TEST REPORT

Applicant:	Quectel Wireless Solutions Co., Ltd.
EUT Description:	Wi-Fi & Bluetooth Module
Model:	FLM163D
Brand:	Quectel
FCC ID:	XMR2024FLM163D
Standards:	FCC 47 CFR Part 15 Subpart C
Date of Receipt:	2024/07/03
Date of Test:	2024/07/03 to 2024/07/25
Date of Issue:	2024/08/12

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.

Huang Kun
Approved By:

Chen Chengfu
Reviewed By:

Revision History

Rev.	Issue Date	Description	Revised by
01	2024/07/26	Original	Chen Chengfu
02	2024/08/12	Update information on page 6	Chen Chengfu

Summary of Test Results

Clause	FCC Part	Test Items	Result
4.1	§15.203/15.247(b)	Antenna Requirement	PASS
4.2	§15.207	AC Power Line Conducted Emission	PASS
4.3	§15.247 (b)(3)	Output Power	PASS
4.4	§15.247 (a)(2)	Occupied Bandwidth	Reporting purposes only
4.5	§15.247 (e)	Power Spectral Density	PASS
4.6	§15.247(d)	Band Edge for Conducted Emissions	PASS
4.7	§15.247(d)	Spurious RF Conducted Emissions	PASS
4.8	§15.205/15.209	Radiated Spurious emissions and Band Edge	PASS
Test Method: ANSI C63.10-2020, KDB 558074 D01 15.247 Mesa Guidan12/08/2024ce v05r02.			

Table of Contents

1 General Description

1.1 Lab Information

1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014
Tel.: +86-755-27212361
Contact Email: info@towewireless.com

1.1.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

ISED CAB identifier: CN0152
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0152
Company Number: 31000

1.2 Client Information

1.2.1 Applicant

Applicant:	Quectel Wireless Solutions Co., Ltd.
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China, 200233

1.2.2 Manufacturer

Manufacturer:	Quectel Wireless Solutions Co., Ltd.
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China, 200233

1.3 Product Information

EUT Description:	Wi-Fi & Bluetooth Module		
Model No.:	FLM163D		
Brand:	Quectel		
Hardware Version:	R1.0		
Software Version:	N/A		
SN.:	E1824G21X000001(Test RF) E1824G21X000002(Test RSE&CE)		
Modulation Type:	802.11b:	DSSS-DBPSK, DQPSK, CCK	
	802.11g/n/ax:	OFDM-BPSK, QPSK, 16QAM, 64QAM	
Smart System:	☒SISO	802.11b/g/n/ax	/
	☐MIMO	802.11g/n/ax	( )TX( )RX
	☐CDD	802.11b	( )TX( )RX
Frequency Range:	2400 ~ 2483.5MHz		
Channel Frequency:	20MHz bandwidth Channel: 2412 ~ 2462MHz		
Channel Number:	11:	802.11b/g/n/ax	
Resource unit (RU):	☐ Support ☒ Not Supported		
Antenna Type:	☐ External, ☒ PCB		
Antenna Gain:	-1.85dBi		
Remark: The above EUT's information was declared by applicant, please refer to the specifications or user's manual for more detailed description.			

2 Test Configuration

2.1 Test Channel

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

Remark:
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:

Modulation Type	**Test Channel**	**Test Frequency**
802.11b/g/n20/ax20	The Lowest channel (CH1)	2412MHz
	The Middle channel (CH6)	2437MHz
	The Highest channel (CH11)	2462MHz

2.2 Worst-case configuration and Mode

Modulation Type	**SISO - Data Rate**	**MIMO - Data Rate**
802.11b	1 Mbps	N/A
802.11g	6 Mbps	N/A
802.11(n20)	MCS0 (6.5 Mbps)	N/A
802.11(ax20)	MCS0 (8 Mbps)	N/A
Transmitting mode:	Keep the EUT was programmed to be in continuously transmitting mode.	
Normal Link:	Keep the EUT operation to normal function.	

2.3 Test Duty Cycle

Test Type	T(ms)	T Period(ms)	Duty Cycle(%)	1/T	VBW Set
11b-2412	8.39	8.48	98.94	0.119189511	10Hz
11b-2437	8.38	8.48	98.82	0.119331742	10Hz
11b-2462	8.38	8.47	98.94	0.119331742	10Hz
11g-2412	1.39	1.41	98.58	0.71942446	10Hz
11g-2437	1.40	1.41	99.29	0.714285714	10Hz
11g-2462	1.39	1.41	98.58	0.71942446	10Hz
11n20SISO-2412	1.30	1.32	98.48	0.769230769	10Hz
11n20SISO-2437	1.30	1.32	98.48	0.769230769	10Hz
11n20SISO-2462	1.30	1.32	98.48	0.769230769	10Hz
11ax20SISO-2412	1.07	1.12	95.54	0.934579439	1kHz
11ax20SISO-2437	1.06	1.12	94.64	0.943396226	1kHz
11ax20SISO-2462	1.07	1.12	95.54	0.934579439	1kHz

Note: If Duty Cycle>98% VBW is set to 10Hz.

2.4 Support Unit used in test

Description	Manufacturer	Model	Serial Number
Development Board *	Quectel	FLM140D-TE-B	E1823RC5A000053
LAPTOP	APPLE	MacBook Pro	C02SPBESFVH3
Adapter	APPLE	MagSafe 2	N/A
Remark: * the information of table are provided by client.			

2.5 Test Environment

Temperature:	Normal: 15℃ ~ 35℃
Humidity:	45-56 % RH Ambient
Voltage:	DC 3.3V
AC Voltage:	120V (Laptop Output DC 5V in Development Board)
Remark: The testing environment is within the scope of the EUT user manual and meets the requirements of the standard testing environment.	

2.6 Test RF Cable

For all conducted test items: The offset level is set spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.

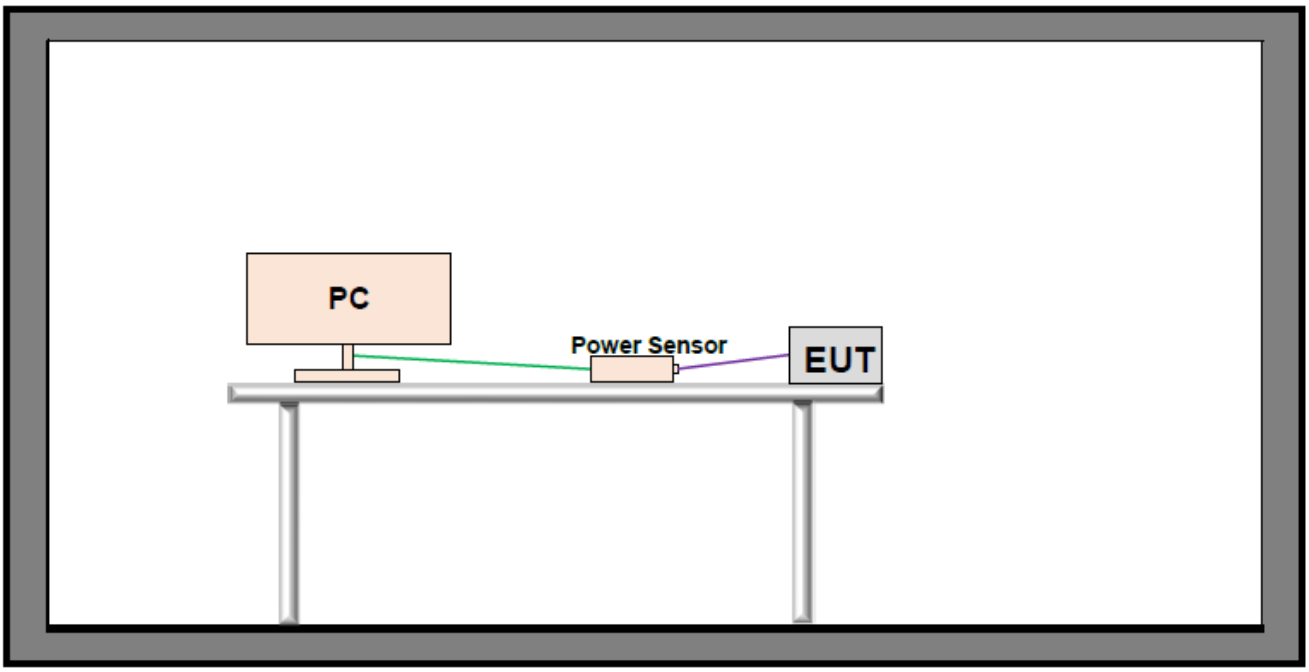
2.7 Modifications

No modifications were made during testing.

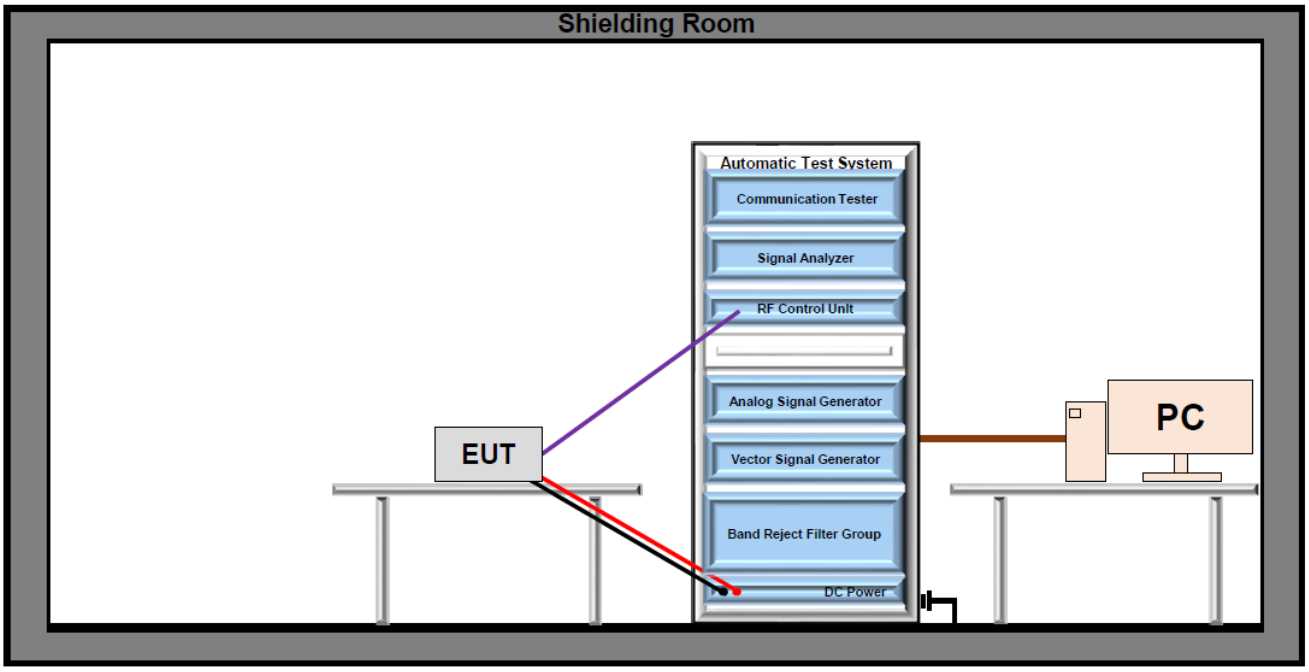
2.8 Test Setup Diagram

2.8.1 Conducted Configuration

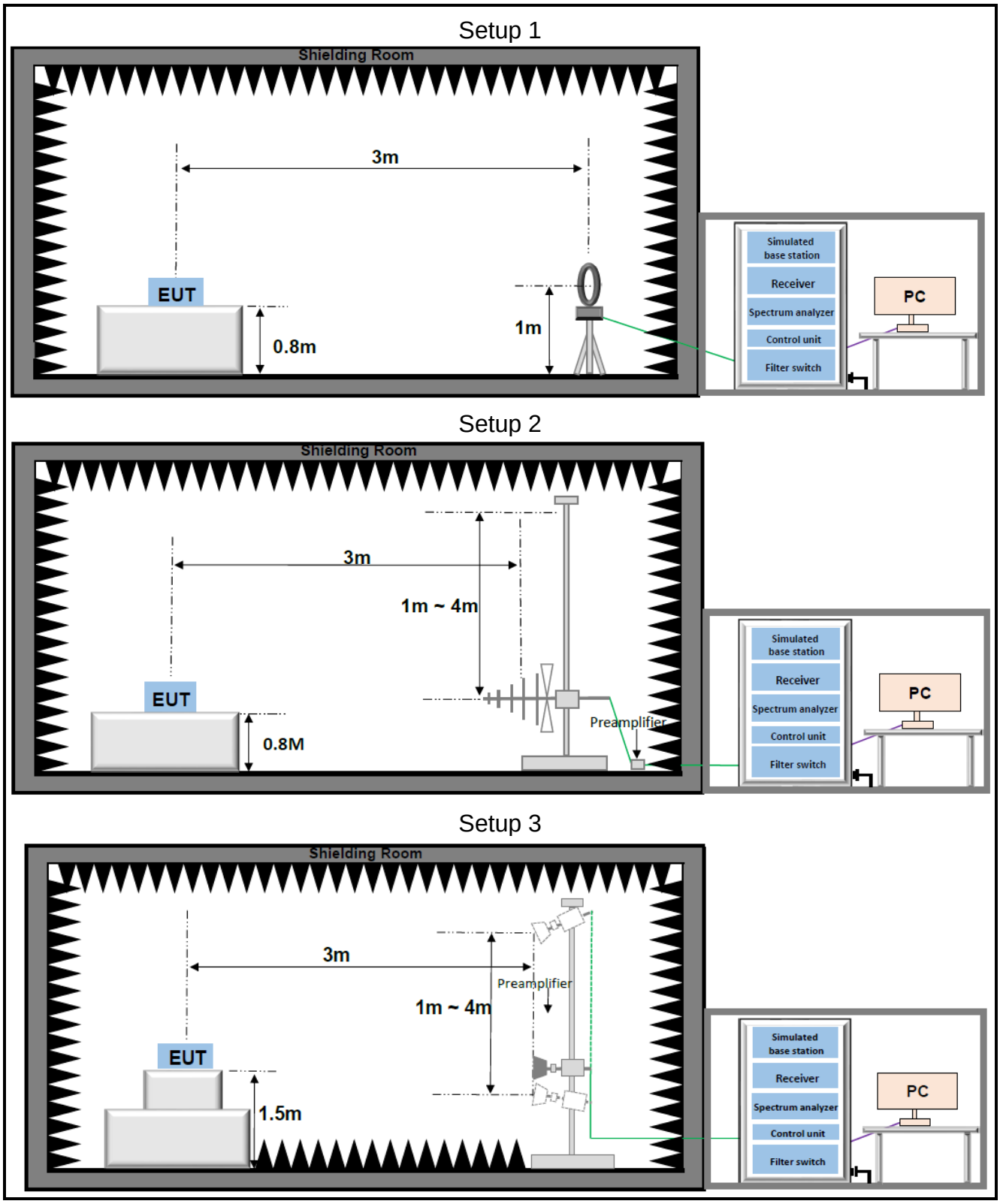
Setup 1



Setup 2



2.8.2 Radiated Configuration



3 Equipment and Measurement Uncertainty

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, whichever is less, and where applicable is traceable to recognized national standards.

3.1 Test Equipment List

RF03					
Description	**Manufacturer**	**Model**	**SN**	**Last Due**	**Cal Due**
Signal Analyzer	Keysight	N9020A	US46470429	2024/03/25	2025/03/24
EXA Signal Analyzer Multi-touch	Keysight	N9010B	MY63440541	2024/05/30	2025/05/29
RF Control Unit	Tonscend	JS0806-2	23C80620671	2024/05/30	2025/05/29
Measurement Software	Tonscend	JS1120-3 V3.5.49	10776	N/A	N/A

Radiated Emission					
Description	**Manufacturer**	**Model**	**S.N.**	**Last Due**	**Cal Due**
Loop Antenna	Schwarzbeck	FMZB 1519C	1519C-028	2023/06/29	2025/06/28
Biconic Logarithmic Periodic Antennas	Schwarzbeck	VULB9163	1643	2023/06/25	2025/06/24
Double-Ridged Horn Antennas	Schwarzbeck	BBHA 9120D	2809	2023/06/25	2025/06/24
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	1290	2023/06/25	2025/06/24
Signal Analyzer	Keysight	N9020A	MY49100252	2024/03/25	2025/03/24
Signal Analyzer	Keysight	N9010B	MY63440541	2024/05/30	2025/05/29
EMI Tester Receiver	Rohde & Schwarz	ESR7	102719	2024/05/31	2025/05/20
Low Noise Amplifier	Tonscend	TAP9K3G40	AP23A8060273	2023/04/08	2025/04/07
Low Noise Amplifier	Tonscend	TAP01018050	AP22G806258	2023/04/08	2025/04/07
Band Reject Filter Group	Townshend	JS0806-F	23A806F0652	N/A	N/A
Test Software	Tonscend	TS+	Version: 5.0.0	N/A	N/A

Conducted Emission					
Description	**Manufacturer**	**Model**	**S.N.**	**Last Due**	**Cal Due**
EMI Tester Receiver	Rohde & Schwarz	ESR3	103108	2024/05/31	2025/05/30
LISN	Rohde & Schwarz	ENV 216	102836	2024/01/10	2025/01/09
Test software	Rohde & Schwarz	ELEKTRA V4.61	N/A	N/A	N/A

3.2 Measurement Uncertainty

Parameter	U_{lab}
Frequency Error	679.98Hz
Output Power	0.76dB
Conducted Spurious Emissions	2.22dB
Conducted Emissions(150KHz~30MHz)	2.43dB
Radiated Emissions(9kHz~30MHz)	2.40dB
Radiated Emissions(30MHz~1000MHz)	4.66dB
Radiated Emissions(1GHz~18GHHz)	5.42dB
Radiated Emissions(18GHz~40GHHz)	5.46dB

Uncertainty figures are valid to a confidence level of 95%

4 Test Results

4.1 Antenna Requirement

Standard Applicable:	47 CFR Part 15C Section 15.203 /247(b)
15.203 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
The antenna gain and type as provided by the manufacturer are as follows: The antenna Type is PCB. With maximum gain is -1.85dBi. Antenna Anti-Replacement Construction: An embedded-in antenna design is used.	

4.2 AC Power Line Conducted Emissions

Limits

Frequency range (MHz)	Limit (dBuV)	
	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.		

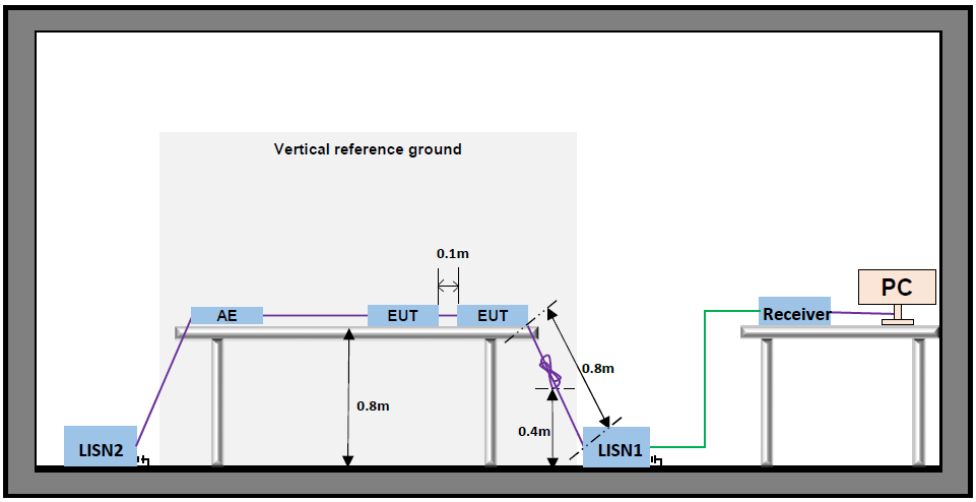
Test Procedure

ANSI C63.10-2020, Section 6.2.

Test Settings

1. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
3. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
4. Set the test-receiver system to Peak detect function and specified bandwidth (if bandwidth =9kHz) with maximum hod mode. Then measurement is also conducted by average detector and Quasi-Peak detector function respectively.
5. Both sides of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Test Setup

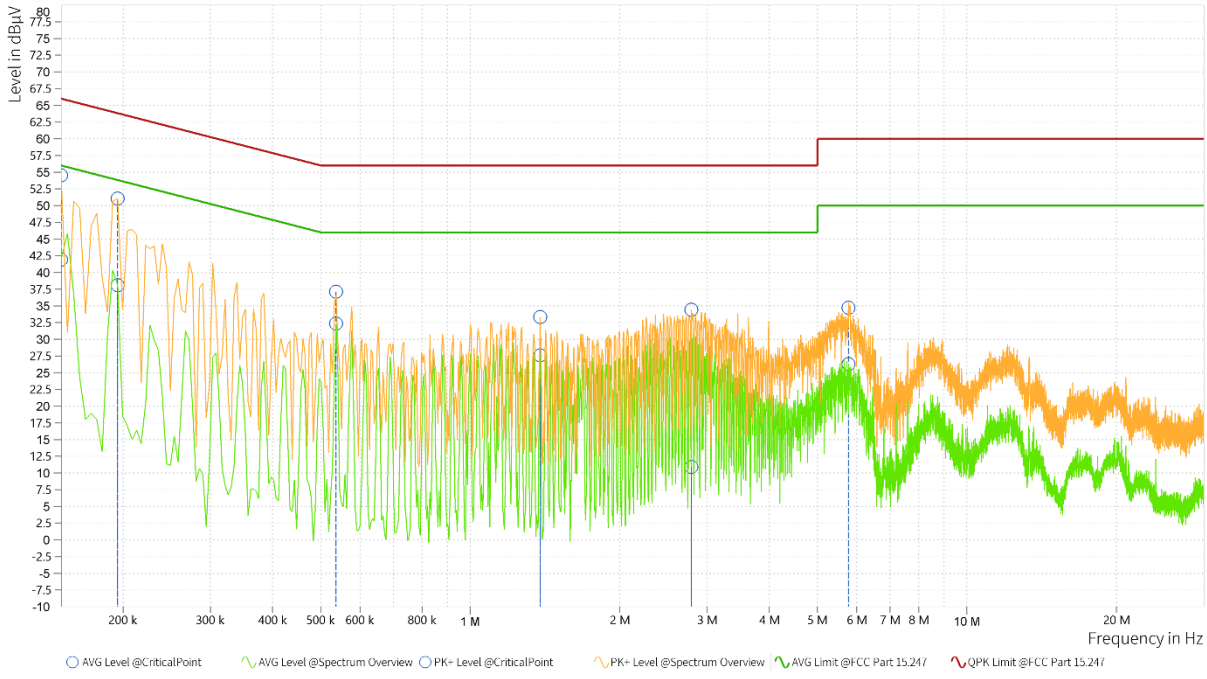


Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result:

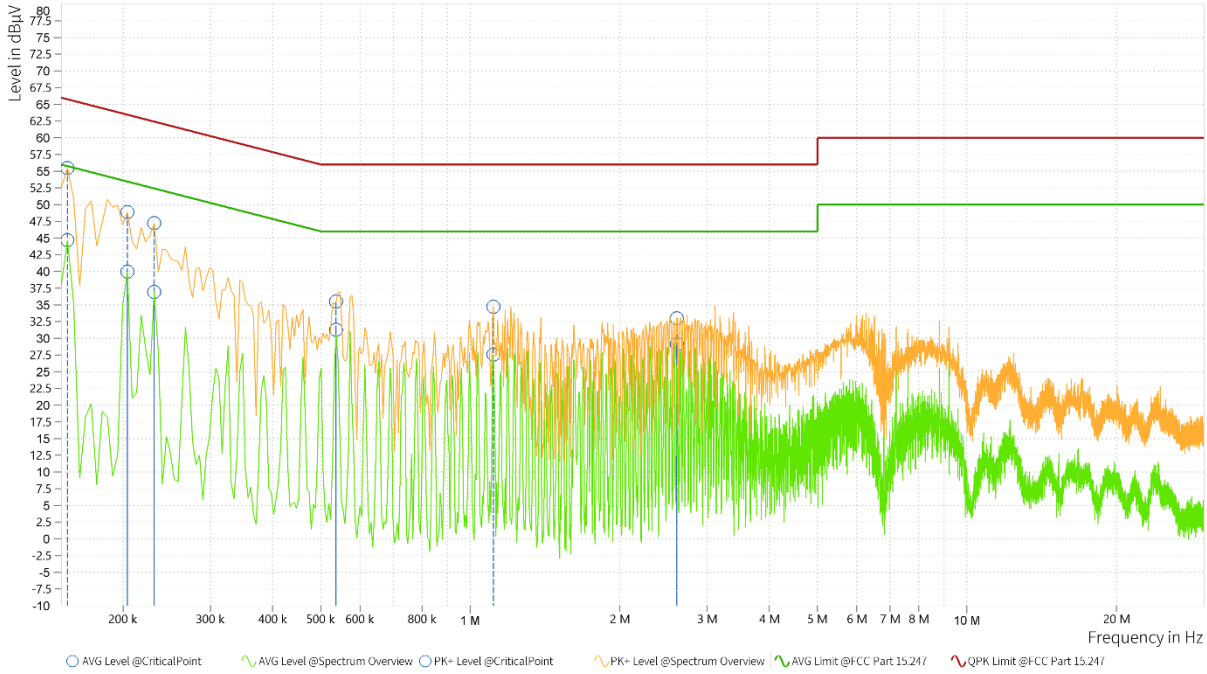
Test mode:	WIFI Link		
Test Voltage:	AC 120V / 60Hz	Phase:	Line



Rg	Frequency [MHz]	PK+ Level [dBµV]	PK+: QPK Limit [dBµV]	PK+ Margin [dB]	AVG Level [dBµV]	AVG Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line
1	0.150	54.52	66.00	11.48	41.90	56.00	14.10	9.26	L1
1	0.195	51.06	63.82	12.77	38.09	53.82	15.73	9.59	L1
1	0.537	37.12	56.00	18.88	32.36	46.00	13.64	9.51	L1
1	1.383	33.35	56.00	22.65	27.59	46.00	18.41	9.86	L1
1	2.787	34.44	56.00	21.56	10.91	46.00	35.09	9.55	L1
1	5.775	34.72	60.00	25.28	26.28	50.00	23.72	9.77	L1

Note: Margin = Limit(dB μ V) - Level(dB μ V).

Test mode:	WIFI Link		
Test Voltage:	AC 120V / 60Hz	Phase:	Neutral



Rg	Frequency [MHz]	PK+ Level [dBµV]	PK+: QPK Limit [dBµV]	PK+ Margin [dB]	AVG Level [dBµV]	AVG Limit [dBµV]	AVG Margin [dB]	Correction [dB]	Line
1	0.155	55.47	65.75	10.29	44.68	55.75	11.08	9.49	N
1	0.204	48.87	63.45	14.57	39.96	53.45	13.48	9.54	N
1	0.231	47.24	62.41	15.18	36.94	52.41	15.47	9.55	N
1	0.537	35.50	56.00	20.50	31.28	46.00	14.72	9.60	N
1	1.113	34.73	56.00	21.27	27.55	46.00	18.45	9.67	N
1	2.607	33.01	56.00	22.99	29.14	46.00	16.86	9.63	N

Note: Margin = Limit(dB μ V) - Level(dB μ V).

4.3 Output Power

Limits

If with directional antenna gains less than 6 dBi, the limit is 30dBm.

Test Procedure

ANSI C63.10:2013 Section 11.9.1.3(PKPM1) or 11.9.2.3.2(AVGPM-G)

Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously.
2. The power output was measured on the EUT antenna port using RF Cable with attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.
3. Measure and record the results in the test report.

Test Setup

Refer to section 2.8.1 Setup 1 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.4 Occupied Bandwidth

Limits

DTSBW: The minimum 6 dB bandwidth shall be at least 500 kHz.
99%BW: None, for reporting purposes only.

Test Procedure

ANSI C63.10:2013 Section 11.8.2 and 6.9.3

Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously.
2. The transmitter output is connected to a spectrum analyzer:
3. RBW = 100kHz(DTS)
4. RBW = 1% - 5%(99%BW)
5. VBW ≥ 3 times the RBW
6. Sweep = Auto
7. Detector = Peak
8. Trace = Max hold
9. The trace was allowed to stabilize
10. Measure and record the results in the test report.

Test Notes

DTS: The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X= 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.

Test Setup

Refer to section 2.8.1 Setup 2 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.5 Power Spectral Density

Limits

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.

Test Procedure

ANSI C63.10:2013 Section 11.10.2(PKPSD)

Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously
2. The transmitter output is connected to a spectrum analyzer
3. 3kHz ≤ RBW ≤ 100 kHz
   (If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.)
4. VBW ≥ 3 times the RBW
5. Span = 1.5 times the DTS bandwidth
6. Sweep = Auto
7. Detector = Peak
8. Trace = Max hold
9. The trace was allowed to stabilize
10. Measure and record the results in the test report.

Test Setup

Refer to section 2.8.1 Setup 2 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.6 Band Edge for Conducted Emissions

Limits

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 15.247(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Procedure

ANSI C63.10:2013 Section 11.11.3

Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously
2. The transmitter output is connected to a spectrum analyzer
3. RBW = 100kHz
4. VBW = 300kHz
5. Point ≥ 2 x span/RBW
6. Sweep = Auto
7. Detector = Peak
8. Trace = Max hold
9. The trace was allowed to stabilize
10. Measure and record the results in the test report

Test Setup

Refer to section 2.8.1 Setup 2 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.7 Spurious RF Conducted Emissions

Limits

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 15.247(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Procedure

ANSI C63.10:2013 Section 11.11.3

Test Settings

1. Set to the maximum power setting and enable the EUT transmit continuously.
2. Activate frequency hopping function if necessary.
3. The transmitter output is connected to a spectrum analyzer
4. The spectrum from 30MHz - 26.5GHz
5. RBW = 100kHz
6. VBW = 300kHz
7. Sweep = Auto
8. Detector = Peak
9. Trace = Max hold
10. The trace was allowed to stabilize
11. Measure and record the results in the test report

Test Setup

Refer to section 2.8.1 Setup 2 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

4.8 Radiated Spurious Emissions and Band Edge

Limits

Spurious emissions are permitted in an of the frequency bands:

MHz	MHz	MHz	MHz	GHz	GHz
0.090 - 0.110	12.29 - 12.293	149.9 - 150.05	1660 - 1710	4.5 - 5.15	14.47 - 14.5
0.495 - 0.505	12.51975 - 1252025	156.52475 - 156.52525	1718.8 - 1722.2	5.35 - 5.46	15.35 - 16.2
2.1735 - 2.1905	12.5767 - 12.57725	156.7 - 156.9	2200 - 2300	7.25 - 7.75	17.7 - 21.4
4.125 - 128	13.36 - 13.41	162.0125 - 167.17	2310 - 2390	8.025 - 8.5	22.01 - 23.12
4.17725 - 4.17775	16.42 - 16.423	167.72 - 173.2	2483.5 - 2500	9.0 - 9.2	23.6 - 24.0
4.20725 - 4.20775	16.69475 - 16.69525	240 - 285	2655 - 2900	9.3 - 9.5	31.2 - 31.8
6.215 - 6.218	1680425 - 1680475	322 - 335.4	3260 - 3267	10.6 - 12.7	36.43 - 36.5
6.26775 - 6.26825	25.5 - 25.67	399.9 - 410	3332 - 3339	13.25 - 13.4	
6.31175 - 6.31225	37.5 - 38.25	608 - 614	3345.8 - 3358		
8.291 - 8.294	73 - 74.6	960 - 1240	3600 - 4400		
8.362 - 8.366	74.8 - 75.2	1300 - 1427			
8.37625 - 8.38675	108 - 121.94	1435 - 1626.5			
8.41425 - 8.41475	123 - 138	1645.5 - 1646.5			

Radiated disturbance of an intentional radiator:

Frequency	Field strength (μV/m)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	74.0	Peak	3
		54.0	Average	

Test Procedure

ANSI C63.10:2013 Section 6.4 & 6.5 & 6.6

Test Settings

1. For radiated emissions measurements performed at frequencies less than or equal to 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 80cm above the reference ground plane.
2. For radiated emissions measurements performed at frequencies above 1GHz, the EUT shall be placed on a RF-transparent table or support at a nominal height of 150cm above the ground plane.
3. Radiated measurements shall be made with the measurement antenna positioned in both horizontal and vertical polarization. The measurement antenna shall be varied from 1m to 4m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level (i.e, field strength or received power), when orienting the measurement antenna in vertical polarization, the minimum height of the lowest element of the antenna shall clear the site reference ground plane by at least 25cm.
4. For each suspected emission, the EUT was ranged its worst case and then tune the antenna tower(from 1~4m) and turntable(from 0~360°) find the maximum reading. Preamplifier and a high pass filter are used for the test in order get better signal level comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. 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.
7. spectrum analyzer setting:

   Measurements 30MHz ~ 1000MHz: RBW = 120 kHz; VBW ≥ 300 kHz; Detector = Peak

Measurements Above 1000MHz: RBW = 1 MHz; VBW ≥ 3 MHz; Detector = Peak

Average Measurements Above 1000MHz:

RBW = 1 MHz, VBW ≥ 1/T, with peak detector for average measurements.

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

   Level = Reading(dBμV) + AF(dB/m) + Factor(dB):

   AF = Antenna Factor(dB/m)

   Factor = Cable Factor(dB) - Preamplifier gain(dB)

   Margin = Limit(dBμV/m) – Level(dBμV/m)

9. Repeat above procedures until all frequencies measured was complete.
10. Measure and record the results in the test report.

Test Notes

1. Emissions were measured at a 3-meter test.
2. Radiated spurious emissions were investigated from 9kHz to 30MHz, 30MHz-1GHz and above 1GHz. the disturbance between 9KHz to 30MHz and 18GHz to 40GHz was very low. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be recorded, so only the harmonics had been displayed.
3. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Test Setup

Refer to section 2.8.2 for details.

Measuring Instruments

The measuring equipment is listed in the section 3.1 of this test report.

Test Result

The detailed test data see: **Appendix.**

Appendix

DTS Bandwidth

Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.520	2407.040	2416.560	0.5	PASS
11B	Ant1	2437	9.680	2431.960	2441.640	0.5	PASS
11B	Ant1	2462	9.080	2457.440	2466.520	0.5	PASS
11G	Ant1	2412	13.560	2405.080	2418.640	0.5	PASS
11G	Ant1	2437	15.120	2429.440	2444.560	0.5	PASS
11G	Ant1	2462	14.160	2454.480	2468.640	0.5	PASS
11N20SISO	Ant1	2412	13.840	2405.680	2419.520	0.5	PASS
11N20SISO	Ant1	2437	13.080	2430.480	2443.560	0.5	PASS
11N20SISO	Ant1	2462	15.000	2454.480	2469.480	0.5	PASS
11AX20SISO	Ant1	2412	14.480	2404.440	2418.920	0.5	PASS
11AX20SISO	Ant1	2437	14.680	2429.440	2444.120	0.5	PASS
11AX20SISO	Ant1	2462	14.880	2454.600	2469.480	0.5	PASS

Test Graphs

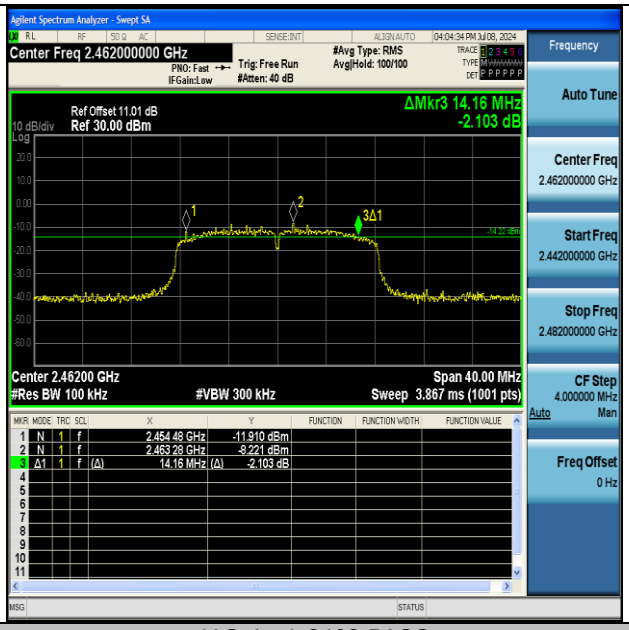
11B-Ant1-2412-PASS

11B-Ant1-2437-PASS

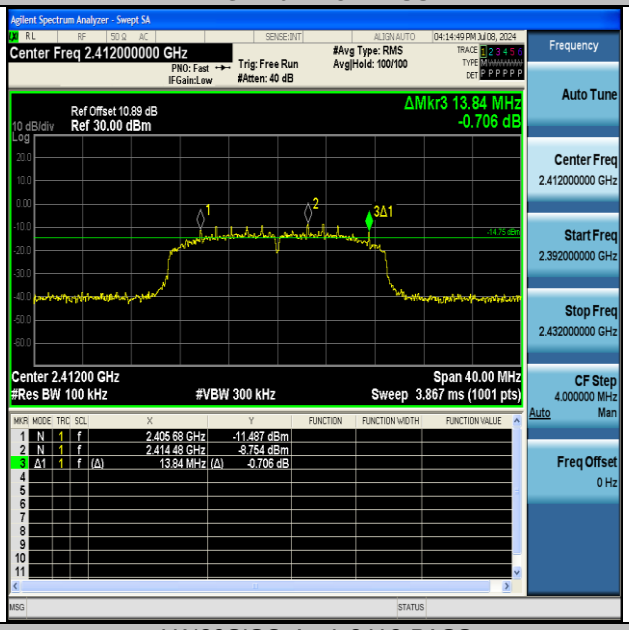
11B-Ant1-2462-PASS

11G-Ant1-2412-PASS

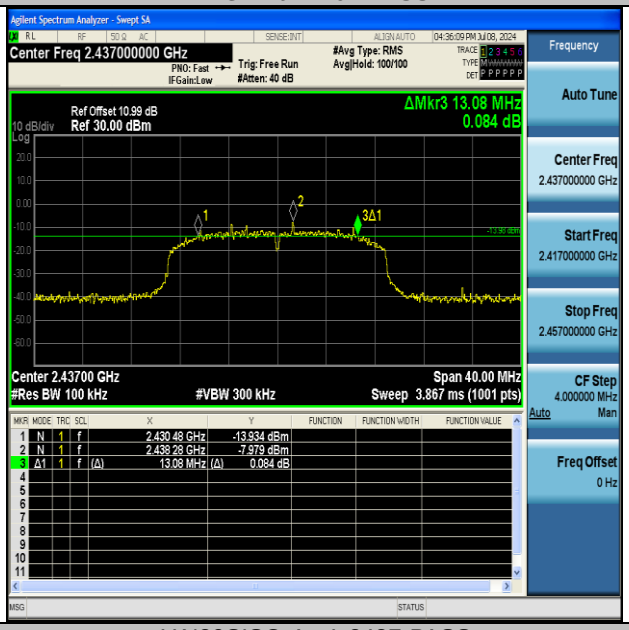
11G-Ant1-2437-PASS



11G-Ant1-2462-PASS



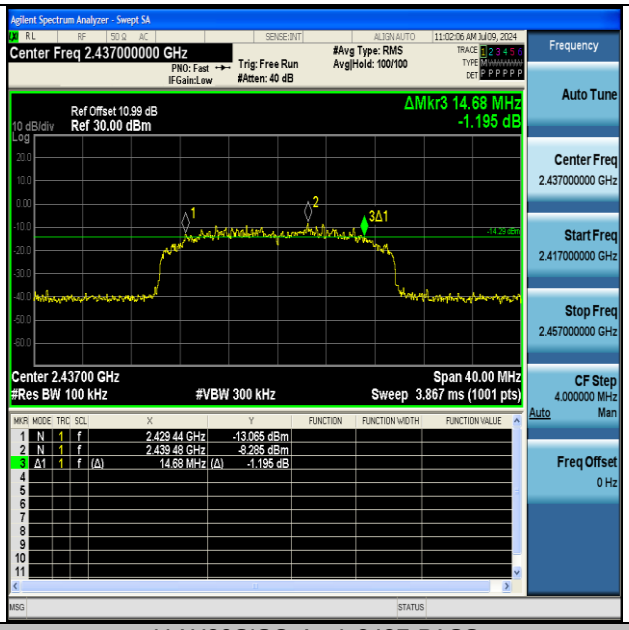
11N20SISO-Ant1-2412-PASS



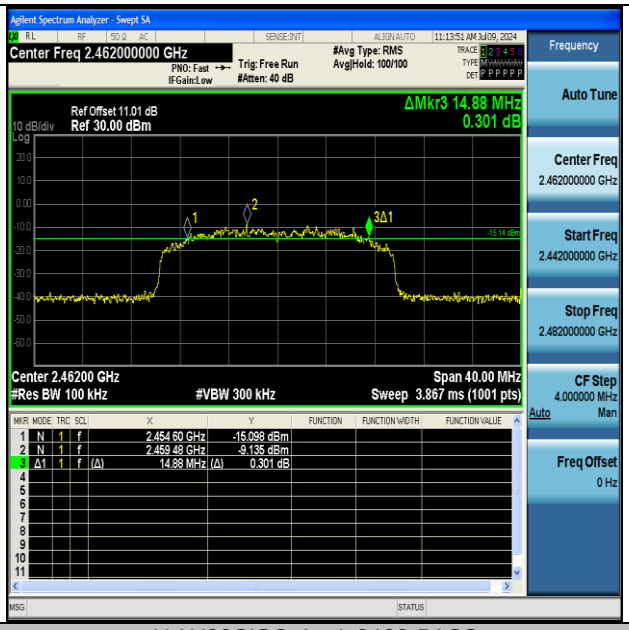
11N20SISO-Ant1-2437-PASS

11N20SISO-Ant1-2462-PASS

11AX20SISO-Ant1-2412-PASS



11AX20SISO-Ant1-2437-PASS



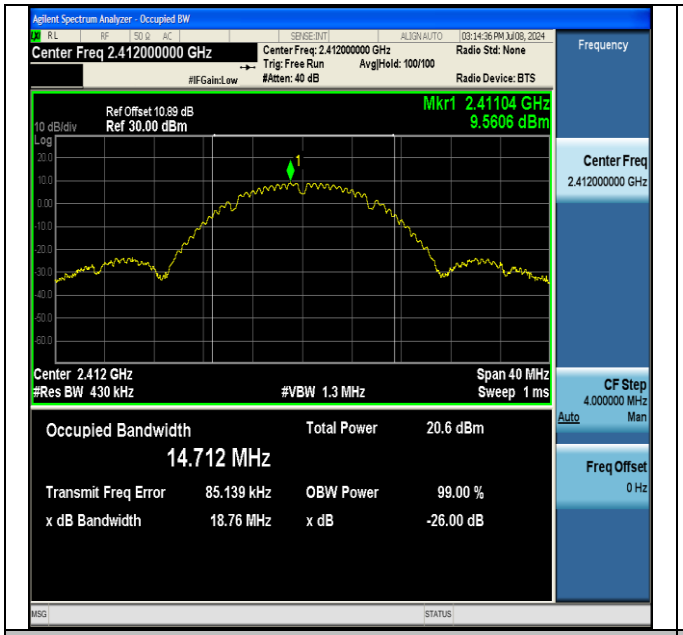
11AX20SISO-Ant1-2462-PASS

Occupied Channel Bandwidth

Test Result

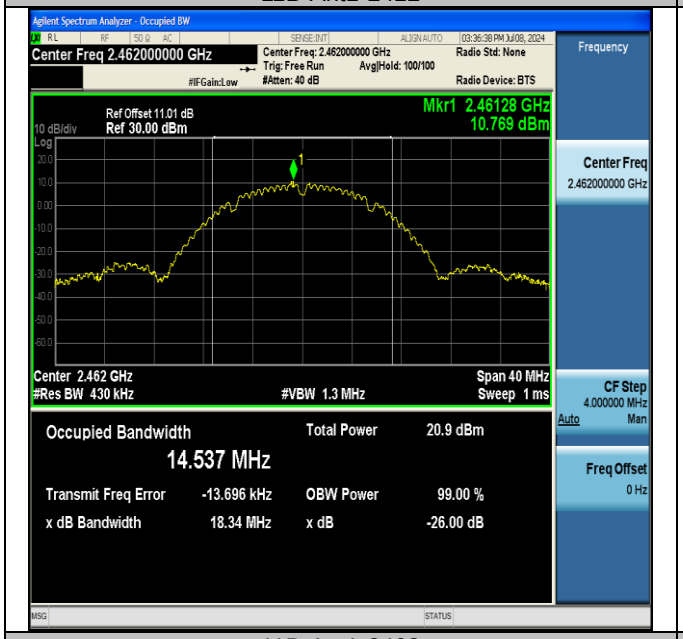
TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	14.712	2404.7291	2419.4411	---	---
11B	Ant1	2437	14.640	2429.7563	2444.3963	---	---
11B	Ant1	2462	14.537	2454.7178	2469.2548	---	---
11G	Ant1	2412	16.215	2403.8965	2420.1115	---	---
11G	Ant1	2437	16.314	2428.8584	2445.1724	---	---
11G	Ant1	2462	16.292	2453.8381	2470.1301	---	---
11N20SISO	Ant1	2412	17.380	2403.3164	2420.6964	---	---
11N20SISO	Ant1	2437	17.325	2428.3300	2445.6550	---	---
11N20SISO	Ant1	2462	17.323	2453.3094	2470.6324	---	---
11AX20SISO	Ant1	2412	18.240	2402.9272	2421.1672	---	---
11AX20SISO	Ant1	2437	18.176	2427.9217	2446.0977	---	---
11AX20SISO	Ant1	2462	18.219	2452.9108	2471.1298	---	---

Test Graphs

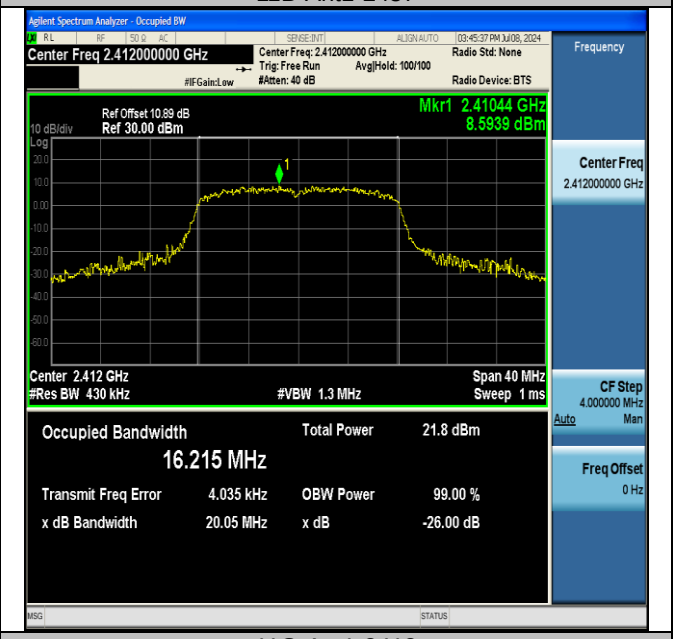


11B-Ant1-2412

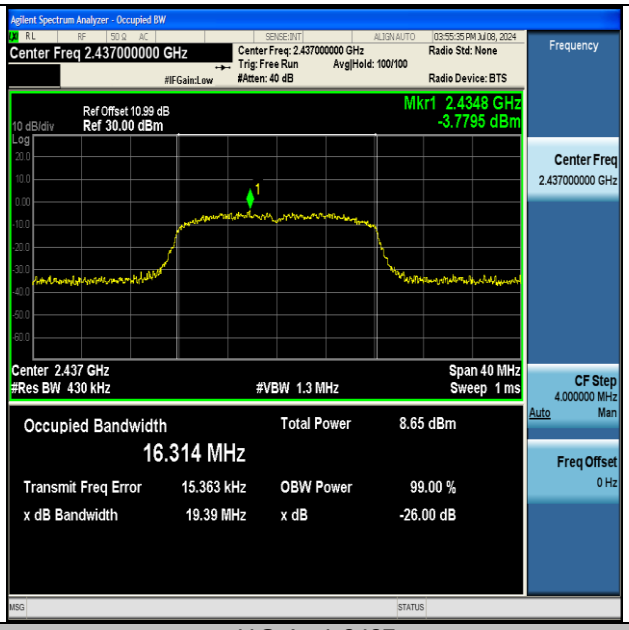
11B-Ant1-2437



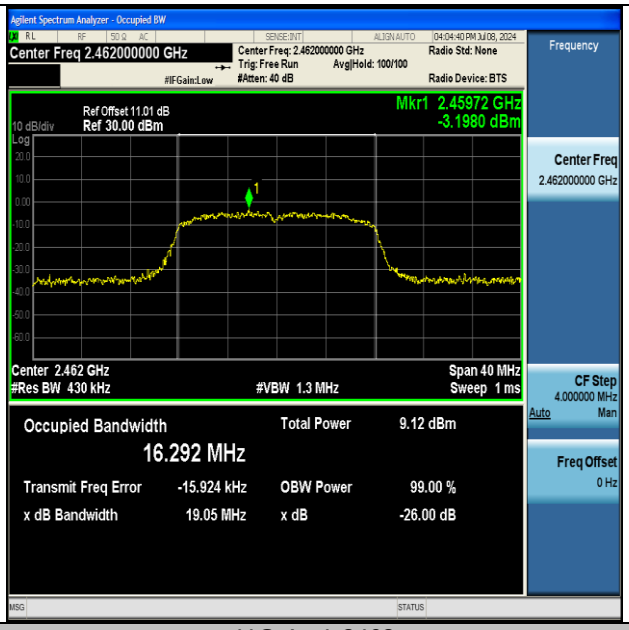
11B-Ant1-2462



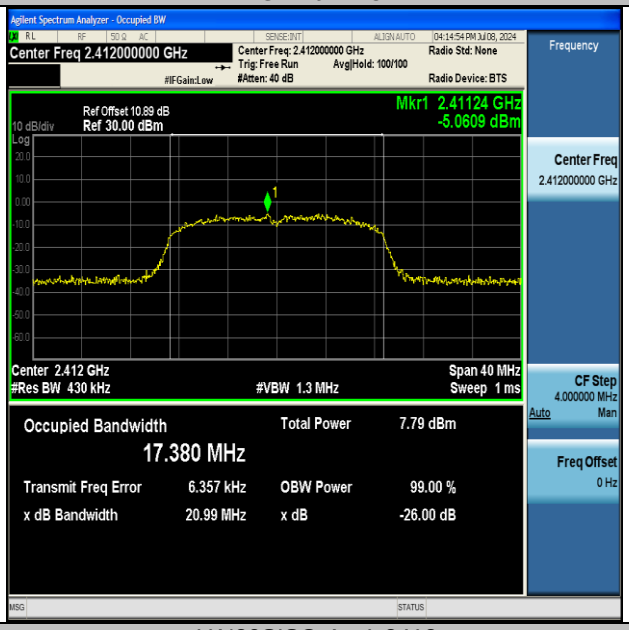
11G-Ant1-2412



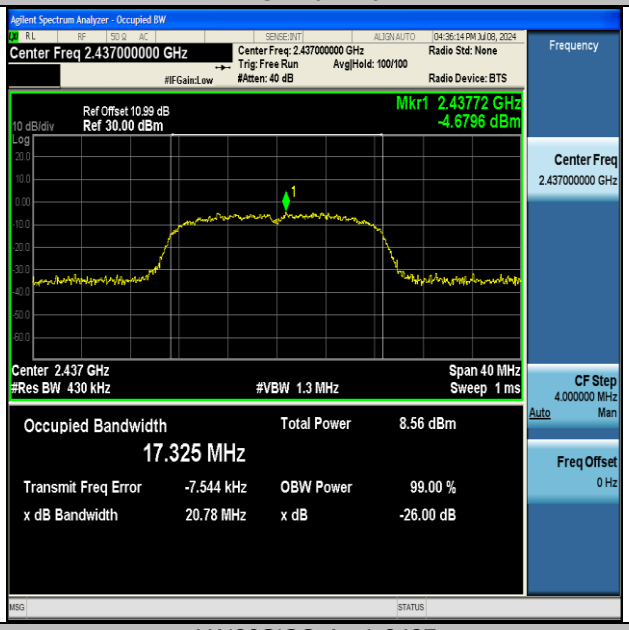
11G-Ant1-2437



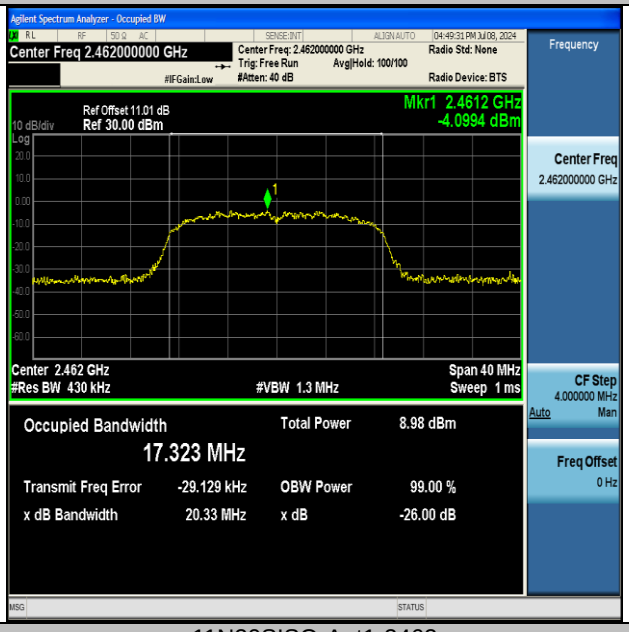
11G-Ant1-2462



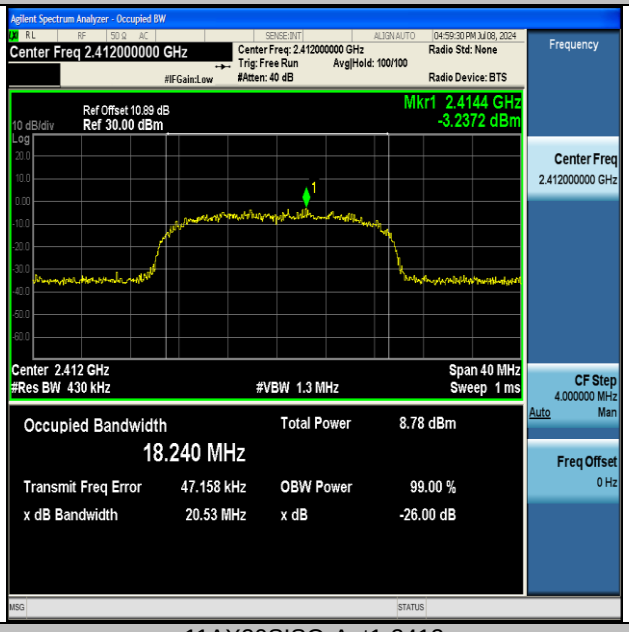
11N20SISO-Ant1-2412



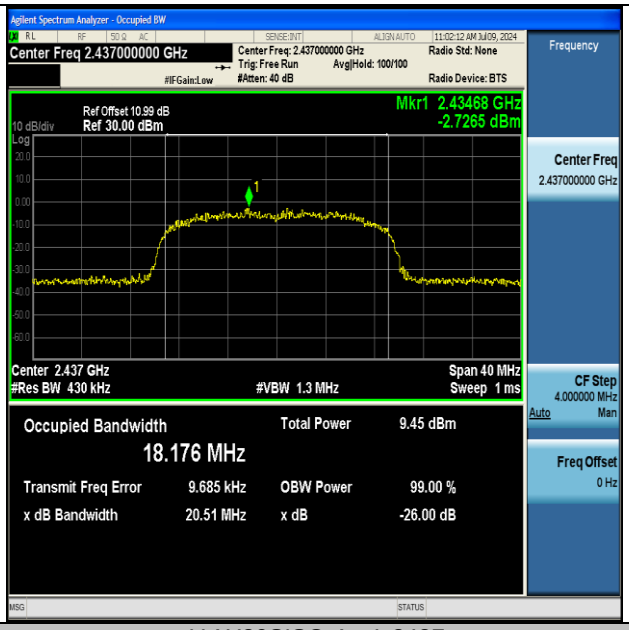
11N20SISO-Ant1-2437



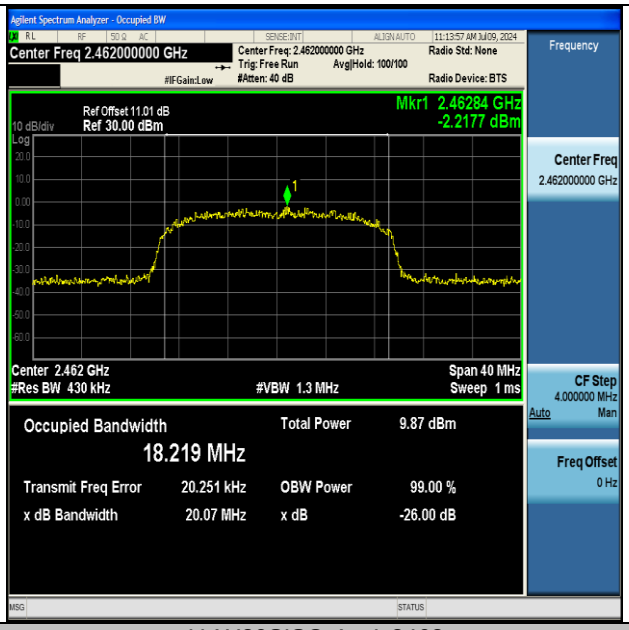
11N20SISO-Ant1-2462



11AX20SISO-Ant1-2412



11AX20SISO-Ant1-2437



11AX20SISO-Ant1-2462

Maximum conducted output power

Test Result Peak

TestMode	Antenna	Frequency[MHz]	Peak Power [dBm]	Conducted Limit[dBm]	Verdict
11B	Ant1	2412	19.888	30	PASS
11B	Ant1	2437	19.982	30	PASS
11B	Ant1	2462	20.113	30	PASS
11G	Ant1	2412	22.728	30	PASS
11G	Ant1	2437	23.652	30	PASS
11G	Ant1	2462	23.592	30	PASS
11N20SISO	Ant1	2412	23.522	30	PASS
11N20SISO	Ant1	2437	23.418	30	PASS
11N20SISO	Ant1	2462	23.191	30	PASS
11AX20SISO	Ant1	2412	23.937	30	PASS
11AX20SISO	Ant1	2437	22.872	30	PASS
11AX20SISO	Ant1	2462	22.832	30	PASS

Test Result Average

TestMode	Antenna	Frequency[MHz]	Average Power [dBm]	Conducted Limit[dBm]	Verdict
11B	Ant1	2412	17.540	30	PASS
11B	Ant1	2437	17.604	30	PASS
11B	Ant1	2462	17.758	30	PASS
11G	Ant1	2412	15.777	30	PASS
11G	Ant1	2437	15.984	30	PASS
11G	Ant1	2462	15.811	30	PASS
11N20SISO	Ant1	2412	14.823	30	PASS
11N20SISO	Ant1	2437	14.146	30	PASS
11N20SISO	Ant1	2462	14.737	30	PASS
11AX20SISO	Ant1	2412	14.884	30	PASS
11AX20SISO	Ant1	2437	14.801	30	PASS
11AX20SISO	Ant1	2462	14.854	30	PASS

Maximum power spectral density

Test Result

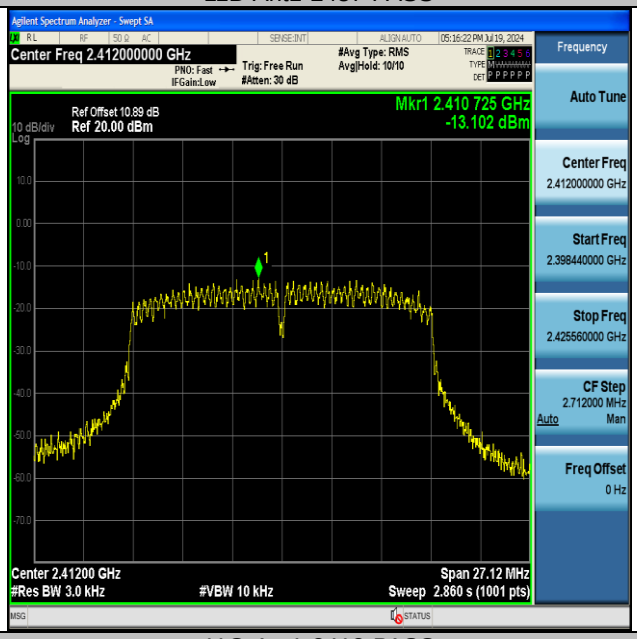
TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-10.05	≤8.00	PASS
11B	Ant1	2437	-10.02	≤8.00	PASS
11B	Ant1	2462	-8.64	≤8.00	PASS
11G	Ant1	2412	-13.10	≤8.00	PASS
11G	Ant1	2437	-12.33	≤8.00	PASS
11G	Ant1	2462	-11.92	≤8.00	PASS
11N20SISO	Ant1	2412	-14.51	≤8.00	PASS
11N20SISO	Ant1	2437	-13.72	≤8.00	PASS
11N20SISO	Ant1	2462	-13.40	≤8.00	PASS
11AX20SISO	Ant1	2412	-13.80	≤8.00	PASS
11AX20SISO	Ant1	2437	-13.04	≤8.00	PASS
11AX20SISO	Ant1	2462	-12.25	≤8.00	PASS

Test Graphs

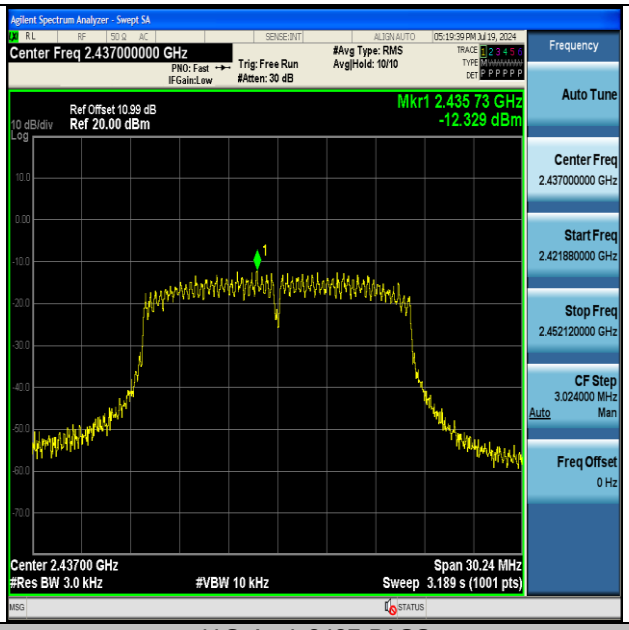
11B-Ant1-2412-PASS

11B-Ant1-2437-PASS

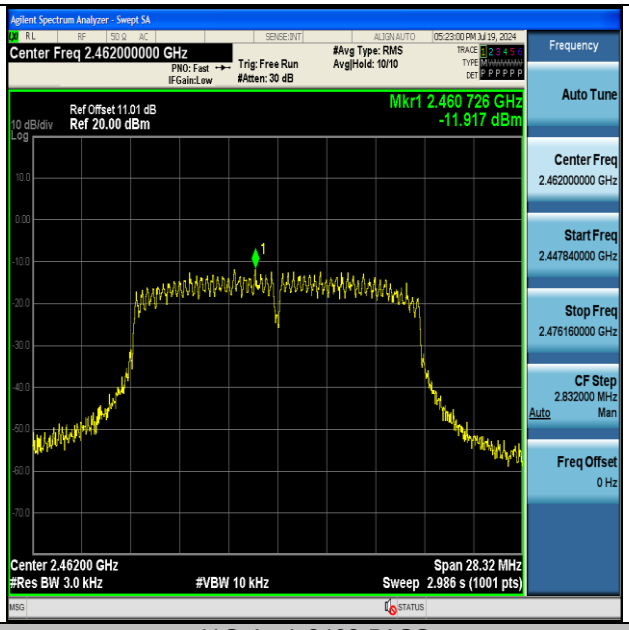
11B-Ant1-2462-PASS



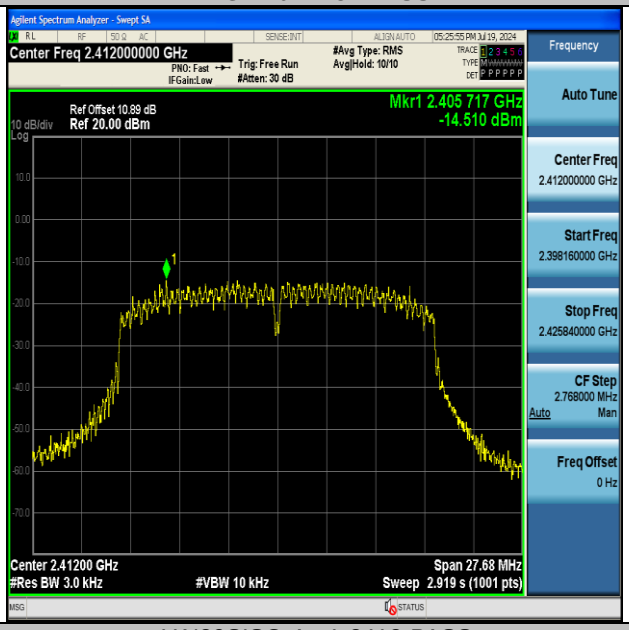
11G-Ant1-2412-PASS



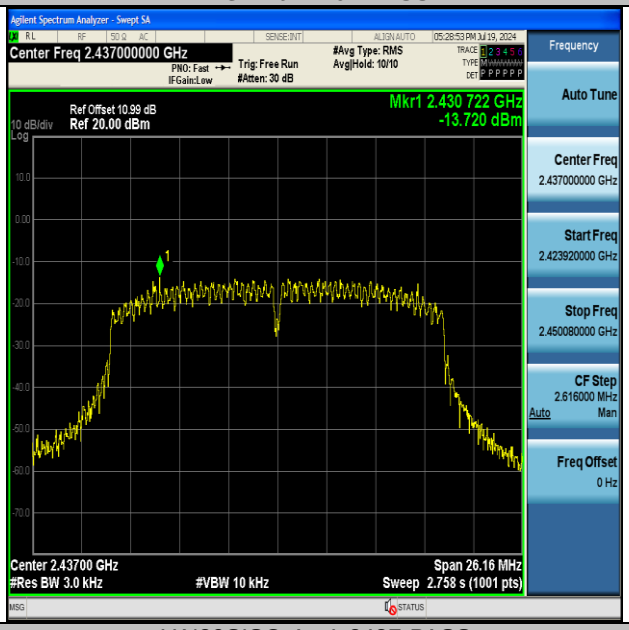
11G-Ant1-2437-PASS



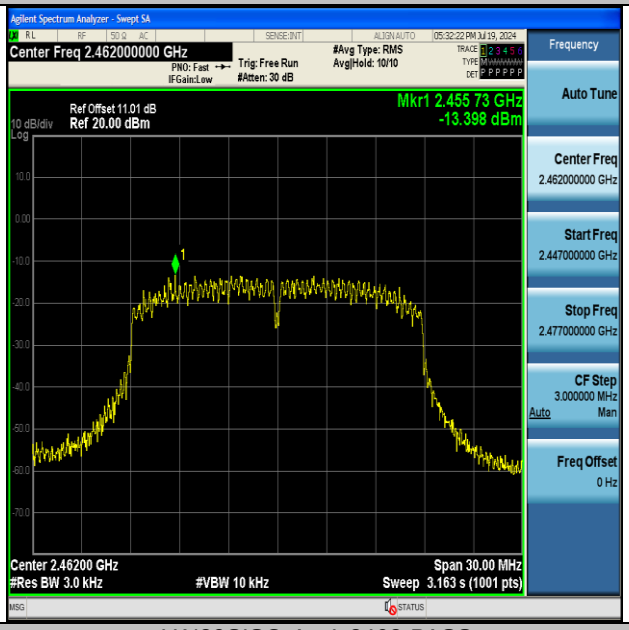
11G-Ant1-2462-PASS



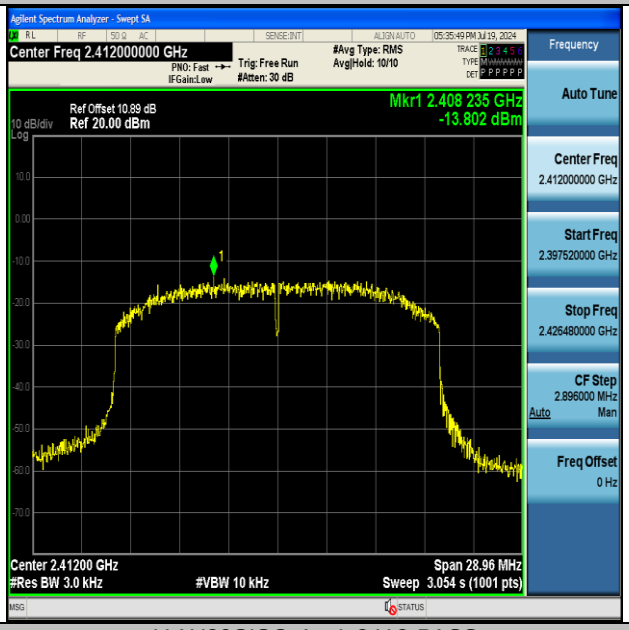
11N20SISO-Ant1-2412-PASS



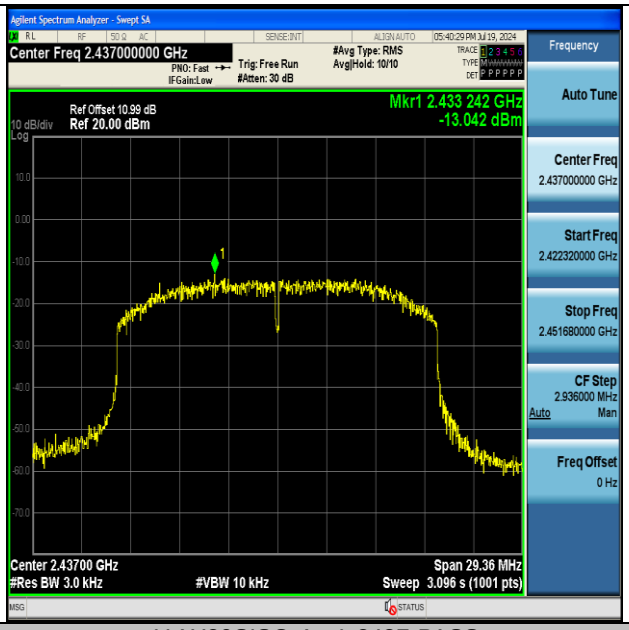
11N20SISO-Ant1-2437-PASS



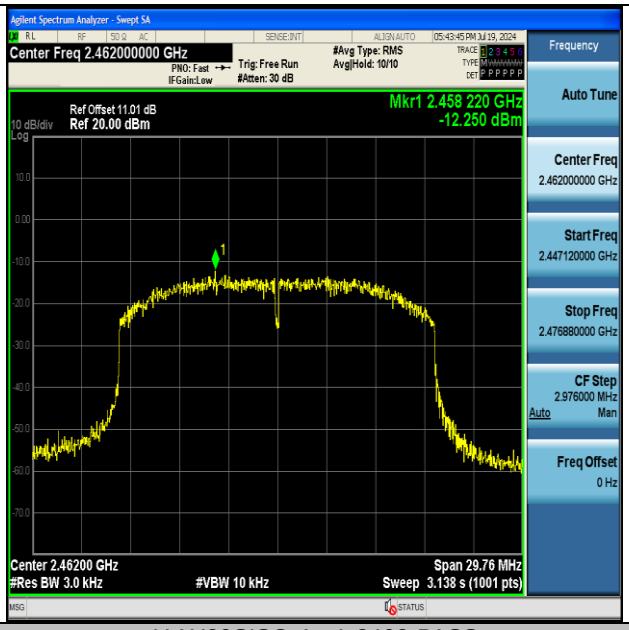
11N20SISO-Ant1-2462-PASS



11AX20SISO-Ant1-2412-PASS



11AX20SISO-Ant1-2437-PASS



11AX20SISO-Ant1-2462-PASS

Band edge measurements

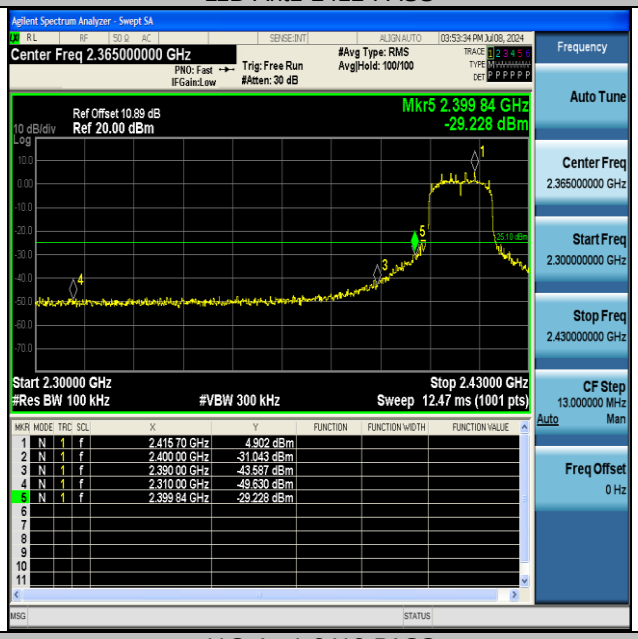
Test Result

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	7.63	-27.33	≤-22.37	PASS
11B	Ant1	High	2462	7.80	-46.22	≤-22.2	PASS
11G	Ant1	Low	2412	4.90	-29.23	≤-25.1	PASS
11G	Ant1	High	2462	-7.77	-45.92	≤-37.77	PASS
11N20SISO	Ant1	Low	2412	-8.75	-46.2	≤-38.75	PASS
11N20SISO	Ant1	High	2462	-7.78	-46.18	≤-37.78	PASS
11AX20SISO	Ant1	Low	2412	-9.42	-46.91	≤-39.42	PASS
11AX20SISO	Ant1	High	2462	-8.36	-46.17	≤-38.36	PASS

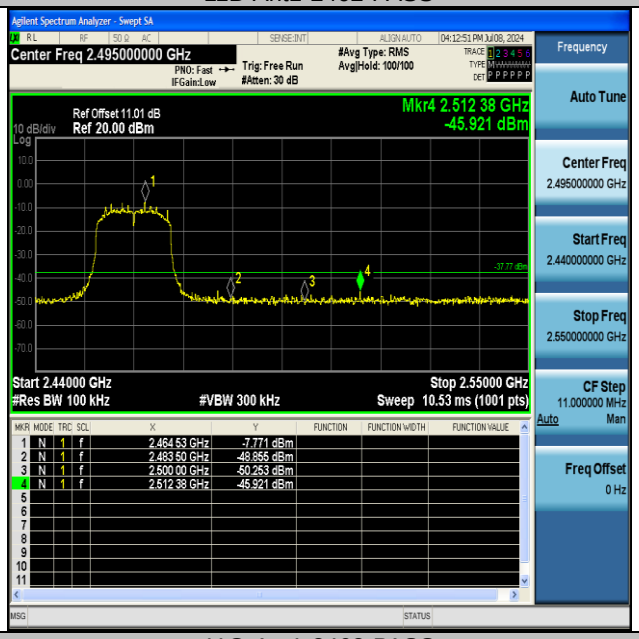
Test Graphs

11B-Ant1-2412-PASS

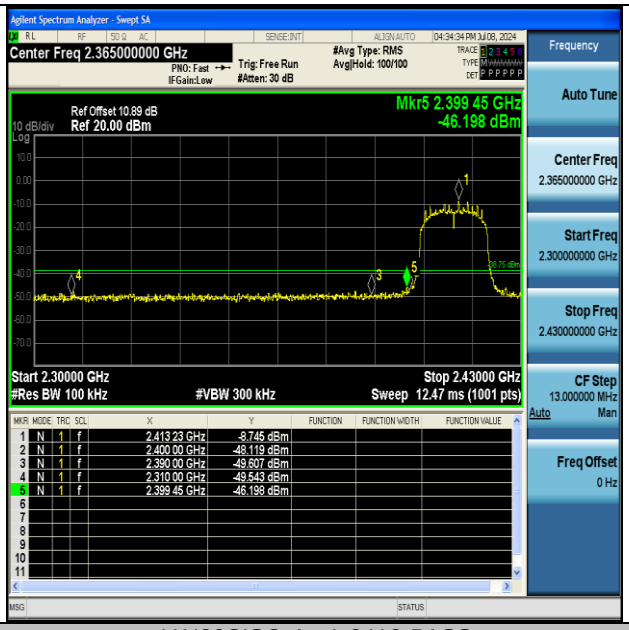
11B-Ant1-2462-PASS



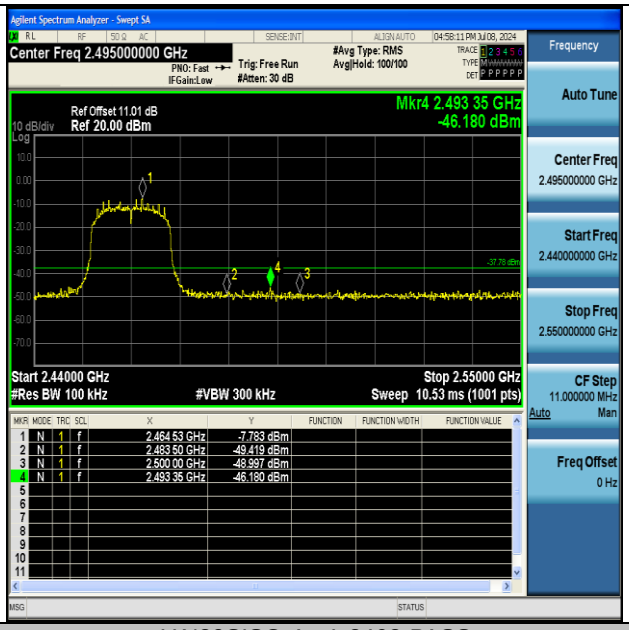
11G-Ant1-2412-PASS



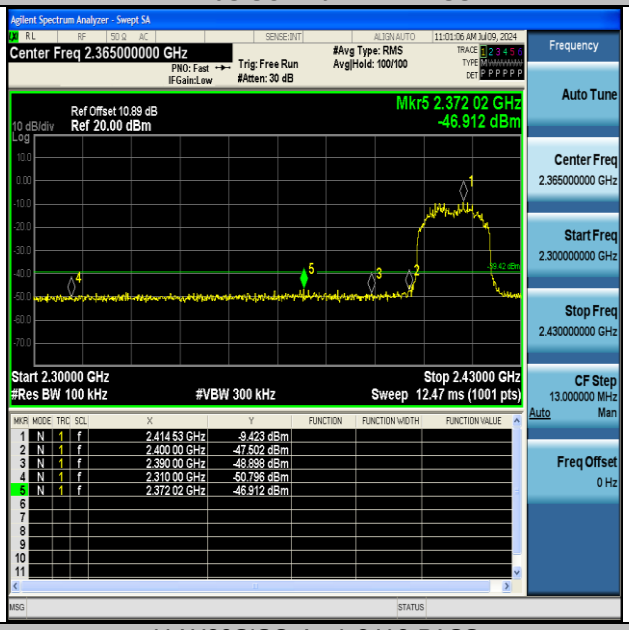
11G-Ant1-2462-PASS



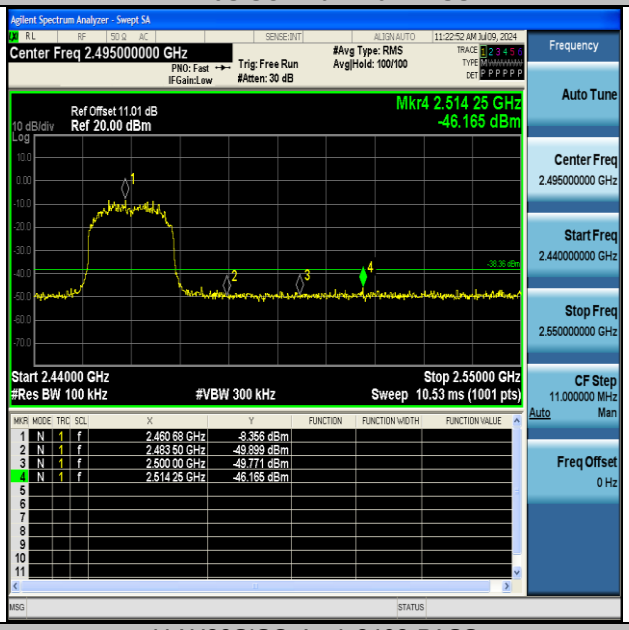
11N20SISO-Ant1-2412-PASS



11N20SISO-Ant1-2462-PASS



11AX20SISO-Ant1-2412-PASS



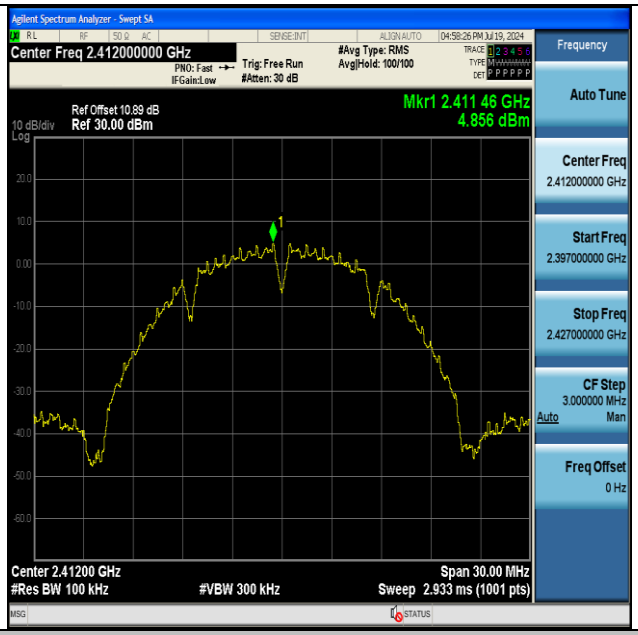
11AX20SISO-Ant1-2462-PASS

Conducted Spurious Emission

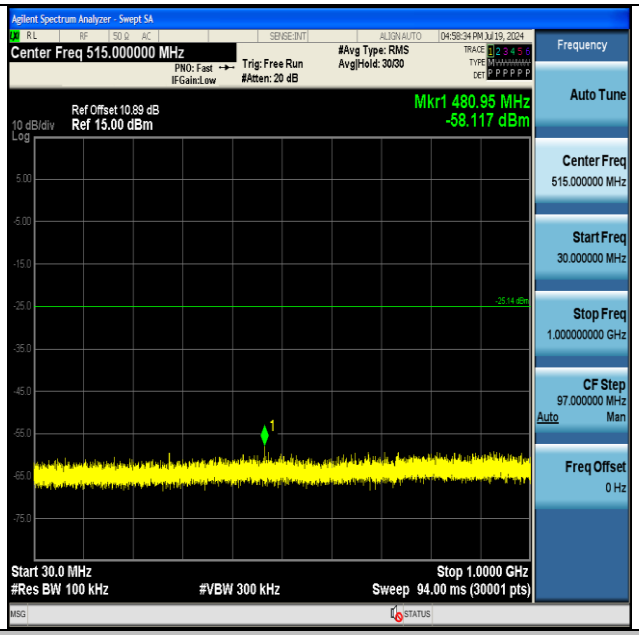
Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	0~Reference	4.86	4.86	---	PASS
11B	Ant1	2412	30~1000	4.86	-58.12	≤-25.14	PASS
11B	Ant1	2412	1000~26500	4.86	-44.31	≤-25.14	PASS
11B	Ant1	2437	0~Reference	5.72	5.72	---	PASS
11B	Ant1	2437	30~1000	5.72	-58.17	≤-24.28	PASS
11B	Ant1	2437	1000~26500	5.72	-44.23	≤-24.28	PASS
11B	Ant1	2462	0~Reference	6.51	6.51	---	PASS
11B	Ant1	2462	30~1000	6.51	-58.57	≤-23.49	PASS
11B	Ant1	2462	1000~26500	6.51	-44.1	≤-23.49	PASS
11G	Ant1	2412	0~Reference	2.64	2.64	---	PASS
11G	Ant1	2412	30~1000	2.64	-58.23	≤-27.36	PASS
11G	Ant1	2412	1000~26500	2.64	-44.14	≤-27.36	PASS
11G	Ant1	2437	0~Reference	3.50	3.50	---	PASS
11G	Ant1	2437	30~1000	3.50	-58.07	≤-26.5	PASS
11G	Ant1	2437	1000~26500	3.50	-43.62	≤-26.5	PASS
11G	Ant1	2462	0~Reference	3.80	3.80	---	PASS
11G	Ant1	2462	30~1000	3.80	-58.5	≤-26.2	PASS
11G	Ant1	2462	1000~26500	3.80	-44.19	≤-26.2	PASS
11N20SISO	Ant1	2412	0~Reference	2.14	2.14	---	PASS
11N20SISO	Ant1	2412	30~1000	2.14	-58.75	≤-27.86	PASS
11N20SISO	Ant1	2412	1000~26500	2.14	-44.53	≤-27.86	PASS
11N20SISO	Ant1	2437	0~Reference	2.59	2.59	---	PASS
11N20SISO	Ant1	2437	30~1000	2.59	-57.71	≤-27.41	PASS
11N20SISO	Ant1	2437	1000~26500	2.59	-43.99	≤-27.41	PASS
11N20SISO	Ant1	2462	0~Reference	2.96	2.96	---	PASS
11N20SISO	Ant1	2462	30~1000	2.96	-58.41	≤-27.04	PASS
11N20SISO	Ant1	2462	1000~26500	2.96	-43.56	≤-27.04	PASS
11AX20SISO	Ant1	2412	0~Reference	2.20	2.20	---	PASS
11AX20SISO	Ant1	2412	30~1000	2.20	-58.94	≤-27.8	PASS
11AX20SISO	Ant1	2412	1000~26500	2.20	-44.04	≤-27.8	PASS
11AX20SISO	Ant1	2437	0~Reference	2.58	2.58	---	PASS
11AX20SISO	Ant1	2437	30~1000	2.58	-58.19	≤-27.42	PASS
11AX20SISO	Ant1	2437	1000~26500	2.58	-44.25	≤-27.42	PASS
11AX20SISO	Ant1	2462	0~Reference	3.18	3.18	---	PASS
11AX20SISO	Ant1	2462	30~1000	3.18	-58.17	≤-26.82	PASS
11AX20SISO	Ant1	2462	1000~26500	3.18	-44.2	≤-26.82	PASS

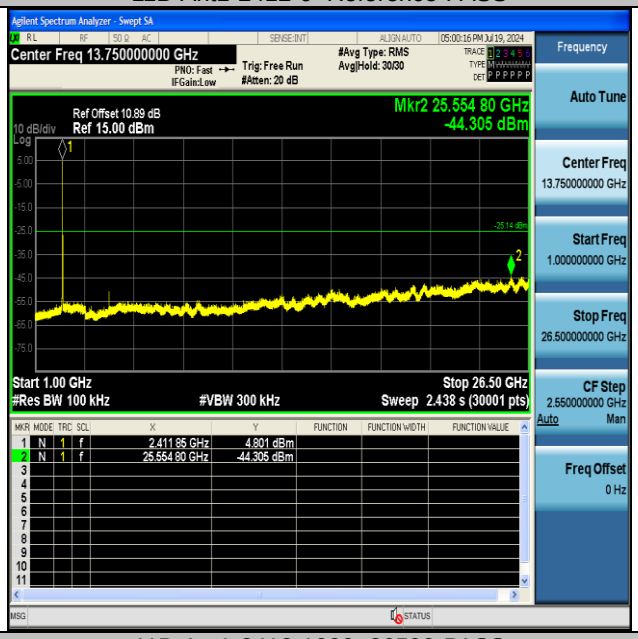
Test Graphs



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

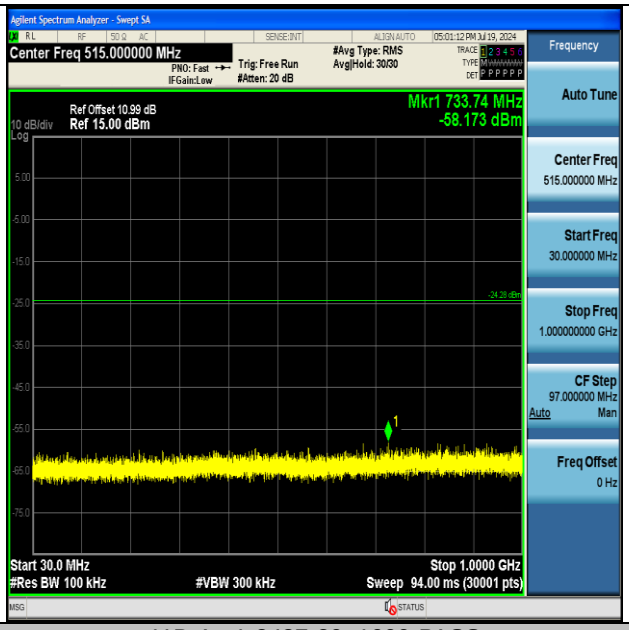


11B-Ant1-2412-30~1000-PASS

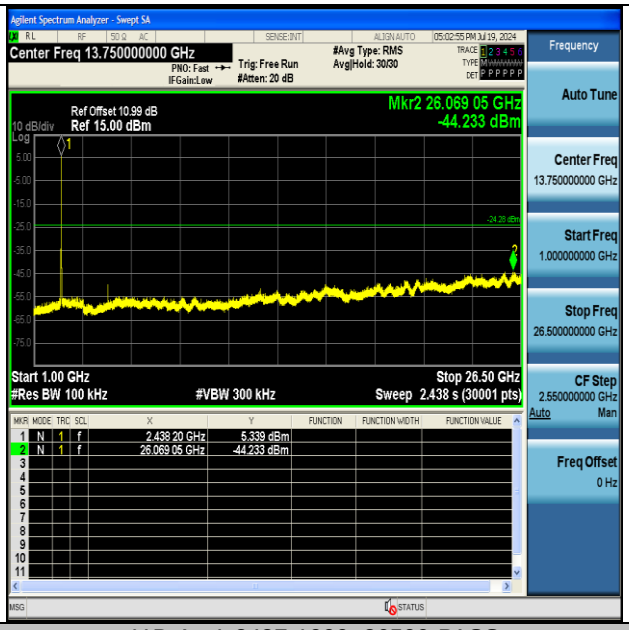


11B-Ant1-2412-1000~26500-PASS

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

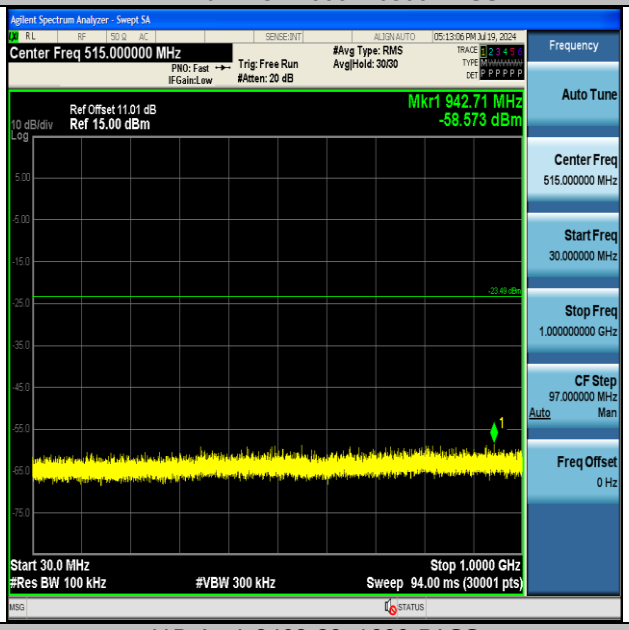


11B-Ant1-2437-30~1000-PASS

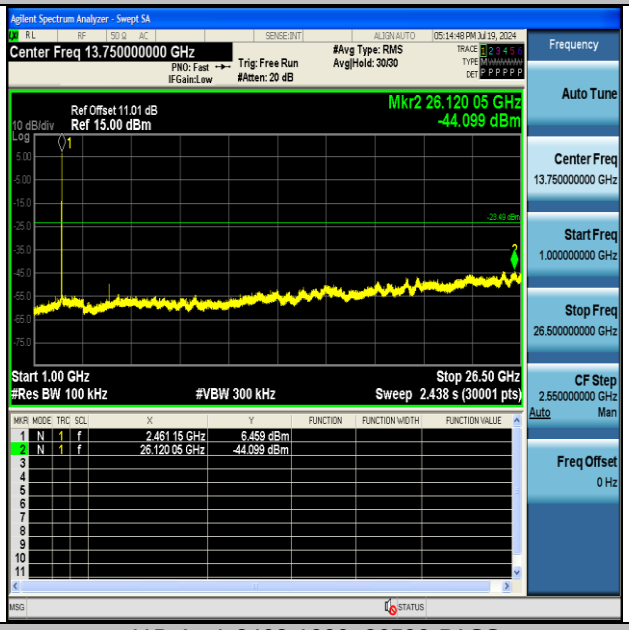


11B-Ant1-2437-1000~26500-PASS

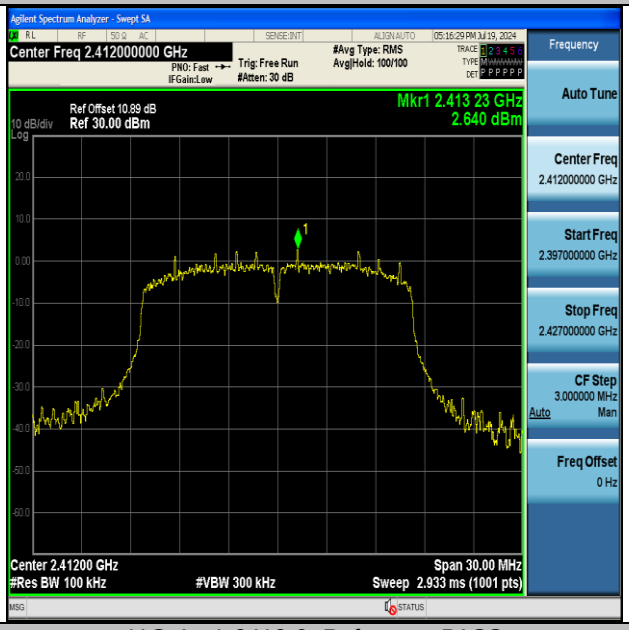
11B-Ant1-2462-0~Reference-PASS



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



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



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