



TEST REPORT

Application No.:	ZEWM2306000892RG
Applicant:	Spark Technology iQsim
Address of Applicant:	731 Rt 18 East Brunswick NJ USA 08816
Manufacturer:	Shenzhen Huasifei Technology Co., Ltd
Address of Manufacturer:	1203, No.1 Langrong Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen City, Guangdong Province, China
EUT Description:	WIFI Router
Model No.:	MR40
Trade Mark:	HUASIFEI
FCC ID:	2BCEZ-MR40
Standards:	FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C
Date of Receipt:	2023/07/03
Date of Test:	2023/07/06 to 2023/08/01
Date of Issue:	2023/08/02

Test Result :	PASS *
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* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Ervin Li
Regulatory Manager



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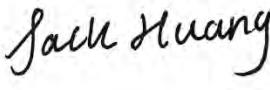
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1 Version

Revision Record

Version	Chapter	Date	Modifier	Remark
01		2023/08/02		Original

Prepared By	 (Jack Huang) / Test Engineer
Checked By	 (Daniel Wang) / Reviewer

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2 Test Summary

Test Item	FCC Rule No.	Test Method	Test Result	Result	Test Lab*
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	B
Duty Cycle	--	ANSI C63.10-2020 Section 11.6	Clause 4.3	For Report Purpose	B
Conducted Output Power	15.247 (b)(3)	ANSI C63.10-2020 Section 11.9.1.2	Clause 4.4	PASS	B
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	B
Power Spectral Density	15.247 (e)	ANSI C63.10-2020 Section 11.10.2	Clause 4.6	PASS	B
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.7	PASS	B
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10-2020 Section 11.11	Clause 4.8	PASS	B
Radiated Spurious Emissions	15.247(d);15.205/15.209	ANSI C63.10-2020 Section 11.12	Clause 4.9	PASS	A
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	A

Remark:

1. Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
2. Lab B SGS-CSTC Standards Technical Services (Xi'an) Co., Ltd.



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3 General Information

3.1 Details of Client

Applicant:	Spark Technology iQsim
Address of Applicant:	731 Rt 18 East Brunswick NJ USA 08816
Manufacturer:	Shenzhen Huasifei Technology Co., Ltd
Address of Manufacturer:	1203, No.1 Langrong Road, Xinshi Community, Dalang Street, Longhua District, Shenzhen City, Guangdong Province, 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 (Xi'an) Co., Ltd.
Address:	1/F, Unit D, Building 1, Kanghong Orange Science Park, No.137, Keyuan 3rd Road, Fengdong New Town, Xi'an, Shaanxi China
Post code:	710086
Test engineer:	Qiang Zhang, Ken Liu

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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.

- **VCCI**

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. 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**

SGS-CSTC Standards Technical Services (Xi'an) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0095.

IC#: 25613.

- **FCC –Designation Number: CN1337**

SGS-CSTC Standards Technical Services (Xi'an) Co., Ltd. has been recognized as an accredited testing laboratory.

Designation Number: CN1337.

Test Firm Registration Number: 917410



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3.4 General Description of EUT

EUT Description:	WIFI Router	
Model No.:	MR40	
Trade Mark:	HUASIFEI	
Hardware Version:	WS1208 V2.0	
Software Version:	openwrt	
Power Supply:	12.0V-3.0A (DC Supply)	
IMEI:	RF Conducted & AC power line	MR40-A0-00015636
	RSE	MR40-A0-00015273
Operation Frequency:	802.11b/g/n(HT20):	2412MHz to 2462MHz
	802.11n(HT40):	2422MHz to 2452MHz
Modulation Type:	802.11b:	DSSS (DBPSK, DQPSK, CCK)
	802.11g/n:	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Number of Channels:	802.11b/g/n(HT20): 11 802.11n(HT40): 7	
Channel Spacing:	5MHz	
Smart System:	<input type="checkbox"/> SISO	802.11b/g
	<input checked="" type="checkbox"/> MIMO	802.11n: 2Tx & 2Rx
	<input checked="" type="checkbox"/> Diversity	CDD:802.11b/g : 2Tx & 2Rx
Antenna Type:	<input checked="" type="checkbox"/> External, <input type="checkbox"/> Integrated	
Antenna Gain:	2.1dBi(Ant0); 2.1dBi(Ant1)	
	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)							
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)							
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 kPa Selected Values During Tests	
Relative Humidity	40-60 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	22~25	12

Remark:
 NV: Normal Voltage
 NT: Normal Temperature

3.6 Description of Support Units

Description	Manufacturer	Model No.
Adapter	Shenzhen Junchen Technology Co., Ltd.	J302-1203000UX

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	CDD/MIMO - Data Rate
802.11b	/	2 Mbps
802.11g	/	12 Mbps
802.11n (HT 20)	/	MCS0 (13 Mbps)
802.11n (HT 40)	/	MCS0 (27 Mbps)



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4 Test results and Measurement Data

4.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(b)
15.203 requirement:	
<p>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>	
15.247(b) (4) requirement:	
<p>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 External Antenna and no consideration of replacement. The best case gain of the antenna is 2.1dBi(Ant0); 2.1dBi(Ant1).*</p>	
<p>*Note: <i>The antenna gain are derived from the gain information report provided by the manufacturer.</i></p>	
<p>Remark: <i>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>	



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Cyclic Delay Diversity (CDD) System:

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

 If all antennas have the same gain, G_{ANT} , Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,
 $\text{Array Gain} = 10 \log(N_{ANT}/N_{SS}) = 1 \text{ dB}$.
- For power measurements on IEEE 802.11 devices:
 $\text{Array Gain} = 0 \text{ dB} \text{ (i.e., no array gain) for } N_{ANT} \leq 4$;

Directional gain may be calculated by using the formulas applicable to equal gain antennas with GANT set equal to the gain of the antenna having the highest gain.

The Power and PSD limit should be modified if the directional gain of eut is over 6dbi.

The EUT supports CDD System.

All antennas have the same gain:

ANT Gain0 (dBi)	ANT Gain1 (dBi)	Power DG (dBi)	PSD DG (dBi)	Power Limit Reduction(dB)	PSD Limit Reduction(dB)
2.1	2.1	2.1	5.11	0	0

Power Limit Reduction = Directional gain – 6dBi, (Directional gain < 6dBi) = 0

PSD Limit Reduction = Directional gain – 6dBi, (Directional gain < 6dBi) = 0



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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:	Frequency range (MHz)	Limit (dBuV)	
	0.15-0.5	Quasi-peak	Average
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ 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. 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, 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.		

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

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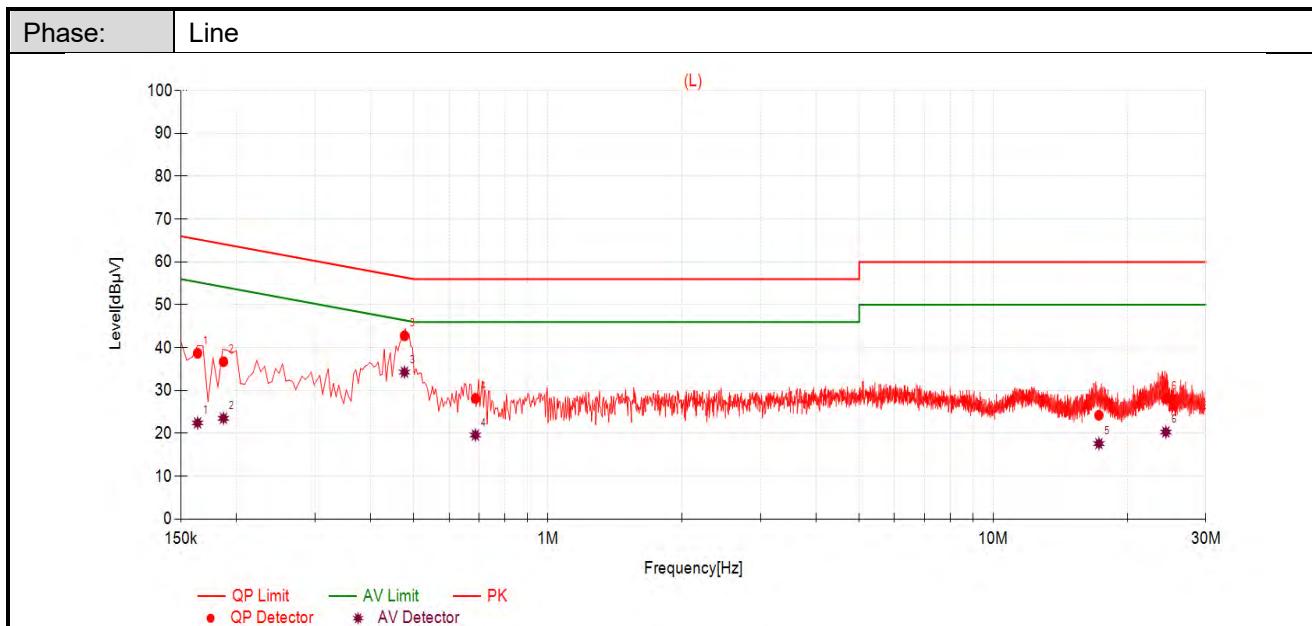


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Measurement Data

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.



Final 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	0.1634	9.85	28.85	38.70	65.29	26.59	12.60	22.45	55.29	32.84	PASS	
2	0.1868	9.85	26.88	36.73	64.18	27.45	13.67	23.52	54.18	30.66	PASS	
3	0.4763	9.88	32.89	42.77	56.40	13.63	24.42	34.30	46.40	12.10	PASS	
4	0.6874	9.95	18.21	28.16	56.00	27.84	9.66	19.61	46.00	26.39	PASS	
5	17.2696	10.25	13.99	24.24	60.00	35.76	7.37	17.62	50.00	32.38	PASS	
6	24.4137	10.29	17.78	28.07	60.00	31.93	10.03	20.32	50.00	29.68	PASS	

Remark:

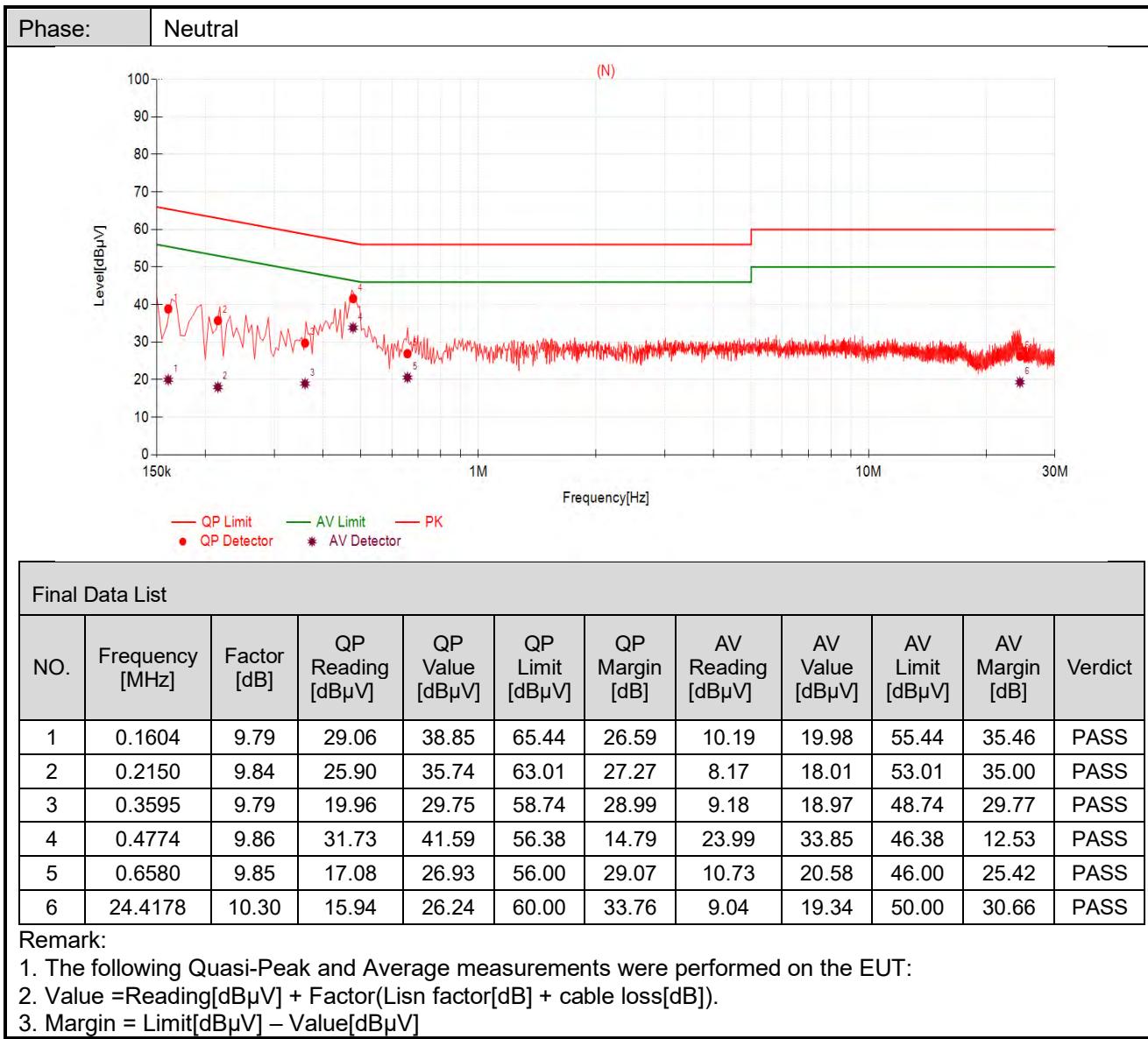
1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Value =Reading[dBμV] + Factor(List factor[dB] + cable loss[dB]).
3. Margin = Limit[dBμV] – Value[dBμV]



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4.3 Duty Cycle

Test Requirement:	ANSI C63.10-2020 Section 11.6
Test Method:	ANSI C63.10-2020 Section 11.6
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:	No restriction limits
Test Results:	For Report Purpose
The detailed test data see: Appendix	



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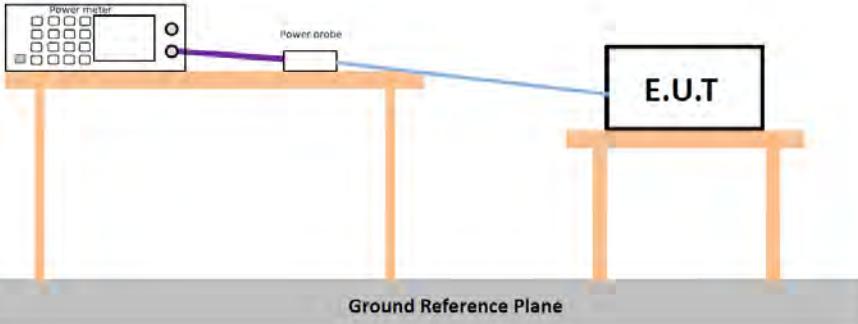
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4.4 Conducted Output Power

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: **Appendix**



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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:	
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 for DTS Bandwidth
Test Results:	Pass
The detailed test data see: Appendix	

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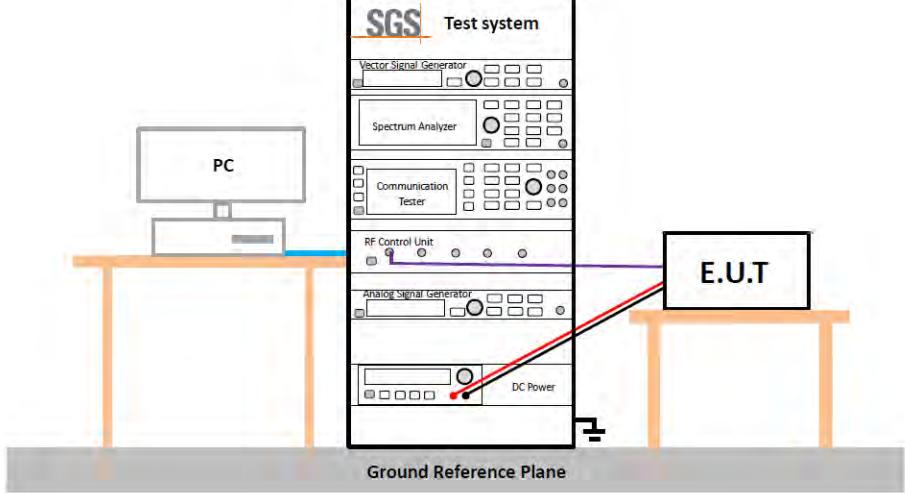


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4.6 Power Spectral Density

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:	$\leq 8.00 \text{dBm}/3\text{kHz}$
Test Results:	Pass
The detailed test data see: Appendix	

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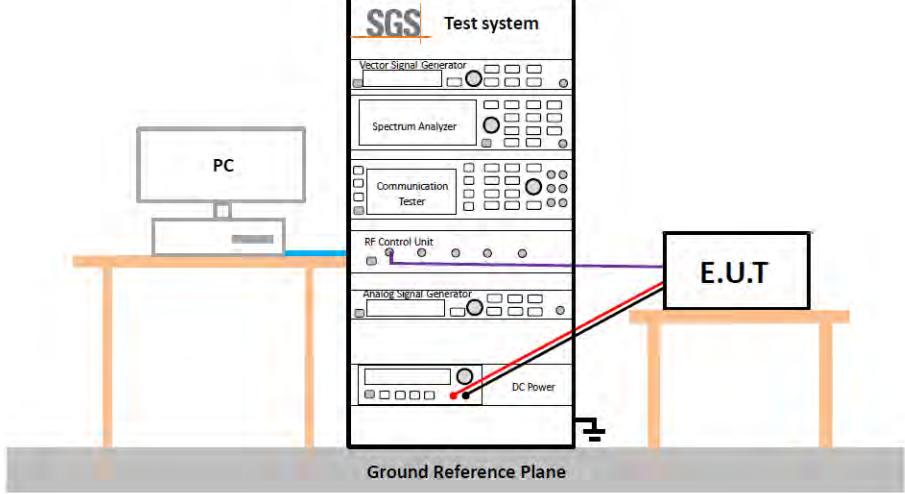
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4.7 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10-2020 Section 11.11
Test Setup:	
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: Appendix	

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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:	
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: Appendix	

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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
	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.				



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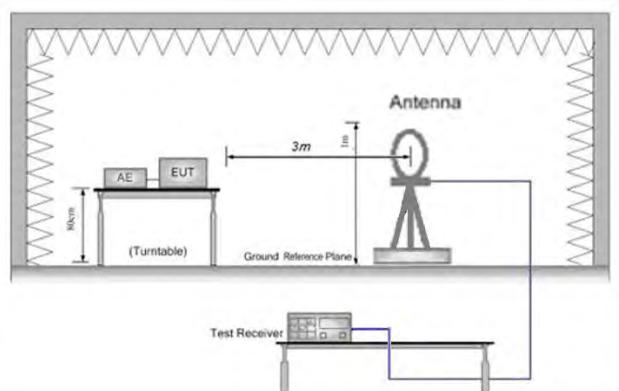

Test Setup:


Figure 1. Below 30MHz

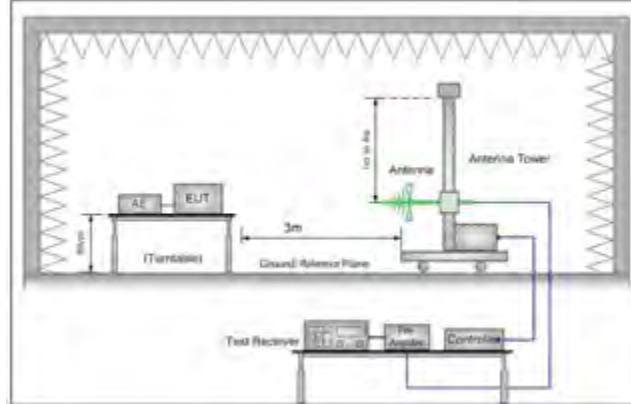


Figure 2. 30MHz to 1GHz

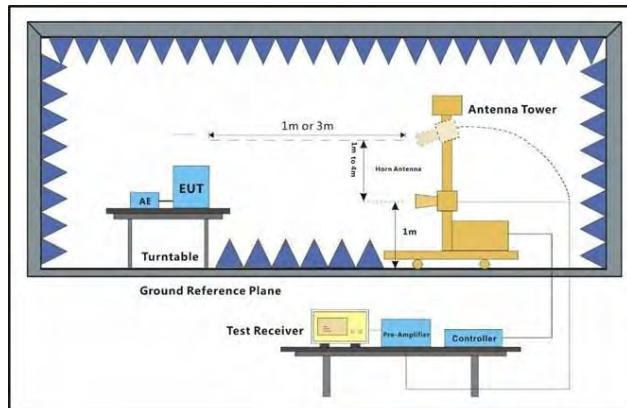


Figure 3. Above 1 GHz

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 chamber. 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 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).
- 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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	<p>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 $20 * \log(3/1) = 9.54$ dB.</p>
Test Configuration:	<p>Measurements below 30MHz</p> <ul style="list-style-type: none"> • RBW = 10 kHz • VBW = 30 kHz • Detector = Peak & Average & Quasi-peak • Trace mode = max hold <p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> • RBW = 120 kHz • VBW = 300 kHz • Detector = Quasi-peak • Trace mode = max hold <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> • RBW = 1 MHz • VBW \geq 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none"> • RBW = 1 MHz • VBW = 10 Hz, when duty cycle is no less than 98 percent. • VBW \geq 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. DC Supply + Transmitting mode.
Final Test Mode:	Refer to section 3.7 for details. For below 1GHz part, through pre-scan all channels, but only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details.



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Test Results:	Pass
The detailed test data see: Appendix	



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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
		54.0	Average Value
		74.0	Peak Value

Test Setup:

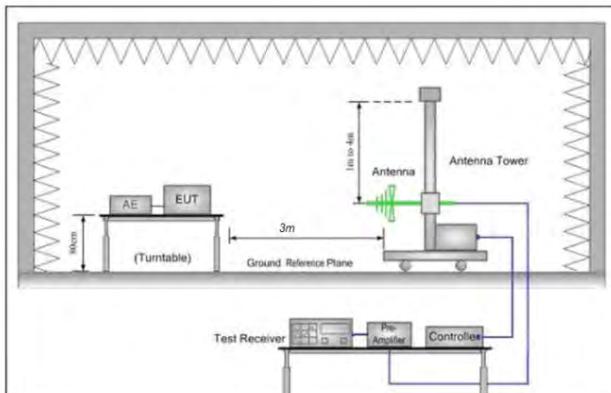


Figure 1. 30MHz to 1GHz

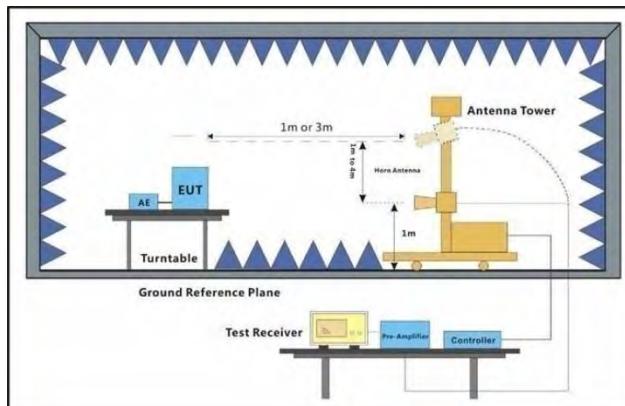


Figure 2. Above 1 GHz



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Test Procedure:	<ol style="list-style-type: none"> 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. 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. 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 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 Test the EUT in the lowest channel, the Highest channel 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. Repeat above procedures until all frequencies measured was complete.
Test Configuration:	<p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> RBW = 120 kHz VBW = 300 kHz Detector = Quasi-peak Trace mode = max hold <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> RBW = 1 MHz VBW \geq 3 MHz Detector = Peak Sweep time = auto Trace mode = max hold <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none"> RBW = 1 MHz VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW \geq 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. DC Supply + Transmitting mode.
Final Test Mode:	Refer to section 3.7 for details.



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

Lab A		
No.	Item	Measurement Uncertainty
2	Radiated Emission	±4.8dB (30MHz-1GHz)
		±4.68dB (1GHz-6GHz)
		±4.52dB (6GHz-18GHz)
		±5.26dB (18GHz-40GHz)

Remark:
 The U_{lab} (lab Uncertainty) is less than $U_{cisp/ETSI}$ (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.

Lab B		
No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25×10^{-8} GHz
2	Duty cycle	± 0.37%
3	Occupied Bandwidth	± 0.2%
4	RF conducted power	± 0.21dB
5	RF power density	± 2.84dB
6	Conducted Spurious emissions	± 0.75dB
7	Conduction Emission	± 3.0dB (150kHz to 30MHz)

Remark:
 The U_{lab} (lab Uncertainty) is less than $U_{cisp/ETSI}$ (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.



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6 Equipment List

RF Test System Lab B					
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
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	2022/09/14	2023/09/13
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 Lab B					
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	2023/06/30	2024/06/29
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
Artificial network	ROHDE & SCHWARZ	ENV216	XAW01-04-02	2023/06/30	2024/06/29

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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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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-CDD	Ant0	2412	9.600	2407.440	2417.040	0.5	PASS
	Ant1	2412	9.560	2407.440	2417.000	0.5	PASS
	Ant0	2437	9.560	2432.000	2441.560	0.5	PASS
	Ant1	2437	9.560	2432.000	2441.560	0.5	PASS
	Ant0	2462	9.600	2457.440	2467.040	0.5	PASS
	Ant1	2462	9.560	2457.440	2467.000	0.5	PASS
11g-CDD	Ant0	2412	15.080	2404.480	2419.560	0.5	PASS
	Ant1	2412	15.120	2404.440	2419.560	0.5	PASS
	Ant0	2437	15.080	2429.440	2444.520	0.5	PASS
	Ant1	2437	15.080	2429.440	2444.520	0.5	PASS
	Ant0	2462	15.040	2454.480	2469.520	0.5	PASS
	Ant1	2462	15.120	2454.440	2469.560	0.5	PASS
11n20MIMO	Ant0	2412	15.040	2404.480	2419.520	0.5	PASS
	Ant1	2412	15.680	2404.480	2420.160	0.5	PASS
	Ant0	2437	15.120	2429.440	2444.560	0.5	PASS
	Ant1	2437	15.680	2428.840	2444.520	0.5	PASS
	Ant0	2462	15.120	2454.440	2469.560	0.5	PASS
	Ant1	2462	15.040	2454.520	2469.560	0.5	PASS
11n40MIMO	Ant0	2422	35.040	2404.480	2439.520	0.5	PASS
	Ant1	2422	34.960	2404.560	2439.520	0.5	PASS
	Ant0	2437	35.040	2419.480	2454.520	0.5	PASS
	Ant1	2437	35.040	2419.480	2454.520	0.5	PASS
	Ant0	2452	35.120	2434.480	2469.600	0.5	PASS
	Ant1	2452	35.040	2434.480	2469.520	0.5	PASS

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Test Graphs


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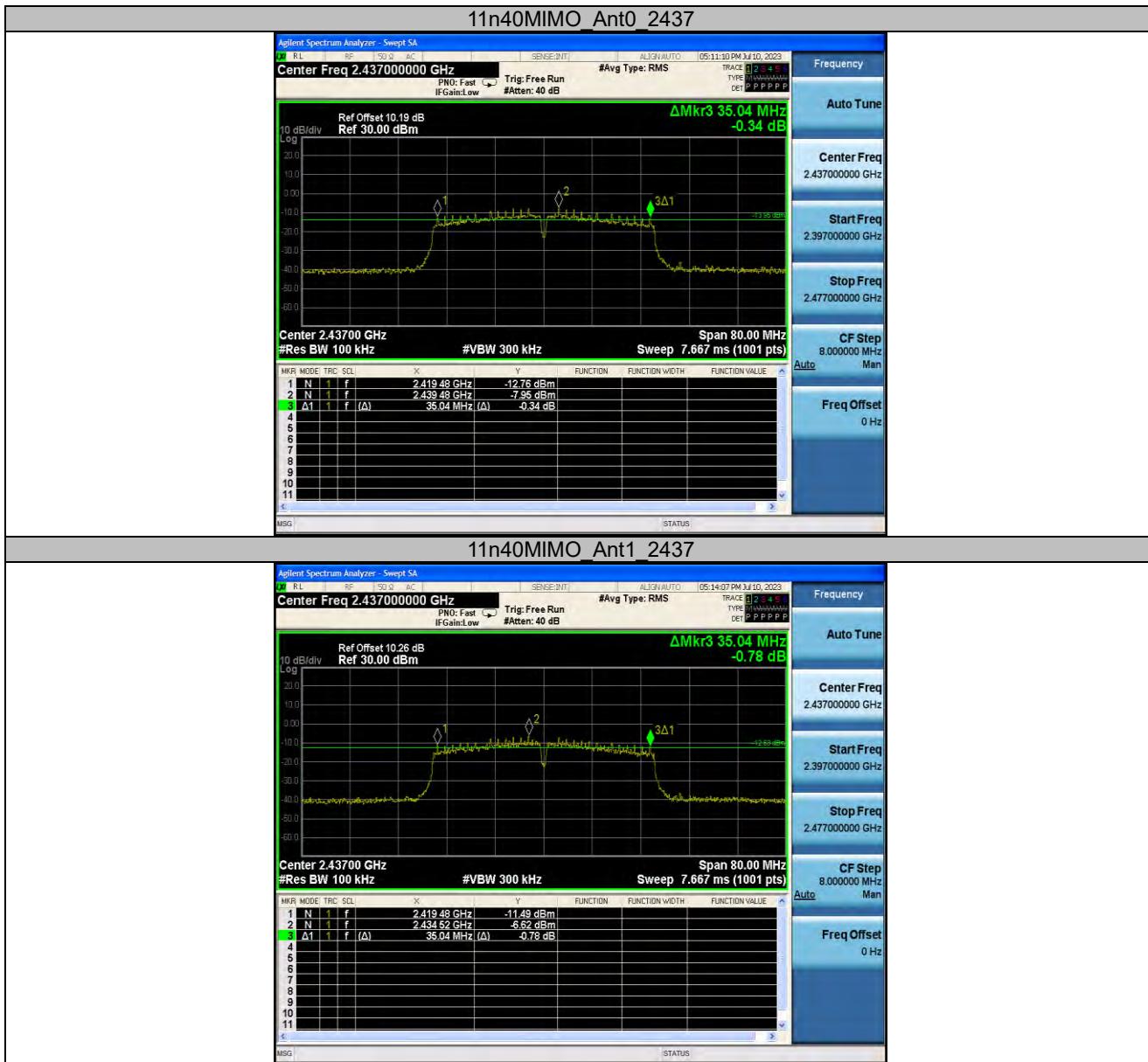
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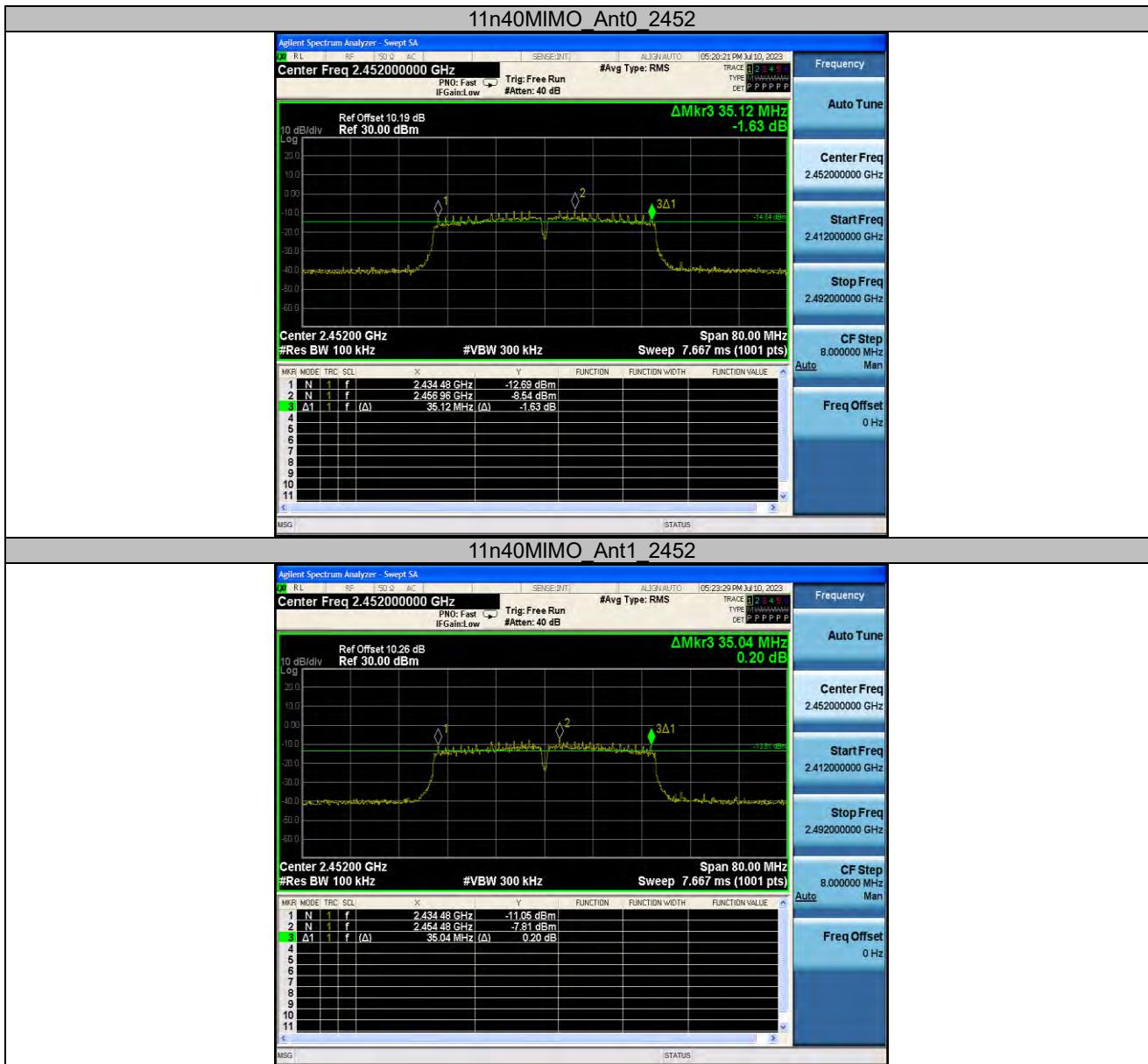
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**Occupied Channel Bandwidth
Test Result**

TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
11b-CDD	Ant0	2412	14.552	2404.8571	2419.4091	For Report Purpose
	Ant1	2412	14.345	2404.9077	2419.2527	
	Ant0	2437	14.445	2429.7176	2444.1626	
	Ant1	2437	14.259	2429.7550	2444.0140	
	Ant0	2462	14.497	2454.8846	2469.3816	
	Ant1	2462	14.270	2454.9439	2469.2139	
11g-CDD	Ant0	2412	16.969	2403.5680	2420.5370	For Report Purpose
	Ant1	2412	16.579	2403.7438	2420.3228	
	Ant0	2437	16.954	2428.4637	2445.4177	
	Ant1	2437	16.556	2428.6817	2445.2377	
	Ant0	2462	16.987	2453.5629	2470.5499	
	Ant1	2462	16.538	2453.7763	2470.3143	
11n20MIMO	Ant0	2412	17.815	2403.1297	2420.9447	For Report Purpose
	Ant1	2412	17.541	2403.2711	2420.8121	
	Ant0	2437	17.781	2428.0660	2445.8470	
	Ant1	2437	17.499	2428.2214	2445.7204	
	Ant0	2462	17.803	2453.1745	2470.9775	
	Ant1	2462	17.521	2453.2902	2470.8112	
11n40MIMO	Ant0	2422	36.159	2404.0160	2440.1750	For Report Purpose
	Ant1	2422	36.094	2404.0306	2440.1246	
	Ant0	2437	36.306	2418.8705	2455.1765	
	Ant1	2437	36.229	2418.8752	2455.1042	
	Ant0	2452	36.529	2433.8214	2470.3504	
	Ant1	2452	36.508	2433.7886	2470.2966	

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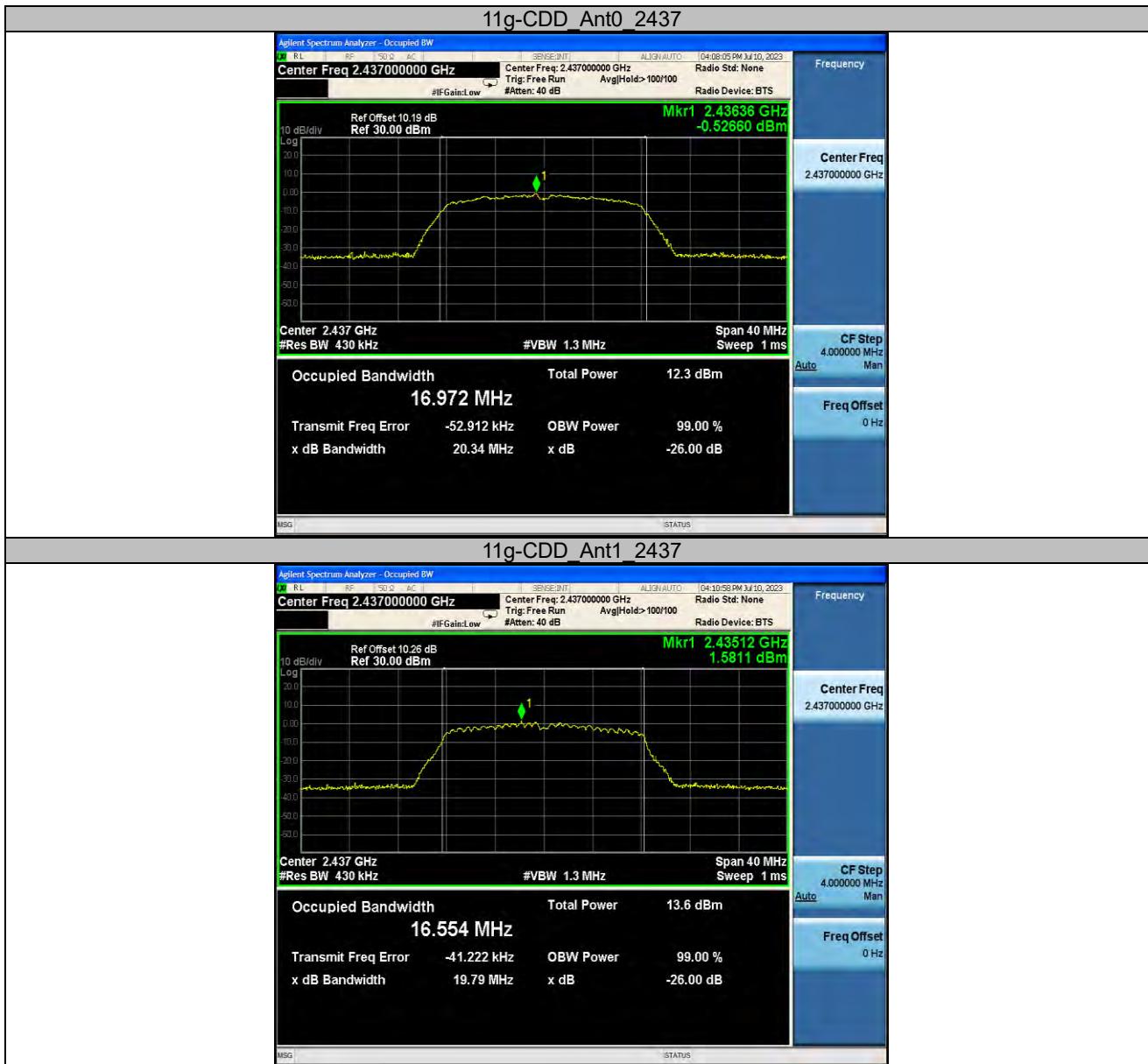
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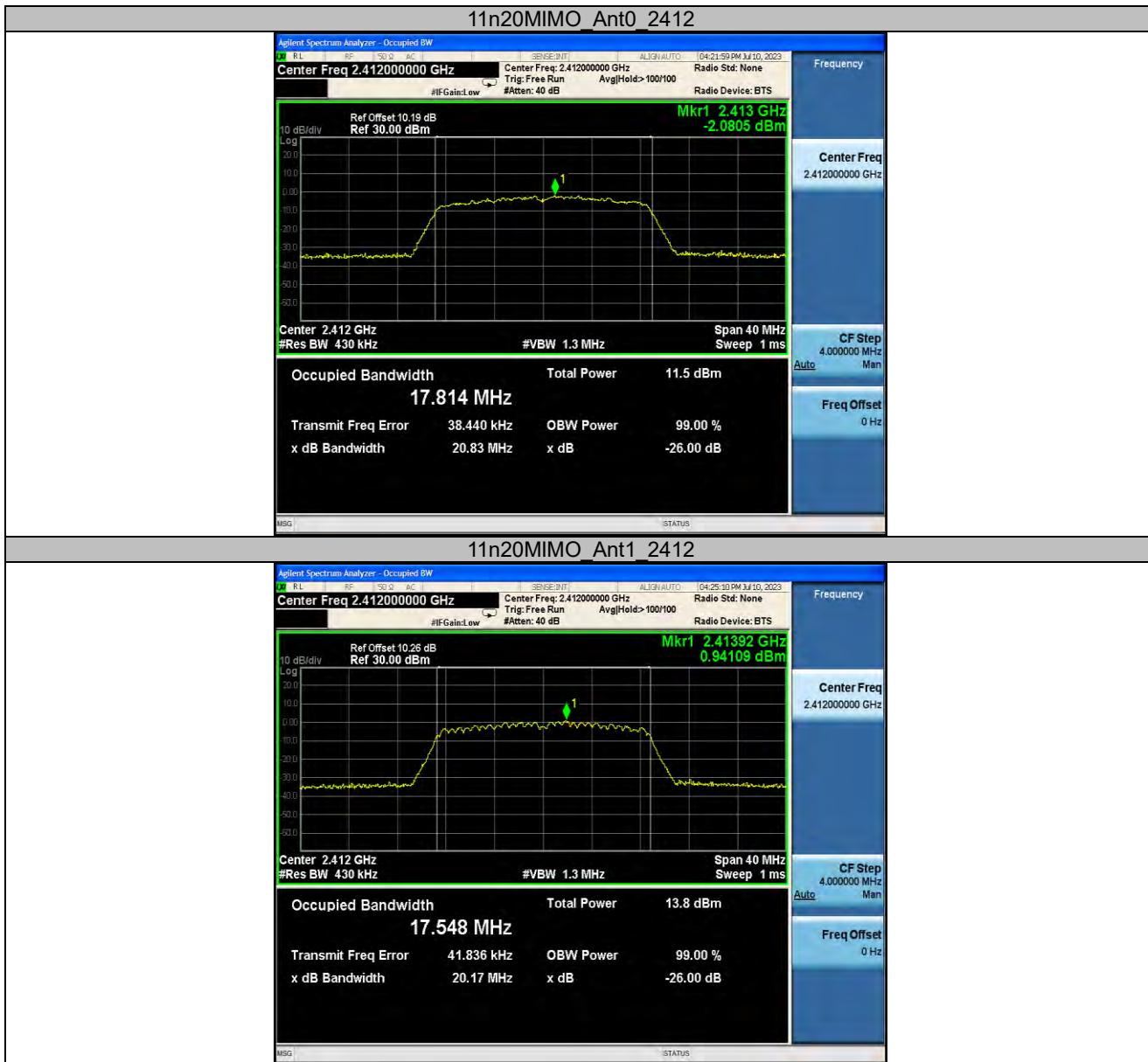
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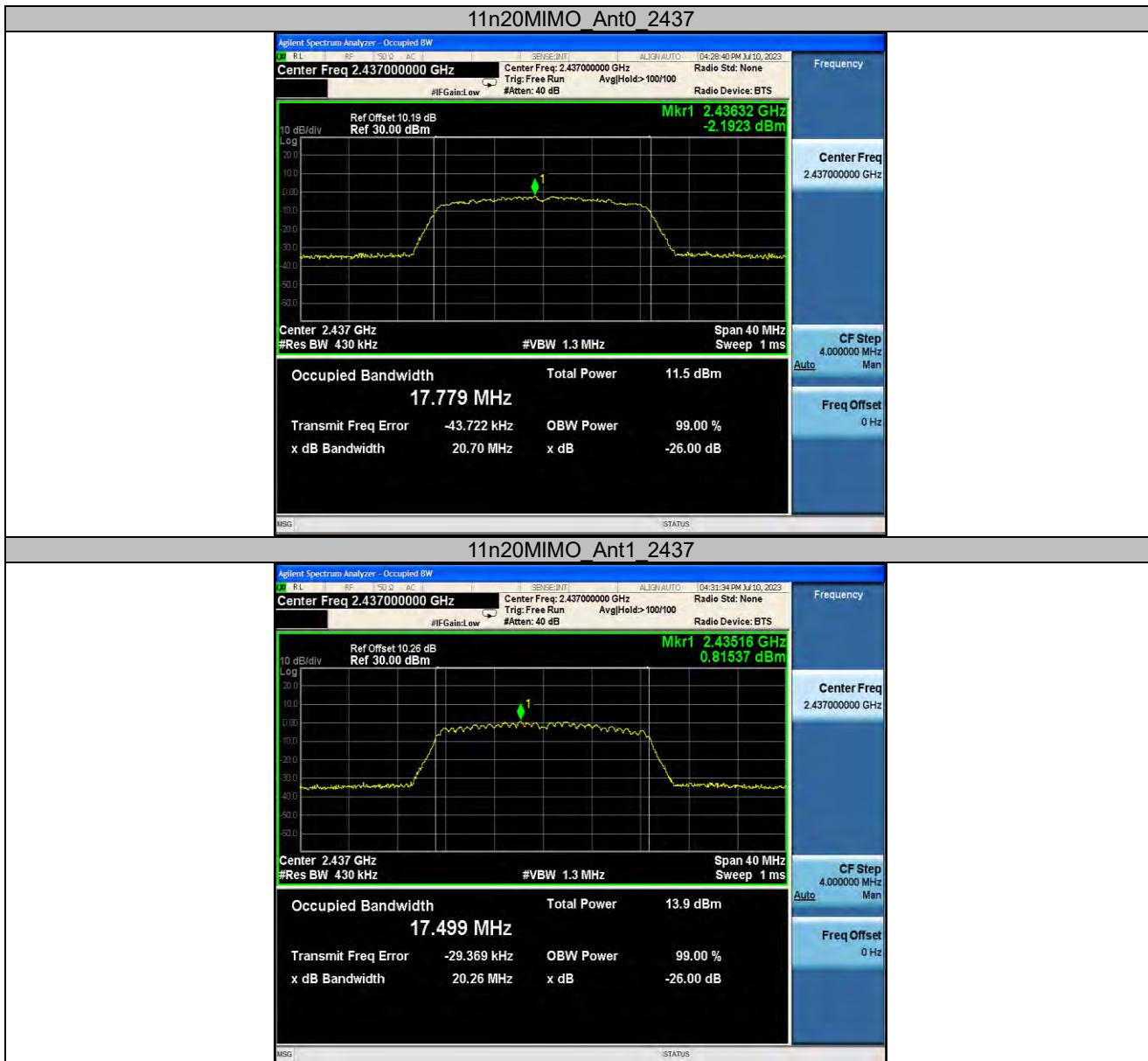
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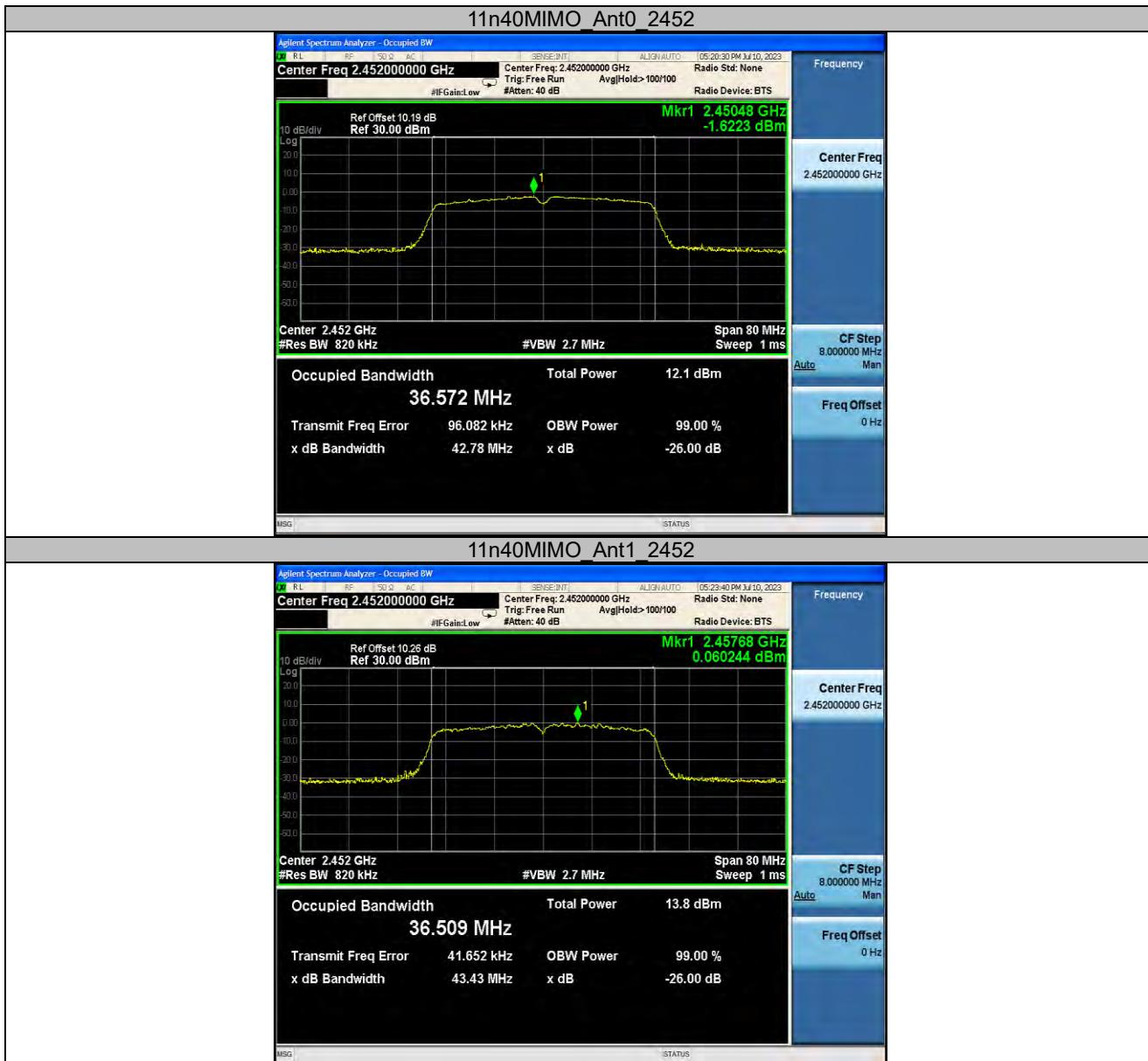
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**Maximum conducted output power
Test Result Peak**

TestMode	Antenna	Frequency[MHz]	Peak Power[dBm]	Conducted Limit[dBm]	Verdict
11b-CDD	Ant0	2412	16.35	≤30.00	PASS
	Ant1	2412	15.84	≤30.00	PASS
	total	2412	19.11	≤30.00	PASS
	Ant0	2437	15.62	≤30.00	PASS
	Ant1	2437	16.09	≤30.00	PASS
	total	2437	18.87	≤30.00	PASS
	Ant0	2462	15.45	≤30.00	PASS
	Ant1	2462	16.06	≤30.00	PASS
	total	2462	18.78	≤30.00	PASS
11g-CDD	Ant0	2412	14.24	≤30.00	PASS
	Ant1	2412	14.61	≤30.00	PASS
	total	2412	17.44	≤30.00	PASS
	Ant0	2437	14.25	≤30.00	PASS
	Ant1	2437	14.17	≤30.00	PASS
	total	2437	17.22	≤30.00	PASS
	Ant0	2462	13.85	≤30.00	PASS
	Ant1	2462	14.15	≤30.00	PASS
	total	2462	17.01	≤30.00	PASS
11n20MIMO	Ant0	2412	14.08	≤30.00	PASS
	Ant1	2412	14.56	≤30.00	PASS
	total	2412	17.34	≤30.00	PASS
	Ant0	2437	13.78	≤30.00	PASS
	Ant1	2437	14.38	≤30.00	PASS
	total	2437	17.10	≤30.00	PASS
	Ant0	2462	13.62	≤30.00	PASS
	Ant1	2462	14.35	≤30.00	PASS
	total	2462	17.01	≤30.00	PASS
11n40MIMO	Ant0	2422	13.43	≤30.00	PASS
	Ant1	2422	14.13	≤30.00	PASS
	total	2422	16.80	≤30.00	PASS
	Ant0	2437	13.37	≤30.00	PASS
	Ant1	2437	14.33	≤30.00	PASS
	total	2437	16.89	≤30.00	PASS
	Ant0	2452	13.37	≤30.00	PASS
	Ant1	2452	14.48	≤30.00	PASS
	total	2452	16.97	≤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-CDD	Ant0	2412	-10.66	≤8.00	PASS
	Ant1	2412	-11.9	≤8.00	PASS
	total	2412	-8.23	≤8.00	PASS
	Ant0	2437	-10.93	≤8.00	PASS
	Ant1	2437	-11.62	≤8.00	PASS
	total	2437	-8.25	≤8.00	PASS
	Ant0	2462	-12.52	≤8.00	PASS
	Ant1	2462	-10.73	≤8.00	PASS
	total	2462	-8.52	≤8.00	PASS
11g-CDD	Ant0	2412	-20.44	≤8.00	PASS
	Ant1	2412	-20.61	≤8.00	PASS
	total	2412	-17.51	≤8.00	PASS
	Ant0	2437	-21.3	≤8.00	PASS
	Ant1	2437	-20.08	≤8.00	PASS
	total	2437	-17.64	≤8.00	PASS
	Ant0	2462	-21.04	≤8.00	PASS
	Ant1	2462	-20.54	≤8.00	PASS
	total	2462	-17.77	≤8.00	PASS
11n20MIMO	Ant0	2412	-22.2	≤8.00	PASS
	Ant1	2412	-21.32	≤8.00	PASS
	total	2412	-18.73	≤8.00	PASS
	Ant0	2437	-22.6	≤8.00	PASS
	Ant1	2437	-21.49	≤8.00	PASS
	total	2437	-19.00	≤8.00	PASS
	Ant0	2462	-21.74	≤8.00	PASS
	Ant1	2462	-21.01	≤8.00	PASS
	total	2462	-18.35	≤8.00	PASS
11n40MIMO	Ant0	2422	-23.78	≤8.00	PASS
	Ant1	2422	-23.56	≤8.00	PASS
	total	2422	-20.66	≤8.00	PASS
	Ant0	2437	-24.06	≤8.00	PASS
	Ant1	2437	-23.65	≤8.00	PASS
	total	2437	-20.84	≤8.00	PASS
	Ant0	2452	-24.13	≤8.00	PASS
	Ant1	2452	-24.2	≤8.00	PASS
	total	2452	-21.15	≤8.00	PASS

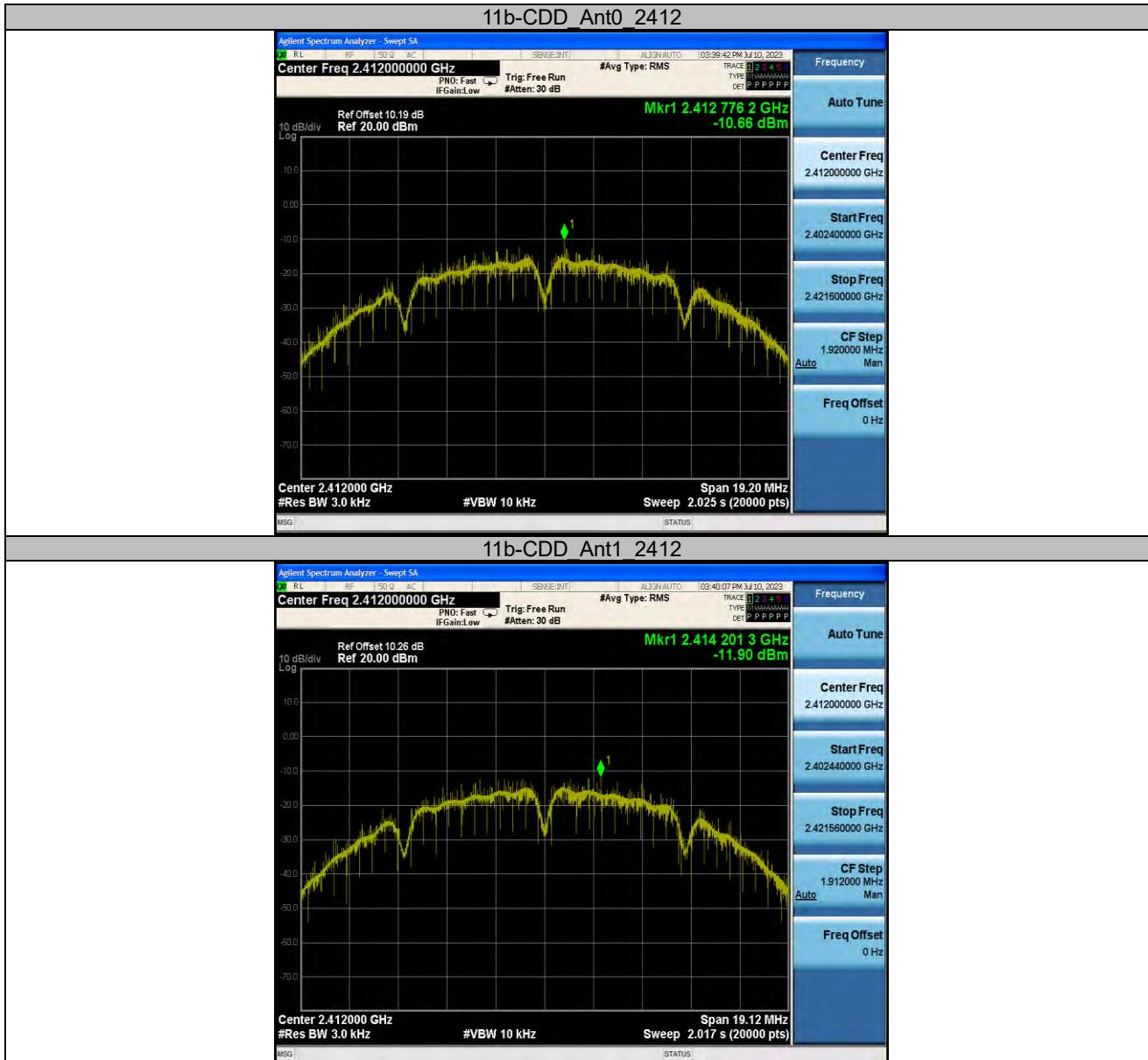
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Test Graphs


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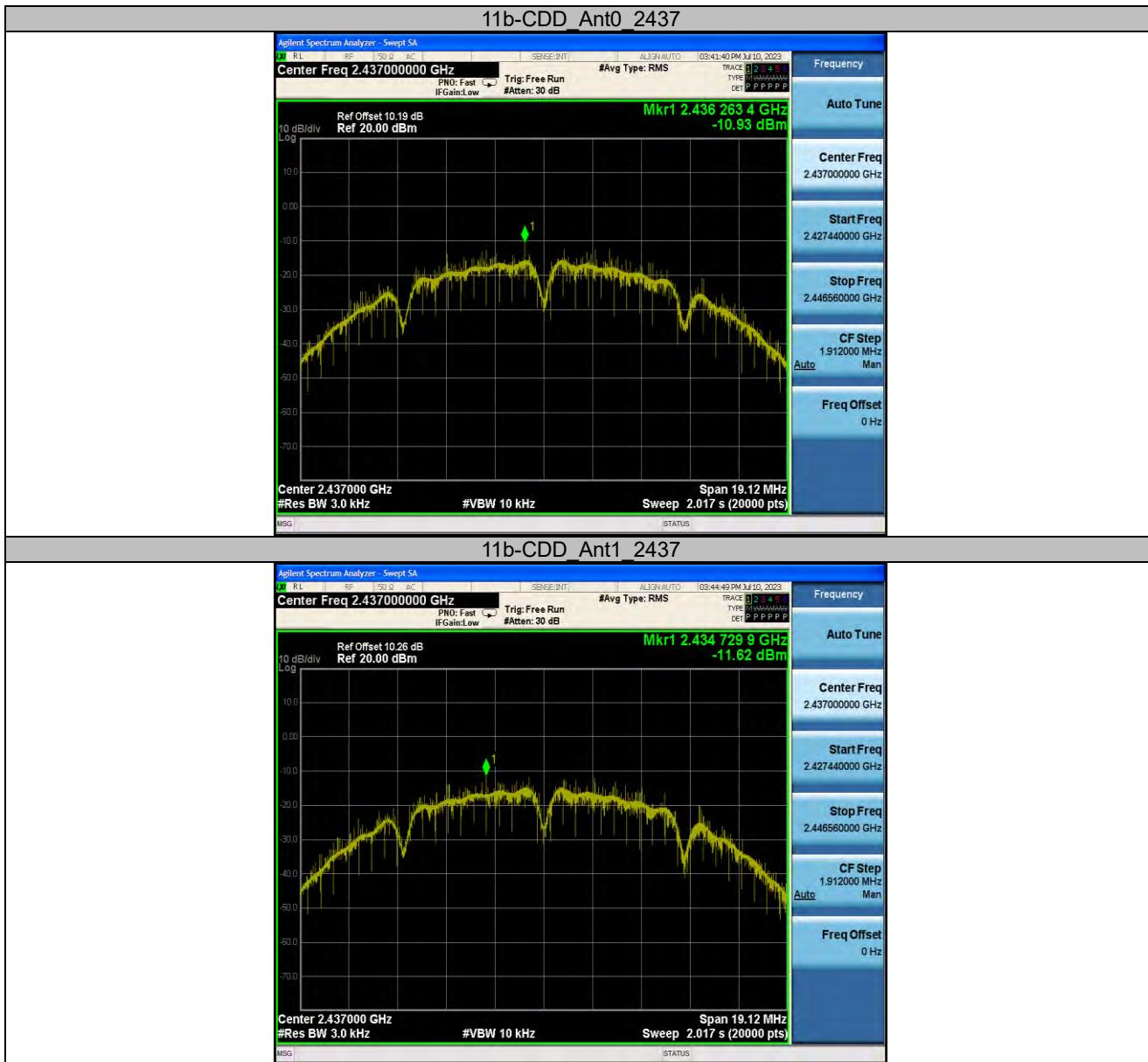
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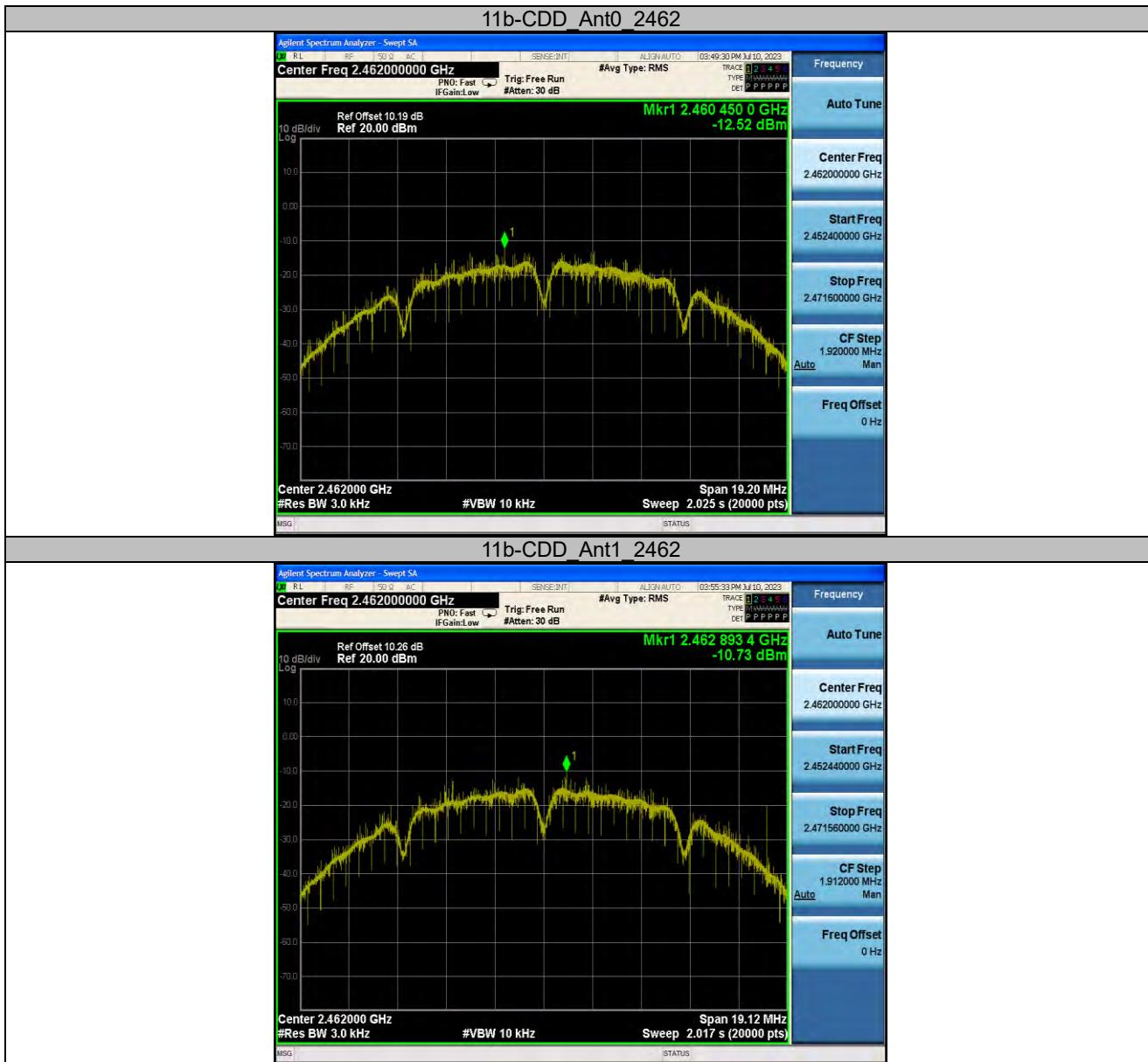
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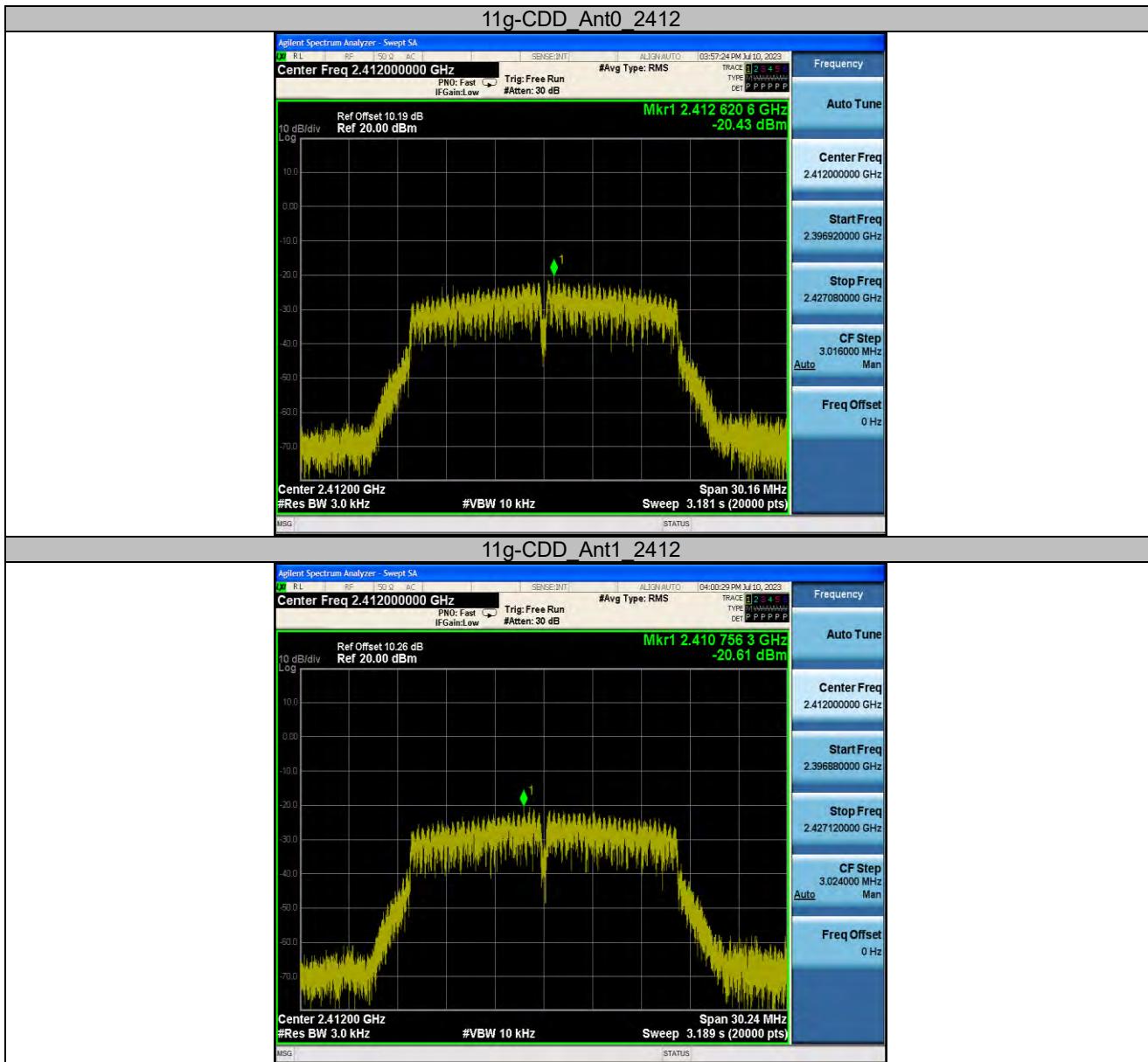
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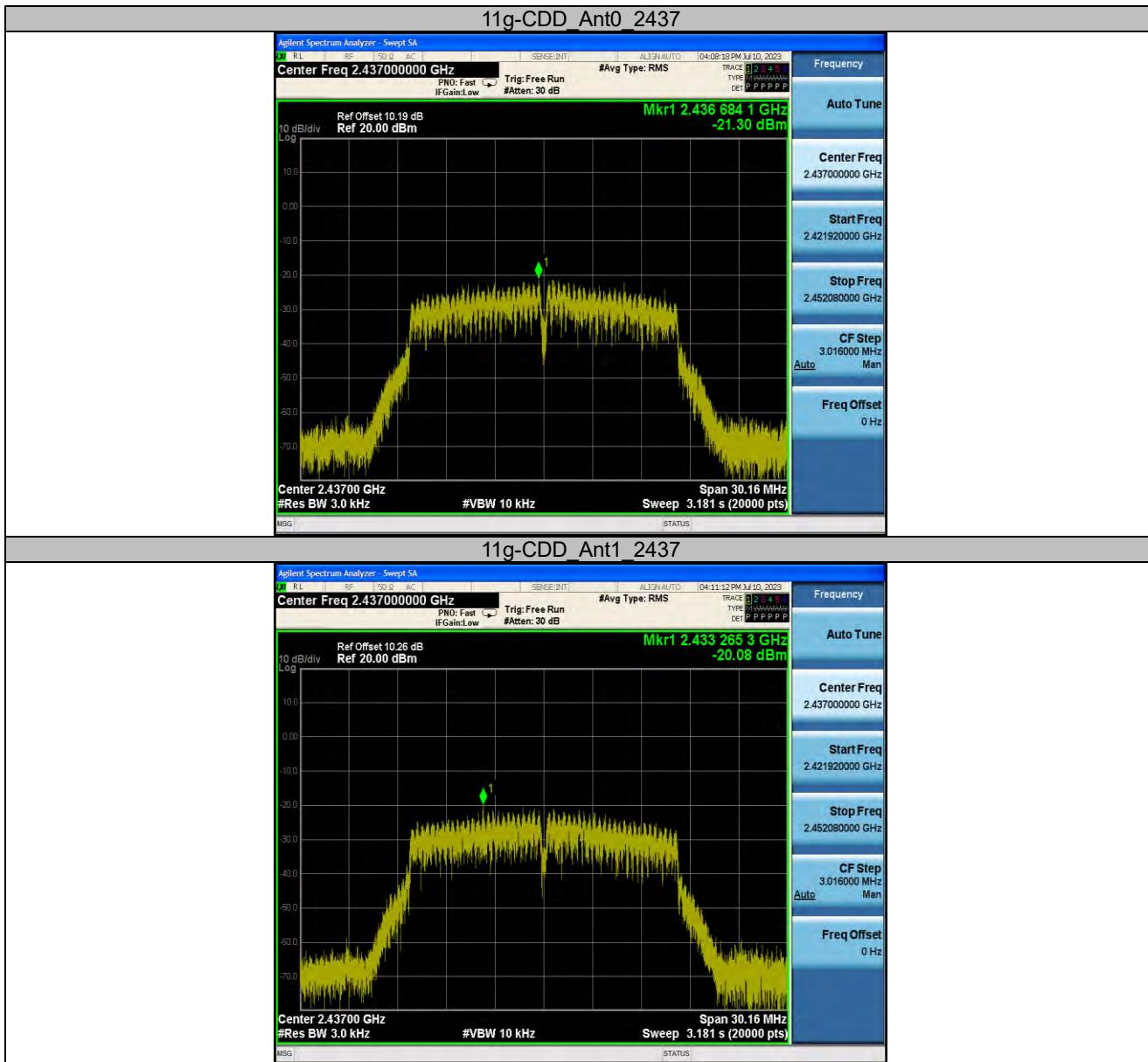
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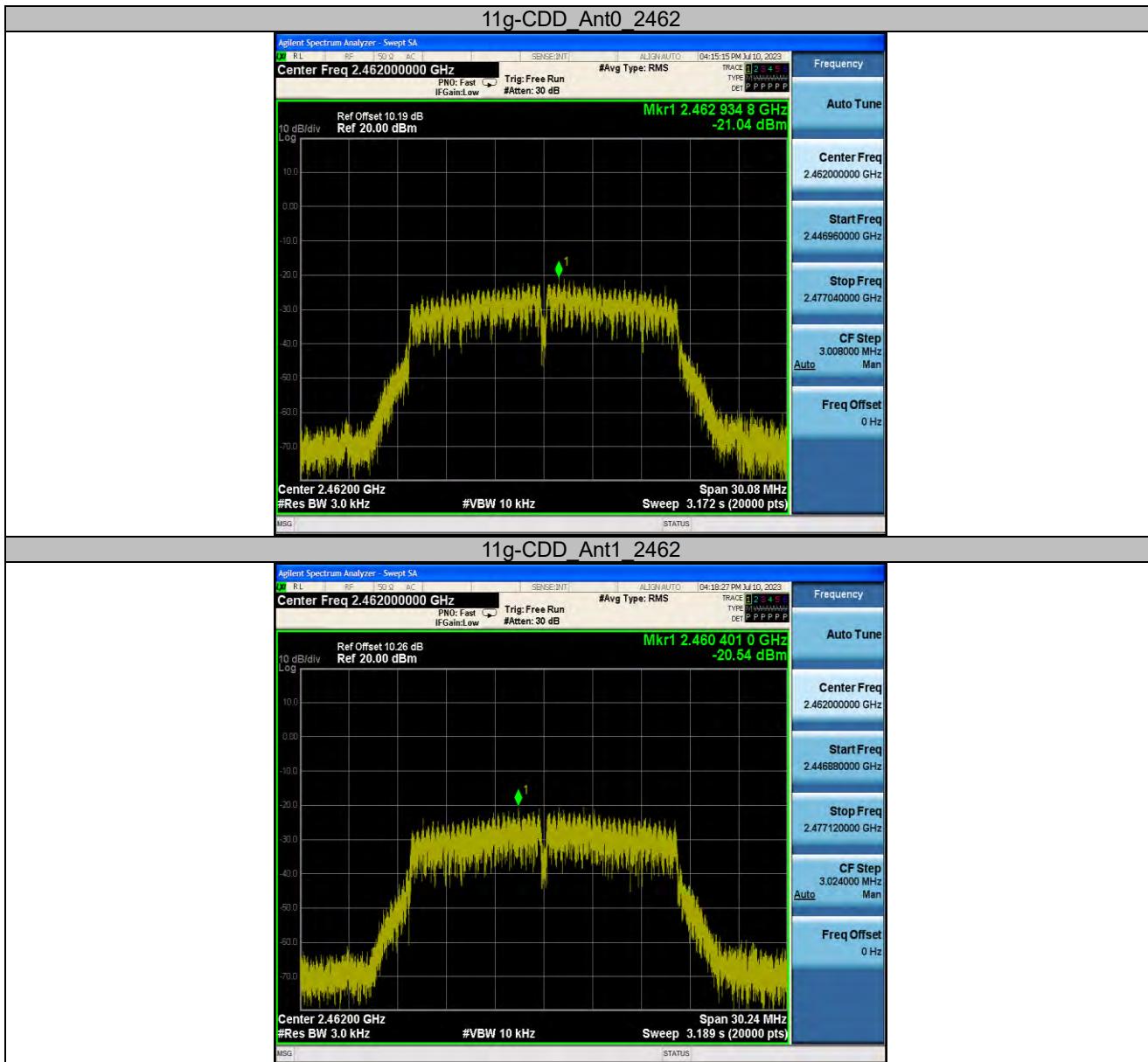
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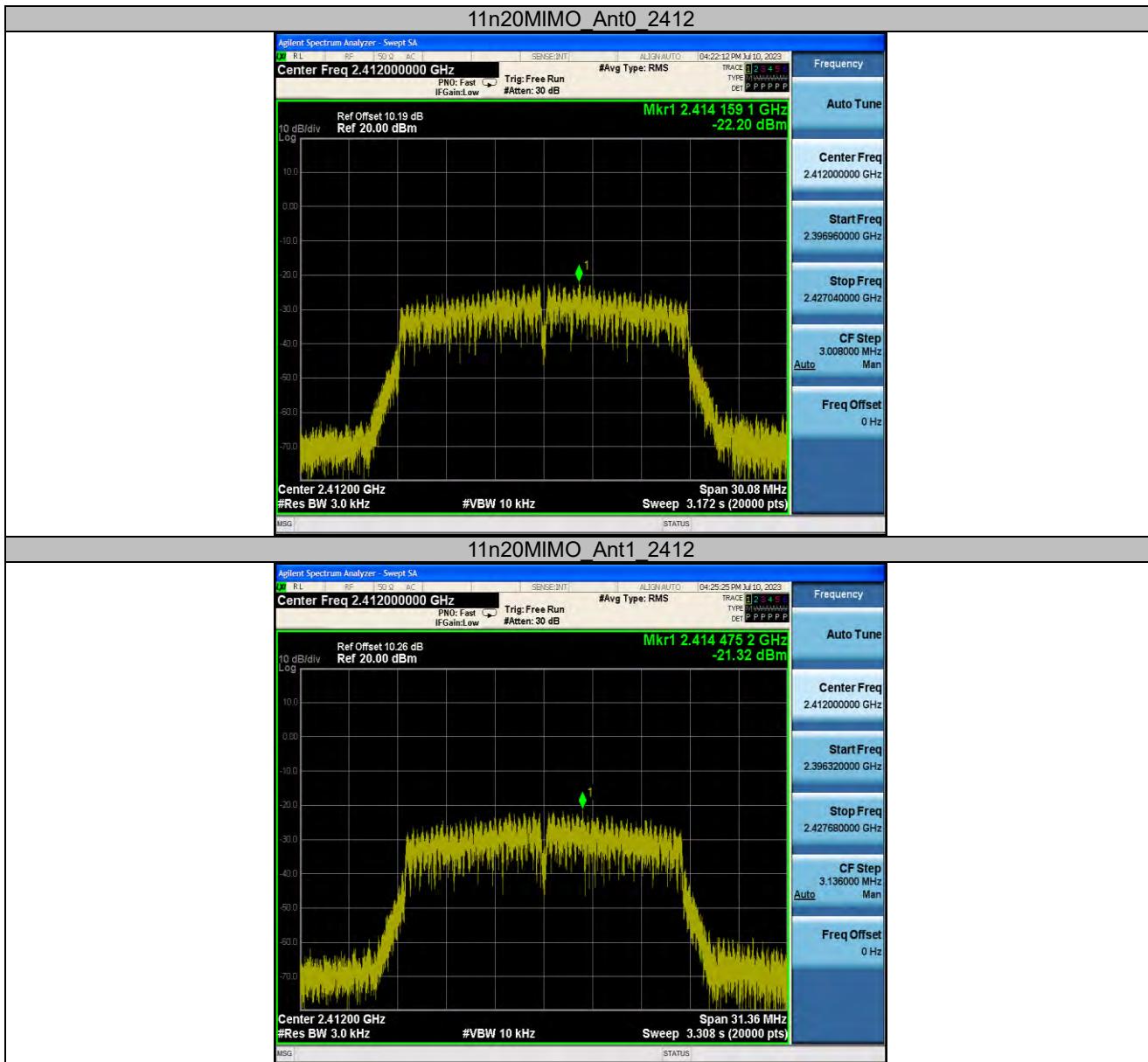
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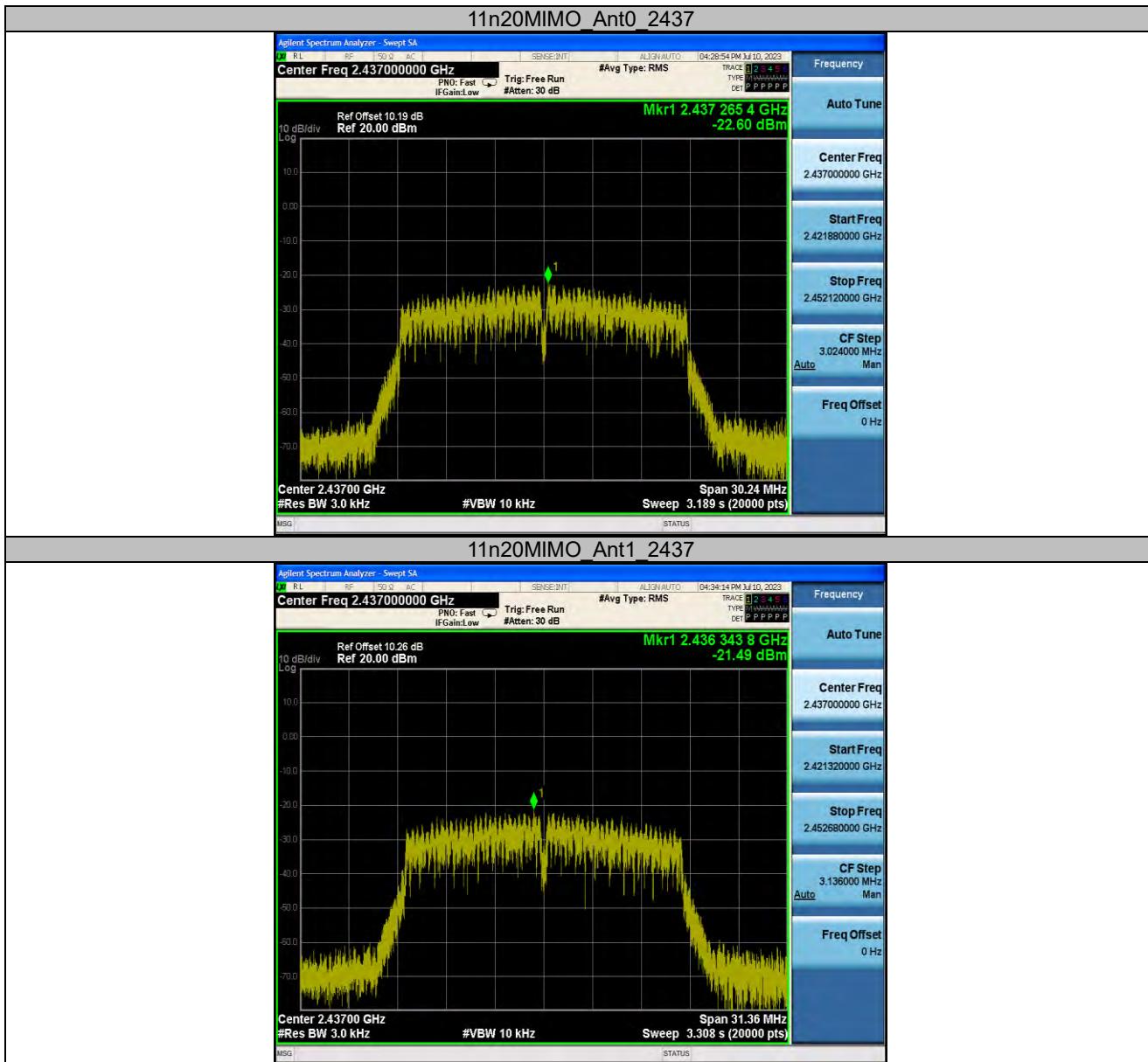
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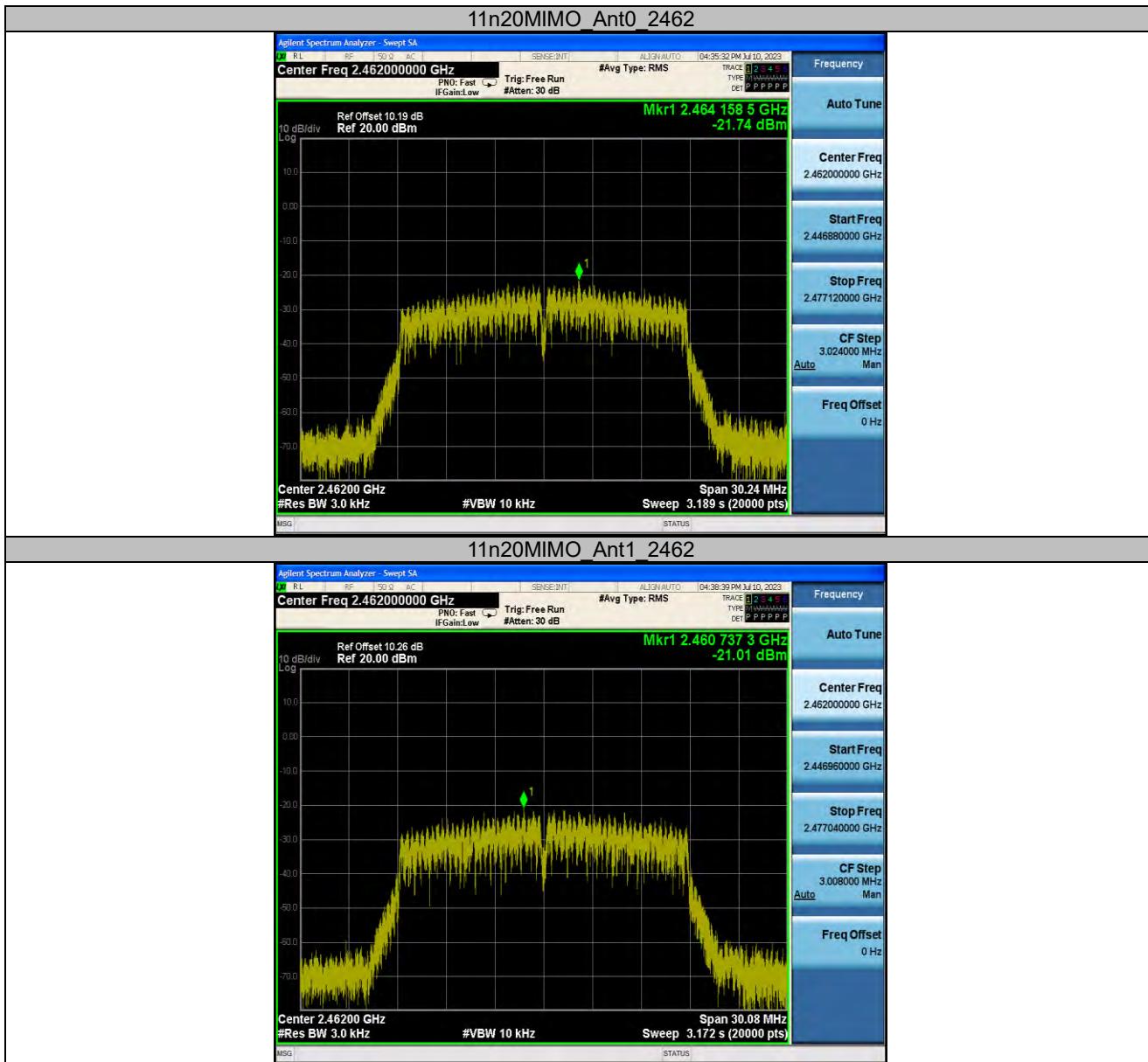
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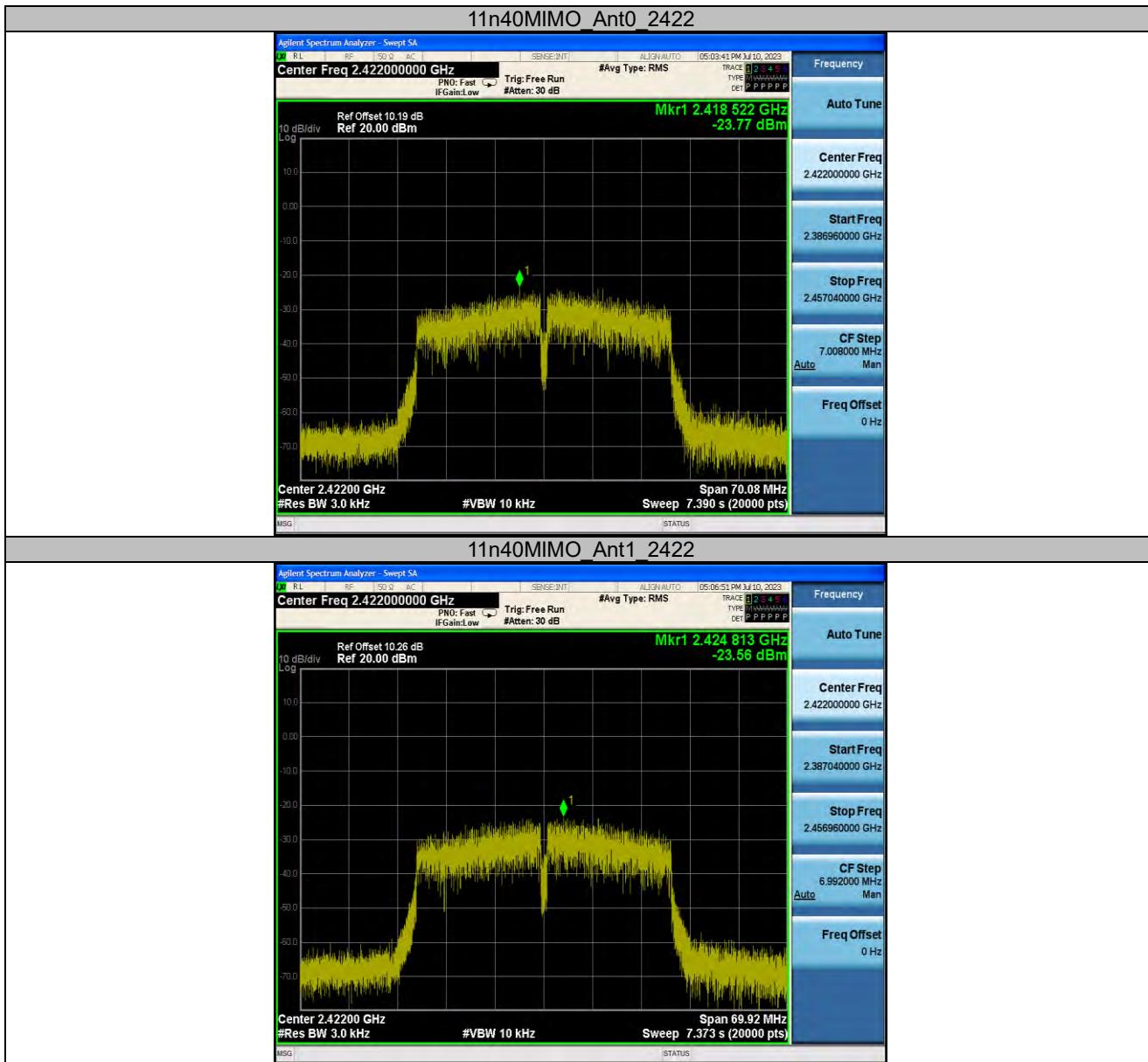
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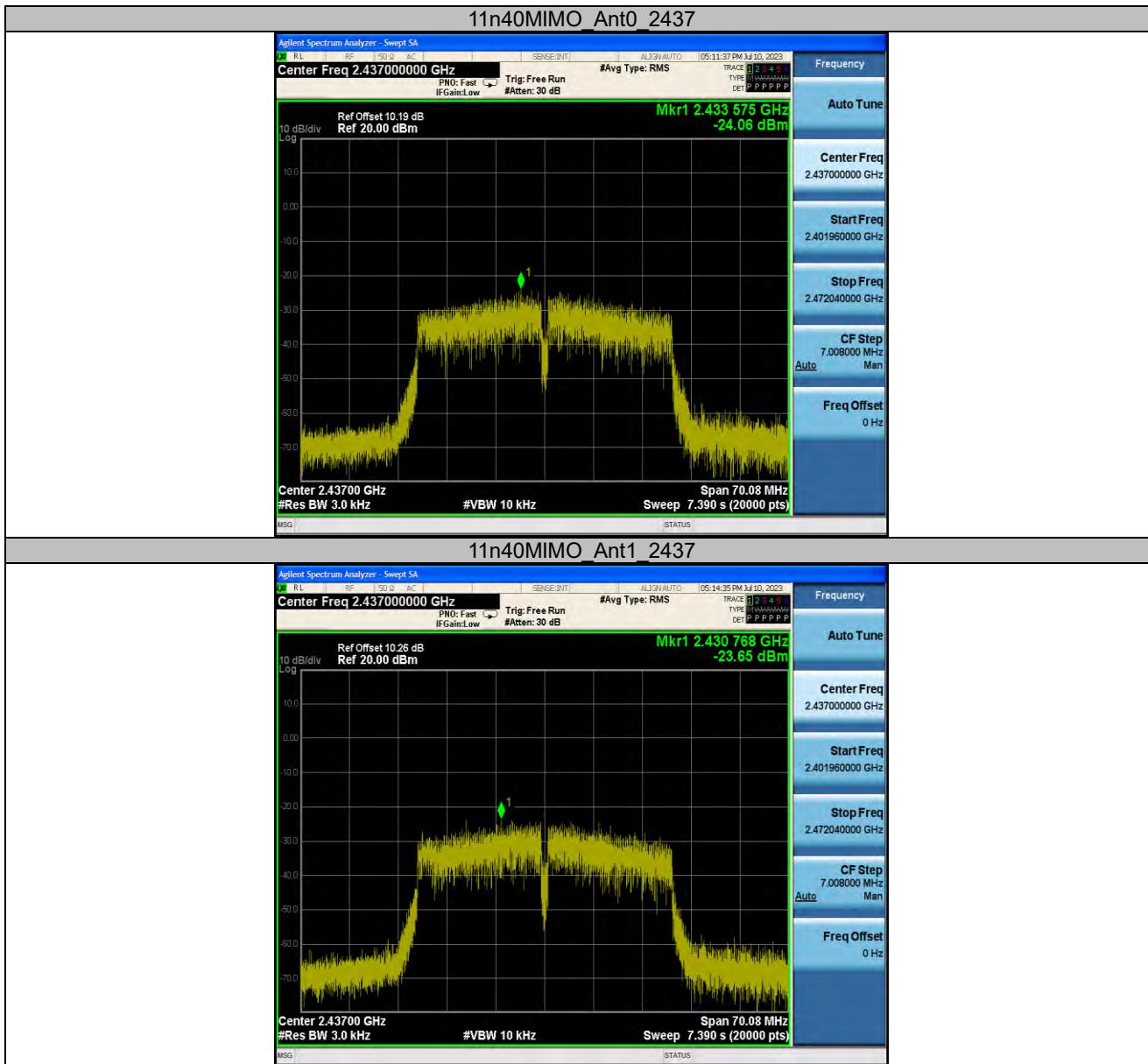
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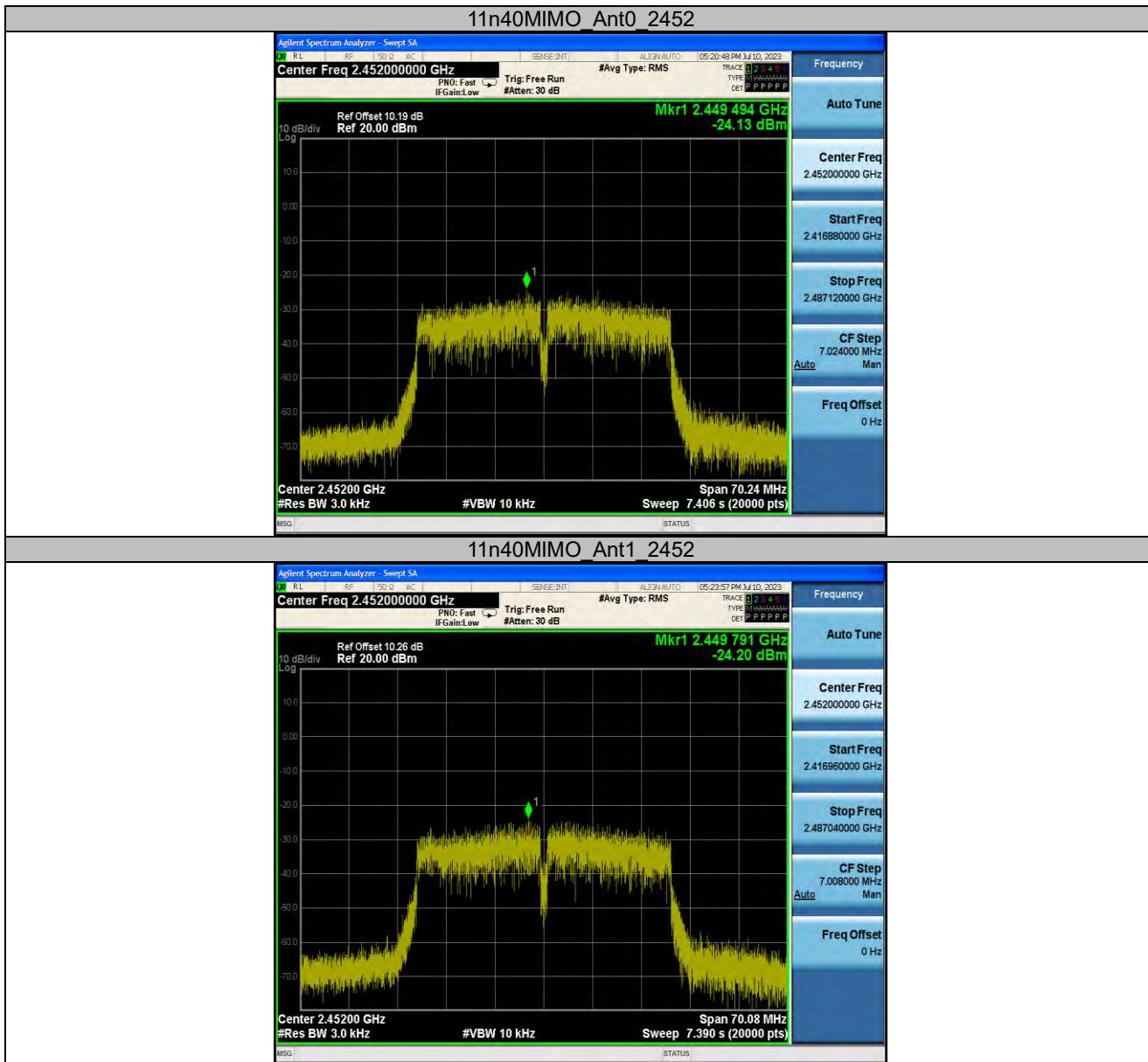
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Band edge measurements
Test Result

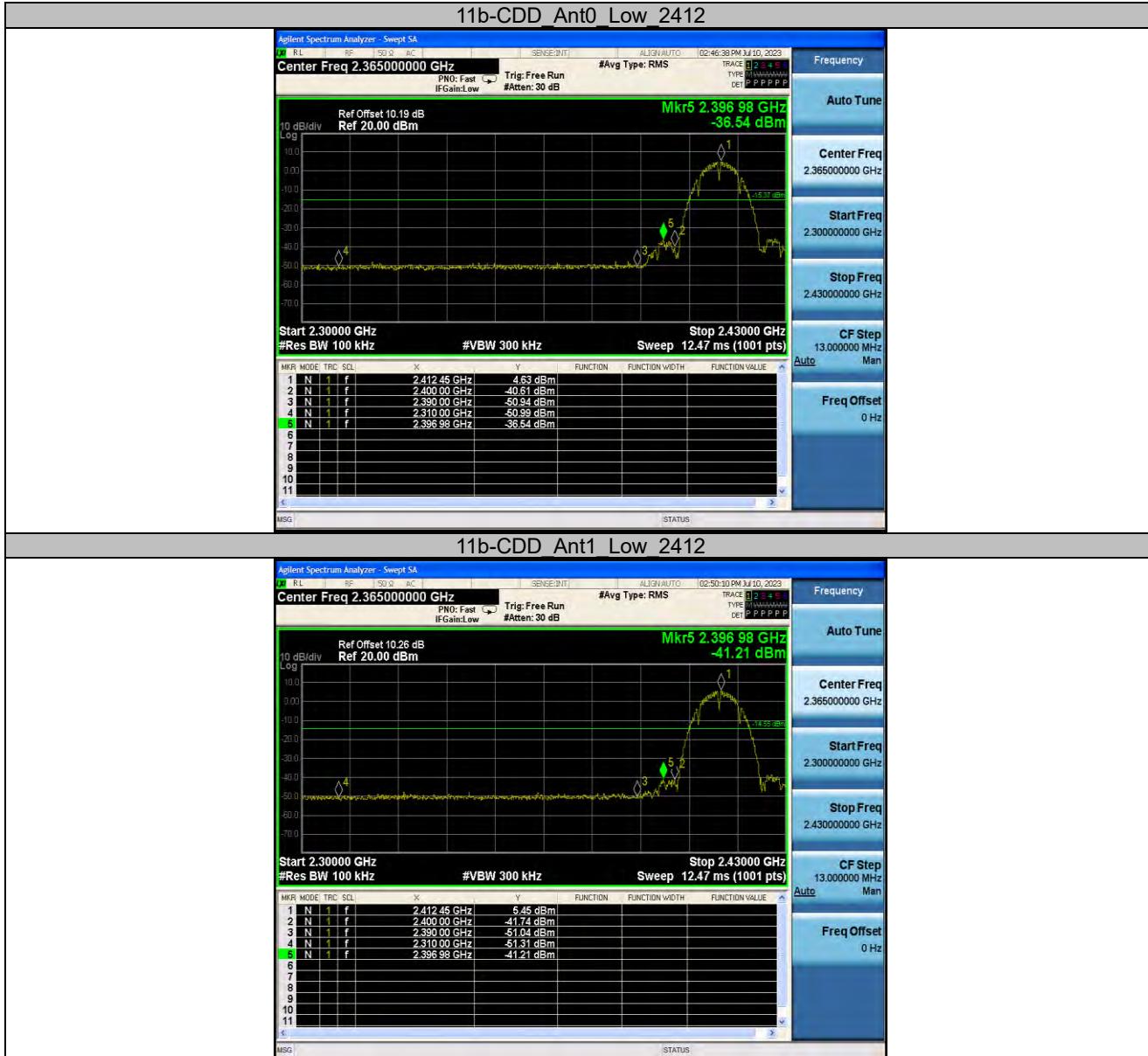
TestMode	Antenna	Channel	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11b-CDD	Ant0	Low	2412	4.63	-36.54	≤-15.37	PASS
	Ant1	Low	2412	5.45	-41.21	≤-14.55	PASS
	Ant0	High	2462	4.23	-47.25	≤-15.77	PASS
	Ant1	High	2462	5.14	-47.7	≤-14.86	PASS
11g-CDD	Ant0	Low	2412	-4.74	-45.75	≤-24.74	PASS
	Ant1	Low	2412	-4.12	-44.03	≤-24.12	PASS
	Ant0	High	2462	-4.03	-46.87	≤-24.03	PASS
	Ant1	High	2462	-3.42	-46.89	≤-23.42	PASS
11n20MIMO	Ant0	Low	2412	-6.29	-45.21	≤-26.29	PASS
	Ant1	Low	2412	-4.77	-43.98	≤-24.77	PASS
	Ant0	High	2462	-5.33	-48.49	≤-25.33	PASS
	Ant1	High	2462	-5.28	-47.82	≤-25.28	PASS
11n40MIMO	Ant0	Low	2422	-7.21	-41.09	≤-27.21	PASS
	Ant1	Low	2422	-6.24	-39.69	≤-26.24	PASS
	Ant0	High	2452	-8.54	-44.71	≤-28.54	PASS
	Ant1	High	2452	-7.77	-43.78	≤-27.77	PASS



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Test Graphs


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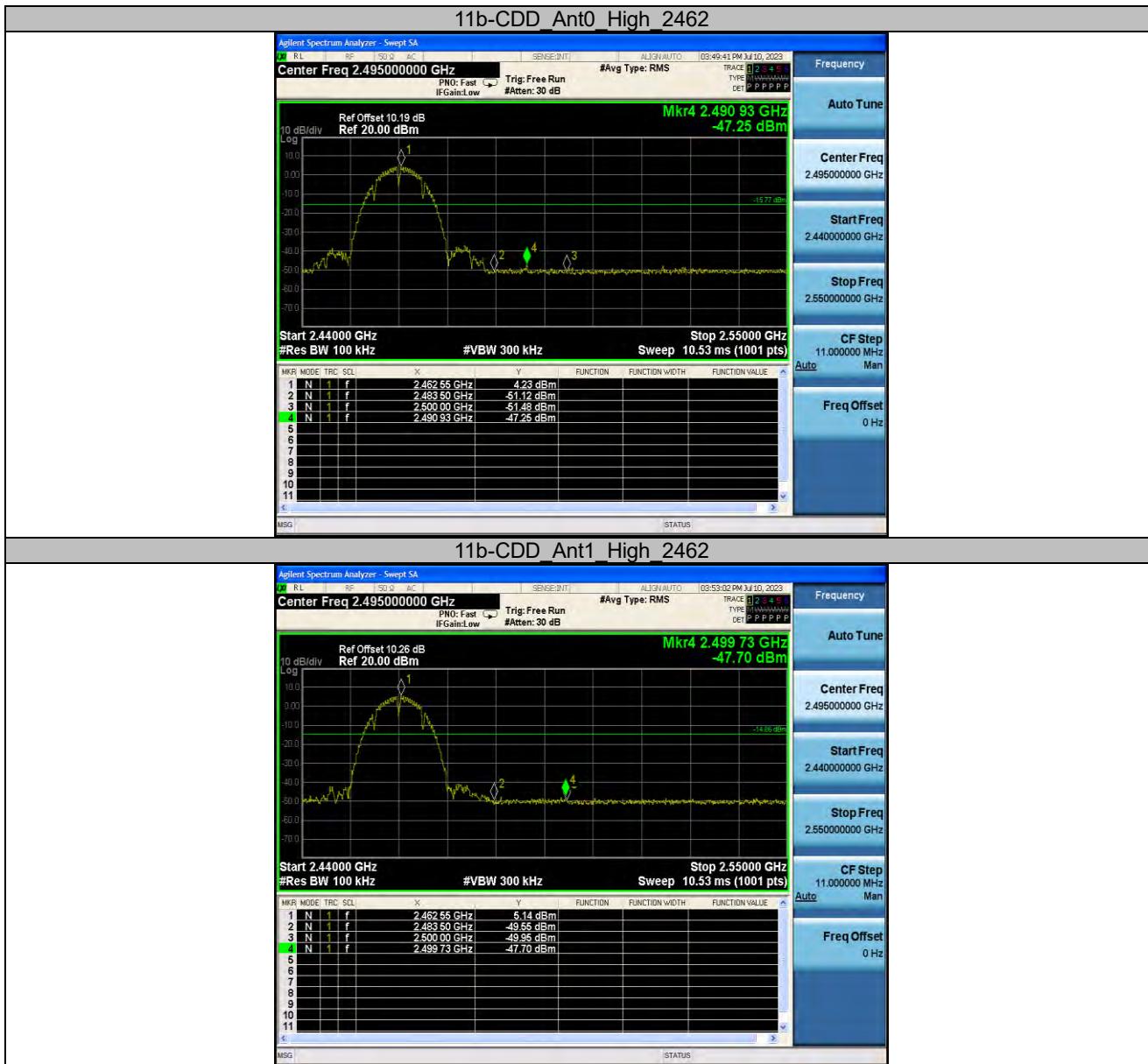
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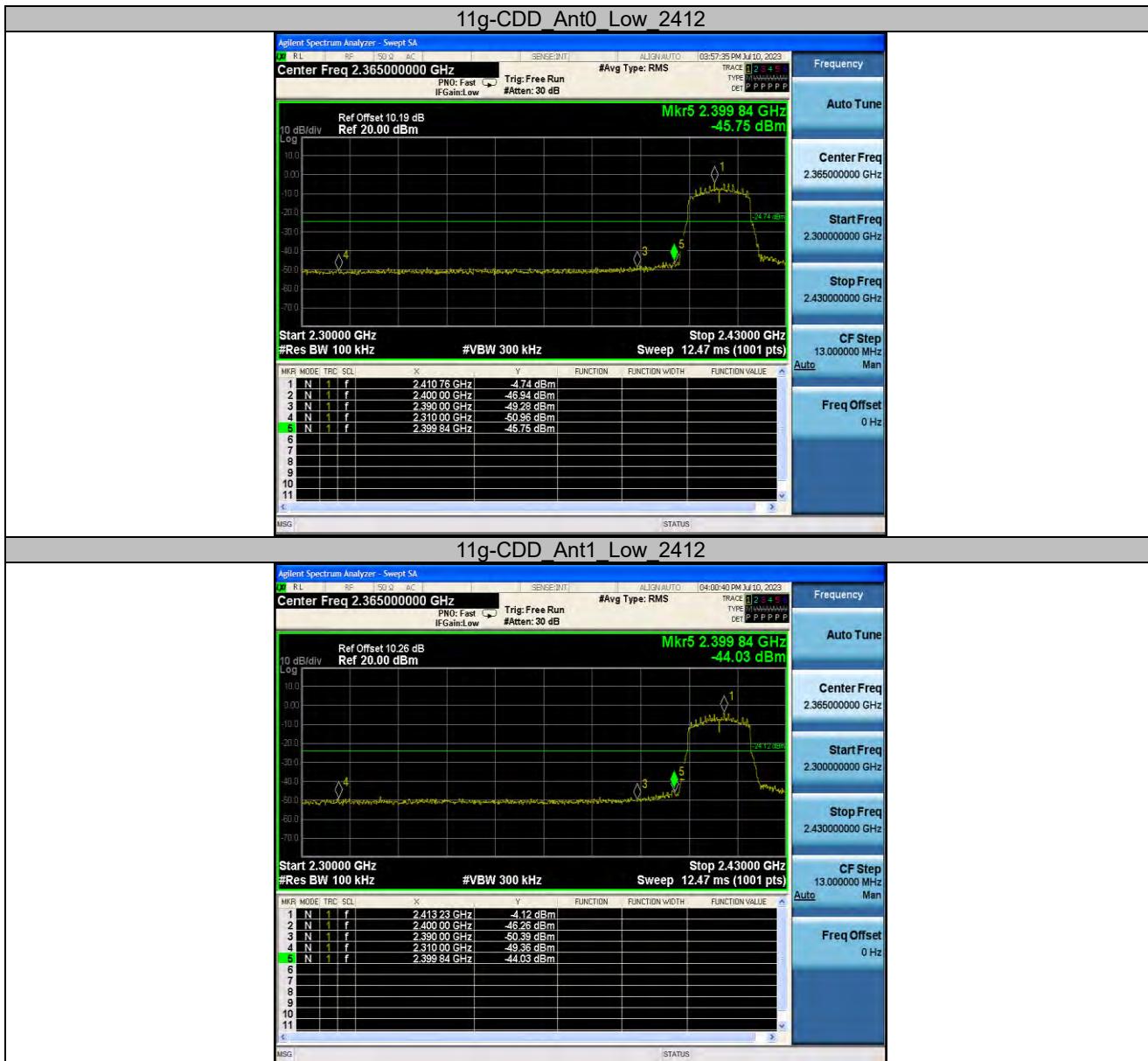
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