TEST REPORT

Application No.:	BTEK231122011AE
Applicant:	Guangdong Fenergy Technology Co., Ltd
Address of Applicant:	Building 35, Zone 5, Huaide Cuigang Industrial Park, Fuyong Street, Bao 'an District, Shenzhen, China
Manufacturer:	Guangdong Fenergy Technology Co., Ltd
Address of Manufacturer:	Building 35, Zone 5, Huaide Cuigang Industrial Park, Fuyong Street, Bao 'an District, Shenzhen, China
Factory:	Guangdong Fenergy Technology Co., Ltd
Address of Factory:	Building 35, Zone 5, Huaide Cuigang Industrial Park, Fuyong Street, Bao 'an District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	Smart EV Charger
Model No.:	FE-W-US-B115D, XXX-W-US-XXXXX (The first three 'X' represent the company name, which can be represented by letters A-Z; 'W' stands for wall-mounted, 'US' stands for the United States, and the fourth 'X' represents the housing type, which can be represented by the letters BCD; The fifth, sixth and seventh 'X' indicates the output power, which can be represented by the numbers 96 and 115; The last 'X' indicates the output plug type, which can be represented by the letter ABD.) Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	NA
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2023-11-28
Date of Test:	2023-11-28 to 2023-12-22
Date of Issue:	2024-01-29
Test Result:	Pass*

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

Damon Su
EMC Laboratory Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2024-01-29		*Original*

Authorized for issue by				
		Elma Yang **Elma Yang /Project Engineer**		
		Carl Yang **Carl Yang /Reviewer**		

2 Test Summary

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

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted 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 11.9.1.3	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 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

Model No.: FE-W-US-B115D, XXX-W-US-XXXXX

(The first three 'X' represent the company name, which can be represented by letters A-Z; 'W' stands for wall-mounted, 'US' stands for the United States, and the fourth 'X' represents the housing type, which can be represented by the letters BCD; The fifth, sixth and seventh 'X' indicates the output power, which can be represented by the numbers 96 and 115; The last 'X' indicates the output plug type, which can be represented by the letter ABD.)

Only the model FE-W-US-B115D was tested. According to the declaration from the applicant, all of these models only the model name and appearance style are different, and everything else is the same. And parameter 48A and parameter 40A, the voltage is different because the input plug is inconsistent, 48A is the terminal, 40A is the plug.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	48A: Input/Output power: 110-240V~48A 60Hz 1-phase Charging capacity: Up to 11.52KW 40A: Input/Output power: 240V~40A 60Hz 1-phase Charging capacity: Up to 9.6KW
Test Voltage:	NA
Cable(s):	/
Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	Bluetooth 5.3
Modulation Type:	GFSK
Number of Channels:	40
Antenna Type:	PCB Antenna
Antenna Gain:	2.21 dBi
Remark: The information in this section is provided by the applicant or manufacturer, BANTEK is not liable to the accuracy, suitability, reliability or/and integrity of the information.	
Sample No.:	BTEK231122011AE-01

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Corrugated resistance adjustable load box	Green work electron	AC220V35A	/

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	±3.12dB
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
Power Spectrum Density	± 0.35dB
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Radiated Emissions which fall in the restricted bands	±5.08dB (1GHz-6GHz);±5.14dB(above 6GHz)
Radiated Spurious Emissions (Below 1GHz)	±5.06dB (3m); ±4.46dB (10m)
Radiated Spurious Emissions (Above 1GHz)	±5.08dB (1GHz-6GHz);±5.14dB(above 6GHz)

4.4 Test Location

All tests were performed at:

Shenzhen BANTEK Testing Co., Ltd.

A5&A6, Building B1&B2, No.45 Gangtou Road, Bogang Community, Shajing Street, Bao'an District, Shenzhen, Guangdong, China 518103

Tel: +86 0755-2334 4200 Fax: +86 0755-2334 4200

FCC Registration Number: 264293

Designation Number: CN1356

No tests were sub-contracted.

4.5 Deviation from Standards

None

4.6 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Mains Power Port					
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Shielding Room	YIHENG ENECTRONIC	9*5*3.3	YH-BT-220304-04	2022-03-03	2025-03-02
EMI Test Receiver	Rohde&Schwarz	ESCI	101021	2023-06-12	2024-06-11
Measurement Software	Fara	EZ_EMC Ver. FA-03A2	N/A	N/A	N/A
LISN	Rohde&Schwarz	ENV216	101472	2023-06-12	2024-06-11
LISN	Schwarzbeck	NSLK 8128	05127	2023-06-12	2024-06-11

RF Conducted					
Equipment	**Manufacturer**	**Model No**	**Serial No**	**Cal Date**	**Cal Due Date**
Shielding Room	YIHENG ENECTRONIC	5.5*3.1*3	YH-BT-220304-03	2022-03-03	2025-03-02
EXA Signal Analyzer	KEYSIGHT	N9020A	MY54230486	2023-06-12	2024-06-11
DC Power Supply	E3632A	E3642A	KR75304416	2023-06-12	2024-06-11
Attenuator	RswTech	SMA-JK-6dB	N/A	2023-06-12	2024-06-11
Attenuator	RswTech	SMA-JK-3dB	N/A	2023-06-12	2024-06-11
RF Control Unit	Techy	TR1029-1	N/A	2023-06-12	2024-06-11
RF Sensor Unit	Techy	TR1029-2	N/A	2023-06-12	2024-06-11
WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW 500	141258	2023-06-12	2024-06-11
MXG Vector Signal Generator	Agilent	N5182A	US46240522	2023-06-12	2024-06-11
Programmable Temperature&Humidity Chamber	GRT	GR-HWX1000	GR22051001	2023-06-12	2024-06-11
Measurement Software	TACHOY	RF TestSoft V2.0.0.0	N/A	N/A	N/A

RSE					
Equipment	**Manufacturer**	**Model No**	**Serial No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	YIHENG ENECTRONIC	966	YH-BT-220304-01	2022-05-06	2025-05-05
EMI Test Receiver	Rohde&Schwarz	ESCI	100694	2023-06-12	2024-06-11
TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	01324	2022-06-15	2025-06-14
Pre-Amplifier	Schwarzbeck	BBV 9745	#180	2023-06-12	2024-06-11
Measurement Software	Fara	EZ_EMC Ver. FA-03A2	N/A	2023-06-12	2024-06-11
EXA Signal Analyzer	Keysight	N9020A	MY54440290	2023-06-12	2024-06-11
Horn Antenna	Schwarzbeck	BBHA 9120D	02695	2022-06-15	2025-06-14
Pre-Amplifier	Tonscend	TAP0118045	AP20K806109	2023-06-12	2024-06-11
Horn Antenna	SCHWARZBECK	BBHA9170	1157	2022-06-15	2025-06-14

Low Noise Pre-amplifier	SKET	LNPA-1840G-50	SK2022032902	2023-06-12	2024-06-11
Signal analyzer	ROHDE&SCHWARZ	FSQ40	100010	2023-06-12	2024-06-11
Loop Antenna	ETS	6502	00201177	2022-06-15	2025-06-14

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Serial No**	**Cal Date**	**Cal Due Date**
Humidity/Temperature/Barometric Pressure Indicator	KUMAR	F132	N/A	2023-06-12	2024-06-11
Humidity/Temperature/Barometric Pressure Indicator	KUMAR	F132	N/A	2023-06-12	2024-06-11

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:

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

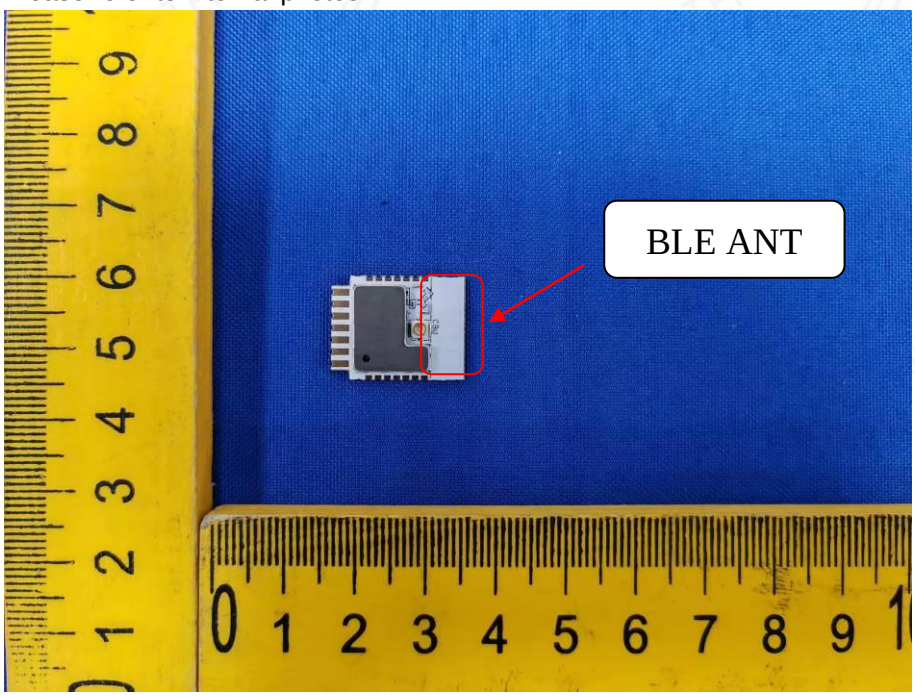
15.247(b) (4) requirement:

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

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.21dBi.

Please refer to internal photos.



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

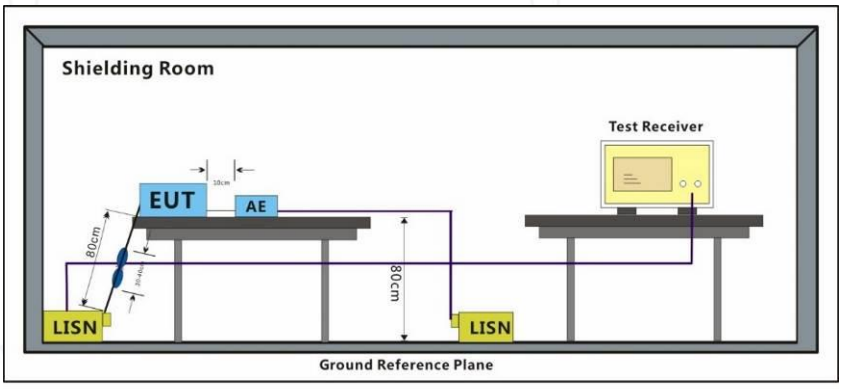
Operating Environment:

Temperature: 22.2 °C Humidity: 60.5 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	Charge+TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

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.

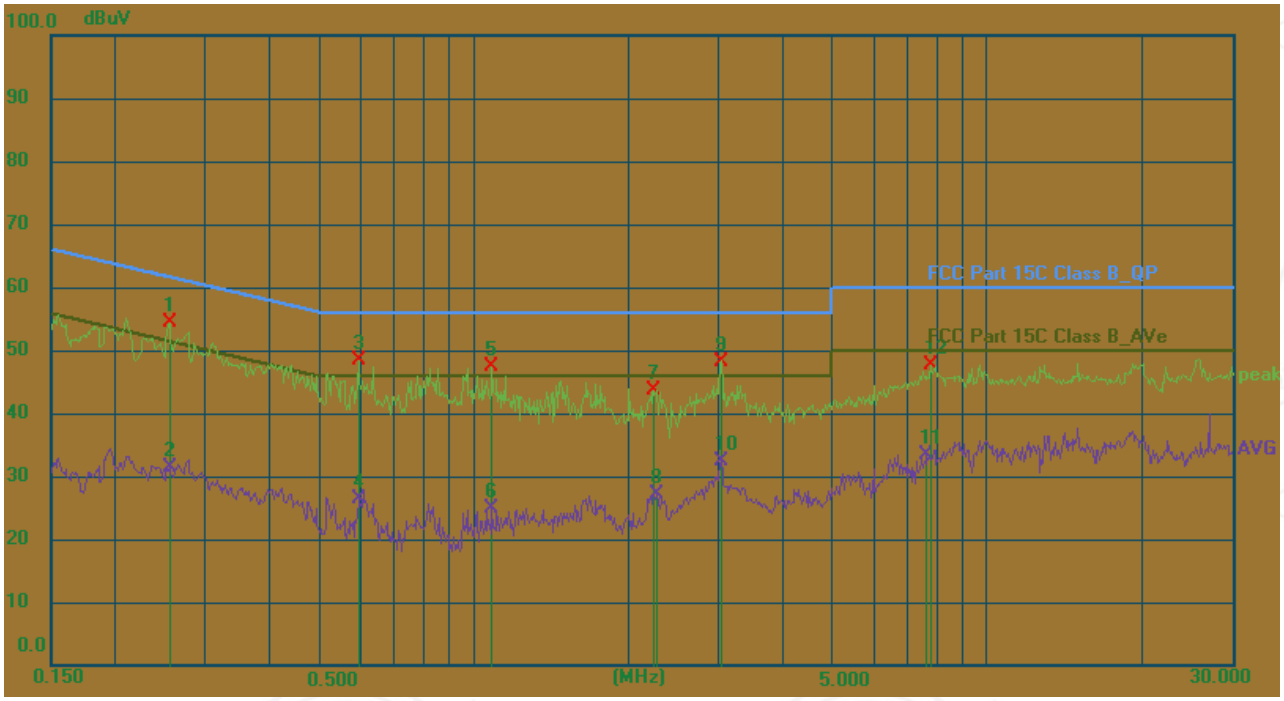
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

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.

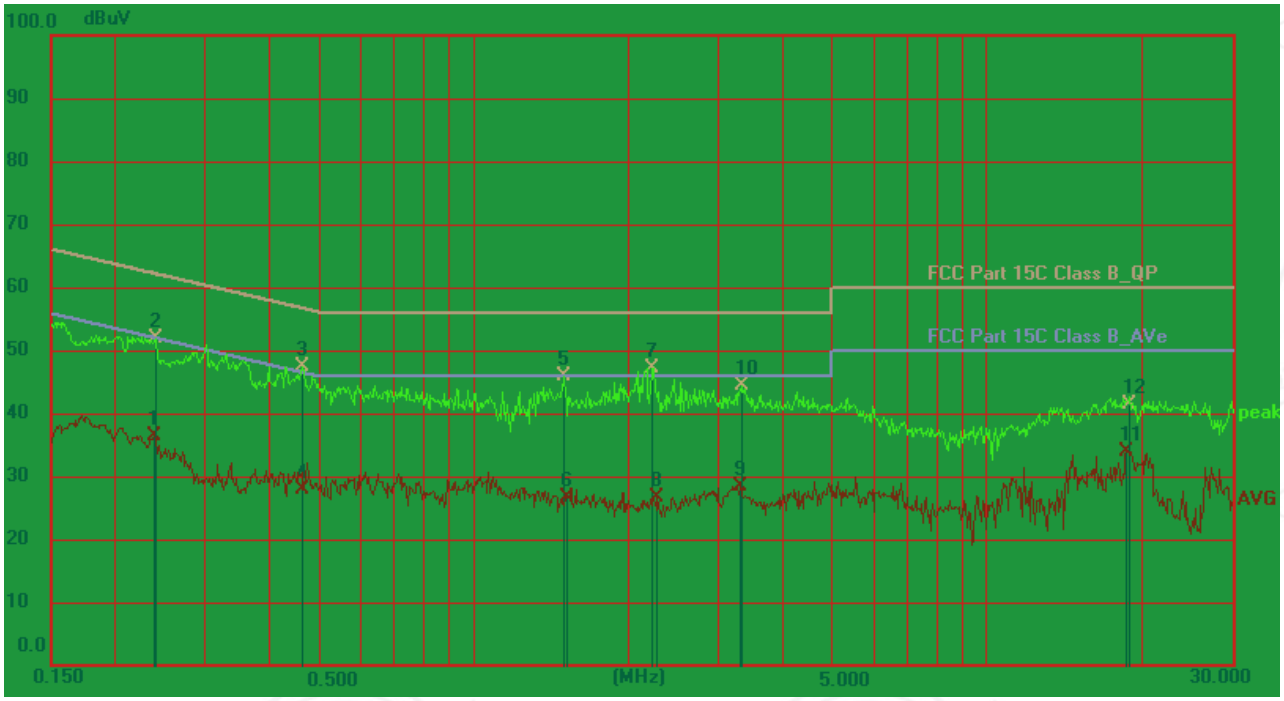
Remark: LISN=Read Level+ Cable Loss+ LISN Factor

Test Mode: 01; Line: Neutral line; Modulation: GFSK; Channel:Low



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1 *	0.2535	44.84	9.56	54.40	61.64	-7.24	QP	P	
2	0.2535	21.81	9.56	31.37	51.64	-20.27	AVG	P	
3	0.5955	38.76	9.64	48.40	56.00	-7.60	QP	P	
4	0.5955	16.80	9.64	26.44	46.00	-19.56	AVG	P	
5	1.0859	37.51	9.79	47.30	56.00	-8.70	QP	P	
6	1.0859	15.02	9.79	24.81	46.00	-21.19	AVG	P	
7	2.2425	33.84	9.86	43.70	56.00	-12.30	QP	P	
8	2.2650	17.34	9.86	27.20	46.00	-18.80	AVG	P	
9	3.0255	38.25	9.95	48.20	56.00	-7.80	QP	P	
10	3.0255	22.33	9.95	32.28	46.00	-13.72	AVG	P	
11	7.6245	23.26	10.16	33.42	50.00	-16.58	AVG	P	
12	7.7550	37.43	10.17	47.60	60.00	-12.40	QP	P	

Test Mode: 01; Line: Live Line; Modulation:GFSK; Channel:Low



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2378	26.72	9.55	36.27	52.17	-15.90	AVG	P	
2	0.2391	42.25	9.55	51.80	62.13	-10.33	QP	P	
3	0.4605	37.82	9.58	47.40	56.68	-9.28	QP	P	
4	0.4636	18.28	9.58	27.86	46.63	-18.77	AVG	P	
5	1.4955	35.99	9.81	45.80	56.00	-10.20	QP	P	
6	1.5180	16.93	9.80	26.73	46.00	-19.27	AVG	P	
7 *	2.2290	37.25	9.85	47.10	56.00	-8.90	QP	P	
8	2.2740	16.79	9.84	26.63	46.00	-19.37	AVG	P	
9	3.3000	18.58	9.92	28.50	46.00	-17.50	AVG	P	
10	3.3360	34.48	9.92	44.40	56.00	-11.60	QP	P	
11	18.6990	23.80	10.16	33.96	50.00	-16.04	AVG	P	
12	19.0000	31.33	10.17	41.50	60.00	-18.50	QP	P	

Note:
1) Pre-scan all modes and recorded the worst case results in this report(Low Channel).
2) Level= Reading+ Factor; Margin=Level-limit.

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 11.9.1.3
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

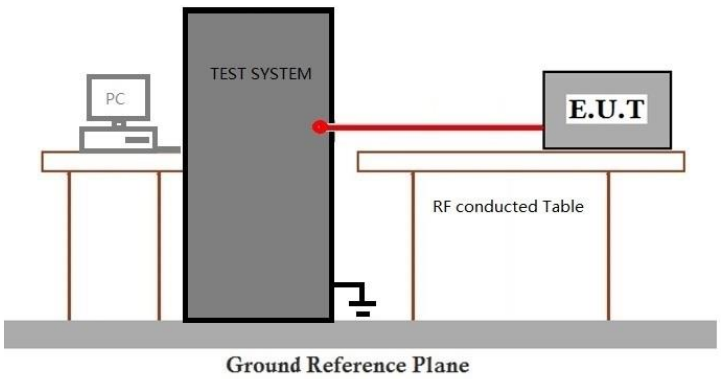
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 20.5 °C Humidity: 50.0 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

cable loss=0.9dB
Please Refer to Appendix for Details

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

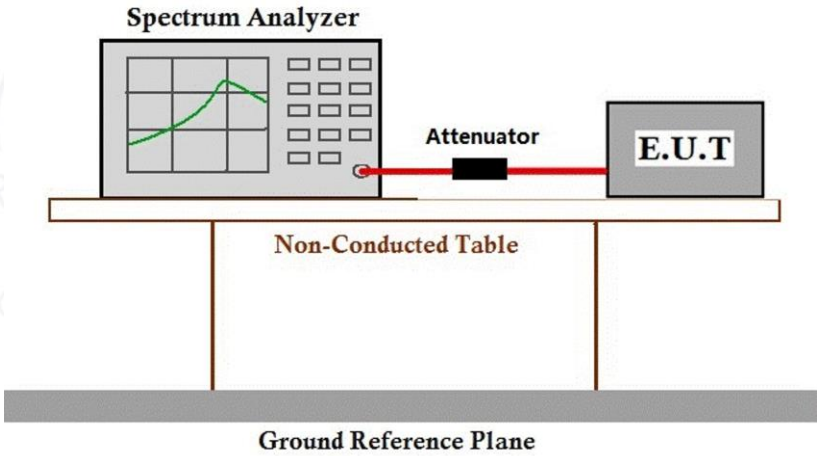
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 20.5 °C Humidity: 50.0 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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

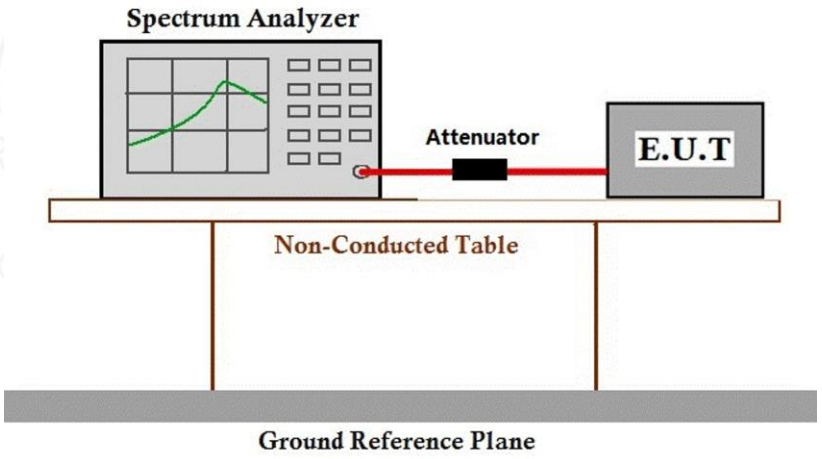
Operating Environment:

Temperature: 20.5 °C Humidity: 50.0 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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

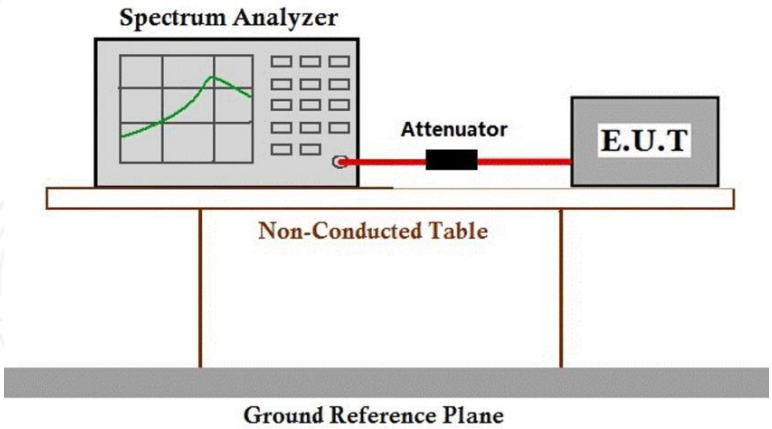
Operating Environment:

Temperature: 20.5 °C Humidity: 50.0 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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 §15.205(c).

7.6.1 E.U.T. Operation

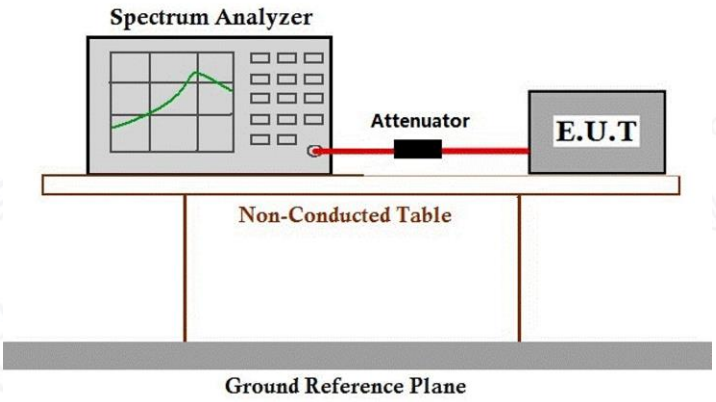
Operating Environment:

Temperature: 20.5 °C Humidity: 50.0 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details

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.		

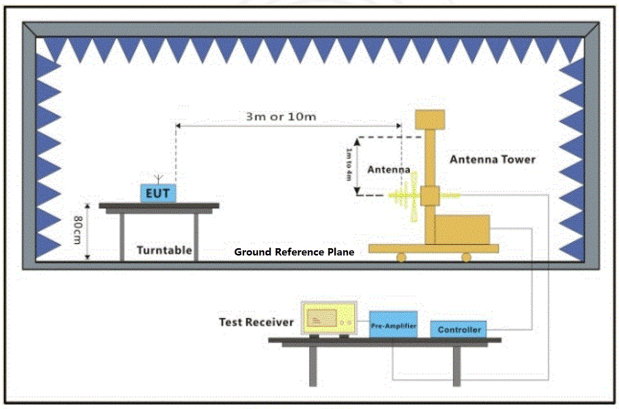
7.7.1 E.U.T. Operation

Operating Environment:
Temperature: 21.4 °C Humidity: 54.3 % RH Atmospheric Pressure: 1010 mbar

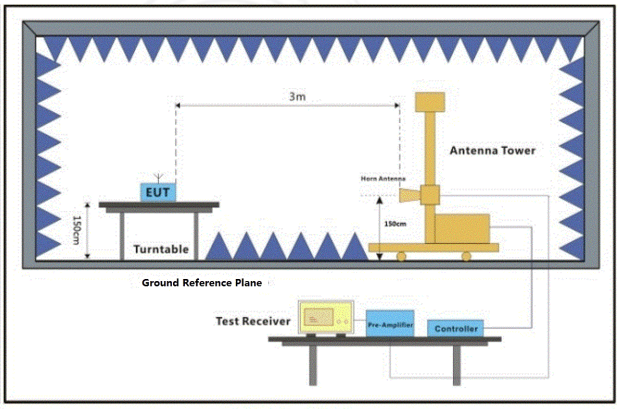
7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

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 Highest channel.

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

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

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

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

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2310.000	68.62	-30.59	38.03	74.00	-35.97	peak	P
2	2390.000	70.51	-30.49	40.02	74.00	-33.98	peak	P
3	2400.000	78.71	-30.48	48.23	74.00	-25.77	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2310.000	68.93	-30.59	38.34	74.00	-35.66	peak	P
2	2390.000	70.62	-30.49	40.13	74.00	-33.87	peak	P
3	2400.000	78.68	-30.48	48.20	74.00	-25.80	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2483.500	79.88	-30.39	49.49	74.00	-24.51	peak	P
2	2500.000	71.05	-30.37	40.68	74.00	-33.32	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2483.500	80.46	-30.39	50.07	74.00	-23.93	peak	P
2	2500.000	70.13	-30.37	39.76	74.00	-34.24	peak	P

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 6.4,6.5,6.6
Limit:

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

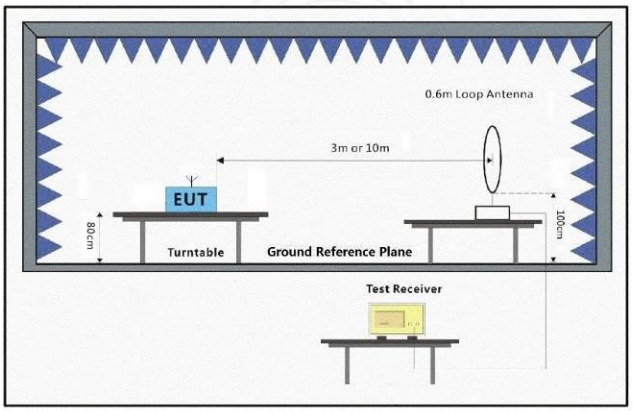
7.7.5 E.U.T. Operation

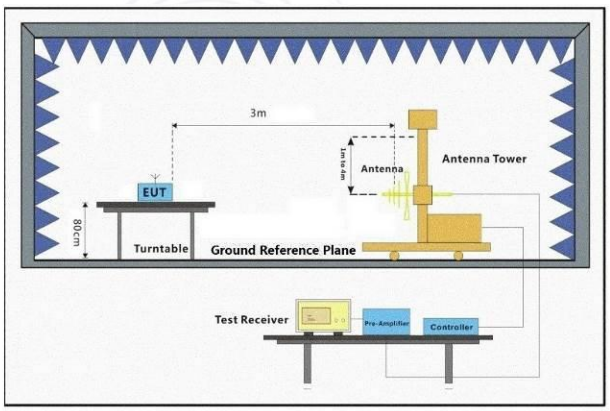
Operating Environment:
Temperature: 25.5 °C Humidity: 68.6 % RH Atmospheric Pressure: 1010 mbar

7.7.6 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Final test	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.7.7 Test Setup Diagram





7.7.8 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 peak, quasi-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:

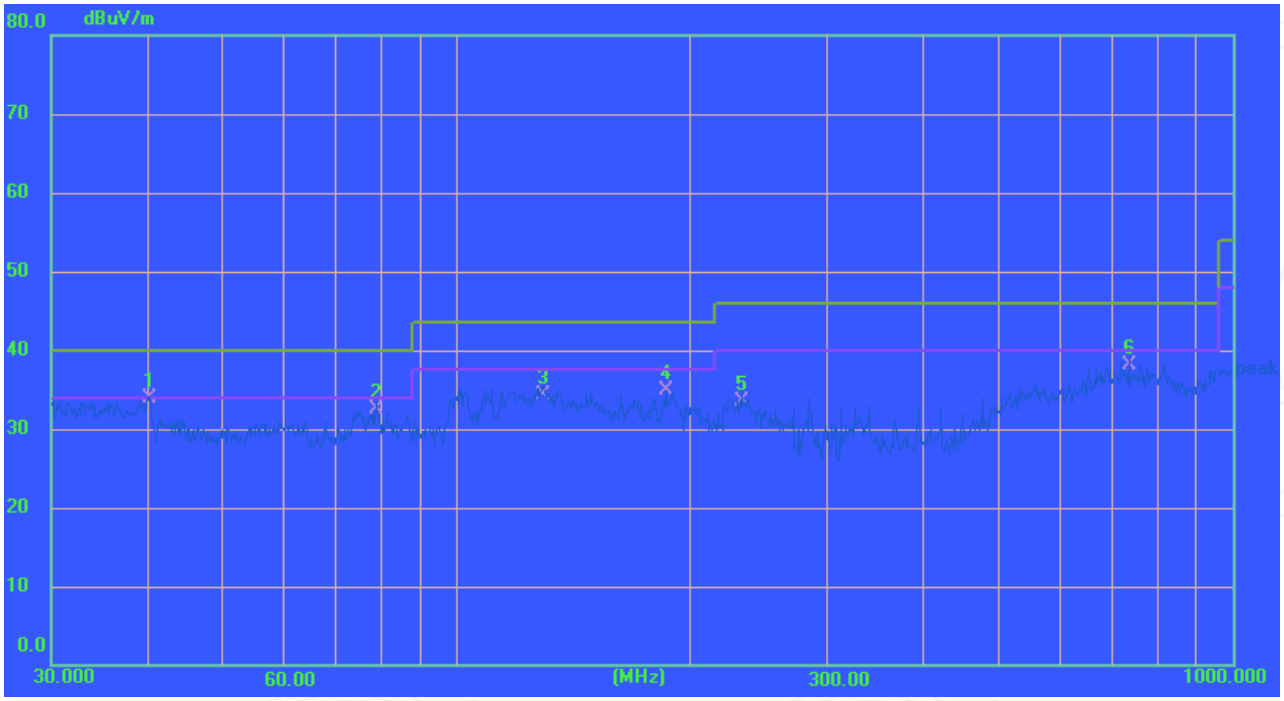
1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

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

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

3) Scan from 9kHz to 1 GHz, 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.

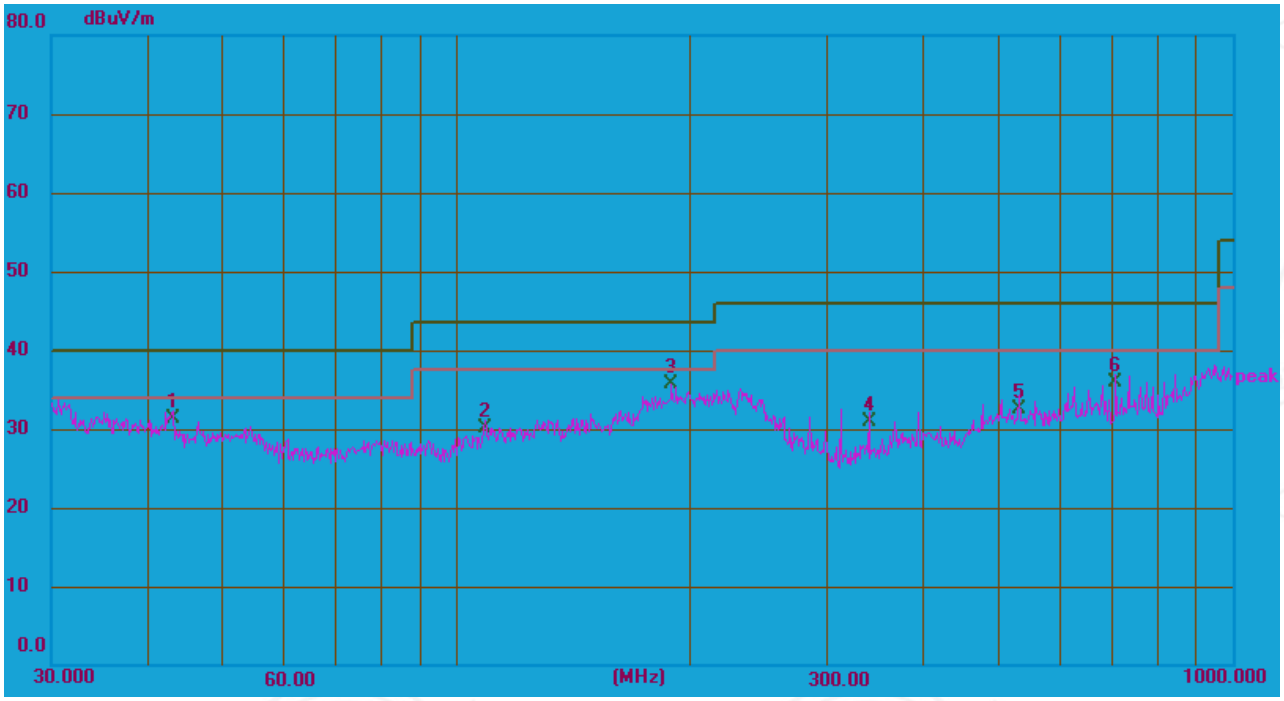
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK ; Channel:Low



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	40.1347	50.92	-16.92	34.00	40.00	-6.00	QP
2	78.6885	54.45	-21.95	32.50	40.00	-7.50	QP
3	129.0141	52.57	-18.17	34.40	43.50	-9.10	QP
4	185.7880	55.49	-20.49	35.00	43.50	-8.50	QP
5	232.5318	53.05	-19.45	33.60	46.00	-12.40	QP
6	734.4913	47.06	-8.96	38.10	46.00	-7.90	QP

Note: Level =Reading + Factor

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



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	43.0504	48.89	-17.59	31.30	40.00	-8.70	QP
2	108.6470	50.15	-20.05	30.10	43.50	-13.40	QP
3 *	189.0740	56.64	-20.94	35.70	43.50	-7.80	QP
4	339.5887	47.59	-16.59	31.00	46.00	-15.00	QP
5	530.1013	45.48	-12.98	32.50	46.00	-13.50	QP
6	706.6997	45.50	-9.60	35.90	46.00	-10.10	QP

Note: Level =Reading + Factor

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 6.4,6.5,6.6
Limit:

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

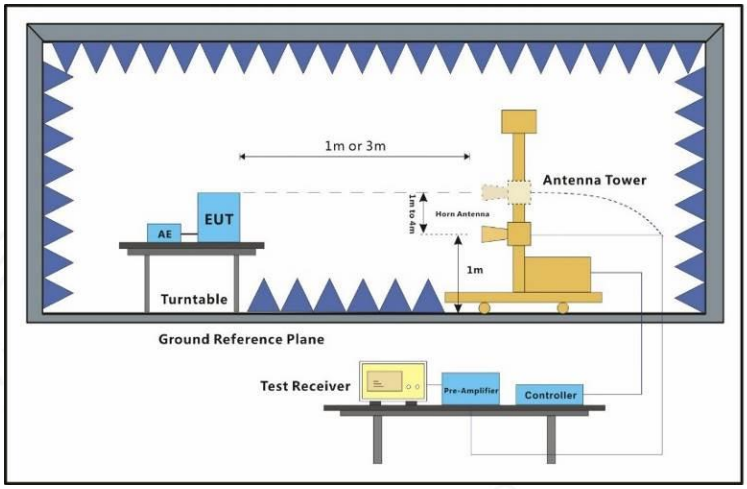
7.8.1 E.U.T. Operation

Operating Environment:
Temperature: 21.4 °C Humidity: 54.3 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.
Pre-scan	01	Charge+ TX mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation.

7.8.3 Test Setup Diagram



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

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

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

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2914.946	69.21	-30.30	38.91	74.00	-35.09	peak	P
2	4277.838	68.91	-28.16	40.75	74.00	-33.25	peak	P
3	6085.446	64.95	-24.64	40.31	74.00	-33.69	peak	P
4	8645.685	69.65	-24.81	44.84	74.00	-29.16	peak	P
5	11047.239	68.92	-24.18	44.74	74.00	-29.26	peak	P
6	14217.208	70.91	-21.65	49.26	74.00	-24.74	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.194	66.41	-28.85	37.56	74.00	-36.44	peak	P
2	4312.673	68.91	-28.61	40.30	74.00	-33.70	peak	P
3	6353.764	67.71	-26.32	41.38	74.00	-32.62	peak	P
4	8576.754	69.43	-24.70	44.73	74.00	-29.27	peak	P
5	11286.387	67.58	-22.33	45.25	74.00	-28.75	peak	P
6	14955.067	70.40	-20.96	49.44	74.00	-24.56	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2914.163	70.52	-30.17	40.35	74.00	-33.65	peak	P
2	4277.099	68.40	-29.42	38.98	74.00	-35.02	peak	P
3	6084.518	64.07	-25.28	38.79	74.00	-35.21	peak	P
4	8645.510	69.63	-24.40	45.22	74.00	-28.78	peak	P
5	11046.711	67.78	-23.54	44.24	74.00	-29.76	peak	P
6	14218.765	70.63	-20.82	49.81	74.00	-24.19	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2972.412	67.40	-30.45	36.95	74.00	-37.05	peak	P
2	4313.754	69.12	-29.48	39.64	74.00	-34.36	peak	P
3	6353.028	67.65	-25.79	41.86	74.00	-32.14	peak	P
4	8575.658	70.30	-24.29	46.01	74.00	-27.99	peak	P
5	11286.138	68.07	-22.94	45.13	74.00	-28.87	peak	P
6	14955.341	70.86	-20.24	50.61	74.00	-23.39	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2915.558	70.36	-29.08	41.28	74.00	-32.72	peak	P
2	4276.746	68.64	-28.07	40.57	74.00	-33.43	peak	P
3	6086.289	64.63	-24.65	39.98	74.00	-34.02	peak	P
4	8646.169	68.97	-24.13	44.84	74.00	-29.16	peak	P
5	11047.704	68.49	-23.44	45.06	74.00	-28.94	peak	P
6	14217.240	71.46	-21.34	50.12	74.00	-23.88	peak	P

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

No.	Frequency (MHz)	Reading (dBuv)	Factor (dB/m)	Level (dBuv/m)	Limit (dBuv/m)	Margin(dB)	Detector	P/F
1	2973.124	67.76	-28.70	39.06	74.00	-34.94	peak	P
2	4313.324	69.10	-28.08	41.02	74.00	-32.98	peak	P
3	6354.144	67.24	-25.23	42.01	74.00	-31.99	peak	P
4	8575.641	69.37	-24.83	44.54	74.00	-29.46	peak	P
5	11286.376	67.13	-22.69	44.44	74.00	-29.56	peak	P
6	14956.483	70.15	-20.34	49.81	74.00	-24.19	peak	P

8 Test Setup Photo

Please refer to the Appendix test setup Photos.

9 EUT Constructional Details (EUT Photos)

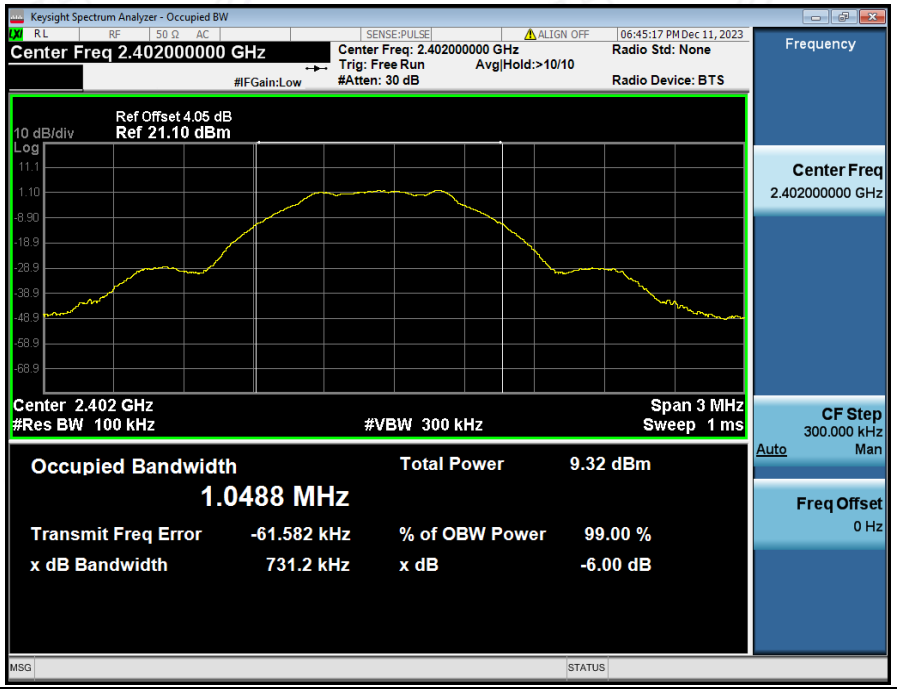
Please refer to the Appendix EUT Photos.

10 Appendix

1. -6dB Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	-6dB BW(kHz)	limit(kHz)	Result
NVNT	ANT1	1Mbps	2402	731.17	500	Pass
NVNT	ANT1	1Mbps	2440.00	728.03	500	Pass
NVNT	ANT1	1Mbps	2480	737.04	500	Pass

-6dB_Bandwidth_NVNT_ANT1_1Mbps_2402



-6dB_Bandwidth_NVNT_ANT1_1Mbps_2440

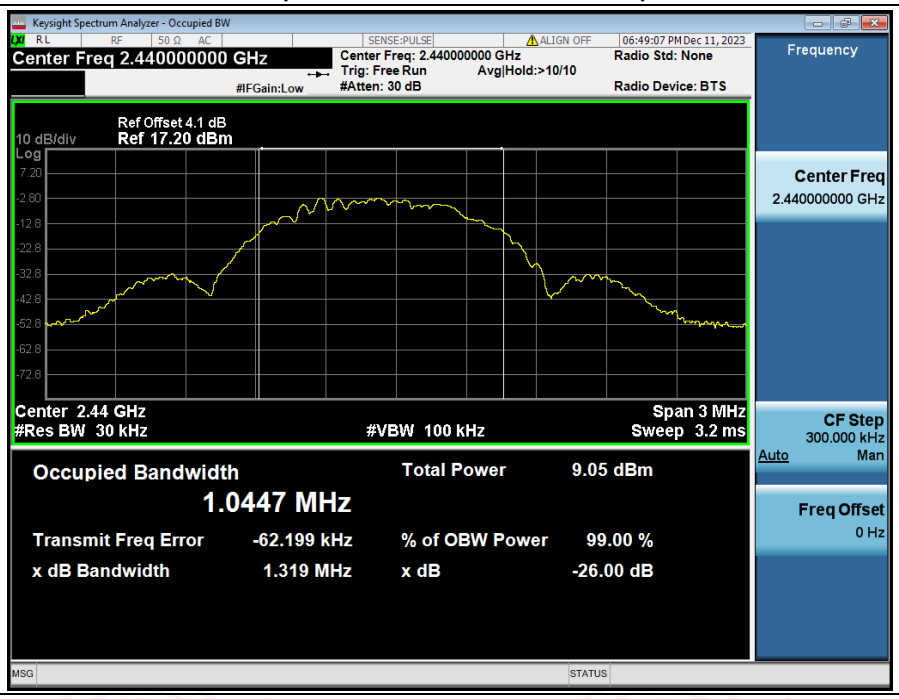

-6dB_Bandwidth_NVNT_ANT1_1Mbps_2480


2. 99% Occupied Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	99%%BW(MHz)
NVNT	ANT1	1Mbps	2402	1.045
NVNT	ANT1	1Mbps	2440.00	1.045
NVNT	ANT1	1Mbps	2480	1.045

99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2402

99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2440

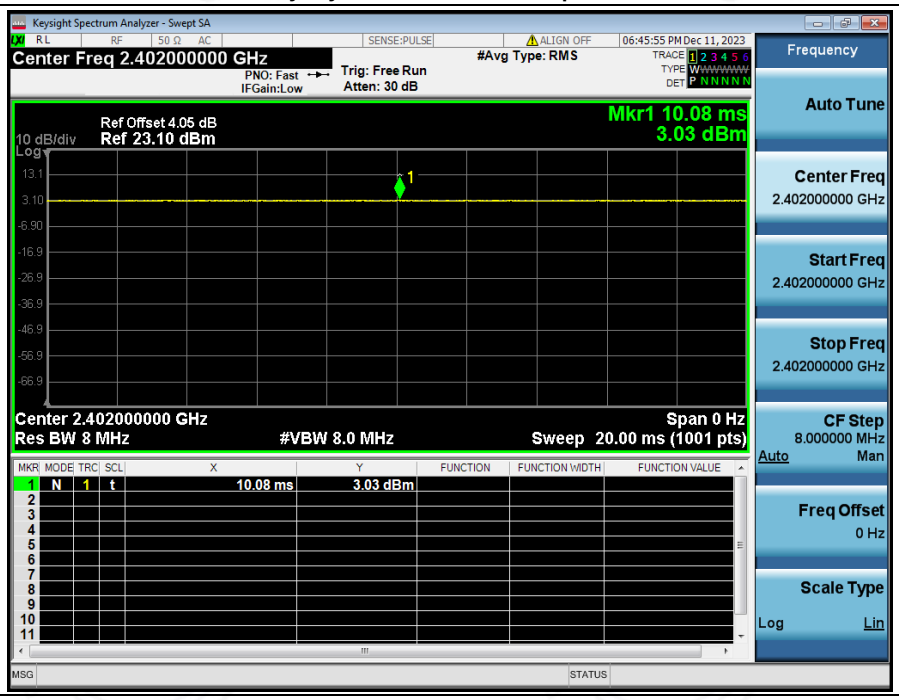


99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2480

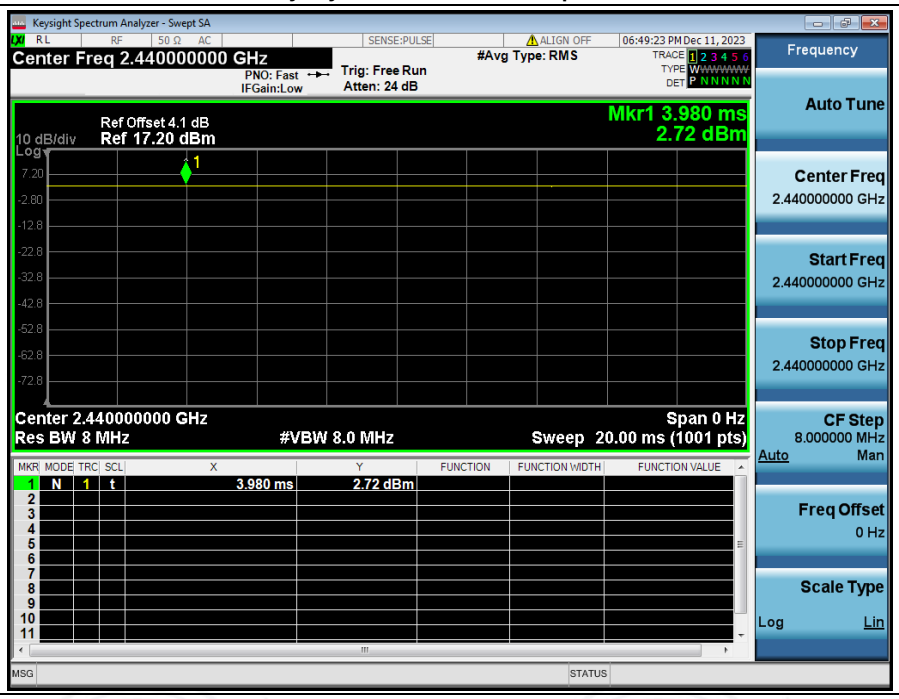

3. Duty Cycle

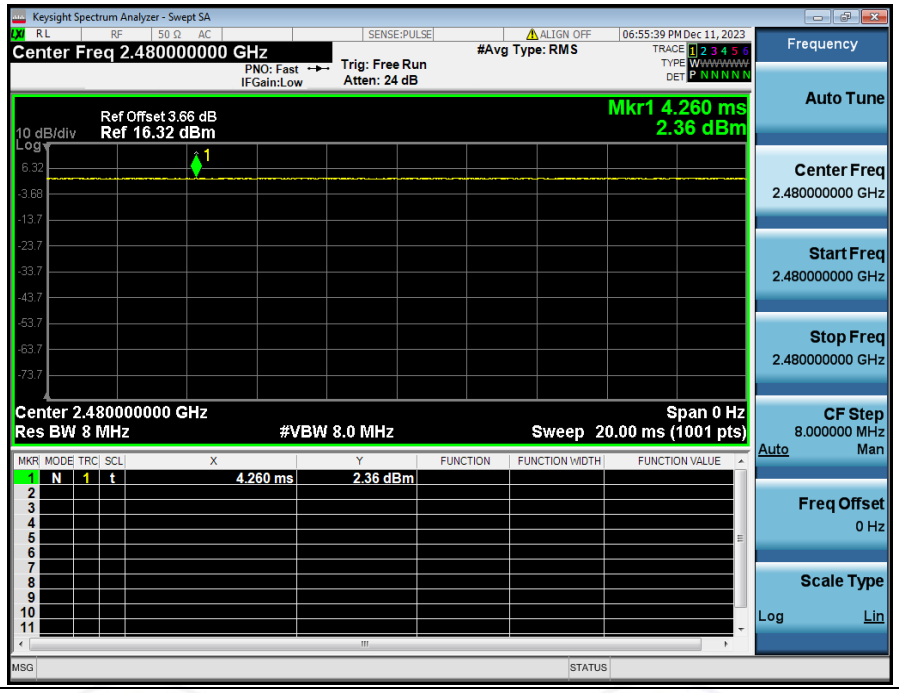
Condition	Antenna	Rate	Frequency (MHz)	Dutycycle(%)	Duty_factor
NVNT	ANT1	1Mbps	2402	100	0.00
NVNT	ANT1	1Mbps	2440.00	100	0.00
NVNT	ANT1	1Mbps	2480.00	100	0.00

Duty_Cycle_NVNT_ANT1_1Mbps_2402



Duty_Cycle_NVNT_ANT1_1Mbps_2440

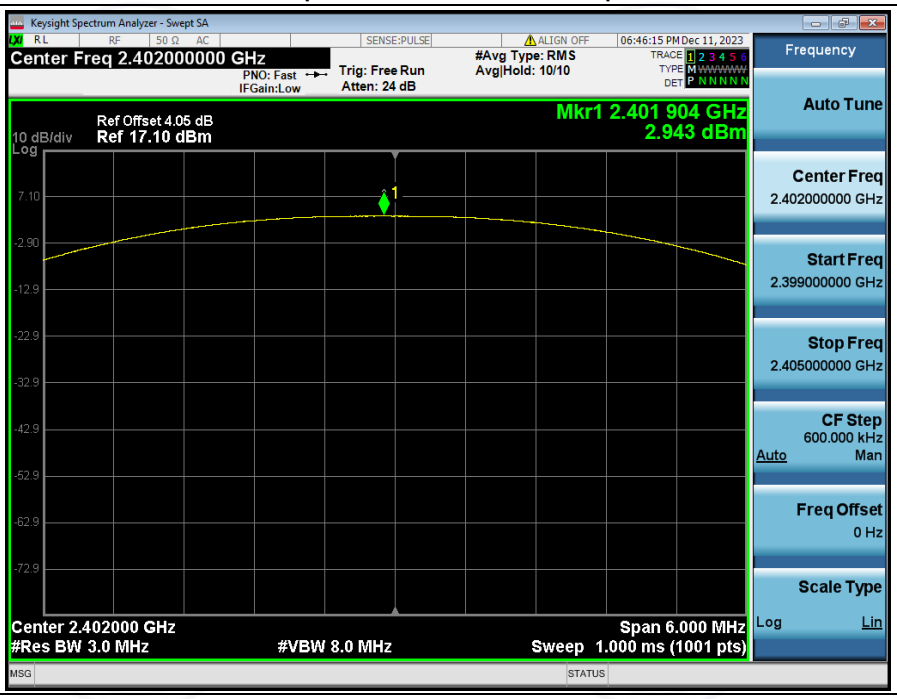


Duty_Cycle_NVNT_ANT1_1Mbps_2480


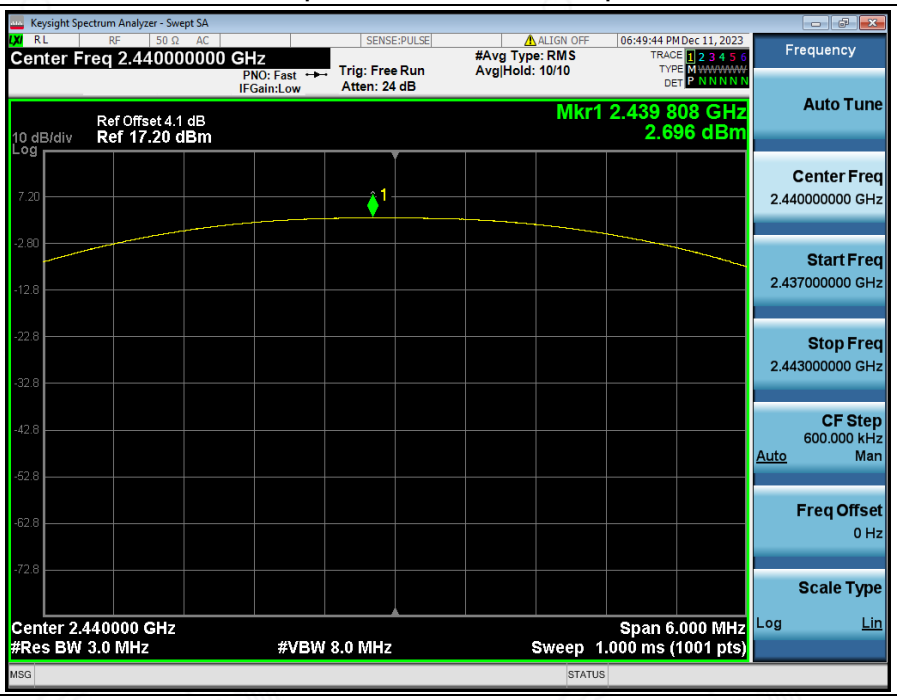
4. Peak Output Power

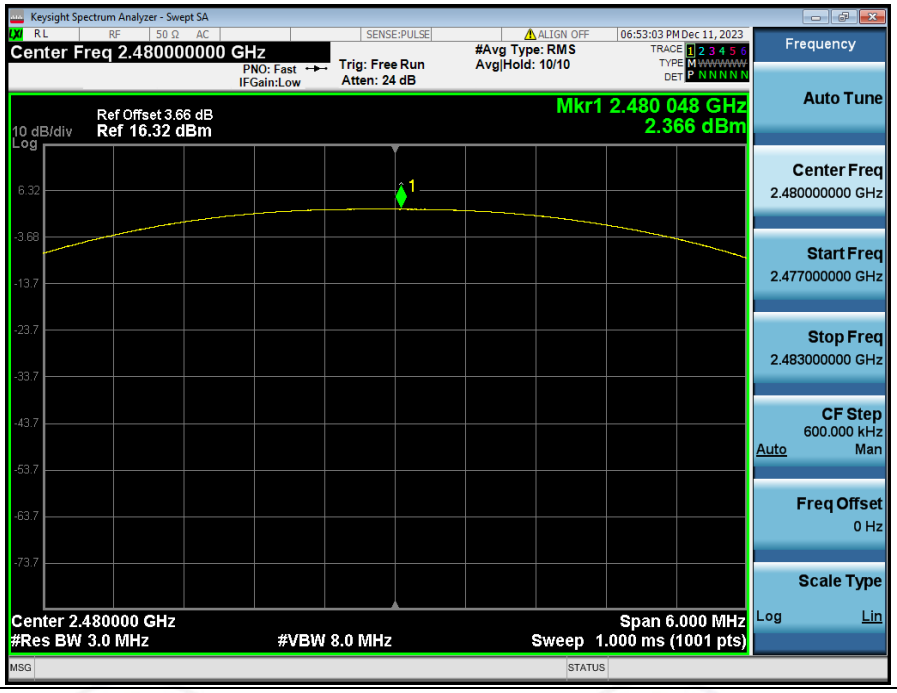
Condition	Antenna	Rate	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1Mbps	2402	2.94	1.97	1000	Pass
NVNT	ANT1	1Mbps	2440.00	2.70	1.86	1000	Pass
NVNT	ANT1	1Mbps	2480	2.37	1.72	1000	Pass

Peak_Output_Power_NVNT_ANT1_1Mbps_2402



Peak_Output_Power_NVNT_ANT1_1Mbps_2440

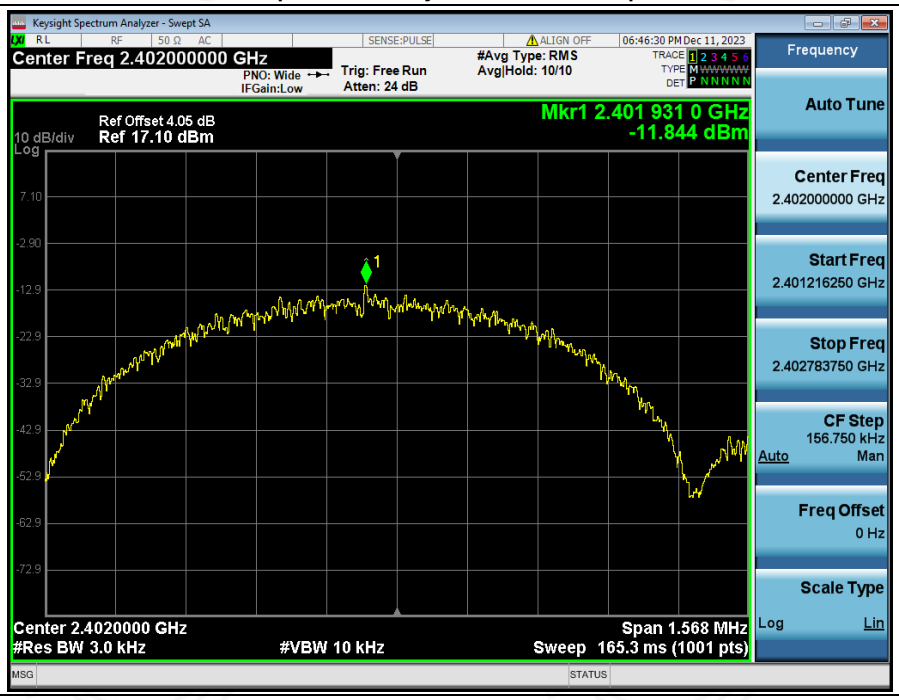


Peak_Output_Power_NVNT_ANT1_1Mbps_2480


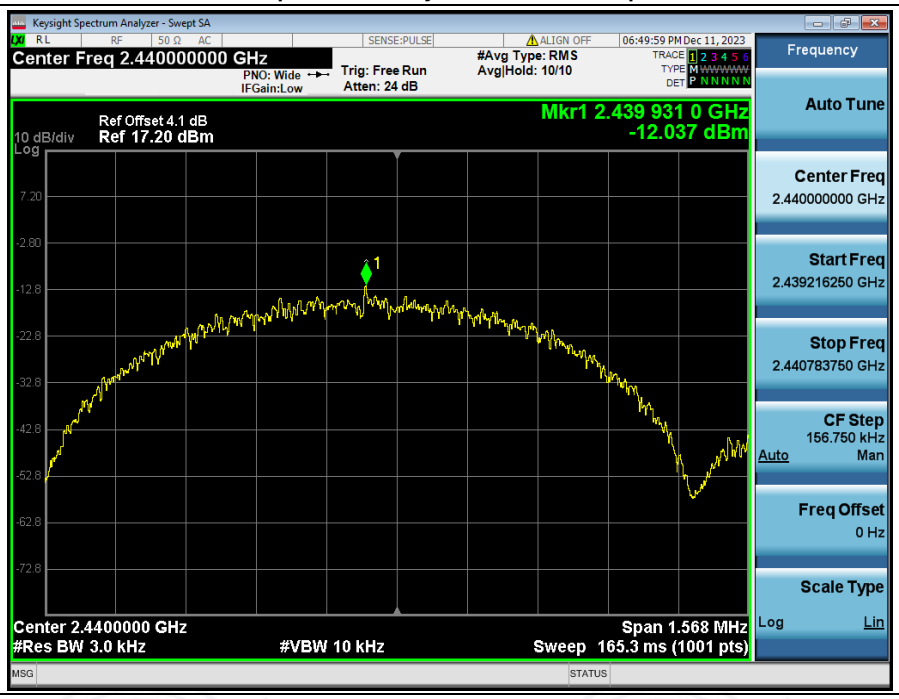
5. Power Spectral Density

Condition	Antenna	Rate	Frequency (MHz)	Power Spectral Density(dBm)	Limit(dBm/3kHz)	Result
NVNT	ANT1	1Mbps	2402	-11.84	8	Pass
NVNT	ANT1	1Mbps	2440.00	-12.04	8	Pass
NVNT	ANT1	1Mbps	2480	-12.42	8	Pass

Power_Spectral_Density_NVNT_ANT1_1Mbps_2402



Power_Spectral_Density_NVNT_ANT1_1Mbps_2440

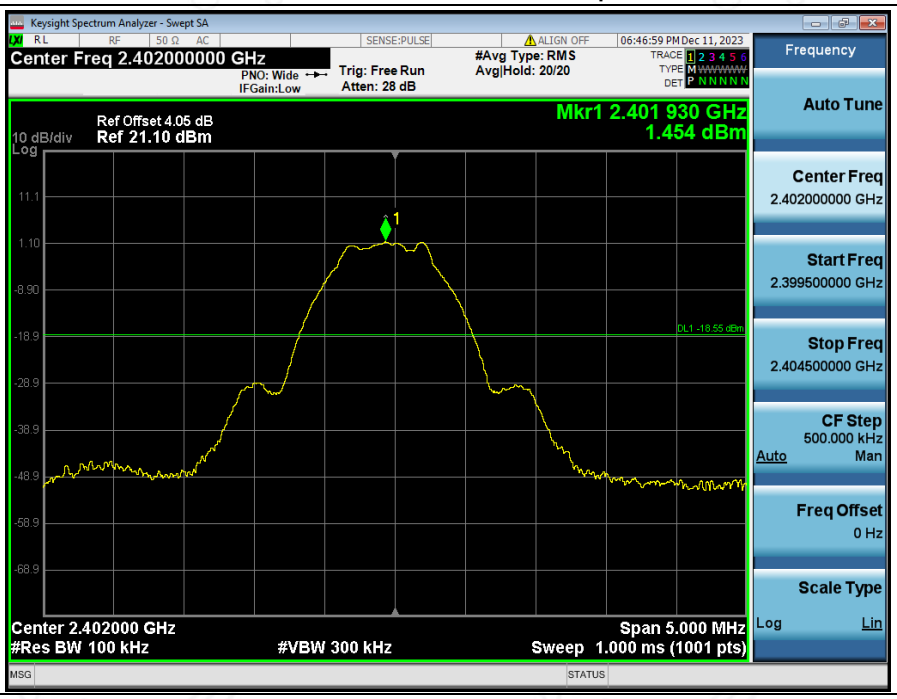


Power_Spectral_Density_NVNT_ANT1_1Mbps_2480

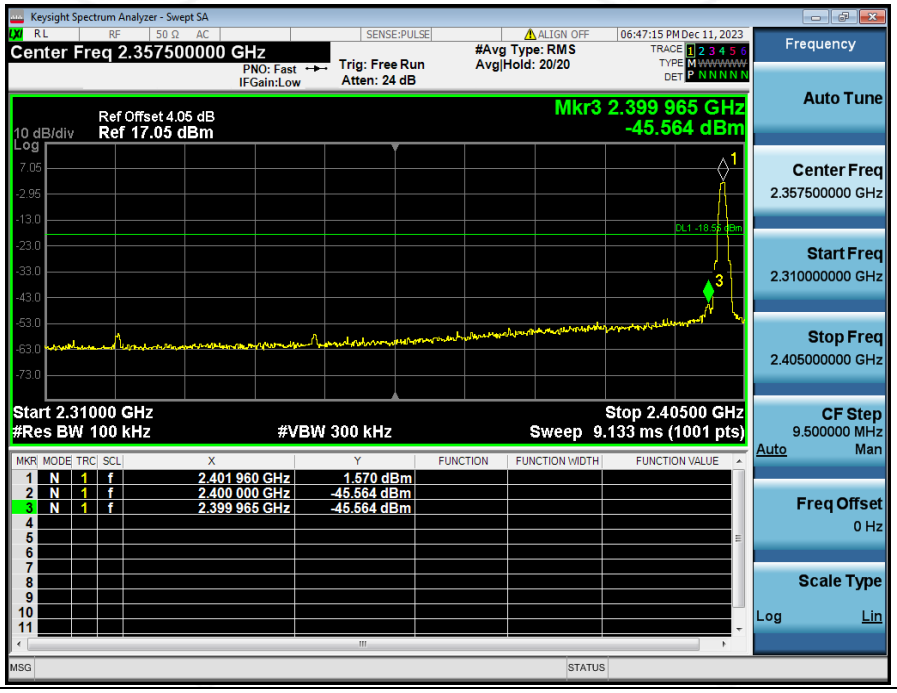

6. Bandedge

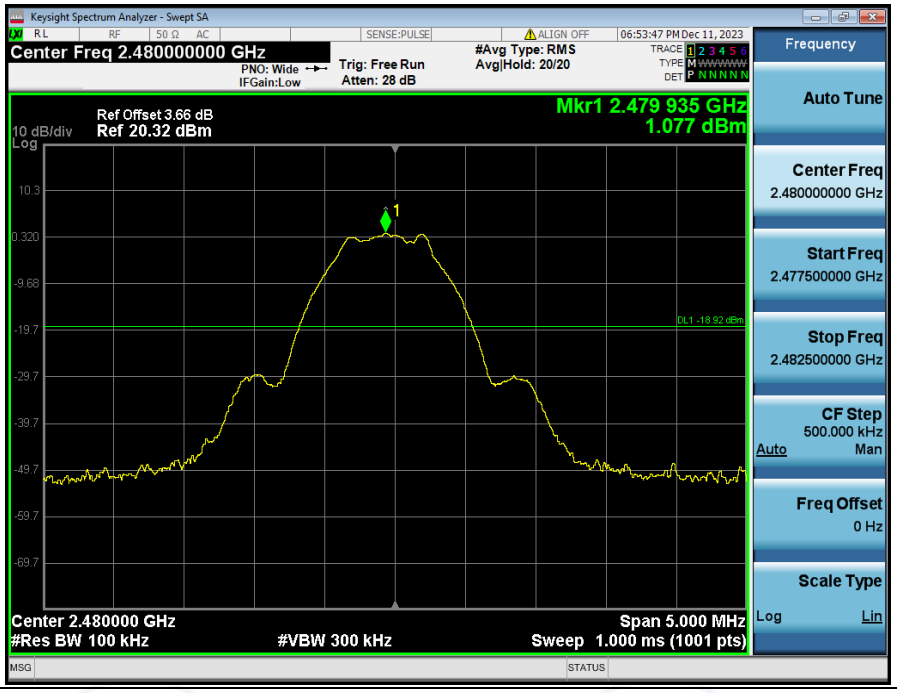
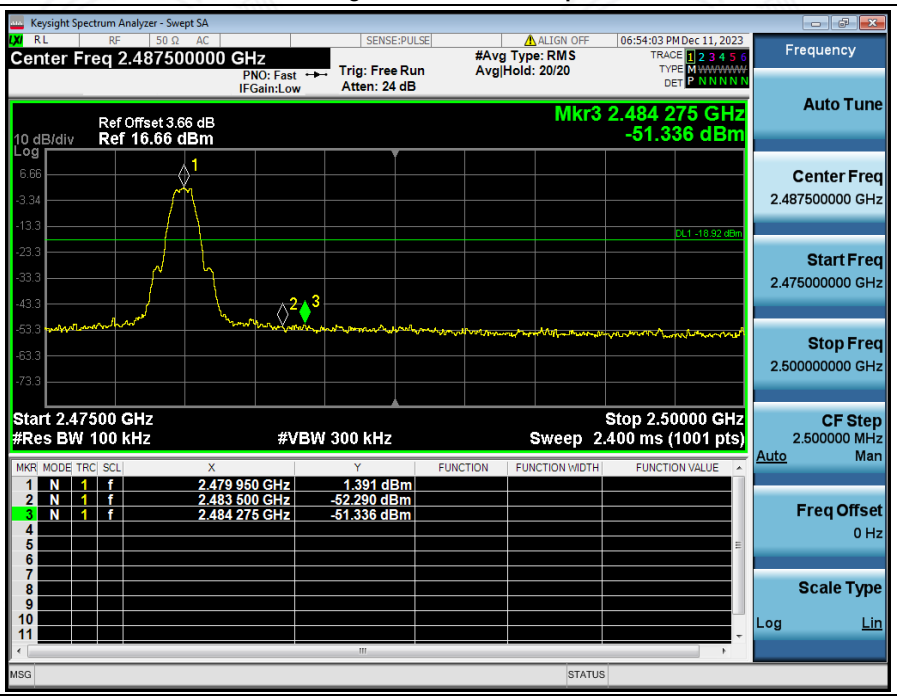
Condition	Antenna	Rate	TX_Frequency (MHz)	Max. Mark Frequency (MHz)	Spurious level(dBm)	limit(dBm)	Result
NVNT	ANT1	1Mbps	2402	2399.965	-45.564	-18.546	Pass
NVNT	ANT1	1Mbps	2480	2484.275	-51.336	-18.923	Pass

1_Reference_Level_NVNT_ANT1_1Mbps_2402



2_Bandedge_NVNT_ANT1_1Mbps_2402

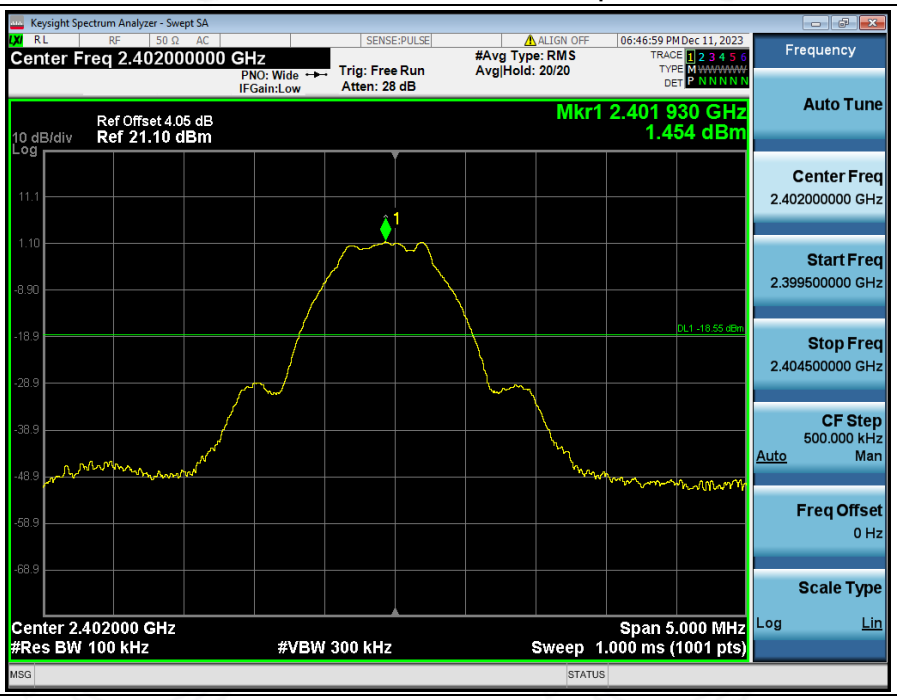


1_Reference_Level_NVNT_ANT1_1Mbps_2480

2_Bandedge_NVNT_ANT1_1Mbps_2480


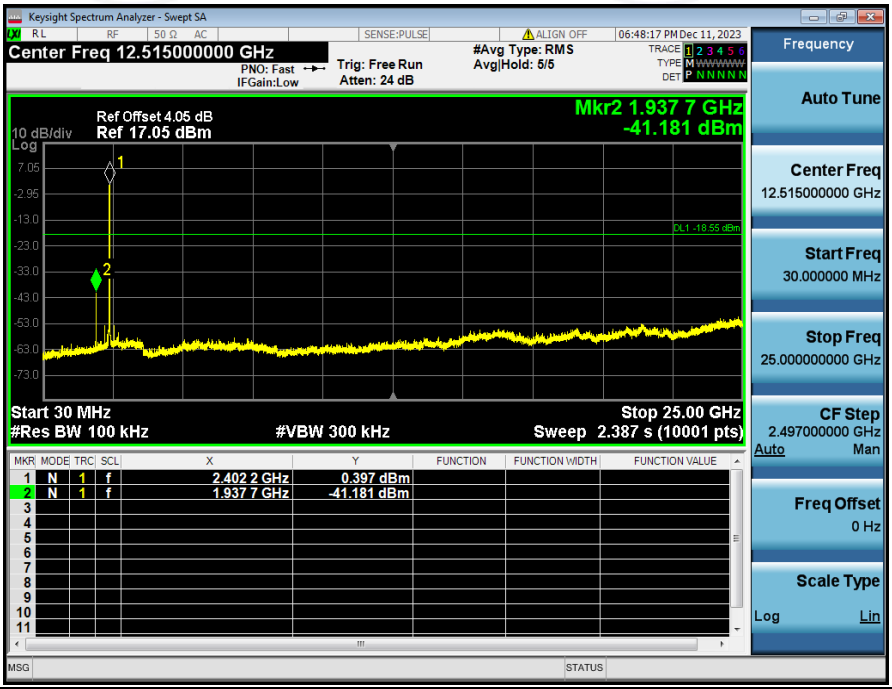
7. Spurious Emission

Condition	Antenna	Rate	TX_Frequency(MHz)	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1Mbps	2402	-41.181	-18.546	Pass
NVNT	ANT1	1Mbps	2440.00	-49.279	-18.583	Pass
NVNT	ANT1	1Mbps	2480	-51.404	-18.923	Pass

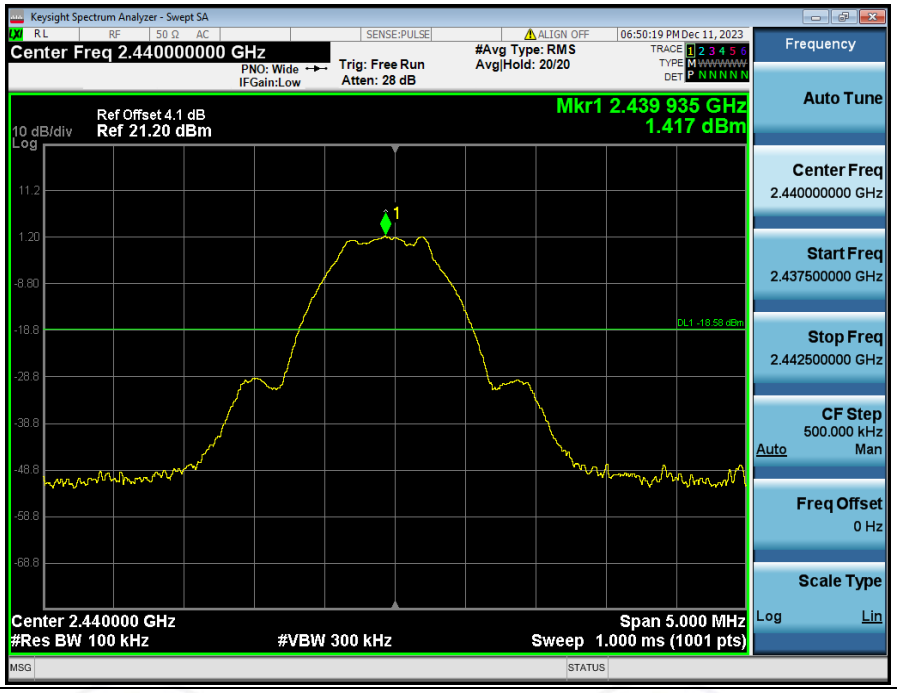
1_Reference_Level_NVNT_ANT1_1Mbps_2402



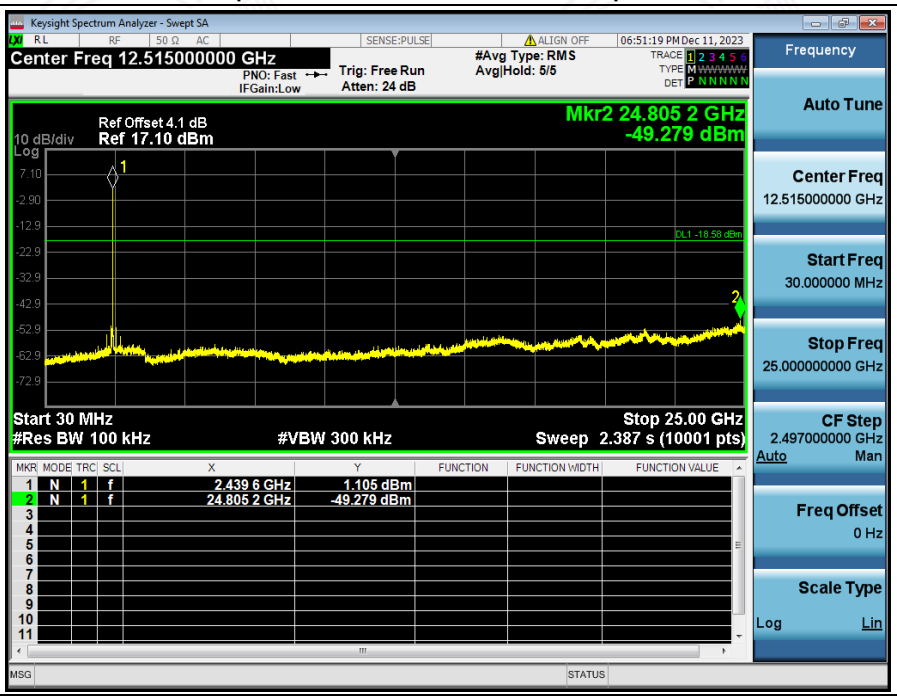
2_Spurious_Emission_NVNT_ANT1_1Mbps_2402

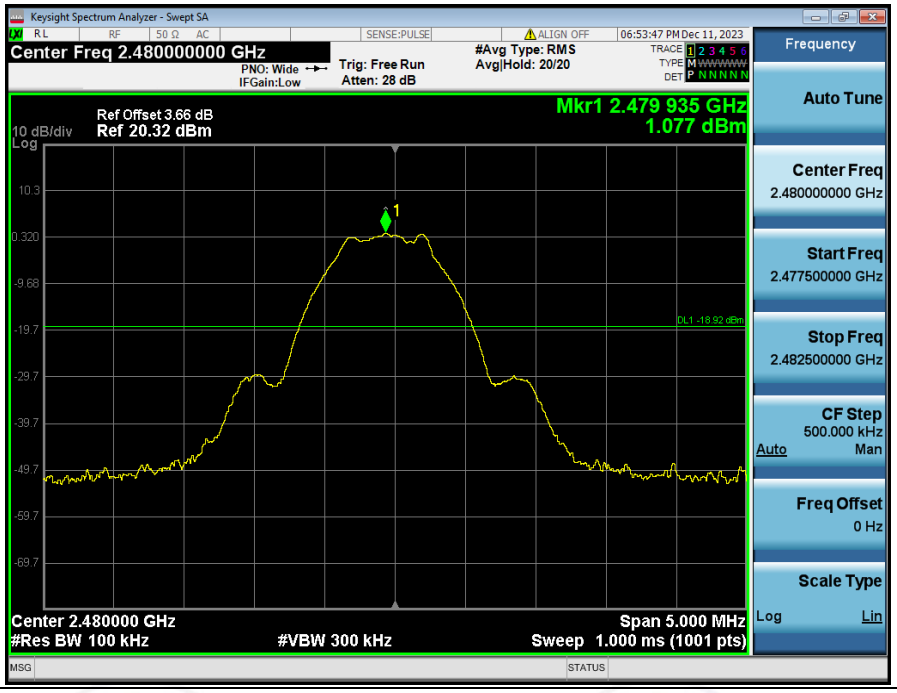
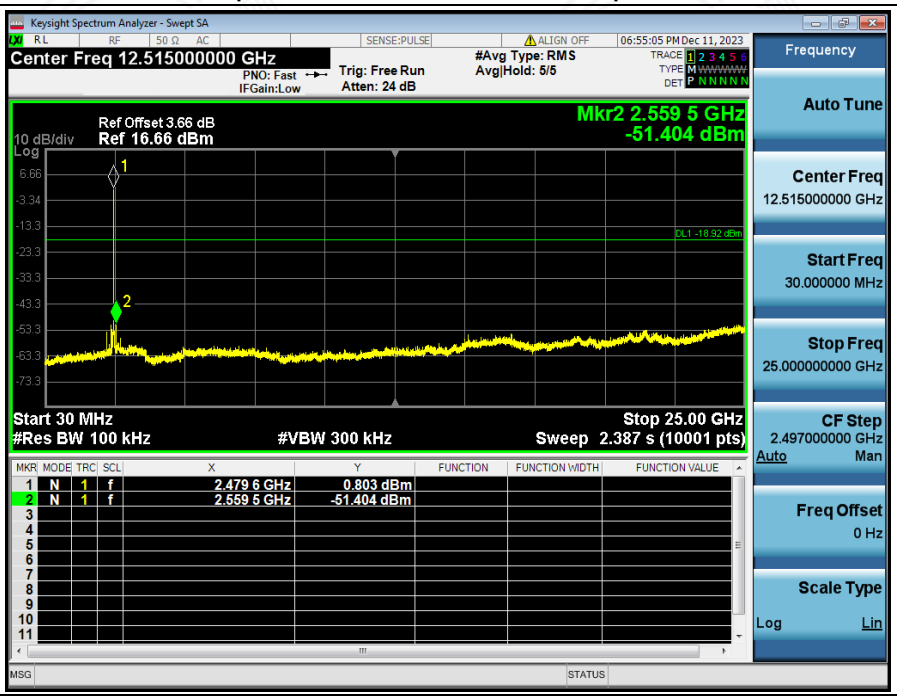


1_Reference_Level_NVNT_ANT1_1Mbps_2440



2_Spurious_Emission_NVNT_ANT1_1Mbps_2440



1_Reference_Level_NVNT_ANT1_1Mbps_2480

2_Spurious_Emission_NVNT_ANT1_1Mbps_2480


- End of the Report -