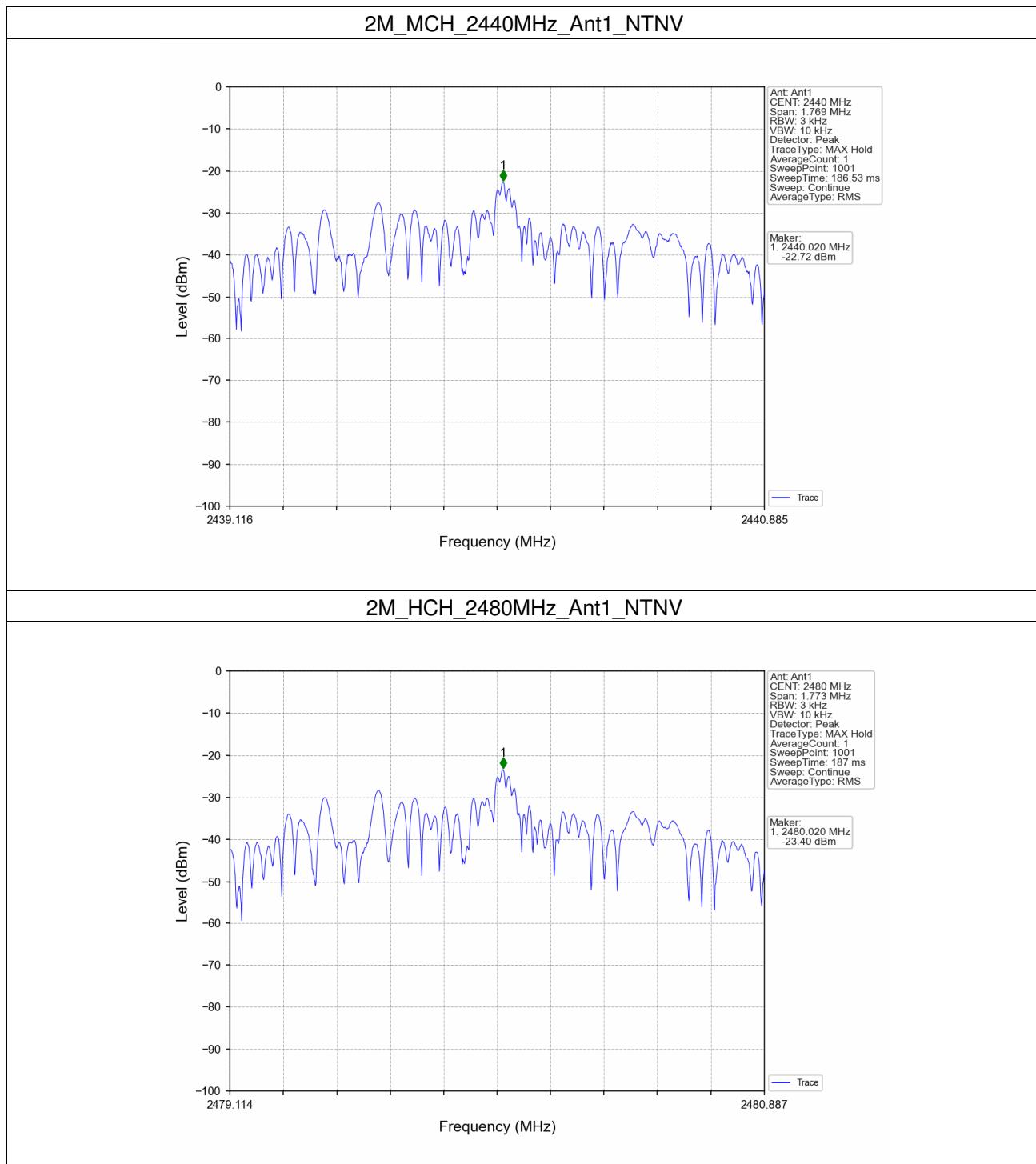
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5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	-3.13
		2440	1	-3.35
		2480	1	-4.09
2M	SISO	2402	1	-3.06
		2440	1	-3.41
		2480	1	-4.11

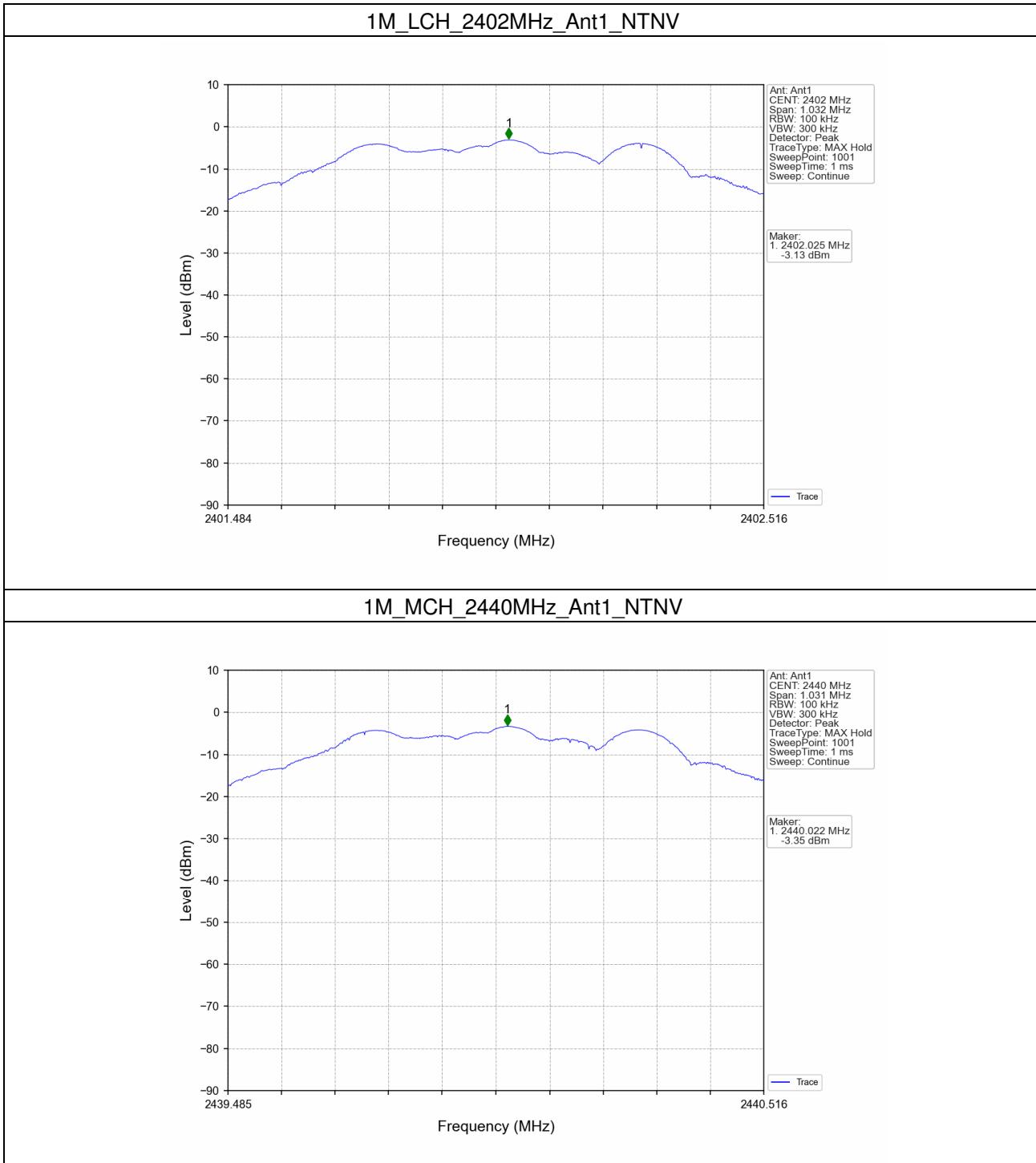
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.



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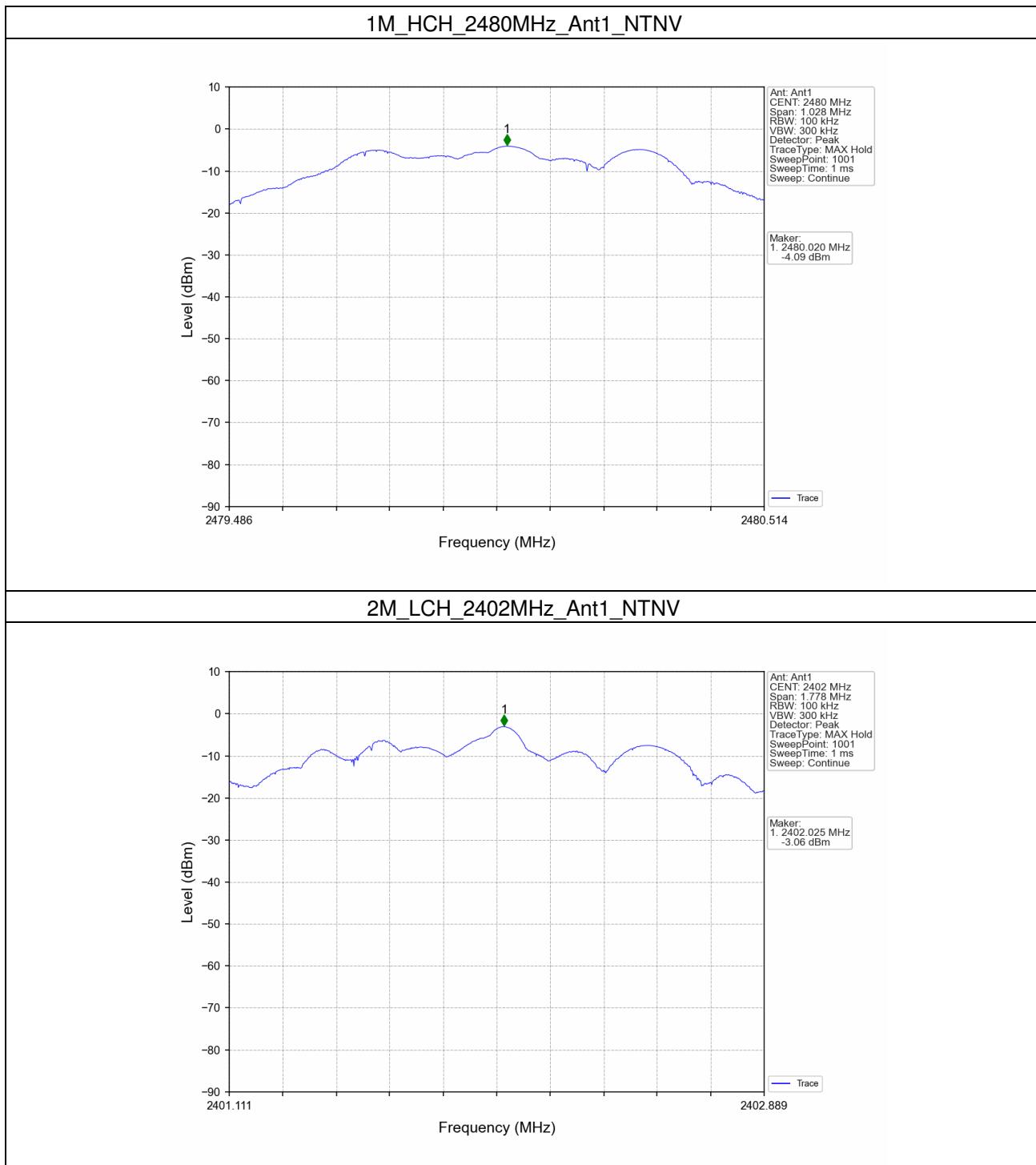
5.1.2 Test Graph



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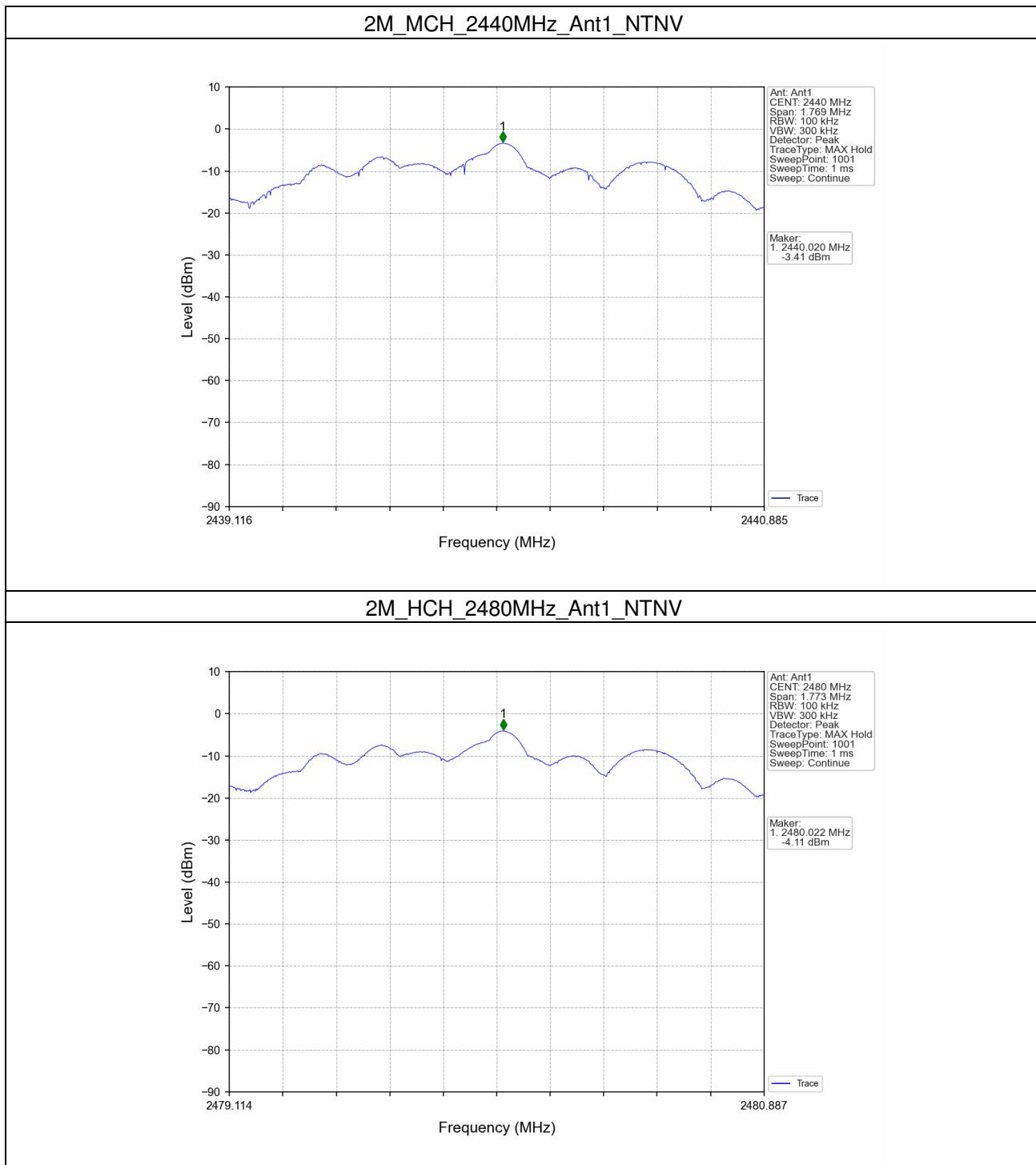
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5.2 CSE and Band Edges

5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	-3.13	-23.13	Pass
		2440	1	-3.13	-23.13	Pass
		2480	1	-3.13	-23.13	Pass
2M	SISO	2402	1	-3.06	-23.06	Pass
		2440	1	-3.06	-23.06	Pass
		2480	1	-3.06	-23.06	Pass

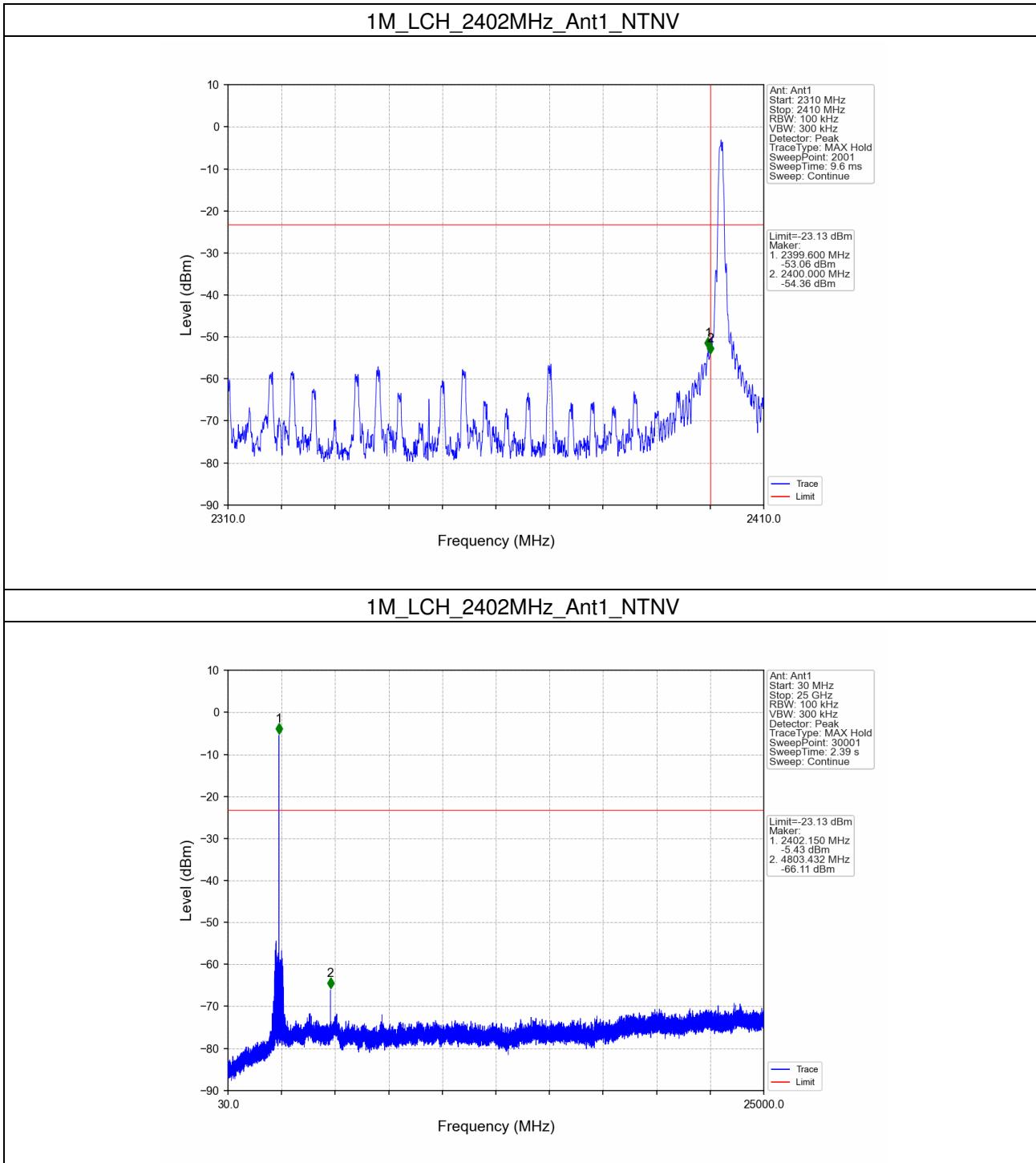
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.



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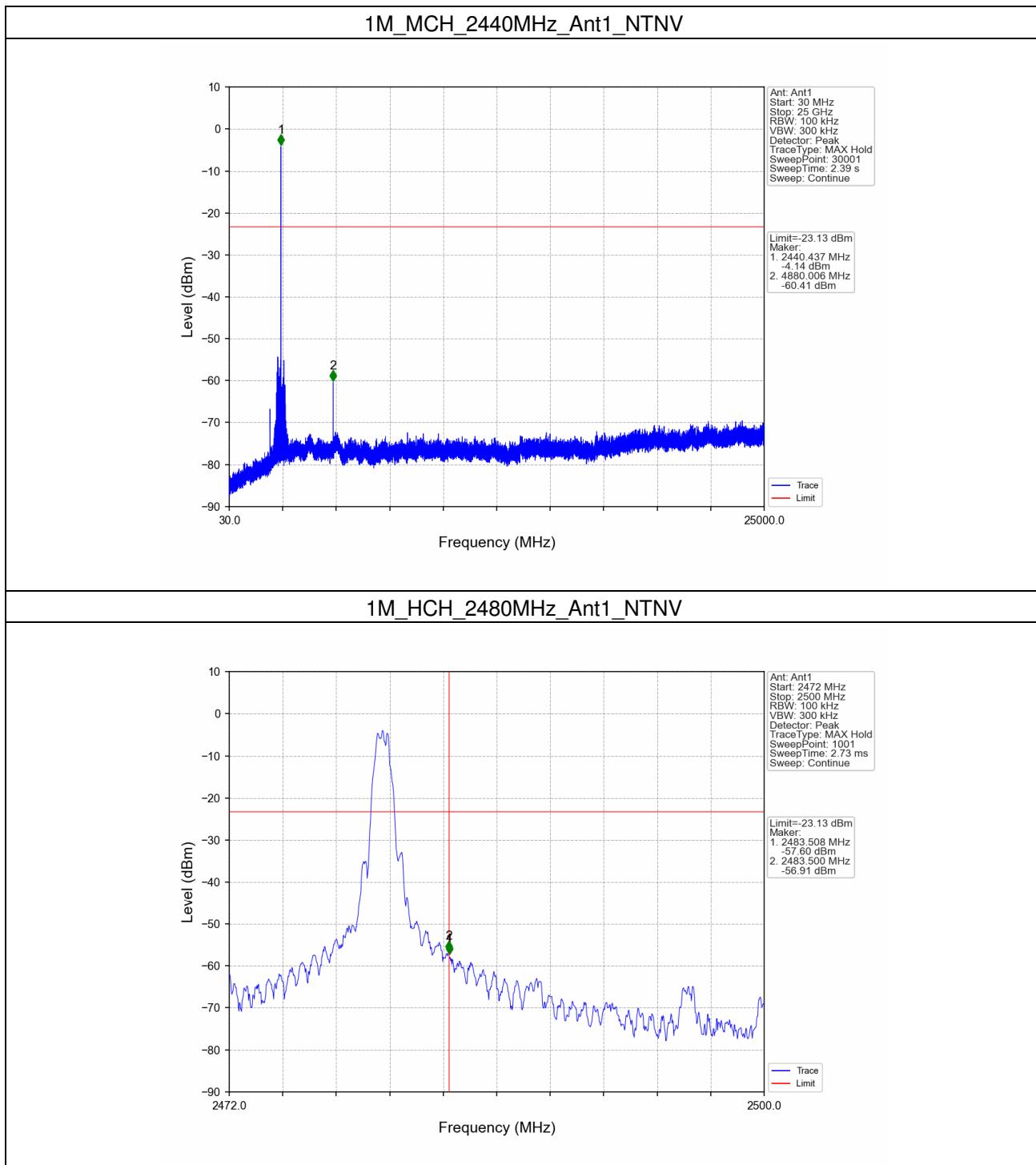
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5.2.2 Test Graph



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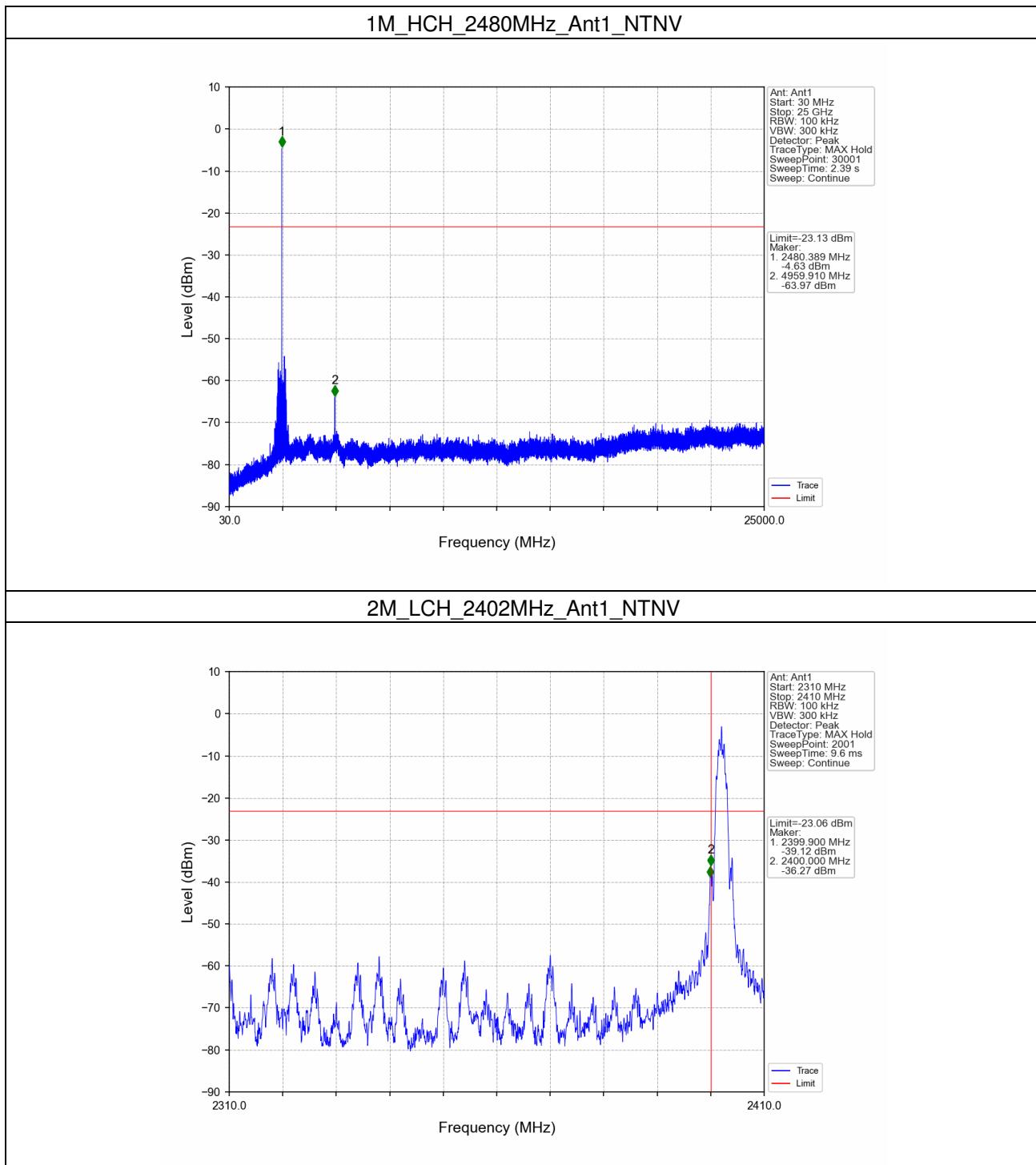
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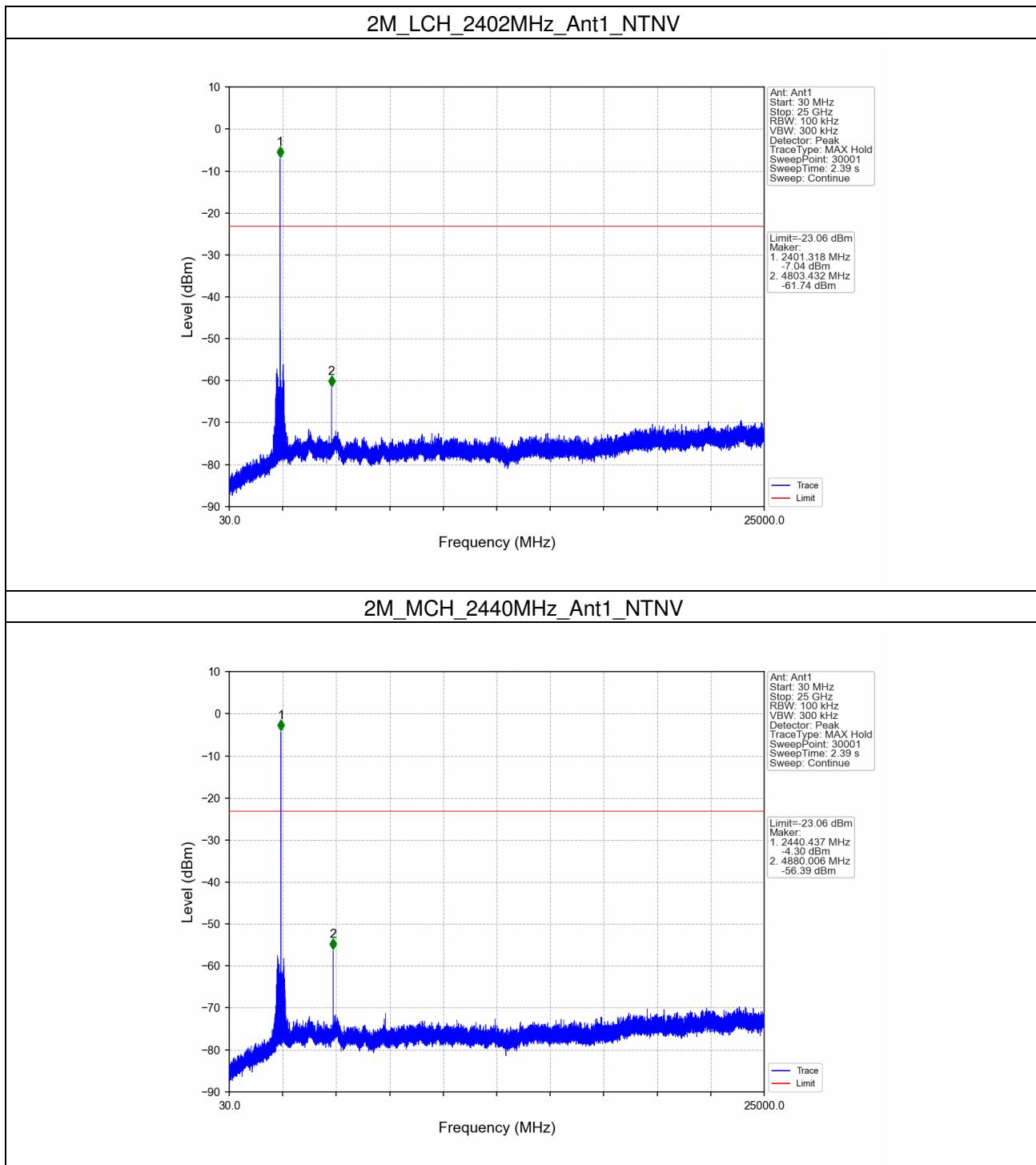


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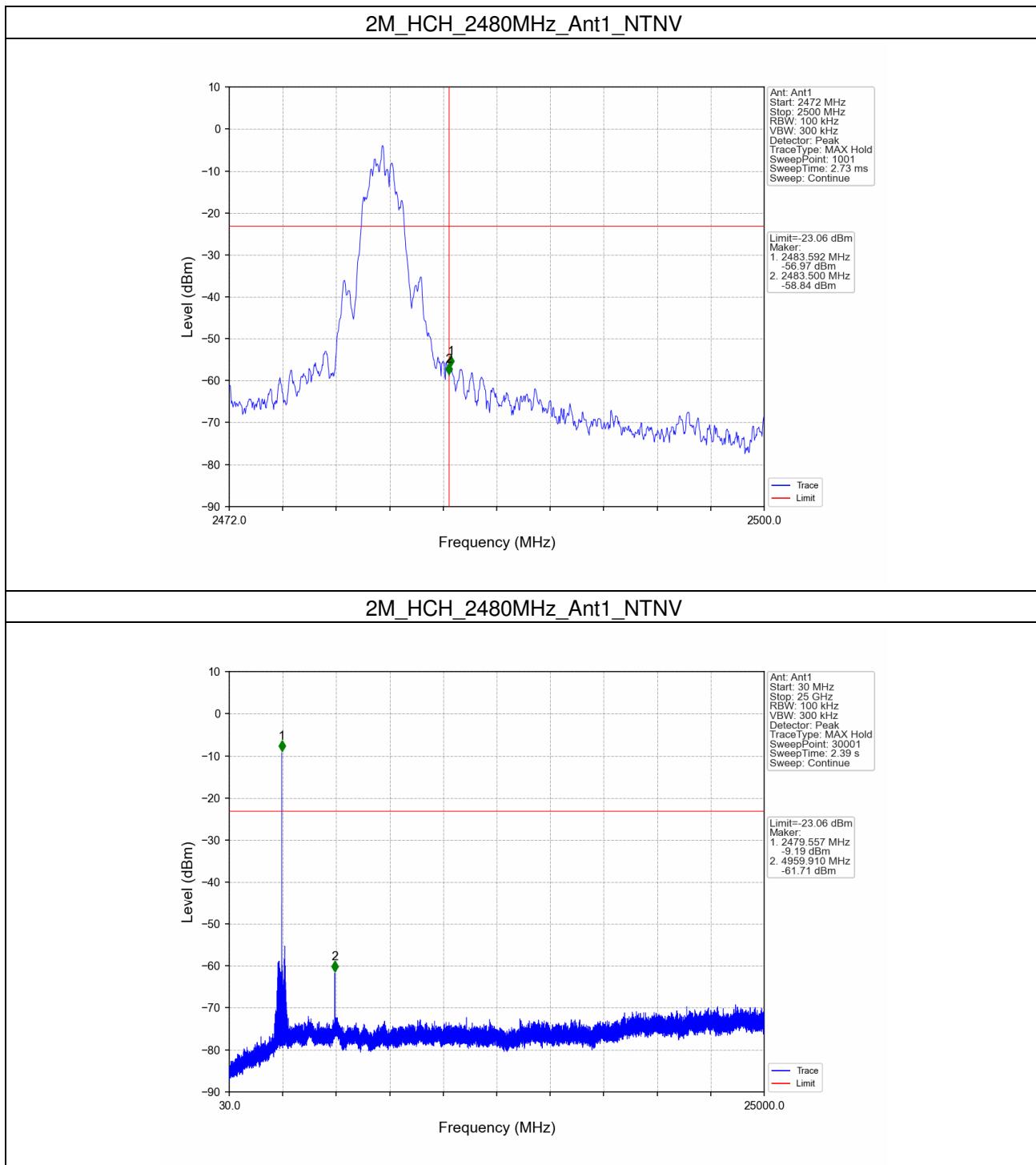
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