

Report No.: XEWM2309000451RG05
 Rev.: 01
 Page: 1 of 323

TEST REPORT

Application No.: XEWM2309000451RG
Applicant: Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Applicant: NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City, Guangdong, China
Manufacturer: Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Manufacturer: NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City, Guangdong, China
EUT Description: Mobile Phone
Model No.: CPH2599
Trade Mark: OPPO
FCC ID: R9C-CPH2599
Standards: FCC 47 CFR Part 2, Subpart J
 FCC 47 CFR Part 15, Subpart C
Date of Receipt: 2023/09/08
Date of Test: 2023/09/11 to 2023/09/29
Date of Issue: 2023/10/20

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:



Peter Tan
 Regulatory Technical Manager



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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023/10/20		Original

Prepared By	 <hr/> (Leah Chen) / Test Engineer
Checked By	 <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	--	ANSI C63.10-2020 Section 11.6	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:	Guangdong OPPO Mobile Telecommunications Corp., Ltd.
Address of Manufacturer:	NO.18 Haibin Road, Wusha Village, Chang'an Town, Dongguan City, Guangdong, China

3.2 Test Location

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, Jacky Xue

3.3 Test Facility

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

<p>• 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.</p> <p>• 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.</p> <p>• 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</p>
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3.4 General Description of EUT

EUT Description:	Mobile Phone	
Model No.:	CPH2599	
Trade Mark:	OPPO	
Hardware Version:	11	
Software Version:	ColosOS 14.0	
Power Supply:	Li-ion polymer Battery(3.89V)	
IMEI:	RF Conducted	865055060031471
	RSE & AC power line	865055060029756
Operation Frequency:	802.11b/g/n(HT20)/VHT20/ax(HE20):	2412MHz to 2462MHz
	802.11n(HT40)/VHT40/ax(HE40):	2422MHz to 2452MHz
Modulation Type:	802.11b:	DSSS (DBPSK, DQPSK, CCK)
	802.11g/n:	OFDM (BPSK, QPSK, 16QAM, 64QAM)
	802.11VHT:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
	802.11ax:	OFDM/OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Number of Channels:	802.11b/g/n(HT20)/VHT20/ax(HE20): 11 802.11n(HT40)/VHT40/ax(HE40): 7	
Channel Spacing:	5MHz	
Smart System:	<input checked="" type="checkbox"/> SISO	802.11b/g/n/VHT/ax
	<input checked="" type="checkbox"/> MIMO	802.11n/VHT20/ax: 2Tx & 2Rx
	<input checked="" type="checkbox"/> Diversity	802.11b/g: 2Tx & 2Rx
Antenna Type:	Fixed Internal Antenna	
Antenna Gain:	0dBi(Ant9); 0dBi(Ant10)	
	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.	



Operation Frequency of each channel (802.11b/g/n HT20 / VHT20 /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 / VHT40 /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) / (VHT20) /ax (HE20)			Frequency for 802.11n (HT40)/(VHT40)/ax(HE40)			
The Lowest channel	2412MHz			2422MHz			
The Middle channel	2437MHz			2437MHz			
The Highest channel	2462MHz			2452MHz			



3.5 Test Environment and Mode

Environment Parameter	96~101 kPa Selected Values During Tests	
Relative Humidity	40-60 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	22~25	3.89
Remark: NV: Normal Voltage NT: Normal Temperature		

3.6 Description of Support Units

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	CDD/MIMO - Data Rate
802.11b	1 Mbps	2 Mbps
802.11g	6 Mbps	12 Mbps
802.11n (HT 20)	MCS0 (6.5 Mbps)	MCS0 (13 Mbps)
802.11n (HT 40)	MCS0 (13.5 Mbps)	MCS0 (27 Mbps)
802.11 (VHT 20)	MCS0 (6.5 Mbps)	MCS0 (13 Mbps)
802.11 (VHT 40)	MCS0 (13.5 Mbps)	MCS0 (27 Mbps)
802.11ax (HE 20)	MCS0 (8 Mbps)	MCS0 (16 Mbps)
802.11ax (HE 40)	MCS0 (16 Mbps)	MCS0 (32 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)
<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 Fixed Internal Antenna and no consideration of replacement. The best case gain of the antenna is 0dBi(Ant9); 0dBi(Ant10).*</p>	
<p><i>*Note:</i> <i>The antenna gain are derived from the gain information report provided by the manufacturer.</i></p> <p><i>Remark:</i> <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} + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,
 Array Gain = $10 \log(N_{ANT}/N_{SS}=1)$ dB.
- For power measurements on IEEE 802.11 devices:
 Array Gain = 0 dB (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 G_{ANT} 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 Gain9 (dBi)	ANT Gain10 (dBi)	Power DG (dBi)	PSD DG (dBi)	Power Limit Reduction(dB)	PSD Limit Reduction(dB)
0	0	0	3.01	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)	
		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>		



<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>



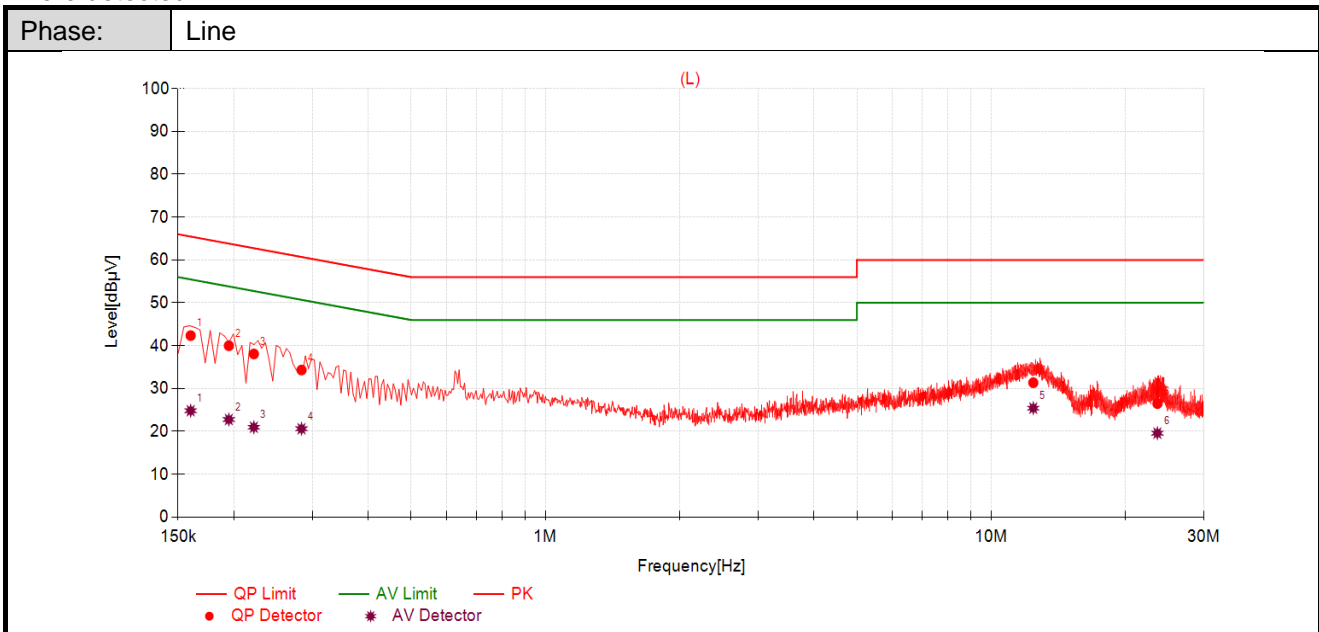
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Measurement Data

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.

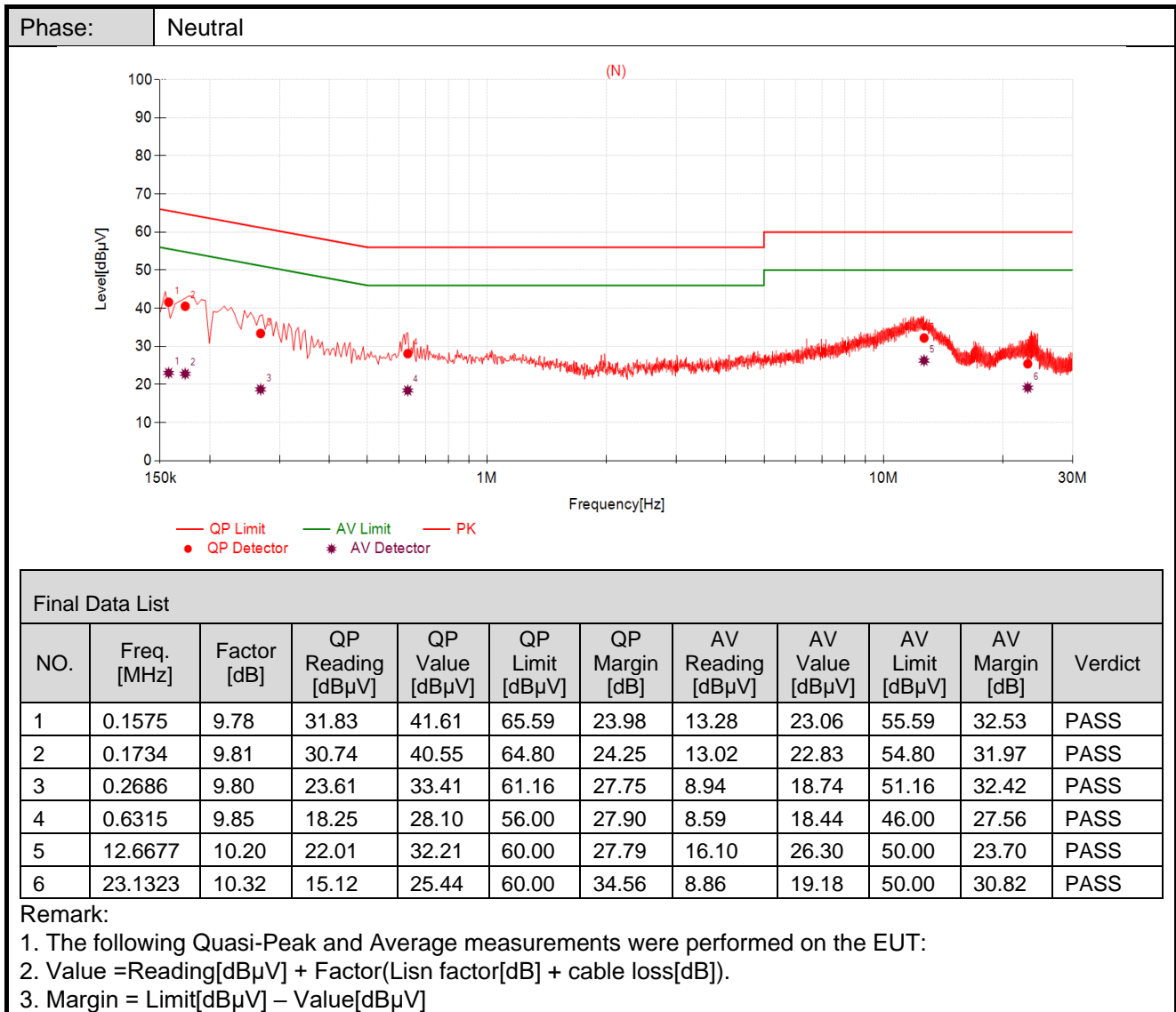


Data List											
NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBµV]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.1600	9.86	32.50	42.36	65.46	23.10	14.97	24.83	55.46	30.63	PASS
2	0.1949	9.84	30.16	40.00	63.82	23.82	12.93	22.77	53.82	31.05	PASS
3	0.2218	9.86	28.22	38.08	62.75	24.67	11.11	20.97	52.75	31.78	PASS
4	0.2837	9.90	24.43	34.33	60.71	26.38	10.72	20.62	50.71	30.09	PASS
5	12.4391	10.07	21.30	31.37	60.00	28.63	15.36	25.43	50.00	24.57	PASS
6	23.6180	10.30	16.20	26.50	60.00	33.50	9.29	19.59	50.00	30.41	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[dBµV] – Value[dBµV]





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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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	



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	



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: Appendix	



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	



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	



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:

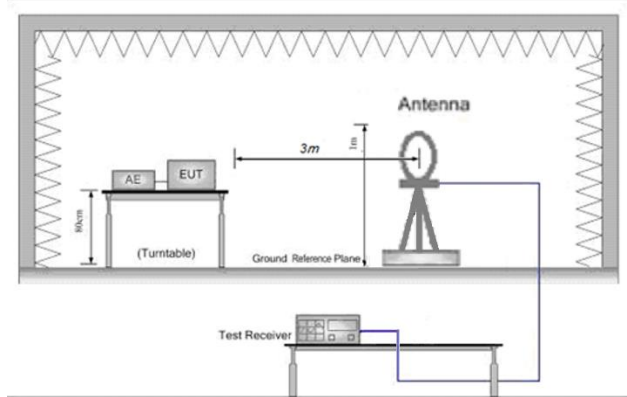


Figure 1. Below 30MHz

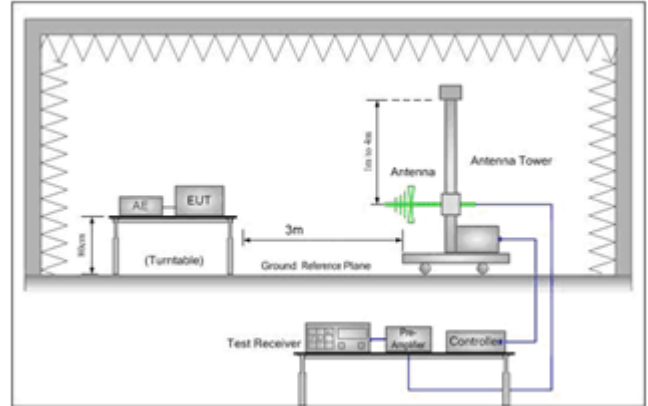


Figure 2. 30MHz to 1GHz

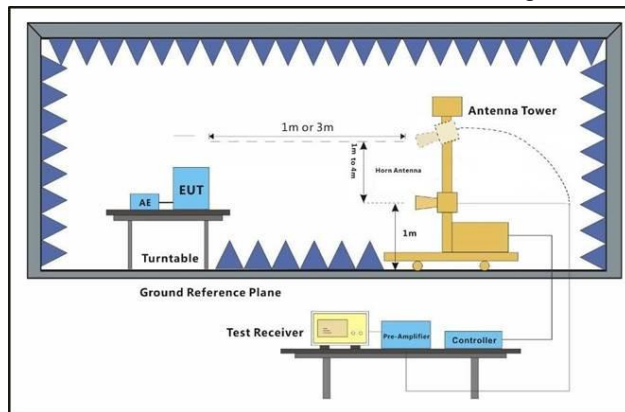


Figure 3. Above 1 GHz

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



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	<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 $20 \cdot \text{LOG}(3/1) = 9.54 \text{ dB}$.</p>
<p>Test Configuration:</p>	<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.
<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. For below 1GHz part, through pre-scan all channels, but only the worst case is recorded in the report.</p>



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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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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:

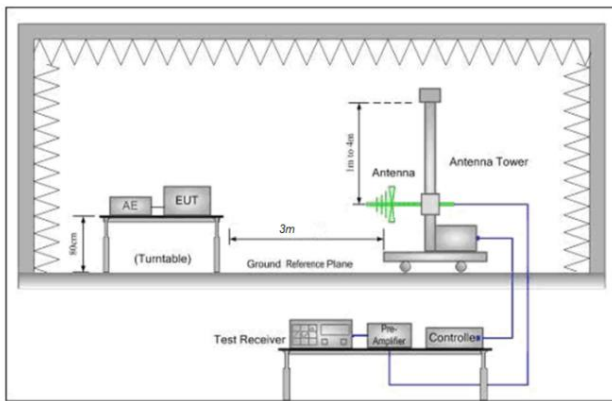


Figure 1. 30MHz to 1GHz

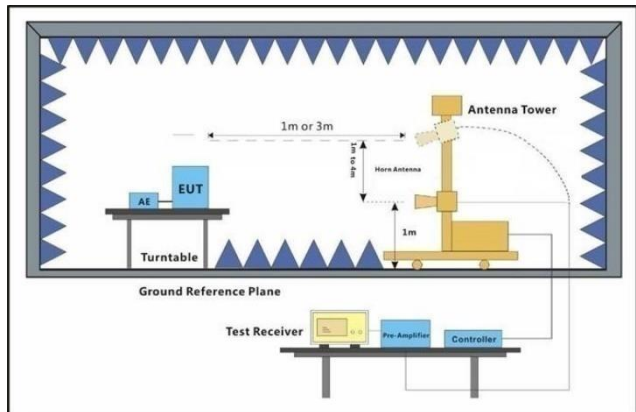


Figure 2. Above 1 GHz



<p>Test Procedure:</p>	<ol style="list-style-type: none"> 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. 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 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. j. Repeat above procedures until all frequencies measured was complete.
<p>Test Configuration:</p>	<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 ≥ 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 ≥ 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.
<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: Appendix	



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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	± 0.21 dB
5	RF power density	± 2.84 dB
6	Conducted Spurious emissions	± 0.75 dB
7	Conduction Emission	± 3.0 dB (150kHz to 30MHz)
8	Radiated Emission	± 4.6 dB (9kHz to 30MHz)
		± 4.9 dB (30MHz to 1GHz)
		± 4.9 dB (1GHz to 6GHz)
		± 4.7 dB (6GHz to 18GHz)
		± 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	2023/08/30	2024/08/29
Power Supply	Agilent	66311B	XAW01-17-01	2023/02/16	2024/02/15
Temperature and humidity meter	MingGao	T809	XAW01-01-16	2023/09/04	2024/09/03

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	2023/08/30	2024/08/29
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2023/06/30	2024/06/29
Temperature and humidity meter	MingGao	TH101B	XAW01-01-02	2023/08/30	2024/08/29
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	2023/06/30	2024/06/29



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RSE Test System					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)
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	2023/08/30	2024/08/29
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	2023/08/30	2024/08/29
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2023/08/30	2024/08/29
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2023/08/30	2024/08/29
Temperature and humidity meter	MingGao	TH101B	XAW01-01-02	2023/09/04	2024/09/03
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-CDD	Ant9	2412	8.000	2408.000	2416.000	0.5	PASS
	Ant10	2412	7.120	2408.440	2415.560	0.5	PASS
	Ant9	2437	7.520	2433.000	2440.520	0.5	PASS
	Ant10	2437	7.960	2433.040	2441.000	0.5	PASS
	Ant9	2462	7.560	2458.480	2466.040	0.5	PASS
	Ant10	2462	7.560	2458.480	2466.040	0.5	PASS
11g-CDD	Ant9	2412	16.080	2403.840	2419.920	0.5	PASS
	Ant10	2412	16.320	2403.840	2420.160	0.5	PASS
	Ant9	2437	12.120	2430.160	2442.280	0.5	PASS
	Ant10	2437	15.400	2429.120	2444.520	0.5	PASS
	Ant9	2462	15.080	2454.480	2469.560	0.5	PASS
	Ant10	2462	14.080	2455.680	2469.760	0.5	PASS
11n20MIMO	Ant9	2412	16.040	2403.480	2419.520	0.5	PASS
	Ant10	2412	17.560	2403.240	2420.800	0.5	PASS
	Ant9	2437	13.880	2429.440	2443.320	0.5	PASS
	Ant10	2437	15.440	2429.080	2444.520	0.5	PASS
	Ant9	2462	17.280	2453.480	2470.760	0.5	PASS
	Ant10	2462	15.960	2454.440	2470.400	0.5	PASS
11n40MIMO	Ant9	2422	35.120	2404.480	2439.600	0.5	PASS
	Ant10	2422	32.560	2406.960	2439.520	0.5	PASS
	Ant9	2437	33.760	2419.480	2453.240	0.5	PASS
	Ant10	2437	35.040	2419.480	2454.520	0.5	PASS
	Ant9	2452	36.160	2433.840	2470.000	0.5	PASS
	Ant10	2452	35.040	2434.480	2469.520	0.5	PASS
11VHT20MIMO	Ant9	2412	14.720	2405.680	2420.400	0.5	PASS
	Ant10	2412	17.560	2403.240	2420.800	0.5	PASS
	Ant9	2437	14.480	2430.080	2444.560	0.5	PASS
	Ant10	2437	16.280	2428.840	2445.120	0.5	PASS
	Ant9	2462	16.920	2453.840	2470.760	0.5	PASS
	Ant10	2462	13.120	2457.000	2470.120	0.5	PASS
11VHT40MIMO	Ant9	2422	35.040	2404.480	2439.520	0.5	PASS
	Ant10	2422	26.320	2413.200	2439.520	0.5	PASS
	Ant9	2437	22.560	2425.720	2448.280	0.5	PASS
	Ant10	2437	35.040	2419.480	2454.520	0.5	PASS
	Ant9	2452	35.920	2434.240	2470.160	0.5	PASS
	Ant10	2452	35.120	2434.480	2469.600	0.5	PASS
11ax20MIMO	Ant9	2412	16.560	2404.560	2421.120	0.5	PASS
	Ant10	2412	16.360	2404.440	2420.800	0.5	PASS
	Ant9	2437	15.120	2429.440	2444.560	0.5	PASS
	Ant10	2437	15.000	2428.320	2443.320	0.5	PASS
	Ant9	2462	16.960	2454.520	2471.480	0.5	PASS
	Ant10	2462	18.000	2453.160	2471.160	0.5	PASS
11ax40MIMO	Ant9	2422	35.040	2405.760	2440.800	0.5	PASS
	Ant10	2422	35.520	2404.480	2440.000	0.5	PASS
	Ant9	2437	27.600	2420.680	2448.280	0.5	PASS
	Ant10	2437	35.680	2418.840	2454.520	0.5	PASS
	Ant9	2452	37.920	2433.120	2471.040	0.5	PASS
	Ant10	2452	37.600	2433.200	2470.800	0.5	PASS



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Test Graphs



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11b-CDD Ant9 2437



11b-CDD Ant10 2437

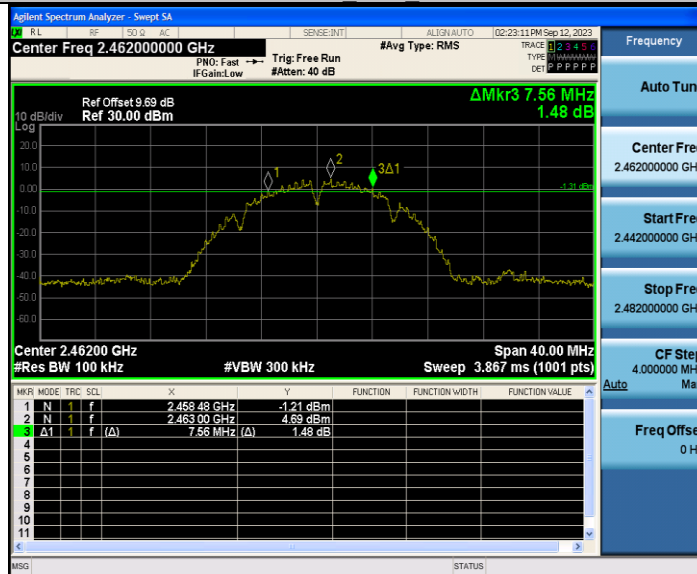


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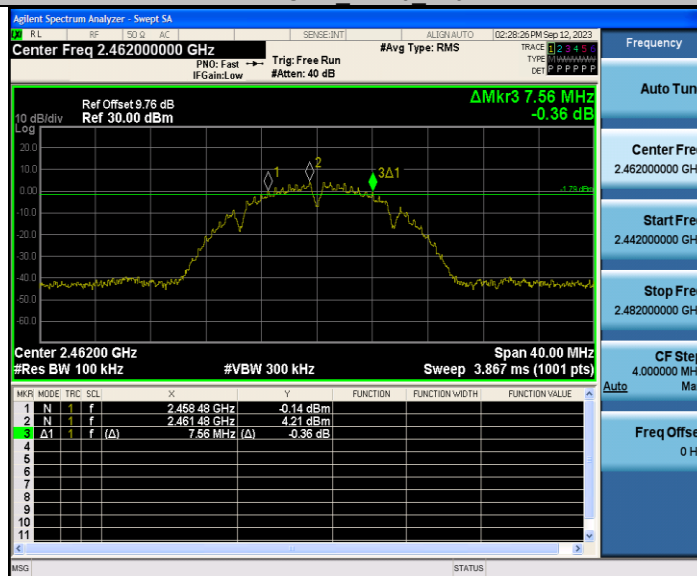
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11b-CDD Ant9 2462



11b-CDD Ant10 2462



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11g-CDD Ant9 2412



11g-CDD Ant10 2412



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11g-CDD Ant9 2437



11g-CDD Ant10 2437



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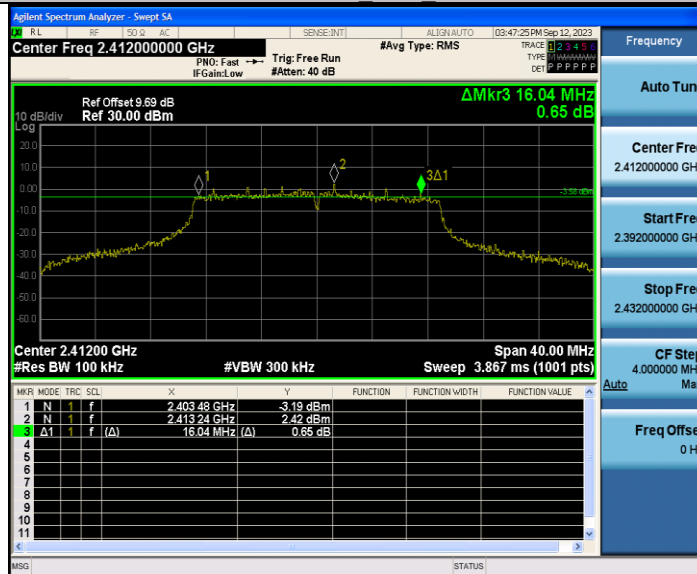
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11n20MIMO Ant9 2412



11n20MIMO Ant10 2412



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11n20MIMO Ant9 2462



11n20MIMO Ant10 2462



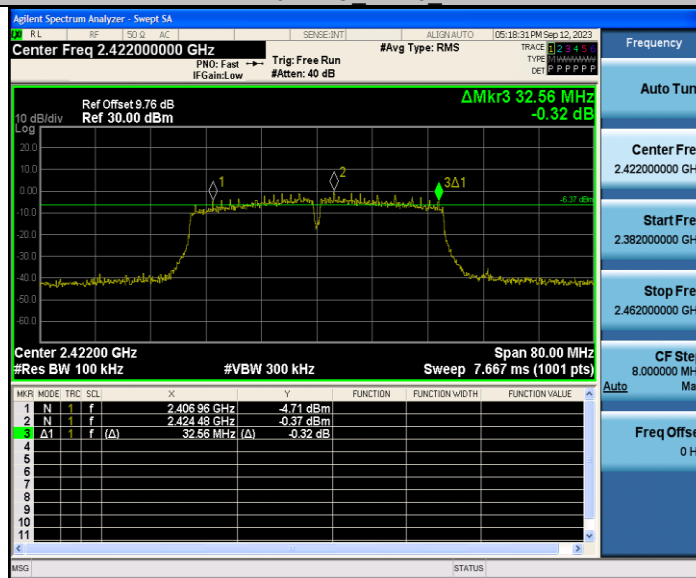
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11n40MIMO Ant9 2422



11n40MIMO Ant10 2422

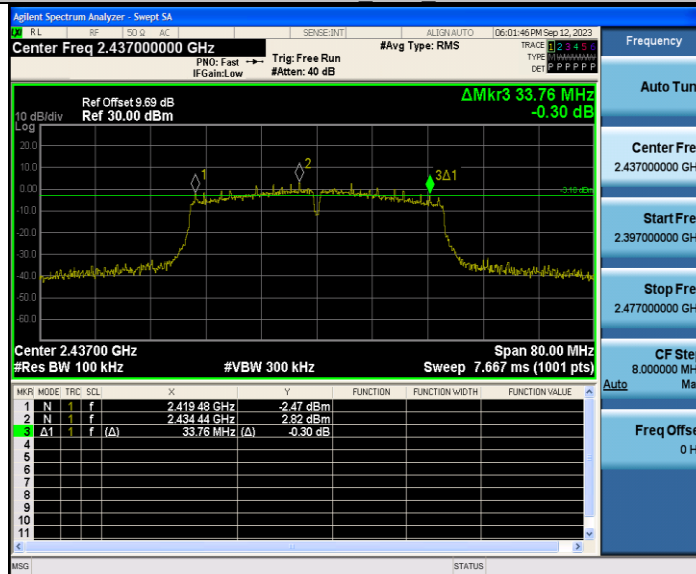


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11n40MIMO Ant9 2437



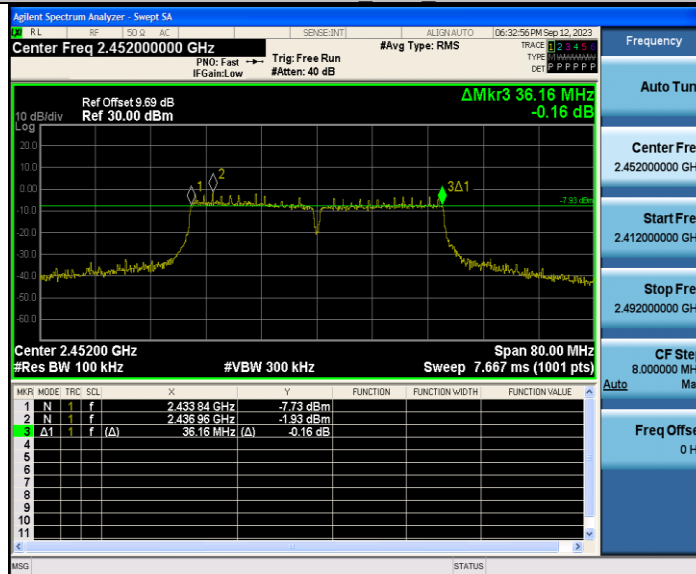
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11n40MIMO Ant9 2452



11n40MIMO Ant10 2452



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11VHT20MIMO Ant9 2412



Frequency
Auto Tune
Center Freq
2.41200000 GHz
Start Freq
2.39200000 GHz
Stop Freq
2.43200000 GHz
CF Step
4.000000 MHz
Man
Freq Offset
0 Hz

11VHT20MIMO Ant10 2412



Frequency
Auto Tune
Center Freq
2.41200000 GHz
Start Freq
2.39200000 GHz
Stop Freq
2.43200000 GHz
CF Step
4.000000 MHz
Man
Freq Offset
0 Hz



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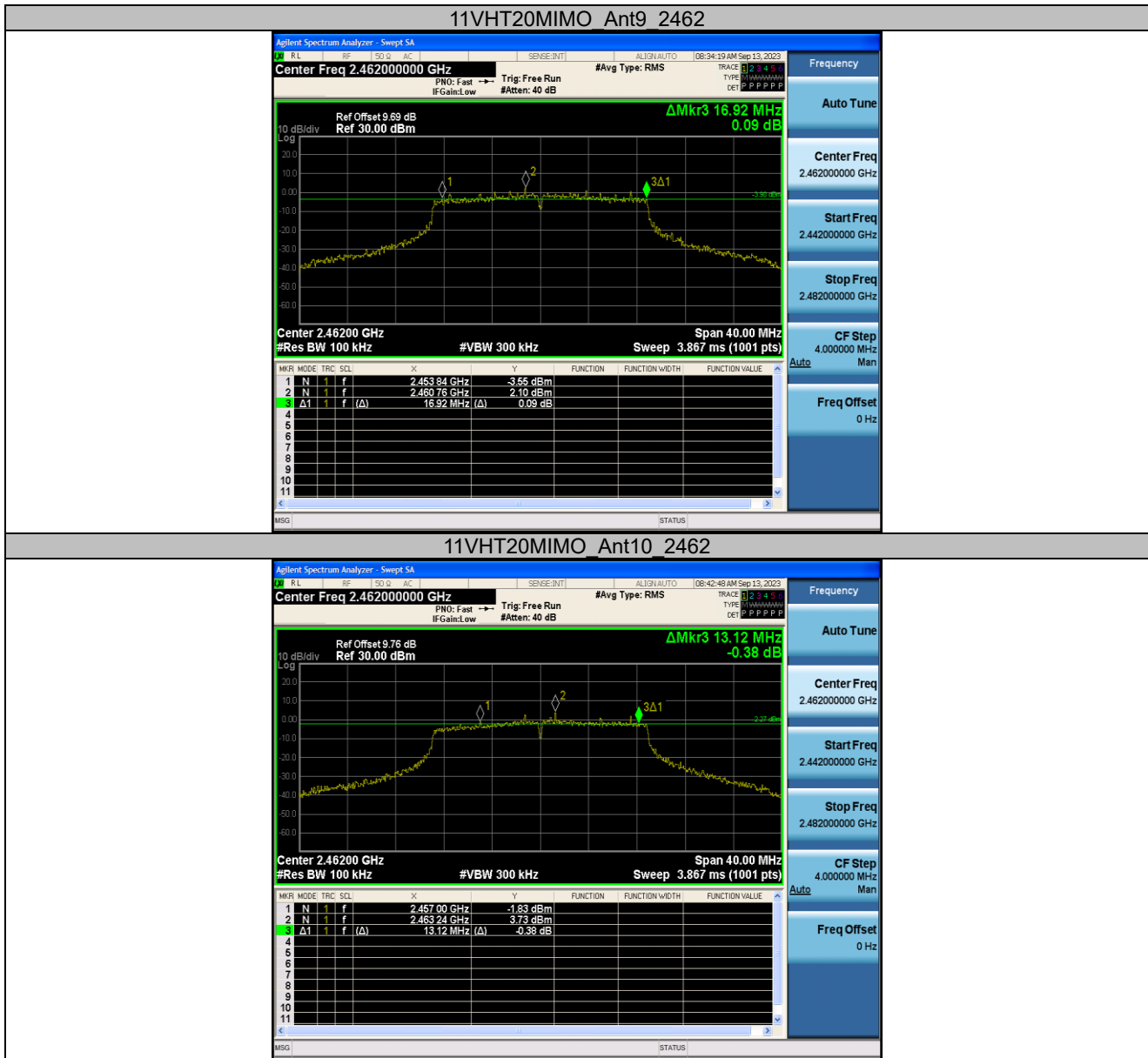
11VHT20MIMO Ant9 2437



11VHT20MIMO Ant10 2437

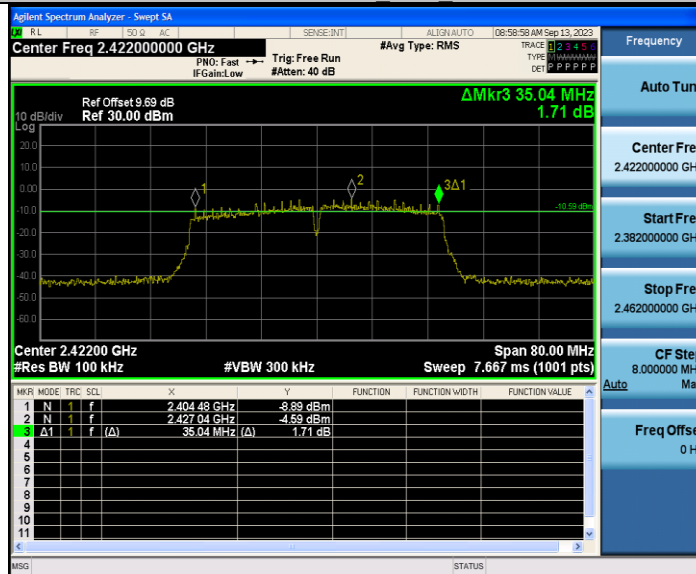


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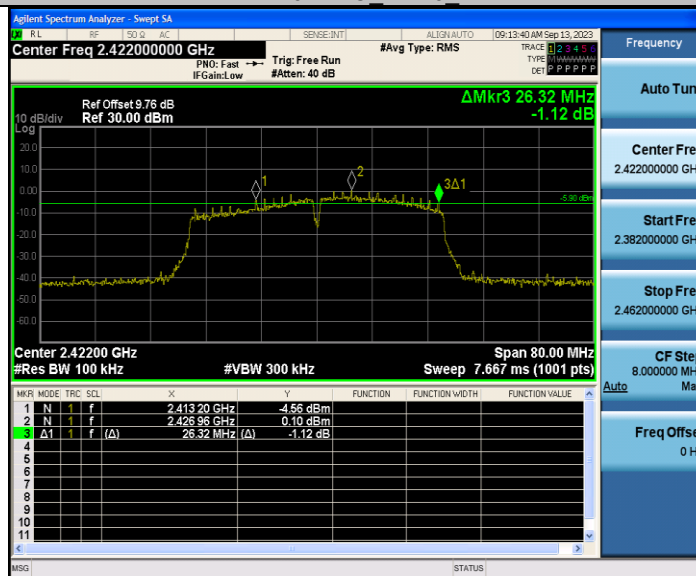
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11VHT40MIMO Ant9 2422



Frequency
Auto Tune
Center Freq
2.42200000 GHz
Start Freq
2.382000000 GHz
Stop Freq
2.462000000 GHz
CF Step
8.000000 MHz
Man
Auto
Freq Offset
0 Hz

11VHT40MIMO Ant10 2422



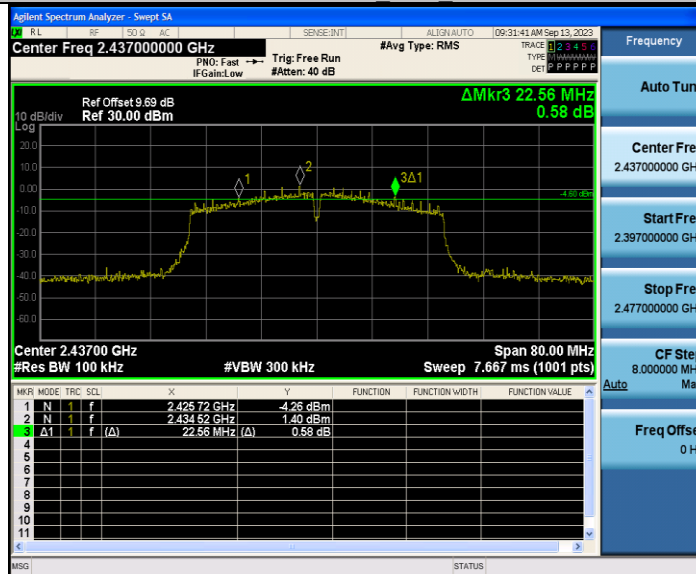
Frequency
Auto Tune
Center Freq
2.42200000 GHz
Start Freq
2.382000000 GHz
Stop Freq
2.462000000 GHz
CF Step
8.000000 MHz
Man
Auto
Freq Offset
0 Hz



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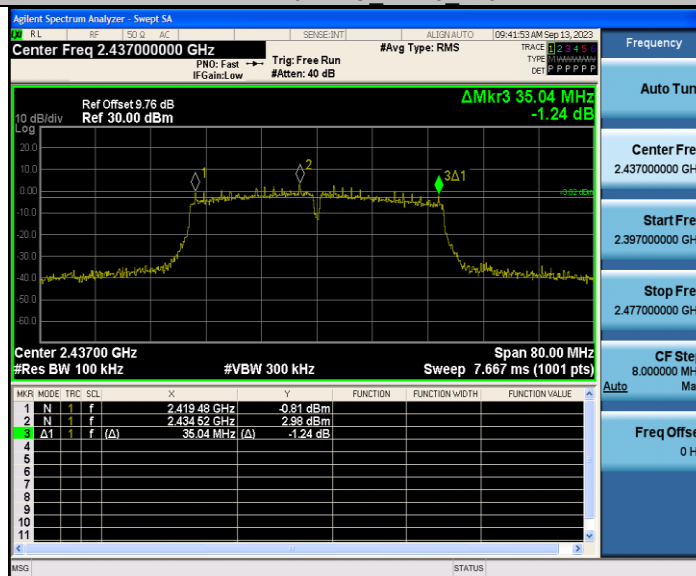
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11VHT40MIMO Ant9 2437



Frequency
Auto Tune
Center Freq 2.43700000 GHz
Start Freq 2.397000000 GHz
Stop Freq 2.477000000 GHz
CF Step 8.000000 MHz
Freq Offset 0 Hz

11VHT40MIMO Ant10 2437



Frequency
Auto Tune
Center Freq 2.43700000 GHz
Start Freq 2.397000000 GHz
Stop Freq 2.477000000 GHz
CF Step 8.000000 MHz
Freq Offset 0 Hz

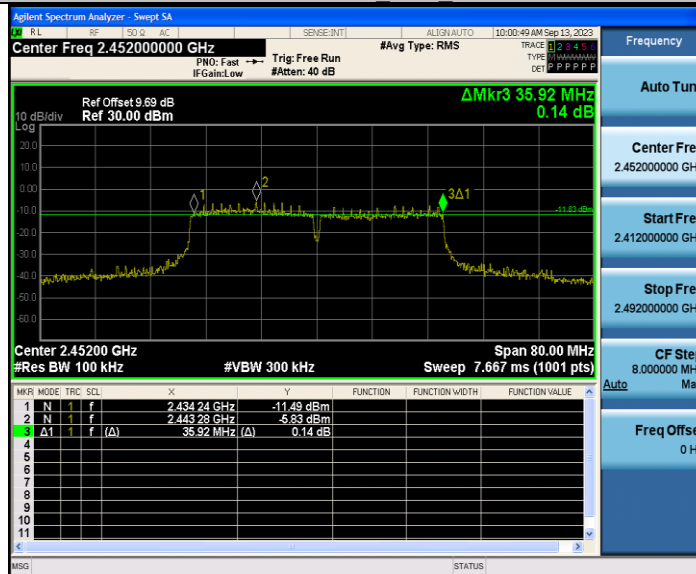


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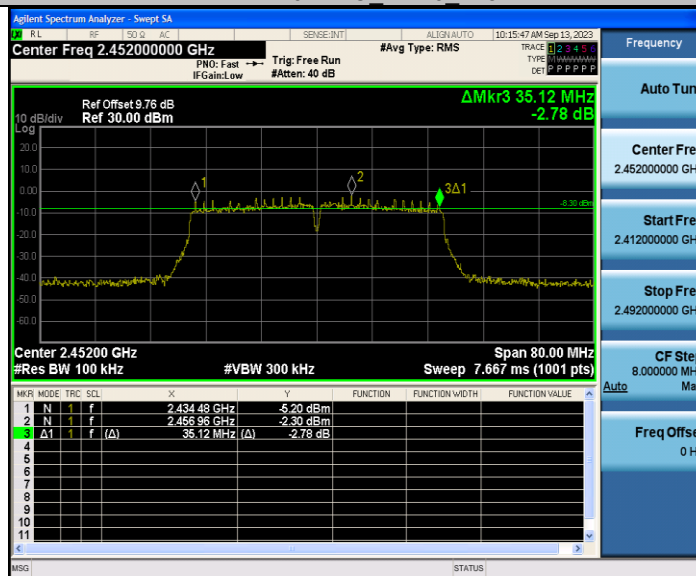
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11VHT40MIMO Ant9 2452



Frequency
Auto Tune
Center Freq
2.45200000 GHz
Start Freq
2.412000000 GHz
Stop Freq
2.492000000 GHz
CF Step
8.000000 MHz
Man
Freq Offset
0 Hz

11VHT40MIMO Ant10 2452



Frequency
Auto Tune
Center Freq
2.45200000 GHz
Start Freq
2.412000000 GHz
Stop Freq
2.492000000 GHz
CF Step
8.000000 MHz
Man
Freq Offset
0 Hz

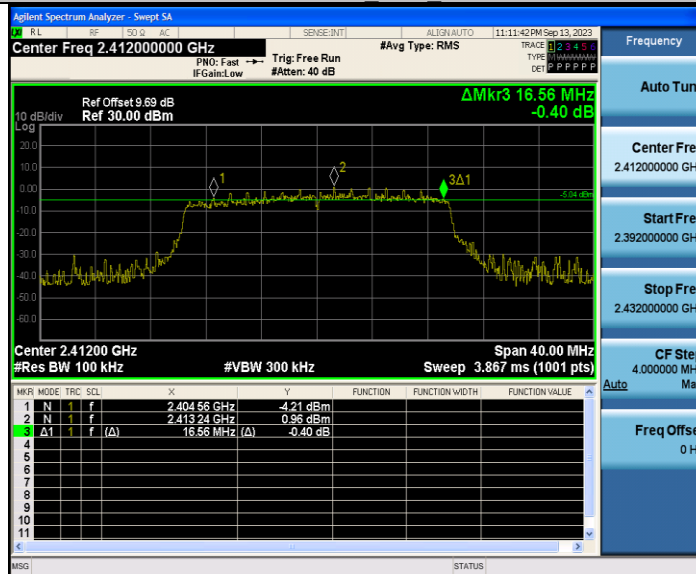


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11ax20MIMO Ant9 2412



Frequency
Auto Tune
Center Freq
2.41200000 GHz
Start Freq
2.39200000 GHz
Stop Freq
2.43200000 GHz
CF Step
4.000000 MHz
Man
Auto
Freq Offset
0 Hz

11ax20MIMO Ant10 2412

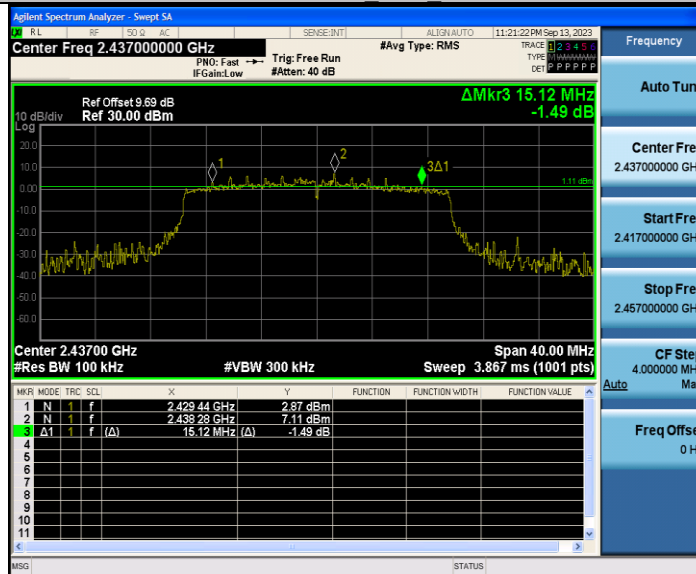


Frequency
Auto Tune
Center Freq
2.41200000 GHz
Start Freq
2.39200000 GHz
Stop Freq
2.43200000 GHz
CF Step
4.000000 MHz
Man
Auto
Freq Offset
0 Hz



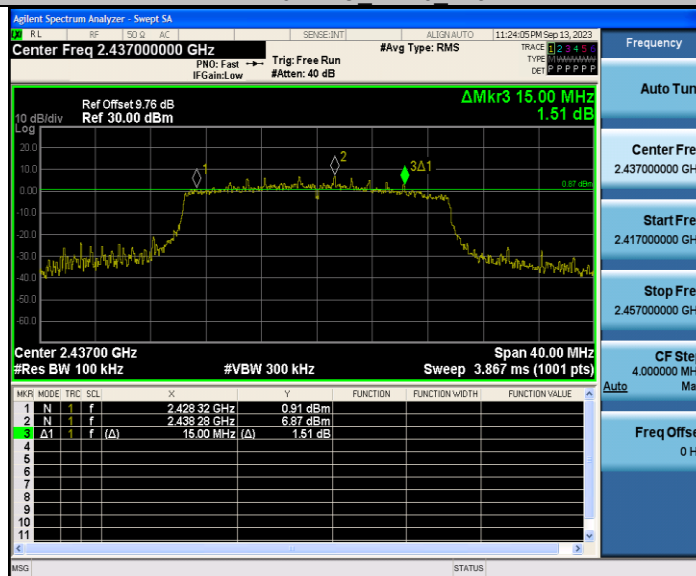
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11ax20MIMO Ant9 2437



Frequency
Auto Tune
Center Freq
2.43700000 GHz
Start Freq
2.41700000 GHz
Stop Freq
2.45700000 GHz
CF Step
4.000000 MHz
Man
Auto
Freq Offset
0 Hz

11ax20MIMO Ant10 2437



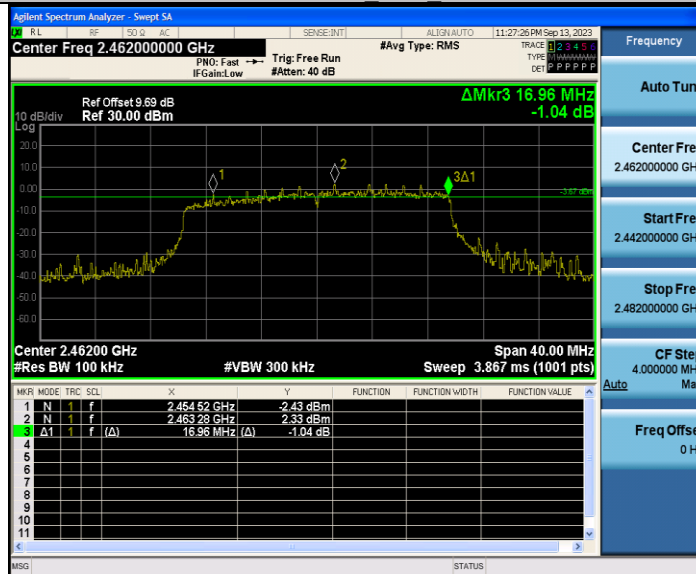
Frequency
Auto Tune
Center Freq
2.43700000 GHz
Start Freq
2.41700000 GHz
Stop Freq
2.45700000 GHz
CF Step
4.000000 MHz
Man
Auto
Freq Offset
0 Hz



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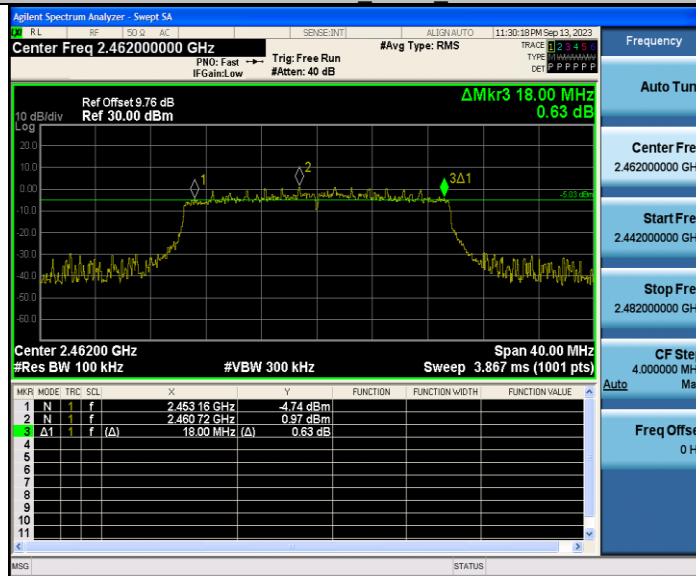
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11ax20MIMO Ant9 2462



Frequency
Auto Tune
Center Freq
2.46200000 GHz
Start Freq
2.442000000 GHz
Stop Freq
2.482000000 GHz
CF Step
4.000000 MHz
Man
Freq Offset
0 Hz

11ax20MIMO Ant10 2462



Frequency
Auto Tune
Center Freq
2.46200000 GHz
Start Freq
2.442000000 GHz
Stop Freq
2.482000000 GHz
CF Step
4.000000 MHz
Man
Freq Offset
0 Hz



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