FCC TEST REPORT

FCC ID: 2BFG4-M51HV

Product	:	MDVR
Model Name	:	M51HV.TGWE-A-A
Additional model	:	Refer to page 6
Brand	:	CITOPS
Report No.	:	PTC24022912301E-FC01

Prepared for

Shenzhen Citops Systems Co., Ltd.

11/F. Block A. Delux Sci-Tech Park,No.5 GuanleRoad, Longhua New District, Shenzhen, China

Prepared by

Precise Testing & Certification Co., Ltd

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

1 TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Citops Systems Co., Ltd.
Address	:	11/F. Block A. Delux Sci-Tech Park,No.5 GuanleRoad, Longhua New District, Shenzhen, China
Manufacture's name	:	Shenzhen Citops Systems Co., Ltd.
Address	:	11/F. Block A. Delux Sci-Tech Park,No.5 GuanleRoad, Longhua New District, Shenzhen, China
Product name	:	MDVR
Model name	:	M51HV.TGWE-A-A
Additional model	:	Refer to page 6
Standards	:	FCC CFR47 Part 15 Section 15.247
Test procedure	:	ANSI C63.10:2013
Test Date	:	Mar. 07, 2024 to May. 10, 2024
Date of Issue	:	May. 22, 2024
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Test Engineer:

Jack zhou / Engineer

Technical Manager:

Simon Pu / Manager

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2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	N/A
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted Spurious Emission	15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3)	PASS
Power Spectral Density	15.247(e)	PASS
Antenna Requirement	15.203	PASS
Remark: N/A: Not Applicable		

3 General Information

3.1General Description of E.U.T.

Product Name	:	MDVR
Model Name	:	M51HV.TGWE-A-A
Additional model	:	M16Hv.DGWE1-A,M20Cv.DGWE-A,M32Hv.TGWE1-A,M51Hv.DGWE1-A, M52Hv.DGWE1-A,M71Hv.SGWE-A,M91Hv.DGWE-A,M15Hv.SGNE-A, M16Hv.DGWE2-A,M20Cv.DGWE-A-A,M32Hv.TGWE2-A,M51Hv.DGWE2-A, M52Hv.DGWE2-A,M16Hv.DGNE1-A-A,M18Ev.DGWE-A,M32Hv.TGWE1-A-A,M51Hv.DGWE1-A-A,M52Hv.DGWE1-A-A,M16Hv.DGWE1-A-A, M18Ev.DGWE-A-A,M32Hv.TGWE2-A-A,M51Hv.DGWE2-A-A, M52Hv.DGWE2-A-A, 20Ev.SGWC-A, 18Ev.SGWC-A
Specification	:	802.11b/g/n HT20
Operating frequency	:	2412-2462MHz for 802.11b/g/ n(HT20)
Numbers of Channel	:	11 channels for 802.11b/g/ n(HT20)
Antenna Type	:	External Antenna
Antenna Gain	:	1.82 dBi
Type of Modulation	:	DSSS with DBPSK/DQPSK/CCK for 802.11b; OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n;
Power supply	:	Input: 12V/24V 20W Output: 12V 12W
Hardware Version	:	M125.02
Software Version	:	M51Hv-APP-V010153.
Test sample No.	:	PTC24022912301E-1/2, PTC24022912301E-2/2

3.2 Channel List

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (802.11b: 1 Mbps; 802.11g: 6 Mbps; 802.11n (HT20): MCS0;) were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list for 802.11 b/g/n (HT20/HT40)

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2427	8	2447		

The maximum duty cycle as following table:

Test Mode	Duty Cycle(%)
802.11b	100%
802.11g	100%
802.11n(HT20)	100%
802.11n(HT40)	100%

3.3Test Site

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A

FCC Designation Number: CN1219

4 Equipment During Test

4.1Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-26.5GHz	Aug.17, 2023	1 Year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug.17, 2023	1 Year
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug.17, 2023	1 Year
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug.17, 2023	1 Year
Test S/W	Tonscend	JS1120-3	/	/	/	/

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
EMI Test Receiver	Rohde&Schwarz	ESPI7	101671	9KHz-7GHz	Aug. 17,2023	1 Year
Loop Antenna	Schwarzbeck	FMZB 1519	192	9 KHz -30MHz	Aug. 17,2023	1 Year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug. 17,2023	1 Year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Aug. 17,2023	1 Year
Cable	IMRO	AK-9515E(9m)	Cable-L	9KHz-3GHz	Aug. 17,2023	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSV40	6625-01-588-5515	9KHz-40GHz	Aug. 17,2023	1 Year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 17,2023	1 Year
Power Amplifier	ZHINAN	ZN3380C	15002	1GHz-26.5GHz	Aug. 17,2023	1 Year

Horn Antenna	SCHWARZBECK	BBHA 9170	9170-1066	15GHz-40GHz	Jul. 19, 2023	1 Year
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Jul. 19, 2023	1 Year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug. 17,2023	1 Year
RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug. 17,2023	1 Year
Test S/W	Tonscend	TS+	/	/	/	/

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Date	Calibration Interval
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 17, 2023	1 Year
Artificial Mains Network	Rohde&Schwarz	ENV216	102453	9KHz-300MHz	Aug. 17, 2023	1 Year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Aug. 17, 2023	1 Year
Limiter	R&S	ESH3-Z2	0357.8810.54-102808-NB	0Hz-30MHz	Aug. 16,2023	1 Year
RF Switch	DIAMOND ANTENNA	CX-210	/	9kHz-6GHz	Mar. 22,2024	1 Year
Test S/W	Tonscend	JS32-CE	/	/	/	/

4.2Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9kHz~30MHz)	±3.15dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB

4.3Description of Support Units

N/A.

The EUT only powered by DC.

5 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

5.1EUT Operation

Operating Environment :

Temperature: : 24.5 °C

Humidity: : 52 % RH

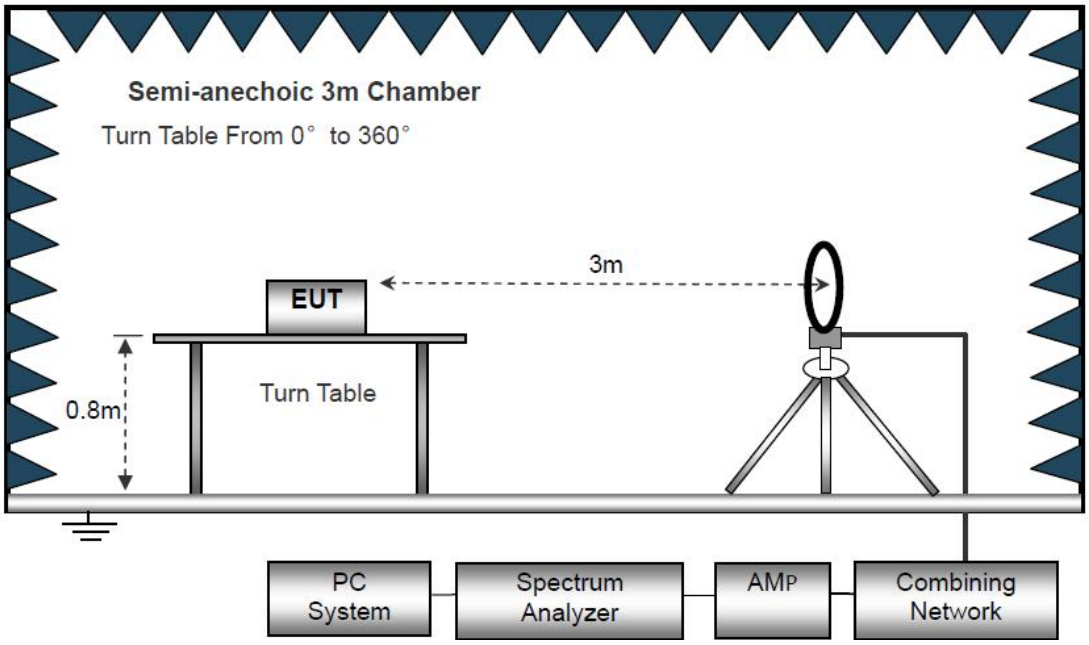
Atmospheric Pressure: : 101.3kPa

Test Voltage : AC 120V 60Hz

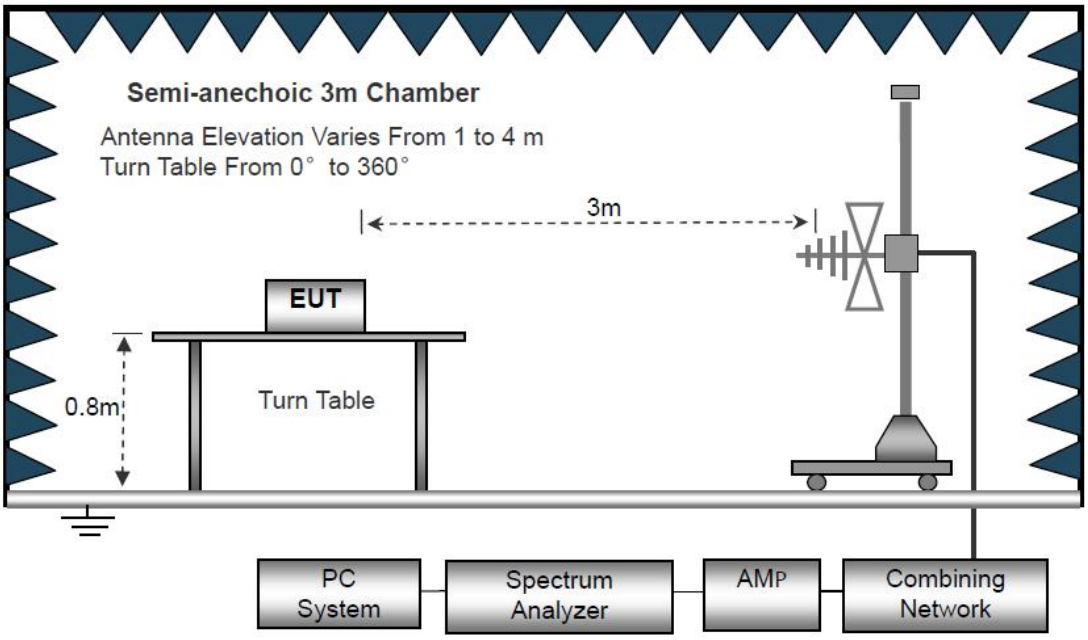
5.2Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

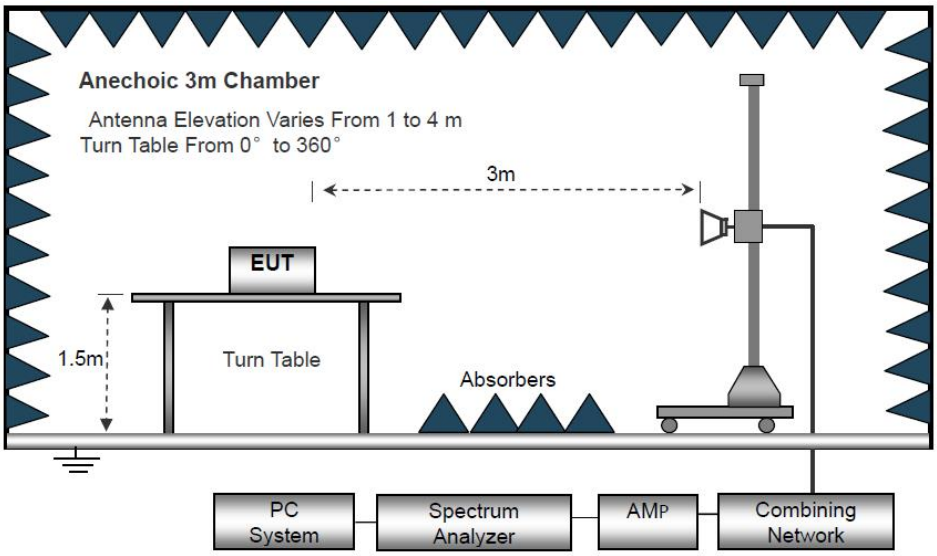
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



5.3Spectrum Analyzer Setup

	Frequency	Detector	RBW	VBW	Remark
Receiver Setup	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value

5.4Test Procedure

1. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane, And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

8. The test above 1GHz must be use the fully anechoic room, and the test below 1GHz use the half anechoic room

5.5Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

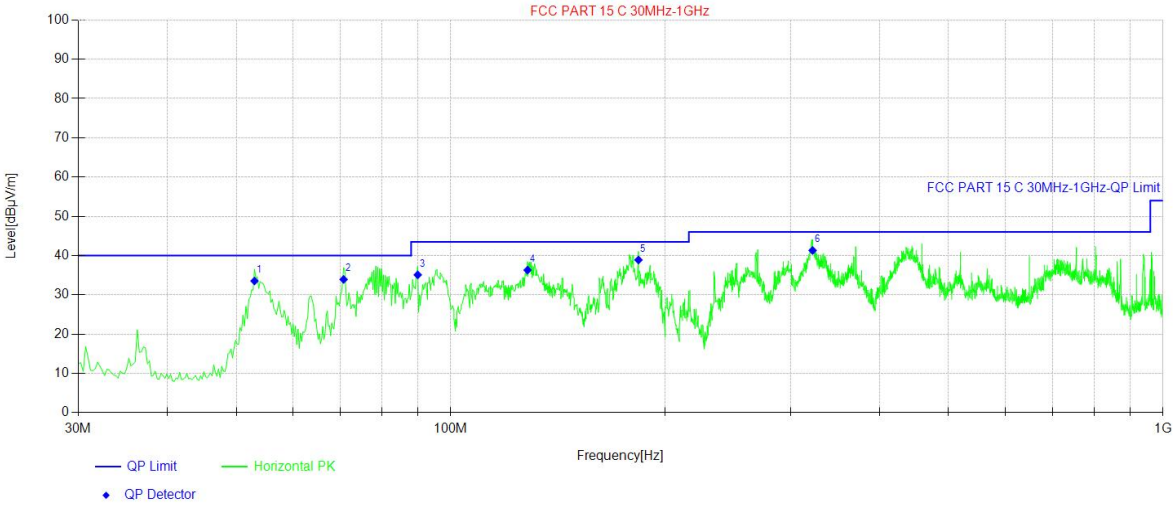
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

All the modulation modes were tested the data of the worst mode (TX 802.11b Low Channel) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following test plots:

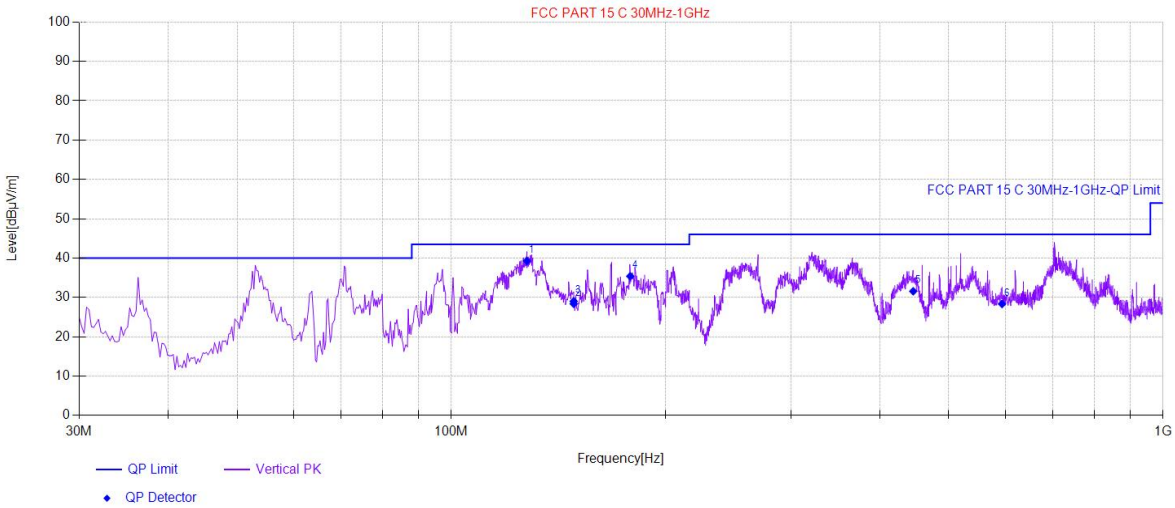
Antenna Polarization: Horizontal



Final Data List[QP]								
NO.	Freq. [MHz]	QP Reading [dBµV/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	53.04	51.23	-17.69	33.54	40.00	6.46	Horizontal	PASS
2	70.74	53.37	-19.44	33.93	40.00	6.07	Horizontal	PASS
3	89.90	56.08	-20.99	35.09	43.50	8.41	Horizontal	PASS
4	128.21	53.52	-17.21	36.31	43.50	7.19	Horizontal	PASS
5	183.50	56.71	-17.82	38.89	43.50	4.61	Horizontal	PASS
6	322.21	56.23	-14.92	41.31	46.00	4.69	Horizontal	PASS

Remark:1. QP Value= QP Reading+ Factor;
2.QP Margin= QP Limit- QP Value；
3.Factor= ANT Factor+ Cable Loss -AMP Factor.

Antenna Polarization: Vertical



Final Data List[QP]								
NO.	Freq. [MHz]	QP Reading [dBµV/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	127.73	56.51	-17.24	39.27	43.50	4.23	Vertical	PASS
2	148.58	44.48	-16.10	28.38	43.50	15.12	Vertical	PASS
3	148.58	45.12	-16.10	29.02	43.50	14.48	Vertical	PASS
4	178.41	52.8	-17.42	35.38	43.50	8.12	Vertical	PASS
5	445.65	43.25	-11.68	31.57	46.00	14.43	Vertical	PASS
6	594.06	36.84	-8.49	28.35	46.00	17.65	Vertical	PASS

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Test Frequency: From 1GHz to 18GHz

Worst case 802.11b

Test Mode: 2412					Test channel: Lowest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4824	47.44	32.35	4.12	28.44	55.47	74	-18.53	V
7236	38.81	36.08	6.3	27.74	53.45	74	-20.55	V
9648	35.44	38.25	7.91	24.65	56.95	74	-17.05	V
4824	43.39	32.35	4.12	28.44	51.42	74	-22.58	H
7236	39.05	36.08	6.3	27.74	53.69	74	-20.31	H
9648	34.50	38.25	7.91	24.65	56.01	74	-17.99	H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4824	31.29	32.35	4.12	28.44	39.32	54	-14.68	V
7236	24.44	36.08	6.3	27.74	39.08	54	-14.92	V
9648	20.56	38.25	7.91	24.65	42.07	54	-11.93	V
4824	30.29	32.35	4.12	28.44	38.32	54	-15.68	H
7236	25.70	36.08	6.3	27.74	40.34	54	-13.66	H
9648	20.93	38.25	7.91	24.65	42.44	54	-11.56	H

Worst case 802.11b

Test Mode: 2437					Test channel: Middle			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4874	45.83	32.35	4.12	28.44	53.86	74	-20.14	V
7311	38.17	36.08	6.3	27.74	52.81	74	-21.19	V
9748	35.54	38.25	7.91	24.65	57.05	74	-16.95	V
4874	42.60	32.35	4.12	28.44	50.63	74	-23.37	H
7311	37.32	36.08	6.3	27.74	51.96	74	-22.04	H
9748	34.53	38.25	7.91	24.65	56.04	74	-17.96	H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4874	30.42	32.35	4.12	28.44	38.45	54	-15.55	V
7311	23.46	36.08	6.3	27.74	38.10	54	-15.90	V
9748	21.23	38.25	7.91	24.65	42.74	54	-11.26	V
4874	30.37	32.35	4.12	28.44	38.40	54	-15.60	H
7311	25.75	36.08	6.3	27.74	40.39	54	-13.61	H
9748	21.02	38.25	7.91	24.65	42.53	54	-11.47	H

Worst case 802.11b

Test Mode: 2462					Test channel: High			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4924	45.53	32.41	4.14	28.42	53.66	74	-20.34	V
7386	38.62	36.15	6.36	27.68	53.45	74	-20.55	V
9848	35.20	38.35	7.97	24.33	57.19	74	-16.81	V
4924	42.83	32.41	4.14	28.42	50.96	74	-23.04	H
7386	37.40	36.15	6.36	27.68	52.23	74	-21.77	H
9848	33.95	38.35	7.97	24.33	55.94	74	-18.06	H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4924	32.04	32.41	4.14	28.42	40.17	54	-13.83	V
7386	23.77	36.15	6.36	27.68	38.60	54	-15.40	V
9848	21.10	38.35	7.97	24.33	43.09	54	-10.91	V
4924	30.45	32.41	4.14	28.42	38.58	54	-15.42	H
7386	25.14	36.15	6.36	27.68	39.97	54	-14.03	H
9848	21.28	38.35	7.97	24.33	43.27	54	-10.73	H

Note:

1. The testing has been conformed to 10*2462MHz=24620MHz.
2. All other emissions more than 30dB below the limit.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
   Emission Level = Reading + Factor
   Margin=Emission Level-Limit
4. X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.

Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz
2.4G WiFi (802.11b/g/n)mode have been tested, and the worst result(802.11g) was report as below
Test Mode: Worst case 802.11g Low Channel 2412MHz

Test Mode: 802.11g Low Channel 2412MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2390	48.83	27.39	2.77	34.01	44.98	74	-29.02	H	Peak
2400	59.19	27.42	2.78	34.01	55.38	74	-18.62	H	
2390	47.66	27.39	2.77	34.01	43.81	74	-30.19	V	
2400	55.96	27.42	2.78	34.01	52.15	74	-21.85	V	
2390	40.79	27.39	2.77	34.01	36.94	54	-17.06	H	Average
2400	43.17	27.42	2.78	34.01	39.36	54	-14.64	H	
2390	39.40	27.39	2.77	34.01	35.55	54	-18.45	V	
2400	44.08	27.42	2.78	34.01	40.27	54	-13.73	V	

Test Mode: Worst case 802.11g High Channel 2462MHz

Test Mode: 802.11g High Channel 2462MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2483.5	60.04	27.39	2.77	34.01	56.19	74	-17.81	H	Peak
2500	49.80	27.42	2.78	34.01	45.99	74	-28.01	H	
2483.5	60.54	27.39	2.77	34.01	56.69	74	-17.31	V	
2500	49.65	27.42	2.78	34.01	45.84	74	-28.16	V	
2483.5	42.98	27.39	2.77	34.01	39.13	54	-14.87	H	Average
2500	39.01	27.42	2.78	34.01	35.20	54	-18.80	H	
2483.5	43.73	27.39	2.77	34.01	39.88	54	-14.12	V	
2500	39.90	27.42	2.78	34.01	36.09	54	-17.91	V	

Test Frequency: From 18GHz to 25GHz

The measurements were more than 20dB below the limit and not reported.

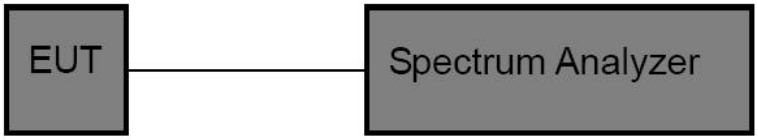
6 Conducted Spurious Emission

Test Requirement : FCC CFR47 Part 15 Section 15.247
Test Method : ANSI C63.10:2013
Test Limit : Regulation 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. 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)).

6.1Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

6.2Test Setup



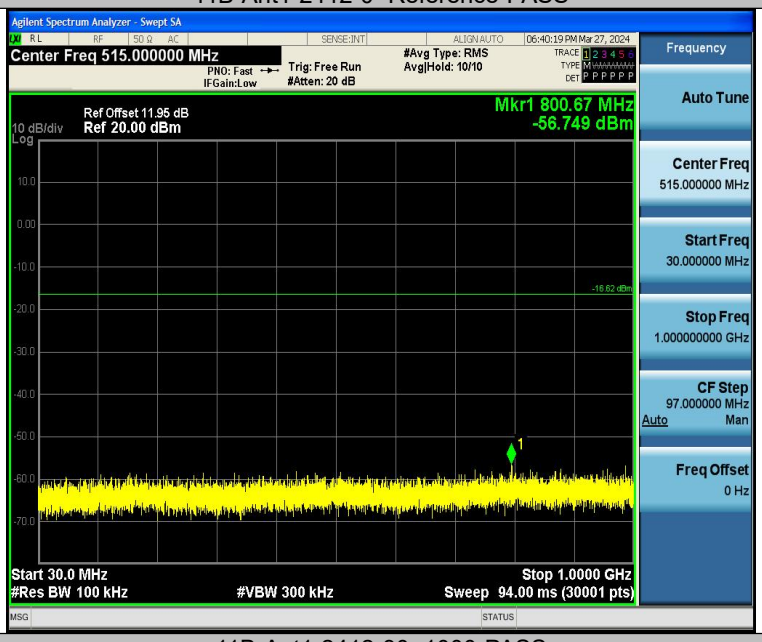
6.3Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	0~Reference	3.38	3.38	---	PASS
11B	Ant1	2412	30~1000	3.38	-56.75	≤-16.62	PASS
11B	Ant1	2412	1000~26500	3.38	-40.82	≤-16.62	PASS
11B	Ant1	2437	0~Reference	3.61	3.61	---	PASS
11B	Ant1	2437	30~1000	3.61	-57.38	≤-16.39	PASS
11B	Ant1	2437	1000~26500	3.61	-42.43	≤-16.39	PASS
11B	Ant1	2462	0~Reference	3.41	3.41	---	PASS
11B	Ant1	2462	30~1000	3.41	-57.55	≤-16.59	PASS
11B	Ant1	2462	1000~26500	3.41	-41.57	≤-16.59	PASS
11G	Ant1	2412	0~Reference	-0.62	-0.62	---	PASS
11G	Ant1	2412	30~1000	-0.62	-57.69	≤-20.62	PASS
11G	Ant1	2412	1000~26500	-0.62	-41.59	≤-20.62	PASS
11G	Ant1	2437	0~Reference	0.22	0.22	---	PASS
11G	Ant1	2437	30~1000	0.22	-57.42	≤-19.78	PASS
11G	Ant1	2437	1000~26500	0.22	-42.5	≤-19.78	PASS
11G	Ant1	2462	0~Reference	-2.19	-2.19	---	PASS
11G	Ant1	2462	30~1000	-2.19	-57.32	≤-22.19	PASS

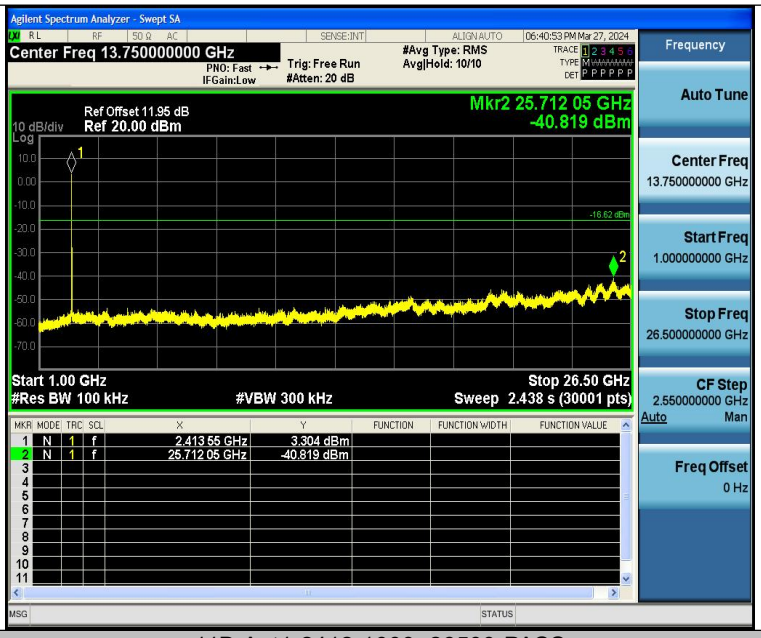
11G	Ant1	2462	1000~26500	-2.19	-42.1	≤-22.19	PASS
11N20SISO	Ant1	2412	0~Reference	-3.58	-3.58	---	PASS
11N20SISO	Ant1	2412	30~1000	-3.58	-56.51	≤-23.58	PASS
11N20SISO	Ant1	2412	1000~26500	-3.58	-42.48	≤-23.58	PASS
11N20SISO	Ant1	2437	0~Reference	-0.51	-0.51	---	PASS
11N20SISO	Ant1	2437	30~1000	-0.51	-57.98	≤-20.51	PASS
11N20SISO	Ant1	2437	1000~26500	-0.51	-42.11	≤-20.51	PASS
11N20SISO	Ant1	2462	0~Reference	-3.52	-3.52	---	PASS
11N20SISO	Ant1	2462	30~1000	-3.52	-57.59	≤-23.52	PASS
11N20SISO	Ant1	2462	1000~26500	-3.52	-41.31	≤-23.52	PASS

Test Graphs:

11B-Ant1-2412-0~Reference-PASS

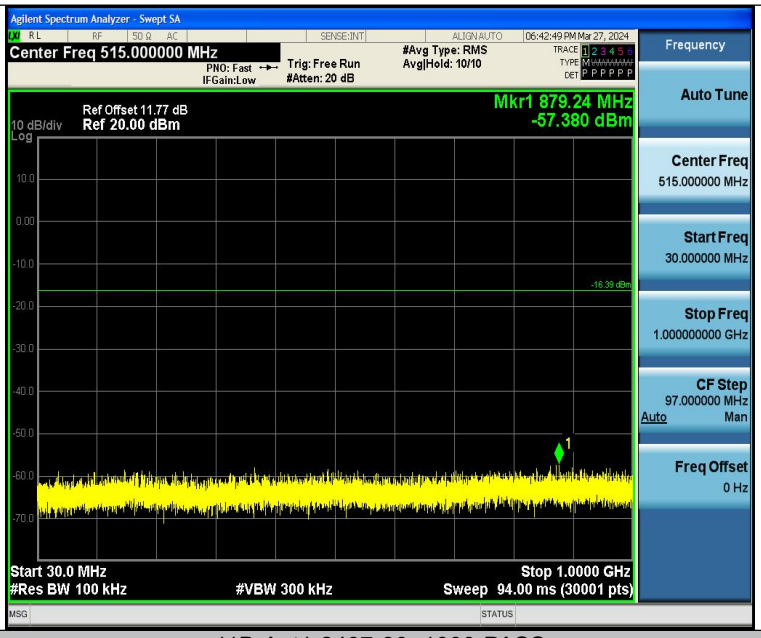


11B-Ant1-2412-30~1000-PASS

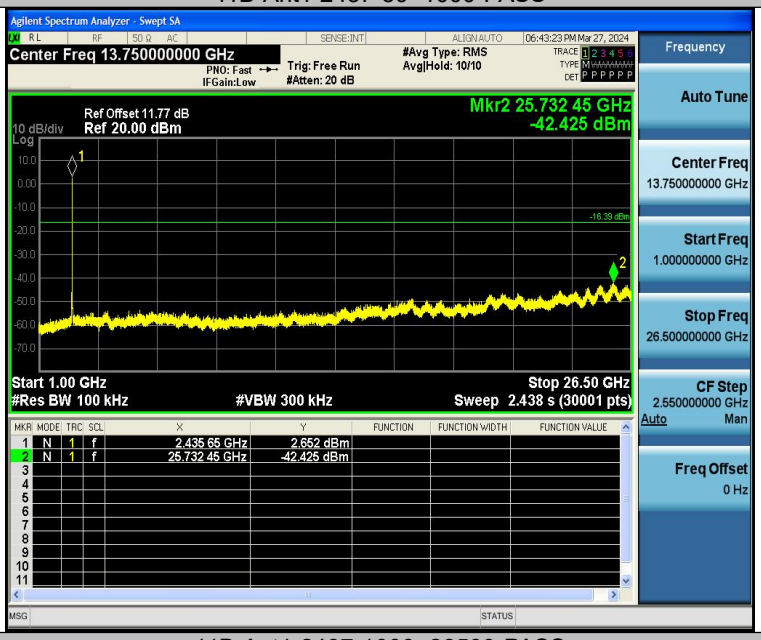


11B-Ant1-2412-1000~26500-PASS

11B-Ant1-2437-0~Reference-PASS

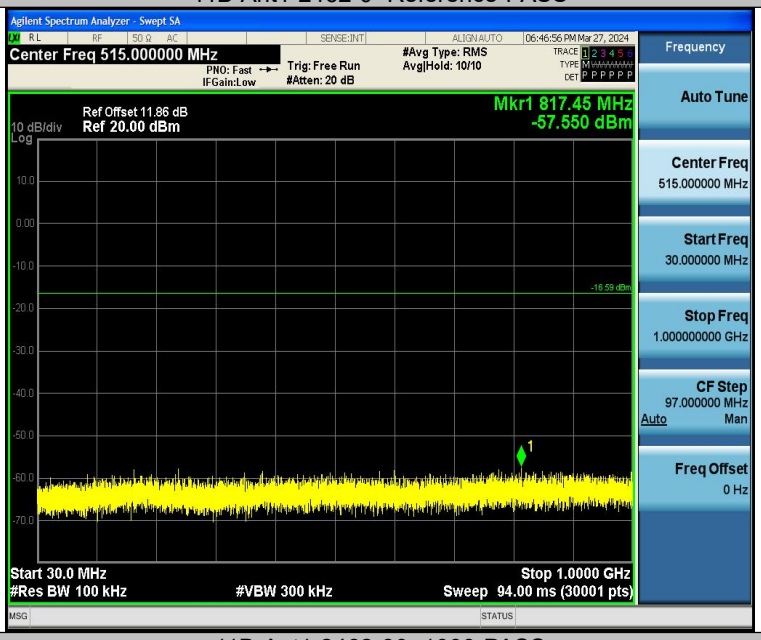


11B-Ant1-2437-30~1000-PASS

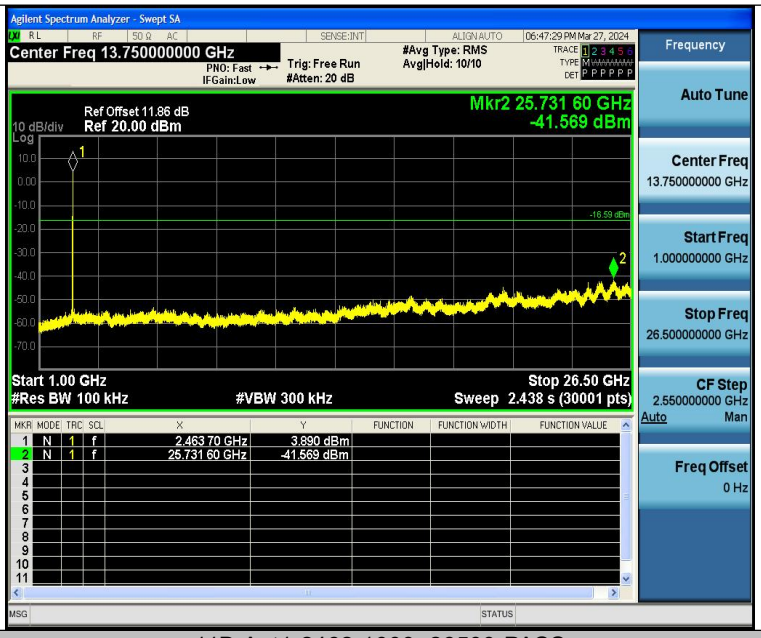


11B-Ant1-2437-1000~26500-PASS

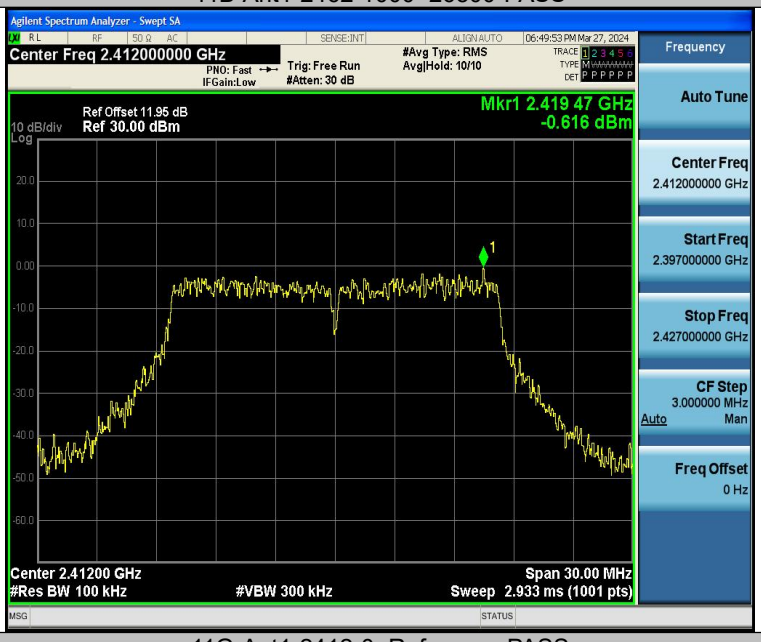
11B-Ant1-2462-0~Reference-PASS



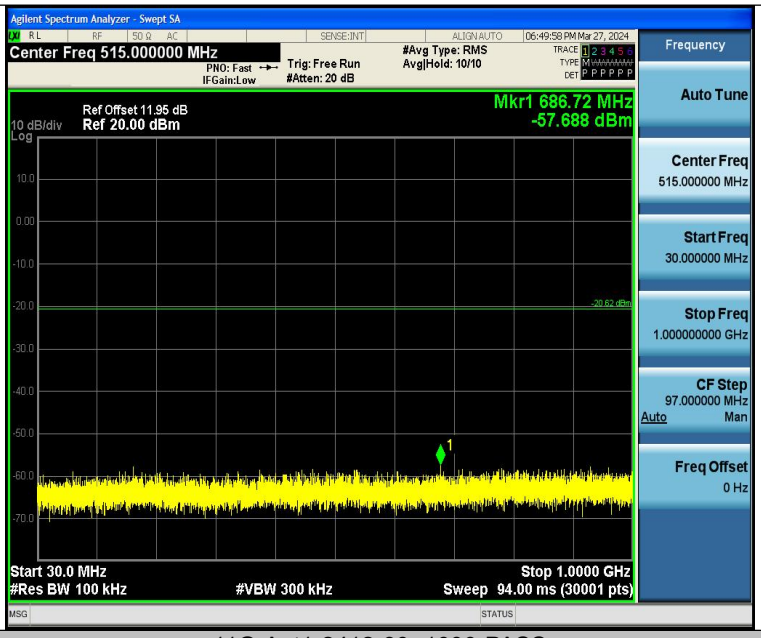
11B-Ant1-2462-30~1000-PASS



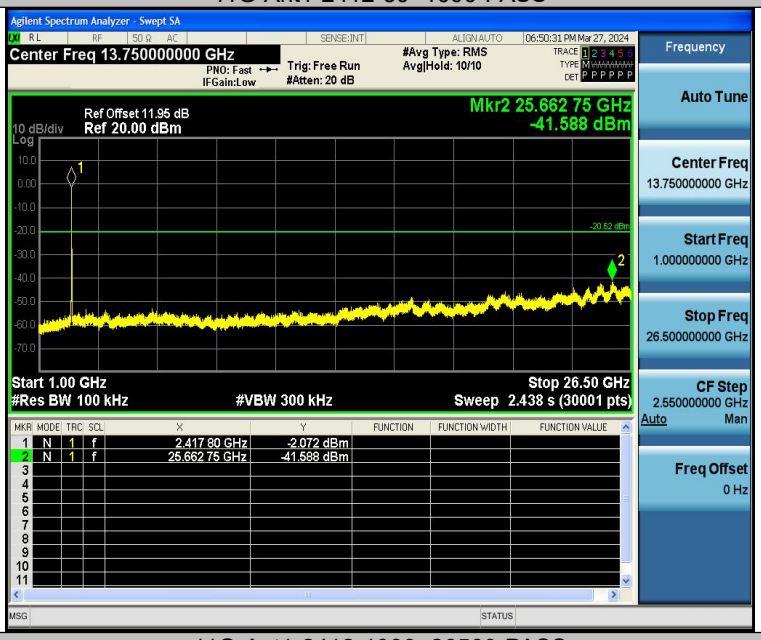
11B-Ant1-2462-1000~26500-PASS



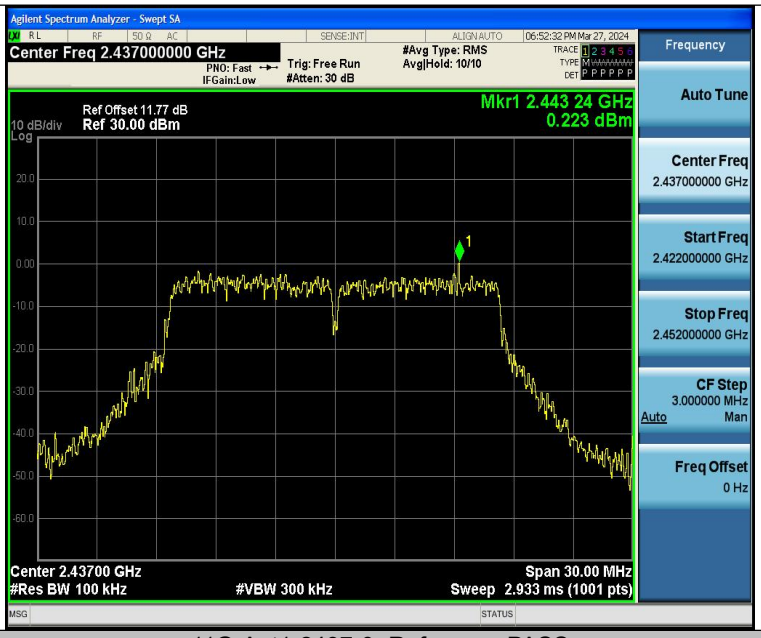
11G-Ant1-2412-0~Reference-PASS



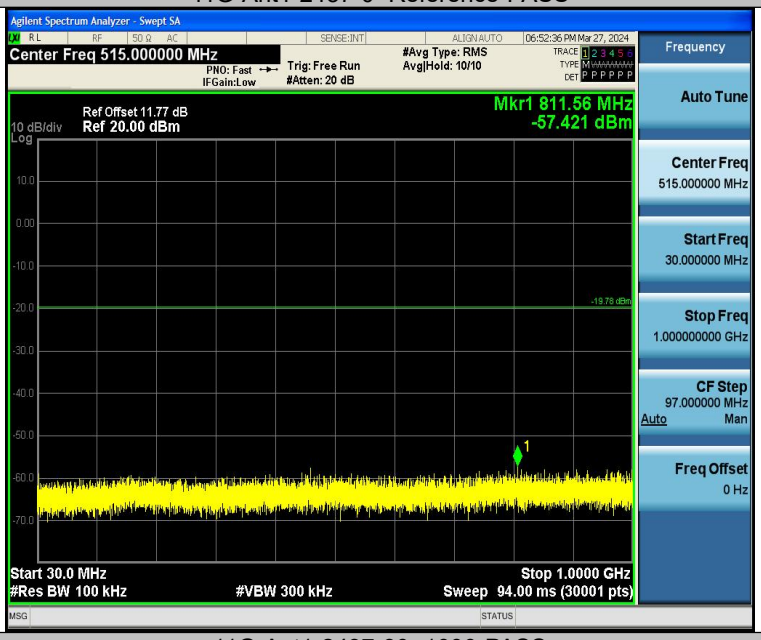
11G-Ant1-2412-30~1000-PASS



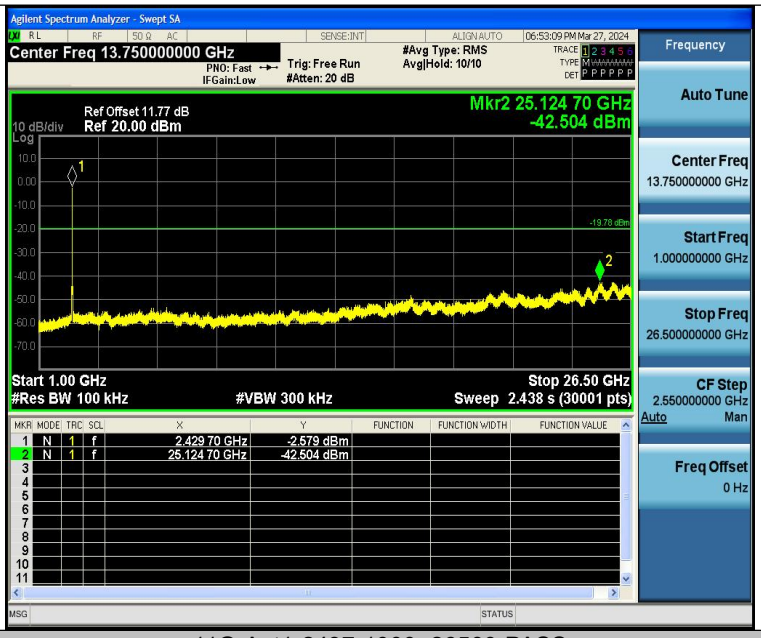
11G-Ant1-2412-1000~26500-PASS



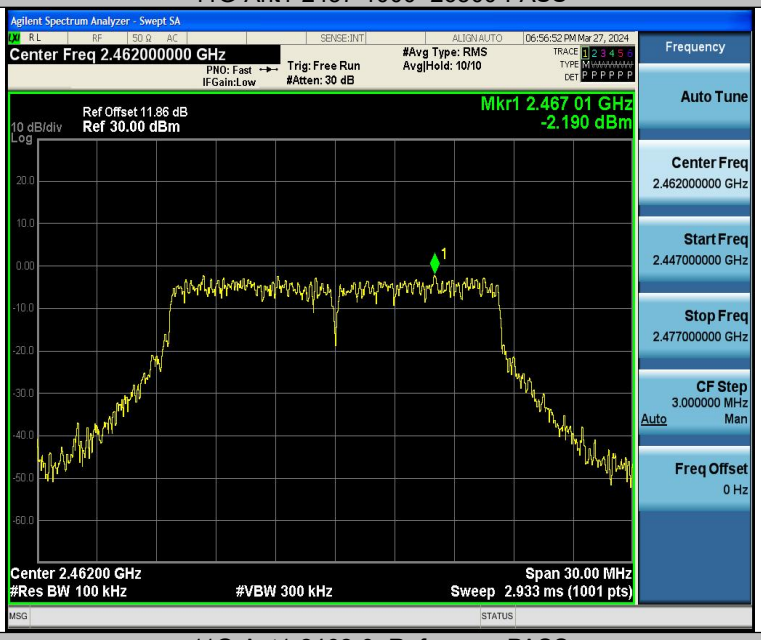
11G-Ant1-2437-0~Reference-PASS



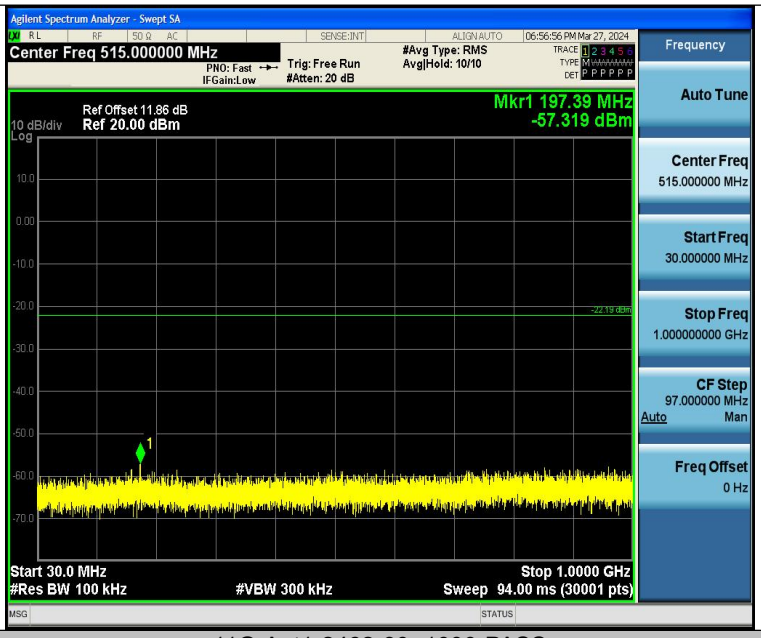
11G-Ant1-2437-30~1000-PASS



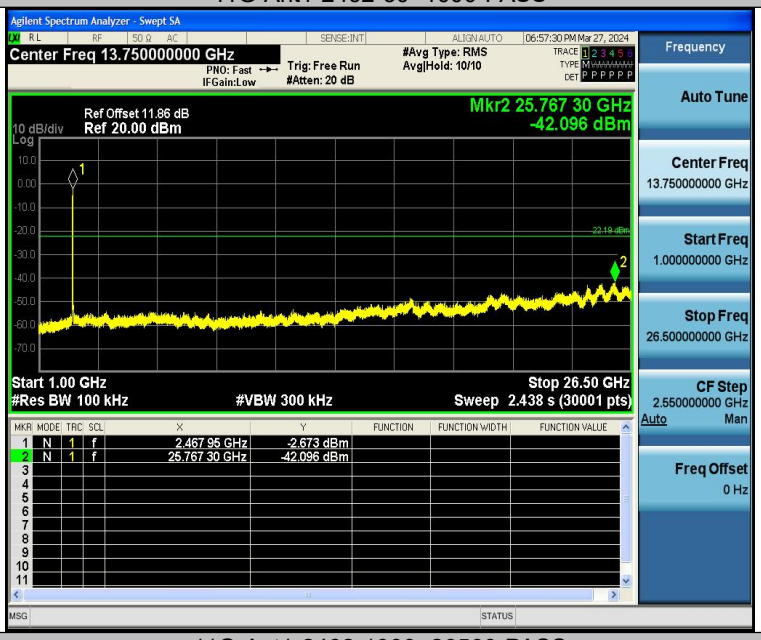
11G-Ant1-2437-1000~26500-PASS



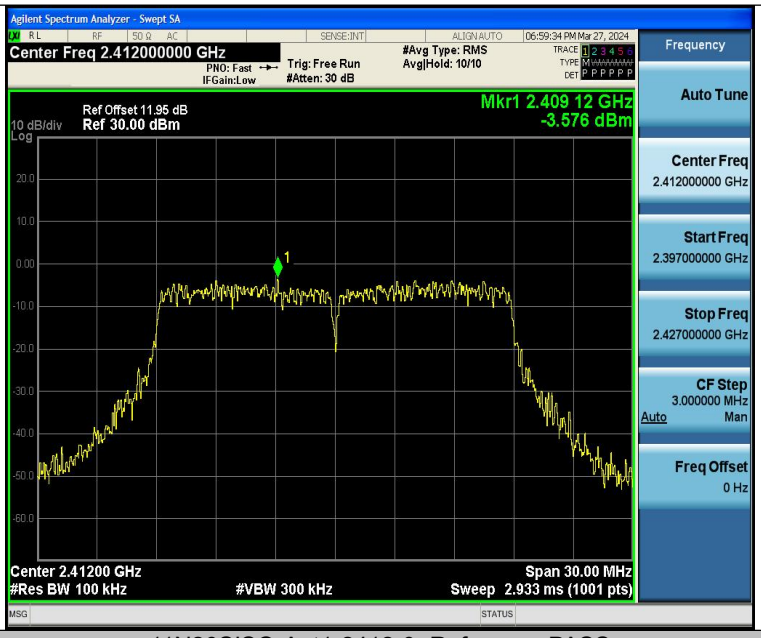
11G-Ant1-2462-0~Reference-PASS



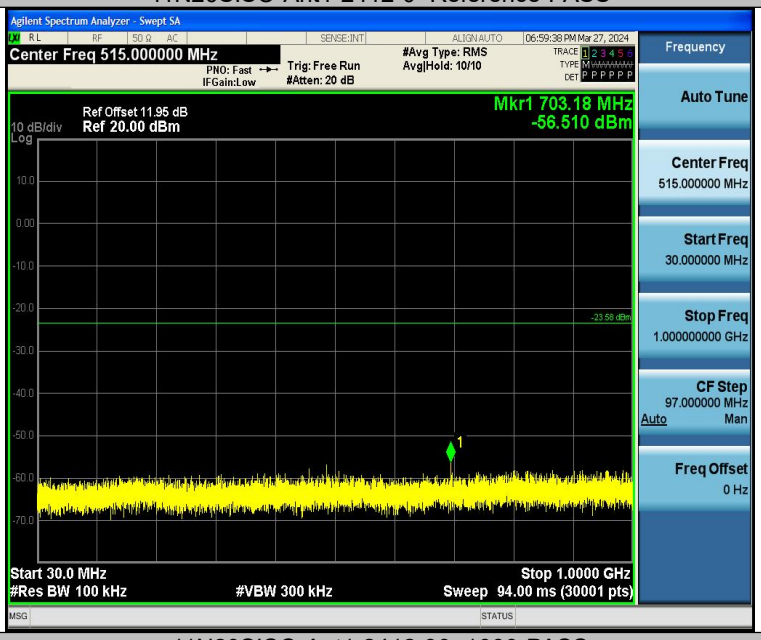
11G-Ant1-2462-30~1000-PASS



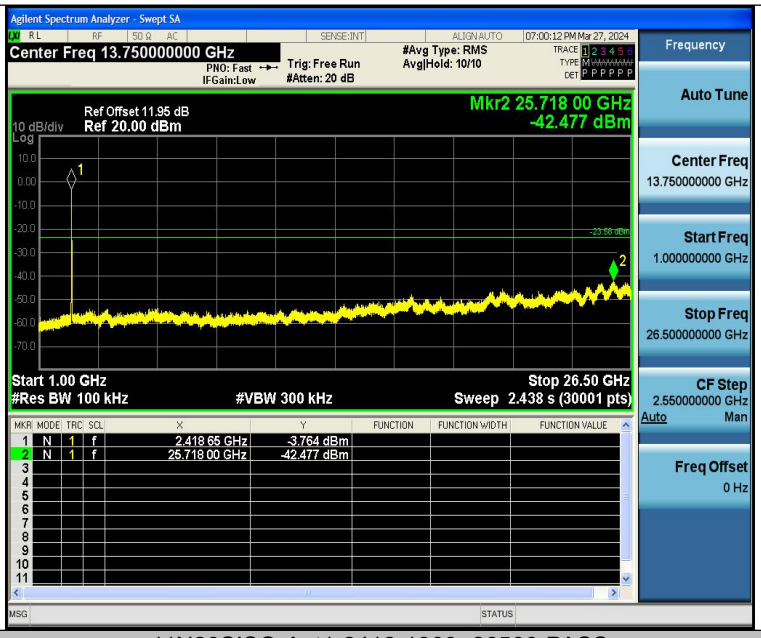
11G-Ant1-2462-1000~26500-PASS



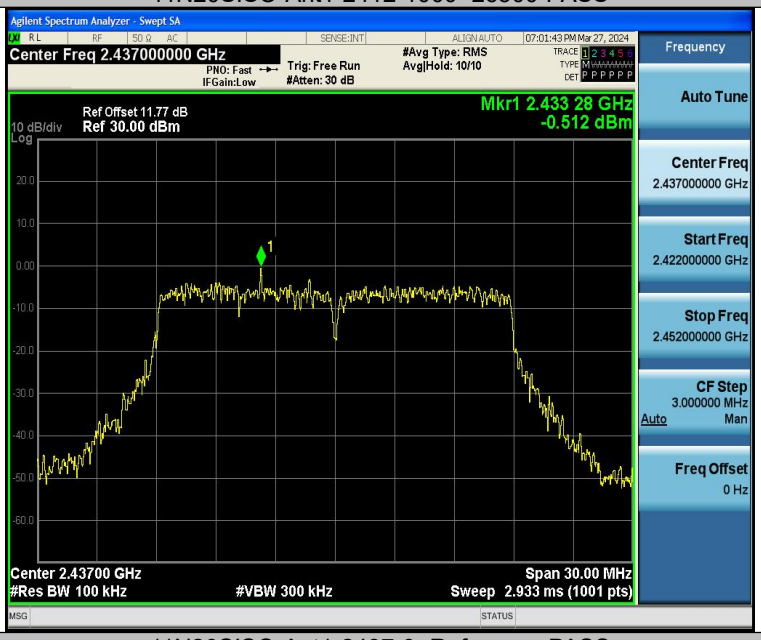
11N20SISO-Ant1-2412-0~Reference-PASS



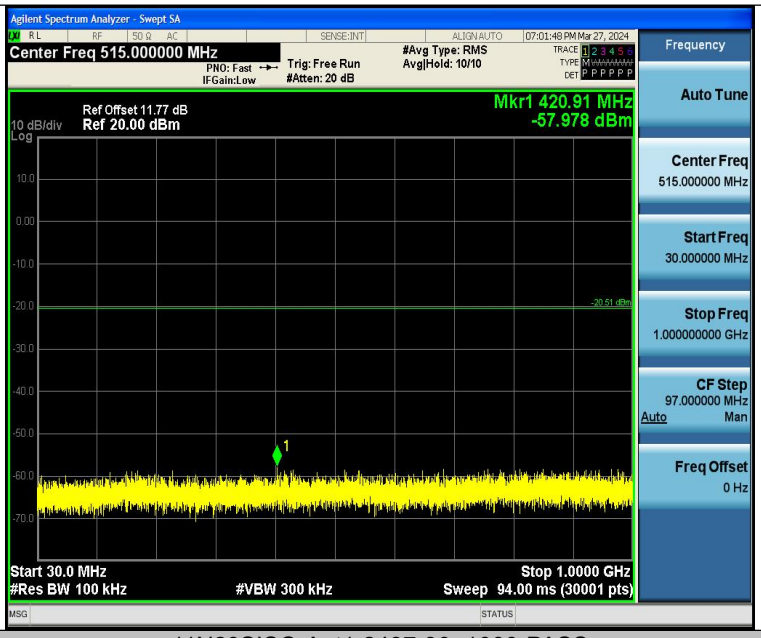
11N20SISO-Ant1-2412-30~1000-PASS



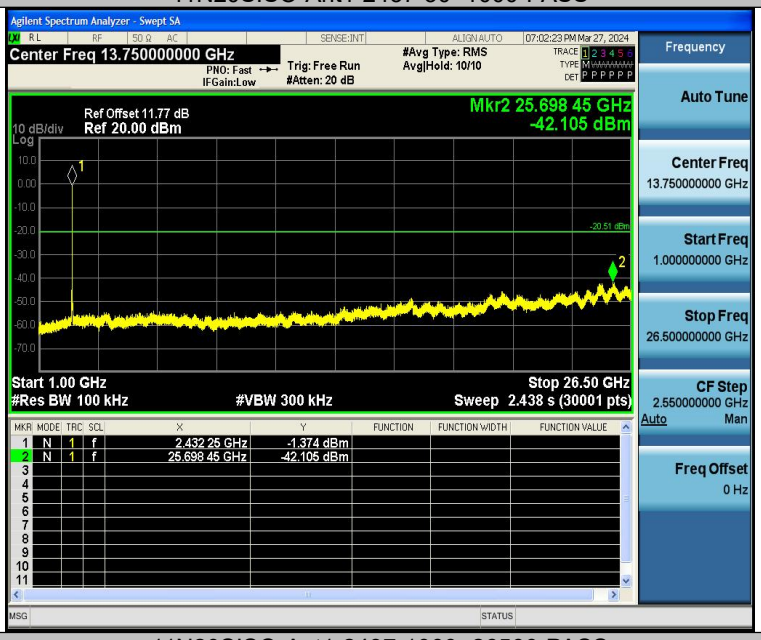
11N20SISO-Ant1-2412-1000~26500-PASS



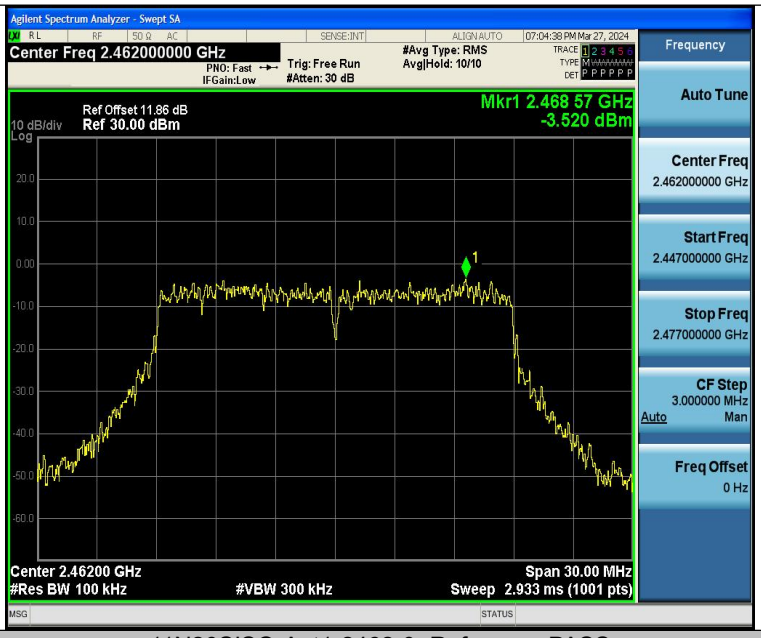
11N20SISO-Ant1-2437-0~Reference-PASS



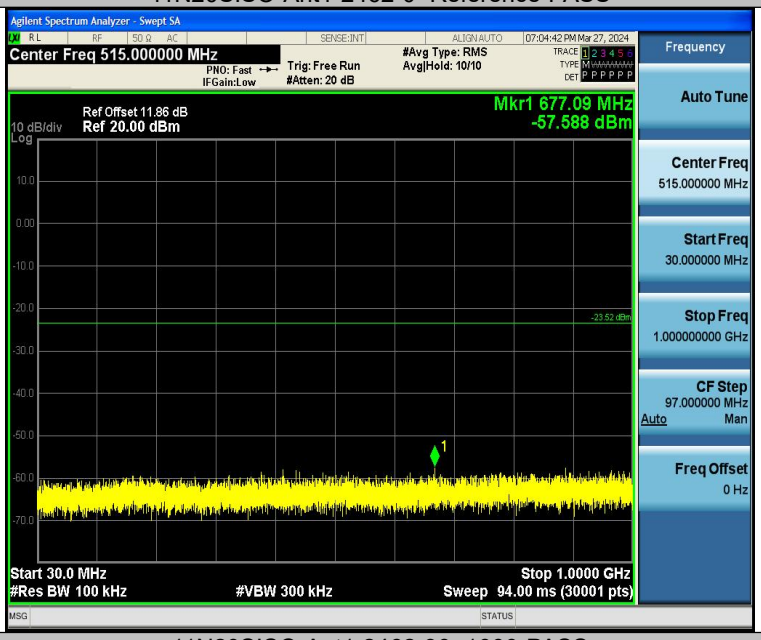
11N20SISO-Ant1-2437-30~1000-PASS



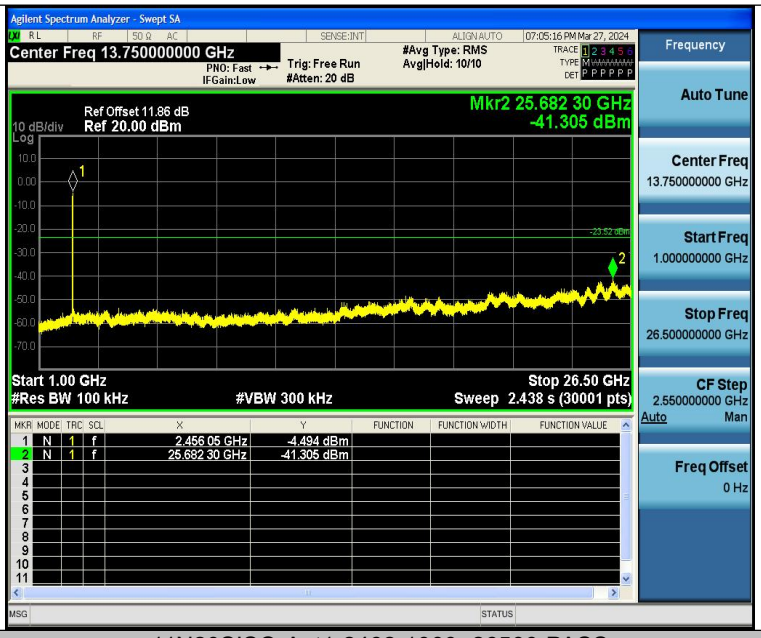
11N20SISO-Ant1-2437-1000~26500-PASS



11N20SISO-Ant1-2462-0~Reference-PASS



11N20SISO-Ant1-2462-30~1000-PASS



11N20SISO-Ant1-2462-1000~26500-PASS

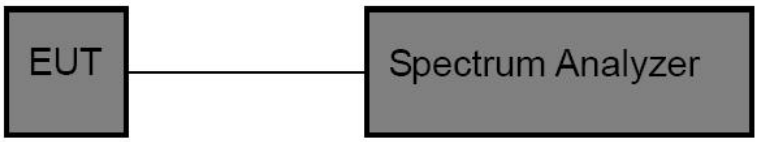
7 Band Edge Measurement

Test Requirement	:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 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. 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)).

7.1Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

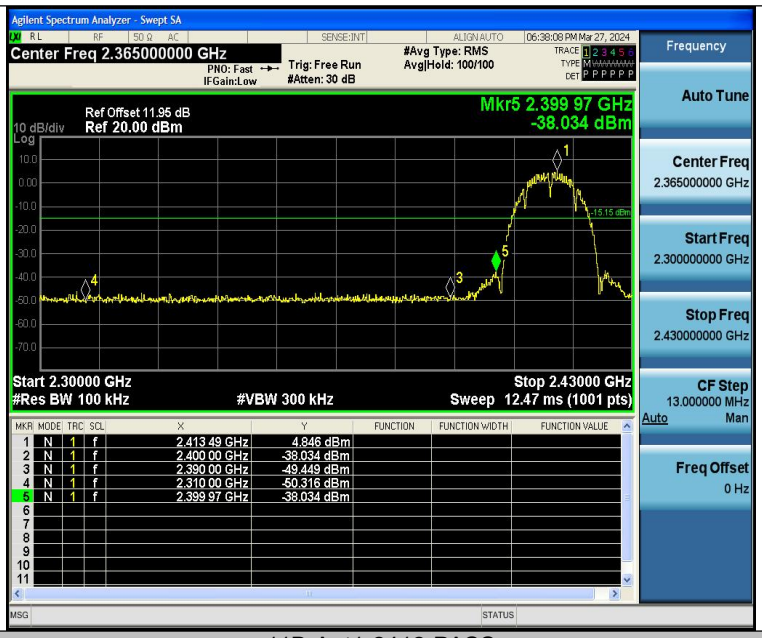
7.2Test Setup



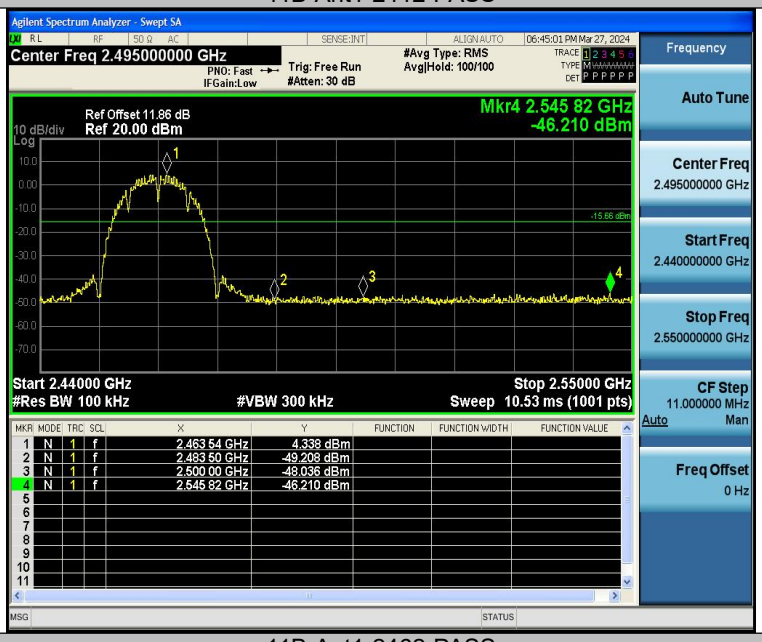
7.3Test Result

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	4.85	-38.03	≤-15.15	PASS
11B	Ant1	High	2462	4.34	-46.21	≤-15.66	PASS
11G	Ant1	Low	2412	0.90	-35.72	≤-19.1	PASS
11G	Ant1	High	2462	0.42	-46.5	≤-19.58	PASS
11N20SISO	Ant1	Low	2412	0.02	-38.23	≤-19.98	PASS
11N20SISO	Ant1	High	2462	-0.04	-46.17	≤-20.04	PASS

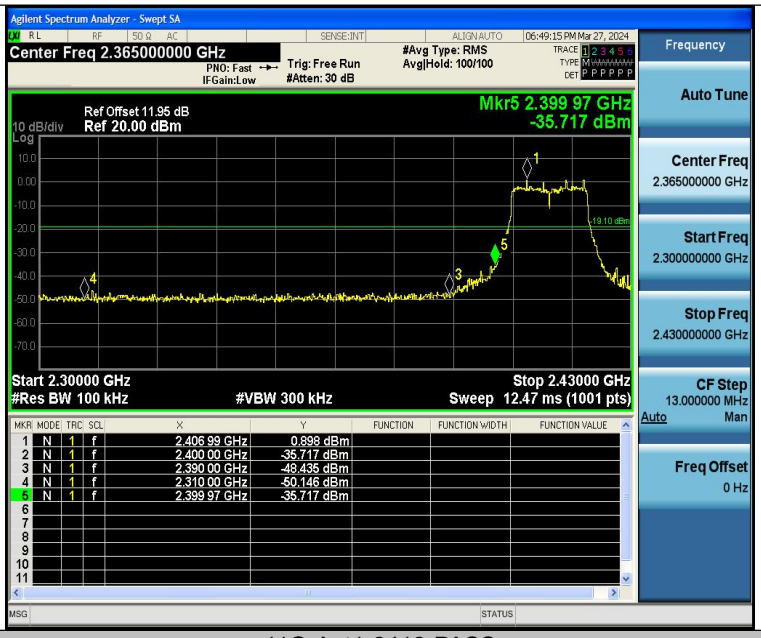
Test Graphs:



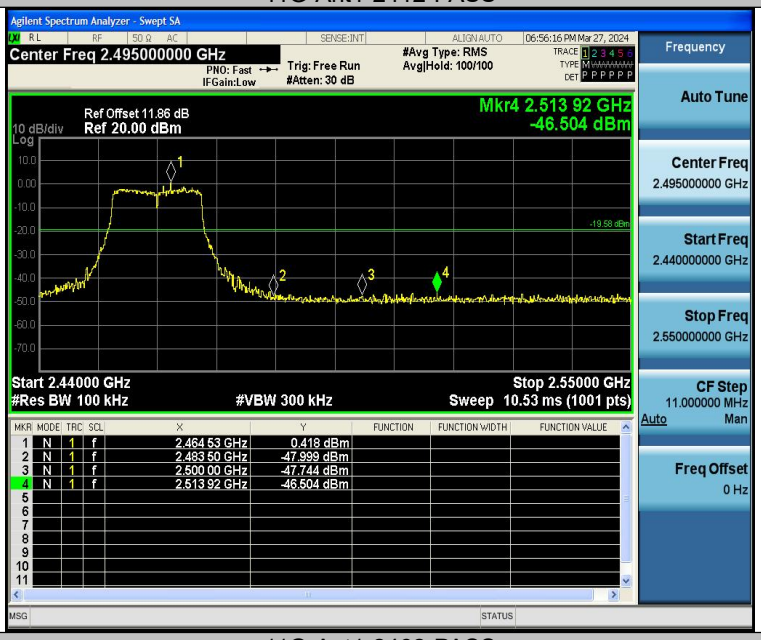
11B-Ant1-2412-PASS



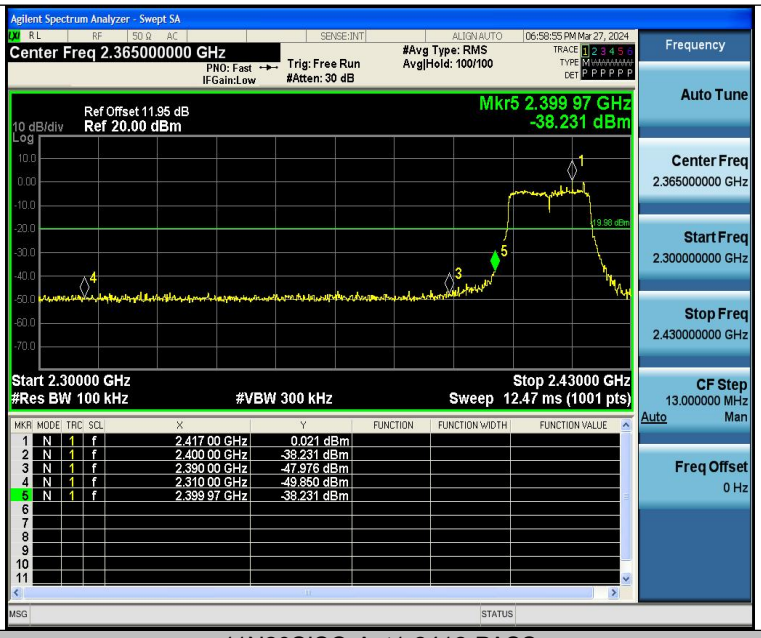
11B-Ant1-2462-PASS



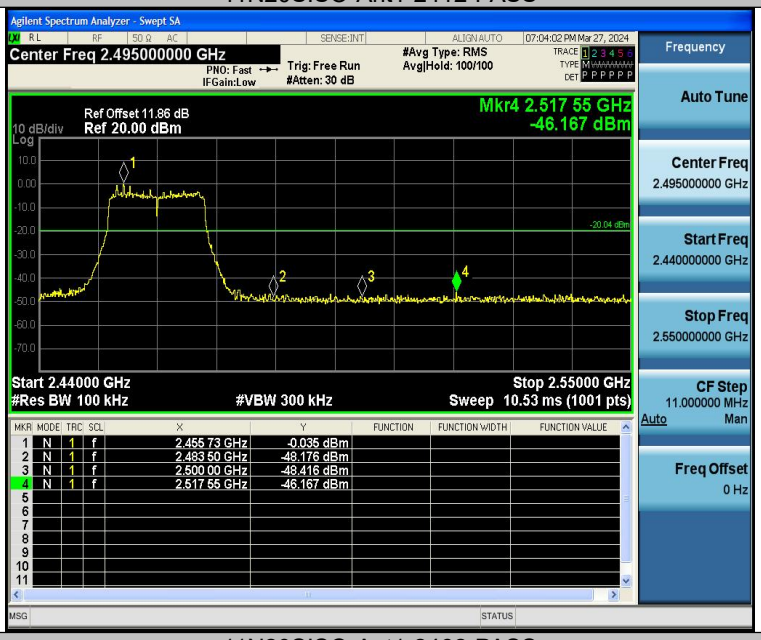
11G-Ant1-2412-PASS



11G-Ant1-2462-PASS



11N20SISO-Ant1-2412-PASS



11N20SISO-Ant1-2462-PASS

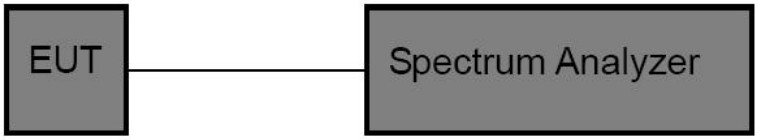
8 6dB Bandwidth Measurement

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Test Limit		Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.1Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

8.2Test Setup

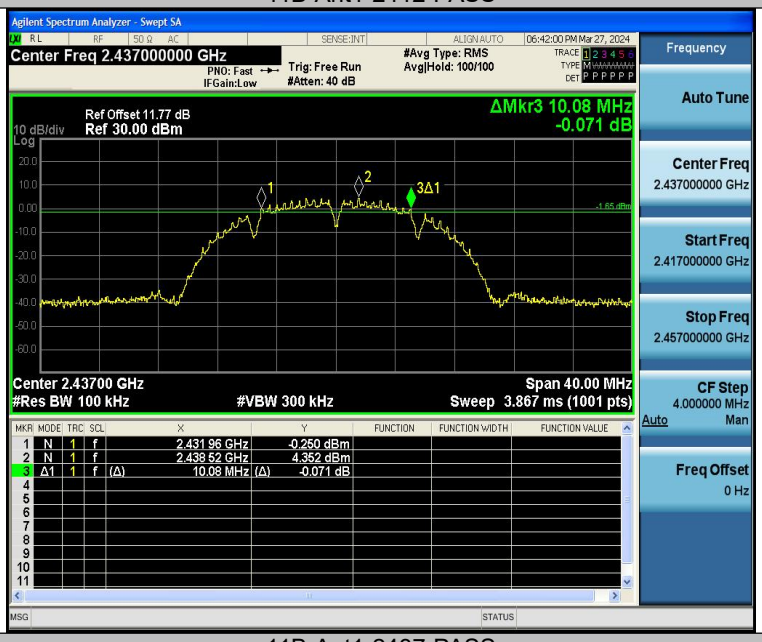


8.3Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	10.040	2407.000	2417.040	0.5	PASS
11B	Ant1	2437	10.080	2431.960	2442.040	0.5	PASS
11B	Ant1	2462	10.040	2457.000	2467.040	0.5	PASS
11G	Ant1	2412	16.320	2403.840	2420.160	0.5	PASS
11G	Ant1	2437	16.320	2428.840	2445.160	0.5	PASS
11G	Ant1	2462	16.320	2453.840	2470.160	0.5	PASS
11N20SISO	Ant1	2412	17.520	2403.240	2420.760	0.5	PASS
11N20SISO	Ant1	2437	17.520	2428.240	2445.760	0.5	PASS
11N20SISO	Ant1	2462	17.520	2453.240	2470.760	0.5	PASS

Test Graphs:

11B-Ant1-2412-PASS



11B-Ant1-2437-PASS

11B-Ant1-2462-PASS

11G-Ant1-2412-PASS