



RF TEST REPORT

For

ShenZhen RiShengHua Technology Co., Ltd.

Product Name: Smart Scene Button

Test Model(s): RSH-SC20

Report Reference No. : POCE240322003RL001

FCC ID : 2A9K2-RSH-SC20

Applicant's Name : ShenZhen RiShengHua Technology Co., Ltd.

Address : Floor 2, building E1, qiangrong East Industrial Zone, No. 723, Zhoushi Road, Jiuwei community, Hangcheng street, Bao'an District, Shenzhen

Testing Laboratory : Shenzhen POCE Technology Co., Ltd.

Address : 101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyuan, Bao'an District, Shenzhen, Guangdong, China

Test Specification Standard : 47 CFR Part 15.247

Date of Receipt : March 22, 2024

Date of Test : March 22, 2024 to March 26, 2024

Data of Issue : March 26, 2024

Result : Pass

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Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	POCE240322003RL001	March 26, 2024

NOTE1:

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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1 TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

47 CFR Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

1.2 Summary of Test Result

Item	Standard	Method	Requirement	Result
Antenna requirement	47 CFR Part 15.247		47 CFR 15.203	Pass
Occupied Bandwidth	47 CFR Part 15.247	ANSI C63.10-2013, section 11.8 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(a)(2)	Pass
Maximum Conducted Output Power	47 CFR Part 15.247	ANSI C63.10-2013, section 11.9.1 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(b)(3)	Pass
Power Spectral Density	47 CFR Part 15.247	ANSI C63.10-2013, section 11.10 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(e)	Pass
Emissions in non-restricted frequency bands	47 CFR Part 15.247	ANSI C63.10-2013 section 11.11 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass
Band edge emissions (Radiated)	47 CFR Part 15.247	ANSI C63.10-2013 section 6.10 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass
Emissions in frequency bands (below 1GHz)	47 CFR Part 15.247	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass
Emissions in frequency bands (above 1GHz)	47 CFR Part 15.247	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02	47 CFR 15.247(d), 15.209, 15.205	Pass

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : ShenZhen RiShengHua Technology Co., Ltd.
Address : Floor 2, building E1, qiangrong East Industrial Zone, No. 723, Zhoushi Road, Jiuwei community, Hangcheng street, Bao'an District, Shenzhen

Manufacturer : ShenZhen RiShengHua Technology Co., Ltd.
Address : Floor 2, building E1, qiangrong East Industrial Zone, No. 723, Zhoushi Road, Jiuwei community, Hangcheng street, Bao'an District, Shenzhen

2.2 Description of Device (EUT)

Product Name:	Smart Scene Button
Model/Type reference:	RSH-SC20
Series Model:	N/A
Trade Mark:	RSH
Power Supply:	DC:3.0V
Operation Frequency:	2405MHz to 2480MHz
Number of Channels:	16
Modulation Type:	O-QPSK
Antenna Type:	PCB
Antenna Gain:	2.54dBi
Hardware Version:	V1.0
Software Version:	V1.0

(Remark:The Antenna Gain is supplied by the customer.POCE is not responsible for This data and the related calculations associated with it)

Operation Frequency each of channel			
Channel	Frequency	Channel	Frequency
1	2405 MHz	9	2445 MHz
2	2410 MHz	10	2450 MHz
3	2415 MHz	11	2455 MHz
4	2420 MHz	12	2460 MHz
5	2425 MHz	13	2465 MHz
6	2430 MHz	14	2470 MHz
7	2435 MHz	15	2475 MHz
8	2440 MHz	16	2480 MHz

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)
Lowest channel	2405MHz
Middle channel	2440MHz
Highest channel	2480MHz

2.3 Description of Test Modes

No	Title	Description
TM1	Lowest channel	Keep the EUT connect to DC power line and works in continuously transmitting mode with O-QPSK modulation.
TM2	Middle channel	Keep the EUT connect to DC power line and works in continuously transmitting mode with O-QPSK modulation.
TM3	Highest channel	Keep the EUT connect to DC power line and works in continuously transmitting mode with O-QPSK modulation.

2.4 Description of Support Units

The EUT was tested as an independent device.

2.5 Equipments Used During The Test

Power Spectral Density
Emissions in non-restricted frequency bands
Occupied Bandwidth
Maximum Conducted Output Power

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RF Test Software	TACHOY	RTS-01	V2.0.0.0	/	/
High Pass filter	ZHINAN	OQHPF1-M1.5-18G-224	6210075	/	/
Power divider	MIDEWEST	PWD-2533	SMA-79	2023-05-11	2026-05-10
DC power	HP	66311B	38444359	/	/
RF Sensor Unit	Tachoy Information Technology(shenzhen) Co.,Ltd.	TR1029-2	000001	/	/
Wideband radio communication tester	R&S	CMW500	113410	2023-06-13	2024-06-12
Vector signal generator	Keysight	N5181A	MY48180415	2023-11-09	2024-11-08
Signal generator	Keysight	N5182A	MY50143455	2023-11-09	2024-11-08
Spectrum Analyzer	Keysight	N9020A	MY53420323	2023-12-12	2024-12-11

Band edge emissions (Radiated)
Emissions in frequency bands (below 1GHz)
Emissions in frequency bands (above 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test software	Farad	EZ -EMC	V1.1.42	/	/
Positioning Controller	/	MF-7802	/	/	/
High Pass filter	ZHINAN	OQHPF1-M1.5-18G-224	6210075	/	/
Amplifier(18-40G)	COM-POWER	AH-1840	10100008-1	2022-04-05	2025-04-04
Horn antenna	COM-POWER	AH-1840 (18-40G)	10100008	2023-04-05	2025-04-04
Loop antenna	ZHINAN	ZN30900C	ZN30900C	2021-07-05	2024-07-04
Cable(LF)#2	Schwarzbeck	/	/	2024-02-19	2025-02-18
Cable(LF)#1	Schwarzbeck	/	/	2024-02-19	2025-02-18
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2024-02-19	2025-02-18
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2024-02-19	2025-02-18
Power amplifier(LF)	Schwarzbeck	BBV9743	9743-151	2023-06-13	2024-06-12
Power amplifier(HF)	Schwarzbeck	BBV9718	9718-282	2023-06-13	2024-06-12
Wideband radio communication tester	R&S	CMW500	113410	2023-06-13	2024-06-12
Spectrum Analyzer	R&S	FSP30	1321.3008K40-101729-jR	2023-06-14	2024-06-13
Horn Antenna	Sunol Sciences	DRH-118	A091114	2023-05-13	2025-05-12
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	2023-05-21	2025-05-20
Test Receiver	R&S	ESCI	102109	2023-06-13	2024-06-12

2.6 Statement Of The Measurement Uncertainty

Test Item	Measurement Uncertainty
Occupied Bandwidth	$\pm 3.63\%$
RF conducted power	$\pm 0.733\text{dB}$
RF power density	$\pm 0.234\%$
Conducted Spurious emissions	$\pm 1.98\text{dB}$
Radiated Emission (Above 1GHz)	$\pm 5.46\text{dB}$
Radiated Emission (Below 1GHz)	$\pm 5.79\text{dB}$
Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.	

2.7 Identification of Testing Laboratory

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252

Identification of the Responsible Testing Location

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252
FCC Registration Number:	0032847402
Designation Number:	CN1342
Test Firm Registration Number:	778666
A2LA Certificate Number:	6270.01

2.8 Announcement

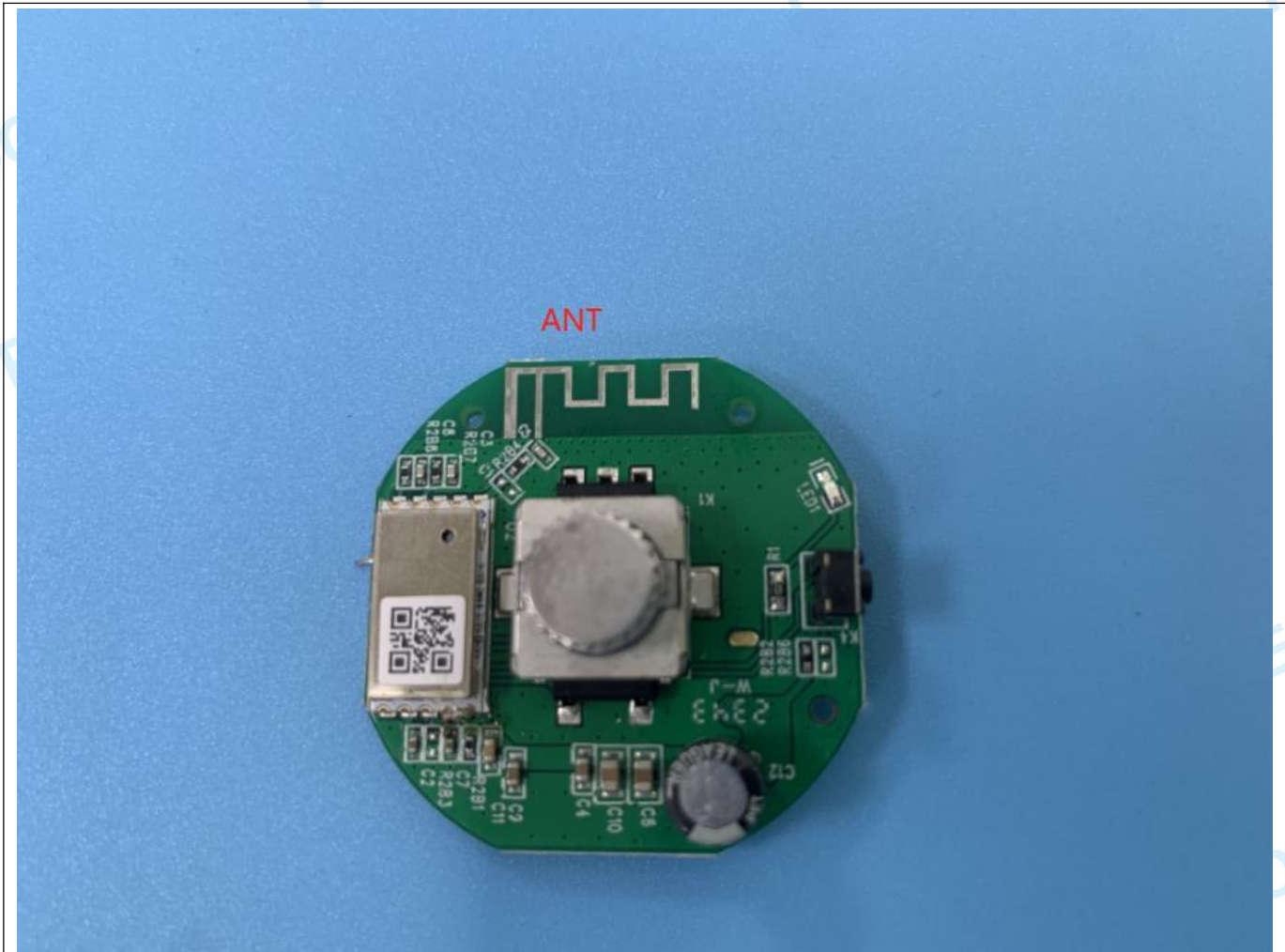
- (1) The test report reference to the report template version v1.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) This document may not be altered or revised in any way unless done so by POCE and all revisions are duly noted in the revisions section.
- (5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

3 Evaluation Results (Evaluation)

3.1 Antenna requirement

Test Requirement:	Refer to 47 CFR Part 15.203, 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 shall be considered sufficient to comply with the provisions of this section.
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3.1.1 Conclusion:



4 Radio Spectrum Matter Test Results (RF)

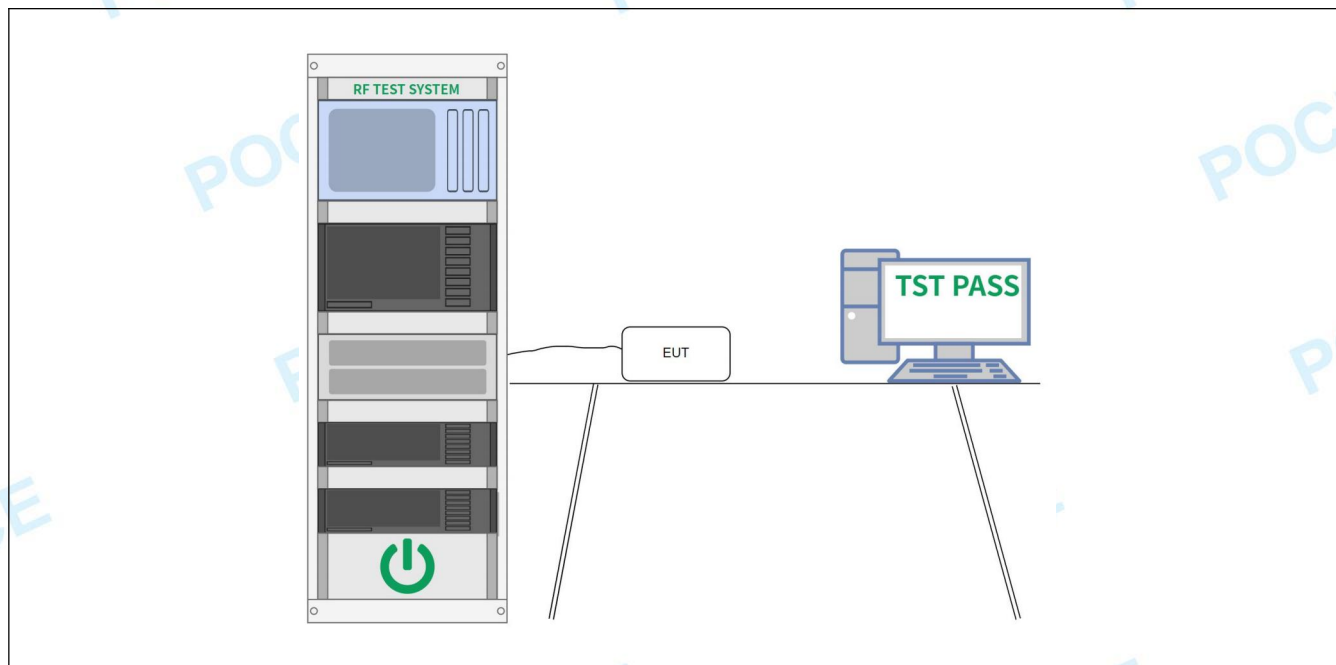
4.1 Occupied Bandwidth

Test Requirement:	47 CFR 15.247(a)(2)
Test Limit:	Refer to 47 CFR 15.247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	ANSI C63.10-2013, section 11.8 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	a) Set RBW = 100 kHz. b) Set the VBW $\geq [3 \times \text{RBW}]$. c) Detector = peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.1.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	48.1 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.1.2 Test Setup Diagram:



4.1.3 Test Data:

Please Refer to Appendix for Details.

4.2 Maximum Conducted Output Power

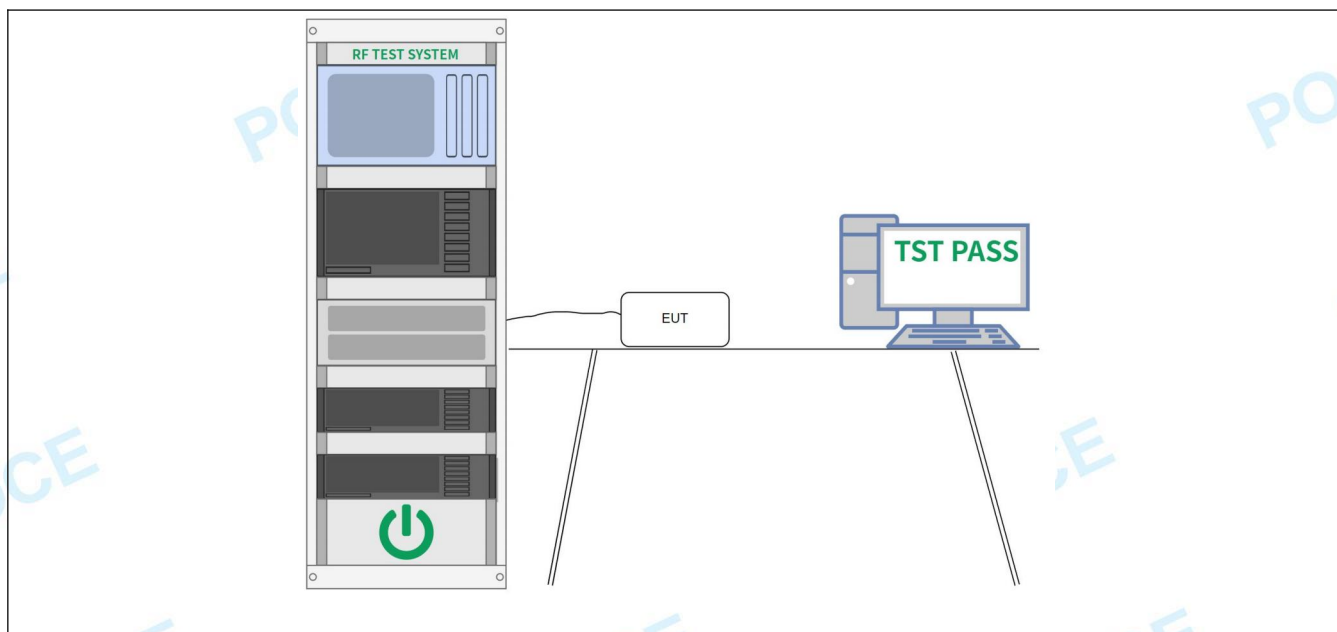
Test Requirement:	47 CFR 15.247(b)(3)
Test Limit:	Refer to 47 CFR 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Test Method:	ANSI C63.10-2013, section 11.9.1 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013, section 11.9.1 Maximum peak conducted output power Note: Per ANSI C63.10-2013, if there are two or more antennas, the conducted powers at Core 0, Core 1,..., Core i were first measured separately, as shown in the section above (this product only have one antenna). The measured values were then summed in linear power units then converted back to dBm. Per ANSI C63.10-2013 Section 14.4.3.2.3, the directional gain is calculated using the following formula, where GN is the gain of the nth antenna and NANT, the total number of antennas used. For correlated unequal antenna gain Directional gain = $10 \cdot \log[(10G1/20 + 10G2/20 + \dots + 10GN/20)^2 / NANT]$ dBi For completely uncorrelated unequal antenna gain Directional gain = $10 \cdot \log[(10G1/10 + 10G2/10 + \dots + 10GN/10) / NANT]$ dBi Sample Multiple antennas Calculation: Core 0 + Core 1 + ... Core i. = MIMO/CDD (i is the number of antennas) (#VALUE! mW + mW) = #VALUE! mW = dBm Sample e.i.r.p. Calculation: e.i.r.p. (dBm) = Conducted Power (dBm) + Ant gain (dBi)

4.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	48.1 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.2.2 Test Setup Diagram:

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4.2.3 Test Data:

Please Refer to Appendix for Details.

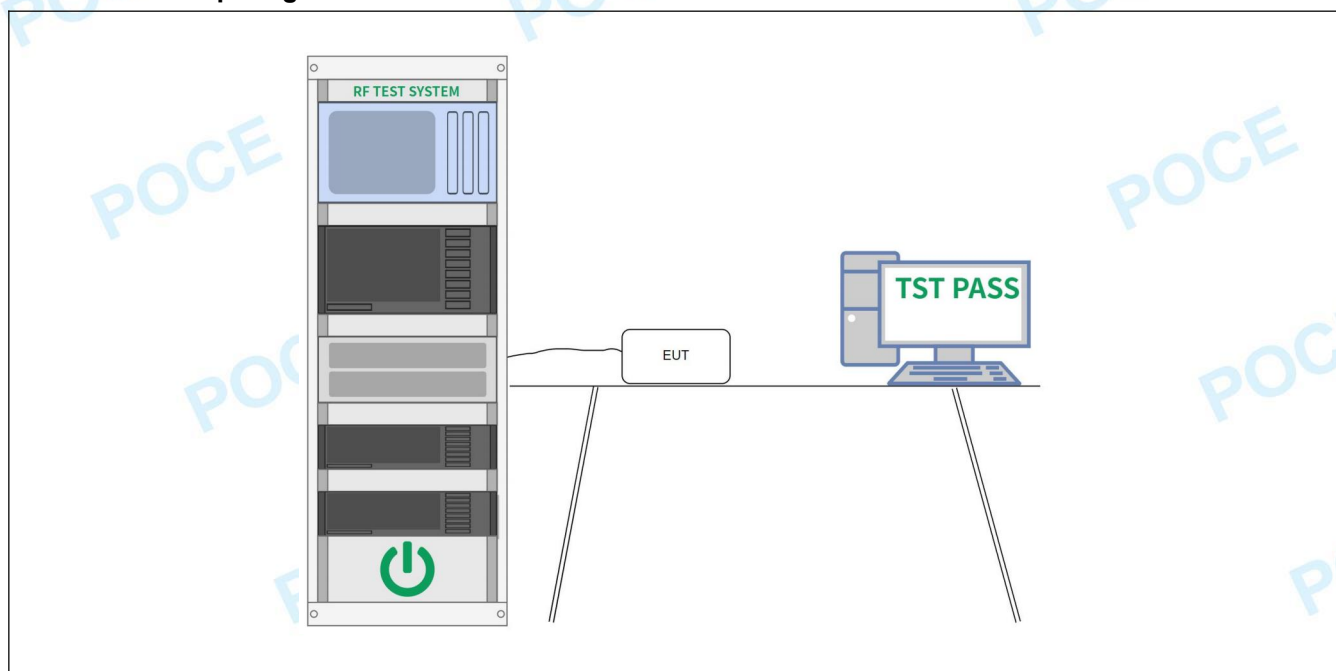
4.3 Power Spectral Density

Test Requirement:	47 CFR 15.247(e)
Test Limit:	Refer to 47 CFR 15.247(e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	ANSI C63.10-2013, section 11.10 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013, section 11.10, Maximum power spectral density level in the fundamental emission

4.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	48.1 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.3.2 Test Setup Diagram:



4.3.3 Test Data:

Please Refer to Appendix for Details.

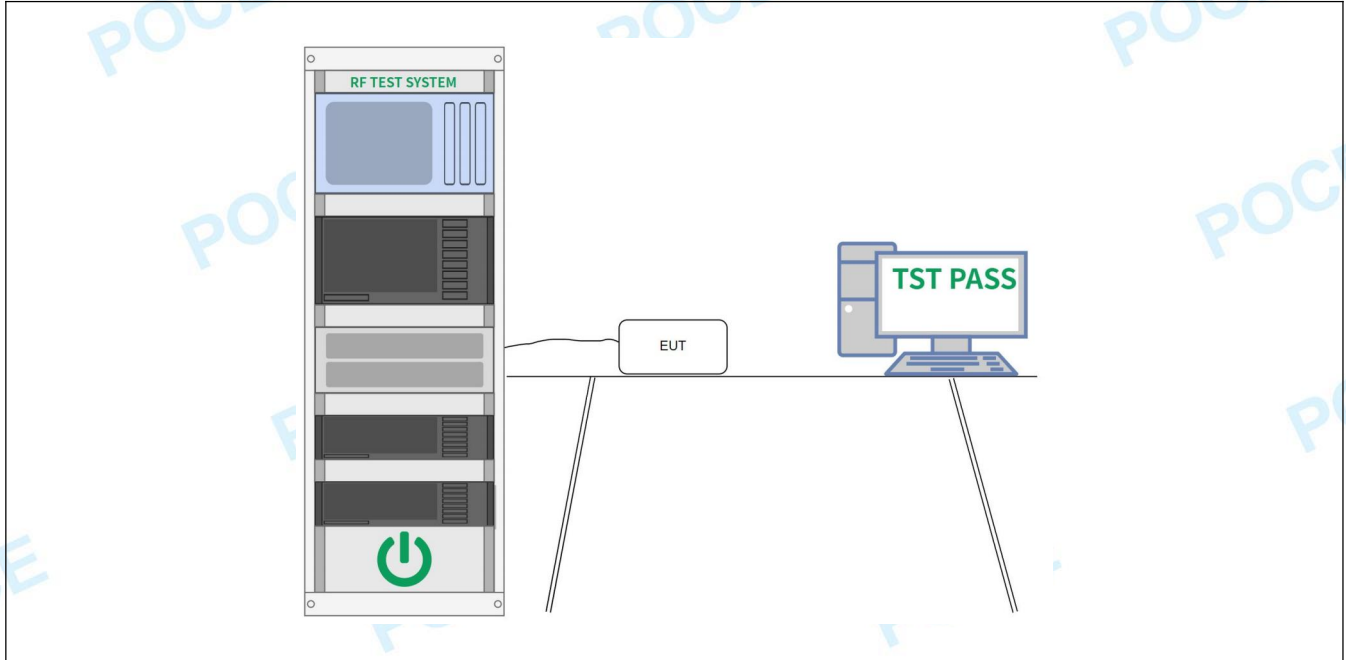
4.4 Emissions in non-restricted frequency bands

Test Requirement:	47 CFR 15.247(d), 15.209, 15.205
Test Limit:	Refer to 47 CFR 15.247(d), 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.
Test Method:	ANSI C63.10-2013 section 11.11 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013 Section 11.11.1, Section 11.11.2, Section 11.11.3

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	48.1 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.4.2 Test Setup Diagram:



4.4.3 Test Data:

Please Refer to Appendix for Details.

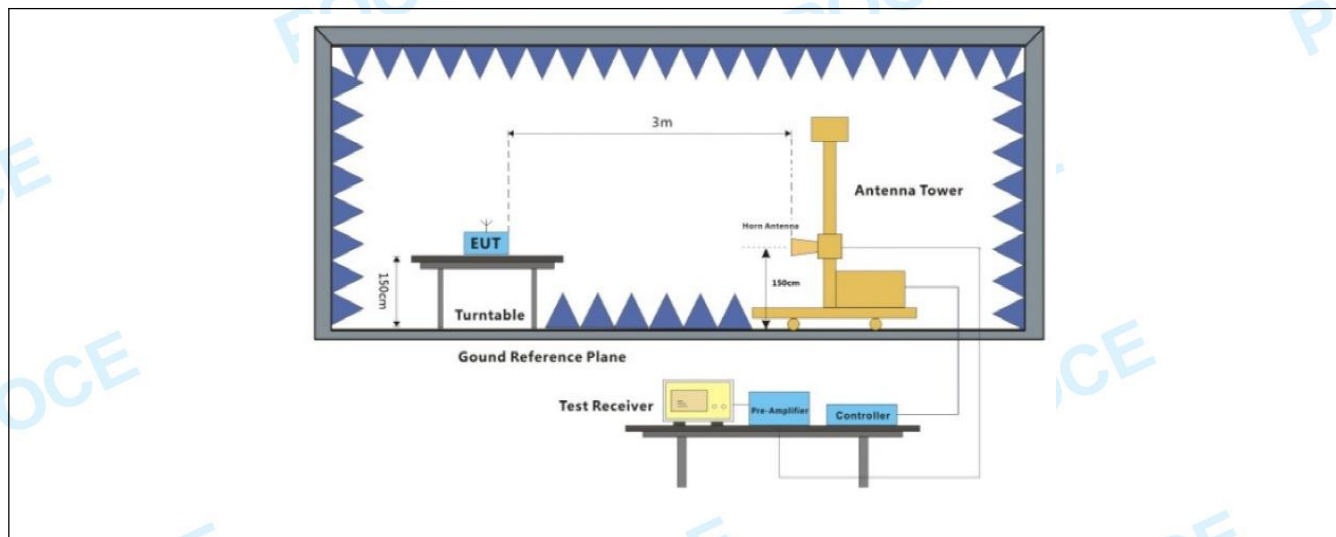
4.5 Band edge emissions (Radiated)

Test Requirement:	Refer to 47 CFR 15.247(d), 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)).		
Test 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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.			
Test Method:	ANSI C63.10-2013 section 6.10 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	ANSI C63.10-2013 section 6.10.5.2		

4.5.1 E.U.T. Operation:

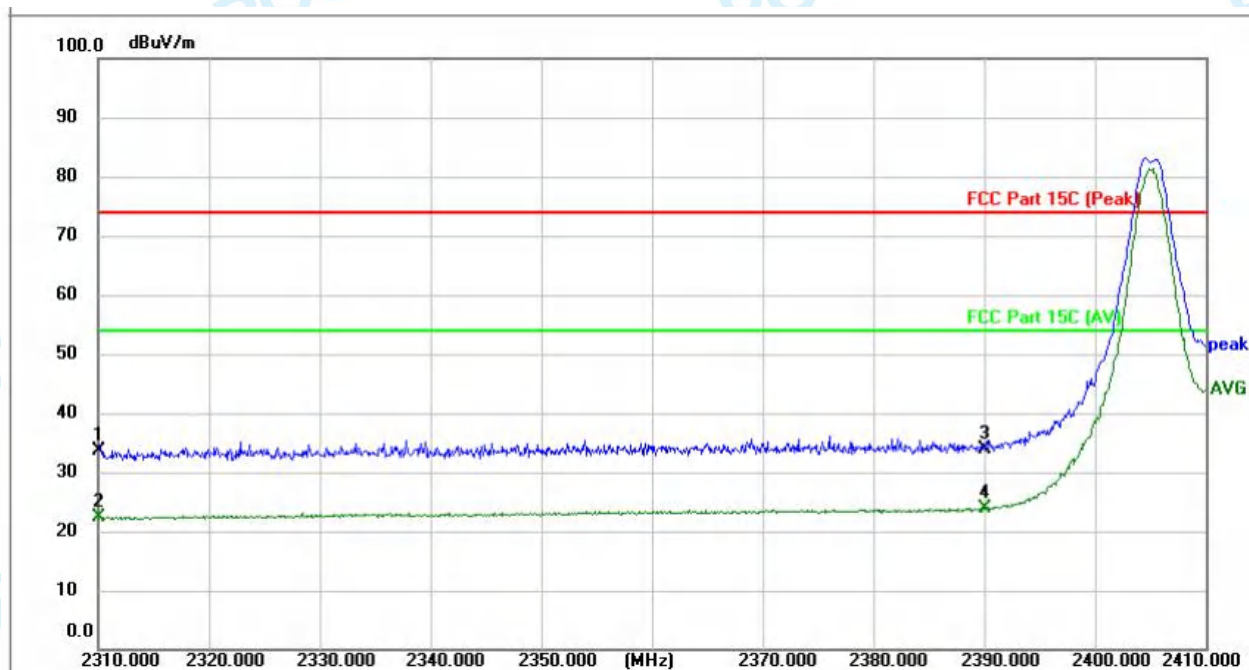
Operating Environment:						
Temperature:	22 °C		Humidity:	48.1 %	Atmospheric Pressure:	101 kPa
Pretest mode:		TM1, TM2, TM3				
Final test mode:		TM1, TM2, TM3				

4.5.2 Test Setup Diagram:



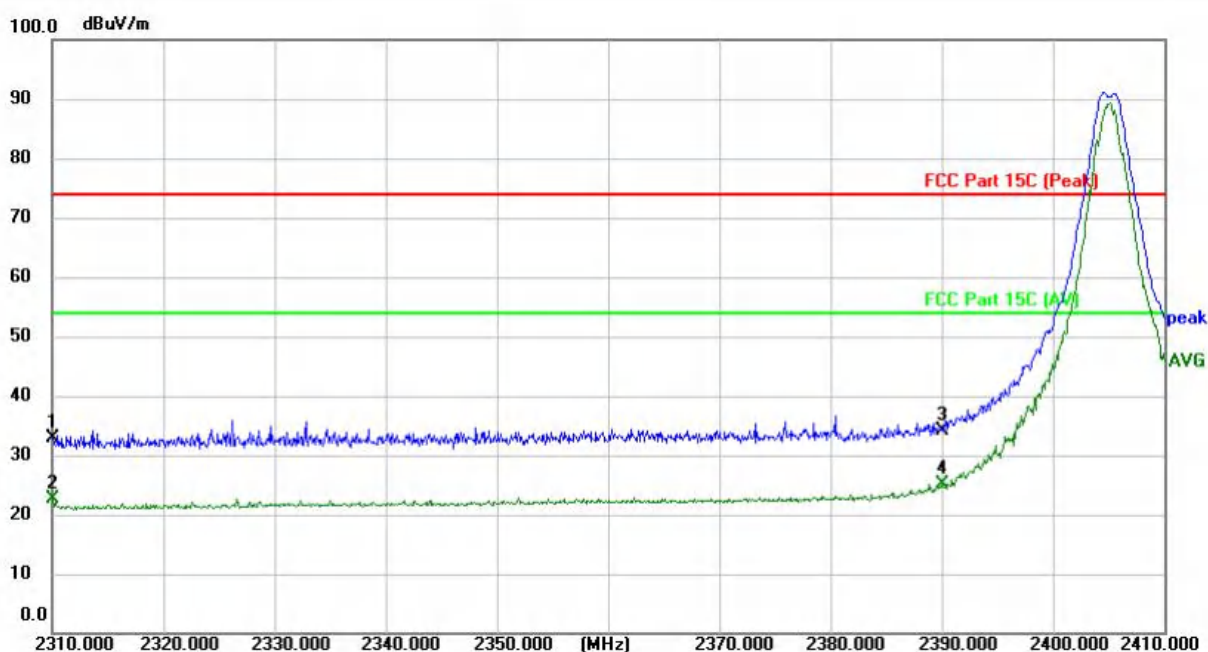
4.5.3 Test Data:

TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L



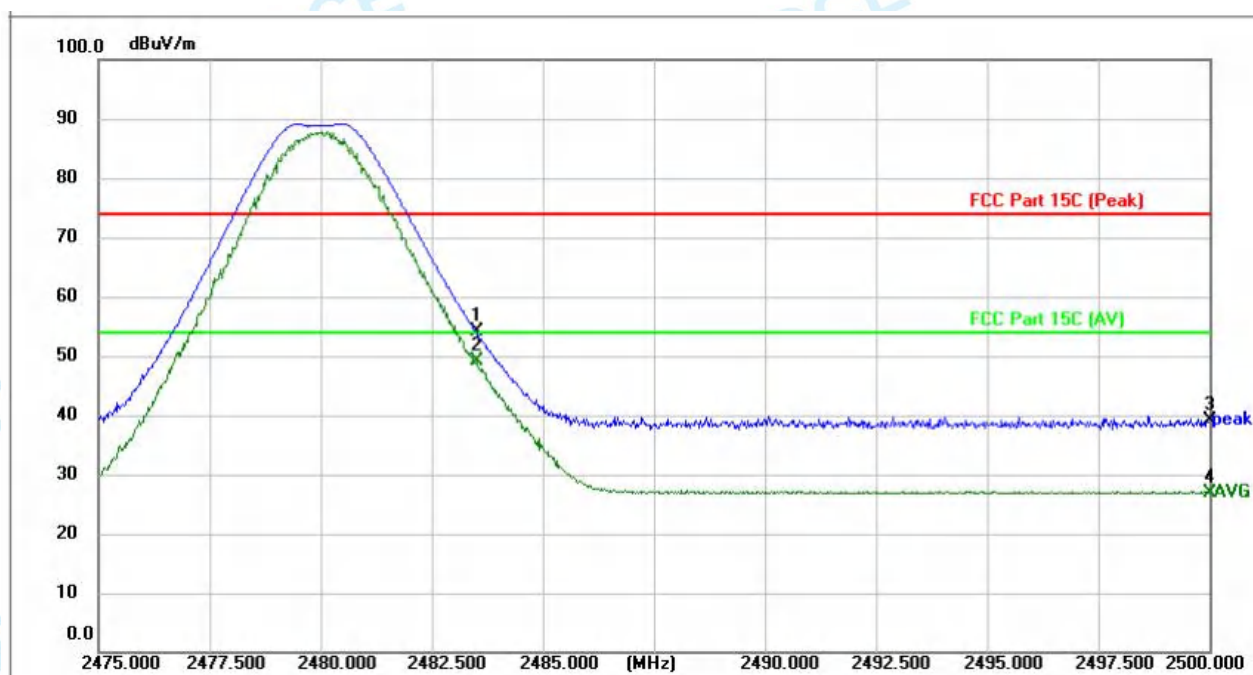
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	40.53	-6.93	33.60	74.00	-40.40	peak	100		P	
2	2310.000	29.43	-6.93	22.50	54.00	-31.50	AVG	100		P	
3	2390.000	40.48	-6.72	33.76	74.00	-40.24	peak	100		P	
4 *	2390.000	30.52	-6.72	23.80	54.00	-30.20	AVG	100		P	

TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L



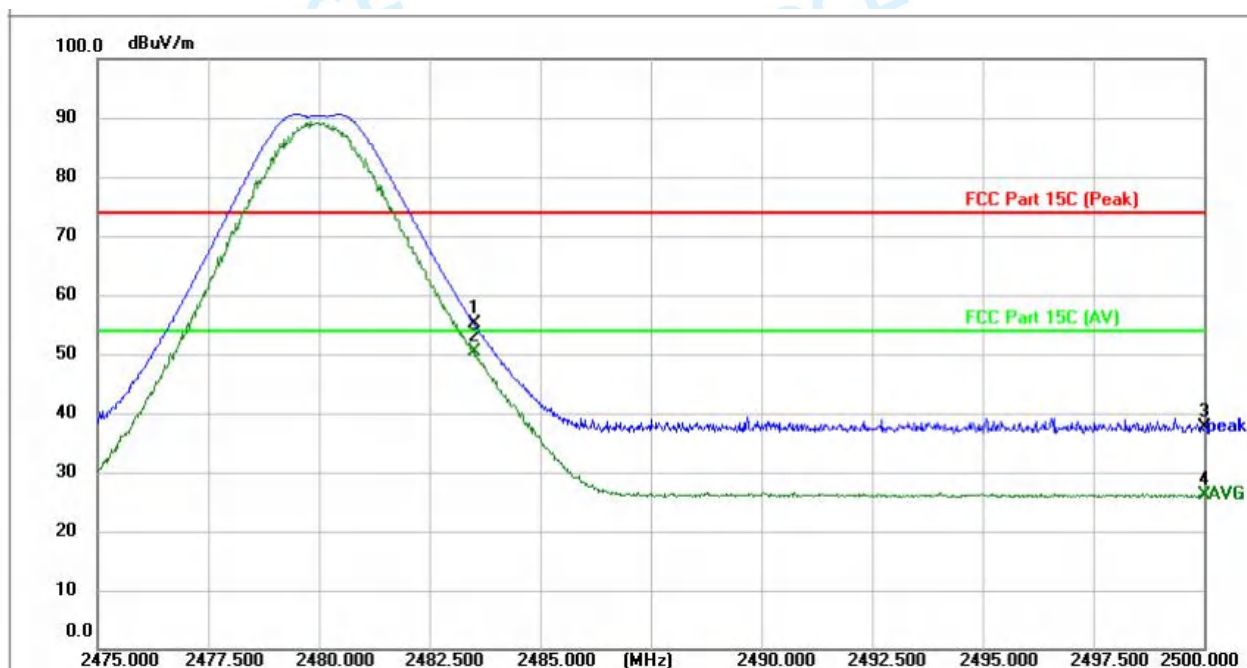
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	41.17	-8.23	32.94	74.00	-41.06	peak	100		P	
2	2310.000	30.97	-8.23	22.74	54.00	-31.26	AVG	100		P	
3	2390.000	42.08	-7.91	34.17	74.00	-39.83	peak	100		P	
4 *	2390.000	33.09	-7.91	25.18	54.00	-28.82	AVG	100		P	

TM3 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.500	60.49	-6.47	54.02	74.00	-19.98	peak	100		P	
2 *	2483.500	55.49	-6.47	49.02	54.00	-4.98	AVG	100		P	
3	2500.000	45.66	-6.43	39.23	74.00	-34.77	peak	100		P	
4	2500.000	33.34	-6.43	26.91	54.00	-27.09	AVG	100		P	

TM3 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.500	62.75	-7.54	55.21	74.00	-18.79	peak	100		P	
2 *	2483.500	57.97	-7.54	50.43	54.00	-3.57	AVG	100		P	
3	2500.000	44.99	-7.48	37.51	74.00	-36.49	peak	100		P	
4	2500.000	33.60	-7.48	26.12	54.00	-27.88	AVG	100		P	

4.6 Emissions in frequency bands (below 1GHz)

Test Requirement:	Refer to 47 CFR 15.247(d), 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)).`		
Test 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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.			
Test Method:	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. h. Test the EUT in the lowest channel, the middle channel, the Highest channel. i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. j. Repeat above procedures until all frequencies measured was complete. Remark: 1) For emission below 1GHz, through pre-scan found the worst case is the lowest		

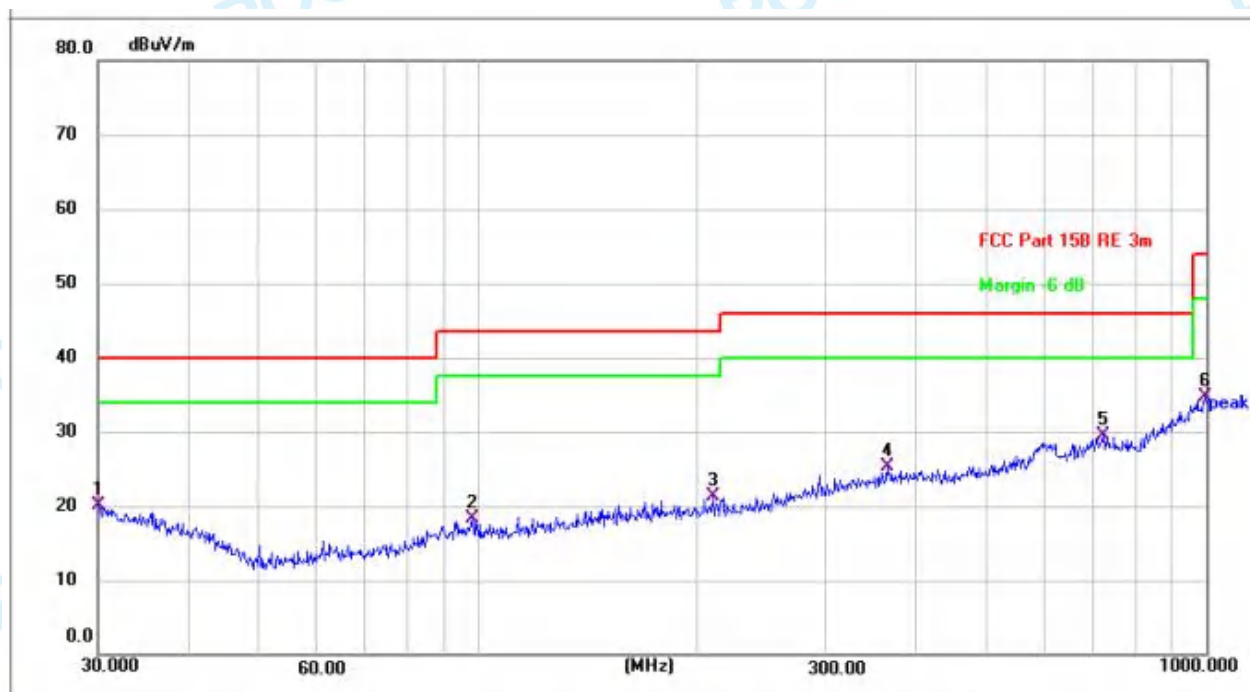
	channel. Only the worst case is recorded in the report. 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level = Receiver Reading + Antenna Factor + Cable Factor + Preamplifier Factor 3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.
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4.6.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	48.1 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1				
Final test mode:	TM1				

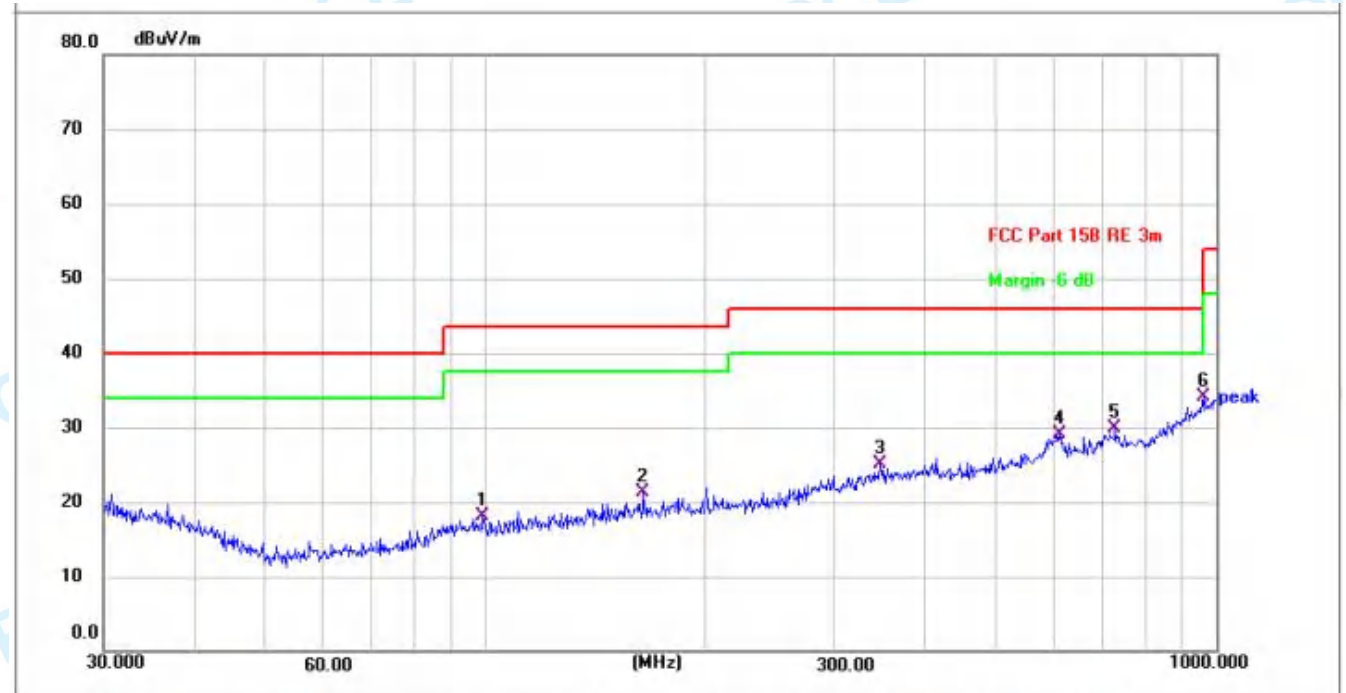
4.6.2 Test Data:

TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	30.1054	22.90	-2.89	20.01	40.00	-19.99	QP	100		P	
2	98.1419	24.02	-5.62	18.40	43.50	-25.10	QP	100		P	
3	210.0482	24.03	-2.78	21.25	43.50	-22.25	QP	100		P	
4	364.2595	23.57	1.65	25.22	46.00	-20.78	QP	100		P	
5 *	721.7259	23.80	5.71	29.51	46.00	-16.49	QP	100		P	
6	996.4996	24.41	10.36	34.77	54.00	-19.23	QP	100		P	

TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	99.1797	23.67	-5.57	18.10	43.50	-25.40	QP	100		P	
2	164.3301	24.70	-3.43	21.27	43.50	-22.23	QP	100		P	
3	346.8092	24.45	0.72	25.17	46.00	-20.83	QP	100		P	
4	609.9217	24.25	4.91	29.16	46.00	-16.84	QP	100		P	
5	726.8052	24.81	5.03	29.84	46.00	-16.16	QP	100		P	
6 *	958.7943	24.76	9.30	34.06	46.00	-11.94	QP	100		P	

4.7 Emissions in frequency bands (above 1GHz)

Test Requirement:	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)).		
Test 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
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241. In the emission table above, the tighter limit applies at the band edges. The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.			
Test Method:	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02		
Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. h. Test the EUT in the lowest channel, the middle channel, the Highest channel. i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. j. Repeat above procedures until all frequencies measured was complete. Remark: 1) For emission below 1GHz, through pre-scan found the worst case is the lowest		

channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor + Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.

4.7.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22 °C	Humidity:	48.1 %	Atmospheric Pressure:	101 kPa
Pretest mode:	TM1, TM2, TM3				
Final test mode:	TM1, TM2, TM3				

4.7.2 Test Data:

TM1 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4807.000	45.16	-0.89	44.27	74.00	-29.73	peak	100		P	
2	4807.000	31.82	-0.89	30.93	54.00	-23.07	AVG	100		P	
3	7204.000	25.32	4.13	29.45	54.00	-24.55	AVG	100		P	
4	7309.750	36.65	4.29	40.94	74.00	-33.06	peak	100		P	
5 *	9366.000	26.18	8.07	34.25	54.00	-19.75	AVG	100		P	
6	9413.000	37.21	8.09	45.30	74.00	-28.70	peak	100		P	

TM1 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: L

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4807.000	57.07	-0.27	56.80	74.00	-17.20	peak	100		P	
2 *	4807.000	42.10	-0.27	41.83	54.00	-12.17	AVG	100		P	
3	7215.750	37.55	4.11	41.66	74.00	-32.34	peak	100		P	
4	7215.750	26.36	4.11	30.47	54.00	-23.53	AVG	100		P	
5	9319.000	36.42	7.82	44.24	74.00	-29.76	peak	100		P	
6	9342.500	26.23	7.84	34.07	54.00	-19.93	AVG	100		P	

TM2 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4877.500	41.67	-0.65	41.02	74.00	-32.98	peak	100		P	
2	4877.500	29.71	-0.65	29.06	54.00	-24.94	AVG	100		P	
3	7192.250	25.30	4.10	29.40	54.00	-24.60	AVG	100		P	
4	7215.750	37.28	4.14	41.42	74.00	-32.58	peak	100		P	
5	9354.250	37.34	8.06	45.40	74.00	-28.60	peak	100		P	
6 *	9377.750	26.04	8.07	34.11	54.00	-19.89	AVG	100		P	

TM2 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: M

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4877.500	48.58	-0.04	48.54	74.00	-25.46	peak	100		P	
2 *	4877.500	34.40	-0.04	34.36	54.00	-19.64	AVG	100		P	
3	7380.250	25.32	4.50	29.82	54.00	-24.18	AVG	100		P	
4	7474.250	37.28	4.73	42.01	74.00	-31.99	peak	100		P	
5	9530.500	25.09	7.97	33.06	54.00	-20.94	AVG	100		P	
6	9565.750	35.86	7.99	43.85	74.00	-30.15	peak	100		P	

TM3 / Polarization: Horizontal / Band: 2400-2483.5 MHz / BW: 1 / CH: H

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4654.250	39.82	-1.41	38.41	74.00	-35.59	peak	100		P	
2	4818.750	27.15	-0.85	26.30	54.00	-27.70	AVG	100		P	
3	6546.000	26.04	2.53	28.57	54.00	-25.43	AVG	100		P	
4	6593.000	38.80	2.66	41.46	74.00	-32.54	peak	100		P	
5	8661.000	37.27	7.42	44.69	74.00	-29.31	peak	100		P	
6 *	8661.000	25.72	7.42	33.14	54.00	-20.86	AVG	100		P	

TM3 / Polarization: Vertical / Band: 2400-2483.5 MHz / BW: 1 / CH: H

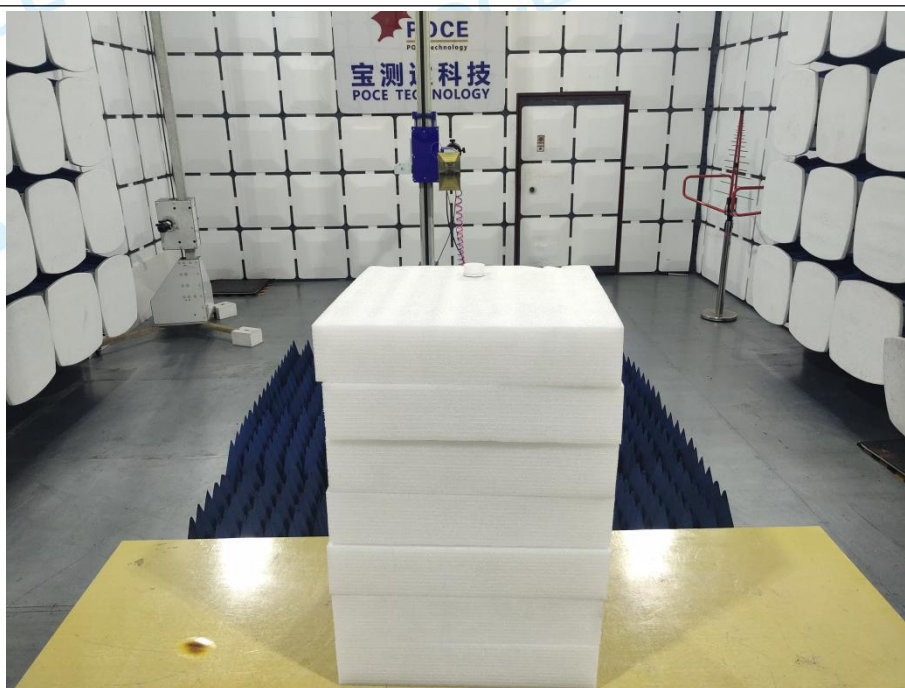
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	4959.750	50.28	0.23	50.51	74.00	-23.49	peak	100		P	
2 *	4959.750	36.00	0.23	36.23	54.00	-17.77	AVG	100		P	
3	7627.000	25.04	5.10	30.14	54.00	-23.86	AVG	100		P	
4	7638.750	36.65	5.12	41.77	74.00	-32.23	peak	100		P	
5	9518.750	25.35	7.96	33.31	54.00	-20.69	AVG	100		P	
6	9530.500	36.45	7.97	44.42	74.00	-29.58	peak	100		P	

5 TEST SETUP PHOTOS

Emissions in frequency bands (below 1GHz)



Emissions in frequency bands (above 1GHz)



6 PHOTOS OF THE EUT

External

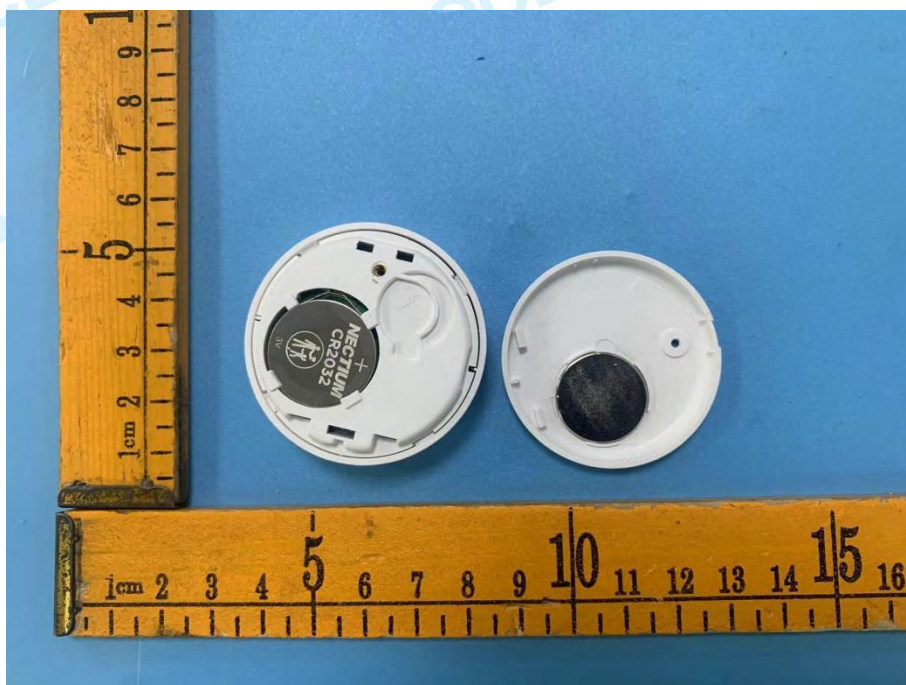


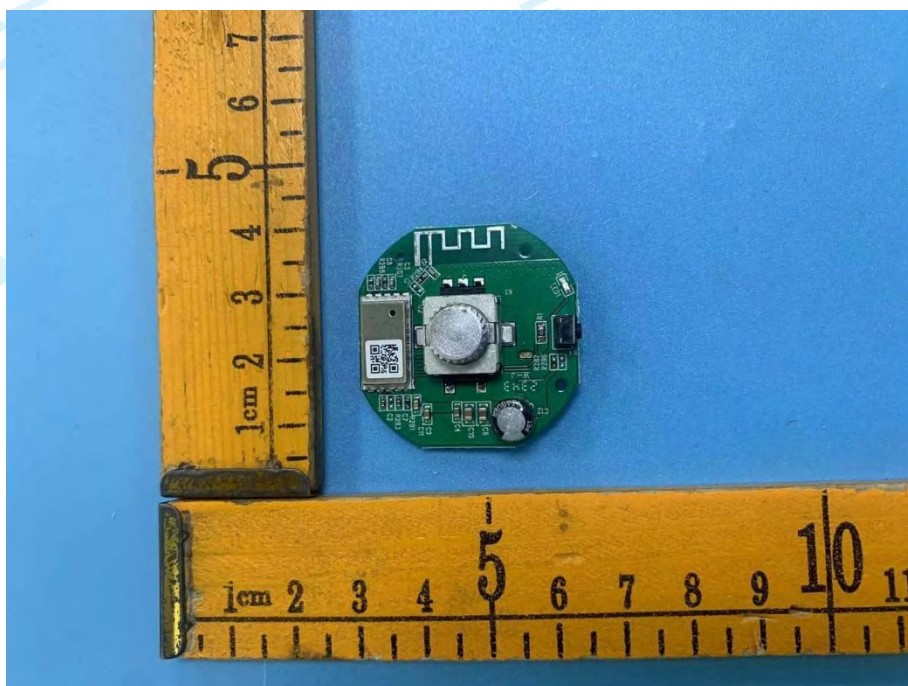


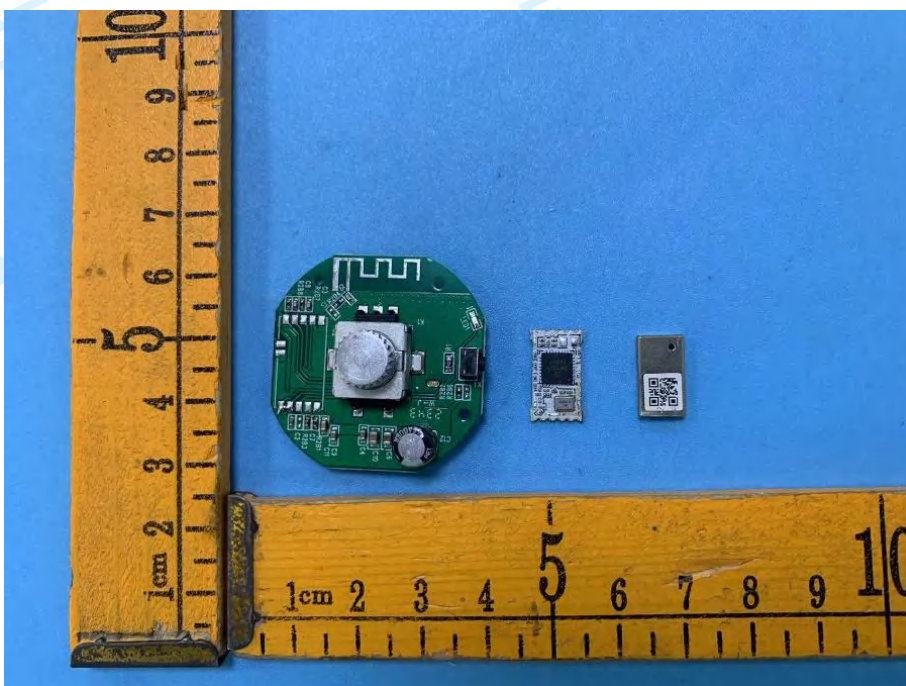
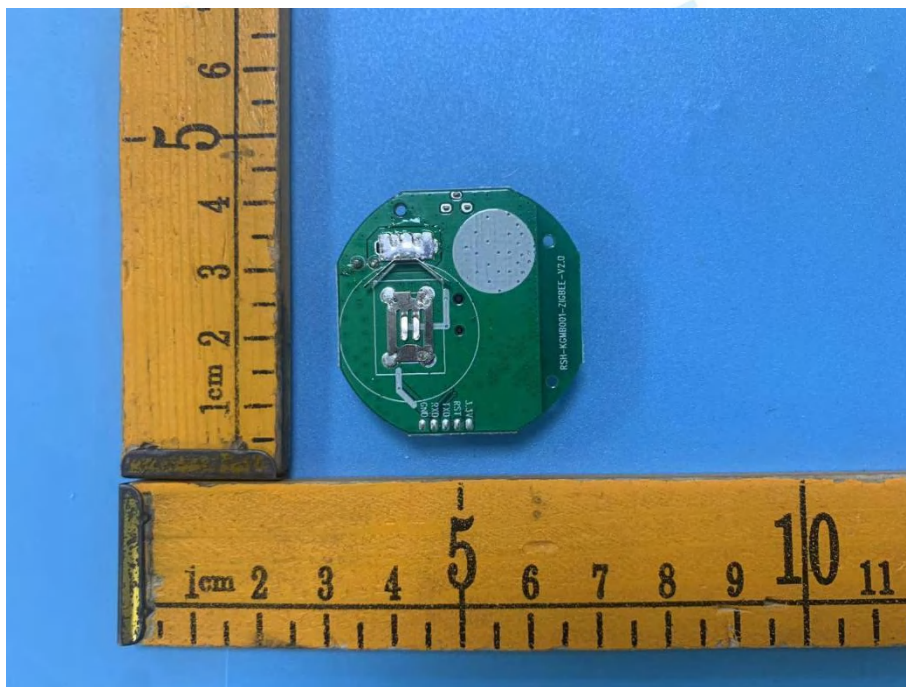


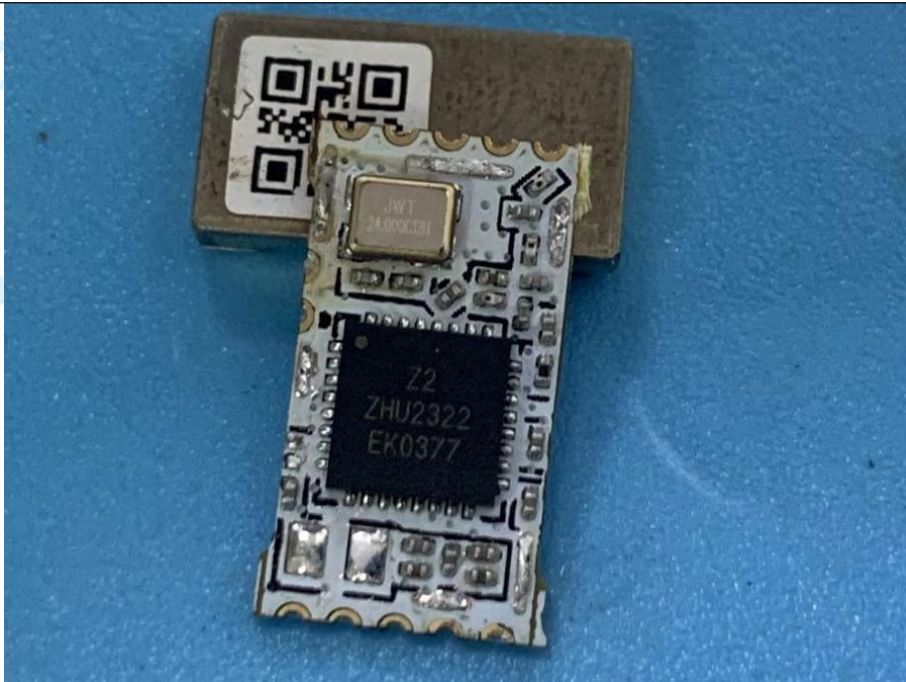
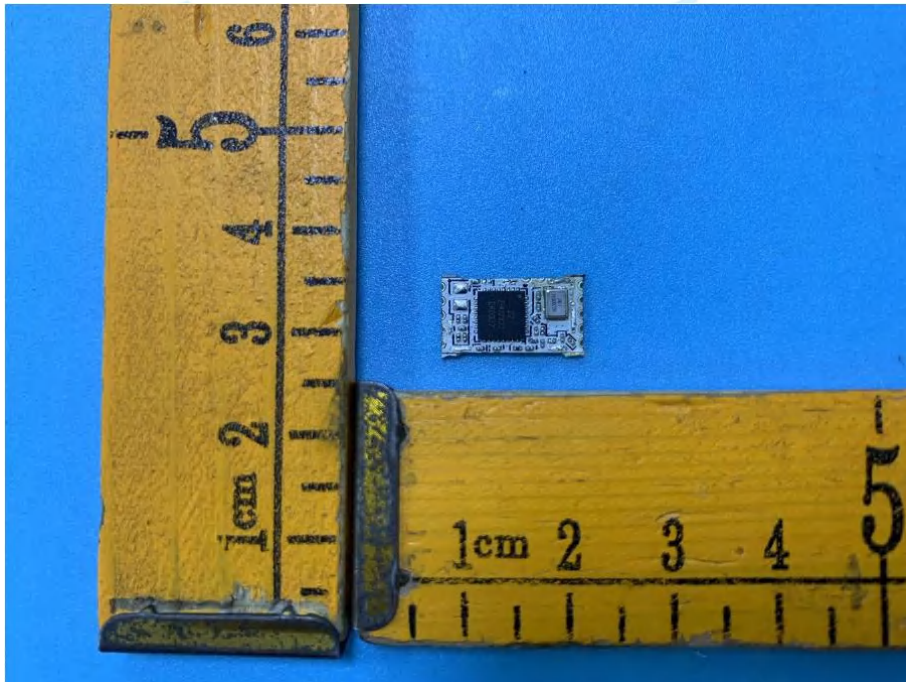


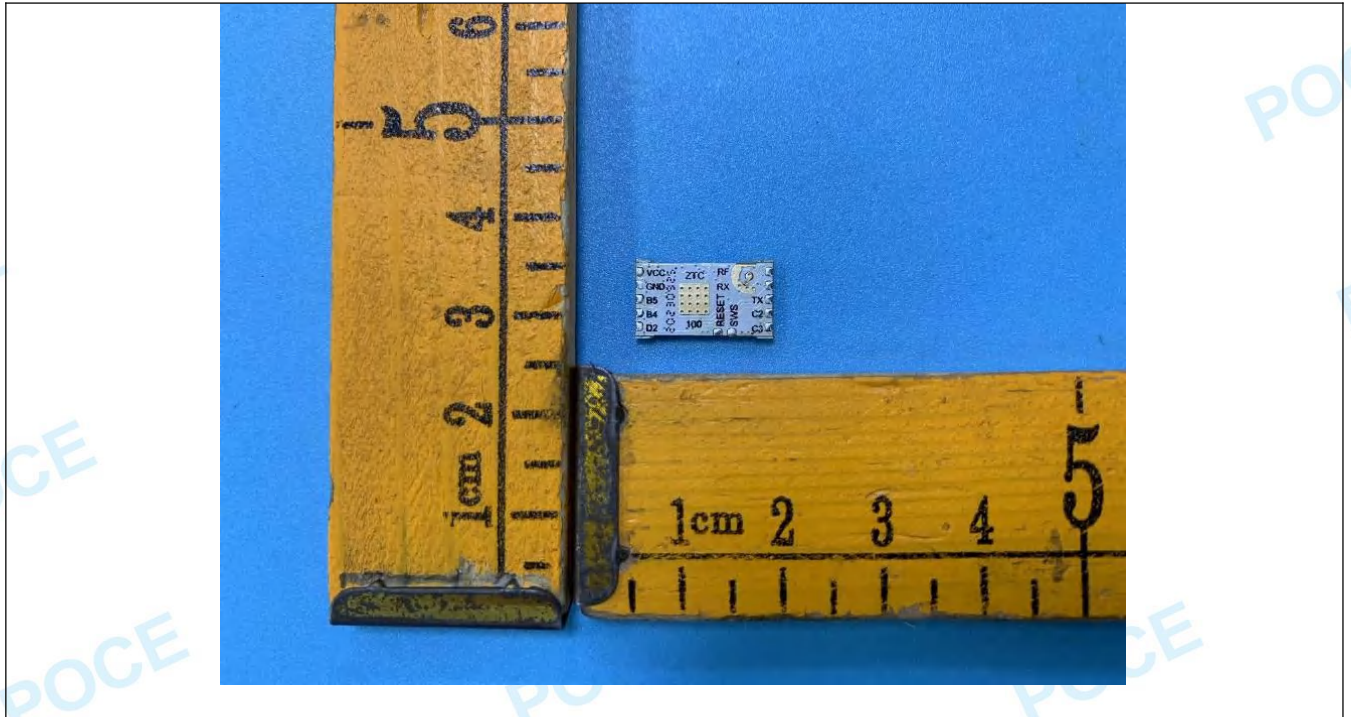
Internal













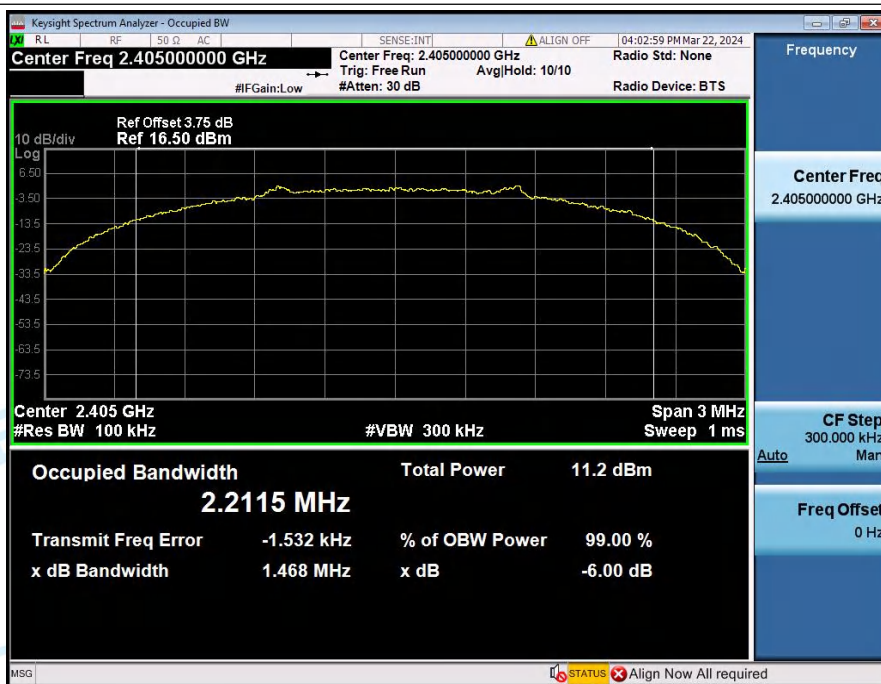
Appendix

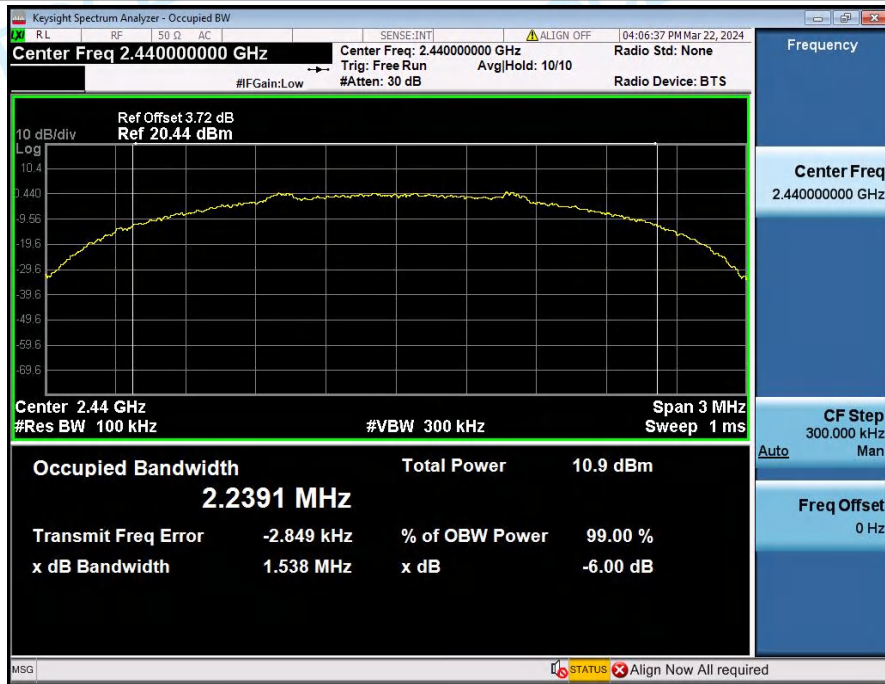
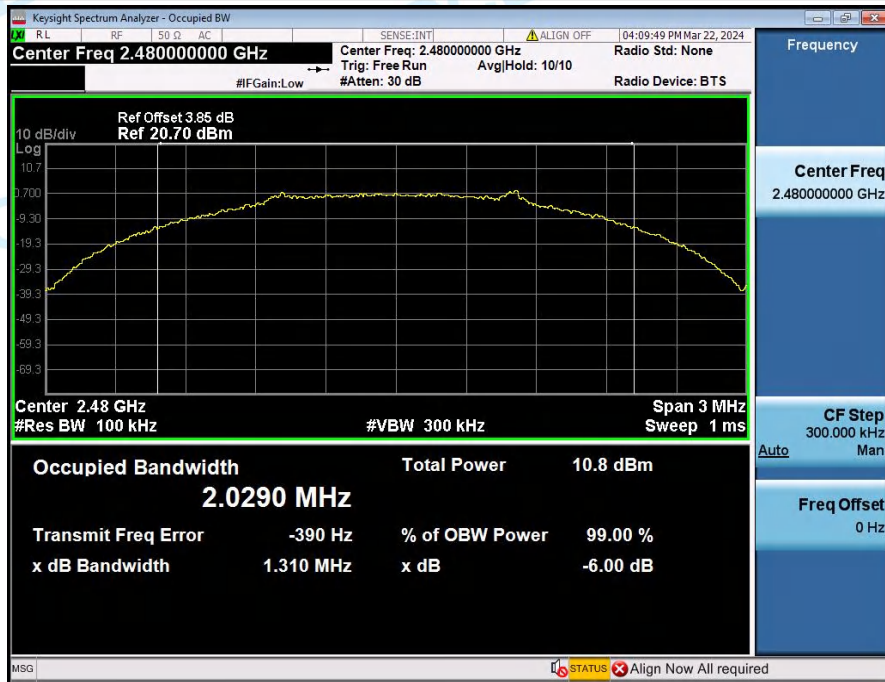
HT240322004--RSH-SC20--Zigbee--FCC FCC_BLE (Part15.247) Test Data

1. -6dB Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	-6dB BW(kHz)	limit(kHz)	Result
NVNT	ANT1	1Mbps	2405.00	1467.57	500	Pass
NVNT	ANT1	1Mbps	2440.00	1537.94	500	Pass
NVNT	ANT1	1Mbps	2480	1310.21	500	Pass

-6dB_Bandwidth_NVNT_ANT1_1Mbps_2405

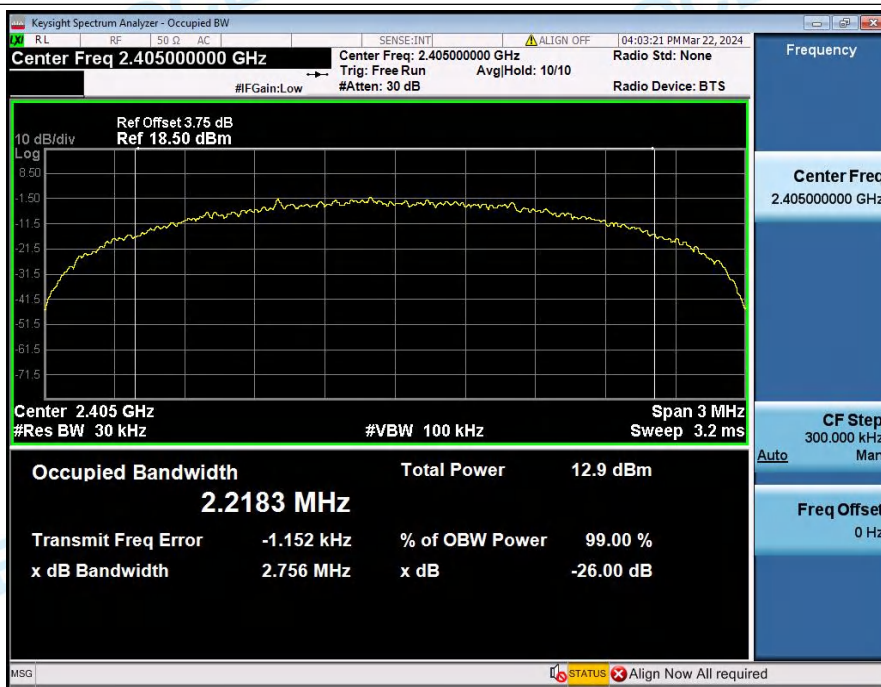


-6dB_Bandwidth_NVNT_ANT1_1Mbps_2440**-6dB_Bandwidth_NVNT_ANT1_1Mbps_2480**

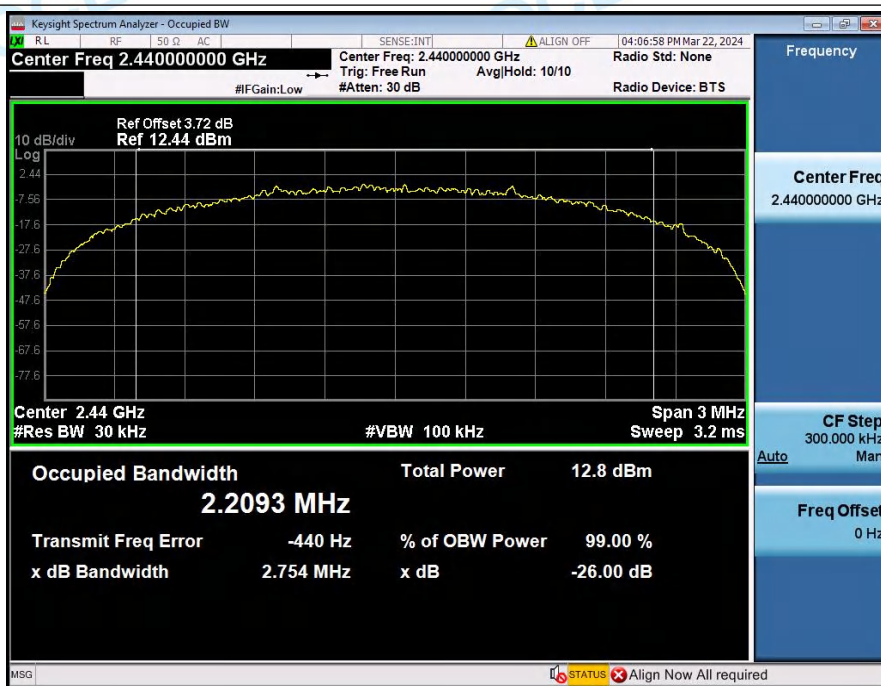
2. 99% Occupied Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	99% BW(MHz)
NVNT	ANT1	1Mbps	2405.00	2.218
NVNT	ANT1	1Mbps	2440.00	2.209
NVNT	ANT1	1Mbps	2480	2.022

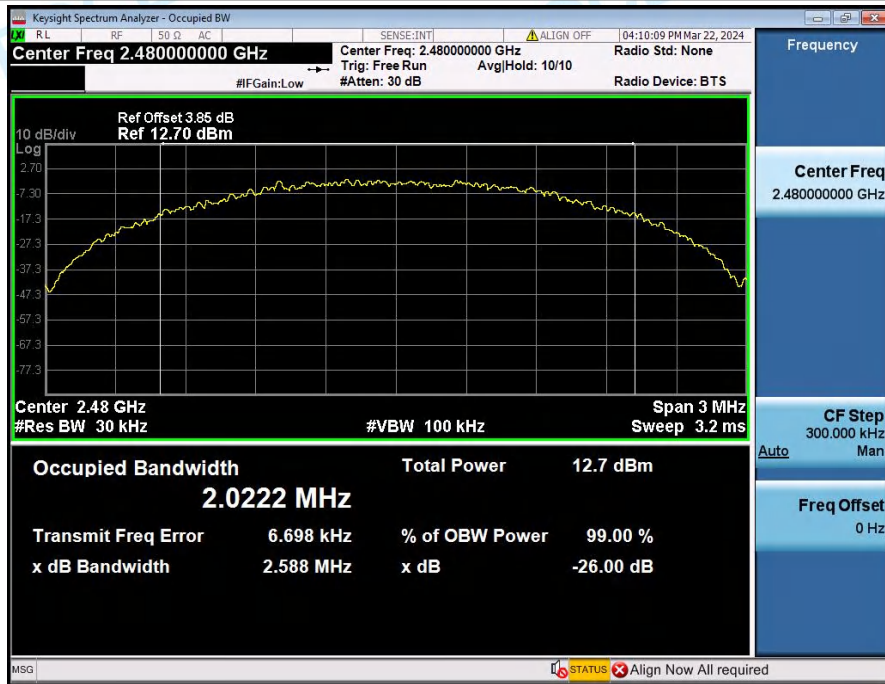
99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2405



99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2440



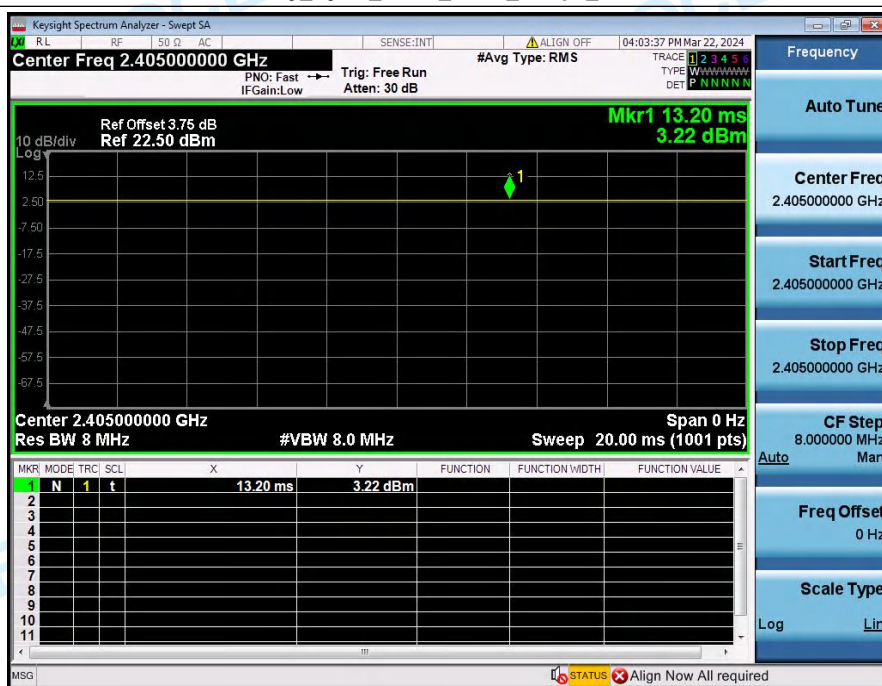
99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2480



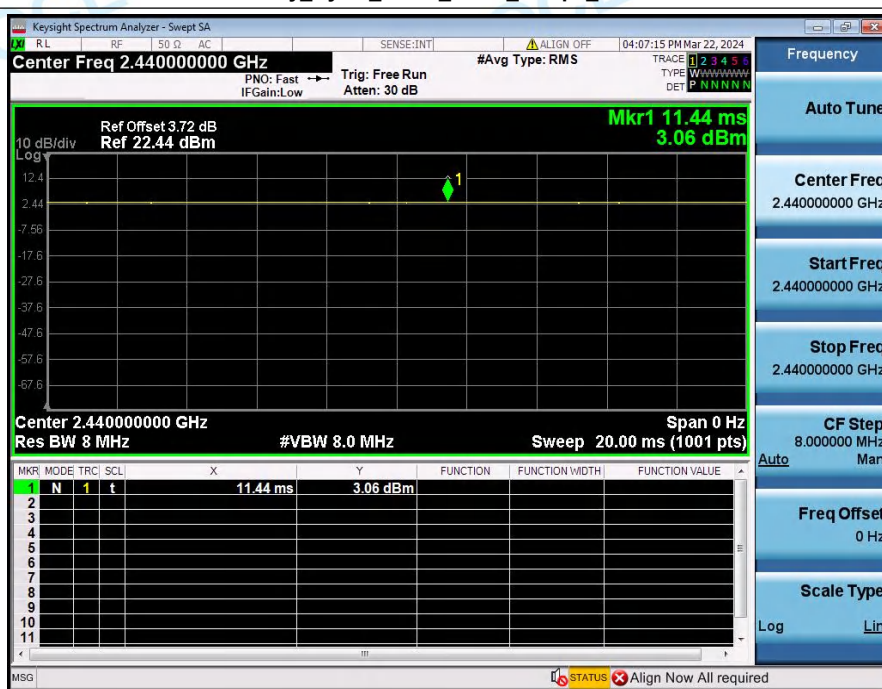
3. Duty Cycle

Condition	Antenna	Rate	Frequency (MHz)	Dutycycle(%)	Duty_factor
NVNT	ANT1	1Mbps	2405.00	100	0.00
NVNT	ANT1	1Mbps	2440.00	100	0.00
NVNT	ANT1	1Mbps	2480	100	0.00

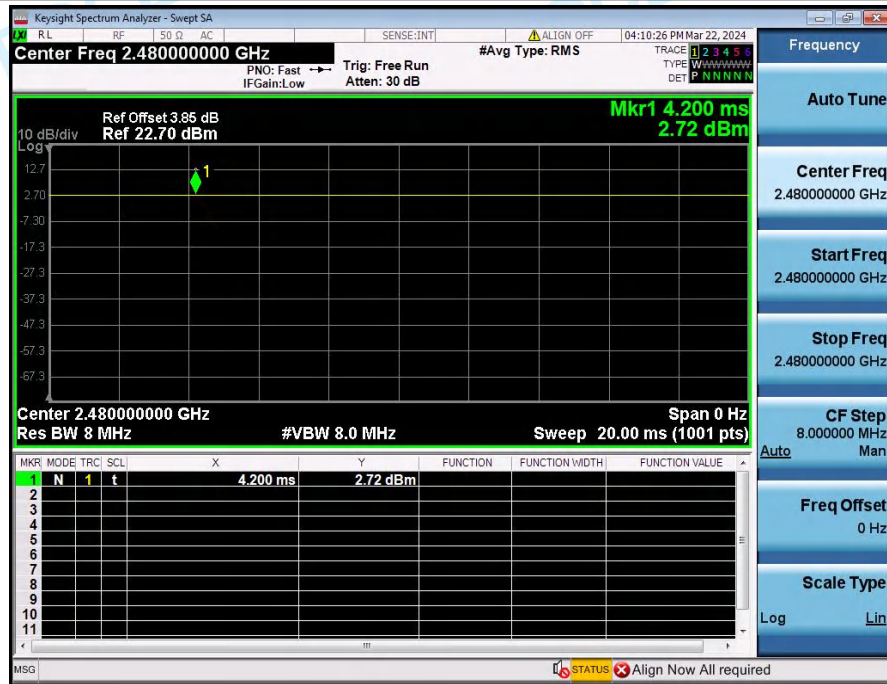
Duty_Cycle_NVNT_ANT1_1Mbps_2405



Duty_Cycle_NVNT_ANT1_1Mbps_2440



Duty_Cycle_NVNT_ANT1_1Mbps_2480



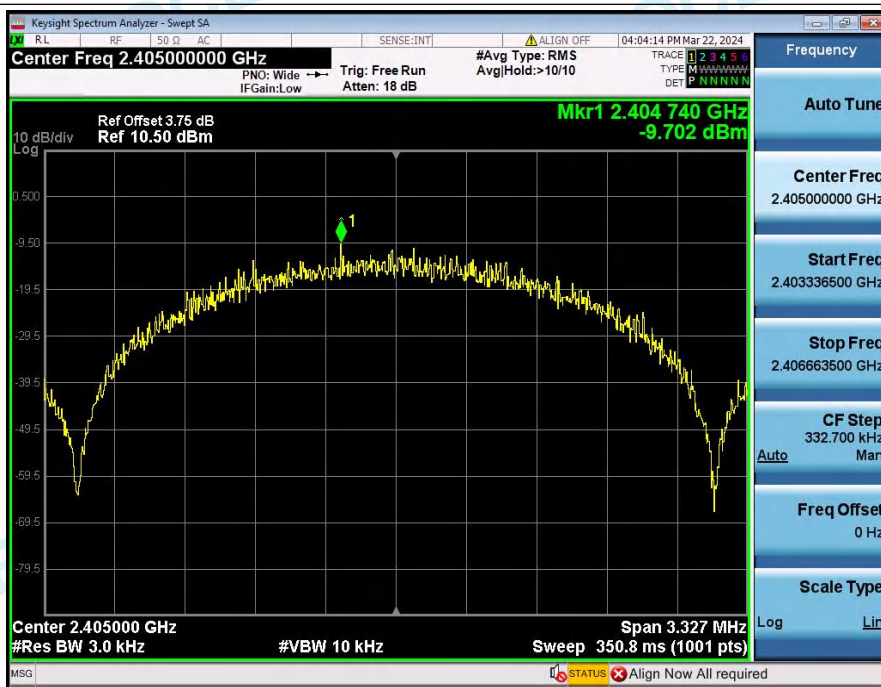
Peak_Output_Power_NVNT_ANT1_1Mbps_2480



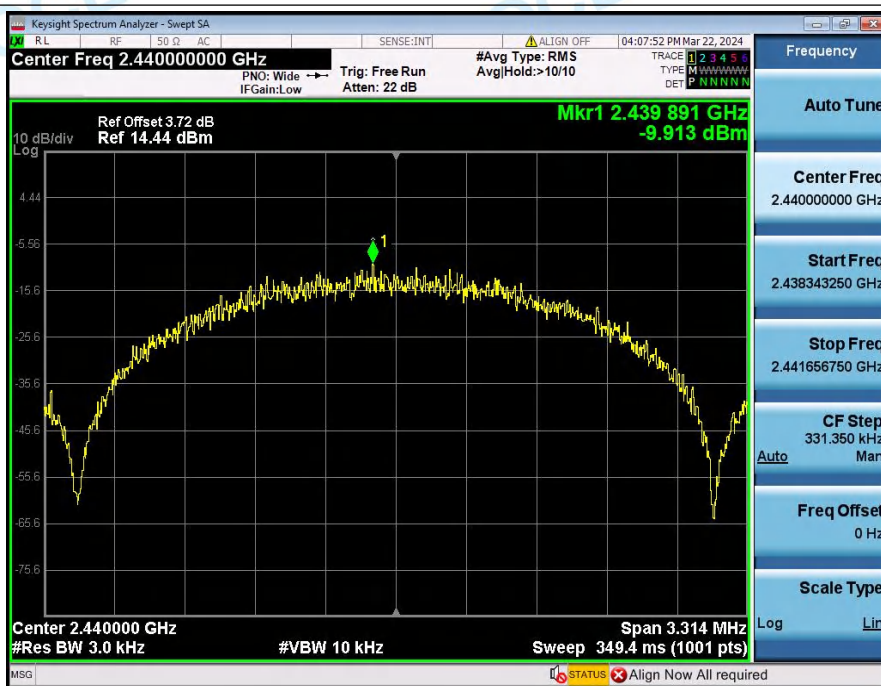
5. Power Spectral Density

Condition	Antenna	Rate	Frequency (MHz)	Power Spectral Density(dBm)	Limit(dBm/3kHz)	Result
NVNT	ANT1	1Mbps	2405.00	-9.70	8	Pass
NVNT	ANT1	1Mbps	2440.00	-9.91	8	Pass
NVNT	ANT1	1Mbps	2480	-9.89	8	Pass

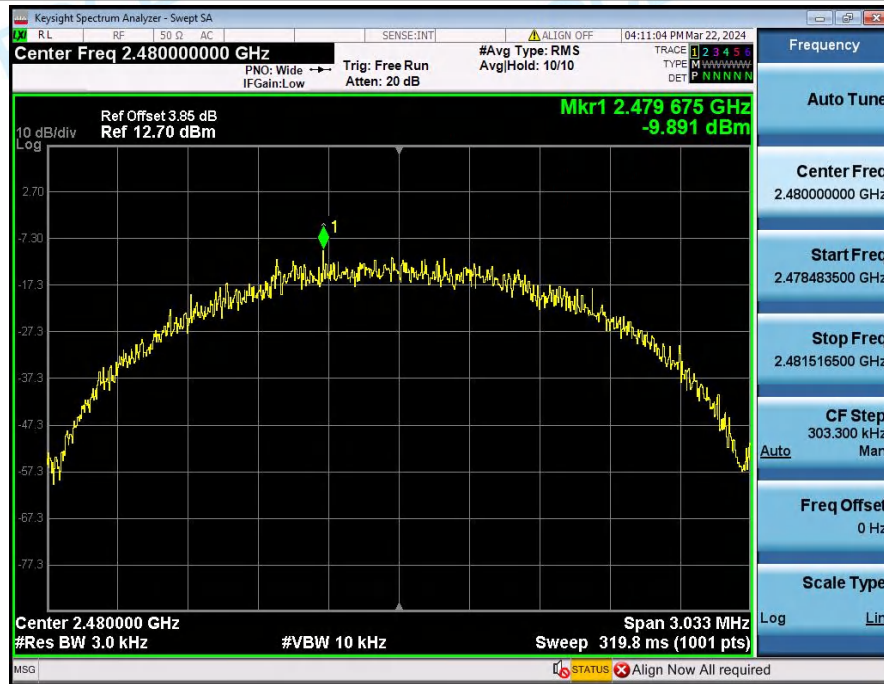
Power_Spectral_Density_NVNT_ANT1_1Mbps_2405



Power_Spectral_Density_NVNT_ANT1_1Mbps_2440



Power_Spectral_Density_NVNT_ANT1_1Mbps_2480



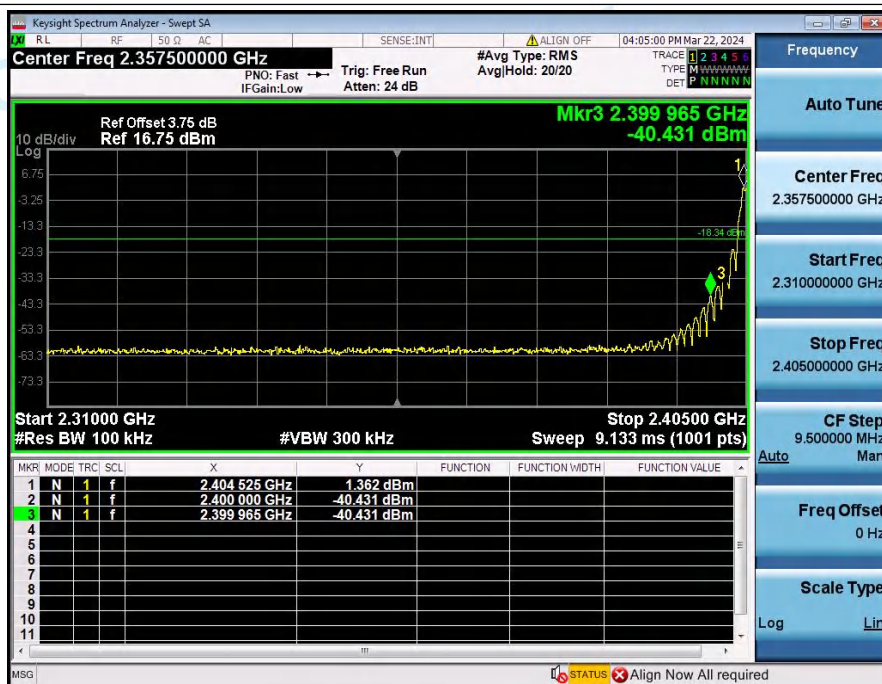
6. Bandedge

Condition	Antenna	Rate	TX_Frequency (MHz)	Max. Mark Frequency (MHz)	Spurious level(dBm)	limit(dBm)	Result
NVNT	ANT1	1Mbps	2405.00	2399.965	-40.431	-18.342	Pass
NVNT	ANT1	1Mbps	2480	2487.425	-58.485	-18.580	Pass

1_Reference_Level_NVNT_ANT1_1Mbps_2405



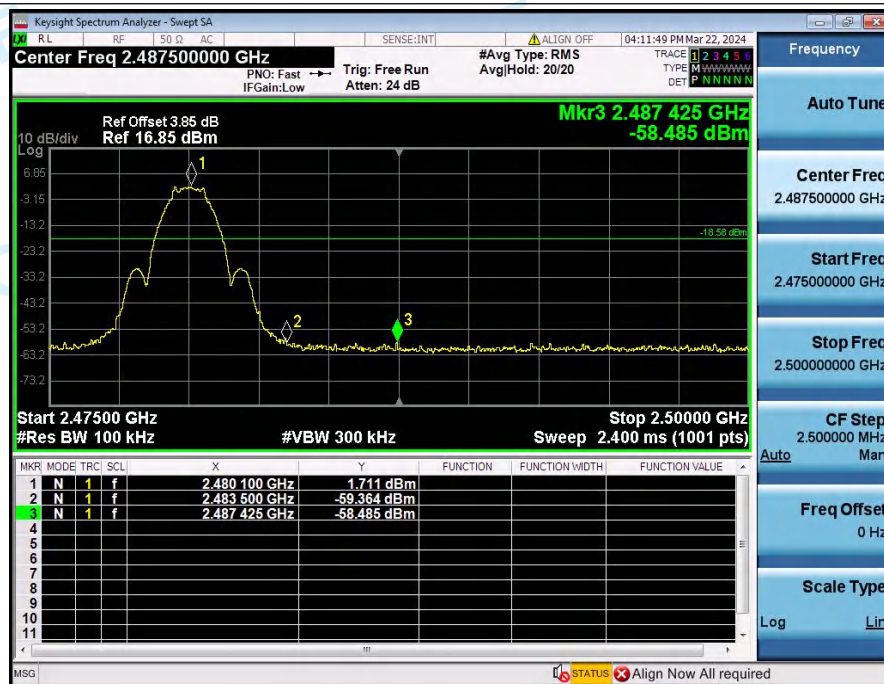
2_Bandedge_NVNT_ANT1_1Mbps_2405



1_Reference_Level_NVNT_ANT1_1Mbps_2480



2_Bandedge_NVNT_ANT1_1Mbps_2480



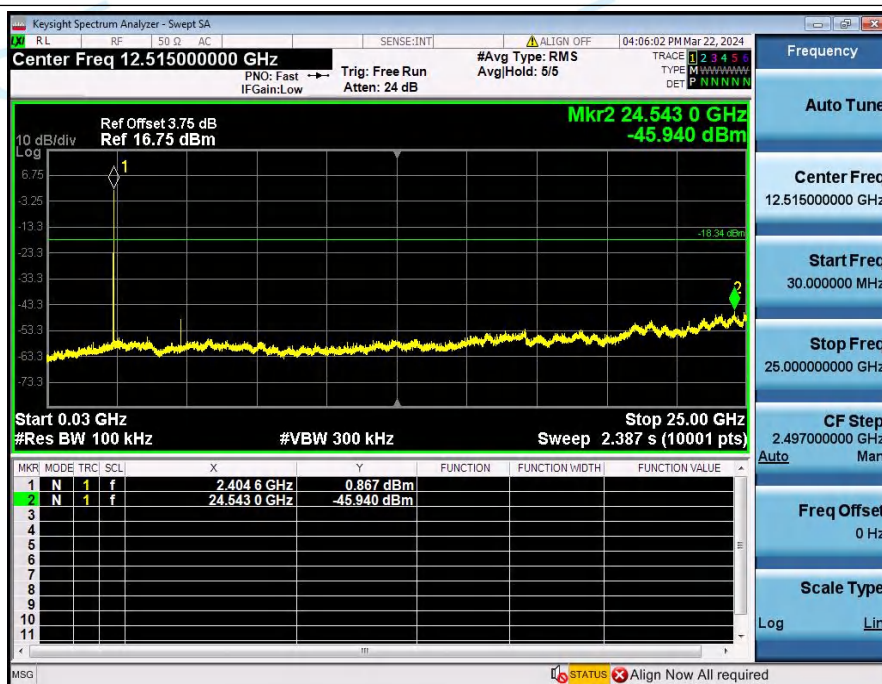
7. Spurious Emission

Condition	Antenna	Rate	TX_Frequency(MHz)	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1Mbps	2405.00	-45.940	-18.342	Pass
NVNT	ANT1	1Mbps	2440.00	-45.271	-18.584	Pass
NVNT	ANT1	1Mbps	2480	-46.734	-18.580	Pass

1_Reference_Level_NVNT_ANT1_1Mbps_2405



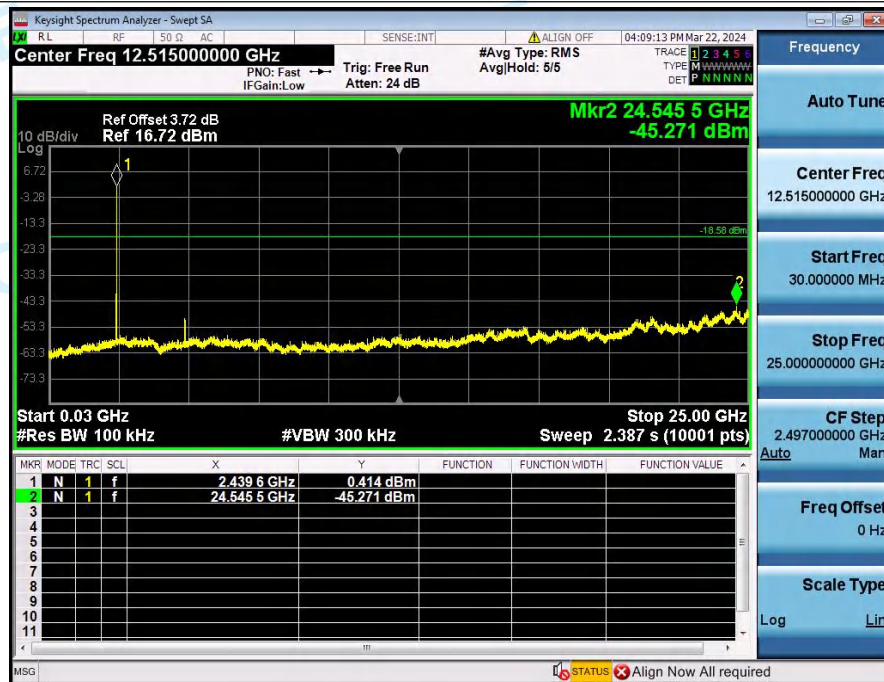
2_Spurious_Emission_NVNT_ANT1_1Mbps_2405



1_Reference_Level_NVNT_ANT1_1Mbps_2440



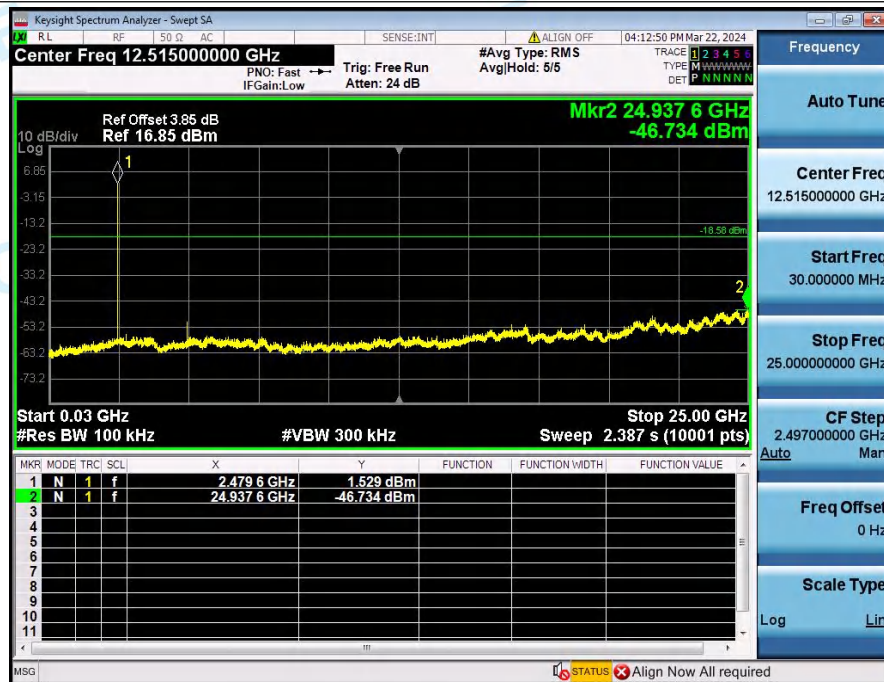
2_Spurious_Emission_NVNT_ANT1_1Mbps_2440



1_Reference_Level_NVNT_ANT1_1Mbps_2480



2_Spurious_Emission_NVNT_ANT1_1Mbps_2480



***** End of Report *****