TEST REPORT

Application No.:	SHCR2210002279LM
FCC ID:	2A9ADGP-1ZC200
Applicant:	Ningbo Joymore Technology Imp&Exp Co.,Ltd
Address of Applicant:	1503 DIQU Building No.666 Taikang Road. Yinzhou District, NingBo
Manufacturer:	Ningbo Joymore Technology Imp&Exp Co.,Ltd
Address of Manufacturer:	1503 DIQU Building No.666 Taikang Road. Yinzhou District, NingBo
Factory:	Ningbo Joymore Technology Imp&Exp Co.,Ltd
Address of Factory:	1503 DIQU Building No.666 Taikang Road. Yinzhou District, NingBo
Equipment Under Test (EUT):	
EUT Name:	Christmas Light String
Model No.:	GP-8DP100, GP-1ZC200
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2022-10-26
Date of Test:	2022-10-27 to 2022-11-14
Date of Issue:	2022-11-16
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	2022-11-16	/

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

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		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		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Note: There are two models mentioned in this report, and they have the same controller and adapter except different Light string, Only the model GP-8DP100 was tested as representative and the worst data was recorded in the report.

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4 General Information

4.1 Details of E.U.T.

Power supply:	AC 120V 60Hz, 0.22A
Test Voltage:	AC 120V 60Hz
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V5.0 LE
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	PCB Antenna
Antenna Gain:	3.26 dBi (Provided by manufacturer)
Date Rate:	1Mbps, 2Mbps

4.2 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	-

4.3 Power level setting using in test:

Channel	Power setting
0	Default
19	Default
39	Default

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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:
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab
588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China
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

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 6332.01)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

• FCC (Designation Number: CN1301)

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

• ISED (CAB Identifier: CN0020)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 8617A

• 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

Conducted Emissions at AC Mains Power Port (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI test receiver	Rohde & Schwarz	ESR7	SHEM162-1	2021/12/20	2022/12/19
Line impedance stabilization network	SCHWARZBECK	NSLK8127	SHEM061-1	2021/12/20	2022/12/19
Line impedance stabilization network	EMCO	3816_2	SHEM019-1	2021/12/20	2022/12/19
Pulse limiter	Rohde & Schwarz	ESH3-Z2	SHEM029-1	2021/12/20	2022/12/19
Shielding Room	ZHONGYU	8*4*3M	SHEM079-2	2020/12/20	2023/12/19
CE test Cable	/	/	SHEM172-1	2022/1/7	2023/1/6
Test Software	ESE	e3	Version: 6.111221a	N/A	N/A

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Conducted Test					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2021-12-20	2022-12-19
Spectrum Analyzer	Keysight	N9020B	SHEM241-1	2021-12-20	2022-12-19
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	2021-12-20	2022-12-19
DC Power Supply	MCH	MCH-303A	SHEM210-1	2021-12-20	2022-12-19
Conducted test Cable	/	RF01~RF04	/	2021-12-20	2022-12-19
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	2021-12-20	2022-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2021-12-20	2022-12-19
Communication Tester	R&S	CMW500	SHEM268-1	2022-07-25	2023-07-24
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2021-12-20	2022-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2021-09-11	2023-09-10
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2021-05-07	2023-05-06
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	2021-12-20	2022-12-19
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/

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Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
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	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2022-01-07	2023-01-06
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 3.26 dBi.

Antenna location: Refer to internal photo.

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7 Radio Spectrum Matter Test Results

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

Test Requirement 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

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

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C Humidity: 50.5 % 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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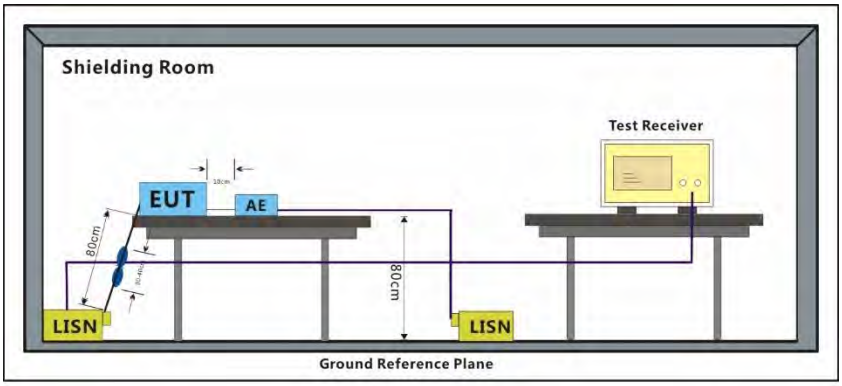
7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

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

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

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

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

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

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

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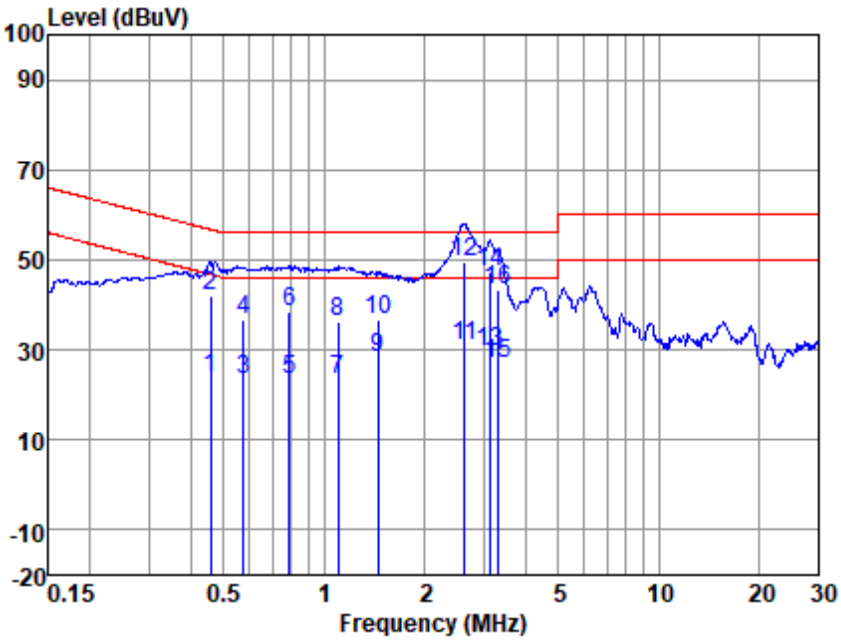
Test Mode: 00; Line: Live line



LISN : LINE
EUT/Project No : 02279LM
Test Mode : 00

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.46	13.67	0.10	10.07	23.84	46.71	-22.87	Average
2	0.46	31.96	0.10	10.07	42.13	56.71	-14.58	QP
3	0.57	13.30	0.10	10.09	23.49	46.00	-22.51	Average
4	0.57	26.32	0.10	10.09	36.51	56.00	-19.49	QP
5	0.79	13.32	0.10	10.09	23.51	46.00	-22.49	Average
6	0.79	28.08	0.10	10.09	38.27	56.00	-17.73	QP
7	1.11	13.06	0.10	10.12	23.28	46.00	-22.72	Average
8	1.11	25.85	0.10	10.12	36.07	56.00	-19.93	QP
9	1.45	17.96	0.10	10.14	28.20	46.00	-17.80	Average
10	1.45	26.24	0.10	10.14	36.48	56.00	-19.52	QP
11	2.64	20.44	0.13	10.18	30.75	46.00	-15.25	Average
12	2.64	39.06	0.13	10.18	49.37	56.00	-6.63	QP
13	3.12	19.29	0.15	10.20	29.64	46.00	-16.36	Average
14	3.12	37.02	0.15	10.20	47.37	56.00	-8.63	QP
15	3.31	16.80	0.15	10.20	27.15	46.00	-18.85	Average

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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Test Mode: 00; Line: Live line

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
16	3.31	32.99	0.15	10.20	43.34	56.00	-12.66	QP

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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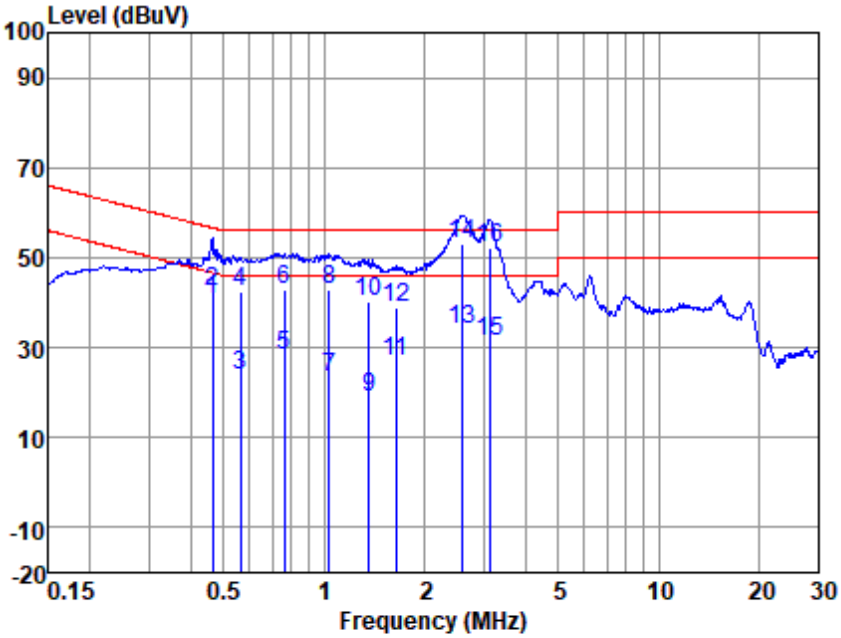
Test Mode: 00; Line: Neutral Line



LISN : NEUTRAL
EUT/Project No : 02279LM
Test Mode : 00

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.46	30.52	0.10	10.07	40.69	46.63	-5.94	Average
2	0.46	32.45	0.10	10.07	42.62	56.63	-14.01	QP
3	0.56	13.43	0.10	10.09	23.62	46.00	-22.38	Average
4	0.56	32.04	0.10	10.09	42.23	56.00	-13.77	QP
5	0.76	18.18	0.10	10.09	28.37	46.00	-17.63	Average
6	0.76	32.81	0.10	10.09	43.00	56.00	-13.00	QP
7	1.04	12.98	0.10	10.11	23.19	46.00	-22.81	Average
8	1.04	32.73	0.10	10.11	42.94	56.00	-13.06	QP
9	1.37	8.68	0.10	10.14	18.92	46.00	-27.08	Average
10	1.37	29.82	0.10	10.14	40.06	56.00	-15.94	QP
11	1.64	16.79	0.10	10.16	27.05	46.00	-18.95	Average
12	1.64	28.85	0.10	10.16	39.11	56.00	-16.89	QP
13	2.59	23.84	0.10	10.18	34.12	46.00	-11.88	Average
14	2.59	42.99	0.10	10.18	53.27	56.00	-2.73	QP
15	3.14	21.10	0.10	10.20	31.40	46.00	-14.60	Average

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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Test Mode: 00; Line: Neutral Line

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
16	3.14	42.05	0.10	10.20	52.35	56.00	-3.65	QP

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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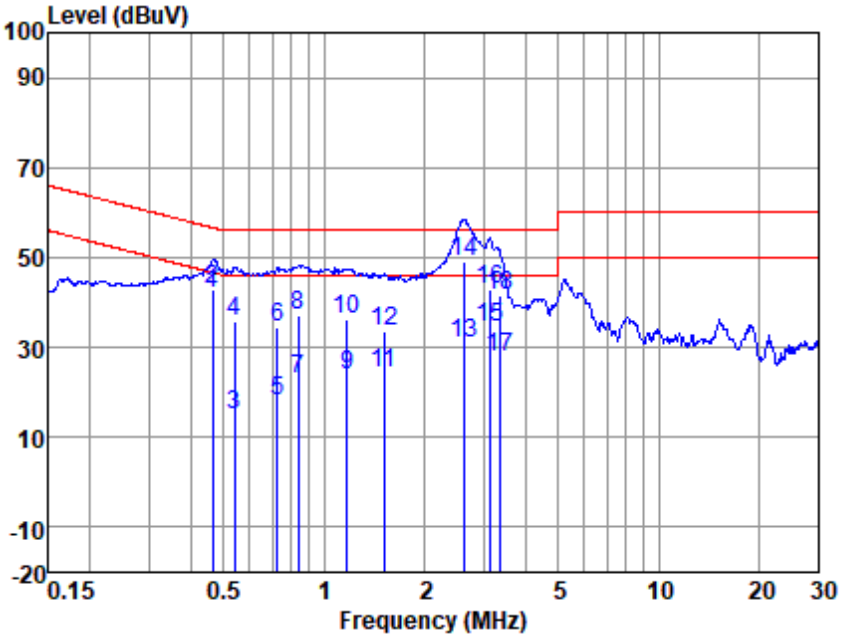

LISN : LINE
EUT/Project No : 02279LM
Test Mode : 01

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.46	31.85	0.10	10.07	42.02	46.63	-4.61	Average
2	0.46	32.50	0.10	10.07	42.67	56.63	-13.96	QP
3	0.54	4.60	0.10	10.08	14.78	46.00	-31.22	Average
4	0.54	25.45	0.10	10.08	35.63	56.00	-20.37	QP
5	0.73	8.00	0.10	10.09	18.19	46.00	-27.81	Average
6	0.73	24.33	0.10	10.09	34.52	56.00	-21.48	QP
7	0.83	12.64	0.10	10.09	22.83	46.00	-23.17	Average
8	0.83	27.00	0.10	10.09	37.19	56.00	-18.81	QP
9	1.17	13.83	0.10	10.12	24.05	46.00	-21.95	Average
10	1.17	25.88	0.10	10.12	36.10	56.00	-19.90	QP
11	1.51	13.83	0.10	10.15	24.08	46.00	-21.92	Average
12	1.51	23.41	0.10	10.15	33.66	56.00	-22.34	QP
13	2.62	20.42	0.13	10.18	30.73	46.00	-15.27	Average
14	2.62	38.97	0.13	10.18	49.28	56.00	-6.72	QP
15	3.14	23.99	0.15	10.20	34.34	46.00	-11.66	Average

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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Test Mode: 01; Line: Live line

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
16	3.14	32.63	0.15	10.20	42.98	56.00	-13.02	QP
17	3.36	17.49	0.16	10.20	27.85	46.00	-18.15	Average
18	3.36	31.18	0.16	10.20	41.54	56.00	-14.46	QP

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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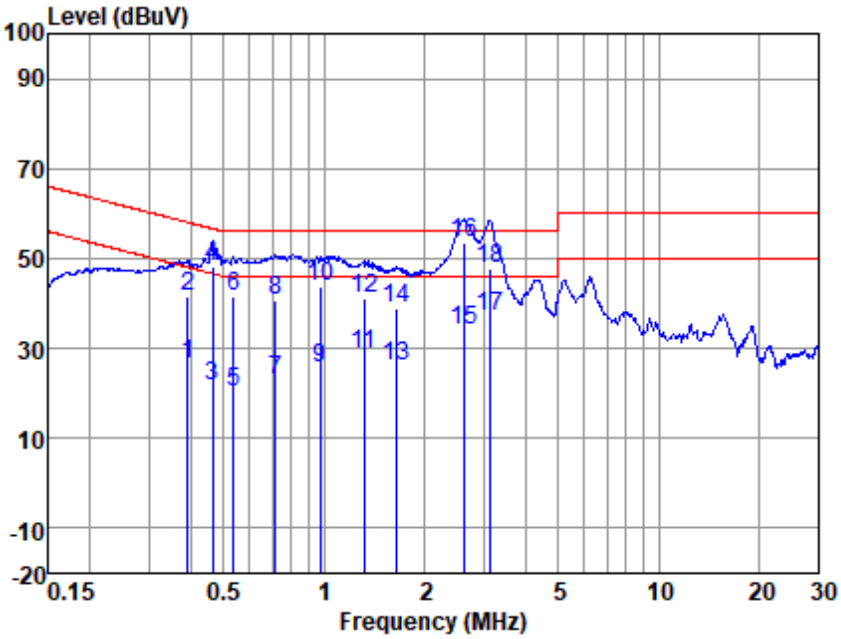
Test Mode: 01; Line: Neutral Line



LISN : NEUTRAL
EUT/Project No : 02279LM
Test Mode : 01

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.39	16.53	0.10	10.06	26.69	48.03	-21.34	Average
2	0.39	31.59	0.10	10.06	41.75	58.03	-16.28	QP
3	0.46	11.29	0.10	10.07	21.46	46.63	-25.17	Average
4	0.46	37.98	0.10	10.07	48.15	56.63	-8.48	QP
5	0.54	10.20	0.10	10.08	20.38	46.00	-25.62	Average
6	0.54	31.34	0.10	10.08	41.52	56.00	-14.48	QP
7	0.72	12.86	0.10	10.09	23.05	46.00	-22.95	Average
8	0.72	30.33	0.10	10.09	40.52	56.00	-15.48	QP
9	0.97	15.29	0.10	10.10	25.49	46.00	-20.51	Average
10	0.97	33.35	0.10	10.10	43.55	56.00	-12.45	QP
11	1.32	18.49	0.10	10.13	28.72	46.00	-17.28	Average
12	1.32	30.97	0.10	10.13	41.20	56.00	-14.80	QP
13	1.64	15.79	0.10	10.16	26.05	46.00	-19.95	Average
14	1.64	28.76	0.10	10.16	39.02	56.00	-16.98	QP
15	2.61	23.74	0.10	10.18	34.02	46.00	-11.98	Average

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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Test Mode: 01; Line: Neutral Line

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
16	2.61	43.43	0.10	10.18	53.71	56.00	-2.29	QP
17	3.14	26.95	0.10	10.20	37.25	46.00	-8.75	Average
18	3.14	37.35	0.10	10.20	47.65	56.00	-8.35	QP

Notes: Emission Level = Read Level +LISN Factor + Cable loss

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7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method: ANSI C63.10 (2013) Section 11.9.1
Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥50 hopping channels
	0.25 for 25≤ hopping channels <50
	1 for digital modulation
2400-2483.5	1 for ≥75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

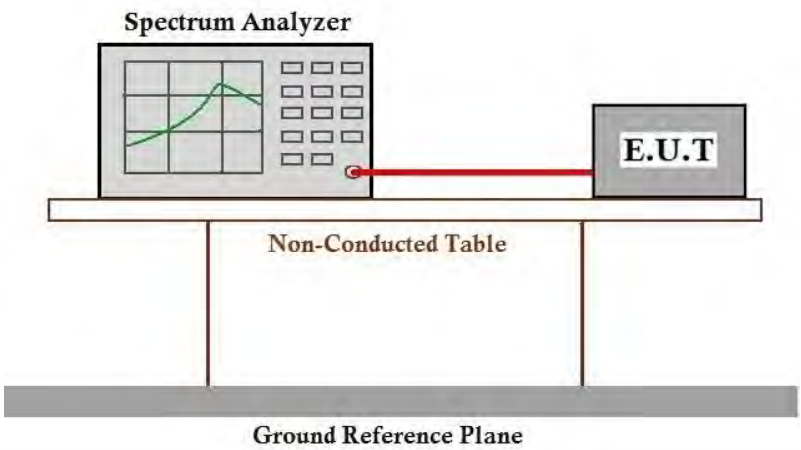
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 22.6 °C Humidity: 50.3 % RH Atmospheric Pressure: 1010 mbar

7.2.1 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.

7.2.2 Test Setup Diagram



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7.2.3 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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7.3 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

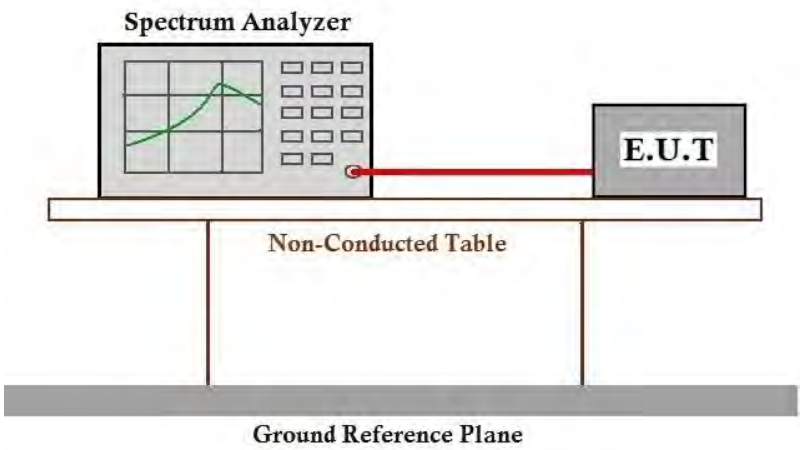
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 22.6 °C Humidity: 49.9 % 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 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

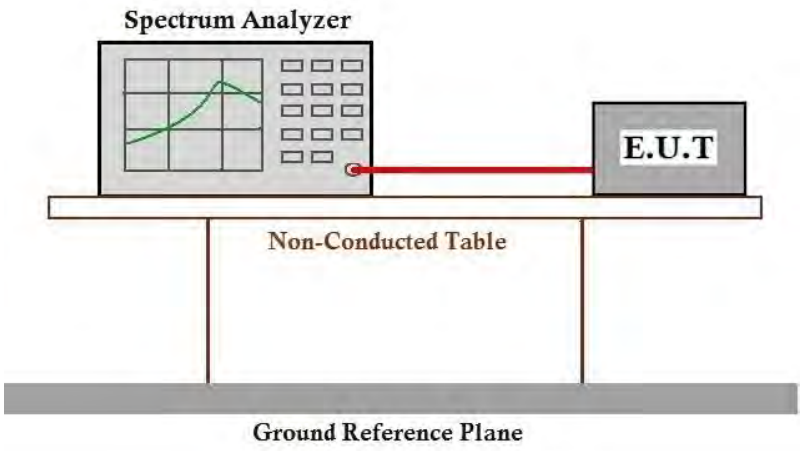
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 22.6 °C Humidity: 49.1 % 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.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

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7.5 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).

7.5.1 E.U.T. Operation

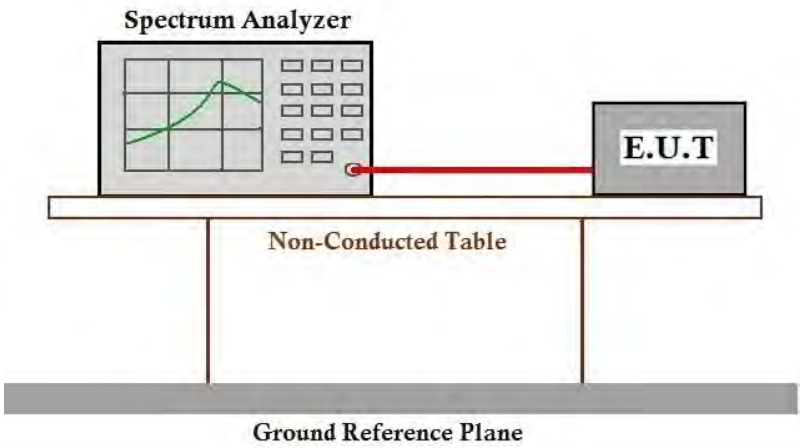
Operating Environment:

Temperature: 22.7 °C Humidity: 48.8 % 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.

7.5.3 Test Setup Diagram



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7.5.4 Measurement Procedure and Data

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7.6 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).

7.6.1 E.U.T. Operation

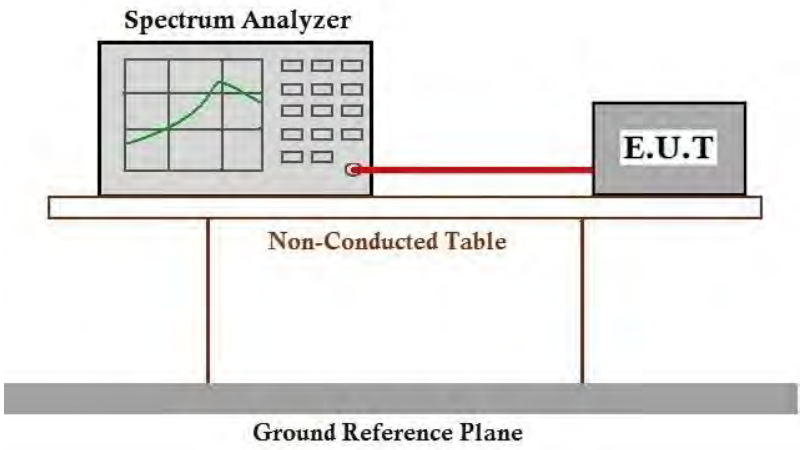
Operating Environment:

Temperature: 22.6 °C Humidity: 48.8 % 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.

7.6.3 Test Setup Diagram



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7.7 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.		

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C Humidity: 48.8 % 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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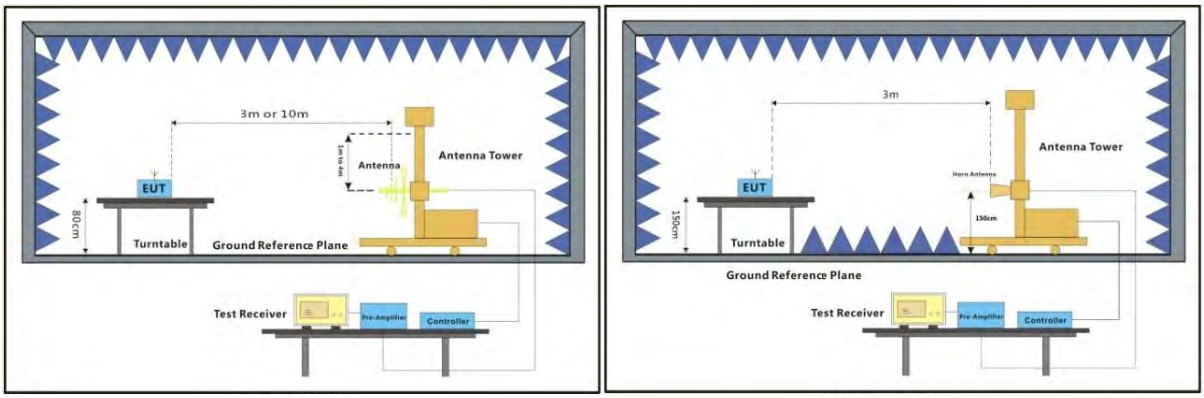
7.7.3 Test Setup Diagram



30MHz-1GHz Above 1GHz

7.7.4 Measurement Procedure and Data

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

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

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

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

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

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

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

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

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

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

Remark 1: 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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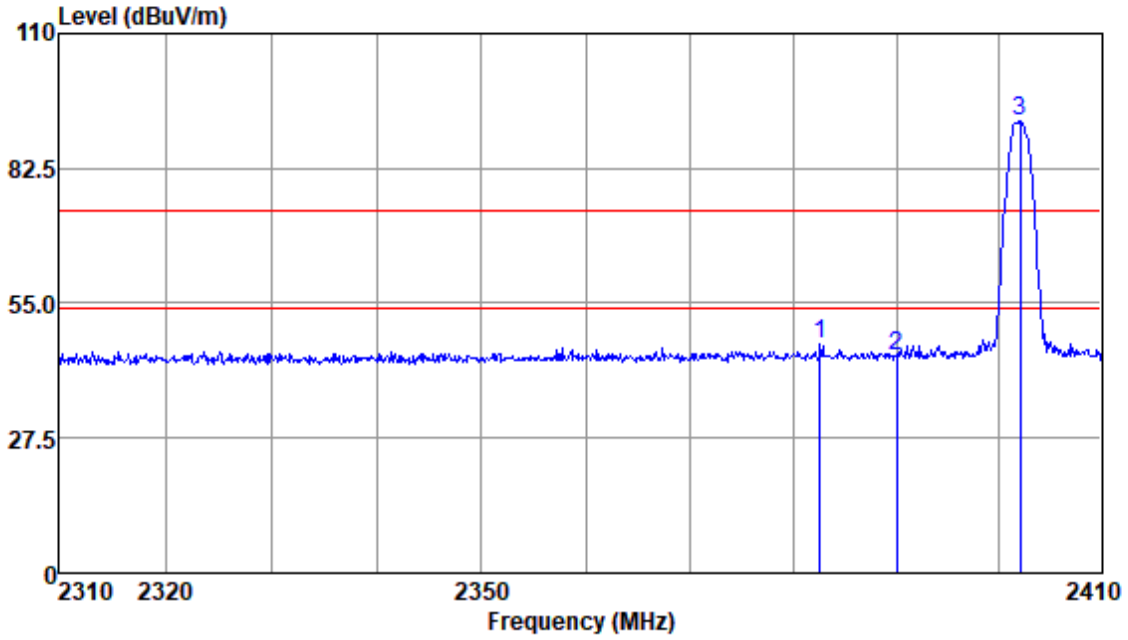
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	
2382.59	49.94	28.76	3.16	35.17	46.69	74.00	-27.31	Peak
2390.00	47.35	28.80	3.15	35.18	44.12	74.00	-29.88	Peak
2402.05	95.22	28.85	3.14	35.19	92.02	74.00	18.02	Peak

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

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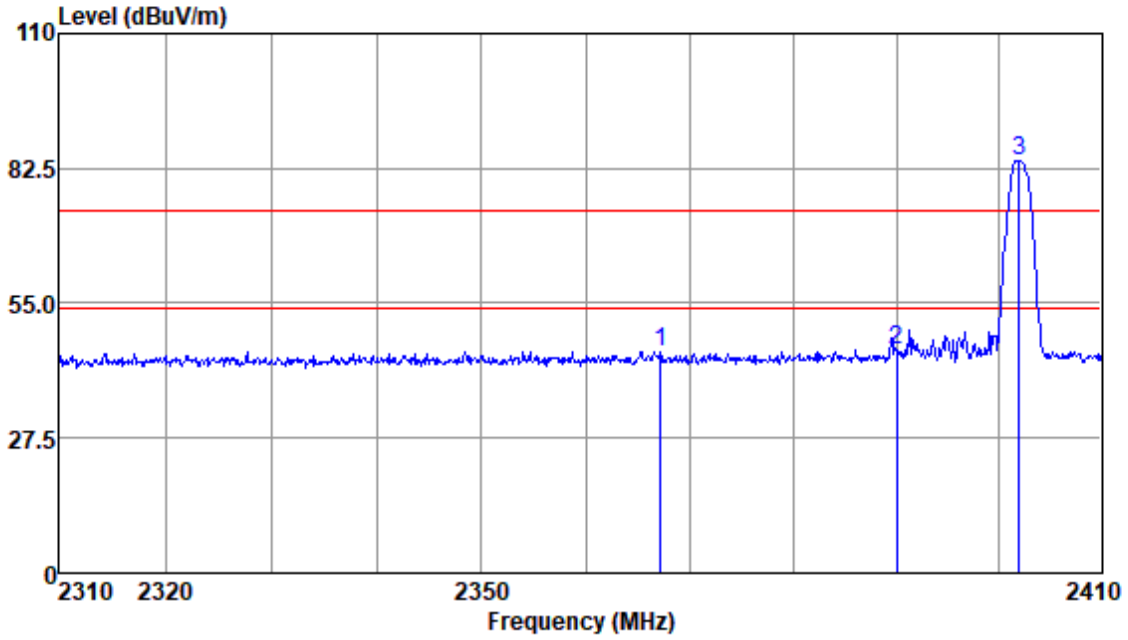
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



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	
2367.17	48.49	28.68	3.17	35.16	45.18	74.00	-28.82	Peak
2390.00	48.52	28.80	3.15	35.18	45.29	74.00	-28.71	Peak
2401.94	87.27	28.85	3.14	35.19	84.07	74.00	10.07	Peak

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

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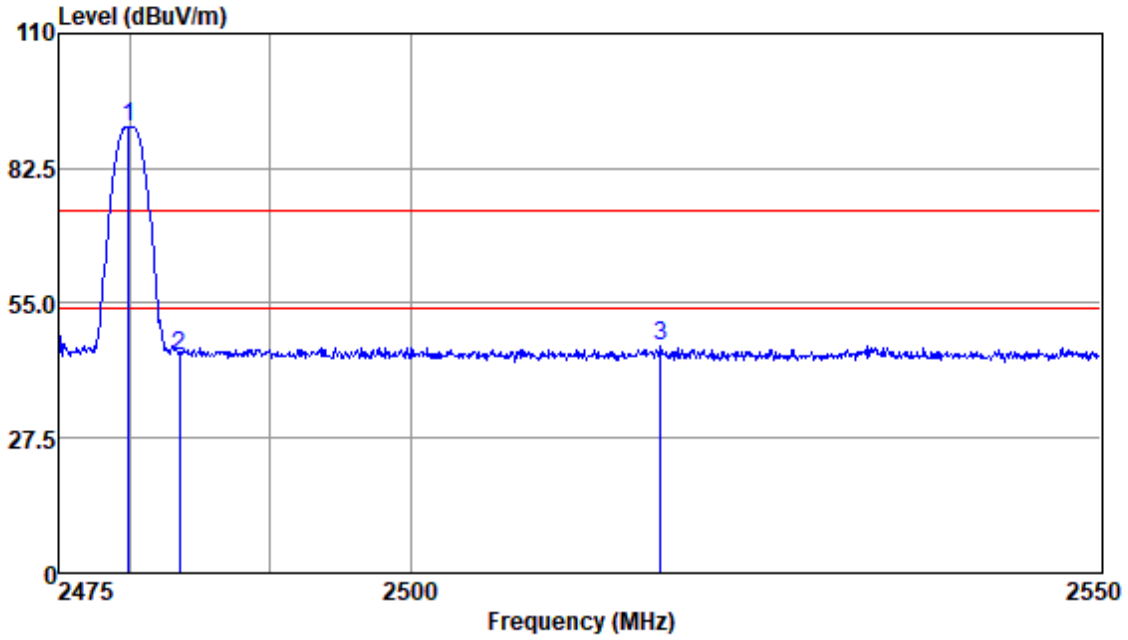
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



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	
2479.88	94.07	29.08	3.14	35.25	91.04	74.00	17.04	Peak
2483.50	47.39	29.09	3.14	35.26	44.36	74.00	-29.64	Peak
2518.00	49.46	29.13	3.15	35.29	46.45	74.00	-27.55	Peak

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

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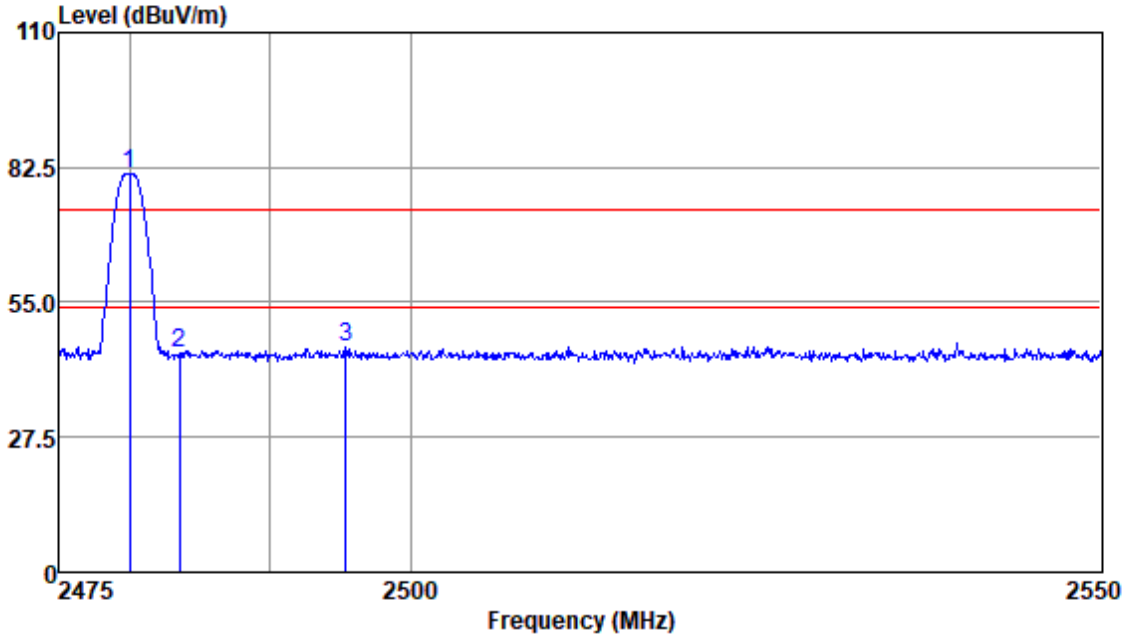
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



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	
2479.96	84.41	29.08	3.14	35.25	81.38	74.00	7.38	Peak
2483.50	47.62	29.09	3.14	35.26	44.59	74.00	-29.41	Peak
2495.40	48.68	29.10	3.15	35.26	45.67	74.00	-28.33	Peak

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

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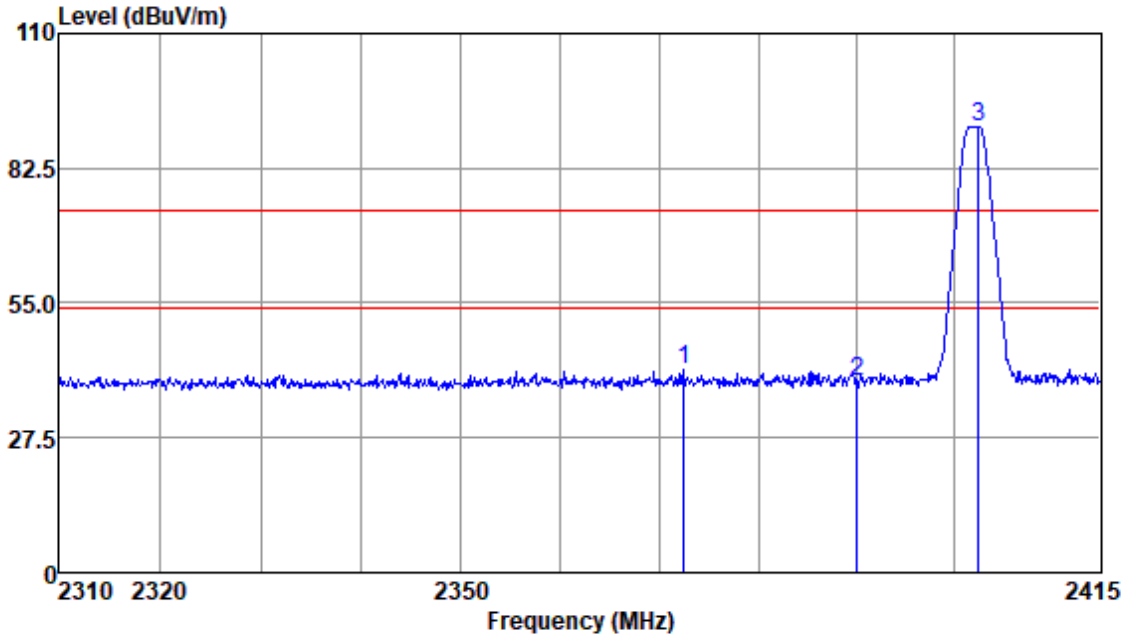
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	
2372.44	44.52	28.71	3.17	35.17	41.23	74.00	-32.77	Peak
2390.00	42.22	28.80	3.15	35.18	38.99	74.00	-35.01	Peak
2402.47	94.30	28.85	3.14	35.19	91.10	74.00	17.10	Peak

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

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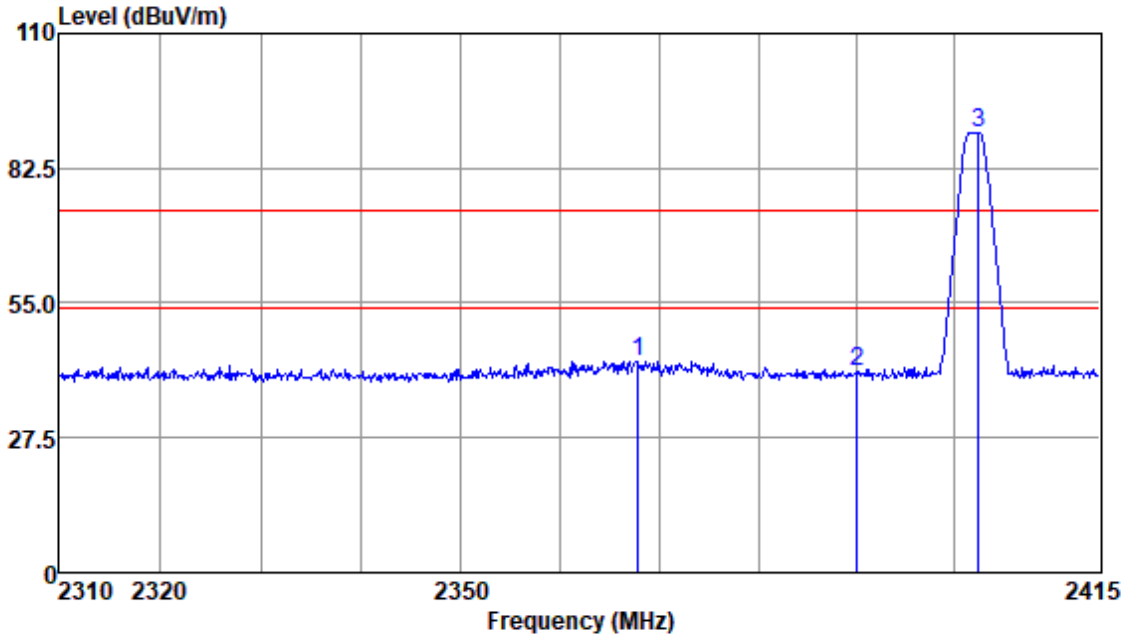
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



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	
2367.80	46.51	28.68	3.17	35.16	43.20	74.00	-30.80	Peak
2390.00	44.14	28.80	3.15	35.18	40.91	74.00	-33.09	Peak
2402.47	93.04	28.85	3.14	35.19	89.84	74.00	15.84	Peak

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

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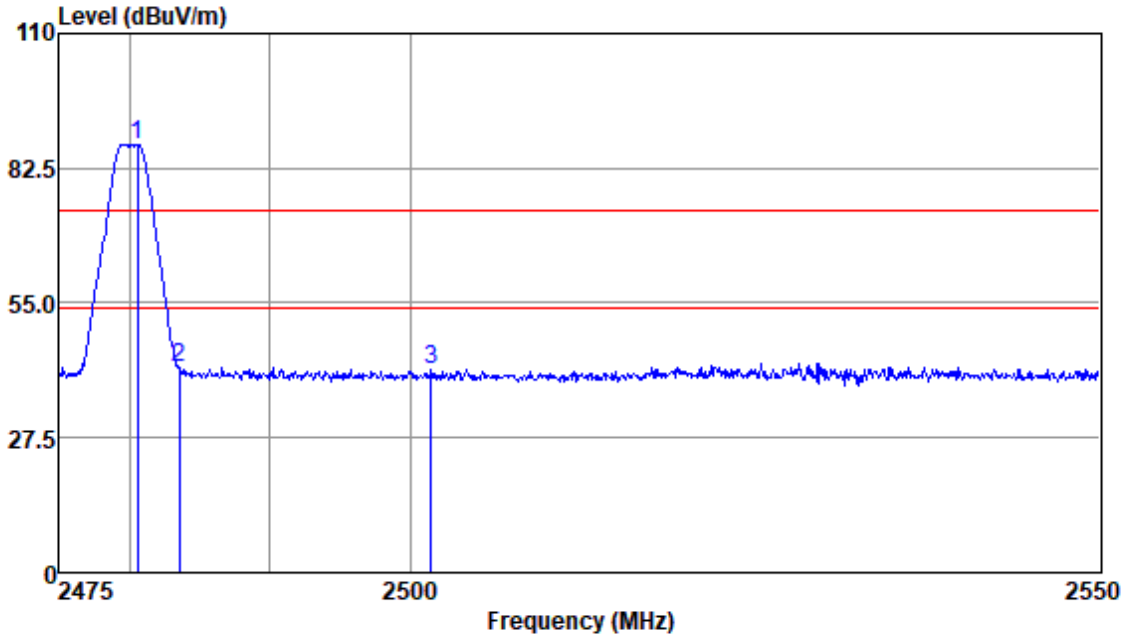
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



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	
2480.55	90.43	29.08	3.14	35.25	87.40	74.00	13.40	Peak
2483.50	44.72	29.09	3.14	35.26	41.69	74.00	-32.31	Peak
2501.52	44.33	29.12	3.15	35.27	41.33	74.00	-32.67	Peak

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

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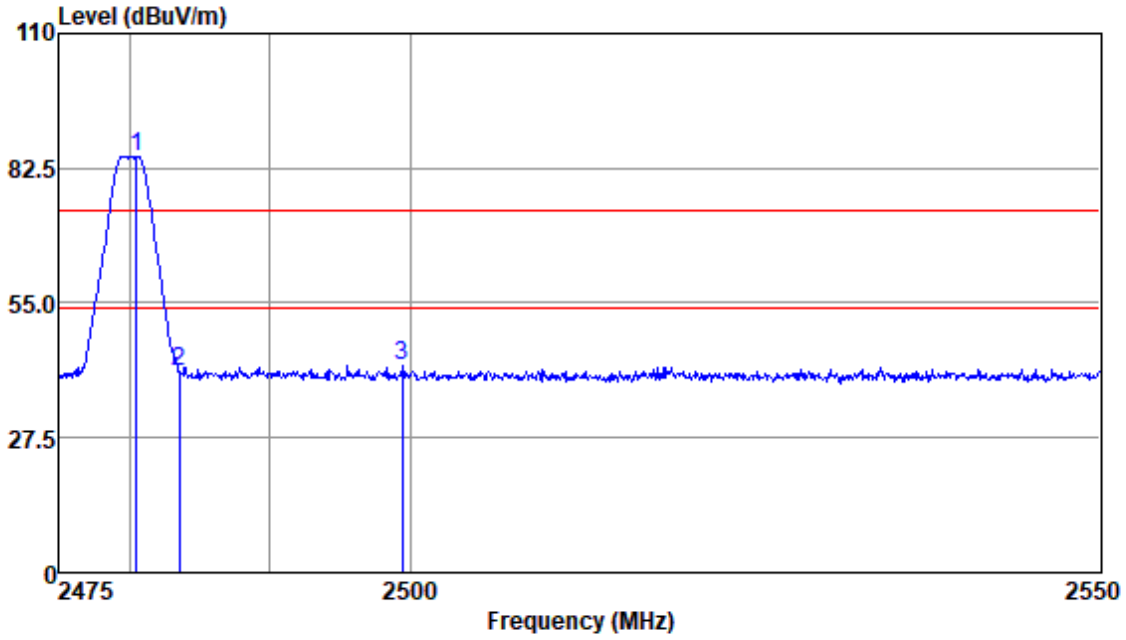
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



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	
2480.47	88.04	29.08	3.14	35.25	85.01	74.00	11.01	Peak
2483.50	43.91	29.09	3.14	35.26	40.88	74.00	-33.12	Peak
2499.43	45.24	29.12	3.15	35.27	42.24	74.00	-31.76	Peak

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

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7.8 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

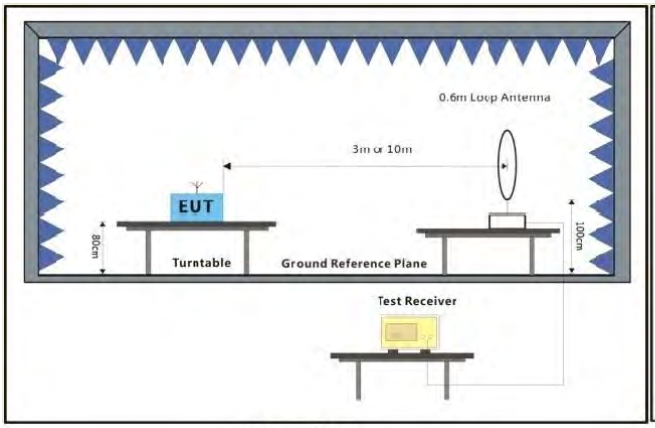
7.8.1 E.U.T. Operation

Operating Environment:
Temperature: 22.6 °C Humidity: 49.1 % RH Atmospheric Pressure: 1010 mbar

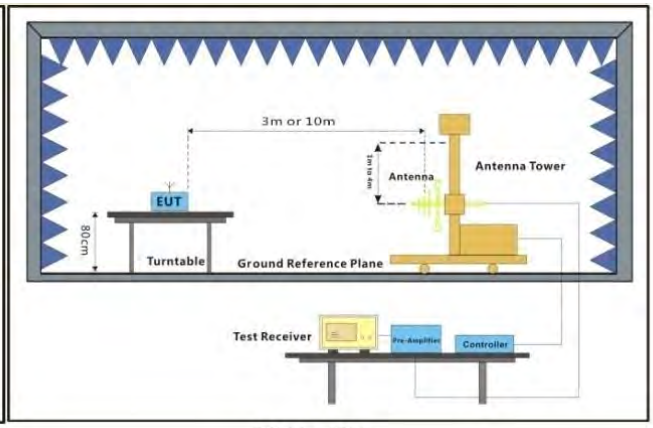
7.8.2 Test Mode Description

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

7.8.3 Test Setup Diagram



Below 30MHz



30MHz-1GHz

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7.8.4 Measurement Procedure and Data

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

b. 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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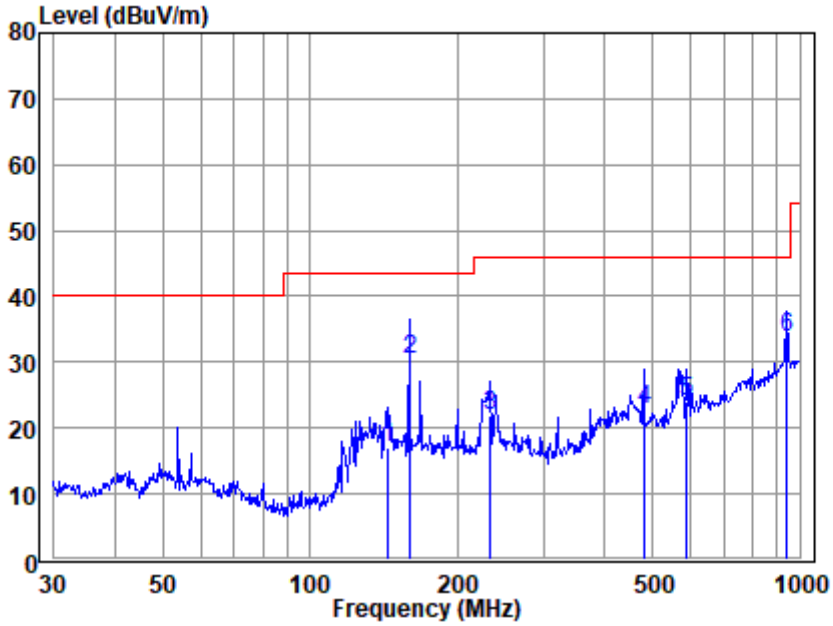
Test Mode: 00; Polarity: Horizontal



Antenna Polarity :Horizontal
EUT/Project :2279LM
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	144.25	33.03	13.14	2.88	31.94	17.11	43.50	-26.39	QP
2	159.68	46.13	13.38	3.10	32.23	30.38	43.50	-13.12	QP
3	233.76	39.66	10.89	3.78	32.39	21.94	46.00	-24.06	QP
4	481.04	33.89	17.50	5.51	34.02	22.88	46.00	-23.12	QP
5	589.47	31.63	19.59	6.08	33.36	23.94	46.00	-22.06	QP
6	940.84	32.09	23.75	7.69	29.74	33.79	46.00	-12.21	QP

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

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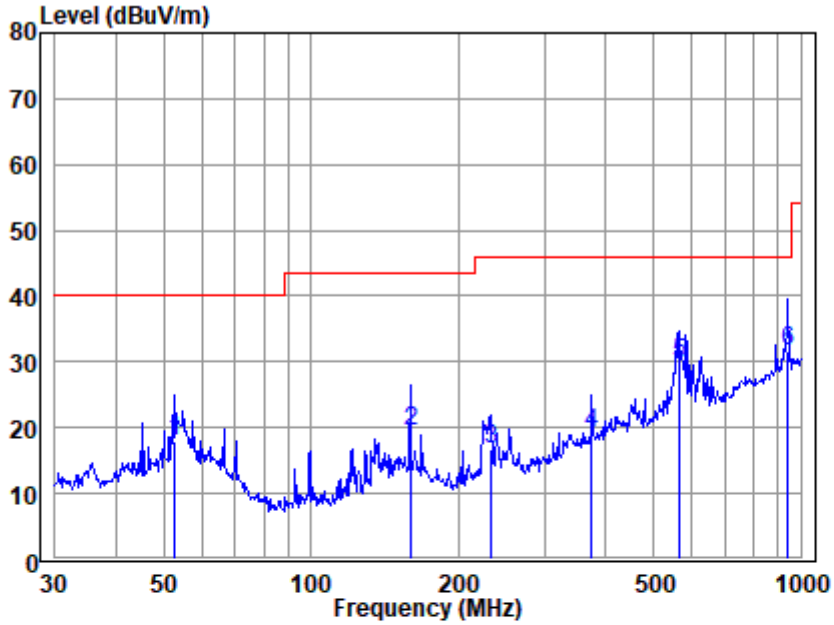
Test Mode: 00; Polarity: Vertical



Antenna Polarity :Vertical
EUT/Project :2279LM
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	52.74	34.66	13.68	1.74	32.00	18.08	40.00	-21.92	QP
2	159.68	35.34	13.38	3.10	32.23	19.59	43.50	-23.91	QP
3	233.76	34.53	10.89	3.78	32.39	16.81	46.00	-29.19	QP
4	375.00	32.49	15.15	4.90	33.48	19.06	46.00	-26.94	QP
5	563.12	38.03	18.97	6.01	33.22	29.79	46.00	-16.21	QP
6	940.84	29.93	23.75	7.69	29.74	31.63	46.00	-14.37	QP

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

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7.9 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

7.9.1 E.U.T. Operation

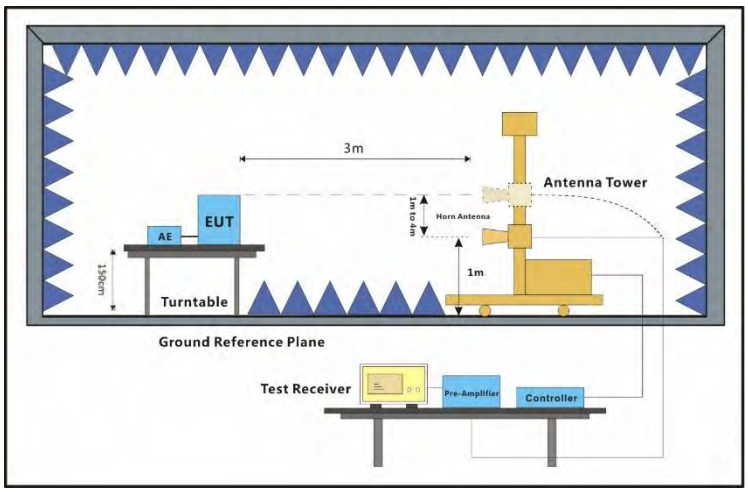
Operating Environment:

Temperature: 22.6 °C Humidity: 49.1 % 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



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7.9.4 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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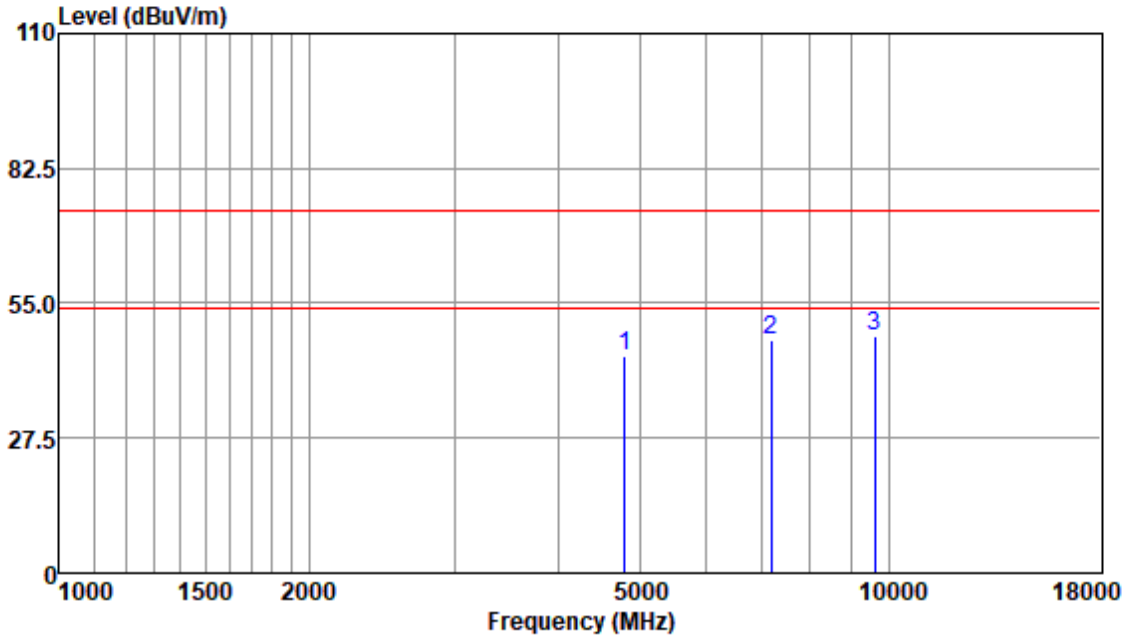
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	44.05	33.72	5.09	38.71	44.15	74.00	-29.85	Peak
7206.00	42.60	36.28	5.75	37.18	47.45	74.00	-26.55	Peak
9608.00	37.96	37.70	6.78	34.18	48.26	74.00	-25.74	Peak

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

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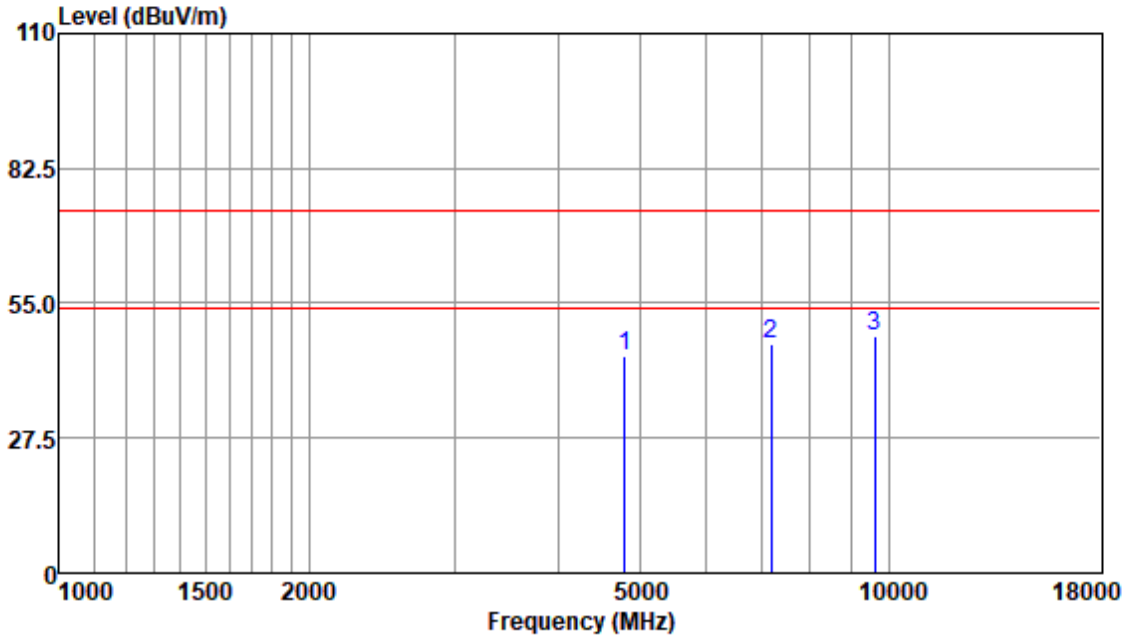
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



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	44.04	33.72	5.09	38.71	44.14	74.00	-29.86	Peak
7206.00	41.67	36.28	5.75	37.18	46.52	74.00	-27.48	Peak
9608.00	38.14	37.70	6.78	34.18	48.44	74.00	-25.56	Peak

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

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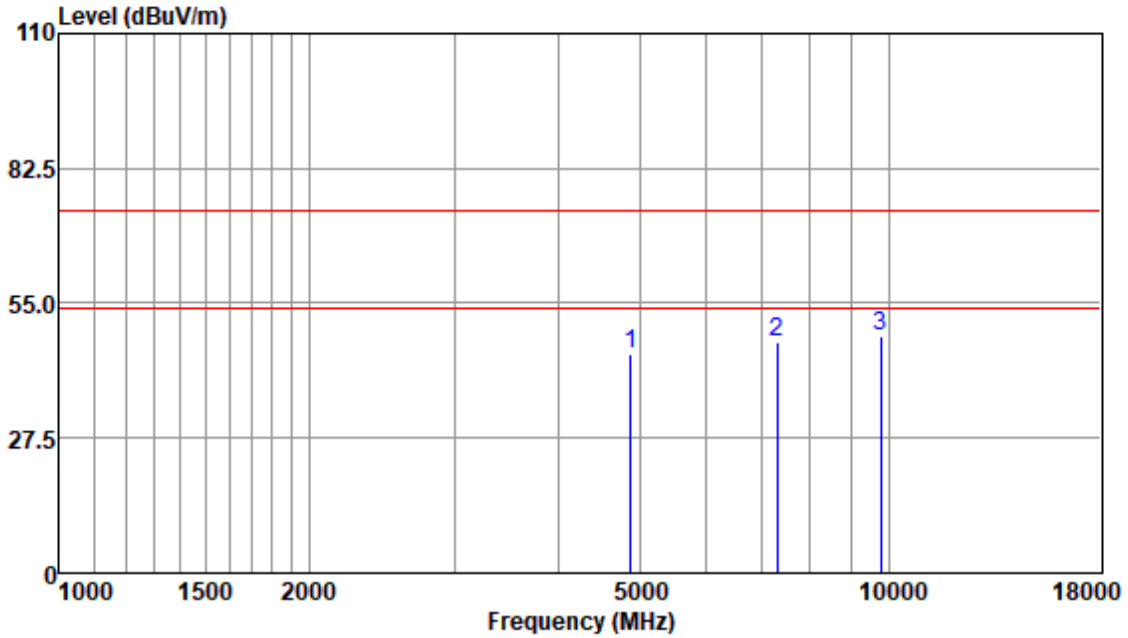
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



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	45.02	33.93	4.48	38.78	44.65	74.00	-29.35	Peak
7320.00	41.98	36.47	5.80	37.10	47.15	74.00	-26.85	Peak
9760.00	38.40	37.68	6.48	34.15	48.41	74.00	-25.59	Peak

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

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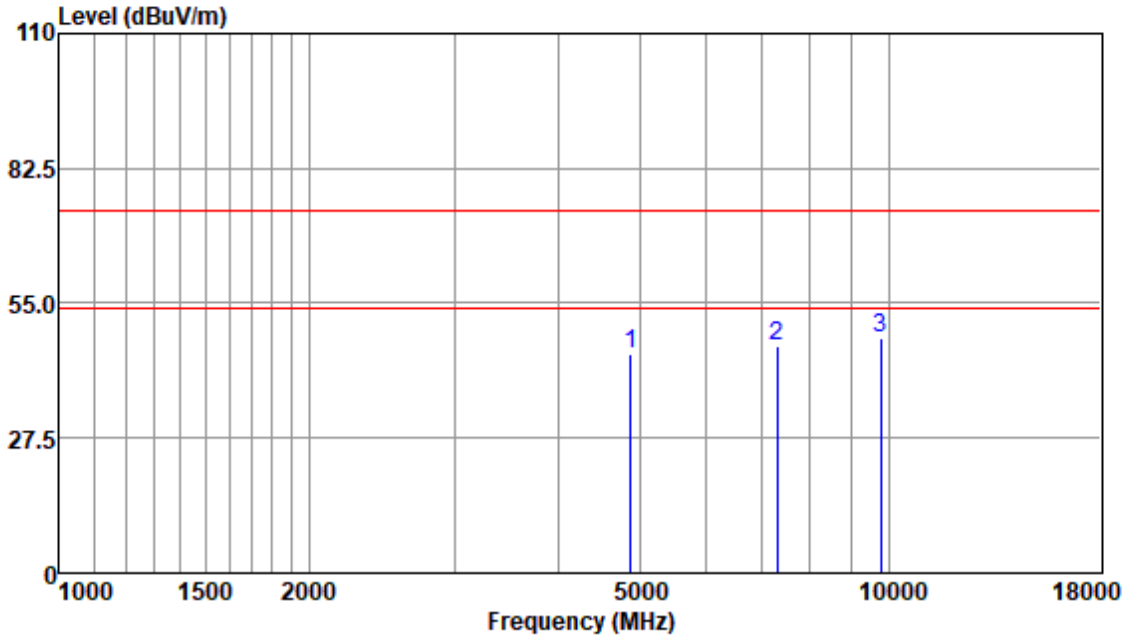
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



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	44.89	33.93	4.48	38.78	44.52	74.00	-29.48	Peak
7320.00	41.24	36.47	5.80	37.10	46.41	74.00	-27.59	Peak
9760.00	37.84	37.68	6.48	34.15	47.85	74.00	-26.15	Peak

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

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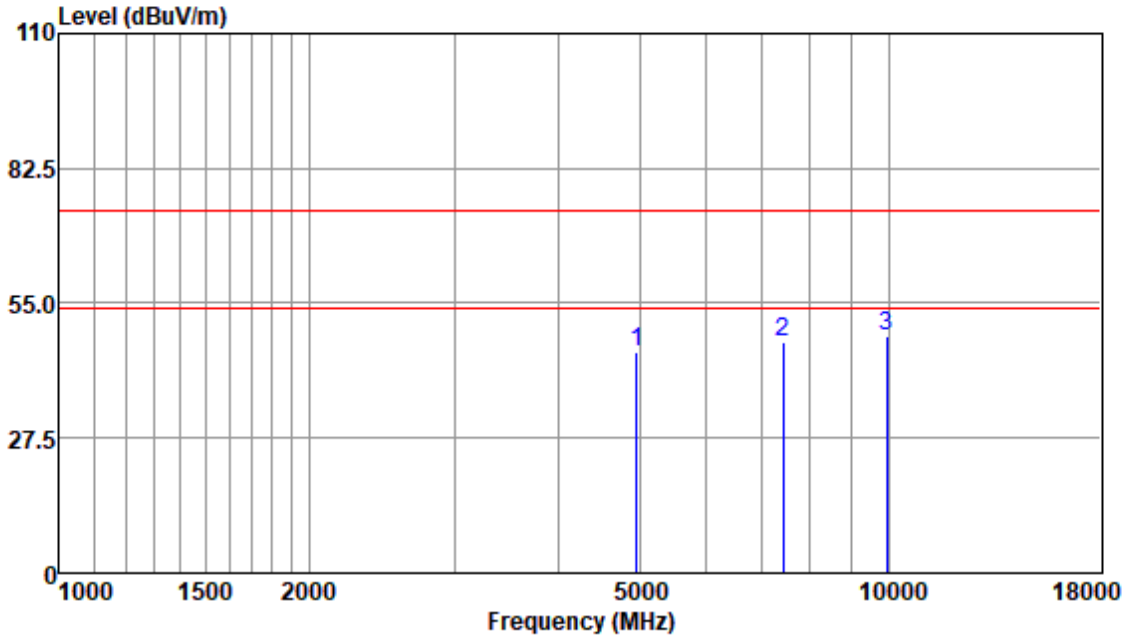
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



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	44.96	33.98	5.04	38.87	45.11	74.00	-28.89	Peak
7440.00	41.68	36.40	6.09	37.03	47.14	74.00	-26.86	Peak
9920.00	38.06	37.81	6.53	34.11	48.29	74.00	-25.71	Peak

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

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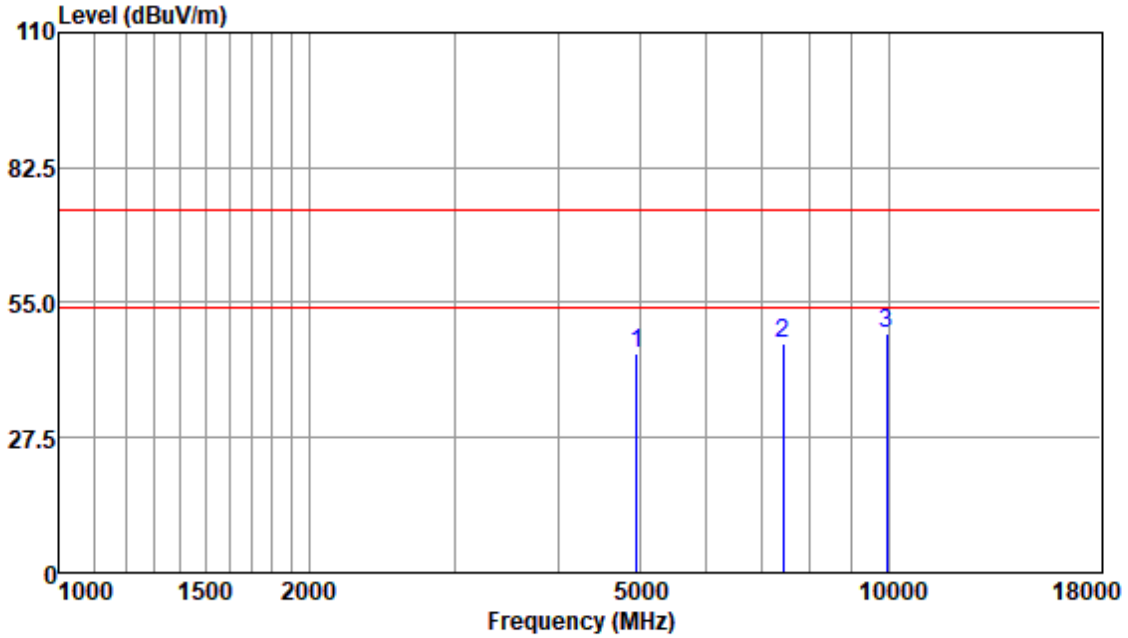
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



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	44.36	33.98	5.04	38.87	44.51	74.00	-29.49	Peak
7440.00	41.07	36.40	6.09	37.03	46.53	74.00	-27.47	Peak
9920.00	38.48	37.81	6.53	34.11	48.71	74.00	-25.29	Peak

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

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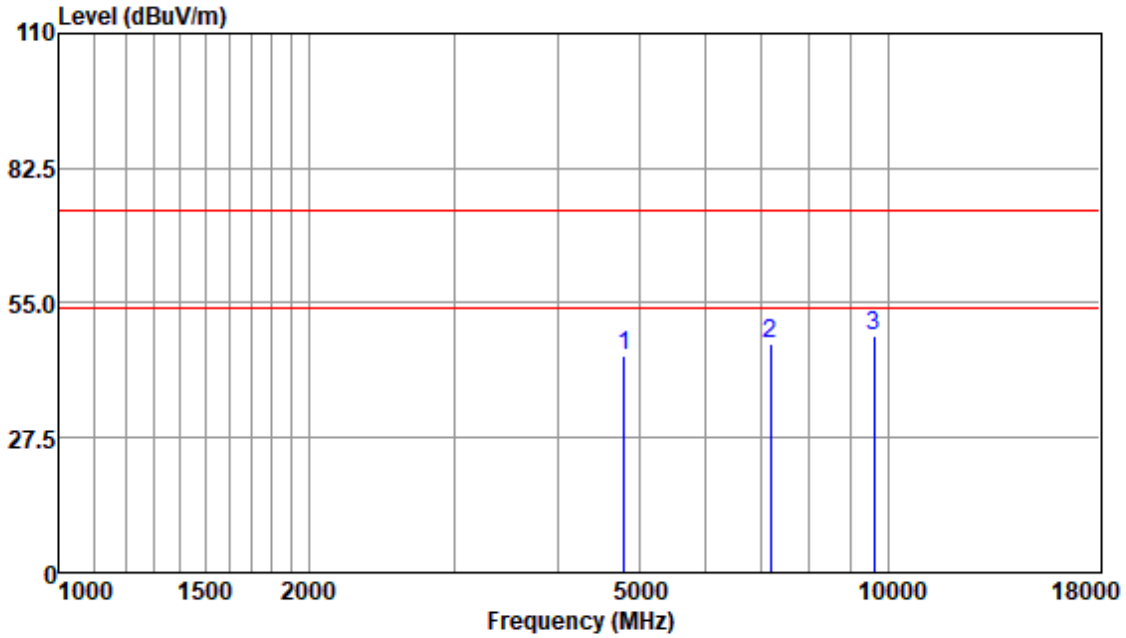
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	44.06	33.72	5.09	38.71	44.16	74.00	-29.84	Peak
7206.00	41.99	36.28	5.75	37.18	46.84	74.00	-27.16	Peak
9608.00	37.86	37.70	6.78	34.18	48.16	74.00	-25.84	Peak

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

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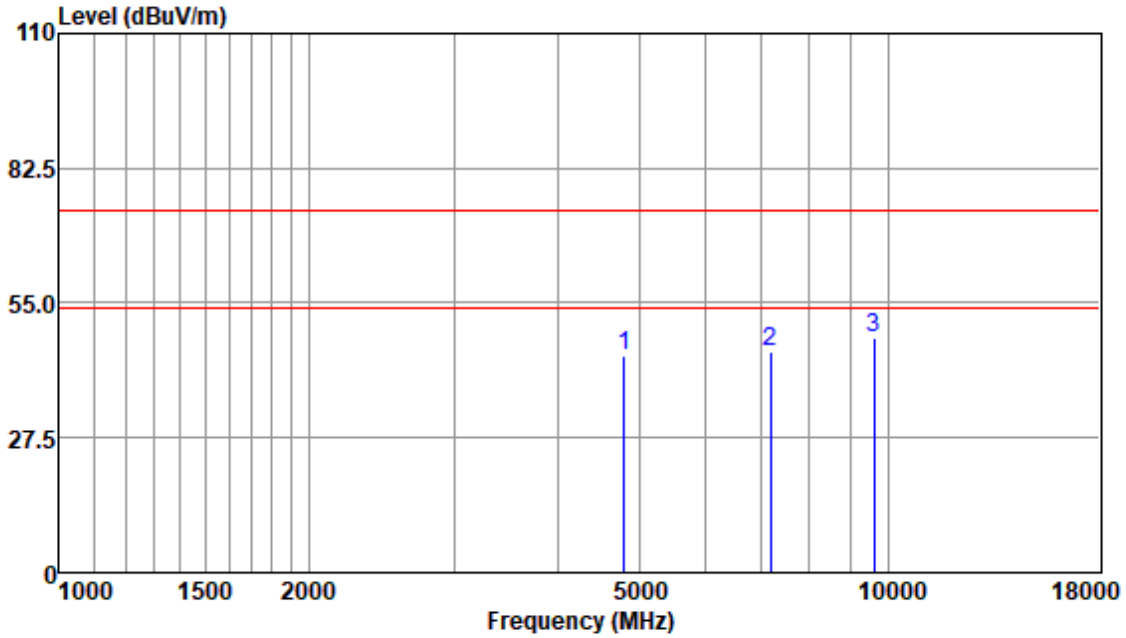
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low



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	44.12	33.72	5.09	38.71	44.22	74.00	-29.78	Peak
7206.00	40.34	36.28	5.75	37.18	45.19	74.00	-28.81	Peak
9608.00	37.41	37.70	6.78	34.18	47.71	74.00	-26.29	Peak

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

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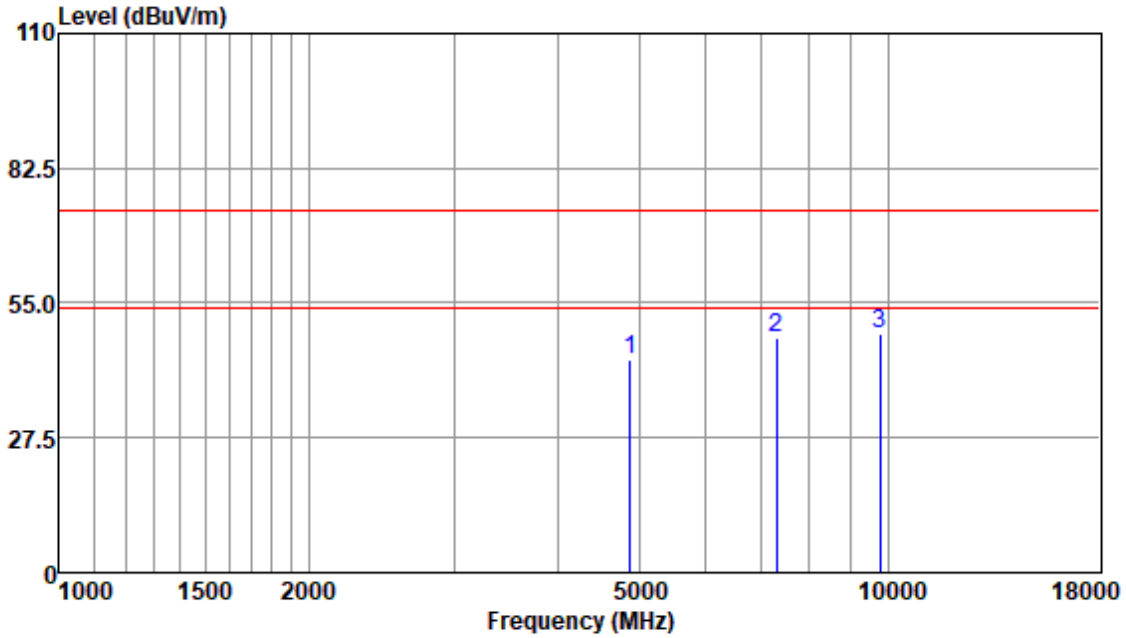
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle



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	43.62	33.93	4.48	38.78	43.25	74.00	-30.75	Peak
7320.00	42.75	36.47	5.80	37.10	47.92	74.00	-26.08	Peak
9760.00	38.73	37.68	6.48	34.15	48.74	74.00	-25.26	Peak

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

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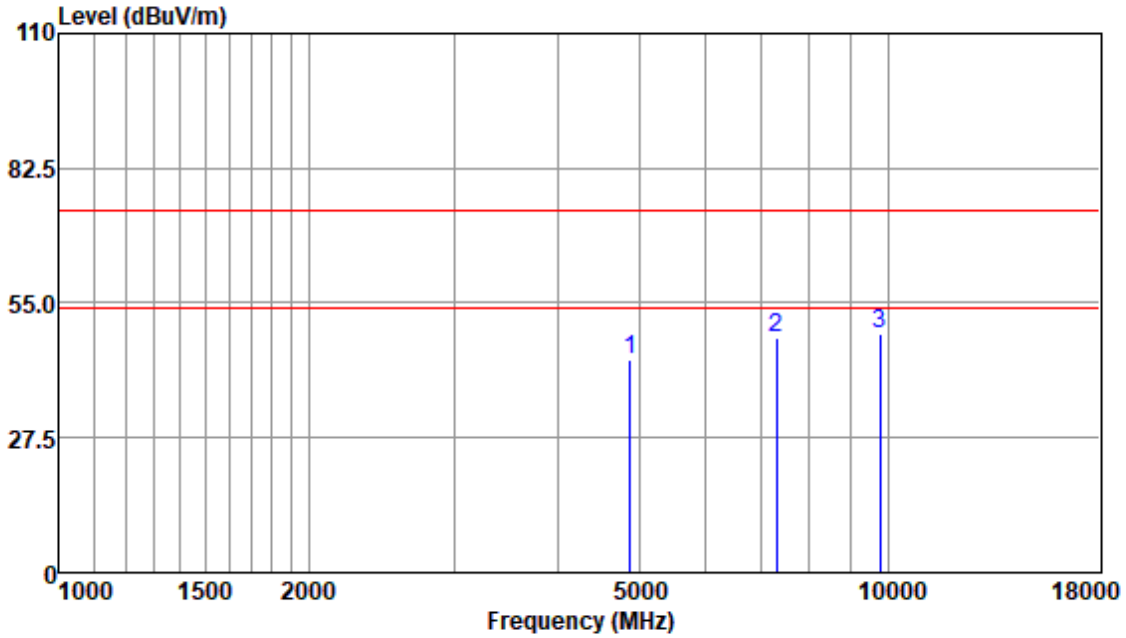
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:middle



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	43.88	33.93	4.48	38.78	43.51	74.00	-30.49	Peak
7320.00	42.67	36.47	5.80	37.10	47.84	74.00	-26.16	Peak
9760.00	38.54	37.68	6.48	34.15	48.55	74.00	-25.45	Peak

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

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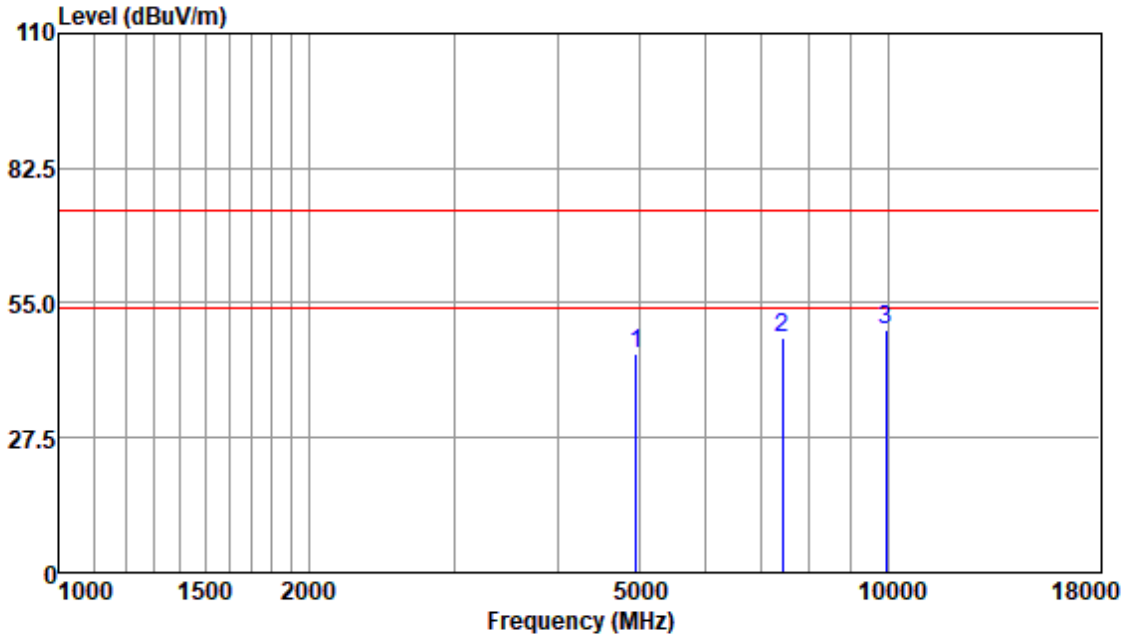
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



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	44.47	33.98	5.04	38.87	44.62	74.00	-29.38	Peak
7440.00	42.51	36.40	6.09	37.03	47.97	74.00	-26.03	Peak
9920.00	39.28	37.81	6.53	34.11	49.51	74.00	-24.49	Peak

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

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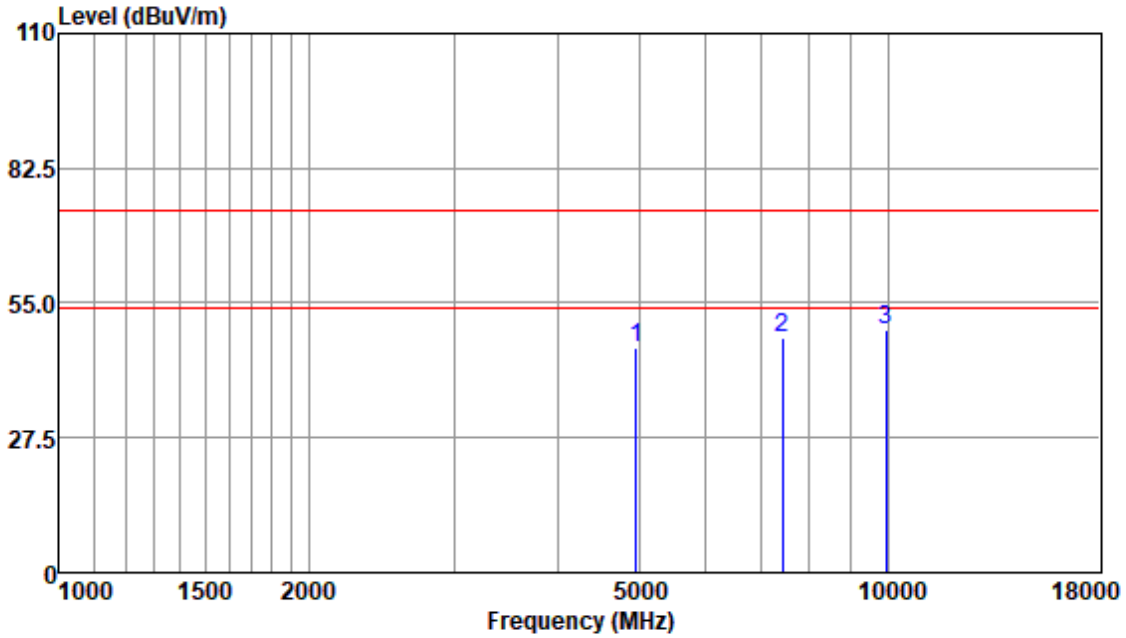
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



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	45.56	33.98	5.04	38.87	45.71	74.00	-28.29	Peak
7440.00	42.36	36.40	6.09	37.03	47.82	74.00	-26.18	Peak
9920.00	39.28	37.81	6.53	34.11	49.51	74.00	-24.49	Peak

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

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SHCR2210002279LM

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for SHCR2210002279LM

10 Appendix

10.1 Appendix A: DTS Bandwidth

10.1.1 Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.664	2401.656	2402.320	0.5	PASS
		2440	0.676	2439.660	2440.336	0.5	PASS
		2480	0.676	2479.664	2480.340	0.5	PASS
BLE_2M	Ant1	2402	1.320	2401.316	2402.636	0.5	PASS
		2440	1.352	2439.348	2440.700	0.5	PASS
		2480	1.304	2479.356	2480.660	0.5	PASS

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10.1.2 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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10.2 Appendix B: Occupied Channel Bandwidth

10.2.1 Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0363	2401.4714	2402.5077	---	---
		2440	1.0301	2439.4873	2440.5174	---	---
		2480	1.0263	2479.4772	2480.5035	---	---
BLE_2M	Ant1	2402	2.0367	2400.9617	2402.9984	---	---
		2440	2.0674	2438.9698	2441.0372	---	---
		2480	2.0366	2478.9829	2481.0195	---	---

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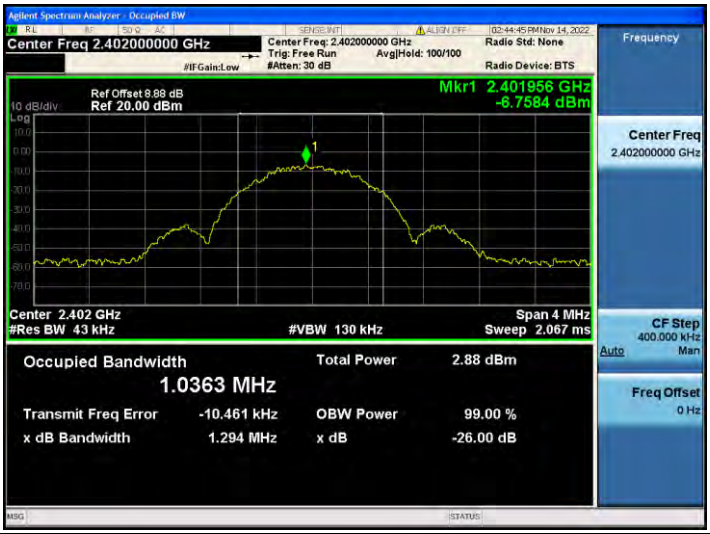
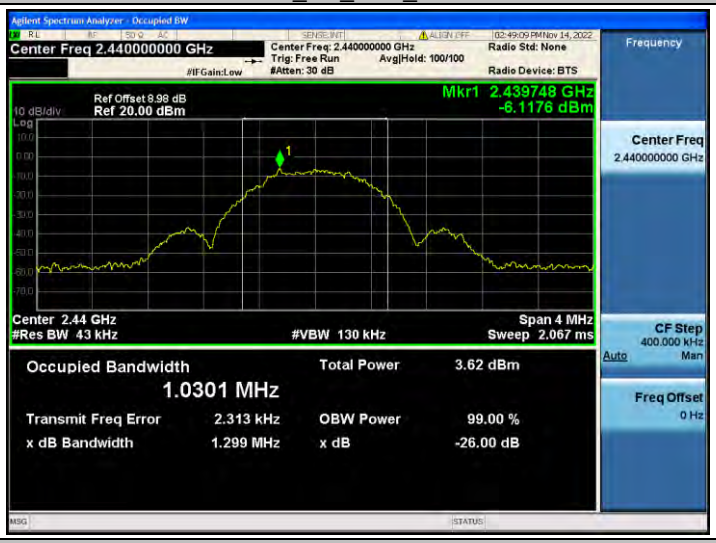
10.2.2 Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

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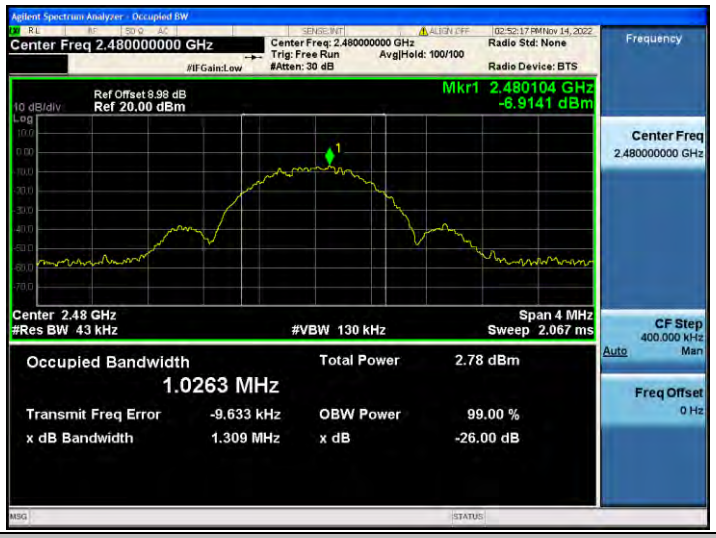

BLE_2M_Ant1_2402

BLE_2M_Ant1_2440

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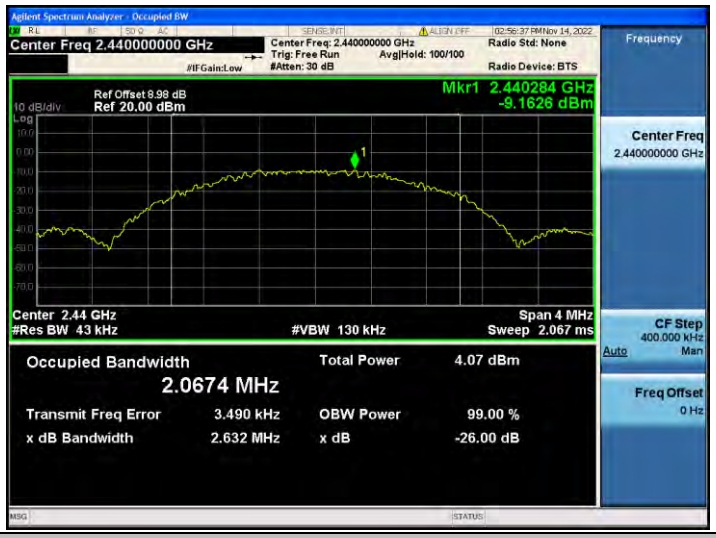

BLE_2M_Ant1_2480

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10.3 Appendix C: Maximum conducted output power

10.3.1 Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	-4.12	≤30	PASS
		2440	-3.34	≤30	PASS
		2480	-4.42	≤30	PASS
BLE_2M	Ant1	2402	-4.11	≤30	PASS
		2440	-3.33	≤30	PASS
		2480	-4.4	≤30	PASS

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10.3.2 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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10.4 Appendix D: Maximum power spectral density

10.4.1 Test Result

TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-13.06	≤8.00	PASS
		2440	-12.74	≤8.00	PASS
		2480	-13.79	≤8.00	PASS
BLE_2M	Ant1	2402	-15.46	≤8.00	PASS
		2440	-15.67	≤8.00	PASS
		2480	-15.9	≤8.00	PASS

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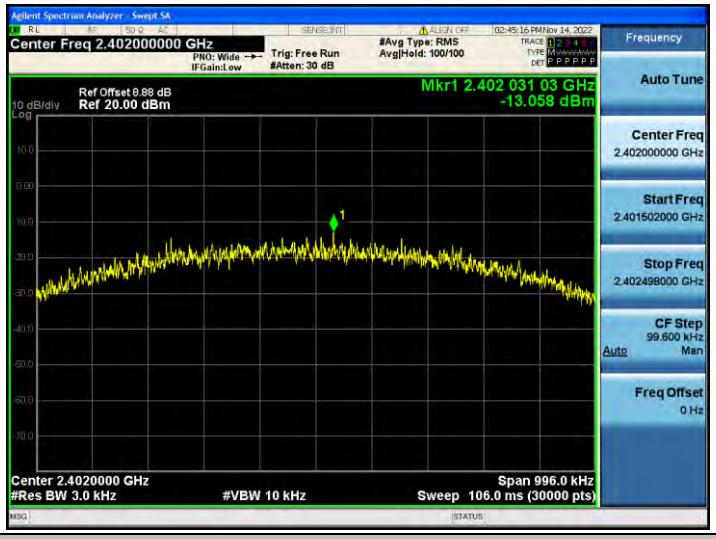
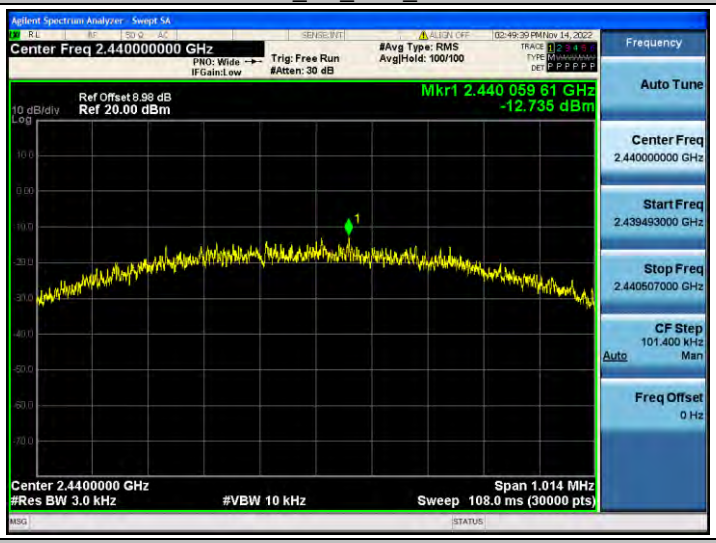
10.4.2 Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

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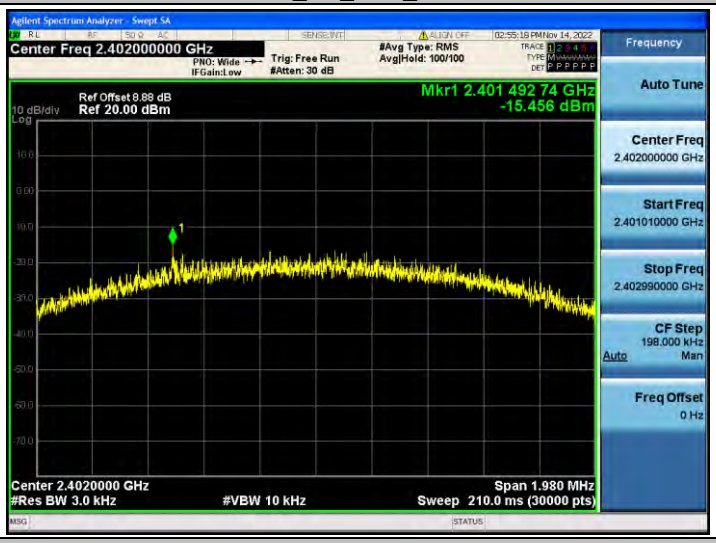
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440

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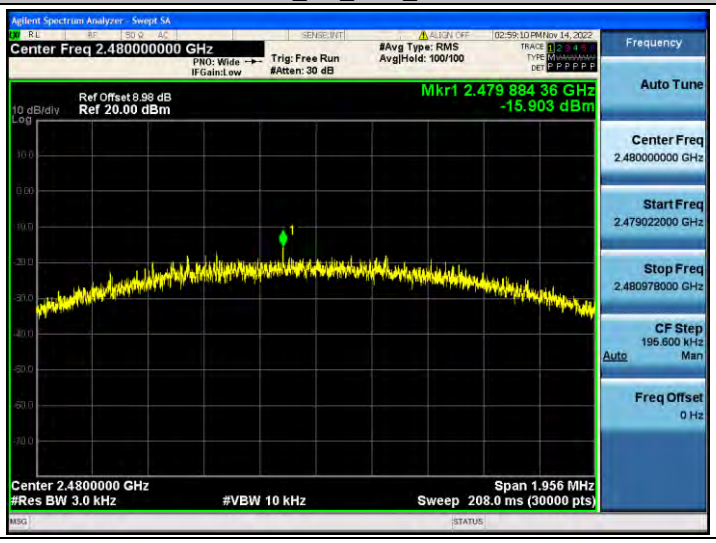

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10.5 Appendix E: Band edge measurements

10.5.1 Test Result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-4.40	-50.22	≤-24.4	PASS
		High	2480	-4.97	-48.69	≤-24.97	PASS
BLE_2M	Ant1	Low	2402	-6.47	-40.38	≤-26.47	PASS
		High	2480	-7.00	-48.87	≤-27	PASS

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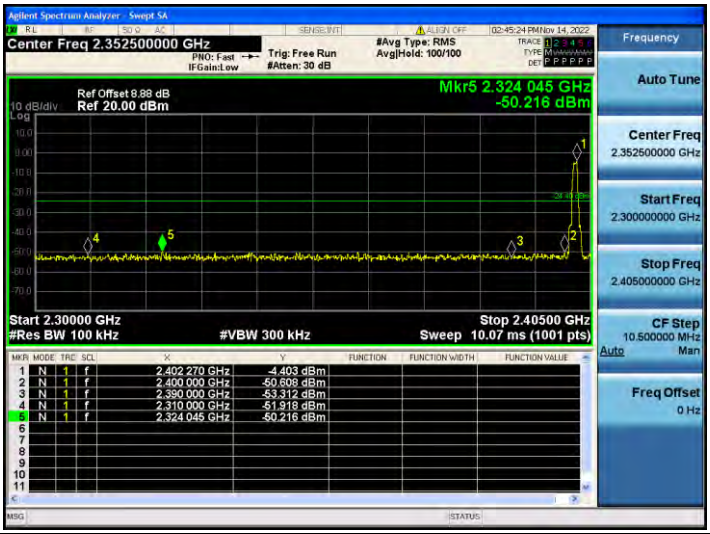
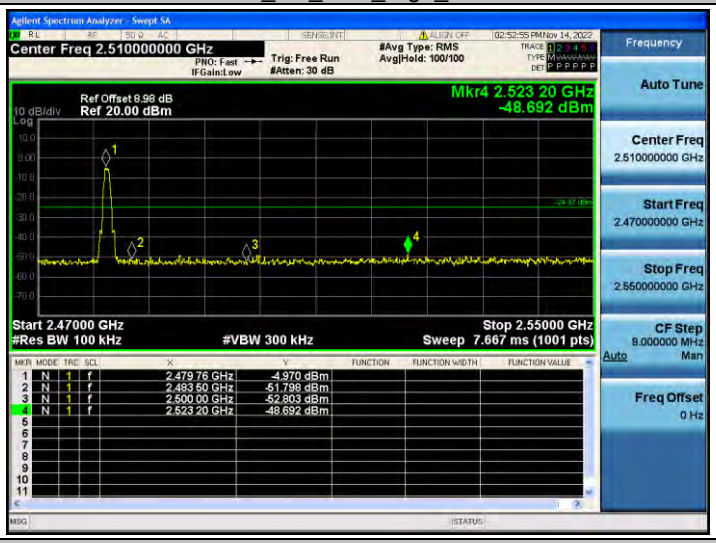
10.5.2 Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



BLE_2M_Ant1_Low_2402

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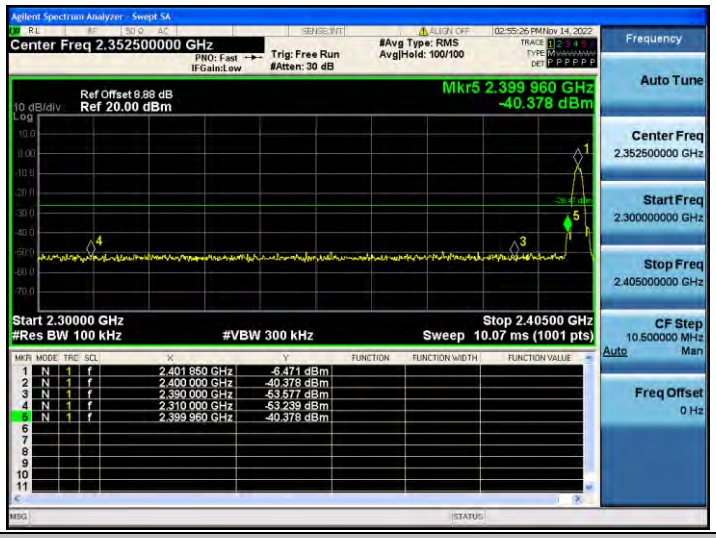

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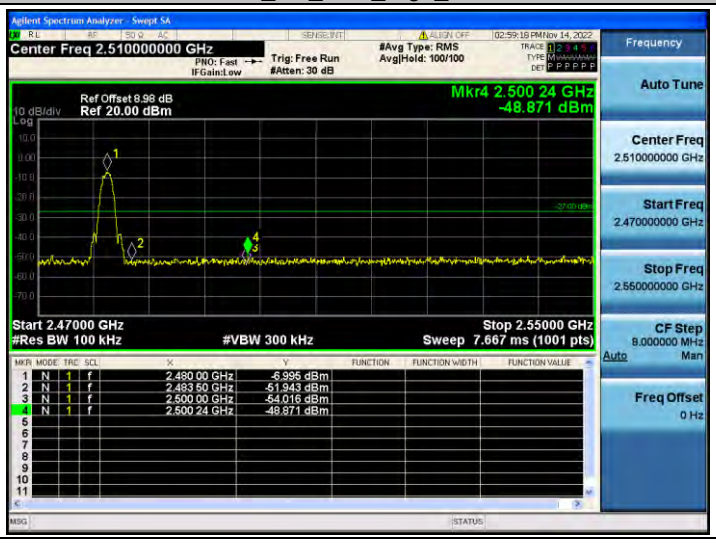

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10.6 Appendix F: Conducted Spurious Emission

10.6.1 Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	-6.21	-6.21	---	PASS
			30~1000	-6.21	-61.96	≤-26.21	PASS
			1000~26500	-6.21	-42.9	≤-26.21	PASS
		2440	Reference	-4.11	-4.11	---	PASS
			30~1000	-4.11	-61.08	≤-24.11	PASS
			1000~26500	-4.11	-42.89	≤-24.11	PASS
		2480	Reference	-5.78	-5.78	---	PASS
			30~1000	-5.78	-61.36	≤-25.78	PASS
			1000~26500	-5.78	-42.83	≤-25.78	PASS
BLE_2M	Ant1	2402	Reference	-7.63	-7.63	---	PASS
			30~1000	-7.63	-61.79	≤-27.63	PASS
			1000~26500	-7.63	-42.01	≤-27.63	PASS
		2440	Reference	-6.68	-6.68	---	PASS
			30~1000	-6.68	-60.64	≤-26.68	PASS
			1000~26500	-6.68	-42.3	≤-26.68	PASS
		2480	Reference	-7.44	-7.44	---	PASS
			30~1000	-7.44	-60.77	≤-27.44	PASS
			1000~26500	-7.44	-42.99	≤-27.44	PASS

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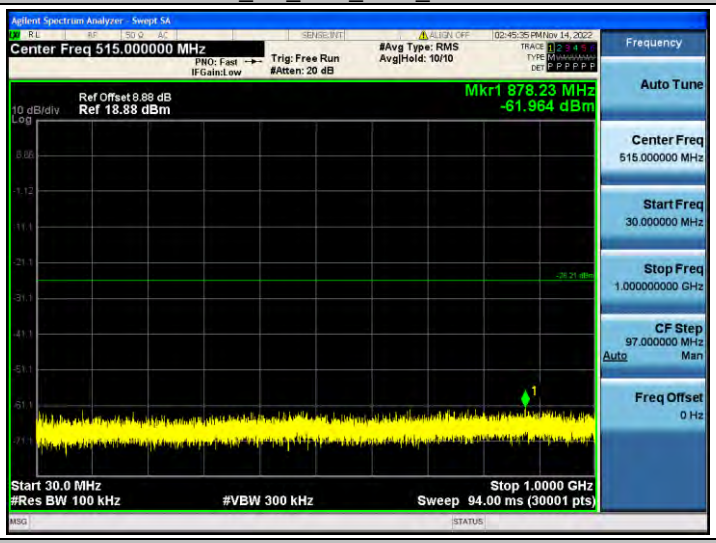
10.6.2 Test Graphs

BLE_1M_Ant1_2402_0~Reference

BLE_1M_Ant1_2402_30~1000



BLE_1M_Ant1_2402_1000~26500

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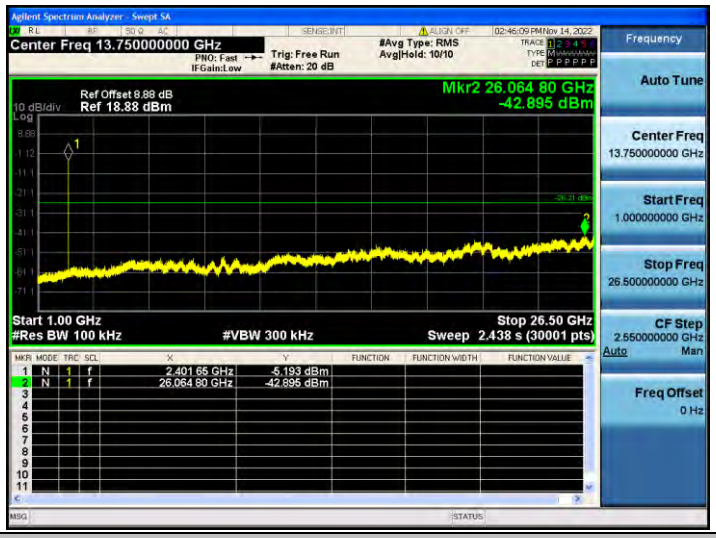

BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000

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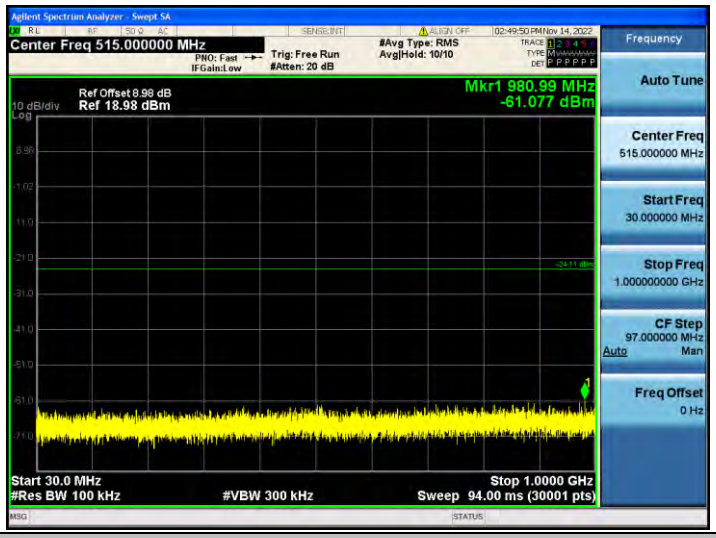

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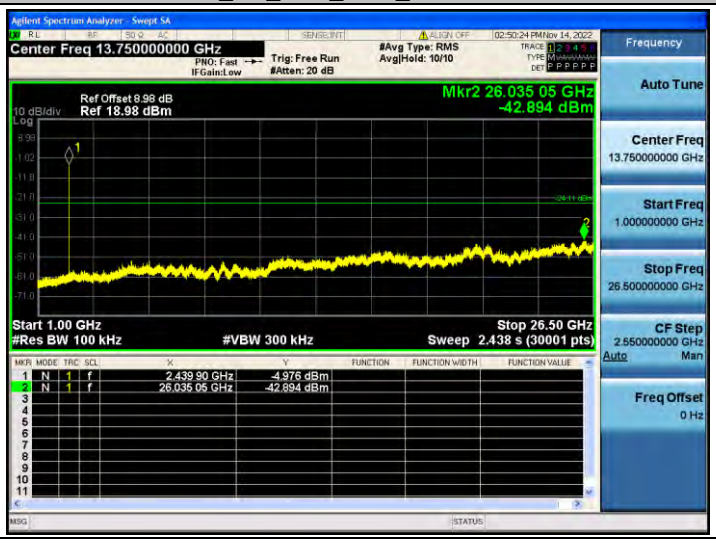

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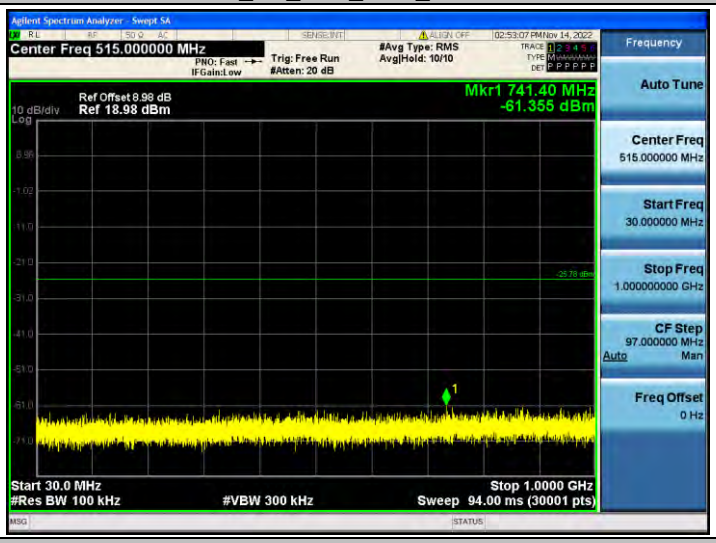
BLE_1M_Ant1_2480_0~Reference

BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500

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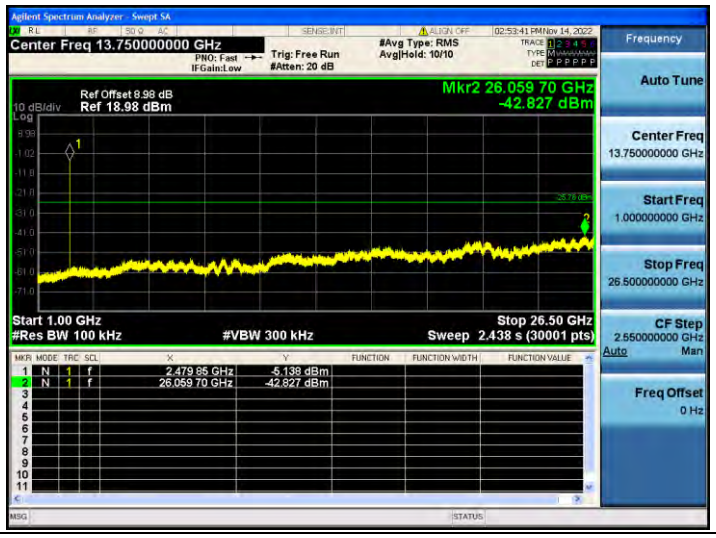

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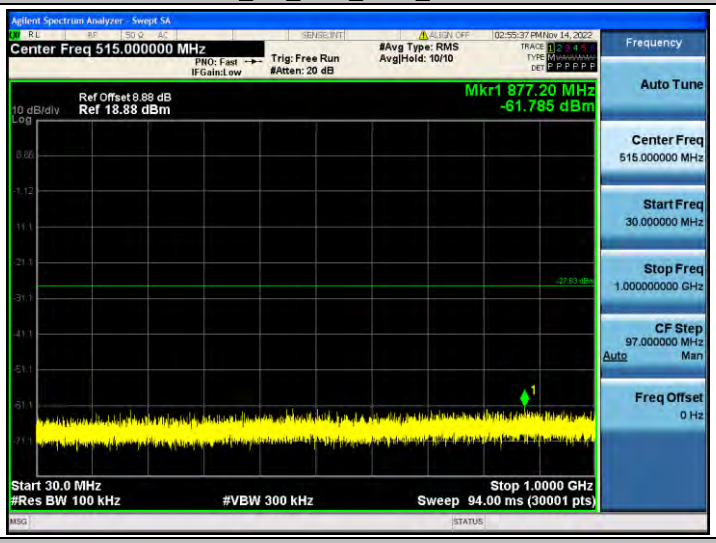
BLE_2M_Ant1_2402_0~Reference

BLE_2M_Ant1_2402_30~1000



BLE_2M_Ant1_2402_1000~26500

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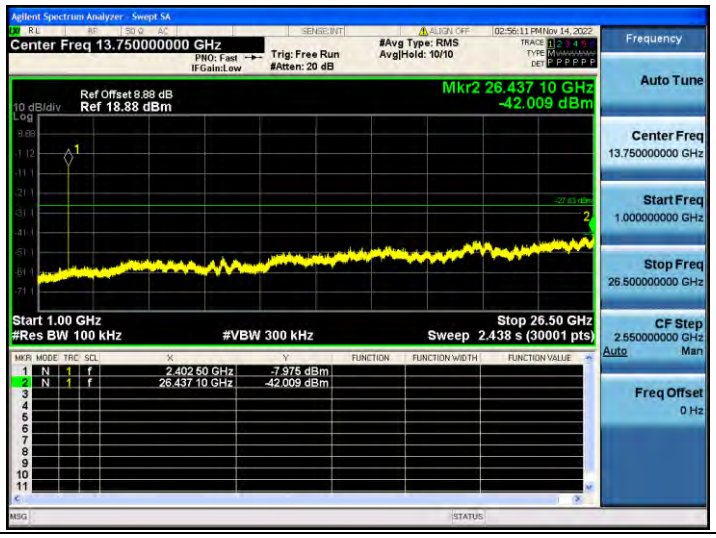

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BLE_2M_Ant1_2440_0~Reference

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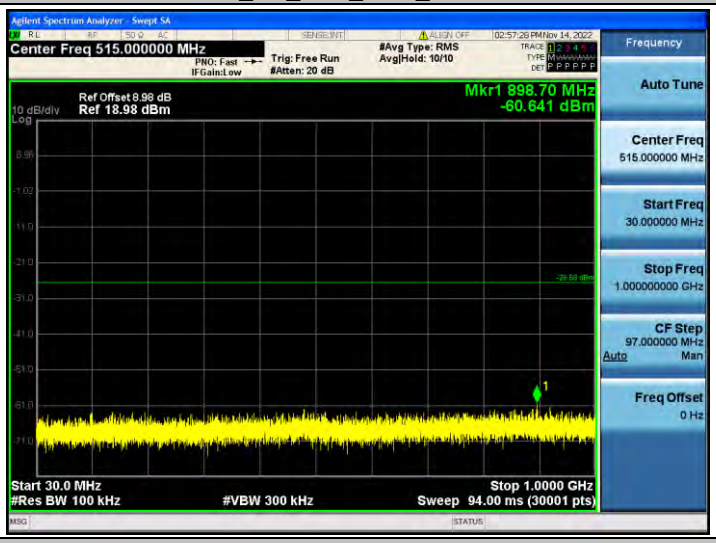

BLE_2M_Ant1_2440_1000~26500

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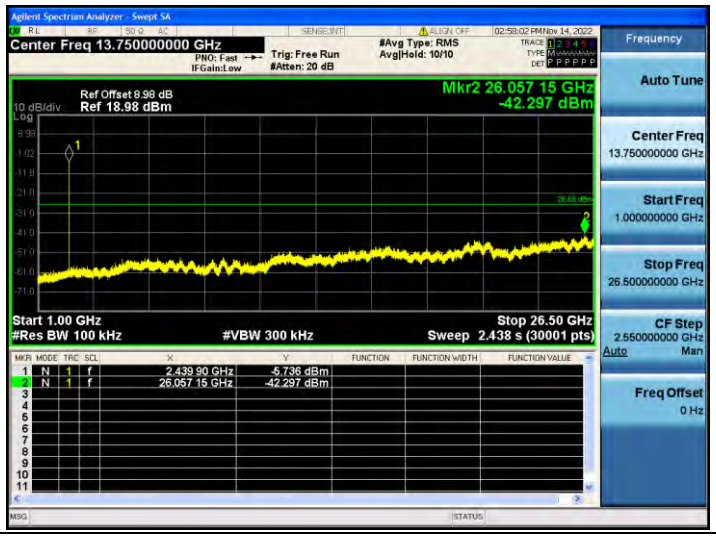

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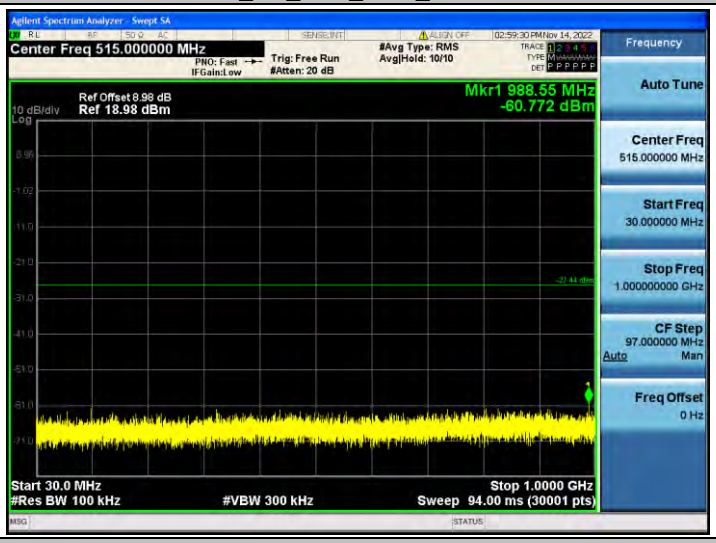

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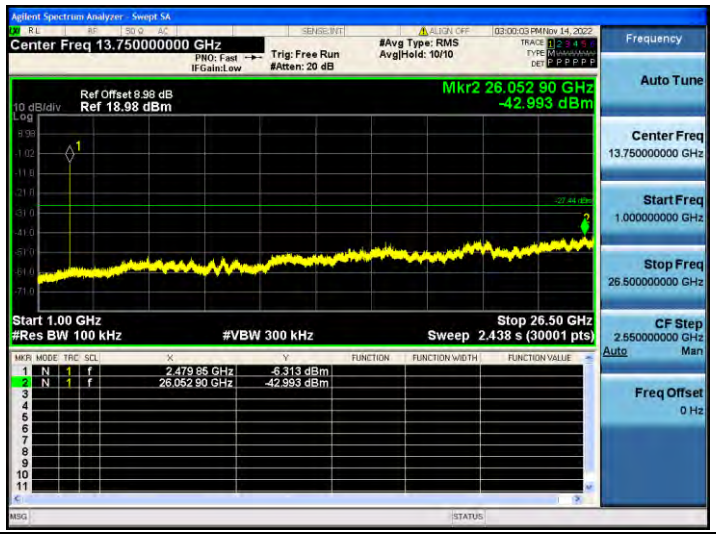

10.7 Appendix G: Duty Cycle

10.7.1 Test Result

TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	2.10	2.50	0.8400	84.00	0.76	---	---
		2440	2.10	2.50	0.8400	84.00	0.76	---	---
		2480	2.10	2.50	0.8400	84.00	0.76	---	---
BLE_2M	Ant1	2402	2.08	2.50	0.8320	83.20	0.80	---	---
		2440	2.08	2.50	0.8320	83.20	0.80	---	---
		2480	2.10	2.50	0.8400	84.00	0.76	---	---

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10.7.2 Test Graphs

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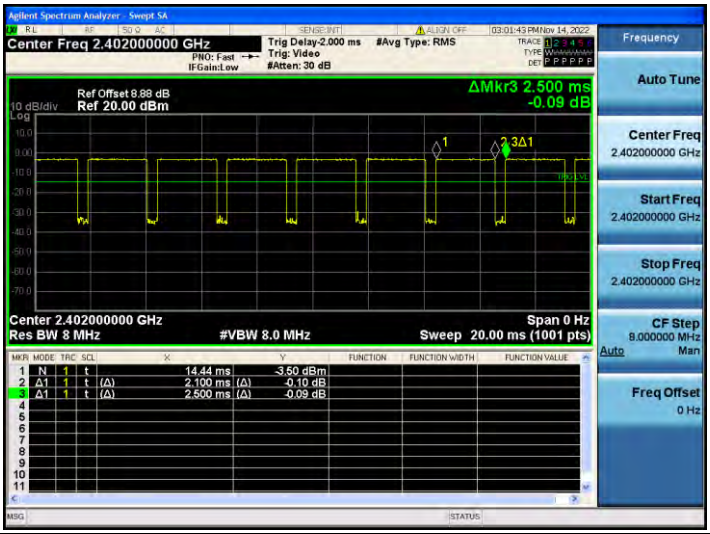

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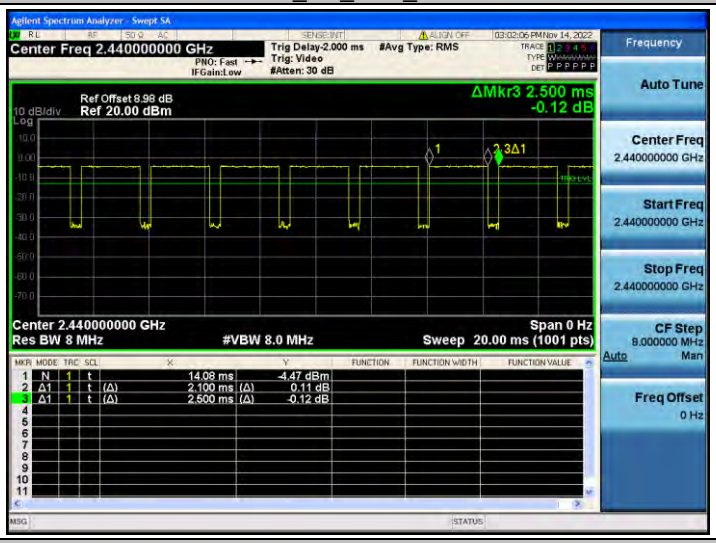

BLE_1M_Ant1_2480

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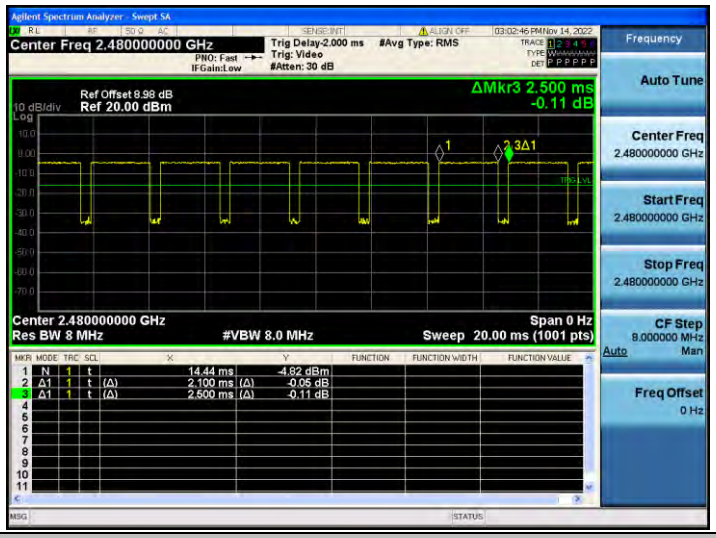
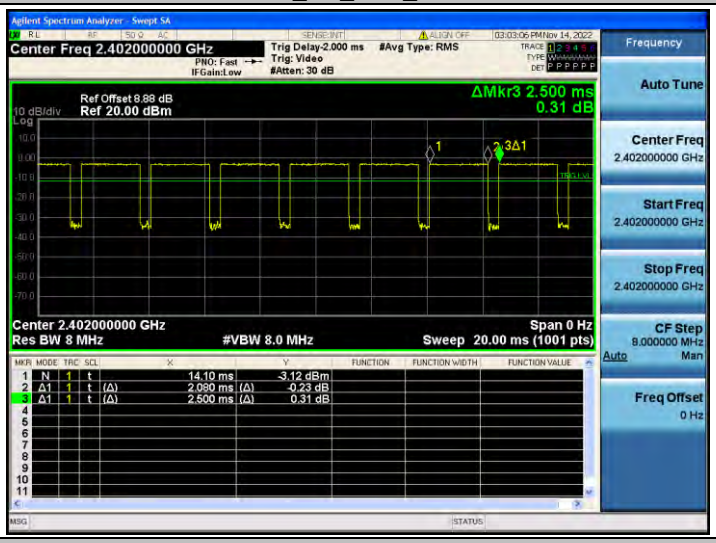


BLE_2M_Ant1_2402



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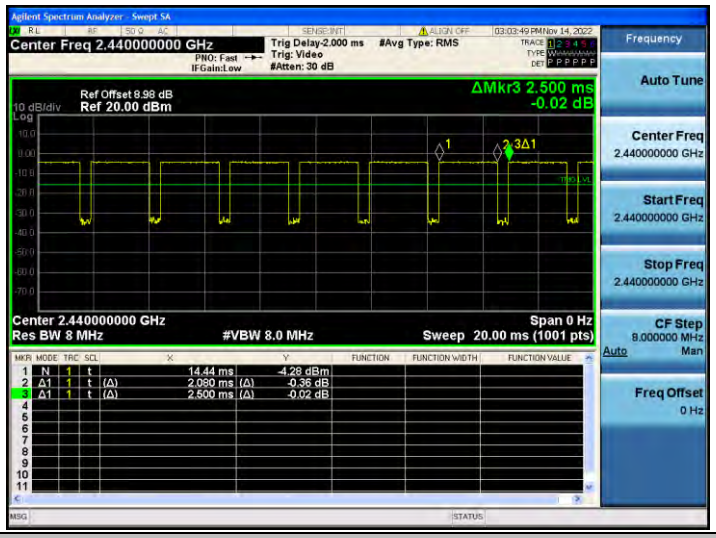

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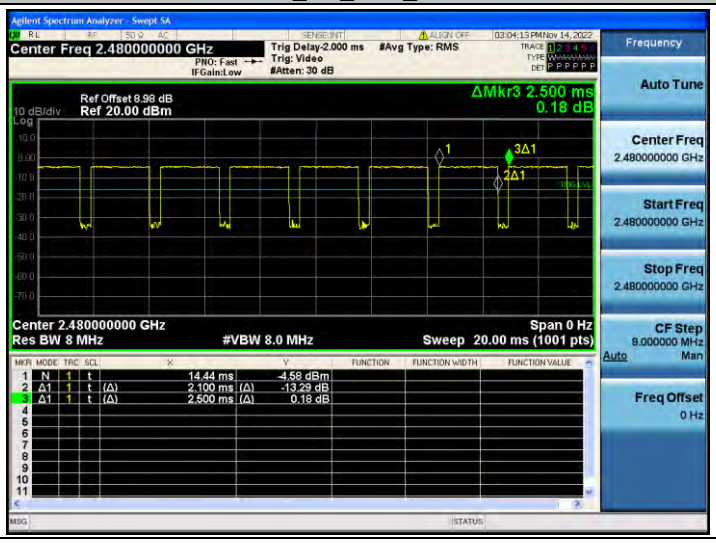

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