TEST REPORT

Application No.:	GZEM2004011397CR
Applicant:	EASEPAL ENTERPRISES LTD.
Address of Applicant:	18th Floor, 17# East Tapu Road, Siming Distric, Xiamen, China
Manufacturer:	EASEPAL ENTERPRISES LTD.
Address of Manufacturer:	18th Floor, 17# East Tapu Road, Siming Distric, Xiamen, China
Factory:	EASEPAL ENTERPRISES LTD.
Address of Factory:	18th Floor, 17# East Tapu Road, Siming Distric, Xiamen, China
Equipment Under Test (EUT):	
EUT Name:	Indoor cycling bike
Model No.:	X-2001
Trade Mark:	XGEAR
Standard(s):	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2020-04-07
Date of Test:	2020-04-27 to 2020-05-06
Date of Issue:	2020-05-08
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		2020-05-08		Original

Authorized for issue by:				
Tested By		**Curry_Wu /Project Engineer**		2020-04-27 to 2020-05-06 **Date**
Checked By		**Jerry_Chan /Reviewer**		2020-05-08 **Date**

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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

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.13.3.2	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 11.11	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

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3 Contents

Page

1 Cover Page 1

2 Test Summary 3

3 Contents 4

4 General Information 6

4.1 Details of E.U.T. 6
4.2 Description of Support Units 6
4.3 Measurement Uncertainty 6
4.4 Test Location 6
4.5 Test Facility 8
4.6 Deviation from Standards 9
4.7 Abnormalities from Standard Conditions 9

5 Equipment List 10

6 Radio Spectrum Technical Requirement 13

6.1 Antenna Requirement 13
6.1.1 Test Requirement: 13
6.1.2 Conclusion 13

7 Radio Spectrum Matter Test Results 14

7.1 Minimum 6dB Bandwidth 14
7.1.1 E.U.T. Operation 14
7.1.2 Test Setup Diagram 14
7.1.3 Measurement Procedure and Data 14
7.2 Conducted Peak Output Power 15
7.2.1 E.U.T. Operation 16
7.2.2 Test Setup Diagram 16
7.2.3 Measurement Procedure and Data 16
7.3 Power Spectrum Density 17
7.3.1 E.U.T. Operation 17
7.3.2 Test Setup Diagram 17
7.3.3 Measurement Procedure and Data 17
7.4 Conducted Band Edges Measurement 18
7.4.1 E.U.T. Operation 19
7.4.2 Test Setup Diagram 19
7.4.3 Measurement Procedure and Data 19
7.5 Conducted Spurious Emissions 20
7.5.1 E.U.T. Operation 21
7.5.2 Test Setup Diagram 21
7.5.3 Measurement Procedure and Data 21
7.6 Radiated Emissions which fall in the restricted bands 22
7.6.1 E.U.T. Operation 22
7.6.2 Test Setup Diagram 22
7.6.3 Measurement Procedure and Data 23

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7.7 Radiated Spurious Emissions 28
7.7.1 E.U.T. Operation 29
7.7.2 Test Setup Diagram 29
7.7.3 Measurement Procedure and Data 30

8 Appendix 39

8.1 Appendix 15.247 39

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4 General Information

4.1 Details of E.U.T.

Power Supply:	DC 3V
Test Voltage:	DC 3V
Antenna Gain	0dBi
Antenna Type	PCB antenna
Channel Spacing	2MHz
Modulation Type	GFSK
Number of Channels	40
Operation Frequency	2402MHz to 2480MHz

4.2 Description of Support Units

The EUT has been tested with corresponding accessories as below:

Supplied by SGS:

Description	Manufacturer	Model No.	SN/Certificate NO
CC debugger	N/A	N/A	N/A

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℃
10	Humidity	±1.3%
11	Supply Voltages	±1.5%
12	Time	±3%

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

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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)**

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 C-Tick mark as a result of our NVLAP accreditation.

- **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 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **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, Jul 13, 2017.

- **Industry Canada (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-10449 and T-11179)**

The 10m Semi-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-10449 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 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

Minimum 6dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
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 Peak Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
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

Power Spectrum Density					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
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**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
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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Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
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

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	2020-01-10	2021-01-09
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2020-01-10	2021-01-09
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	2017-06-01	2020-05-31
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	2020-01-10	2021-01-09
Amplifier	HP	8447F	EMC2065	2019-05-29	2020-05-28
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2019-11-18	2020-11-17
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2021-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2020-01-10	2021-01-09
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2020-01-10	2021-01-09
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	2017-12-19	2020-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2019-11-18	2020-11-17
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2019-11-18	2020-11-17
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	2020-01-10	2021-01-09
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC0056	2020-01-10	2021-01-09
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	2017-06-01	2020-05-31
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	2020-01-10	2021-01-09
Amplifier	HP	8447F	EMC2065	2019-05-29	2020-05-28
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2019-11-18	2020-11-17
Active Loop Antenna	EMCO	6502	EMC0523	2018-03-05	2021-03-04
High Pass Filter(915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2020-01-10	2021-01-09
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2020-01-10	2021-01-09
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	2017-12-19	2020-12-18
MXE EMI Receiver	Keysight	N9038A	EMC2139	2019-11-18	2020-11-17
EXA Signal Analyzer	Keysight	N9010A	EMC2138	2019-11-18	2020-11-17
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	2019-07-16	2020-07-15
DMM	Fluke	73	EMC0007	2019-07-16	2020-07-15

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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)

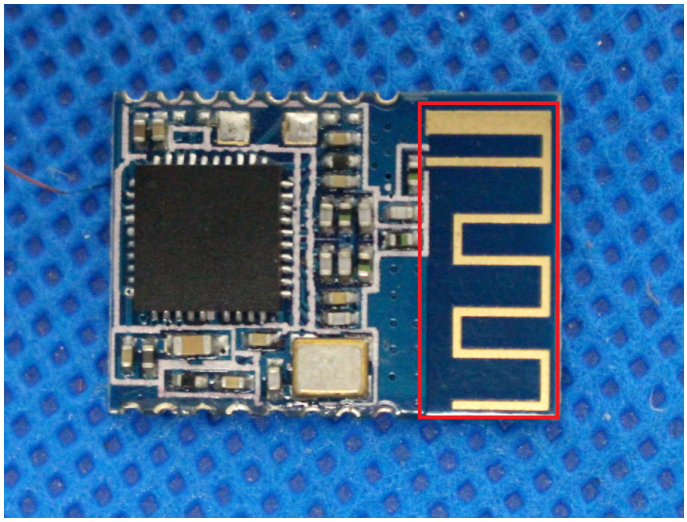
6.1.2 Conclusion

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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7 Radio Spectrum Matter Test Results

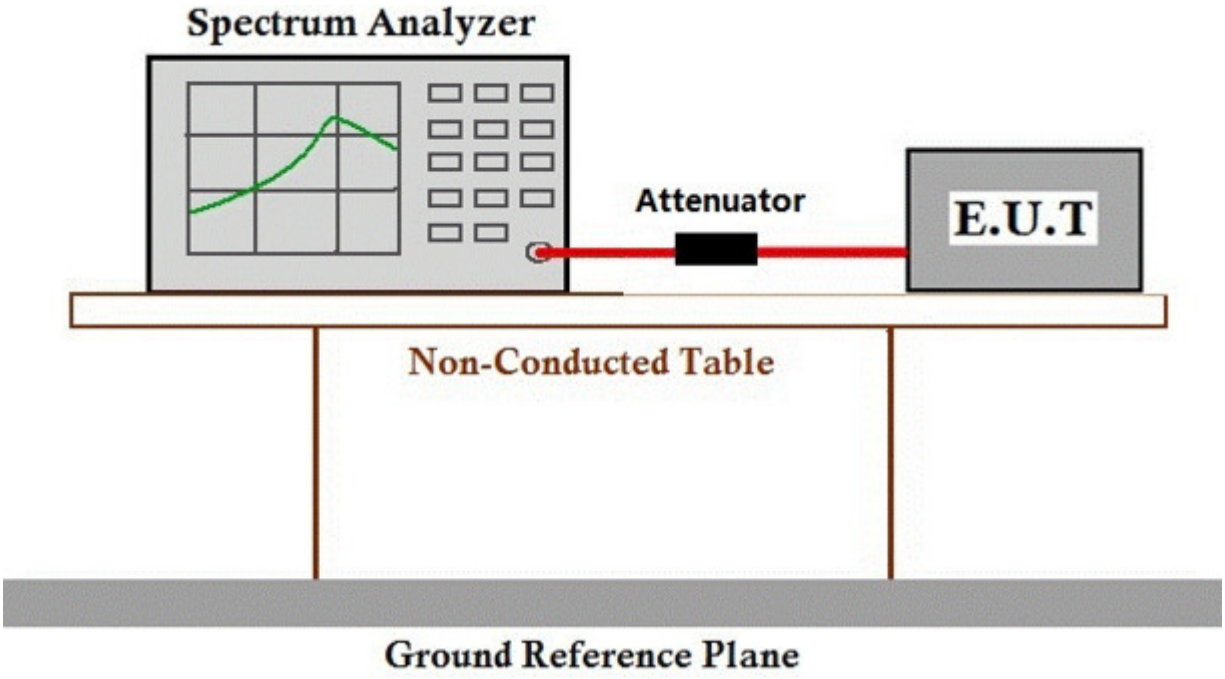
7.1 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1
Limit: ≥500 kHz

7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 24.8 °C Humidity: 47.1 % RH Atmospheric Pressure: 1020 mbar
Test mode a: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.1

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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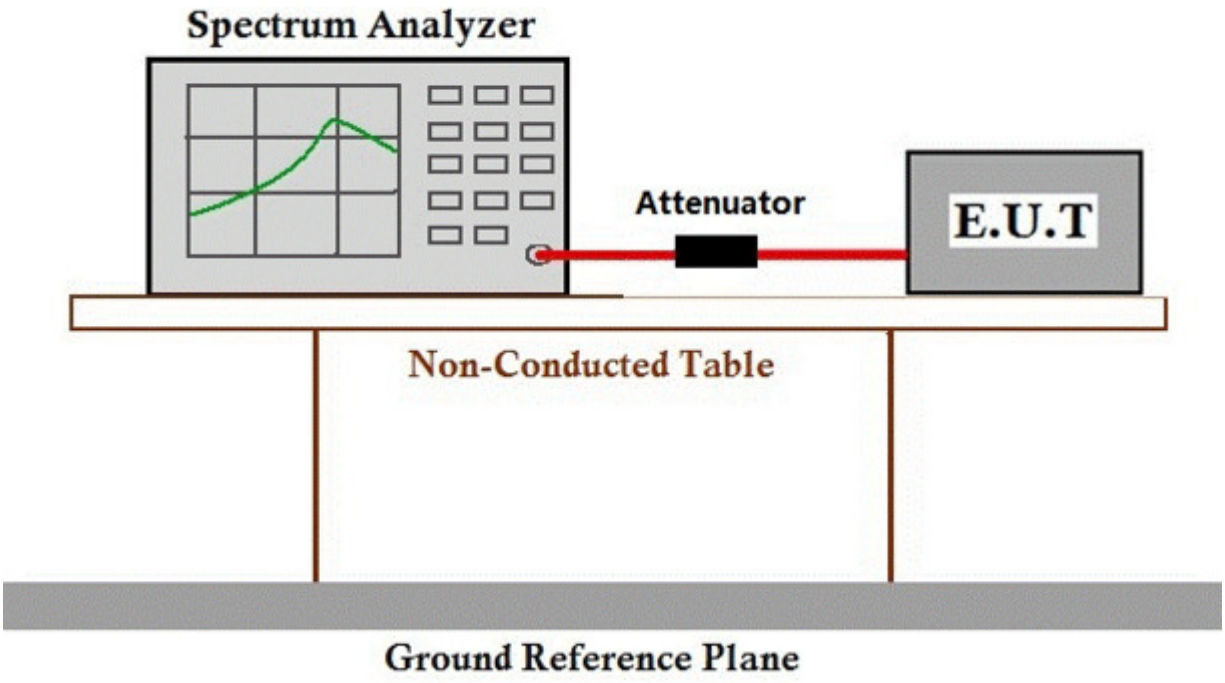
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24.8 °C Humidity: 47.1 % RH Atmospheric Pressure: 1020 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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 Power Spectrum Density

Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2013) Section 11.10.2
Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

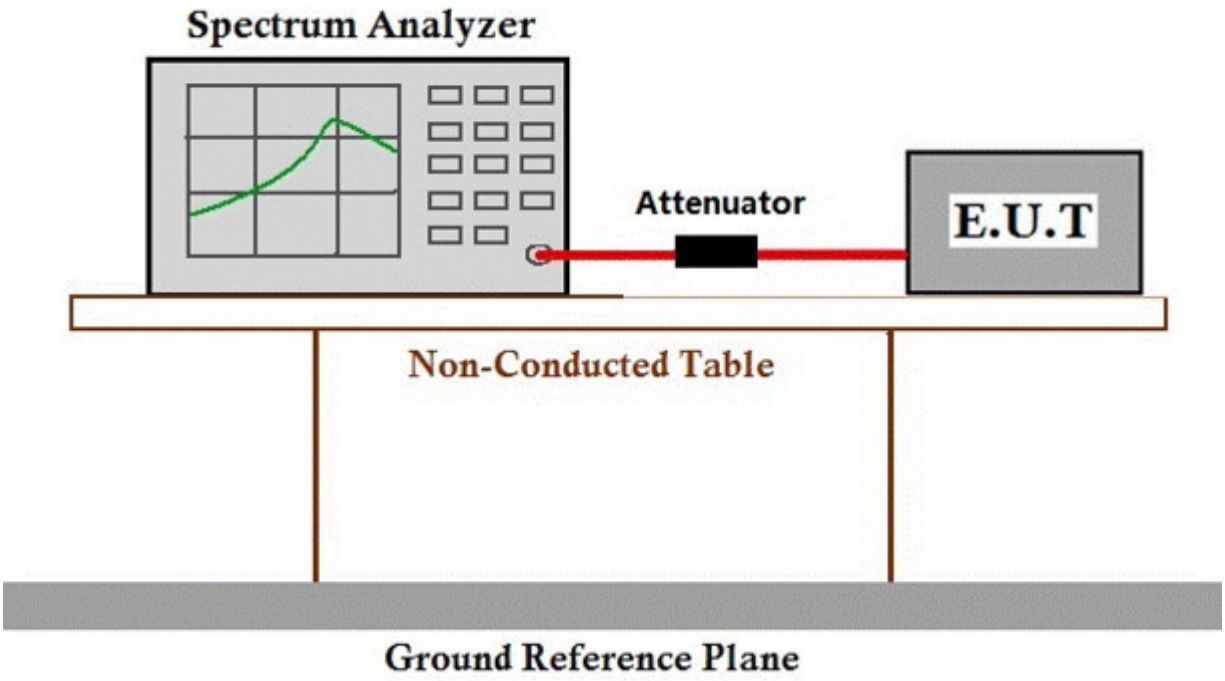
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24.8 °C Humidity: 47.1 % RH Atmospheric Pressure: 1020 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.13.3.2
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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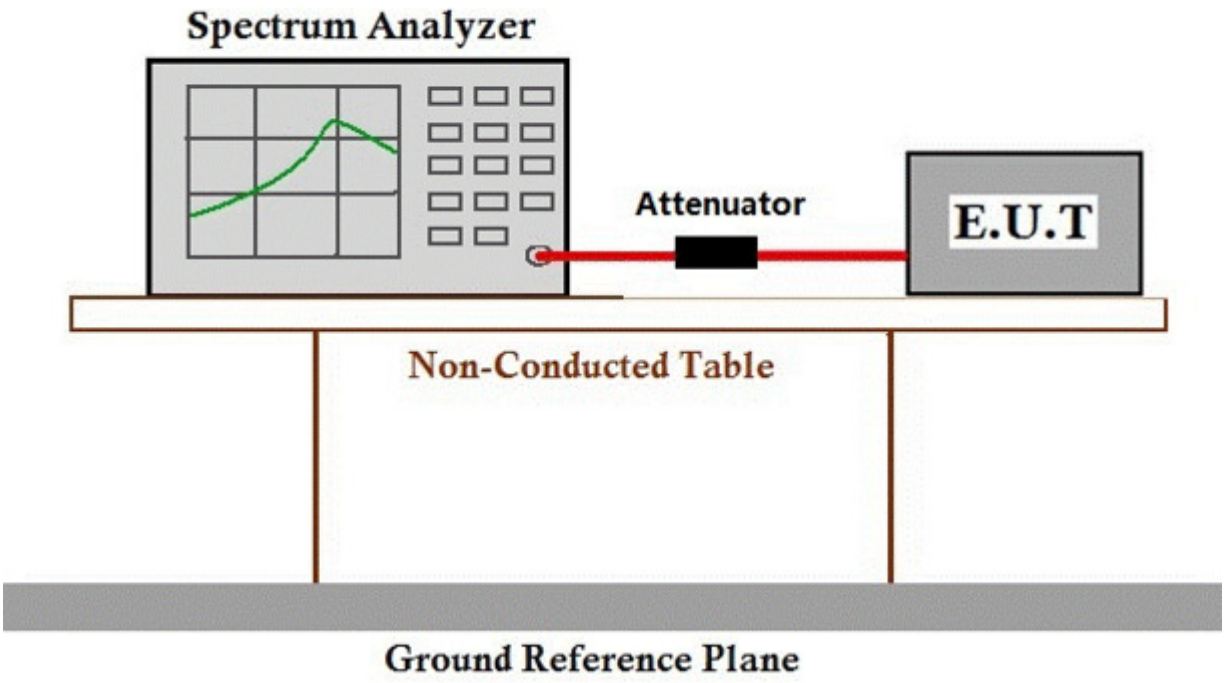
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 24.8 °C Humidity: 47.1 % RH Atmospheric Pressure: 1020 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.11
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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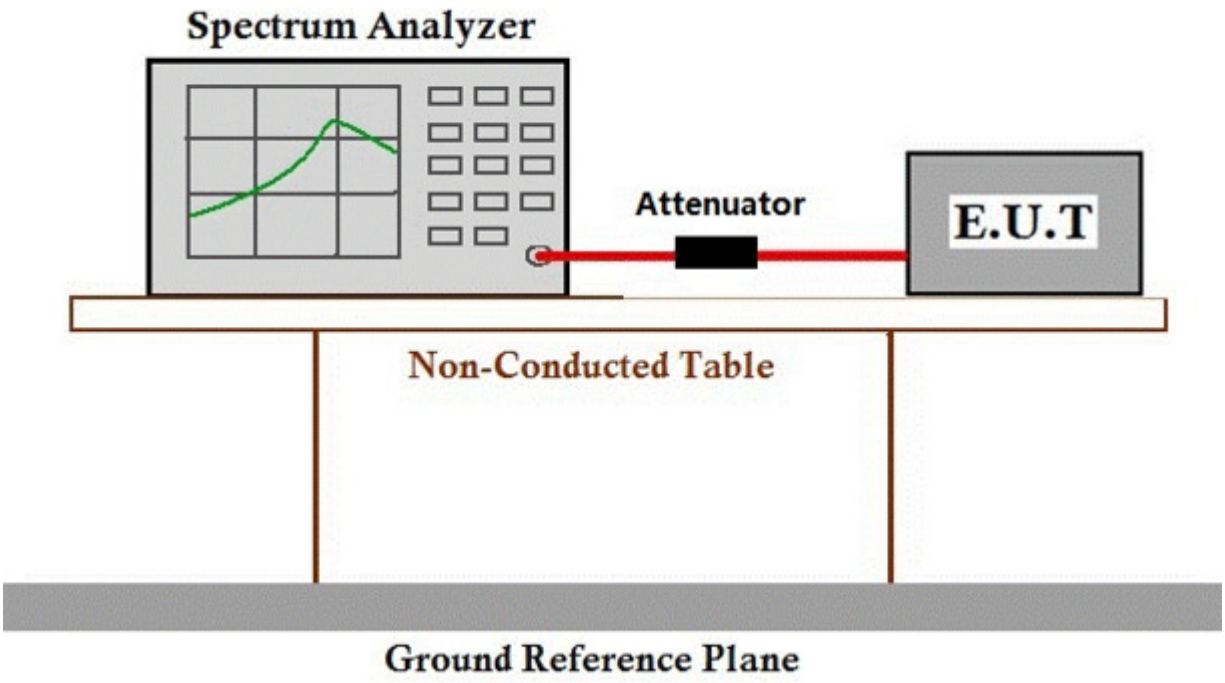
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24.8 °C Humidity: 47.1 % RH Atmospheric Pressure: 1020 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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 Radiated Emissions which fall in the restricted bands

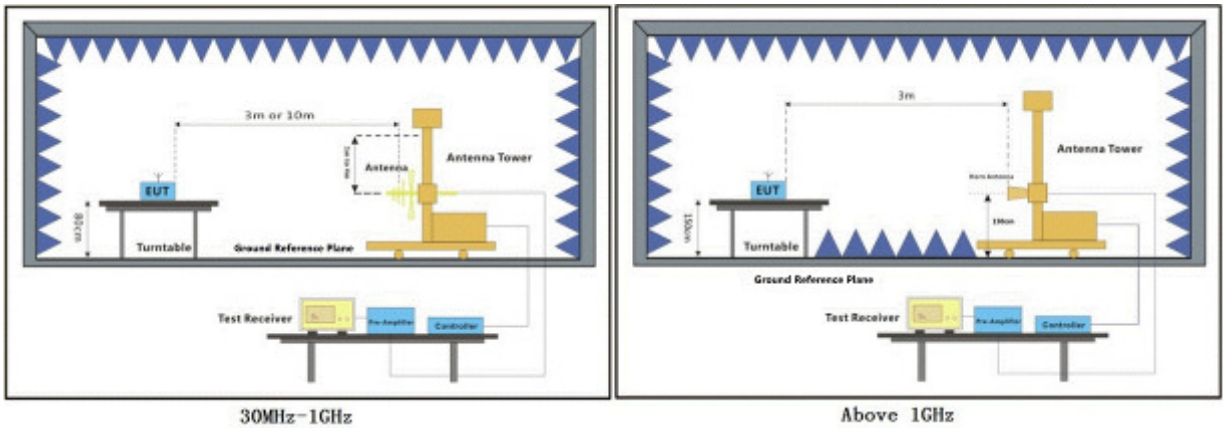
Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m
Limit:

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

7.6.1 E.U.T. Operation

Operating Environment:
Temperature: 24 °C Humidity: 55.7 % RH Atmospheric Pressure: 1020 mbar
Test mode a: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.2 Test Setup Diagram



30MHz-1GHz Above 1GHz

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7.6.3 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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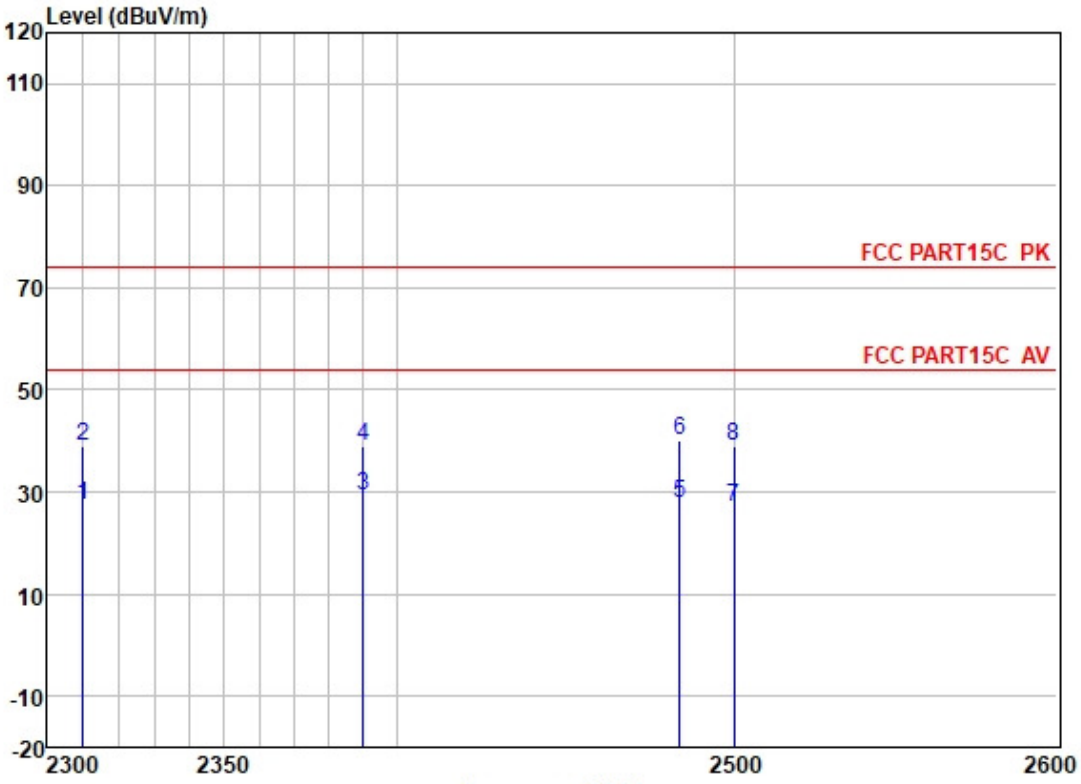
Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



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	33.97	27.15	3.32	36.94	27.50	54.00	-26.50	HORIZONTAL	Average
2	2310.000	45.62	27.15	3.32	36.94	39.15	74.00	-34.85	HORIZONTAL	Peak
3	2390.000	35.43	27.33	3.48	36.92	29.32	54.00	-24.68	HORIZONTAL	Average
4	2390.000	45.14	27.33	3.48	36.92	39.03	74.00	-34.97	HORIZONTAL	Peak
5	2483.500	33.54	27.48	3.53	36.90	27.65	54.00	-26.35	HORIZONTAL	Average
6	2483.500	46.05	27.48	3.53	36.90	40.16	74.00	-33.84	HORIZONTAL	Peak
7	2500.000	33.19	27.50	3.40	36.89	27.20	54.00	-26.80	HORIZONTAL	Average
8	2500.000	45.11	27.50	3.40	36.89	39.12	74.00	-34.88	HORIZONTAL	Peak

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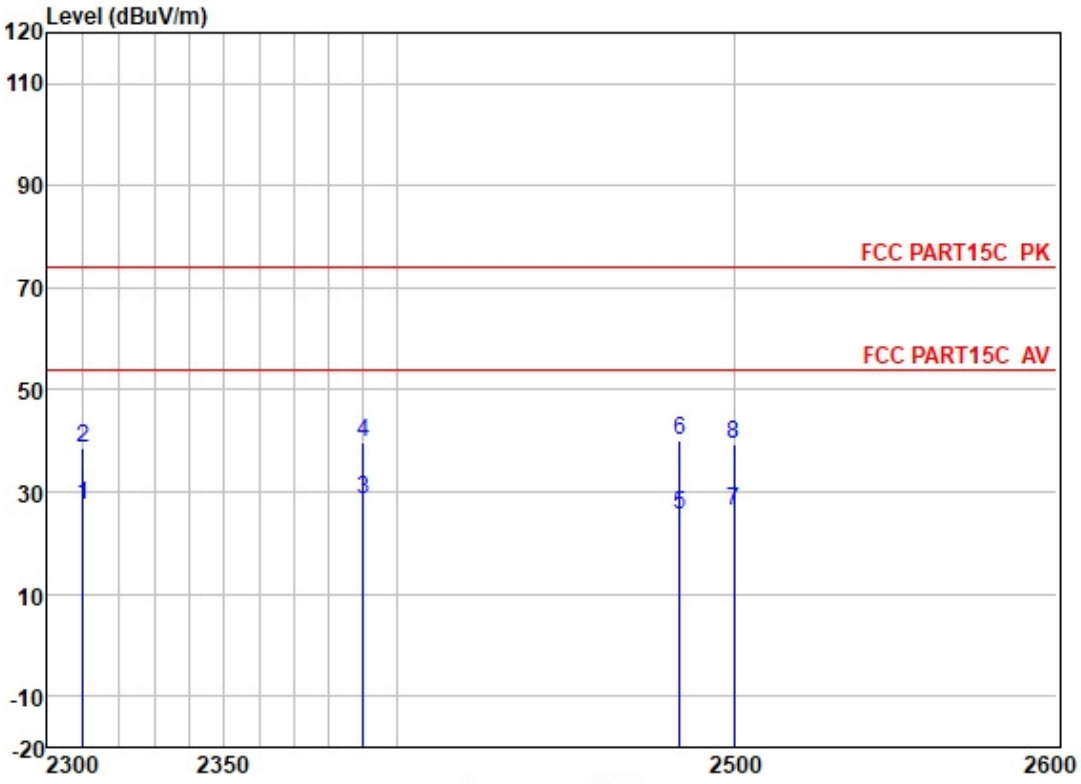
Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



race: (Discrete)

	Freq	ReadLevel	AntennaFactor	CableLoss	PreampFactor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	33.93	27.15	3.32	36.94	27.46	54.00	-26.54	VERTICAL	Average
2	2310.000	45.02	27.15	3.32	36.94	38.55	74.00	-35.45	VERTICAL	Peak
3	2390.000	34.49	27.33	3.48	36.92	28.38	54.00	-25.62	VERTICAL	Average
4	2390.000	45.97	27.33	3.48	36.92	39.86	74.00	-34.14	VERTICAL	Peak
5	2483.500	31.42	27.48	3.53	36.90	25.53	54.00	-28.47	VERTICAL	Average
6	2483.500	46.00	27.48	3.53	36.90	40.11	74.00	-33.89	VERTICAL	Peak
7	2500.000	32.23	27.50	3.40	36.89	26.24	54.00	-27.76	VERTICAL	Average
8	2500.000	45.42	27.50	3.40	36.89	39.43	74.00	-34.57	VERTICAL	Peak

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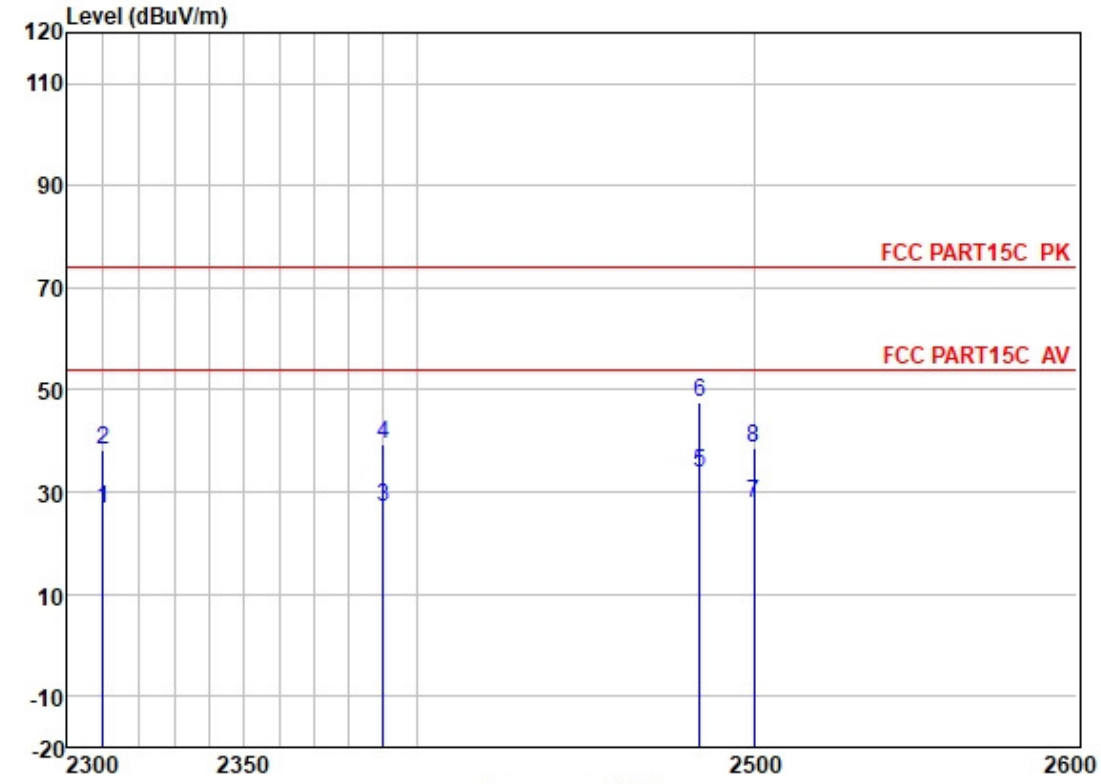
Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



race: (Discrete)

	Freq	ReadLevel	AntennaFactor	CableLoss	PreampFactor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	33.25	27.15	3.32	36.94	26.78	54.00	-27.22	HORIZONTAL	Average
2	2310.000	44.53	27.15	3.32	36.94	38.06	74.00	-35.94	HORIZONTAL	Peak
3	2390.000	33.27	27.33	3.48	36.92	27.16	54.00	-26.84	HORIZONTAL	Average
4	2390.000	45.56	27.33	3.48	36.92	39.45	74.00	-34.55	HORIZONTAL	Peak
5	2483.500	39.68	27.48	3.53	36.90	33.79	54.00	-20.21	HORIZONTAL	Average
6	2483.500	53.35	27.48	3.53	36.90	47.46	74.00	-26.54	HORIZONTAL	Peak
7	2500.000	33.84	27.50	3.40	36.89	27.85	54.00	-26.15	HORIZONTAL	Average
8	2500.000	44.79	27.50	3.40	36.89	38.80	74.00	-35.20	HORIZONTAL	Peak

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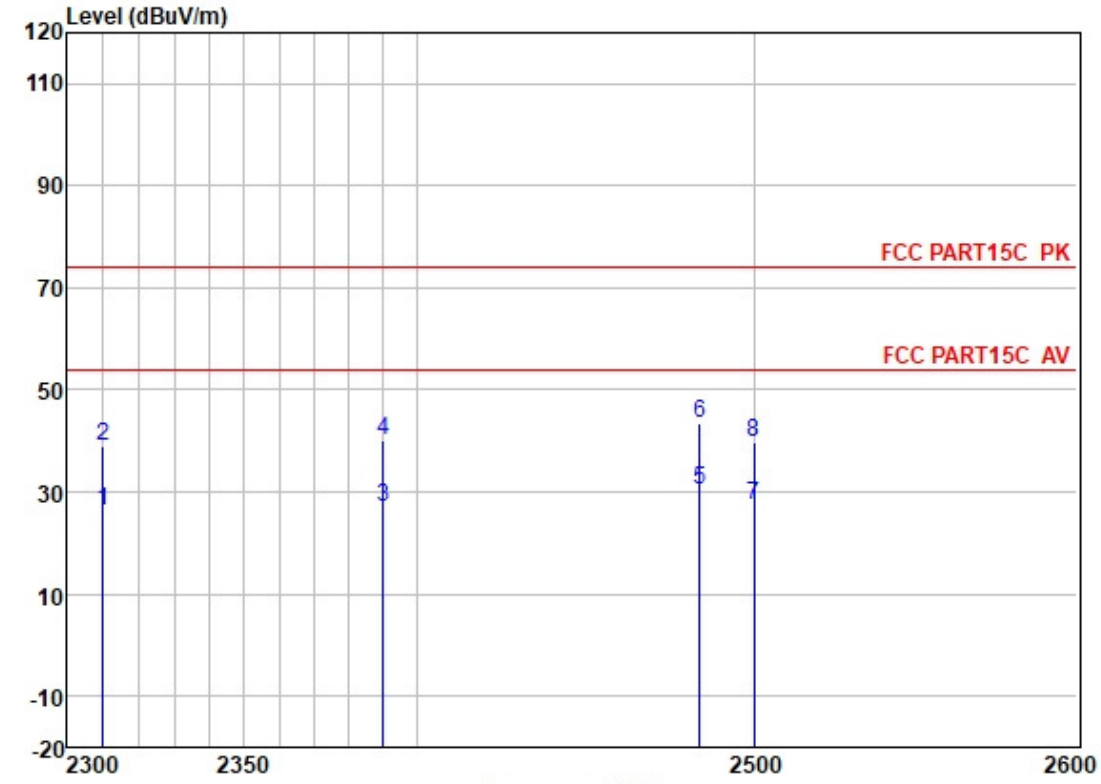
Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:High



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	32.61	27.15	3.32	36.94	26.14	54.00	-27.86	VERTICAL	Average
2	2310.000	45.32	27.15	3.32	36.94	38.85	74.00	-35.15	VERTICAL	Peak
3	2390.000	33.31	27.33	3.48	36.92	27.20	54.00	-26.80	VERTICAL	Average
4	2390.000	46.33	27.33	3.48	36.92	40.22	74.00	-33.78	VERTICAL	Peak
5	2483.500	36.16	27.48	3.53	36.90	30.27	54.00	-23.73	VERTICAL	Average
6	2483.500	49.51	27.48	3.53	36.90	43.62	74.00	-30.38	VERTICAL	Peak
7	2500.000	33.37	27.50	3.40	36.89	27.38	54.00	-26.62	VERTICAL	Average
8	2500.000	45.78	27.50	3.40	36.89	39.79	74.00	-34.21	VERTICAL	Peak

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7.7 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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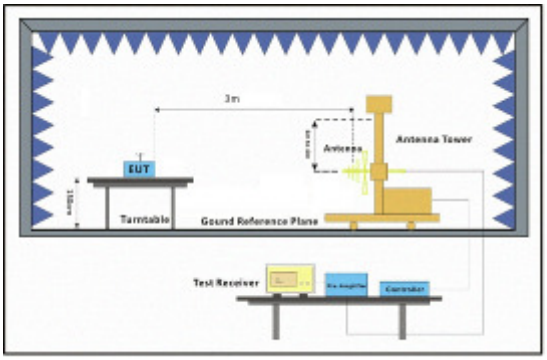
7.7.1 E.U.T. Operation

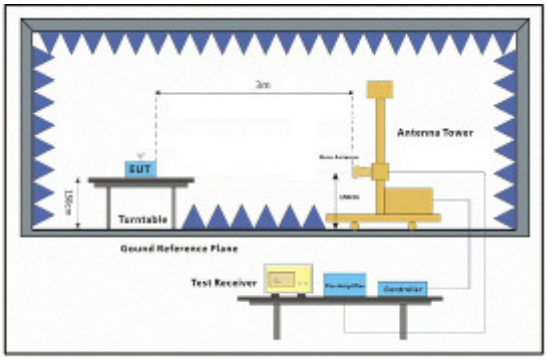
Operating Environment:

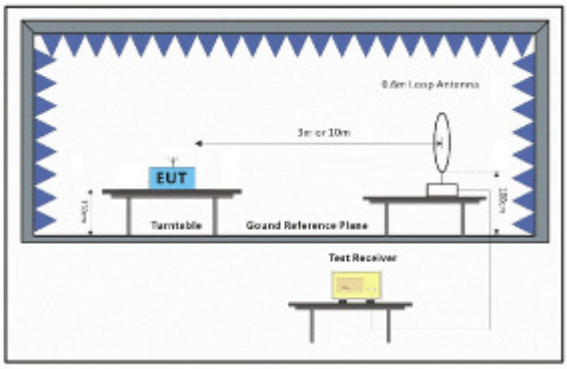
Temperature: 24 °C Humidity: 55.7 % RH Atmospheric Pressure: 1020 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.2 Test Setup Diagram







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7.7.3 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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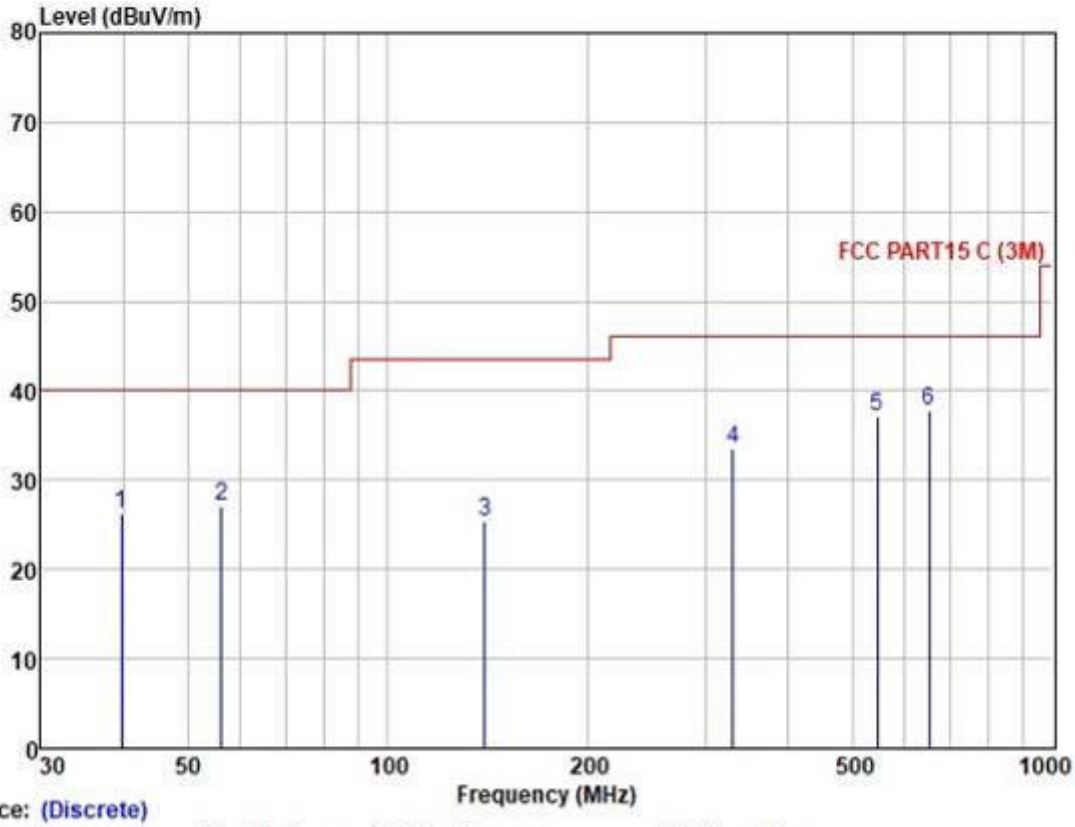
Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



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	39.715	37.33	11.89	0.70	23.65	26.27	40.00	-13.73	HORIZONTAL	QP
2	56.197	39.40	11.98	0.82	25.12	27.08	40.00	-12.92	HORIZONTAL	QP
3	139.851	39.16	13.00	1.35	28.16	25.35	43.50	-18.15	HORIZONTAL	QP
4	330.195	46.93	13.81	2.10	29.42	33.42	46.00	-12.58	HORIZONTAL	QP
5	545.183	45.28	18.71	2.78	29.67	37.10	46.00	-8.90	HORIZONTAL	QP
6	651.942	42.99	20.46	3.09	28.84	37.70	46.00	-8.30	HORIZONTAL	QP

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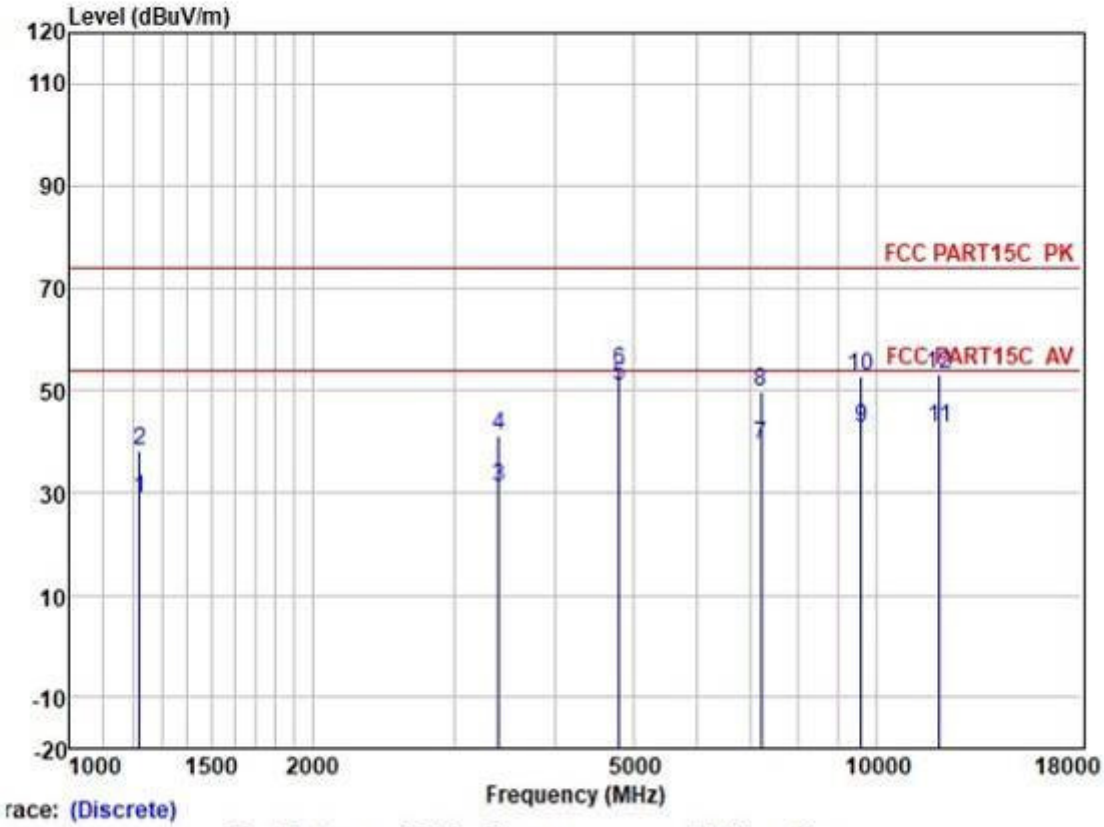
Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



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	1220.714	39.25	24.82	2.32	37.34	29.05	54.00	-24.95	HORIZONTAL	Average
2	1220.714	48.55	24.82	2.32	37.34	38.35	74.00	-35.65	HORIZONTAL	Peak
3	3405.929	34.78	28.85	4.11	36.47	31.27	54.00	-22.73	HORIZONTAL	Average
4	3405.929	44.91	28.85	4.11	36.47	41.40	74.00	-32.60	HORIZONTAL	Peak
5	4804.691	50.63	31.42	5.40	36.48	50.97	54.00	-3.03	HORIZONTAL	Average
6	4804.691	53.75	31.42	5.40	36.48	54.09	74.00	-19.91	HORIZONTAL	Peak
7	7206.122	34.69	35.54	5.98	36.75	39.46	54.00	-14.54	HORIZONTAL	Average
8	7206.122	44.94	35.54	5.98	36.75	49.71	74.00	-24.29	HORIZONTAL	Peak
9	9608.497	33.62	38.37	7.07	36.36	42.70	54.00	-11.30	HORIZONTAL	Average
10	9608.497	43.54	38.37	7.07	36.36	52.62	74.00	-21.38	HORIZONTAL	Peak
11	12010.220	32.06	38.90	8.19	36.40	42.75	54.00	-11.25	HORIZONTAL	Average
12	12010.220	42.57	38.90	8.19	36.40	53.26	74.00	-20.74	HORIZONTAL	Peak

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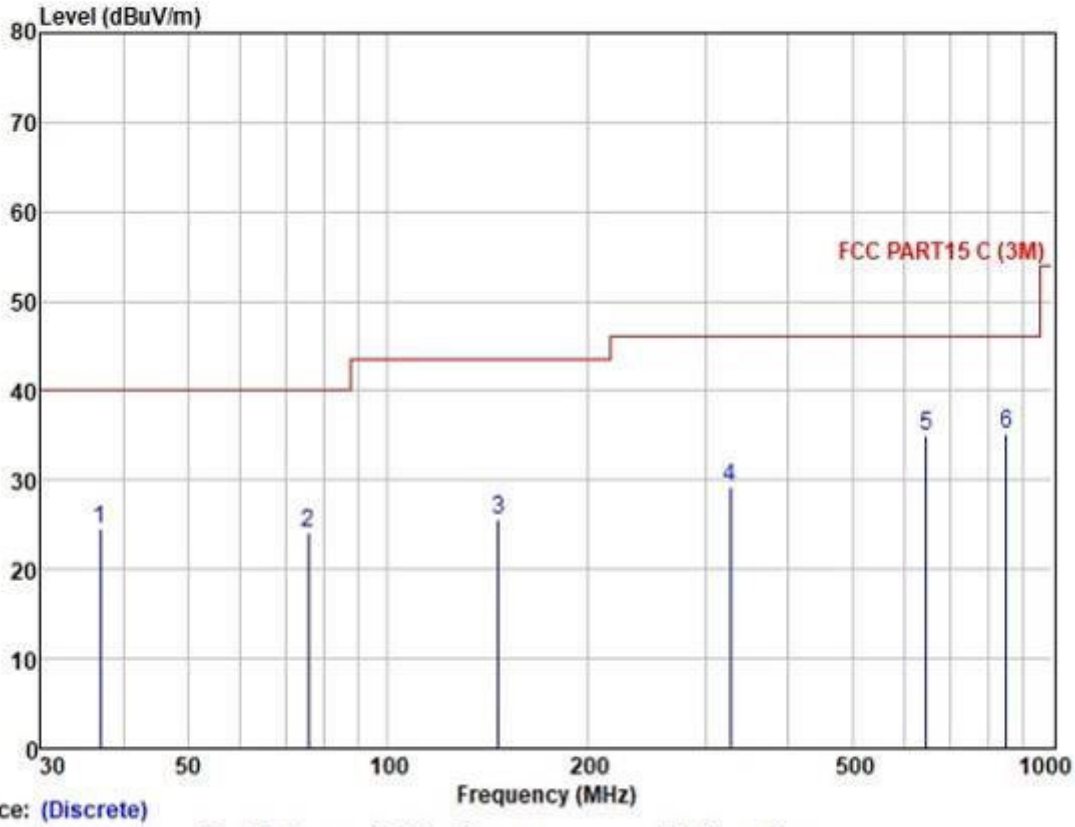

race: (Discrete)

	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	36.895	35.08	11.75	0.70	23.04	24.49	40.00	-15.51	VERTICAL	QP
2	75.977	40.26	8.76	1.00	25.84	24.18	40.00	-15.82	VERTICAL	QP
3	146.374	39.34	13.00	1.39	28.14	25.59	43.50	-17.91	VERTICAL	QP
4	327.887	42.81	13.75	2.10	29.40	29.26	46.00	-16.74	VERTICAL	QP
5	645.120	40.43	20.37	3.05	28.88	34.97	46.00	-11.03	VERTICAL	QP
6	851.035	37.07	23.10	3.54	28.46	35.25	46.00	-10.75	VERTICAL	QP

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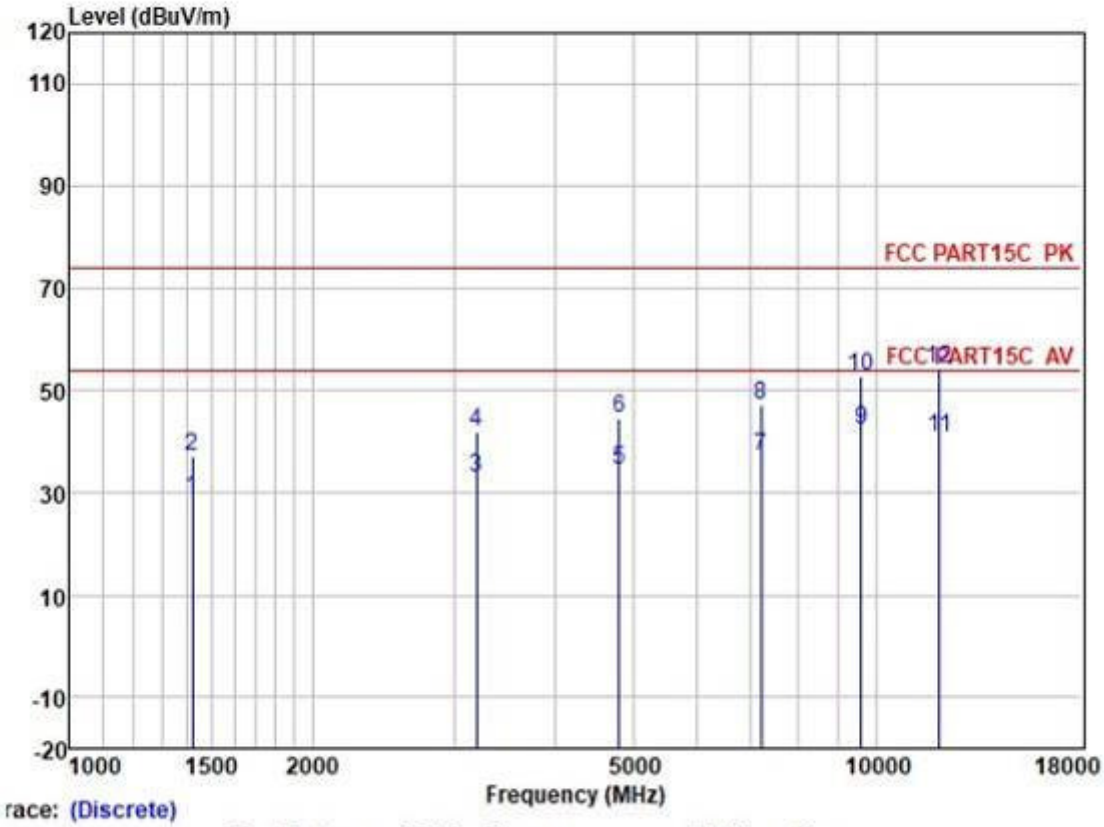

race: (Discrete)

	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	1418.692	37.94	25.42	2.63	37.19	28.80	54.00	-25.20	VERTICAL	Average
2	1418.692	46.43	25.42	2.63	37.19	37.29	74.00	-36.71	VERTICAL	Peak
3	3196.094	36.93	28.58	4.00	36.51	33.00	54.00	-21.00	VERTICAL	Average
4	3196.094	45.85	28.58	4.00	36.51	41.92	74.00	-32.08	VERTICAL	Peak
5	4804.999	34.18	31.42	5.40	36.48	34.52	54.00	-19.48	VERTICAL	Average
6	4804.999	44.41	31.42	5.40	36.48	44.75	74.00	-29.25	VERTICAL	Peak
7	7206.207	32.20	35.54	5.98	36.75	36.97	54.00	-17.03	VERTICAL	Average
8	7206.207	42.29	35.54	5.98	36.75	47.06	74.00	-26.94	VERTICAL	Peak
9	9608.880	33.42	38.37	7.07	36.36	42.50	54.00	-11.50	VERTICAL	Average
10	9608.880	43.82	38.37	7.07	36.36	52.90	74.00	-21.10	VERTICAL	Peak
11	12010.700	30.28	38.90	8.19	36.40	40.97	54.00	-13.03	VERTICAL	Average
12	12010.700	43.47	38.90	8.19	36.40	54.16	74.00	-19.84	VERTICAL	Peak

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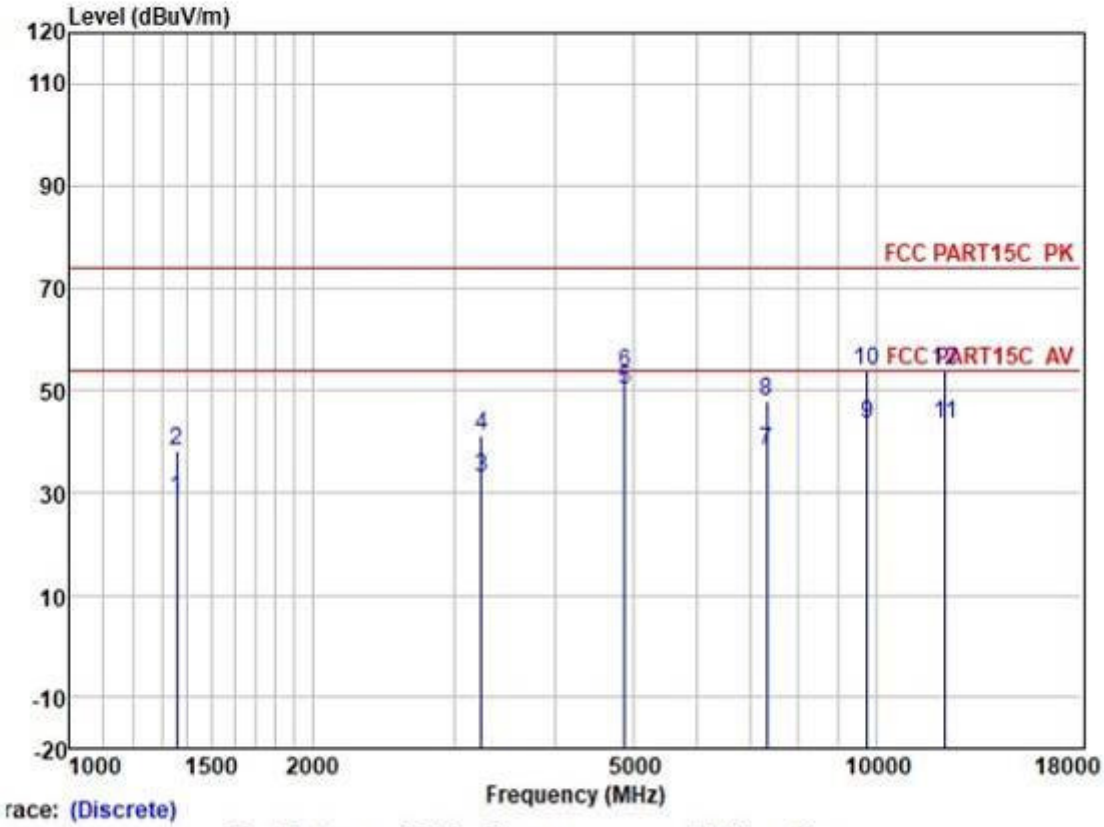

race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1358.498	38.28	25.33	2.60	37.26	28.95	54.00	-25.05	HORIZONTAL	Average
2	1358.498	47.44	25.33	2.60	37.26	38.11	74.00	-35.89	HORIZONTAL	Peak
3	3242.619	36.87	28.67	4.02	36.50	33.06	54.00	-20.94	HORIZONTAL	Average
4	3242.619	45.14	28.67	4.02	36.50	41.33	74.00	-32.67	HORIZONTAL	Peak
5	4881.925	49.55	31.56	5.52	36.50	50.13	54.00	-3.87	HORIZONTAL	Average
6	4881.925	52.79	31.56	5.52	36.50	53.37	74.00	-20.63	HORIZONTAL	Peak
7	7326.516	32.69	36.00	6.13	36.76	38.06	54.00	-15.94	HORIZONTAL	Average
8	7326.516	42.52	36.00	6.13	36.76	47.89	74.00	-26.11	HORIZONTAL	Peak
9	9768.149	34.17	38.53	7.01	36.33	43.38	54.00	-10.62	HORIZONTAL	Average
10	9768.149	44.81	38.53	7.01	36.33	54.02	74.00	-19.98	HORIZONTAL	Peak
11	12210.390	33.02	38.74	8.08	36.30	43.54	54.00	-10.46	HORIZONTAL	Average
12	12210.390	43.43	38.74	8.08	36.30	53.95	74.00	-20.05	HORIZONTAL	Peak

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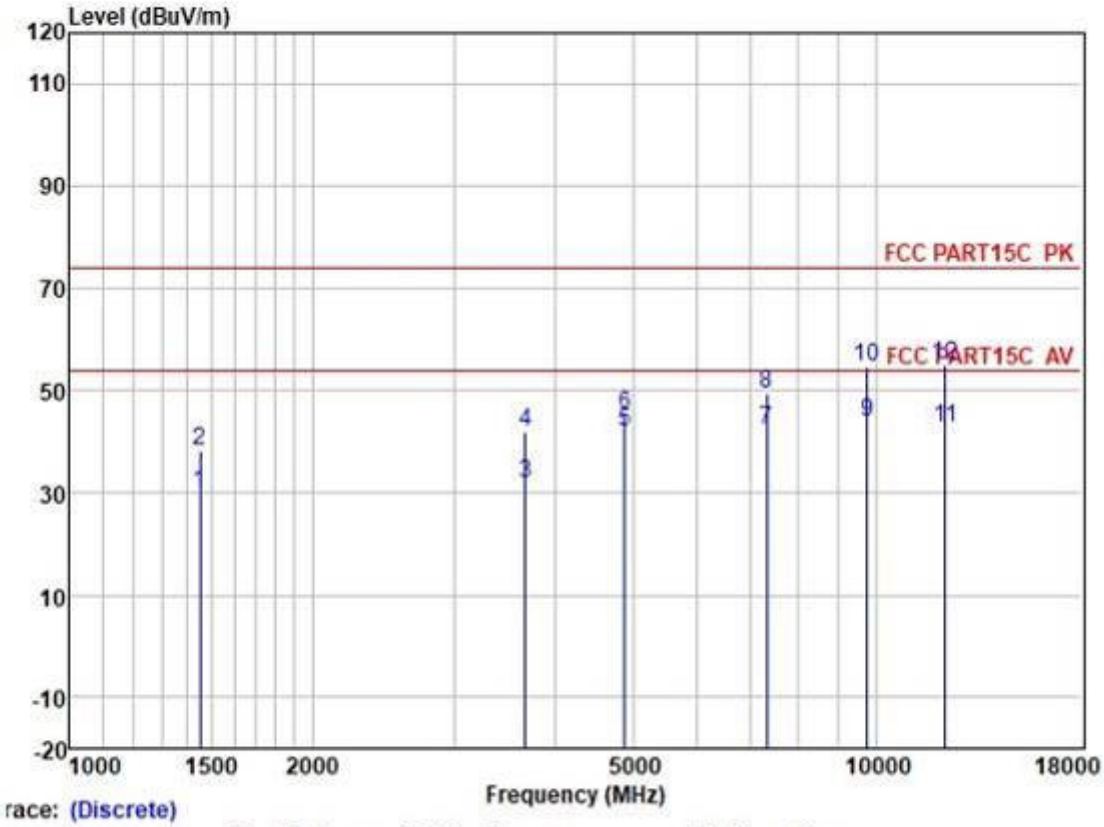

race: (Discrete)

	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	1451.878	38.96	25.45	2.71	37.15	29.97	54.00	-24.03	VERTICAL	Average
2	1451.878	47.21	25.45	2.71	37.15	38.22	74.00	-35.78	VERTICAL	Peak
3	3671.746	34.76	29.17	4.54	36.43	32.04	54.00	-21.96	VERTICAL	Average
4	3671.746	44.55	29.17	4.54	36.43	41.83	74.00	-32.17	VERTICAL	Peak
5	4884.016	41.49	31.56	5.52	36.50	42.07	54.00	-11.93	VERTICAL	Average
6	4884.016	44.76	31.56	5.52	36.50	45.34	74.00	-28.66	VERTICAL	Peak
7	7326.741	36.96	36.00	6.13	36.76	42.33	54.00	-11.67	VERTICAL	Average
8	7326.741	44.17	36.00	6.13	36.76	49.54	74.00	-24.46	VERTICAL	Peak
9	9768.580	34.81	38.53	7.01	36.33	44.02	54.00	-9.98	VERTICAL	Average
10	9768.580	45.44	38.53	7.01	36.33	54.65	74.00	-19.35	VERTICAL	Peak
11	12210.540	32.10	38.74	8.08	36.30	42.62	54.00	-11.38	VERTICAL	Average
12	12210.540	44.38	38.74	8.08	36.30	54.90	74.00	-19.10	VERTICAL	Peak

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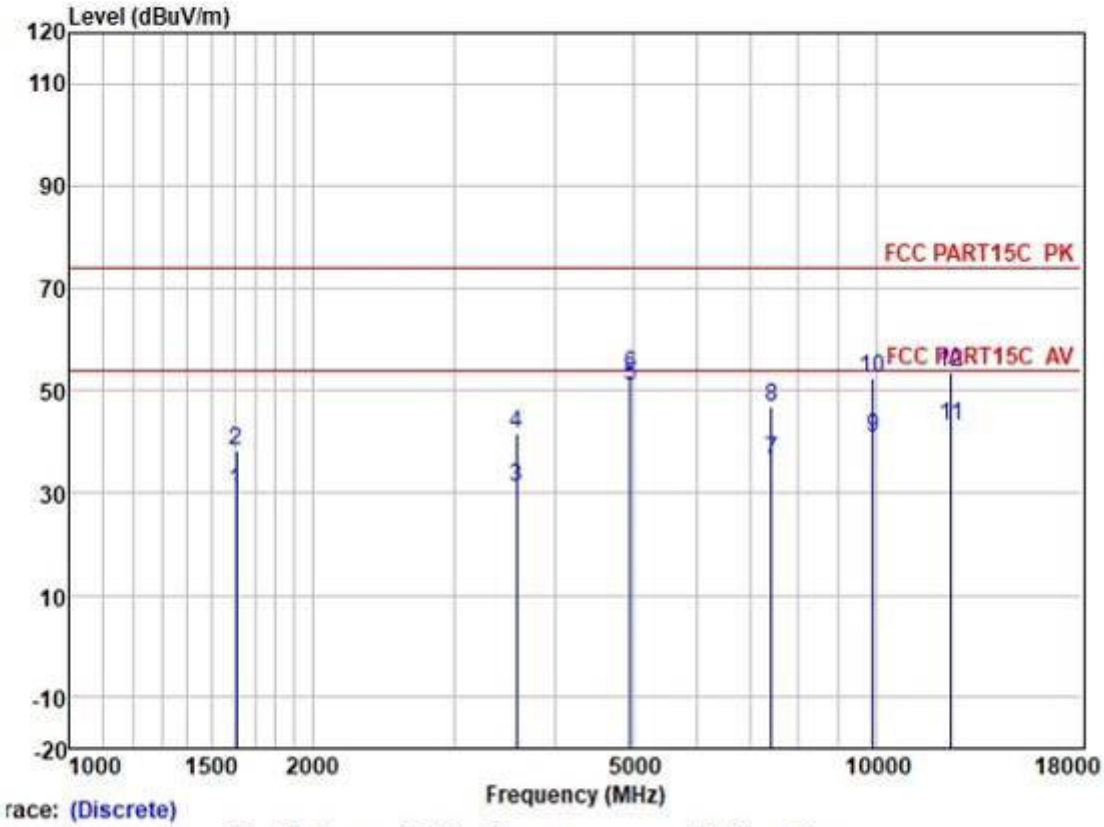

race: (Discrete)

	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	1611.091	38.96	25.59	2.80	37.07	30.28	54.00	-23.72	HORIZONTAL	Average
2	1611.091	47.01	25.59	2.80	37.07	38.33	74.00	-35.67	HORIZONTAL	Peak
3	3587.818	34.16	29.02	4.49	36.44	31.23	54.00	-22.77	HORIZONTAL	Average
4	3587.818	44.54	29.02	4.49	36.44	41.61	74.00	-32.39	HORIZONTAL	Peak
5	4957.970	50.00	31.65	5.65	36.51	50.79	54.00	-3.21	HORIZONTAL	Average
6	4957.970	52.41	31.65	5.65	36.51	53.20	74.00	-20.80	HORIZONTAL	Peak
7	7440.654	30.56	36.27	6.22	36.77	36.28	54.00	-17.72	HORIZONTAL	Average
8	7440.654	40.97	36.27	6.22	36.77	46.69	74.00	-27.31	HORIZONTAL	Peak
9	9920.540	31.69	38.65	6.96	36.31	40.99	54.00	-13.01	HORIZONTAL	Average
10	9920.540	43.27	38.65	6.96	36.31	52.57	74.00	-21.43	HORIZONTAL	Peak
11	12400.420	32.82	38.57	7.97	36.17	43.19	54.00	-10.81	HORIZONTAL	Average
12	12400.420	43.24	38.57	7.97	36.17	53.61	74.00	-20.39	HORIZONTAL	Peak

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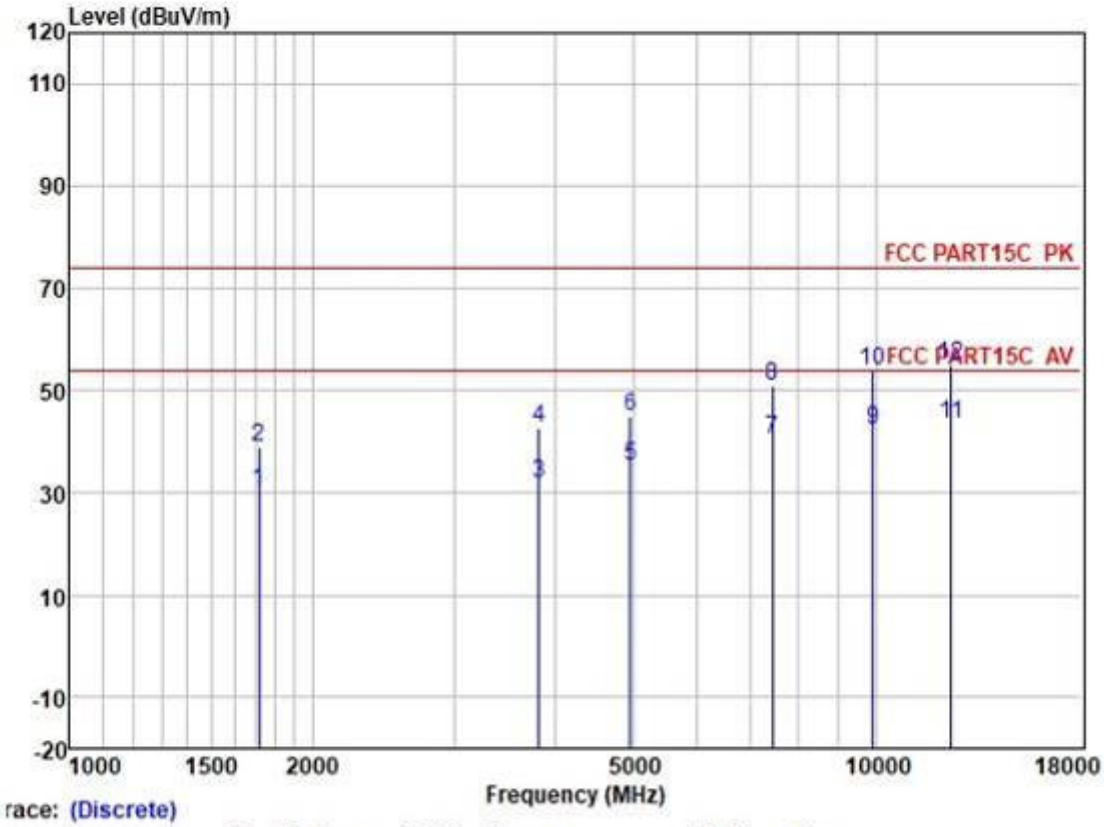

race: (Discrete)

	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	1716.864	38.94	25.76	2.82	37.04	30.48	54.00	-23.52	VERTICAL	Average
2	1716.864	47.44	25.76	2.82	37.04	38.98	74.00	-35.02	VERTICAL	Peak
3	3823.371	33.99	29.57	4.60	36.41	31.75	54.00	-22.25	VERTICAL	Average
4	3823.371	44.86	29.57	4.60	36.41	42.62	74.00	-31.38	VERTICAL	Peak
5	4960.887	34.29	31.65	5.65	36.52	35.07	54.00	-18.93	VERTICAL	Average
6	4960.887	44.36	31.65	5.65	36.52	45.14	74.00	-28.86	VERTICAL	Peak
7	7440.914	34.86	36.27	6.22	36.77	40.58	54.00	-13.42	VERTICAL	Average
8	7440.914	45.18	36.27	6.22	36.77	50.90	74.00	-23.10	VERTICAL	Peak
9	9920.789	33.08	38.65	6.96	36.31	42.38	54.00	-11.62	VERTICAL	Average
10	9920.789	44.48	38.65	6.96	36.31	53.78	74.00	-20.22	VERTICAL	Peak
11	12400.130	33.09	38.57	7.97	36.17	43.46	54.00	-10.54	VERTICAL	Average
12	12400.130	44.81	38.57	7.97	36.17	55.18	74.00	-18.82	VERTICAL	Peak

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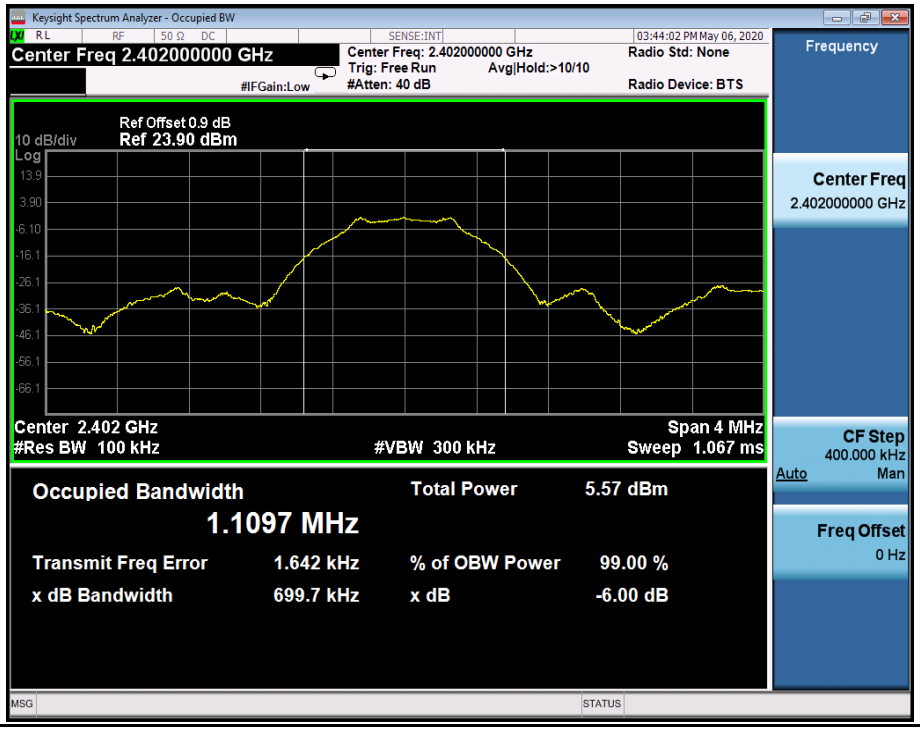
8 Appendix

8.1 Appendix 15.247

1.6dB Bandwidth

Test Mode	Test Channel	Ant	OBW[MHz]	EBW[MHz]	Limit	Verdict
BLE	2402	Ant1	1.1097	0.6997	0.5	PASS
BLE	2442	Ant1	1.0866	0.6918	0.5	PASS
BLE	2480	Ant1	1.0756	0.6769	0.5	PASS

TEST PLOT
6dB Bandwidth_BLE_2402_Ant1



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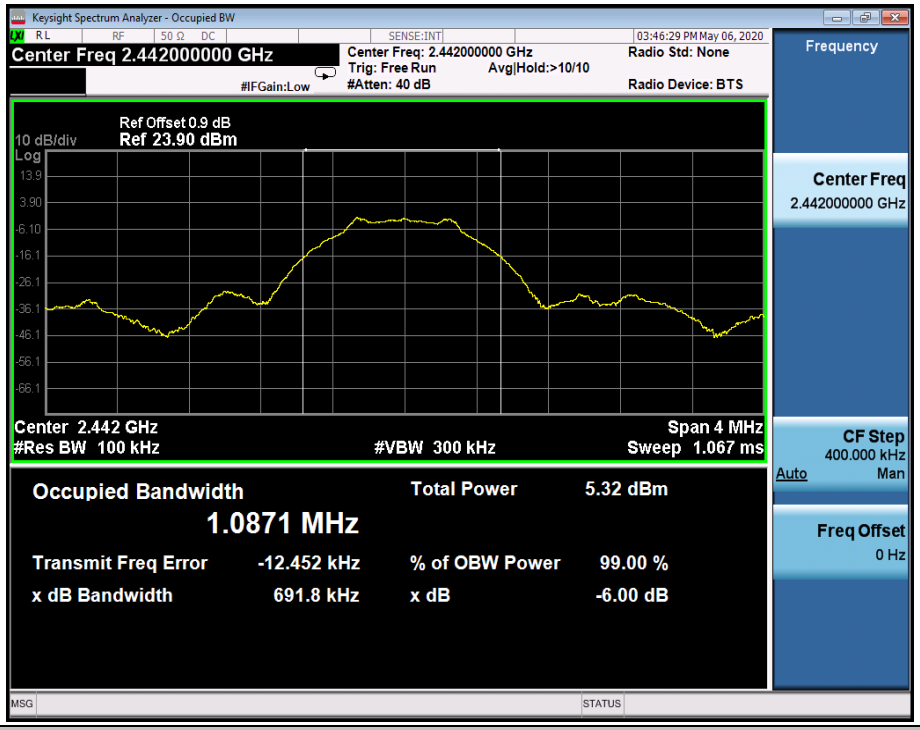
6dB Bandwidth_BLE_2442_Ant1



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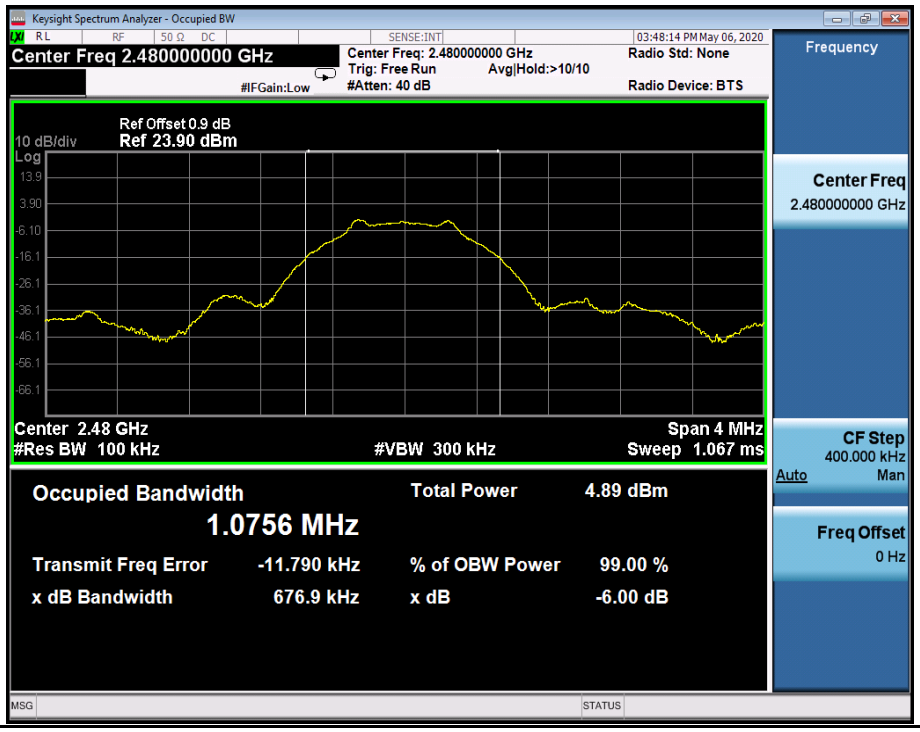

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2.Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	-0.901	30	PASS
BLE	2442	Ant1	-1.142	30	PASS
BLE	2480	Ant1	-1.606	30	PASS

TEST PLOT

Maximum peak conducted output power_BLE_2402_Ant1

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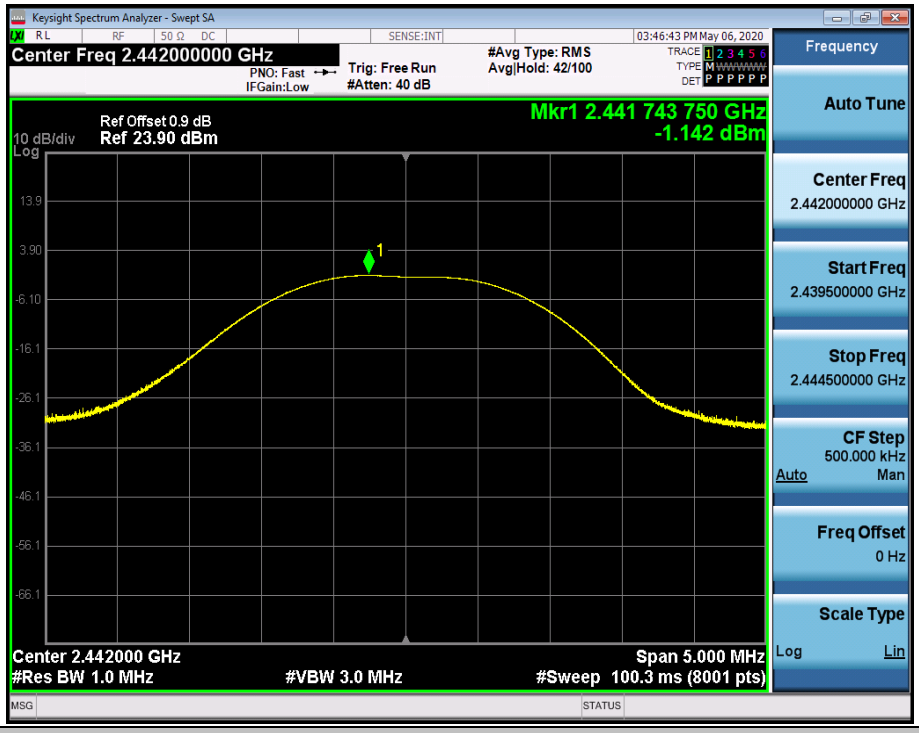
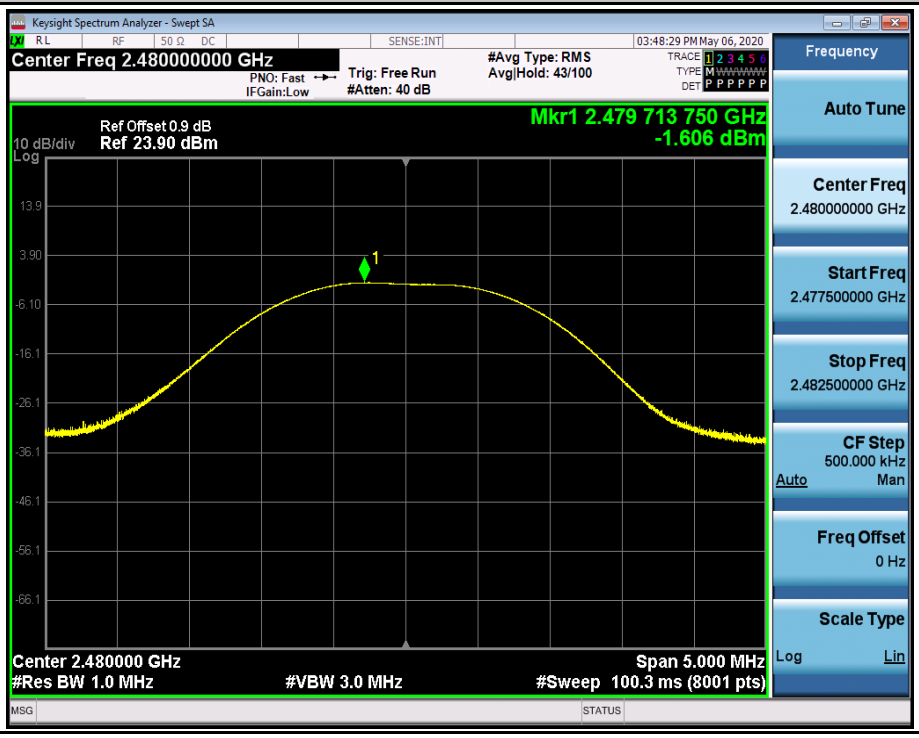
Maximum peak conducted output power_BLE_2442_Ant1



Maximum peak conducted output power_BLE_2480_Ant1



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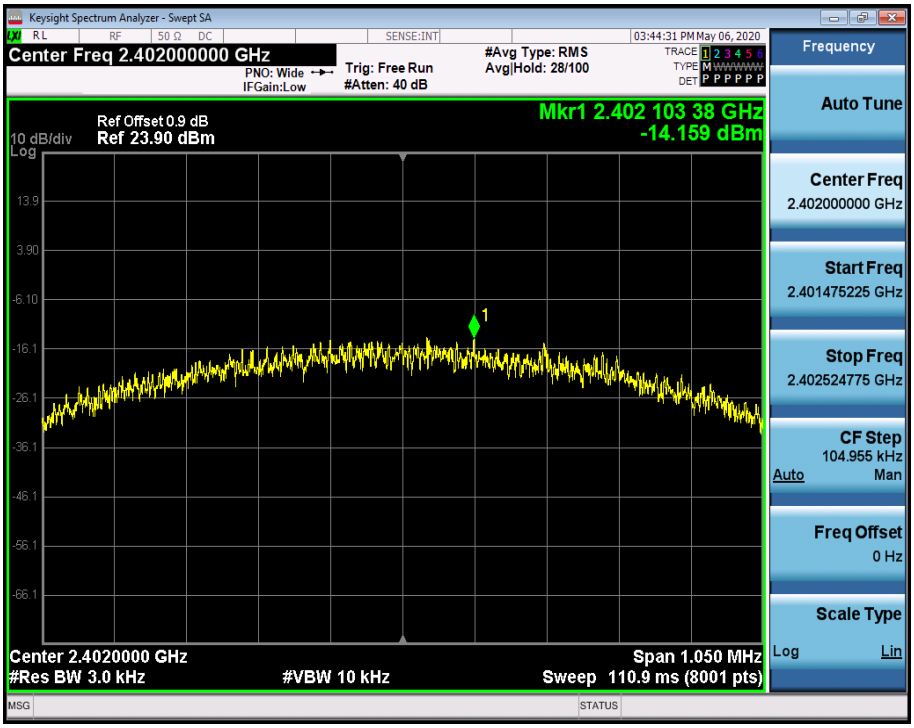
3.Maximum Peak power spectral density

Test Mode	Test Channel	Ant	Result	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-14.159	8.00	PASS
BLE	2442	Ant1	-13.67	8.00	PASS
BLE	2480	Ant1	-14.431	8.00	PASS

TEST PLOT

Maximum Peak power spectral density_BLE_2402_Ant1



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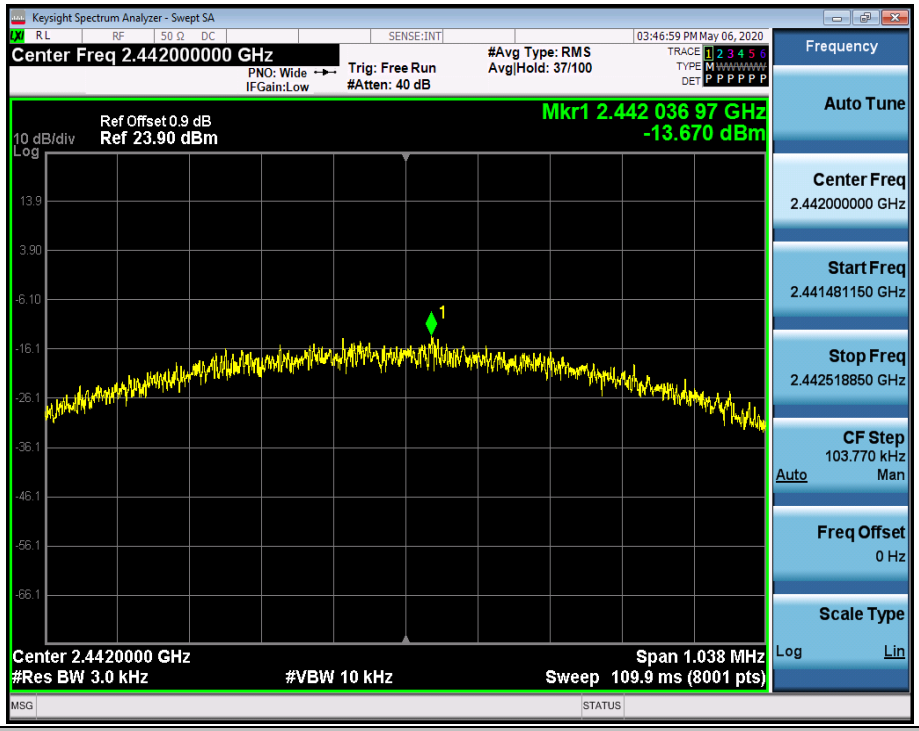
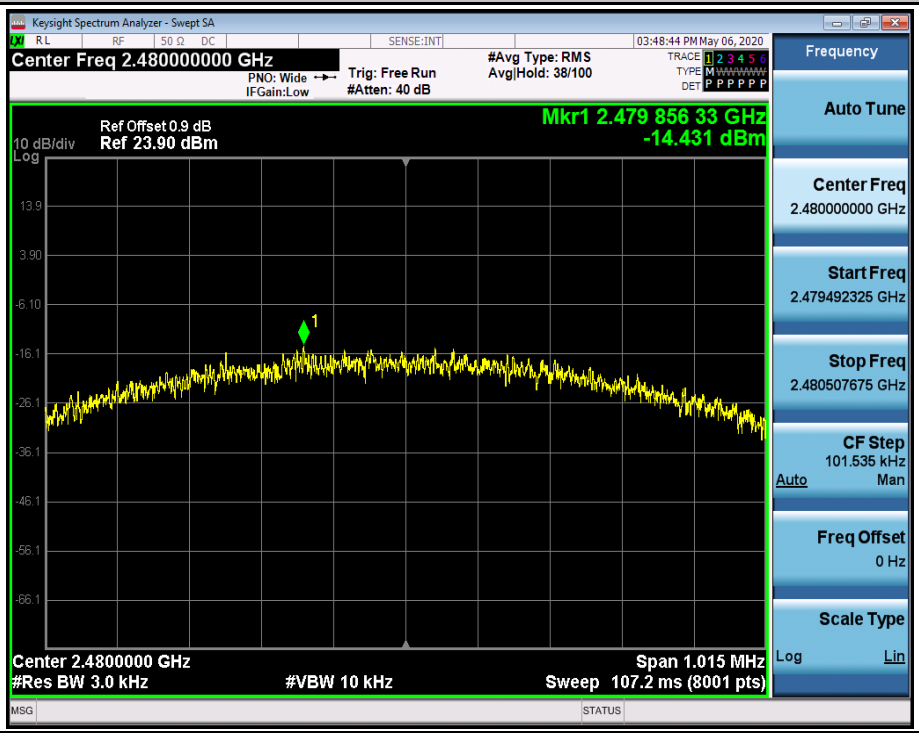
Maximum Peak power spectral density_BLE_2442_Ant1



Maximum Peak power spectral density_BLE_2480_Ant1



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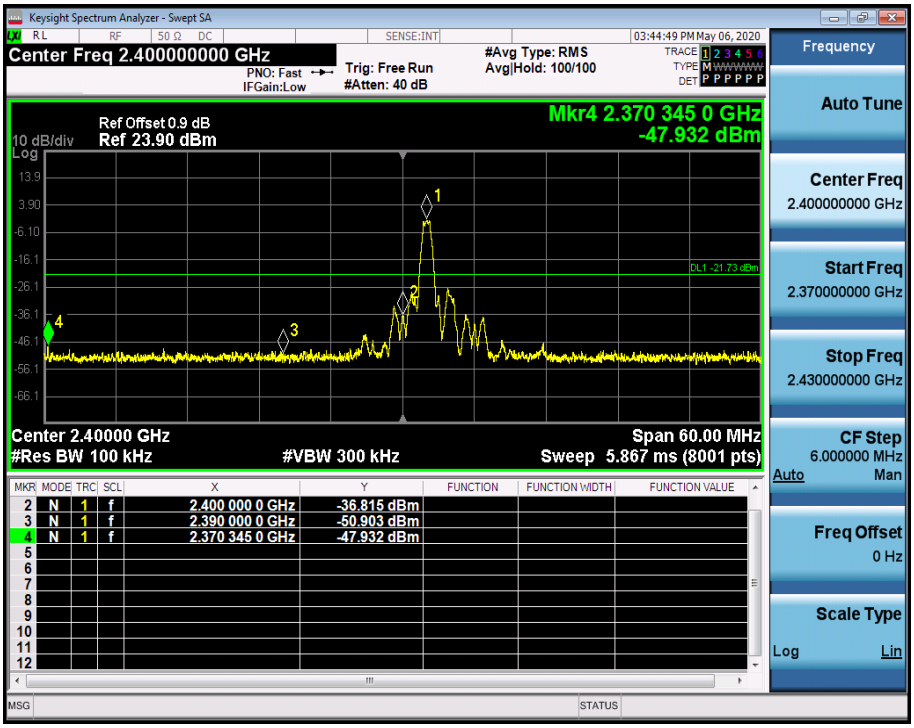
4.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	-1.732	-47.932	-21.73	PASS
BLE	2480	Ant1	-2.436	-47.412	-22.44	PASS

TEST PLOT

Band-edge for RF Conducted Emissions_BLE_2402_Ant1



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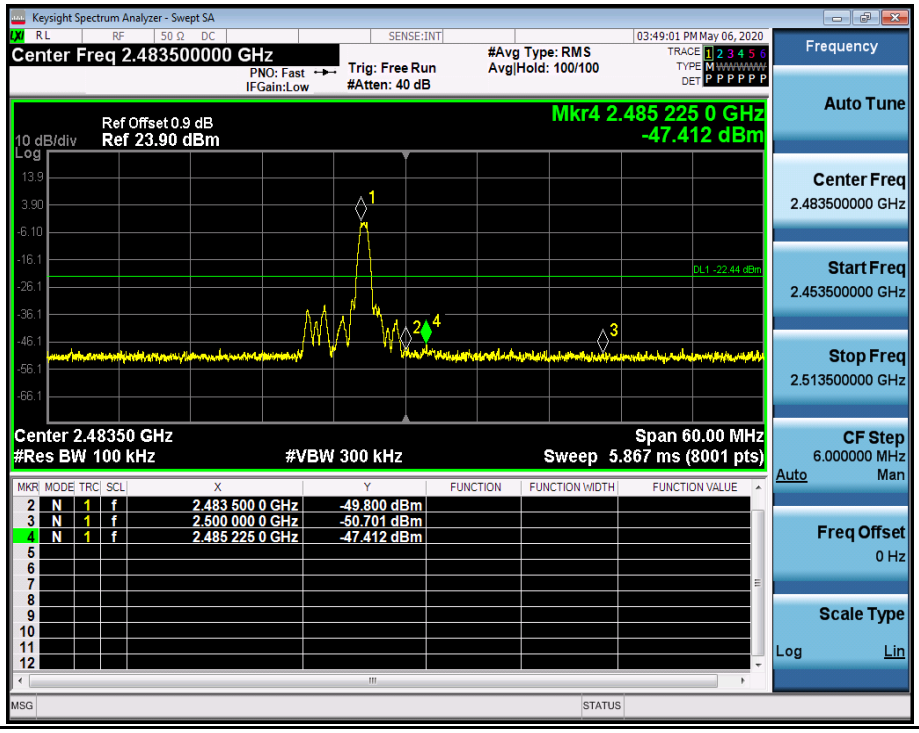
Band-edge for RF Conducted Emissions_BLE_2480_Ant1



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5.RF Conducted Spurious Emissions

Test Mode	Test Channel	Ant	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	30	10000	100	300	-1.113	-54.576	<-21.113	PASS
BLE	2402	Ant1	10000	26000	100	300	-1.113	-51.986	<-21.113	PASS
BLE	2442	Ant1	30	10000	100	300	-1.619	-54.266	<-21.619	PASS
BLE	2442	Ant1	10000	26000	100	300	-1.619	-52.066	<-21.619	PASS
BLE	2480	Ant1	30	10000	100	300	-2.058	-54.442	<-22.058	PASS
BLE	2480	Ant1	10000	26000	100	300	-2.058	-52.127	<-22.058	PASS

TEST PLOT

RF Conducted Spurious Emissions_BLE_2402_Ant1

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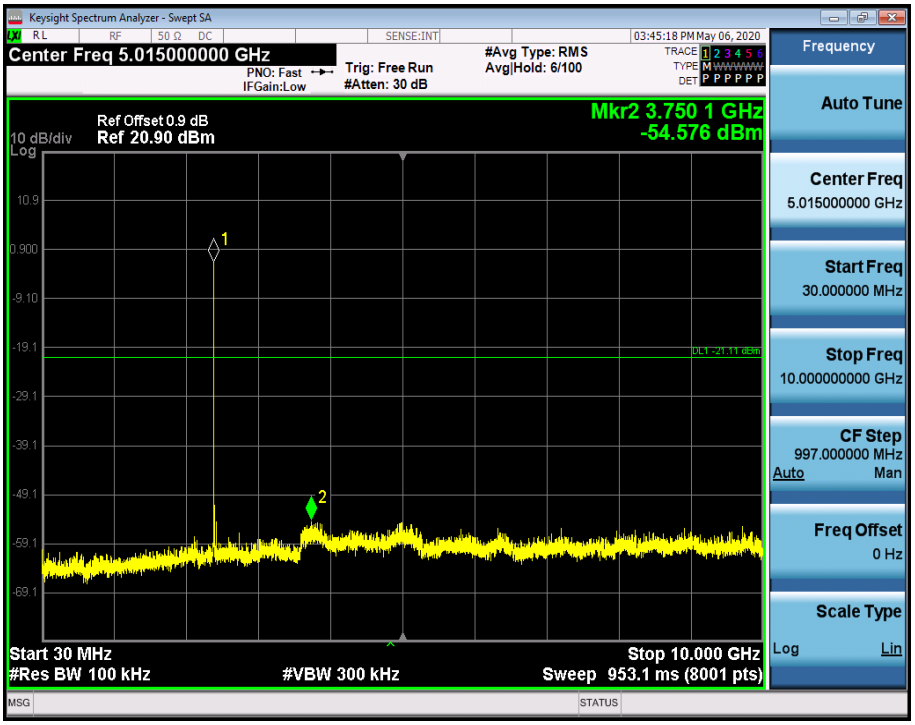
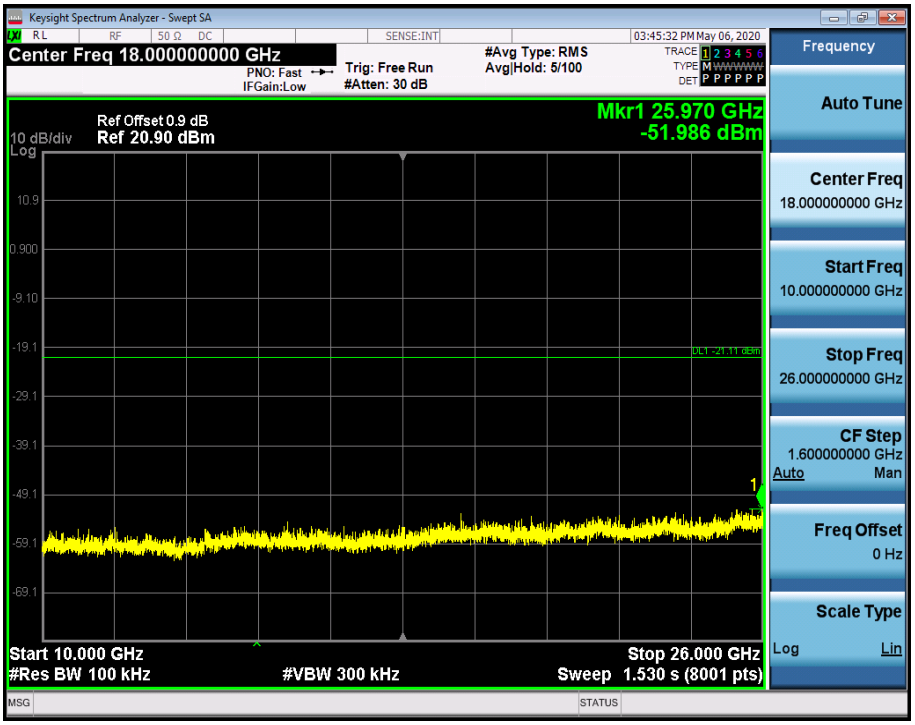
CSE_1	
CSE_2	

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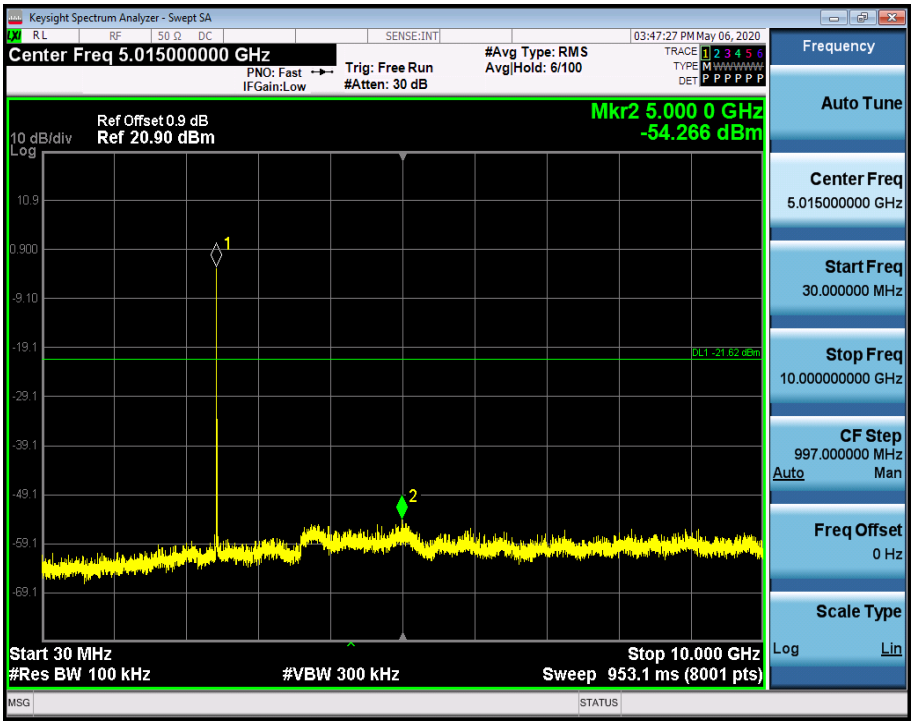
CSE_1	

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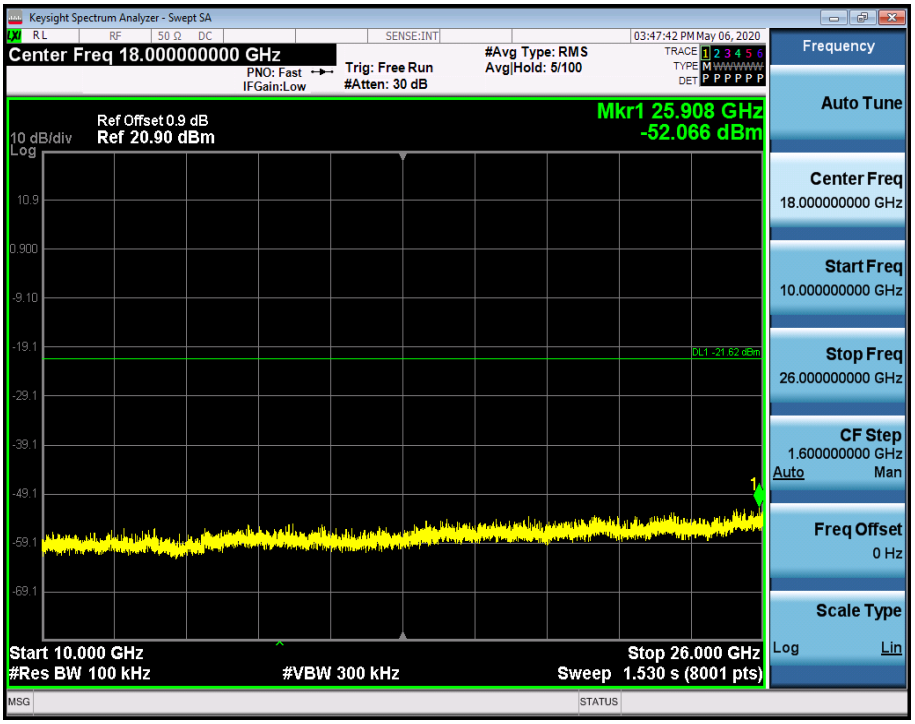
CSE_2	
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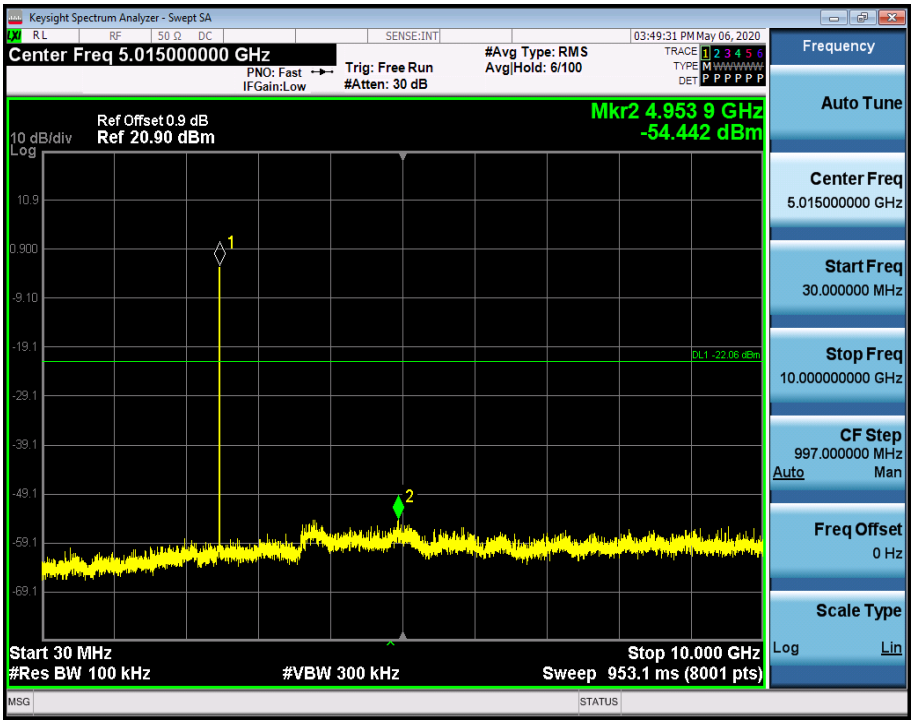
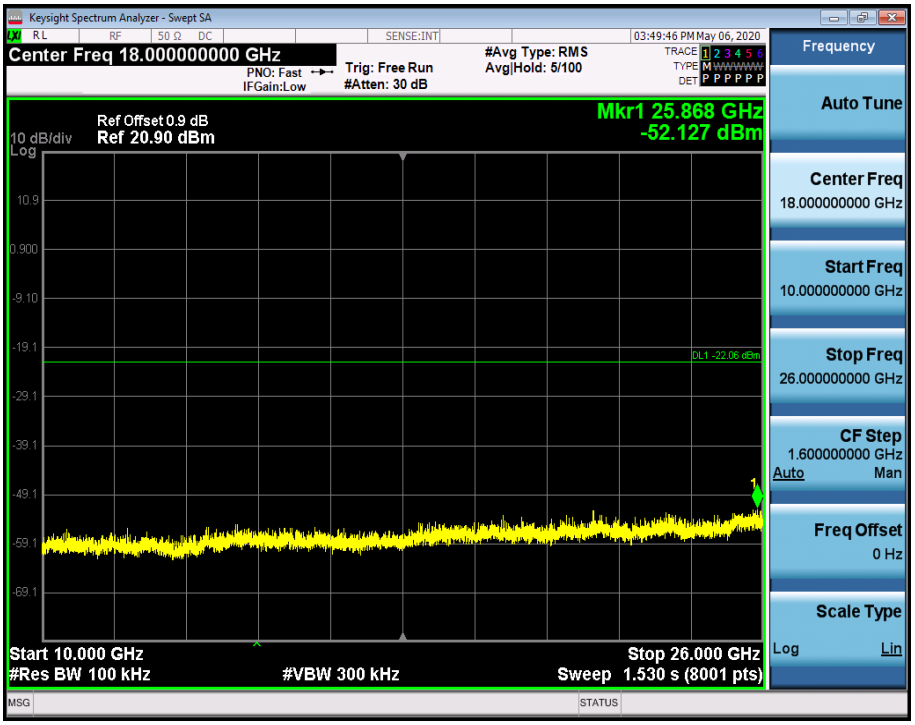
CSE_1	
CSE_2	

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