TEST REPORT

Application No.:	GZCR2103000006AT
Applicant:	B & W Group Ltd
Address of Applicant:	Dale Road, Worthing, West Sussex BN11 2BH, United Kingdom
Manufacturer:	B & W Group Ltd
Address of Manufacturer:	Dale Road, Worthing, West Sussex BN11 2BH, United Kingdom
Factory:	Guoguang Electric Co., Ltd.
Address of Factory:	No.8 Jinghu Road, Xinya Street, Huadu Reg, Guangzhou, China
Equipment Under Test (EUT):	
EUT Name:	Wireless Active Soundbar
Model No.:	Panorama 3
Trade mark:	Bowers & Wilkins
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2021-03-09
Date of Test:	2021-03-19 to 2021-03-28
Date of Issue:	2021-04-16
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		*2021-04-16*		*Original*

Authorized for issue by				
Tested By		**Curry Wu/Project Engineer**		
Reviewed By		**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	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 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

Emission 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

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.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	AC 100-240V 50/60Hz 100W
Cable(s):	about 1.5m x 2 wires AC mains cable about 1.2m HDMI cable
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, Π/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum (FHSS)
Antenna type:	Integral antenna
Antenna gain:	4.4dBi
Power Setting	8
Software version	SUE V0.19
Hardware version	BW_ALBD_MAIN_PV
Sample NO.	A3

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Sony TV	Sony	KD-55X8500G	1447198
Blue-ray Player	Sony	BDP-S370	4015791

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	3.12dB
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	± 4.5dB (Below 1GHz); ± 4.8dB (Above 1GHz)
Radiated Spurious Emissions	± 4.5dB (Below 1GHz); ± 4.8dB (Above 1GHz)

Remark:

The U_{lab} (lab Uncertainty) is less than U_{cispr} (CISPR Uncertainty), so the test results

– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;

– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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 Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESCS30	EMC0506	2020-11-13	2021-11-12
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	2022-01-06
Coaxial Cable	HangTianXing	2m	EMC0107	2020-09-09	2022-09-08
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A

Conducted Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	Agilent Technologies	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

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	Agilent Technologies	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

Carrier Frequencies Separation					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	Agilent Technologies	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

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

Hopping Channel Number					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	Agilent Technologies	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
Dwell Time					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	Agilent Technologies	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

Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	Agilent Technologies	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

Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	Agilent Technologies	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

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Horn Antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2016	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

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
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Active Loop Antenna	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

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

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

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

6.1.2 Conclusion

Standard Requirement:

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.15.247(b) (4) requirement:The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated and no consideration of replacement. The best case gain of the antenna is 4.4 dBi.

Please refer to internal photos.

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)

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.

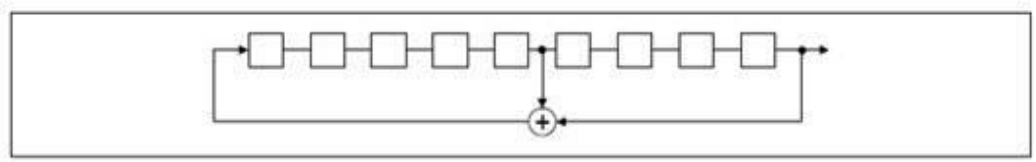
> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

> Longest sequence of zeros: 8 (non-inverted signal)

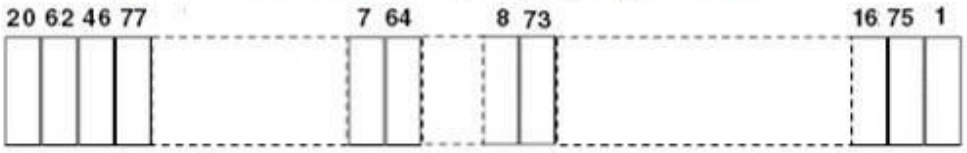
Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



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 transmitters.

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

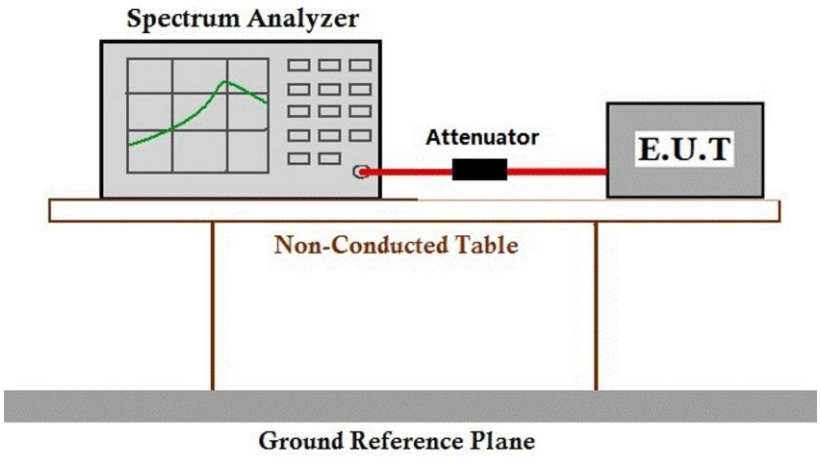
7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 24.6 °C Humidity: 67.4 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

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

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

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

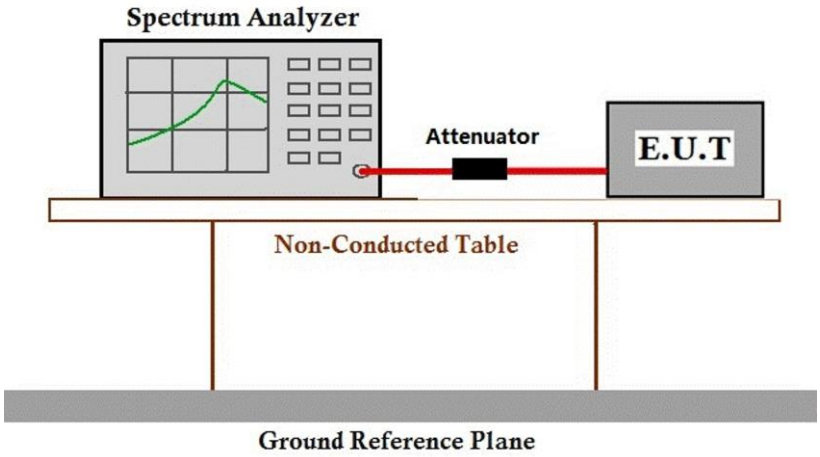
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 24.6 °C Humidity: 67.4 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

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

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

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:

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

7.3.1 E.U.T. Operation

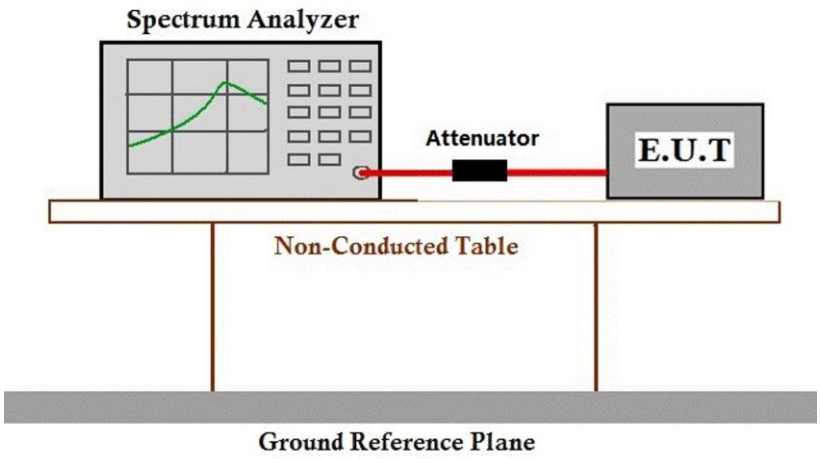
Operating Environment:

Temperature: 24.6 °C Humidity: 67.4 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

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

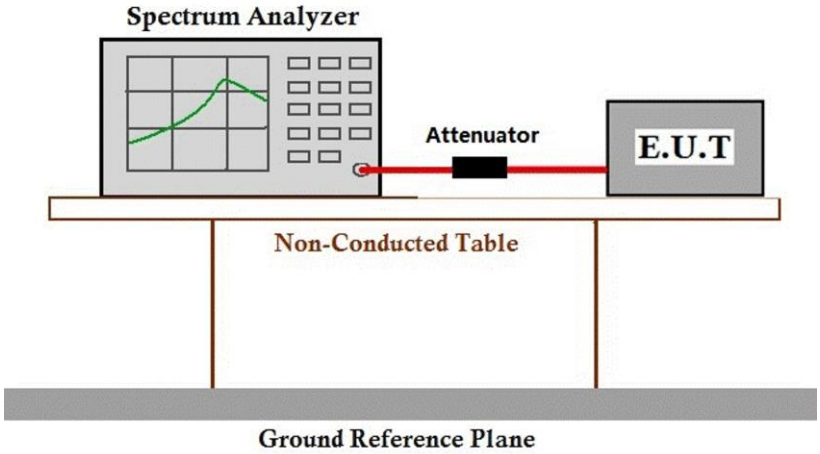
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 24.6 °C Humidity: 67.4 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



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

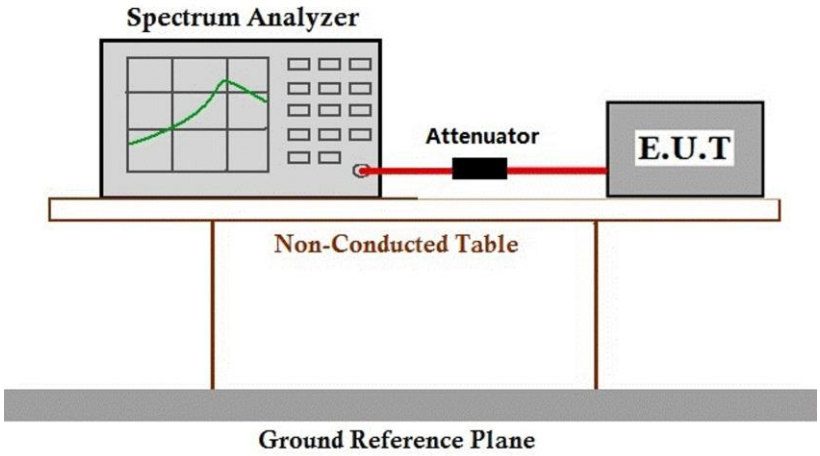
7.5.1 E.U.T. Operation

Operating Environment:
Temperature: 24.6 °C Humidity: 67.4 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

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

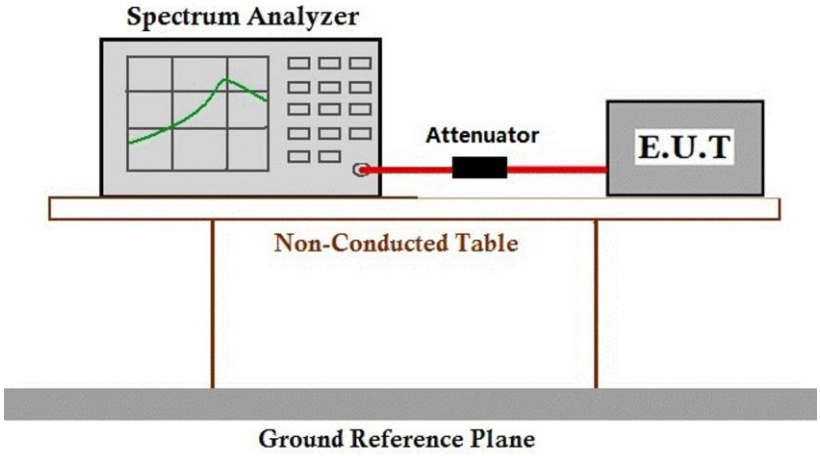
Operating Environment:

Temperature: 24.6 °C Humidity: 67.4 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

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

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.7 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

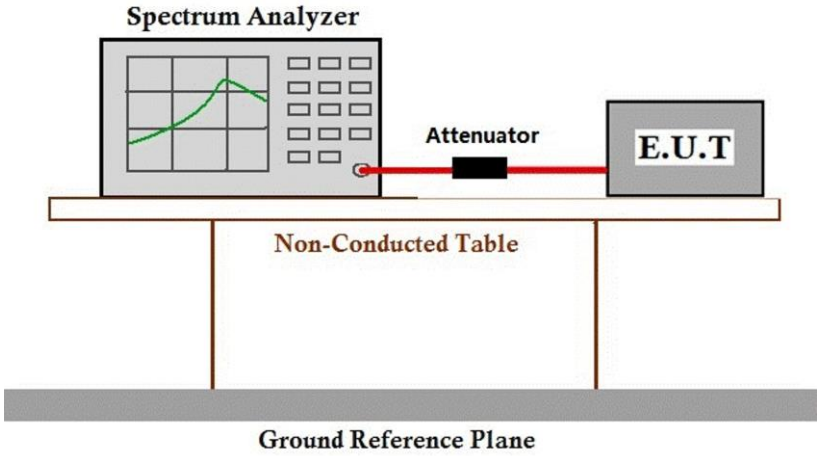
Operating Environment:

Temperature: 24.6 °C Humidity: 67.4 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

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

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.8 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.		

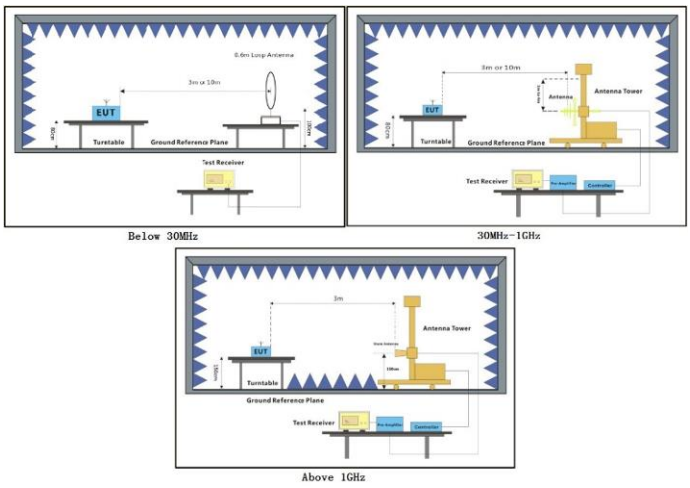
7.8.1 E.U.T. Operation

Operating Environment:
Temperature: 25.3 °C Humidity: 65.3 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

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

7.8.3 Test Setup Diagram



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 middle channel, the Highest channel.

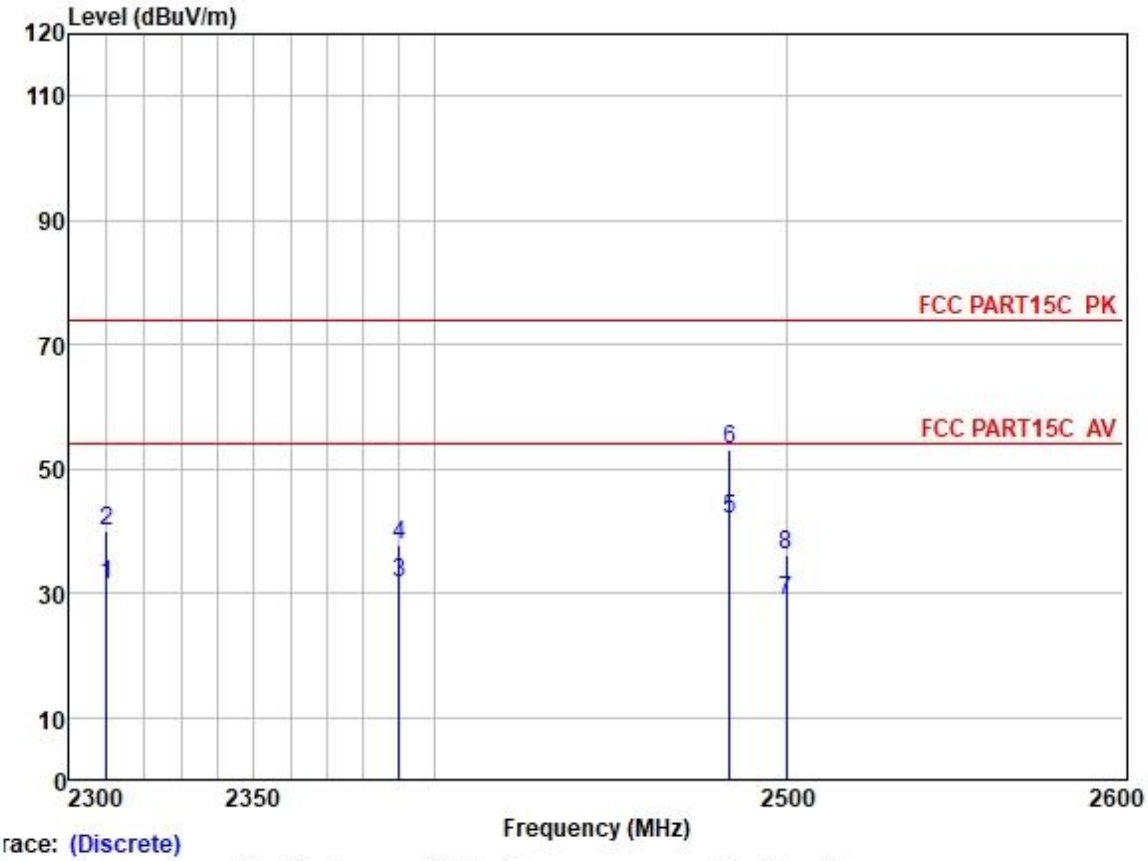
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

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

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

Remark 2: 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.

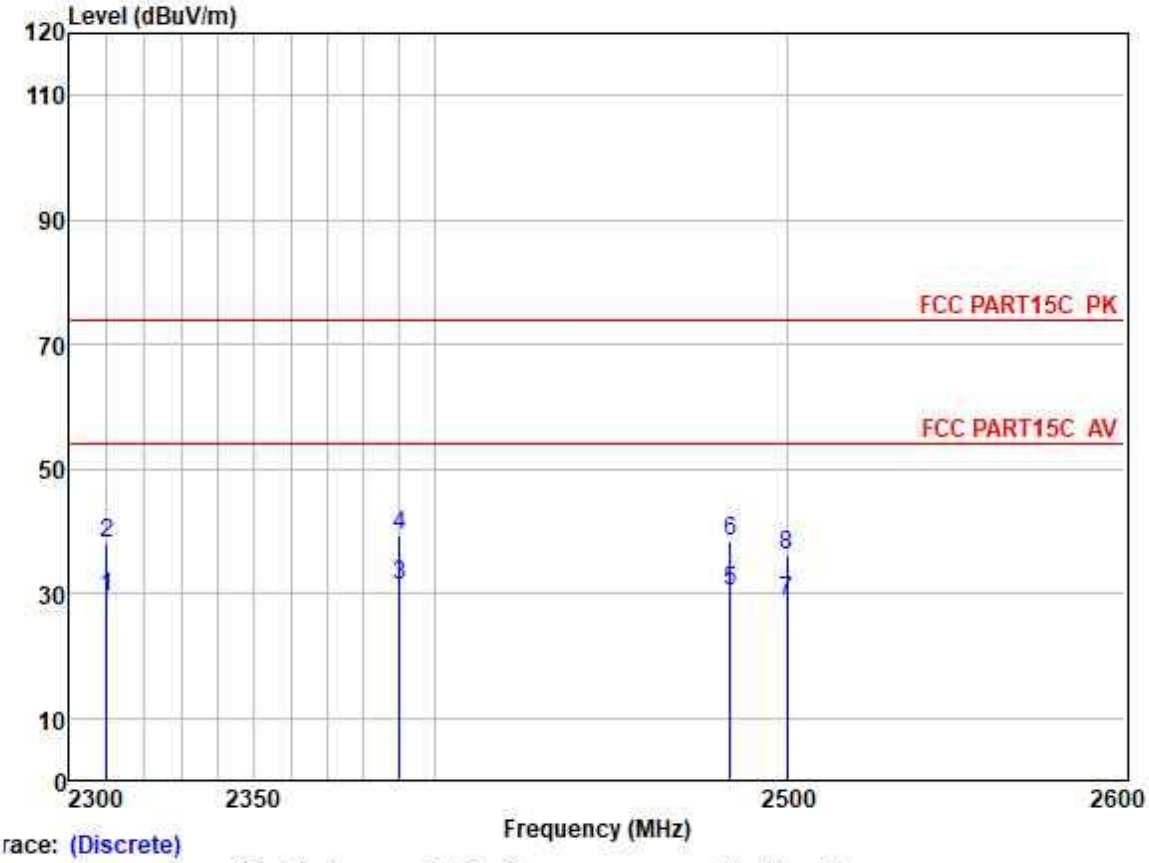
Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High;



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	2310.000	38.41	27.15	3.32	37.44	31.44	54.00	-22.56	HORIZONTAL	Average
2	2310.000	46.87	27.15	3.32	37.44	39.90	74.00	-34.10	HORIZONTAL	Peak
3	2390.000	38.21	27.33	3.48	37.42	31.60	54.00	-22.40	HORIZONTAL	Average
4	2390.000	44.41	27.33	3.48	37.42	37.80	74.00	-36.20	HORIZONTAL	Peak
5	2483.500	48.21	27.48	3.53	37.40	41.82	54.00	-12.18	HORIZONTAL	Average
6	2483.500	59.37	27.48	3.53	37.40	52.98	74.00	-21.02	HORIZONTAL	Peak
7	2500.000	35.15	27.50	3.40	37.39	28.66	54.00	-25.34	HORIZONTAL	Average
8	2500.000	42.58	27.50	3.40	37.39	36.09	74.00	-37.91	HORIZONTAL	Peak

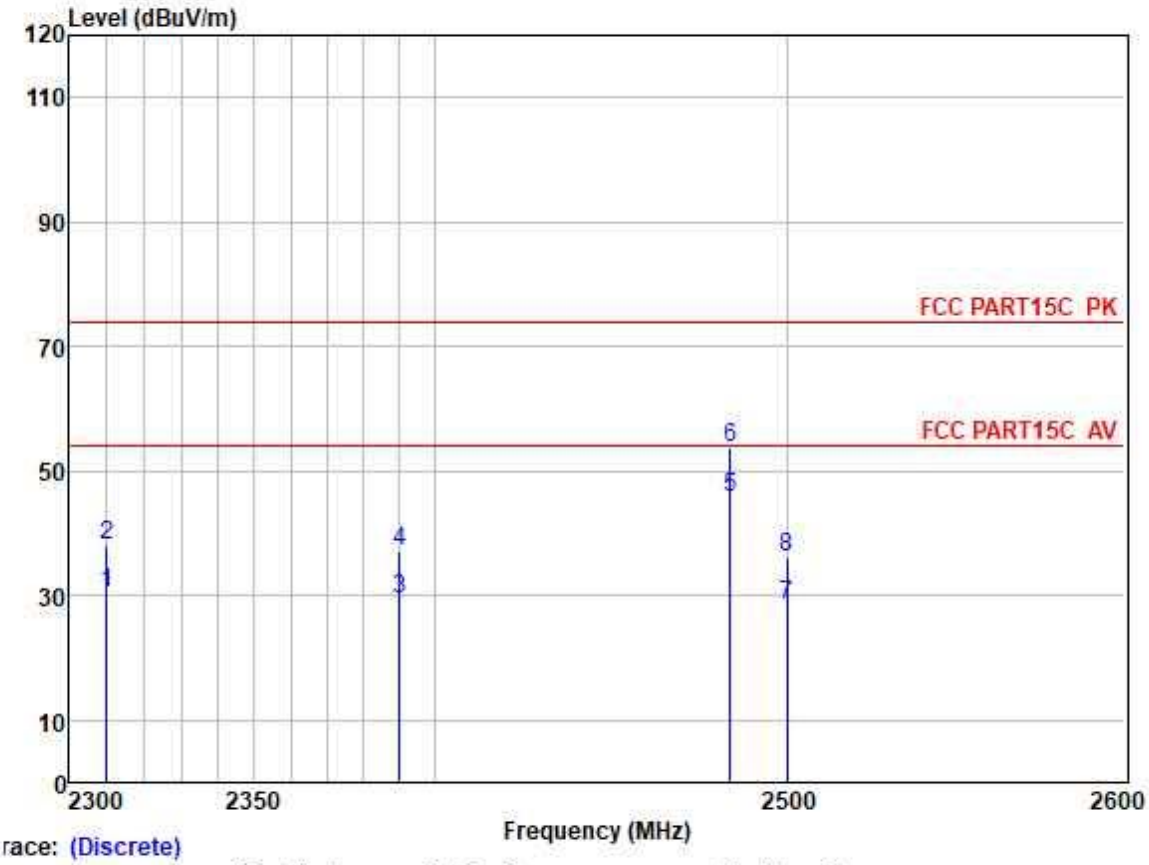
Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: Low;



race: (Discrete)

	Freq	ReadLevel	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	36.56	27.15	3.32	37.44	29.59	54.00	-24.41	HORIZONTAL	Average
2	2310.000	44.95	27.15	3.32	37.44	37.98	74.00	-36.02	HORIZONTAL	Peak
3	2390.000	38.03	27.33	3.48	37.42	31.42	54.00	-22.58	HORIZONTAL	Average
4	2390.000	46.11	27.33	3.48	37.42	39.50	74.00	-34.50	HORIZONTAL	Peak
5	2483.500	36.88	27.48	3.53	37.40	30.49	54.00	-23.51	HORIZONTAL	Average
6	2483.500	44.71	27.48	3.53	37.40	38.32	74.00	-35.68	HORIZONTAL	Peak
7	2500.000	35.29	27.50	3.40	37.39	28.80	54.00	-25.20	HORIZONTAL	Average
8	2500.000	42.71	27.50	3.40	37.39	36.22	74.00	-37.78	HORIZONTAL	Peak

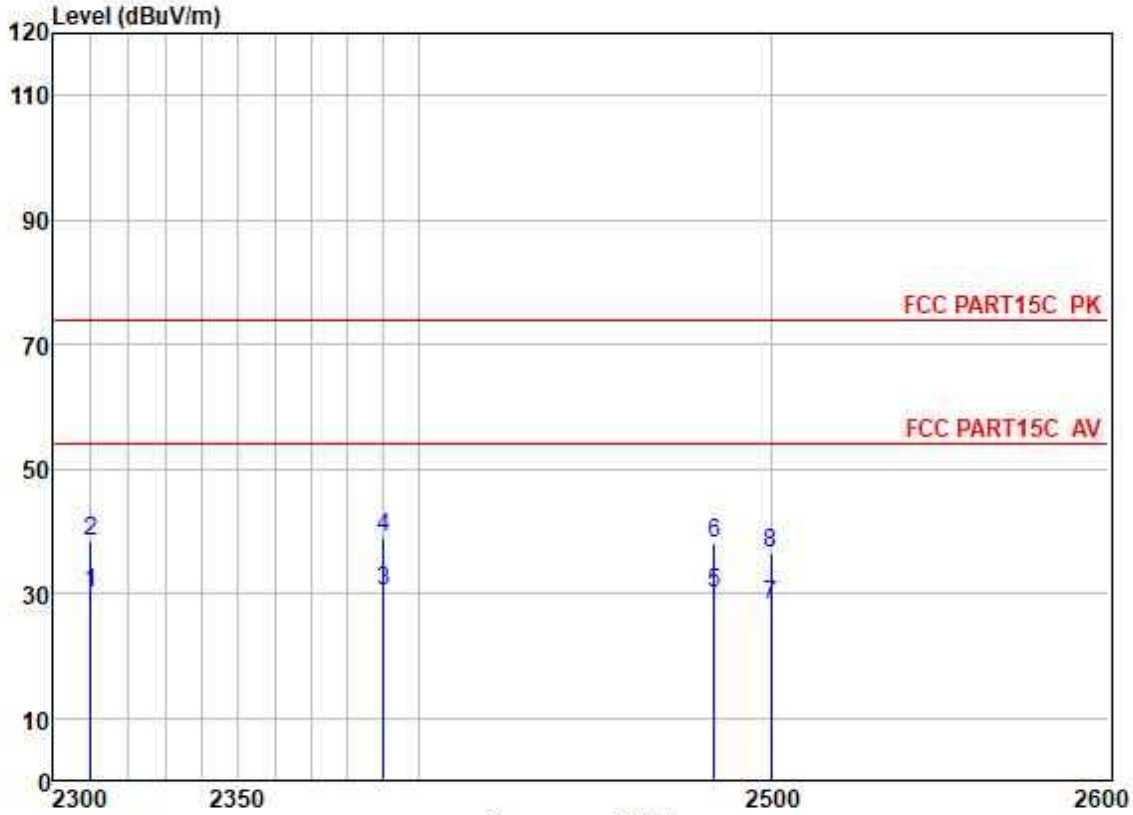
Test Mode: 01; Polarity: Vertical; Modulation: GFSK ； Channel: High



race: (Discrete)

	Freq	ReadLevel	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	37.46	27.15	3.32	37.44	30.49	54.00	-23.51	VERTICAL	Average
2	2310.000	45.18	27.15	3.32	37.44	38.21	74.00	-35.79	VERTICAL	Peak
3	2390.000	36.08	27.33	3.48	37.42	29.47	54.00	-24.53	VERTICAL	Average
4	2390.000	43.88	27.33	3.48	37.42	37.27	74.00	-36.73	VERTICAL	Peak
5	2483.500	52.19	27.48	3.53	37.40	45.80	54.00	-8.20	VERTICAL	Average
6	2483.500	60.15	27.48	3.53	37.40	53.76	74.00	-20.24	VERTICAL	Peak
7	2500.000	34.93	27.50	3.40	37.39	28.44	54.00	-25.56	VERTICAL	Average
8	2500.000	42.72	27.50	3.40	37.39	36.23	74.00	-37.77	VERTICAL	Peak

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



race: (Discrete)

	Freq	ReadAntenna Level	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	37.05	27.15	3.32	37.44	30.08	54.00	-23.92	VERTICAL	Average
2	2310.000	45.35	27.15	3.32	37.44	38.38	74.00	-35.62	VERTICAL	Peak
3	2390.000	37.07	27.33	3.48	37.42	30.46	54.00	-23.54	VERTICAL	Average
4	2390.000	45.57	27.33	3.48	37.42	38.96	74.00	-35.04	VERTICAL	Peak
5	2483.500	36.58	27.48	3.53	37.40	30.19	54.00	-23.81	VERTICAL	Average
6	2483.500	44.58	27.48	3.53	37.40	38.19	74.00	-35.81	VERTICAL	Peak
7	2500.000	34.72	27.50	3.40	37.39	28.23	54.00	-25.77	VERTICAL	Average
8	2500.000	43.13	27.50	3.40	37.39	36.64	74.00	-37.36	VERTICAL	Peak

7.9 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
Limit:

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

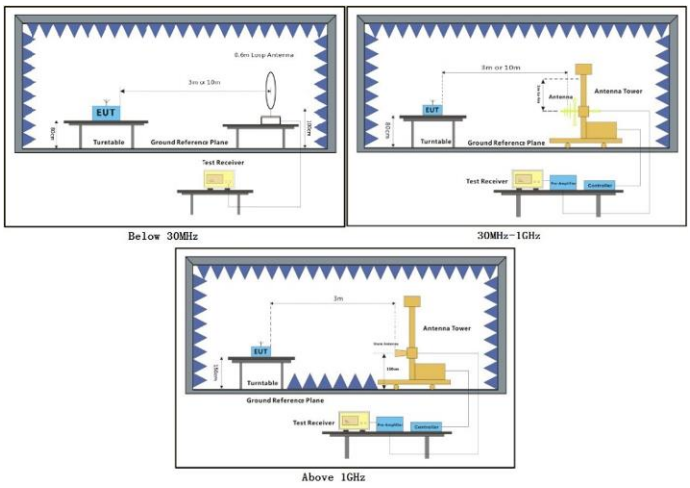
7.9.1 E.U.T. Operation

Operating Environment:
Temperature: 22 °C Humidity: 52 % RH Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

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

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

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

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

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

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

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

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

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

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

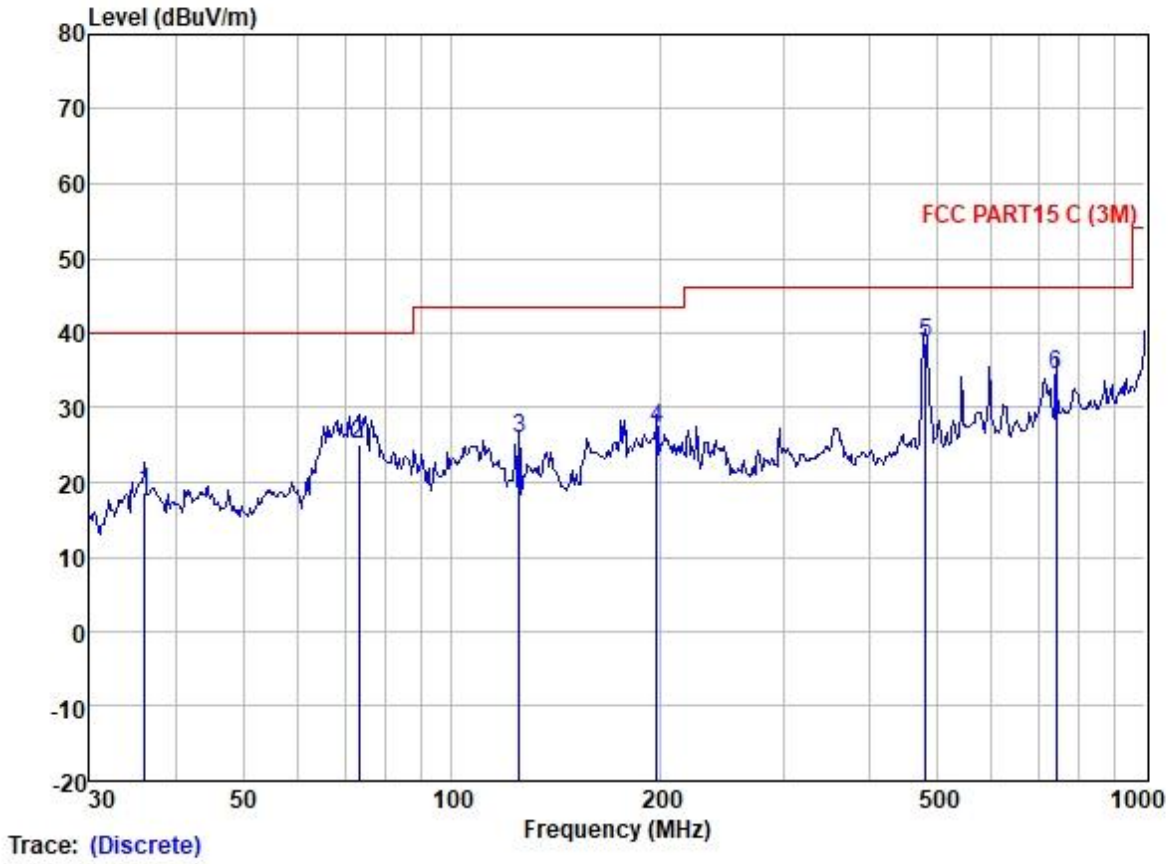
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

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, if 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.

5) The average emission data was not adding the duty cycle correction factor as the peak emission is below the average emission limit in this report.

Test Mode: 01; Polarity: Horizontal, Modulation: GFSK; Channel: low

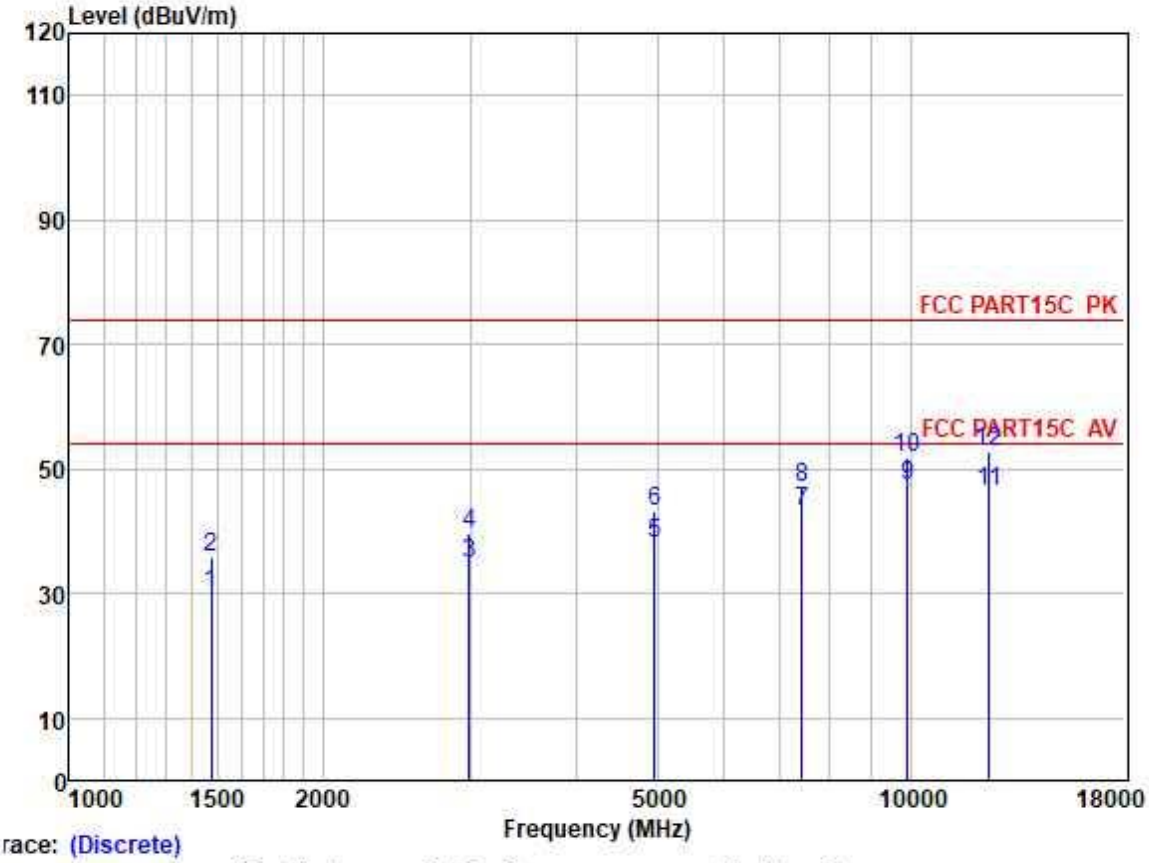


Trace: (Discrete)

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

	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	36.00	31.82	13.00	1.07	27.18	18.71	40.00	-21.29	HORIZONTAL	QP
2	73.36	39.52	11.09	1.44	27.11	24.94	40.00	-15.06	HORIZONTAL	QP
3	125.01	39.47	11.50	1.91	27.01	25.87	43.50	-17.63	HORIZONTAL	QP
4	197.20	40.93	10.47	2.51	26.73	27.18	43.50	-16.32	HORIZONTAL	QP
5	482.22	44.56	17.63	4.34	27.92	38.61	46.00	-7.39	HORIZONTAL	QP
6	744.87	34.50	22.10	5.97	28.10	34.47	46.00	-11.53	HORIZONTAL	QP

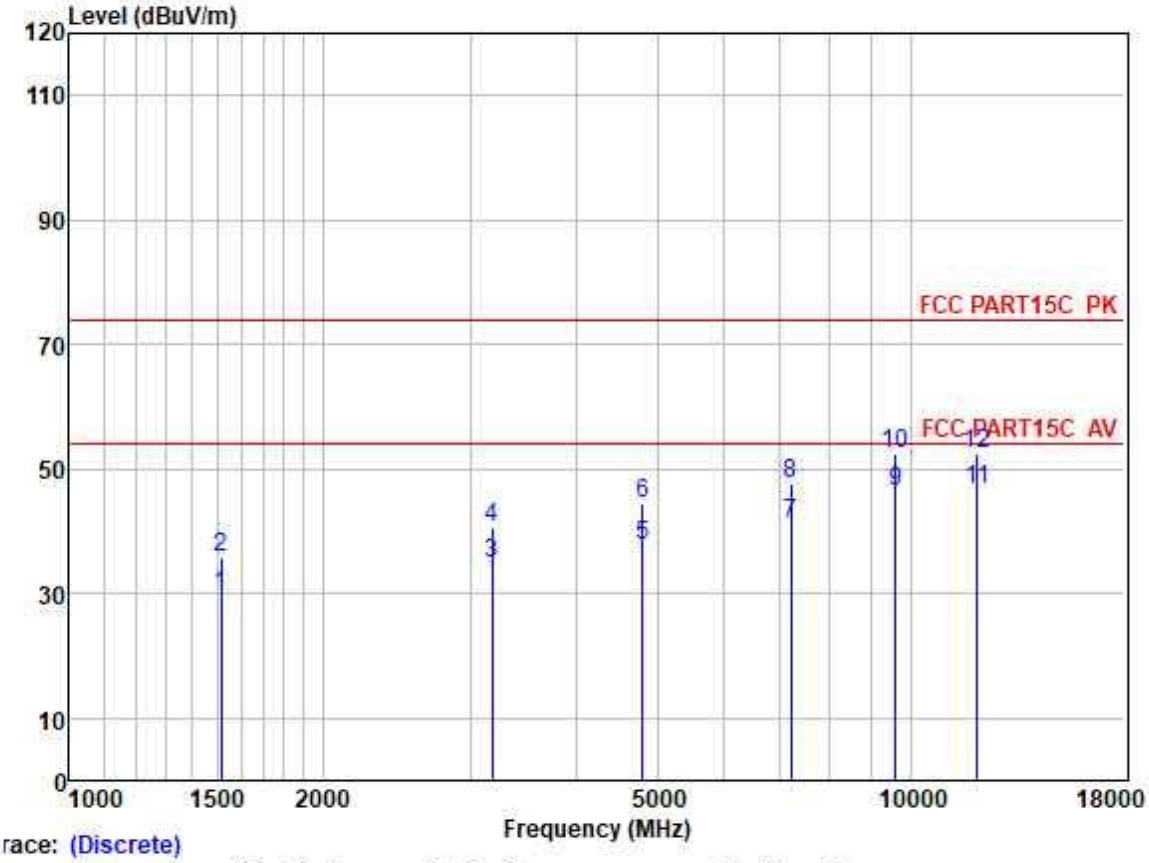
Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: low



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	1473.013	39.51	25.48	2.76	37.76	29.99	54.00	-24.01	HORIZONTAL	Average
2	1473.013	45.41	25.48	2.76	37.76	35.89	74.00	-38.11	HORIZONTAL	Peak
3	2990.531	39.78	28.39	3.79	37.08	34.88	54.00	-19.12	HORIZONTAL	Average
4	2990.531	44.56	28.39	3.79	37.08	39.66	74.00	-34.34	HORIZONTAL	Peak
5	4960.559	37.74	31.65	5.65	36.96	38.08	54.00	-15.92	HORIZONTAL	Average
6	4960.559	42.90	31.65	5.65	36.96	43.24	74.00	-30.76	HORIZONTAL	Peak
7	7440.019	37.53	36.27	6.22	36.92	43.10	54.00	-10.90	HORIZONTAL	Average
8	7440.019	41.36	36.27	6.22	36.92	46.93	74.00	-27.07	HORIZONTAL	Peak
9	9920.114	38.84	38.65	6.96	37.10	47.35	54.00	-6.65	HORIZONTAL	Average
10	9920.114	43.30	38.65	6.96	37.10	51.81	74.00	-22.19	HORIZONTAL	Peak
11	12400.710	36.82	38.57	7.97	36.90	46.46	54.00	-7.54	HORIZONTAL	Average
12	12400.710	43.31	38.57	7.97	36.90	52.95	74.00	-21.05	HORIZONTAL	Peak

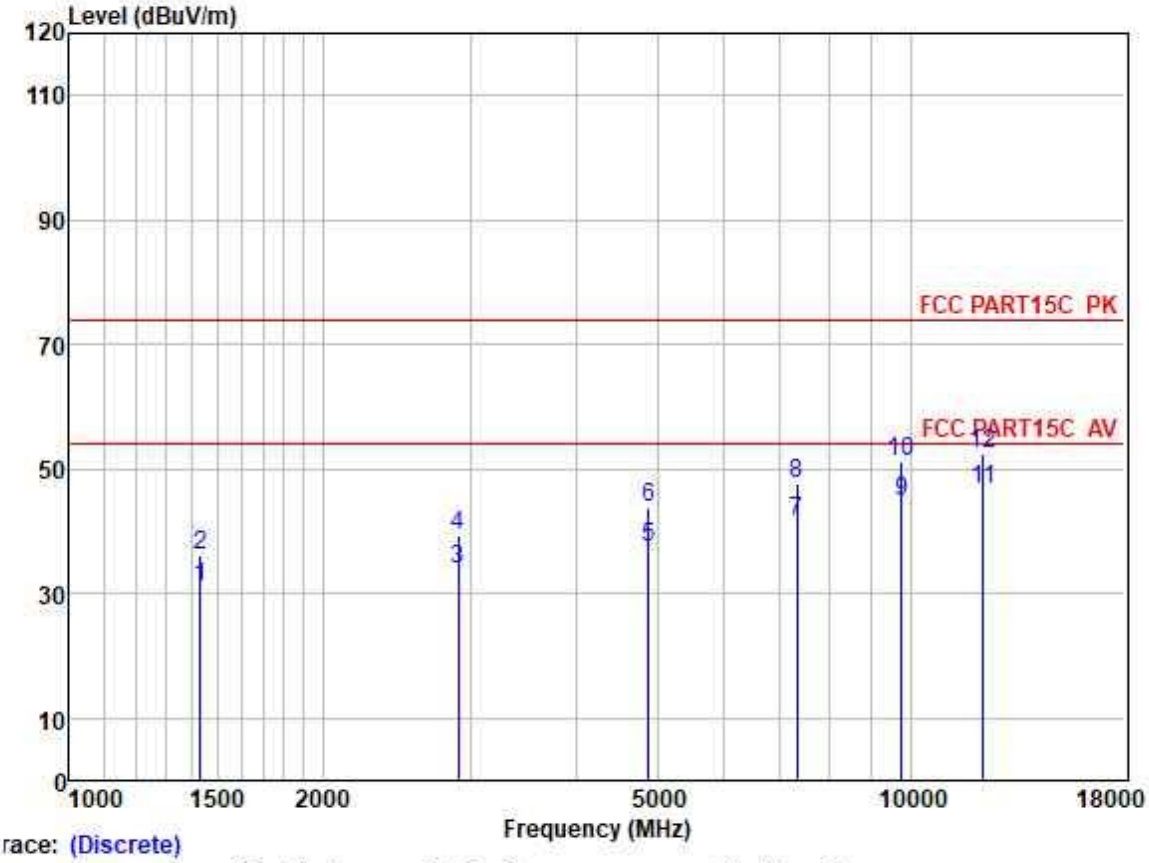
Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: High ;



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	1516.210	39.53	25.51	2.80	38.07	29.77	54.00	-24.23	HORIZONTAL	Average
2	1516.210	45.69	25.51	2.80	38.07	35.93	74.00	-38.07	HORIZONTAL	Peak
3	3177.672	39.47	28.56	3.99	37.10	34.92	54.00	-19.08	HORIZONTAL	Average
4	3177.672	45.14	28.56	3.99	37.10	40.59	74.00	-33.41	HORIZONTAL	Peak
5	4804.110	37.69	31.42	5.40	36.83	37.68	54.00	-16.32	HORIZONTAL	Average
6	4804.110	44.50	31.42	5.40	36.83	44.49	74.00	-29.51	HORIZONTAL	Peak
7	7206.010	37.03	35.54	5.98	37.38	41.17	54.00	-12.83	HORIZONTAL	Average
8	7206.010	43.45	35.54	5.98	37.38	47.59	74.00	-26.41	HORIZONTAL	Peak
9	9608.689	38.42	38.37	7.07	37.42	46.44	54.00	-7.56	HORIZONTAL	Average
10	9608.689	44.31	38.37	7.07	37.42	52.33	74.00	-21.67	HORIZONTAL	Peak
11	12010.750	36.68	38.90	8.19	37.10	46.67	54.00	-7.33	HORIZONTAL	Average
12	12010.750	42.60	38.90	8.19	37.10	52.59	74.00	-21.41	HORIZONTAL	Peak

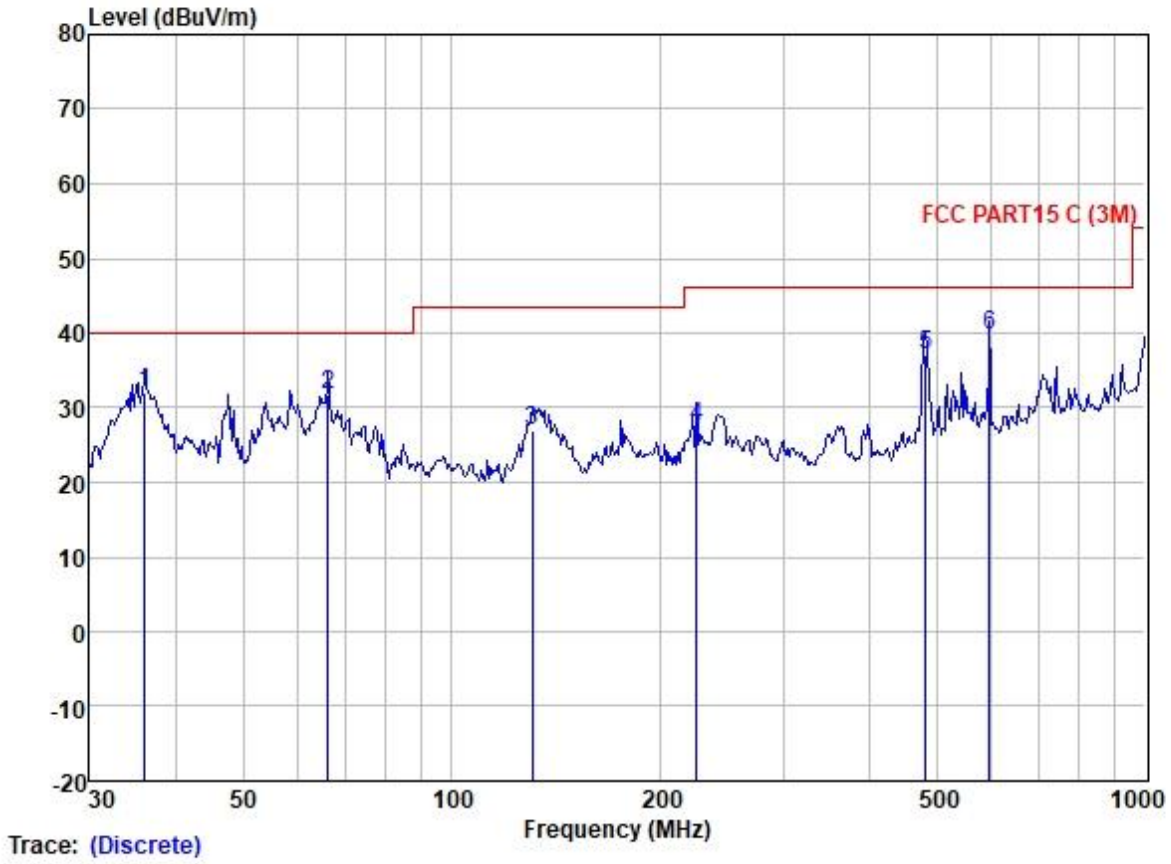
Test Mode: 01; Polarity: Horizontal; Modulation: GFSK; Channel: middle;



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	1431.047	40.95	25.43	2.66	37.85	31.19	54.00	-22.81	HORIZONTAL	Average
2	1431.047	46.02	25.43	2.66	37.85	36.26	74.00	-37.74	HORIZONTAL	Peak
3	2896.945	39.02	28.29	3.70	37.14	33.87	54.00	-20.13	HORIZONTAL	Average
4	2896.945	44.62	28.29	3.70	37.14	39.47	74.00	-34.53	HORIZONTAL	Peak
5	4882.276	37.20	31.56	5.52	36.95	37.33	54.00	-16.67	HORIZONTAL	Average
6	4882.276	43.75	31.56	5.52	36.95	43.88	74.00	-30.12	HORIZONTAL	Peak
7	7323.551	36.51	36.00	6.13	36.92	41.72	54.00	-12.28	HORIZONTAL	Average
8	7323.551	42.58	36.00	6.13	36.92	47.79	74.00	-26.21	HORIZONTAL	Peak
9	9764.543	36.39	38.50	7.02	37.09	44.82	54.00	-9.18	HORIZONTAL	Average
10	9764.543	42.86	38.50	7.02	37.09	51.29	74.00	-22.71	HORIZONTAL	Peak
11	12205.130	36.85	38.74	8.08	37.06	46.61	54.00	-7.39	HORIZONTAL	Average
12	12205.130	42.57	38.74	8.08	37.06	52.33	74.00	-21.67	HORIZONTAL	Peak

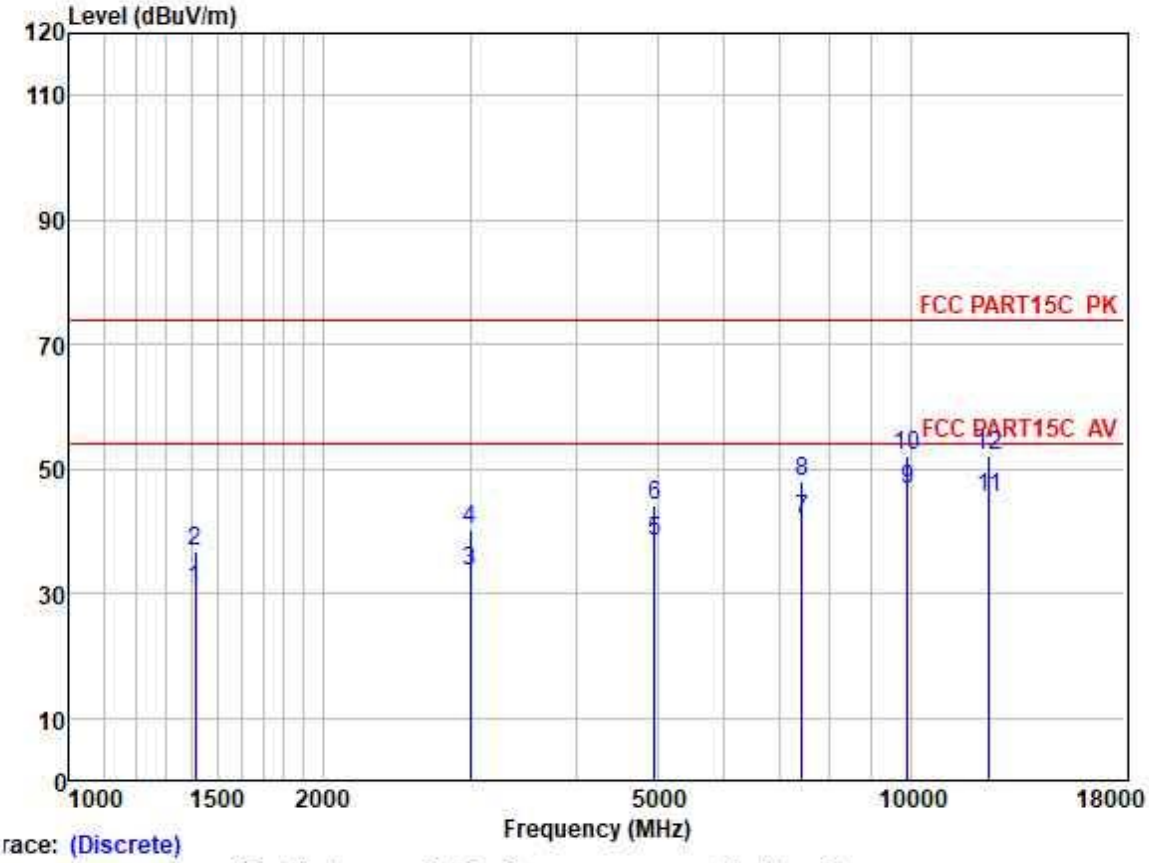
Test Mode: 01; Polarity: Vertical, Modulation: GFSK; Channel: low




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

	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	36.00	45.18	13.00	1.07	27.18	32.07	40.00	-7.93	VERTICAL	QP
2	66.27	44.84	12.56	1.36	27.14	31.62	40.00	-8.38	VERTICAL	QP
3	130.38	39.81	12.15	1.97	26.99	26.94	43.50	-16.56	VERTICAL	QP
4	225.31	41.70	9.90	2.69	26.70	27.59	46.00	-18.41	VERTICAL	QP
5	482.22	42.98	17.63	4.34	27.92	37.03	46.00	-8.97	VERTICAL	QP
6	595.13	43.10	19.70	5.10	28.20	39.70	46.00	-6.30	VERTICAL	QP

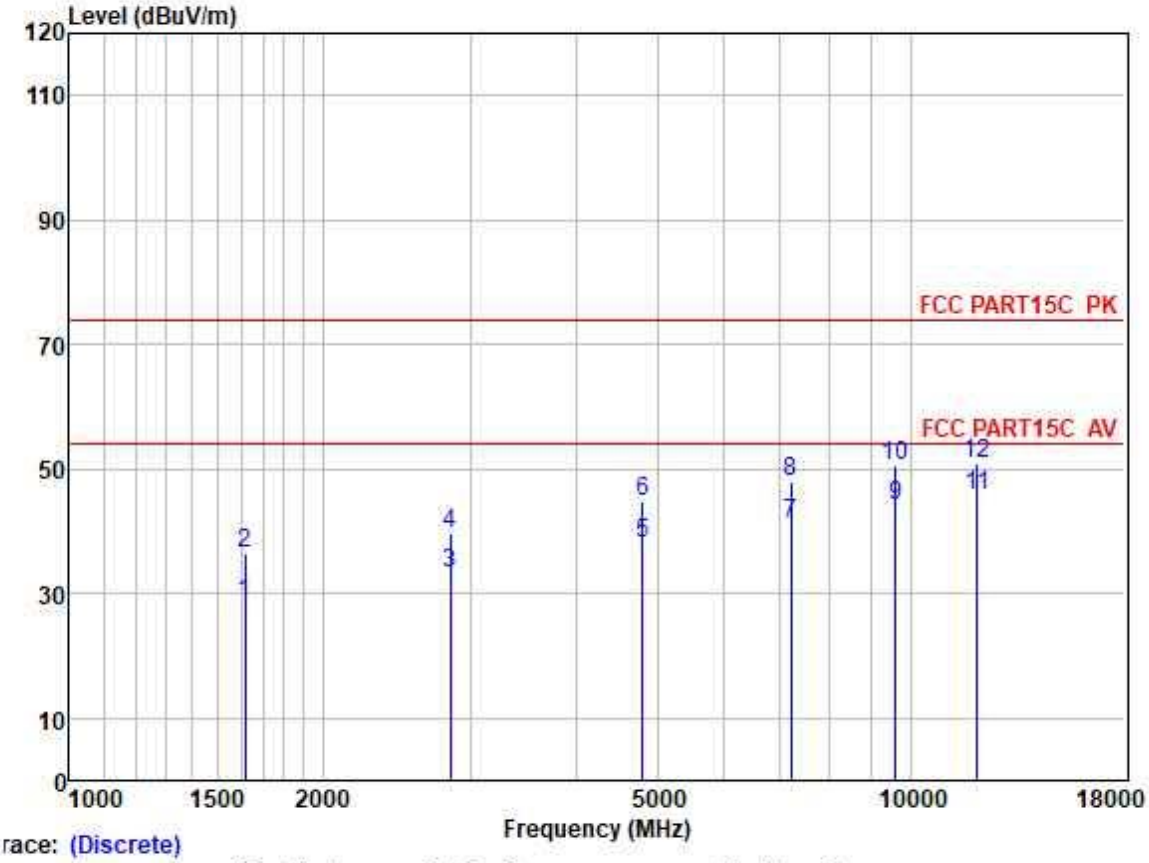
Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: High;



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	1410.514	40.73	25.40	2.62	37.90	30.85	54.00	-23.15	VERTICAL	Average
2	1410.514	46.82	25.40	2.62	37.90	36.94	74.00	-37.06	VERTICAL	Peak
3	2999.187	38.60	28.40	3.80	37.07	33.73	54.00	-20.27	VERTICAL	Average
4	2999.187	45.17	28.40	3.80	37.07	40.30	74.00	-33.70	VERTICAL	Peak
5	4960.440	38.01	31.65	5.65	36.96	38.35	54.00	-15.65	VERTICAL	Average
6	4960.440	43.67	31.65	5.65	36.96	44.01	74.00	-29.99	VERTICAL	Peak
7	7440.122	36.25	36.27	6.22	36.92	41.82	54.00	-12.18	VERTICAL	Average
8	7440.122	42.42	36.27	6.22	36.92	47.99	74.00	-26.01	VERTICAL	Peak
9	9920.450	38.26	38.65	6.96	37.10	46.77	54.00	-7.23	VERTICAL	Average
10	9920.450	43.52	38.65	6.96	37.10	52.03	74.00	-21.97	VERTICAL	Peak
11	12400.540	35.93	38.57	7.97	36.90	45.57	54.00	-8.43	VERTICAL	Average
12	12400.540	42.59	38.57	7.97	36.90	52.23	74.00	-21.77	VERTICAL	Peak

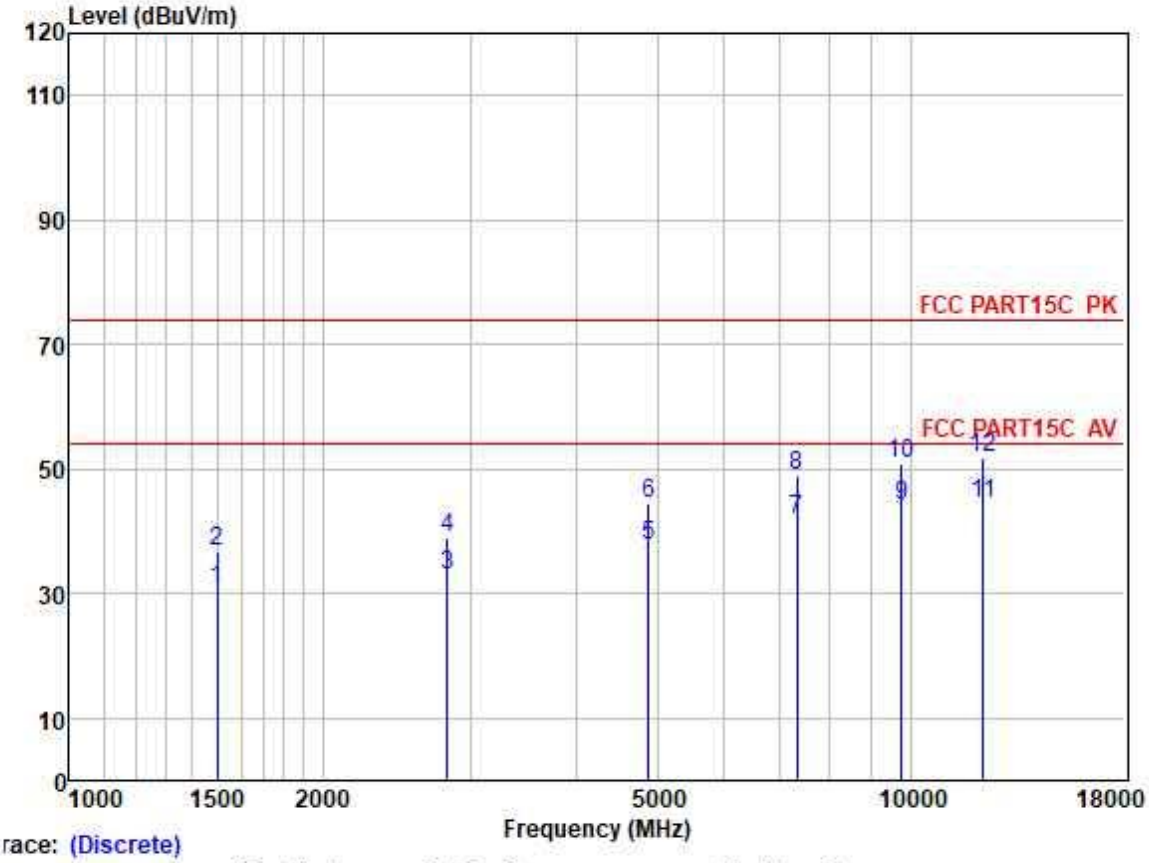
Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Low;



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	1615.754	38.00	25.60	2.80	37.95	28.45	54.00	-25.55	VERTICAL	Average
2	1615.754	45.88	25.60	2.80	37.95	36.33	74.00	-37.67	VERTICAL	Peak
3	2838.921	38.62	28.21	3.70	37.38	33.15	54.00	-20.85	VERTICAL	Average
4	2838.921	45.07	28.21	3.70	37.38	39.60	74.00	-34.40	VERTICAL	Peak
5	4804.016	38.01	31.42	5.40	36.83	38.00	54.00	-16.00	VERTICAL	Average
6	4804.016	44.96	31.42	5.40	36.83	44.95	74.00	-29.05	VERTICAL	Peak
7	7205.980	37.01	35.54	5.98	37.38	41.15	54.00	-12.85	VERTICAL	Average
8	7205.980	43.78	35.54	5.98	37.38	47.92	74.00	-26.08	VERTICAL	Peak
9	9608.600	36.10	38.37	7.07	37.42	44.12	54.00	-9.88	VERTICAL	Average
10	9608.600	42.65	38.37	7.07	37.42	50.67	74.00	-23.33	VERTICAL	Peak
11	12010.130	35.87	38.90	8.19	37.10	45.86	54.00	-8.14	VERTICAL	Average
12	12010.130	40.84	38.90	8.19	37.10	50.83	74.00	-23.17	VERTICAL	Peak

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



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1498.781	40.09	25.50	2.80	37.73	30.66	54.00	-23.34	VERTICAL	Average
2	1498.781	46.18	25.50	2.80	37.73	36.75	74.00	-37.25	VERTICAL	Peak
3	2814.411	38.25	28.17	3.70	37.21	32.91	54.00	-21.09	VERTICAL	Average
4	2814.411	44.39	28.17	3.70	37.21	39.05	74.00	-34.95	VERTICAL	Peak
5	4882.151	37.48	31.56	5.52	36.95	37.61	54.00	-16.39	VERTICAL	Average
6	4882.151	44.38	31.56	5.52	36.95	44.51	74.00	-29.49	VERTICAL	Peak
7	7323.852	36.77	36.00	6.13	36.92	41.98	54.00	-12.02	VERTICAL	Average
8	7323.852	43.85	36.00	6.13	36.92	49.06	74.00	-24.94	VERTICAL	Peak
9	9764.880	35.89	38.50	7.02	37.09	44.32	54.00	-9.68	VERTICAL	Average
10	9764.880	42.46	38.50	7.02	37.09	50.89	74.00	-23.11	VERTICAL	Peak
11	12205.950	34.76	38.74	8.08	37.06	44.52	54.00	-9.48	VERTICAL	Average
12	12205.950	41.96	38.74	8.08	37.06	51.72	74.00	-22.28	VERTICAL	Peak

8 Emission Test Results

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

Test Requirement: 47 CFR Part 15, Subpart C 15.247

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

Limit:

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

8.1.1 E.U.T. Operation

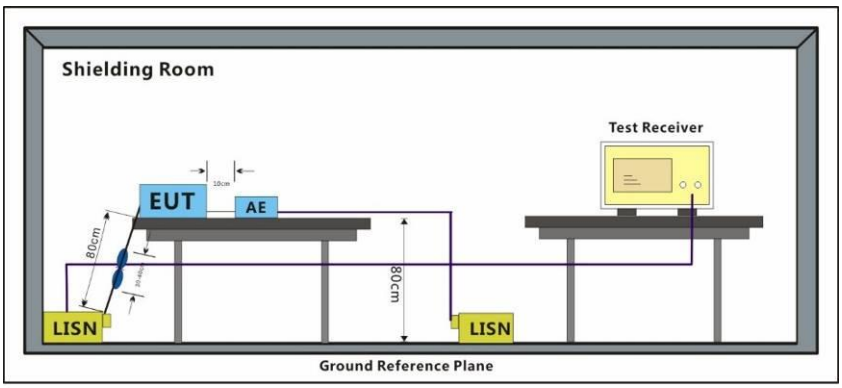
Operating Environment:

Temperature: 25.5 °C Humidity: 48.8 % RH Atmospheric Pressure: 1010 mbar

8.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, Π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
Pre-scan	02	TX_Hop mode_Keep the EUT in frequency hopping mode with GFSK modulation, Π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

8.1.3 Test Setup Diagram



8.1.4 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

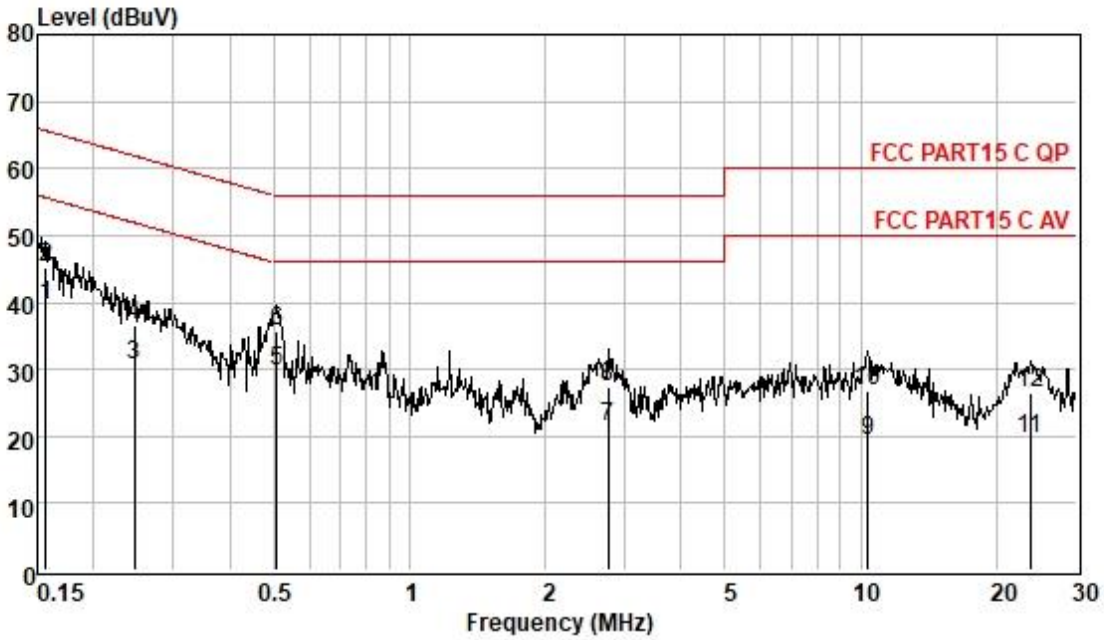
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

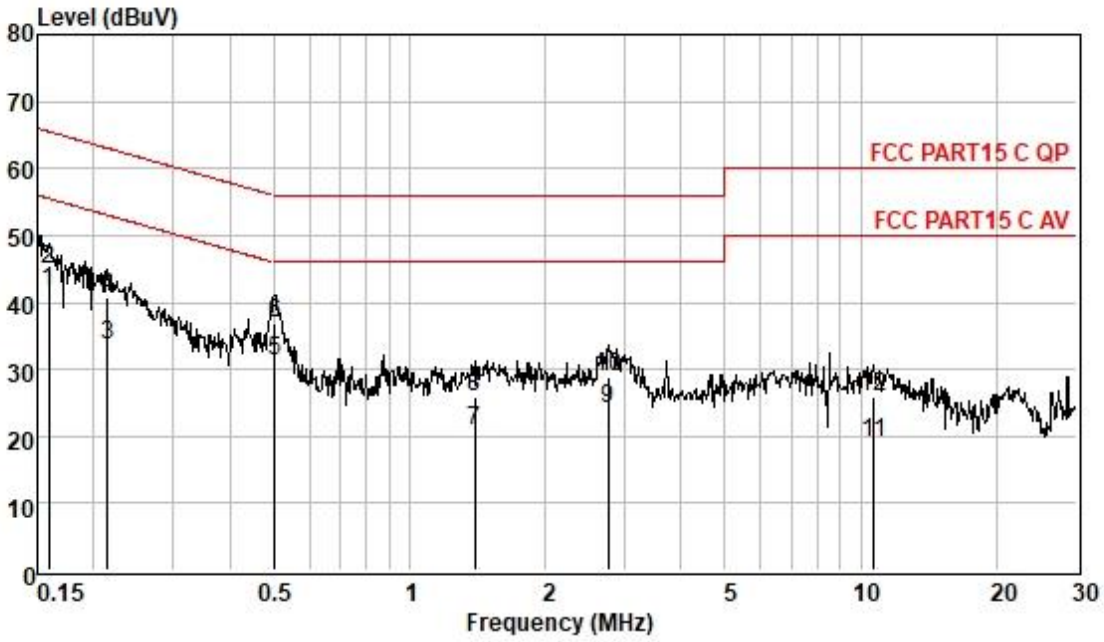
Test Mode: 01; Line: Live line



Pol :LINE
Mode :BT
Model :

Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.16	29.87	0.06	9.62	39.55	55.65	-16.10	Average
0.16	35.62	0.06	9.62	45.30	65.65	-20.35	QP
0.25	21.02	0.06	9.62	30.70	51.91	-21.21	Average
0.25	26.84	0.06	9.62	36.52	61.91	-25.39	QP
0.51	20.08	0.07	9.63	29.78	46.00	-16.22	Average
0.51	25.97	0.07	9.63	35.67	56.00	-20.33	QP
2.75	11.71	0.14	9.62	21.47	46.00	-24.53	Average
2.75	17.62	0.14	9.62	27.38	56.00	-28.62	QP
10.34	9.42	0.24	9.69	19.35	50.00	-30.65	Average
10.34	16.90	0.24	9.69	26.83	60.00	-33.17	QP
23.64	9.41	0.40	9.86	19.67	50.00	-30.33	Average
23.64	16.15	0.40	9.86	26.41	60.00	-33.59	QP

Test Mode: 01; Line: Neutral Line



Pol :NEUTRAL
Mode :BT
Model :

Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.16	32.15	0.06	9.55	41.76	55.52	-13.76	Average
0.16	35.23	0.06	9.55	44.84	65.52	-20.68	QP
0.22	24.05	0.06	9.54	33.65	53.01	-19.36	Average
0.22	31.15	0.06	9.54	40.75	63.01	-22.26	QP
0.50	21.72	0.07	9.55	31.34	46.00	-14.66	Average
0.50	27.34	0.07	9.55	36.96	56.00	-19.04	QP
1.40	11.18	0.09	9.55	20.82	46.00	-25.18	Average
1.40	16.10	0.09	9.55	25.74	56.00	-30.26	QP
2.75	14.41	0.14	9.55	24.10	46.00	-21.90	Average
2.75	19.21	0.14	9.55	28.90	56.00	-27.10	QP
10.68	9.25	0.24	9.60	19.09	50.00	-30.91	Average
10.68	16.07	0.24	9.60	25.91	60.00	-34.09	QP