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Moonstone Technology(Shaoxing) Co., Ltd.

RF TEST REPORT

Report Type:
FCC Part 15.247 & ISED RSS-247 RF report

Model:
RLE51SC

REPORT NUMBER:
2412B0045SHA-001

ISSUE DATE:
Jan 2, 2025

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 2412B0045SHA-001

Applicant:	Moonstone Technology(Shaoxing) Co., Ltd. Room 301, 3rd Floor, Building 2, No. 99 Chuangxing Road, Sunduan Street, Yuecheng District, Shaoxing City, Zhejiang Province, China
Manufacturer:	Moonstone Technology(Shaoxing) Co., Ltd. Room 301, 3rd Floor, Building 2, No. 99 Chuangxing Road, Sunduan Street, Yuecheng District, Shaoxing City, Zhejiang Province, China
FCC ID:	2BKDG-RLE51SC
IC:	32913-RLE51SC

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2023): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-247 Issue 3 (August 2023): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (April 2018)+A1(March 2019)+A2(February 2021): General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
	
Project Engineer Teddy Yin	Reviewer Wakeyou Wang

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Content

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Revision History

Report No.	Version	Description	Issued Date
2412B0045SHA-001	Rev. 01	Initial issue of report	Jan 2, 2025

Measurement result summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-247 Issue 3 Clause 5.2	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	RSS-247 Issue 3 Clause 5.4	Pass
Power spectrum density	15.247(e)	RSS-247 Issue 3 Clause 5.2	Pass
Emission outside the frequency band	15.247(d)	RSS-247 Issue 3 Clause 5.5	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	RSS-Gen Issue 5 Clause 8.9&8.10	Pass
Power line conducted emission	15.207(a)	RSS-Gen Issue 5 Clause 8.8	Pass
Occupied bandwidth	-	RSS-Gen Issue 5 Clause 6.7	Tested
Antenna requirement	15.203	-	Pass

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Robotic Vacuum Cleaner
Type/Model/PMN/HVIN:	RLE51SC
Description of EUT:	The appliance covered by this report is automatically battery-powered vacuum cleaner and dry pick up for household indoor use only. The EUT contains WIFI mode and BLE mode. This report is for WIFI mode. The worst data is listed in the report.
Rating:	DC 14.4V
EUT type:	☐ Table top ☒ Floor standing
Software Version:	V1.0
Hardware Version:	V1.0
Sample No.:	A241205-03-001
Sample received date:	Dec 10, 2024
Date of test:	Dec 10~24, 2024

1.2 Technical Specification

Frequency Range:	2412MHz ~ 2462MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Channel Number:	11 Channels for 802.11b, 802.11g and 802.11n(HT20) 7 Channels for 802.11n(HT40)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Channel Separation:	5 MHz

1.3 Antenna information

Antenna No.	Model	Antenna type	Antenna Gain	Note
1	/	PIFA antenna	1.75dBi	Declared by manufacturer

Mode	Tx/Rx Function	Beamforming function	CDD function
802.11b	1Tx/1Rx	NO	NO
802.11g	1Tx/1Rx	NO	NO
802.11n(HT20)	1Tx/1Rx	NO	NO
802.11n(HT40)	1Tx/1Rx	NO	NO

1.4 Description of Test Facility

Name:	Intertek Testing Services (Shanghai FTZ) Co., Ltd.
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L21189
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2023)
ANSI C63.10 (2013)
KDB 558074 D01(v05r02)
RSS-247 Issue 3 (August 2023)
RSS-Gen Issue 5 (April 2018)+A1(March 2019))+A2(February 2021)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the continuously transmission was applied by following software.

Software name	Manufacturer	Version	Supplied by
WifiSRRC	/	V2.7.4	Manufacturer

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)	Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
2400-2483.5	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n(HT20)	2412	2437	2462
	802.11n(HT40)	2422	2437	2452

Data rate VS Power:
The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases. After this pre-scan, we choose the following table of the data rata as the worst case.

Frequency Band (MHz)	Mode	Worst case data rate	Power Setting
2400-2483.5	802.11b	1Mbps	13
	802.11g	6Mbps	8
	802.11n(HT20)	MCS0	8
	802.11n(HT40)	MCS0	8

The EUT will use two types antenna, and there have the following test mode:
Radiated test mode:
Mode 1: EUT transmitted signal with internal antenna;
Conducted test mode:
Mode 2: EUT transmitted signal from PCBA RF port connected to SPA directly;
We have verified all test modes, and choose the worst mode 1 for radiated test and mode 2 for conducted test as representatively to list the results in this report.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL 5480	/
2	Base Station	RBEC0101	Input: 20VDC, 1.8A; Output: 20VDC, 0.8A
3	Charger	SC36H-200180U	Input: 100-240V~, 50/60Hz, 1.2A; Output: DC 20V, 1.8A. Class II

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	22°C	55% RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	22°C	55% RH
Power line conducted emission	22°C	55% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2025-02-27
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2025-07-23
☒	Shielded room	Zhongyu	-	EC 2838	2025-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2025-08-18
☒	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2025-03-19
☒	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2025-12-07
☒	Horn antenna	Tonscend	bha9120d	EC 6432-2	2025-03-20
☒	Horn antenna	ETS	3116c	EC 5955	2025-08-14
☒	Semi-anechoic chamber	Albatross	-	EC 3048	2026-07-11
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2025-03-05
☒	Coaxial cable	ETS	/	/	2025-03-05
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	Testo	175h1	EC 6640	2025-08-29
☒	Therom-Hygrograph	Testo	175h1	EC 6641	2025-08-29
☒	Thermo-Hygrograph	Testo	175h1	EC6642	2025-08-29

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Occupied Channel Bandwidth	± 0.88 %
Power line conducted emission	± 3.19dB

3 Minimum 6dB bandwidth

Test result: Pass

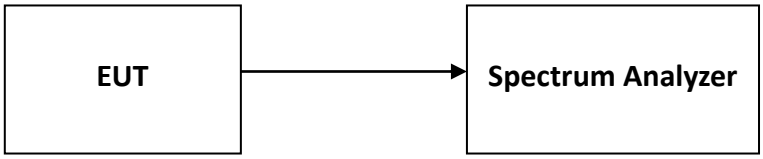
3.1 Limit

For systems using digital modulation techniques that 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.

3.2 Measurement Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (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.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix A

4 Maximum conducted output power and e.i.r.p.

Test result: Pass

4.1 Limit

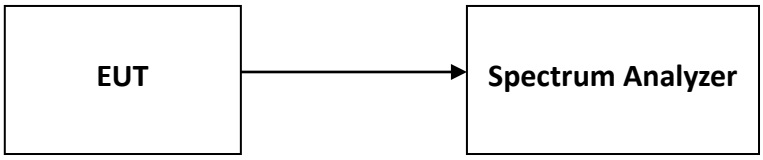
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to DTS test procedure of “KDB558074 D01v05r02 15.247 Meas Guidance” (clause 8.3.1.2) for compliance requirements.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix A

5 Power spectrum density

Test result: **Pass**

5.1 Limit

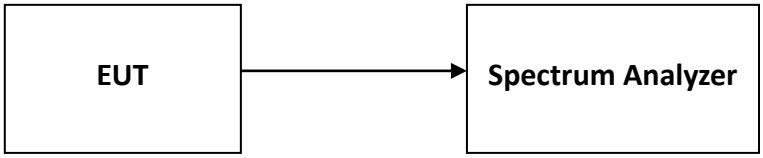
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

5.2 Measurement Procedure

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.
a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to 3 kHz ≥ RBW ≥ 100 kHz.
d) Set the VBW ≥ [3 × RBW].
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

5.3 Test Configuration



5.4 Test Results of Power spectrum density

Please refer to Appendix A

6 Emission outside the frequency band

Test result: **Pass**

6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

6.2 Measurement Procedure

Reference level measurement

Establish a reference level by using the following procedure:

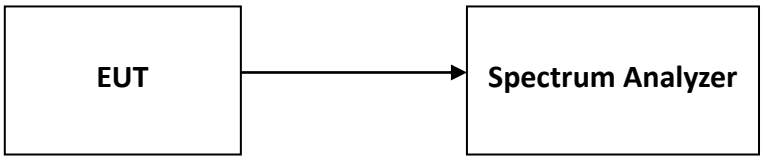
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix A

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (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

7.2 Measurement Procedure

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (0.1 meters for floor-standing device) above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b) The EUT was set 3 meters away from the interference-receiving antenna, the lowest height of the magnetic antenna was 1 m above the ground.
c) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

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For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) or 0.1 meters (for floor-standing device) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

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

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

d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

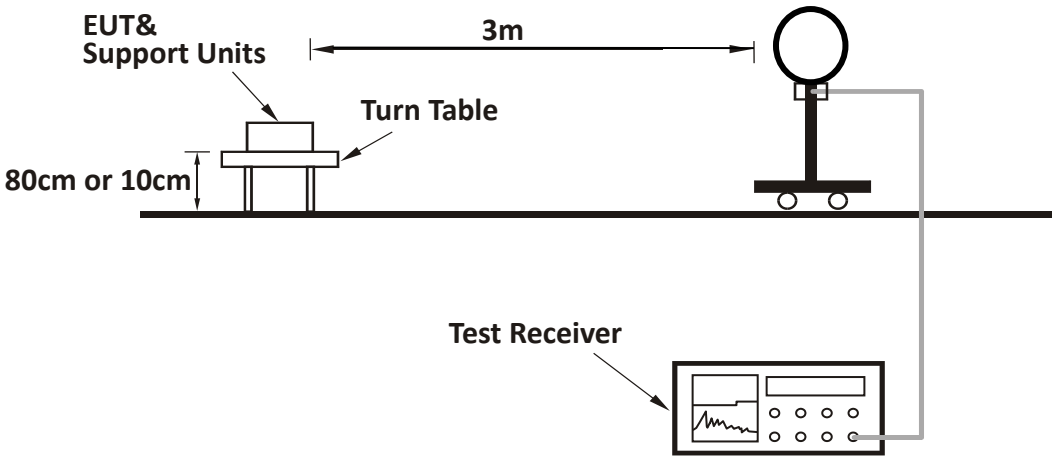
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

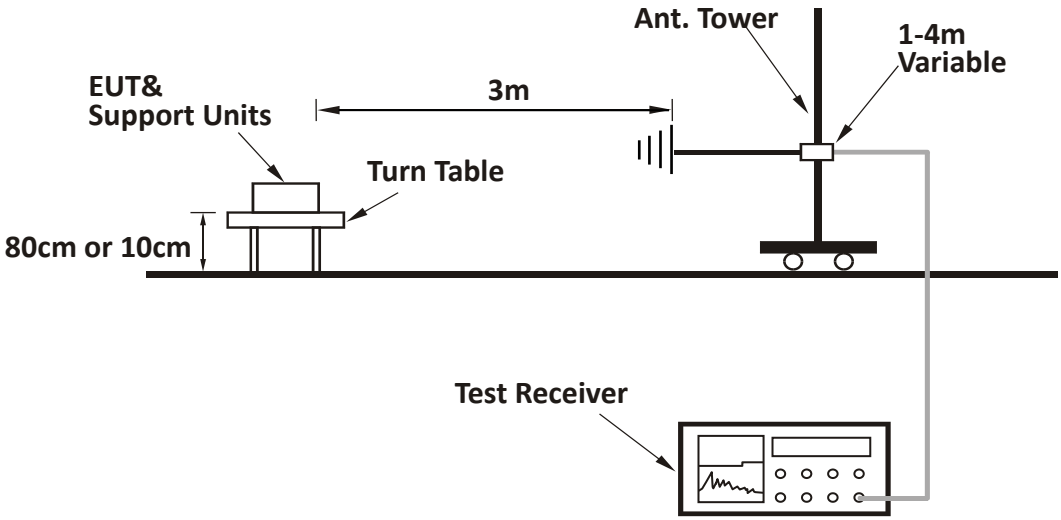
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

7.3 Test Configuration

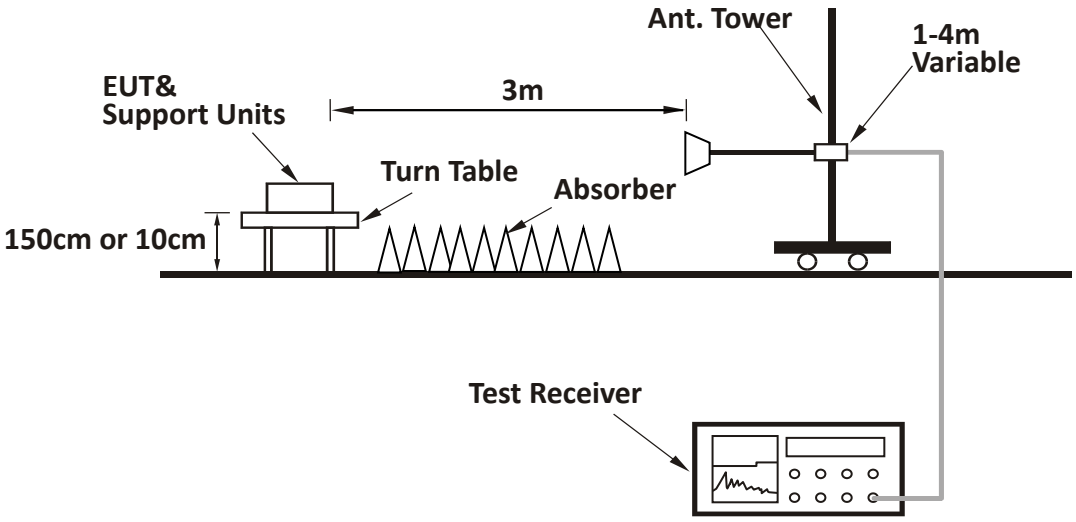
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

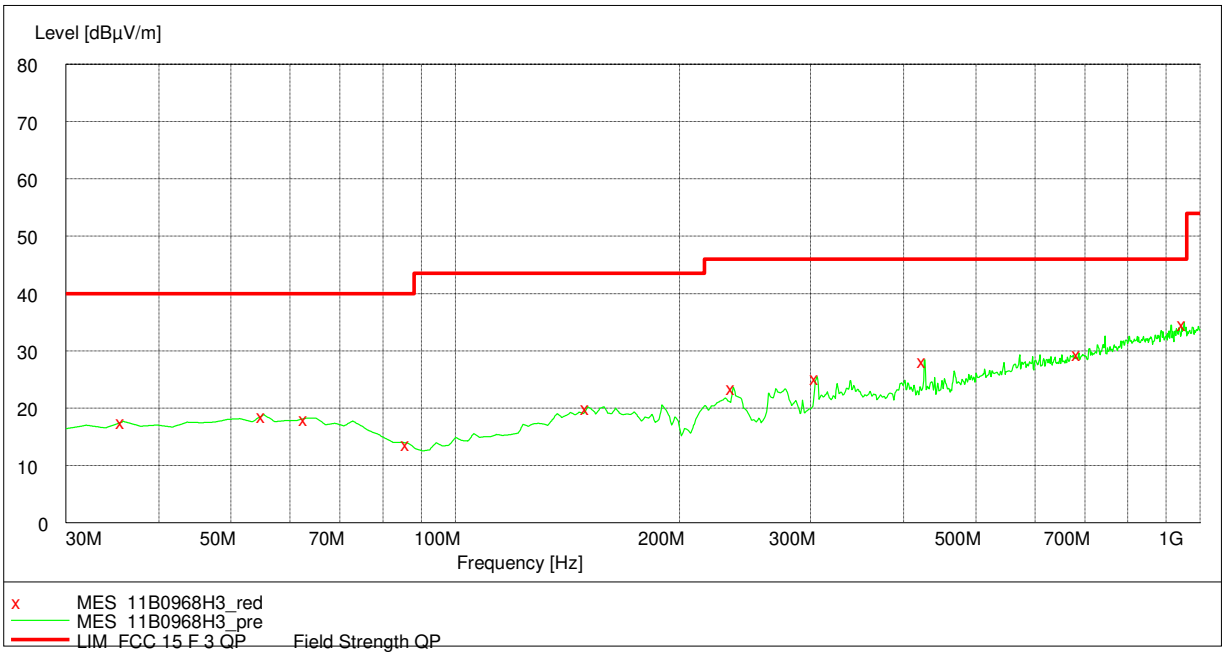


7.4 Test Results of Radiated Emissions

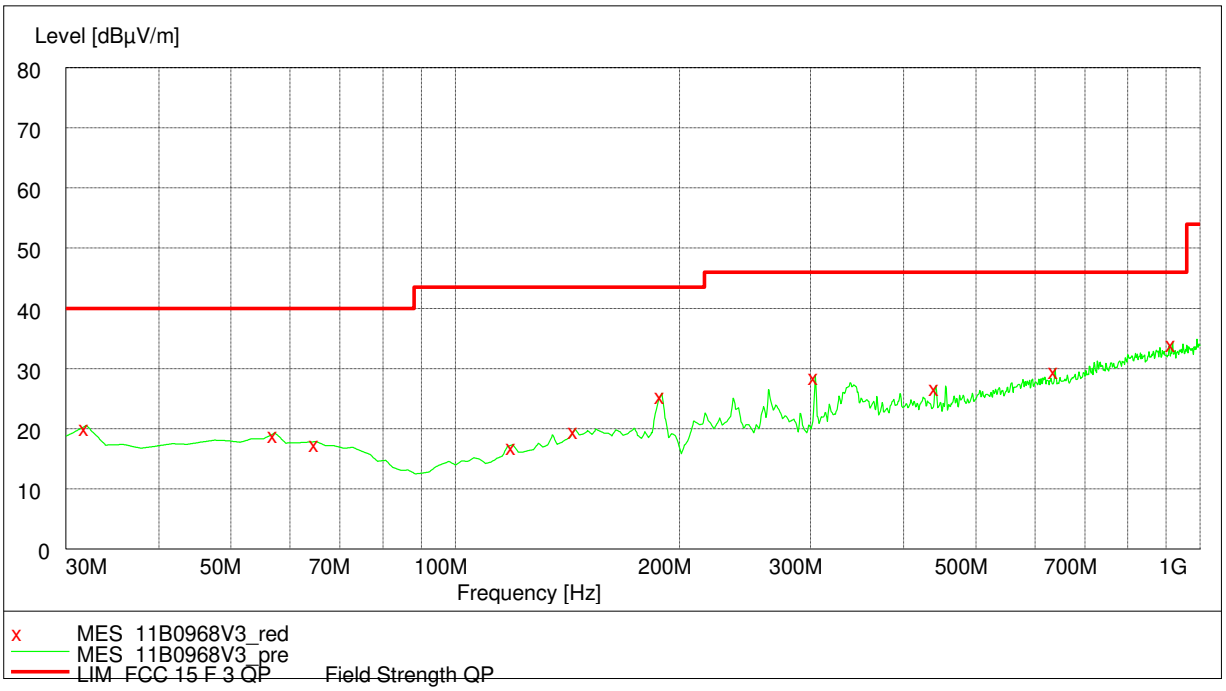
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 1 5.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



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Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	55.27	18.90	14.30	40.00	21.10	PK
H	63.05	18.30	13.70	40.00	21.70	PK
H	306.03	25.50	15.30	46.00	20.50	PK
H	426.55	28.40	18.30	46.00	17.60	PK
H	687.03	29.60	23.40	46.00	16.40	PK
H	951.40	34.90	26.80	46.00	11.10	PK
V	31.94	20.50	13.00	40.00	19.50	PK
V	189.40	25.90	12.20	43.50	17.60	PK
V	304.09	28.90	15.30	46.00	17.10	PK
V	442.10	27.10	18.70	46.00	18.90	PK
V	638.44	30.00	22.70	46.00	16.00	PK
V	918.36	34.40	26.40	46.00	11.60	PK

Note: The worst test result (30MHz to 1GHz) of 802.11b channel L (2412MHz) was chosen to list in the report as representative.

Test result above 1GHz:

The emission was conducted from 1GHz to 25GHz

802.11b

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2390.00	62.30	32.6	74	11.70	PK
	H/V	2390.00	48.96	32.6	54	5.04	AV
	H/V	4824.00	48.52	-12.7	74	25.48	PK
	H/V	4824.00	41.89	-12.7	54	12.11	AV
M	H/V	4874.00	47.57	-12.6	74	26.43	PK
	H/V	4874.00	41.54	-12.6	54	12.46	AV
H	H/V	2483.50	62.85	32.9	74	11.15	PK
	H/V	2483.50	49.54	32.9	54	4.46	AV
	H/V	4924.00	42.16	-12.3	74	31.84	PK
	H/V	4924.00	35.72	-12.3	54	18.28	AV

802.11g

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2390.00	61.91	32.6	74	12.09	PK
	H/V	2390.00	47.95	32.6	54	6.05	AV
	H/V	4824.00	45.24	-12.7	74	28.76	PK
	H/V	4824.00	38.56	-12.7	54	15.44	AV
M	H/V	4874.00	43.79	-12.6	74	30.21	PK
	H/V	4874.00	37.14	-12.6	54	16.86	AV
H	H/V	2483.50	61.62	32.9	74	12.38	PK
	H/V	2483.50	48.07	32.9	54	5.93	AV
	H/V	4924.00	40.25	-12.3	74	33.75	PK
	H/V	4924.00	34.33	-12.3	54	19.67	AV

802.11n(HT20)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2390.00	60.64	32.6	74	13.36	PK
	H/V	2390.00	45.48	32.6	54	8.52	AV
	H/V	4824.00	45.51	-12.7	74	28.49	PK
	H/V	4824.00	38.85	-12.7	54	15.15	AV
M	H/V	4874.00	43.15	-12.6	74	30.85	PK
	H/V	4874.00	35.88	-12.6	54	18.12	AV
H	H/V	2483.50	60.71	32.9	74	13.29	PK
	H/V	2483.50	46.38	32.9	54	7.62	AV
	H/V	4924.00	40.63	-12.3	74	33.37	PK
	H/V	4924.00	34.42	-12.3	54	19.58	AV

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802.11n(HT40)

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2390.00	66.22	32.6	74	7.78	PK
	H/V	2390.00	49.75	32.6	54	4.25	AV
	H/V	4844.00	46.66	-12.6	74	27.34	PK
	H/V	4844.00	40.22	-12.6	54	13.78	AV
M	H/V	4874.00	44.35	-12.6	74	29.65	PK
	H/V	4874.00	38.06	-12.6	54	15.94	AV
H	H/V	2483.50	68.20	32.9	74	5.80	PK
	H/V	2483.50	51.48	32.9	54	2.52	AV
	H/V	4904.00	42.52	-12.4	74	31.48	PK
	H/V	4904.00	36.43	-12.4	54	17.57	AV

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

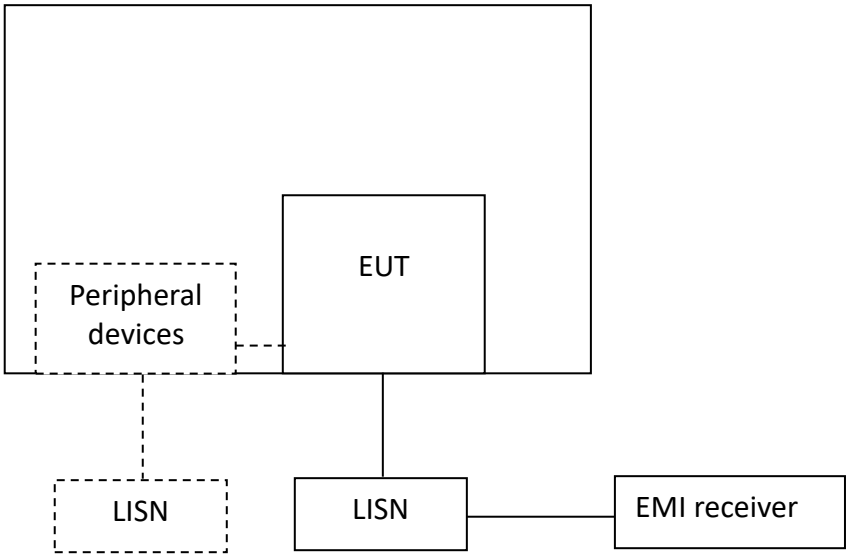
8 Power line conducted emission

Test result: **Pass**

8.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
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.		

8.2 Test Configuration



8.3 Measurement Procedure

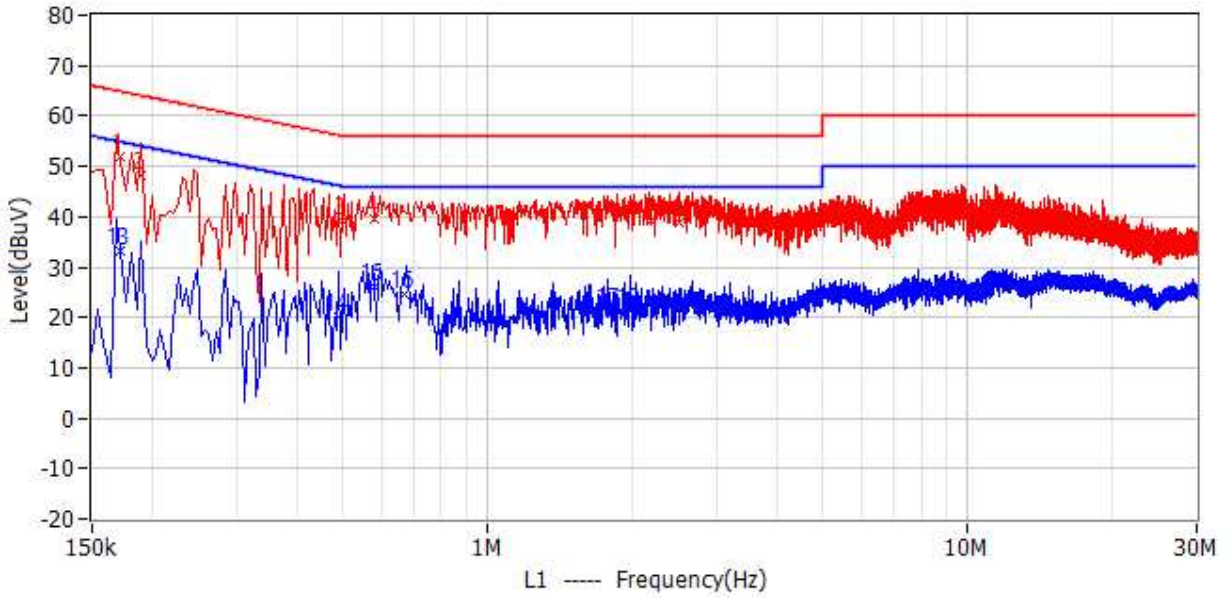
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

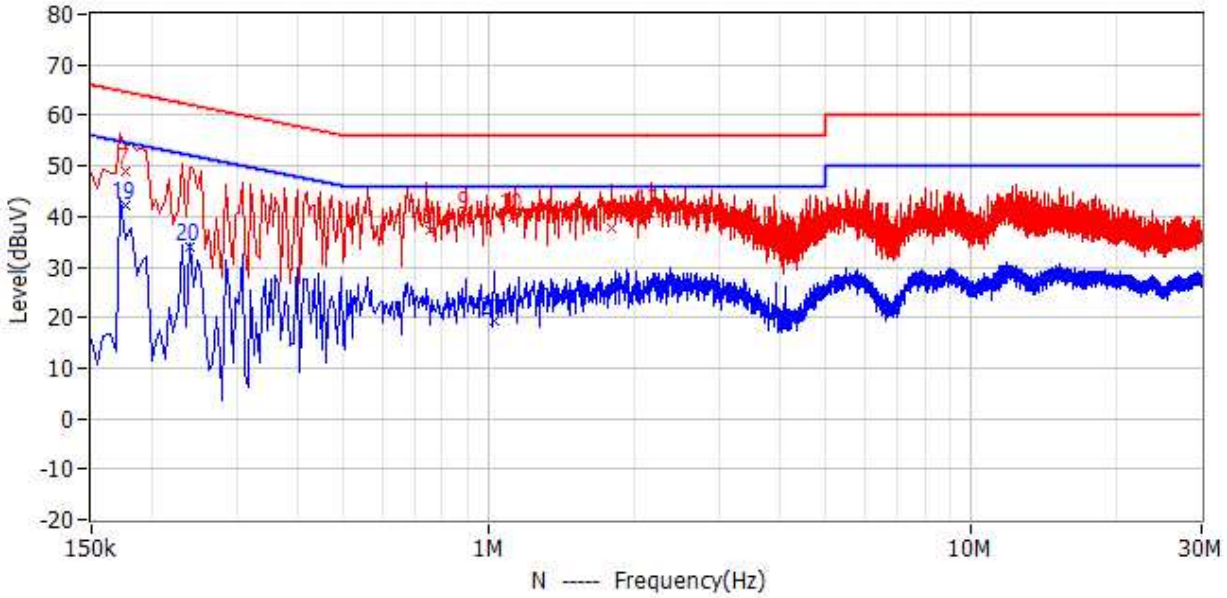
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

8.4 Test Results of Power line conducted emission

Power supply: 120V~, 60Hz





No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
1	172.500kHz	64.84	51.85	-12.99	45.75	6.10	QP	L1
2	190.500kHz	64.01	48.22	-15.79	42.02	6.20	QP	L1
3	496.500kHz	56.06	39.29	-16.77	33.09	6.20	QP	L1
4	582.000kHz	56.00	39.53	-16.47	33.33	6.20	QP	L1
5	2.189MHz	56.00	39.26	-16.74	33.06	6.20	QP	L1
6	2.513MHz	56.00	38.82	-17.18	32.62	6.20	QP	L1
7	177.000kHz	64.63	48.85	-15.78	42.75	6.10	QP	N

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No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
8	753.000kHz	56.00	37.15	-18.85	30.95	6.20	QP	N
9	897.000kHz	56.00	40.24	-15.76	34.04	6.20	QP	N
10	1.118MHz	56.00	39.84	-16.16	33.64	6.20	QP	N
11	1.797MHz	56.00	37.58	-18.42	31.38	6.20	QP	N
12	2.157MHz	56.00	40.86	-15.14	34.66	6.20	QP	N
13	172.500kHz	54.84	33.30	-21.54	27.20	6.10	CAV	L1
14	487.500kHz	46.21	20.12	-26.09	13.92	6.20	CAV	L1
15	582.000kHz	46.00	26.01	-19.99	19.81	6.20	CAV	L1
16	672.000kHz	46.00	24.44	-21.56	18.24	6.20	CAV	L1
17	1.793MHz	46.00	21.18	-24.82	14.98	6.20	CAV	L1
18	1.986MHz	46.00	21.31	-24.69	15.11	6.20	CAV	L1
19	177.000kHz	54.63	42.31	-12.32	36.21	6.10	CAV	N
20	240.000kHz	52.10	33.98	-18.12	27.78	6.20	CAV	N
21	1.028MHz	46.00	19.31	-26.69	13.11	6.20	CAV	N

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Level = Original Receiver Reading + Factor

3. Delta = Level- Limit

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

9 Occupied Bandwidth

Test result: **Tested**

9.1 Limit

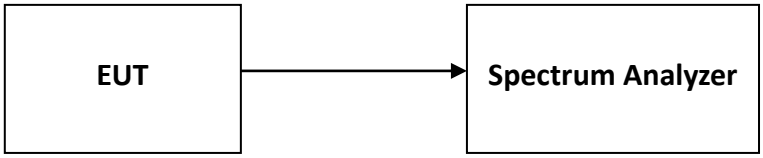
None

9.2 Measurement Procedure

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

9.3 Test Configuration



9.4 The results of Occupied Bandwidth

Please refer to Appendix A

10 Antenna requirement

Requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result:
EUT uses a permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

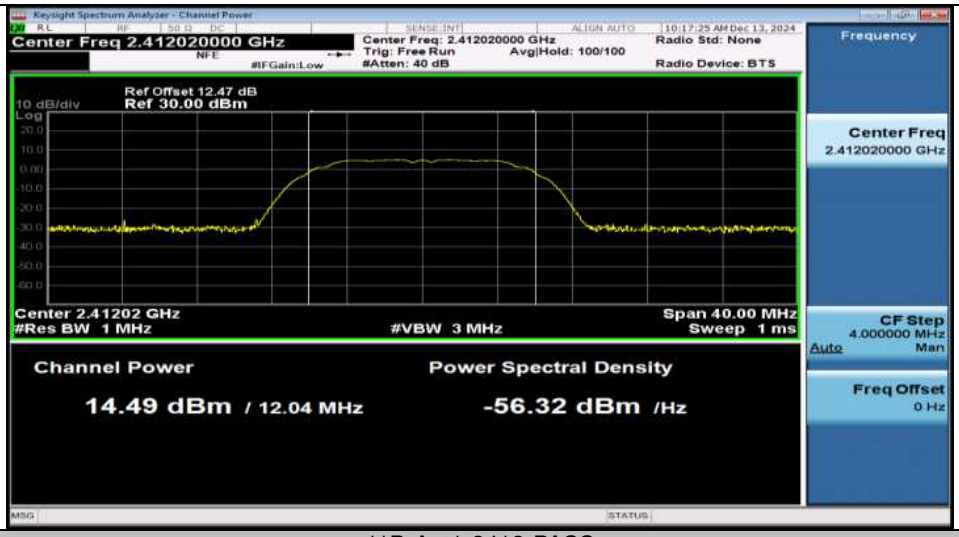
Appendix A: Test results

1. RF Output Power

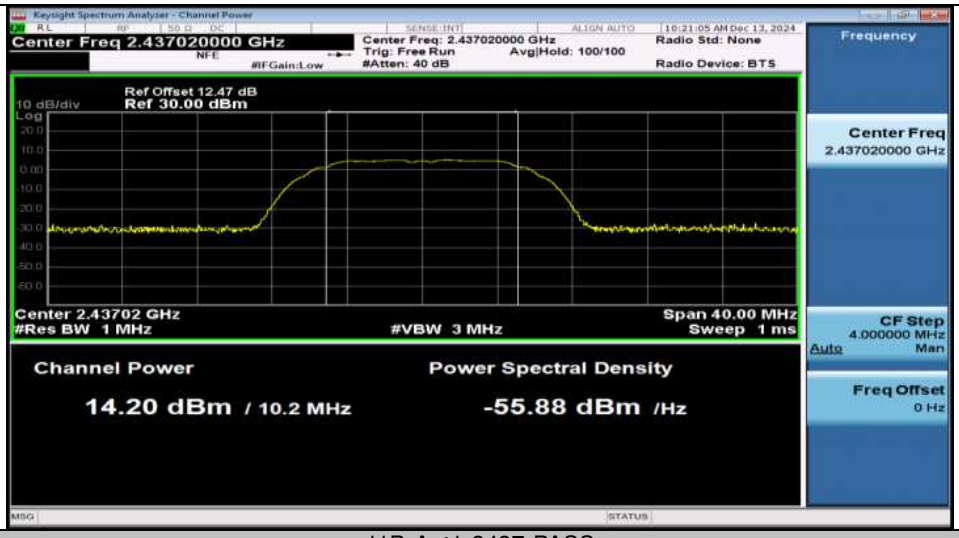
1.1 Test Result and Data

Test Mode	Antenna	Frequency[MHz]	Peak power [dBm]	Limit [dBm]	Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
11B	Ant1	2412	14.49	≤30.00	1.75	16.24	≤36.00	PASS
11B	Ant1	2437	14.20	≤30.00	1.75	15.95	≤36.00	PASS
11B	Ant1	2462	14.40	≤30.00	1.75	16.15	≤36.00	PASS
11G	Ant1	2412	16.61	≤30.00	1.75	18.36	≤36.00	PASS
11G	Ant1	2437	16.82	≤30.00	1.75	18.57	≤36.00	PASS
11G	Ant1	2462	16.73	≤30.00	1.75	18.48	≤36.00	PASS
11N20SISO	Ant1	2412	16.25	≤30.00	1.75	18.00	≤36.00	PASS
11N20SISO	Ant1	2437	16.74	≤30.00	1.75	18.49	≤36.00	PASS
11N20SISO	Ant1	2462	16.83	≤30.00	1.75	18.58	≤36.00	PASS
11N40SISO	Ant1	2422	17.85	≤30.00	1.75	19.60	≤36.00	PASS
11N40SISO	Ant1	2437	17.78	≤30.00	1.75	19.53	≤36.00	PASS
11N40SISO	Ant1	2452	17.91	≤30.00	1.75	19.66	≤36.00	PASS

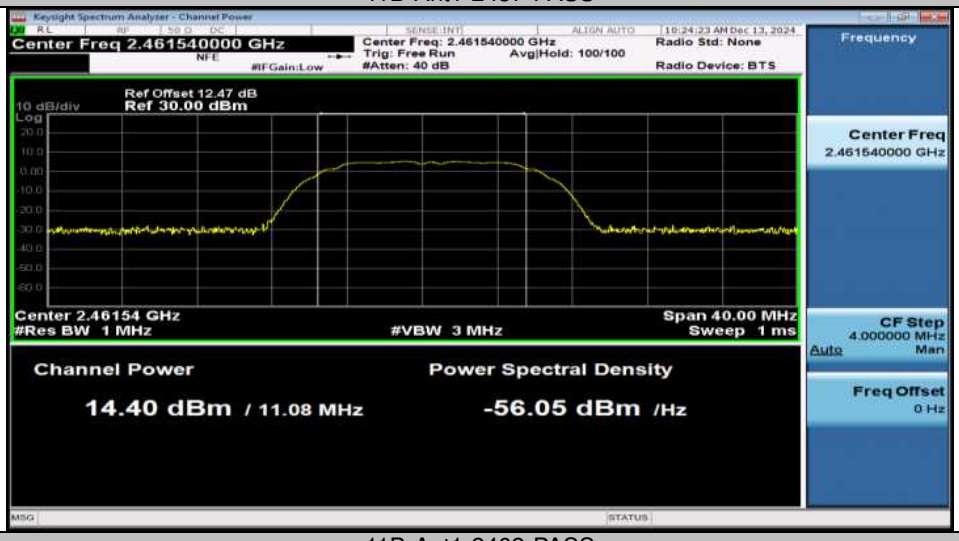
1.2 Test Plots



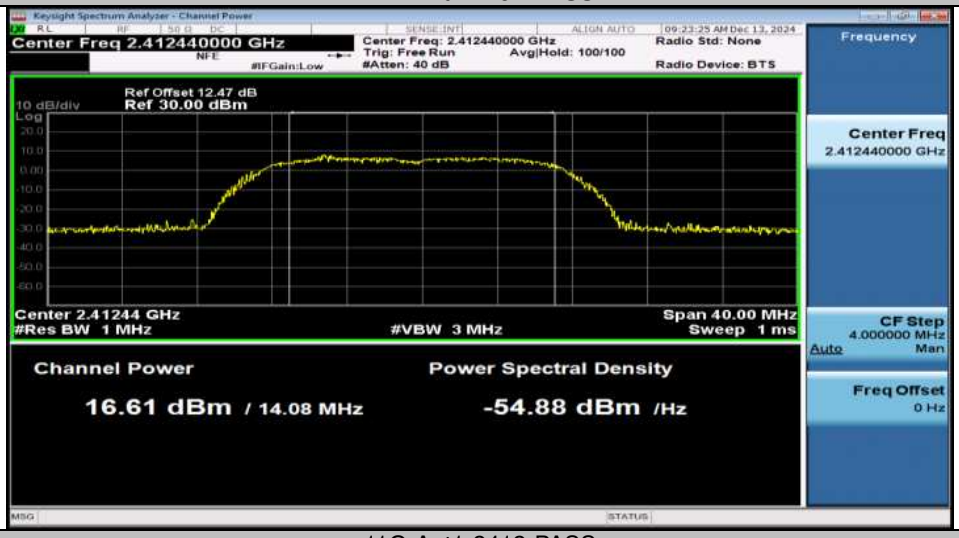
11B-Ant1-2412-PASS



11B-Ant1-2437-PASS



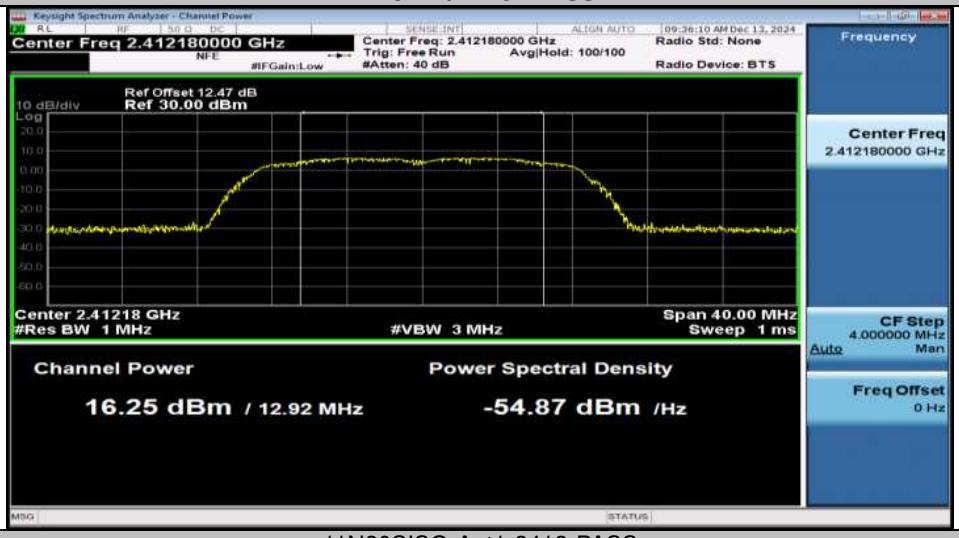
11B-Ant1-2462-PASS



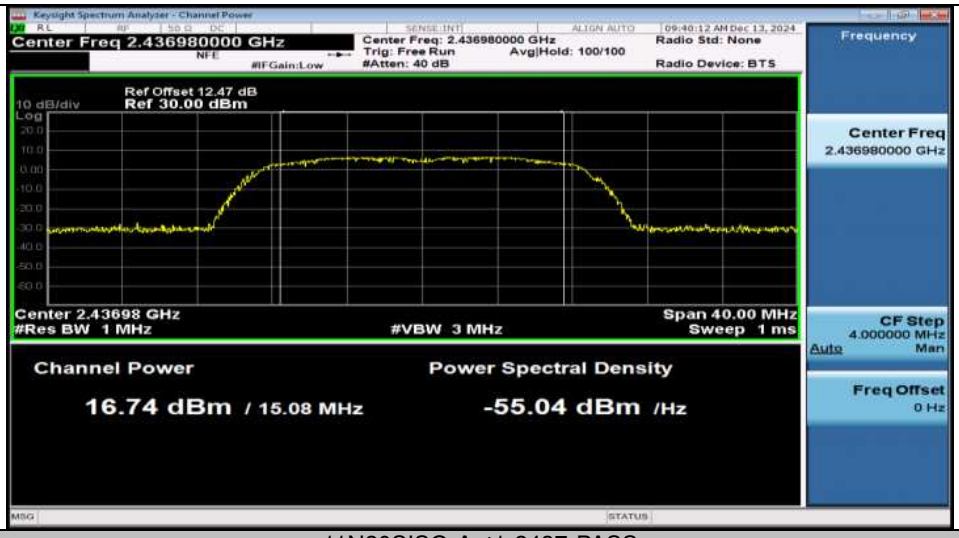
11G-Ant1-2412-PASS

11G-Ant1-2437-PASS

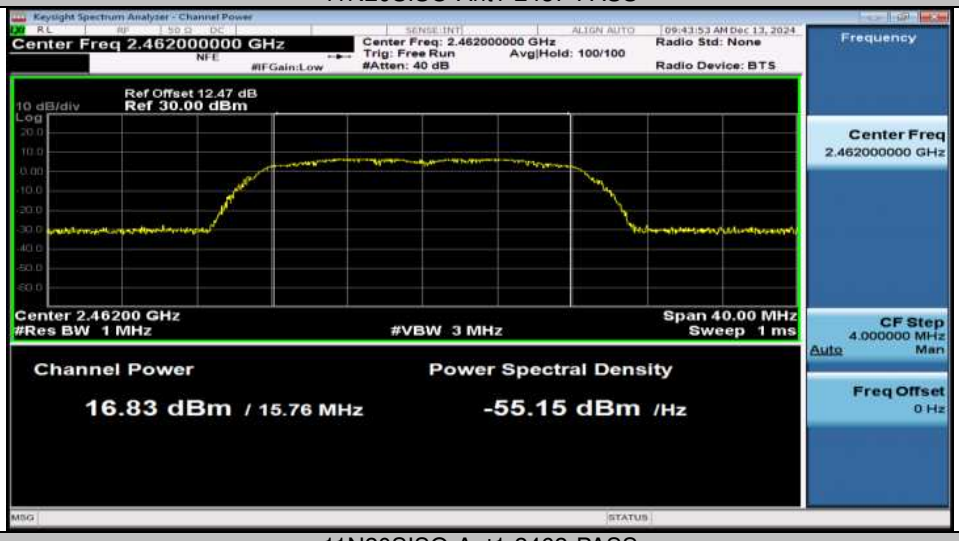
11G-Ant1-2462-PASS



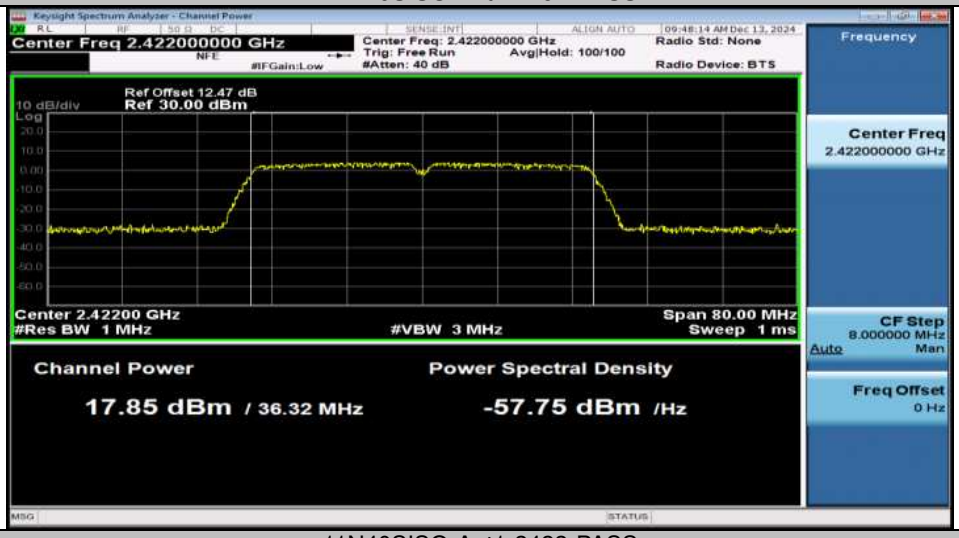
11N20SISO-Ant1-2412-PASS



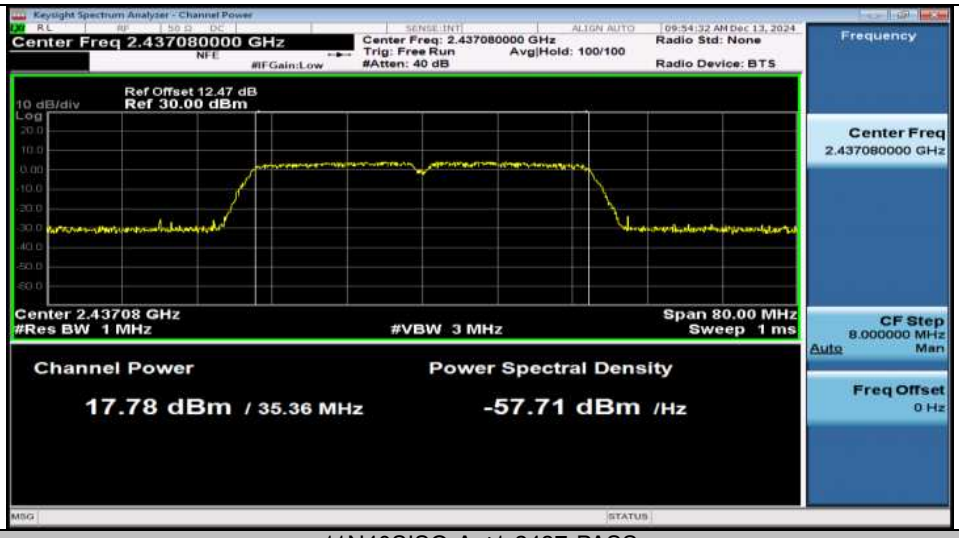
11N20SISO-Ant1-2437-PASS



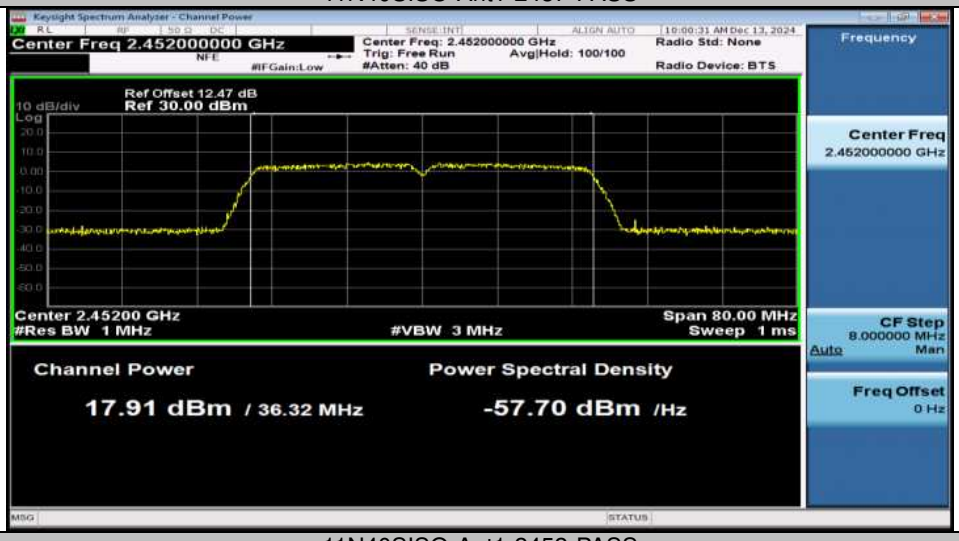
11N20SISO-Ant1-2462-PASS



11N40SISO-Ant1-2422-PASS



11N40SISO-Ant1-2437-PASS



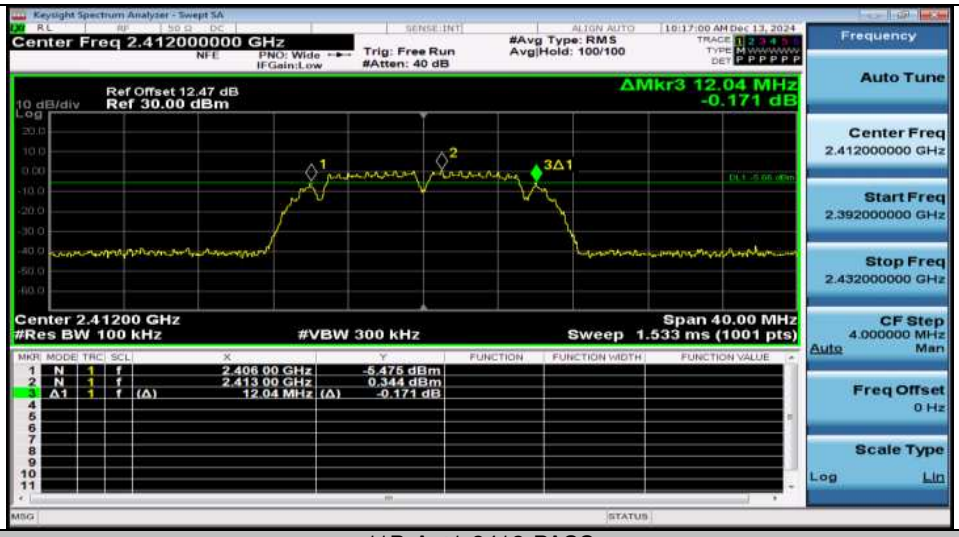
11N40SISO-Ant1-2452-PASS

2. Minimum 6dB bandwidth

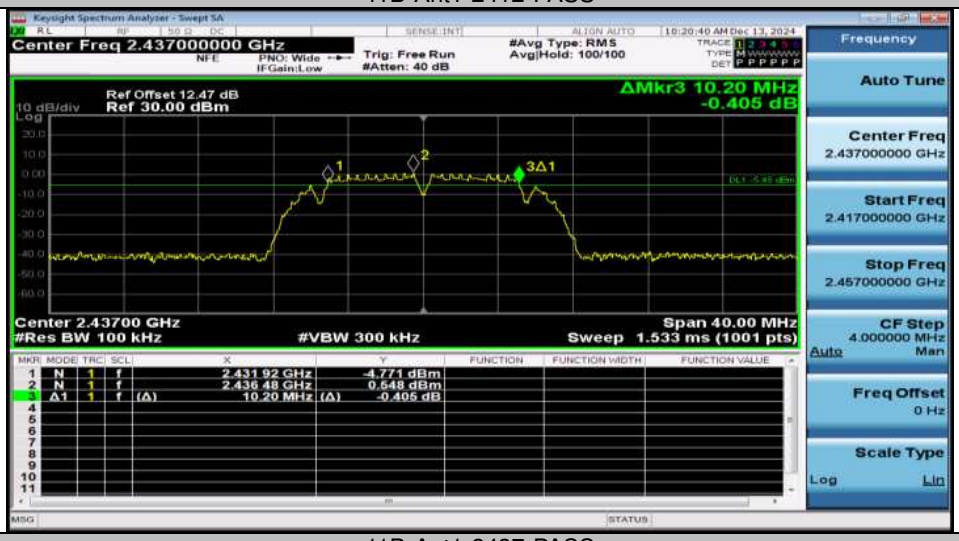
2.1 Test Result and Data

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	12.040	2406.000	2418.040	0.5	PASS
11B	Ant1	2437	10.200	2431.920	2442.120	0.5	PASS
11B	Ant1	2462	11.080	2456.000	2467.080	0.5	PASS
11G	Ant1	2412	14.080	2405.400	2419.480	0.5	PASS
11G	Ant1	2437	15.080	2429.440	2444.520	0.5	PASS
11G	Ant1	2462	15.080	2454.440	2469.520	0.5	PASS
11N20SISO	Ant1	2412	12.920	2405.720	2418.640	0.5	PASS
11N20SISO	Ant1	2437	15.080	2429.440	2444.520	0.5	PASS
11N20SISO	Ant1	2462	15.760	2454.120	2469.880	0.5	PASS
11N40SISO	Ant1	2422	36.320	2403.840	2440.160	0.5	PASS
11N40SISO	Ant1	2437	35.360	2419.400	2454.760	0.5	PASS
11N40SISO	Ant1	2452	36.320	2433.840	2470.160	0.5	PASS

2.2 Test Plots



11B-Ant1-2412-PASS



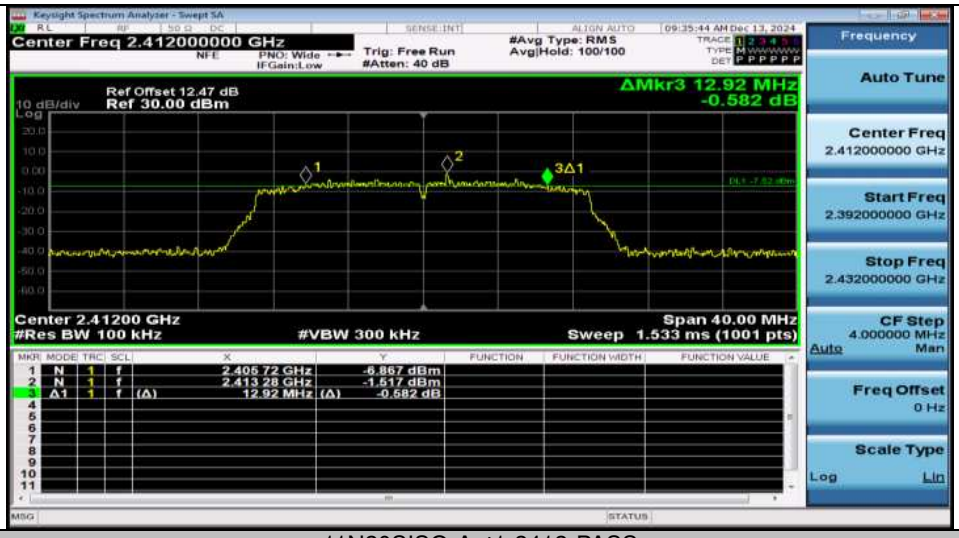
11B-Ant1-2437-PASS

11B-Ant1-2462-PASS

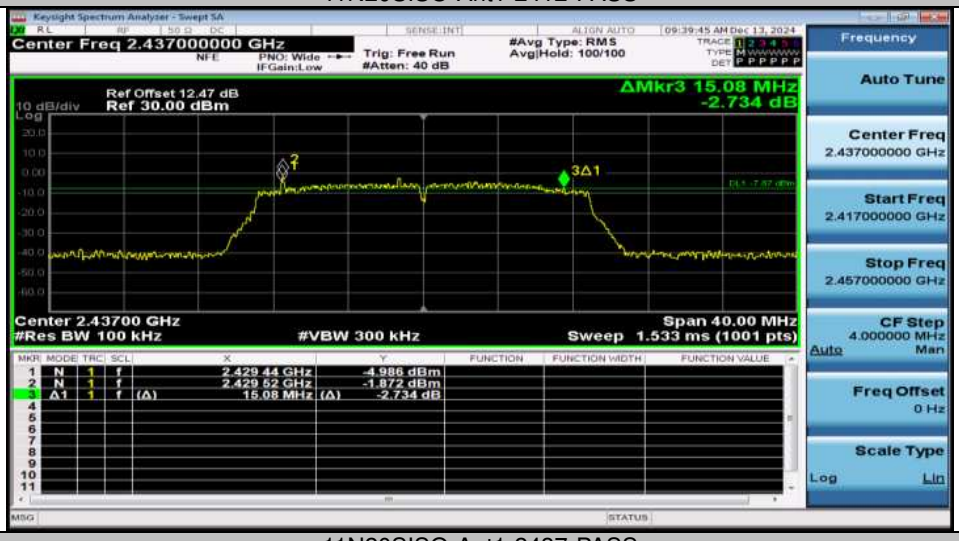
11G-Ant1-2412-PASS

11G-Ant1-2437-PASS

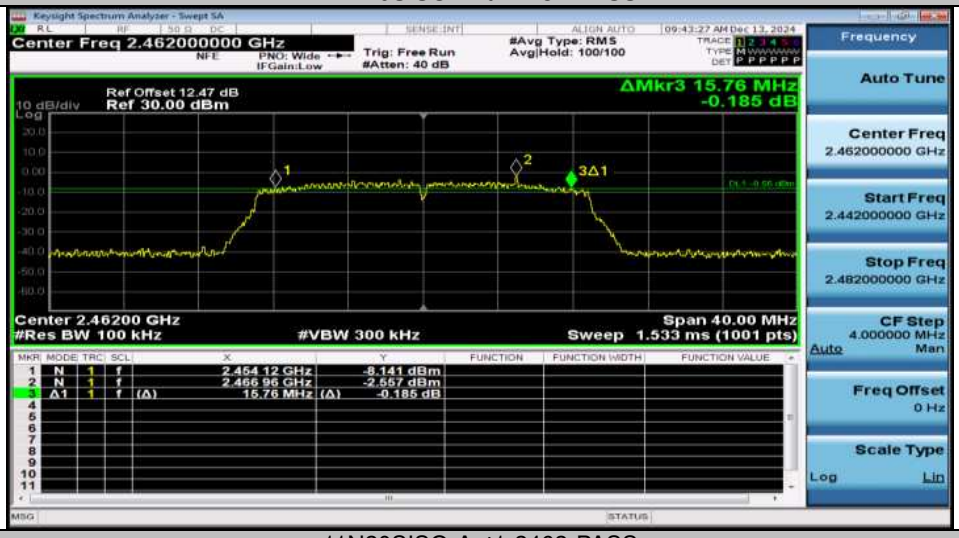
11G-Ant1-2462-PASS



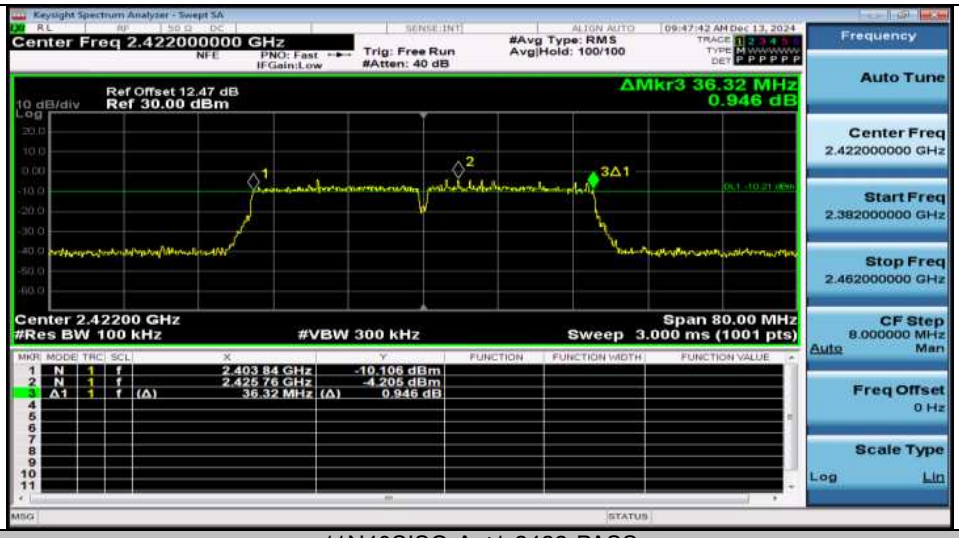
11N20SISO-Ant1-2412-PASS



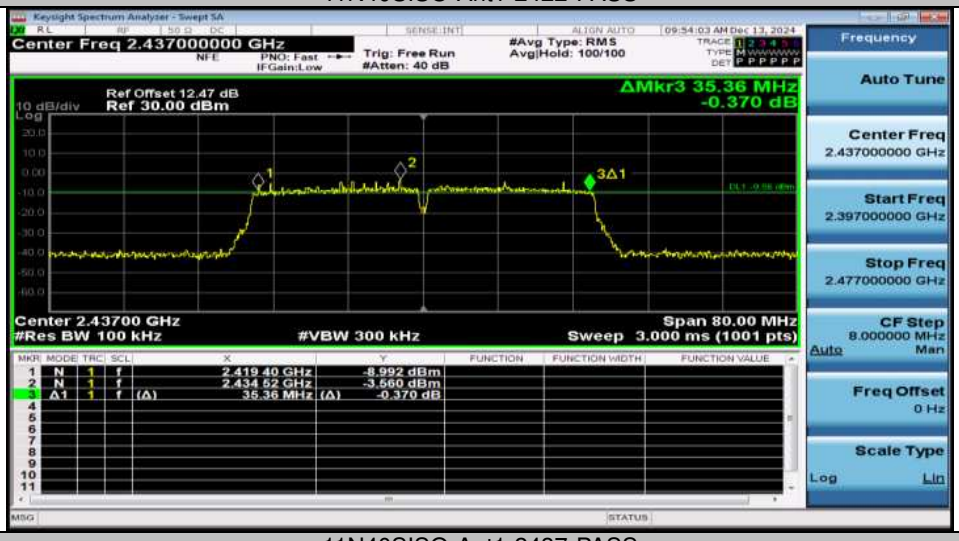
11N20SISO-Ant1-2437-PASS



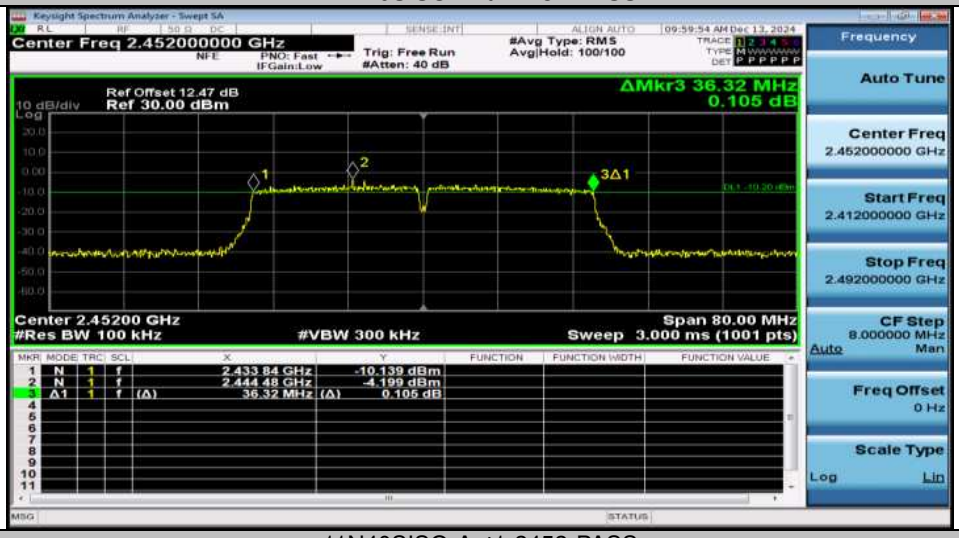
11N20SISO-Ant1-2462-PASS



11N40SISO-Ant1-2422-PASS



11N40SISO-Ant1-2437-PASS



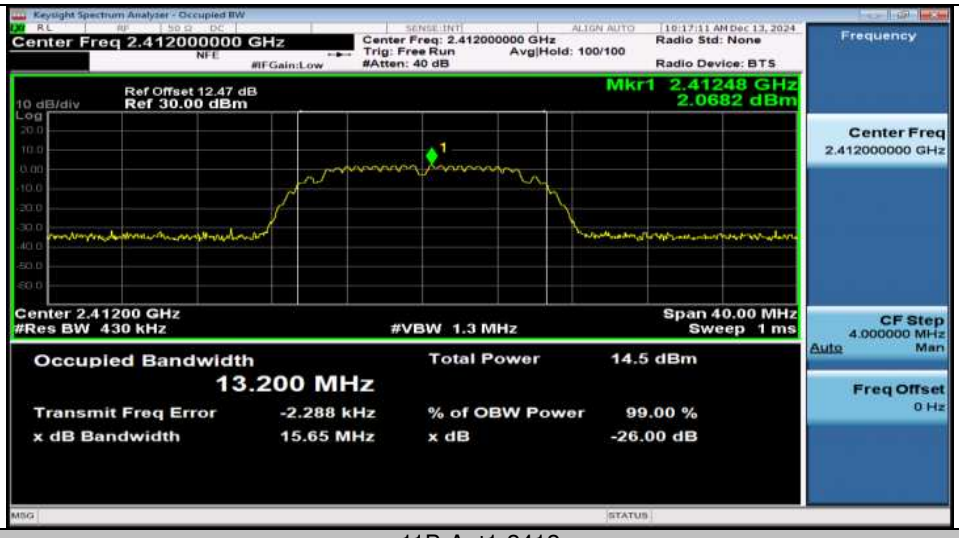
11N40SISO-Ant1-2452-PASS

3. Occupied Bandwidth

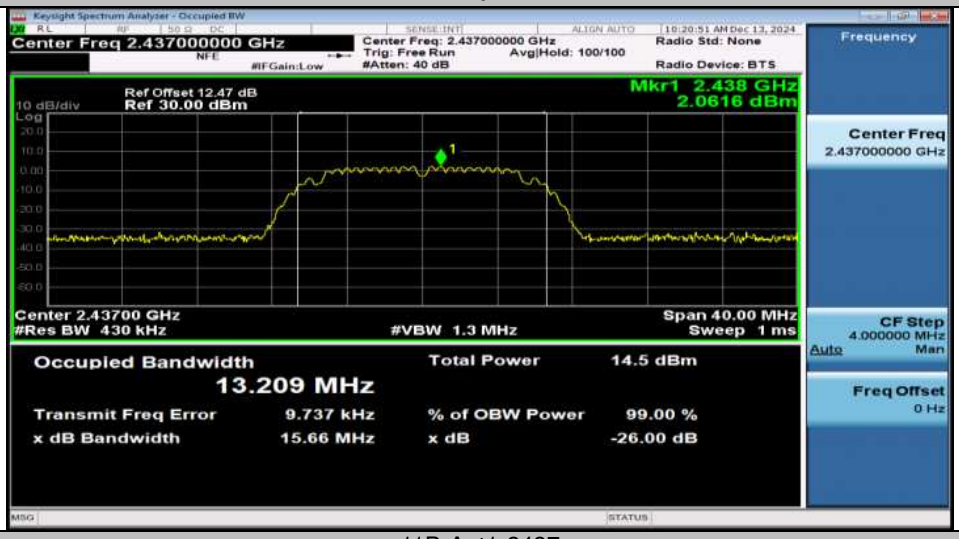
3.1 Test Result and Data

TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.200	2405.3977	2418.5977	---	PASS
11B	Ant1	2437	13.209	2430.4052	2443.6142	---	PASS
11B	Ant1	2462	13.215	2455.3884	2468.6034	---	PASS
11G	Ant1	2412	16.917	2403.5147	2420.4317	---	PASS
11G	Ant1	2437	16.930	2428.5319	2445.4619	---	PASS
11G	Ant1	2462	16.868	2453.5423	2470.4103	---	PASS
11N20SISO	Ant1	2412	17.784	2403.1029	2420.8869	---	PASS
11N20SISO	Ant1	2437	17.740	2428.1432	2445.8832	---	PASS
11N20SISO	Ant1	2462	17.757	2453.1256	2470.8826	---	PASS
11N40SISO	Ant1	2422	36.468	2403.7551	2440.2231	---	PASS
11N40SISO	Ant1	2437	36.473	2418.7741	2455.2471	---	PASS
11N40SISO	Ant1	2452	36.342	2433.8167	2470.1587	---	PASS

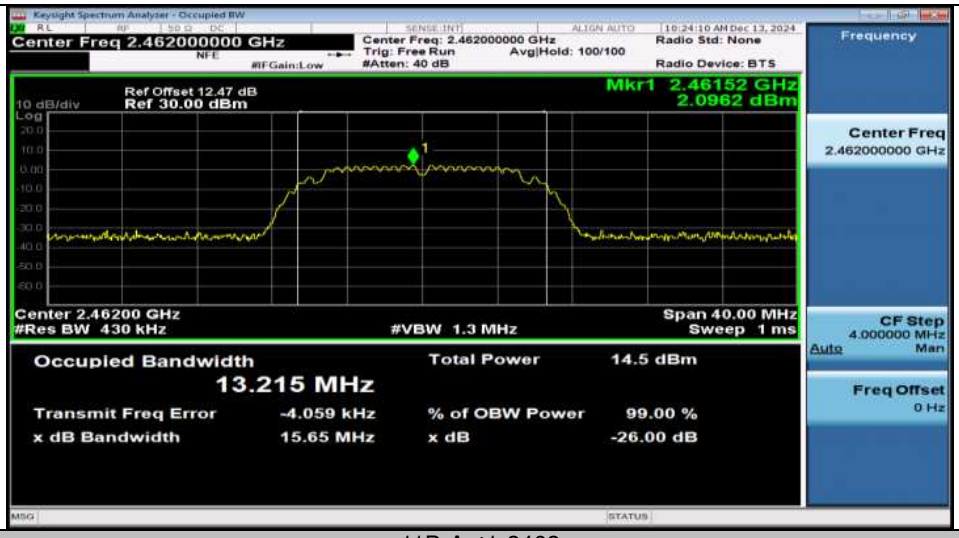
3.2 Test Plots



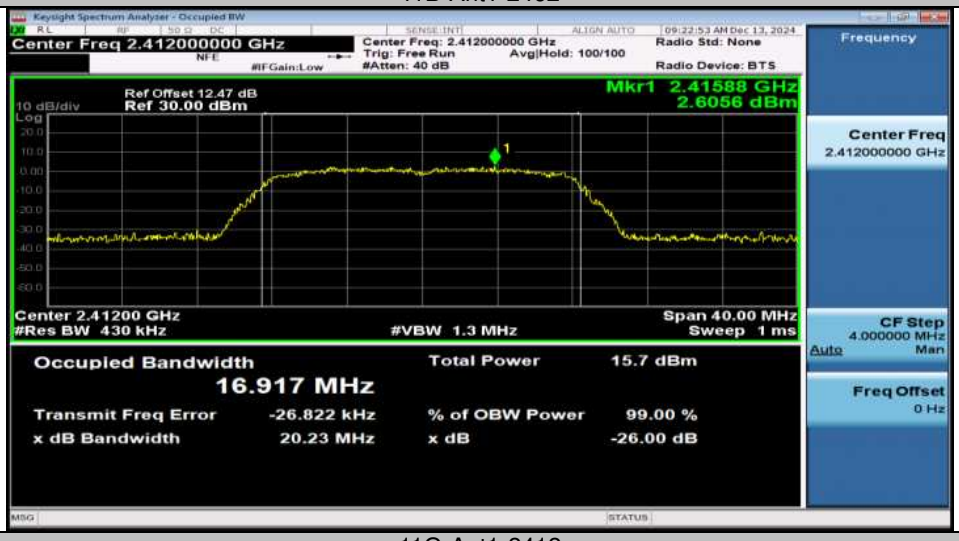
11B-Ant1-2412



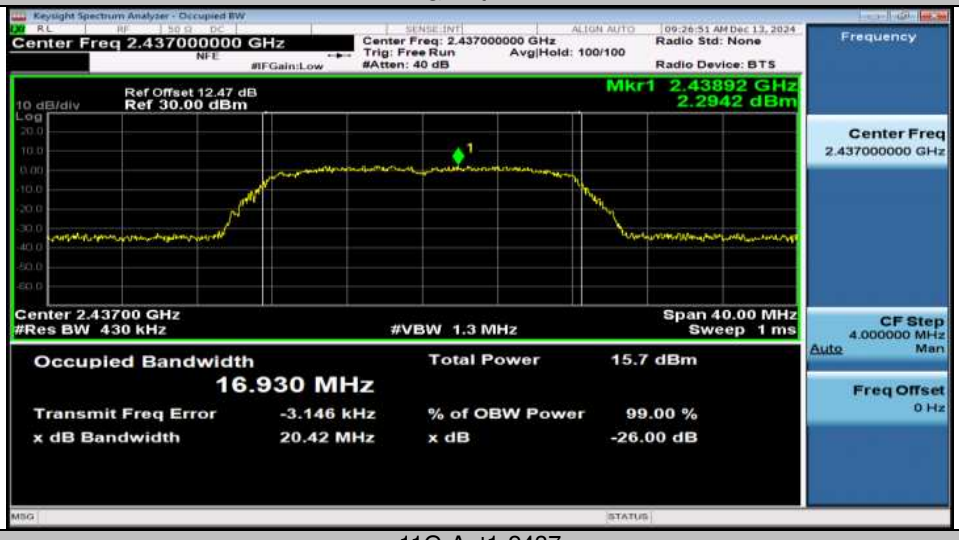
11B-Ant1-2437



11B-Ant1-2462

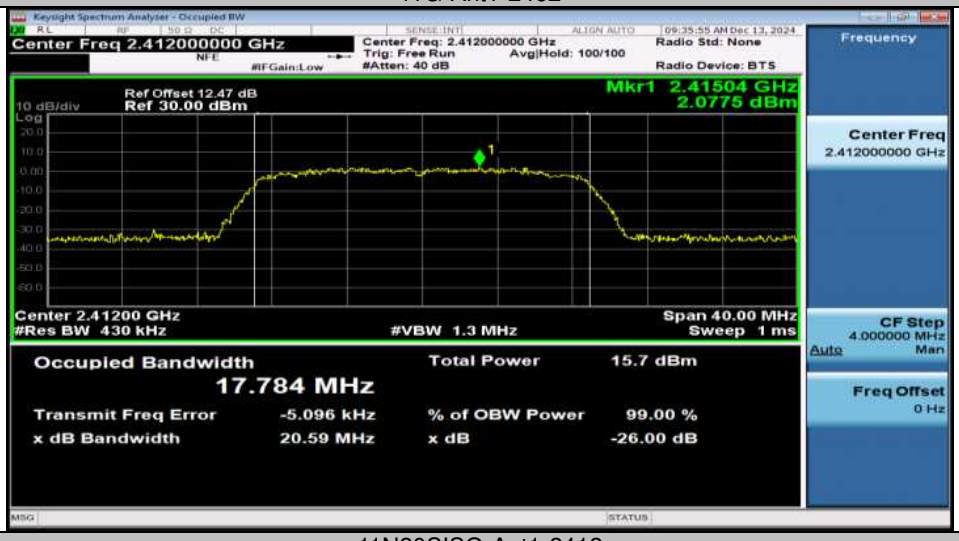


11G-Ant1-2412

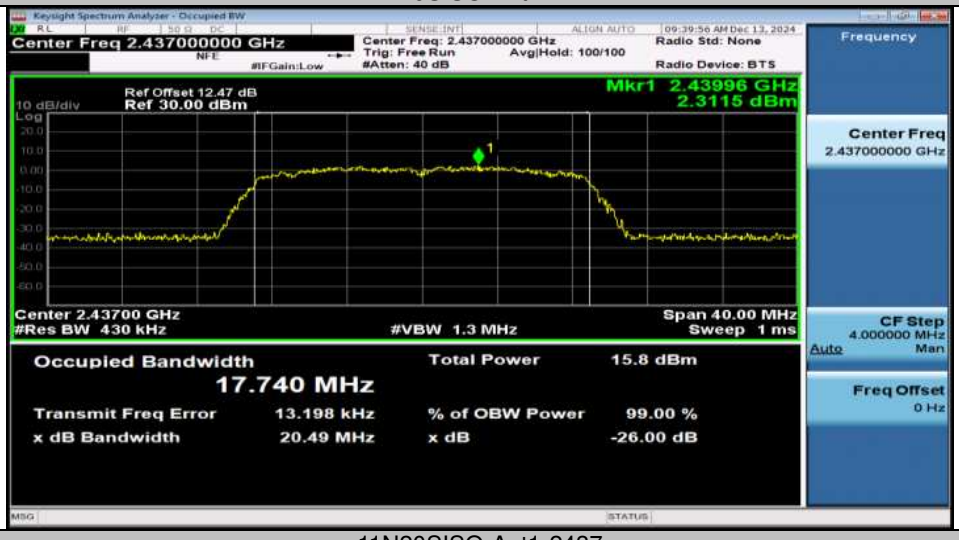


11G-Ant1-2437

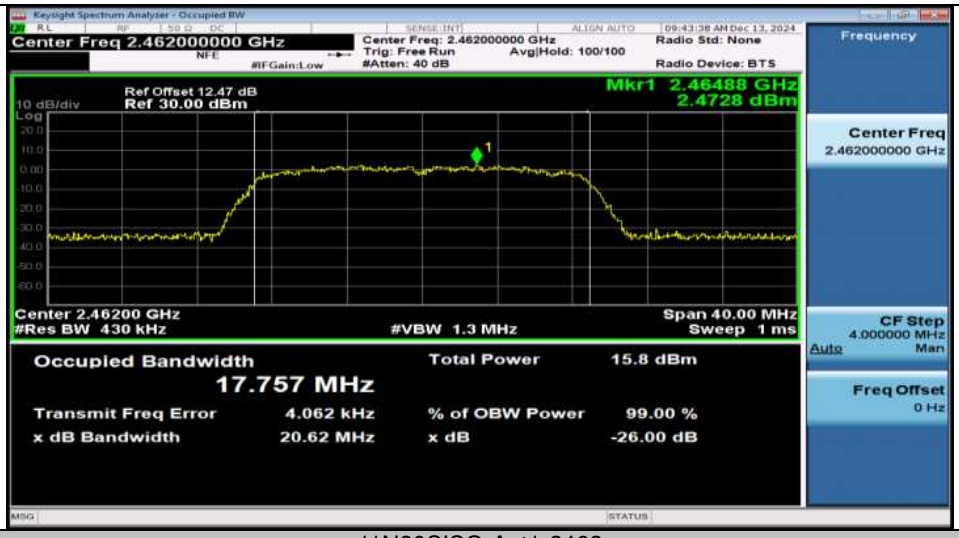
11G-Ant1-2462



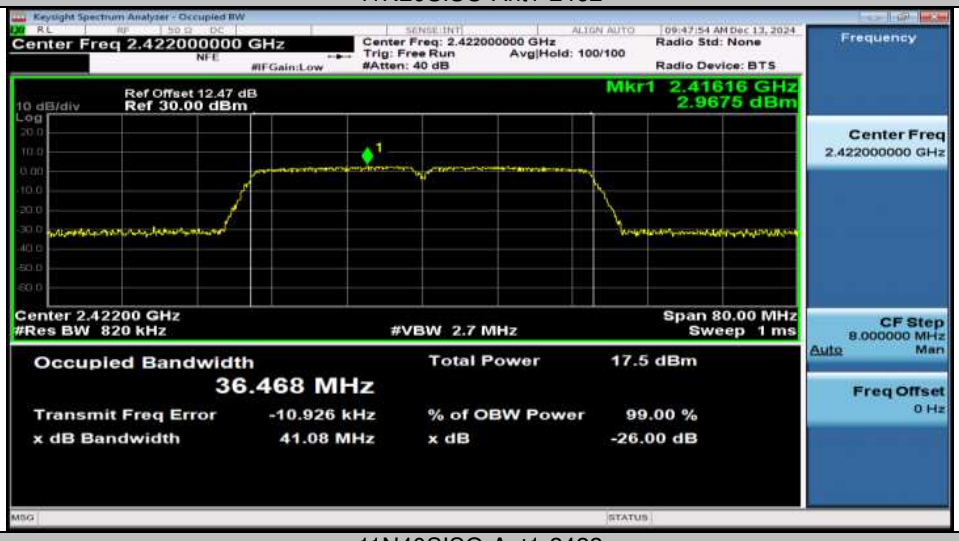
11N20SISO-Ant1-2412



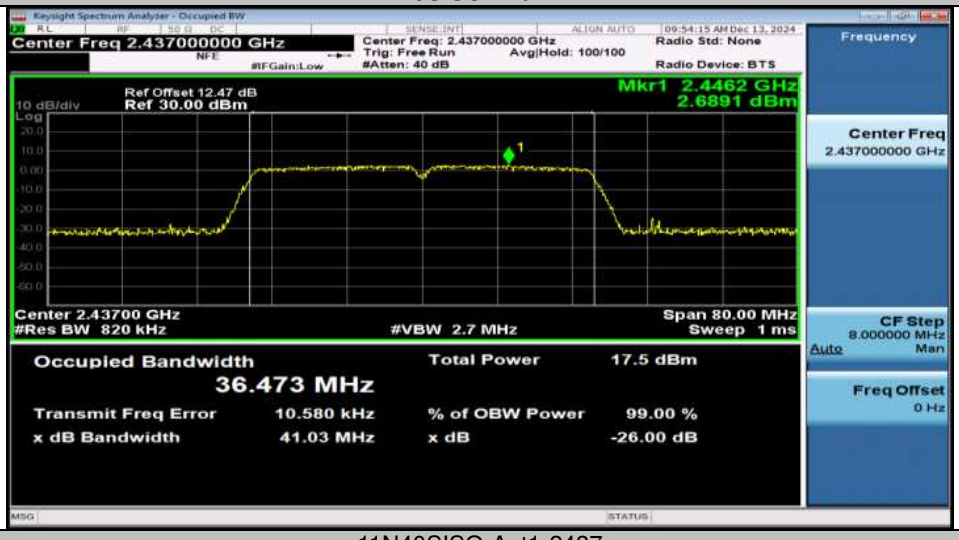
11N20SISO-Ant1-2437



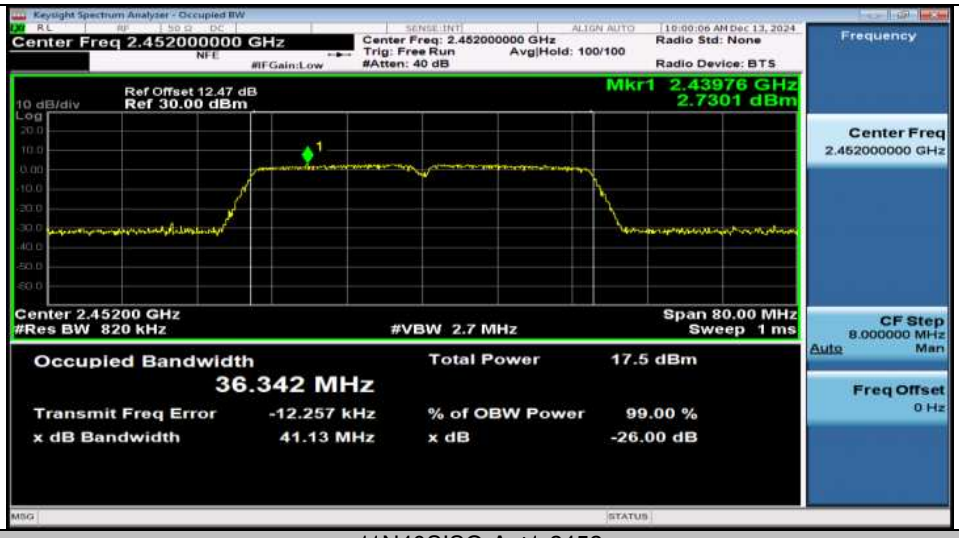
11N20SISO-Ant1-2462



11N40SISO-Ant1-2422



11N40SISO-Ant1-2437



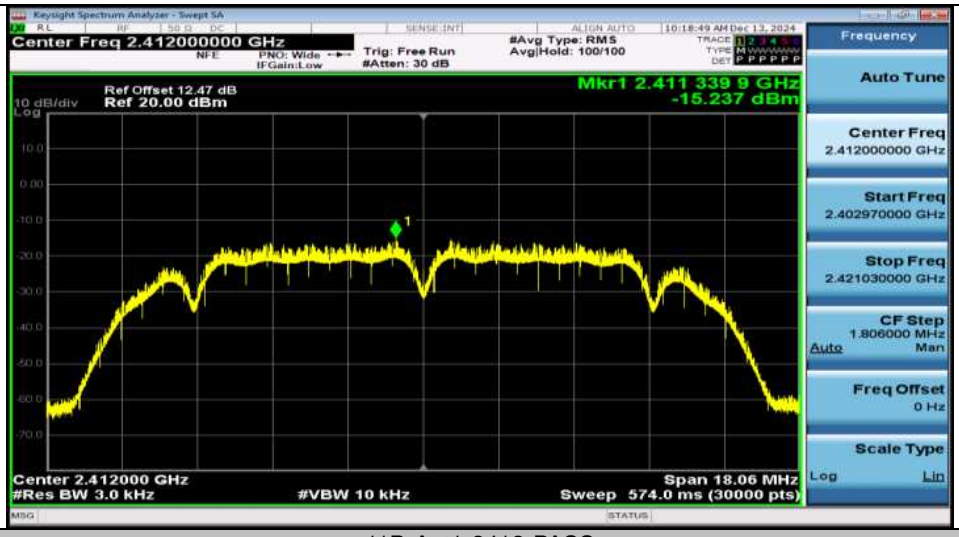
11N40SISO-Ant1-2452

4. Power Spectral Density

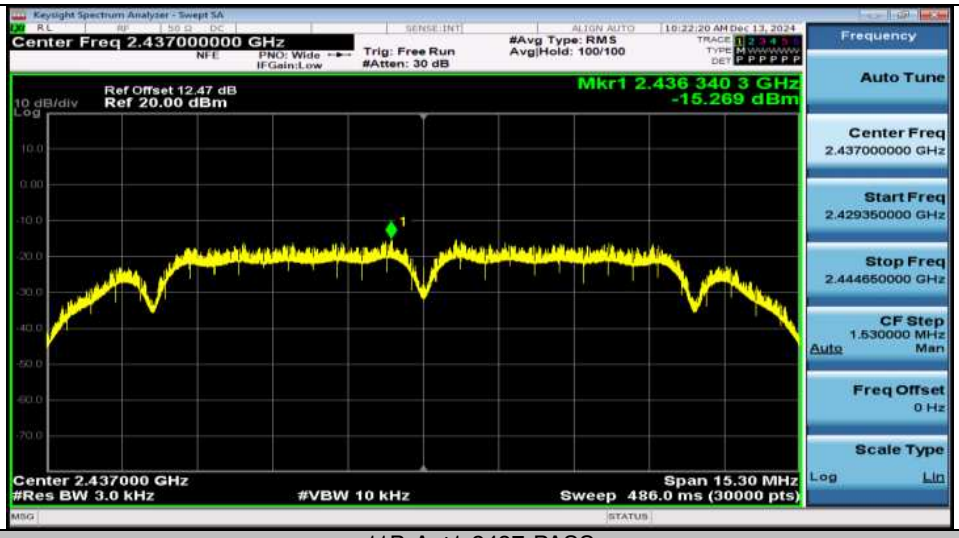
4.1 Test Result and Data

TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-15.24	≤8.00	PASS
11B	Ant1	2437	-15.27	≤8.00	PASS
11B	Ant1	2462	-15.28	≤8.00	PASS
11G	Ant1	2412	-16.43	≤8.00	PASS
11G	Ant1	2437	-16.21	≤8.00	PASS
11G	Ant1	2462	-16.31	≤8.00	PASS
11N20SISO	Ant1	2412	-16.87	≤8.00	PASS
11N20SISO	Ant1	2437	-16.87	≤8.00	PASS
11N20SISO	Ant1	2462	-15.72	≤8.00	PASS
11N40SISO	Ant1	2422	-18.34	≤8.00	PASS
11N40SISO	Ant1	2437	-18.24	≤8.00	PASS
11N40SISO	Ant1	2452	-18.43	≤8.00	PASS

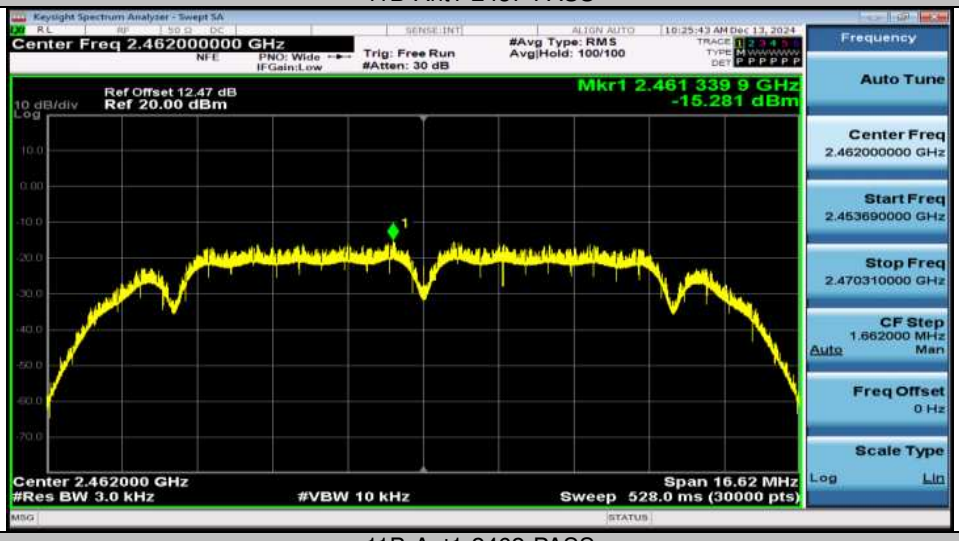
4.2 Test Plots



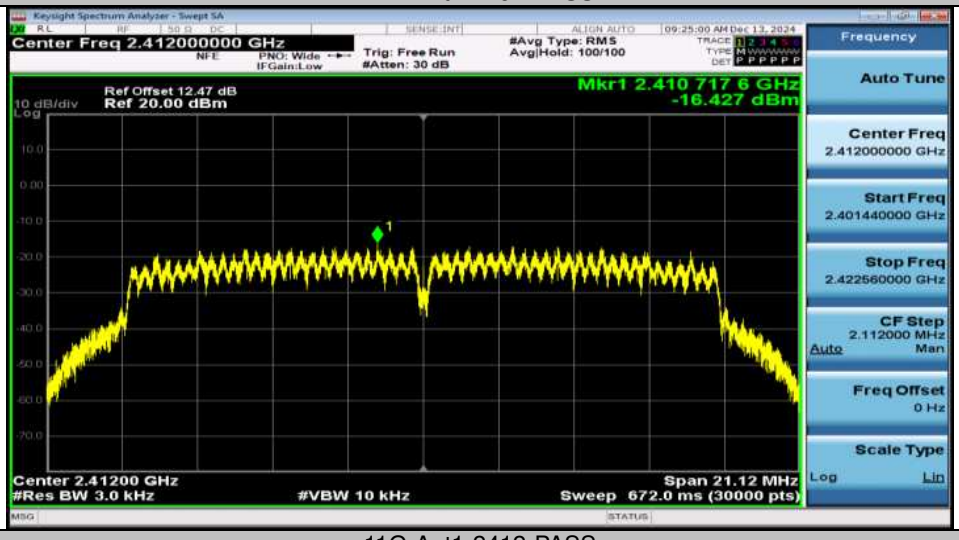
11B-Ant1-2412-PASS



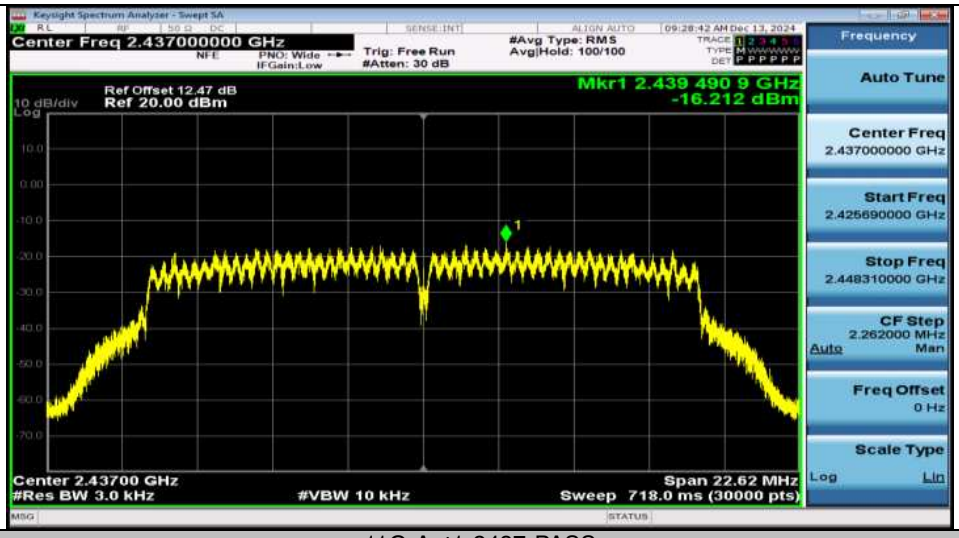
11B-Ant1-2437-PASS



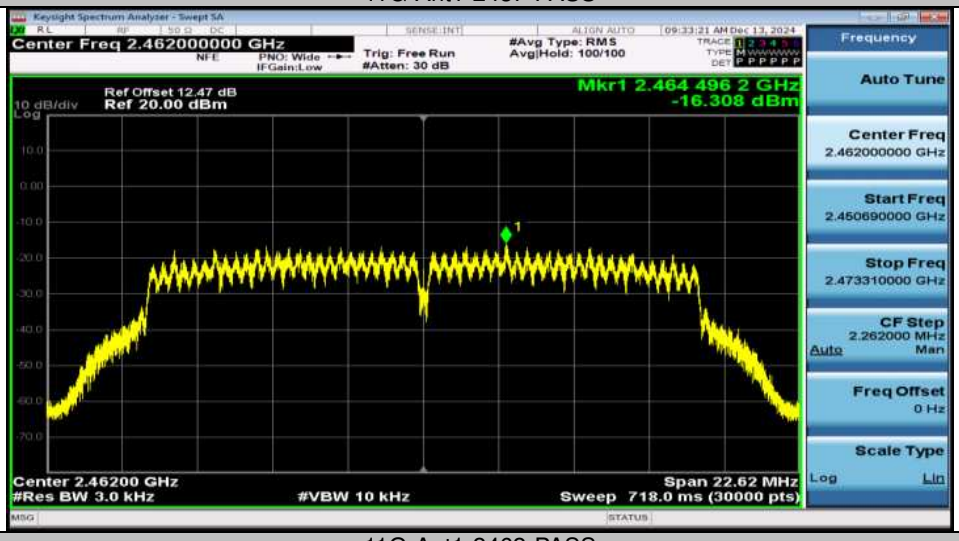
11B-Ant1-2462-PASS



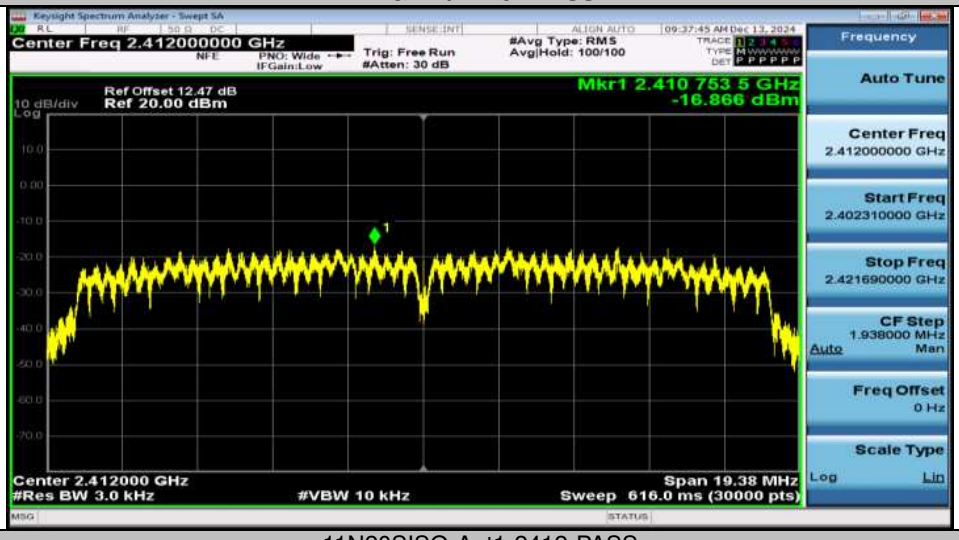
11G-Ant1-2412-PASS



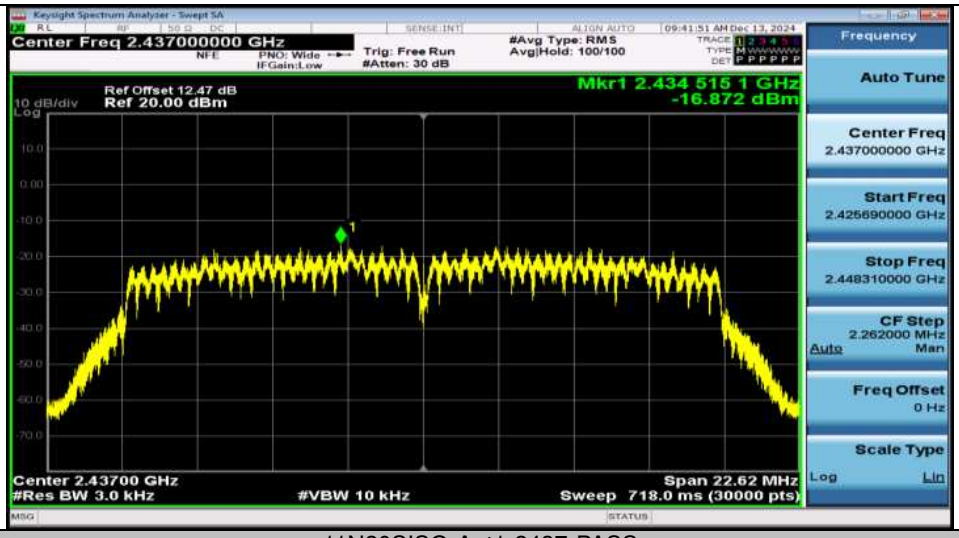
11G-Ant1-2437-PASS



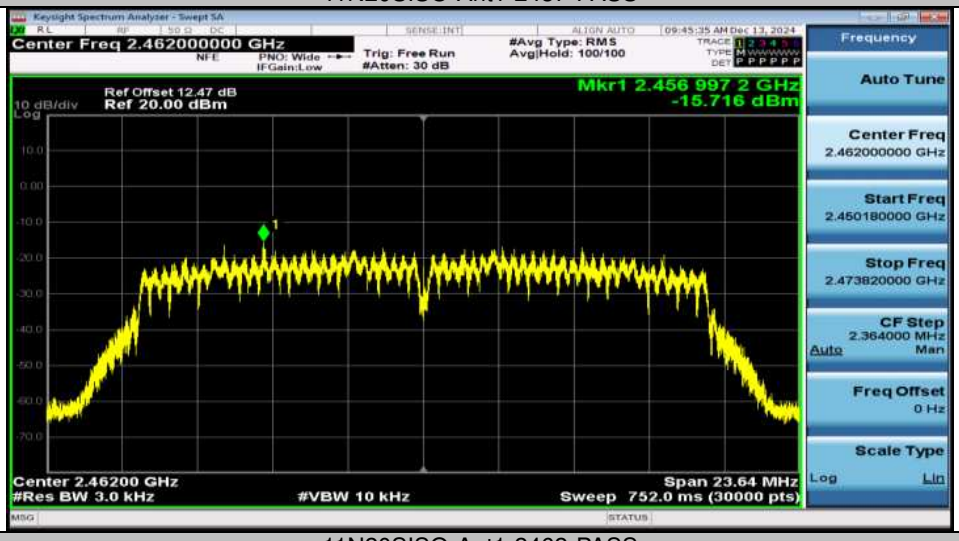
11G-Ant1-2462-PASS



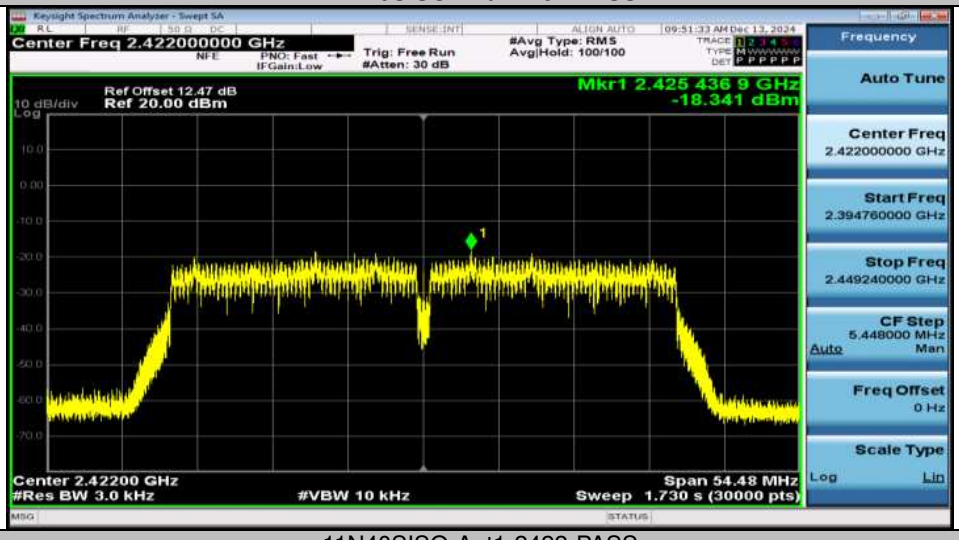
11N20SISO-Ant1-2412-PASS



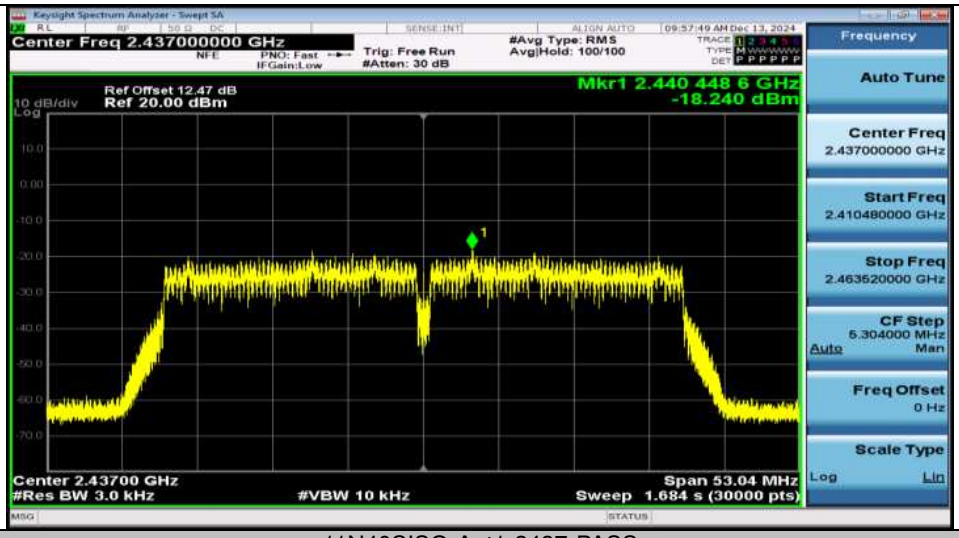
11N20SISO-Ant1-2437-PASS



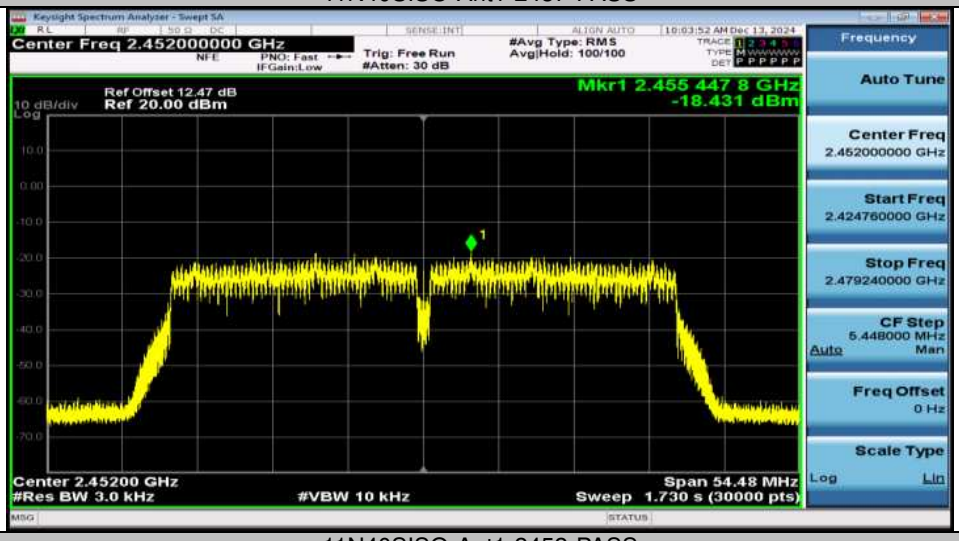
11N20SISO-Ant1-2462-PASS



11N40SISO-Ant1-2422-PASS



11N40SISO-Ant1-2437-PASS



11N40SISO-Ant1-2452-PASS

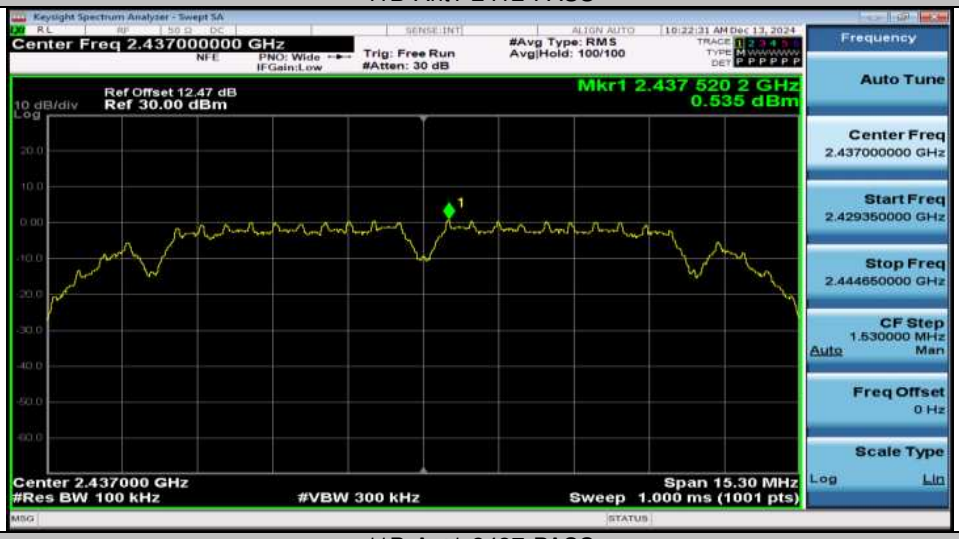
5. Reference level measurement

5.1 Test Result and Data

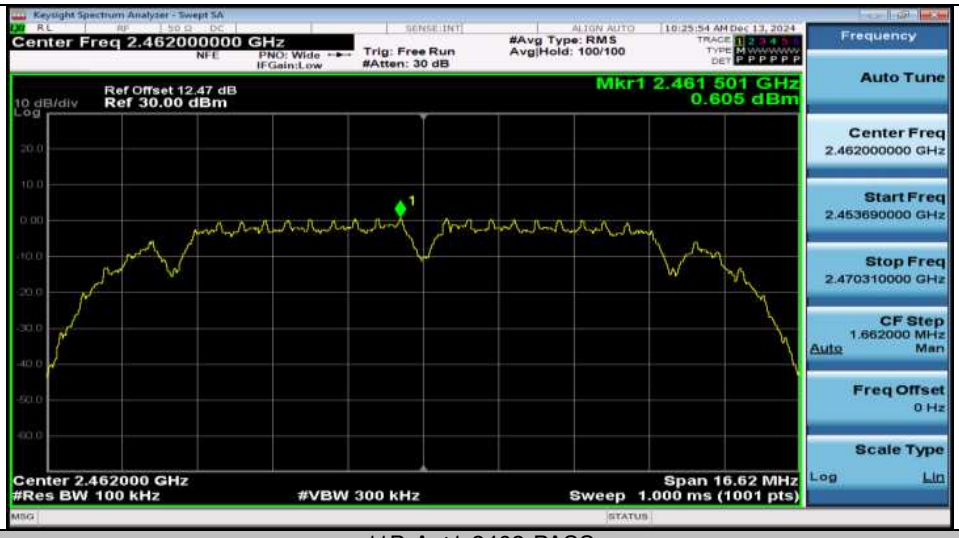
TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm]
11B	Ant1	2412	2412.52	0.50
11B	Ant1	2437	2437.52	0.54
11B	Ant1	2462	2461.50	0.61
11G	Ant1	2412	2405.75	-1.24
11G	Ant1	2437	2444.51	-1.34
11G	Ant1	2462	2466.98	-1.46
11N20SISO	Ant1	2412	2408.24	-4.53
11N20SISO	Ant1	2437	2442.02	-1.39
11N20SISO	Ant1	2462	2464.51	-1.24
11N40SISO	Ant1	2422	2413.50	-6.66
11N40SISO	Ant1	2437	2440.77	-3.37
11N40SISO	Ant1	2452	2449.49	-3.32

5.2 Test plots

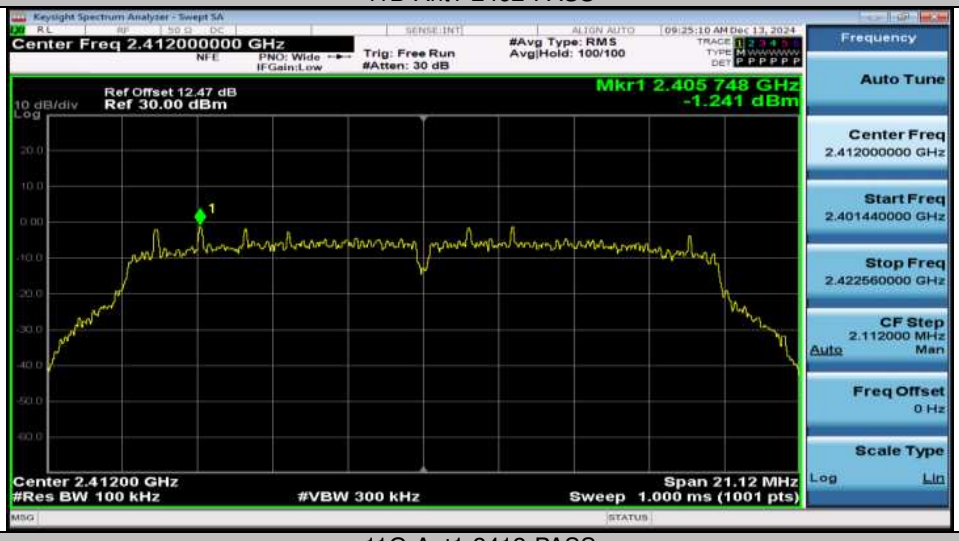
11B-Ant1-2412-PASS



11B-Ant1-2437-PASS

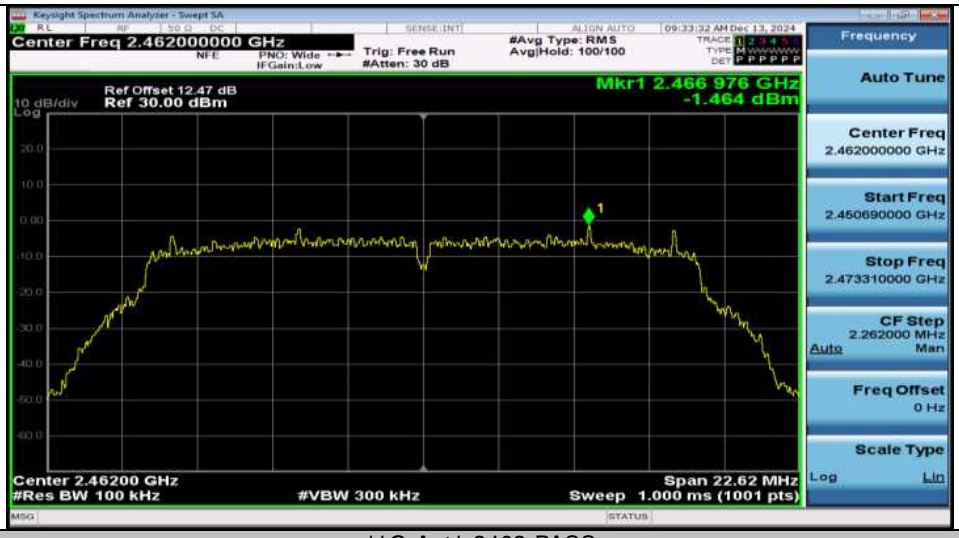


11B-Ant1-2462-PASS

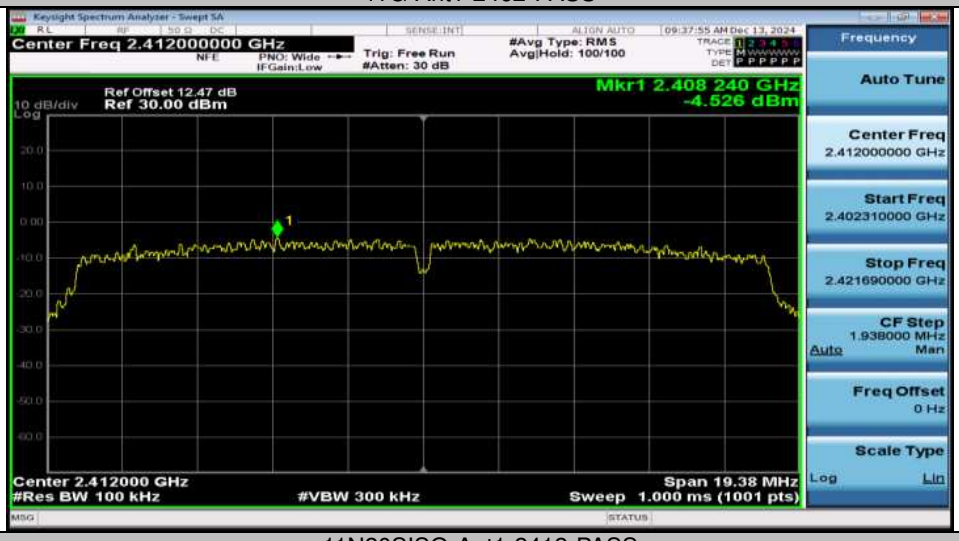


11G-Ant1-2412-PASS

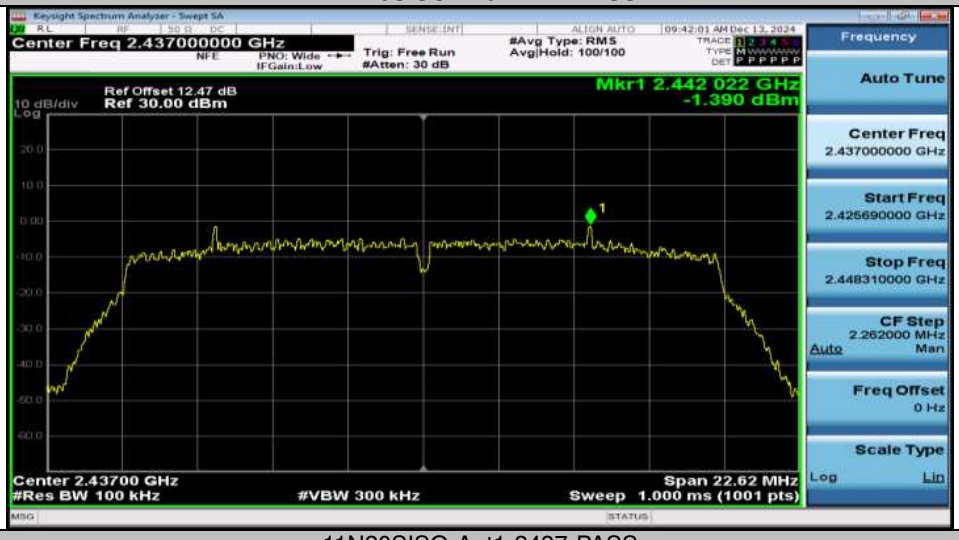
11G-Ant1-2437-PASS



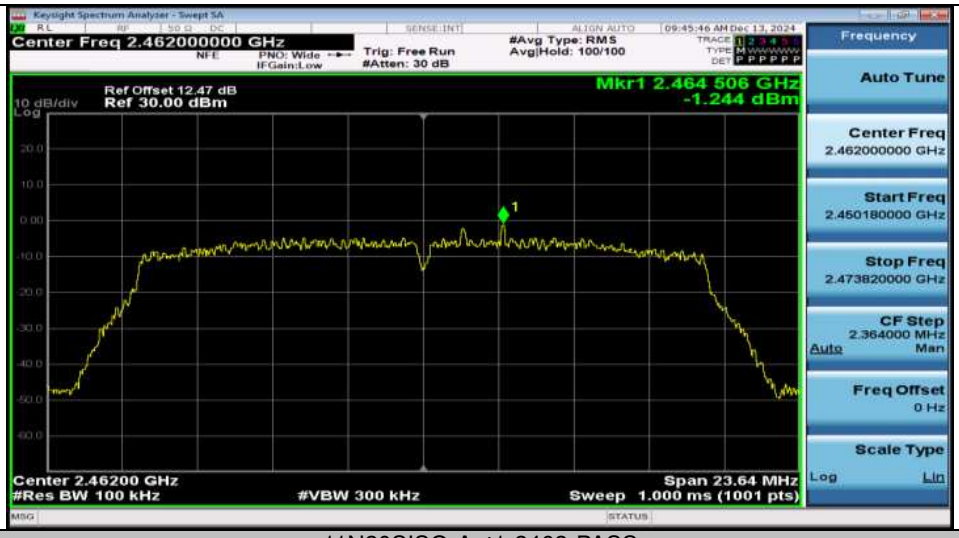
11G-Ant1-2462-PASS



11N20SISO-Ant1-2412-PASS

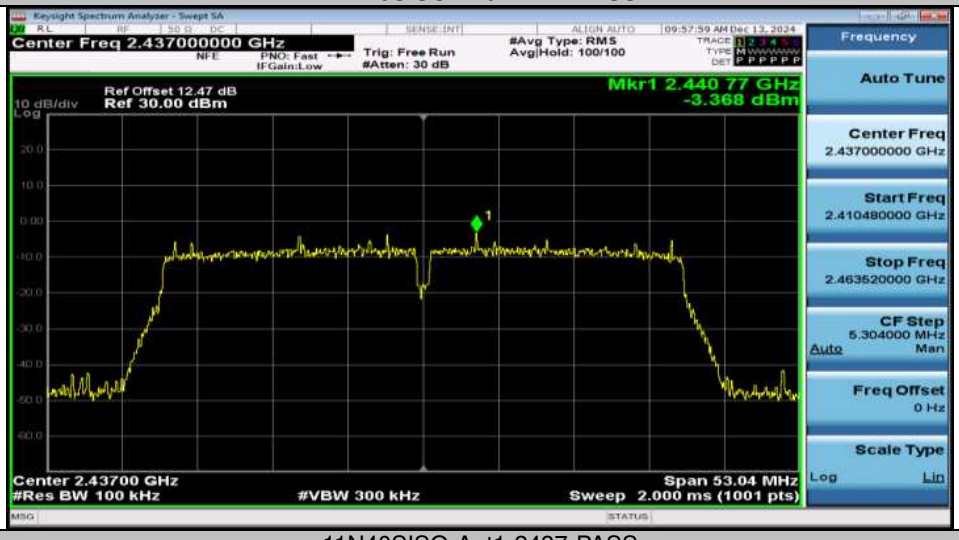


11N20SISO-Ant1-2437-PASS

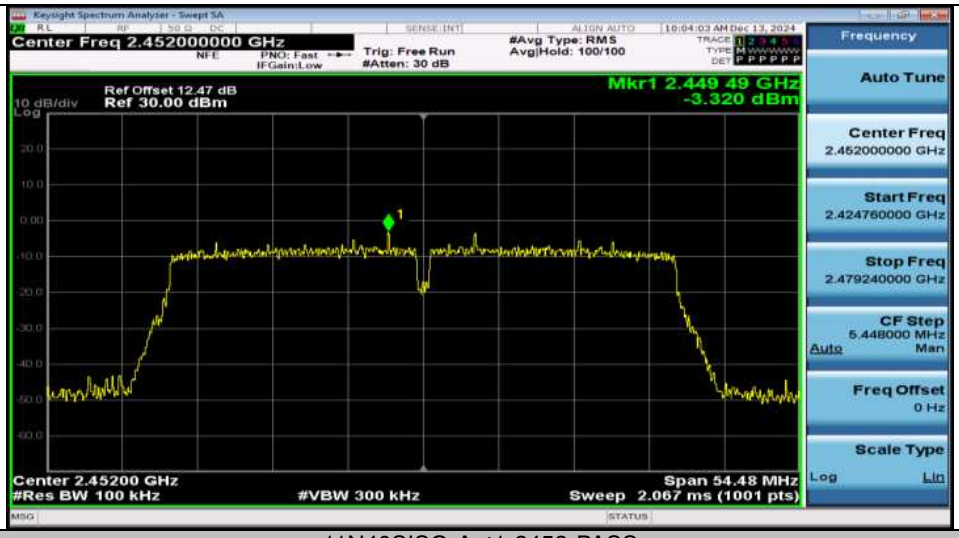


11N20SISO-Ant1-2462-PASS

11N40SISO-Ant1-2422-PASS



11N40SISO-Ant1-2437-PASS



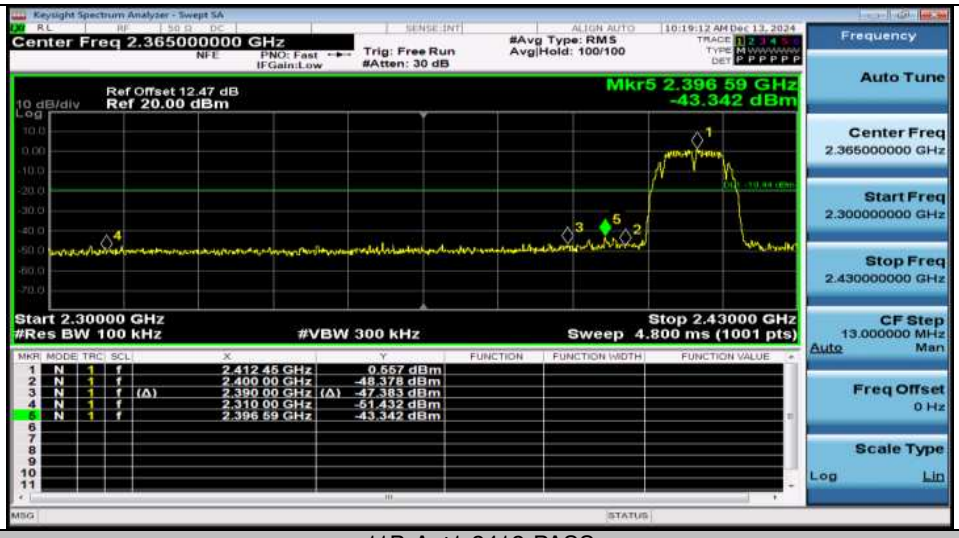
11N40SISO-Ant1-2452-PASS

6. Band edge measurements

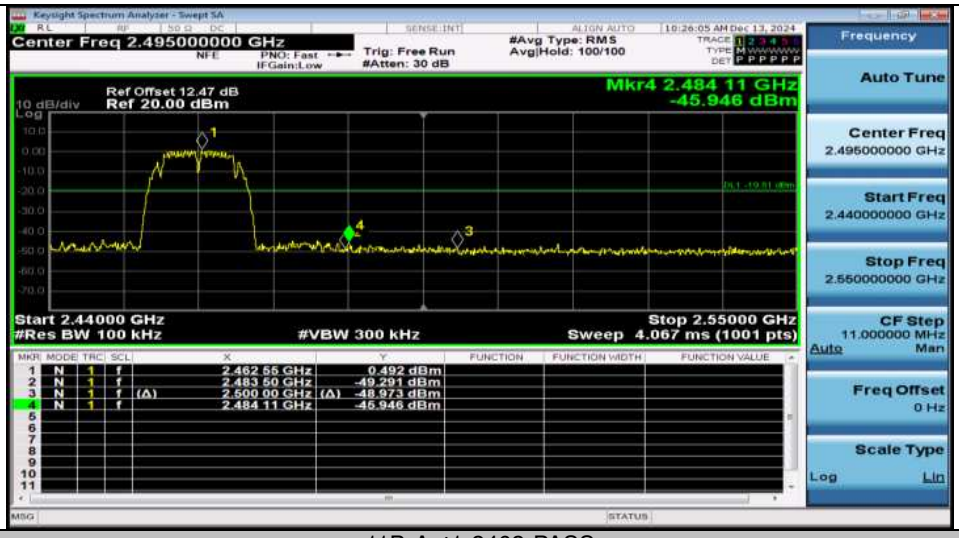
6.1 Test Result and Data

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	0.56	-43.34	≤-19.44	PASS
11B	Ant1	High	2462	0.49	-45.95	≤-19.51	PASS
11G	Ant1	Low	2412	-1.50	-40.53	≤-21.5	PASS
11G	Ant1	High	2462	-1.17	-46.37	≤-21.17	PASS
11N20SISO	Ant1	Low	2412	-4.19	-43.7	≤-24.19	PASS
11N20SISO	Ant1	High	2462	-4.30	-45.92	≤-24.3	PASS
11N40SISO	Ant1	Low	2422	-5.40	-43.41	≤-25.4	PASS
11N40SISO	Ant1	High	2452	-4.64	-46.92	≤-24.64	PASS

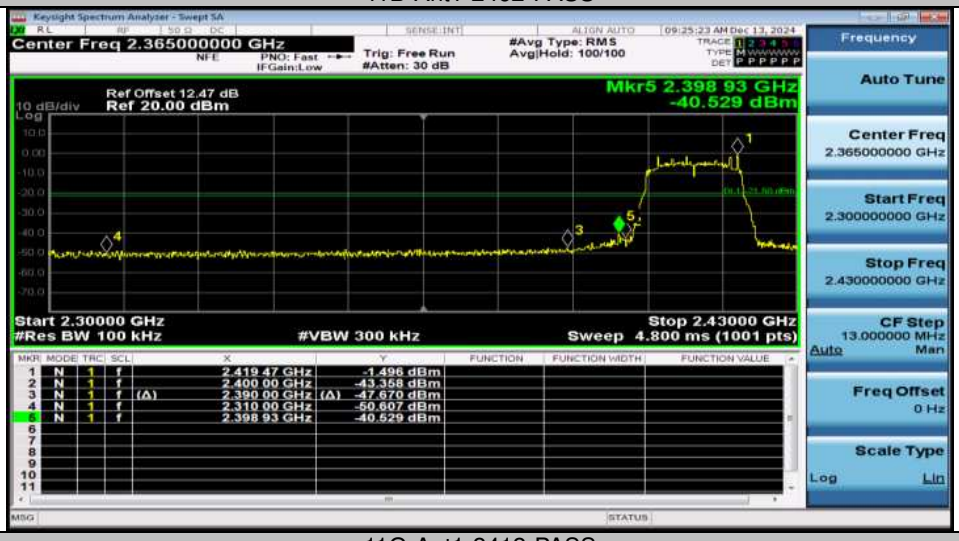
6.2 Test plots



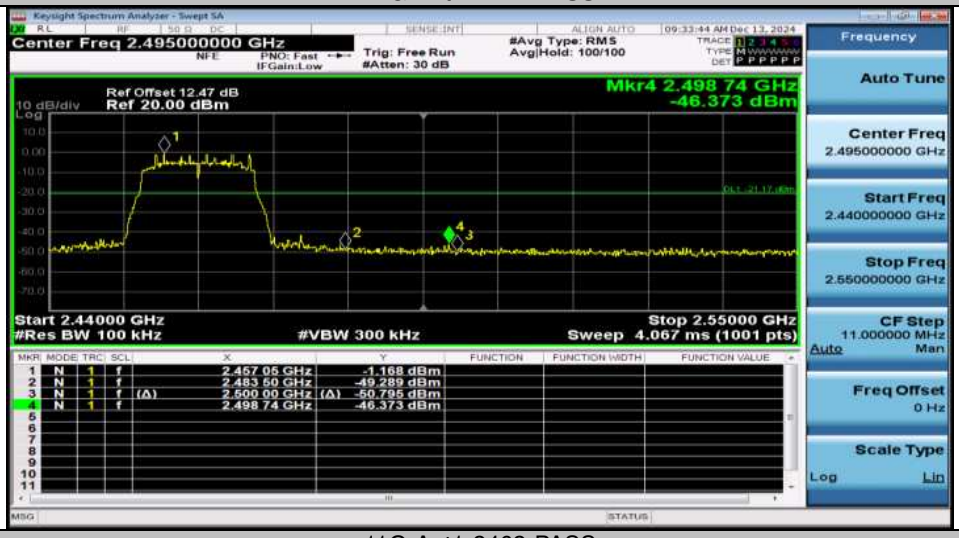
11B-Ant1-2412-PASS



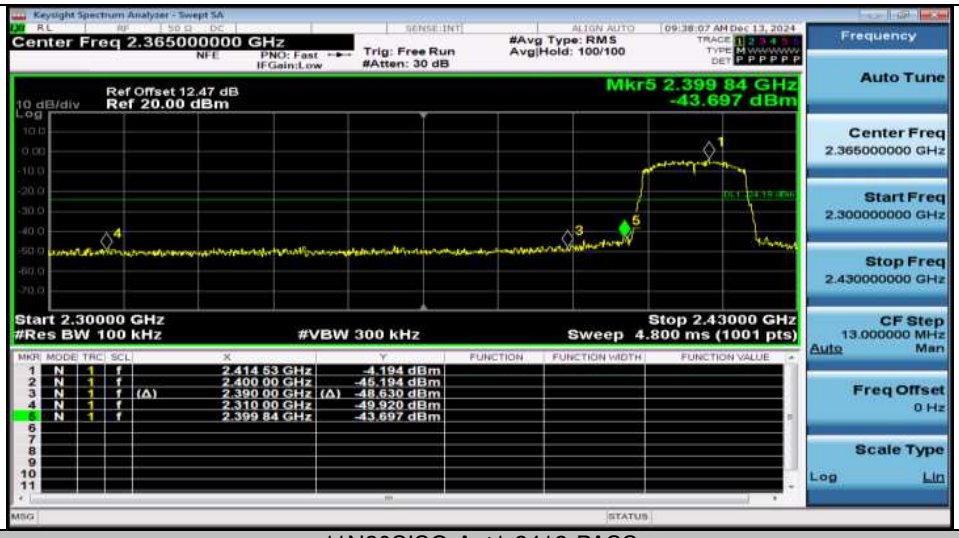
11B-Ant1-2462-PASS



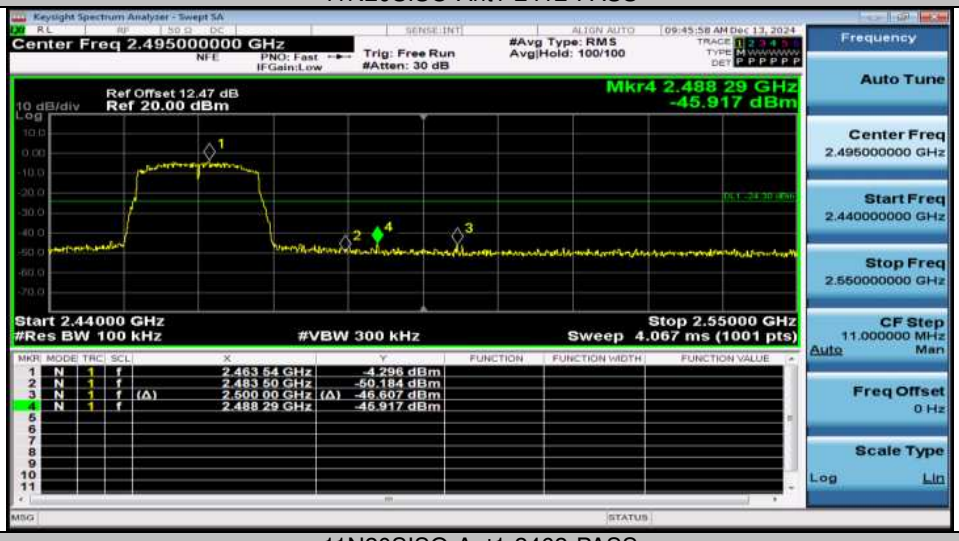
11G-Ant1-2412-PASS



11G-Ant1-2462-PASS



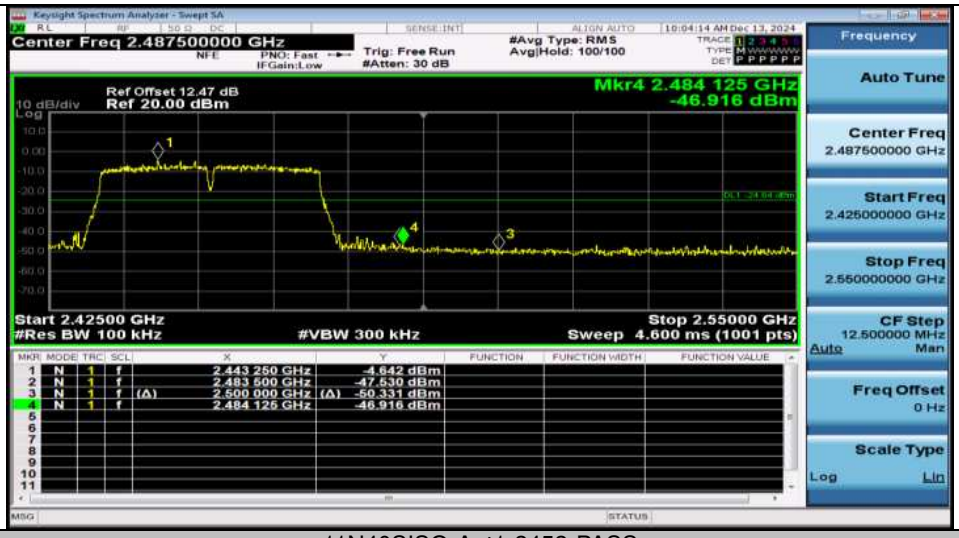
11N20SISO-Ant1-2412-PASS



11N20SISO-Ant1-2462-PASS

11N40SISO-Ant1-2422-PASS

TEST REPORT



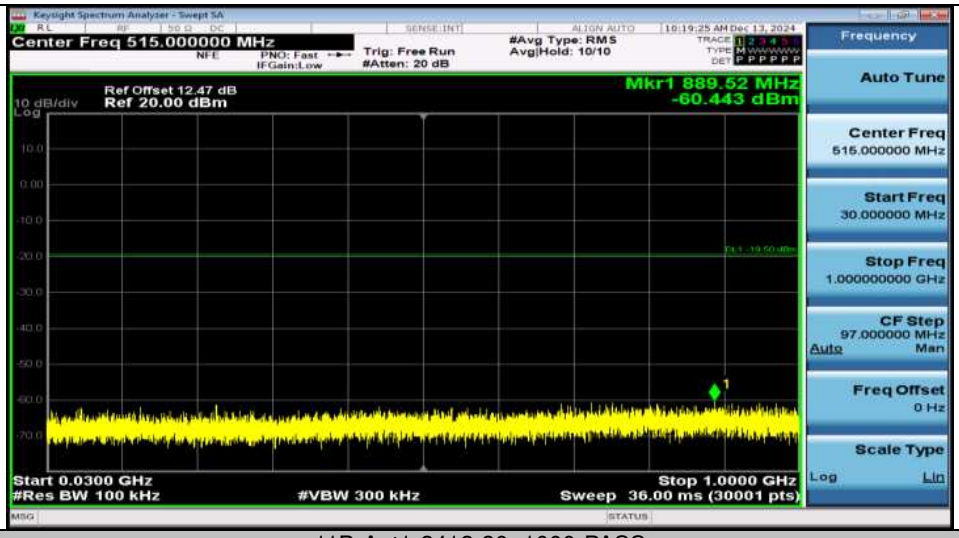
11N40SISO-Ant1-2452-PASS

7. Conducted Spurious Emission

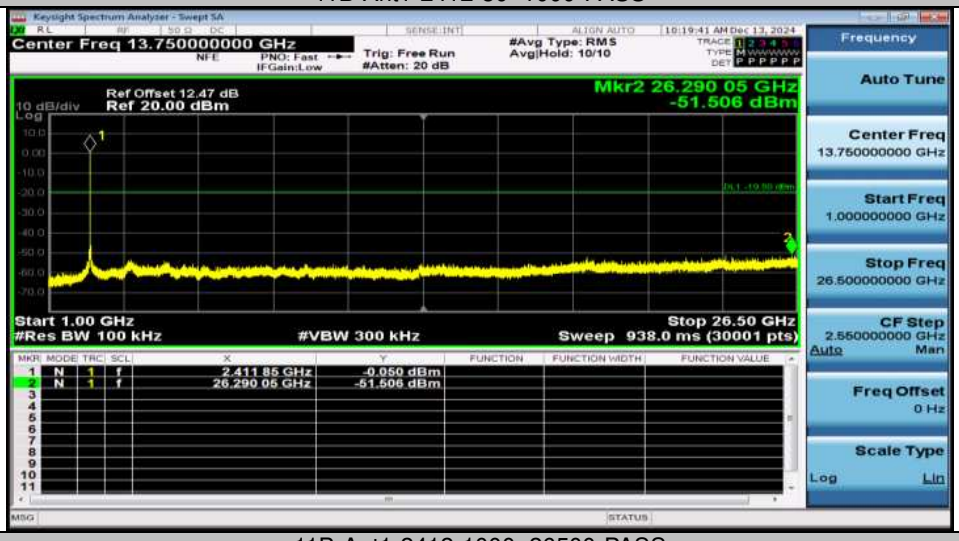
7.1 Test Result and Data

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	30~1000	0.50	-60.44	≤-19.5	PASS
11B	Ant1	2412	1000~26500	0.50	-51.51	≤-19.5	PASS
11B	Ant1	2437	30~1000	0.54	-60.08	≤-19.46	PASS
11B	Ant1	2437	1000~26500	0.54	-51.92	≤-19.46	PASS
11B	Ant1	2462	30~1000	0.61	-60.43	≤-19.39	PASS
11B	Ant1	2462	1000~26500	0.61	-51.64	≤-19.39	PASS
11G	Ant1	2412	30~1000	-1.24	-60.18	≤-21.24	PASS
11G	Ant1	2412	1000~26500	-1.24	-51.3	≤-21.24	PASS
11G	Ant1	2437	30~1000	-1.34	-59.46	≤-21.34	PASS
11G	Ant1	2437	1000~26500	-1.34	-51.95	≤-21.34	PASS
11G	Ant1	2462	30~1000	-1.46	-60.33	≤-21.46	PASS
11G	Ant1	2462	1000~26500	-1.46	-51.55	≤-21.46	PASS
11N20SISO	Ant1	2412	30~1000	-4.53	-60.36	≤-24.53	PASS
11N20SISO	Ant1	2412	1000~26500	-4.53	-51.74	≤-24.53	PASS
11N20SISO	Ant1	2437	30~1000	-1.39	-60.42	≤-21.39	PASS
11N20SISO	Ant1	2437	1000~26500	-1.39	-51.03	≤-21.39	PASS
11N20SISO	Ant1	2462	30~1000	-1.24	-60.01	≤-21.24	PASS
11N20SISO	Ant1	2462	1000~26500	-1.24	-51.08	≤-21.24	PASS
11N40SISO	Ant1	2422	30~1000	-6.66	-60.53	≤-26.66	PASS
11N40SISO	Ant1	2422	1000~26500	-6.66	-50.63	≤-26.66	PASS
11N40SISO	Ant1	2437	30~1000	-3.37	-59.44	≤-23.37	PASS
11N40SISO	Ant1	2437	1000~26500	-3.37	-51.63	≤-23.37	PASS
11N40SISO	Ant1	2452	30~1000	-3.32	-60.21	≤-23.32	PASS
11N40SISO	Ant1	2452	1000~26500	-3.32	-50.74	≤-23.32	PASS

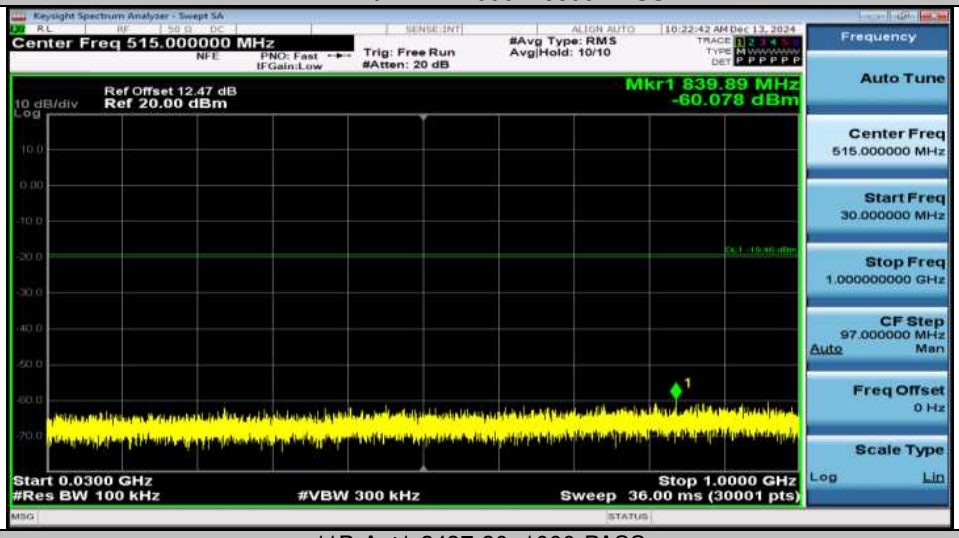
7.2 Test plots



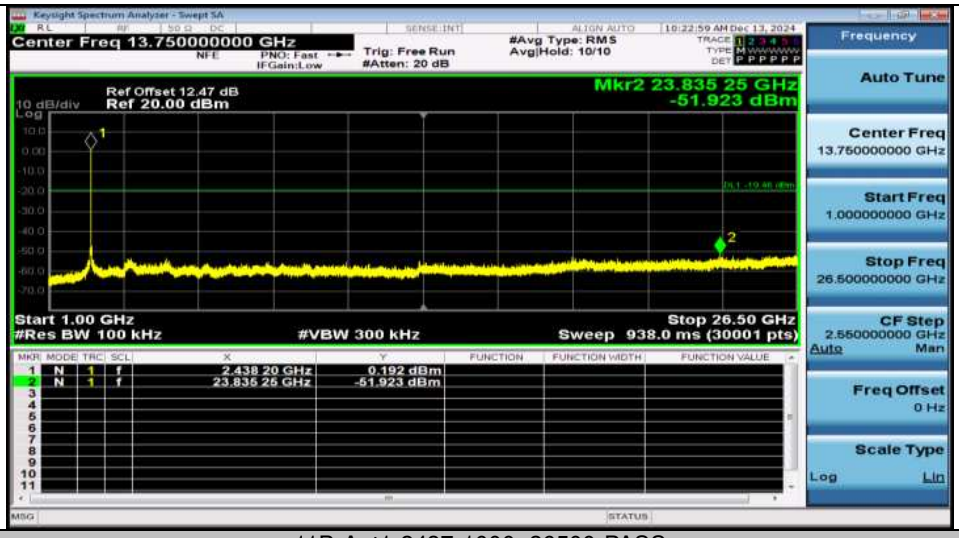
11B-Ant1-2412-30~1000-PASS



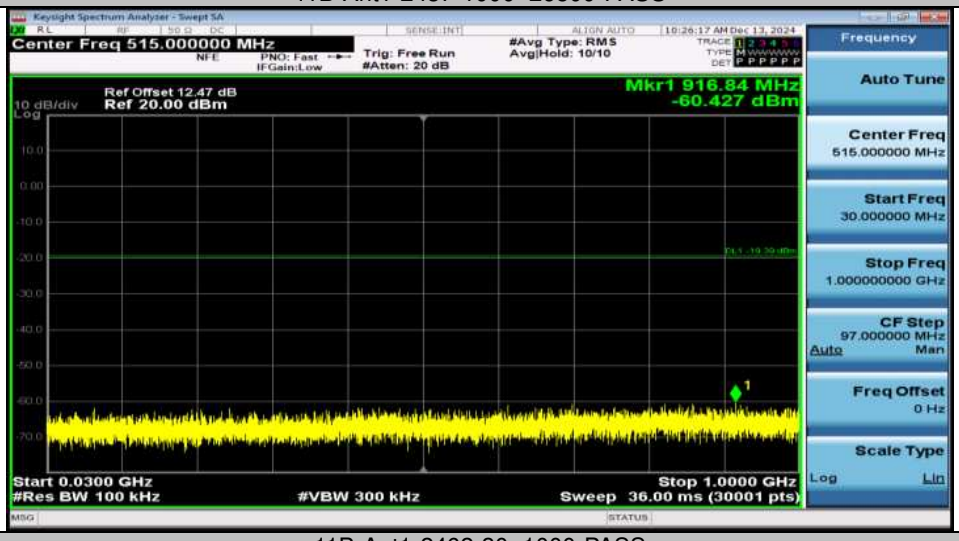
11B-Ant1-2412-1000~26500-PASS



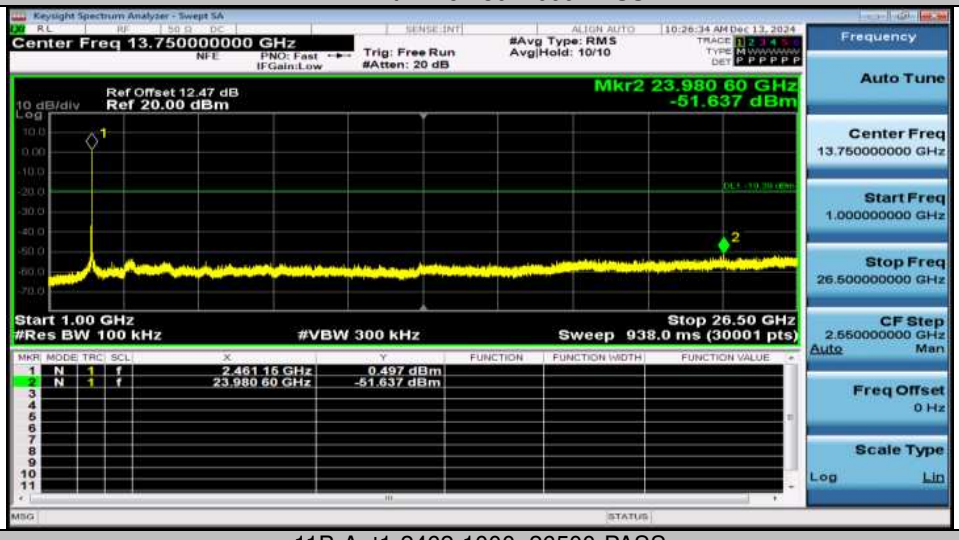
11B-Ant1-2437-30~1000-PASS



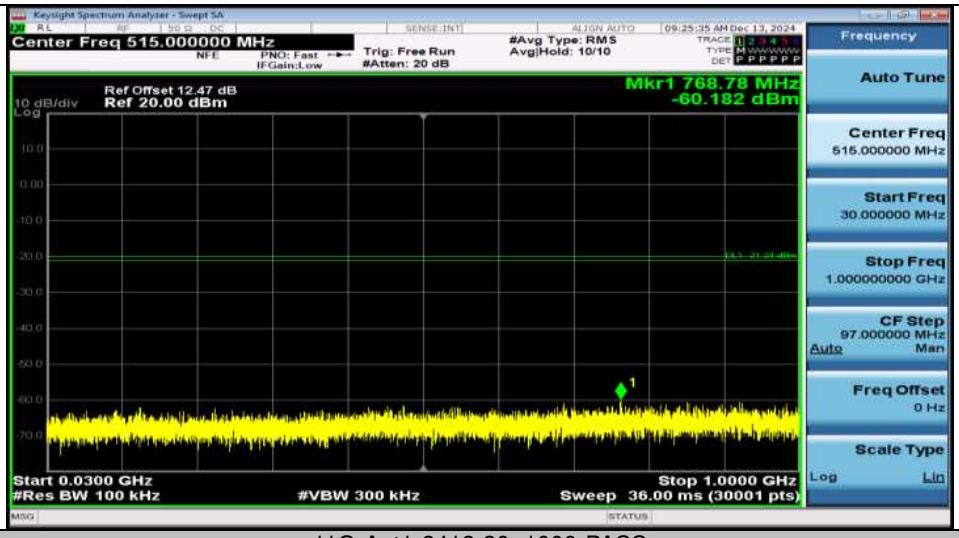
11B-Ant1-2437-1000~26500-PASS



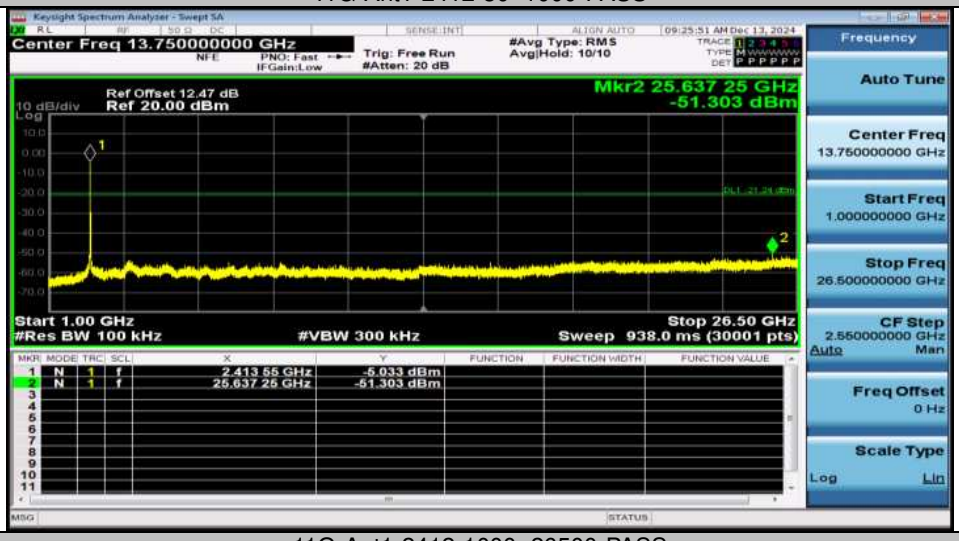
11B-Ant1-2462-30~1000-PASS



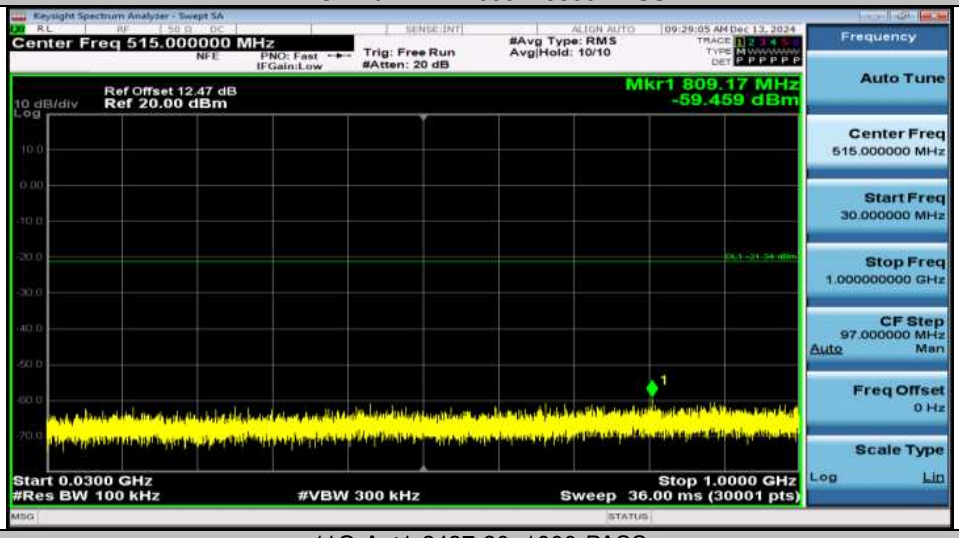
11B-Ant1-2462-1000~26500-PASS



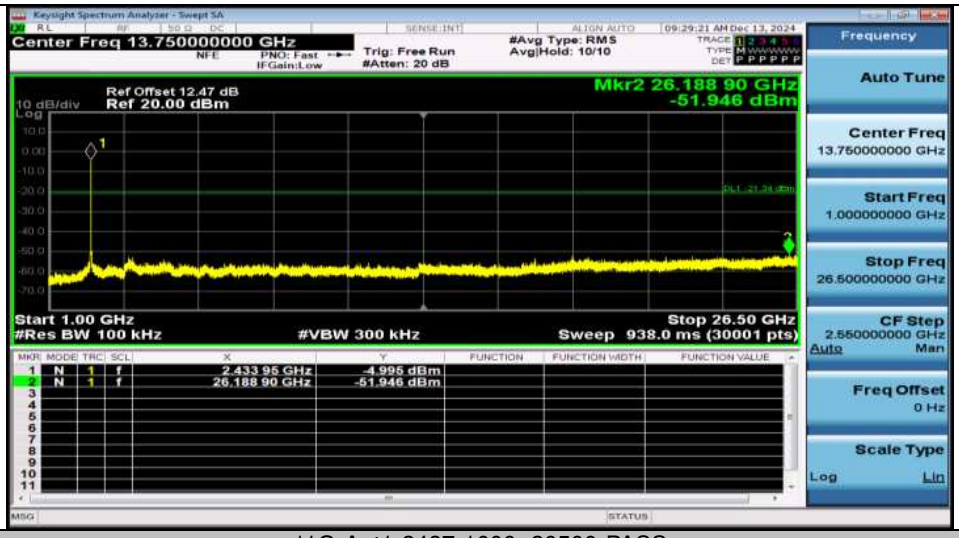
11G-Ant1-2412-30~1000-PASS



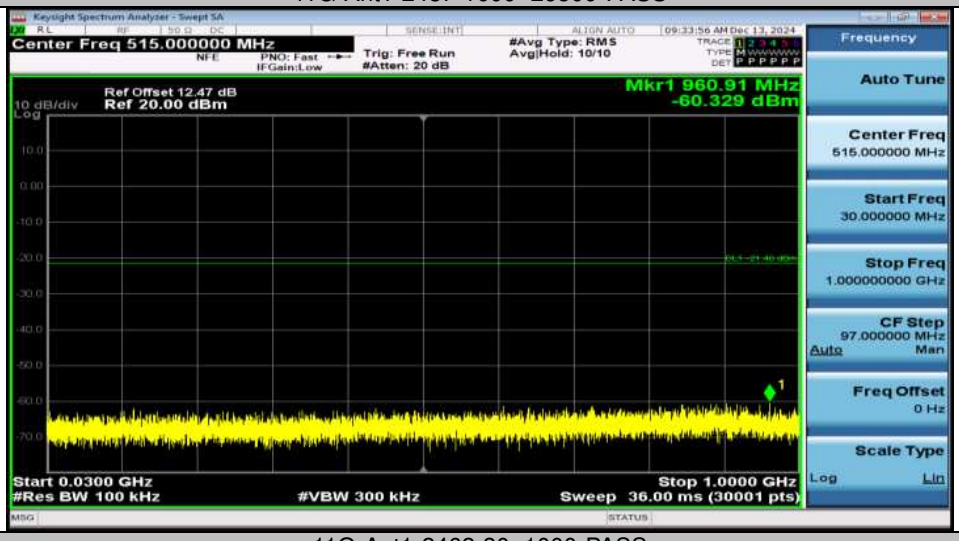
11G-Ant1-2412-1000~26500-PASS



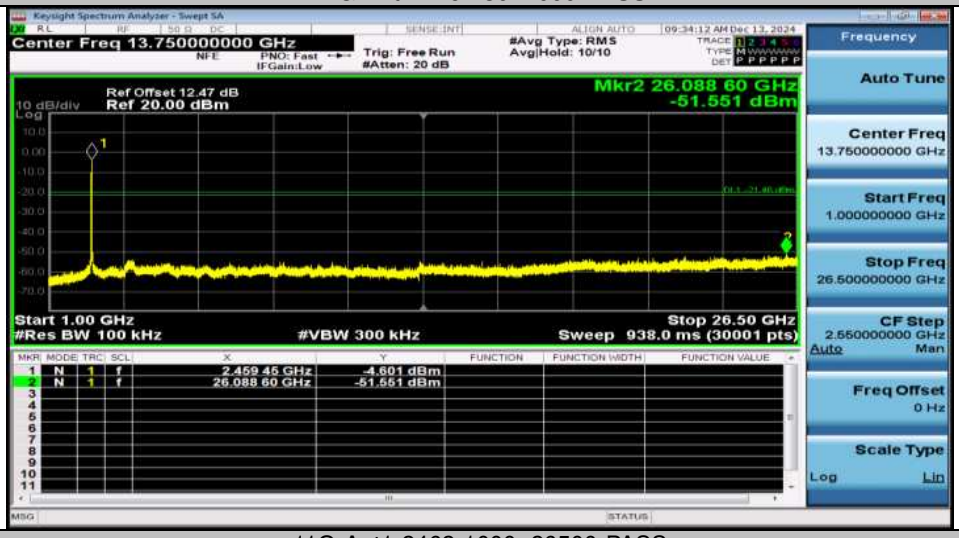
11G-Ant1-2437-30~1000-PASS



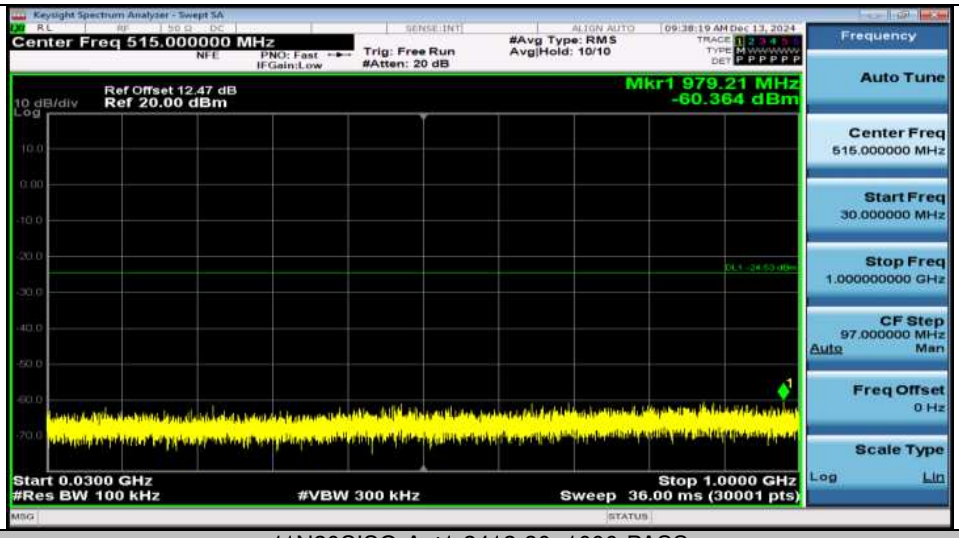
11G-Ant1-2437-1000~26500-PASS



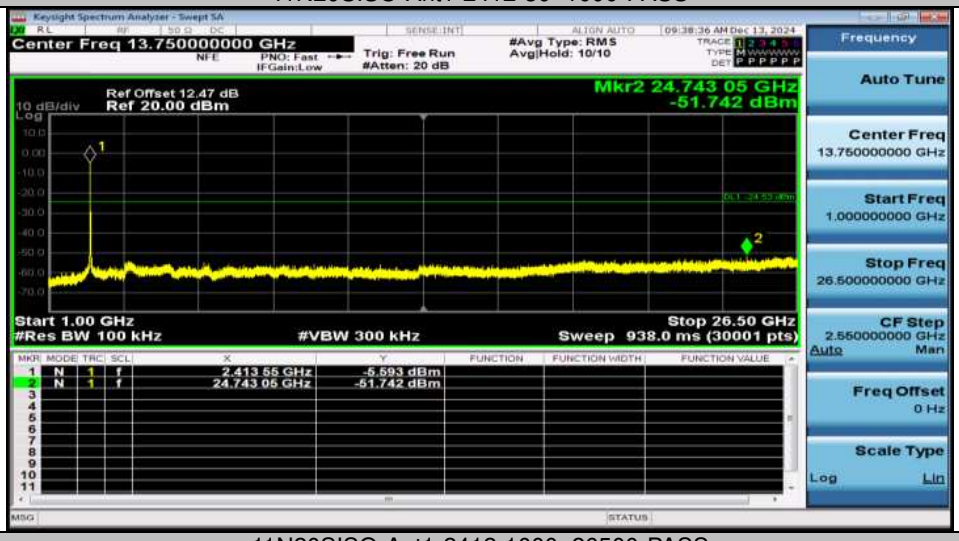
11G-Ant1-2462-30~1000-PASS



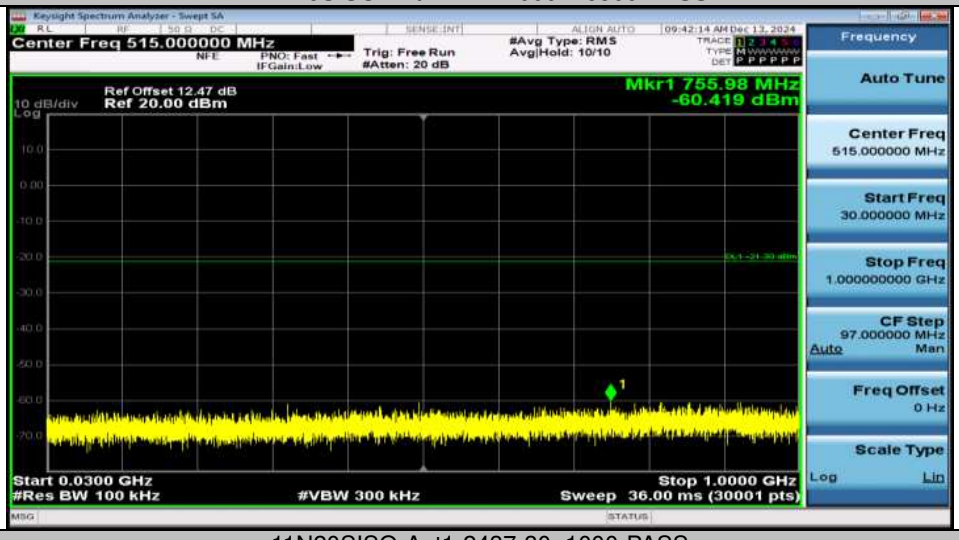
11G-Ant1-2462-1000~26500-PASS



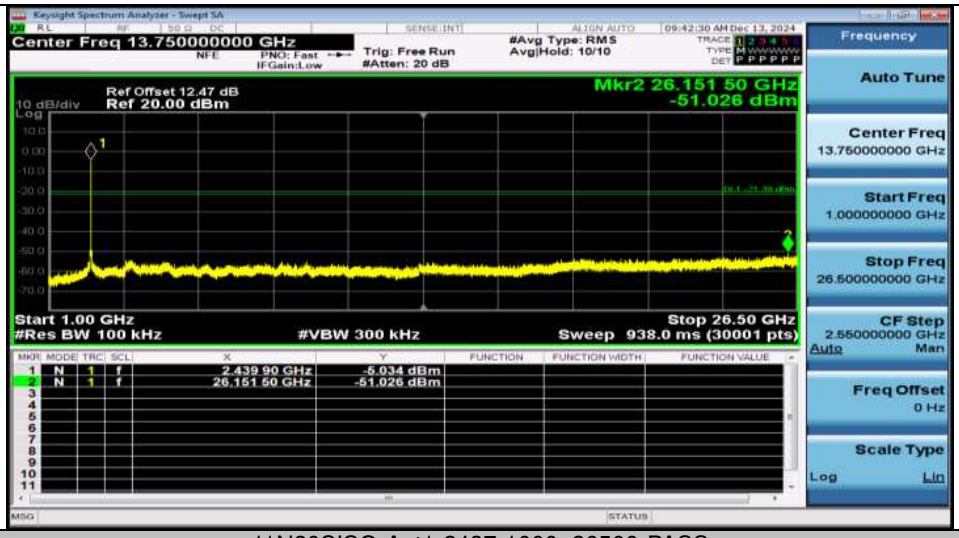
11N20SISO-Ant1-2412-30~1000-PASS



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



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



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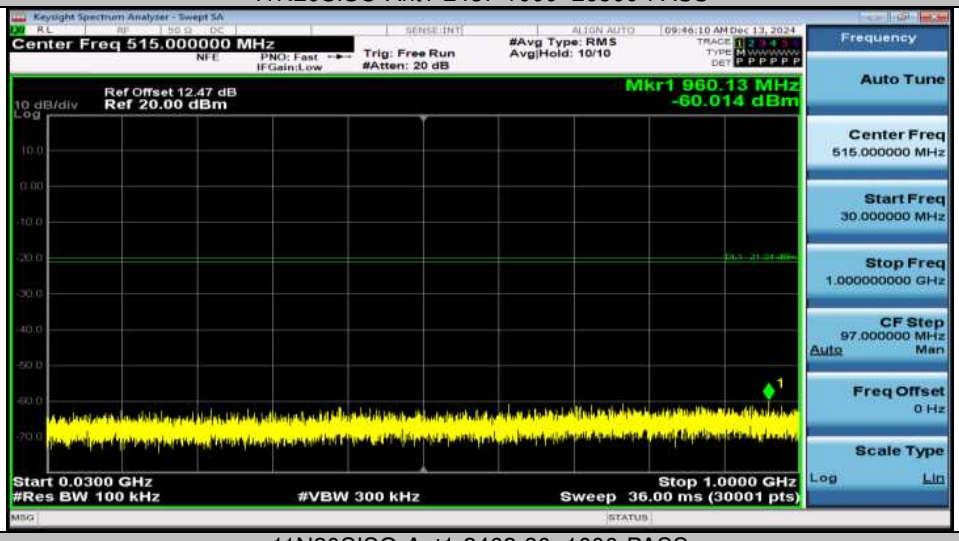
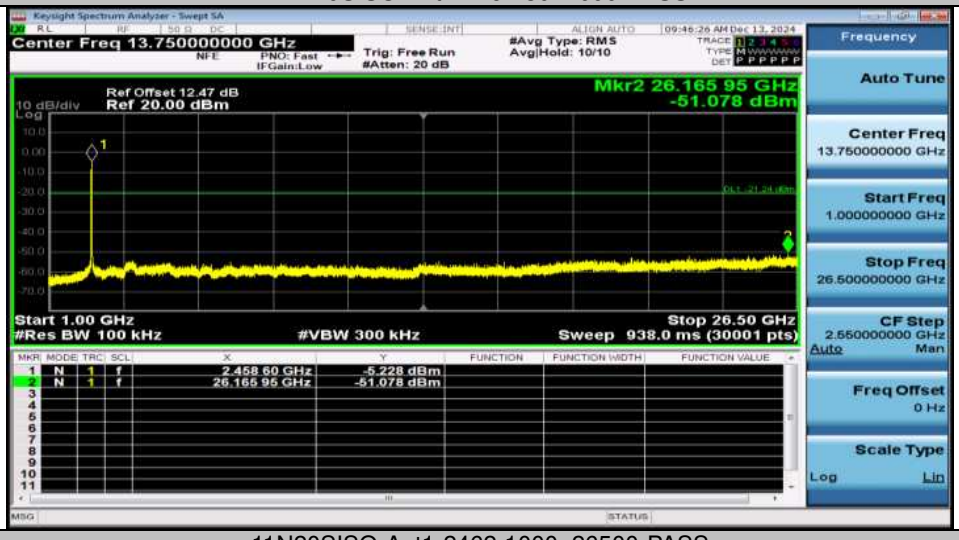


11N20SISO-Ant1-2462-30~1000-PASS



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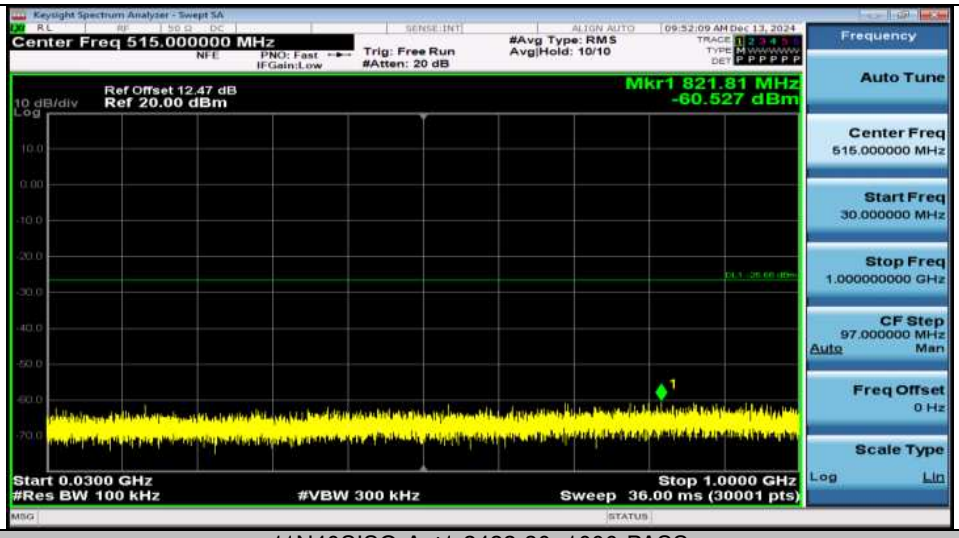
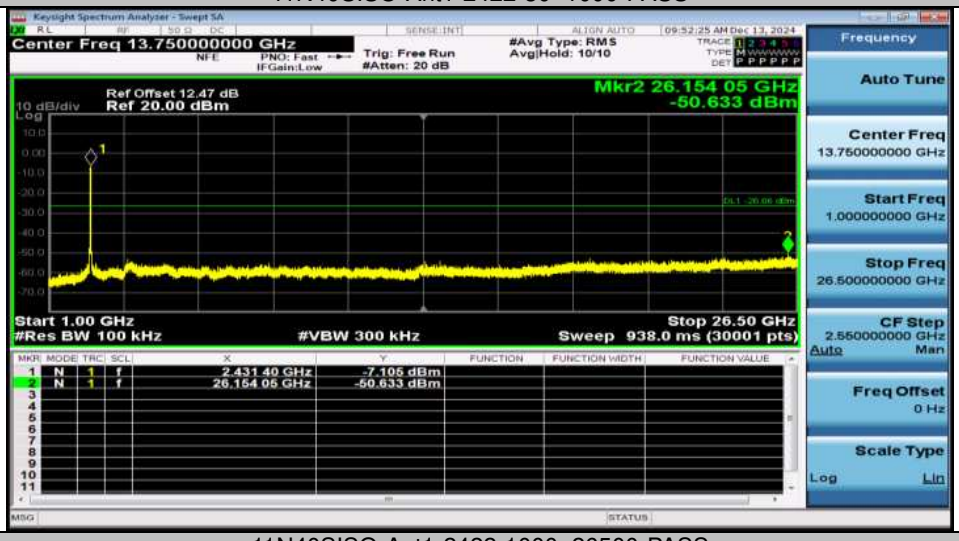


11N40SISO-Ant1-2422-30~1000-PASS



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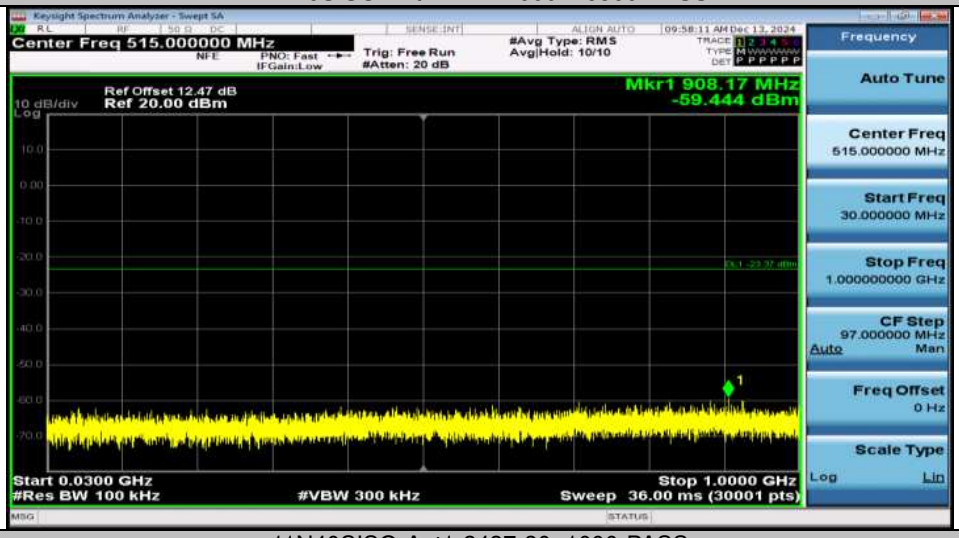

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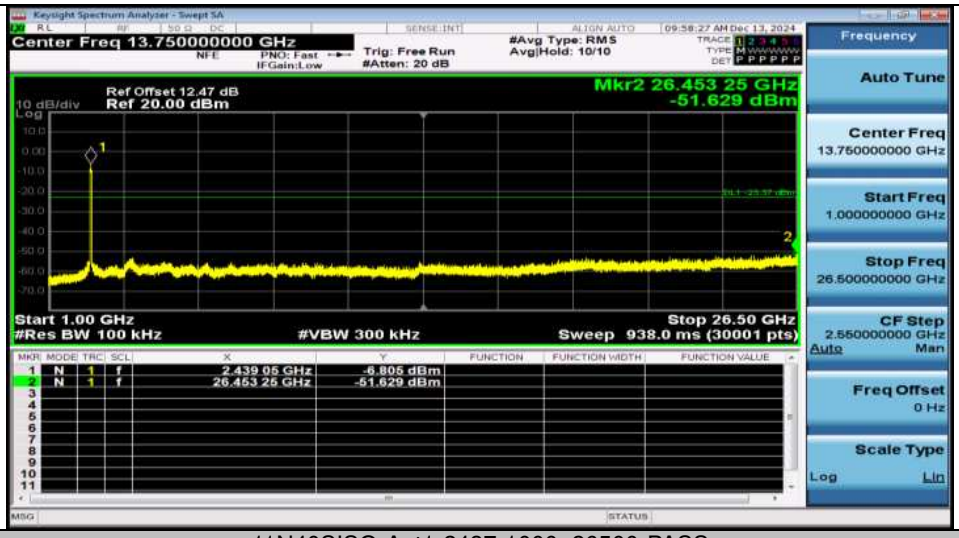

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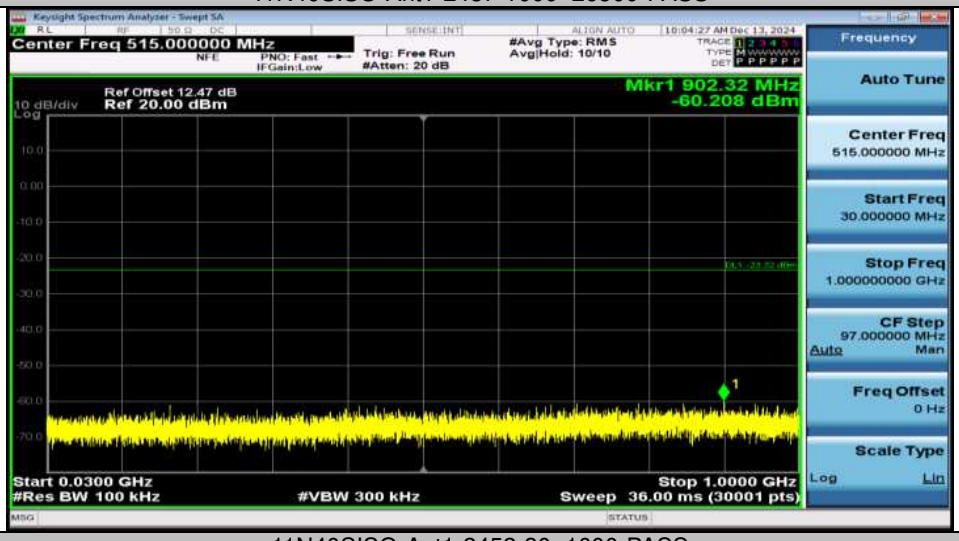
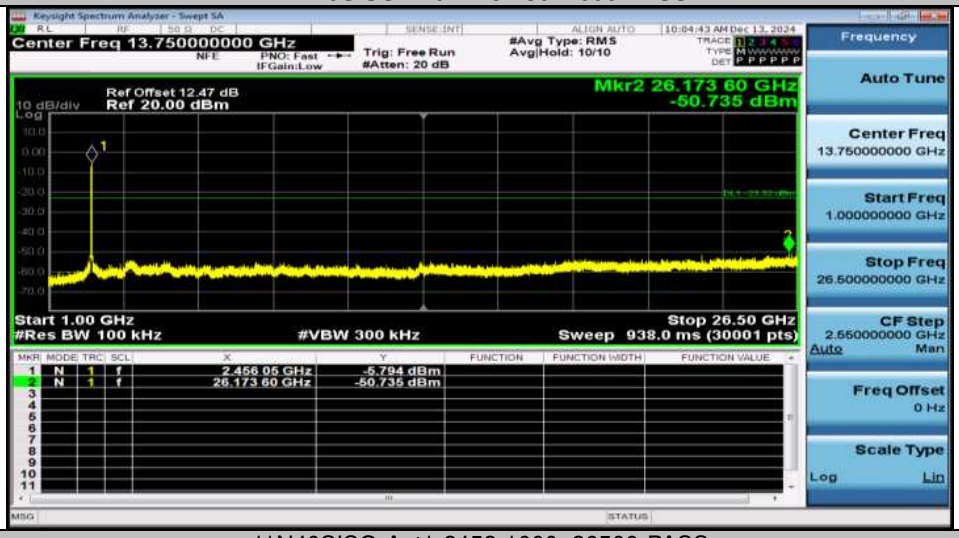


11N40SISO-Ant1-2452-30~1000-PASS



11N40SISO-Ant1-2452-1000~26500-PASS

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