Report No.: ZEWM2306000826RG03

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## TEST REPORT

**Application No.:** ZEWM2306000826RG

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 200233, China

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 200233, China

**EUT Description: Smart Module** SG368Z-WF Model No.:

Trade Mark: Quectel

FCC ID: XMR2023SG368ZWF

Standards: FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

**Date of Receipt:** 2023/06/20

Date of Test: 2023/06/20 to 2023/07/07

Date of Issue: 2023/07/07

PASS \* Test Result:

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

Authorized Signature:

Ervh Ii

Ervin Li Regulatory Manager



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# SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

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## Version

Revision Record					
Version	Chapter	Date	Modifier	Remark	
01		2023/07/07		Original	

Prepared By	Dee.Zheng  (Dee Zheng) / Test Engineer
Checked By	Daniel Wang  (Daniel Wang) / Reviewer



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## **Test Summary**

Test Item	FCC Rule No.	Test Method	Test Result	Result	Test Lab <sup>[1]</sup>
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	В
Duty Cycle			Clause 4.3	For Report Purpose	А
Conducted Output Power	15.247 (b)(3)	ANSI C63.10-2020 Section 11.9.1.2	Clause 4.4	PASS	Α
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	А
Power Spectral Density	15.247 (e)	ANSI C63.10-2020 Section 11.10.2	Clause 4.6	PASS	Α
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.7	PASS	Α
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.8	PASS	Α
Radiated Spurious Emissions	15.247(d);15.205/15.209	ANSI C63.10-2020 Section 11.12	Clause 4.9	PASS	Α
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	А

## Remark:



<sup>1.</sup> Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch Lab B SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.



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## 3 General Information

## 3.1 Details of Client

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 200233, China
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 200233, China

## 3.2 Test Location

Lab A:	
Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China
Post code:	518057
Test engineer:	Xing Guo
Lab B:	
Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	King-p Li



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## 3.3 Test Facility

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

### Lab A:

## • A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

## • Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

### FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized as an accredited testing laboratory.

Designation Number: CN1336.

Test Firm Registration Number: 787754

## Lab B:

## A2LA (Certificate No. 6336.01)

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD, is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

## • Innovation, Science and Economic Development Canada

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

## • FCC -Designation Number: CN1312

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an

accredited testing laboratory. Designation Number: CN1312.

Test Firm Registration Number: 717327



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## 3.4 General Description of EUT

EUT Description:	Smart Module	Smart Module			
Model No.:	SG368Z-WF				
Trade Mark:	Quectel	Quectel			
Hardware Version:	R1.0				
Software Version:	SG368ZWFN	IAR60A04			
	RF Conducte	ed	Sample 1: E1C23DR40000116		
SN:	RSE		Sample 1: E1C23DS03000122 Sample 2: E1C23DR40000116		
	AC power line	е	Sample 1: E1C23DS03000130		
Operation Frequency:	802.11b/g/n(l	HT20):	2412MHz to 2462MHz		
Operation Frequency.	802.11n(HT4	0):	2422MHz to 2452MHz		
Madulation Type:	802.11b:	DSSS (DBPSK, DQPSK, CCK)			
Modulation Type:	802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)		PSK, QPSK, 16QAM, 64QAM)		
Number of Channels:	802.11b/g/n(HT20): 11 802.11n(HT40): 7				
Channel Spacing:	5MHz				
	⊠ siso	802.11b/g/n			
		CDD: 802	2.11b/g/n: Tx & Rx		
Smart System:	☐ MIMO	STBC: 802.11n: Tx & Rx			
		TXBF: 80	2.11n: Tx & Rx		
	☐ Diversity	802.11b/g: Tx & Rx			
Antenna Type:		☐ Integrate	ed		
	-0.5dBi (Ant0	))			
Antenna Gain:	Note: The antenna gain are derived from the gain information report provided by the manufacturer.				
RF Cable:	2000MHz ~ 3	3000MHz(1	.1dB)		
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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# SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

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	Operation Frequency of each channel (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		
		Operation Fr	equency of ea	ach channel (	802.11n HT40	)	
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)	Frequency for 802.11n (HT40)
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

Environment Parameter	101.0 kPa Selected Values During Tests			
Relative Humidity	44-46 % R	RH Ambient		
Value	Temperature(°C) Voltage(V)			
NTNV	22~23	3.4		
Remark: NV: Normal Voltage				

3.6 Description of Support Units

NT: Normal Temperature

The EUT has been tested as an independent unit.

## 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)	/



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## **Test results and Measurement Data**

## 4.1 Antenna Requirement

Standard requirement: 47 CFR Part 15C Section 15.203 /247(b)

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The antenna is External Antenna on the main PCB and no consideration of replacement. The best case gain of the antenna is -0.5dBi (Ant0).\*

## \*Note:

The antenna gain are derived from the gain information report provided by the manufacturer.

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## 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:	Limit (dBuV)			
	Frequency range (MHz)	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 log	arithm of the frequency.		
Test Procedure:	The mains terminal d room.	isturbance voltage test was c	onducted in a shielded	
	Impedance Stabilization impedance. The power of a second LISN 2, which plane in the same way a multiple socket outlet str single LISN provided the 3) The tabletop EUT was ground reference plane. placed on the horizontal 4) The test was perform of the EUT shall be 0.4 reference plane. The LIS unit under test and bond mounted on top of the ground the EUT and associated In order to find the maxim	ed with a vertical ground refern from the vertical ground reference plane was bonded to the hose N 1 was placed 0.8 m from the doto a ground reference plane. This dots of the LISN 1 and the EUT equipment was at least 0.8 m mum emission, the relative pointerface cables must be cha	DΩ/50μH + 5Ω linear EUT were connected to ference g measured. A ple power cables to a exceeded. Itable 0.8m above the ement, the EUT was rence plane. The rearesence plane. The rizontal ground the boundary of the ne for LISNs istance was a strong the control of the form the LISN 2. The properties of the form the LISN 2.	



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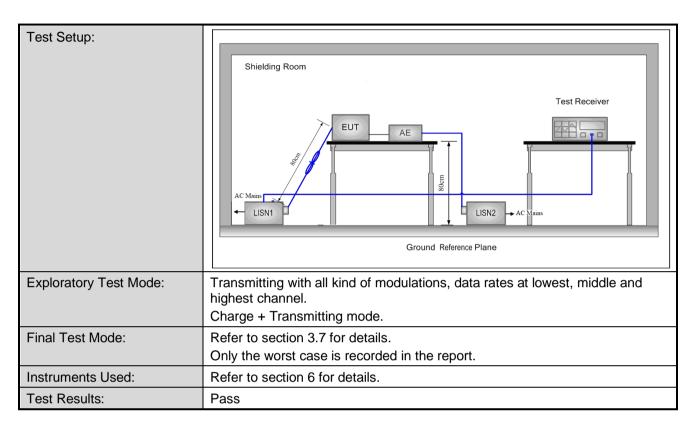
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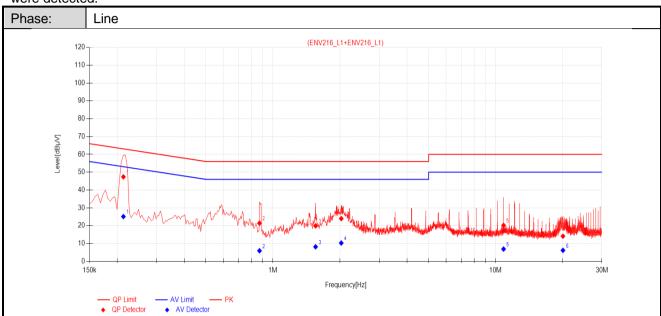
邮编: 518057

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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.	Frequency [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	0.2130	11.65	35.74	47.39	63.09	15.70	13.46	25.11	53.09	27.98	PASS
2	0.8700	11.71	9.73	21.44	56.00	34.56	-5.76	5.95	46.00	40.05	PASS
3	1.5540	11.73	8.18	19.91	56.00	36.09	-3.56	8.17	46.00	37.83	PASS
4	2.0265	11.73	12.25	23.98	56.00	32.02	-1.44	10.29	46.00	35.71	PASS
5	10.8555	11.88	8.32	20.20	60.00	39.80	-4.97	6.91	50.00	43.09	PASS
6	20.0625	11.99	2.15	14.14	60.00	45.86	-5.80	6.19	50.00	43.81	PASS

## Remark:

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



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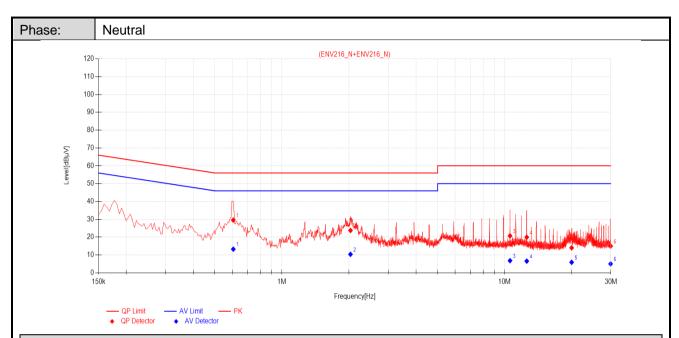
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Data	List										
NO.	Frequency [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.6045	11.63	17.96	29.59	56.00	26.41	1.65	13.28	46.00	32.72	PASS
2	2.0310	11.73	12.04	23.77	56.00	32.23	-1.34	10.39	46.00	35.61	PASS
3	10.5765	11.88	8.85	20.73	60.00	39.27	-5.05	6.83	50.00	43.17	PASS
4	12.5700	11.90	8.08	19.98	60.00	40.02	-5.33	6.57	50.00	43.43	PASS
5	19.9995	11.99	2.03	14.02	60.00	45.98	-6.07	5.92	50.00	44.08	PASS
6	29.9220	12.11	2.91	15.02	60.00	44.98	-7.09	5.02	50.00	44.98	PASS

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



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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:	Power probe  E.U.T  Ground Reference Plane
	* Test with power meter (Detector function: Peak)
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: A	ppendix

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## 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:	PC   Communication   O O O O O O O O O O O O O O O O O O				
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: Ap	pendix				



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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:	PC    Spectrum Analyzer   O   O   O   O   O   O   O   O   O				
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: A	ppendix				



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## 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:	PC    Spectrum Analyzer   O   O   O   O   O   O   O   O   O				
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: A	ppendix				



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## 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:	PC   Communication   O O O O O O O O O O O O O O O O O O				
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: A	ppendix				



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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		
	Above 1G112	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		
Remark: 15.35(b),Unless otherwise specified, the limit on peak radio frequencies of the emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total emission level radiated by the device.							



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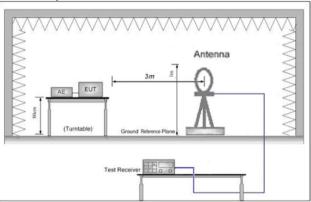
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## Test Setup:



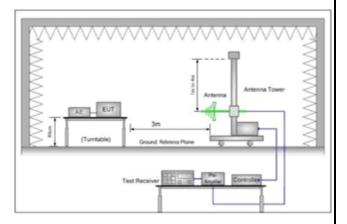


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

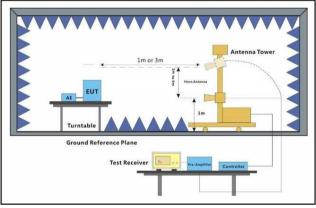


Figure 3. Above 1 GHz

### Test Procedure:

- 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 camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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 camber. The table was rotated 360 degrees to determine the position of the highest radiation (Distance from antenna to EUT is 1m for measurements >18GHz).
- 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.
- 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.
- 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 frequency of below 30MHz, the antenna was tuned to heights 1 meter) and



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	the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
	<ol> <li>The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> </ol>
	g. Test the EUT in the lowest channel, the middle channel ,the Highest channel.
	<ul> <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> </ul>
	i. Repeat above procedures until all frequencies measured was complete.
	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
	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.
	<ol> <li>At a measurement distance of 1 meter the limit line was increased by 20*LOG(3/1) = 9.54 dB.</li> </ol>
Test Configuration:	Measurements below 30MHz
	• RBW = 10 kHz
	• VBW = 30 kHz
	Detector = Peak & Average & Quasi-peak
	Trace mode = max hold
	Measurements Below 1000MHz
	• RBW = 120 kHz
	• VBW = 300 kHz
	Detector = Quasi-peak
	• Trace mode = max hold
	Peak Measurements Above 1000 MHz
	• RBW = 1 MHz
	• VBW ≥ 3 MHz
	Detector = Peak
	• Sweep time = auto
	Trace mode = max hold
	Average Measurements Above 1000MHz  • RBW = 1 MHz
	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.
	• 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.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates.
	Charge + Transmitting mode.
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	e: Appendix



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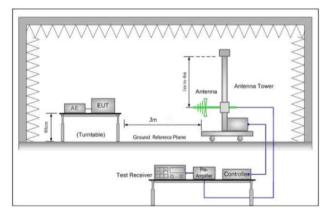
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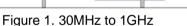
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## 4.10 Restricted bands around fundamental frequency

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 Chaml	per)				
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				
	Above IGHZ	74.0	Peak Value				

## Test Setup:





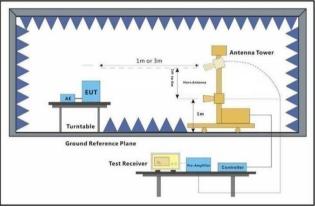


Figure 2. Above 1 GHz



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Test Procedure:	<ul> <li>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 camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>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 camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> </ul>
	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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
	f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
	g. 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
	h. Test the EUT in the lowest channel, the Highest channel
	<ul> <li>i. 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>j. Repeat above procedures until all frequencies measured was complete.</li> </ul>
Test Configuration:	Measurements Below 1000MHz
J	• RBW = 120 kHz
	• VBW = 300 kHz
	Detector = Quasi-peak
	Trace mode = max hold
	Peak Measurements Above 1000 MHz
	• RBW = 1 MHz
	• VBW ≥ 3 MHz
	Detector = Peak
	Sweep time = auto
	Trace mode = max hold
	Average Measurements Above 1000MHz
	• RBW = 1 MHz
	VBW = 10 Hz, when duty cycle is no less than 98 percent.
	<ul> <li>VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum</li> </ul>
	transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Refer to section 3.7 for details.
Tinal Tool Wood.	Note: to obstrain our for detaile.



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Instruments Used:	Refer to section 6 for details.			
Test Results:	Pass			
The detailed test data see: Appendix				



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

Lab A					
No.	Item	Measurement Uncertain			
1	Radio Frequency	± 9.84Hz			
2	Duty cycle	± 0.185%			
3	Occupied Bandwidth	± 0.20%			
4	RF conducted power	± 0.42dB			
5	RF power density ± 1.97dB				
6	Conducted Spurious emissions	± 0.42dB			
7		±4.8dB (30MHz-1GHz)			
	Redicted Emission	±4.68dB (1GHz-6GHz)			
	Radiated Emission —	±4.52dB (6GHz-18GHz)			
		±5.26dB (18GHz-40GHz)			

The U<sub>lab</sub> (lab Uncertainty) is less than U<sub>cispr/ETSI</sub> (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.

Lab B					
No.	Item	Measurement Uncertainty			
1	Conduction Emission	± 2.90dB (150kHz to 30MHz)			

## Remark:

The U<sub>lab</sub> (lab Uncertainty) is less than U<sub>cispr/ETSI</sub> (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.





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**Equipment List** 

Lab A RF Test System							
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)		
Spectrum Analyzer	Keysight	N9020A	SZ-WRG-M-002	2022/11/18	2023/11/17		
Signal Generator	Keysight	N5181A	SZ-WRG-M-005	2022/11/18	2023/11/17		
DC power supply	Tonscend	TS0806-4ADC	SZ-WRG-A-007	NCR	NCR		
RF Control Unit	Tonscend	JS0806-2	SZ-WRG-M-008	2022/11/18	2023/11/17		
Radio Communication Tester	Rohde & Schwarz	CMW270	SZ-WRG-M-009	2023/02/16	2024/02/15		
Radio Communication Tester	Rohde & Schwarz	CMW-Z800A	SZ-WRG-M-010	NCR	NCR		
Signal Generator	Rohde & Schwarz	SMM100A	SZ-WRG-M-011	2023/02/22	2024/02/21		
Test Software	Tonscend	JS1120 V3.2.22	N/A	NCR	NCR		
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	HTC-1	SZ-WRG-M-077	2023/05/26	2024/05/25		
Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-012	2023/02/16	2024/02/15		



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Lab A							
Radiated spurious emissions							
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)		
EMI TEST RECEIVER	Rohde & Schwarz	ESR	SZ-WRG-M-047	2023/02/16	2024/02/15		
Signal &Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2023/02/16	2024/02/15		
Low Noise Amplifier 9K- 3GHz	Tonscend	TAP9K3G32	SZ-WRG-M-049	2023/02/16	2024/02/15		
Low Noise Amplifier 30M- 8GHz	Tonscend	TAP30M8G30	SZ-WRG-M-050	2023/02/16	2024/02/15		
Low Noise Amplifier 1G- 18GHz	Tonscend	TAP01018050	SZ-WRG-M-051	2023/02/16	2024/02/15		
Low Noise Amplifier 18G- 40GHz	Tonscend	TAP18040048	SZ-WRG-M-052	2023/02/16	2024/02/15		
Active Loop Antenna 9kHz- 30MHz	SCHWARZBECK	FMZB 1519B	SZ-WRG-M-053	2022/01/16	2024/01/15		
TRILOG Breitband Antenne 30MHz- 1GHz	SCHWARZBECK	VULB 9168	SZ-WRG-M-054	2022/01/16	2024/01/15		
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2022/01/16	2024/01/15		
SHF-EHF Horn 15GHz-40GHz	SCHWARZBECK	BBHA 9170	SZ-WRG-M-056	2022/01/16	2024/01/15		
RSE Test Software	Tonscend	JS32-RSE V4.0.0	SZ-WRG-M-058	NCR	NCR		
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2022/01/05	2025/01/04		
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	HTC-1	SZ-WRG-M-022	2023/02/17	2024/02/16		
Spectrum Analyzer	Keysight	N9020A	SZ-WRG-M-002	2022/11/18	2023/11/17		



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Lab B Conduction Test Equipment							
Test Equipment	Manufacturer	Model No.	Inventory No.	ventory No. Cal. date (yyyy/mm/dd)			
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07		
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-06	2023/02/07	2024/02/06		
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-03	2023/02/08	2024/02/07		
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-04	2023/02/08	2024/02/07		
Measurement Software	Tonscend	JS32-CE V4.0.0.2	SUWI-02-09-05	NCR	NCR		



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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	9.68	2407.40	2417.08	≥0.5	PASS
		2437	10.16	2431.92	2442.08	≥0.5	PASS
		2462	10.16	2456.92	2467.08	≥0.5	PASS
	Ant0	2412	16.16	2404.04	2420.20	≥0.5	PASS
11g		2437	16.40	2428.80	2445.20	≥0.5	PASS
		2462	16.40	2453.80	2470.20	≥0.5	PASS
11n20SISO	Ant0	2412	16.24	2404.20	2420.44	≥0.5	PASS
		2437	17.36	2428.44	2445.80	≥0.5	PASS
		2462	17.00	2453.44	2470.44	≥0.5	PASS
11n40SISO	Ant0	2422	35.28	2404.40	2439.68	≥0.5	PASS
		2437	36.00	2419.00	2455.00	≥0.5	PASS
		2452	35.28	2434.40	2469.68	≥0.5	PASS



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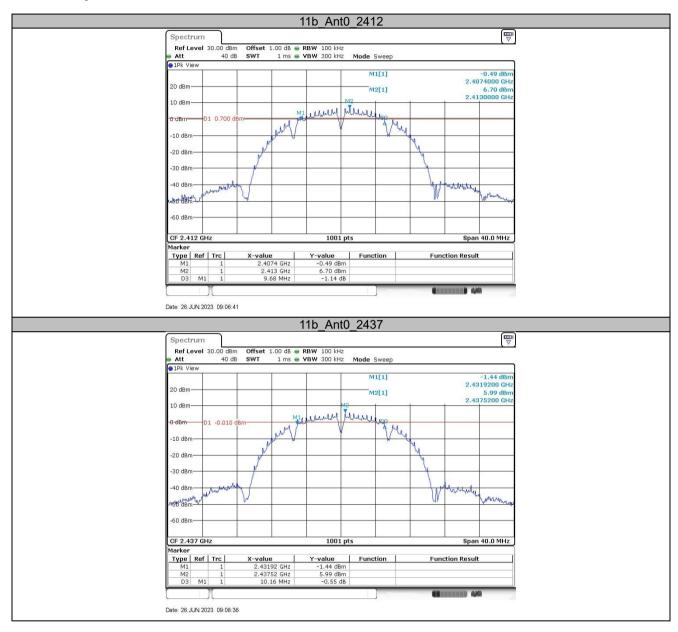


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## **Test Graphs**





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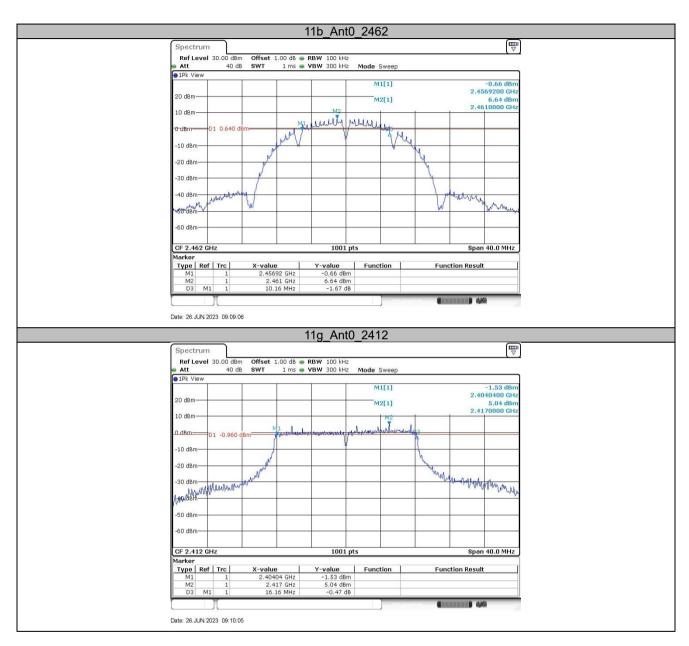
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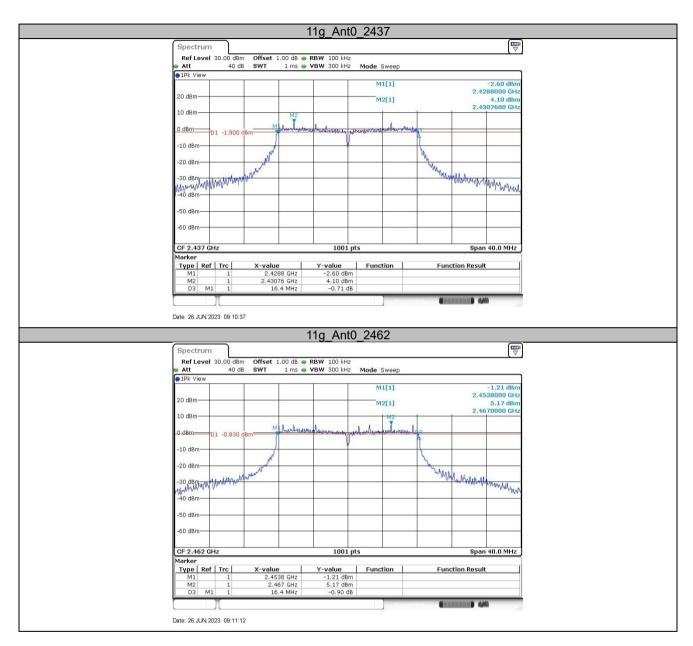
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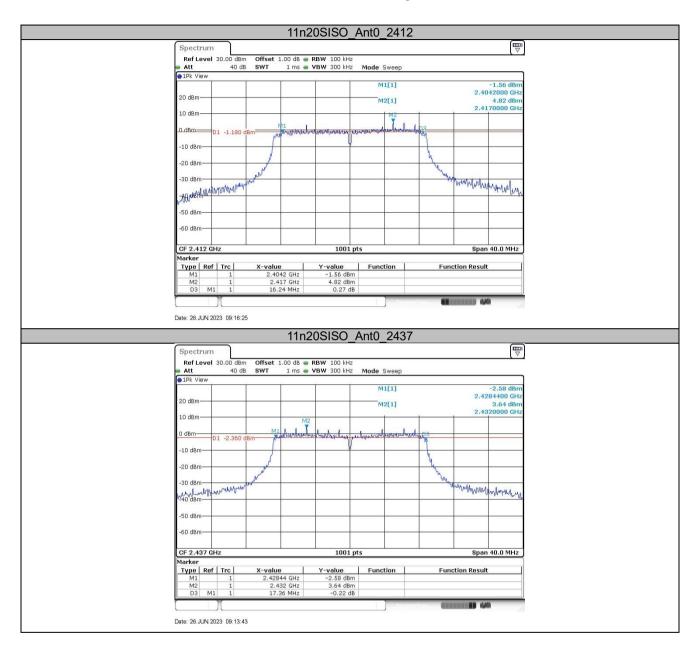
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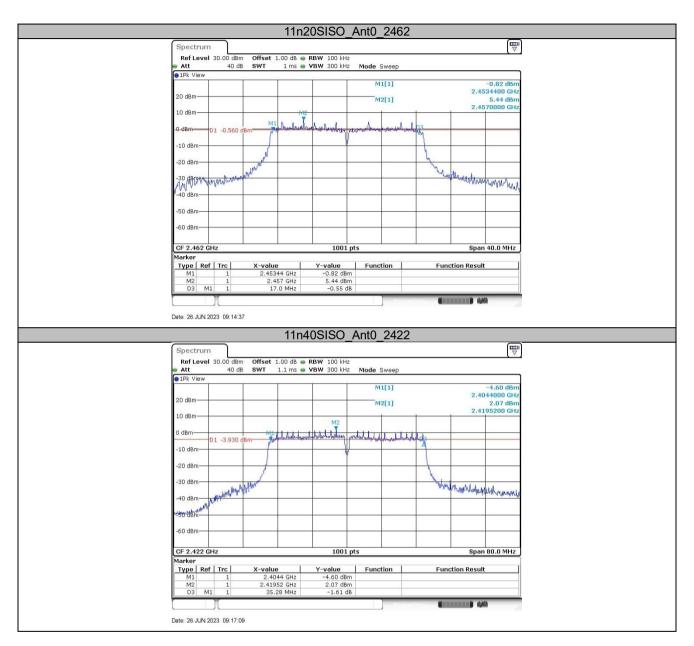




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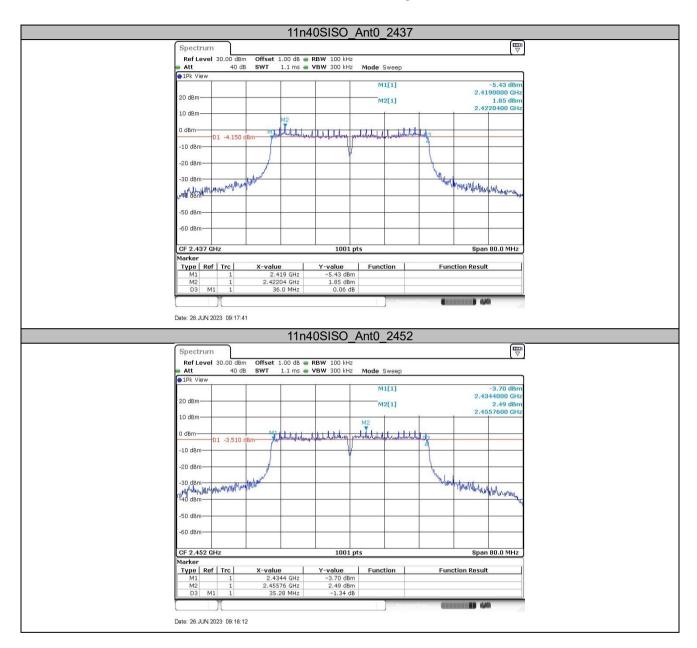




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#### **Occupied Channel Bandwidth Test Result**

TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
11b	Ant0	2412	14.825	2404.6873	2419.5125	For Report Purpose
		2437	15.225	2429.3277	2444.5524	
		2462	15.025	2454.3676	2469.3926	
11g	Ant0	2412	17.423	2403.2887	2420.7113	
		2437	17.622	2428.0090	2445.6314	
		2462	17.582	2453.0889	2470.6713	
11n20SISO	Ant0	2412	18.382	2402.8492	2421.2308	
		2437	18.382	2427.7293	2446.1109	
		2462	18.302	2452.7692	2471.0709	
11n40SISO	Ant0	2422	36.843	2403.6184	2440.4615	
		2437	37.083	2418.2987	2455.3816	
		2452	36.843	2433.6184	2470.4615	



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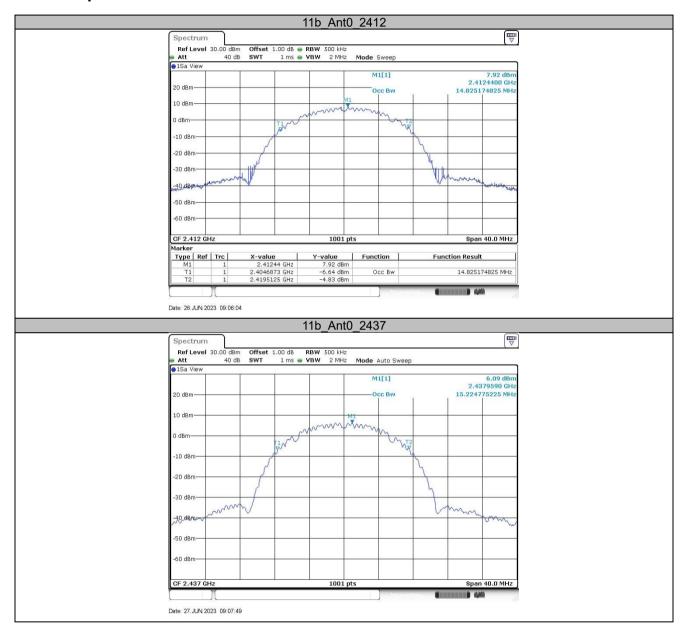


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#### **Test Graphs**



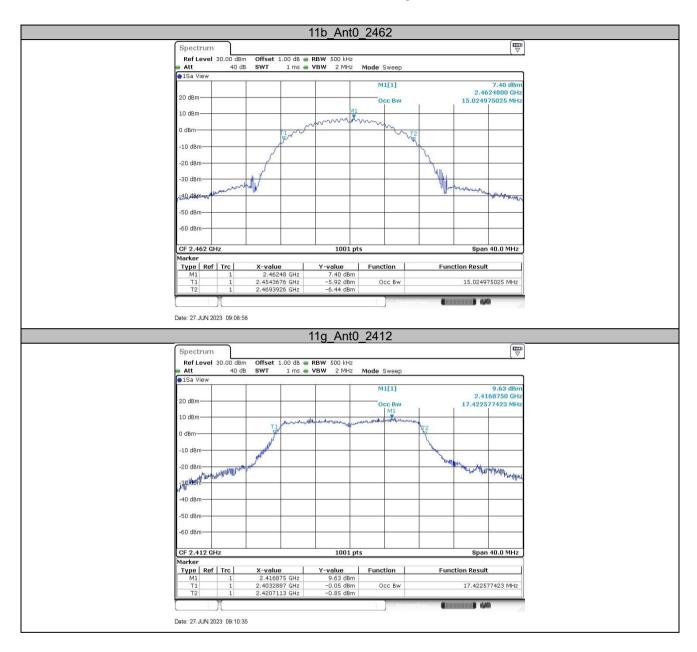




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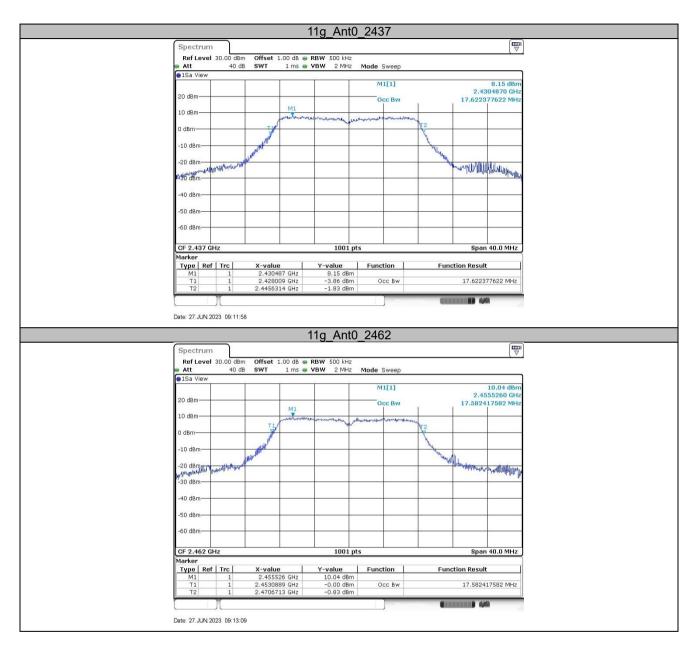




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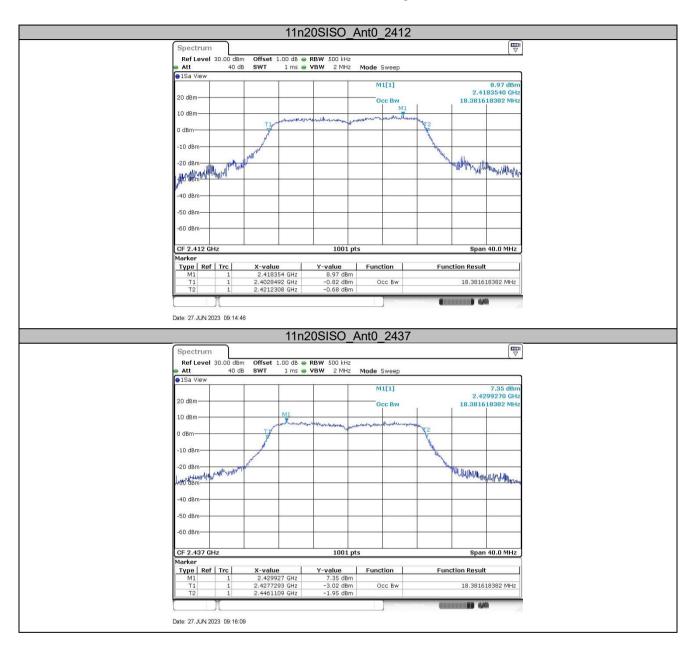




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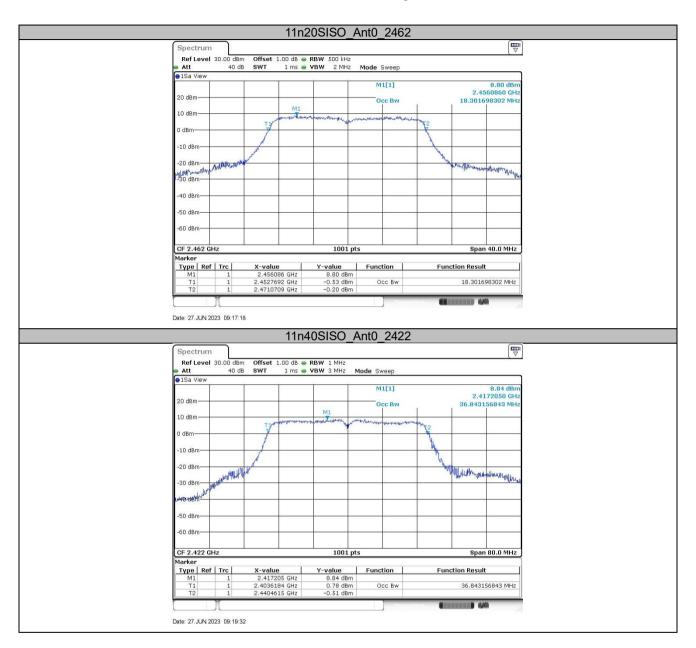
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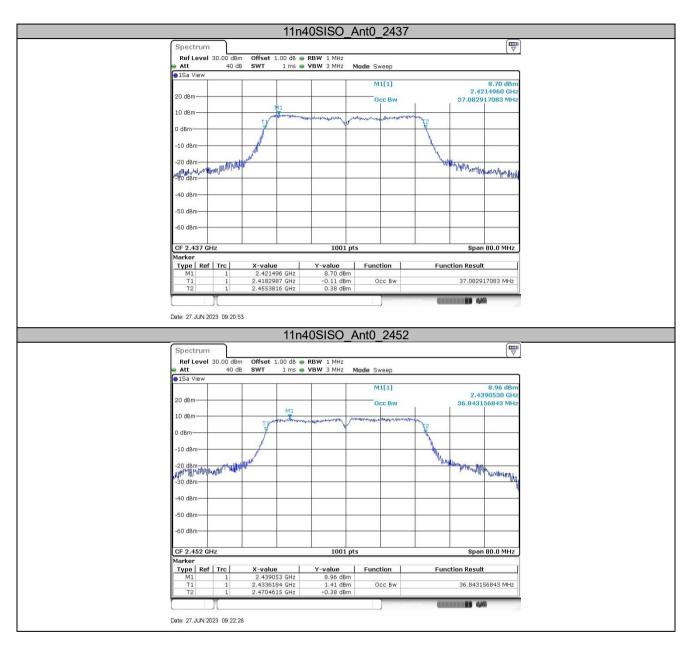




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#### Maximum conducted output power **Test Result**

TestMode	Antenna	Channel	Peak Power[dBm]	Limit[dBm]	Verdict
11b	Ant0	2412	17.79	≤30.00	PASS
		2437	18.28	≤30.00	PASS
		2462	18.66	≤30.00	PASS
11g	Ant0	2412	22.84	≤30.00	PASS
		2437	23.19	≤30.00	PASS
		2462	23.81	≤30.00	PASS
11n20	Ant0	2412	22.48	≤30.00	PASS
		2437	22.86	≤30.00	PASS
		2462	23.44	≤30.00	PASS
11n40	Ant0	2422	22.25	≤30.00	PASS
		2437	23.35	≤30.00	PASS
		2452	22.87	≤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	-8.96	≤8.00	PASS
		2437	-8.59	≤8.00	PASS
		2462	-7.94	≤8.00	PASS
11g	Ant0	2412	-11.31	≤8.00	PASS
		2437	-9.5	≤8.00	PASS
		2462	-10.95	≤8.00	PASS
11n20SISO	Ant0	2412	-11.46	≤8.00	PASS
		2437	-10.2	≤8.00	PASS
		2462	-11.48	≤8.00	PASS
11n40SISO	Ant0	2422	-16.24	≤8.00	PASS
		2437	-12.76	≤8.00	PASS
		2452	-15.51	≤8.00	PASS



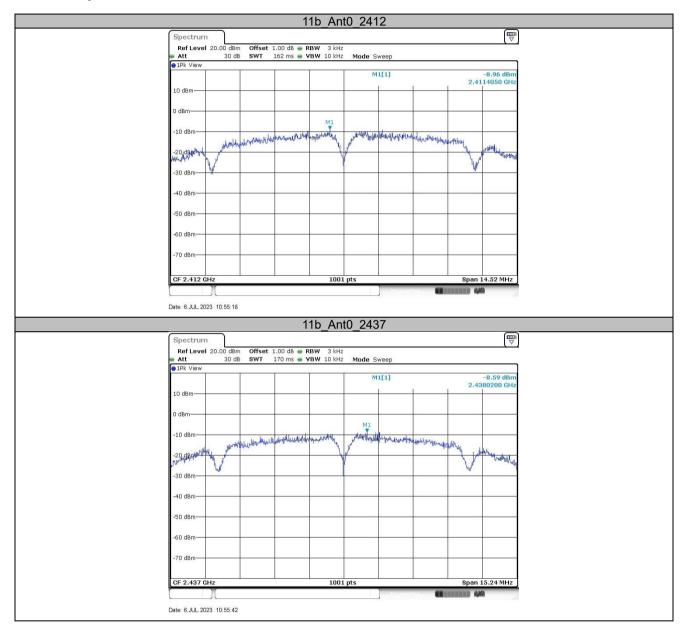


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#### **Test Graphs**





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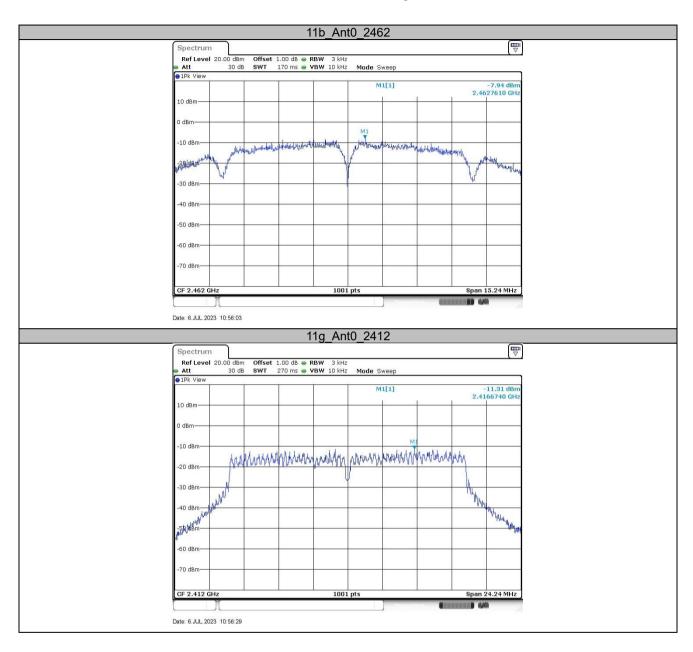
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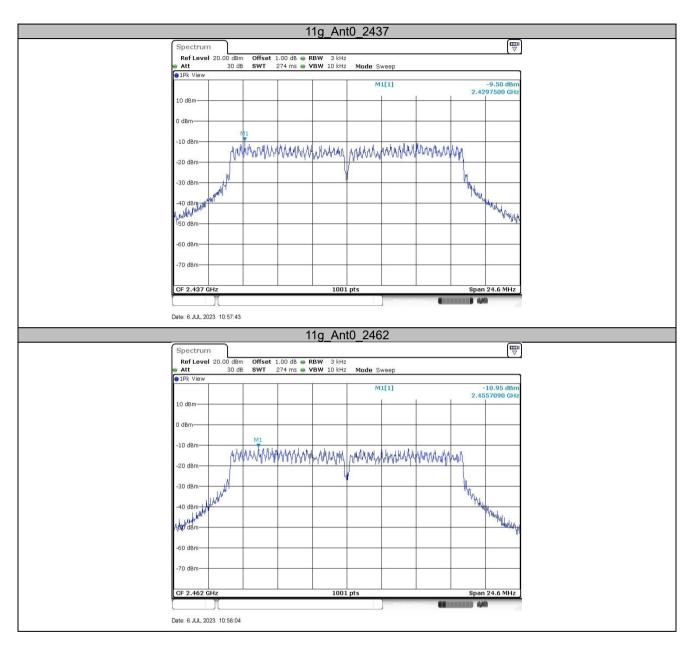
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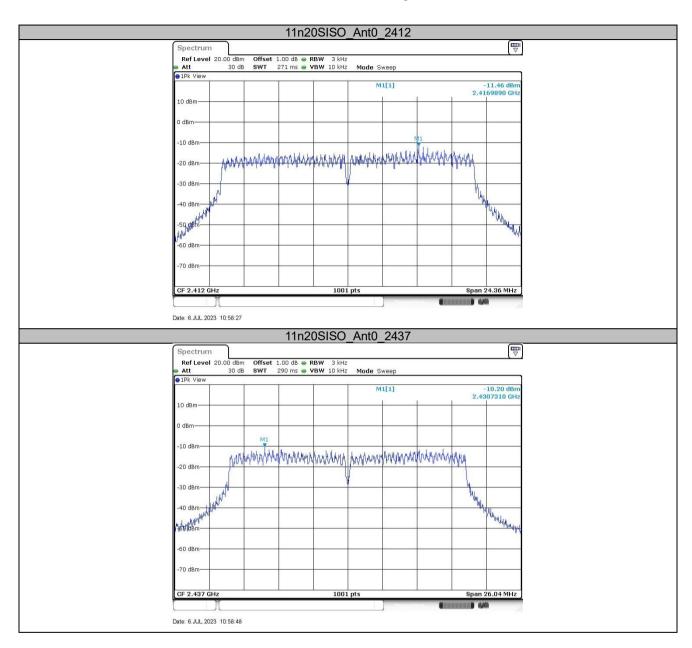
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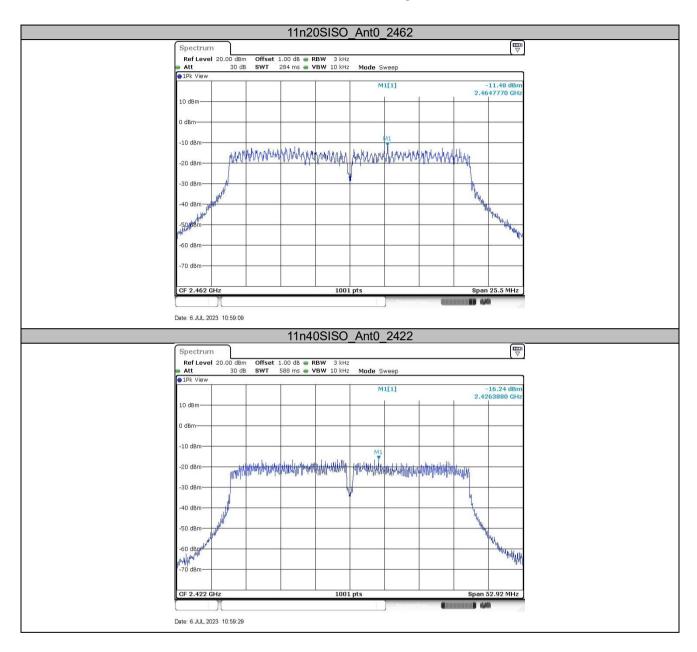




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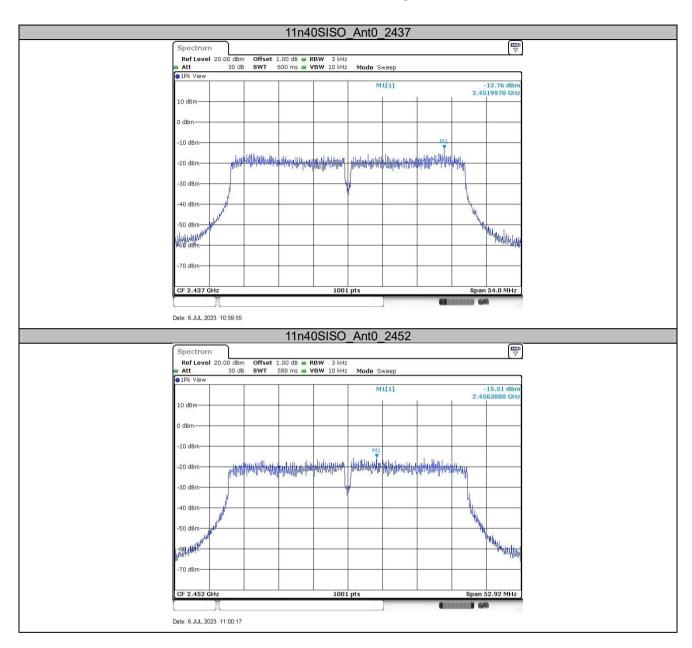
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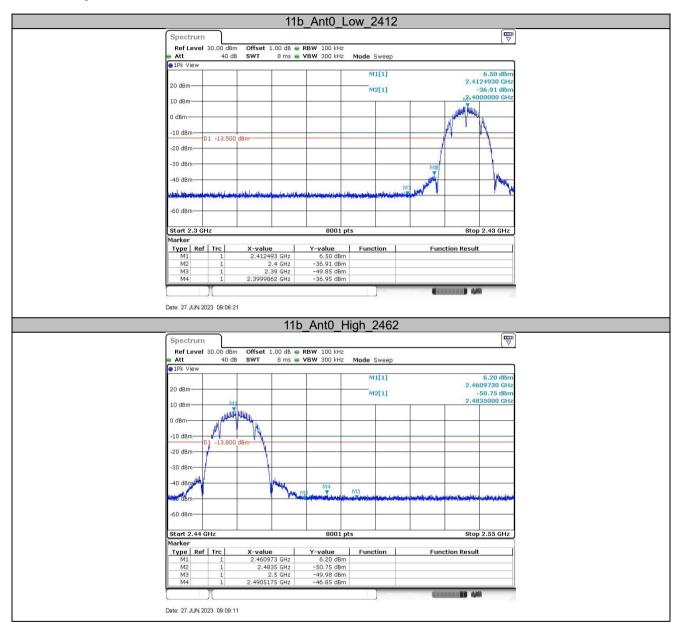




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#### **Band edge measurements Test Graphs**



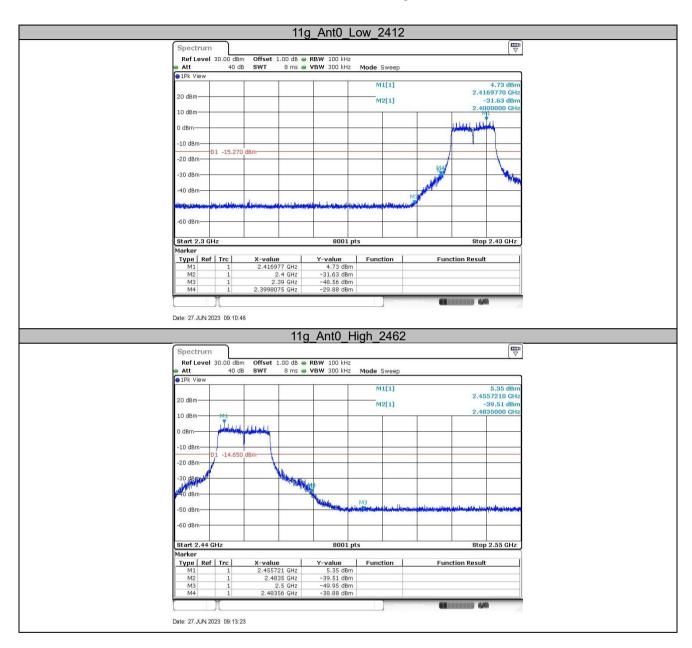




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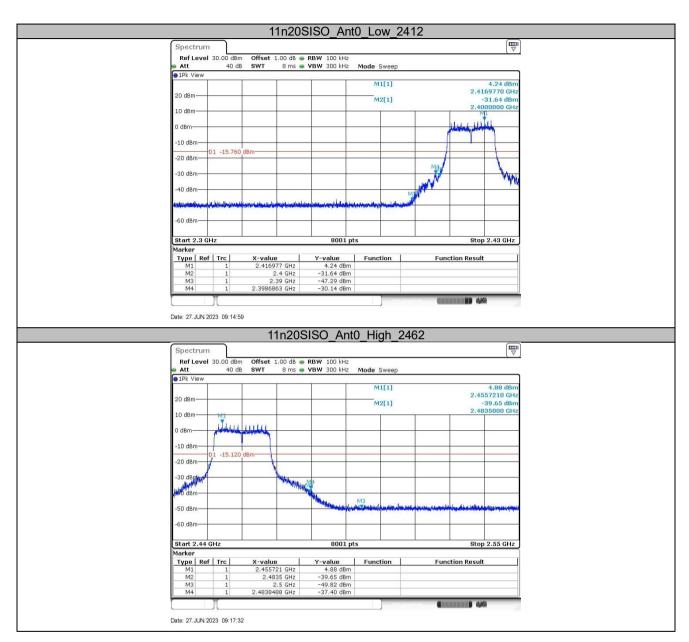
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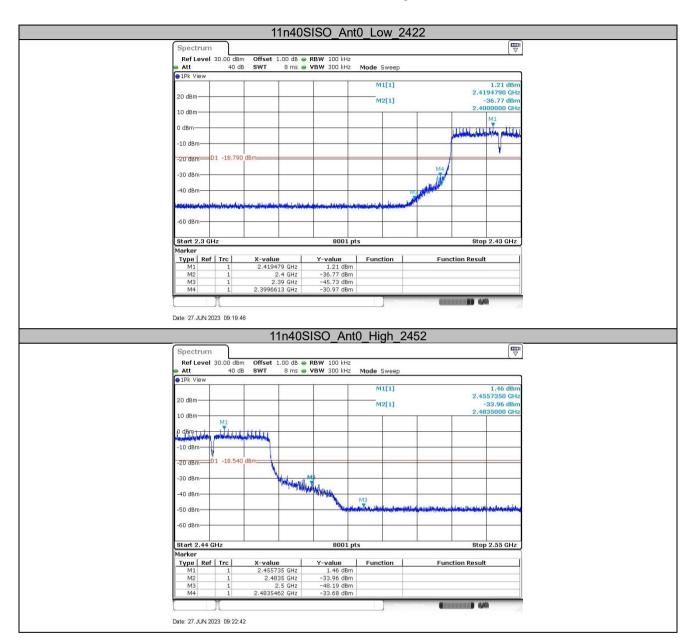




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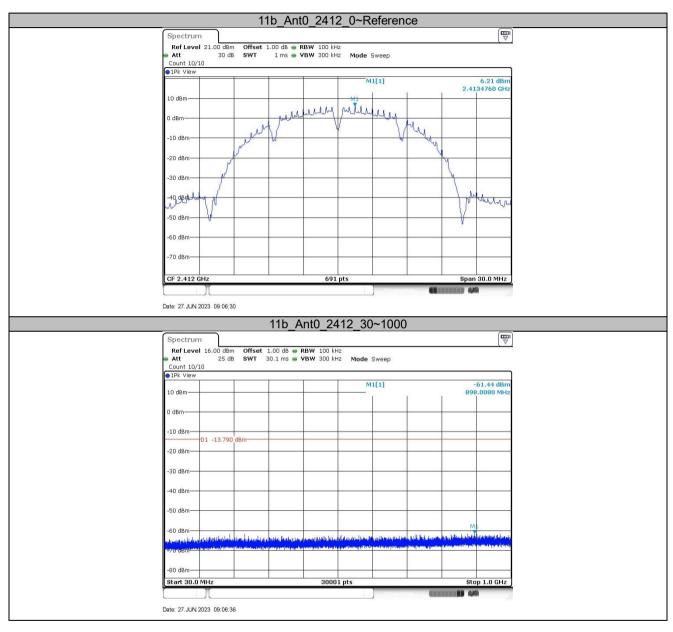


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#### **Conducted Spurious Emission Test Graphs**





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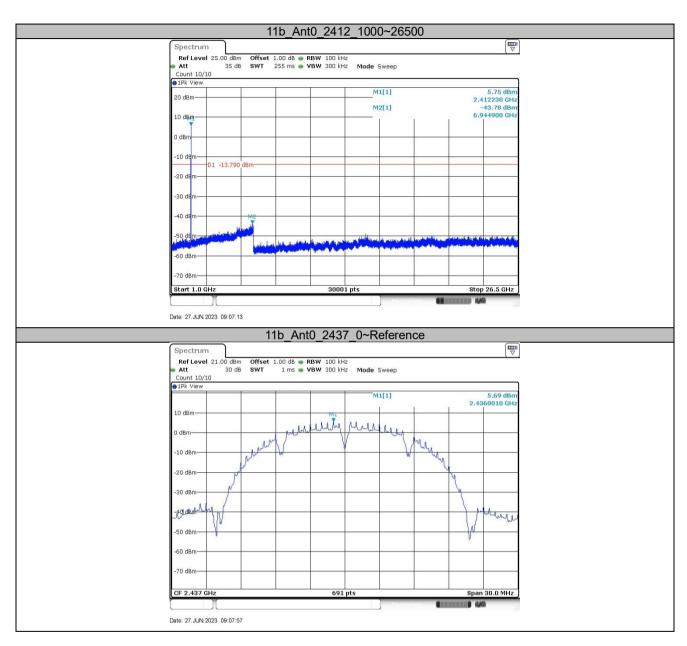
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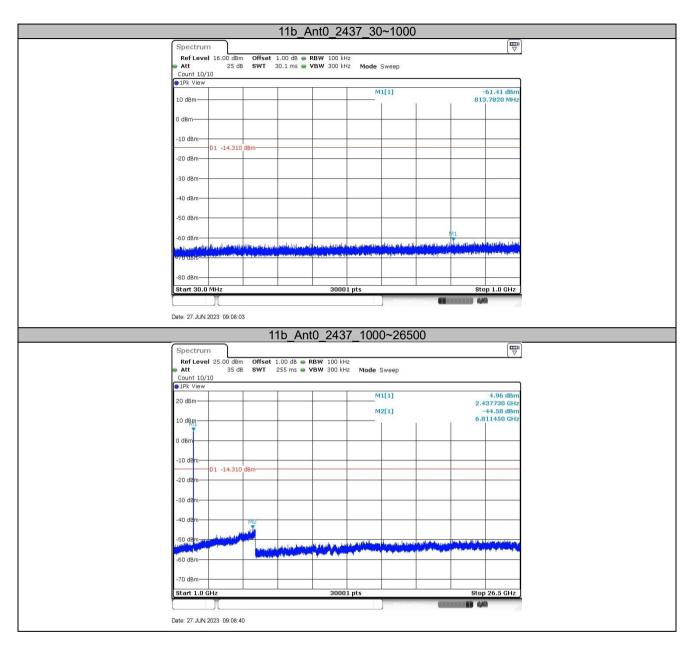




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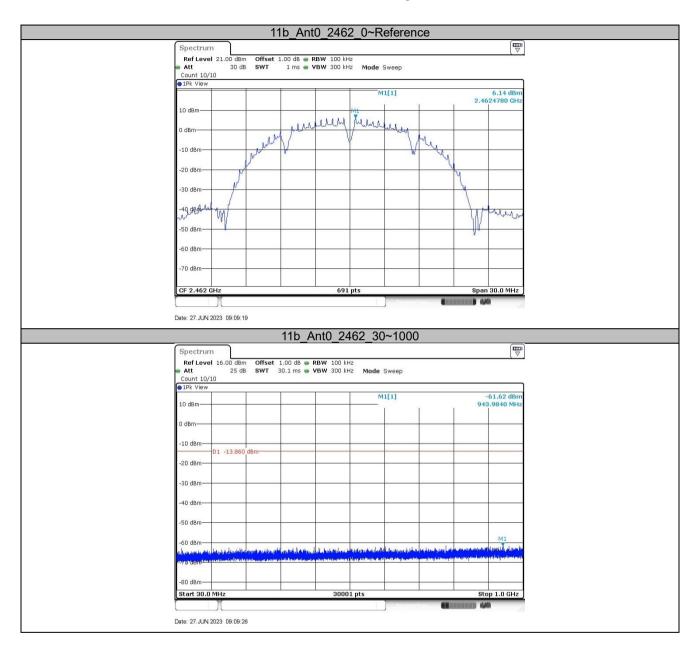
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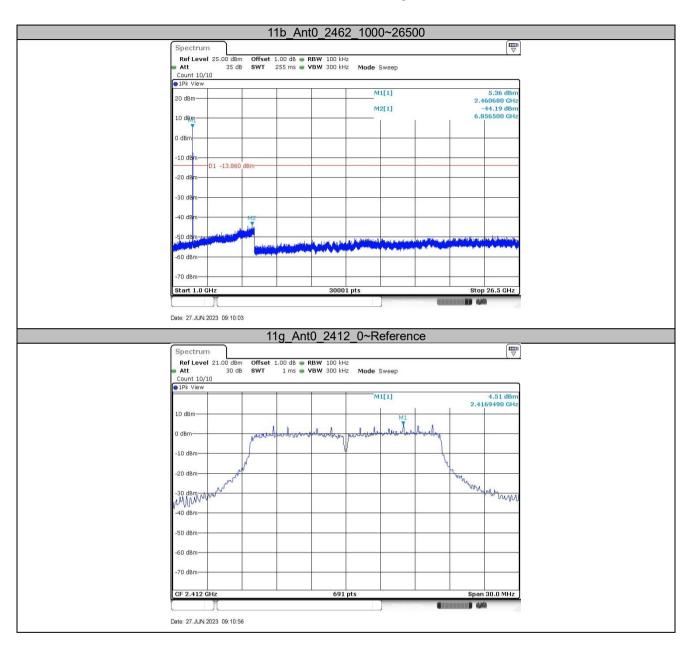
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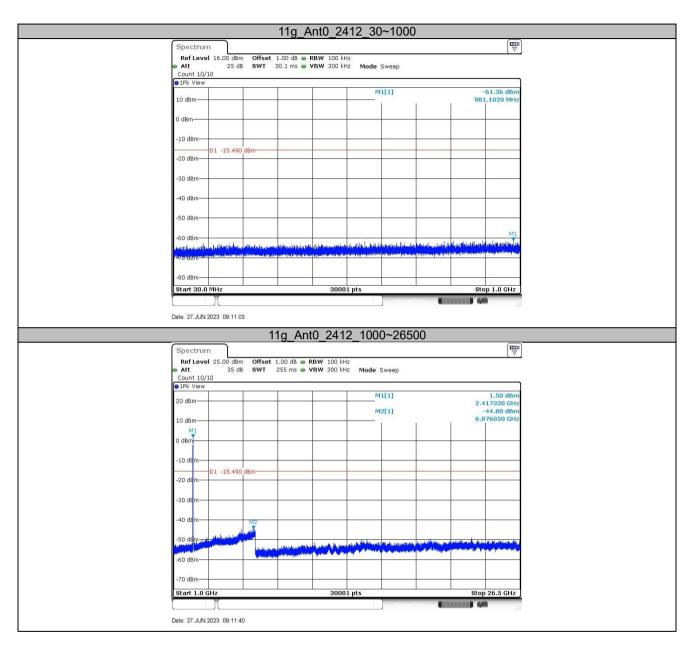
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