



TEST REPORT

Application No.: GZCR2108020932AT
Applicant: Huawei Device Co., Ltd
Address of Applicant: No.2 of Xincheng Road, Songshan Lake Zone, Dongguan, Guangdong, 523808, P.R CHINA.
Manufacturer: Huawei Device Co., Ltd
Address of Manufacturer: No.2 of Xincheng Road, Songshan Lake Zone, Dongguan, Guangdong 523808, People's Republic of China

Equipment Under Test (EUT):

EUT Name: Wireless Earphone
Model No.: Wireless Earphone: T0010; Charging Case: T0010C
Trade Mark: HUAWEI
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2021-08-23
Date of Test: 2021-08-23 to 2021-11-01
Date of Issue: 2021-11-04

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

Kobe Jian
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-11-04		Original

Authorized for issue by			
		Curry Wu/Project Engineer	
		Ricky Liu/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 Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number		ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time		ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Below 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

Remark:

The difference between Second supply prototypes is only that some electronic components are supplied by different manufacturers, the technical specifications and parameters are the same and has no effect on the RF circuitry.

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3 Contents

	Page
1 Cover Page	1
2 Test Summary.....	3
3 Contents	4
4 General Information.....	6
4.1 Details of E.U.T.....	6
4.2 Description of Support Units.....	7
4.3 Measurement Uncertainty	8
4.4 Test Location	9
4.5 Test Facility.....	9
4.6 Deviation from Standards	10
4.7 Abnormalities from Standard Conditions.....	10
5 Equipment List	11
6 Radio Spectrum Technical Requirement.....	14
6.1 Antenna Requirement	14
6.1.1 Test Requirement:	14
6.1.2 Conclusion	14
6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	15
6.2.1 Test Requirement:	15
7 Radio Spectrum Matter Test Results.....	17
7.1 Conducted Peak Output Power	17
7.1.1 E.U.T. Operation	17
7.1.2 Test Mode Description	17
7.1.3 Test Setup Diagram	17
7.1.4 Measurement Procedure and Data.....	17
7.2 20dB Bandwidth	18
7.2.1 E.U.T. Operation	18
7.2.2 Test Mode Description	18
7.2.3 Test Setup Diagram	18
7.2.4 Measurement Procedure and Data.....	18
7.3 Carrier Frequencies Separation.....	19
7.3.1 E.U.T. Operation	19
7.3.2 Test Mode Description	19
7.3.3 Test Setup Diagram	19
7.3.4 Measurement Procedure and Data.....	19
7.4 Hopping Channel Number	20
7.4.1 E.U.T. Operation	20
7.4.2 Test Mode Description	20
7.4.3 Test Setup Diagram	20
7.4.4 Measurement Procedure and Data.....	21
7.5 Dwell Time	22
7.5.1 E.U.T. Operation	22
7.5.2 Test Mode Description	22



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7.5.3	Test Setup Diagram	22
7.5.4	Measurement Procedure and Data.....	23
7.6	Conducted Band Edges Measurement	24
7.6.1	E.U.T. Operation.....	24
7.6.2	Test Mode Description	24
7.6.3	Test Setup Diagram	25
7.6.4	Measurement Procedure and Data.....	25
7.7	Conducted Spurious Emissions	26
7.7.1	E.U.T. Operation.....	26
7.7.2	Test Mode Description	26
7.7.3	Test Setup Diagram	26
7.7.4	Measurement Procedure and Data.....	27
7.8	Radiated Emissions which fall in the restricted bands	28
7.8.1	E.U.T. Operation.....	28
7.8.2	Test Mode Description	28
7.8.3	Test Setup Diagram	29
7.8.4	Measurement Procedure and Data.....	29
7.9	Radiated Spurious Emissions (Below 1GHz)	38
7.9.1	E.U.T. Operation.....	38
7.9.2	Test Mode Description	38
7.9.3	Test Setup Diagram	39
7.9.4	Measurement Procedure and Data.....	39
7.10	Radiated Spurious Emissions (Above 1GHz).....	44
7.10.1	E.U.T. Operation.....	44
7.10.2	Test Mode Description	44
7.10.3	Test Setup Diagram	45
7.10.4	Measurement Procedure and Data.....	46
8	Test Setup Photo	59
9	EUT Constructional Details (EUT Photos).....	59
10	Appendix.....	60

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4 General Information

4.1 Details of E.U.T.

Power supply:	Left earbud:Rechargeable battery DC 3.7V 37mAh 0.137Wh(Charge by charging box)
	Right earbud:Rechargeable battery DC 3.7V 37mAh 0.137Wh (Charge by charging box)
	Charging box:Rechargeable battery DC 3.8V 410mAh 1.558Wh(Charge by Type C)
Cable(s):	17cm unshielded
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.2 Dual mode
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Antenna Type:	FPC Antenna
Antenna Gain:	-2.3dBi

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
2	2404MHz	22	2424MHz	42	2444MHz	62	2464MHz
3	2405MHz	23	2425MHz	43	2445MHz	63	2465MHz
4	2406MHz	24	2426MHz	44	2446MHz	64	2466MHz
5	2407MHz	25	2427MHz	45	2447MHz	65	2467MHz
6	2408MHz	26	2428MHz	46	2448MHz	66	2468MHz
7	2409MHz	27	2429MHz	47	2449MHz	67	2469MHz
8	2410MHz	28	2430MHz	48	2450MHz	68	2470MHz
9	2411MHz	29	2431MHz	49	2451MHz	69	2471MHz
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
12	2414MHz	32	2434MHz	52	2454MHz	72	2474MHz
13	2415MHz	33	2435MHz	53	2455MHz	73	2475MHz
14	2416MHz	34	2436MHz	54	2456MHz	74	2476MHz
15	2417MHz	35	2437MHz	55	2457MHz	75	2477MHz
16	2418MHz	36	2438MHz	56	2458MHz	76	2478MHz
17	2419MHz	37	2439MHz	57	2459MHz	77	2479MHz
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		

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Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Selected Test Channel	
Channel	Frequency
The lowest channel (CH0)	2402MHz
The middle channel (C39)	2441MHz
The highest channel (CH78)	2480MHz

4.2 Description of Support Units

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

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4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	± 0.75dB
20dB Bandwidth	± 3%
Carrier Frequencies Separation	± 7.25 x 10-8
Hopping Channel Number	± 7.25 x 10-8
Dwell Time	± 0.37%
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Radiated Emissions which fall in the restricted bands	±5.08dB (1GHz-6GHz);±5.14dB(above 6GHz)
Radiated Spurious Emissions (Below 1GHz)	±5.06dB (3m); ±4.46dB (10m)
Radiated Spurious Emissions (Above 1GHz)	±5.08dB (1GHz-6GHz);±5.14dB(above 6GHz)

Remark:
The U_{lab} (lab Uncertainty) is less than U_{cispr} (CISPR Uncertainty), so the test results
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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4.4 Test Location

All tests were performed at:

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198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

4.5 Test Facility

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

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

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

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

- **ACMA**

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

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

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

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

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

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

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

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

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

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

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

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IEC60068-2-27 and Rules of procedure IEC60068-2-27, and the relevant IEC60068-2-27 Operational documents.

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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
				2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Carrier Frequencies Separation					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
				2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Hopping Channel Number					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
				2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

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Dwell Time					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
				2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
				2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
				2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
Chamber cable(Above 1GHz)	Scoflex	KMKG-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
				2021-09-16	2022-09-15



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Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Horn Antenna(14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27

Radiated Spurious Emissions (Below 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Trilog Broadband Antenna(25MHz-1GHz)-Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25

Radiated Spurious Emissions (Above 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
Chamber cable(Above 1GHz)	Scoflex	KMKG-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna (1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17 2021-09-16	2021-09-16 2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Horn Antenna(14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27

General used equipment

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2021-07-05	2022-07-05
DMM	Fluke	73	EMC0007	2021-07-05	2022-07-05

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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:

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

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 6dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -2.3dBi.

Please refer to internal photos.

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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)

Limit:

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)

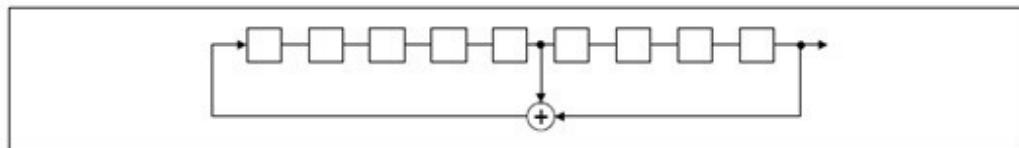
Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

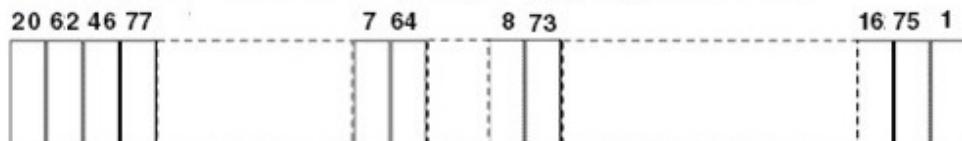


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*Linear Feedback Shift Register for Generation of the PRBS sequence*

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinate with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

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7 Radio Spectrum Matter Test Results

7.1 Conducted Peak Output Power

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

Test Method: ANSI C63.10 (2013) Section 7.8.5

Limit: ≤20.97dBm

7.1.1 E.U.T. Operation

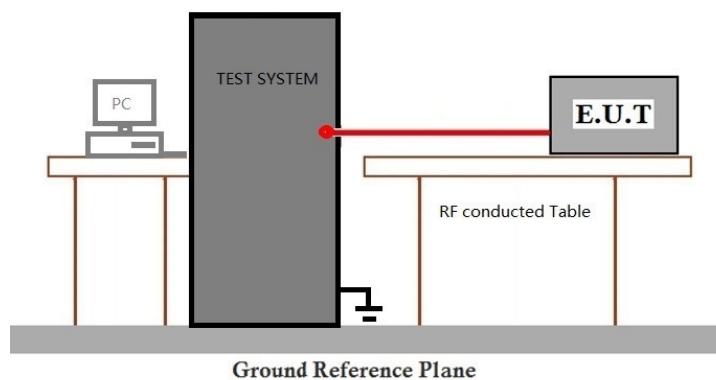
Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(left earbud)_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	02	TX_non-Hop mode(right earbud)_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

cable loss=0.9dB

Please Refer to Appendix for Details



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7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247(a)(1)
Test Method: ANSI C63.10 (2013) Section 7.8.7

7.2.1 E.U.T. Operation

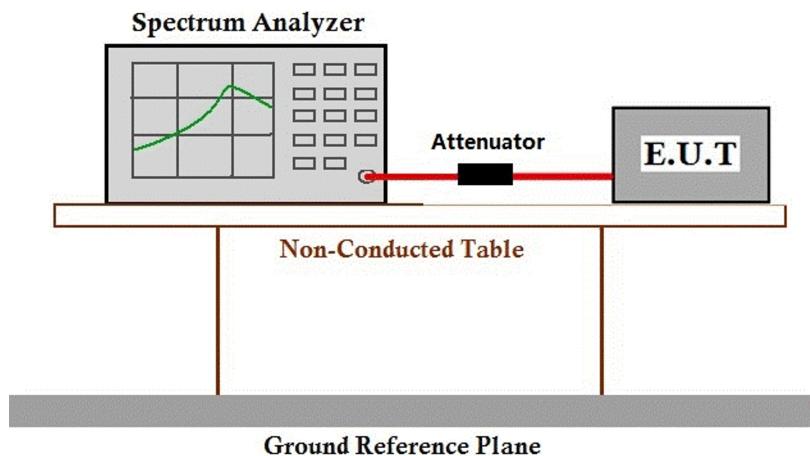
Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Mode	Final test	Code	Description
	Final test	00	TX_non-Hop mode(left earbud)_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	02	TX_non-Hop mode(right earbud)_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

cable loss=0.9dB

Please Refer to Appendix for Details

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7.3 Carrier Frequencies Separation

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

Test Method: ANSI C63.10 (2013) Section 7.8.2

Limit:

2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W.

7.3.1 E.U.T. Operation

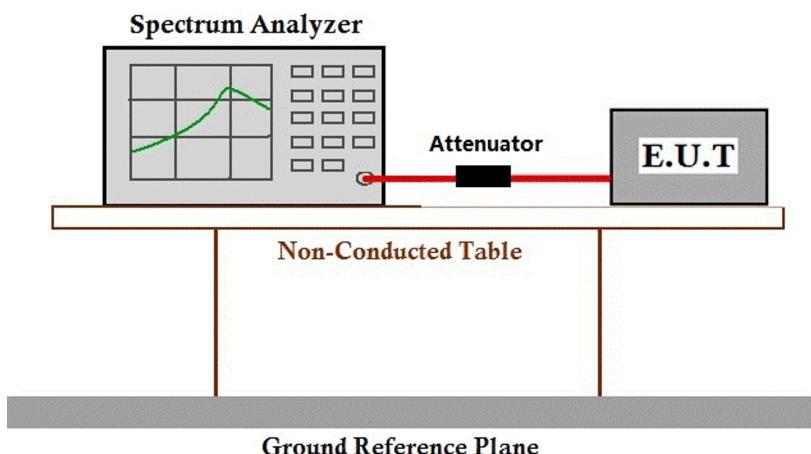
Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode(left earbud)_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.
Final test	03	TX_Hop mode(right earbud)_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.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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7.4 Hopping Channel Number

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

Test Method: ANSI C63.10 (2013) Section 7.8.3

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

7.4.1 E.U.T. Operation

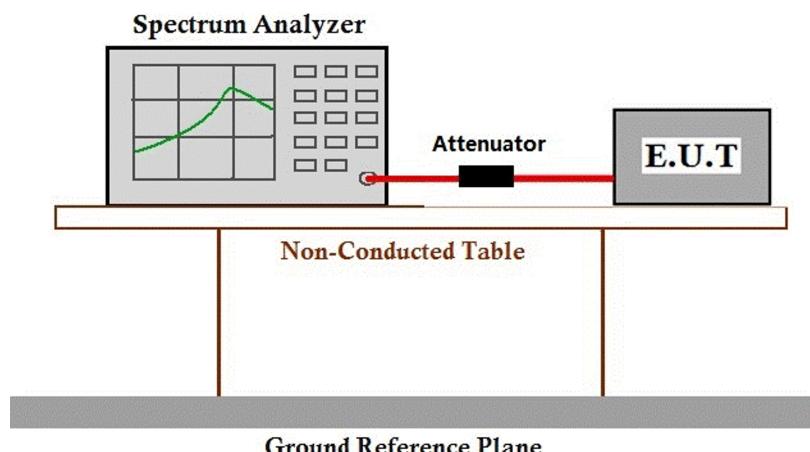
Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode(left earbud)_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.
Final test	03	TX_Hop mode(right earbud)_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.

7.4.3 Test Setup Diagram



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7.4.4 Measurement Procedure and Data

cable loss=0.9dB

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7.5 Dwell Time

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

Test Method: ANSI C63.10 (2013) Section 7.8.4

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

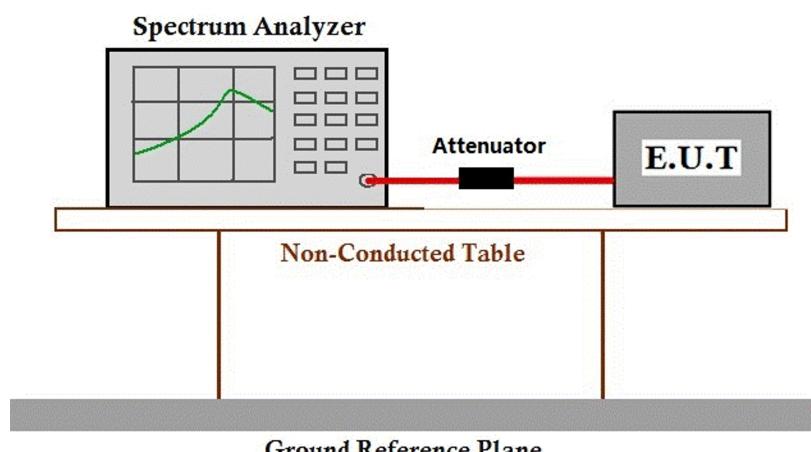
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode(left earbud)_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.
Final test	03	TX_Hop mode(right earbud)_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

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7.5.4 Measurement Procedure and Data

cable loss=0.9dB

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7.6 Conducted Band Edges Measurement

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

Test Method: ANSI C63.10 (2013) Section 7.8.6

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

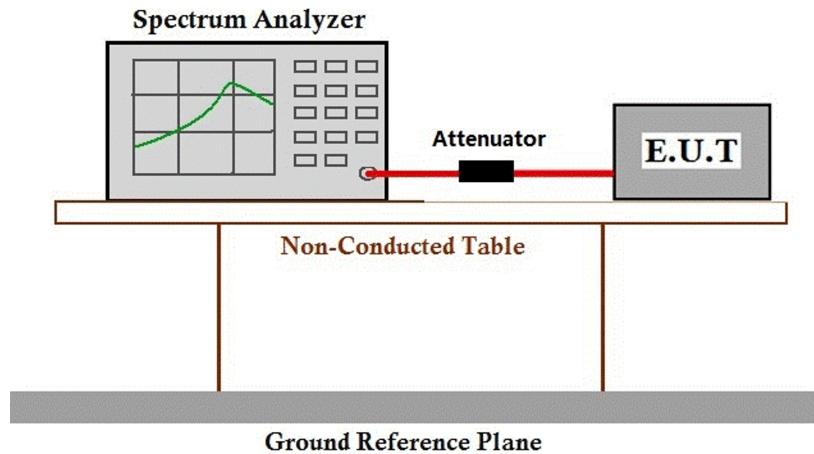
Pre-scan / Mode Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(left earbud)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	TX_Hop mode(left earbud)_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.
Final test	02	TX_non-Hop mode(right earbud)_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	03	TX_Hop mode(right earbud)_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.

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7.6.3 Test Setup Diagram**7.6.4 Measurement Procedure and Data**

cable loss=0.9dB

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7.7 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2013) Section 7.8.8

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.7.1 E.U.T. Operation

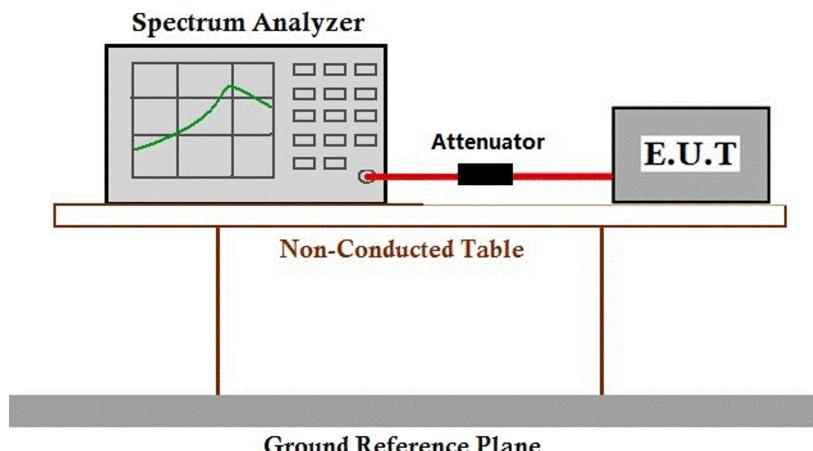
Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Mode Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(left earbud)_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	02	TX_non-Hop mode(right earbud)_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.

7.7.3 Test Setup Diagram



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7.7.4 Measurement Procedure and Data

cable loss=0.9dB

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7.8 Radiated Emissions which fall in the restricted bands

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

Test Method: ANSI C63.10 (2013) Section 6.10.5

Measurement 3m

Distance:

Limit:

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

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

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 53.8 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode / Code	Description
Final test	00	TX_non-Hop mode(left earbud)_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	02	TX_non-Hop mode(right earbud)_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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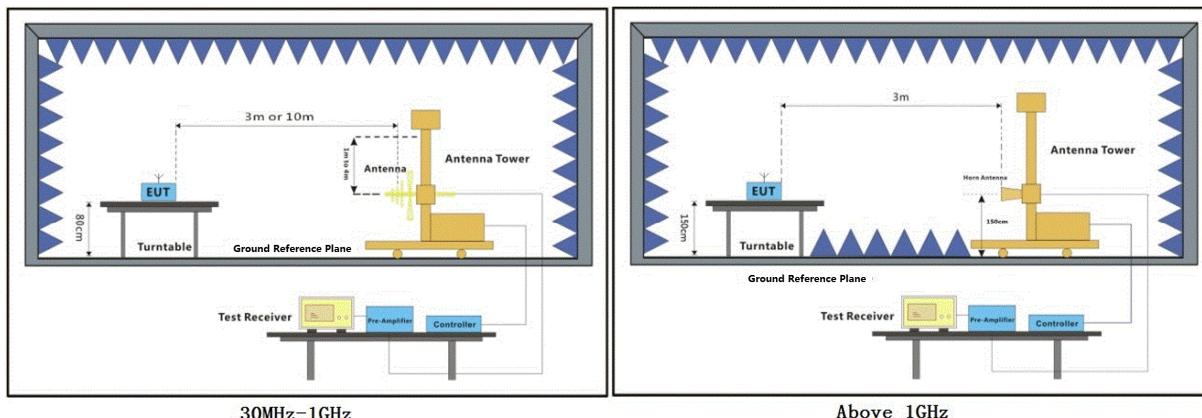
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7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 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 Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- Repeat above procedures until all frequencies measured was complete.

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

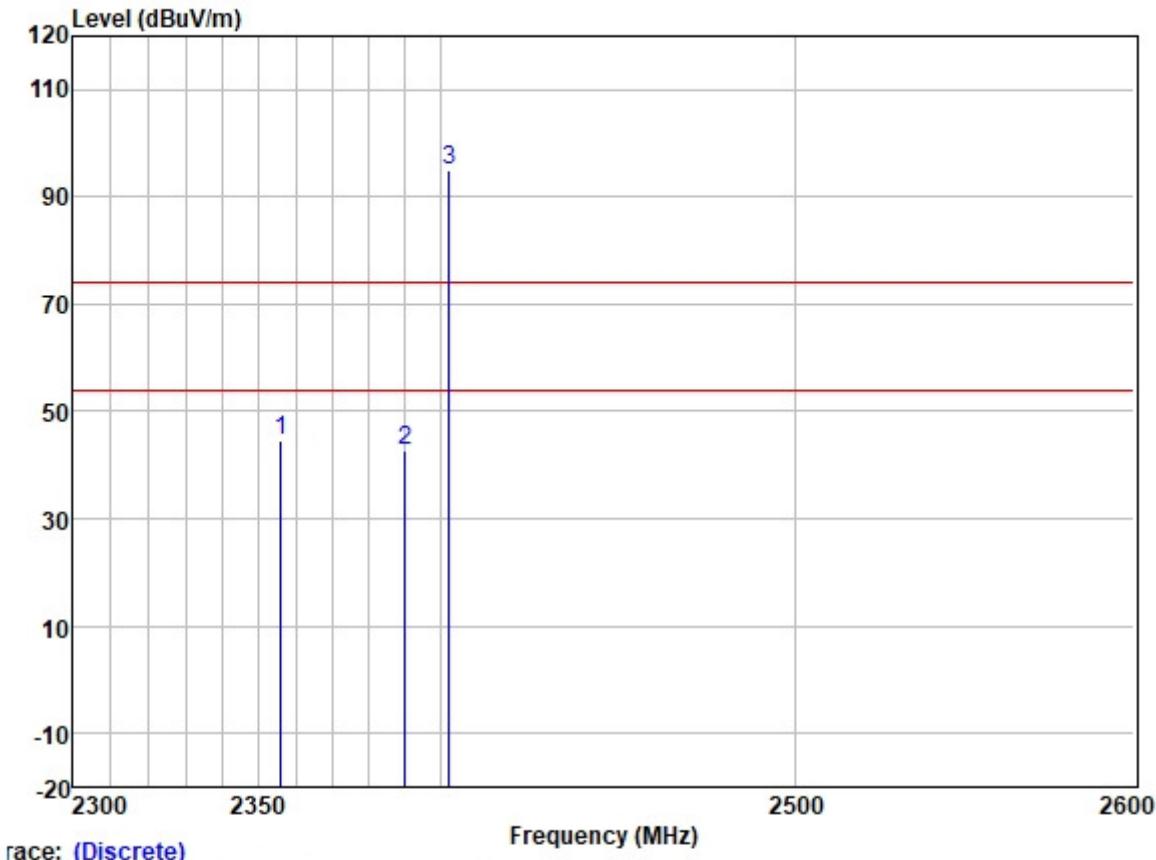
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level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

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



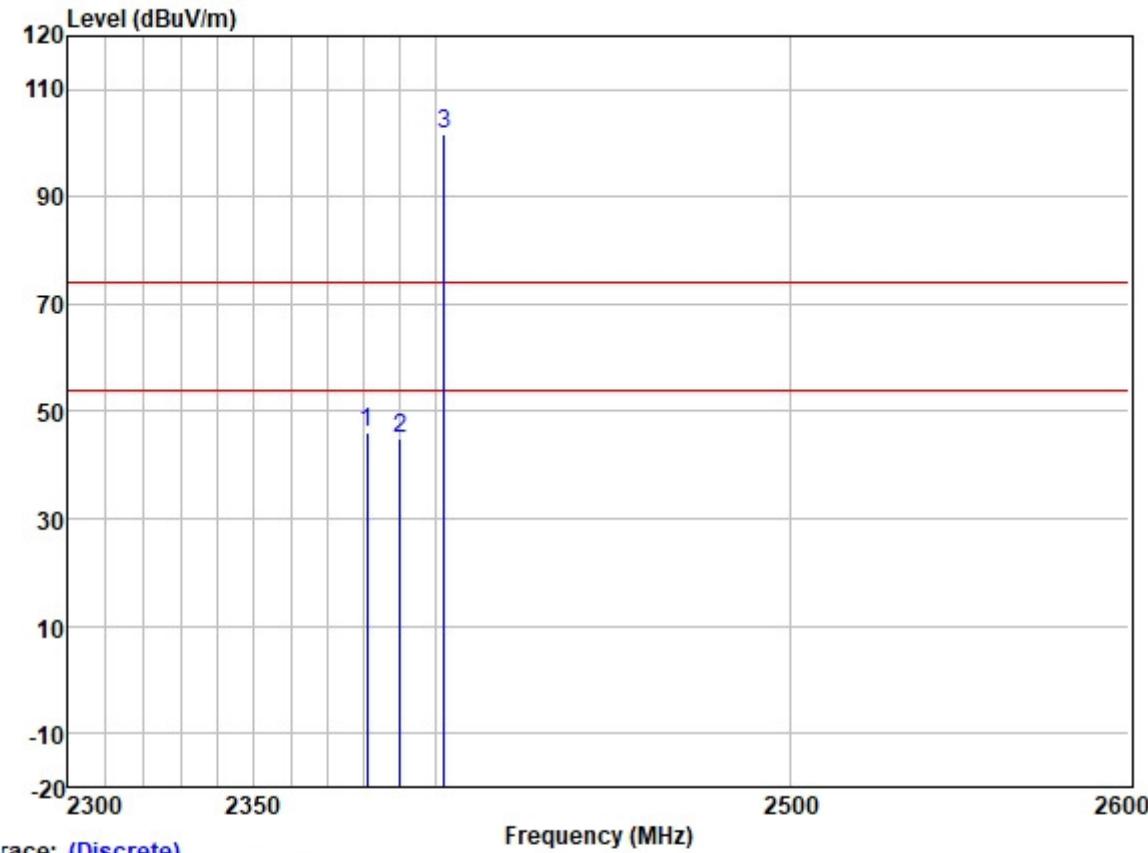
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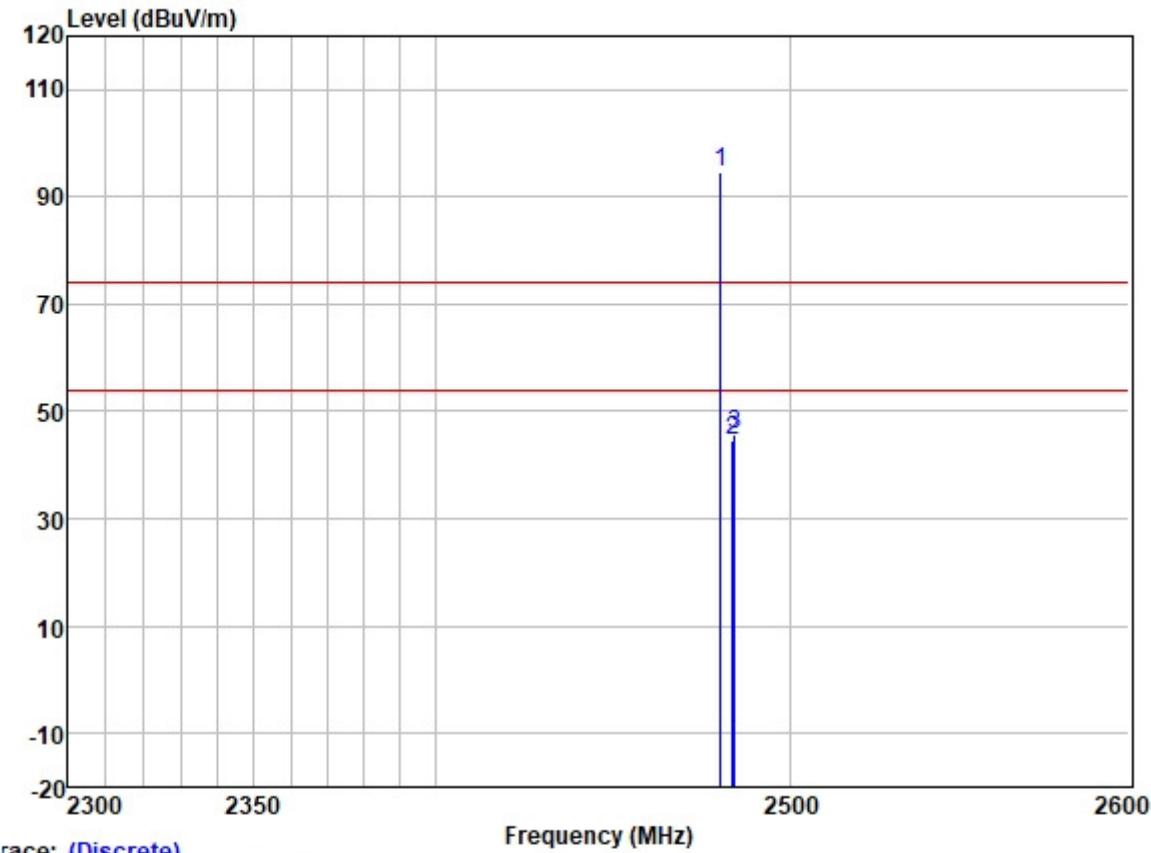


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



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



Mode: (Discrete)

Freq	ReadAntenna	Cable	Preamp	Limit	Over	Over	Over	Over	Remark
	Level	Factor	Loss						
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	
1 *	2480.000	100.93	27.47	3.60	37.57	94.43	74.00	20.43	HORIZONTAL Peak
2	2483.500	51.02	27.48	3.53	37.57	44.46	74.00	-29.54	HORIZONTAL Peak
3	2484.071	52.31	27.48	3.53	37.57	45.75	74.00	-28.25	HORIZONTAL Peak

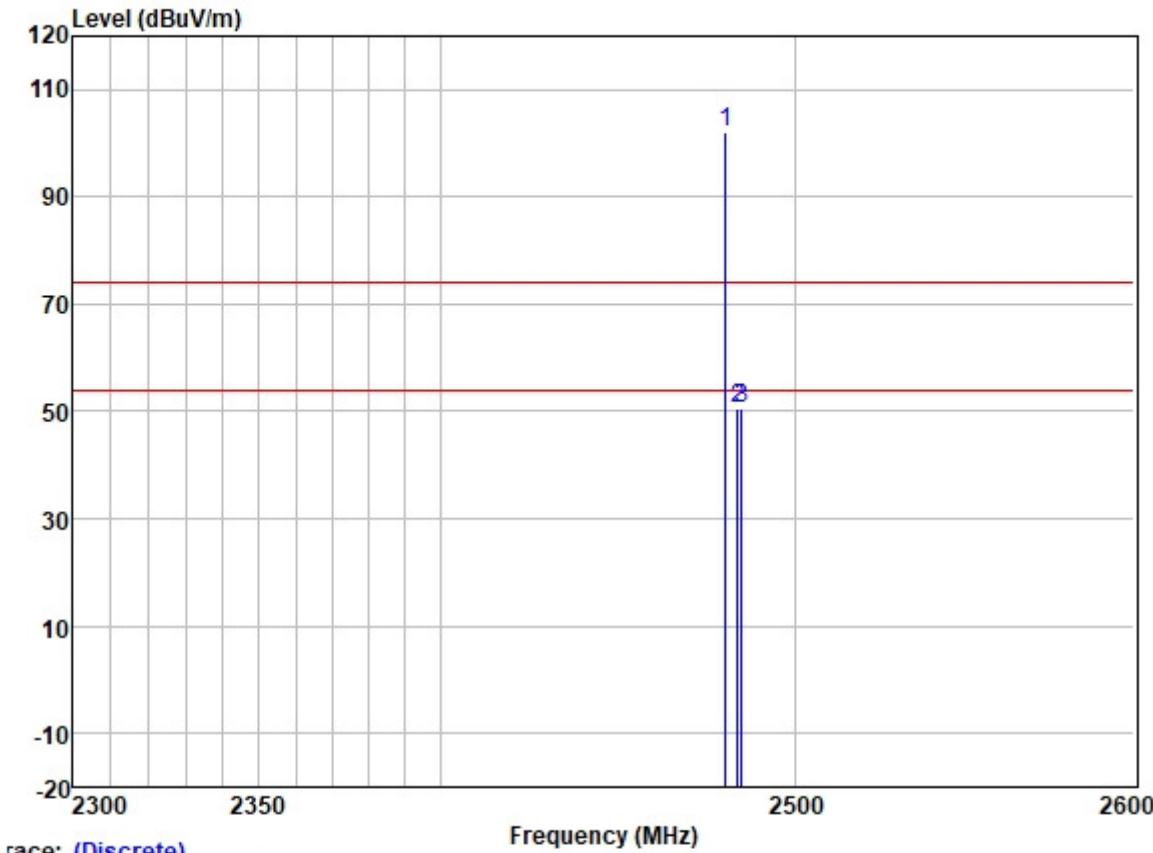
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



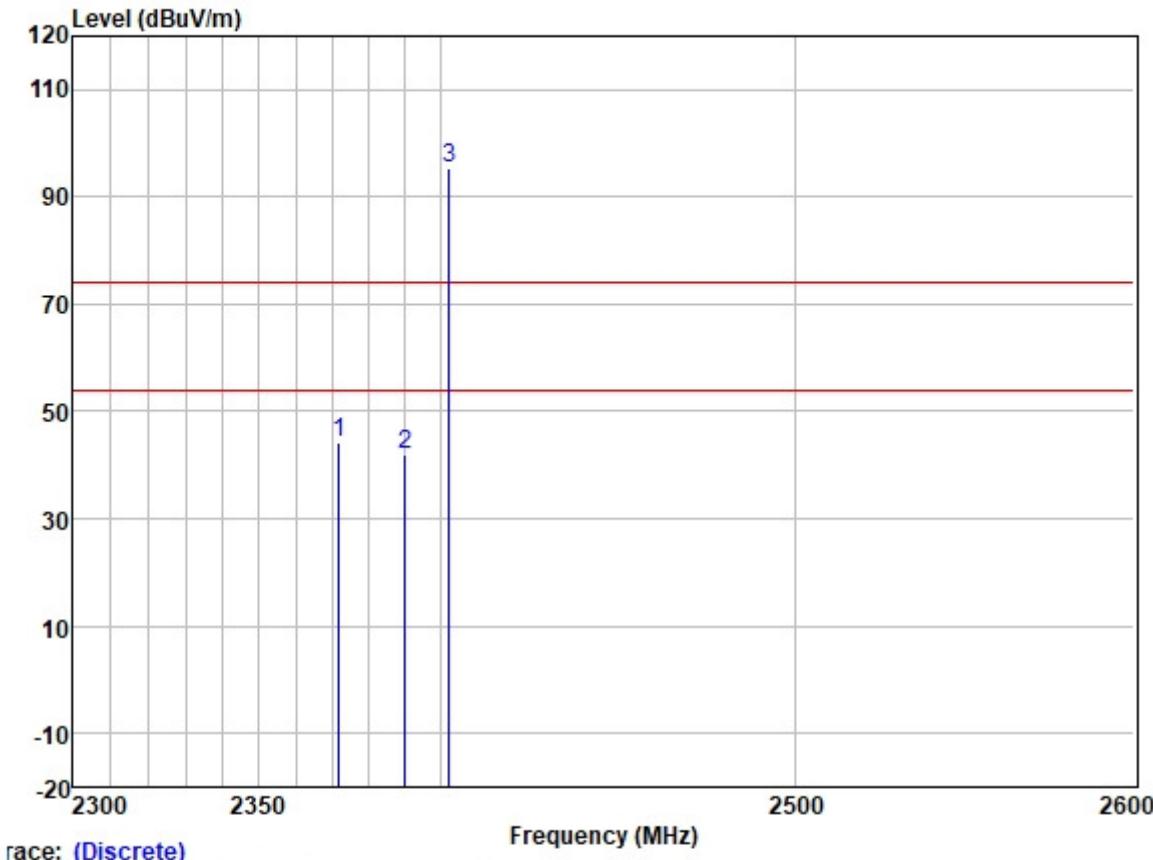
Trace (Discrete)	ReadAntenna		Cable		Preamp		Level	Limit	Over	Pol/Phase	Remark
	Freq	Level	Factor	Loss	Factor	Level					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1 *	2480.000	108.75	27.47	3.60	37.57	102.25	74.00	28.25	VERTICAL	Peak	
2	2483.500	56.99	27.48	3.53	37.57	50.43	74.00	-23.57	VERTICAL	Peak	
3	2484.595	57.24	27.48	3.53	37.57	50.68	74.00	-23.32	VERTICAL	Peak	

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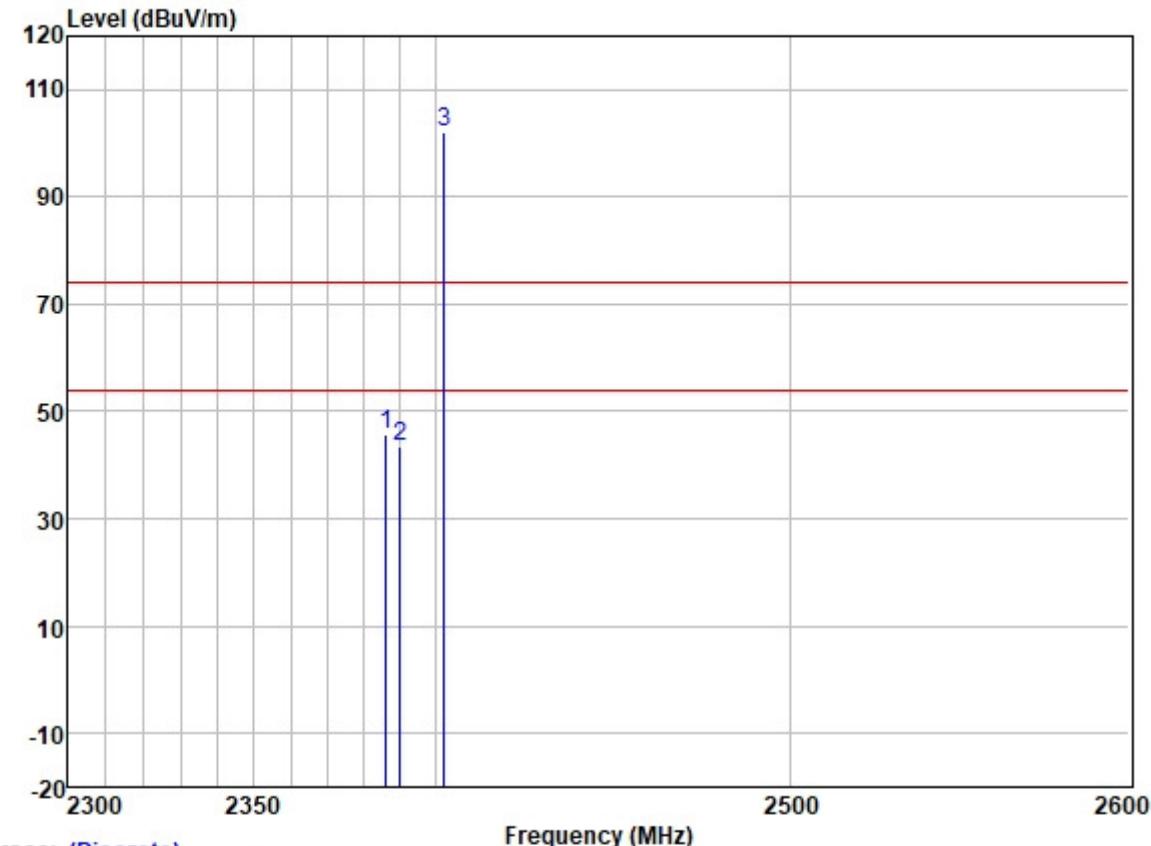
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



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



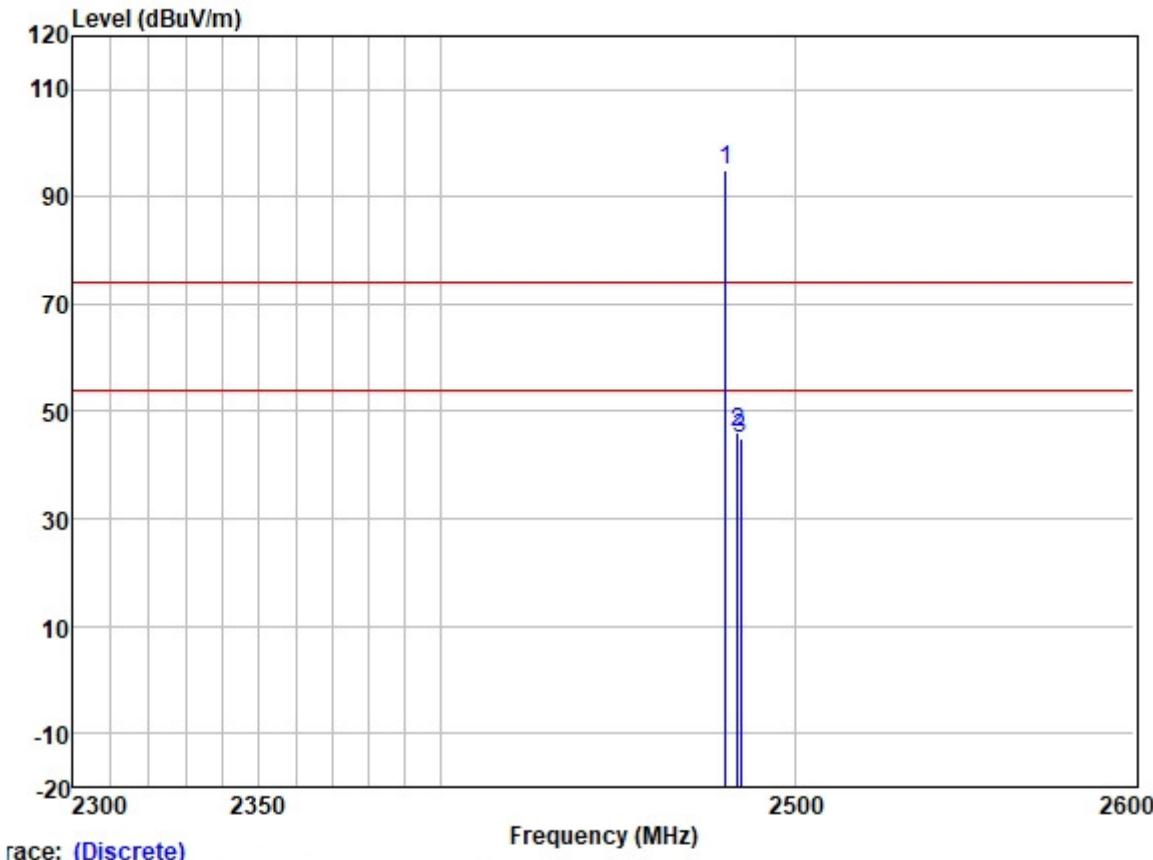
Freq	ReadAntenna		Cable		Preamp		Limit	Over	Limit	Pol/Phase	Remark
	Level	Factor	Loss	Factor	Level	Line					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1	2386.118	52.45	27.33	3.48	37.60	45.66	74.00	-28.34	VERTICAL	Peak	
2	2390.000	50.08	27.33	3.48	37.59	43.30	74.00	-30.70	VERTICAL	Peak	
3 *	2402.000	108.68	27.35	3.50	37.59	101.94	74.00	27.94	VERTICAL	Peak	

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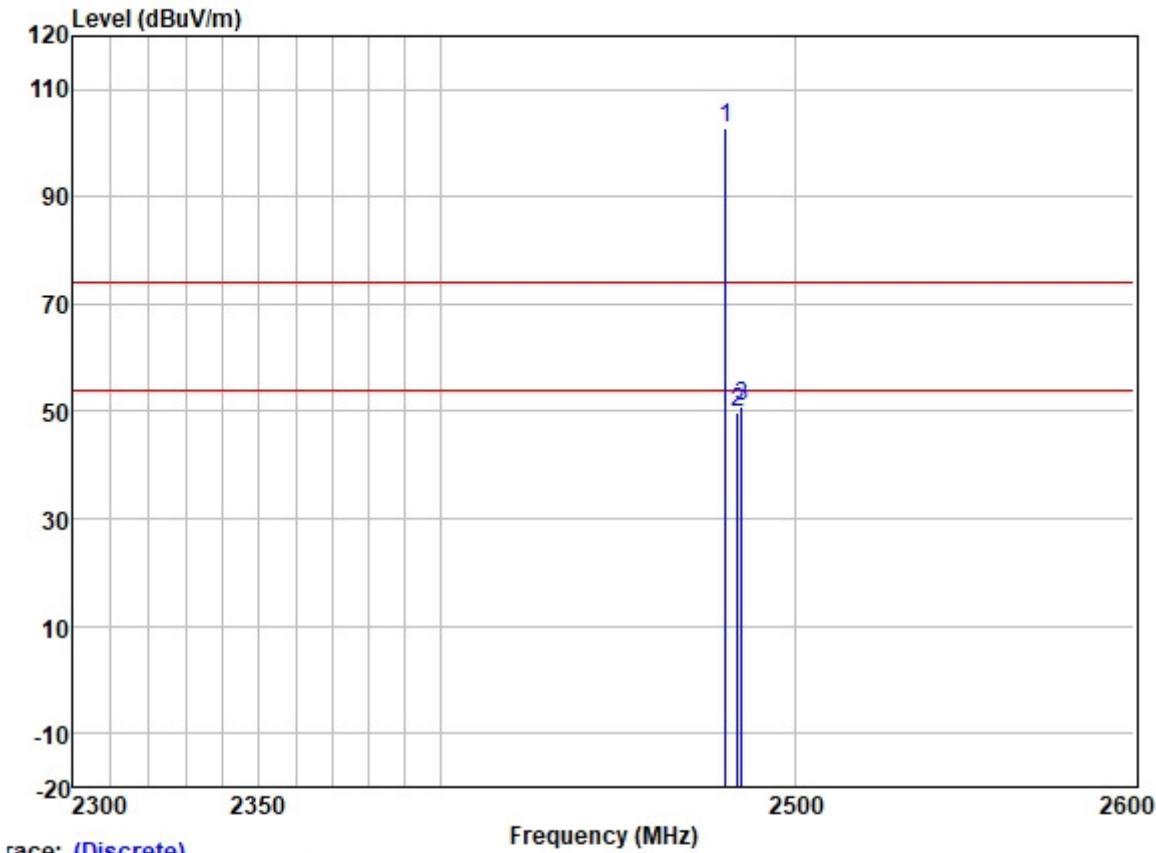
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Guangzhou Regional Technical Services Co.,Ltd Laboratory

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



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



Trace (Discrete)	ReadAntenna		Cable		Preamp		Level	Limit	Over	Pol/Phase	Remark
	Freq	Level	Factor	Loss	Factor	Level					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1 *	2480.000	109.28	27.47	3.60	37.57	102.78	74.00	28.78	VERTICAL	Peak	
2	2483.500	56.39	27.48	3.53	37.57	49.83	74.00	-24.17	VERTICAL	Peak	
3	2484.595	57.65	27.48	3.53	37.57	51.09	74.00	-22.91	VERTICAL	Peak	

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7.9 Radiated Spurious Emissions (Below 1GHz)

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

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Measurement 3m

Distance:

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.

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 23.1 °C Humidity: 53.8 % RH Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode / Code	Description
Final test	00	TX_non-Hop mode(left earbud)_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	02	TX_non-Hop mode(right earbud)_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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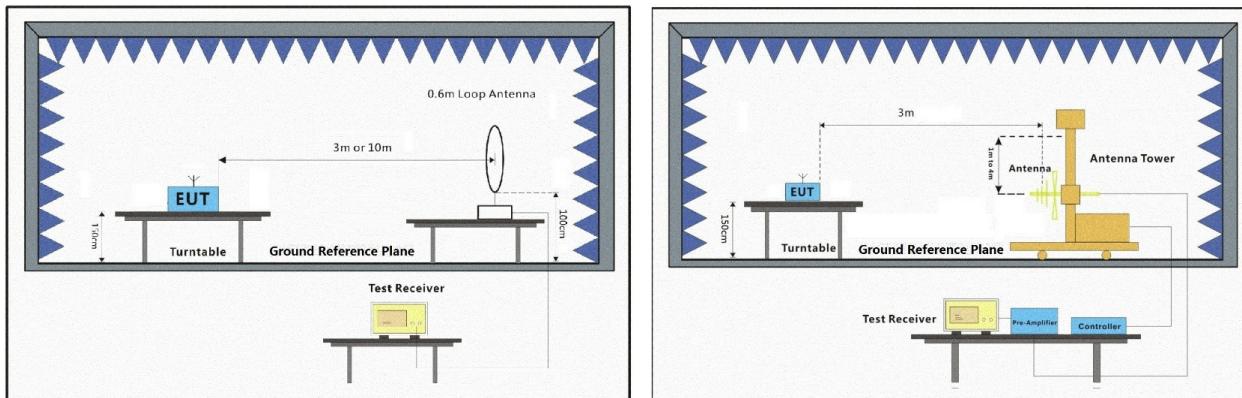
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7.9.3 Test Setup Diagram



7.9.4 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.
- 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:

- Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

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

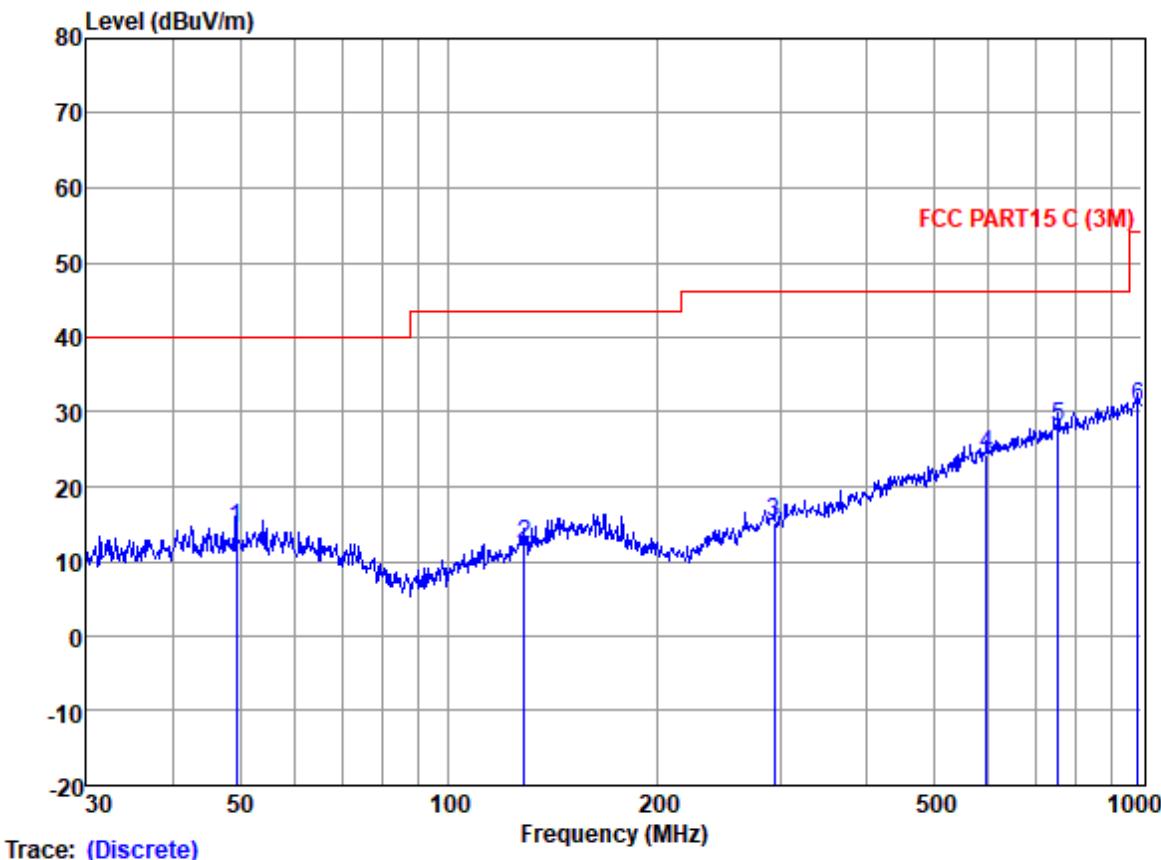
- Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.



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Test mode:00



Site : SGS
Condition : FCC PART15 C (3M)
Job :
Model :
Power :
Test Mode :

Freq	Read	Antenna	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1 49.36	26.58	13.93	1.14	27.17	14.48	40.00	-25.52	VERTICAL	QP
2 128.56	25.52	11.87	1.94	27.00	12.33	43.50	-31.17	VERTICAL	QP
3 294.11	25.10	13.48	3.15	26.55	15.18	46.00	-30.82	VERTICAL	QP
4 595.13	27.56	19.70	5.10	28.20	24.16	46.00	-21.84	VERTICAL	QP
5 755.39	27.92	22.20	6.01	28.08	28.05	46.00	-17.95	VERTICAL	QP
6 986.07	26.78	24.17	7.37	27.68	30.64	54.00	-23.36	VERTICAL	QP

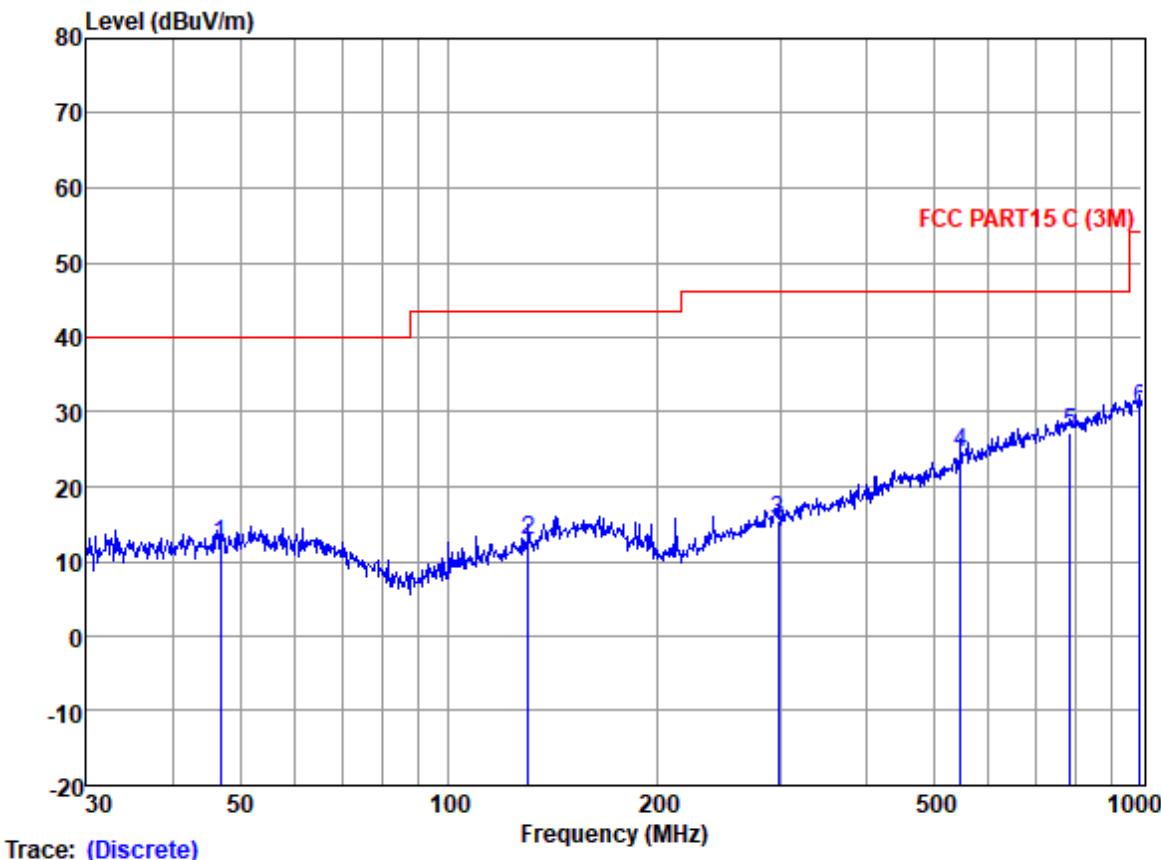
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Test mode:00



Site : SGS
Condition : FCC PART15 C (3M)
Job :
Model :
Power :
Test Mode :

Freq	Read	Antenna	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1 46.83	24.48	13.94	1.13	27.17	12.38	40.00	-27.62	VERTICAL	QP
2 129.92	25.81	12.10	1.96	26.99	12.88	43.50	-30.62	VERTICAL	QP
3 298.27	25.38	13.57	3.16	26.55	15.56	46.00	-30.44	VERTICAL	QP
4 547.10	29.17	18.60	4.76	28.09	24.44	46.00	-21.56	VERTICAL	QP
5 787.85	26.57	22.45	6.11	28.04	27.09	46.00	-18.91	VERTICAL	QP
6 993.01	26.37	24.23	7.37	27.67	30.30	54.00	-23.70	VERTICAL	QP

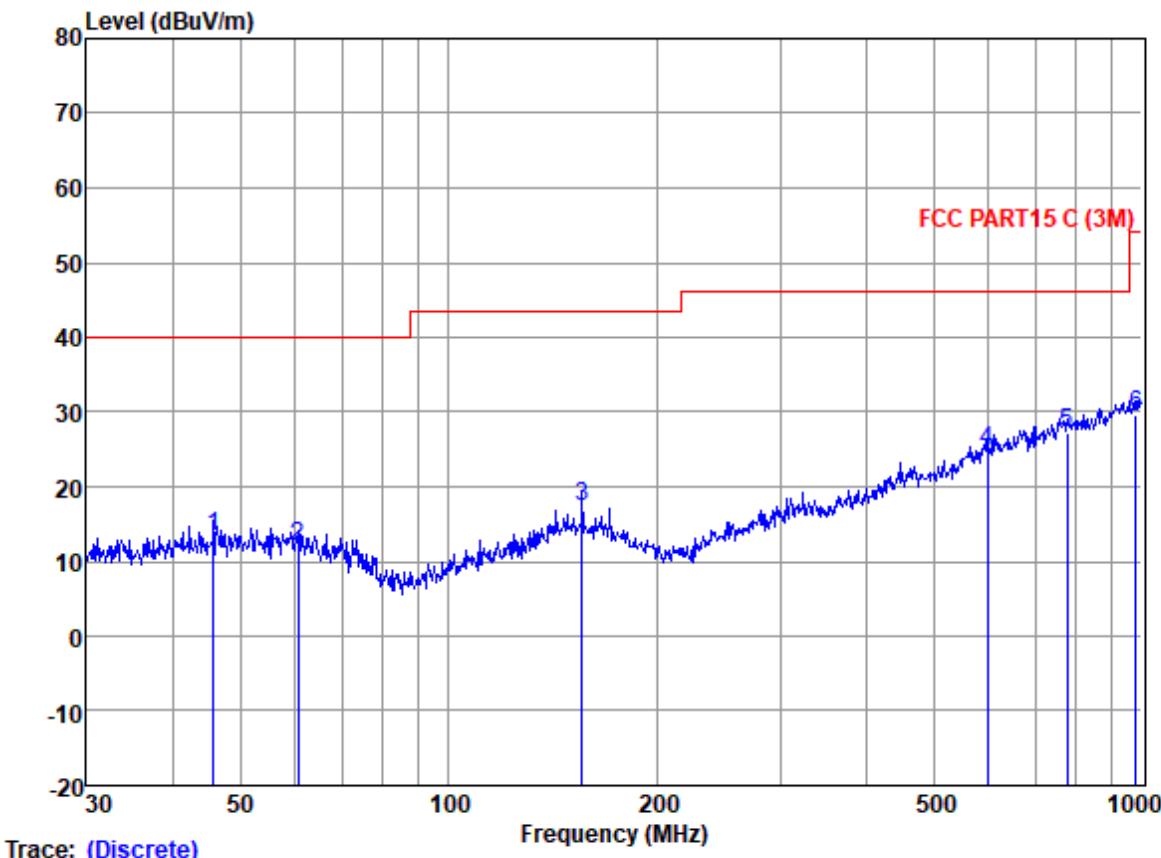
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Test mode:02



Site : SGS
Condition : FCC PART15 C (3M)
Job :
Model :
Power :
Test Mode :

Freq	Read	Antenna	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1	45.69	25.60	13.89	1.12	27.17	13.44	40.00	-26.56	HORIZONTAL QP
2	60.49	24.67	13.33	1.27	27.16	12.11	40.00	-27.89	HORIZONTAL QP
3	155.36	28.25	13.72	2.30	26.81	17.46	43.50	-26.04	HORIZONTAL QP
4	597.22	28.03	19.80	5.14	28.21	24.76	46.00	-21.24	HORIZONTAL QP
5	779.61	26.90	22.30	6.11	28.05	27.26	46.00	-18.74	HORIZONTAL QP
6	979.18	25.89	24.10	7.31	27.69	29.61	54.00	-24.39	HORIZONTAL QP

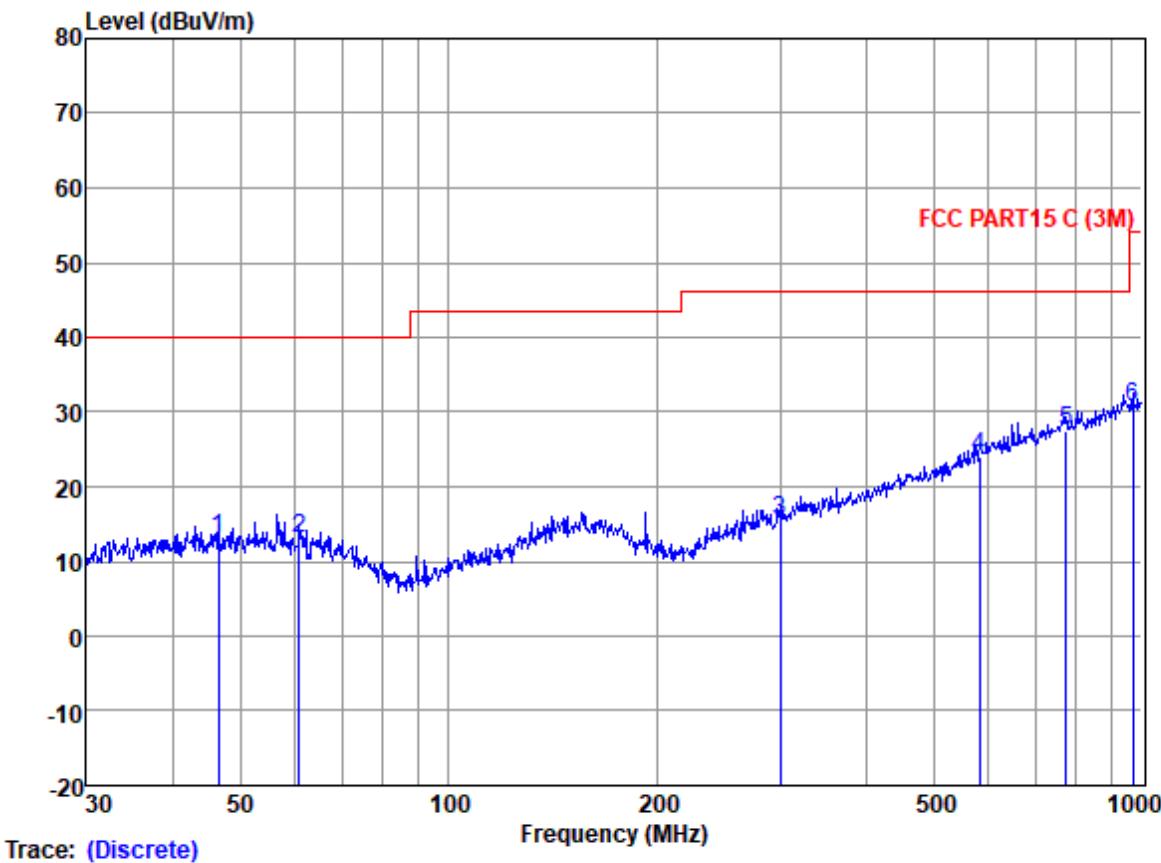
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Test mode:02



Site : SGS
Condition : FCC PART15 C (3M)
Job :
Model :
Power :
Test Mode :

Freq	Read	Antenna	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1 46.50	25.09	13.92	1.13	27.17	12.97	40.00	-27.03	VERTICAL	QP
2 60.70	25.54	13.29	1.27	27.16	12.94	40.00	-27.06	VERTICAL	QP
3 300.37	25.31	13.60	3.16	26.56	15.51	46.00	-30.49	VERTICAL	QP
4 582.74	27.92	19.25	5.06	28.19	24.04	46.00	-21.96	VERTICAL	QP
5 776.88	27.03	22.28	6.08	28.05	27.34	46.00	-18.66	VERTICAL	QP
6 968.93	27.19	23.90	7.25	27.70	30.64	54.00	-23.36	VERTICAL	QP

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7.10 Radiated Spurious Emissions (Above 1GHz)

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

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Measurement 3m

Distance:

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.

7.10.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 53.8 % RH Atmospheric Pressure: 1010 mbar

7.10.2 Test Mode Description

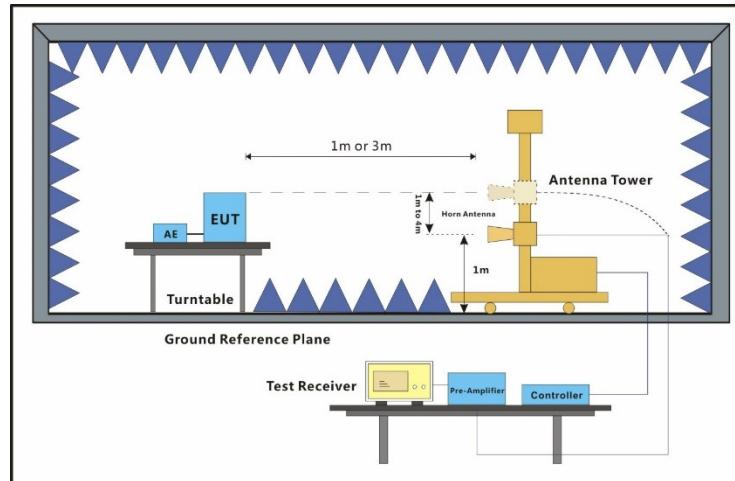
Pre-scan / Final test	Mode / Code	Description
Final test	00	TX_non-Hop mode(left earbud)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	02	TX_non-Hop mode(right earbud)_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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7.10.3 Test Setup Diagram

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7.10.4 Measurement Procedure and Data

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

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

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

2) Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

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

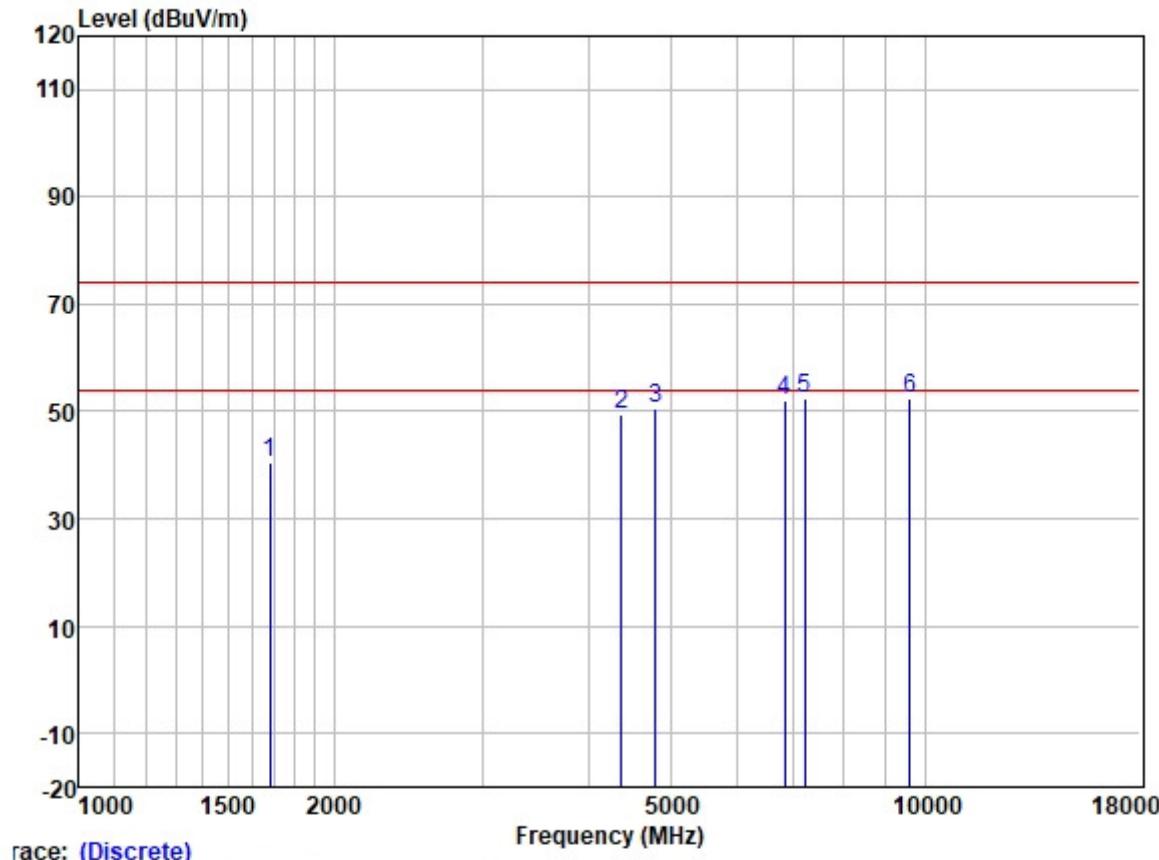
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



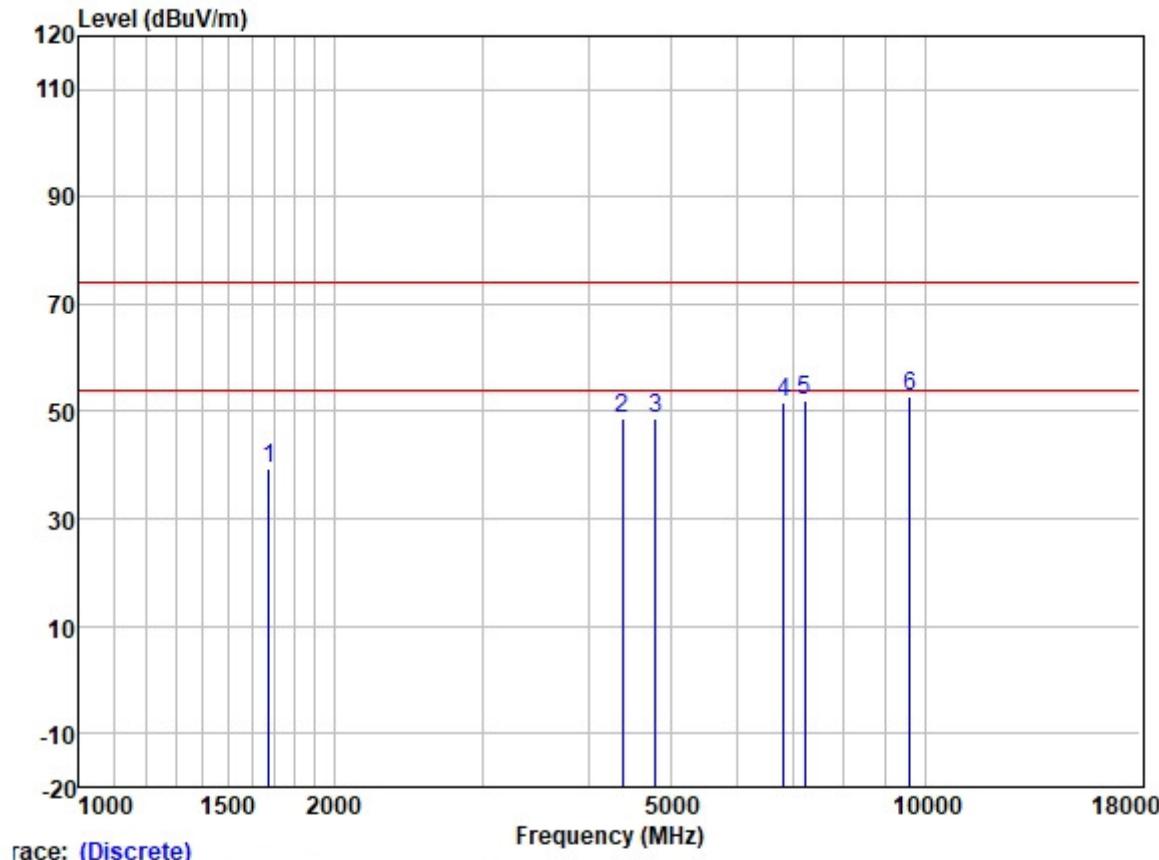
Trace: (Discrete)	ReadAntenna						Limit	Over	Over	Pol/Phase	Remark
	Freq	Level	Antenna	Cable	Preamp	Loss					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB		
1	1682.477	49.94	25.68	2.80	37.91	40.51	74.00	-33.49	HORIZONTAL	Peak	
2	4379.699	51.07	30.64	4.69	36.81	49.59	74.00	-24.41	HORIZONTAL	Peak	
3	4804.000	50.39	31.42	5.40	36.83	50.38	74.00	-23.62	HORIZONTAL	Peak	
4	6835.278	48.54	34.74	5.82	37.13	51.97	74.00	-22.03	HORIZONTAL	Peak	
5	7206.000	48.21	35.54	5.98	37.38	52.35	74.00	-21.65	HORIZONTAL	Peak	
6	9608.000	44.57	38.37	7.07	37.42	52.59	74.00	-21.41	HORIZONTAL	Peak	

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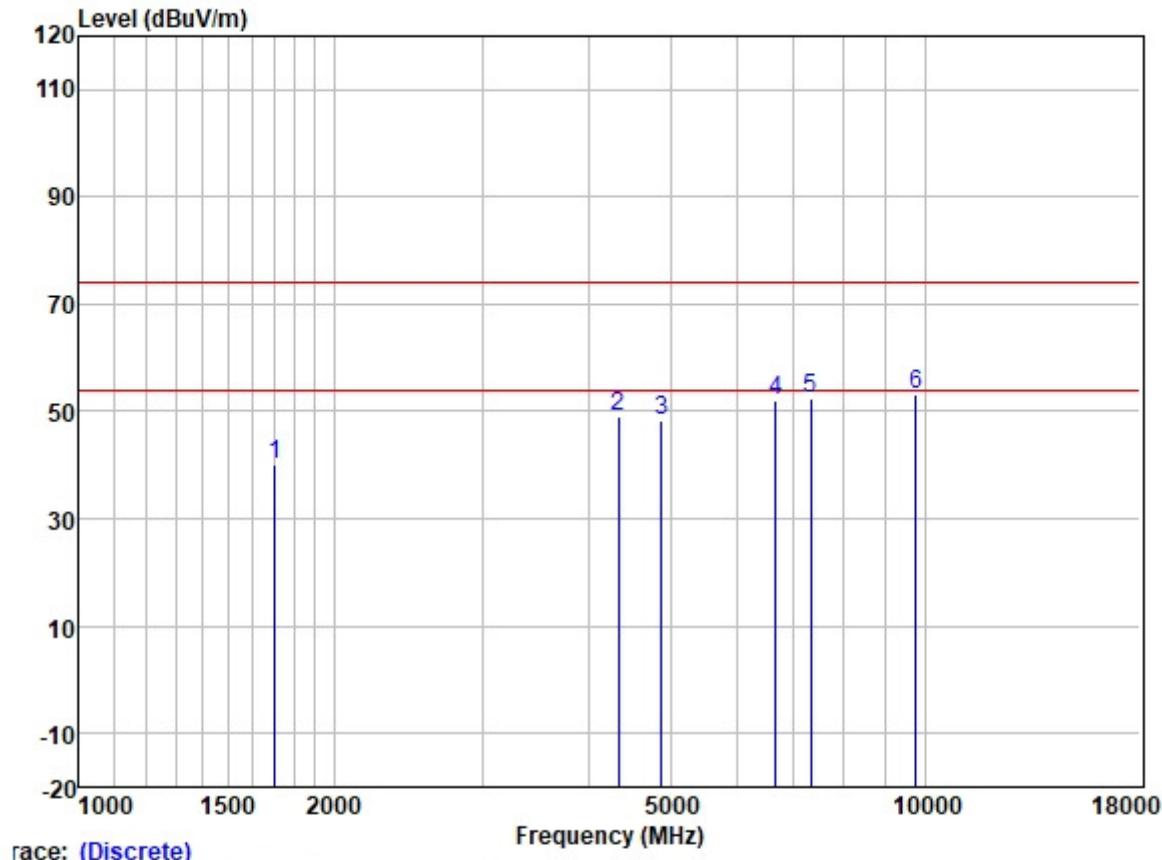
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



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



Trace: (Discrete)	ReadAntenna						Limit	Over	Over	Pol/Phase	Remark
	Freq	Level	Antenna	Cable	Preamp	Loss					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1	1702.042	49.46	25.72	2.80	37.89	40.09	74.00	-33.91	HORIZONTAL	Peak	
2	4341.886	50.54	30.57	4.67	36.81	48.97	74.00	-25.03	HORIZONTAL	Peak	
3	4882.000	48.07	31.56	5.52	36.84	48.31	74.00	-25.69	HORIZONTAL	Peak	
4	6659.763	48.99	34.29	5.83	37.06	52.05	74.00	-21.95	HORIZONTAL	Peak	
5	7323.000	47.78	36.00	6.13	37.43	52.48	74.00	-21.52	HORIZONTAL	Peak	
6	9764.000	44.94	38.50	7.02	37.41	53.05	74.00	-20.95	HORIZONTAL	Peak	

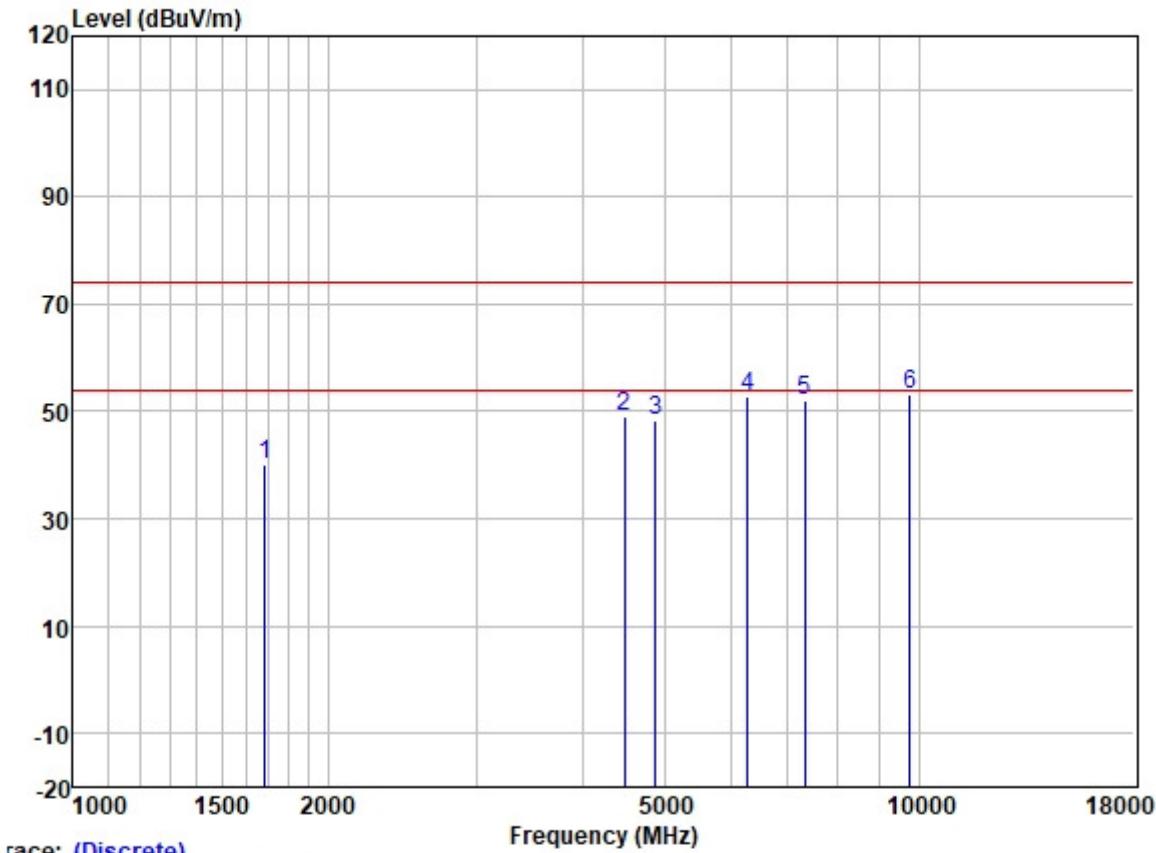
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:middle



Mode: (Discrete)

Trace	Freq	ReadAntenna		Cable		Preamp	Limit	Over	Over	Over	Remark
		Level	Factor	Loss	Factor						
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	dB	
1	1687.347	49.71	25.69	2.80	37.91	40.29	74.00	-33.71	VERTICAL	Peak	
2	4482.150	50.24	30.78	4.99	36.81	49.20	74.00	-24.80	VERTICAL	Peak	
3	4882.000	48.06	31.56	5.52	36.84	48.30	74.00	-25.70	VERTICAL	Peak	
4	6267.553	50.32	33.29	6.00	36.95	52.66	74.00	-21.34	VERTICAL	Peak	
5	7323.000	47.36	36.00	6.13	37.43	52.06	74.00	-21.94	VERTICAL	Peak	
6	9764.000	45.24	38.50	7.02	37.41	53.35	74.00	-20.65	VERTICAL	Peak	

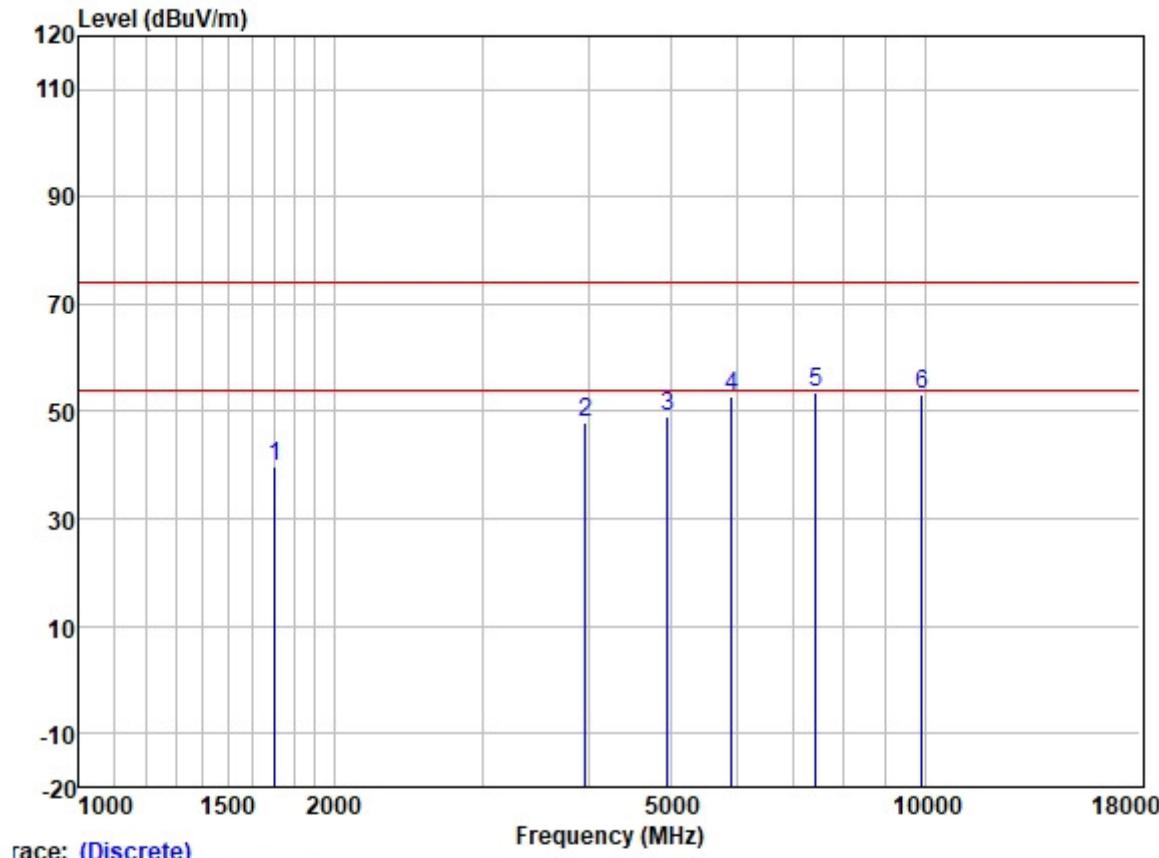
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)	ReadAntenna						Limit	Over	Pol/Phase	Remark
	Freq	Level	Antenna	Cable	Preamp	Loss				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1702.042	49.07	25.72	2.80	37.89	39.70	74.00	-34.30	HORIZONTAL	Peak
2	3969.767	50.55	29.77	4.60	36.81	48.11	74.00	-25.89	HORIZONTAL	Peak
3	4960.000	48.42	31.65	5.65	36.84	48.88	74.00	-25.12	HORIZONTAL	Peak
4	5915.516	51.38	32.33	5.95	36.90	52.76	74.00	-21.24	HORIZONTAL	Peak
5	7440.000	48.38	36.27	6.22	37.47	53.40	74.00	-20.60	HORIZONTAL	Peak
6	9920.000	44.97	38.65	6.96	37.40	53.18	74.00	-20.82	HORIZONTAL	Peak

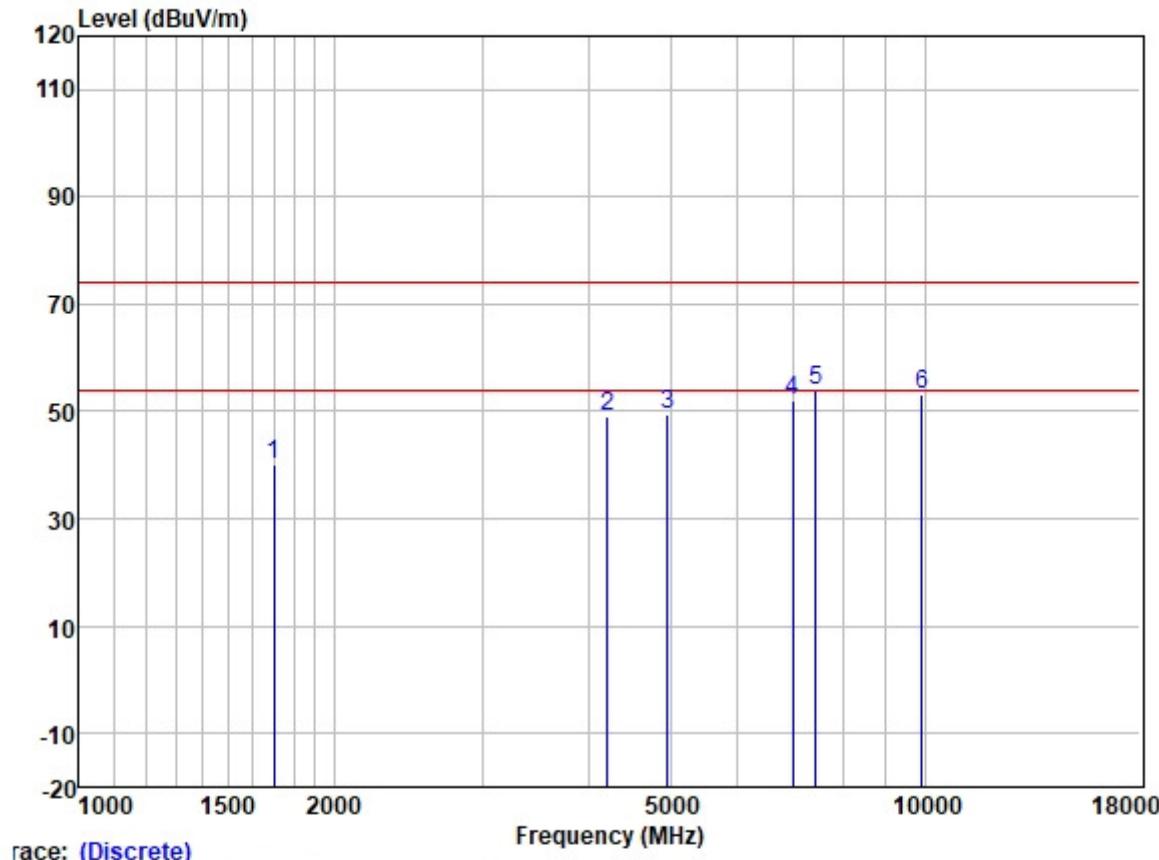
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Trace: (Discrete)	ReadAntenna						Limit	Over	Pol/Phase	Remark
	Freq	Level	Antenna	Cable	Preamp	Loss				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1697.129	49.56	25.71	2.80	37.89	40.18	74.00	-33.82	VERTICAL	Peak
2	4218.186	51.21	30.22	4.60	36.81	49.22	74.00	-24.78	VERTICAL	Peak
3	4960.000	48.84	31.65	5.65	36.84	49.30	74.00	-24.70	VERTICAL	Peak
4	6974.982	48.56	34.97	5.81	37.23	52.11	74.00	-21.89	VERTICAL	Peak
5	7440.000	48.79	36.27	6.22	37.47	53.81	74.00	-20.19	VERTICAL	Peak
6	9920.000	45.12	38.65	6.96	37.40	53.33	74.00	-20.67	VERTICAL	Peak

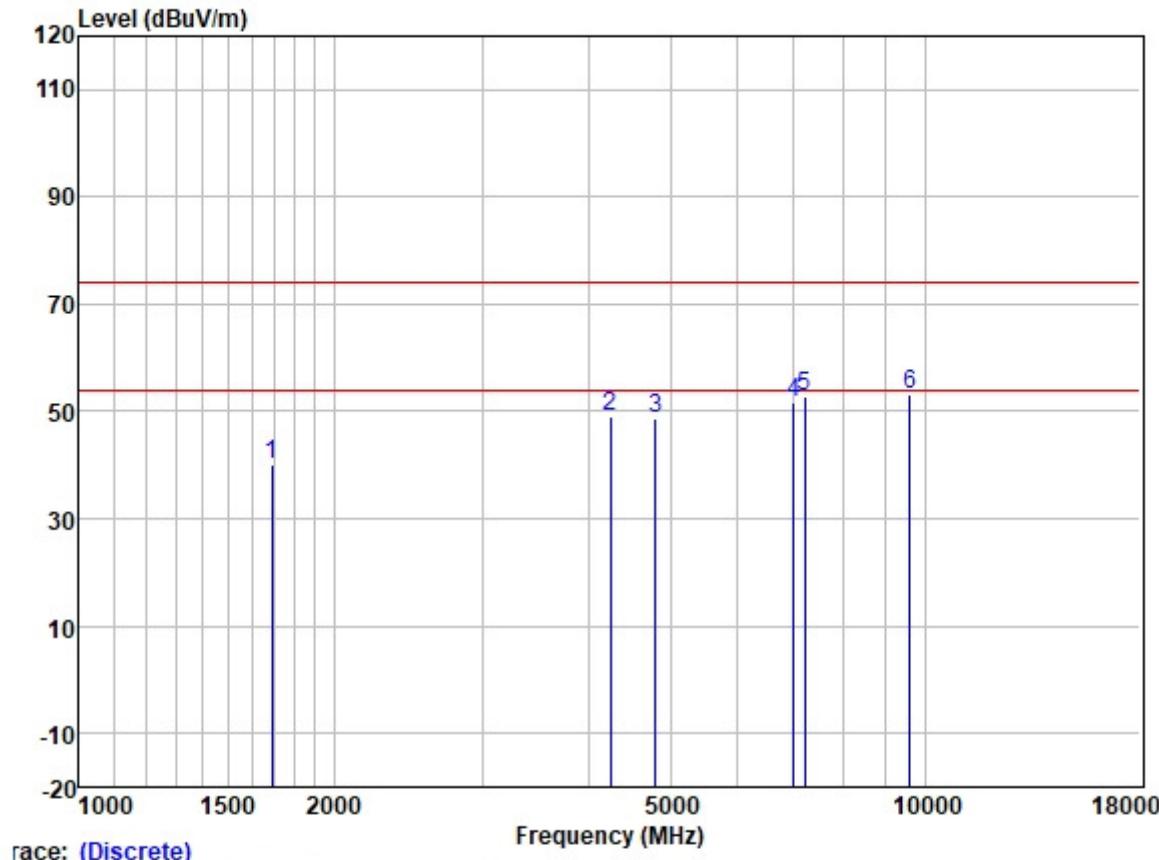
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)	ReadAntenna						Limit	Over	Pol/Phase	Remark
	Freq	Level	Antenna	Cable	Preamp	Loss				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1692.231	49.35	25.70	2.80	37.89	39.96	74.00	-34.04	HORIZONTAL	Peak
2	4242.641	50.91	30.30	4.62	36.81	49.02	74.00	-24.98	HORIZONTAL	Peak
3	4804.000	48.81	31.42	5.40	36.83	48.80	74.00	-25.20	HORIZONTAL	Peak
4	6995.172	48.11	35.00	5.81	37.25	51.67	74.00	-22.33	HORIZONTAL	Peak
5	7206.000	48.56	35.54	5.98	37.38	52.70	74.00	-21.30	HORIZONTAL	Peak
6	9608.000	45.07	38.37	7.07	37.42	53.09	74.00	-20.91	HORIZONTAL	Peak

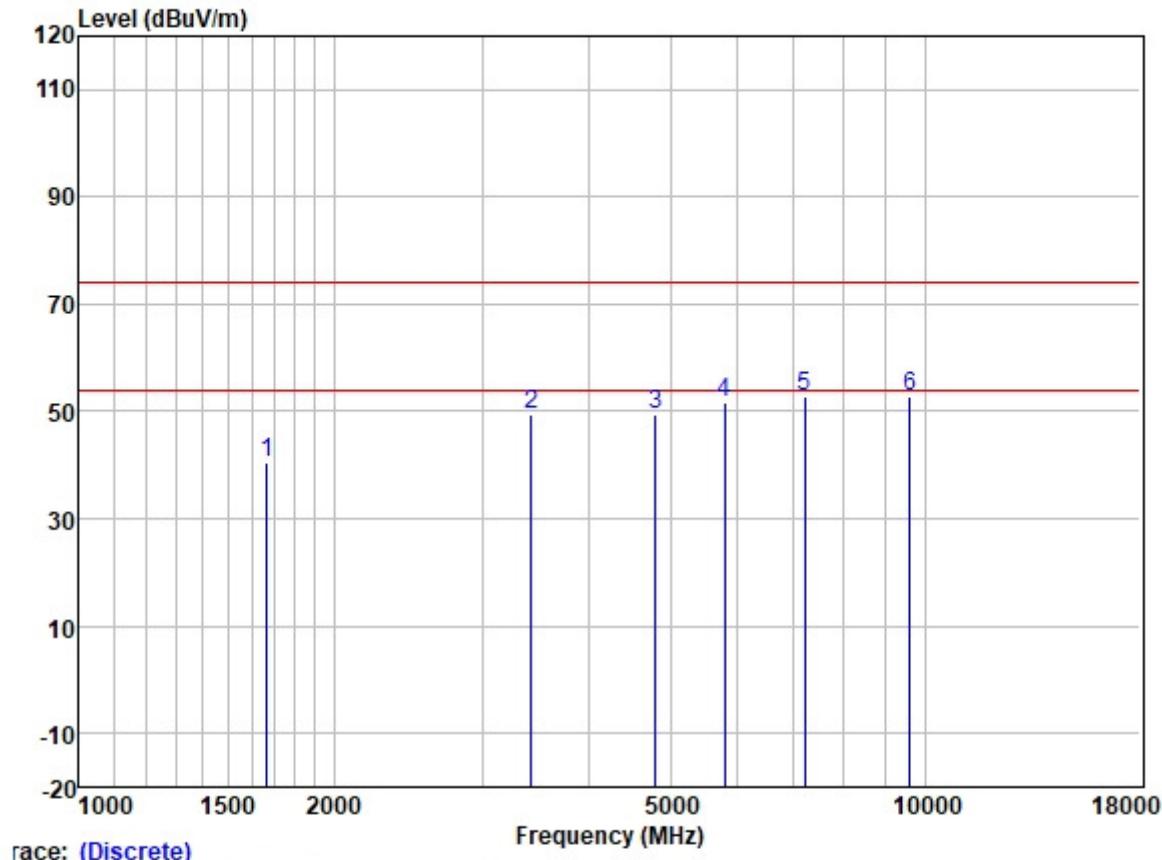
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Mode: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB		
1	1667.951	49.81	25.66	2.80	37.91	40.36	74.00	-33.64	VERTICAL	Peak	
2	3425.675	53.55	28.86	4.15	36.97	49.59	74.00	-24.41	VERTICAL	Peak	
3	4804.000	49.40	31.42	5.40	36.83	49.39	74.00	-24.61	VERTICAL	Peak	
4	5797.032	50.28	32.19	6.10	36.89	51.68	74.00	-22.32	VERTICAL	Peak	
5	7206.000	48.83	35.54	5.98	37.38	52.97	74.00	-21.03	VERTICAL	Peak	
6	9608.000	44.66	38.37	7.07	37.42	52.68	74.00	-21.32	VERTICAL	Peak	

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

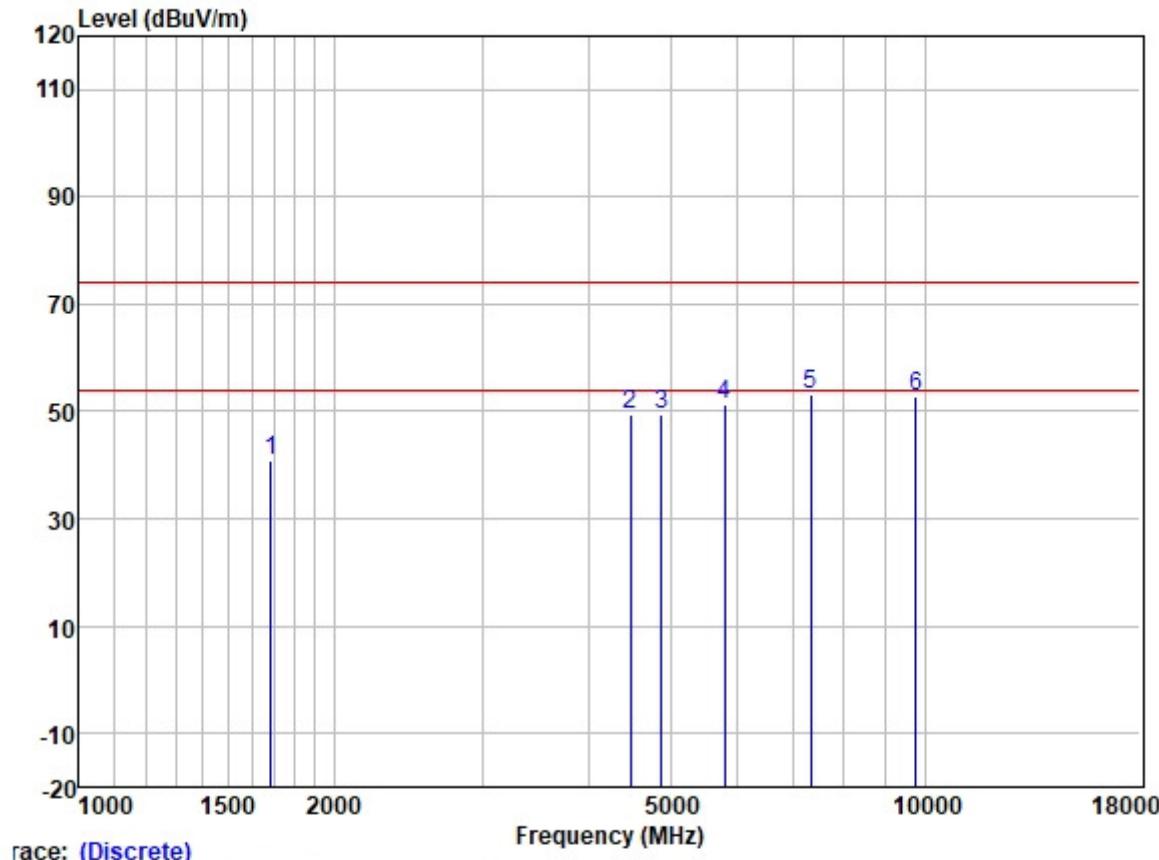


Table showing the measured data for each point:

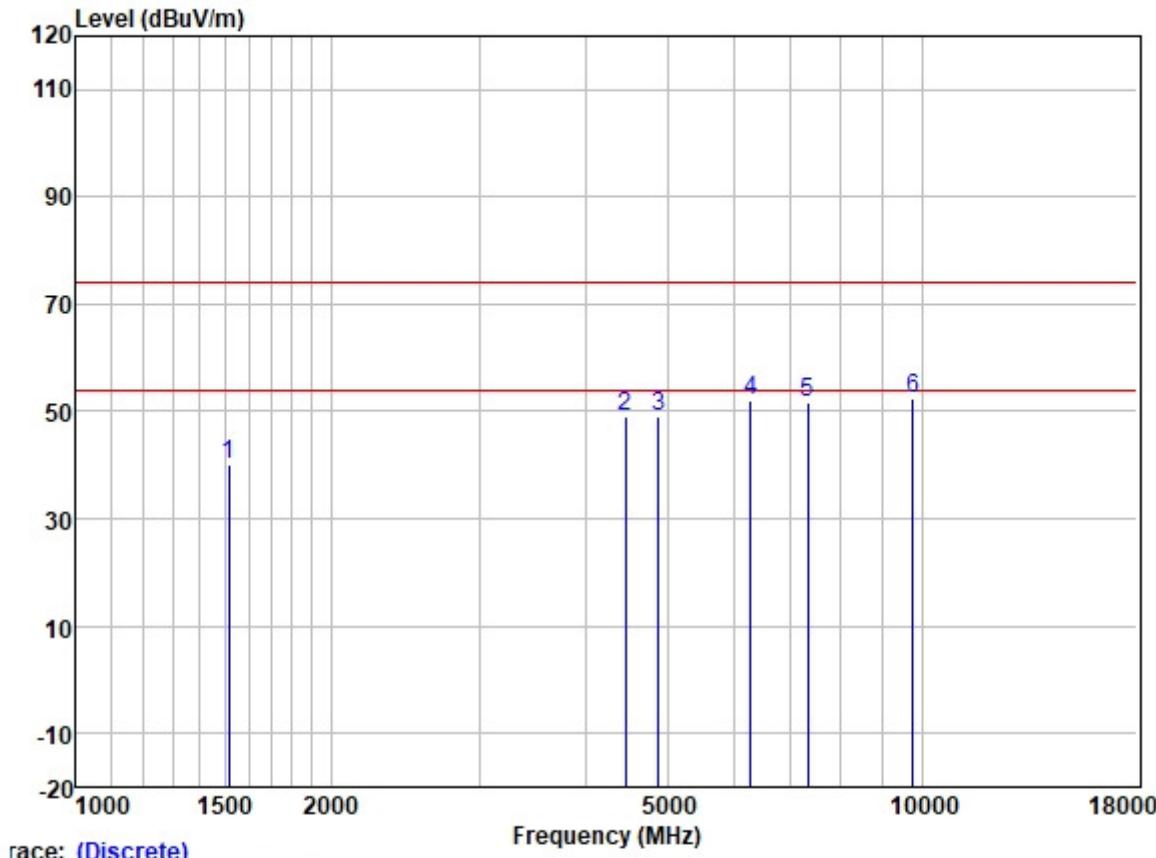
Point	Frequency (MHz)	ReadAntenna		Cable		Preamp	Limit	Over	Over	Over	Remark
		Freq	Level	Factor	Loss						
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	dB	
1	1687.347	50.15	25.69	2.80	37.91	40.73	74.00	-33.27	HORIZONTAL	Peak	
2	4482.150	50.43	30.78	4.99	36.81	49.39	74.00	-24.61	HORIZONTAL	Peak	
3	4882.000	49.08	31.56	5.52	36.84	49.32	74.00	-24.68	HORIZONTAL	Peak	
4	5797.032	49.90	32.19	6.10	36.89	51.30	74.00	-22.70	HORIZONTAL	Peak	
5	7323.000	48.30	36.00	6.13	37.43	53.00	74.00	-21.00	HORIZONTAL	Peak	
6	9764.000	44.56	38.50	7.02	37.41	52.67	74.00	-21.33	HORIZONTAL	Peak	

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



Mode: (Discrete)

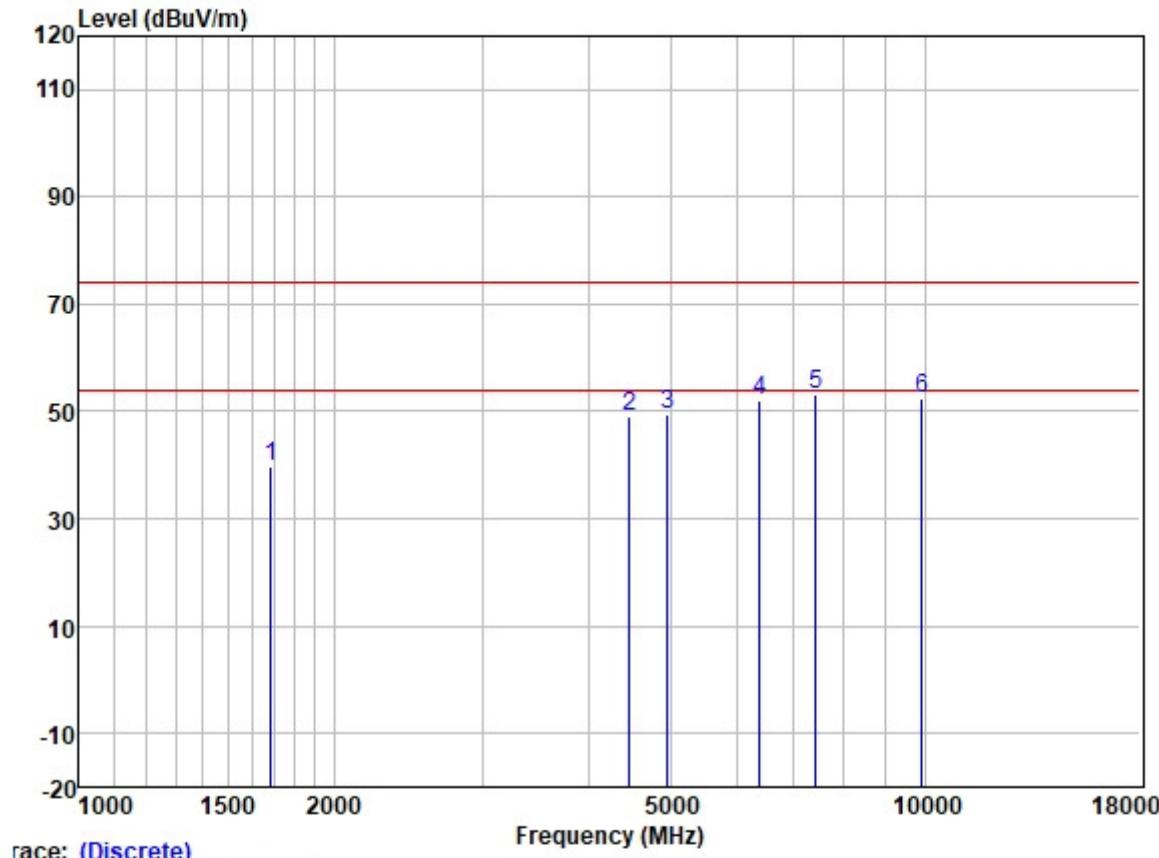
Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1	1516.210	49.69	25.51	2.80	38.07	39.93	74.00	-34.07	VERTICAL	Peak	
2	4456.315	50.40	30.75	4.88	36.81	49.22	74.00	-24.78	VERTICAL	Peak	
3	4882.000	48.94	31.56	5.52	36.84	49.18	74.00	-24.82	VERTICAL	Peak	
4	6267.553	49.88	33.29	6.00	36.95	52.22	74.00	-21.78	VERTICAL	Peak	
5	7323.000	46.87	36.00	6.13	37.43	51.57	74.00	-22.43	VERTICAL	Peak	
6	9764.000	44.44	38.50	7.02	37.41	52.55	74.00	-21.45	VERTICAL	Peak	

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



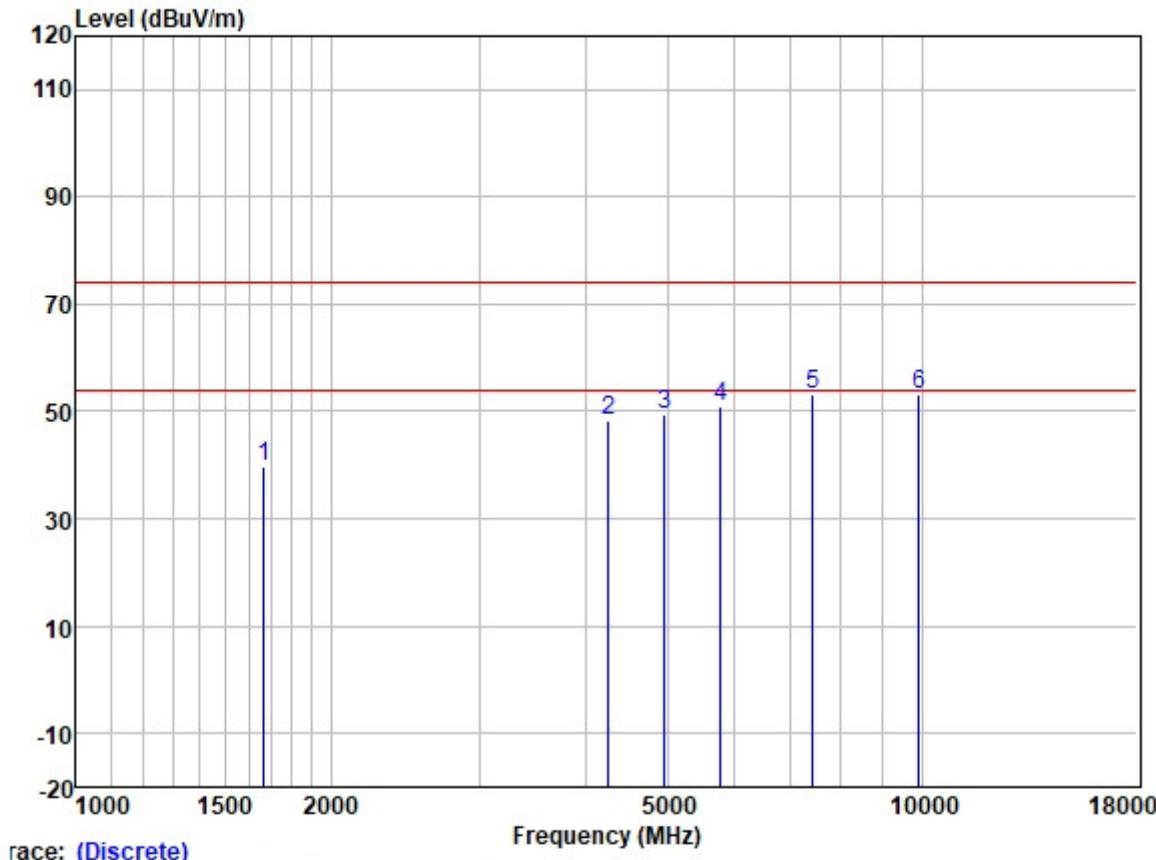
Trace: (Discrete)	ReadAntenna						Limit	Over	Pol/Phase	Remark
	Freq	Level	Antenna	Cable	Preamp	Loss				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1687.347	49.21	25.69	2.80	37.91	39.79	74.00	-34.21	HORIZONTAL	Peak
2	4469.214	50.32	30.77	4.93	36.81	49.21	74.00	-24.79	HORIZONTAL	Peak
3	4960.000	48.95	31.65	5.65	36.84	49.41	74.00	-24.59	HORIZONTAL	Peak
4	6377.195	49.35	33.68	5.91	36.98	51.96	74.00	-22.04	HORIZONTAL	Peak
5	7440.000	48.03	36.27	6.22	37.47	53.05	74.00	-20.95	HORIZONTAL	Peak
6	9920.000	44.40	38.65	6.96	37.40	52.61	74.00	-21.39	HORIZONTAL	Peak

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



Trace: (Discrete)	ReadAntenna		Cable		Preamp		Limit	Over	Over	Over	Remark
	Freq	Level	Factor	Loss	Factor	Level					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	dB	
1	1667.951	49.30	25.66	2.80	37.91	39.85	74.00	-34.15	VERTICAL	Peak	
2	4254.921	50.17	30.34	4.62	36.81	48.32	74.00	-25.68	VERTICAL	Peak	
3	4960.000	48.94	31.65	5.65	36.84	49.40	74.00	-24.60	VERTICAL	Peak	
4	5780.300	49.69	32.16	6.10	36.89	51.06	74.00	-22.94	VERTICAL	Peak	
5	7440.000	48.30	36.27	6.22	37.47	53.32	74.00	-20.68	VERTICAL	Peak	
6	9920.000	44.92	38.65	6.96	37.40	53.13	74.00	-20.87	VERTICAL	Peak	

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for GZCR2108020932AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for GZCR2108020932AT



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10 Appendix

Left earbud

1. Bandwidth

1.1 OBW

1.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	Ant	99% Occupied Bandwidth (MHz)	Verdict
					Result	
GFSK	SISO	2402	DH5	1	0.937	Pass
		2441	DH5	1	0.929	Pass
		2480	DH5	1	0.920	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.124	Pass
		2441	2DH5	1	1.125	Pass
		2480	2DH5	1	1.126	Pass
8DPSK	SISO	2402	3DH5	1	1.135	Pass
		2441	3DH5	1	1.135	Pass
		2480	3DH5	1	1.138	Pass

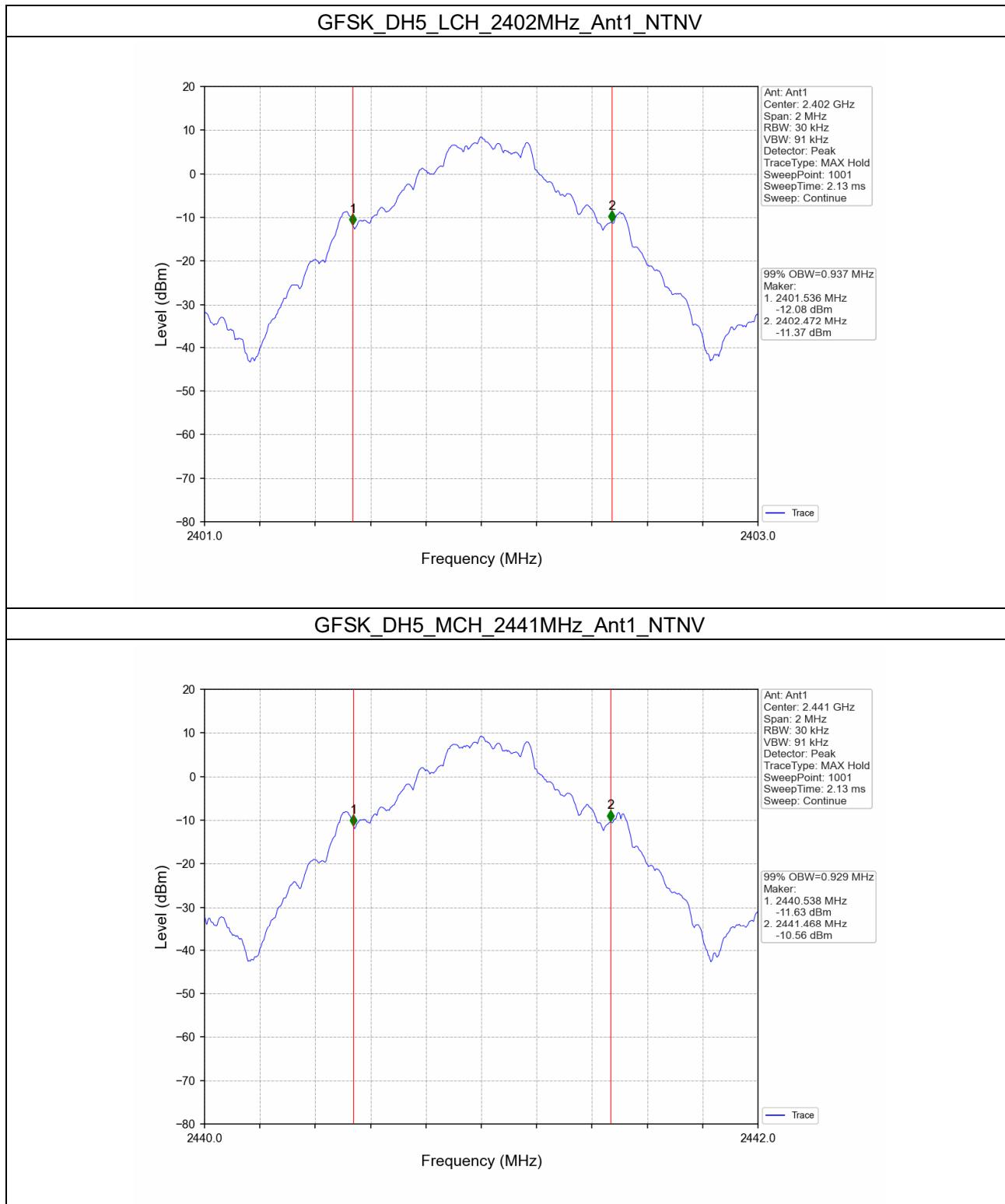
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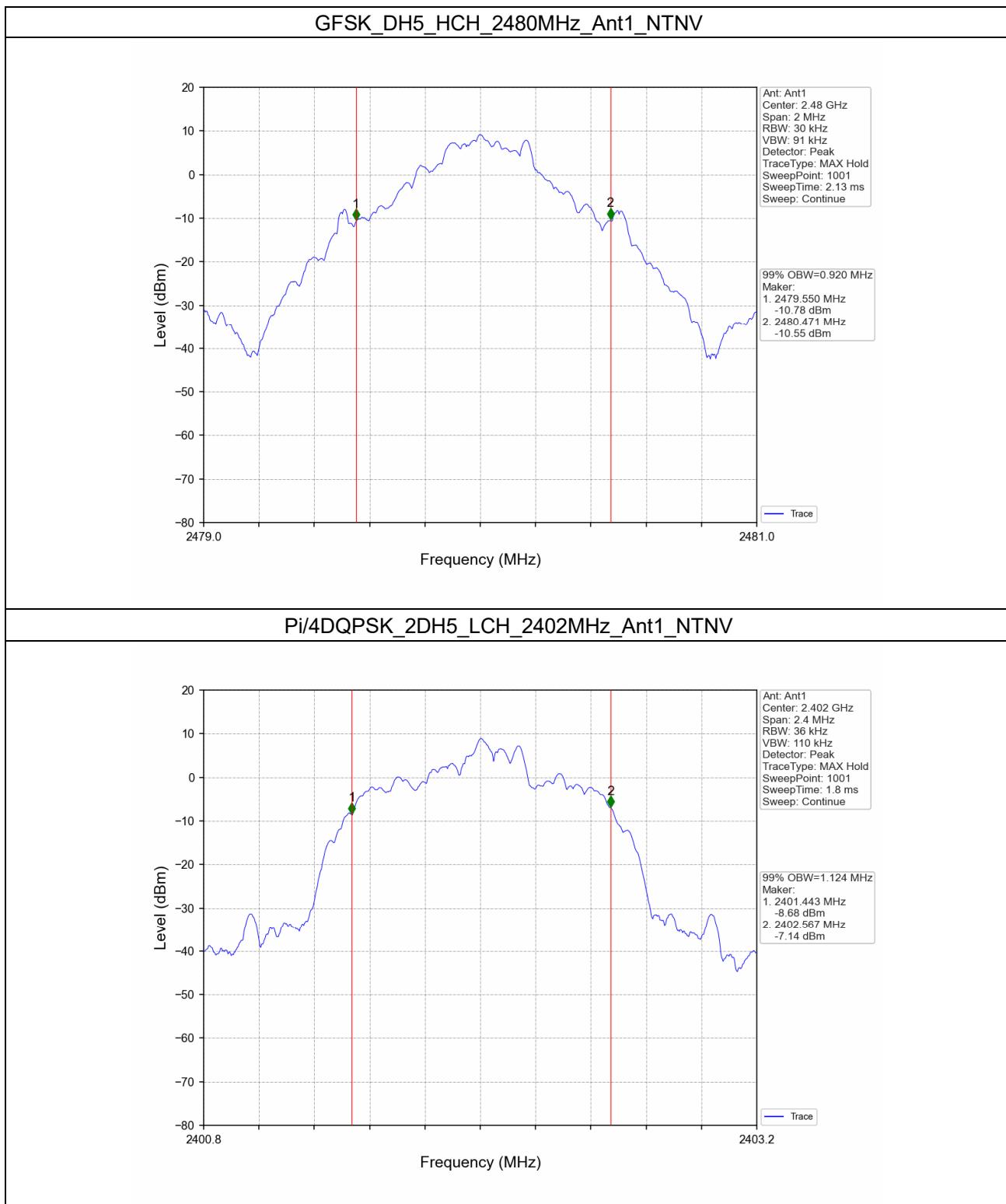
1.1.2 Test Graph



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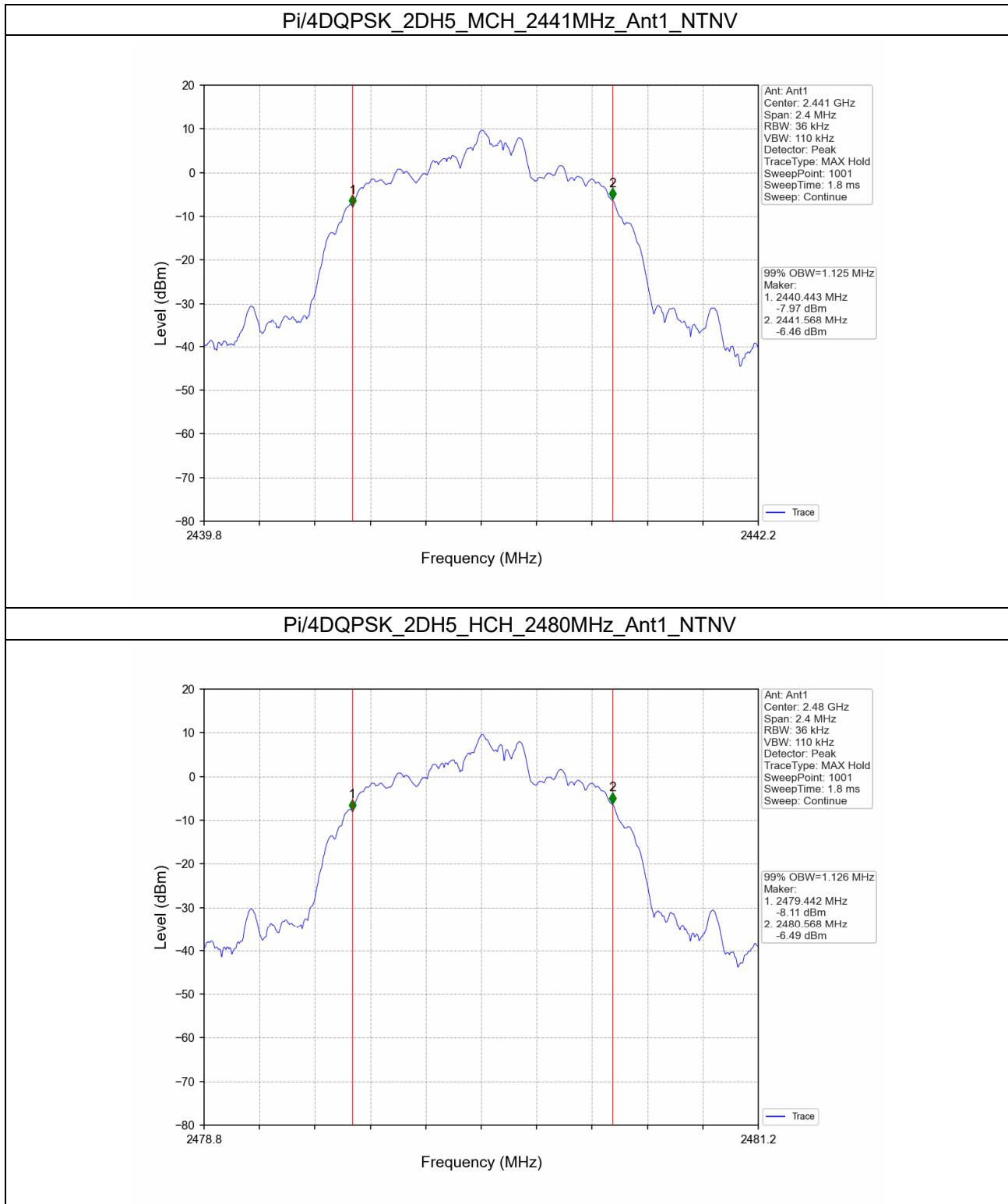


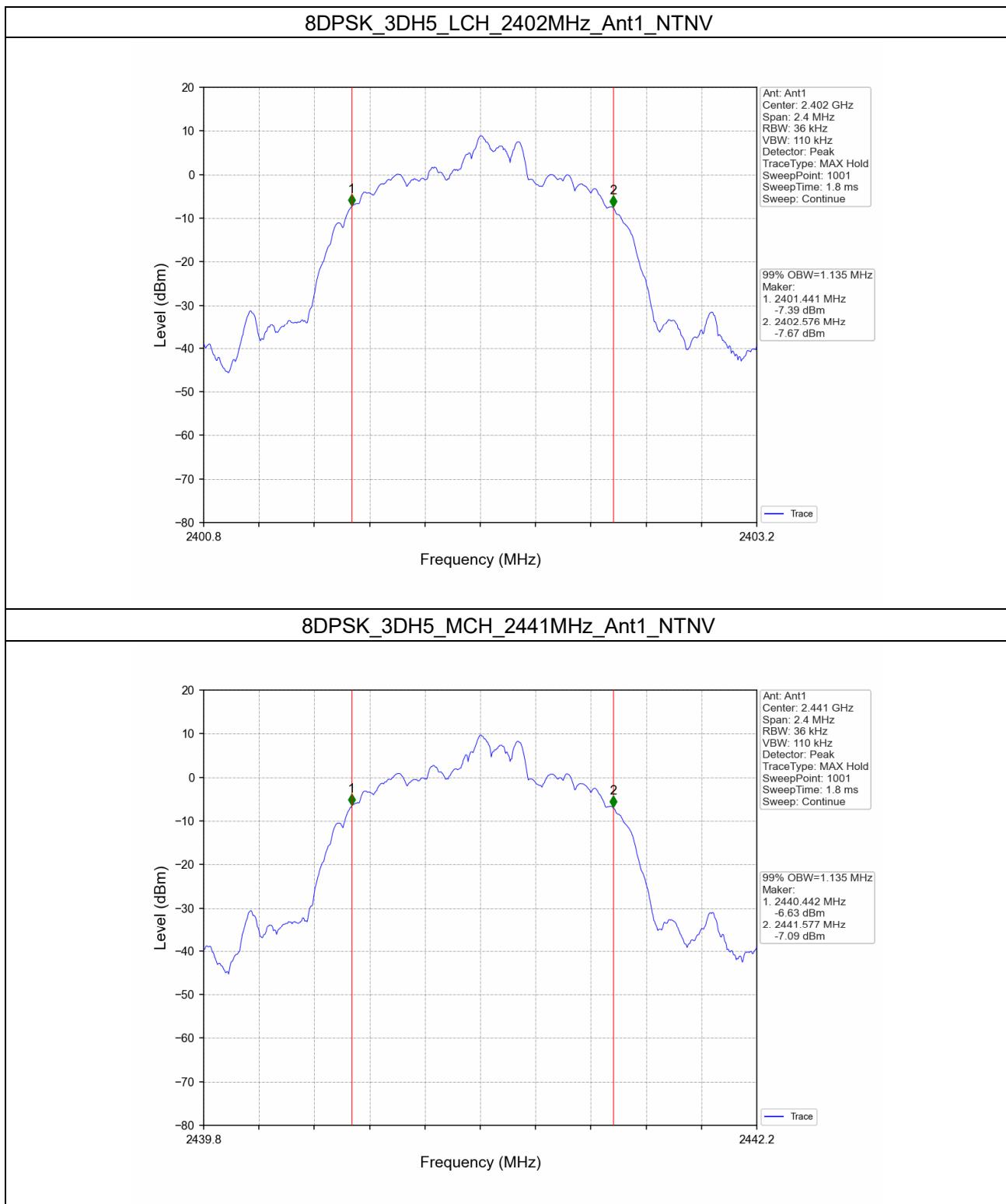


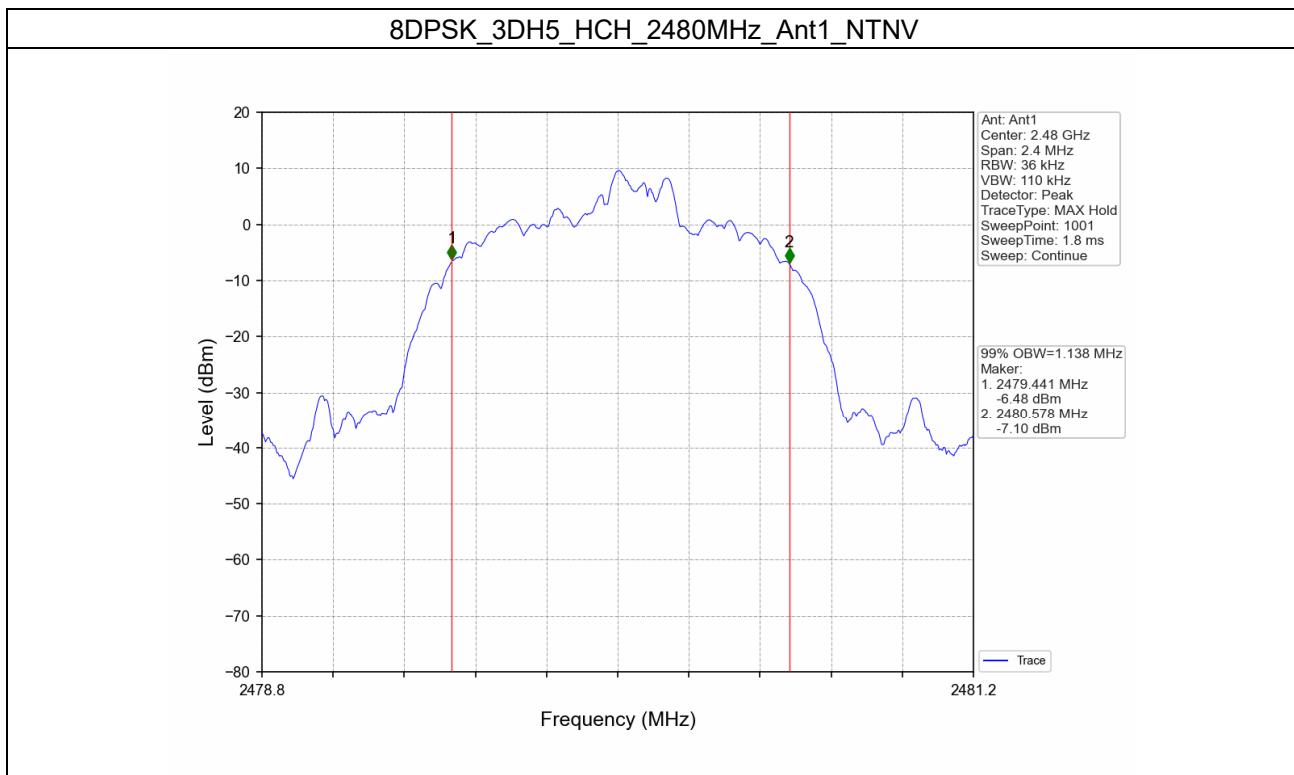
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1.2 20dB BW

1.2.1 Test Result

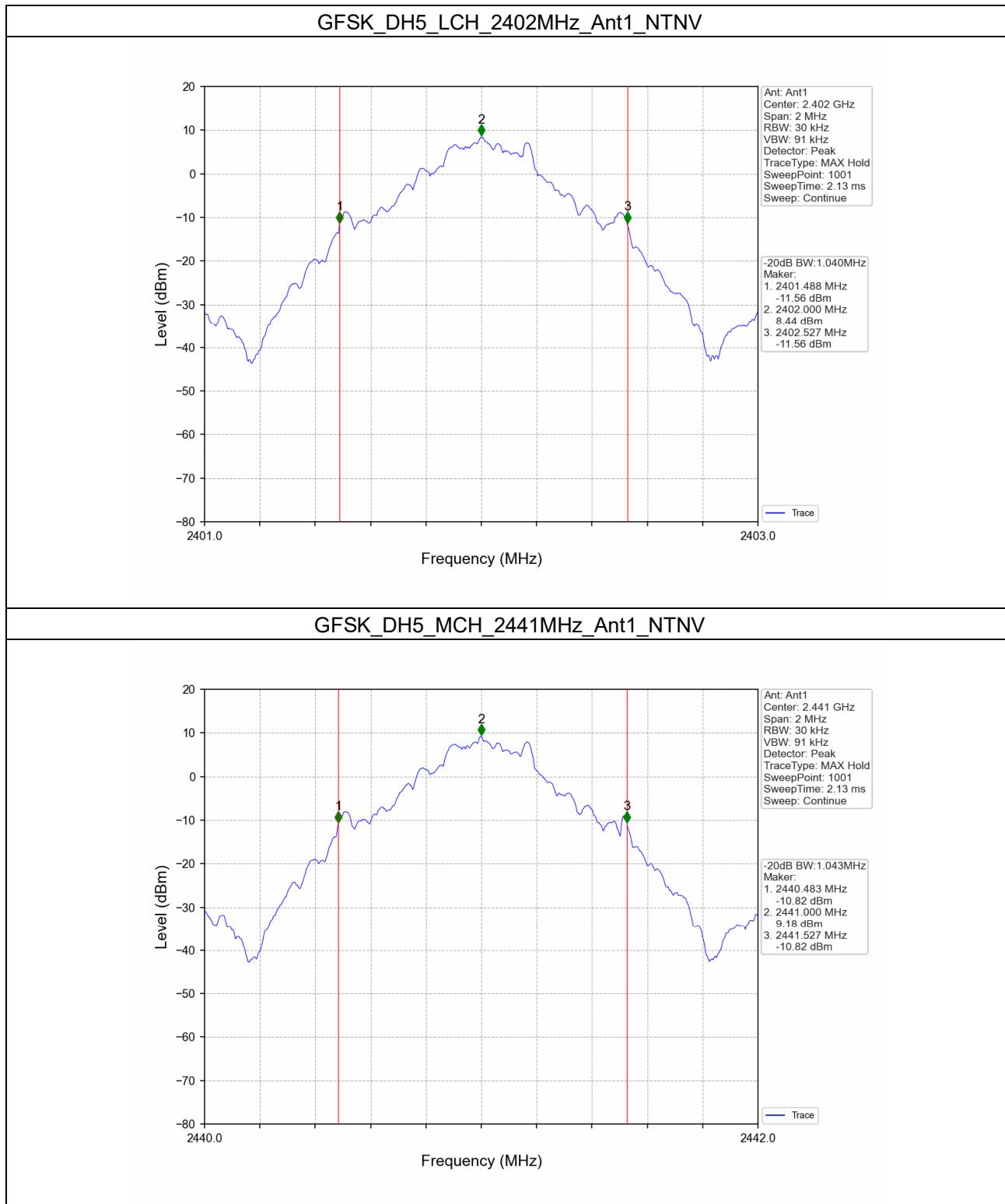
Mode	TX Type	Frequency (MHz)	Packet Type	Ant	20dB Bandwidth (MHz)	Verdict
					Result	
GFSK	SISO	2402	DH5	1	1.040	Pass
		2441	DH5	1	1.043	Pass
		2480	DH5	1	1.045	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.204	Pass
		2441	2DH5	1	1.207	Pass
		2480	2DH5	1	1.202	Pass
8DPSK	SISO	2402	3DH5	1	1.214	Pass
		2441	3DH5	1	1.248	Pass
		2480	3DH5	1	1.241	Pass

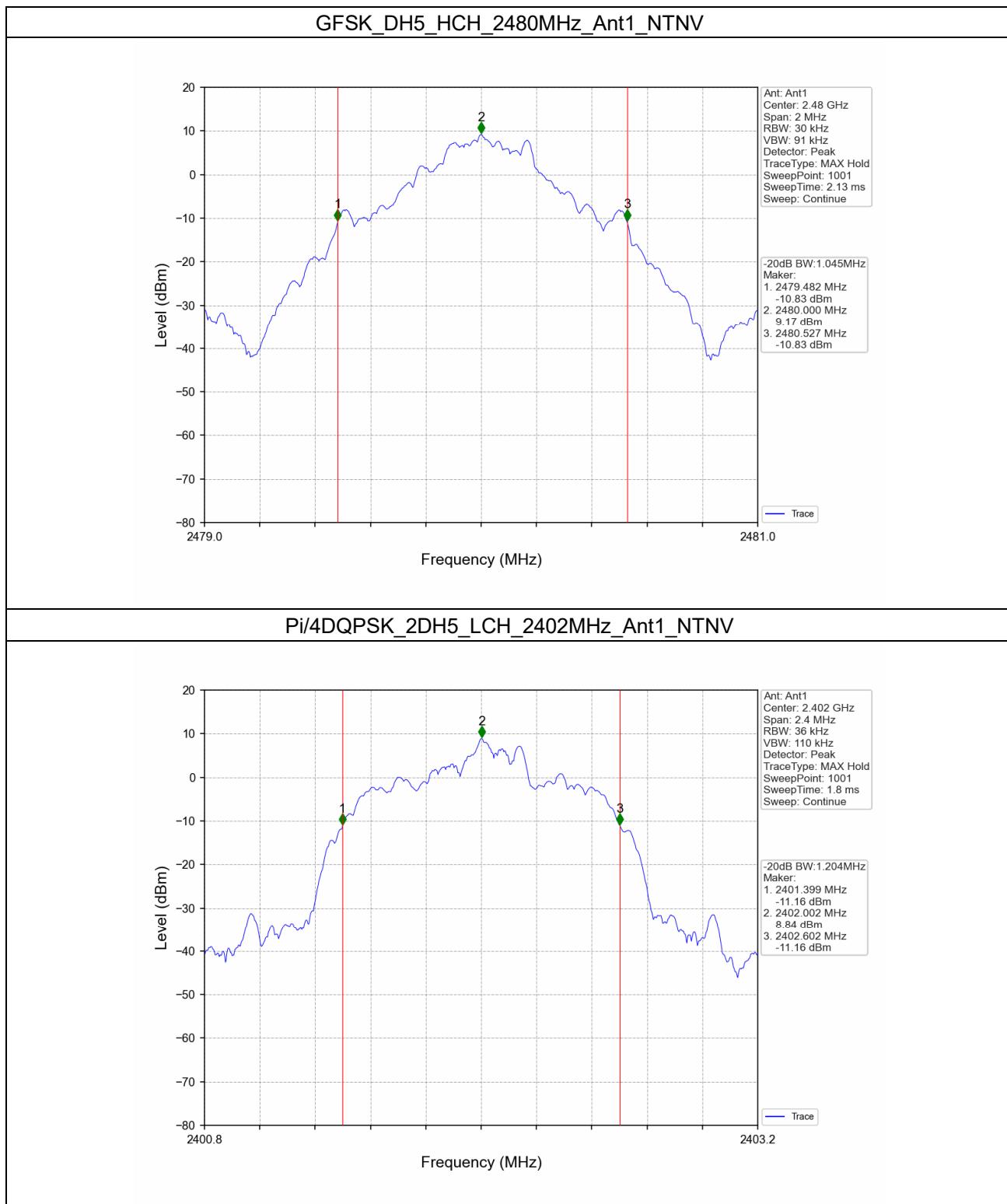
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1.2.2 Test Graph



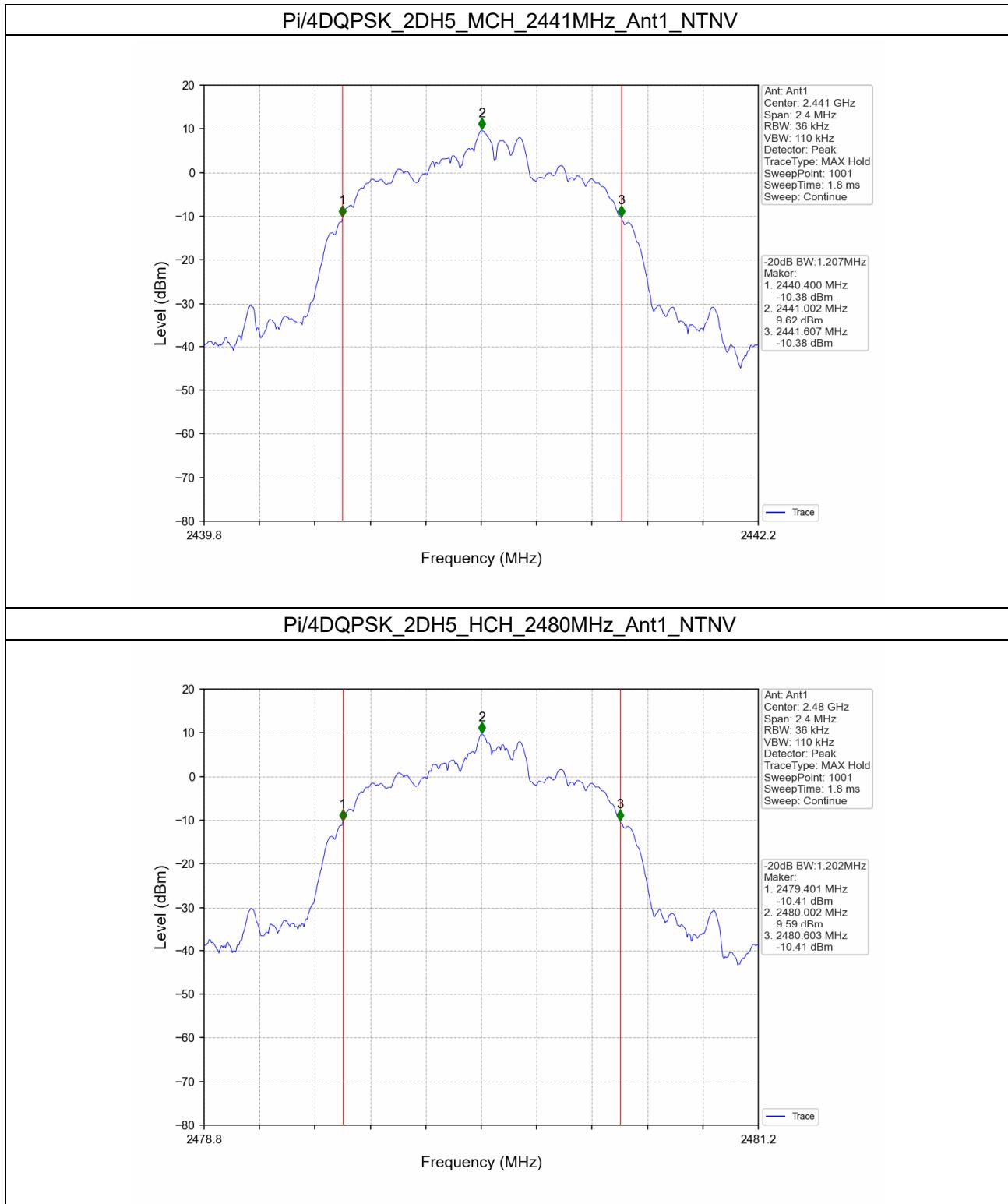


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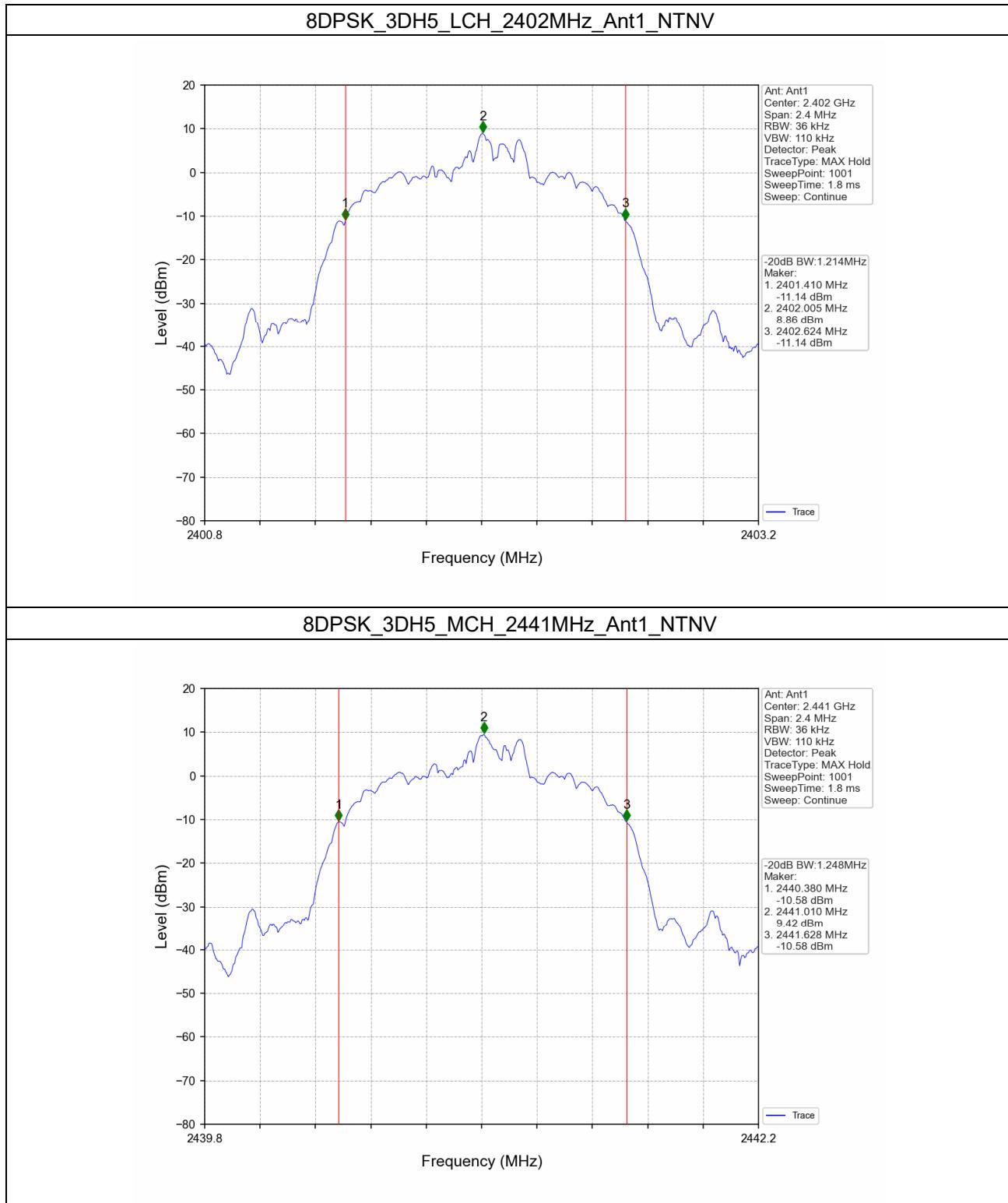


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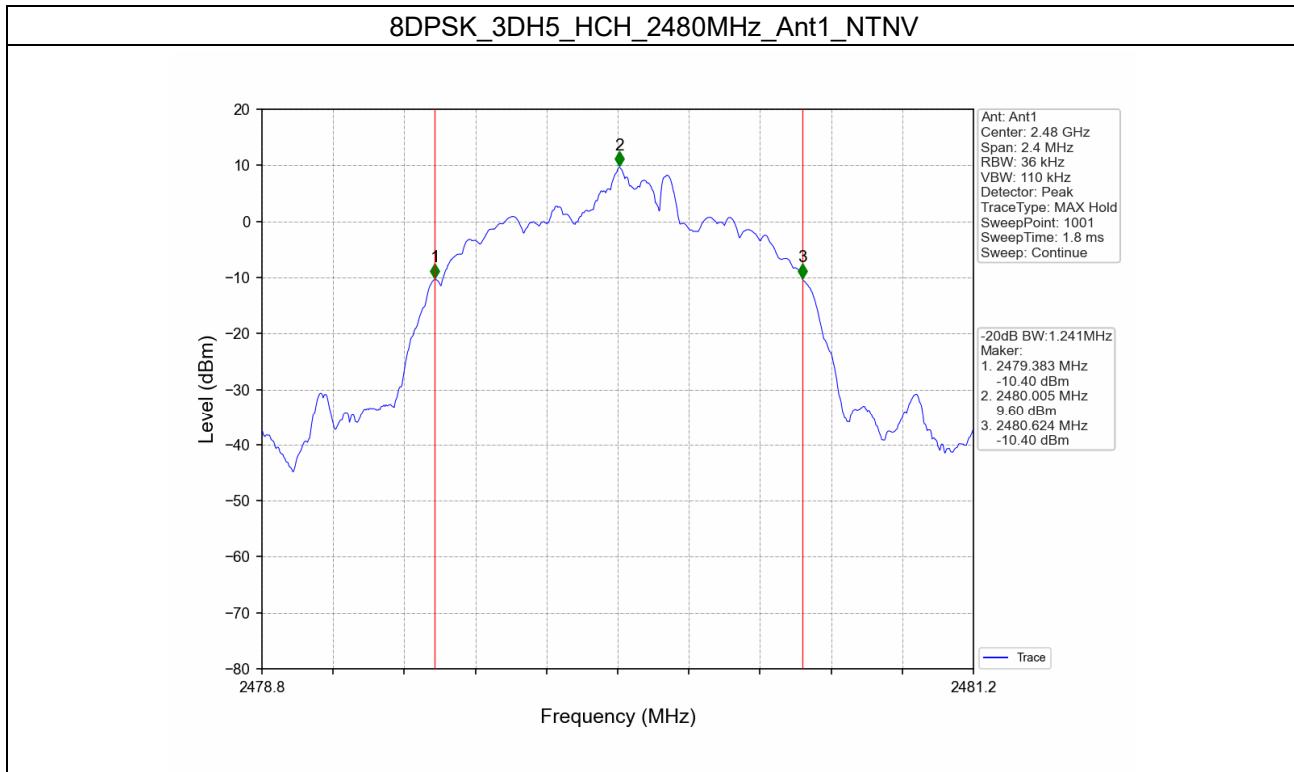


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2. Maximum Conducted Output Power

2.1 Power

2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	Maximum Peak Conducted Output Power (dBm)		Verdict
				Ant1	Limit	
GFSK	SISO	2402	DH5	9.68	<=20.97	Pass
		2441	DH5	10.49	<=20.97	Pass
		2480	DH5	10.43	<=20.97	Pass
Pi/4DQPSK	SISO	2402	2DH5	9.66	<=20.97	Pass
		2441	2DH5	10.47	<=20.97	Pass
		2480	2DH5	10.46	<=20.97	Pass
8DPSK	SISO	2402	3DH5	9.65	<=20.97	Pass
		2441	3DH5	10.46	<=20.97	Pass
		2480	3DH5	10.45	<=20.97	Pass

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3. Carrier Frequency Separation

3.1 Ant1

3.1.1 Test Result

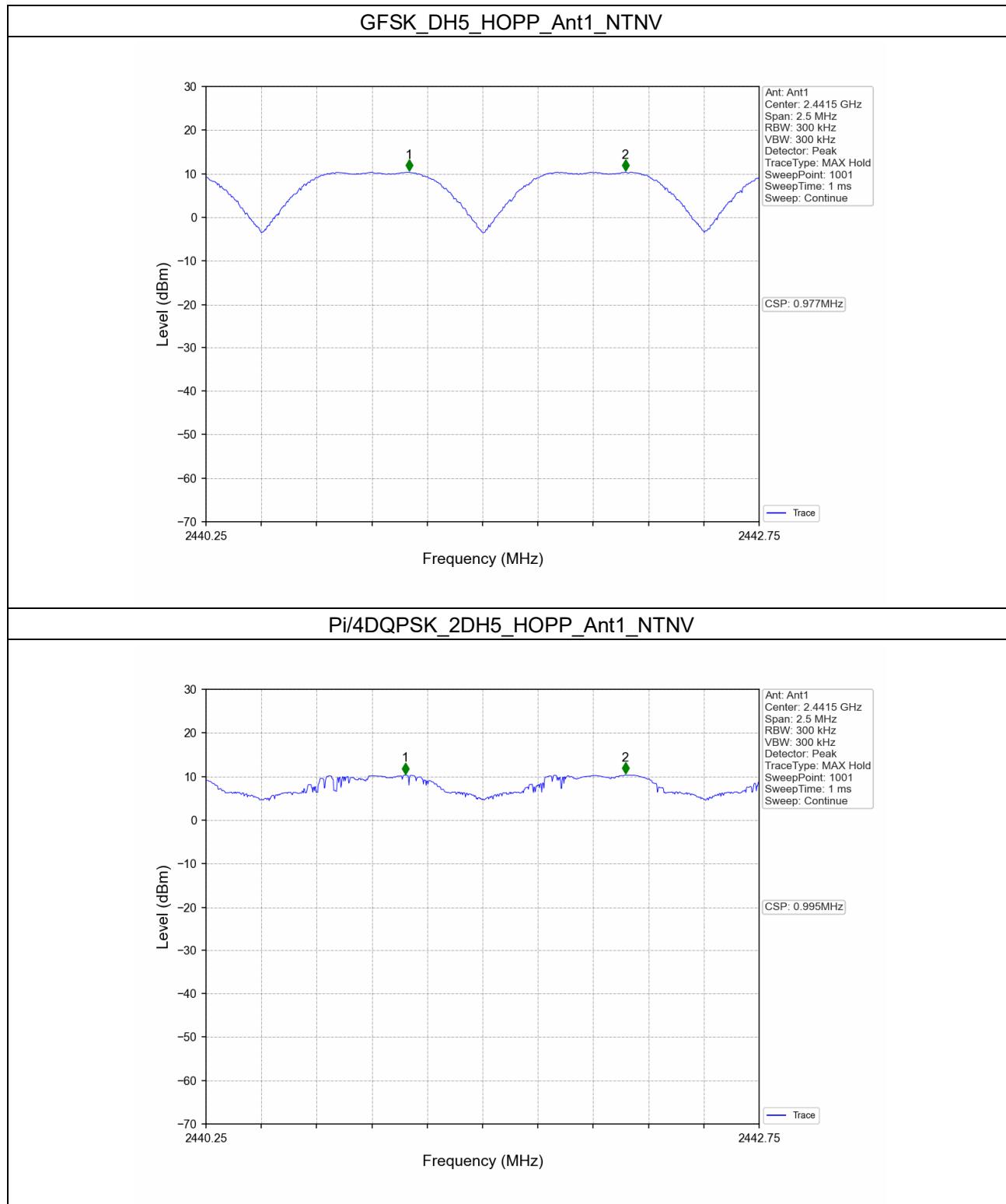
Ant1							
Mode	TX Type	Frequency (MHz)	Packet Type	Channel Separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	SISO	HOPP	DH5	0.977	1.045	>=0.697	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	0.995	1.207	>=0.805	Pass
8DPSK	SISO	HOPP	3DH5	0.992	1.248	>=0.832	Pass

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3.1.2 Test Graph

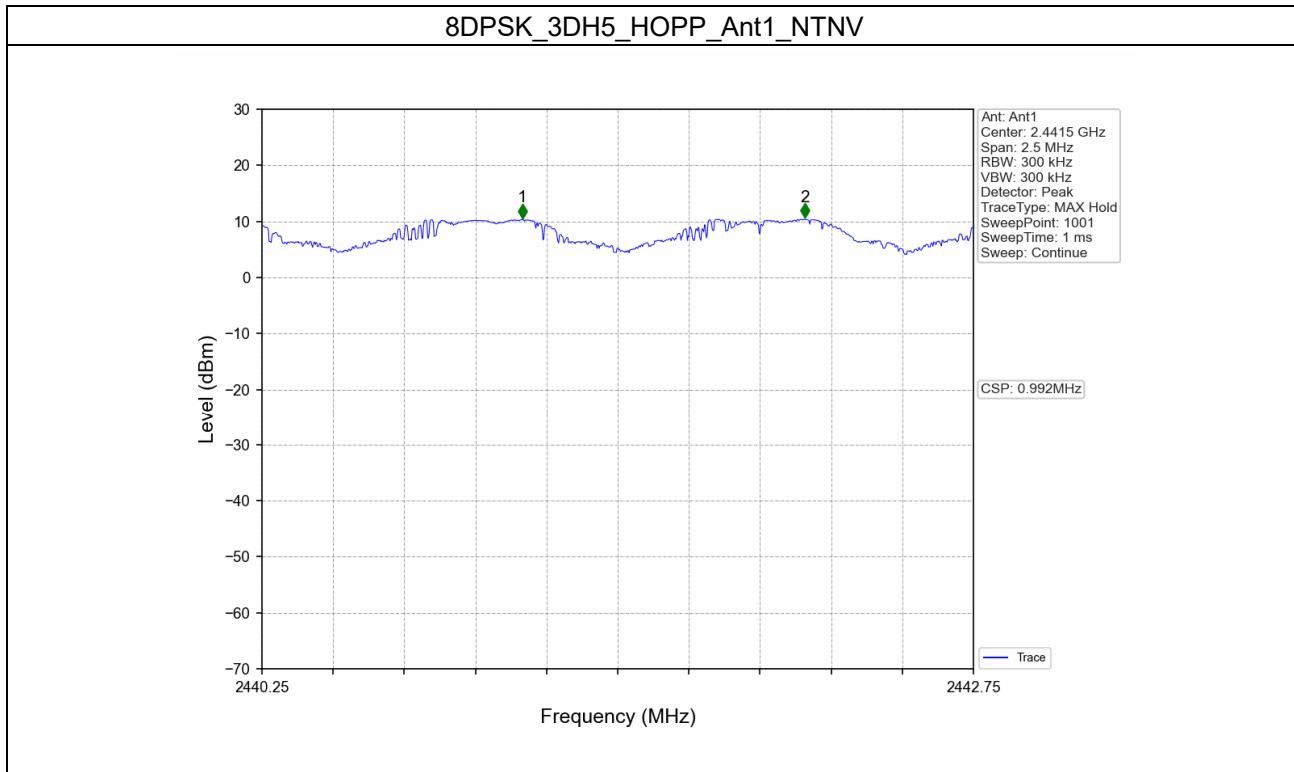


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4. Number of Hopping Frequencies

4.1 HoppNum

4.1.1 Test Result

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

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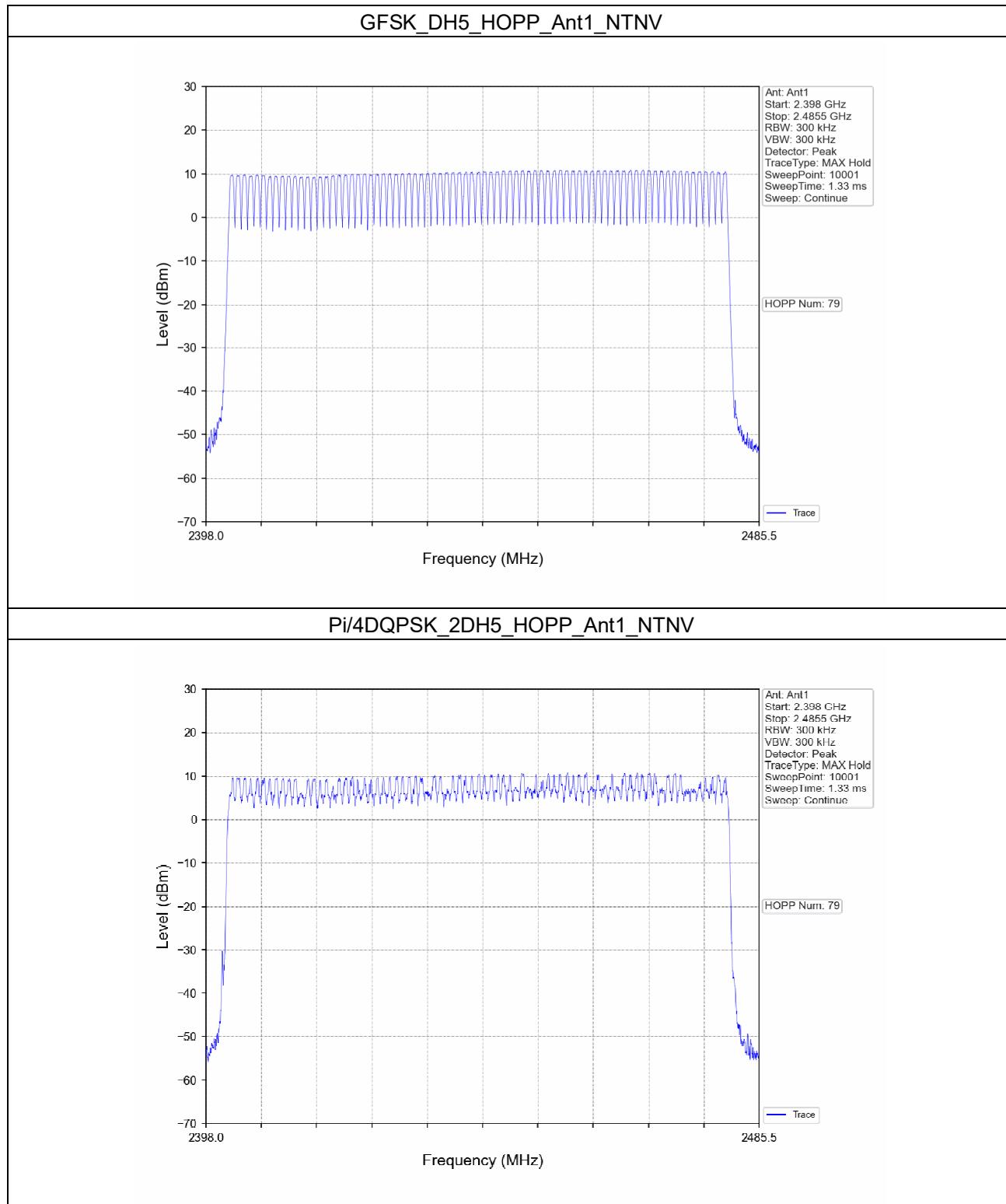
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4.1.2 Test Graph

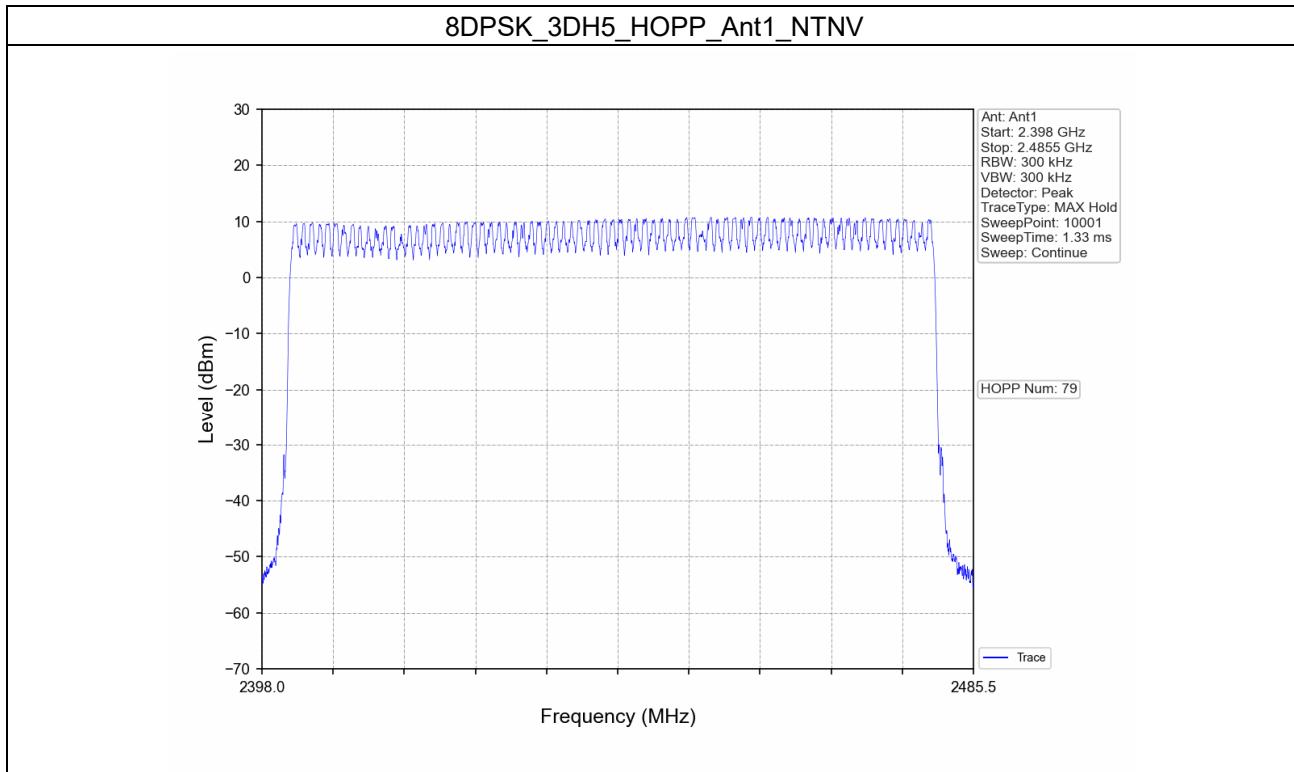


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5. Time of Occupancy (Dwell Time)

5.1 Ant1

5.1.1 Test Result

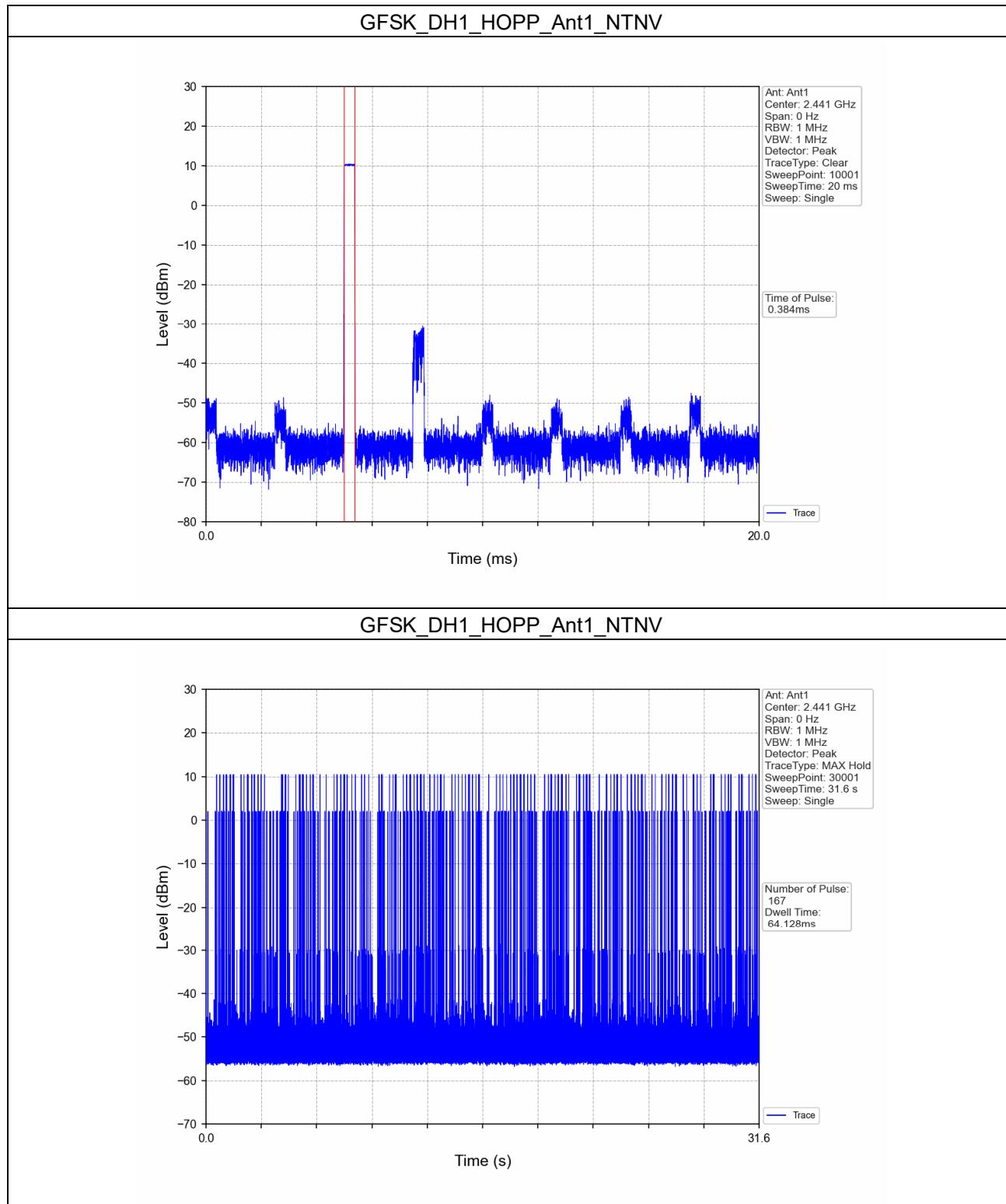
Ant1									
Mode	TX Type	Frequency (MHz)	Packet Type	Duration of Single Pulse (ms)	Observation Period (s)	Num of Pulse in Observation Period	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	SISO	HOPP	DH1	0.384	31.600	167	64.128	<=400	Pass
			DH3	1.638	31.600	116	190.008	<=400	Pass
			DH5	2.886	31.600	80	230.880	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.394	31.600	167	65.798	<=400	Pass
			2DH3	1.644	31.600	115	189.060	<=400	Pass
			2DH5	2.894	31.600	74	214.156	<=400	Pass
8DPSK	SISO	HOPP	3DH1	0.394	31.600	170	66.980	<=400	Pass
			3DH3	1.644	31.600	110	180.840	<=400	Pass
			3DH5	2.894	31.600	81	234.414	<=400	Pass

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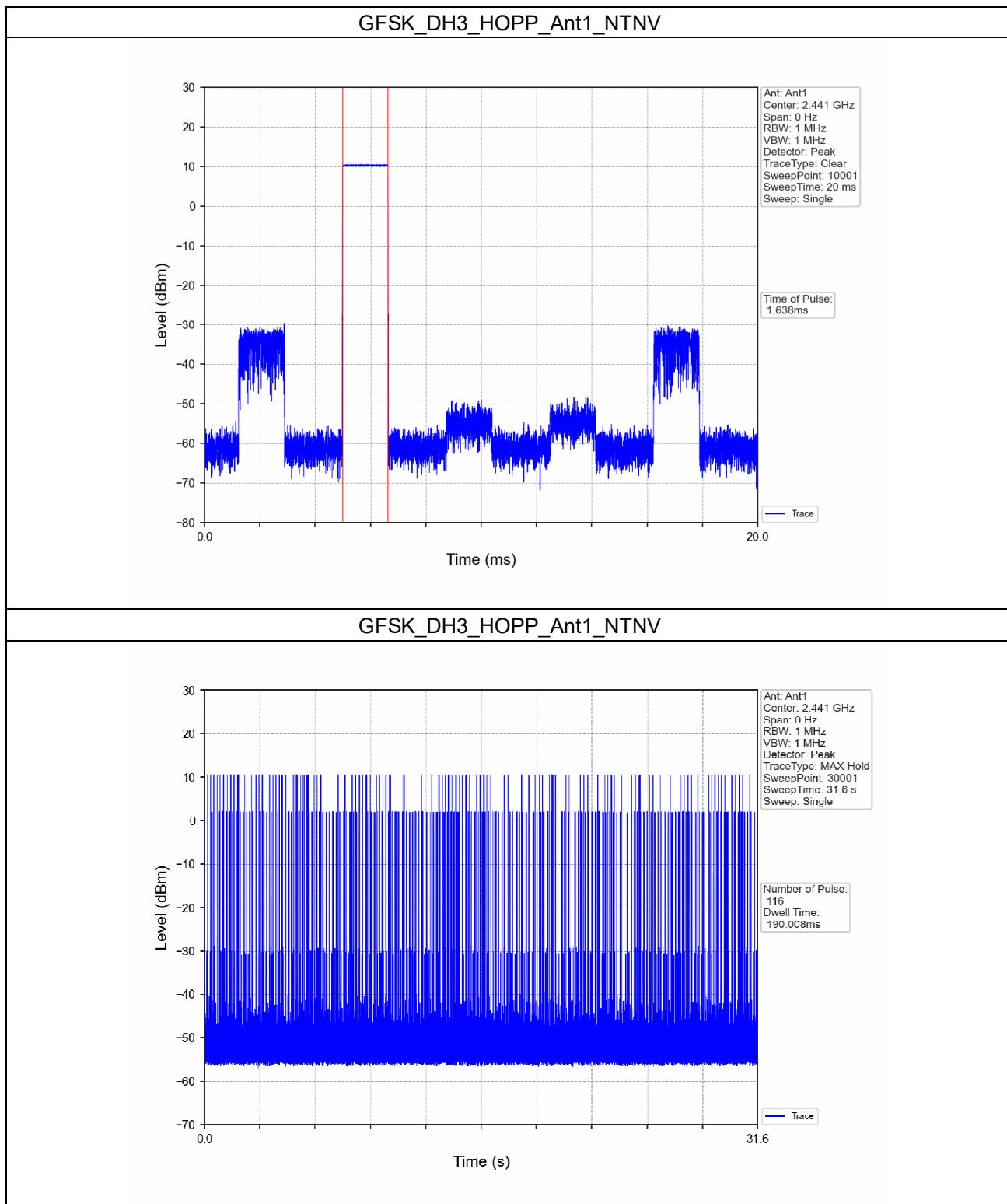
5.1.2 Test Graph



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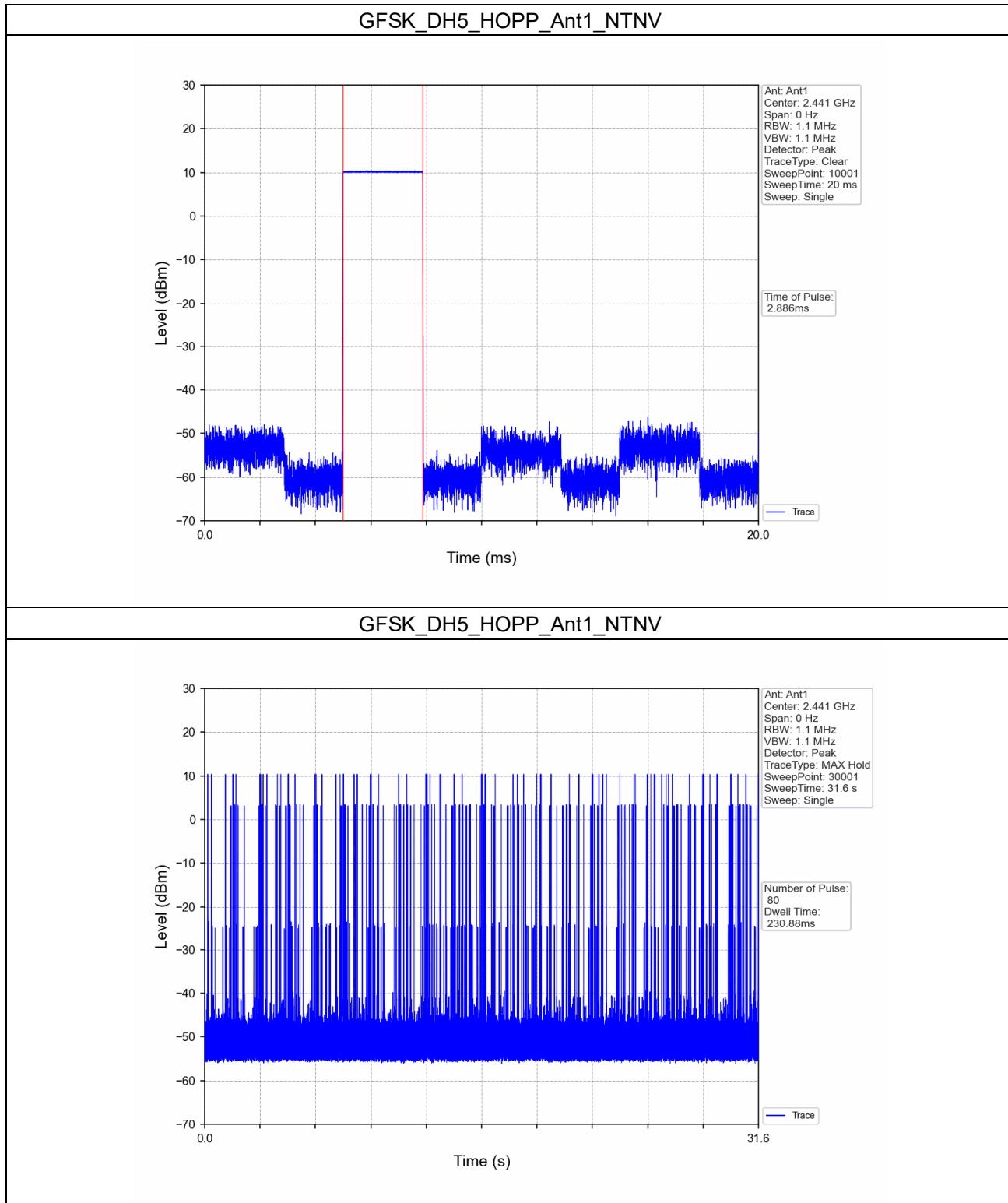


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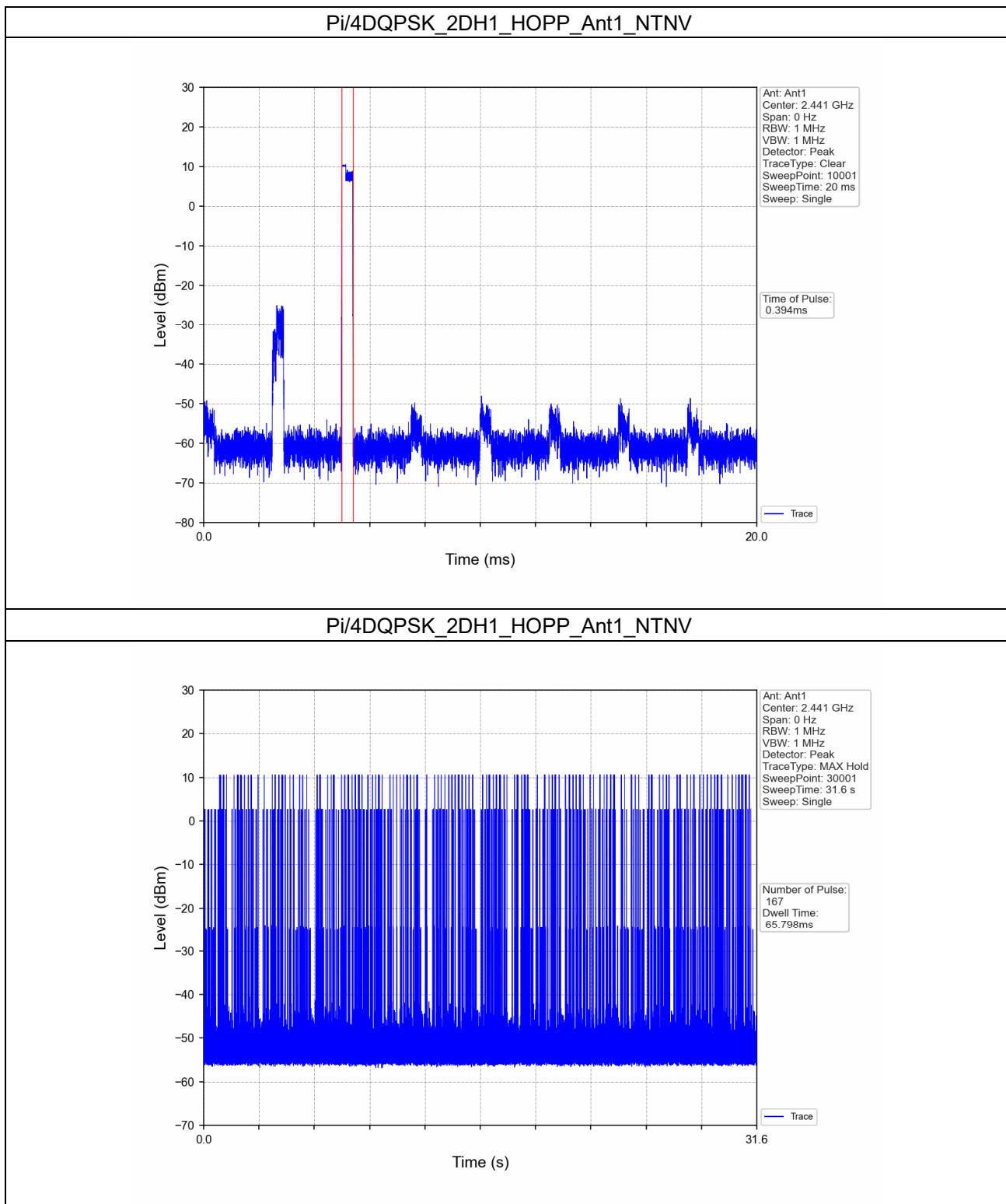


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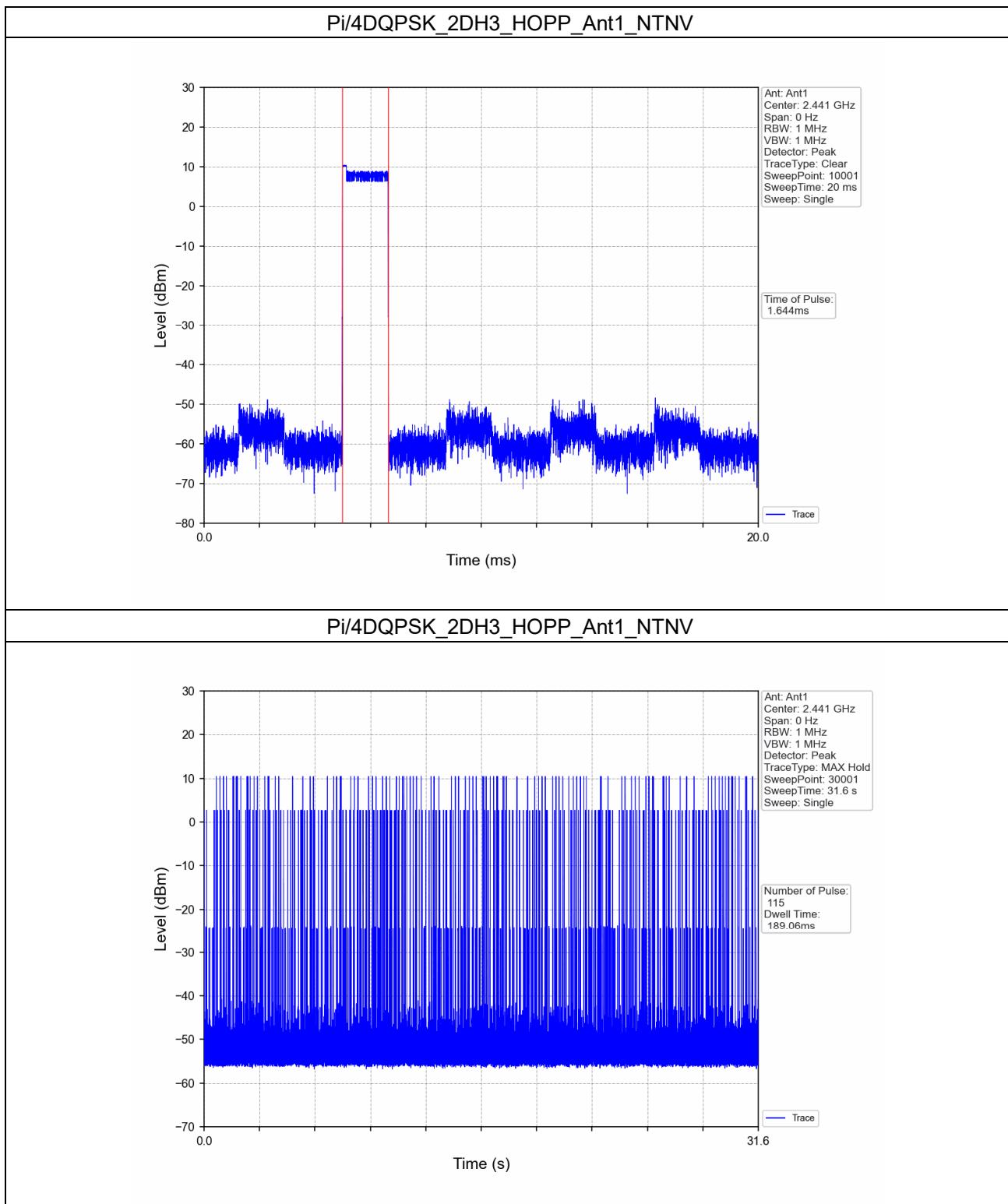
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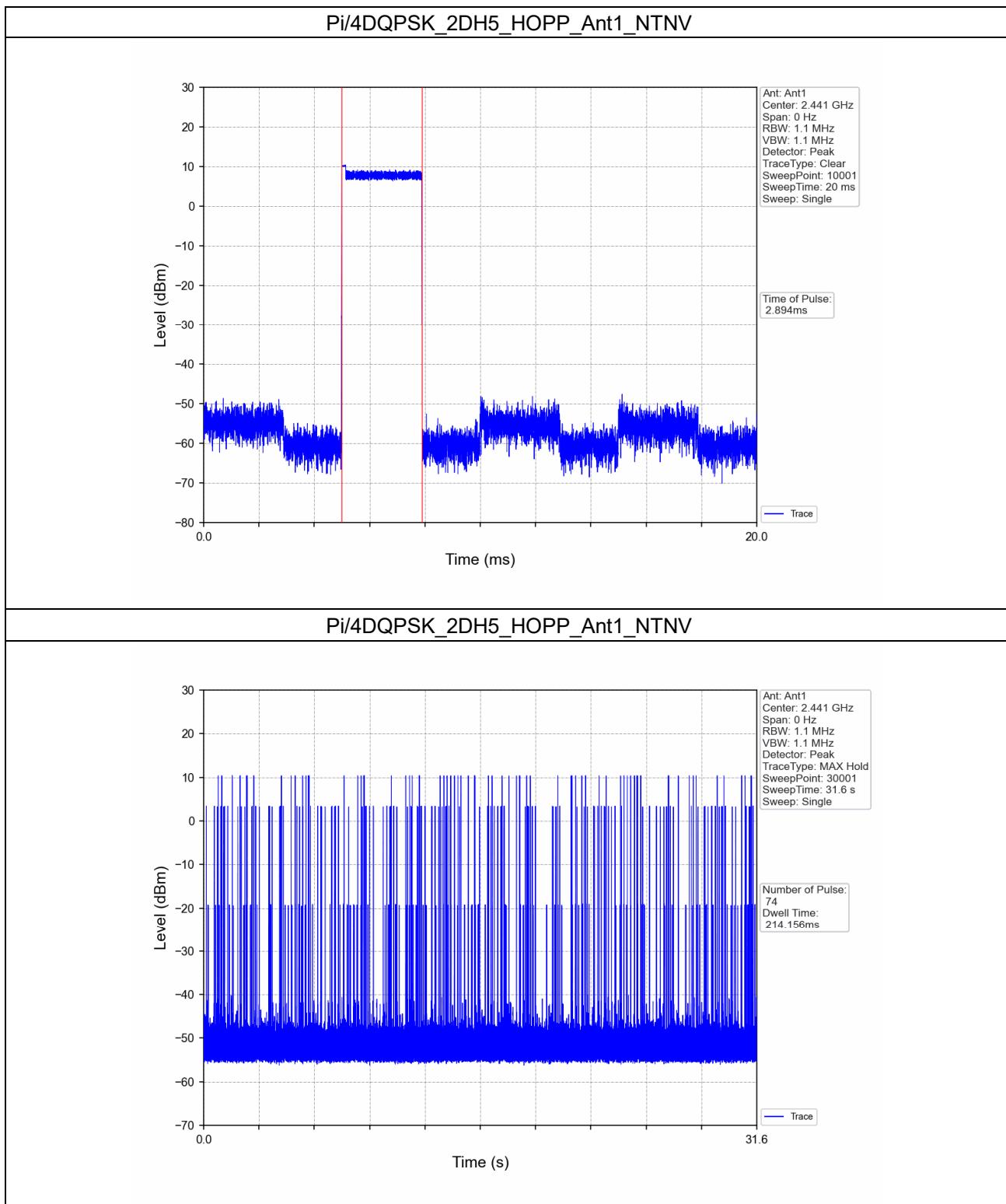


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