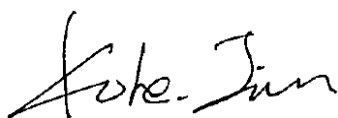


TEST REPORT

Application No.: GZCR2210001283AT
Applicant: NW BLUE LLC
Address of Applicant: 7805 SW 40th Ave #19282 Portland, OR 97219 USA
Manufacturer: CUBEPILOT PTY. LTD.
Address of Manufacturer: 153 Mercer street, Geelong, VIC, Australia 3220
Factory: NW BLUE LLC
Address of Factory: 1130 NW Noble Drive Estacada, Oregon 97023
Equipment Under Test (EUT):
EUT Name: HERELINK Blue Controller Unit
Model No.: HLBC-1001
Trade Mark: **HERELINK**
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2022-10-09
Date of Test: 2022-10-21 to 2022-11-07
Date of Issue: 2022-11-21

Test Result:	Pass*
---------------------	--------------

* In the configuration tested, the EUT complied with the standards specified above.



Kobe Jian
EMC Laboratory Manager



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Revision Record			
Version	Report No.	Date	Remark
01	GZCR221000128302	2022-11-21	Original

Authorized for issue by:			
			
		Curry Wu/Project Engineer	
			
		Vico Cui/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 Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart E 15.407	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power		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 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	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.

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.6V supply by rechargeable battery DC 5V charging by USB port
Test Voltage:	AC 120 V, 60 Hz powered by Adapter referred to section 4.3
Operation Frequency:	2412MHz to 2462MHz for 20MHz 2409MHz to 2459MHz for 10MHz
Modulation Type:	QPSK
Bandwidth	10MHz & 20MHz
Antenna Type:	Dedicated antenna
Antenna Number:	2
Antenna Gain:	3.8 dBi for both
Remark	Ant 1 is transmitting + receiving function Ant 2 is receiving function only

4.2 Channel List

10MHz:

1	2409.00	5	2429.00	9	2449.00
2	2414.00	6	2434.00	10	2454.00
3	2419.00	7	2439.00	11	2459.00
4	2424.00	8	2444.00		

20MHz:

1	2412.00	5	2432.00	9	2452.00
2	2417.00	6	2437.00	10	2457.00
3	2422.00	7	2442.00	11	2462.00
4	2427.00	8	2447.00		

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter 2(EMCA022)	Caixinge Shenzhen Electronic Co., Ltd	CX-4405	N/A

4.4 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); $\pm 4.38\text{dB}$ (30MHz-1GHz; 10m); $\pm 5.12\text{dB}$ (1GHz-6GHz); $\pm 5.38\text{dB}$ (6GHz-18GHz); $\pm 5.61\text{dB}$ (18GHz-40GHz)
Radiated Spurious Emissions Below 1GHz	$\pm 5.00\text{dB}$ (3m); $\pm 4.38\text{dB}$ (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)

4.5 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.



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4.6 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.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

- **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.

4.7 Deviation from Standards

None

4.8 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
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2022-08-24	2023-08-23
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	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2022-08-24	2023-08-23
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	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2022-08-24	2023-08-23
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	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2022-08-24	2023-08-23
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	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2022-08-24	2023-08-23
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
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-12-17	2022-12-16
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
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
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2022-10-21	2023-10-20
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
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
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2022-10-16	2025-10-15
Chamber cable	HangTianXing	N/A	EMC0542	2022-08-24	2023-08-23
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
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2022-05-20	2023-05-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Trilog Broadband Antenna (25MHz-1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	EMC2174	2022-06-19	2025-06-18



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	2021-12-17	2022-12-16
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
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
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2022-09-08	2023-09-07
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2022-10-21	2023-10-20
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Coaxial Cable	HangTianXing	2m	EMC0107	2022-08-24	2023-08-23
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	2022-10-16	2025-10-15
Two-Line V-Network-GZ	Rohde & Schwarz	ENV216	EMC2135	2022-09-09	2023-09-08
EMI Test Receiver (9kHz-3.6GHz)	Rohde & Schwarz	ESR3	EMC2221	2022-05-20	2023-05-19
Test Software E3r	Audix	Ver.6.11812	GZE100-77	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



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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 3.8 dBi.

Antenna location: Refer to internal photo.

7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207 & Subpart E 15.407 b(9)

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25.8 °C

Humidity: 50.3 % RH

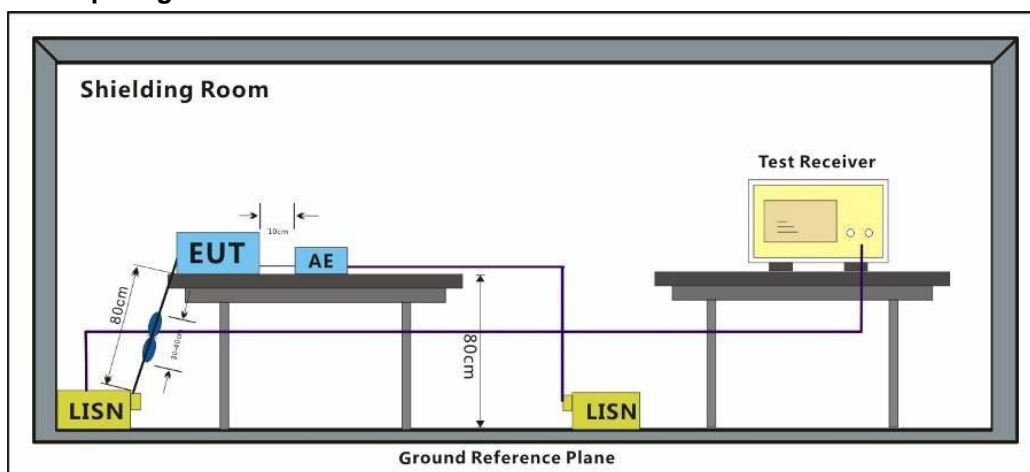
Atmospheric Pressure: 1015 mbar

7.1.2 Test Mode Description

Pre-scan / Mode
Final test Code Description

Final test 08 Operation mode (2.4G +5G WiFi):Keep the EUT communicating with air unit and connecting 5GHz WiFi Network.

7.1.3 Test Setup Diagram

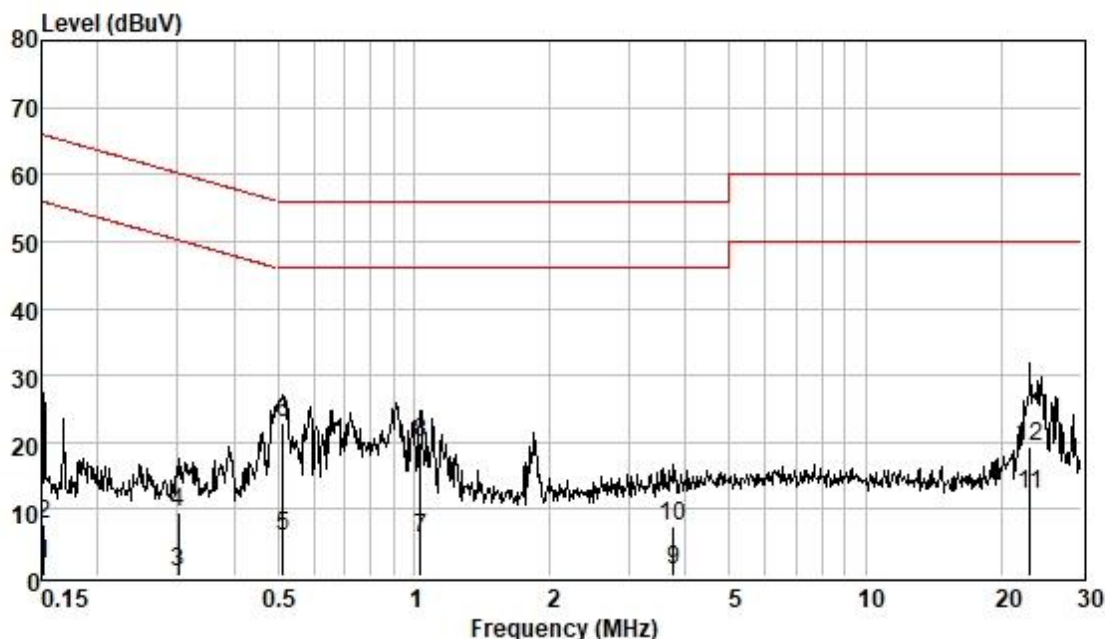


7.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: Level=Read Level+ Cable Loss+ LISN Factor

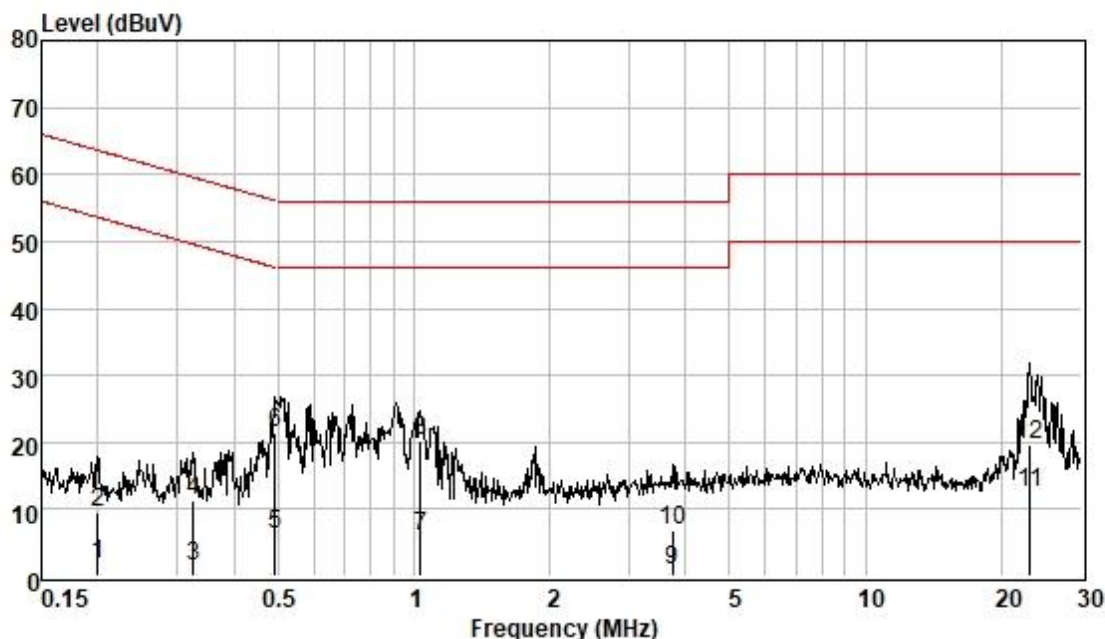
Test Mode: 08; Line: Live line



Pol : LINE
Mode :
Model :

	Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.152	-7.76	0.06	9.61	1.91	55.91	-54.00	Average
2	0.152	-2.08	0.06	9.61	7.59	65.91	-58.32	QP
3	0.302	-9.12	0.06	9.62	0.56	50.19	-49.63	Average
4	0.302	-0.26	0.06	9.62	9.42	60.19	-50.77	QP
5	0.513	-3.61	0.07	9.59	6.05	46.00	-39.95	Average
6	0.513	13.18	0.07	9.59	22.84	56.00	-33.16	QP
7	1.032	-3.87	0.07	9.59	5.79	46.00	-40.21	Average
8	1.032	10.35	0.07	9.59	20.01	56.00	-35.99	QP
9	3.759	-8.77	0.16	9.63	1.02	46.00	-44.98	Average
10	3.759	-2.35	0.16	9.63	7.44	56.00	-48.56	QP
11	23.140	2.04	0.38	9.66	12.08	50.00	-37.92	Average
12	23.140	9.28	0.38	9.66	19.32	60.00	-40.68	QP

Test Mode: 02; Line: Neutral Line



Pol : NEUTRAL

Mode :

Model :

	Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.200	-7.77	0.06	9.60	1.89	53.62	-51.73	Average
2	0.200	-0.28	0.06	9.60	9.38	63.62	-54.24	QP
3	0.325	-8.09	0.06	9.60	1.57	49.57	-48.00	Average
4	0.325	1.73	0.06	9.60	11.39	59.57	-48.18	QP
5	0.494	-3.46	0.07	9.60	6.21	46.10	-39.89	Average
6	0.494	11.87	0.07	9.60	21.54	56.10	-34.56	QP
7	1.032	-3.85	0.07	9.61	5.83	46.00	-40.17	Average
8	1.032	10.64	0.07	9.61	20.32	56.00	-35.68	QP
9	3.740	-8.88	0.16	9.64	0.92	46.00	-45.08	Average
10	3.740	-2.90	0.16	9.64	6.90	56.00	-49.10	QP
11	23.140	2.22	0.38	9.87	12.47	50.00	-37.53	Average
12	23.140	9.39	0.38	9.87	19.64	60.00	-40.36	QP



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7.2 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

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C

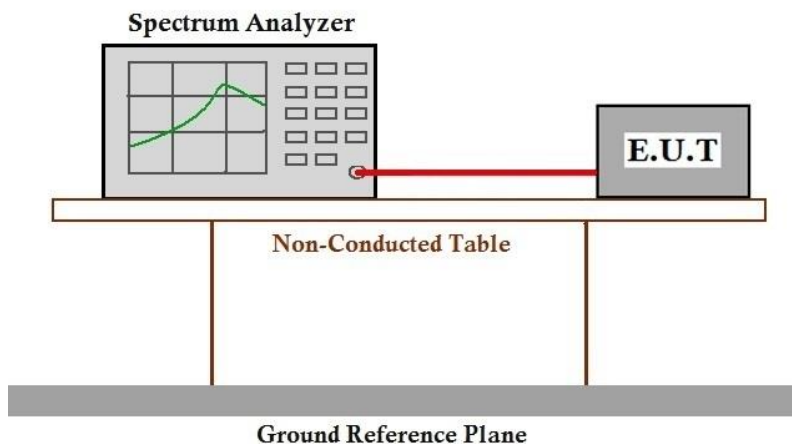
Humidity: 65 % RH

Atmospheric Pressure: 1014 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(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

7.2.3 Test Setup Diagram



7.2.4 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

7.3 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

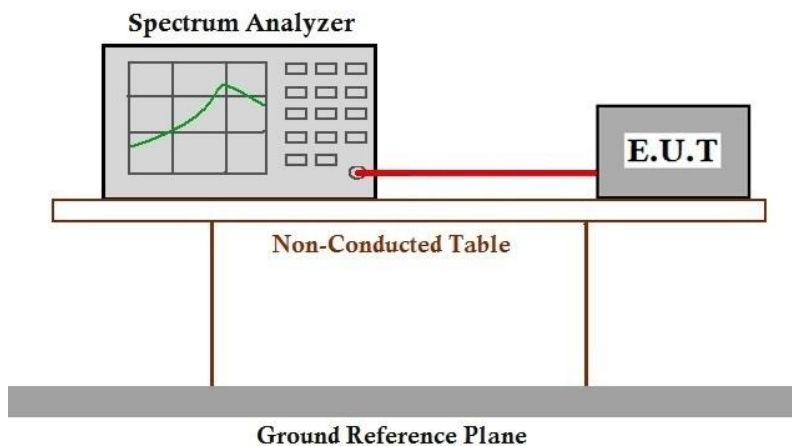
7.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 24 °C Humidity: 65 % RH Atmospheric Pressure: 1014 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(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.4 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

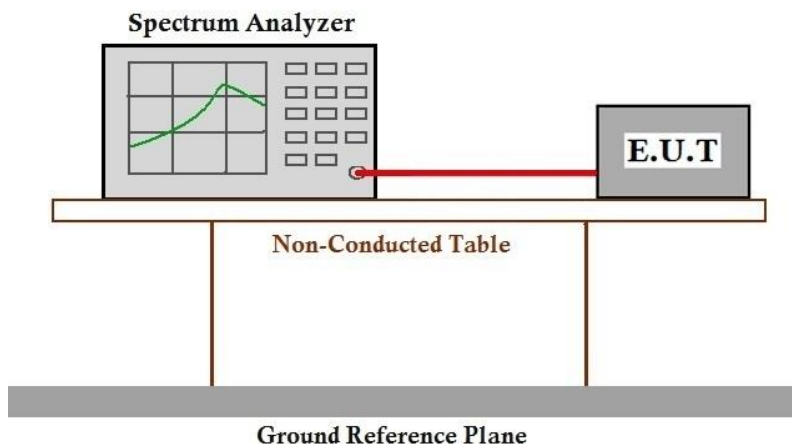
7.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 24 °C Humidity: 65 % RH Atmospheric Pressure: 1014 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(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.5 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)).

7.5.1 E.U.T. Operation

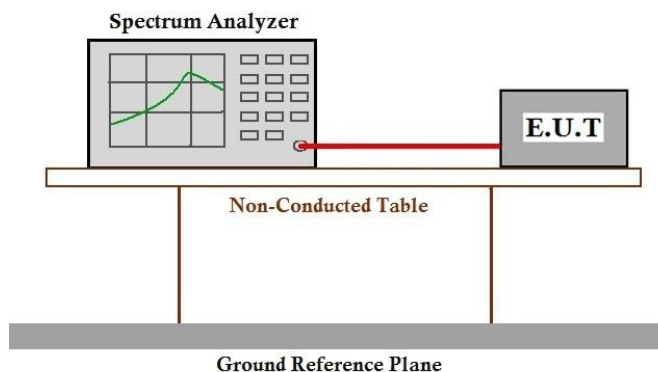
Operating Environment:

Temperature: 24 °C Humidity: 65 % RH Atmospheric Pressure: 1014 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(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

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 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)).

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C

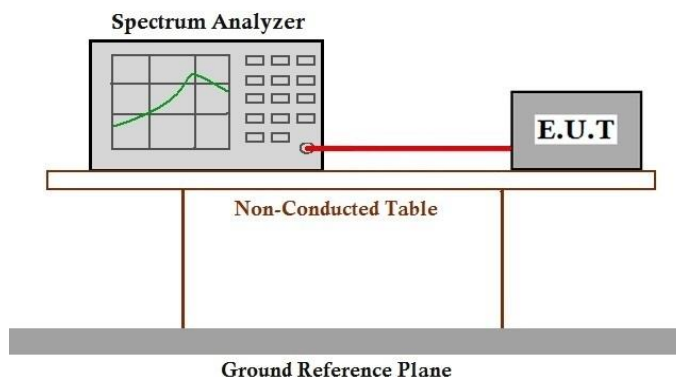
Humidity: 65 % RH

Atmospheric Pressure: 1014 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(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.7 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

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.

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 24.1 °C

Humidity: 53.8 % RH

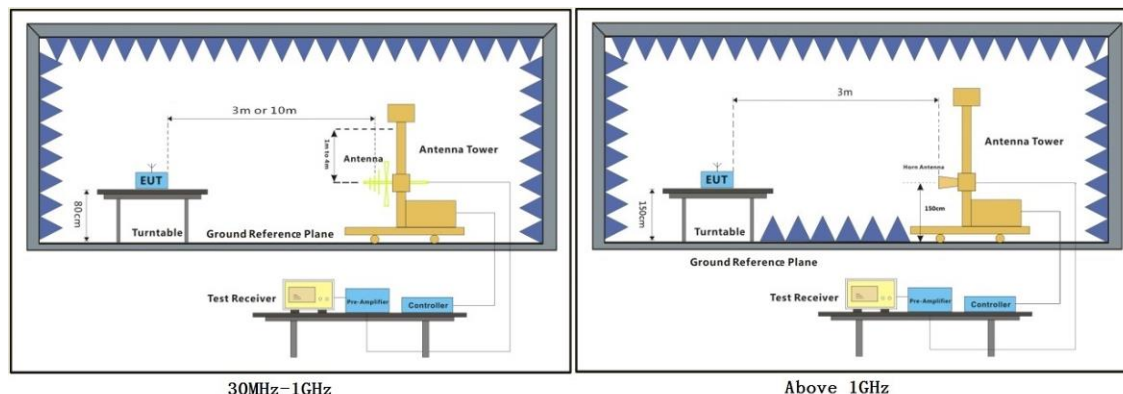
Atmospheric Pressure: 1015 mbar

7.7.2 Test Mode Description

Pre-scan / Mode
Final test Code Description

Final test 00 TX mode_Keep the EUT in continuously transmitting mode(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

7.7.3 Test Setup Diagram



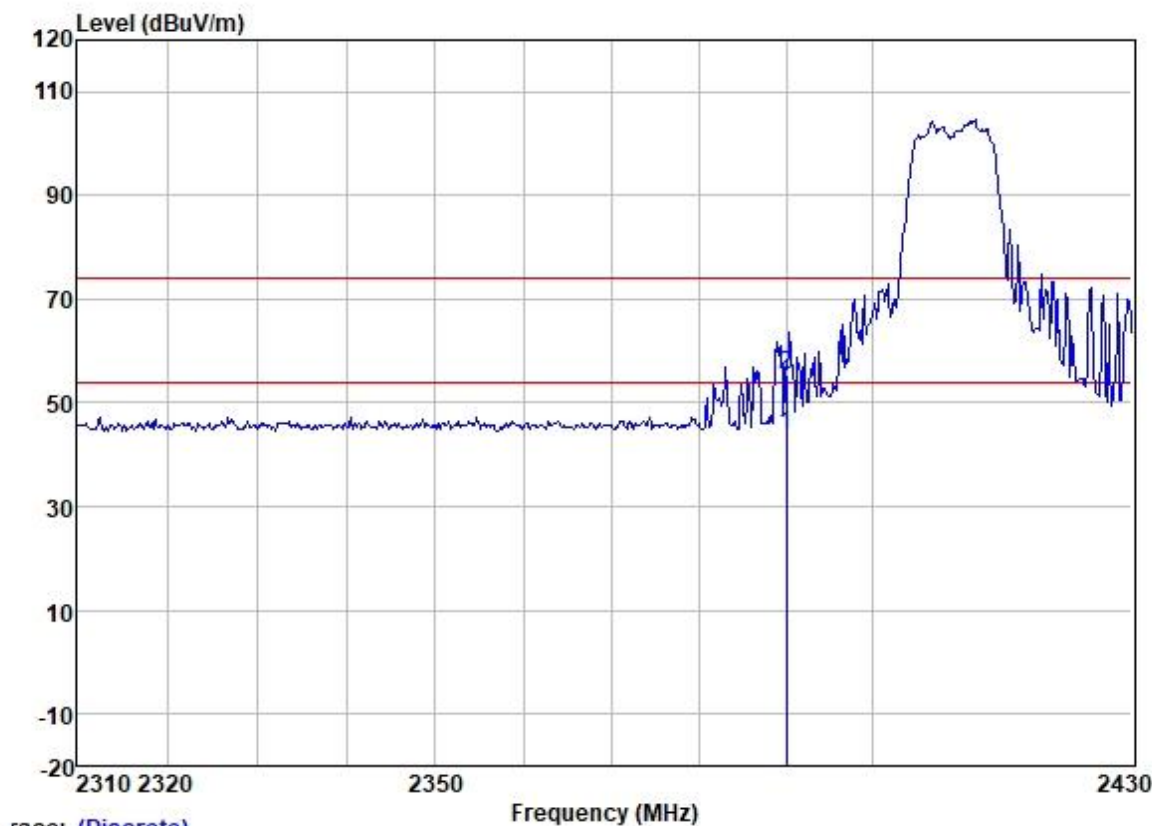
7.7.4 Measurement Procedure and Data

- 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.
- 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 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 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.

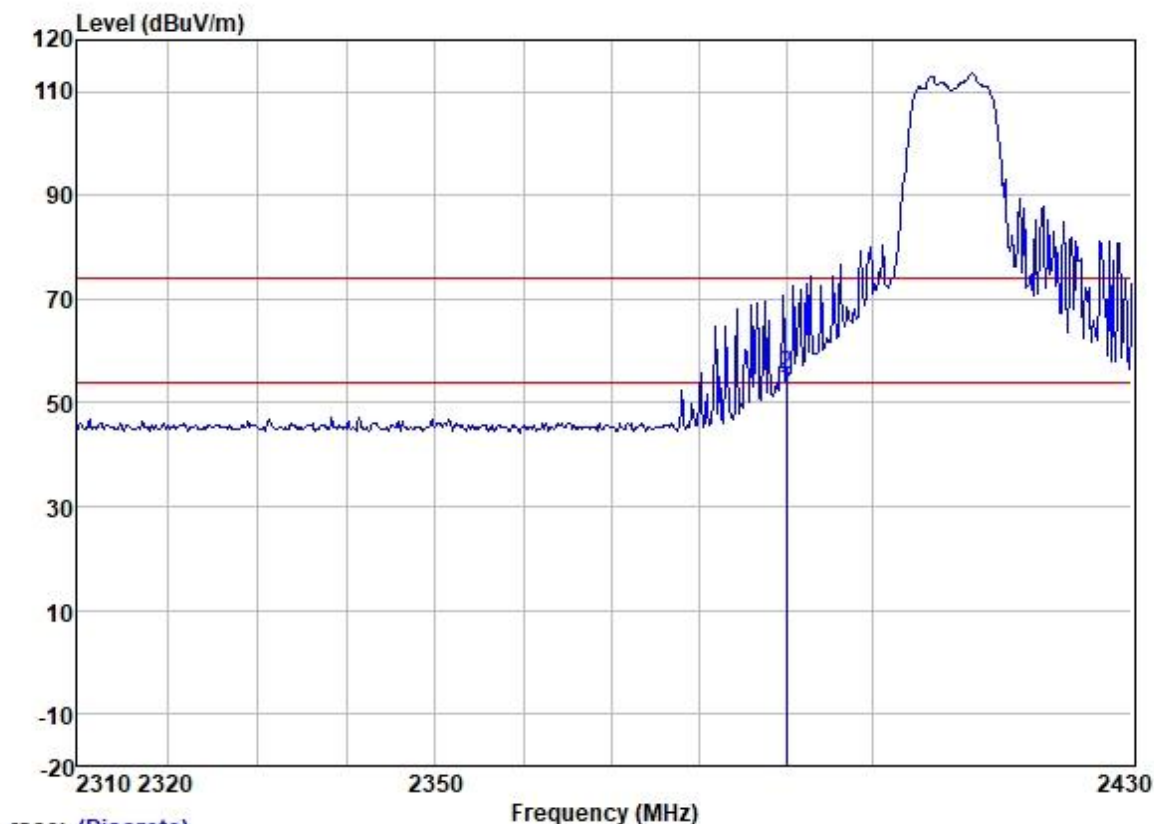
Test Mode: 01; Polarity: Vertical; Modulation:QPSK; Channel:Low (10M)



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	2390.000	49.38	27.45	4.22	37.14	43.91	54.00	-10.09	VERTICAL
2	2390.000	61.00	27.45	4.22	37.14	55.53	74.00	-18.47	VERTICAL

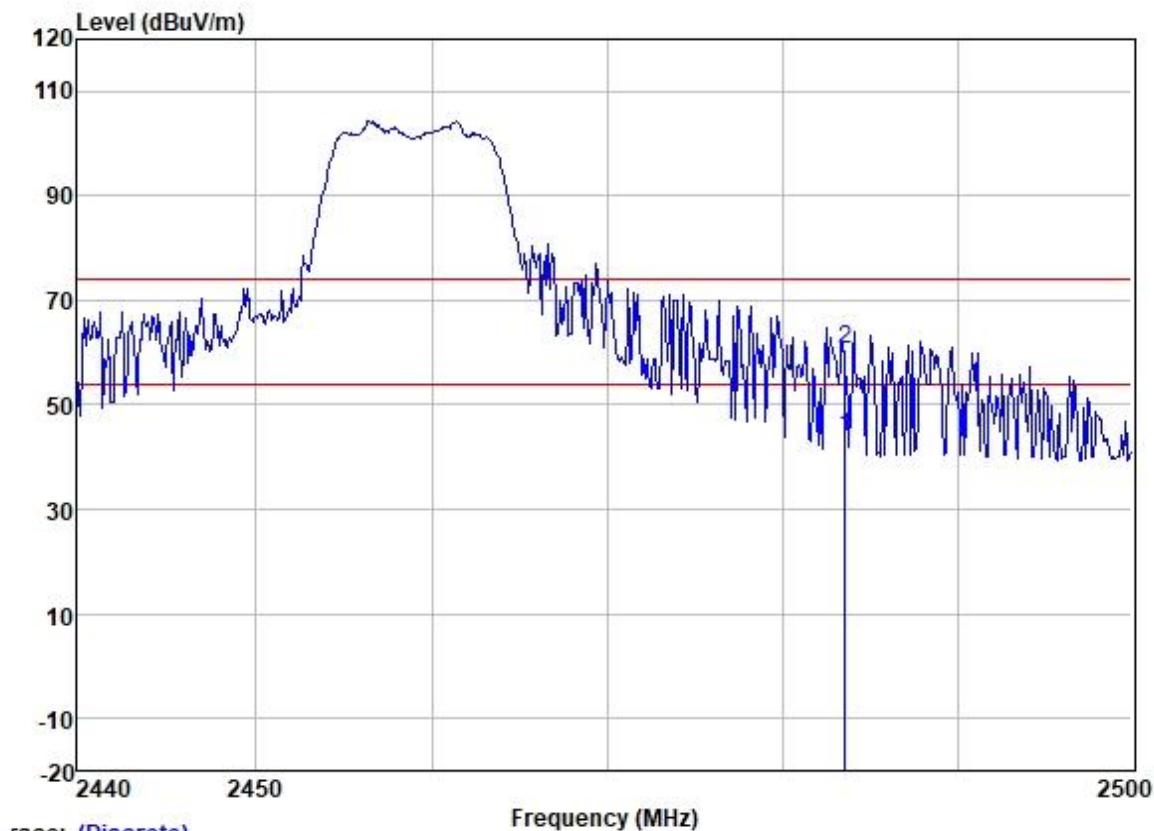
Test Mode: 01; Polarity: Horizontal; Modulation: QPSK; Channel: Low (10M)



race: (Discrete)

	Read	Antenna	Cable	Preamp	Level	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	2390.000	57.82	27.45	4.22	37.14	52.35	54.00	-1.65	HORIZONTAL Average
2	2390.000	61.04	27.45	4.22	37.14	55.57	74.00	-18.43	HORIZONTAL Peak

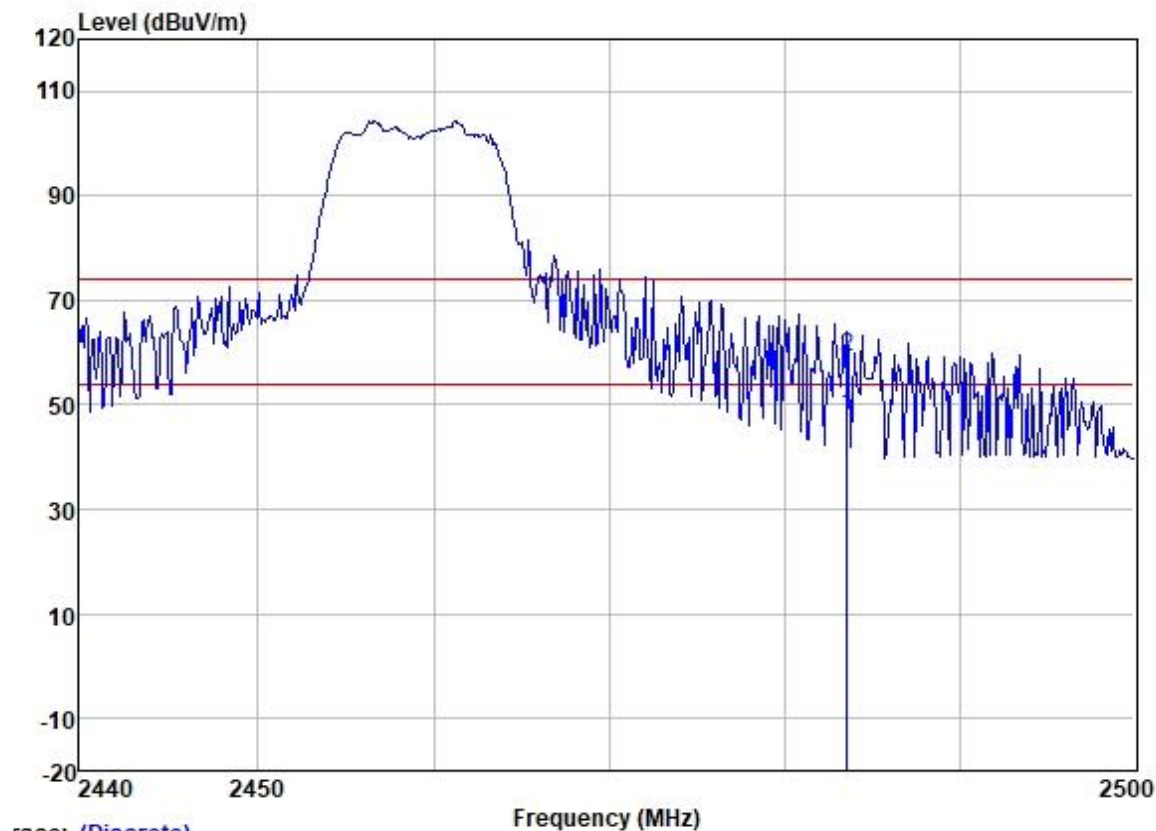
Test Mode: 01; Polarity: Vertical; Modulation: QPSK; Channel: High (10M)



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	2483.500	49.61	27.80	3.42	37.13	43.70	54.00	-10.30	VERTICAL
2	2483.500	66.52	27.80	3.42	37.13	60.61	74.00	-13.39	VERTICAL

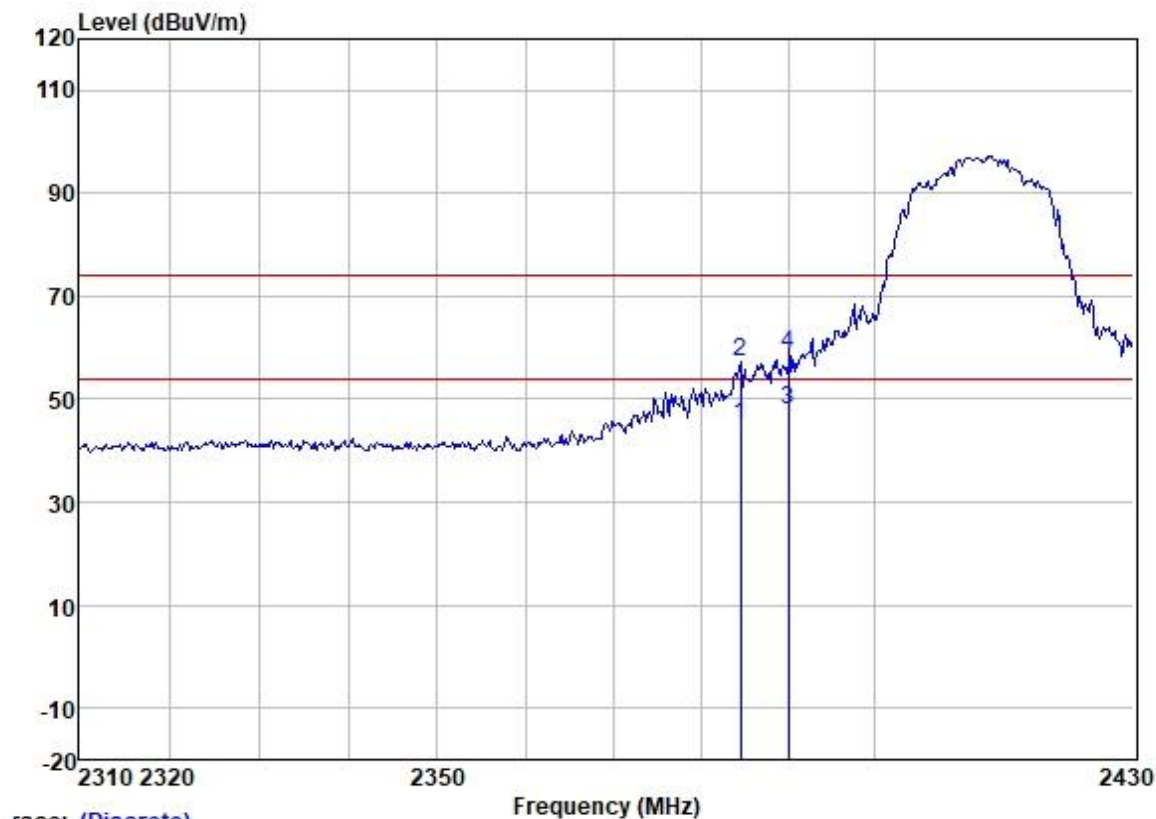
Test Mode: 01; Polarity: Horizontal; Modulation: QPSK; Channel: High (10M)



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	2483.500	53.97	27.80	3.42	37.13	48.06	54.00	-5.94	HORIZONTAL	Average
2	2483.500	64.97	27.80	3.42	37.13	59.06	74.00	-14.94	HORIZONTAL	Peak

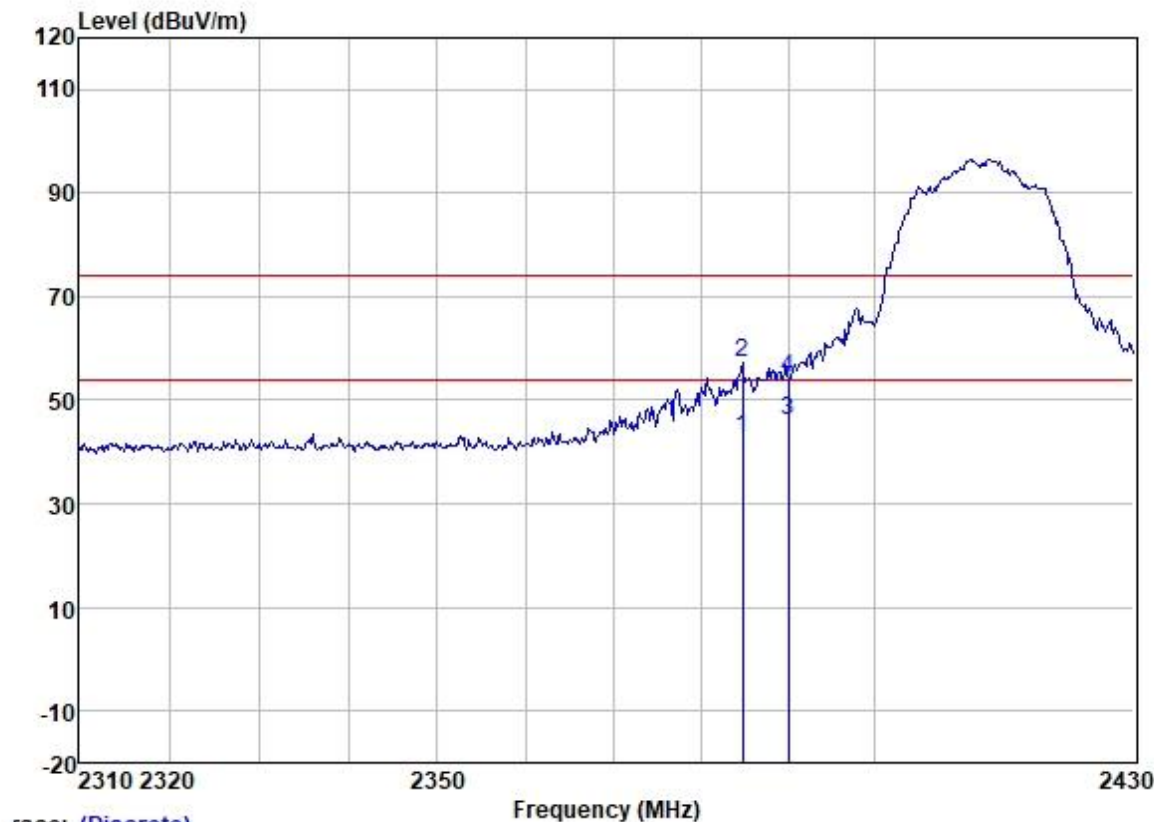
Test Mode: 00; Polarity: Vertical; Modulation: QPSK; Channel: Low (20M)



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2384.528	50.42	27.45	4.22	37.14	44.95	54.00	-9.05	VERTICAL Average
2	2384.528	62.81	27.45	4.22	37.14	57.34	74.00	-16.66	VERTICAL Peak
3	2390.000	53.36	27.45	4.22	37.14	47.89	54.00	-6.11	VERTICAL Average
4	2390.000	64.39	27.45	4.22	37.14	58.92	74.00	-15.08	VERTICAL Peak

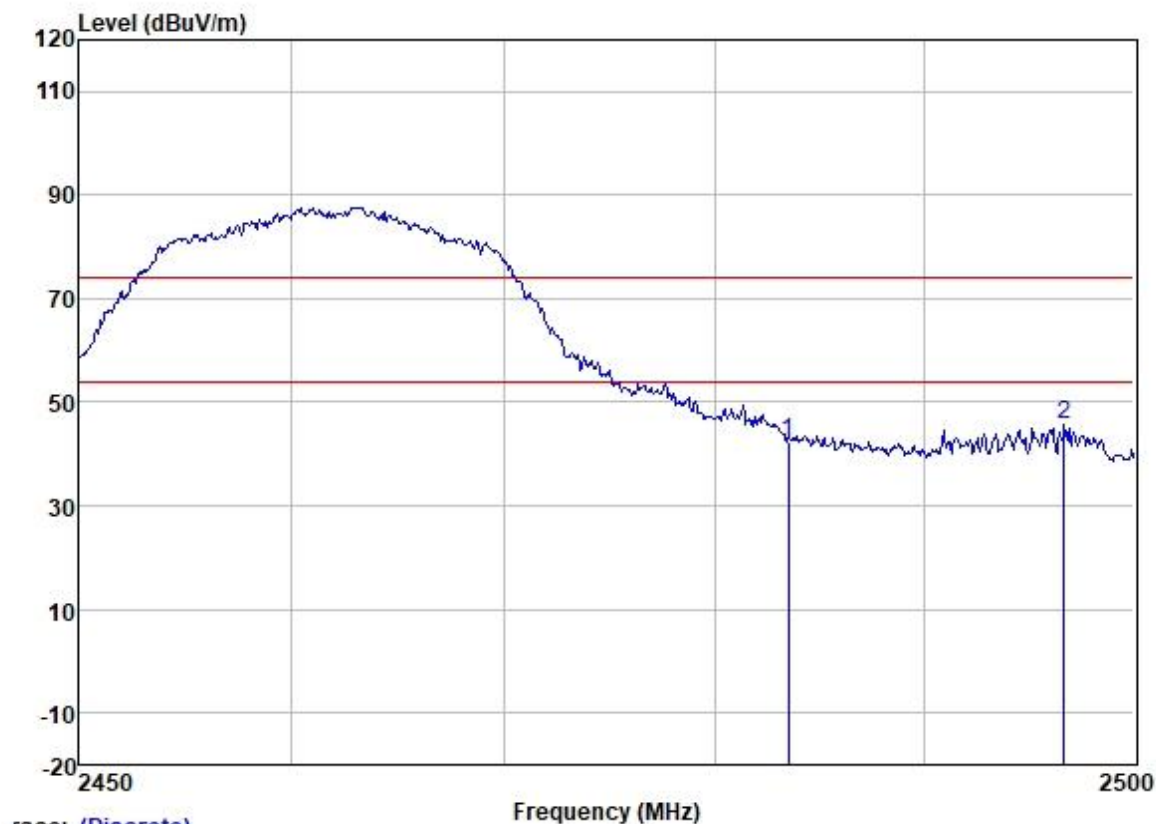
Test Mode: 00; Polarity: Horizontal; Modulation: QPSK; Channel: Low (20M)



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2384.769	48.19	27.45	4.22	37.14	42.72	54.00	-11.28	HORIZONTAL Average
2	2384.769	62.65	27.45	4.22	37.14	57.18	74.00	-16.82	HORIZONTAL Peak
3	2390.000	51.71	27.45	4.22	37.14	46.24	54.00	-7.76	HORIZONTAL Average
4	2390.000	59.65	27.45	4.22	37.14	54.18	74.00	-19.82	HORIZONTAL Peak

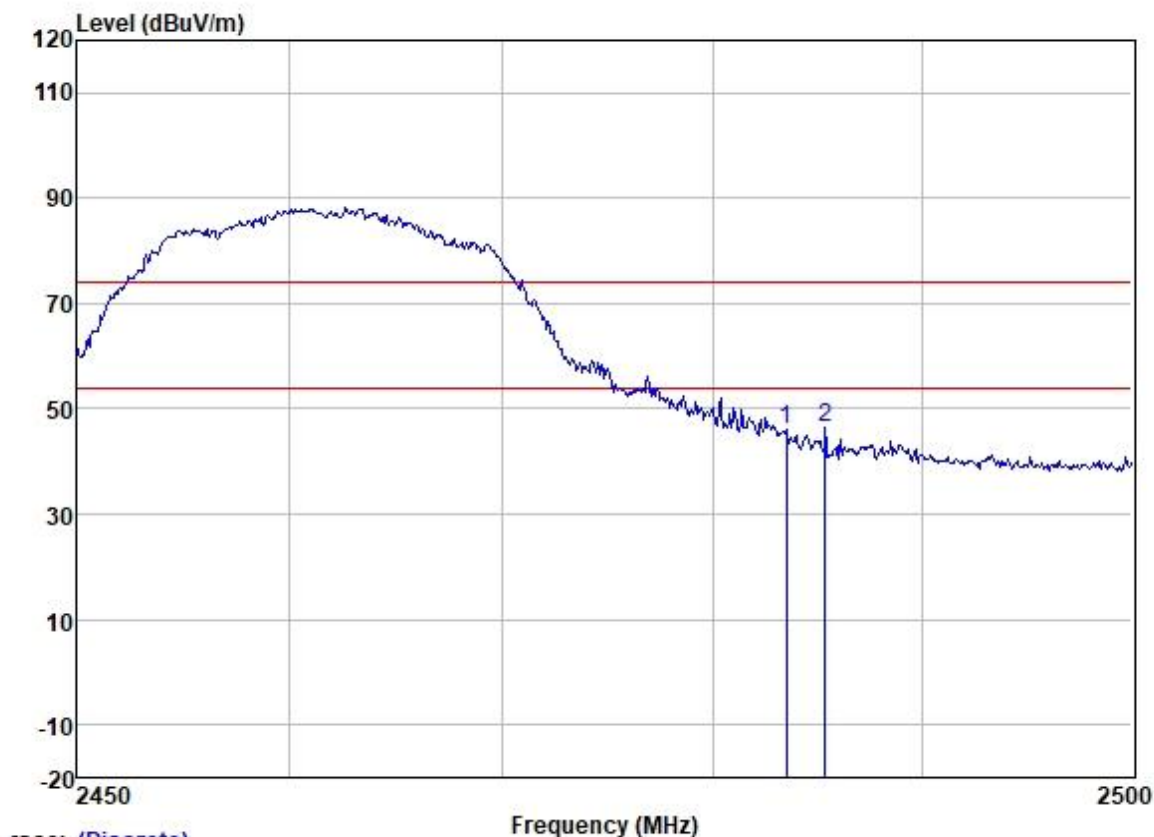
Test Mode: 00; Polarity: Vertical; Modulation: QPSK; Channel: High (20M)



Trace: (Discrete)

	Read	Antenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
Freq	Level	Factor	Loss	Factor	Level	Line	Limit		
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2483.500	48.23	27.80	3.42	37.13	42.32	74.00	-31.68	VERTICAL Peak
2	2496.669	51.57	27.85	3.24	37.12	45.54	74.00	-28.46	VERTICAL Peak

Test Mode: 00; Polarity: Horizontal; Modulation: QPSK; Channel: High (20M)



Trace: (Discrete)

	ReadAntenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2483.500	51.92	27.80	3.42	37.13	46.01	74.00	-27.99 HORIZONTAL
2	2485.346	52.45	27.80	3.42	37.13	46.54	74.00	-27.46 HORIZONTAL

7.8 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

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 22.9 °C

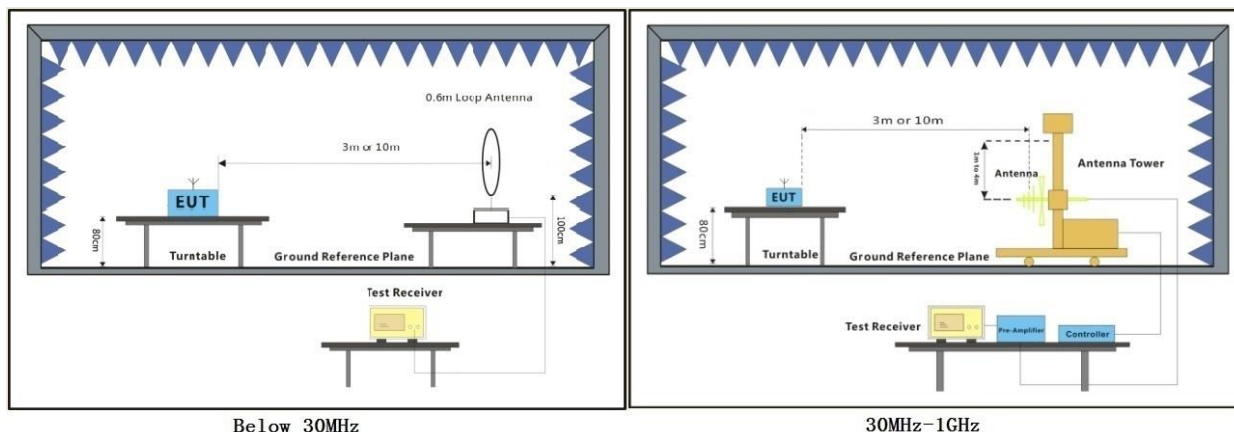
Humidity: 56.3 % RH

Atmospheric Pressure: 1015 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(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

7.8.3 Test Setup Diagram



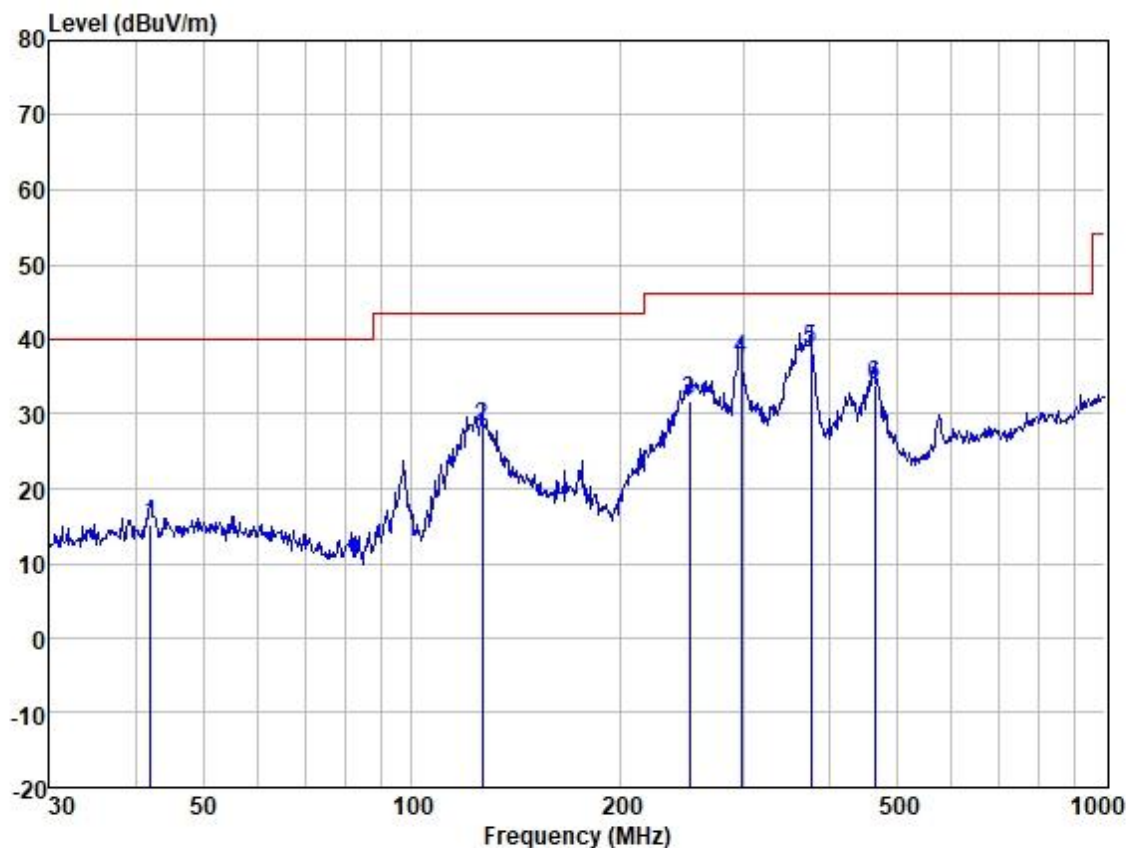
7.8.4 Measurement Procedure and Data

- 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 quasi-peak 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:

- Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- 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.
- 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.

Test Mode: 00; Polarity: Horizontal



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

	Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	42.007	28.16	13.66	1.10	27.61	15.31	40.00	-24.69	HORIZONTAL	QP
2	126.329	42.10	11.79	1.90	27.54	28.25	43.50	-15.25	HORIZONTAL	QP
3	251.180	44.08	11.82	2.96	27.24	31.62	46.00	-14.38	HORIZONTAL	QP
4	298.268	47.81	13.38	3.22	27.20	37.21	46.00	-8.79	HORIZONTAL	QP
5	375.939	47.83	15.02	3.78	27.89	38.74	46.00	-7.26	HORIZONTAL	QP
6	465.599	40.84	17.19	4.27	28.46	33.84	46.00	-12.16	HORIZONTAL	QP



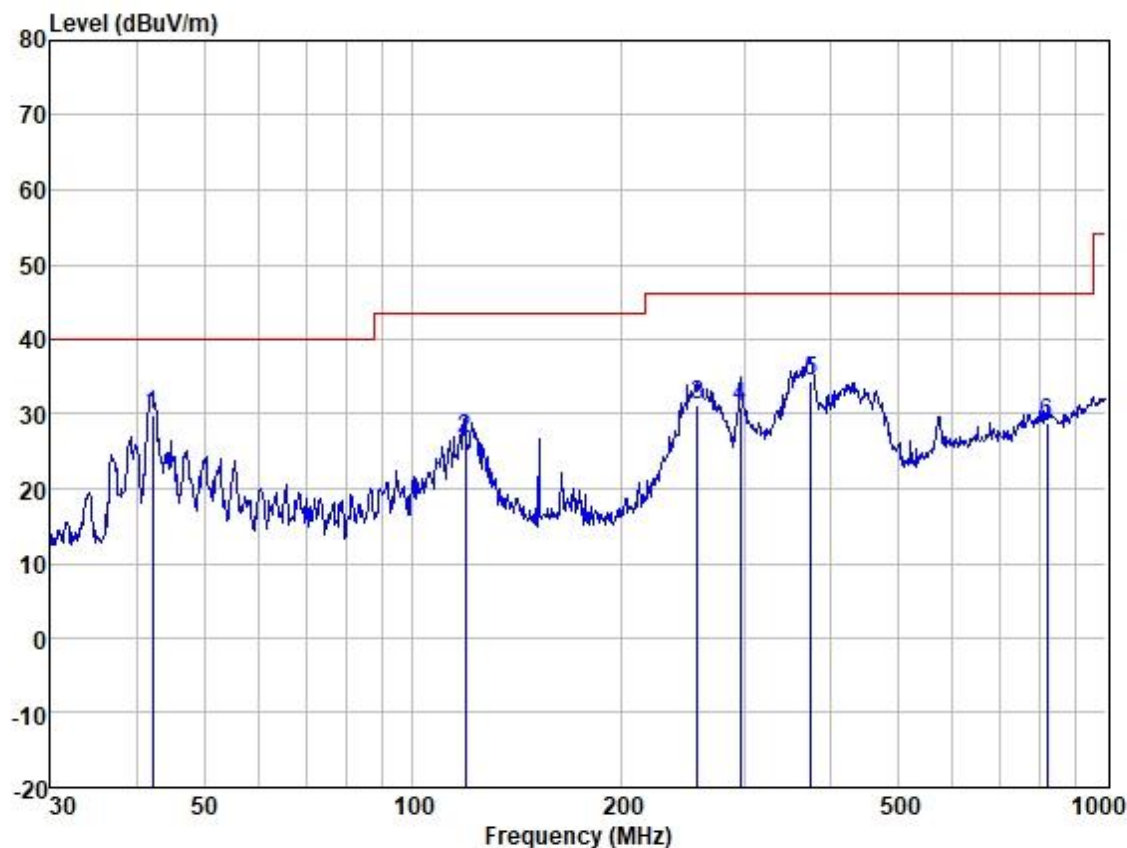
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Test Mode: 00; Polarity: Vertical



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

	Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	42.154	42.50	13.75	1.10	27.61	29.74	40.00	-10.26	VERTICAL	QP
2	119.018	41.35	11.14	1.83	27.56	26.76	43.50	-16.74	VERTICAL	QP
3	257.422	43.49	12.02	3.01	27.23	31.29	46.00	-14.71	VERTICAL	QP
4	296.184	41.59	13.32	3.21	27.20	30.92	46.00	-15.08	VERTICAL	QP
5	374.623	43.57	14.95	3.76	27.88	34.40	46.00	-11.60	VERTICAL	QP
6	821.710	27.96	23.38	6.11	28.53	28.92	46.00	-17.08	VERTICAL	QP



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7.9 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

7.9.1 E.U.T. Operation

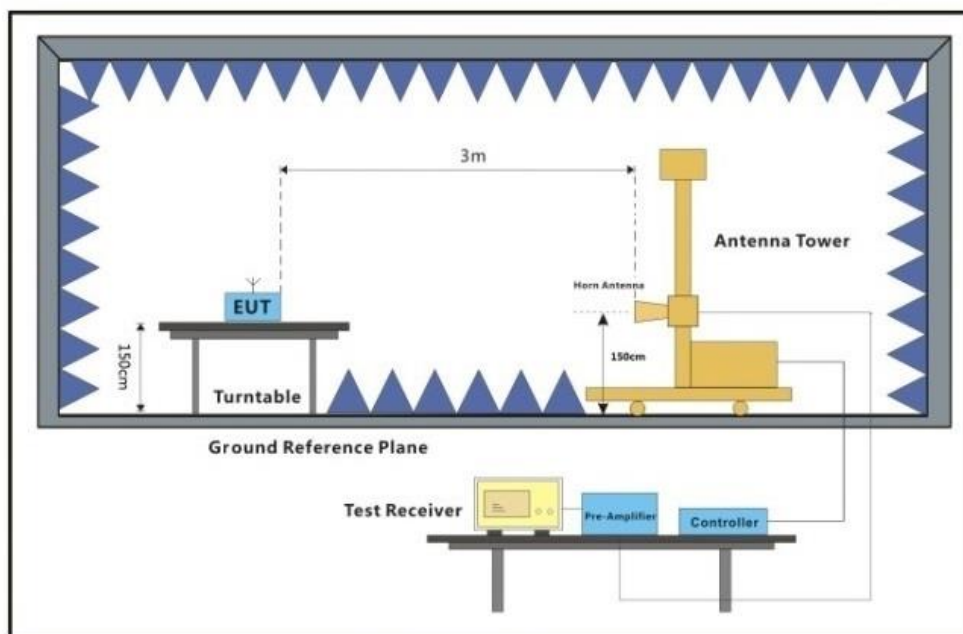
Operating Environment:

Temperature: 24.1 °C Humidity: 53.8 % RH Atmospheric Pressure: 1015 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode(10MHz/20MHz) with all modulation types. Only the data of worst case is recorded in the report.

7.9.3 Test Setup Diagram



Above 1GHz

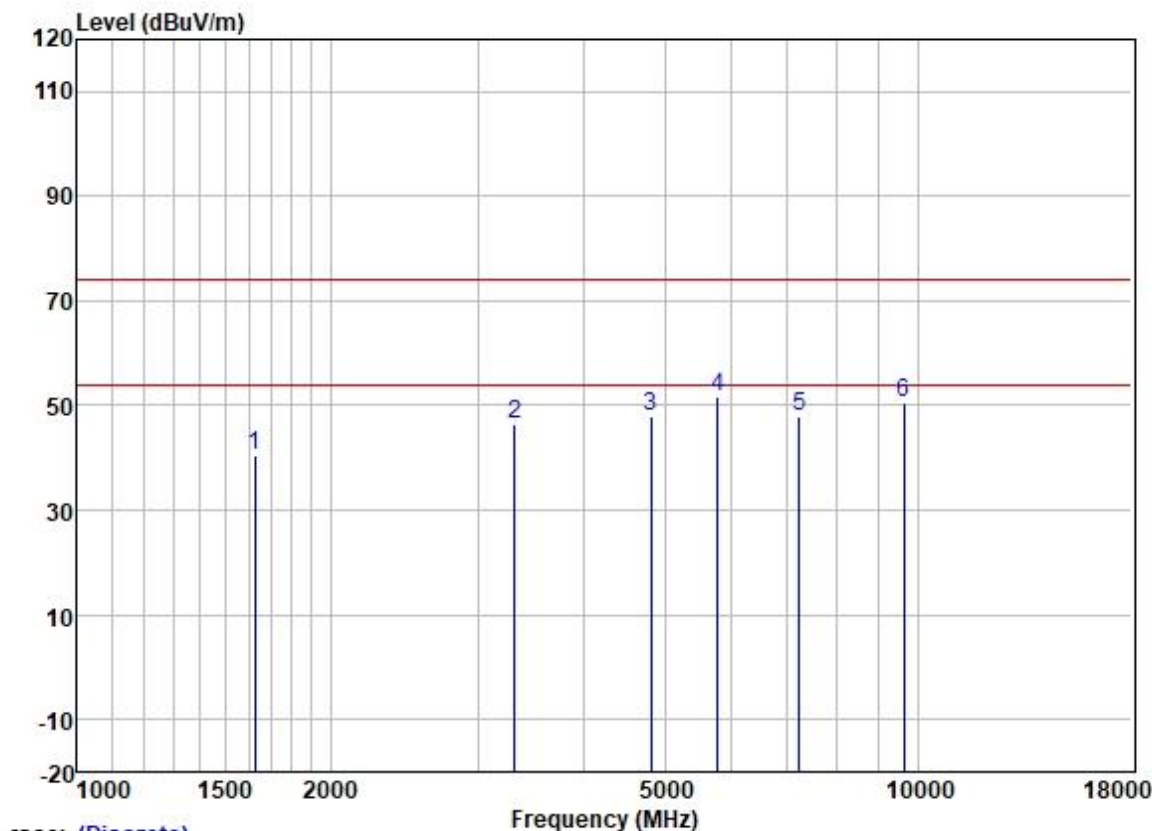
7.9.4 Measurement Procedure and Data

- 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.

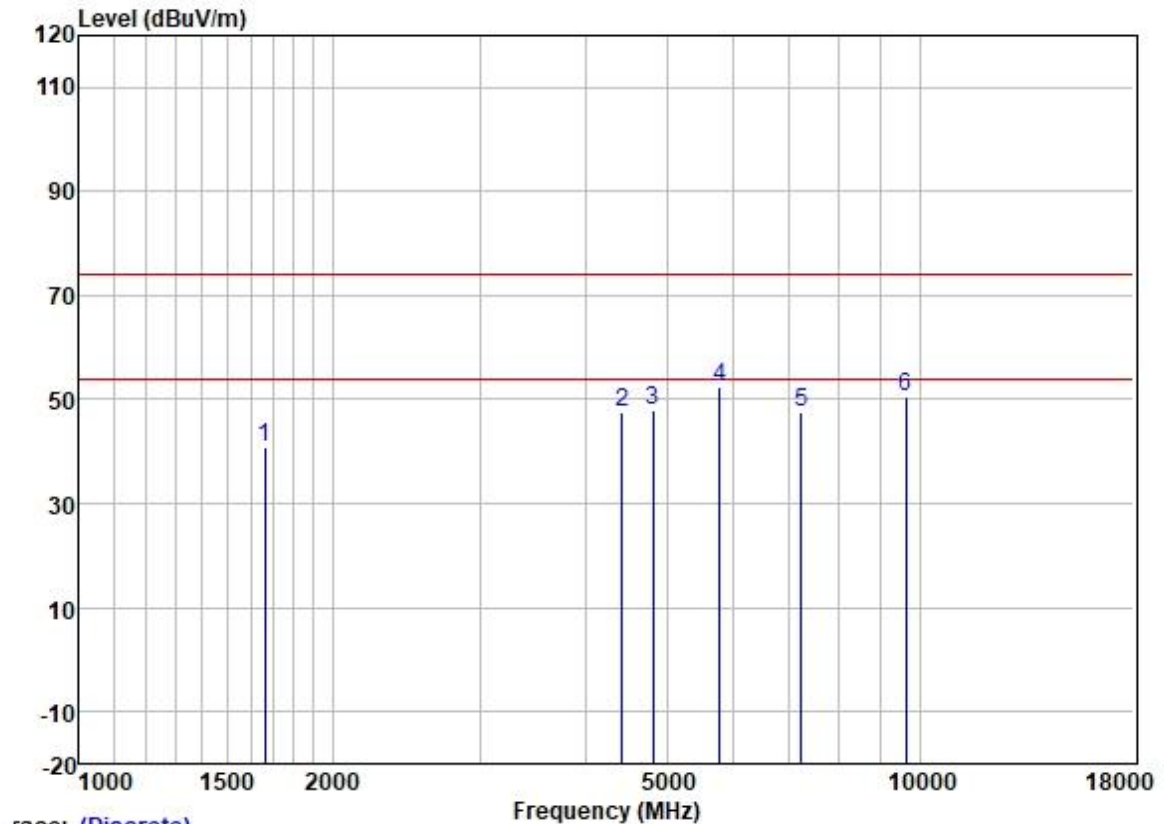
Test Mode: 01; Polarity: Vertical; Modulation: QPSK; Channel: Low (10M)



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	1625.121	49.61	25.41	3.06	37.55	40.53	74.00	-33.47	VERTICAL	peak
2	3318.471	49.40	29.77	4.26	36.82	46.61	74.00	-27.39	VERTICAL	peak
3	4818.000	46.40	32.57	5.46	36.50	47.93	74.00	-26.07	VERTICAL	peak
4	5780.300	48.16	34.05	5.68	36.14	51.75	74.00	-22.25	VERTICAL	peak
5	7227.000	41.98	36.71	6.35	36.94	48.10	74.00	-25.90	VERTICAL	peak
6	9636.000	41.28	38.38	7.89	36.86	50.69	74.00	-23.31	VERTICAL	peak

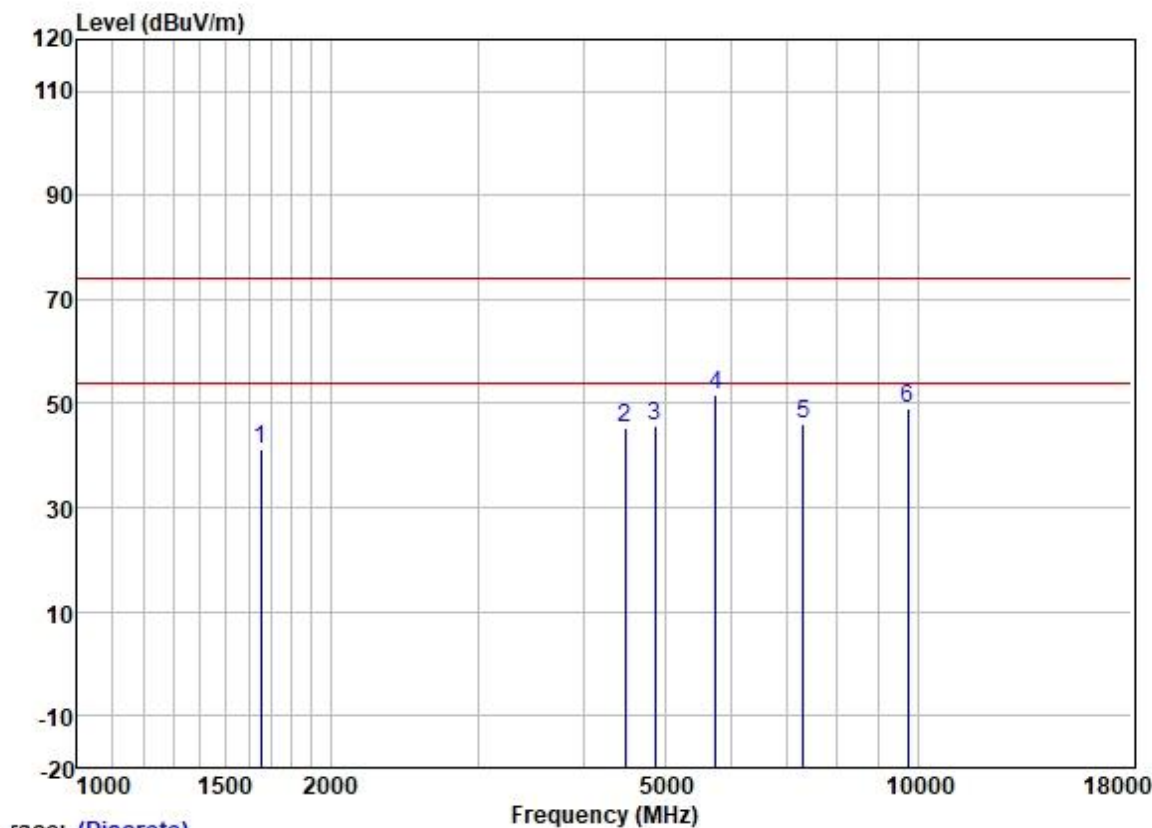
Test Mode: 01; Polarity: Horizontal; Modulation: QPSK; Channel: Low (10M)



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	1663.137	49.96	25.32	3.18	37.48	40.98	74.00	-33.02	HORIZONTAL	peak
2	4430.628	47.03	31.77	5.36	36.62	47.54	74.00	-26.46	HORIZONTAL	peak
3	4818.000	46.55	32.57	5.46	36.50	48.08	74.00	-25.92	HORIZONTAL	peak
4	5780.300	48.81	34.05	5.68	36.14	52.40	74.00	-21.60	HORIZONTAL	peak
5	7227.000	41.61	36.71	6.35	36.94	47.73	74.00	-26.27	HORIZONTAL	peak
6	9636.000	41.03	38.38	7.89	36.86	50.44	74.00	-23.56	HORIZONTAL	peak

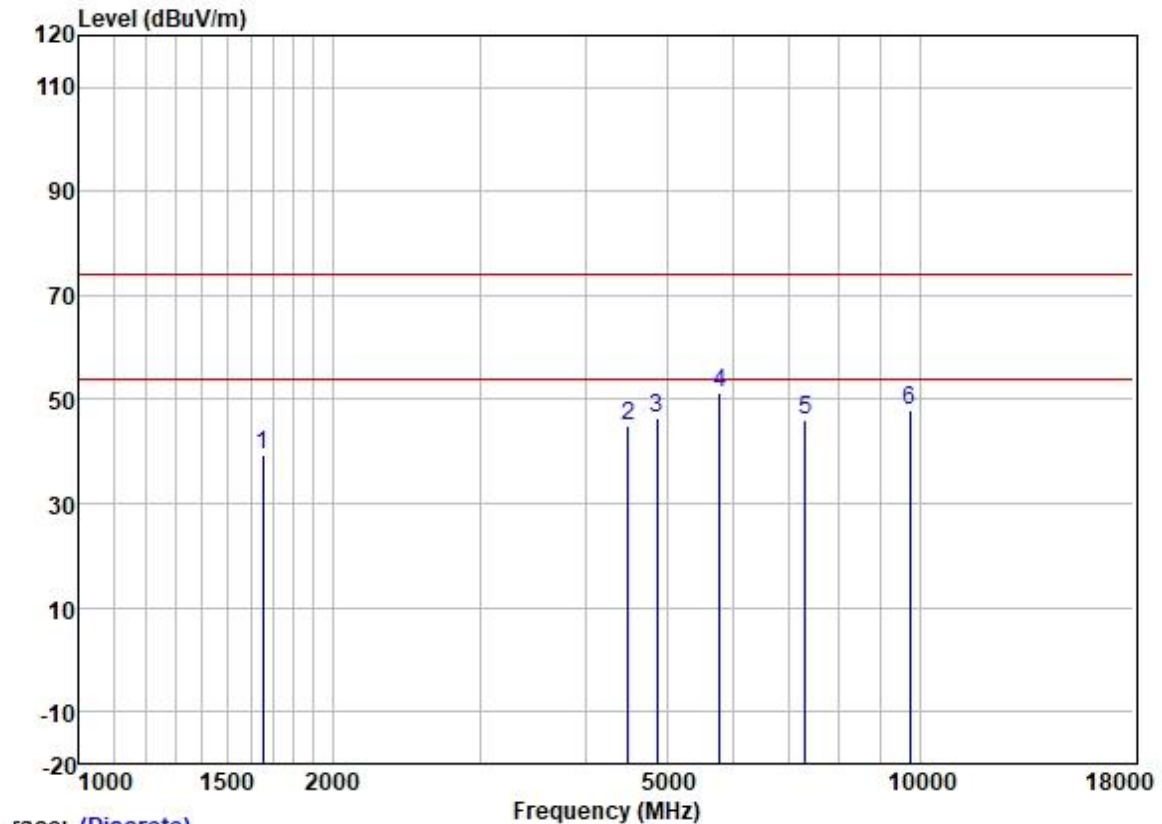
Test Mode: 01; Polarity: Vertical; Modulation: QPSK; Channel: Middle (10M)



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	50.34	25.35	3.14	37.51	41.32	74.00	-32.68	VERTICAL	peak
2	4482.150	44.98	31.77	5.34	36.61	45.48	74.00	-28.52	VERTICAL	peak
3	4868.000	43.90	32.83	5.49	36.48	45.74	74.00	-28.26	VERTICAL	peak
4	5746.982	48.12	33.88	5.70	36.14	51.56	74.00	-22.44	VERTICAL	peak
5	7302.000	40.12	36.68	6.32	36.99	46.13	74.00	-27.87	VERTICAL	peak
6	9736.000	40.04	38.27	7.56	36.84	49.03	74.00	-24.97	VERTICAL	peak

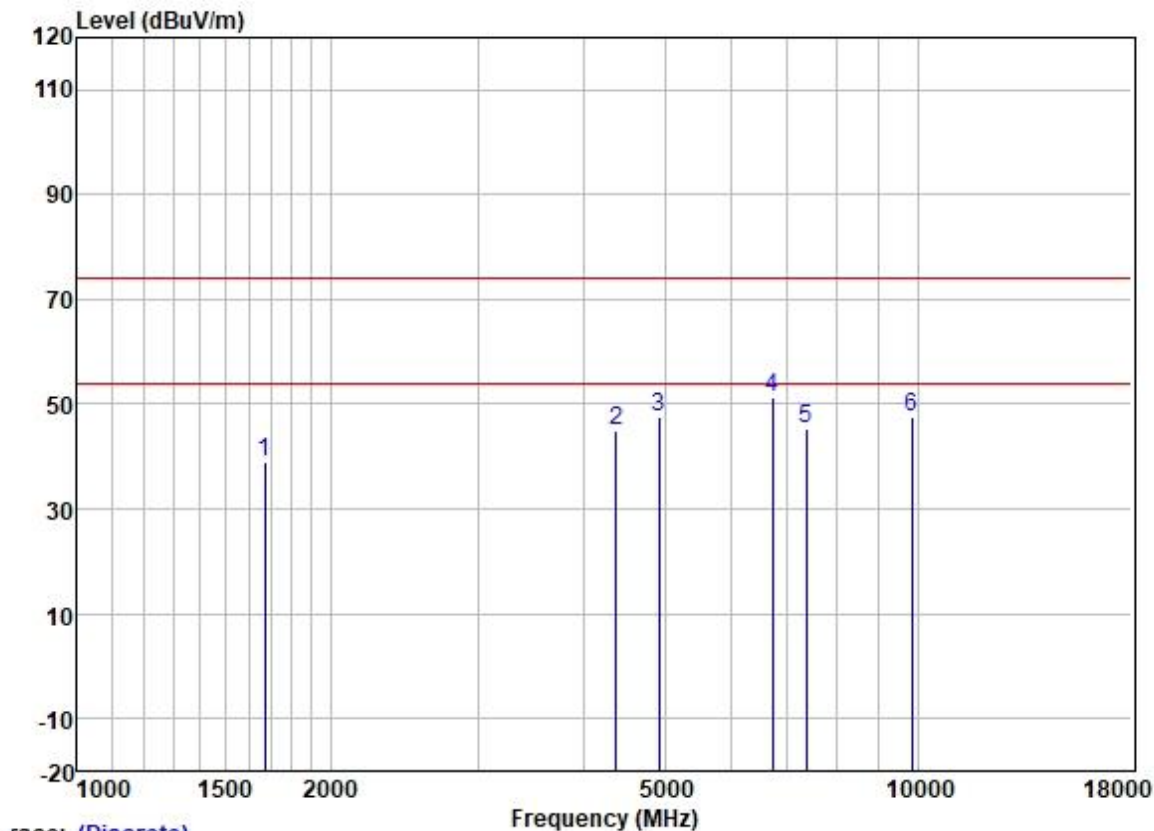
Test Mode: 01; Polarity: Horizontal; Modulation: QPSK; Channel: Middle (10M)



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	48.31	25.35	3.14	37.51	39.29	74.00	-34.71	HORIZONTAL	peak
2	4495.125	44.50	31.77	5.33	36.60	45.00	74.00	-29.00	HORIZONTAL	peak
3	4868.000	44.68	32.83	5.49	36.48	46.52	74.00	-27.48	HORIZONTAL	peak
4	5780.300	47.75	34.05	5.68	36.14	51.34	74.00	-22.66	HORIZONTAL	peak
5	7302.000	39.97	36.68	6.32	36.99	45.98	74.00	-28.02	HORIZONTAL	peak
6	9736.000	38.92	38.27	7.56	36.84	47.91	74.00	-26.09	HORIZONTAL	peak

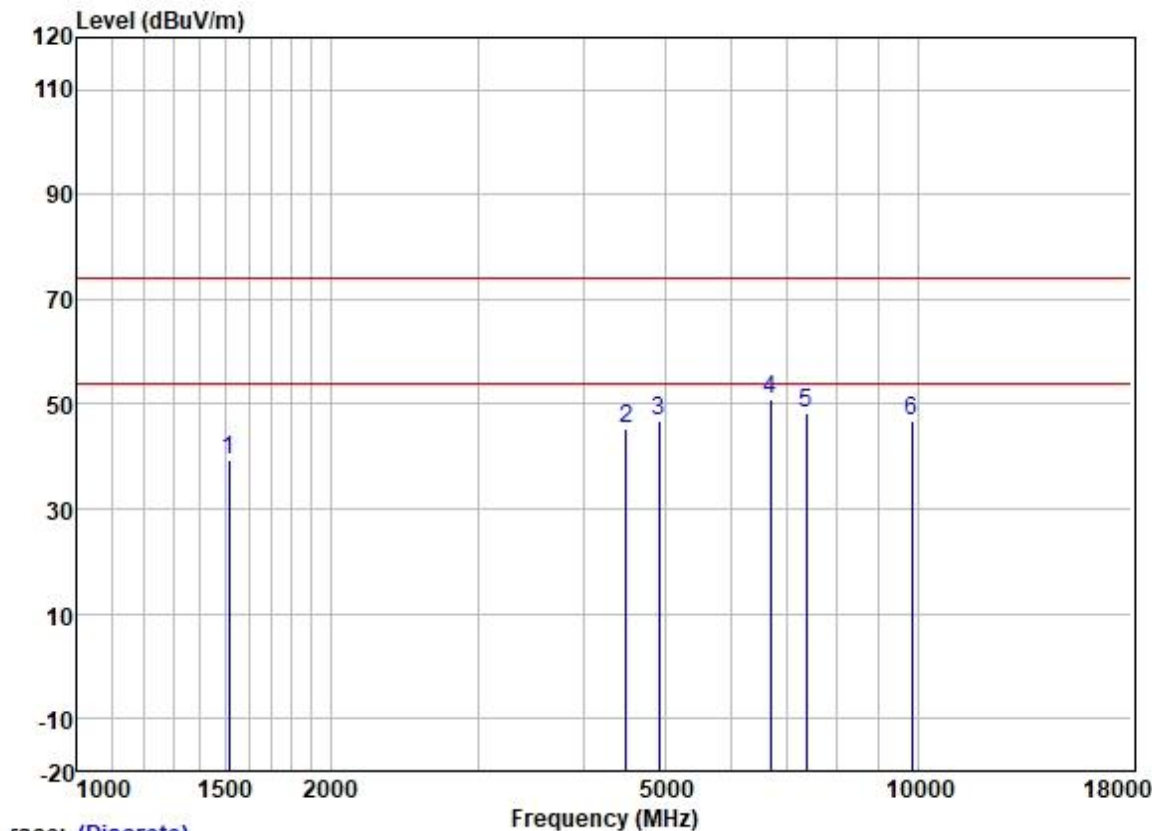
Test Mode: 01; Polarity: Vertical; Modulation: QPSK; Channel: High (10M)



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1672.779	48.09	25.30	3.21	37.48	39.12	74.00	-34.88	VERTICAL peak
2	4379.699	44.68	31.73	5.35	36.63	45.13	74.00	-28.87	VERTICAL peak
3	4918.000	45.40	32.96	5.51	36.45	47.42	74.00	-26.58	VERTICAL peak
4	6717.762	45.36	35.90	6.29	36.42	51.13	74.00	-22.87	VERTICAL peak
5	7377.000	39.54	36.47	6.31	37.04	45.28	74.00	-28.72	VERTICAL peak
6	9836.000	39.00	38.24	7.06	36.82	47.48	74.00	-26.52	VERTICAL peak

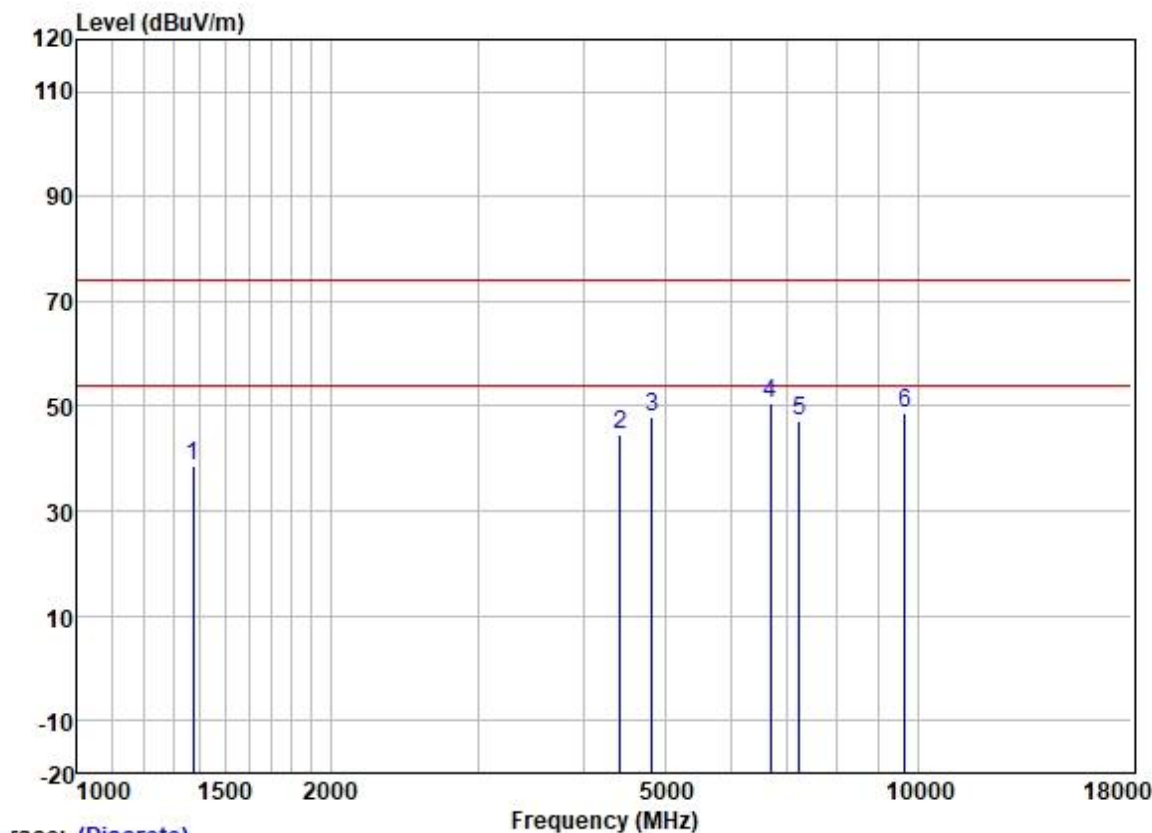
Test Mode: 01; Polarity: Horizontal; Modulation: QPSK; Channel: High (10M)



Trace: (Discrete)

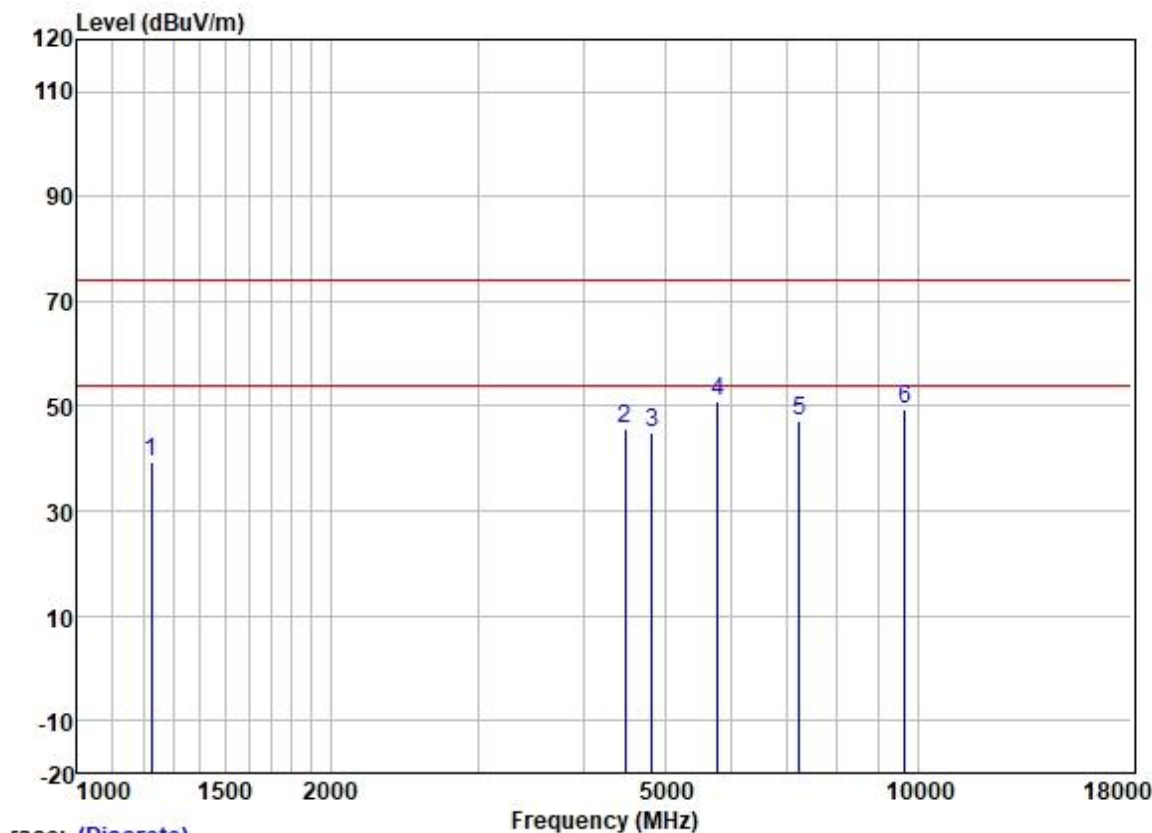
	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1516.210	48.77	25.54	2.92	37.70	39.53	74.00	-34.47	HORIZONTAL peak
2	4495.125	44.80	31.77	5.33	36.60	45.30	74.00	-28.70	HORIZONTAL peak
3	4918.000	44.69	32.96	5.51	36.45	46.71	74.00	-27.29	HORIZONTAL peak
4	6679.040	45.20	35.87	6.27	36.39	50.95	74.00	-23.05	HORIZONTAL peak
5	7377.000	42.51	36.47	6.31	37.04	48.25	74.00	-25.75	HORIZONTAL peak
6	9836.000	38.27	38.24	7.06	36.82	46.75	74.00	-27.25	HORIZONTAL peak

Test Mode: 00; Polarity: Vertical; Modulation: QPSK; Channel: Low (20M)



	ReadAntenna	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	1374.295	47.85	25.79	2.76	37.95	38.45	74.00	-35.55	VERTICAL peak
2	4430.628	44.21	31.77	5.36	36.62	44.72	74.00	-29.28	VERTICAL peak
3	4824.000	46.57	32.57	5.46	36.50	48.10	74.00	-25.90	VERTICAL peak
4	6679.040	44.80	35.87	6.27	36.39	50.55	74.00	-23.45	VERTICAL peak
5	7236.000	41.22	36.70	6.35	36.94	47.33	74.00	-26.67	VERTICAL peak
6	9648.000	39.25	38.38	7.89	36.85	48.67	74.00	-25.33	VERTICAL peak

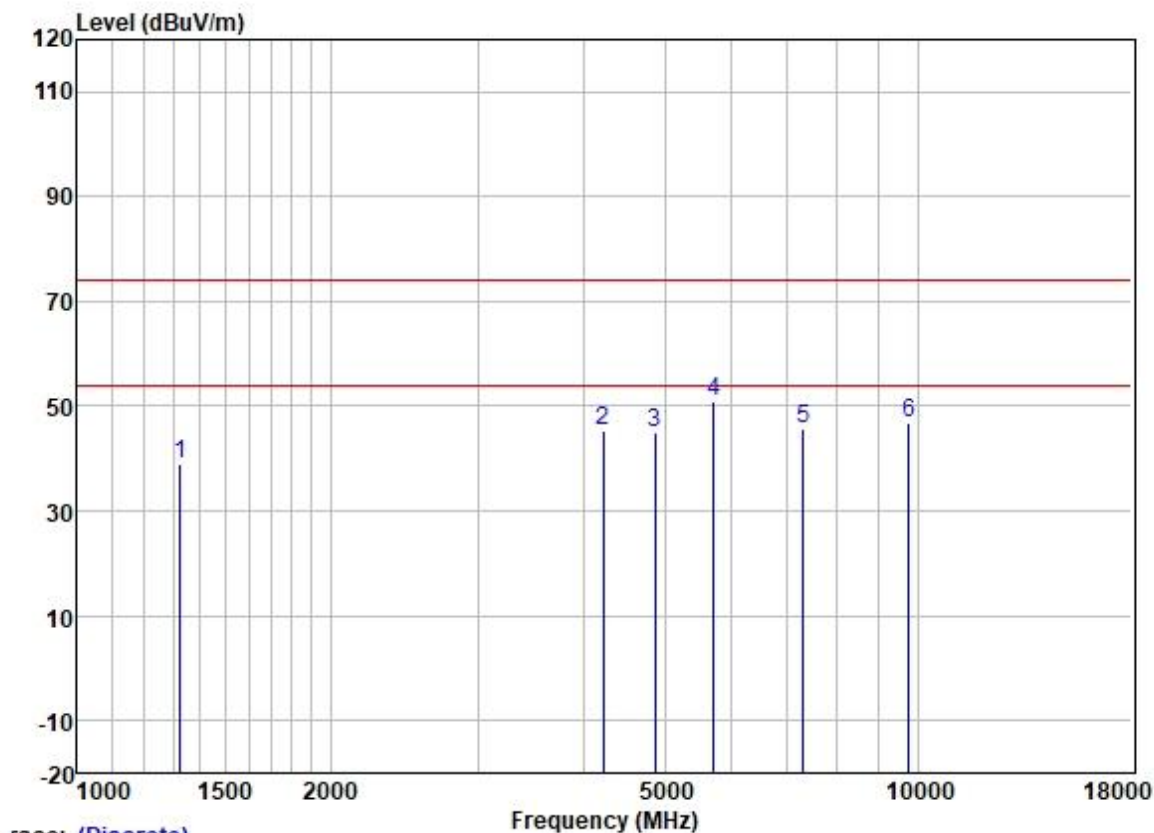
Test Mode: 00; Polarity: Horizontal; Modulation: QPSK; Channel: Low (20M)



Trace: (Discrete)

	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	1224.247	48.86	25.92	2.60	38.12	39.26	74.00	-34.74	HORIZONTAL peak
2	4482.150	45.30	31.77	5.34	36.61	45.80	74.00	-28.20	HORIZONTAL peak
3	4824.000	43.59	32.57	5.46	36.50	45.12	74.00	-28.88	HORIZONTAL peak
4	5780.300	47.44	34.05	5.68	36.14	51.03	74.00	-22.97	HORIZONTAL peak
5	7236.000	41.02	36.70	6.35	36.94	47.13	74.00	-26.87	HORIZONTAL peak
6	9648.000	40.09	38.38	7.89	36.85	49.51	74.00	-24.49	HORIZONTAL peak

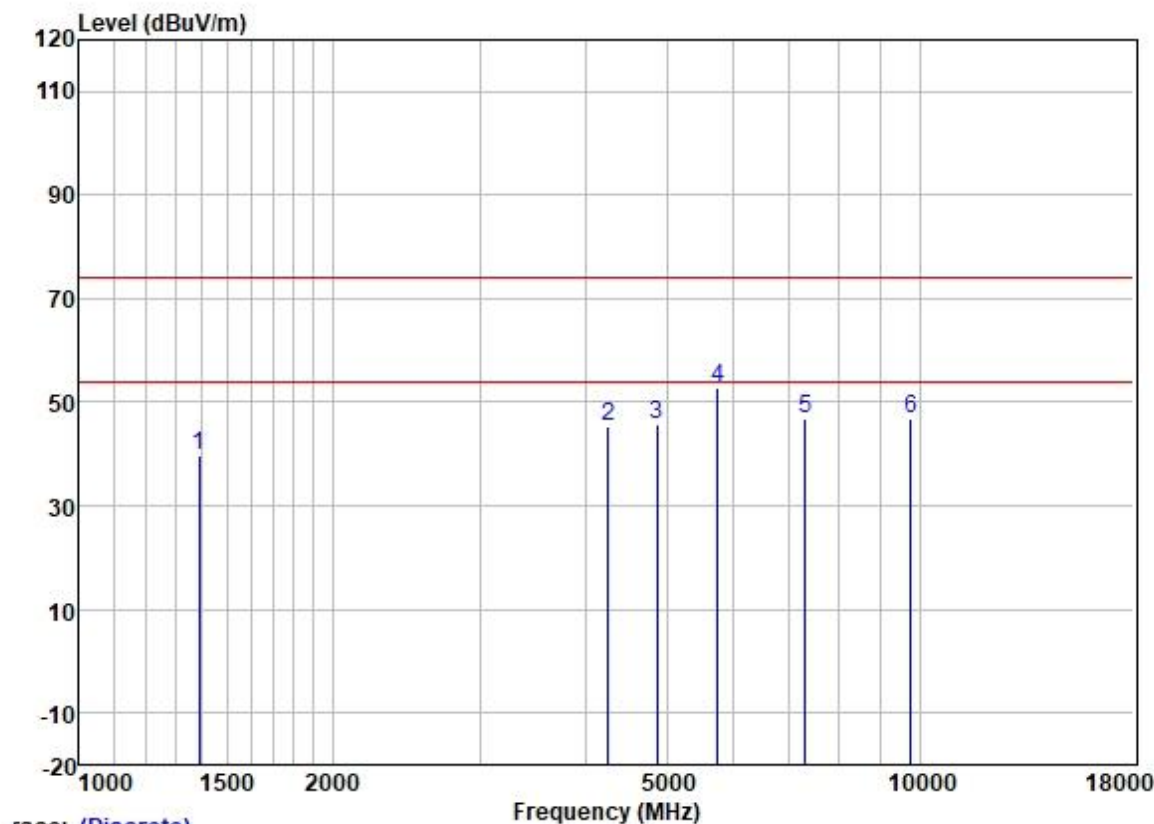
Test Mode: 00; Polarity: Vertical; Modulation: QPSK; Channel: Middle (20M)



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit		
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1327.446	48.37	25.94	2.72	38.02	39.01	74.00	-34.99	VERTICAL peak
2	4230.396	45.55	31.37	5.23	36.66	45.49	74.00	-28.51	VERTICAL peak
3	4874.000	43.31	32.83	5.49	36.48	45.15	74.00	-28.85	VERTICAL peak
4	5713.856	47.63	33.71	5.72	36.15	50.91	74.00	-23.09	VERTICAL peak
5	7311.000	39.81	36.68	6.32	36.99	45.82	74.00	-28.18	VERTICAL peak
6	9748.000	38.03	38.26	7.43	36.83	46.89	74.00	-27.11	VERTICAL peak

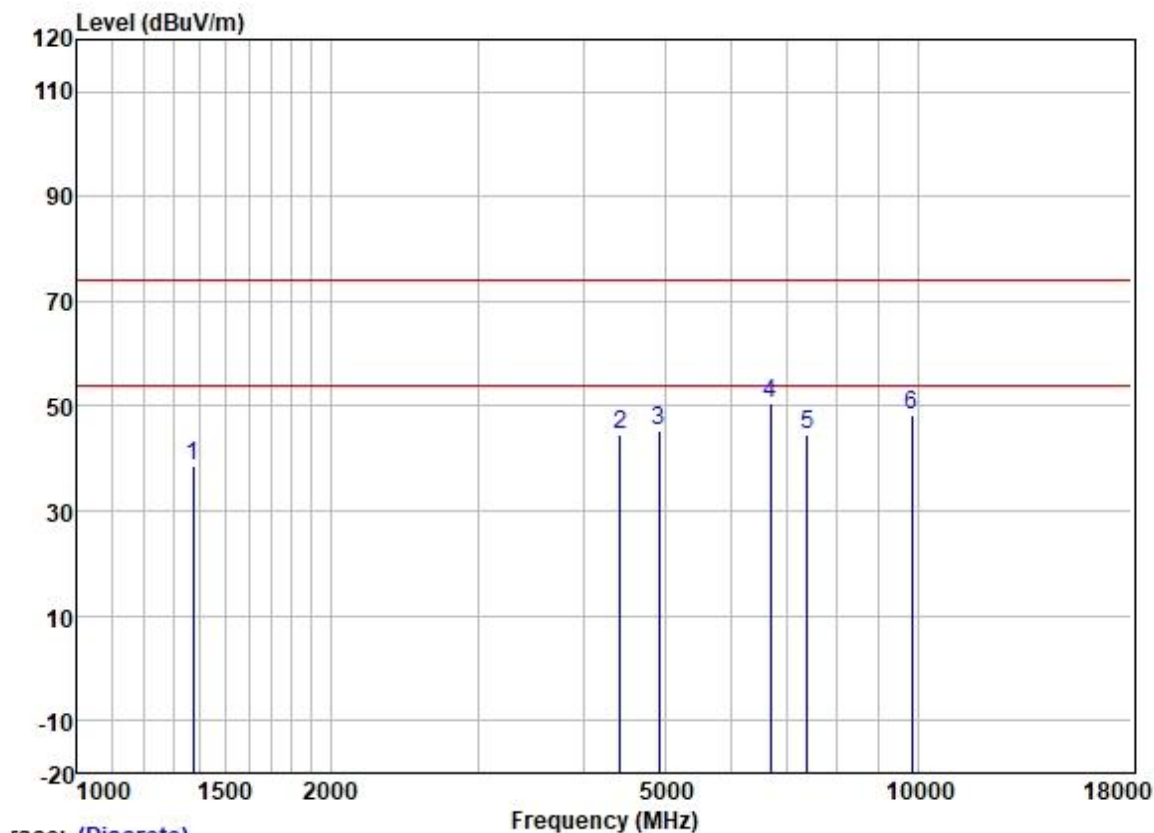
Test Mode: 00; Polarity: Horizontal; Modulation: QPSK; Channel: Middle (20M)



Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1390.276	48.99	25.76	2.77	37.92	39.60	74.00	-34.40	HORIZONTAL	peak
2	4254.921	45.36	31.45	5.24	36.66	45.39	74.00	-28.61	HORIZONTAL	peak
3	4874.000	43.93	32.83	5.49	36.48	45.77	74.00	-28.23	HORIZONTAL	peak
4	5746.982	49.36	33.88	5.70	36.14	52.80	74.00	-21.20	HORIZONTAL	peak
5	7311.000	40.95	36.68	6.32	36.99	46.96	74.00	-27.04	HORIZONTAL	peak
6	9748.000	37.89	38.26	7.43	36.83	46.75	74.00	-27.25	HORIZONTAL	peak

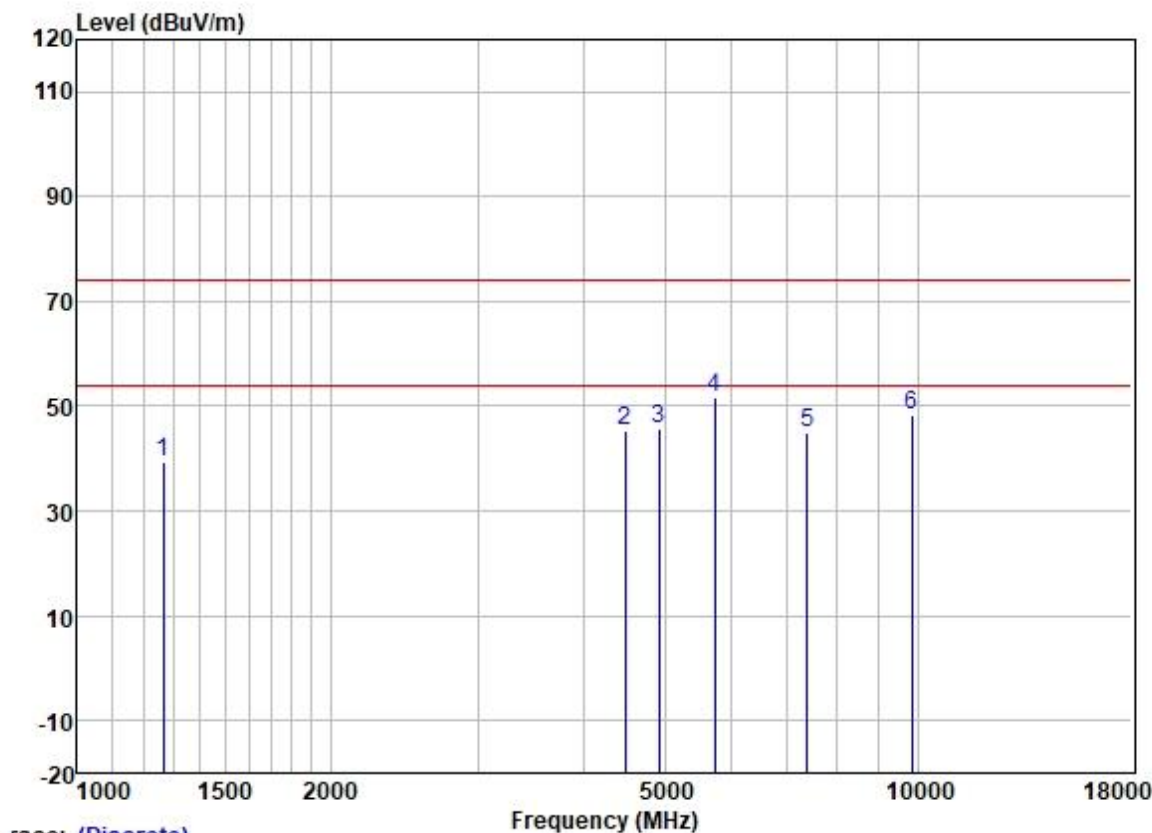
Test Mode: 00; Polarity: Vertical; Modulation: QPSK; Channel: High (20M)



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1374.295	47.85	25.79	2.76	37.95	38.45	74.00	-35.55	VERTICAL peak
2	4430.628	44.21	31.77	5.36	36.62	44.72	74.00	-29.28	VERTICAL peak
3	4924.000	43.21	33.00	5.51	36.45	45.27	74.00	-28.73	VERTICAL peak
4	6679.040	44.80	35.87	6.27	36.39	50.55	74.00	-23.45	VERTICAL peak
5	7386.000	38.88	36.40	6.30	37.04	44.54	74.00	-29.46	VERTICAL peak
6	9848.000	39.78	38.24	7.06	36.82	48.26	74.00	-25.74	VERTICAL peak

Test Mode: 00; Polarity: Horizontal; Modulation: QPSK; Channel: High (20M)



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	1267.454	48.83	25.97	2.63	38.07	39.36	74.00	-34.64	HORIZONTAL	peak
2	4482.150	44.78	31.77	5.34	36.61	45.28	74.00	-28.72	HORIZONTAL	peak
3	4924.000	43.54	33.00	5.51	36.45	45.60	74.00	-28.40	HORIZONTAL	peak
4	5730.396	48.41	33.79	5.71	36.15	51.76	74.00	-22.24	HORIZONTAL	peak
5	7386.000	39.13	36.40	6.30	37.04	44.79	74.00	-29.21	HORIZONTAL	peak
6	9848.000	39.92	38.24	7.06	36.82	48.40	74.00	-25.60	HORIZONTAL	peak

8 Test Setup Photo

Refer to Appendix_Setup Photo for GZCR221000128302



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9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2210001283AT

10 Appendix

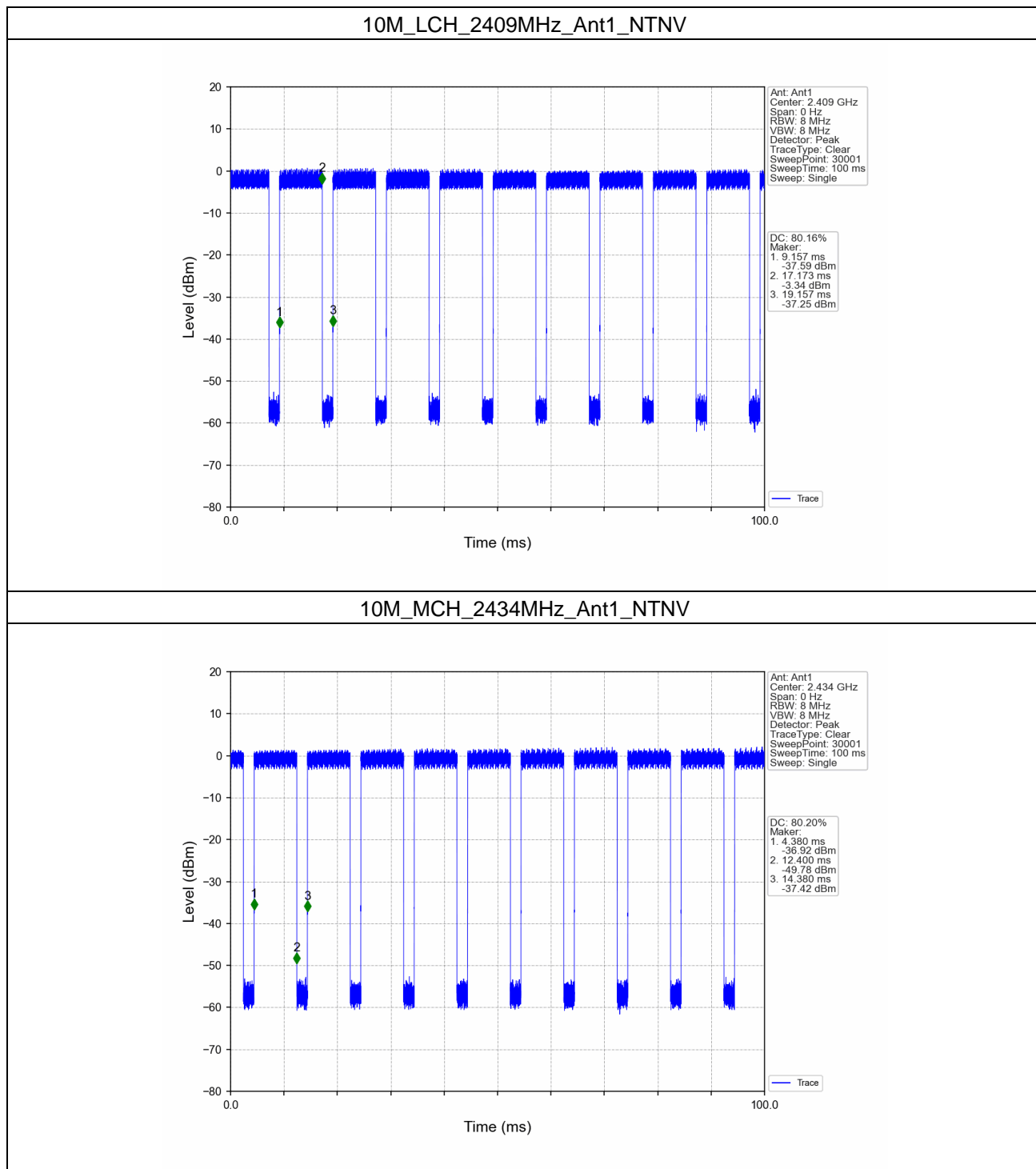
1. Duty Cycle

1.1 Ant1

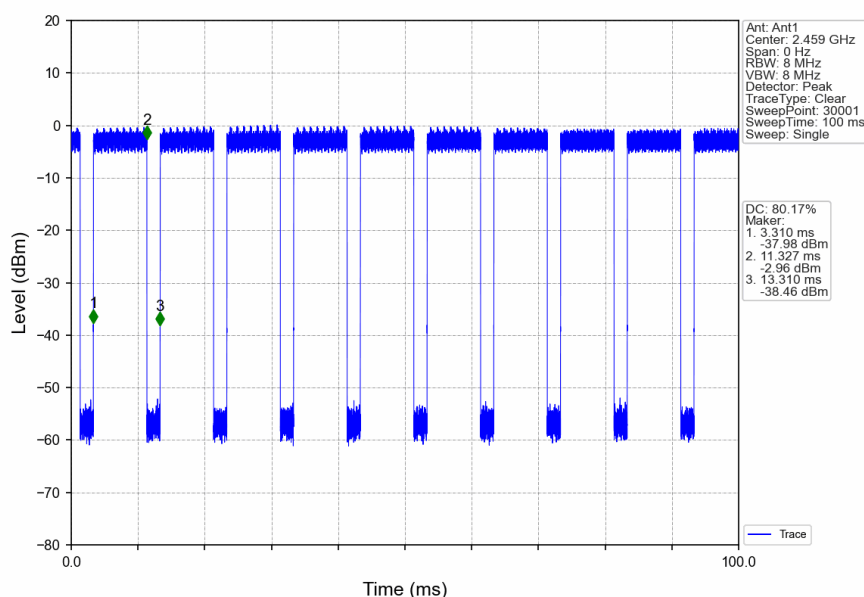
1.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
10M	SISO	2409	8.016	10.000	80.16	0.96	0.00
		2434	8.020	10.000	80.20	0.96	0.00
		2459	8.017	10.000	80.17	0.96	0.00
20M	SISO	2412	8.020	10.000	80.20	0.96	0.00
		2437	8.020	10.000	80.20	0.96	0.00
		2462	8.020	10.000	80.20	0.96	0.00

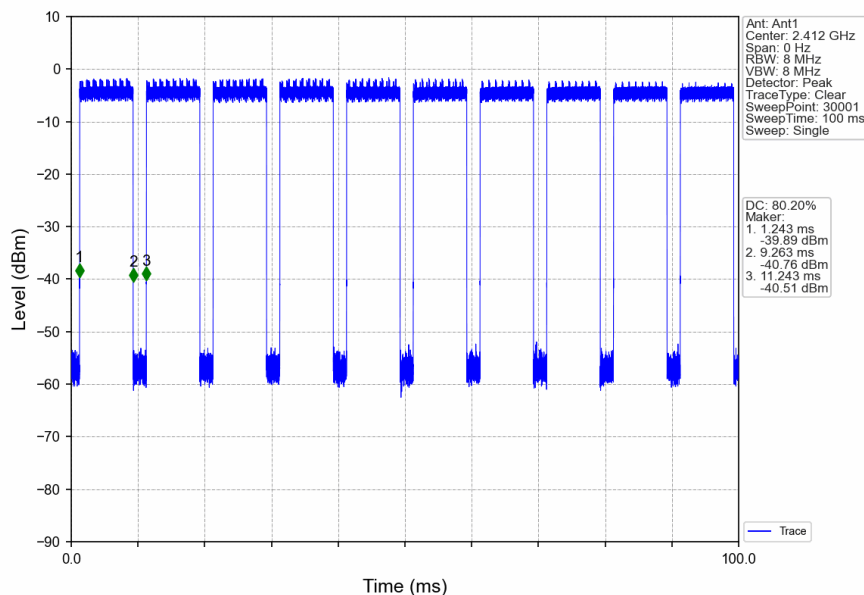
1.1.2 Test Graph



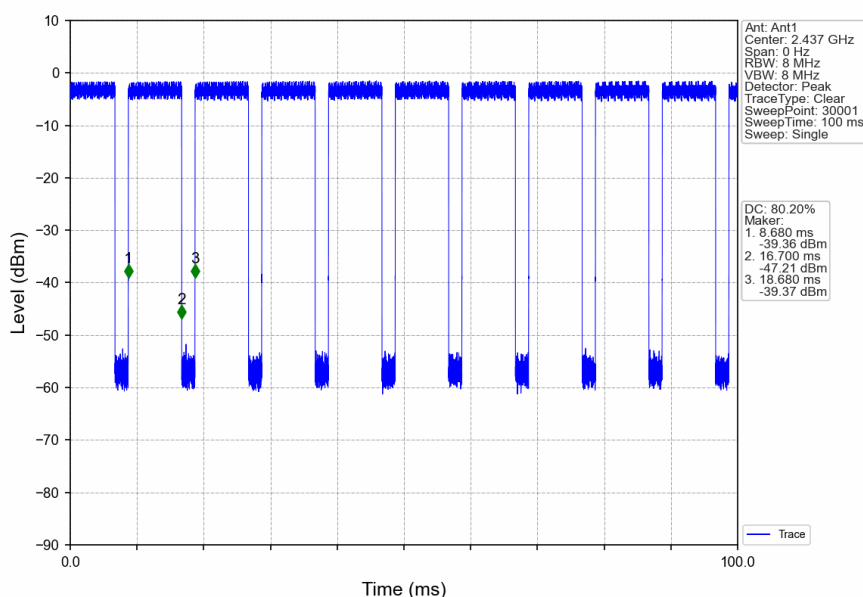
10M_HCH_2459MHz_Ant1_NTNV



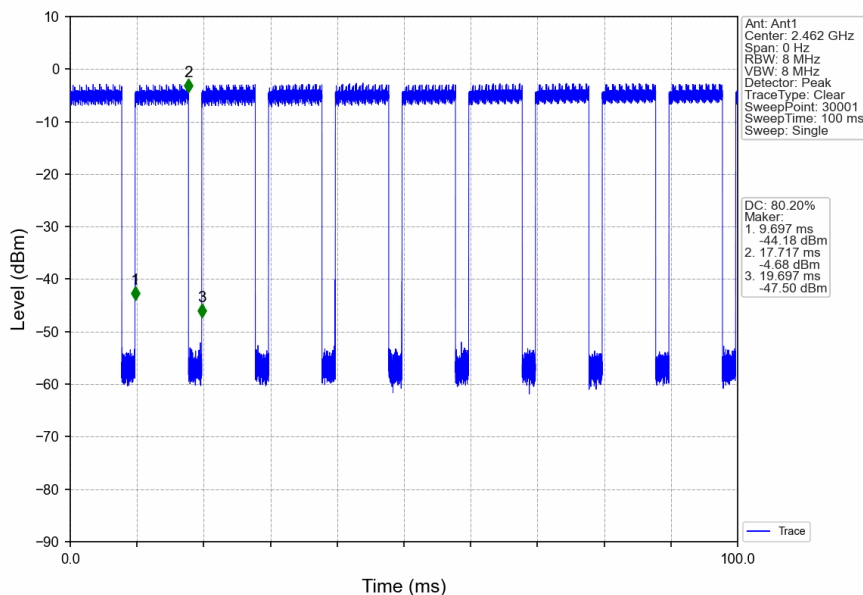
20M_LCH_2412MHz_Ant1_NTNV



20M_MCH_2437MHz_Ant1_NTNV



20M_HCH_2462MHz_Ant1_NTNV



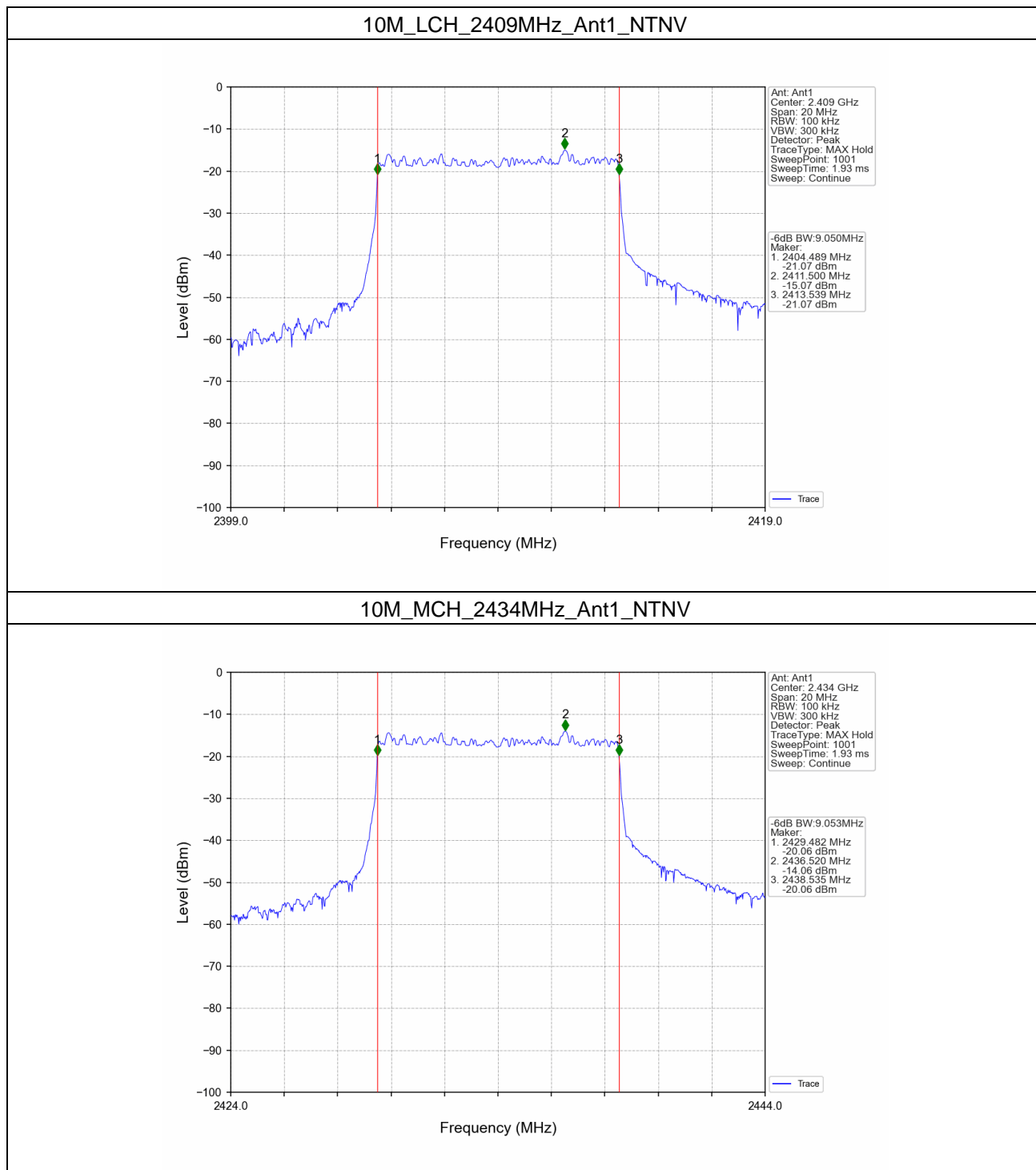
2. Bandwidth

2.1 6dB BW

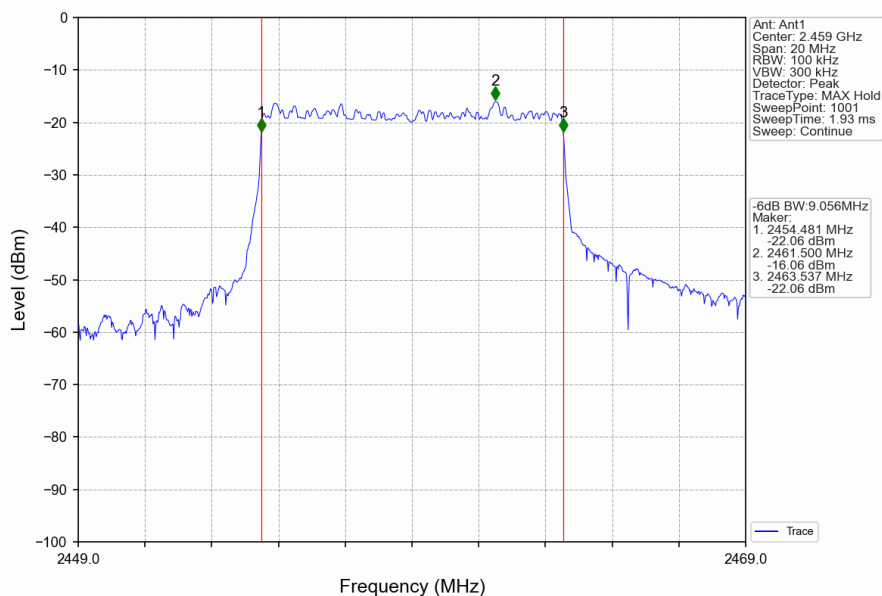
2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
10M	SISO	2409	1	9.050	≥ 0.5	Pass
		2434	1	9.053	≥ 0.5	Pass
		2459	1	9.056	≥ 0.5	Pass
20M	SISO	2412	1	18.091	≥ 0.5	Pass
		2437	1	18.059	≥ 0.5	Pass
		2462	1	18.089	≥ 0.5	Pass

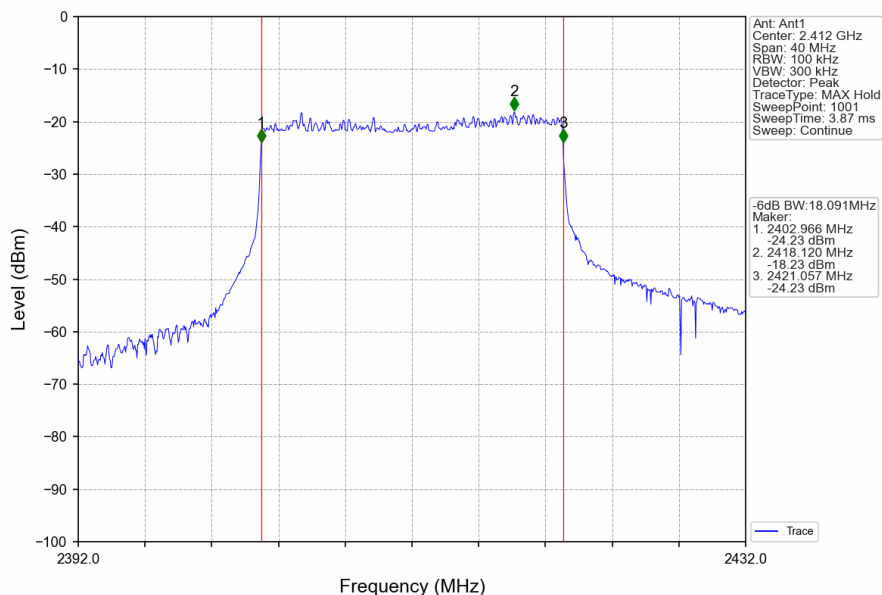
2.1.2 Test Graph



10M_HCH_2459MHz_Ant1_NTNV



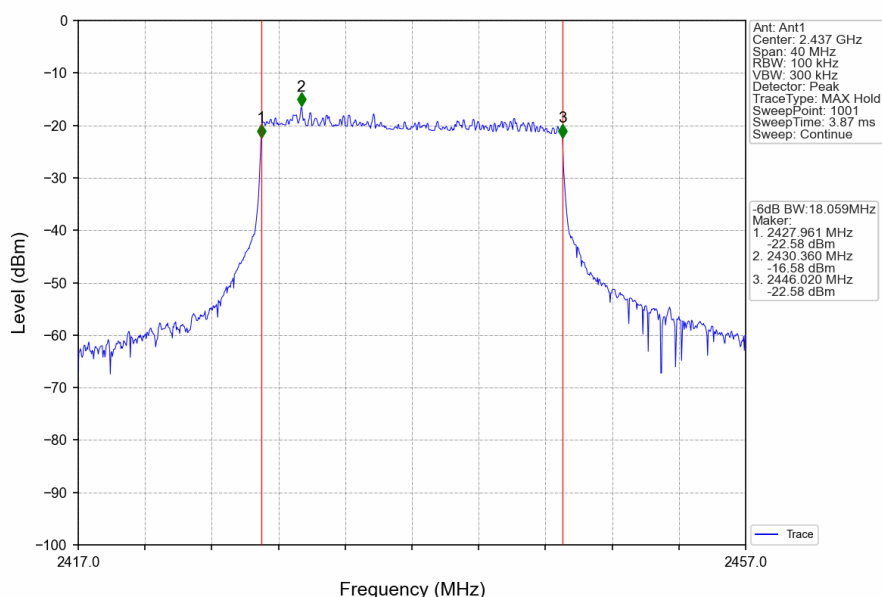
20M_LCH_2412MHz_Ant1_NTNV



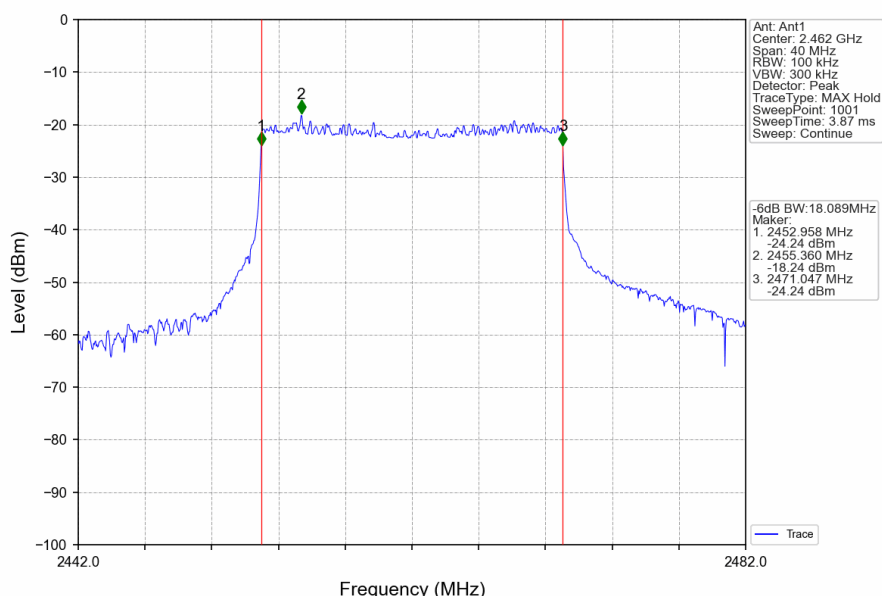
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20M_MCH_2437MHz_Ant1_NTNV



20M_HCH_2462MHz_Ant1_NTNV



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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	
10M	SISO	2409	1.41	<=30	Pass
		2434	2.64	<=30	Pass
		2459	0.62	<=30	Pass
20M	SISO	2412	1.74	<=30	Pass
		2437	2.53	<=30	Pass
		2462	1.18	<=30	Pass

Note1: Antenna Gain: Ant1: 3.80dBi;

4. Maximum Power Spectral Density

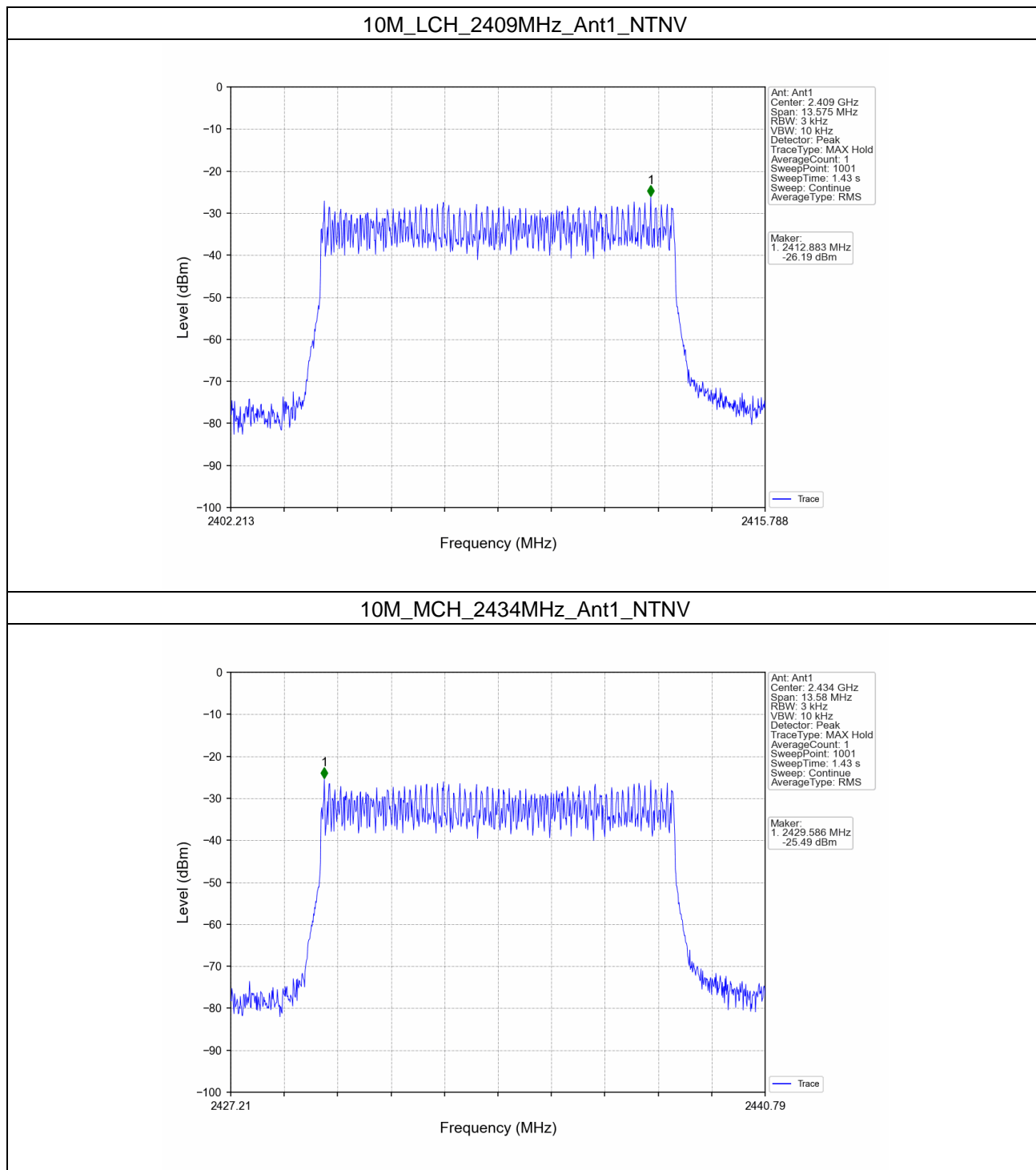
4.1 PSD

4.1.1 Test Result

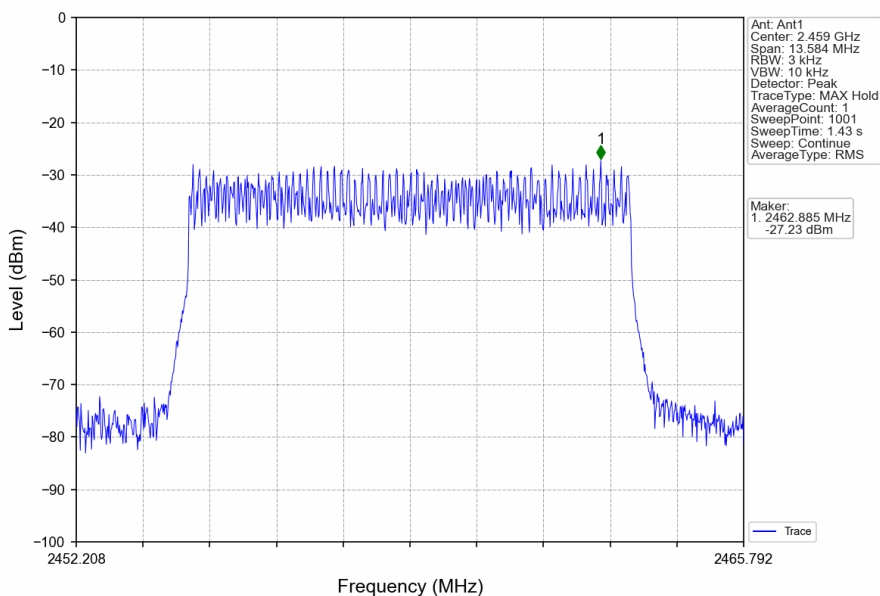
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
10M	SISO	2409	-26.19	<=8	Pass
		2434	-25.49	<=8	Pass
		2459	-27.23	<=8	Pass
20M	SISO	2412	-28.71	<=8	Pass
		2437	-28.27	<=8	Pass
		2462	-29.85	<=8	Pass

Note1: Antenna Gain: Ant1: 3.80dBi;

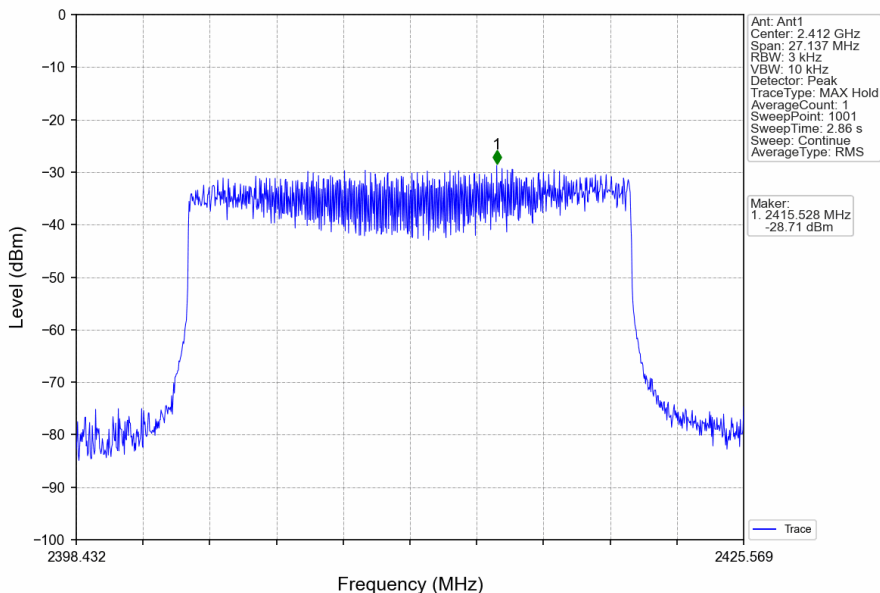
4.1.2 Test Graph



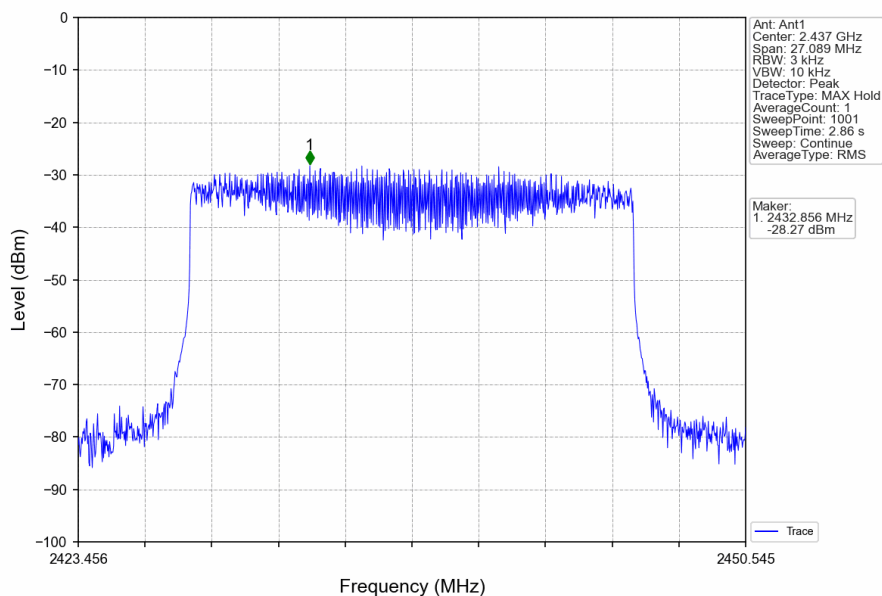
10M_HCH_2459MHz_Ant1_NTNV



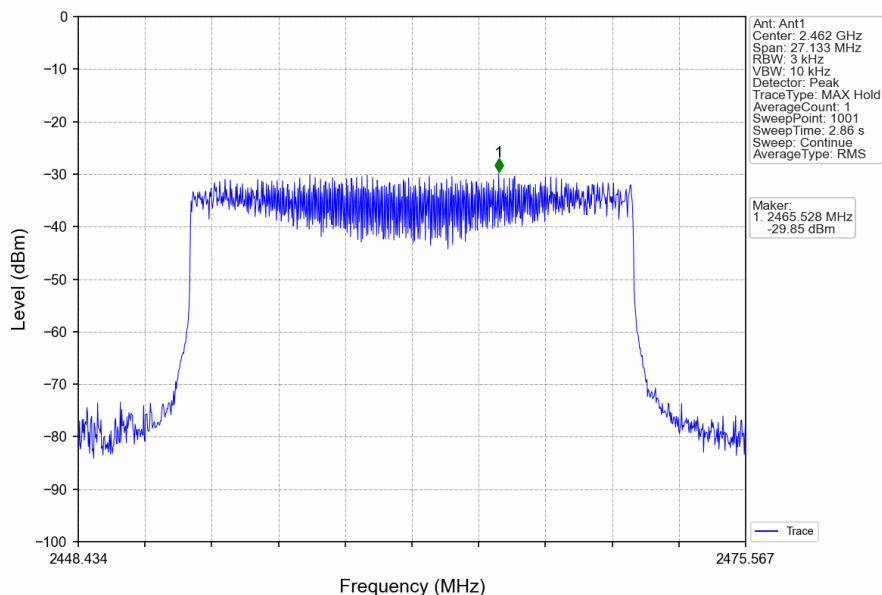
20M_LCH_2412MHz_Ant1_NTNV



20M_MCH_2437MHz_Ant1_NTNV



20M_HCH_2462MHz_Ant1_NTNV



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5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Ref

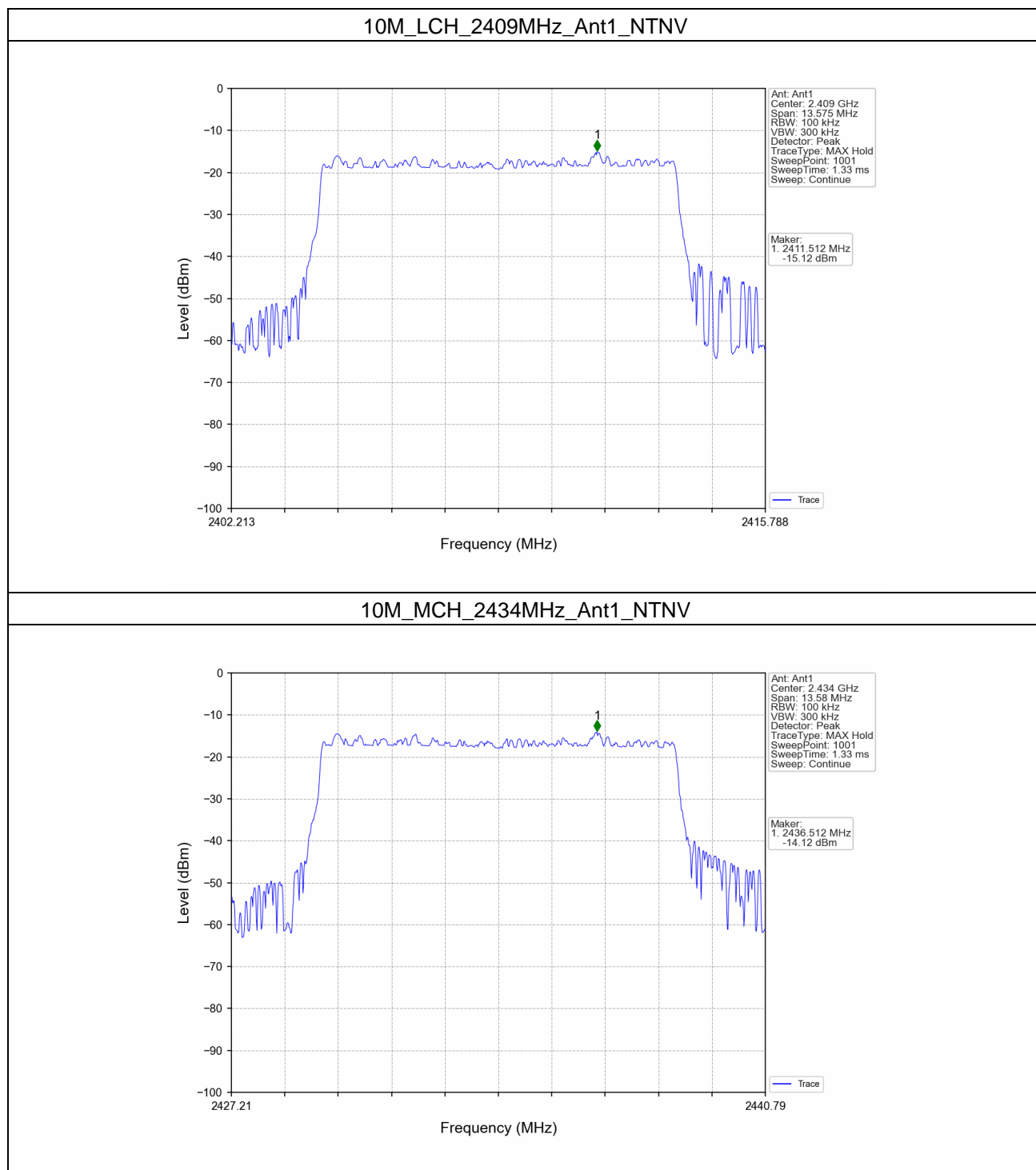
5.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
10M	SISO	2409	1	-15.12
		2434	1	-14.12
		2459	1	-16.11
20M	SISO	2412	1	-18.17
		2437	1	-16.59
		2462	1	-18.30

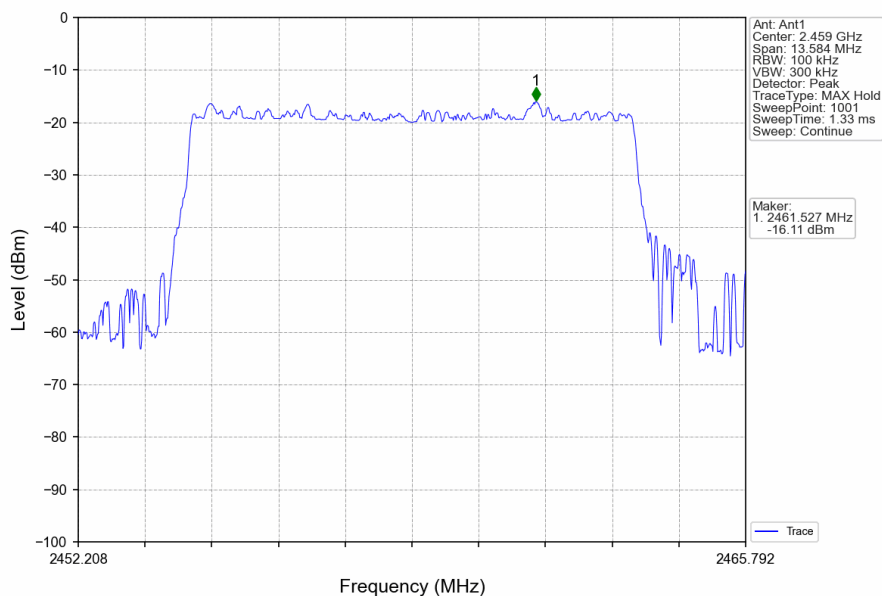
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.

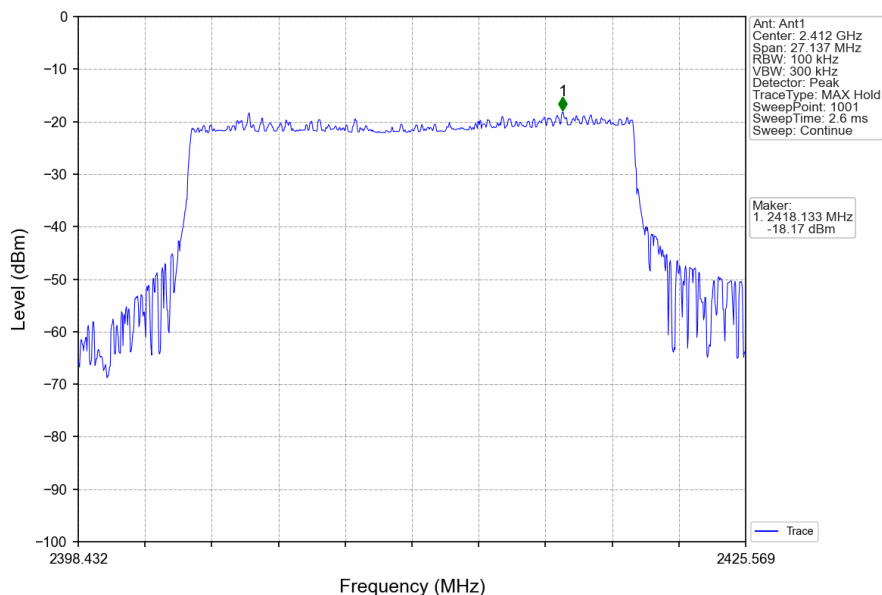
5.1.2 Test Graph



10M_HCH_2459MHz_Ant1_NTNV



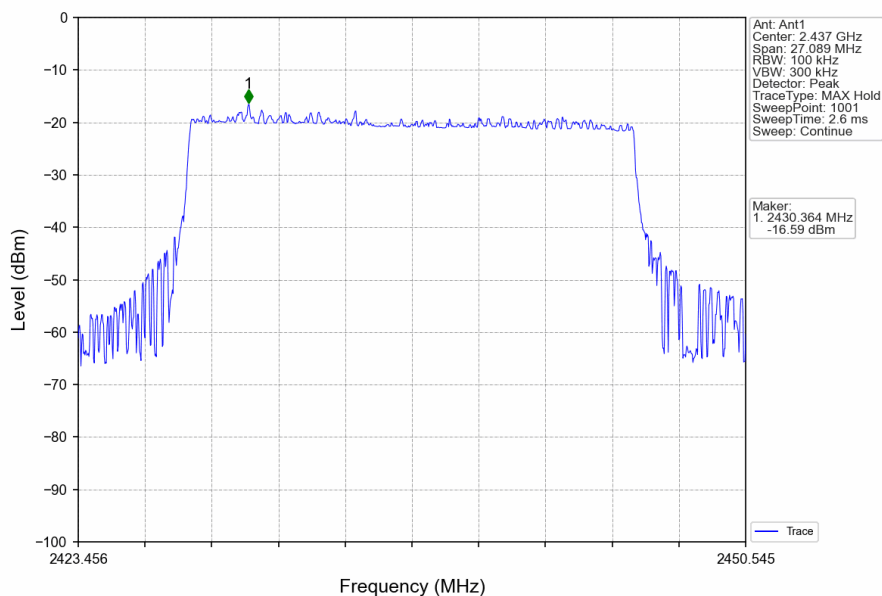
20M_LCH_2412MHz_Ant1_NTNV



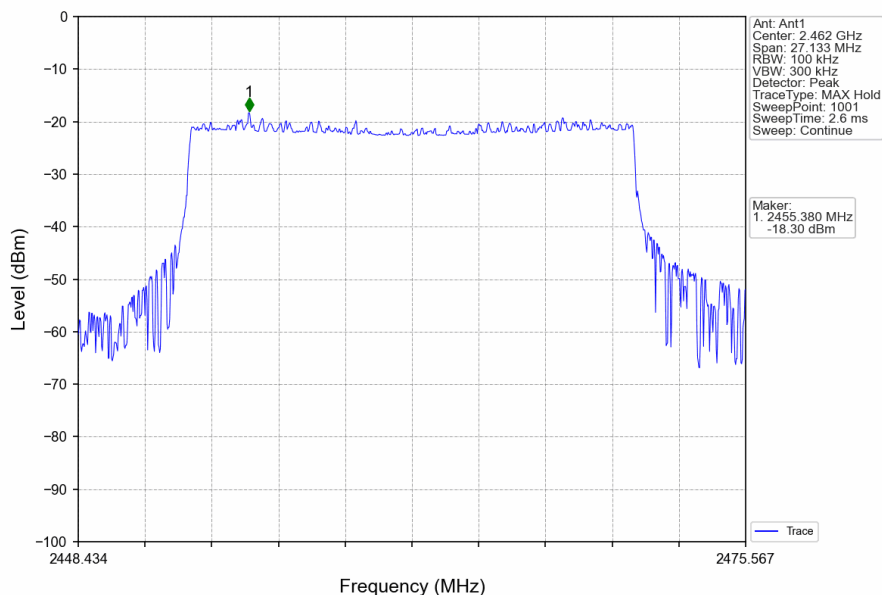
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20M_MCH_2437MHz_Ant1_NTNV



20M_HCH_2462MHz_Ant1_NTNV



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5.2 CSE

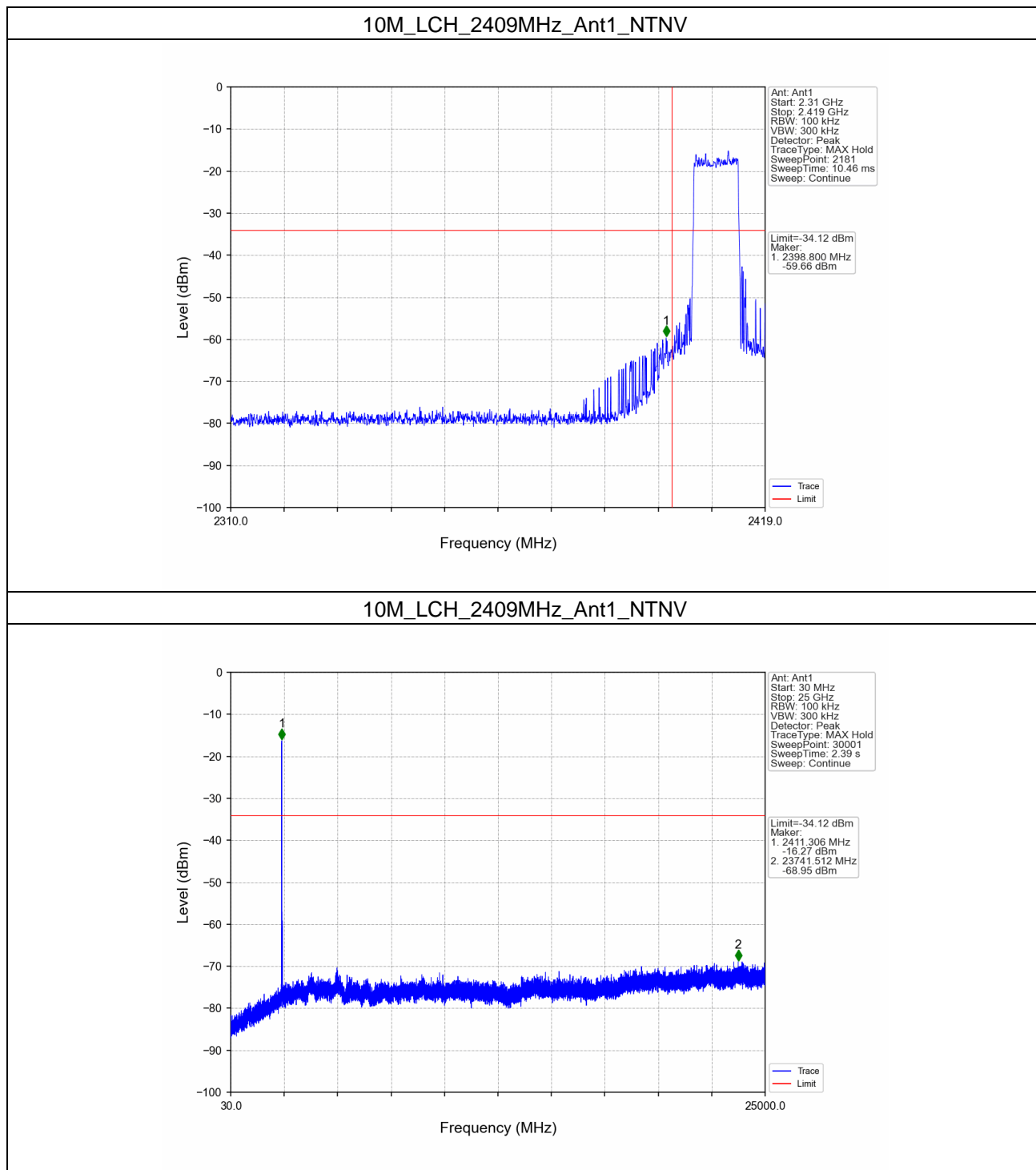
5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
10M	SISO	2409	1	-14.12	-34.12	Pass
		2434	1	-14.12	-34.12	Pass
		2459	1	-14.12	-34.12	Pass
20M	SISO	2412	1	-16.59	-36.59	Pass
		2437	1	-16.59	-36.59	Pass
		2462	1	-16.59	-36.59	Pass

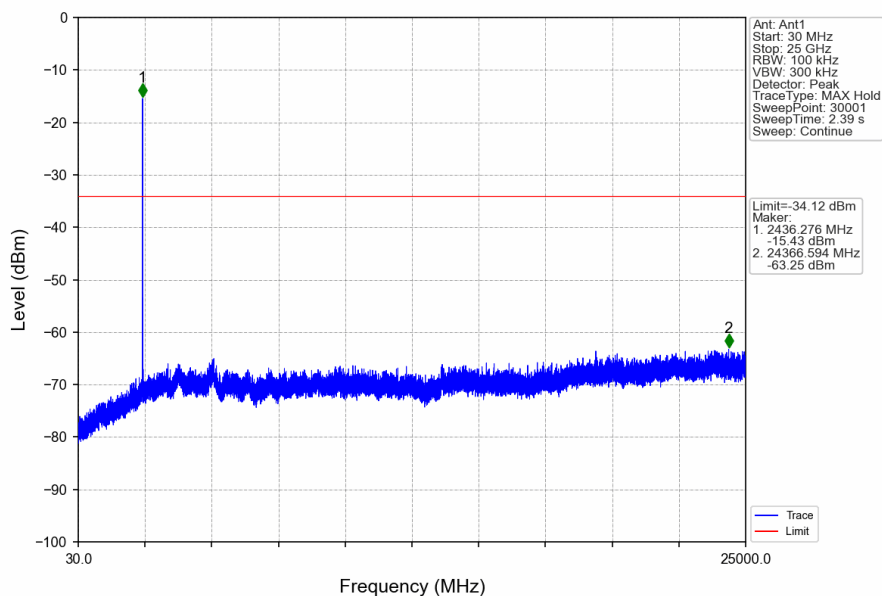
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.

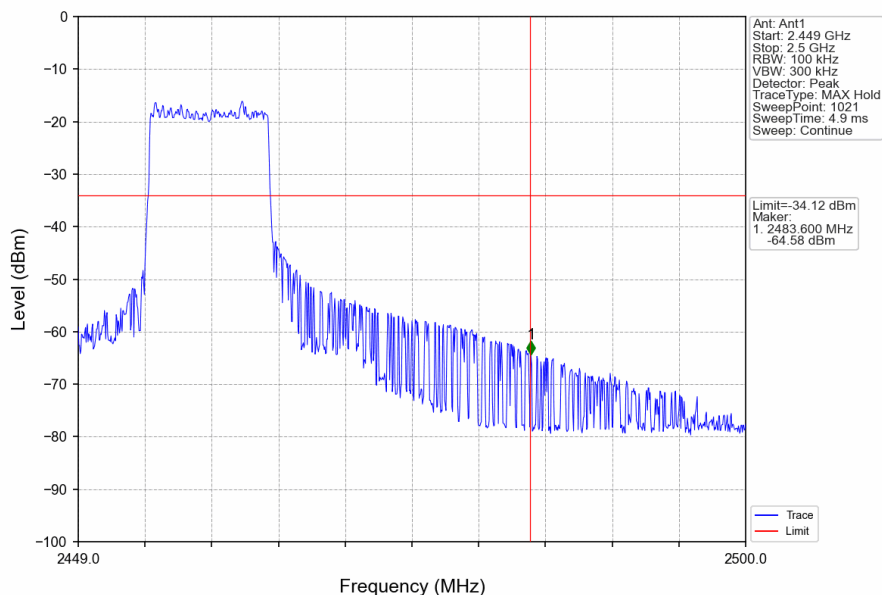
5.2.2 Test Graph



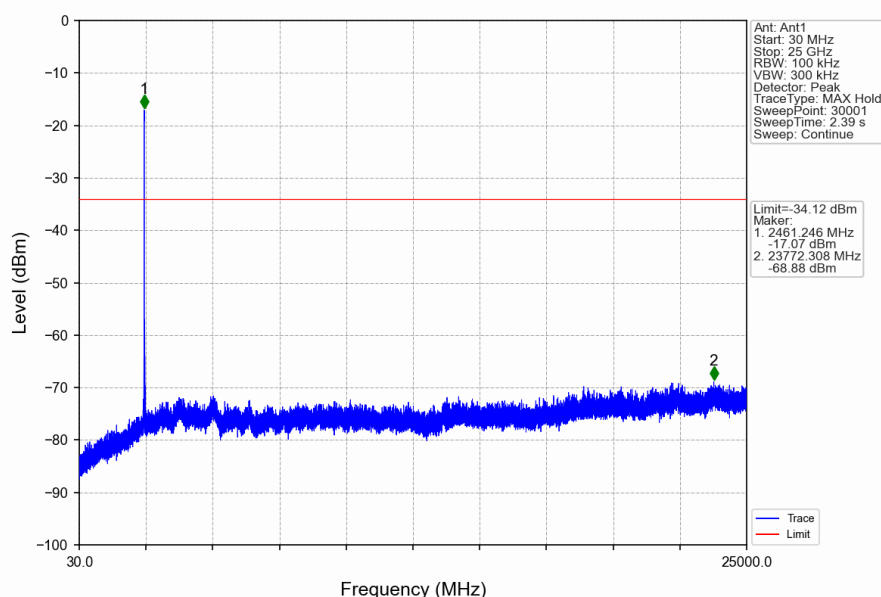
10M_MCH_2434MHz_Ant1_NTNV



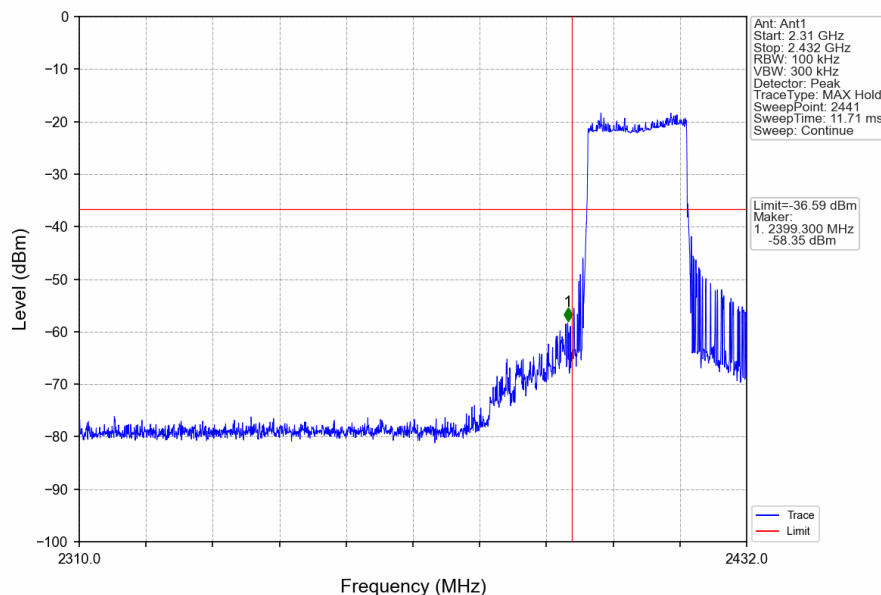
10M_HCH_2459MHz_Ant1_NTNV



10M_HCH_2459MHz_Ant1_NTNV



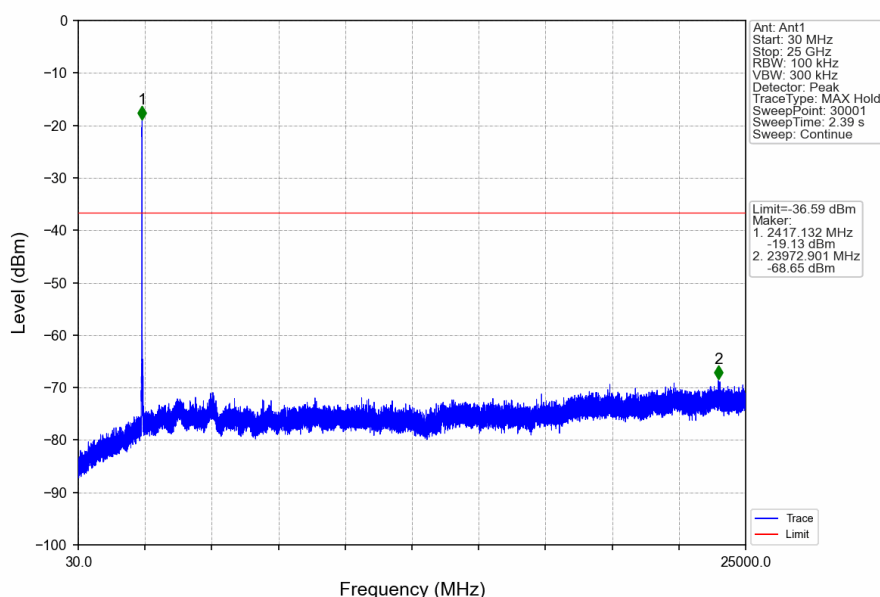
20M_LCH_2412MHz_Ant1_NTNV



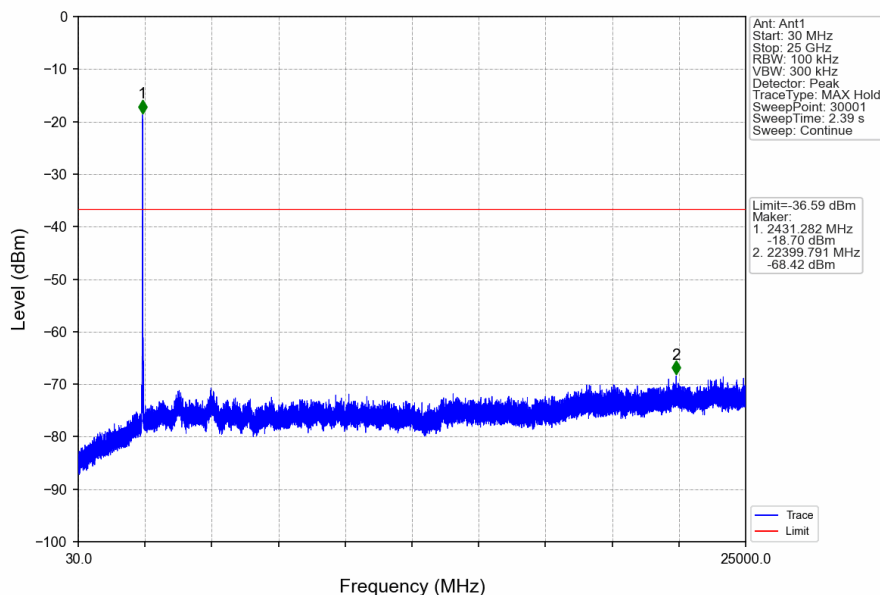
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20M_LCH_2412MHz_Ant1_NTNV



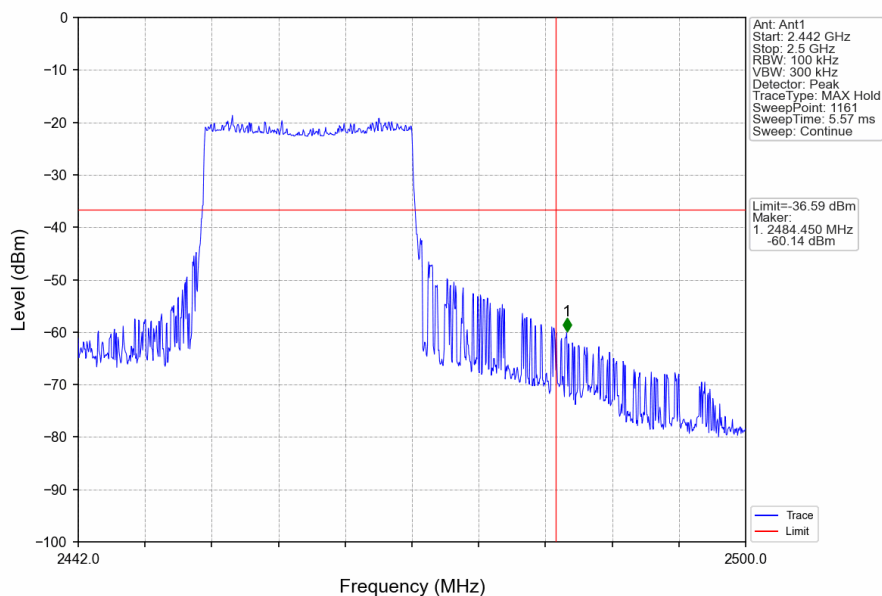
20M_MCH_2437MHz_Ant1_NTNV



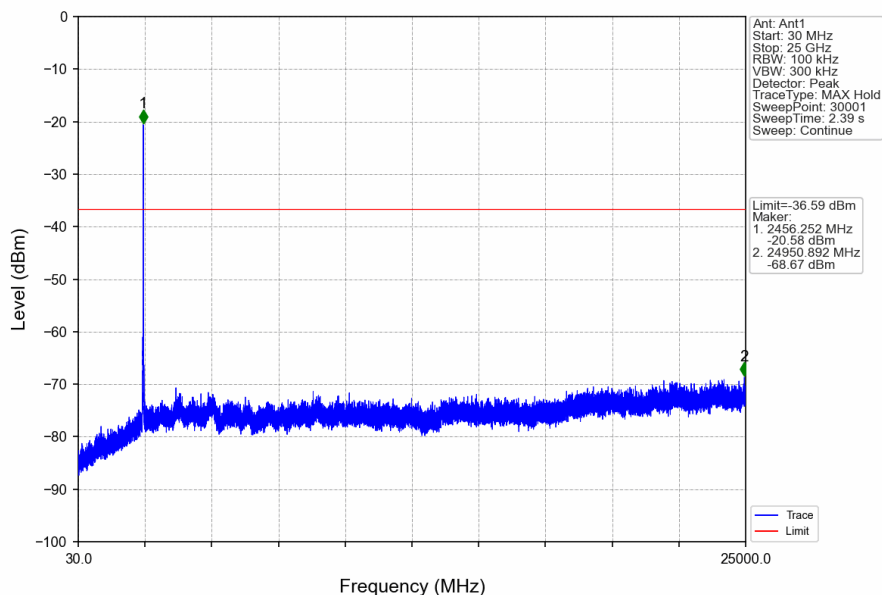
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20M_HCH_2462MHz_Ant1_NTNV



20M_HCH_2462MHz_Ant1_NTNV



- End of the Report -



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