TEST REPORT

Application No.:	SHCR2304000774HS
FCC ID:	2AMH4M7GPSHSET
IC:	29364-M7GPSHSET
Applicant:	MOTOCADDY LTD.
Address of Applicant:	Units 15-18 Stansted Distribution Centre, Great Hallingbury, Hertfordshire, CM22 7DG, United Kingdom
Manufacturer:	TED GOLF EQUIPMENT CO.,LTD
Address of Manufacturer:	NO.65-17 Xinggang Road,Zhonglou District,Changzhou,Jiangsu,China
Factory:	TED GOLF EQUIPMENT CO.,LTD
Address of Factory:	NO.65-17 Xinggang Road,Zhonglou District,Changzhou,Jiangsu,China
Equipment Under Test (EUT):	
EUT Name:	Remote control
Model No.:	M7GPS HSET
Trade Mark:	MOTOCADDY
Standard(s) :	47 CFR Part 15, Subpart C 15.247 RSS-247 Issue 2, February 2017 RSS-Gen RSS-Gen Issue 5 Amendment 2 (February 2021)
Date of Receipt:	2023-04-18
Date of Test:	2023-04-20 to 2023-05-04
Date of Issue:	2023-06-06
Test Result:	**Pass***

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

Parlam Zhan
Laboratory Manager

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Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2023-06-06	/

Authorized for issue by:				
		Wade Zhang **Wade Zhang/Project Engineer**		
		Parlam Zhan **Parlam Zhan/Reviewer**		

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**FCC Requirement**	**IC Requirement**	**Method**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	RSS-Gen Clause 6.8	N/A	Customer Declaration

N/A: Not applicable

Radio Spectrum Matter Part				
Item	**FCC Requirement**	**IC Requirement**	**Method**	**Result**
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247a(2)	RSS-247 Clause 5.2(a)	ANSI C63.10 (2013) Section 11.8.1	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247(b)(3)	RSS-247 Clause 5.4(d)	ANSI C63.10 (2013) Section 11.9.1	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247(e)	RSS-247 Clause 5.2(b)	ANSI C63.10 (2013) Section 11.10.2	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247(d)	RSS-247 Clause 5.5	ANSI C63.10 (2013) Section 11.13.3.2	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247(d)	RSS-247 Clause 5.5	ANSI C63.10 (2013) Section 11.11	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	RSS-247 Section 3.3 & RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.10.5	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	RSS-247 Section 3.3 & RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.4,6.5,6.6	Pass
99% Bandwidth	-	RSS-Gen Section 6.7	ANSI C63.10 Section 6.9.3	Pass

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4 General Information

4.1 Details of E.U.T.

Power supply:	DC3.7V Li-ion Battery (340mA)
Test Voltage:	DC3.7V
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 LE
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Data Rate:	1Mbps, 2Mbps
Antenna Type:	PCB Antenna
Antenna Gain:	-2.62dBi (Provided by manufacturer)
S/N:	MCM7MG230300315
Firmware Version:	M7_BLE_REMOTE_BOOT_PLUS_APP_LONGRANGE_V6

4.2 Power level setting using in test:

Channel	Power setting
0	0
19	0
39	0

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	LENOVO	L460	-
SecureCRT	VanDyke	V 6.2.0	-
Serial port adapter plate	-	Test Plate 3	-

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4.4 Measurement Uncertainty & Decision Rule

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty cycle	0.4%
4	Occupied Bandwidth	3%
5	RF conducted power	0.6dB
6	RF power density	2.9dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious emission test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-6GHz)
		5.4dB (6GHz-18GHz)
10	Temperature test	1°C
11	Humidity test	3%
12	Supply voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.5 Test Location

All tests were performed at:
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Tel: +86 21 6191 5666 Fax: +86 21 6191 5678
No tests were sub-contracted.
Note:
1. SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock frequency, highest internal frequency, antenna gain, cable loss, etc) is provided by the applicant. (if applicable).
2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (if applicable).

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4.6 Test Facility

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• FCC (Designation Number: CN1301)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

• ISED (CAB Identifier: CN0020)

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• VCCI (Member No.: 3061)

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4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

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5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2022-12-20	2023-12-19
Spectrum Analyzer	Keysight	N9020B	SHEM241-1	2022-12-20	2023-12-19
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2022-08-02	2023-08-01
Signal Generator	R&S	SMR20	SHEM006-1	2022-08-02	2023-08-01
Signal Generator	Agilent	N5182A	SHEM182-1	2022-08-02	2023-08-01
Communication Tester	R&S	CMW270	SHEM183-1	2022-07-25	2023-07-24
Communication Tester	R&S	CMW500	SHEM268-1	2022-07-25	2023-07-24
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2022-08-02	2023-08-01
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2022-11-08	2024-11-07
AC Power Stabilizer	APC	KDF-31020T-V0-F0	SHEM216-1	2022-12-20	2023-12-19
DC Power Supply	MCH	MCH-303A	SHEM210-1	2022-12-20	2023-12-19
Conducted test Cable	/	RF01~RF04	/	2022-12-20	2023-12-19
Switcher	Tonscend	JS0806	SHEM184-1	2022-08-02	2023-08-01
Test software	Tonscend	JS Tonscend BT/WIFI System	Version: 2.6	/	/
Coaxial Cable	TST		SHEM263-1	2022-08-02	2023-08-01
Test software	TST	TST PASS	Version: 2.0	/	/
RF Radiated Test					
EMI test Receiver	R&S	ESU40	SHEM051-1	2022-12-20	2023-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2022-12-20	2023-12-19
Communication Tester	R&S	CMW500	SHEM268-1	2022-07-25	2023-07-24
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2022-12-20	2023-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2021-09-11	2023-09-10
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2022-05-07	2024-05-06
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2022/8/11	2024-08-10
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2021-09-18	2023-09-17
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2021-09-18	2023-09-17
Pre-Amplifier	HP	8447D	SHEM236-1	2022-08-02	2023-08-01
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2022-12-20	2023-12-19
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2021-05-25	2024-05-24
RE test Cable	/	RE01, RE02, RE06	/	2023-01-07	2024-01-06
Test software	ESE	E3	Version: 6.111221a	/	/

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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)

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 PCB Antenna and no consideration of replacement. The best case gain of the antenna is -2.62dBi.

Antenna location: Refer to internal photo.

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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≤ 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: 20.9 °C Humidity: 70.7 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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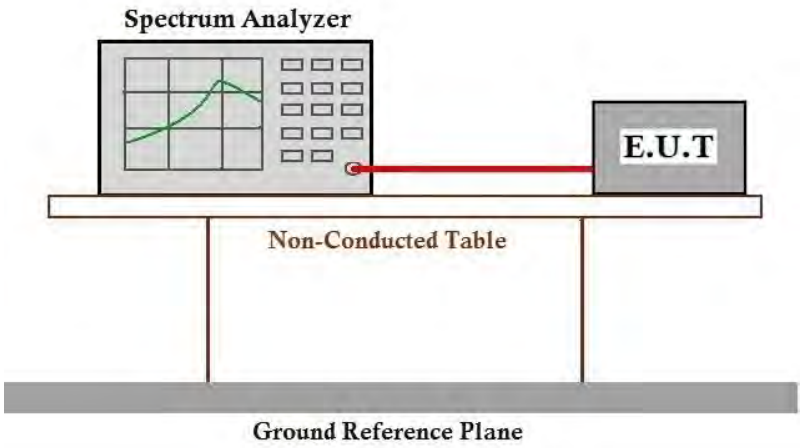
7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Note: Since the verify power the same operating range bandwidth and smaller power can be covered by the higher power.

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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

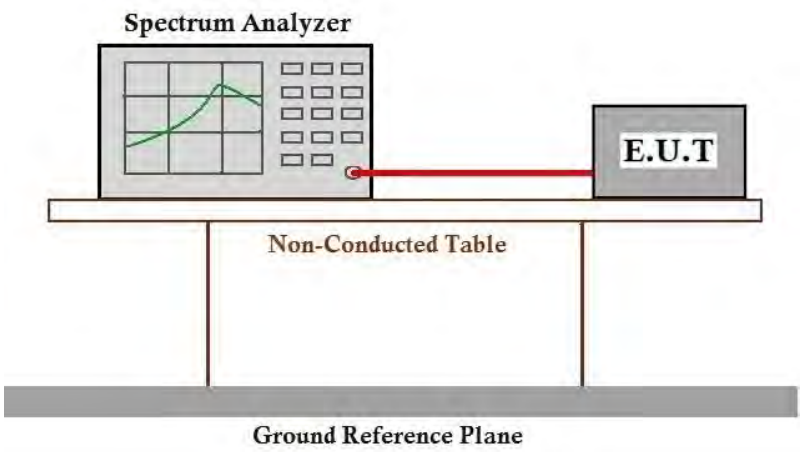
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 20.9 °C Humidity: 70.8 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_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

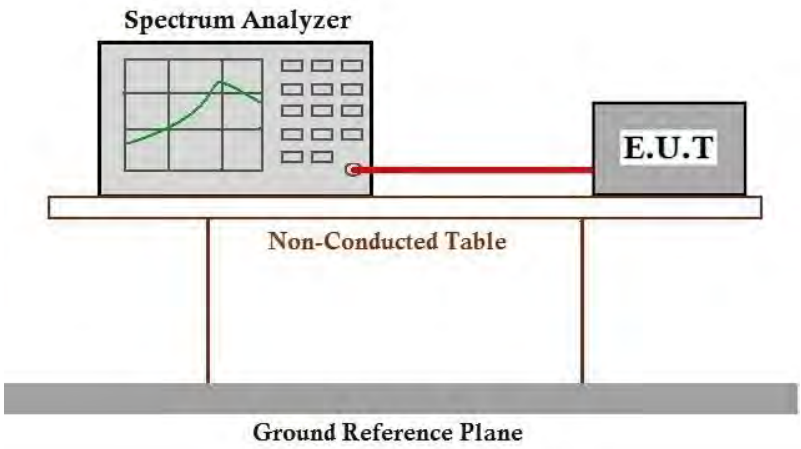
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 20.9 °C Humidity: 70.8 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_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: 20.8 °C Humidity: 70.7 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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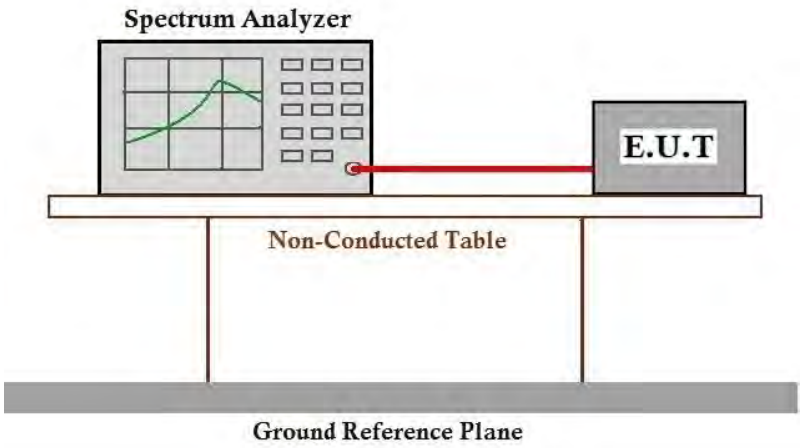
7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

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7.5 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2013) Section 11.11

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §1 5.205(c).

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 20.9 °C Humidity: 70.6 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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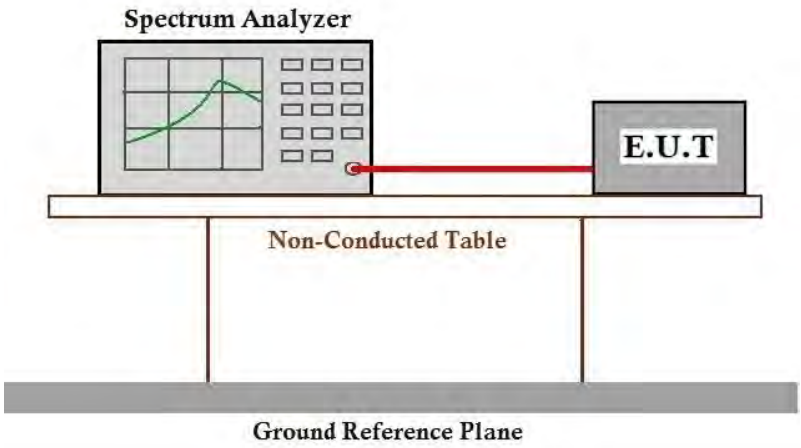
7.5.3 Test Setup Diagram



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: 20.9 °C Humidity: 70.6 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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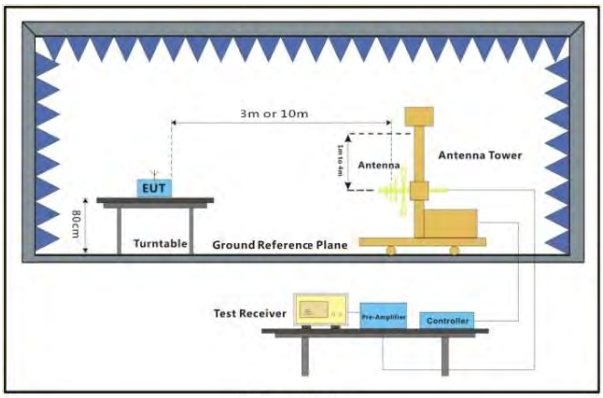
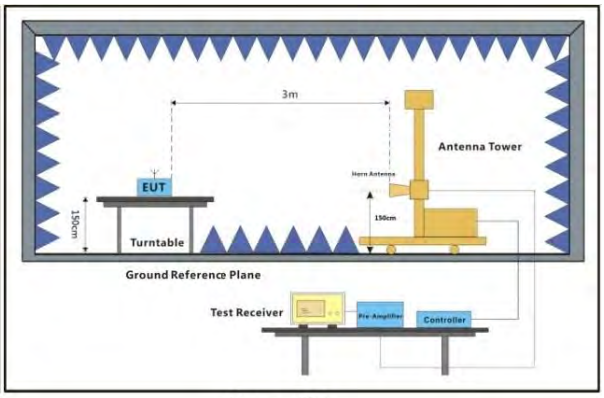
7.6.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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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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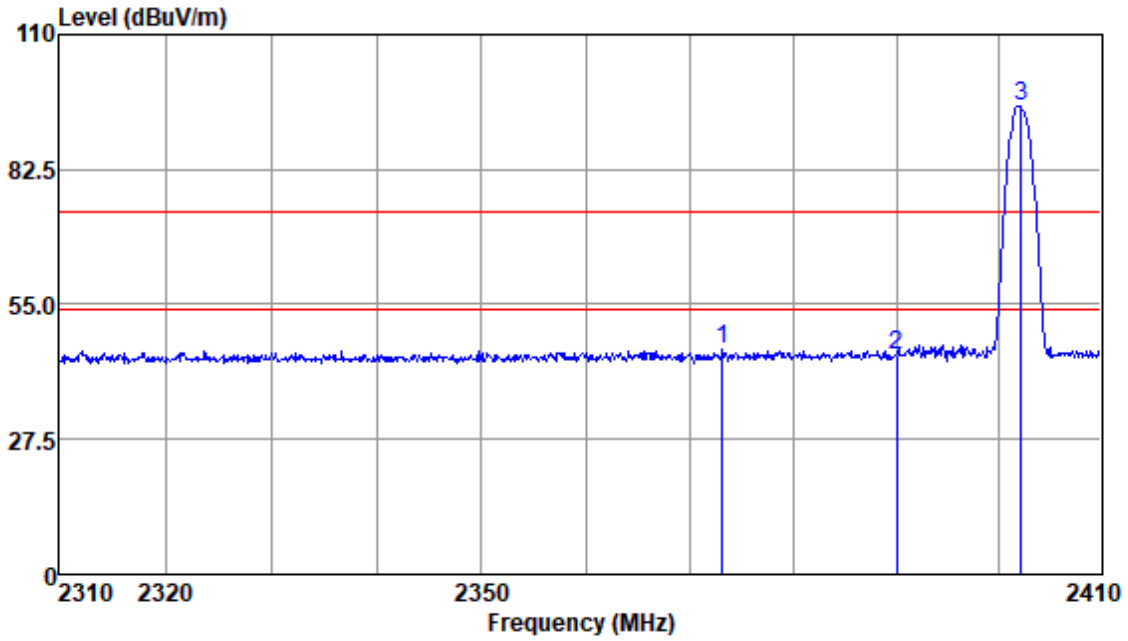
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2373.11	49.23	28.71	3.14	35.17	45.91	74.00	-28.09	Peak
2390.00	48.09	28.80	3.13	35.18	44.84	74.00	-29.16	Peak
2402.15	98.76	28.85	3.13	35.19	95.55	74.00	21.55	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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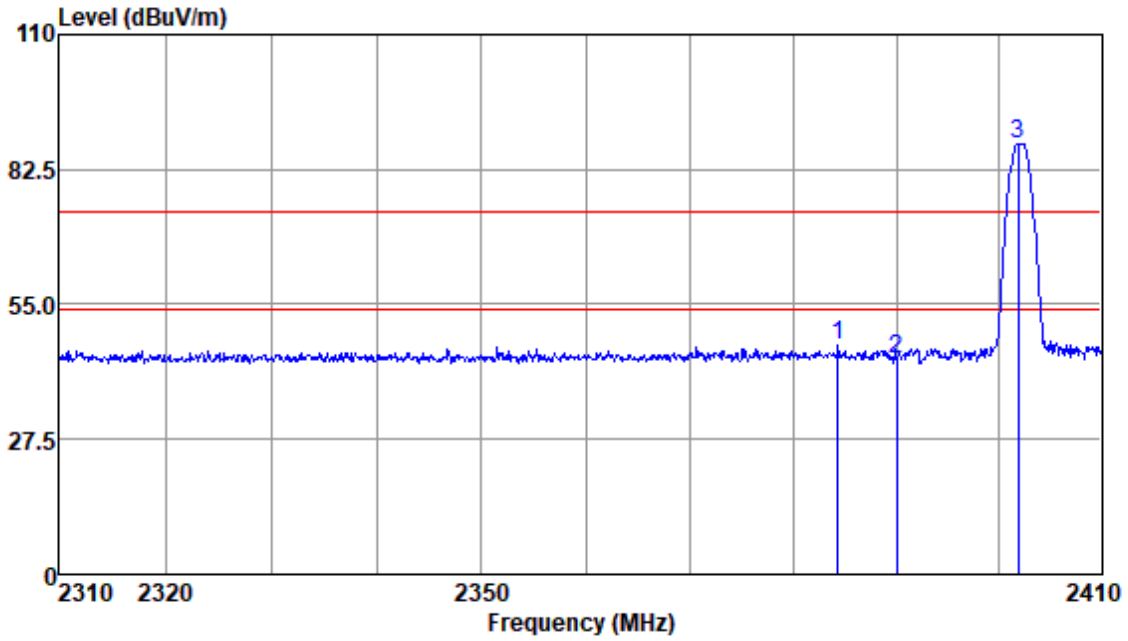
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2384.30	50.10	28.80	3.14	35.18	46.86	74.00	-27.14	Peak
2390.00	47.10	28.80	3.13	35.18	43.85	74.00	-30.15	Peak
2401.84	91.04	28.85	3.13	35.19	87.83	74.00	13.83	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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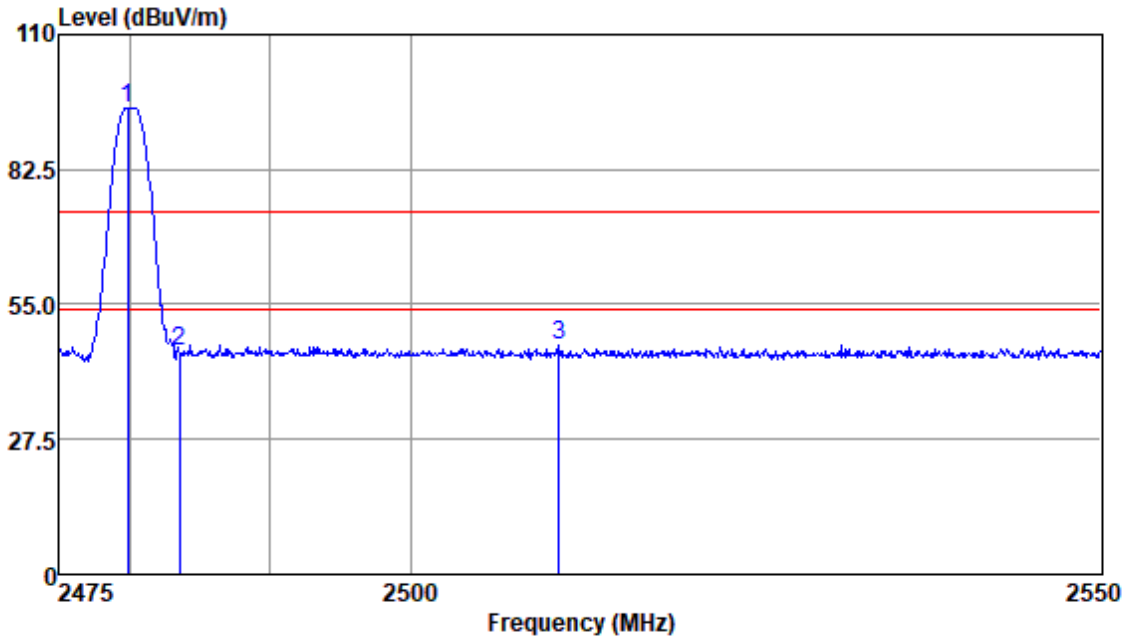
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2479.81	98.02	29.08	3.20	35.25	95.05	74.00	21.05	Peak
2483.50	48.53	29.09	3.20	35.26	45.56	74.00	-28.44	Peak
2510.65	49.41	29.13	3.27	35.28	46.53	74.00	-27.47	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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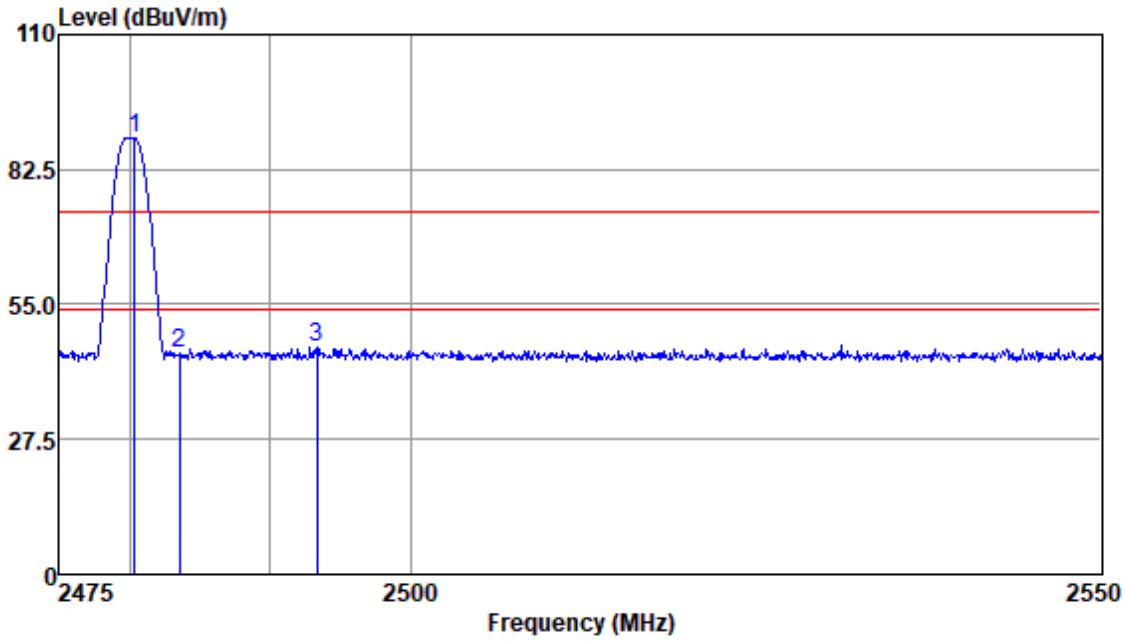
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2480.33	91.75	29.08	3.20	35.25	88.78	74.00	14.78	Peak
2483.50	47.89	29.09	3.20	35.26	44.92	74.00	-29.08	Peak
2493.32	49.17	29.10	3.23	35.26	46.24	74.00	-27.76	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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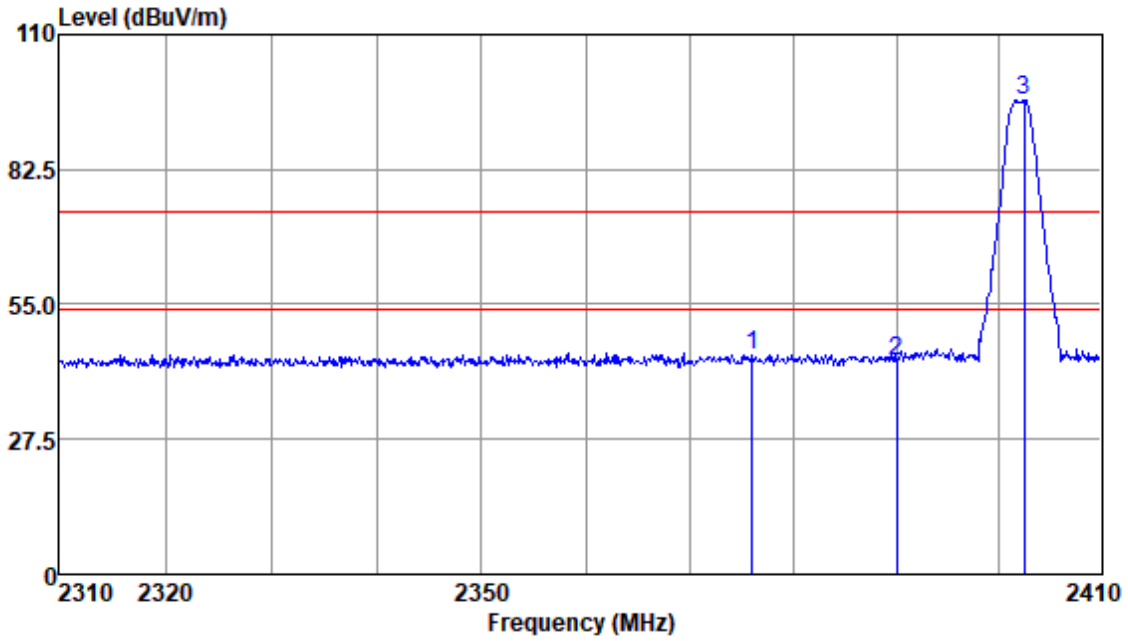
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2376.03	48.14	28.71	3.14	35.17	44.82	74.00	-29.18	Peak
2390.00	46.85	28.80	3.13	35.18	43.60	74.00	-30.40	Peak
2402.45	99.93	28.85	3.13	35.19	96.72	74.00	22.72	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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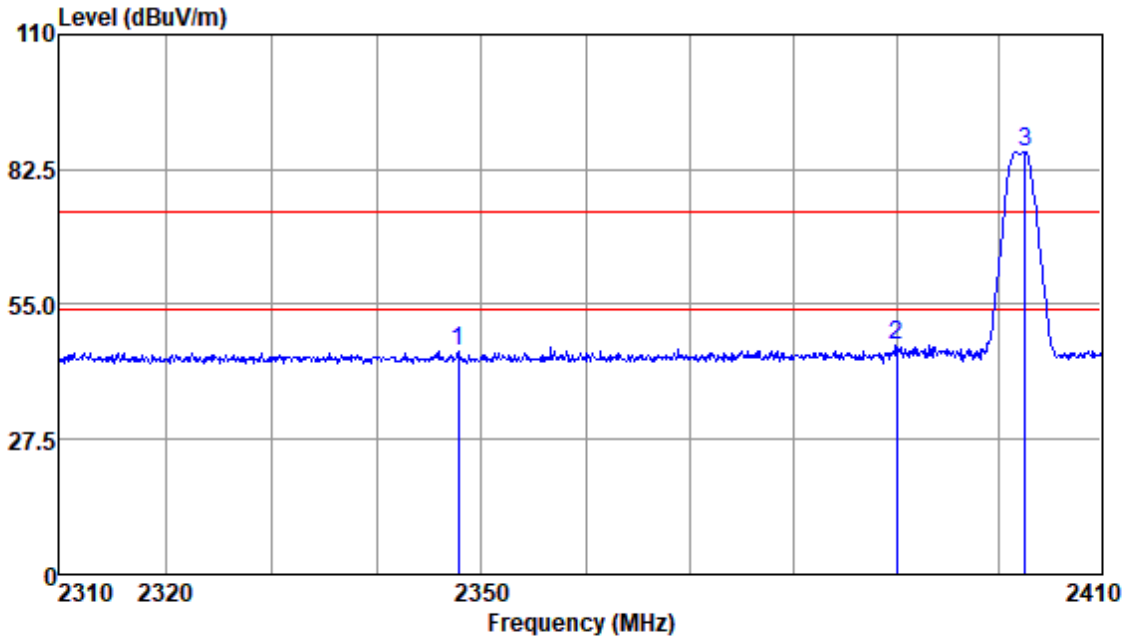
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2347.80	49.00	28.58	3.14	35.14	45.58	74.00	-28.42	Peak
2390.00	49.92	28.80	3.13	35.18	46.67	74.00	-27.33	Peak
2402.56	89.42	28.85	3.13	35.19	86.21	74.00	12.21	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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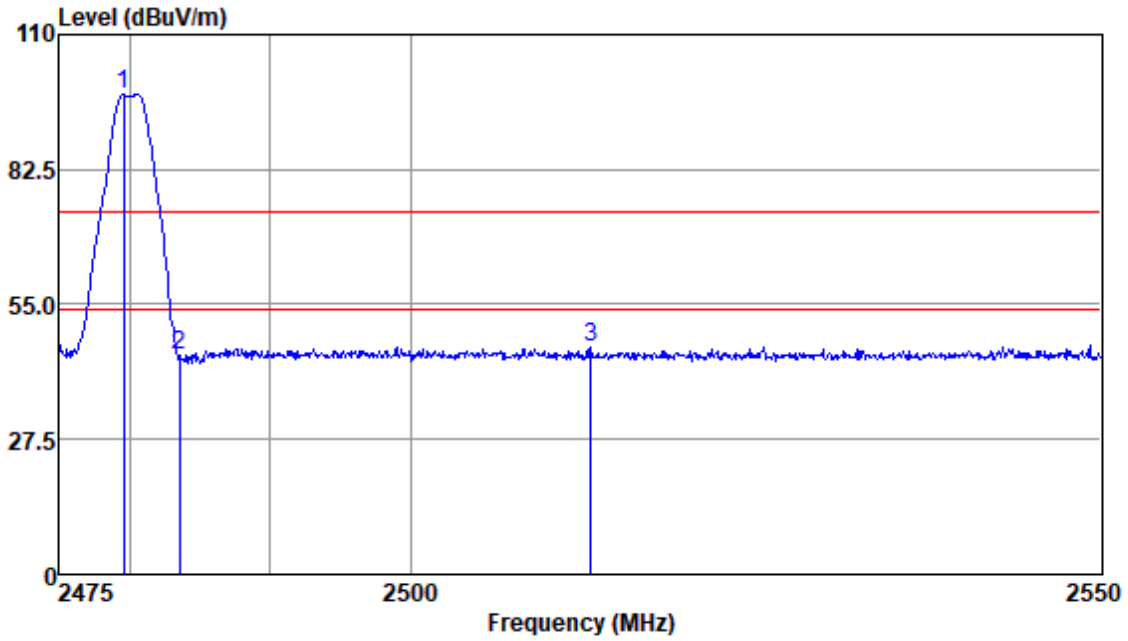
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2479.59	100.75	29.08	3.20	35.25	97.78	74.00	23.78	Peak
2483.50	47.58	29.09	3.20	35.26	44.61	74.00	-29.39	Peak
2512.97	49.02	29.13	3.27	35.29	46.13	74.00	-27.87	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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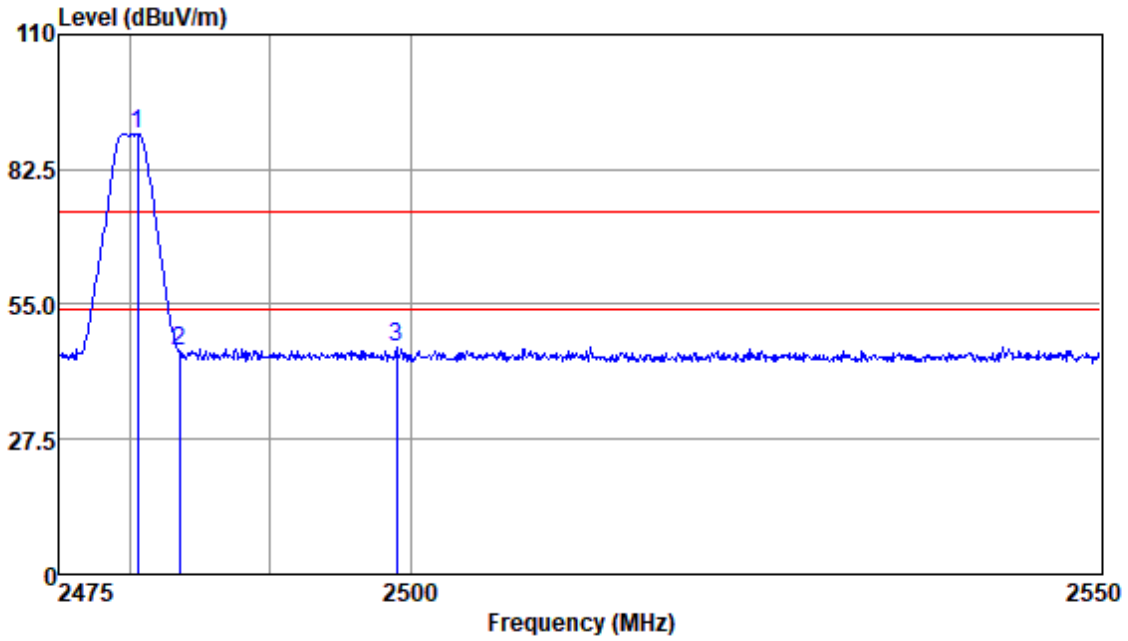
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
2480.55	92.80	29.08	3.20	35.25	89.83	74.00	15.83	Peak
2483.50	48.35	29.09	3.20	35.26	45.38	74.00	-28.62	Peak
2499.06	49.22	29.12	3.23	35.27	46.30	74.00	-27.70	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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7.7 Radiated Spurious Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5

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
960-1000	500	3

7.7.1 E.U.T. Operation

Operating Environment:
Temperature: 20.9 °C Humidity: 70.5 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

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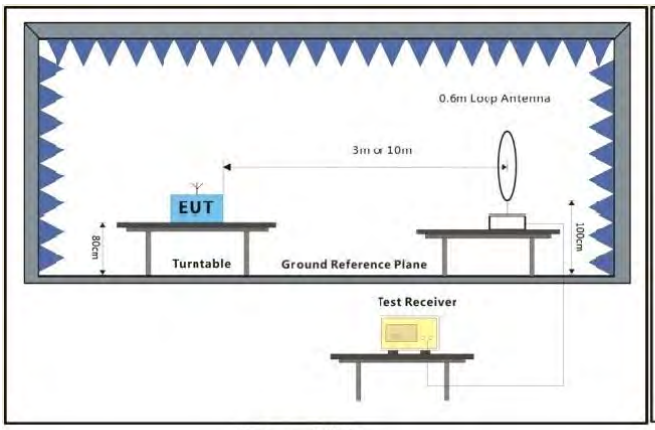
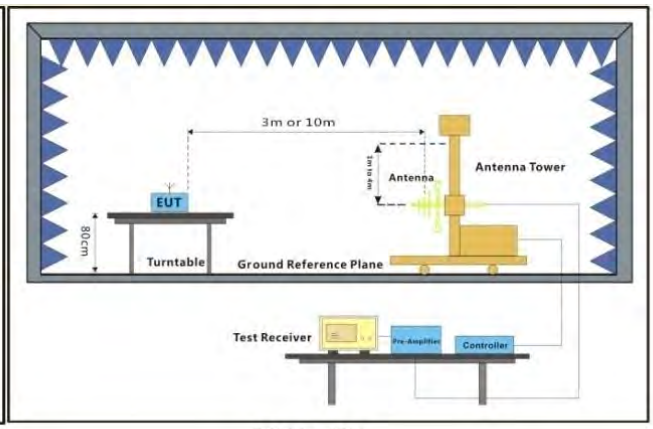
7.7.3 Test Setup Diagram



Below 30MHz



30MHz-1GHz

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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. 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.

c. 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.

d. 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.

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

f. 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 quasi-peak method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. 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.

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

Remark:

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

2. Scan from 9kHz to 30MHz, the disturbance 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.

3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

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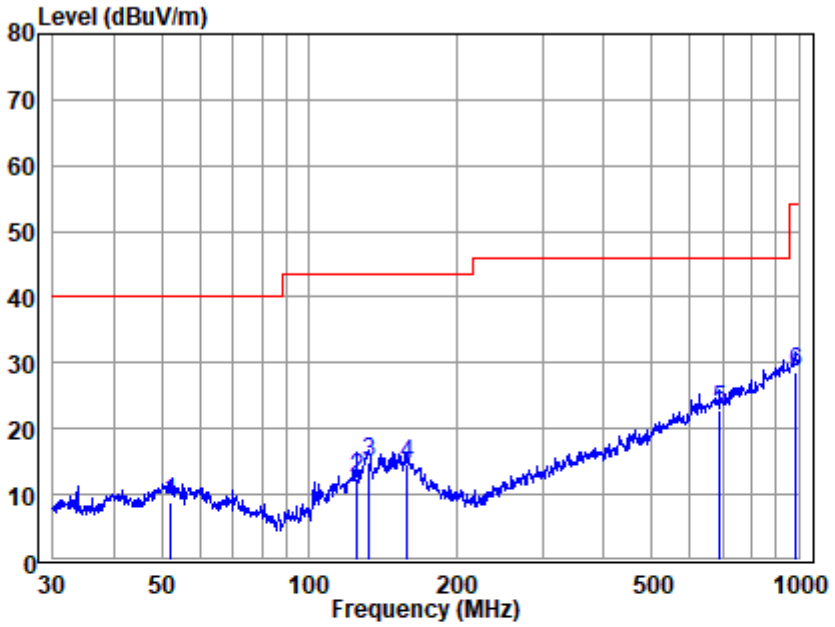
Test Mode: 00; Polarity: Horizontal



Antenna Polarity :Horizontal
EUT/Project :0774HS
Test mode :00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	52.03	27.54	13.80	1.06	33.68	8.72	40.00	-31.28	QP
2	125.01	32.28	11.64	2.15	33.55	12.52	43.50	-30.98	QP
3	132.22	33.82	12.21	2.29	33.54	14.78	43.50	-28.72	QP
4	158.11	32.28	13.22	2.48	33.47	14.51	43.50	-28.99	QP
5	691.99	28.68	20.63	6.21	32.82	22.70	46.00	-23.30	QP
6	982.62	28.62	24.22	7.65	31.80	28.69	54.00	-25.31	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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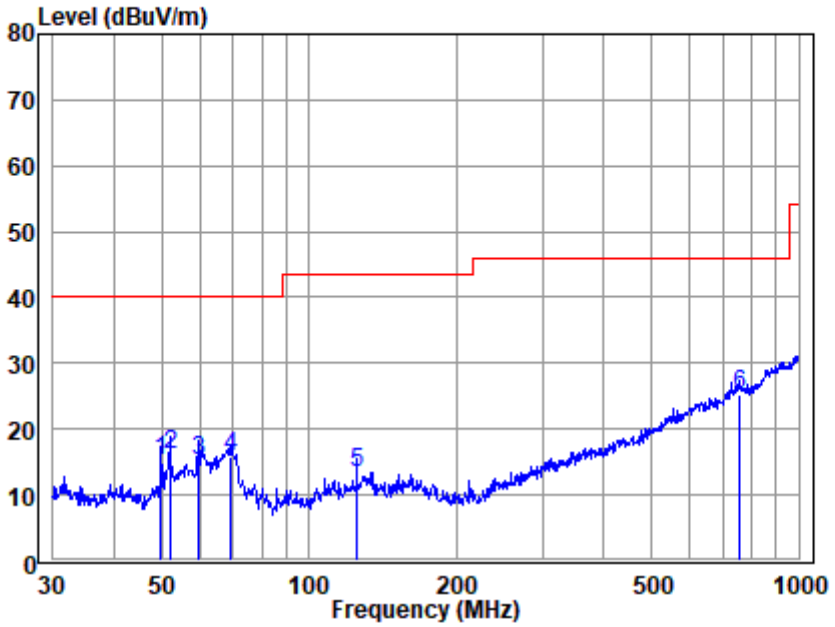
Test Mode: 00; Polarity: Vertical



Antenna Polarity :Vertical
EUT/Project :0774HS
Test mode :00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	49.88	34.14	13.84	1.02	33.70	15.30	40.00	-24.70	QP
2	52.03	34.79	13.80	1.06	33.68	15.97	40.00	-24.03	QP
3	59.65	34.33	13.28	1.19	33.60	15.20	40.00	-24.80	QP
4	69.36	36.05	11.87	1.43	33.60	15.75	40.00	-24.25	QP
5	125.01	33.18	11.64	2.15	33.55	13.42	43.50	-30.08	QP
6	755.39	29.22	22.32	6.40	32.68	25.26	46.00	-20.74	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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7.8 Radiated Spurious Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.8.1 E.U.T. Operation

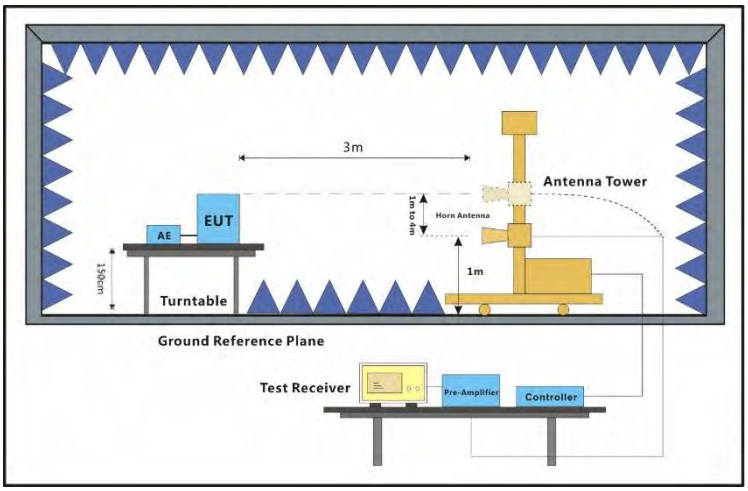
Operating Environment:

Temperature: 20.9 °C Humidity: 70.6 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



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7.8.4 Measurement Procedure and Data

a. 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.

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

c. 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.

d. 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.

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

f. 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 or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. 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.

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

Remark:

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

2. Scan from 1GHz to 25GHz, the disturbance above 18GHz 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.

3. As shown in this section, 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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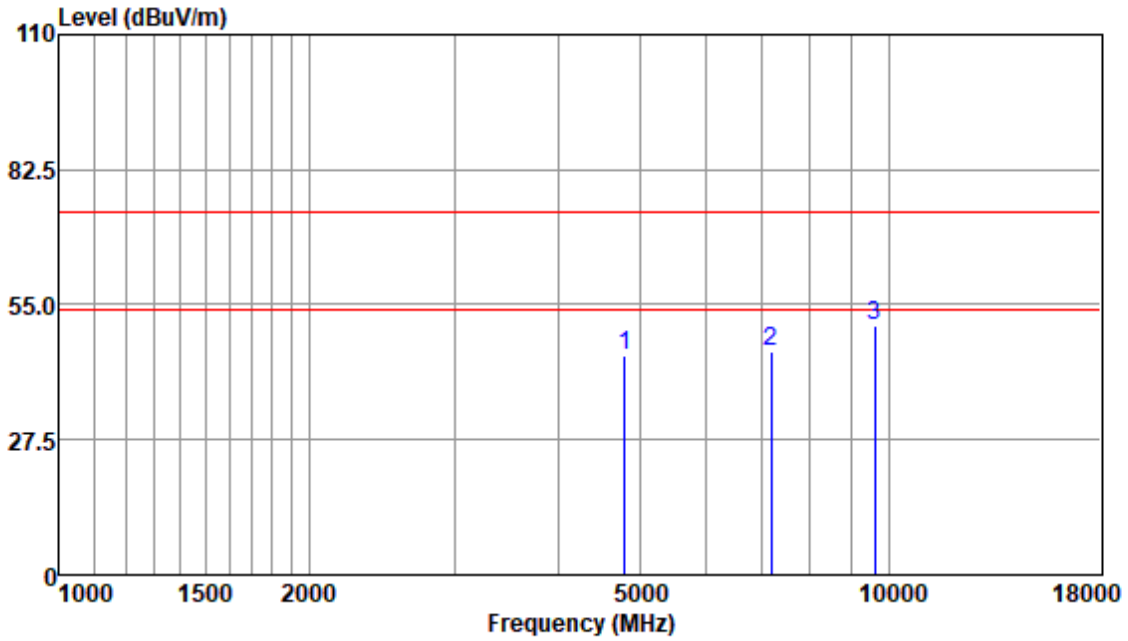
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	43.21	33.57	4.53	36.79	44.52	74.00	-29.48	Peak
7206.00	38.24	36.24	6.66	35.53	45.61	74.00	-28.39	Peak
9608.00	38.01	37.75	8.56	33.58	50.74	74.00	-23.26	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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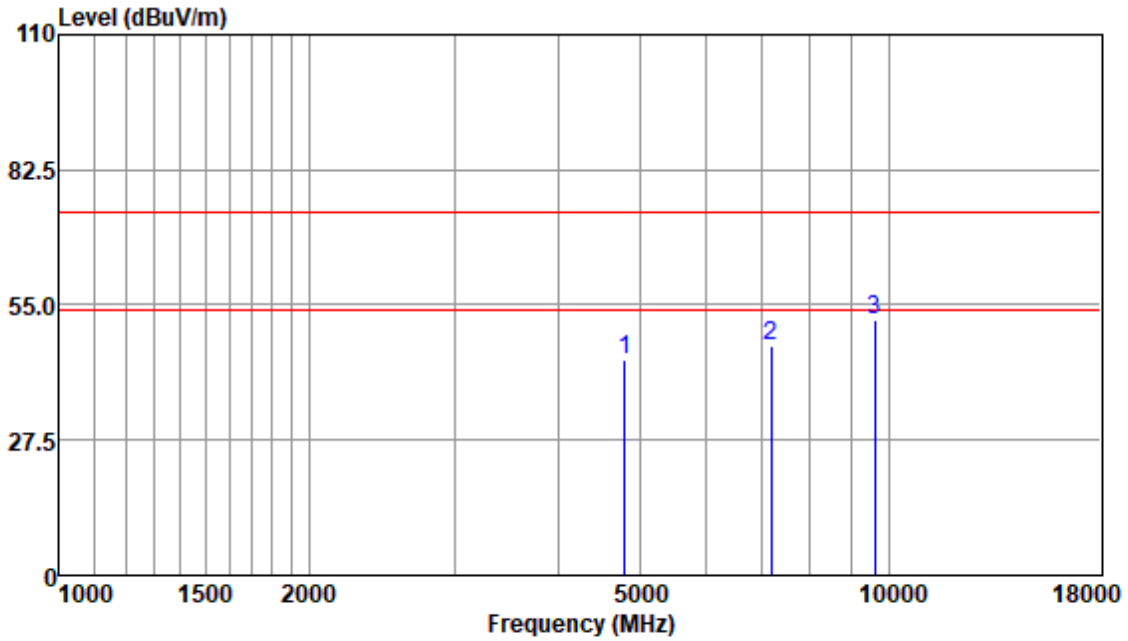
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	42.34	33.57	4.53	36.79	43.65	74.00	-30.35	Peak
7206.00	39.48	36.24	6.66	35.53	46.85	74.00	-27.15	Peak
9608.00	39.21	37.75	8.56	33.58	51.94	74.00	-22.06	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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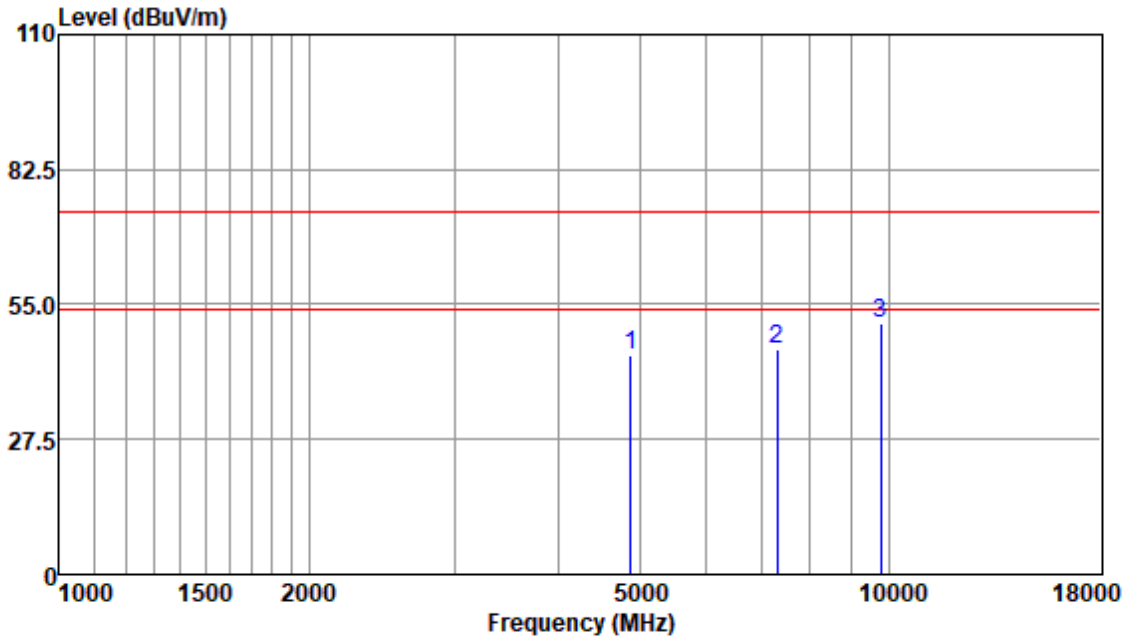
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4880.00	42.94	33.66	4.73	36.81	44.52	74.00	-29.48	Peak
7320.00	38.26	36.33	6.59	35.42	45.76	74.00	-28.24	Peak
9760.00	38.51	37.54	8.69	33.50	51.24	74.00	-22.76	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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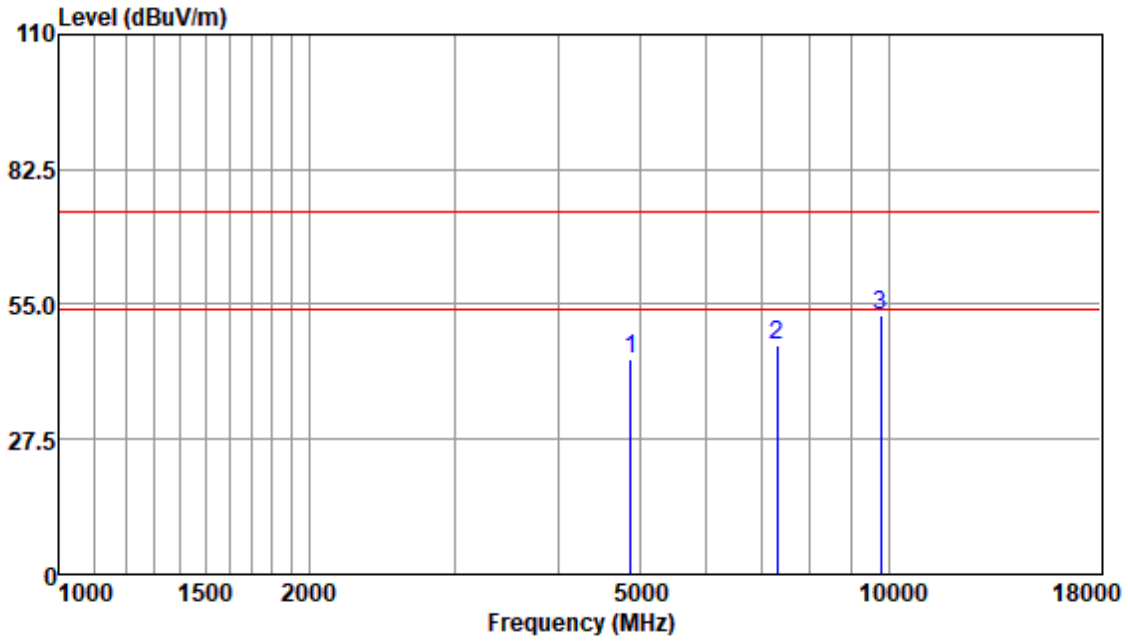
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4880.00	42.13	33.66	4.73	36.81	43.71	74.00	-30.29	Peak
7320.00	39.02	36.33	6.59	35.42	46.52	74.00	-27.48	Peak
9760.00	40.21	37.54	8.69	33.50	52.94	74.00	-21.06	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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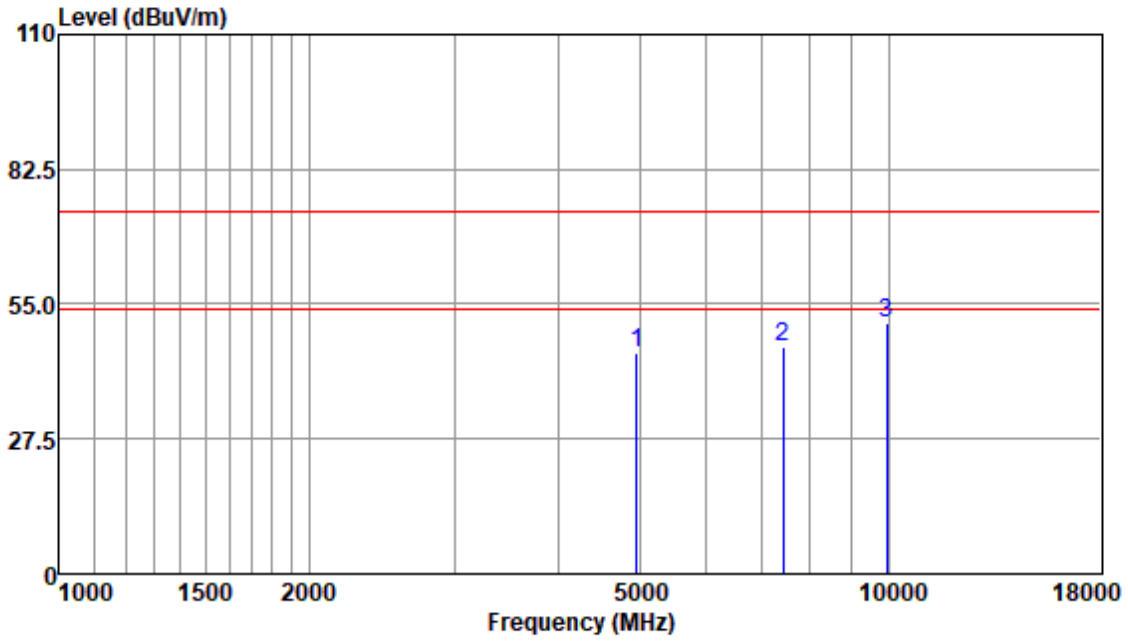
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	43.47	33.65	4.92	36.83	45.21	74.00	-28.79	Peak
7440.00	38.78	36.31	6.61	35.34	46.36	74.00	-27.64	Peak
9920.00	37.99	37.62	8.87	33.41	51.07	74.00	-22.93	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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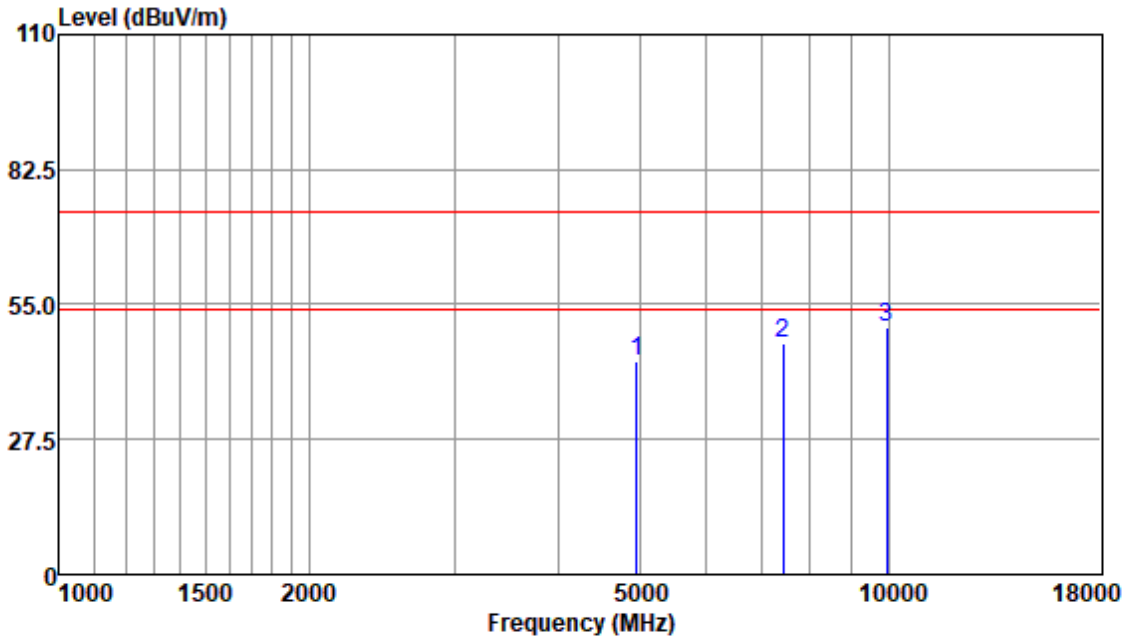
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	41.81	33.65	4.92	36.83	43.55	74.00	-30.45	Peak
7440.00	39.39	36.31	6.61	35.34	46.97	74.00	-27.03	Peak
9920.00	37.11	37.62	8.87	33.41	50.19	74.00	-23.81	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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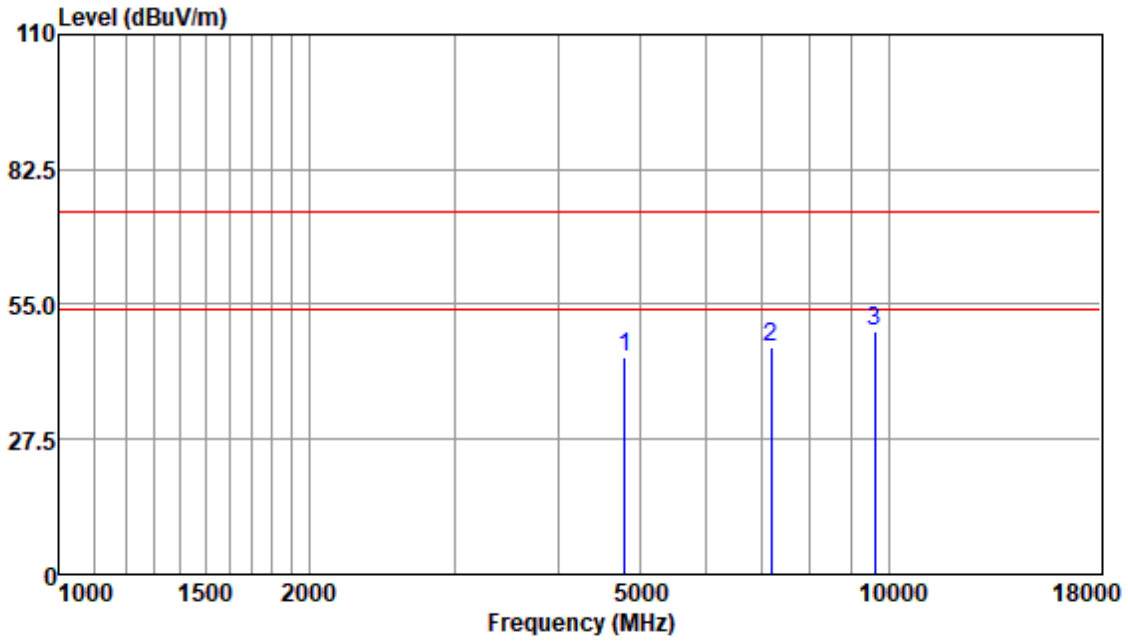
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	42.93	33.57	4.53	36.79	44.24	74.00	-29.76	Peak
7206.00	38.96	36.24	6.66	35.53	46.33	74.00	-27.67	Peak
9608.00	36.79	37.75	8.56	33.58	49.52	74.00	-24.48	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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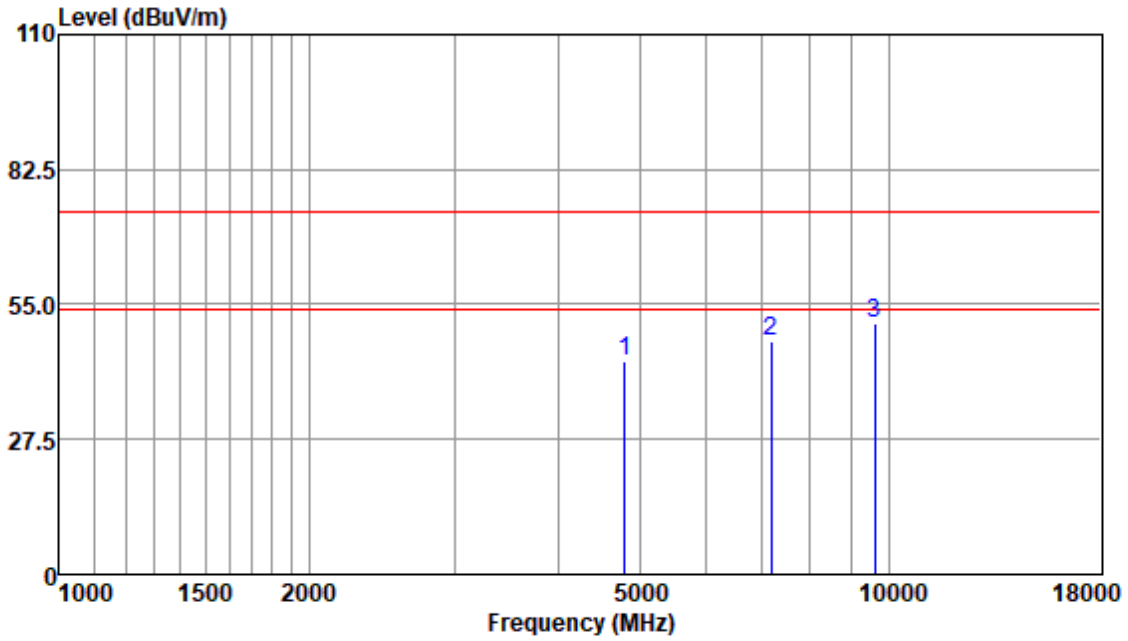
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4804.00	41.94	33.57	4.53	36.79	43.25	74.00	-30.75	Peak
7206.00	40.14	36.24	6.66	35.53	47.51	74.00	-26.49	Peak
9608.00	38.46	37.75	8.56	33.58	51.19	74.00	-22.81	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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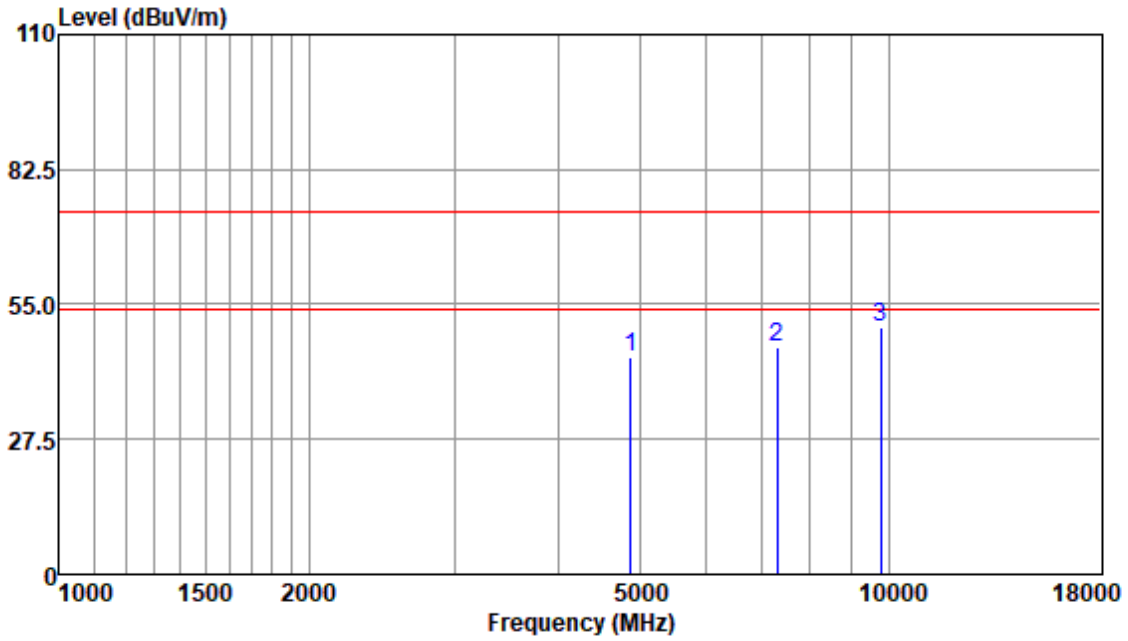
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4880.00	42.80	33.66	4.73	36.81	44.38	74.00	-29.62	Peak
7320.00	38.69	36.33	6.59	35.42	46.19	74.00	-27.81	Peak
9760.00	37.54	37.54	8.69	33.50	50.27	74.00	-23.73	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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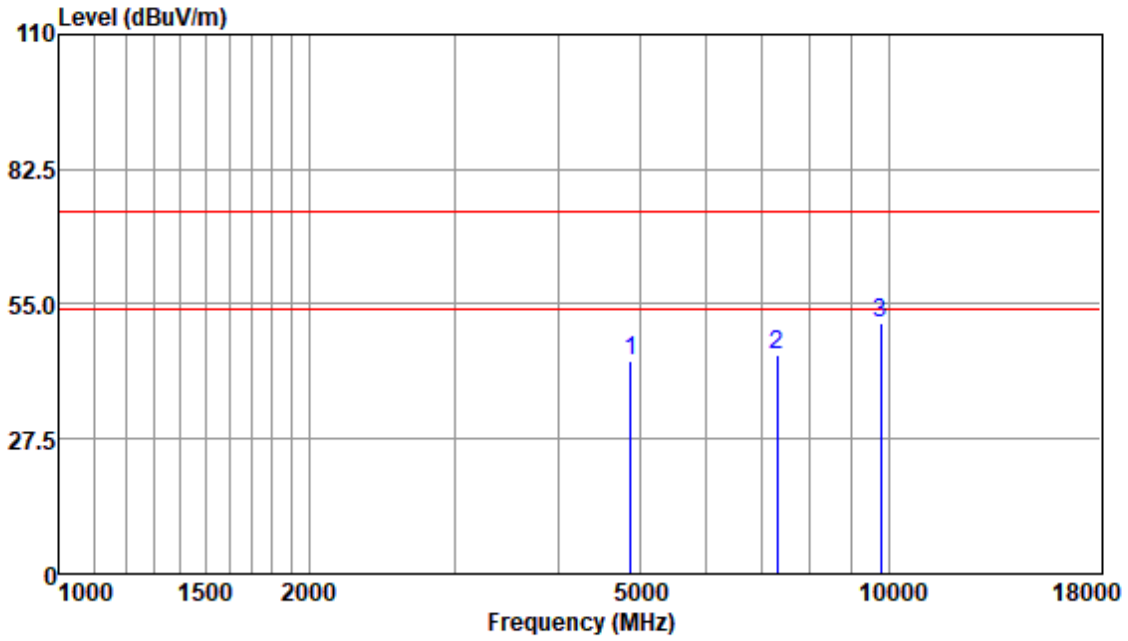
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:middle



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4880.00	42.03	33.66	4.73	36.81	43.61	74.00	-30.39	Peak
7320.00	37.32	36.33	6.59	35.42	44.82	74.00	-29.18	Peak
9760.00	38.46	37.54	8.69	33.50	51.19	74.00	-22.81	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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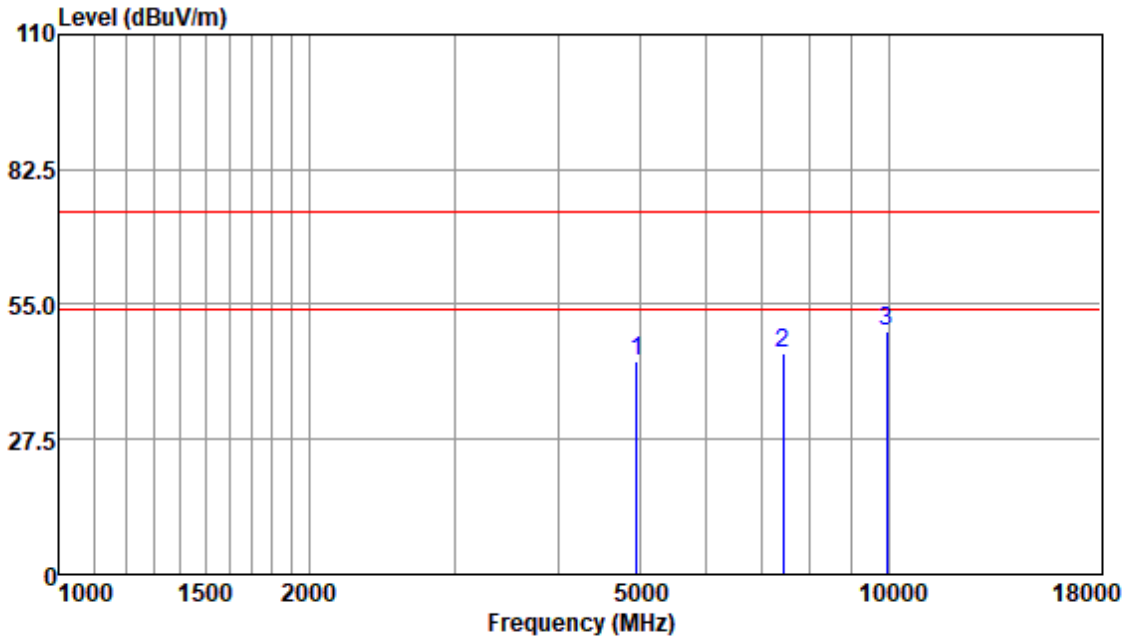
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	41.53	33.65	4.92	36.83	43.27	74.00	-30.73	Peak
7440.00	37.51	36.31	6.61	35.34	45.09	74.00	-28.91	Peak
9920.00	36.47	37.62	8.87	33.41	49.55	74.00	-24.45	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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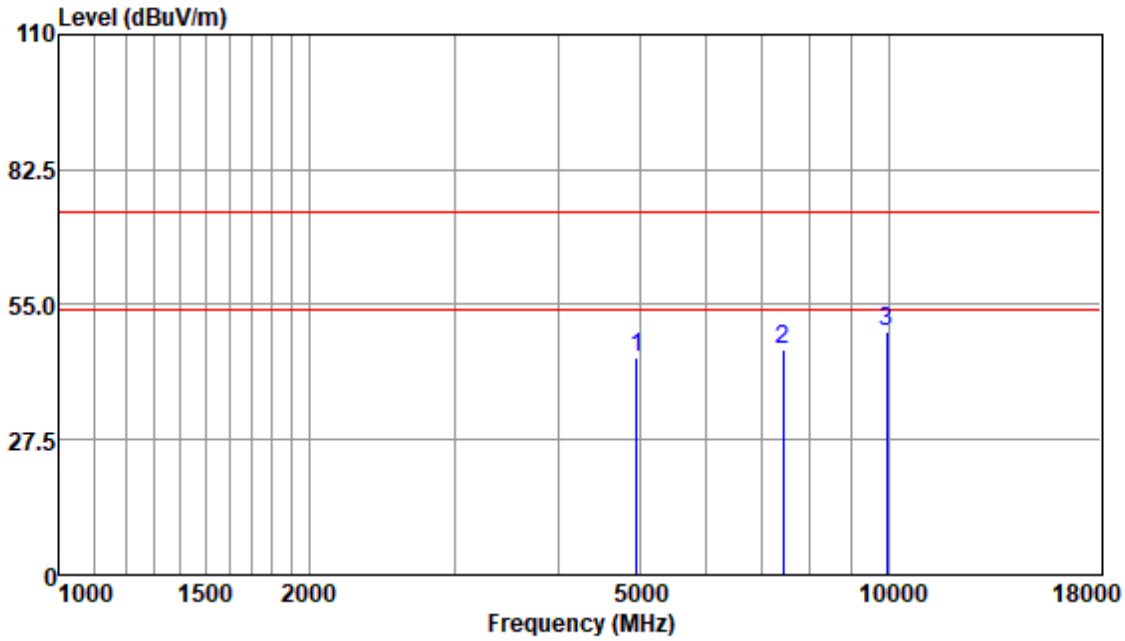
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
4960.00	42.54	33.65	4.92	36.83	44.28	74.00	-29.72	Peak
7440.00	38.14	36.31	6.61	35.34	45.72	74.00	-28.28	Peak
9920.00	36.44	37.62	8.87	33.41	49.52	74.00	-24.48	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

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7.9 99% Bandwidth

Test Requirement RSS-Gen Section 6.7

Test Method: ANSI C63.10 Section 6.9.3

7.9.1 E.U.T. Operation

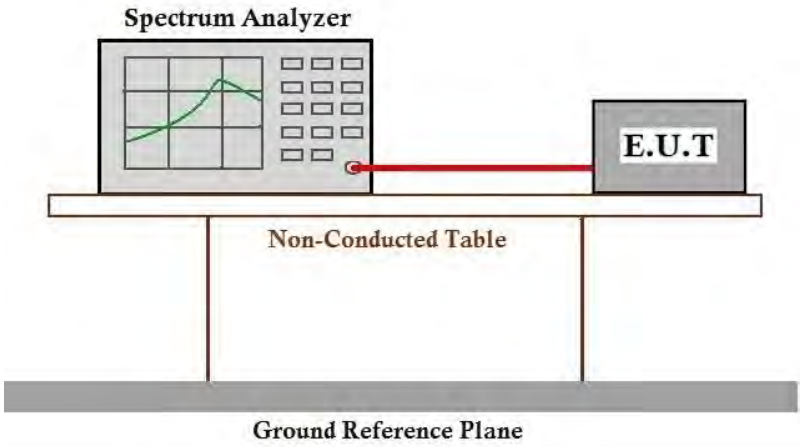
Operating Environment:

Temperature: 20.9 °C Humidity: 70.7 % RH Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode(1Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	TX mode(2Mbps)_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.9.3 Test Setup Diagram



7.9.4 Measurement Procedure and Data

Please Refer to Appendix for Details

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8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

9 EUT Constructional Details

Refer to the < External Photos > & <Internal Photos >.

10 Appendix

Appendix A: DTS Bandwidth

Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.692	2401.644	2402.336	0.5	PASS
		2440	0.744	2439.612	2440.356	0.5	PASS
		2480	0.688	2479.640	2480.328	0.5	PASS
BLE_2M	Ant1	2402	1.116	2401.408	2402.524	0.5	PASS
		2440	1.220	2439.396	2440.616	0.5	PASS
		2480	1.160	2479.424	2480.584	0.5	PASS

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Test Graphs

BLE_1M_Ant1_2402

BLE_1M_Ant1_2440

BLE_1M_Ant1_2480

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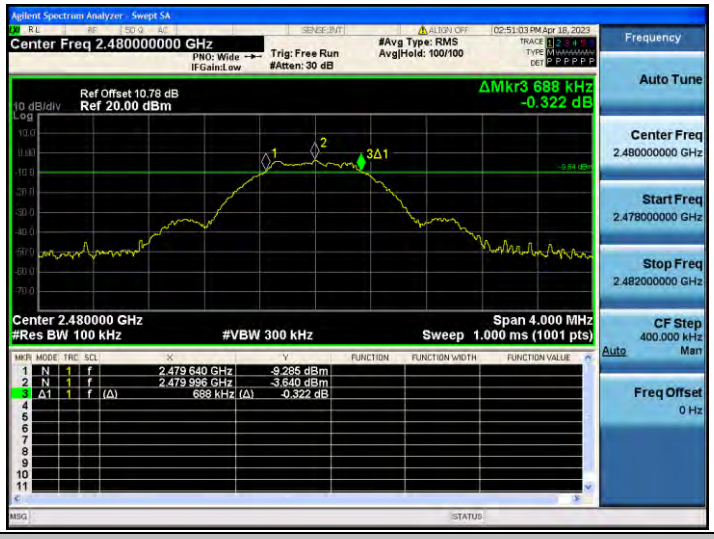

BLE_2M_Ant1_2402

BLE_2M_Ant1_2440

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BLE_2M_Ant1_2480

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Appendix B: Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0531	2401.4511	2402.5042	---	---
		2440	1.0611	2439.4520	2440.5131	---	---
		2480	1.0631	2479.4563	2480.5194	---	---
BLE_2M	Ant1	2402	2.0434	2400.9716	2403.0150	---	---
		2440	2.0439	2438.9501	2440.9940	---	---
		2480	2.0453	2478.9564	2481.0017	---	---

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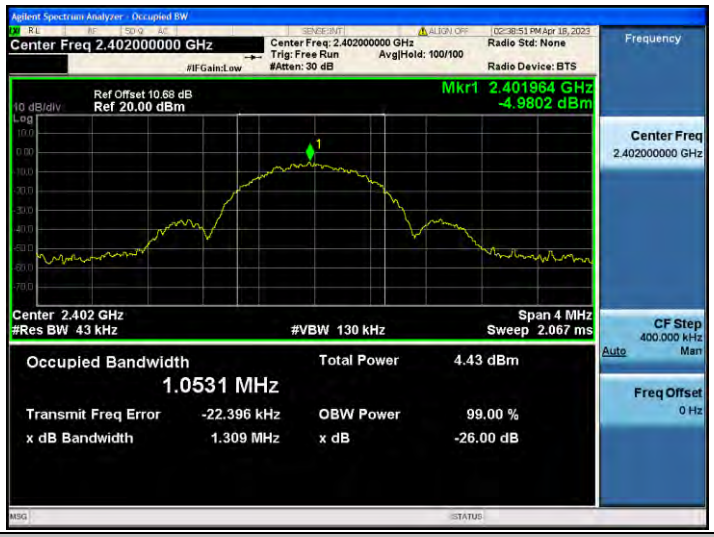
Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440

BLE_1M_Ant1_2480

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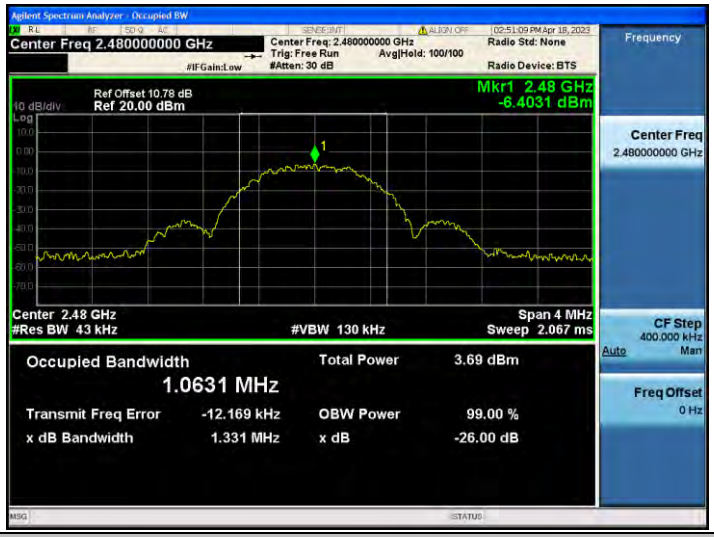

BLE_2M_Ant1_2402

BLE_2M_Ant1_2440

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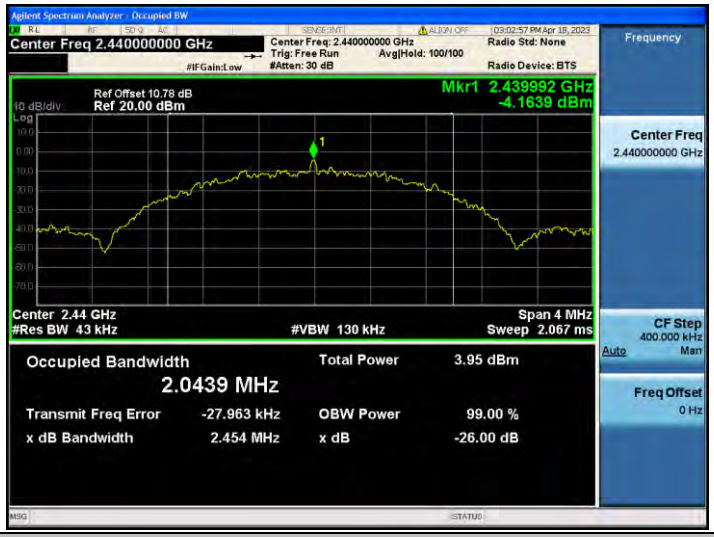

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Appendix C: Maximum conducted output power

Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-2.46	≤30	PASS
		2440	-3.25	≤30	PASS
		2480	-3.11	≤30	PASS
BLE_2M	Ant1	2402	-2.47	≤30	PASS
		2440	-3.24	≤30	PASS
		2480	-3.07	≤30	PASS

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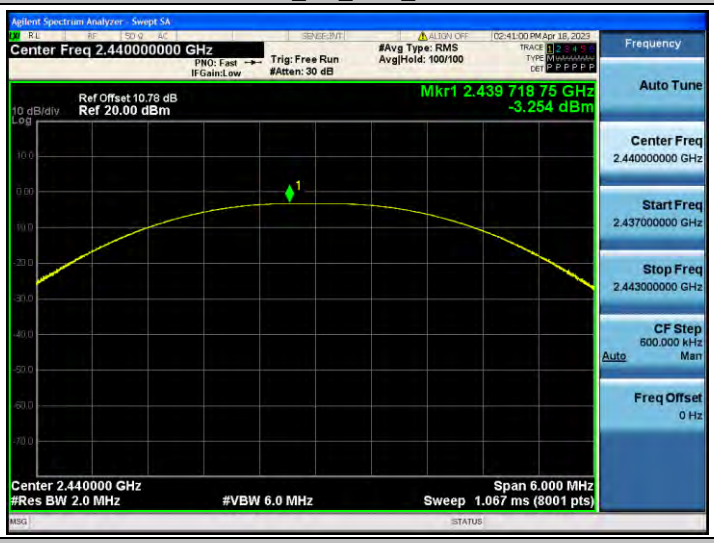
Test Graphs

BLE_1M_Ant1_2402

BLE_1M_Ant1_2440



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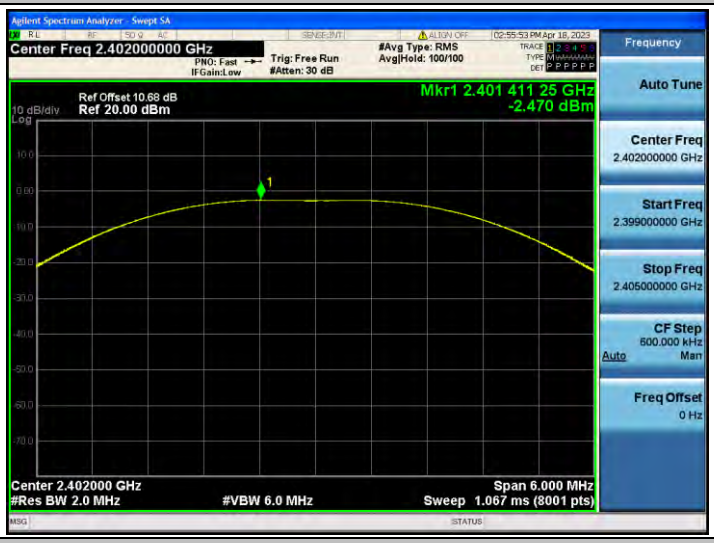

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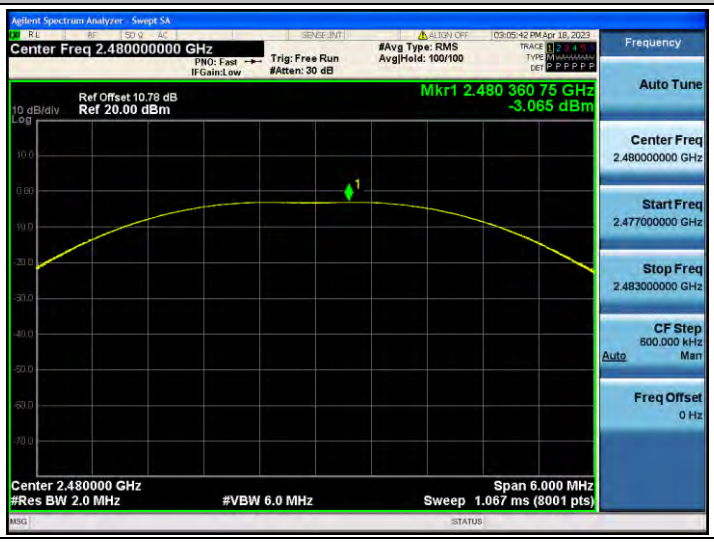

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Appendix D: Maximum power spectral density

Test Result

TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-15.83	≤8.00	PASS
		2440	-16.56	≤8.00	PASS
		2480	-16.43	≤8.00	PASS
BLE_2M	Ant1	2402	-19.04	≤8.00	PASS
		2440	-19.93	≤8.00	PASS
		2480	-18.56	≤8.00	PASS

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Test Graphs

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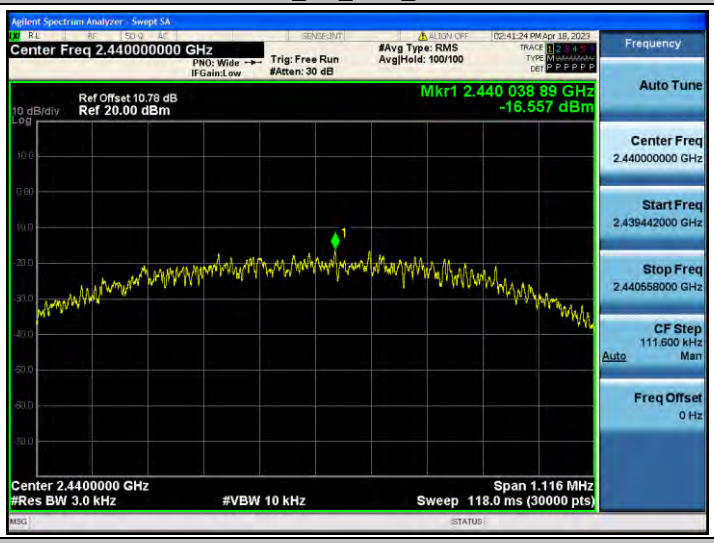
BLE_1M_Ant1_2440



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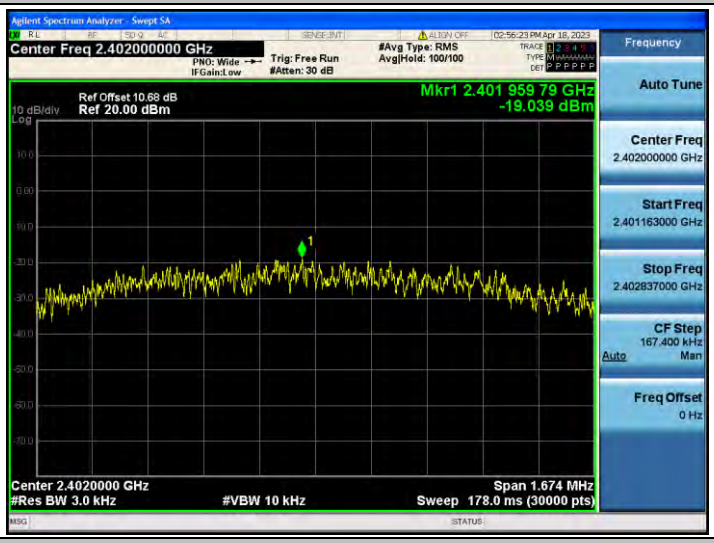

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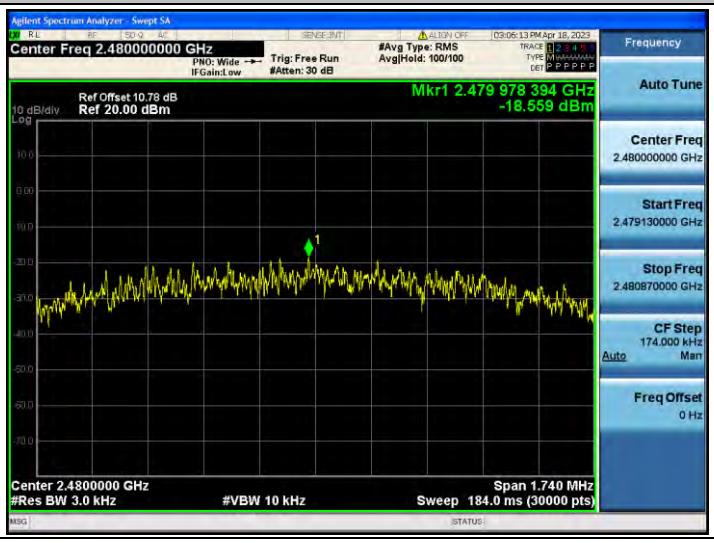

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Appendix E: Band edge measurements

Test Result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-2.89	-48.78	≤-22.89	PASS
		High	2480	-4.58	-47.59	≤-24.58	PASS
BLE_2M	Ant1	Low	2402	-2.87	-36.63	≤-22.87	PASS
		High	2480	-4.22	-45.81	≤-24.22	PASS

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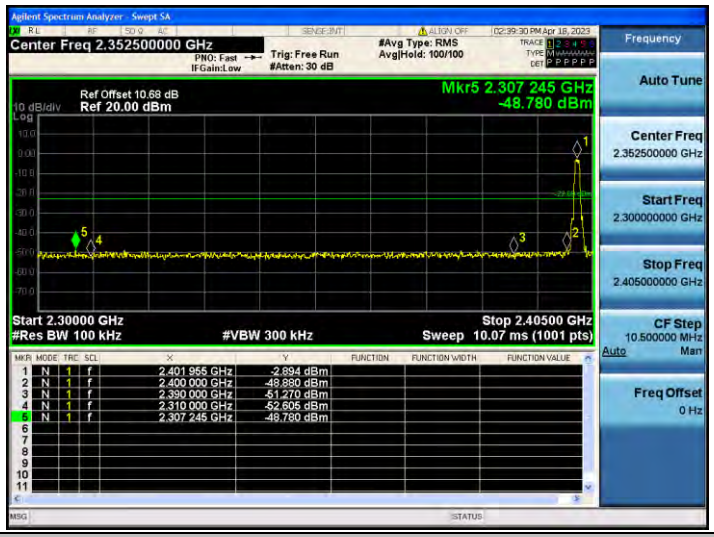
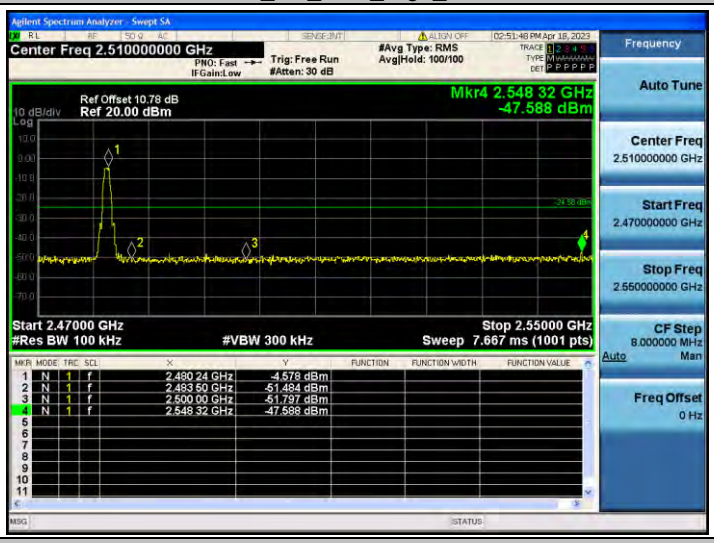
Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



BLE_2M_Ant1_Low_2402

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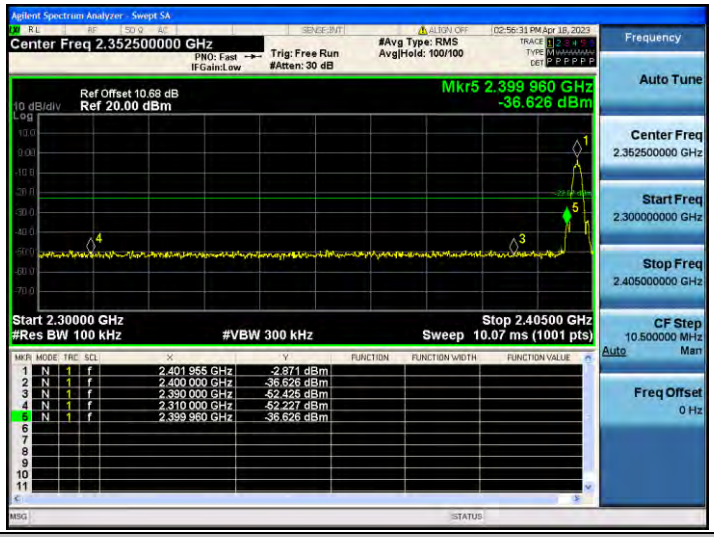

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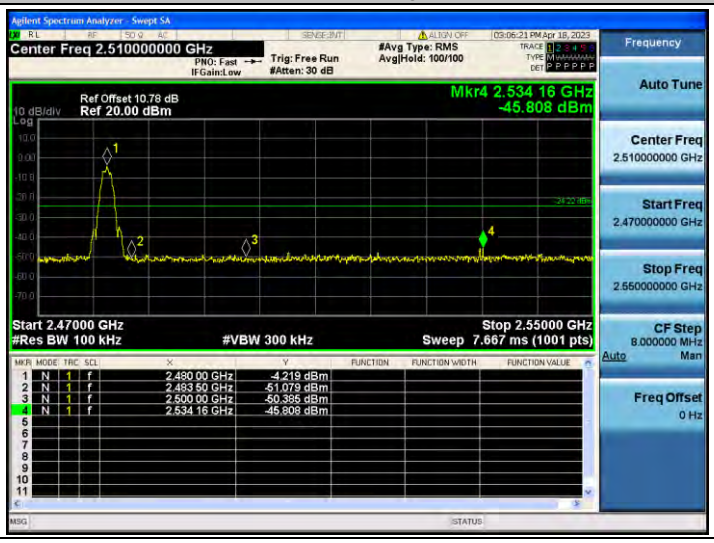

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Appendix F: Conducted Spurious Emission

Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-4.74	-4.74	---	PASS
			30~1000	-4.74	-58.43	≤-24.74	PASS
			1000~26500	-4.74	-41.73	≤-24.74	PASS
		2440	Reference	-4.50	-4.50	---	PASS
			30~1000	-4.50	-59.74	≤-24.5	PASS
			1000~26500	-4.50	-41.54	≤-24.5	PASS
		2480	Reference	-4.17	-4.17	---	PASS
			30~1000	-4.17	-60.11	≤-24.17	PASS
			1000~26500	-4.17	-41.04	≤-24.17	PASS
BLE_2M	Ant1	2402	Reference	-6.27	-6.27	---	PASS
			30~1000	-6.27	-59.95	≤-26.27	PASS
			1000~26500	-6.27	-41.55	≤-26.27	PASS
		2440	Reference	-6.89	-6.89	---	PASS
			30~1000	-6.89	-59.93	≤-26.89	PASS
			1000~26500	-6.89	-40.7	≤-26.89	PASS
		2480	Reference	-5.16	-5.16	---	PASS
			30~1000	-5.16	-59.86	≤-25.16	PASS
			1000~26500	-5.16	-41.35	≤-25.16	PASS

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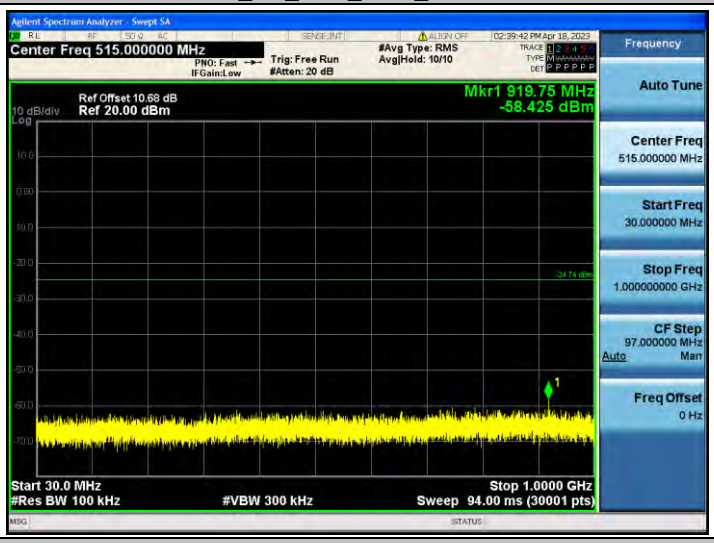
Test Graphs

BLE_1M_Ant1_2402_0~Reference

BLE_1M_Ant1_2402_30~1000



BLE_1M_Ant1_2402_1000~26500

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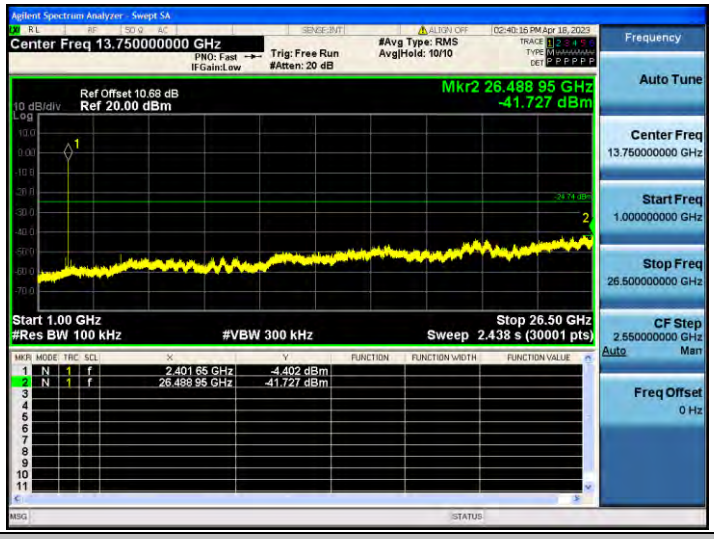

BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000

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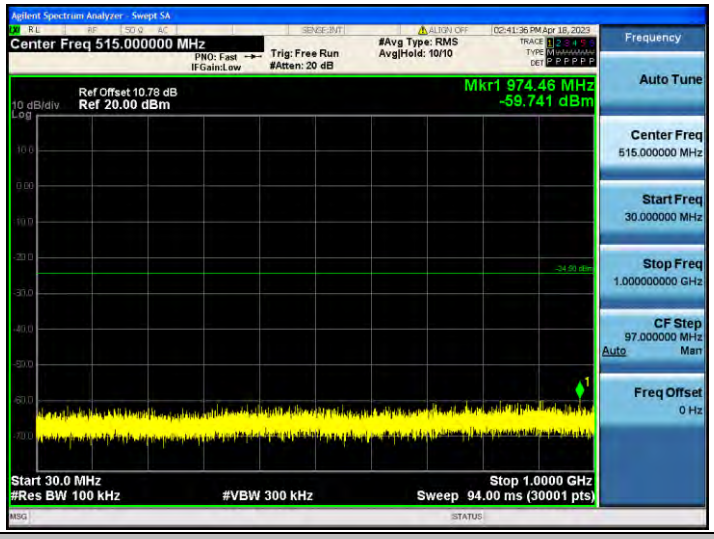

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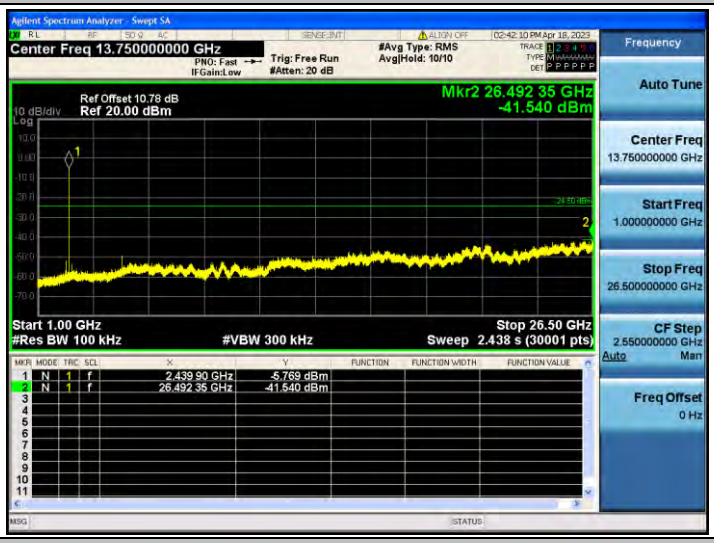

BLE_1M_Ant1_2480_0~Reference

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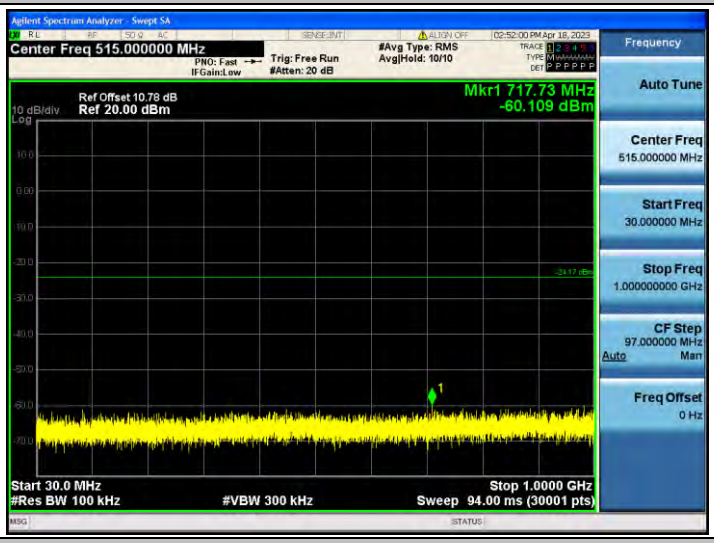
BLE_1M_Ant1_2480_30~1000



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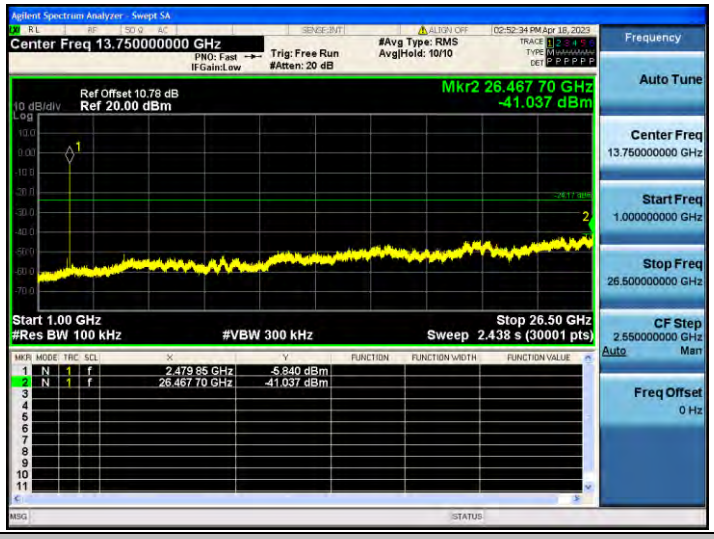

BLE_2M_Ant1_2402_0~Reference

BLE_2M_Ant1_2402_30~1000

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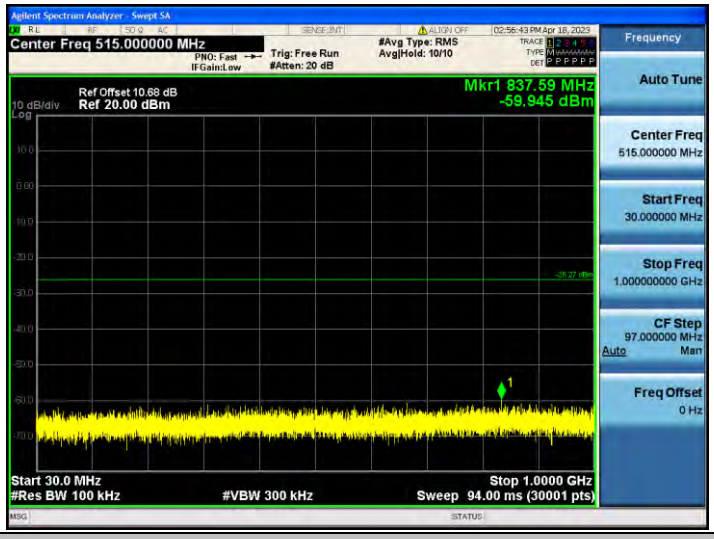

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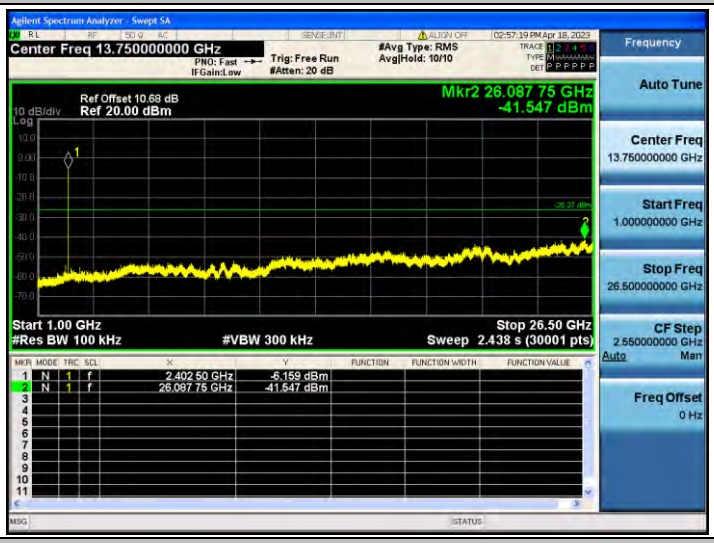

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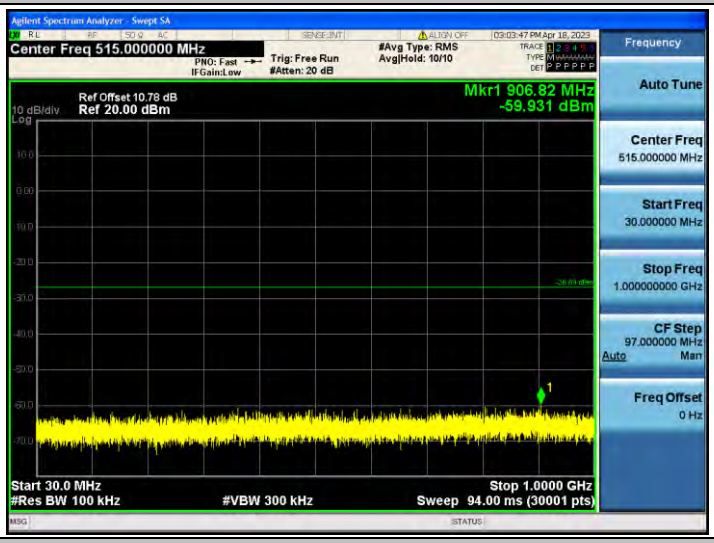

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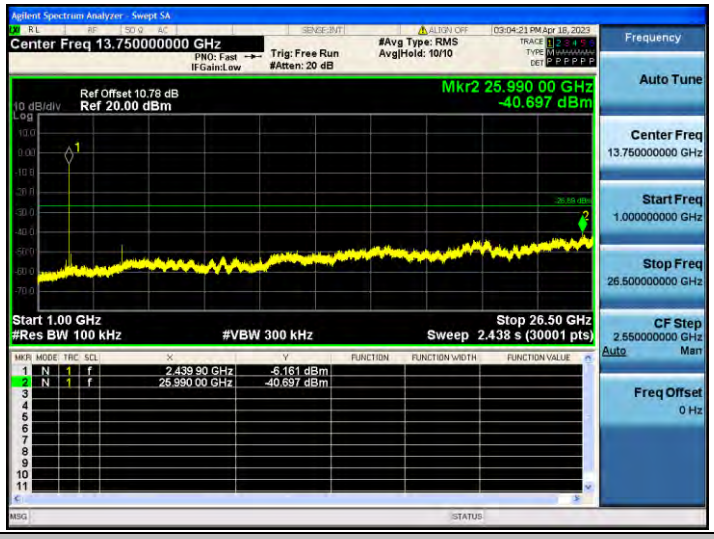

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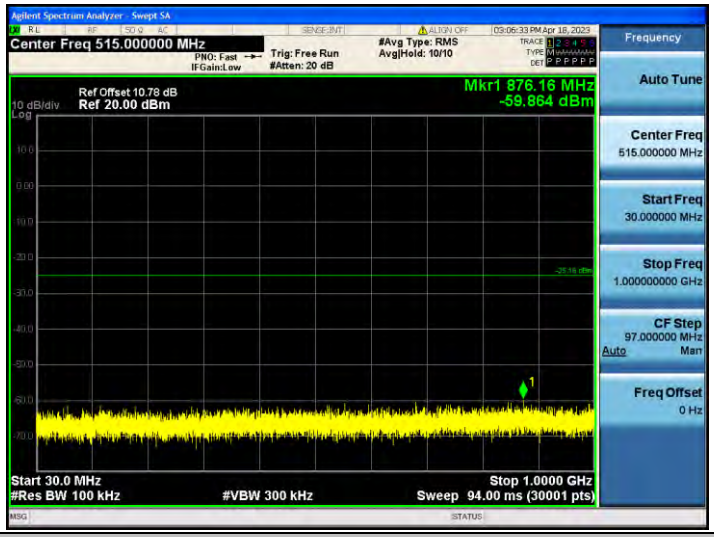

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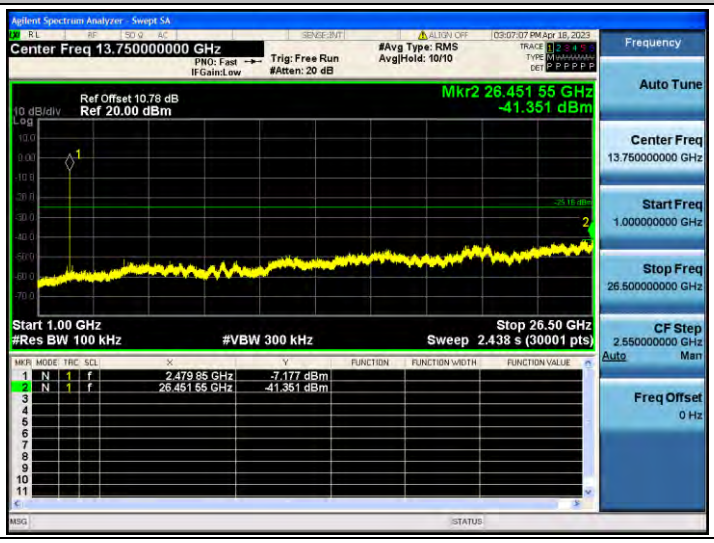

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