TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID. ..... :	2AEJARAYOX1PLUS	
Test Report No..... :	TCT230403E024	
Date of issue..... :	Apr. 17, 2023	
Testing laboratory ..... :	SHENZHEN TONGCE TESTING LAB	
Testing location/ address:	2101 & 2201, Zhenchang Factory Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China	
Applicant's name..... :	GSM GLOBE.COM INC	
Address..... :	10286 SW 22nd pl. Davie, Florida 33324 United States	
Manufacturer's name ... :	GSM GLOBE.COM INC	
Address..... :	10286 SW 22nd pl. Davie, Florida 33324 United States	
Standard(s) ..... :	FCC CFR Title 47 Part 15 Subpart C Section 15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013	
Product Name..... :	MOBILE PHONE	
Trade Mark ..... :	RAYO MOVIL	
Model/Type reference..... :	X1 Plus	
Rating(s)..... :	Refer to EUT description of page 3	
Date of receipt of test item ..... :	Apr. 03, 2023	
Date (s) of performance of test..... :	Apr. 03, 2023 - Apr. 17, 2023	
Tested by (+signature) ... :	Rleo LIU	
Check by (+signature).... :	Beryl ZHAO	
Approved by (+signature):	Tomsin	

General disclaimer:

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. General Product Information

1.1. EUT description

Product Name.....:	MOBILE PHONE
Model/Type reference.....:	X1 Plus
Sample Number.....:	TCT230403E011-0101
Operation Frequency.....:	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20))
Channel Separation.....:	5MHz
Number of Channel.....:	11 for 802.11b/802.11g/802.11n(HT20)
Modulation Technology.....:	802.11b: Direct Sequence Spread Spectrum (DSSS) 802.11g/802.11n: Orthogonal Frequency Division Multiplexing(OFDM)
Data speed.....:	802.11b: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps 802.11g: 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps 802.11n: Up to 150Mbps
Antenna Type.....:	Internal Antenna
Antenna Gain.....:	1.1dBi
Rating(s).....:	Adapter Information: Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V,1000mA, 5W Rechargeable Li-ion Battery DC 3.8V

Note: The antenna gain listed in this report is provided by applicant, and the test laboratory is not responsible for this parameter.

1.2. Model(s) list

None.

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1.3. Operation Frequency

For 802.11b/g/n(HT20)

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	--	--

Note:

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

802.11b/802.11g/802.11n (HT20)

Channel	Frequency
The lowest channel	2412MHz
The middle channel	2437MHz
The Highest channel	2462MHz

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2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Output Power	§15.247 (b)(3)	PASS
6dB Emission Bandwidth	§15.247 (a)(2)	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§15.247(d)	PASS
Spurious Emission	§15.205/§15.209	PASS

Note:

1. PASS: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

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3. General Information

3.1. Test environment and mode

Operating Environment:		
Condition	Conducted Emission	Radiated Emission
Temperature:	23.5 °C	25.3 °C
Humidity:	52 % RH	54 % RH
Atmospheric Pressure:	1010 mbar	1010 mbar
Test Software:		
Software Information:	Engineering mode	
Power Level:	16	
Test Mode:		
Engineer mode:	Keep the EUT in continuous transmitting by select channel and modulations with Fully-charged battery.	

The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case(Z axis) are shown in Test Results of the following pages.

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	Data rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(H20)	6.5Mbps

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3.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

4. Facilities and Accreditations

4.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

  SHENZHEN TONGCE TESTING LAB

  Designation Number: CN1205

  The testing lab has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

  SHENZHEN TONGCE TESTING LAB

  CAB identifier: CN0031

  The testing lab has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

4.2. Location

SHENZHEN TONGCE TESTING LAB

Address: 2101 & 2201, Zhenchang Factory Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China

TEL: +86-755-27673339

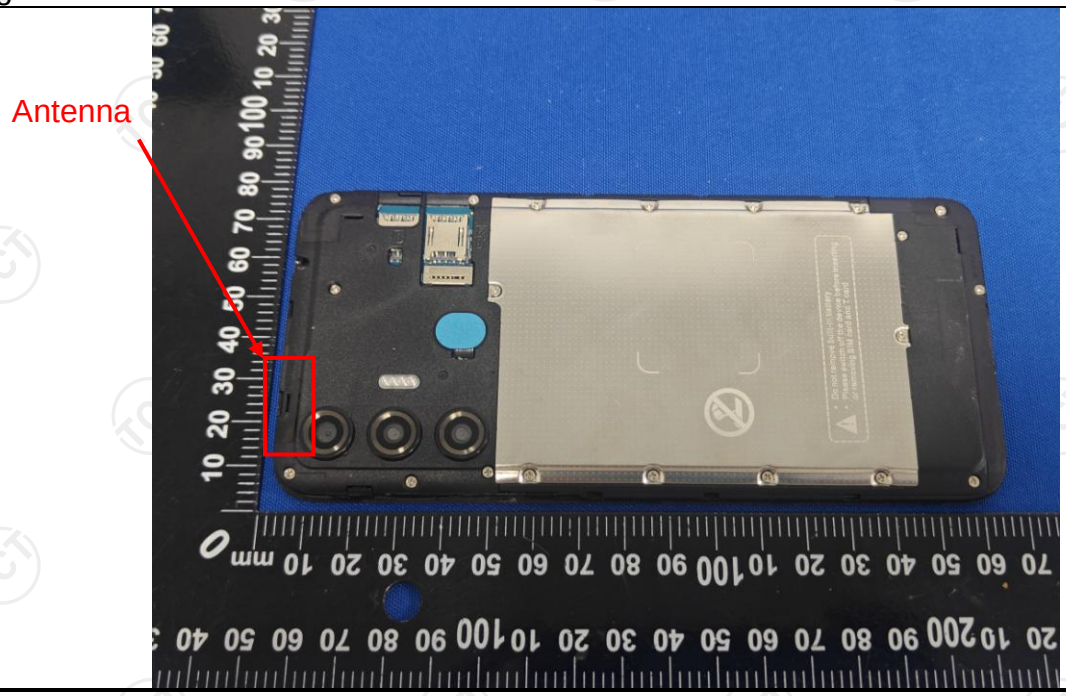
4.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	± 3.10 dB
2	RF power, conducted	± 0.12 dB
3	Spurious emissions, conducted	± 0.11 dB
4	All emissions, radiated(<1 GHz)	± 4.56 dB
5	All emissions, radiated(1 GHz - 18 GHz)	± 4.22 dB
6	All emissions, radiated(18 GHz- 40 GHz)	± 4.36 dB

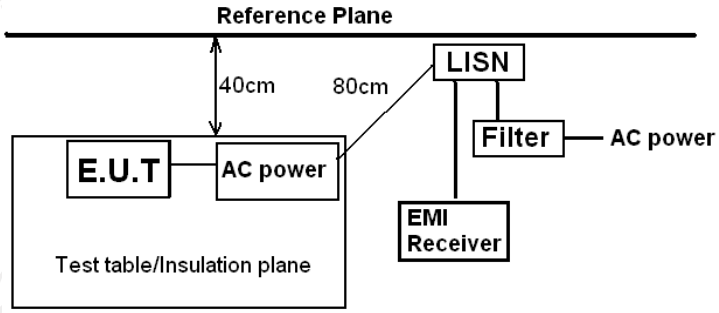
5. Test Results and Measurement Data

5.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
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(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
E.U.T Antenna:	
The WIFI antenna is Internal antenna which permanently attached, and the best case gain of the antenna is 1.1dBi.	
	

5.2. Conducted Emission

5.2.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>Test Setup:</td><td> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Mode:</td><td>Charging+ Transmitting Mode</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. 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 C63.10:2013 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>PASS</td></tr>
</table>

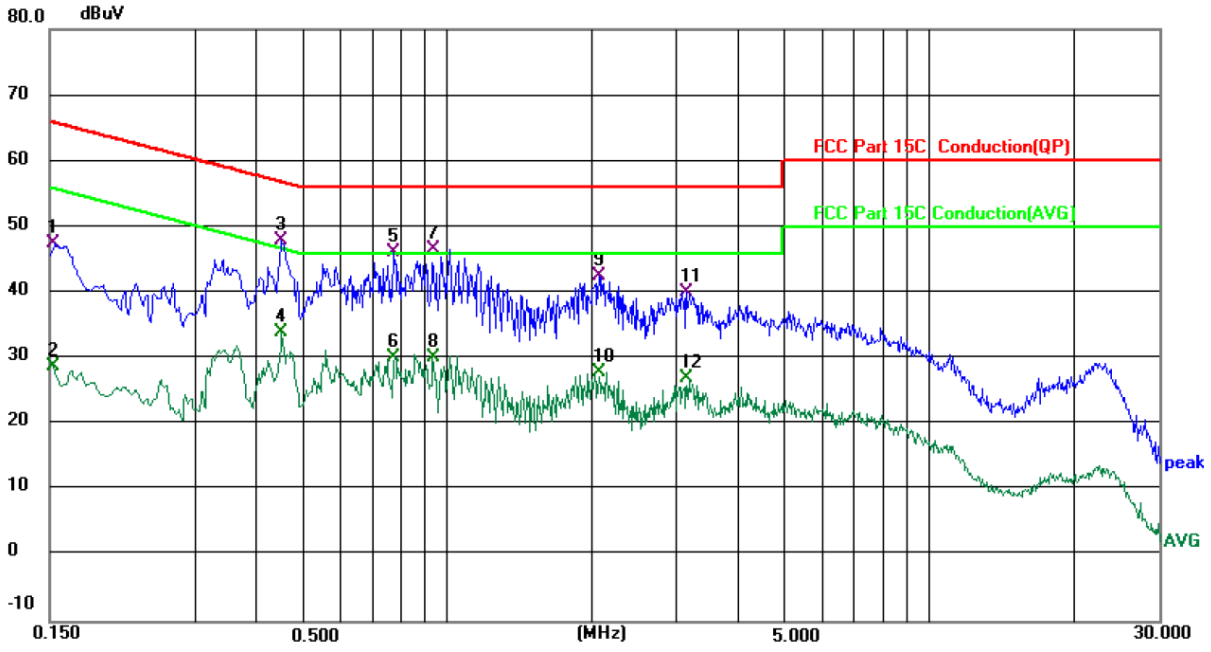
5.2.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCI3	100898	Jul. 03, 2023
Line Impedance Stabilisation Newtork(LISN)	Schwarzbeck	NSLK 8126	8126453	Feb. 24, 2023
Line-5	TCT	CE-05	/	Jul. 03, 2024
EMI Test Software	Shurple Technology	EZ-EMC	/	/

5.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site 844 Shielding Room Phase: *L1* Temperature: 23.5 (℃) Humidity: 52 %

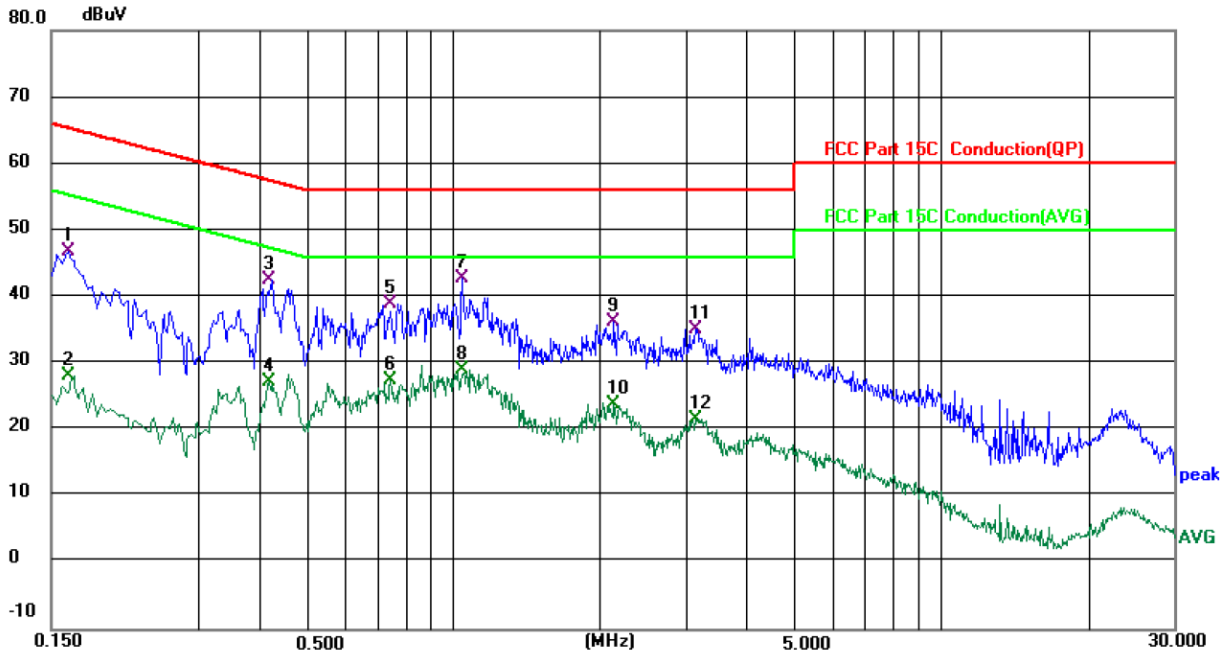
Limit: FCC Part 15C Conduction(QP) Power:AC 120 V/ 60 Hz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1524	37.32	10.09	47.41	65.87	-18.46	QP	
2		0.1524	18.62	10.09	28.71	55.87	-27.16	AVG	
3	*	0.4540	38.44	9.51	47.95	56.80	-8.85	QP	
4		0.4540	24.42	9.51	33.93	46.80	-12.87	AVG	
5		0.7780	36.85	9.19	46.04	56.00	-9.96	QP	
6		0.7780	21.06	9.19	30.25	46.00	-15.75	AVG	
7		0.9376	37.46	9.05	46.51	56.00	-9.49	QP	
8		0.9376	21.14	9.05	30.19	46.00	-15.81	AVG	
9		2.0700	32.62	10.02	42.64	56.00	-13.36	QP	
10		2.0700	17.87	10.02	27.89	46.00	-18.11	AVG	
11		3.1500	30.10	10.05	40.15	56.00	-15.85	QP	
12		3.1500	16.95	10.05	27.00	46.00	-19.00	AVG	

Note:

Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading
Corr. Factor (dB) = LISN factor + Cable loss
Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)
Limit (dBμV) = Limit stated in standard
Margin (dB) = Measurement (dBμV) – Limits (dBμV)
Q.P. =Quasi-Peak
AVG =average
** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz*

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site 844 Shielding Room Phase: *N* Temperature: 23.5 (℃) Humidity: 52 %

Limit: FCC Part 15C Conduction(QP) Power:AC 120 V/ 60 Hz

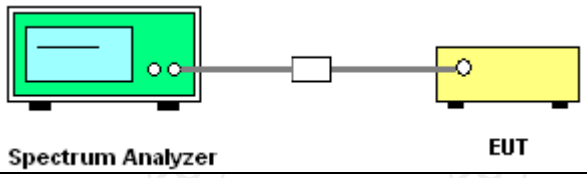
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1620	36.77	10.10	46.87	65.36	-18.49	QP	
2		0.1620	17.98	10.10	28.08	55.36	-27.28	AVG	
3		0.4178	33.07	9.53	42.60	57.49	-14.89	QP	
4		0.4178	17.69	9.53	27.22	47.49	-20.27	AVG	
5		0.7459	29.72	9.22	38.94	56.00	-17.06	QP	
6		0.7459	18.25	9.22	27.47	46.00	-18.53	AVG	
7	*	1.0460	33.83	8.94	42.77	56.00	-13.23	QP	
8		1.0460	20.14	8.94	29.08	46.00	-16.92	AVG	
9		2.1419	26.13	10.02	36.15	56.00	-19.85	QP	
10		2.1419	13.81	10.02	23.83	46.00	-22.17	AVG	
11		3.1459	25.10	10.05	35.15	56.00	-20.85	QP	
12		3.1459	11.58	10.05	21.63	46.00	-24.37	AVG	

Note:

Freq. = Emission frequency in MHz
Reading level (dBμV) = Receiver reading
Corr. Factor (dB) = LISN factor + Cable loss
Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)
Limit (dBμV) = Limit stated in standard
Margin (dB) = Measurement (dBμV) – Limits (dBμV)
Q.P. =Quasi-Peak
AVG =average
** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

5.3. Maximum Conducted (Average) Output Power

5.3.1. Test Specification

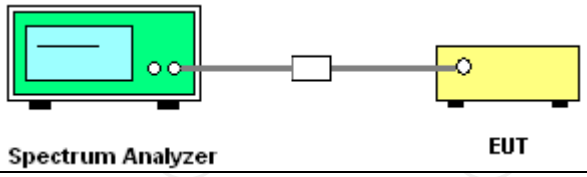
Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074 D01 v05r02
Limit:	30dBm
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Measure the conducted output power and record the results in the test report.
Test Result:	PASS

5.3.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 04, 2023
Combiner Box	Ascentest	AT890-RFB	/	/

5.4. Emission Bandwidth

5.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074 D01 v05r02
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. Set to the maximum power setting and enable the EUT transmit continuously. 2. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 3. Measure and record the results in the test report.
Test Result:	PASS

5.4.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 04, 2023
Combiner Box	Ascentest	AT890-RFB	/	/

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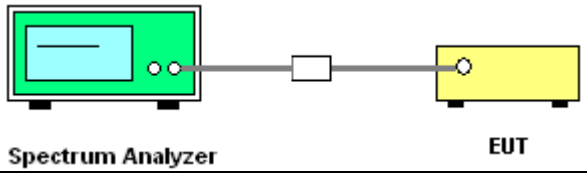
5.5. Power Spectral Density

5.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074
Limit:	The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): 3 kHz ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. Set the span to at least 1.5 times the OBW. 4. Detector = RMS, Sweep time = auto couple. 5. Employ trace averaging (RMS) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level. 6. Measure and record the results in the test report.
Test Result:	PASS

5.5.2. Test Instruments

Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 04, 2023
Combiner Box	Ascentest	AT890-RFB	/	/

5.6. Conducted Band Edge and Spurious Emission Measurement

5.6.1. Test Specification

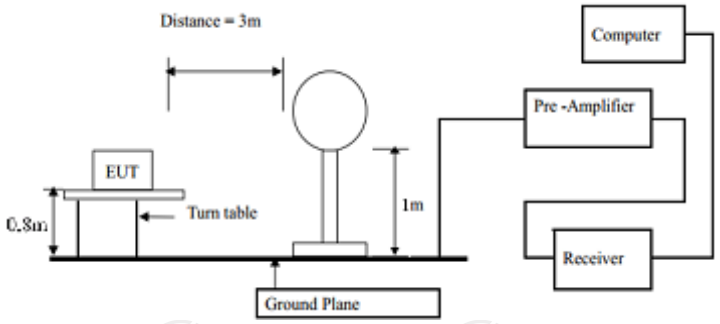
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB558074
Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d). 4. Measure and record the results in the test report. 5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

5.6.2. Test Instruments

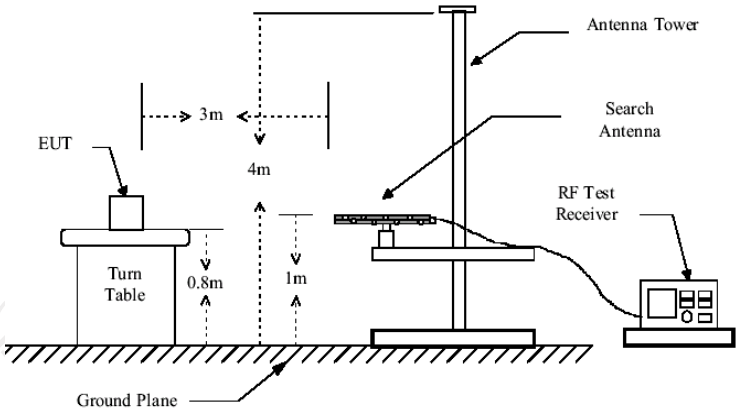
Name	Manufacturer	Model No.	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100619	Jul. 04, 2023
Combiner Box	Ascentest	AT890-RFB	/	/

5.7. Radiated Spurious Emission Measurement

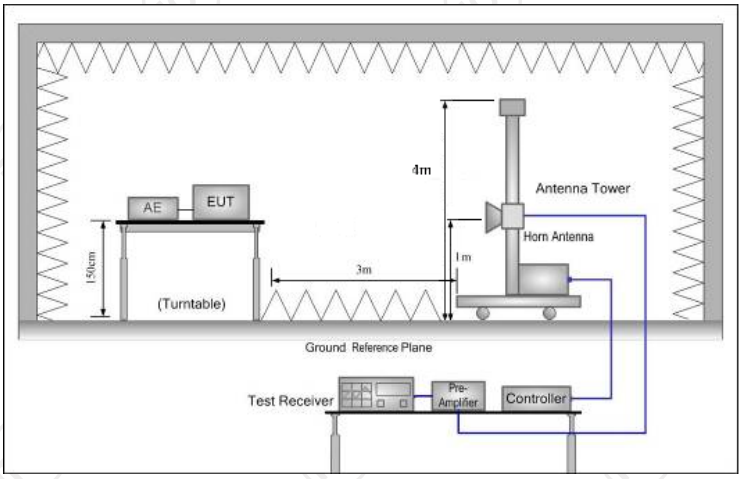
5.7.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Transmitting mode with modulation</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705-30</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td><td>Detector</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>3</td><td>Average</td></tr>
<tr><td>5000</td><td>3</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions below 30MHz
 

30MHz to 1GHz</td></tr>
</table>



Above 1GHz



Test Procedure:

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which

	maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 4. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported. 5. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=120 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for f >1 GHz for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Test results:	PASS

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5.7.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESIB7	100197	Jul. 03, 2023
Spectrum Analyzer	R&S	FSQ40	200061	Jul. 03, 2023
Pre-amplifier	SKET	LNPA_0118G-45	SK2021012102	Feb. 20, 2024
Pre-amplifier	SKET	LNPA_1840G-50	SK202109203500	Feb. 20, 2024
Pre-amplifier	HP	8447D	2727A05017	Jul. 03, 2023
Loop antenna	Schwarzbeck	FMZB1519B	00191	Jun. 11, 2023
Broadband Antenna	Schwarzbeck	VULB9163	340	Jul. 05, 2023
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Jul. 05, 2023
Horn Antenna	Schwarzbeck	BBHA 9170	00956	Feb. 24, 2024
Antenna Mast	Keleto	RE-AM	/	/
Coaxial cable	SKET	RC-18G-N-M	/	Feb. 24, 2024
Coaxial cable	SKET	RC_40G-K-M	/	Feb. 24, 2024
EMI Test Software	Shurple Technology	EZ-EMC	/	/

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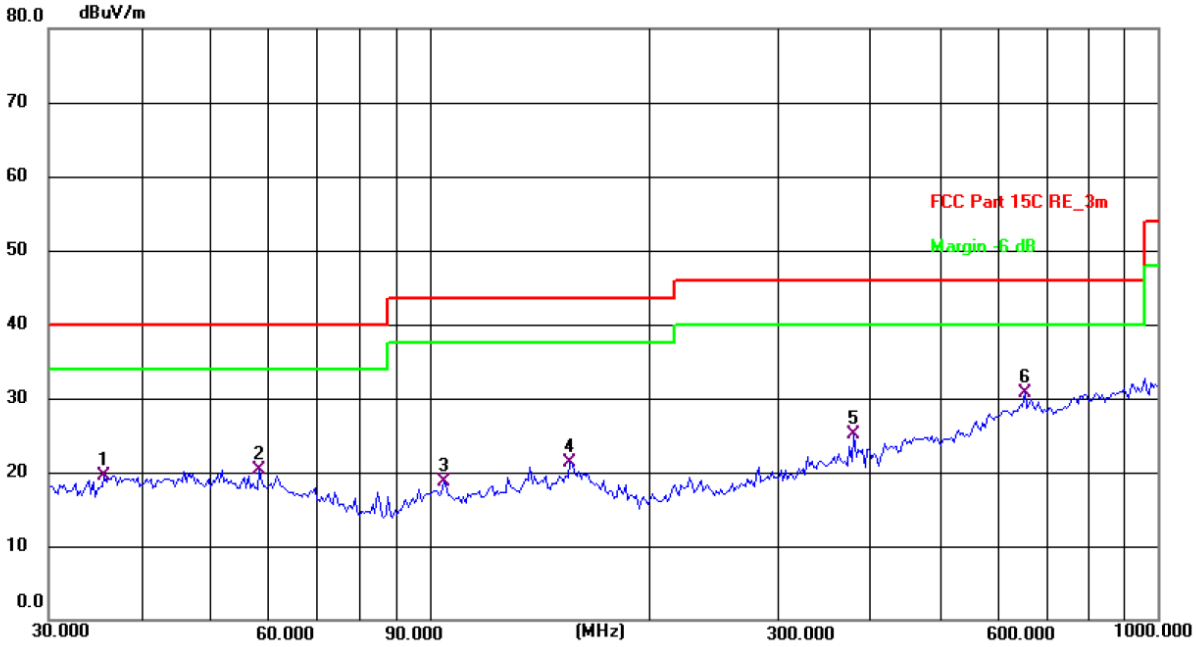
5.7.3. Test Data

Please refer to following diagram for individual

Below 1GHz

Horizontal:

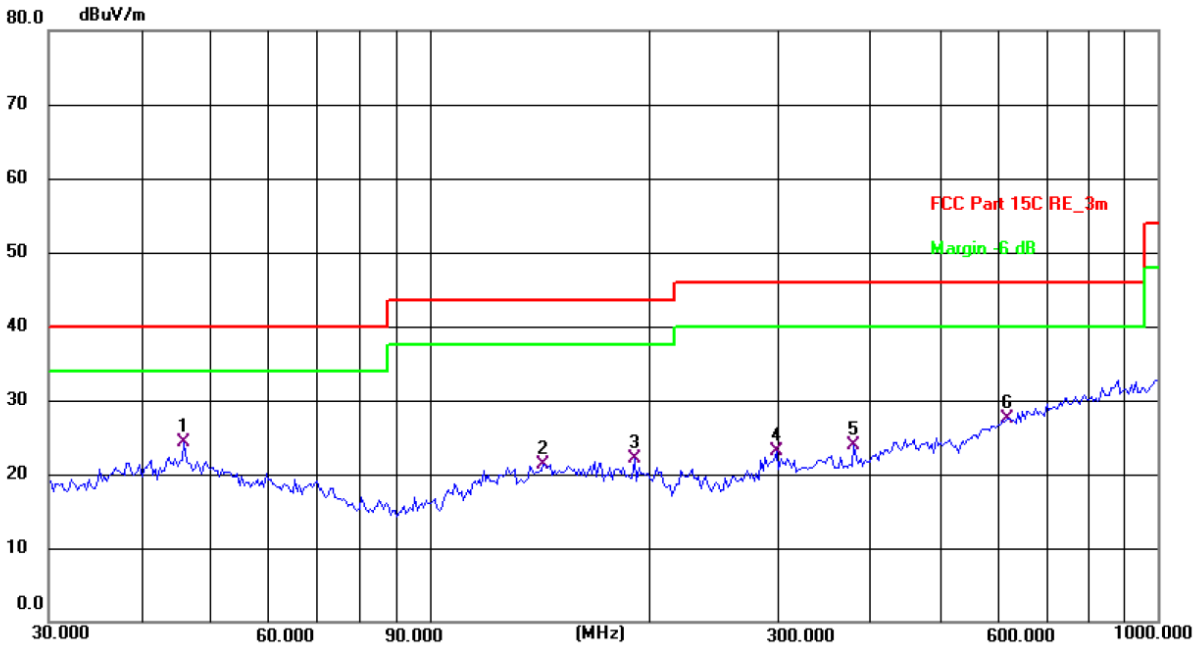


Site: #1 3m Anechoic Chamber Polarization: *Horizontal* Temperature: 25.3(C) Humidity: 54 %

Limit: FCC Part 15C RE_3m Power: DC 3.8V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	35.7490	6.03	13.54	19.57	40.00	-20.43	QP	P	
2	58.4074	7.34	12.98	20.32	40.00	-19.68	QP	P	
3	104.5360	7.84	10.93	18.77	43.50	-24.73	QP	P	
4	155.9100	6.63	14.59	21.22	43.50	-22.28	QP	P	
5	382.5878	9.32	15.88	25.20	46.00	-20.80	QP	P	
6 *	656.5300	9.13	21.67	30.80	46.00	-15.20	QP	P	

Vertical:



Site: #1 3m Anechoic Chamber Polarization: *Vertical* Temperature: 25.3(C) Humidity: 54 %

Limit: FCC Part 15C RE_3m Power: DC 3.8V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	46.0162	10.41	13.85	24.26	40.00	-15.74	QP	P	
2	143.3257	7.32	14.05	21.37	43.50	-22.13	QP	P	
3	191.0738	11.30	10.82	22.12	43.50	-21.38	QP	P	
4	299.3158	9.14	13.98	23.12	46.00	-22.88	QP	P	
5	382.5878	8.01	15.88	23.89	46.00	-22.11	QP	P	
6	620.7096	6.58	20.94	27.52	46.00	-18.48	QP	P	

Note: *1.The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported*

2. Measurements were conducted in all three channels (high, middle, low) and all modulation(802.11b, 802.11g, 802.11n(HT20)), and the worst case Mode (Middle channel and 802.11g) was submitted only.

3. Freq. = Emission frequency in MHz

Measurement (dBμV/m) = Reading level (dBμV) + Corr. Factor (dB)

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

Limit (dBμV/m) = Limit stated in standard

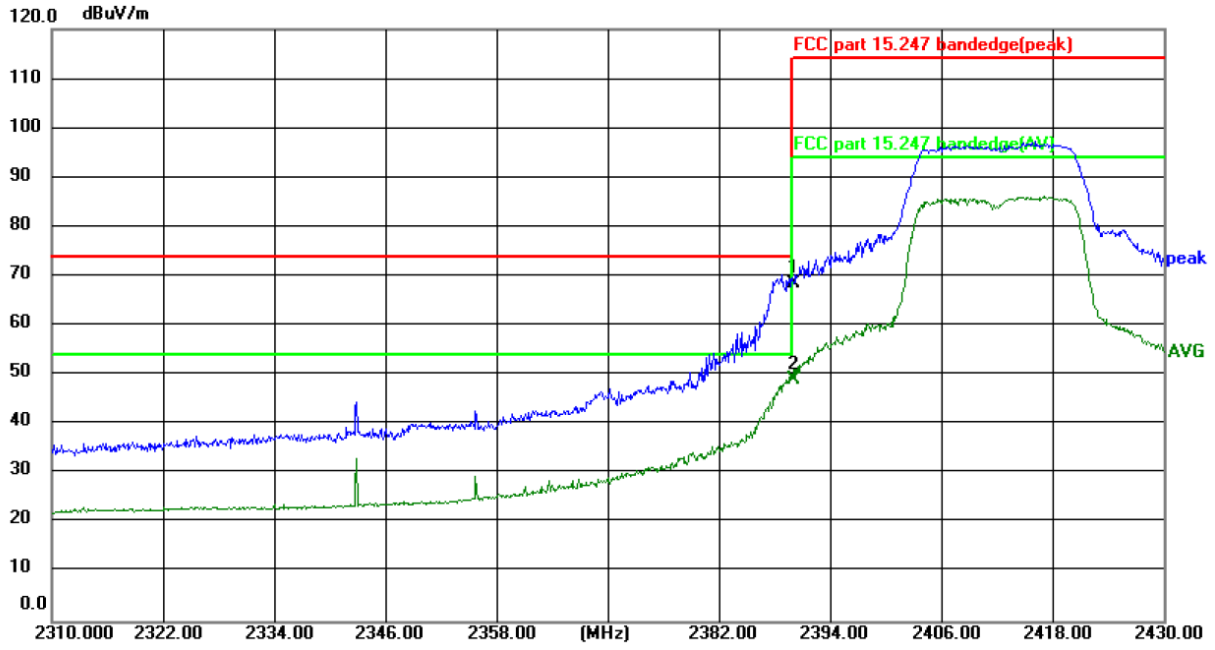
Margin (dB) = Measurement (dBμV/m) – Limits (dBμV/m)

** is meaning the worst frequency has been tested in the test frequency range.*

Test Result of Radiated Spurious at Band edges

Lowest channel 2412:

Horizontal:

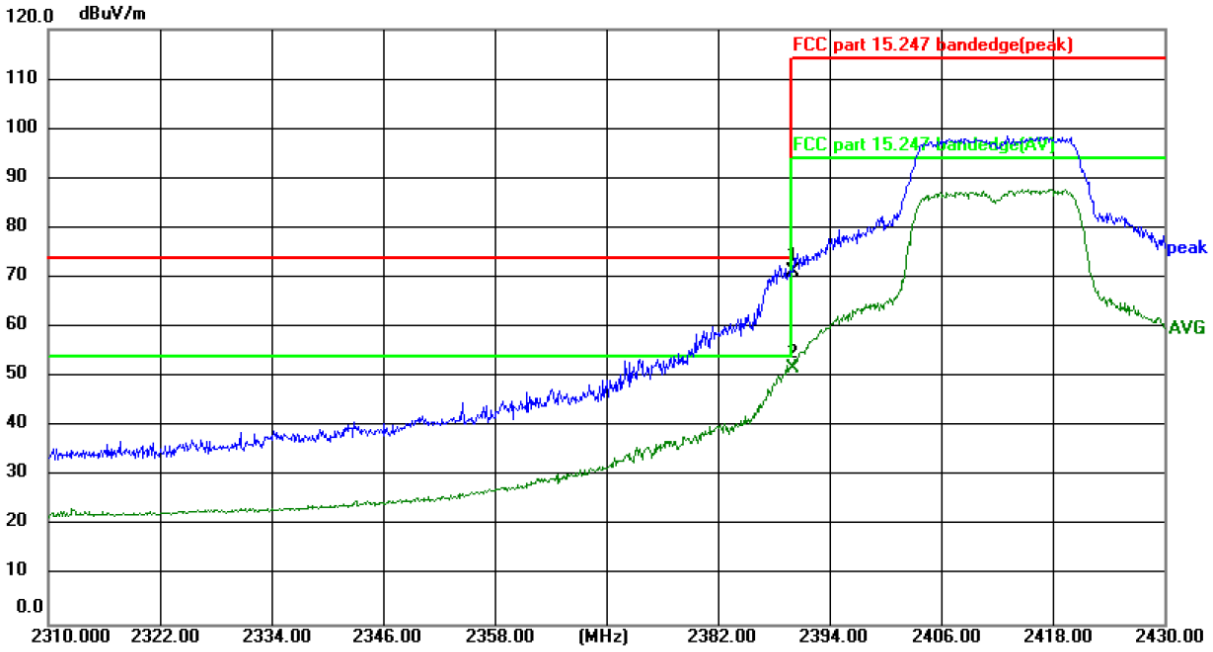


Site: #3 3m Anechoic Chamber Polarization: ***Horizontal*** Temperature: 23.8(℃) Humidity: 54 %

Limit: FCC part 15.247 bandedge(peak) Power:DC 3.8 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	2390.000	85.53	-17.10	68.43	74.00	-5.57	peak	P	
2 *	2390.000	66.18	-17.10	49.08	54.00	-4.92	AVG	P	

Vertical:



Site: #3 3m Anechoic Chamber Polarization: ***Vertical*** Temperature: 23.8(℃) Humidity: 54 %

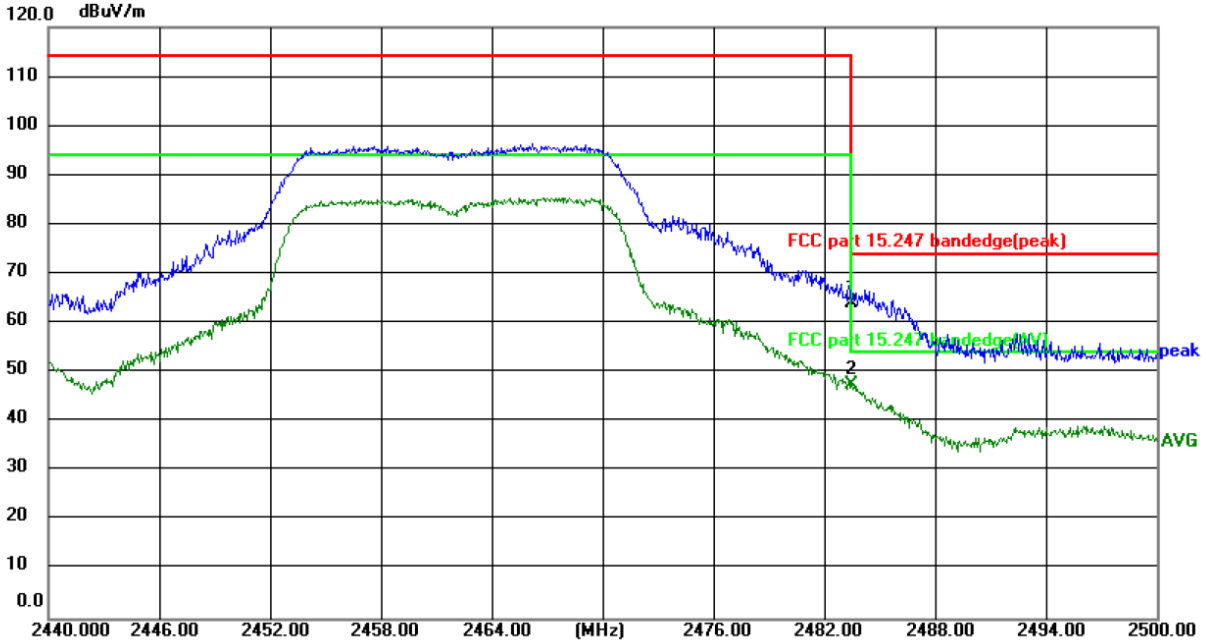
Limit: FCC part 15.247 bandedge(peak) Power:DC 3.8 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	2390.000	88.33	-17.10	71.23	74.00	-2.77	peak	P	
2 *	2390.000	68.77	-17.10	51.67	54.00	-2.33	AVG	P	

Note: *Measurements were conducted in all two channels (high, low) and all modulation (802.11b, 802.11g, 802.11n(HT20)), and the worst case Mode 802.11g was submitted only.*

Highest channel 2462:

Horizontal:

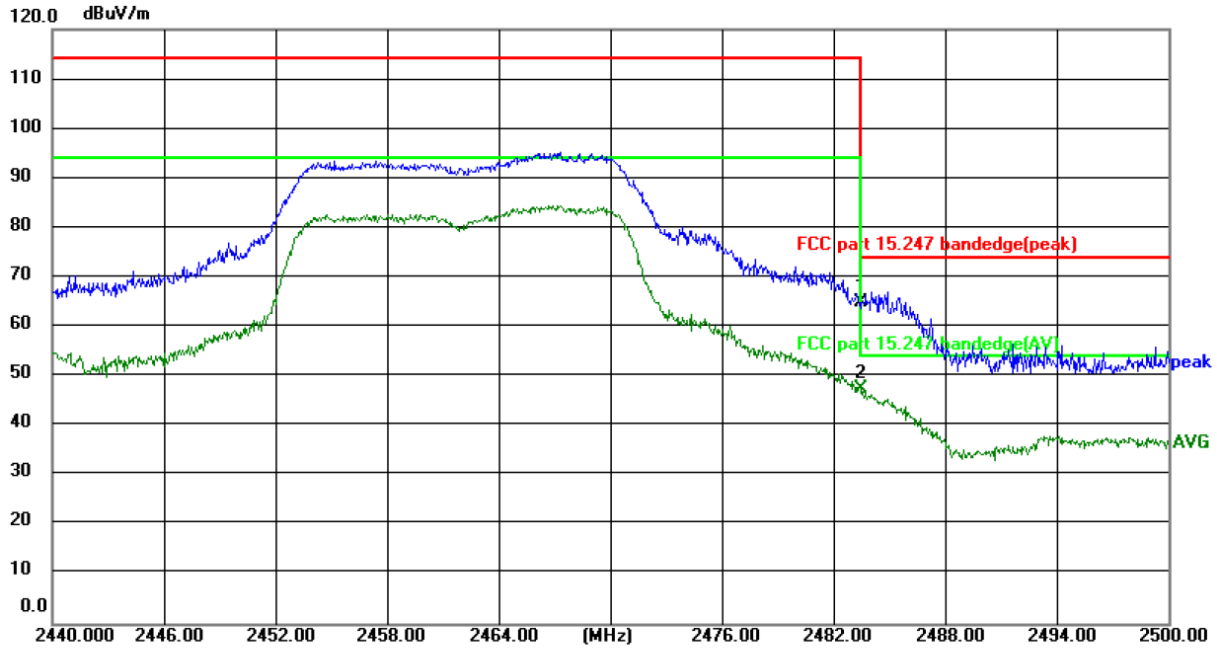


Site: #3 3m Anechoic Chamber Polarization: ***Horizontal*** Temperature: 23.8(℃) Humidity: 54 %

Limit: FCC part 15.247 bandedge(peak) Power:DC 3.8 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	2483.500	80.87	-16.88	63.99	74.00	-10.01	peak	P	
2 *	2483.500	64.36	-16.88	47.48	54.00	-6.52	AVG	P	

Vertical:



Site: #3 3m Anechoic Chamber Polarization: *Vertical* Temperature: 23.8(℃) Humidity: 54 %

Limit: FCC part 15.247 bandedge(peak) Power:DC 3.8 V

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	2483.500	81.92	-16.88	65.04	74.00	-8.96	peak	P	
2 *	2483.500	64.54	-16.88	47.66	54.00	-6.34	AVG	P	

Note:

1. *Peak Final Emission Level=Peak Reading + Correction Factor;*
2. *Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
3. *Measurements were conducted in all modulation(802.11b, 802.11g, 802.11n(HT20)), and the worst case Mode 802.11g was submitted only.*

Above 1GHz

Modulation Type: 802.11b

Low channel: 2412 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4824	H	45.67	---	0.75	46.42	---	74	54	-7.58
7236	H	34.20	---	9.87	44.07	---	74	54	-9.93
---	H	---	---	---	---	---	---	---	---
4824	V	45.75	---	0.75	46.50	---	74	54	-7.50
7236	V	35.64	---	9.87	45.51	---	74	54	-8.49
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4874	H	46.02	---	0.97	46.99	---	74	54	-7.01
7311	H	36.58	---	9.83	46.41	---	74	54	-7.59
---	H	---	---	---	---	---	---	---	---
4874	V	45.86	---	0.97	46.83	---	74	54	-7.17
7311	V	36.51	---	9.83	46.34	---	74	54	-7.66
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4924	H	43.88	---	1.18	45.06	---	74	54	-8.94
7386	H	34.70	---	10.07	44.77	---	74	54	-9.23
---	H	---	---	---	---	---	---	---	---
4924	V	44.42	---	1.18	45.60	---	74	54	-8.40
7386	V	34.56	---	10.07	44.63	---	74	54	-9.37
---	V	---	---	---	---	---	---	---	---

Note:

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (Peak) (dBµV/m)-Average limit (dBµV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.*
5. *Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*
6. *All the restriction bands are compliance with the limit of 15.209.*

Modulation Type: 802.11g

Low channel: 2412 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4824	H	45.01	---	0.75	45.76	---	74	54	-8.24
7236	H	35.37	---	9.87	45.24	---	74	54	-8.76
---	H	---	---	---	---	---	---	---	---
4824	V	47.65	---	0.75	48.40	---	74	54	-5.60
7236	V	36.47	---	9.87	46.34	---	74	54	-7.66
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4874	H	45.13	---	0.97	46.10	---	74	54	-7.90
7311	H	36.29	---	9.83	46.12	---	74	54	-7.88
---	H	---	---	---	---	---	---	---	---
4874	V	44.26	---	0.97	45.23	---	74	54	-8.77
7311	V	35.30	---	9.83	45.13	---	74	54	-8.87
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
					Peak (dBµV/m)	AV (dBµV/m)			
4924	H	44.26	---	1.18	45.44	---	74	54	-8.56
7386	H	34.34	---	10.07	44.41	---	74	54	-9.59
---	H	---	---	---	---	---	---	---	---
4924	V	46.94	---	1.18	48.12	---	74	54	-5.88
7386	V	34.43	---	10.07	44.50	---	74	54	-9.50
---	V	---	---	---	---	---	---	---	---

Note:

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (Peak) (dBµV/m)-Average limit (dBµV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.*
5. *Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*
6. *All the restriction bands are compliance with the limit of 15.209.*

Modulation Type: 802.11n (HT20)

Low channel: 2412 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	46.14	---	0.75	46.89	---	74	54	-7.11
7236	H	36.61	---	9.87	46.48	---	74	54	-7.52
---	H	---	---	---	---	---	---	---	---
4824	V	47.65	---	0.75	48.40	---	74	54	-5.60
7236	V	36.32	---	9.87	46.19	---	74	54	-7.81
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874	H	45.98	---	0.97	46.95	---	74	54	-7.05
7311	H	35.71	---	9.83	45.54	---	74	54	-8.46
---	H	---	---	---	---	---	---	---	---
4874	V	45.36	---	0.97	46.33	---	74	54	-7.67
7311	V	34.45	---	9.83	44.28	---	74	54	-9.72
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4924	H	45.20	---	1.18	46.38	---	74	54	-7.62
7386	H	34.32	---	10.07	44.39	---	74	54	-9.61
---	H	---	---	---	---	---	---	---	---
4924	V	45.34	---	1.18	46.52	---	74	54	-7.48
7386	V	34.39	---	10.07	44.46	---	74	54	-9.54
---	V	---	---	---	---	---	---	---	---

Note:

1. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
2. *Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
4. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.*
5. *Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.*
6. *All the restriction bands are compliance with the limit of 15.209.*

Appendix A: Test Result of Conducted Test

DTS Bandwidth

Test Mode	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	2412	9.640	2407.400	2417.040	0.5	PASS
	2437	9.640	2432.400	2442.040	0.5	PASS
	2462	9.600	2456.960	2466.560	0.5	PASS
11G	2412	16.440	2403.800	2420.240	0.5	PASS
	2437	16.480	2428.760	2445.240	0.5	PASS
	2462	16.440	2453.760	2470.200	0.5	PASS
11N20SISO	2412	17.680	2403.160	2420.840	0.5	PASS
	2437	17.640	2428.160	2445.800	0.5	PASS
	2462	17.640	2453.160	2470.800	0.5	PASS

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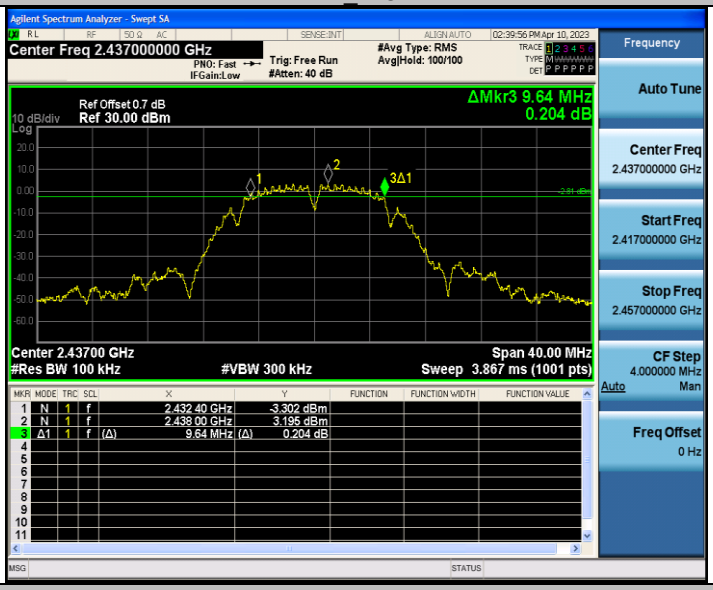
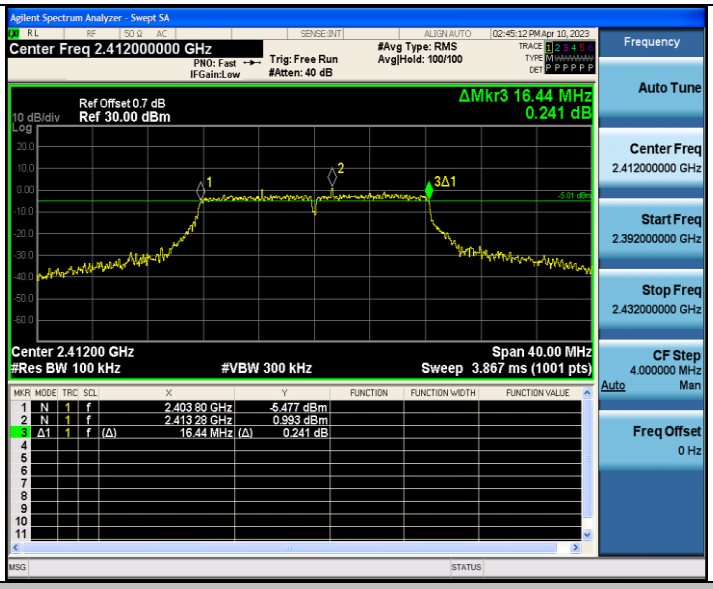
11B_2412

11B_2437

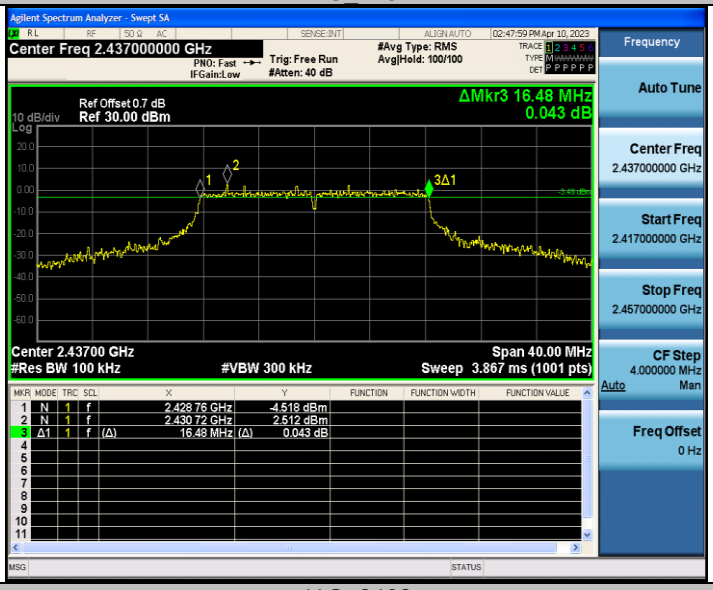


11B_2462

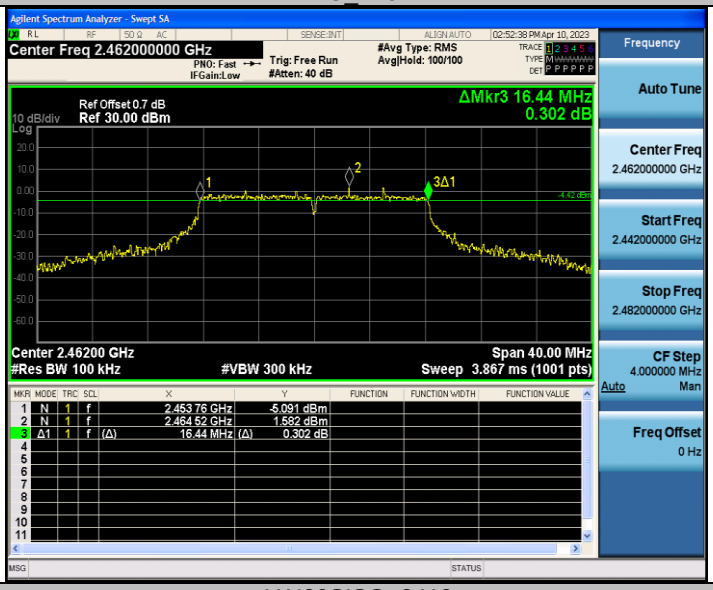
11G_2412



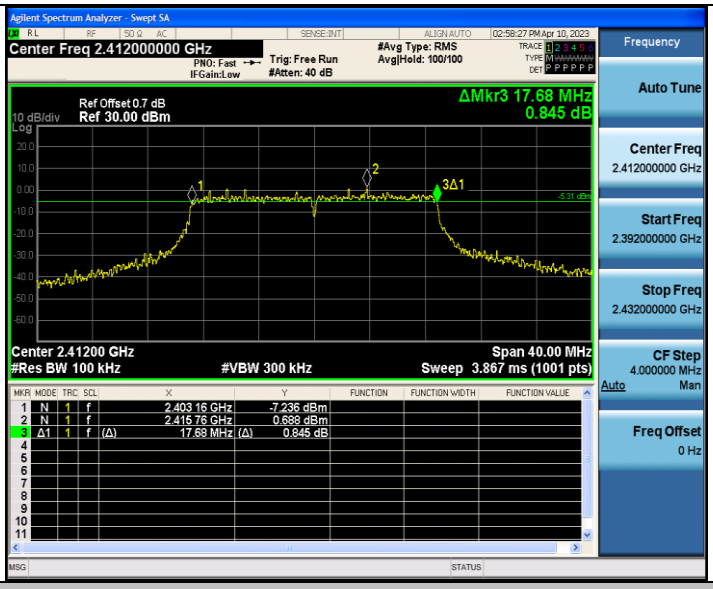
11G_2437



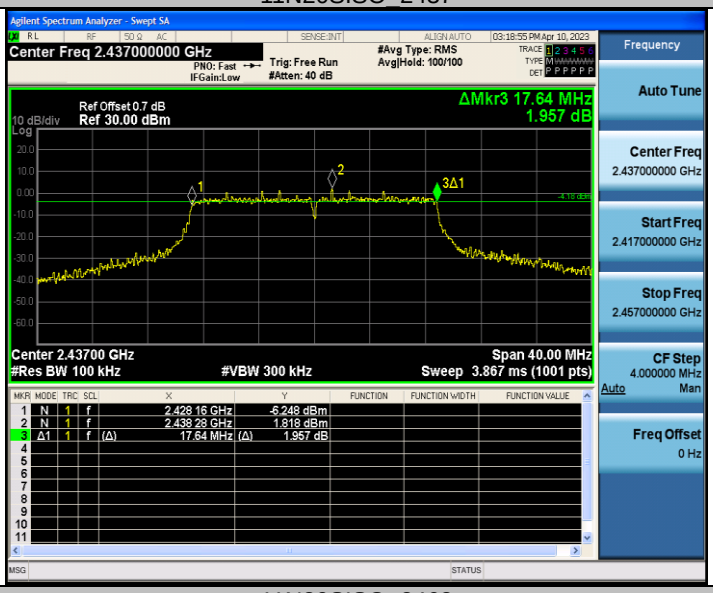
11G_2462



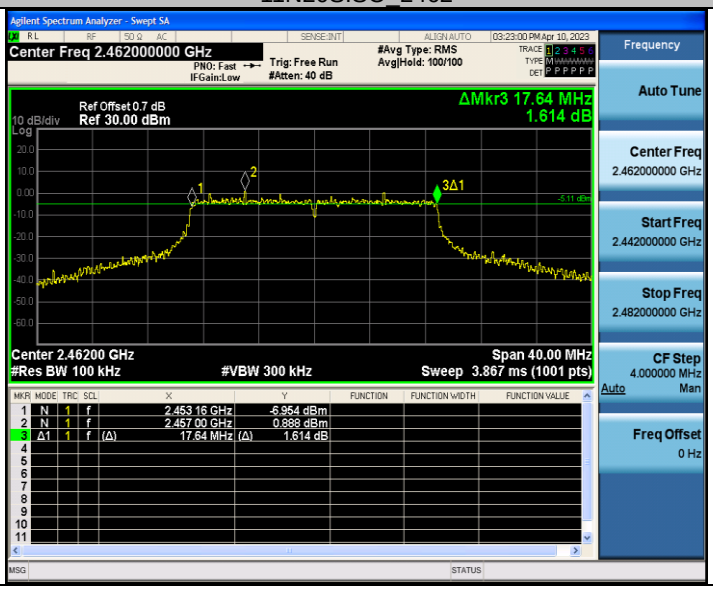
11N20SISO_2412



11N20SISO_2437



11N20SISO_2462



Maximum conducted output power

Test Mode	Channel	Result[dBm]	Duty Factor (dB)	Total Result[dBm]	Limit[dBm]	Verdict
11B	2412	12.62	0	12.62	<=30	PASS
	2437	13.18	0	13.18	<=30	PASS
	2462	12.46	0	12.46	<=30	PASS
11G	2412	12.55	0.1	12.65	<=30	PASS
	2437	14.09	0.1	14.19	<=30	PASS
	2462	13.05	0	13.05	<=30	PASS
11N20SISO	2412	12.47	0.1	12.57	<=30	PASS
	2437	13.04	0	13.04	<=30	PASS
	2462	12.22	0.1	12.32	<=30	PASS

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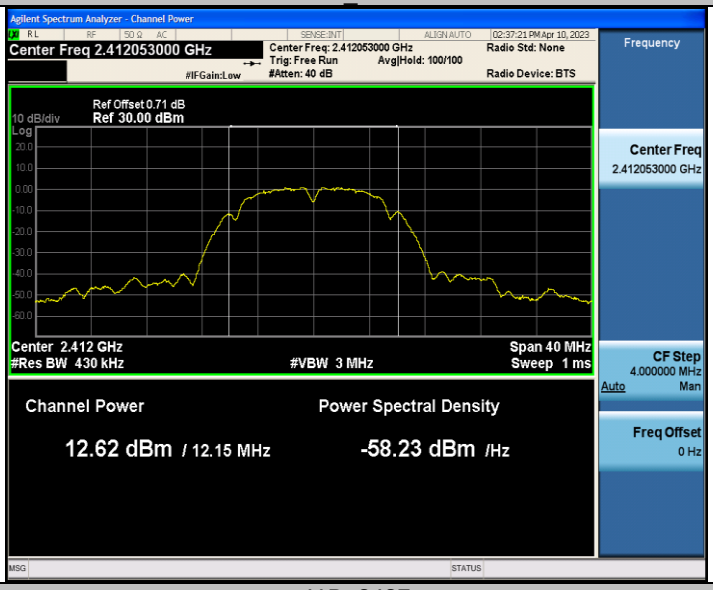
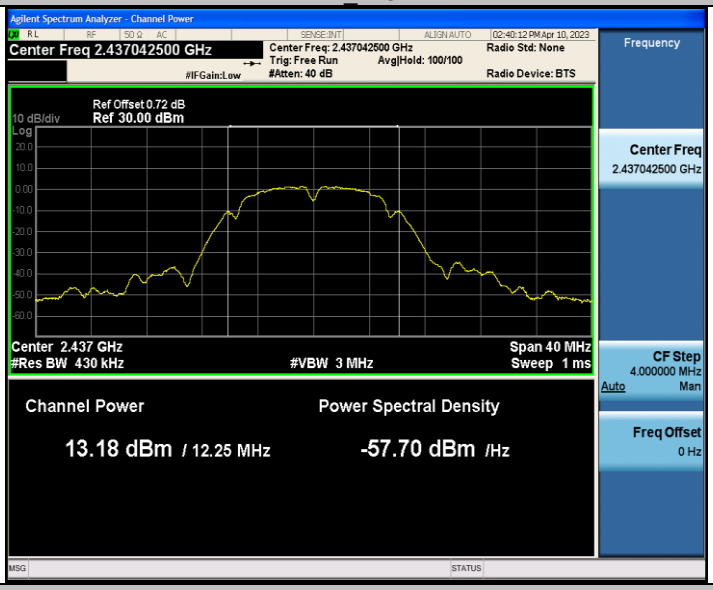
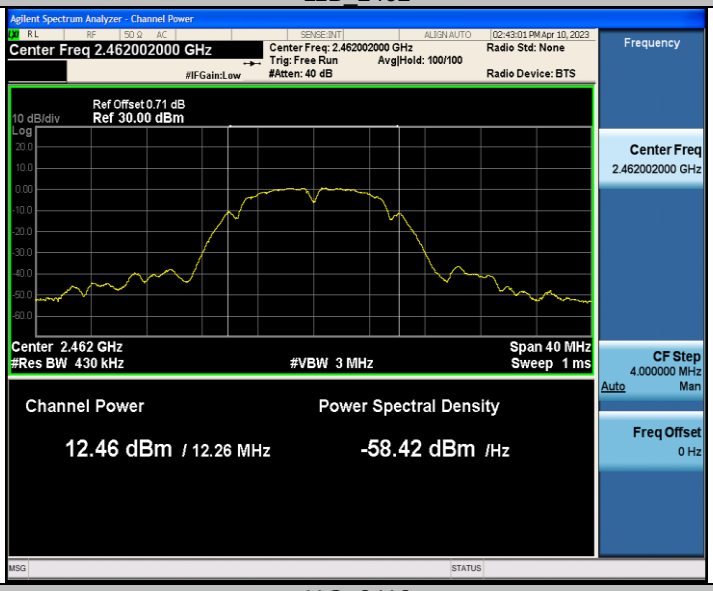
11B_2412



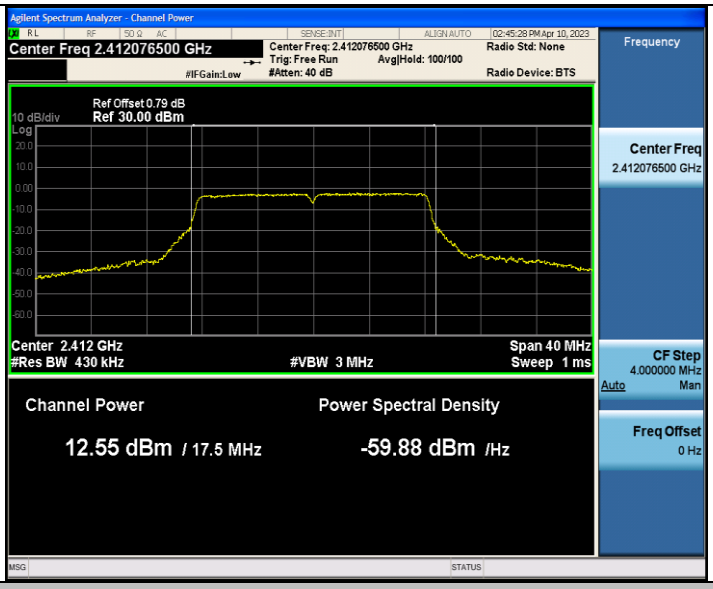
11B_2437



11B_2462

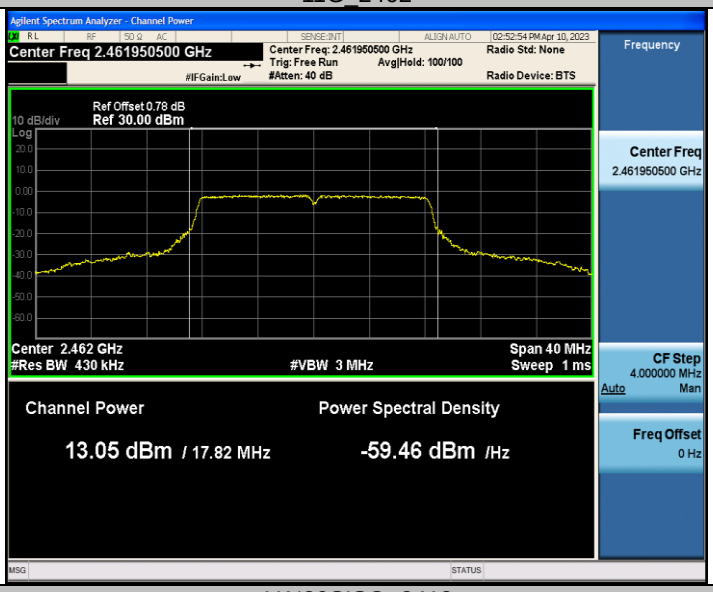


11G_2412

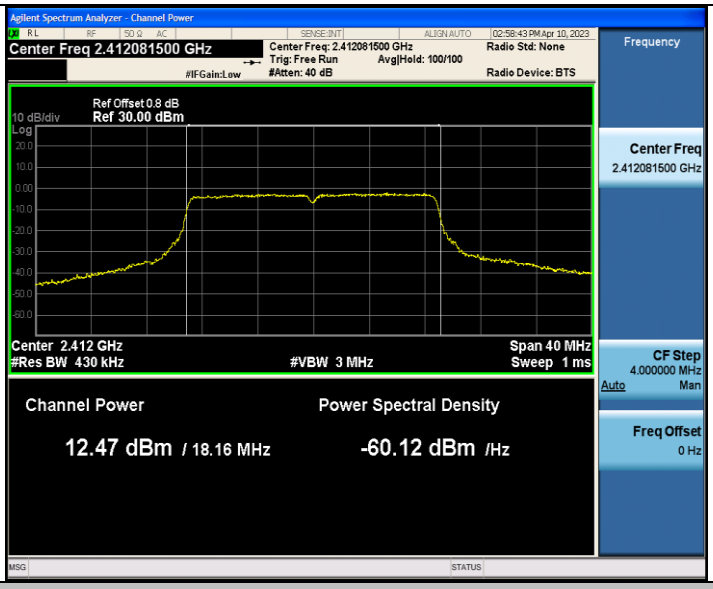


11G_2437

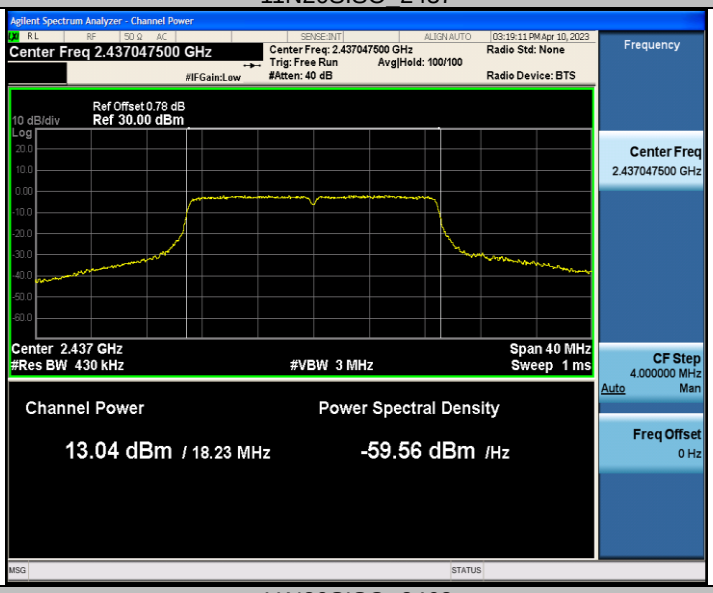
11G_2462



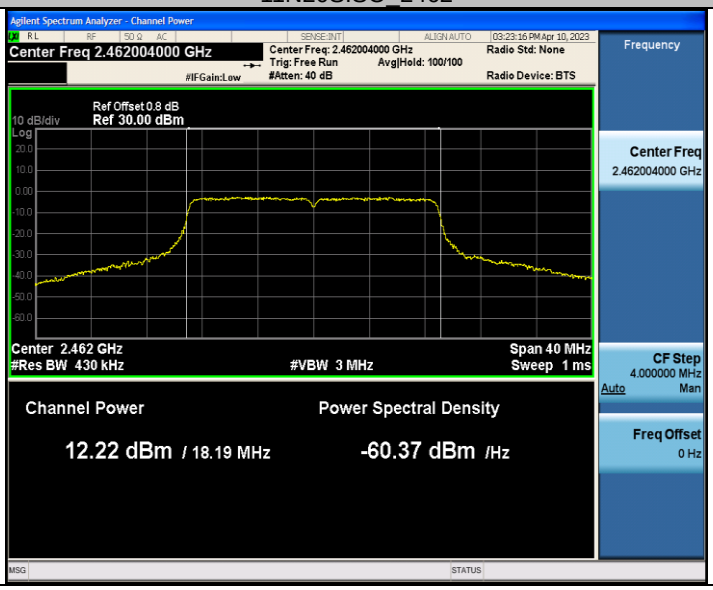
11N20SISO_2412



11N20SISO_2437



11N20SISO_2462



Maximum power spectral density

Test Mode	Channel	Result [dBm/30kHz]	Duty Factor (dB)	Total Result [dBm/30kHz]	Total Result [dBm/3kHz]	Limit [dBm/ 3kHz]	Verdict
11B	2412	-9.16	0	-9.16	-19.16	<=8	PASS
	2437	-9.02	0	-9.02	-19.02	<=8	PASS
	2462	-9.91	0	-9.91	-19.91	<=8	PASS
11G	2412	-11.75	0.1	-11.65	-21.65	<=8	PASS
	2437	-10.30	0.1	-10.20	-20.20	<=8	PASS
	2462	-11.39	0	-11.39	-21.39	<=8	PASS
11N20SISO	2412	-12.27	0.1	-12.17	-22.17	<=8	PASS
	2437	-11.56	0	-11.56	-21.56	<=8	PASS
	2462	-12.20	0.1	-12.10	-22.10	<=8	PASS

Note: Total Result[dBm/3kHz]= Total Result[dBm/30kHz] +10log(3kHz/30kHz)

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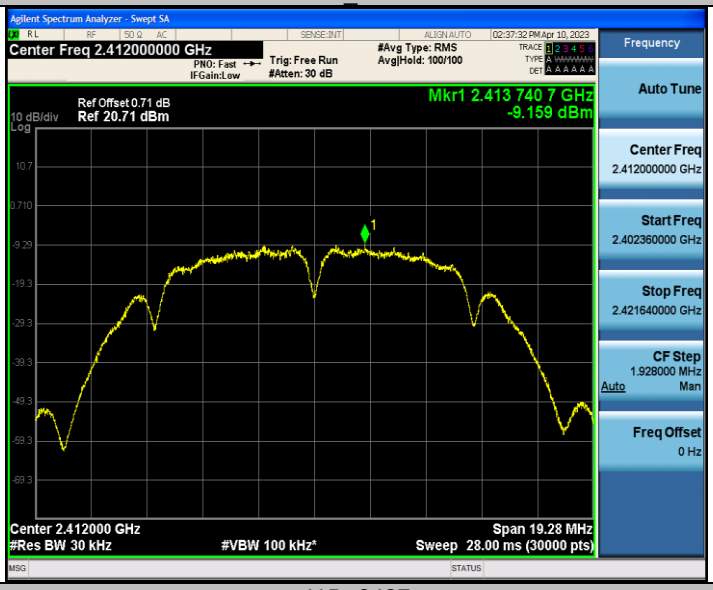
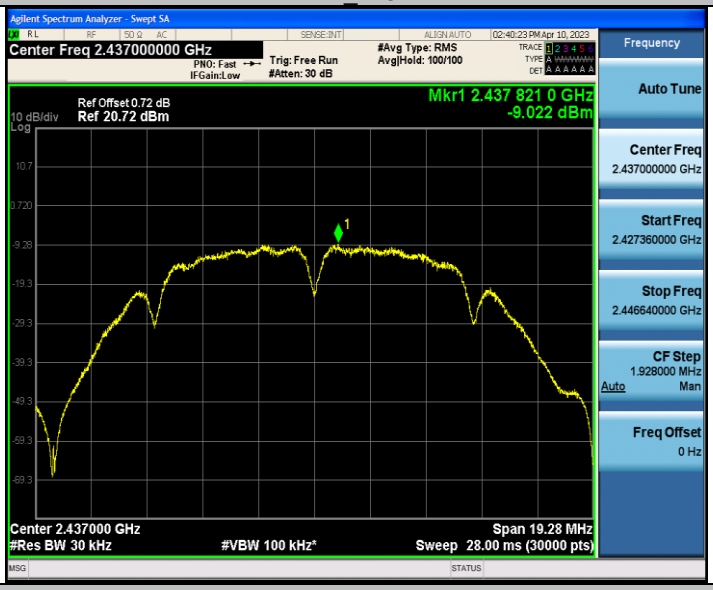
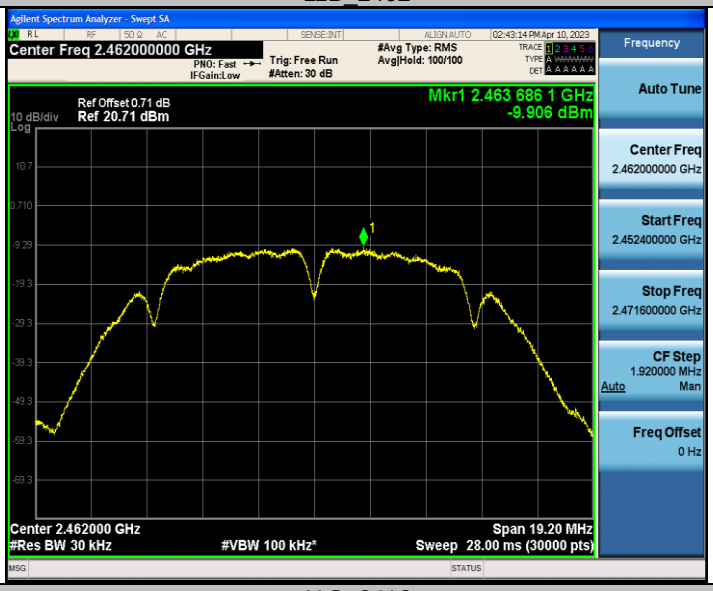
11B_2412



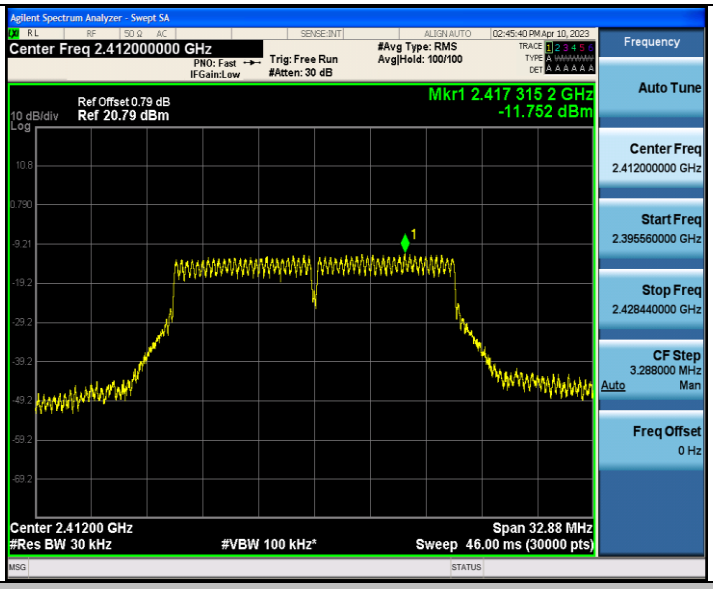
11B_2437



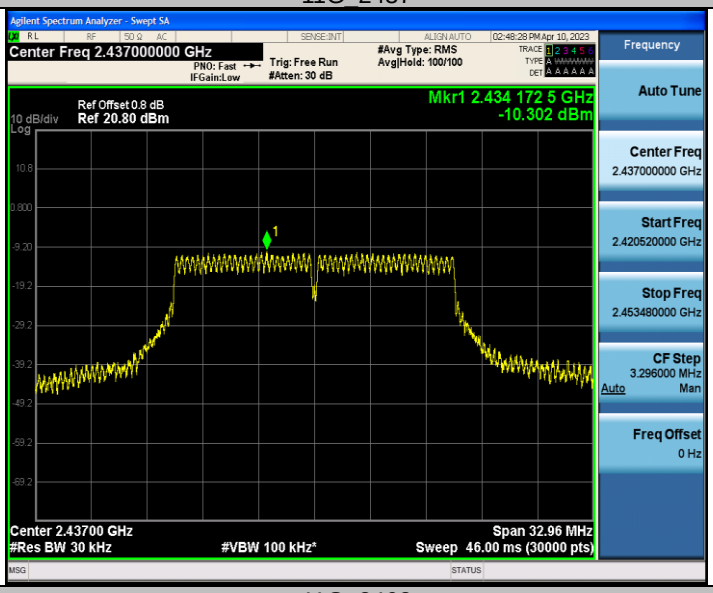
11B_2462



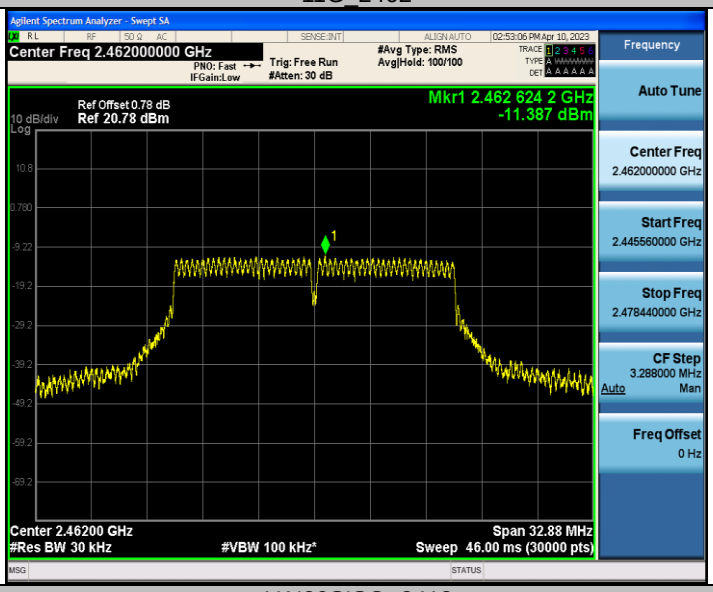
11G_2412



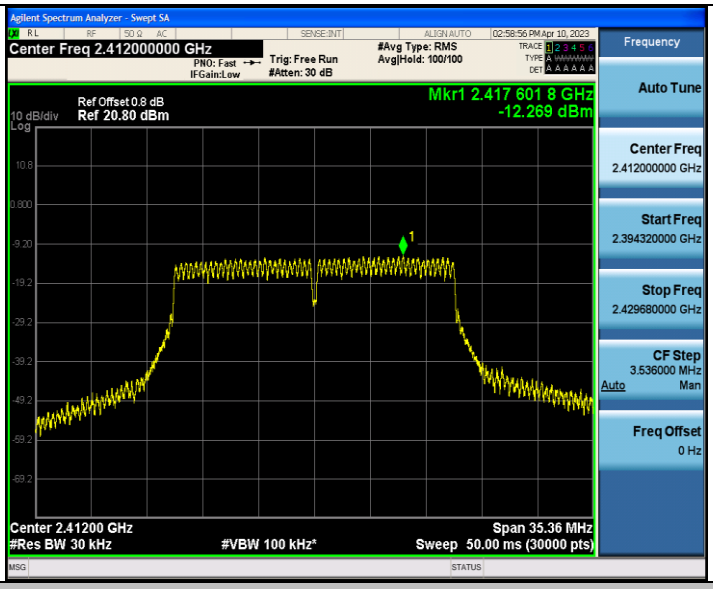
11G_2437



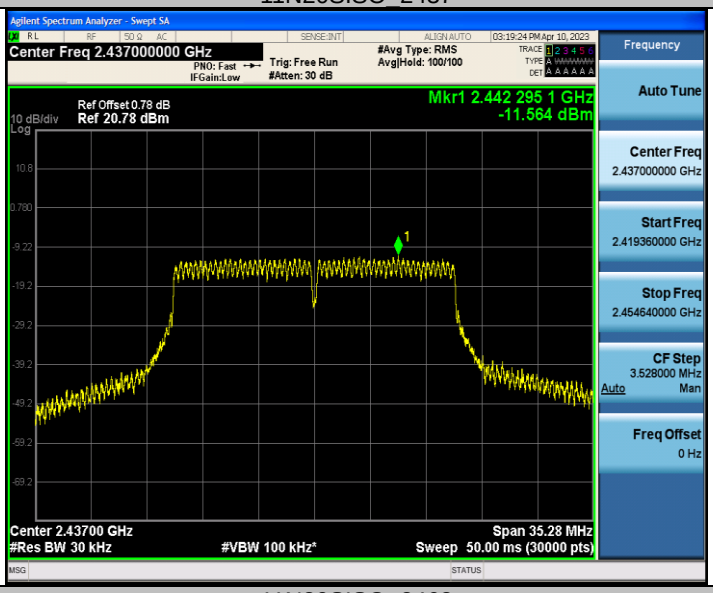
11G_2462



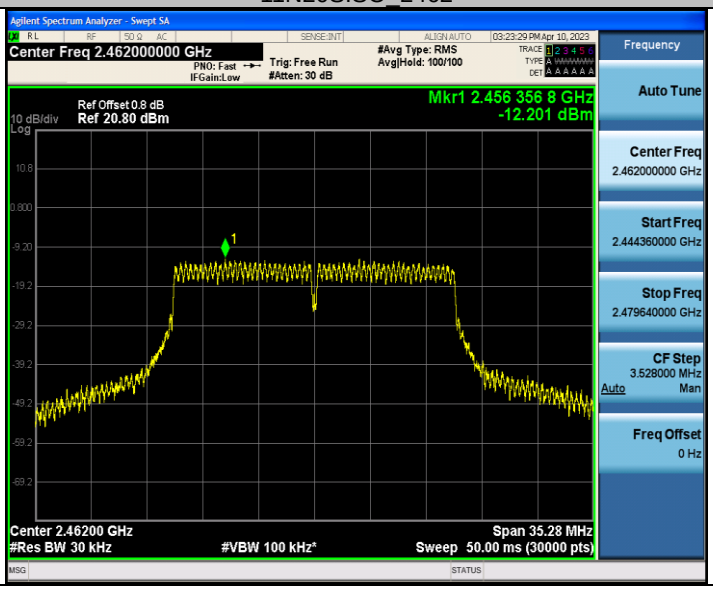
11N20SISO_2412



11N20SISO_2437



11N20SISO_2462



Band edge measurements

Test Mode	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Low	2412	2.75	-40.27	<=-27.25	PASS
	High	2462	2.58	-53.82	<=-27.42	PASS
11G	Low	2412	1.54	-29.08	<=-28.46	PASS
	High	2462	1.69	-36.00	<=-28.31	PASS
11N20SISO	Low	2412	1.26	-29.95	<=-28.74	PASS
	High	2462	1.10	-37.92	<=-28.91	PASS

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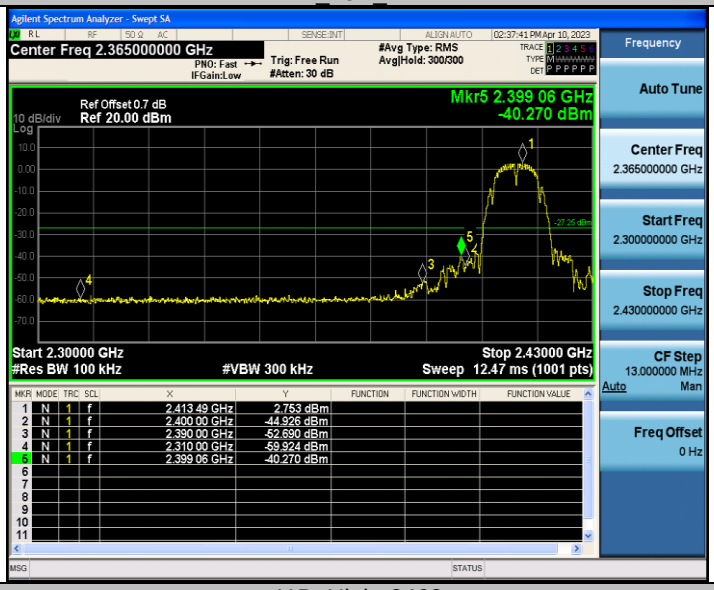
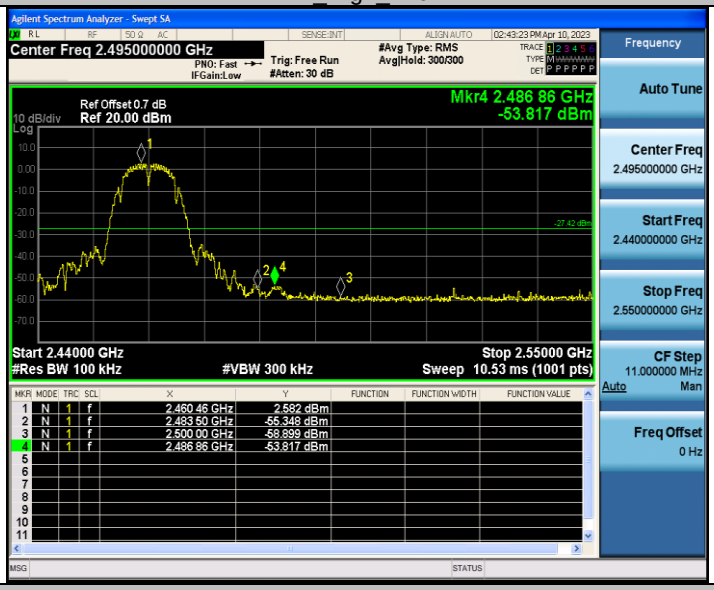
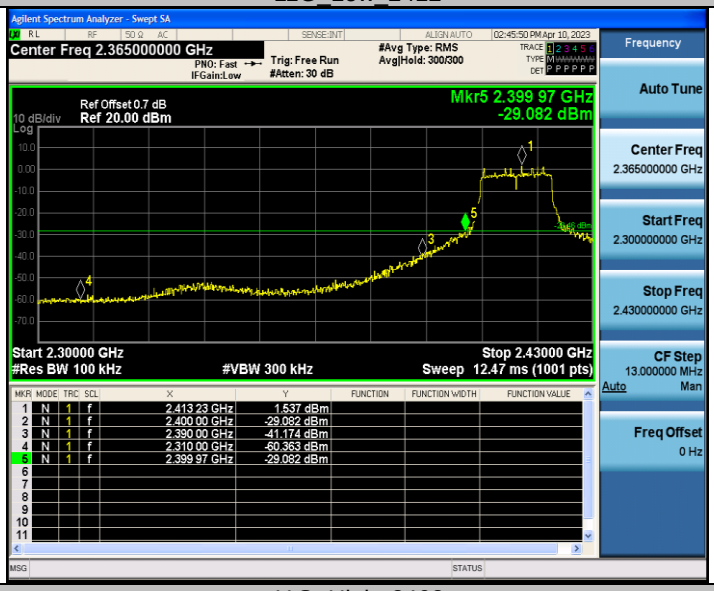
11B_Low_2412



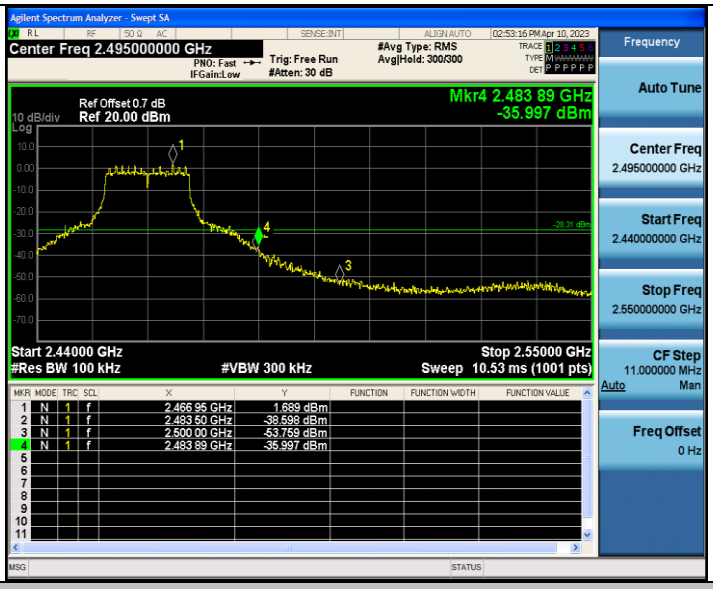
11B_High_2462



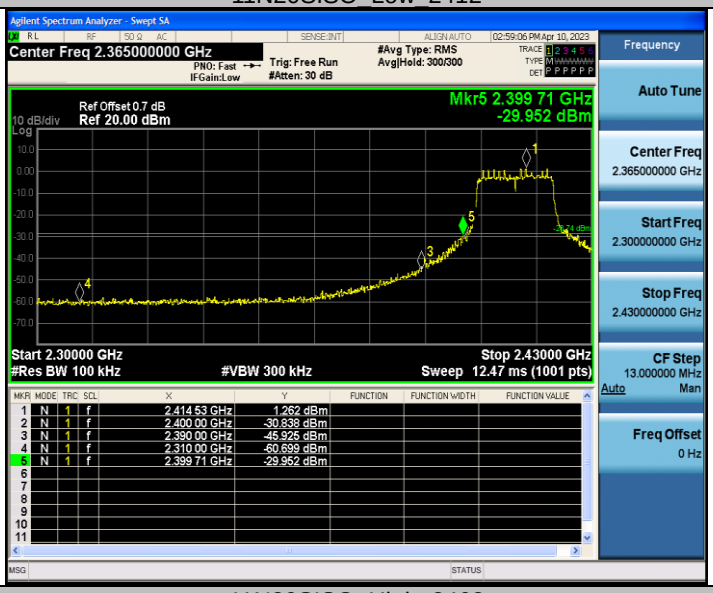
11G_Low_2412



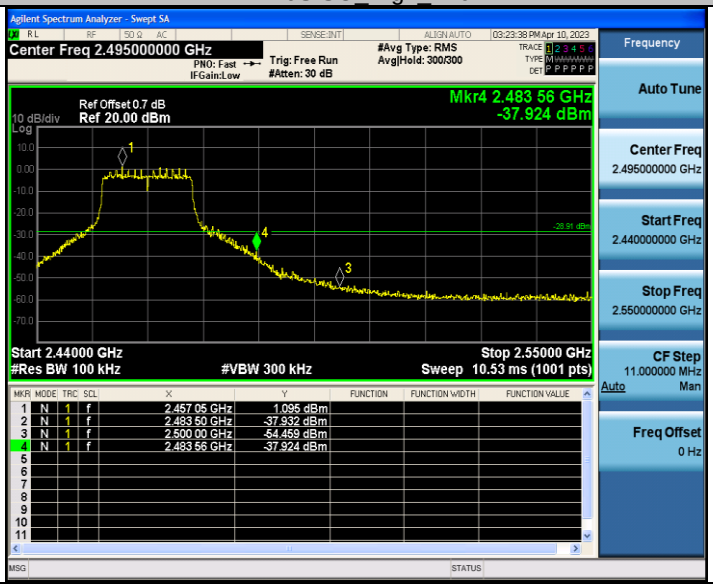
11G_High_2462



11N20SISO_Low_2412



11N20SISO_High_2462



Conducted Spurious Emission

Test Mode	Channel	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	2412	Reference	2.52	2.52	---	PASS
		30~1000	30~1000	-48.297	<=-17.476	PASS
		1000~26500	1000~26500	-44.469	<=-17.476	PASS
	2437	Reference	3.17	3.17	---	PASS
		30~1000	30~1000	-64.47	<=-16.828	PASS
		1000~26500	1000~26500	-53.707	<=-16.828	PASS
	2462	Reference	2.48	2.48	---	PASS
		30~1000	30~1000	-68.324	<=-17.524	PASS
		1000~26500	1000~26500	-52.392	<=-17.524	PASS
11G	2412	Reference	1.37	1.37	---	PASS
		30~1000	30~1000	-67.589	<=-18.63	PASS
		1000~26500	1000~26500	-45.817	<=-18.63	PASS
	2437	Reference	2.73	2.73	---	PASS
		30~1000	30~1000	-66.975	<=-17.266	PASS
		1000~26500	1000~26500	-52.912	<=-17.266	PASS
	2462	Reference	1.35	1.35	---	PASS
		30~1000	30~1000	-65.394	<=-18.65	PASS
		1000~26500	1000~26500	-52.152	<=-18.65	PASS
11N20SISO	2412	Reference	1.20	1.20	---	PASS
		30~1000	30~1000	-67.887	<=-18.798	PASS
		1000~26500	1000~26500	-50.579	<=-18.798	PASS
	2437	Reference	1.91	1.91	---	PASS
		30~1000	30~1000	-68.37	<=-18.087	PASS
		1000~26500	1000~26500	-53.417	<=-18.087	PASS
	2462	Reference	0.85	0.85	---	PASS
		30~1000	30~1000	-67.468	<=-19.15	PASS
		1000~26500	1000~26500	-51.948	<=-19.15	PASS

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