TEST REPORT

Application No.:	GZEM2101000206CR
Applicant:	R.F.E. ASIA PACIFIC LTD
Address of Applicant:	Room 2608 - 2609, 1 Hung To Road, Kwun Tong, Hong Kong
Manufacturer:	RFE EUROPA LTD.
Address of Manufacturer:	8 Clarendon Drive, Wymbush, Milton Keynes, MK8 8ED, England, United Kingdom
Factory:	Zhejiang Arcana Power Sports Tech. CO., LTD
Address of Factory:	Nr.618 Xinxing Avenue, Zonghan, Emerging Industrial Area, Cixi, Zhejiang, China, 315301
Equipment Under Test (EUT):	
EUT Name:	Bike
Model No.:	AVUS-10401 C-21 Bike, AVUS-10501 C-21x Bike ♣
♣	Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
Trade mark:	Adidas
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2021-01-12
Date of Test:	2021-01-28 to 2021-02-26
Date of Issue:	2021-03-01
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		*2021-03-01*		*Original*

Authorized for issue by				
Tested By		Jim Li **Jim Li /Project Engineer**		
Reviewed By		Ricky Liu **Ricky Liu/Reviewer**		

2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

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 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
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
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**

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

¤ Declaration of EUT Family Grouping:

Model No.: AVUS-10401 C-21 Bike, AVUS-10501 C-21x Bike

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

Therefore only one model **AVUS-10401 C-21 Bike** was tested in this report.

3 Contents

No.198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 www.sgsgroup.com.cn
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

4 General Information

4.1 Details of E.U.T.

Power supply:	DC10.5V=7 x DC 1.5V "AA" batteries.
Cable(s):	N/A
Function:	Rower with BLE function
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi declared by applicant
Hardware:	EW-BLE-02-V13
Software:	SV01
S/N:	20121400014
Test Software	BTTest.exe
Power Setting	3 dBm can not be changed by user

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Note Book PC	LENOVO	Lenovo Xiaoxinchao 5000	PF0TNMG8

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
Power Spectrum Density	± 2.84dB
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)

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 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 17025:2017, 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

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

4.8 Duty cycle of the EUT

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percent.

Formula:

Duty Cycle = Ton/(Ton+Toff)

Measurement Procedure:

1. Set span = Zero
2. RBW=8MHz
3. VBW=8MHz
4. Detector=Peak

Mode	Channel(MHz)	Duty Cycle(%)	Correction Factor(dB)*
BLE	2402	77.55	1.10
	2440	77.55	1.10
	2480	77.53	1.11

*Correction Factor(dB) =10log(1/Duty Cycle)

Please refer to appendix for details.

5 Equipment List

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

Minimum 6dB 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

Power Spectrum Density					
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**
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

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:

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.

Antenna location: Refer to Internal photos.

7 Radio Spectrum Matter Test Results

7.1 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

7.1.1 E.U.T. Operation

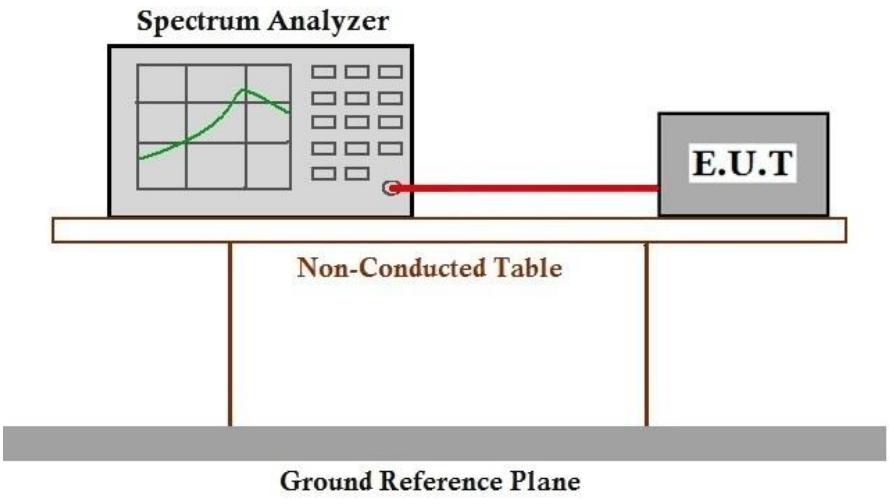
Operating Environment:

Temperature: 25.5 °C Humidity: 47.2 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.2 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

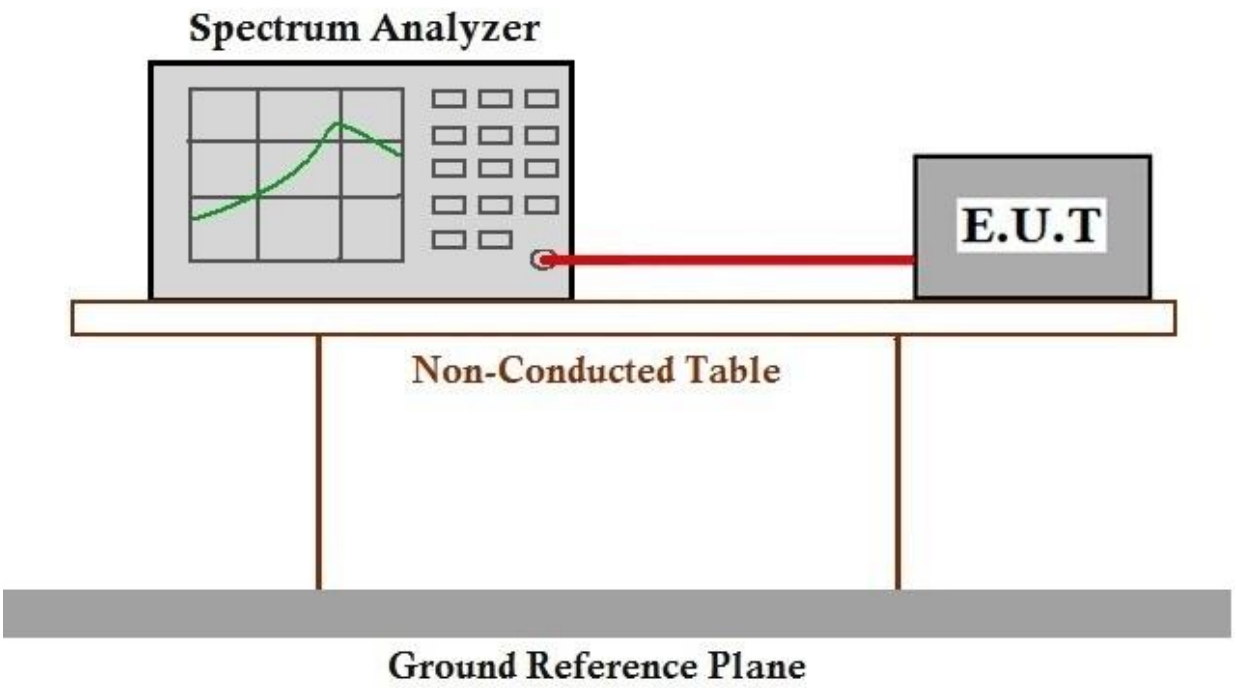
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 25.5 °C Humidity: 47.2 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.3 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

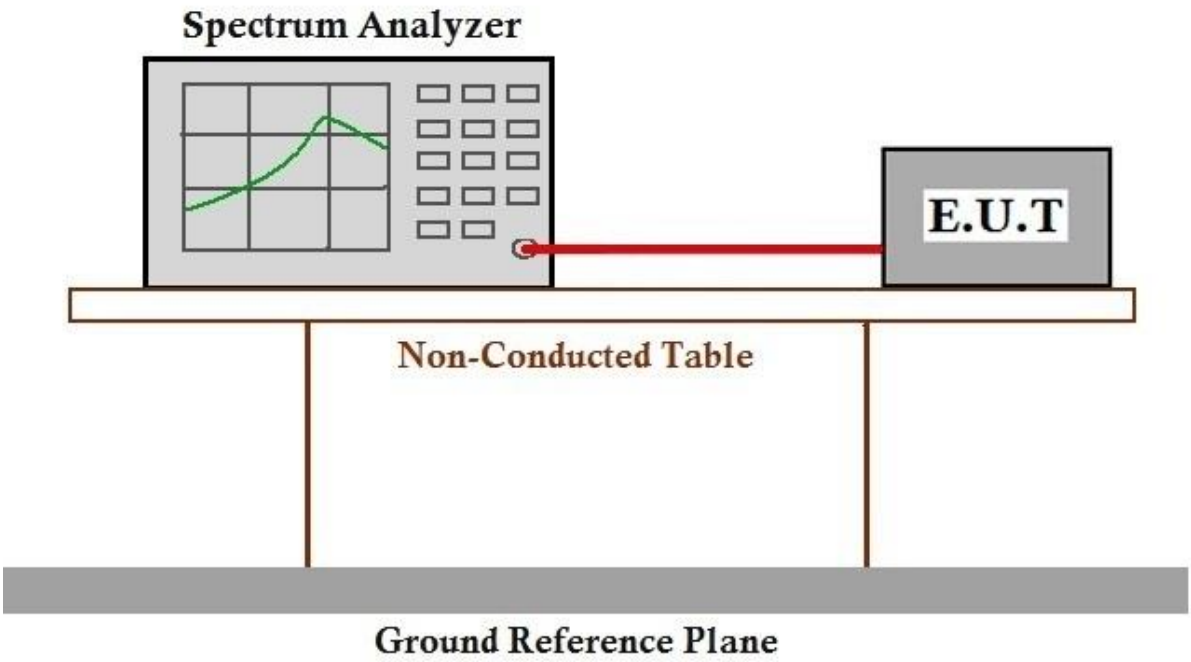
Operating Environment:

Temperature: 25.5 °C Humidity: 47.2 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.4 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).

7.4.1 E.U.T. Operation

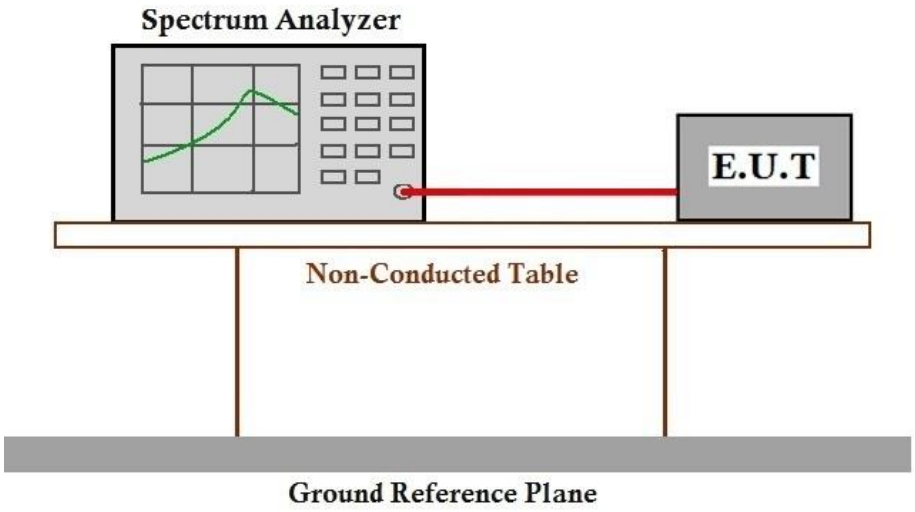
Operating Environment:

Temperature: 25.5 °C Humidity: 47.2 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.5 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).

7.5.1 E.U.T. Operation

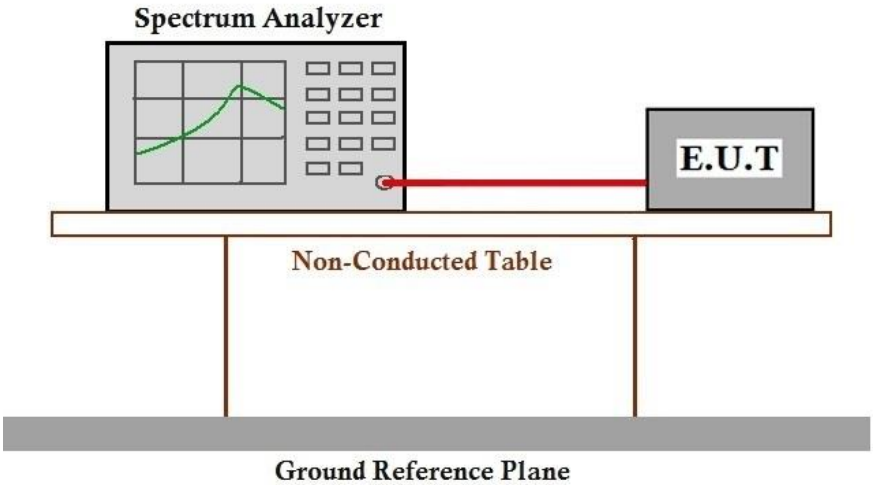
Operating Environment:

Temperature: 25.5 °C Humidity: 47.2 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.6 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.		

7.6.1 E.U.T. Operation

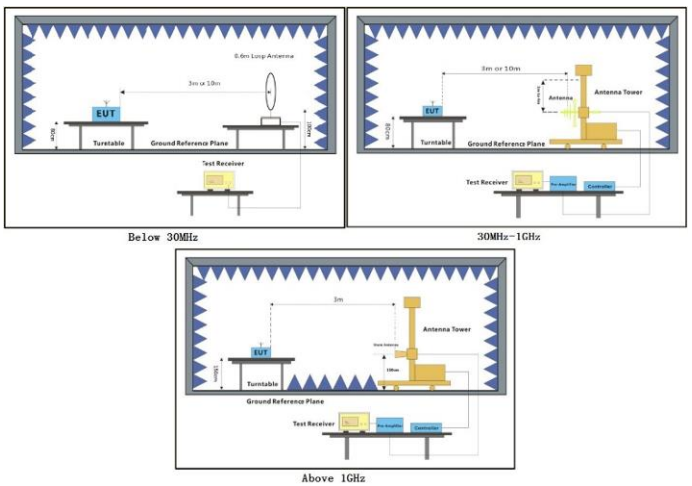
Operating Environment:

Temperature: 24 °C Humidity: 56 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

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

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

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

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

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

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

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

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

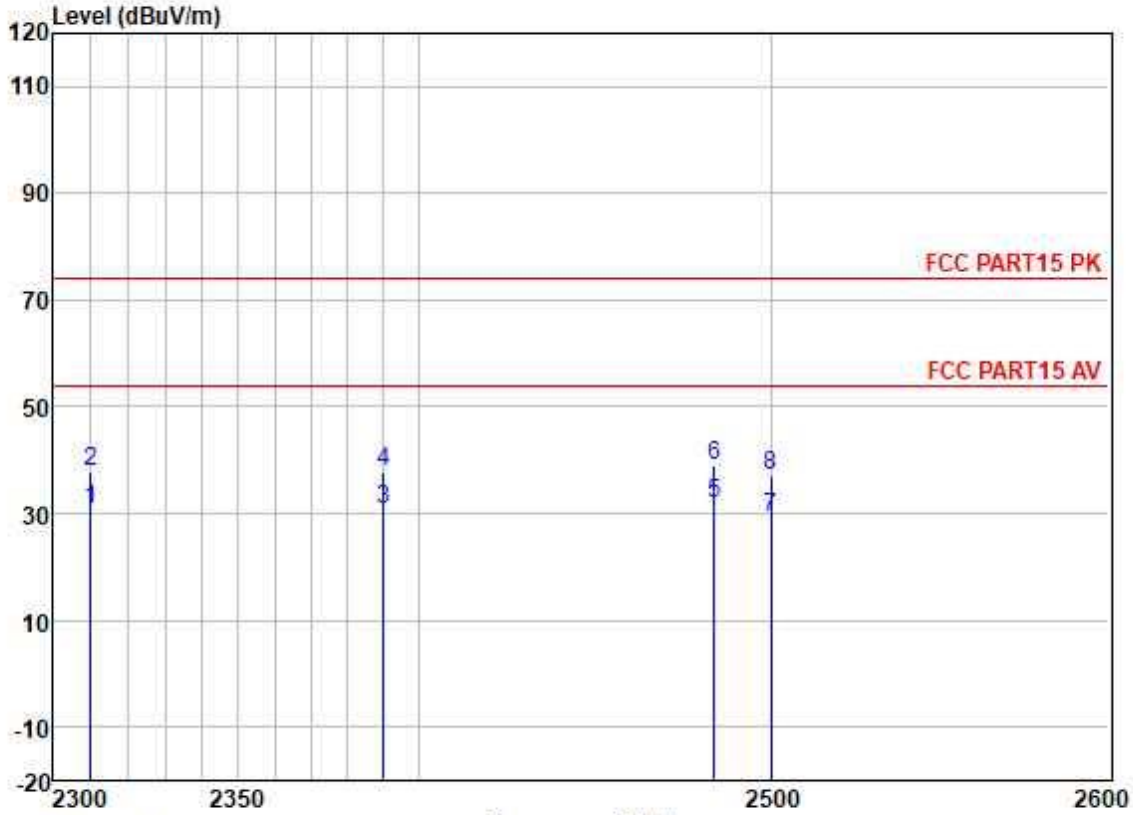
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

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

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

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

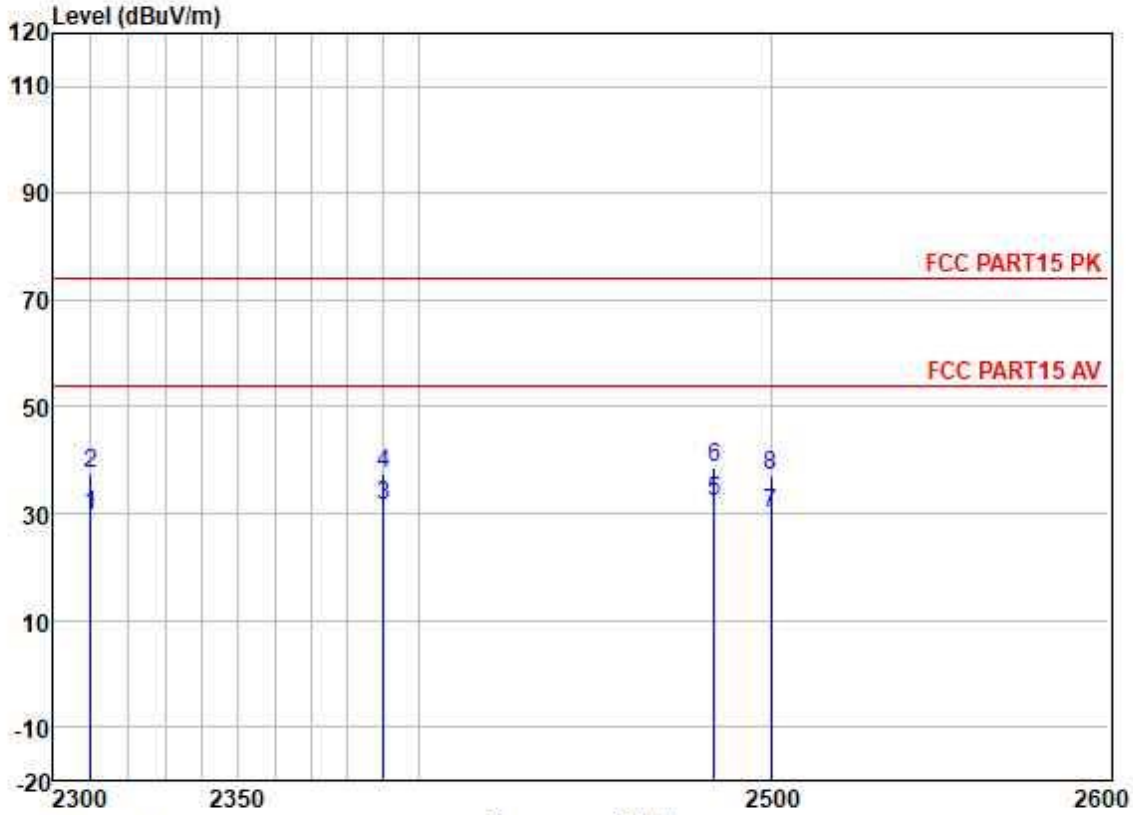
Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:High;



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	38.02	27.15	3.32	37.62	30.87	54.00	-23.13	HORIZONTAL	Average
2	2310.000	45.14	27.15	3.32	37.62	37.99	74.00	-36.01	HORIZONTAL	Peak
3	2390.000	37.54	27.33	3.48	37.59	30.76	54.00	-23.24	HORIZONTAL	Average
4	2390.000	44.63	27.33	3.48	37.59	37.85	74.00	-36.15	HORIZONTAL	Peak
5	2483.500	38.61	27.48	3.53	37.57	32.05	54.00	-21.95	HORIZONTAL	Average
6	2483.500	45.72	27.48	3.53	37.57	39.16	74.00	-34.84	HORIZONTAL	Peak
7	2500.000	36.12	27.50	3.40	37.56	29.46	54.00	-24.54	HORIZONTAL	Average
8	2500.000	43.86	27.50	3.40	37.56	37.20	74.00	-36.80	HORIZONTAL	Peak

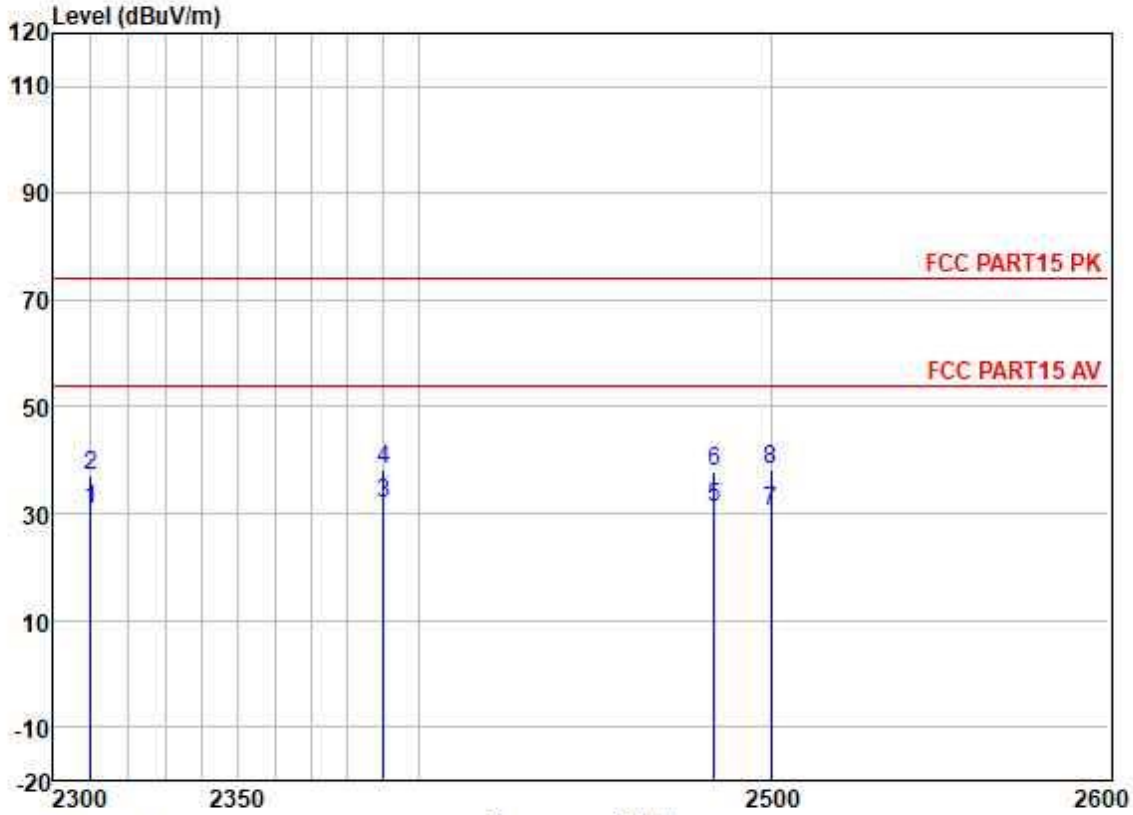
Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low;



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	2310.000	36.82	27.15	3.32	37.62	29.67	54.00	-24.33	HORIZONTAL	Average
2	2310.000	44.60	27.15	3.32	37.62	37.45	74.00	-36.55	HORIZONTAL	Peak
3	2390.000	38.27	27.33	3.48	37.59	31.49	54.00	-22.51	HORIZONTAL	Average
4	2390.000	44.39	27.33	3.48	37.59	37.61	74.00	-36.39	HORIZONTAL	Peak
5	2483.500	38.92	27.48	3.53	37.57	32.36	54.00	-21.64	HORIZONTAL	Average
6	2483.500	45.10	27.48	3.53	37.57	38.54	74.00	-35.46	HORIZONTAL	Peak
7	2500.000	36.51	27.50	3.40	37.56	29.85	54.00	-24.15	HORIZONTAL	Average
8	2500.000	43.72	27.50	3.40	37.56	37.06	74.00	-36.94	HORIZONTAL	Peak

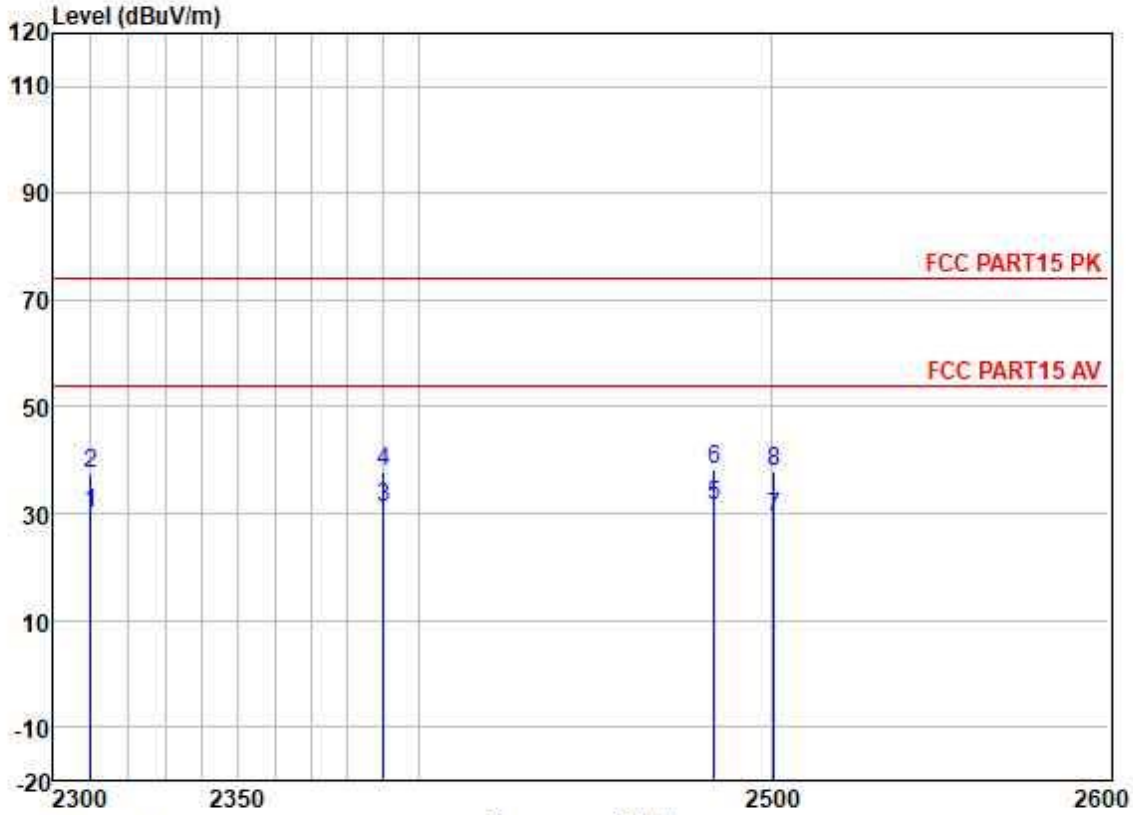
Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:High;



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	2310.000	38.07	27.15	3.32	37.62	30.92	54.00	-23.08	VERTICAL	Average
2	2310.000	44.26	27.15	3.32	37.62	37.11	74.00	-36.89	VERTICAL	Peak
3	2390.000	38.81	27.33	3.48	37.59	32.03	54.00	-21.97	VERTICAL	Average
4	2390.000	44.84	27.33	3.48	37.59	38.06	74.00	-35.94	VERTICAL	Peak
5	2483.500	37.81	27.48	3.53	37.57	31.25	54.00	-22.75	VERTICAL	Average
6	2483.500	44.51	27.48	3.53	37.57	37.95	74.00	-36.05	VERTICAL	Peak
7	2500.000	37.06	27.50	3.40	37.56	30.40	54.00	-23.60	VERTICAL	Average
8	2500.000	44.89	27.50	3.40	37.56	38.23	74.00	-35.77	VERTICAL	Peak

Test Mode: 04; 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	2310.000	37.08	27.15	3.32	37.62	29.93	54.00	-24.07	VERTICAL	Average
2	2310.000	44.61	27.15	3.32	37.62	37.46	74.00	-36.54	VERTICAL	Peak
3	2390.000	38.08	27.33	3.48	37.59	31.30	54.00	-22.70	VERTICAL	Average
4	2390.000	44.77	27.33	3.48	37.59	37.99	74.00	-36.01	VERTICAL	Peak
5	2483.500	38.06	27.48	3.53	37.57	31.50	54.00	-22.50	VERTICAL	Average
6	2483.500	44.96	27.48	3.53	37.57	38.40	74.00	-35.60	VERTICAL	Peak
7	2500.890	36.06	27.50	3.40	37.56	29.40	54.00	-24.60	VERTICAL	Average
8	2500.890	44.53	27.50	3.40	37.56	37.87	74.00	-36.13	VERTICAL	Peak

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
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.		

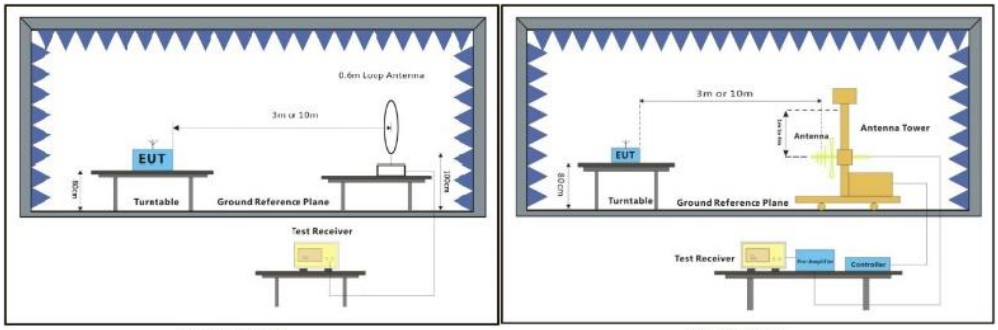
7.7.1 E.U.T. Operation

Operating Environment:
Temperature: 23 °C Humidity: 57 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

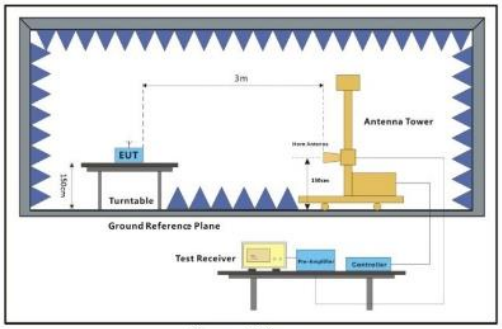
Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.7.3 Test Setup Diagram



Below 30MHz

30MHz-1GHz



Above 1GHz

7.7.4 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.

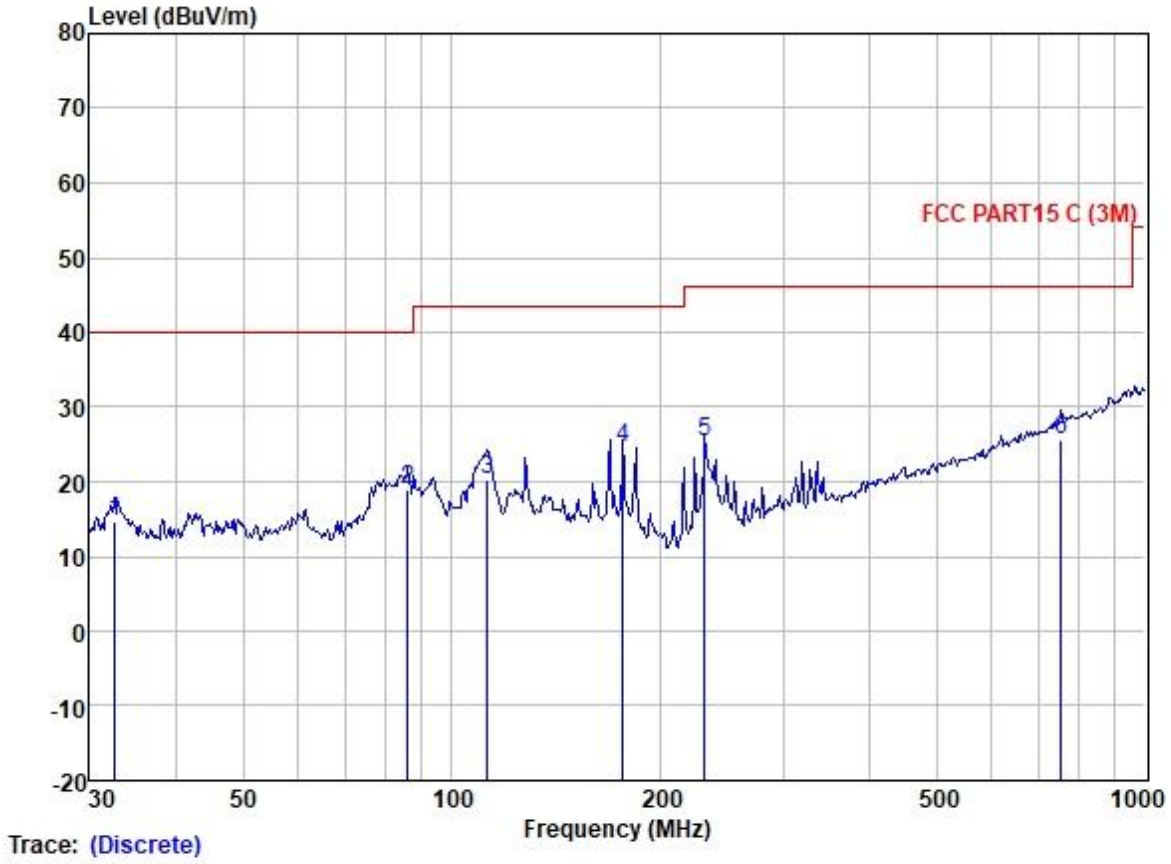
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

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, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Test Mode: 04; Polarity: Horizontal

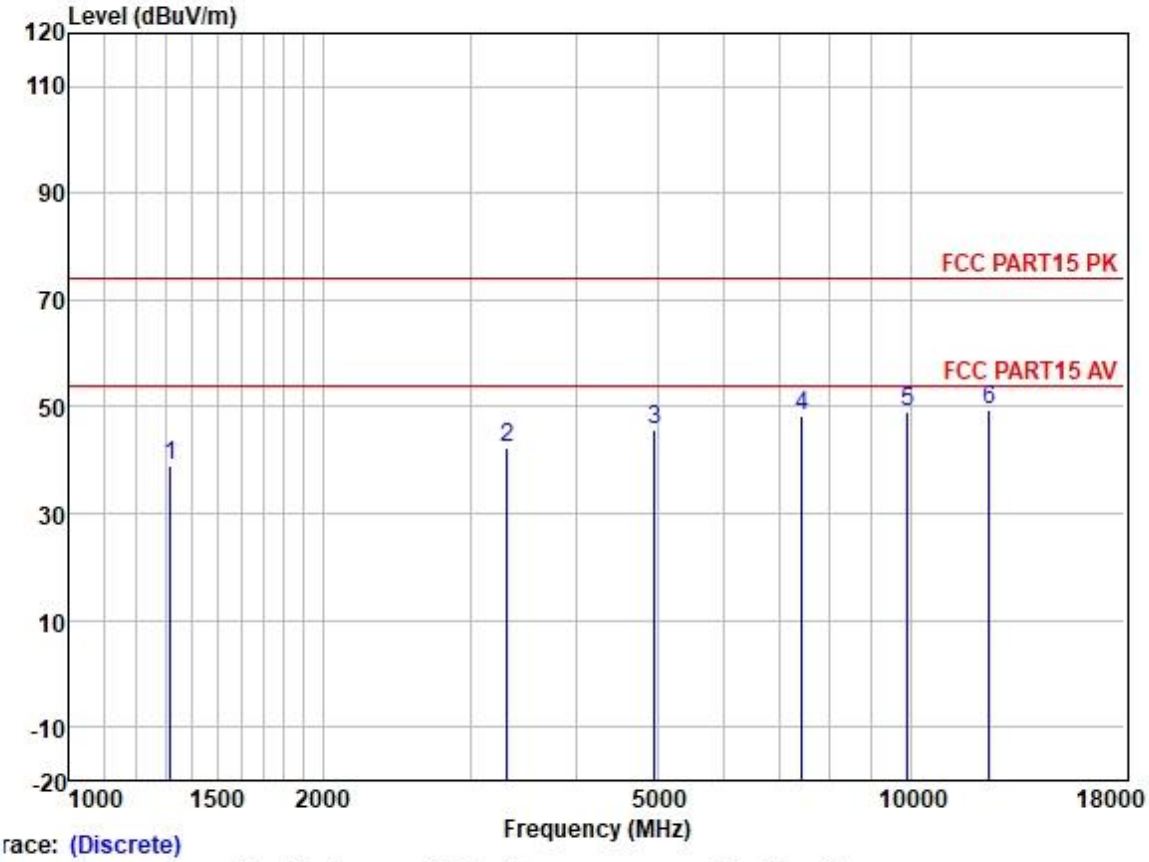


Trace: (Discrete)

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

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	32.63	28.16	12.73	1.05	27.19	14.75	40.00	-25.25	HORIZONTAL	QP
2	86.20	36.73	7.70	1.55	27.09	18.89	40.00	-21.11	HORIZONTAL	QP
3	112.52	35.07	10.52	1.81	27.05	20.35	43.50	-23.15	HORIZONTAL	QP
4	176.27	36.35	12.50	2.43	26.76	24.52	43.50	-18.98	HORIZONTAL	QP
5	231.72	38.57	10.79	2.73	26.68	25.41	46.00	-20.59	HORIZONTAL	QP
6	755.39	25.59	22.20	6.01	28.08	25.72	46.00	-20.28	HORIZONTAL	QP

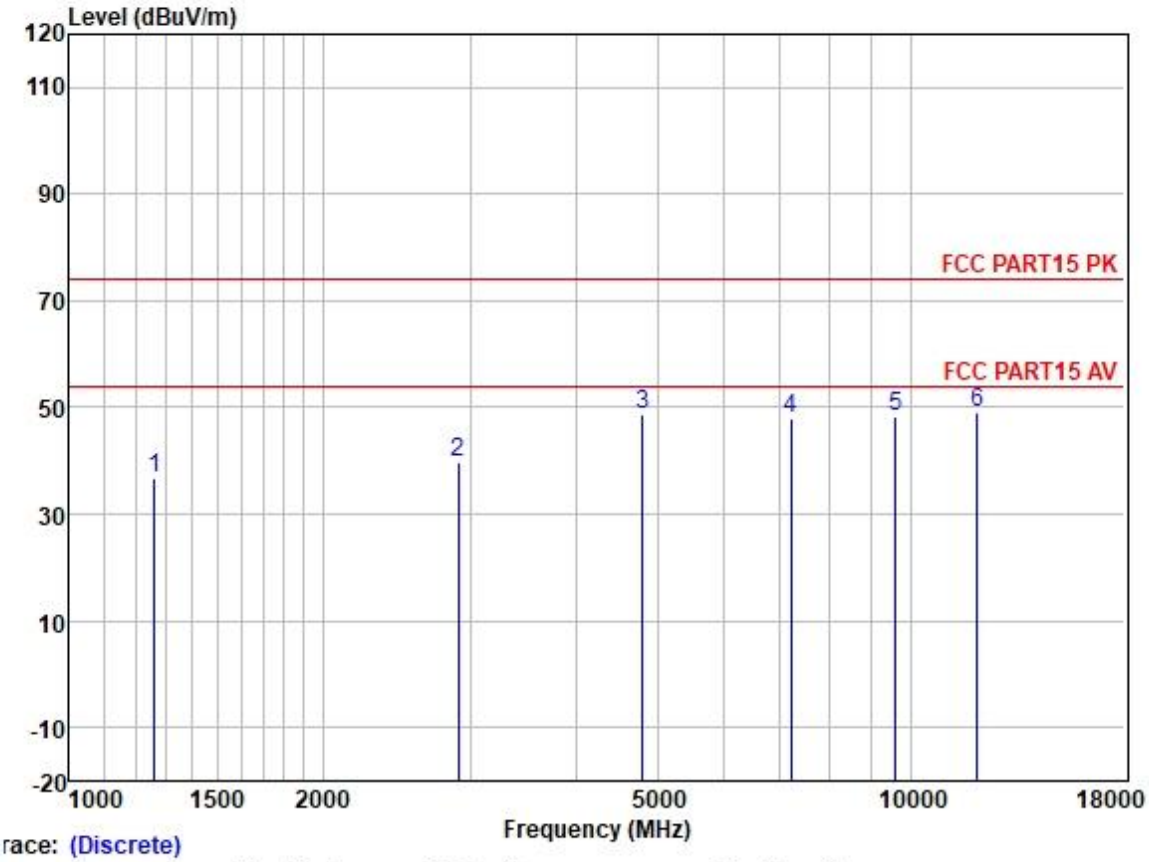
Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:High;



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	1319.794	49.39	25.25	2.60	38.29	38.95	74.00	-35.05	HORIZONTAL	Peak
2	3318.471	46.63	28.77	4.07	37.02	42.45	74.00	-31.55	HORIZONTAL	Peak
3	4960.993	45.26	31.65	5.65	36.84	45.72	74.00	-28.28	HORIZONTAL	Peak
4	7440.684	43.26	36.27	6.22	37.47	48.28	74.00	-25.72	HORIZONTAL	Peak
5	9920.020	40.95	38.65	6.96	37.40	49.16	74.00	-24.84	HORIZONTAL	Peak
6	12400.670	39.81	38.57	7.97	36.88	49.47	74.00	-24.53	HORIZONTAL	Peak

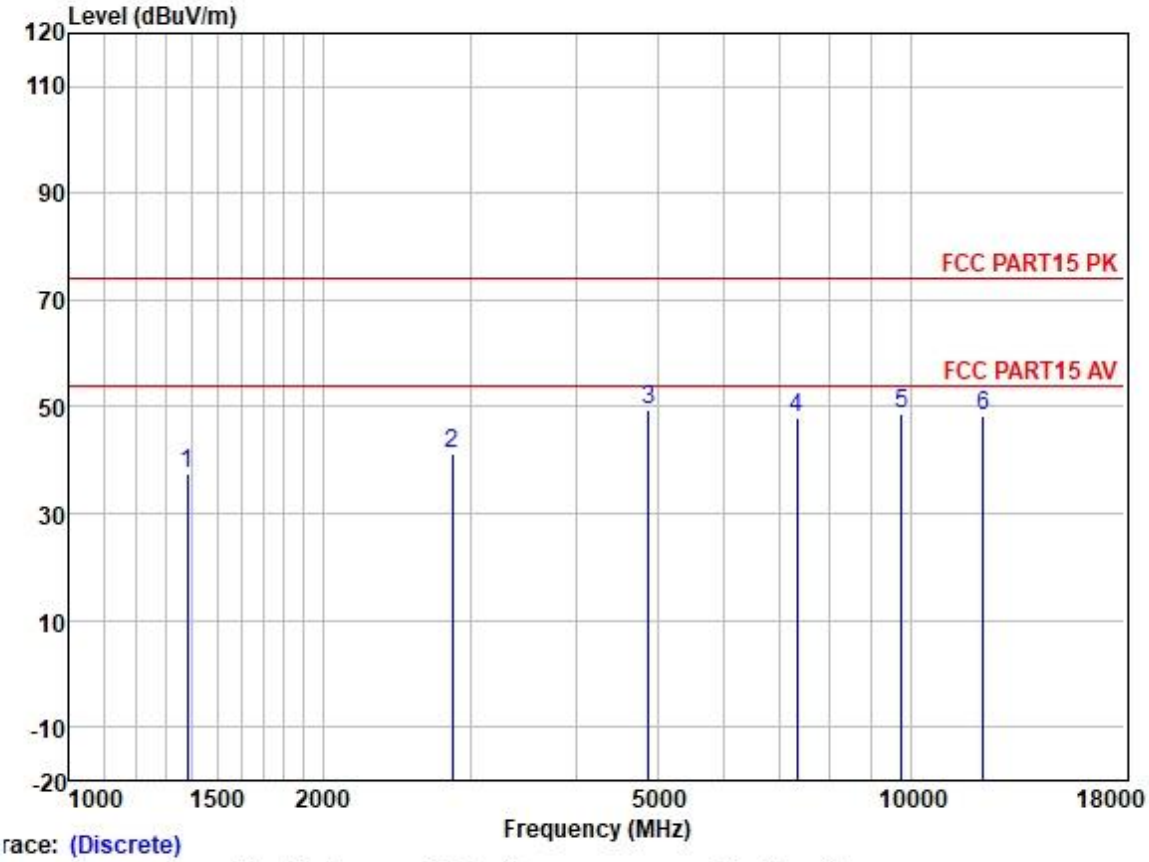
Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low;



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	1263.796	47.46	25.08	2.42	38.33	36.63	74.00	-37.37	HORIZONTAL	Peak
2	2896.945	44.92	28.29	3.70	37.34	39.57	74.00	-34.43	HORIZONTAL	Peak
3	4804.419	48.84	31.42	5.40	36.83	48.83	74.00	-25.17	HORIZONTAL	Peak
4	7206.763	43.99	35.54	5.98	37.38	48.13	74.00	-25.87	HORIZONTAL	Peak
5	9608.789	40.39	38.37	7.07	37.42	48.41	74.00	-25.59	HORIZONTAL	Peak
6	12010.350	39.15	38.90	8.19	37.10	49.14	74.00	-24.86	HORIZONTAL	Peak

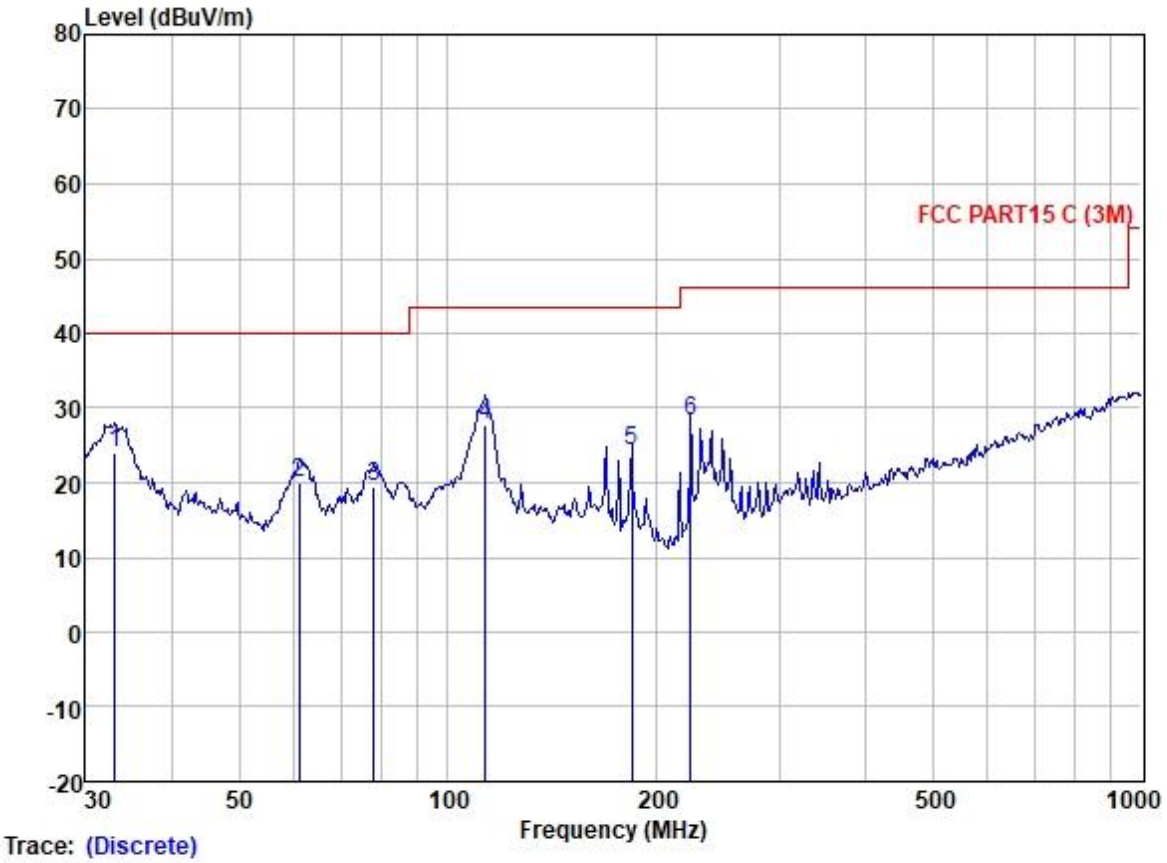
Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle;



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	1382.262	47.67	25.37	2.60	38.25	37.39	74.00	-36.61	HORIZONTAL	Peak
2	2855.380	46.65	28.24	3.70	37.38	41.21	74.00	-32.79	HORIZONTAL	Peak
3	4884.975	49.19	31.56	5.52	36.84	49.43	74.00	-24.57	HORIZONTAL	Peak
4	7326.040	43.24	36.00	6.13	37.43	47.94	74.00	-26.06	HORIZONTAL	Peak
5	9768.684	40.49	38.53	7.01	37.41	48.62	74.00	-25.38	HORIZONTAL	Peak
6	12210.350	38.60	38.74	8.08	37.00	48.42	74.00	-25.58	HORIZONTAL	Peak

Test Mode: 04; Polarity: Vertical

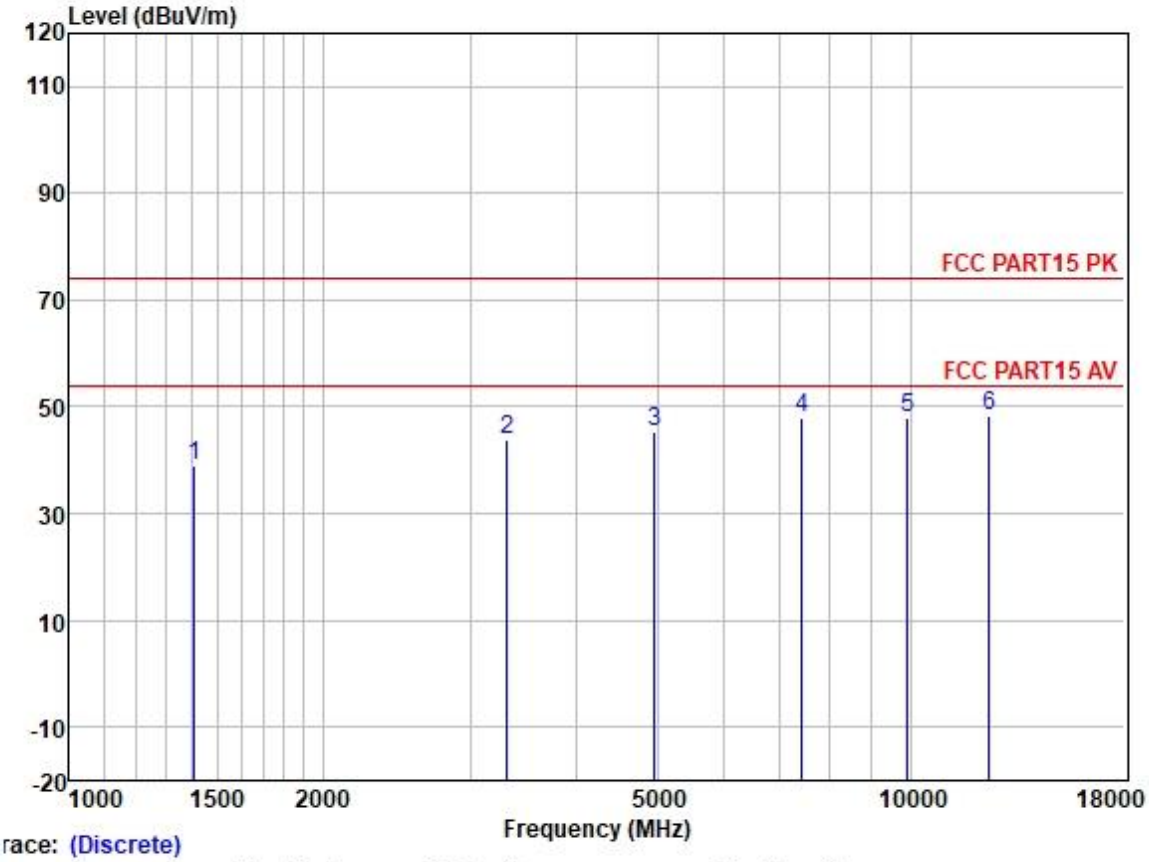


Trace: (Discrete)

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

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	33.09	37.27	12.76	1.05	27.19	23.89	40.00	-16.11	VERTICAL	QP
2	60.92	32.63	13.25	1.27	27.16	19.99	40.00	-20.01	VERTICAL	QP
3	78.14	35.46	9.52	1.47	27.10	19.35	40.00	-20.65	VERTICAL	QP
4	113.32	42.36	10.57	1.82	27.05	27.70	43.50	-15.80	VERTICAL	QP
5	183.84	37.16	11.50	2.46	26.75	24.37	43.50	-19.13	VERTICAL	QP
6	223.73	42.39	9.87	2.67	26.70	28.23	46.00	-17.77	VERTICAL	QP

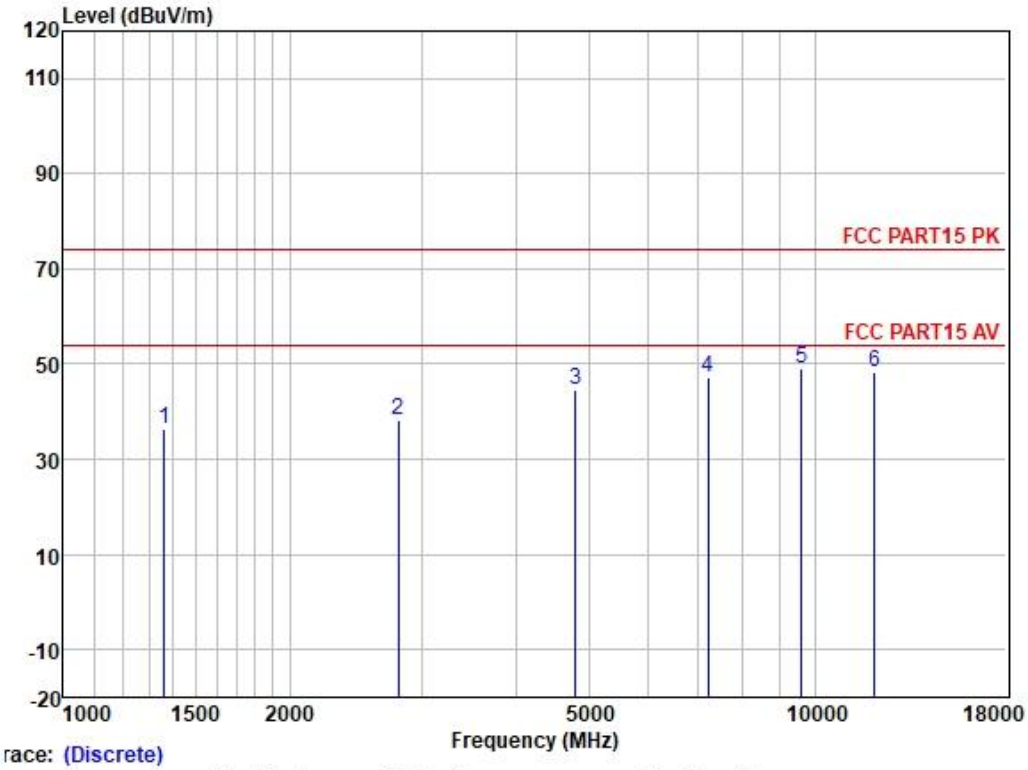
Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:High;



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	1406.443	49.29	25.40	2.61	38.22	39.08	74.00	-34.92	VERTICAL	Peak
2	3318.471	48.02	28.77	4.07	37.02	43.84	74.00	-30.16	VERTICAL	Peak
3	4960.833	44.92	31.65	5.65	36.84	45.38	74.00	-28.62	VERTICAL	Peak
4	7440.684	42.89	36.27	6.22	37.47	47.91	74.00	-26.09	VERTICAL	Peak
5	9920.580	39.85	38.65	6.96	37.40	48.06	74.00	-25.94	VERTICAL	Peak
6	12400.910	38.64	38.57	7.97	36.88	48.30	74.00	-25.70	VERTICAL	Peak

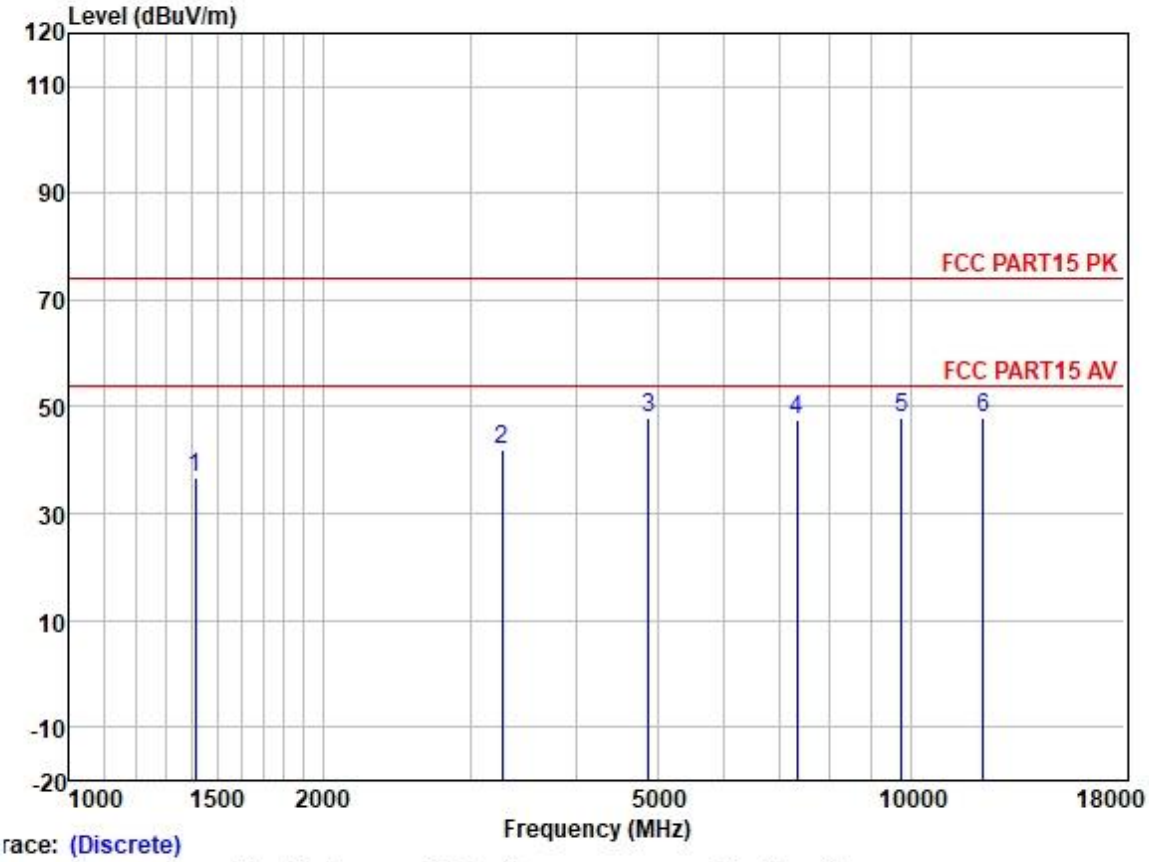
Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:Low;



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	1362.430	46.79	25.33	2.60	38.27	36.45	74.00	-37.55	VERTICAL	Peak
2	2790.113	43.88	28.12	3.69	37.41	38.28	74.00	-35.72	VERTICAL	Peak
3	4804.833	44.59	31.42	5.40	36.83	44.58	74.00	-29.42	VERTICAL	Peak
4	7206.161	43.16	35.54	5.98	37.38	47.30	74.00	-26.70	VERTICAL	Peak
5	9608.020	40.92	38.37	7.07	37.42	48.94	74.00	-25.06	VERTICAL	Peak
6	12010.130	38.15	38.90	8.19	37.10	48.14	74.00	-25.86	VERTICAL	Peak

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:middle;

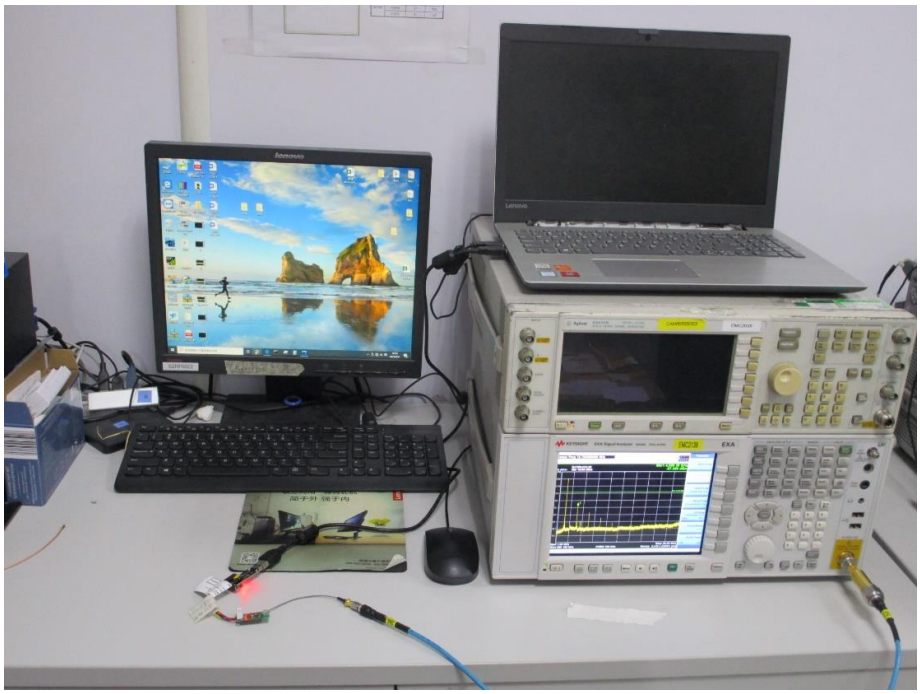


race: (Discrete)

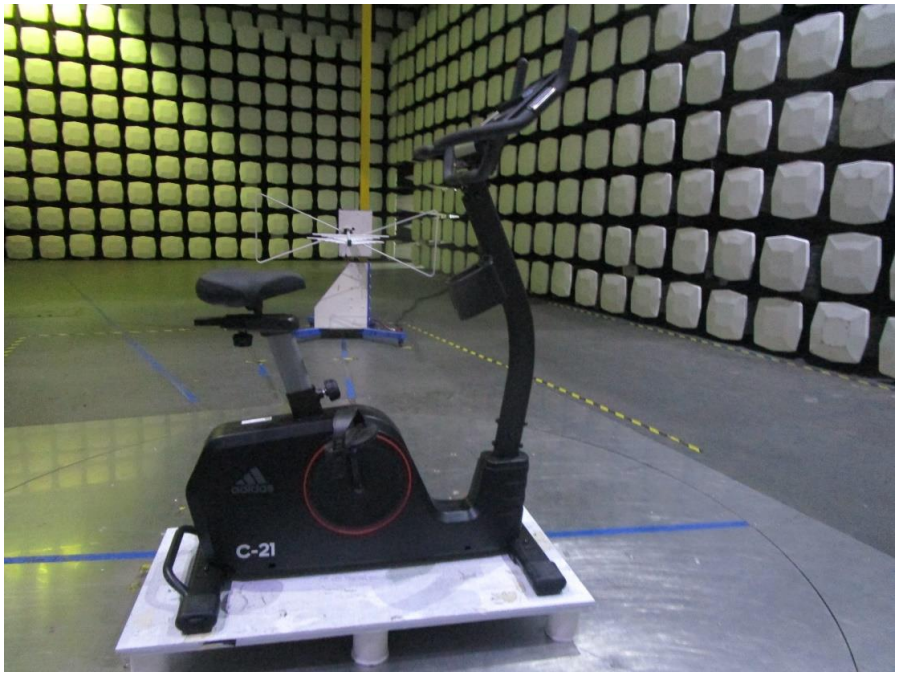
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1410.514	46.94	25.40	2.62	38.22	36.74	74.00	-37.26	VERTICAL	Peak
2	3270.858	46.20	28.71	4.04	37.04	41.91	74.00	-32.09	VERTICAL	Peak
3	4884.151	47.76	31.56	5.52	36.84	48.00	74.00	-26.00	VERTICAL	Peak
4	7326.542	42.87	36.00	6.13	37.43	47.57	74.00	-26.43	VERTICAL	Peak
5	9768.925	39.92	38.53	7.01	37.41	48.05	74.00	-25.95	VERTICAL	Peak
6	12210.710	38.21	38.74	8.08	37.00	48.03	74.00	-25.97	VERTICAL	Peak

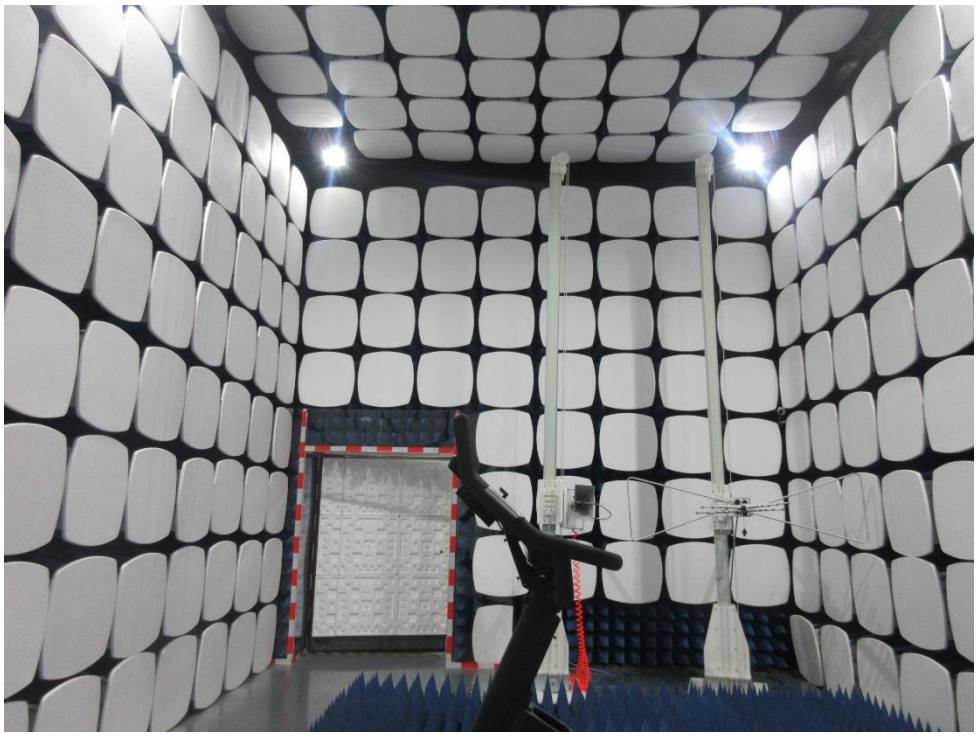
8 Test Setup Photo

RF Conducted Test



Radiated Spurious Emissions & Radiated Emissions which fall in the restricted bands





Remark: The transmitter part of the EUT was kept on the high 1.5m above 1GHz according to the lifting platform during the test.

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for GZEM2101000206CR

10 Appendix

(Cable loss=0.9dB)

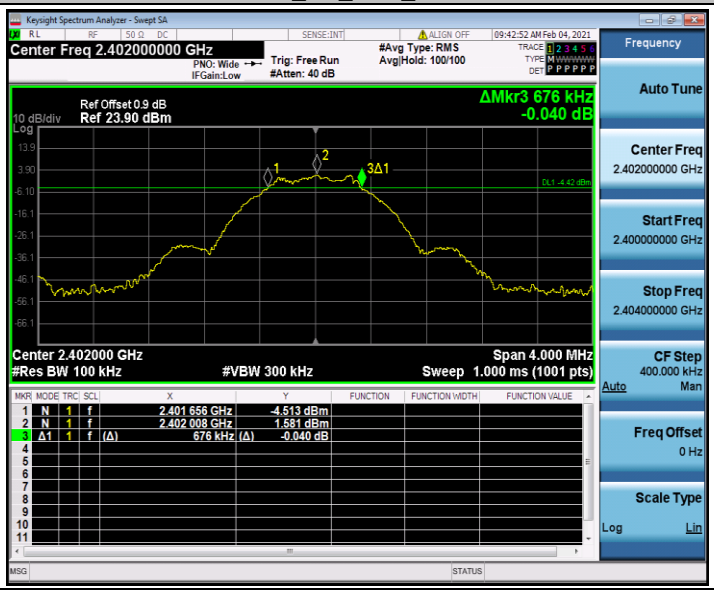
10.1 Appendix A: DTS Bandwidth

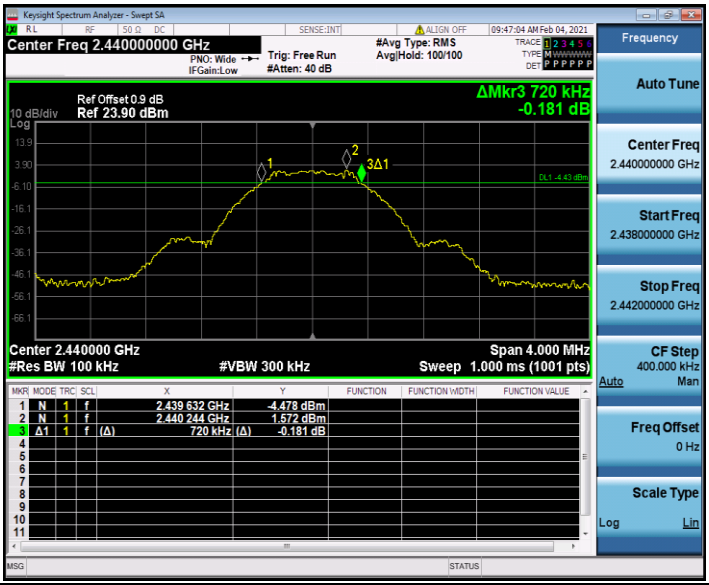
10.1.1 Test Result

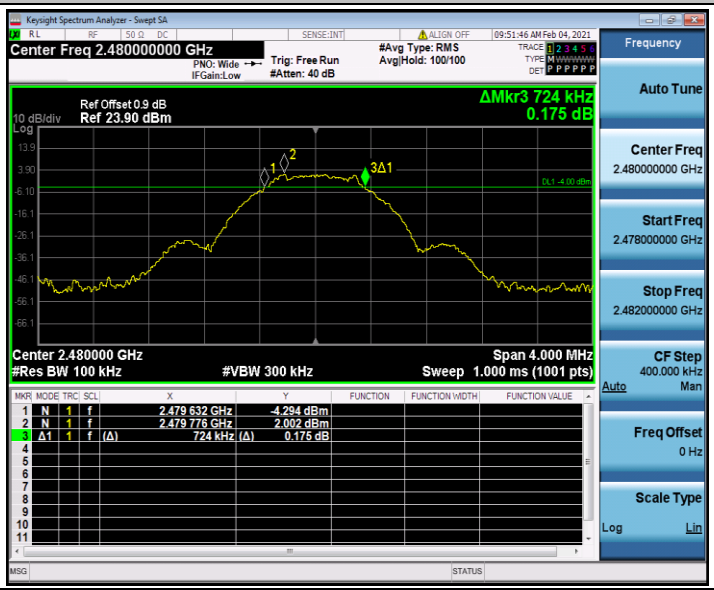
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.676	2401.656	2402.332	>=0.5	PASS
		2440	0.720	2439.632	2440.352	>=0.5	PASS
		2480	0.724	2479.632	2480.356	>=0.5	PASS

10.1.2 Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440


BLE_1M_Ant1_2480


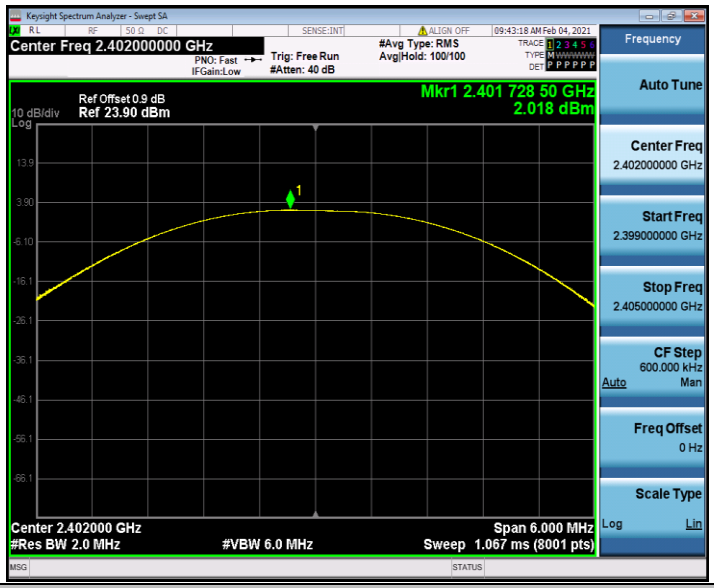
10.2 Appendix B: Maximum conducted output power

10.2.1 Test Result

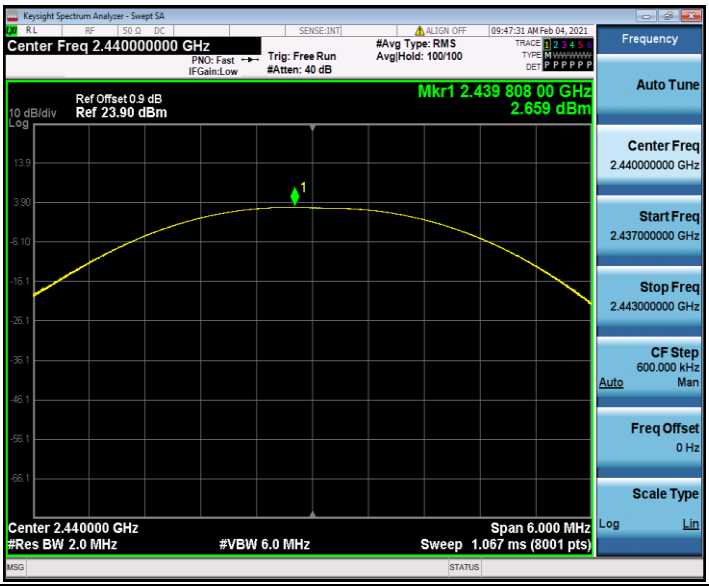
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	2.02	<=30	PASS
		2440	2.66	<=30	PASS
		2480	3.17	<=30	PASS

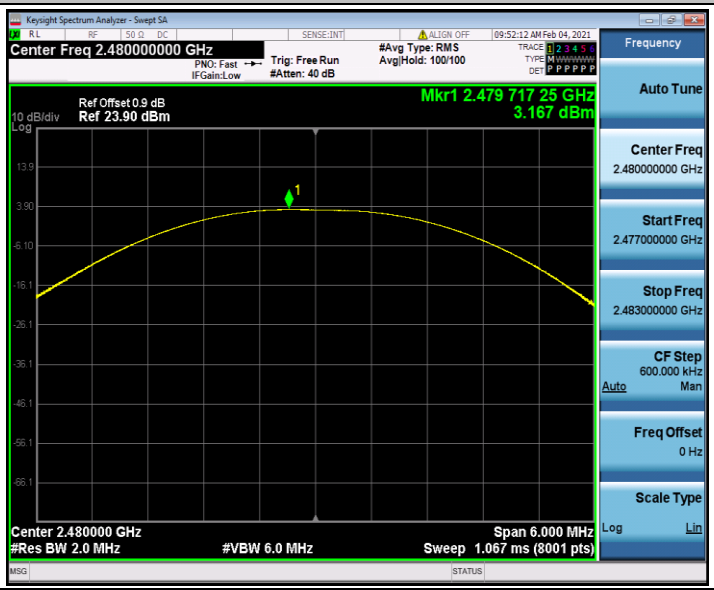
10.2.2 Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


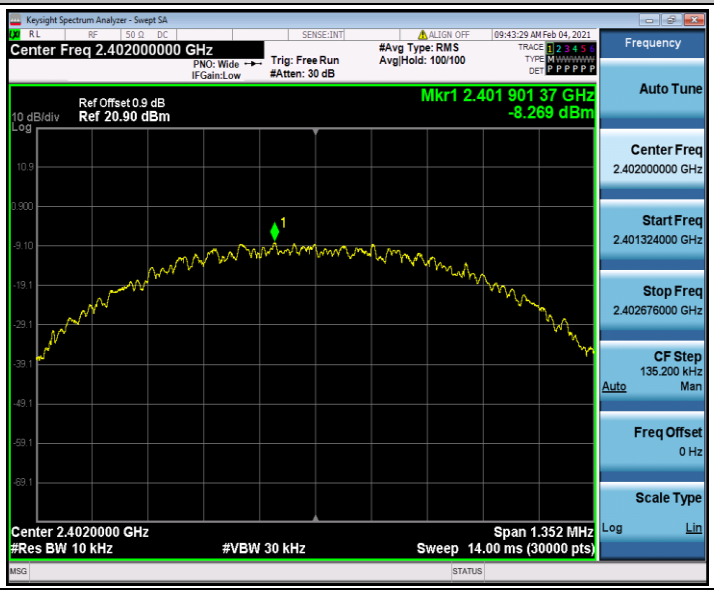
10.3 Appendix C: Maximum power spectral density

10.3.1 Test Result

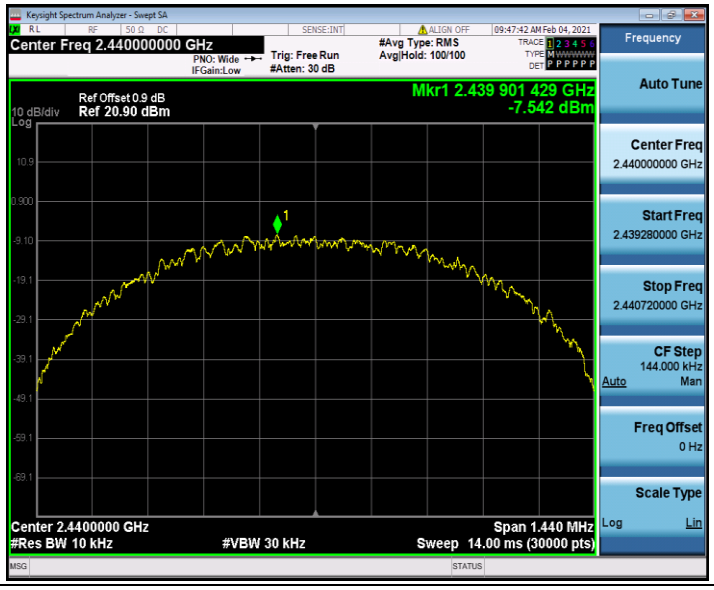
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-8.27	<=8	PASS
		2440	-7.54	<=8	PASS
		2480	-7.05	<=8	PASS

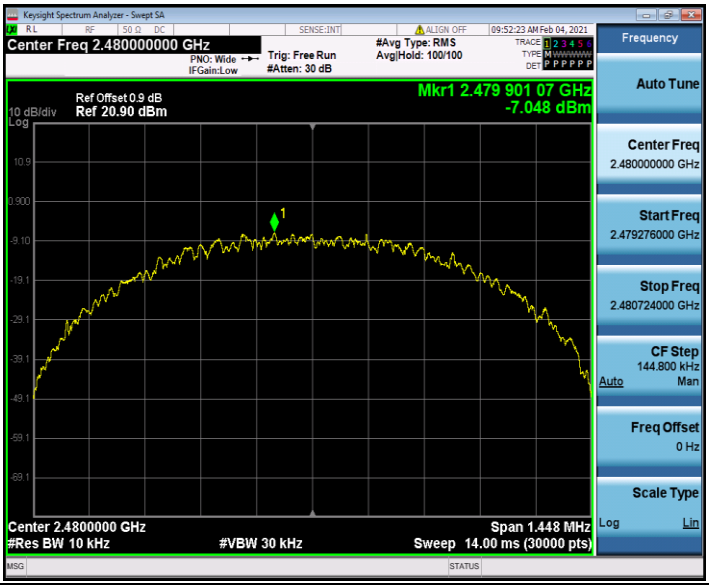
10.3.2 Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


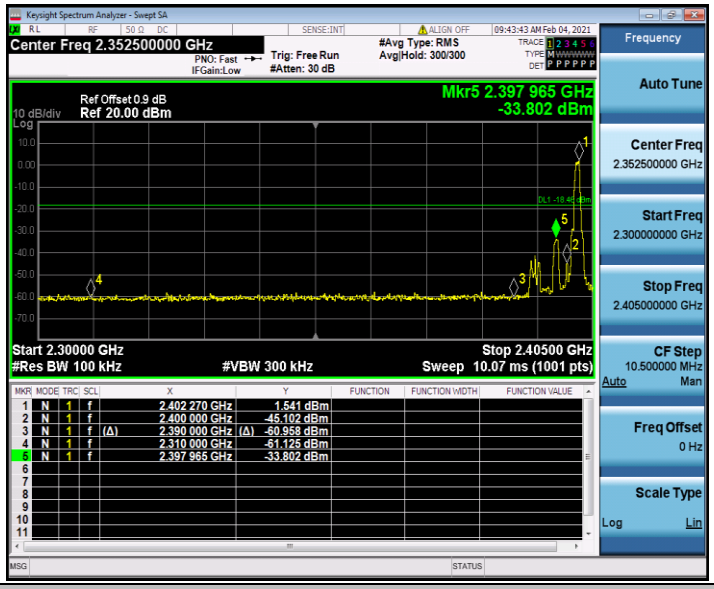
10.4 Appendix D: Band edge measurements

10.4.1 Test Result

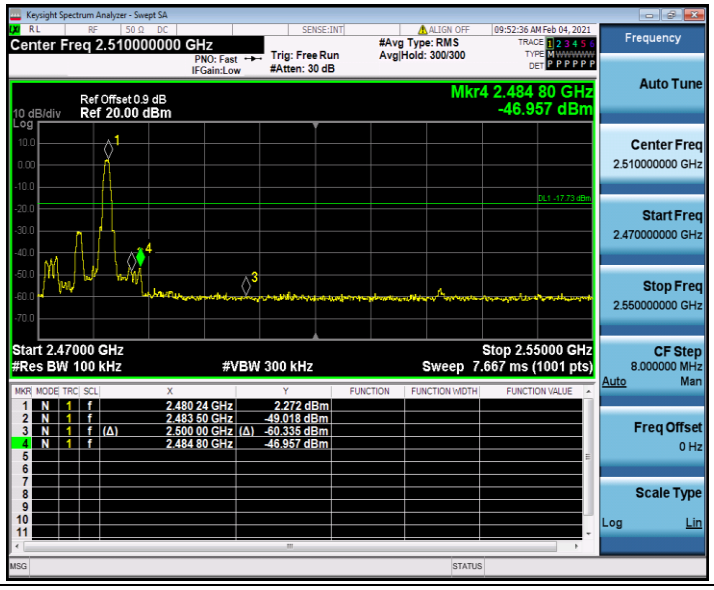
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	1.54	-33.8	<=-18.46	PASS
		High	2480	2.27	-46.96	<=-17.73	PASS

10.4.2 Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



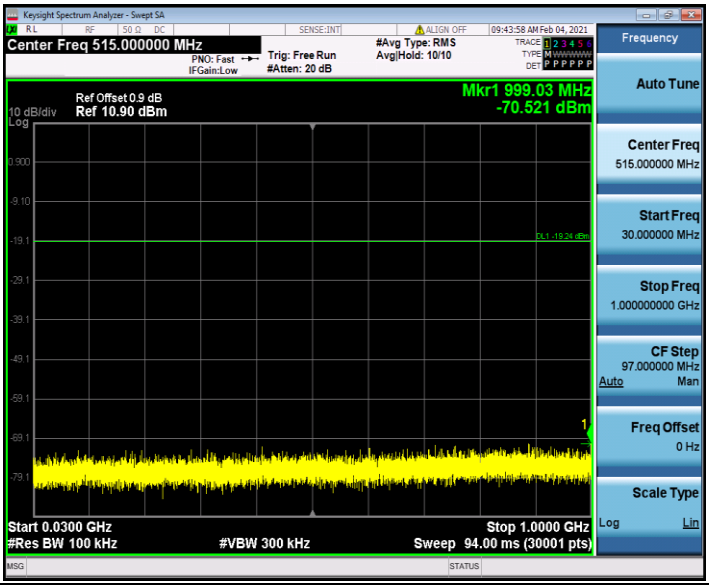
10.5 Appendix E: Conducted Spurious Emission

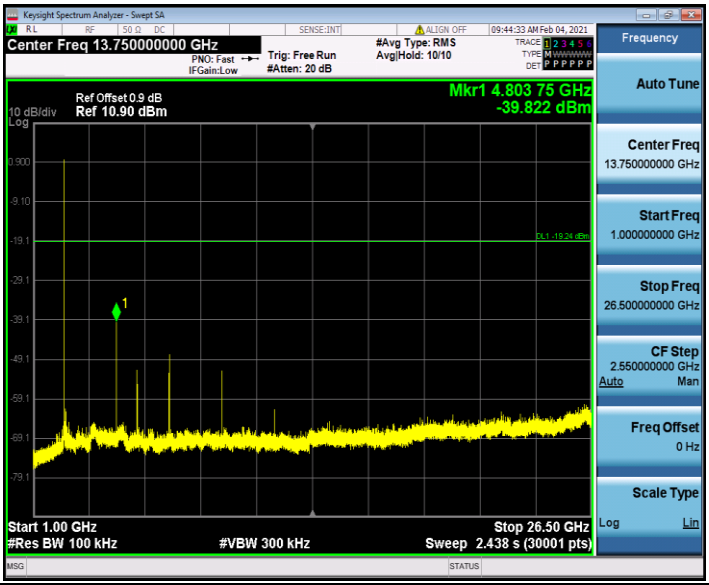
10.5.1 Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	0.76	0.76	---	PASS
			30~1000	30~1000	-70.521	<=-19.243	PASS
			1000~26500	1000~26500	-39.822	<=-19.243	PASS
		2440	Reference	1.83	1.83	---	PASS
			30~1000	30~1000	-70.138	<=-18.166	PASS
			1000~26500	1000~26500	-39.447	<=-18.166	PASS
		2480	Reference	2.68	2.68	---	PASS
			30~1000	30~1000	-69.783	<=-17.322	PASS
			1000~26500	1000~26500	-37.359	<=-17.322	PASS

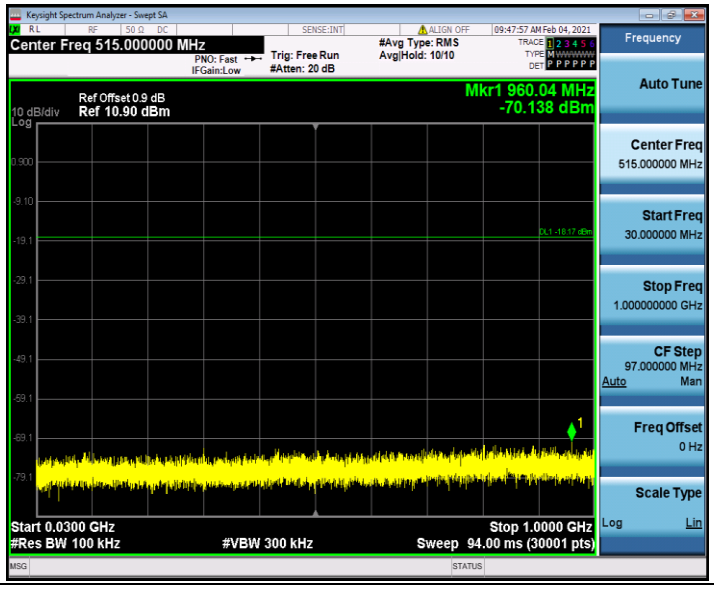
10.5.2 Test Graphs

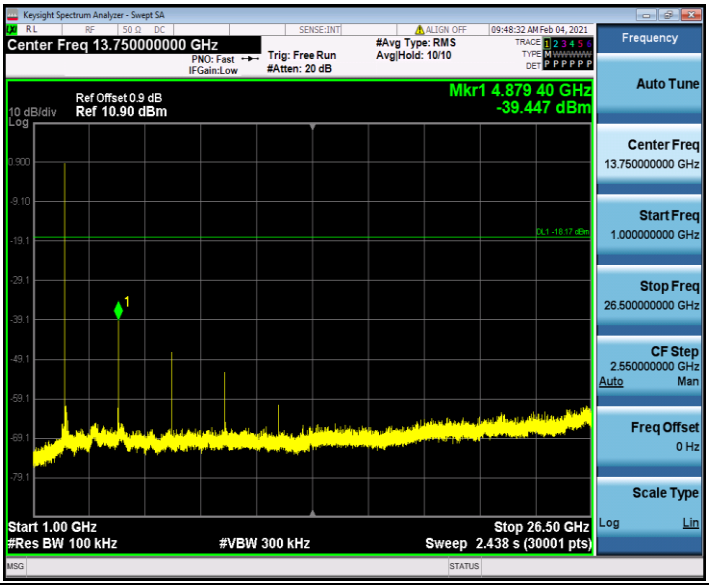
BLE_1M_Ant1_2402_0~Reference

BLE_1M_Ant1_2402_30~1000


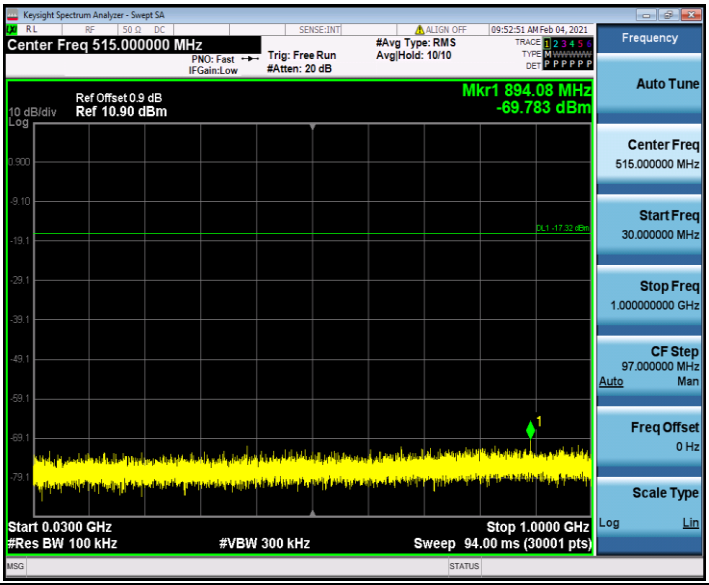
BLE_1M_Ant1_2402_1000~26500


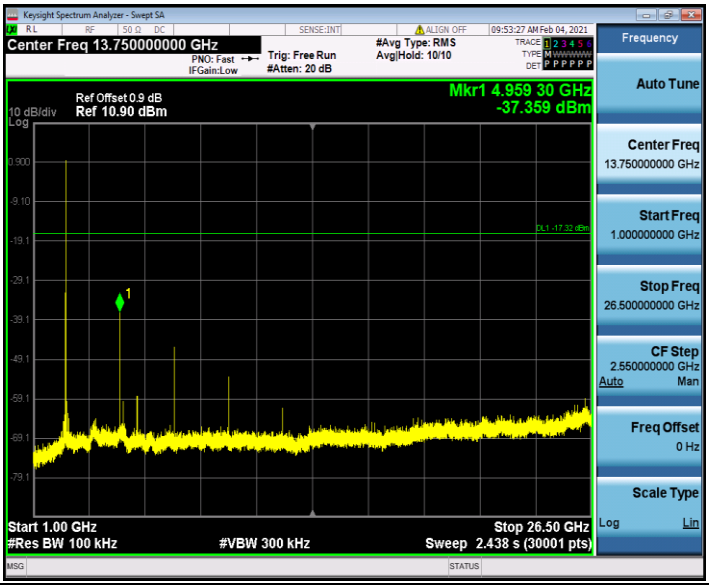
BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000


BLE_1M_Ant1_2440_1000~26500


BLE_1M_Ant1_2480_0~Reference


BLE_1M_Ant1_2480_30~1000


BLE_1M_Ant1_2480_1000~26500


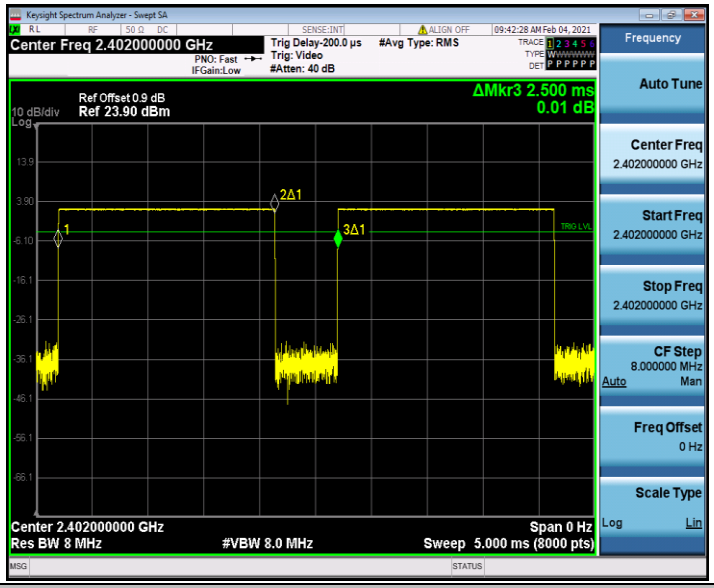
10.6 Appendix F: Duty Cycle

10.6.1 Test Result

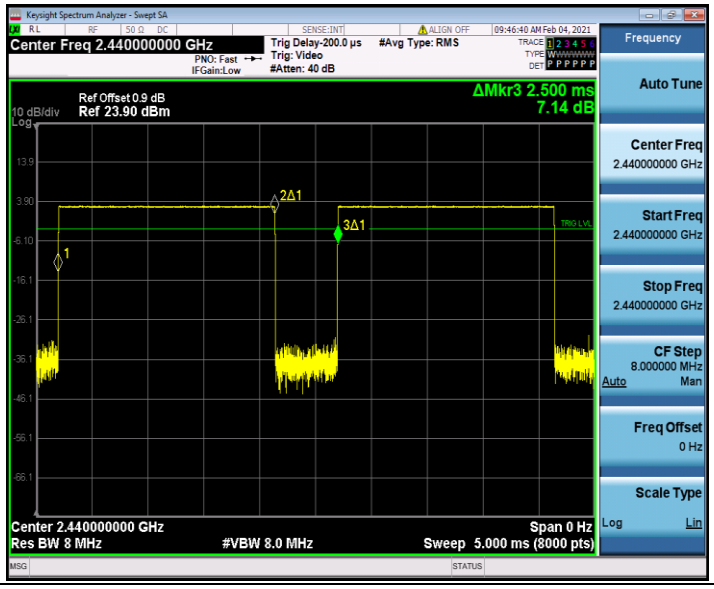
TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE_1M	Ant1	2402	1.94	2.50	77.53
		2440	1.94	2.50	77.55
		2480	1.94	2.50	77.53

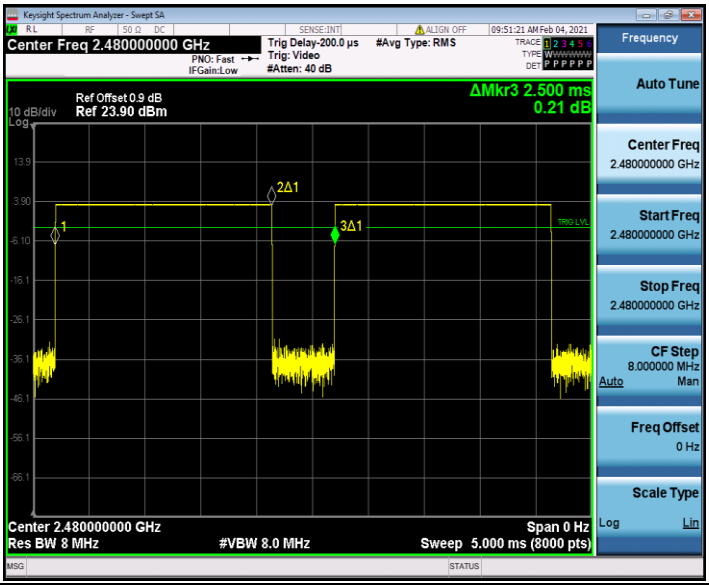
10.6.2 Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480


- End of the Report -

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