TEST REPORT

Application No.:	GZCR2206000711AT
Applicant:	Harman International Industries, Inc
Address of Applicant:	8500 Balboa Boulevard, Northridge, California, 91329, United States
Manufacturer:	Harman International Industries, Inc
Address of Manufacturer:	8500 Balboa Boulevard, Northridge, California, 91329, United States
Factory:	Charter Media (Dongguan) Co., Ltd.
Address of Factory:	Dabandi Industrial Zone, Daning District, Humen Town, 523930 Dongguan City, Guangdong, China
Equipment Under Test (EUT):	
EUT Name:	Gaming Wireless Headset
Model No.:	QUANTUM910WIRELESS, QUANTUM910P CONSOLE WIRELESS ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	JBL
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2022-06-15
Date of Test:	2022-06-27 to 2022-08-09
Date of Issue:	2022-08-12
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		*2022-07-04*		*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 Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 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.

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Declaration of EUT Family Grouping:

Model No.: QUANTUM910WIRELESS, QUANTUM910P CONSOLE WIRELESS

Only the model QUANTUM910WIRELESS was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used, internal wiring and functions were identical for all the above models, with only difference on model No. and color.

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4 General Information

4.1 Details of E.U.T.

Power supply:	Rechargeable battery: 3.7V 1300mAh (Charged by adapter)
Cable(s):	Aux in cable: 1.25m unshielded
	USB cable: 2.2m shielded
	Calibration Microphone cable: 0.49m unshielded

BT

Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.2 Classic
Modulation Type:	GFSK, pi/4DQPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	Integral Antenna
Antenna Gain:	1.4dBi

2.4G property

Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, pi/4DQPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	Integral Antenna
Antenna Gain:	2.0dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	SAMSUNG	EP-TA200	PFTA200

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4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	±2.76dB
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	±5.00dB (30MHz-1GHz; 3m); ± 5.12dB (1GHz-6GHz); ± 5.38dB (6GHz-18GHz); ± 5.61dB (18GHz-40GHz)
Radiated Spurious Emissions (Below 1GHz)	±5.00dB (30MHz-1GHz; 3m); ±4.38dB (30MHz-1GHz; 10m);
Radiated Spurious Emissions (Above 1GHz)	± 5.12dB (1GHz-6GHz); ± 5.38dB (6GHz-18GHz); ± 5.61dB (18GHz-40GHz)
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:

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

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, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme 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 Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	N/A	N/A
Two-Line V-Network	Rohde & Schwarz	ENV216	EMC0118	2021-12-23	2022-12-22
Two-Line V-Network-GZ	Rohde & Schwarz	ENV216	EMC2135	2021-09-24	2022-09-23
Coaxial Cable	HangTianXing	2m	EMC0107	2020-09-09	2022-09-08
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A
EMI Test Receiver(9kHz-3.6GHz)	Rohde & Schwarz	ESR3	EMC2221	2022-05-20	2023-05-19

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	2022-05-16	2023-05-15
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Carrier Frequencies Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

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Hopping Channel Number					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Dwell Time					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

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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	2021-12-17	2022-12-16
Chamber cable(Above 1GHz)	Scoflex	KMKM-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	2021-12-17	2022-12-16
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
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	2021-11-01	2022-10-31
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	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
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2021-08-30	2022-08-29

Radiated Spurious Emissions (Below 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver(10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
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	2022-02-21	2025-02-20
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2022-06-21	2023-06-20
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2022-04-06	2024-04-05
High Pass Filter (915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2021-12-17	2022-12-16
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	2022-05-20	2023-05-19

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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	2021-12-17	2022-12-16
Chamber cable(Above 1GHz)	Scoflex	KMKM-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	2021-12-17	2022-12-16
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
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	2021-11-01	2022-10-31
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	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
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2021-08-30	2022-08-29

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2021-07-05 2022-07-03	2022-07-04 2023-07-02
DMM	Fluke	73	EMC0007	2021-07-05 2022-07-03	2022-07-04 2023-07-02

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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

15.203 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of 15.211, 15.213, 15.217, 15.219, 15.221, or 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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 use unique antenna connector to the main PCB and no consideration of replacement.
The best case gain of the antenna: 1.4dBi of Bluetooth and 2.0dBi of 2.4G property.
Antenna location: Refer to internal photo.

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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)

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: 29 -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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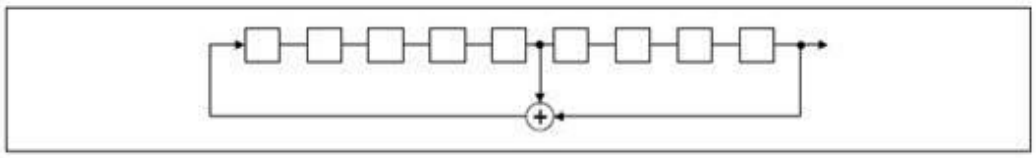
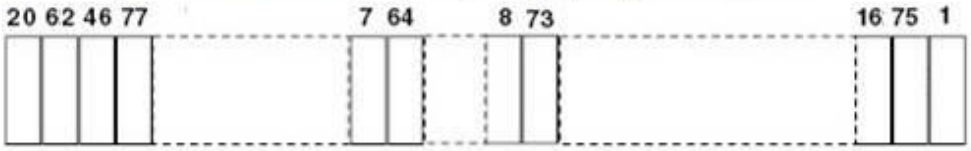


Linear Feedback Shift Register for Generation of the PRBS sequence

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

Test Requirement 47 CFR Part 15, Subpart C 15.207

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

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C Humidity: 46.9 % RH Atmospheric Pressure: 1003 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	Charge + TX_non-Hop mode(BT Chip)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	04	Charge + TX_non-Hop mode(2.4G property)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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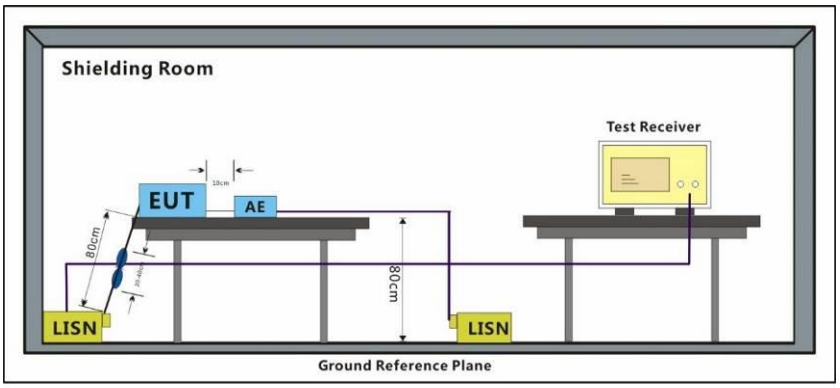
7.1.3 Test Setup Diagram



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: LISN=Read Level+ Cable Loss+ LISN Factor

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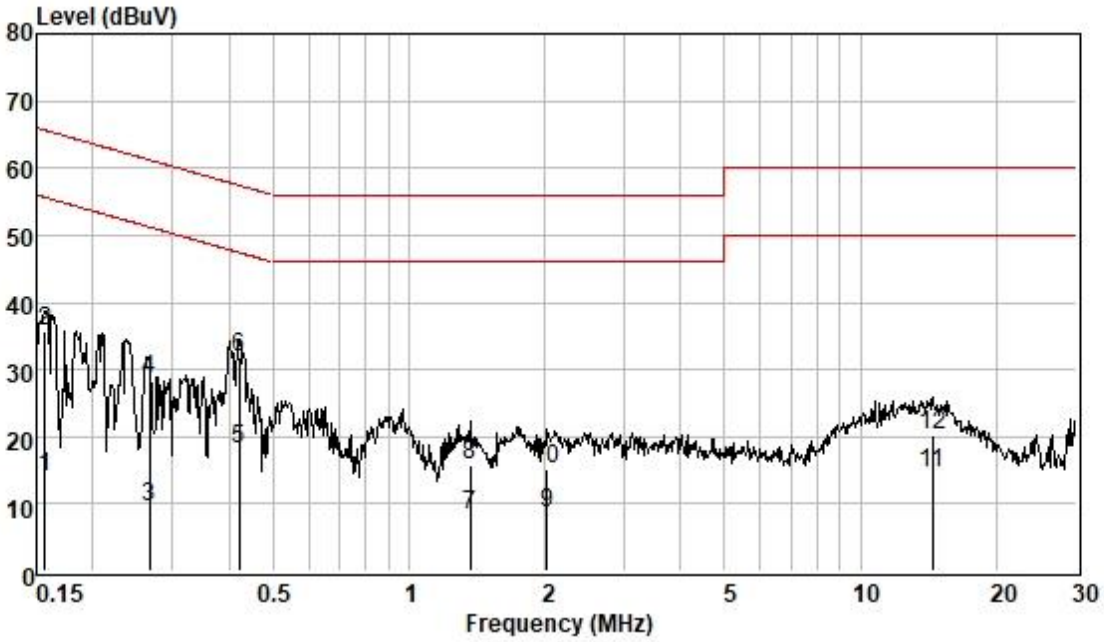
Test Mode: 01; Line: Live line



Pol :LINE
Mode :
Model :

	Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.156	4.32	0.06	9.54	13.92	55.65	-41.73	Average
2	0.156	26.04	0.06	9.54	35.64	65.65	-30.01	QP
3	0.267	-0.06	0.06	9.57	9.57	51.20	-41.63	Average
4	0.267	18.89	0.06	9.57	28.52	61.20	-32.68	QP
5	0.421	8.63	0.06	9.58	18.27	47.42	-29.15	Average
6	0.421	22.06	0.06	9.58	31.70	57.42	-25.72	QP
7	1.367	-1.24	0.09	9.60	8.45	46.00	-37.55	Average
8	1.367	6.16	0.09	9.60	15.85	56.00	-40.15	QP
9	2.023	-1.02	0.12	9.60	8.70	46.00	-37.30	Average
10	2.023	5.59	0.12	9.60	15.31	56.00	-40.69	QP
11	14.440	4.50	0.30	9.82	14.62	50.00	-35.38	Average
12	14.440	10.00	0.30	9.82	20.12	60.00	-39.88	QP

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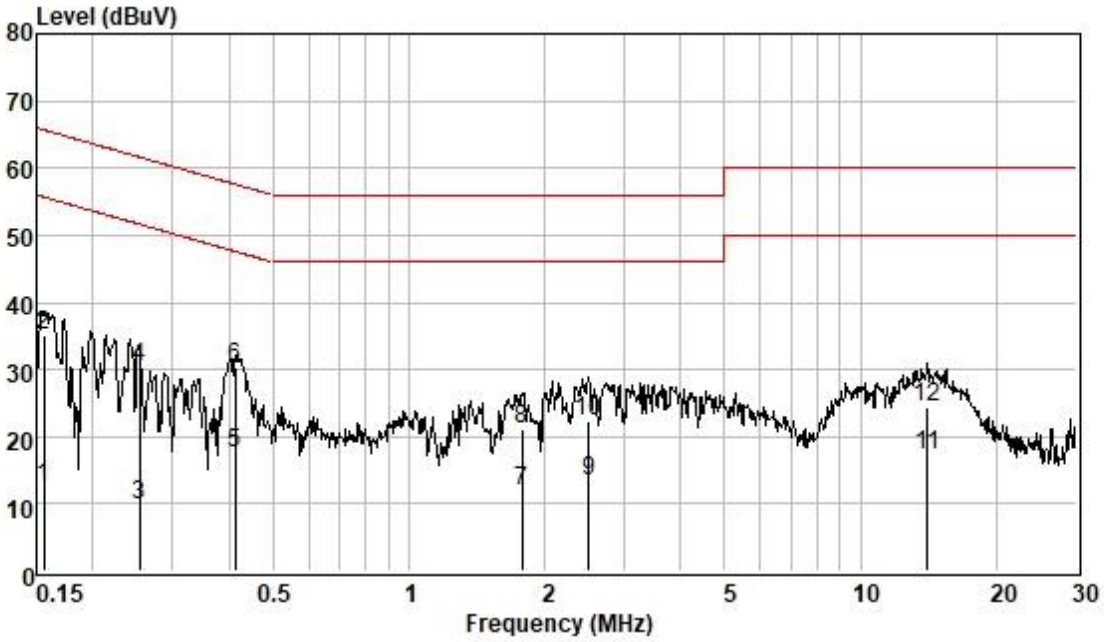
Test Mode: 01; Line: Neutral Line



Pol :NEUTRAL
Mode :
Model :

	Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.156	2.97	0.06	9.53	12.56	55.69	-43.13	Average
2	0.156	25.50	0.06	9.53	35.09	65.69	-30.60	QP
3	0.253	0.25	0.06	9.56	9.87	51.64	-41.77	Average
4	0.253	20.83	0.06	9.56	30.45	61.64	-31.19	QP
5	0.413	7.97	0.06	9.58	17.61	47.59	-29.98	Average
6	0.413	20.62	0.06	9.58	30.26	57.59	-27.33	QP
7	1.781	2.22	0.11	9.59	11.92	46.00	-34.08	Average
8	1.781	11.53	0.11	9.59	21.23	56.00	-34.77	QP
9	2.500	3.69	0.13	9.60	13.42	46.00	-32.58	Average
10	2.500	12.56	0.13	9.60	22.29	56.00	-33.71	QP
11	14.063	6.96	0.30	9.85	17.11	50.00	-32.89	Average
12	14.063	14.32	0.30	9.85	24.47	60.00	-35.53	QP

检验检测专用章 Inspection & Testing Services
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch Testing Center, EEC Laboratory.

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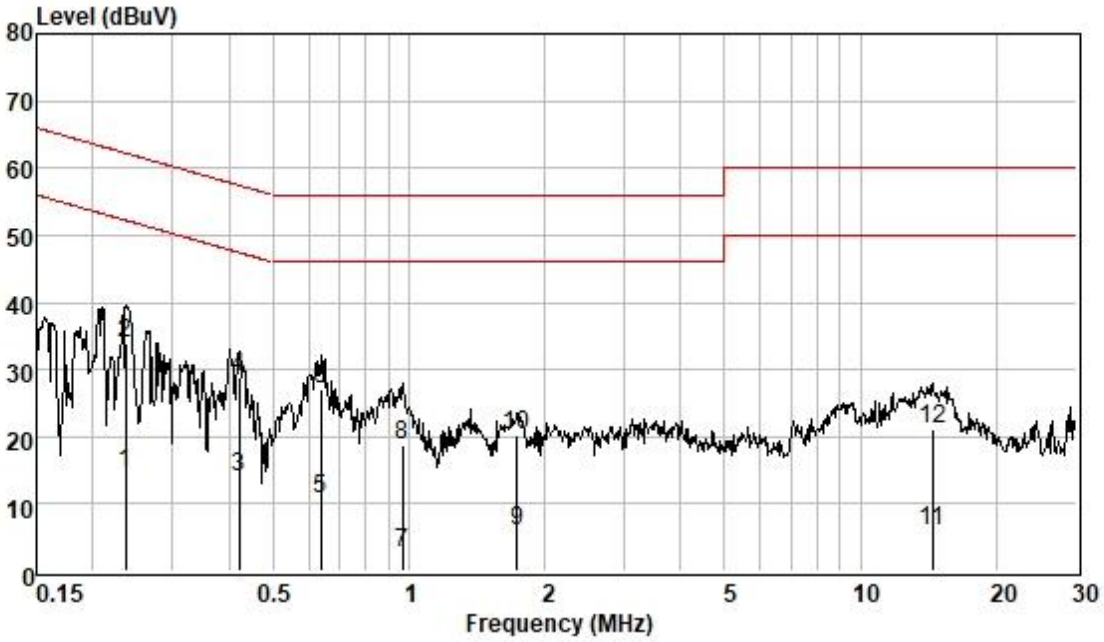
Test Mode: 04; Line: Live line



Pol :LINE
Mode :
Model :

	Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.237	5.03	0.06	9.57	14.66	52.22	-37.56	Average
2	0.237	24.20	0.06	9.57	33.83	62.22	-28.39	QP
3	0.421	4.22	0.06	9.58	13.86	47.42	-33.56	Average
4	0.421	19.34	0.06	9.58	28.98	57.42	-28.44	QP
5	0.637	1.03	0.07	9.59	10.69	46.00	-35.31	Average
6	0.637	17.31	0.07	9.59	26.97	56.00	-29.03	QP
7	0.968	-7.00	0.07	9.60	2.67	46.00	-43.33	Average
8	0.968	8.97	0.07	9.60	18.64	56.00	-37.36	QP
9	1.734	-3.72	0.11	9.60	5.99	46.00	-40.01	Average
10	1.734	10.53	0.11	9.60	20.24	56.00	-35.76	QP
11	14.440	-4.08	0.30	9.82	6.04	50.00	-43.96	Average
12	14.440	11.10	0.30	9.82	21.22	60.00	-38.78	QP

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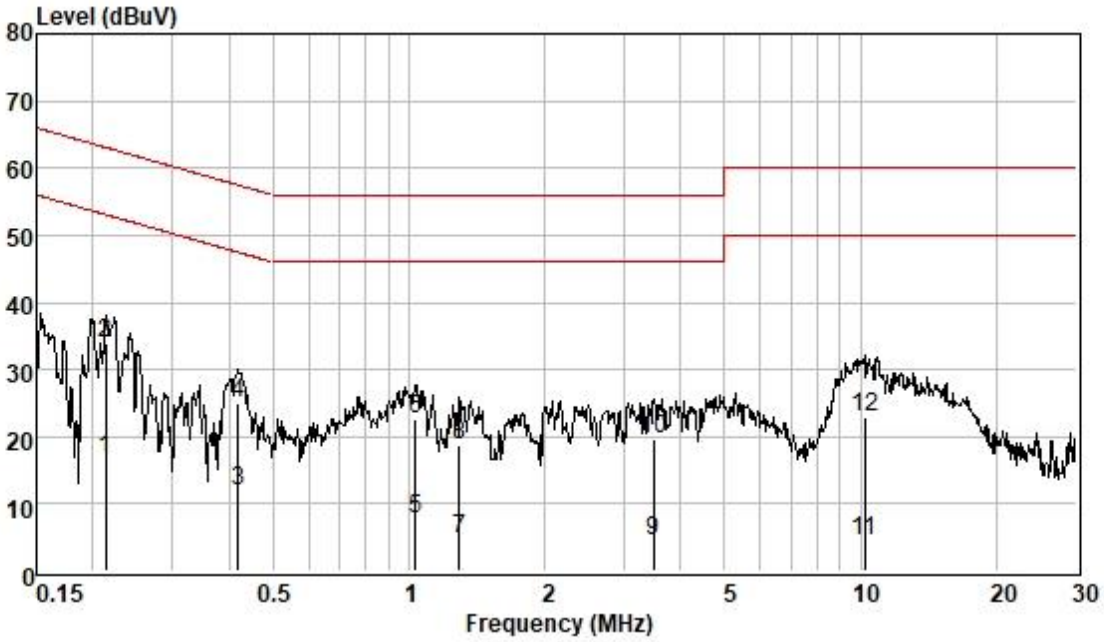
Test Mode: 04; Line: Neutral Line



Pol :NEUTRAL
Mode :
Model :

	Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
1	0.214	7.15	0.06	9.55	16.76	53.05	-36.29	Average
2	0.214	24.15	0.06	9.55	33.76	63.05	-29.29	QP
3	0.419	2.14	0.06	9.58	11.78	47.46	-35.68	Average
4	0.419	15.43	0.06	9.58	25.07	57.46	-32.39	QP
5	1.032	-1.80	0.07	9.59	7.86	46.00	-38.14	Average
6	1.032	13.07	0.07	9.59	22.73	56.00	-33.27	QP
7	1.296	-5.00	0.09	9.59	4.68	46.00	-41.32	Average
8	1.296	9.18	0.09	9.59	18.86	56.00	-37.14	QP
9	3.472	-5.31	0.16	9.62	4.47	46.00	-41.53	Average
10	3.472	9.73	0.16	9.62	19.51	56.00	-36.49	QP
11	10.179	-5.56	0.23	9.78	4.45	50.00	-45.55	Average
12	10.179	12.76	0.23	9.78	22.77	60.00	-37.23	QP

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7.2 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:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(BT chip)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_non-Hop mode(2.4G property)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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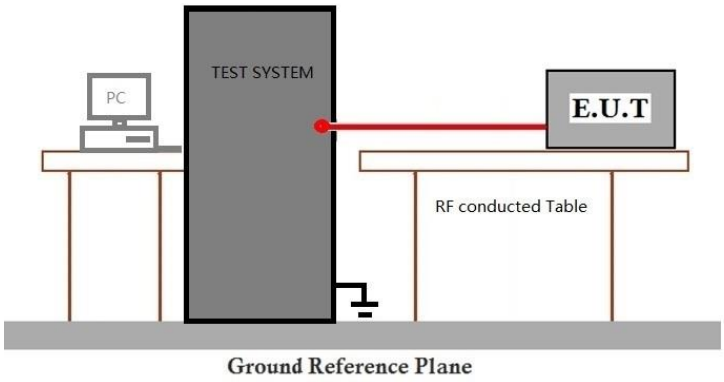
7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

cable loss=0.9dB

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7.3 20dB Bandwidth

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

Test Method: ANSI C63.10 (2013) Section 7.8.7

7.3.1 E.U.T. Operation

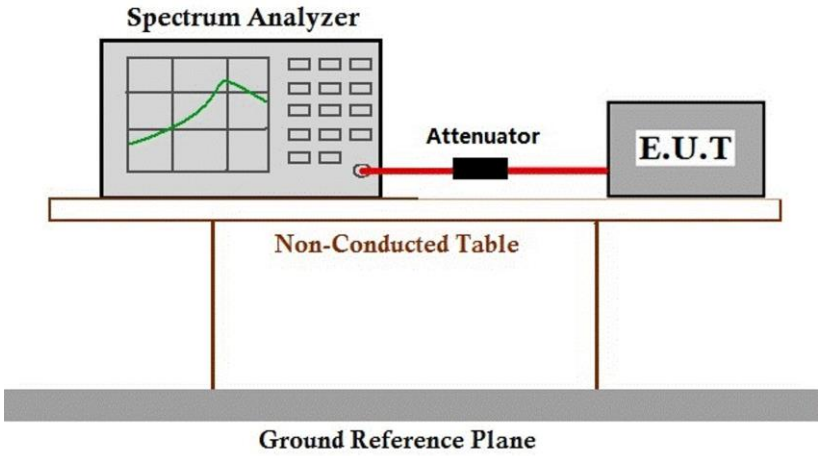
Operating Environment:

Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(BT chip)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_non-Hop mode(2.4G property)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK 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

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7.4 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.

7.4.1 E.U.T. Operation

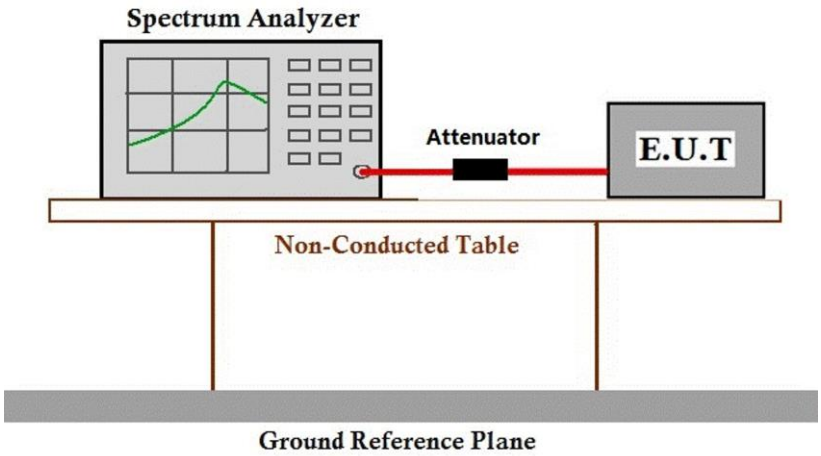
Operating Environment:

Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode(BT chip)_Keep the EUT in frequency hopping mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	05	TX_Hop mode(2.4G property)_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

cable loss=0.9dB

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7.5 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

7.5.1 E.U.T. Operation

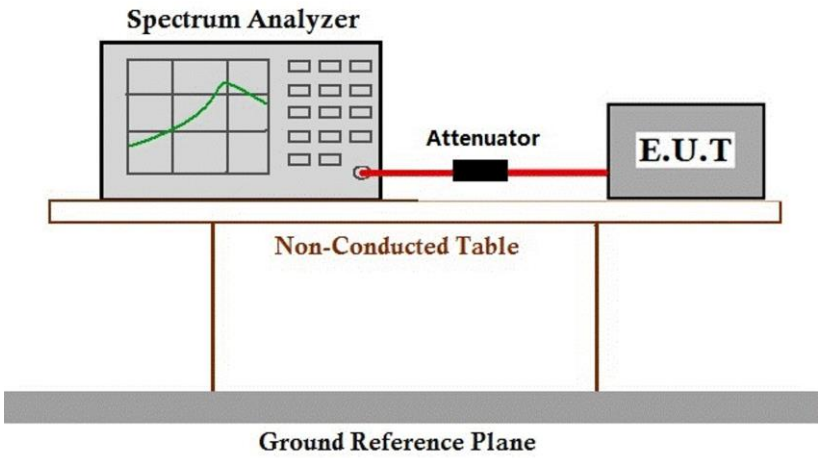
Operating Environment:

Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode(BT chip)_Keep the EUT in frequency hopping mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	05	TX_Hop mode(2.4G property)_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK 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

cable loss=0.9dB

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7.6 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

7.6.1 E.U.T. Operation

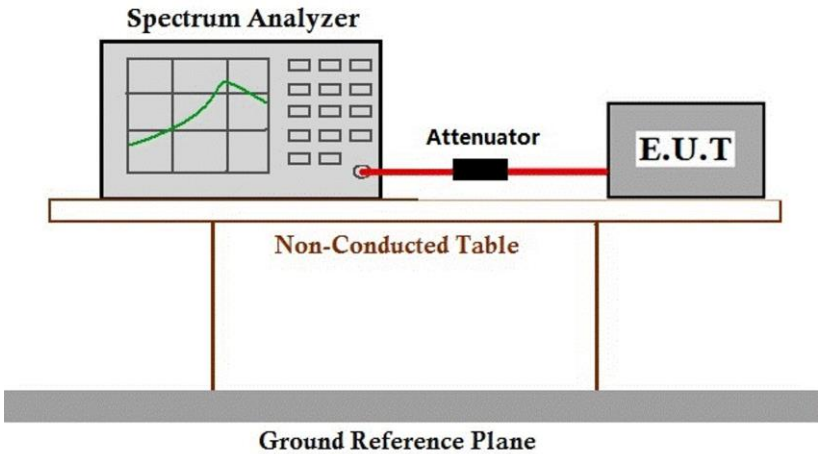
Operating Environment:

Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode(BT chip)_Keep the EUT in frequency hopping mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	05	TX_Hop mode(2.4G property)_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



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7.6.4 Measurement Procedure and Data

cable loss=0.9dB

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7.7 Conducted Band Edges Measurement

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

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

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(BT chip)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	02	TX_Hop mode(BT chip)_Keep the EUT in frequency hopping mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_non-Hop mode(2.4G property)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	05	TX_Hop mode(2.4G property)_Keep the EUT in frequency hopping mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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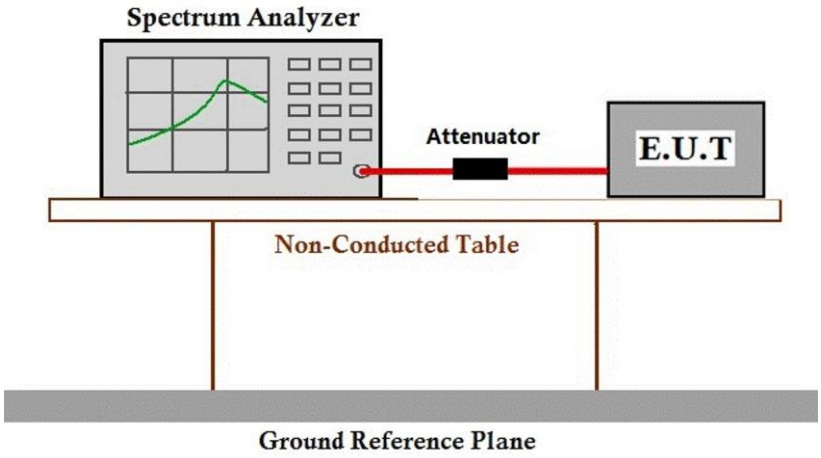
7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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7.8 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).

7.8.1 E.U.T. Operation

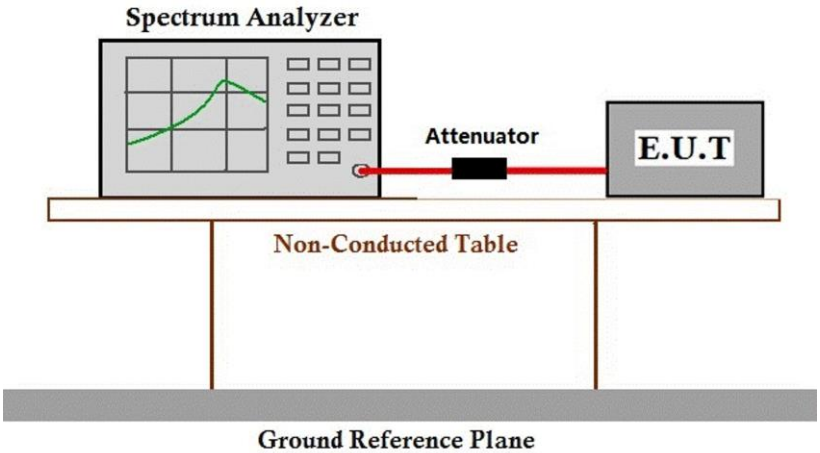
Operating Environment:

Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(BT chip)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_non-Hop mode(2.4G property)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK 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

cable loss=0.9dB

Please Refer to Appendix for Details

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7.9 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 Distance: 3m

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: 24.6 °C Humidity: 46.9 % RH Atmospheric Pressure: 1003 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(BT chip)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Pre-scan	01	Charge + TX_non-Hop mode(BT Chip)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_non-Hop mode(2.4G property)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Pre-scan	04	Charge + TX_non-Hop mode(2.4G property)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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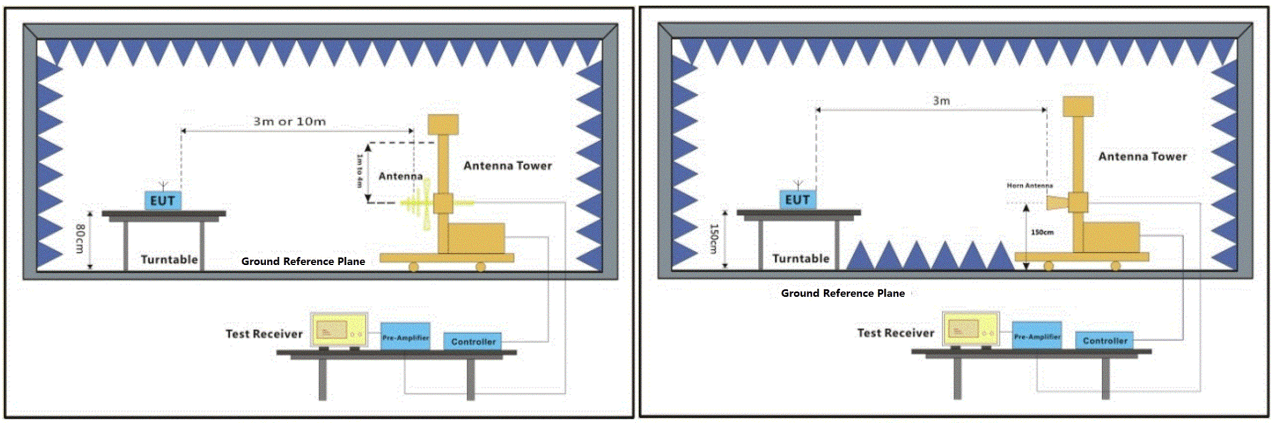
7.9.3 Test Setup Diagram



30MHz-1GHz Above 1GHz

7.9.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

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

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

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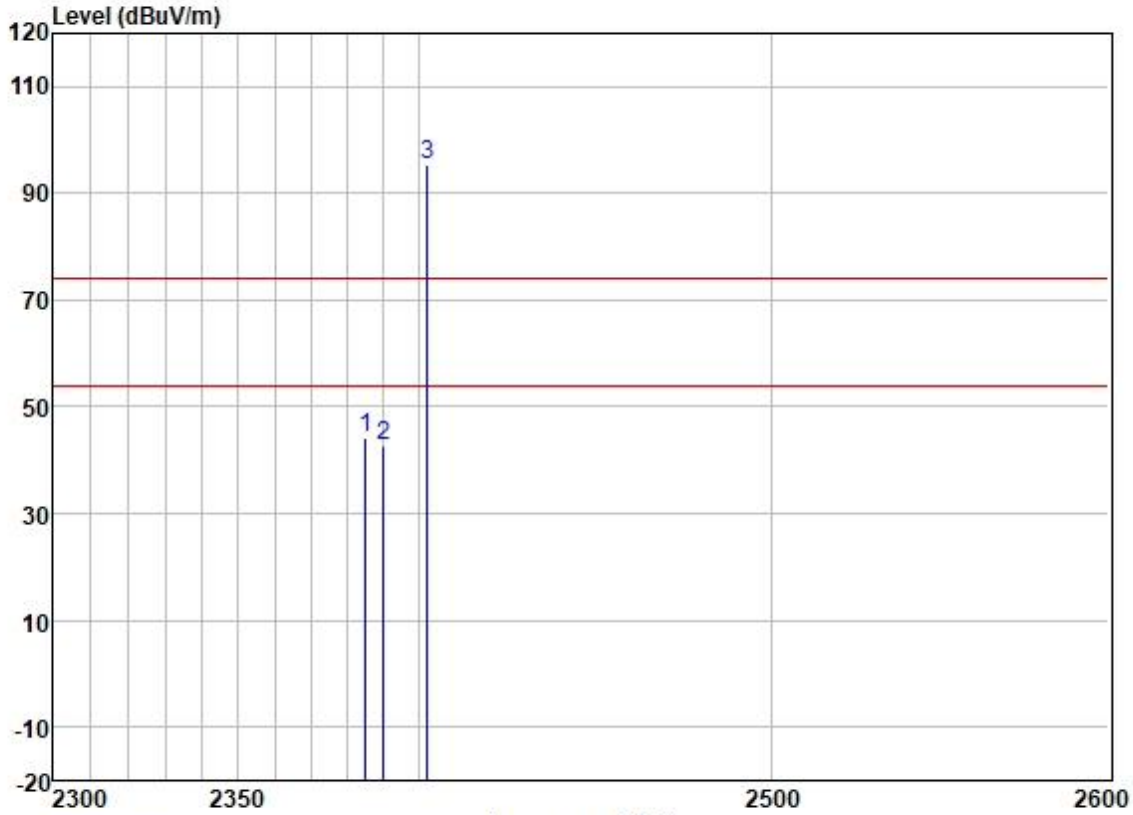
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2385.006	51.05	27.33	3.48	37.60	44.26	74.00	-29.74	HORIZONTAL	Peak
2		2390.000	49.48	27.33	3.48	37.59	42.70	74.00	-31.30	HORIZONTAL	Peak
3	*	2402.000	102.27	27.35	3.50	37.59	95.53	74.00	21.53	HORIZONTAL	Peak

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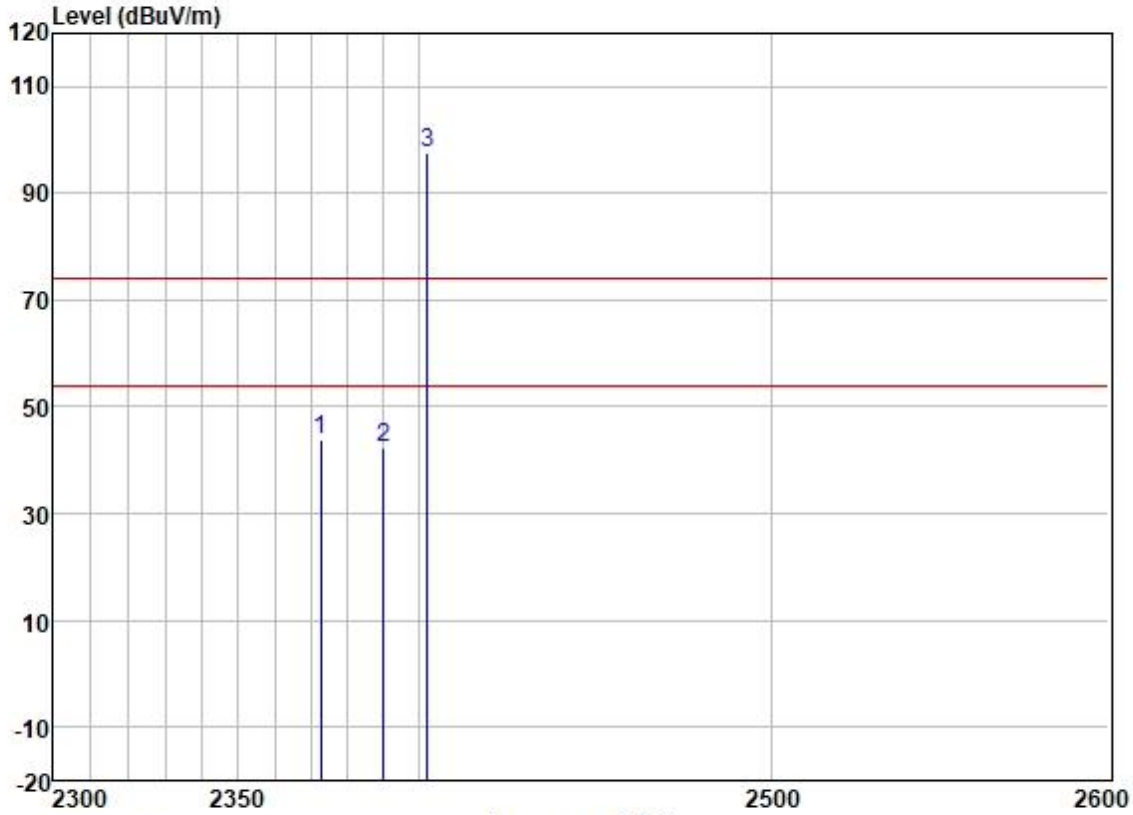
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2372.405	50.82	27.30	3.45	37.60	43.97	74.00	-30.03	VERTICAL	Peak
2		2390.000	49.13	27.33	3.48	37.59	42.35	74.00	-31.65	VERTICAL	Peak
3	*	2402.000	104.46	27.35	3.50	37.59	97.72	74.00	23.72	VERTICAL	Peak

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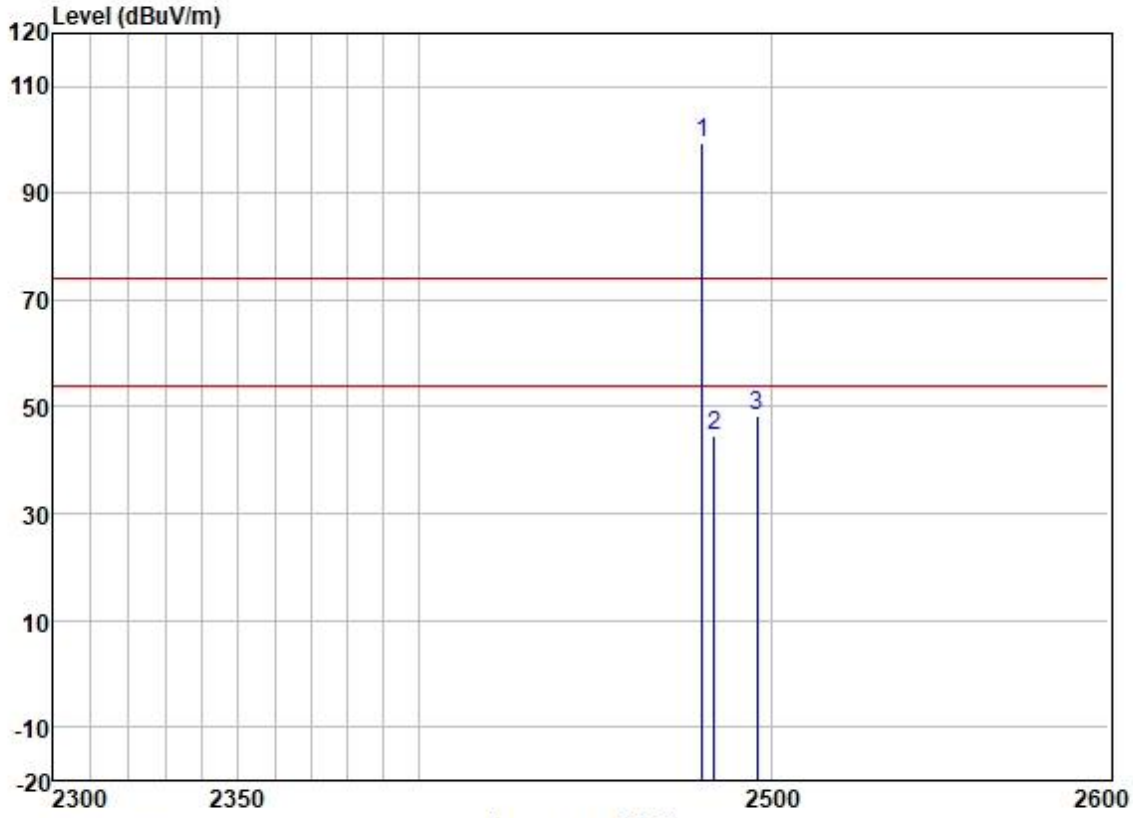
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 *	2480.000	106.03	27.47	3.60	37.57	99.53	74.00	25.53	HORIZONTAL	Peak
2	2483.500	51.13	27.48	3.53	37.57	44.57	74.00	-29.43	HORIZONTAL	Peak
3	2495.757	54.96	27.49	3.47	37.56	48.36	74.00	-25.64	HORIZONTAL	Peak

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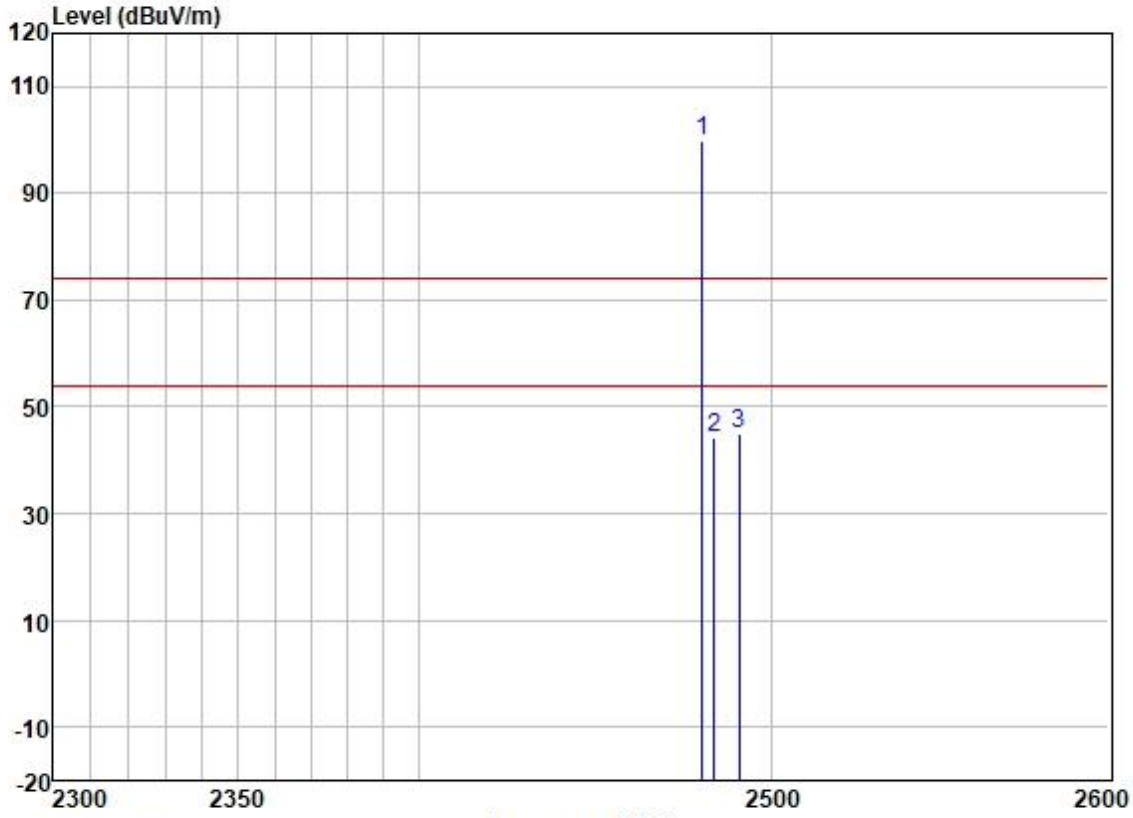
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 *	2480.000	106.23	27.47	3.60	37.57	99.73	74.00	25.73	VERTICAL	Peak
2	2483.500	50.79	27.48	3.53	37.57	44.23	74.00	-29.77	VERTICAL	Peak
3	2490.671	51.48	27.49	3.47	37.56	44.88	74.00	-29.12	VERTICAL	Peak

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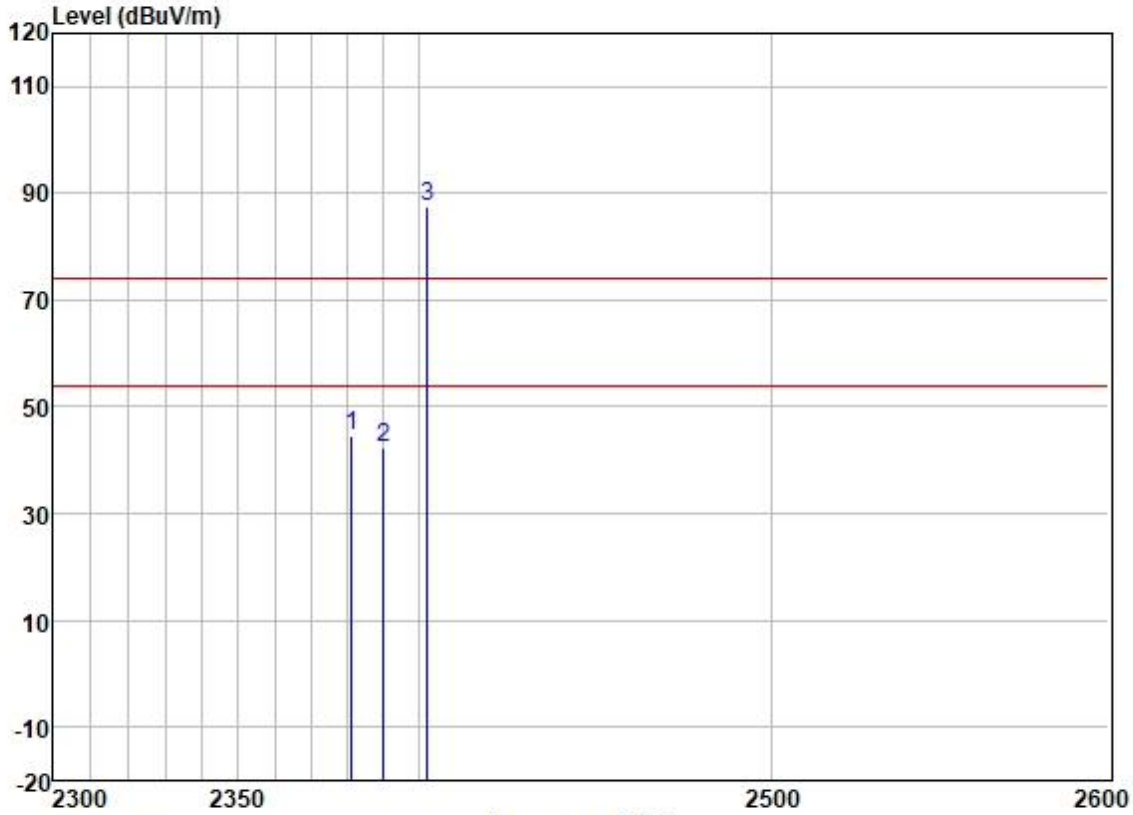
Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2381.067	51.30	27.31	3.46	37.60	44.47	74.00	-29.53	HORIZONTAL	Peak
2		2390.000	49.20	27.33	3.48	37.59	42.42	74.00	-31.58	HORIZONTAL	Peak
3	*	2402.000	94.11	27.35	3.50	37.59	87.37	74.00	13.37	HORIZONTAL	Peak

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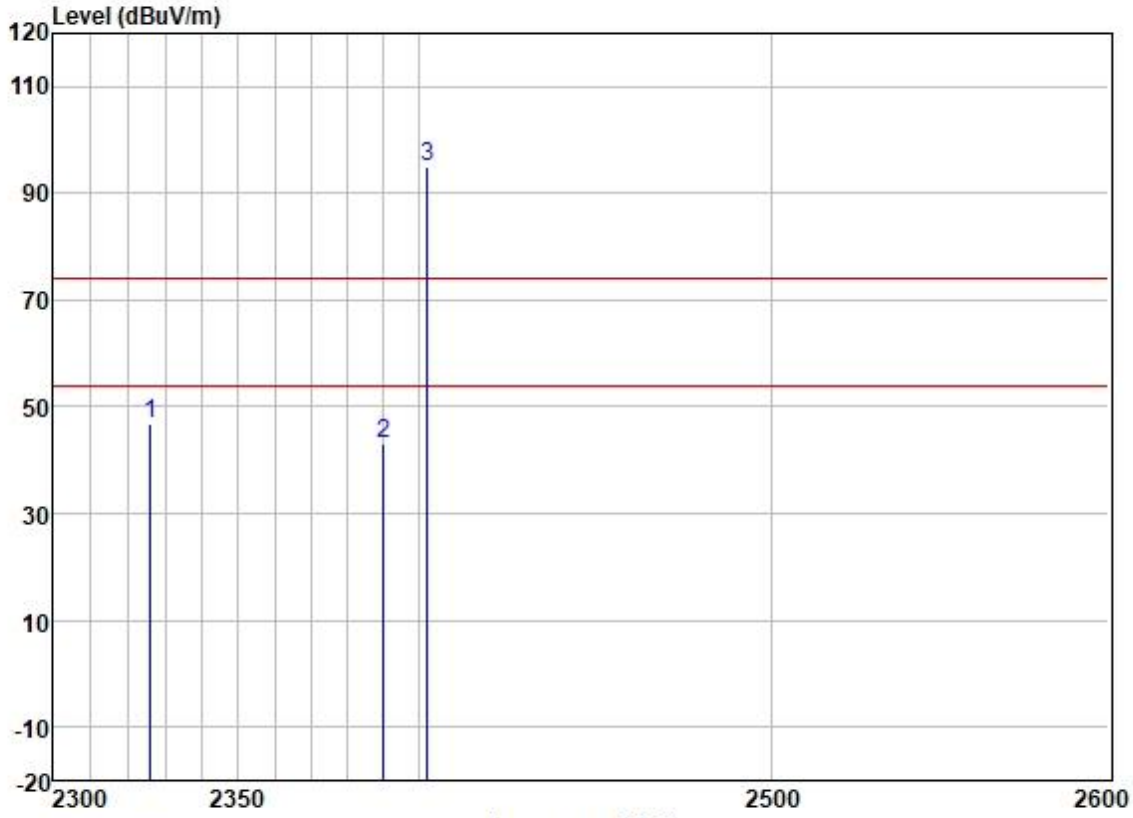

race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2326.111	53.99	27.19	3.34	37.62	46.90	74.00	-27.10	VERTICAL	Peak
2	2390.000	49.88	27.33	3.48	37.59	43.10	74.00	-30.90	VERTICAL	Peak
3 *	2402.000	101.88	27.35	3.50	37.59	95.14	74.00	21.14	VERTICAL	Peak

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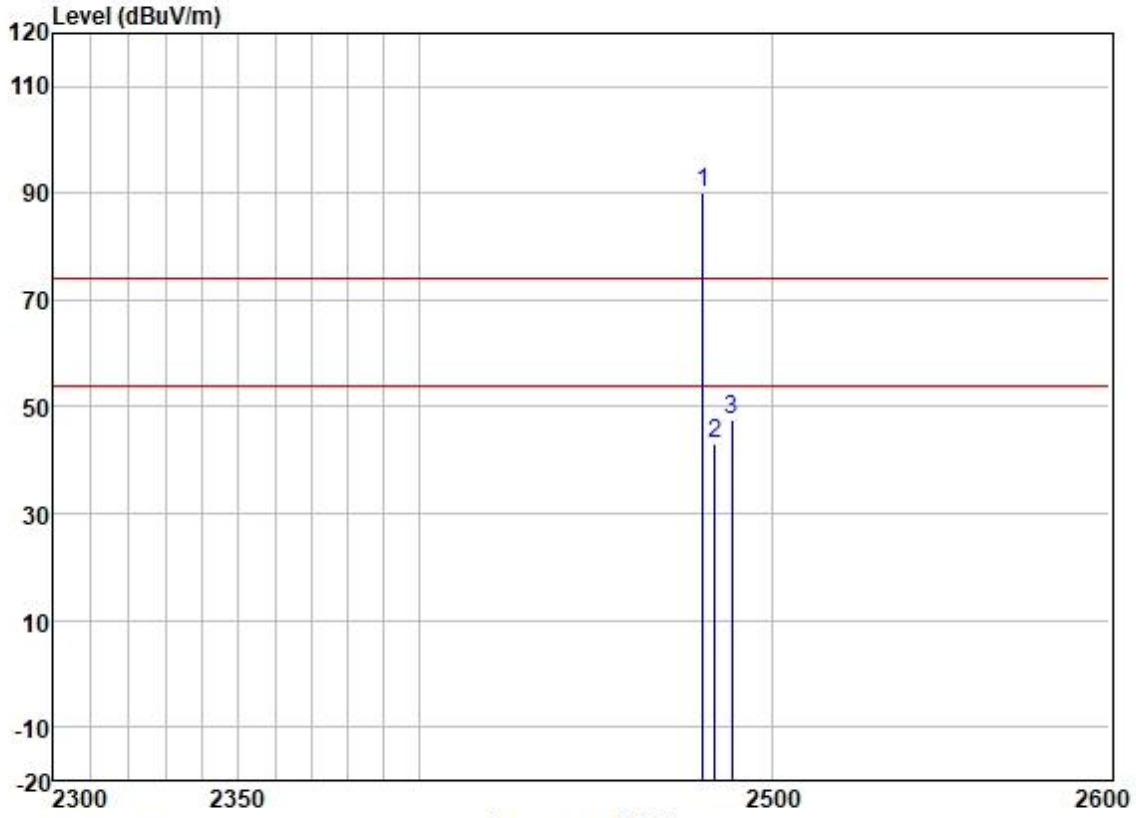
Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 *	2480.000	96.64	27.47	3.60	37.57	90.14	74.00	16.14	HORIZONTAL	Peak
2	2483.500	49.61	27.48	3.53	37.57	43.05	74.00	-30.95	HORIZONTAL	Peak
3	2488.269	54.30	27.48	3.53	37.56	47.75	74.00	-26.25	HORIZONTAL	Peak

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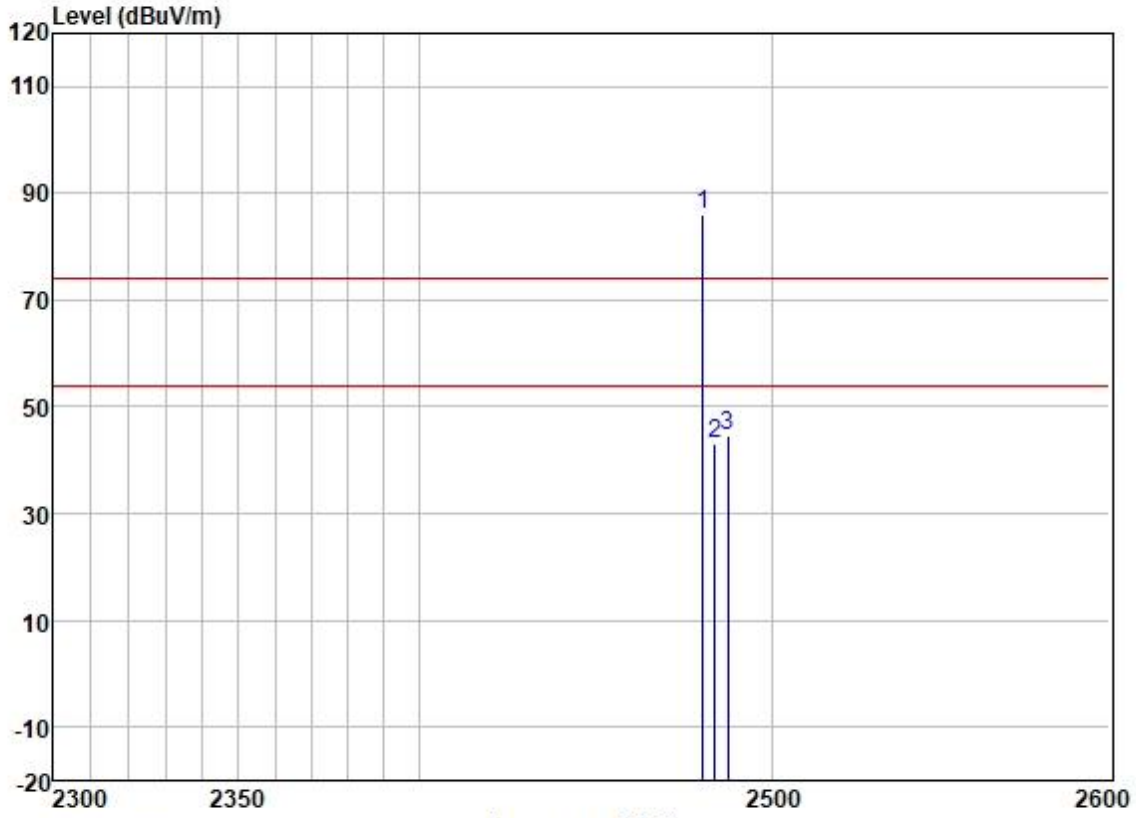
Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 *	2480.000	92.43	27.47	3.60	37.57	85.93	74.00	11.93	VERTICAL	Peak
2	2483.500	49.76	27.48	3.53	37.57	43.20	74.00	-30.80	VERTICAL	Peak
3	2487.194	51.07	27.48	3.53	37.57	44.51	74.00	-29.49	VERTICAL	Peak

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7.10 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 Distance: 10m
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: 24.6 °C Humidity: 46.5 % RH Atmospheric Pressure: 1003 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX_non-Hop mode(BT chip)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	01	Charge + TX_non-Hop mode(BT Chip)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Pre-scan	03	TX_non-Hop mode(2.4G property)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	04	Charge + TX_non-Hop mode(2.4G property)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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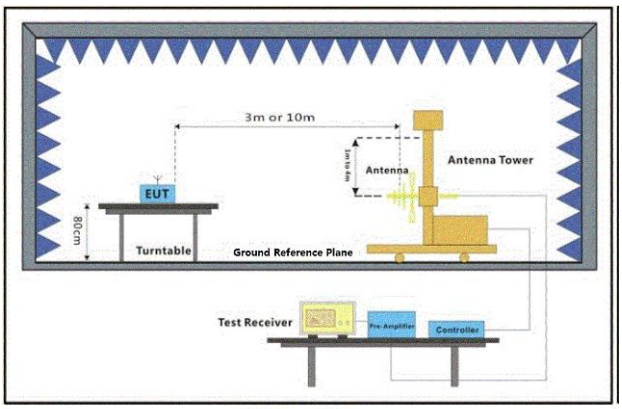
7.10.3 Test Setup Diagram



30MHz-1GHz

7.10.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, 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) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) 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

3) 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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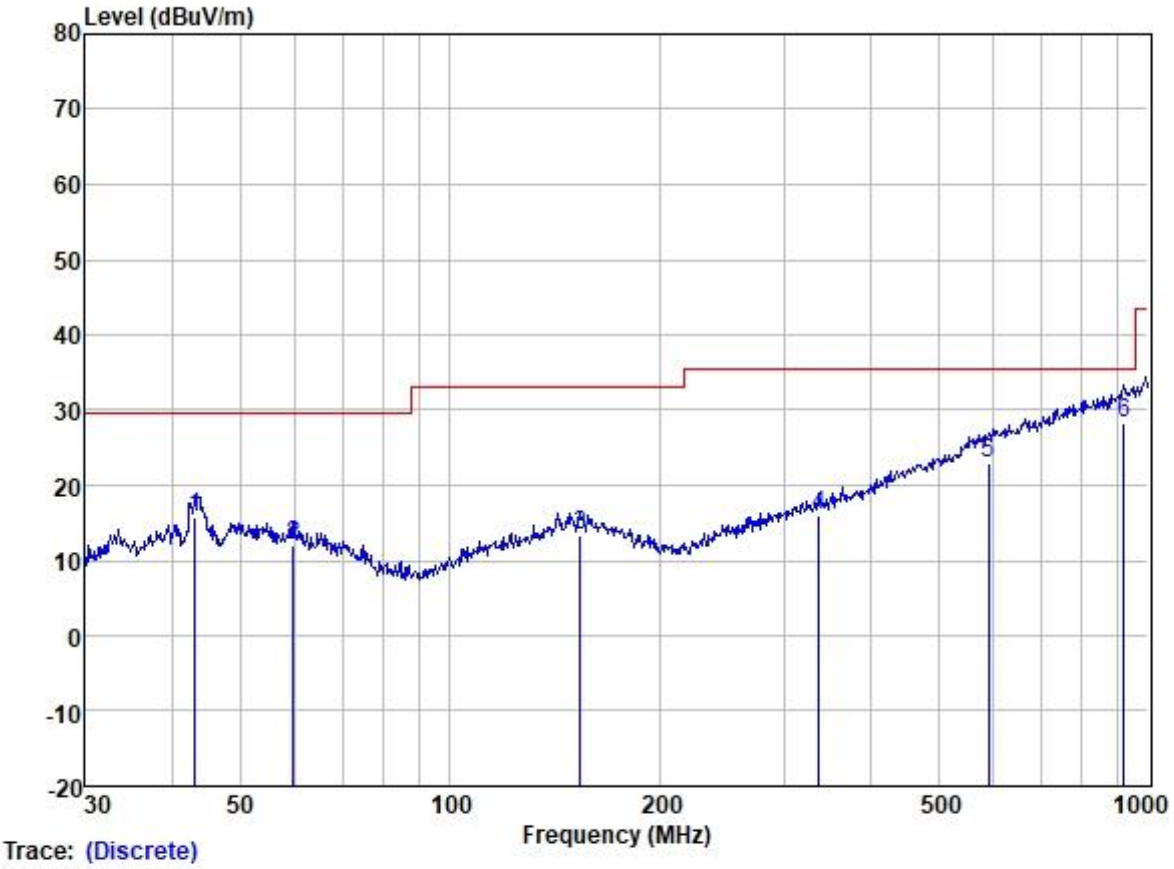
Test Mode: 01; Polarity: Horizontal Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

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

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	43.050	34.17	13.33	1.11	32.98	15.63	29.50	-13.87	HORIZONTAL	QP
2	59.649	30.79	12.93	1.25	33.00	11.97	29.50	-17.53	HORIZONTAL	QP
3	153.739	30.72	13.32	2.28	33.00	13.32	33.10	-19.78	HORIZONTAL	QP
4	337.216	31.44	14.22	3.46	33.14	15.98	35.60	-19.62	HORIZONTAL	QP
5	590.974	31.97	19.29	5.10	33.39	22.97	35.60	-12.63	HORIZONTAL	QP
6	922.516	29.63	23.78	7.01	32.05	28.37	35.60	-7.23	HORIZONTAL	QP

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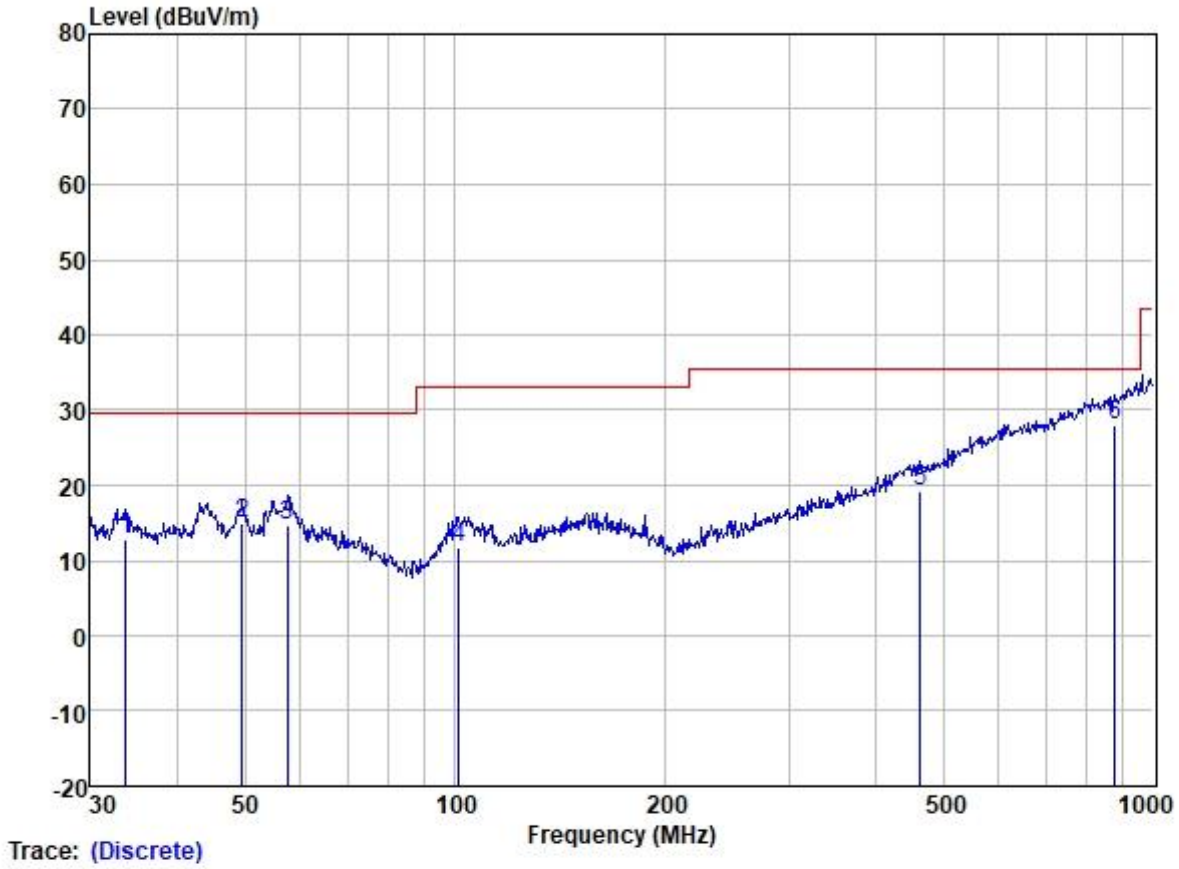
Test Mode: 01; Polarity: Vertical Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

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

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	33.680	32.35	12.28	1.06	32.95	12.74	29.50	-16.76	VERTICAL	QP
2	49.533	33.07	13.61	1.14	33.00	14.82	29.50	-14.68	VERTICAL	QP
3	57.392	33.16	13.17	1.22	33.00	14.55	29.50	-14.95	VERTICAL	QP
4	101.289	34.27	8.85	1.74	33.00	11.86	33.10	-21.24	VERTICAL	QP
5	463.970	31.12	17.04	4.27	33.26	19.17	35.60	-16.43	VERTICAL	QP
6	881.407	30.86	22.64	6.79	32.41	27.88	35.60	-7.72	VERTICAL	QP

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The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

$L_3 / L_{10} = D_{10} / D_3$

Note:

L_3: Level @ 3m distance. Unit: uV/m;

L_{10}: Level @ 10m distance. Unit: uV/m;

D_3: 3m distance. Unit: m

D_{10}: 10m distance. Unit: m

The level at 3m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
43.050	15.63	6.05	20.15	26.09	40.00	-13.91	H
59.649	11.97	3.97	13.22	22.43	40.00	-17.57	H
153.739	13.32	4.63	15.45	23.78	43.50	-19.72	H
337.216	15.98	6.30	20.98	26.44	46.00	-19.56	H
590.974	22.97	14.08	46.92	33.43	46.00	-12.57	H
922.516	28.37	26.21	87.37	38.83	46.00	-7.17	H
33.680	12.74	4.34	14.45	23.20	40.00	-16.80	V
49.533	14.82	5.51	18.36	25.28	40.00	-14.72	V
57.392	14.55	5.34	17.80	25.01	40.00	-14.99	V
101.289	11.86	3.92	13.06	22.32	43.50	-21.18	V
463.970	19.17	9.09	30.30	29.63	46.00	-16.37	V
881.407	27.88	24.77	82.58	38.34	46.00	-7.66	V

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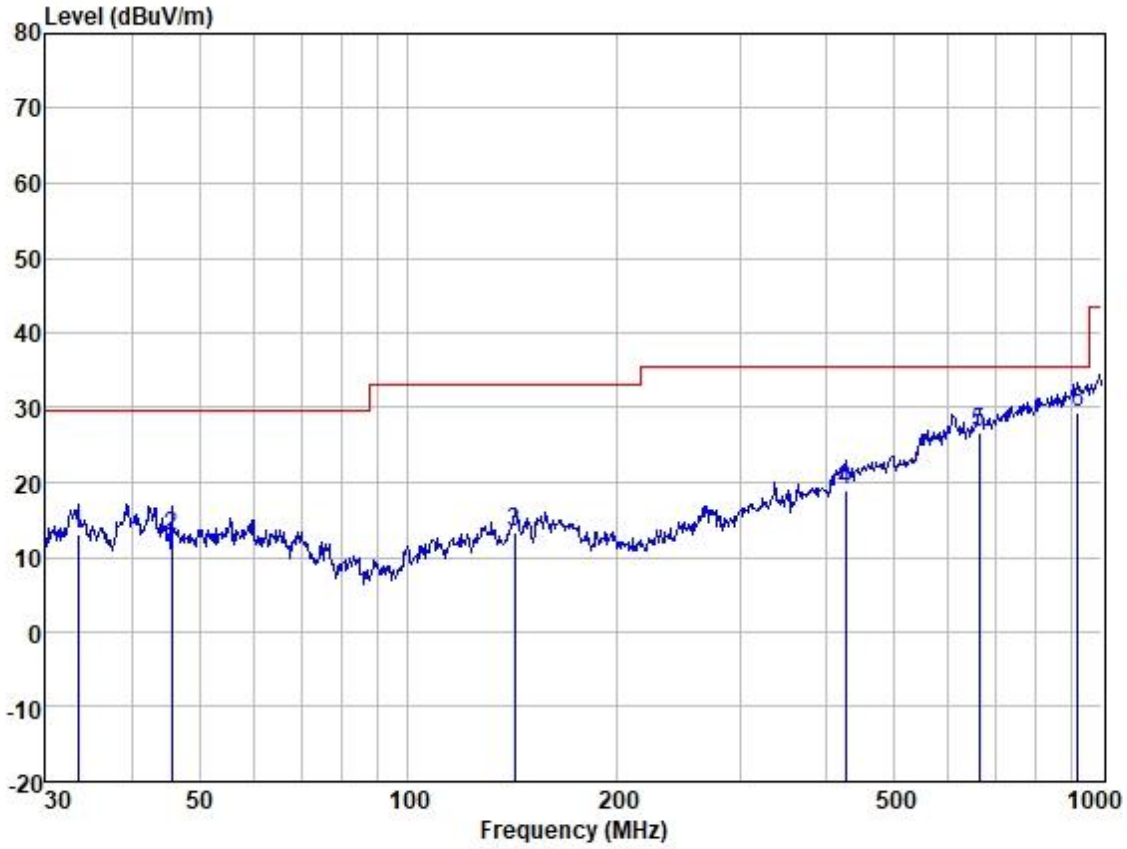
Test Mode: 04; Polarity: Horizontal Modulation:GFSK; ; Channel:Low



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

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	33.445	32.60	12.22	1.06	32.94	12.94	29.50	-16.56	HORIZONTAL	QP
2	45.535	31.18	13.45	1.12	32.99	12.76	29.50	-16.74	HORIZONTAL	QP
3	142.324	31.14	12.98	2.12	33.00	13.24	33.10	-19.86	HORIZONTAL	QP
4	426.521	31.92	16.15	4.07	33.23	18.91	35.60	-16.69	HORIZONTAL	QP
5	665.804	33.85	20.59	5.61	33.33	26.72	35.60	-8.88	HORIZONTAL	QP
6	922.516	30.63	23.78	7.01	32.05	29.37	35.60	-6.23	HORIZONTAL	QP

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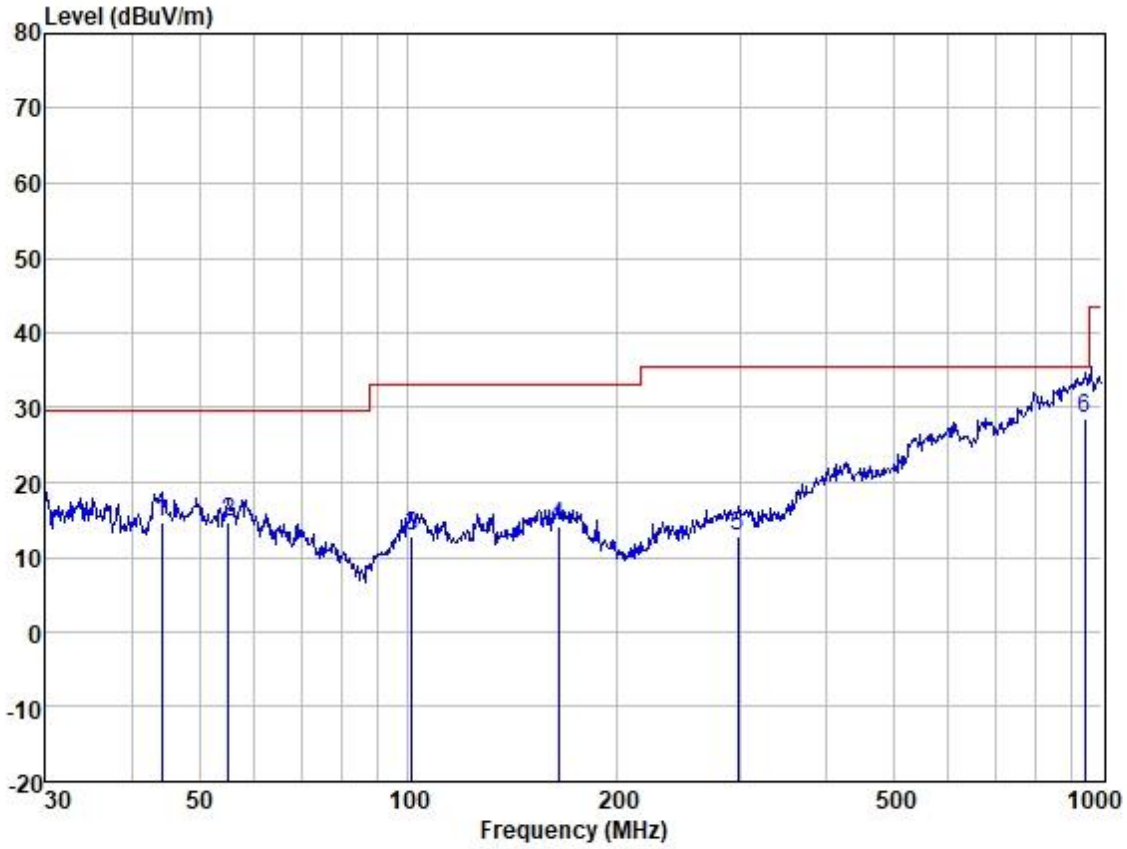

Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	44.120	33.16	13.40	1.12	32.98	14.70	29.50	-14.80	VERTICAL	QP
2	55.027	33.23	13.36	1.19	33.00	14.78	29.50	-14.72	VERTICAL	QP
3	101.289	35.27	8.85	1.74	33.00	12.86	33.10	-20.24	VERTICAL	QP
4	164.330	31.72	13.09	2.37	33.00	14.18	33.10	-18.92	VERTICAL	QP
5	298.268	29.50	13.19	3.16	33.10	12.75	35.60	-22.85	VERTICAL	QP
6	945.440	29.66	23.57	7.12	31.81	28.54	35.60	-7.06	VERTICAL	QP

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The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

$L_3 / L_{10} = D_{10} / D_3$

Note:

L_3: Level @ 3m distance. Unit: uV/m;

L_{10}: Level @ 10m distance. Unit: uV/m;

D_3: 3m distance. Unit: m

D_{10}: 10m distance. Unit: m

The level at 3m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
33.445	12.94	4.44	14.79	23.40	40.00	-16.60	H
45.535	12.76	4.35	14.48	23.22	40.00	-16.78	H
142.324	13.24	4.59	15.31	23.70	43.50	-19.80	H
426.521	18.91	8.82	29.40	29.37	46.00	-16.63	H
665.804	26.72	21.68	72.26	37.18	46.00	-8.82	H
922.516	29.37	29.41	98.03	39.83	46.00	-6.17	H
44.120	14.70	5.43	18.11	25.16	40.00	-14.84	V
55.027	14.78	5.48	18.28	25.24	40.00	-14.76	V
101.289	12.86	4.40	14.65	23.32	43.50	-20.18	V
164.330	14.18	5.12	17.06	24.64	43.50	-18.86	V
298.268	12.75	4.34	14.47	23.21	46.00	-22.79	V
945.440	28.54	26.73	89.10	39.00	46.00	-7.00	V

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7.11 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 Distance: 3m
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.		

7.11.1 E.U.T. Operation

Operating Environment:
Temperature: 24.6 °C Humidity: 46.6 % RH Atmospheric Pressure: 1003 mbar

7.11.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode(BT chip)_Keep the EUT in continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Pre-scan	01	Charge + TX_non-Hop mode(BT Chip)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Final test	03	TX_non-Hop mode(2.4G property)_Keep the EUT in continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Pre-scan	04	Charge + TX_non-Hop mode(2.4G property)_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, Pi/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

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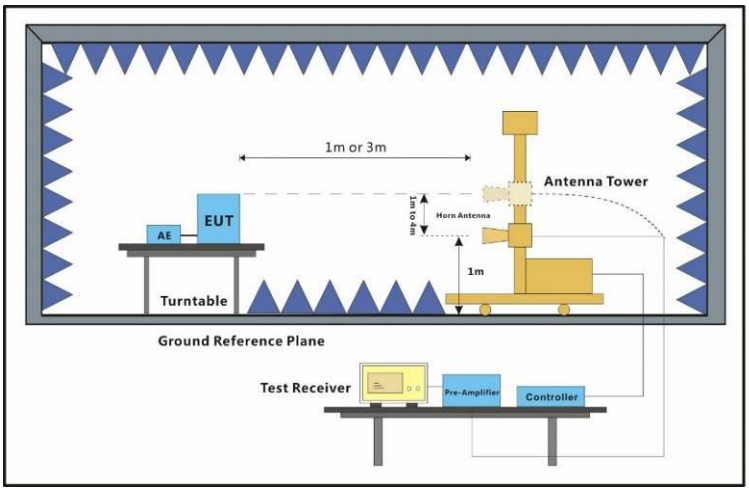
7.11.3 Test Setup Diagram



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7.11.4 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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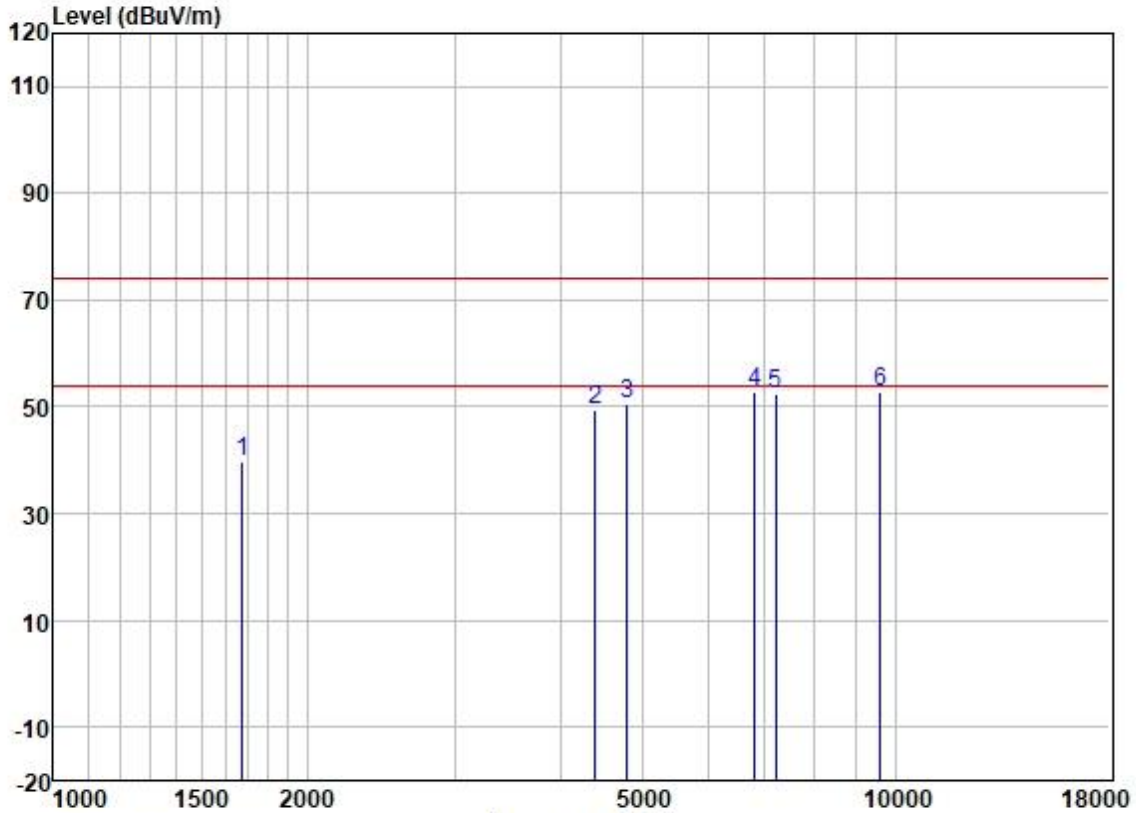
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1677.621	49.27	25.68	2.80	37.91	39.84	74.00	-34.16	HORIZONTAL	Peak
2	4405.090	50.85	30.68	4.70	36.81	49.42	74.00	-24.58	HORIZONTAL	Peak
3	4804.000	50.56	31.42	5.40	36.83	50.55	74.00	-23.45	HORIZONTAL	Peak
4	6815.551	49.54	34.70	5.82	37.13	52.93	74.00	-21.07	HORIZONTAL	Peak
5	7206.000	48.25	35.54	5.98	37.38	52.39	74.00	-21.61	HORIZONTAL	Peak
6	9608.000	44.88	38.37	7.07	37.42	52.90	74.00	-21.10	HORIZONTAL	Peak

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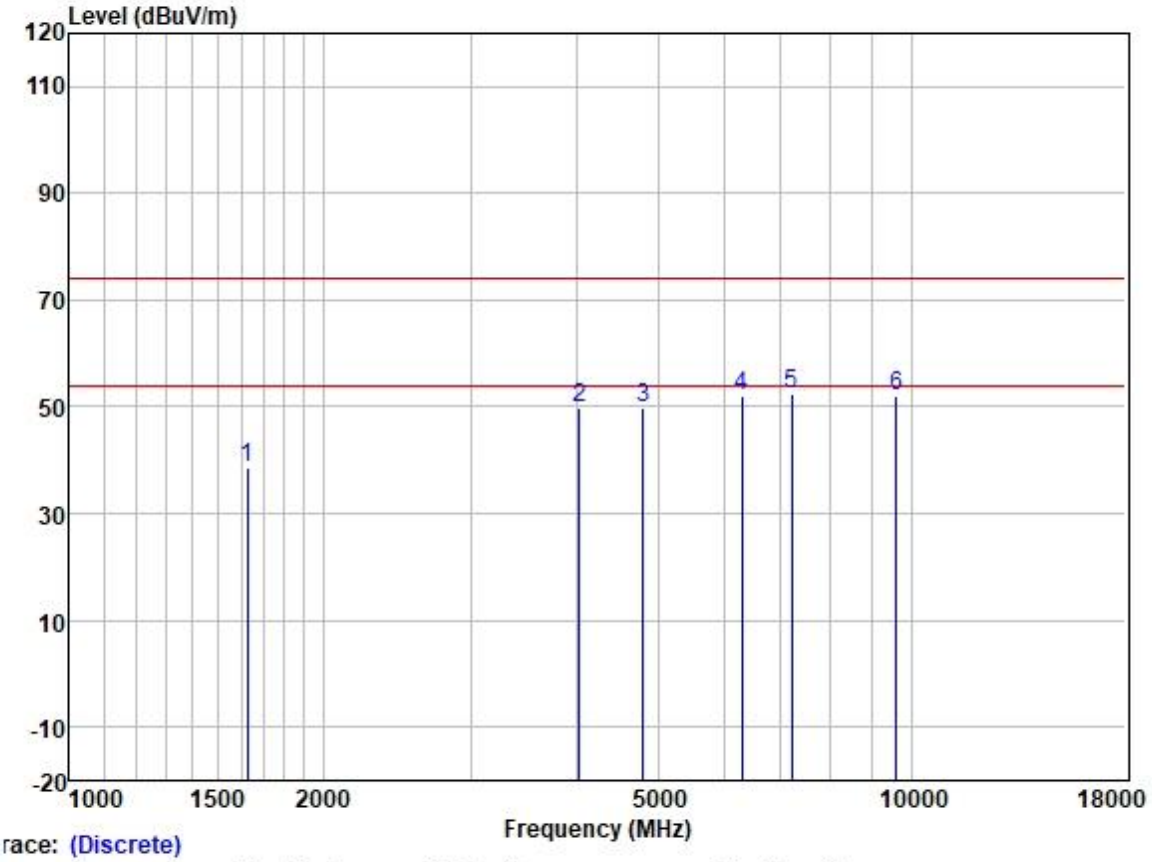
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1625.121	48.24	25.61	2.80	37.95	38.70	74.00	-35.30	VERTICAL	Peak
2	4039.212	52.01	29.85	4.60	36.80	49.66	74.00	-24.34	VERTICAL	Peak
3	4804.000	49.98	31.42	5.40	36.83	49.97	74.00	-24.03	VERTICAL	Peak
4	6285.695	49.78	33.37	5.98	36.95	52.18	74.00	-21.82	VERTICAL	Peak
5	7206.000	48.32	35.54	5.98	37.38	52.46	74.00	-21.54	VERTICAL	Peak
6	9608.000	44.17	38.37	7.07	37.42	52.19	74.00	-21.81	VERTICAL	Peak

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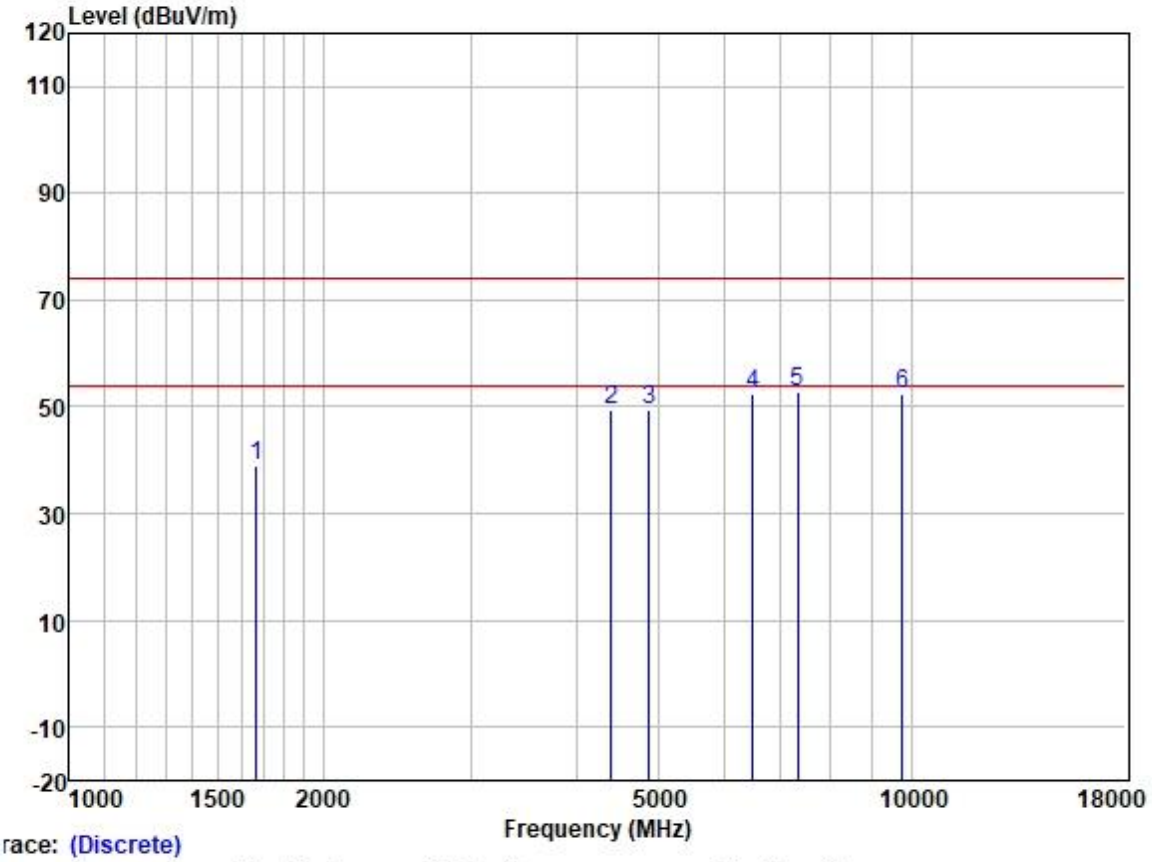
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1667.951	48.51	25.66	2.80	37.91	39.06	74.00	-34.94	HORIZONTAL	Peak
2	4405.090	50.84	30.68	4.70	36.81	49.41	74.00	-24.59	HORIZONTAL	Peak
3	4882.000	49.04	31.56	5.52	36.84	49.28	74.00	-24.72	HORIZONTAL	Peak
4	6488.754	49.47	33.96	5.85	37.01	52.27	74.00	-21.73	HORIZONTAL	Peak
5	7323.000	48.15	36.00	6.13	37.43	52.85	74.00	-21.15	HORIZONTAL	Peak
6	9764.000	44.39	38.50	7.02	37.41	52.50	74.00	-21.50	HORIZONTAL	Peak

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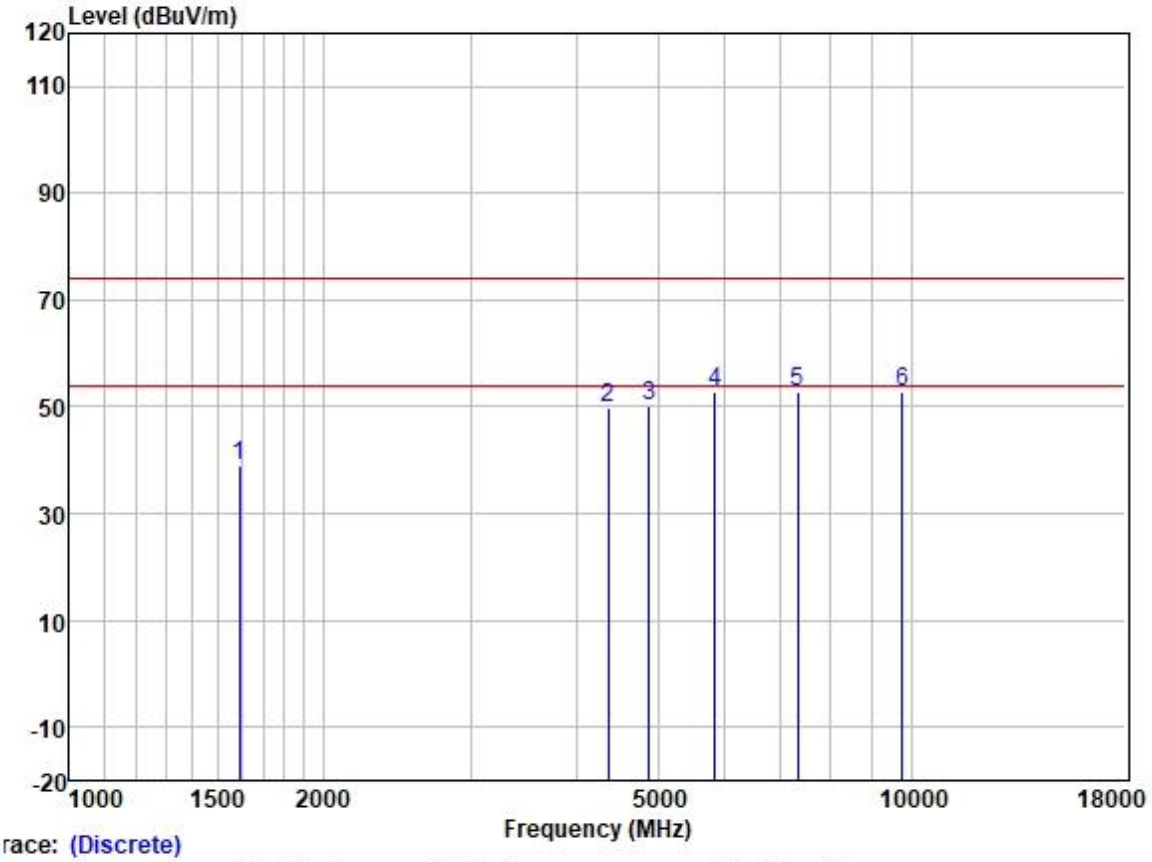
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:middle



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1592.571	48.49	25.57	2.80	37.98	38.88	74.00	-35.12	VERTICAL	Peak
2	4367.058	51.36	30.62	4.68	36.81	49.85	74.00	-24.15	VERTICAL	Peak
3	4882.000	49.94	31.56	5.52	36.84	50.18	74.00	-23.82	VERTICAL	Peak
4	5847.517	51.39	32.25	6.00	36.90	52.74	74.00	-21.26	VERTICAL	Peak
5	7323.000	47.98	36.00	6.13	37.43	52.68	74.00	-21.32	VERTICAL	Peak
6	9764.000	44.63	38.50	7.02	37.41	52.74	74.00	-21.26	VERTICAL	Peak

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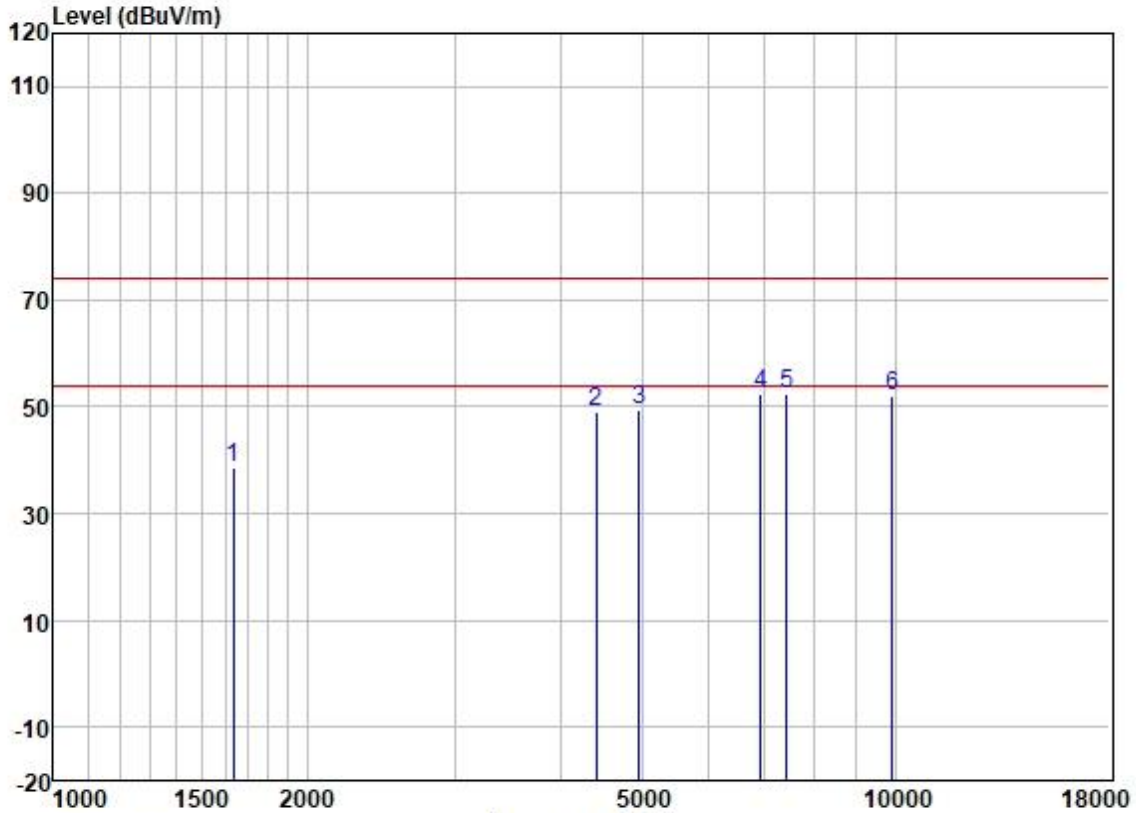
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1634.543	48.28	25.62	2.80	37.95	38.75	74.00	-35.25	HORIZONTAL	Peak
2	4417.841	50.62	30.70	4.74	36.81	49.25	74.00	-24.75	HORIZONTAL	Peak
3	4960.000	49.07	31.65	5.65	36.84	49.53	74.00	-24.47	HORIZONTAL	Peak
4	6914.763	48.95	34.89	5.81	37.19	52.46	74.00	-21.54	HORIZONTAL	Peak
5	7440.000	47.23	36.27	6.22	37.47	52.25	74.00	-21.75	HORIZONTAL	Peak
6	9920.000	43.86	38.65	6.96	37.40	52.07	74.00	-21.93	HORIZONTAL	Peak

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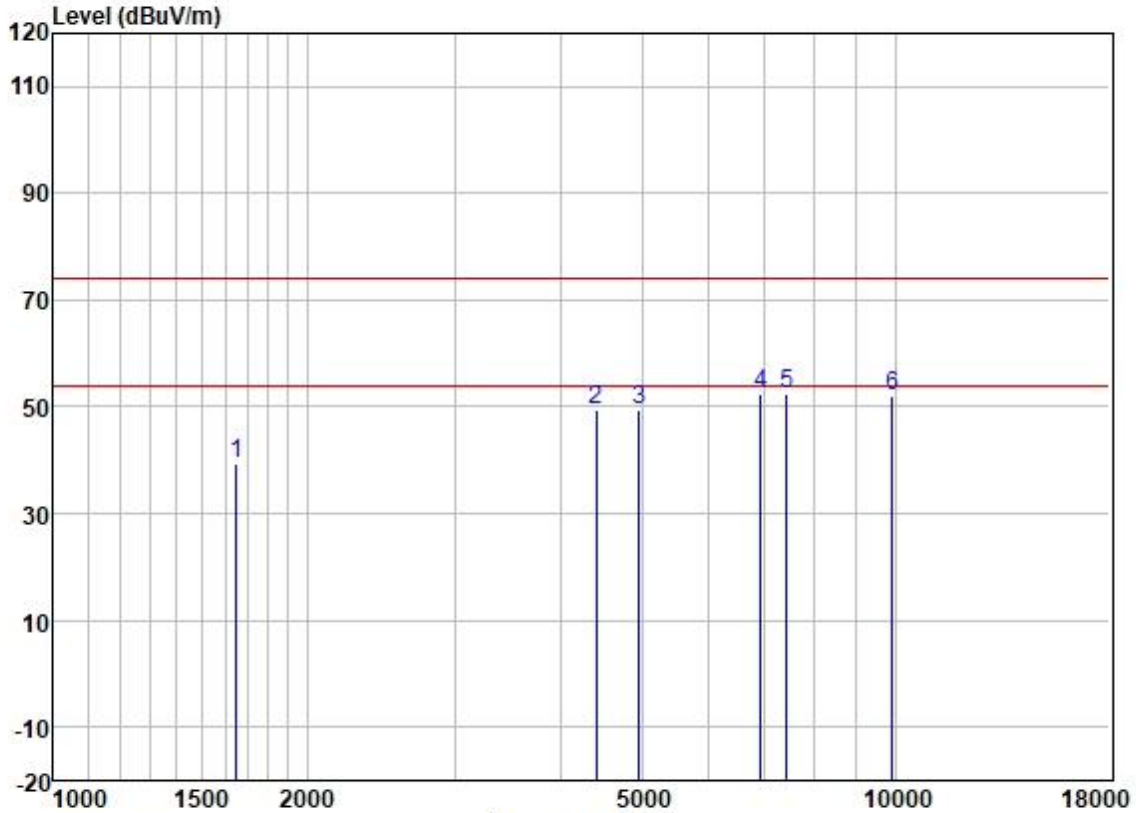
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1648.778	48.70	25.63	2.80	37.93	39.20	74.00	-34.80	VERTICAL	Peak
2	4417.841	50.78	30.70	4.74	36.81	49.41	74.00	-24.59	VERTICAL	Peak
3	4960.000	48.82	31.65	5.65	36.84	49.28	74.00	-24.72	VERTICAL	Peak
4	6914.763	48.76	34.89	5.81	37.19	52.27	74.00	-21.73	VERTICAL	Peak
5	7440.000	47.58	36.27	6.22	37.47	52.60	74.00	-21.40	VERTICAL	Peak
6	9920.000	44.00	38.65	6.96	37.40	52.21	74.00	-21.79	VERTICAL	Peak

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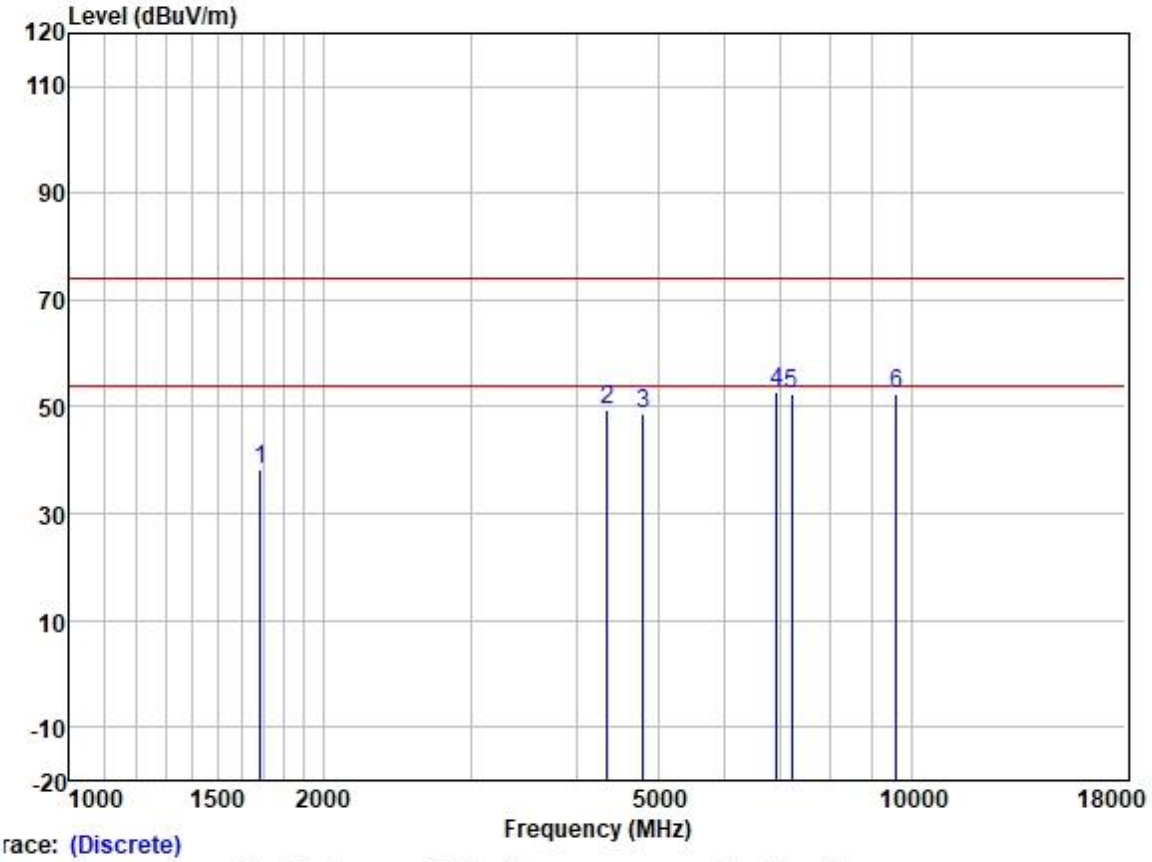
Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1687.347	47.65	25.69	2.80	37.91	38.23	74.00	-35.77	HORIZONTAL	Peak
2	4354.454	50.97	30.59	4.68	36.81	49.43	74.00	-24.57	HORIZONTAL	Peak
3	4804.000	48.57	31.42	5.40	36.83	48.56	74.00	-25.44	HORIZONTAL	Peak
4	6914.763	49.20	34.89	5.81	37.19	52.71	74.00	-21.29	HORIZONTAL	Peak
5	7206.000	48.36	35.54	5.98	37.38	52.50	74.00	-21.50	HORIZONTAL	Peak
6	9608.000	44.58	38.37	7.07	37.42	52.60	74.00	-21.40	HORIZONTAL	Peak

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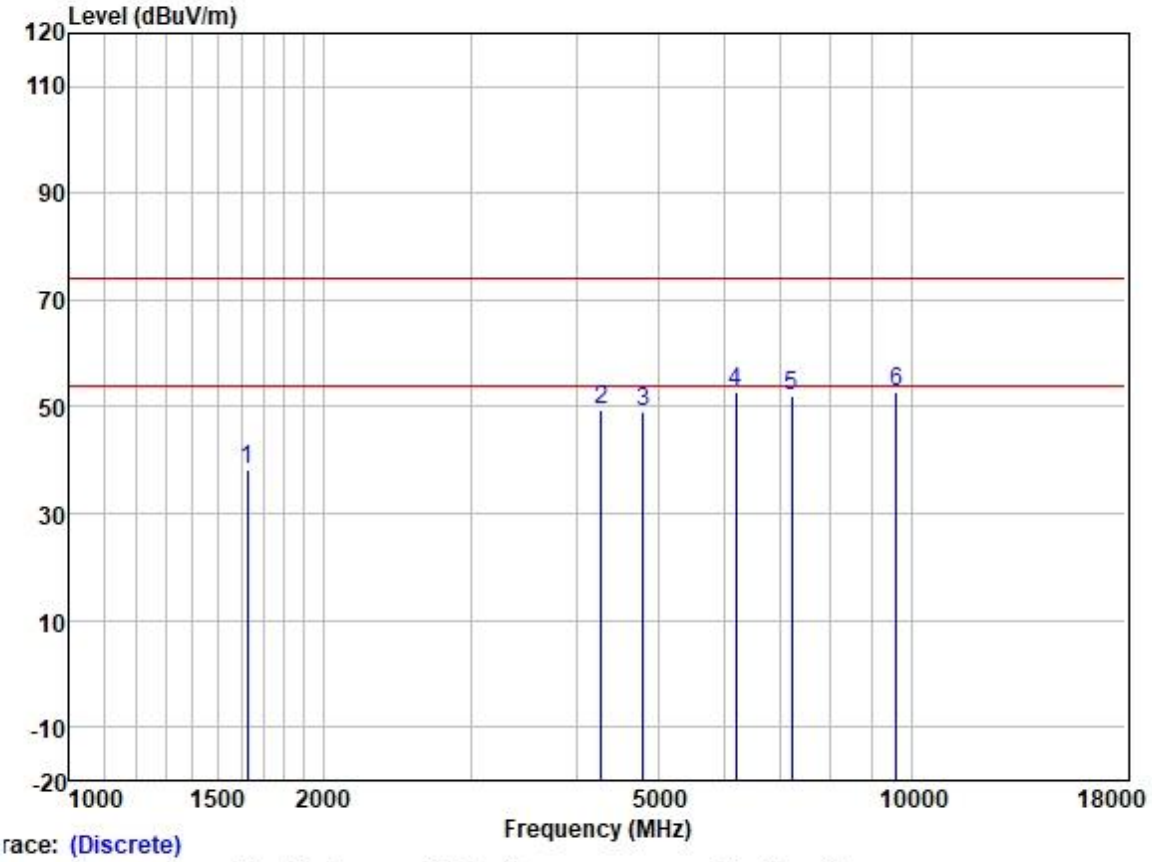
Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1625.121	47.95	25.61	2.80	37.95	38.41	74.00	-35.59	VERTICAL	Peak
2	4279.589	51.33	30.42	4.63	36.81	49.57	74.00	-24.43	VERTICAL	Peak
3	4804.000	49.24	31.42	5.40	36.83	49.23	74.00	-24.77	VERTICAL	Peak
4	6195.508	50.68	32.96	6.07	36.94	52.77	74.00	-21.23	VERTICAL	Peak
5	7206.000	47.88	35.54	5.98	37.38	52.02	74.00	-21.98	VERTICAL	Peak
6	9608.000	44.86	38.37	7.07	37.42	52.88	74.00	-21.12	VERTICAL	Peak

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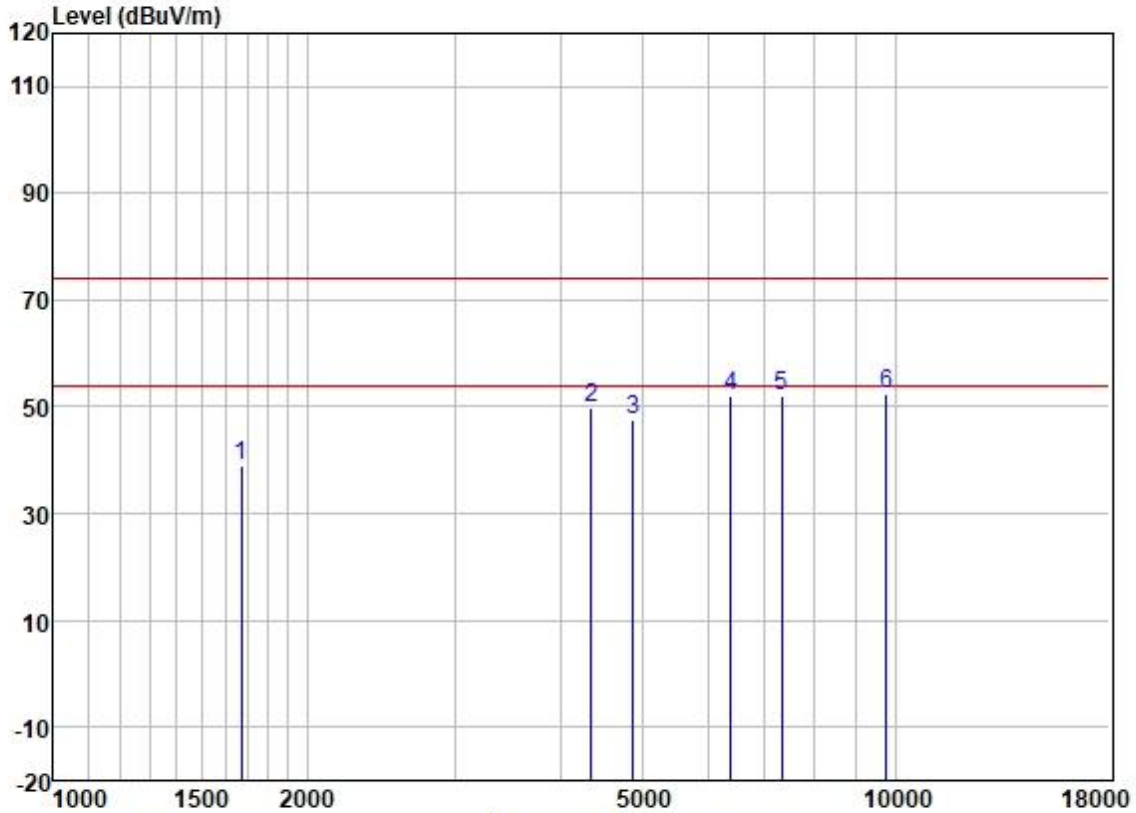
Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1672.779	48.35	25.67	2.80	37.91	38.91	74.00	-35.09	HORIZONTAL	Peak
2	4354.454	51.31	30.59	4.68	36.81	49.77	74.00	-24.23	HORIZONTAL	Peak
3	4882.000	47.46	31.56	5.52	36.84	47.70	74.00	-26.30	HORIZONTAL	Peak
4	6377.195	49.49	33.68	5.91	36.98	52.10	74.00	-21.90	HORIZONTAL	Peak
5	7323.000	47.24	36.00	6.13	37.43	51.94	74.00	-22.06	HORIZONTAL	Peak
6	9764.000	44.37	38.50	7.02	37.41	52.48	74.00	-21.52	HORIZONTAL	Peak

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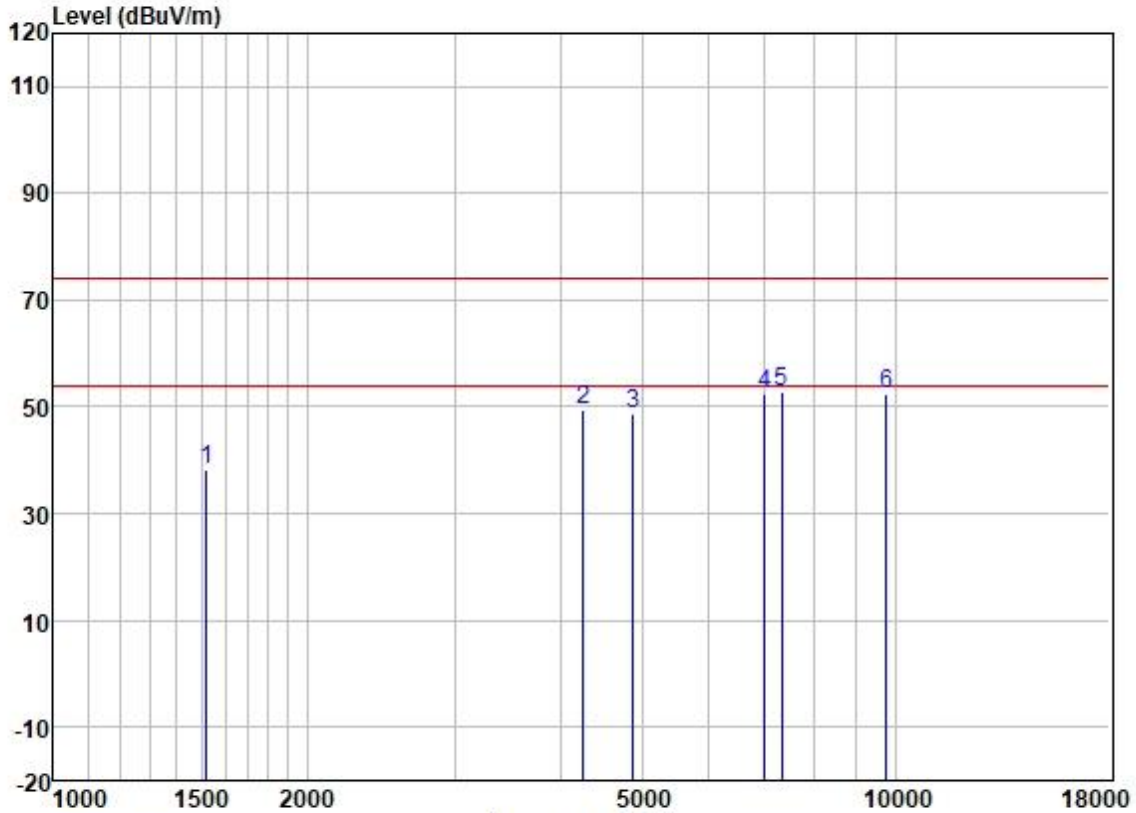

Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1520.598	48.18	25.51	2.80	38.07	38.42	74.00	-35.58	VERTICAL	Peak
2	4254.921	51.12	30.34	4.62	36.81	49.27	74.00	-24.73	VERTICAL	Peak
3	4882.000	48.36	31.56	5.52	36.84	48.60	74.00	-25.40	VERTICAL	Peak
4	6995.172	48.90	35.00	5.81	37.25	52.46	74.00	-21.54	VERTICAL	Peak
5	7323.000	48.09	36.00	6.13	37.43	52.79	74.00	-21.21	VERTICAL	Peak
6	9764.000	44.40	38.50	7.02	37.41	52.51	74.00	-21.49	VERTICAL	Peak

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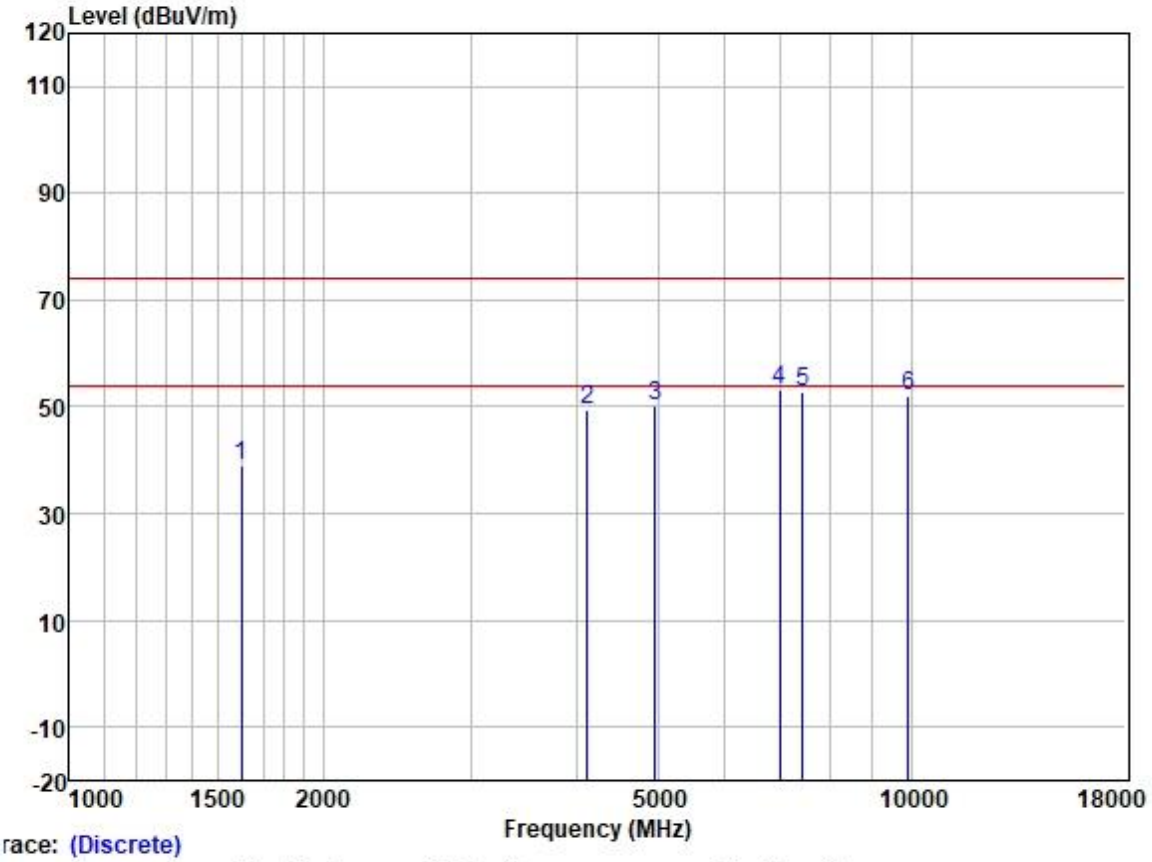
Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1601.804	48.56	25.58	2.80	37.98	38.96	74.00	-35.04	HORIZONTAL	Peak
2	4121.768	51.76	29.98	4.60	36.80	49.54	74.00	-24.46	HORIZONTAL	Peak
3	4960.000	49.80	31.65	5.65	36.84	50.26	74.00	-23.74	HORIZONTAL	Peak
4	6974.982	49.45	34.97	5.81	37.23	53.00	74.00	-21.00	HORIZONTAL	Peak
5	7440.000	47.61	36.27	6.22	37.47	52.63	74.00	-21.37	HORIZONTAL	Peak
6	9920.000	43.82	38.65	6.96	37.40	52.03	74.00	-21.97	HORIZONTAL	Peak

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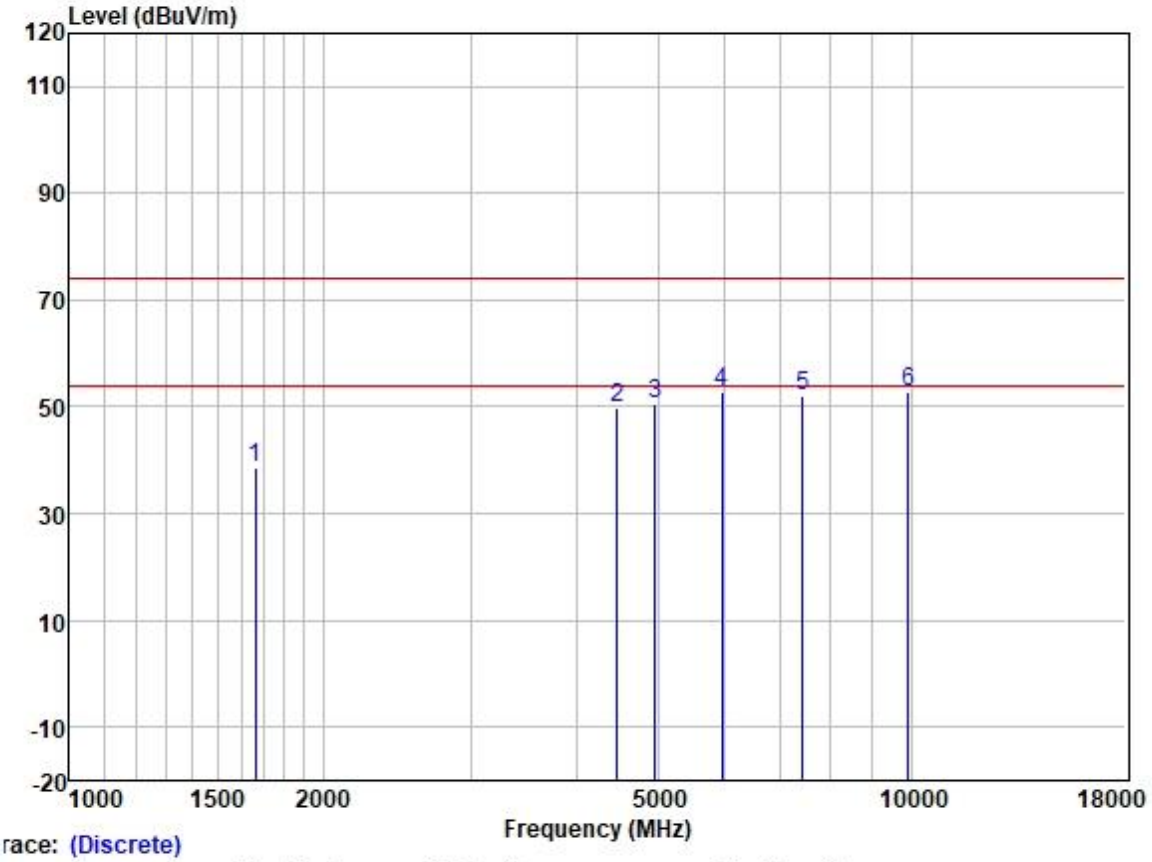
Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1663.137	48.14	25.65	2.80	37.91	38.68	74.00	-35.32	VERTICAL	Peak
2	4469.214	51.10	30.77	4.93	36.81	49.99	74.00	-24.01	VERTICAL	Peak
3	4960.000	49.99	31.65	5.65	36.84	50.45	74.00	-23.55	VERTICAL	Peak
4	5949.811	51.39	32.36	6.05	36.90	52.90	74.00	-21.10	VERTICAL	Peak
5	7440.000	46.97	36.27	6.22	37.47	51.99	74.00	-22.01	VERTICAL	Peak
6	9920.000	44.70	38.65	6.96	37.40	52.91	74.00	-21.09	VERTICAL	Peak

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for GZCR2206000711AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for GZCR2206000711AT

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中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86–20) 82155555 f (86–20) 82075058 sgs.china@sgs.com

10 Appendix

For Bluetooth:

1. Bandwidth

1.1 OBW

1.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	99% Occupied Bandwidth (MHz) Result	Verdict
GFSK	SISO	2402	DH5	1	0.884	Pass
		2441	DH5	1	0.885	Pass
		2480	DH5	1	0.885	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.168	Pass
		2441	2DH5	1	1.165	Pass
		2480	2DH5	1	1.160	Pass

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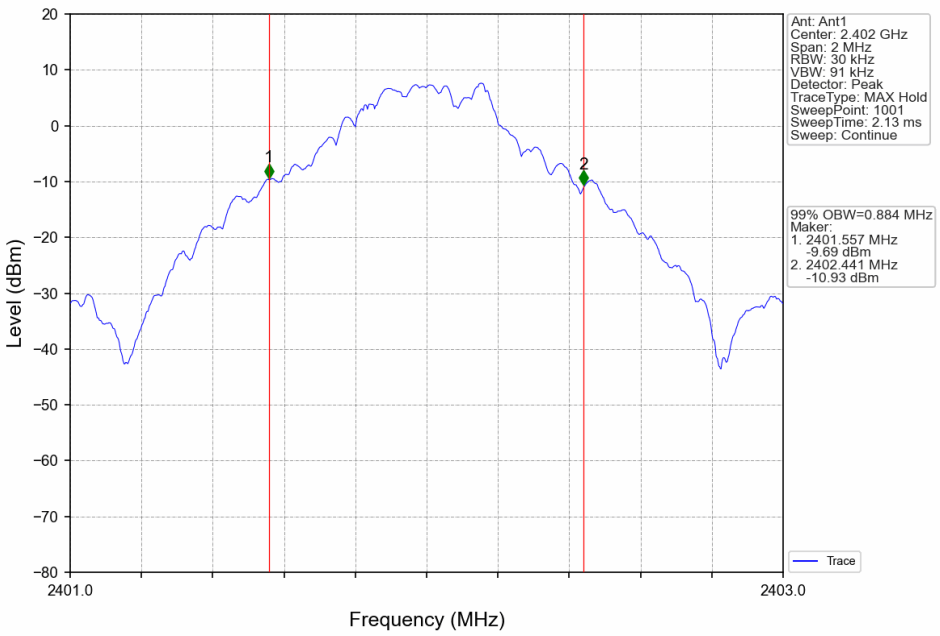
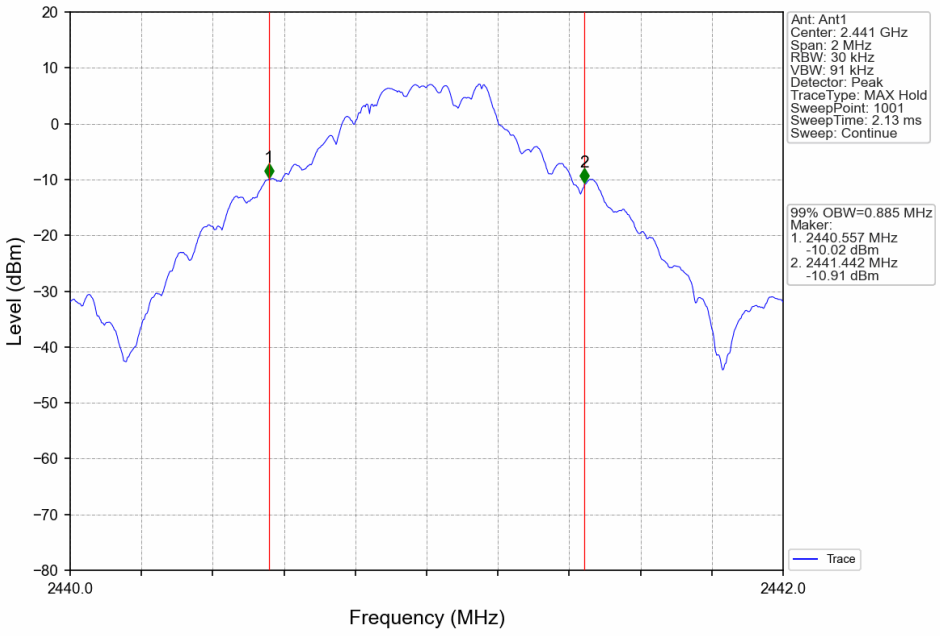
1.1.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



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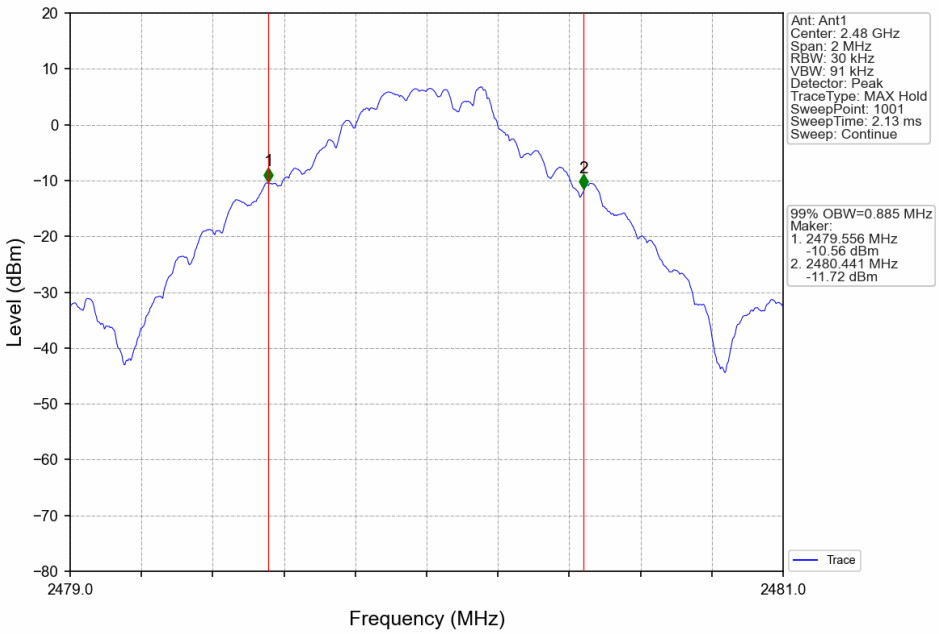
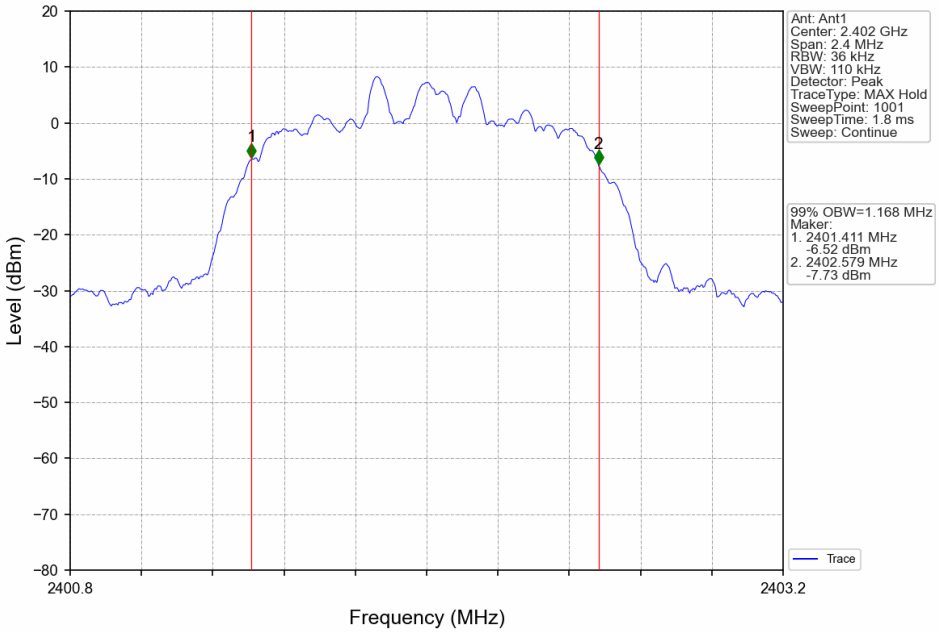
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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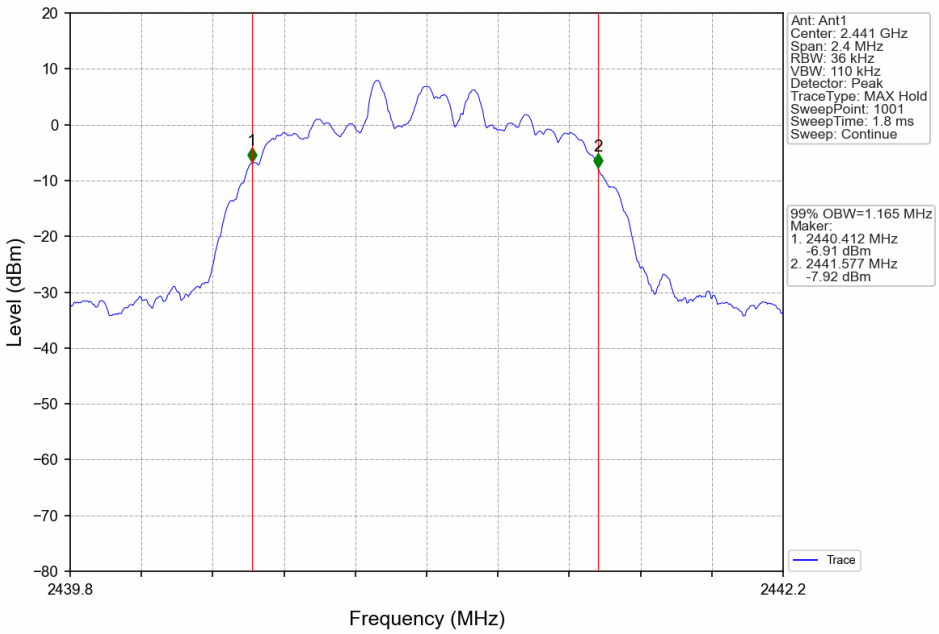
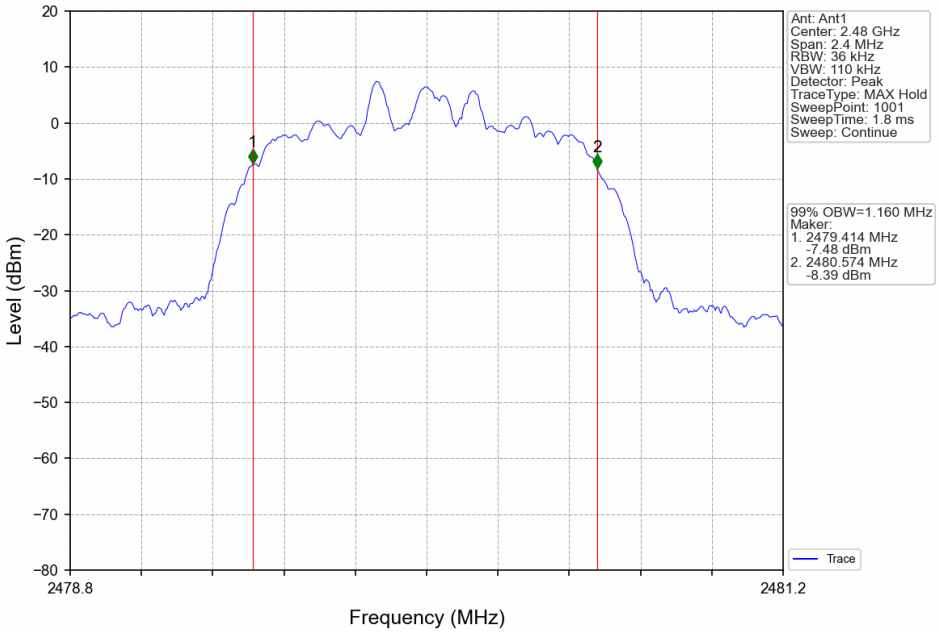
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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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	0.964	Pass
		2441	DH5	1	0.965	Pass
		2480	DH5	1	0.963	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	1.281	Pass
		2441	2DH5	1	1.279	Pass
		2480	2DH5	1	1.274	Pass

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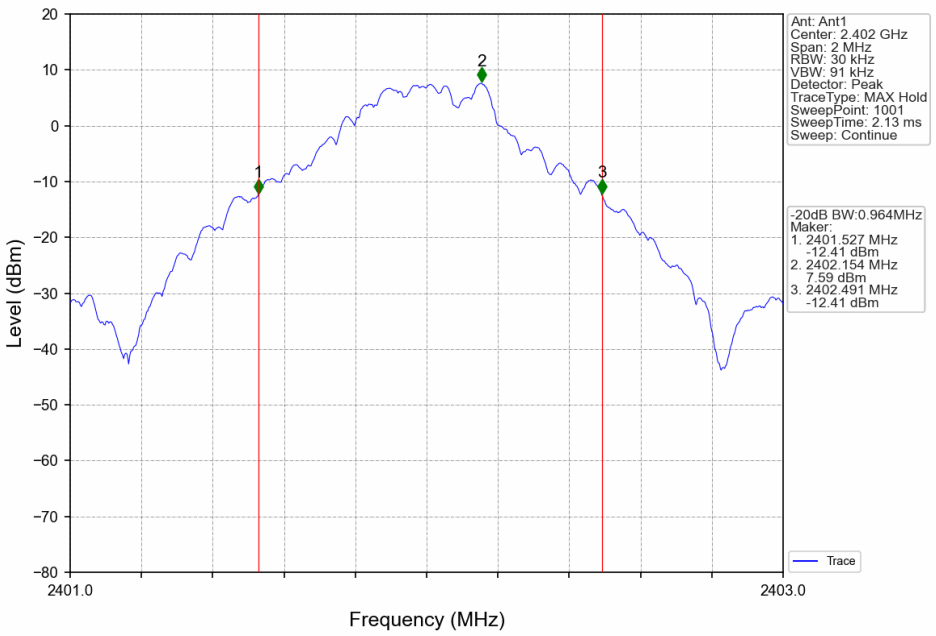
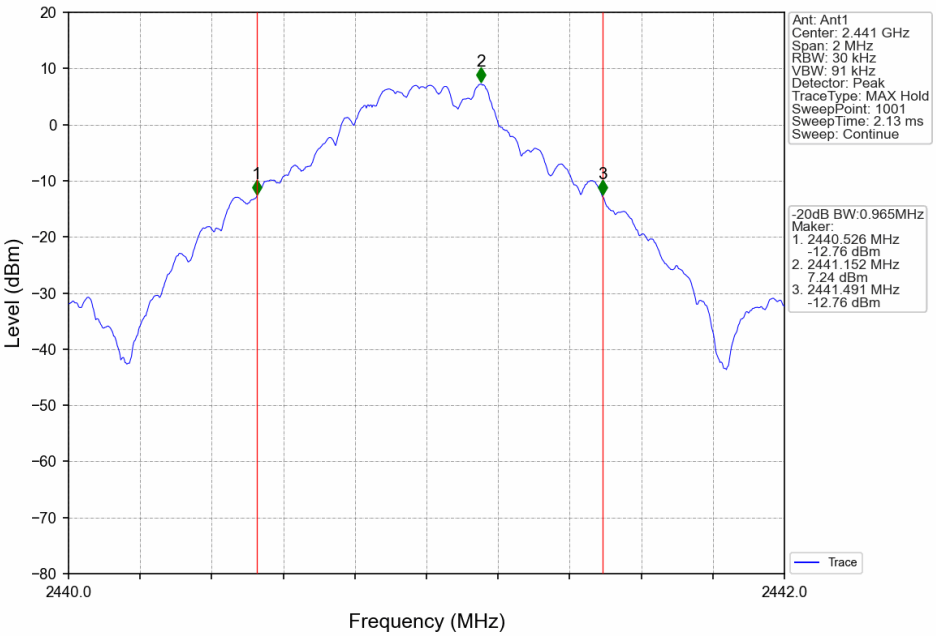
1.2.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



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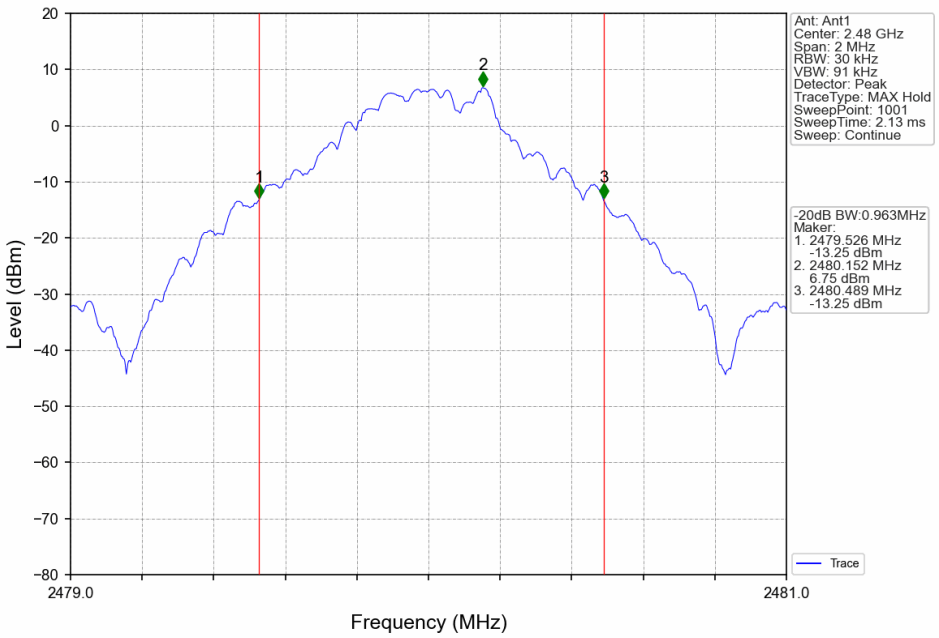
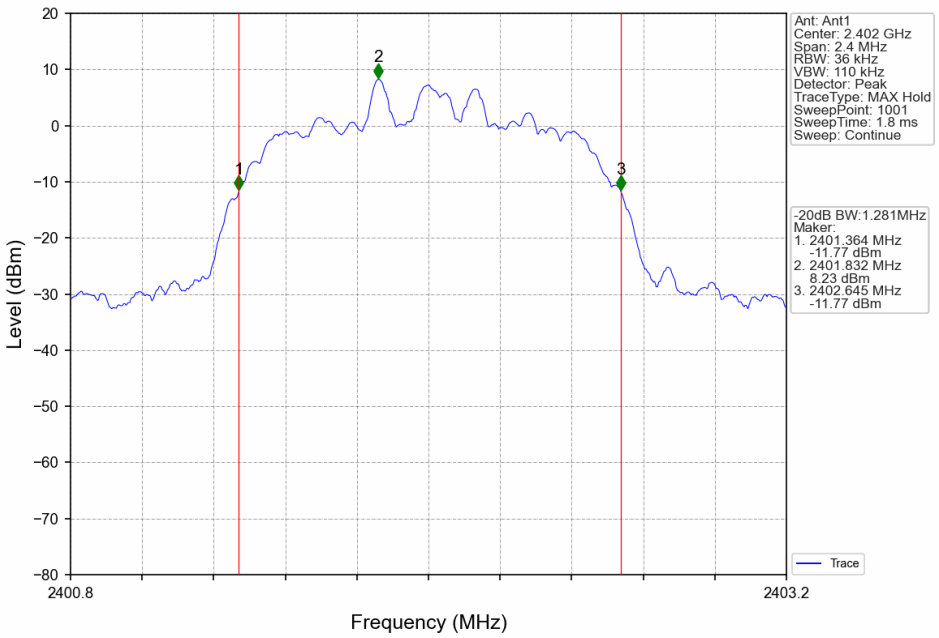
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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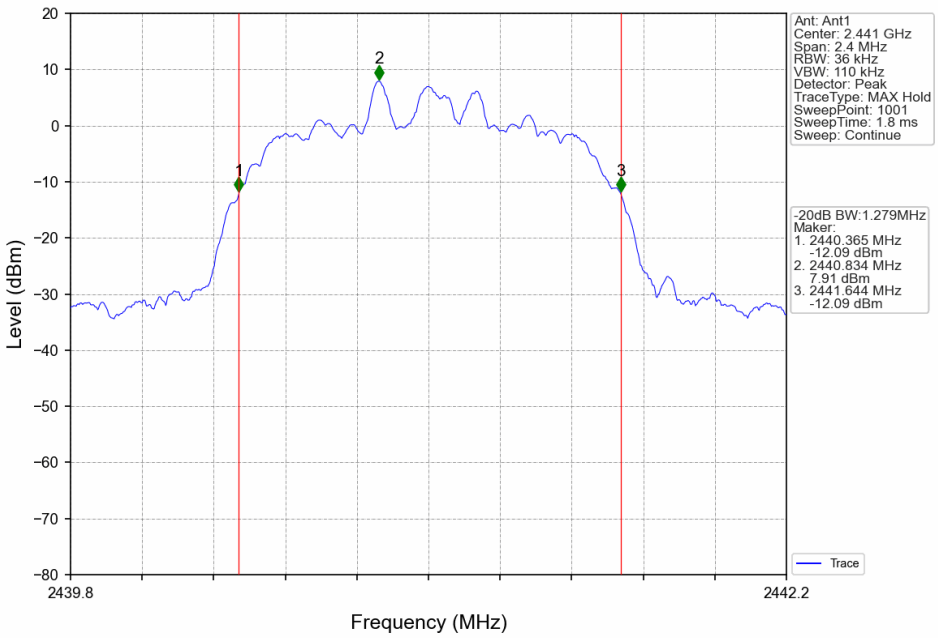
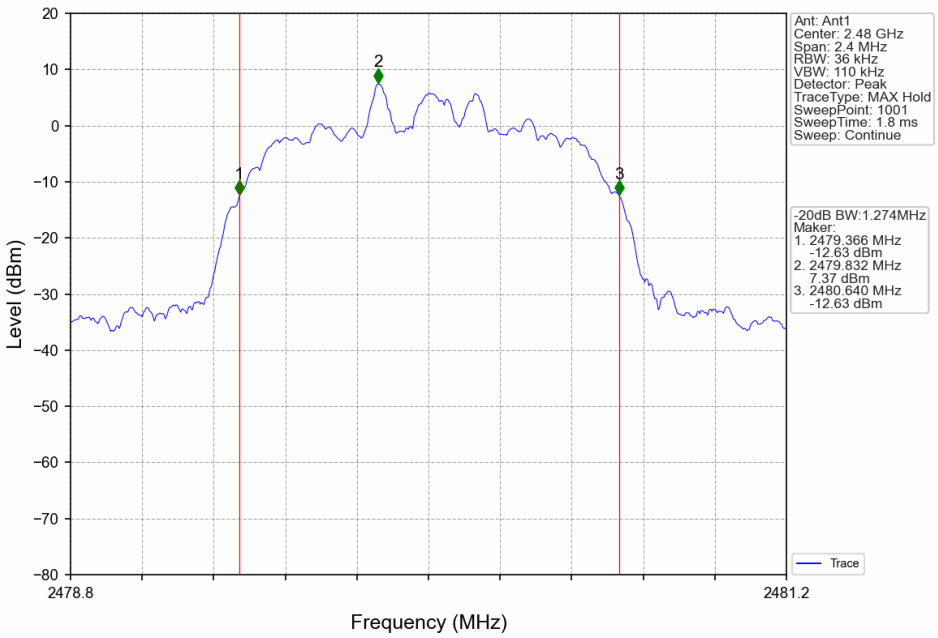
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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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	9.95	<=30	Pass
		2441	DH5	9.62	<=30	Pass
		2480	DH5	9.10	<=30	Pass
Pi/4DQPSK	SISO	2402	2DH5	9.99	<=20.97	Pass
		2441	2DH5	9.66	<=20.97	Pass
		2480	2DH5	9.16	<=20.97	Pass
Note1: Antenna Gain: 1.40dBi;						

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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	0.996	0.965	>=0.965	Pass
Pi/4DQPSK	SISO	HOPP	2DH5	1.001	1.281	>=0.854	Pass

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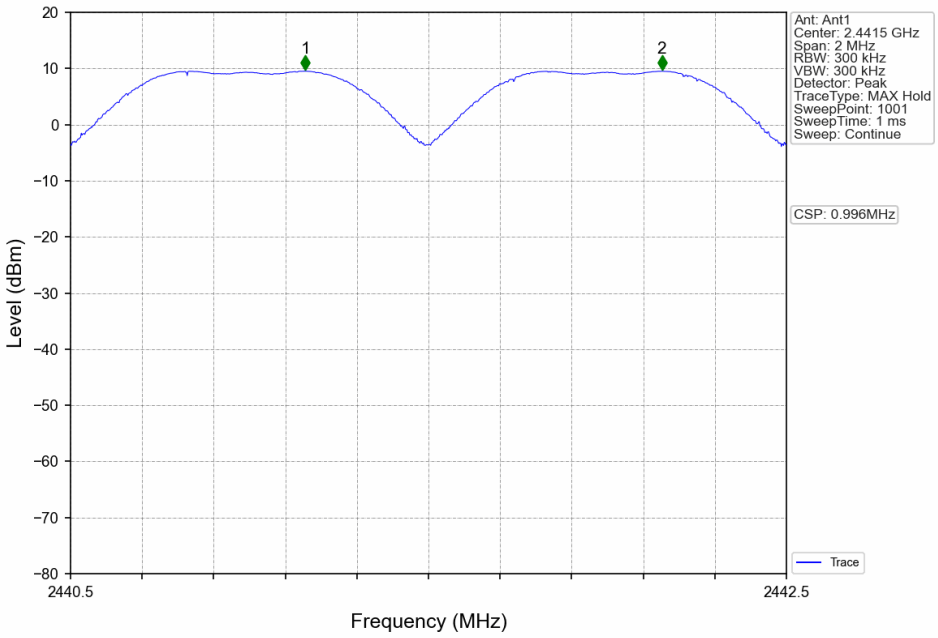
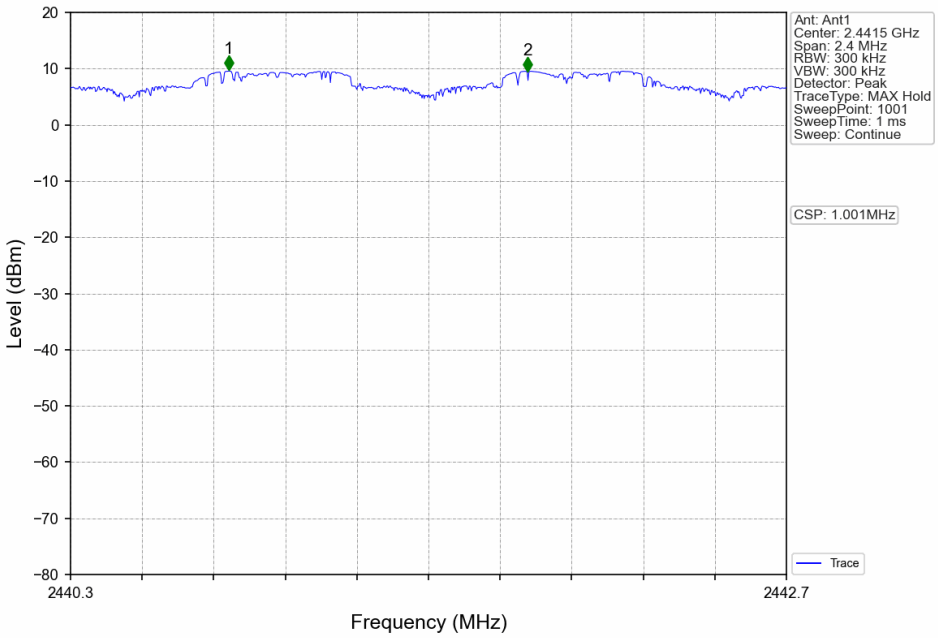
3.1.2 Test Graph

GFSK_DH5_HOPP_Ant1_NTNV



Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



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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

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4.1.2 Test Graph

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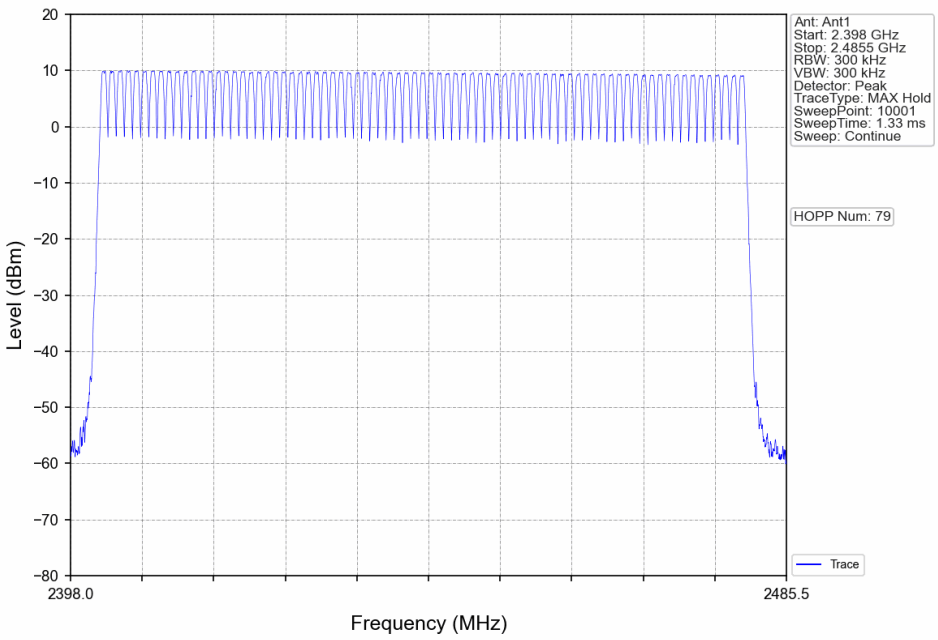
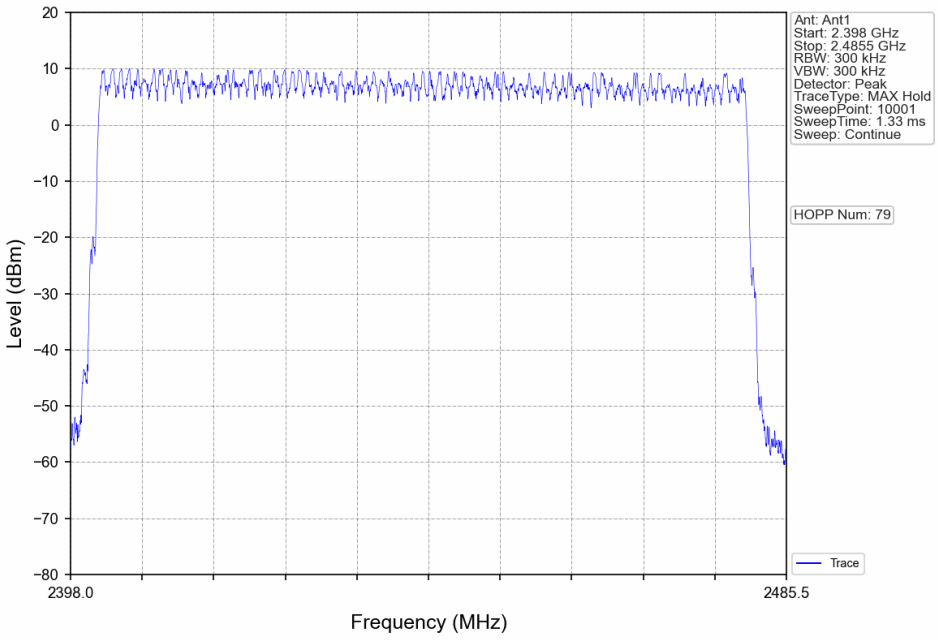


Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



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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	0.378	31.600	320	120.960	<=400	Pass
			DH3	1.634	31.600	160	261.440	<=400	Pass
			DH5	2.882	31.600	106	305.492	<=400	Pass
Pi/4DQPSK	SISO	HOPP	2DH1	0.382	31.600	320	122.240	<=400	Pass
			2DH3	1.634	31.600	160	261.440	<=400	Pass
			2DH5	2.882	31.600	107	308.374	<=400	Pass

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5.1.2 Test Graph

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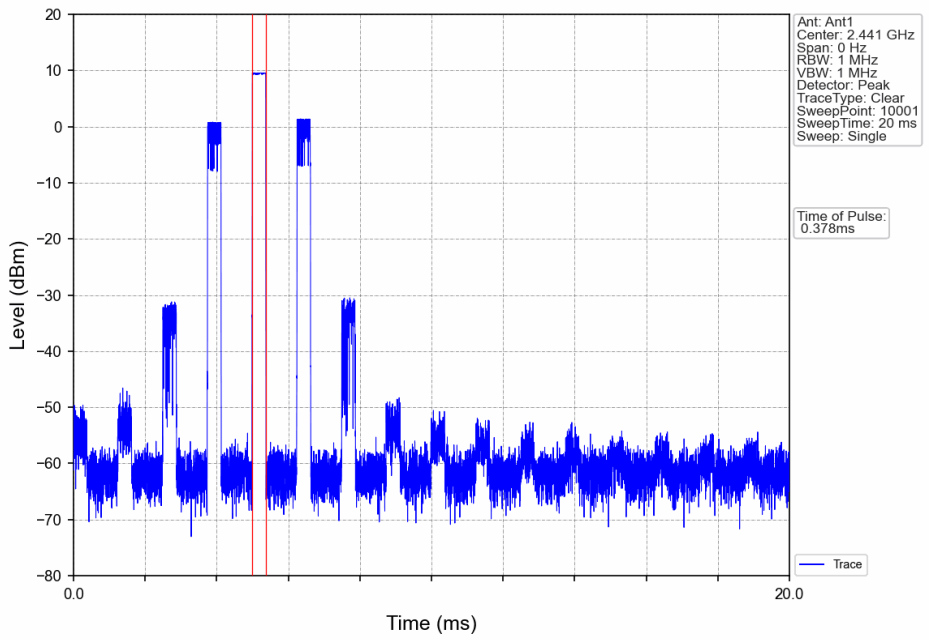

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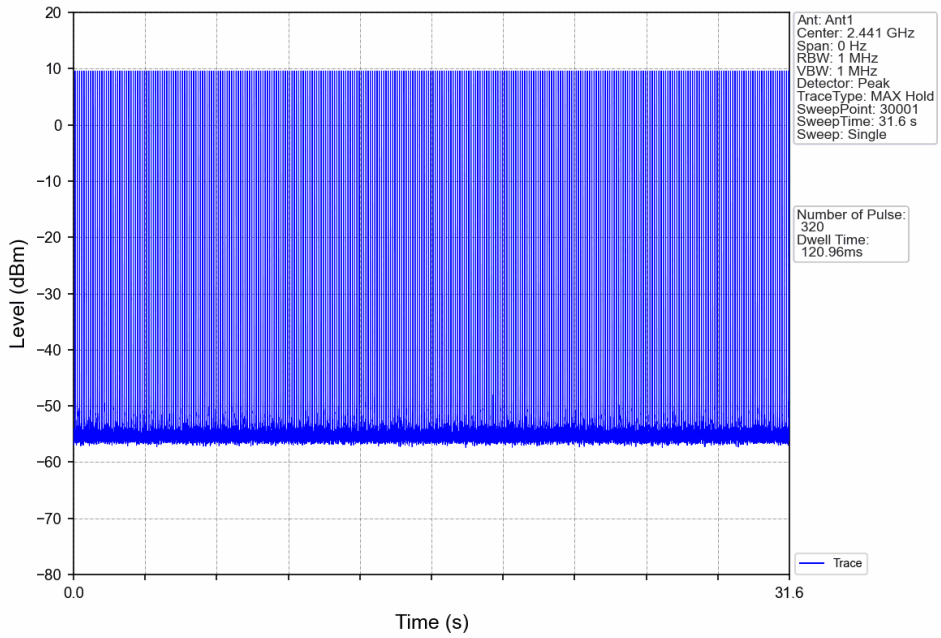

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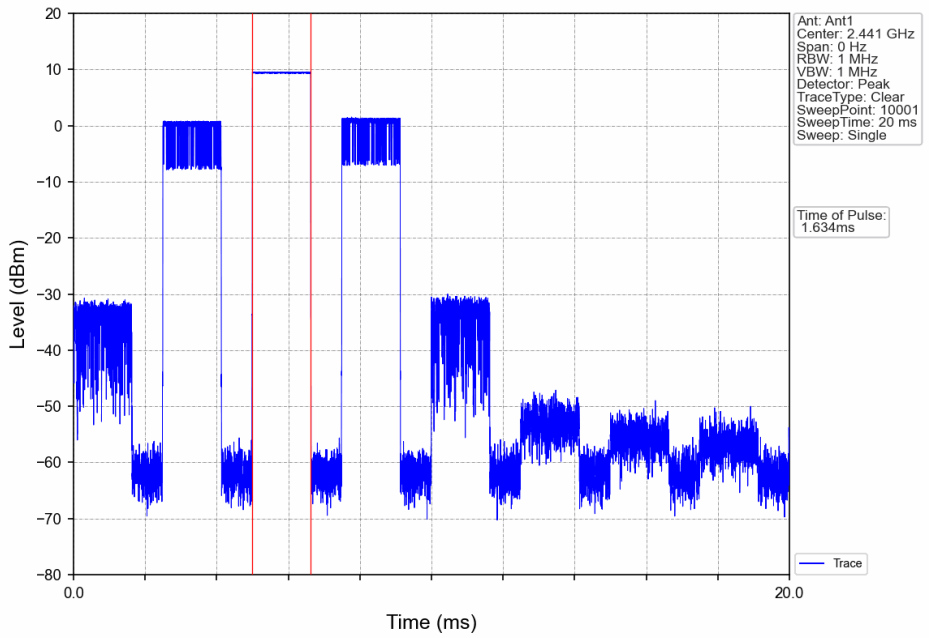
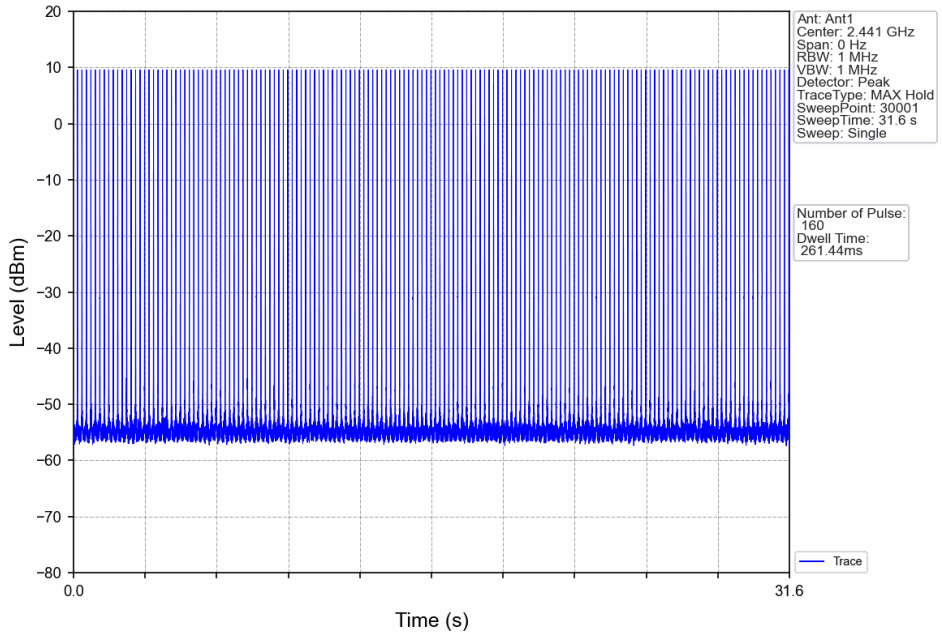
GFSK_DH3_HOPP_Ant1_NTNV



GFSK_DH3_HOPP_Ant1_NTNV



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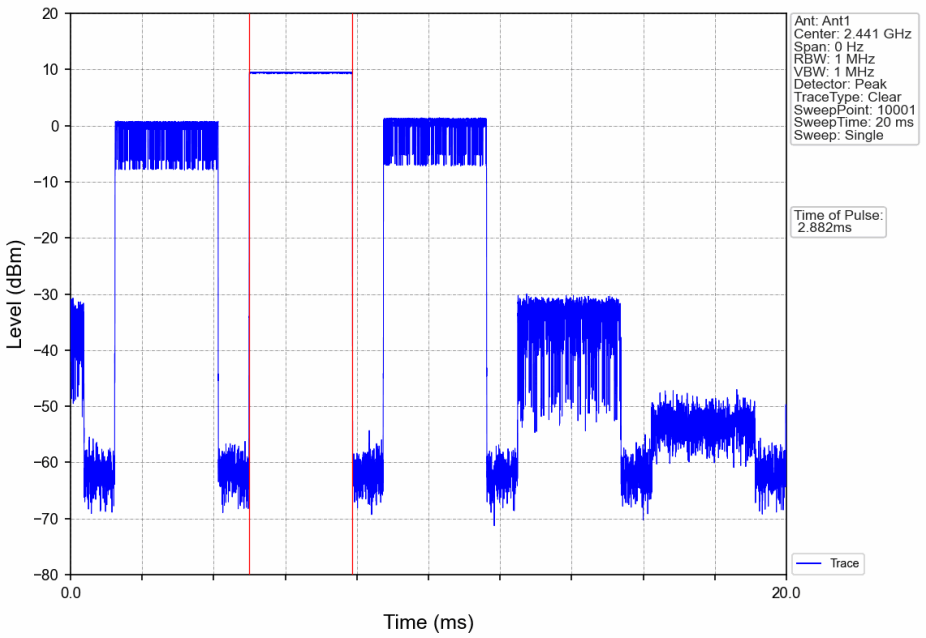
GFSK_DH5_HOPP_Ant1_NTNV



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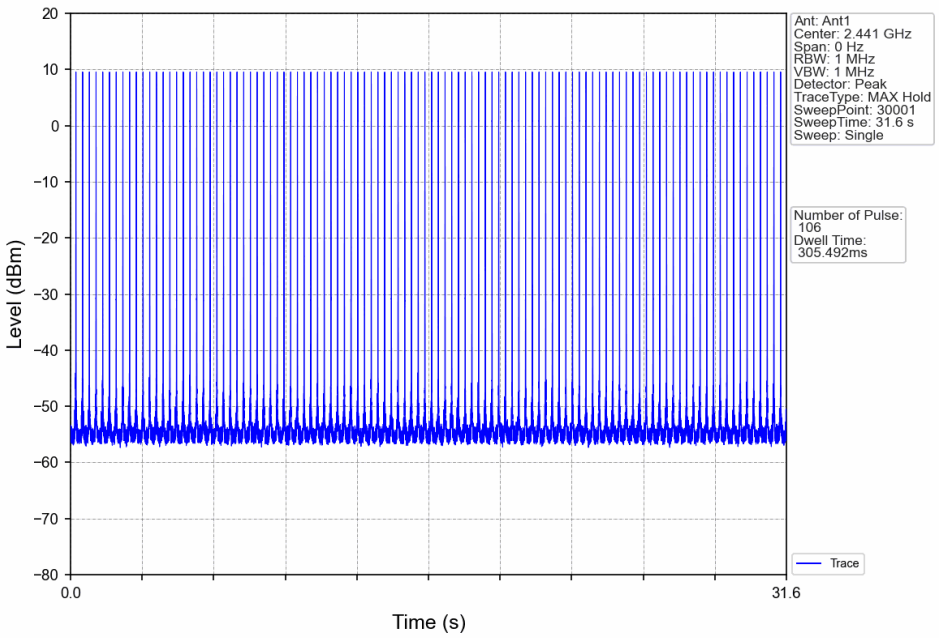

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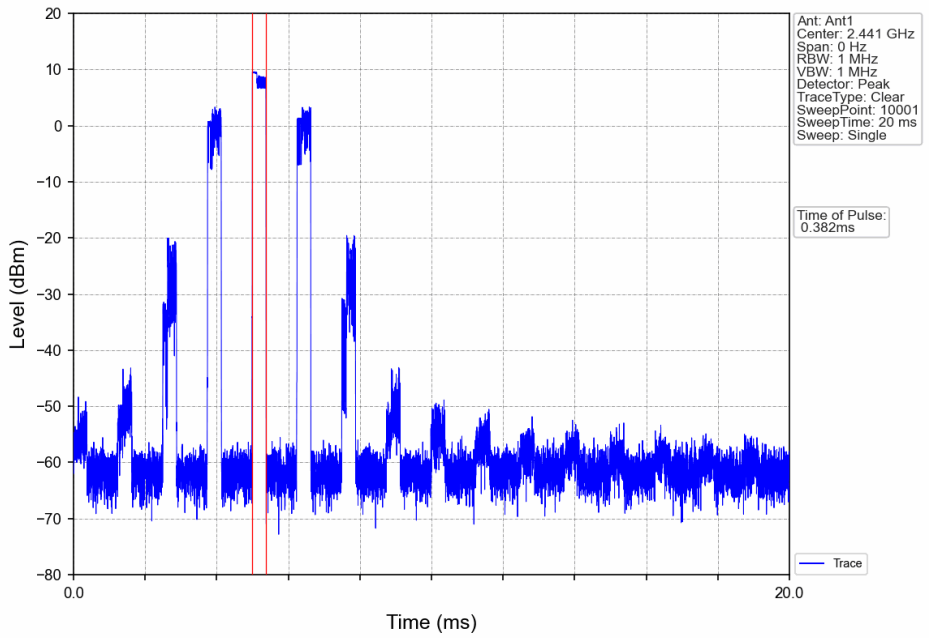
Pi/4DQPSK_2DH1_HOPP_Ant1_NTNV



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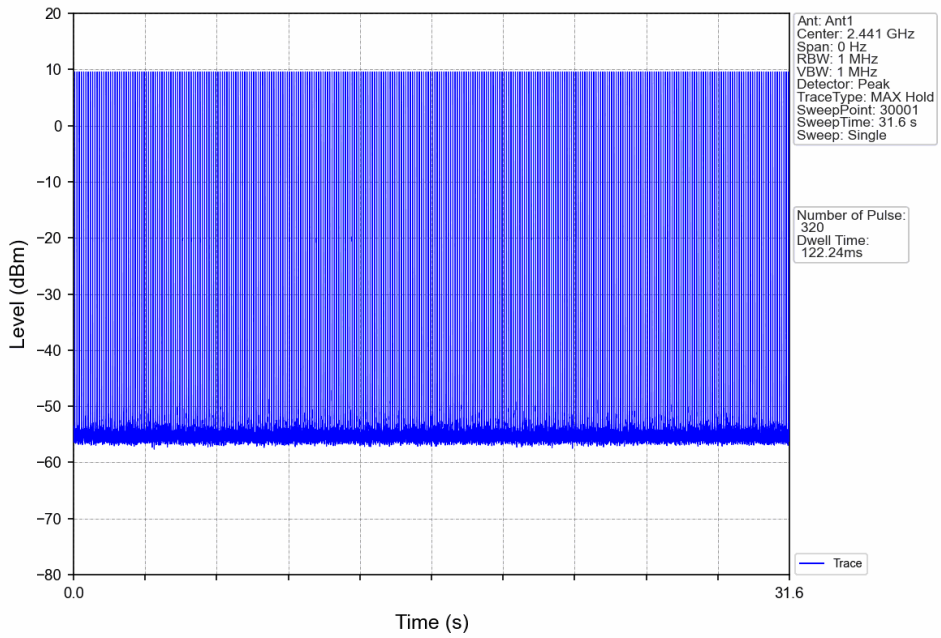

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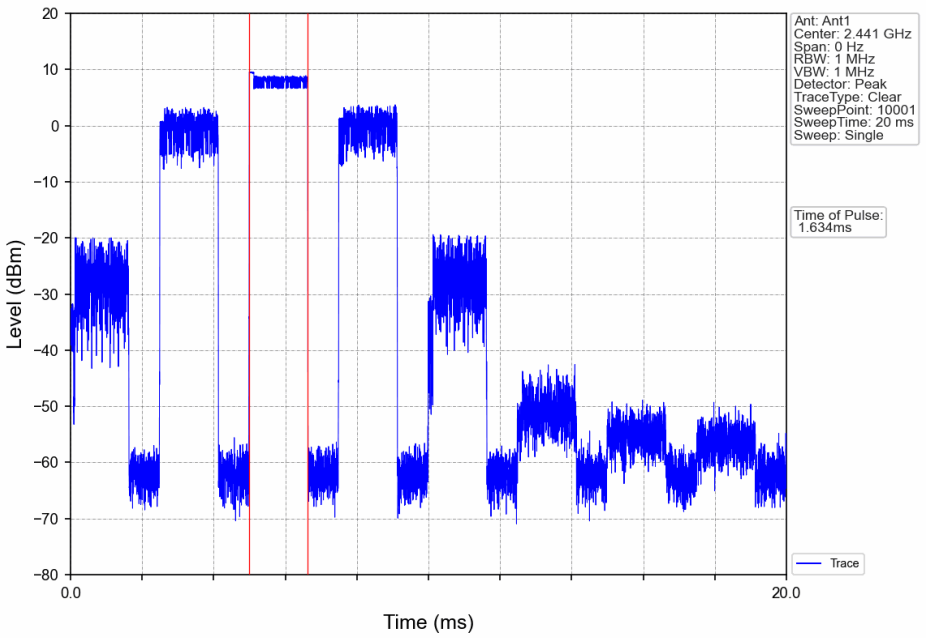
Pi/4DQPSK_2DH3_HOPP_Ant1_NTNV



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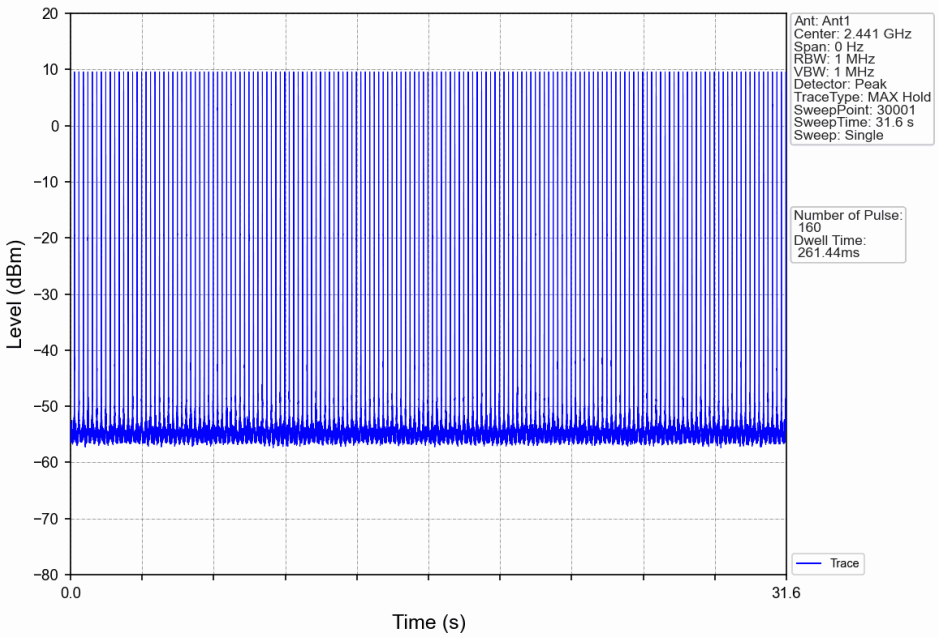

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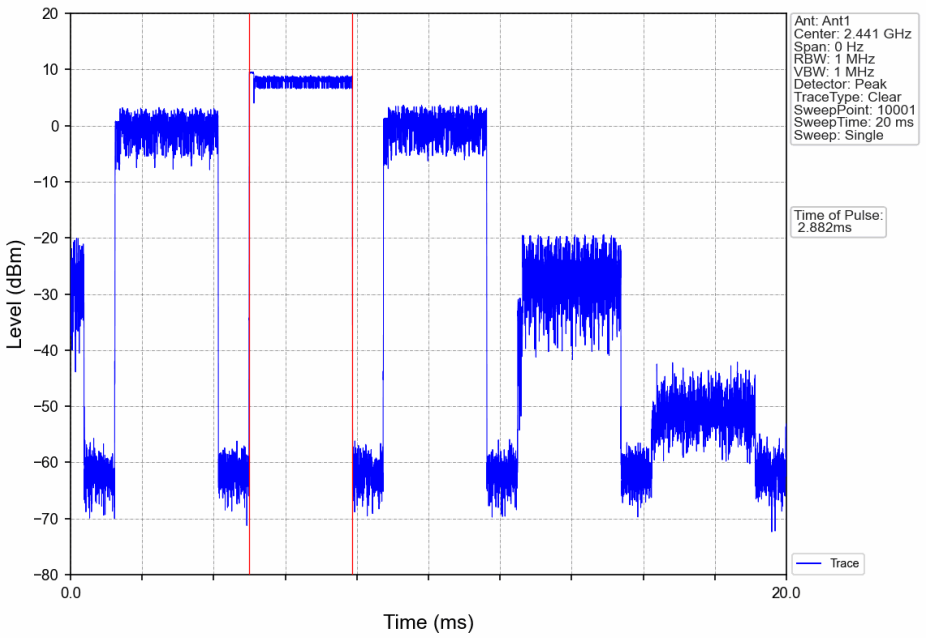
Pi/4DQPSK_2DH5_HOPP_Ant1_NTNV



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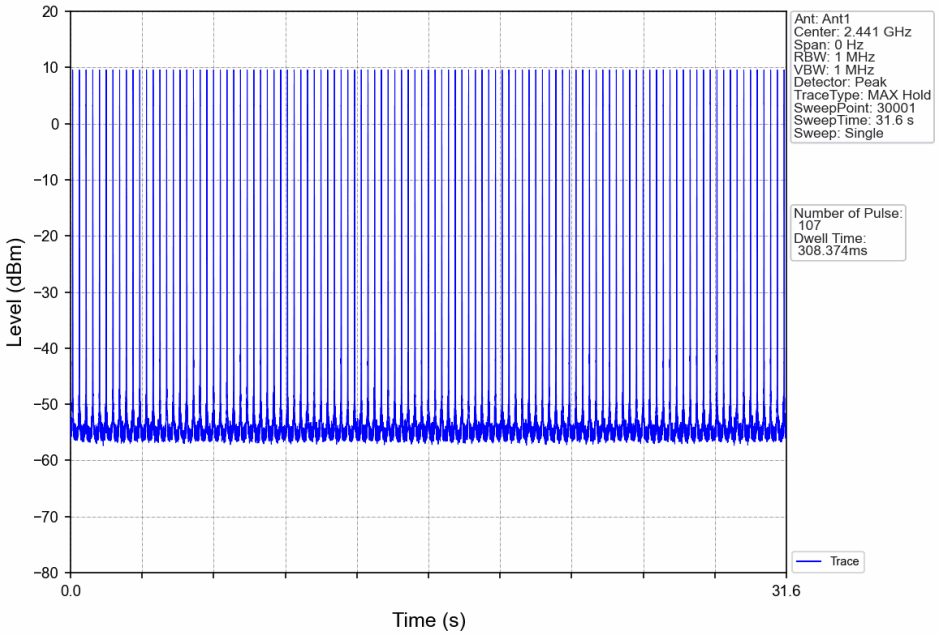

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6. Unwanted Emissions In Non-restricted Frequency Bands

6.1 Ref

6.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)
GFSK	SISO	2402	DH5	1	9.80
		2441	DH5	1	9.45
		2480	DH5	1	8.96
Pi/4DQPSK	SISO	2402	2DH5	1	9.80
		2441	2DH5	1	9.48
		2480	2DH5	1	8.97
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level. Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.					

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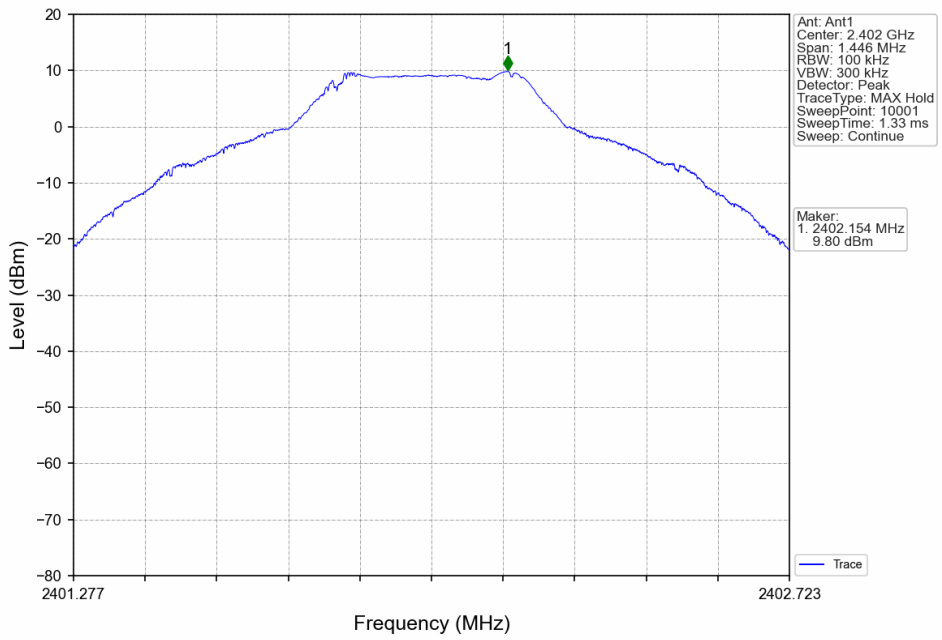
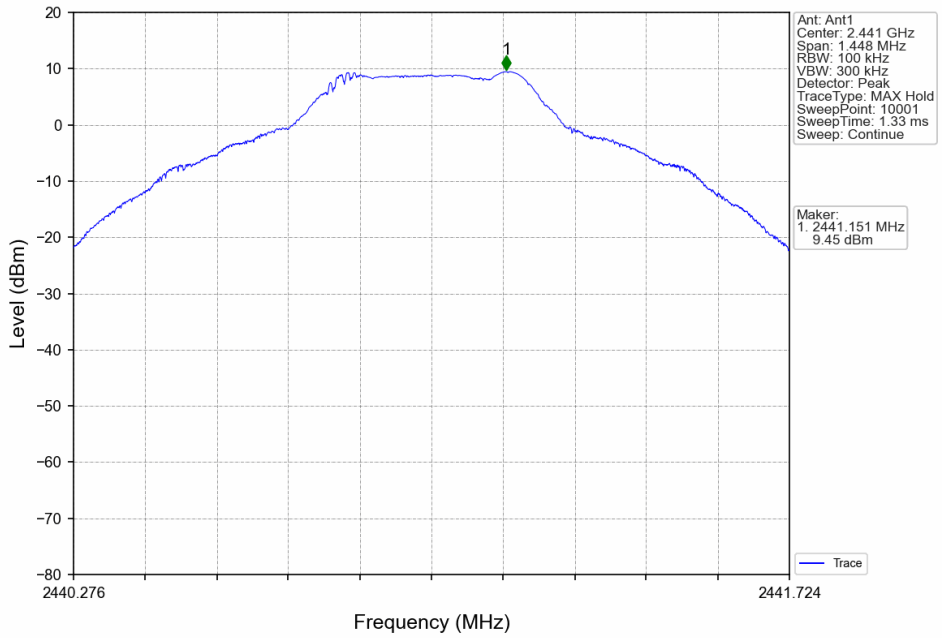
6.1.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_MCH_2441MHz_Ant1_NTNV



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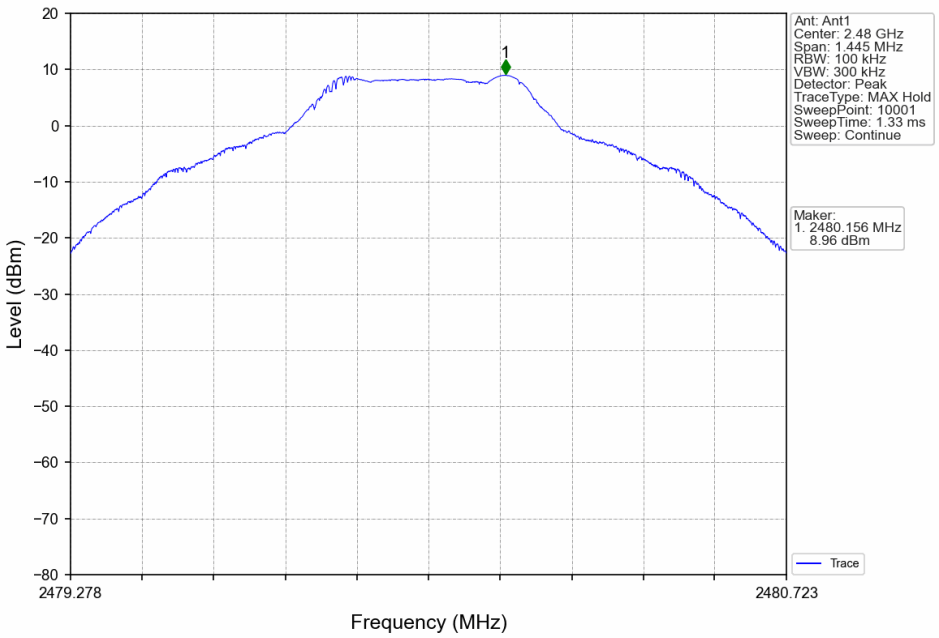
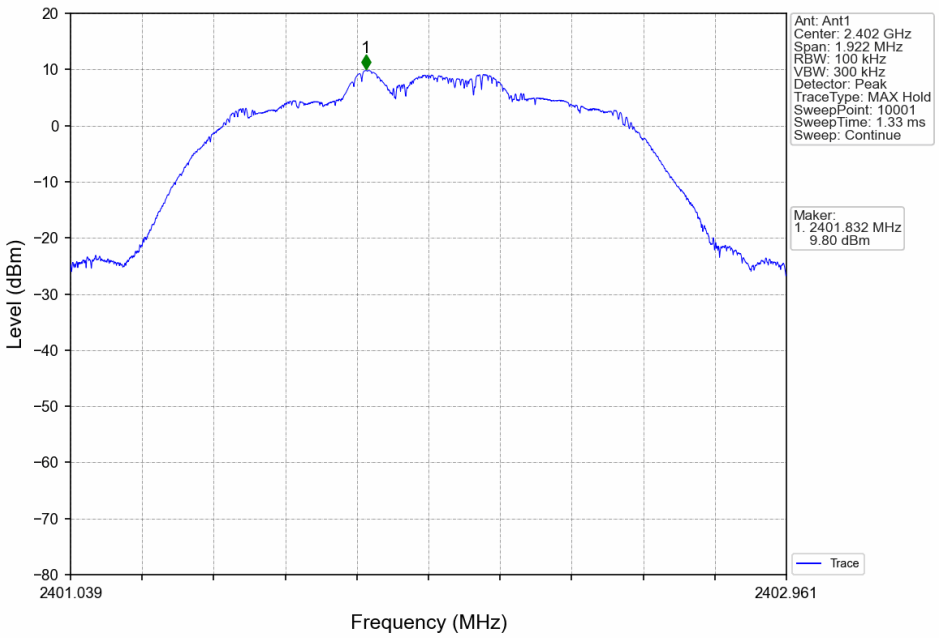
GFSK_DH5_HCH_2480MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_LCH_2402MHz_Ant1_NTNV



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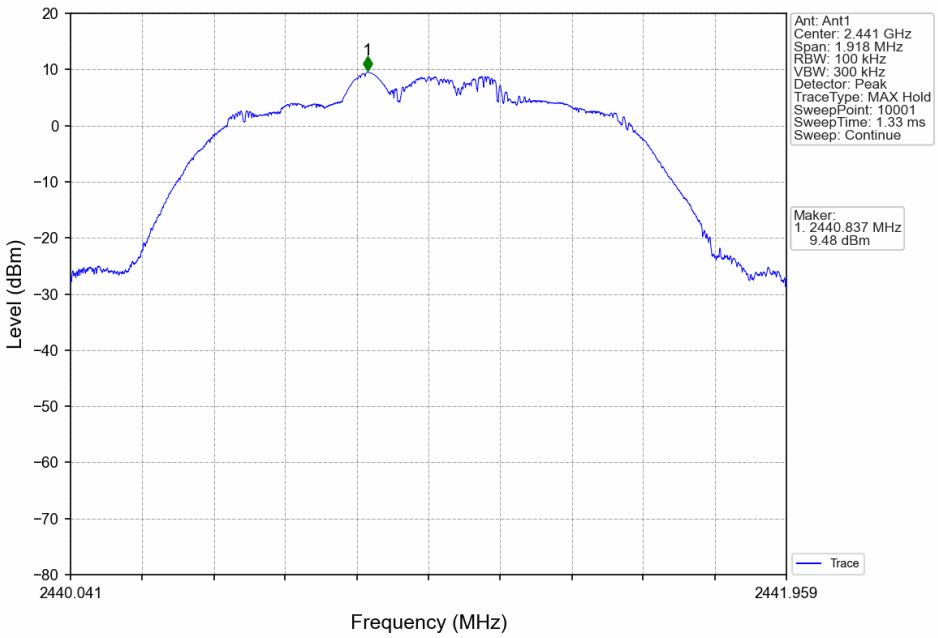
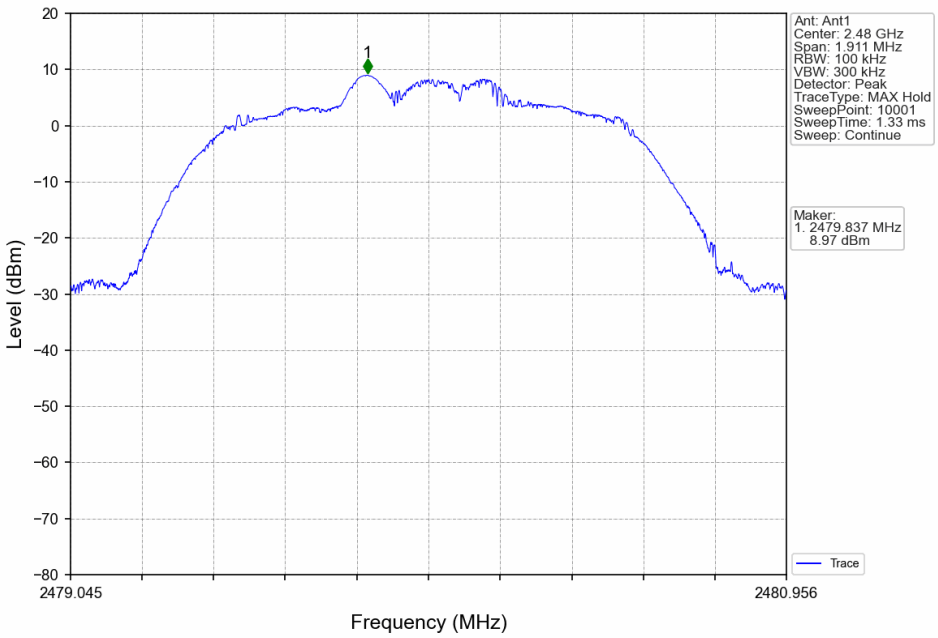
Pi/4DQPSK_2DH5_MCH_2441MHz_Ant1_NTNV



Pi/4DQPSK_2DH5_HCH_2480MHz_Ant1_NTNV



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6.2 CSE

6.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Packet Type	ANT	Level of Reference (dBm)	Limit (dBm)	Verdict
GFSK	SISO	2402	DH5	1	9.80	-10.20	Pass
		2441	DH5	1	9.80	-10.20	Pass
		2480	DH5	1	9.80	-10.20	Pass
		HOPP	DH5	1	9.80	-10.20	Pass
Pi/4DQPSK	SISO	2402	2DH5	1	9.80	-10.20	Pass
		2441	2DH5	1	9.80	-10.20	Pass
		2480	2DH5	1	9.80	-10.20	Pass
		HOPP	2DH5	1	9.80	-10.20	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level. Note2: RBW = 1MHz was used during the pre-test. The final test will be performed at RBW=100kHz while the margin is less than 3dB.							

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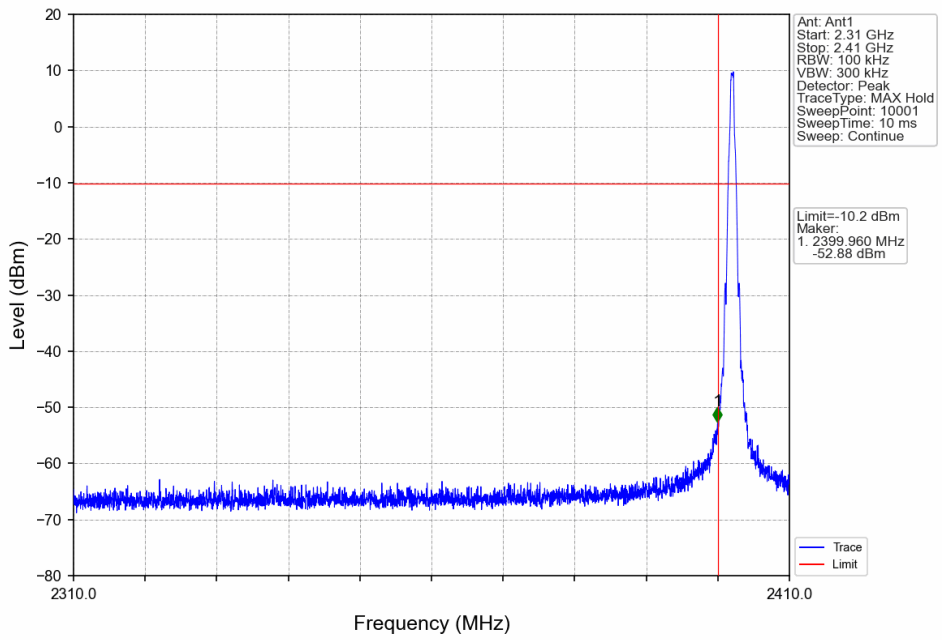
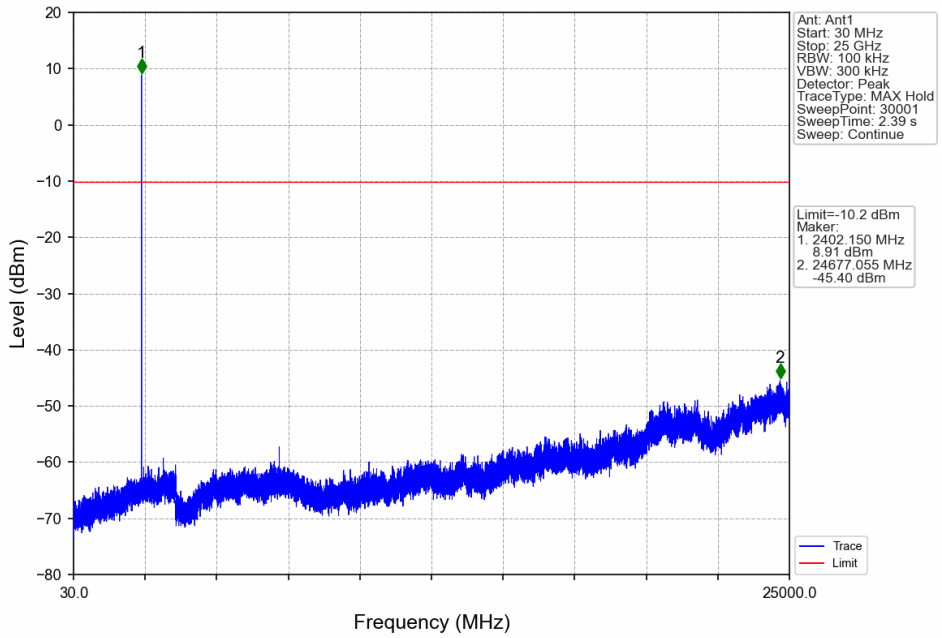
6.2.2 Test Graph

GFSK_DH5_LCH_2402MHz_Ant1_NTNV



GFSK_DH5_LCH_2402MHz_Ant1_NTNV



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