

TEST REPORT

Application No.: GZCR2603000625AT
Applicant: Positive LLC
Address of Applicant: 2820 S Alma School Rd Suite 18 PMB 2011, Chandler, Arizona 85286, United States
Manufacturer: Jia Ge Digital Technology Co. Ltd
Address of Manufacturer: 11F, No. 176, Changchun Rd., Zhongshan Dist., Taipei City 104082, Taiwan
Product Name: Wireless Foot Controller
Model No.: Spark PEDAL
Trade Mark: Positive Grid
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2026-04-03
Date of Test: 2026-04-20 to 2026-06-06
Date of Issue: 2026-06-12

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



SGS-CSTC Standards Technical Services Co., Ltd.
Guangzhou Branch Competency Laboratory

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Revision Record			
Version	Report No.	Date	Remark
01	GZCR260300062502	2026-06-12	Original

Authorized for issue by:			
		Luke Lin	
		Luke Lin/Project Engineer	
Approved By		Vico Cui	
		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 C 15.247	ANSI C63.10 (2020) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2020) Section 6.10.5 & 11.12	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2020) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2020) Section 6.6 & 11.12	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Maximum Conducted Output Power		ANSI C63.10 (2020) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2020) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectral Density		ANSI C63.10 (2020) Section 11.10.3	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2020) Section 6.10.4	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2020) 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.

N/A means Not applicable, please find the detailed decision rule in the report relative section.

Remark:

For model Spark PEDAL with optional USB port isolator IC **ISOUSB111** or **AduM3160**. And all RF modules selected for use are the same. So the EUT with optional IC **AduM3160** was tested Conducted Emissions at AC Power Line (150kHz-30MHz) & Radiated Spurious Emissions Below 1GHz for verification, and the EUT with optional IC **ISOUSB111** was full tested in this report.



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4 General Information

4.1 Details of E.U.T.

Power supply: Powered by built in rechargeable battery as below:
Model: GSP872693
Rated: DC 3.7V, 3000mAh
DC 5V 2A for charging

Cable(s): AUX-IN output *1pcs
Audio OUTPUT port L & R *1pcs
EXP port *1pcs
USB-C port *1pcs (charge and transmit data)
MIDI IN/OUT port
Earphone port

Test Voltage: AC 120 V 60 Hz powered by Notebook computer refer to section 4.2

Operation Frequency: 2402MHz to 2480MHz

Modulation Type: GFSK

Number of Channels: 40

Channel Spacing: 2MHz

Antenna Type: FPC antenna

Antenna Gain: 2.63 dBi according to antenna specification for BLE

Antenna Number: 1 for BT
1 for BLE/2.4GHz Wi-Fi

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.
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ



4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	±3.22dB
Radiated Emissions which fall in the restricted bands	±5.14dB (3m); ±4.90dB (10m); ±4.88dB (1GHz-6GHz); ±5.06dB (6GHz-18GHz); ±5.30dB (18GHz-40GHz)
Radiated Spurious Emissions Below 1GHz	±3.08dB (9kHz to 150kHz); ±3.19dB(150kHz to 30MHz); ±5.14dB (30MHz-1GHz) (3m); ±4.90dB (30MHz-1GHz) (10m)
Radiated Spurious Emissions Above 1GHz	±4.88dB (1GHz-6GHz); ±5.06dB (6GHz-18GHz); ±5.30dB (18GHz-40GHz)
Maximum Conducted Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 0.274%
Power Spectral Density	± 2.84dB
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Remark: The U_{lab} (lab Uncertainty) is less than U_{CISPR} (CISPR Uncertainty) or U_{ETSI}(ETSI Uncertainty). Emission decision rule: – Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit, marked as Pass in the report. – Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit, marked as Fail in the report.	

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,
Guangdong, China 510663

Tel: +86 20 82155555

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



5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Coaxial Cable	HangTianXing	BL03-NMNM-6.00M	EMC0107	2025-08-12	2026-08-11
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	2025-08-14	2028-08-13
Two-Line V-Network-GZ	Rohde & Schwarz	ENV216	EMC2135	2025-08-13	2026-08-12
EMI Test Receiver (9kHz-3.6GHz)	Rohde & Schwarz	ESR3	EMC2221	2025-11-18	2026-11-17
Test Software E3r	Audix	Ver.6.191211	GZE100-77	N/A	N/A

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
1-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2025-08-11	2026-08-10
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2025-08-11	2026-08-10
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2024-08-19	2026-08-18
Horn Antenna (1-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2025-05-13	2027-05-12
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2023-06-18	2026-06-17
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2025-08-12	2026-08-11
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2025-08-11	2026-08-10
966 Anechoic Chamber	Shenzhen C.R.T	CRTSGSSAC966	EMC2230	2025-03-22	2028-03-21
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A



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Radiated Spurious Emissions Below 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2025-08-13	2028-08-12
Coaxial cable	Mirco-COAX UTIFLEX	311A	EMC0540	2024-08-19	2026-08-18
Amplifier (9kHz-1.3GHz)	HP	8447F	EMC2065	2025-11-25	2026-11-24
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2026-03-28	2028-03-27
EMI Test Receiver (9kHz-7GHz)	Rohde & Schwarz	ESR7	EMC2220	2025-11-18	2026-11-17
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Trilog Broadband Antenna (25MHz-2GHz)	Schwarzbeck Mess-Elektronik	VULB 9168	EMC2174	2025-04-21	2027-04-20

Radiated Spurious Emissions Above 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
1-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2025-08-11	2026-08-10
EMI Test Receiver (10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2025-08-11	2026-08-10
Chamber cable (Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2024-08-19	2026-08-18
Horn Antenna (1-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2025-05-13	2027-05-12
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2023-06-18	2026-06-17
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2025-08-12	2026-08-11
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2025-08-12	2026-08-11
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2025-08-11	2026-08-10
966 Anechoic Chamber	Shenzhen C.R.T	CRTSGSSAC966	EMC2230	2025-03-22	2028-03-21
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Preamplifier (1-18GHz)	Shenzhen TST	LNA010180G50	EMC6036	2026-04-14	2027-04-13
Intelligent Coaxial RF Switch (DC-18GHz)	Shenzhen TST	ICS01018	EMC6037	2026-04-14	2027-04-13



RF Conducted Test					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2025-11-02	2026-11-01
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2025-08-12	2026-08-11
Test Software	TST	V2.0	GZE100-78	N/A	N/A
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2025-08-12	2026-08-11

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2026-05-14	2027-05-13



6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

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

6.1.2 Conclusion

Standard Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement.

The best case gain of the antenna is 2.63 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

Test Method: ANSI C63.10 (2020) Section 6.2

Test Engineer: Luffy Chen

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.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

Operating Environment:

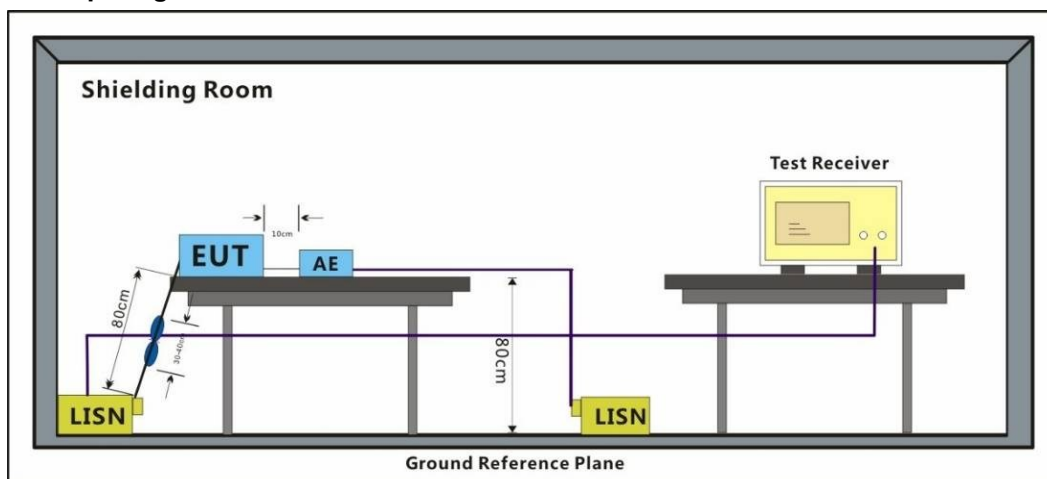
Temperature: 22.0 °C Humidity: 56.4 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(1Mbps)_Keep the EUT (ISOUSB111) in continuously transmitting mode with GFSK modulation.
Pre-scan	03	TX mode(2Mbps)_Keep the EUT (ISOUSB111) in continuously transmitting mode with GFSK modulation.
Final test	22	TX mode(1Mbps)_Keep EUT (AduM3160) in continuously transmitting mode with GFSK modulation.
Pre-scan	23	TX mode(2Mbps)_Keep EUT (AduM3160) in continuously transmitting mode with GFSK modulation.



7.1.3 Test Setup Diagram



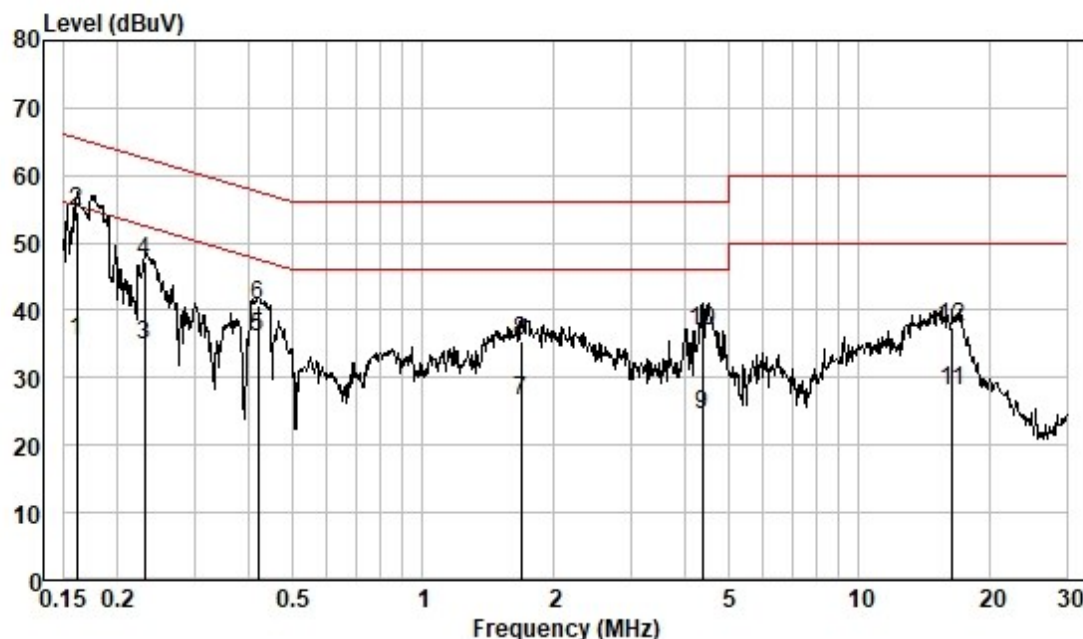
7.1.4 Measurement Procedure and Data

- 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: 02; Line: Live line

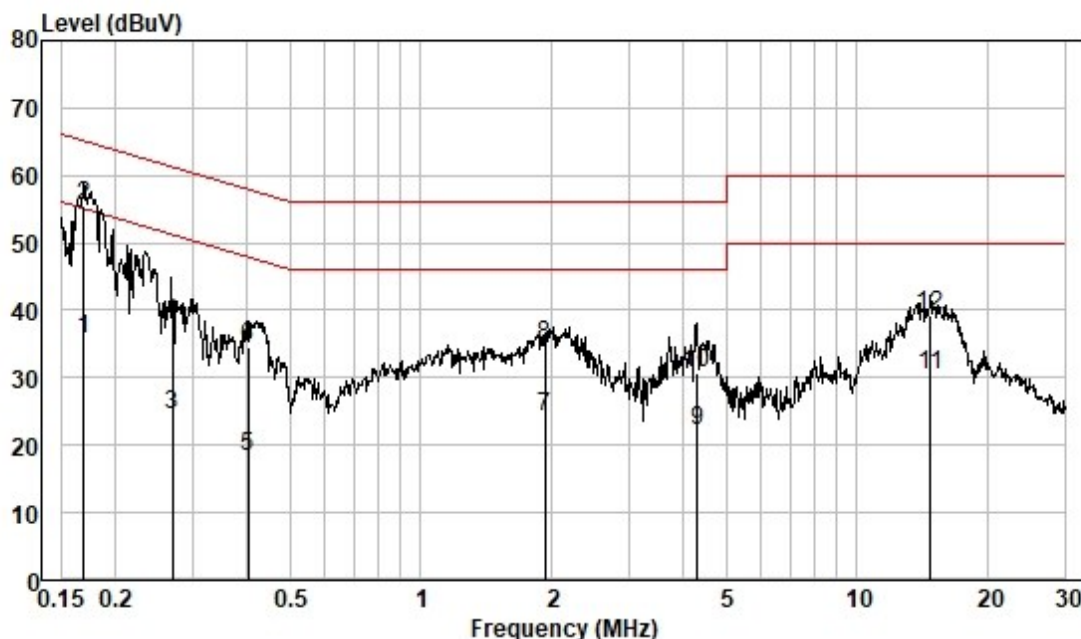


Pol :LINE
Mode :
Model :
Power :

	Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.161	25.71	0.04	9.53	35.28	55.43	-20.15	Average
2	0.161	45.09	0.04	9.53	54.66	65.43	-10.77	QP
3	0.230	25.41	0.04	9.52	34.97	52.44	-17.47	Average
4	0.230	37.73	0.04	9.52	47.29	62.44	-15.15	QP
5	0.419	26.35	0.05	9.56	35.96	47.46	-11.50	Average
6	0.419	31.13	0.05	9.56	40.74	57.46	-16.72	QP
7	1.680	16.77	0.11	9.57	26.45	46.00	-19.55	Average
8	1.680	25.63	0.11	9.57	35.31	56.00	-20.69	QP
9	4.361	14.81	0.18	9.62	24.61	46.00	-21.39	Average
10	4.361	26.97	0.18	9.62	36.77	56.00	-19.23	QP
11	16.398	17.95	0.34	9.83	28.12	50.00	-21.88	Average
12	16.398	27.45	0.34	9.83	37.62	60.00	-22.38	QP



Test Mode: 02; Line: Neutral Line

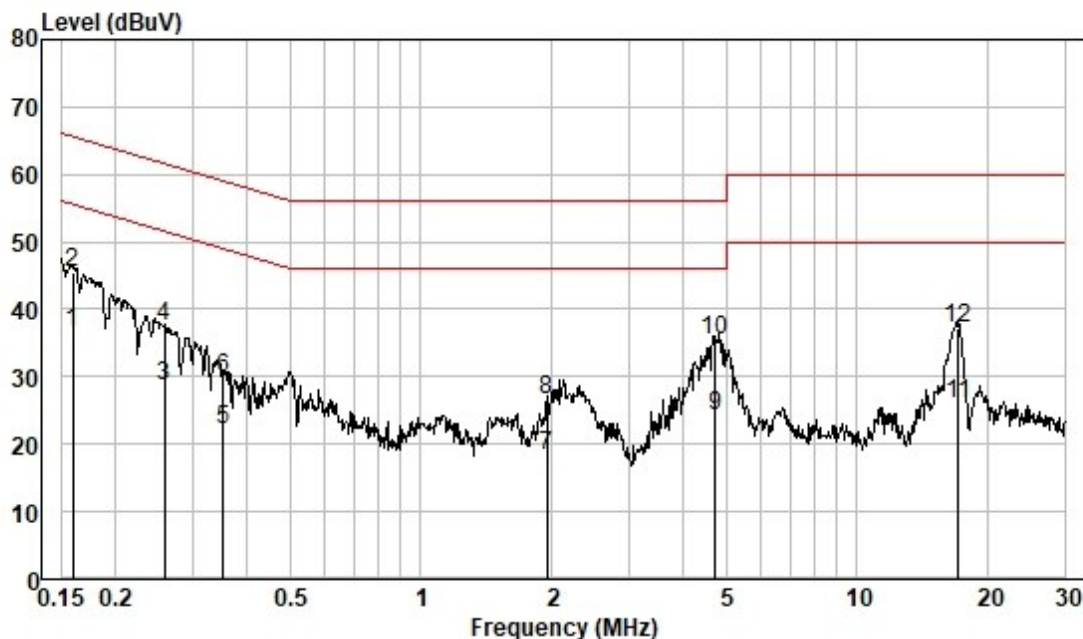


Pol :NEUTRAL
Mode :
Model :
Power :

	Freque	Read	Cable	LISN	Measured	Limit	Over	Remark
	nc	Level	Loss	Factor	Level	Line	Limit	
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.169	26.19	0.04	9.53	35.76	55.03	-19.27	Average
2	0.169	45.83	0.04	9.53	55.40	65.03	-9.63	QP
3	0.269	14.96	0.04	9.53	24.53	51.16	-26.63	Average
4	0.269	28.63	0.04	9.53	38.20	61.16	-22.96	QP
5	0.402	8.63	0.05	9.57	18.25	47.81	-29.56	Average
6	0.402	24.84	0.05	9.57	34.46	57.81	-23.35	QP
7	1.928	14.59	0.12	9.57	24.28	46.00	-21.72	Average
8	1.928	25.25	0.12	9.57	34.94	56.00	-21.06	QP
9	4.292	12.33	0.18	9.63	22.14	46.00	-23.86	Average
10	4.292	21.03	0.18	9.63	30.84	56.00	-25.16	QP
11	14.750	20.03	0.32	9.92	30.27	50.00	-19.73	Average
12	14.750	28.99	0.32	9.92	39.23	60.00	-20.77	QP



Test Mode: 22; Line: Live line

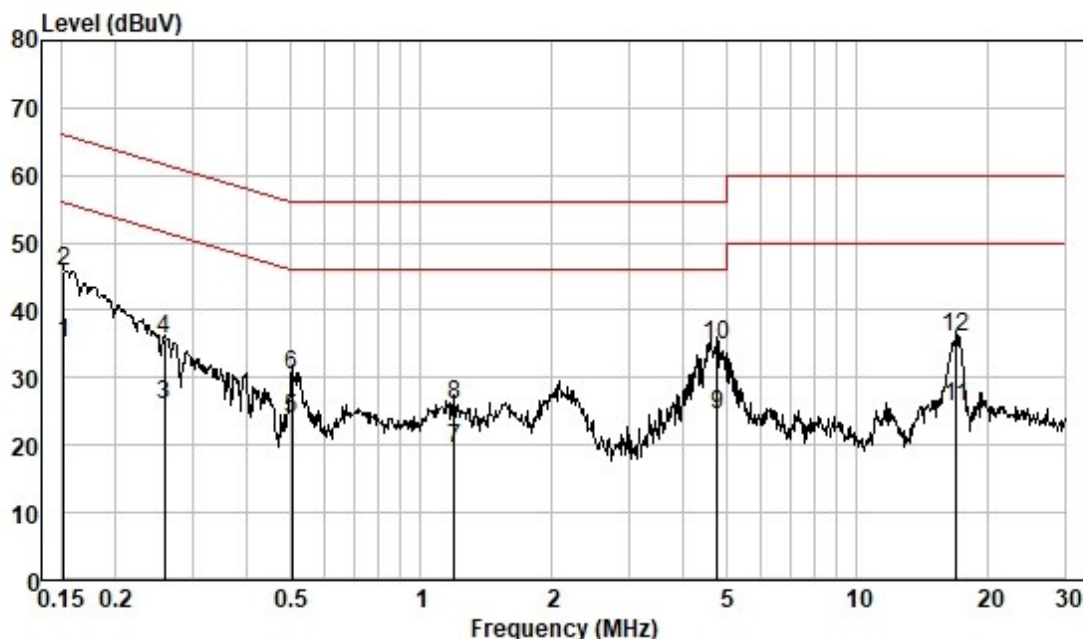


Pol :LINE
Mode :
Model :
Power :

	Freque	Read	Cable	LISN	Measured	Limit	Over	Remark
	nc	Level	Loss	Factor	Level	Line	Limit	
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.159	26.97	0.04	9.53	36.54	55.52	-18.98	Average
2	0.159	35.88	0.04	9.53	45.45	65.52	-20.07	QP
3	0.259	19.21	0.04	9.53	28.78	51.47	-22.69	Average
4	0.259	28.02	0.04	9.53	37.59	61.47	-23.88	QP
5	0.352	12.40	0.05	9.56	22.01	48.91	-26.90	Average
6	0.352	20.24	0.05	9.56	29.85	58.91	-29.06	QP
7	1.949	8.62	0.12	9.56	18.30	46.00	-27.70	Average
8	1.949	16.92	0.12	9.56	26.60	56.00	-29.40	QP
9	4.721	14.49	0.19	9.62	24.30	46.00	-21.70	Average
10	4.721	25.76	0.19	9.62	35.57	56.00	-20.43	QP
11	17.018	15.93	0.35	9.83	26.11	50.00	-23.89	Average
12	17.018	27.14	0.35	9.83	37.32	60.00	-22.68	QP



Test Mode: 22; Line: Neutral Line



Pol : NEUTRAL
Mode :
Model :
Power :

	Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.152	25.57	0.04	9.50	35.11	55.91	-20.80	Average
2	0.152	36.20	0.04	9.50	45.74	65.91	-20.17	QP
3	0.259	16.45	0.04	9.53	26.02	51.47	-25.45	Average
4	0.259	26.05	0.04	9.53	35.62	61.47	-25.85	QP
5	0.507	14.31	0.05	9.56	23.92	46.00	-22.08	Average
6	0.507	20.90	0.05	9.56	30.51	56.00	-25.49	QP
7	1.191	9.72	0.08	9.57	19.37	46.00	-26.63	Average
8	1.191	16.34	0.08	9.57	25.99	56.00	-30.01	QP
9	4.772	14.67	0.19	9.63	24.49	46.00	-21.51	Average
10	4.772	24.98	0.19	9.63	34.80	56.00	-21.20	QP
11	16.839	15.53	0.35	9.91	25.79	50.00	-24.21	Average
12	16.839	25.66	0.35	9.91	35.92	60.00	-24.08	QP



7.2 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 (2020) Section 6.10.5 & 11.12
 Test Engineer: Lily Kuang
 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.

7.2.1 E.U.T. Operation

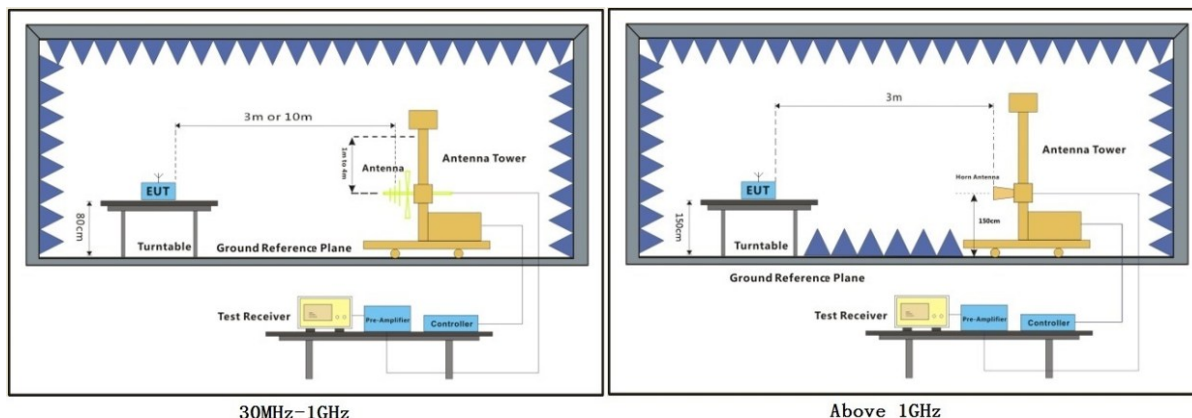
Operating Environment:
 Temperature: 25.3 °C Humidity: 52.7 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

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



7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. 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.
- c. 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.
- d. 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.
- e. 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.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. 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.
- h. Test the EUT in the lowest channel, the Highest channel.
- i. 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.
- j. Repeat above procedures until all frequencies measured was complete.

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

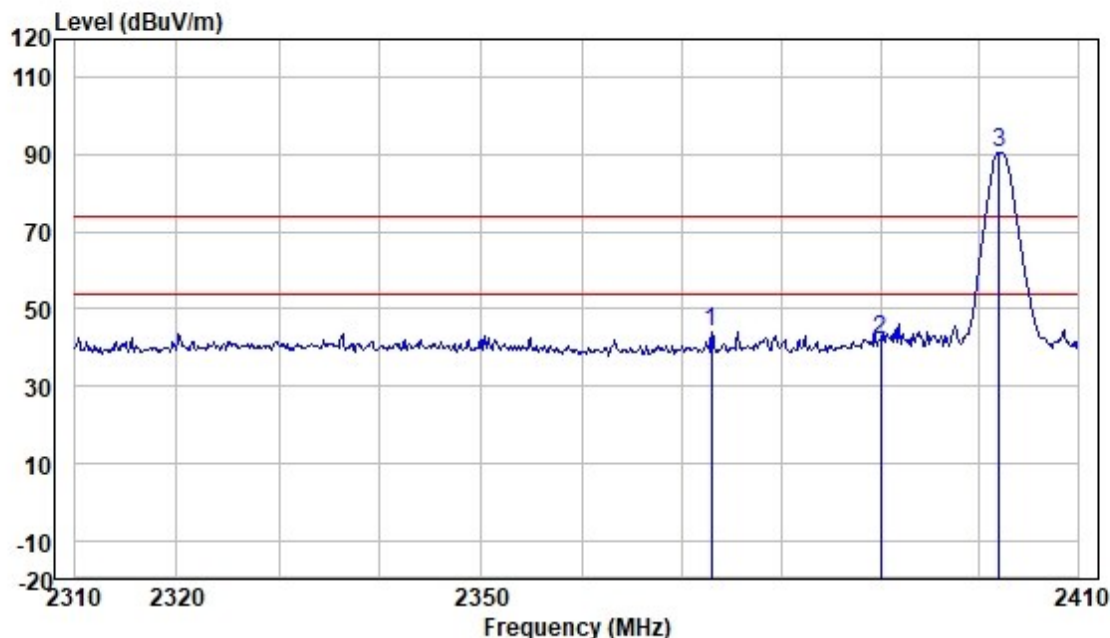
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level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

Remark 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.

Remark 4:For fundamental and harmonic signal measurement, the resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $\leq 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.



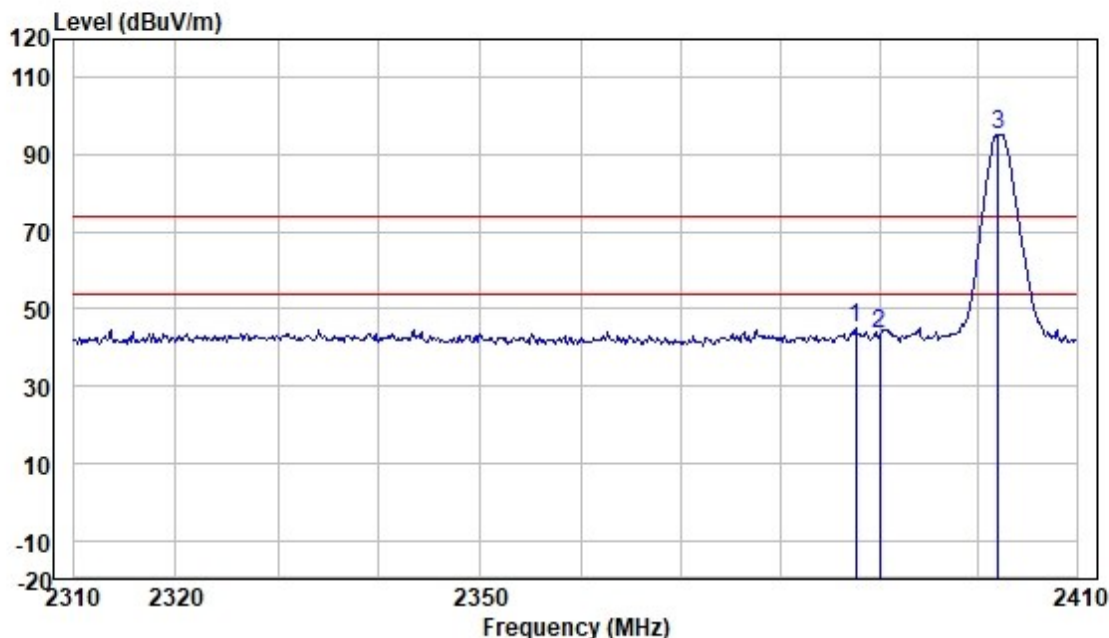
Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:Low



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2372.91	50.78	27.61	3.44	37.77	44.06	74.00	-29.94	VERTICAL	peak
2	2390.00	48.67	27.63	3.44	37.77	41.97	74.00	-32.03	VERTICAL	peak
3*	2402.00	97.24	27.65	3.45	37.77	90.57	74.00	16.57	VERTICAL	peak



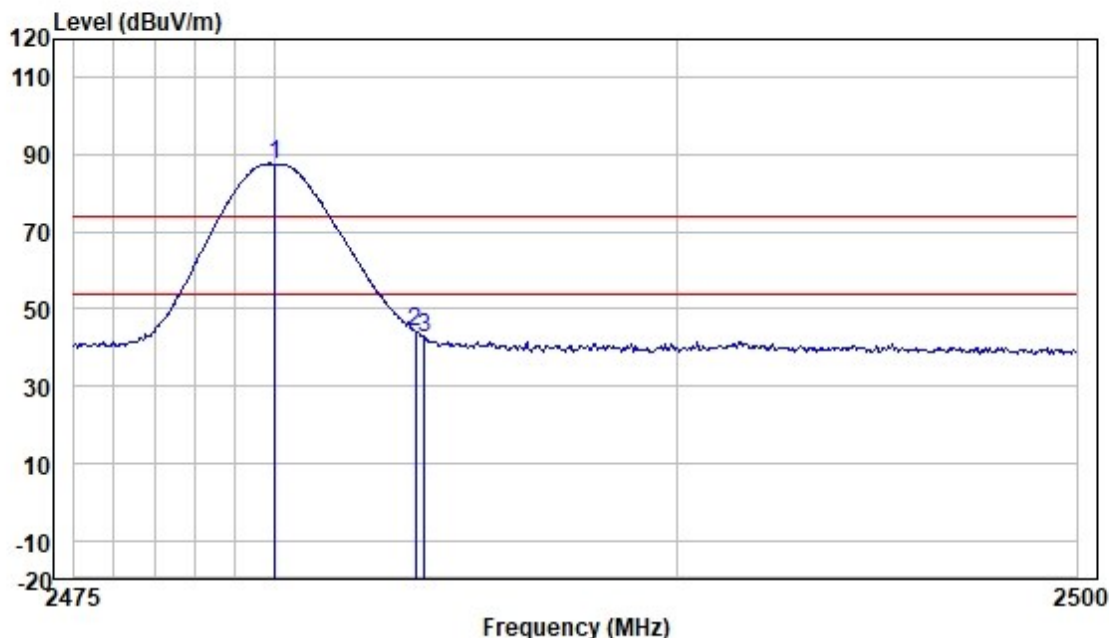
Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:Low



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2387.53	51.83	27.63	3.44	37.77	45.13	74.00	-28.87	HORIZONTAL	peak
2	2390.00	50.11	27.63	3.44	37.77	43.41	74.00	-30.59	HORIZONTAL	peak
3*	2402.00	101.97	27.65	3.45	37.77	95.30	74.00	21.30	HORIZONTAL	peak



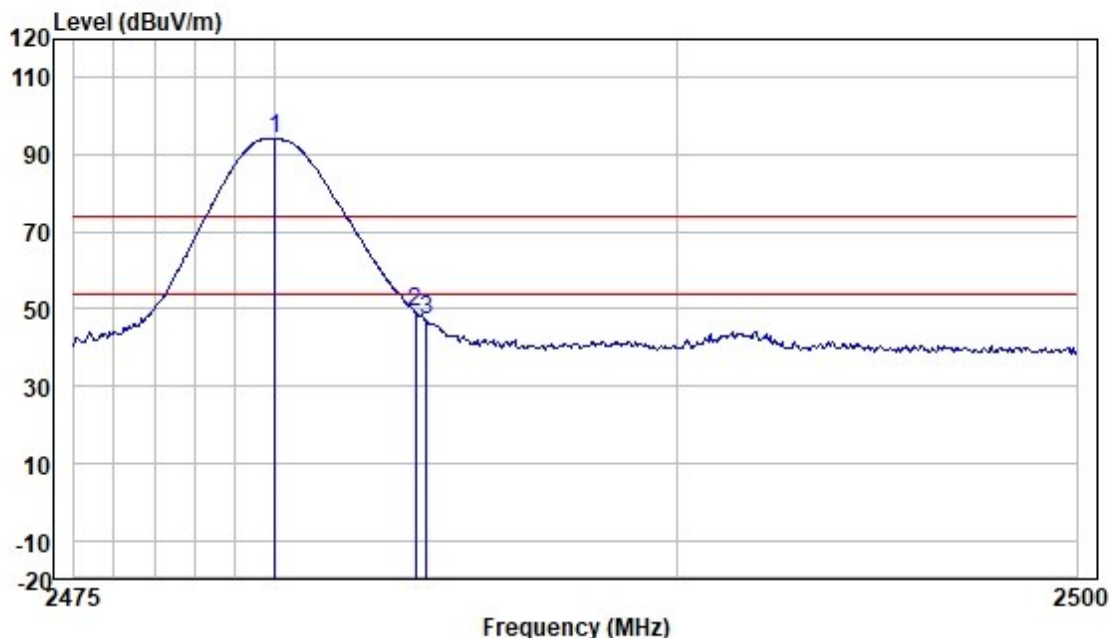
Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:High



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1*	2480.00	94.09	27.75	3.48	37.76	87.56	74.00	13.56	VERTICAL	peak
2	2483.50	50.62	27.76	3.49	37.76	44.11	74.00	-29.89	VERTICAL	peak
3	2483.72	49.07	27.76	3.49	37.76	42.56	74.00	-31.44	VERTICAL	peak



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



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1*	2480.00	100.52	27.75	3.48	37.76	93.99	74.00	19.99	HORIZONTAL	peak
2	2483.50	55.63	27.76	3.49	37.76	49.12	74.00	-24.88	HORIZONTAL	peak
3	2483.77	53.67	27.76	3.49	37.76	47.16	74.00	-26.84	HORIZONTAL	peak



7.3 Radiated Spurious Emissions Below 1GHz

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

Test Method: ANSI C63.10 (2020) Section 6.4,6.5

Test Engineer: Luffy Chen

Limit:

Test Distance: 10m

Frequency (MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
30-88	100	3
88-216	150	3
216-960	200	3
960-1000	500	3

Note

1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

2. At frequencies below 1GHz, measurements may be performed at a distance different to specified in the regulations.

Limit = The limit above - Aux Factor (if applicable)

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

The aux factor needs to be added when measurements are performed at a distance other than the limit distance provided.

EX. Below 30MHz, Aux Factor = 40 dB/decade of distance, the aux factor is $40\log(3/300) = -80\text{dB}$ (for 3m test distance).

EX. Above 30MHz, Aux Factor = 20 dB/decade of distance, the aux factor is $20\log(10/3) = 10.46\text{dB}$ (for 10m test distance).

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.0 °C

Humidity: 53.2 % RH

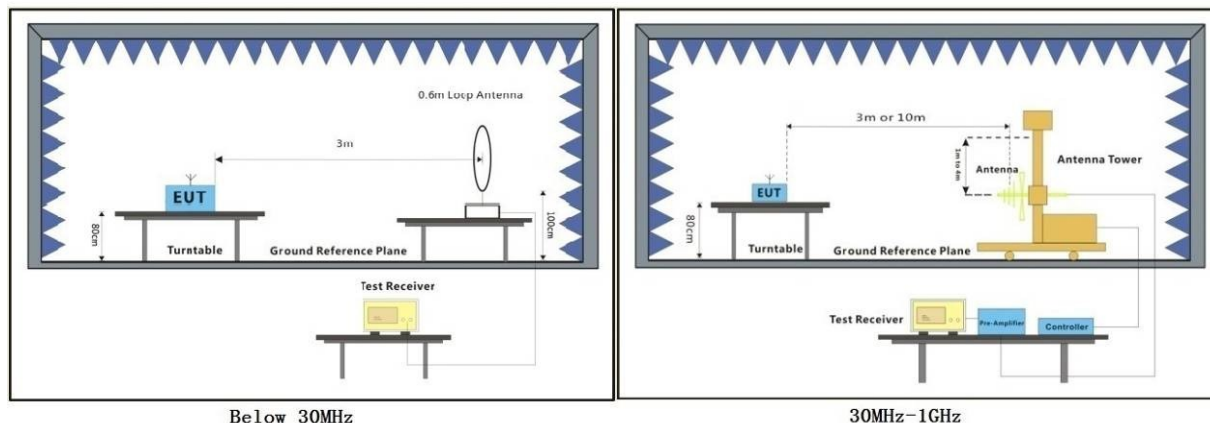
Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	02	TX mode(1Mbps)_Keep the EUT (ISOU5B111) in continuously transmitting mode with GFSK modulation.
Final test	03	TX mode(2Mbps)_Keep the EUT (ISOU5B111) in continuously transmitting mode with GFSK modulation.
Pre-scan	22	TX mode(1Mbps)_Keep the EUT (AduM3160) in continuously transmitting mode with GFSK modulation.
Final test	23	TX mode(2Mbps)_Keep the EUT (AduM3160) in continuously transmitting mode with GFSK modulation.



7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

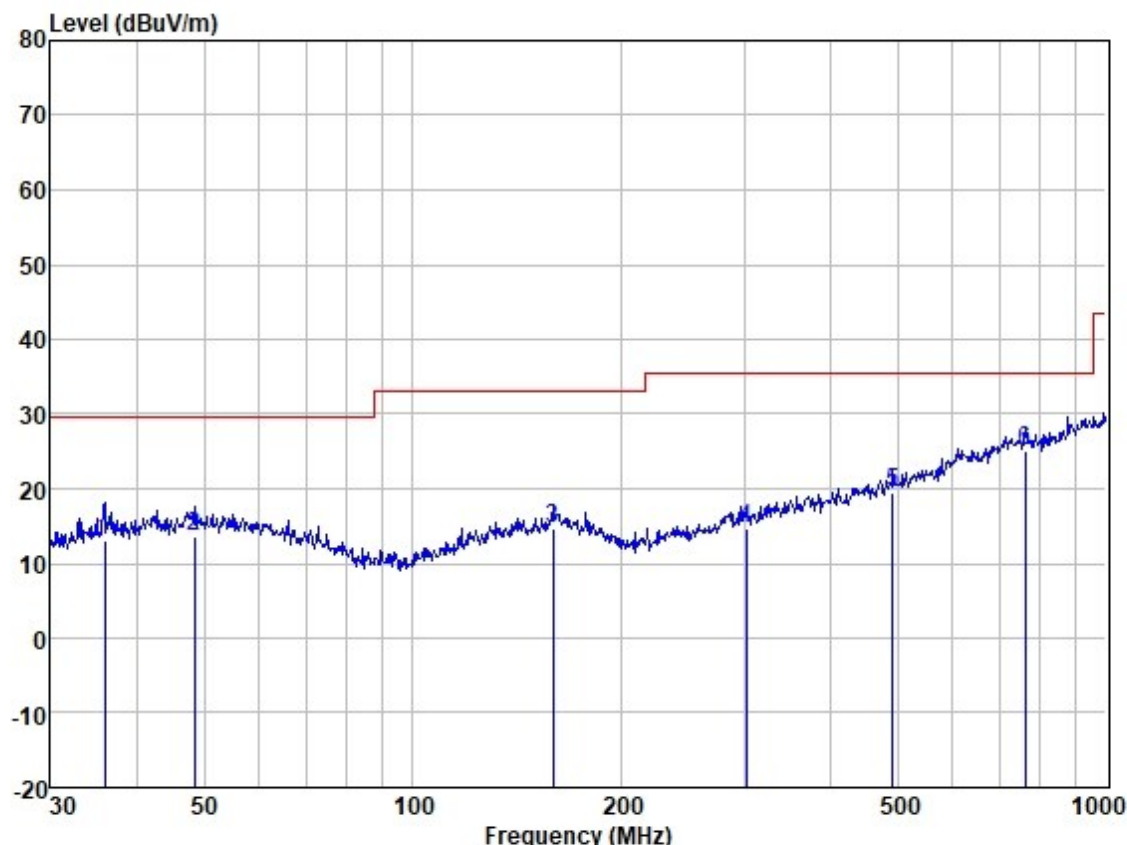
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8m above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3m or 10m away from the interference-receiving antenna, which was mounted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

Remark:

1. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
2. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the worst-case test curve is displayed.



Test Mode: 03; Polarity: Horizontal

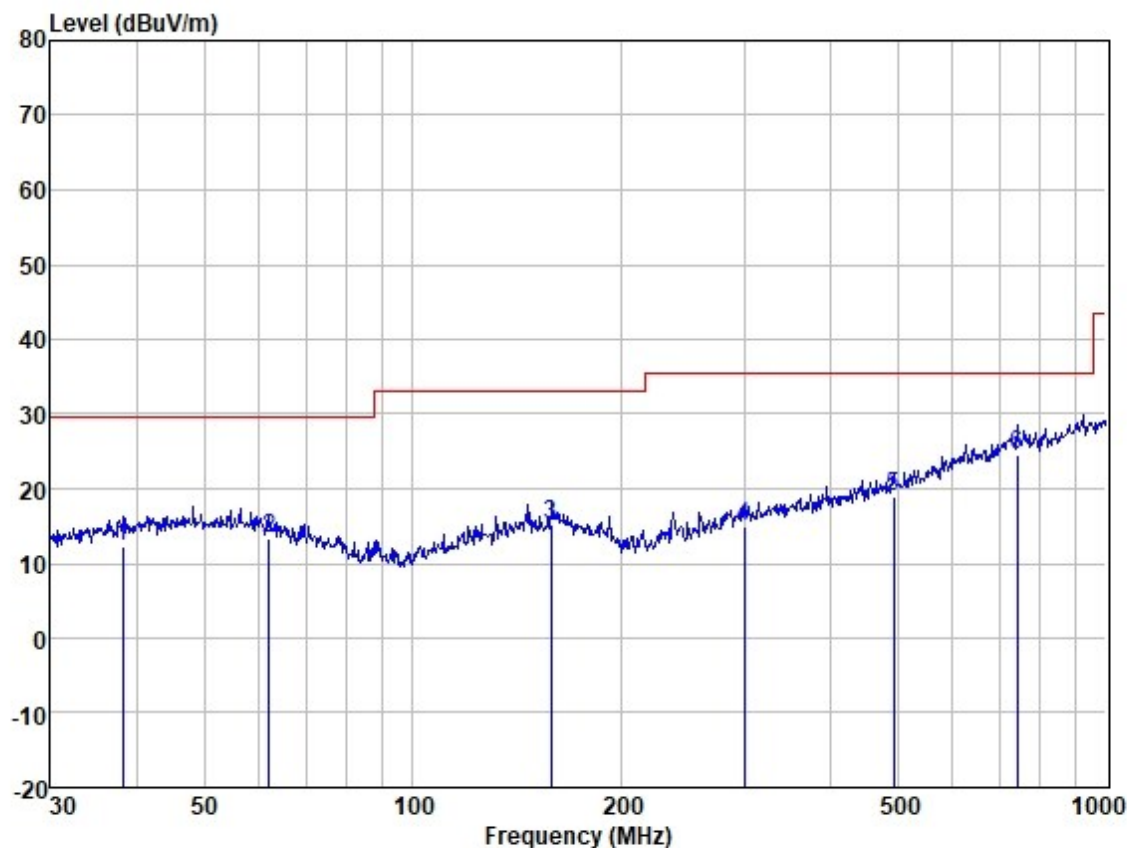


Site : SGS
Job :
Model :
Power :
Test Mode : 2Mbps

	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	35.875	27.29	13.06	0.64	27.99	13.00	29.50	-16.50	HORIZONTAL	QP
2	48.332	26.97	13.93	0.74	27.97	13.67	29.50	-15.83	HORIZONTAL	QP
3	159.225	27.79	13.44	1.02	27.70	14.55	33.10	-18.55	HORIZONTAL	QP
4	302.481	26.56	13.60	1.69	27.21	14.64	35.60	-20.96	HORIZONTAL	QP
5	492.469	28.01	17.93	1.89	28.48	19.35	35.60	-16.25	HORIZONTAL	QP
6	763.376	28.29	22.52	2.46	28.31	24.96	35.60	-10.64	HORIZONTAL	QP



Test Mode: 03; Polarity: Vertical

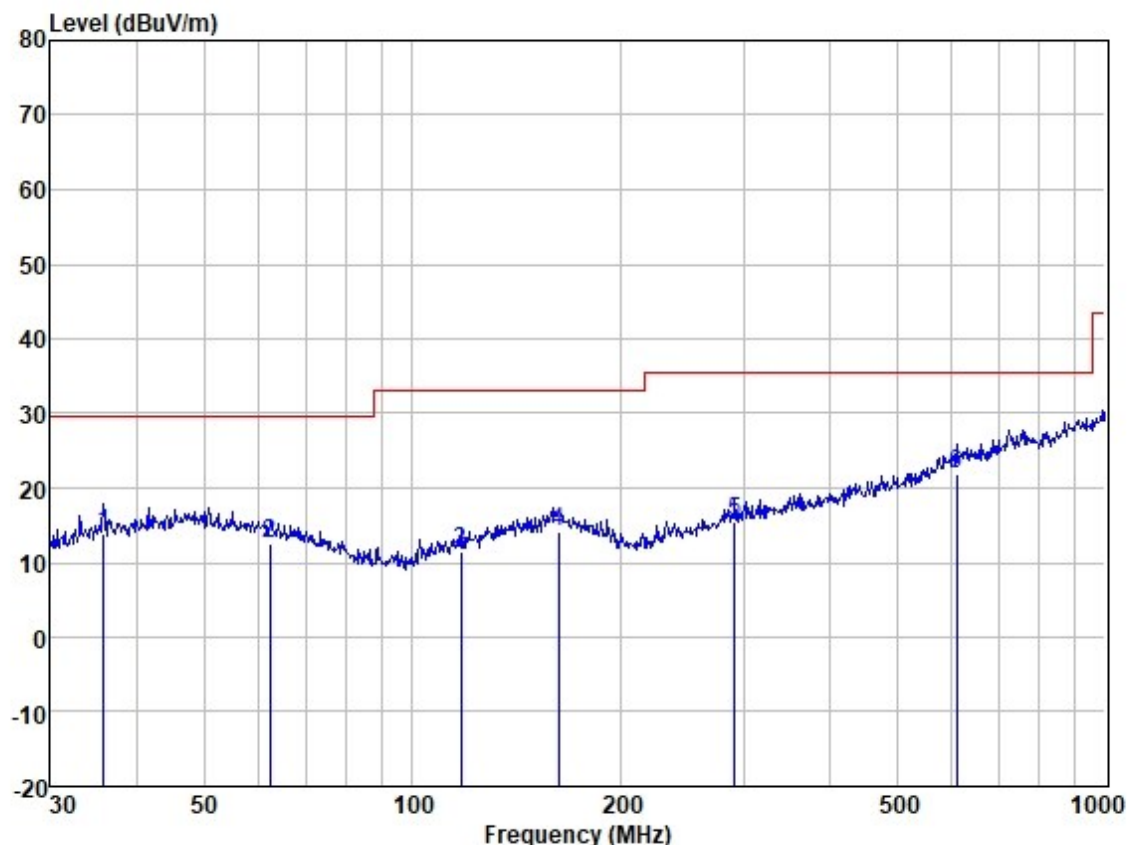


Site : SGS
Job :
Model :
Power :
Test Mode : 2Mbps

	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	38.078	26.34	13.33	0.67	27.99	12.35	29.50	-17.15	VERTICAL	QP
2	61.995	27.42	12.99	0.78	27.92	13.27	29.50	-16.23	VERTICAL	QP
3	158.112	28.33	13.48	1.01	27.71	15.11	33.10	-17.99	VERTICAL	QP
4	300.367	26.84	13.56	1.68	27.20	14.88	35.60	-20.72	VERTICAL	QP
5	494.199	27.70	17.93	1.89	28.49	19.03	35.60	-16.57	VERTICAL	QP
6	744.866	28.08	22.31	2.43	28.32	24.50	35.60	-11.10	VERTICAL	QP



Test Mode: 23; Polarity: Horizontal

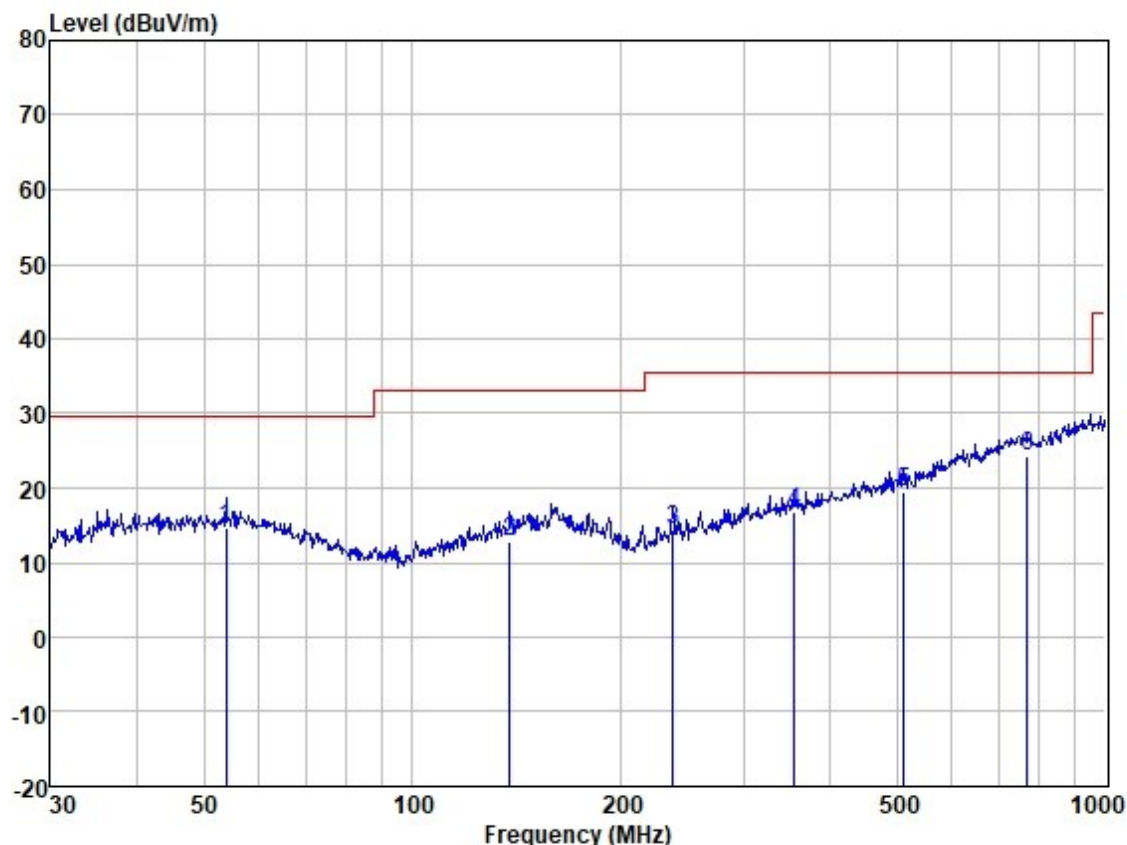


Site : SGS
Job :
Model :
Power :
Test Mode : TX

	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	35.749	28.26	13.06	0.64	27.99	13.97	29.50	-15.53	HORIZONTAL	QP
2	62.213	26.55	12.99	0.78	27.92	12.40	29.50	-17.10	HORIZONTAL	QP
3	117.360	27.32	11.12	0.89	27.78	11.55	33.10	-21.55	HORIZONTAL	QP
4	162.611	27.46	13.39	1.03	27.69	14.19	33.10	-18.91	HORIZONTAL	QP
5	292.058	27.54	13.46	1.67	27.21	15.46	35.60	-20.14	HORIZONTAL	QP
6	609.922	27.92	20.36	2.06	28.46	21.88	35.60	-13.72	HORIZONTAL	QP



Test Mode: 23; Polarity: Vertical



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

	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	53.693	27.91	13.83	0.76	27.95	14.55	29.50	-14.95	VERTICAL	QP
2	137.903	26.58	12.96	0.95	27.75	12.74	33.10	-20.36	VERTICAL	QP
3	237.476	28.75	11.53	1.47	27.30	14.45	35.60	-21.15	VERTICAL	QP
4	355.427	27.73	14.62	1.77	27.39	16.73	35.60	-18.87	VERTICAL	QP
5	511.835	27.89	18.20	1.91	28.50	19.50	35.60	-16.10	VERTICAL	QP
6	771.449	27.76	22.46	2.48	28.31	24.39	35.60	-11.21	VERTICAL	QP



7.4 Radiated Spurious Emissions Above 1GHz

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

Test Method: ANSI C63.10 (2020) Section 6.6 & 11.12

Test Engineer: Lily Kuang

Limit:

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

Note:

At Above 18GHz, measurements may be performed at a distance shorter than that specified in the regulations

Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor+ Aux Factor (if applicable)

The aux factor needs to be added when measurements are performed at a distance other than the limit distance provided.

EX. Above 18GHz, Aux Factor = 20 dB/decade of distance, the aux factor is $20\log(1/3) = -9.54\text{dB}$ (for 1m test distance).

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.3 °C

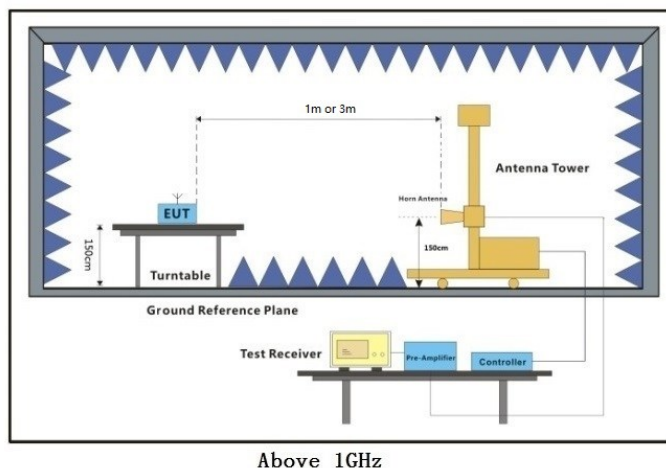
Humidity: 52.7 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

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

7.4.3 Test Setup Diagram



Above 1GHz



7.4.4 Measurement Procedure and Data

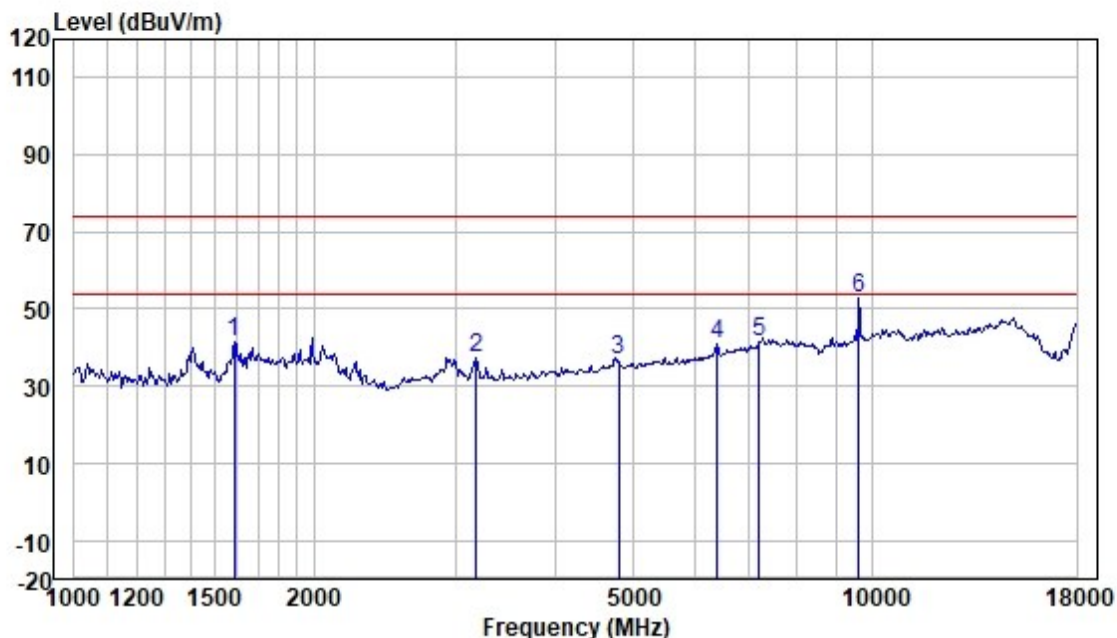
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5m above the ground at a 3m fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3m away from the interference-receiving antenna from 1GHz to 18GHz, and 1m away from the interference-receiving antenna above 18GHz.
- The interference-receiving antenna was mounted on the variable-height antenna tower, with its boresight facing the EUT throughout the test.
- The antenna height is varied from 1m to 4m 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 1m to 4m 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.
- 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:

- Scan from 1GHz to 10th harmonic of the highest frequency or 40 GHz, whichever is lower.
- 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.
- For the frequency above 18GHz, testing had been executed under all test modes, only the worst-case test curve is displayed in the report.
- For devices with multiple operating modes, measurements on the middle channel is used to determine the worst-case mode(s).



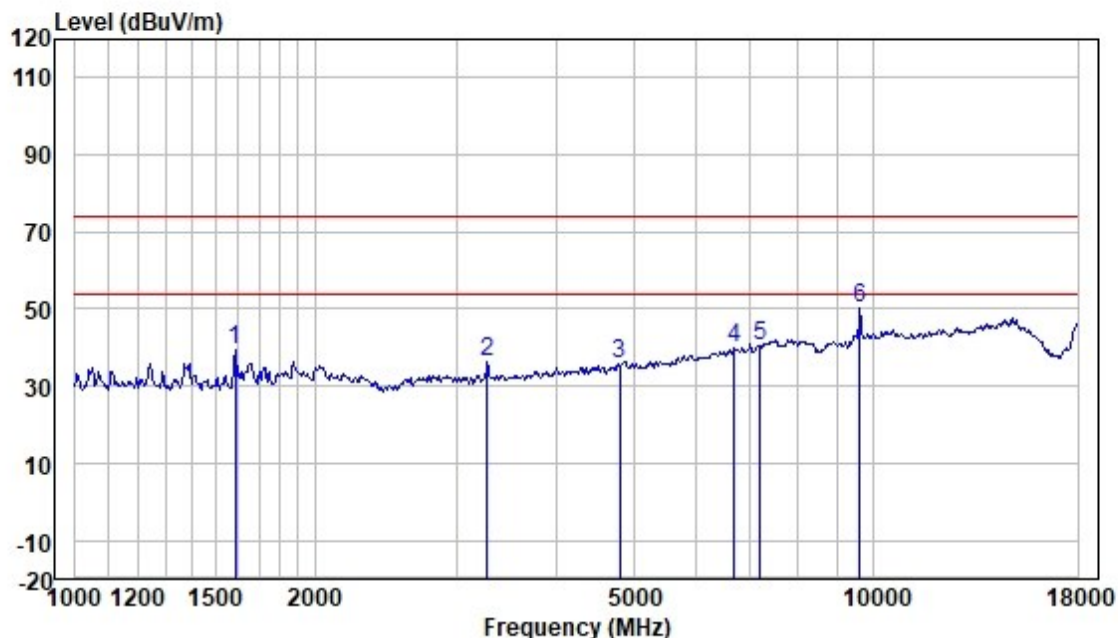
Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:Low



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1587.98	67.34	25.99	2.75	54.63	41.45	74.00	-32.55	VERTICAL	peak
2	3186.87	59.43	28.79	3.91	54.79	37.34	74.00	-36.66	VERTICAL	peak
3	4804.00	54.46	31.51	4.81	53.91	36.87	74.00	-37.13	VERTICAL	peak
4	6377.20	54.65	33.91	5.61	53.20	40.97	74.00	-33.03	VERTICAL	peak
5	7206.00	53.21	35.80	5.93	53.24	41.70	74.00	-32.30	VERTICAL	peak
6	9608.00	60.32	38.70	7.04	53.44	52.62	74.00	-21.38	VERTICAL	peak



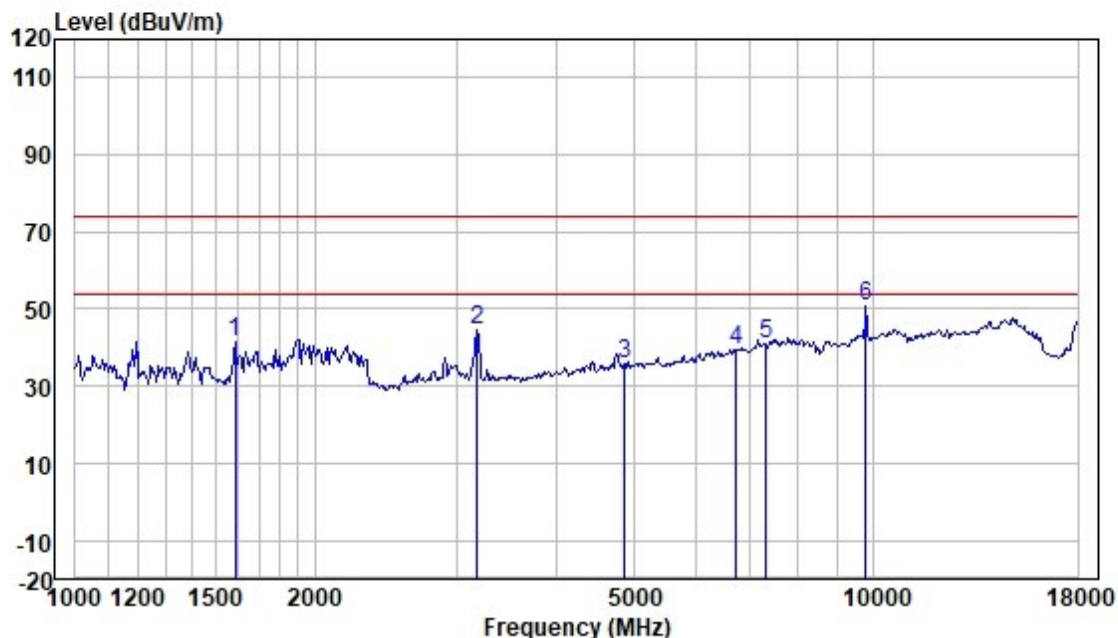
Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:Low



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1587.98	65.05	25.99	2.75	54.63	39.16	74.00	-34.84	HORIZONTAL	peak
2	3280.33	58.03	28.87	3.99	54.74	36.15	74.00	-37.85	HORIZONTAL	peak
3	4804.00	53.33	31.51	4.81	53.91	35.74	74.00	-38.26	HORIZONTAL	peak
4	6679.04	52.81	34.53	5.72	53.20	39.86	74.00	-34.14	HORIZONTAL	peak
5	7206.00	52.05	35.80	5.93	53.24	40.54	74.00	-33.46	HORIZONTAL	peak
6	9608.00	58.09	38.70	7.04	53.44	50.39	74.00	-23.61	HORIZONTAL	peak



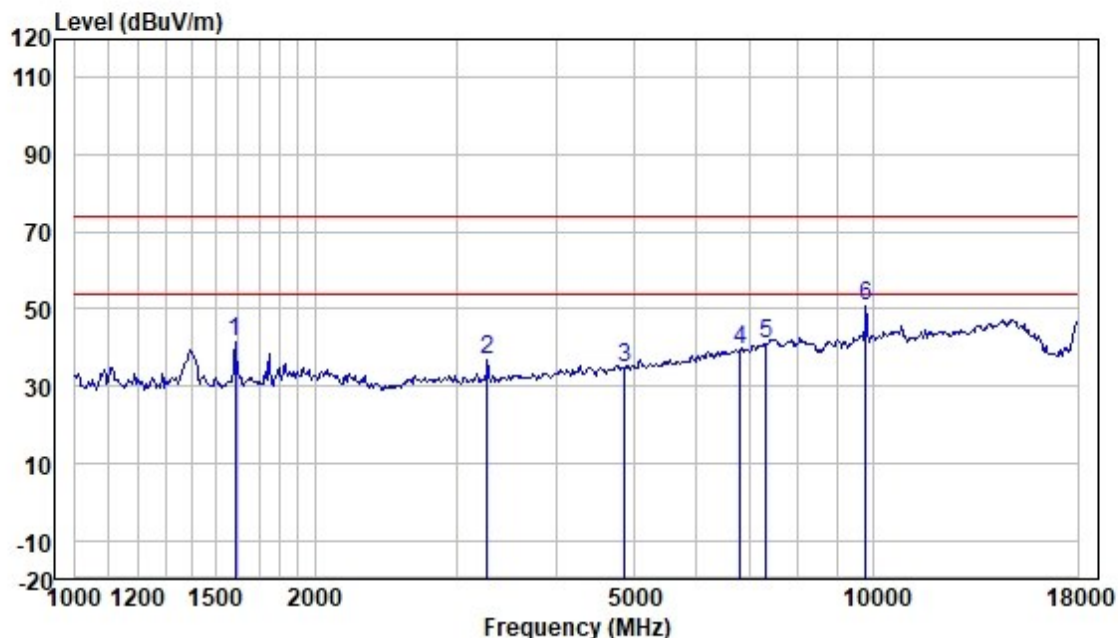
Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:middle



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1587.98	67.53	25.99	2.75	54.63	41.64	74.00	-32.36	VERTICAL	peak
2	3186.87	66.67	28.79	3.91	54.79	44.58	74.00	-29.42	VERTICAL	peak
3	4882.00	53.18	31.65	4.86	53.86	35.83	74.00	-38.17	VERTICAL	peak
4	6717.76	52.37	34.64	5.75	53.20	39.56	74.00	-34.44	VERTICAL	peak
5	7323.00	51.89	36.29	5.98	53.27	40.89	74.00	-33.11	VERTICAL	peak
6	9764.00	58.03	38.87	7.11	53.42	50.59	74.00	-23.41	VERTICAL	peak



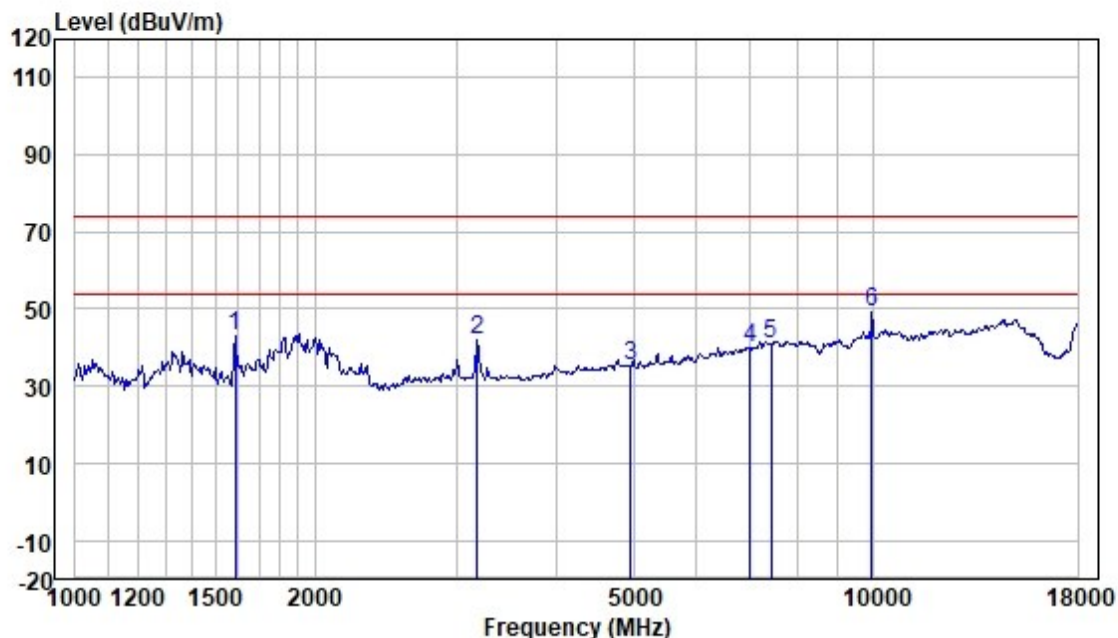
Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:middle



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1587.98	67.38	25.99	2.75	54.63	41.49	74.00	-32.51	HORIZONTAL	peak
2	3280.33	58.69	28.87	3.99	54.74	36.81	74.00	-37.19	HORIZONTAL	peak
3	4882.00	52.29	31.65	4.86	53.86	34.94	74.00	-39.06	HORIZONTAL	peak
4	6795.88	51.96	34.87	5.79	53.20	39.42	74.00	-34.58	HORIZONTAL	peak
5	7323.00	52.16	36.29	5.98	53.27	41.16	74.00	-32.84	HORIZONTAL	peak
6	9764.00	58.10	38.87	7.11	53.42	50.66	74.00	-23.34	HORIZONTAL	peak



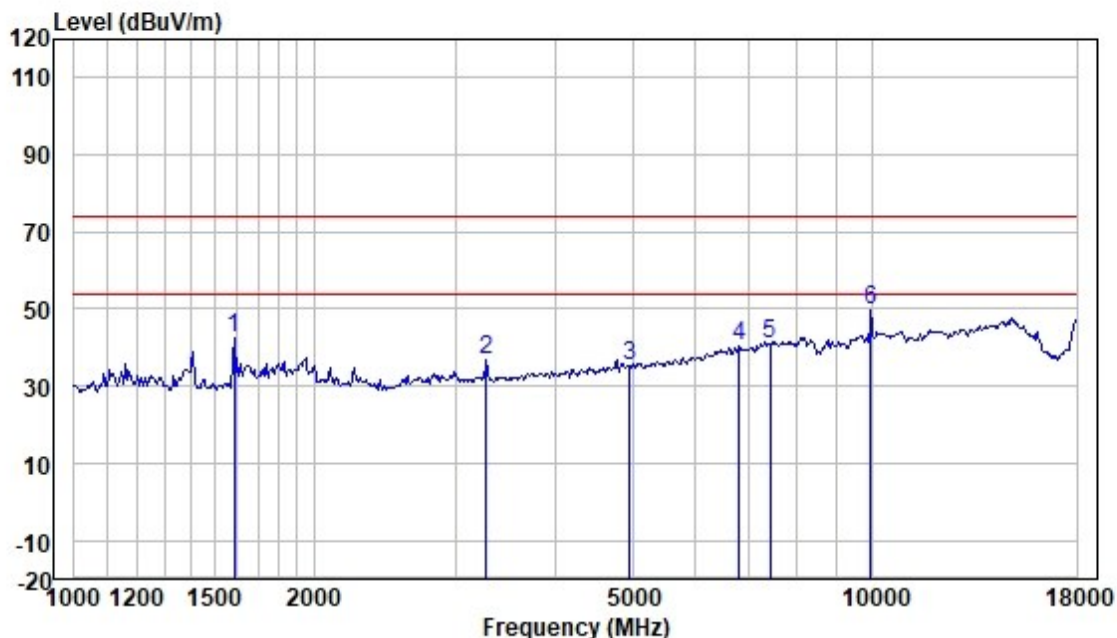
Test Mode: 02; Polarity: Vertical; Modulation:GFSK; Channel:High



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1587.98	69.02	25.99	2.75	54.63	43.13	74.00	-30.87	VERTICAL	peak
2	3186.87	64.13	28.79	3.91	54.79	42.04	74.00	-31.96	VERTICAL	peak
3	4960.00	52.33	31.74	4.89	53.82	35.14	74.00	-38.86	VERTICAL	peak
4	6995.17	52.11	35.23	5.87	53.20	40.01	74.00	-33.99	VERTICAL	peak
5	7440.00	51.86	36.57	6.02	53.29	41.16	74.00	-32.84	VERTICAL	peak
6	9920.00	56.31	39.07	7.19	53.41	49.16	74.00	-24.84	VERTICAL	peak



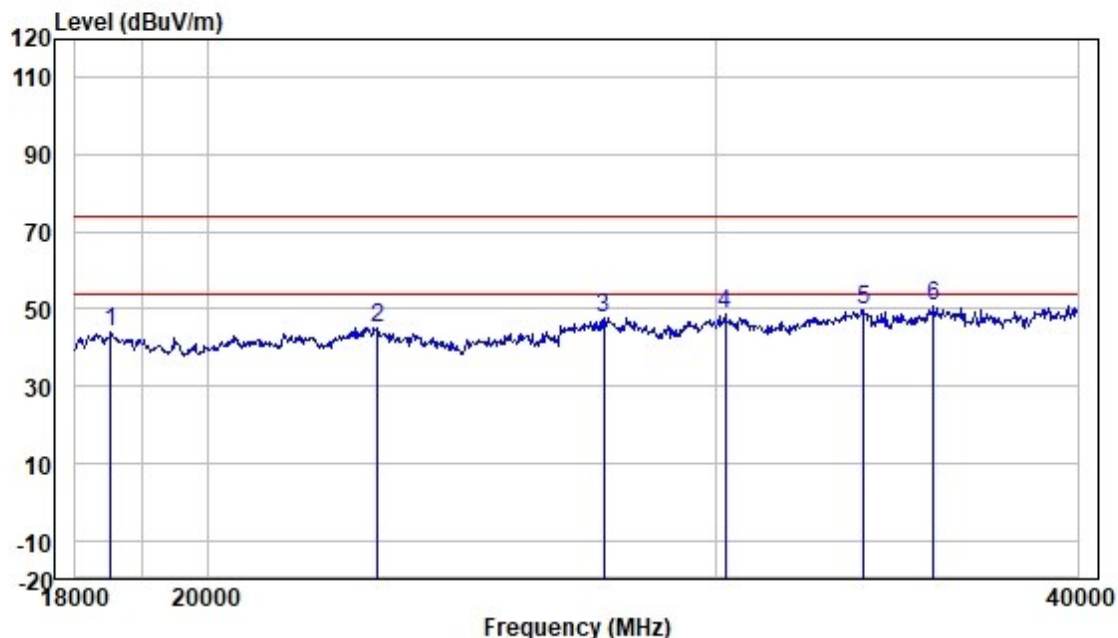
Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; Channel:High



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1587.98	68.46	25.99	2.75	54.63	42.57	74.00	-31.43	HORIZONTAL	peak
2	3280.33	58.76	28.87	3.99	54.74	36.88	74.00	-37.12	HORIZONTAL	peak
3	4960.00	52.51	31.74	4.89	53.82	35.32	74.00	-38.68	HORIZONTAL	peak
4	6795.88	52.77	34.87	5.79	53.20	40.23	74.00	-33.77	HORIZONTAL	peak
5	7440.00	51.73	36.57	6.02	53.29	41.03	74.00	-32.97	HORIZONTAL	peak
6	9920.00	57.12	39.07	7.19	53.41	49.97	74.00	-24.03	HORIZONTAL	peak



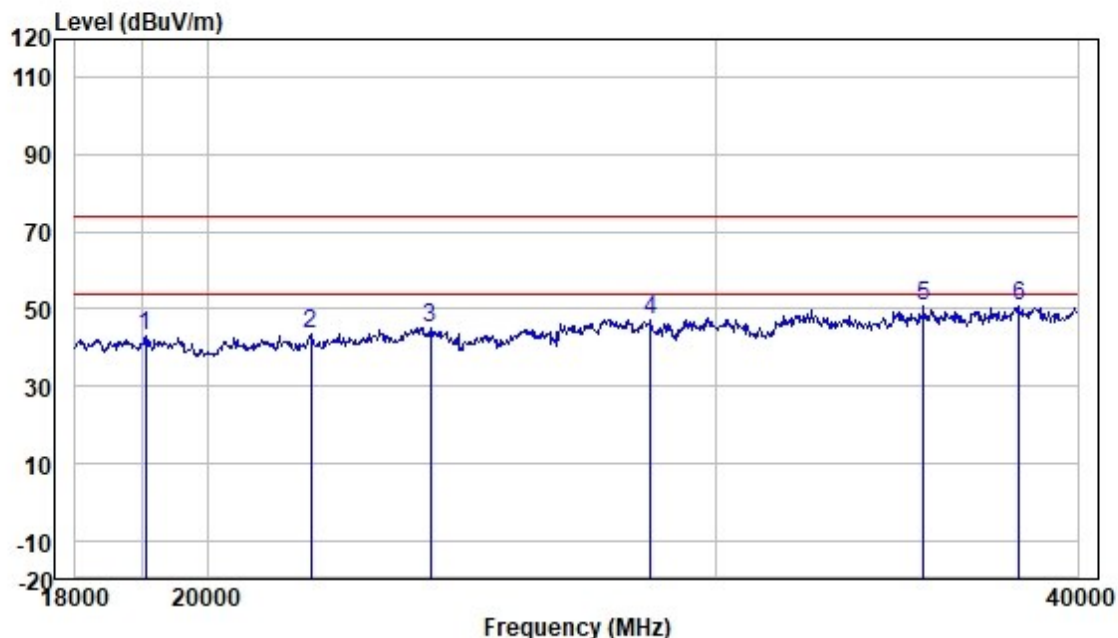
Test Mode: 02; Polarity: Vertical; Modulation:GFSK;



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	18524.94	43.07	36.90	3.12	39.22	43.87	74.00	-30.13	VERTICAL	Peak
2	22908.80	41.60	38.45	3.33	38.27	45.11	74.00	-28.89	VERTICAL	Peak
3	27417.61	42.86	39.20	3.86	38.21	47.71	74.00	-26.29	VERTICAL	Peak
4	30198.88	41.70	40.07	4.37	37.68	48.46	74.00	-25.54	VERTICAL	Peak
5	33716.89	42.39	40.70	6.16	39.53	49.72	74.00	-24.28	VERTICAL	Peak
6	35655.18	40.99	41.36	5.81	37.40	50.76	74.00	-23.24	VERTICAL	Peak



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



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	19049.97	41.88	37.08	3.21	39.34	42.83	74.00	-31.17	HORIZONTAL	Peak
2	21732.73	42.35	37.55	3.32	39.71	43.51	74.00	-30.49	HORIZONTAL	Peak
3	23899.13	41.00	38.69	3.44	37.81	45.32	74.00	-28.68	HORIZONTAL	Peak
4	28466.14	42.96	38.99	3.95	38.50	47.40	74.00	-26.60	HORIZONTAL	Peak
5	35371.60	41.55	41.25	5.99	38.18	50.61	74.00	-23.39	HORIZONTAL	Peak
6	38159.22	38.98	42.63	5.15	36.10	50.66	74.00	-23.34	HORIZONTAL	Peak



7.5 Maximum Conducted Output Power

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

Test Method: ANSI C63.10 (2020) Section 11.9.1

Test Engineer: Banna Ban

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

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C

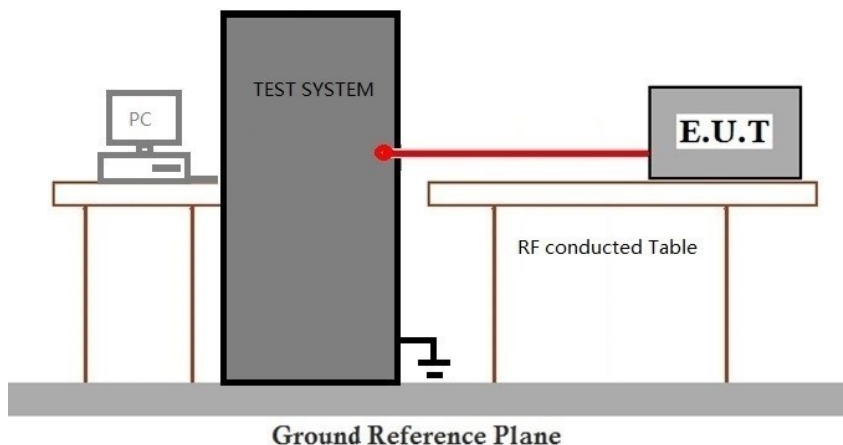
Humidity: 71.2 % RH

Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

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

7.5.3 Test Setup Diagram



7.5.4 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



7.6 Minimum 6dB Bandwidth

Test Requirement	47 CFR Part 15, Subpart C 15.247a(2)
Test Method:	ANSI C63.10 (2020) Section 11.8.1
Test Engineer:	Banna Ban
Limit:	≥500 kHz

7.6.1 E.U.T. Operation

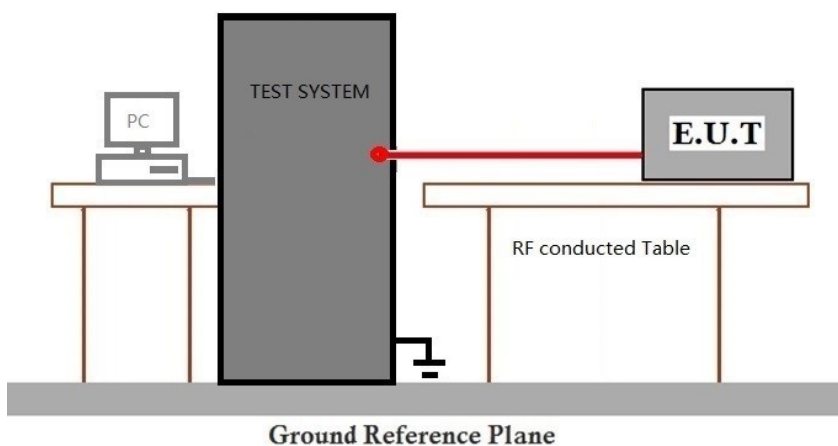
Operating Environment:

Temperature: 22.2 °C Humidity: 71.2 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

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

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 Power Spectral Density

Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2020) Section 11.10.3
Test Engineer:	Banna Ban
Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

7.7.1 E.U.T. Operation

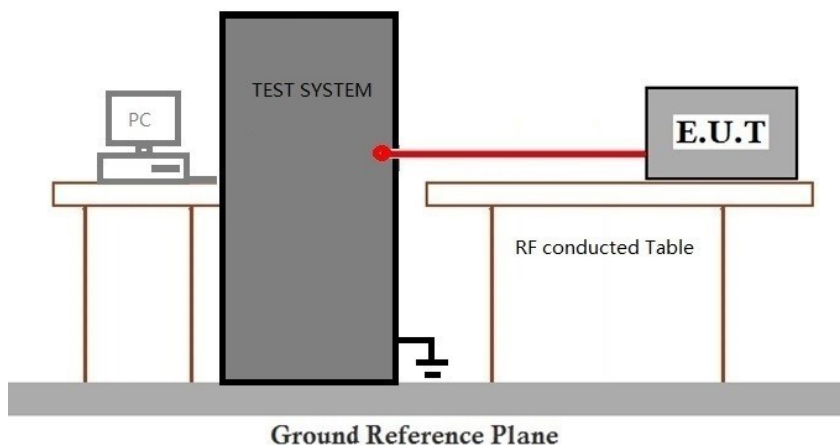
Operating Environment:

Temperature: 22.2 °C Humidity: 71.2 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

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

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.8 Conducted Band Edges Measurement

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

Test Method: ANSI C63.10 (2020) Section 6.10.4

Test Engineer: Banna Ban

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: 22.2 °C

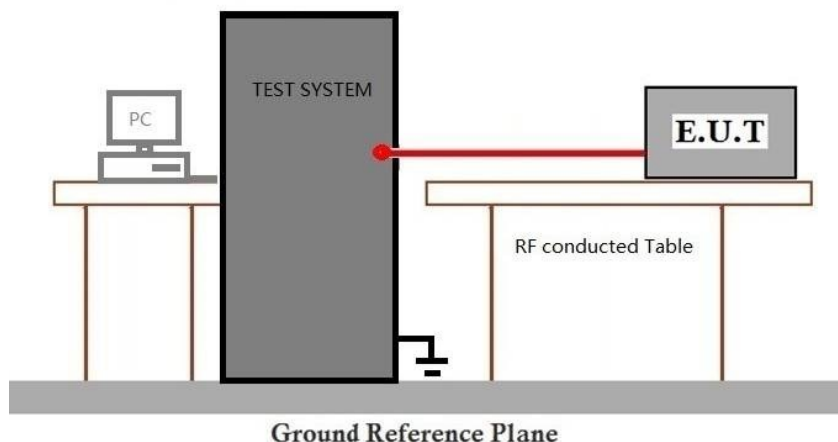
Humidity: 71.2 % RH

Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

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

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

Please Refer to Appendix for Details



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7.9 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2020) Section 11.11

Test Engineer: Banna Ban

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).

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C

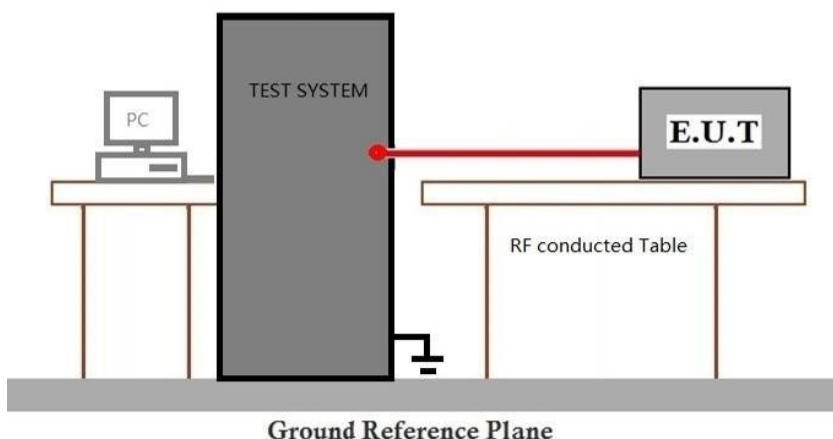
Humidity: 71.2 % RH

Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

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

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details



8 Test Setup Photo

Refer to Appendix - Test Setup Photo for GZCR260300062502



9 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal Photos for GZCR2603000625AT



10 Appendix

1. Duty Cycle

1.1 Test Result

1.1.1 Ant1

Ant1							
Mode	TX Type	Frequency (MHz)	T _{on} (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	0.171	0.625	27.36	5.63	0.00
		2440	0.172	0.625	27.52	5.60	0.03
		2480	0.171	0.625	27.36	5.63	0.00
2M	SISO	2402	0.135	0.625	21.60	6.66	0.03
		2440	0.135	0.625	21.60	6.66	0.03
		2480	0.135	0.625	21.60	6.66	0.03



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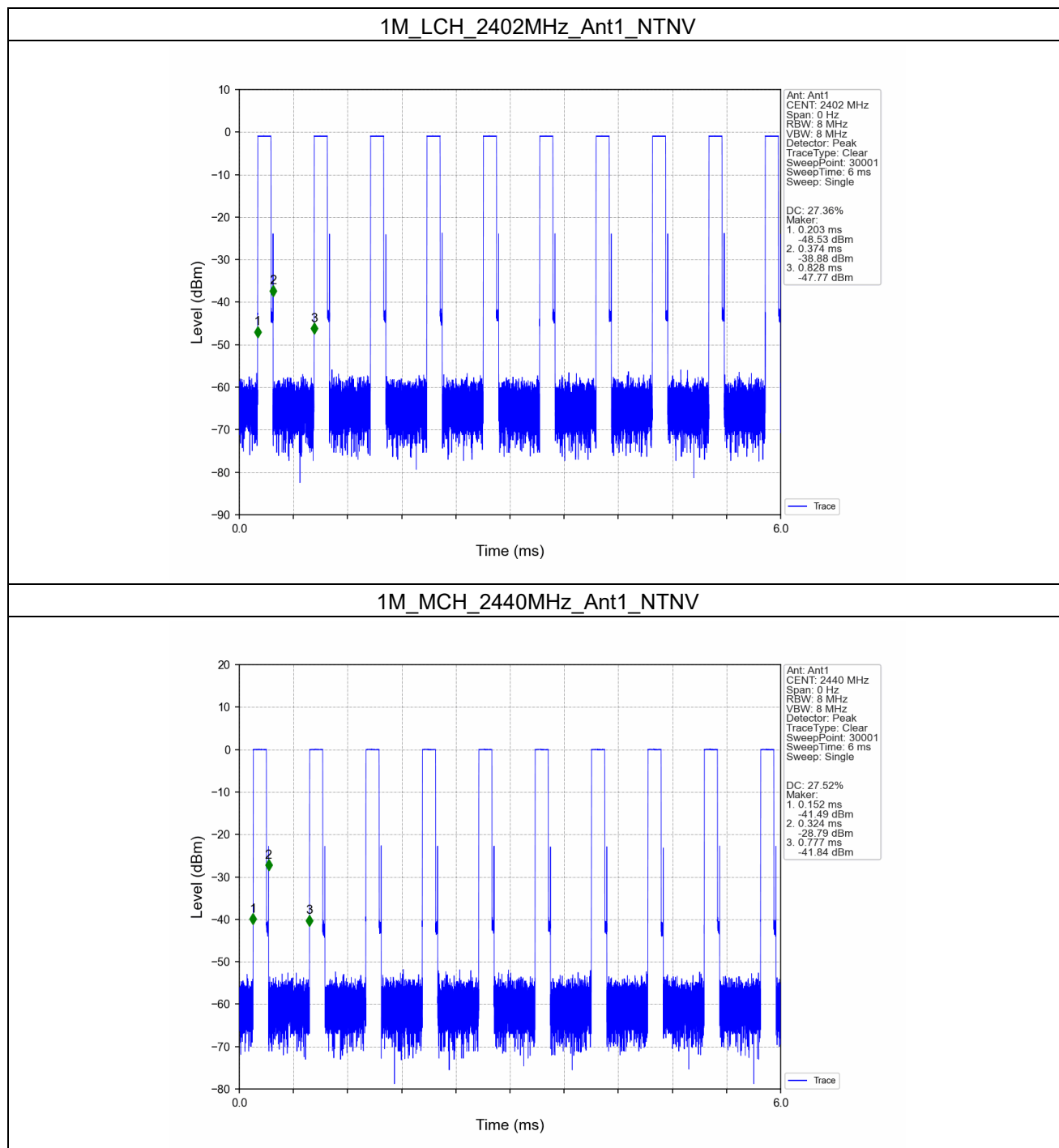
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中国·广东·广州高新技术产业开发区科学城科珠路198号 邮编: 510663

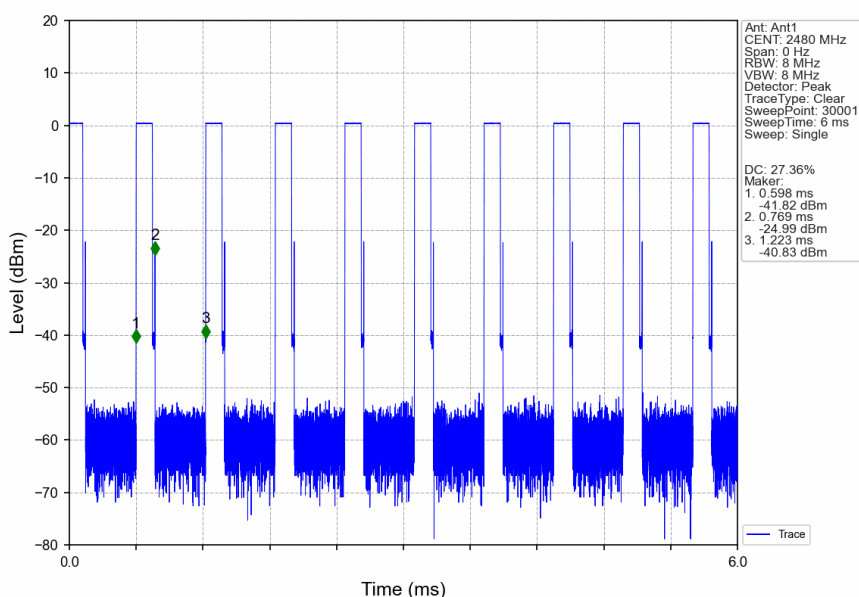
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1.2 Test Graph

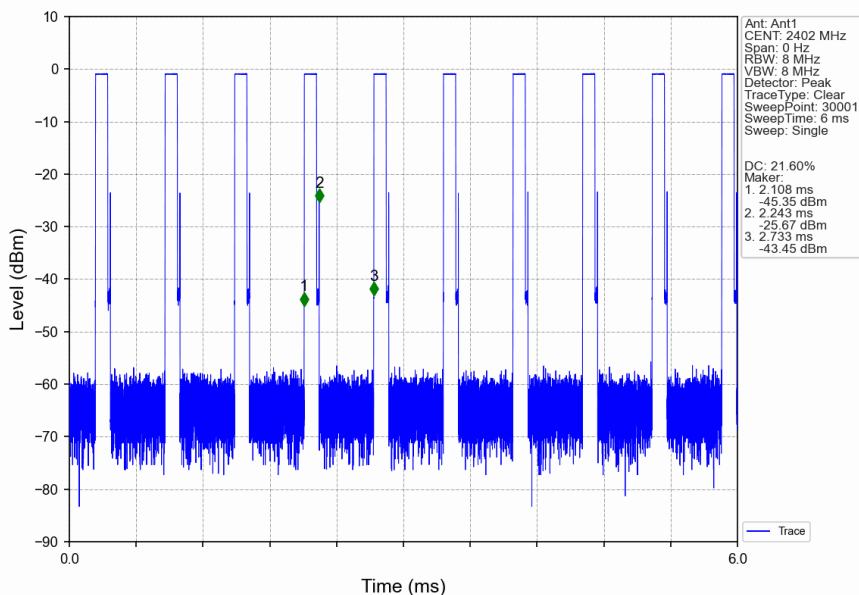
1.2.1 Ant1



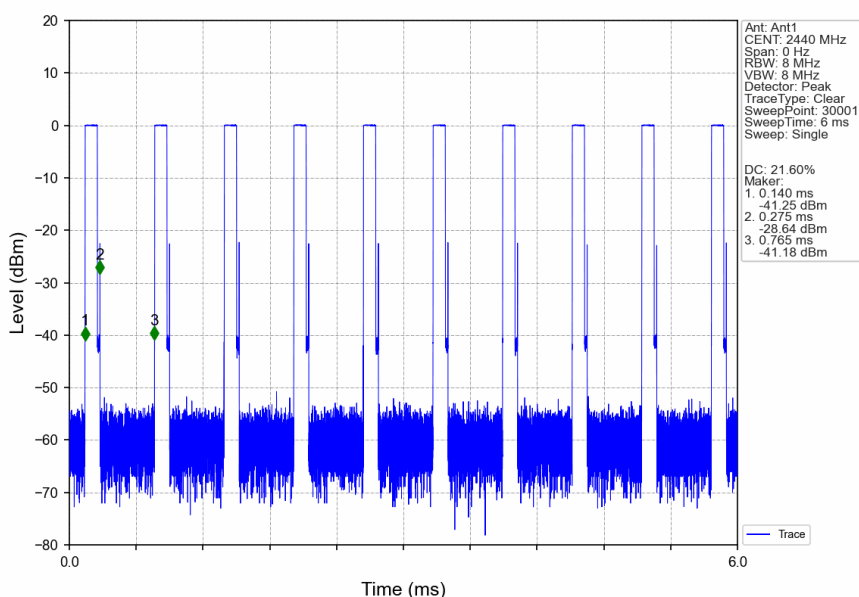
1M_HCH_2480MHz_Ant1_NTNV



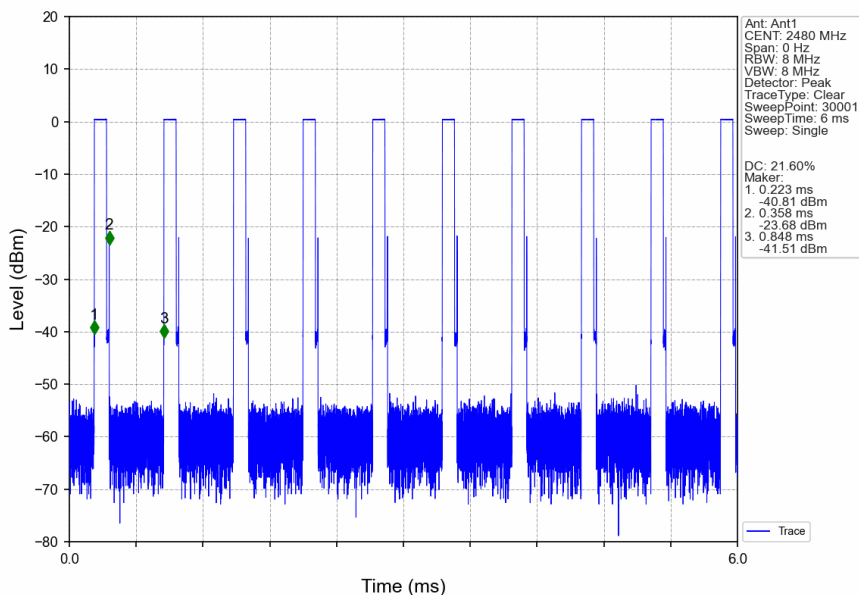
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



2. Bandwidth

2.1 Test Result

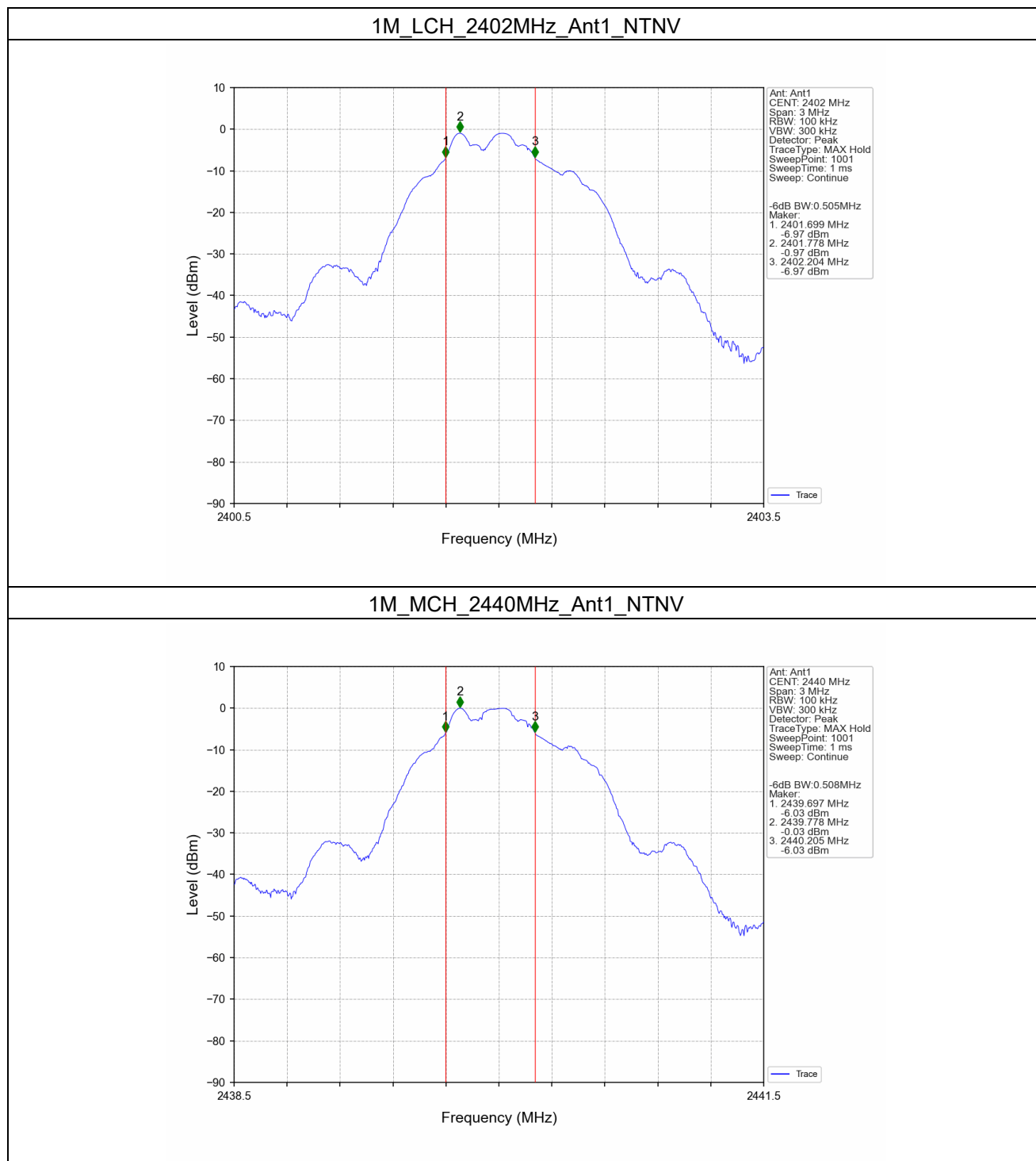
2.1.1 6dB BW

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.505	≥ 0.5	Pass
		2440	1	0.508	≥ 0.5	Pass
		2480	1	0.505	≥ 0.5	Pass
2M	SISO	2402	1	0.855	≥ 0.5	Pass
		2440	1	0.856	≥ 0.5	Pass
		2480	1	0.853	≥ 0.5	Pass

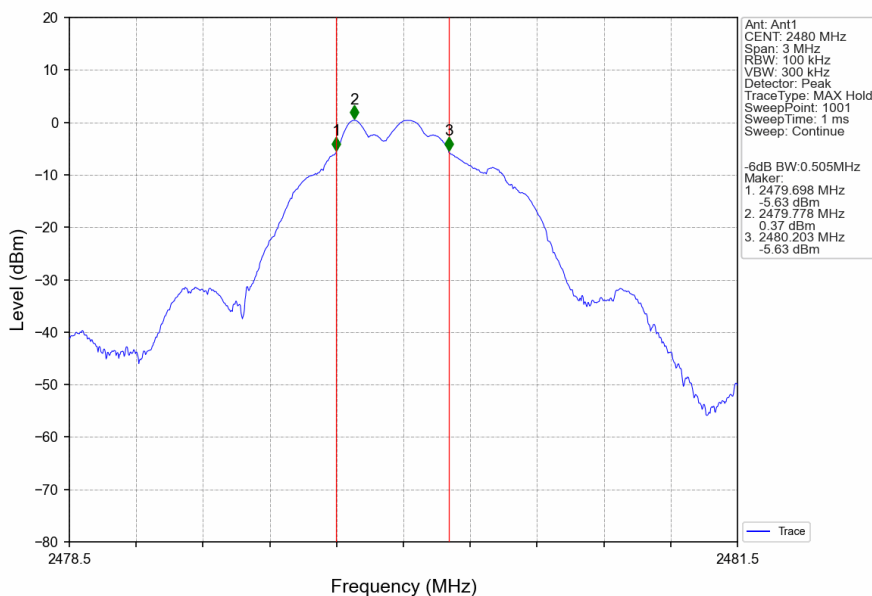


2.2 Test Graph

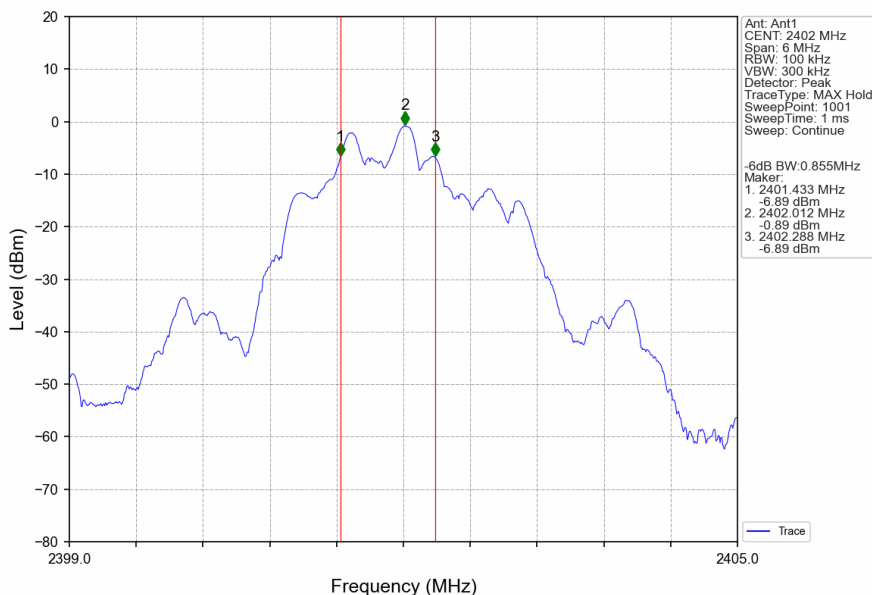
2.2.1 6dB BW



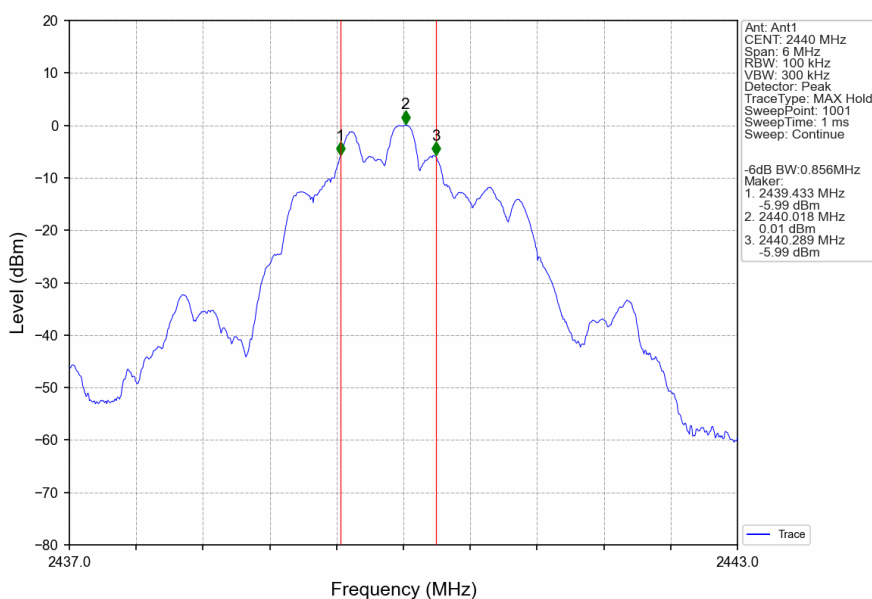
1M_HCH_2480MHz_Ant1_NTNV



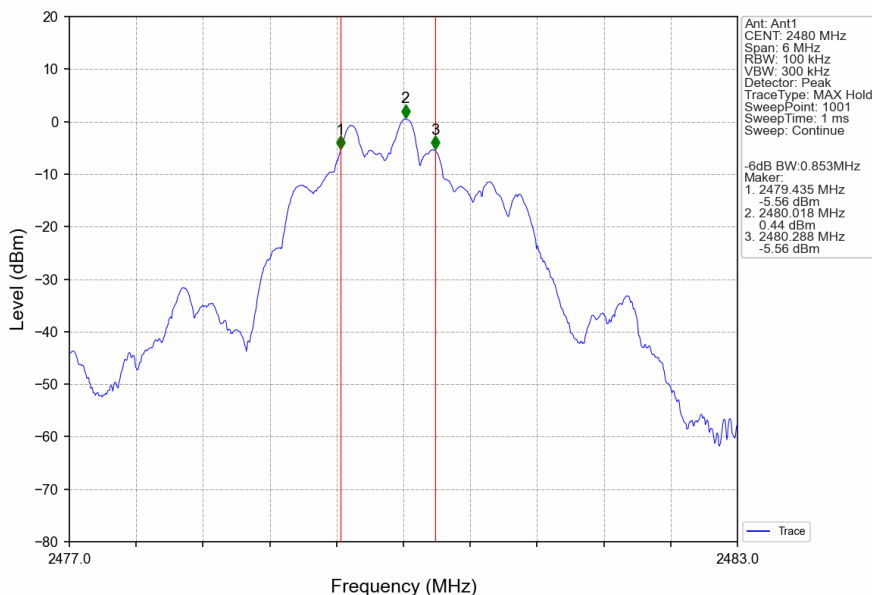
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



3. Maximum Conducted Output Power

3.1 Test Result

3.1.1 Power

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	-0.88	<=30	Pass
		2440	0.06	<=30	Pass
		2480	0.47	<=30	Pass
2M	SISO	2402	-0.83	<=30	Pass
		2440	0.11	<=30	Pass
		2480	0.54	<=30	Pass

4. Maximum Power Spectral Density

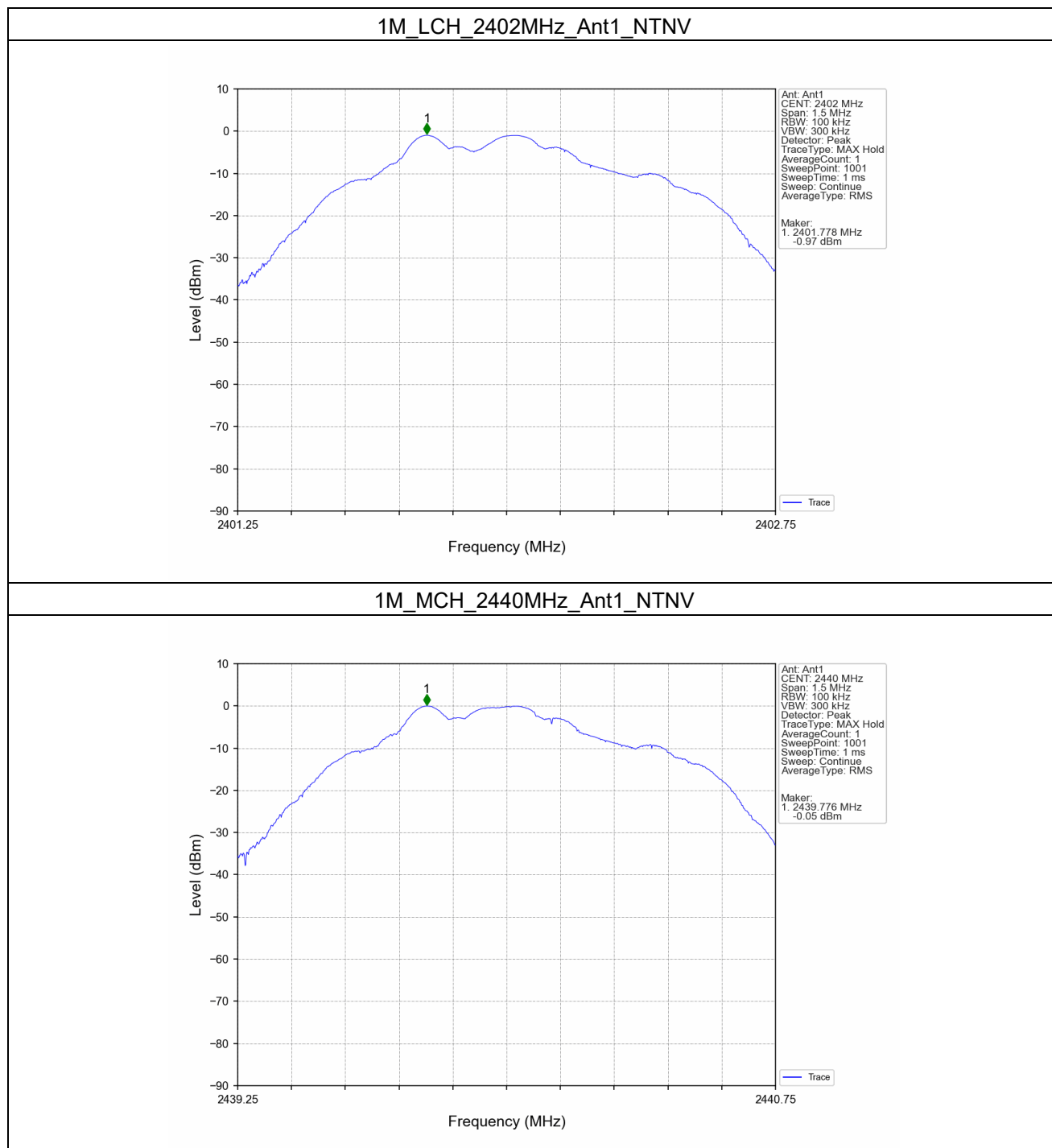
4.1 Test Result

4.1.1 PSD

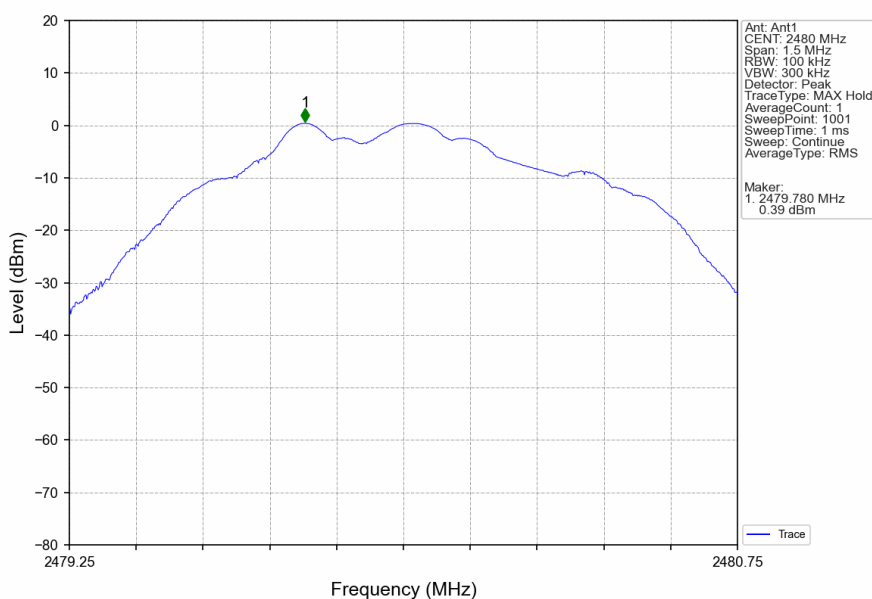
Mode	TX Type	Frequency (MHz)	Maximum PSD (dBm)		Verdict
			ANT1	Limit(dBm/3kHz)	
1M	SISO	2402	-0.97dBm/100kHz	<=8	Pass
		2440	-0.05dBm/100kHz	<=8	Pass
		2480	0.39dBm/100kHz	<=8	Pass
2M	SISO	2402	-0.98dBm/100kHz	<=8	Pass
		2440	-0.05dBm/100kHz	<=8	Pass
		2480	0.37dBm/100kHz	<=8	Pass

4.2 Test Graph

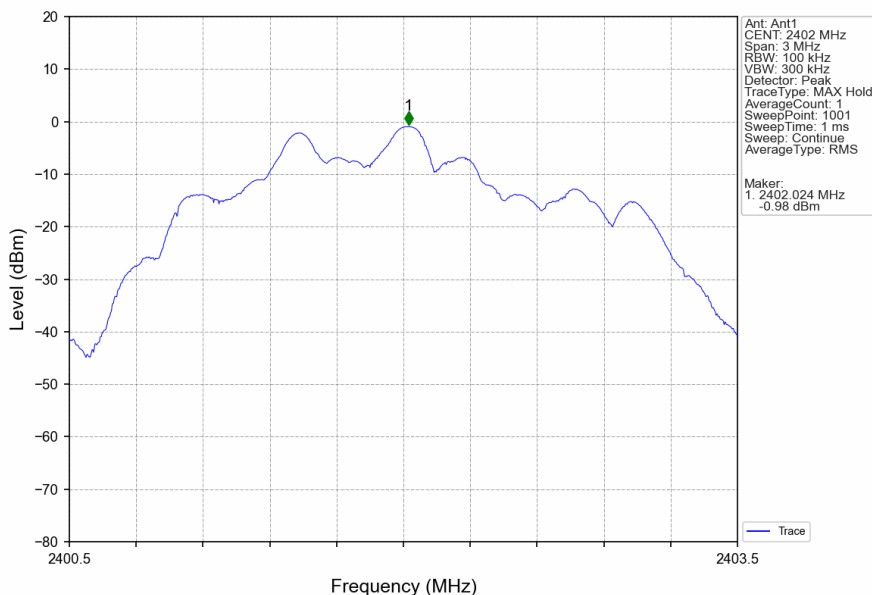
4.2.1 PSD



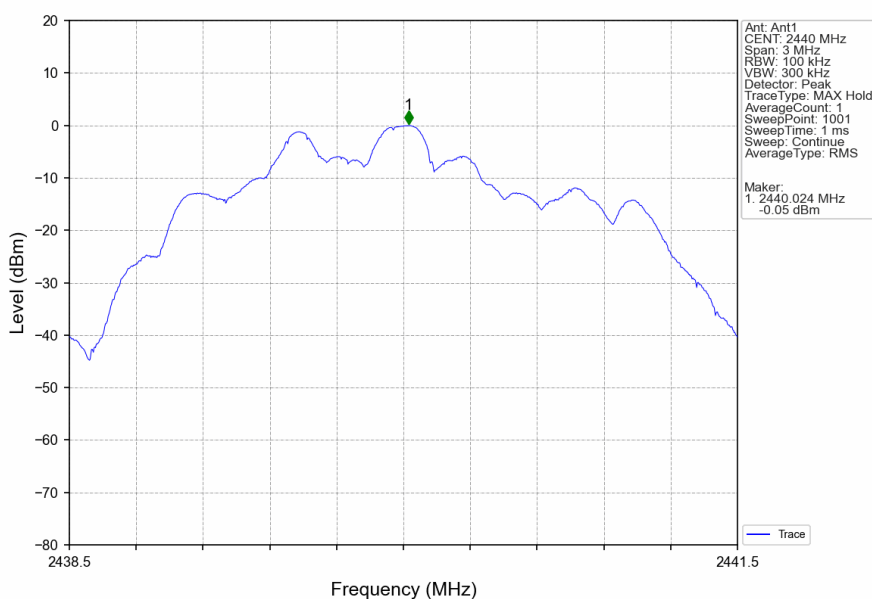
1M_HCH_2480MHz_Ant1_NTNV



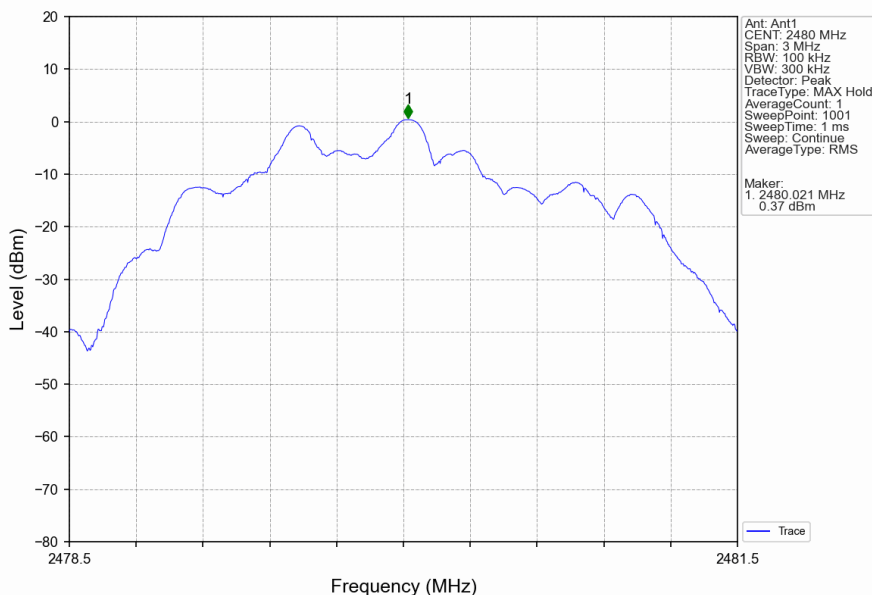
2M_LCH_2402MHz_Ant1_NTNV



2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Test Result

5.1.1 Ref

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	-0.97
		2440	1	-0.05
		2480	1	0.37
2M	SISO	2402	1	-0.99
		2440	1	-0.08
		2480	1	0.34

5.1.2 CSE and Band Edge

Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	0.37	-19.63	Pass
		2440	1	0.37	-19.63	Pass
		2480	1	0.37	-19.63	Pass
2M	SISO	2402	1	0.34	-19.66	Pass
		2440	1	0.34	-19.66	Pass
		2480	1	0.34	-19.66	Pass



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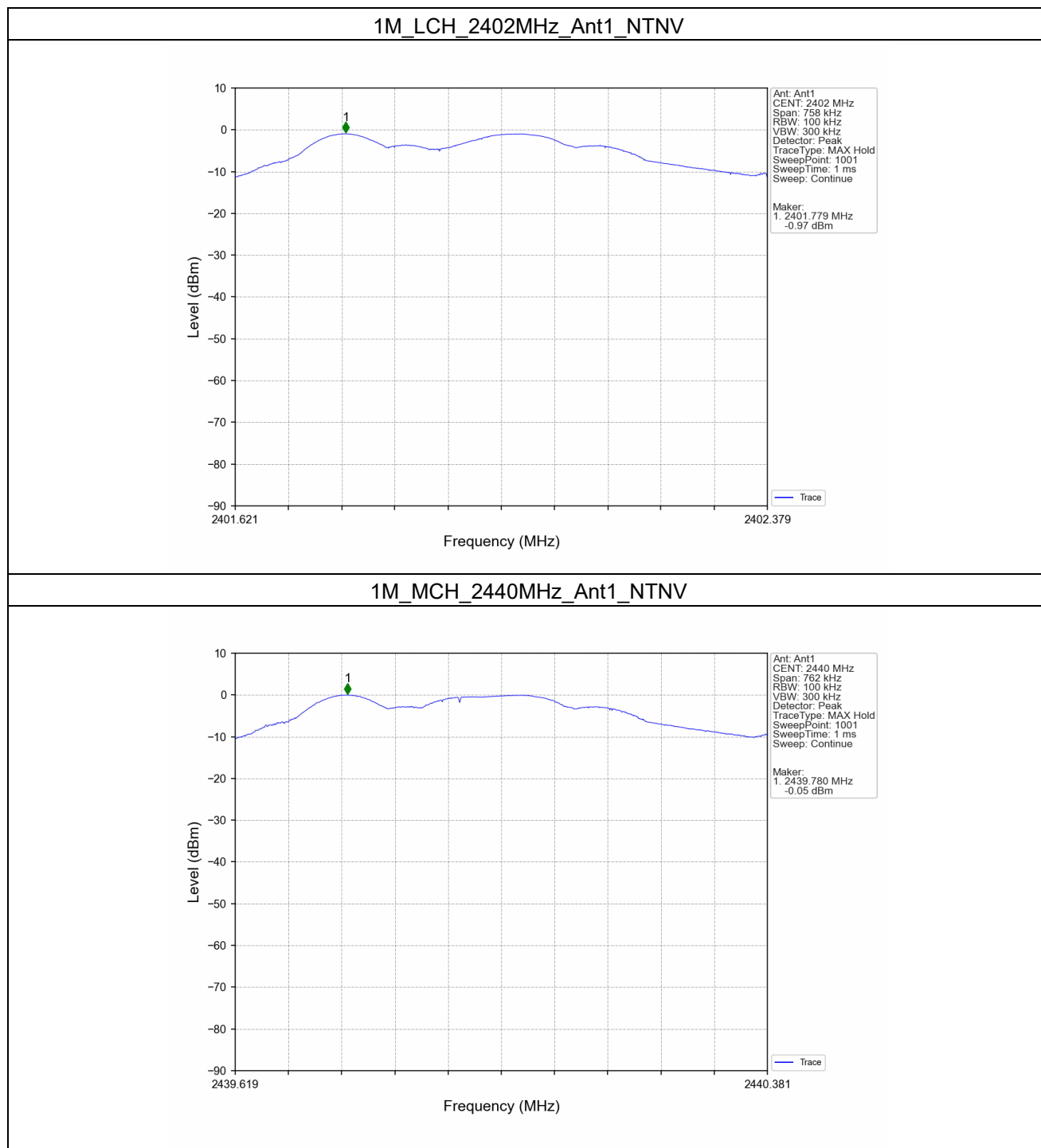
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中国·广东·广州高新技术产业开发区科学城科珠路198号 邮编: 510663

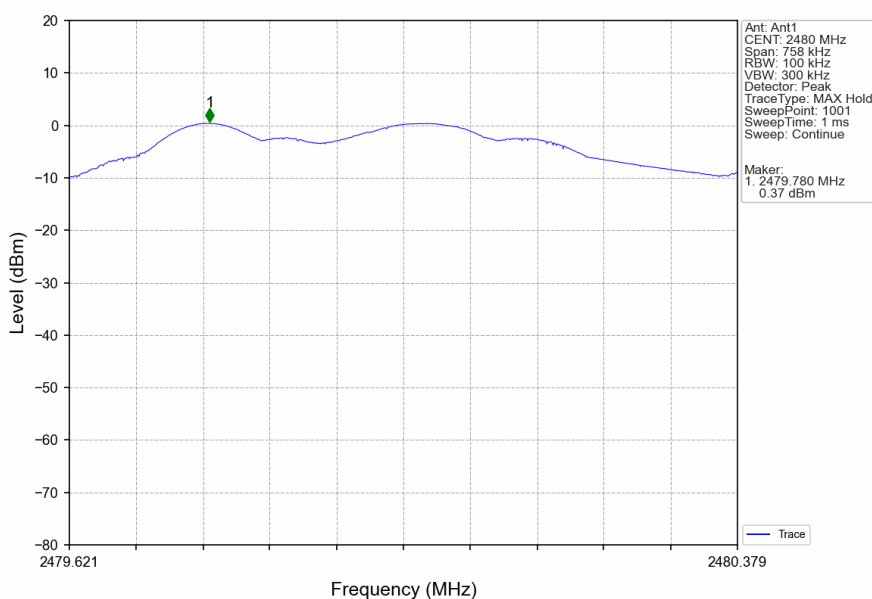
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t (86-20) 82155555 sgs.china@sgs.com

5.2 Test Graph

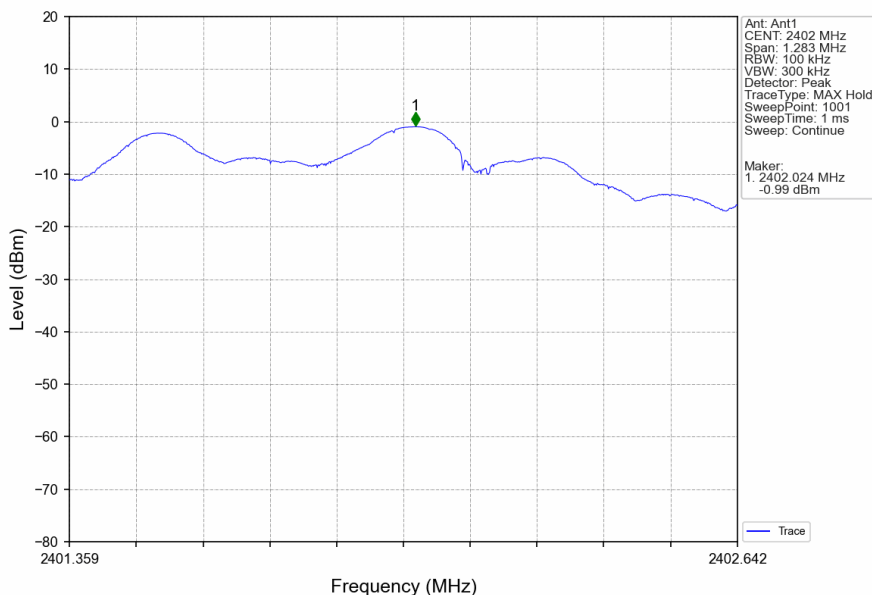
5.2.1 Ref



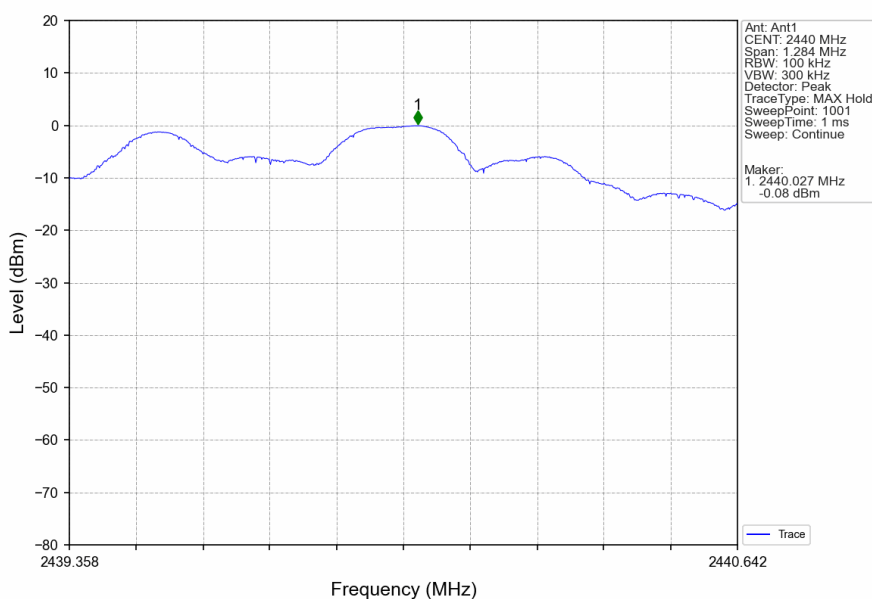
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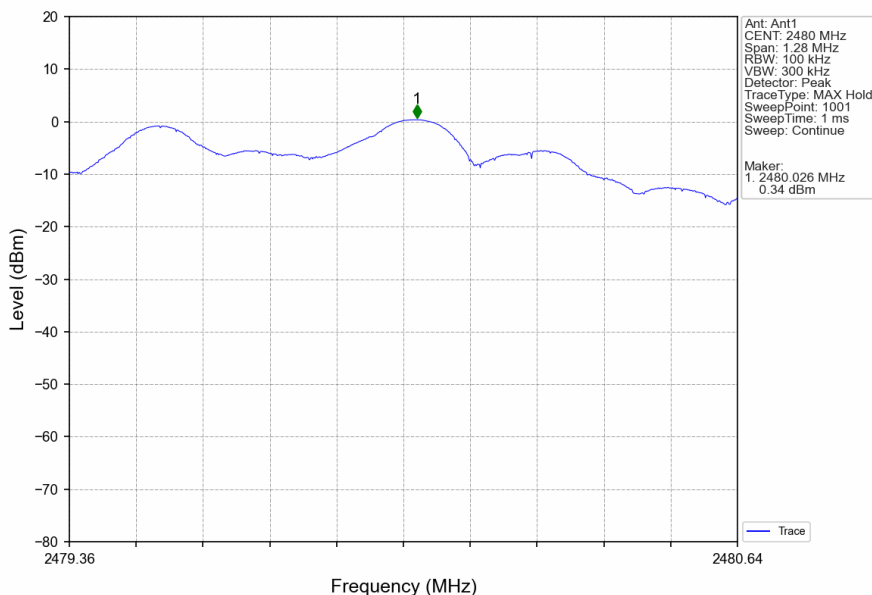
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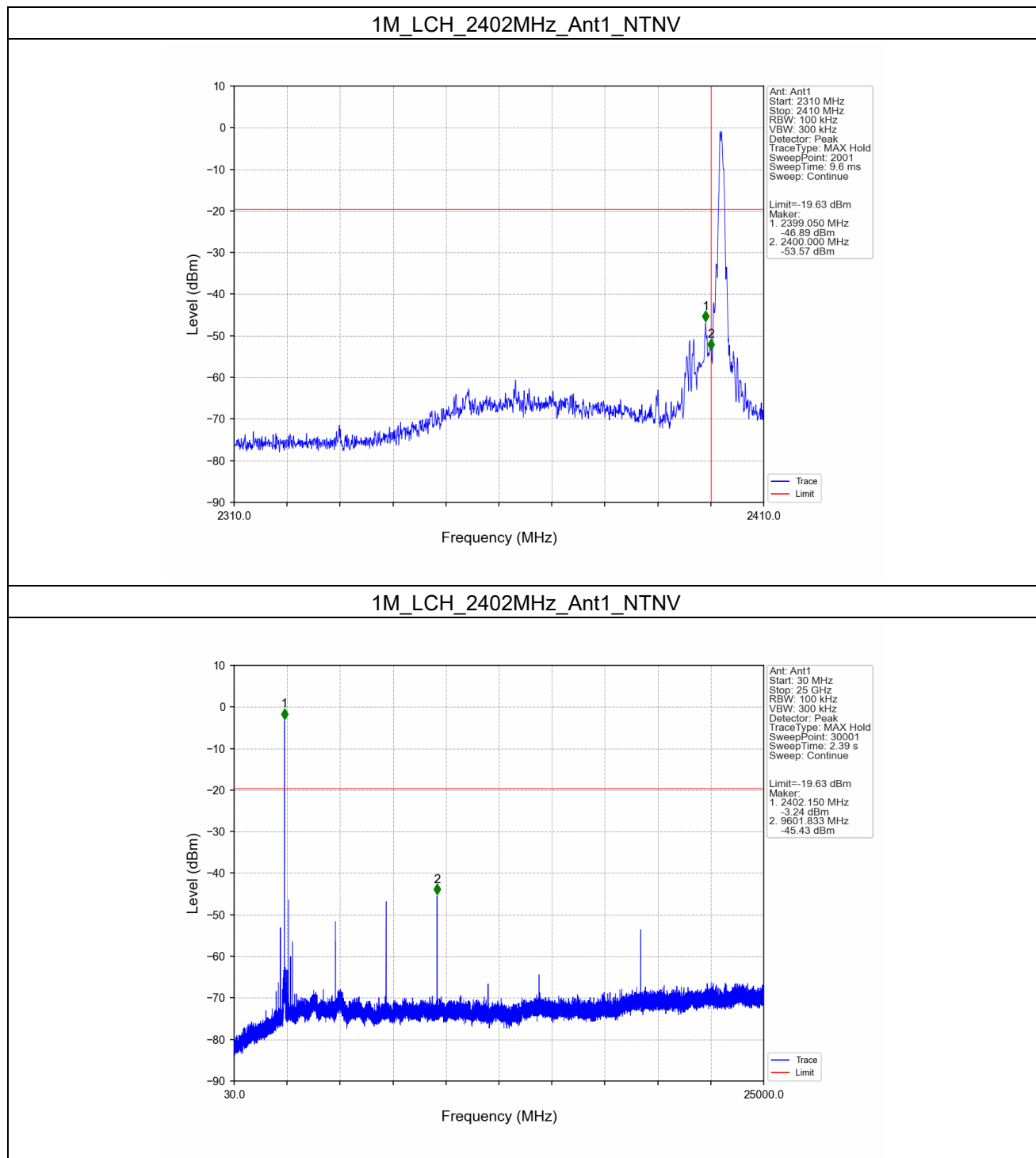
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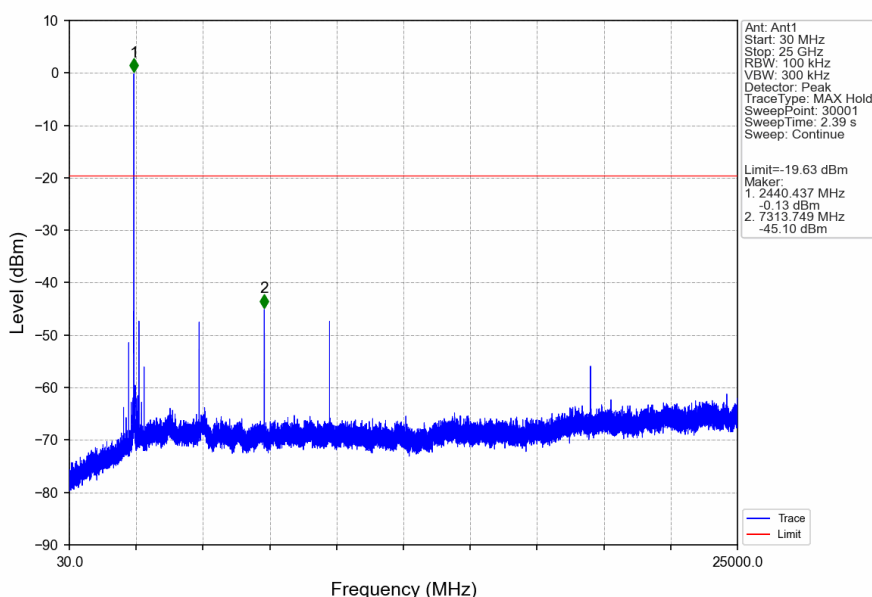
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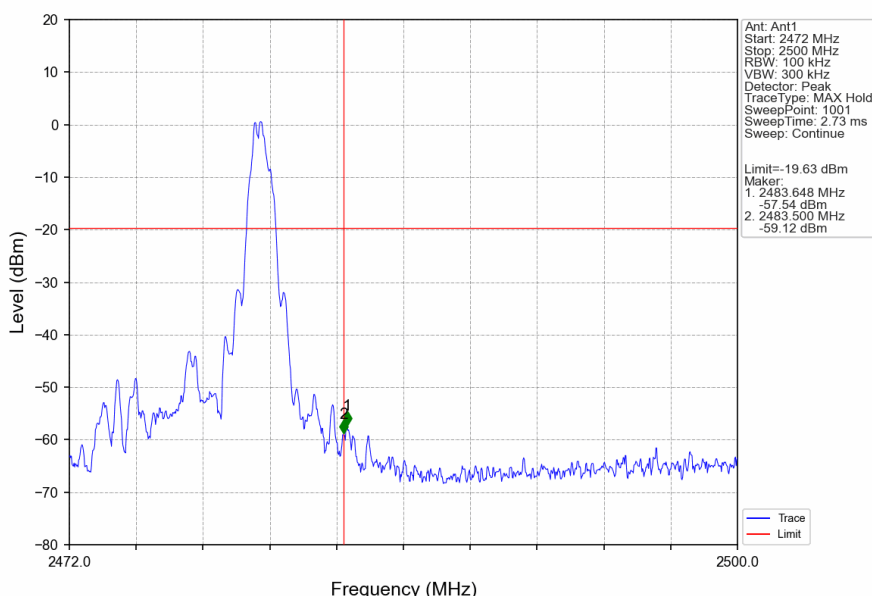
5.2.2 CSE and Band Edge



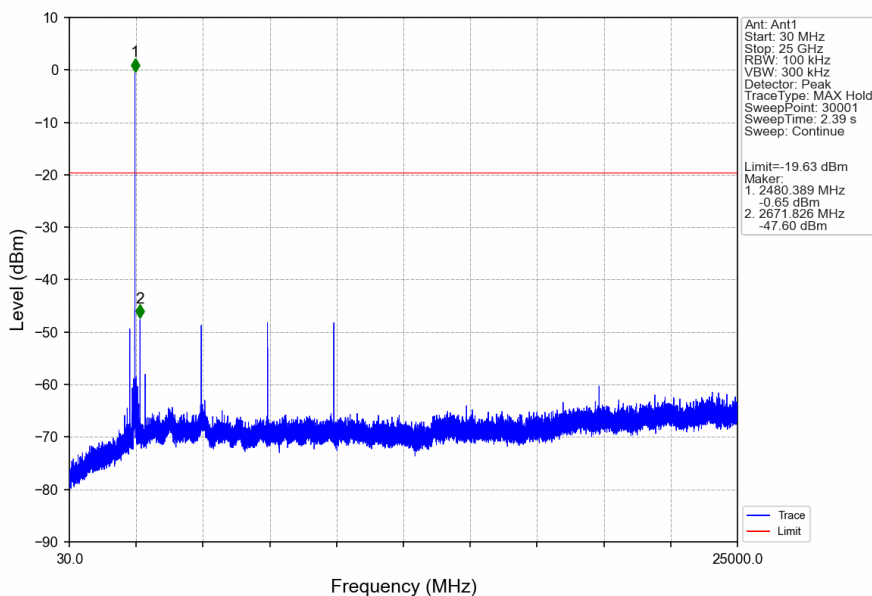
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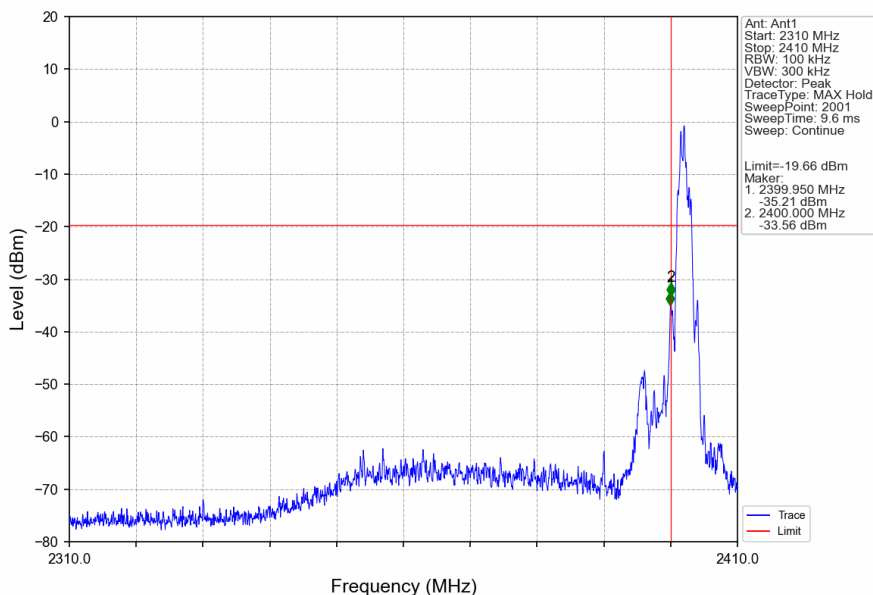
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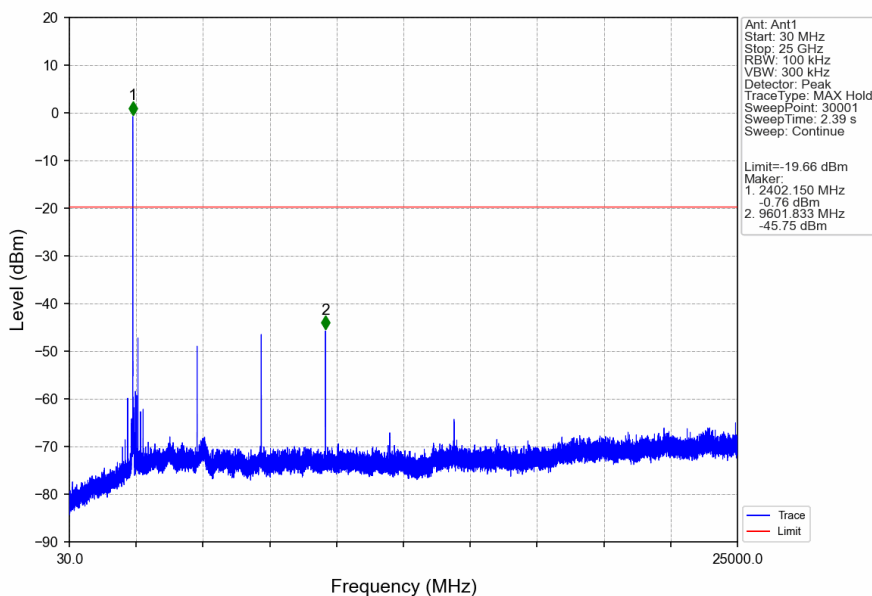
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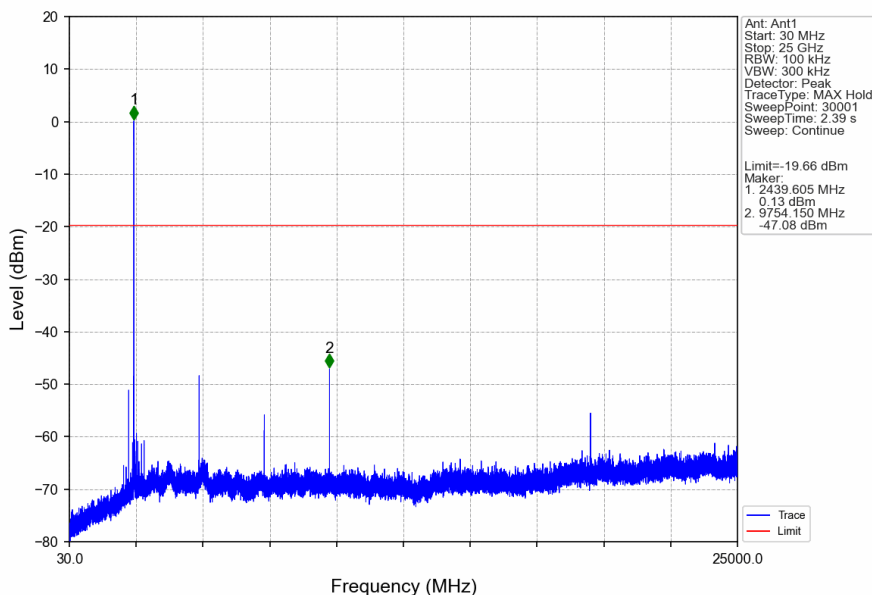
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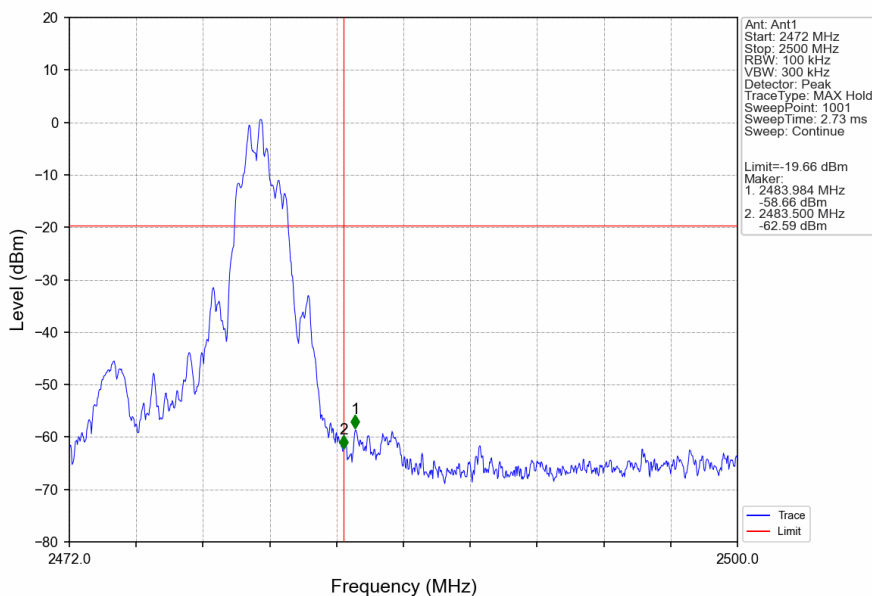
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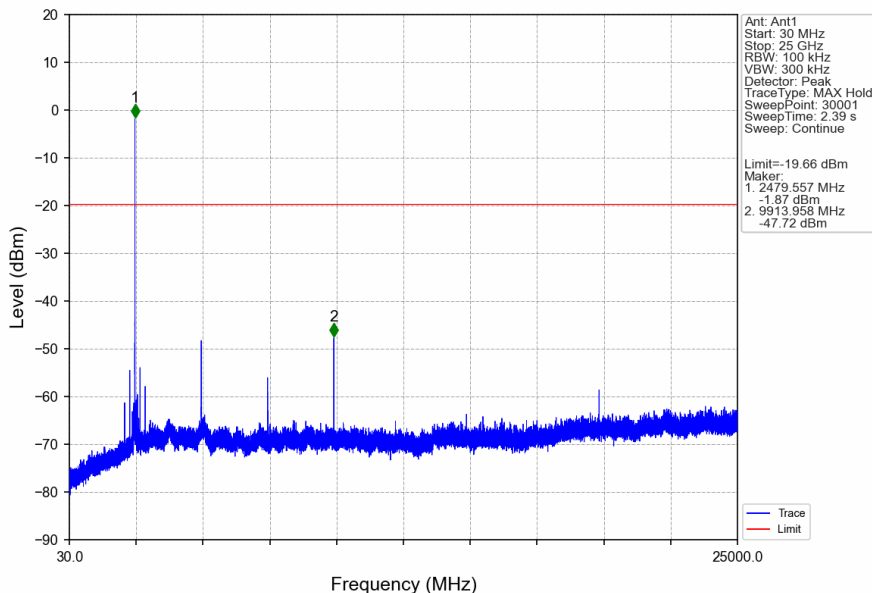
2M_MCH_2440MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



2M_HCH_2480MHz_Ant1_NTNV



- End of the Report -



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