RF TEST REPORT

For

Lorenz High Definition LLC
Product Name: Motion Sensor
Test Model(s).: ZSE18 800LR

Report Reference No.	:	**POCE231116018RL002**
FCC ID	:	**2AZ2V-ZSE18800**
Applicant's Name	:	Lorenz High Definition LLC
Address	:	230 Rt 206 STE 401, Flanders, New Jersey United States 07836
Testing Laboratory	:	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
Test Specification Standard	:	**47 CFR Part 15.247 & ANSI C63.10-2013**
Date of Receipt	:	November 16, 2023
Date of Test	:	November 16, 2023 to December 15, 2023
Data of Issue	:	December 15, 2023
Result	:	**Pass**

Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	POCE231116018RL002	December 15, 2023

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.

Compiled by:	Supervised by:	Approved by:
Keren Huang	Stone Yin	Tom chen
Keren Huang / Test Engineer	Stone Yin / Project Engineer	Tom Chen / Manager

CONTENTS

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	Method	Requirement	Result
Antenna requirement	/	47 CFR 15.203	Pass
Conducted Emission at AC power line	ANSI C63.10-2013 section 6.2	47 CFR 15.207(a)	Pass
Occupied Bandwidth	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	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	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	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)	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)	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)	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

Note: 1.N/A -this device(EUT) is not applicable to this testing item
2. RF-conducted test results including cable loss.

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : Lorenz High Definition LLC
Address : 230 Rt 206 STE 401, Flanders, New Jersey United States 07836

Manufacturer : Lorenz High Definition LLC
Address : 230 Rt 206 STE 401, Flanders, New Jersey United States 07836

2.2 Description of Device (EUT)

Product Name:	Motion Sensor
Sample number:	231116007-1
Model/Type reference:	ZSE18 800LR
Trade Mark:	ZOOZ
Power Supply:	DC3.0V from battery / DC5.0V charging from USB port
Operation Frequency:	912.0--920.0MHz
Number of Channels:	2
Modulation Type:	DSSS/ OQPSK
Antenna Type:	external antenna
Antenna Gain:	-3.70dBi Max
Hardware Version:	V2.0
Software Version:	V1.0

Operation Frequency each of channel			
Channel	Frequency	Channel	Frequency
1	912.00 MHz	2	920.00 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	912.00MHz
Highest channel	920.00MHz

2.3 Description of Test Modes

No	**Title**	**Description**
TM1	912.0MHz	Keep the EUT connect to power and works in 912.0MHz continuously transmitting mode .
TM2	920.0MHz	Keep the EUT connect to power and works in 920.0MHz continuously transmitting mode .
Description		
☒Special software is used. ☐Through engineering command into the engineering mode. engineering command: *#*#3646633#*#* ☐Other method:		

Special software:

2.4 Description of Support Units

Title	Manufacturer	Model No.	Remark
ADAPTER	PHOTON	ATXC-069AC65B	Provide by lab

2.5 Equipments Used During The Test

Conducted Emission at AC power line					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal. Due Date**
Shielding room	CY	8*4*3	20160102	2023/1/26	2025/1/25
Pulse Limiter	Schwarzbeck	VTSD 9561	561-G071	2023/2/27	2024/2/26
Cable	Schwarzbeck	/	/	2023/2/27	2024/2/26
Test Receiver	Rohde & Schwarz	ESPI	1164.6607K03-102109-MH	2023/6/13	2024/6/12
L.I.S.N	R&S	ESH3-Z5	831.5518.52	2022/12/29	2023/12/28
L.I.S.N	Schwarzbeck	NSLK 8126	NSLK 8126	2023/8/8	2024/8/7
50ΩCoaxial Switch	Anritsu	MP59B	M20531	/	/
EMI Testsoftware	Farad	EZ -EMC	V1.1.42	/	/

Emissions in restricted frequency bands and RF					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Test Receiver	R&S	ESCI	102109	2023/6/13	2024/6/12
Spectrum Analyzer	R&S	FSP30	1321.3008K40-101729-jR	2023/6/14	2024/6/13
966 Chamber	CY	9*6*6	20160101	2023/1/26	2025/1/25
Bore-sighting Antenna rack	PBB	1308503	16033	/	/
Loop antenna	ZHINAN	ZN30900C	ZN30900C	2021/7/5	2024/7/4
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	2023/5-21	2025/5-20
Horn Antenna	Sunol Sciences	DRH-118	A091114	2023/5/13	2025/5/12
Horn antenna	COM-POWER	AH-1840(40G)	10100008	2023/4/5	2025/4/4
Power APM(LF)	Schwarzbeck	BBV9743	9743-151	2023/6/13	2024/6/12
Power APM(HF)	Schwarzbeck	BBV9718	9718-282	2023/6/13	2024/6/12
Cable(LF)#2	Schwarzbeck	/	/	2023/2/27	2024/2/26
Cable(LF)#1	Schwarzbeck	/	/	2023/2/27	2024/2/26
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2023/2/28	2024/2/27
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2023/2/27	2024/2/26
Power divider	MIDEWEST	PWD-2533	SMA-79	2023/5/11	2026/5/10
signal generator	Keysight	N5181A	MY48180415	2022/12/10	2023/12/9
signal generator	Keysight	N5182A	MY50143455	2022/12/29	2023/12/28
Spectrum Analyzer	Keysight	N9020A	MY53420323	2022/12/29	2023/12/28
RF Sensor Unit	TACHOY	TR1029-2	000001	/	/
RF Control Unit	TACHOY	TR1029-1	000001	/	/
Position Controller	MF	MF-7802	/	/	/
EMI Testsoftware	Farad	EZ -EMC	V1.1.42	/	/
RF TestSoftware	TACHOY	RTS-01	V2.0.0.0	/	/

2.6 Statement Of The Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Disturbance (0.15~30MHz)	±3.41dB
Occupied Bandwidth	±3.63%
RF conducted power	±0.733dB
RF power density	±0.234%
Conducted Spurious emissions	±1.98dB
Radiated Emission (Above 1GHz)	±5.46dB
Radiated Emission (Below 1GHz)	±5.79dB
Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

2.7 Authorizations

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 No.:	778666
A2LA Certificate Number:	6270.01

2.8 Announcement

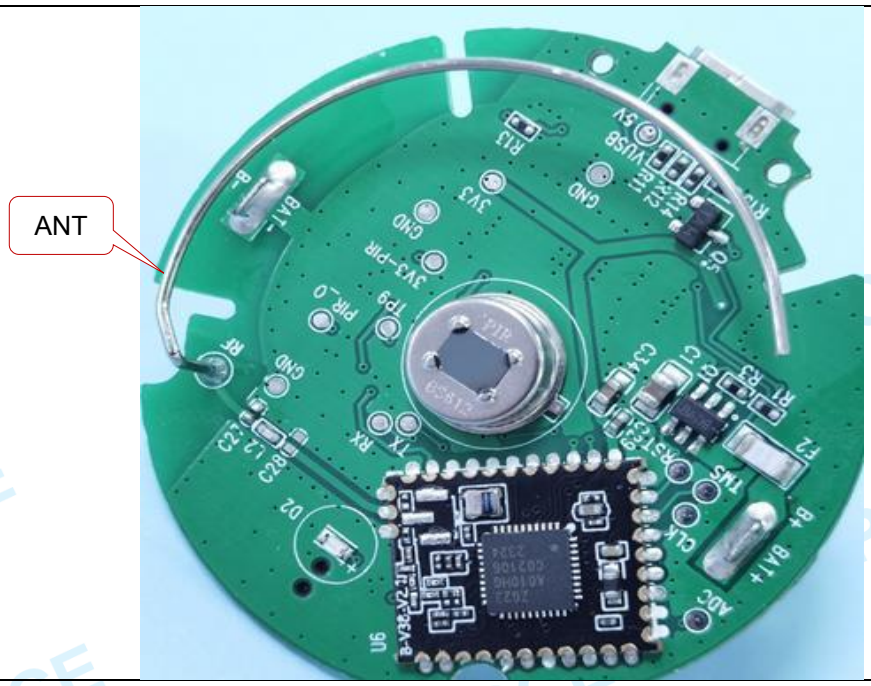
(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document 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) We hereby declare that the laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant. the laboratory is not responsible for the accuracy of the information provided by the client. When the information provided by the customer may affect the effectiveness of the results, the responsibility lies with the customer, and the laboratory does not assume any responsibility.

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.

3.1.1 Conclusion:



4 Radio Spectrum Matter Test Results (RF)

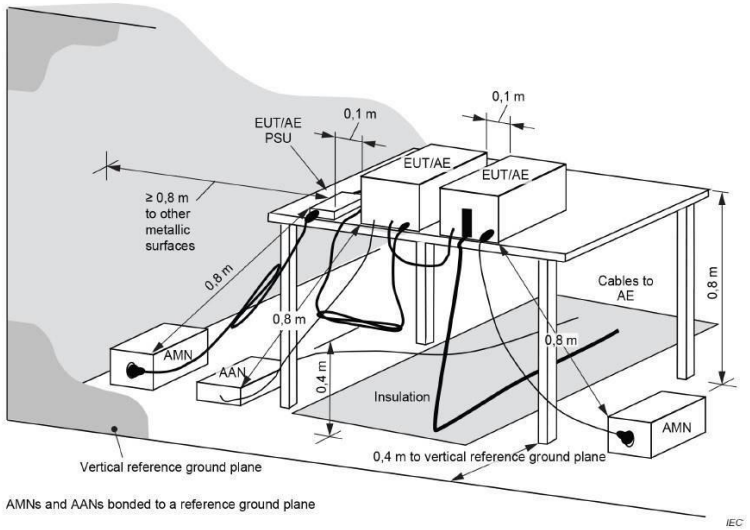
4.1 Conducted Emission at AC power line

Test Requirement:	Refer to 47 CFR 15.207(a), Except as shown in paragraphs (b)and (c)of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).
Test 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.
Test Method:	ANSI C63.10-2013 section 6.2
Procedure:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.1 E.U.T. Operation:

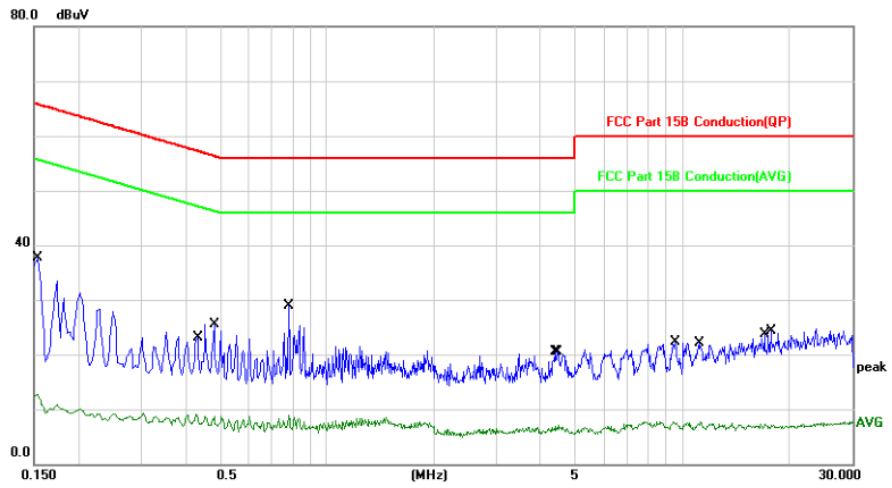
Operating Environment:					
Temperature:	22.5 °C	Humidity:	50.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1,TM2				
Final test mode:	TM1(worse case)				

4.1.2 Test Setup Diagram:



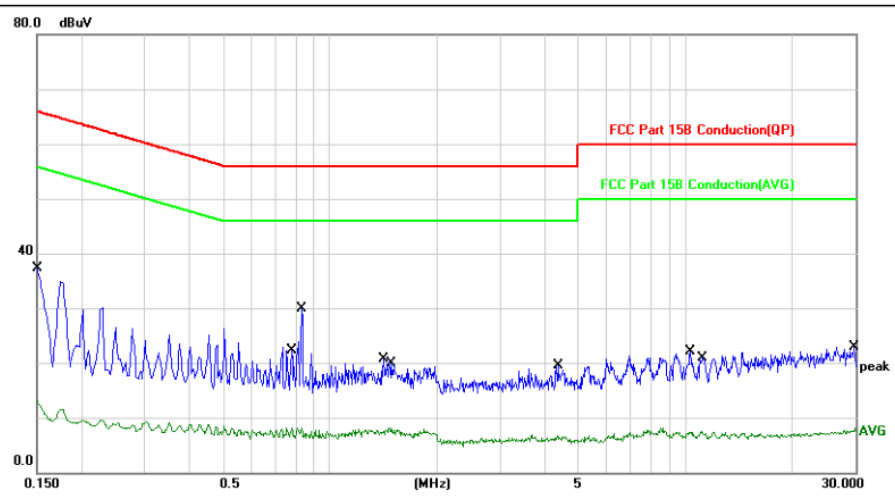
4.1.3 Test Data:

TM1 / Line: Line / Band: 902-928 MHz / BW: 1 / CH: L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1539	27.84	9.95	37.79	65.78	-27.99	QP	
2		0.1539	2.78	9.95	12.73	55.78	-43.05	AVG	
3		0.4300	-0.87	9.89	9.02	47.25	-38.23	AVG	
4		0.4820	15.71	9.88	25.59	56.30	-30.71	QP	
5	*	0.7820	18.97	9.85	28.82	56.00	-27.18	QP	
6		0.7820	-0.90	9.85	8.95	46.00	-37.05	AVG	
7		4.3699	10.77	9.75	20.52	56.00	-35.48	QP	
8		4.4939	-2.73	9.74	7.01	46.00	-38.99	AVG	
9		9.5219	12.91	9.35	22.26	60.00	-37.74	QP	
10		11.2139	-1.36	9.09	7.73	50.00	-42.27	AVG	
11		17.0978	-0.81	8.03	7.22	50.00	-42.78	AVG	
12		17.7259	16.28	7.92	24.20	60.00	-35.80	QP	

TM1 / Line: Neutral / Band: 902-928 MHz / BW: 1 / CH: L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	27.45	9.95	37.40	65.99	-28.59	QP	
2		0.1500	3.10	9.95	13.05	55.99	-42.94	AVG	
3		0.7820	-1.66	9.85	8.19	46.00	-37.81	AVG	
4	*	0.8340	19.98	9.84	29.82	56.00	-26.18	QP	
5		1.4140	10.94	9.79	20.73	56.00	-35.27	QP	
6		1.4940	-1.69	9.78	8.09	46.00	-37.91	AVG	
7		4.3460	-3.08	9.75	6.67	46.00	-39.33	AVG	
8		4.3740	9.69	9.75	19.44	56.00	-36.56	QP	
9		10.3300	12.93	9.25	22.18	60.00	-37.82	QP	
10		11.0340	-1.61	9.12	7.51	50.00	-42.49	AVG	
11		29.8260	16.12	6.81	22.93	60.00	-37.07	QP	
12		29.8700	1.33	6.80	8.13	50.00	-41.87	AVG	

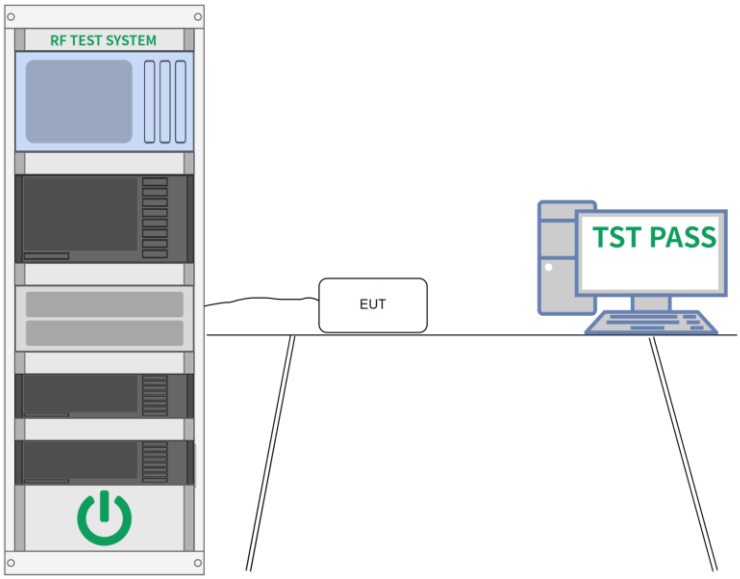
4.2 Occupied Bandwidth

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 >= [3 × 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.

4.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	51.2 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2				
Final test mode:	TM1, TM2				

4.2.2 Test Setup Diagram:



4.2.3 Test Data:

Please Refer to Appendix for Details.

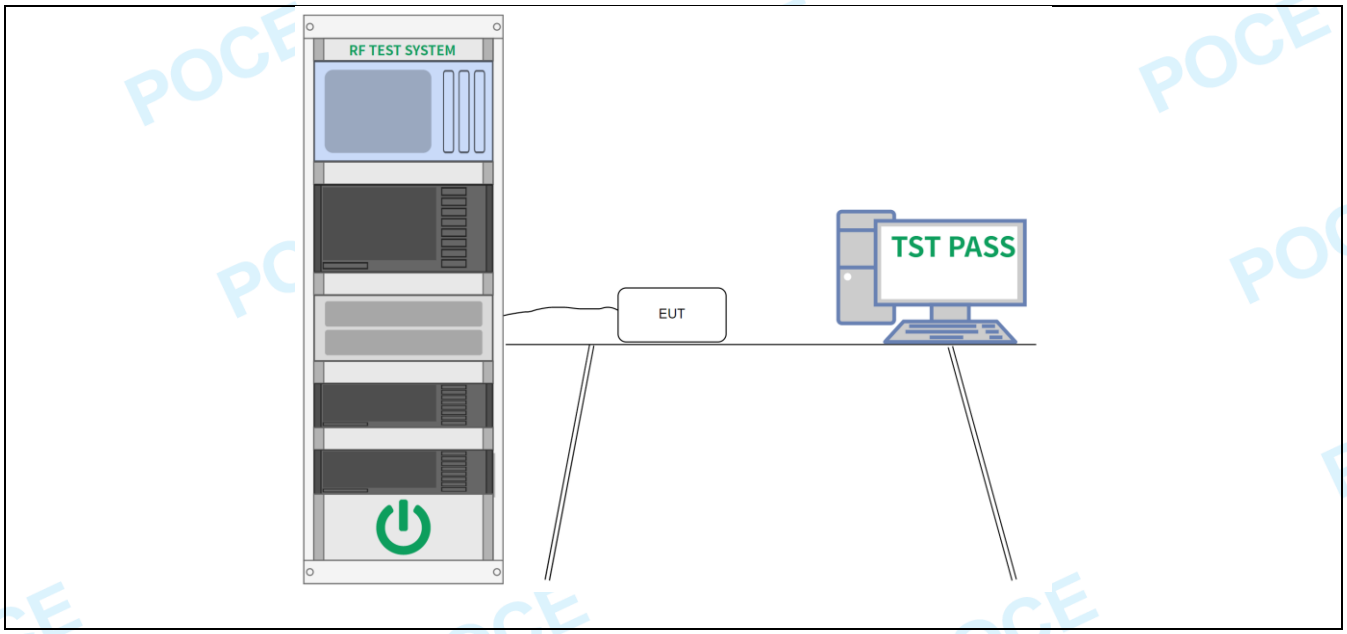
4.3 Maximum Conducted Output Power

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 antnnas, the conducted powers at Core 0, Core 1,…, Core i were first measured separately, as shown in the section above(this product olny 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*log[(10G1/20 + 10G2/20 + … + 10GN/20)2 / NANT] dBi For completely uncorrelated unequal antenna gain Directional gain = 10*log[(10G1/10 + 10G2/10 + … + 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)

4.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	51.2 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2				
Final test mode:	TM1, TM2				

4.3.2 Test Setup Diagram:



4.3.3 Test Data:

Please Refer to Appendix for Details.

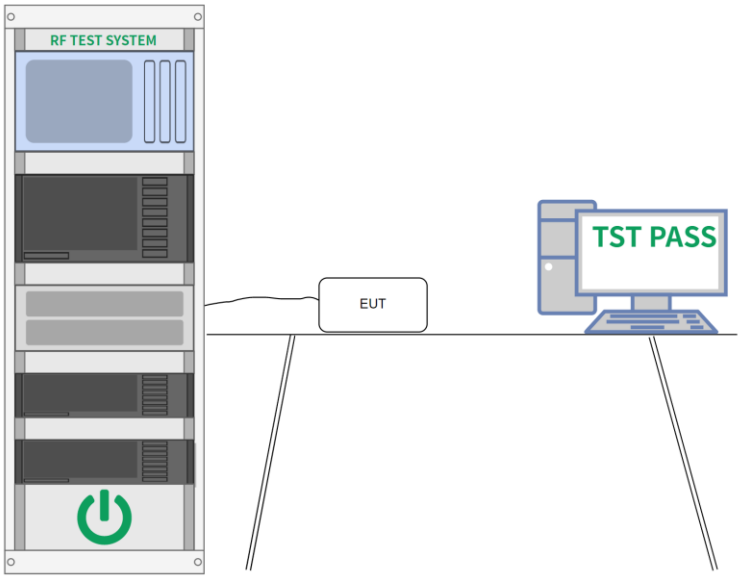
4.4 Power Spectral Density

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

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	51.2 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2				
Final test mode:	TM1, TM2				

4.4.2 Test Setup Diagram:



4.4.3 Test Data:

Please Refer to Appendix for Details.

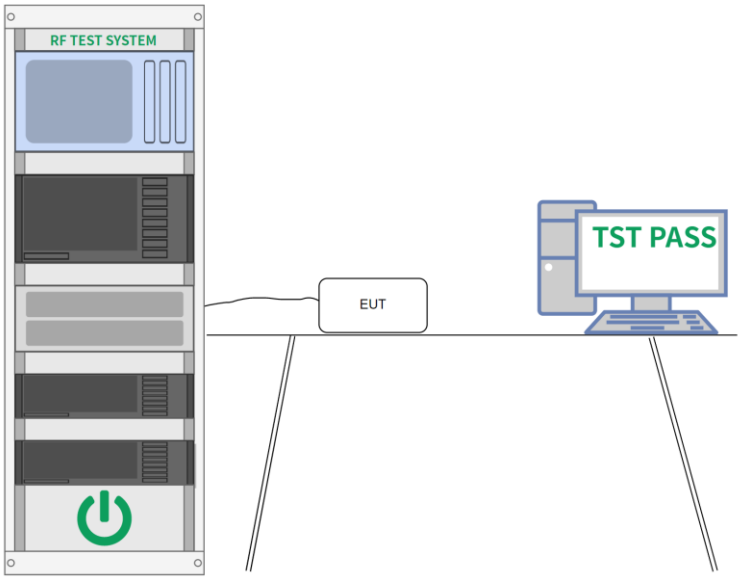
4.5 Emissions in non-restricted frequency bands

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

4.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.4 °C	Humidity:	51.2 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2				
Final test mode:	TM1, TM2				

4.5.2 Test Setup Diagram:



4.5.3 Test Data:

Please Refer to Appendix for Details.

4.6 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

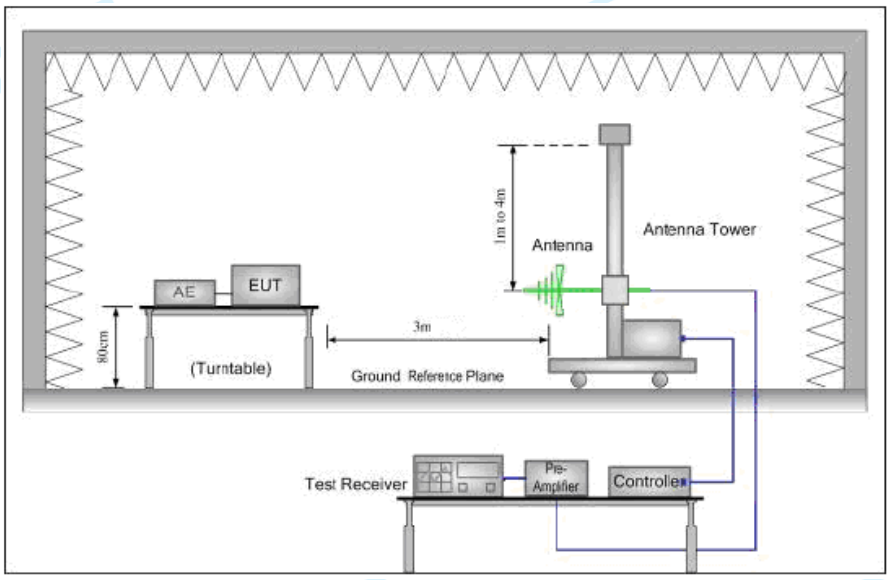
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this 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

4.6.1 E.U.T. Operation:

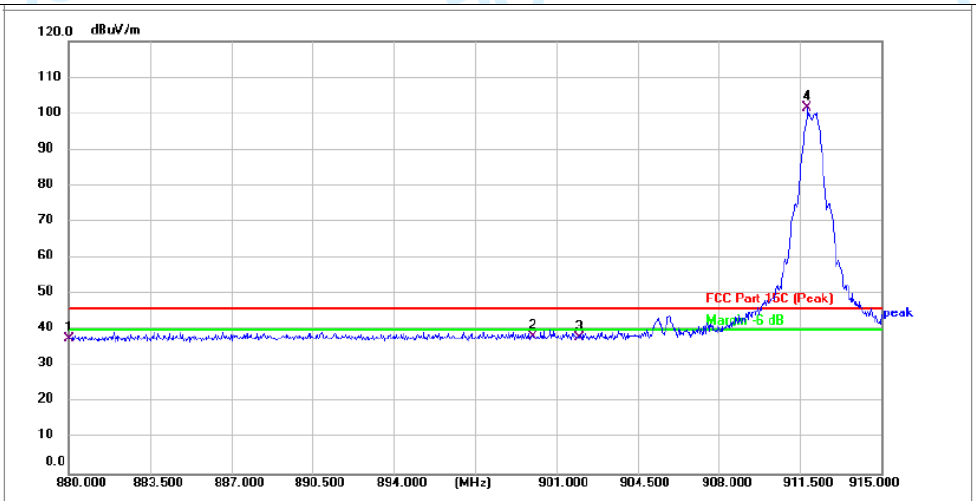
Operating Environment:					
Temperature:	22.4 °C	Humidity:	51.2 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2				
Final test mode:	TM1, TM2				

4.6.2 Test Setup Diagram:



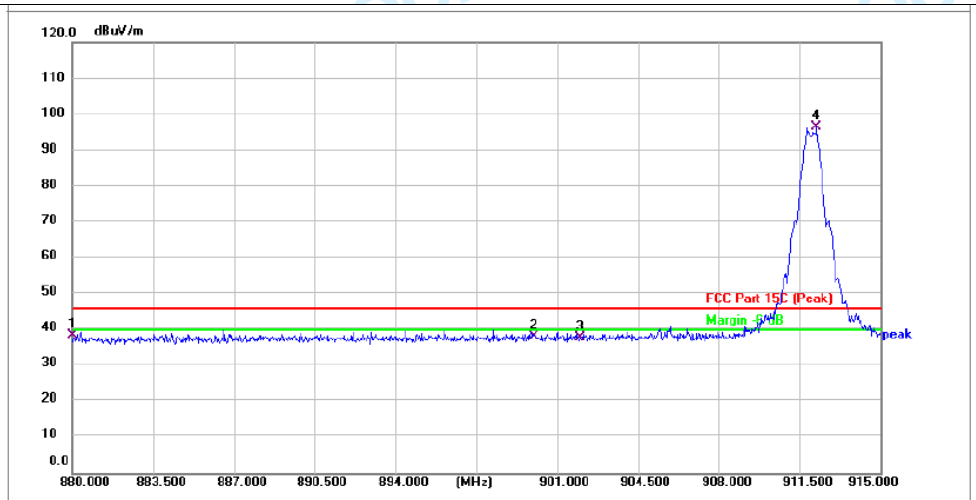
4.6.3 Test Data:

TM1 / Polarization: Horizontal / CH: L



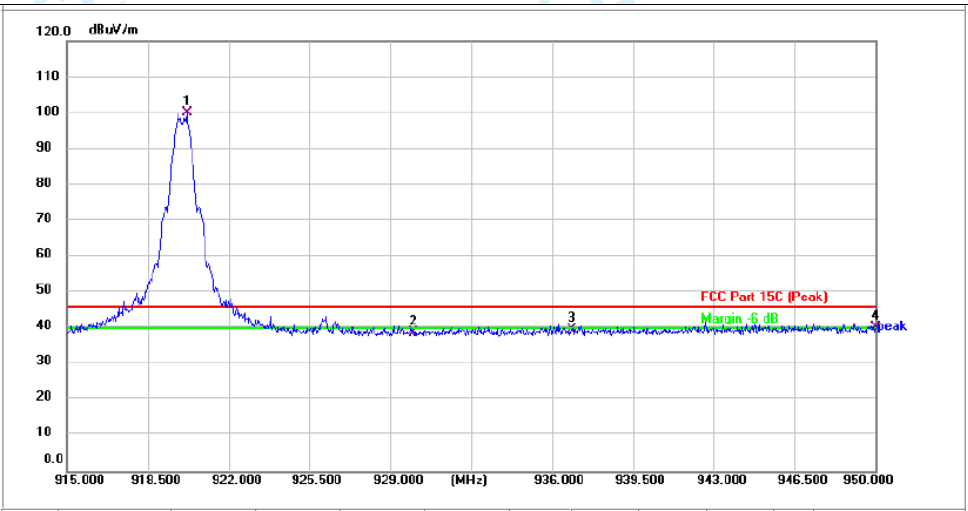
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	880.0000	30.17	7.40	37.57	46.00	-8.43	QP			P	
2	900.0000	30.47	7.76	38.23	46.00	-7.77	QP			P	
3	902.0000	30.24	7.82	38.06	46.00	-7.94	QP			P	
4 *	911.8150	93.46	8.08	101.54	46.00	55.54	QP				Fundamental

TM1 / Polarization: Vertical / CH: L



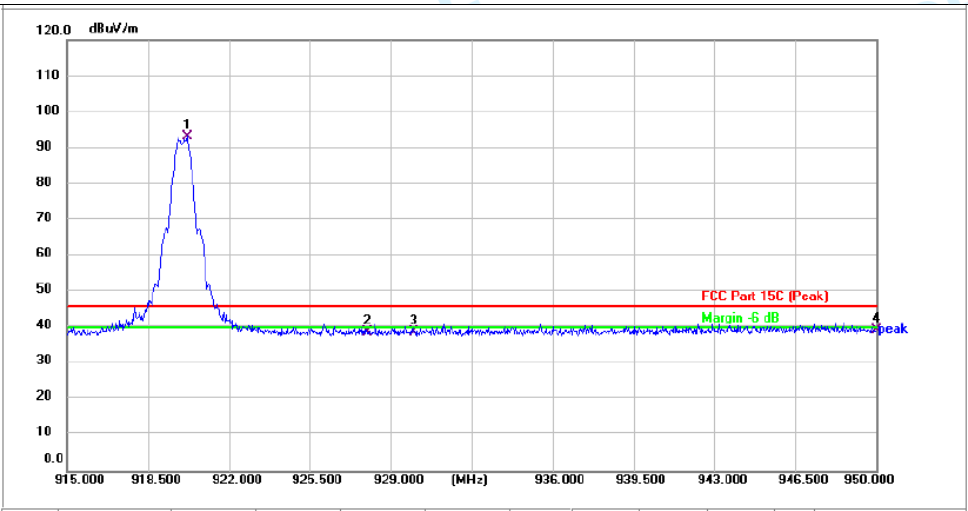
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	880.0000	31.41	7.15	38.56	46.00	-7.44	QP			P	
2	900.0000	30.61	7.76	38.37	46.00	-7.63	QP			P	
3	902.0000	30.21	7.81	38.02	46.00	-7.98	QP			P	
4 *	912.2350	88.48	8.08	96.56	46.00	50.56	QP				Fundamental

TM2 / Polarization: Horizontal / 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 *	920.1800	91.72	8.30	100.02	46.00	54.02	QP				Fundamental
2	930.0000	30.42	8.56	38.98	46.00	-7.02	QP			P	
3	936.8400	30.93	8.76	39.69	46.00	-6.31	QP			P	
4 !	950.0000	31.20	9.11	40.31	46.00	-5.69	QP			P	

TM2 / Polarization: Vertical / 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 *	920.1800	85.02	8.28	93.30	46.00	47.30	QP				Fundamental
2	928.0000	30.32	8.49	38.81	46.00	-7.19	QP			P	
3	930.0000	30.45	8.53	38.98	46.00	-7.02	QP			P	
4	950.0000	30.47	9.06	39.53	46.00	-6.47	QP			P	

Remark:
Margin = Measurement Level - Limit
Measurement Level=Test receiver reading + correction factor
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

4.7 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:

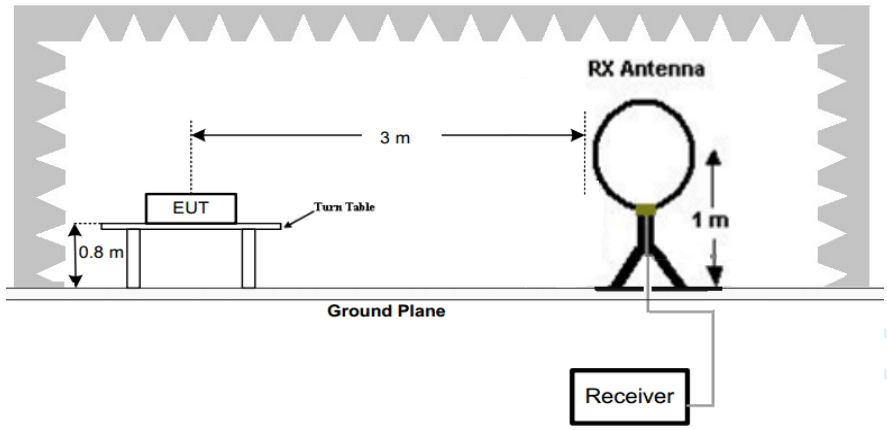
a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters 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 ¨C Preamplifier Factor

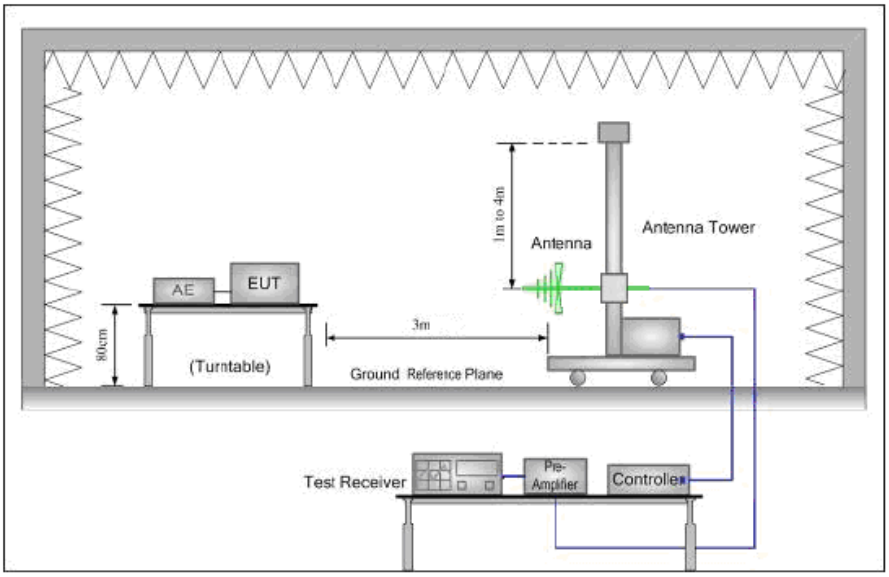
	3) Scan from 9kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 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:	22.4 °C	Humidity:	51.2 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2				
Final test mode:	TM2(worse case)				

4.7.2 Test Setup Diagram:





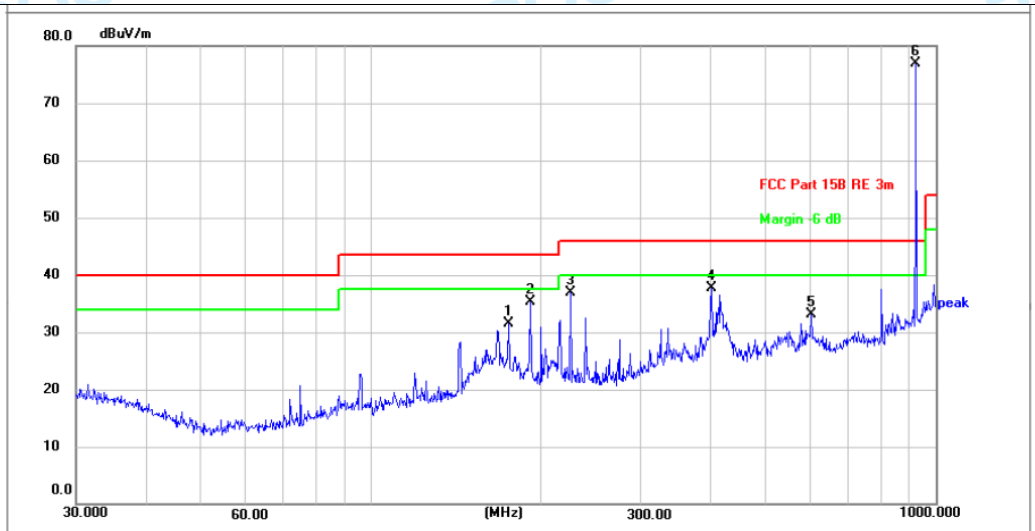
4.7.3 Test Data:

Between 9KHz – 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

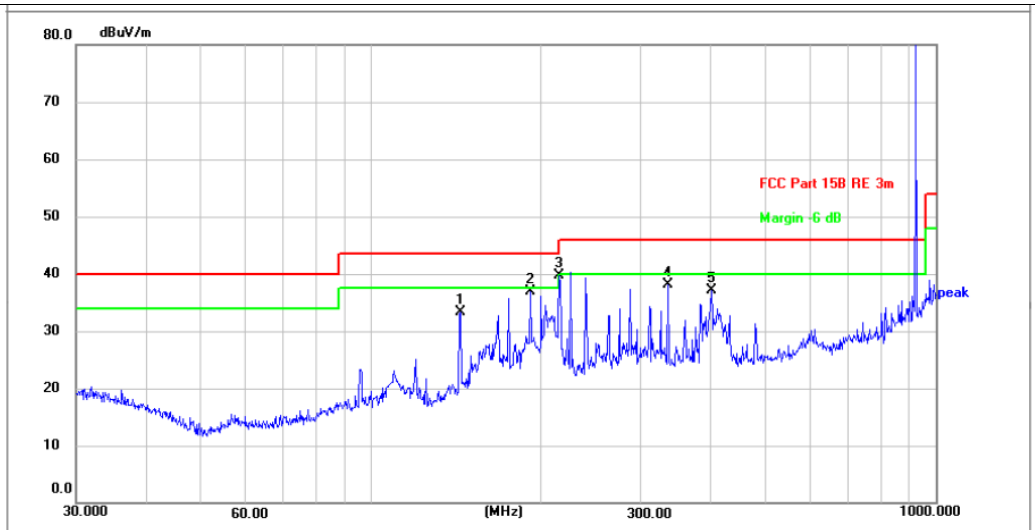
Between 30MHz – 1000MHz

TM2 / Polarization: Horizontal / Band: 902-928 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	175.0368	34.64	-3.22	31.42	43.50	-12.08	QP	100		P	
2	191.0738	38.37	-3.01	35.36	43.50	-8.14	QP	100		P	
3	225.3080	39.39	-2.53	36.86	46.00	-9.14	QP	100		P	
4	400.4319	36.24	1.37	37.61	46.00	-8.39	QP	100		P	
5	601.4265	28.01	5.18	33.19	46.00	-12.81	QP	100		P	
6 *	922.5157	68.60	8.35	76.95	94.00	-17.05	QP	100		P	Fundamental

TM2 / Polarization: Vertical / Band: 902-928 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	143.8295	37.26	-3.98	33.28	43.50	-10.22	QP			P	
2	191.7450	39.84	-3.01	36.83	43.50	-6.67	QP			P	
3 !	215.2678	42.30	-2.69	39.61	43.50	-3.89	QP			P	
4	334.8588	36.70	1.44	38.14	46.00	-7.86	QP			P	
5	400.4318	35.75	1.37	37.12	46.00	-8.88	QP			P	
6 *	922.5157	76.80	8.37	85.17	94.00	-8.83	QP			P	Fundamental

Remark: Over= Measurement Level - Limit
Measurement Level=Test receiver reading + correction factor
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

4.8 Emissions in frequency bands (above 1GHz)

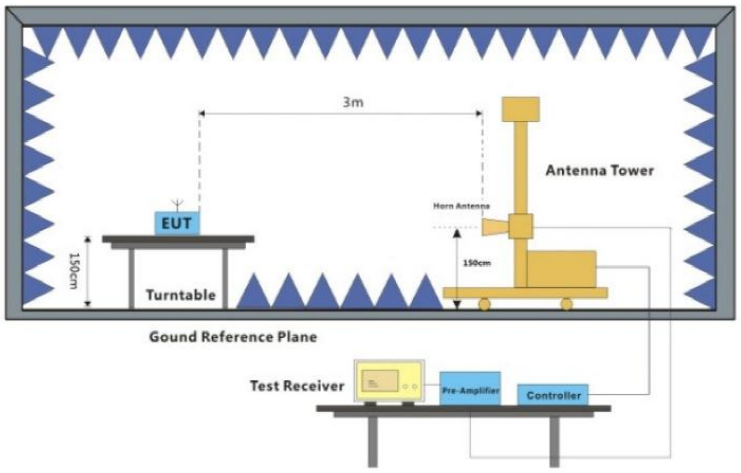
Test Requirement:	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`
Test Limit:	<table><tr><th>Frequency (MHz)</th><th>Field strength (microvolts/meter)</th><th>Measurement distance (meters)</th></tr><tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr><tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr><tr><td>1.705-30.0</td><td>30</td><td>30</td></tr><tr><td>30-88</td><td>100 **</td><td>3</td></tr><tr><td>88-216</td><td>150 **</td><td>3</td></tr><tr><td>216-960</td><td>200 **</td><td>3</td></tr><tr><td>Above 960</td><td>500</td><td>3</td></tr></table> ** 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 ¨C 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.

4.8.1 E.U.T. Operation:

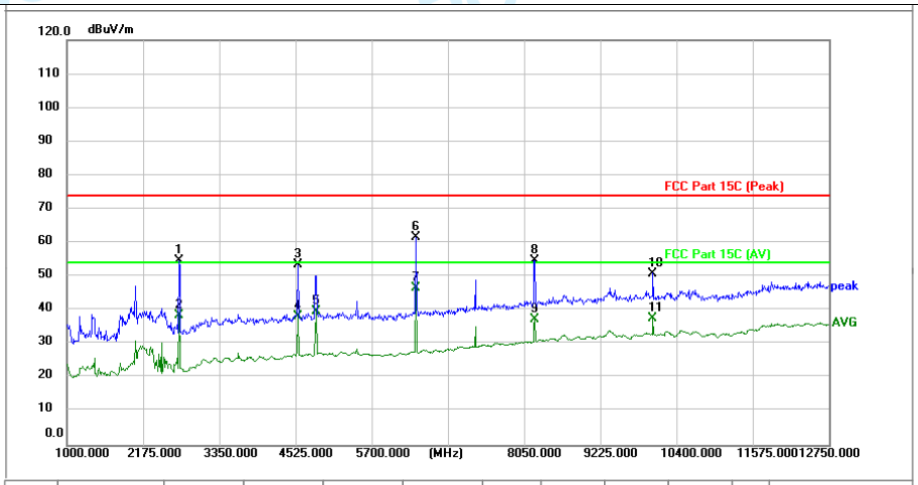
Operating Environment:					
Temperature:	22.4 °C	Humidity:	51.2 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1, TM2				
Final test mode:	TM1, TM2				

4.8.2 Test Setup Diagram:



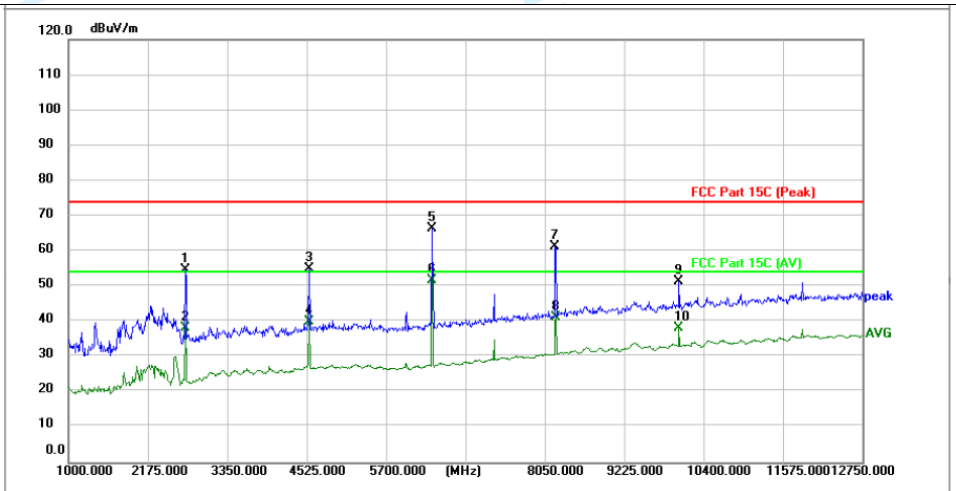
4.8.3 Test Data:

TM1 / Polarization: Horizontal / Band: 902-928 MHz / BW: 1 / CH: L



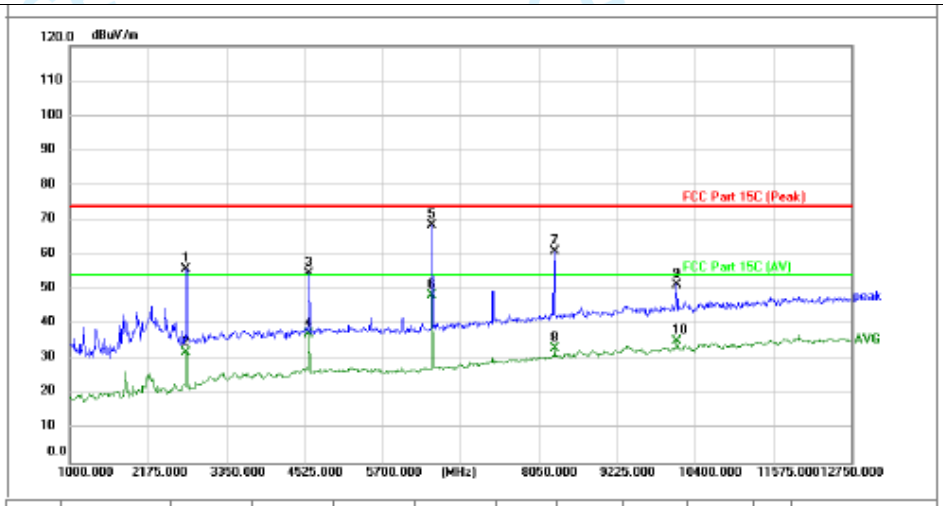
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2727.250	60.90	-6.06	54.84	74.00	-19.16	peak			P	
2	2727.250	44.54	-6.06	38.48	54.00	-15.52	AVG			P	
3	4560.250	55.30	-1.74	53.56	74.00	-20.44	peak			P	
4	4560.250	39.98	-1.74	38.24	54.00	-15.76	AVG			P	
5	4842.250	40.57	-0.77	39.80	54.00	-14.20	AVG			P	
6	6381.500	59.41	2.13	61.54	74.00	-12.46	peak			P	
7 *	6381.500	44.47	2.13	46.60	54.00	-7.40	AVG			P	
8	8214.500	48.18	6.71	54.89	74.00	-19.11	peak			P	
9	8214.500	30.72	6.71	37.43	54.00	-16.57	AVG			P	
10	10035.750	42.85	8.15	51.00	74.00	-23.00	peak			P	
11	10035.750	29.56	8.15	37.71	54.00	-16.29	AVG			P	

TM1 / Polarization: Vertical / Band: 902-928 MHz / BW: 1 / CH: L



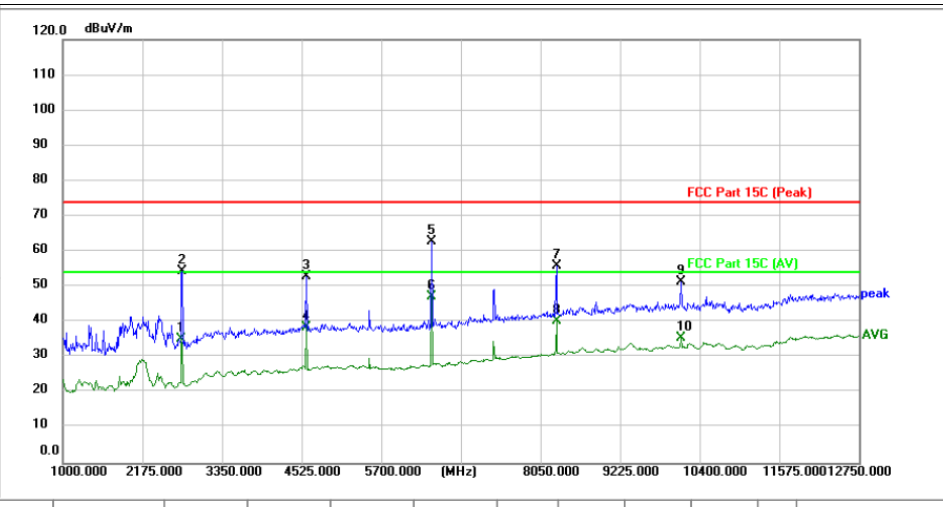
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2727.250	61.42	-6.59	54.83	74.00	-19.17	peak	149		P	
2	2727.250	44.74	-6.59	38.15	54.00	-15.85	AVG	149		P	
3	4560.250	56.28	-1.10	55.18	74.00	-18.82	peak	149		P	
4	4560.250	41.11	-1.10	40.01	54.00	-13.99	AVG	149		P	
5	6381.500	64.43	1.99	66.42	74.00	-7.58	peak	149		P	
6 *	6381.500	49.83	1.99	51.82	54.00	-2.18	AVG	149		P	
7	8202.750	55.02	6.30	61.32	74.00	-12.68	peak	149		P	
8	8214.500	35.02	6.33	41.35	54.00	-12.65	AVG	149		P	
9	10035.750	43.00	8.31	51.31	74.00	-22.69	peak	149		P	
10	10035.750	29.87	8.31	38.18	54.00	-15.82	AVG	149		P	

TM2 / Polarization: Horizontal / Band: 902-928 MHz / BW: 1 / CH: H



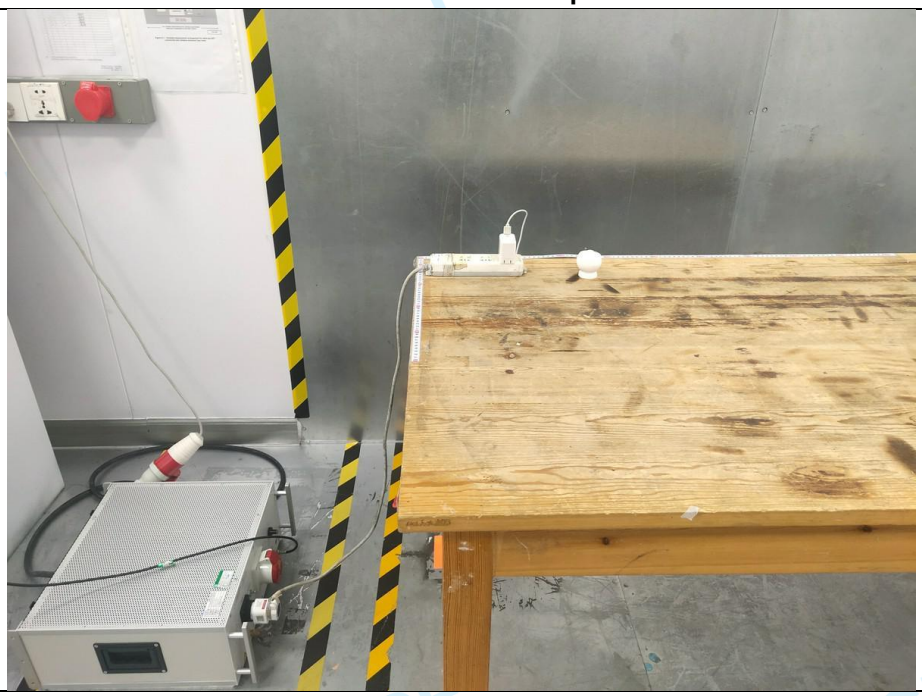
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2750.750	62.45	-6.49	55.96	74.00	-18.04	peak			P	
2	2750.750	38.52	-6.49	32.03	54.00	-21.97	AVG			P	
3	4595.500	55.77	-0.98	54.79	74.00	-19.21	peak			P	
4	4595.500	38.40	-0.98	37.42	54.00	-16.58	AVG			P	
5	6440.250	66.33	2.13	68.46	74.00	-5.54	peak			P	
6 *	6440.250	46.37	2.13	48.50	54.00	-5.50	AVG			P	
7	8285.000	54.49	6.44	60.93	74.00	-13.07	peak			P	
8	8285.000	26.57	6.44	33.01	54.00	-20.99	AVG			P	
9	10118.000	43.22	8.38	51.60	74.00	-22.40	peak			P	
10	10118.000	26.86	8.38	35.24	54.00	-18.76	AVG			P	

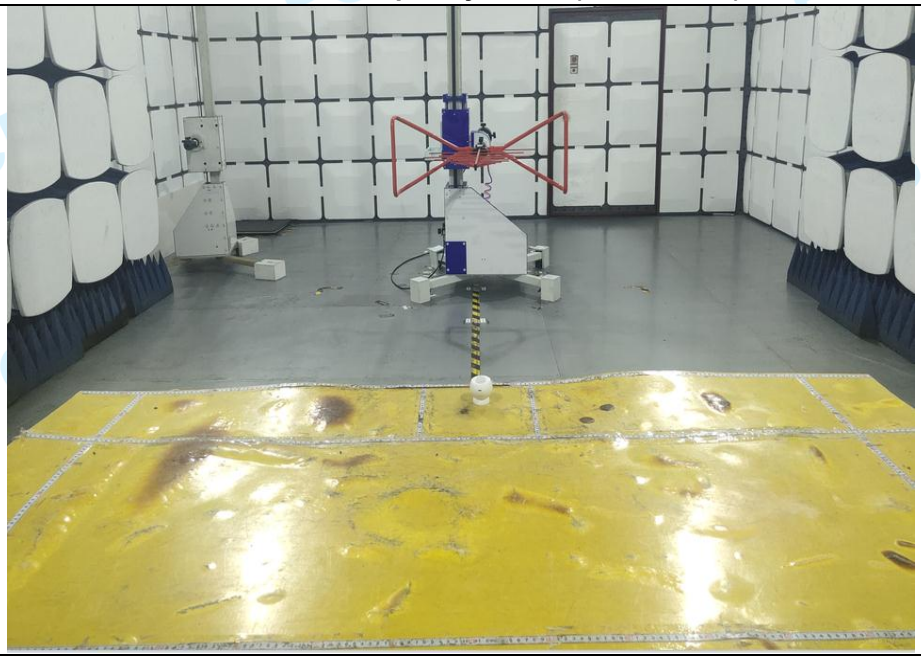
TM2 / Polarization: Vertical / Band: 902-928 MHz / BW: 1 / CH: H

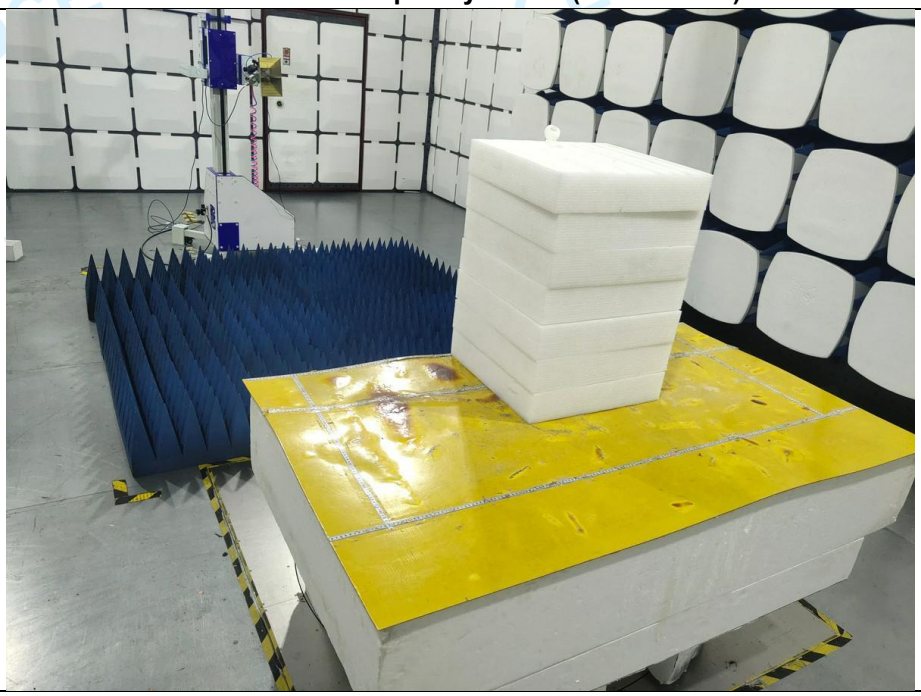


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2750.750	41.30	-6.02	35.28	54.00	-18.72	AVG	149		P	
2	2762.500	60.38	-6.00	54.38	74.00	-19.62	peak	149		P	
3	4595.500	54.55	-1.62	52.93	74.00	-21.07	peak	149		P	
4	4595.500	40.03	-1.62	38.41	54.00	-15.59	AVG	149		P	
5	6440.250	60.69	2.26	62.95	74.00	-11.05	peak	149		P	
6 *	6440.250	45.04	2.26	47.30	54.00	-6.70	AVG	149		P	
7	8285.000	49.17	6.81	55.98	74.00	-18.02	peak	149		P	
8	8285.000	33.64	6.81	40.45	54.00	-13.55	AVG	149		P	
9	10129.750	43.27	8.32	51.59	74.00	-22.41	peak	149		P	
10	10129.750	27.34	8.32	35.66	54.00	-18.34	AVG	149		P	

5 TEST SETUP PHOTOS

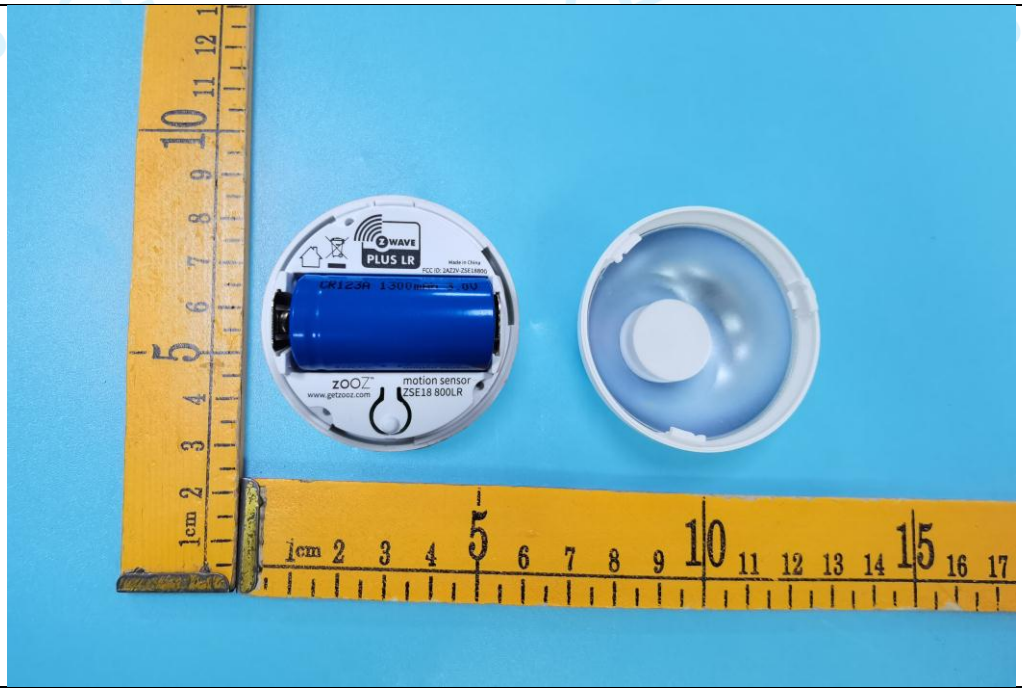
Conducted Emission at AC power line


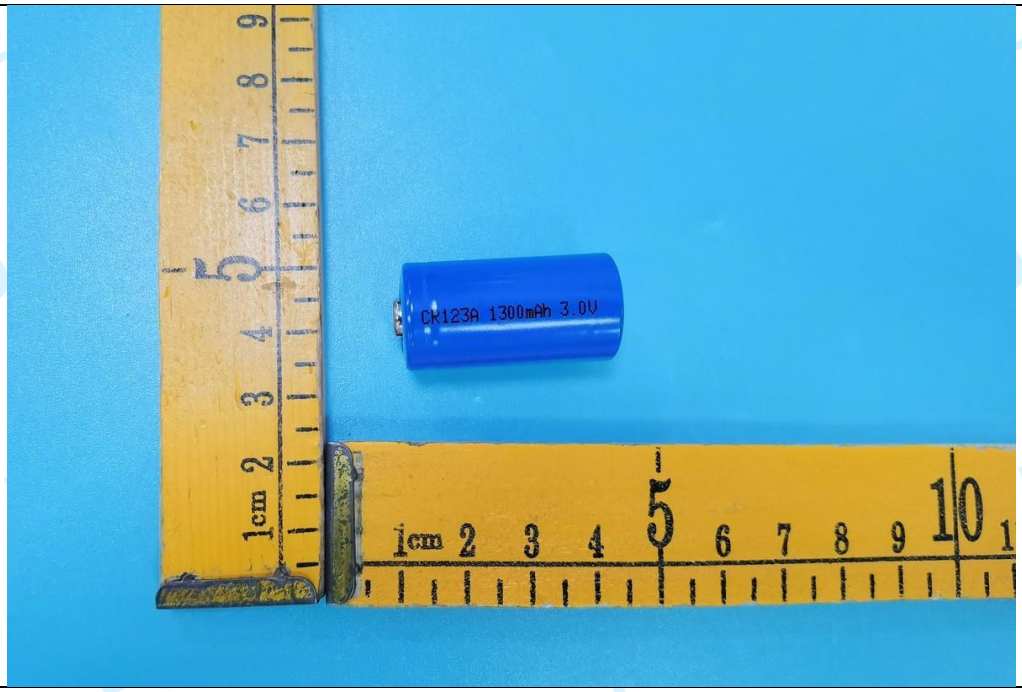
Emissions in frequency bands (below 1GHz)


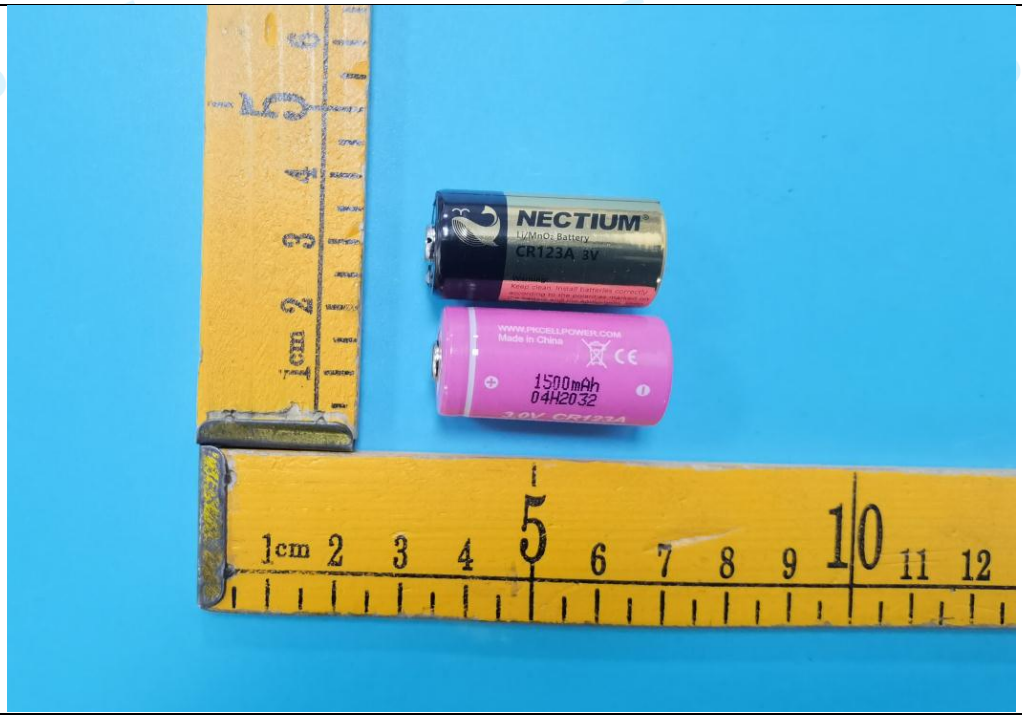
Emissions in frequency bands (above 1GHz)


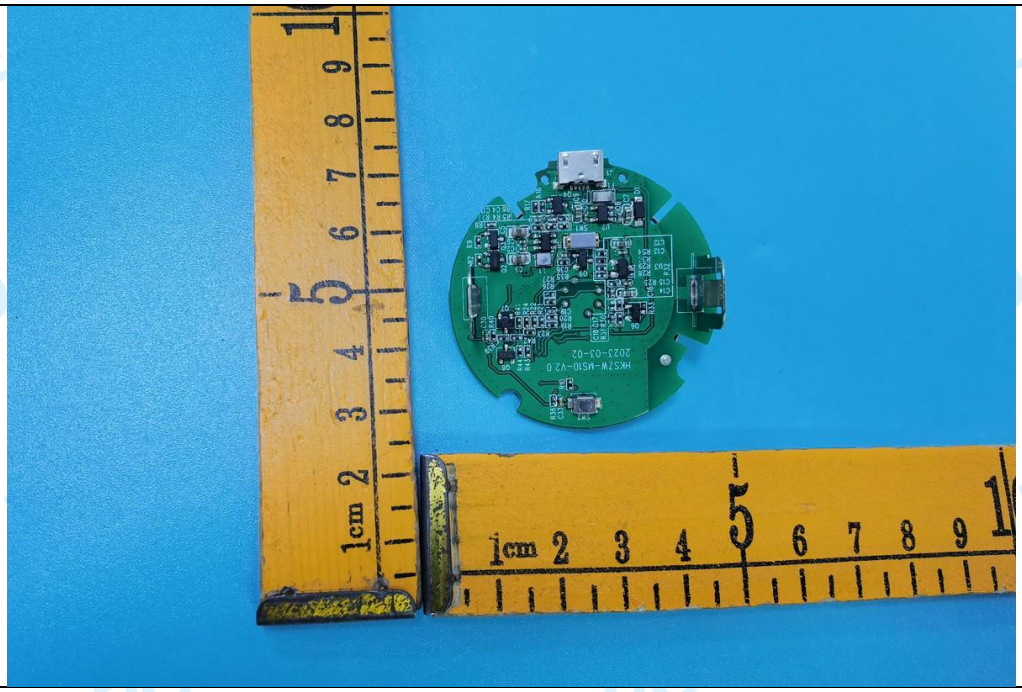
6 PHOTOS OF THE EUT

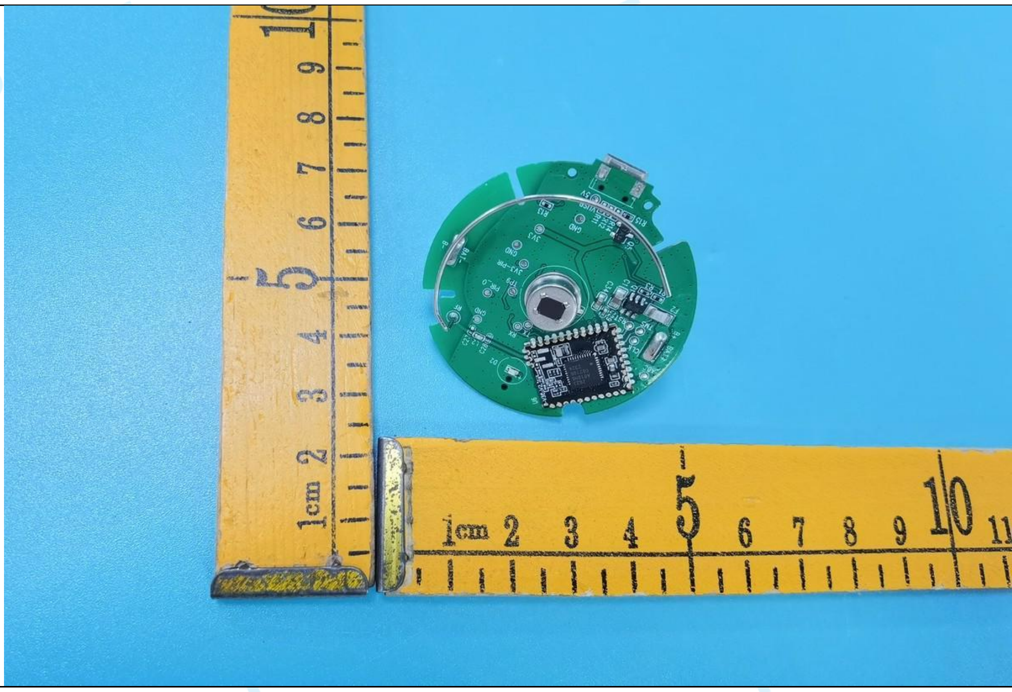
External

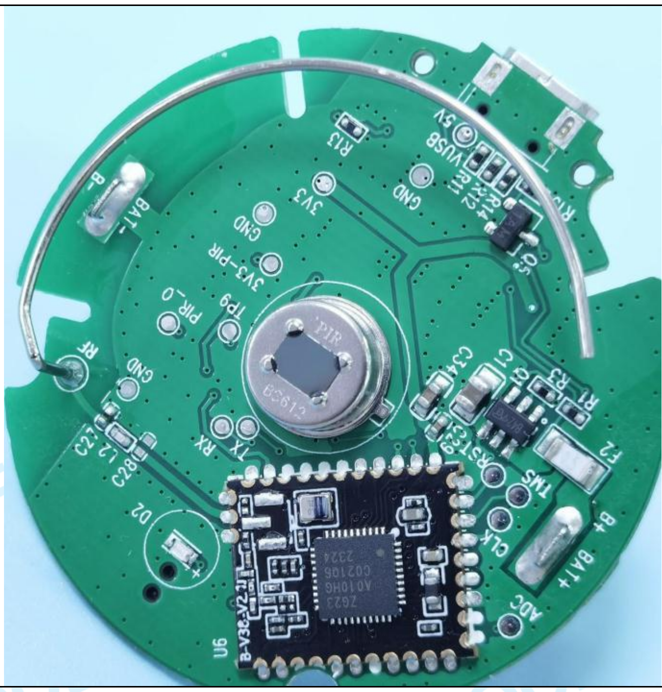

Internal





NECTIUM
Li/MnO2 Battery
CR123A 3V
1500mAh
04H2032



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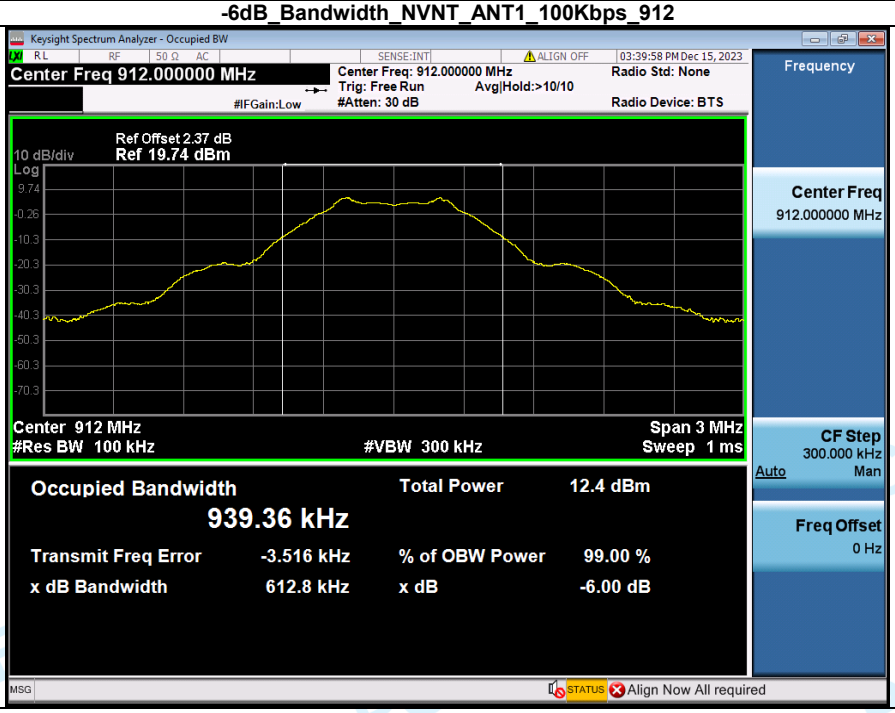
GND
3V3-PIR
PIR_O
TP9
RX
TX
RF
BAT-
5V
VUSB
R13
C34
C1
R3
F2
B+
BAT+
ADC
CLK
TMS
D2
U6
PIR

Appendix

1. -6dB Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	-6dB BW(kHz)	limit(kHz)	Result
NVNT	ANT1	100Kbps	912.00	612.79	500	Pass
NVNT	ANT1	100Kbps	920.00	618.97	500	Pass

-6dB_Bandwidth_NVNT_ANT1_100Kbps_912

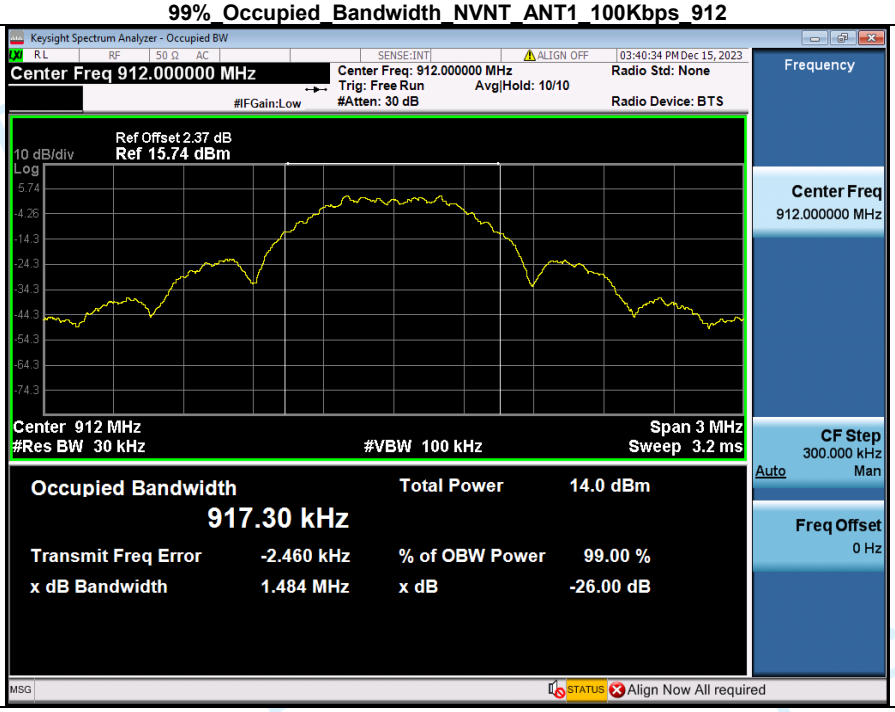


-6dB_Bandwidth_NVNT_ANT1_100Kbps_920

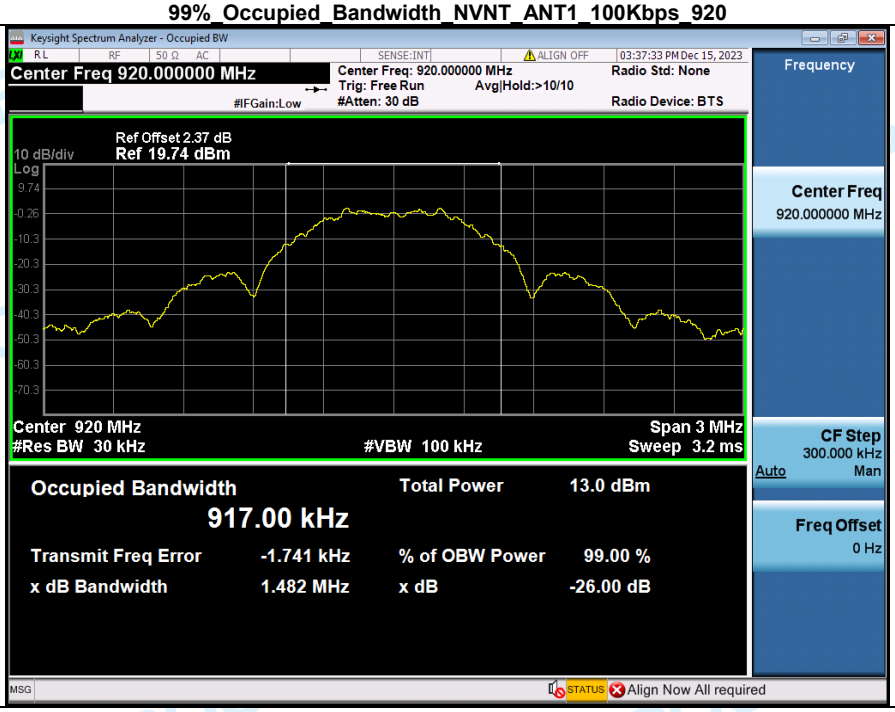
2. 99% Occupied Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	99%%BW(MHz)
NVNT	ANT1	100Kbps	912.00	0.917
NVNT	ANT1	100Kbps	920.00	0.917

99%_Occupied_Bandwidth_NVNT_ANT1_100Kbps_912



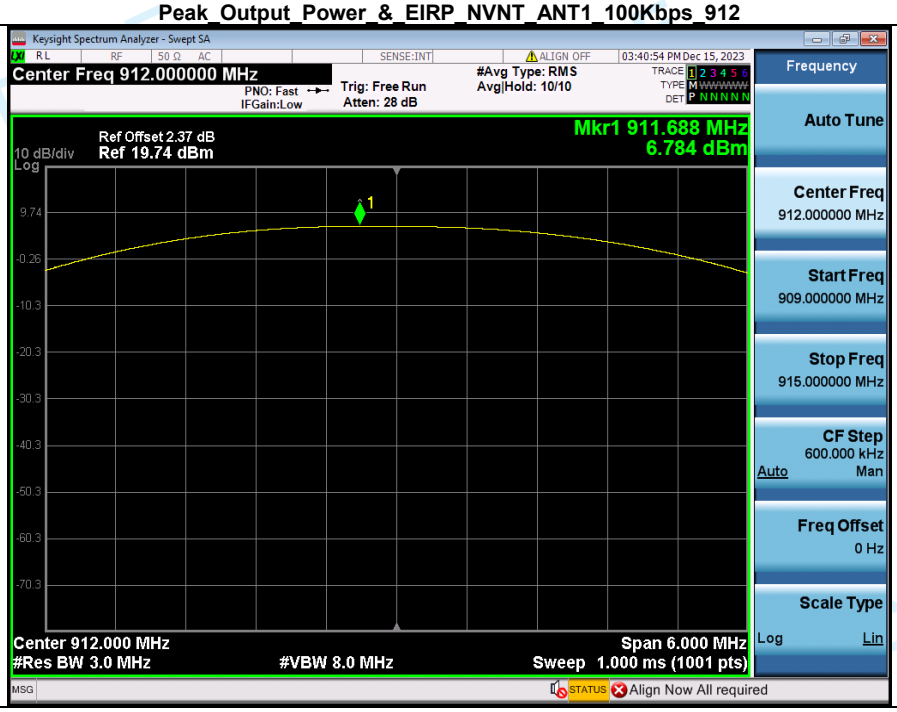
99%_Occupied_Bandwidth_NVNT_ANT1_100Kbps_920



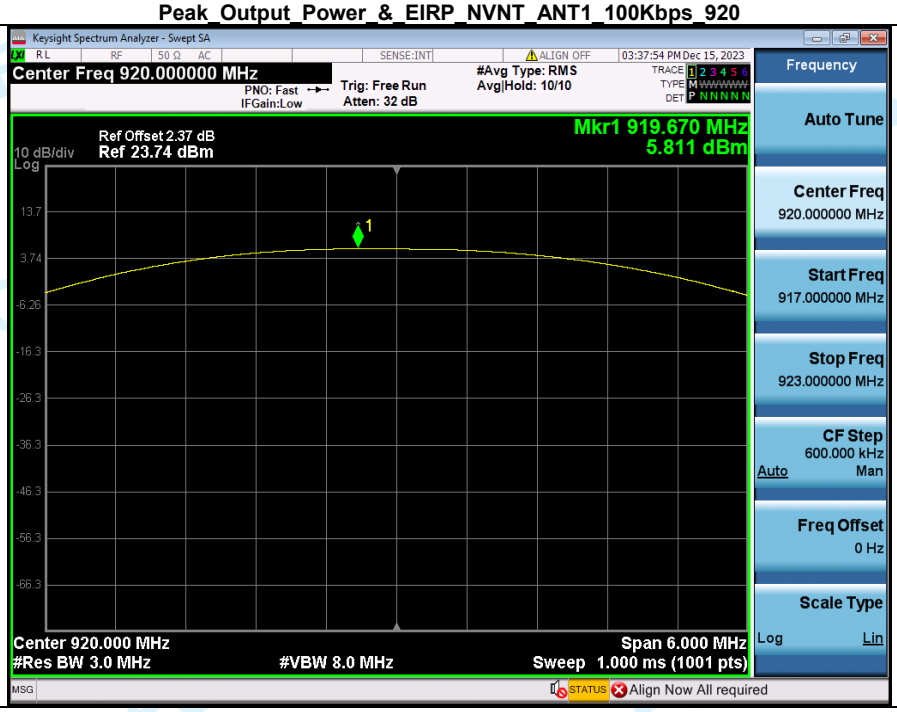
3. Peak Output Power

Condition	Antenna	Rate	Frequency (MHz)	Conducted Power(dBm)	Limit(dBm)	Result
NVNT	ANT1	100Kbps	912.00	6.78	30.00	Pass
NVNT	ANT1	100Kbps	920.00	5.81	30.00	Pass

Peak_Output_Power_&_EIRP_NVNT_ANT1_100Kbps_912



Peak_Output_Power_&_EIRP_NVNT_ANT1_100Kbps_920

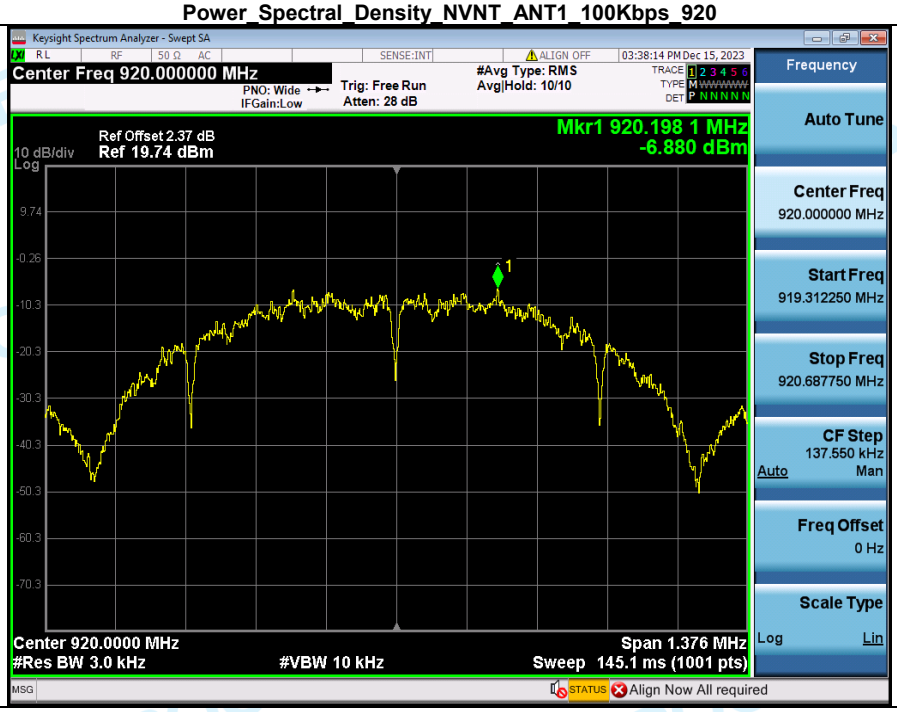


4. Power Spectral Density

Condition	Antenna	Rate	Frequency (MHz)	Power Spectral Density(dBm)	Limit(dBm/3kHz)	Result
NVNT	ANT1	100Kbps	912.00	-5.35	8	Pass
NVNT	ANT1	100Kbps	920.00	-6.88	8	Pass

Power_Spectral_Density_NVNT_ANT1_100Kbps_912

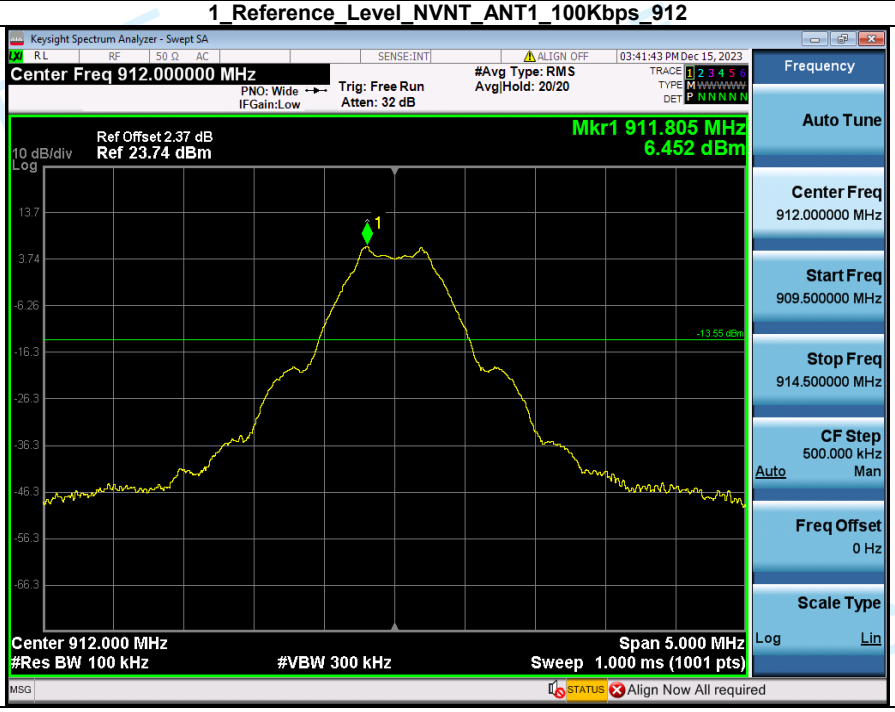
Power_Spectral_Density_NVNT_ANT1_100Kbps_920



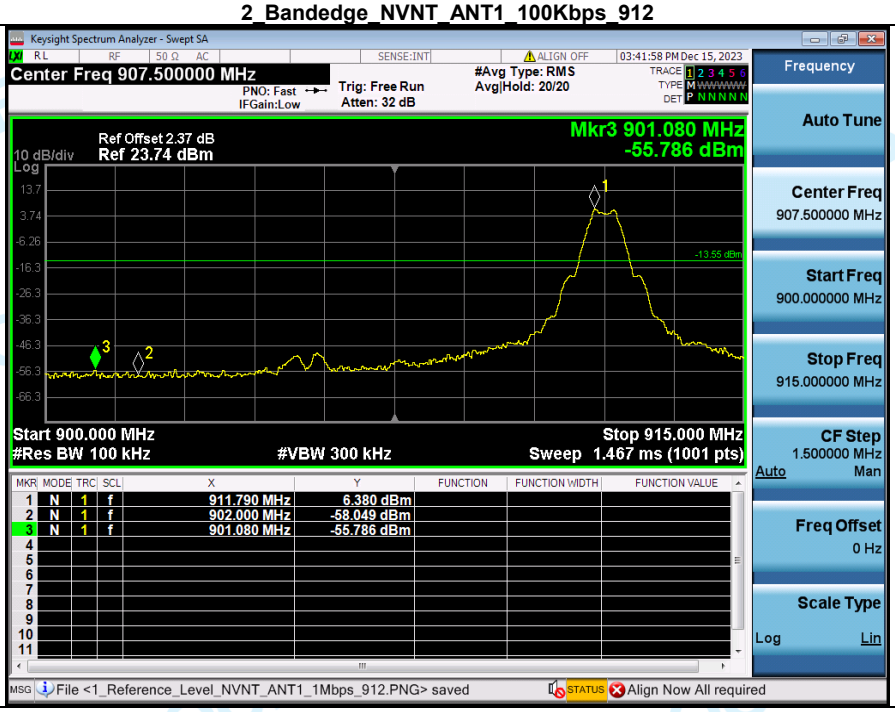
5. Bandedge

Condition	Antenna	Rate	TX_Frequency (MHz)	Max. Mark Frequency (MHz)	Spurious level(dBm)	limit(dBm)	Result
NVNT	ANT1	100Kbps	912.00	901.08	-55.79	-13.55	Pass
NVNT	ANT1	100Kbps	920.00	929.87	-56.19	-14.57	Pass

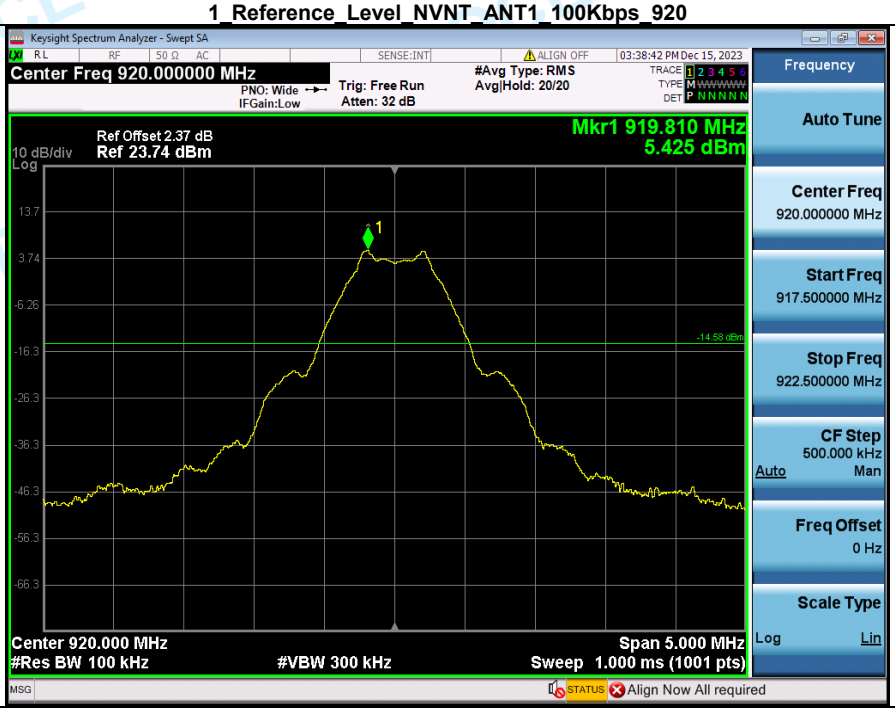
1_Reference_Level_NVNT_ANT1_100Kbps_912



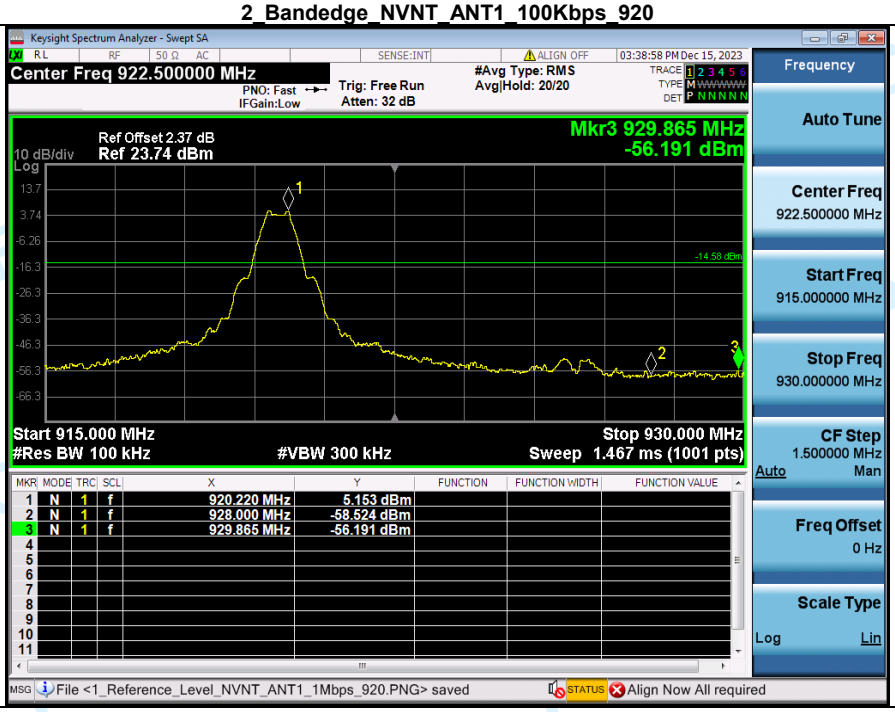
2_Bandedge_NVNT_ANT1_100Kbps_912



1_Reference_Level_NVNT_ANT1_100Kbps_920



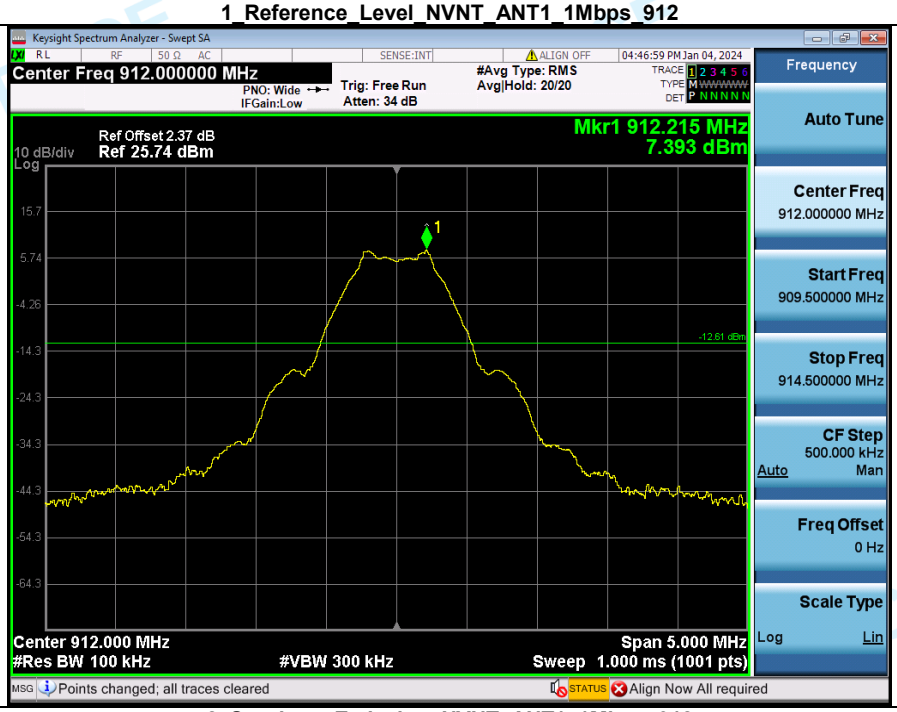
2_Bandedge_NVNT_ANT1_100Kbps_920



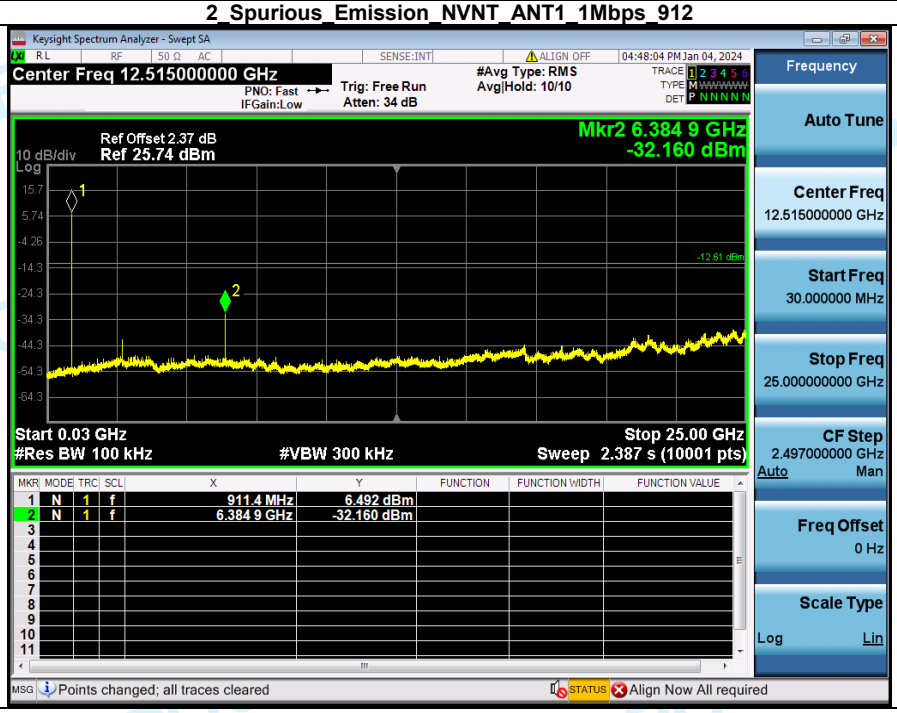
6. Spurious Emission

Condition	Antenna	Rate	TX_Frequency(MHz)	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1Mbps	912.00	-32.16	-12.61	Pass
NVNT	ANT1	1Mbps	920.00	-31.21	-13.46	Pass

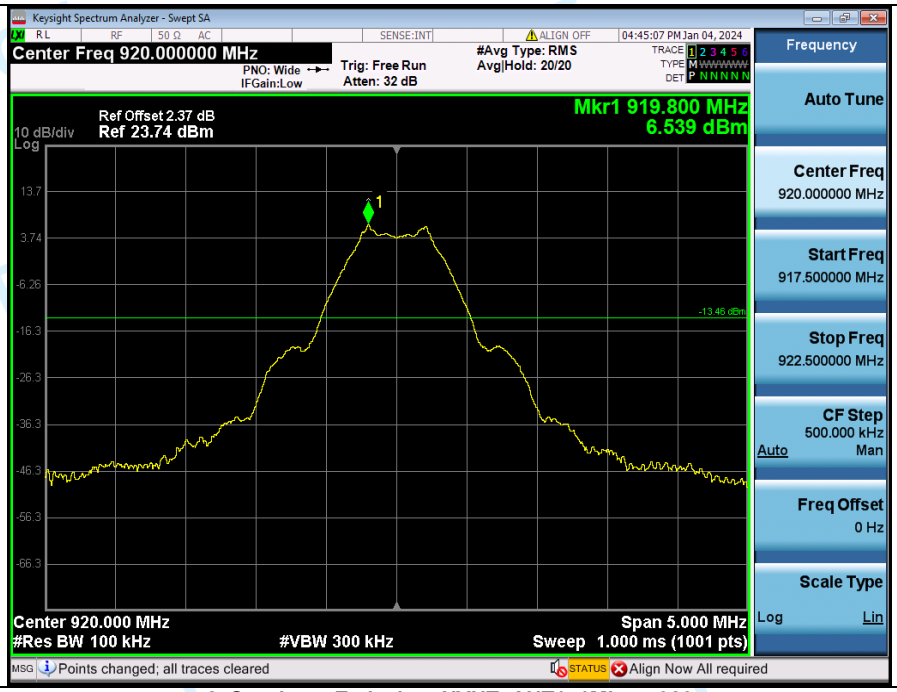
1_Reference_Level_NVNT_ANT1_1Mbps_912



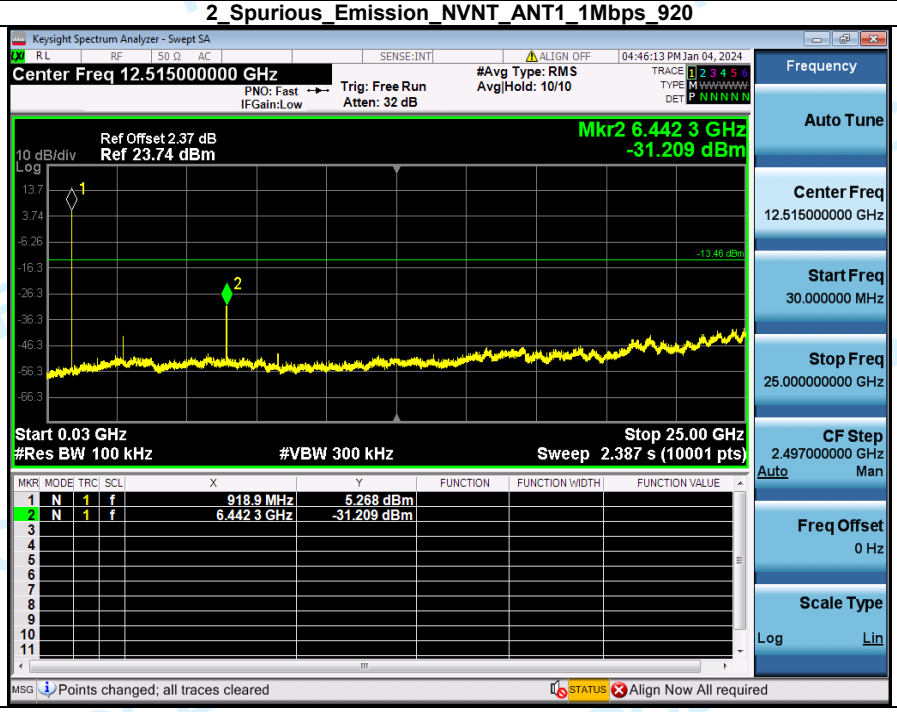
2_Spurious_Emission_NVNT_ANT1_1Mbps_912



1_Reference_Level_NVNT_ANT1_1Mbps_920



2_Spurious_Emission_NVNT_ANT1_1Mbps_920



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