TEST REPORT

Application No.:	GZEM2101000214CR
Applicant:	Kysho Multimedia Ltd.
Address of Applicant:	Flat F, 5/F Valiant Industrial Centre, 2-12 Au Pui Wan Street, Fo Tan, Shatin, N.T.
Manufacturer:	Huizhou Shenke Xinfei Technology Co., Ltd.
Address of Manufacturer:	Building C, Tangxia Chanjing Industrial Park, Huiyang District, Huizhou City
Factory:	Huizhou Shenke Xinfei Technology Co., Ltd.
Address of Factory:	Building C, Tangxia Chanjing Industrial Park, Huiyang District, Huizhou City
Equipment Under Test (EUT):	
EUT Name:	HydraBlast
Model No.:	IMW1300, IMW1300-XXX (X can be A to Z) ♣
♣	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:	2021-01-11
Date of Test:	2021-01-14 to 2021-03-11
Date of Issue:	2021-08-09
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		2021-08-09		Original

Authorized for issue by:				
Tested By		Lily Kuang **Lily_Kuang /Project Engineer**		
Reviewed By		Ricky Liu **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(c)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	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	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	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.7	47 CFR Part 15, Subpart C 15.247(a)(1)	Pass
Carrier Frequencies Separation	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.2	47 CFR Part 15, Subpart C 15.247a(1)	Pass
Hopping Channel Number	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.3	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Dwell Time	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.247a(1)(iii)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 7.8.6	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	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	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass**

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

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♣ **Declaration of EUT Family Grouping:**

Model No.: IMW1300, IMW1300-XXX (X can be A to Z)

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 model number, colour and decorations.

Therefore, only one model IMW1300 was tested in this report.

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4 General Information

4.1 Details of E.U.T.

Power Supply:	Adapter MODEL NO: MLF-A00060501000U0021 INPUT:100-240V 50/60Hz 0.18mA max OUTPUT:5V===1A Rechargeable battery: DC 7.4V 2000mAh 14.8Wh(Charge by USB) Test voltage: AC 120V 60Hz
Test Voltage:	AC 120V 60Hz
Cable:	DC in cable:80cm Unshielded USB cable: 40cm Unshielded
Antenna Gain:	0 dBi
Antenna Type:	Integrated antenna
Channel Spacing:	1MHz
Modulation Type:	GFSK, π/4DQPSK,
Number of Channels:	79
Operation Frequency:	2402MHz to 2480MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum (FHSS)
Hardware Version:	E357502
Firmware Version:	V1.00
S/N:	SP-2020032001
Test Software Version:	FCC Assist 1.0.1.2
Power setting level	0 dBm and cannot be changed by user
BT Version:	BT Classic only

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	IBM	T30	S/N78-3VMLX 06/01
BT test board	SGS EMC	RF 07	RF 07

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4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	±5.5 x 10^{-8}
2	Duty cycle	±0.57%
3	Occupied Bandwidth	±3%
4	RF Conducted power	±0.68dB
5	RF Power Density	±1.50dB
6	Conducted Spurious Emissions	±1.04dB
7	RF Radiated Power	±4.5dB (below 1GHz)
		±4.8dB (above 1GHz)
8	Radiated Spurious Emission Test	±4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
9	Temperature	±0.4°C
10	Humidity	±1.3%
11	Supply Voltages	±1.5%
12	Time	±3%

4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.

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4.5 Test Facility

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

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

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- **ACMA**

  SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark.

- **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)**

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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

The EUT passed Radiated Spurious Emissions test after modifications.

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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	2021-01-08	2022-01-07
LISN	Rohde & Schwarz	ENV216	EMC2135	2020-09-25	2021-09-24
EMI Test Receiver	Rohde & Schwarz	ESCS30	EMC0506	2020-11-13	2021-11-12
Coaxial Cable	HangTianXing	2m	EMC0107	2020-09-09	2022-09-08
Voltage Probe	SGS-EMC	N/A	EMC0106	2019-05-10	2021-05-09
Conical Metal Housing	SGS-EMC	N/A	EMC0167	2020-04-19	2022-04-18
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A

Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Carrier Frequencies Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

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Hopping Channel Number					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Dwell Time					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
MXA Signal Analyzer	AgilentTechnologies	N9020A	SEM004-10	2021-03-02	2022-03-01
ESG Vector Signal Generator	Keysight	E4438C	SEM006-03	2020-03-31	2021-03-30
EXG Analog Signal Generator	AgilentTechnologies	N5171B	SEM006-04	2020-07-15	2021-07-14
Power Meter	AgilentTechnologies	U2021XA_Ch2	SEM009-02	2020-05-26	2021-05-25
Power Meter	AgilentTechnologies	U2021XA_Ch3	SEM009-03	2020-05-26	2021-05-25
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

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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	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2021-01-03	2022-01-02
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 25MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	EMC2174	2018-09-06	2021-09-05
Bi-log Type Antenna	Schaffner Chase	CBL6143	EMC0519	2020-06-08	2023-06-07
Horn Antenna	SCHWARZBECKMESS-ELEKTRONIK	BBHA 9120D	EMC2016	2019-09-25	2022-09-24
Horn Antenna 1GHz-18GHz	Rohde & Schwarz	HF906	EMC0518	2018-09-02	2021-09-01
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2020-11-13	2021-11-12
Active Loop Antenna	EMCO	6502	EMC0523	2020-05-19	2022-05-18
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-19	2023-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

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Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2021-01-03	2022-01-02
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 25MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	EMC2174	2018-09-06	2021-09-05
Bi-log Type Antenna	Schaffner Chase	CBL6143	EMC0519	2020-06-08	2023-06-07
Horn Antenna	SCHWARZBECKMESS-ELEKTRONIK	BBHA 9120D	EMC2016	2019-09-25	2022-09-24
Horn Antenna 1GHz-18GHz	Rohde & Schwarz	HF906	EMC0518	2018-09-02	2021-09-01
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2020-11-13	2021-11-12
Active Loop Antenna	EMCO	6502	EMC0523	2020-05-19	2022-05-18
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-19	2023-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
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	2020-07-09	2021-07-08
DMM	Fluke	73	EMC0007	2020-07-09	2021-07-08

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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(c)

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 0dBi.

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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:

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 bands

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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.		

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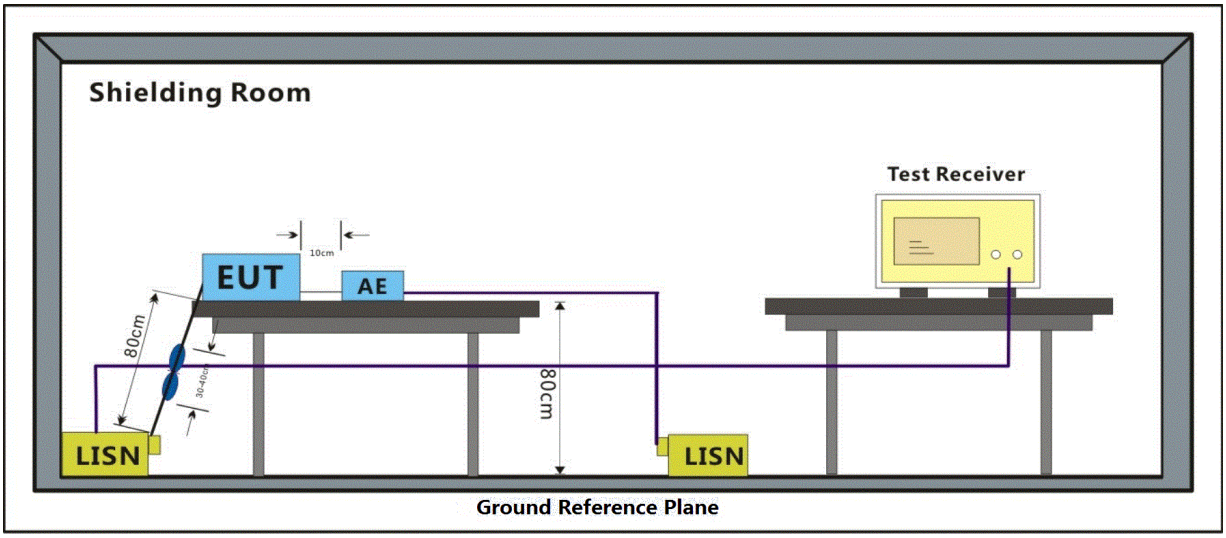
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar

Test mode: b: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, All modes have been tested and only the data of worst case is recorded in the report.

7.1.2 Test Setup Diagram



7.1.3 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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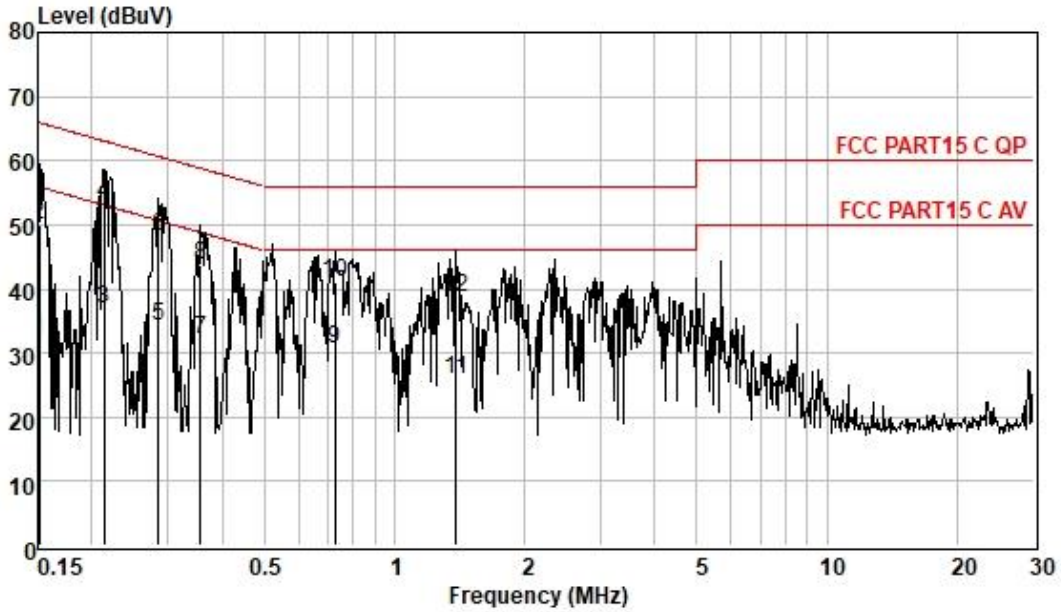
Mode:b; Line: Live Line



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
0.15	22.55	0.06	9.62	32.23	55.96	-23.73	Average
0.15	40.18	0.06	9.62	49.86	65.96	-16.10	QP
0.21	27.19	0.06	9.63	36.88	53.05	-16.17	Average
0.21	43.68	0.06	9.63	53.37	63.05	-9.68	QP
0.28	24.63	0.06	9.62	34.31	50.68	-16.37	Average
0.28	38.57	0.06	9.62	48.25	60.68	-12.43	QP
0.36	22.28	0.06	9.63	31.97	48.83	-16.86	Average
0.36	34.12	0.06	9.63	43.81	58.83	-15.02	QP
0.73	20.94	0.07	9.63	30.64	46.00	-15.36	Average
0.73	31.28	0.07	9.63	40.98	56.00	-15.02	QP
1.39	16.25	0.09	9.61	25.95	46.00	-20.05	Average
1.39	28.86	0.09	9.61	38.56	56.00	-17.44	QP

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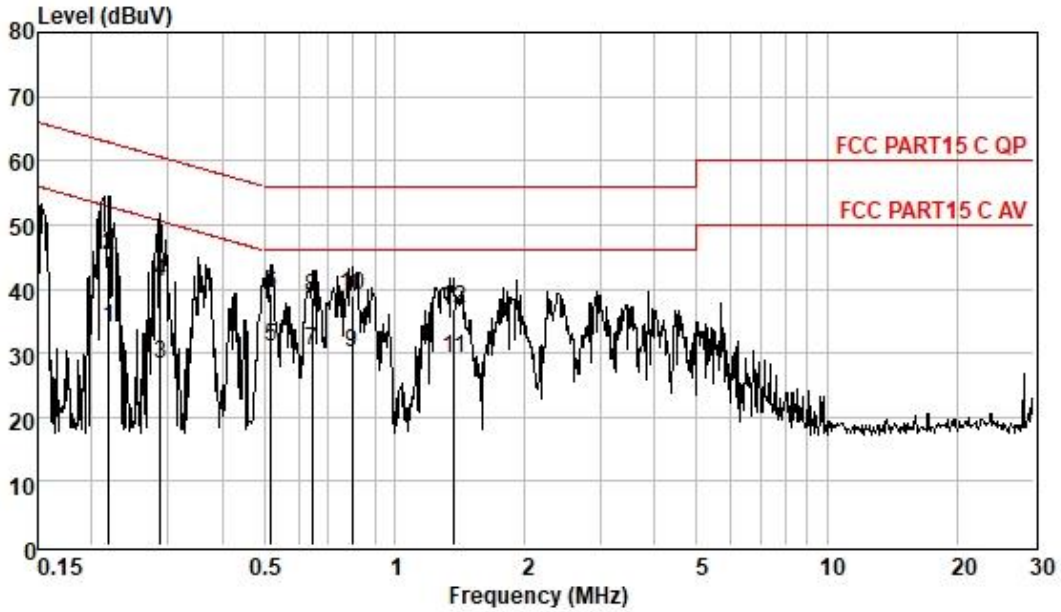
Mode:b; Line: Neutral Line



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
0.22	24.43	0.06	9.54	34.03	52.88	-18.85	Average
0.22	35.52	0.06	9.54	45.12	62.88	-17.76	QP
0.29	18.53	0.06	9.54	28.13	50.59	-22.46	Average
0.29	31.41	0.06	9.54	41.01	60.59	-19.58	QP
0.52	21.45	0.07	9.55	31.07	46.00	-14.93	Average
0.52	29.64	0.07	9.55	39.26	56.00	-16.74	QP
0.64	20.63	0.07	9.54	30.24	46.00	-15.76	Average
0.64	29.02	0.07	9.54	38.63	56.00	-17.37	QP
0.80	20.52	0.07	9.55	30.14	46.00	-15.86	Average
0.80	29.36	0.07	9.55	38.98	56.00	-17.02	QP
1.37	19.43	0.09	9.55	29.07	46.00	-16.93	Average
1.37	27.35	0.09	9.55	36.99	56.00	-19.01	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

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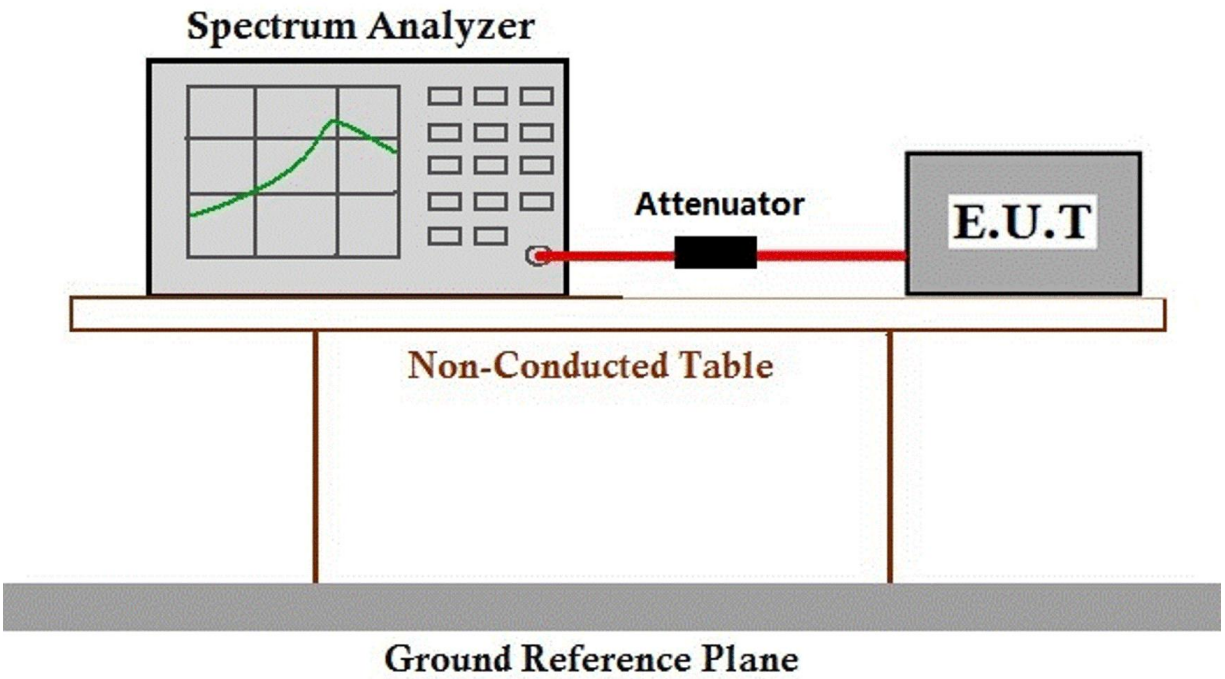
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 38.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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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

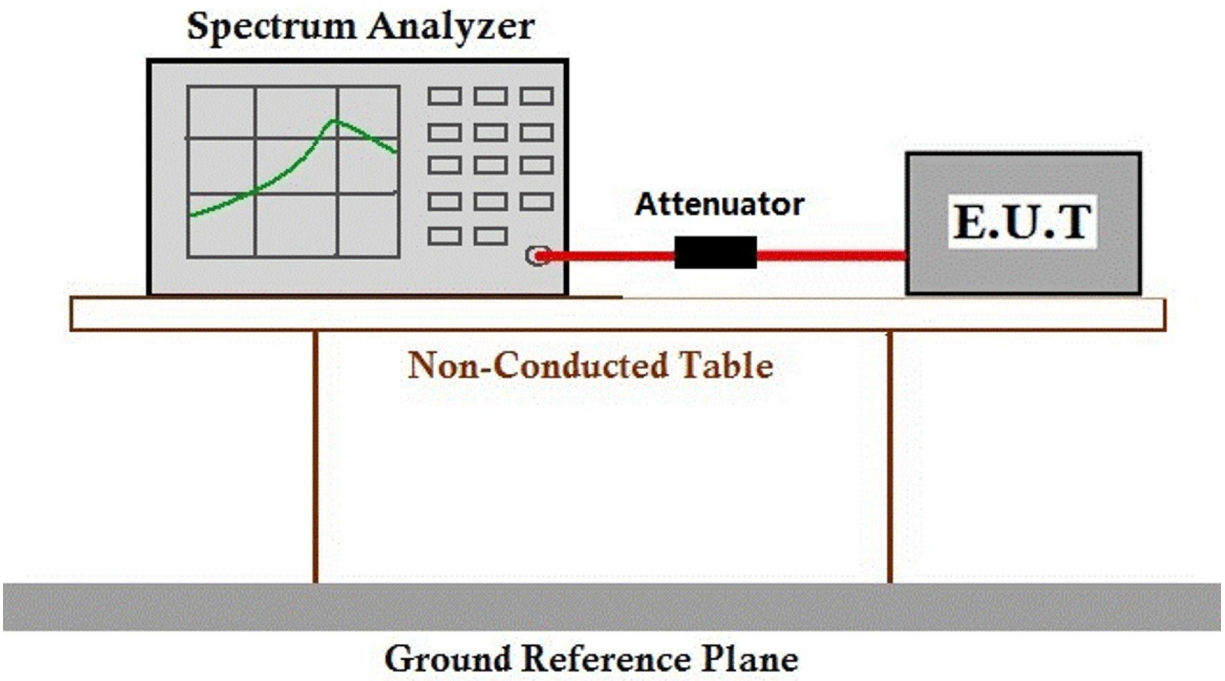
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 38.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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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

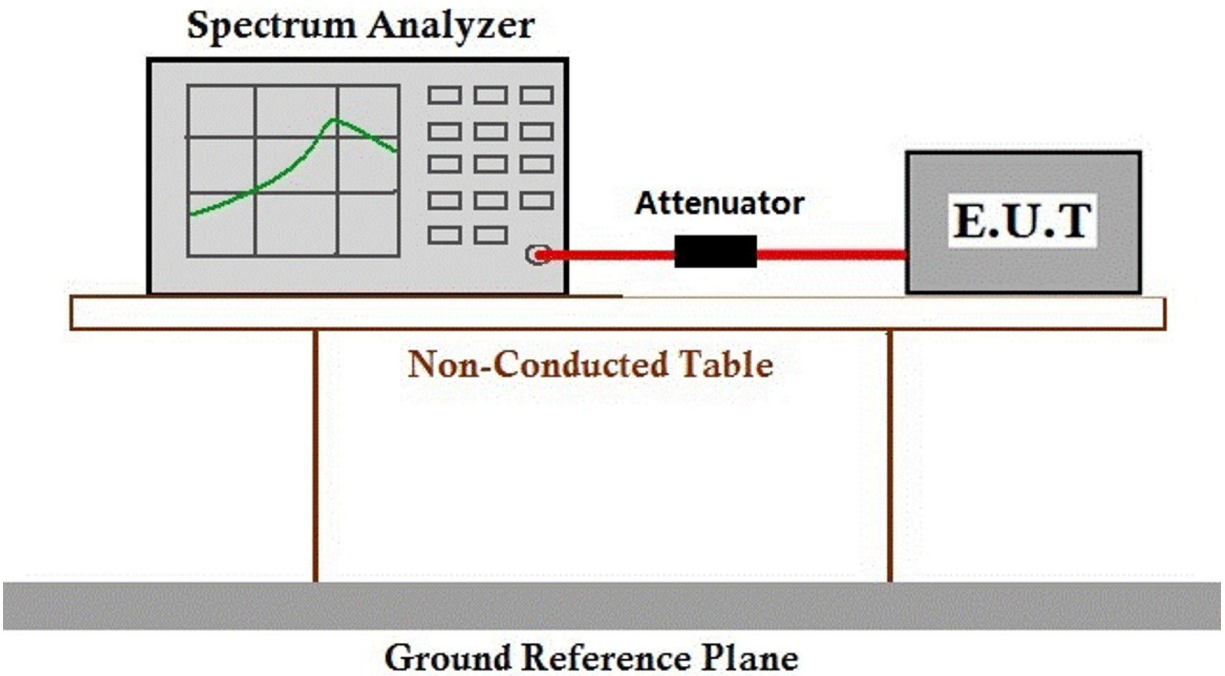
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 38.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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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

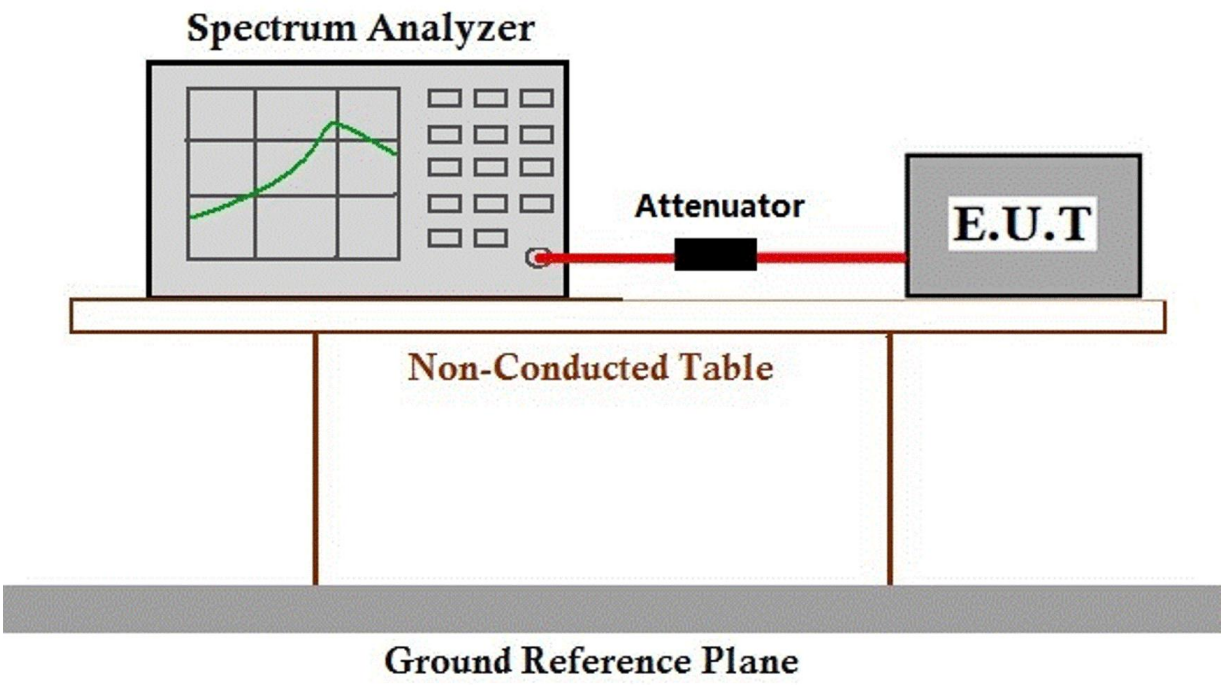
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 38.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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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

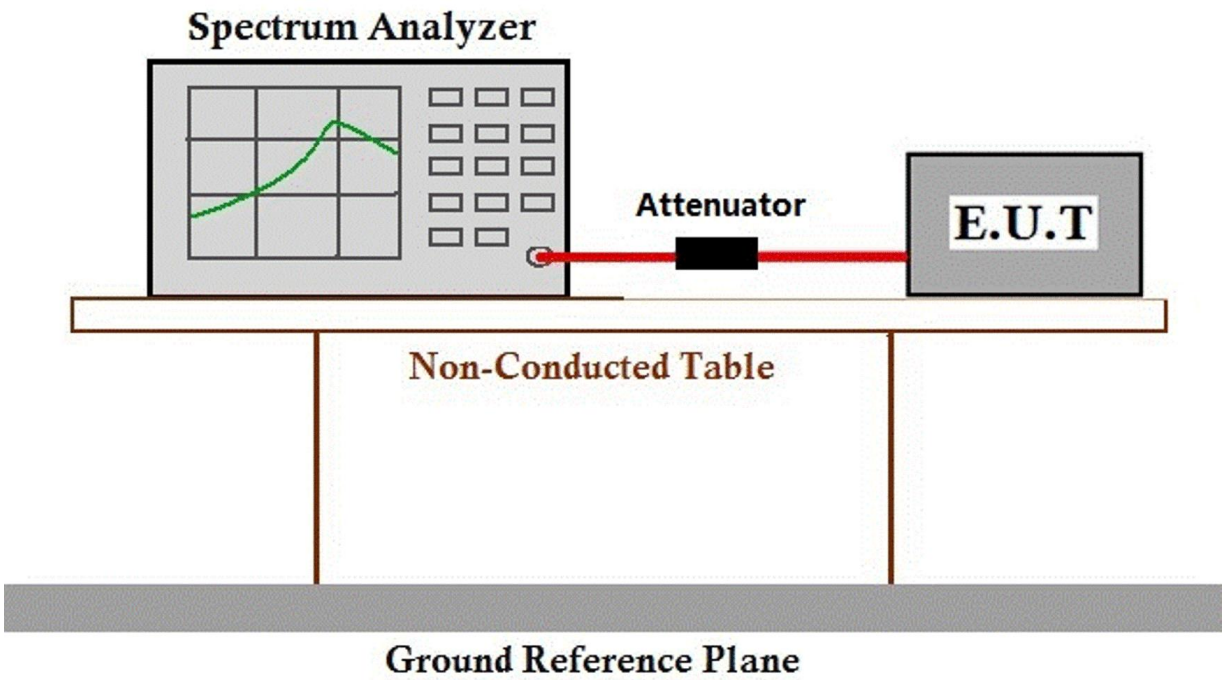
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 38.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.

7.6.2 Test Setup Diagram



7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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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)

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7.7.1 E.U.T. Operation

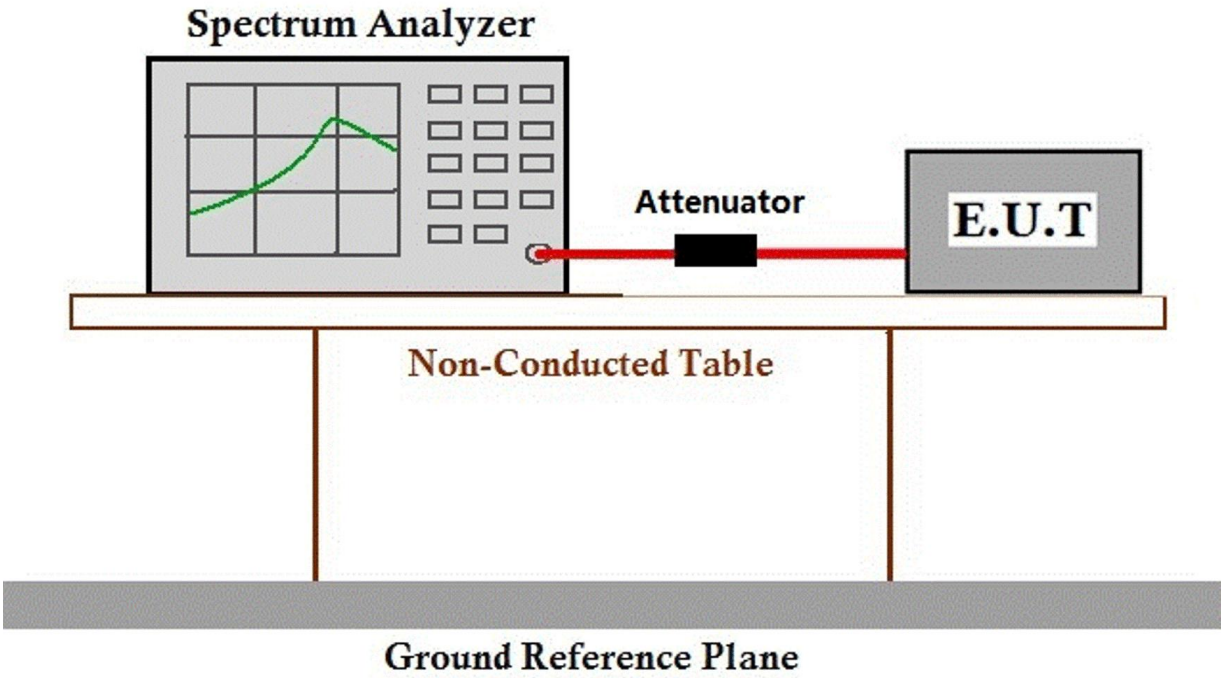
Operating Environment:

Temperature: 23.2 °C Humidity: 38.3 % RH Atmospheric Pressure: 1020 mbar

Test mode: a: TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, π/4DQPSK modulation, All modes have been tested and only the data of worst case is recorded in the report.

b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, All modes have been tested and only the data of worst case is recorded in the report.

7.7.2 Test Setup Diagram



7.7.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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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)

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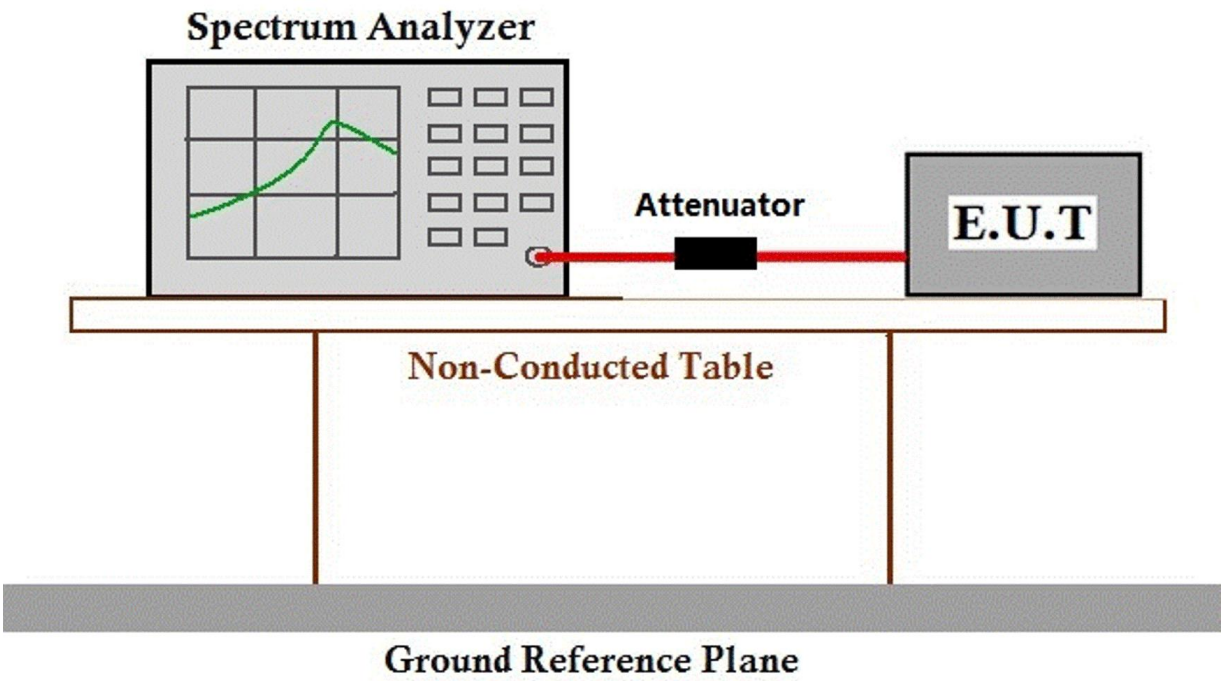
7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C Humidity: 38.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, All modes have been tested and only the data of worst case is recorded in the report.

7.8.2 Test Setup Diagram



7.8.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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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.		

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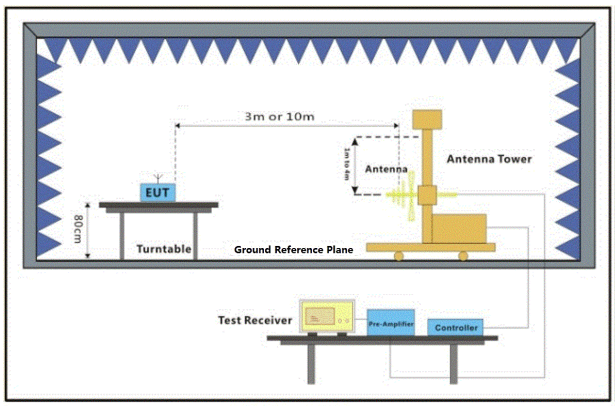
7.9.1 E.U.T. Operation

Operating Environment:

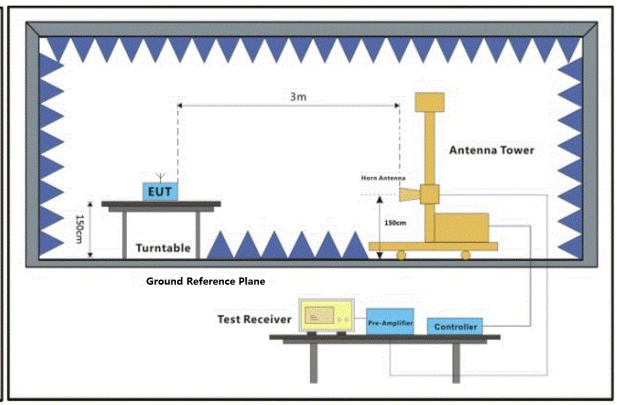
Temperature: 17.5 °C Humidity: 45.4 % RH Atmospheric Pressure: 1020 mbar

Pretest these modes to find the worst case:	b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.
	c: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.
The worst case for final test:	b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.

7.9.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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7.9.3 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 middle 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.

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

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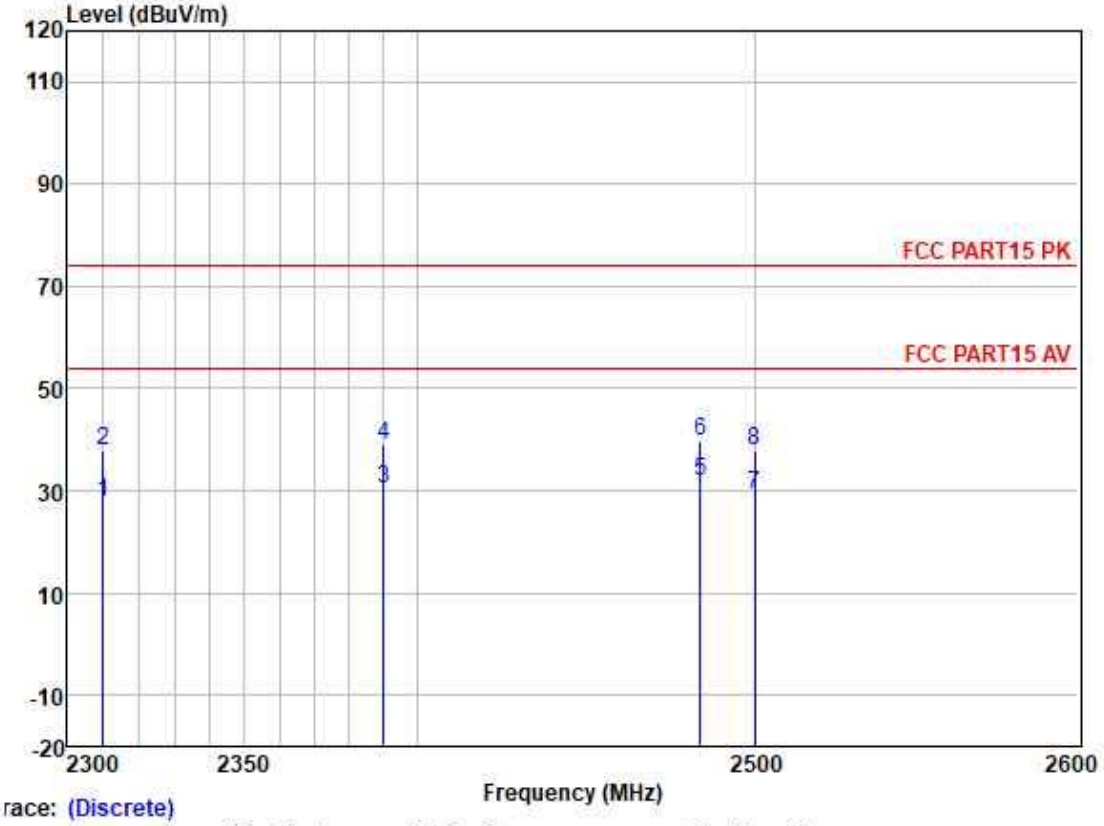
Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



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	2310.000	34.79	27.15	3.32	37.62	27.64	54.00	-26.36	HORIZONTAL	Average
2	2310.000	44.91	27.15	3.32	37.62	37.76	74.00	-36.24	HORIZONTAL	Peak
3	2390.000	37.26	27.33	3.48	37.59	30.48	54.00	-23.52	HORIZONTAL	Average
4	2390.000	45.81	27.33	3.48	37.59	39.03	74.00	-34.97	HORIZONTAL	Peak
5	2483.500	38.47	27.48	3.53	37.57	31.91	54.00	-22.09	HORIZONTAL	Average
6	2483.500	46.28	27.48	3.53	37.57	39.72	74.00	-34.28	HORIZONTAL	Peak
7	2500.000	35.84	27.50	3.40	37.56	29.18	54.00	-24.82	HORIZONTAL	Average
8	2500.000	44.39	27.50	3.40	37.56	37.73	74.00	-36.27	HORIZONTAL	Peak

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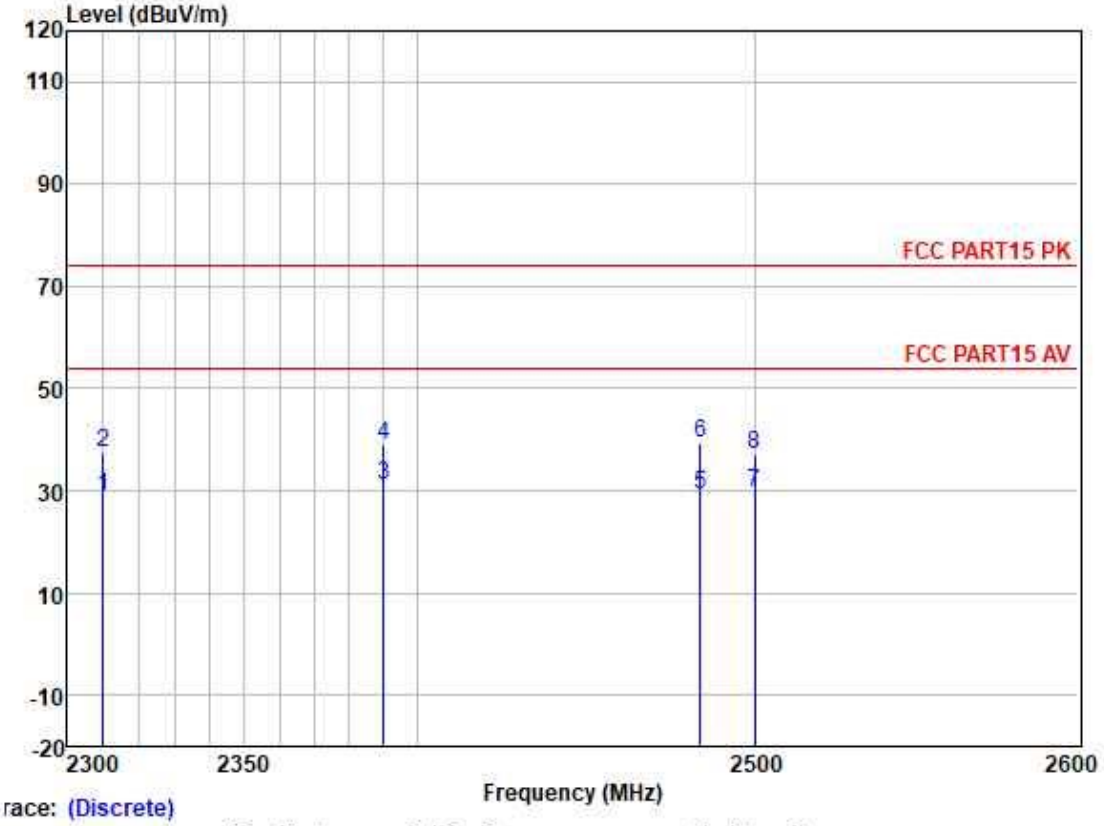
Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



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	2310.000	35.97	27.15	3.32	37.62	28.82	54.00	-25.18	VERTICAL	Average
2	2310.000	44.78	27.15	3.32	37.62	37.63	74.00	-36.37	VERTICAL	Peak
3	2390.000	37.74	27.33	3.48	37.59	30.96	54.00	-23.04	VERTICAL	Average
4	2390.000	45.75	27.33	3.48	37.59	38.97	74.00	-35.03	VERTICAL	Peak
5	2483.500	35.71	27.48	3.53	37.57	29.15	54.00	-24.85	VERTICAL	Average
6	2483.500	45.81	27.48	3.53	37.57	39.25	74.00	-34.75	VERTICAL	Peak
7	2500.000	36.32	27.50	3.40	37.56	29.66	54.00	-24.34	VERTICAL	Average
8	2500.000	43.93	27.50	3.40	37.56	37.27	74.00	-36.73	VERTICAL	Peak

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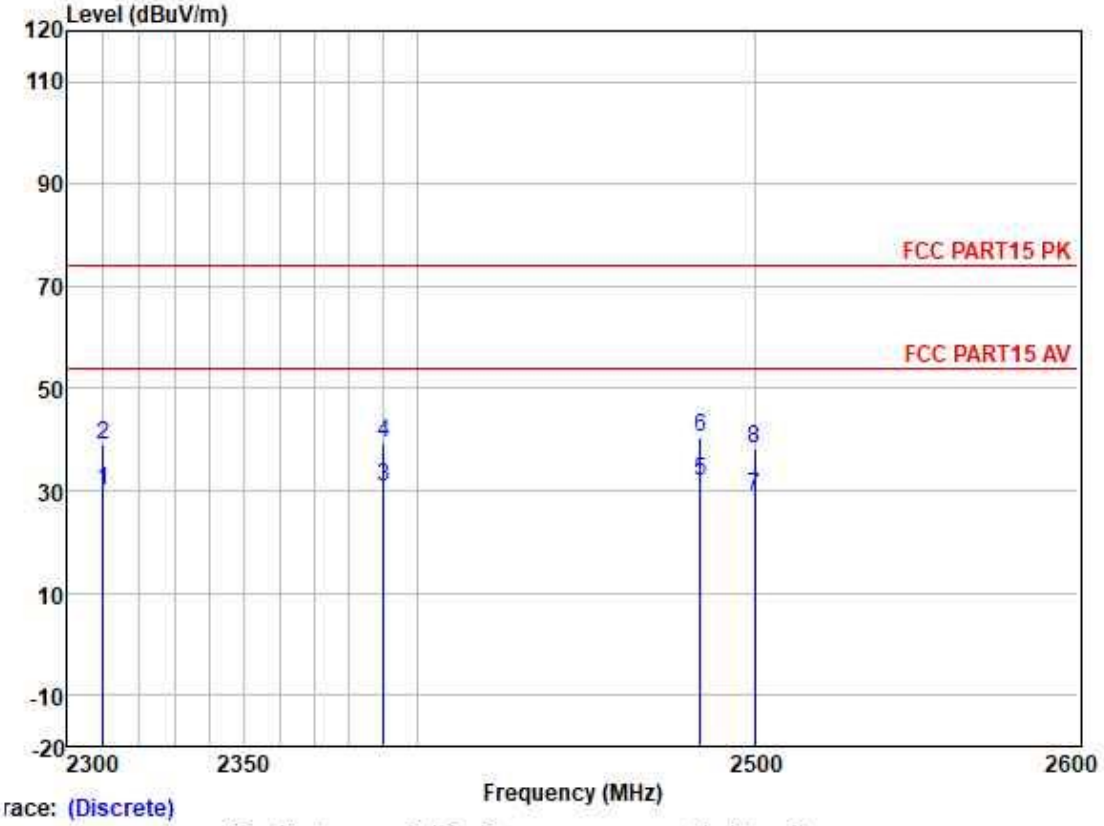
Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



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	2310.000	37.19	27.15	3.32	37.62	30.04	54.00	-23.96	HORIZONTAL	Average
2	2310.000	46.01	27.15	3.32	37.62	38.86	74.00	-35.14	HORIZONTAL	Peak
3	2390.000	37.69	27.33	3.48	37.59	30.91	54.00	-23.09	HORIZONTAL	Average
4	2390.000	46.10	27.33	3.48	37.59	39.32	74.00	-34.68	HORIZONTAL	Peak
5	2483.500	38.31	27.48	3.53	37.57	31.75	54.00	-22.25	HORIZONTAL	Average
6	2483.500	47.02	27.48	3.53	37.57	40.46	74.00	-33.54	HORIZONTAL	Peak
7	2500.000	35.59	27.50	3.40	37.56	28.93	54.00	-25.07	HORIZONTAL	Average
8	2500.000	44.77	27.50	3.40	37.56	38.11	74.00	-35.89	HORIZONTAL	Peak

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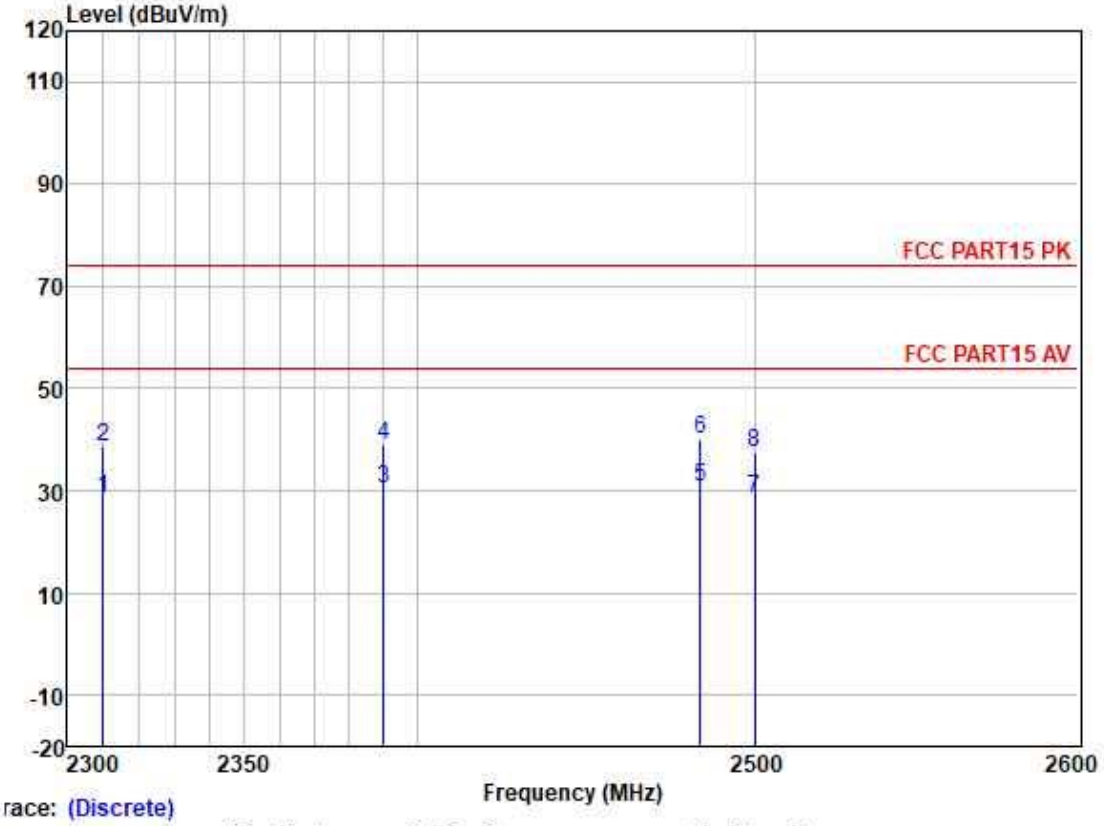
Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:High



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	2310.000	35.68	27.15	3.32	37.62	28.53	54.00	-25.47	VERTICAL	Average
2	2310.000	45.73	27.15	3.32	37.62	38.58	74.00	-35.42	VERTICAL	Peak
3	2390.000	37.21	27.33	3.48	37.59	30.43	54.00	-23.57	VERTICAL	Average
4	2390.000	45.87	27.33	3.48	37.59	39.09	74.00	-34.91	VERTICAL	Peak
5	2483.500	37.49	27.48	3.53	37.57	30.93	54.00	-23.07	VERTICAL	Average
6	2483.500	46.68	27.48	3.53	37.57	40.12	74.00	-33.88	VERTICAL	Peak
7	2500.000	35.06	27.50	3.40	37.56	28.40	54.00	-25.60	VERTICAL	Average
8	2500.000	44.27	27.50	3.40	37.56	37.61	74.00	-36.39	VERTICAL	Peak

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7.10 Radiated Spurious Emissions

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.		

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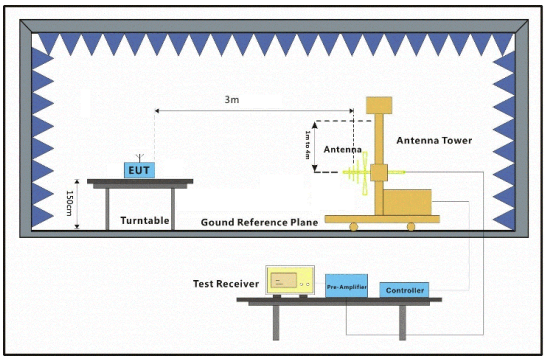
7.10.1 E.U.T. Operation

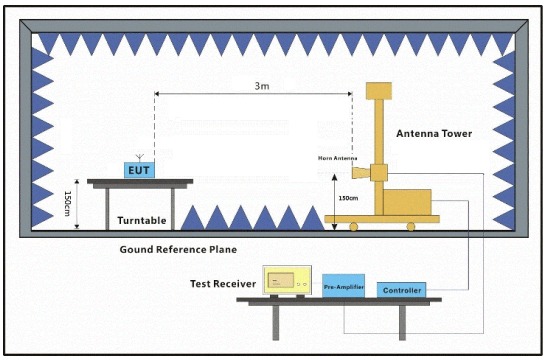
Operating Environment:

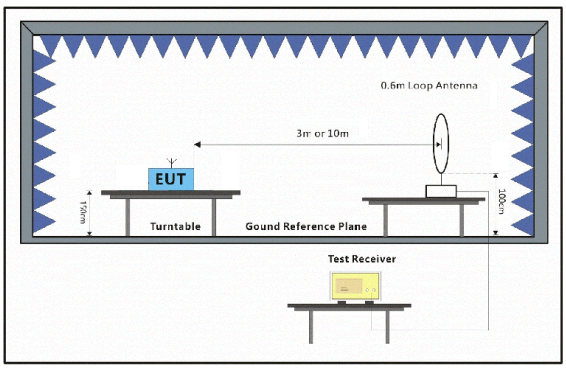
Temperature: 17.5 °C Humidity: 45.4 % RH Atmospheric Pressure: 1020 mbar

Pretest these modes to find the worst case:	b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report. c: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.
The worst case for final test:	b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, . All modes have been tested and only the data of worst case is recorded in the report.

7.10.2 Test Setup Diagram







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7.10.3 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 middle 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) For emission below 1GHz, 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 25GHz, the disturbance above 18GHz and 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.

4) 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

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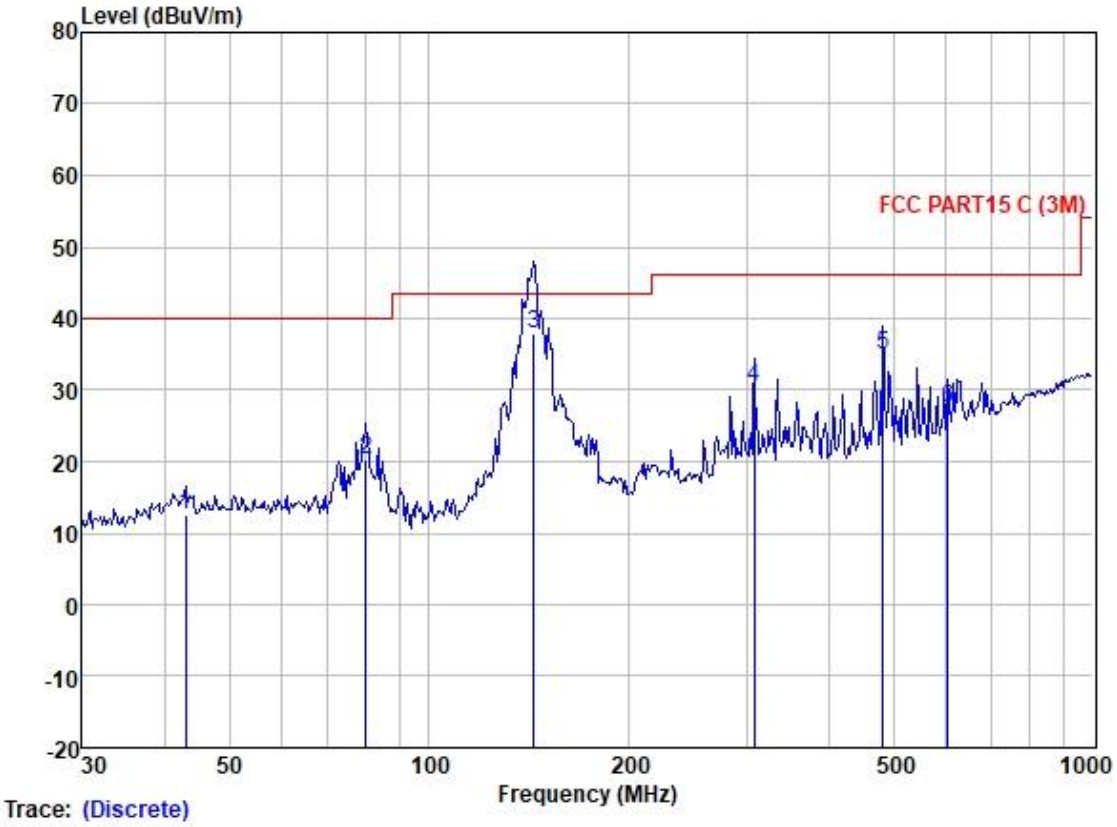
Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



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

	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	dBuV		
1	42.90	24.74	13.75	1.11	27.17	12.43	40.00	-27.57	HORIZONTAL	QP
2	80.36	37.11	8.84	1.48	27.10	20.33	40.00	-19.67	HORIZONTAL	QP
3	143.83	49.09	13.60	2.15	26.88	37.96	43.50	-5.54	HORIZONTAL	QP
4	308.91	40.01	13.85	3.23	26.60	30.49	46.00	-15.51	HORIZONTAL	QP
5	482.22	40.78	17.63	4.34	27.92	34.83	46.00	-11.17	HORIZONTAL	QP
6	603.54	30.45	20.10	5.18	28.21	27.52	46.00	-18.48	HORIZONTAL	QP

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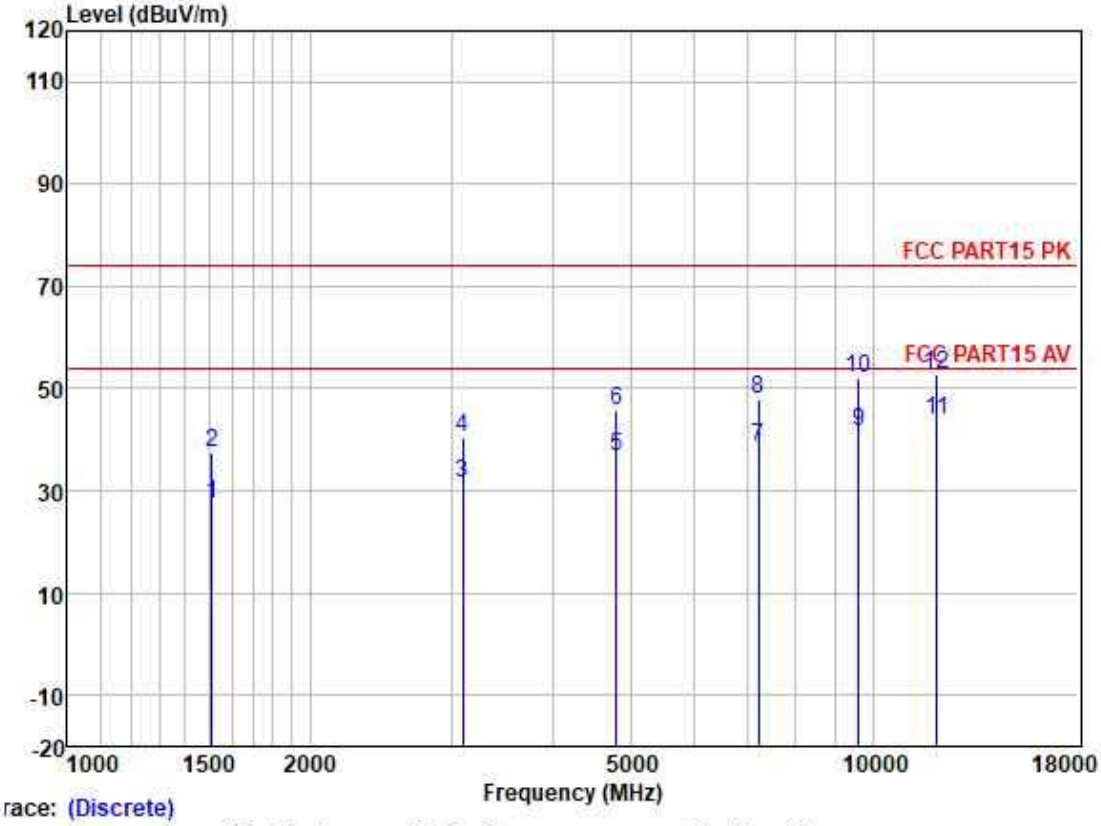
Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



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	1511.833	37.36	25.51	2.80	38.10	27.57	54.00	-26.43	HORIZONTAL	Average
2	1511.833	47.29	25.51	2.80	38.10	37.50	74.00	-36.50	HORIZONTAL	Peak
3	3096.075	36.33	28.47	3.90	37.16	31.54	54.00	-22.46	HORIZONTAL	Average
4	3096.075	45.38	28.47	3.90	37.16	40.59	74.00	-33.41	HORIZONTAL	Peak
5	4804.176	36.67	31.42	5.40	36.83	36.66	54.00	-17.34	HORIZONTAL	Average
6	4804.176	45.69	31.42	5.40	36.83	45.68	74.00	-28.32	HORIZONTAL	Peak
7	7206.516	34.51	35.54	5.98	37.38	38.65	54.00	-15.35	HORIZONTAL	Average
8	7206.516	43.63	35.54	5.98	37.38	47.77	74.00	-26.23	HORIZONTAL	Peak
9	9608.272	33.71	38.37	7.07	37.42	41.73	54.00	-12.27	HORIZONTAL	Average
10	9608.272	43.97	38.37	7.07	37.42	51.99	74.00	-22.01	HORIZONTAL	Peak
11	12010.610	33.74	38.90	8.19	37.10	43.73	54.00	-10.27	HORIZONTAL	Average
12	12010.610	42.64	38.90	8.19	37.10	52.63	74.00	-21.37	HORIZONTAL	Peak

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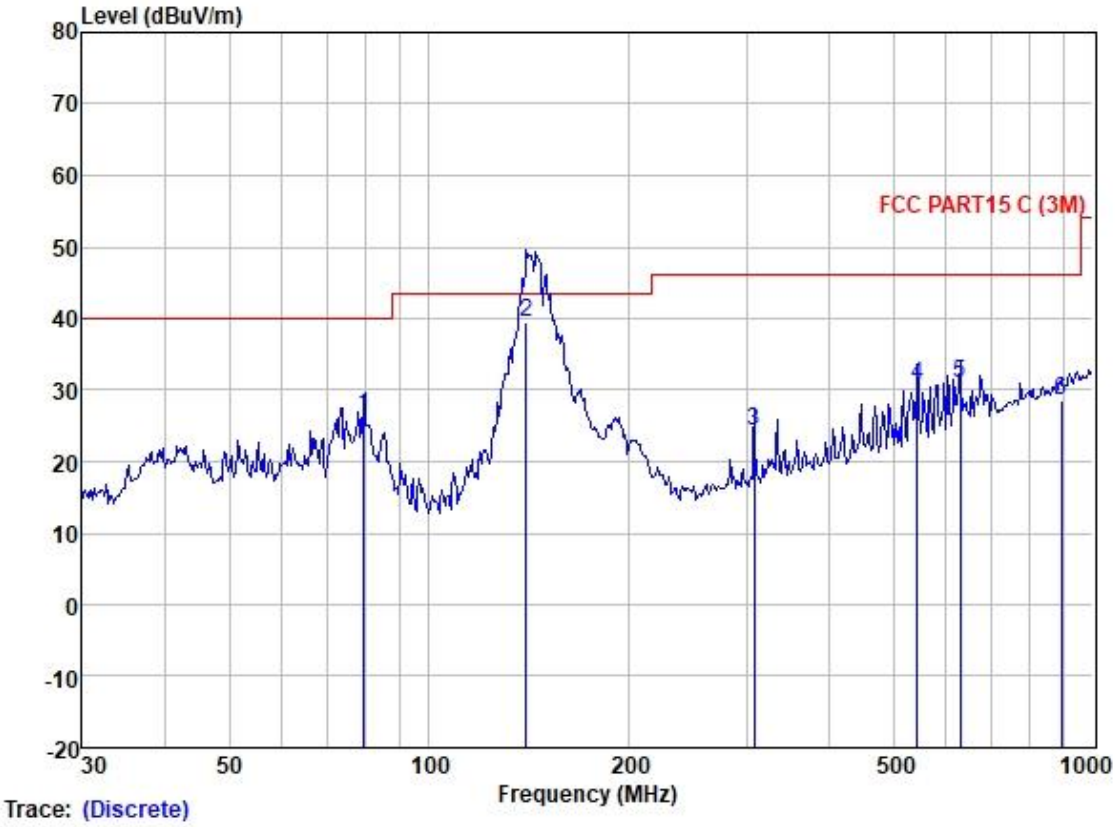
Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



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

	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	dBuV		
1	79.80	43.07	8.98	1.48	27.10	26.43	40.00	-13.57	VERTICAL	QP
2	139.85	51.01	13.30	2.10	26.93	39.48	43.50	-4.02	VERTICAL	QP
3	308.91	33.91	13.85	3.23	26.60	24.39	46.00	-21.61	VERTICAL	QP
4	543.27	35.60	18.50	4.70	28.08	30.72	46.00	-15.28	VERTICAL	QP
5	629.48	33.42	20.40	5.33	28.20	30.95	46.00	-15.05	VERTICAL	QP
6	893.86	26.38	23.17	6.86	27.86	28.55	46.00	-17.45	VERTICAL	QP

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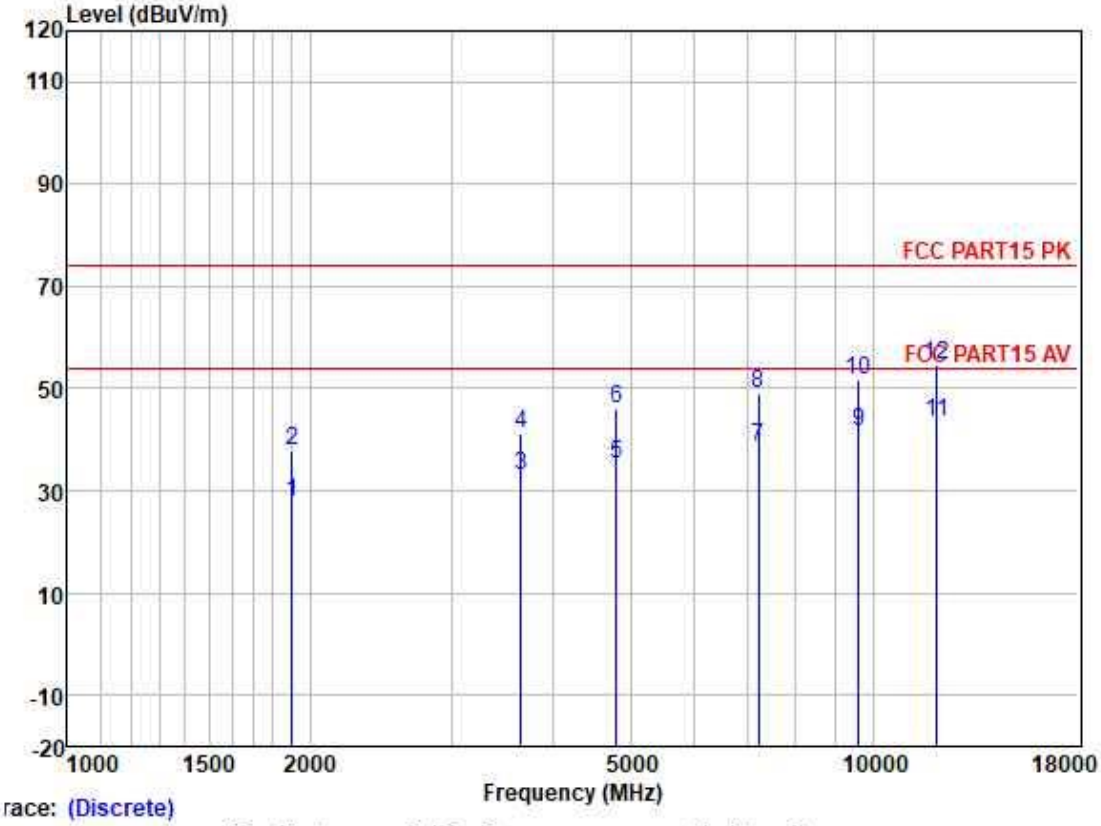
Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



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	1899.636	36.59	26.04	2.90	37.75	27.78	54.00	-26.22	VERTICAL	Average
2	1899.636	46.80	26.04	2.90	37.75	37.99	74.00	-36.01	VERTICAL	Peak
3	3661.149	36.40	29.15	4.53	36.89	33.19	54.00	-20.81	VERTICAL	Average
4	3661.149	44.51	29.15	4.53	36.89	41.30	74.00	-32.70	VERTICAL	Peak
5	4804.418	35.08	31.42	5.40	36.83	35.07	54.00	-18.93	VERTICAL	Average
6	4804.418	46.00	31.42	5.40	36.83	45.99	74.00	-28.01	VERTICAL	Peak
7	7206.818	34.50	35.54	5.98	37.38	38.64	54.00	-15.36	VERTICAL	Average
8	7206.818	44.85	35.54	5.98	37.38	48.99	74.00	-25.01	VERTICAL	Peak
9	9608.330	33.40	38.37	7.07	37.42	41.42	54.00	-12.58	VERTICAL	Average
10	9608.330	43.64	38.37	7.07	37.42	51.66	74.00	-22.34	VERTICAL	Peak
11	12010.320	33.33	38.90	8.19	37.10	43.32	54.00	-10.68	VERTICAL	Average
12	12010.320	44.70	38.90	8.19	37.10	54.69	74.00	-19.31	VERTICAL	Peak

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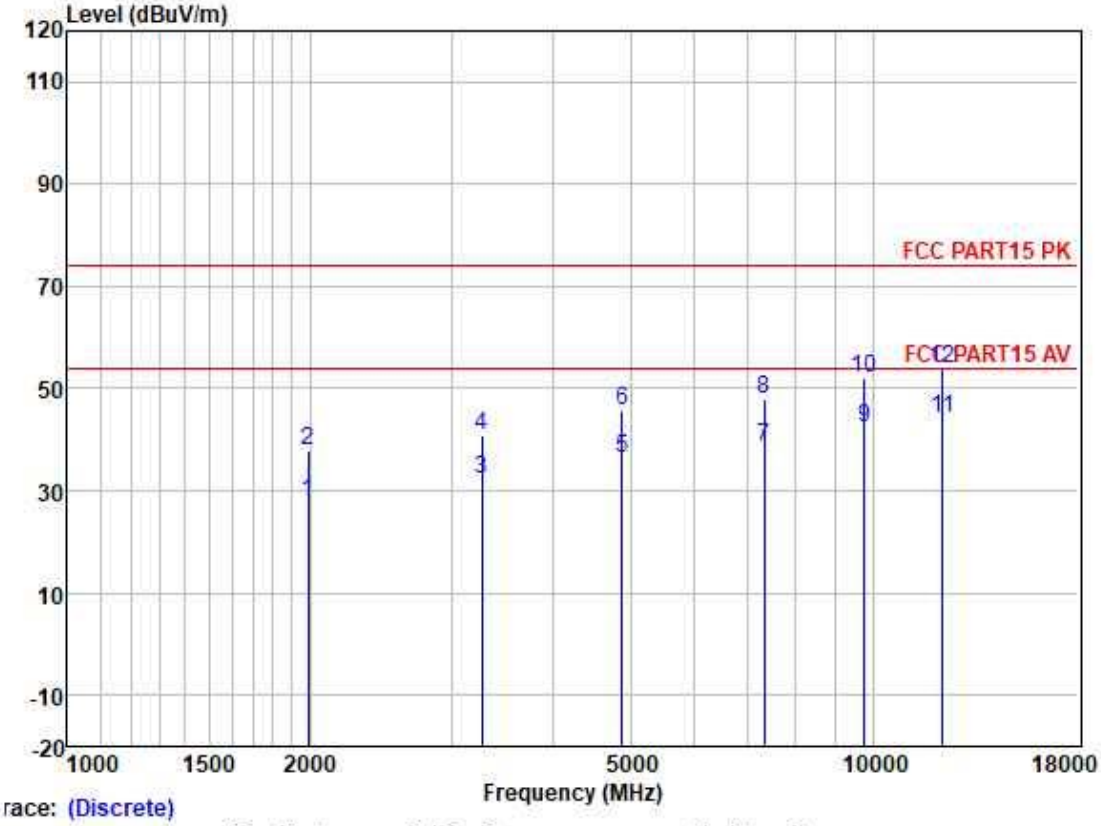
Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



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	1989.550	36.21	26.09	3.08	37.70	27.68	54.00	-26.32	HORIZONTAL	Average
2	1989.550	46.39	26.09	3.08	37.70	37.86	74.00	-36.14	HORIZONTAL	Peak
3	3270.858	36.72	28.71	4.04	37.04	32.43	54.00	-21.57	HORIZONTAL	Average
4	3270.858	45.33	28.71	4.04	37.04	41.04	74.00	-32.96	HORIZONTAL	Peak
5	4882.072	36.13	31.56	5.52	36.84	36.37	54.00	-17.63	HORIZONTAL	Average
6	4882.072	45.37	31.56	5.52	36.84	45.61	74.00	-28.39	HORIZONTAL	Peak
7	7323.015	33.86	36.00	6.13	37.43	38.56	54.00	-15.44	HORIZONTAL	Average
8	7323.015	43.33	36.00	6.13	37.43	48.03	74.00	-25.97	HORIZONTAL	Peak
9	9764.018	34.32	38.50	7.02	37.41	42.43	54.00	-11.57	HORIZONTAL	Average
10	9764.018	44.08	38.50	7.02	37.41	52.19	74.00	-21.81	HORIZONTAL	Peak
11	12205.620	34.55	38.74	8.08	37.00	44.37	54.00	-9.63	HORIZONTAL	Average
12	12205.620	44.14	38.74	8.08	37.00	53.96	74.00	-20.04	HORIZONTAL	Peak

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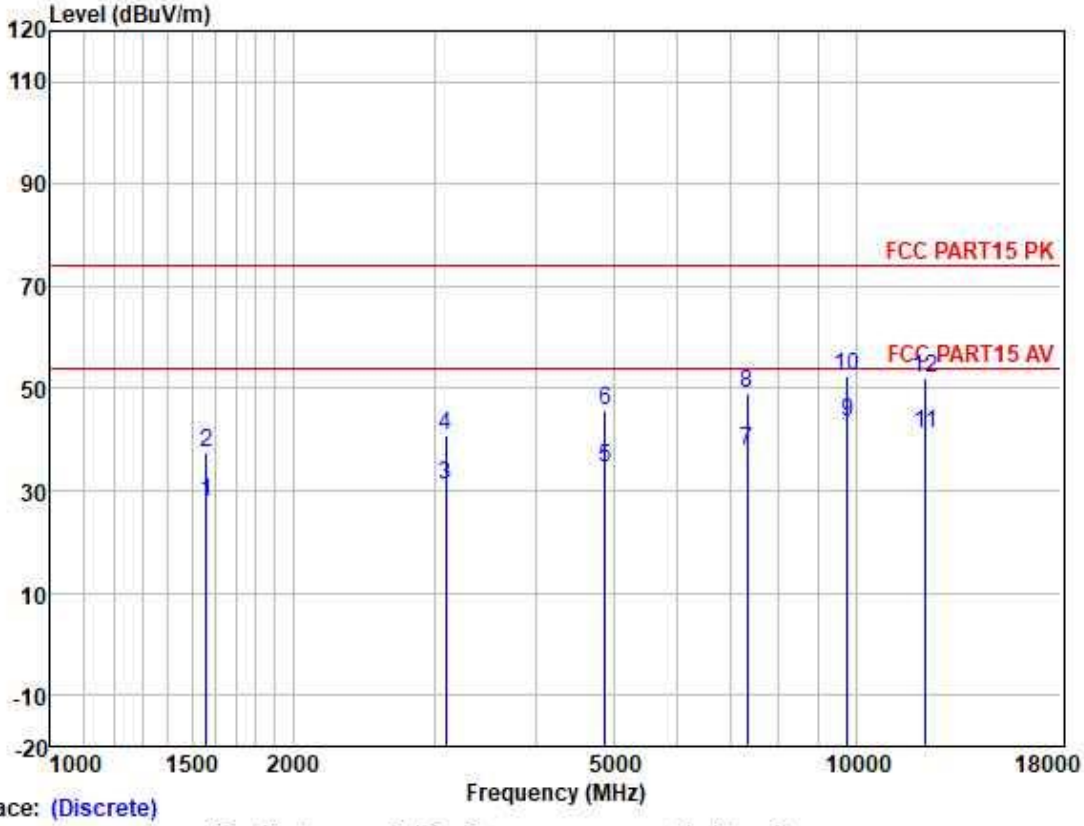
Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:middle



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	1560.673	37.56	25.54	2.80	38.03	27.87	54.00	-26.13	VERTICAL	Average
2	1560.673	47.14	25.54	2.80	38.03	37.45	74.00	-36.55	VERTICAL	Peak
3	3096.075	35.93	28.47	3.90	37.16	31.14	54.00	-22.86	VERTICAL	Average
4	3096.075	45.49	28.47	3.90	37.16	40.70	74.00	-33.30	VERTICAL	Peak
5	4882.260	34.23	31.56	5.52	36.84	34.47	54.00	-19.53	VERTICAL	Average
6	4882.260	45.39	31.56	5.52	36.84	45.63	74.00	-28.37	VERTICAL	Peak
7	7323.474	33.30	36.00	6.13	37.43	38.00	54.00	-16.00	VERTICAL	Average
8	7323.474	44.36	36.00	6.13	37.43	49.06	74.00	-24.94	VERTICAL	Peak
9	9764.312	35.28	38.50	7.02	37.41	43.39	54.00	-10.61	VERTICAL	Average
10	9764.312	44.43	38.50	7.02	37.41	52.54	74.00	-21.46	VERTICAL	Peak
11	12205.070	31.45	38.74	8.08	37.00	41.27	54.00	-12.73	VERTICAL	Average
12	12205.070	42.42	38.74	8.08	37.00	52.24	74.00	-21.76	VERTICAL	Peak

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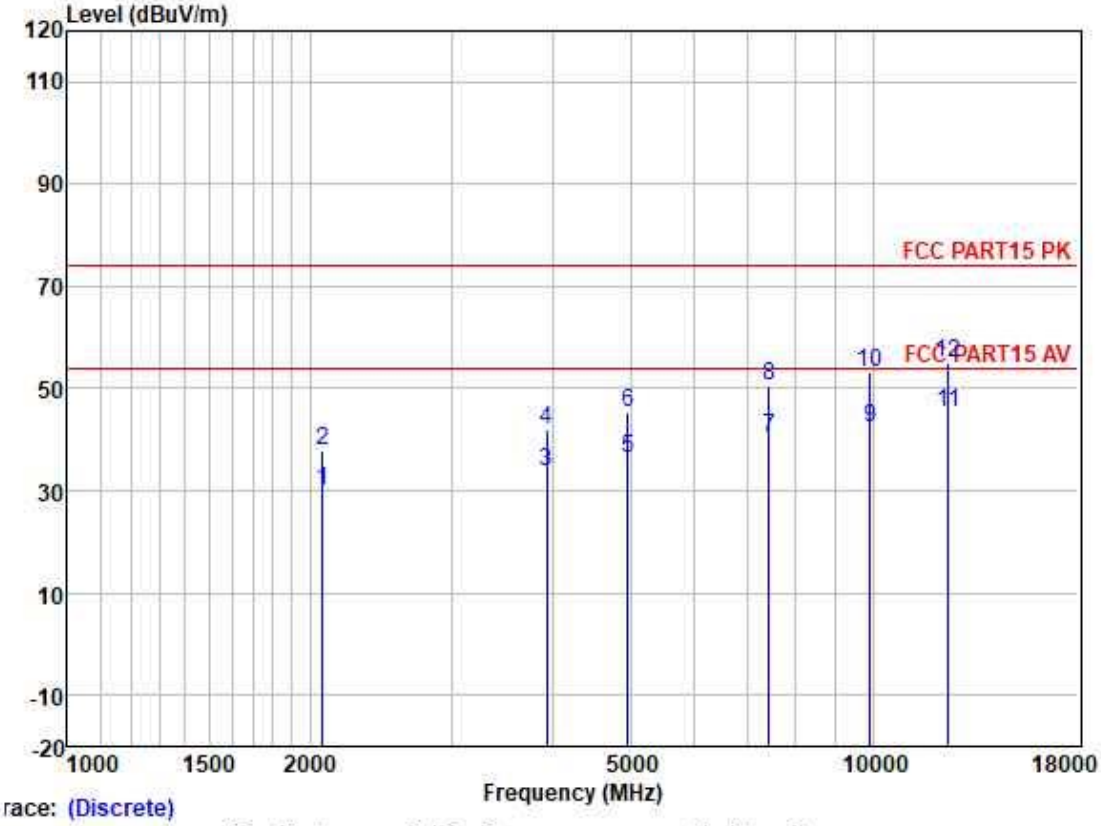
Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



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	2071.708	38.27	26.23	3.13	37.68	29.95	54.00	-24.05	HORIZONTAL	Average
2	2071.708	46.15	26.23	3.13	37.68	37.83	74.00	-36.17	HORIZONTAL	Peak
3	3935.493	36.37	29.73	4.60	36.82	33.88	54.00	-20.12	HORIZONTAL	Average
4	3935.493	44.57	29.73	4.60	36.82	42.08	74.00	-31.92	HORIZONTAL	Peak
5	4960.427	35.76	31.65	5.65	36.84	36.22	54.00	-17.78	HORIZONTAL	Average
6	4960.427	44.69	31.65	5.65	36.84	45.15	74.00	-28.85	HORIZONTAL	Peak
7	7440.200	35.60	36.27	6.22	37.47	40.62	54.00	-13.38	HORIZONTAL	Average
8	7440.200	45.41	36.27	6.22	37.47	50.43	74.00	-23.57	HORIZONTAL	Peak
9	9920.900	33.99	38.65	6.96	37.40	42.20	54.00	-11.80	HORIZONTAL	Average
10	9920.900	44.90	38.65	6.96	37.40	53.11	74.00	-20.89	HORIZONTAL	Peak
11	12400.750	35.70	38.57	7.97	36.88	45.36	54.00	-8.64	HORIZONTAL	Average
12	12400.750	45.31	38.57	7.97	36.88	54.97	74.00	-19.03	HORIZONTAL	Peak

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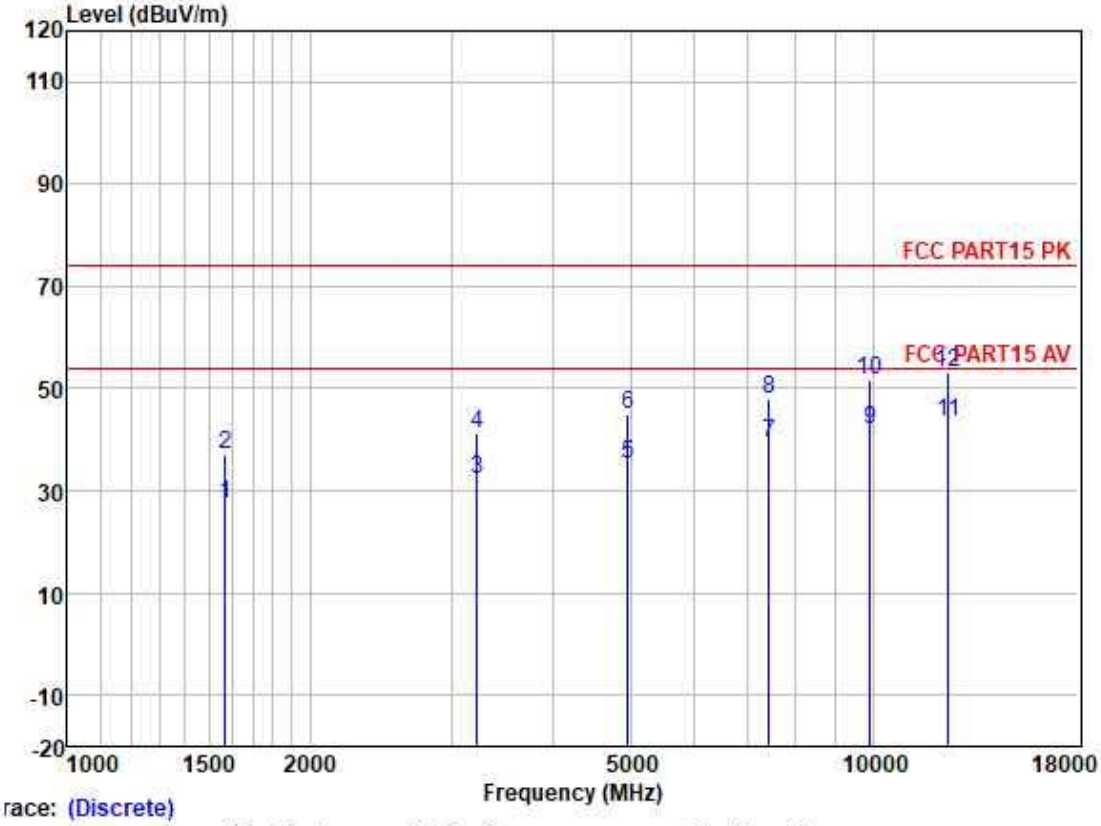
Mode:b; Polarization:Vertical; Modulation:GFSK; ; Channel:High



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	1569.721	37.16	25.55	2.80	38.00	27.51	54.00	-26.49	VERTICAL	Average
2	1569.721	46.64	25.55	2.80	38.00	36.99	74.00	-37.01	VERTICAL	Peak
3	3223.928	36.67	28.63	4.01	37.07	32.24	54.00	-21.76	VERTICAL	Average
4	3223.928	45.66	28.63	4.01	37.07	41.23	74.00	-32.77	VERTICAL	Peak
5	4960.354	34.93	31.65	5.65	36.84	35.39	54.00	-18.61	VERTICAL	Average
6	4960.354	44.63	31.65	5.65	36.84	45.09	74.00	-28.91	VERTICAL	Peak
7	7440.144	34.31	36.27	6.22	37.47	39.33	54.00	-14.67	VERTICAL	Average
8	7440.144	42.75	36.27	6.22	37.47	47.77	74.00	-26.23	VERTICAL	Peak
9	9920.540	33.88	38.65	6.96	37.40	42.09	54.00	-11.91	VERTICAL	Average
10	9920.540	43.55	38.65	6.96	37.40	51.76	74.00	-22.24	VERTICAL	Peak
11	12400.820	33.87	38.57	7.97	36.88	43.53	54.00	-10.47	VERTICAL	Average
12	12400.820	43.56	38.57	7.97	36.88	53.22	74.00	-20.78	VERTICAL	Peak

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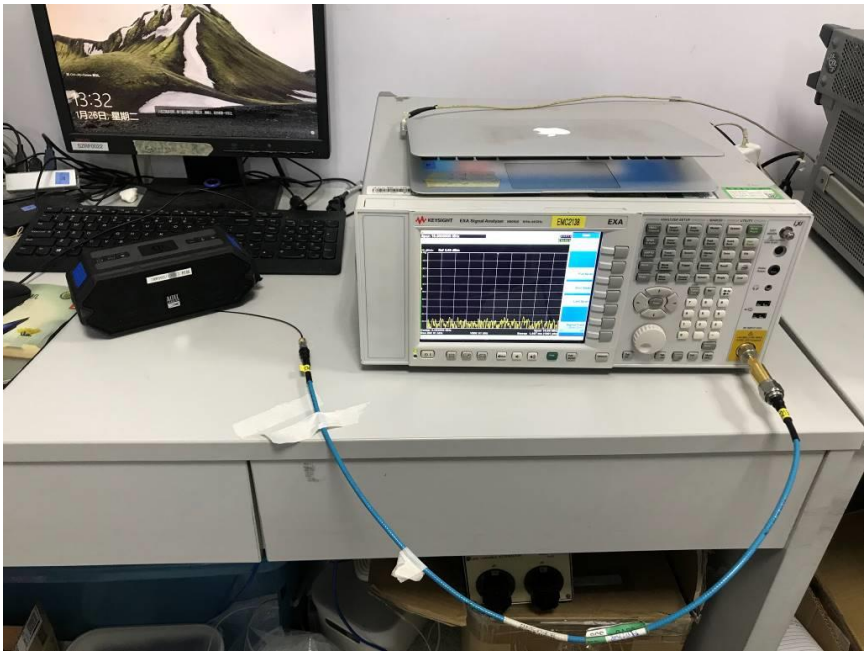
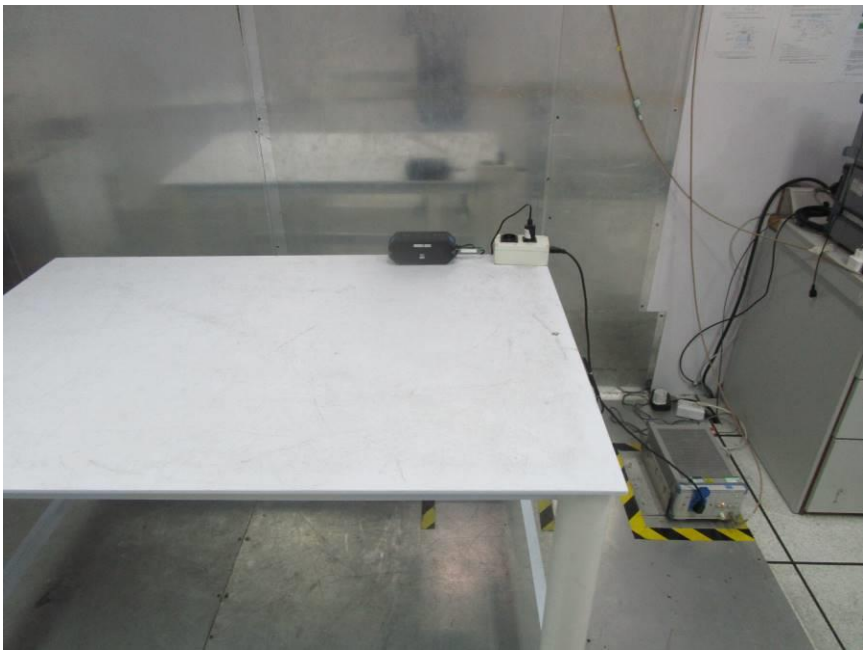
8 Photographs

8.1 RF test Setup



8.2 Conducted Emissions at AC Power Line (150kHz-30MHz) Test Setup



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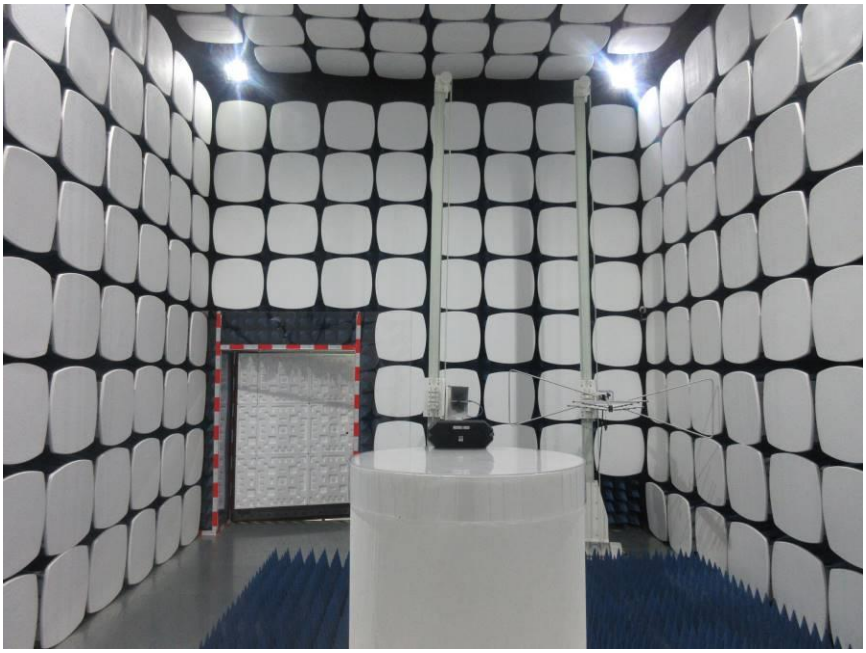
8.3 Radiated Emissions which fall in the restricted bands Test Setup



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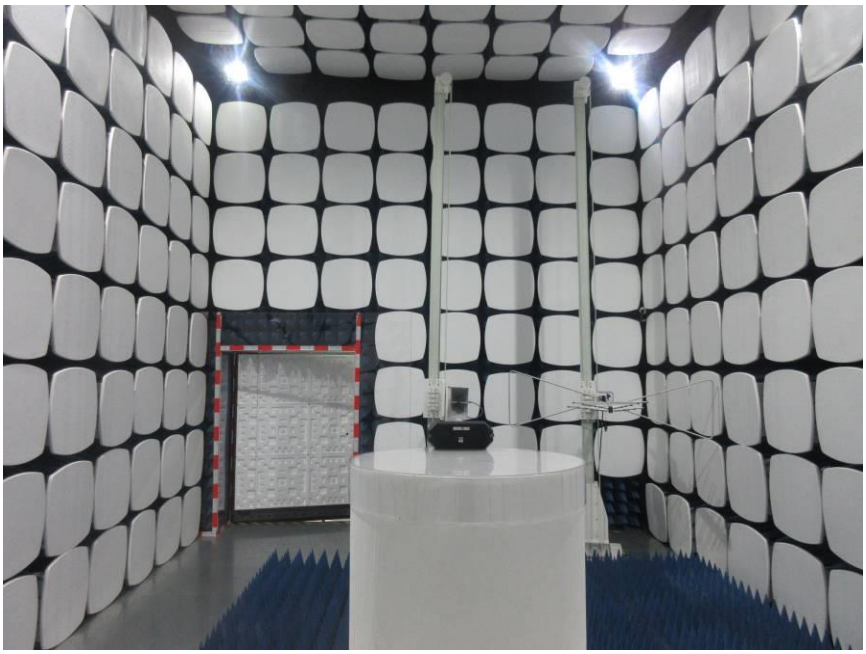
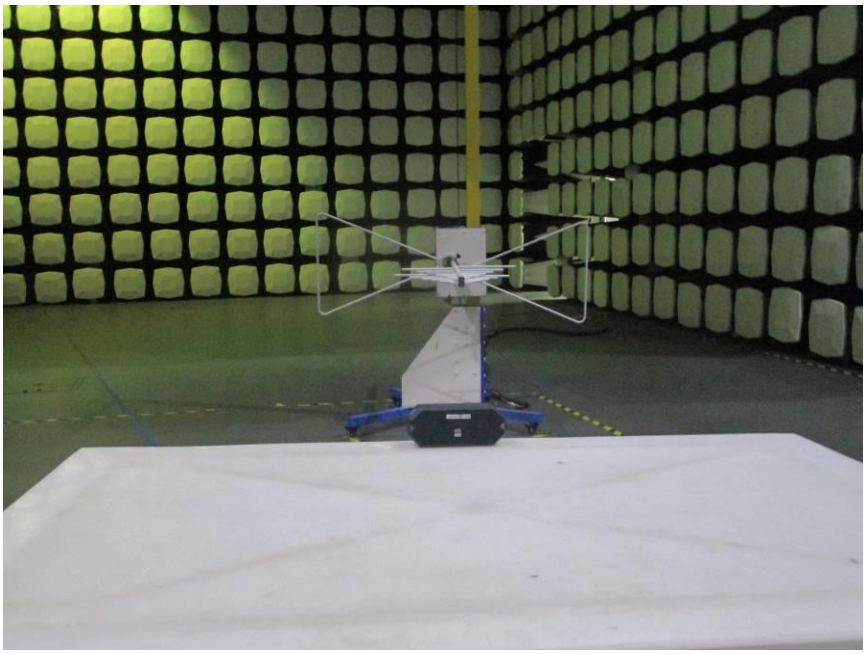
8.4 Radiated Spurious Emissions Test Setup





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8.5 EUT Constructional Details

Refer to external and internal photos for GZEM2101000214CR.

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9 Appendix

9.1 Appendix 15.247

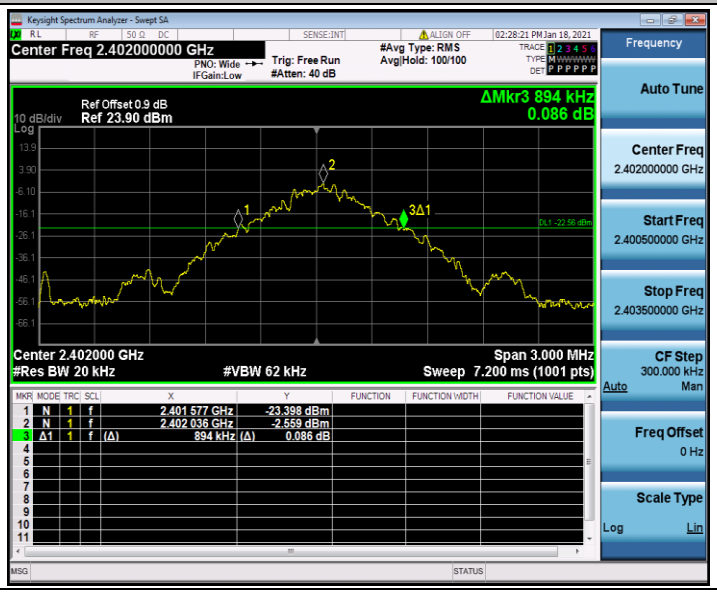
9.2 Appendix A: 20dB Emission Bandwidth

9.2.1 Test Result

Test Mode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.894	2401.577	2402.471	---	PASS
		2441	0.939	2440.577	2441.516	---	PASS
		2480	0.936	2479.577	2480.513	---	PASS
2DH5	Ant1	2402	1.302	2401.382	2402.684	---	PASS
		2441	1.266	2440.403	2441.669	---	PASS
		2480	1.308	2479.379	2480.687	---	PASS

9.2.2 Test Graphs

DH5_Ant1_2402



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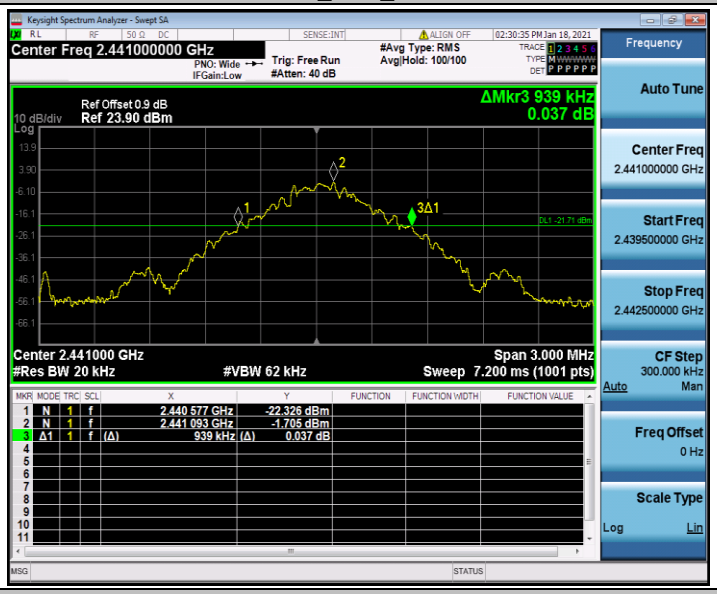
DH5_Ant1_2441


DH5_Ant1_2480

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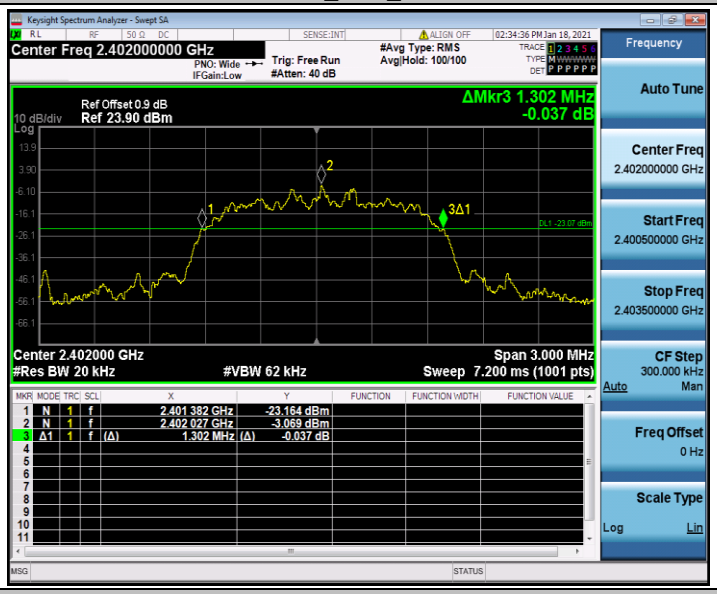
2DH5_Ant1_2402



2DH5_Ant1_2441

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2DH5_Ant1_2480

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9.3 Appendix B: Maximum conducted output power

9.3.1 Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	0.46	<=20.97	PASS
		2441	1.45	<=20.97	PASS
		2480	1.67	<=20.97	PASS
2DH5	Ant1	2402	1.34	<=20.97	PASS
		2441	2.18	<=20.97	PASS
		2480	2.43	<=20.97	PASS

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9.3.2 Test Graphs

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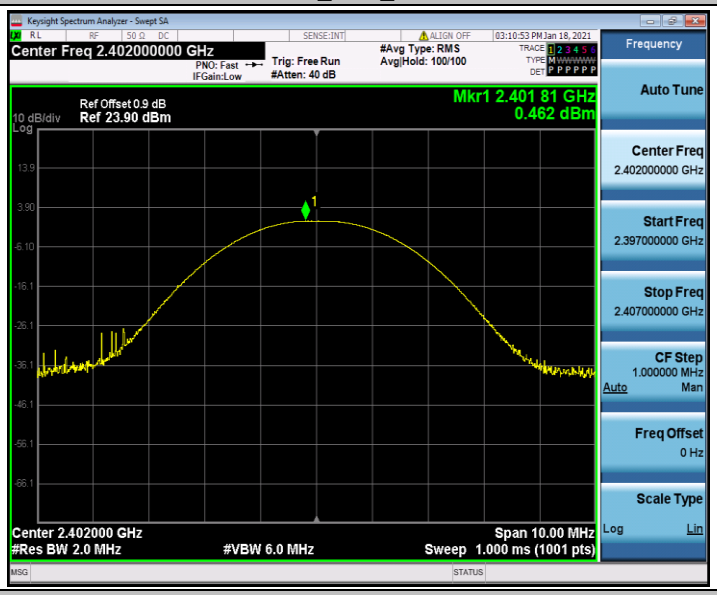
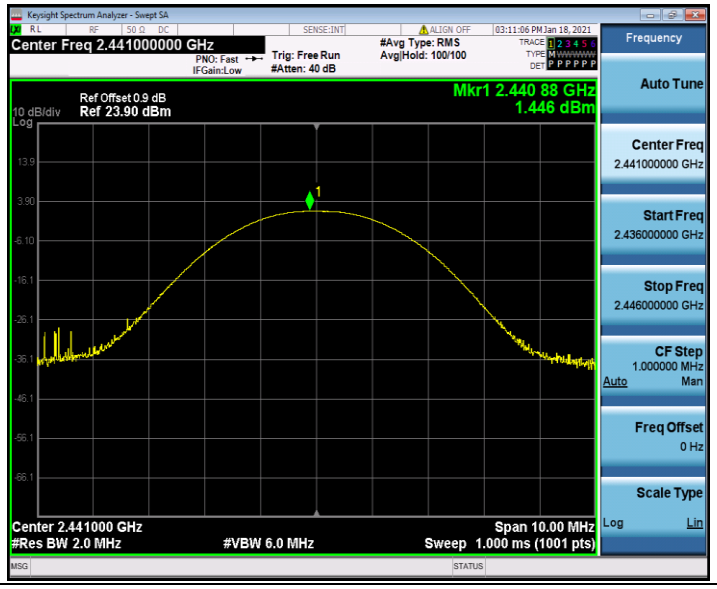

DH5_Ant1_2441


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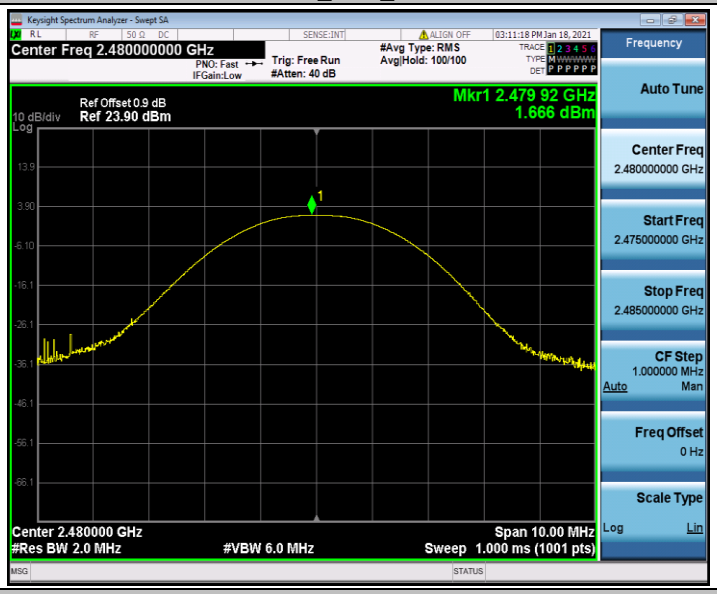
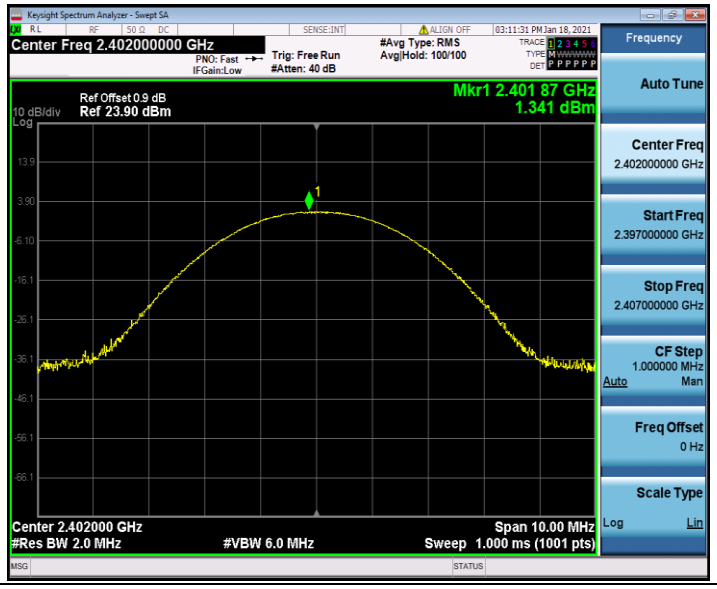
DH5_Ant1_2480



2DH5_Ant1_2402



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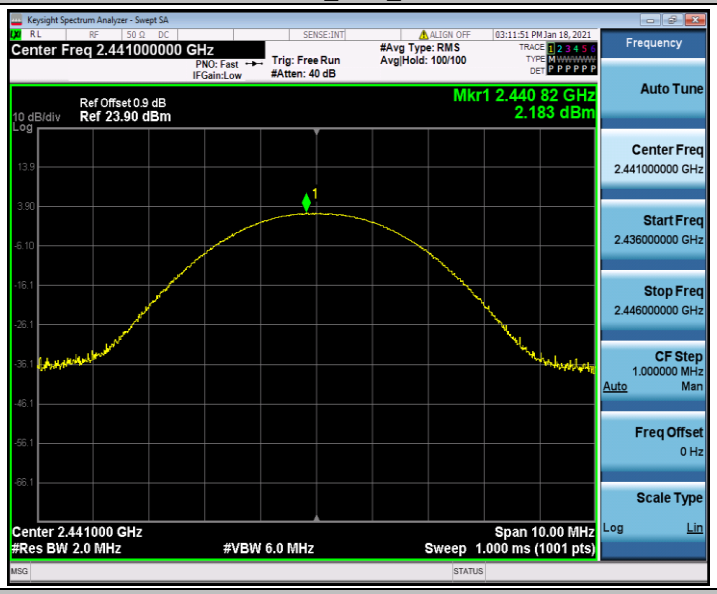
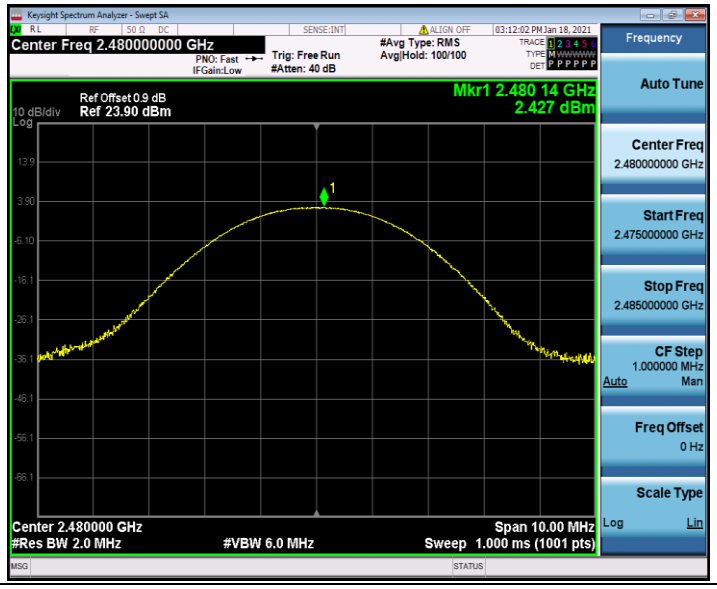
2DH5_Ant1_2441



2DH5_Ant1_2480



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9.4 Appendix C: Carrier frequency separation

9.4.1 Test Result

Test Mode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop_2402	0.978	>=0.565	PASS
		Hop_2441	0.894	>=0.569	PASS
		Hop_2480	1.047	>=0.562	PASS

9.4.2 Test Graphs

DH5_Ant1_Hop_2402

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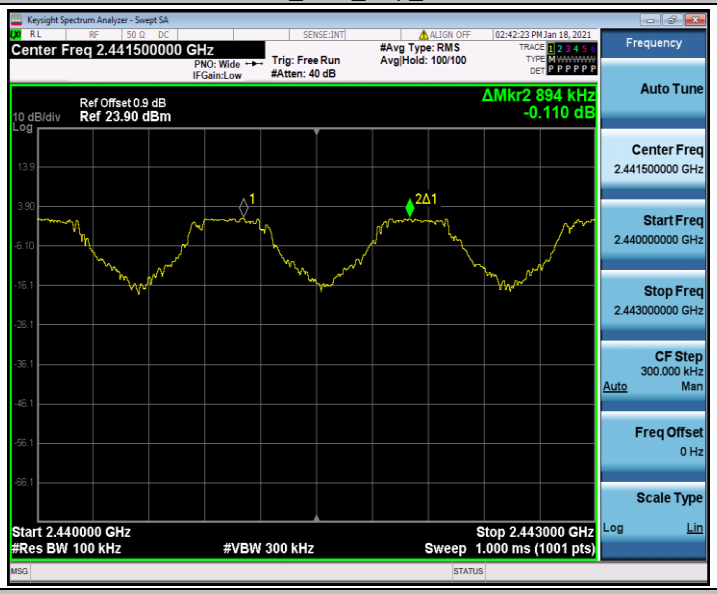
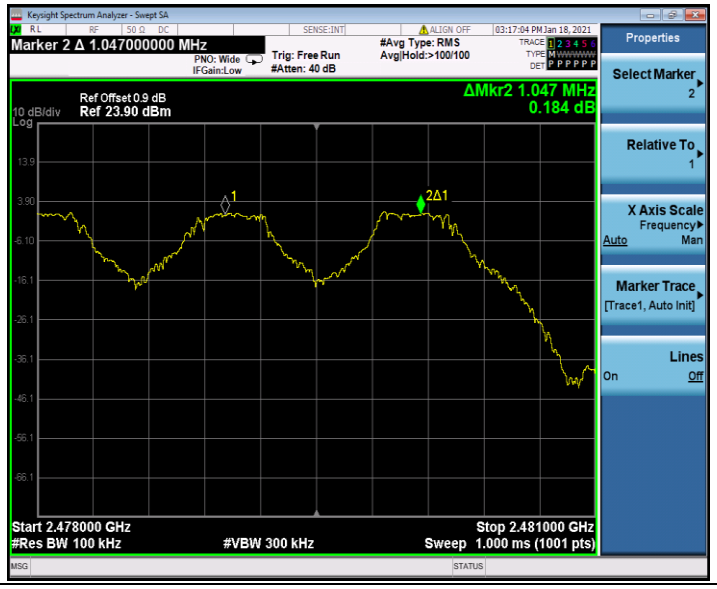
DH5_Ant1_Hop_2441



DH5_Ant1_Hop_2480



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9.5 Appendix D: Dwell Time

9.5.1 Test Result

Test Mode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop_2402	0.37	330	0.124	<=0.4	PASS
		Hop_2441	0.37	320	0.12	<=0.4	PASS
		Hop_2480	0.37	330	0.124	<=0.4	PASS
DH3	Ant1	Hop_2402	1.63	180	0.293	<=0.4	PASS
		Hop_2441	1.63	180	0.293	<=0.4	PASS
		Hop_2480	1.63	180	0.293	<=0.4	PASS
DH5	Ant1	Hop_2402	2.88	70	0.201	<=0.4	PASS
		Hop_2441	2.88	100	0.288	<=0.4	PASS
		Hop_2480	2.88	90	0.259	<=0.4	PASS
2DH1	Ant1	Hop_2402	0.39	330	0.127	<=0.4	PASS
		Hop_2441	0.39	330	0.127	<=0.4	PASS
		Hop_2480	0.39	330	0.127	<=0.4	PASS
2DH3	Ant1	Hop_2402	1.64	160	0.262	<=0.4	PASS
		Hop_2441	1.64	150	0.245	<=0.4	PASS
		Hop_2480	1.64	190	0.311	<=0.4	PASS
2DH5	Ant1	Hop_2402	2.88	90	0.26	<=0.4	PASS
		Hop_2441	2.88	90	0.259	<=0.4	PASS
		Hop_2480	2.88	100	0.288	<=0.4	PASS

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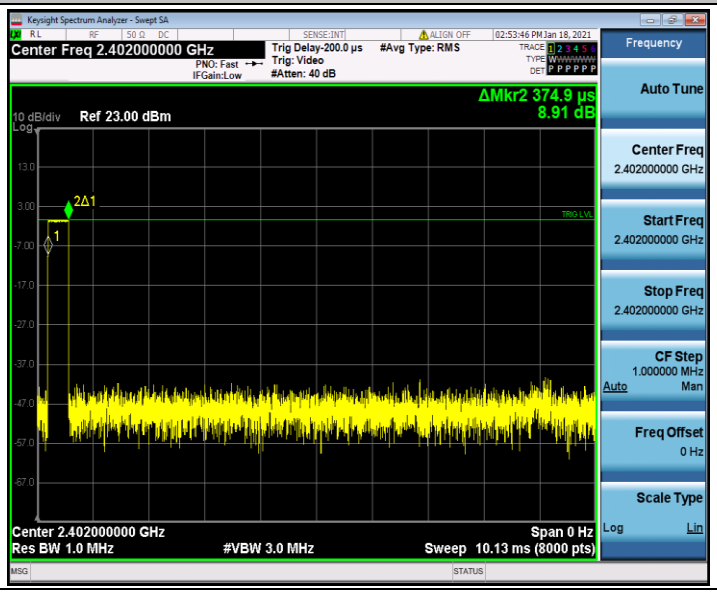
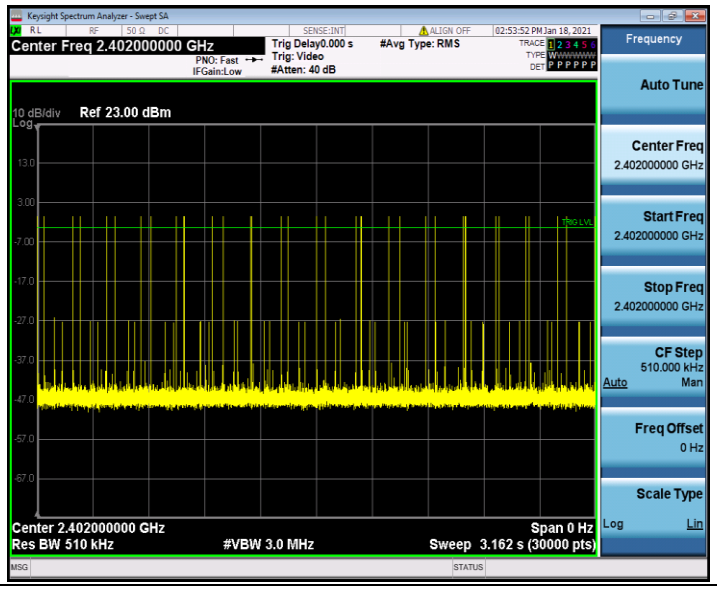
9.5.2 Test Graphs

DH1_Ant1_Hop_2402



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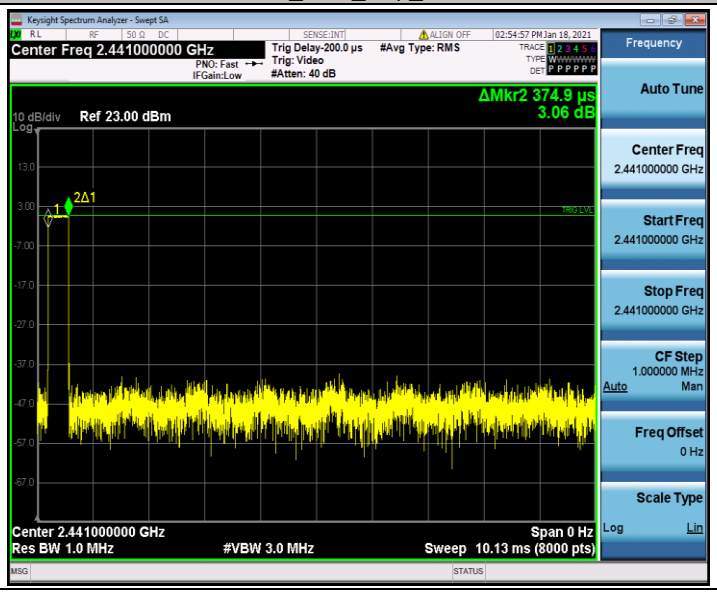
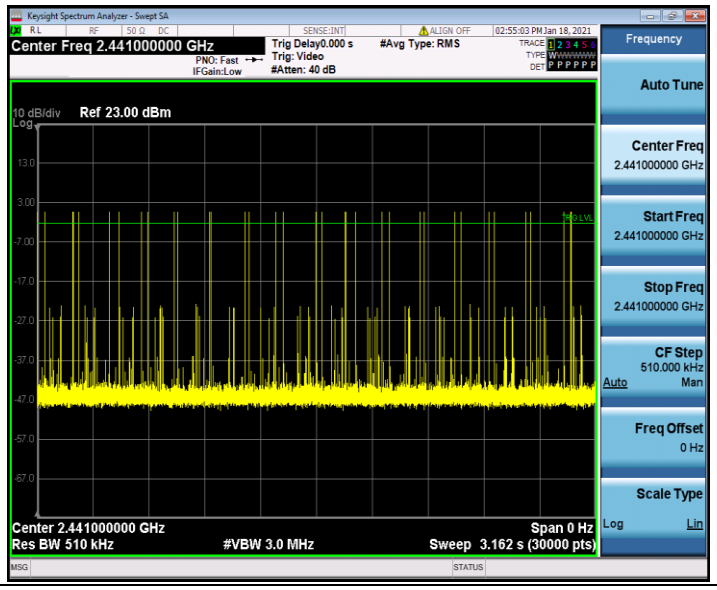
DH1_Ant1_Hop_2441



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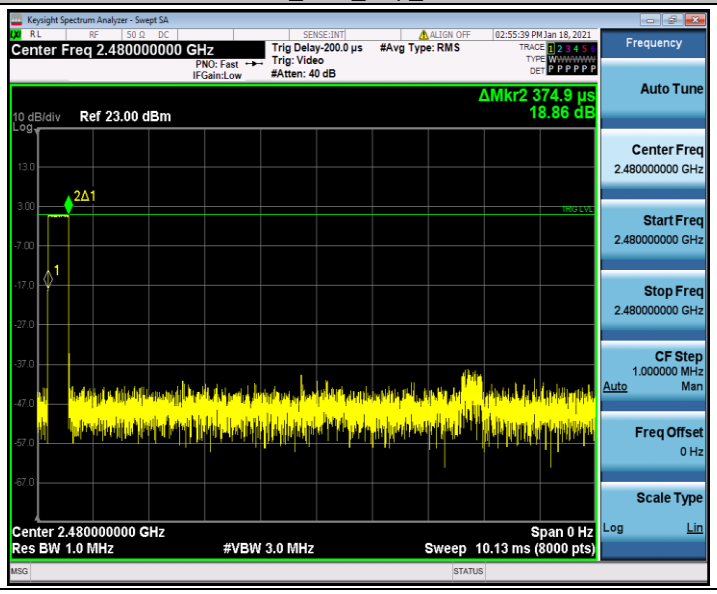
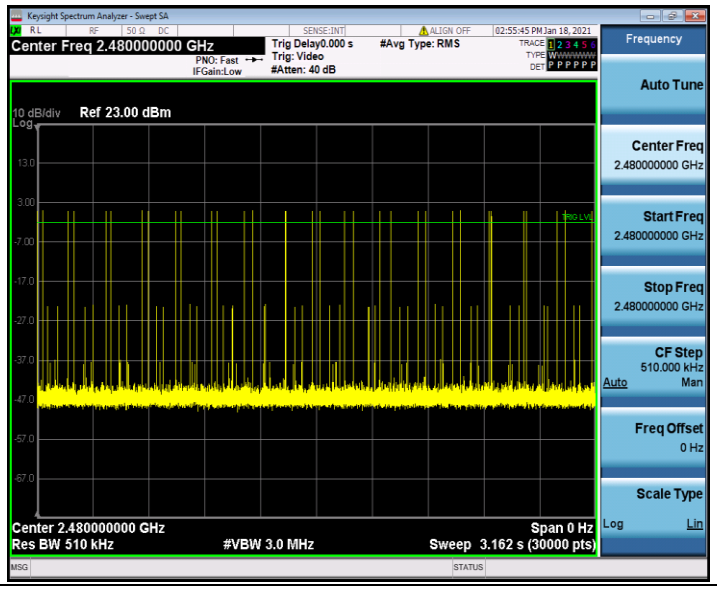
DH1_Ant1_Hop_2480



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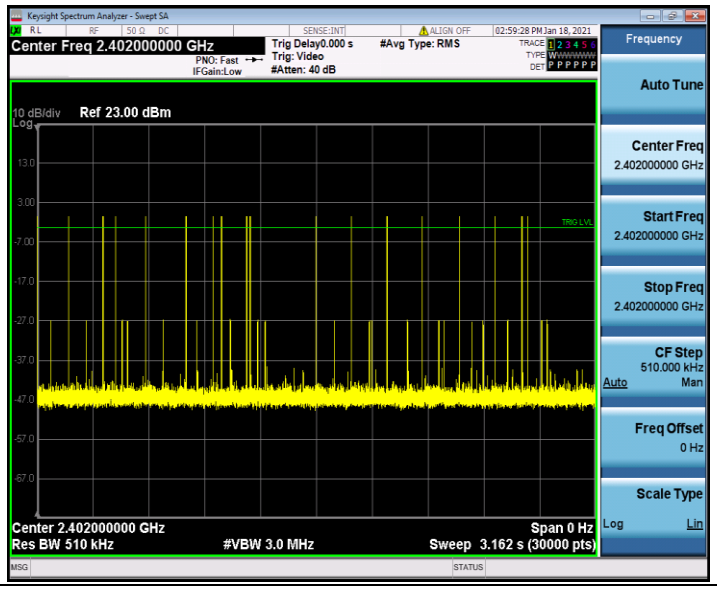

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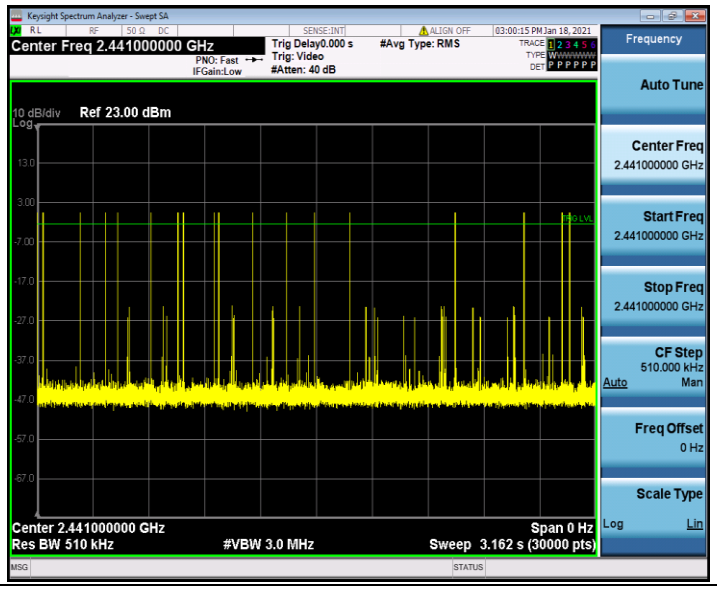
DH3_Ant1_Hop_2441


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