

Report No.: XEWA2305000017RG03  
 Rev.: 01  
 Page: 1 of 188

# TEST REPORT

**Application No.:** XEWA2305000017RG  
**Applicant:** Quectel Wireless Solutions Co., Ltd.  
**Address of Applicant:** Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233  
**Manufacturer:** Quectel Wireless Solutions Co., Ltd.  
**Address of Manufacturer:** Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233  
**EUT Description:** Wi-Fi & Bluetooth Module  
**Model No.:** FCM360K  
**Trade Mark:** Quectel  
**FCC ID:** XMR2023FCM360K  
**Standards:** FCC 47 CFR Part 2, Subpart J  
 FCC 47 CFR Part 15, Subpart C  
**Date of Receipt:** 2023/05/19  
**Date of Test:** 2023/06/04 to 2023/06/18  
**Date of Issue:** 2023/06/26

<b>Test Result :</b>	<b>PASS *</b>
----------------------	---------------

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:



Peter Tan  
 Regulatory Technical Manager



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# 1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023/06/26		Original

<b>Prepared By</b>	 <hr/> (Leah Chen) / Test Engineer
<b>Checked By</b>	 <hr/> (Andy Yao) / Reviewer



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## 2 Test Summary

Test Item	FCC Rule No.	Test Method	Test Result	Result
Antenna Requirement	15.203/15.247(b)	--	Clause 4.1	PASS
AC Power Line Conducted Emission	15.207	ANSI C63.10-2020 Section 6.2	Clause 4.2	PASS
Duty Cycle	--	--	Clause 4.3	For Report Purpose
Conducted Output Power	15.247 (b)(3)	ANSI C63.10-2020 Section 11.9.1.2	Clause 4.4	PASS
DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	15.247 (a)(2)	ANSI C63.10-2020 Section 11.8 Option 2 / 6.9.3	Clause 4.5	PASS
Power Spectral Density	15.247 (e)	ANSI C63.10-2020 Section 11.10.2	Clause 4.6	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.7	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.8	PASS
Radiated Spurious Emissions	15.247(d);15.205/15.209	ANSI C63.10-2020 Section 11.12	Clause 4.9	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d);15.205/15.209	ANSI C63.10-2020 Section 11.12	Clause 4.10	PASS



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### 3 General Information

#### 3.1 Details of Client

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

#### 3.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Xi'an) Co., Ltd.
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Post code:	710086
Test engineer:	Qiang Zhang, Ken Liu

#### 3.3 Test Facility

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

• **A2LA (Certificate No. 4854.01)**

SGS-CSTC Standards Technical Services (Xi'an) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4854.01.

• **Innovation, Science and Economic Development Canada**

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IC#: 25613.

• **FCC –Designation Number: CN1337**

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Designation Number: CN1337.

Test Firm Registration Number: 917410



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### 3.4 General Description of EUT

EUT Description:	Wi-Fi & Bluetooth Module	
Model No.:	FCM360K	
Trade Mark:	Quectel	
Hardware Version:	R1.0	
Software Version:	FCM360KAAR01A03	
SN:	RF Conducted	E1M23D806000131
	RSE & AC power line	E1M23D806000169
Operation Frequency:	802.11b/g/n(HT20)/ax(HE20):	2412MHz to 2462MHz
	802.11n(HT40)/ax(HE40):	2422MHz to 2452MHz
Modulation Type:	802.11b:	DSSS (DBPSK, DQPSK, CCK)
	802.11g/n:	OFDM (BPSK, QPSK, 16QAM, 64QAM)
	802.11ax:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Number of Channels:	802.11b/g/n(HT20)/ax(HE20): 11 802.11n(HT40)/ax(HE40): 7	
Channel Spacing:	5MHz	
Smart System:	<input checked="" type="checkbox"/> SISO	802.11b/g/n/ax
	<input type="checkbox"/> MIMO	CDD: 802.11b/g/n/ax: Tx & Rx
		STBC: 802.11n/ax: Tx & Rx TXBF: 802.11n/ax: Tx & Rx
	<input type="checkbox"/> Diversity	802.11b/g : Tx & Rx
Antenna Type:	PCB Antenna	
Antenna Gain:	2dBi (Ant0)	
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.	
RF Cable:	1.2dB	
Remark:	As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.	



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Operation Frequency of each channel (802.11b/g/n HT20 /ax HE20)							
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		
Operation Frequency of each channel (802.11n HT40 /ax HE40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
3	2422MHz	6	2437MHz	9	2452MHz		
4	2427MHz	7	2442MHz				
5	2432MHz	8	2447MHz				
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:							
Channel	Frequency for 802.11 b/g/n (HT20) /ax (HE20)			Frequency for 802.11n (HT40)/ax(HE40)			
The Lowest channel	2412MHz			2422MHz			
The Middle channel	2437MHz			2437MHz			
The Highest channel	2462MHz			2452MHz			



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### 3.5 Test Environment and Mode

<b>Environment Parameter</b>	96~101 kPa Selected Values During Tests	
<b>Relative Humidity</b>	40-60 % RH Ambient	
<b>Value</b>	<b>Temperature(°C)</b>	<b>Voltage(V)</b>
NTNV	22~25	3.3
Remark: NV: Normal Voltage NT: Normal Temperature		

### 3.6 Description of Support Units

<b>Description</b>	<b>Manufacturer</b>	<b>Model No.</b>
Mother board	Quectel	N/A
Remark: all above the information of table are provided by client.		

### 3.7 Worst-case configuration and mode

Low data rate was used to test on antenna port conducted tests and radiated spurious emissions since it has the highest maximum power. Following are the worst-case data rates set for test:

Modulation Type	SISO - Data Rate	MIMO - Data Rate
802.11b	1 Mbps	/
802.11g	6 Mbps	/
802.11n (HT 20)	MCS0 (6.5 Mbps)	/
802.11n (HT 40)	MCS0 (13.5 Mbps)	/
802.11ax (HE 20)	MCS0 (8 Mbps)	/
802.11ax (HE 40)	MCS0 (16 Mbps)	/





## 4 Test results and Measurement Data

### 4.1 Antenna Requirement

<b>Standard requirement:</b>	47 CFR Part 15C Section 15.203 /247(b)
<p>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.</p> <p>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.</p>	
<p>The antenna is PCB Antenna on the main PCB and no consideration of replacement.          The best case gain of the antenna is 2dBi (Ant0). *</p> <p><i>*Note:          The antenna gain are derived from the gain information report provided by the manufacturer.</i></p> <p><i>Remark:          As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.</i></p>	



### 4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10-2020 Section 6.2		
Test Frequency Range:	150kHz to 30MHz		
Receiver Setup:	RBW = 9kHz, VBW = 30kHz		
Limit:	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:	<p>1) The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>2) 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.</p> <p>3) 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,</p> <p>4) 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. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10-2020 on conducted measurement.</p>		



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<p>Test Setup:</p>	
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.              Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>Refer to section 3.7 for details.              Only the worst case is recorded in the report.</p>
<p>Instruments Used:</p>	<p>Refer to section 6 for details.</p>
<p>Test Results:</p>	<p>Pass</p>

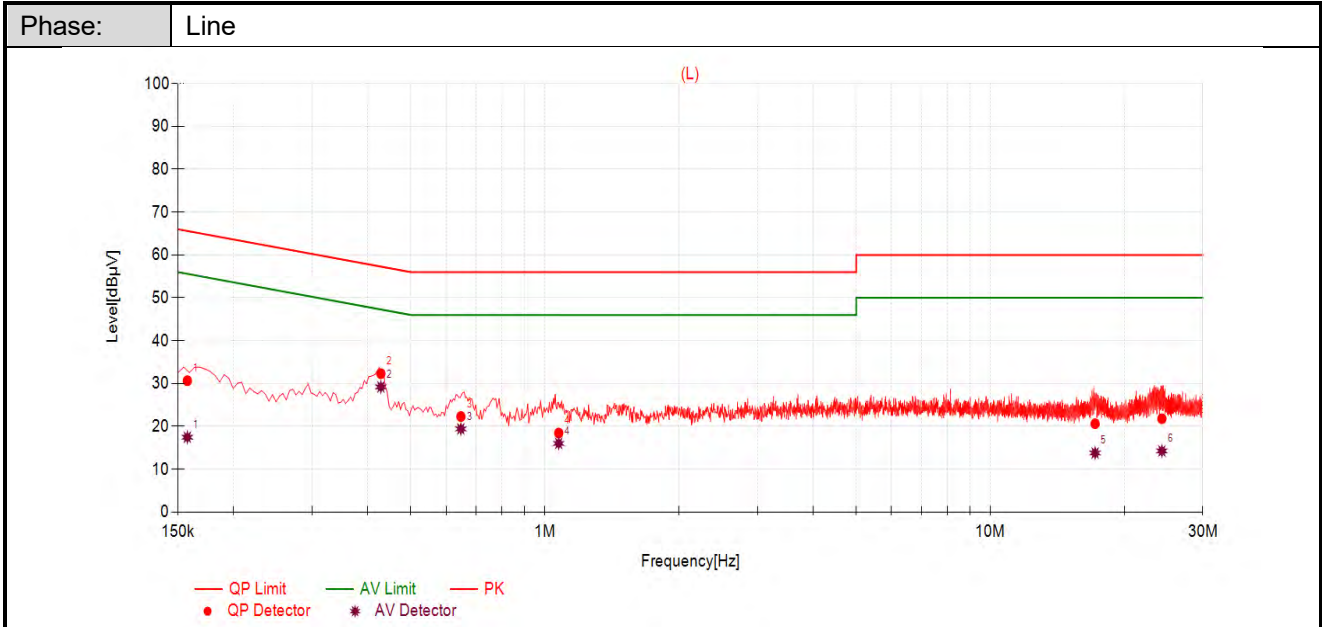


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Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.



Data List											
NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.1574	9.86	20.81	30.67	65.60	34.93	7.62	17.48	55.60	38.12	PASS
2	0.4282	9.86	22.45	32.31	57.29	24.98	19.36	29.22	47.29	18.07	PASS
3	0.6474	9.93	12.39	22.32	56.00	33.68	9.48	19.41	46.00	26.59	PASS
4	1.0738	9.84	8.62	18.46	56.00	37.54	6.19	16.03	46.00	29.97	PASS
5	17.1968	10.25	10.39	20.64	60.00	39.36	3.54	13.79	50.00	36.21	PASS
6	24.2876	10.27	11.53	21.80	60.00	38.20	4.01	14.28	50.00	35.72	PASS

Remark:

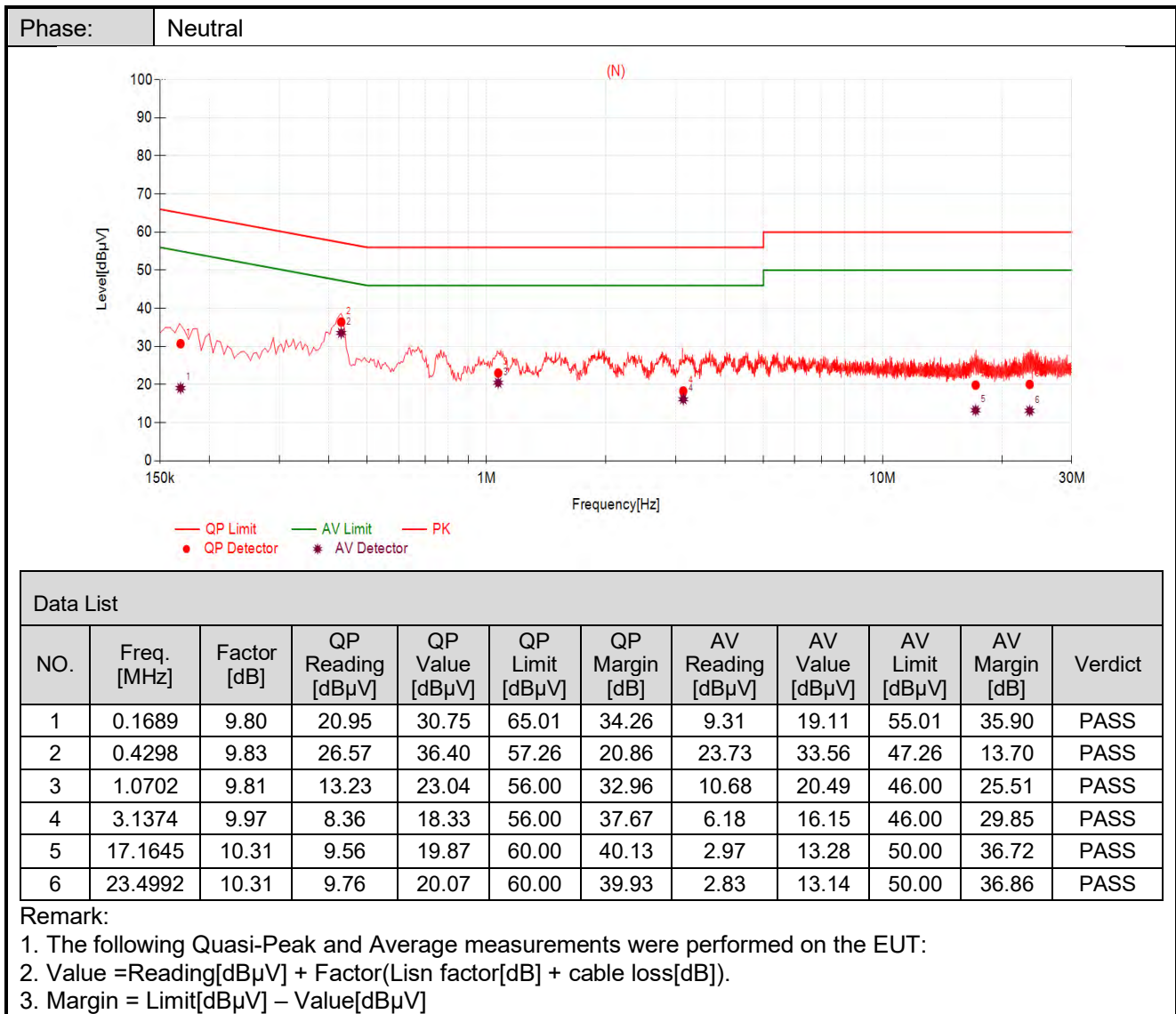
- The following Quasi-Peak and Average measurements were performed on the EUT:
- Value = Reading [dBµV] + Factor (Lisn factor [dB] + cable loss [dB]).
- Margin = Limit [dBµV] – Value [dBµV]



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### 4.3 Duty Cycle

The detailed test data see: **Appendix**

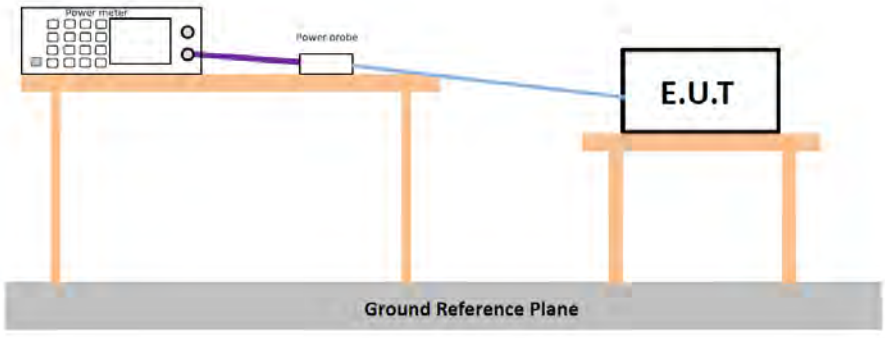


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### 4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10-2020 Section 11.9.1.2
Test Setup:	 <p>* Test with power meter (Detector function: Peak)</p>
Test Instruments:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	30dBm
Test Results:	Pass
The detailed test data see: <b>Appendix</b>	



### 4.5 DTS (6 dB) Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10-2020 Section 11.8 Option 2 / 6.9.3
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	≥ 500 kHz
Test Results:	Pass
The detailed test data see: <b>Appendix</b>	



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### 4.6 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10-2020 Section 11.10.2
Test Setup:	
Test Instruments:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	≤8.00dBm/3kHz
Test Results:	Pass
The detailed test data see: <b>Appendix</b>	





### 4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10-2020 Section 11.11
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
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, based on either an RF conducted or a radiated measurement.
Test Results:	Pass
The detailed test data see: <b>Appendix</b>	





### 4.8 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10-2020 Section 11.11
Test Setup:	
Instruments Used:	Refer to section 6 for details.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
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, based on either an RF conducted or a radiated measurement.
Test Results:	Pass
The detailed test data see: <b>Appendix</b>	



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### 4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10-2020 Section 11.12				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Test Frequency:	9kHz ~ 25GHz				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak	
	Peak	1MHz	3MHz	Peak	
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/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	54.0	Average	3
<p>Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.</p>					



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Test Setup:

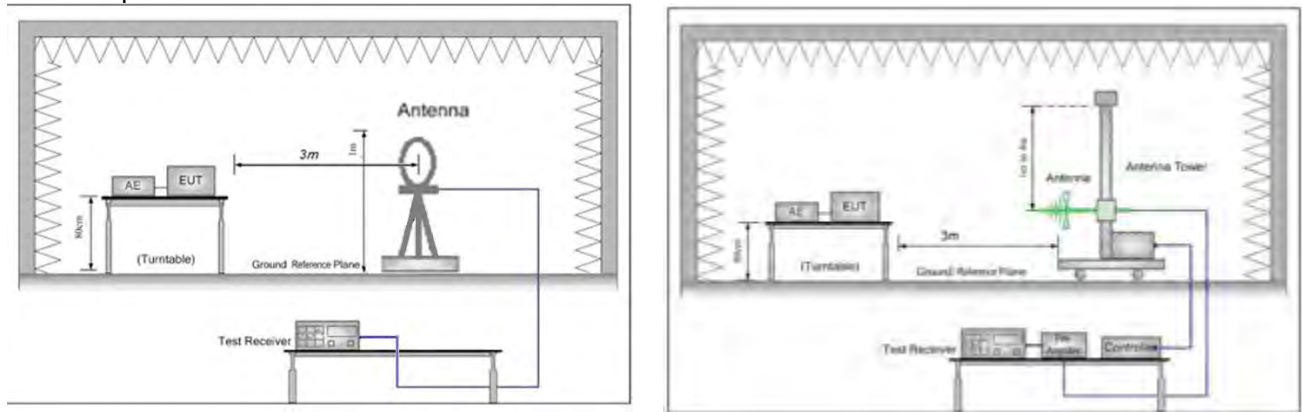


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

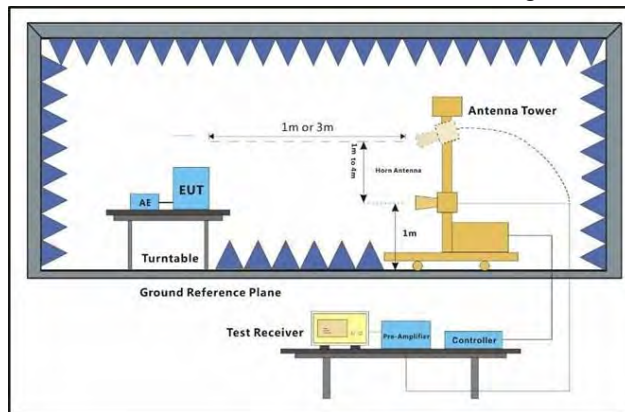


Figure 3. Above 1 GHz

Test Procedure:

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation (Distance from antenna to EUT is 1m for measurements >18GHz).
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test





	<p>frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</p> <p>f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>g. Test the EUT in the lowest channel, the middle channel ,the Highest channel.</p> <p>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case.</p> <p>i. Repeat above procedures until all frequencies measured was complete.</p> <p>j. The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported</p> <p>k. The disturbance above 18GHz was very low, and the harmonics were the highest point could be found when testing, so only the harmonics had been displayed.</p> <p>l. At a measurement distance of 1 meter the limit line was increased by <math>20 \cdot \text{LOG}(3/1) = 9.54 \text{ dB}</math>.</p>
<p>Test Configuration:</p>	<p>Measurements below 30MHz</p> <ul style="list-style-type: none"> <li>• RBW = 10 kHz</li> <li>• VBW = 30 kHz</li> <li>• Detector = Peak &amp; Average &amp; Quasi-peak</li> <li>• Trace mode = max hold</li> </ul> <p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 120 kHz</li> <li>• VBW = 300 kHz</li> <li>• Detector = Quasi-peak</li> <li>• Trace mode = max hold</li> </ul> <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW <math>\geq</math> 3 MHz</li> <li>• Detector = Peak</li> <li>• Sweep time = auto</li> <li>• Trace mode = max hold</li> </ul> <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW = 10 Hz, when duty cycle is no less than 98 percent.</li> <li>• VBW <math>\geq</math> 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.</li> </ul>
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates.          Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>Refer to section 3.7 for details.</p>
<p>Instruments Used:</p>	<p>Refer to section 6 for details.</p>





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Test Results:	Pass
The detailed test data see: <b>Appendix</b>	



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### 4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10-2020 Section 11.12		
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
Above 1GHz		54.0	Average Value
		74.0	Peak Value

Test Setup:

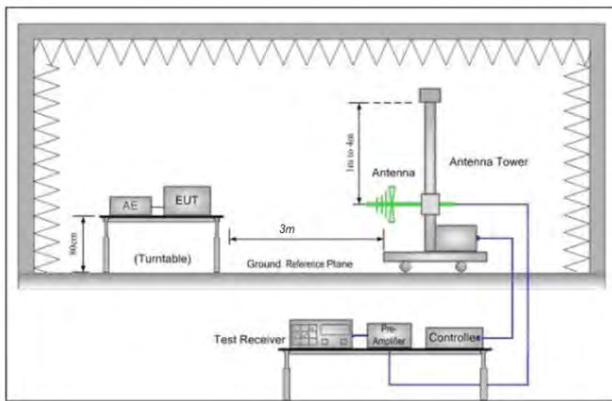


Figure 1. 30MHz to 1GHz

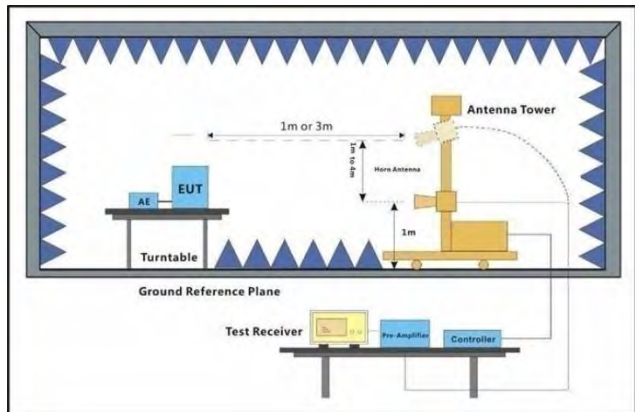


Figure 2. Above 1 GHz



<p>Test Procedure:</p>	<ol style="list-style-type: none"> <li>For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>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.</li> <li>The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel</li> <li>Test the EUT in the lowest channel , the Highest channel</li> <li>The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case.</li> <li>Repeat above procedures until all frequencies measured was complete.</li> </ol>
<p>Test Configuration:</p>	<p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 120 kHz</li> <li>• VBW = 300 kHz</li> <li>• Detector = Quasi-peak</li> <li>• Trace mode = max hold</li> </ul> <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW ≥ 3 MHz</li> <li>• Detector = Peak</li> <li>• Sweep time = auto</li> <li>• Trace mode = max hold</li> </ul> <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none"> <li>• RBW = 1 MHz</li> <li>• VBW = 10 Hz, when duty cycle is no less than 98 percent.</li> <li>• 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.</li> </ul>
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates.        Charge + Transmitting mode.</p>



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Final Test Mode:	Refer to section 3.7 for details.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass
The detailed test data see: <b>Appendix</b>	



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## 5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$ GHz
2	Duty cycle	$\pm 0.37\%$
3	Occupied Bandwidth	$\pm 0.2\%$
4	RF conducted power	$\pm 0.21$ dB
5	RF power density	$\pm 2.84$ dB
6	Conducted Spurious emissions	$\pm 0.75$ dB
7	Conduction Emission	$\pm 3.0$ dB (150kHz to 30MHz)
8	Radiated Emission	$\pm 4.6$ dB (9kHz to 30MHz)
		$\pm 4.9$ dB (30MHz to 1GHz)
		$\pm 4.9$ dB (1GHz to 6GHz)
		$\pm 4.7$ dB (6GHz to 18GHz)
		$\pm 5.26$ dB (Above 18GHz)

**Remark:**

The  $U_{lab}$  (lab Uncertainty) is less than  $U_{CISPR/ETSI}$  (CISPR/ETSI Uncertainty), so the test results  
 – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;  
 – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.





## 6 Equipment List

RF Test System					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)
MXA signal analyzer	Agilent	N9020A	XAW01-06-07	2023/02/16	2024/02/15
MXG vector signal Generator	Agilent	N5182B	XAW01-07-16	2023/02/16	2024/02/15
Measurement Software	Tonscend	JS1120-3 (3.2.18)	XAW02-14-01	NCR	NCR
RF control unit	Tonscend	JS0806-2	XAW03-37-01	NCR	NCR
Power Meter	Anritsu	ML2495A	XAW01-25-03	2023/02/16	2024/02/15
Power Supply	Agilent	66311b	XAW01-17-01	2023/02/16	2024/02/15
Temperature and humidity meter	MingGao	T809	XAW01-01-16	2022/09/18	2023/09/17

CE Test System					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)
Shielding Room	Brilliant-emc	N/A	XAW04-03-01	N/A	N/A
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-01	2022/09/08	2023/09/07
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2022/06/30	2023/06/29
Temperature and humidity meter	MingGao	TH101B	XAW01-01-02	2022/09/18	2023/09/17
Measurement Software	Tonscend	TS+ V4.0.0.0	XAW02-07-01	NCR	NCR
Radio communication analyzer	ROHDE&SCHWARZ	CMW 500	XAW01-03-02	2023/02/16	2024/02/15
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-02	2022/06/30	2023/06/29



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RSE Test System					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/d)	Cal.Due date (yyyy/mm/d)
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2021/09/09	2024/09/08
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2023/02/16	2024/02/15
Spectrum Analyzer	ROHDE &SCHWARZ	FSV3044	XAW01-13-05	2023/05/15	2024/05/14
Test receiver	ROHDE &SCHWARZ	ESR	XAW01-08-01	2022/09/08	2023/09/07
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2022/07/28	2024/07/27
Receiving antenna(1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2022/07/28	2024/07/27
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2022/07/23	2024/07/22
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP9K3G32	XAW01-41-01	2023/05/15	2024/05/14
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2022/09/14	2023/09/13
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2022/09/14	2023/09/13
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2022/09/14	2023/09/13
Temperature and humidity meter	MingGao	TH101B	XAW01-01-02	2022/09/18	2023/09/17
Radio communication analyzer	ROHDE&SCHWARZ	CMW 500	XAW01-03-02	2023/02/16	2024/02/15
Measurement Software	Tonscend	TS+ V4.0.0.0	XAW02-05-01	NCR	NCR
Loop Antenna	Schwarzbeck	FMZB 1519B	XAW01-48-02	2022/05/26	2024/05/25



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## 7 Photographs - Setup Photos

Refer to Appendix A.2 WLAN Setup Photos.



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# Appendix



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**DTS Bandwidth  
Test Result**

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11b	Ant0	2412	7.560	2408.440	2416.000	0.5	PASS
		2437	7.560	2433.000	2440.560	0.5	PASS
		2462	7.600	2458.440	2466.040	0.5	PASS
11g	Ant0	2412	16.320	2403.840	2420.160	0.5	PASS
		2437	16.360	2428.800	2445.160	0.5	PASS
		2462	16.320	2453.840	2470.160	0.5	PASS
11n20SISO	Ant0	2412	17.600	2403.200	2420.800	0.5	PASS
		2437	16.640	2428.200	2444.840	0.5	PASS
		2462	17.600	2453.200	2470.800	0.5	PASS
11n40SISO	Ant0	2422	36.080	2403.840	2439.920	0.5	PASS
		2437	36.000	2418.840	2454.840	0.5	PASS
		2452	36.320	2433.840	2470.160	0.5	PASS
11ax20SISO	Ant0	2412	18.960	2402.560	2421.520	0.5	PASS
		2437	18.760	2427.560	2446.320	0.5	PASS
		2462	18.920	2452.560	2471.480	0.5	PASS
11ax40SISO	Ant0	2422	37.680	2403.200	2440.880	0.5	PASS
		2437	37.040	2418.200	2455.240	0.5	PASS
		2452	37.920	2432.960	2470.880	0.5	PASS



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Test Graphs



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11b\_Ant0\_2462



11g\_Ant0\_2412



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11n20SISO\_Ant0\_2412



11n20SISO\_Ant0\_2437



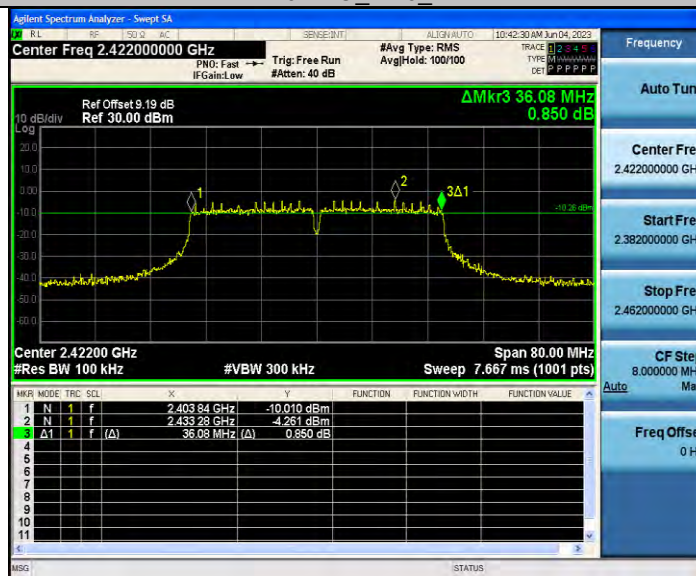
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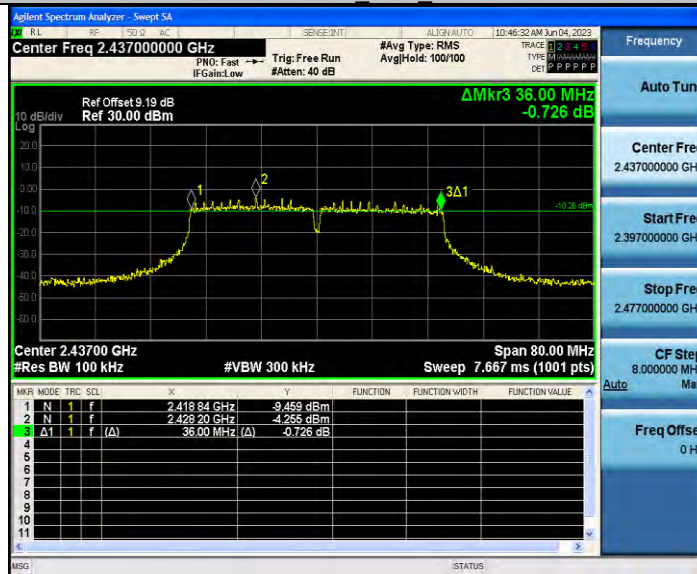


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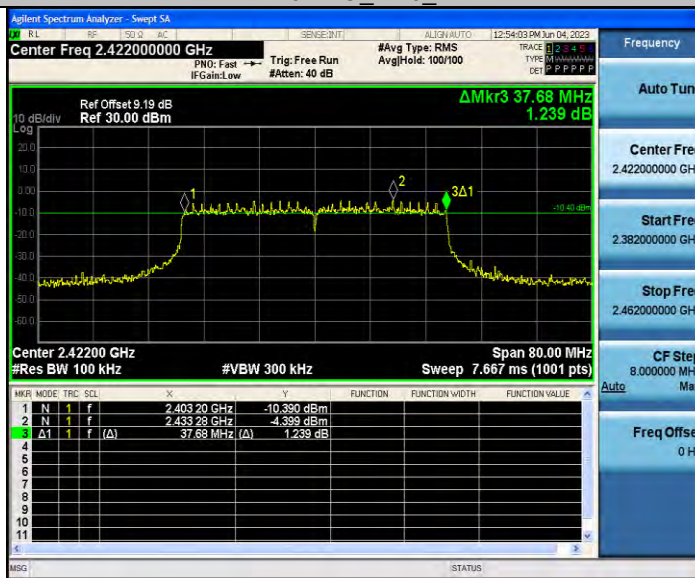


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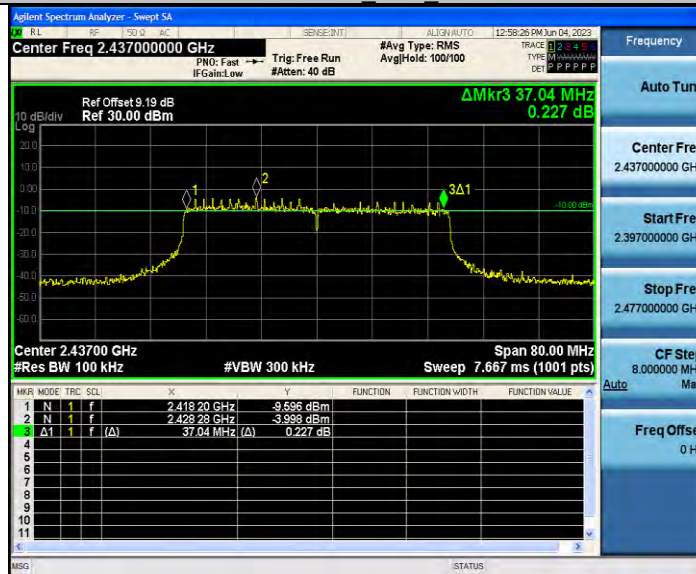
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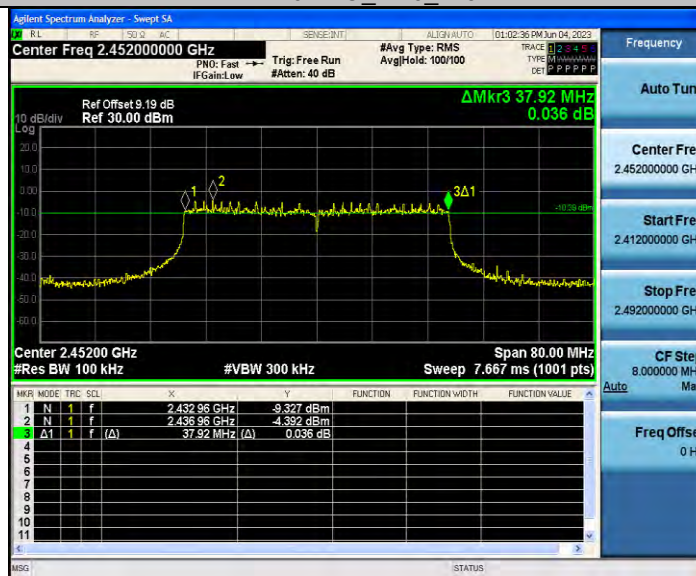
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11ax40SISO\_Ant0\_2437



11ax40SISO\_Ant0\_2452



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### Occupied Channel Bandwidth Test Result

TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
11b	Ant0	2412	12.670	2405.7304	2418.4004	For Report Purpose
		2437	12.413	2430.7074	2443.1204	
		2462	12.443	2455.8399	2468.2829	
11g	Ant0	2412	17.924	2403.1476	2421.0716	
		2437	17.770	2427.9816	2445.7516	
		2462	17.761	2453.1931	2470.9541	
11n20SISO	Ant0	2412	19.031	2402.5290	2421.5600	
		2437	18.911	2427.3247	2446.2357	
		2462	18.755	2452.6385	2471.3935	
11n40SISO	Ant0	2422	37.303	2403.3954	2440.6984	
		2437	37.120	2418.3998	2455.5198	
		2452	37.641	2433.1713	2470.8123	
11ax20SISO	Ant0	2412	19.607	2402.2728	2421.8798	
		2437	19.677	2427.1535	2446.8305	
		2462	19.666	2452.2339	2471.8999	
11ax40SISO	Ant0	2422	38.270	2402.8203	2441.0903	
		2437	38.317	2417.7262	2456.0432	
		2452	38.597	2432.5795	2471.1765	



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 Rev.: 01  
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Test Graphs



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11b\_Ant0\_2462



11g\_Ant0\_2412



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**Maximum conducted output power  
 Test Result Peak**

TestMode	Antenna	Frequency[MHz]	Peak Power[dBm]	Conducted Limit[dBm]	Verdict
11b	Ant0	2412	18.31	≤30.00	PASS
		2437	18.16	≤30.00	PASS
		2462	18.23	≤30.00	PASS
11g	Ant0	2412	18.53	≤30.00	PASS
		2437	18.85	≤30.00	PASS
		2462	18.78	≤30.00	PASS
11n20SISO	Ant0	2412	18.78	≤30.00	PASS
		2437	19.00	≤30.00	PASS
		2462	18.98	≤30.00	PASS
11n40SISO	Ant0	2422	18.54	≤30.00	PASS
		2437	18.89	≤30.00	PASS
		2452	18.92	≤30.00	PASS
11ax20SISO	Ant0	2412	18.98	≤30.00	PASS
		2437	19.12	≤30.00	PASS
		2462	19.25	≤30.00	PASS
11ax40SISO	Ant0	2422	18.49	≤30.00	PASS
		2437	19.12	≤30.00	PASS
		2452	19.25	≤30.00	PASS



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### Maximum power spectral density Test Result

TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
11b	Ant0	2412	-6.05	≤8.00	PASS
		2437	-6.43	≤8.00	PASS
		2462	-5.68	≤8.00	PASS
11g	Ant0	2412	-15.09	≤8.00	PASS
		2437	-14.57	≤8.00	PASS
		2462	-14.23	≤8.00	PASS
11n20SISO	Ant0	2412	-14.94	≤8.00	PASS
		2437	-14.72	≤8.00	PASS
		2462	-14.09	≤8.00	PASS
11n40SISO	Ant0	2422	-17.86	≤8.00	PASS
		2437	-17.62	≤8.00	PASS
		2452	-18.13	≤8.00	PASS
11ax20SISO	Ant0	2412	-15.55	≤8.00	PASS
		2437	-15.49	≤8.00	PASS
		2462	-14.59	≤8.00	PASS
11ax40SISO	Ant0	2422	-19.23	≤8.00	PASS
		2437	-18.9	≤8.00	PASS
		2452	-20.26	≤8.00	PASS

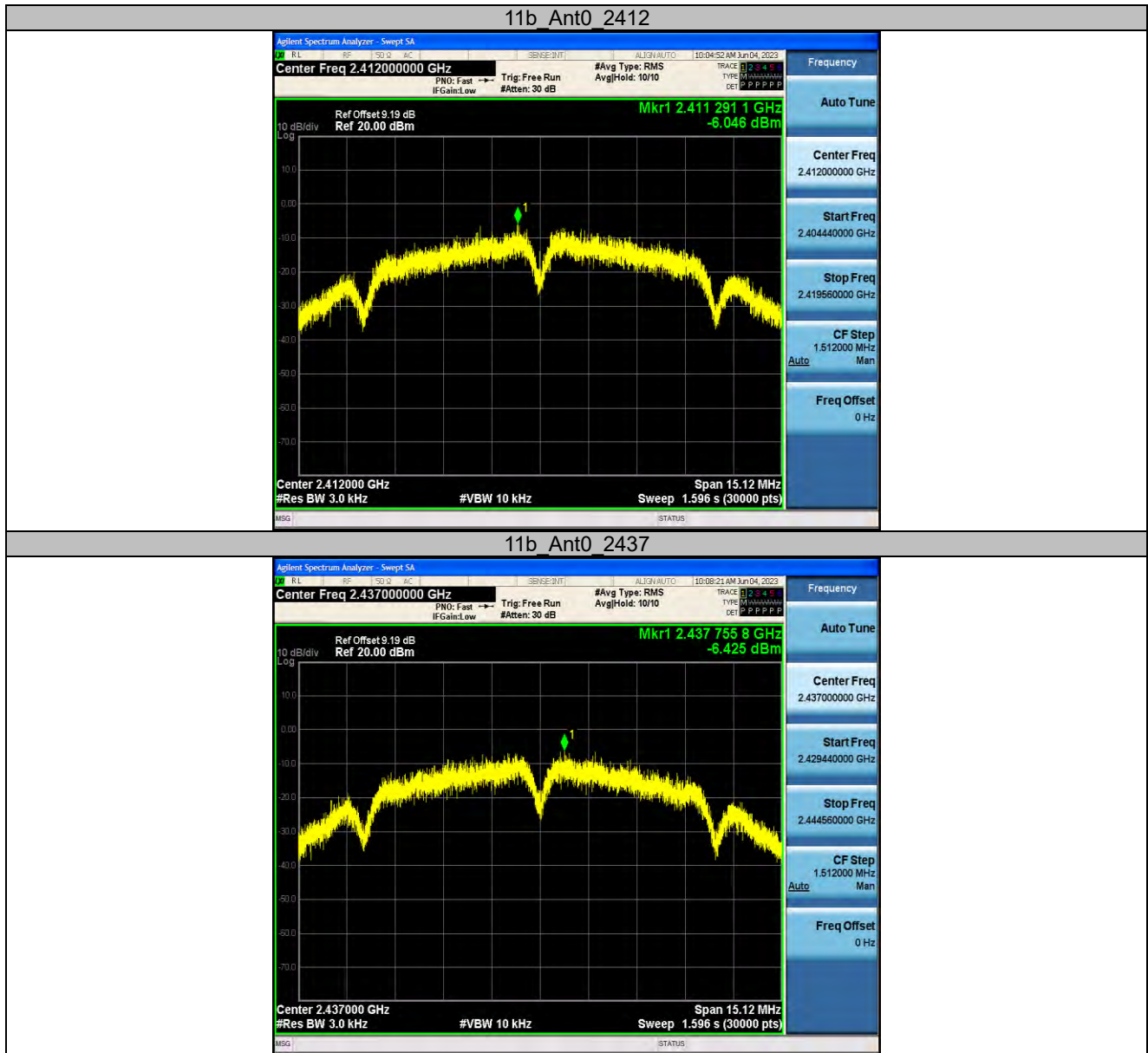


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Test Graphs



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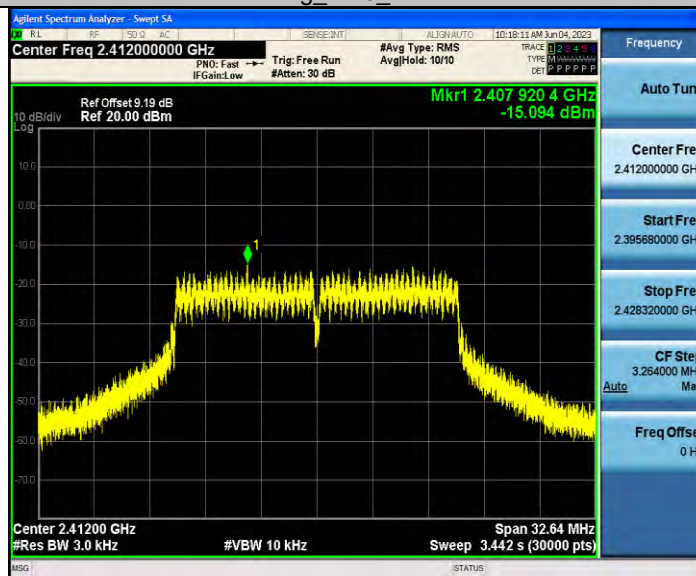
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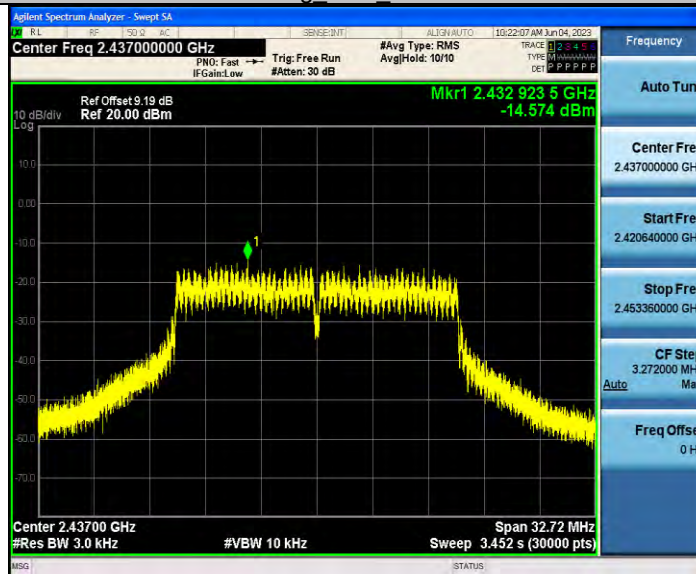
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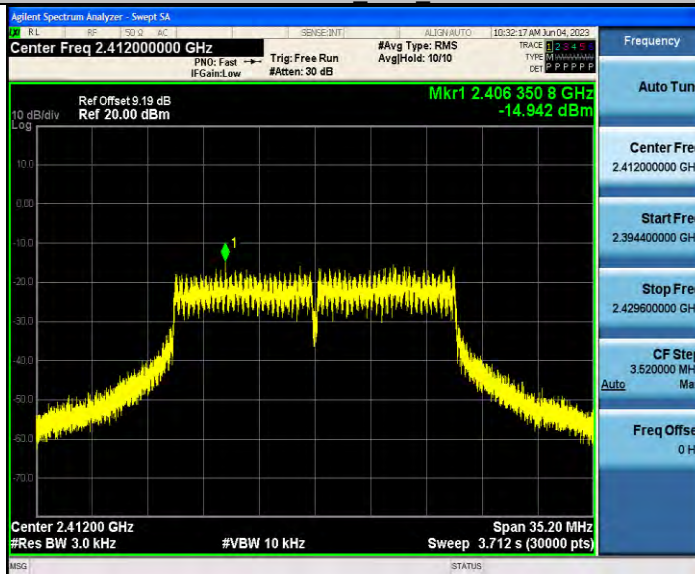


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11n20SISO\_Ant0\_2412



11n20SISO\_Ant0\_2437



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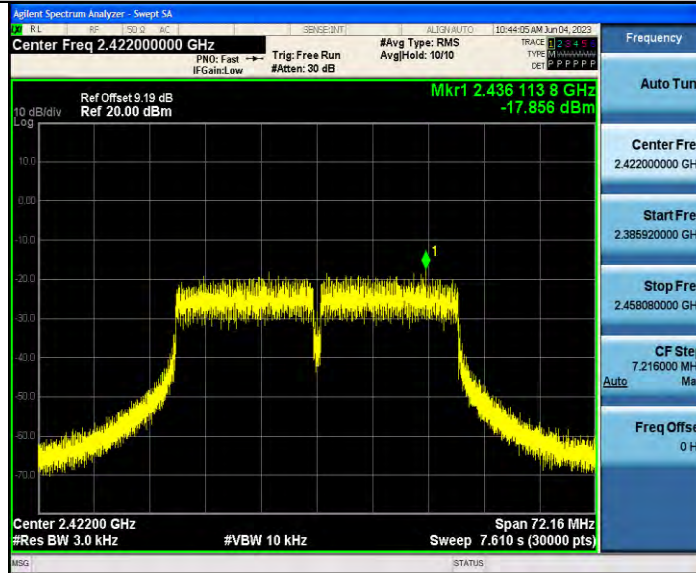
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11n20SISO\_Ant0\_2462

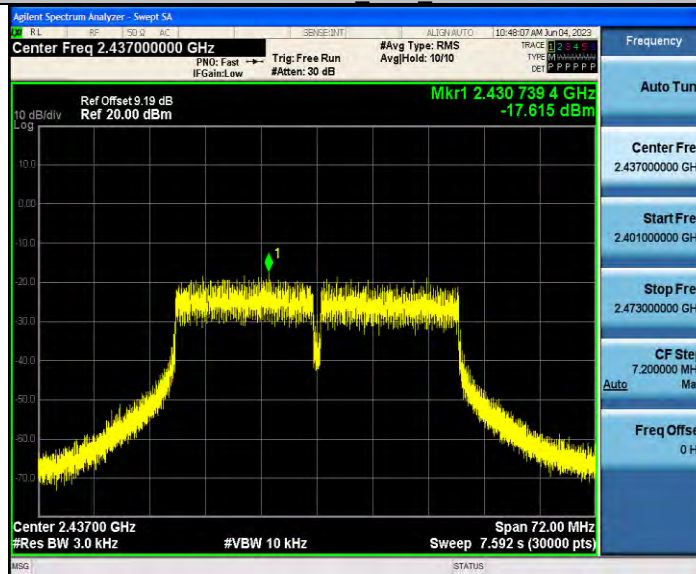


11n40SISO\_Ant0\_2422

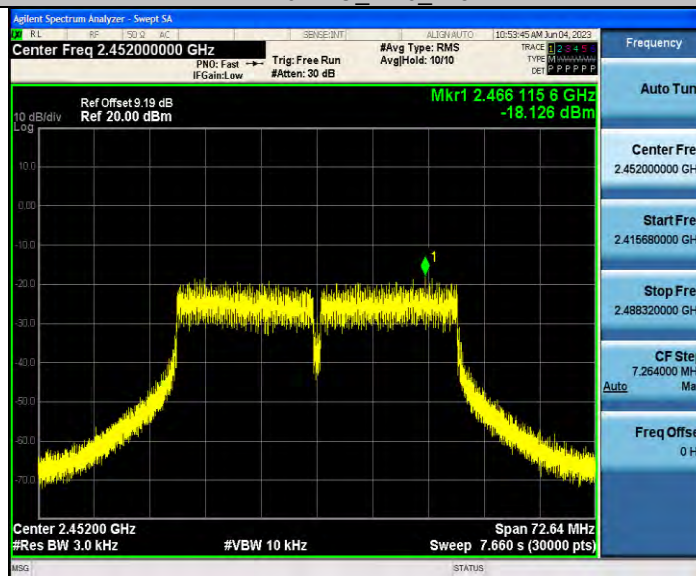


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11n40SISO\_Ant0\_2437



11n40SISO\_Ant0\_2452

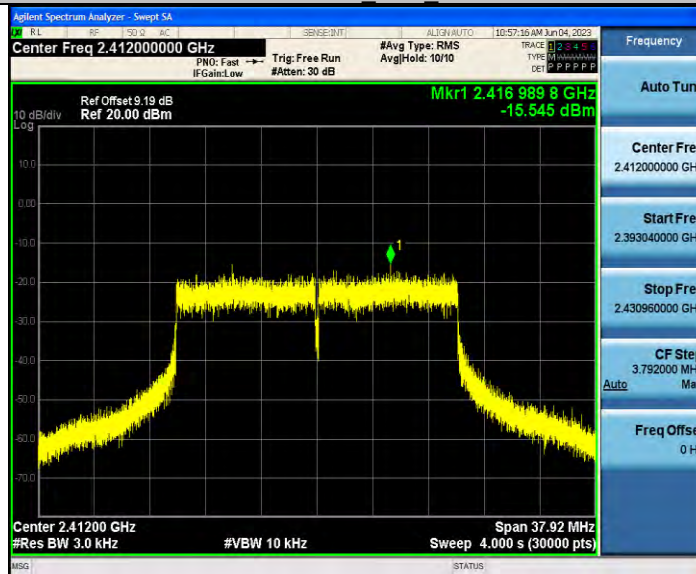


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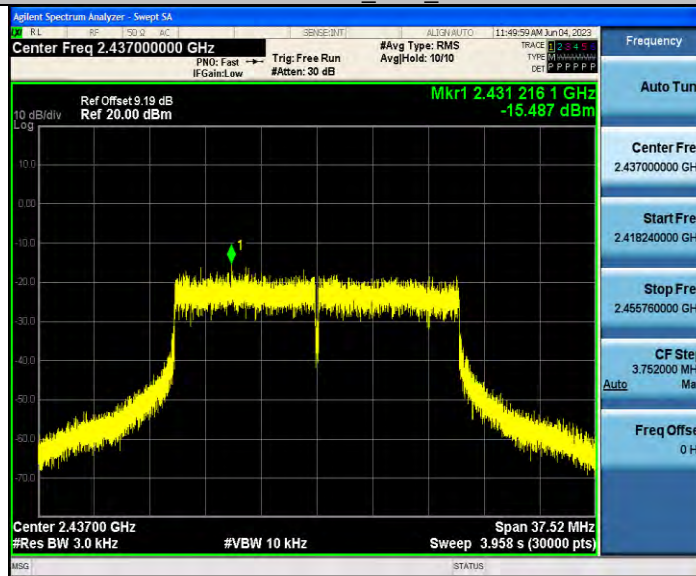
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11ax20SISO\_Ant0\_2412



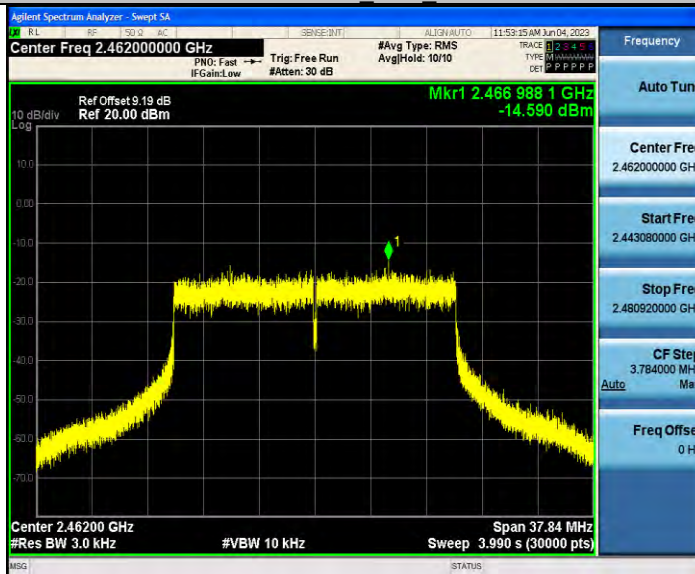
11ax20SISO\_Ant0\_2437



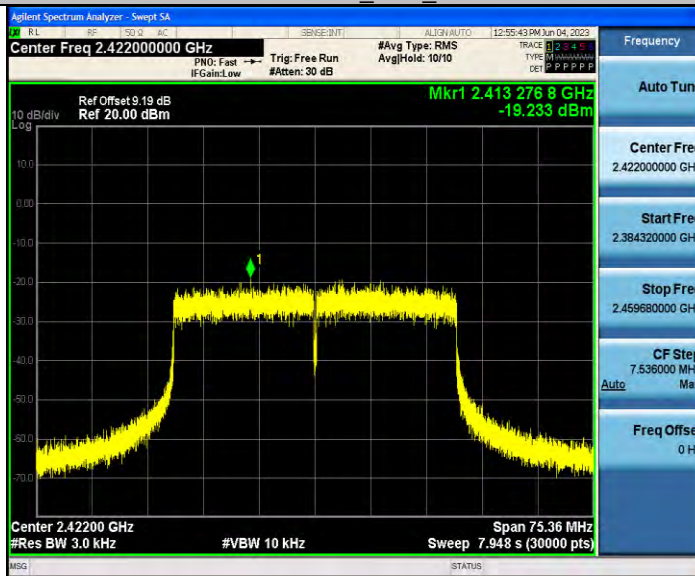
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11ax20SISO\_Ant0\_2462



11ax40SISO\_Ant0\_2422

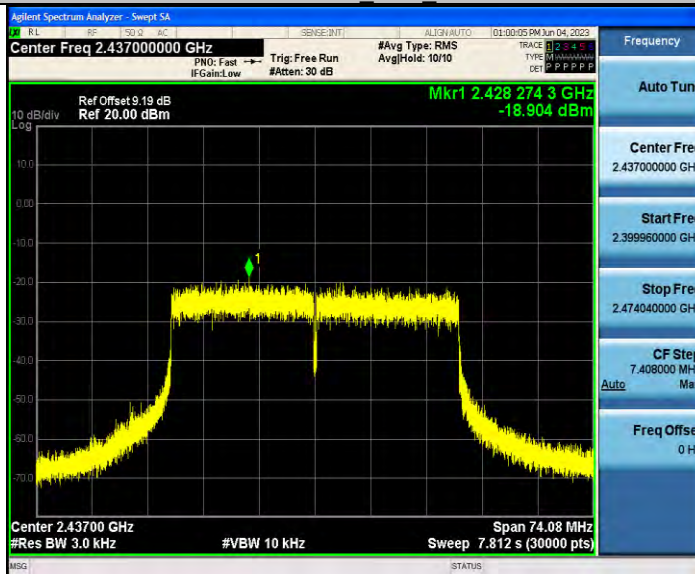


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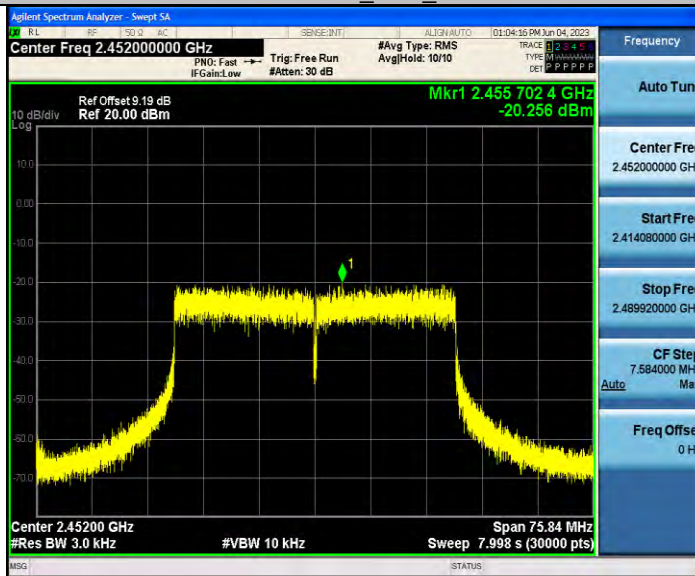
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11ax40SISO\_Ant0\_2437



11ax40SISO\_Ant0\_2452



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**Band edge measurements  
 Test Result**

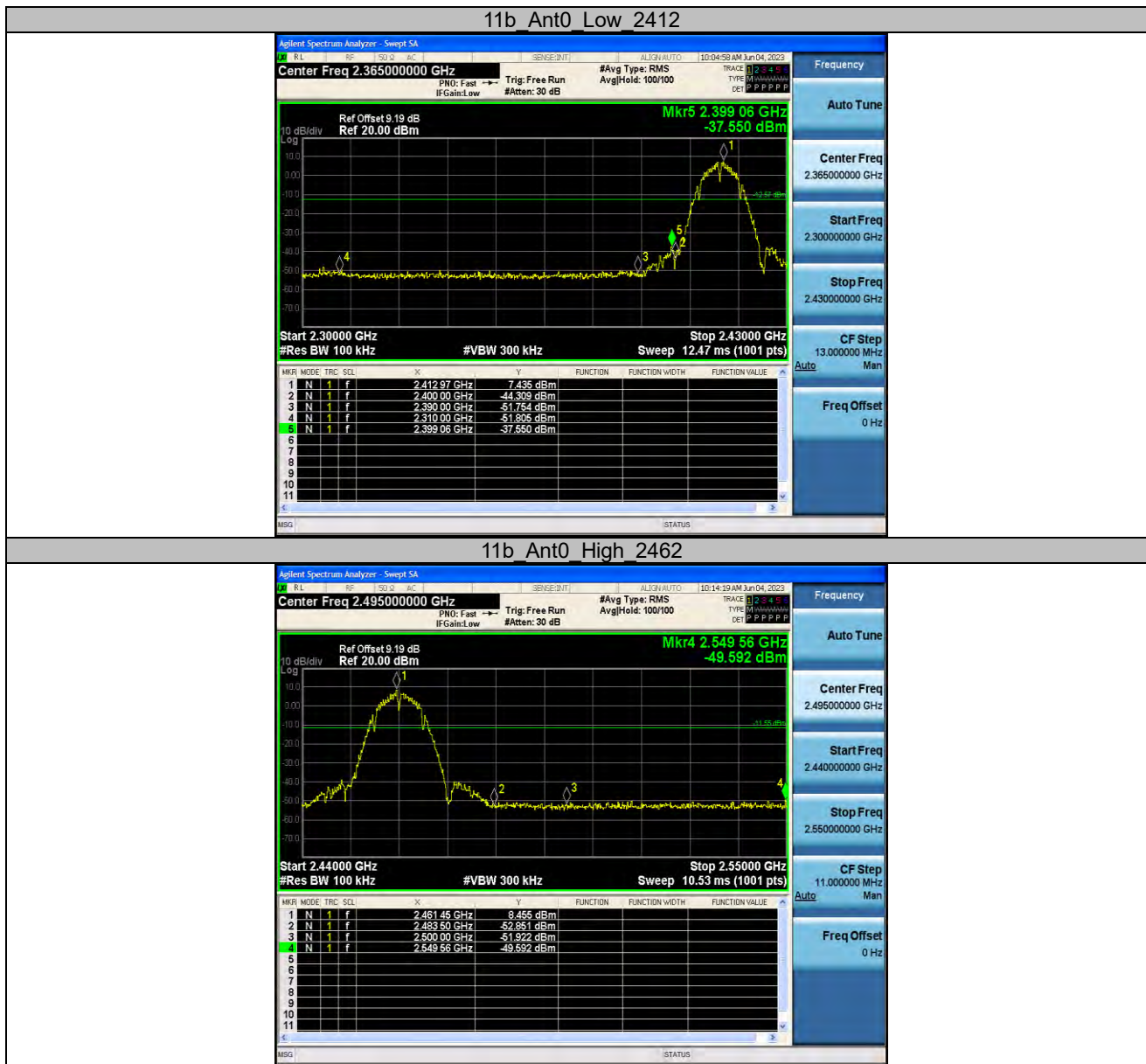
TestMode	Antenna	Channel	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11b	Ant0	Low	2412	7.44	-37.55	≤-12.57	PASS
		High	2462	8.46	-49.59	≤-11.55	PASS
11g	Ant0	Low	2412	-1.59	-31.16	≤-21.59	PASS
		High	2462	-0.76	-45.27	≤-20.76	PASS
11n20SISO	Ant0	Low	2412	-1.90	-30.02	≤-21.9	PASS
		High	2462	-1.04	-45.94	≤-21.04	PASS
11n40SISO	Ant0	Low	2422	-4.47	-33.88	≤-24.47	PASS
		High	2452	-4.60	-44.31	≤-24.6	PASS
11ax20SISO	Ant0	Low	2412	-1.67	-29.56	≤-21.67	PASS
		High	2462	-1.16	-44.23	≤-21.16	PASS
11ax40SISO	Ant0	Low	2422	-4.51	-35.14	≤-24.51	PASS
		High	2452	-4.98	-45.21	≤-24.98	PASS



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Test Graphs



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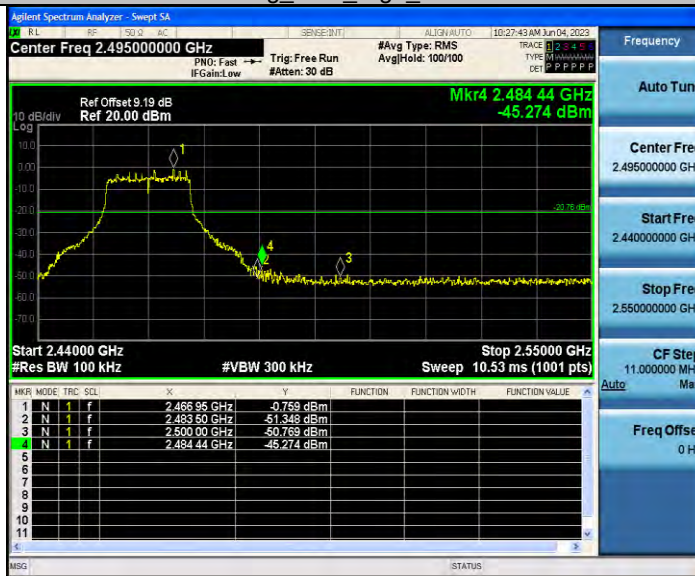
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11g\_Ant0\_Low\_2412



11g\_Ant0\_High\_2462



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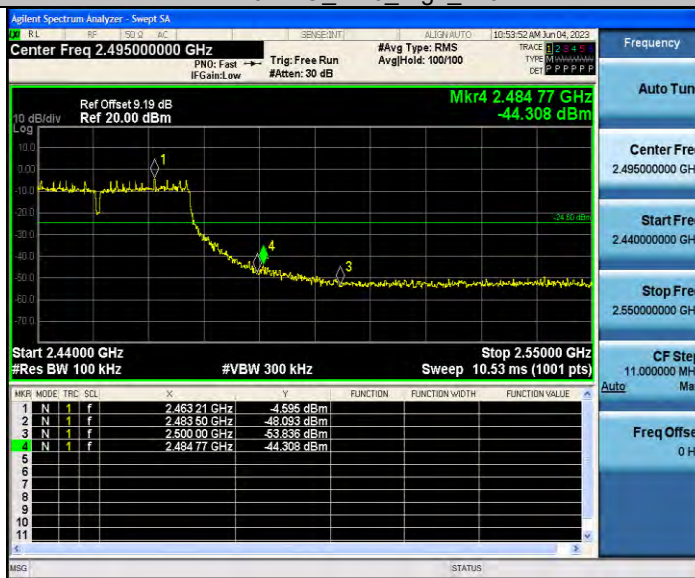
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### Conducted Spurious Emission Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11b	Ant0	2412	Reference	6.68	6.68	---	PASS
			30~1000	6.68	-59	≤-13.32	PASS
			1000~26500	6.68	-45.09	≤-13.32	PASS
		2437	Reference	6.08	6.08	---	PASS
			30~1000	6.08	-60.2	≤-13.92	PASS
			1000~26500	6.08	-45.89	≤-13.92	PASS
		2462	Reference	7.04	7.04	---	PASS
			30~1000	7.04	-59.32	≤-12.96	PASS
			1000~26500	7.04	-46.05	≤-12.96	PASS
11g	Ant0	2412	Reference	-1.80	-1.80	---	PASS
			30~1000	-1.80	-60.12	≤-21.8	PASS
			1000~26500	-1.80	-44.55	≤-21.8	PASS
		2437	Reference	-1.92	-1.92	---	PASS
			30~1000	-1.92	-58.64	≤-21.92	PASS
			1000~26500	-1.92	-45.16	≤-21.92	PASS
		2462	Reference	-1.49	-1.49	---	PASS
			30~1000	-1.49	-60.21	≤-21.49	PASS
			1000~26500	-1.49	-45.74	≤-21.49	PASS
11n20SISO	Ant0	2412	Reference	-1.96	-1.96	---	PASS
			30~1000	-1.96	-60.72	≤-21.96	PASS
			1000~26500	-1.96	-45.87	≤-21.96	PASS
		2437	Reference	-3.55	-3.55	---	PASS
			30~1000	-3.55	-59.83	≤-23.55	PASS
			1000~26500	-3.55	-46.58	≤-23.55	PASS
		2462	Reference	-1.28	-1.28	---	PASS
			30~1000	-1.28	-60.6	≤-21.28	PASS
			1000~26500	-1.28	-45.4	≤-21.28	PASS
11n40SISO	Ant0	2422	Reference	-4.39	-4.39	---	PASS
			30~1000	-4.39	-60.1	≤-24.39	PASS
			1000~26500	-4.39	-45.45	≤-24.39	PASS
		2437	Reference	-4.48	-4.48	---	PASS
			30~1000	-4.48	-60.67	≤-24.48	PASS
			1000~26500	-4.48	-45.3	≤-24.48	PASS
		2452	Reference	-5.16	-5.16	---	PASS
			30~1000	-5.16	-60.68	≤-25.16	PASS
			1000~26500	-5.16	-45.14	≤-25.16	PASS
11ax20SISO	Ant0	2412	Reference	-3.44	-3.44	---	PASS
			30~1000	-3.44	-60.48	≤-23.44	PASS
			1000~26500	-3.44	-44.2	≤-23.44	PASS
		2437	Reference	-2.85	-2.85	---	PASS
			30~1000	-2.85	-60.39	≤-22.85	PASS
			1000~26500	-2.85	-45.91	≤-22.85	PASS
		2462	Reference	-4.20	-4.20	---	PASS
			30~1000	-4.20	-60.53	≤-24.2	PASS
			1000~26500	-4.20	-46	≤-24.2	PASS
11ax40SISO	Ant0	2422	Reference	-4.52	-4.52	---	PASS
			30~1000	-4.52	-60.49	≤-24.52	PASS
			1000~26500	-4.52	-44.69	≤-24.52	PASS



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Rev.: 01

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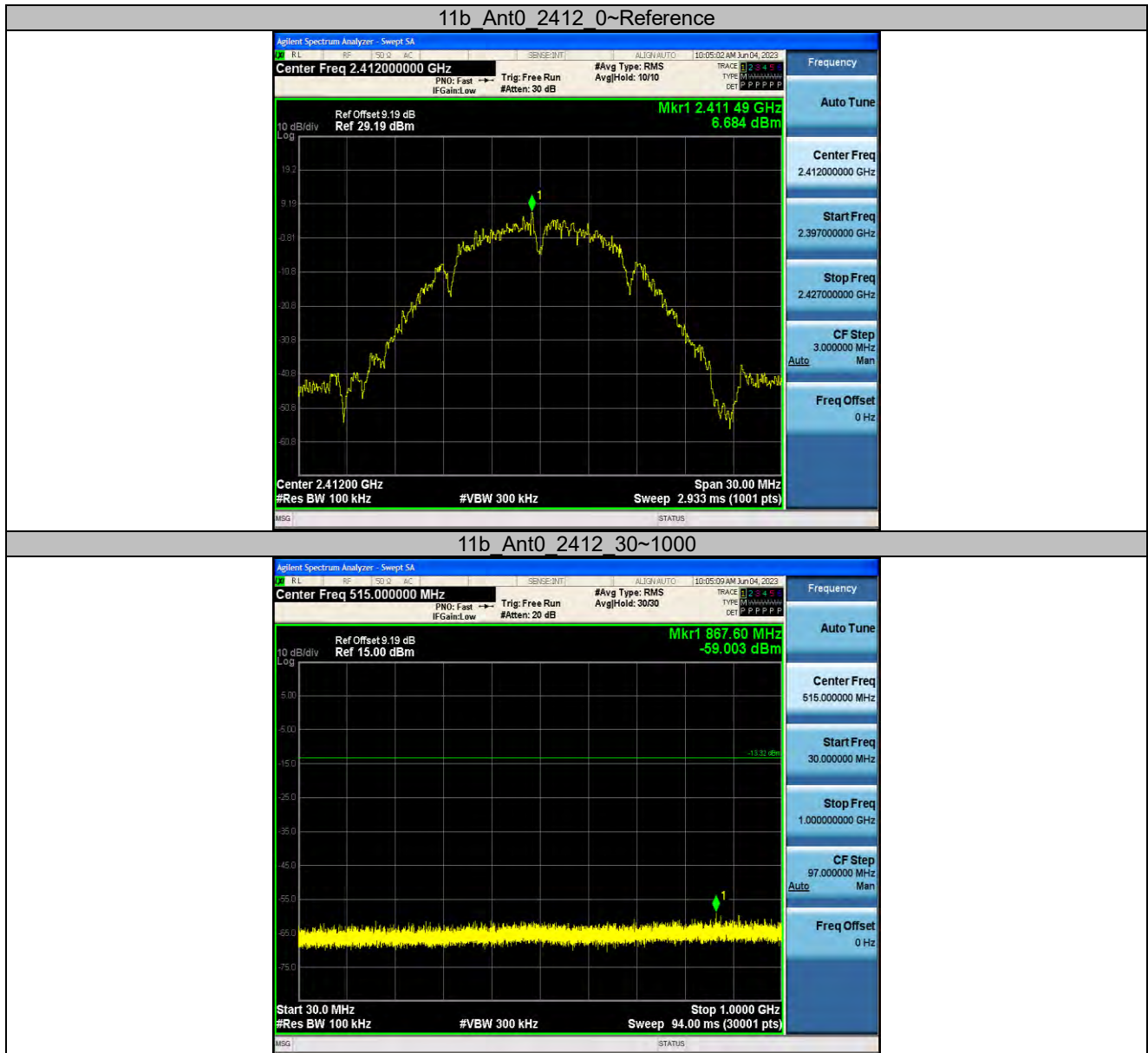
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		2452	Reference	-4.39	-4.39	---	PASS
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			1000~26500	-4.39	-45.35	≤-24.39	PASS



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Test Graphs



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11b Ant0 2412\_1000~26500



11b Ant0 2437\_0~Reference



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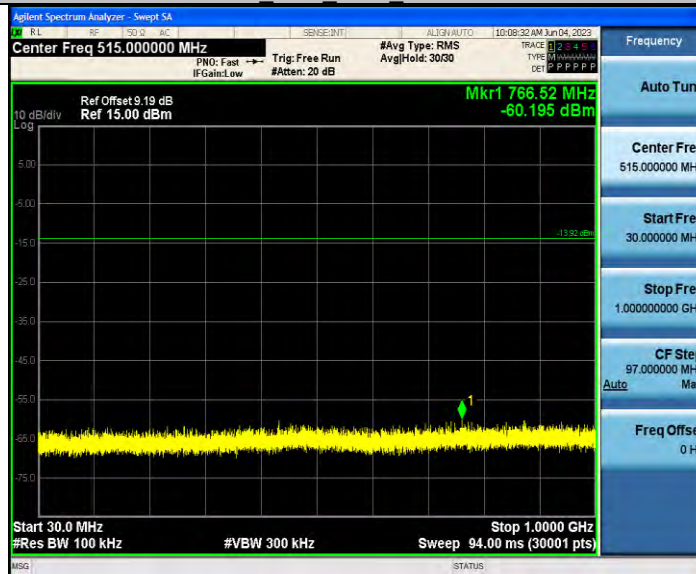
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11b Ant0\_2437\_30~1000



11b Ant0\_2437\_1000~26500

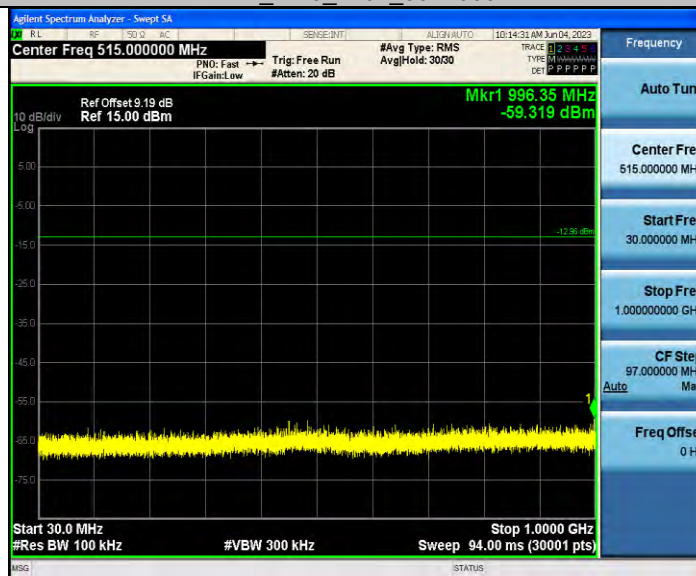


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11b\_Ant0\_2462\_0~Reference



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11g\_Ant0\_2412\_0~Reference

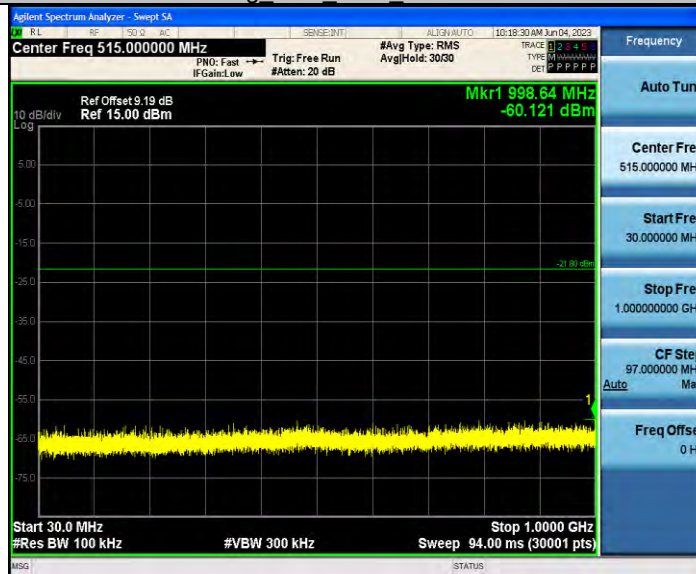


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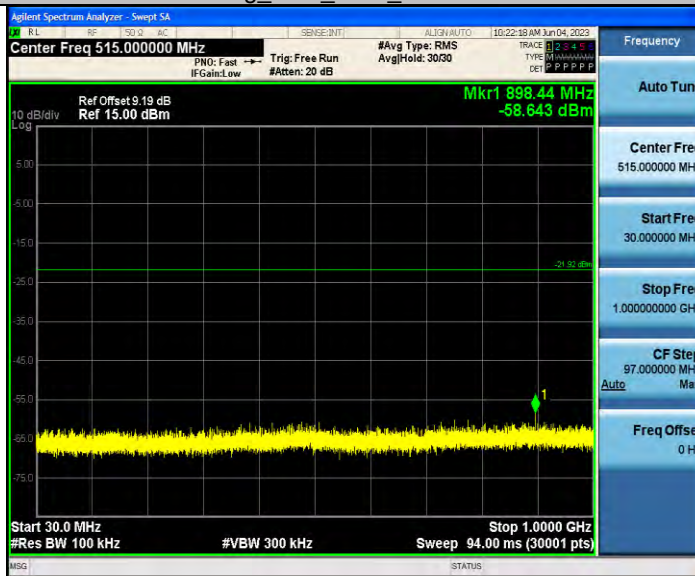


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