

TEST REPORT

Application No.: GZEM2102000759CR
Applicant: Guangdong Transtek Medical Electronics Co., Ltd.
Address of Applicant: Zone A, No.105, Dongli Road, Torch Development District, Zhongshan, 528437, Guangdong, China
Manufacturer: Guangdong Transtek Medical Electronics Co., Ltd.
Address of Manufacturer: Zone A, No.105, Dongli Road, Torch Development District, Zhongshan, 528437, Guangdong, China
Factory: Guangdong Transtek Medical Electronics Co., Ltd.
Address of Factory: Zone B, No.105, Dongli Road, Torch Development District, Zhongshan, 528437, Guangdong, China
Equipment Under Test (EUT):
EUT Name: Activity Tracker
Model No.: LS431-B3
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2021-02-07
Date of Test: 2021-02-08 to 2021-03-05
Date of Issue: 2021-03-17

Test Result:	Pass*
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* 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		2021-03-17		Original

Authorized for issue by			
Tested By		 <hr/> Curry Wu/Project Engineer	
Reviewed By		 <hr/> Ricky Liu/Reviewer	



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2 Test Summary

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

N/A: Not applicable

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



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 5V charging supply by USB port DC 3.7V supply by internal battery as below: Model: LH096T-IC18
Test Voltage:	DC 3.7 V
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna type	PCB antenna
Antenna gain	4 dBi declared by applicant
Hardware version	V5.1
Software version	T311
Test software	nRFgo studio.exe(version:1.21.2.10)
Sample no.	A1
Power setting:	4 dBm can not be changed by user

4.2 Description of Support Units

The EUT has been tested as an independent unit.

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)

Remark:

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

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,
Guangzhou, China 510663

Tel: +86 20 82155555

Fax: +86 20 82075059

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 17025:2017, 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

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:

$$\text{Duty Cycle} = \text{Ton}/(\text{Ton}+\text{Toff})$$

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	14.50	8.39
	2440	14.50	8.39
	2480	14.50	8.39

*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 Analyzer	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 Analyzer	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 Analyzer	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 Analyzer	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01



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Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer	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



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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(b)(4)

Standard Requirement:

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

15.247(b) (4) requirement:

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

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 4 dBi.

Please refer to internal photos.



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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 $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24.6 °C

Humidity: 60.2 % RH

Atmospheric Pressure: 1010 mbar

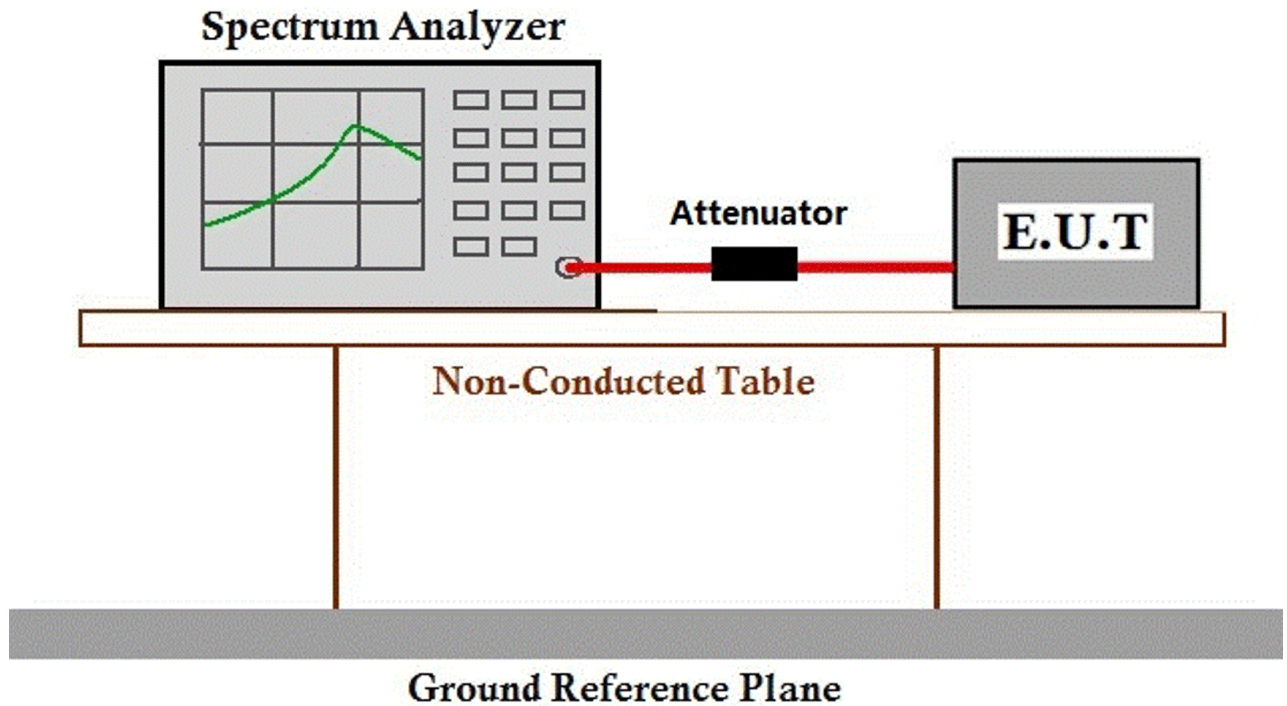
7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer To Appendix For Details



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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

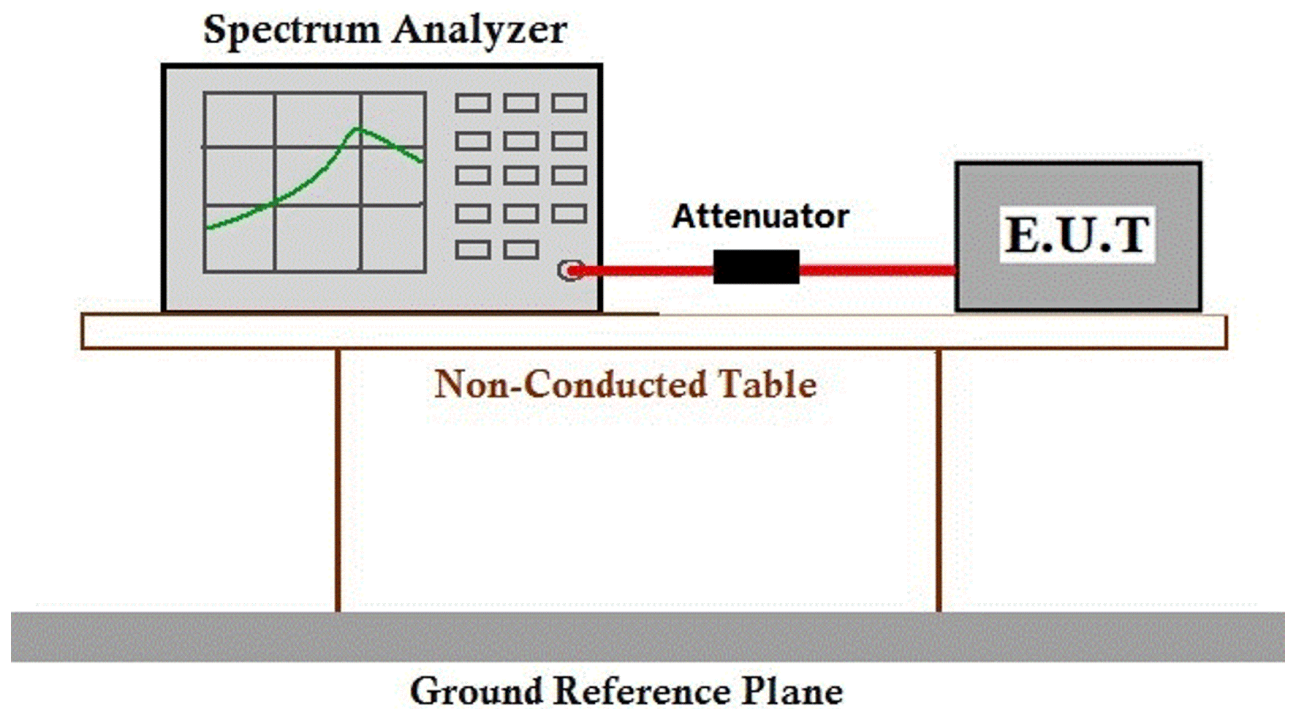
7.2.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.6 °C Humidity: 60.1 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	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

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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

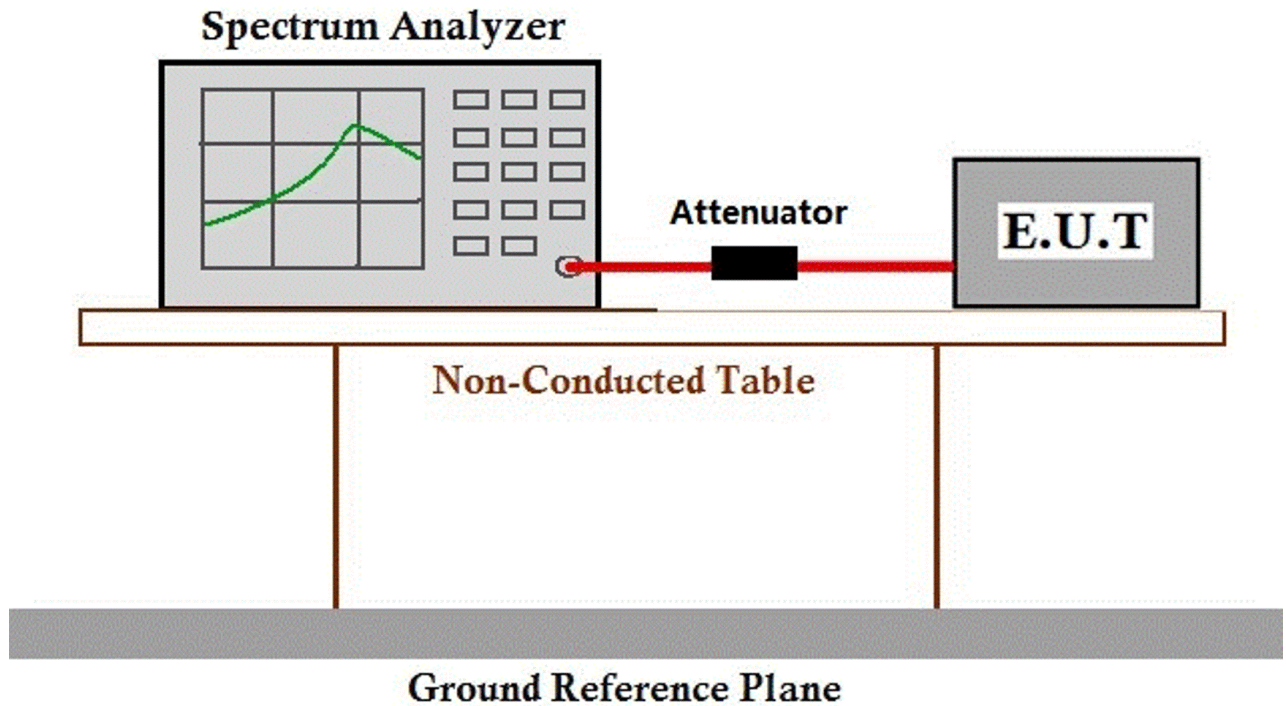
7.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.6 °C Humidity: 60.3 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	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

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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)).

7.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 24.6 °C Humidity: 60.1 % RH Atmospheric Pressure: 1010 mbar

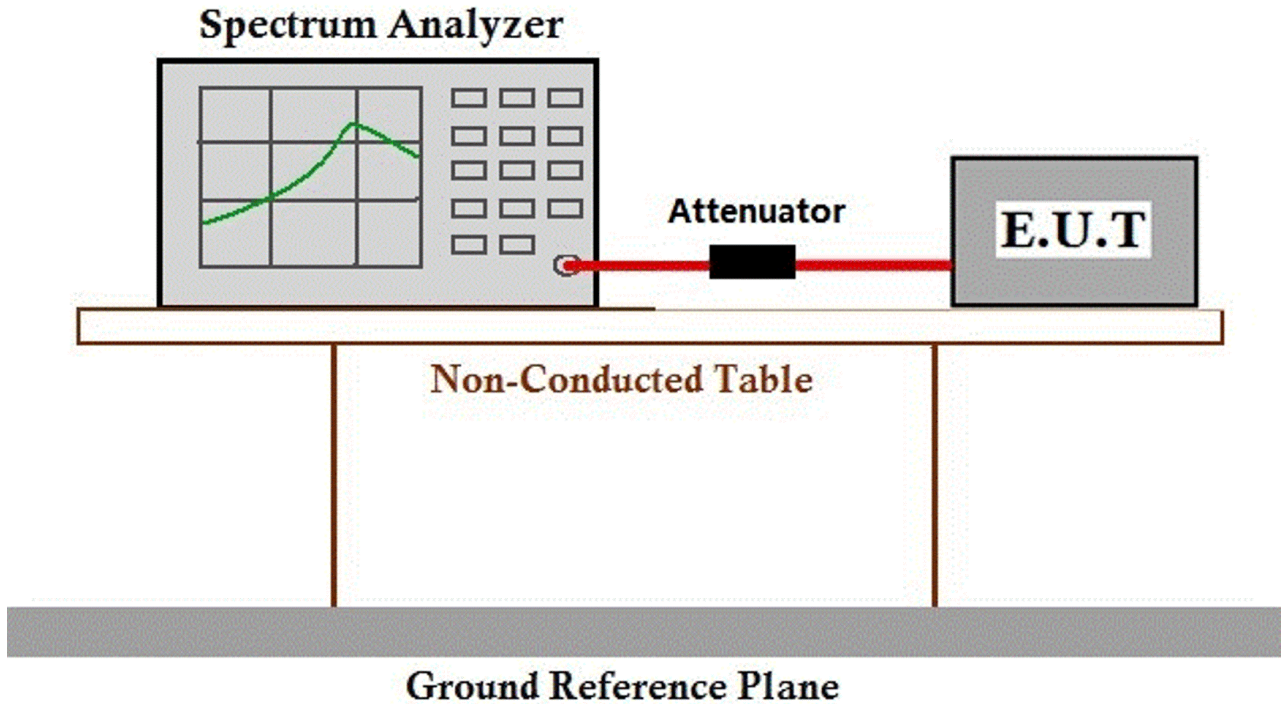
7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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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: 24.6 °C Humidity: 60.3 % RH Atmospheric Pressure: 1010 mbar

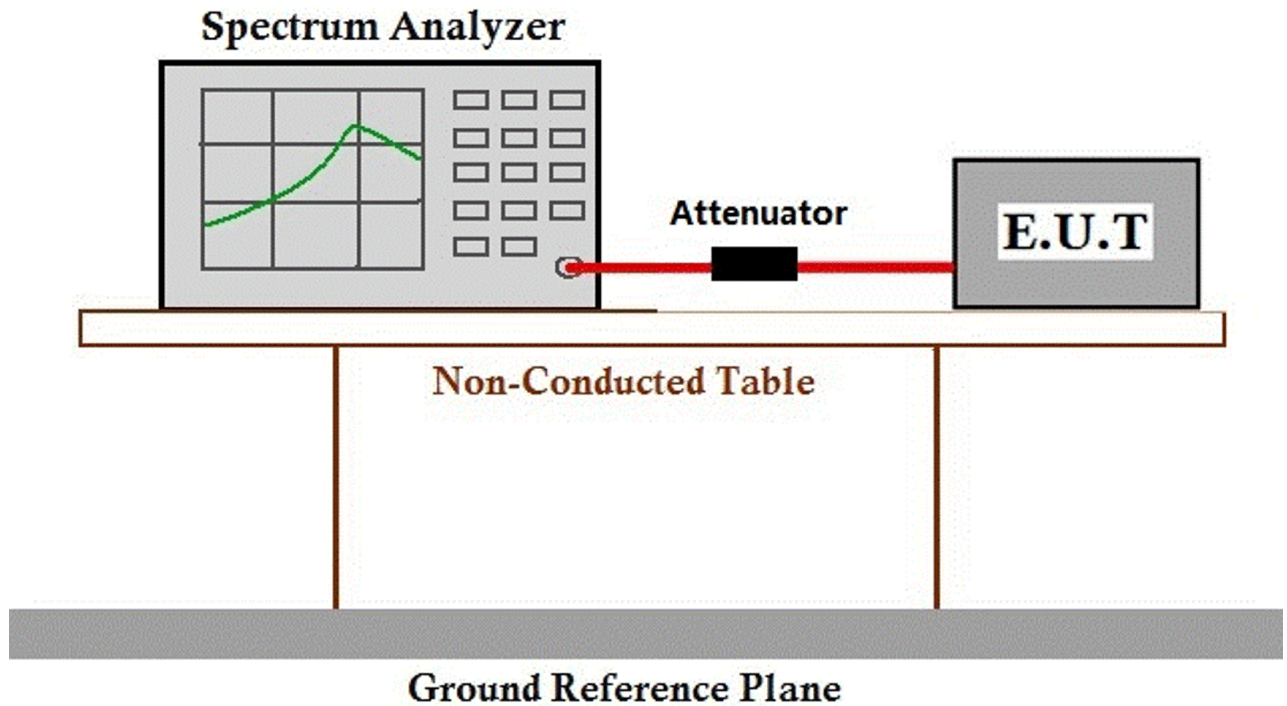
7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.



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7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

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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
 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.

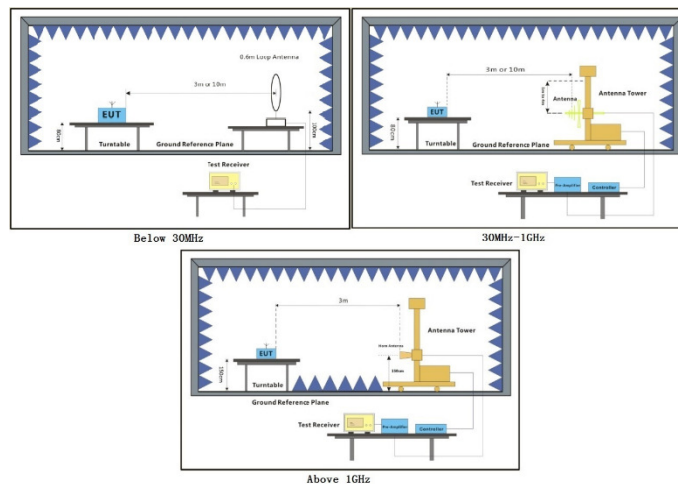
7.6.1 E.U.T. Operation

Operating Environment:
 Temperature: 26 °C Humidity: 55 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.3 Test Setup Diagram



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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 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.

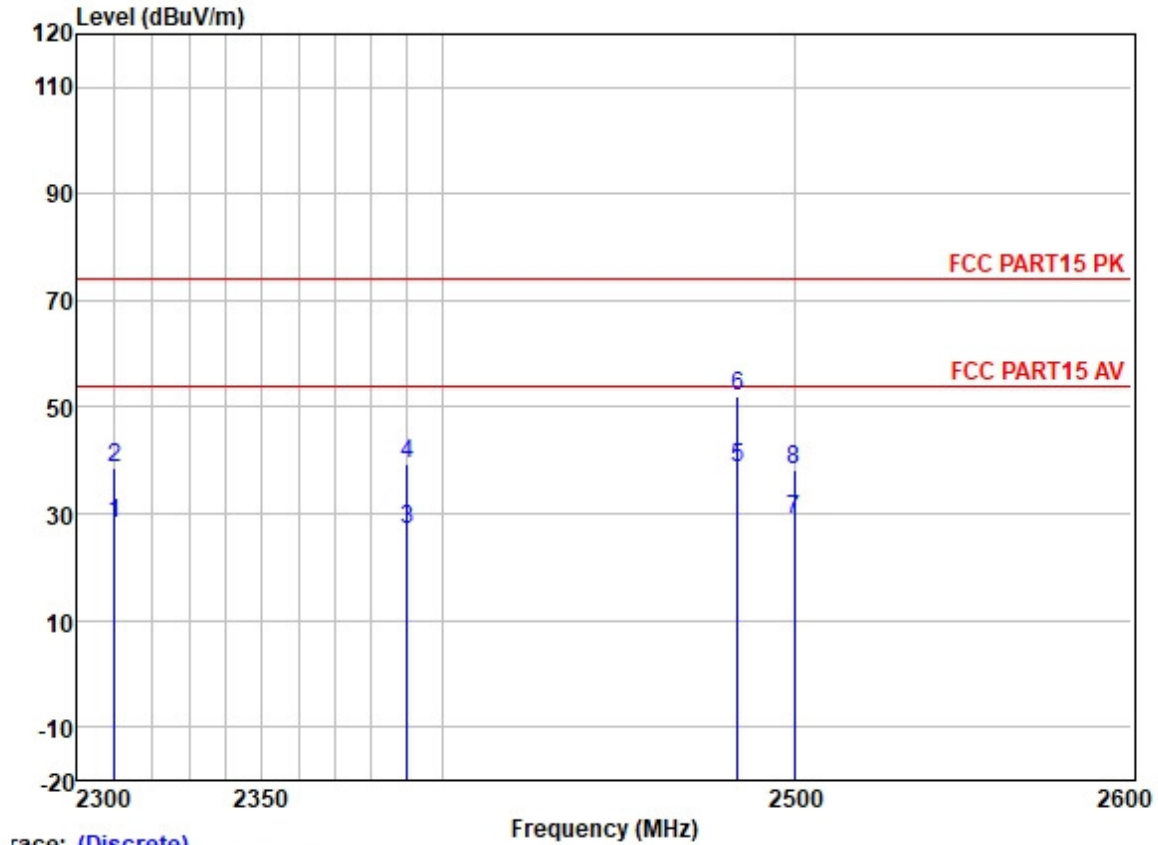
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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.



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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:High;



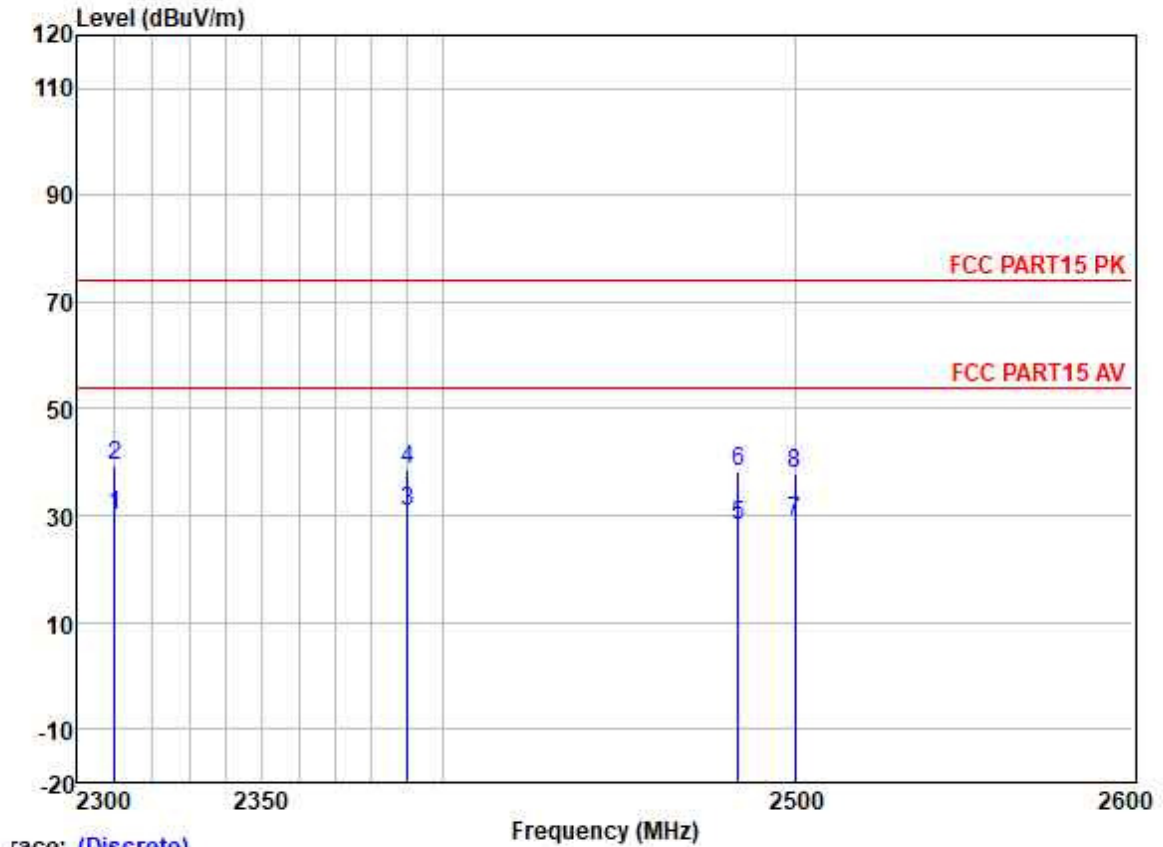
Trace: (Discrete)

	ReadAntenna	Cable	Preamp	Limit	Over				
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	35.46	27.15	3.32	37.62	28.31	54.00	-25.69	HORIZONTAL Average
2	2310.000	45.89	27.15	3.32	37.62	38.74	74.00	-35.26	HORIZONTAL Peak
3	2390.000	33.73	27.33	3.48	37.59	26.95	54.00	-27.05	HORIZONTAL Average
4	2390.000	46.30	27.33	3.48	37.59	39.52	74.00	-34.48	HORIZONTAL Peak
5	2483.500	45.18	27.48	3.53	37.57	38.62	54.00	-15.38	HORIZONTAL Average
6	2483.500	58.59	27.48	3.53	37.57	52.03	74.00	-21.97	HORIZONTAL Peak
7	2500.000	35.60	27.50	3.40	37.56	28.94	54.00	-25.06	HORIZONTAL Average
8	2500.000	44.82	27.50	3.40	37.56	38.16	74.00	-35.84	HORIZONTAL Peak



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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low;



Trace: (Discrete)

	Read Freq	Antenna Level	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	2310.000	37.13	27.15	3.32	37.62	29.98	54.00	-24.02	HORIZONTAL Average
2	2310.000	46.39	27.15	3.32	37.62	39.24	74.00	-34.76	HORIZONTAL Peak
3	2390.000	37.67	27.33	3.48	37.59	30.89	54.00	-23.11	HORIZONTAL Average
4	2390.000	45.35	27.33	3.48	37.59	38.57	74.00	-35.43	HORIZONTAL Peak
5	2483.500	34.73	27.48	3.53	37.57	28.17	54.00	-25.83	HORIZONTAL Average
6	2483.500	44.84	27.48	3.53	37.57	38.28	74.00	-35.72	HORIZONTAL Peak
7	2500.000	35.52	27.50	3.40	37.56	28.86	54.00	-25.14	HORIZONTAL Average
8	2500.000	44.37	27.50	3.40	37.56	37.71	74.00	-36.29	HORIZONTAL Peak

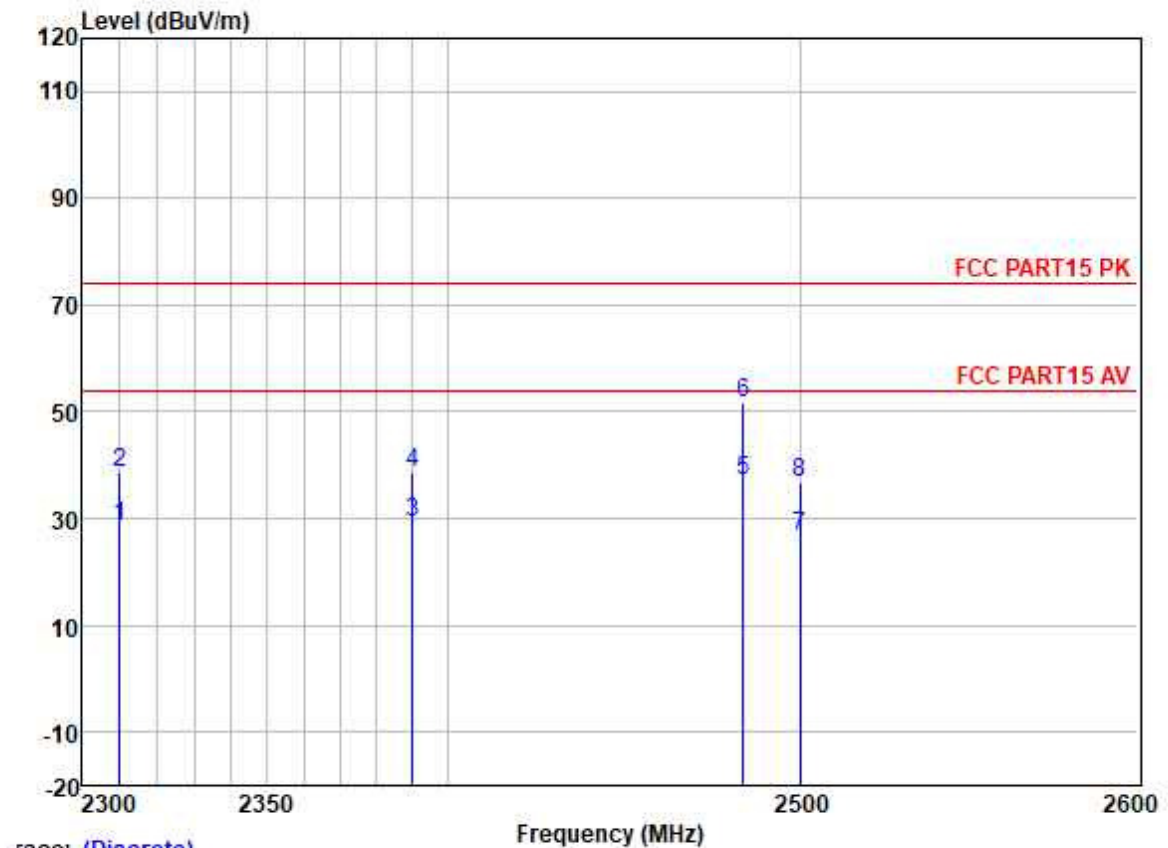


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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:High;



Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2310.000	35.59	27.15	3.32	37.62	28.44	54.00	-25.56	VERTICAL	Average
2	2310.000	45.89	27.15	3.32	37.62	38.74	74.00	-35.26	VERTICAL	Peak
3	2390.000	35.91	27.33	3.48	37.59	29.13	54.00	-24.87	VERTICAL	Average
4	2390.000	45.26	27.33	3.48	37.59	38.48	74.00	-35.52	VERTICAL	Peak
5	2483.500	43.57	27.48	3.53	37.57	37.01	54.00	-16.99	VERTICAL	Average
6	2483.500	58.09	27.48	3.53	37.57	51.53	74.00	-22.47	VERTICAL	Peak
7	2500.000	33.25	27.50	3.40	37.56	26.59	54.00	-27.41	VERTICAL	Average
8	2500.000	43.49	27.50	3.40	37.56	36.83	74.00	-37.17	VERTICAL	Peak

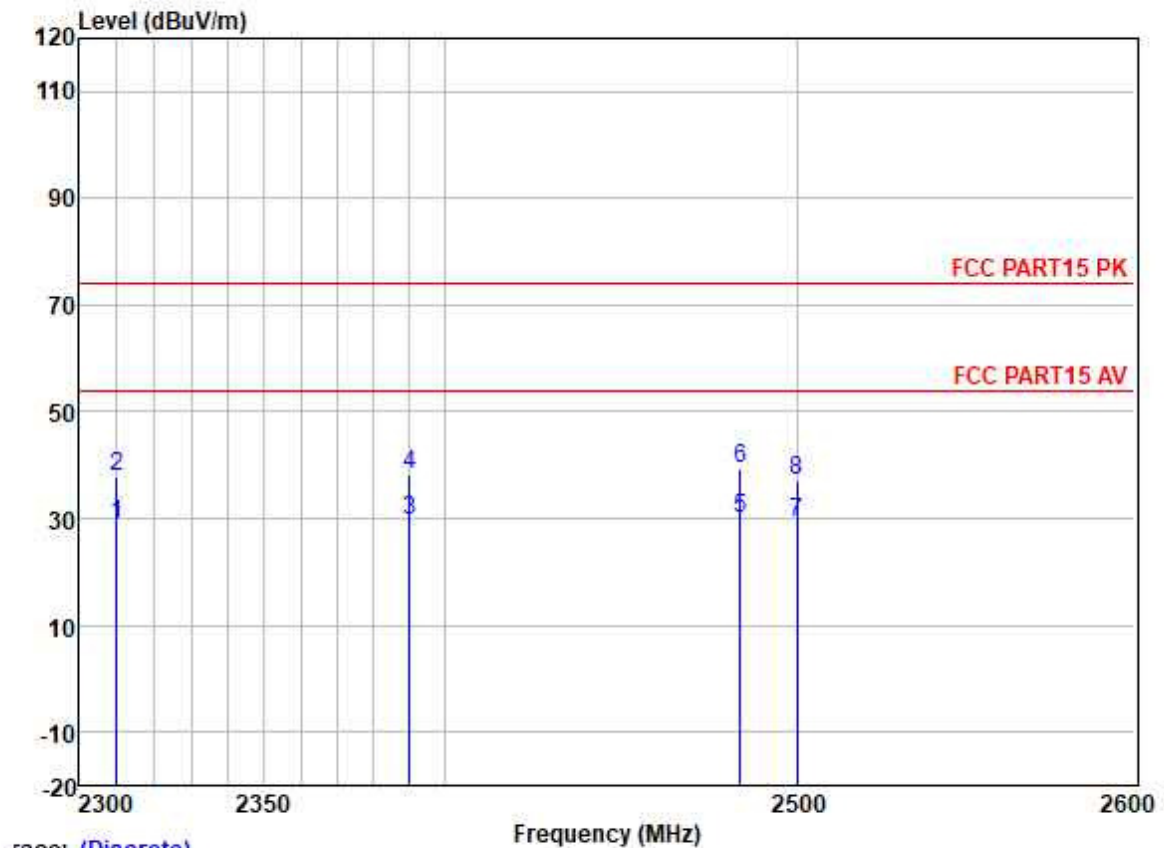


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 Guangzhou Branch Testing & Calibration Laboratory 中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:Low;



Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp 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	36.21	27.15	3.32	37.62	29.06	54.00	-24.94	VERTICAL	Average
2	2310.000	45.10	27.15	3.32	37.62	37.95	74.00	-36.05	VERTICAL	Peak
3	2390.000	36.35	27.33	3.48	37.59	29.57	54.00	-24.43	VERTICAL	Average
4	2390.000	44.91	27.33	3.48	37.59	38.13	74.00	-35.87	VERTICAL	Peak
5	2483.500	36.73	27.48	3.53	37.57	30.17	54.00	-23.83	VERTICAL	Average
6	2483.500	45.76	27.48	3.53	37.57	39.20	74.00	-34.80	VERTICAL	Peak
7	2500.000	35.86	27.50	3.40	37.56	29.20	54.00	-24.80	VERTICAL	Average
8	2500.000	43.81	27.50	3.40	37.56	37.15	74.00	-36.85	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
 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

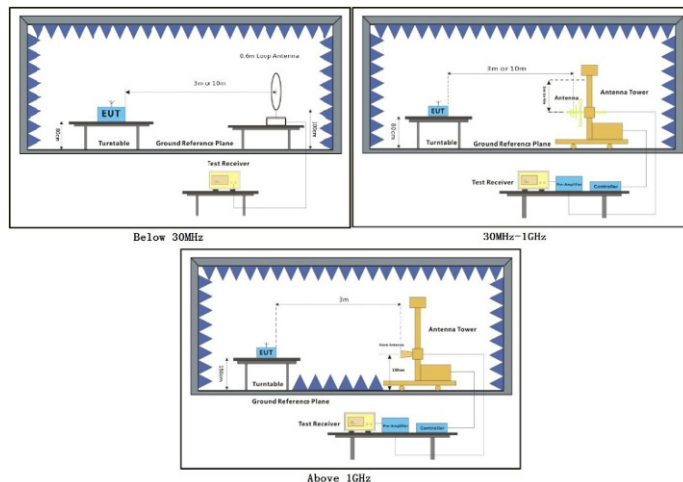
Operating Environment:

Temperature: 26 °C Humidity: 55 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.3 Test Setup Diagram



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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.

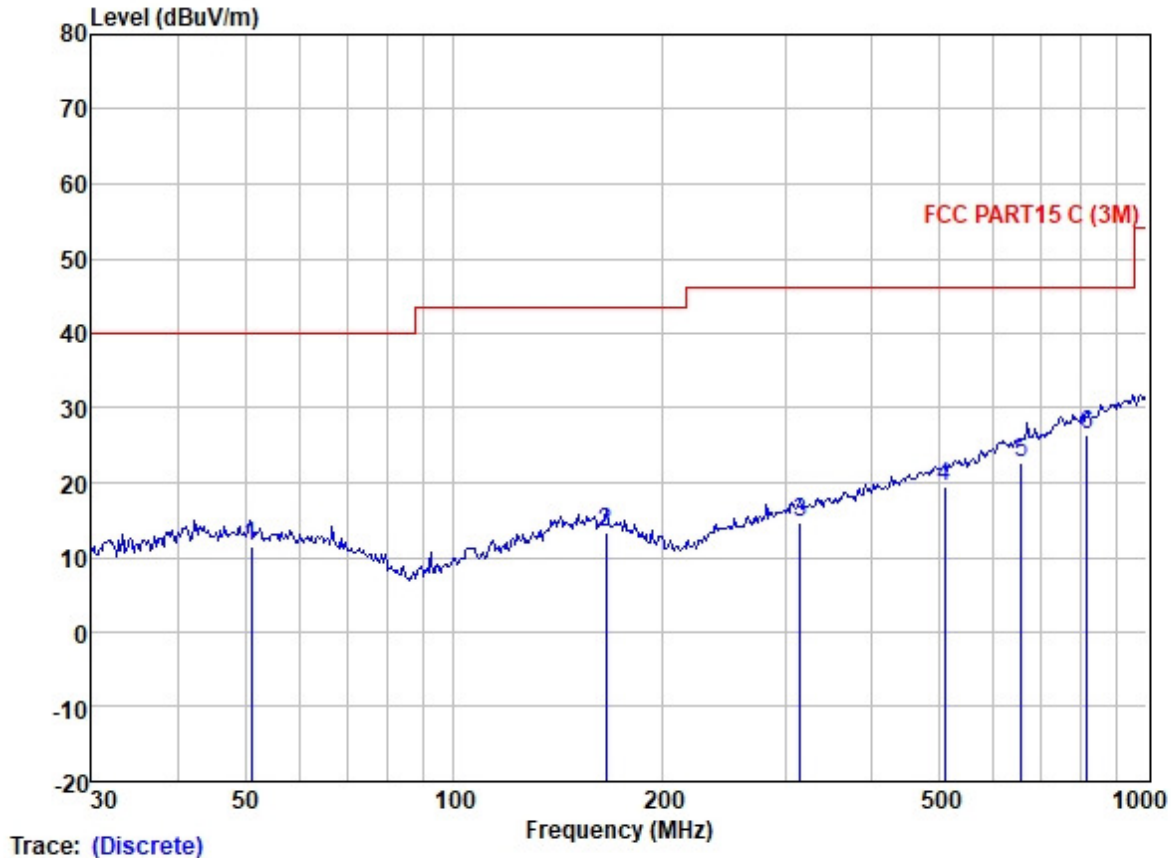
Remark:

- 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 & Pre-amplifier. The basic equation with a sample calculation is as follows:
 Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Pre-amplifier 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.



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Test Mode: 02; Polarity: Horizontal



Trace: (Discrete)

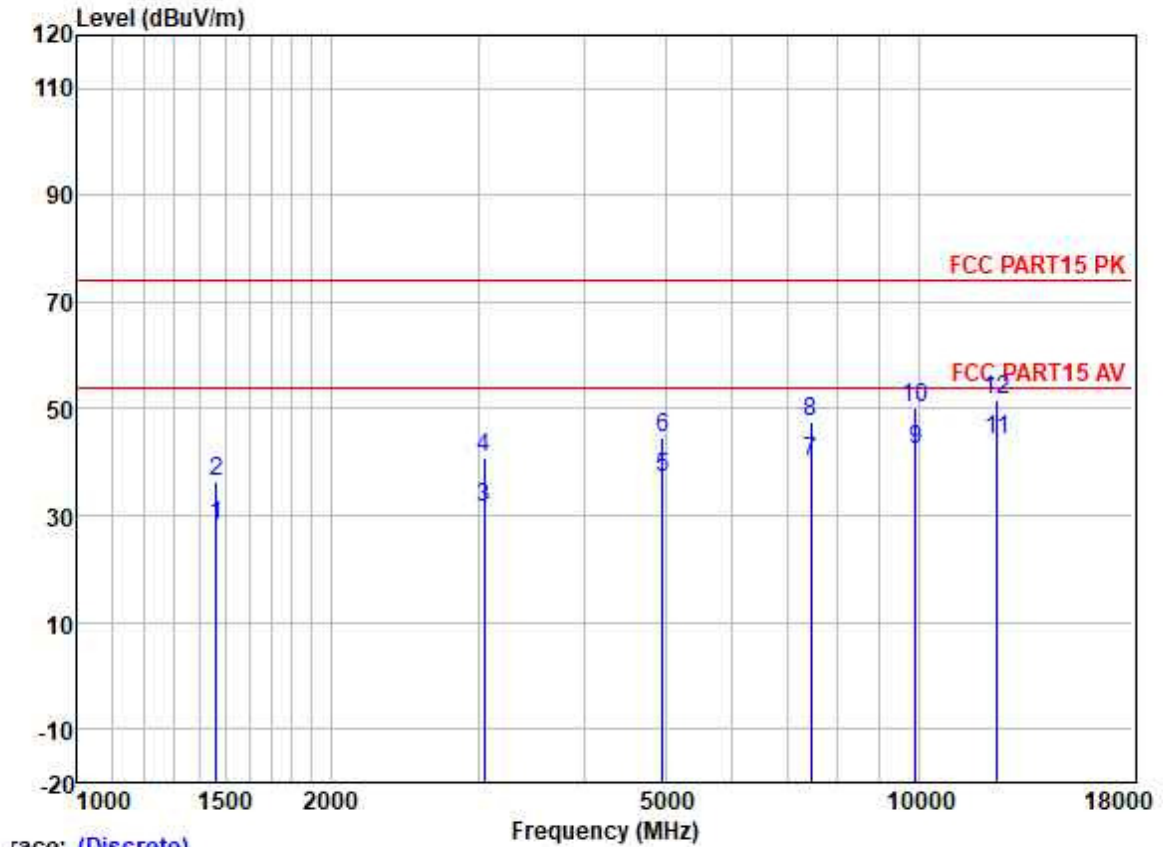
Site : SGS
 Condition : FCC PART15 C (3M) HORIZONTAL
 Job :
 Model :
 Power :
 Test Mode :

	Freq	Read Level	Antenna 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	50.94	23.45	13.94	1.15	27.17	11.37	40.00	-28.63	HORIZONTAL	QP
2	165.49	24.29	13.42	2.37	26.78	13.30	43.50	-30.20	HORIZONTAL	QP
3	315.48	23.89	14.10	3.29	26.63	14.65	46.00	-31.35	HORIZONTAL	QP
4	510.04	24.78	18.10	4.47	28.00	19.35	46.00	-26.65	HORIZONTAL	QP
5	658.84	24.73	20.58	5.56	28.18	22.69	46.00	-23.31	HORIZONTAL	QP
6	818.83	25.18	22.80	6.30	28.00	26.28	46.00	-19.72	HORIZONTAL	QP



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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:High;



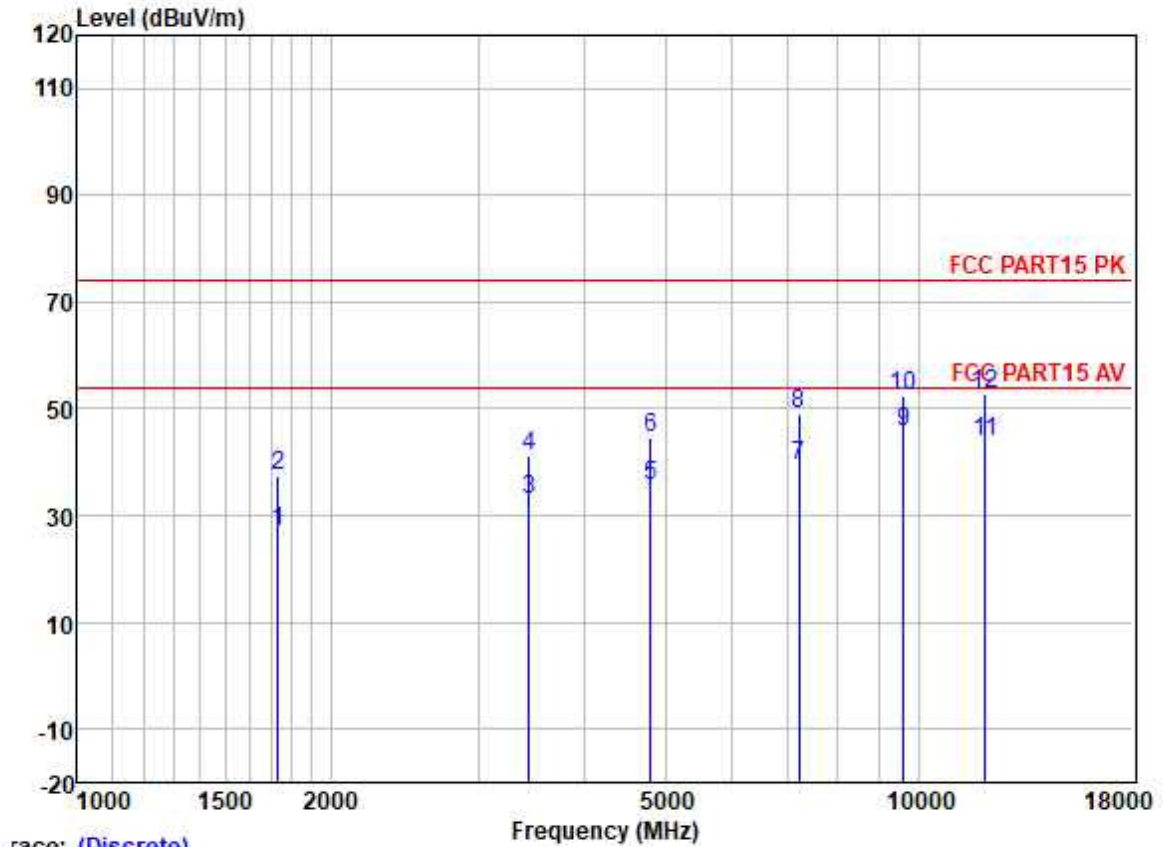
Trace: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1464.522	38.24	25.47	2.74	38.13	28.32	54.00	-25.68	HORIZONTAL	Average
2	1464.522	46.15	25.47	2.74	38.13	36.23	74.00	-37.77	HORIZONTAL	Peak
3	3042.846	36.54	28.43	3.84	37.20	31.61	54.00	-22.39	HORIZONTAL	Average
4	3042.846	45.74	28.43	3.84	37.20	40.81	74.00	-33.19	HORIZONTAL	Peak
5	4960.668	36.75	31.65	5.65	36.84	37.21	54.00	-16.79	HORIZONTAL	Average
6	4960.668	44.17	31.65	5.65	36.84	44.63	74.00	-29.37	HORIZONTAL	Peak
7	7440.778	34.99	36.27	6.22	37.47	40.01	54.00	-13.99	HORIZONTAL	Average
8	7440.778	42.66	36.27	6.22	37.47	47.68	74.00	-26.32	HORIZONTAL	Peak
9	9920.123	34.21	38.65	6.96	37.40	42.42	54.00	-11.58	HORIZONTAL	Average
10	9920.123	42.15	38.65	6.96	37.40	50.36	74.00	-23.64	HORIZONTAL	Peak
11	12400.600	34.70	38.57	7.97	36.88	44.36	54.00	-9.64	HORIZONTAL	Average
12	12400.600	41.90	38.57	7.97	36.88	51.56	74.00	-22.44	HORIZONTAL	Peak



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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low;



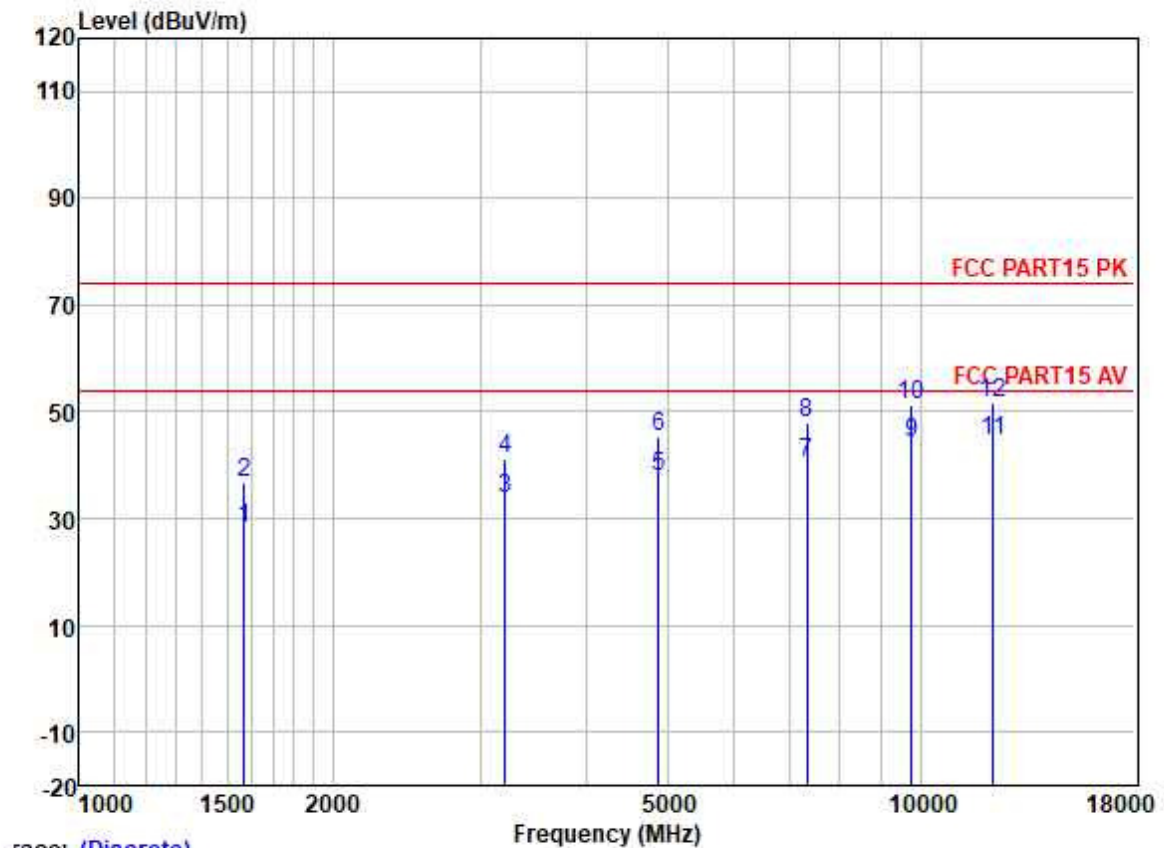
Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Limit	Over			
	MHz	Level	Loss	Factor	Line	Limit	Pol/Phase	Remark	
		dBuV	dB	dB	dBuV/m	dB			
1	1731.816	36.23	25.80	2.85	37.87	27.01	54.00	-26.99	HORIZONTAL Average
2	1731.816	46.70	25.80	2.85	37.87	37.48	74.00	-36.52	HORIZONTAL Peak
3	3445.535	37.01	28.87	4.18	36.96	33.10	54.00	-20.90	HORIZONTAL Average
4	3445.535	45.30	28.87	4.18	36.96	41.39	74.00	-32.61	HORIZONTAL Peak
5	4804.412	35.72	31.42	5.40	36.83	35.71	54.00	-18.29	HORIZONTAL Average
6	4804.412	44.62	31.42	5.40	36.83	44.61	74.00	-29.39	HORIZONTAL Peak
7	7206.260	35.38	35.54	5.98	37.38	39.52	54.00	-14.48	HORIZONTAL Average
8	7206.260	45.11	35.54	5.98	37.38	49.25	74.00	-24.75	HORIZONTAL Peak
9	9608.018	37.82	38.37	7.07	37.42	45.84	54.00	-8.16	HORIZONTAL Average
10	9608.018	44.51	38.37	7.07	37.42	52.53	74.00	-21.47	HORIZONTAL Peak
11	12010.350	33.86	38.90	8.19	37.10	43.85	54.00	-10.15	HORIZONTAL Average
12	12010.350	42.78	38.90	8.19	37.10	52.77	74.00	-21.23	HORIZONTAL Peak



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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle;



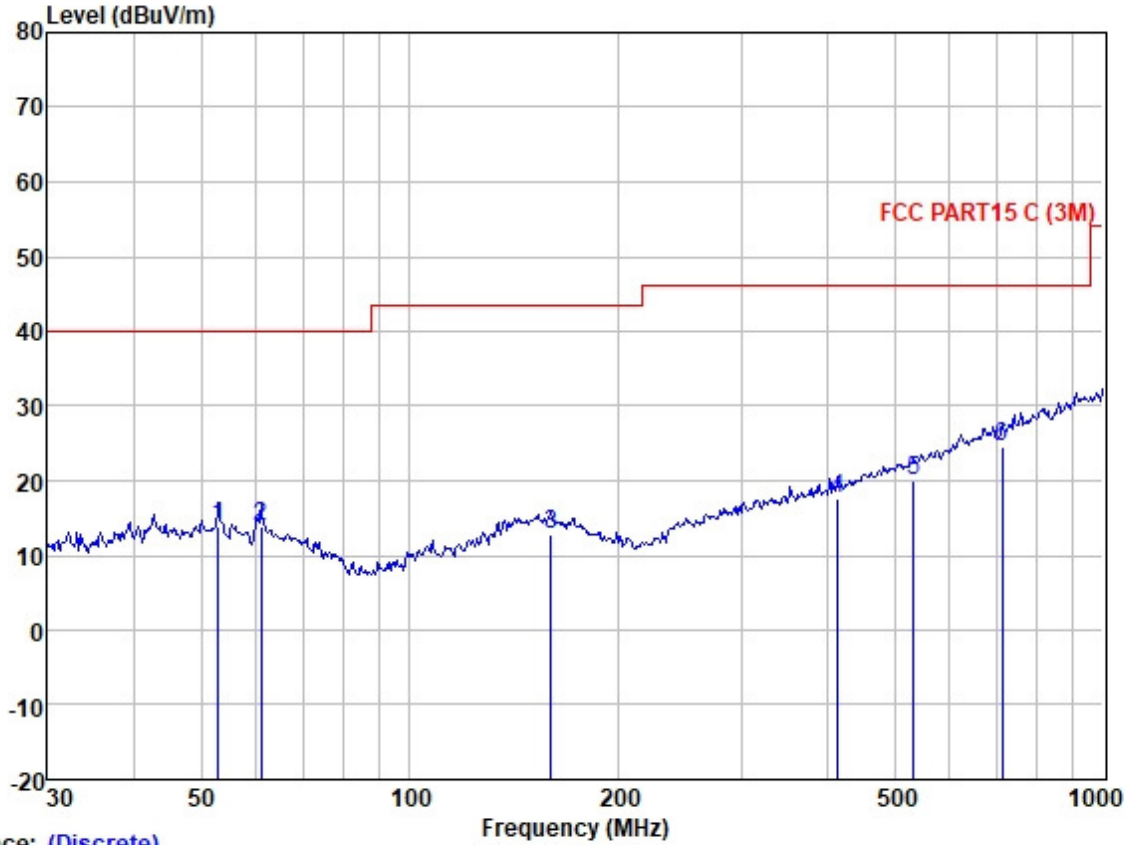
Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Preamp Factor	Limit Level	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	1569.721	37.69	25.55	2.80	38.00	28.04	54.00	-25.96	HORIZONTAL Average
2	1569.721	46.35	25.55	2.80	38.00	36.70	74.00	-37.30	HORIZONTAL Peak
3	3205.345	38.33	28.60	4.00	37.09	33.84	54.00	-20.16	HORIZONTAL Average
4	3205.345	45.65	28.60	4.00	37.09	41.16	74.00	-32.84	HORIZONTAL Peak
5	4884.184	37.51	31.56	5.52	36.84	37.75	54.00	-16.25	HORIZONTAL Average
6	4884.184	45.06	31.56	5.52	36.84	45.30	74.00	-28.70	HORIZONTAL Peak
7	7326.052	35.70	36.00	6.13	37.43	40.40	54.00	-13.60	HORIZONTAL Average
8	7326.052	43.09	36.00	6.13	37.43	47.79	74.00	-26.21	HORIZONTAL Peak
9	9768.187	36.09	38.53	7.01	37.41	44.22	54.00	-9.78	HORIZONTAL Average
10	9768.187	43.10	38.53	7.01	37.41	51.23	74.00	-22.77	HORIZONTAL Peak
11	12210.240	34.66	38.74	8.08	37.00	44.48	54.00	-9.52	HORIZONTAL Average
12	12210.240	41.98	38.74	8.08	37.00	51.80	74.00	-22.20	HORIZONTAL Peak



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Test Mode: 02; Polarity: Vertical



Trace: (Discrete)

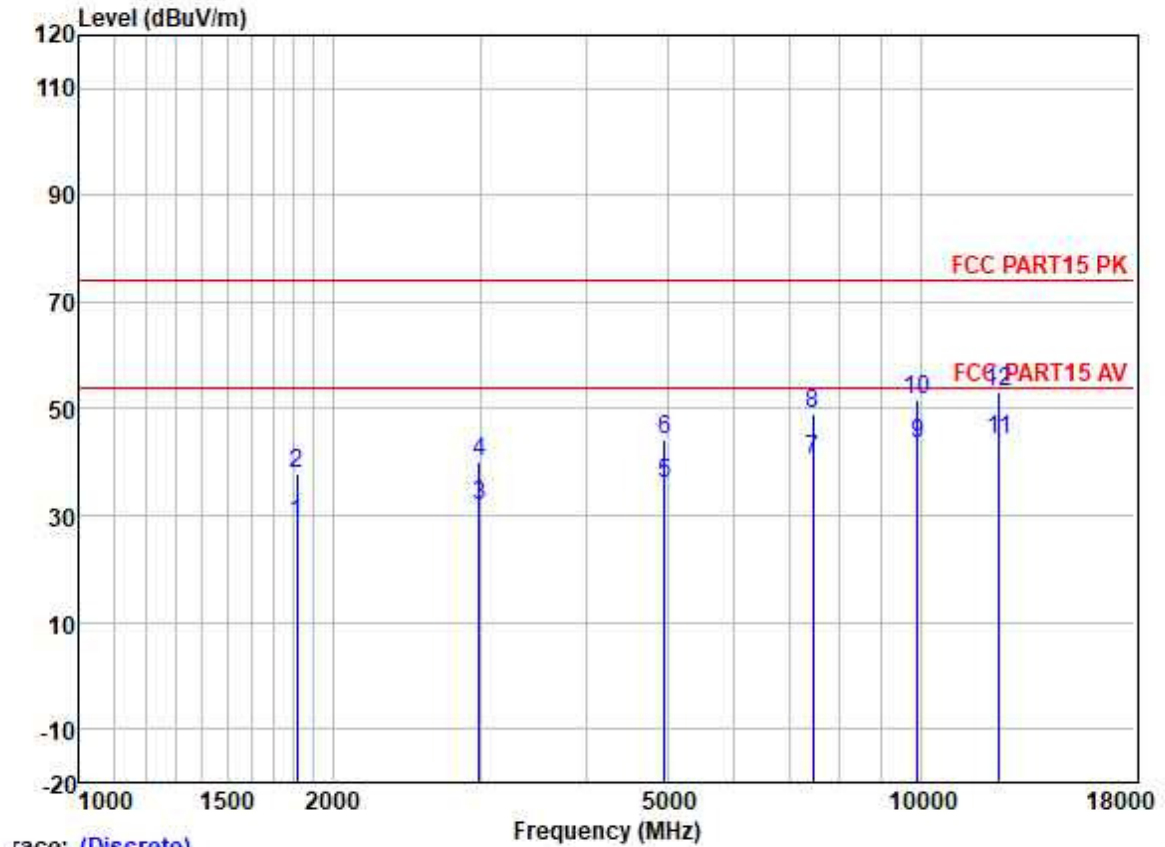
Site : SGS
 Condition : FCC PART15 C (3M) VERTICAL
 Job :
 Model :
 Power :
 Test Mode :

	Freq	Read Level	Antenna 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	52.95	26.04	13.90	1.17	27.17	13.94	40.00	-26.06	VERTICAL	QP
2	60.92	26.37	13.25	1.27	27.16	13.73	40.00	-26.27	VERTICAL	QP
3	159.78	23.58	13.60	2.33	26.80	12.71	43.50	-30.79	VERTICAL	QP
4	414.72	24.82	16.10	3.99	27.40	17.51	46.00	-28.49	VERTICAL	QP
5	531.96	24.95	18.32	4.65	28.04	19.88	46.00	-26.12	VERTICAL	QP
6	714.17	25.38	21.35	5.83	28.15	24.41	46.00	-21.59	VERTICAL	QP



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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:High;



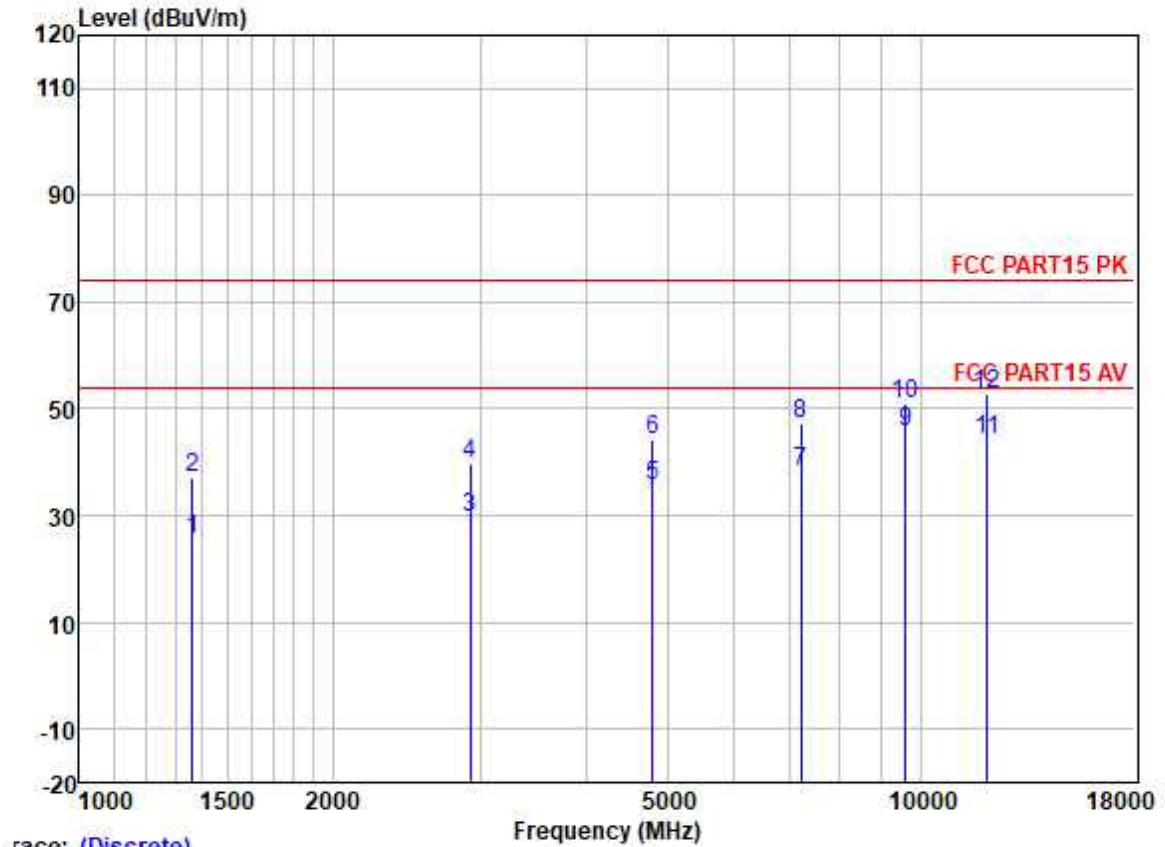
Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Preamp Factor	Level	Limit	Over	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1813.786	37.26	25.96	2.99	37.80	28.41	54.00	-25.59	VERTICAL	Average
2	1813.786	46.55	25.96	2.99	37.80	37.70	74.00	-36.30	VERTICAL	Peak
3	2990.531	37.12	28.39	3.79	37.25	32.05	54.00	-21.95	VERTICAL	Average
4	2990.531	45.13	28.39	3.79	37.25	40.06	74.00	-33.94	VERTICAL	Peak
5	4960.197	35.53	31.65	5.65	36.84	35.99	54.00	-18.01	VERTICAL	Average
6	4960.197	43.82	31.65	5.65	36.84	44.28	74.00	-29.72	VERTICAL	Peak
7	7440.741	35.38	36.27	6.22	37.47	40.40	54.00	-13.60	VERTICAL	Average
8	7440.741	44.08	36.27	6.22	37.47	49.10	74.00	-24.90	VERTICAL	Peak
9	9920.725	35.25	38.65	6.96	37.40	43.46	54.00	-10.54	VERTICAL	Average
10	9920.725	43.30	38.65	6.96	37.40	51.51	74.00	-22.49	VERTICAL	Peak
11	12400.580	34.44	38.57	7.97	36.88	44.10	54.00	-9.90	VERTICAL	Average
12	12400.580	43.60	38.57	7.97	36.88	53.26	74.00	-20.74	VERTICAL	Peak



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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:Low;



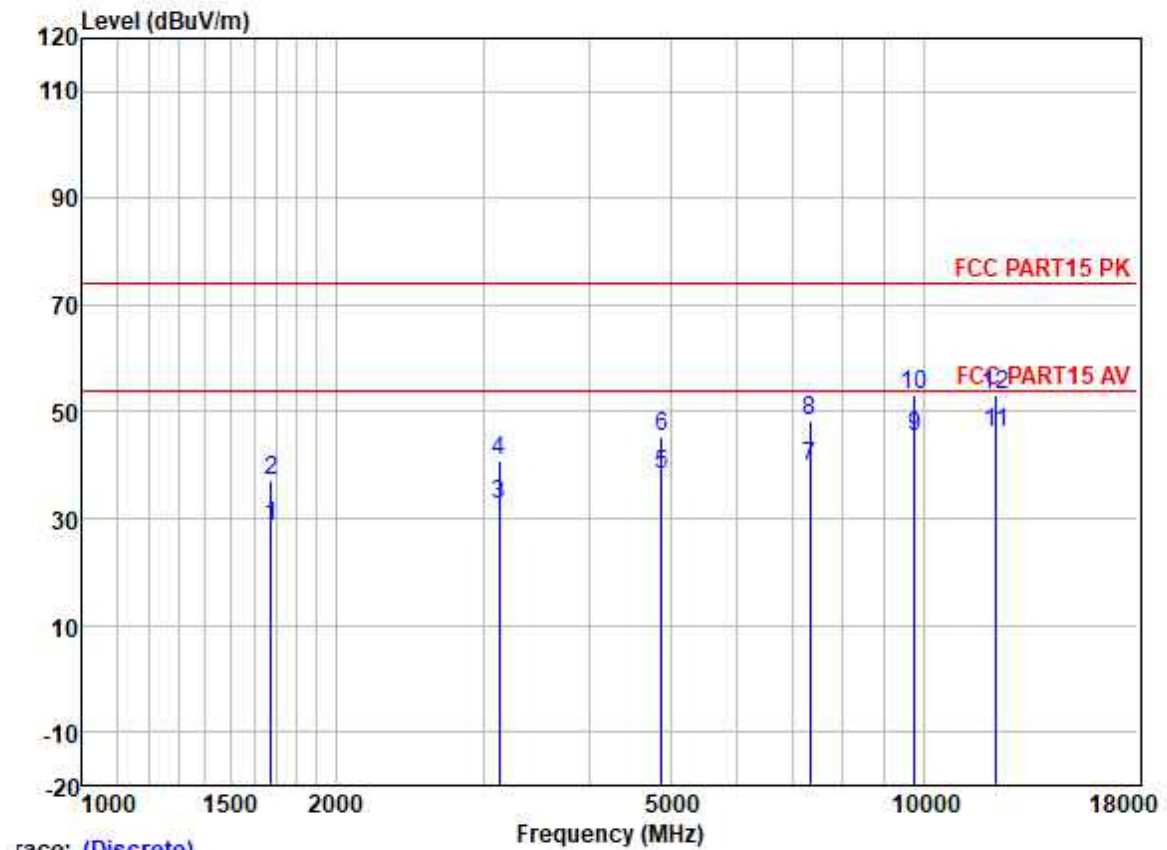
Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Preamp Factor	Level	Limit	Over	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1362.430	36.04	25.33	2.60	38.27	25.70	54.00	-28.30	VERTICAL	Average
2	1362.430	47.46	25.33	2.60	38.27	37.12	74.00	-36.88	VERTICAL	Peak
3	2913.740	34.84	28.31	3.71	37.32	29.54	54.00	-24.46	VERTICAL	Average
4	2913.740	45.11	28.31	3.71	37.32	39.81	74.00	-34.19	VERTICAL	Peak
5	4804.396	35.71	31.42	5.40	36.83	35.70	54.00	-18.30	VERTICAL	Average
6	4804.396	44.19	31.42	5.40	36.83	44.18	74.00	-29.82	VERTICAL	Peak
7	7206.806	34.28	35.54	5.98	37.38	38.42	54.00	-15.58	VERTICAL	Average
8	7206.806	43.25	35.54	5.98	37.38	47.39	74.00	-26.61	VERTICAL	Peak
9	9608.160	37.59	38.37	7.07	37.42	45.61	54.00	-8.39	VERTICAL	Average
10	9608.160	43.01	38.37	7.07	37.42	51.03	74.00	-22.97	VERTICAL	Peak
11	12010.980	34.18	38.90	8.19	37.10	44.17	54.00	-9.83	VERTICAL	Average
12	12010.980	42.65	38.90	8.19	37.10	52.64	74.00	-21.36	VERTICAL	Peak



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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:middle;



Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Preamp Factor	Level	Limit	Over	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1677.621	37.87	25.68	2.80	37.91	28.44	54.00	-25.56	VERTICAL	Average
2	1677.621	46.60	25.68	2.80	37.91	37.17	74.00	-36.83	VERTICAL	Peak
3	3132.079	37.20	28.51	3.95	37.14	32.52	54.00	-21.48	VERTICAL	Average
4	3132.079	45.67	28.51	3.95	37.14	40.99	74.00	-33.01	VERTICAL	Peak
5	4884.049	37.92	31.56	5.52	36.84	38.16	54.00	-15.84	VERTICAL	Average
6	4884.049	45.08	31.56	5.52	36.84	45.32	74.00	-28.68	VERTICAL	Peak
7	7326.741	35.04	36.00	6.13	37.43	39.74	54.00	-14.26	VERTICAL	Average
8	7326.741	43.74	36.00	6.13	37.43	48.44	74.00	-25.56	VERTICAL	Peak
9	9768.430	37.28	38.53	7.01	37.41	45.41	54.00	-8.59	VERTICAL	Average
10	9768.430	44.95	38.53	7.01	37.41	53.08	74.00	-20.92	VERTICAL	Peak
11	12210.710	36.38	38.74	8.08	37.00	46.20	54.00	-7.80	VERTICAL	Average
12	12210.710	43.45	38.74	8.08	37.00	53.27	74.00	-20.73	VERTICAL	Peak



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8 Appendix

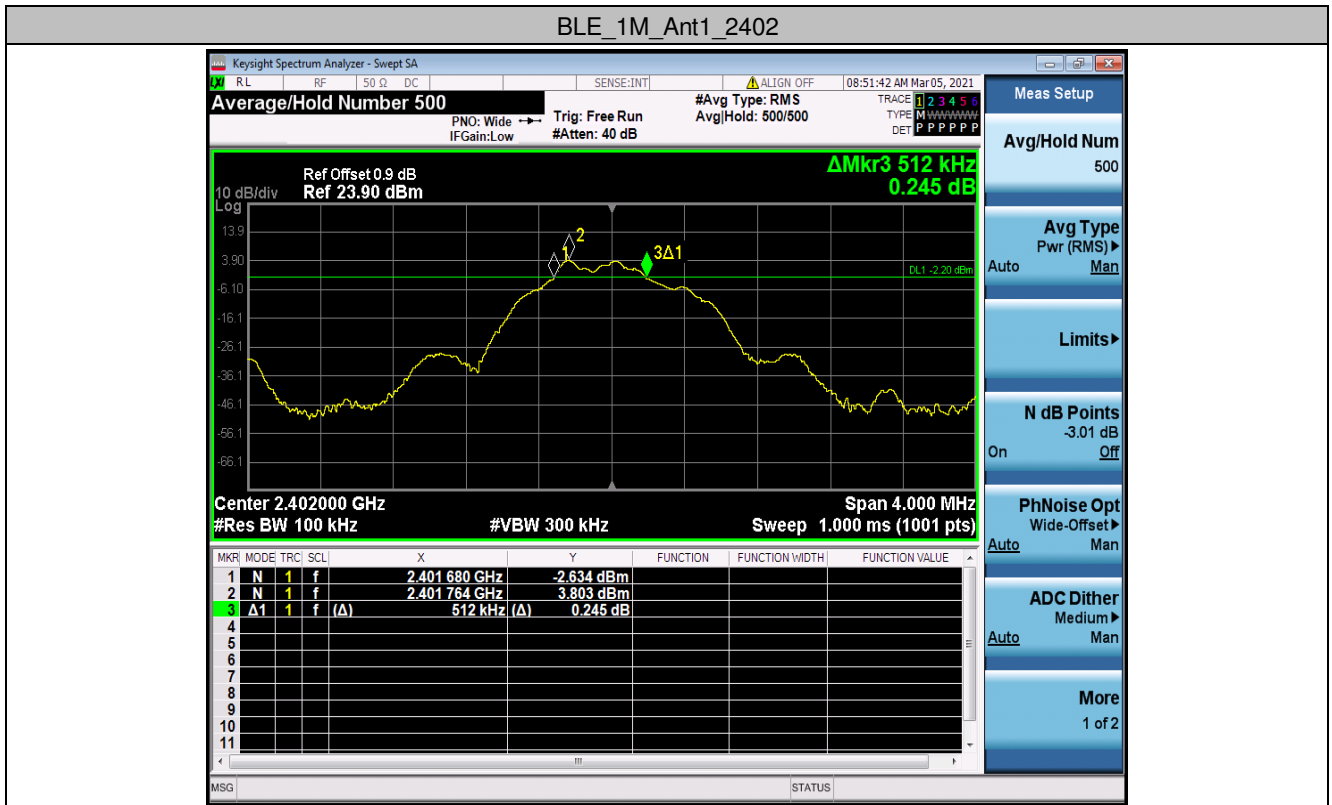
(cable loss =0.9dB)

8.1 Appendix A: DTS Bandwidth

8.1.1 Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.512	2401.680	2402.192	>=0.5	PASS
		2440	0.504	2439.684	2440.188	>=0.5	PASS
		2480	0.512	2479.680	2480.192	>=0.5	PASS

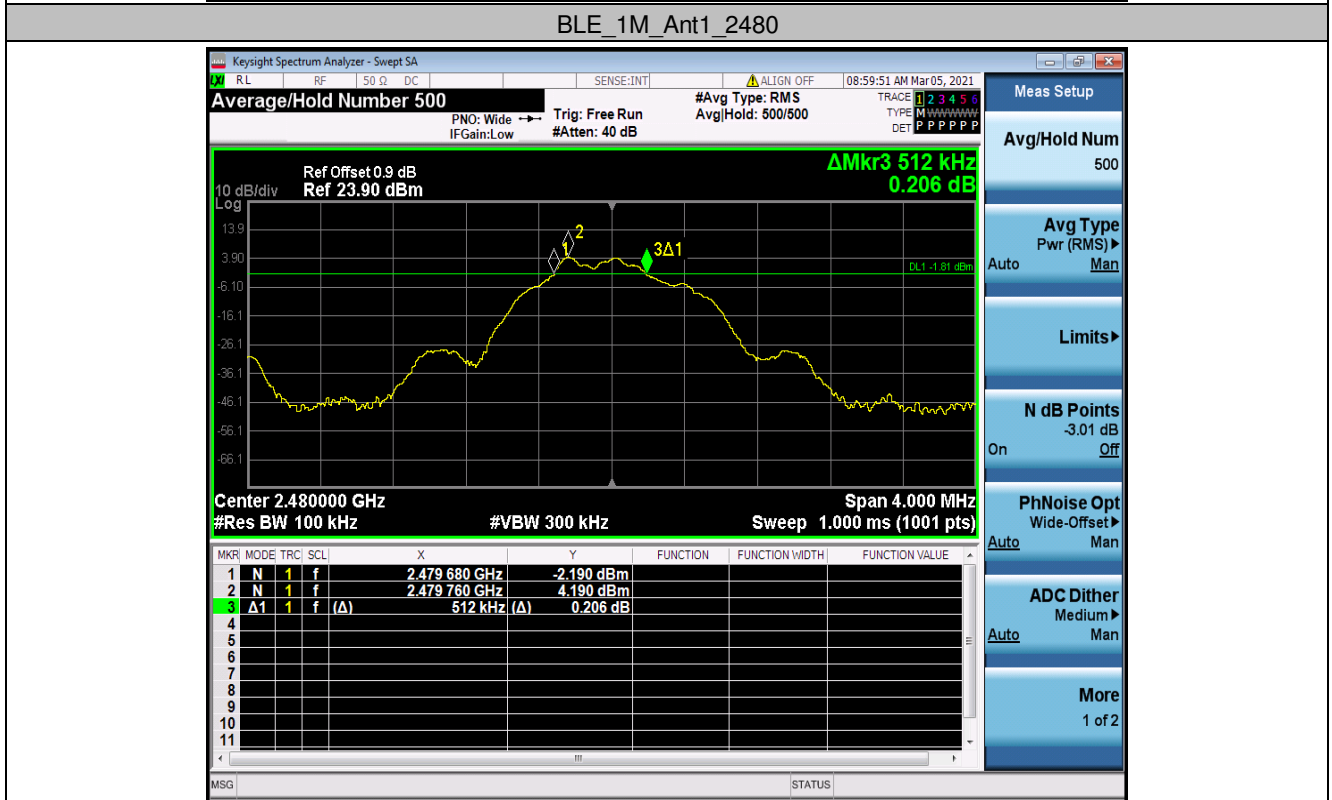
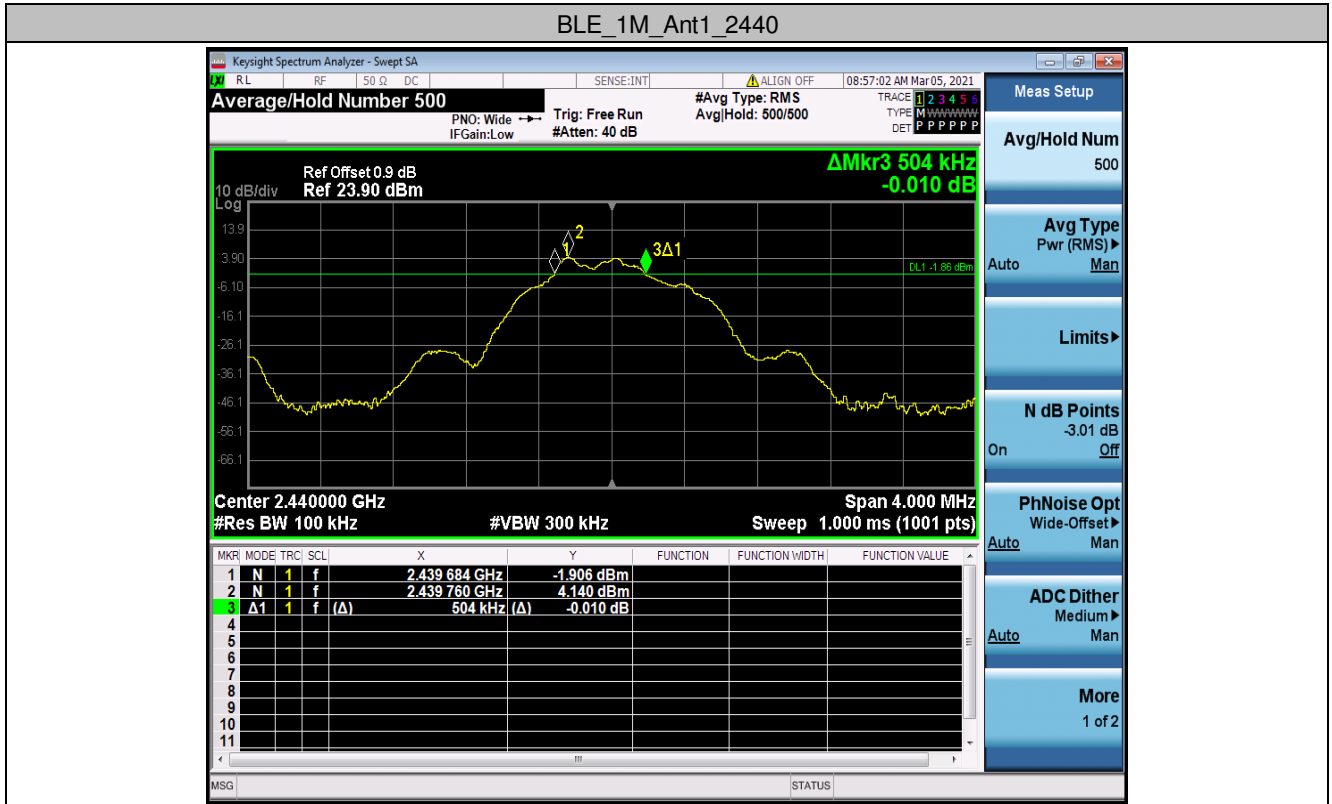
8.1.2 Test Graphs



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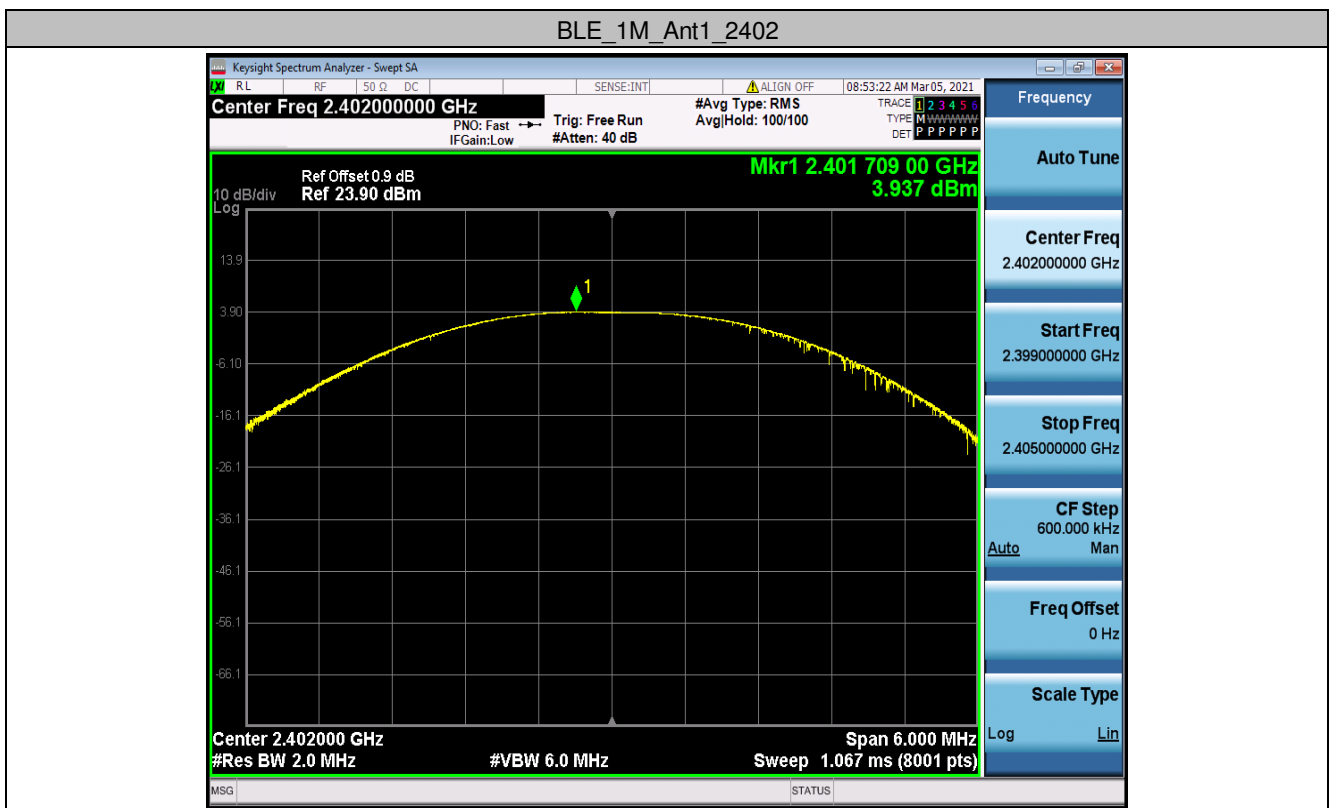
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8.2 Appendix B: Maximum conducted output power

8.2.1 Test Result

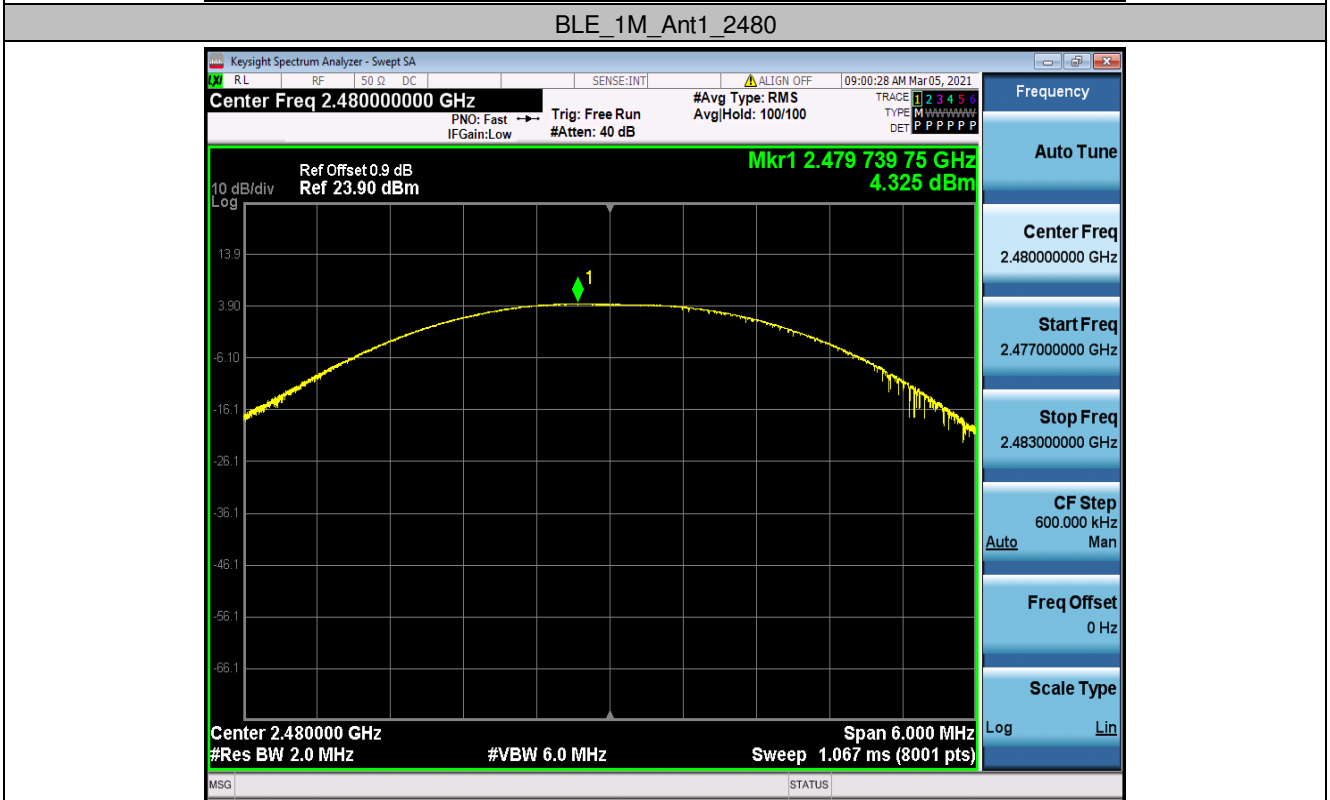
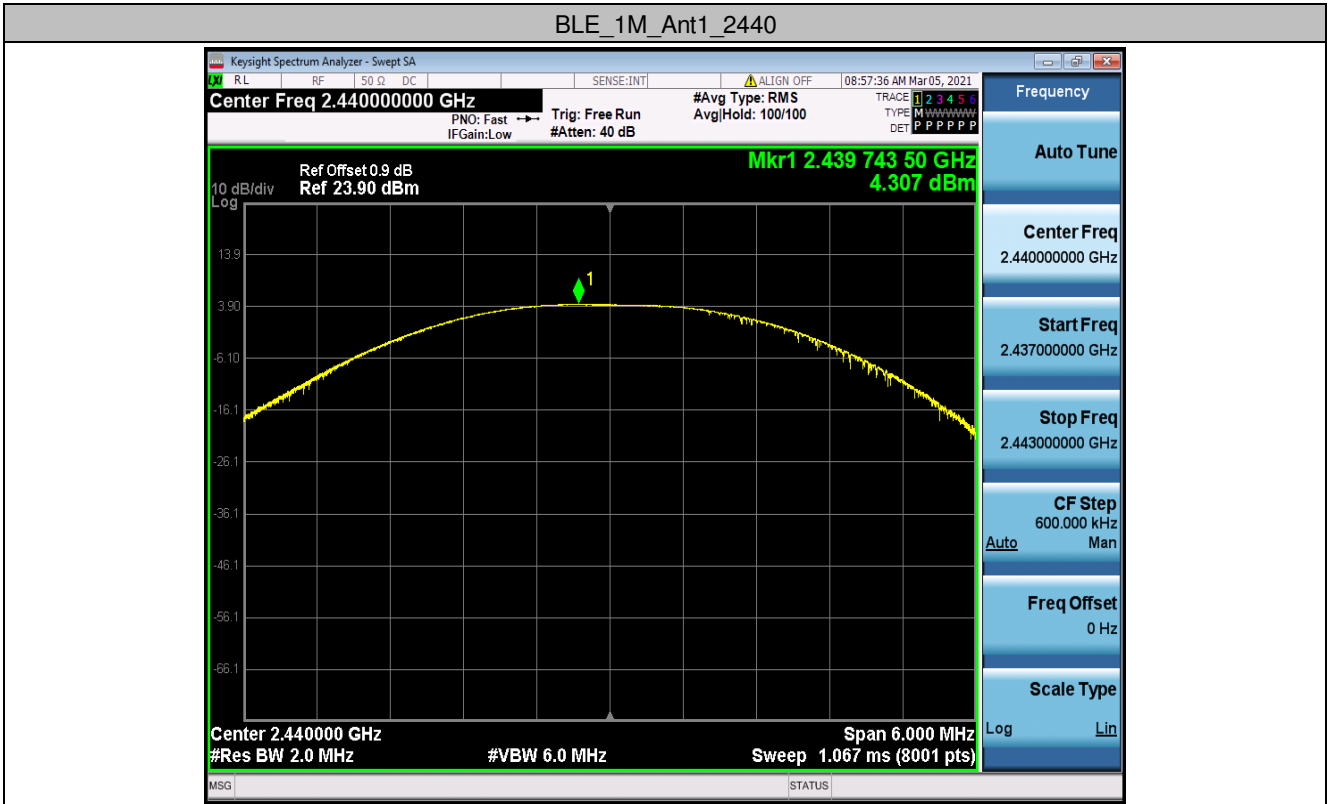
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	3.94	<=30	PASS
		2440	4.31	<=30	PASS
		2480	4.33	<=30	PASS

8.2.2 Test Graphs



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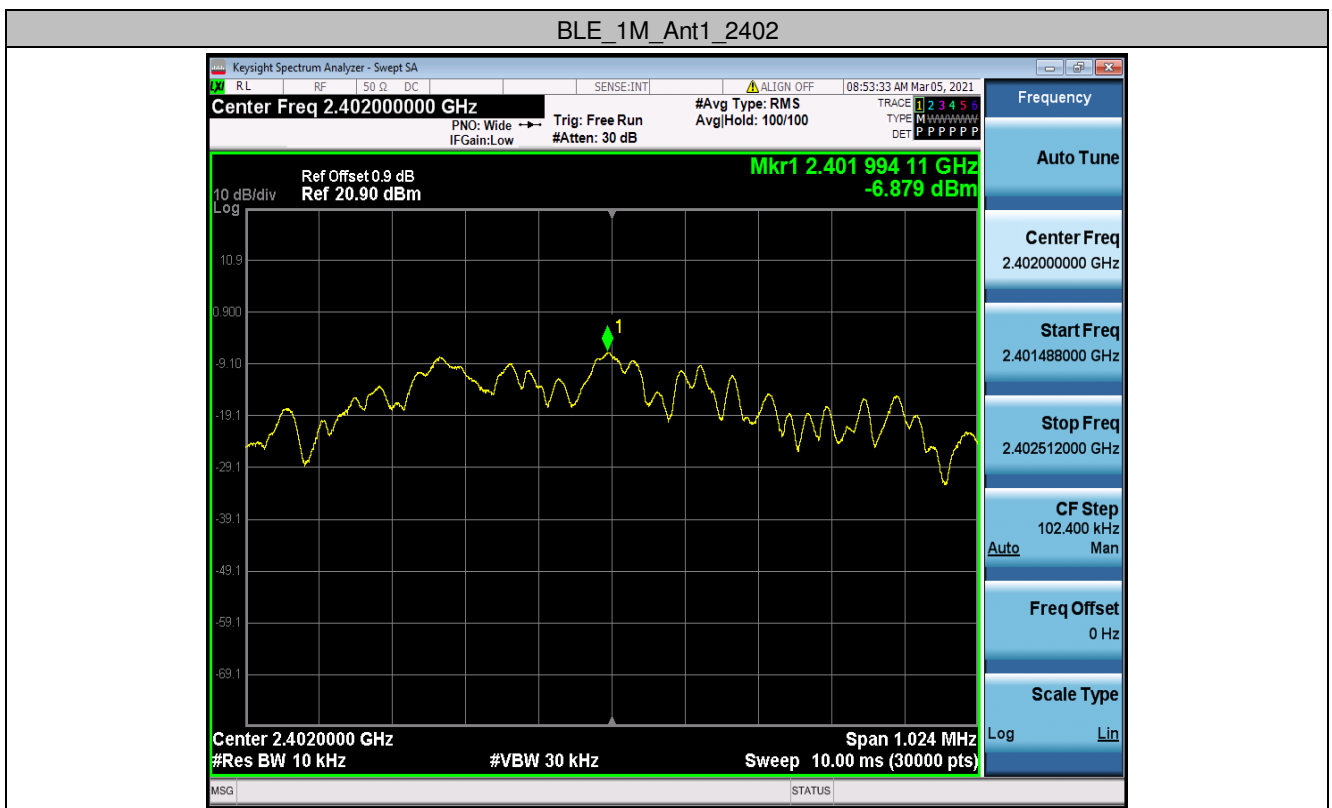
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8.3 Appendix C: Maximum power spectral density

8.3.1 Test Result

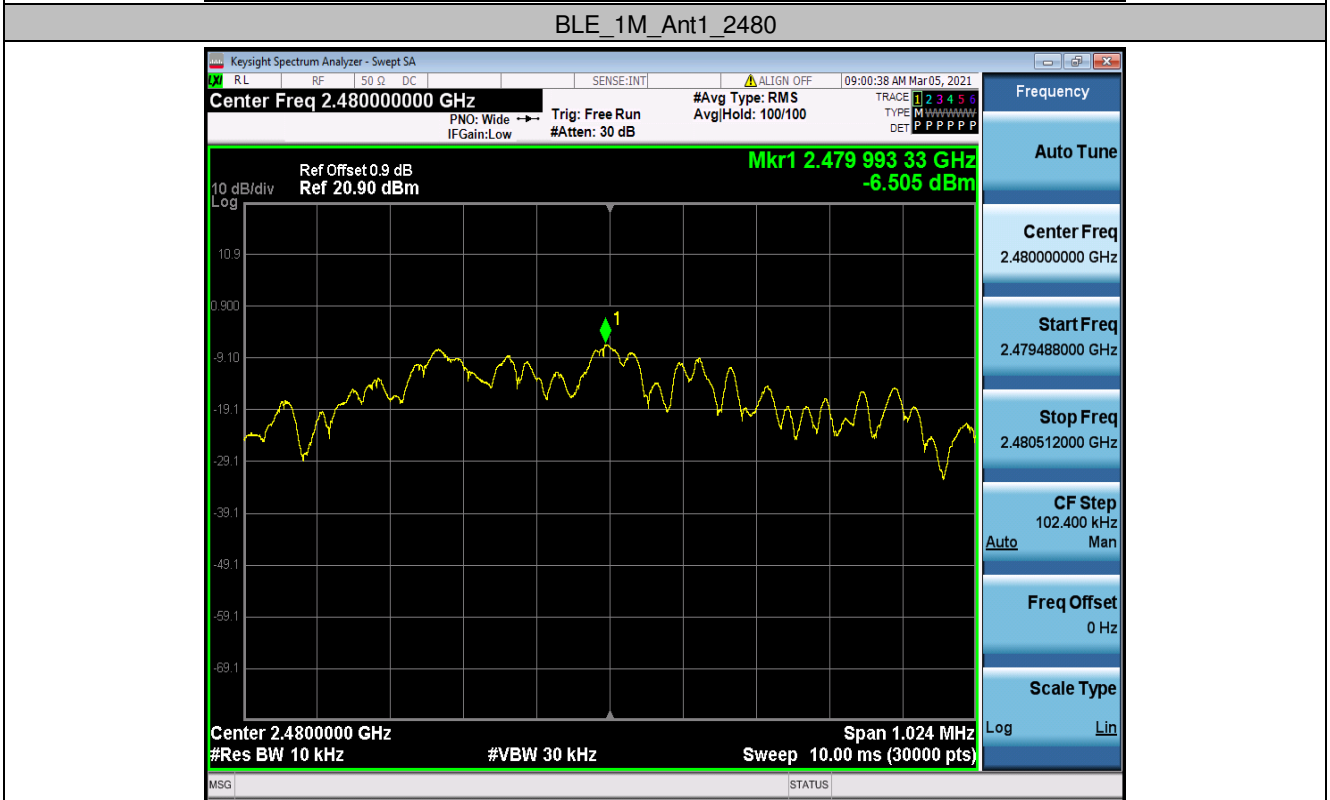
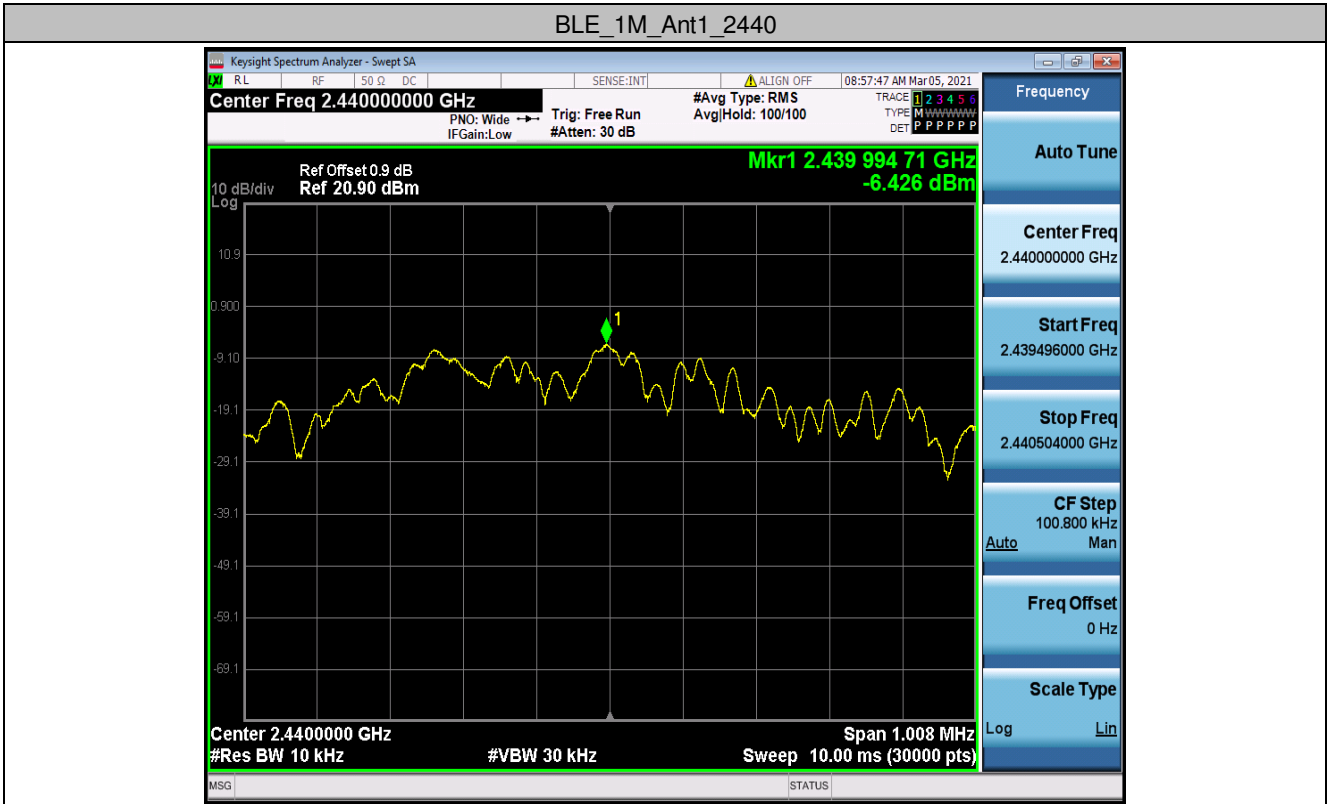
TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-6.88	<=8	PASS
		2440	-6.43	<=8	PASS
		2480	-6.51	<=8	PASS

8.3.2 Test Graphs



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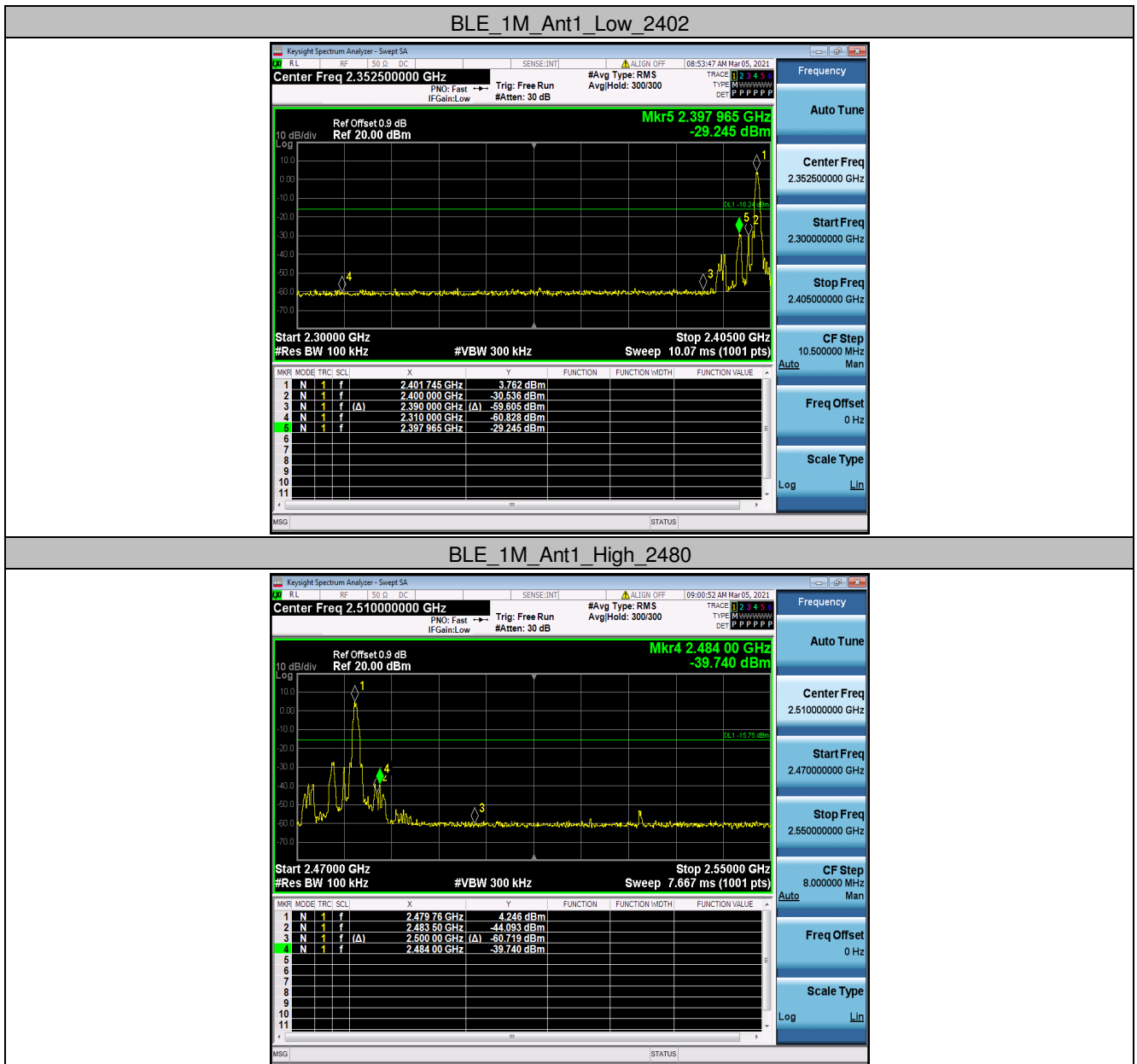
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8.4 Appendix D: Band edge measurements

8.4.1 Test Result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	3.76	-29.25	<=-16.24	PASS
		High	2480	4.25	-39.74	<=-15.75	PASS

8.4.2 Test Graphs



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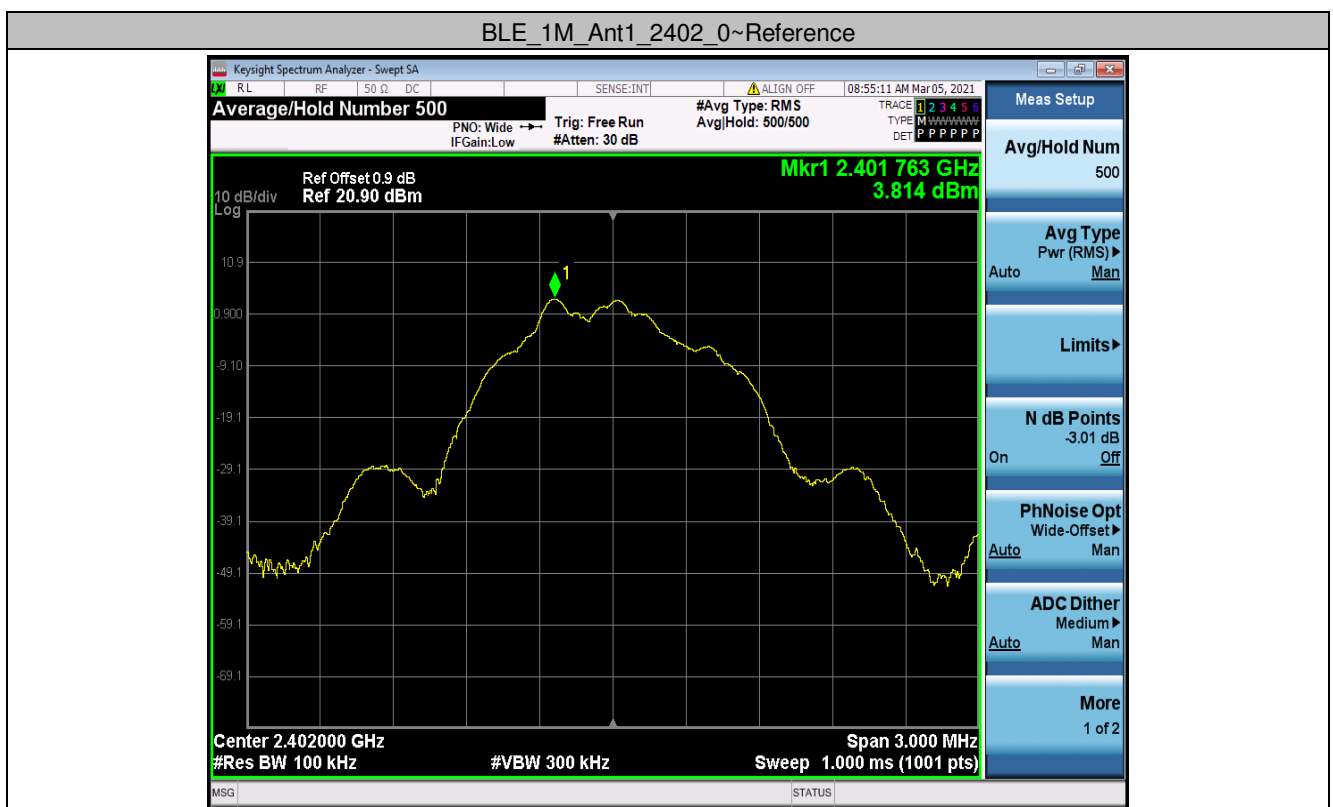
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8.5 Appendix E: Conducted Spurious Emission

8.5.1 Test Result

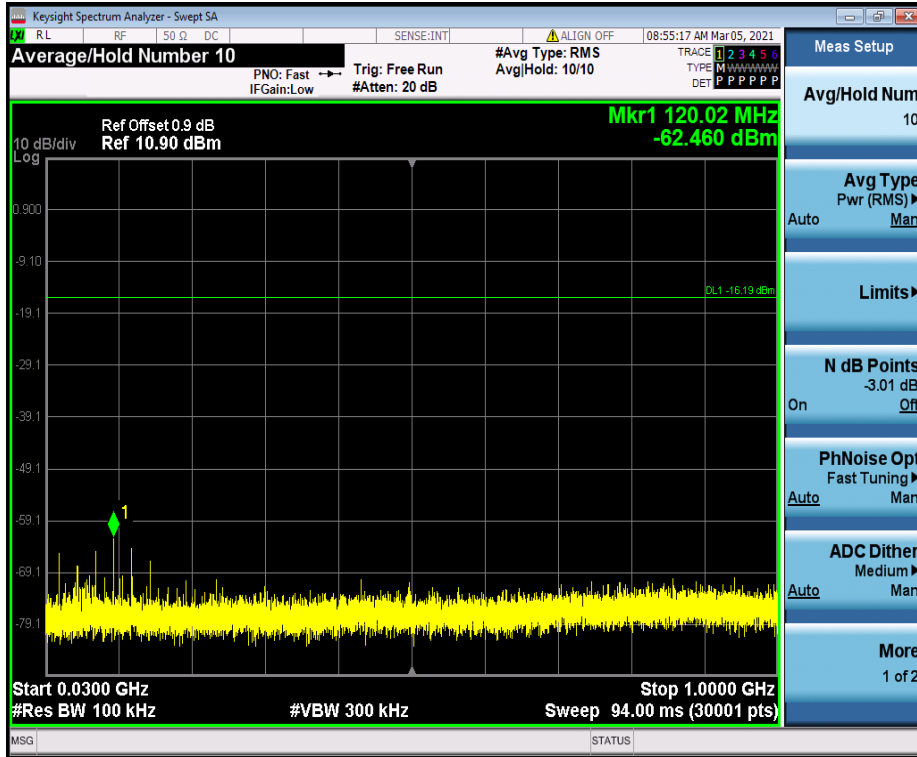
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	3.81	3.81	---	PASS
			30~1000	30~1000	-62.46	<=-16.186	PASS
			1000~26500	1000~26500	-41.293	<=-16.186	PASS
		2440	Reference	4.22	4.22	---	PASS
			30~1000	30~1000	-61.486	<=-15.78	PASS
			1000~26500	1000~26500	-39.144	<=-15.78	PASS
		2480	Reference	4.19	4.19	---	PASS
			30~1000	30~1000	-61.212	<=-15.806	PASS
			1000~26500	1000~26500	-39.715	<=-15.806	PASS

8.5.2 Test Graphs

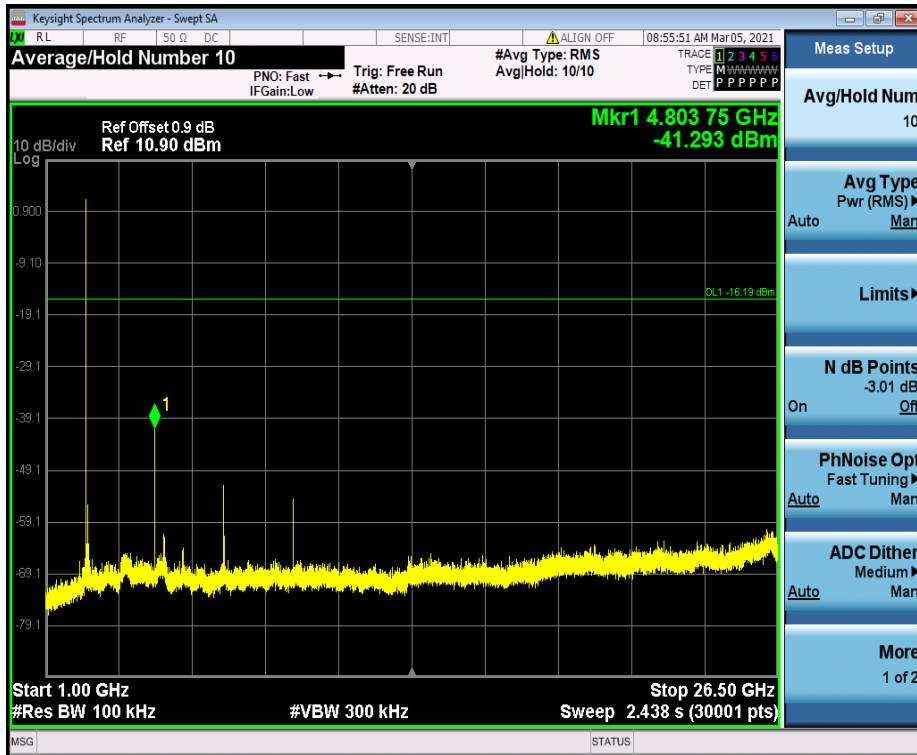


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BLE_1M_Ant1_2402_30~1000



BLE_1M_Ant1_2402_1000~26500

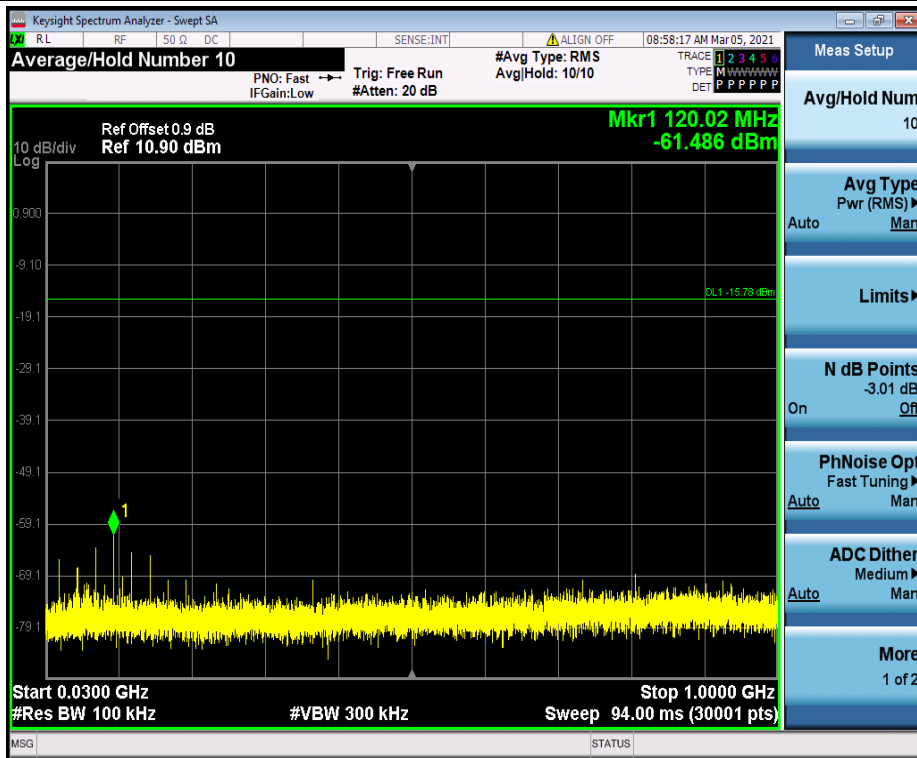


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BLE_1M_Ant1_2440_0~Reference



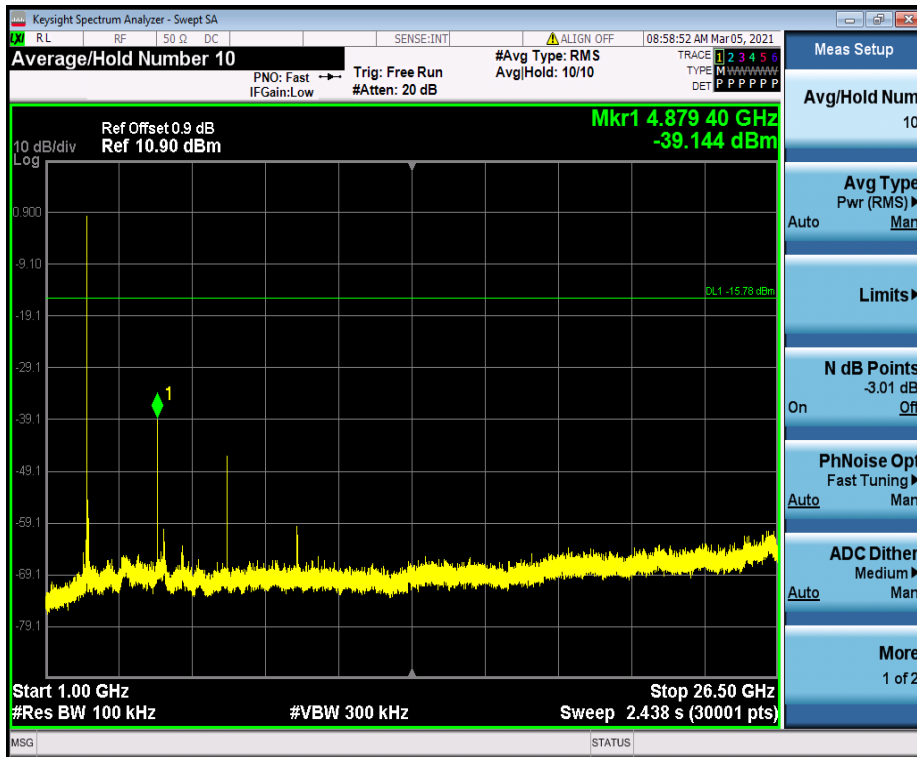
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BLE_1M_Ant1_2440_1000~26500



BLE_1M_Ant1_2480_0~Reference

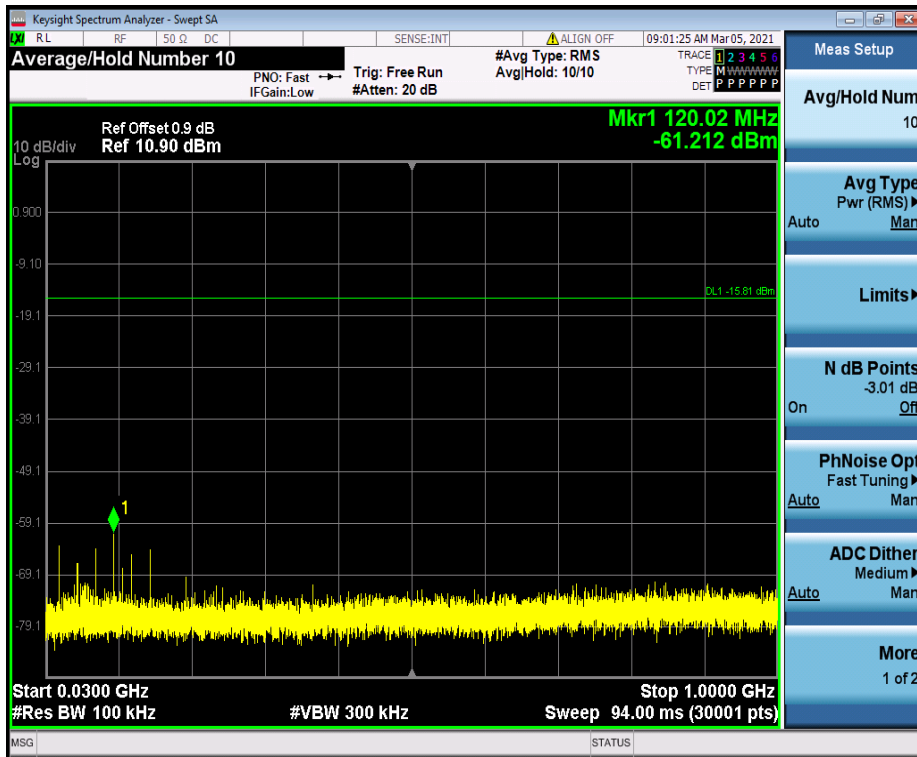


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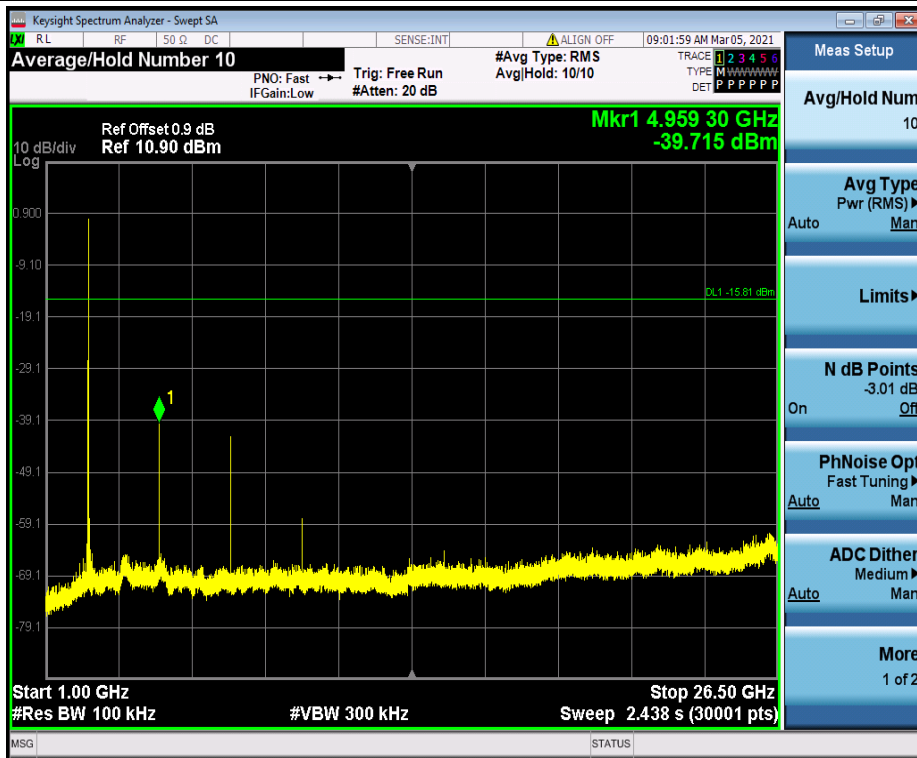
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BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~2650



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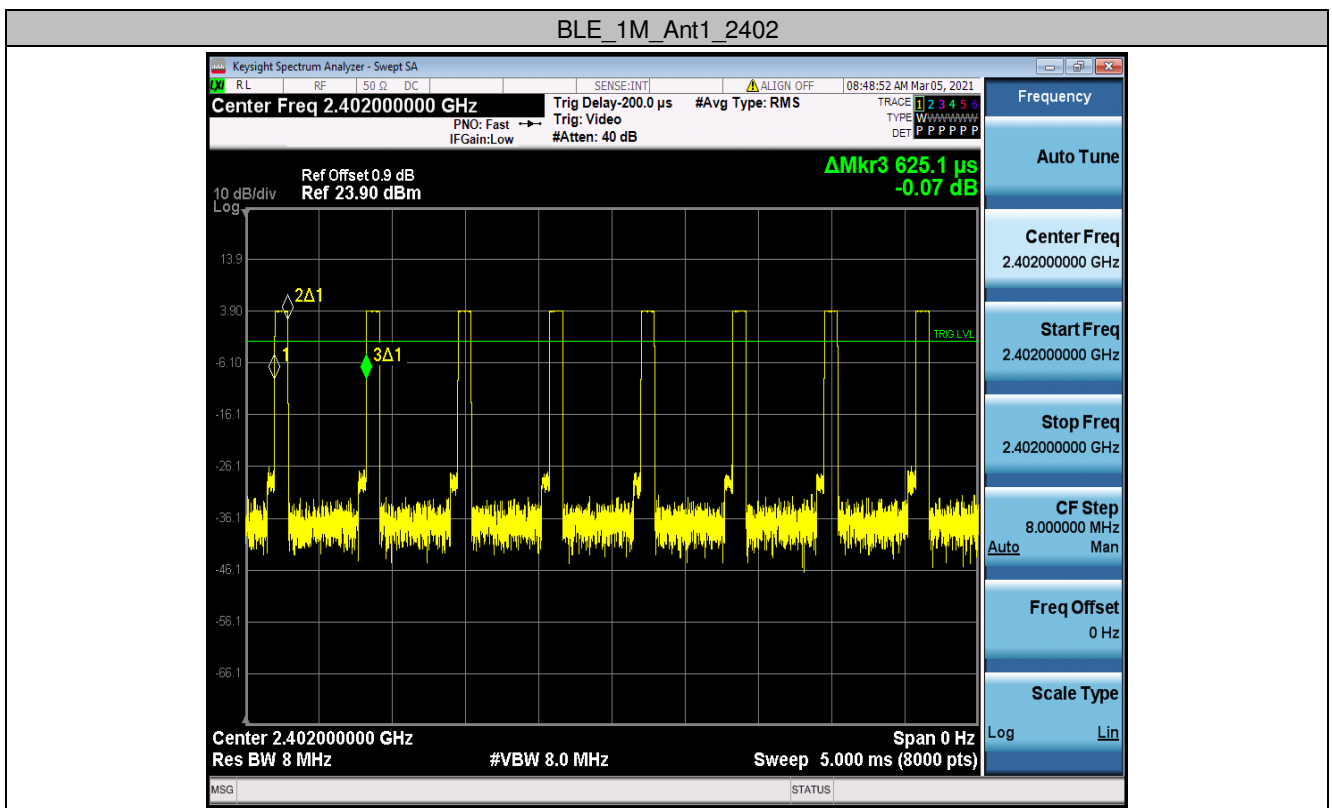
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8.6 Appendix F: Duty Cycle

8.6.1 Test Result

TestMode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
BLE_1M	Ant1	2402	0.09	0.63	14.50
		2440	0.09	0.63	14.50
		2480	0.09	0.63	14.50

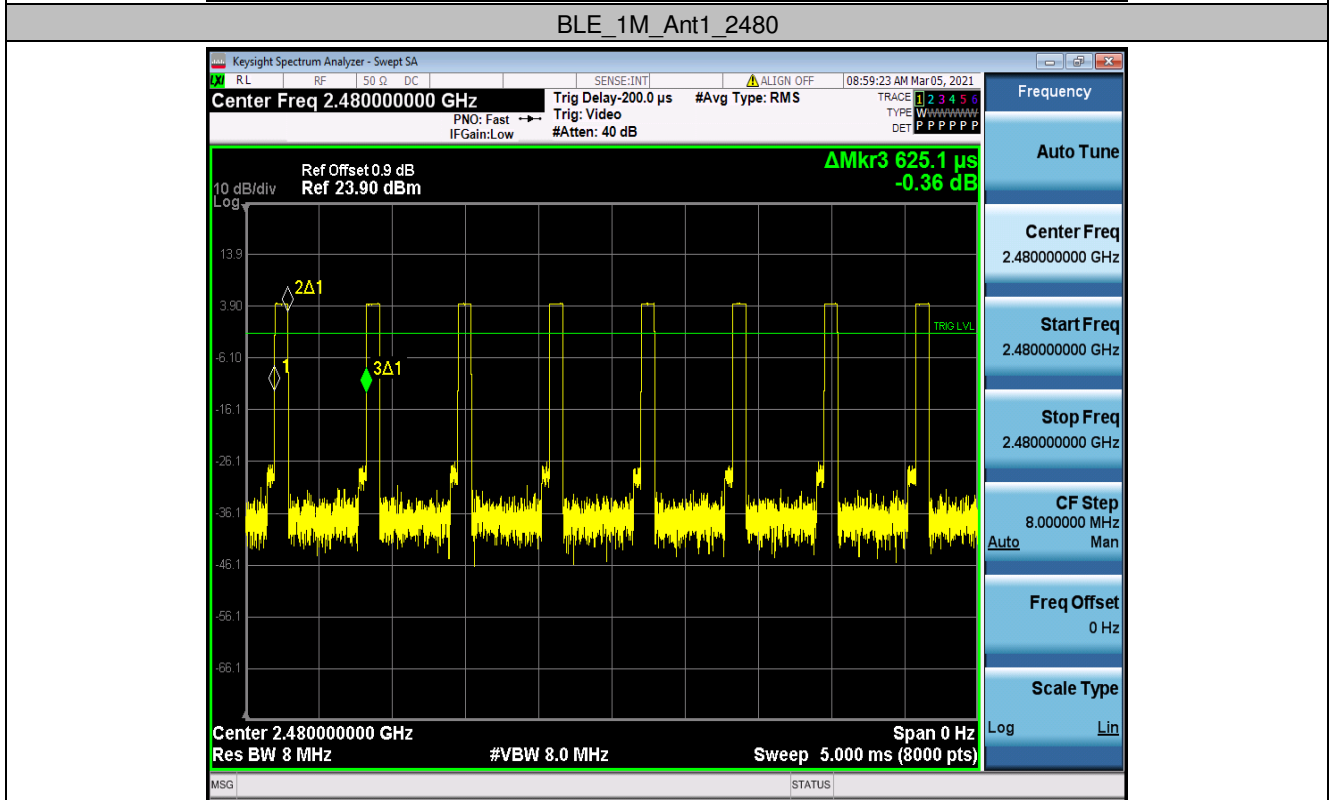
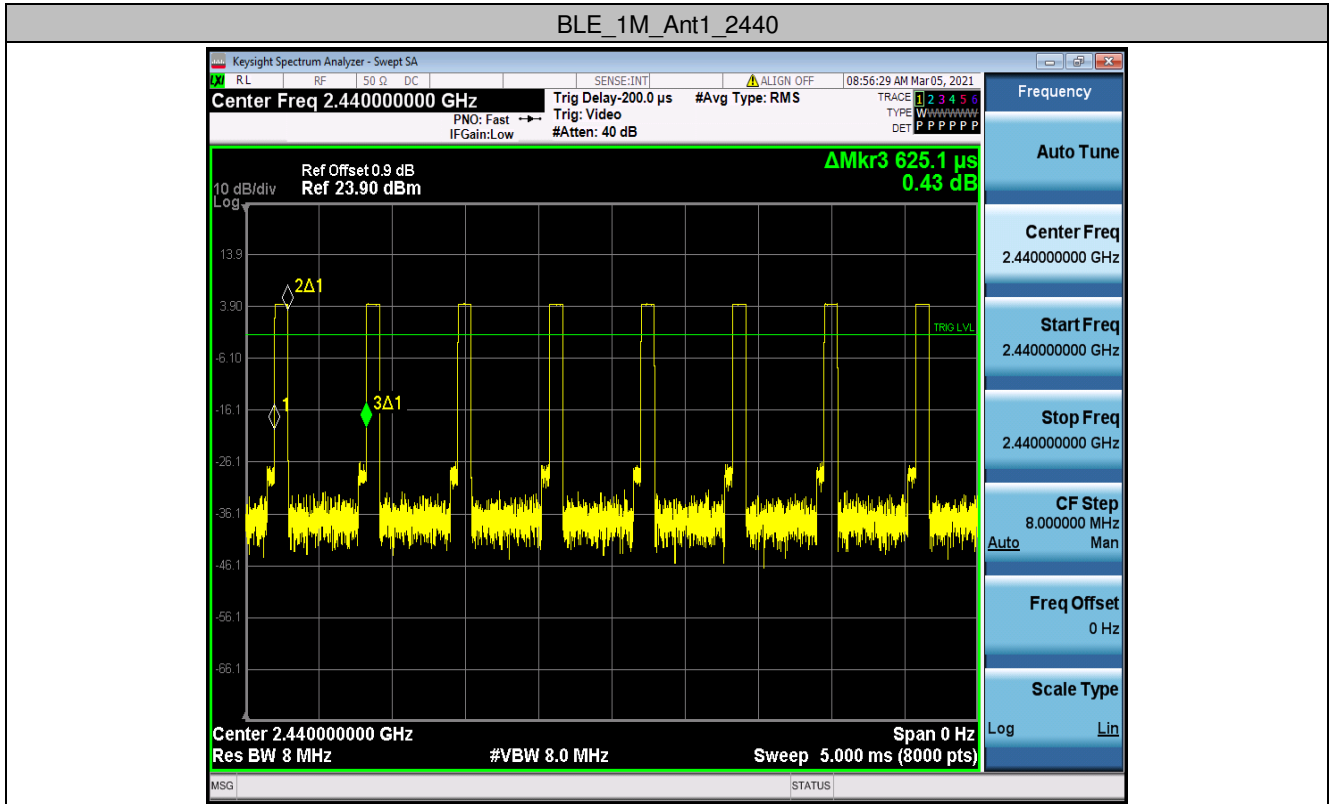
8.6.2 Test Graphs



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- End of the Report -



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