TEST REPORT

Application No.:	GZCR2202000178LM
Applicant:	Vanguard USA Inc.
Address of Applicant:	9157 East M-36 Whitmore Lake, Michigan USA
Manufacturer:	FOSHAN NANHAI CHEVAN OPTICAL ELECTRONICS CO., LTD
Address of Manufacturer:	Carp Industry Area, Dawo Danzao Town, Nanhai Foshan City, Guangdong, P.R. China
Factory:	GOLD EMPIRE (MYANMAR) CO., LTD
Address of Factory:	PLOT NO.33/1 + 33KA/2 + 34KA/1 BLOCK NO. 560, LAKEPOOT TAW VILLAGE HMAWBI T/S, YANGON MYANMAR
Equipment Under Test (EUT):	
EUT Name:	Bluetooth remote control
Model No.:	BT-11, BT-10 ♣
♣	Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2022-02-21
Date of Test:	2022-02-23 to 2022-03-09
Date of Issue:	2022-03-15
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory Manager

Revision Record			
Version	**Report No.**	**Date**	**Remark**
01	GZCR220200017803	2022-03-15	Original

Authorized for issue by:				
		Kevin Zhang **Kevin Zhang/Project Engineer**		
		Ricky Liu **Ricky Liu/Reviewer**		

2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence		N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.5	47 CFR Part 15, Subpart C 15.247(b)(1)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation		ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number		ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time		ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 7.8.8	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass**

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.

**: The EUT passed Radiated Spurious Emissions Above 1GHz test after modifications.

¤ Declaration of EUT Family Grouping:

Model No.: BT-11, BT-10

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

Therefore only one model BT-11 was tested in this report.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3 V (1*CR2032 size battery)
Cable(s):	None
Test Voltage:	DC 3 V
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PCB Antenna
Antenna Gain:	0.55 dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted 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); ±4.38dB (30MHz-1GHz; 10m); ± 4.52dB (1GHz-6GHz); ± 4.54dB (above 6GHz)
Radiated Spurious Emissions Below 1GHz	±5.00dB (3m); ±4.38dB (10m)
Radiated Spurious Emissions Above 1GHz	±4.52dB (1GHz-6GHz); ±4.54dB (above 6GHz)

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.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch3)	Agilent Technologies	U2021XA_Ch3	SEM009-03	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch1)	Agilent Technologies	U2021XA_Ch1	SEM009-01	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch4)	Agilent Technologies	U2021XA_Ch4	SEM009-04	2021-05-19	2022-05-18

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch3)	Agilent Technologies	U2021XA_Ch3	SEM009-03	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch1)	Agilent Technologies	U2021XA_Ch1	SEM009-01	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch4)	Agilent Technologies	U2021XA_Ch4	SEM009-04	2021-05-19	2022-05-18

Carrier Frequencies Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch3)	Agilent Technologies	U2021XA_Ch3	SEM009-03	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch1)	Agilent Technologies	U2021XA_Ch1	SEM009-01	2021-05-19	2022-05-18

Power Meter (U2021XA_Ch4)	Agilent Technologies	U2021XA_Ch4	SEM009-04	2021-05-19	2022-05-18

Hopping Channel Number

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch3)	Agilent Technologies	U2021XA_Ch3	SEM009-03	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch1)	Agilent Technologies	U2021XA_Ch1	SEM009-01	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch4)	Agilent Technologies	U2021XA_Ch4	SEM009-04	2021-05-19	2022-05-18

Dwell Time

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch3)	Agilent Technologies	U2021XA_Ch3	SEM009-03	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch1)	Agilent Technologies	U2021XA_Ch1	SEM009-01	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch4)	Agilent Technologies	U2021XA_Ch4	SEM009-04	2021-05-19	2022-05-18

Conducted Band Edges Measurement

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch3)	Agilent Technologies	U2021XA_Ch3	SEM009-03	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch1)	Agilent Technologies	U2021XA_Ch1	SEM009-01	2021-05-19	2022-05-18

Power Meter (U2021XA_Ch4)	Agilent Technologies	U2021XA_Ch4	SEM009-04	2021-05-19	2022-05-18

Conducted Spurious Emissions

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-02	2023-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
Test Software JS1120-3	JS Tonscend	V2.6	GZE100-69	N/A	N/A
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch3)	Agilent Technologies	U2021XA_Ch3	SEM009-03	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch1)	Agilent Technologies	U2021XA_Ch1	SEM009-01	2021-05-19	2022-05-18
Power Meter (U2021XA_Ch4)	Agilent Technologies	U2021XA_Ch4	SEM009-04	2021-05-19	2022-05-18

Radiated Emissions which fall in the restricted bands

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-12-17	2022-12-16
EMI Test Receiver (10Hz-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
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

Radiated Spurious Emissions Below 1GHz

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Amplifier (9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2020-04-16	2022-04-15

EMI Test Receiver (1Hz-8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Trilog Broadband Antenna (25MHz-1GHz)-Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22

Radiated Spurious Emissions Above 1GHz					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-12-17	2022-12-16
EMI Test Receiver (10Hz-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
Horn Antenna (14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-20	2022-09-19
MXE EMI Receiver (10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

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

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

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

6.1.2 Conclusion

Standard Requirement:

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

15.247(b) (4) requirement:

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

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0.55 dBi.

Antenna location: Refer to internal photo.

6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

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

6.2.2 Conclusion

Standard Requirement:The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.Compliance for section 15.247(a)(1):According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.> Number of shift register stages: 9> Length of pseudo-random sequence: 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: 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.

7 Radio Spectrum Matter Test Results

7.1 Conducted Peak Output Power

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

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

Limit:

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

7.1.1 E.U.T. Operation

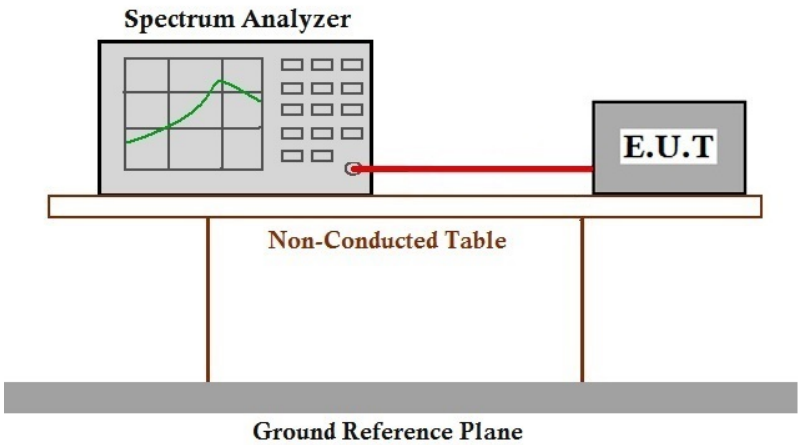
Operating Environment:

Temperature: 22.0 °C Humidity: 51.0 % RH Atmospheric Pressure: 1008 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.2 20dB Bandwidth

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

7.2.1 E.U.T. Operation

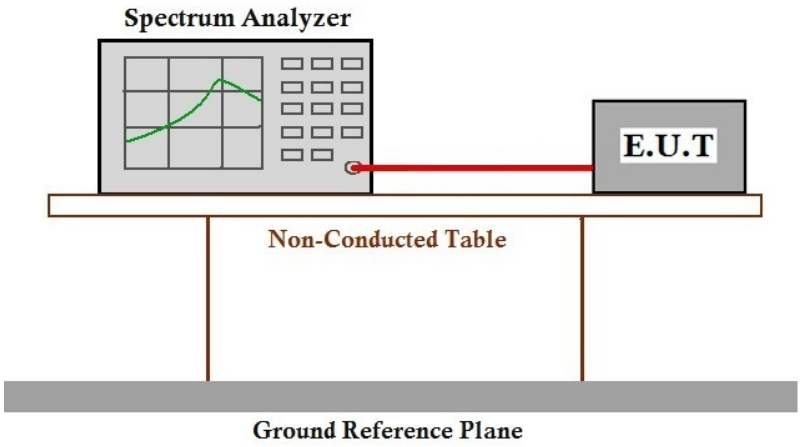
Operating Environment:

Temperature: 22.0 °C Humidity: 51.0 % RH Atmospheric Pressure: 1008 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.3 Carrier Frequencies Separation

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

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

Limit:

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

7.3.1 E.U.T. Operation

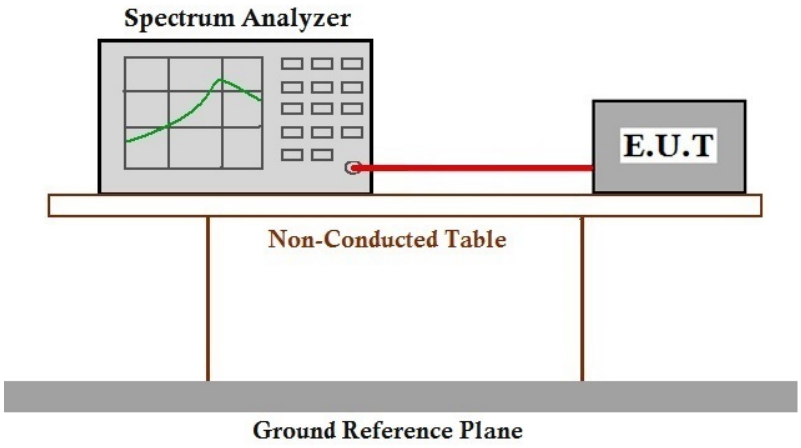
Operating Environment:

Temperature: 22.0 °C Humidity: 51.0 % RH Atmospheric Pressure: 1008 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.4 Hopping Channel Number

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

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

Limit:

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

7.4.1 E.U.T. Operation

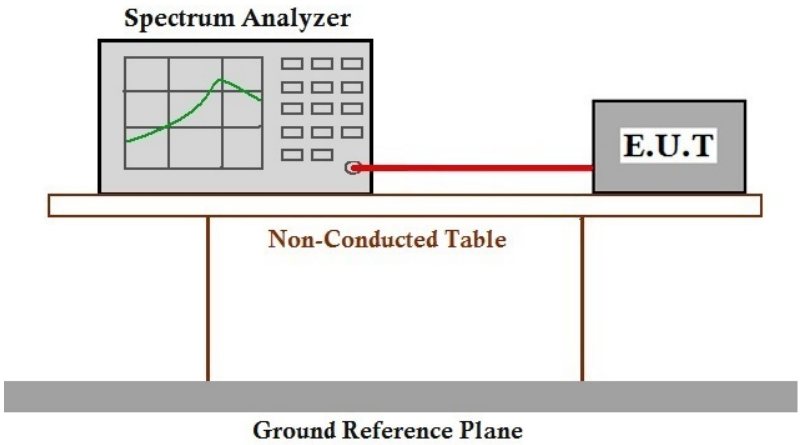
Operating Environment:

Temperature: 22.0 °C Humidity: 51.0 % RH Atmospheric Pressure: 1008 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.5 Dwell Time

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

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

Limit:

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

7.5.1 E.U.T. Operation

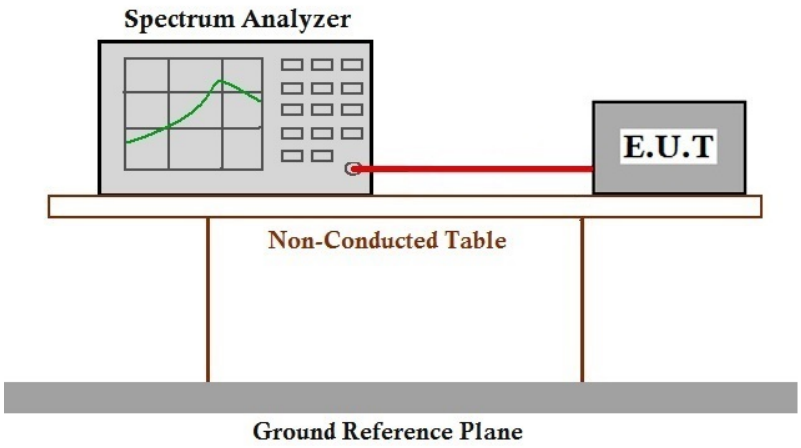
Operating Environment:

Temperature: 22.0 °C Humidity: 51.0 % RH Atmospheric Pressure: 1008 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.6 Conducted Band Edges Measurement

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

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

Limit:

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

7.6.1 E.U.T. Operation

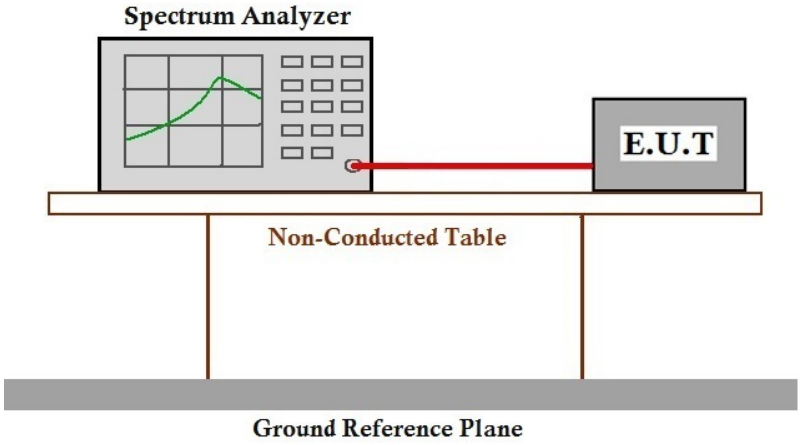
Operating Environment:

Temperature: 22.0 °C Humidity: 51.0 % RH Atmospheric Pressure: 1008 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.7 Conducted Spurious Emissions

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

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

Limit:

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

7.7.1 E.U.T. Operation

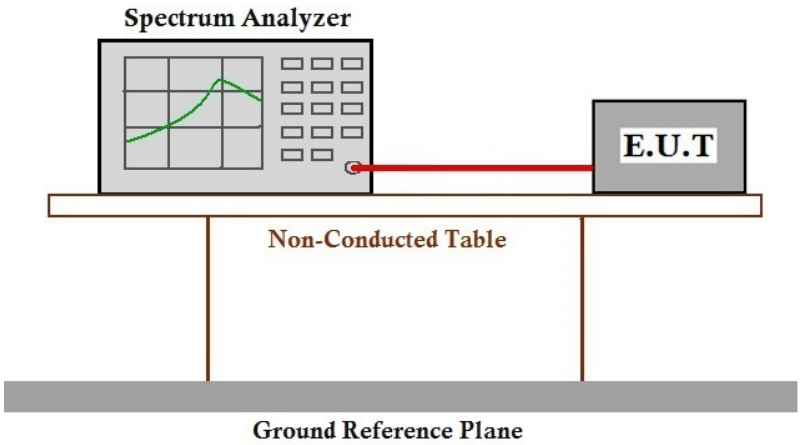
Operating Environment:

Temperature: 22.0 °C Humidity: 51.0 % RH Atmospheric Pressure: 1008 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.8 Radiated Emissions which fall in the restricted bands

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

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

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

7.8.1 E.U.T. Operation

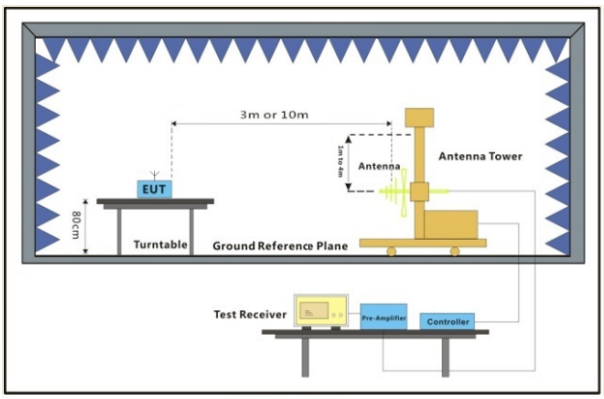
Operating Environment:

Temperature: 21.6 °C Humidity: 68.0 % RH Atmospheric Pressure: 1014 mbar

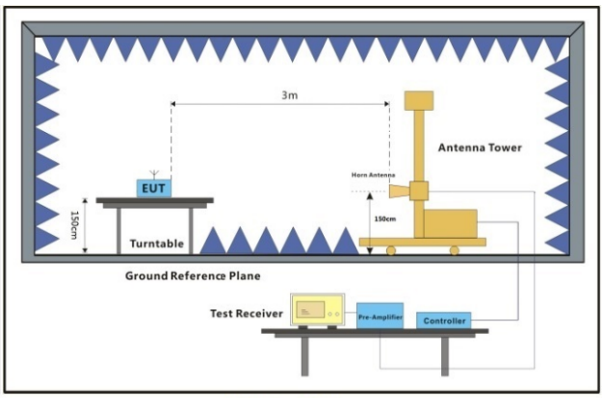
7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

7.8.4 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.

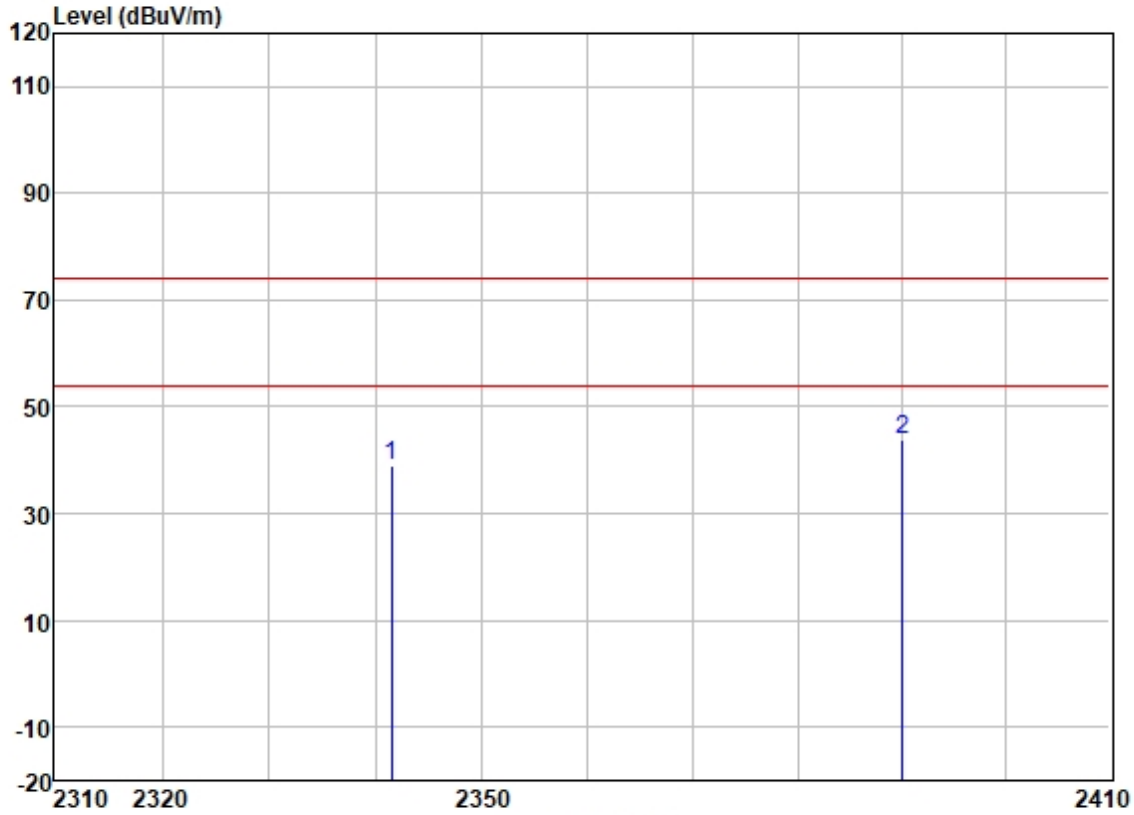
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

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.

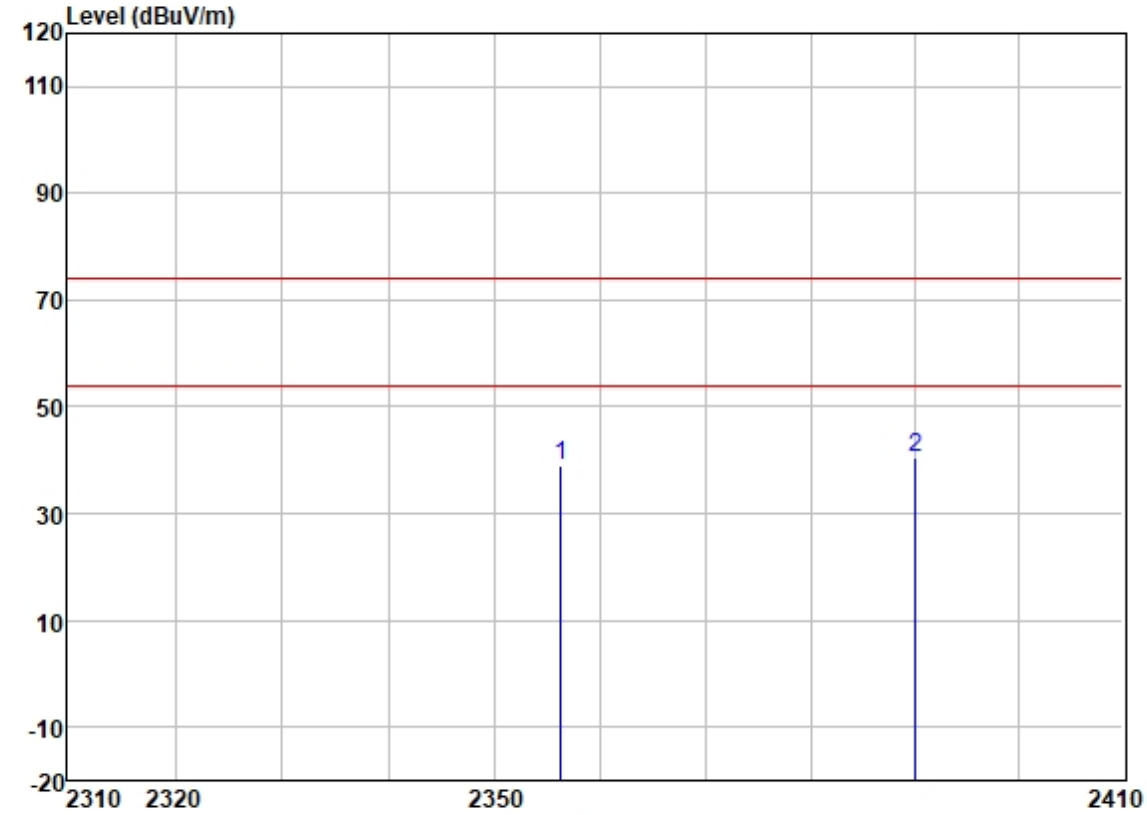
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



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	2341.441	45.44	27.22	3.47	37.14	38.99	74.00	-35.01	VERTICAL	Peak
2	2390.000	50.09	27.33	3.50	37.13	43.79	74.00	-30.21	VERTICAL	Peak

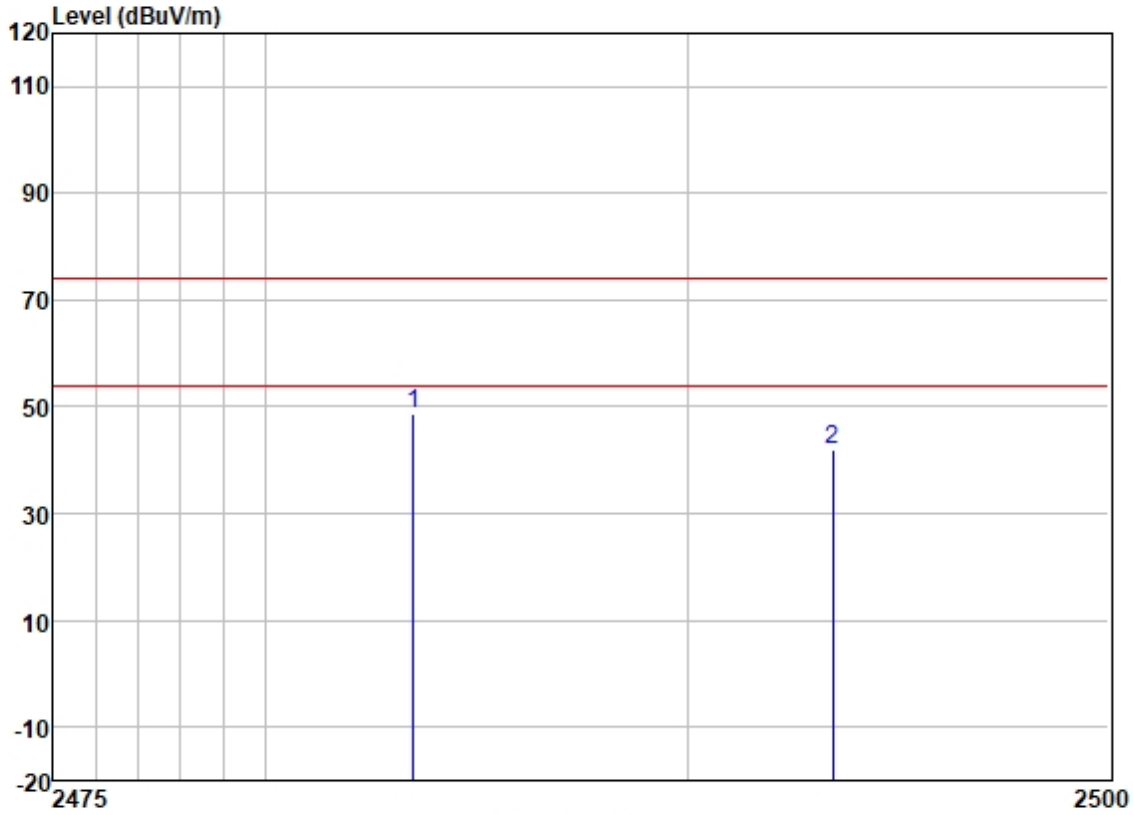
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	2356.173	45.42	27.27	3.49	37.14	39.04	74.00	-34.96	HORIZONTAL	Peak
2	2390.000	46.74	27.33	3.50	37.13	40.44	74.00	-33.56	HORIZONTAL	Peak

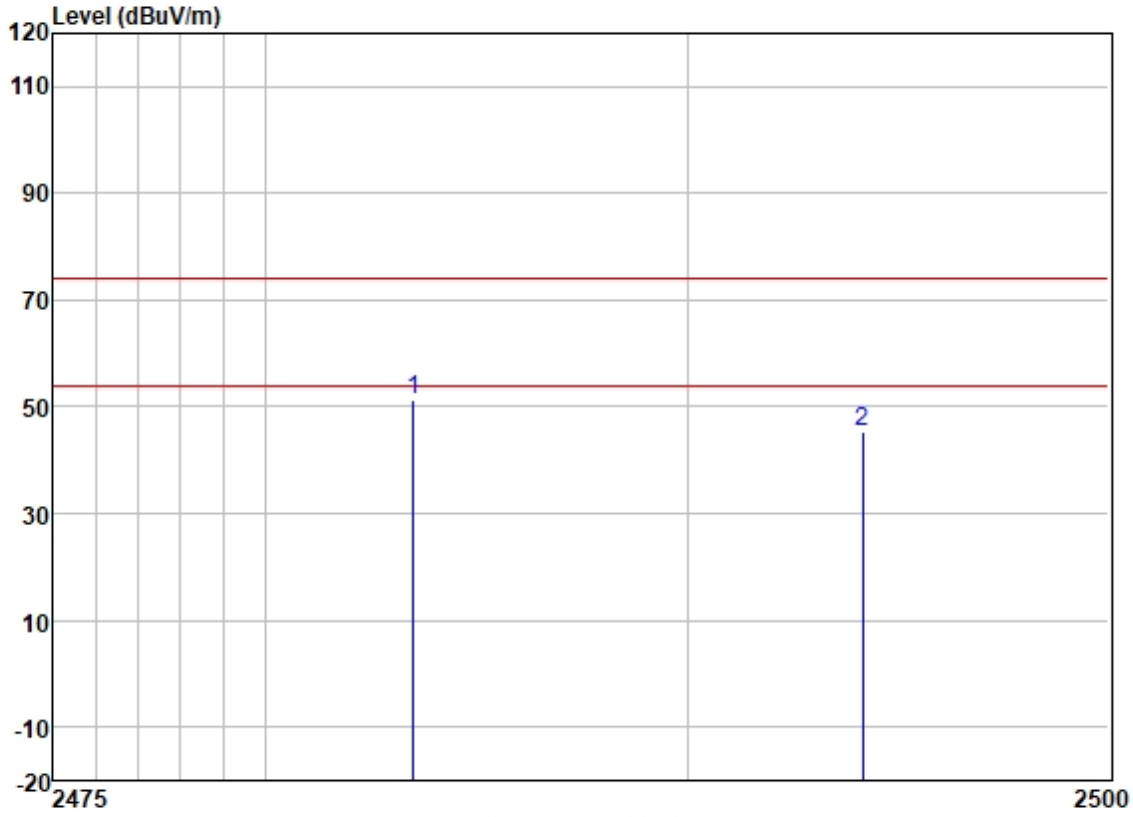
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



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	2483.500	54.73	27.48	3.54	37.11	48.64	74.00	-25.36	VERTICAL	Peak
2	2493.426	48.10	27.49	3.54	37.10	42.03	74.00	-31.97	VERTICAL	Peak

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	2483.500	57.45	27.48	3.54	37.11	51.36	74.00	-22.64	HORIZONTAL	Peak
2	2494.153	51.52	27.49	3.54	37.10	45.45	74.00	-28.55	HORIZONTAL	Peak

7.9 Radiated Spurious Emissions Below 1GHz

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

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

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
960-1000	500	3

7.9.1 E.U.T. Operation

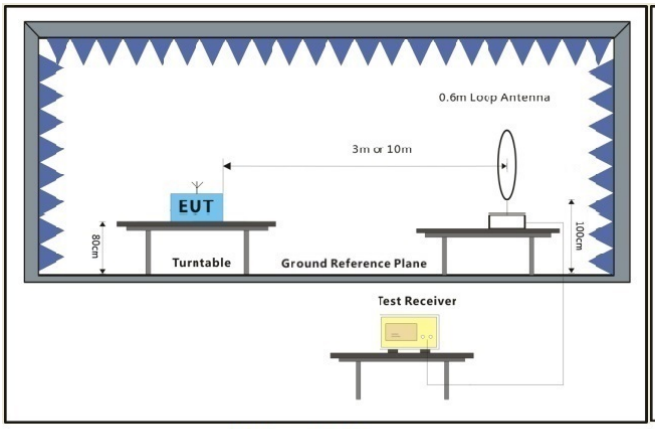
Operating Environment:

Temperature: 23 °C Humidity: 52 % RH Atmospheric Pressure: 1014 mbar

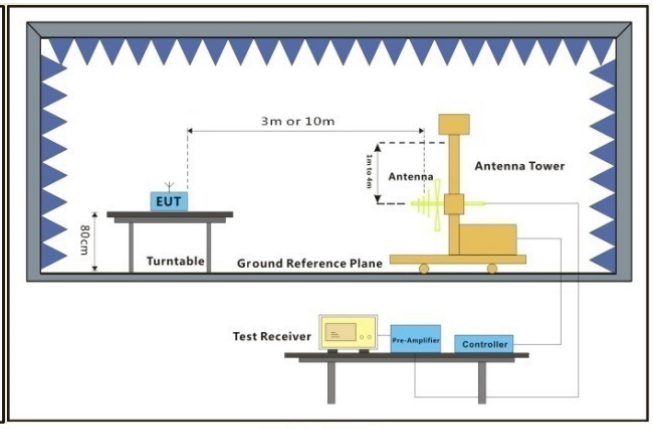
7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.9.3 Test Setup Diagram



Below 30MHz



30MHz-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. 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 quasi-peak method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

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

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

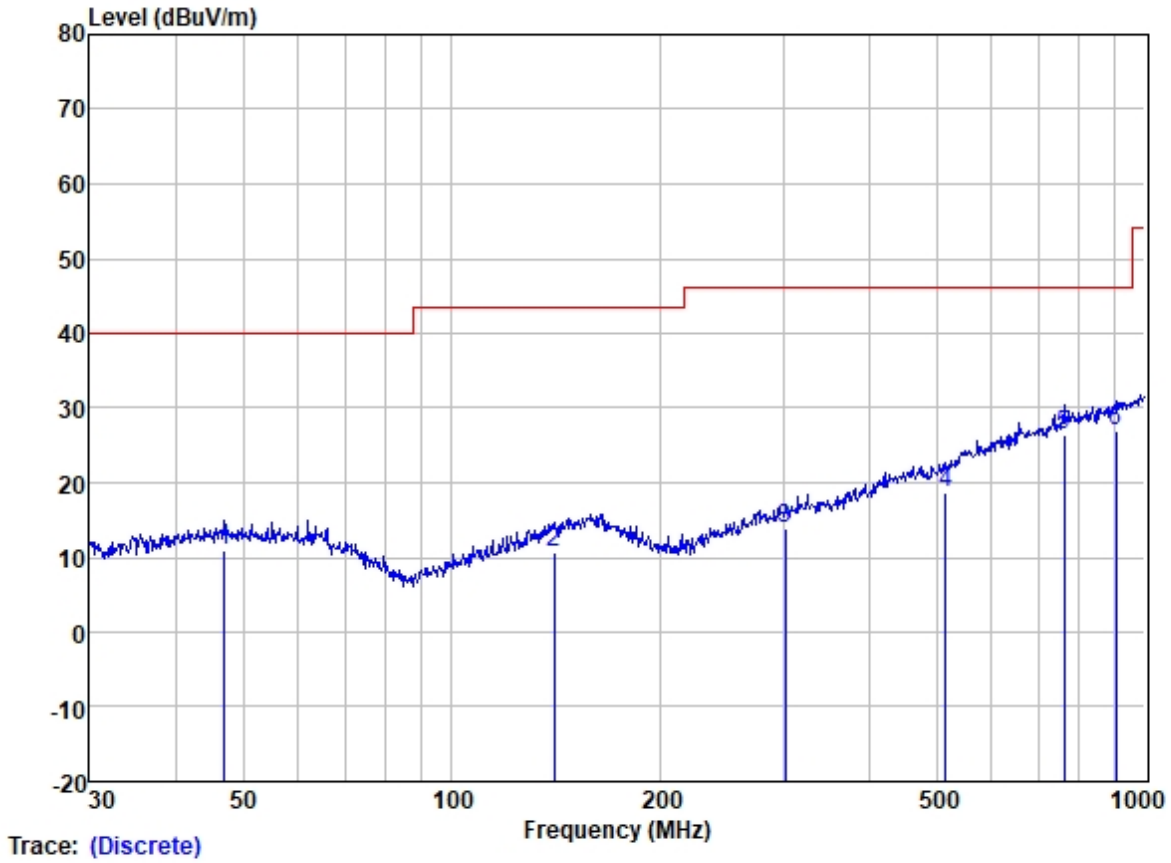
Remark:

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

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

3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

Test Mode: 00; Polarity: Horizontal

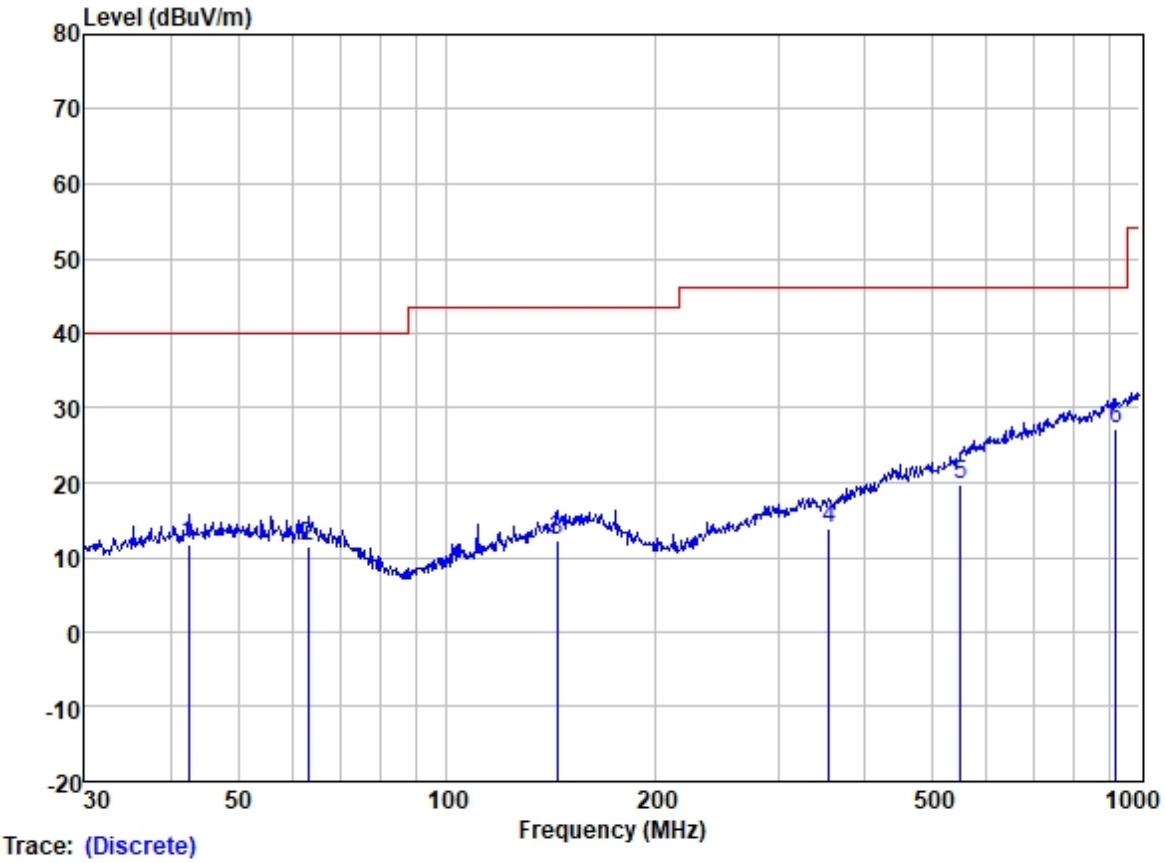


Trace: (Discrete)

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	46.995	23.26	13.70	1.13	27.17	10.92	40.00	-29.08	HORIZONTAL	QP
2	140.342	22.29	13.11	2.10	26.92	10.58	43.50	-32.92	HORIZONTAL	QP
3	302.481	23.97	13.25	3.18	26.56	13.84	46.00	-32.16	HORIZONTAL	QP
4	515.437	24.44	17.75	4.51	28.01	18.69	46.00	-27.31	HORIZONTAL	QP
5	763.376	26.39	22.11	6.05	28.07	26.48	46.00	-19.52	HORIZONTAL	QP
6	906.482	24.65	23.13	6.96	27.84	26.90	46.00	-19.10	HORIZONTAL	QP

Test Mode: 00; Polarity: Vertical



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	42.451	24.29	13.52	1.11	27.17	11.75	40.00	-28.25	VERTICAL	QP
2	63.092	23.89	13.35	1.31	27.15	11.40	40.00	-28.60	VERTICAL	QP
3	144.335	23.70	13.27	2.15	26.87	12.25	43.50	-31.25	VERTICAL	QP
4	355.427	22.94	14.35	3.67	27.07	13.89	46.00	-32.11	VERTICAL	QP
5	550.948	24.66	18.30	4.83	28.11	19.68	46.00	-26.32	VERTICAL	QP
6	922.516	24.49	23.42	7.01	27.82	27.10	46.00	-18.90	VERTICAL	QP

7.10 Radiated Spurious Emissions Above 1GHz

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

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

Limit:

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

7.10.1 E.U.T. Operation

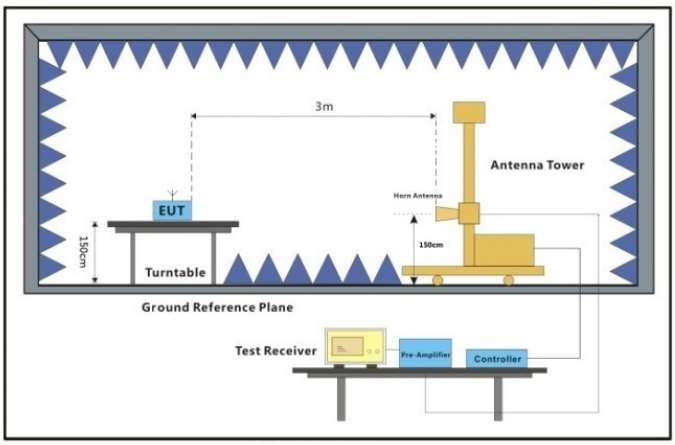
Operating Environment:

Temperature: 21.6 °C Humidity: 68.0 % RH Atmospheric Pressure: 1014 mbar

7.10.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.10.3 Test Setup Diagram



Above 1GHz

7.10.4 Measurement Procedure and Data

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

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

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

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

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

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

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

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

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

Remark:

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

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

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

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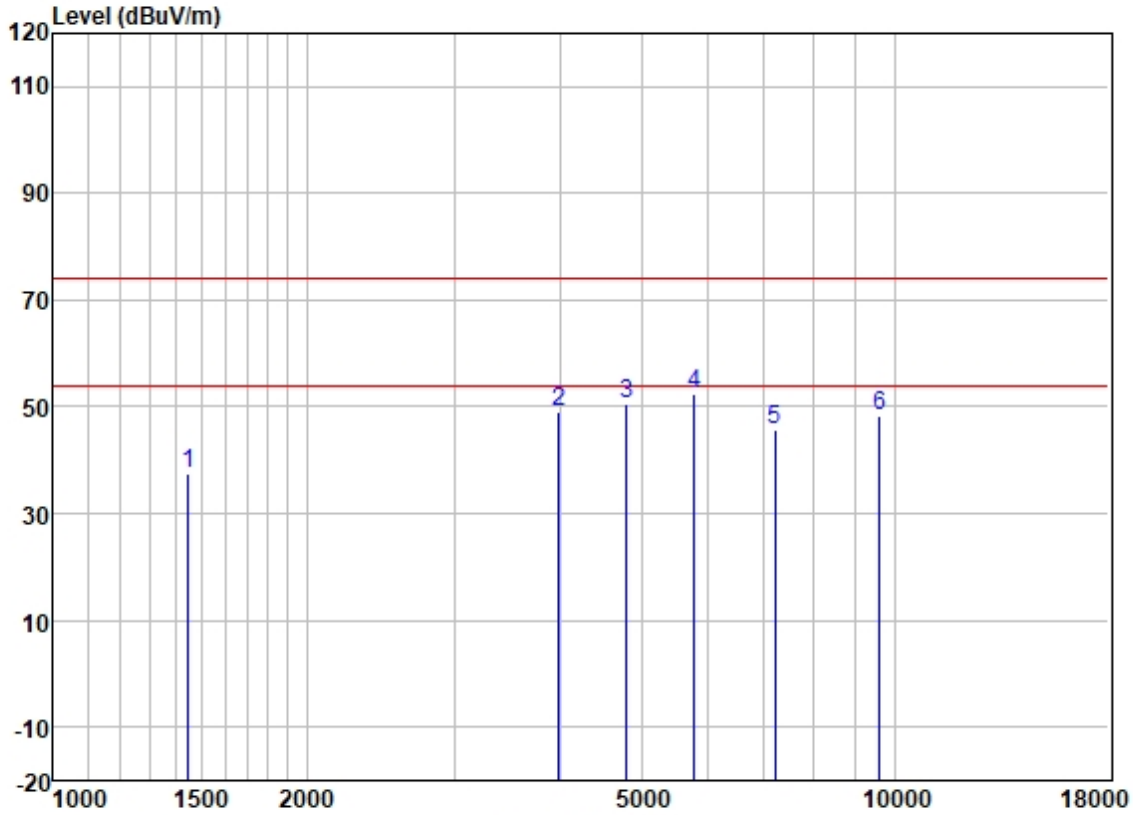
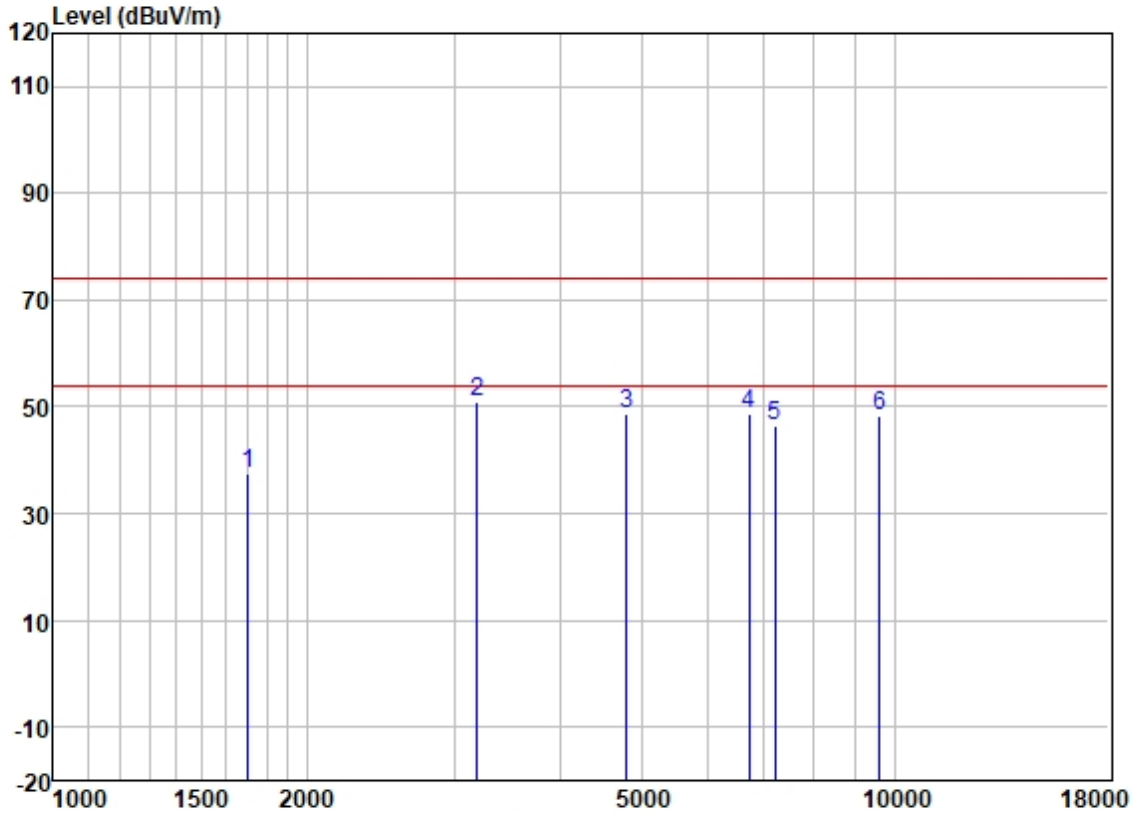
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



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	1447.688	46.95	25.45	2.76	37.49	37.67	74.00	-36.33	VERTICAL	peak
2	3992.781	50.97	29.79	5.00	36.60	49.16	74.00	-24.84	VERTICAL	peak
3	4804.000	50.38	31.42	5.20	36.63	50.37	74.00	-23.63	VERTICAL	peak
4	5780.300	51.08	32.16	5.84	36.69	52.39	74.00	-21.61	VERTICAL	peak
5	7206.000	40.35	35.54	6.68	36.77	45.80	74.00	-28.20	VERTICAL	peak
6	9608.000	39.58	38.37	7.50	37.15	48.30	74.00	-25.70	VERTICAL	peak

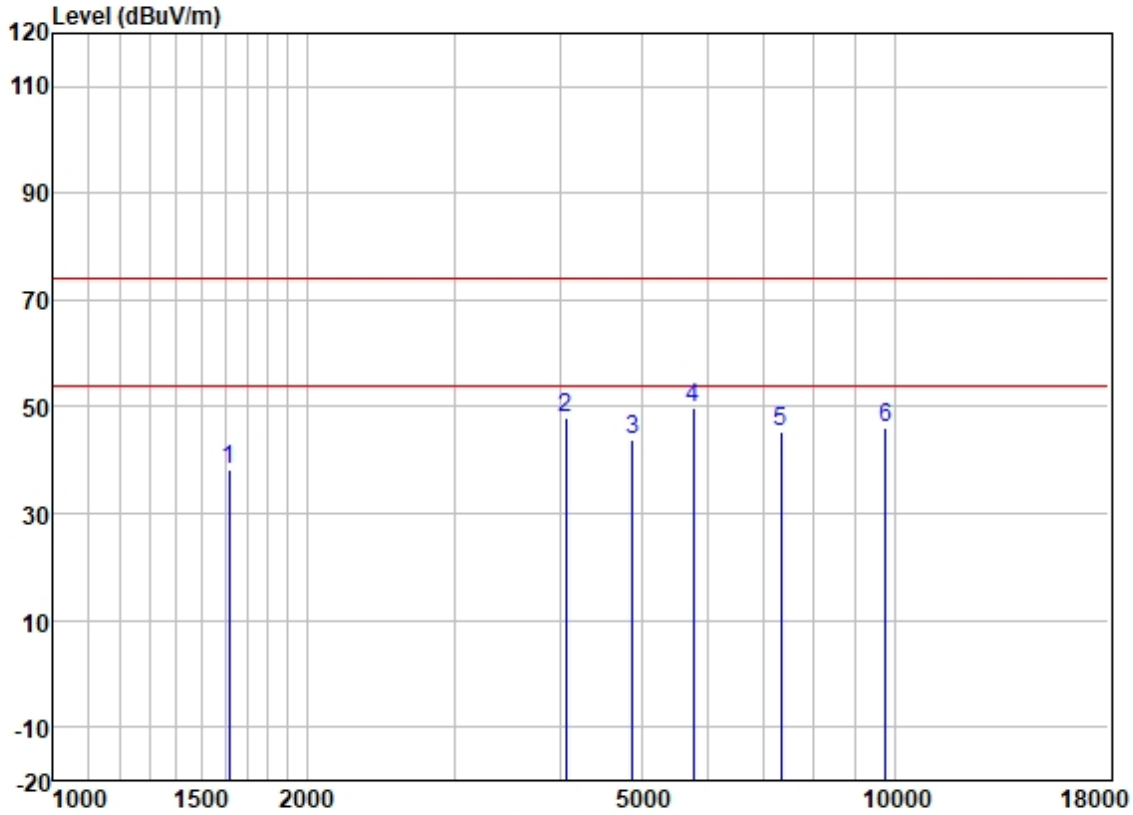
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	1702.042	46.17	25.72	2.94	37.31	37.52	74.00	-36.48	HORIZONTAL	peak
2	3186.869	55.13	28.57	4.12	36.79	51.03	74.00	-22.97	HORIZONTAL	peak
3	4804.000	48.70	31.42	5.20	36.63	48.69	74.00	-25.31	HORIZONTAL	peak
4	6717.762	44.22	34.44	6.63	36.73	48.56	74.00	-25.44	HORIZONTAL	peak
5	7206.000	40.86	35.54	6.68	36.77	46.31	74.00	-27.69	HORIZONTAL	peak
6	9608.000	39.49	38.37	7.50	37.15	48.21	74.00	-25.79	HORIZONTAL	peak

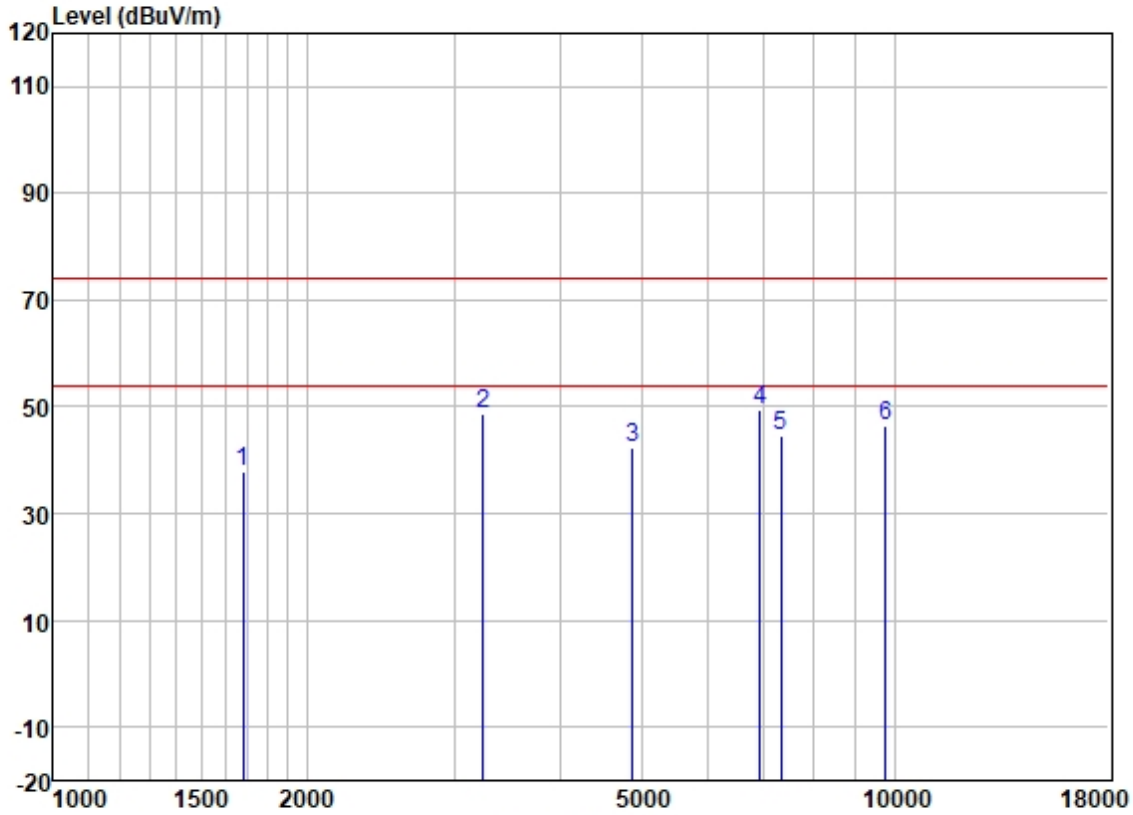
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



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	1615.754	47.33	25.60	2.85	37.37	38.41	74.00	-35.59	VERTICAL	peak
2	4062.629	49.62	29.88	5.00	36.60	47.90	74.00	-26.10	VERTICAL	peak
3	4882.000	43.69	31.56	5.28	36.64	43.89	74.00	-30.11	VERTICAL	peak
4	5763.617	48.68	32.13	5.82	36.69	49.94	74.00	-24.06	VERTICAL	peak
5	7323.000	39.37	36.00	6.61	36.77	45.21	74.00	-28.79	VERTICAL	peak
6	9764.000	37.08	38.50	7.62	37.17	46.03	74.00	-27.97	VERTICAL	peak

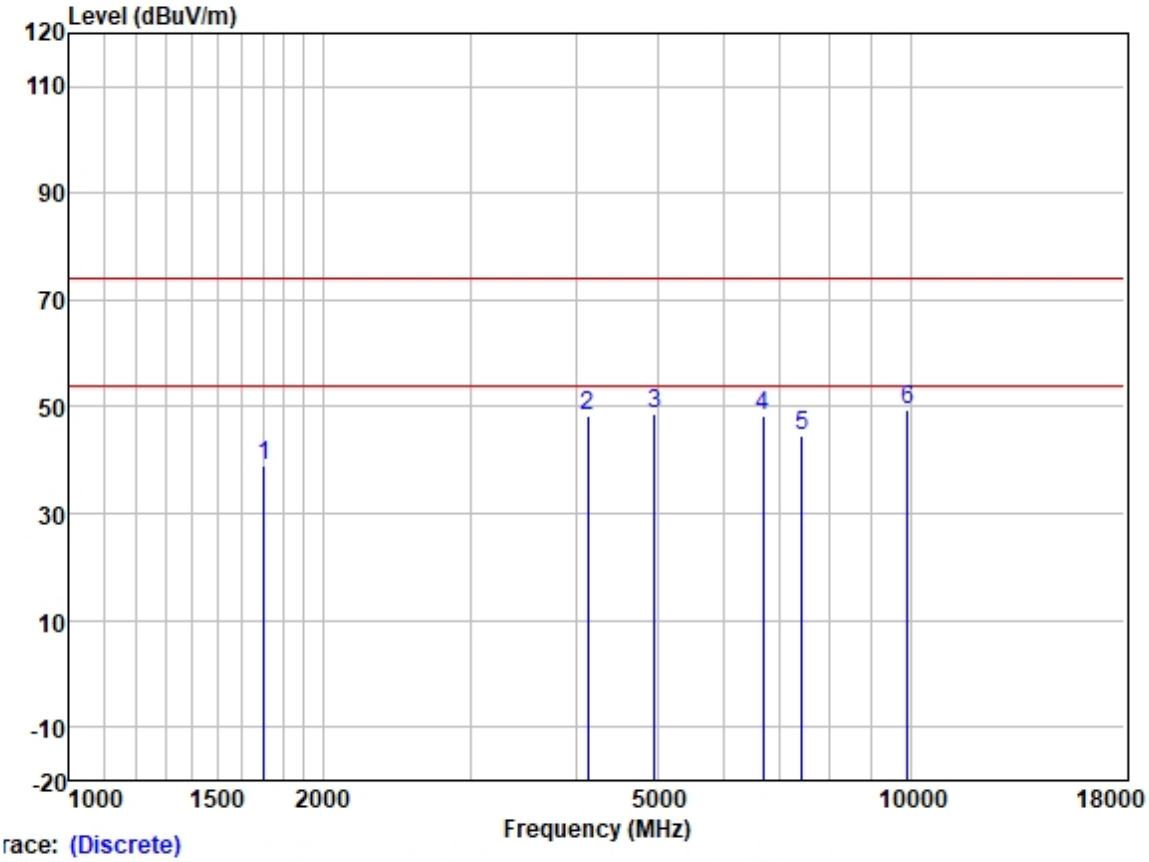
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



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	1682.477	46.43	25.68	2.91	37.33	37.69	74.00	-36.31	HORIZONTAL	peak
2	3242.619	52.72	28.67	4.18	36.77	48.80	74.00	-25.20	HORIZONTAL	peak
3	4882.000	42.09	31.56	5.28	36.64	42.29	74.00	-31.71	HORIZONTAL	peak
4	6914.763	44.54	34.89	6.73	36.74	49.42	74.00	-24.58	HORIZONTAL	peak
5	7323.000	38.80	36.00	6.61	36.77	44.64	74.00	-29.36	HORIZONTAL	peak
6	9764.000	37.35	38.50	7.62	37.17	46.30	74.00	-27.70	HORIZONTAL	peak

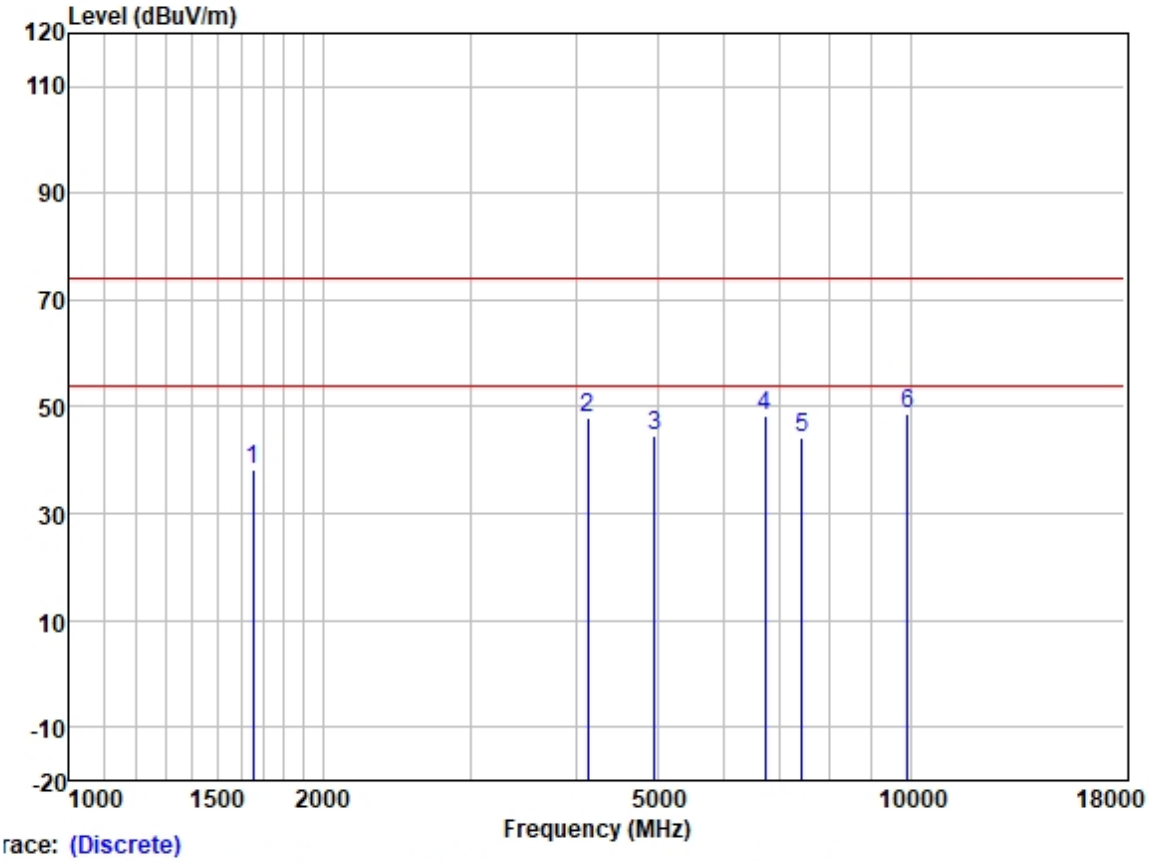
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



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	1702.042	47.53	25.72	2.94	37.31	38.88	74.00	-35.12	VERTICAL	peak
2	4133.699	49.86	30.01	4.98	36.60	48.25	74.00	-25.75	VERTICAL	peak
3	4960.000	48.52	31.65	5.33	36.64	48.86	74.00	-25.14	VERTICAL	peak
4	6679.040	44.28	34.33	6.61	36.72	48.50	74.00	-25.50	VERTICAL	peak
5	7440.000	38.63	36.27	6.58	36.78	44.70	74.00	-29.30	VERTICAL	peak
6	9920.000	40.26	38.65	7.78	37.19	49.50	74.00	-24.50	VERTICAL	peak

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	1653.550	46.93	25.64	2.88	37.34	38.11	74.00	-35.89	HORIZONTAL	peak
2	4133.699	49.49	30.01	4.98	36.60	47.88	74.00	-26.12	HORIZONTAL	peak
3	4960.000	44.07	31.65	5.33	36.64	44.41	74.00	-29.59	HORIZONTAL	peak
4	6717.762	44.05	34.44	6.63	36.73	48.39	74.00	-25.61	HORIZONTAL	peak
5	7440.000	38.01	36.27	6.58	36.78	44.08	74.00	-29.92	HORIZONTAL	peak
6	9920.000	39.52	38.65	7.78	37.19	48.76	74.00	-25.24	HORIZONTAL	peak

8 Test Setup Photo

Refer to Test Setup Photo for GZCR220200017803.

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9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2202000178LM

10 Appendix

10.1 Appendix A: 20dB Emission Bandwidth

10.1.1 Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	1.320	2401.577	2402.897	---	PASS
		2441	1.335	2440.562	2441.897	---	PASS
		2480	1.335	2479.565	2480.900	---	PASS

10.1.2 Test Graphs

DH5_Ant1_2402

DH5_Ant1_2441

DH5_Ant1_2480

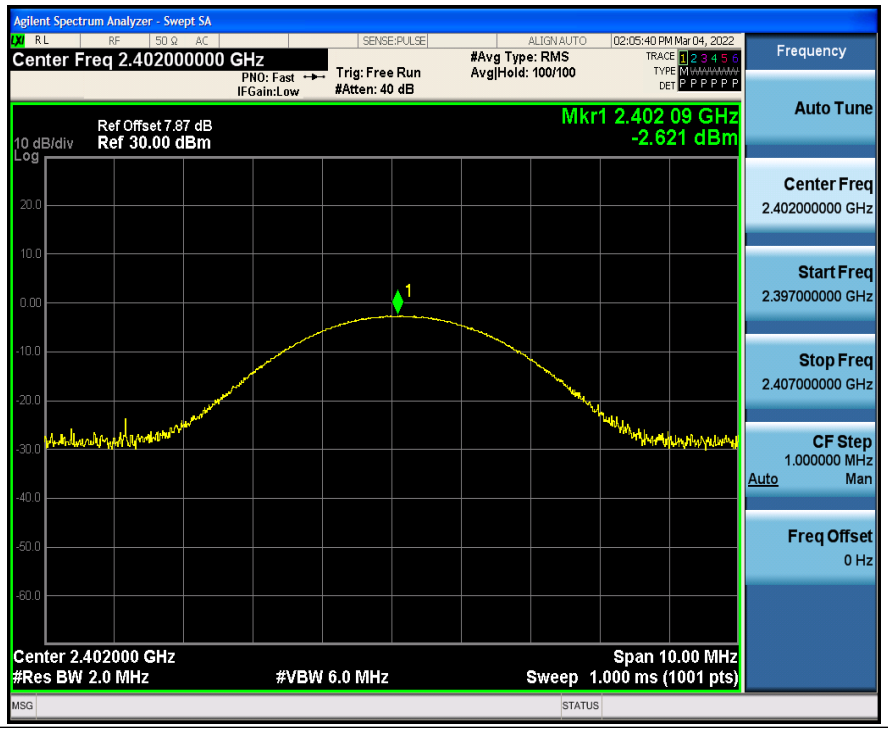
10.2 Appendix B: Maximum conducted output power

10.2.1 Test Result

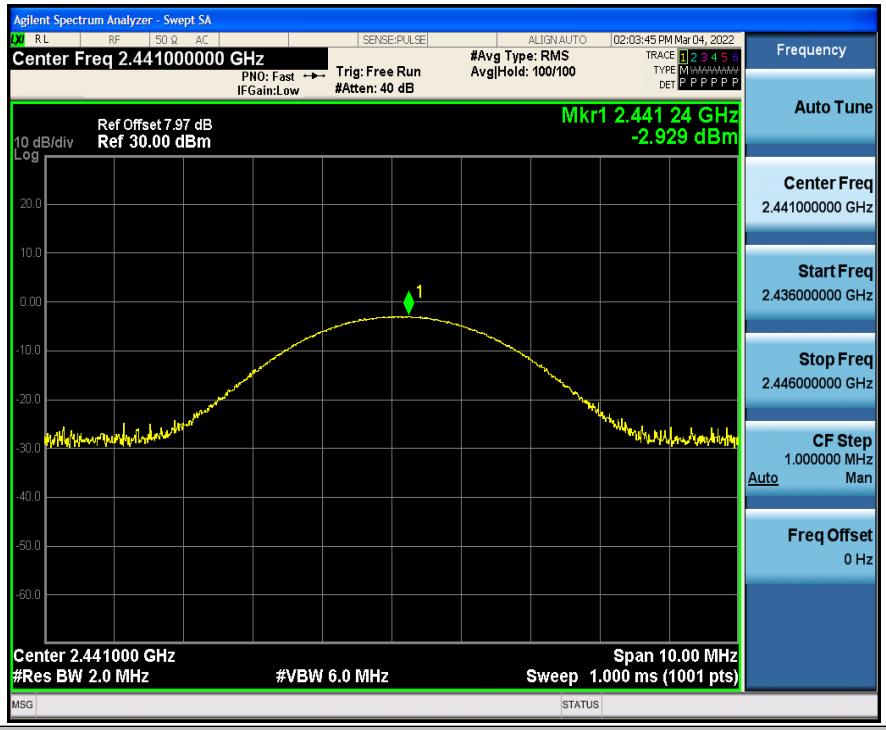
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	-2.62	<=20.97	PASS
		2441	-2.93	<=20.97	PASS
		2480	-4	<=20.97	PASS

10.2.2 Test Graphs

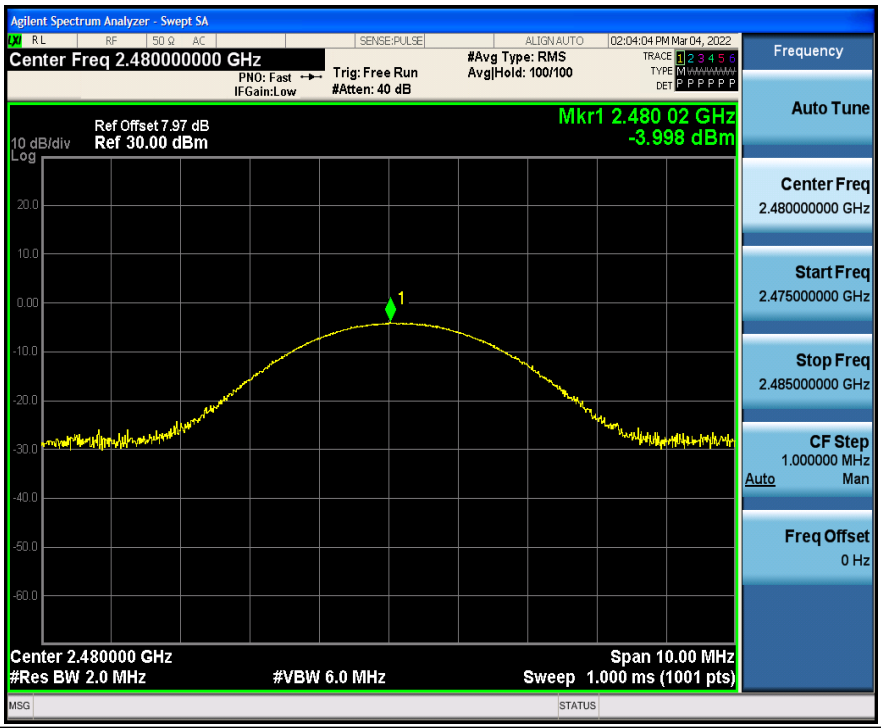
DH5_Ant1_2402



DH5_Ant1_2441



DH5_Ant1_2480



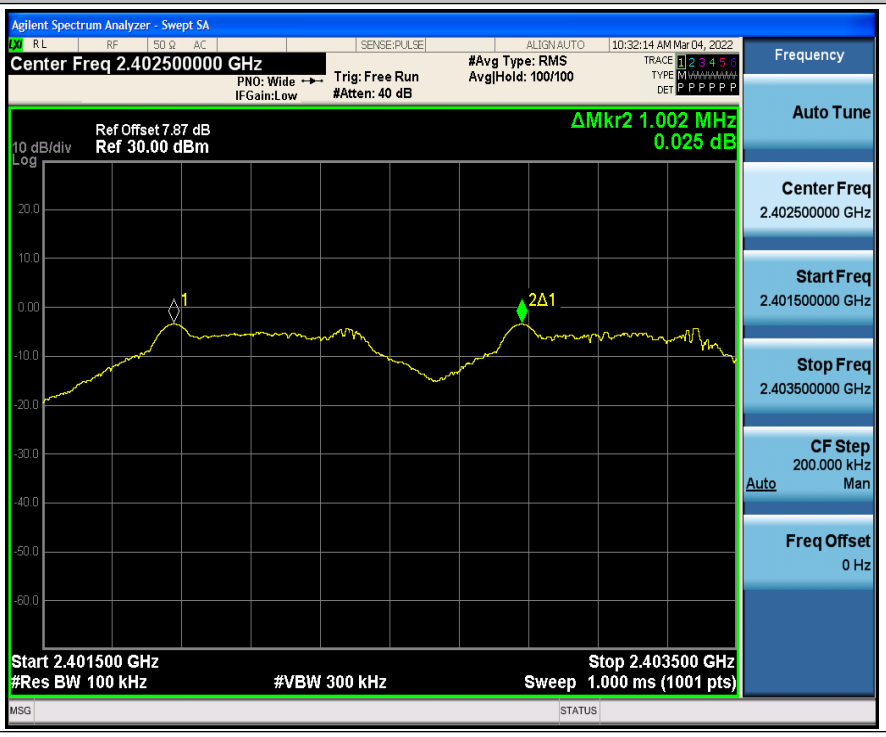
10.3 Appendix C: Carrier frequency separation

10.3.1 Test Result

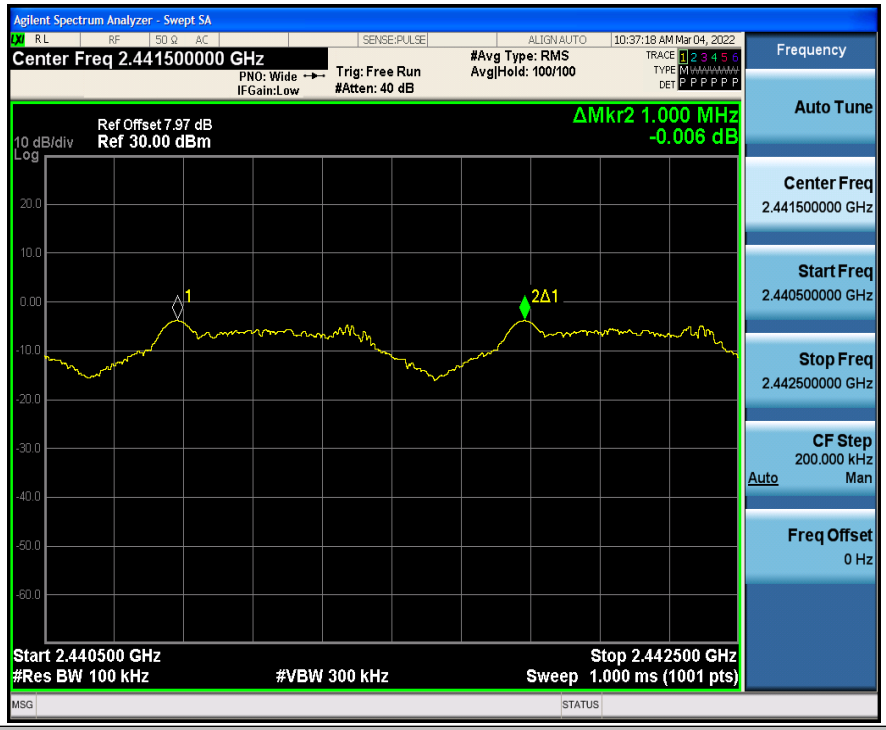
TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop_2402	1.002	>=0.890	PASS
		Hop_2441	1	>=0.890	PASS
		Hop_2480	1.002	>=0.890	PASS

10.3.2 Test Graphs

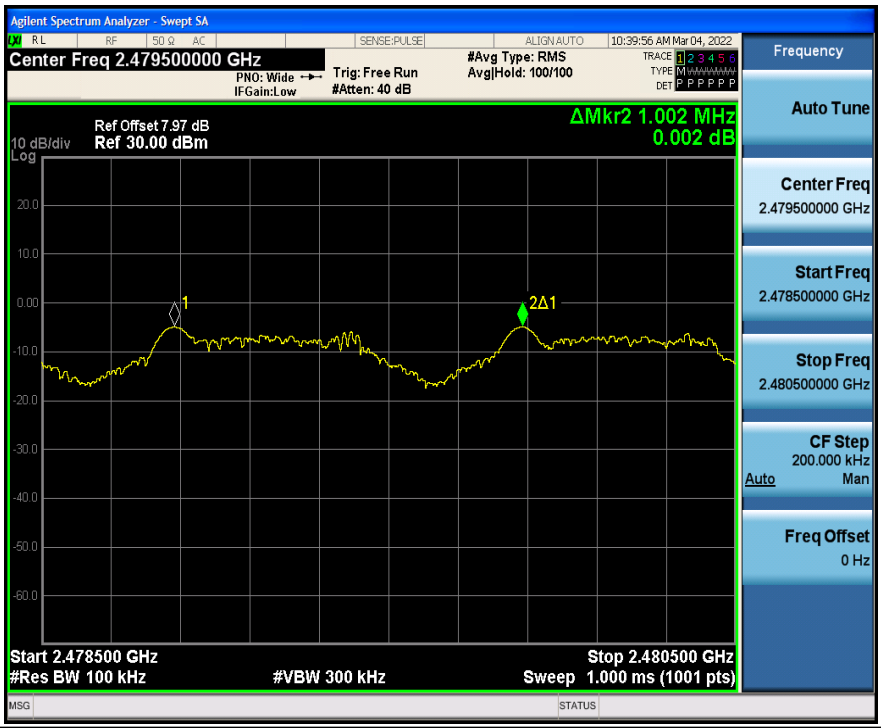
DH5_Ant1_Hop_2402



DH5_Ant1_Hop_2441



DH5_Ant1_Hop_2480



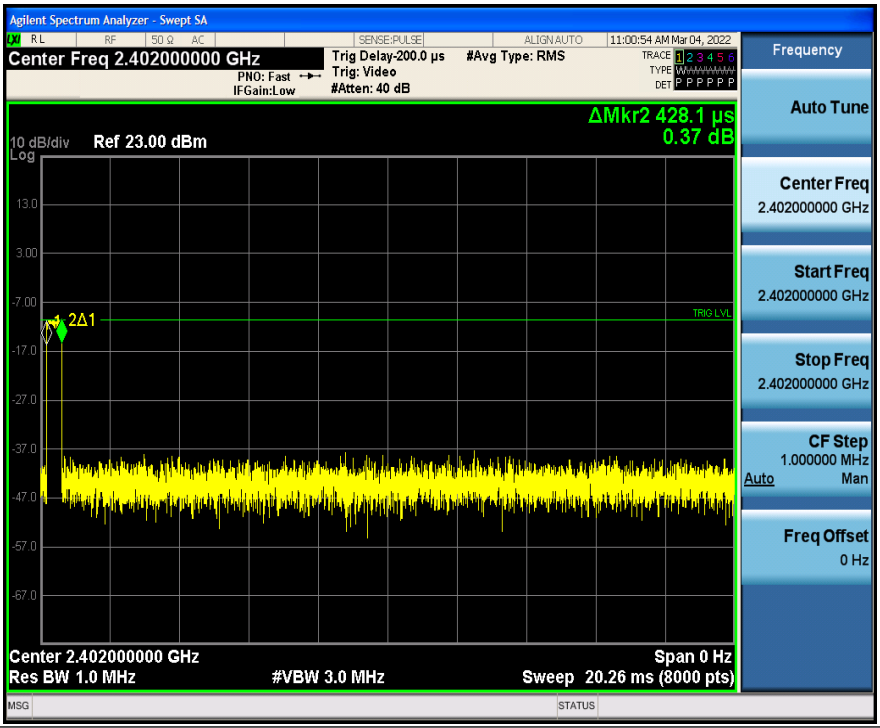
10.4 Appendix D: Time of occupancy

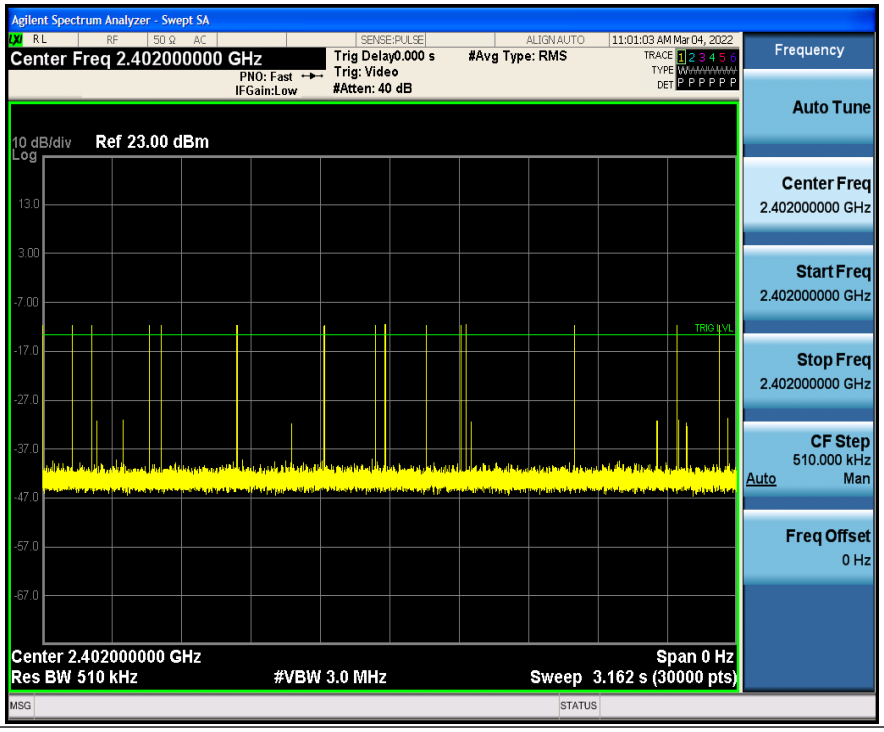
10.4.1 Test Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop_2402	0.43	150	0.064	<=0.4	PASS
		Hop_2441	0.43	60	0.026	<=0.4	PASS
		Hop_2480	0.43	50	0.022	<=0.4	PASS
DH3	Ant1	Hop_2402	1.63	70	0.114	<=0.4	PASS
		Hop_2441	1.63	60	0.098	<=0.4	PASS
		Hop_2480	1.63	40	0.065	<=0.4	PASS
DH5	Ant1	Hop_2402	2.83	110	0.312	<=0.4	PASS
		Hop_2441	2.83	50	0.142	<=0.4	PASS
		Hop_2480	2.83	60	0.17	<=0.4	PASS

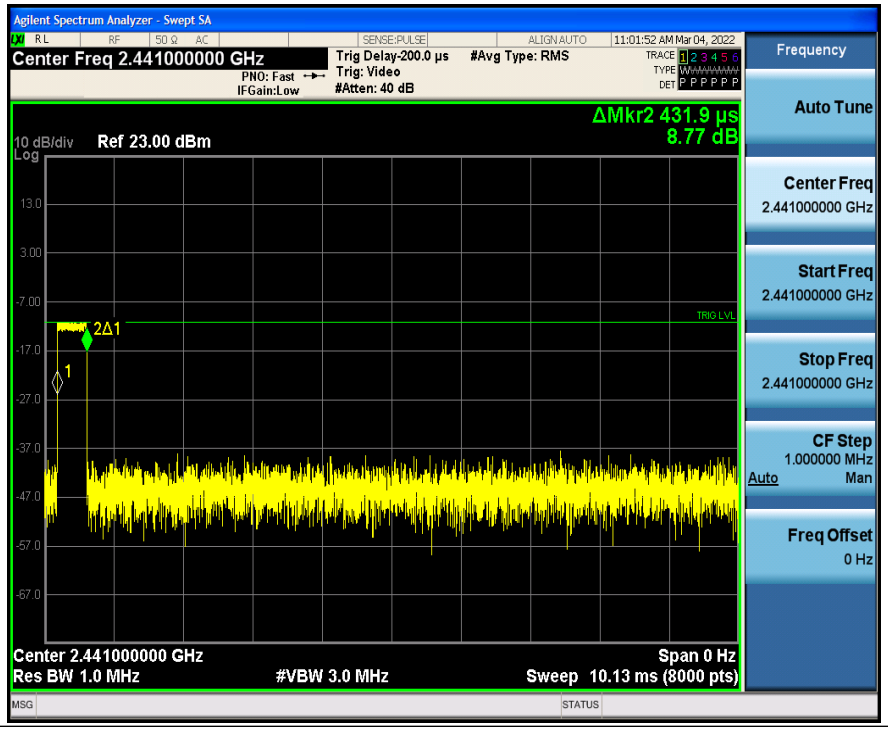
10.4.2 Test Graphs

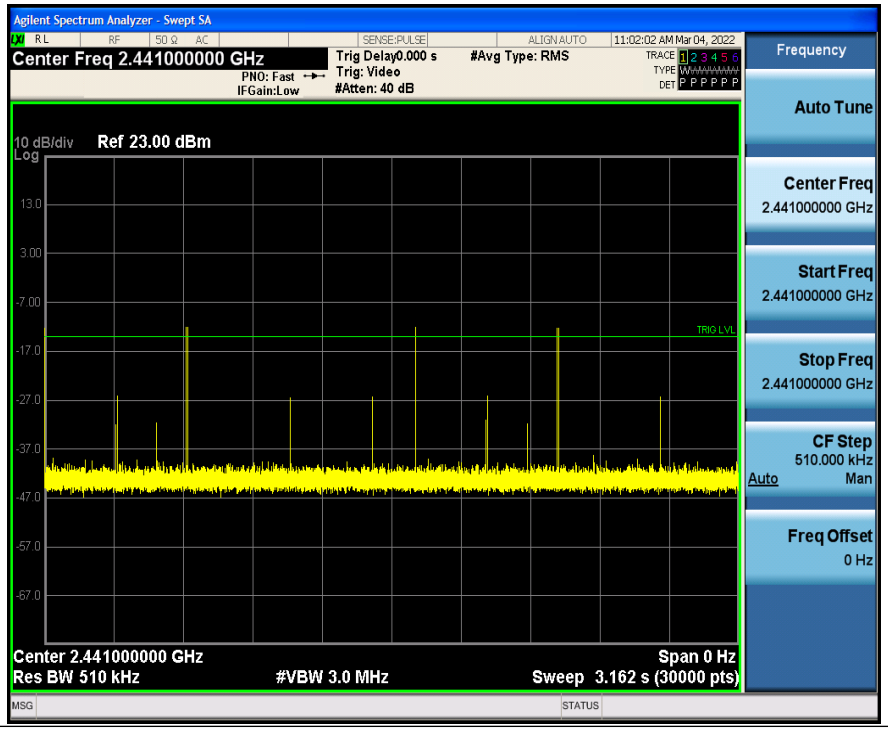
DH1_Ant1_Hop_2402



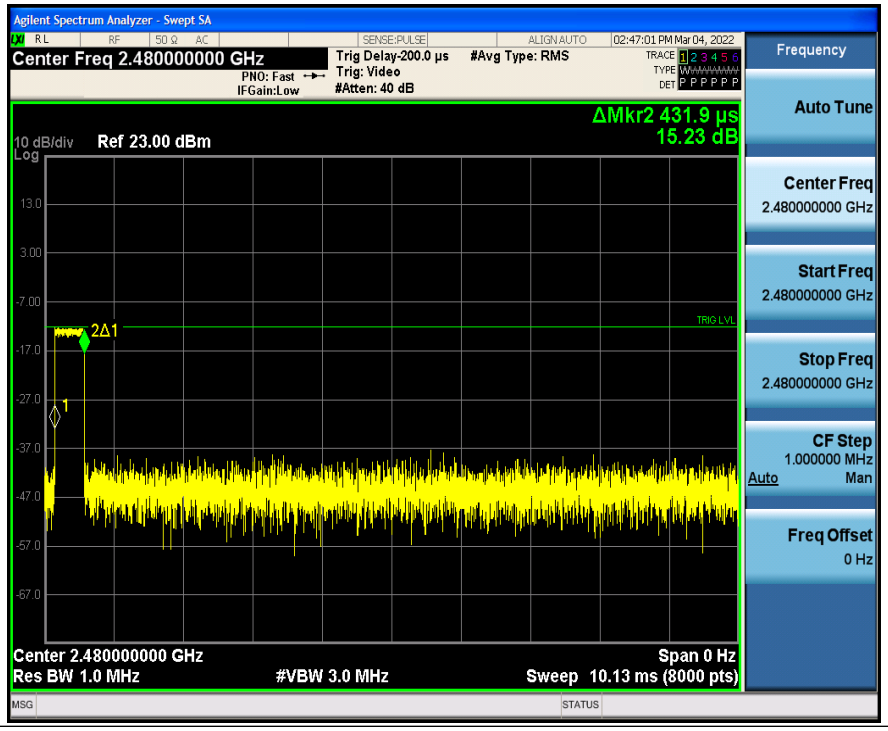


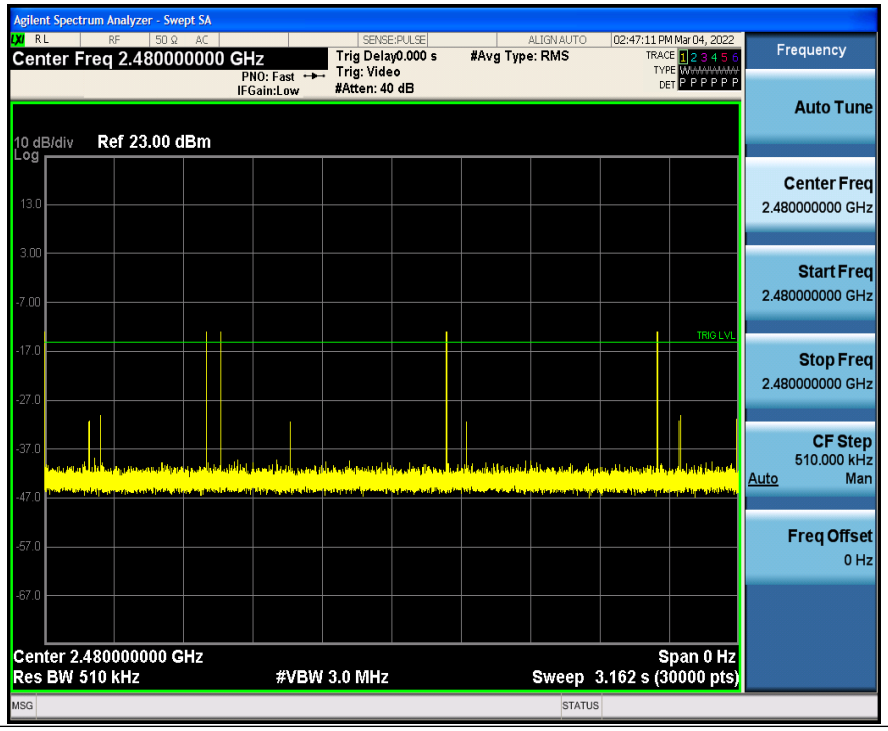
DH1_Ant1_Hop_2441



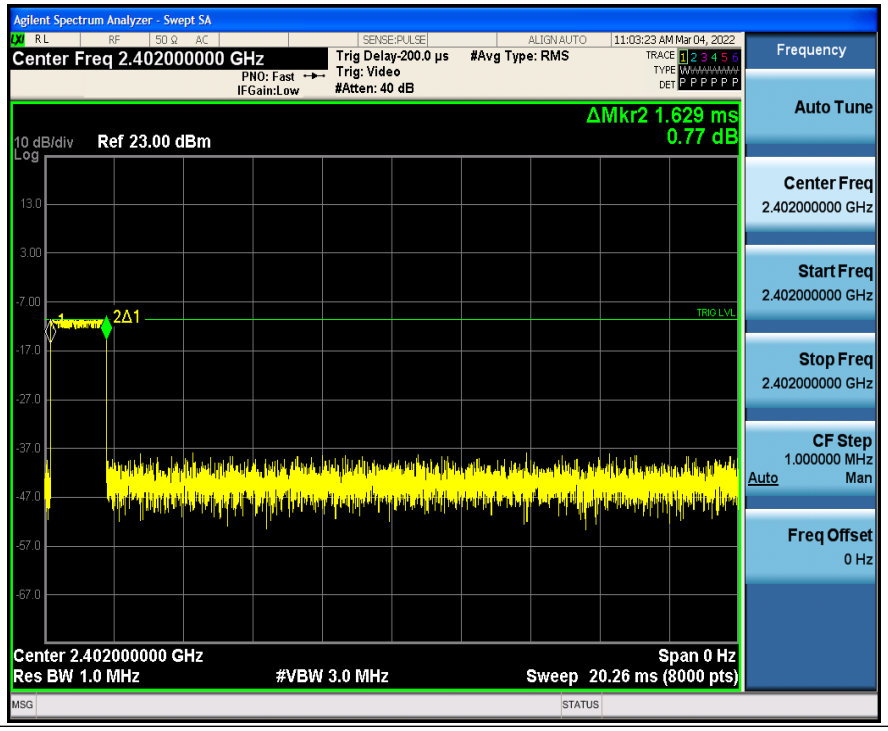


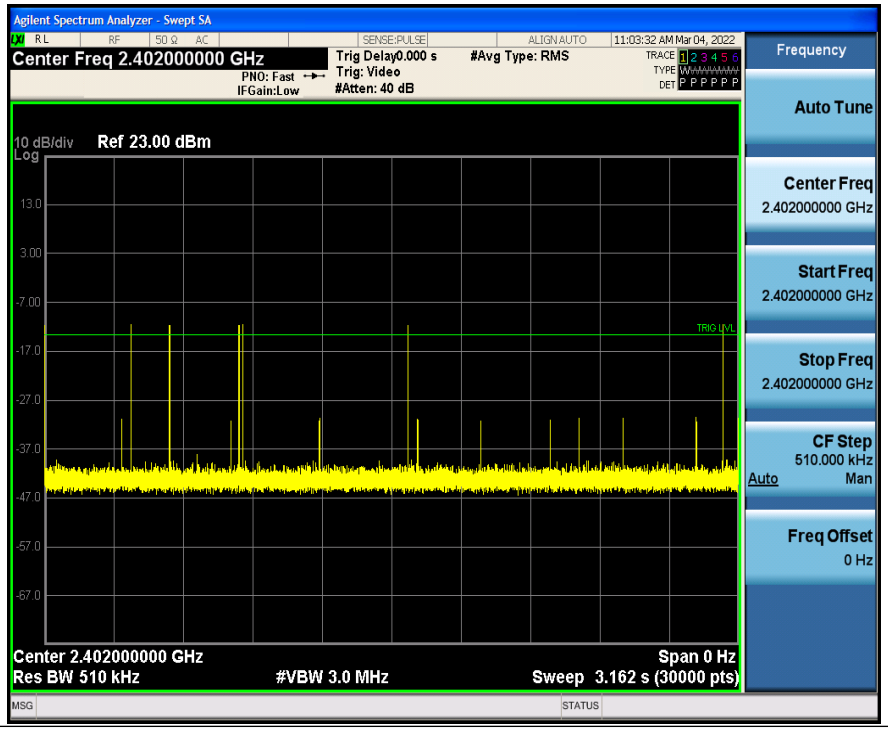
DH1_Ant1_Hop_2480



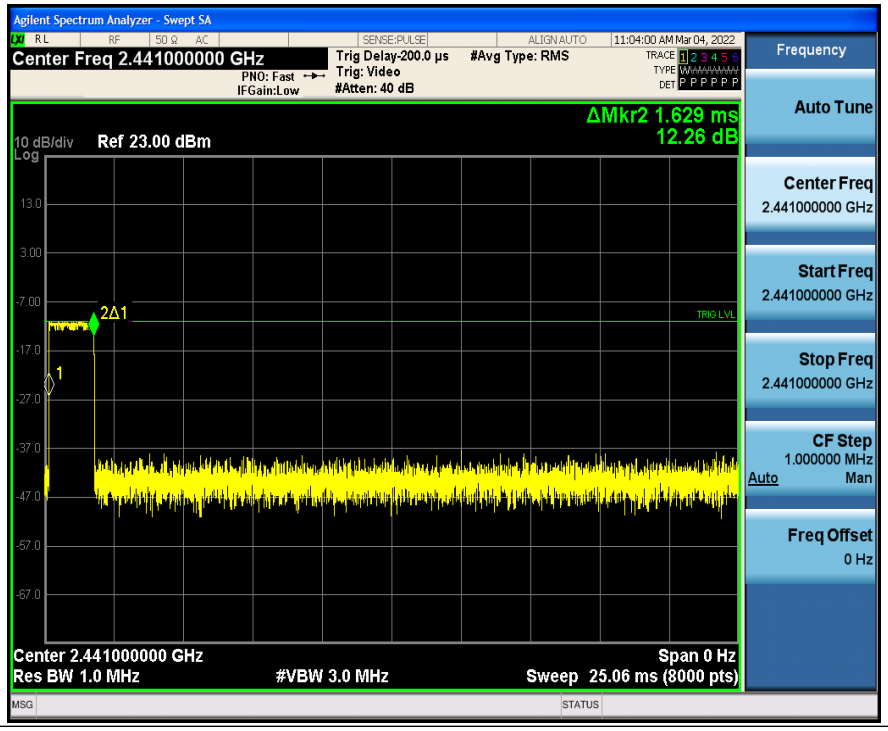


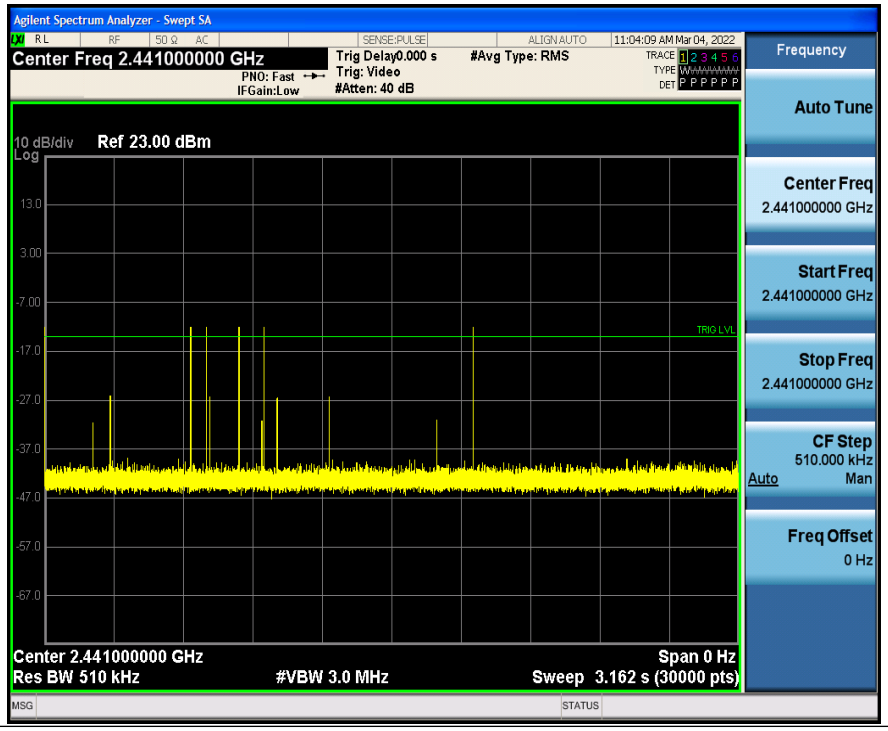
DH3_Ant1_Hop_2402



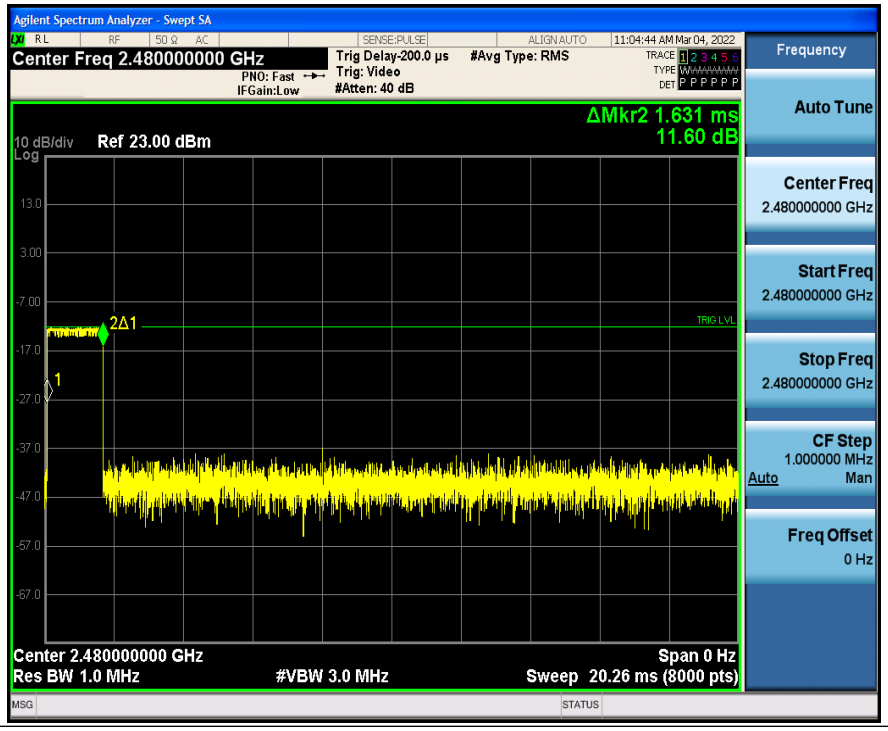


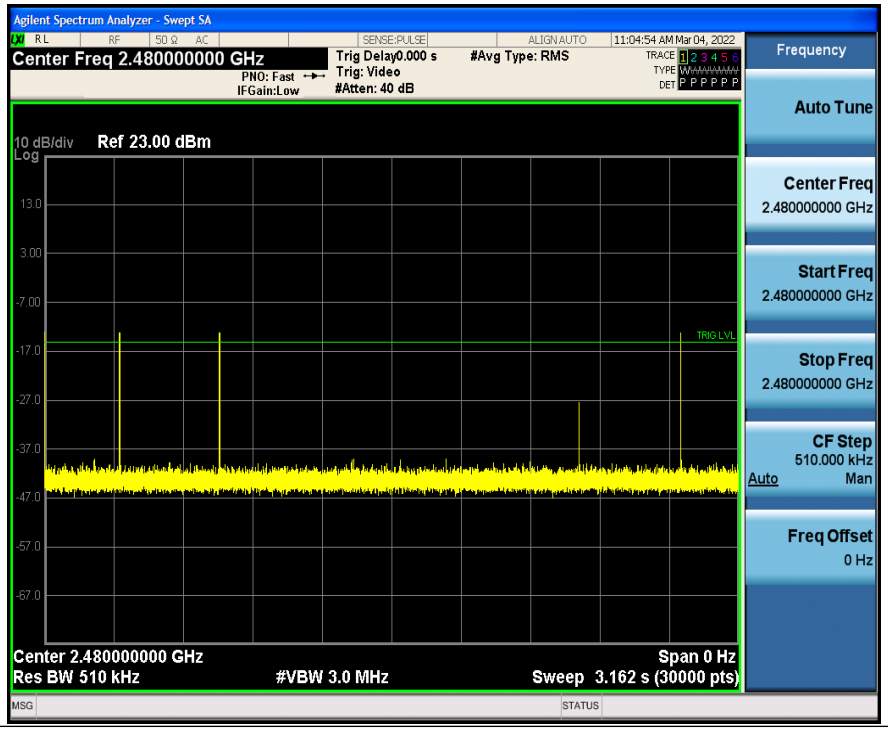
DH3_Ant1_Hop_2441



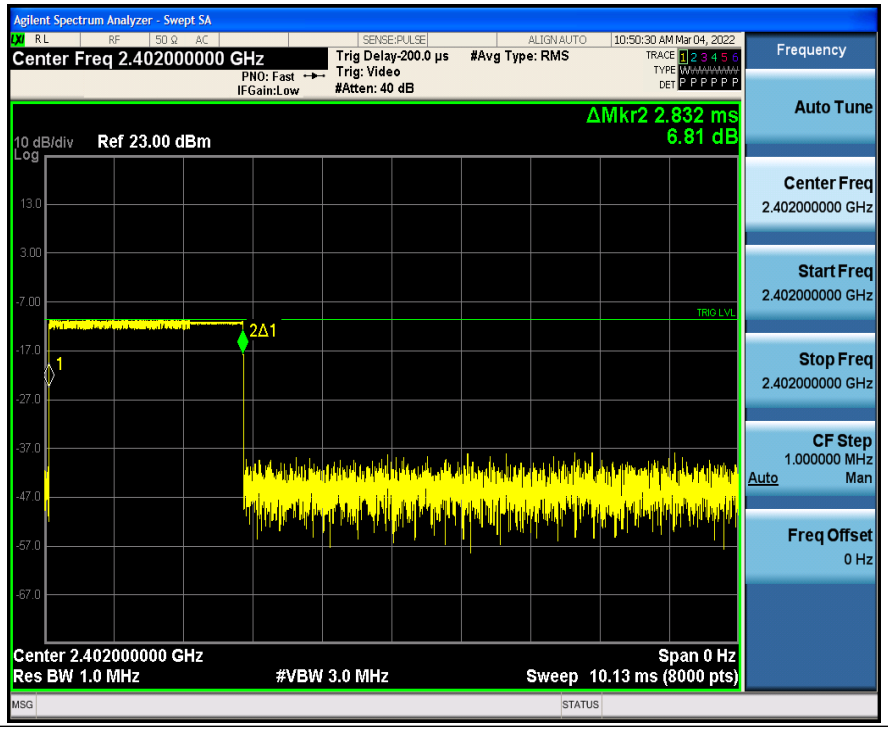


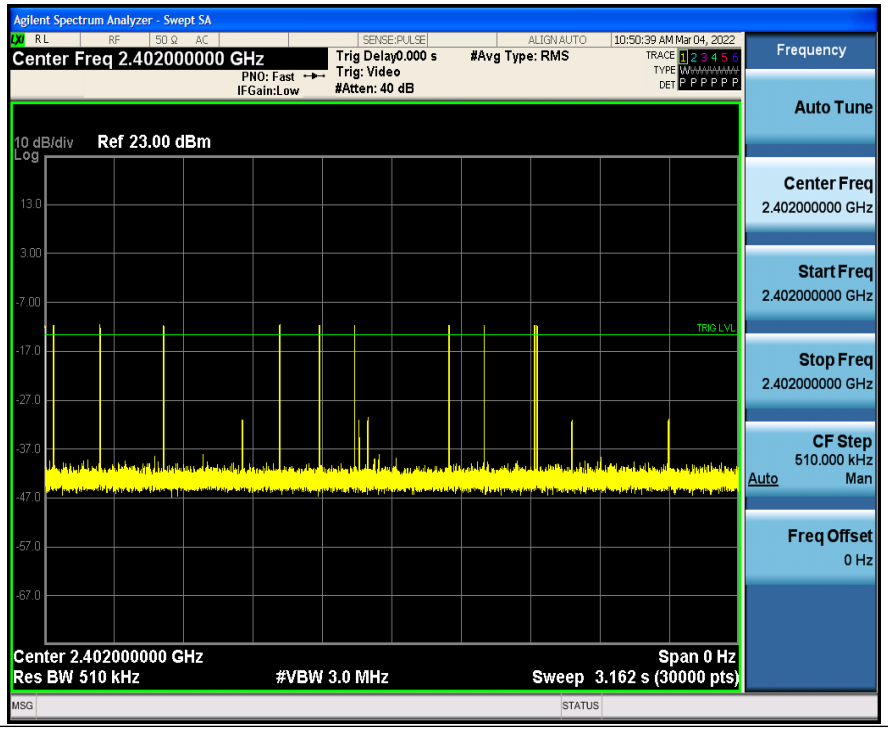
DH3_Ant1_Hop_2480



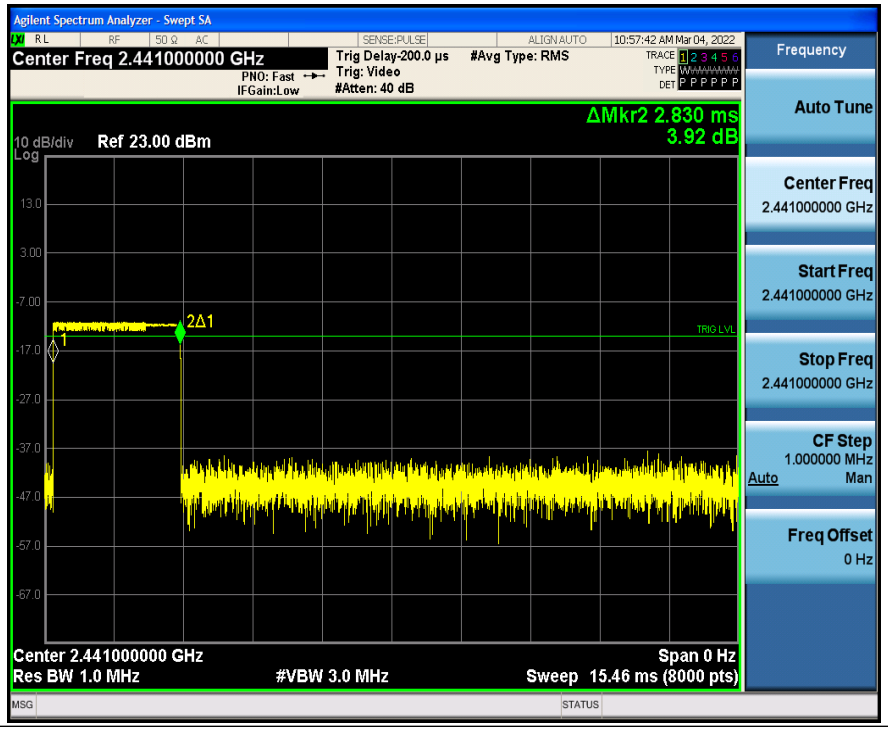


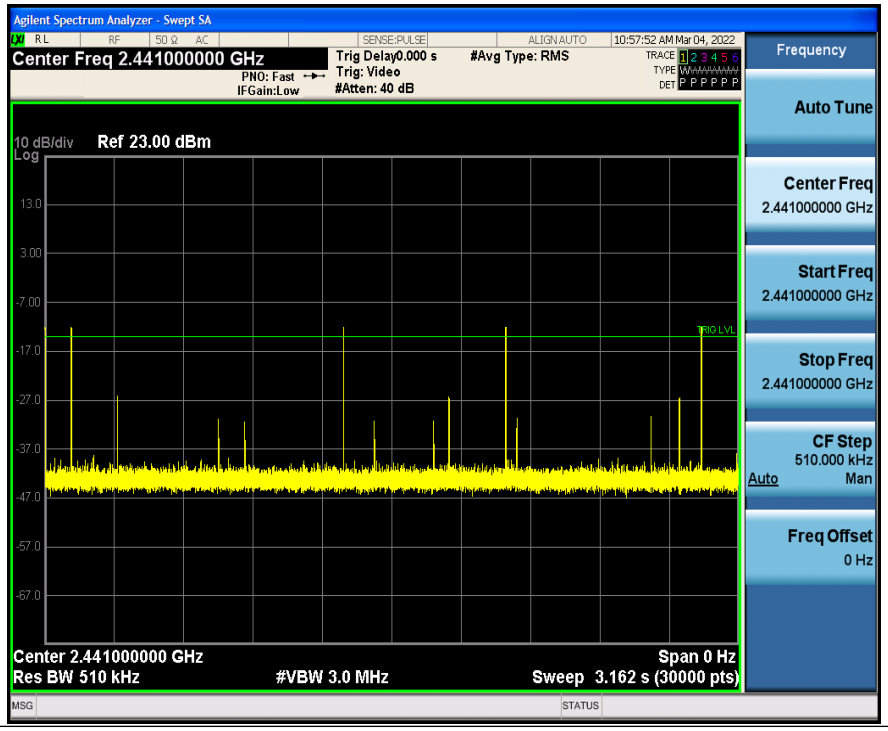
DH5_Ant1_Hop_2402



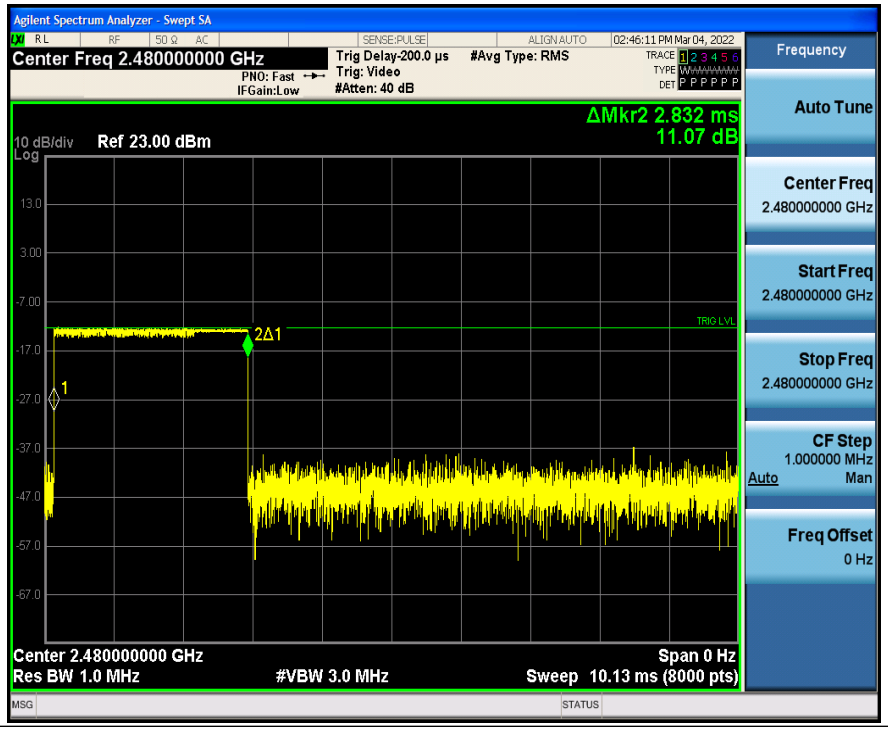


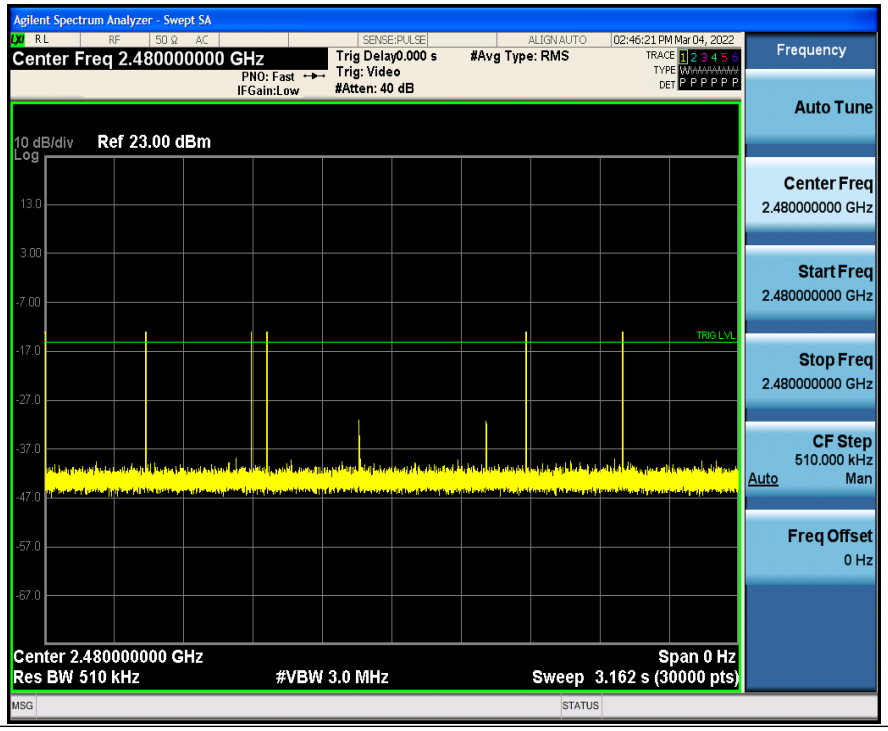
DH5_Ant1_Hop_2441





DH5_Ant1_Hop_2480





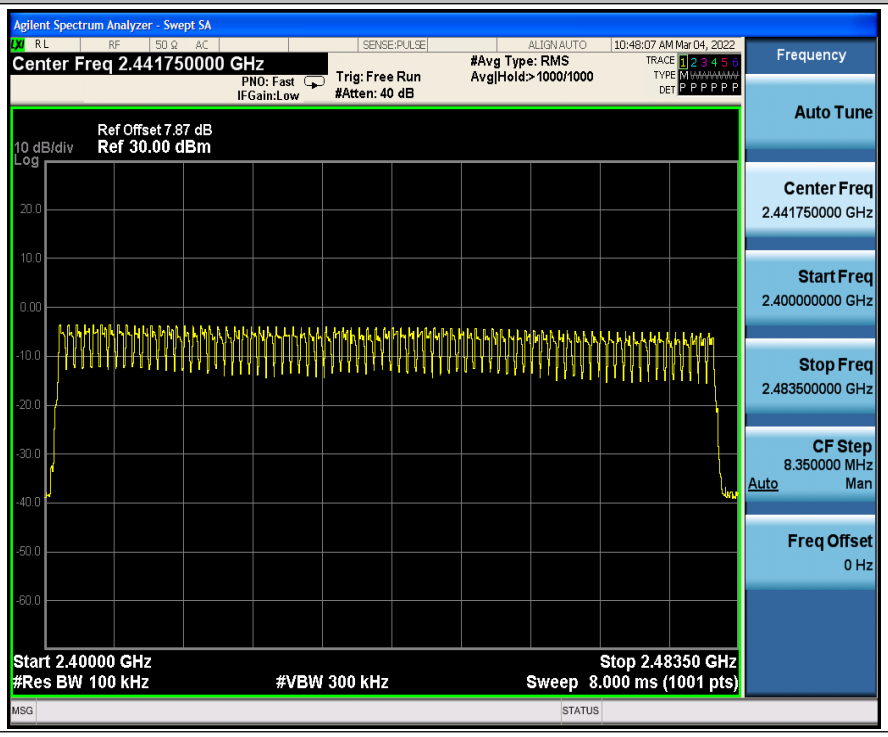
10.5 Appendix E: Number of hopping channels

10.5.1 Test Result

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	>=15	PASS

10.5.2 Test Graphs

DH5_Ant1_Hop



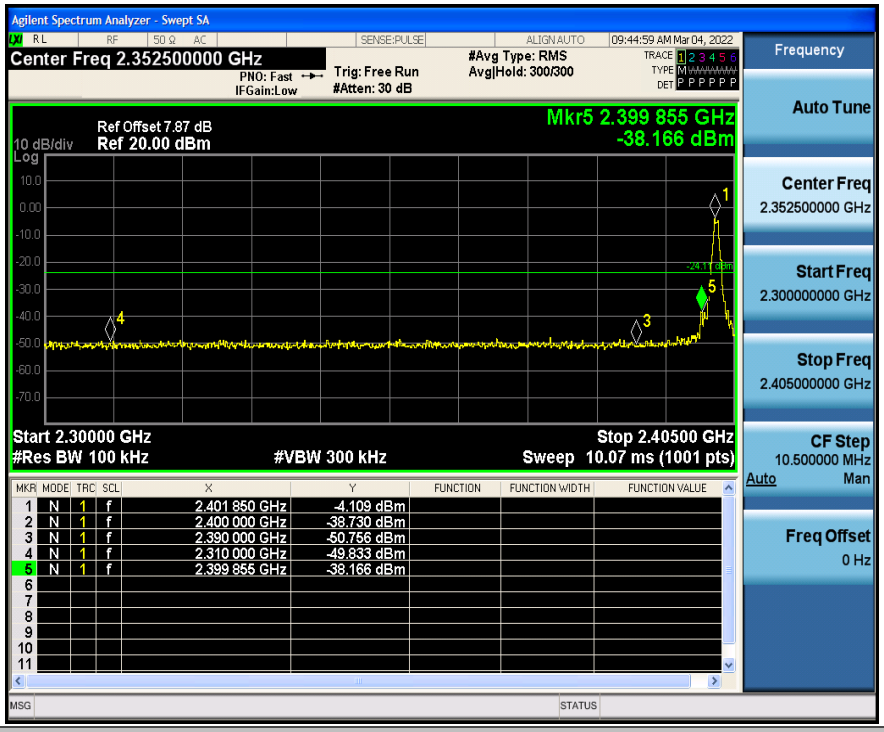
10.6 Appendix F: Band edge measurements

10.6.1 Test Result

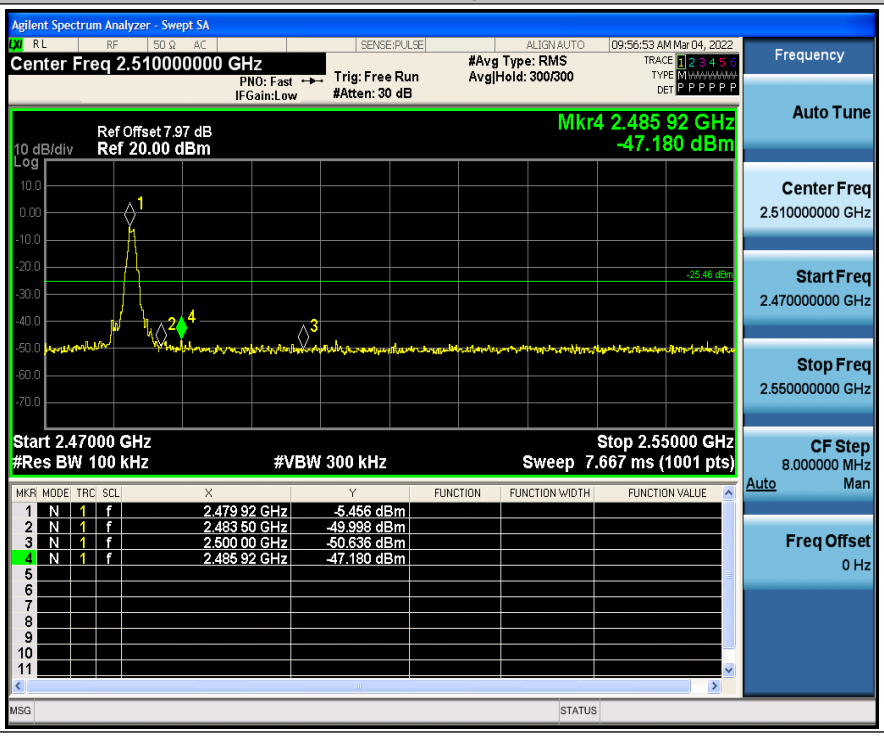
TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	-4.11	-38.17	<=-24.11	PASS
		High	2480	-5.46	-47.18	<=-25.46	PASS
		Low	Hop_2402	-3.55	-48.66	<=-23.55	PASS
		High	Hop_2480	-5.04	-47.13	<=-25.04	PASS

10.6.2 Test Graphs

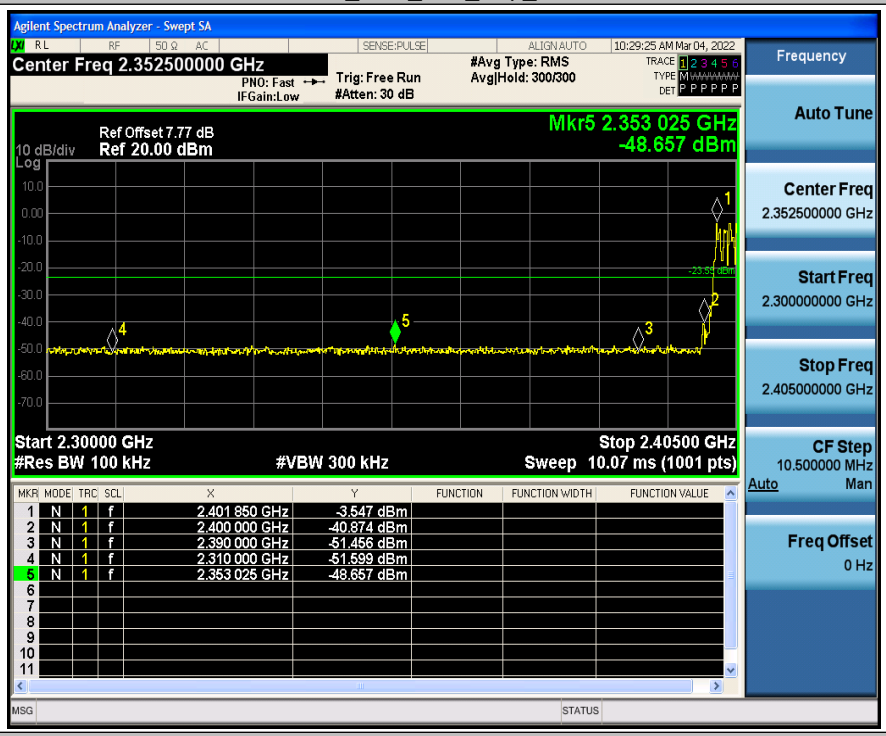
DH5_Ant1_Low_2402



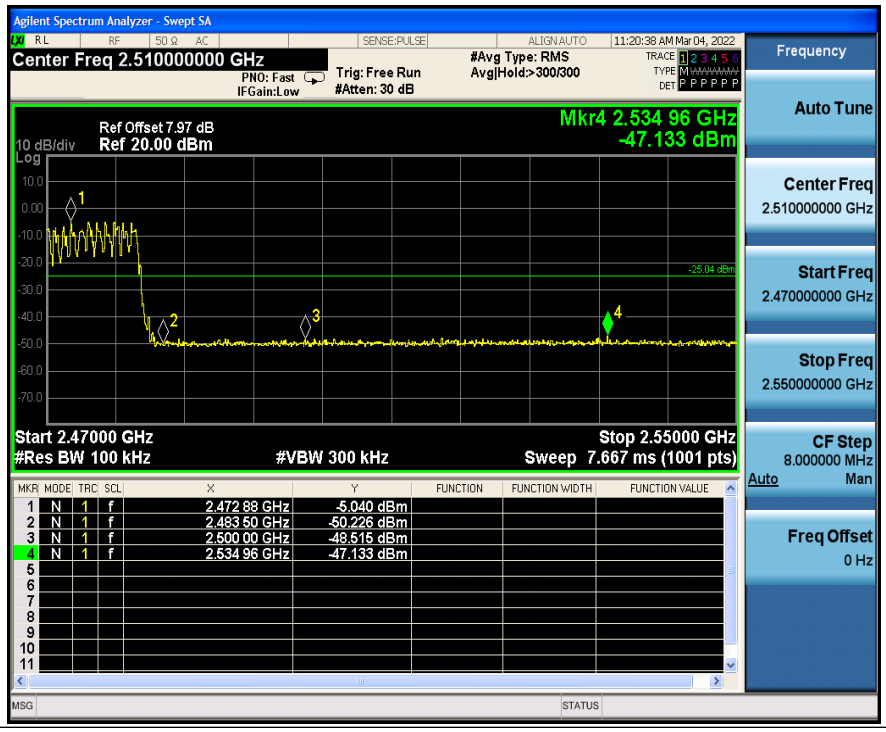
DH5_Ant1_High_2480



DH5_Ant1_Low_Hop_2402



DH5_Ant1_High_Hop_2480



10.7 Appendix G: Conducted Spurious Emission

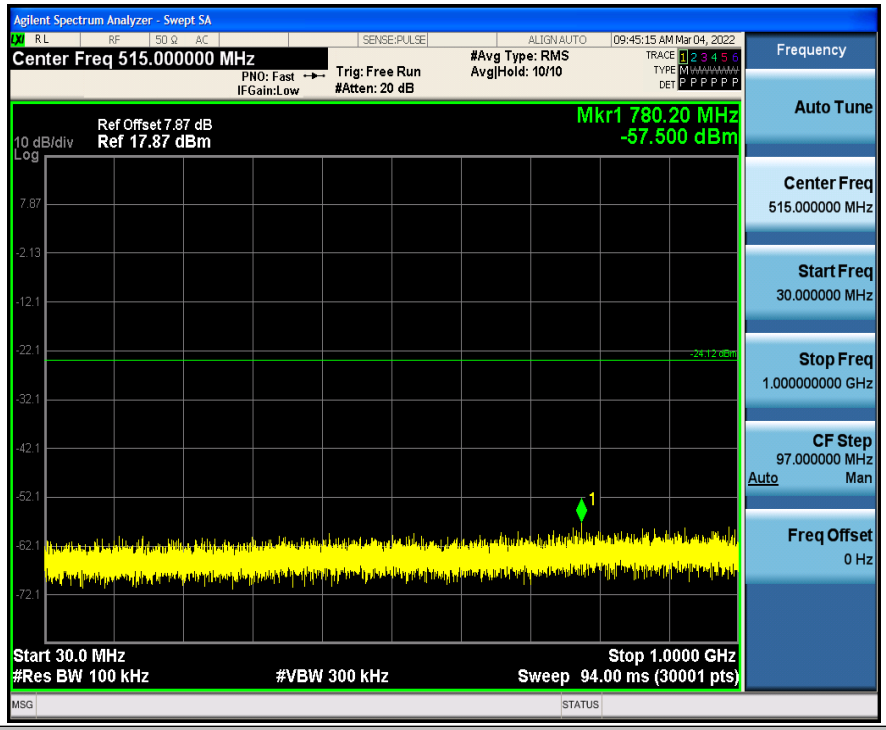
10.7.1 Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	-4.12	-4.12	---	PASS
			30~1000	---	-57.5	<=-24.124	PASS
			1000~26500	---	-39.589	<=-24.124	PASS
		2441	Reference	-4.44	-4.44	---	PASS
			30~1000	---	-57.502	<=-24.442	PASS
			1000~26500	---	-39.87	<=-24.442	PASS
		2480	Reference	-5.46	-5.46	---	PASS
			30~1000	---	-56.822	<=-25.46	PASS
			1000~26500	---	-39.902	<=-25.46	PASS

10.7.2 Test Graphs

DH5_Ant1_2402_0~Reference

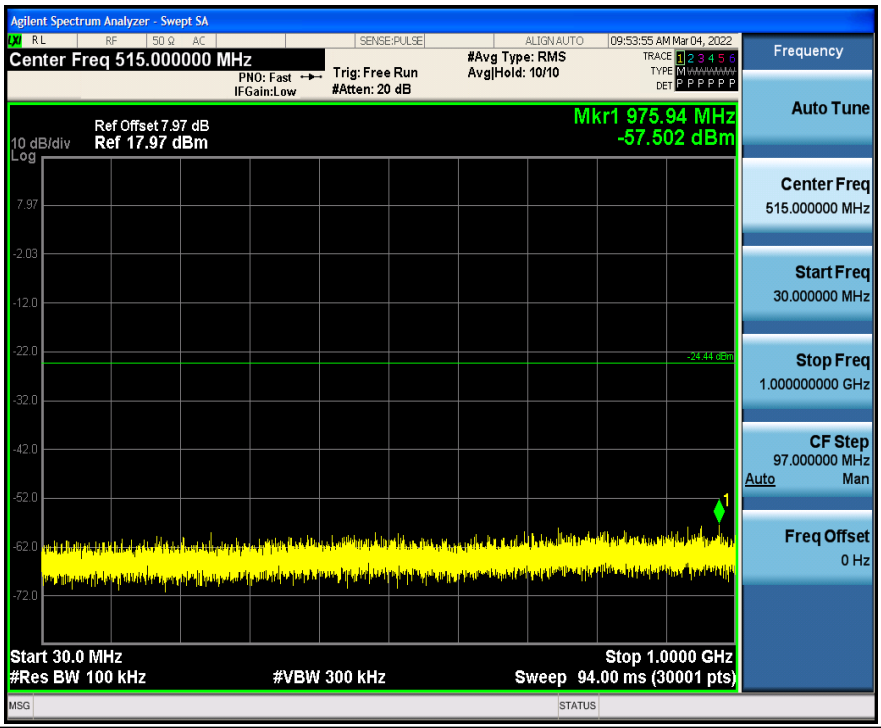
DH5_Ant1_2402_30~1000



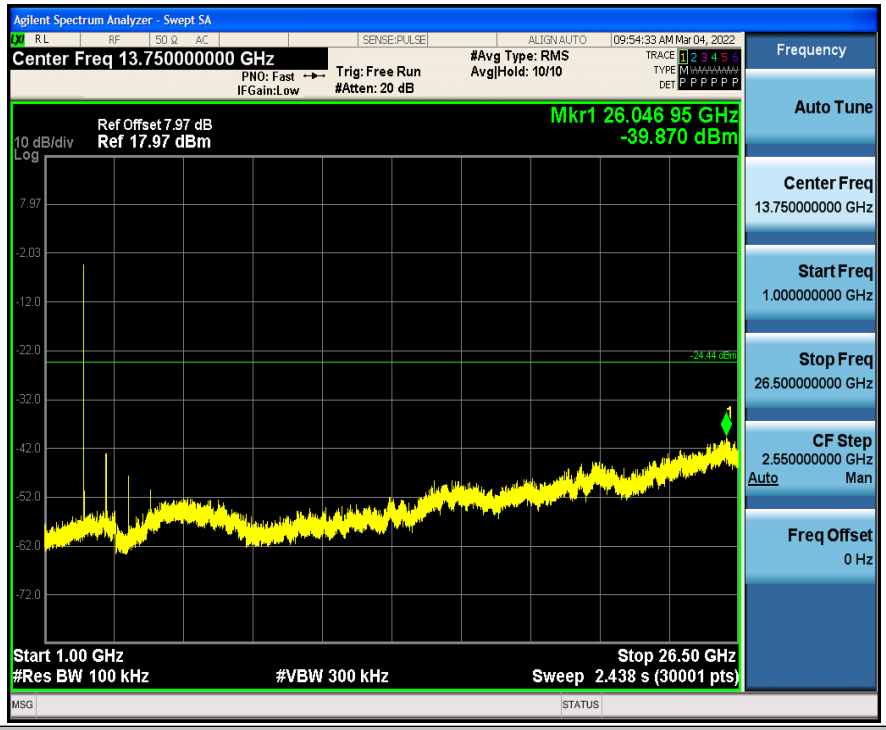
DH5_Ant1_2402_1000~26500

DH5_Ant1_2441_0~Reference

DH5_Ant1_2441_30~1000

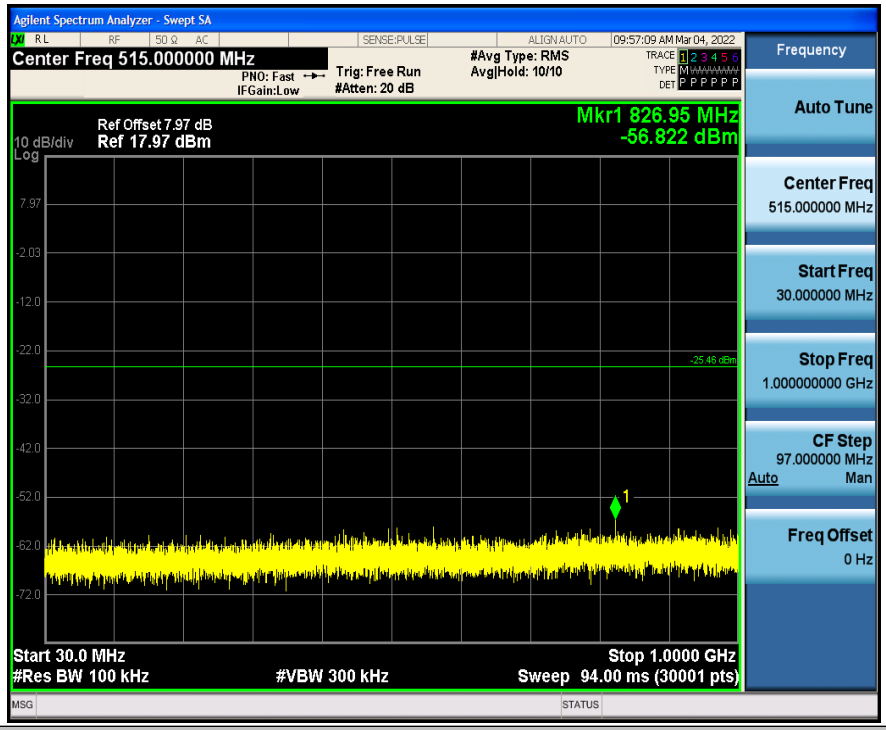


DH5_Ant1_2441_1000~26500

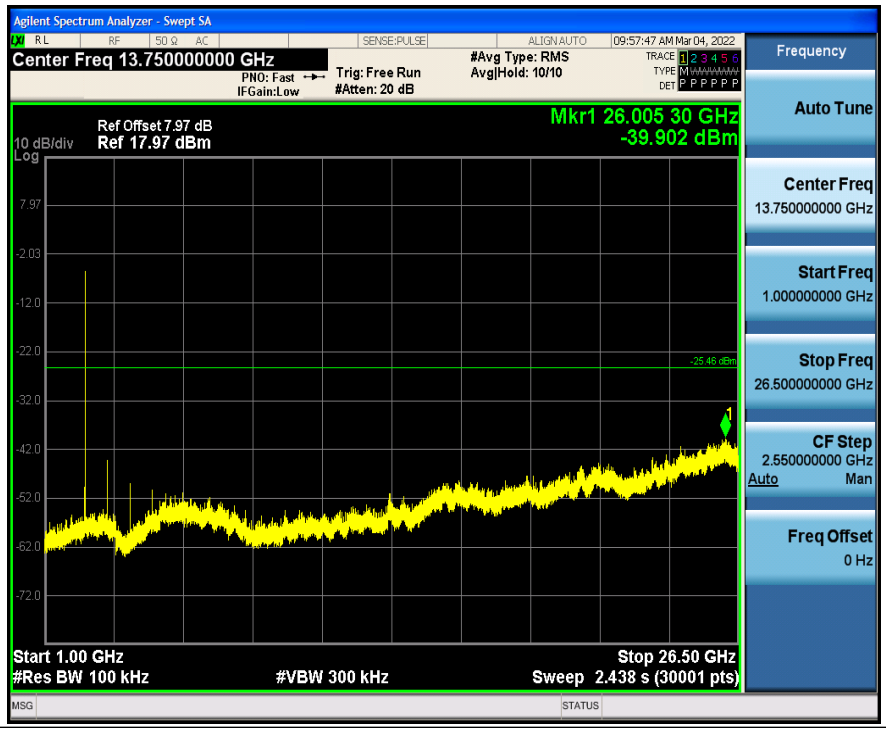


DH5_Ant1_2480_0~Reference

DH5_Ant1_2480_30~1000



DH5_Ant1_2480_1000~26500



- End of the Report -