

TEST REPORT

Application No.: SZCR2602000712AT
Applicant: INNOVATIVE TECHNOLOGY ELECTRONICS LLC
Address of Applicant: 3350 Walnut St Denver Colorado 80205 United States
Manufacturer: INNOVATIVE TECHNOLOGY ELECTRONICS LLC
Address of Manufacturer: 3350 Walnut St Denver Colorado 80205 United States
Factory: Zhongshan City Richsound Electronic Industrial Ltd
Address of Factory: No. 16, East Shagang Road, Gangkou Town, Zhongshan City, 528447 Guangdong, P.R. China

Equipment Under Test (EUT):

EUT Name: VICTROLA ENCORE

Model No.: VPS-1000, VPS-1000-BLK-DSH ♣

♣ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.

Trade Mark: **VICTROLA**

FCC ID: 2AFHW-VPS1000

Standard(s) : 47 CFR Part 15, Subpart C 15.247

Date of Receipt: 2026-02-27

Date of Test: 2026-03-03 to 2026-03-10

Date of Issue: 2026-03-17

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

Keny Xu

Keny Xu
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2026-03-17		Original

Authorized for issue by:				
		Gebin Sun		
		Gebin Sun/Project Engineer		
		Eric Fu		
		Eric Fu/Reviewer		



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2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence		N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	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 & 7.8.8	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 & 7.8.8	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Maximum Conducted Output Power		ANSI C63.10 (2020) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth		ANSI C63.10 (2020) Section 6.9.2	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2020) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number		ANSI C63.10 (2020) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time		ANSI C63.10 (2020) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2020) Section 7.8.7.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2020) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(d)	Pass



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Declaration of EUT Family Grouping:

Model No.: VPS-1000, VPS-1000-BLK-DSH

Only the model VPS-1000 was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above models, with only difference being of appearance and model No.



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4 General Information

4.1 Details of E.U.T.

Power supply:	AC 120V/60Hz 3V DC (1.5Vx2"AAA" Size Batteries) for remote controller
Cable(s):	Adapter AC cable: 150cm unshielded HDMI cable: 150cm shielded with two ferrite core
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	FPC Antenna
Antenna Gain:	3.92dBi
Power Setting:	0
Test Software:	bt_tool_v1.1.2

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.
--	--	--	--

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	$\pm 3.2\text{dB}$
Radiated Emissions which fall in the restricted bands	$\pm 6.0\text{dB}$ (Below 1GHz); $\pm 4.6\text{dB}$ (Above 1GHz)
Radiated Spurious Emissions Below 1GHz	$\pm 6.0\text{dB}$ for 3m; $\pm 5.0\text{dB}$ for 10m
Radiated Spurious Emissions Above 1GHz	$\pm 4.6\text{dB}$ (1-18GHz); $\pm 4.8\text{dB}$ (18-40GHz)
Maximum Conducted Output Power	$\pm 0.4\text{dB}$
20dB Bandwidth	$\pm 0.3\%$
Carrier Frequencies Separation	$\pm 5.4 \times 10^{-8}$
Hopping Channel Number	$\pm 5.4 \times 10^{-8}$
Dwell Time	$\pm 0.3\%$
Conducted Band Edges Measurement	$\pm 2.7\text{dB}$



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Conducted Spurious Emissions	$\pm 2.7\text{dB}$
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:

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No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2025-05-07	2028-05-06
EMI Test Receiver	Rohde&Schwarz	ESR	SZ-WRG-M-047	2025-12-15	2026-12-14
Measurement Software	AUDIX	e3 V8.2014-6-27a	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2025-07-05	2026-07-04
LISN	Rohde&Schwarz	ENV216	SEM007-01	2025-07-25	2026-07-24
LISN	ETS-LINDGREN	3816/2	SEM007-02	2026-02-24	2027-02-23

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Fully-Anechoic Chamber	AUDIX	N/A	SEM001-02	2025-05-07	2028-05-06
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2026-02-02	2027-02-01
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2025-07-22	2026-07-21
Microwave system amplifier	Agilent	83017A	SEM005-25	2025-09-10	2026-09-09
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2025-07-05	2026-07-04
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2025-07-22	2027-07-21
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2025-03-21	2026-03-20

Radiated Spurious Emissions Below 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2025-11-17	2027-11-16
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2023-06-19	2026-06-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2025-07-25	2026-07-24
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2025-08-29	2027-08-28
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2026-02-02	2027-02-01
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2025-07-05	2026-07-04



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Radiated Spurious Emissions Above 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Fully-Anechoic Chamber	AUDIX	N/A	SEM001-02	2025-05-07	2028-05-06
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2026-02-02	2027-02-01
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2025-07-22	2026-07-21
Microwave system amplifier	Agilent	83017A	SEM005-25	2025-09-10	2026-09-09
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2025-07-05	2026-07-04
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2025-07-22	2027-07-21
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2025-03-21	2026-03-20

RF Conducted Test					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Power Sensor	TST PASS	TSPS2023R	SEM009-26	2026-02-04	2027-02-03
Power Sensor	KEYSIGHT	U2021XA	SEM009-16	2026-02-04	2027-02-03
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2025-07-24	2026-07-23
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2026-02-03	2027-02-02
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2025-07-05	2026-07-04
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2026-02-02	2027-02-01

General used equipment					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	deli	8838	SEM002-32	2025-07-23	2026-07-22
Humidity/ Temperature Indicator	deli	8838	SEM002-33	2025-07-23	2026-07-22
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2026-02-14	2027-02-13



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

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

6.1.2 Conclusion

Standard Requirement:

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

15.247(b) (4) requirement:

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

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.92dBi.

Antenna location: Refer to internal photo.



6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.

- > Number of shift register stages: 9
- > Length of pseudo-random sequence: $2^9 - 1 = 511$ bits
- > Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

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: Mason Wu

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:

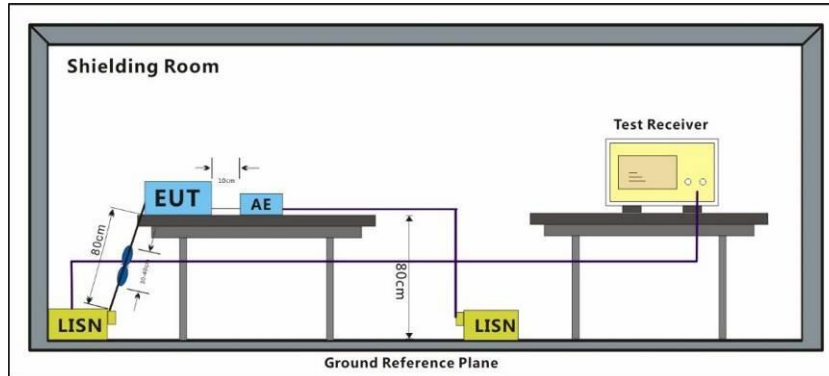
Temperature: 23.4 °C Humidity: 42.5 % RH Atmospheric Pressure: 1020 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



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



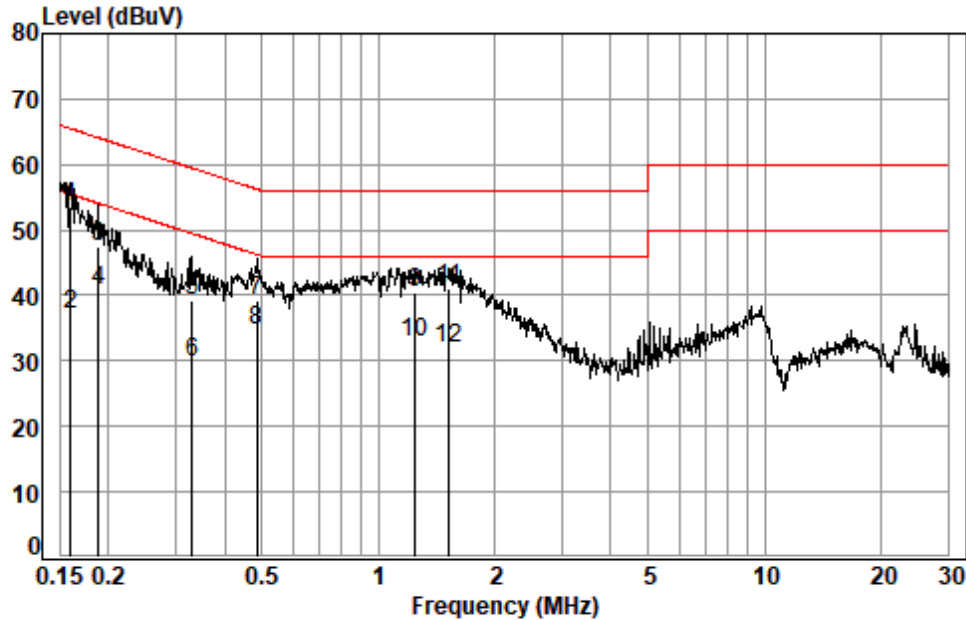
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Report No.: SZCR260200071202

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Test Mode: 00; Line: Live line



Site : Shielding Room
Condition: Line
Job No. : 00712AT
Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 *	0.1598	0.06	9.63	43.90	53.59	65.47	-11.88	QP
2	0.1598	0.06	9.63	27.37	37.06	55.47	-18.41	Average
3	0.1884	0.07	9.63	37.82	47.52	64.11	-16.59	QP
4	0.1884	0.07	9.63	30.92	40.62	54.11	-13.49	Average
5	0.3303	0.08	9.63	29.50	39.21	59.44	-20.23	QP
6	0.3303	0.08	9.63	20.14	29.85	49.44	-19.59	Average
7	0.4837	0.09	9.64	29.45	39.18	56.27	-17.09	QP
8 *	0.4837	0.09	9.64	24.85	34.58	46.27	-11.69	Average
9	1.2488	0.11	9.69	30.79	40.59	56.00	-15.41	QP
10	1.2488	0.11	9.69	22.97	32.77	46.00	-13.23	Average
11	1.5274	0.12	9.70	31.21	41.03	56.00	-14.97	QP
12	1.5274	0.12	9.70	22.02	31.84	46.00	-14.16	Average



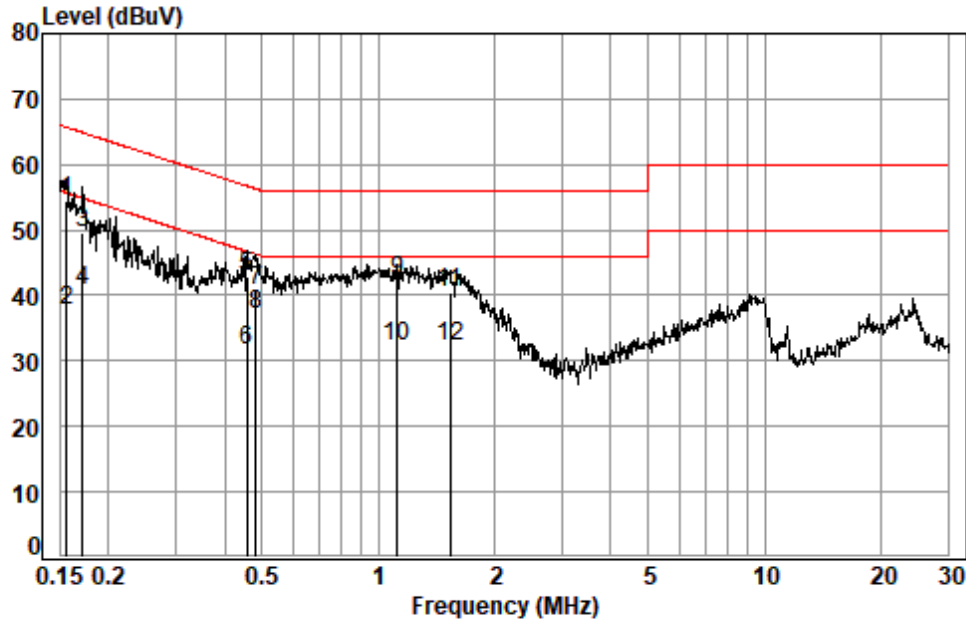
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Test Mode: 00; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 00712AT
Test mode: 00

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 *	0.1565	0.06	9.64	44.72	54.42	65.65	-11.23	QP
2	0.1565	0.06	9.64	27.94	37.64	55.65	-18.01	Average
3	0.1712	0.06	9.68	39.88	49.62	64.90	-15.28	QP
4	0.1712	0.06	9.68	31.12	40.86	54.90	-14.04	Average
5	0.4564	0.09	9.63	33.10	42.82	56.76	-13.94	QP
6	0.4564	0.09	9.63	22.03	31.75	46.76	-15.01	Average
7	0.4812	0.09	9.63	31.06	40.78	56.32	-15.54	QP
8 *	0.4812	0.09	9.63	27.53	37.25	46.32	-9.07	Average
9	1.1233	0.11	9.67	32.50	42.28	56.00	-13.72	QP
10	1.1233	0.11	9.67	22.44	32.22	46.00	-13.78	Average
11	1.5355	0.12	9.70	30.69	40.51	56.00	-15.49	QP
12	1.5355	0.12	9.70	22.41	32.23	46.00	-13.77	Average



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 & 7.8.8
 Measurement Distance: 3m
 Test Engineer: Logic Wang

Limit:

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

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

7.2.1 E.U.T. Operation

Operating Environment:

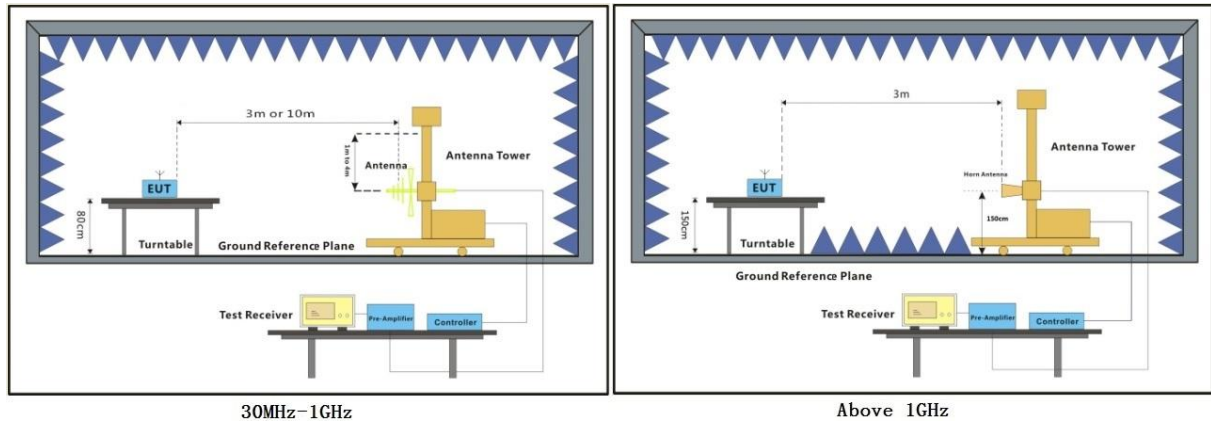
Temperature: 23.5 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

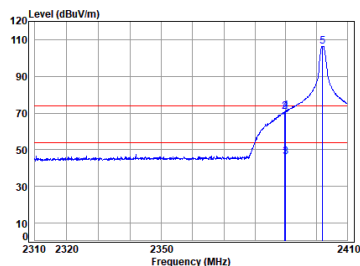
- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above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

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

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



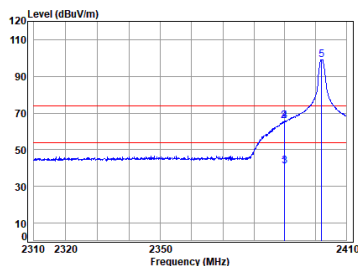
BT_DH5_TX_CH_00_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00712AT\00713AT
Mode : 2402 Band edge
BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1	2389.659	16.13	29.10	32.78	33.31	45.76	54.00	-8.24 Average	0.00
2	2389.659	16.13	29.10	32.78	58.13	70.58	74.00	-3.42 Peak	0.00
3	q 2390.000	16.13	29.10	32.78	33.76	46.21	54.00	-7.79 Average	0.00
4	2390.000	16.13	29.10	32.78	58.58	71.03	74.00	-2.97 Peak	0.00
5	p 2402.000	16.15	29.09	32.77	93.97	106.44	74.00	32.44 Peak	0.00

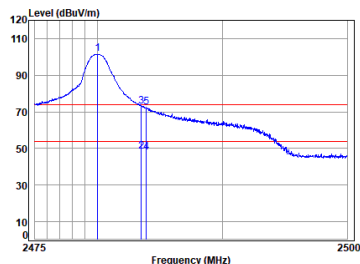
BT_DH5_TX_CH_00_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 00712AT\00713AT
Mode : 2402 Band edge
BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1	2389.862	16.13	29.10	32.78	28.24	40.69	54.00	-13.31 Average	0.00
2	2389.862	16.13	29.10	32.78	53.06	65.51	74.00	-8.49 Peak	0.00
3	q 2390.000	16.13	29.10	32.78	28.41	40.86	54.00	-13.14 Average	0.00
4	2390.000	16.13	29.10	32.78	53.23	65.68	74.00	-8.32 Peak	0.00
5	p 2402.000	16.15	29.09	32.77	86.75	99.22	74.00	25.22 Peak	0.00

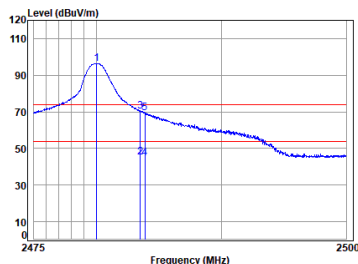
BT_DH5_TX_CH_78_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00712AT\00713AT
Mode : 2400 Band edge
BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1	p 2480.000	16.27	28.90	32.73	89.16	101.60	74.00	27.60 Peak	0.00
2	q 2483.500	16.28	28.90	32.73	35.90	48.35	54.00	-5.65 Average	0.00
3	2483.500	16.28	28.90	32.73	60.72	73.17	74.00	-0.63 Peak	0.00
4	2483.896	16.28	28.90	32.73	35.28	47.73	54.00	-6.27 Average	0.00
5	2483.896	16.28	28.90	32.73	60.10	72.55	74.00	-1.45 Peak	0.00

BT_DH5_TX_CH_78_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 00712AT\00713AT
Mode : 2400 Band edge
BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1	p 2480.000	16.27	28.90	32.73	83.80	96.24	74.00	22.24 Peak	0.00
2	q 2483.500	16.28	28.90	32.73	32.93	45.38	54.00	-8.62 Average	0.00
3	2483.500	16.28	28.90	32.73	57.75	70.20	74.00	-3.00 Peak	0.00
4	2483.871	16.28	28.90	32.73	32.28	44.73	54.00	-9.27 Average	0.00
5	2483.871	16.28	28.90	32.73	57.10	69.55	74.00	-4.45 Peak	0.00



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
 Measurement Distance: 3m
 Test Engineer: Kaito Zeng

Limit:

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

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. 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:

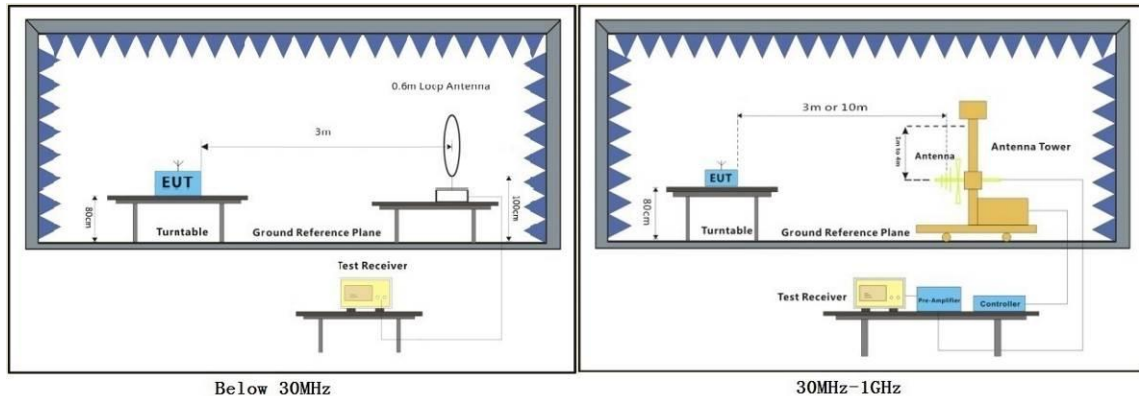
Temperature: 23.5 °C Humidity: 46.8 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

- 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.
- The EUT was set 3m away from the interference-receiving antenna, which was mounted on the variable-height antenna tower.
- 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 (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.
- 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:

- 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.
- 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.

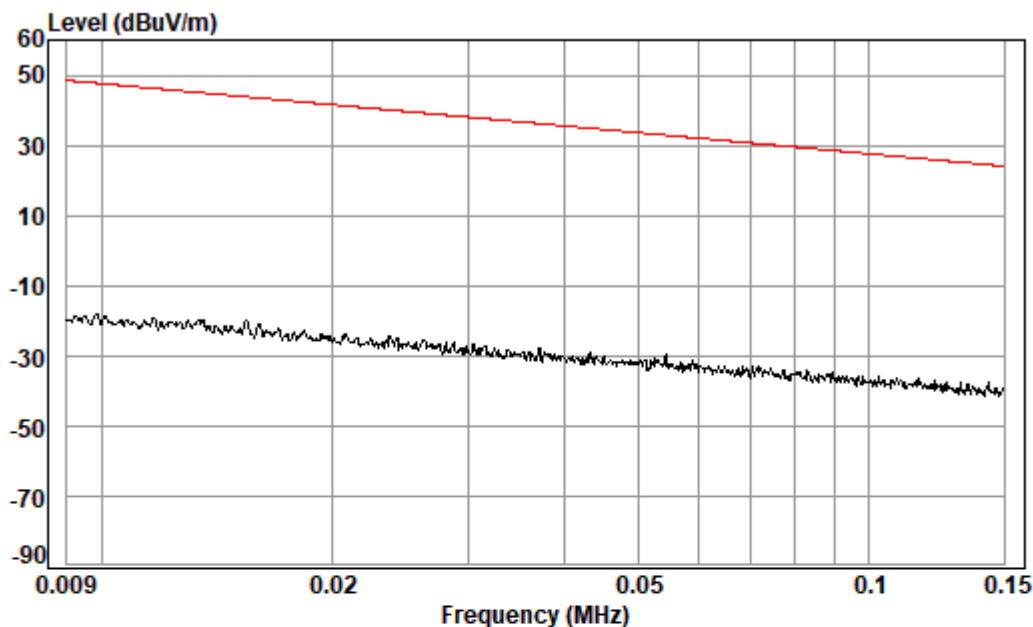


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Condition: 3m
Job No. : 00712AT
Test Mode: 00
: coaxial



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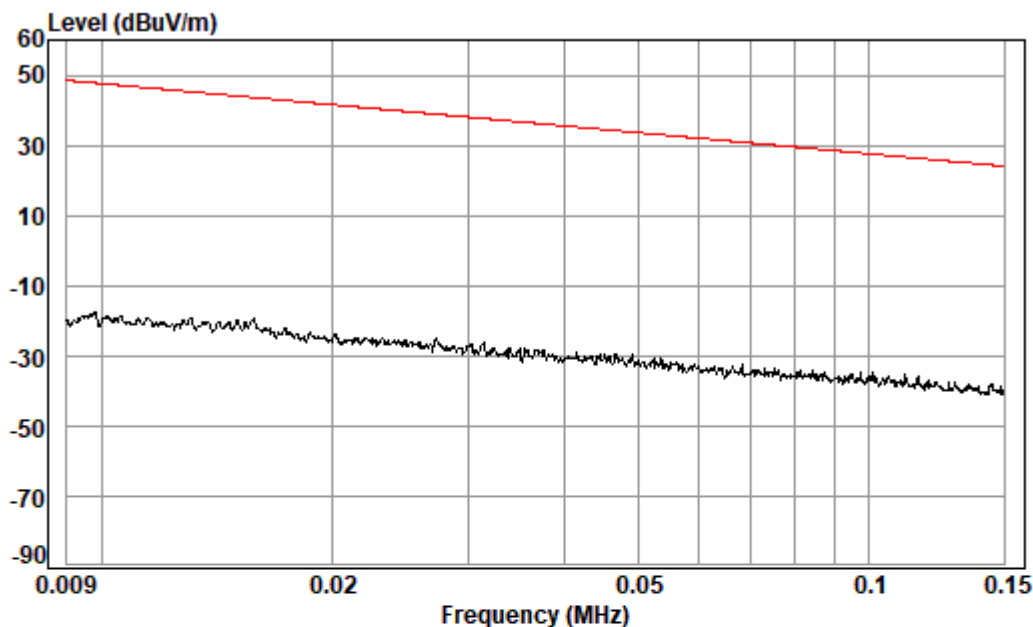
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Condition: 3m
Job No. : 00712AT
Test Mode: 00
: coplanar

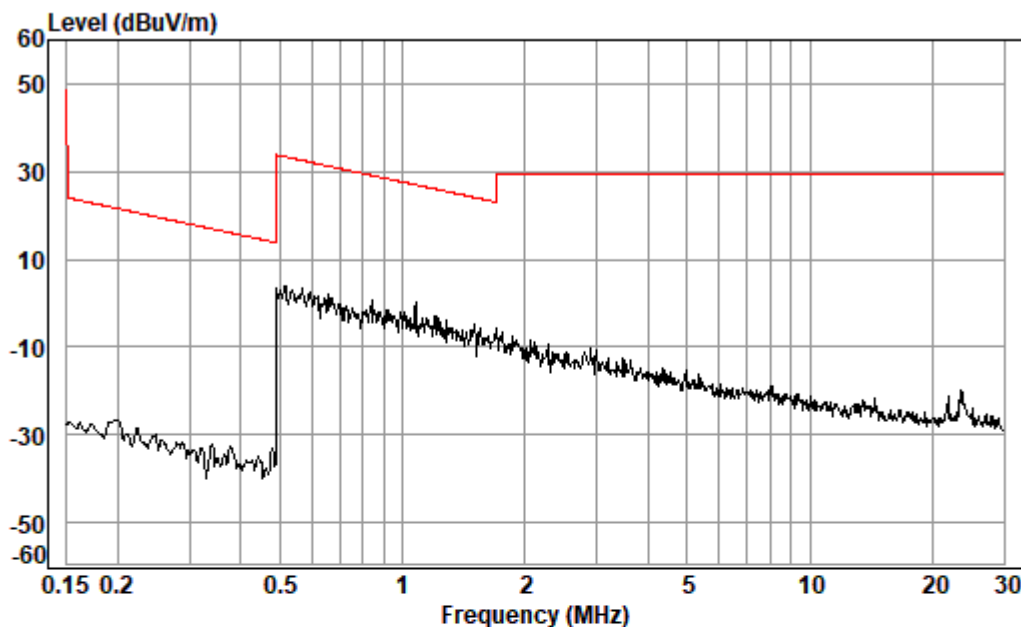


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Shenzhen Branch Testing & Calibration Laboratory

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中国·广东·深圳市南山区科技园中区M-10栋1号厂房 邮编: 518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com

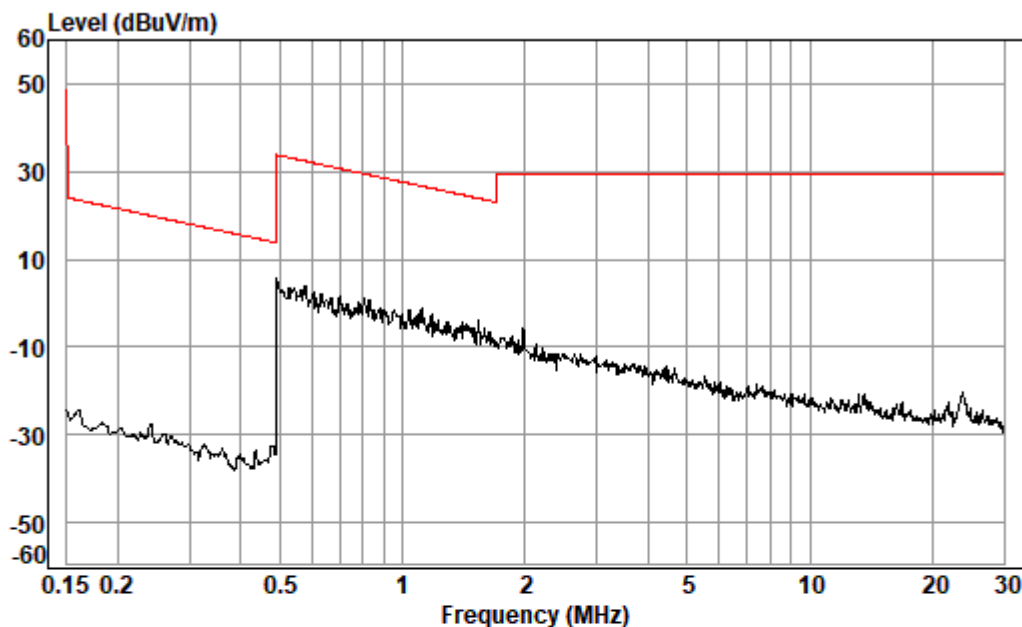


Condition: 3m
 Job No. : 00712AT
 Test Mode: 00
 : coaxial



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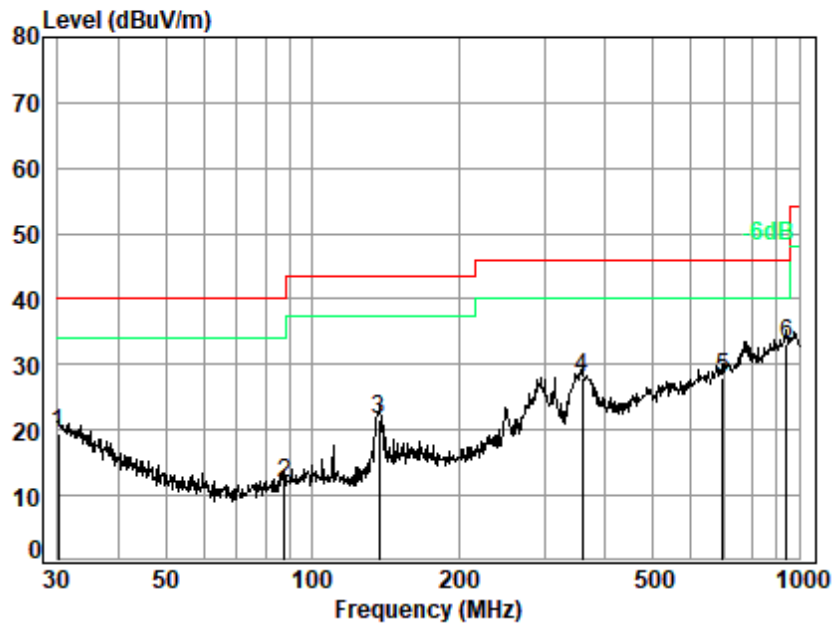
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Condition: 3m
 Job No. : 00712AT
 Test Mode: 00
 : coplanar



Test Mode: 00; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : 00712AT
Test Mode: 00

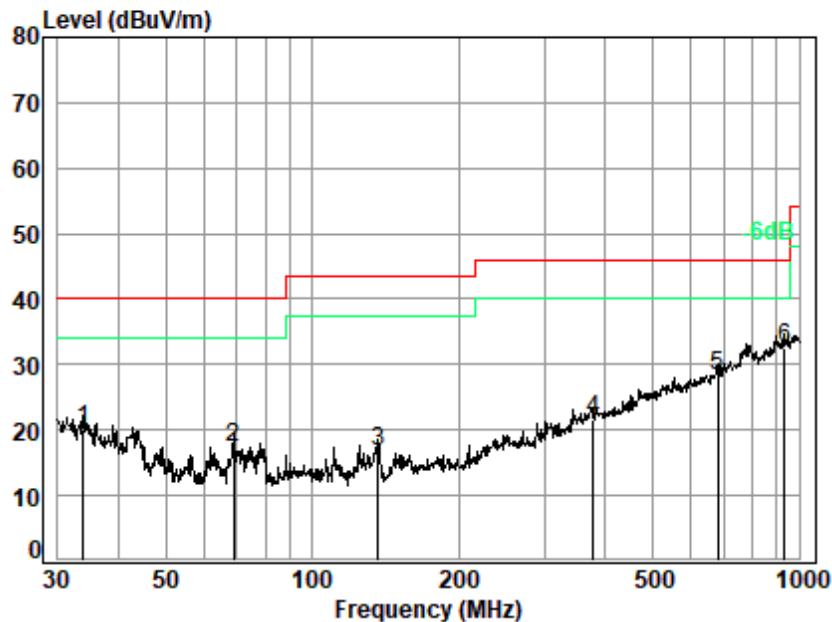
	Ant	Cable	Preamp	Read		Limit	Over	
Freq	Factor	Loss	Factor	Level	Level	Line	Limit	Remark
MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	30.105	21.40	0.74	27.65	24.97	19.46	40.00	-20.54 QP
2	87.725	11.56	1.16	27.61	26.71	11.82	40.00	-28.18 QP
3	136.939	12.11	1.44	27.69	35.77	21.63	43.50	-21.87 QP
4	357.929	19.80	2.34	27.65	33.47	27.96	46.00	-18.04 QP
5	696.857	25.83	3.40	27.84	26.65	28.04	46.00	-17.96 QP
6 q	942.131	29.01	4.06	26.72	26.91	33.26	46.00	-12.74 QP



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Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 00712AT
Test Mode: 00

	Ant	Cable	Preamp	Read		Limit	Over	
	Freq	Factor	Loss	Factor	Level	Level	Line	Limit Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	33.917	19.29	0.77	27.65	27.69	20.10	40.00	-19.90 QP
2	68.872	10.59	0.97	27.62	33.41	17.35	40.00	-22.65 QP
3	136.460	12.12	1.44	27.69	30.75	16.62	43.50	-26.88 QP
4	377.259	20.46	2.41	27.70	26.33	21.50	46.00	-24.50 QP
5	679.960	25.62	3.35	27.88	27.05	28.14	46.00	-17.86 QP
6 q	935.546	28.92	4.05	26.76	26.43	32.64	46.00	-13.36 QP



SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

SZEMC-TRF-01 Rev. A/2

Report No.: SZCR260200071202

Page: 28 of 97

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 & 7.8.8
 Measurement Distance: 3m
 Test Engineer: Logic Wang

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: 23.5 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



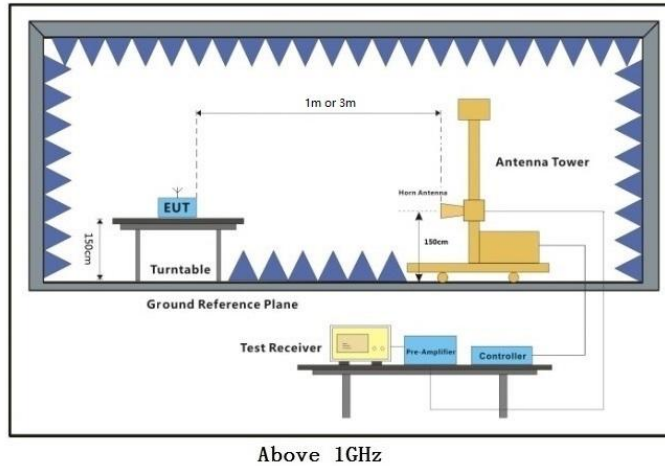
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 Shenzhen Branch Inspection & Testing Laboratory

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7.4.3 Test Setup Diagram



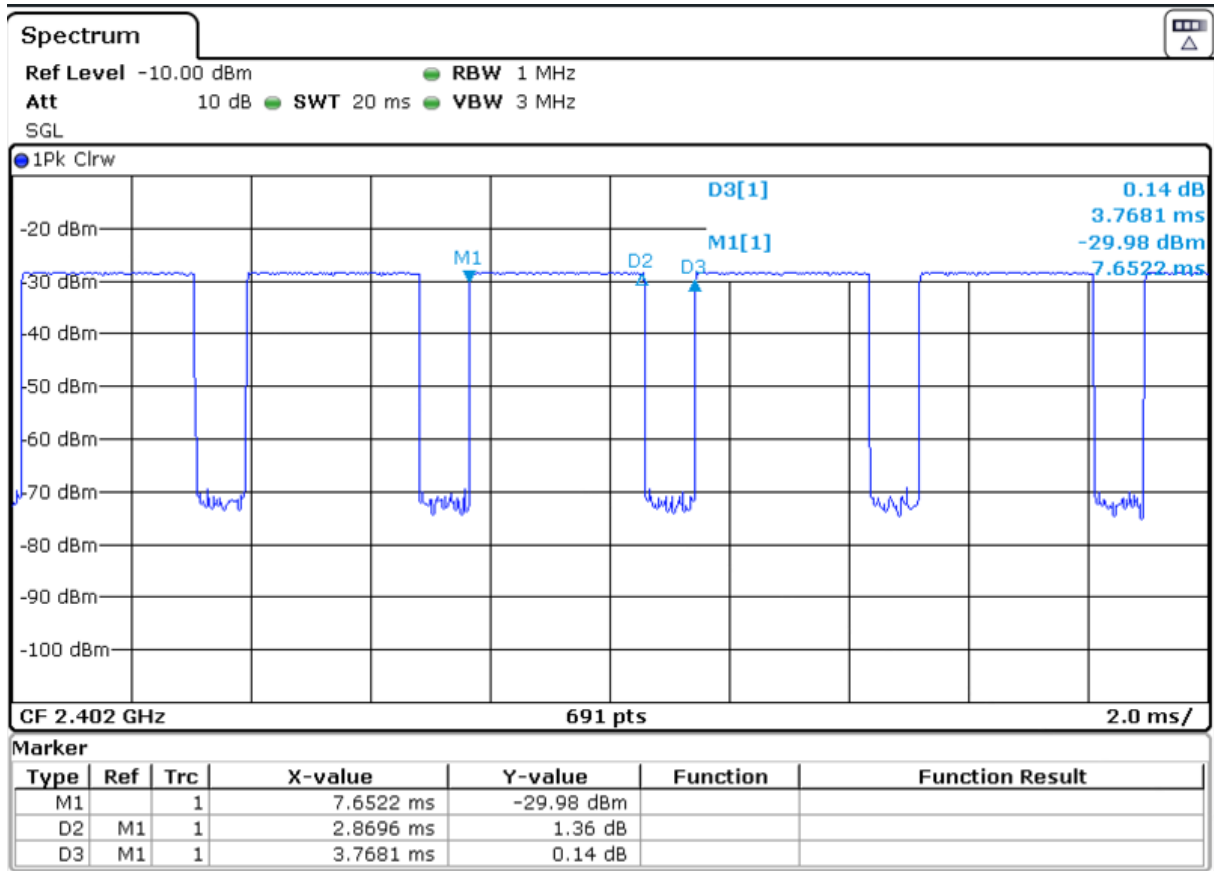
7.4.4 Measurement Procedure and Data

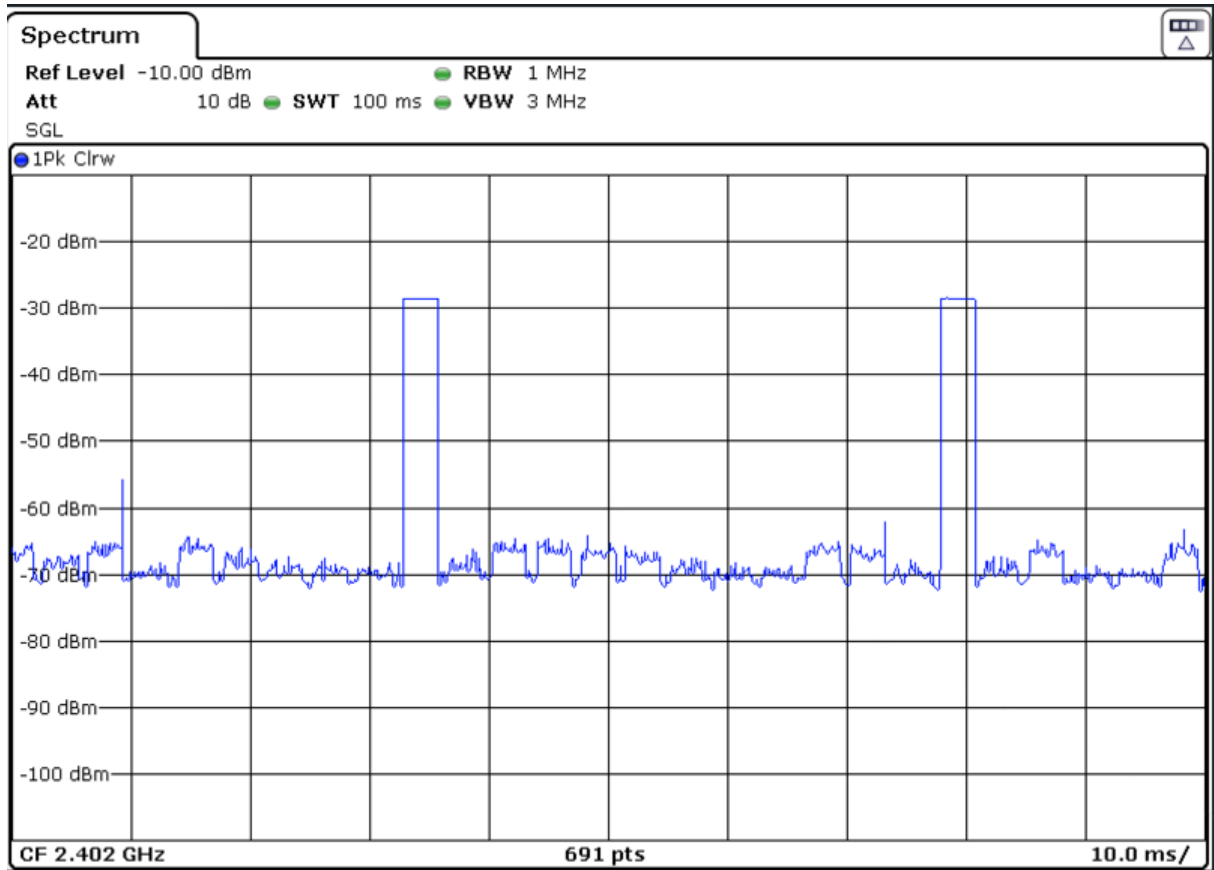
- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5m above the ground at a 3m fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3m away from the interference-receiving antenna from 1GHz to 18GHz, and 1m away from the interference-receiving antenna above 18GHz.
- b. The interference-receiving antenna was mounted on the variable-height antenna tower, with its boresight facing the EUT throughout the test.
- 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 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. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- g. 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.
- h. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Scan from 1GHz to 10th harmonic of the highest frequency or 40 GHz, whichever is lower.
2. 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.
3. For the frequency above 18GHz, testing had been executed under all test modes, only the worst-case test curve is displayed in the report.
4. For devices with multiple operating modes, measurements on the middle channel is used to determine the worst-case mode(s). Only the worst-case mode with the highest output power and the mode with the highest output power spectral density for each modulation family (e.g., OFDM and direct sequence spread spectrum) is recorded in the test report.





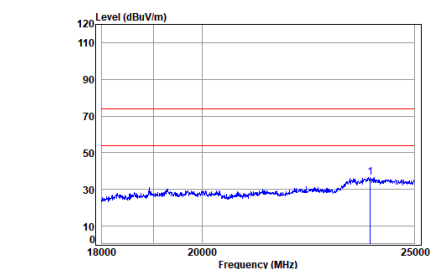


FCC BT DH5 Band edge and RSE TX Worse

Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.000	0.924	≥ 0.924	Pass
PI/4DQPSK	SISO	HOPP	2DH5	0.926	1.319	≥ 0.879	Pass
8DPSK	SISO	HOPP	3DH5	1.013	1.242	≥ 0.828	Pass

	Hopping number	On time(ms)	Duty cycle(%)	Correction factor									
				Bandedge	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
DH5	2	2.8696	0.06	-24.82	-24.82	-24.82	-24.82	-24.82	-24.82	-24.82	-24.82	-24.82	-24.82

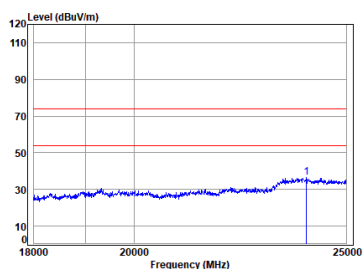
BT_TX_CH_M_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00712AT\00713AT
Mode : 2441 TX RSE
: BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1 p23868.430	6.77	38.95	50.37	50.74	36.55	74.00	-37.45	Peak	-9.54

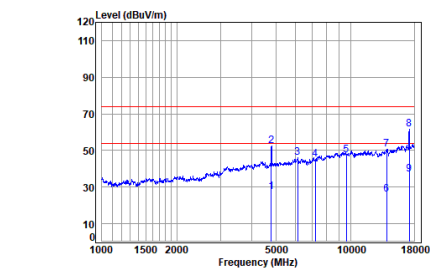
BT_TX_CH_M_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 00712AT\00713AT
Mode : 2441 TX RSE
: BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1 p23978.460	6.78	38.99	50.40	50.81	36.64	74.00	-37.36	Peak	-9.54

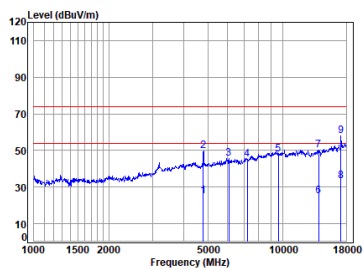
BT_DH5_TX_CH_00_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00712AT\00713AT
Mode : 2402 TX RSE
: BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1 4804.000	7.41	34.32	54.22	39.97	27.48	54.00	-26.52	Average	0.00
2 4804.000	7.41	34.32	54.22	64.79	52.30	74.00	-21.70	Peak	0.00
3 6124.292	8.92	35.00	53.11	55.12	45.93	74.00	-28.07	Peak	0.00
4 7206.000	8.50	35.70	53.18	54.38	45.40	74.00	-28.60	Peak	0.00
5 9608.000	10.74	37.42	53.35	52.44	47.25	74.00	-26.75	Peak	0.00
6 13957.530	10.97	39.62	52.91	28.11	25.79	54.00	-28.21	Average	0.00
7 13957.530	10.97	39.62	52.91	52.93	56.61	74.00	-23.39	Peak	0.00
8 p17186.530	11.07	43.01	52.80	60.41	61.69	74.00	-12.31	Peak	0.00
9 q17186.530	11.07	43.01	52.80	35.59	36.87	54.00	-17.13	Average	0.00

BT_DH5_TX_CH_00_Vertical

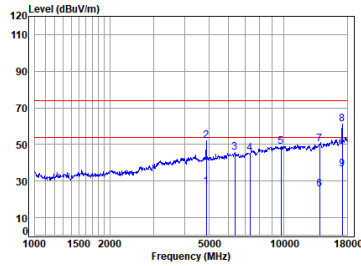


Site : chamber
Condition: 3m VERTICAL
Job No : 00712AT\00713AT
Mode : 2402 TX RSE
: BT

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		dB
1 4804.000	7.41	34.32	54.22	37.41	24.92	54.00	-29.08	Average	0.00
2 4804.000	7.41	34.32	54.22	62.23	49.74	74.00	-24.26	Peak	0.00
3 6071.417	8.92	35.04	53.11	54.00	45.65	74.00	-28.35	Peak	0.00
4 7206.000	8.50	35.70	53.18	54.11	45.13	74.00	-28.87	Peak	0.00
5 9608.000	10.74	37.42	53.35	52.99	47.80	74.00	-26.20	Peak	0.00
6 13957.530	10.97	39.62	52.91	27.53	25.21	54.00	-28.79	Average	0.00
7 13957.530	10.97	39.62	52.91	52.35	56.03	74.00	-23.97	Peak	0.00
8 q17136.920	11.05	43.06	52.83	32.94	33.32	54.00	-20.68	Average	0.00
9 p17136.920	11.05	43.06	52.83	56.86	58.14	74.00	-15.86	Peak	0.00



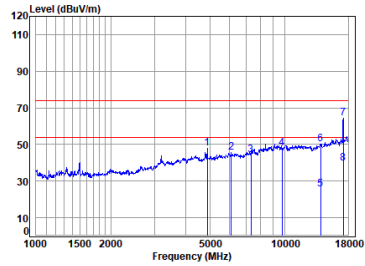
BT_DH5_TX_CH_39_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00712AT\00713AT
Mode : 2441 TX RSE
BT

Freq	Cable Loss	Factor	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	dB		dB
1 4882.000	7.47	34.63	54.21	39.09	26.98	54.00	-27.02	Average	0.00	
2 4882.000	7.47	34.63	54.21	63.91	51.00	74.00	-22.20	Peak	0.00	
3 6358.789	8.89	34.95	53.14	54.87	45.57	74.00	-28.43	Peak	0.00	
4 7323.000	8.46	35.70	53.17	54.38	45.37	74.00	-28.63	Peak	0.00	
5 9764.000	10.69	37.37	53.29	54.15	48.92	74.00	-25.08	Peak	0.00	
6 13957.530	10.97	39.62	52.91	27.79	25.47	54.00	-28.53	Average	0.00	
7 13957.530	10.97	39.62	52.91	52.61	50.29	74.00	-23.71	Peak	0.00	
8 p17186.530	11.07	43.01	52.80	59.09	61.17	74.00	-12.83	Peak	0.00	
9 q17186.530	11.07	43.01	52.80	35.07	36.35	54.00	-17.65	Average	0.00	

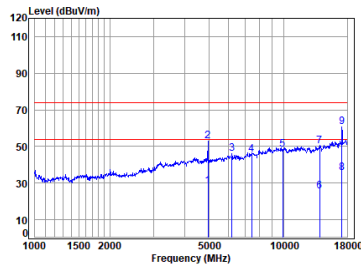
BT_DH5_TX_CH_39_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 00712AT\00713AT
Mode : 2441 TX RSE
BT

Freq	Cable Loss	Factor	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	dB		dB
1 4882.000	7.47	34.63	54.21	59.84	47.73	74.00	-26.27	Peak	0.00	
2 6088.991	8.92	35.08	53.11	54.64	45.53	74.00	-28.47	Peak	0.00	
3 7323.000	8.46	35.70	53.17	53.46	44.45	74.00	-29.55	Peak	0.00	
4 9764.000	10.69	37.37	53.29	53.27	48.04	74.00	-25.96	Peak	0.00	
5 13957.530	10.97	39.62	52.91	27.76	25.44	54.00	-28.56	Average	0.00	
6 13957.530	10.97	39.62	52.91	52.58	50.26	74.00	-23.74	Peak	0.00	
7 p17186.530	11.07	43.01	52.80	63.19	64.47	74.00	-9.53	Peak	0.00	
8 q17186.530	11.07	43.01	52.80	38.37	39.65	54.00	-14.35	Average	0.00	

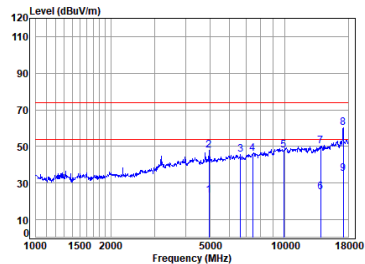
BT_DH5_TX_CH_78_Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00712AT\00713AT
Mode : 2408 TX RSE
BT

Freq	Cable Loss	Factor	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	dB		dB
1 4960.000	7.53	34.56	54.20	40.38	28.27	54.00	-25.73	Average	0.00	
2 4960.000	7.53	34.56	54.20	65.20	53.09	74.00	-20.91	Peak	0.00	
3 6195.580	8.91	34.72	53.12	55.63	46.14	74.00	-27.86	Peak	0.00	
4 7440.000	8.43	35.96	53.15	54.41	45.65	74.00	-28.35	Peak	0.00	
5 9920.000	10.64	37.30	53.23	53.49	48.20	74.00	-25.80	Peak	0.00	
6 13957.530	10.97	39.62	52.91	27.90	25.58	54.00	-28.42	Average	0.00	
7 13957.530	10.97	39.62	52.91	52.72	50.40	74.00	-23.60	Peak	0.00	
8 q17136.920	11.05	43.06	52.83	34.50	35.78	54.00	-18.22	Average	0.00	
9 p17136.920	11.05	43.06	52.83	59.32	60.60	74.00	-13.40	Peak	0.00	

BT_DH5_TX_CH_78_Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 00712AT\00713AT
Mode : 2408 TX RSE
BT

Freq	Cable Loss	Factor	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark	Aux Factor
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	dB		dB
1 4960.000	7.53	34.56	54.20	35.41	23.30	54.00	-30.70	Average	0.00	
2 4960.000	7.53	34.56	54.20	60.23	48.12	74.00	-25.88	Peak	0.00	
3 6640.542	8.79	35.22	53.17	54.62	45.46	74.00	-28.54	Peak	0.00	
4 7440.000	8.43	35.96	53.15	54.72	45.96	74.00	-28.04	Peak	0.00	
5 9920.000	10.64	37.30	53.23	53.23	47.94	74.00	-26.06	Peak	0.00	
6 13957.530	10.97	39.62	52.91	27.55	25.23	54.00	-28.77	Average	0.00	
7 13957.530	10.97	39.62	52.91	52.37	50.05	74.00	-23.95	Peak	0.00	
8 p17186.530	11.07	43.01	52.80	58.74	60.02	74.00	-13.98	Peak	0.00	
9 q17186.530	11.07	43.01	52.80	33.92	35.20	54.00	-18.80	Average	0.00	



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7.5 Maximum Conducted Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(1)
 Test Method: ANSI C63.10 (2020) Section 7.8.5
 Test Engineer: Mingli Hu

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:

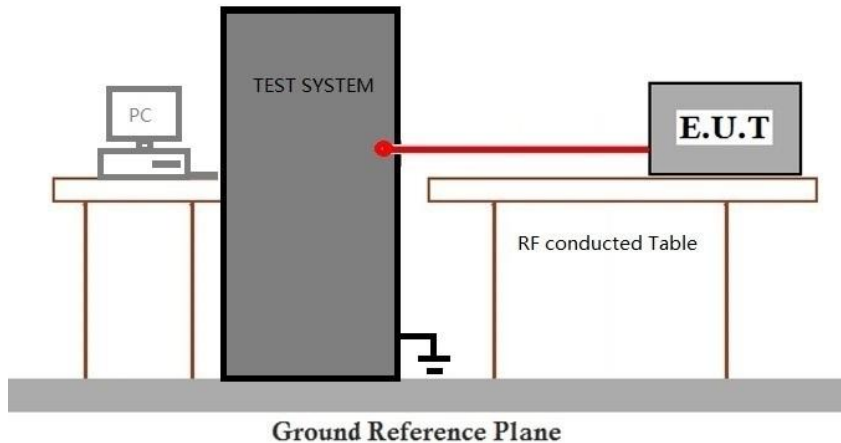
Temperature: 21.1 °C Humidity: 57.3 % RH Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



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 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)
 Test Method: ANSI C63.10 (2020) Section 6.9.2
 Test Engineer: Mingli Hu

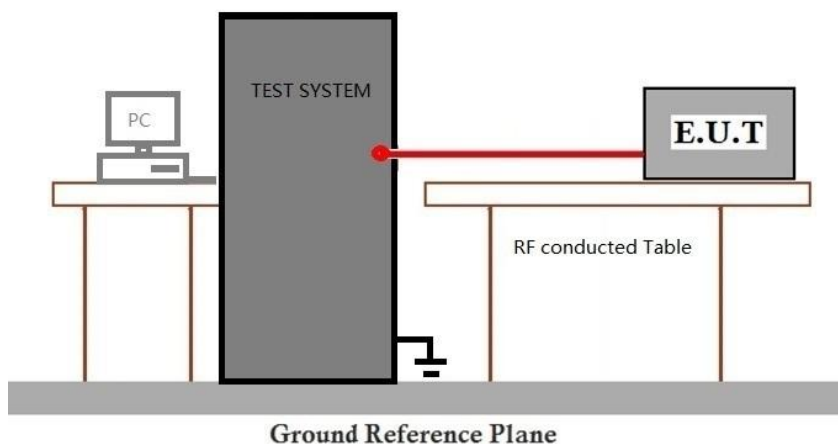
7.6.1 E.U.T. Operation

Operating Environment:
 Temperature: 21.1 °C Humidity: 57.3 % RH Atmospheric Pressure: 1020 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details



7.7 Carrier Frequencies Separation

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)
 Test Method: ANSI C63.10 (2020) Section 7.8.2
 Test Engineer: Mingli Hu

Limit:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

7.7.1 E.U.T. Operation

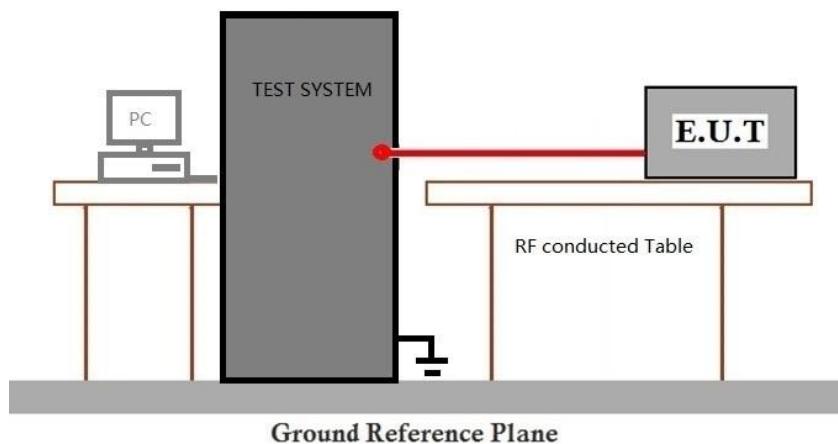
Operating Environment:

Temperature: 21.1 °C Humidity: 57.3 % RH Atmospheric Pressure: 1020 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details



7.8 Hopping Channel Number

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2020) Section 7.8.3

Test Engineer: Mingli Hu

Limit:

Frequency range(MHz)	Number of hopping channels (minimum)
902-928	50 for 20dB bandwidth <250kHz
	25 for 20dB bandwidth ≥250kHz
2400-2483.5	15
5725-5850	75

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 21.1 °C

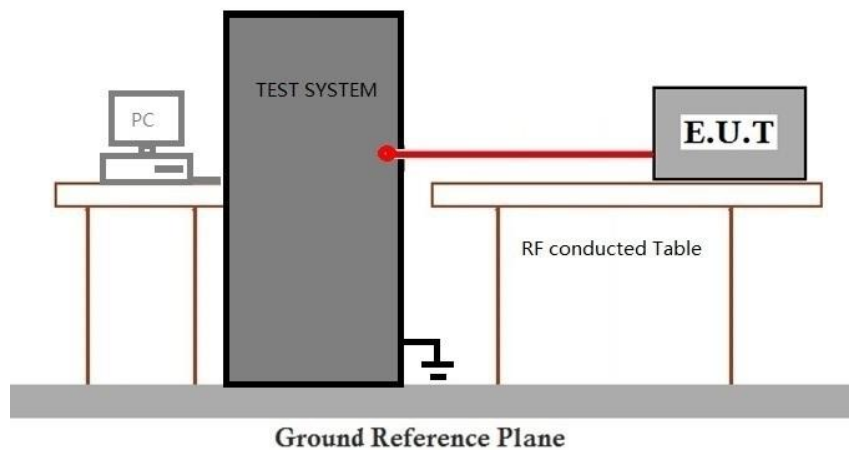
Humidity: 57.3 % RH

Atmospheric Pressure: 1020 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.8.3 Test Setup Diagram



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7.8.4 Measurement Procedure and Data

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7.9 Dwell Time

Test Requirement 47 CFR Part 15, Subpart C 15.247a(1)(iii)

Test Method: ANSI C63.10 (2020) Section 7.8.4

Test Engineer: Mingli Hu

Limit:

Frequency(MHz)	Limit
902-928	0.4S within a 20S period(20dB bandwidth<250kHz)
	0.4S within a 10S period(20dB bandwidth≥250kHz)
2400-2483.5	0.4S within a period of 0.4S multiplied by the number of hopping channels
5725-5850	0.4S within a 30S period

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 21.1 °C

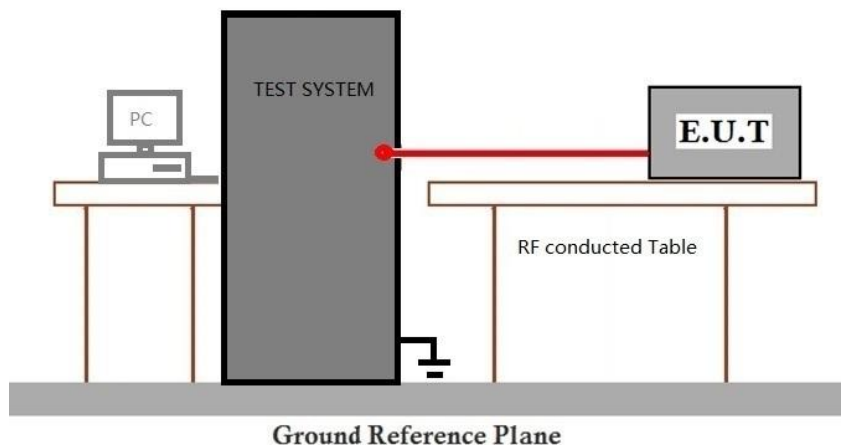
Humidity: 57.3 % RH

Atmospheric Pressure: 1020 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.9.3 Test Setup Diagram



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7.9.4 Measurement Procedure and Data

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7.10 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
 Test Method: ANSI C63.10 (2020) Section 7.8.7.2
 Test Engineer: Mingli Hu

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)).

7.10.1 E.U.T. Operation

Operating Environment:

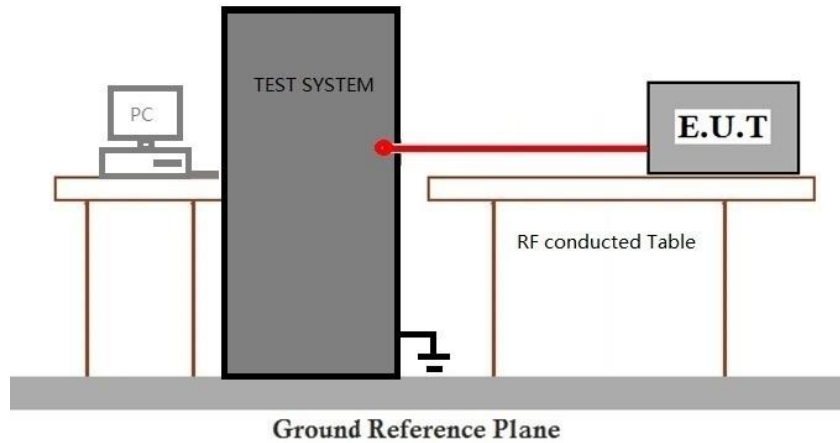
Temperature: 21.1 °C Humidity: 57.3 % RH Atmospheric Pressure: 1020 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.



7.10.3 Test Setup Diagram



7.10.4 Measurement Procedure and Data

Please Refer to Appendix for Details



7.11 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
 Test Method: ANSI C63.10 (2020) Section 7.8.7
 Test Engineer: Mingli Hu

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)).

7.11.1 E.U.T. Operation

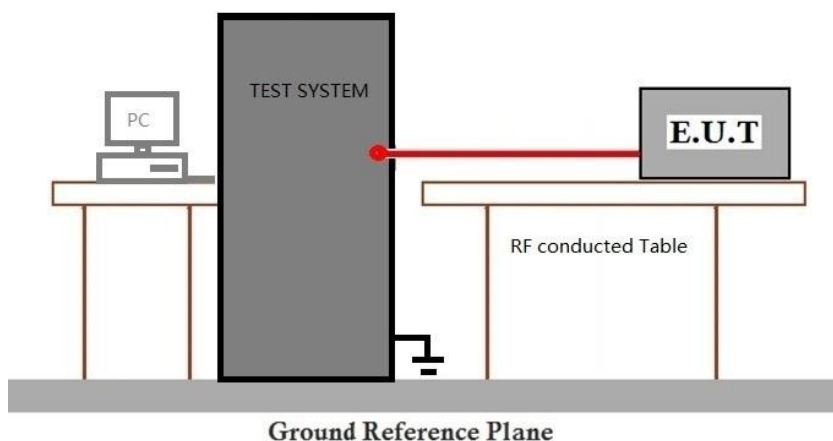
Operating Environment:

Temperature: 21.1 °C Humidity: 57.3 % RH Atmospheric Pressure: 1020 mbar

7.11.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.11.3 Test Setup Diagram





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7.11.4 Measurement Procedure and Data

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZCR2602000712AT

9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for SZCR2602000712AT



10 Appendix

1. Duty Cycle

1.1 Test Result

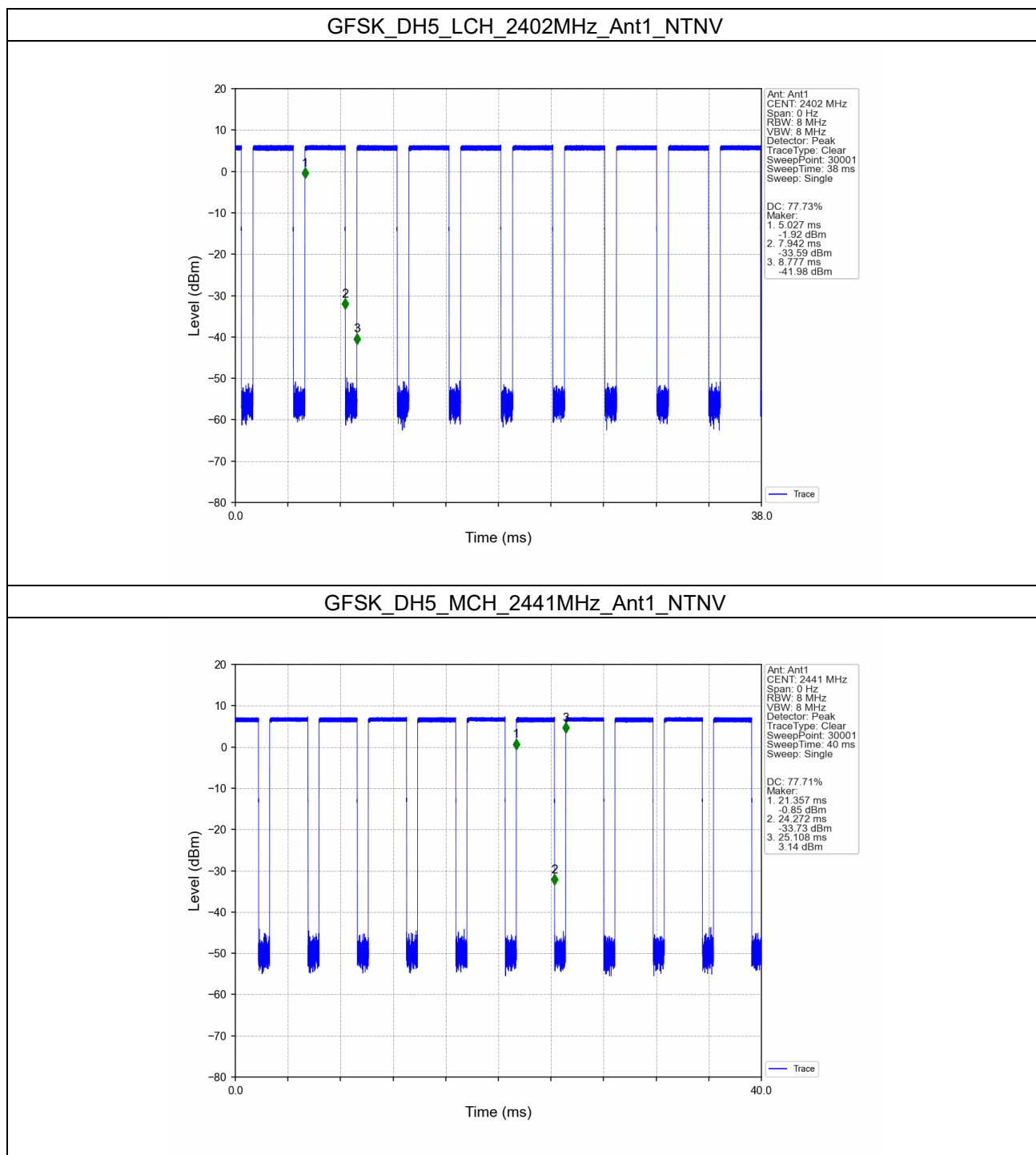
1.1.1 Ant1

Ant1								
Mode	Tx Type	Frequency (MHz)	Packet Type	T _{on} (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
GFSK	SISO	2402	DH5	2.915	3.750	77.73	1.09	0.03
		2441	DH5	2.915	3.751	77.71	1.10	0.04
		2480	DH5	2.915	3.750	77.73	1.09	0.04
Pi/4DQPSK	SISO	2402	2DH5	2.922	3.751	77.90	1.08	0.03
		2441	2DH5	2.920	3.749	77.89	1.09	0.04
		2480	2DH5	2.921	3.750	77.89	1.08	0.03
8DPSK	SISO	2402	3DH5	2.922	3.751	77.90	1.08	0.03
		2441	3DH5	2.922	3.751	77.90	1.08	0.03
		2480	3DH5	2.922	3.750	77.92	1.08	0.03

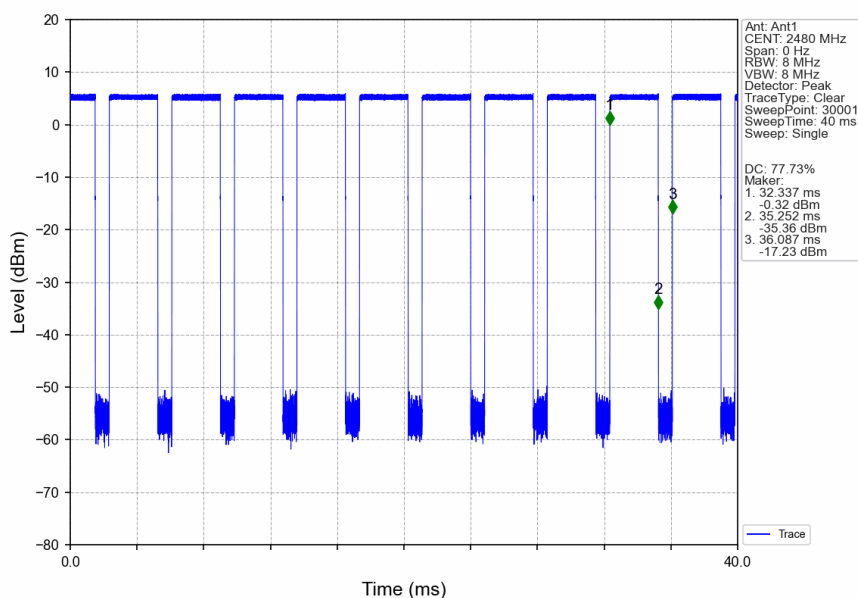


1.2 Test Graph

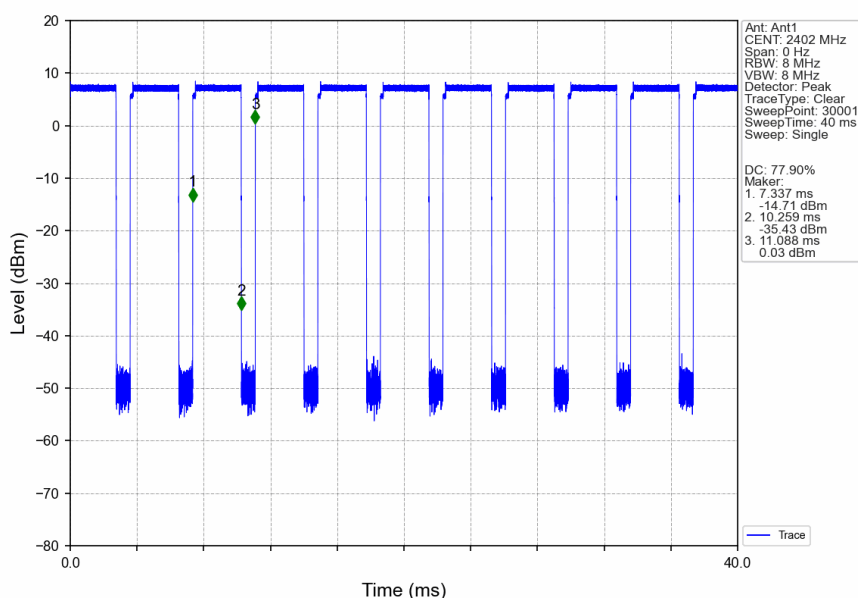
1.2.1 Ant1



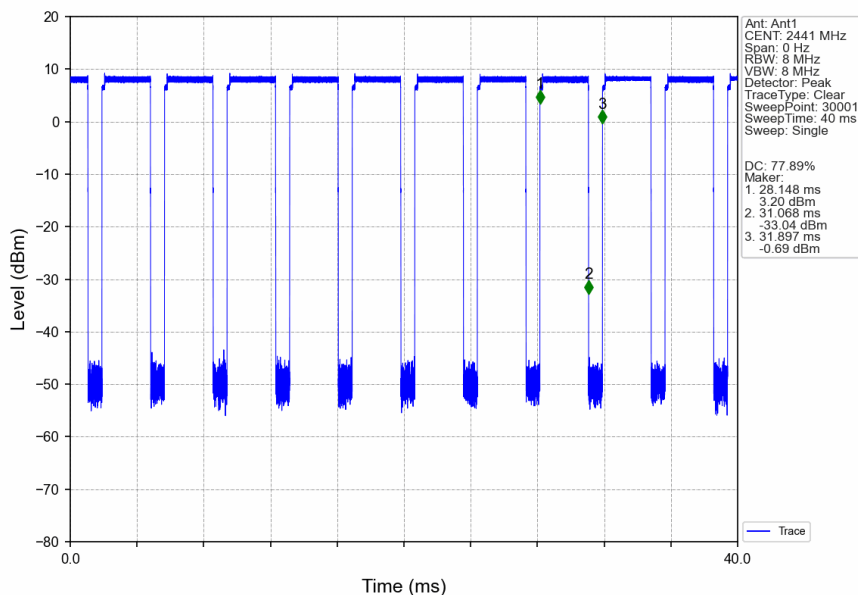
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



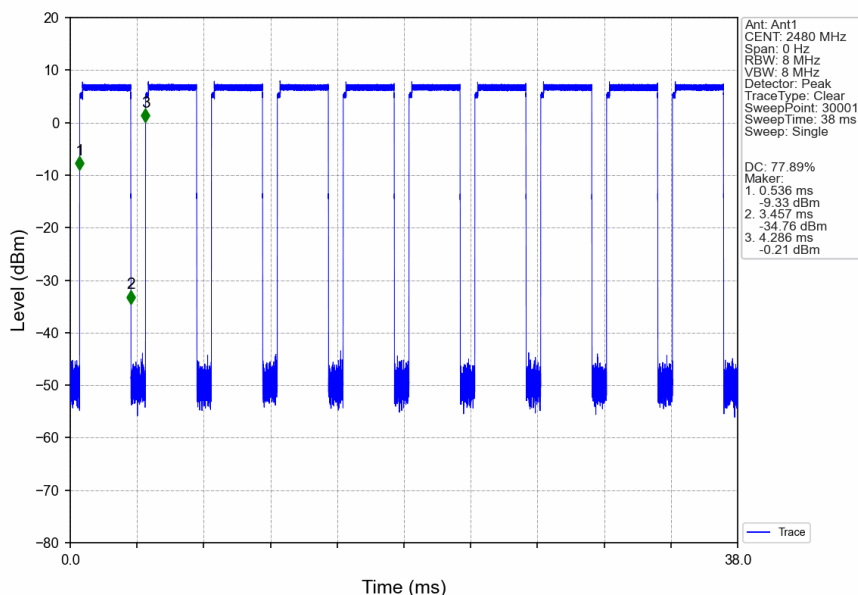
Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



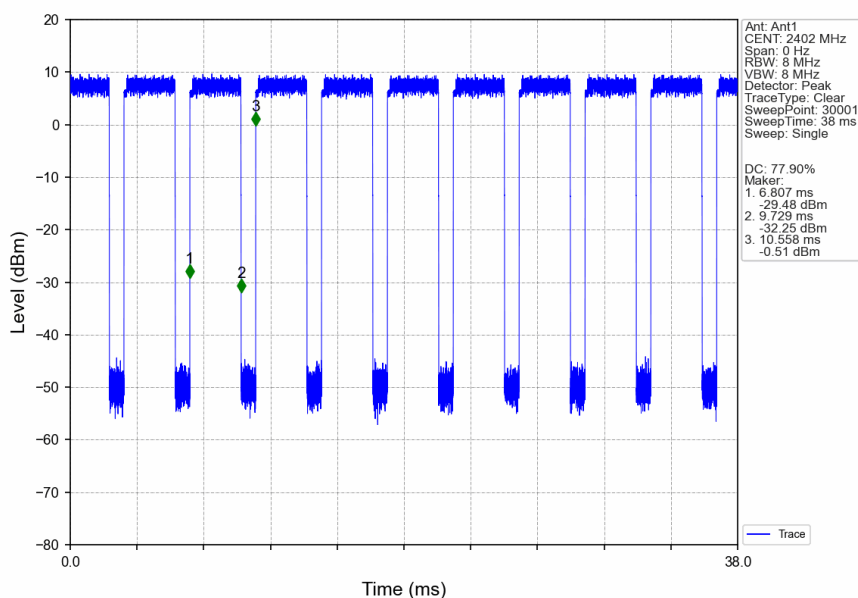
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



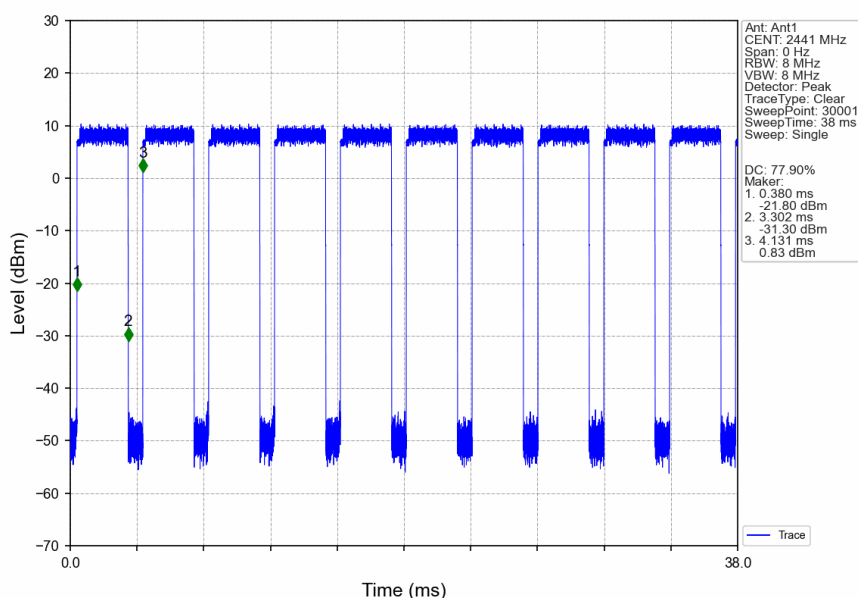
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



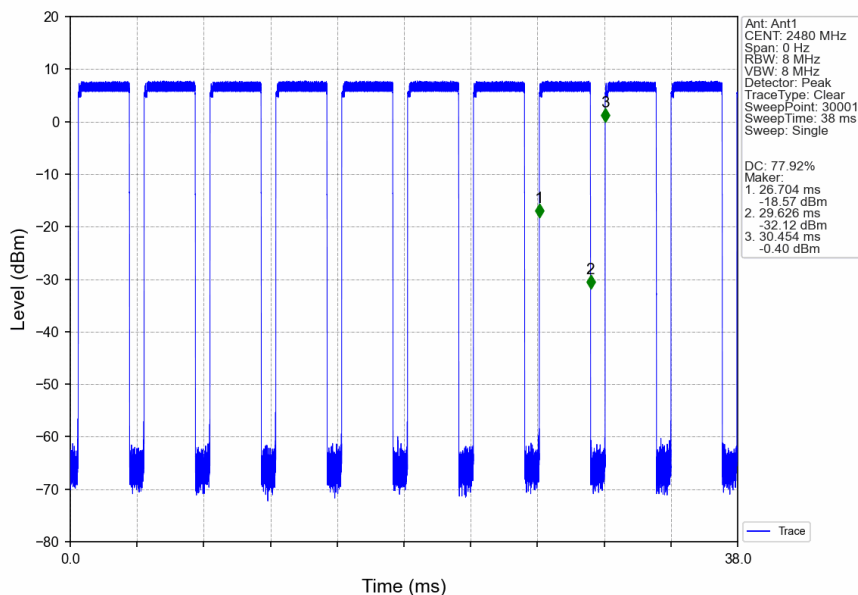
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



2. Bandwidth

2.1 Test Result

2.1.1 OBW

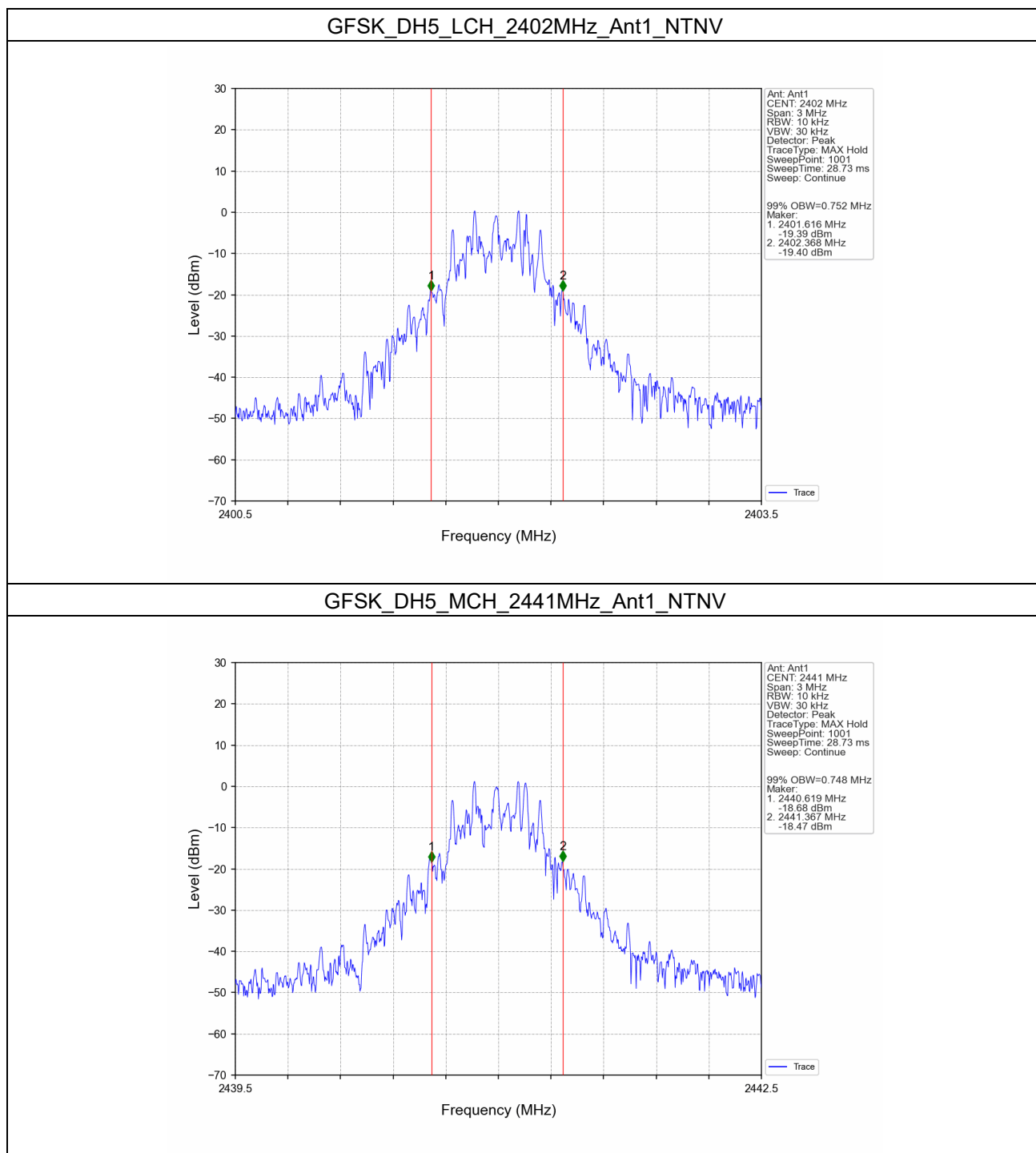
Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.752	/	Pass
		2441	DH5	1	0.748	/	Pass
		2480	DH5	1	0.751	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.227	/	Pass
		2441	2DH5	1	1.215	/	Pass
		2480	2DH5	1	1.218	/	Pass
8DPSK	SISO	2402	3DH5	1	1.187	/	Pass
		2441	3DH5	1	1.192	/	Pass
		2480	3DH5	1	1.096	/	Pass

2.1.2 20dB BW

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	20dB Bandwidth (MHz)		Verdict
					Result	Limit	
GFSK	SISO	2402	DH5	1	0.764	/	Pass
		2441	DH5	1	0.760	/	Pass
		2480	DH5	1	0.762	/	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.288	/	Pass
		2441	2DH5	1	1.285	/	Pass
		2480	2DH5	1	1.284	/	Pass
8DPSK	SISO	2402	3DH5	1	1.272	/	Pass
		2441	3DH5	1	1.267	/	Pass
		2480	3DH5	1	1.195	/	Pass

2.2 Test Graph

2.2.1 OBW



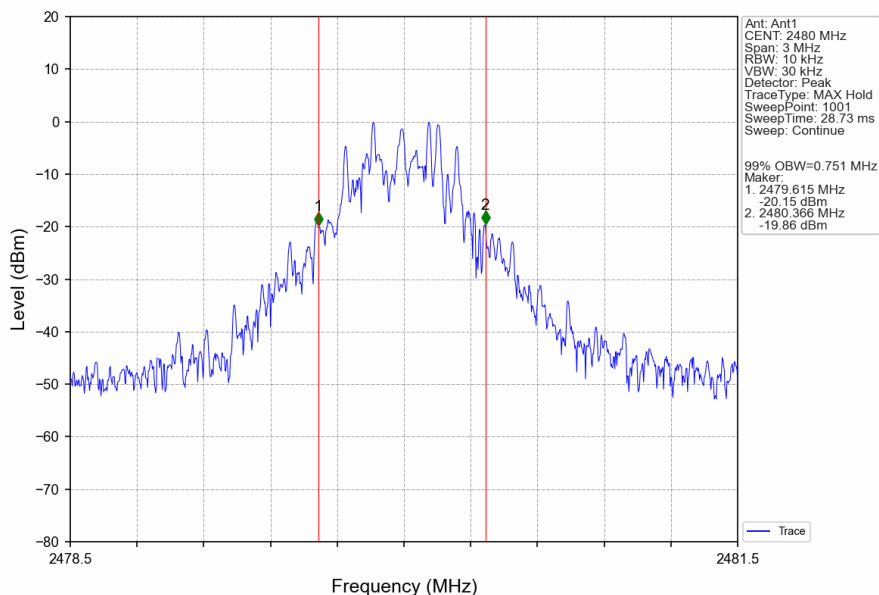
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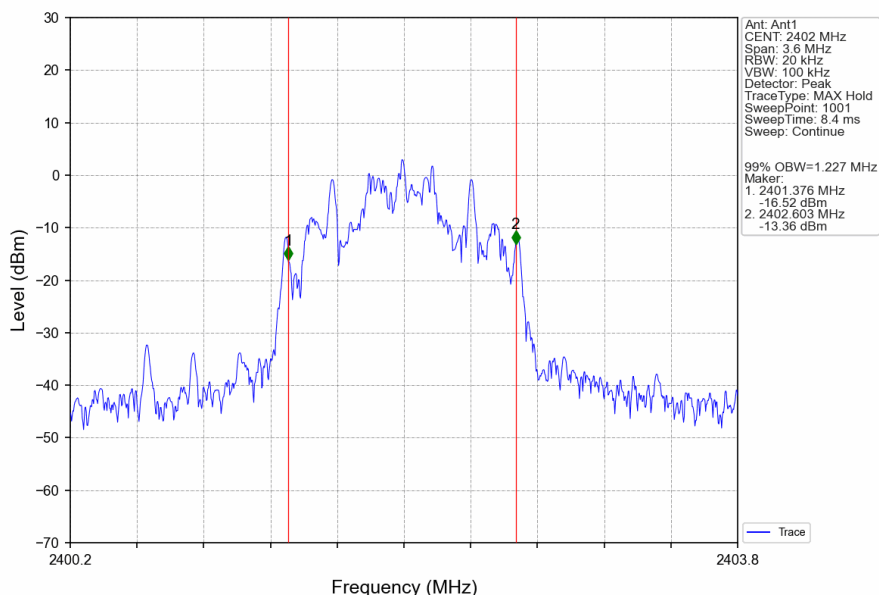
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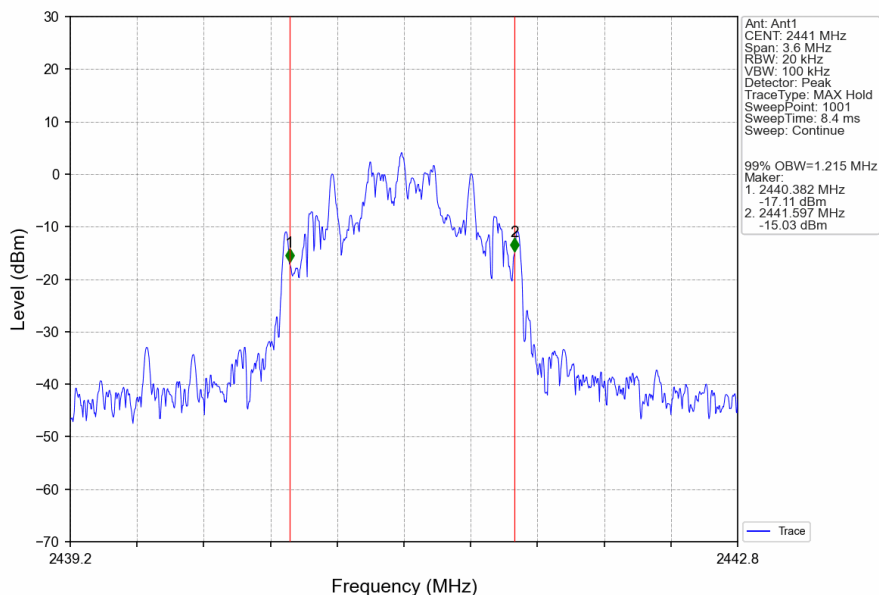
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



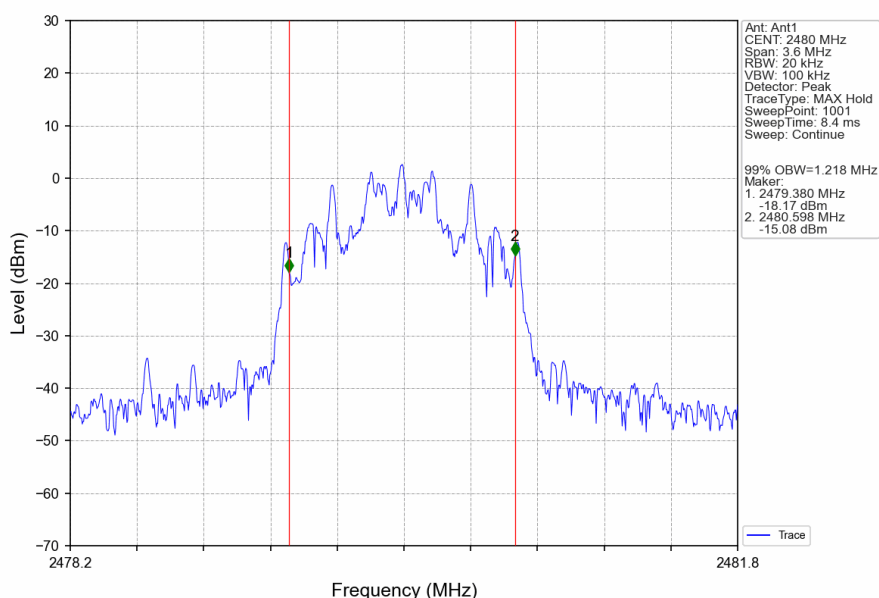
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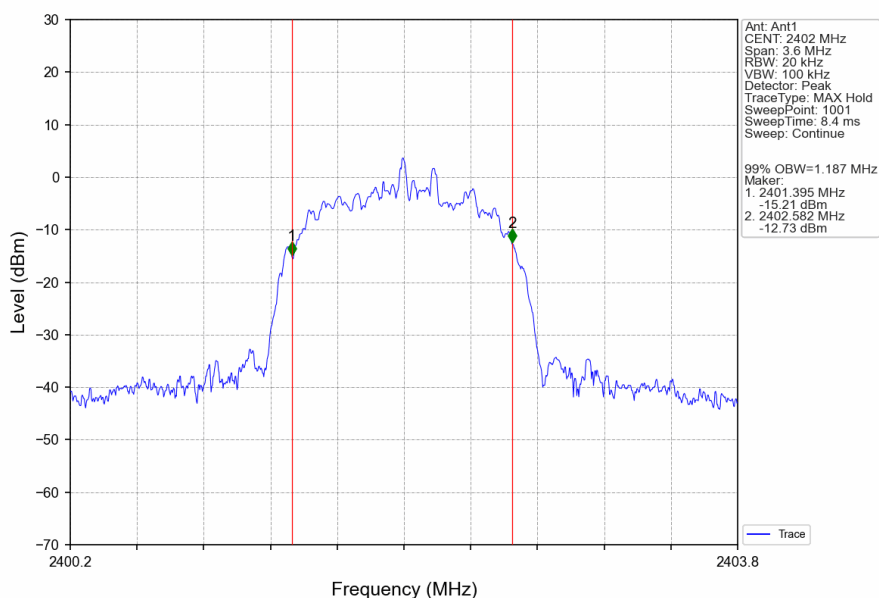
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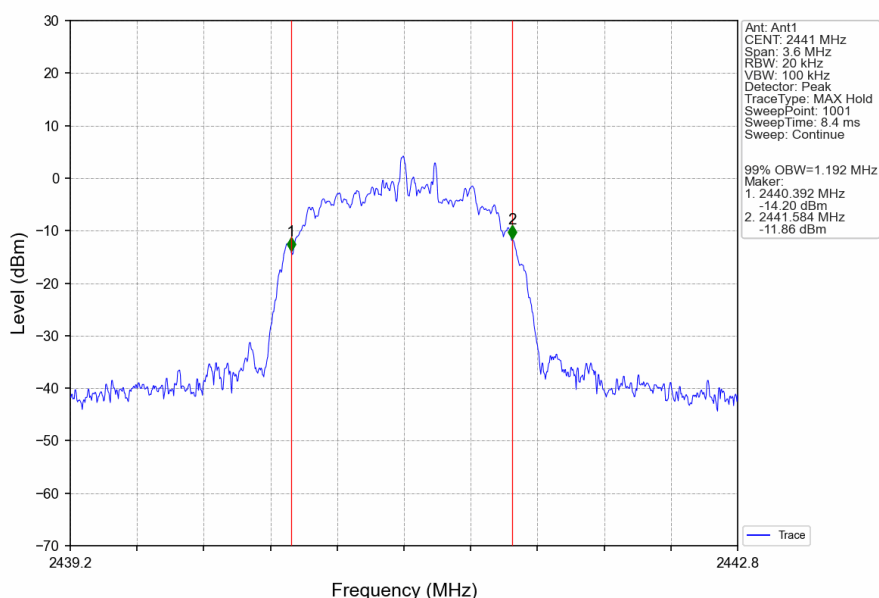
Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



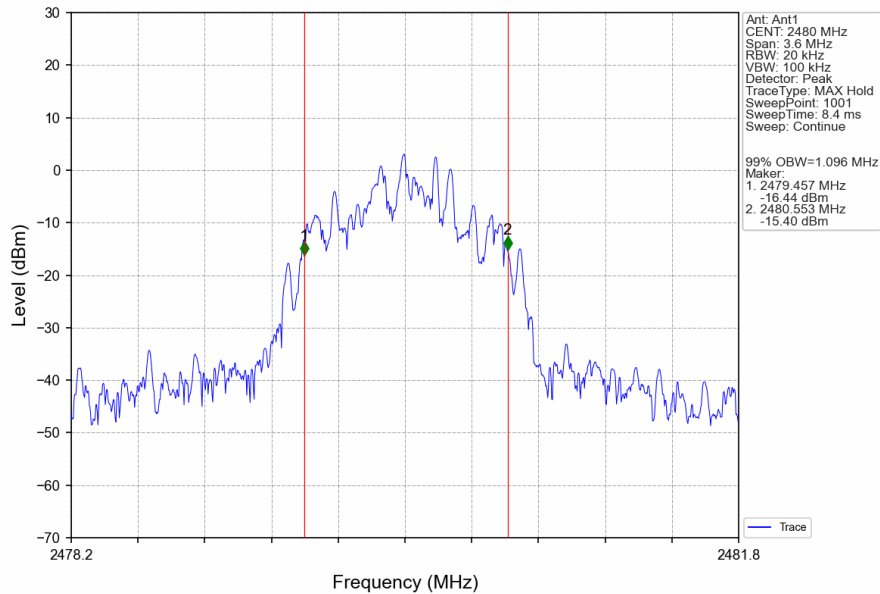
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



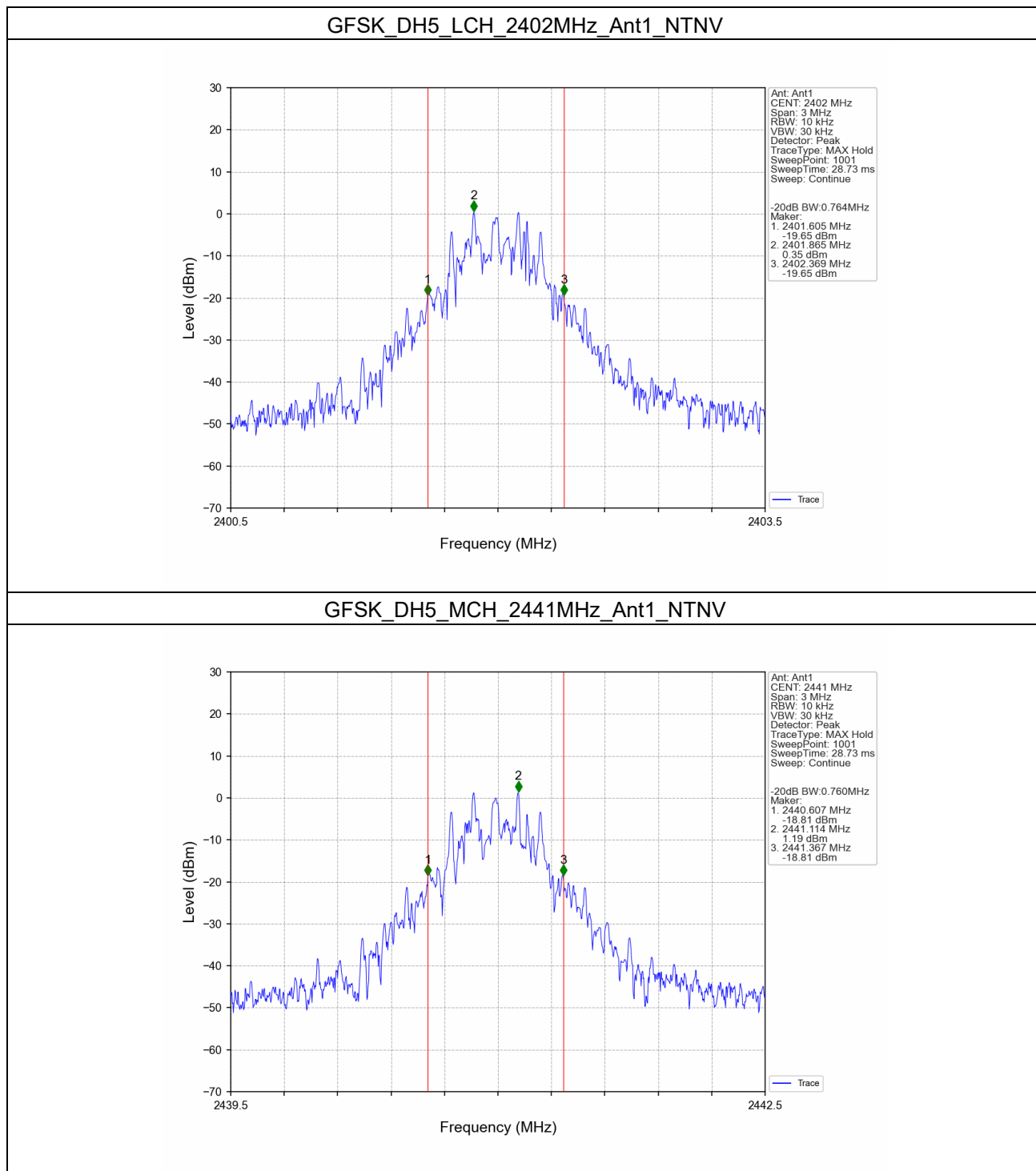
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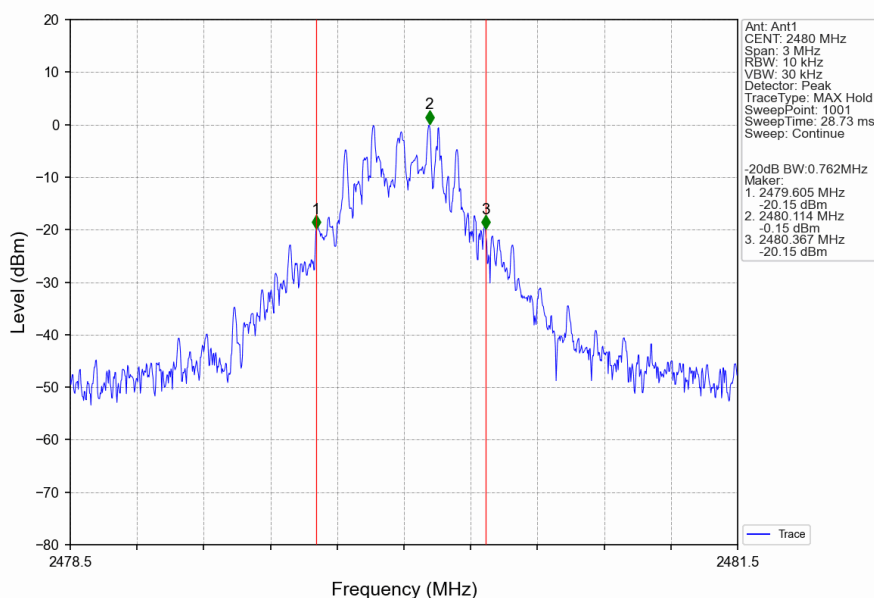
8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



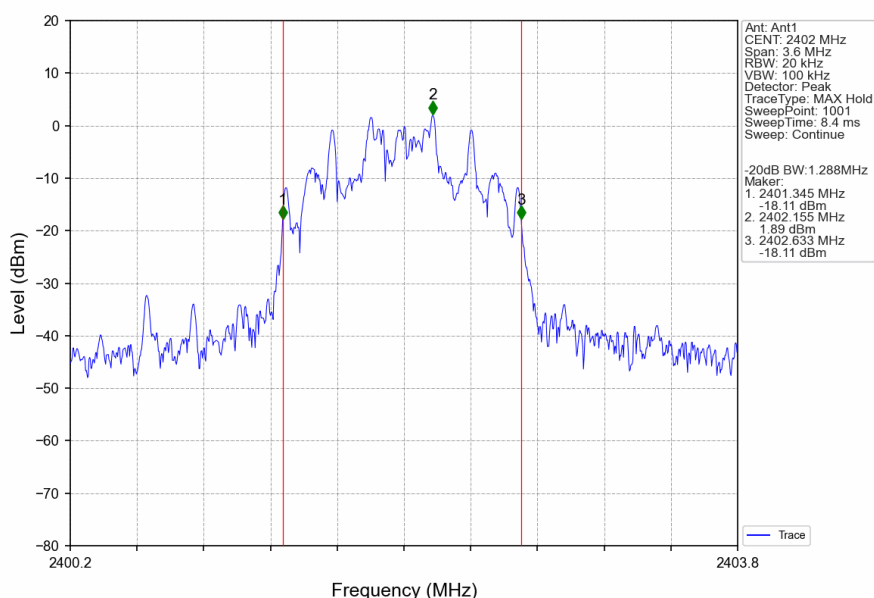
2.2.2 20dB BW



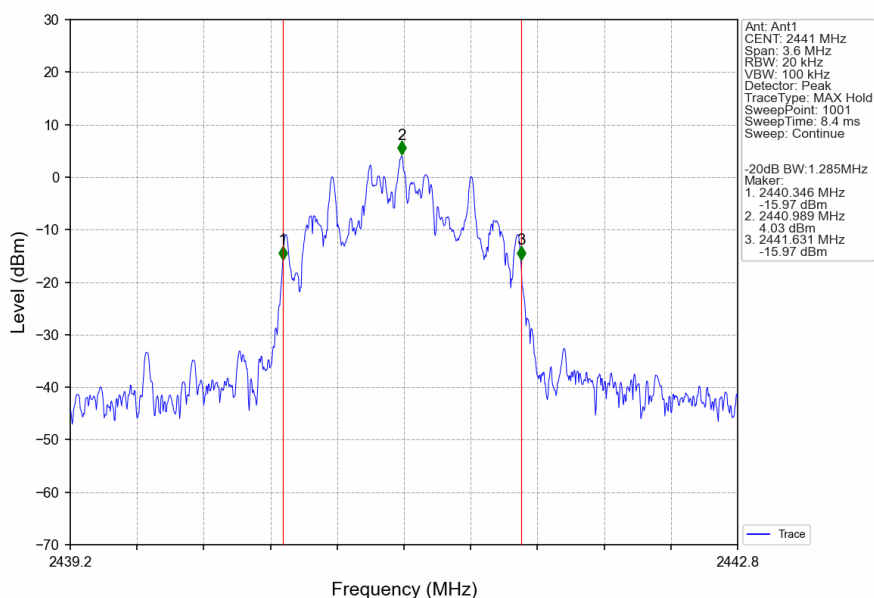
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



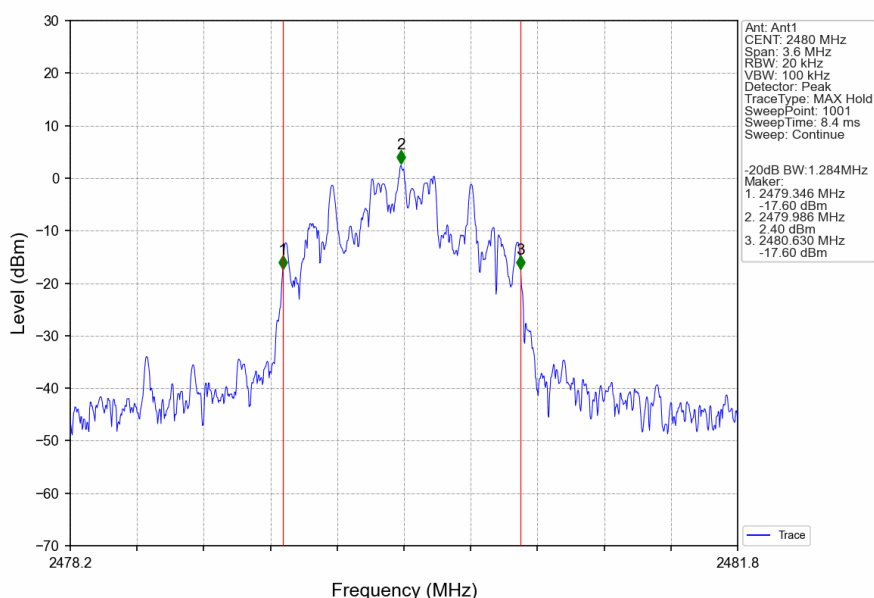
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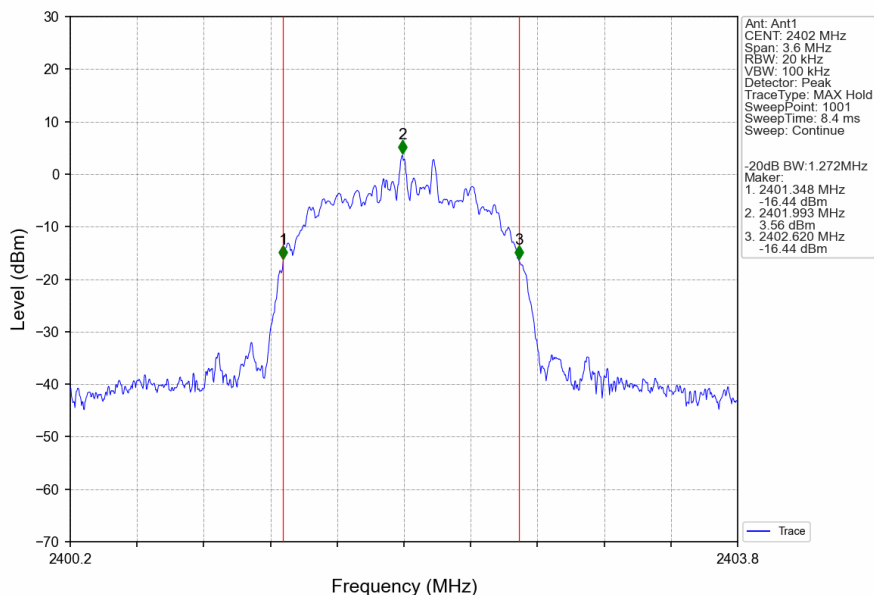
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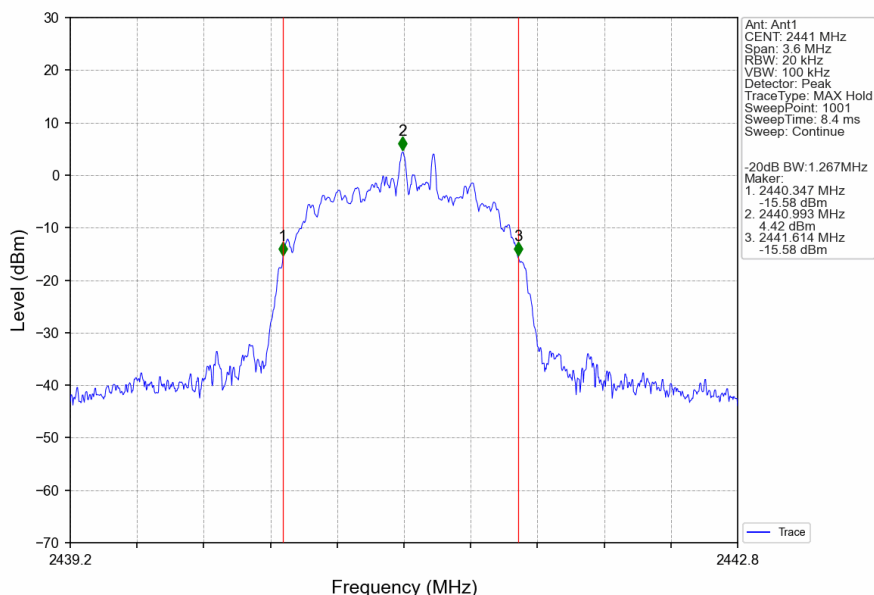
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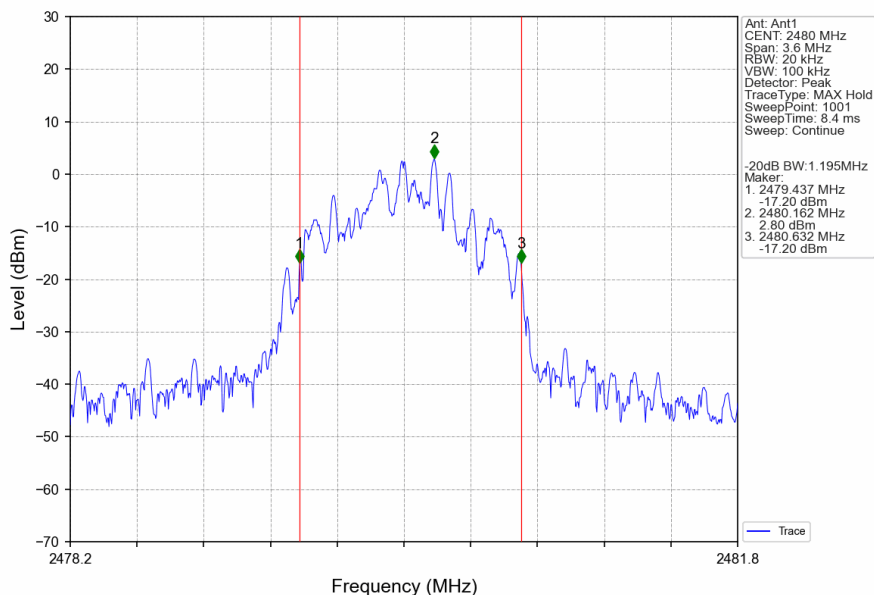
8DPSK_3DH5_LCH_2402MHz_Ant1_NTNV



8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



8DPSK_3DH5_HCH_2480MHz_Ant1_NTNV



3. Maximum Conducted Output Power

3.1 Test Result

3.1.1 Power

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				ANT1	Limit	
GFSK	SISO	2402	DH5	6.13	<=30	Pass
		2441	DH5	6.97	<=30	Pass
		2480	DH5	5.66	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	7.96	<=20.97	Pass
		2441	2DH5	8.78	<=20.97	Pass
		2480	2DH5	7.44	<=20.97	Pass
8DPSK	SISO	2402	3DH5	9.34	<=20.97	Pass
		2441	3DH5	10.04	<=20.97	Pass
		2480	3DH5	8.01	<=20.97	Pass

Note1: Antenna Gain: Ant1: 3.92dBi;

4. Carrier Frequency Separation

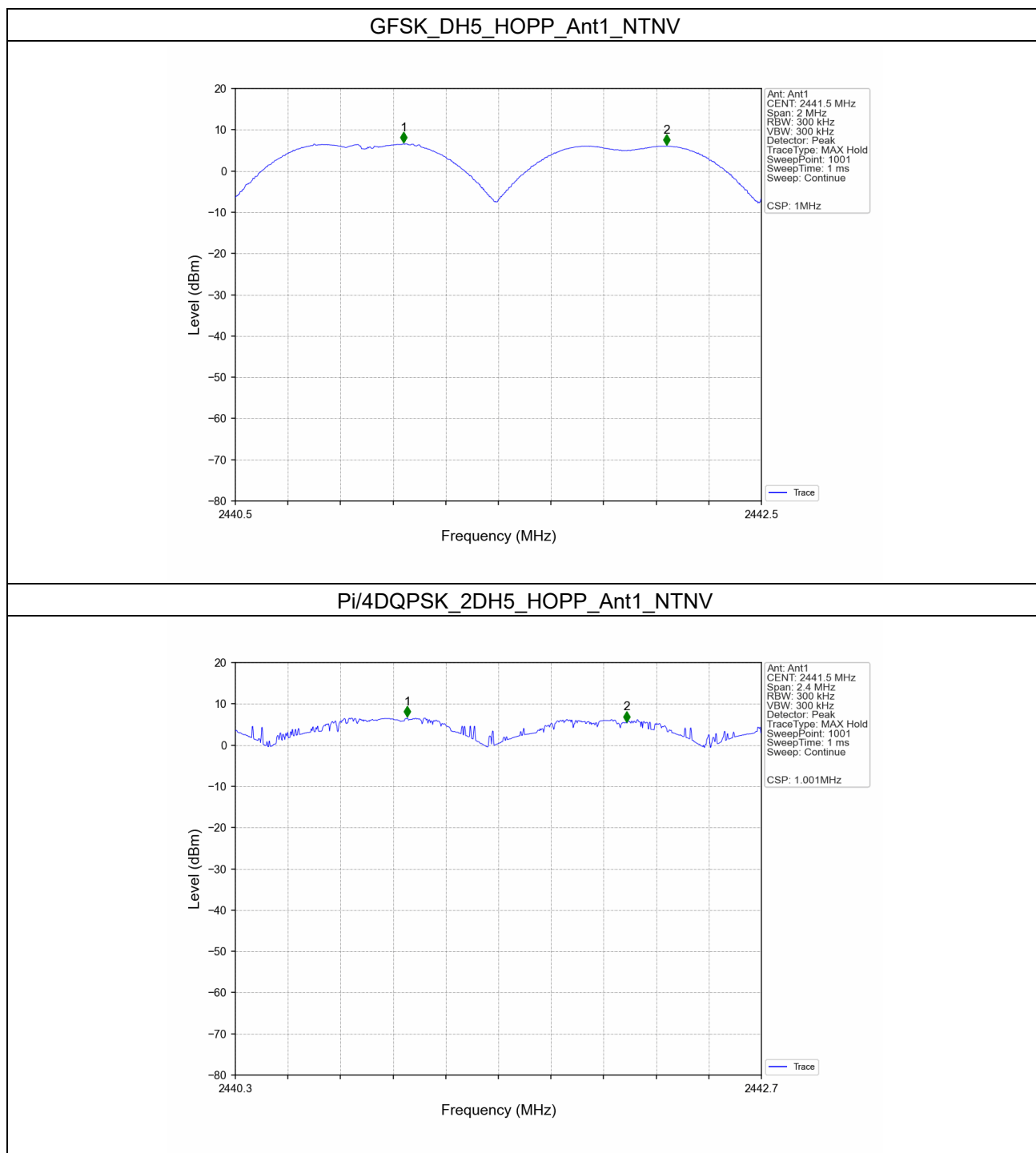
4.1 Test Result

4.1.1 Ant1

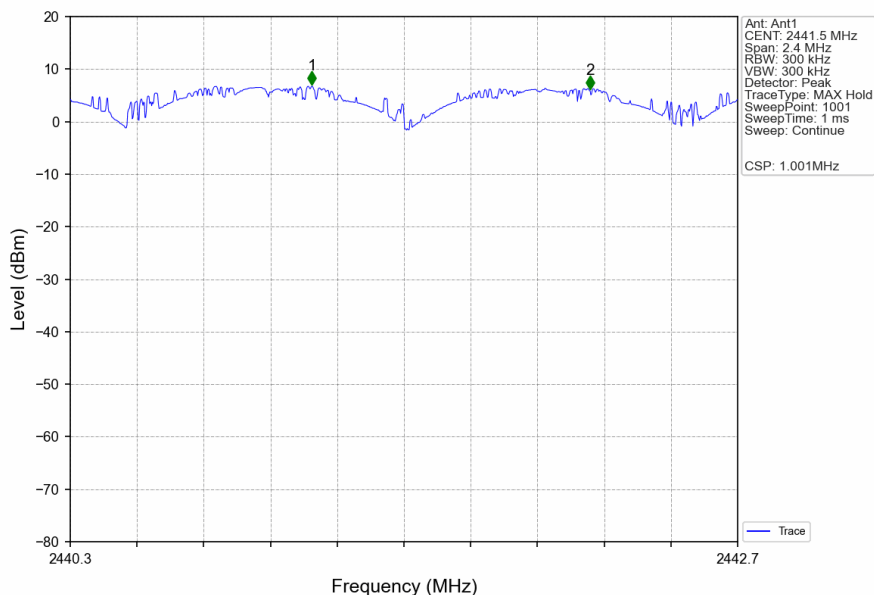
Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	1.000	0.764	>=0.764	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.288	>=0.859	Pass
8DPSK	SISO	HOPP	3DH5	1.001	1.272	>=0.848	Pass

4.2 Test Graph

4.2.1 Ant1



8DPSK_3DH5_HOPP_Ant1_NTNV



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5. Number of Hopping Frequencies

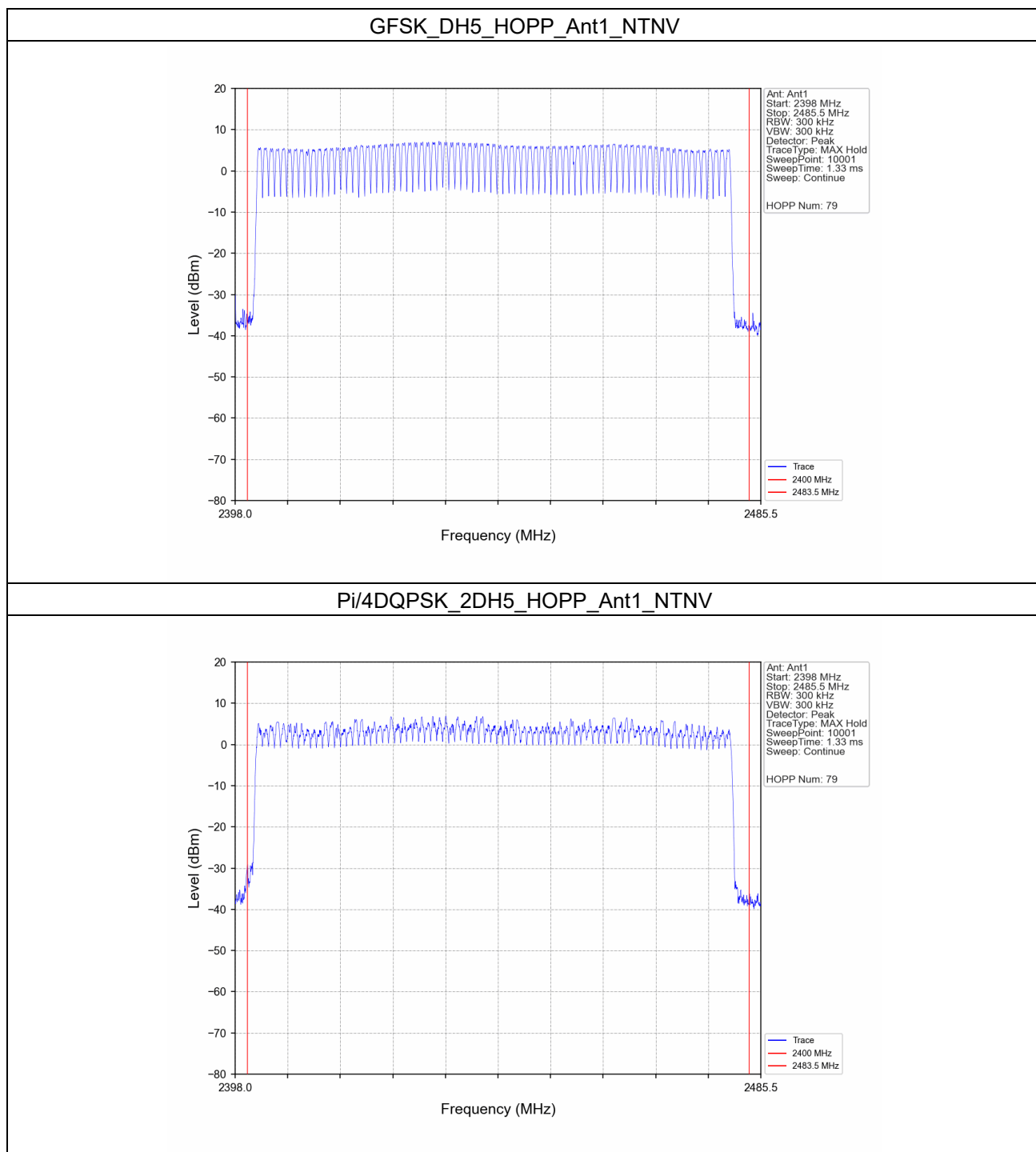
5.1 Test Result

5.1.1 HoppNum

Mode	TX Type	Frequency (MHz)	Packet Type	Num of Hopping Frequencies		Verdict
				ANT1	Limit	
GFSK	SISO	HOPP	DH5	79	>=15	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	79	>=15	Pass
8DPSK	SISO	HOPP	3DH5	79	>=15	Pass

5.2 Test Graph

5.2.1 HoppNum



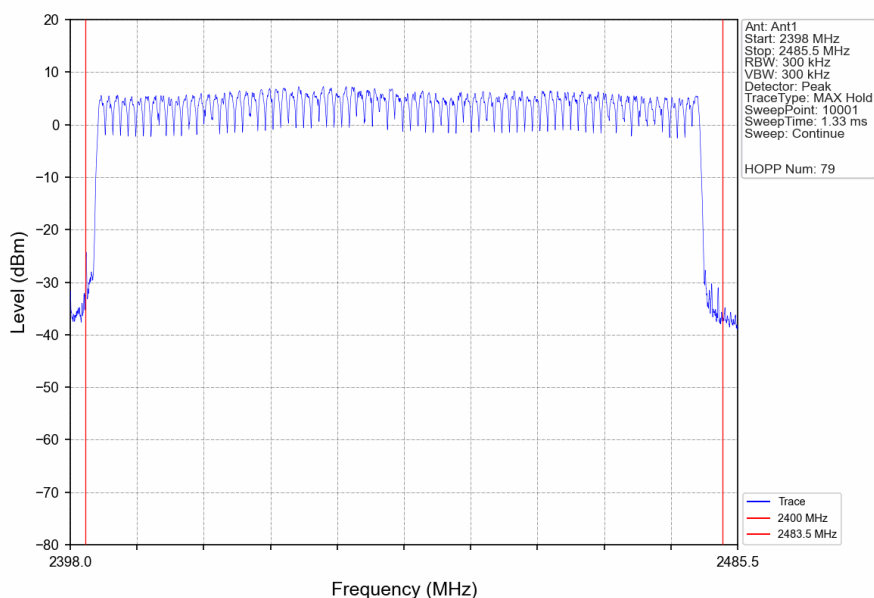
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8DPSK_3DH5_HOPP_Ant1_NTNV



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6. Time of Occupancy (Dwell Time)

6.1 Test Result

6.1.1 Ant1

Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.410	31.600	320	131.200	<=400	Pass
			DH3	1.668	31.600	148	246.864	<=400	Pass
			DH5	2.918	31.600	103	300.554	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.420	31.600	320	134.400	<=400	Pass
			2DH3	1.668	31.600	164	273.552	<=400	Pass
			2DH5	2.920	31.600	109	318.280	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.412	31.600	320	131.840	<=400	Pass
			3DH3	1.660	31.600	154	255.640	<=400	Pass
			3DH5	2.920	31.600	107	312.440	<=400	Pass

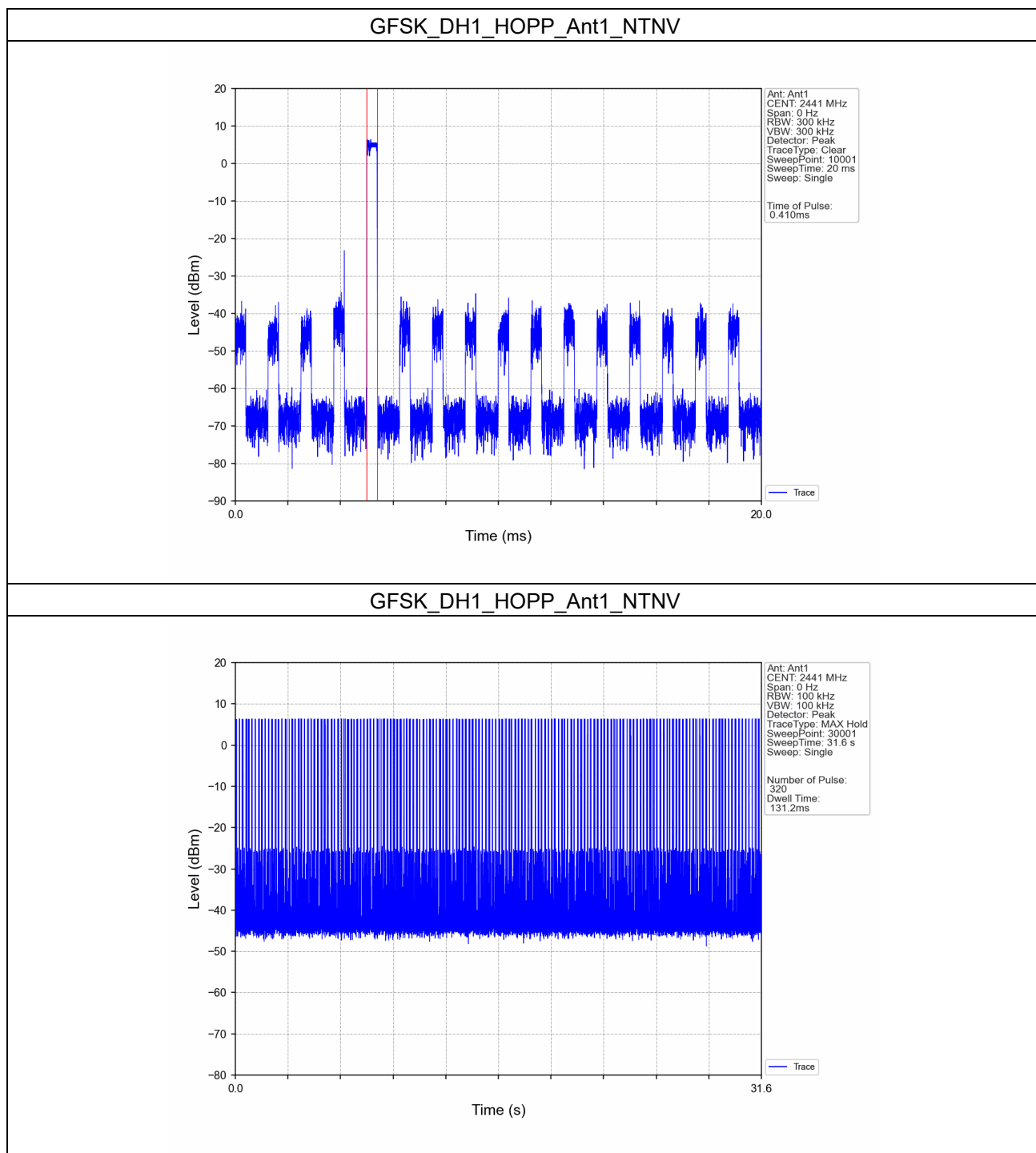


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6.2 Test Graph

6.2.1 Ant1



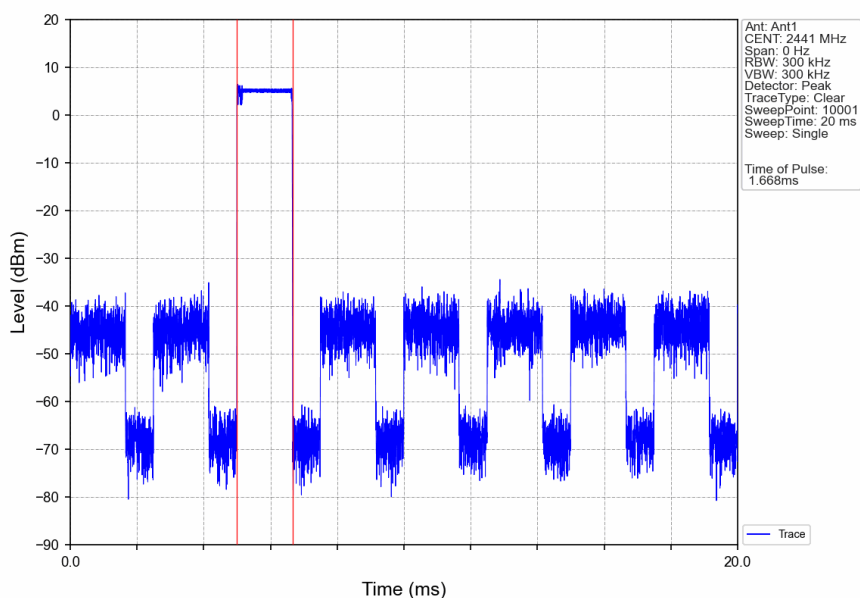
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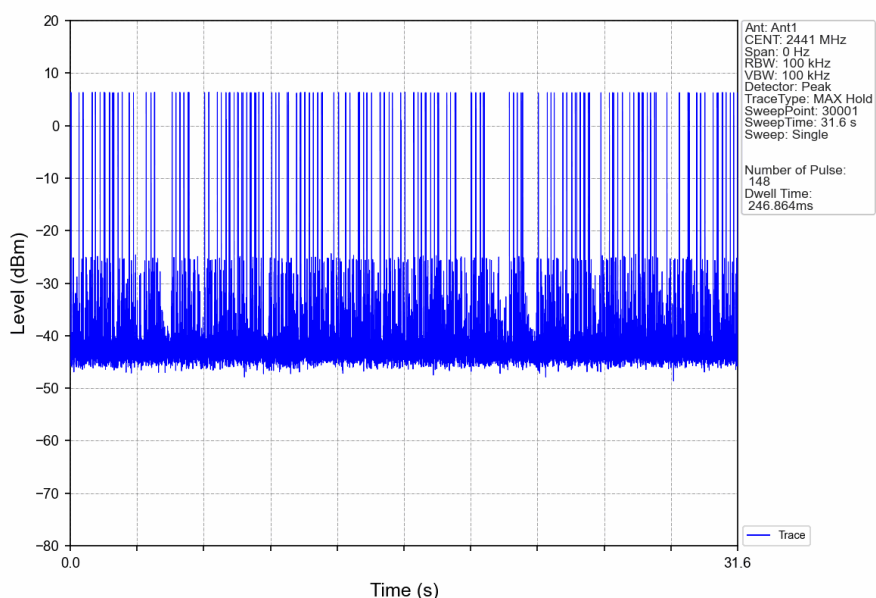
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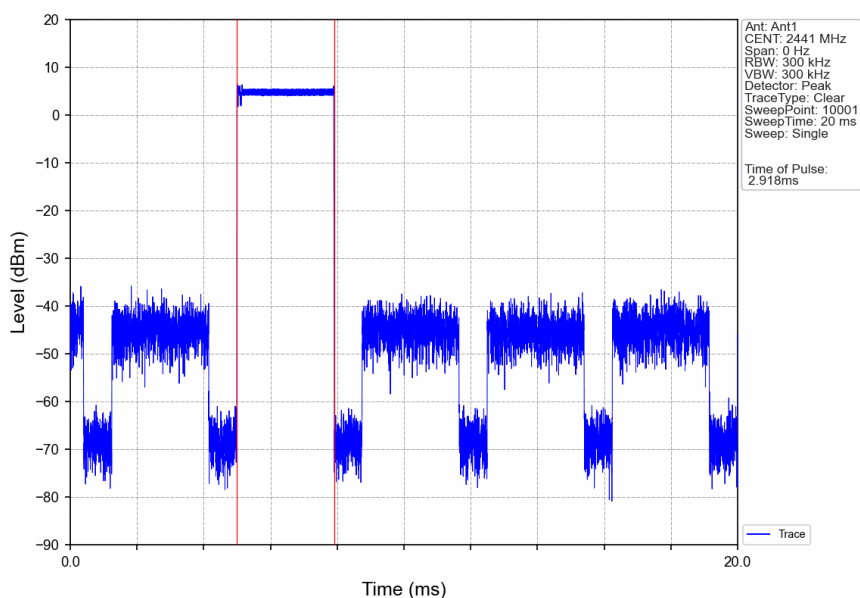
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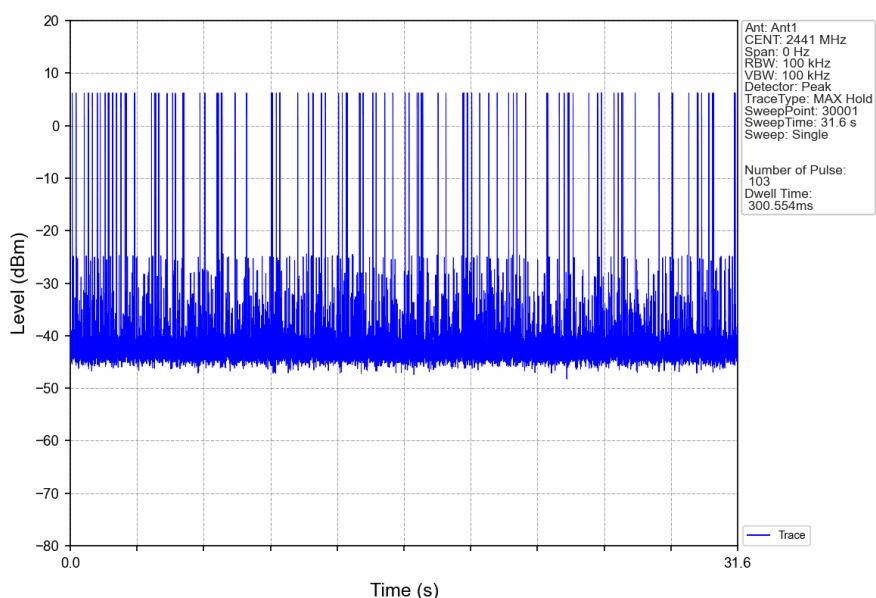
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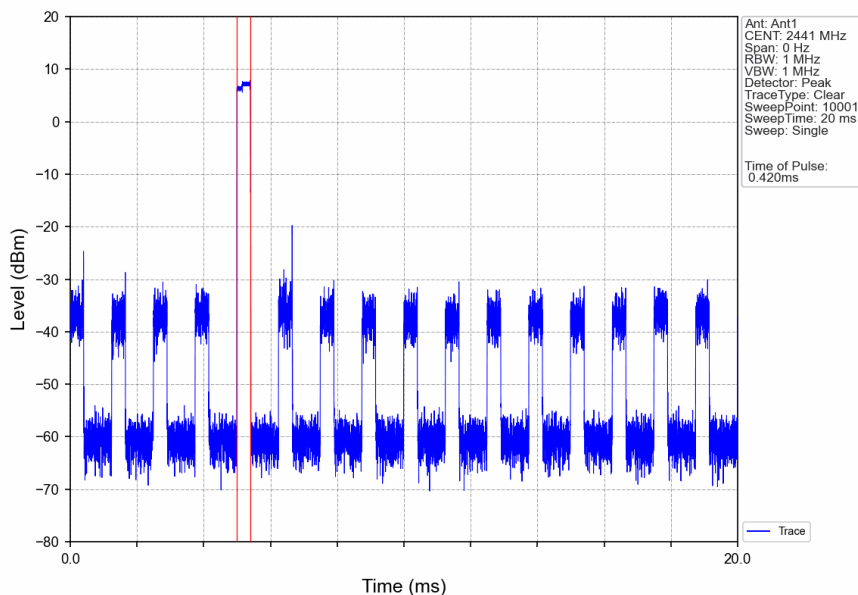
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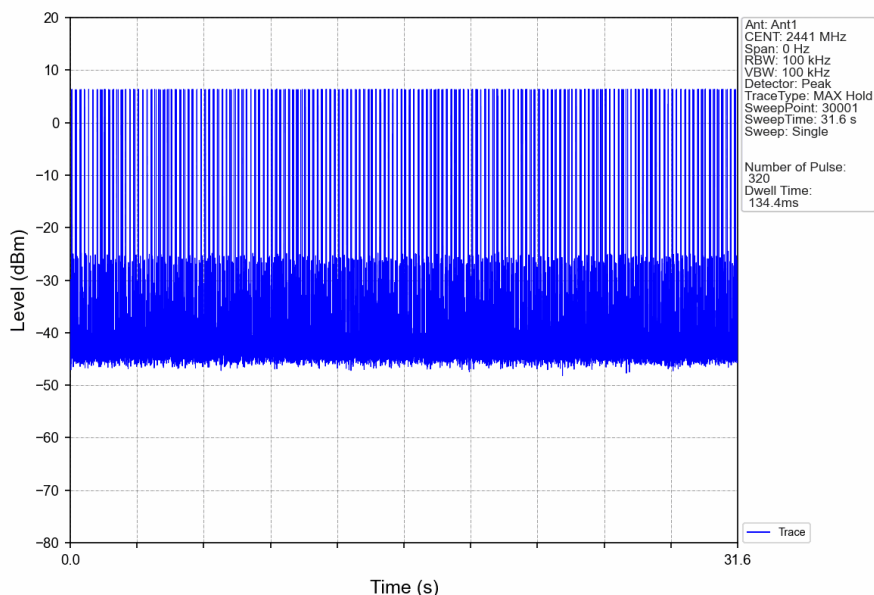
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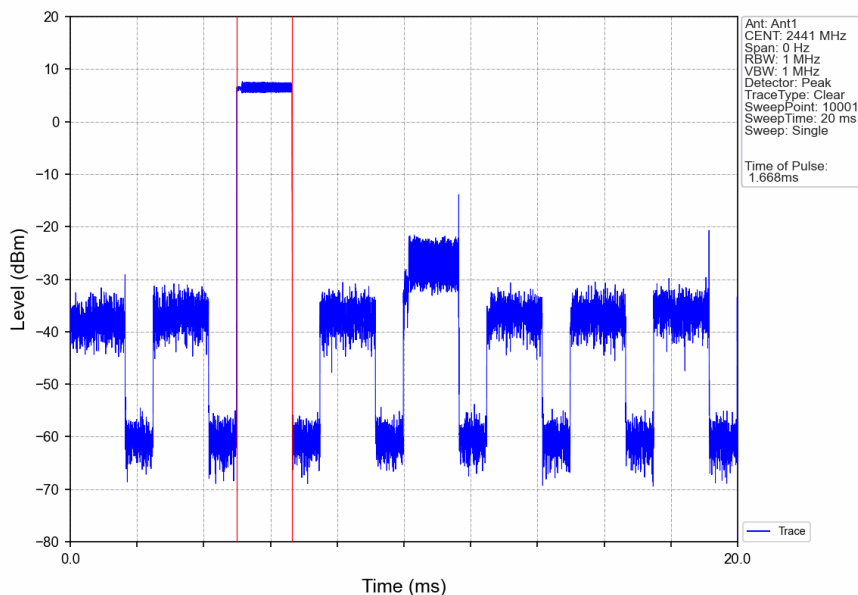
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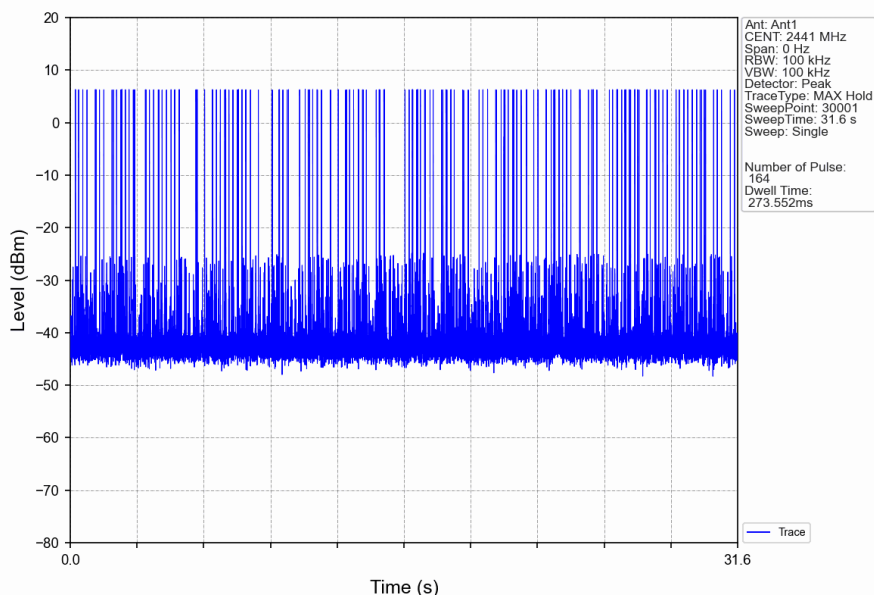
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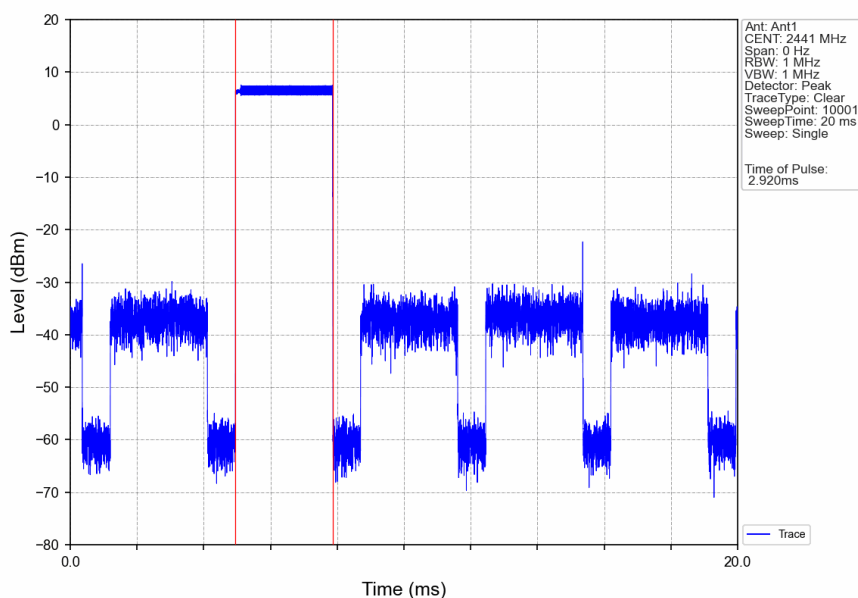
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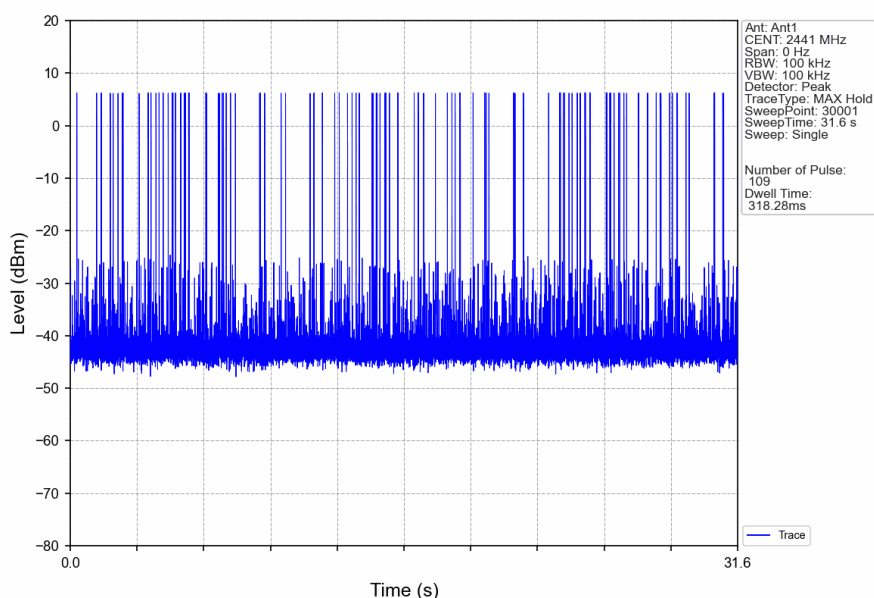
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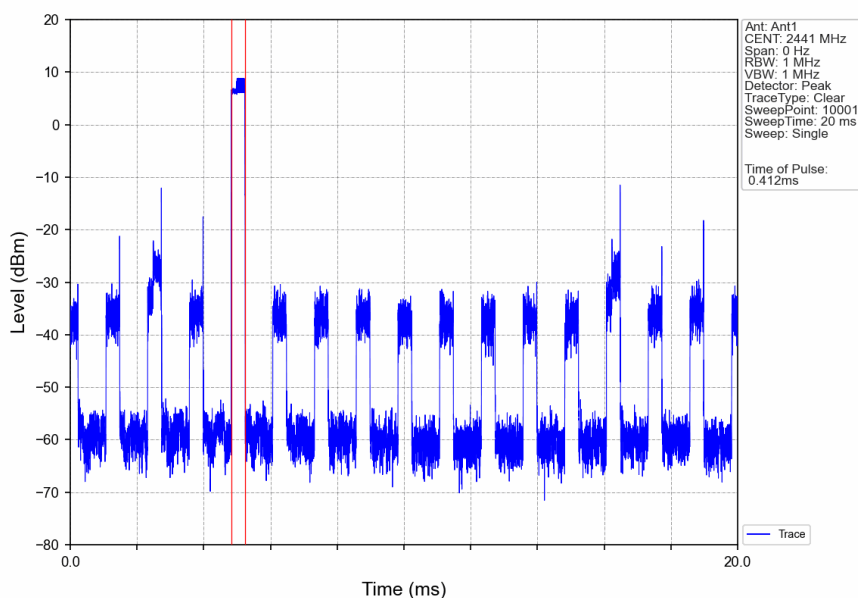
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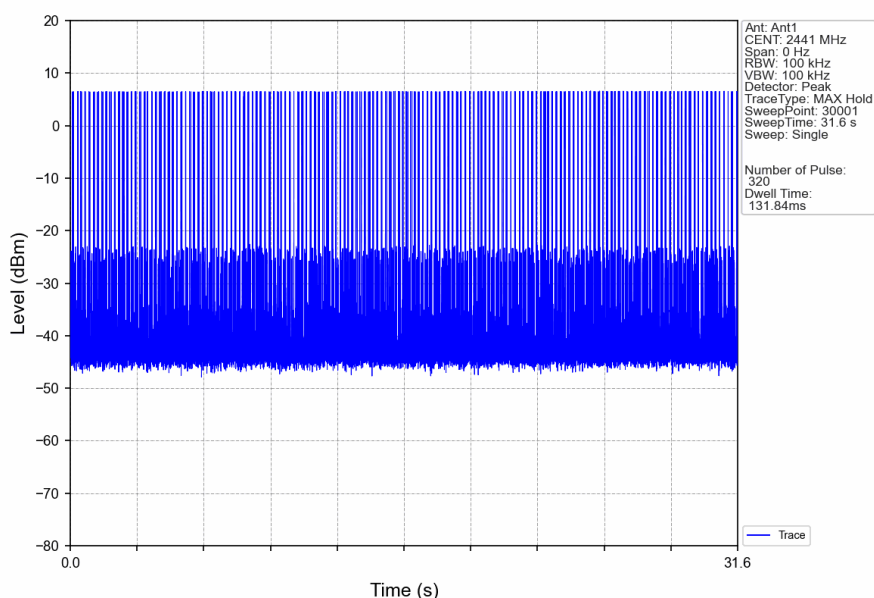
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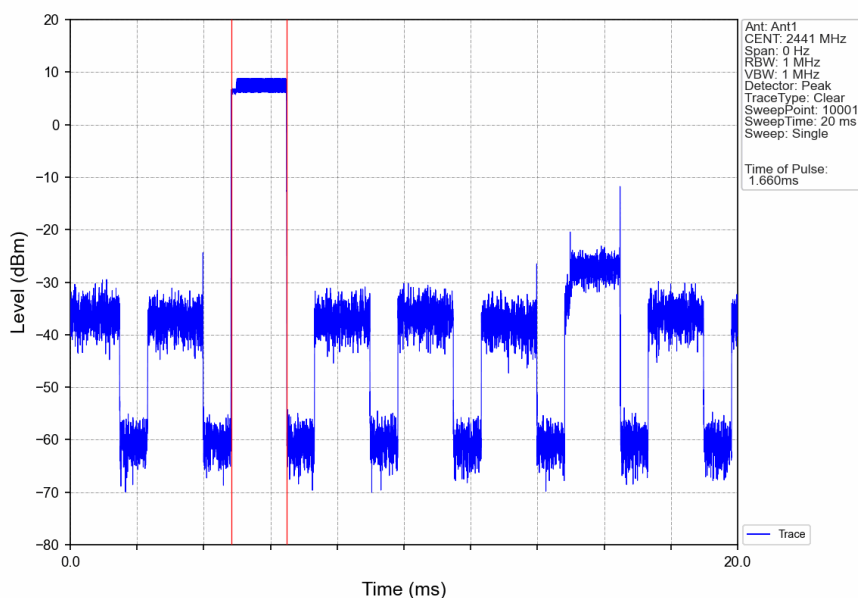
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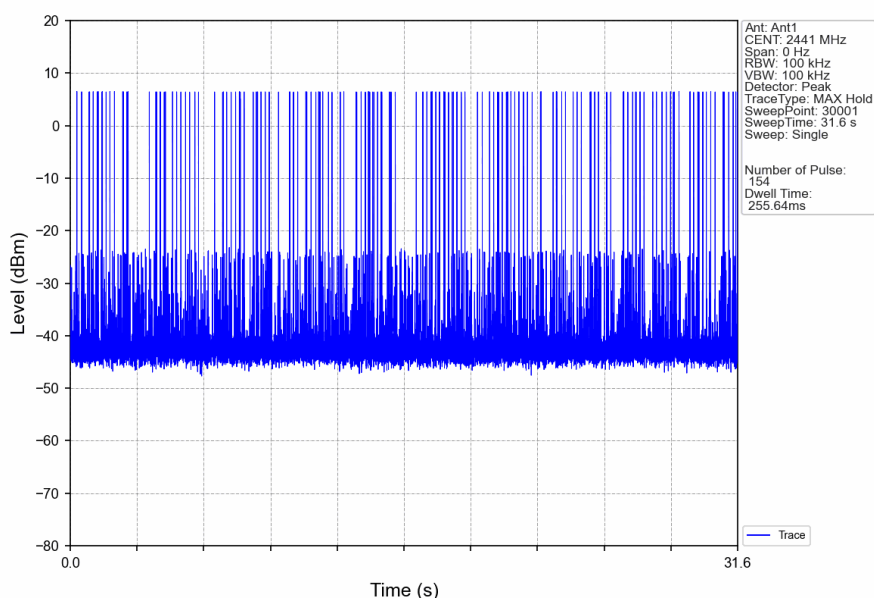
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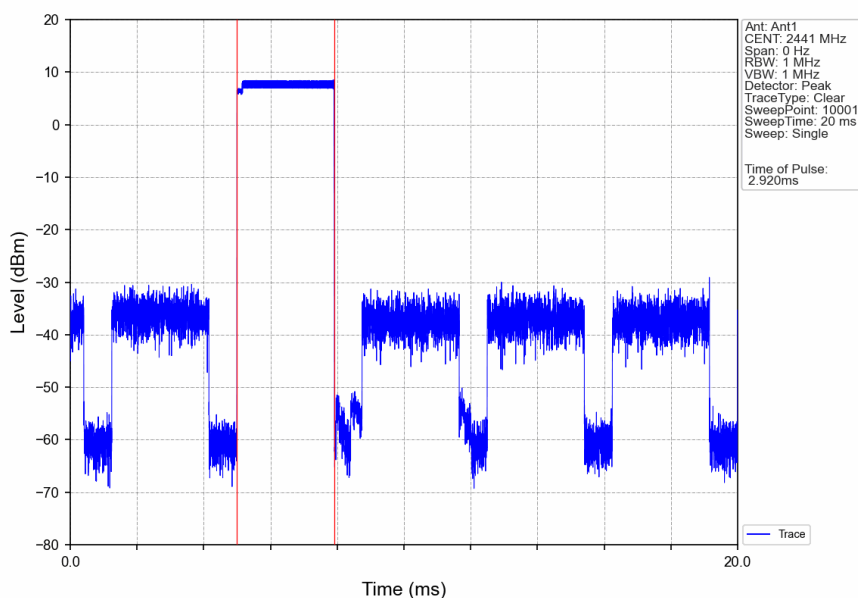
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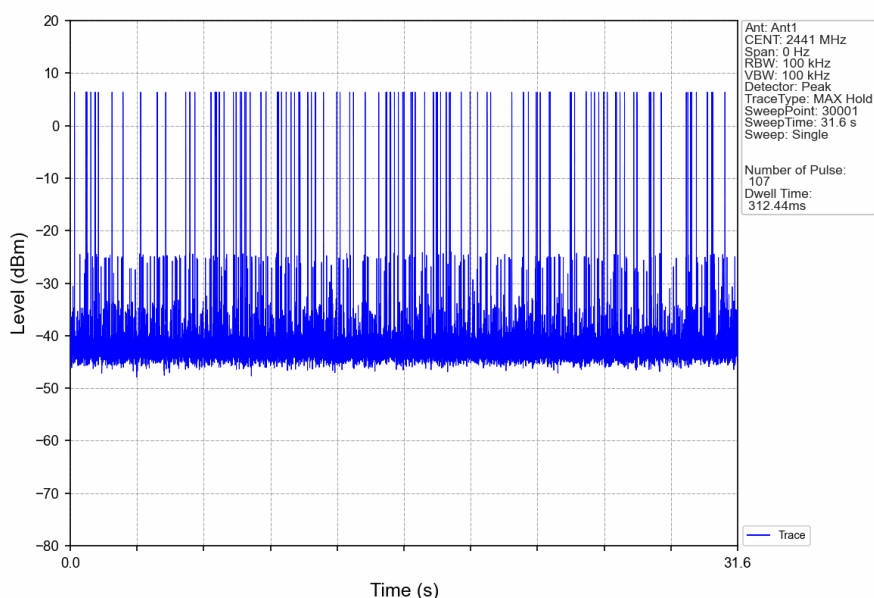
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8DPSK_3DH5_HOPP_Ant1_NTNV



8DPSK_3DH5_HOPP_Ant1_NTNV



7. Unwanted Emissions In Non-restricted Frequency Bands

7.1 Test Result

7.1.1 Ref

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	5.56
		2441	DH5	1	6.44
		2480	DH5	1	5.14
Pi/4DQPSK	SISO	2402	2DH5	1	5.55
		2441	2DH5	1	6.42
		2480	2DH5	1	5.14
8DPSK	SISO	2402	3DH5	1	6.02
		2441	3DH5	1	6.78
		2480	3DH5	1	5.41

7.1.2 CSE

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	6.44	-13.56	Pass
		2441	DH5	1	6.44	-13.56	Pass
		2480	DH5	1	6.44	-13.56	Pass
		HOPP	DH5	1	6.44	-13.56	Pass
					6.44	-13.56	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	6.42	-13.58	Pass
		2441	2DH5	1	6.42	-13.58	Pass
		2480	2DH5	1	6.42	-13.58	Pass
		HOPP	2DH5	1	6.42	-13.58	Pass
					6.42	-13.58	Pass
8DPSK	SISO	2402	3DH5	1	6.78	-13.22	Pass
		2441	3DH5	1	6.78	-13.22	Pass
		2480	3DH5	1	6.78	-13.22	Pass
		HOPP	3DH5	1	6.78	-13.22	Pass
					6.78	-13.22	Pass



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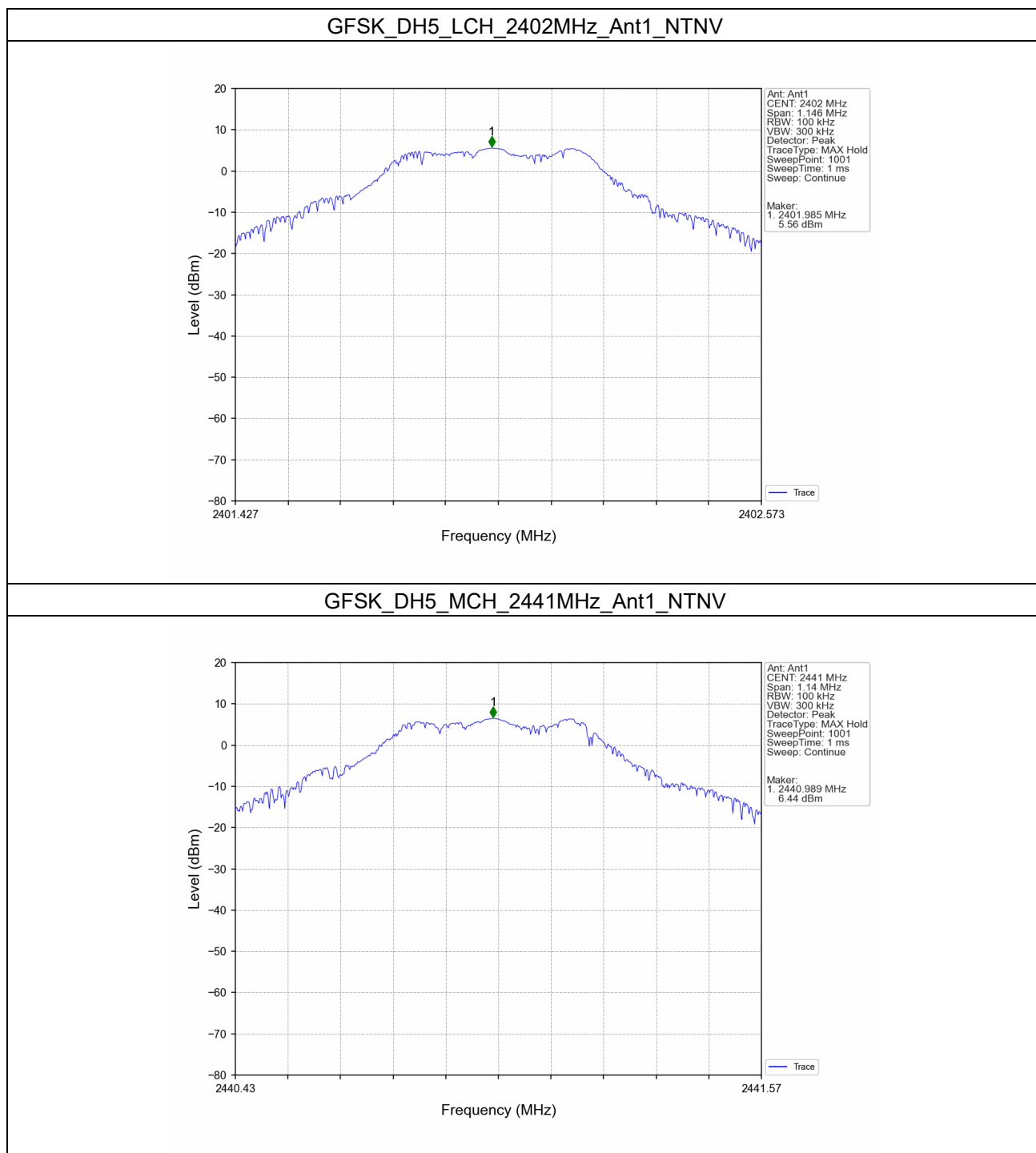
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7.2 Test Graph

7.2.1 Ref



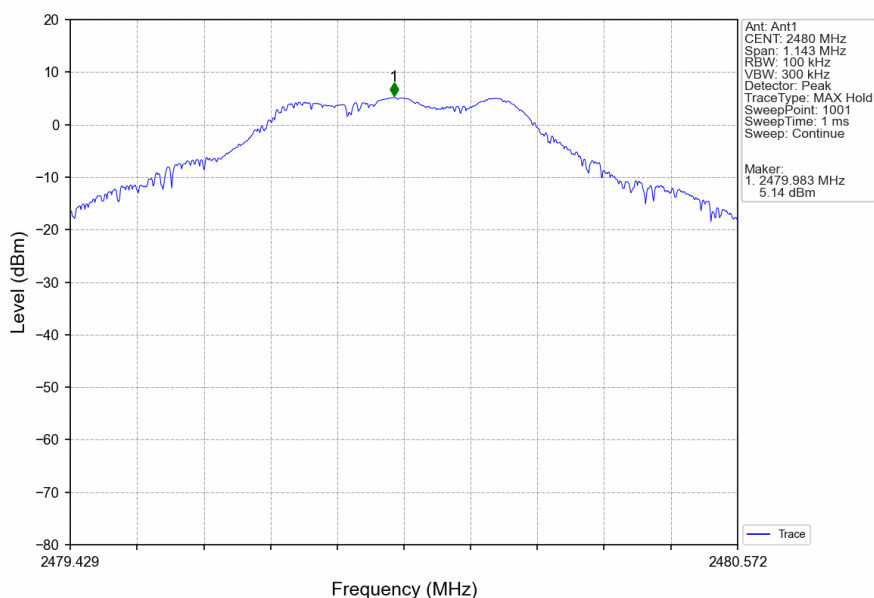
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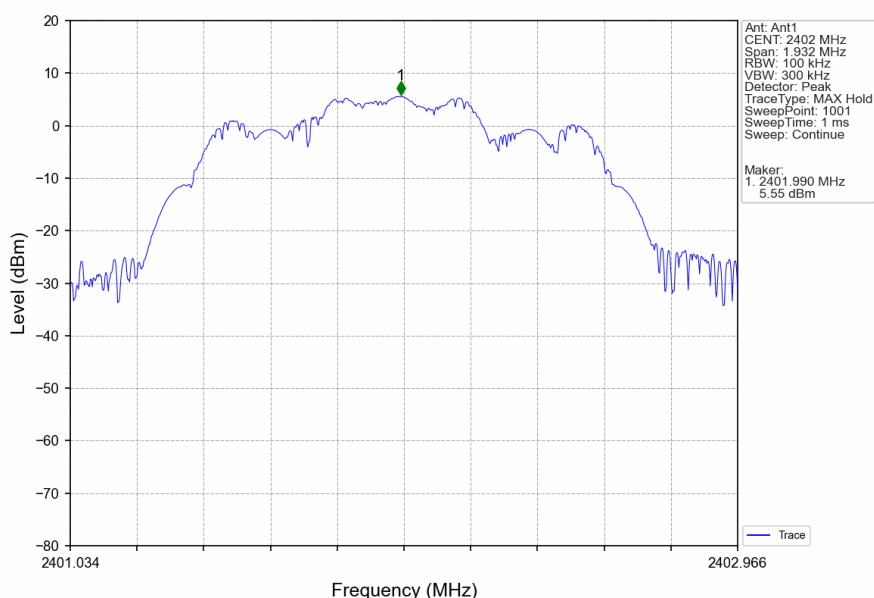
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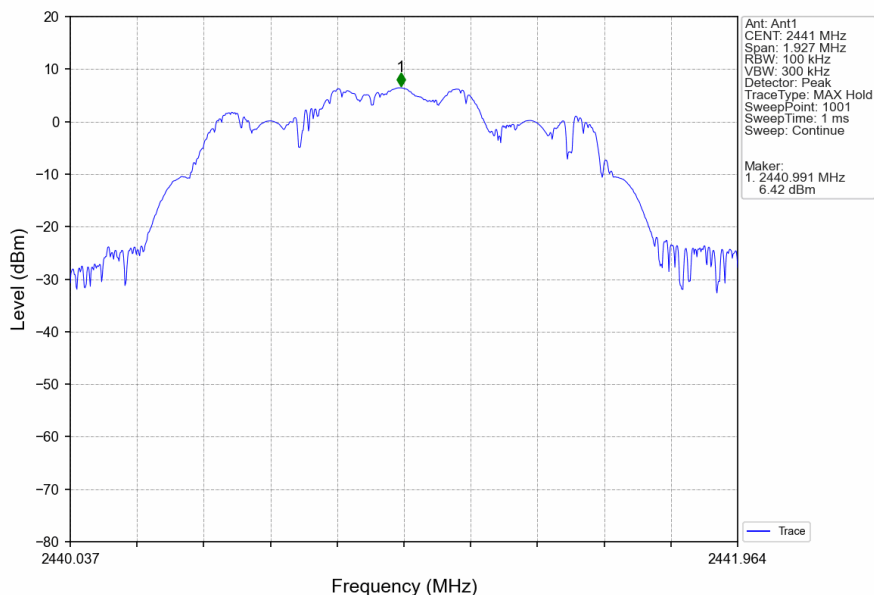
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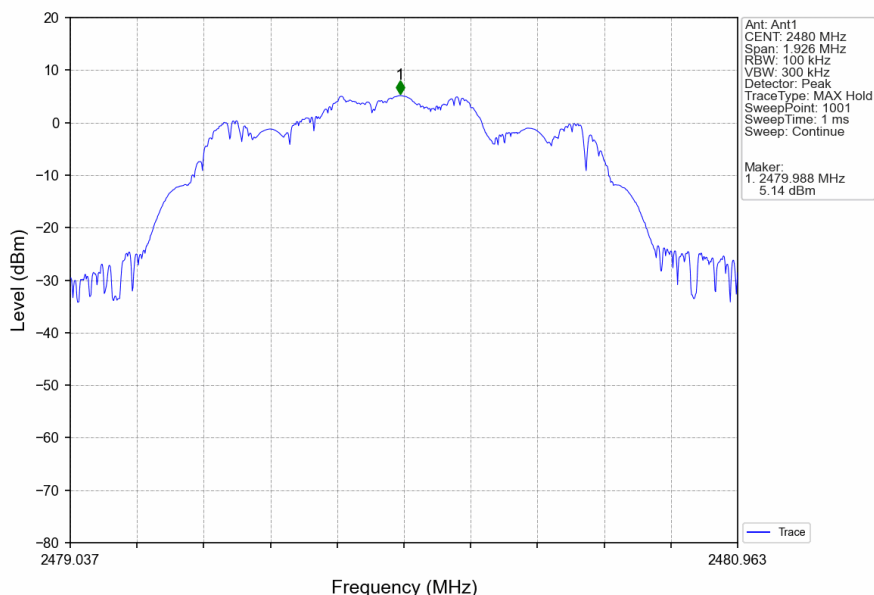
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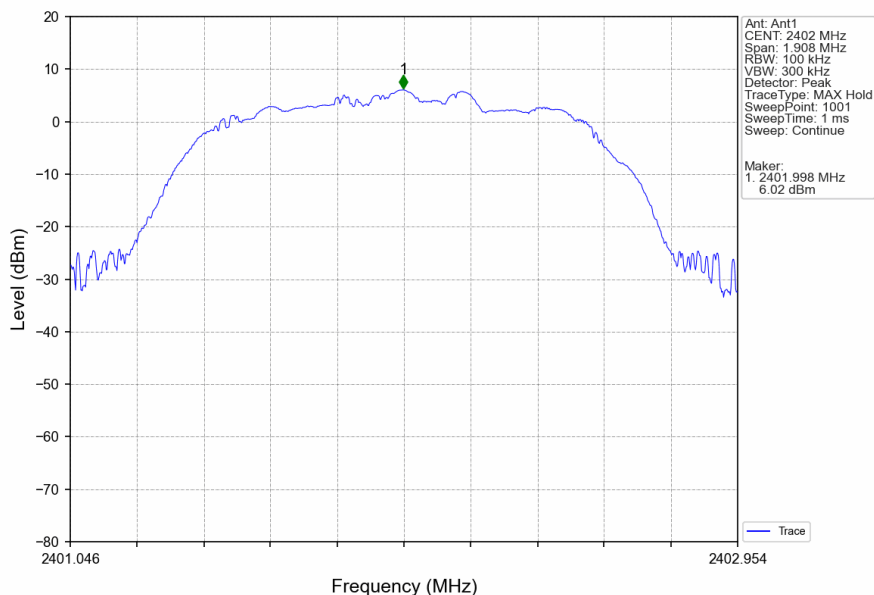
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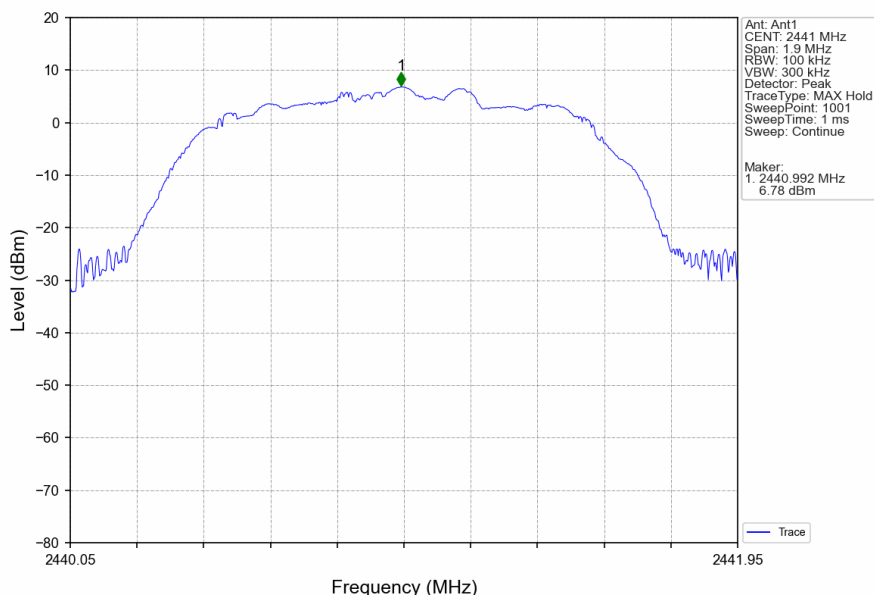
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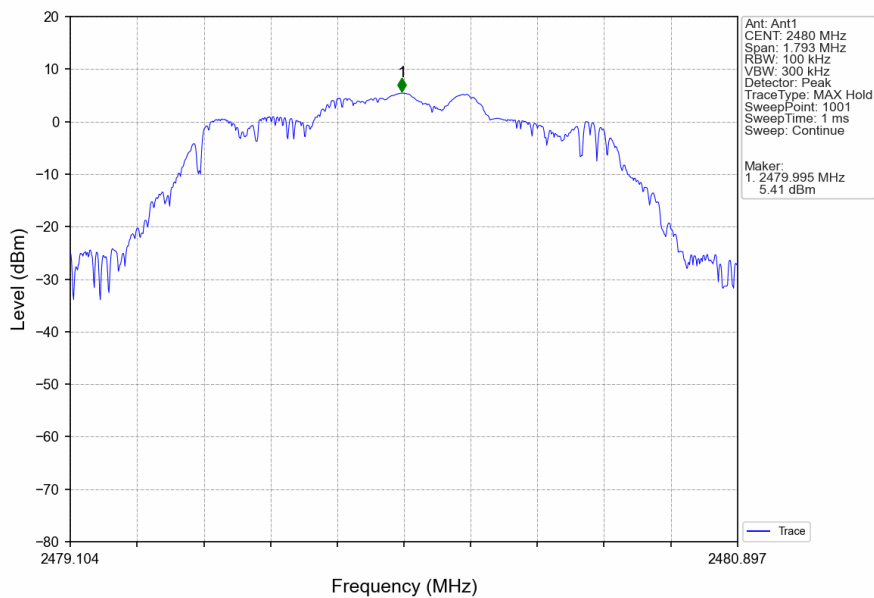
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8DPSK_3DH5_MCH_2441MHz_Ant1_NTNV



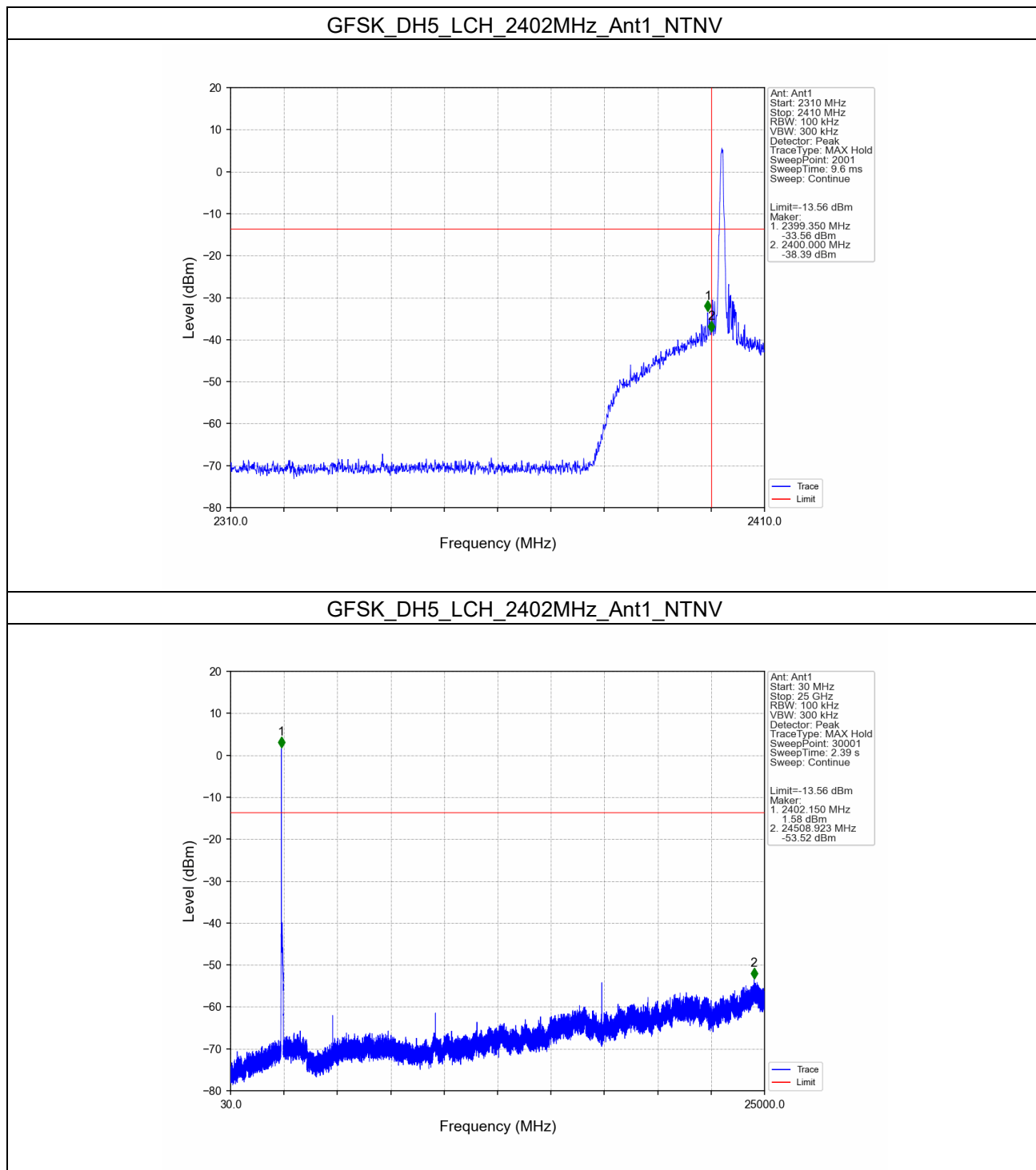
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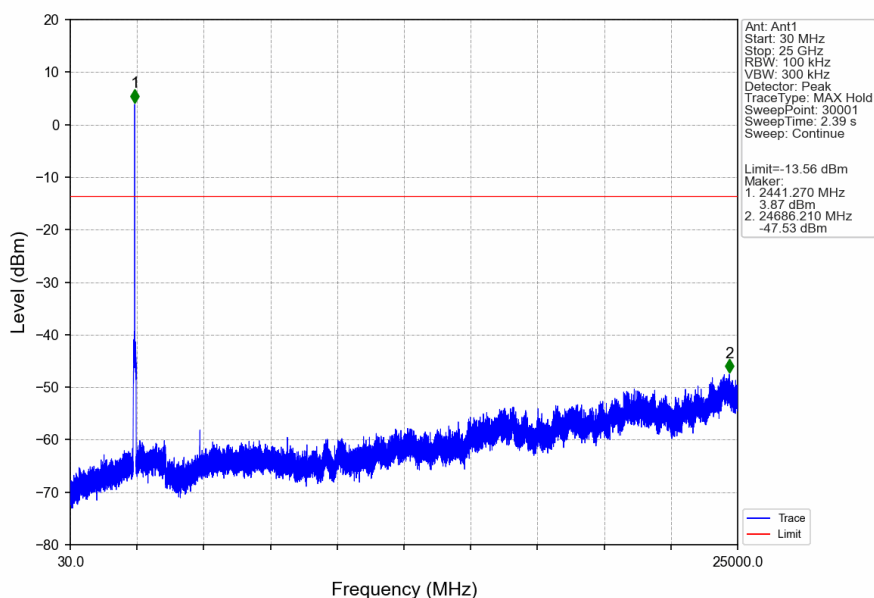
7.2.2 CSE



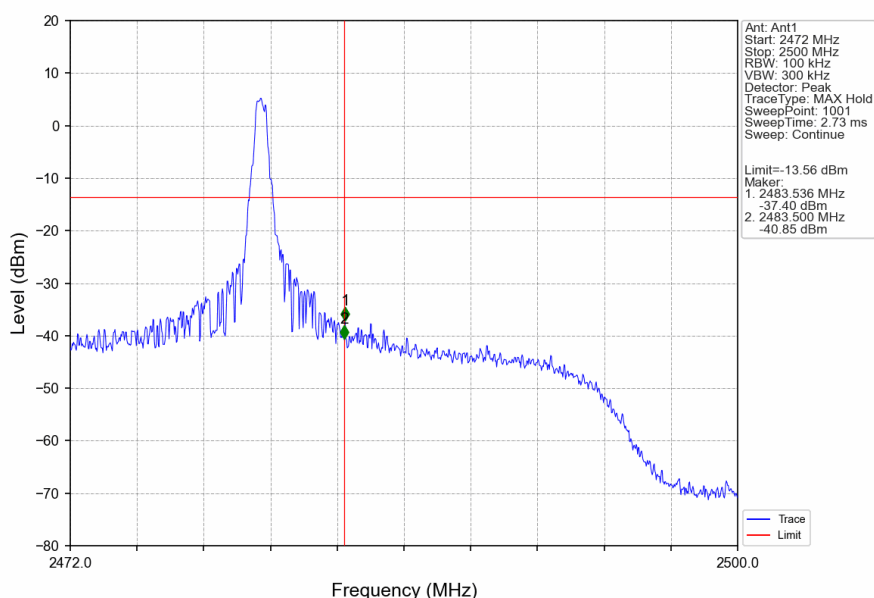
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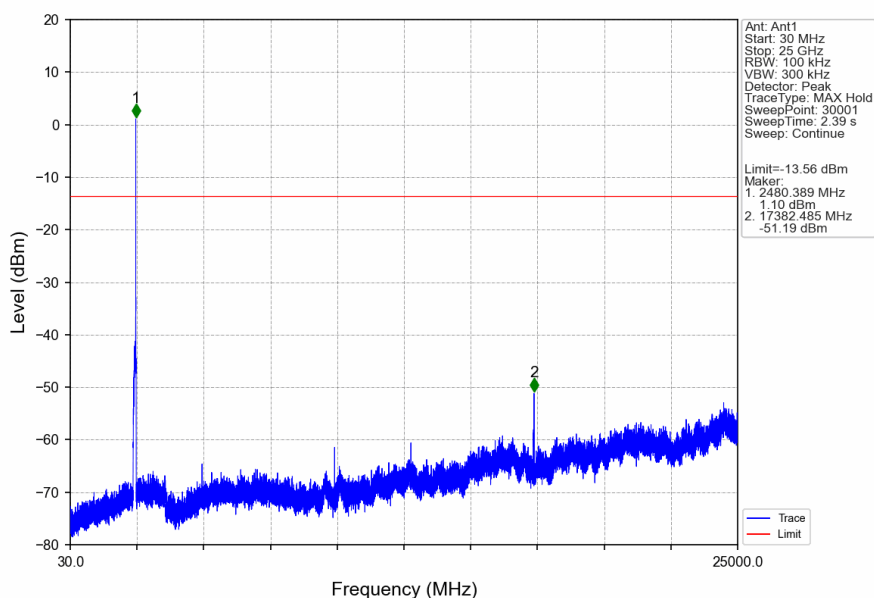
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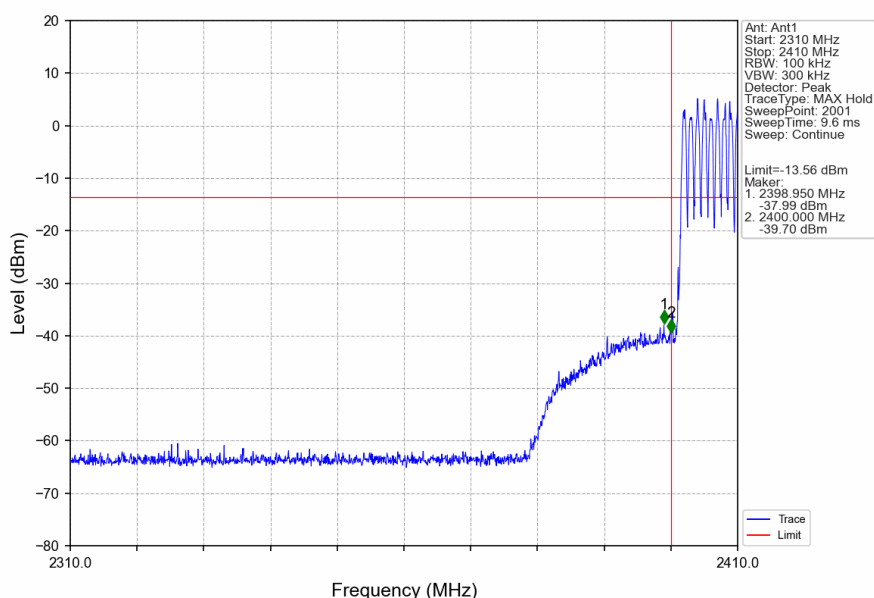
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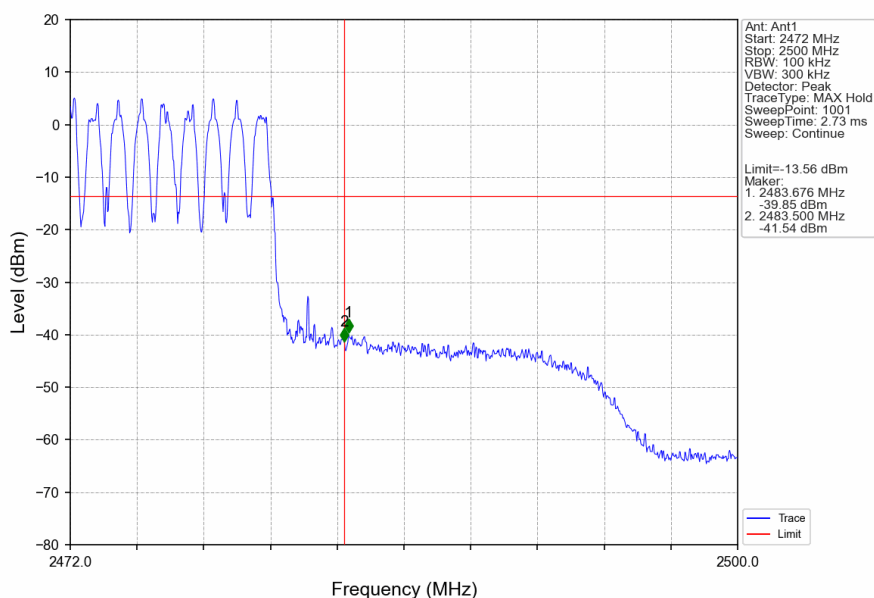
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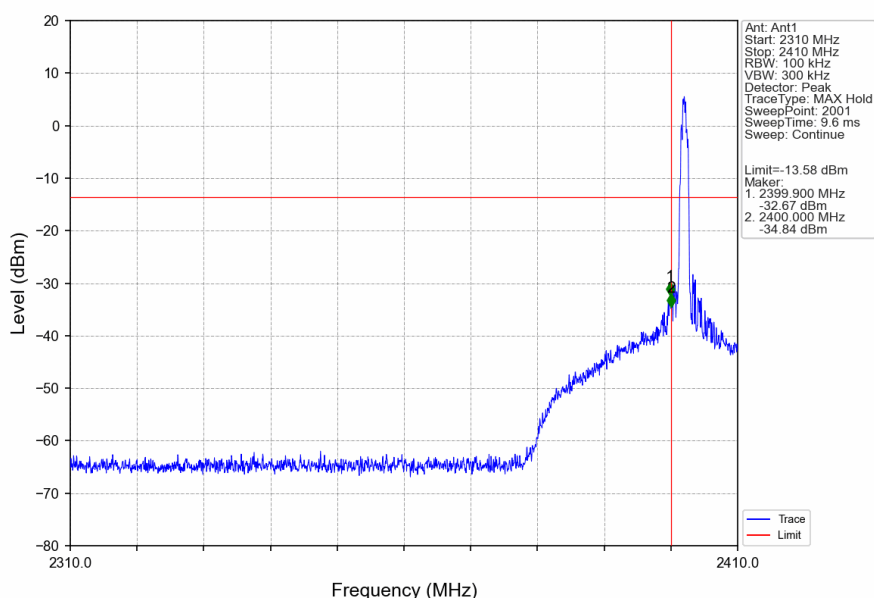
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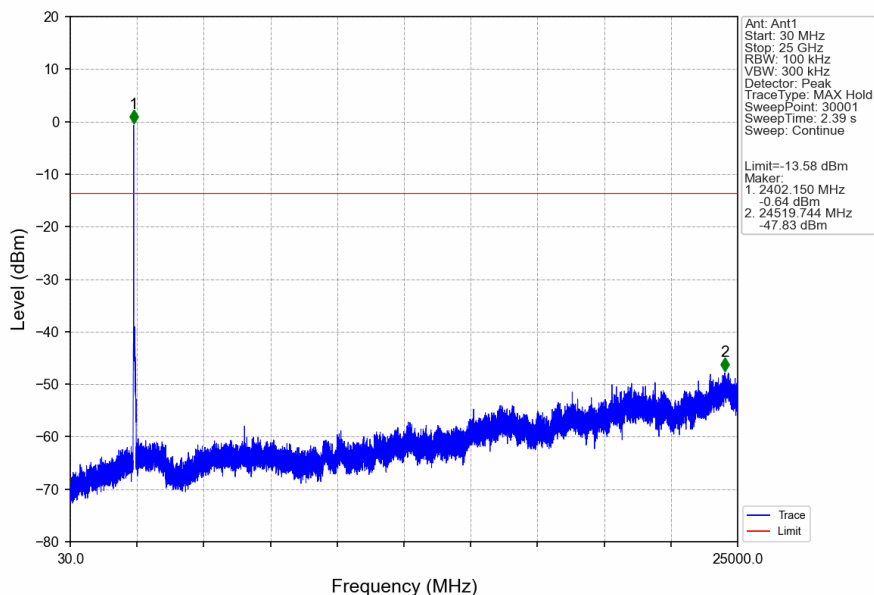
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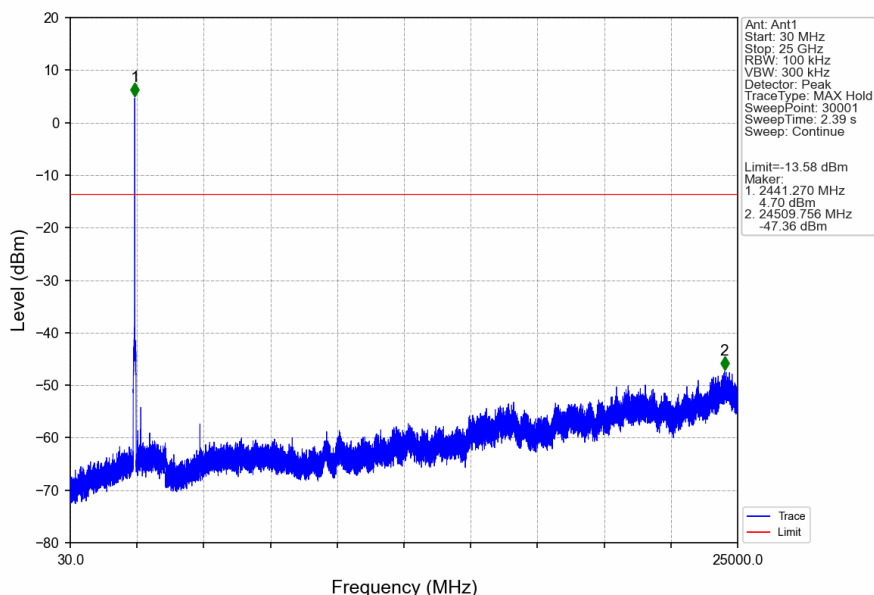
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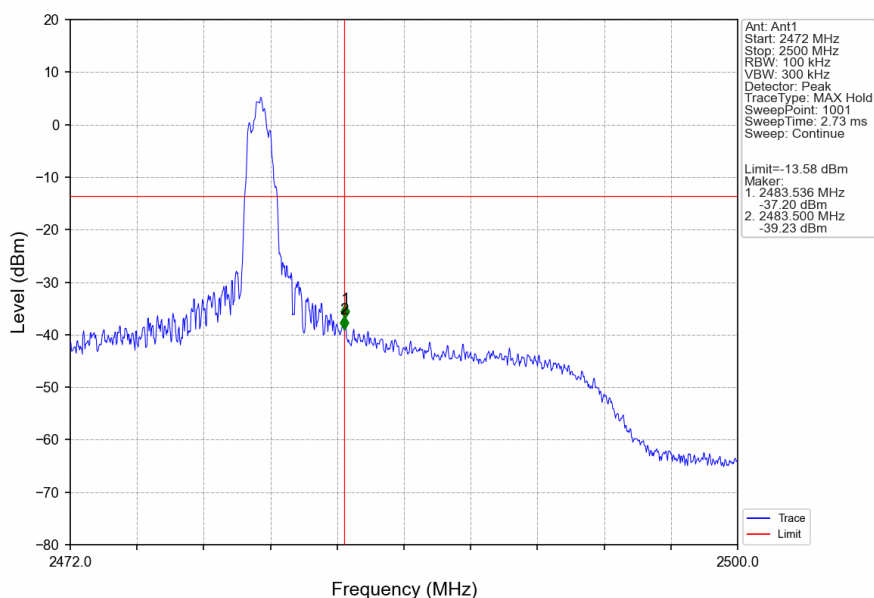
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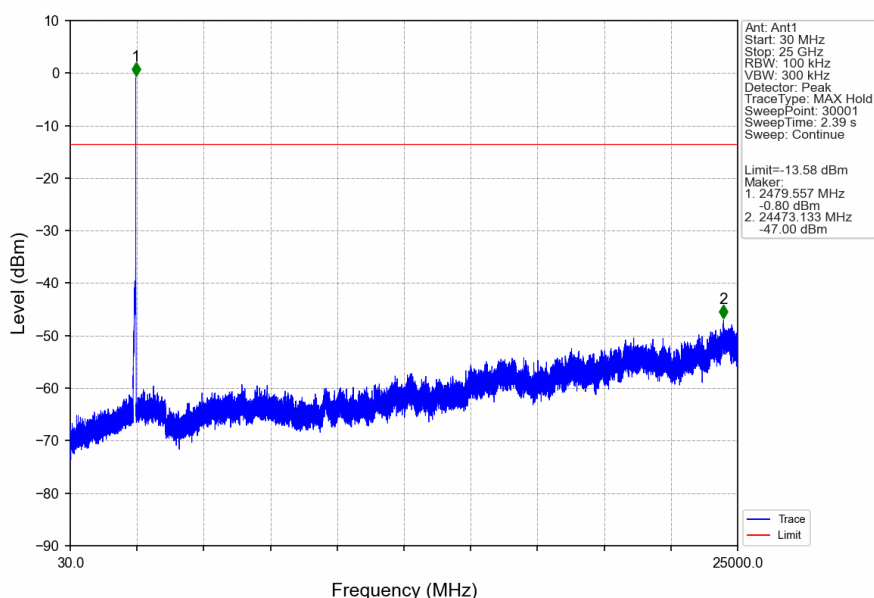
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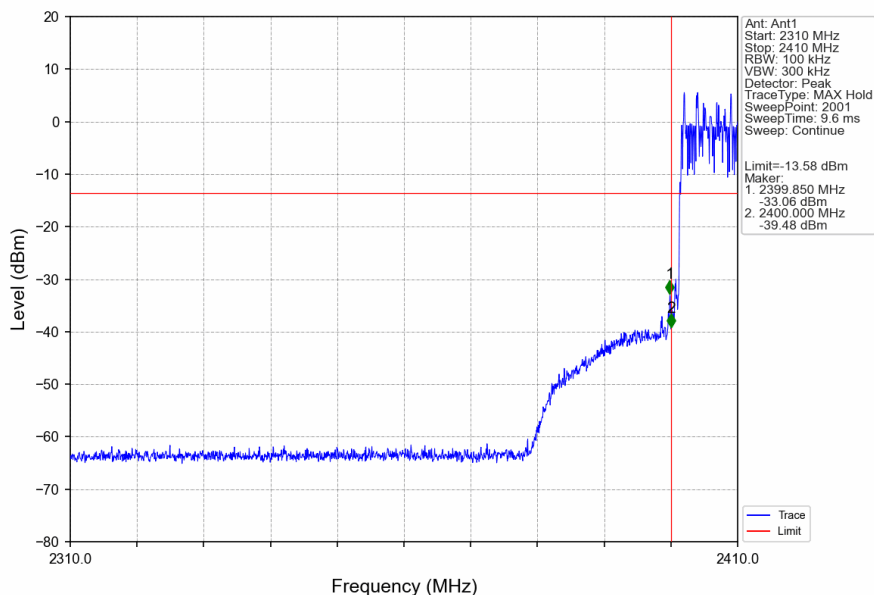
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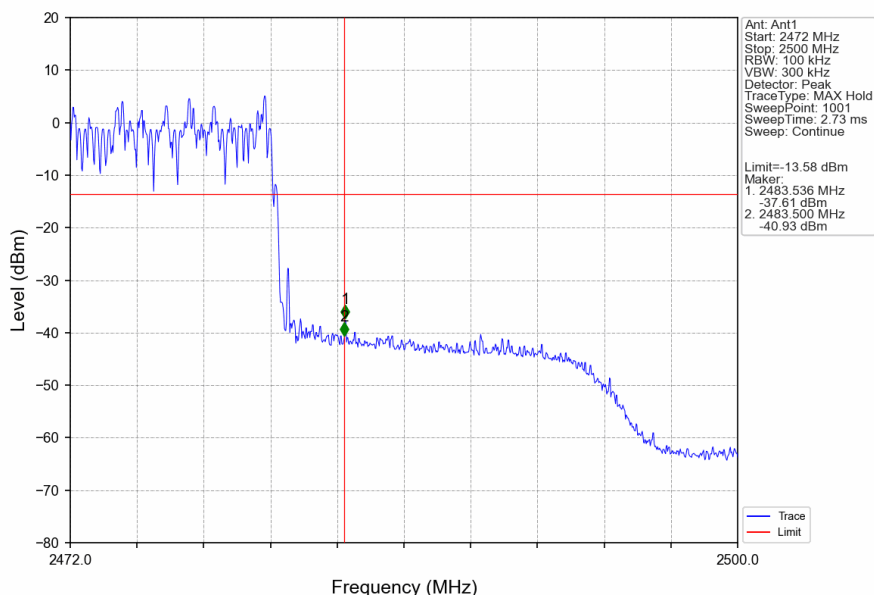
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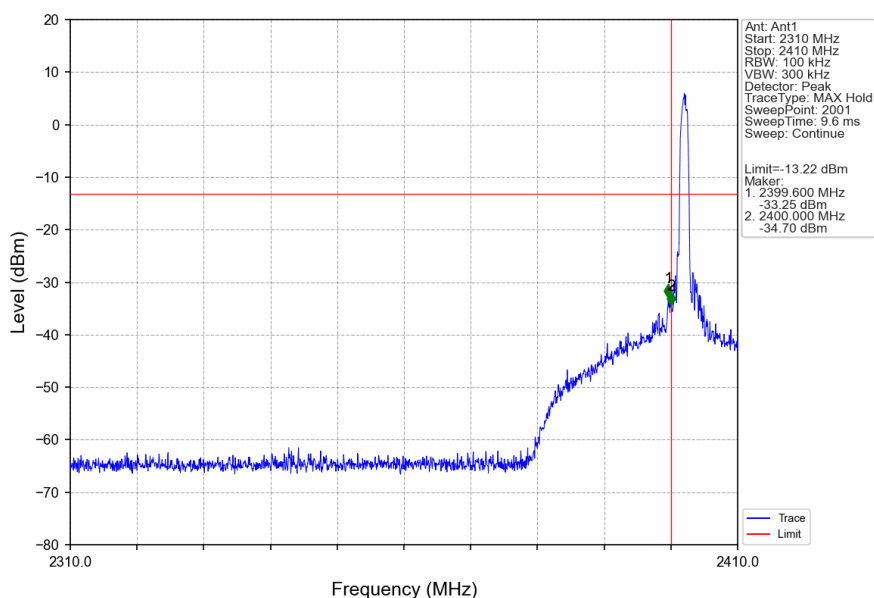
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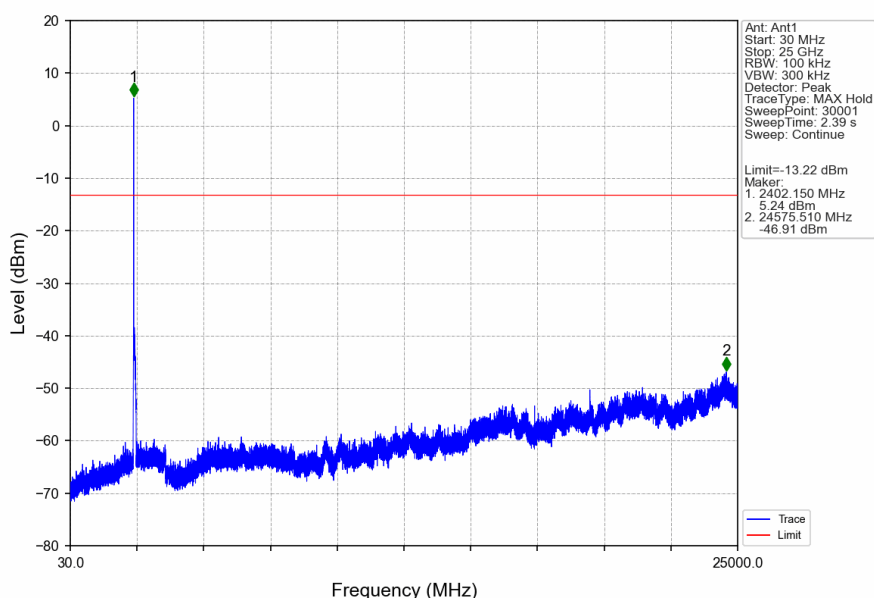
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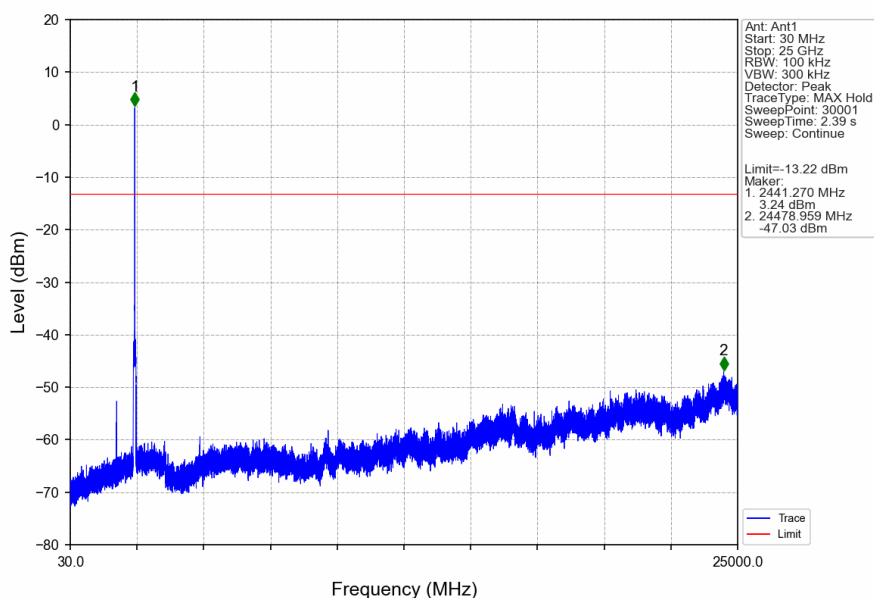
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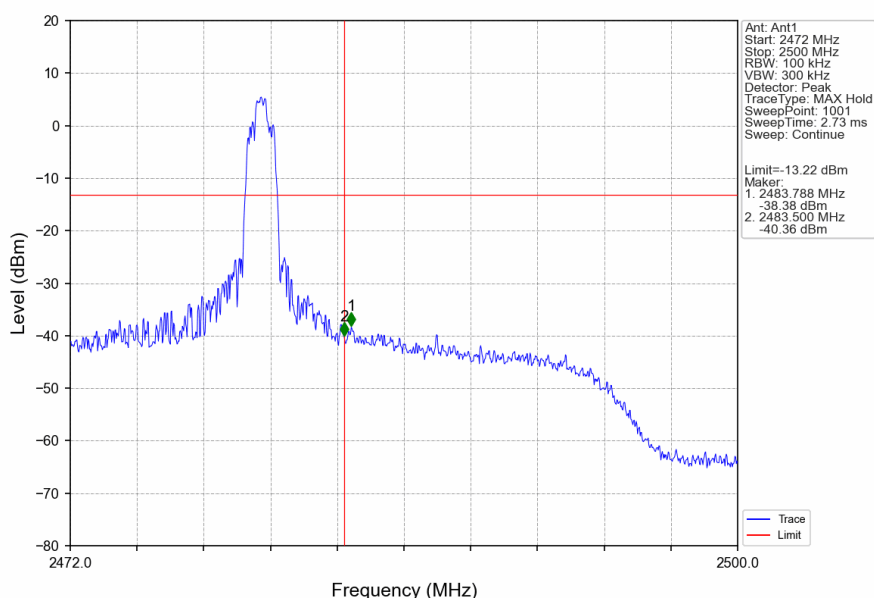
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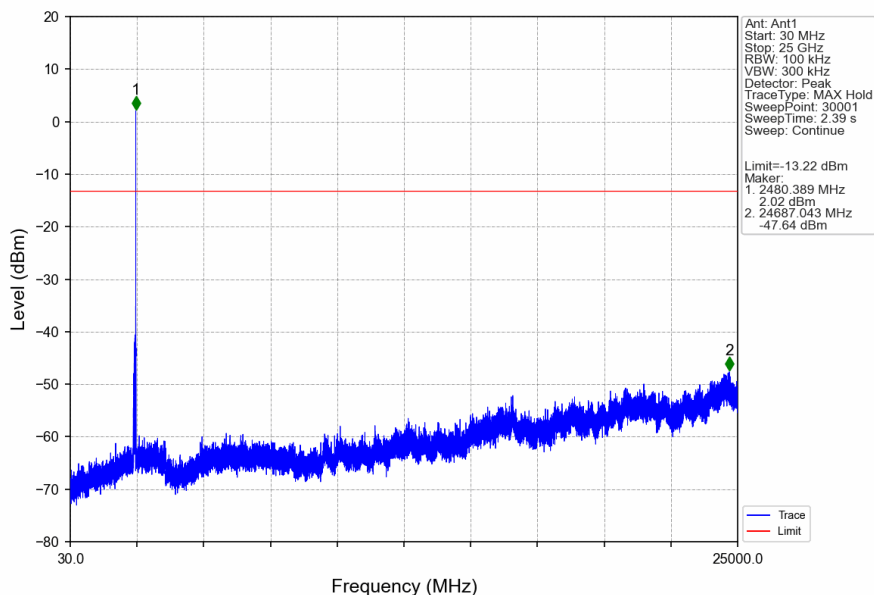
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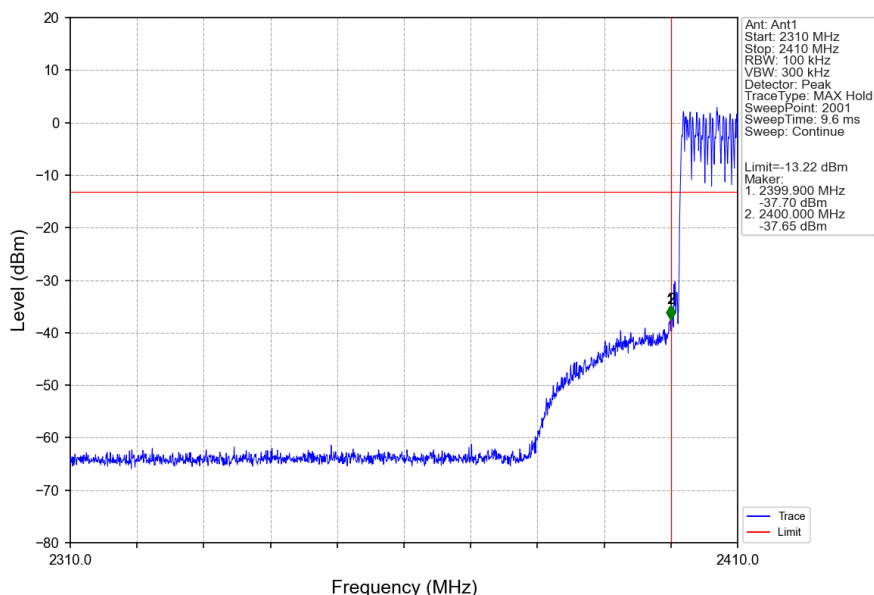
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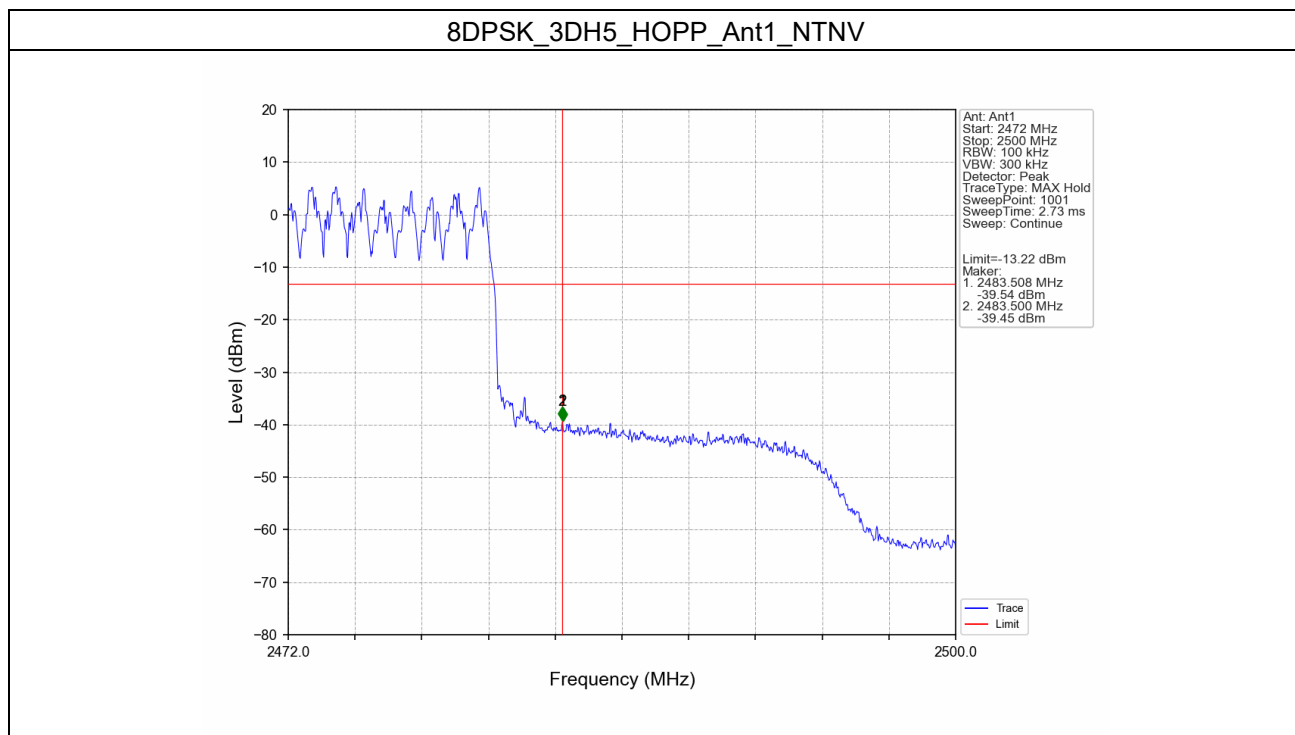


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8DPSK_3DH5_HOPP_Ant1_NTNV





- End of the Report -