

TEST REPORT

Application No.: GZCR2406000590LM
Applicant: Luxottica Group S.p.A
Address of Applicant: One Icon, Foothill Ranch, California, 92610, United States
Manufacturer: Luxottica Group S.p.A
Address of Manufacturer: One Icon, Foothill Ranch, California, 92610, United States
Product Name: Nuance Audio Glasses
Model No.: AW5002, AW5001, AW5004 ♣
 ♣ Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2024-06-03
Date of Test: 2024-06-07 to 2024-06-24 for test report GZCR240600059003
 2024-10-15 to 2024-10-16 for test report GZCR240600059009
Date of Issue: 2024-12-03

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

Ricky Liu

Ricky Liu
Manager



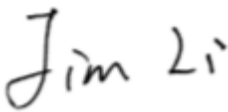
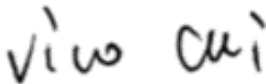
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Revision Record			
Version	Report No.	Date	Remark
01	GZCR240600059003	2024-09-27	Original
02	GZCR240600059009	2024-12-03	Amendment report: Modification of Nuance Audio Glasses

Authorized for issue by			
			
		Jim LiProject 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
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.12	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
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

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.

✦Remark for report GZCR240600059003:

Model No.: AW5002, AW5001, AW5004

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference on appearance color and size.

Therefore, only one model AW5001 was tested in this report.



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♣ Remark for report GZCR240600059009:

This report GZCR240600059009 was an amendment report copied from the GZCR240600059003 original report, in which there some modifications were made in the charging pad.

Considering the change of the EUT, the test Radiated Spurious Emissions Below 1GHz was performed on the EUT after changing in this report and original data is copied from original report GZCR240600059003.



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4 General Information

4.1 Details of E.U.T.

Power supply: Powered by built-in battery as below for glasses:
Model: 400652CNS
Rated: DC 3.87 V, 119mAh, 0.461Wh

Cable(s): None

Test Voltage: DC 3.87 V

Operation Frequency: 2402MHz to 2480MHz for 1 Mbps
2404MHz to 2478MHz for 2 Mbps

Modulation Type: GFSK
40 for 1Mbps

Number of Channels: 37 for 2Mbps (except for 2402MHz, 2426MHz and 2480MHz from 1Mbps channel list)

Channel Spacing: 2MHz

Antenna Type: Integral Antenna

Antenna Gain: -4.3 dBi according to antenna specification

Antenna Number: 1

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Mobile Phone	SAMSUNG	SM-G9508	R28K110W9JV
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ



4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
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)
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	$\pm 0.75\text{dB}$
Remark: The U_{lab} (lab Uncertainty) is less than $U_{\text{CISPR/ETSI}}$ (CISPR/ETSI Uncertainty), so the test results – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.	

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
No.198, Kezhu Road, Science City, Economic & Technological Development Area, Guangzhou,
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No tests were sub-contracted.



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4.5 Test Facility

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

● ACMA

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

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

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

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

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

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

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

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

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

● CBTL (Lab Code: TL129)

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

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

For test report GZCR240600059003

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

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



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RF Conducted Test					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2136	2023-11-02	2025-11-01
4X4 Power sensor Unit	TST	TSPS2023R	EMC2257	2023-08-23	2024-08-22
MXG Vector Signal Generator	Keysight	N5182B	EMC2258	2023-08-23	2024-08-22
Test Software	TST	V2.0	GZE100-82	N/A	N/A
EXA Signal Analyzer	Agilent Technologies	N9010A	EMC2222	2024-06-17	2025-06-16

For test report GZCR240600059009

Radiated Spurious Emissions Below 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
966 Anechoic Chamber	Shenzhen C.R.T	CRTSGSSAC966	EMC2230	2022-04-12	2025-04-11
EMI Test Receiver(1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2229	2024-02-19	2025-02-18
Amplifier(9k-1000MHz)	SONOMA	310	EMC2237	2024-03-22	2025-03-21
TRILOG Broadband Antenna (25M-2GHz)	SCHWRZBECK	VULB 9168	EMC2238	2022-04-20	2025-04-19
Coaxial Cable	Mirco-COAX UTIFLEX ve	LA2-C125-8000	EMC2239	2023-06-14	2025-06-13
Test Software E3	Audix	Ver.6.191211	GZE100-81	N/A	N/A
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2024-04-08	2026-04-07

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2024-06-13	2025-06-12



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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 -4.3 dBi.

Antenna location: Refer to internal photo.

7 Radio Spectrum Matter Test Results

7.1 Radiated Emissions which fall in the restricted bands

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

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

Limit:

Test Distance: 3 m

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

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

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 26.0 °C Humidity: 57.6 % RH Atmospheric Pressure: 1003 mbar

7.1.2 Test Mode Description

Pre-scan / Mode	Description
Final test Code	
Final test 00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.
Pre-scan 01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.



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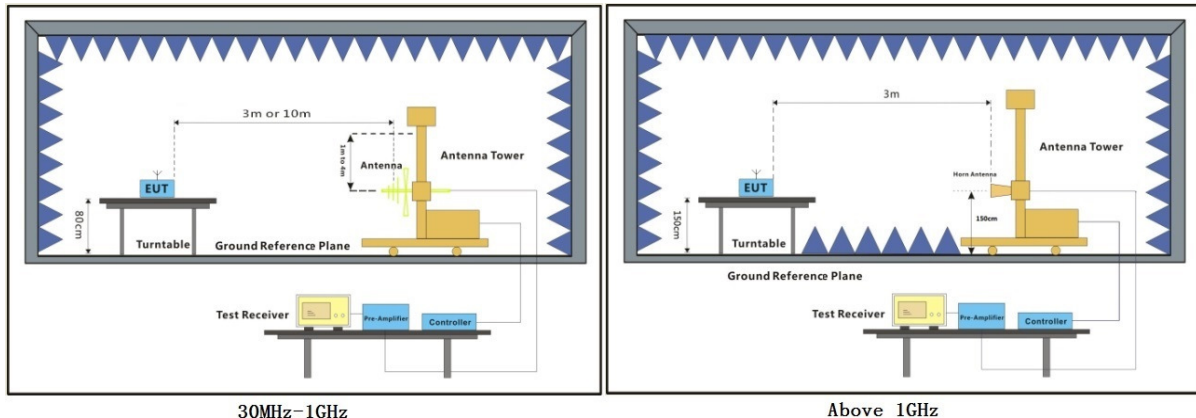
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7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

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

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

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



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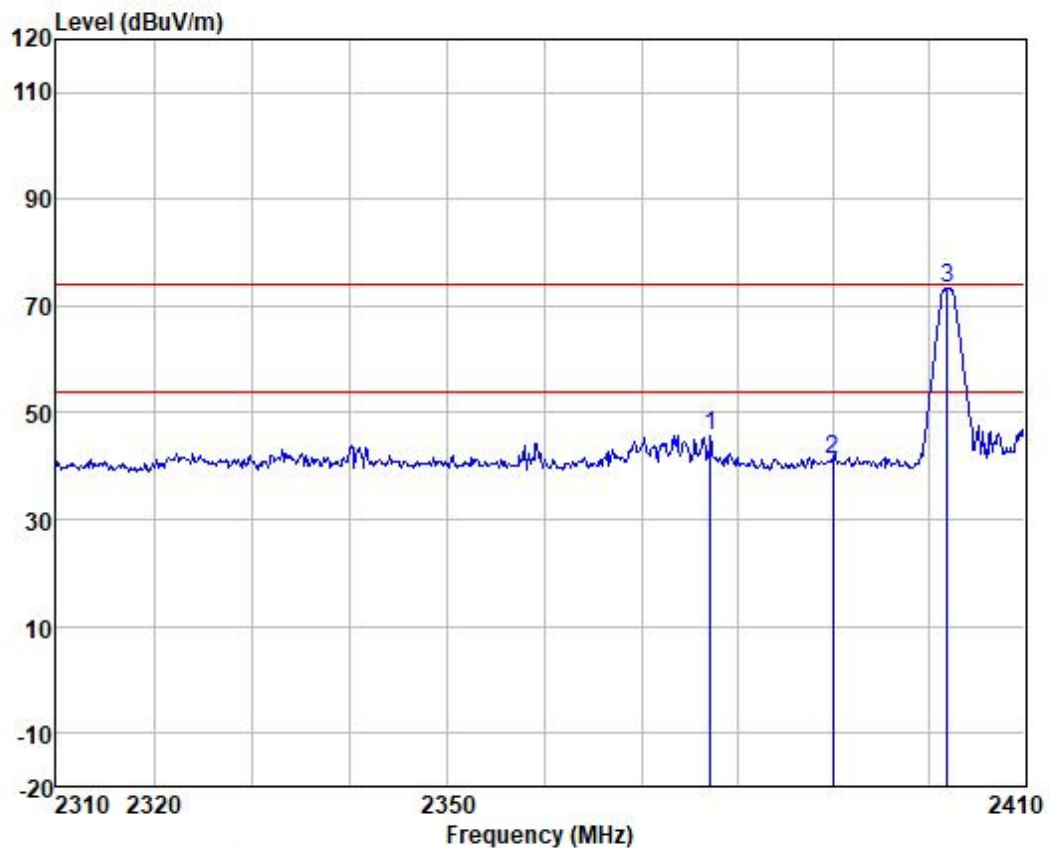
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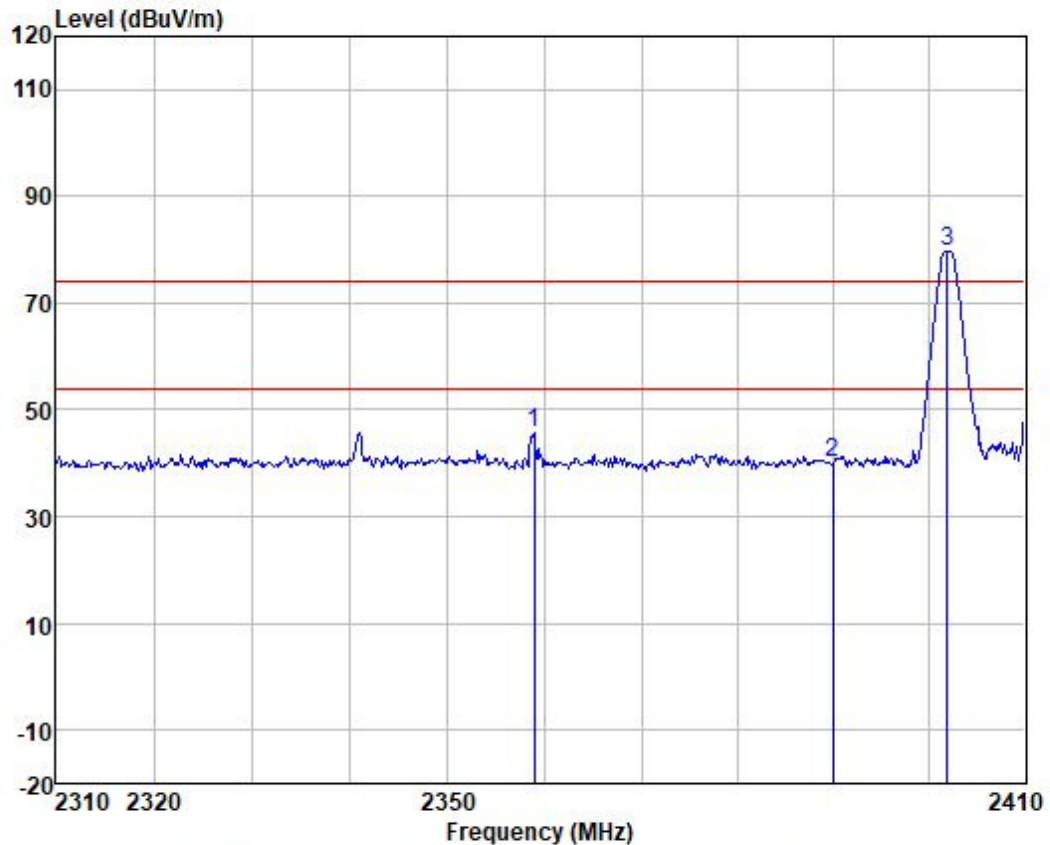
Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel: Low



	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	dB		
1	2377.135	51.78	27.67	3.53	37.22	45.76	74.00	-28.24	VERTICAL peak
2	2390.000	47.40	27.68	3.54	37.21	41.41	74.00	-32.59	VERTICAL peak
3	2402.000	79.10	27.71	3.56	37.21	73.16	74.00	-0.84	VERTICAL peak



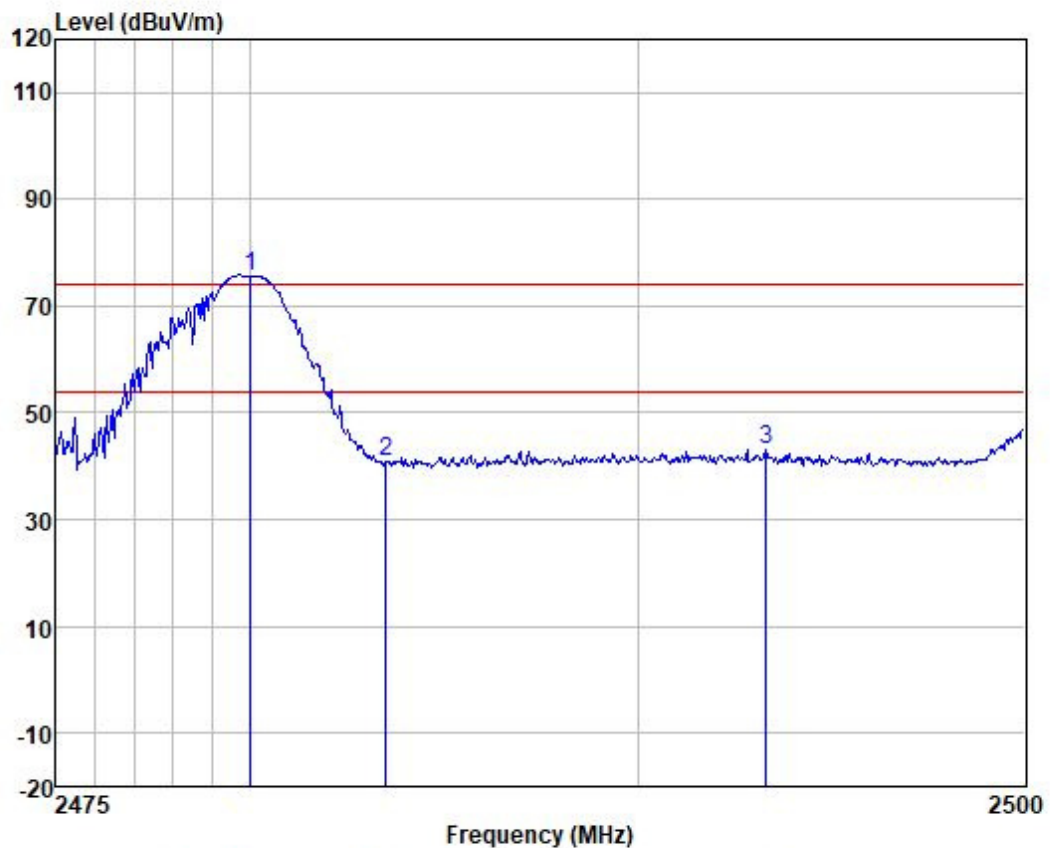
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



	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	2358.870	52.00	27.62	3.50	37.23	45.89	74.00	-28.11	HORIZONTAL peak
2	2390.000	46.00	27.68	3.54	37.21	40.01	74.00	-33.99	HORIZONTAL peak
3 *	2402.000	85.47	27.71	3.56	37.21	79.53	74.00	5.53	HORIZONTAL peak



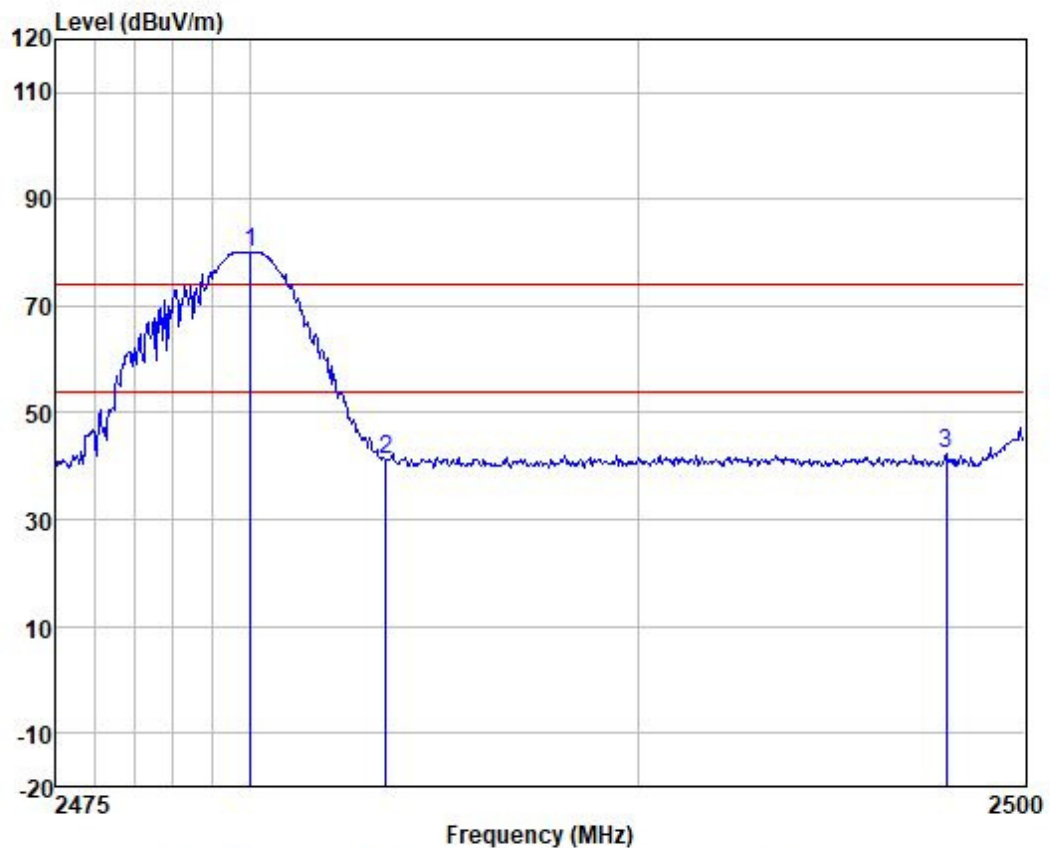
Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel: High



	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	dB		
1 *	2480.000	81.31	27.84	3.72	37.19	75.68	74.00	1.68	VERTICAL peak
2	2483.500	46.41	27.85	3.74	37.19	40.81	74.00	-33.19	VERTICAL peak
3	2493.325	48.78	27.86	3.75	37.18	43.21	74.00	-30.79	VERTICAL peak



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



	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	dB		
1 *	2480.000	85.68	27.84	3.72	37.19	80.05	74.00	6.05	HORIZONTAL peak
2	2483.500	46.77	27.85	3.74	37.19	41.17	74.00	-32.83	HORIZONTAL peak
3	2497.991	48.06	27.87	3.76	37.18	42.51	74.00	-31.49	HORIZONTAL peak



7.2 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

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22.4 °C

Humidity: 52.7 % RH

Atmospheric Pressure: 1003 mbar

7.2.2 Test Mode Description

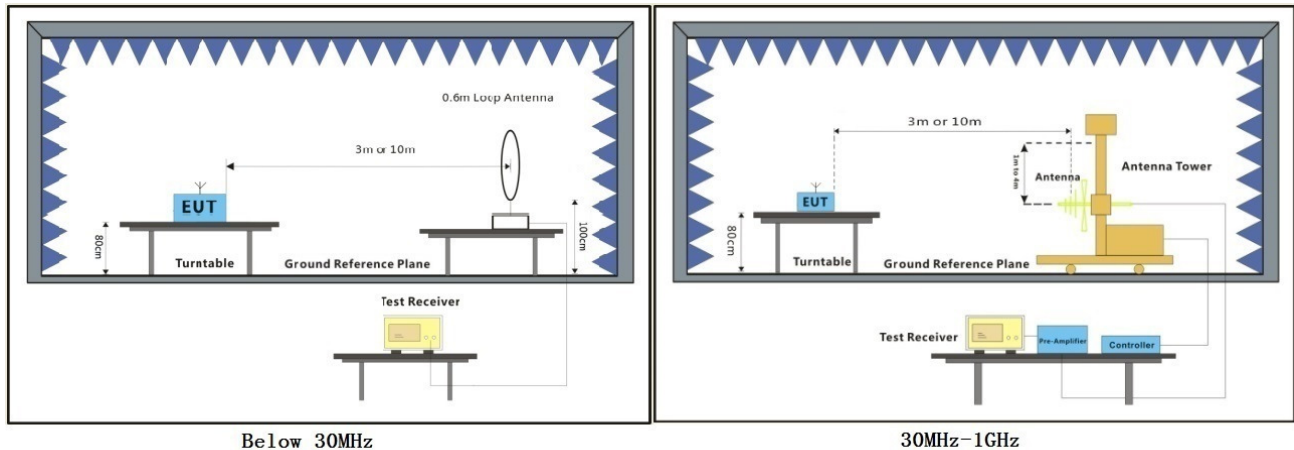
Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.



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7.2.3 Test Setup Diagram



7.2.4 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:

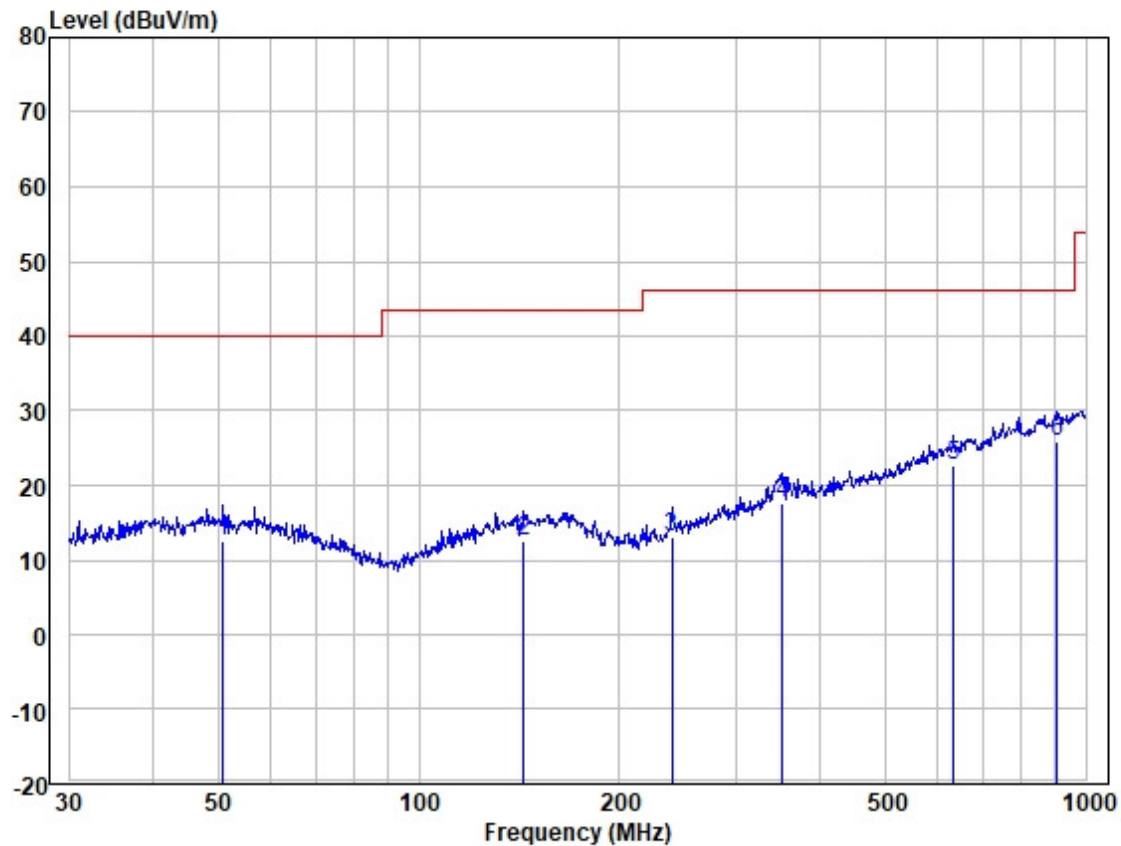
- Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from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



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Test Mode: 00; Polarity: Horizontal

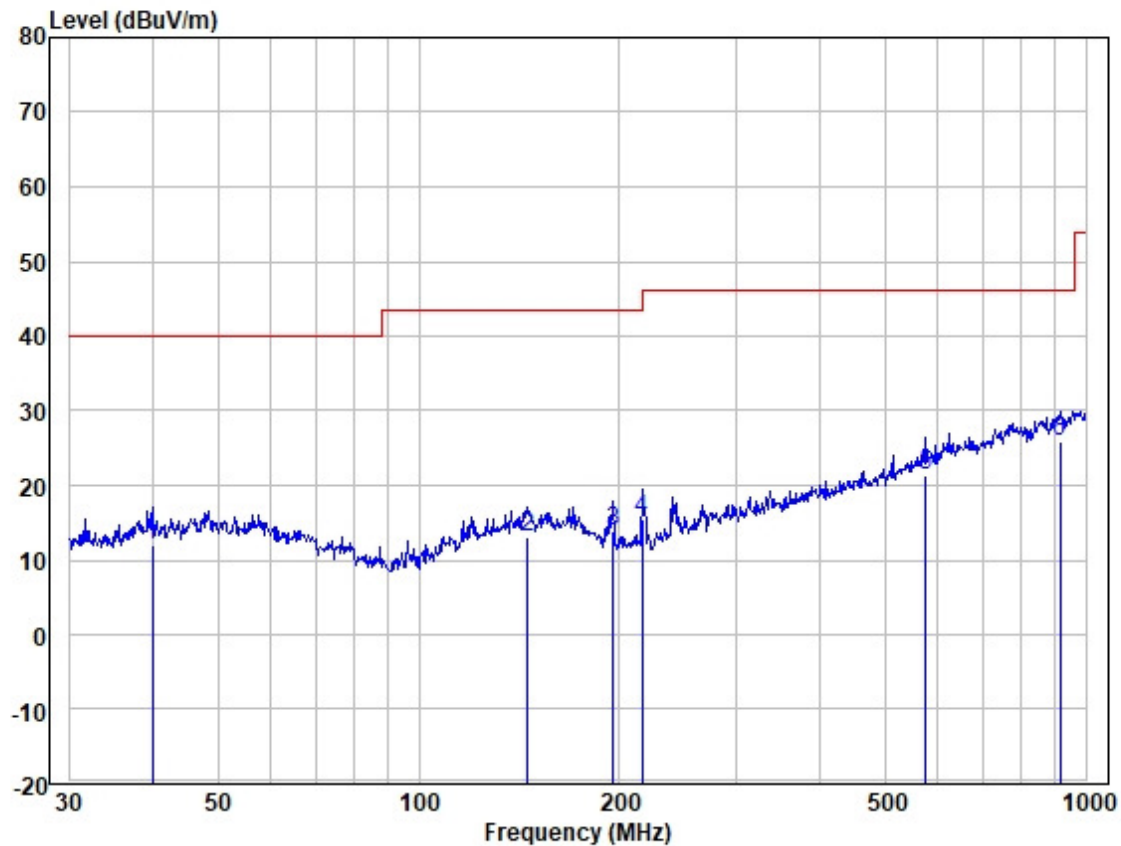


Site : 966 Chamber
Job :
Model :
Power :
Test Mode : normal working

	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	50.942	25.34	19.50	0.39	32.80	12.43	40.00	-27.57	HORIZONTAL	QP
2	143.830	25.85	18.77	0.65	32.80	12.47	43.52	-31.05	HORIZONTAL	QP
3	239.987	27.77	17.27	0.85	32.80	13.09	46.02	-32.93	HORIZONTAL	QP
4	350.477	28.96	20.29	1.07	32.80	17.52	46.02	-28.50	HORIZONTAL	QP
5	633.907	27.57	26.43	1.46	32.85	22.61	46.02	-23.41	HORIZONTAL	QP
6	906.482	26.32	29.48	1.76	31.57	25.99	46.02	-20.03	HORIZONTAL	QP



Test Mode: 00; Polarity: Vertical



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

	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	39.854	25.35	19.09	0.35	32.83	11.96	40.00	-28.04	VERTICAL	QP
2	145.861	26.38	18.83	0.66	32.80	13.07	43.52	-30.45	VERTICAL	QP
3	195.822	29.97	15.86	0.78	32.80	13.81	43.52	-29.71	VERTICAL	QP
4	216.024	31.70	15.66	0.81	32.80	15.37	46.02	-30.65	VERTICAL	QP
5	574.626	27.82	25.12	1.41	32.90	21.45	46.02	-24.57	VERTICAL	QP
6	912.862	26.04	29.51	1.77	31.54	25.78	46.02	-20.24	VERTICAL	QP



7.3 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

7.3.1 E.U.T. Operation

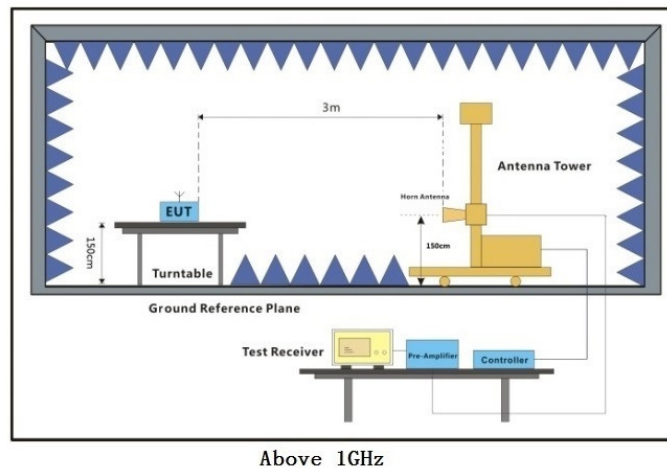
Operating Environment:

Temperature: 26.0 °C Humidity: 57.6 % RH Atmospheric Pressure: 1003 mbar

7.3.2 Test Mode Description

Pre-scan / Mode	Description
Final test Code	
Final test 00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.
Pre-scan 01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

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

Remark:

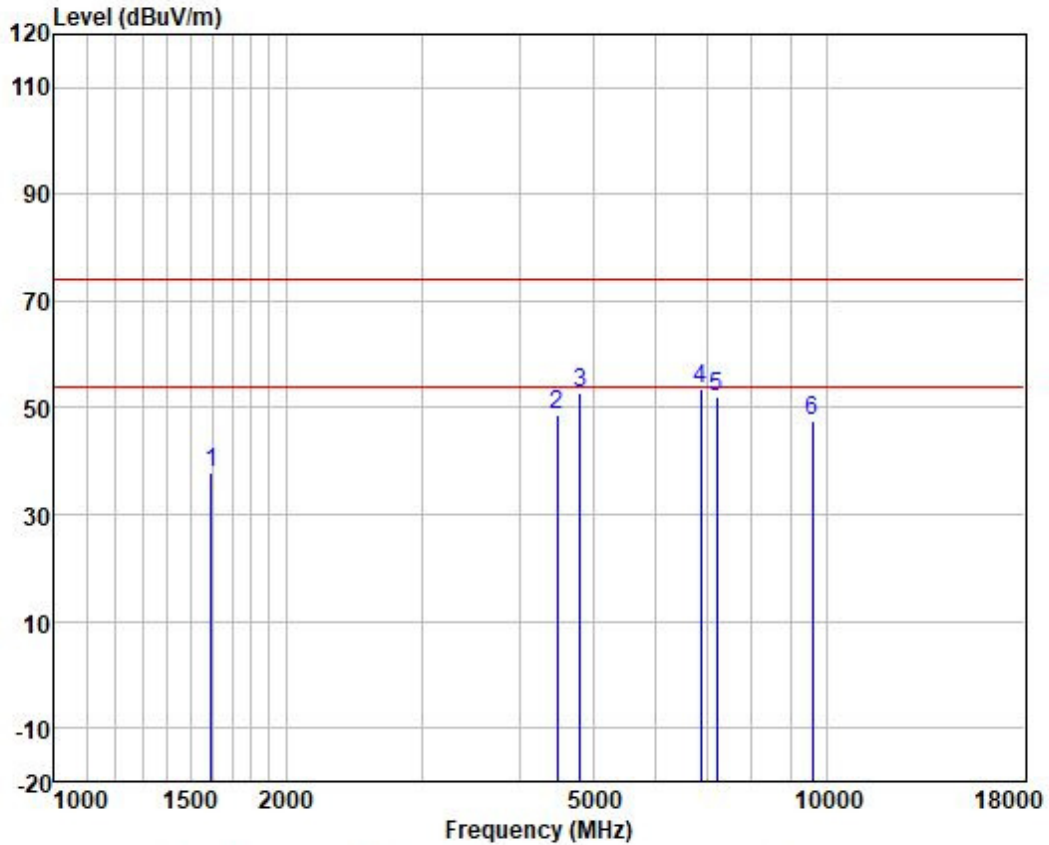
1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from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



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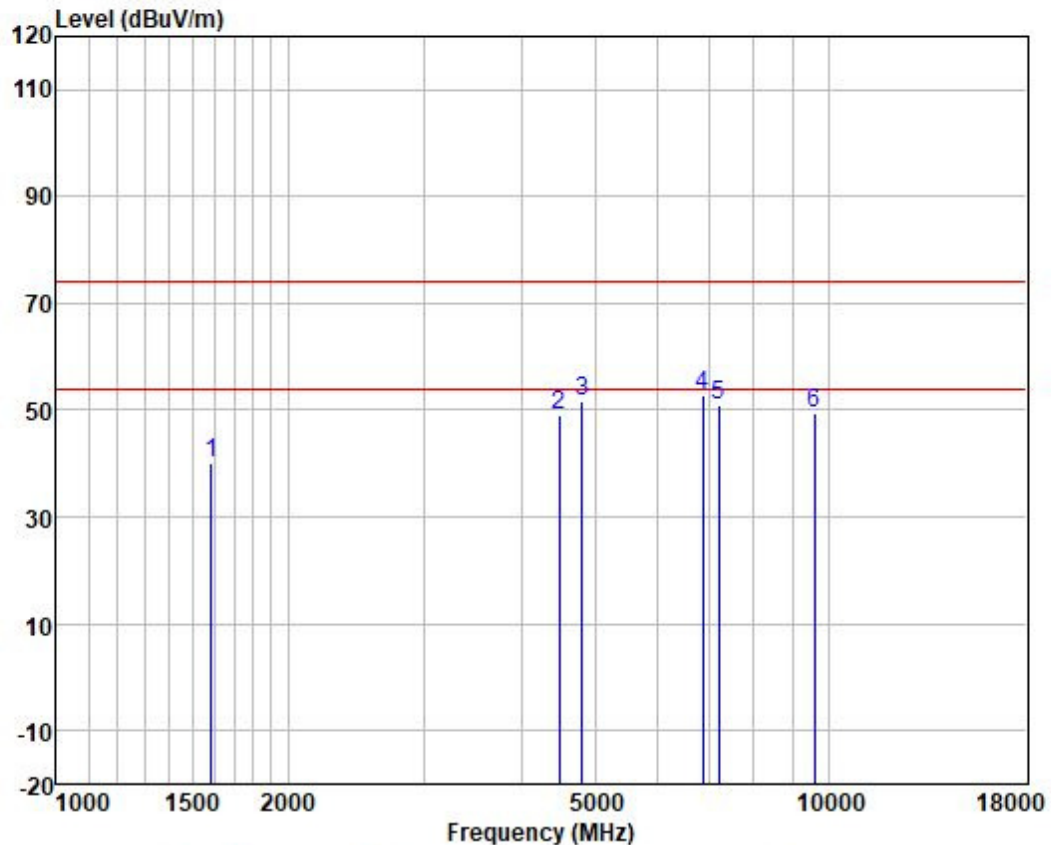
Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel: Low



	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
	MHz	Level	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1597.181	47.65	24.68	3.12	37.45	38.00	74.00	-36.00	VERTICAL peak
2	4482.150	45.36	34.12	5.80	36.63	48.65	74.00	-25.35	VERTICAL peak
3	4804.000	49.61	34.16	5.85	36.66	52.96	74.00	-21.04	VERTICAL peak
4	6874.906	47.92	34.88	7.46	36.87	53.39	74.00	-20.61	VERTICAL peak
5	7206.000	46.01	35.63	7.53	36.93	52.24	74.00	-21.76	VERTICAL peak
6	9608.000	37.78	38.68	8.10	36.82	47.74	74.00	-26.26	VERTICAL peak



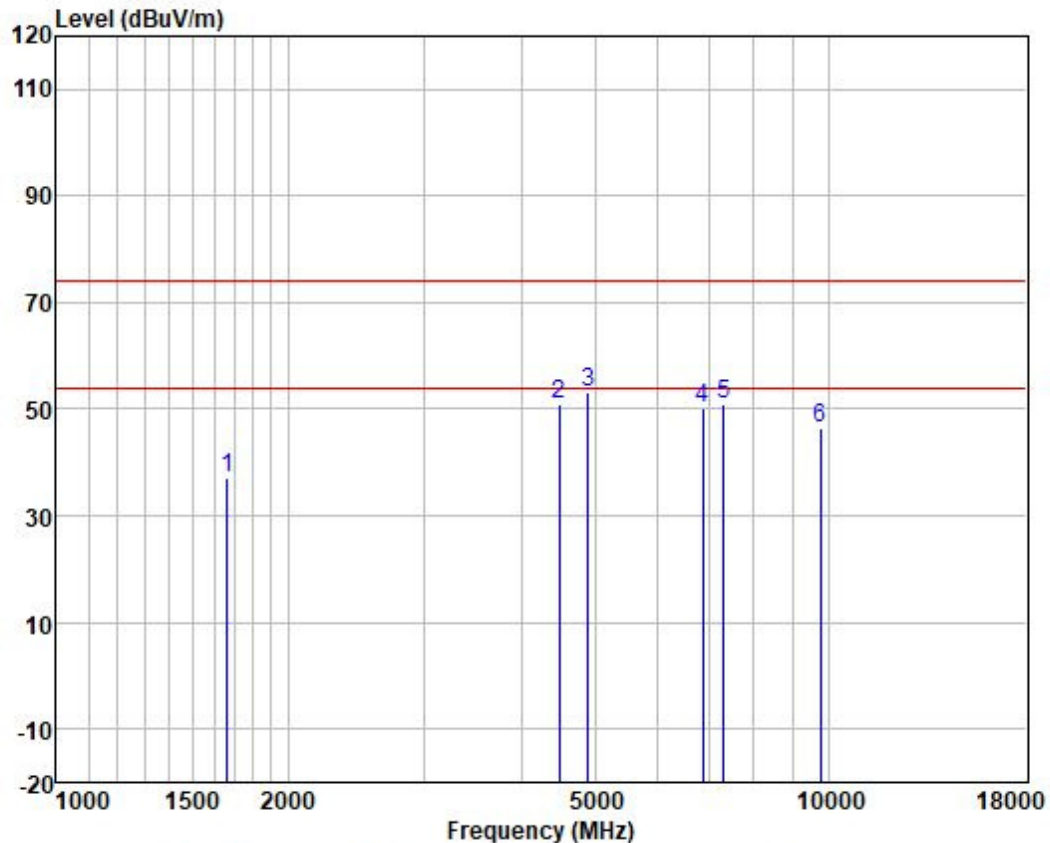
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



	Freq	ReadAntenna	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	1587.975	49.64	24.65	3.12	37.45	39.96	74.00	-34.04	HORIZONTAL peak
2	4482.150	45.81	34.12	5.80	36.63	49.10	74.00	-24.90	HORIZONTAL peak
3	4804.000	48.42	34.16	5.85	36.66	51.77	74.00	-22.23	HORIZONTAL peak
4	6874.906	47.32	34.88	7.46	36.87	52.79	74.00	-21.21	HORIZONTAL peak
5	7206.000	44.80	35.63	7.53	36.93	51.03	74.00	-22.97	HORIZONTAL peak
6	9608.000	39.36	38.68	8.10	36.82	49.32	74.00	-24.68	HORIZONTAL peak



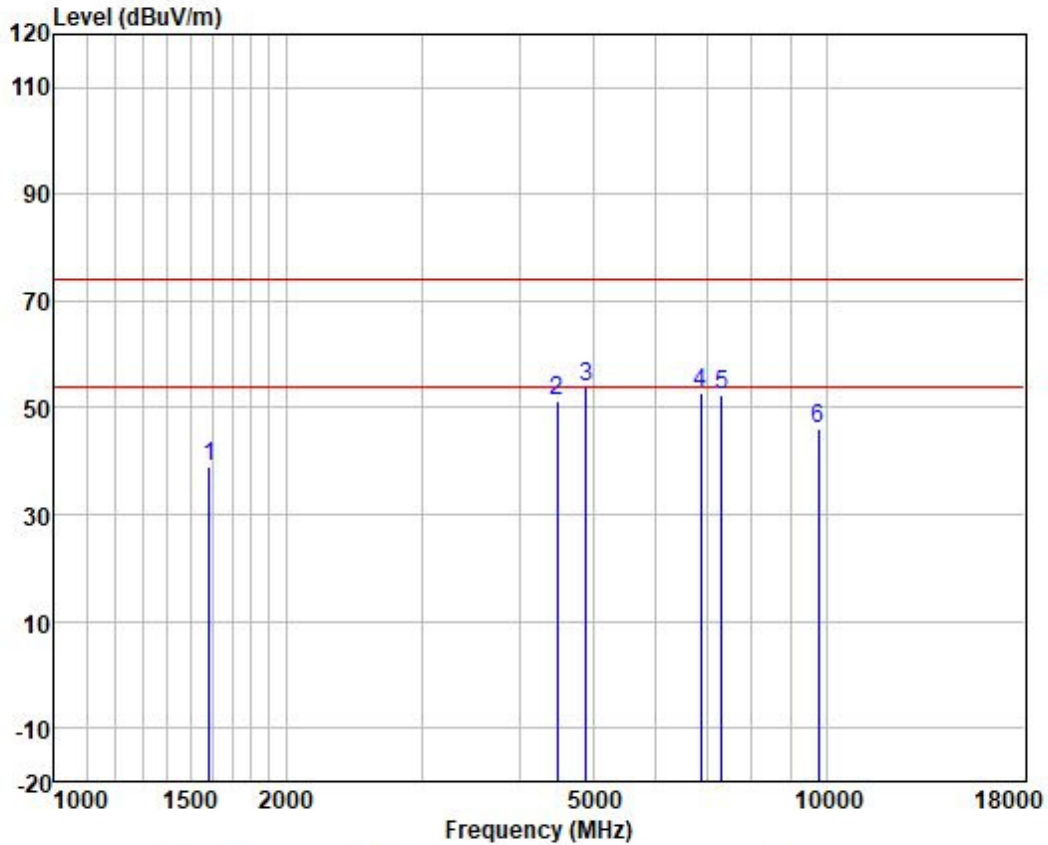
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
		dBuV	dB/m	dB	dB	dBuV/m	dB		
1	1663.137	46.54	24.93	3.16	37.41	37.22	74.00	-36.78	VERTICAL peak
2	4482.150	47.46	34.12	5.80	36.63	50.75	74.00	-23.25	VERTICAL peak
3	4880.000	49.95	34.15	5.85	36.67	53.28	74.00	-20.72	VERTICAL peak
4	6874.906	44.78	34.88	7.46	36.87	50.25	74.00	-23.75	VERTICAL peak
5	7320.000	44.40	36.07	7.55	36.95	51.07	74.00	-22.93	VERTICAL peak
6	9760.000	36.38	38.81	8.17	36.81	46.55	74.00	-27.45	VERTICAL peak



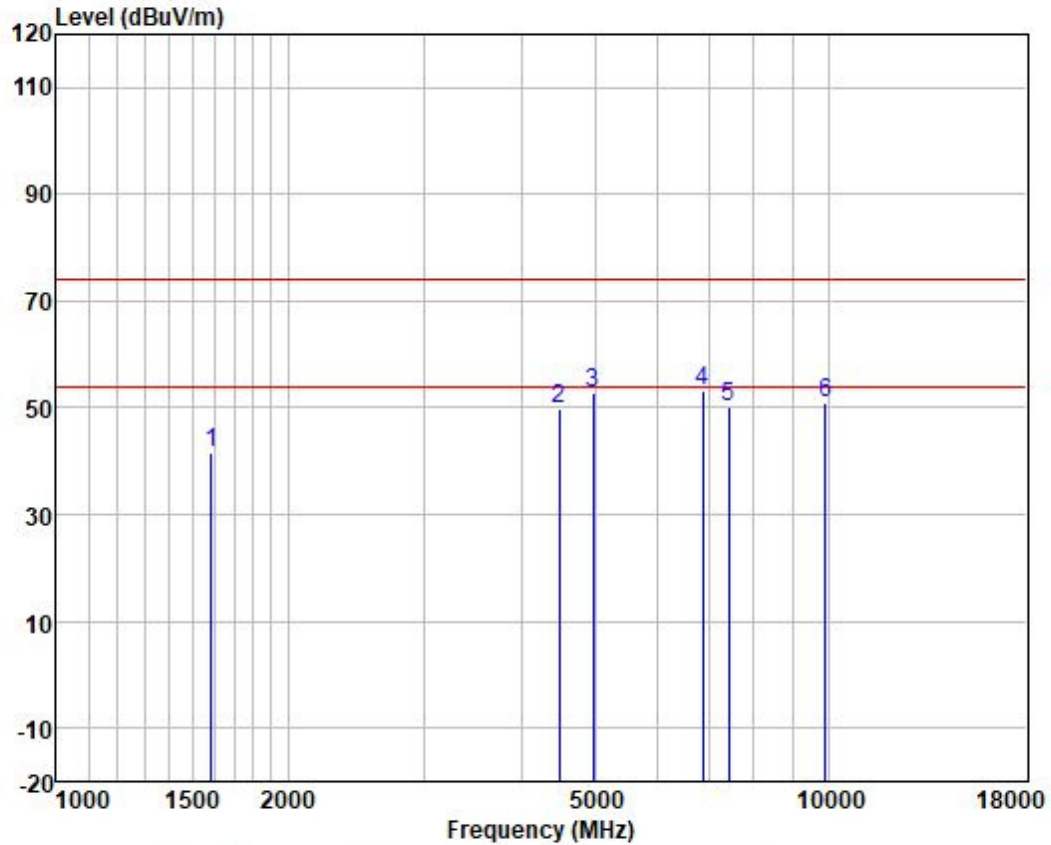
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
	MHz	Level	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
		dBuV	dB/m	dB	dB	dBuV/m	dB		
1	1587.975	48.55	24.65	3.12	37.45	38.87	74.00	-35.13	HORIZONTAL peak
2	4482.150	47.88	34.12	5.80	36.63	51.17	74.00	-22.83	HORIZONTAL peak
3	4880.000	50.60	34.15	5.85	36.67	53.93	74.00	-20.07	HORIZONTAL peak
4	6874.906	47.27	34.88	7.46	36.87	52.74	74.00	-21.26	HORIZONTAL peak
5	7320.000	45.69	36.07	7.55	36.95	52.36	74.00	-21.64	HORIZONTAL peak
6	9760.000	36.05	38.81	8.17	36.81	46.22	74.00	-27.78	HORIZONTAL peak



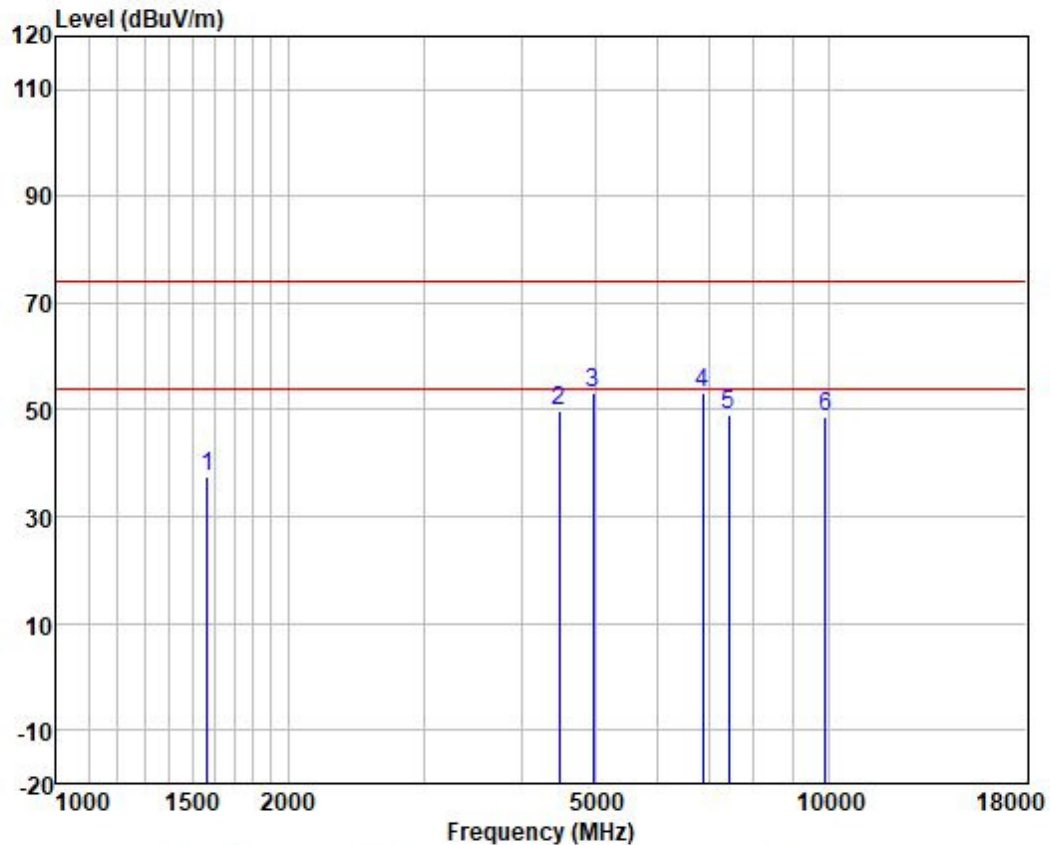
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	1587.975	51.18	24.65	3.12	37.45	41.50	74.00	-32.50	VERTICAL peak
2	4482.150	46.36	34.12	5.80	36.63	49.65	74.00	-24.35	VERTICAL peak
3	4960.000	49.41	34.15	5.86	36.69	52.73	74.00	-21.27	VERTICAL peak
4	6874.906	47.69	34.88	7.46	36.87	53.16	74.00	-20.84	VERTICAL peak
5	7440.000	43.35	36.33	7.58	36.96	50.30	74.00	-23.70	VERTICAL peak
6	9920.000	40.48	38.95	8.23	36.80	50.86	74.00	-23.14	VERTICAL peak



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



	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
	MHz	Level	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1569.721	47.16	24.60	3.10	37.47	37.39	74.00	-36.61	HORIZONTAL peak
2	4482.150	46.37	34.12	5.80	36.63	49.66	74.00	-24.34	HORIZONTAL peak
3	4960.000	49.88	34.15	5.86	36.69	53.20	74.00	-20.80	HORIZONTAL peak
4	6874.906	47.59	34.88	7.46	36.87	53.06	74.00	-20.94	HORIZONTAL peak
5	7440.000	42.28	36.33	7.58	36.96	49.23	74.00	-24.77	HORIZONTAL peak
6	9920.000	38.42	38.95	8.23	36.80	48.80	74.00	-25.20	HORIZONTAL peak



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7.4 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

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C

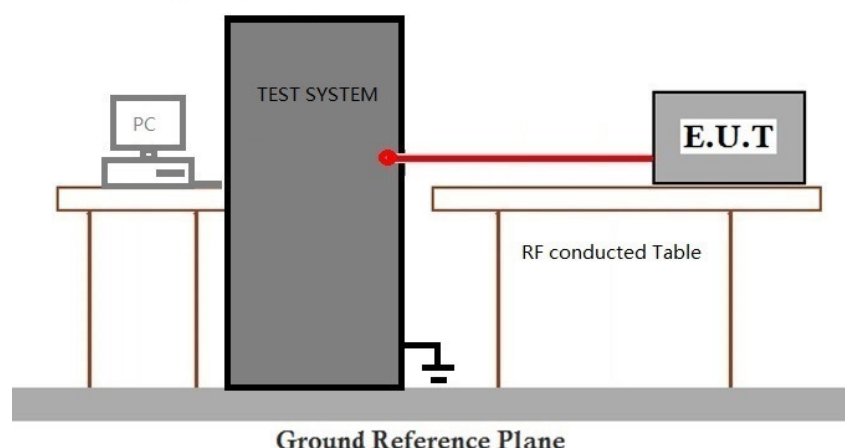
Humidity: 64.3 % RH

Atmospheric Pressure: 1003 mbar

7.4.2 Test Mode Description

Pre-scan / Mode	Description
Final test Code	
Final test 00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.
Final test 01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.

7.4.3 Test Setup Diagram



7.4.4 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



7.5 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

7.5.1 E.U.T. Operation

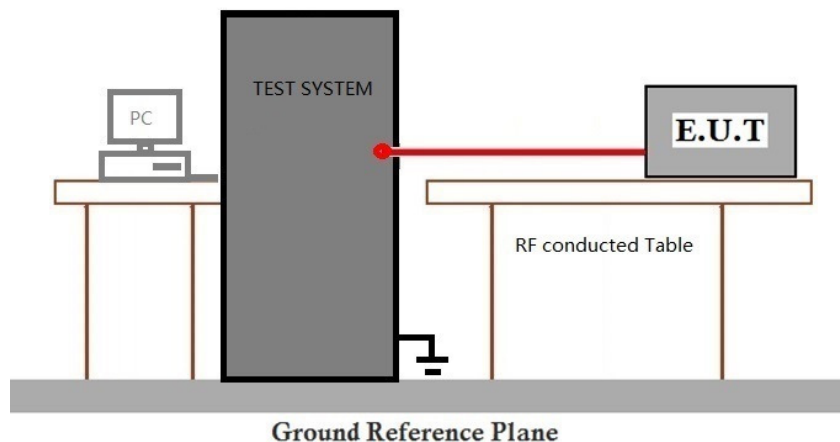
Operating Environment:

Temperature: 23.6 °C Humidity: 64.3 % RH Atmospheric Pressure: 1003 mbar

7.5.2 Test Mode Description

Pre-scan / Mode	Description
Final test Code	
Final test 00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.
Final test 01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.

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 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

7.6.1 E.U.T. Operation

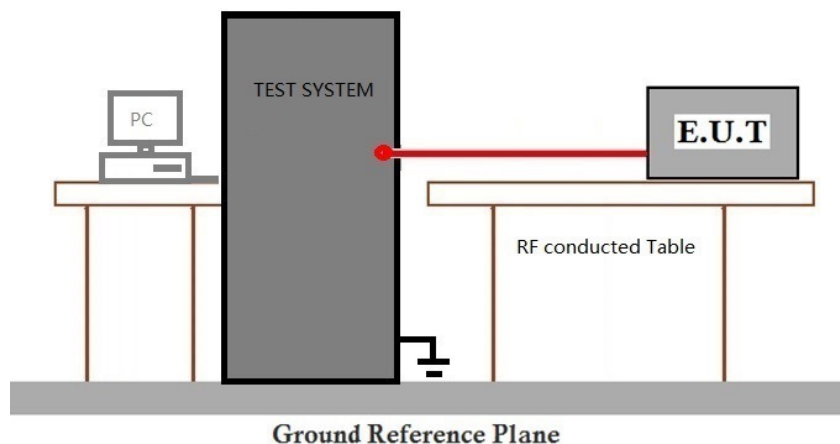
Operating Environment:

Temperature: 23.6 °C Humidity: 64.3 % RH Atmospheric Pressure: 1003 mbar

7.6.2 Test Mode Description

Pre-scan / Mode	Description
Final test Code	
Final test 00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.
Final test 01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.

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 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)).

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C

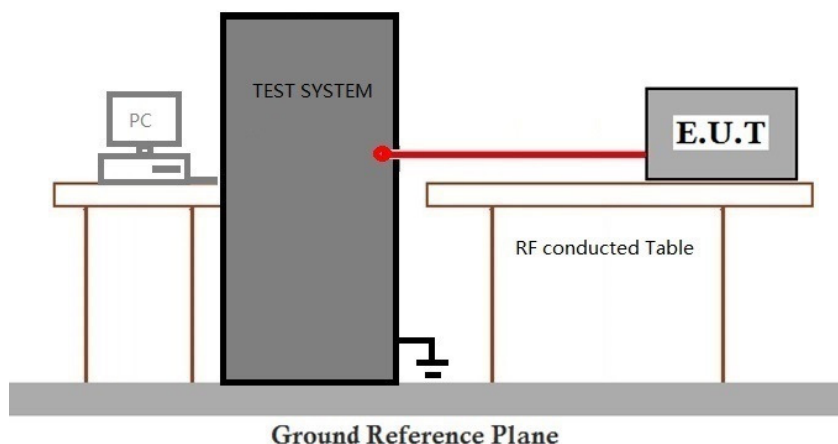
Humidity: 64.3 % RH

Atmospheric Pressure: 1003 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.

7.7.3 Test Setup Diagram



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7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details



7.8 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)).

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C

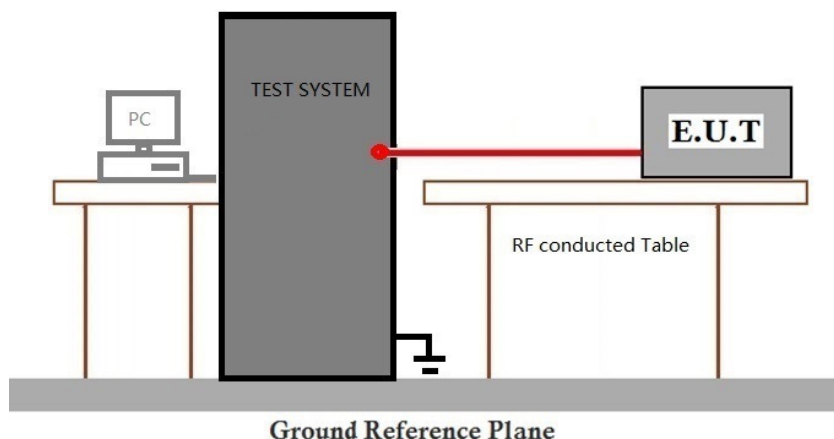
Humidity: 64.3 % RH

Atmospheric Pressure: 1003 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation for glasses.

7.8.3 Test Setup Diagram



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EMC-TRF-01 Rev 1.1

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7.8.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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8 Test Setup Photo

Refer to Setup Photos for GZCR240600059009



9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2406000590LM



10 Appendix

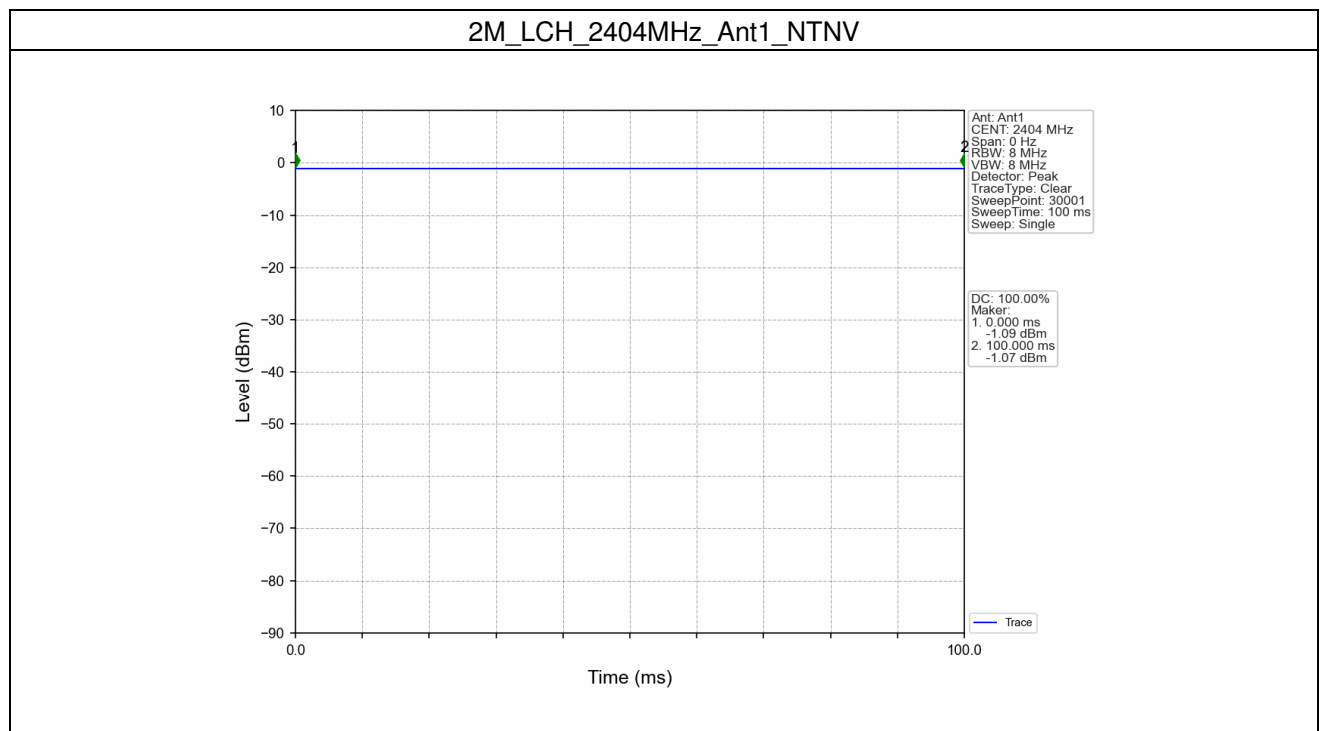
1. Duty Cycle

1.1 Ant1

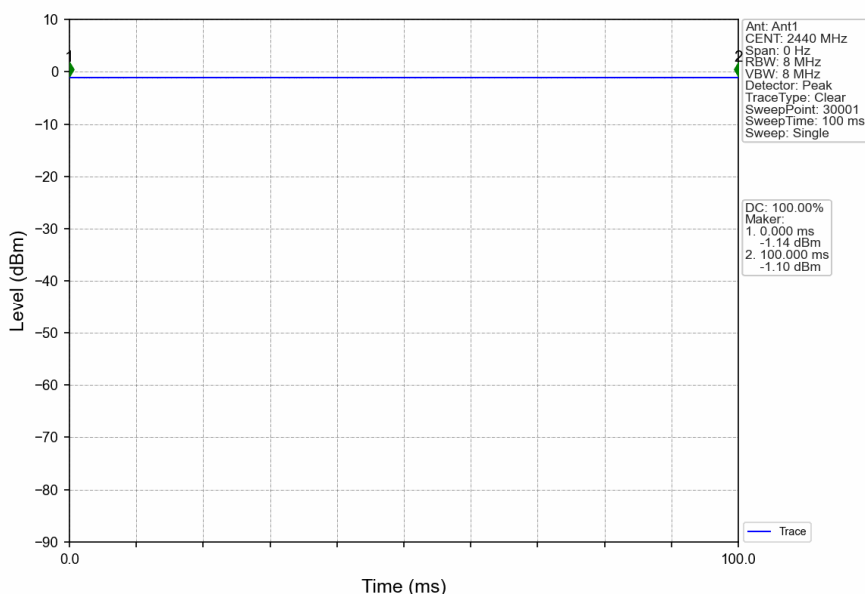
1.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
2M	SISO	2404	100.000	100.000	100.00	0.00	0.00
		2440	100.000	100.000	100.00	0.00	0.00
		2478	100.000	100.000	100.00	0.00	0.00

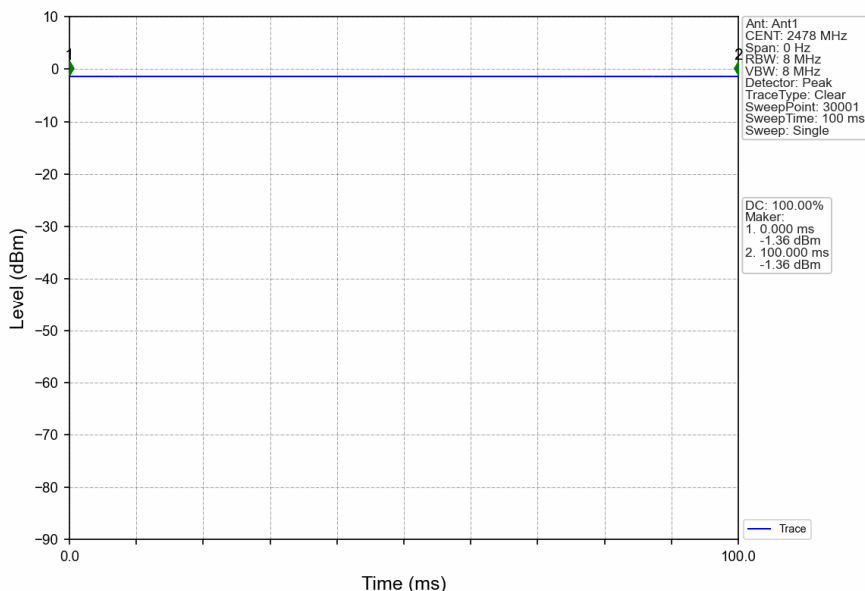
1.1.2 Test Graph



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV



2. Bandwidth

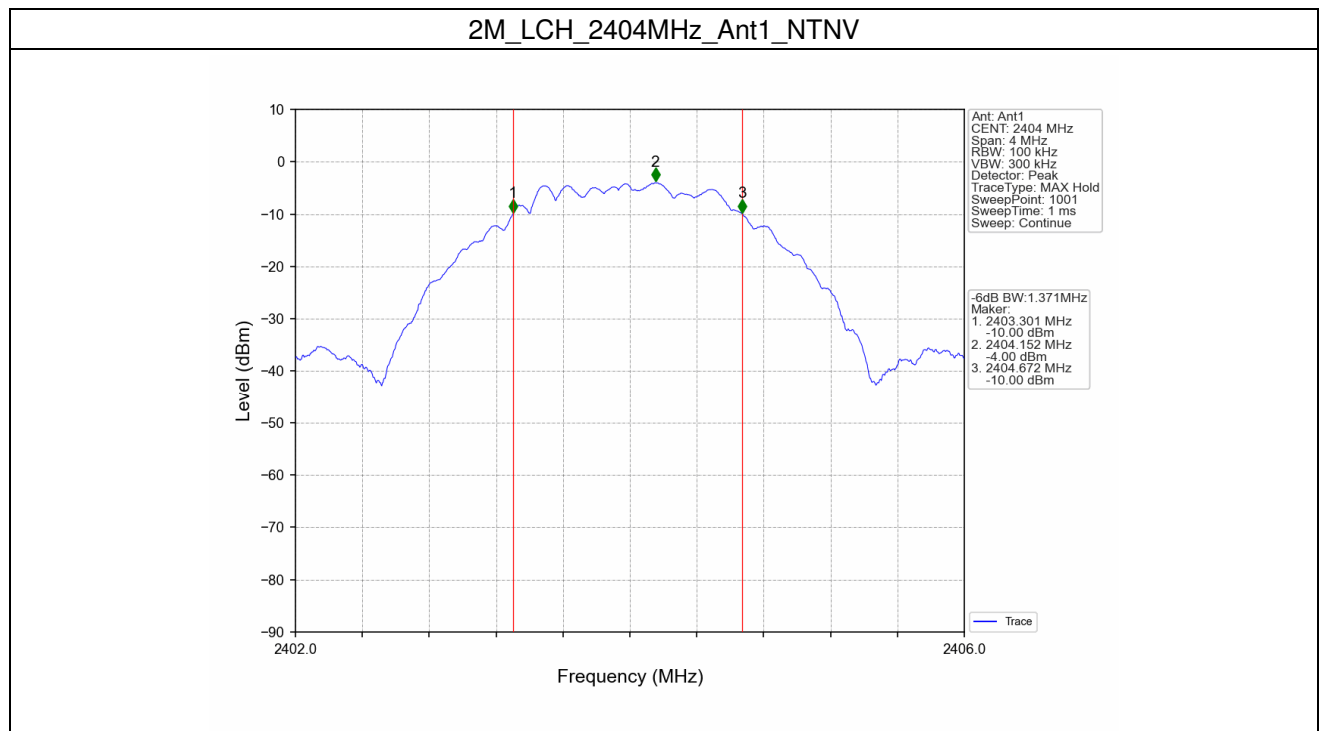
2.1 6dB BW

2.1.1 Test Result

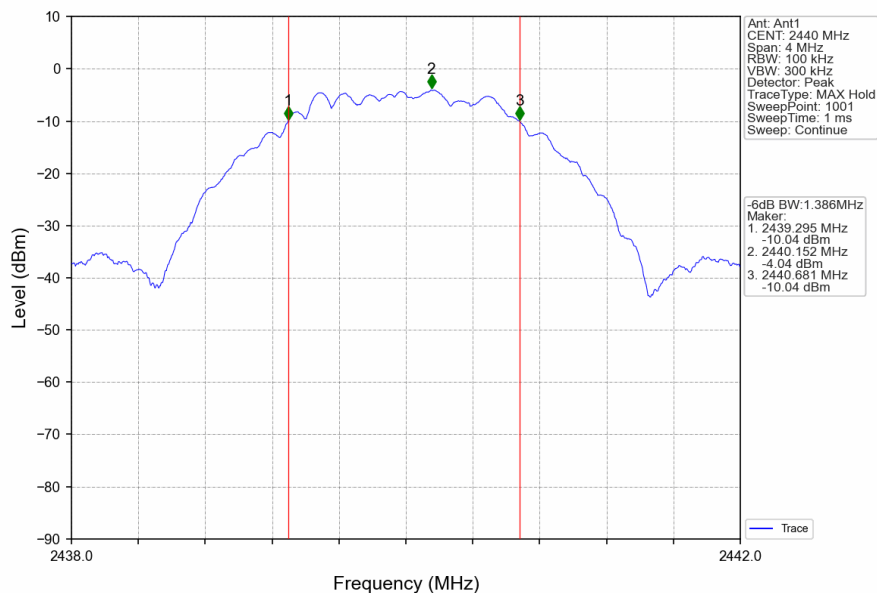
Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
2M	SISO	2404	1	1.371	≥ 0.5	Pass
		2440	1	1.386	≥ 0.5	Pass
		2478	1	1.371	≥ 0.5	Pass

2.1 6dB BW

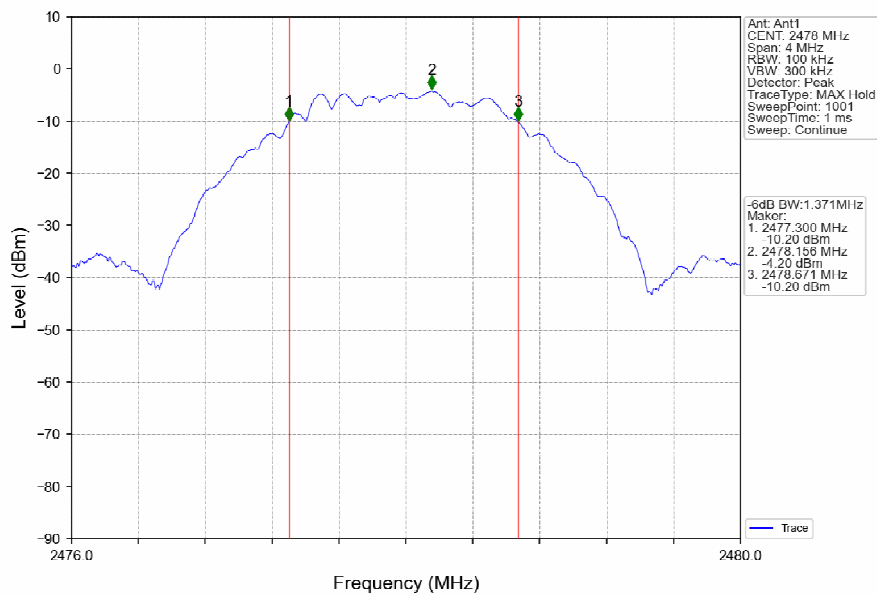
2.2.2 Test Graph



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	
2M	SISO	2404	-1.11	<=30	Pass
		2440	-1.14	<=30	Pass
		2478	-1.36	<=30	Pass
Note1: Antenna Gain: Ant1: -4.3dBi;					



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4. Maximum Power Spectral Density

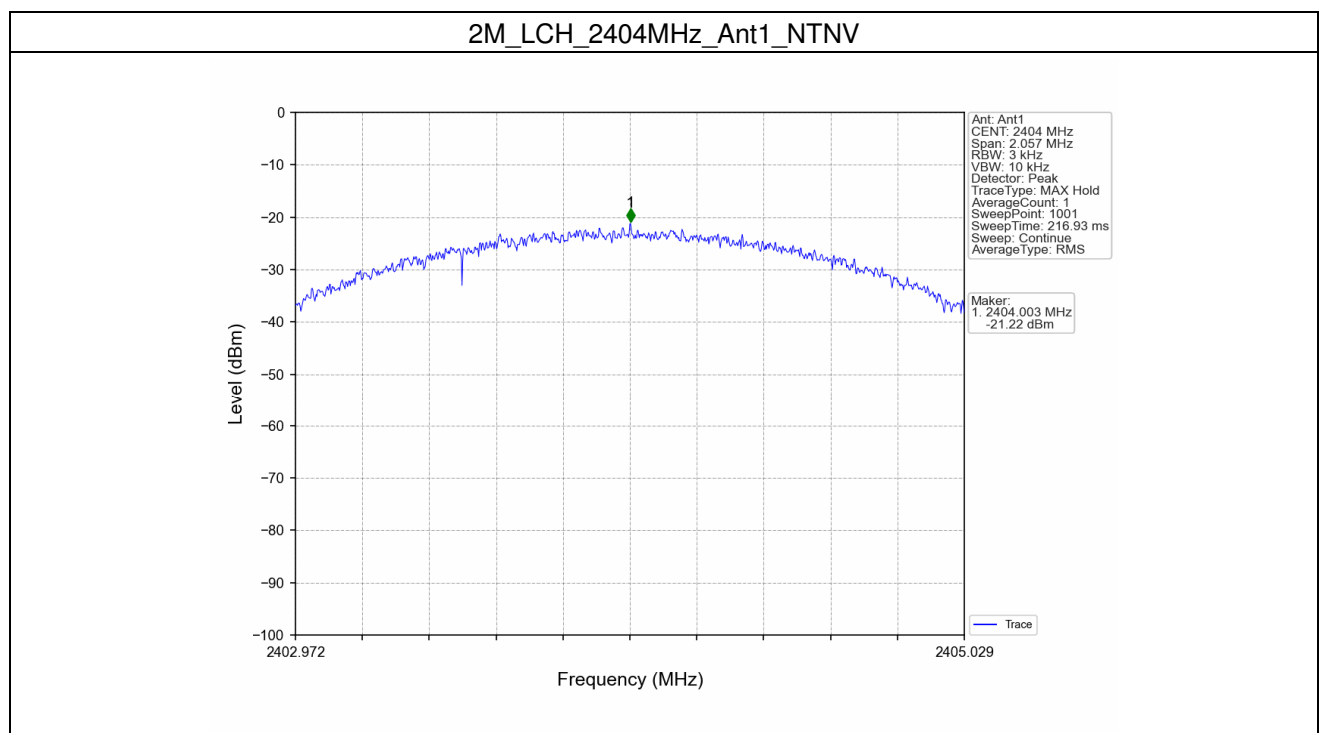
4.1 PSD

4.1.1 Test Result

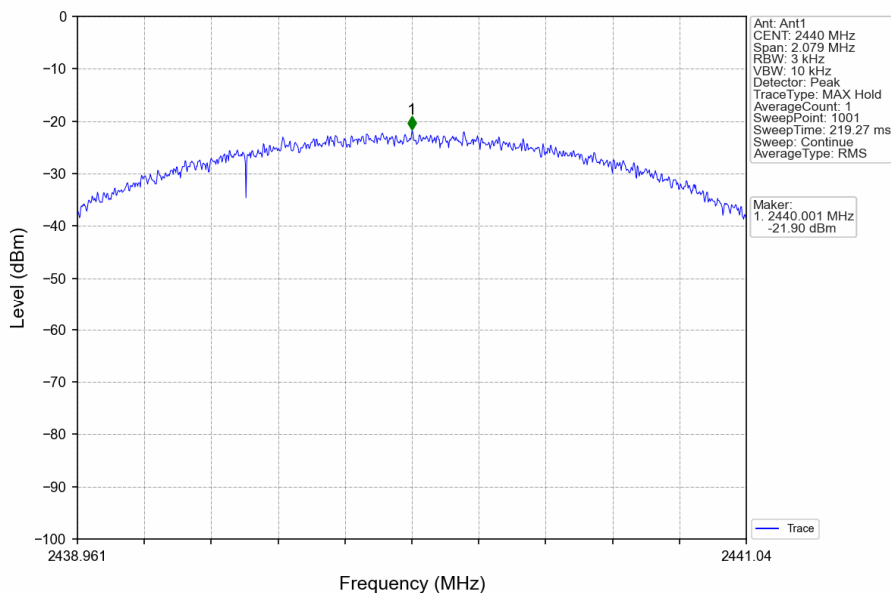
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
2M	SISO	2404	-21.22	<=8	Pass
		2440	-21.90	<=8	Pass
		2478	-21.88	<=8	Pass

Note1: Antenna Gain: Ant1: -4.3dBi;

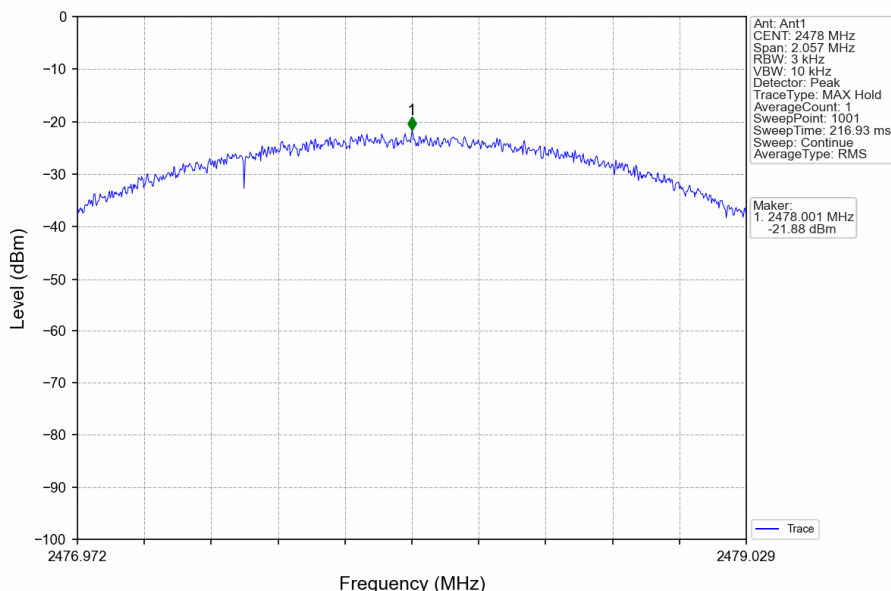
4.1.2 Test Graph



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_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)
2M	SISO	2404	1	-4.17
		2440	1	-4.19
		2478	1	-4.42

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.

5.2 CSE and Band Edges

5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
2M	SISO	2404	1	-4.17	-24.17	Pass
		2440	1	-4.17	-24.17	Pass
		2478	1	-4.17	-24.17	Pass

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

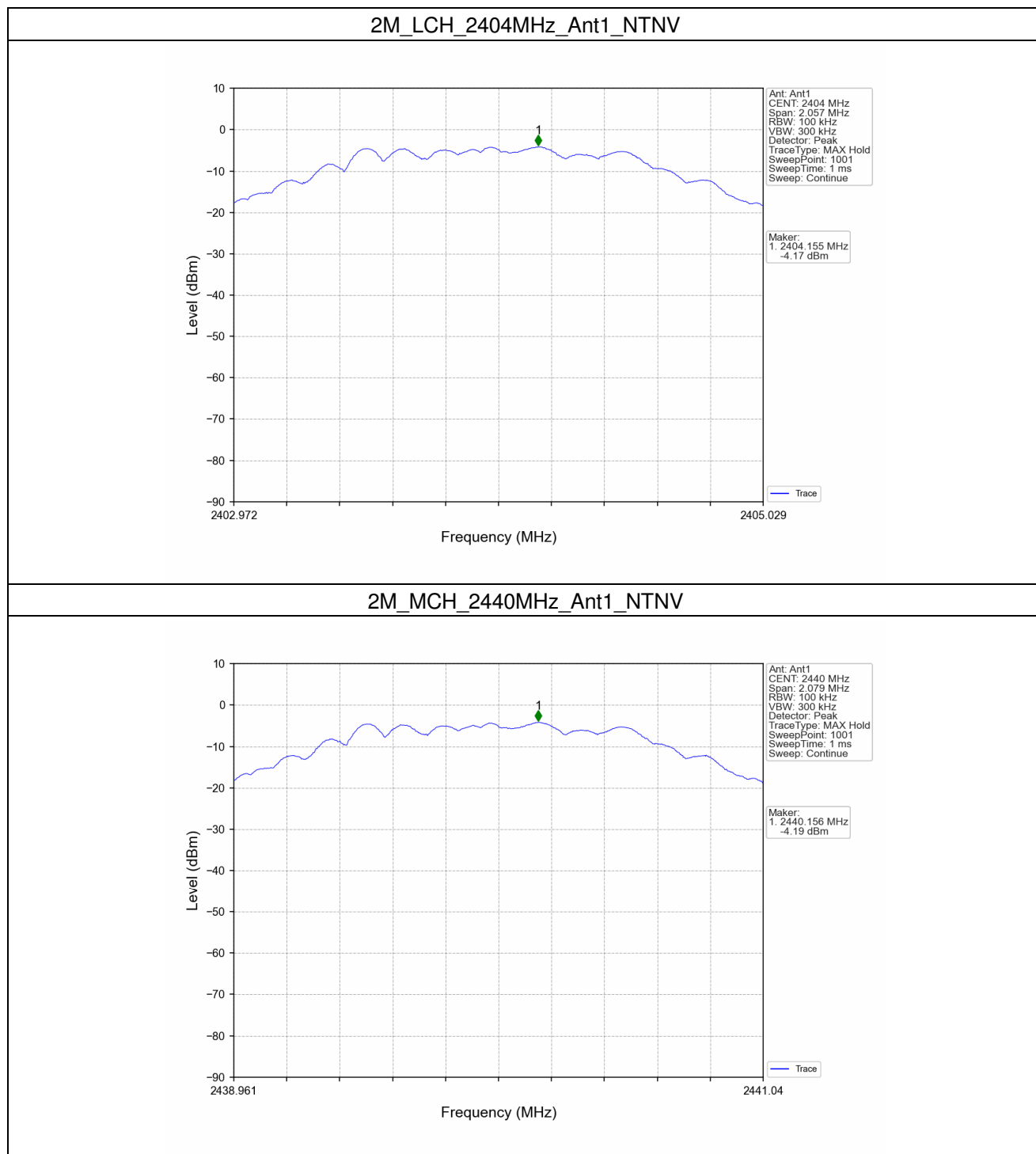


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5.1 Ref

5.1.2 Test Graph



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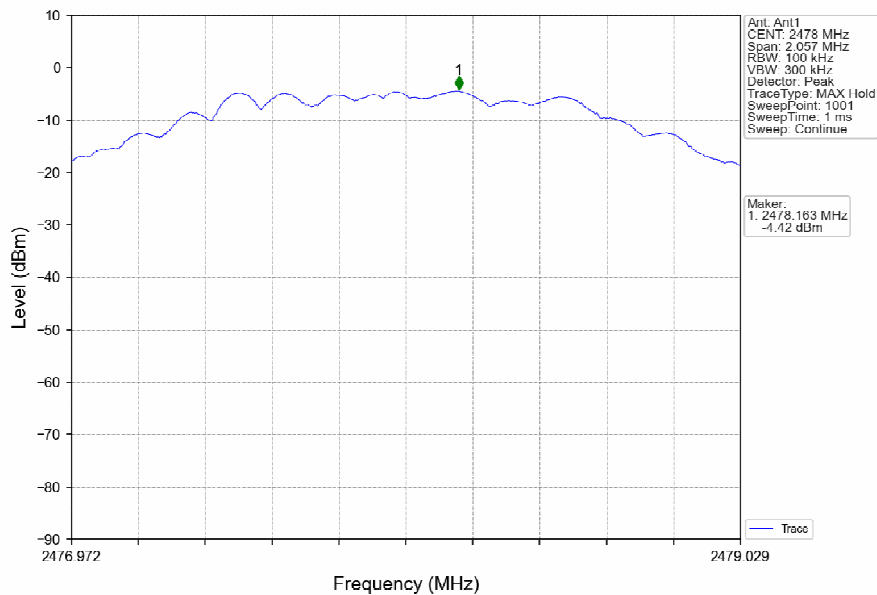
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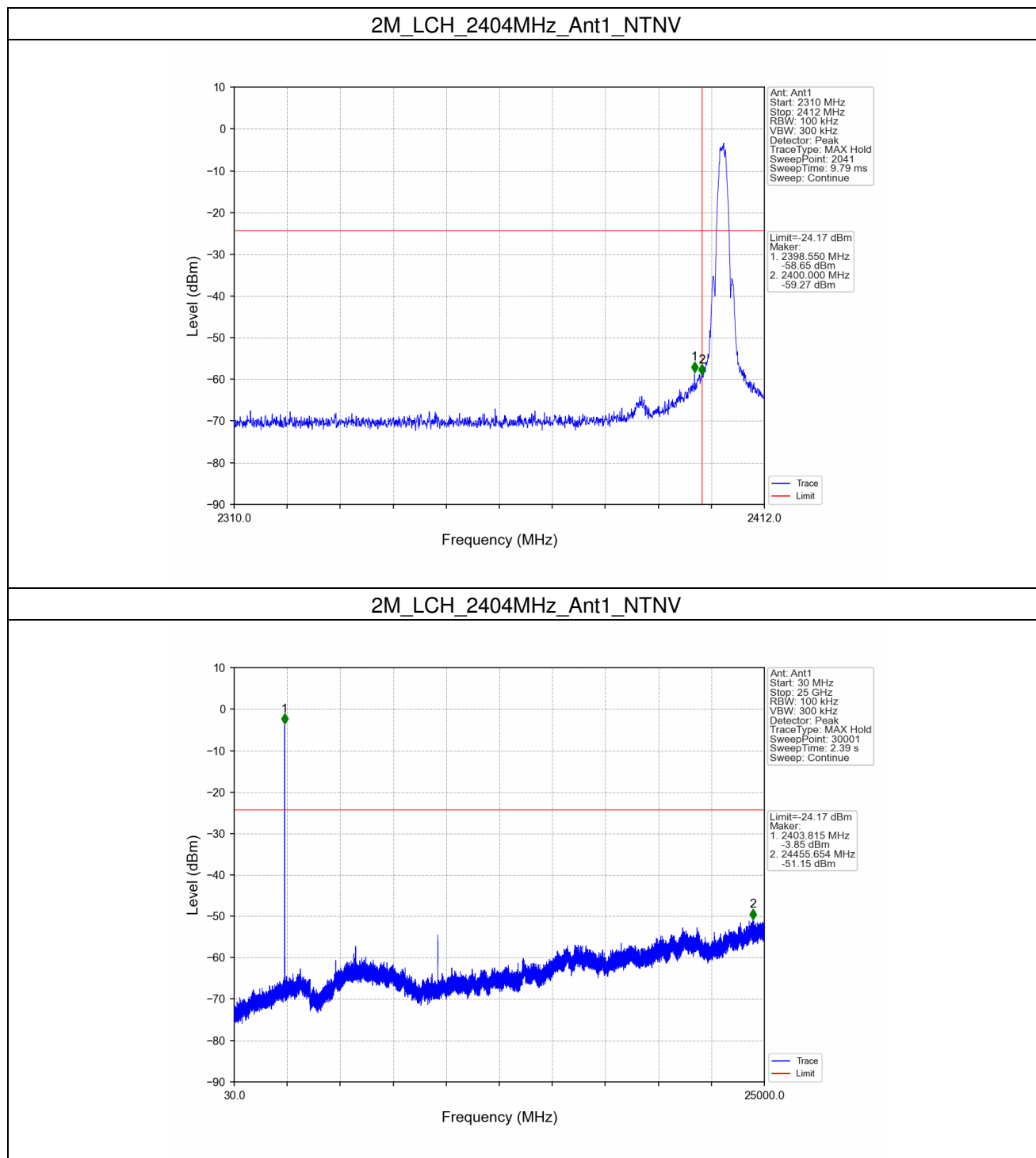
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2M_HCH_2478MHz_Ant1_NTNV



5.2 CSE and Band Edges

5.2.2 Test Graph



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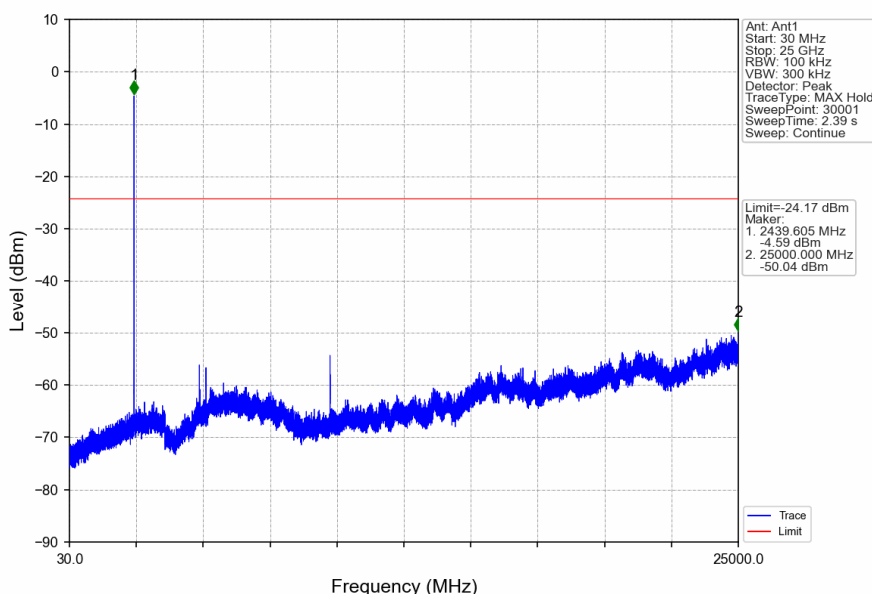
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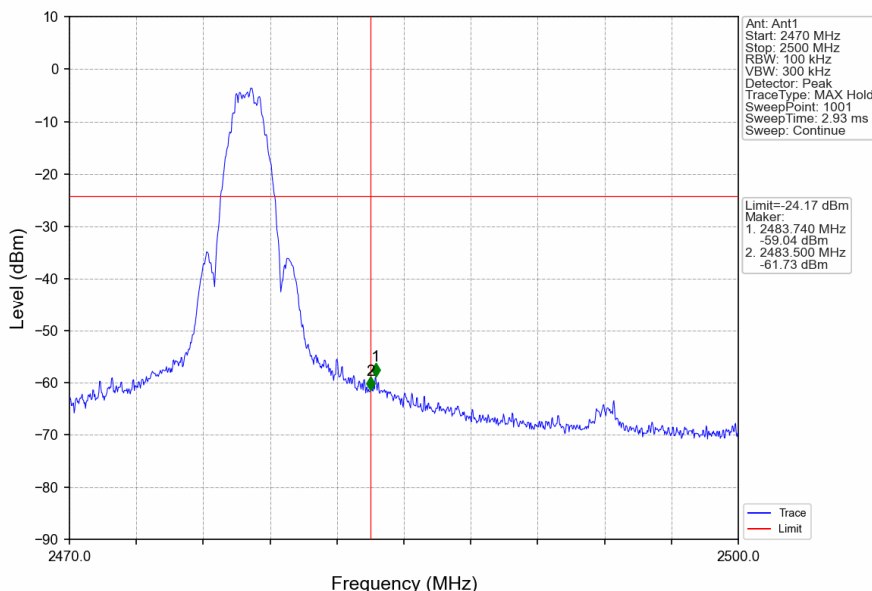
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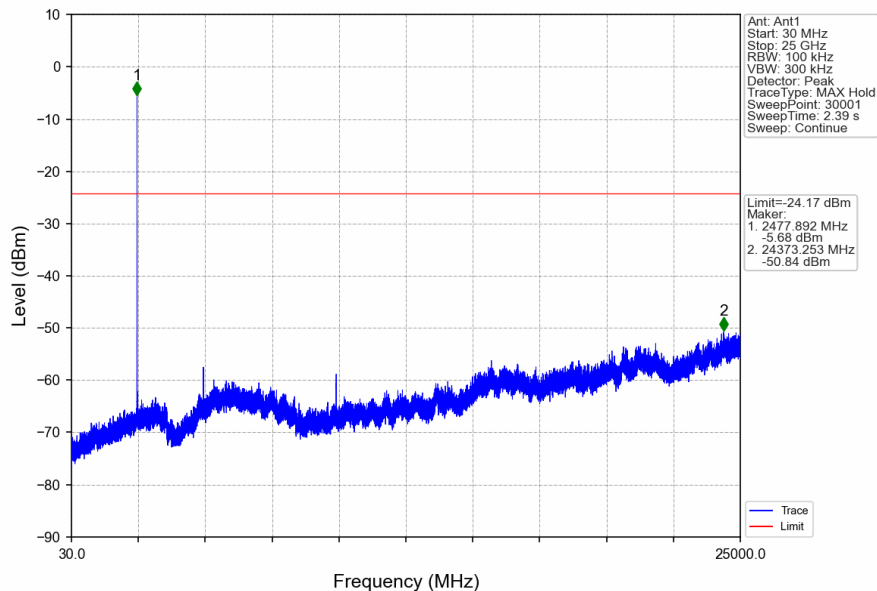
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV



2M_HCH_2478MHz_Ant1_NTNV



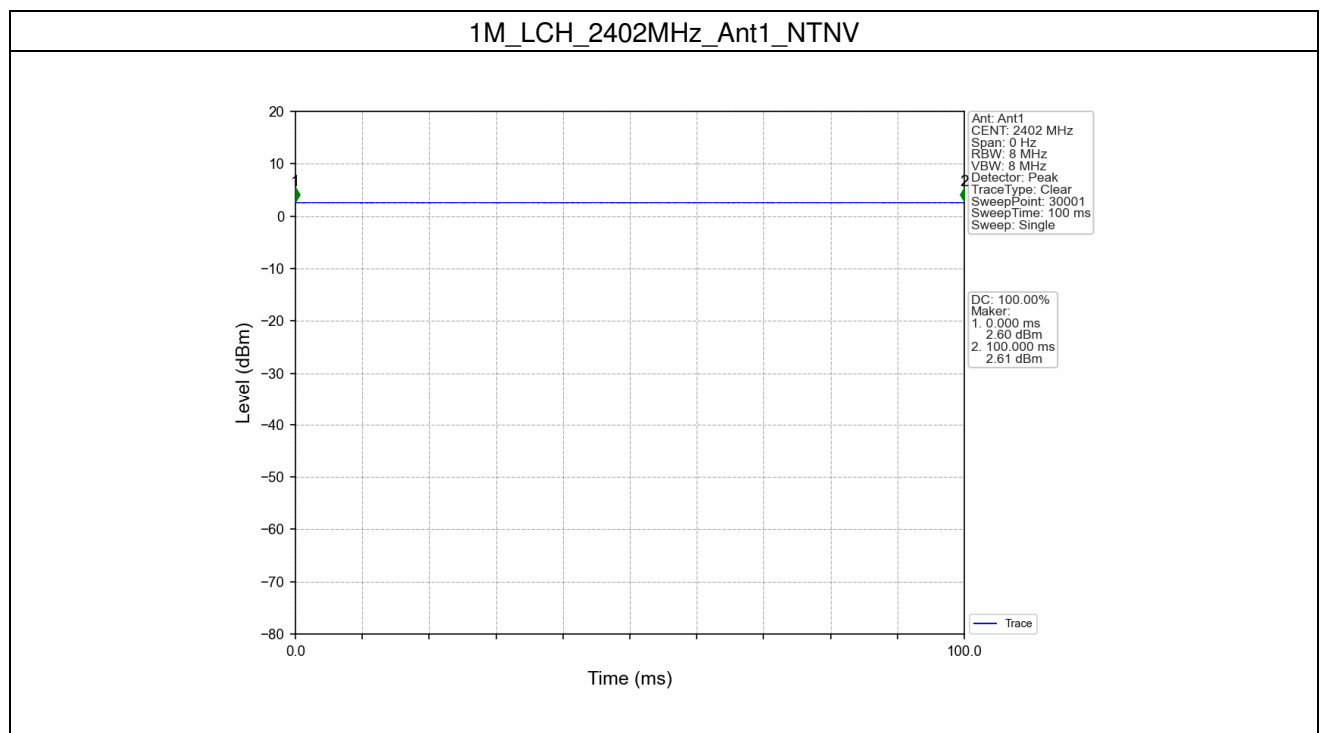
6. Duty Cycle

6.1 Ant1

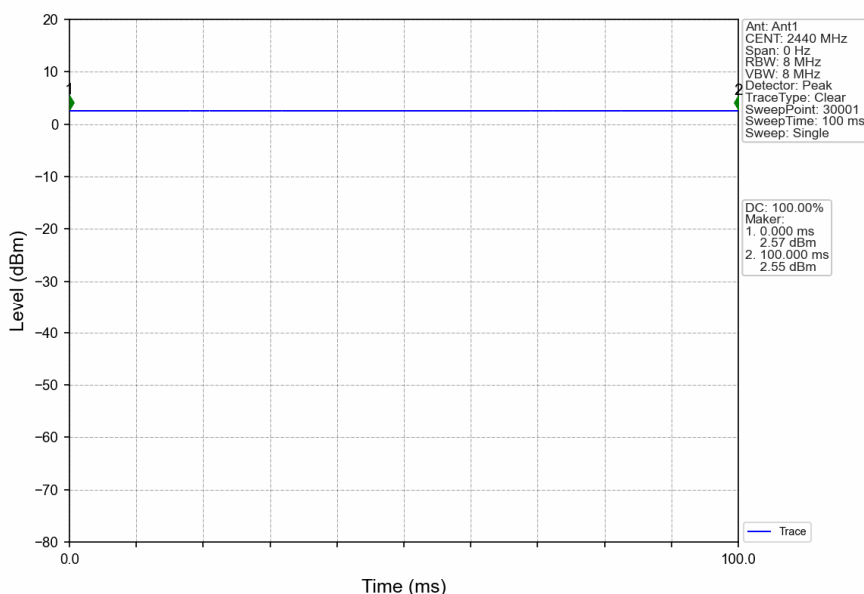
6.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	100.000	100.000	100.00	0.00	0.00
		2440	100.000	100.000	100.00	0.00	0.00
		2480	100.000	100.000	100.00	0.00	0.00

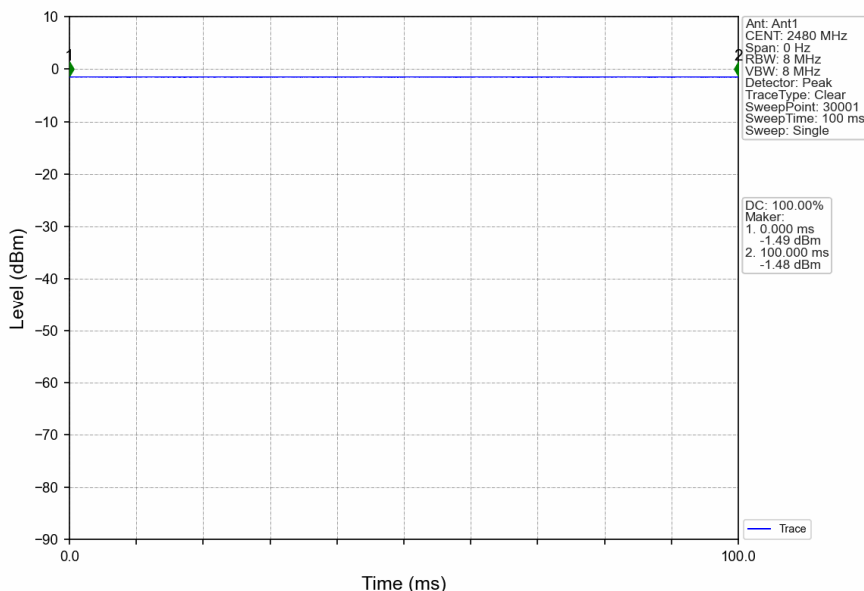
6.1.2 Test Graph



1M_MCH_2440MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



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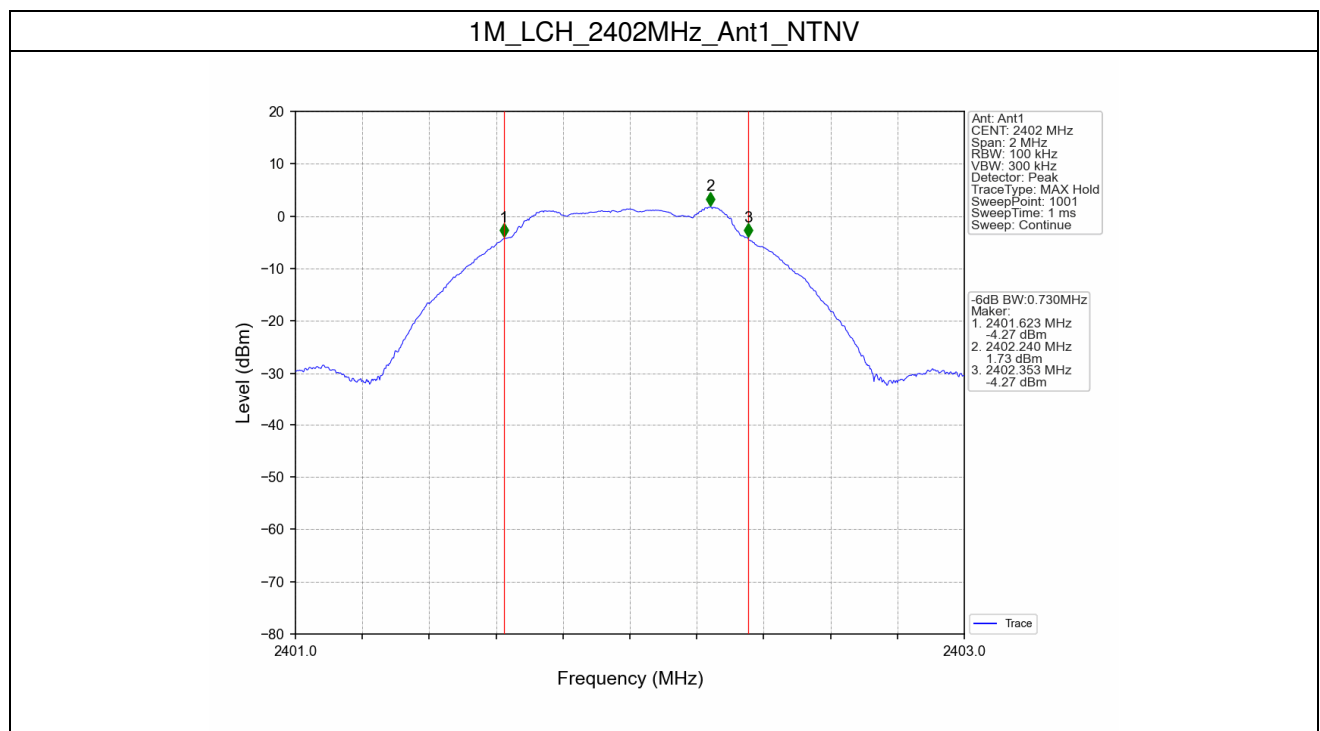
7. Bandwidth

7.1 6dB BW

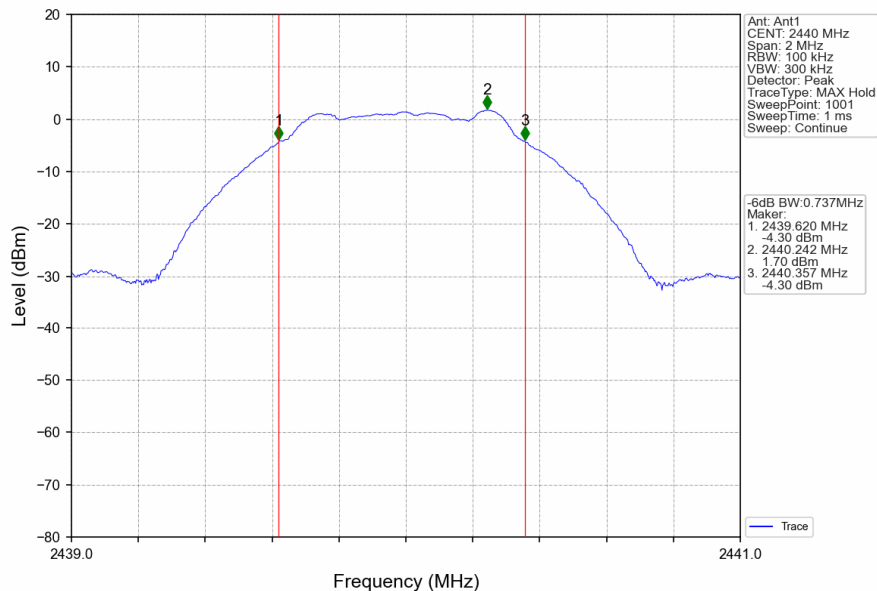
7.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.730	≥ 0.5	Pass
		2440	1	0.737	≥ 0.5	Pass
		2480	1	0.731	≥ 0.5	Pass

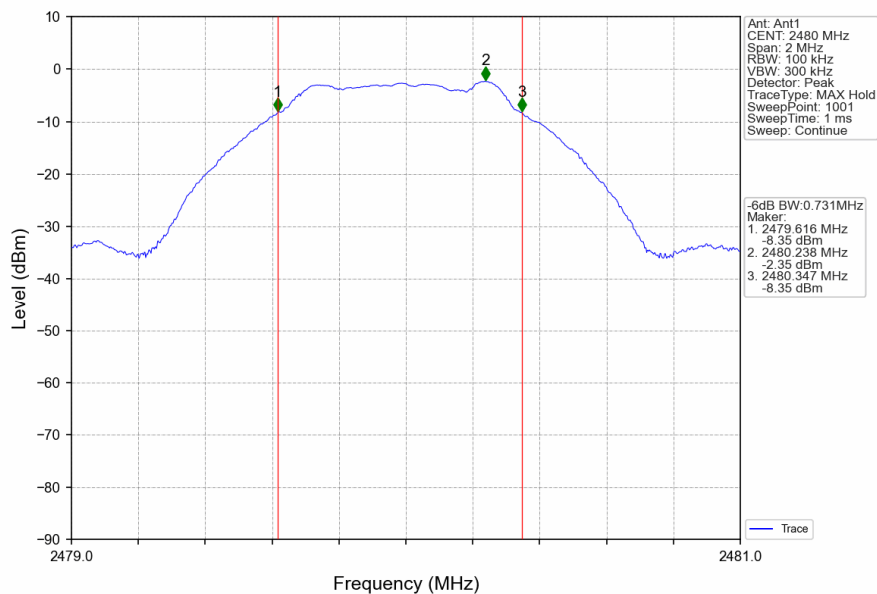
7.1.2 Test Graph



1M_MCH_2440MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



8. Maximum Conducted Output Power

8.1 Power

8.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	2.60	<=30	Pass
		2440	2.57	<=30	Pass
		2480	-1.47	<=30	Pass
Note1: Antenna Gain: Ant1: -4.3dBi;					



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9. Maximum Power Spectral Density

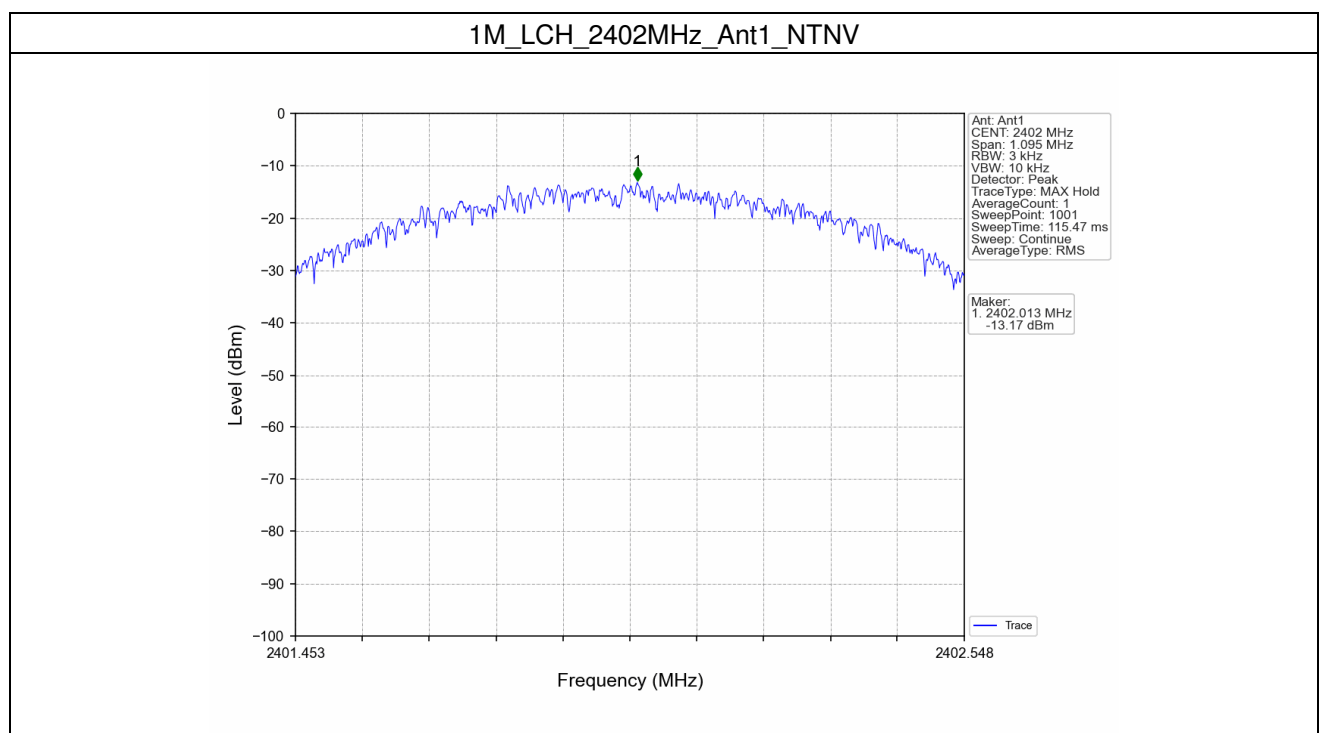
9.1 PSD

9.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm/3kHz)		Verdict
			ANT1	Limit	
1M	SISO	2402	-13.17	<=8	Pass
		2440	-13.43	<=8	Pass
		2480	-17.40	<=8	Pass

Note1: Antenna Gain: Ant1: -4.3dBi;

9.1.2 Test Graph



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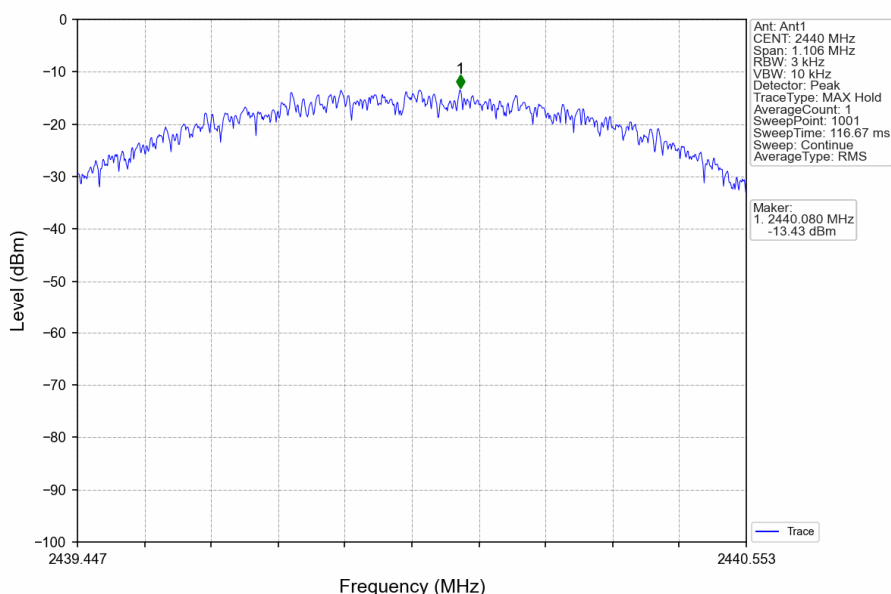
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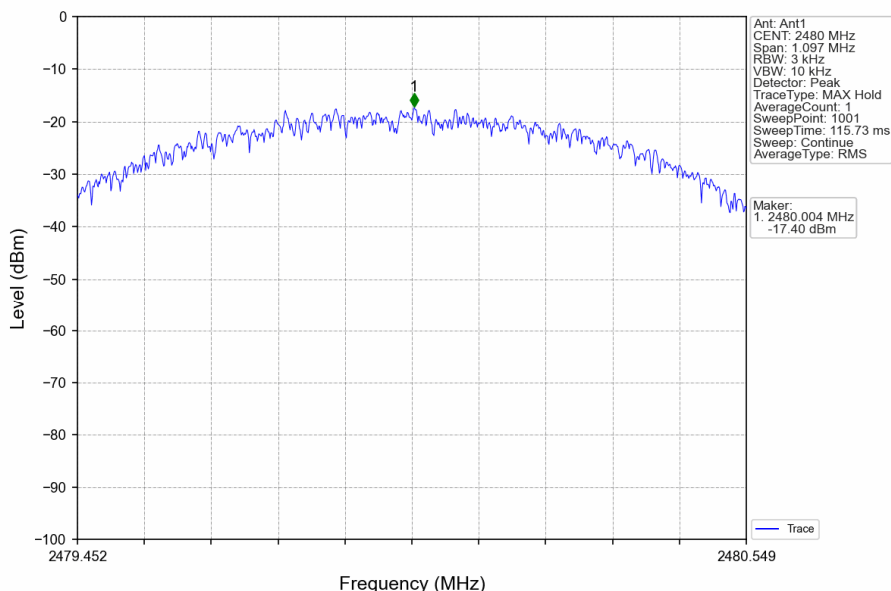
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1M_MCH_2440MHz_Ant1_NTNV



1M_HCH_2480MHz_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)
1M	SISO	2402	1	1.73
		2440	1	1.69
		2480	1	-2.33

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.

5.2 CSE and Band Edges

5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	1.73	-18.27	Pass
		2440	1	1.73	-18.27	Pass
		2480	1	1.73	-18.27	Pass

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



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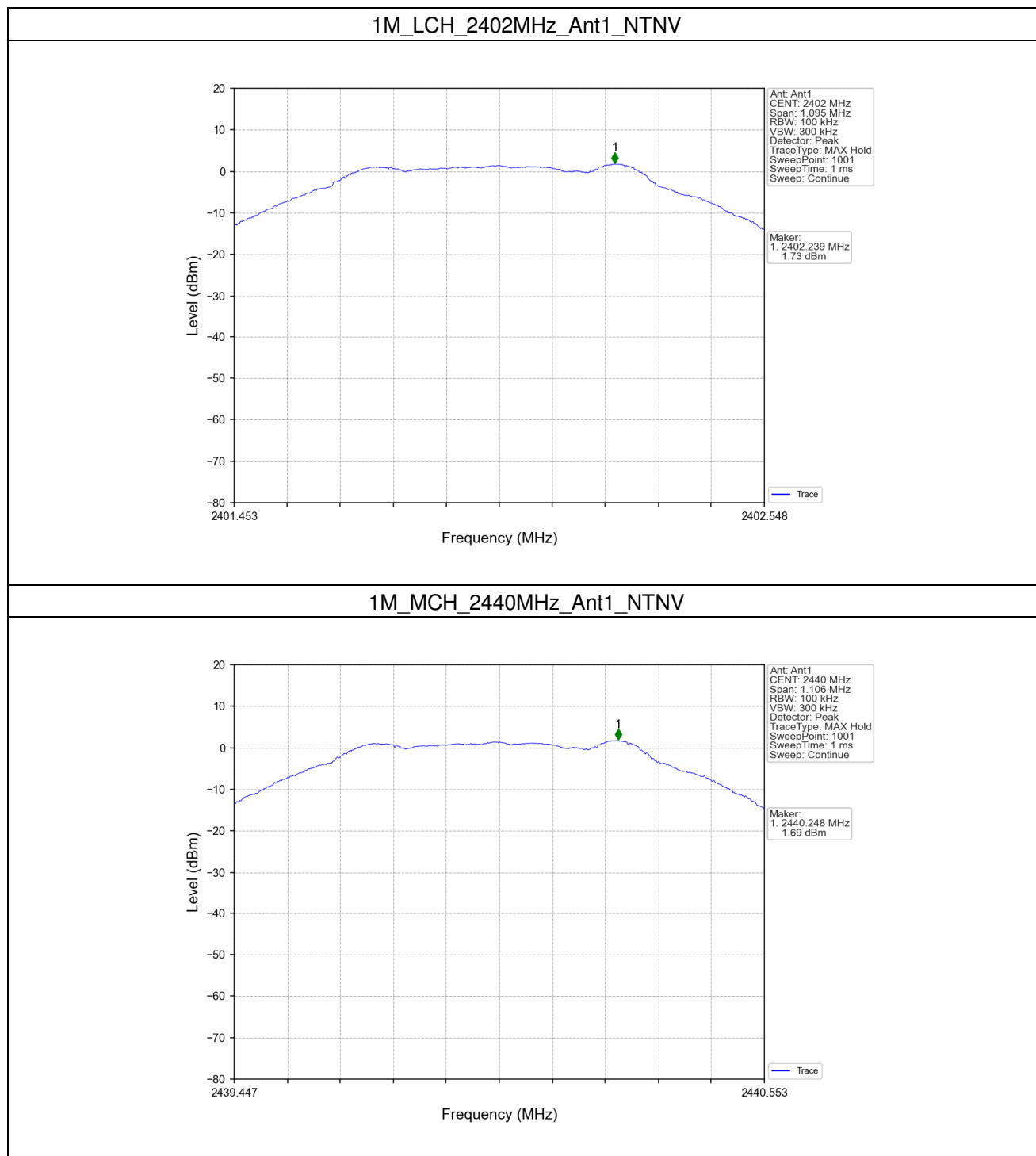
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5.1 Ref

5.1.2 Test Graph



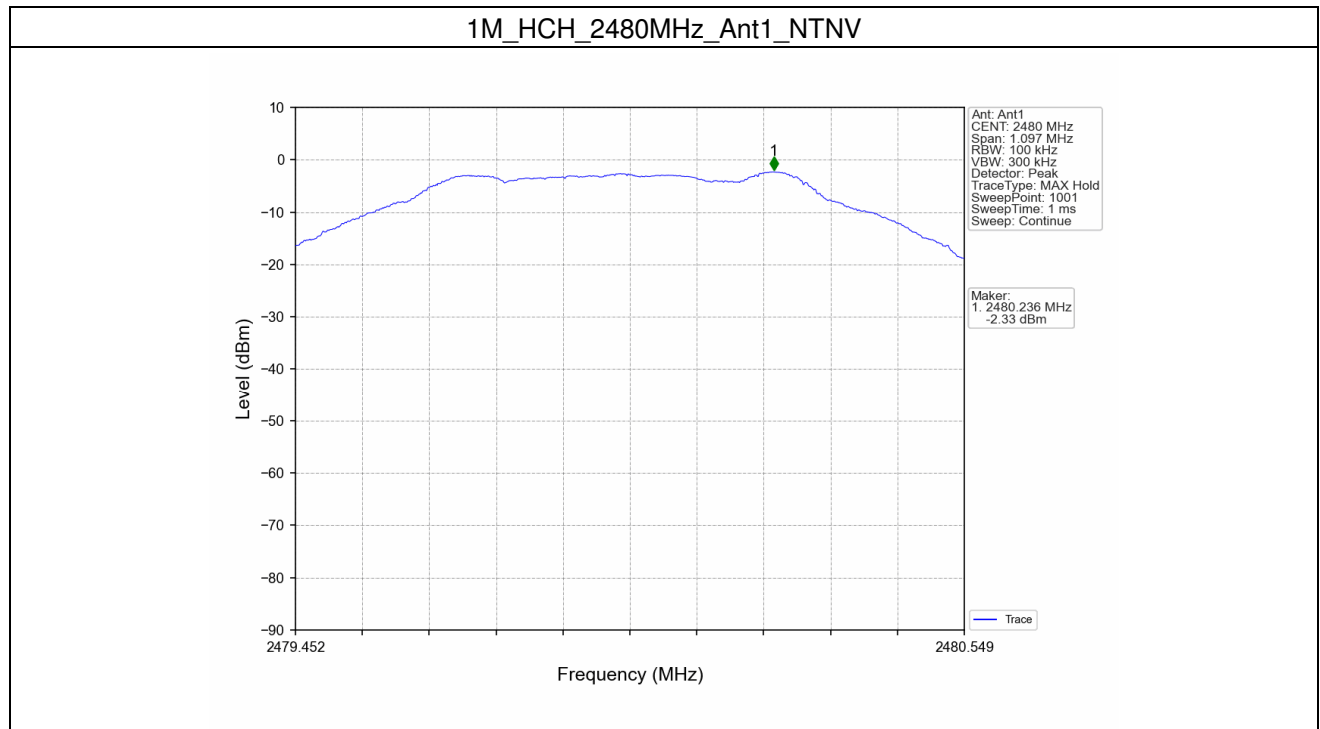
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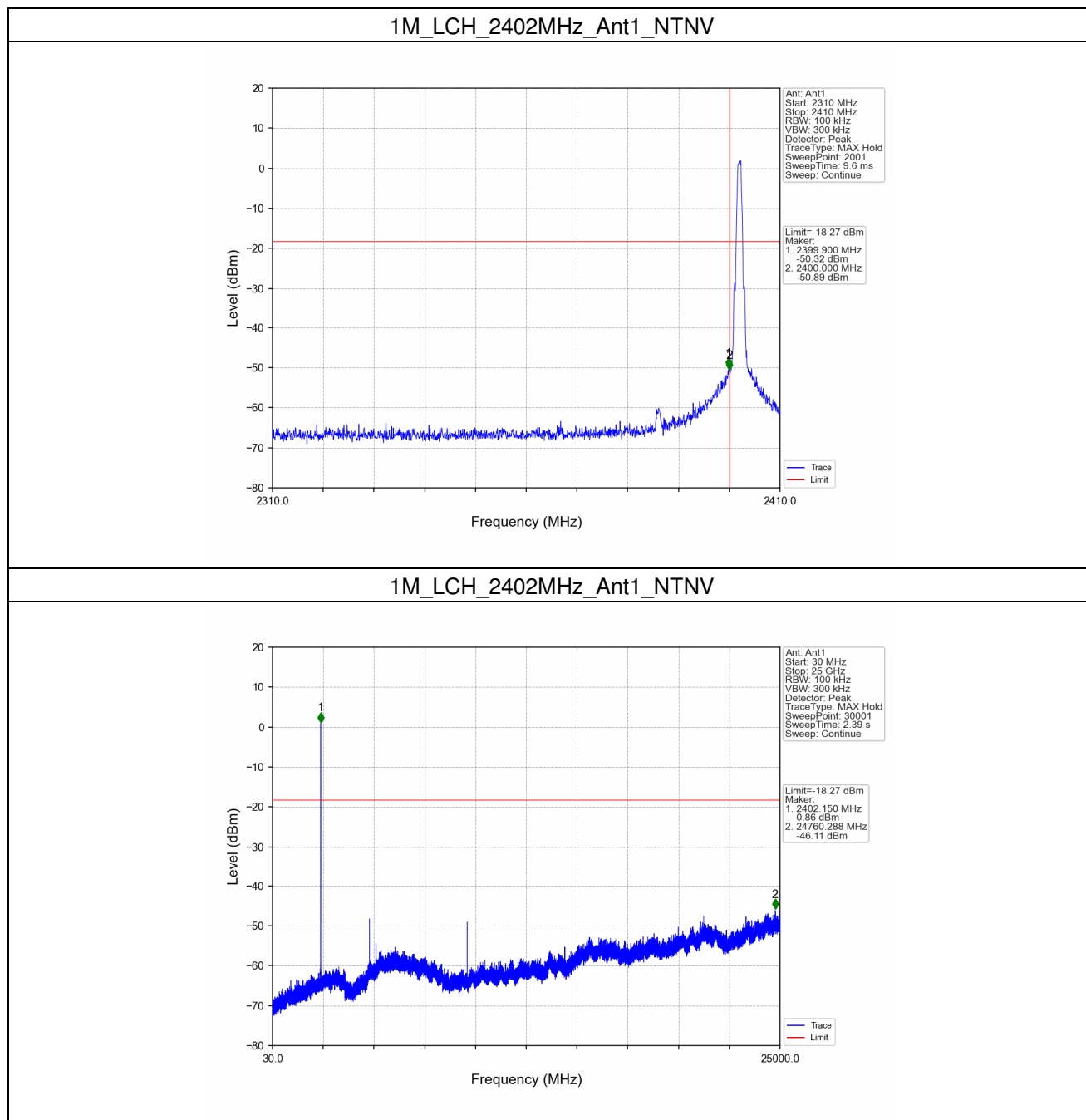
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5.2 CSE and Band Edges

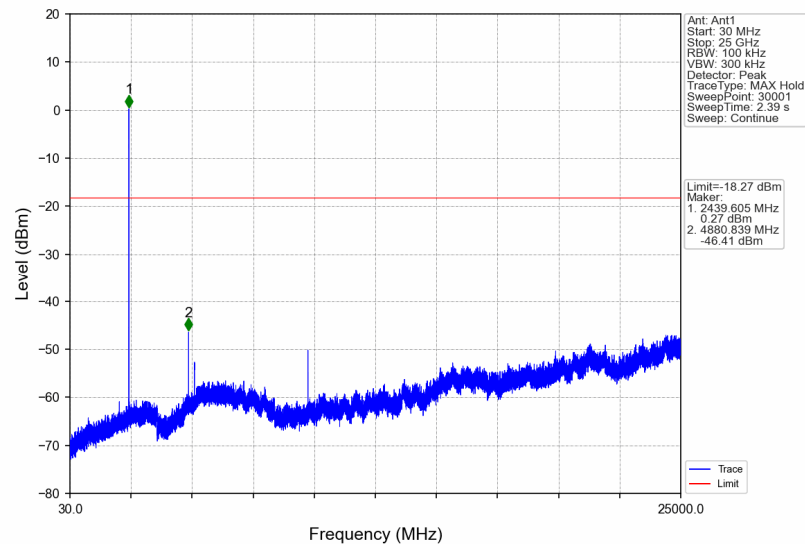
5.2.2 Test Graph



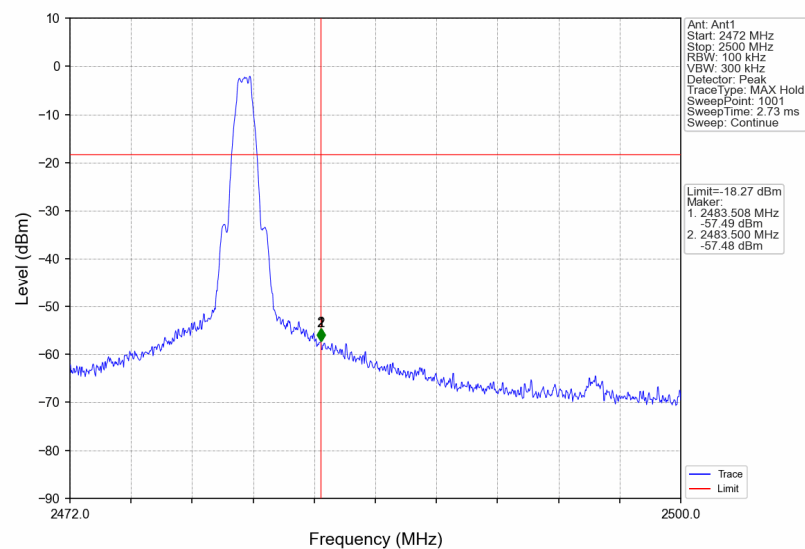
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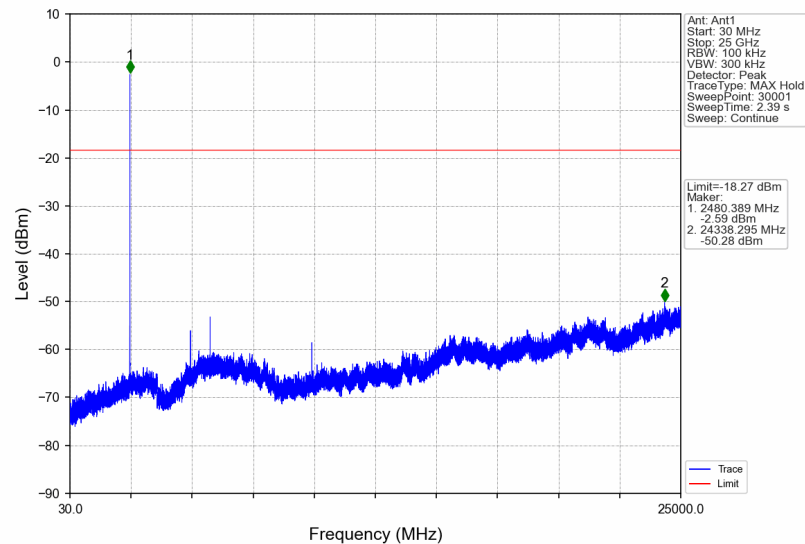
1M_MCH_2440MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



1M_HCH_2480MHz_Ant1_NTNV



- End of the Report -

