



TEST REPORT

Application No.: GZCR2301000014AT
Applicant: Harman International Industries, Incorporated
Address of Applicant: 8500 Balboa Boulevard, Northridge, California, 91329, United States
Manufacturer: Harman International Industries, Incorporated
Address of Manufacturer: 8500 Balboa Boulevard, Northridge, California, 91329, United States
Equipment Under Test (EUT):
EUT Name: Bluetooth headset
Model No.: TUNE770NC
Trade Mark: JBL
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2023-01-09
Date of Test: 2023-01-11
Date of Issue: 2023-01-11

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

Ricky Liu

Ricky Liu
Manager



Revision Record			
Version	Report No.	Date	Remark
01		2023-01-11	Original

Authorized for issue by			
			
		Curry Wu/Project Engineer	
			
		Ricky Liu/Reviewer	

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 11.9.1.3	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 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Below 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Duty Cycle		ANSI C63.10 (2013) Section 11.6	KDB 558074 D01 v05r02 section 6	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.



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4 General Information

4.1 Details of E.U.T.

Power supply: Rechargeable battery: 3.7V 690mAh (Charged by adapter)
Cable(s): Type-C cable:26.8cm unshielded
Aux in cable: 128cm unshielded
Operation Frequency: 2402MHz to 2480MHz (LE 1M/Bits)
2404MHz to 2478MHz (LE 2M/Bits)
Bluetooth Version: V5.3 Dual mode
Modulation Type: GFSK
Number of Channels: 40
Channel Spacing: 2MHz
Antenna Type: Integral Antenna
Antenna Gain: 3.38 dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--
The EUT has been tested as an independent unit.			

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	$\pm 0.75\text{dB}$
Minimum 6dB Bandwidth	$\pm 3\%$
Power Spectrum Density	$\pm 2.84\text{dB}$
Conducted Band Edges Measurement	$\pm 0.75\text{dB}$
Conducted Spurious Emissions	$\pm 0.75\text{dB}$
Radiated Emissions which fall in the restricted bands	$\pm 5.00\text{dB}$ (30MHz-1GHz; 3m); $\pm 5.12\text{dB}$ (1GHz-6GHz); $\pm 5.38\text{dB}$ (6GHz-18GHz); $\pm 5.61\text{dB}$ (18GHz-40GHz)
Radiated Spurious Emissions (Below 1GHz)	$\pm 5.00\text{dB}$ (30MHz-1GHz; 3m); $\pm 4.38\text{dB}$ (30MHz-1GHz; 10m);
Radiated Spurious Emissions (Above 1GHz)	$\pm 5.12\text{dB}$ (1GHz-6GHz); $\pm 5.38\text{dB}$ (6GHz-18GHz); $\pm 5.61\text{dB}$ (18GHz-40GHz)
Duty Cycle	$\pm 0.37\%$
Remark: The U_{lab} (lab Uncertainty) is less than U_{CISPR} (CISPR 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.	

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciencetech 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:

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **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, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2022-05-16	2023-05-15
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2022-09-08	2023-09-07
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
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
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2022-09-08	2023-09-07
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
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
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2022-09-08	2023-09-07
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
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
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2022-09-08	2023-09-07
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A



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Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2022-09-08	2023-09-07
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2022-12-16	2023-12-15
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	2022-09-21	2025-09-20
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2022-12-16	2023-12-15
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2022-12-16	2023-12-15
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2022-10-21	2023-10-20
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2022-07-29	2023-07-28
Horn Antenna(14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2022-08-24	2023-08-23

Radiated Spurious Emissions (Below 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2022-12-16	2023-12-15
Chamber cable	HangTianXing	N/A	EMC0542	2022-08-24	2023-08-23
Trilog Broadband Antenna(25MHz-1GHz)-Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2022-02-22	2025-02-21
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2022-06-21	2023-06-20
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2022-04-06	2024-04-05
High Pass Filter (915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2022-12-16	2023-12-15
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2022-10-16	2025-10-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
EMI Test Receiver(1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2022-05-20	2023-05-19

Radiated Spurious Emissions (Above 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2022-12-16	2023-12-15
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	2022-09-21	2025-09-20
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2022-12-16	2023-12-15
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2022-12-16	2023-12-15
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2022-10-21	2023-10-20
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2022-07-29	2023-07-28
Horn Antenna(14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27



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Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2022-08-24	2023-08-23
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Duty Cycle					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2022-09-08	2023-09-07
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2022-06-24	2023-06-23
DMM	Fluke	73	EMC0007	2022-06-24	2023-06-23



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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

15.203 Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of 15.211, 15.213, 15.217, 15.219, 15.221, or 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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 3.38dBi.

Antenna location: Refer to internal photo.

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 11.9.1.3

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

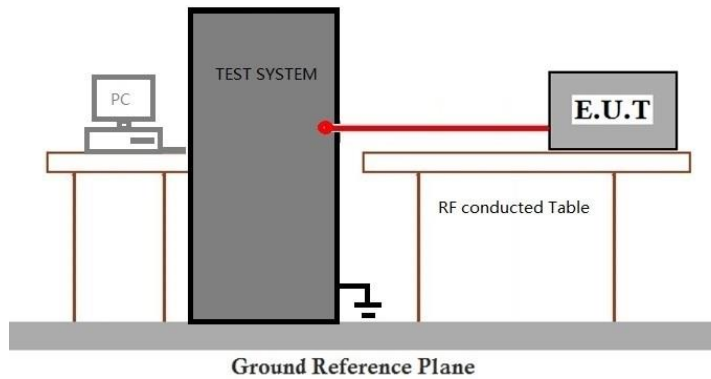
Operating Environment:

Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1003 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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: 25 °C

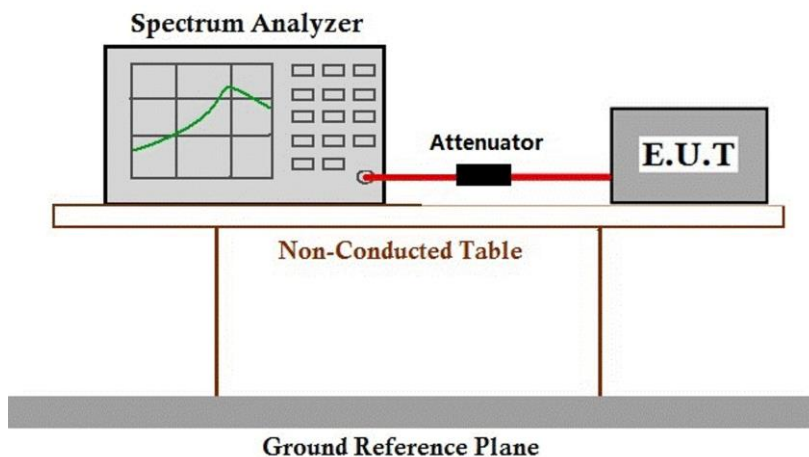
Humidity: 52 % RH

Atmospheric Pressure: 1003 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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

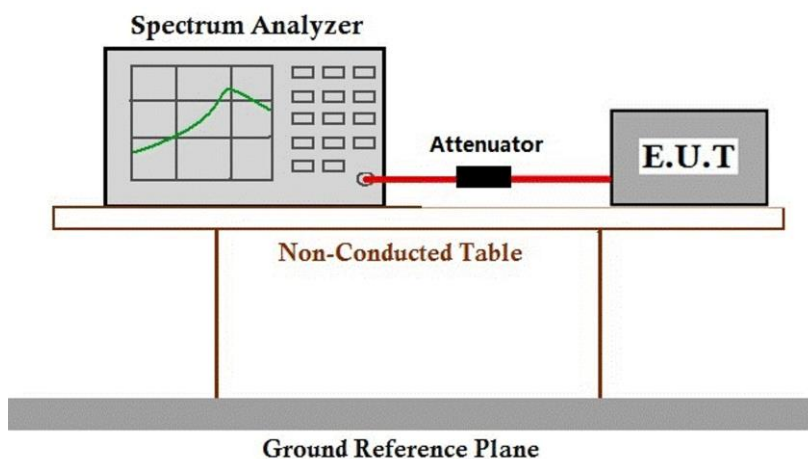
Operating Environment:

Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1003 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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

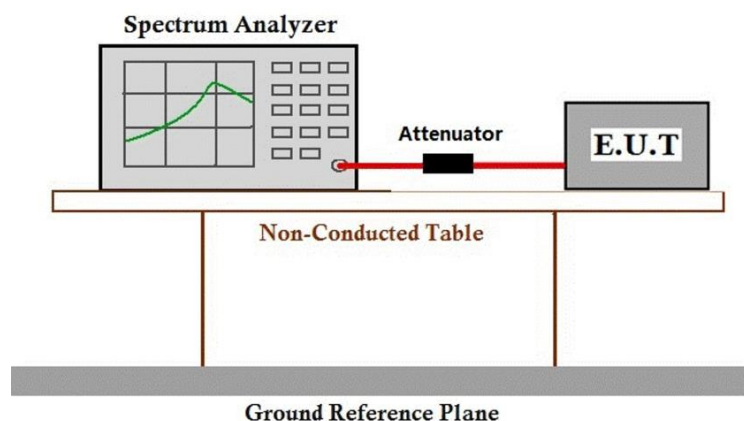
Operating Environment:

Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1003 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

cable loss=0.9dB

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

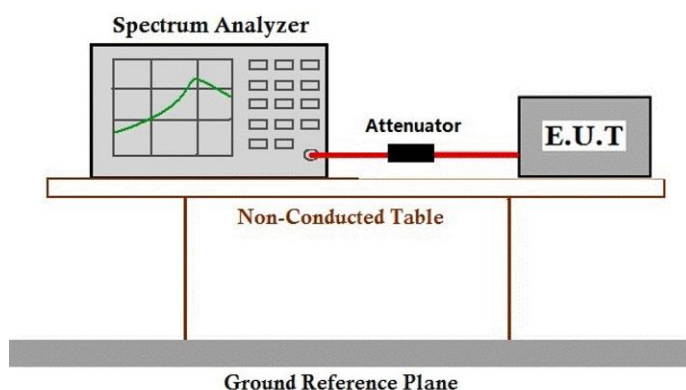
Operating Environment:

Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1003 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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 6.10.5

Measurement Distance: 3m

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

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

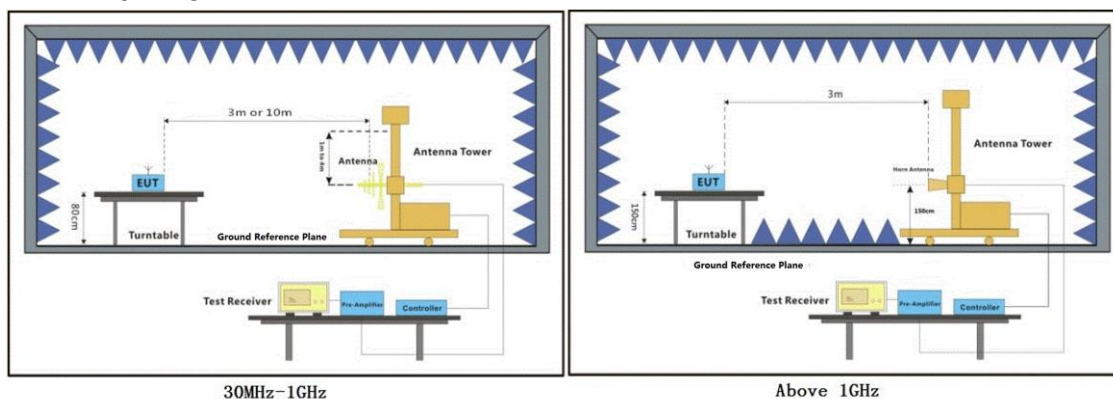
Operating Environment:

Temperature: 24 °C Humidity: 53 % RH Atmospheric Pressure: 1003 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.3 Test Setup Diagram



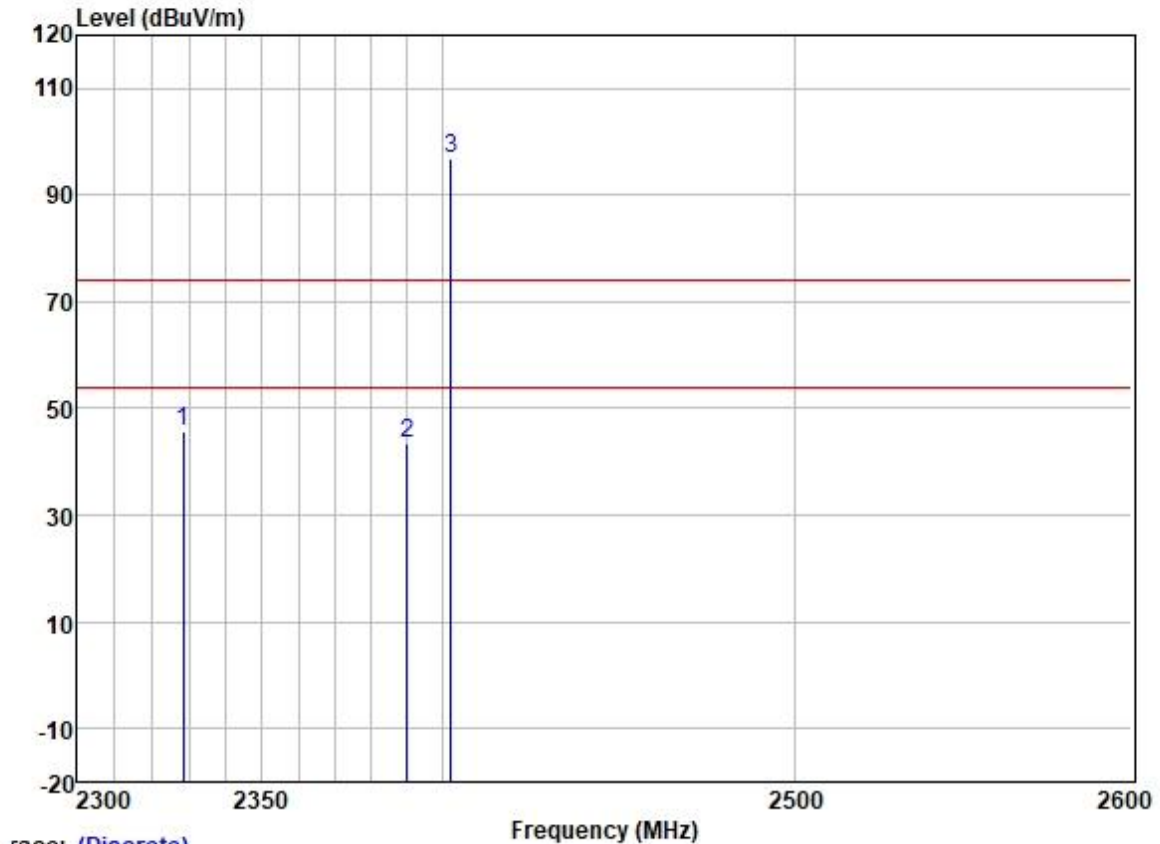
7.6.4 Measurement Procedure and Data

- 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.

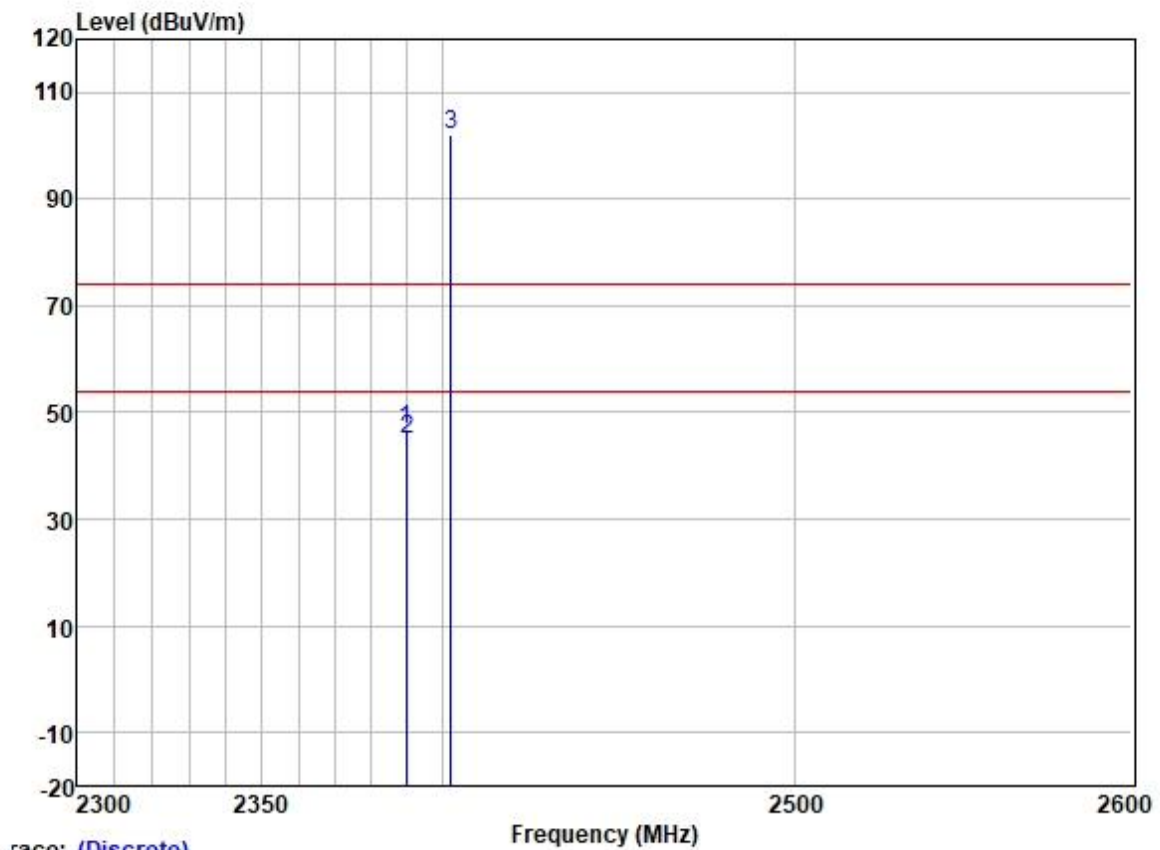
Test Mode: 02; Polarity: Horizontal; Modulation: GFSK; ; Channel: Low



Trace: (Discrete)

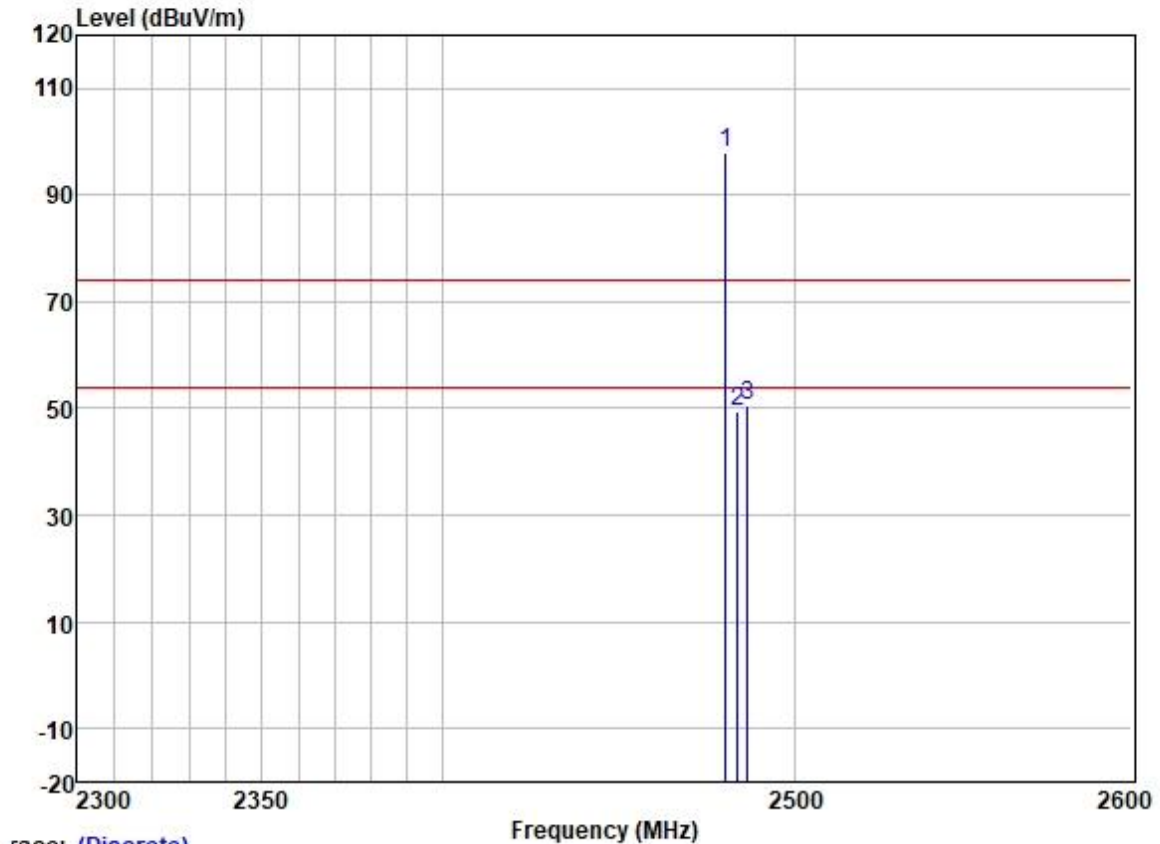
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2328.577	52.76	27.19	3.34	37.62	45.67	74.00	-28.33	HORIZONTAL	Peak
2	2390.000	50.40	27.33	3.48	37.59	43.62	74.00	-30.38	HORIZONTAL	Peak
3 *	2402.000	103.69	27.35	3.50	37.59	96.95	74.00	22.95	HORIZONTAL	Peak

Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
		Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2389.659	53.52	27.33	3.48	37.59	46.74	74.00	-27.26	VERTICAL	Peak
2	2390.000	51.58	27.33	3.48	37.59	44.80	74.00	-29.20	VERTICAL	Peak
3 *	2402.000	108.71	27.35	3.50	37.59	101.97	74.00	27.97	VERTICAL	Peak

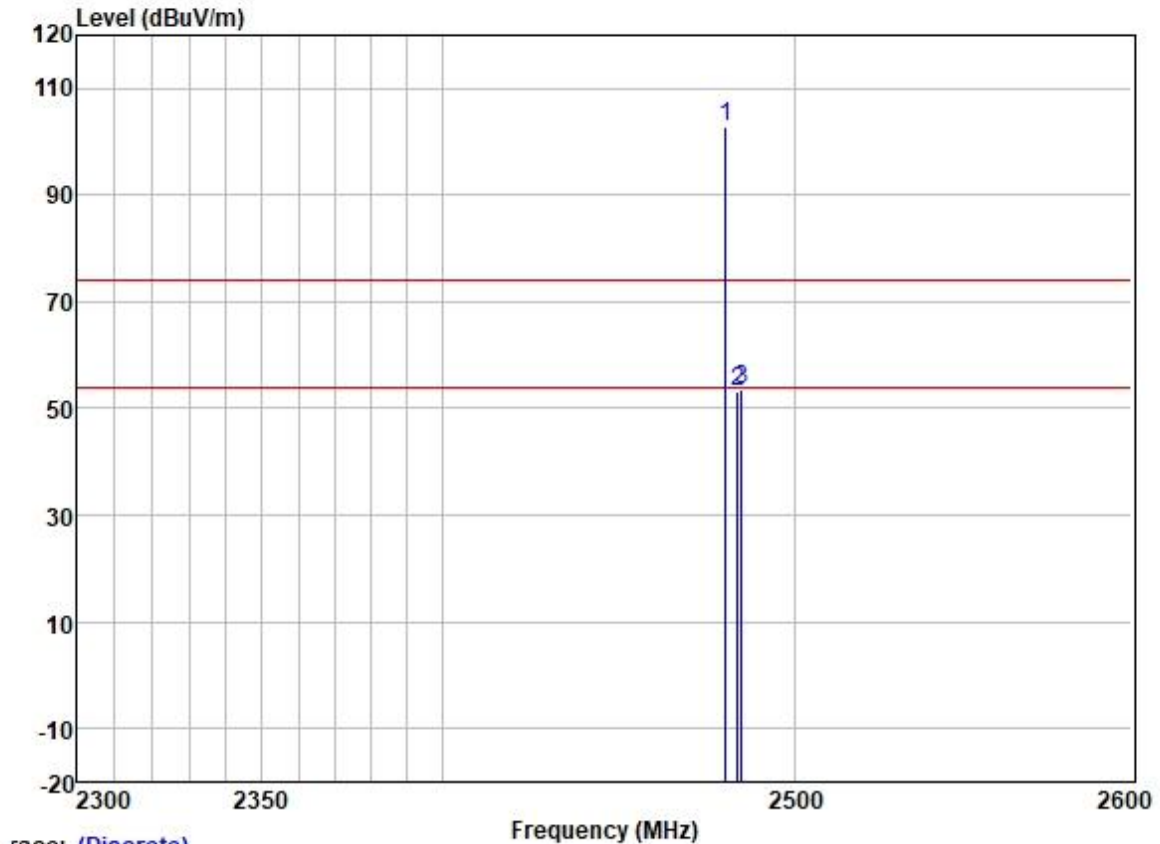
Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Freq	ReadAntenna Level Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 *	2480.000	104.57	27.47	3.60	37.57	98.07	74.00	24.07	HORIZONTAL Peak
2	2483.500	56.07	27.48	3.53	37.57	49.51	74.00	-24.49	HORIZONTAL Peak
3	2486.319	57.16	27.48	3.53	37.57	50.60	74.00	-23.40	HORIZONTAL Peak

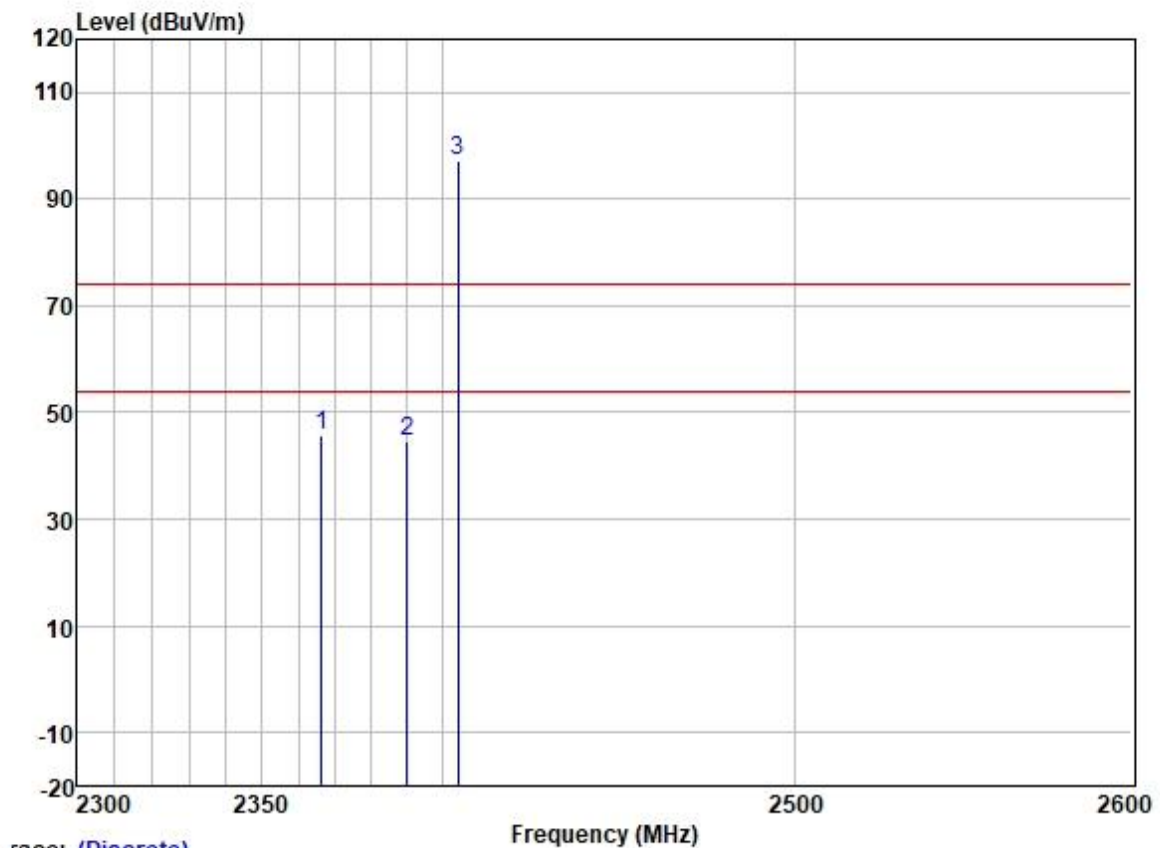
Test Mode: 02; Polarity: Vertical; Modulation: GFSK; ; Channel: High



Trace: (Discrete)

		Read	Antenna	Cable	Preamp		Limit	Over		
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 *	2480.000	109.28	27.47	3.60	37.57	102.78	74.00	28.78	VERTICAL	Peak
2	2483.500	59.66	27.48	3.53	37.57	53.10	74.00	-20.90	VERTICAL	Peak
3	2484.620	60.19	27.48	3.53	37.57	53.63	74.00	-20.37	VERTICAL	Peak

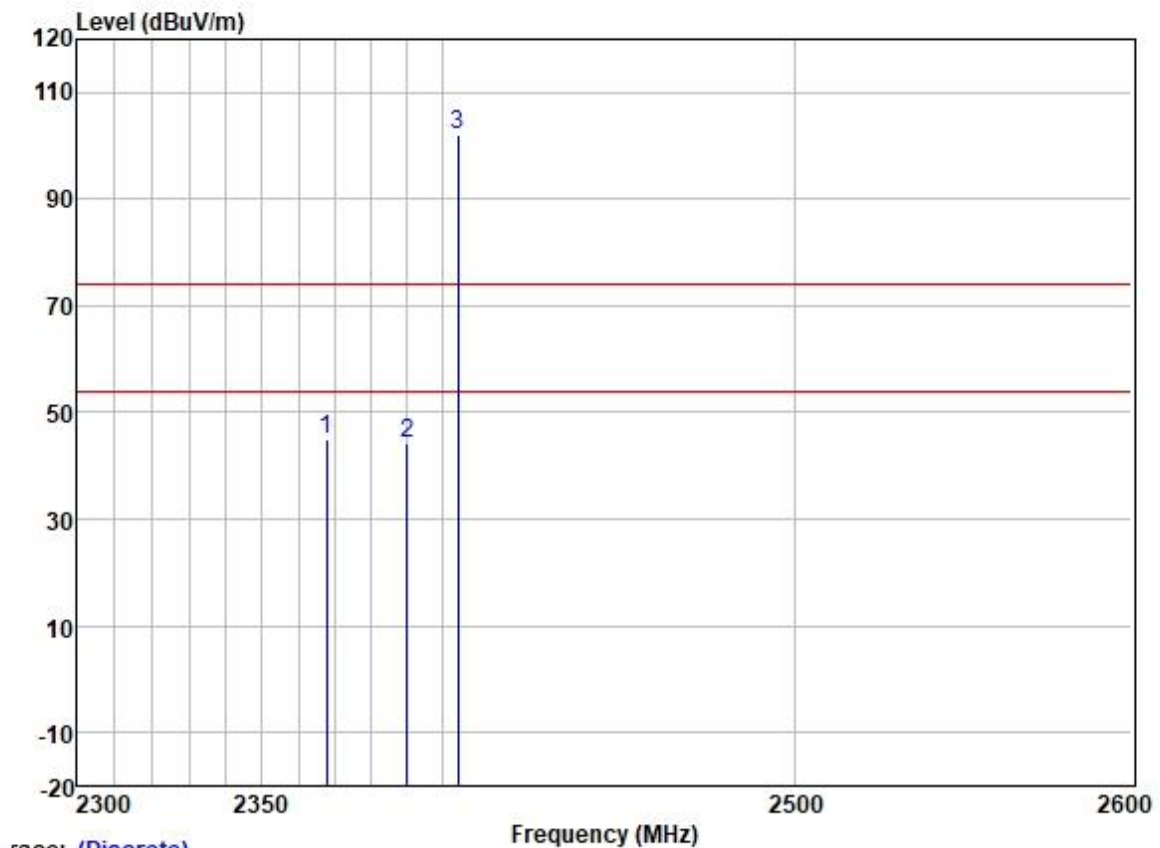
Test Mode: 03; Polarity: Horizontal; Modulation: GFSK; ; Channel: Low



Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Limit Level	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	2366.120	52.42	27.28	3.43	37.60	45.53	74.00	-28.47	HORIZONTAL Peak
2	2390.000	51.45	27.33	3.48	37.59	44.67	74.00	-29.33	HORIZONTAL Peak
3 *	2404.000	103.82	27.35	3.50	37.59	97.08	74.00	23.08	HORIZONTAL Peak

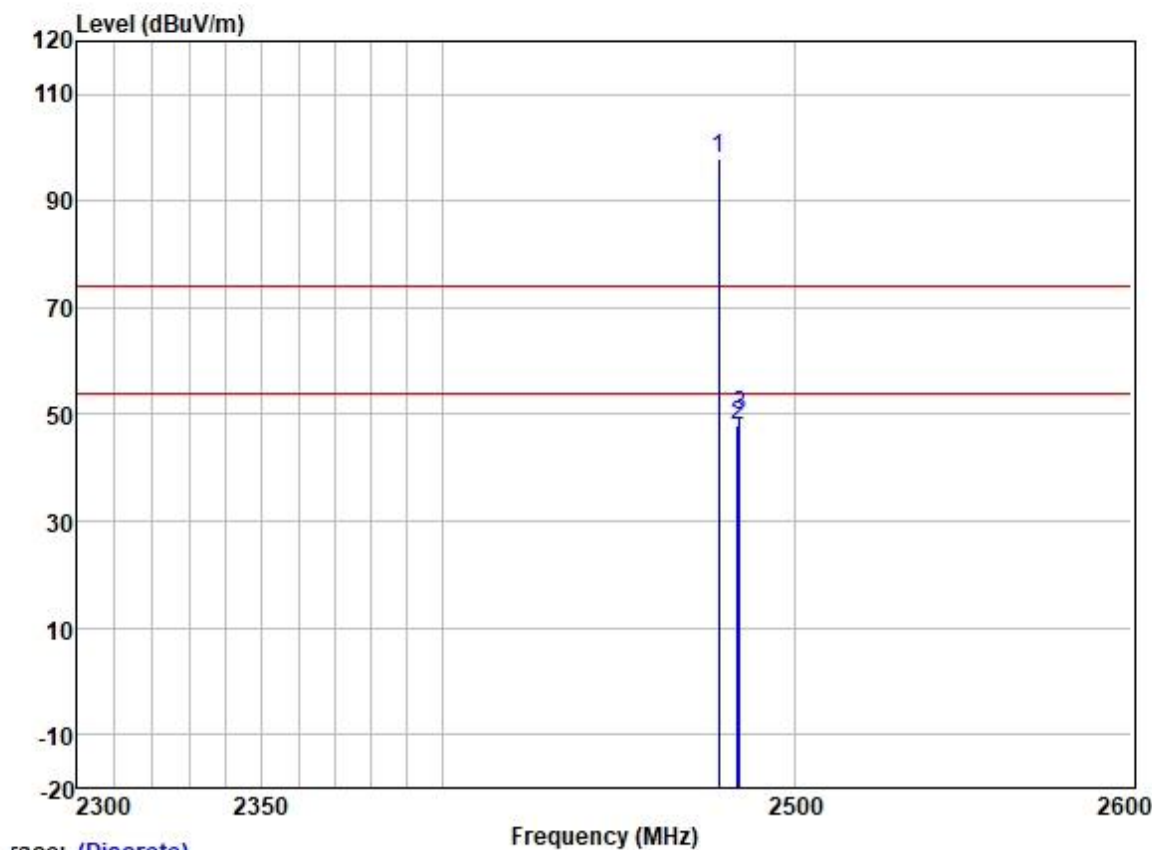
Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2367.698	52.02	27.28	3.43	37.60	45.13	74.00	-28.87	VERTICAL	Peak
2	2390.000	50.91	27.33	3.48	37.59	44.13	74.00	-29.87	VERTICAL	Peak
3 *	2404.000	108.69	27.35	3.50	37.59	101.95	74.00	27.95	VERTICAL	Peak

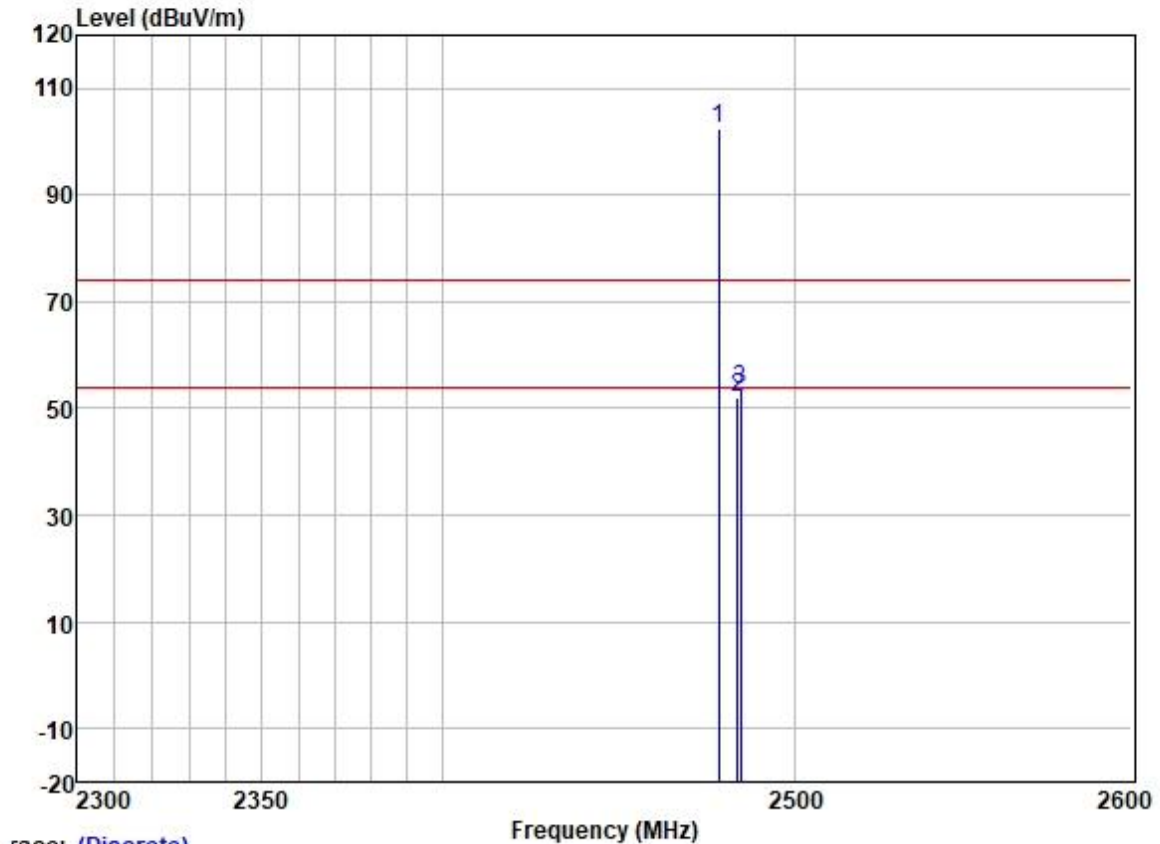
Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Read	Antenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 *	2478.000	104.36	27.47	3.60	37.57	97.86	74.00	23.86	HORIZONTAL Peak
2	2483.500	54.60	27.48	3.53	37.57	48.04	74.00	-25.96	HORIZONTAL Peak
3	2484.071	56.26	27.48	3.53	37.57	49.70	74.00	-24.30	HORIZONTAL Peak

Test Mode: 03; Polarity: Vertical; Modulation: GFSK; ; Channel: High



Trace: (Discrete)

	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 *	2478.000	109.10	27.47	3.60	37.57	102.60	74.00	28.60	VERTICAL	Peak
2	2483.500	58.65	27.48	3.53	37.57	52.09	74.00	-21.91	VERTICAL	Peak
3	2484.321	60.14	27.48	3.53	37.57	53.58	74.00	-20.42	VERTICAL	Peak

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 6.4,6.5,6.6

Measurement Distance: 3m

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

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.

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1003 mbar

7.7.2 Test Mode Description

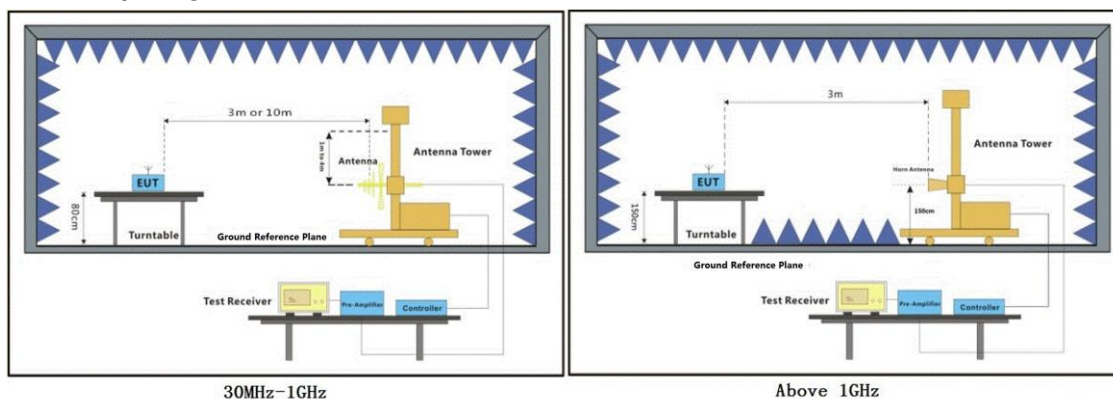
Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.



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7.7.3 Test Setup Diagram



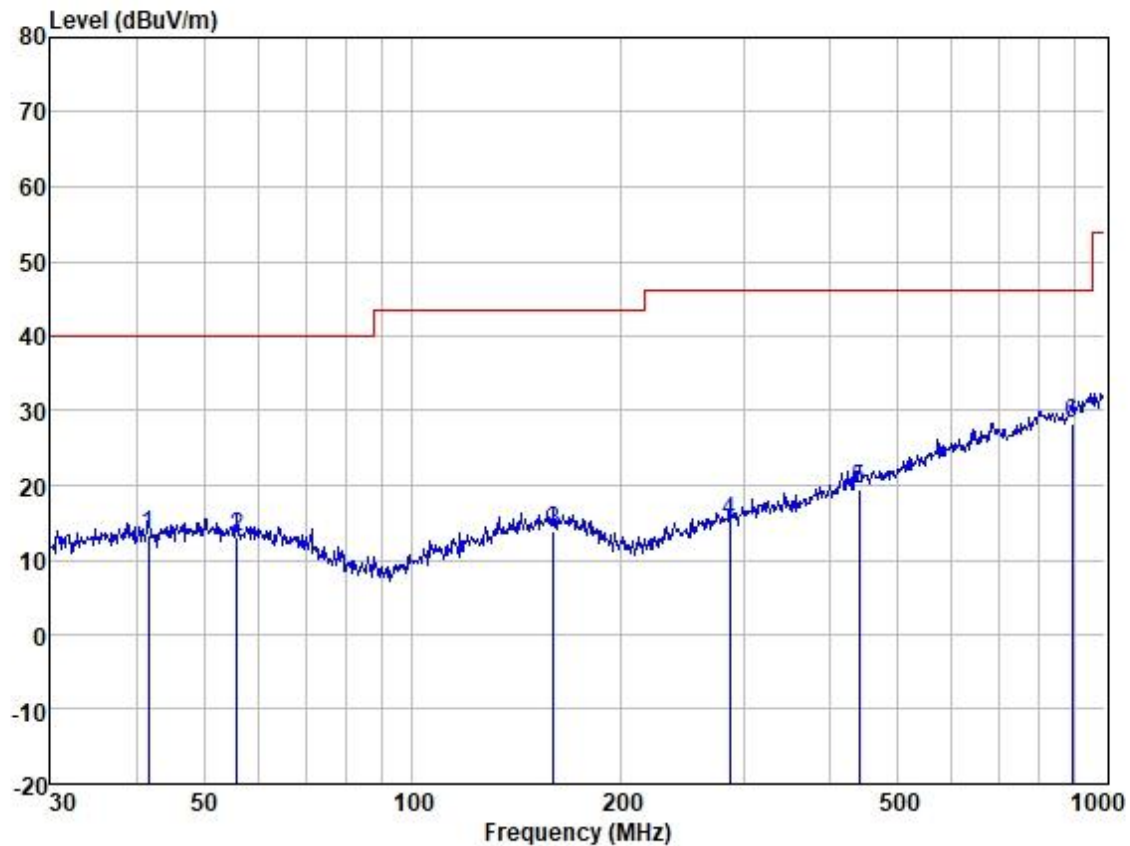
7.7.4 Measurement Procedure and Data

- 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.
- 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 middle 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:

- Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor
- Scan from 9kHz to 1 GHz, 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.

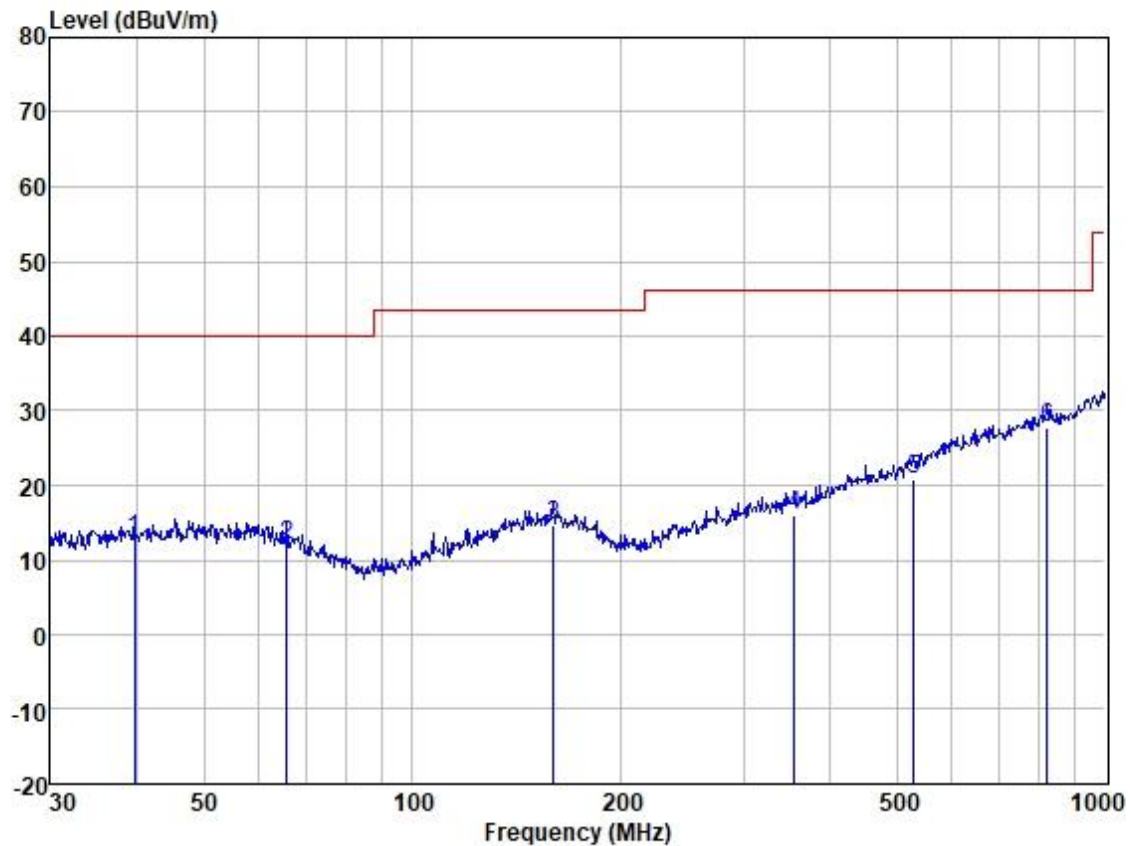
Test Mode: 02; Polarity: Horizontal



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	41.567	26.31	13.66	1.10	27.61	13.46	40.00	-26.54	HORIZONTAL	QP
2	55.805	25.71	13.74	1.19	27.60	13.04	40.00	-26.96	HORIZONTAL	QP
3	159.784	25.24	13.69	2.32	27.36	13.89	43.52	-29.63	HORIZONTAL	QP
4	286.982	26.07	13.12	3.18	27.21	15.16	46.02	-30.86	HORIZONTAL	QP
5	441.743	26.68	16.81	4.14	28.24	19.39	46.02	-26.63	HORIZONTAL	QP
6	893.857	27.20	22.96	6.38	28.22	28.32	46.02	-17.70	HORIZONTAL	QP

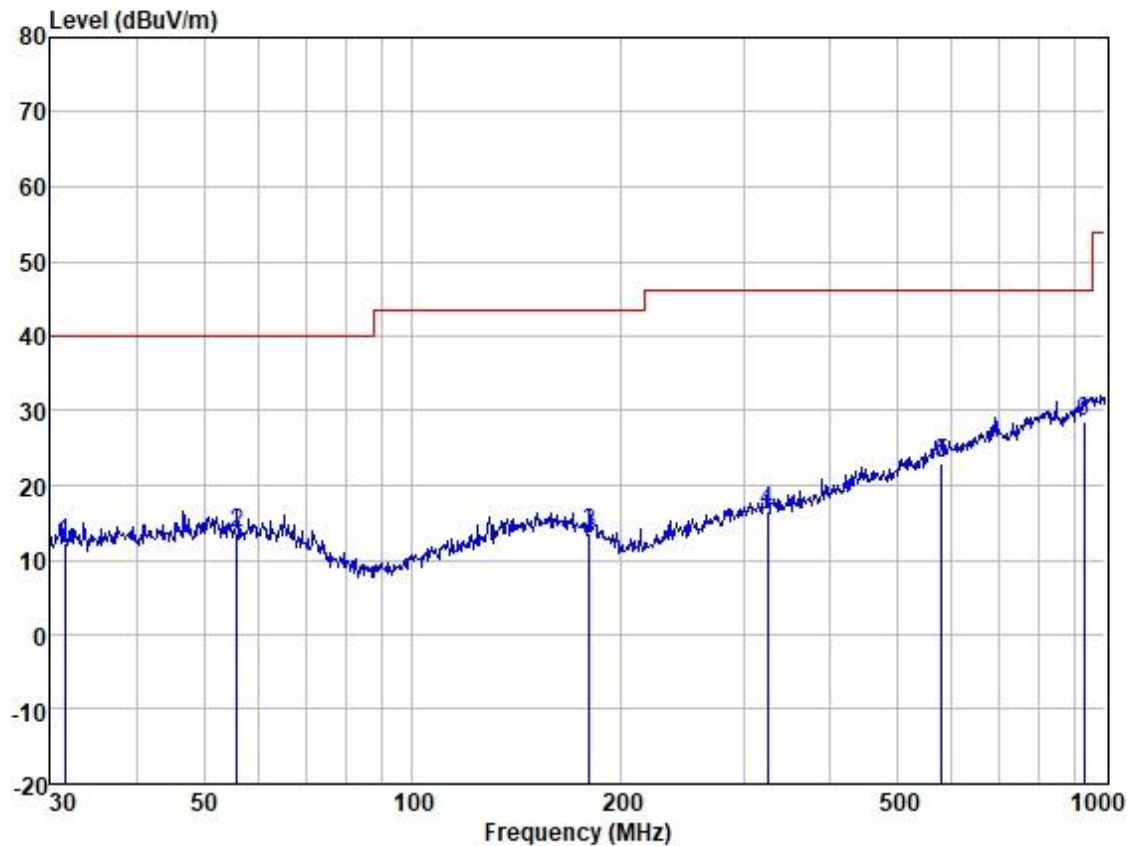
Test Mode: 02; Polarity: Vertical



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	39.715	25.93	13.50	1.09	27.61	12.91	40.00	-27.09	VERTICAL	QP
2	65.803	25.71	12.41	1.36	27.60	11.88	40.00	-28.12	VERTICAL	QP
3	159.784	26.08	13.69	2.32	27.36	14.73	43.52	-28.79	VERTICAL	QP
4	355.427	25.70	14.52	3.65	27.74	16.13	46.02	-29.89	VERTICAL	QP
5	528.246	26.44	18.41	4.57	28.65	20.77	46.02	-25.25	VERTICAL	QP
6	824.597	26.69	23.32	6.11	28.52	27.60	46.02	-18.42	VERTICAL	QP

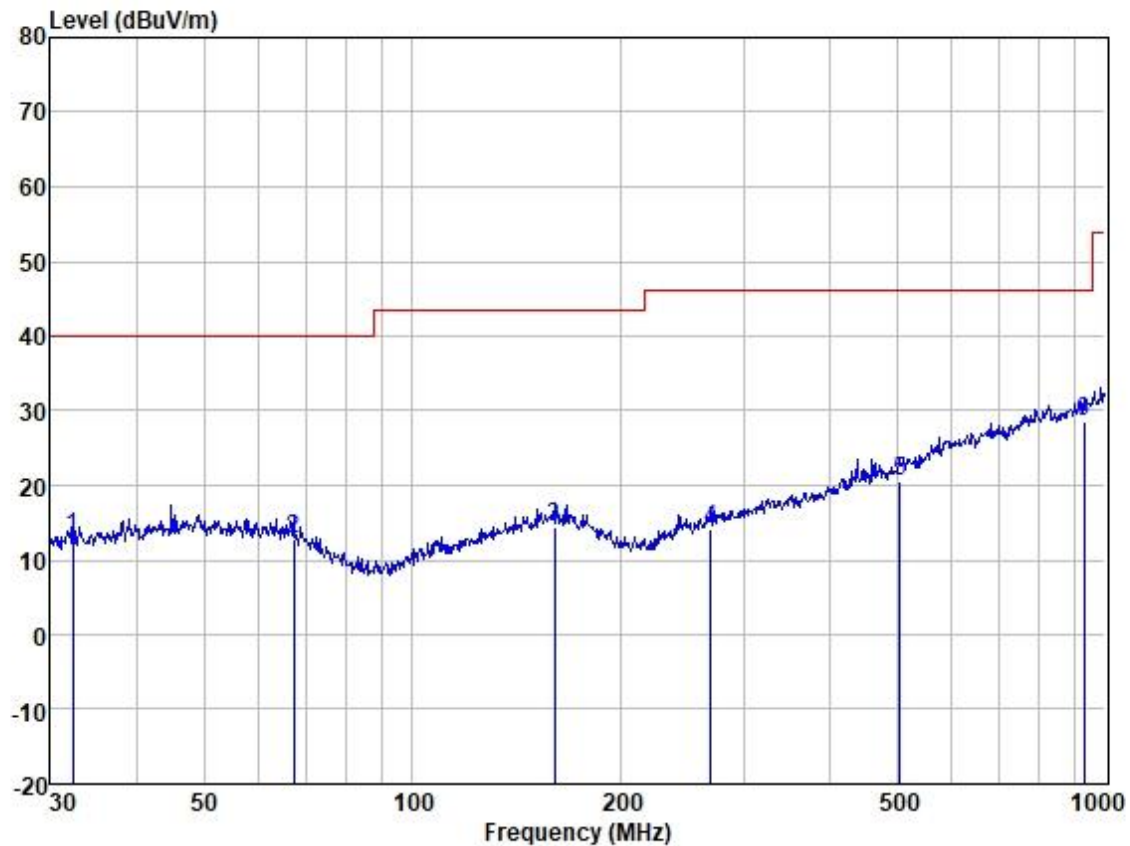
Test Mode: 03; Polarity: Horizontal



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	31.510	26.15	12.88	1.02	27.65	12.40	40.00	-27.60	HORIZONTAL	QP
2	55.805	26.29	13.74	1.19	27.60	13.62	40.00	-26.38	HORIZONTAL	QP
3	180.017	26.14	12.40	2.44	27.32	13.66	43.52	-29.86	HORIZONTAL	QP
4	325.596	26.41	14.17	3.38	27.35	16.61	46.02	-29.41	HORIZONTAL	QP
5	580.703	27.40	19.32	4.89	28.78	22.83	46.02	-23.19	HORIZONTAL	QP
6	932.272	26.49	23.67	6.62	28.14	28.64	46.02	-17.38	HORIZONTAL	QP

Test Mode: 03; Polarity: Vertical



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	32.293	26.79	12.88	1.03	27.64	13.06	40.00	-26.94	VERTICAL	QP
2	67.438	26.88	12.06	1.38	27.60	12.72	40.00	-27.28	VERTICAL	QP
3	160.346	25.72	13.69	2.32	27.36	14.37	43.52	-29.15	VERTICAL	QP
4	269.428	25.61	12.58	3.09	27.22	14.06	46.02	-31.96	VERTICAL	QP
5	504.706	26.87	17.91	4.44	28.61	20.61	46.02	-25.41	VERTICAL	QP
6	932.272	26.45	23.67	6.62	28.14	28.60	46.02	-17.42	VERTICAL	QP

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 6.4,6.5,6.6

Measurement Distance: 3m

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

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.

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1003 mbar

7.8.2 Test Mode Description

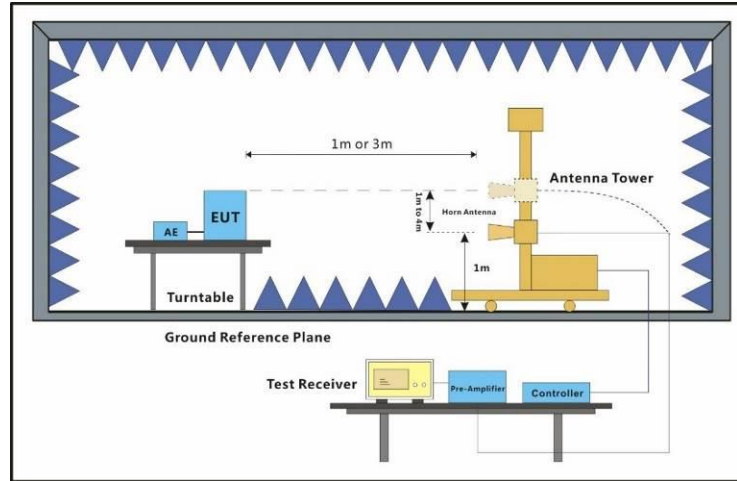
Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.



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7.8.3 Test Setup Diagram



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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, 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) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

2) Scan from 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.

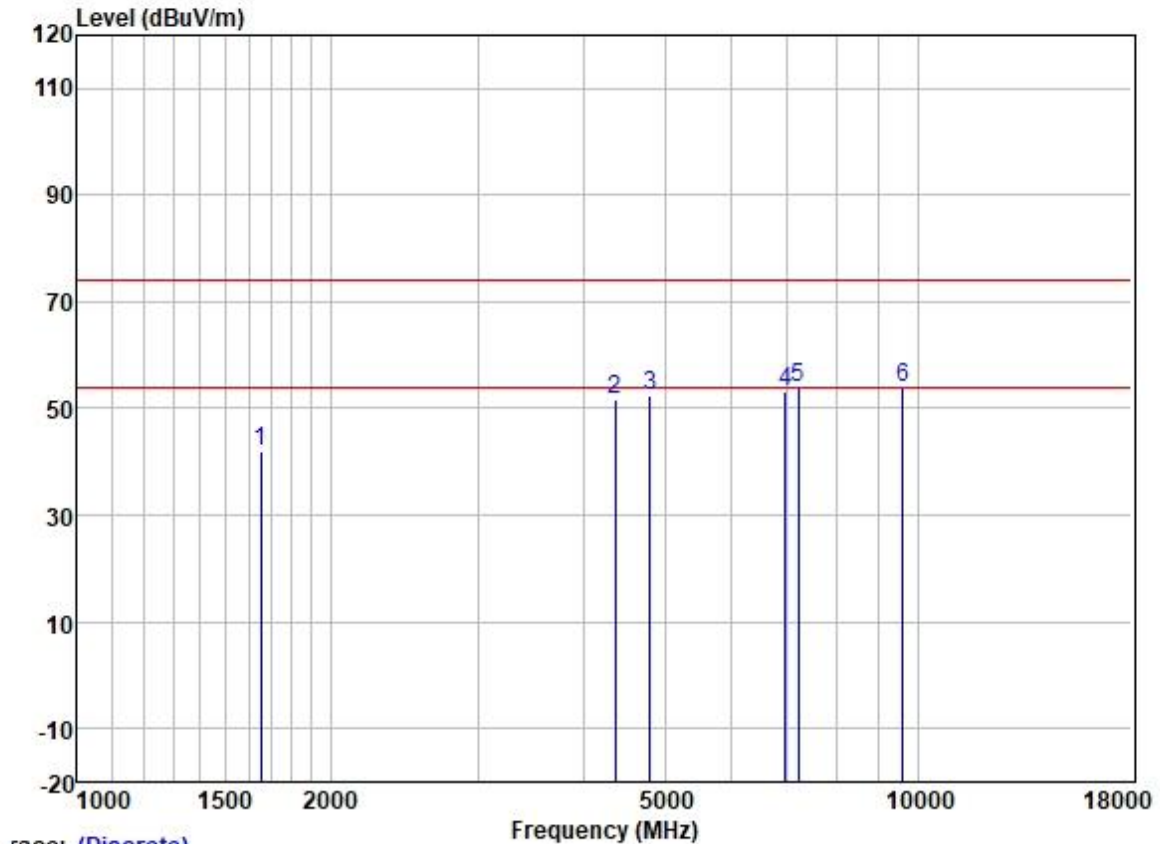
3) The field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only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



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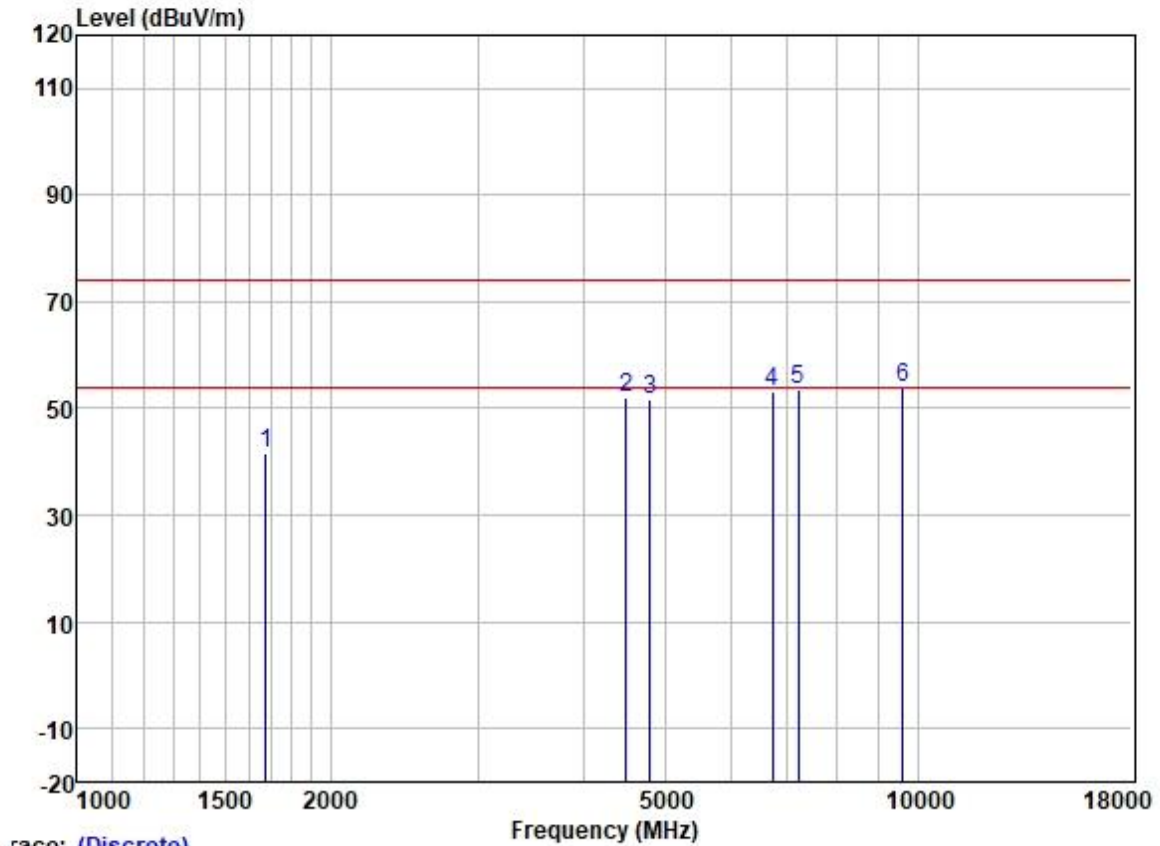
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1653.550	51.42	25.64	2.80	37.93	41.93	74.00	-32.07	HORIZONTAL	Peak
2	4367.058	53.19	30.62	4.68	36.81	51.68	74.00	-22.32	HORIZONTAL	Peak
3	4804.000	52.25	31.42	5.40	36.83	52.24	74.00	-21.76	HORIZONTAL	Peak
4	6954.852	49.52	34.95	5.81	37.21	53.07	74.00	-20.93	HORIZONTAL	Peak
5	7206.000	49.73	35.54	5.98	37.38	53.87	74.00	-20.13	HORIZONTAL	Peak
6	9608.000	45.86	38.37	7.07	37.42	53.88	74.00	-20.12	HORIZONTAL	Peak

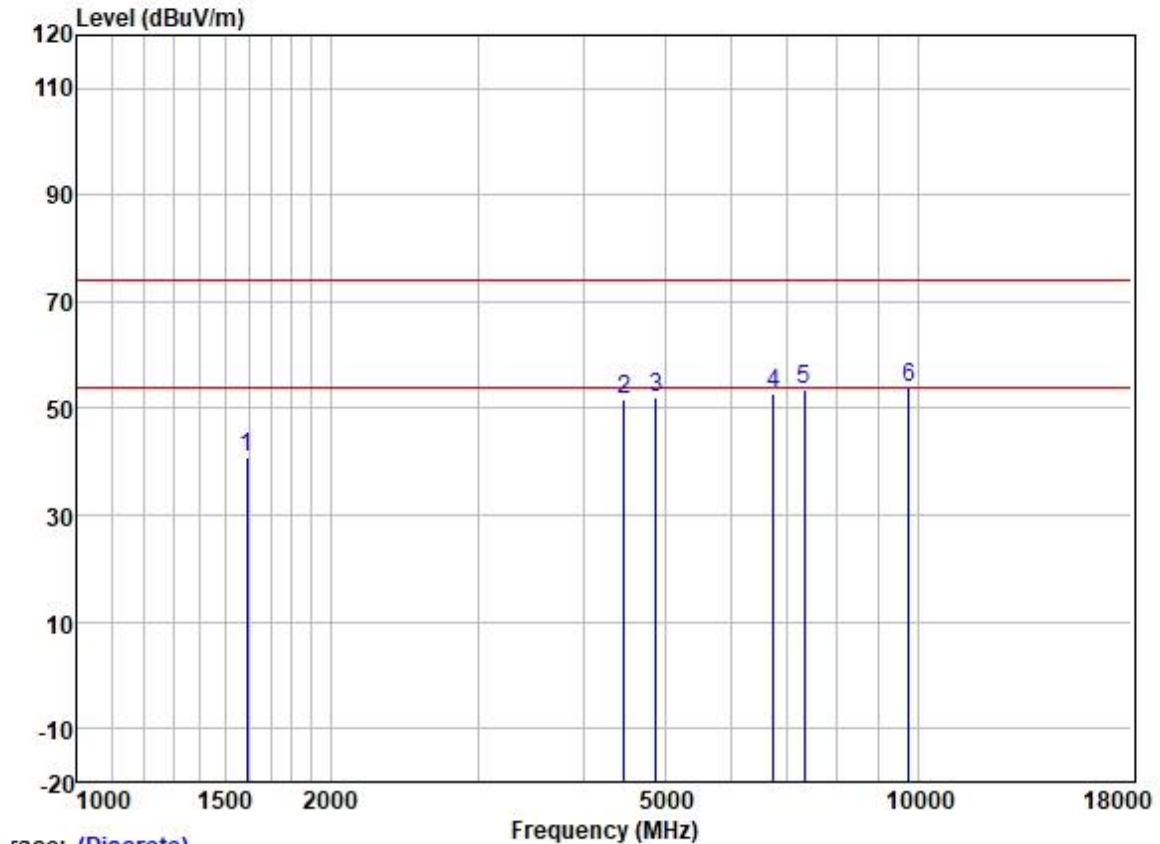
Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



race: (Discrete)

	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1677.621	50.90	25.68	2.80	37.91	41.47	74.00	-32.53	VERTICAL	Peak
2	4495.125	53.05	30.80	5.05	36.82	52.08	74.00	-21.92	VERTICAL	Peak
3	4804.000	51.73	31.42	5.40	36.83	51.72	74.00	-22.28	VERTICAL	Peak
4	6717.762	49.81	34.44	5.83	37.09	52.99	74.00	-21.01	VERTICAL	Peak
5	7206.000	49.58	35.54	5.98	37.38	53.72	74.00	-20.28	VERTICAL	Peak
6	9608.000	45.80	38.37	7.07	37.42	53.82	74.00	-20.18	VERTICAL	Peak

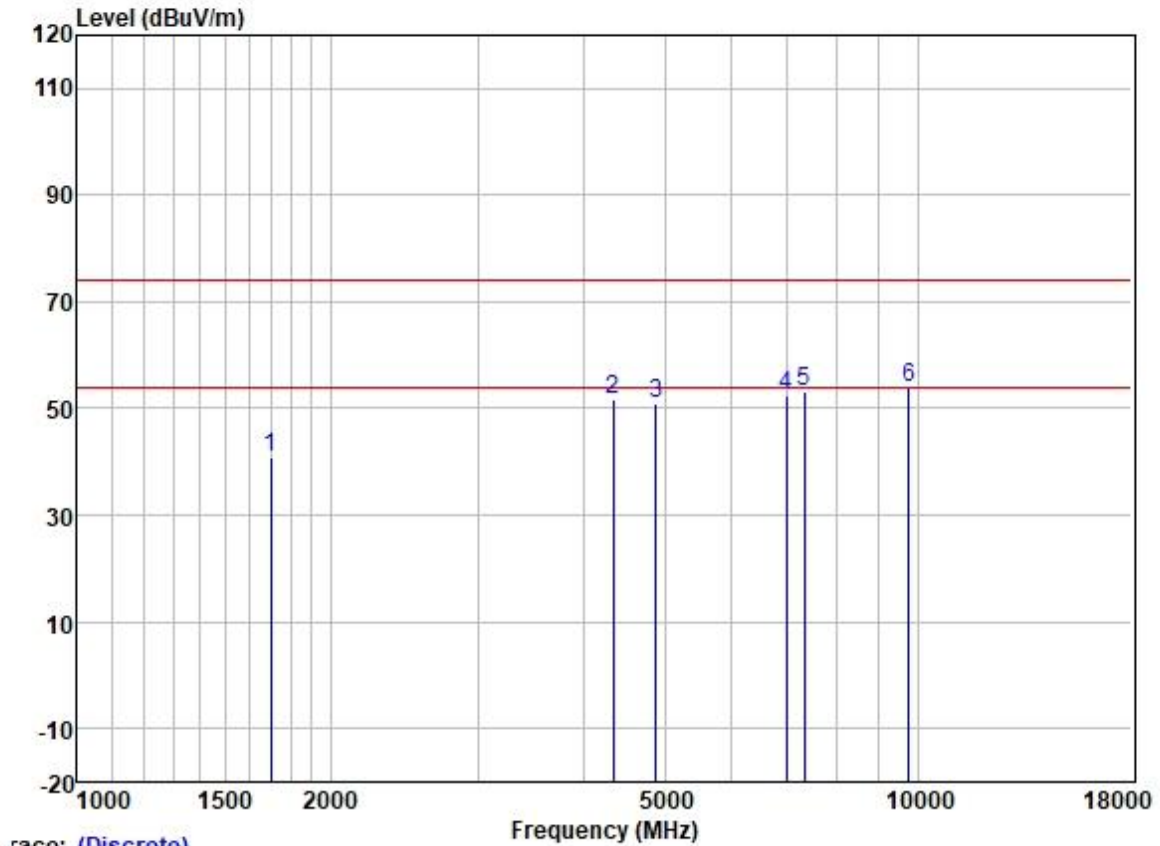
Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1592.571	50.39	25.57	2.80	37.98	40.78	74.00	-33.22	HORIZONTAL	Peak
2	4469.214	52.72	30.77	4.93	36.81	51.61	74.00	-22.39	HORIZONTAL	Peak
3	4880.000	51.76	31.54	5.50	36.84	51.96	74.00	-22.04	HORIZONTAL	Peak
4	6737.207	49.58	34.50	5.82	37.09	52.81	74.00	-21.19	HORIZONTAL	Peak
5	7320.000	48.84	36.00	6.13	37.43	53.54	74.00	-20.46	HORIZONTAL	Peak
6	9760.000	45.89	38.50	7.02	37.41	54.00	74.00	-20.00	HORIZONTAL	Peak

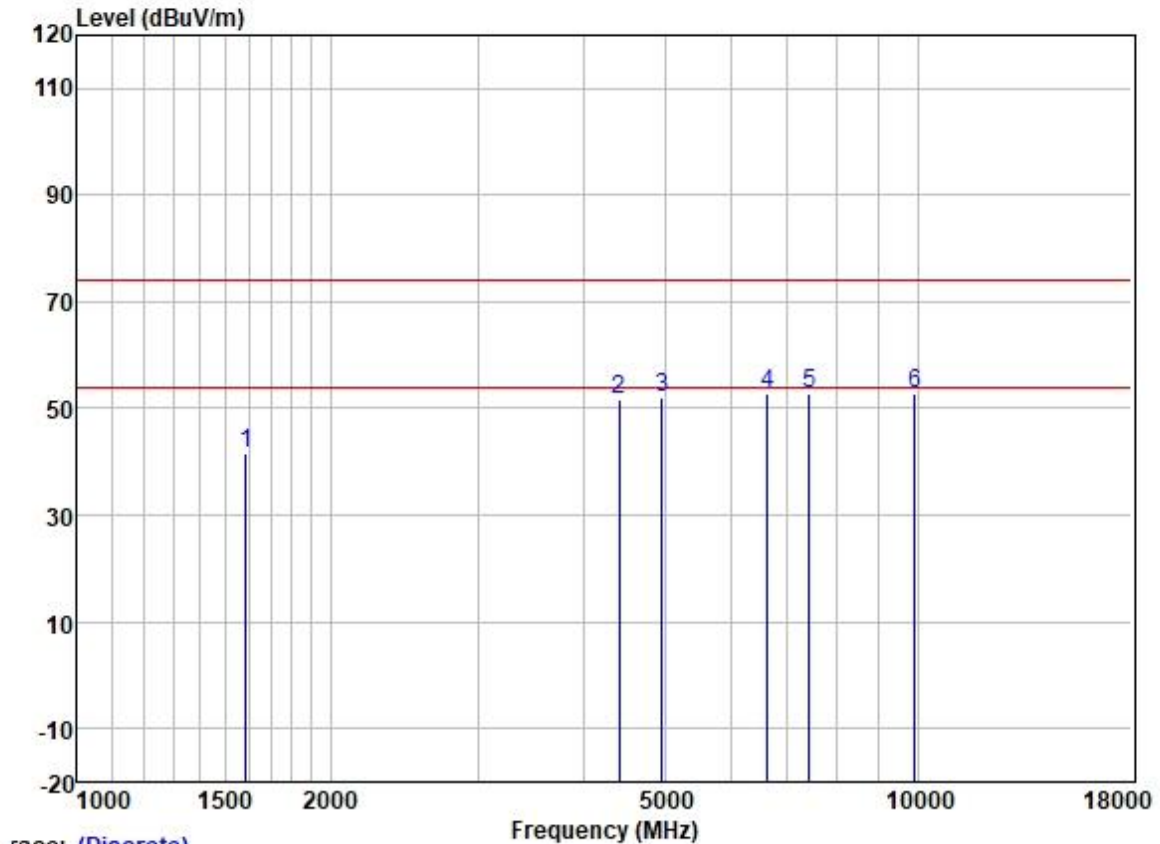
Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)

	Freq	Read	Antenna	Cable	Preamp	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	1697.129	50.30	25.71	2.80	37.89	40.92	74.00	-33.08	VERTICAL Peak
2	4341.886	53.16	30.57	4.67	36.81	51.59	74.00	-22.41	VERTICAL Peak
3	4880.000	50.88	31.54	5.50	36.84	51.08	74.00	-22.92	VERTICAL Peak
4	6974.982	49.03	34.97	5.81	37.23	52.58	74.00	-21.42	VERTICAL Peak
5	7320.000	48.46	36.00	6.13	37.43	53.16	74.00	-20.84	VERTICAL Peak
6	9760.000	45.71	38.50	7.02	37.41	53.82	74.00	-20.18	VERTICAL Peak

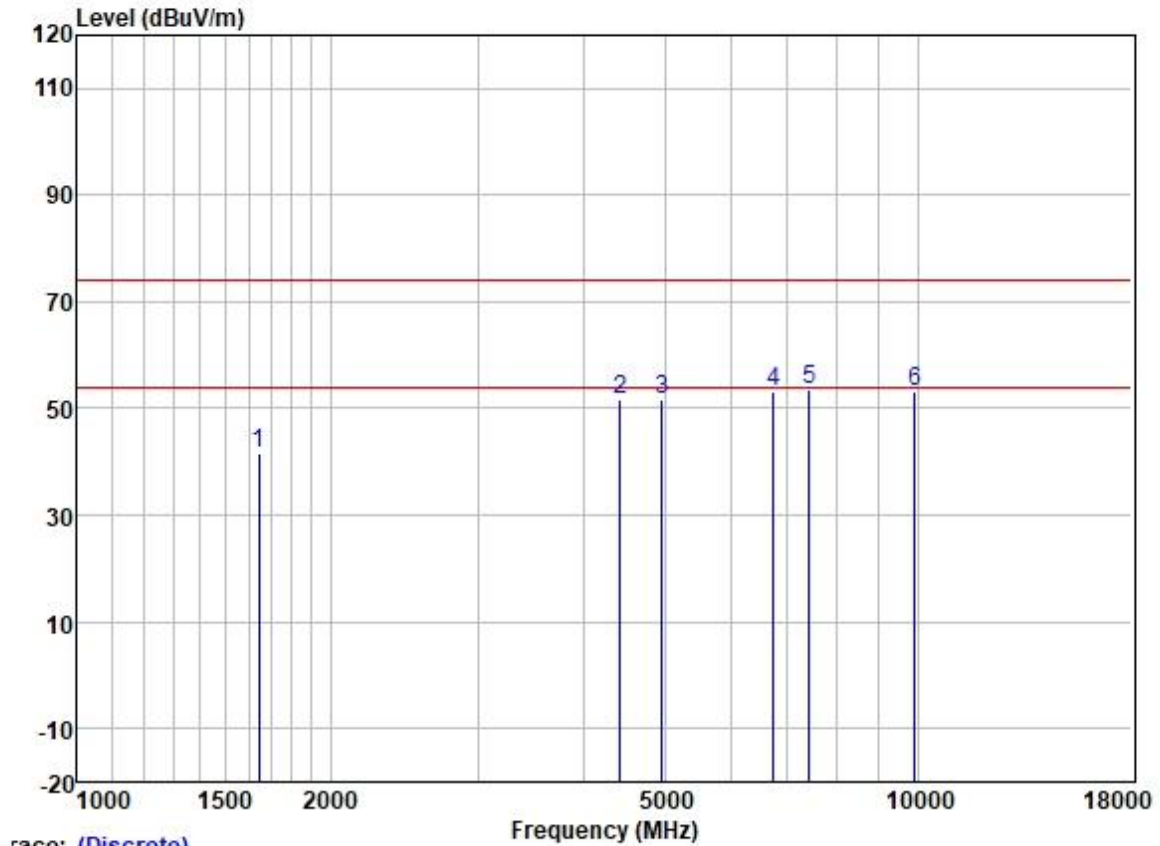
Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

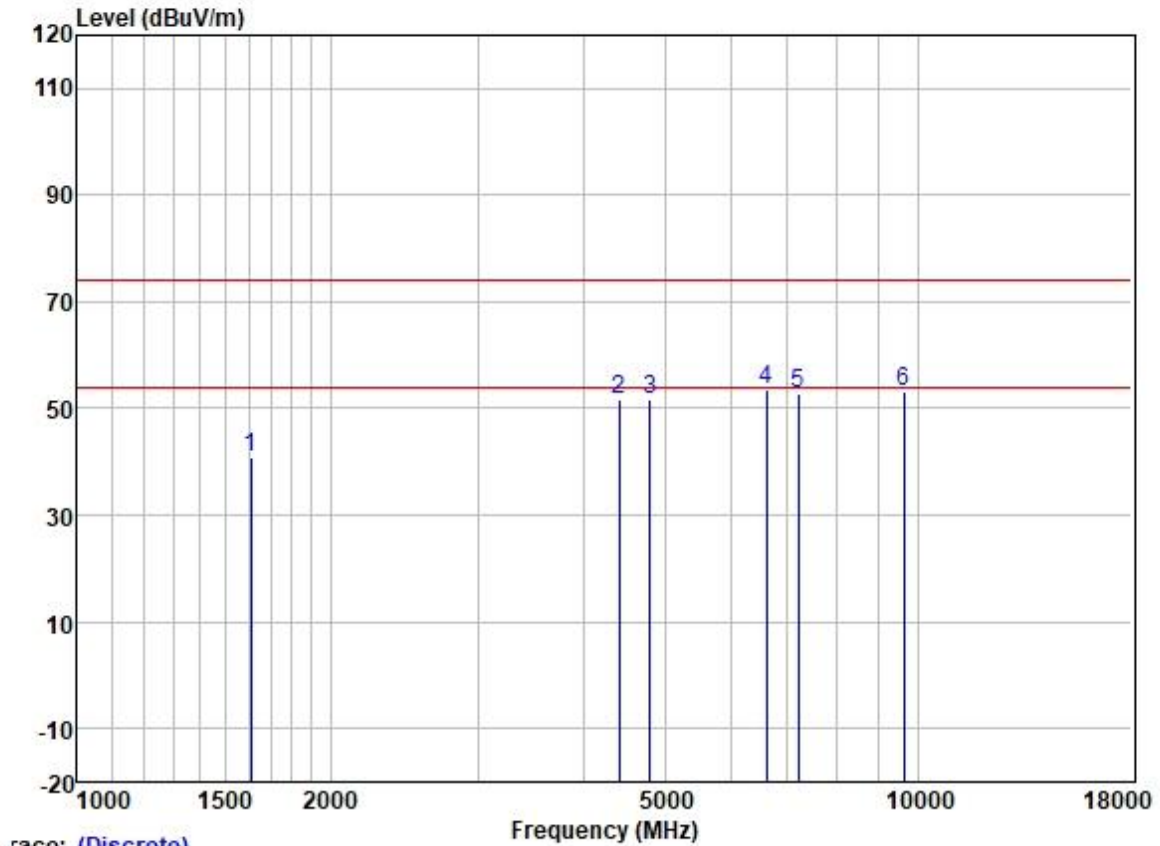
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1587.975	51.16	25.57	2.80	37.98	41.55	74.00	-32.45	HORIZONTAL	Peak
2	4417.841	53.18	30.70	4.74	36.81	51.81	74.00	-22.19	HORIZONTAL	Peak
3	4960.000	51.60	31.65	5.65	36.84	52.06	74.00	-21.94	HORIZONTAL	Peak
4	6621.375	49.76	34.20	5.83	37.05	52.74	74.00	-21.26	HORIZONTAL	Peak
5	7440.000	47.85	36.27	6.22	37.47	52.87	74.00	-21.13	HORIZONTAL	Peak
6	9920.000	44.67	38.65	6.96	37.40	52.88	74.00	-21.12	HORIZONTAL	Peak

Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:High



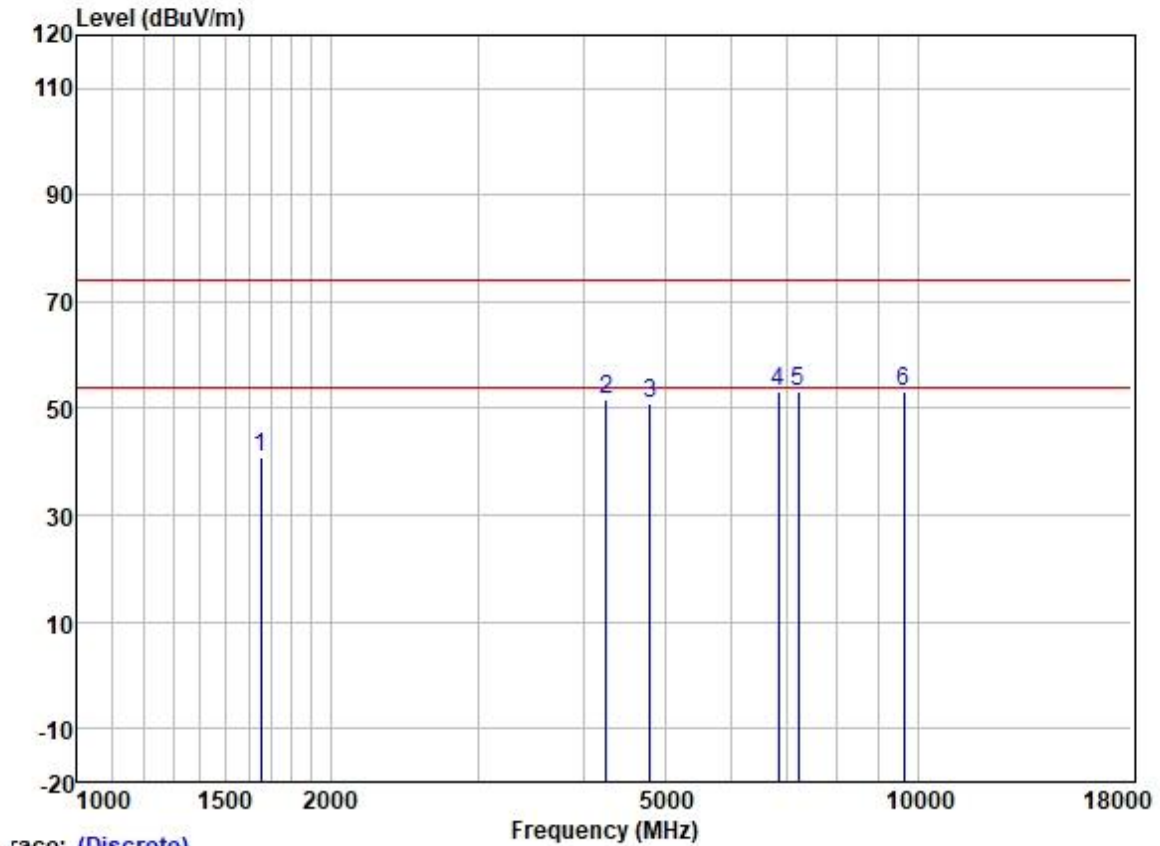
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1644.019	51.13	25.63	2.80	37.93	41.63	74.00	-32.37	VERTICAL	Peak
2	4430.628	53.04	30.72	4.78	36.81	51.73	74.00	-22.27	VERTICAL	Peak
3	4960.000	51.20	31.65	5.65	36.84	51.66	74.00	-22.34	VERTICAL	Peak
4	6737.207	49.93	34.50	5.82	37.09	53.16	74.00	-20.84	VERTICAL	Peak
5	7440.000	48.50	36.27	6.22	37.47	53.52	74.00	-20.48	VERTICAL	Peak
6	9920.000	45.12	38.65	6.96	37.40	53.33	74.00	-20.67	VERTICAL	Peak

Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1611.091	50.57	25.59	2.80	37.98	40.98	74.00	-33.02	HORIZONTAL	Peak
2	4417.841	53.19	30.70	4.74	36.81	51.82	74.00	-22.18	HORIZONTAL	Peak
3	4808.000	51.73	31.42	5.40	36.83	51.72	74.00	-22.28	HORIZONTAL	Peak
4	6602.265	50.45	34.16	5.84	37.04	53.41	74.00	-20.59	HORIZONTAL	Peak
5	7212.000	48.69	35.62	6.01	37.38	52.94	74.00	-21.06	HORIZONTAL	Peak
6	9616.000	45.20	38.37	7.07	37.42	53.22	74.00	-20.78	HORIZONTAL	Peak

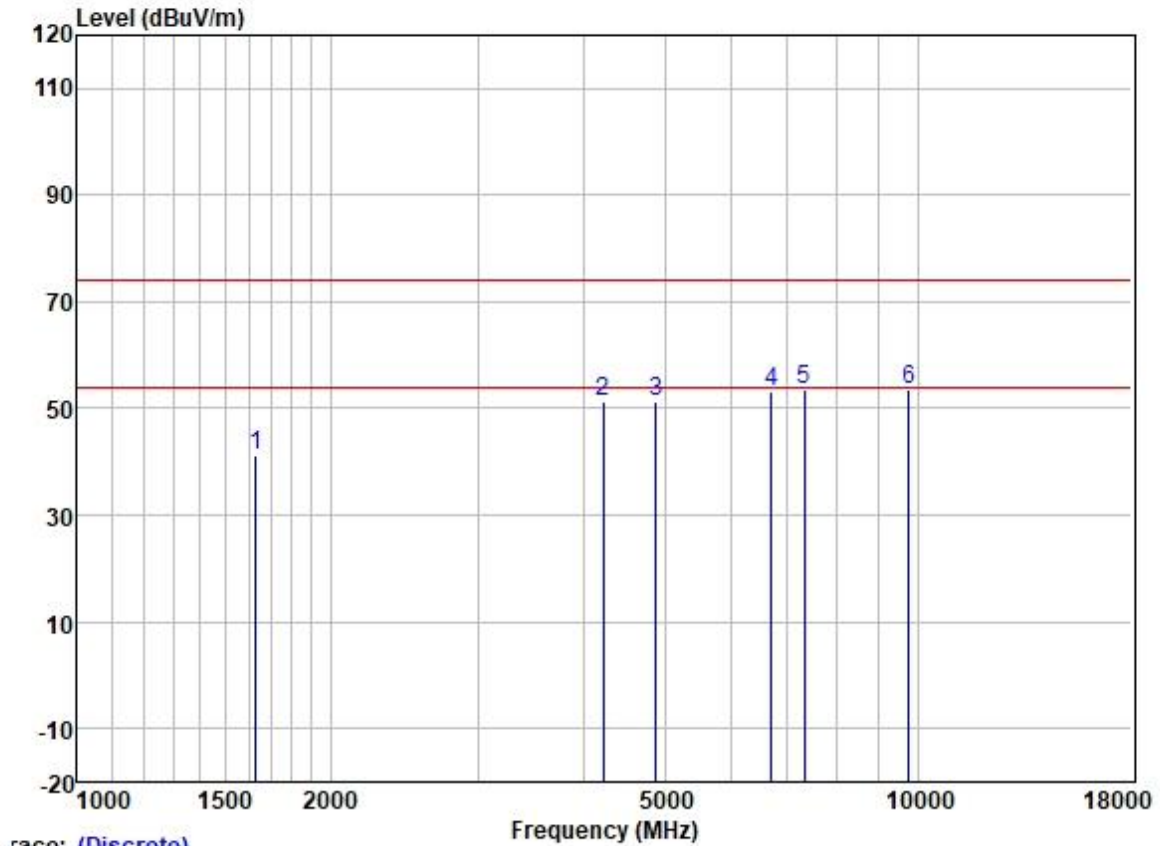
Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



race: (Discrete)

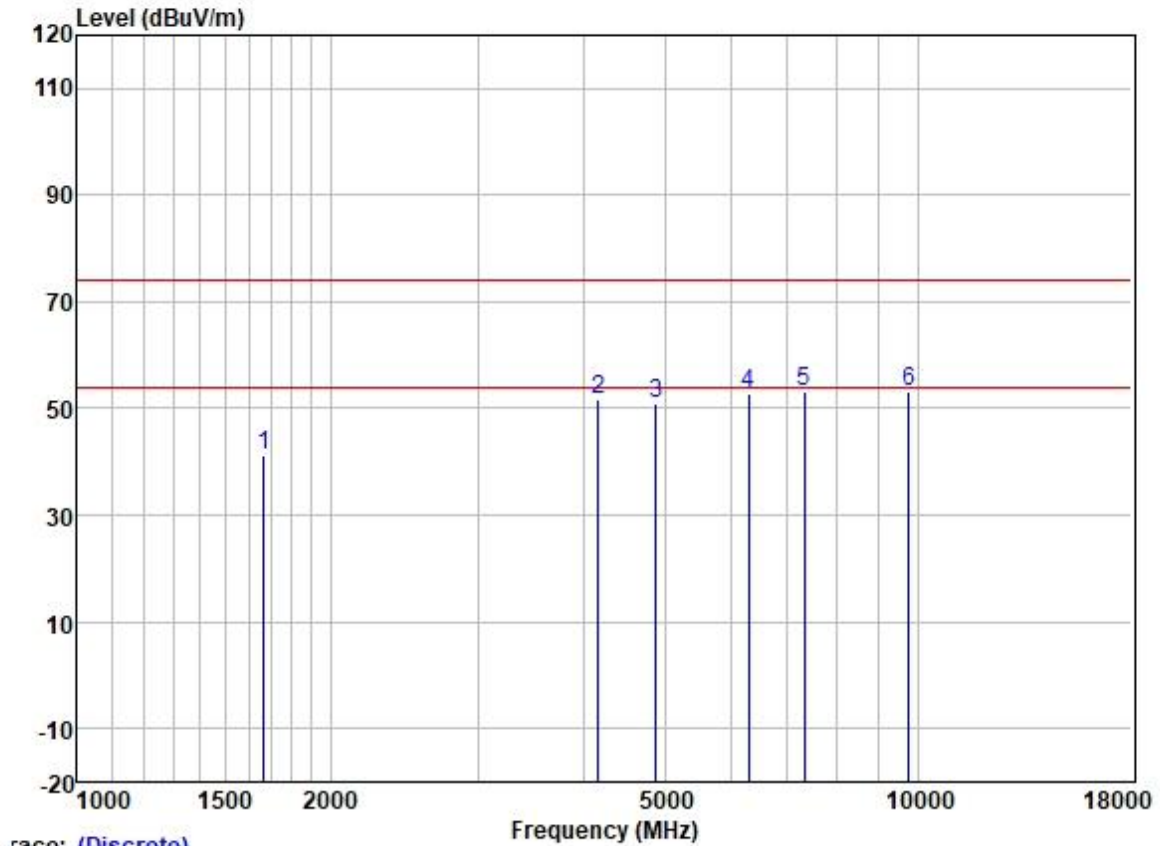
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1653.550	50.42	25.64	2.80	37.93	40.93	74.00	-33.07	VERTICAL	Peak
2	4254.921	53.51	30.34	4.62	36.81	51.66	74.00	-22.34	VERTICAL	Peak
3	4808.000	51.08	31.42	5.40	36.83	51.07	74.00	-22.93	VERTICAL	Peak
4	6835.278	49.70	34.74	5.82	37.13	53.13	74.00	-20.87	VERTICAL	Peak
5	7212.000	48.82	35.62	6.01	37.38	53.07	74.00	-20.93	VERTICAL	Peak
6	9616.000	45.28	38.37	7.07	37.42	53.30	74.00	-20.70	VERTICAL	Peak

Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



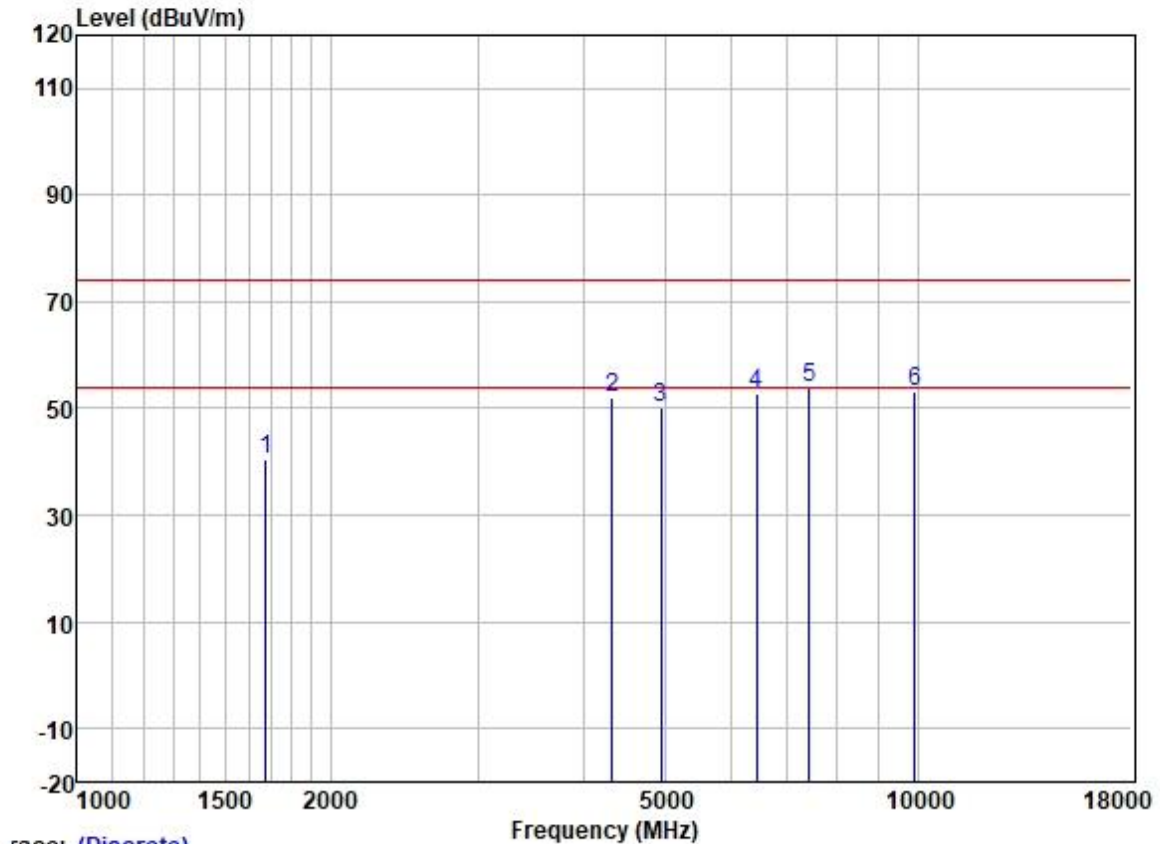
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1629.825	50.69	25.61	2.80	37.95	41.15	74.00	-32.85	HORIZONTAL	Peak
2	4230.396	53.08	30.26	4.61	36.81	51.14	74.00	-22.86	HORIZONTAL	Peak
3	4880.000	51.02	31.54	5.50	36.84	51.22	74.00	-22.78	HORIZONTAL	Peak
4	6698.373	49.89	34.38	5.83	37.08	53.02	74.00	-20.98	HORIZONTAL	Peak
5	7320.000	48.78	36.00	6.13	37.43	53.48	74.00	-20.52	HORIZONTAL	Peak
6	9760.000	45.31	38.50	7.02	37.41	53.42	74.00	-20.58	HORIZONTAL	Peak

Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:middle



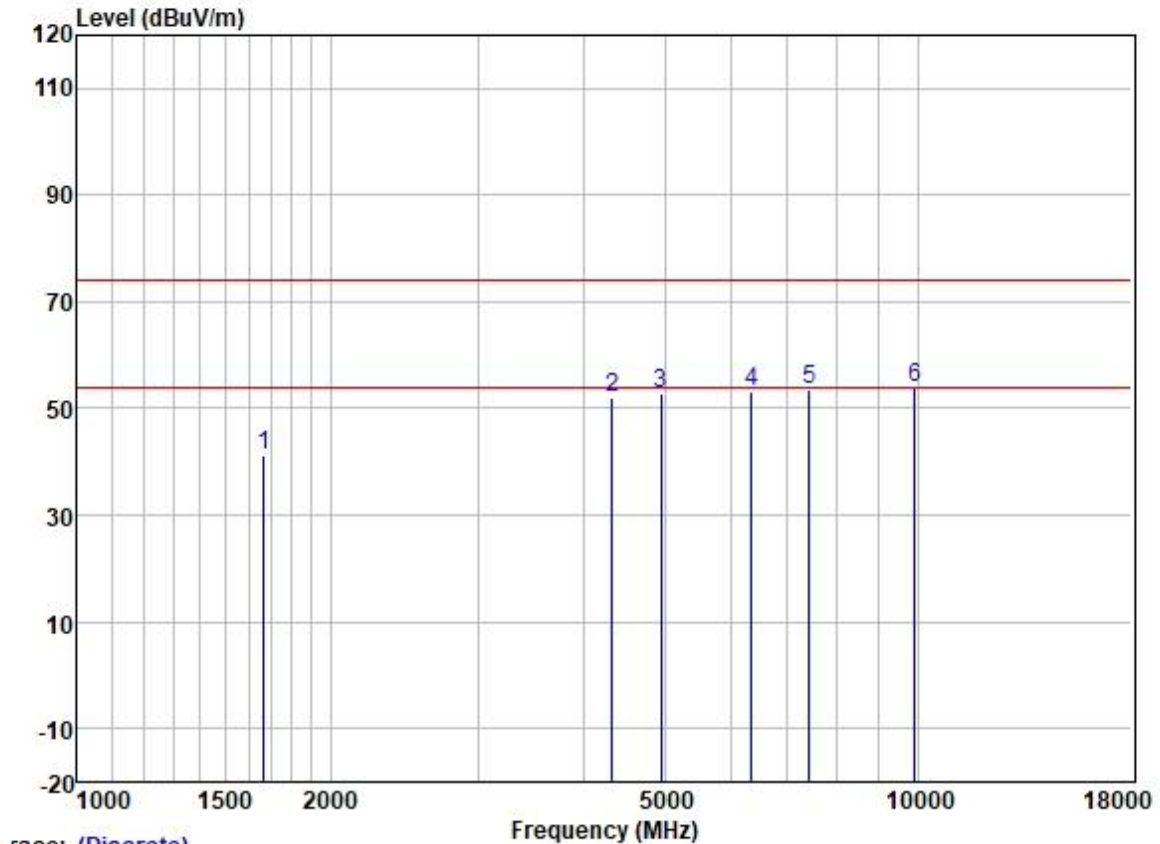
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1667.951	50.65	25.66	2.80	37.91	41.20	74.00	-32.80	VERTICAL	Peak
2	4169.698	53.79	30.09	4.60	36.80	51.68	74.00	-22.32	VERTICAL	Peak
3	4880.000	50.74	31.54	5.50	36.84	50.94	74.00	-23.06	VERTICAL	Peak
4	6285.695	50.28	33.37	5.98	36.95	52.68	74.00	-21.32	VERTICAL	Peak
5	7320.000	48.37	36.00	6.13	37.43	53.07	74.00	-20.93	VERTICAL	Peak
6	9760.000	44.97	38.50	7.02	37.41	53.08	74.00	-20.92	VERTICAL	Peak

Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



	Freq	Read	Antenna	Cable	Preamp	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1677.621	49.82	25.68	2.80	37.91	40.39	74.00	-33.61	HORIZONTAL Peak
2	4329.354	53.62	30.54	4.67	36.81	52.02	74.00	-21.98	HORIZONTAL Peak
3	4956.000	49.87	31.65	5.65	36.84	50.33	74.00	-23.67	HORIZONTAL Peak
4	6432.732	50.19	33.83	5.88	36.99	52.91	74.00	-21.09	HORIZONTAL Peak
5	7434.000	48.98	36.27	6.22	37.47	54.00	74.00	-20.00	HORIZONTAL Peak
6	9912.000	44.87	38.65	6.96	37.41	53.07	74.00	-20.93	HORIZONTAL Peak

Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Freq	Read	Antenna	Cable	Preamp	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	1667.951	50.65	25.66	2.80	37.91	41.20	74.00	-32.80	VERTICAL Peak
2	4329.354	53.67	30.54	4.67	36.81	52.07	74.00	-21.93	VERTICAL Peak
3	4956.000	52.49	31.65	5.65	36.84	52.95	74.00	-21.05	VERTICAL Peak
4	6340.436	50.70	33.57	5.94	36.97	53.24	74.00	-20.76	VERTICAL Peak
5	7434.000	48.47	36.27	6.22	37.47	53.49	74.00	-20.51	VERTICAL Peak
6	9912.000	45.70	38.65	6.96	37.41	53.90	74.00	-20.10	VERTICAL Peak

7.9 Duty Cycle

Test Requirement KDB 558074 D01 v05r02 section 6
Test Method: ANSI C63.10 (2013) Section 11.6

7.9.1 E.U.T. Operation

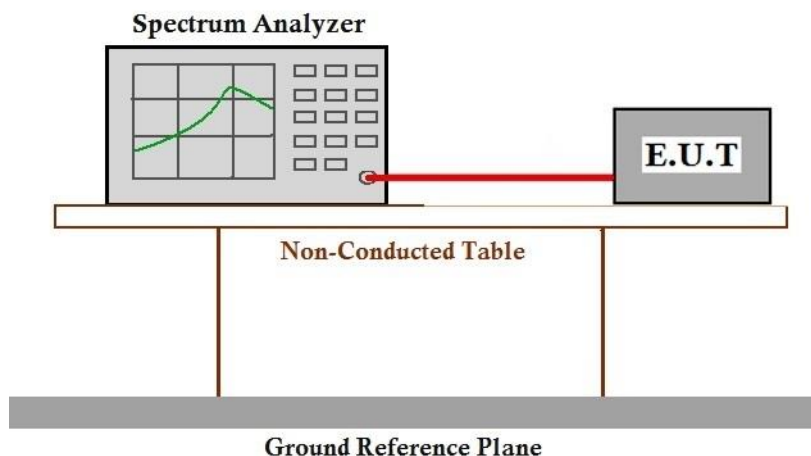
Operating Environment:

Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1003 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2M/bits)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for GZCR2301000014AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for GZCR2301000014AT

10 Appendix

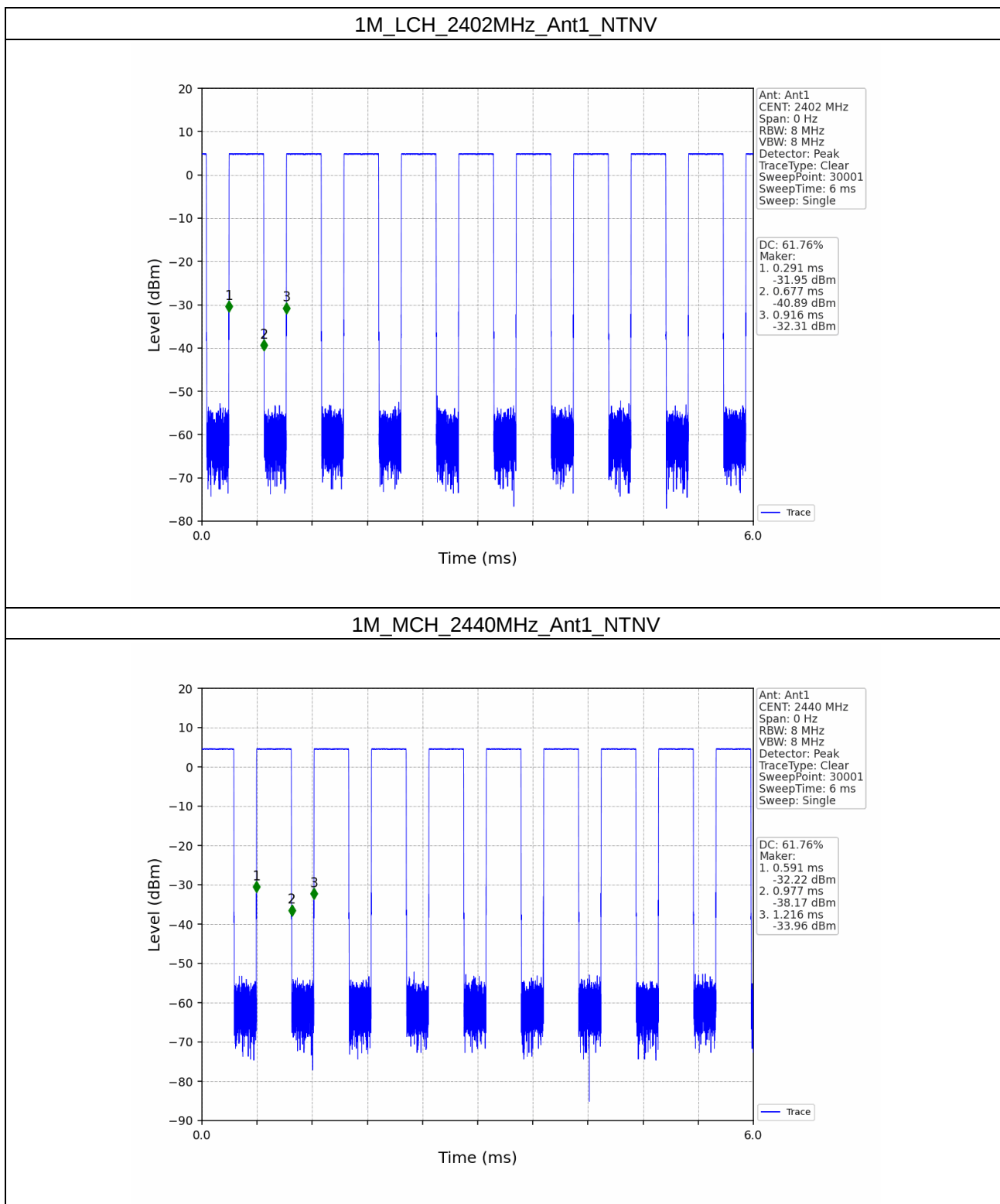
1. Duty Cycle

1.1 Ant1

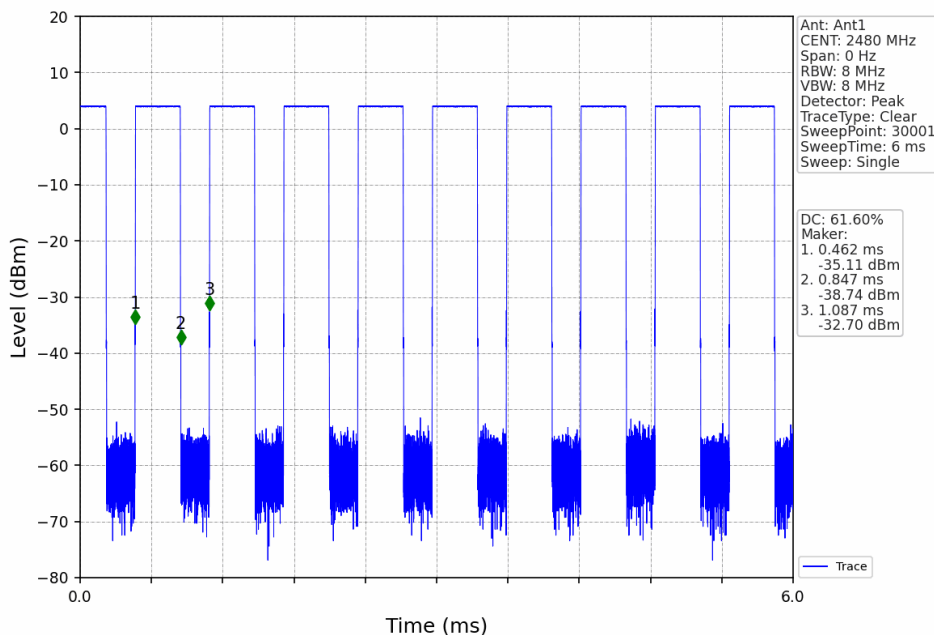
1.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	0.386	0.625	61.76	2.09	0.00
		2440	0.386	0.625	61.76	2.09	0.00
		2480	0.385	0.625	61.60	2.10	0.03
2M	SISO	2404	0.202	0.625	32.32	4.91	0.00
		2440	0.201	0.625	32.16	4.93	0.03
		2478	0.202	0.625	32.32	4.91	0.00

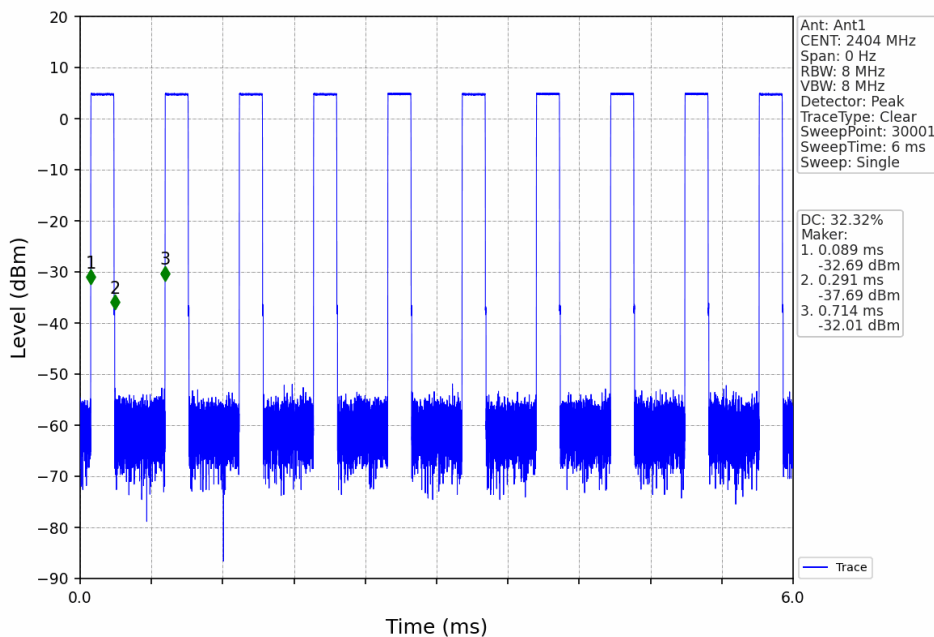
1.1.2 Test Graph



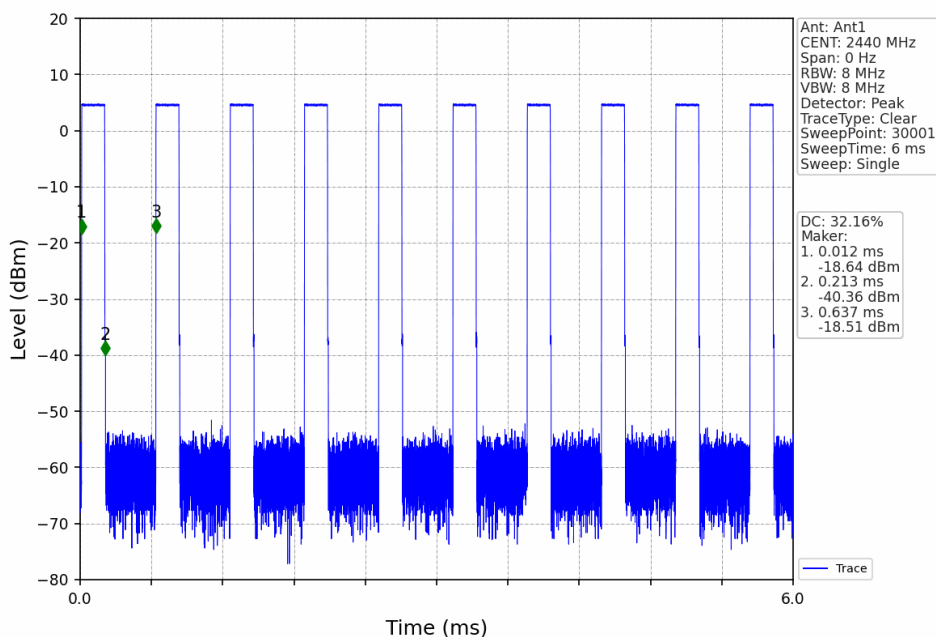
1M_HCH_2480MHz_Ant1_NTNV



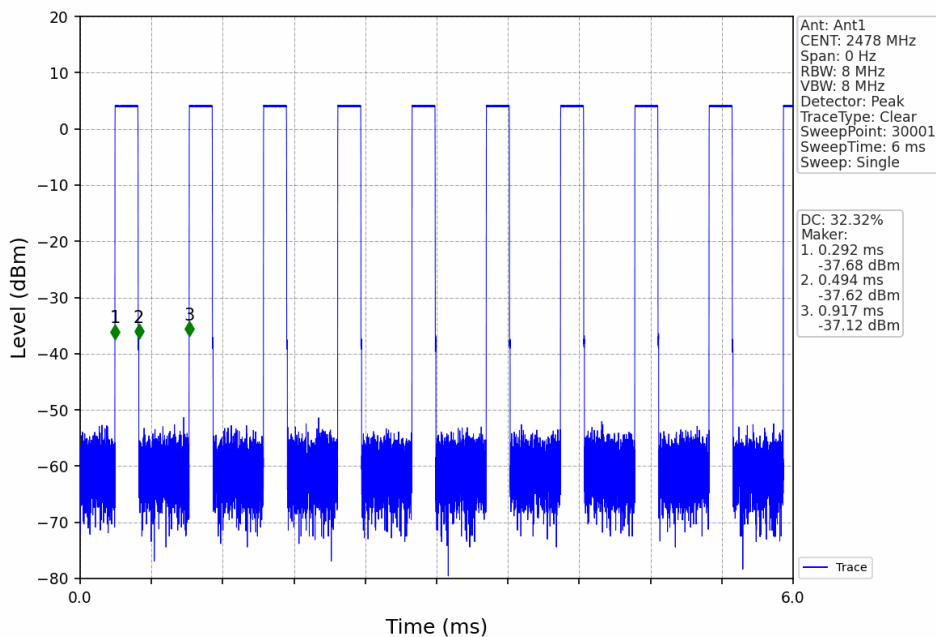
2M_LCH_2404MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV



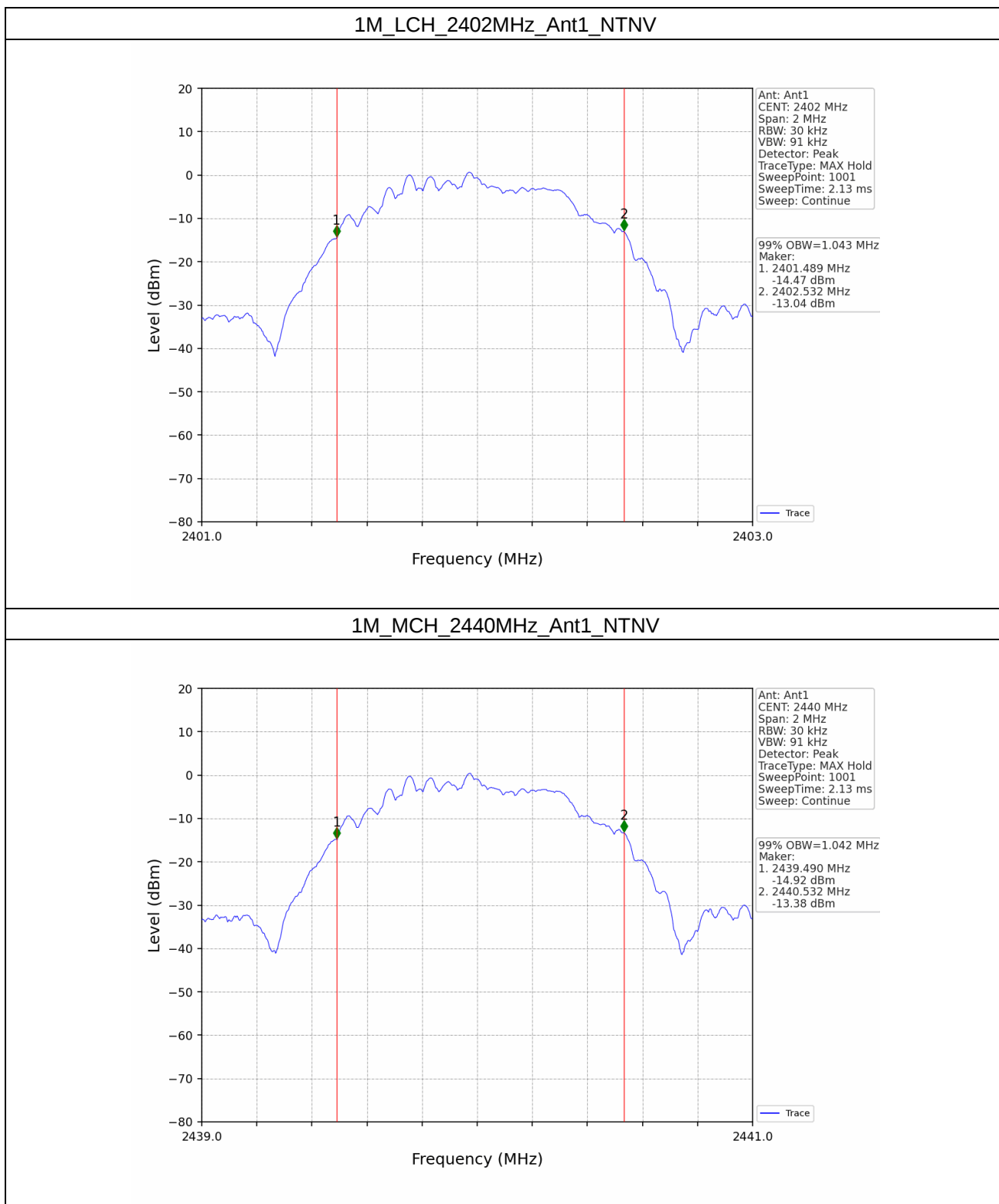
2. Bandwidth

2.1 OBW

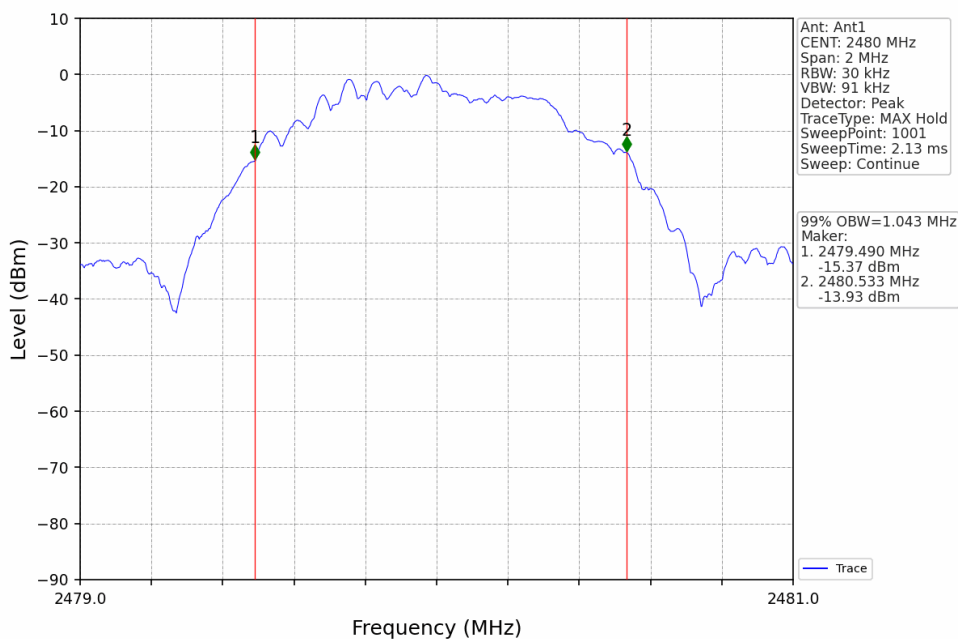
2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)	Verdict
				Result	
1M	SISO	2402	1	1.043	Pass
		2440	1	1.042	Pass
		2480	1	1.043	Pass
2M	SISO	2404	1	2.082	Pass
		2440	1	2.081	Pass
		2478	1	2.081	Pass

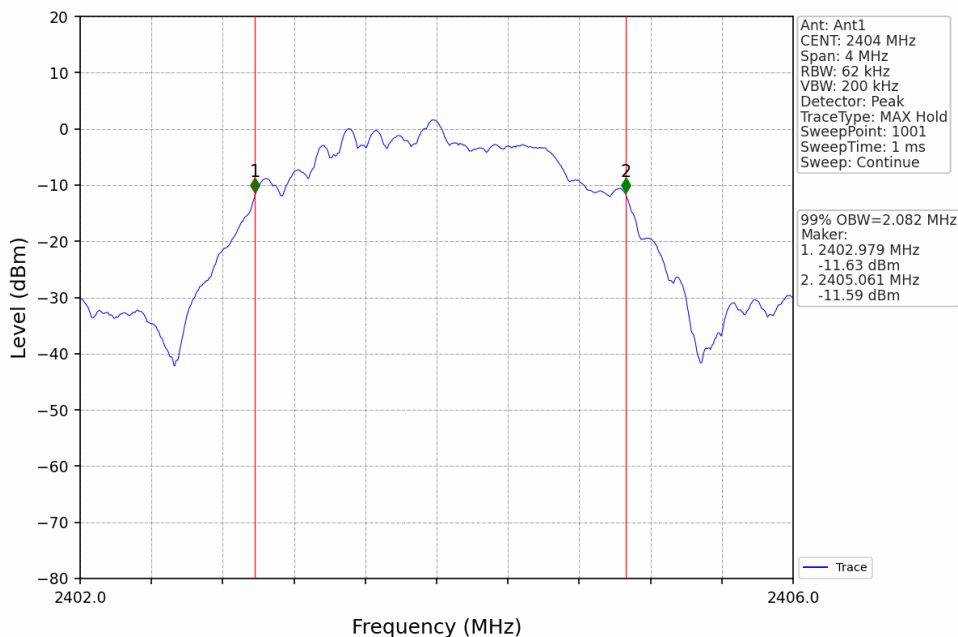
2.1.2 Test Graph



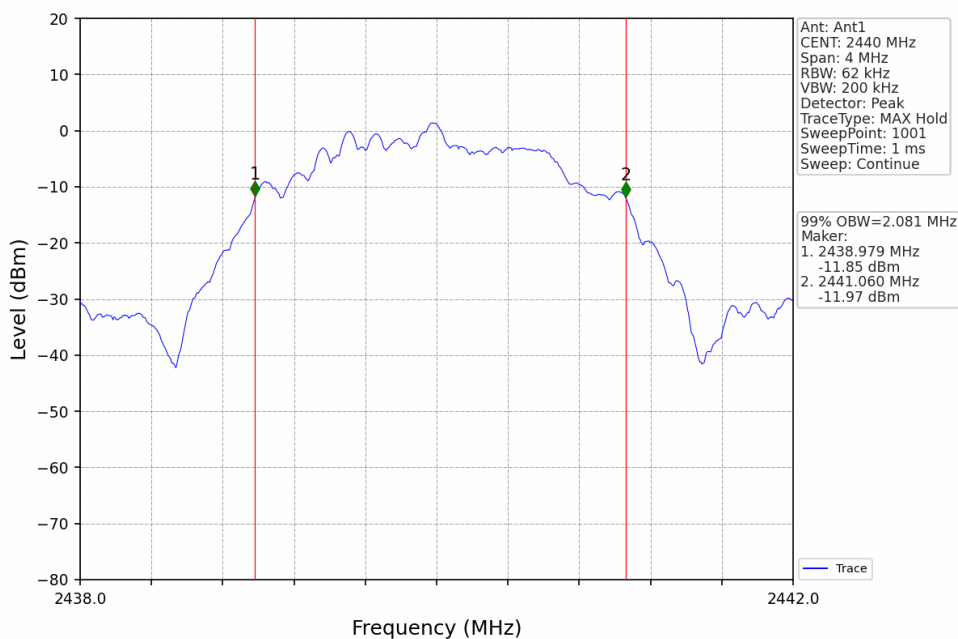
1M_HCH_2480MHz_Ant1_NTNV



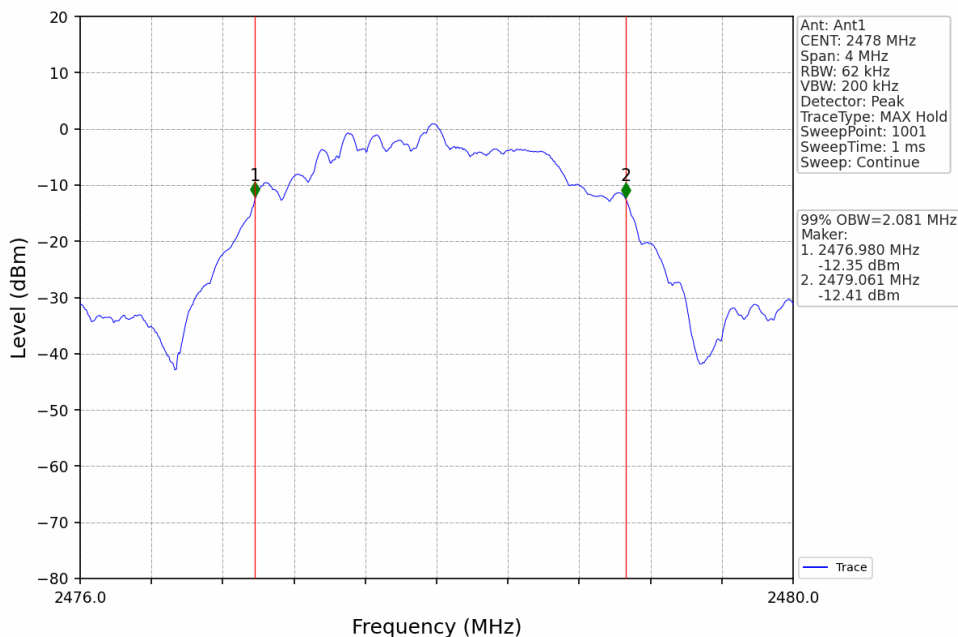
2M_LCH_2404MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV

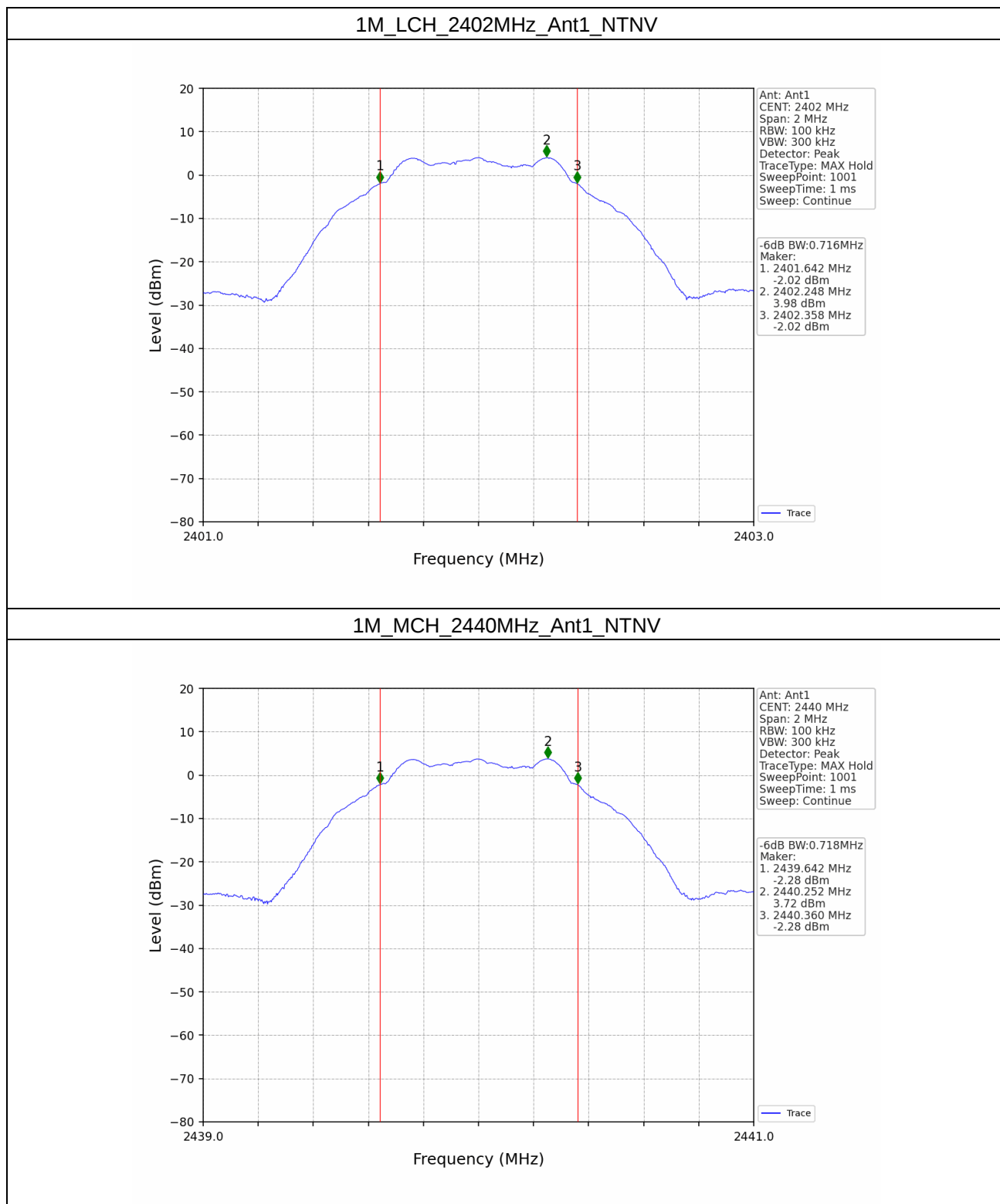


2.2 6dB BW

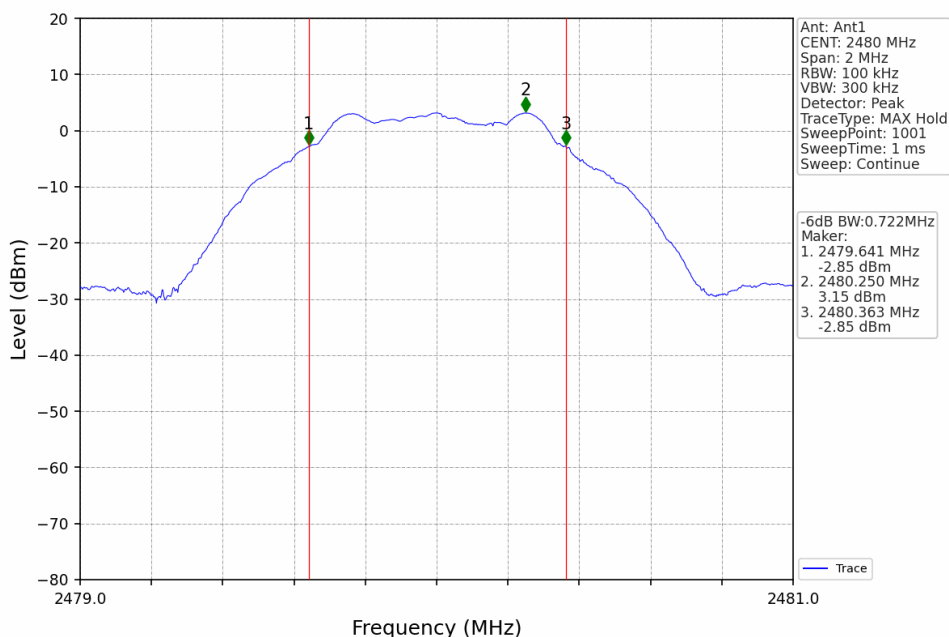
2.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.716	≥ 0.5	Pass
		2440	1	0.718	≥ 0.5	Pass
		2480	1	0.722	≥ 0.5	Pass
2M	SISO	2404	1	1.248	≥ 0.5	Pass
		2440	1	1.254	≥ 0.5	Pass
		2478	1	1.248	≥ 0.5	Pass

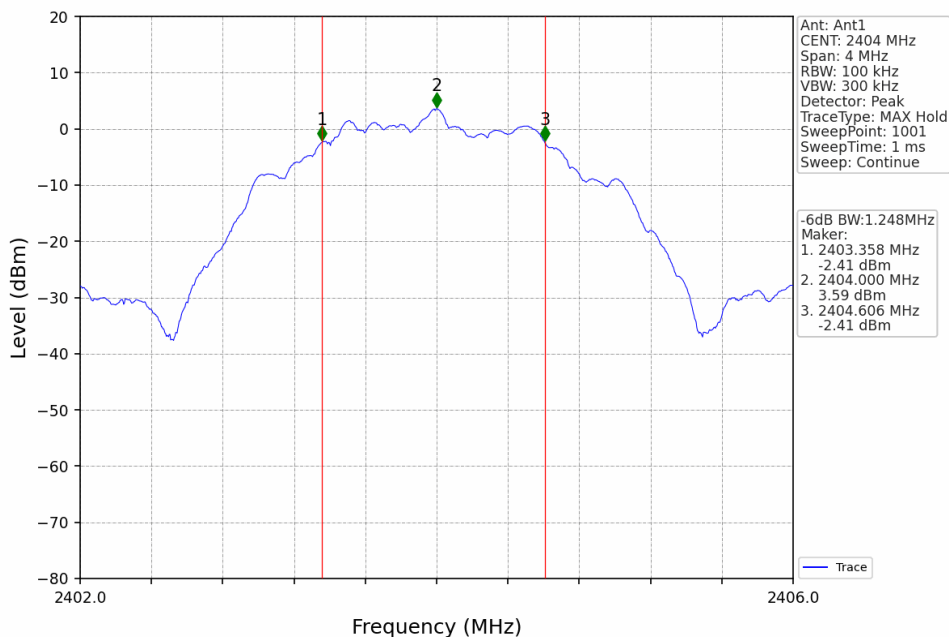
2.2.2 Test Graph



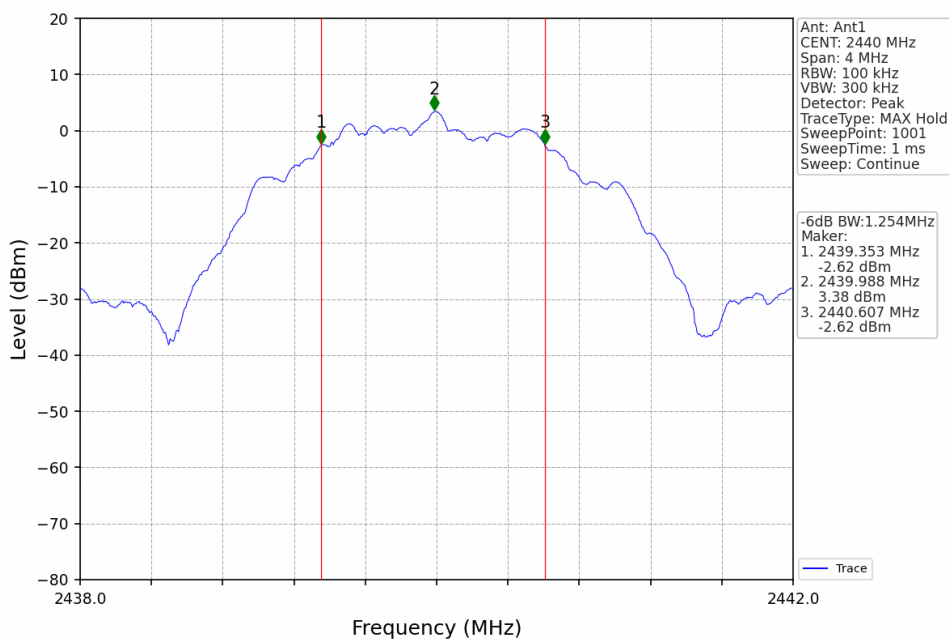
1M_HCH_2480MHz_Ant1_NTNV



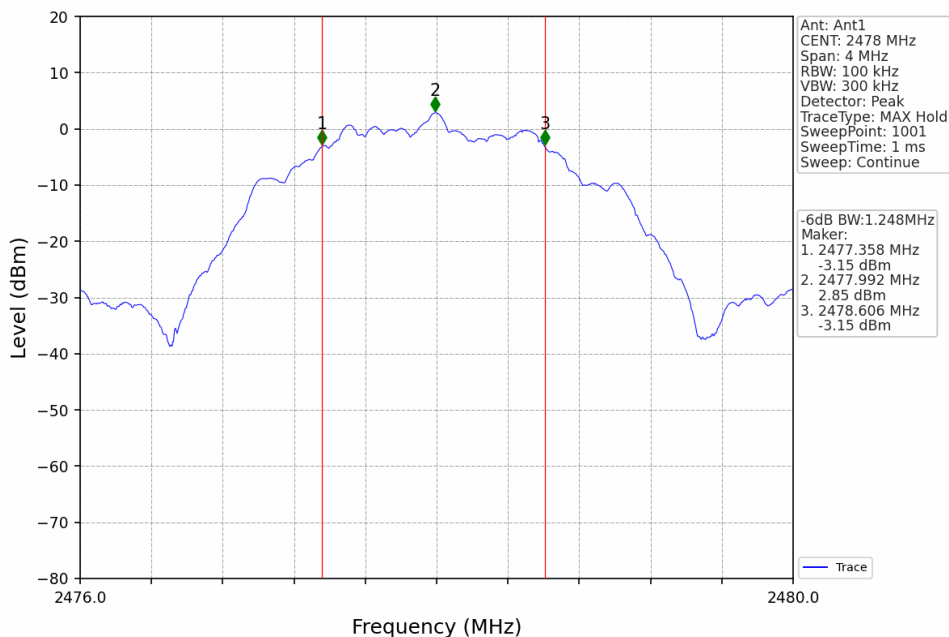
2M_LCH_2404MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_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	4.82	<=30	Pass
		2440	4.55	<=30	Pass
		2480	4.18	<=30	Pass
2M	SISO	2404	4.84	<=30	Pass
		2440	4.59	<=30	Pass
		2478	4.21	<=30	Pass

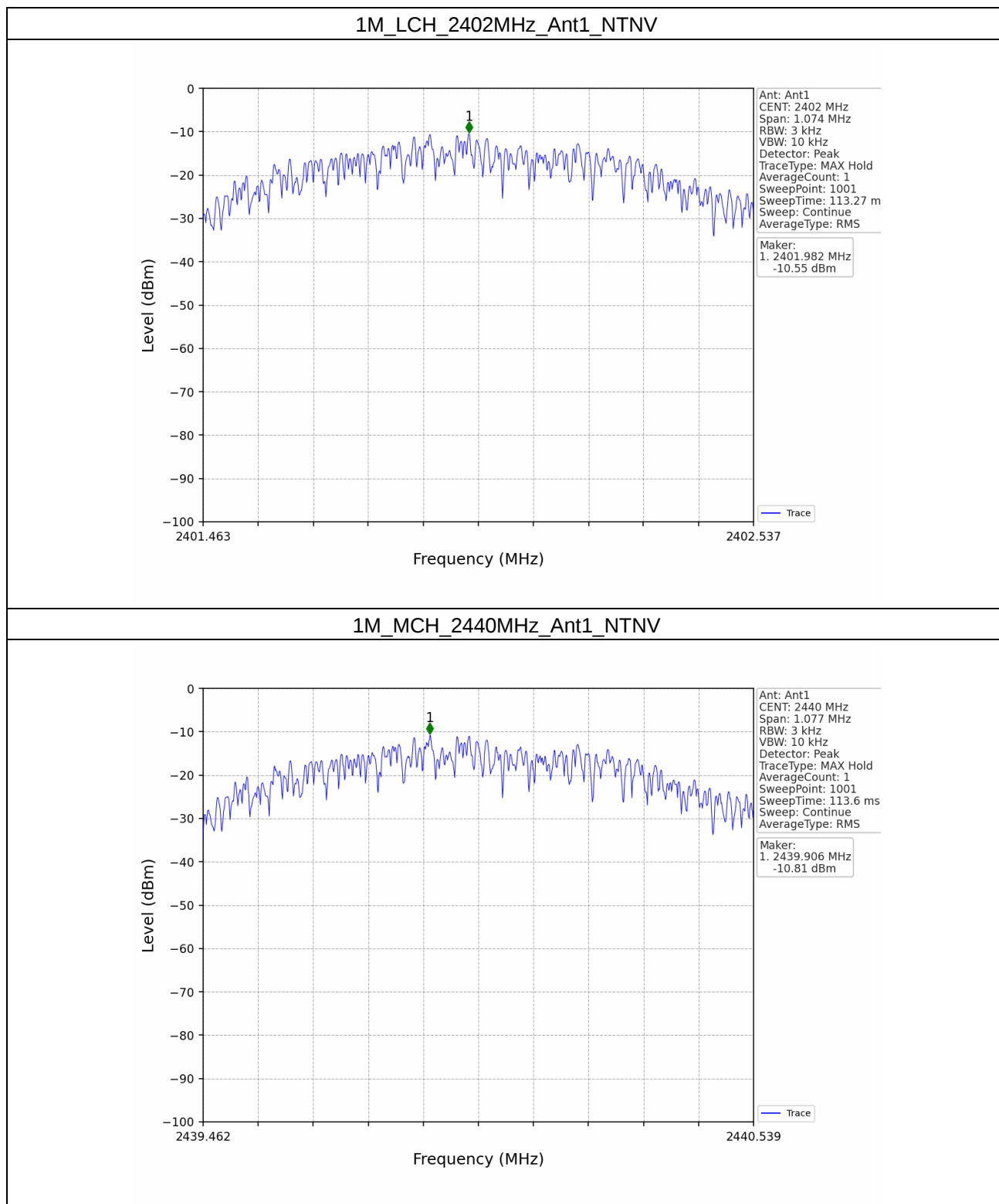
4. Maximum Power Spectral Density

4.1 PSD

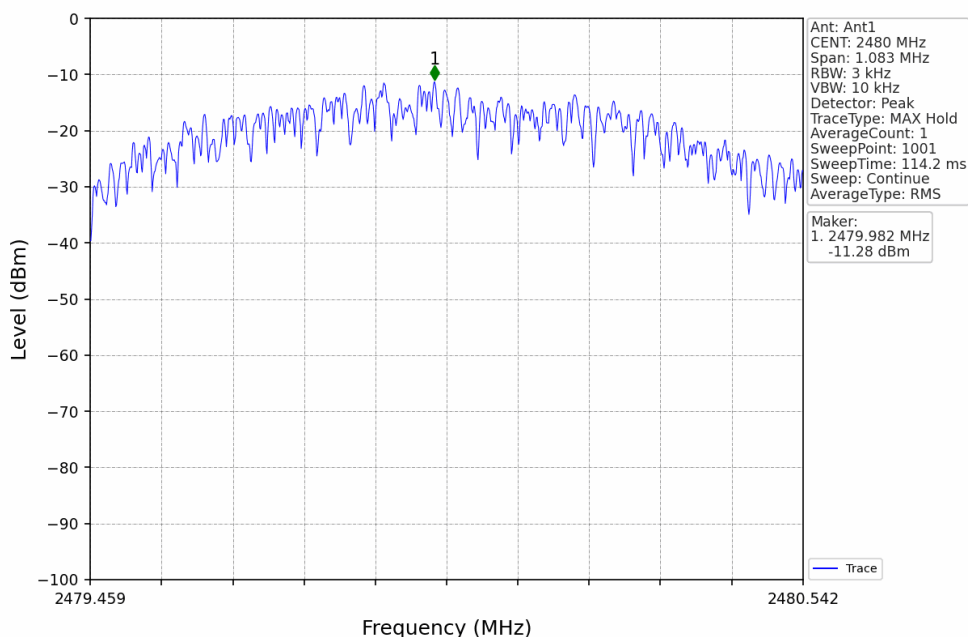
4.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
1M	SISO	2402	-10.55	<=8	Pass
		2440	-10.81	<=8	Pass
		2480	-11.28	<=8	Pass
2M	SISO	2404	-12.79	<=8	Pass
		2440	-12.82	<=8	Pass
		2478	-13.37	<=8	Pass

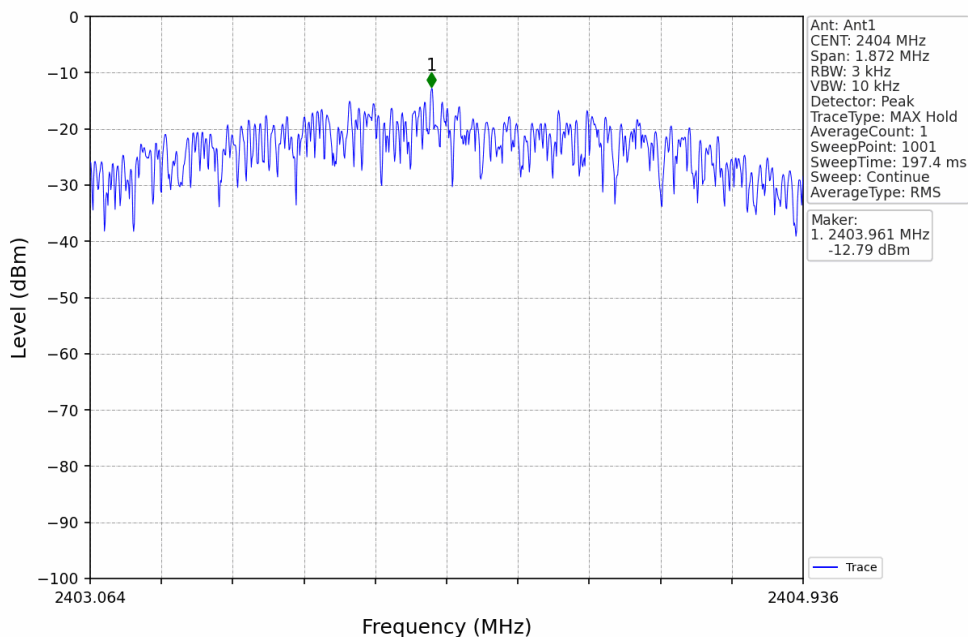
4.1.2 Test Graph



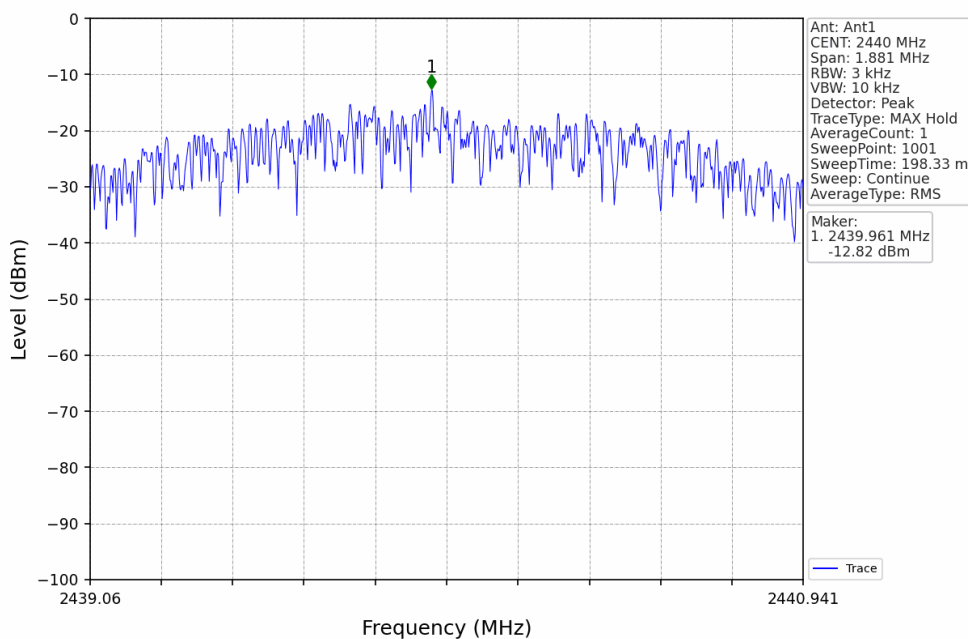
1M_HCH_2480MHz_Ant1_NTNV



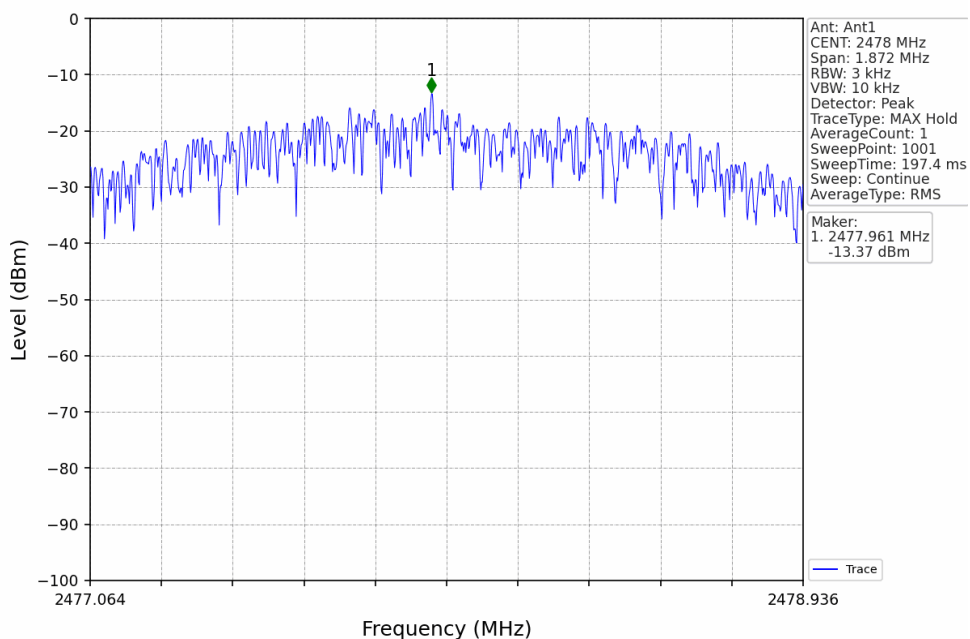
2M_LCH_2404MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV



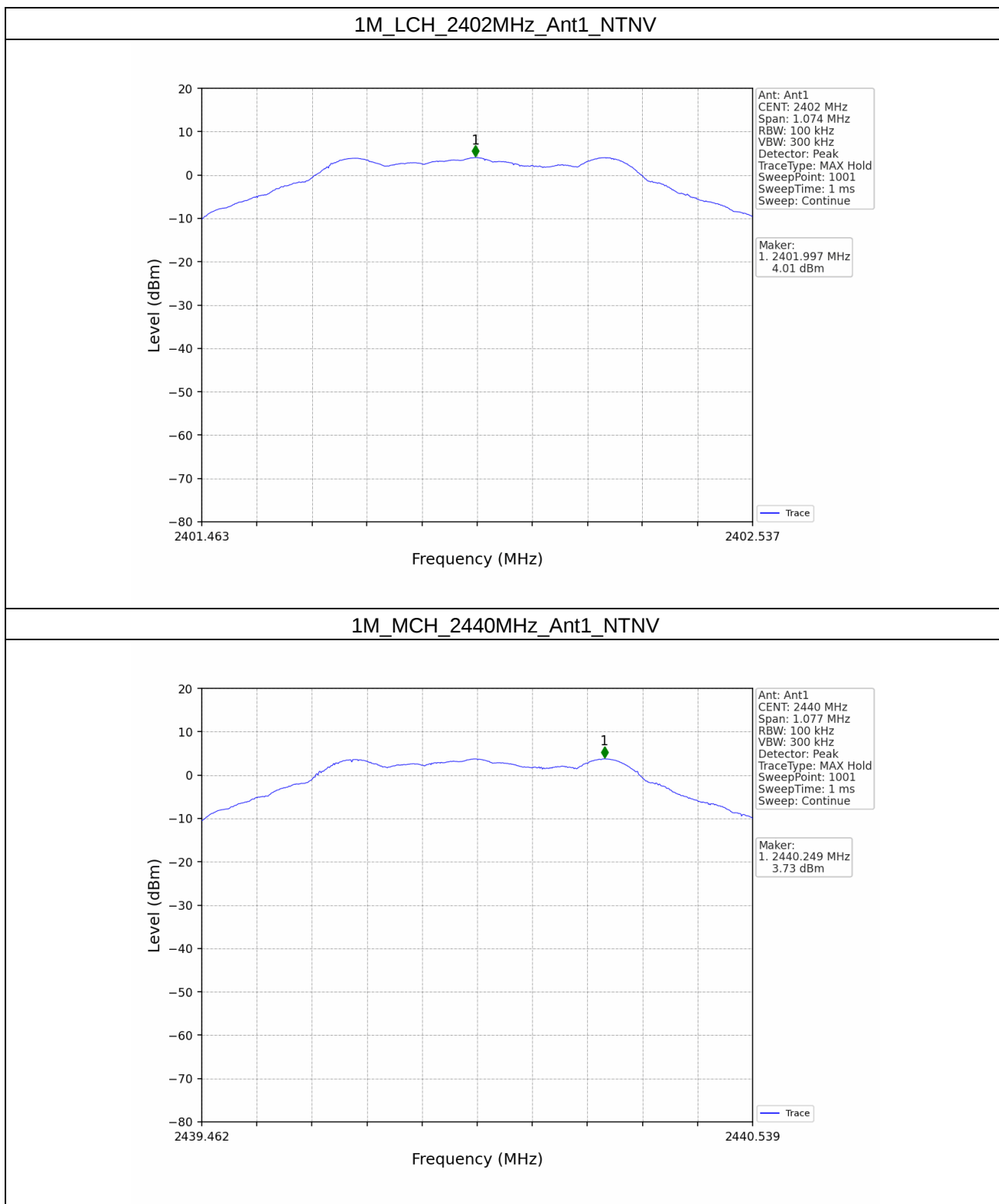
5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

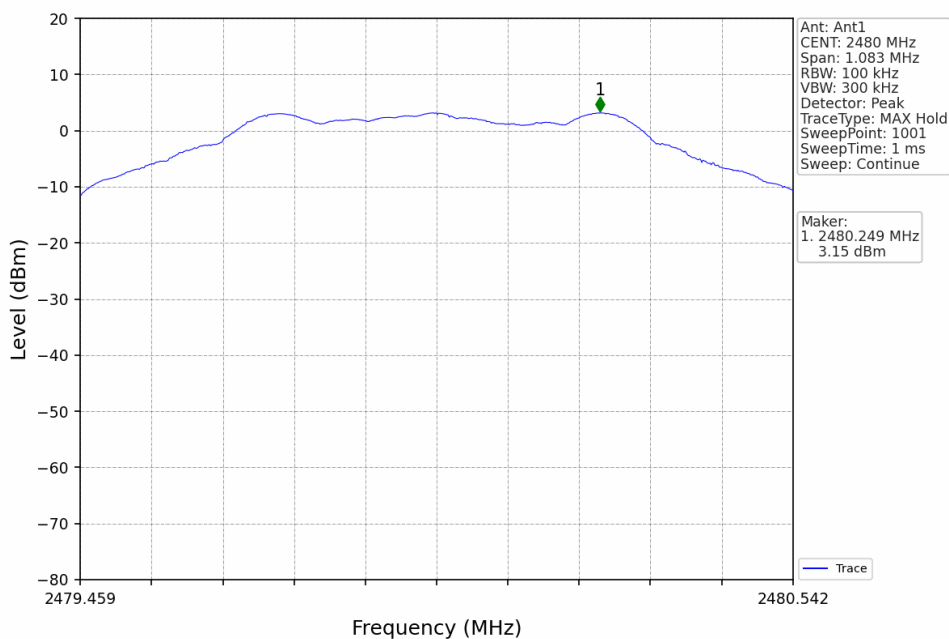
5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	4.01
		2440	1	3.73
		2480	1	3.15
2M	SISO	2404	1	3.60
		2440	1	3.37
		2478	1	2.83

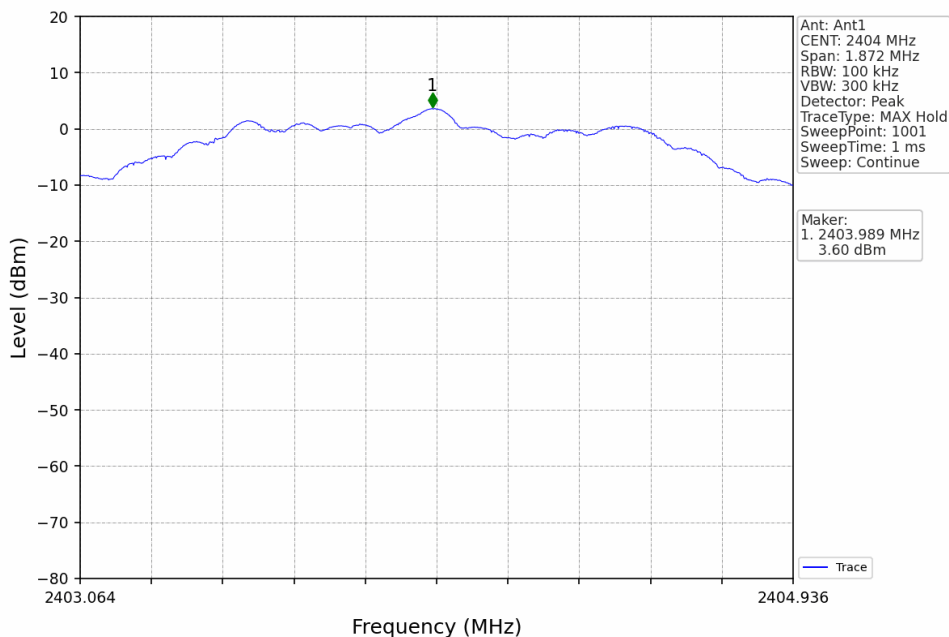
5.1.2 Test Graph



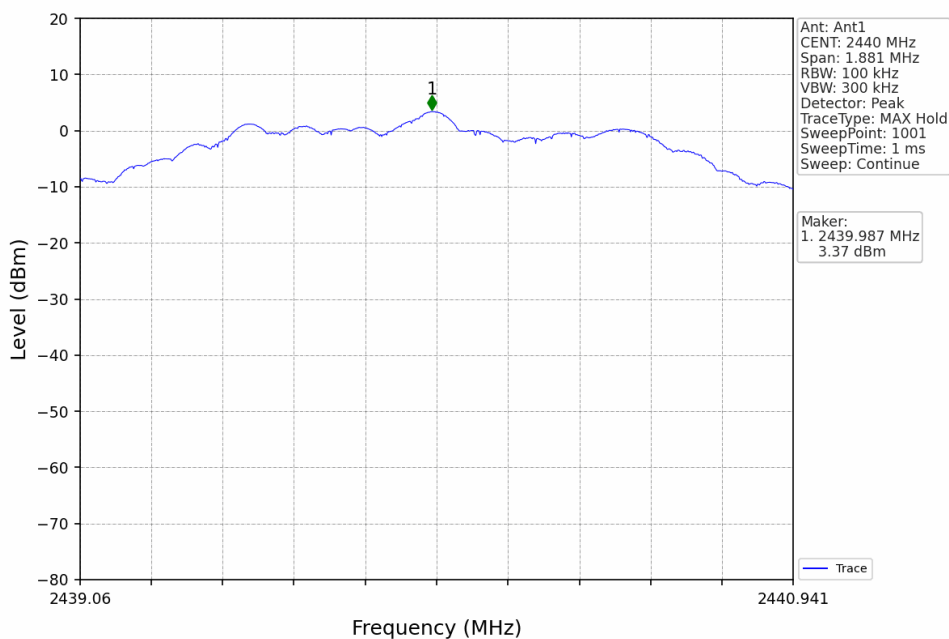
1M_HCH_2480MHz_Ant1_NTNV



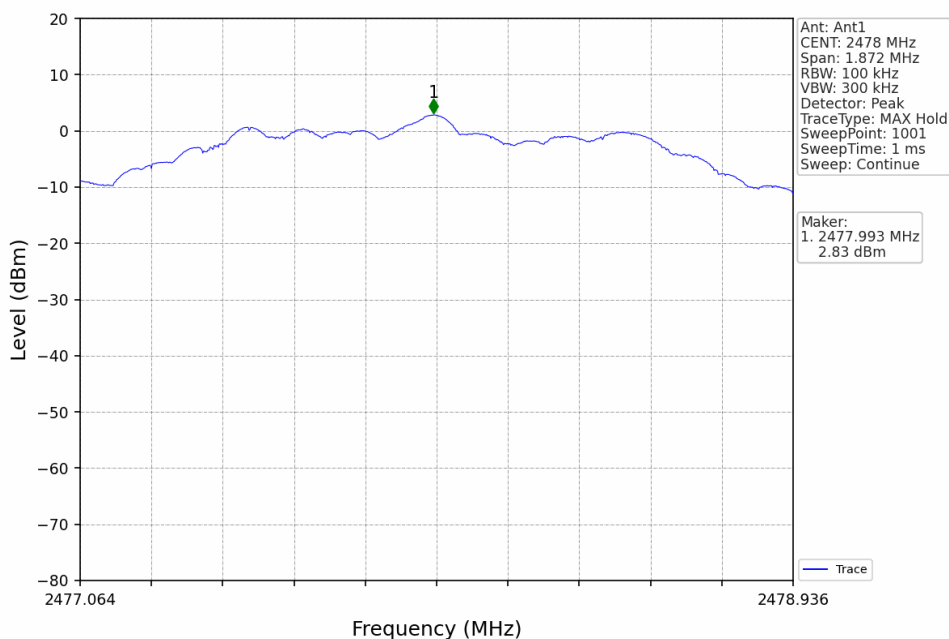
2M_LCH_2404MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV

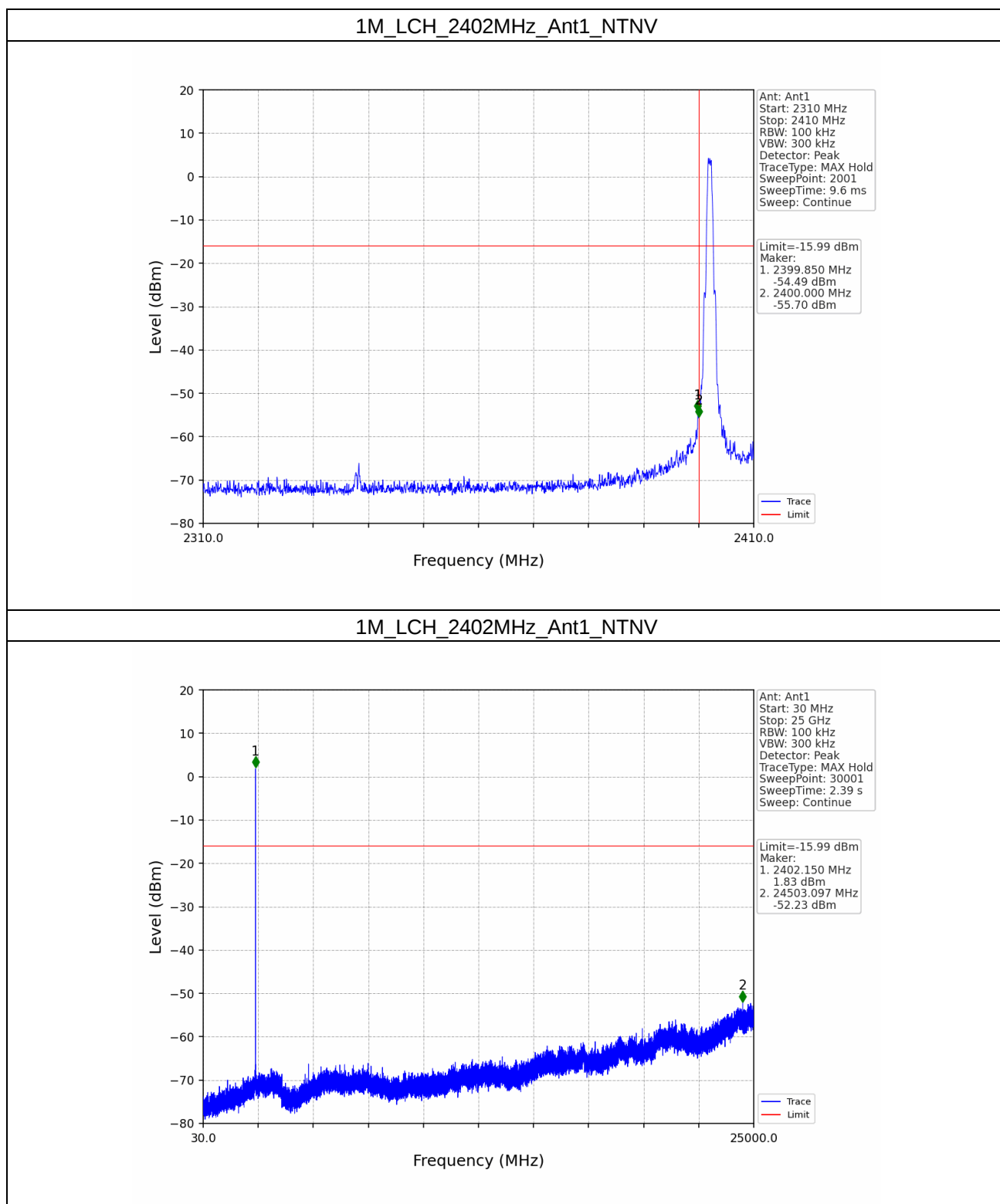


5.2 CSE

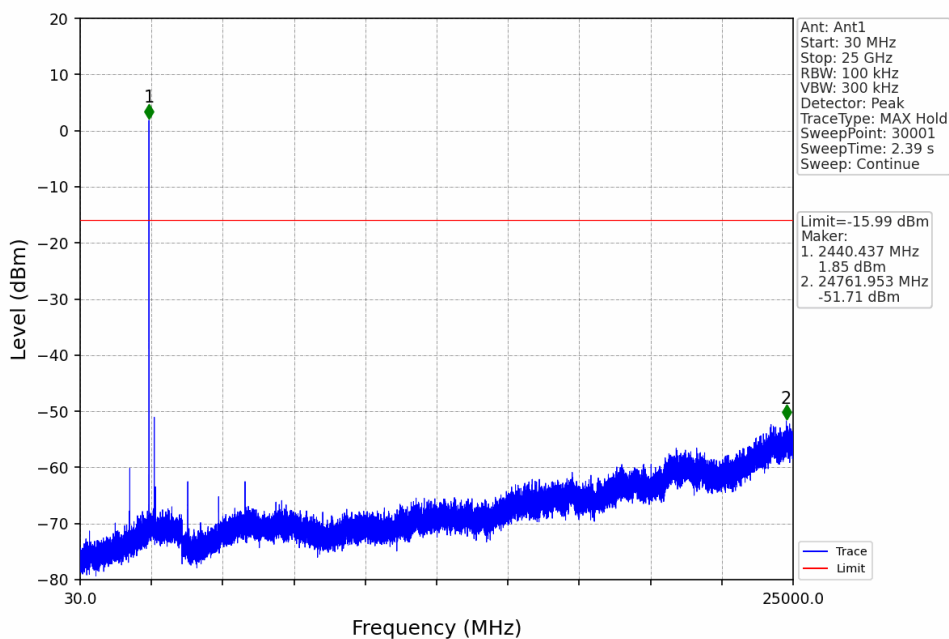
5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	4.01	-15.99	Pass
		2440	1	4.01	-15.99	Pass
		2480	1	4.01	-15.99	Pass
2M	SISO	2404	1	3.60	-16.40	Pass
		2440	1	3.60	-16.40	Pass
		2478	1	3.60	-16.40	Pass

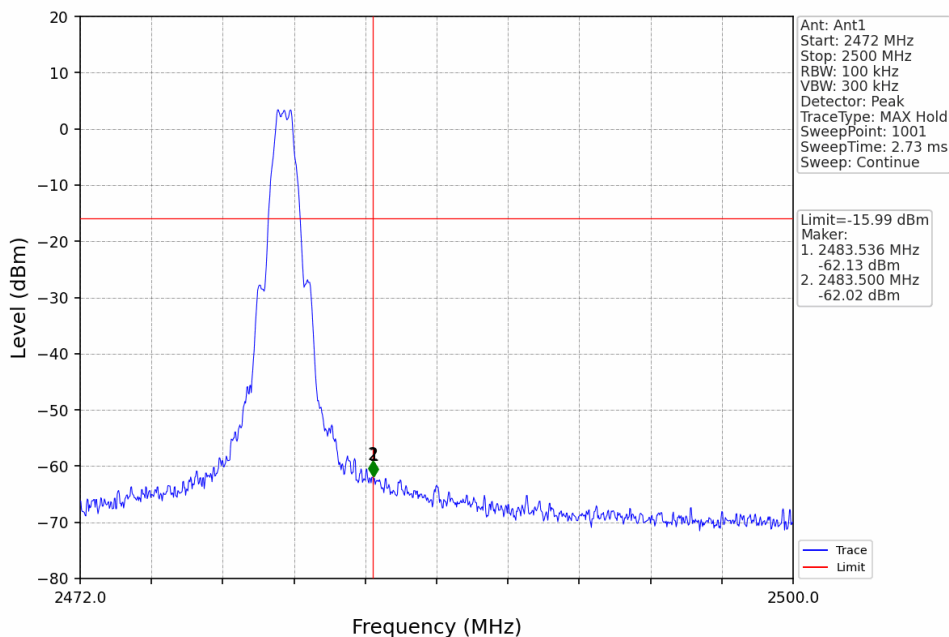
5.2.2 Test Graph



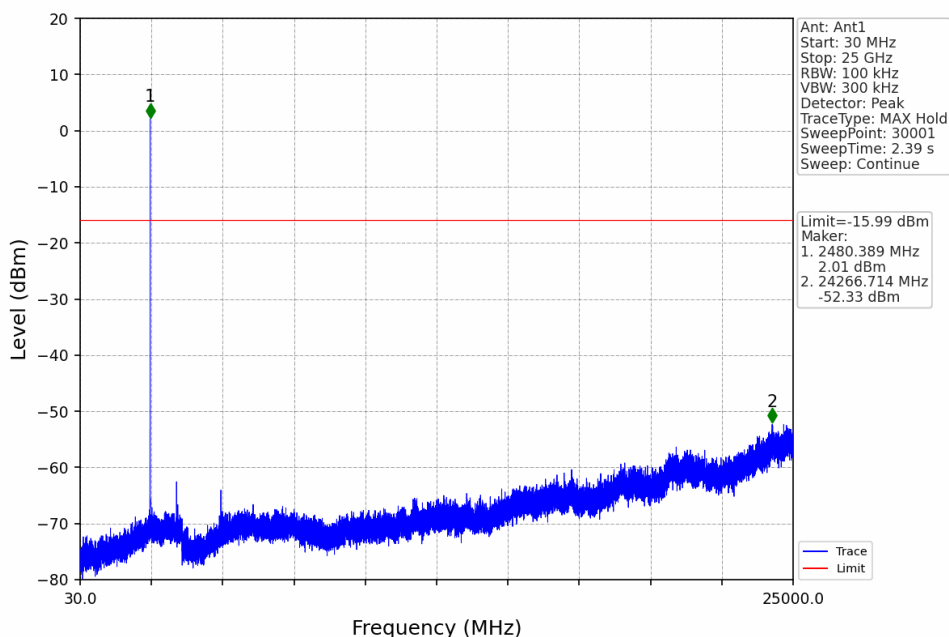
1M_MCH_2440MHz_Ant1_NTNV



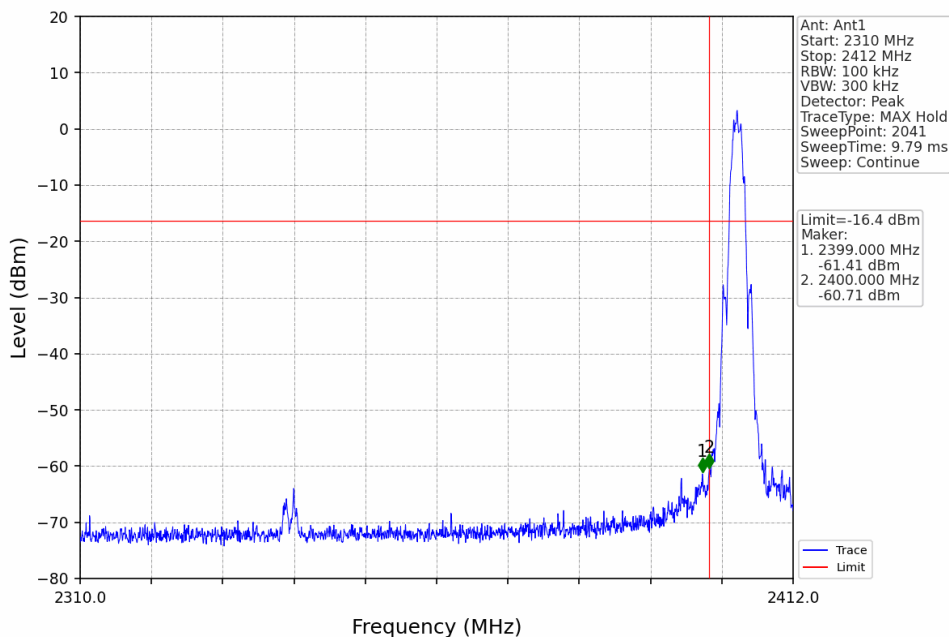
1M_HCH_2480MHz_Ant1_NTNV



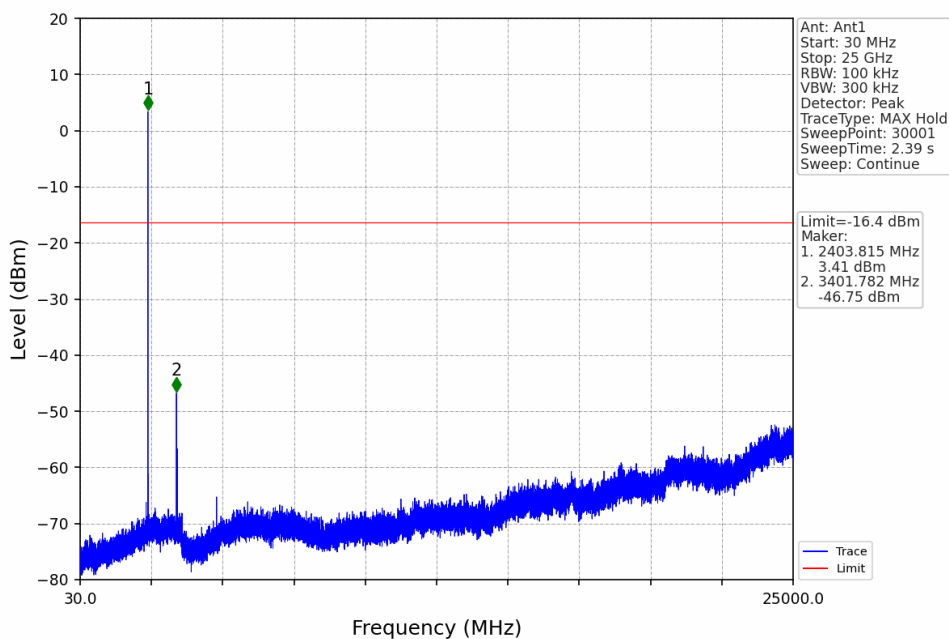
1M_HCH_2480MHz_Ant1_NTNV



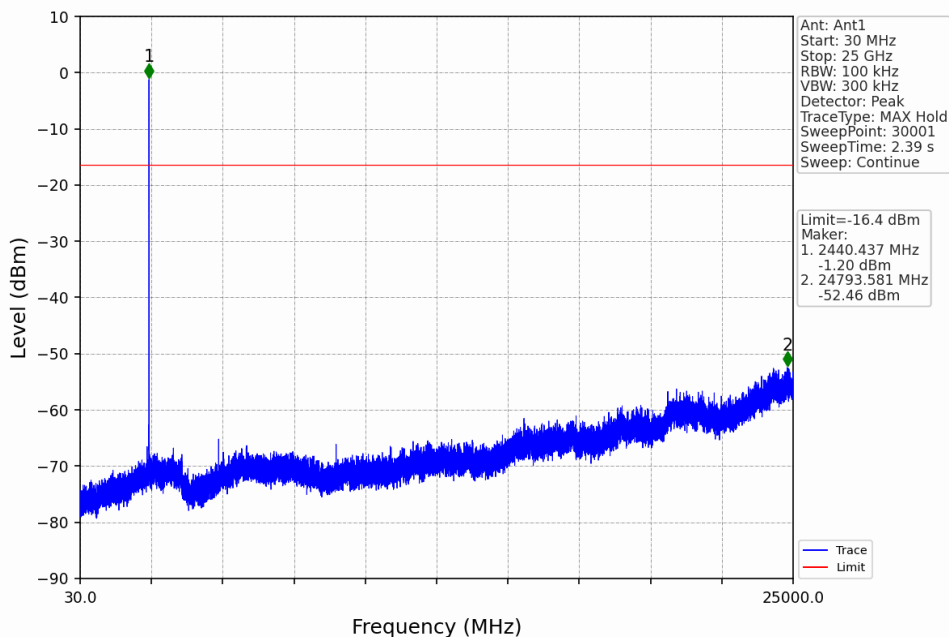
2M_LCH_2404MHz_Ant1_NTNV



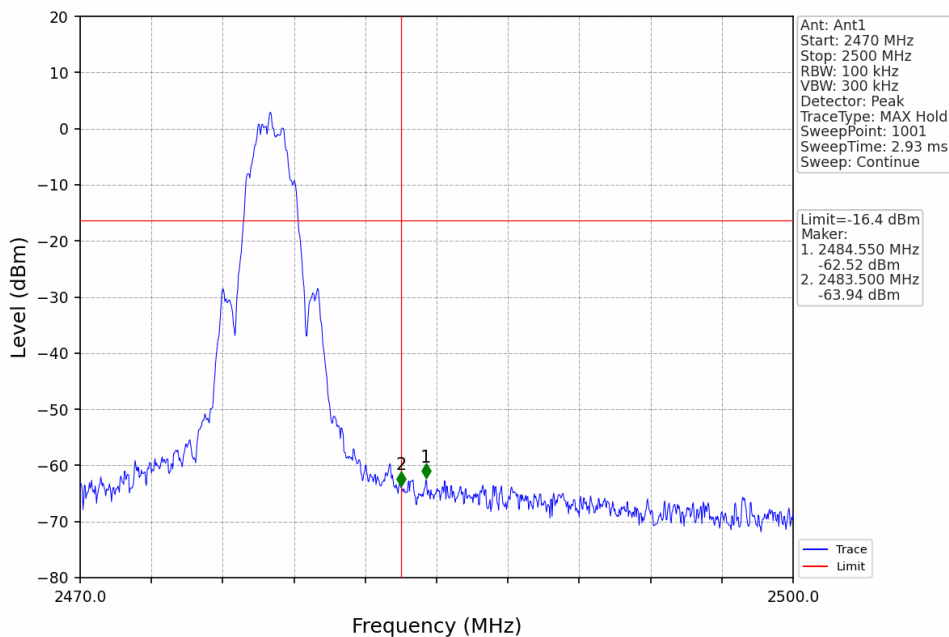
2M_LCH_2404MHz_Ant1_NTNV



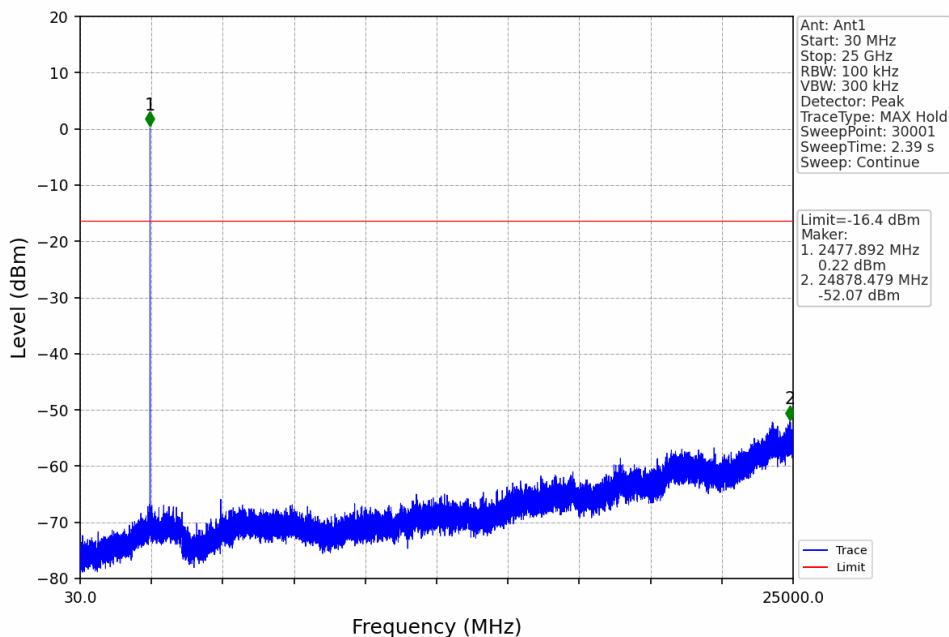
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV



- End of the Report -