

Report No.: XEWM2311000559RG02

Rev.: 01

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TEST REPORT

Application No.: XEWM2311000559RG

Applicant: Beijing InHand Networks Technology Co., Ltd.

Address of Applicant: Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing

Manufacturer: Beijing InHand Networks Technology Co., Ltd.

Address of Manufacturer: Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing

EUT Description: 5G Fixed Wireless Access

Model No.: FWA02
FWA03
FWA12
FWA32
FWA62
FWA92

Trade Mark: 

FCC ID: 2AANY-FWA

Standards: FCC 47 CFR Part 2, Subpart J
FCC 47 CFR Part 15, Subpart E

Date of Receipt: 2023/11/02

Date of Test: 2023/11/05 to 2023/11/17

Date of Issue: 2023/11/21

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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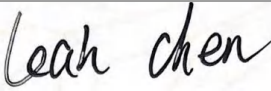
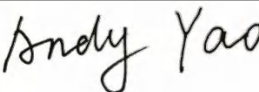
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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023/11/21		Original

Prepared By	 (Leah Chen) / Test Engineer
Checked By	 (Andy Yao) / Reviewer



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2 Test Summary

Test Item	Band ^[1]	FCC rules No.	Test Requirements	Test Result	Result
Antenna Requirement	--	15.203/15.407(a)	--	Clause 4.1	PASS
26dB Emission Bandwidth	Band I	15.407(a)(1)	No limit.	Clause 4.5	For Report Purpose
	Band III	KDB 789033 D02& C			
6dB Emission Bandwidth	Band III	15.407(e)	≥ 500 kHz.	Clause 4.6	PASS
99% Occupied Bandwidth	Band I	KDB 789033 D02& D	No limit.	Clause 4.7	For Report Purpose
	Band III				
Duty Cycle	Band I Band III	--	No limit.	Clause 4.3	For Report Purpose
Maximum Conducted Output Power	Band I	15.407(a)(ii)	<1W	Clause 4.4	PASS
	Band III	15.407(a)(3)	< 1W		
Maximum Power Spectral Density	Band I	15.407(a)(ii)	< 17dBm/MHz	Clause 4.8	PASS
	Band III	15.407(a)(3)	<30dBm/500KHz		
Radiated Spurious Emissions	Band I	15.407(b) 15.205/15.209	F<1GHz: §15.209 limit (QP). F≥1GHz & out-restricted: <-27dBm/MHz PK e.i.r.p. (exl. 5.15-5.35 GHz). F≥1GHz & in-restricted: §15.209 limit (AV&PK).	Clause 4.9	PASS
	Band III	15.407(b) 15.205/15.209	F<1GHz: §15.209 limit (QP) F≥1GHz & out-restricted:(PK) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		PASS



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			F≥1GHz & in-restricted: §15.209 limit (AV&PK).		
Restricted bands around fundamental frequency	Band I Band III	15.407(b) 15.205/15.209	---	Clause 4.10	PASS
AC Power Line Conducted Emissions	Band I Band III	15.207	---	Clause 4.2	PASS
Frequency Stability	Band I Band III	15.407(g)	Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual	N/A	N/A
Note 1: Band I: 5150-5250MHz Band III: 5725-5850MHz					

Remark:

According to the Declaration letter from client, these models are the same in these: appearance, PCB layout and basic software function; The only difference is that the products are used in different markets.

Therefore in this report only the Model No.(FWA02) was tested, and internal wiring were identical for all above items. Only different on model No. for marketing requirement.



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3 General Information

3.1 Details of Client

Applicant:	Beijing InHand Networks Technology Co., Ltd.
Address of Applicant:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing
Manufacturer:	Beijing InHand Networks Technology Co., Ltd.
Address of Manufacturer:	Room 501, floor 5, building 3, yard 18, ziyue road, chaoyang district, Beijing

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, Ken Liu

3.3 Test Facility

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

• **A2LA (Certificate No. 4854.01)**

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

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

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:	5G Fixed Wireless Access	
Model No.:	FWA02 FWA03 FWA12 FWA32 FWA62 FWA92	
Trade Mark:		
Hardware Version:	V1.2	
Software Version:	V2.0	
Power Supply:	DC 12V	
IMEI:	RF Conducted	862424050313294
	RSE & AC power line	862424050366003
WLAN Mode Supported:	802.11a:	20 MHz channel bandwidth
	802.11n:	20 MHz / 40 MHz channel bandwidth
	802.11ac:	20 MHz / 40 MHz / 80 MHz channel bandwidth
	802.11ax:	20 MHz / 40 MHz / 80 MHz channel bandwidth
Operation Frequency:	5150MHz to 5250MHz 5725MHz to 5850MHz	
Modulation Type:	802.11a:	OFDM (BPSK, QPSK, 16QAM, 64QAM)
	802.11n:	OFDM (BPSK, QPSK, 16QAM, 64QAM)
	802.11ac:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
	802.11ax:	OFDM/OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Channel Spacing:	20MHz:	802.11a/n(HT20)/ac(VHT20)/ax(HE20)
	40MHz:	802.11n(HT40)/ac(VHT40)/ax(HE40)
	80MHz:	802.11ac(VHT80)/ax(HE80)
Antenna Type:	Built in WiFi antenna	
Antenna Gain:	5150MHz to 5250MHz: 3.55dBi (Ant1); 3.55dBi (Ant2); 3.55dBi (Ant3); 3.55dBi (Ant4)	
	5725MHz to 5850MHz: 4.90dBi (Ant1); 4.90dBi (Ant2); 4.90dBi (Ant3); 4.90dBi (Ant4)	
	Note: The antenna gain are derived from the gain information report provided by the	



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	manufacturer.	
Smart System:	☒ SISO	802.11a/n
	☒ MIMO	802.11ac/ax: 4Tx & 4Rx
	☐ Diversity	802.11a: 4Tx & 4Rx
Use Conditions:	Indoor	
RF Cable:	1.5dB	
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.		

Remark: In FCC 15.31, for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table, and the selected channel to perform the test as below:		
Frequency range over which device operates	Number of Measurement Frequencies Required	Location of Measurement Frequency in Band of Operation
1 MHz or less	1	centre
1 MHz to 10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near centre

For UNII Band I:		
Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac/ax 20MHz	The Lowest channel	5180
	The Middle channel	5200
	The Highest channel	5240
IEEE 802.11n/ac/ax 40MHz	The Lowest channel	5190
	The Highest channel	5230
IEEE 802.11ac/ax 80MHz	The Middle channel	5210



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For UNII Band III:		
Mode	Channel	Frequency(MHz)
IEEE 802.11a/n/ac/ax 20MHz	The Lowest channel	5745
	The Middle channel	5785
	The Highest channel	5825
IEEE 802.11n/ac/ax 40MHz	The Lowest channel	5755
	The Highest channel	5795
IEEE 802.11ac/ax 80MHz	The Middle channel	5775

Remark:

802.11ax support OFDMA full RU tone and partial RU tone, both full RU and partial RU-left (for low CH) and partial RU-right (for high CH) test output power, the full RU power > partial RU, therefore the full RU perform full test to cover partial RU except for PSD/ Duty cycle/BE.



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3.5 Test Environment and Mode

Environment Parameter	96.0~101.0 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	KUANTEN LIMITED	KT36W120300US
Remark: all above the information of table are provided by client.		

3.7 Worst-case configuration and mode

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

Modulation Type	SISO - Data Rate	MIMO - Data Rate
802.11a	6 Mbps	/
802.11n (HT 20)	MCS0 (6.5 Mbps)	/
802.11n (HT 40)	MCS0 (13.5 Mbps)	/
802.11ac (VHT 20)	/	MCS0 (13 Mbps)
802.11ac (VHT 40)	/	MCS0 (27 Mbps)
802.11ac (VHT 80)	/	MCS0 (58.5 Mbps)
802.11ax (HE 20)	/	MCS0 (16 Mbps)
802.11ax (HE 40)	/	MCS0 (32 Mbps)
802.11ax (HE 80)	/	MCS0 (68 Mbps)



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4 Test results and Measurement Data

4.1 Antenna Requirement

Standard requirement:	47 CFR Part 15 Section 15.203
The antenna is Built in WiFi antenna and no consideration of replacement. The best case gain of the antenna is 5150MHz to 5250MHz: 3.55dBi (Ant1); 3.55dBi (Ant2); 3.55dBi (Ant3); 3.55dBi (Ant4).* 5725MHz to 5850MHz: 4.90dBi (Ant1); 4.90dBi (Ant2); 4.90dBi (Ant3); 4.90dBi (Ant4).* <i>*Note:</i> <i>The antenna gain are derived from the gain information report provided by the manufacturer.</i> <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>	



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MIMO Model:

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,

$$\text{Array Gain} = 10 \log(N_{ANT}/N_{SS}=1) \text{ dB.}$$

- For power measurements on IEEE 802.11 devices:

$$\text{Array Gain} = 0 \text{ dB (i.e., no array gain) for } N_{ANT} \leq 4;$$

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:

Operation Frequency	ANT Gain1 (dBi)	ANT Gain2 (dBi)	ANT Gain3 (dBi)	ANT Gain4 (dBi)	Directional gain For Power (dBi)	Directional gain For PSD (dBi)	Power Limit Reduction (dBm)	PSD Limit Reduction (dBm)
5150MHz to 5250MHz	3.55	3.55	3.55	3.55	3.55	9.57	0	3.57
5725MHz to 5850MHz	4.90	4.90	4.90	4.90	4.90	10.92	0	4.92

5150MHz to 5250MHz:

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

PSD Limit Reduction = Directional gain – 6dBi, (Directional gain > 6dBi) =9.57 – 6 = 3.57

5725MHz to 5850MHz:

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

PSD Limit Reduction = Directional gain – 6dBi, (Directional gain > 6dBi) =10.92 – 6 = 4.92



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4.2 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15 Section 15.207		
Test Method:	ANSI C63.10: 2013 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:	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 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. 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. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.		

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Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Adapter + 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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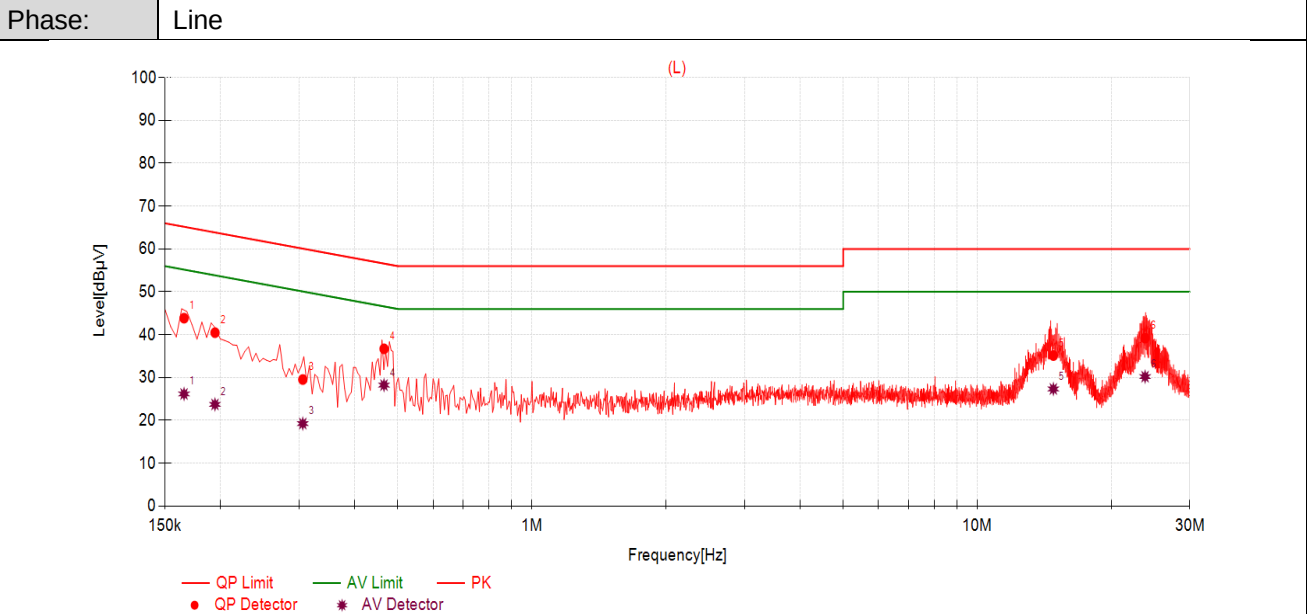
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Measurement Data

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.



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	0.1655	9.85	34.01	43.86	65.19	21.33	16.32	26.17	55.19	29.02	PASS
2	0.1942	9.84	30.64	40.48	63.85	23.37	13.89	23.73	53.85	30.12	PASS
3	0.3058	9.91	19.64	29.55	60.09	30.54	9.35	19.26	50.09	30.83	PASS
4	0.4654	9.88	26.82	36.70	56.60	19.90	18.36	28.24	46.60	18.36	PASS
5	14.8215	10.21	24.93	35.14	60.00	24.86	17.13	27.34	50.00	22.66	PASS
6	23.8133	10.28	28.93	39.21	60.00	20.79	19.93	30.21	50.00	19.79	PASS

Remark:

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



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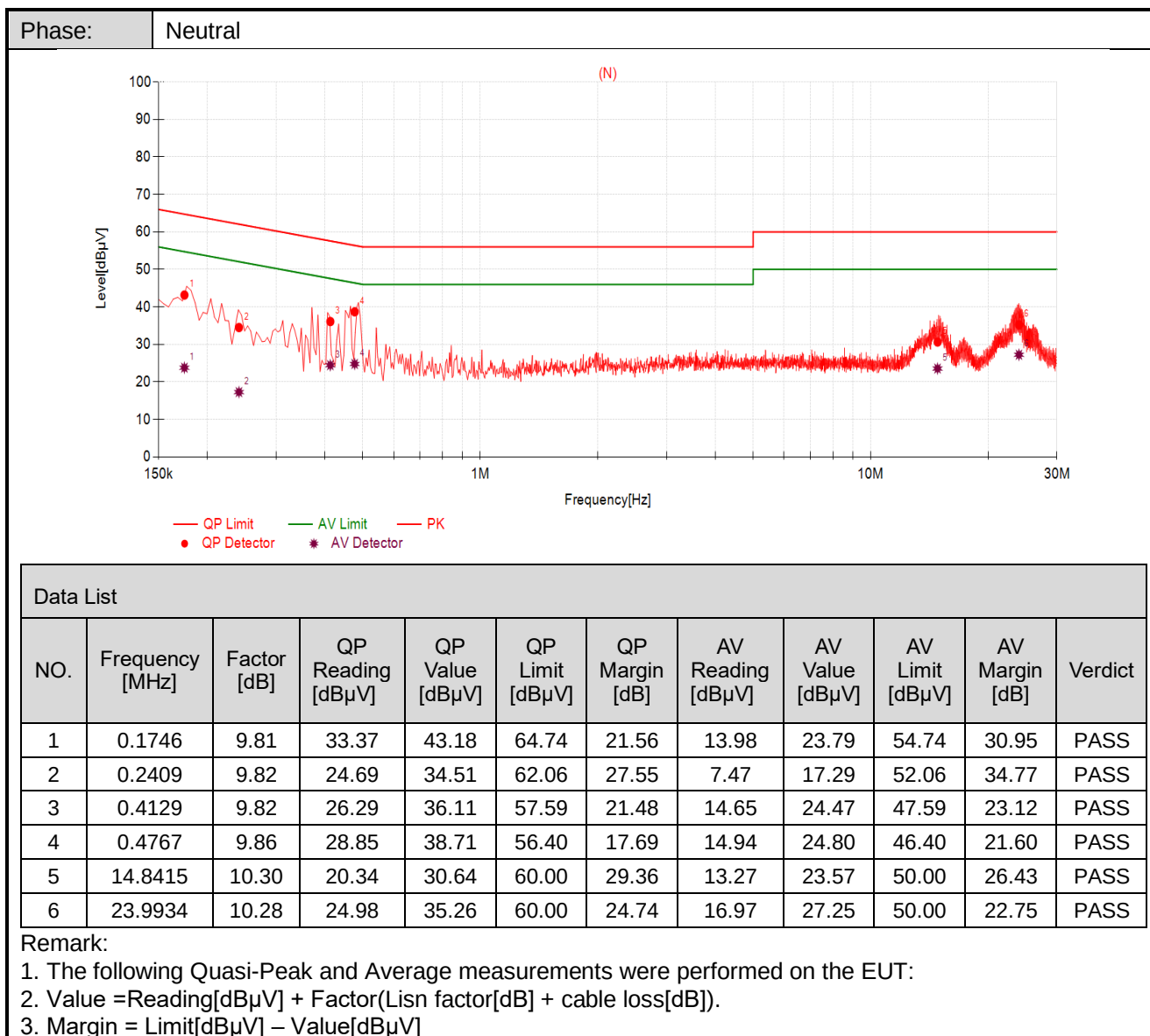
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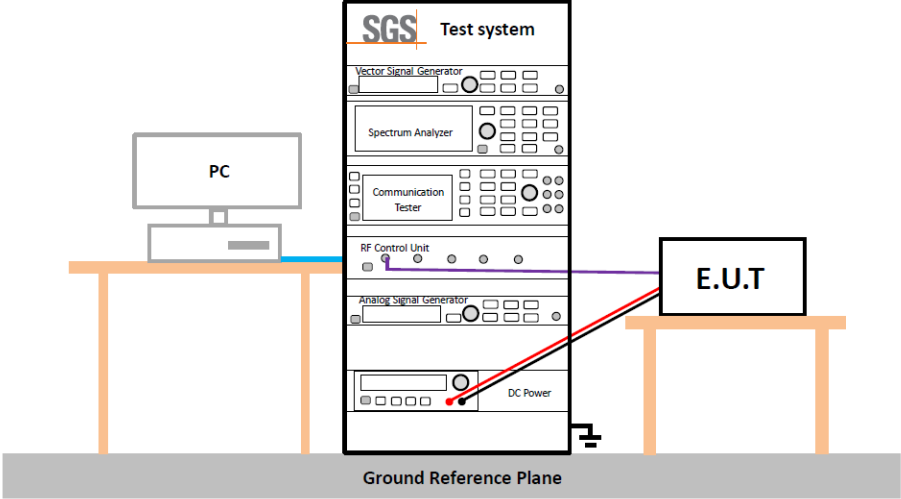
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4.3 Duty Cycle

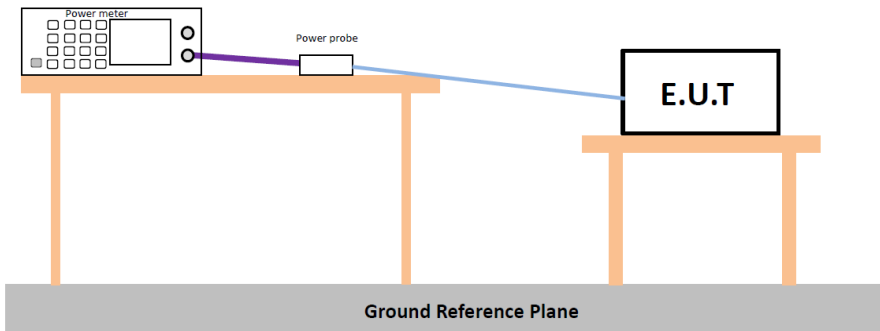
Test Requirement:	ANSI C63.10 :2013 Section 12.2
Test Method:	ANSI C63.10 :2013 Section 12.2
Test Setup:	
Instruments Used:	Refer to section 6 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Refer to section 3.7 for details.
Limit:	No restriction limits
Test Results:	For report purpose
The detailed test data see: Appendix	

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4.4 Conducted Output Power

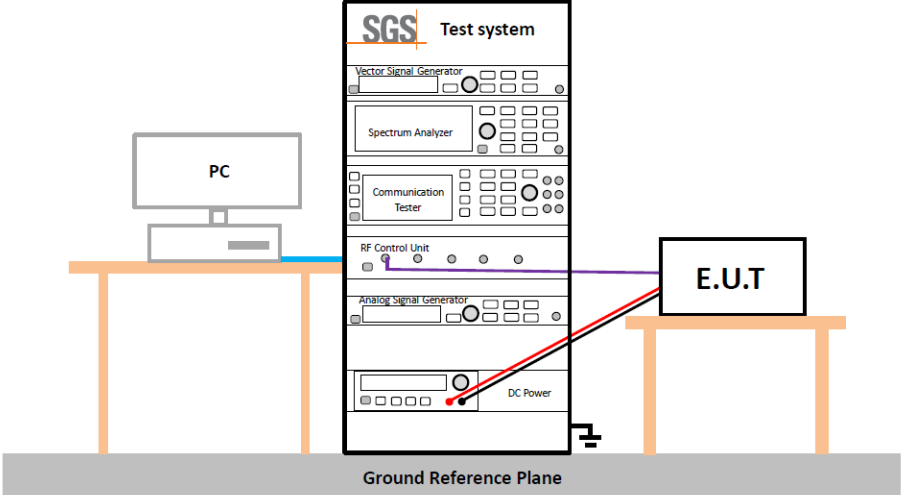
Test Requirement:	47 CFR Part 15 Section 15.407(a)						
Test Method:	ANSI C63.10 :2013 Section 12.3.3						
Test Setup:	 * Test with power meter (Detector function: Average) Method PM-G is measurement using a gated RF average power meter. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.						
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:	<table border="1"> <thead> <tr> <th>Frequency Band</th><th>Limit</th></tr> </thead> <tbody> <tr> <td>5150-5250MHz</td><td>Not exceed 1W(30dBm)</td></tr> <tr> <td>5725-5850MHz</td><td>Not exceed 1W(30dBm)</td></tr> </tbody> </table>	Frequency Band	Limit	5150-5250MHz	Not exceed 1W(30dBm)	5725-5850MHz	Not exceed 1W(30dBm)
Frequency Band	Limit						
5150-5250MHz	Not exceed 1W(30dBm)						
5725-5850MHz	Not exceed 1W(30dBm)						
Test Results:	Pass						
The detailed test data see: Appendix							

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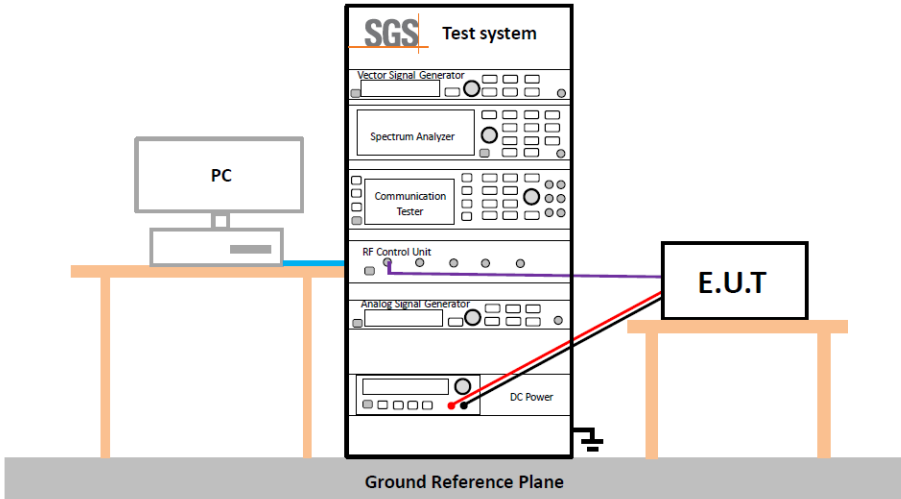
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4.5 26dB Emission Bandwidth

Test Requirement:	47 CFR Part 15 Section 15.407(a), KDB 789033 D02& C
Test Method:	ANSI C63.10: 2013 Section 12.4.1
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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4.6 6dB Emission Bandwidth

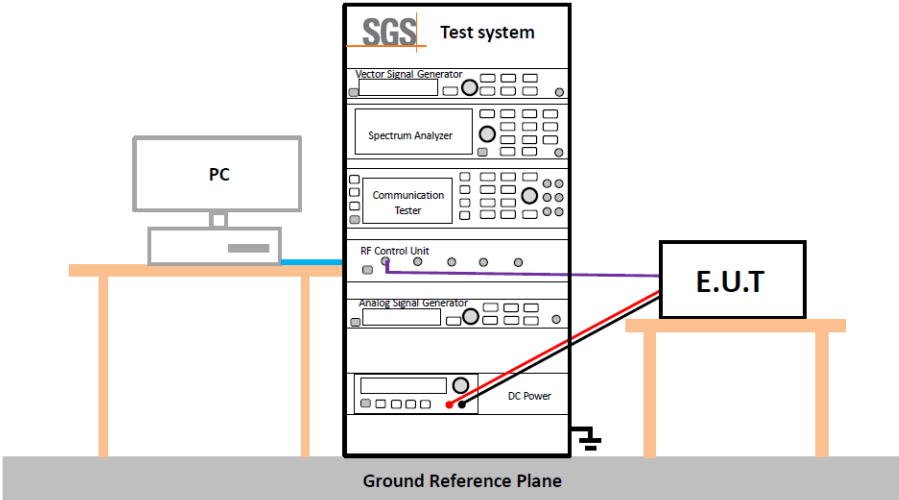
Test Requirement:	47 CFR Part 15 Section 15.407(e)	
Test Method:	ANSI C63.10: 2013 Section 12.4.1	
Test Setup:		
Test Instruments:	Refer to section 6 for details.	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Refer to section 3.7 for details.	
Limit:	Frequency Band	Limit
	5725-5850MHz	At lease 500kHz
Test Results:	Pass	
The detailed test data see: Appendix		

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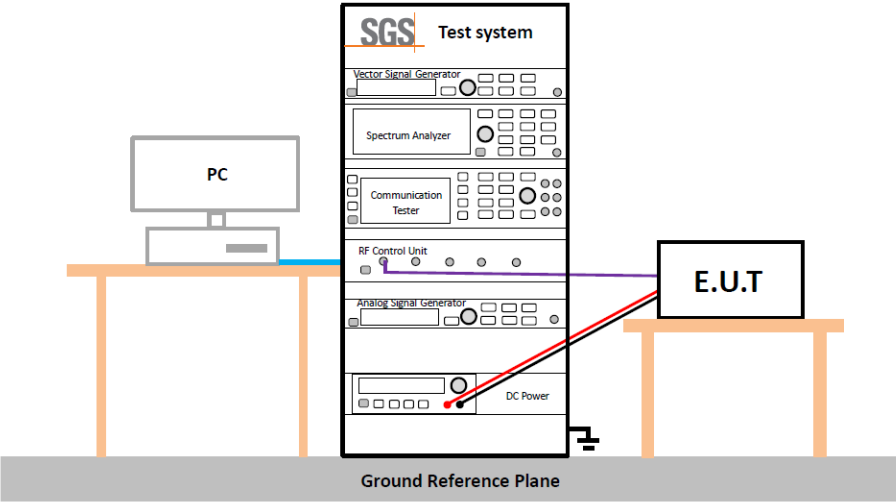
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4.7 99% Occupied Bandwidth

Test Requirement:	KDB 789033 D02§ D
Test Method:	ANSI C63.10: 2013 Section 12.4.2
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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4.8 Power Spectral Density

Test Requirement:	47 CFR Part 15 Section 15.407(a)	
Test Method:	ANSI C63.10: 2013 Section 12.5 KDB 789033 D02 v02r01, Section F.	
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:	Frequency Band	Limit
	5150-5250MHz	The power spectral density less than 17dBm/1MHz
	5725-5850MHz	The power spectral density less than <30dBm/500KHz
Test Results:	Pass	
The detailed test data see: Appendix		

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4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15 Section 15.205/15.209/15.407(b)
Test Method:	ANSI C63.10: 2013 Section 6.4 / 6.5 / 6.6
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)
Test frequency:	9kHz ~ 40GHz(or 10 Harmonic)

Test Setup:

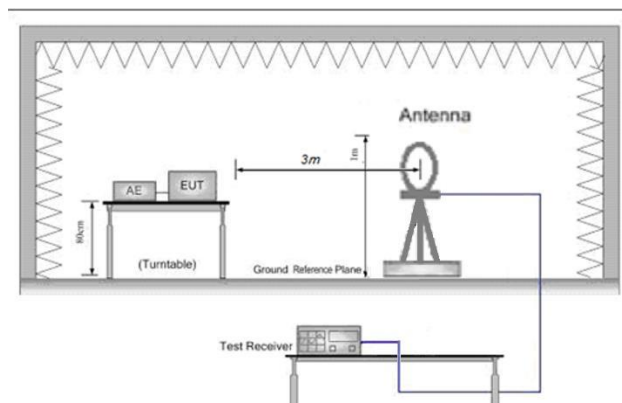


Figure 1. 9kHz to 30MHz

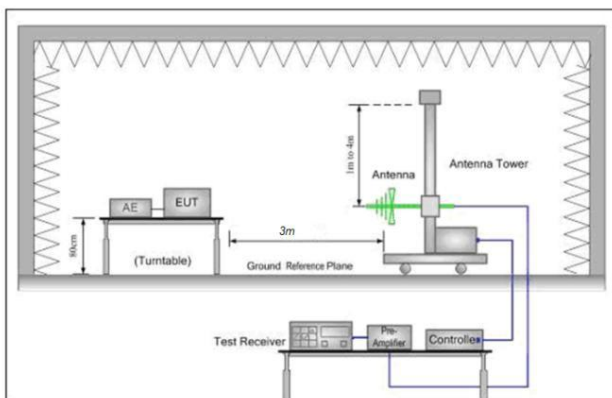


Figure 1. 30MHz to 1GHz

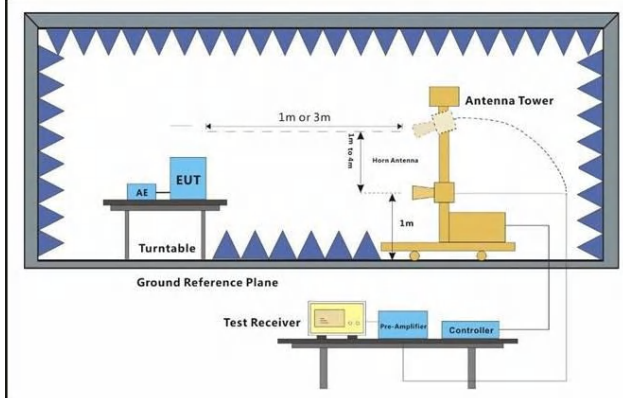


Figure 2. Above 1 GHz

Test Procedure:

- For below 1GHz test, 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 test, 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.

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	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. Test the EUT in the outermost channels. 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. 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. l. At a measurement distance of 1 meter the limit line was increased by $20 \times \log(3/1) = 9.54$ dB.
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 $\geq$ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold Average Measurements Above 1000MHz • RBW = 1 MHz • VBW = 10Hz, 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.



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中国·西安·沣东新城科源三路137号康鸿橙方科技园1号楼D单元1层 邮编: 710086

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	Adapter + 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.
Test Results:	Pass
The detailed test data see: Appendix	



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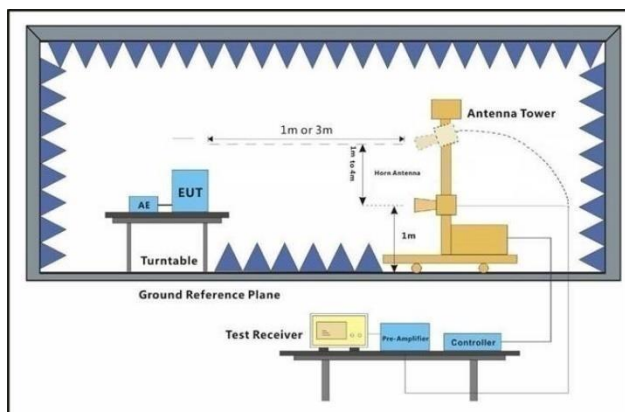
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4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15 Section 15.205/15.209/15.407(b)		
Test Method:	ANSI C63.10: 2013 Section 12.7		
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:



Test Procedure:

- 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.
- The EUT was set 3 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

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	modulation for lowest and highest channel g. Test the EUT in the outermost channels. 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. i. Repeat above procedures until all frequencies measured was complete.
Test Configuration:	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 $\geq$ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold Average Measurements Above 1000MHz • RBW = 1 MHz • VBW = 10Hz, 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. Adapter + 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: Appendix	



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中国·西安·沣东新城科源三路137号康鸿橙方科技园1号楼D单元1层 邮编: 710086

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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.



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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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Emission Bandwidth Test Result

TestMode	Antenna	Frequency[MHz]	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Verdict
11a	Ant1	5180	19.800	5170.120	5189.920	For Report Purpose
	Ant2	5180	19.760	5170.200	5189.960	
	Ant3	5180	19.840	5170.160	5190.000	
	Ant4	5180	19.520	5170.120	5189.640	
	Ant1	5200	19.960	5190.080	5210.040	
	Ant2	5200	20.040	5190.000	5210.040	
	Ant3	5200	20.120	5189.880	5210.000	
	Ant4	5200	19.600	5190.240	5209.840	
	Ant1	5240	19.920	5230.040	5249.960	
	Ant2	5240	20.080	5230.000	5250.080	
	Ant3	5240	19.840	5230.080	5249.920	
	Ant4	5240	19.840	5230.080	5249.920	
	Ant1	5745	20.080	5734.920	5755.000	
	Ant2	5745	19.760	5735.120	5754.880	
	Ant3	5745	19.800	5735.040	5754.840	
	Ant4	5745	19.480	5735.200	5754.680	
	Ant1	5785	20.040	5774.960	5795.000	
	Ant2	5785	20.000	5775.160	5795.160	
	Ant3	5785	19.800	5775.160	5794.960	
	Ant4	5785	19.680	5775.240	5794.920	
	Ant1	5825	19.800	5815.120	5834.920	
	Ant2	5825	19.880	5815.240	5835.120	
	Ant3	5825	19.920	5815.200	5835.120	
	Ant4	5825	19.600	5815.280	5834.880	
11n20SISO	Ant1	5180	20.600	5169.640	5190.240	
	Ant2	5180	20.480	5169.640	5190.120	
	Ant3	5180	20.160	5169.920	5190.080	
	Ant4	5180	20.000	5170.040	5190.040	
	Ant1	5200	20.480	5189.720	5210.200	
	Ant2	5200	20.400	5189.840	5210.240	
	Ant3	5200	20.280	5189.840	5210.120	
	Ant4	5200	20.320	5189.840	5210.160	
	Ant1	5240	20.280	5229.840	5250.120	
	Ant2	5240	20.320	5229.800	5250.120	
	Ant3	5240	20.200	5229.920	5250.120	
	Ant4	5240	20.200	5230.000	5250.200	
	Ant1	5745	20.360	5734.800	5755.160	
	Ant2	5745	20.280	5734.760	5755.040	
	Ant3	5745	20.080	5735.040	5755.120	
	Ant4	5745	20.240	5734.880	5755.120	
	Ant1	5785	20.120	5774.920	5795.040	
	Ant2	5785	20.200	5775.000	5795.200	
	Ant3	5785	20.200	5774.800	5795.000	
	Ant4	5785	20.200	5774.960	5795.160	
	Ant1	5825	20.200	5814.880	5835.080	
	Ant2	5825	20.320	5814.880	5835.200	
	Ant3	5825	20.320	5814.840	5835.160	
	Ant4	5825	20.240	5815.040	5835.280	



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11n40SISO	Ant1	5190	39.840	5170.080	5209.920
	Ant2	5190	40.000	5169.760	5209.760
	Ant3	5190	40.160	5169.680	5209.840
	Ant4	5190	39.440	5170.320	5209.760
	Ant1	5230	39.600	5210.240	5249.840
	Ant2	5230	40.000	5210.080	5250.080
	Ant3	5230	39.680	5210.240	5249.920
	Ant4	5230	39.760	5210.160	5249.920
	Ant1	5755	39.680	5735.320	5775.000
	Ant2	5755	40.080	5735.000	5775.080
	Ant3	5755	40.080	5735.080	5775.160
	Ant4	5755	40.240	5735.080	5775.320
	Ant1	5795	39.840	5775.080	5814.920
	Ant2	5795	39.680	5775.080	5814.760
	Ant3	5795	40.320	5775.000	5815.320
	Ant4	5795	39.760	5775.240	5815.000
11ac20MIMO	Ant1	5180	20.280	5169.920	5190.200
	Ant2	5180	20.320	5169.800	5190.120
	Ant3	5180	20.120	5169.920	5190.040
	Ant4	5180	20.160	5170.000	5190.160
	Ant1	5200	20.320	5189.840	5210.160
	Ant2	5200	20.360	5189.760	5210.120
	Ant3	5200	20.160	5189.840	5210.000
	Ant4	5200	20.360	5189.840	5210.200
	Ant1	5240	20.320	5229.800	5250.120
	Ant2	5240	20.320	5229.840	5250.160
	Ant3	5240	20.160	5229.880	5250.040
	Ant4	5240	20.120	5230.040	5250.160
	Ant1	5745	20.240	5734.880	5755.120
	Ant2	5745	20.280	5734.800	5755.080
	Ant3	5745	19.920	5735.080	5755.000
	Ant4	5745	20.040	5734.960	5755.000
	Ant1	5785	20.360	5774.840	5795.200
	Ant2	5785	20.080	5774.960	5795.040
	Ant3	5785	20.240	5774.960	5795.200
	Ant4	5785	20.080	5774.960	5795.040
	Ant1	5825	20.320	5814.880	5835.200
	Ant2	5825	19.960	5815.000	5834.960
	Ant3	5825	20.120	5814.960	5835.080
	Ant4	5825	19.920	5815.160	5835.080
11ac40MIMO	Ant1	5190	39.840	5169.840	5209.680
	Ant2	5190	39.360	5170.160	5209.520
	Ant3	5190	39.120	5170.400	5209.520
	Ant4	5190	40.080	5170.000	5210.080
	Ant1	5230	40.080	5209.840	5249.920
	Ant2	5230	38.960	5210.720	5249.680
	Ant3	5230	39.200	5210.240	5249.440
	Ant4	5230	39.760	5210.160	5249.920
	Ant1	5755	40.720	5734.600	5775.320
	Ant2	5755	39.920	5735.000	5774.920
	Ant3	5755	39.440	5735.240	5774.680
	Ant4	5755	40.320	5734.680	5775.000
	Ant1	5795	40.160	5774.680	5814.840



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	Ant2	5795	39.120	5775.560	5814.680
	Ant3	5795	40.000	5775.400	5815.400
	Ant4	5795	39.680	5775.240	5814.920
11ac80MIMO	Ant1	5210	79.840	5170.000	5249.840
	Ant2	5210	79.520	5170.160	5249.680
	Ant3	5210	79.200	5170.320	5249.520
	Ant4	5210	79.520	5170.480	5250.000
	Ant1	5775	79.200	5735.320	5814.520
	Ant2	5775	79.200	5735.480	5814.680
	Ant3	5775	79.040	5735.480	5814.520
	Ant4	5775	79.520	5735.320	5814.840
11ax20MIMO	Ant1	5180	21.920	5169.360	5191.280
	Ant2	5180	22.200	5169.080	5191.280
	Ant3	5180	22.040	5168.920	5190.960
	Ant4	5180	22.360	5168.960	5191.320
	Ant1	5200	25.040	5187.720	5212.760
	Ant2	5200	23.520	5188.640	5212.160
	Ant3	5200	21.800	5189.000	5210.800
	Ant4	5200	23.560	5188.200	5211.760
	Ant1	5240	19.880	5230.040	5249.920
	Ant2	5240	20.040	5230.040	5250.080
	Ant3	5240	19.960	5230.040	5250.000
	Ant4	5240	19.840	5230.080	5249.920
	Ant1	5745	22.200	5733.360	5755.560
	Ant2	5745	22.000	5733.920	5755.920
	Ant3	5745	22.360	5733.640	5756.000
	Ant4	5745	22.040	5733.840	5755.880
	Ant1	5785	22.880	5773.400	5796.280
	Ant2	5785	21.600	5774.480	5796.080
	Ant3	5785	22.160	5774.080	5796.240
	Ant4	5785	22.080	5774.160	5796.240
	Ant1	5825	23.240	5813.440	5836.680
	Ant2	5825	22.320	5813.520	5835.840
	Ant3	5825	23.840	5812.760	5836.600
	Ant4	5825	22.680	5813.520	5836.200
11ax40MIMO	Ant1	5190	39.360	5170.320	5209.680
	Ant2	5190	39.280	5170.400	5209.680
	Ant3	5190	39.520	5170.240	5209.760
	Ant4	5190	39.280	5170.320	5209.600
	Ant1	5230	39.520	5210.240	5249.760
	Ant2	5230	39.280	5210.400	5249.680
	Ant3	5230	39.520	5210.240	5249.760
	Ant4	5230	39.520	5210.320	5249.840
	Ant1	5755	39.440	5735.240	5774.680
	Ant2	5755	39.440	5735.240	5774.680
	Ant3	5755	39.520	5735.240	5774.760
	Ant4	5755	39.520	5735.320	5774.840
	Ant1	5795	39.360	5775.240	5814.600
	Ant2	5795	39.200	5775.400	5814.600
	Ant3	5795	39.600	5775.240	5814.840
	Ant4	5795	39.600	5775.160	5814.760
11ax80MIMO	Ant1	5210	80.000	5170.000	5250.000
	Ant2	5210	80.160	5170.000	5250.160



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	Ant3	5210	80.000	5170.000	5250.000	
	Ant4	5210	80.000	5170.000	5250.000	
	Ant1	5775	80.000	5735.000	5815.000	
	Ant2	5775	80.320	5734.840	5815.160	
	Ant3	5775	80.000	5735.000	5815.000	
	Ant4	5775	80.000	5735.000	5815.000	



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Wireless Laboratory

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Test Graphs



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11a Ant3 5180



11a Ant4 5180



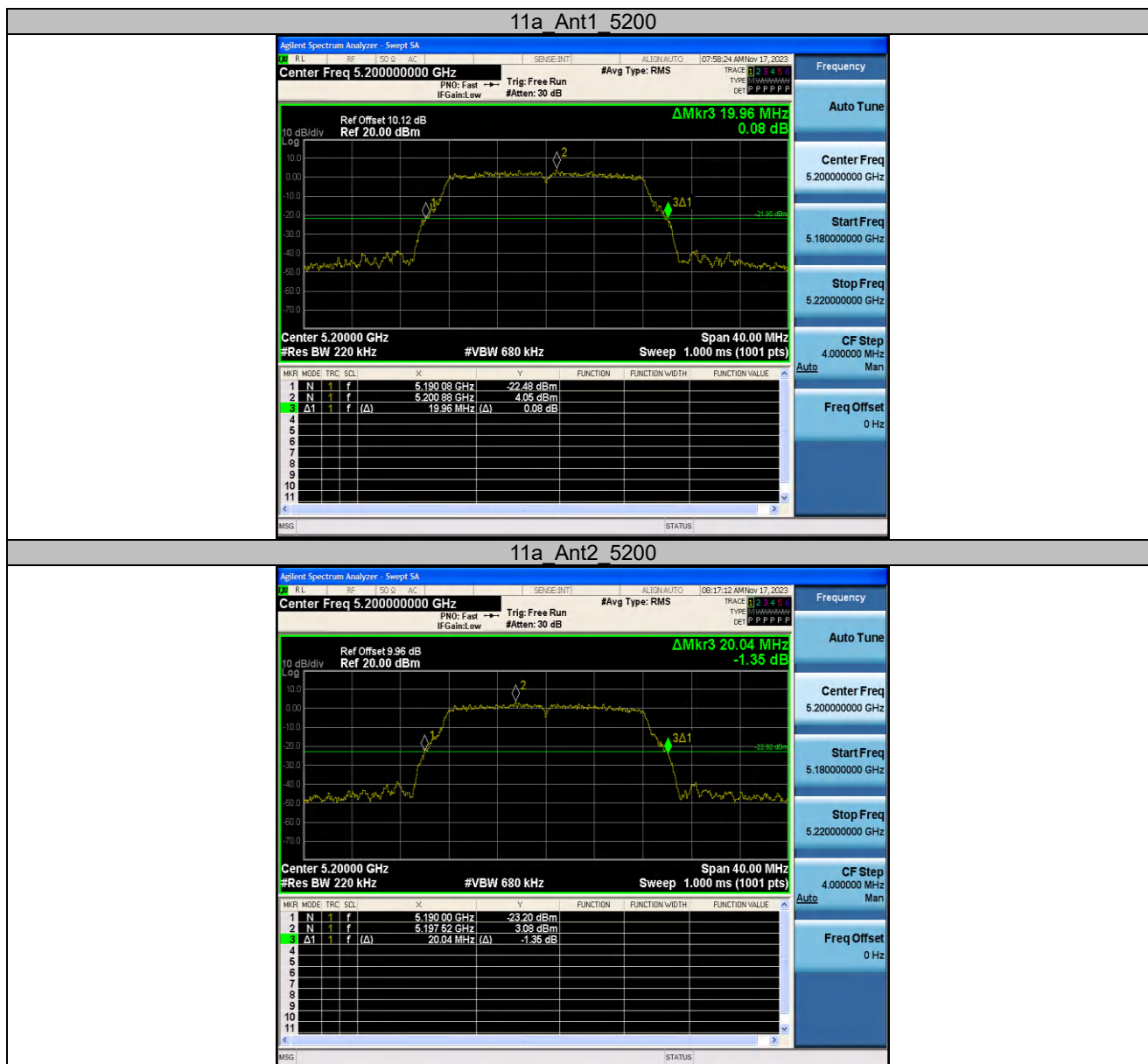
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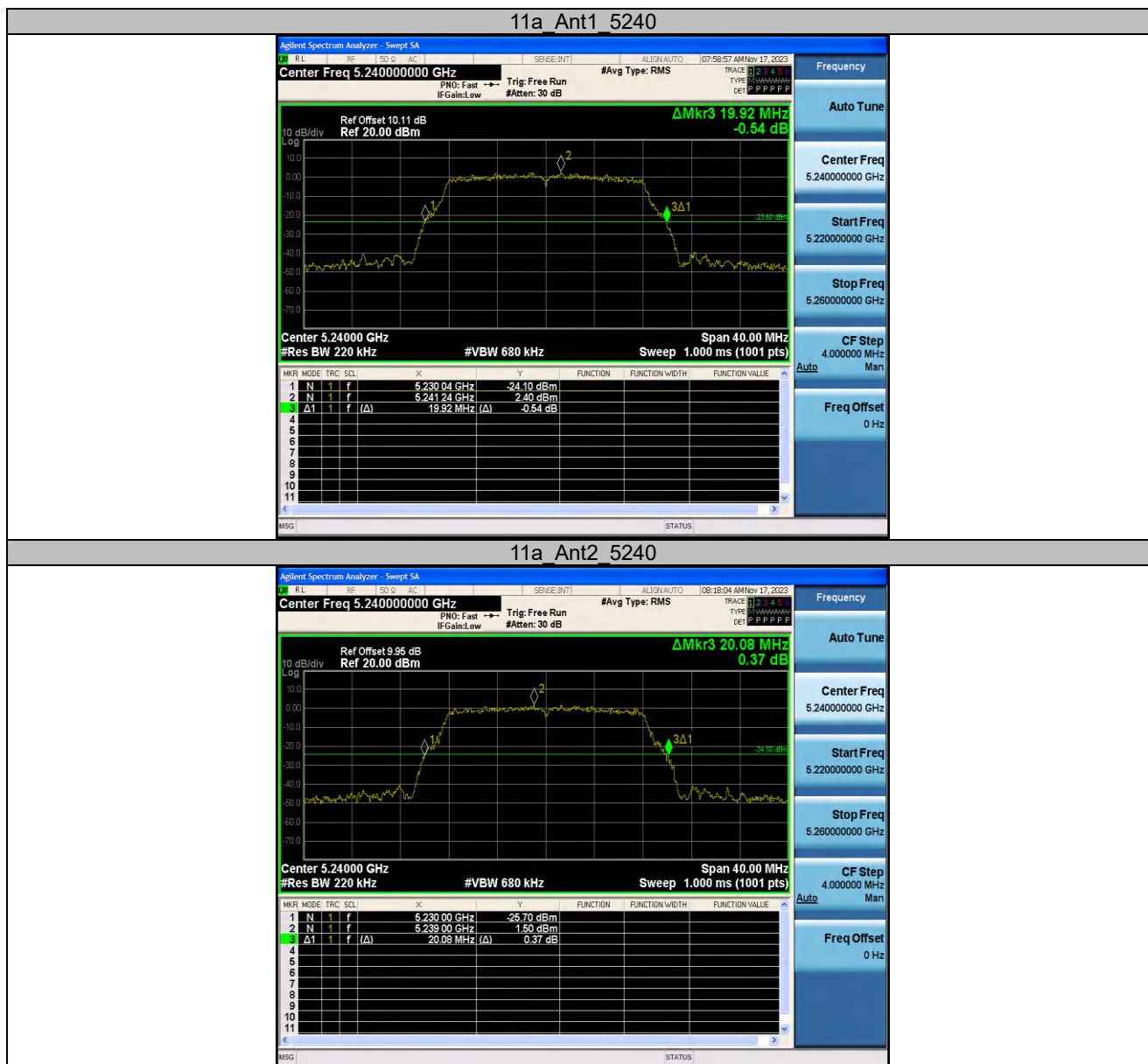
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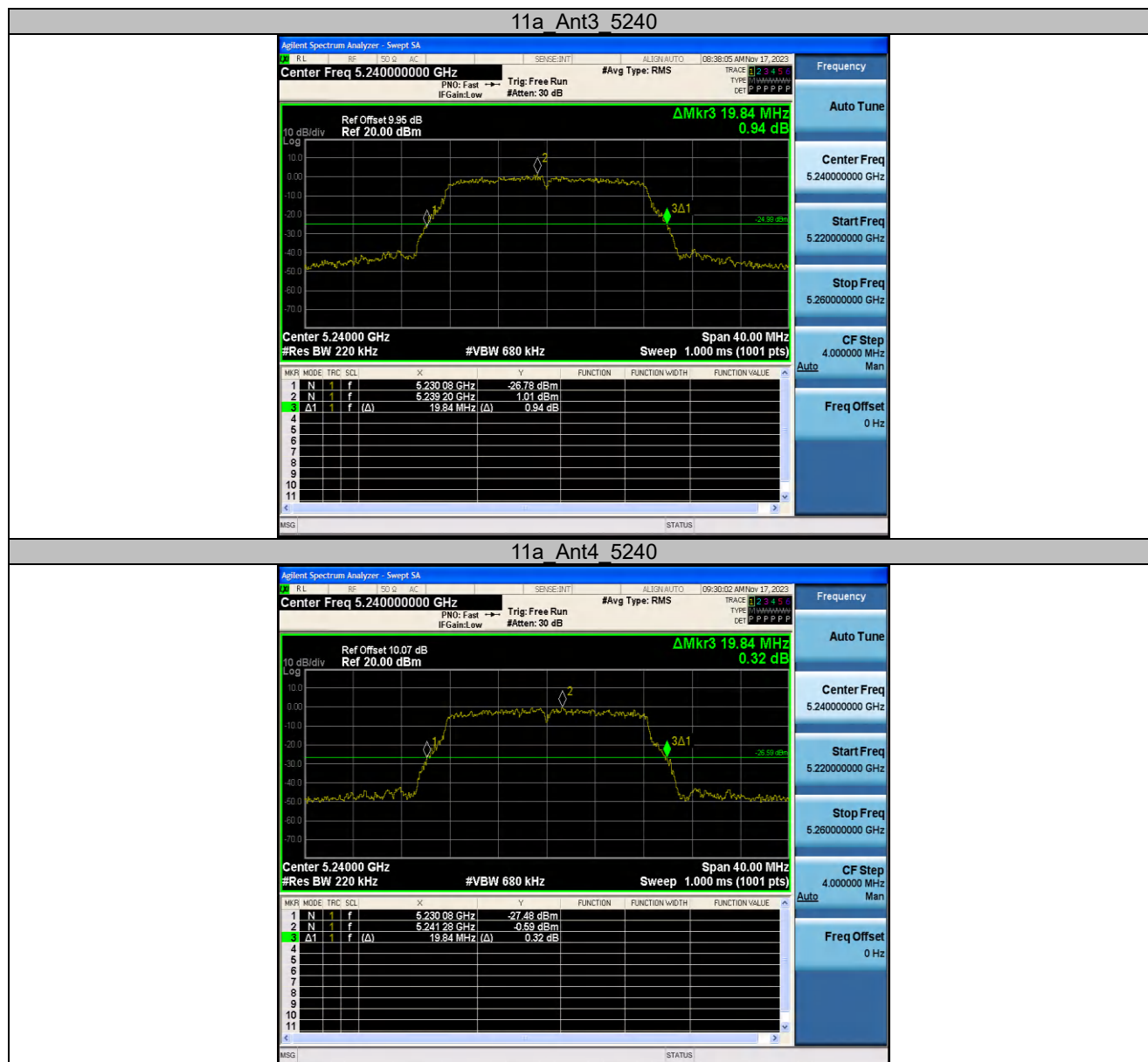
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11a Ant1 5745



11a Ant2 5745



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11a Ant3 5745



11a Ant4 5745



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11a Ant1 5785



11a Ant2 5785



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11a Ant1 5825



11a Ant2 5825



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11a Ant3 5825



11a Ant4 5825



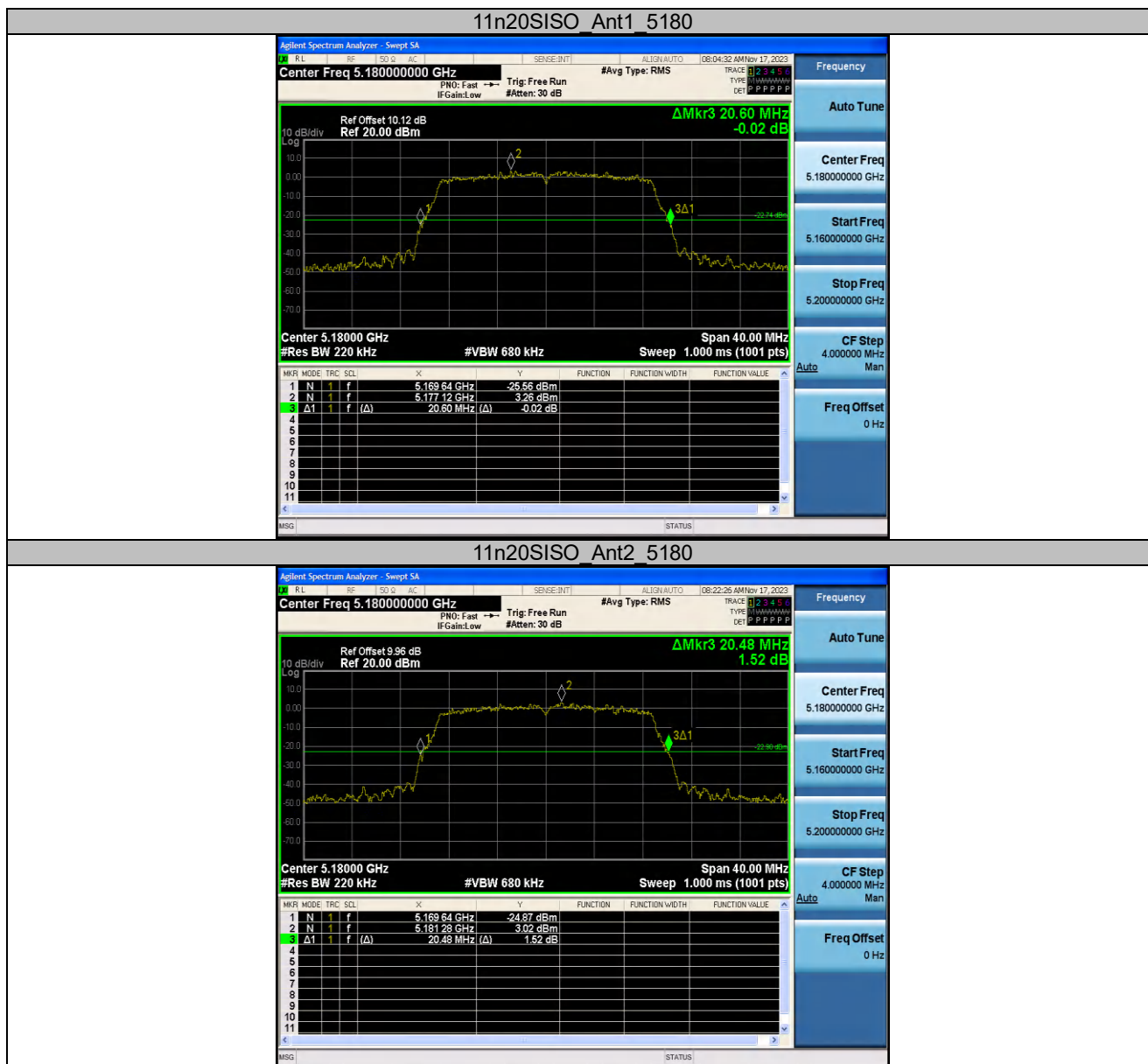
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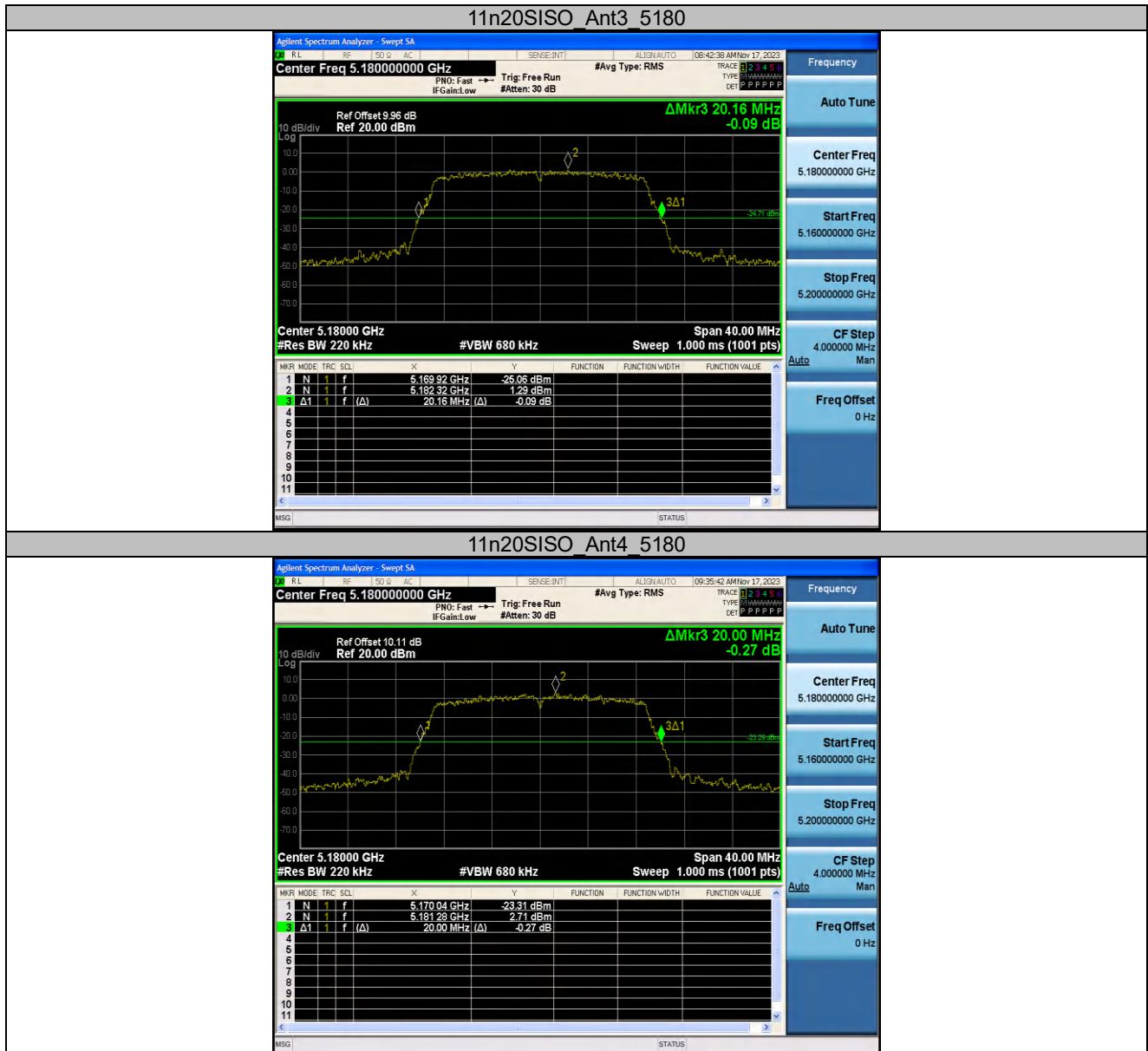
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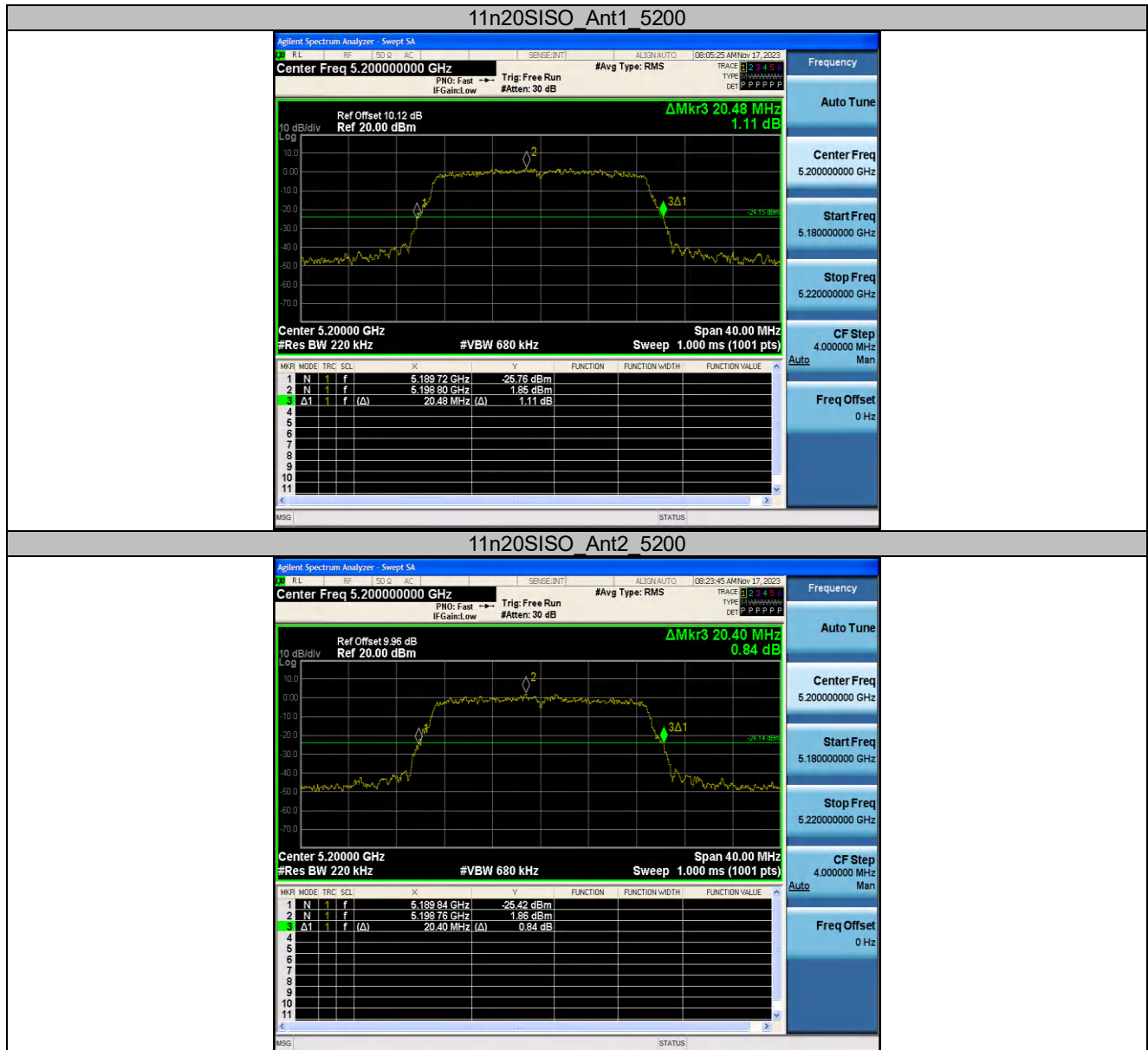
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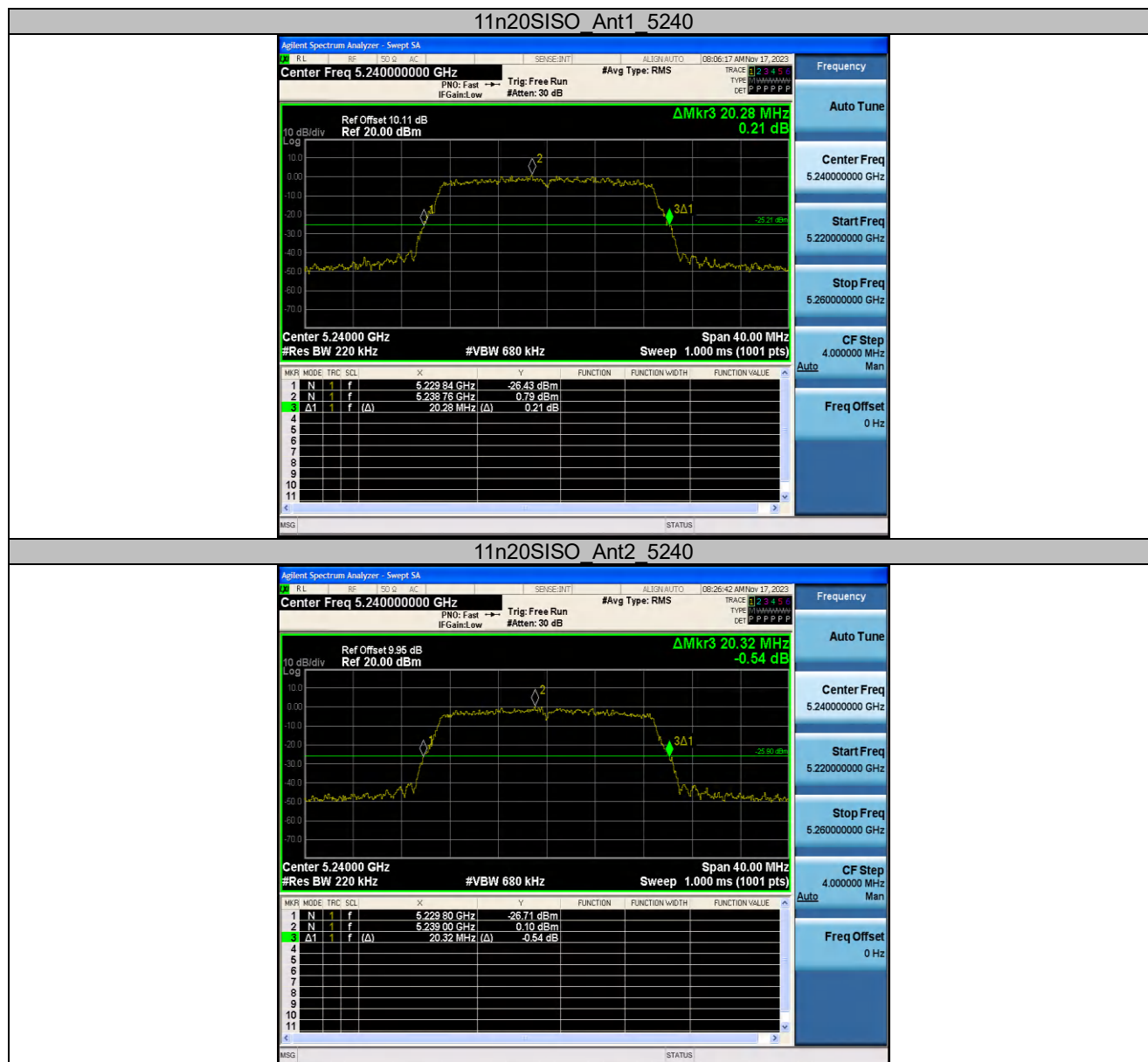
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11n20SISO_Ant3_5200



11n20SISO_Ant4_5200





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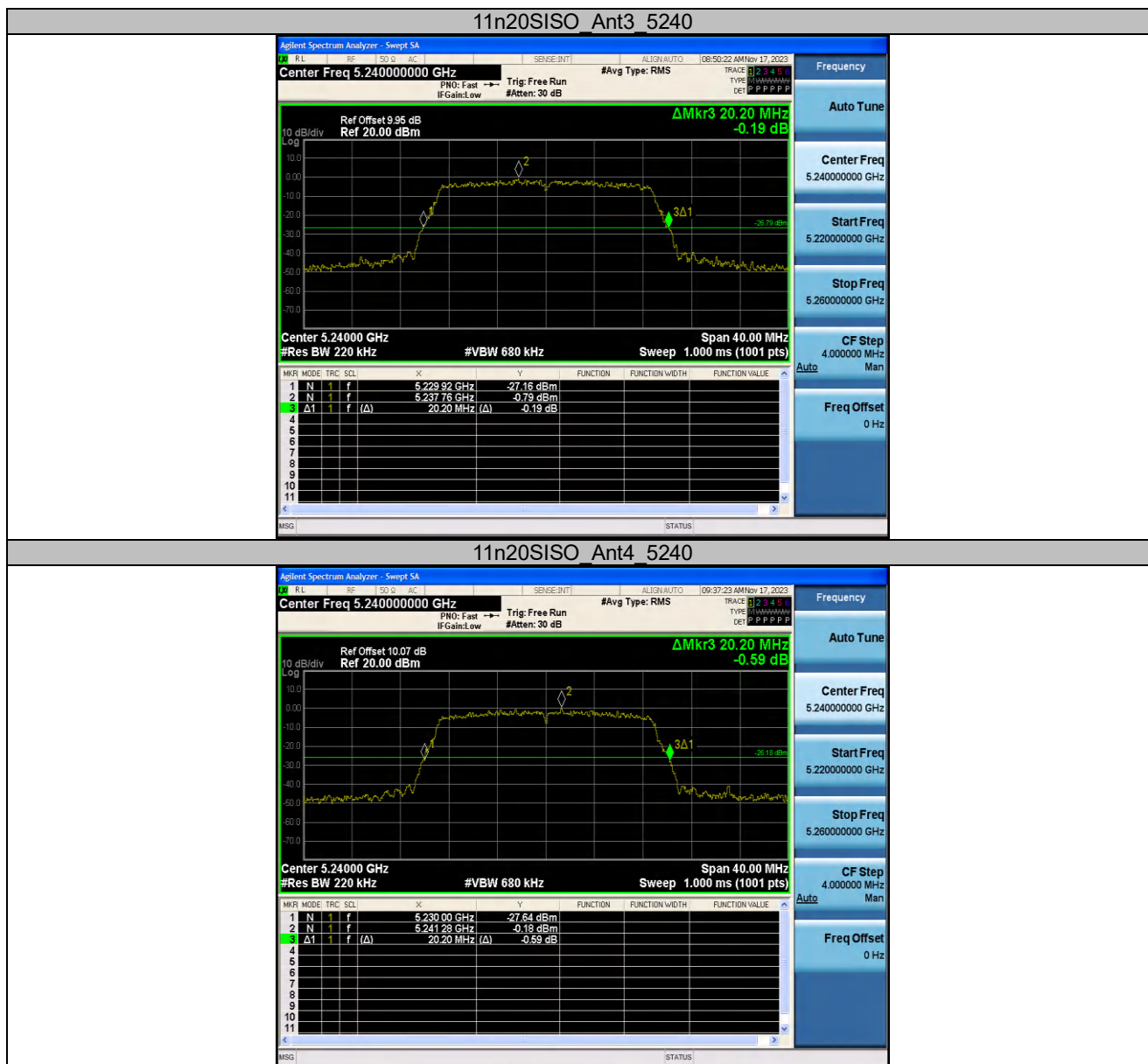
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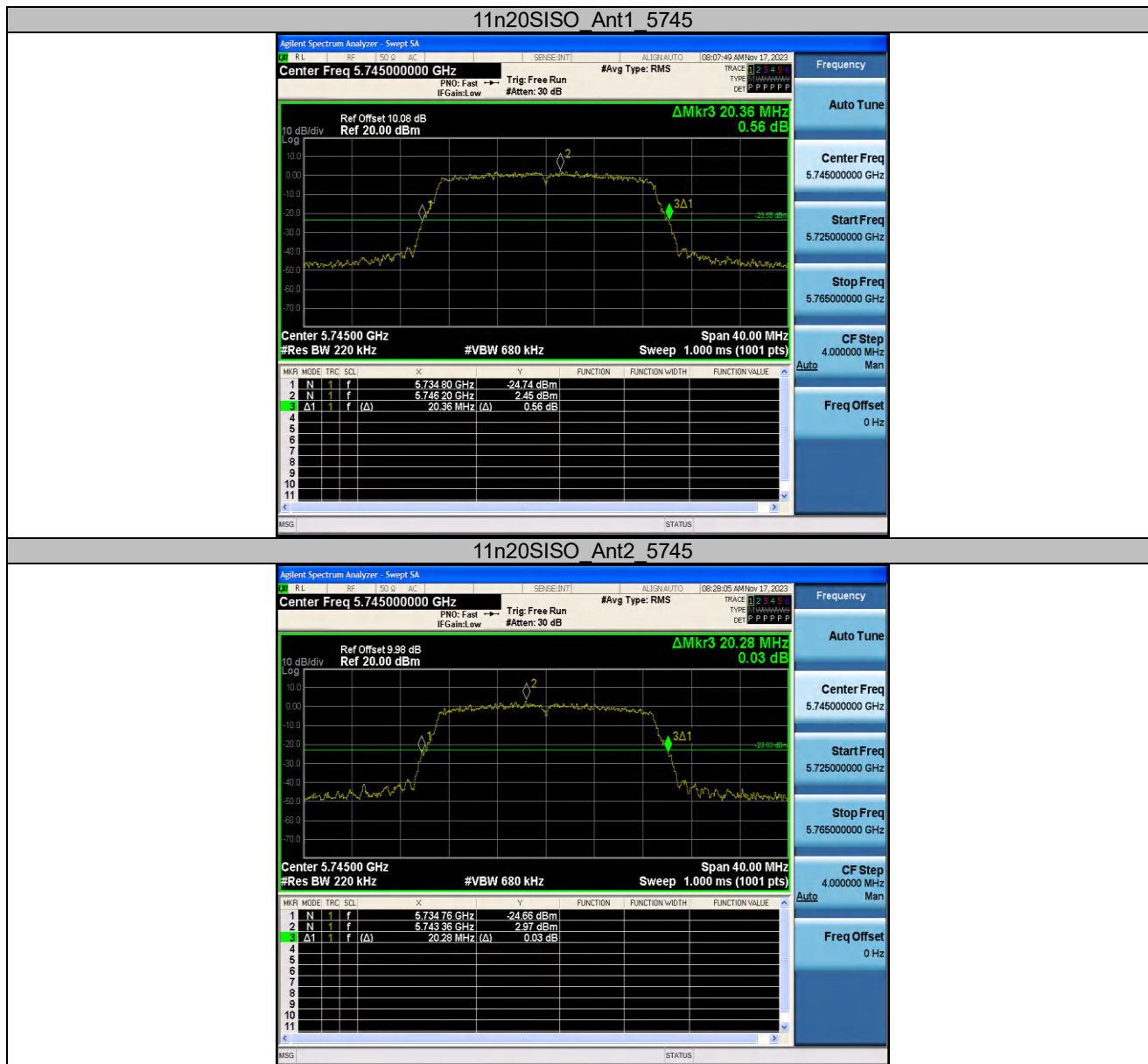
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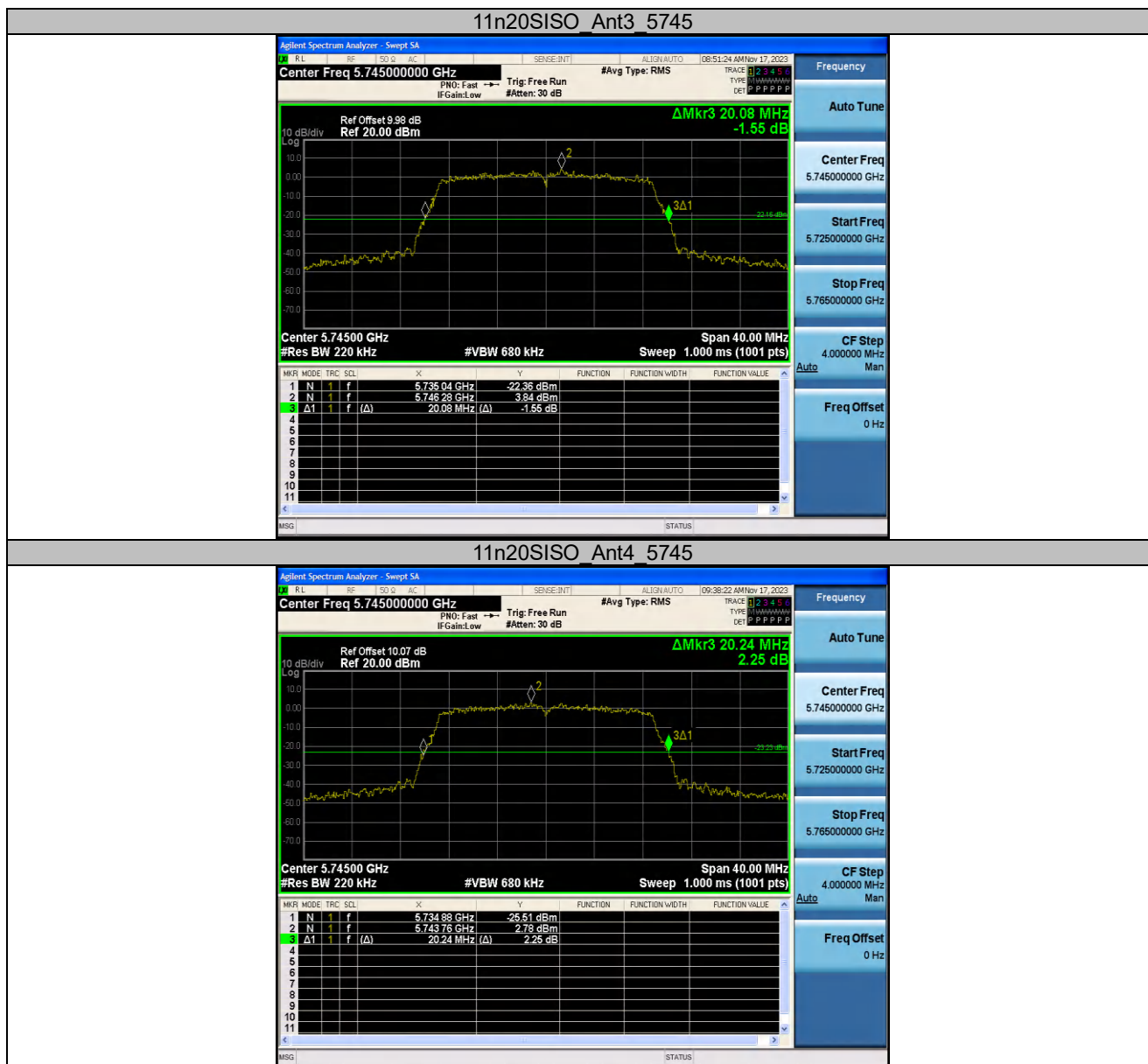
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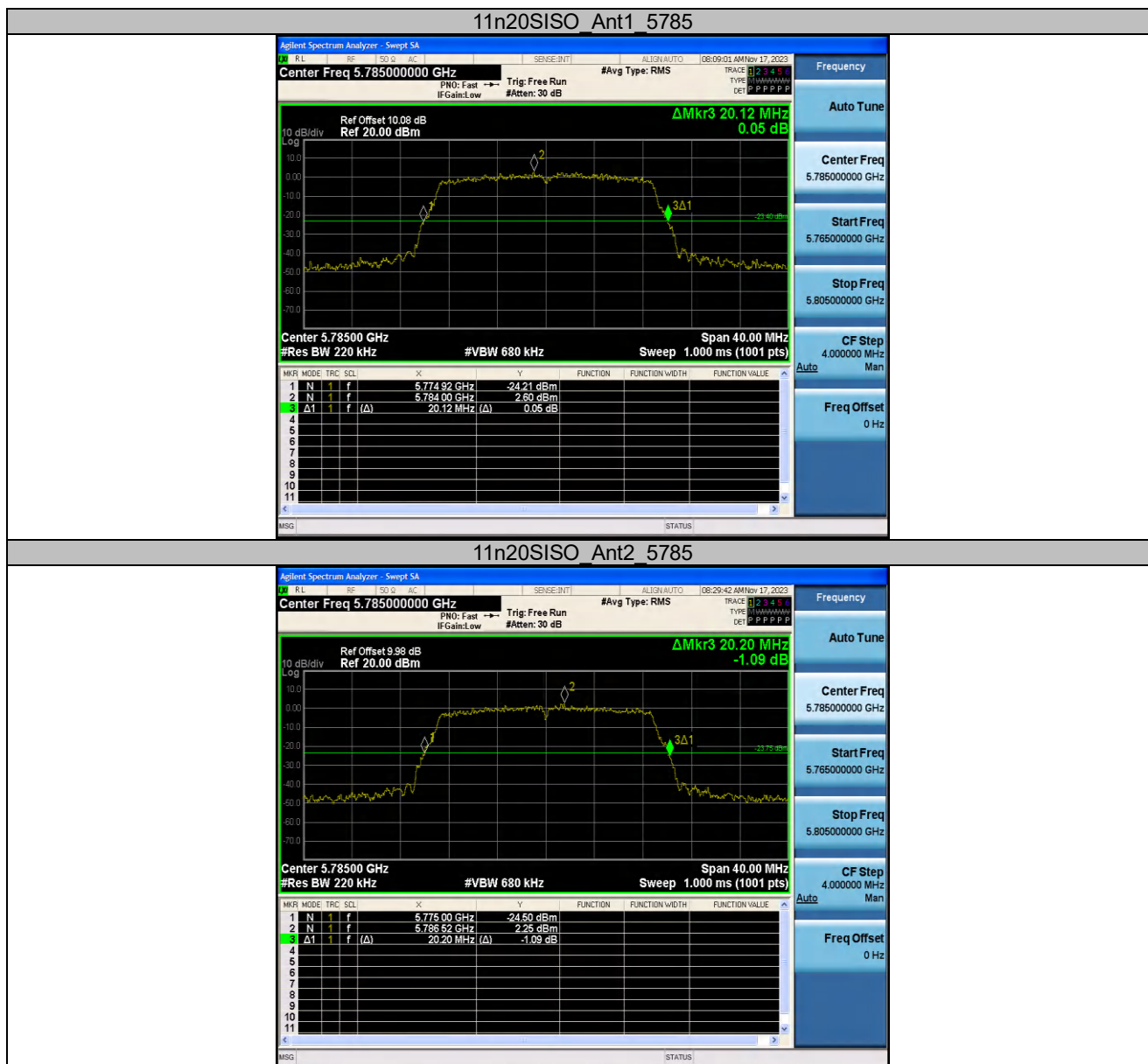
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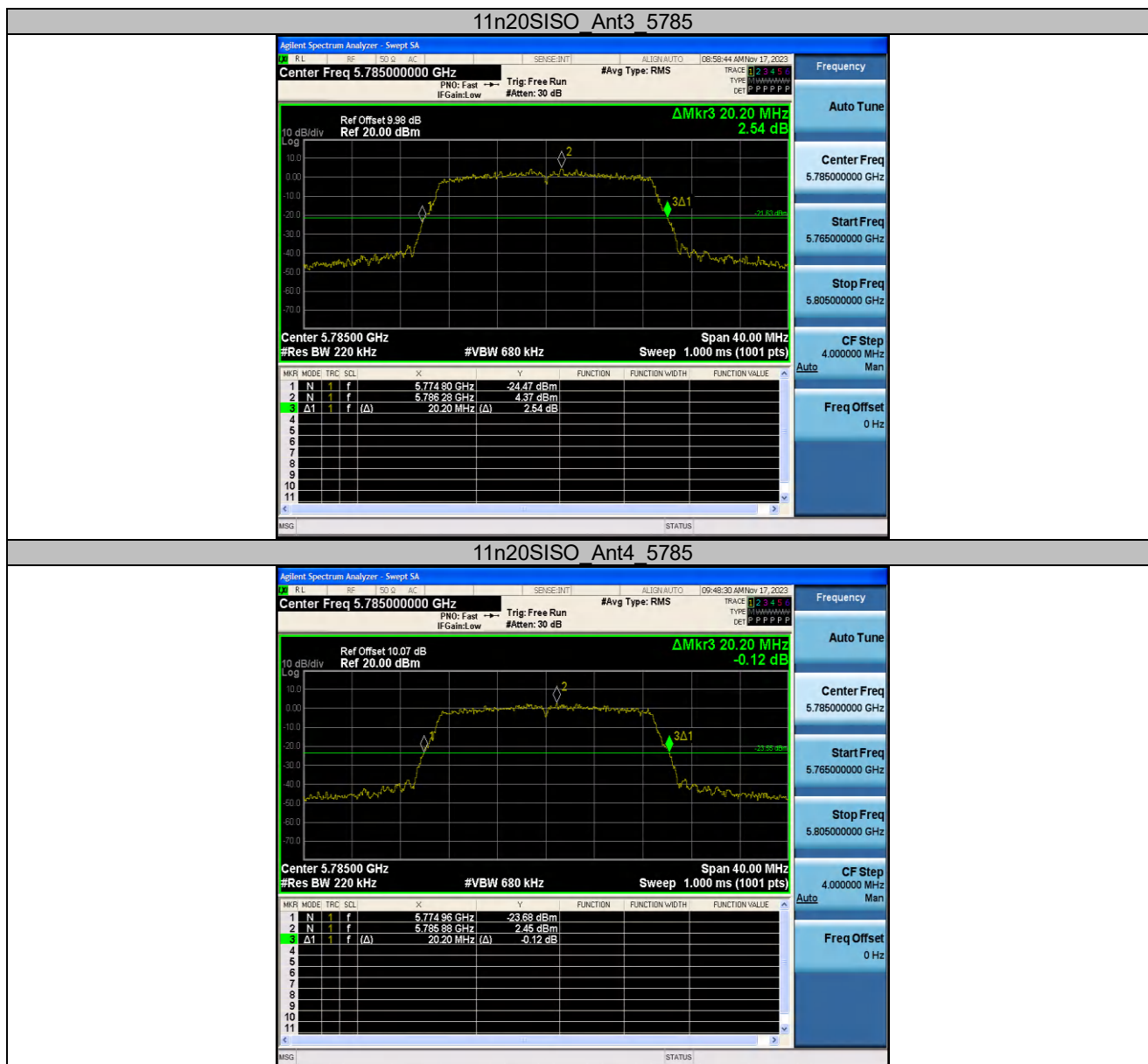
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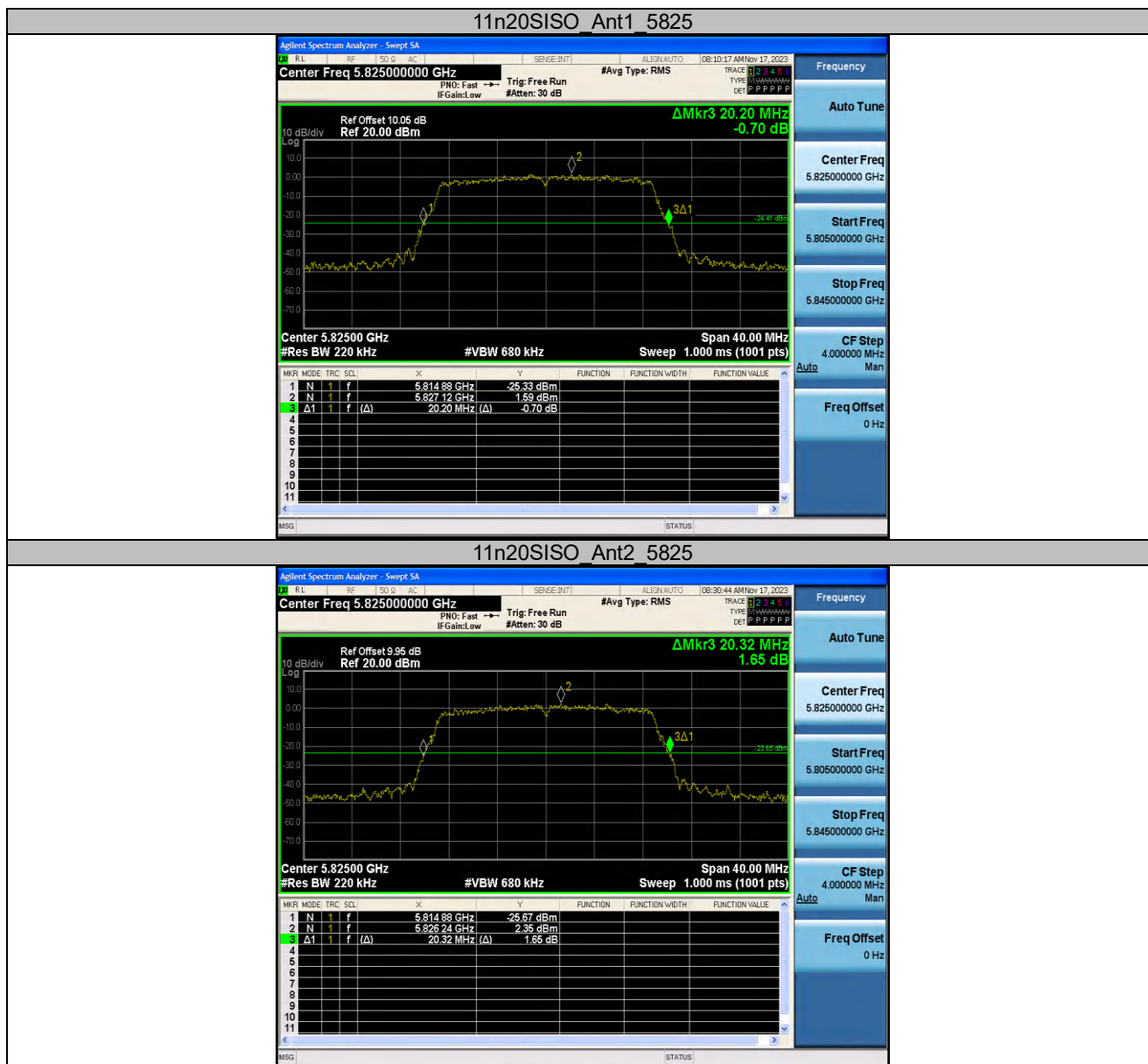
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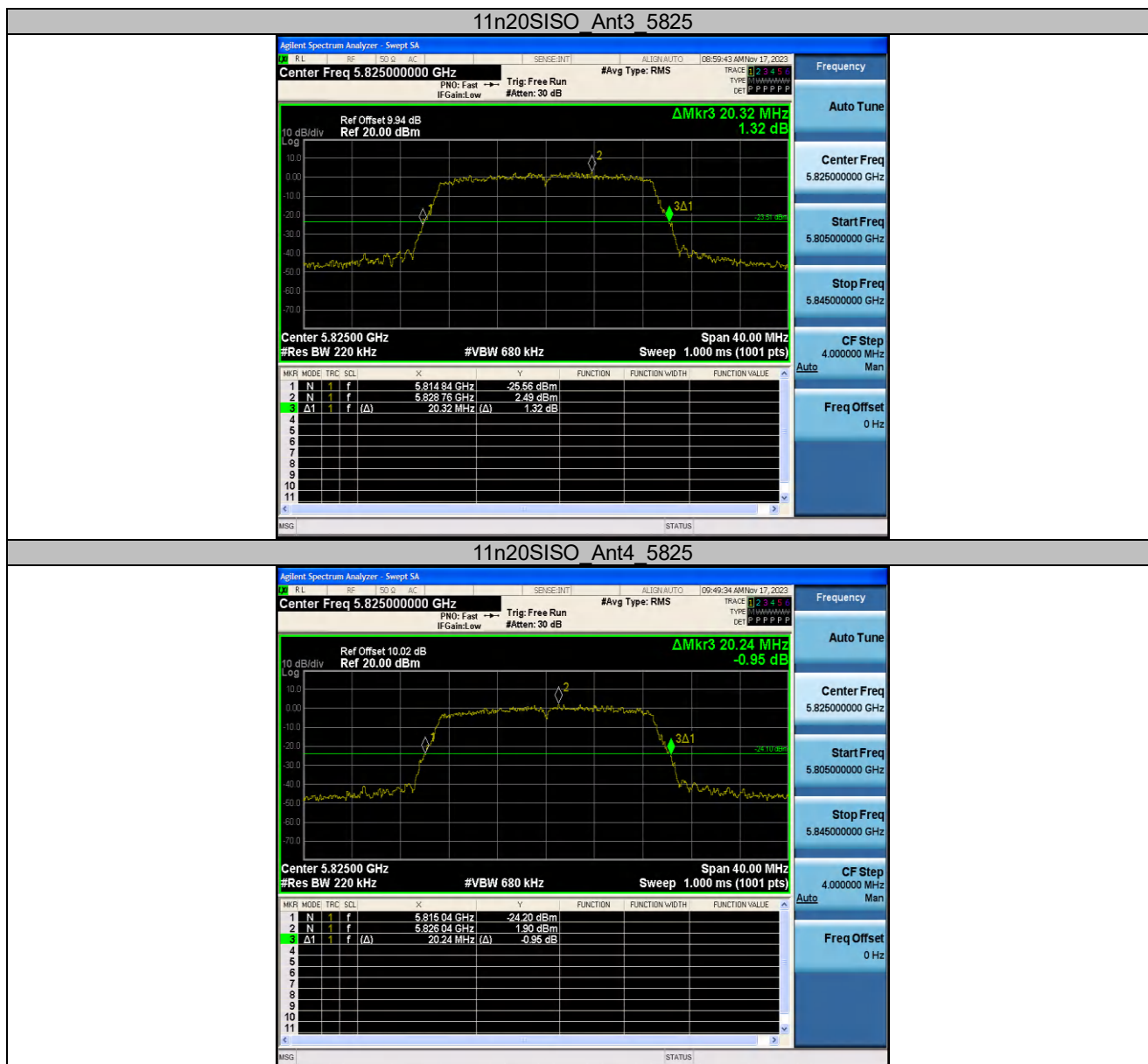
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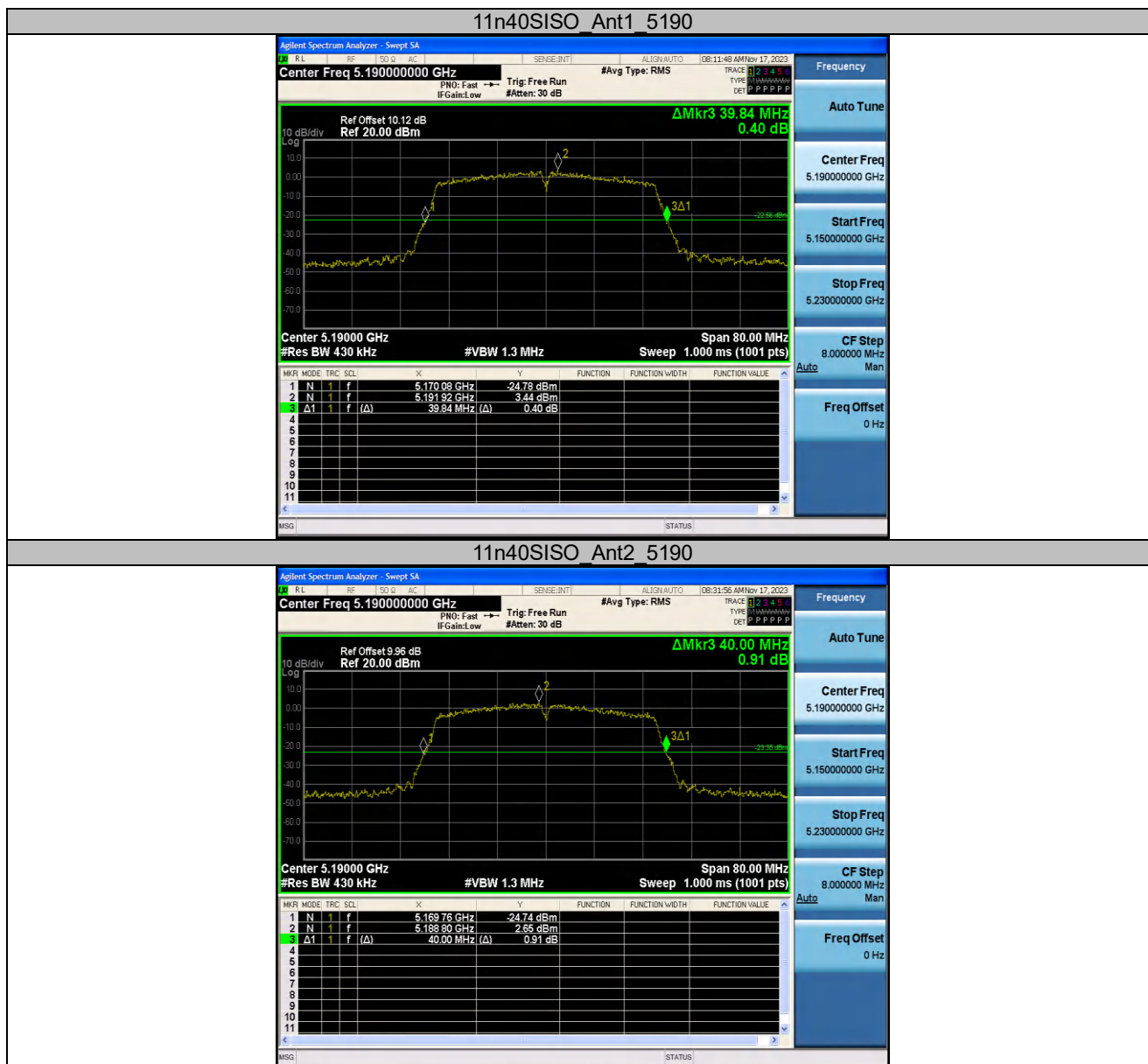
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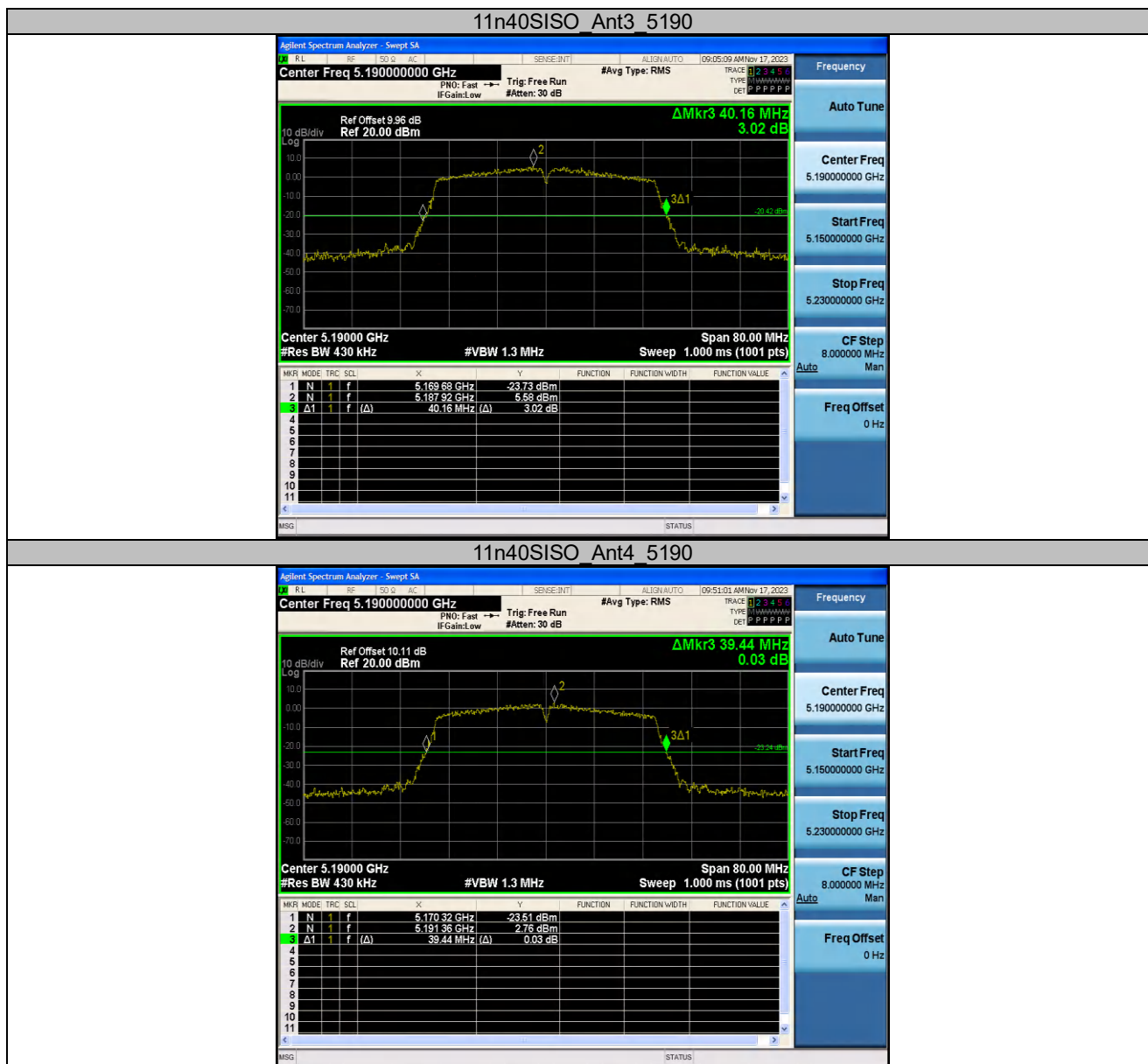
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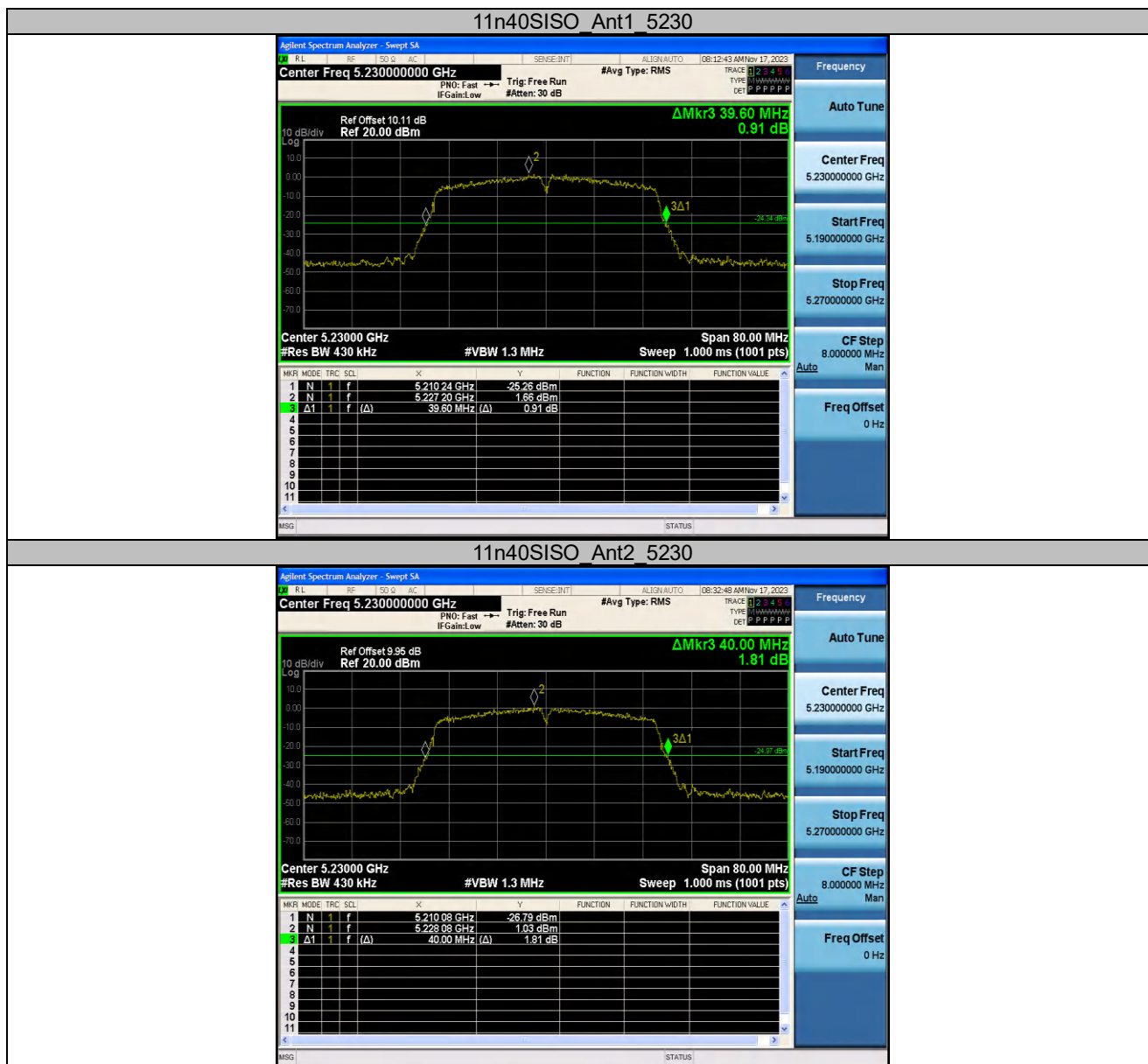
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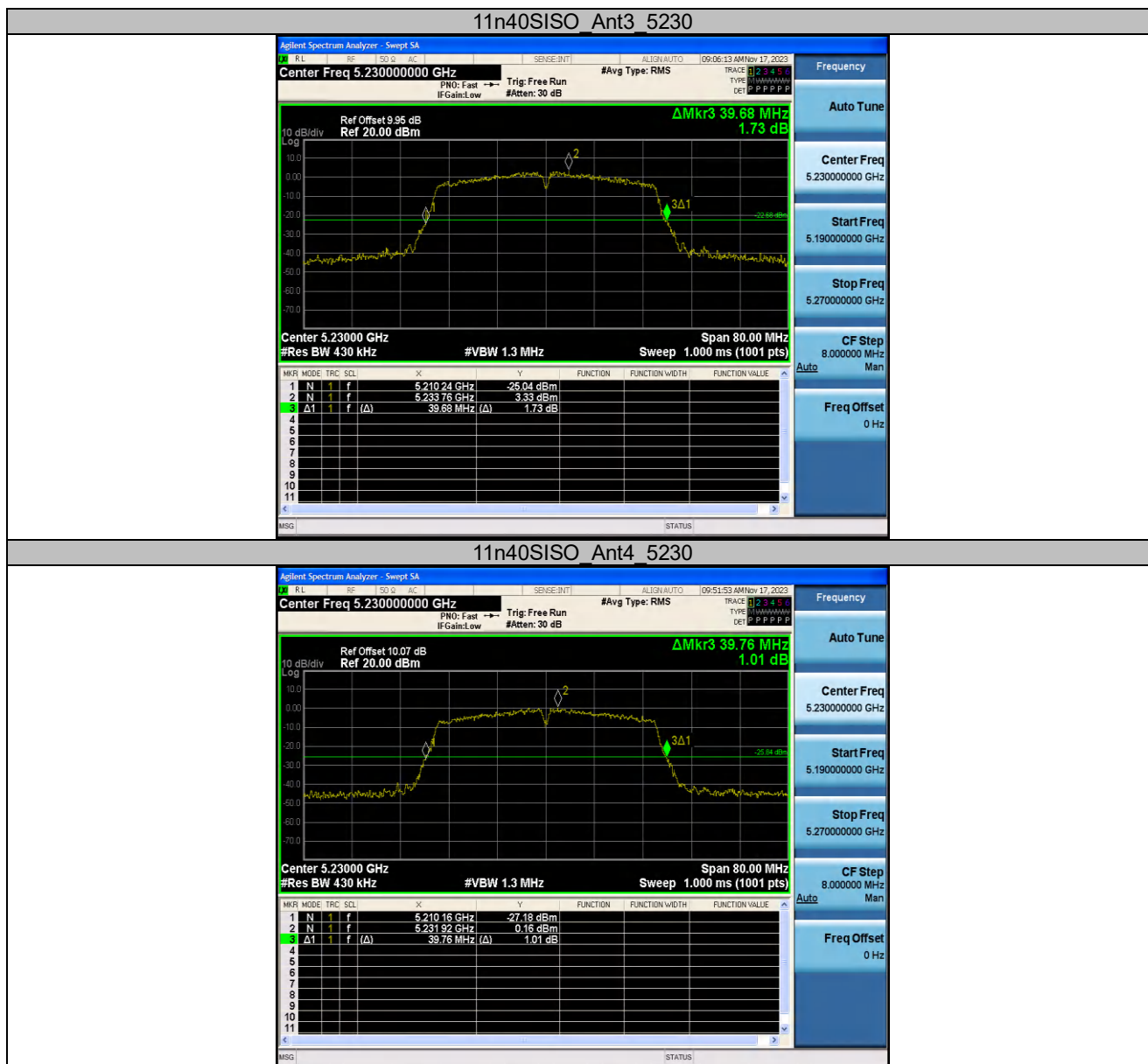
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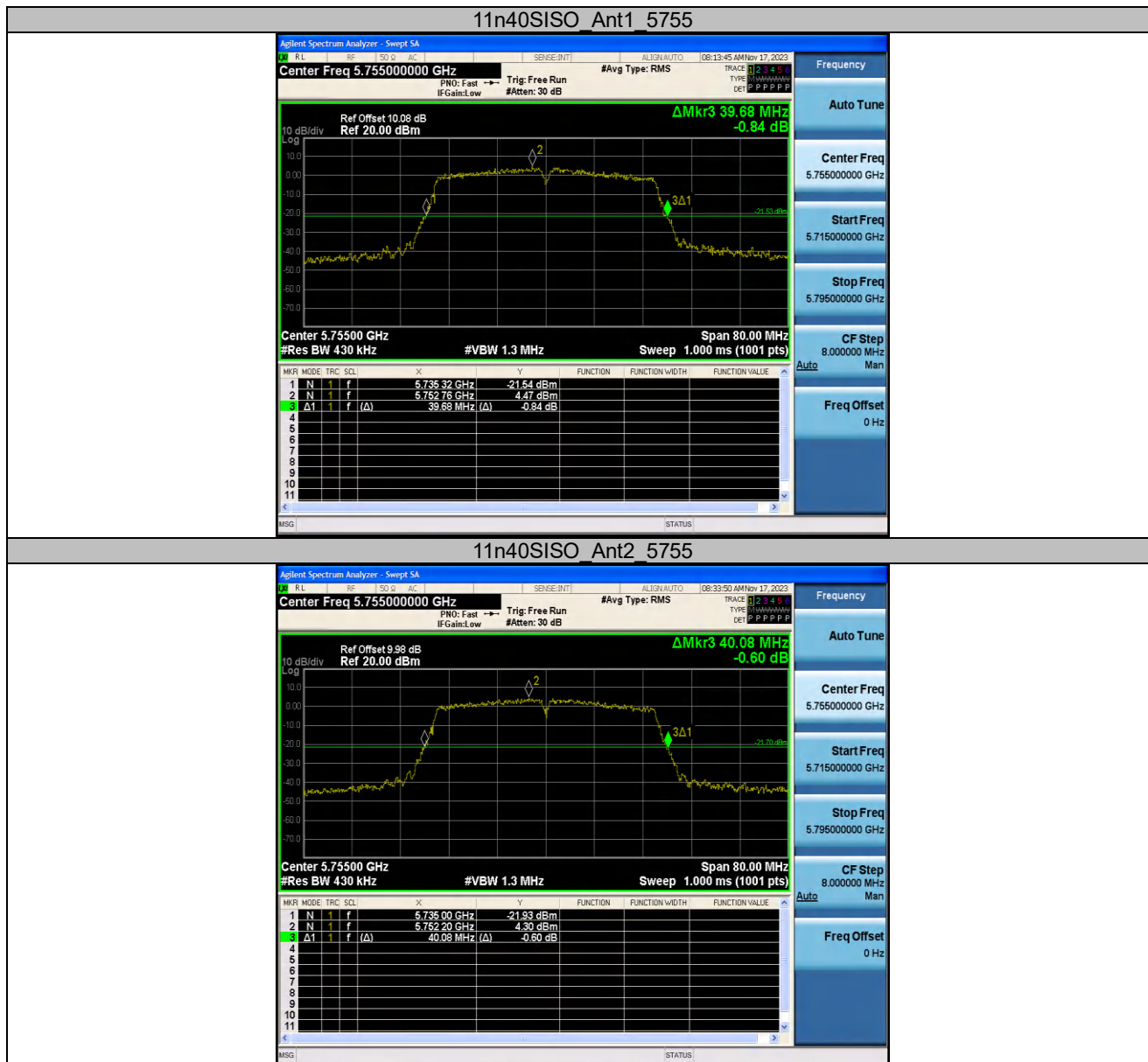
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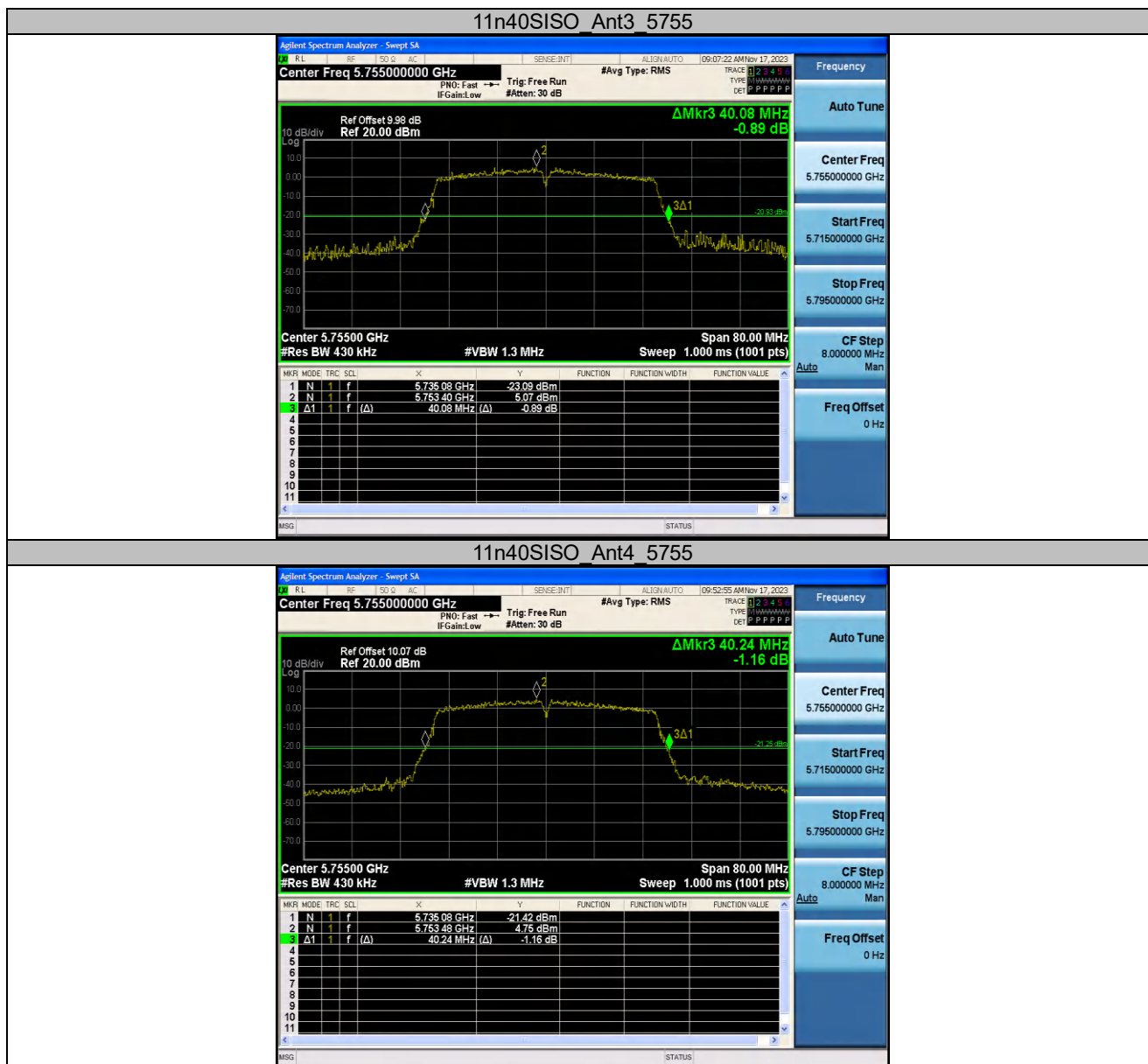
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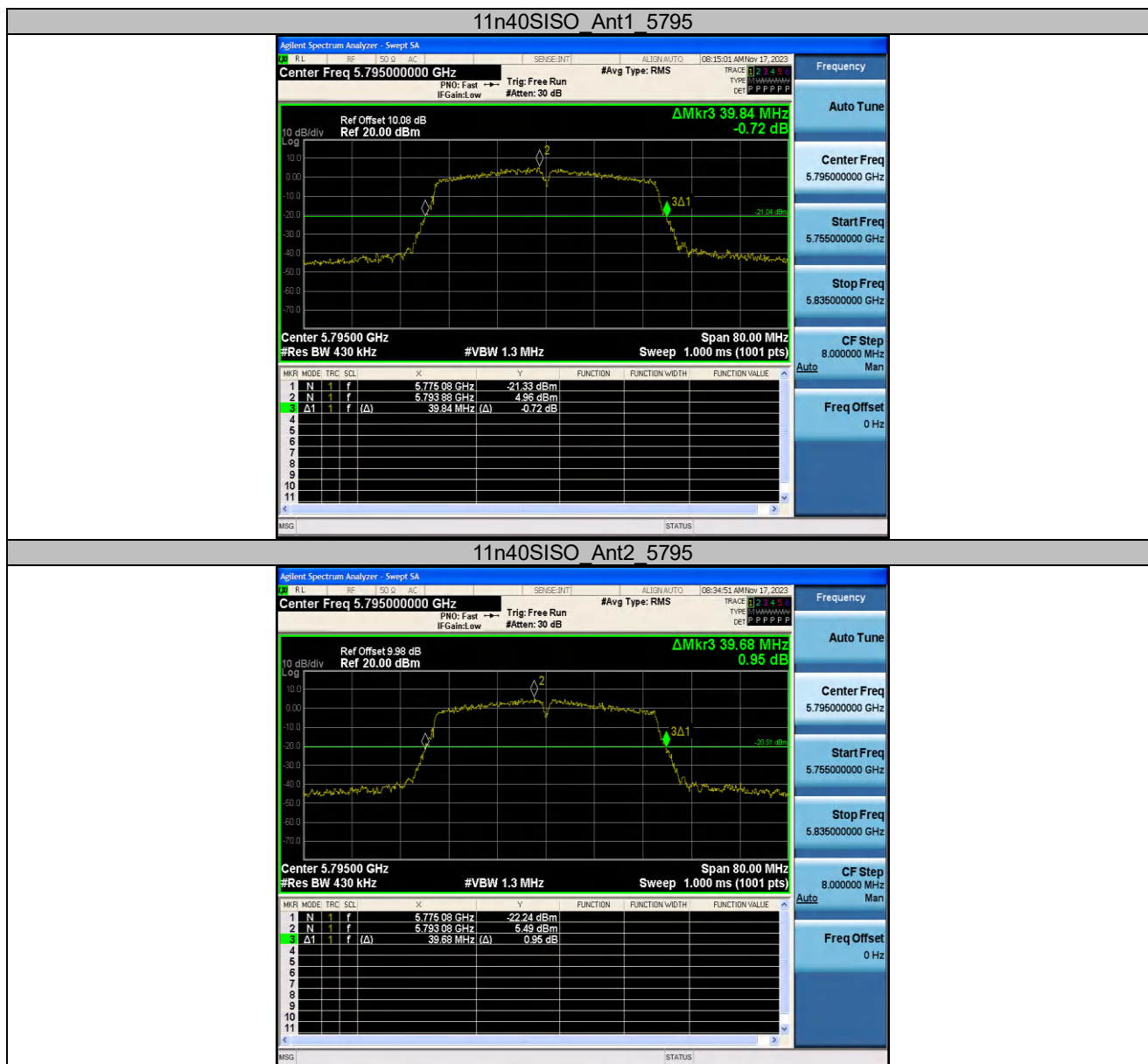
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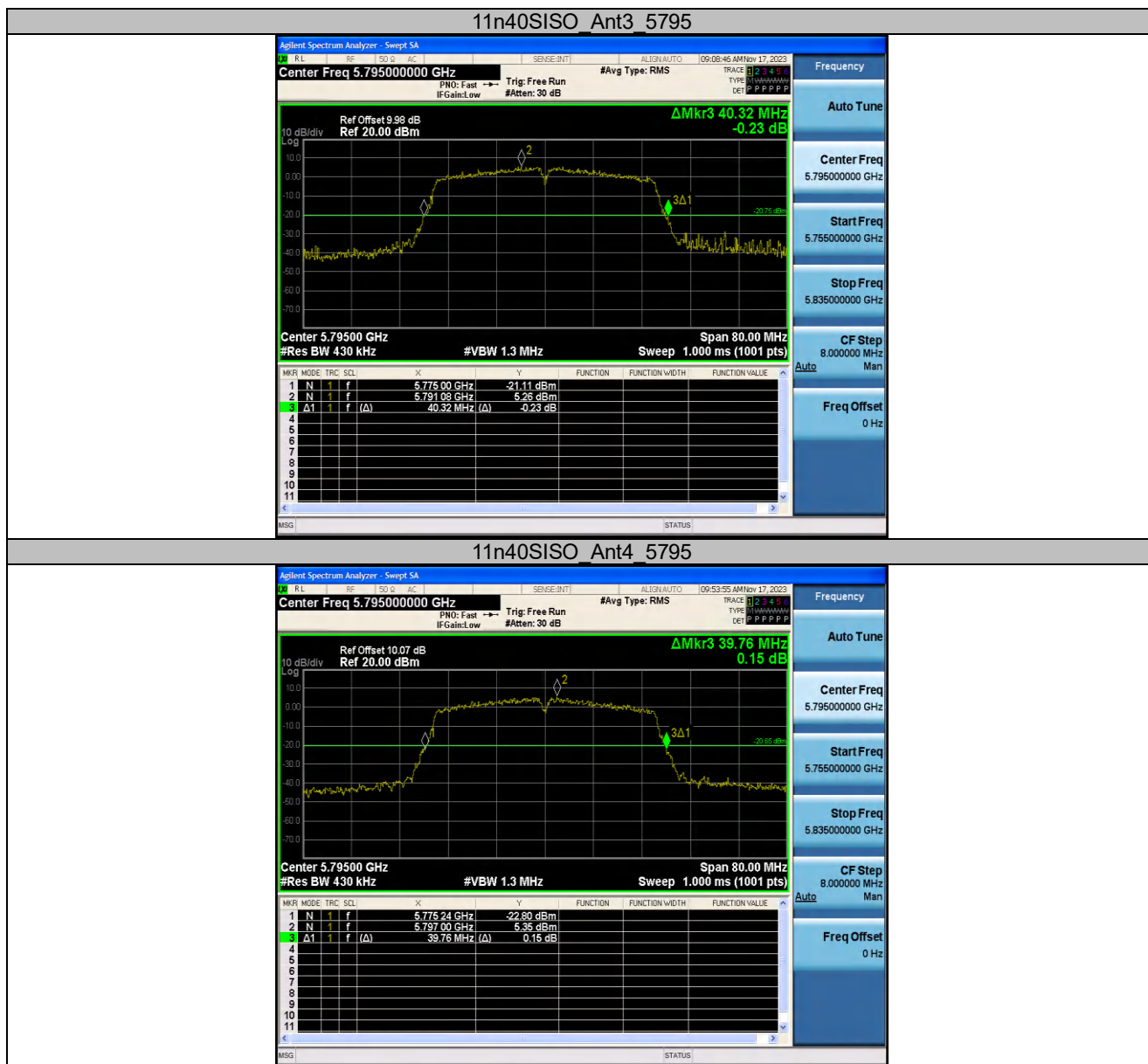
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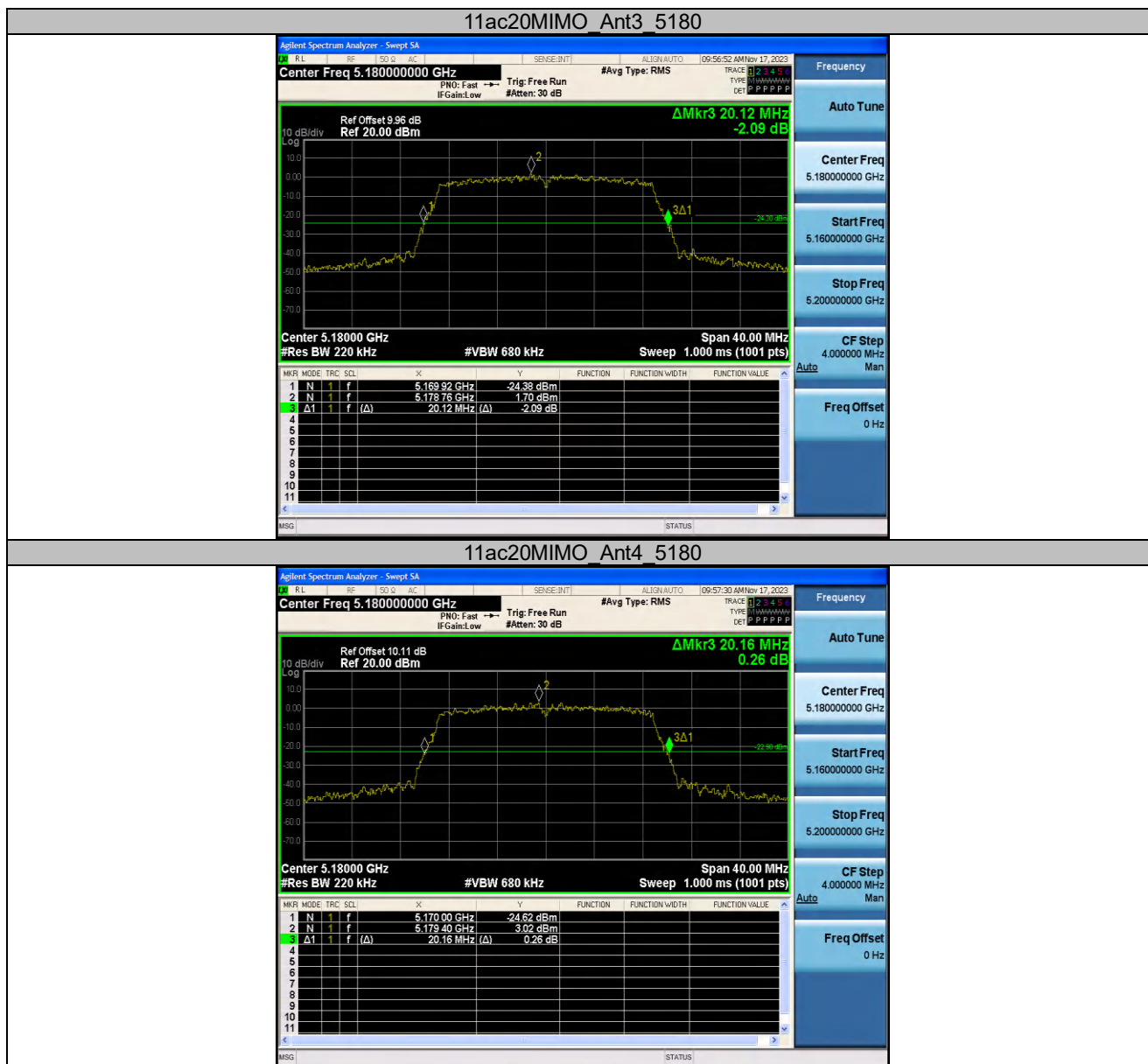
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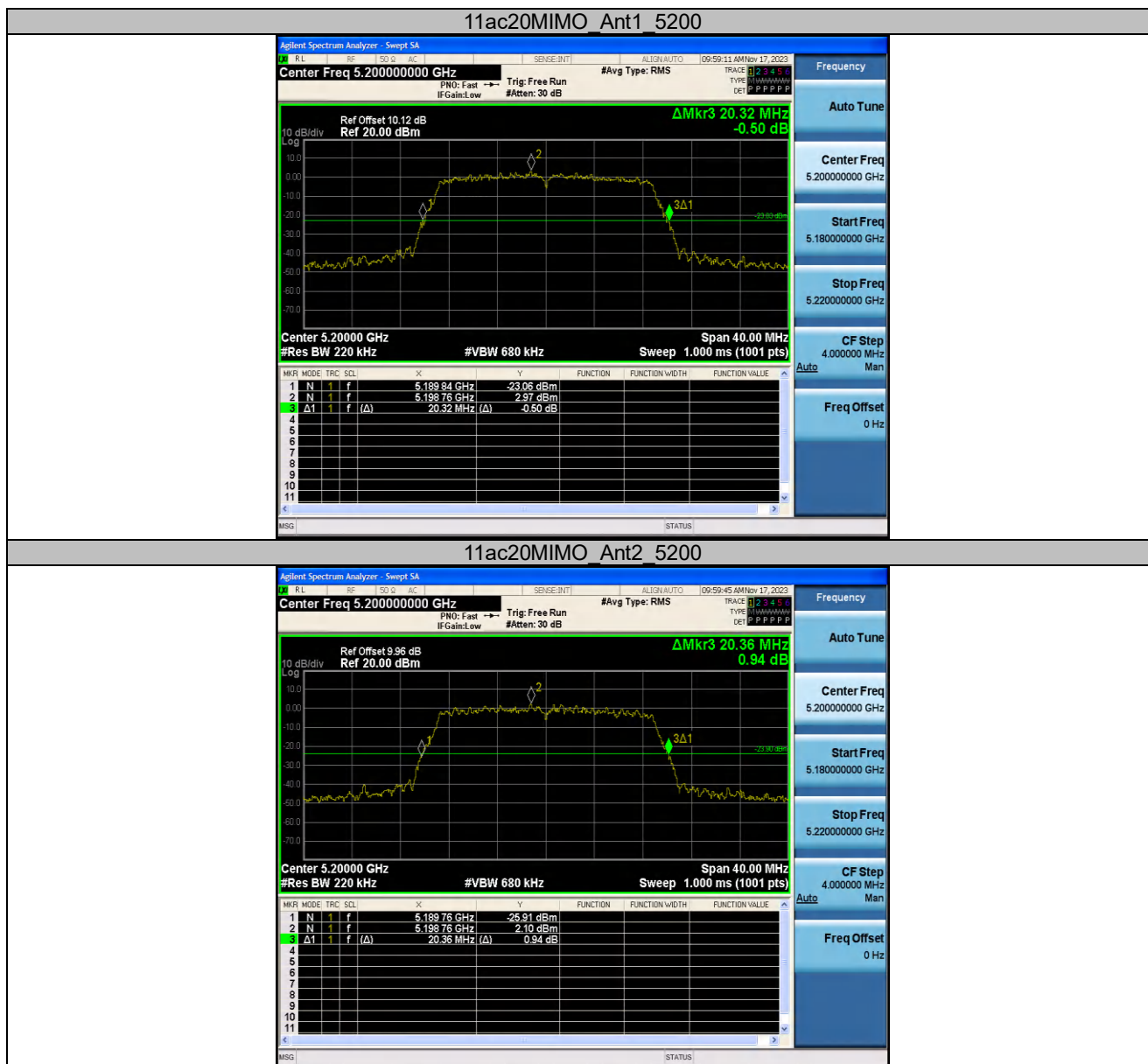
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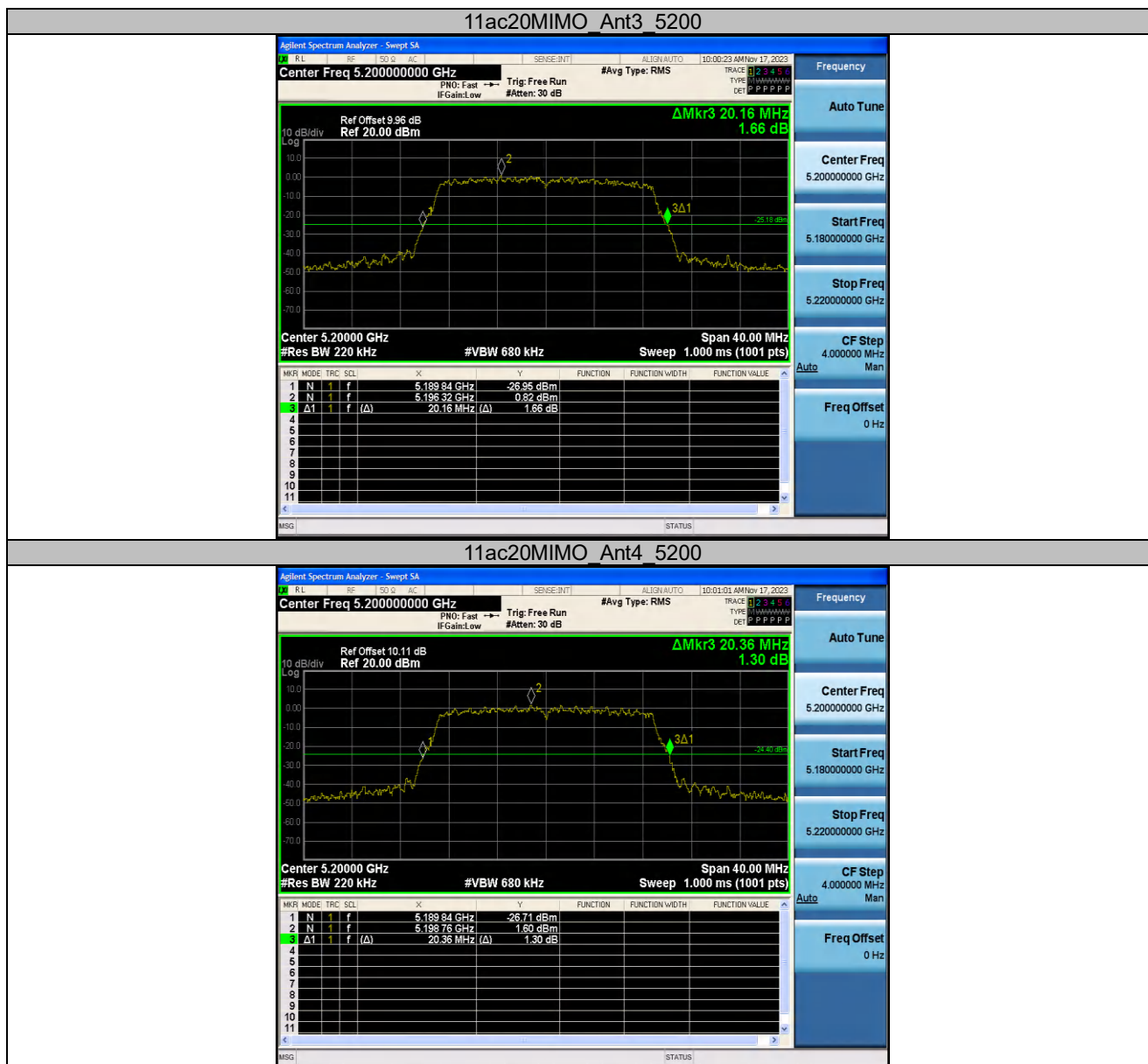
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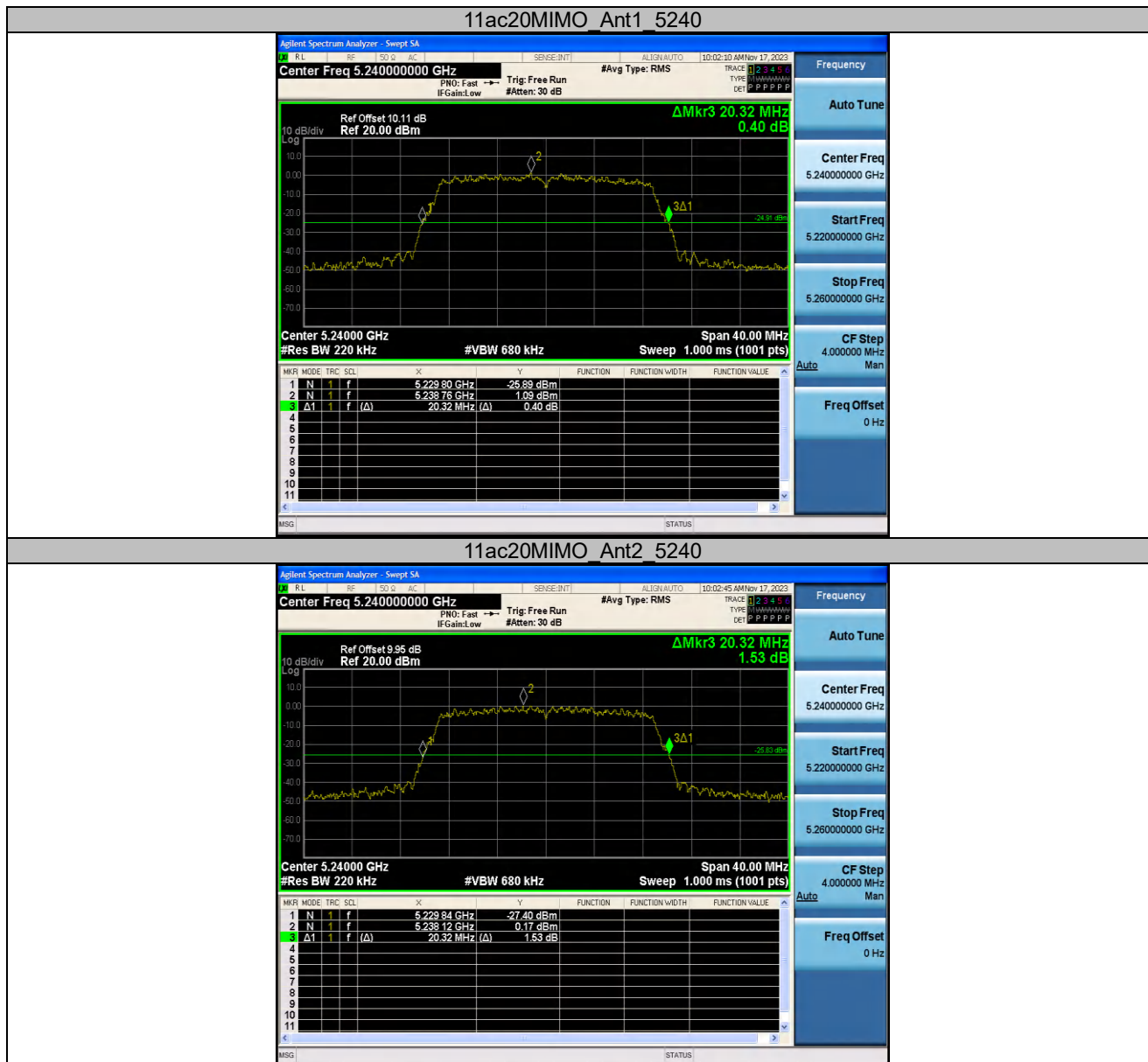
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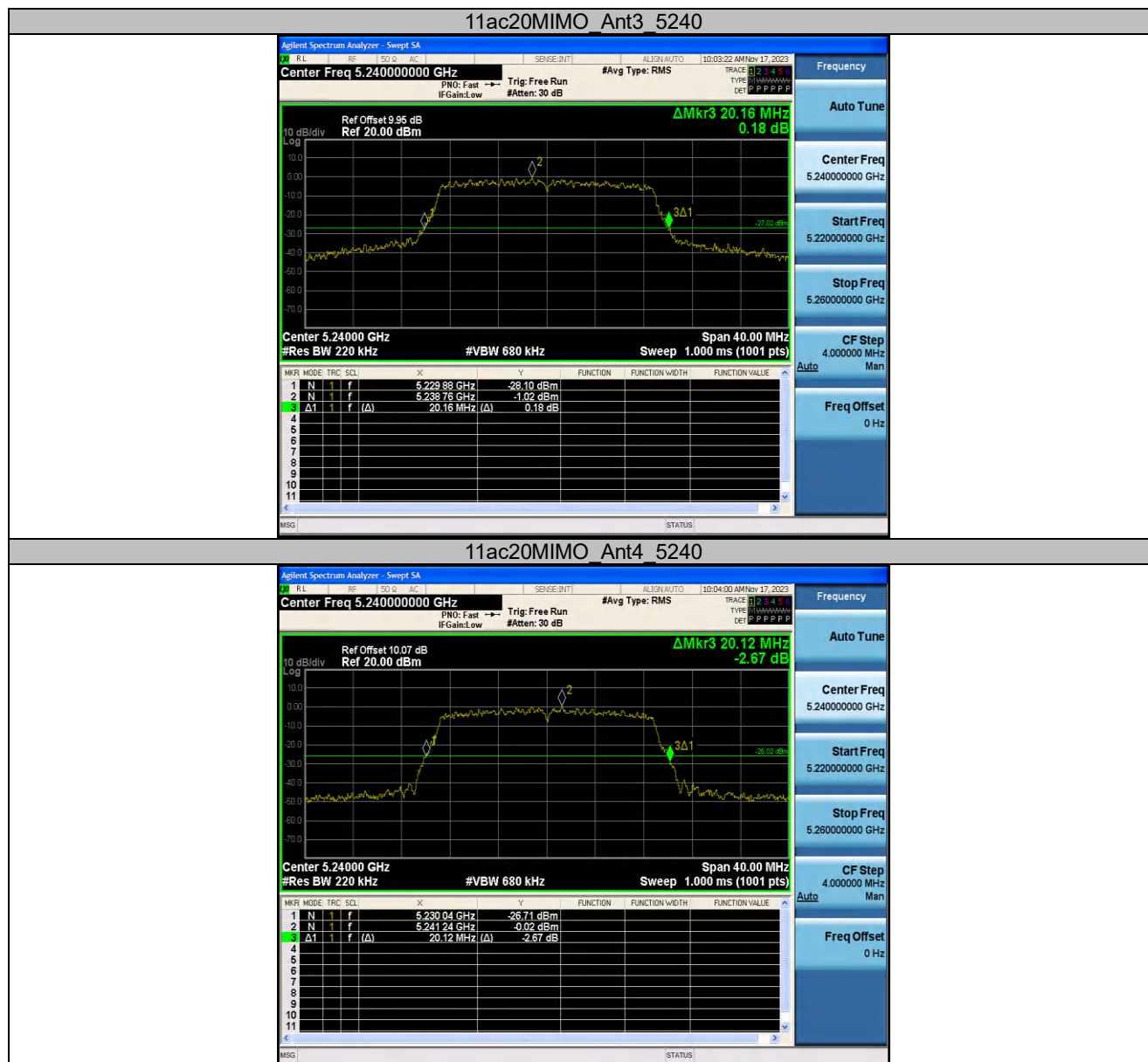
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