

Report No.: SEWM2211000265RG04
Rev.: 01
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TEST REPORT

Application No.:	SEWM2211000265RG
Applicant:	Asiatelco Technologies Co.
Address of Applicant:	#289 Bisheng Road, Building-8, 3F, Zhang jiang Hi-Tech Park, Pudong, Shanghai 201204, China
Manufacturer:	Asiatelco Technologies Co.
Address of Manufacturer:	#289 Bisheng Road, Building-8, 3F, Zhang jiang Hi-Tech Park, Pudong, Shanghai 201204, China
EUT Description:	5G CPE
Model No.:	WB550-NA/WB550-EU
Trade Mark:	ATEL
FCC ID:	XYO-WB550
Standards:	FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart E
Date of Receipt:	2022/11/22
Date of Test:	2022/12/15 to 2023/01/04
Date of Issue:	2023/01/05

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

Authorized Signature:

Panta Sun

Panta Sun
Wireless Laboratory Manager



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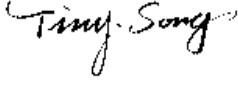
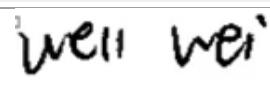
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1 Version

Revision Record

Version	Chapter	Date	Modifier	Remark
01		2023/01/05		Original

Prepared By	 (Tizzy Song) / Test Engineer
Checked By	 (Well Wei) / 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	Reporting only
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	Reporting only
	Band III				
Duty Cycle	Band I Band III	--	No limit.	Clause 4.3	Reporting only
Maximum Conducted Output Power	Band I	15.407(a)(iv)	< 250mW	Clause 4.4	PASS
	Band III	15.407(a)(3)	< 1W		
Maximum Power Spectral Density	Band I	15.407(a)(iv)	<11dBm/MHz	Clause 4.8	PASS
	Band III	15.407(a)(3)	<30dBm/500KHz		
Unwanted Emissions that fall Out of the Restricted Bands (Radiated)	Band I	15.209 15.407(b)	F<1GHz: §15.209/§7.2.5 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/§7.2.5 limit (AV&PK).	Clause 4.9	PASS
	Band III	15.407(b) 15.209	F<1GHz: §15.209/§7.2.5 limit (QP) F≥1GHz & out-restricted:(QP) a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges. F≥1GHz & in-restricted: §15.209/§7.2.5 limit (AV&PK).		PASS



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Unwanted Emissions in the Restricted Bands (Radiated)	Band I Band III	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					



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3 General Information

3.1 Details of Client

Applicant:	Asiatelco Technologies Co.
Address of Applicant:	#289 Bisheng Road, Building-8, 3F, Zhang jiang Hi-Tech Park, Pudong, Shanghai 201204, China
Manufacturer:	Asiatelco Technologies Co.
Address of Manufacturer:	#289 Bisheng Road, Building-8, 3F, Zhang jiang Hi-Tech Park, Pudong, Shanghai 201204, China

3.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	Ives Cheng, Tizzy Song

3.3 Test Facility

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

• **A2LA (Certificate No. 6336.01)**

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

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

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

CAB identifier: CN0120.

IC#: 27594.

• **FCC –Designation Number: CN1312**

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Designation Number: CN1312.

Test Firm Registration Number: 717327



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3.4 General Description of EUT

EUT Description:	5G CPE	
Model No.:	WB550-NA/WB550-EU	
Trade Mark:	ATEL	
Hardware Version:	P1	
Software Version:	CPE_WB550_NA00_VZW_v1.0.8.1	
IMEI:	RF Conducted	862424050029957
	RSE & AC power line	862424050021814
WLAN Mode Supported:	802.11a:	20 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)
	802.11ac:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
	802.11ax:	OFDM/OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Channel Spacing:	20MHz:	802.11a/ac(VHT20)/ax(HE20)
	40MHz:	802.11ac(VHT40)/ax(HE40)
	80MHz:	802.11ac(VHT80)/ax(HE80)
Antenna Type:	Fixed Internal Antenna	
Antenna Gain:	5150MHz to 5250MHz: 5.7dBi(Ant1); 5.2dBi(Ant2); 5725MHz to 5850MHz: 4.7dBi(Ant1); 3.5dBi(Ant2);	
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.	
Smart System:	<input checked="" type="checkbox"/> SISO	802.11a
	<input checked="" type="checkbox"/> MIMO	802.11ac/ax: 2Tx & 2Rx
	<input type="checkbox"/> Diversity	802.11a: 2Tx & 2Rx
RF Cable:	1.0dB	
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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 of Operation Operating Frequency Range (in each Band)	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/ac/ax 20MHz	The Lowest channel	5180
	The Middle channel	5200
	The Highest channel	5240
IEEE 802.11ac/ax 40MHz	The Lowest channel	5190
	The Highest channel	5230
IEEE 802.11ac/ax 80MHz	The Middle channel	5210

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

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3.5 Test Environment and Mode

Environment Parameter	101.0 kPa Selected Values During Tests	
Relative Humidity	44-46 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	22~23	12
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	MIMO - Data Rate
802.11a	6 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 Fixed Internal Antenna and no consideration of replacement.	
The best case gain of the antenna is	
5150MHz to 5250MHz: 5.7dBi(Ant1); 5.2dBi(Ant2);*	
5725MHz to 5850MHz: 4.7dBi(Ant1); 3.5dBi(Ant2);*	
*Note: <i>The antenna gain are derived from the gain information report provided by the manufacturer.</i>	
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>	



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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 $N_{ANT} \leq 4$;

$Array\ Gain = 0\ dB$ (i.e., no array gain) for channel widths $\geq 40\ MHz$ for any N_{ANT} ;

$Array\ Gain = 5 \log(N_{ANT}/N_{SS}=1) dB$ or $3\ dB$, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, \dots, G_N dBi

- If transmit signals are correlated, then

$Directional\ gain = 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] dBi$ [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

- If all transmit signals are completely uncorrelated, then

$Directional\ gain = 10 \log[(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N_{ANT}] dBi$

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

The EUT supports CDD System.

Unequal antenna gain:

Operation Frequency	ANT Gain1 (dBi)	ANT Gain2 (dBi)	Directional gain For Power (dBi)	Directional gain For PSD (dBi)	Power Limit Reduction (dBm)	PSD Limit Reduction (dBm)
5150MHz to 5250MHz	5.7	5.2	5.46	8.46	0	2.46
5725MHz to 5850MHz	4.7	3.5	4.14	7.13	0	1.13

5150MHz to 5250MHz:

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

PSD Limit Reduction = Directional gain – 6dBi, (Directional gain > 6dBi) = 8.46 – 6 = 2.46

5725MHz to 5850MHz:

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

PSD Limit Reduction = Directional gain – 6dBi, (Directional gain > 6dBi) = 7.13 – 6 = 1.13

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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
	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:	<ol style="list-style-type: none">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 2.5) 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.
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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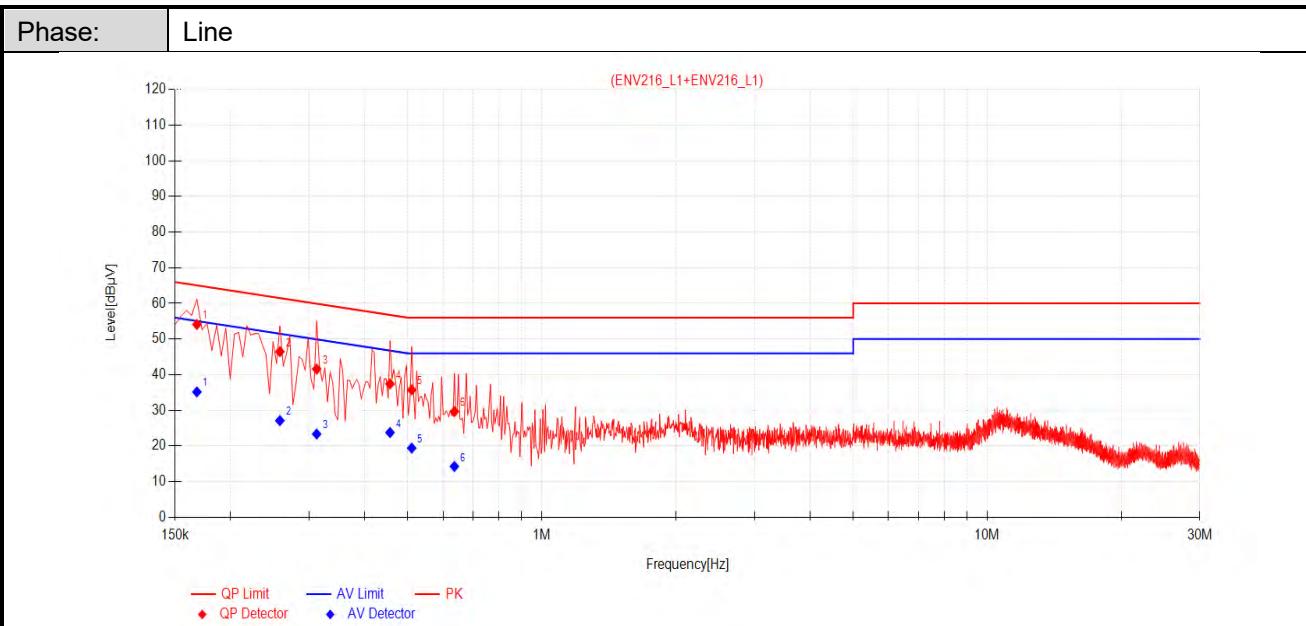
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Measurement Data

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	0.1680	10.71	43.38	54.09	65.06	10.97	24.46	35.17	55.06	19.89	PASS
2	0.2580	10.76	35.70	46.46	61.50	15.04	16.35	27.11	51.50	24.39	PASS
3	0.3120	10.60	30.98	41.58	59.92	18.34	12.76	23.36	49.92	26.56	PASS
4	0.4560	10.56	26.85	37.41	56.77	19.36	13.22	23.78	46.77	22.99	PASS
5	0.5100	10.61	25.14	35.75	56.00	20.25	8.80	19.41	46.00	26.59	PASS
6	0.6360	10.53	19.13	29.66	56.00	26.34	3.73	14.26	46.00	31.74	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]

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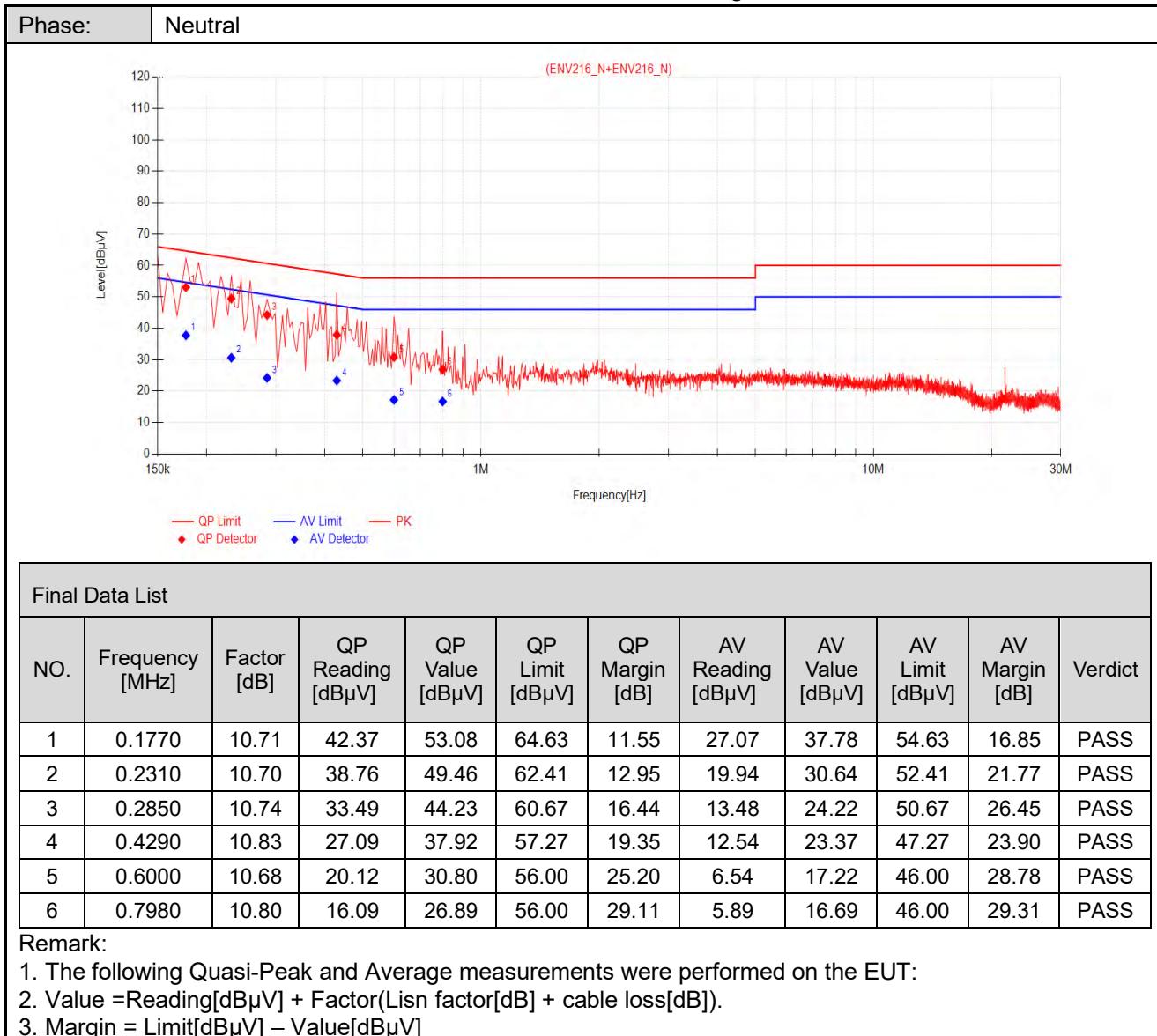
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4.3 Duty Cycle

The detailed test data see: **Appendix**



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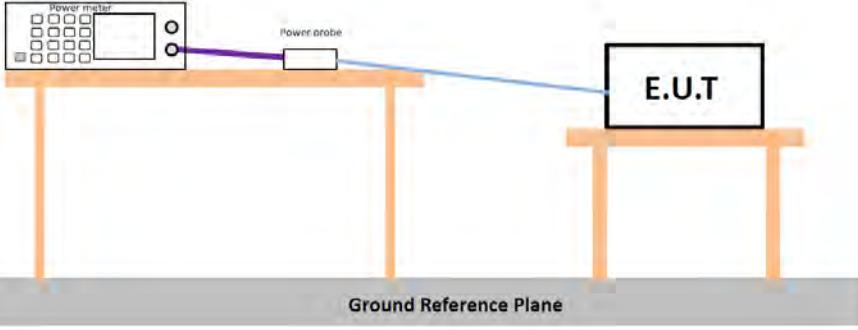
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4.4 Conducted Output Power

Test Requirement:	47 CFR Part 15 Section 15.407(a)(iv)	
Test Method:	ANSI C63.10 :2013 Section 12.3.3	
Test Setup:	 <p>* Test with power meter (Detector function: Average)</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:	Frequency Band	Limit
	5150-5250MHz	Not exceed 250mW(24dBm)
	5725-5850MHz	Not exceed 1W(30dBm)
	*Where B is the 26dB emission bandwidth in MHz	
Test Results:	Pass	
The detailed test data see: Appendix		



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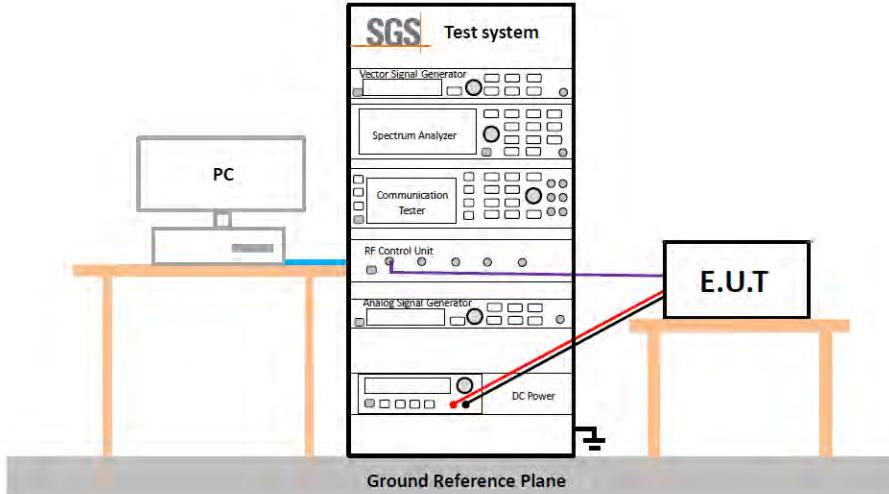
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4.5 26dB Emission Bandwidth

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:	Pass
The detailed test data see: Appendix	



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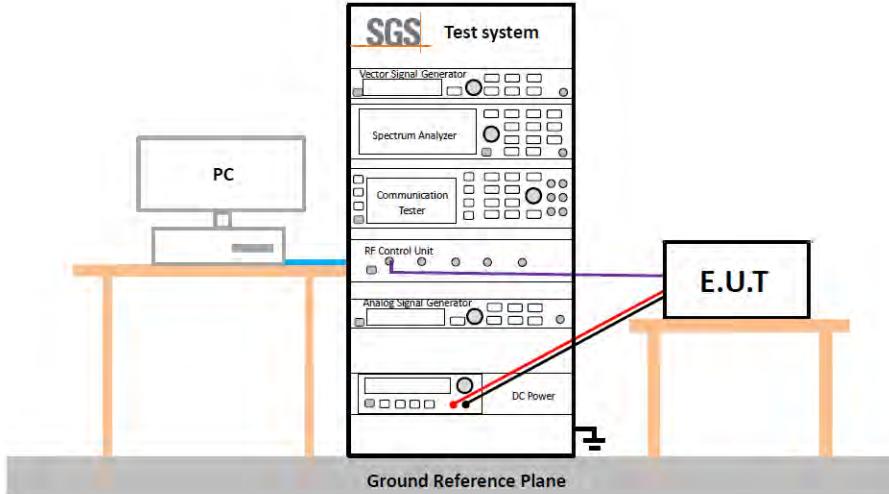
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4.6 6dB Emission Bandwidth

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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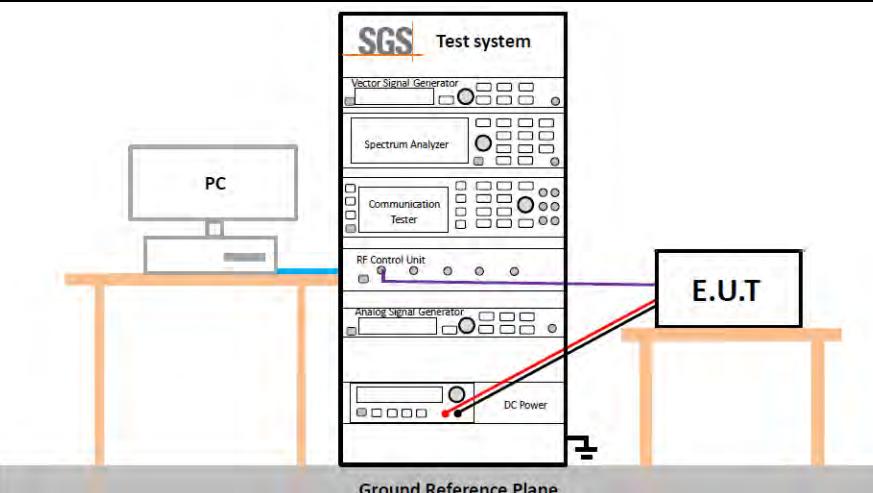


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4.7 99% Occupied Bandwidth

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:	Pass
The detailed test data see: Appendix	



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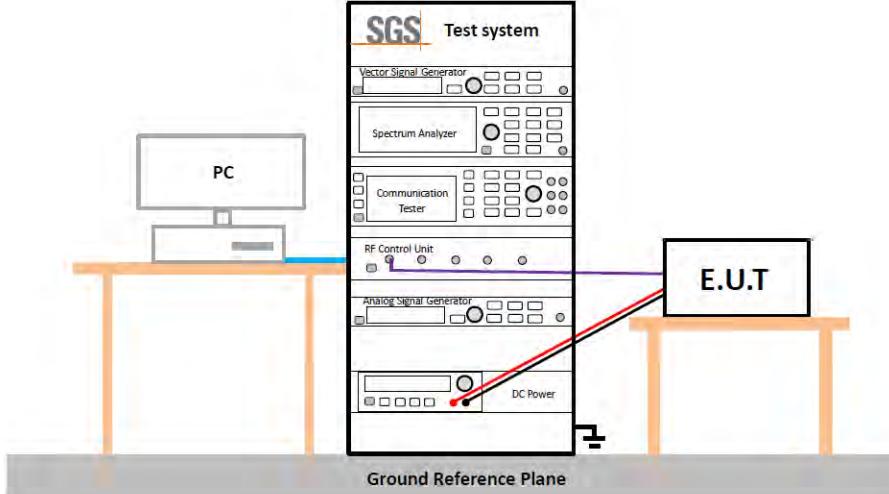
SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
 Wireless Laboratory

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4.8 Power Spectral Density

Test Requirement:	47 CFR Part 15 Section 15.407(a)(iv)	
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 11dBm/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 and 15.209
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:

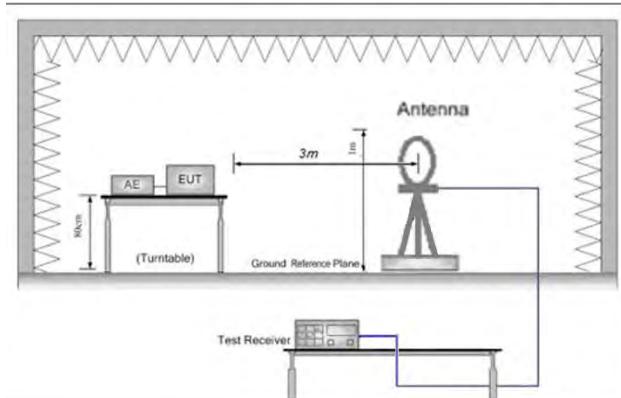


Figure 1. 9kHz to 30MHz

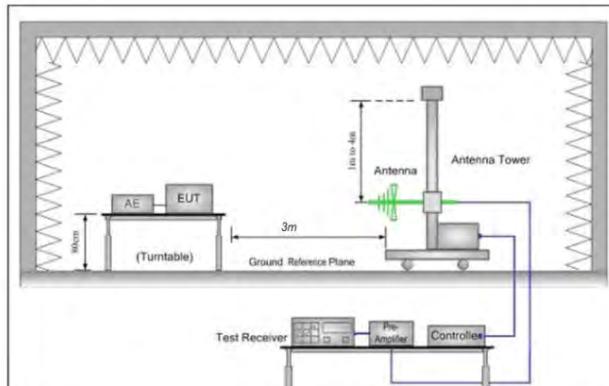


Figure 1. 30MHz to 1GHz

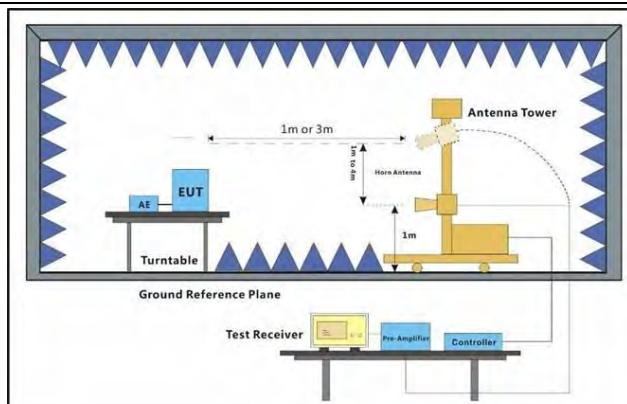


Figure 2. Above 1 GHz

Test Procedure:	<ul style="list-style-type: none">a. 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 camber. The table was rotated 360 degrees to determine the position of the highest radiation.b. 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 camber. The table was rotated 360 degrees to determine the position of the highest radiation. (Distance from antenna to EUT is 1m for measurements >18GHz).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.
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	<p>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.</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 outermost channels.</p> <p>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which 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 $20 \times \log(3/1) = 9.54$ dB.</p>
Test Configuration:	<p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> • RBW = 120 kHz • VBW = 300 kHz • Detector = 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 \geq [3 *RBW] • Detector = RMS (power averaging), if span / (# of points in sweep) \leq (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak. • Sweep time = auto • Perform a trace average of at least 100 traces.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates.
Final Test Mode:	Refer to section 3.7 for details.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass

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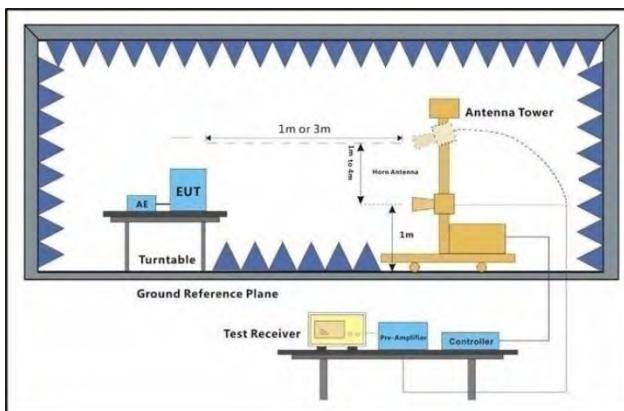
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The logo is circular with a red border. Inside the border, the text 'SGS-CSTC' is at the top, '检验检测专用章' (Inspection & Testing Special Seal) is in the center, and 'SGS-CSTC Inspection & Testing Services (Suzhou) Co., Ltd.' is at the bottom. In the center of the circle is a five-pointed red star.

4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15 Section 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:	<ol style="list-style-type: none">a. 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.b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.c. 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.d. 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.e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.f. 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 channelg. Test the EUT in the outermost channels.h. The radiation measurements are performed in X, Y, Z axis positioning for
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	<p>Transmitting mode, And found the X axis positioning which is worse case.</p> <p>i. Repeat above procedures until all frequencies measured was complete.</p>
Test Configuration:	<p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> • RBW = 120 kHz • VBW = 300 kHz • Detector = 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 \geq [3 *RBW] • Detector = RMS (power averaging), if span / (# of points in sweep) \leq (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak. • Sweep time = auto • Perform a trace average of at least 100 traces.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates.
Final Test Mode:	Refer to section 3.7 for details.
Instruments Used:	Refer to section 6 for details.
Test Results:	Pass

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

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.54dB
2	RF power density, conducted	±1.03dB
3	Spurious emissions, conducted	±0.54dB
4	Radio Frequency	±1.0 %
5	Duty Cycle	±0.37%
6	Occupied Bandwidth	±1.0 %
7	Conduction Emission	± 2.90dB (150kHz to 30MHz)
8	Radiated Emission	± 3.13dB (9k -30MHz)
		± 4.80dB (30M -1GHz)
		± 4.80dB (1GHz to 18GHz)
		± 4.80dB (Above 18GHz)

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 Equipment					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)
Shielding Room	Brilliant-emc	N/A	SUWI-04-01-06	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2022/02/16	2023/02/15
Signal Analyzer	ROHDE& SCHWARZ	FSV3030	SUWI-01-02-02	2022/05/17	2023/05/16
Measurement Software	Tonscend	JS1120-3 Test System V3.1.55	SUWI-02-09-09	NCR	NCR
Signal Analyzer	ROHDE& SCHWARZ	FSW43	SUWI-01-02-04	2022/05/28	2023/05/27
Wideband Radio Communication Tester	ROHDE& SCHWARZ	CMW500	SUWI-01-16-05	2022/02/14	2023/02/13
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2022/02/15	2023/02/14
Power meter	Anritsu	ML2495A	SUWI-01-31-01	2022/11/23	2023/11/22
Pulse power sensor	Anritsu	MA2411B	SUWI-01-32-01	2022/11/23	2023/11/22
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-01	2022/02/15	2023/02/14

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	SUWI-04-03-01	2021/05/08	2024/05/07
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2022/02/19	2023/02/18
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-06	2022/02/16	2023/02/15
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-01	2022/02/19	2023/02/18
Artificial network	ROHDE&SCHWARZ	ENV216	SUWI-01-19-02	2022/02/19	2023/02/18
Measurement Software	Tonscend	JS32-CE 4.0.0.2	SUWI-02-09-05	NCR	NCR

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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	SUWI-04-02-02	2021/11/25	2024/11/24
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-15	2022/02/16	2023/02/15
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2022/05/28	2023/05/27
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-06	2022/11/23	2023/11/22
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2022/02/19	2023/02/18
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9163	SUWI-01-11-04	2021/12/05	2023/12/04
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9120D	SUWI-01-11-05	2021/12/05	2023/12/04
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9170	SUWI-01-11-03	2021/05/14	2023/05/13
Active Loop Antenna	SCHWRZBECK MESS-ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2021/06/10	2023/06/09
Amplifier	Tonscend	TAP9K3G32	SUWI-01-14-06	2022/11/23	2023/11/22
Amplifier	Tonscend	TAP01018050	SUWI-01-14-04	2022/11/23	2023/11/22
Amplifier	Tonscend	TAP30M7G30	SUWI-01-14-05	2022/11/23	2023/11/22
Measurement Software	Tonscend	JS32-RE V4.0.0.0	SUWI-02-09-04	NCR	NCR



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7 Photographs - Setup Photos

Refer to Appendix A.2 WLAN Setup Photos.



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Appendix



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Emission Bandwidth Test Result

TestMode	Antenna	Frequency[MHz]	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Verdict
11a	Ant1	5180	20.24	5169.88	5190.12	
		5220	20.16	5209.96	5230.12	
		5240	20.04	5230.00	5250.04	
		5745	20.04	5734.96	5755.00	
		5785	20.52	5774.52	5795.04	
		5825	19.96	5815.08	5835.04	
11ac20MIMO	Ant1	5180	20.36	5169.80	5190.16	
	Ant2	5180	20.32	5169.84	5190.16	
	Ant1	5220	20.44	5209.84	5230.28	
	Ant2	5220	20.20	5209.96	5230.16	
	Ant1	5240	20.36	5229.92	5250.28	
	Ant2	5240	20.28	5229.88	5250.16	
	Ant1	5745	21.56	5734.40	5755.96	
	Ant2	5745	21.20	5734.48	5755.68	
	Ant1	5785	21.80	5774.68	5796.48	
	Ant2	5785	22.12	5773.60	5795.72	
	Ant1	5825	21.84	5813.52	5835.36	
	Ant2	5825	21.56	5814.88	5836.44	
11ac40MIMO	Ant1	5190	40.40	5169.76	5210.16	
	Ant2	5190	40.00	5170.00	5210.00	
	Ant1	5230	40.24	5210.08	5250.32	
	Ant2	5230	39.76	5210.08	5249.84	
	Ant1	5755	40.48	5735.00	5775.48	
	Ant2	5755	40.00	5735.00	5775.00	
	Ant1	5795	40.96	5774.60	5815.56	
	Ant2	5795	39.68	5775.16	5814.84	
11ac80MIMO	Ant1	5210	80.32	5170.00	5250.32	
	Ant2	5210	80.00	5170.00	5250.00	
	Ant1	5775	80.32	5734.84	5815.16	
	Ant2	5775	80.16	5735.00	5815.16	
11ax20MIMO	Ant1	5180	24.60	5167.04	5191.64	
	Ant2	5180	25.68	5167.60	5193.28	
	Ant1	5220	28.16	5206.92	5235.08	
	Ant2	5220	23.72	5208.28	5232.00	
	Ant1	5240	20.08	5230.00	5250.08	
	Ant2	5240	20.00	5230.04	5250.04	
	Ant1	5745	24.64	5733.12	5757.76	
	Ant2	5745	23.72	5732.88	5756.60	
	Ant1	5785	24.04	5772.76	5796.80	
	Ant2	5785	23.68	5773.52	5797.20	
	Ant1	5825	23.40	5813.60	5837.00	
	Ant2	5825	23.20	5812.68	5835.88	
11ax40MIMO	Ant1	5190	39.44	5170.32	5209.76	
	Ant2	5190	39.68	5170.24	5209.92	
	Ant1	5230	39.68	5210.16	5249.84	
	Ant2	5230	39.68	5210.16	5249.84	
	Ant1	5755	39.76	5735.16	5774.92	
	Ant2	5755	39.68	5735.24	5774.92	
	Ant1	5795	39.68	5775.24	5814.92	
	Ant2	5795	39.76	5775.16	5814.92	
11ax80MIMO	Ant1	5210	80.48	5169.84	5250.32	
	Ant2	5210	80.64	5169.68	5250.32	

Reporting only

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	Ant1	5775	80.80	5734.52	5815.32	
	Ant2	5775	80.64	5734.68	5815.32	

Remark:

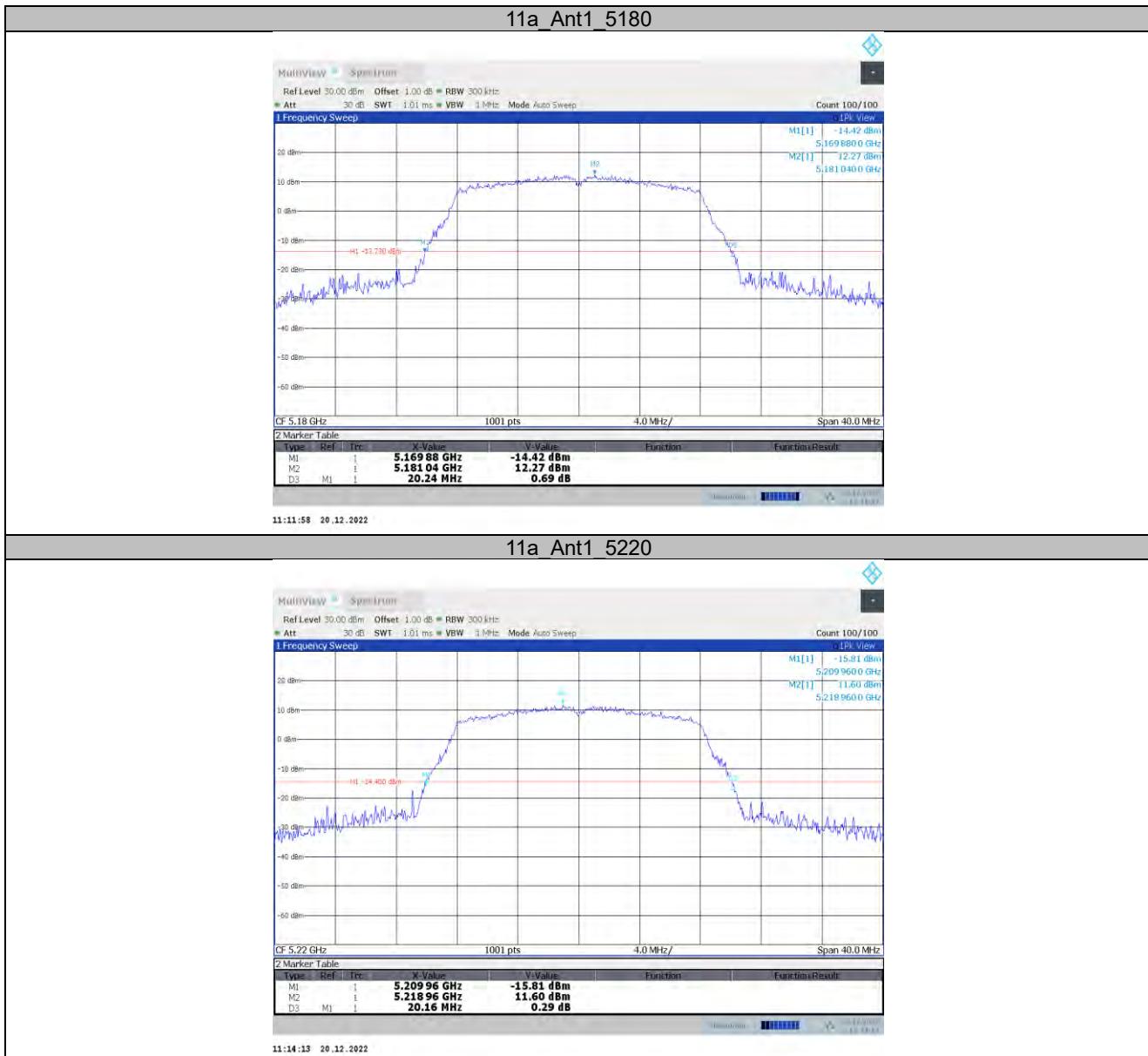
For WLAN 802.11a SISO mode, only select the antenna of power worst for test.



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Test Graphs



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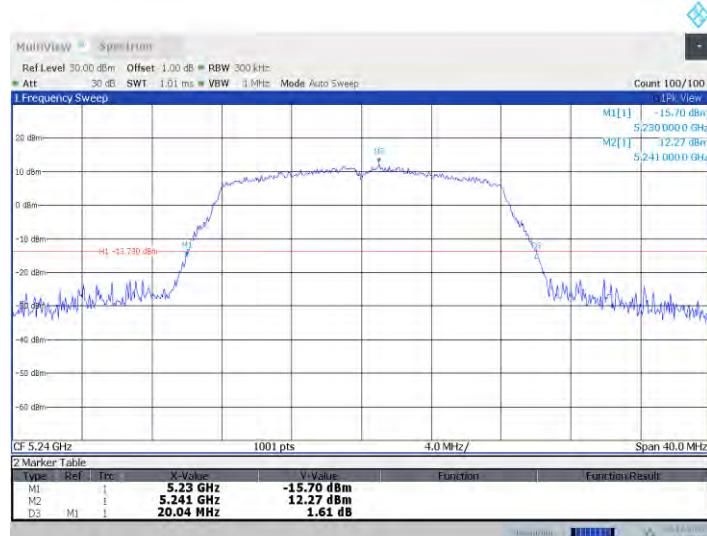


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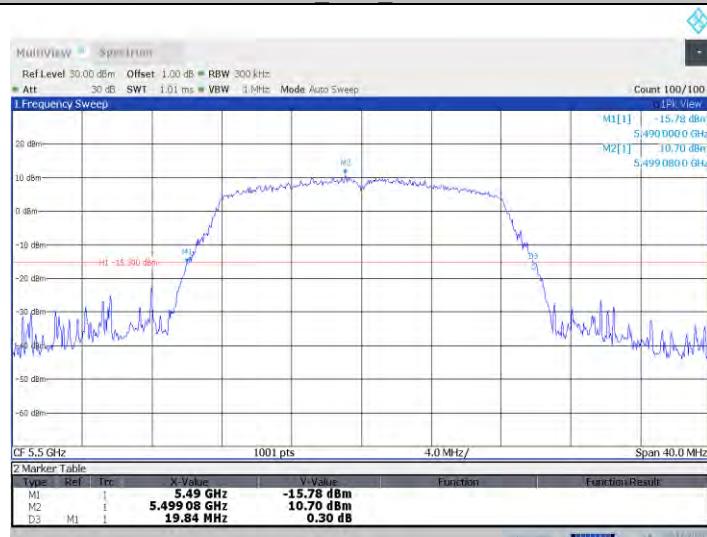
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11a_Ant1_5240



11:16:20 20.12.2022

11a_Ant1_5500



11:36:06 20.12.2022

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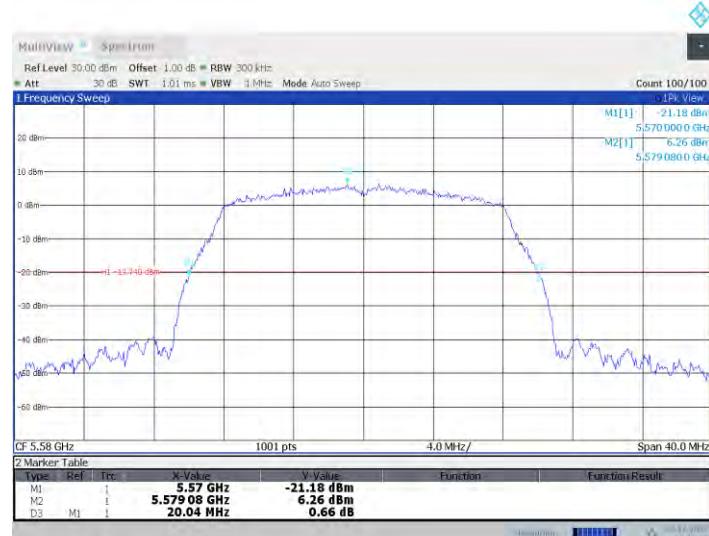
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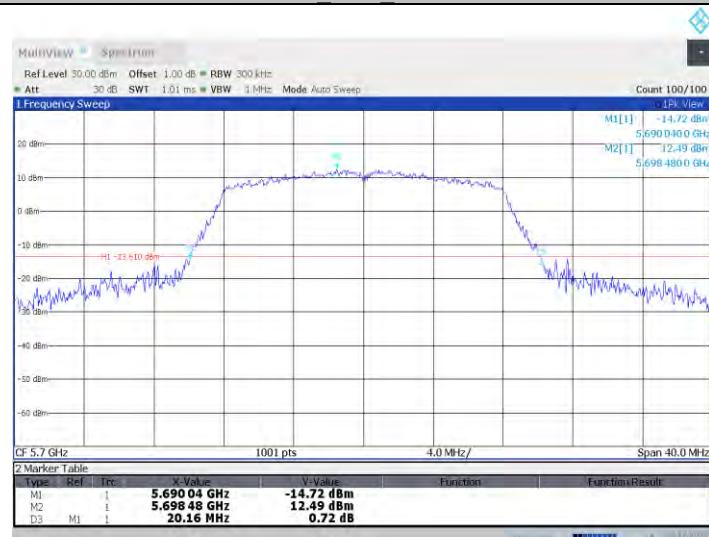
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11a_Ant1_5700



11:46:17 20.12.2022

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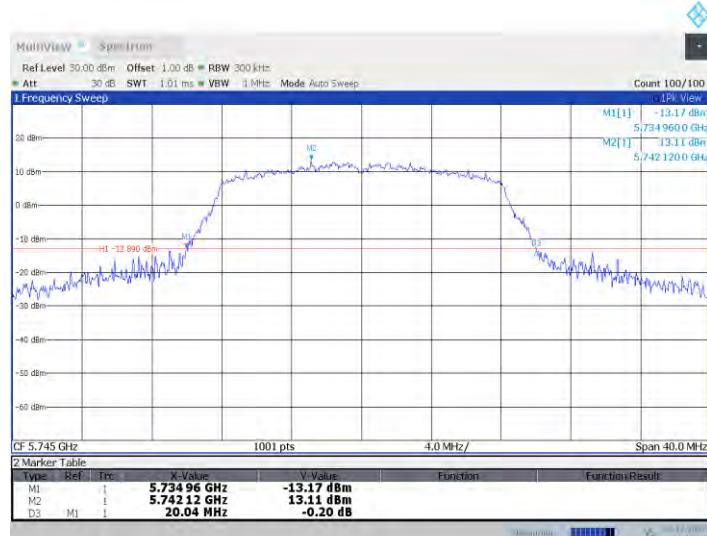
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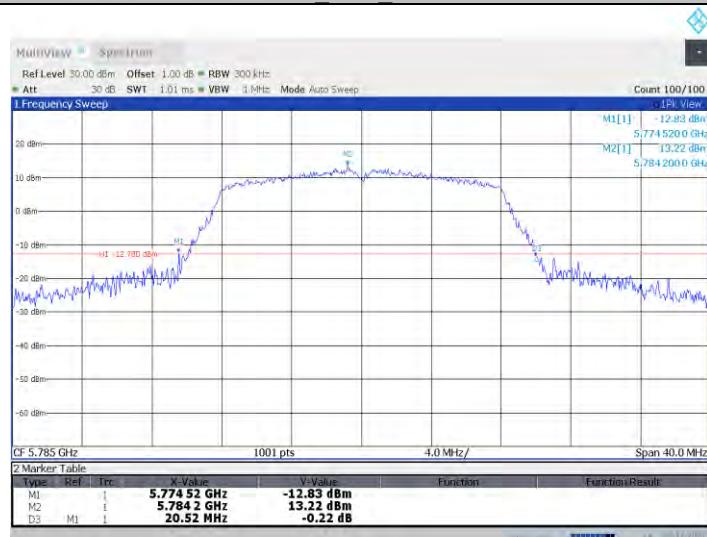
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11a_Ant1_5785



11:50:38 20.12.2022

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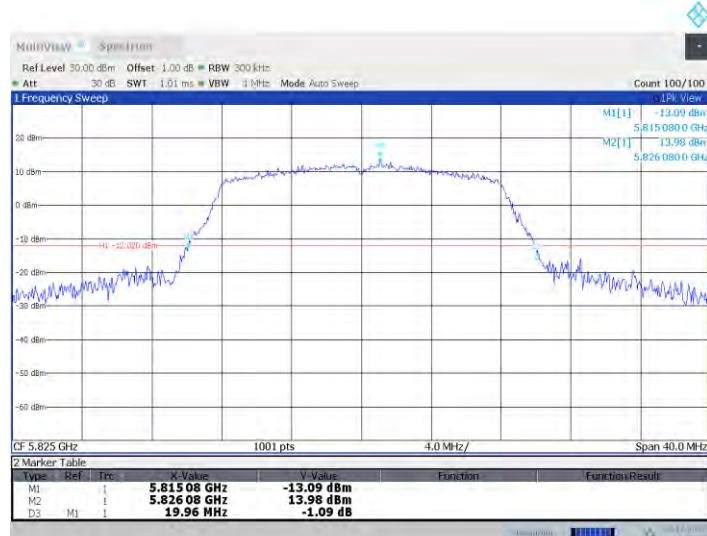
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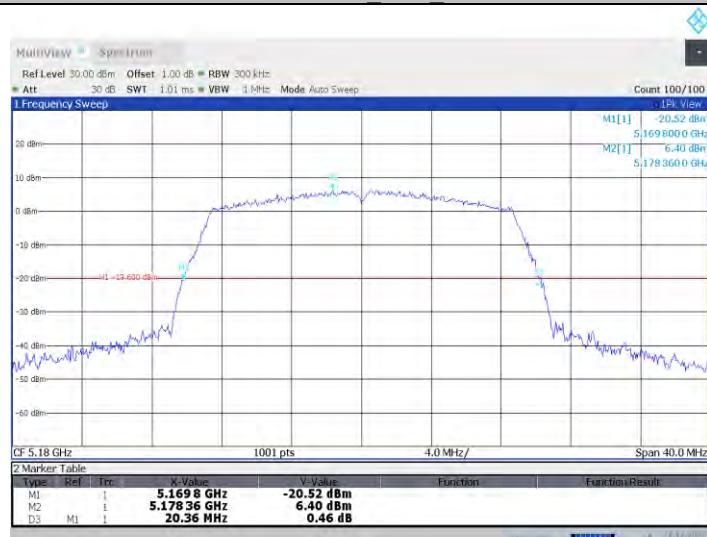
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11a_Ant1_5825



11:52:02 20.12.2022

11ac20MIMO_Ant1_5180



07:33:55 27.12.2022

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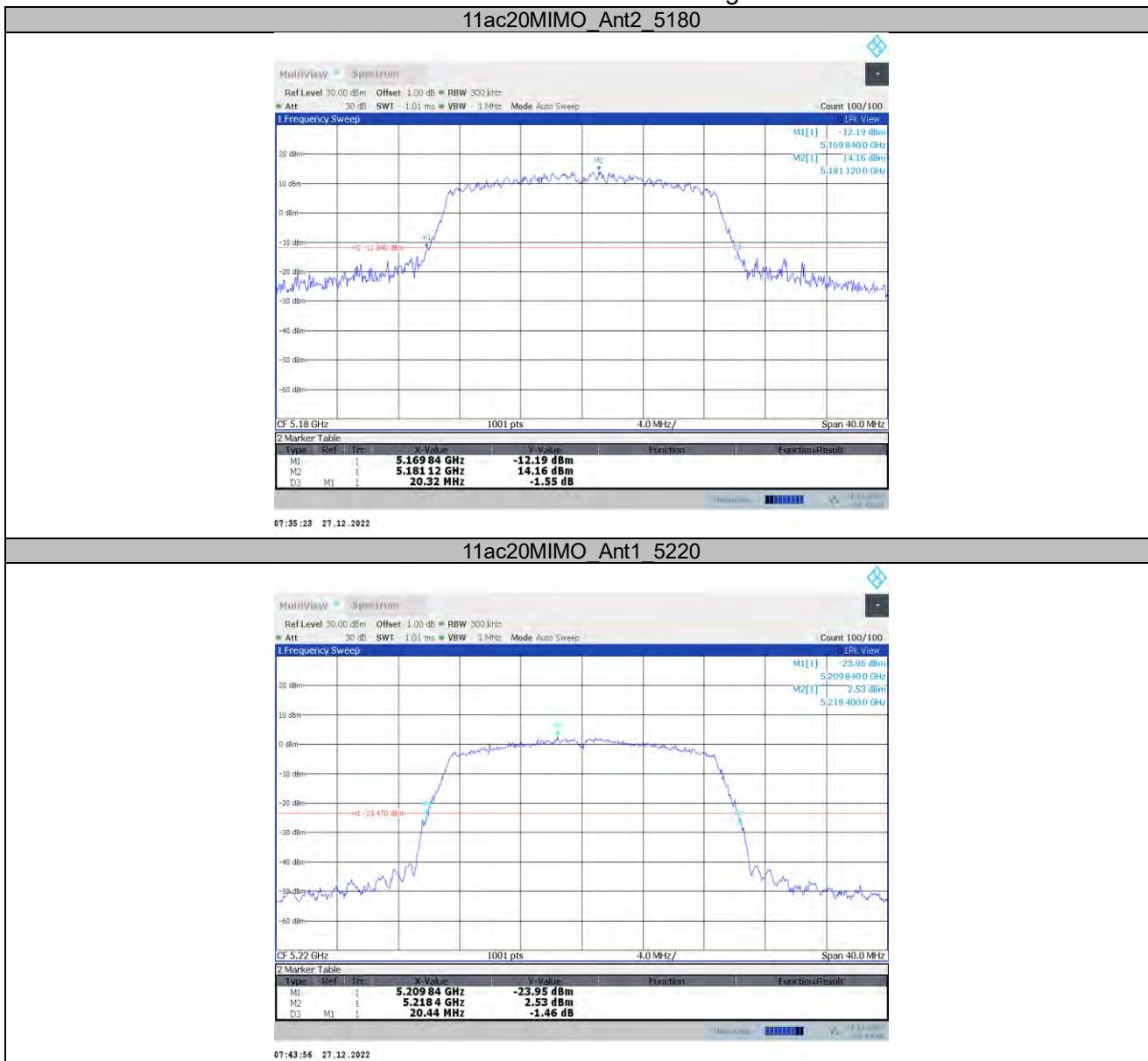
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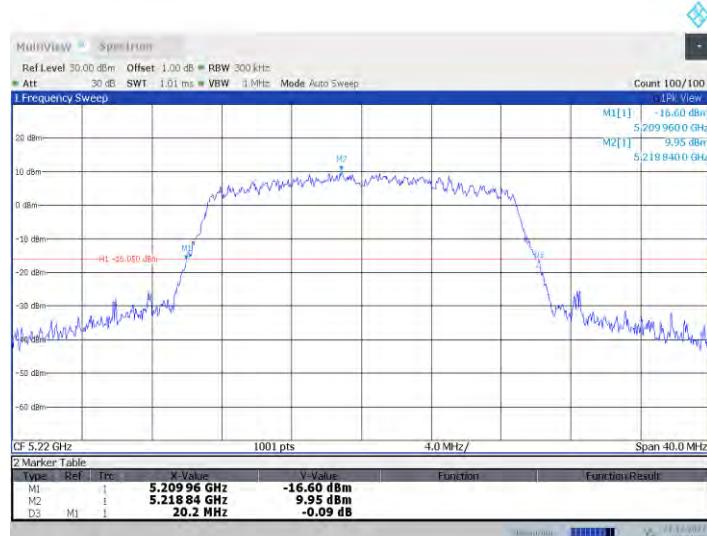
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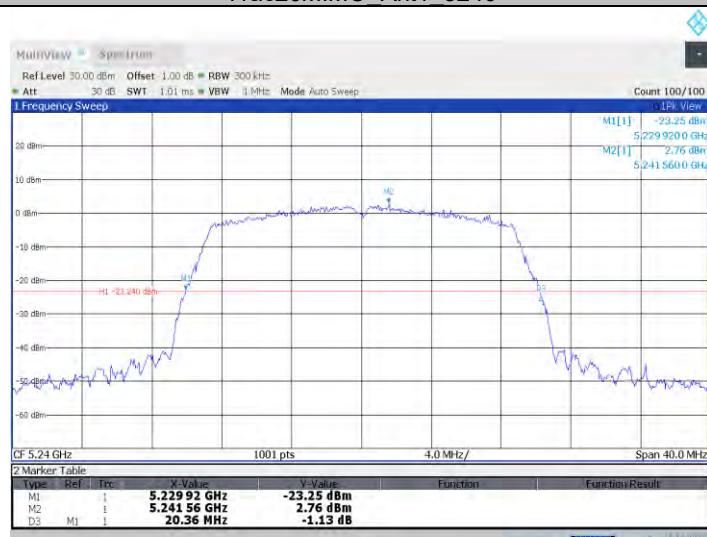
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11ac20MIMO_Ant2_5220



07:44:49 27.12.2022

11ac20MIMO Ant1 5240



07-10-20 07-10-2020

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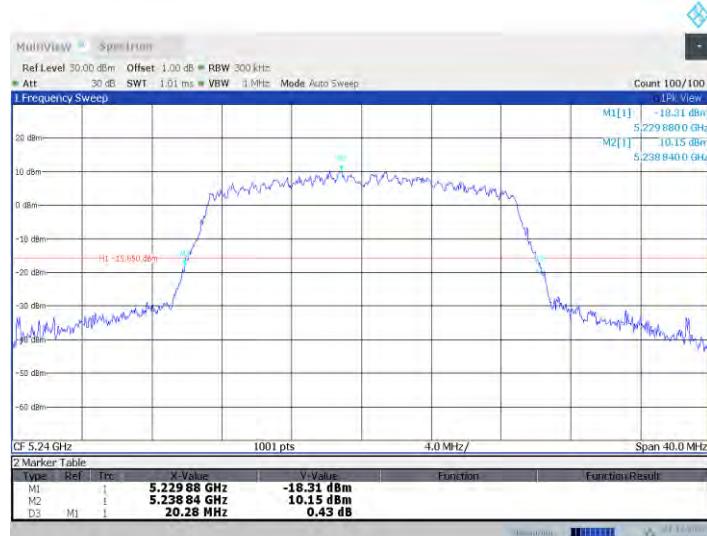
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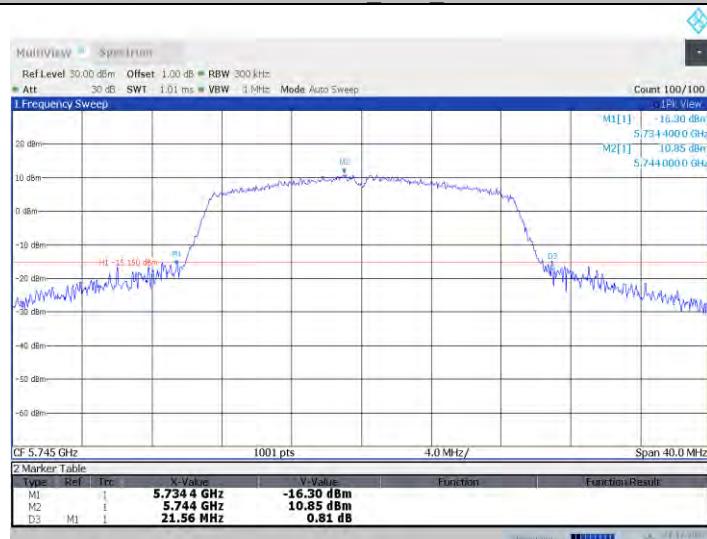
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07:57:22 27.12.2022

11ac20MIMO_Ant1_5745



07:58:47 27.12.2022

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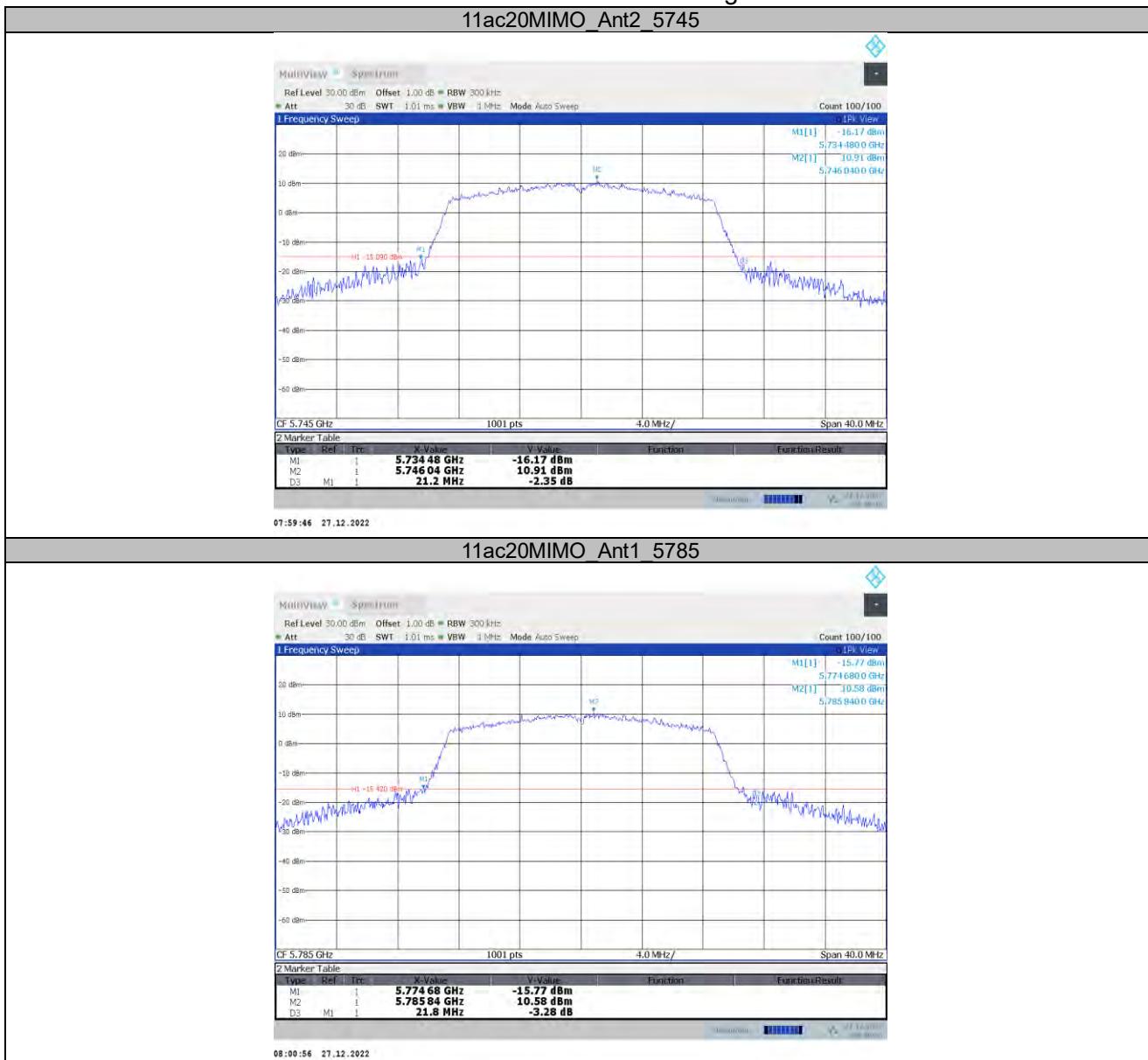
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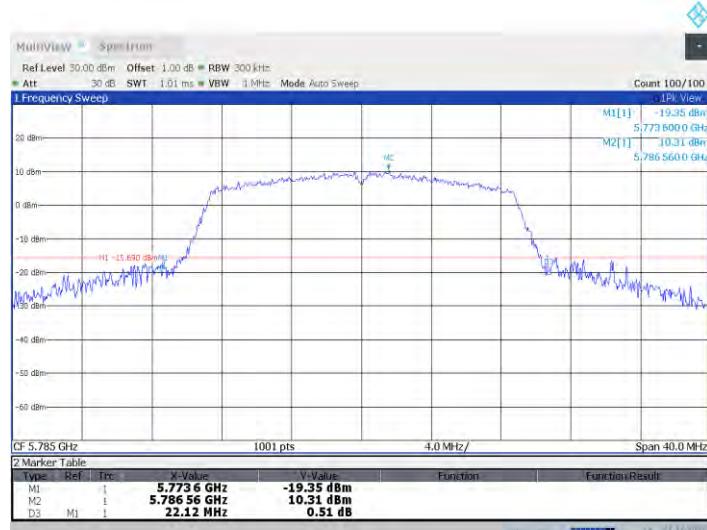
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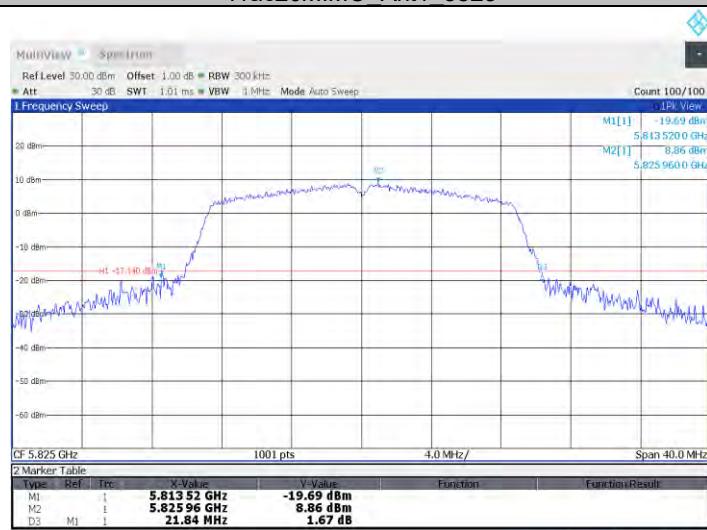
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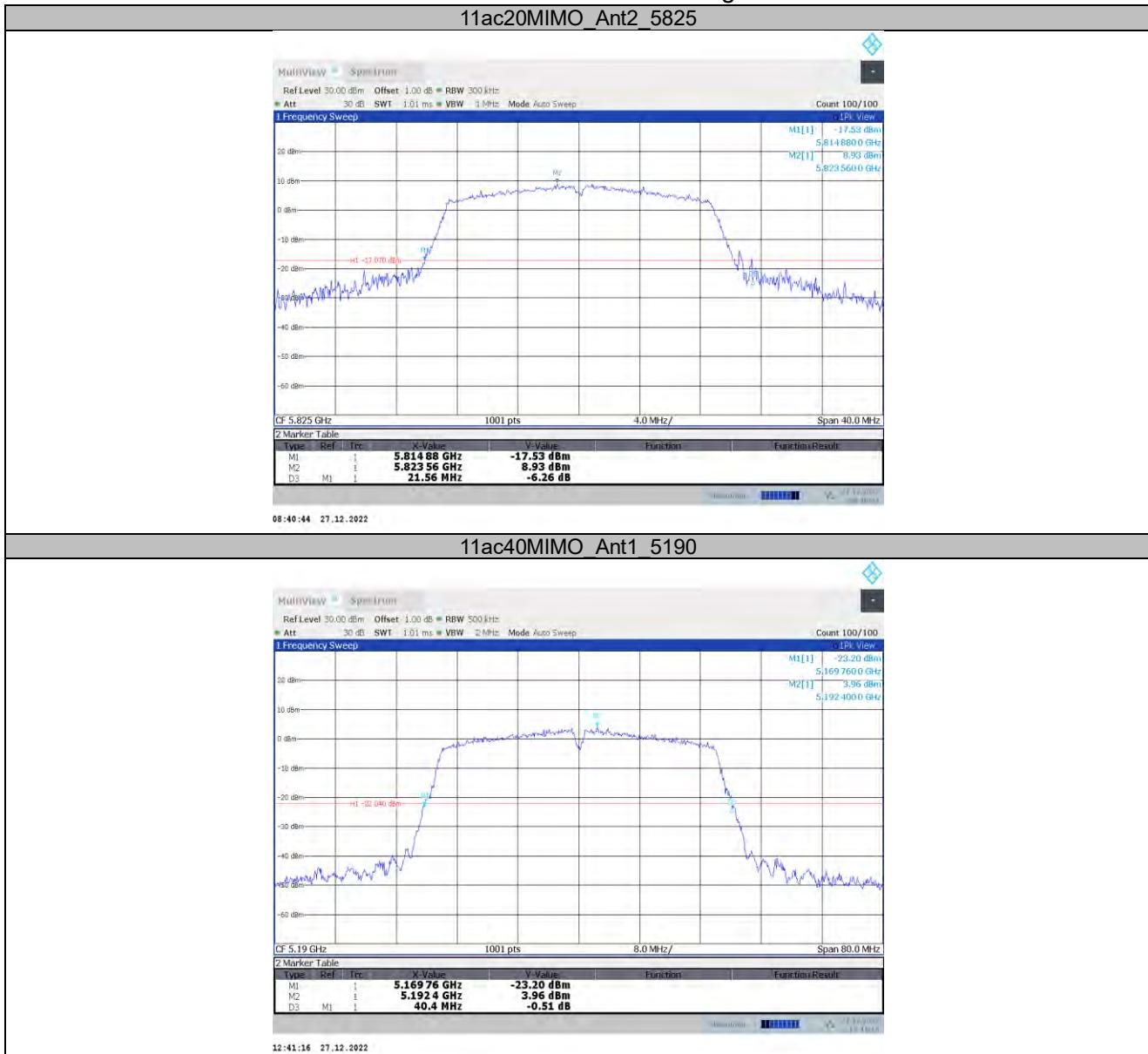
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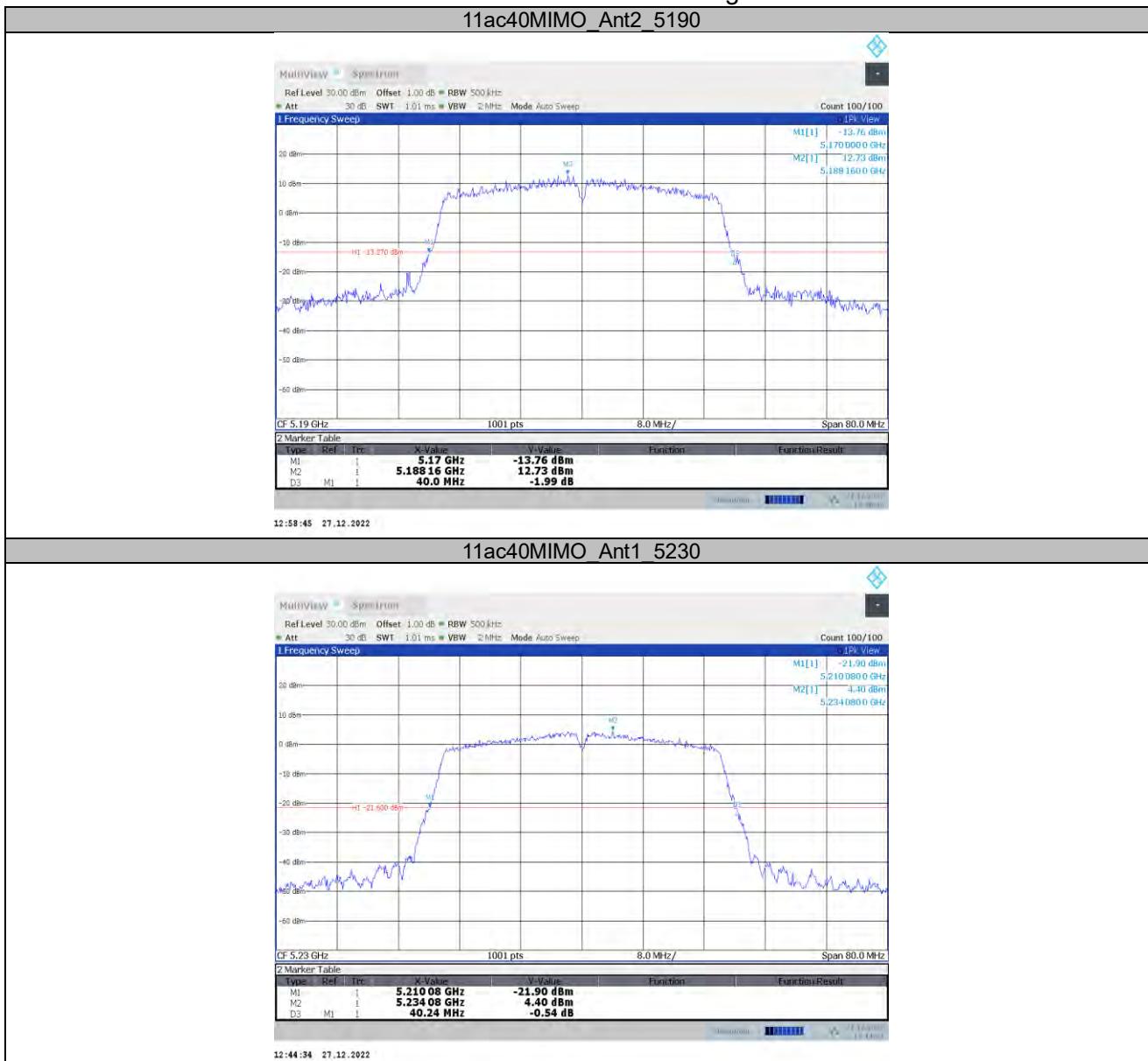
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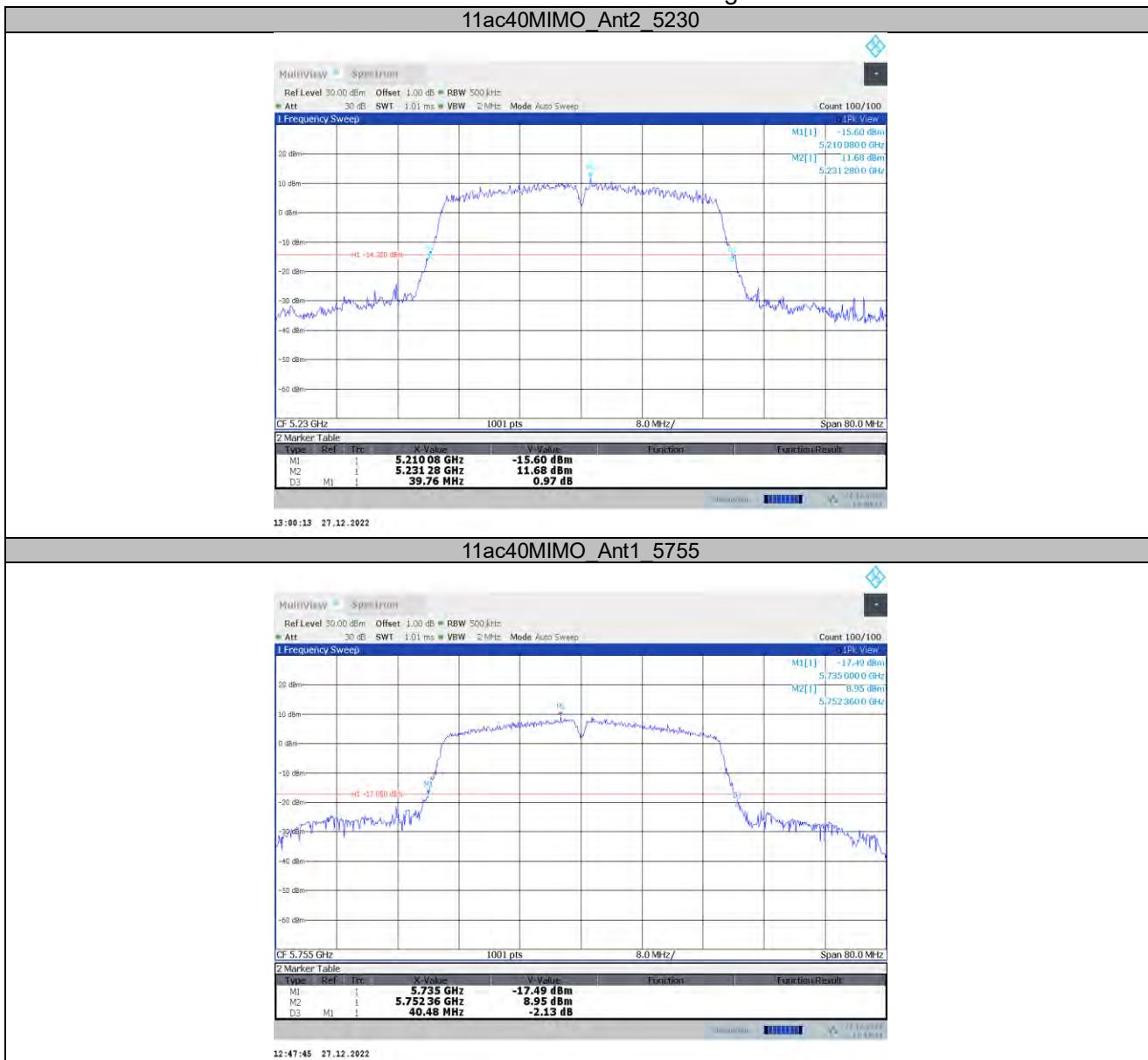
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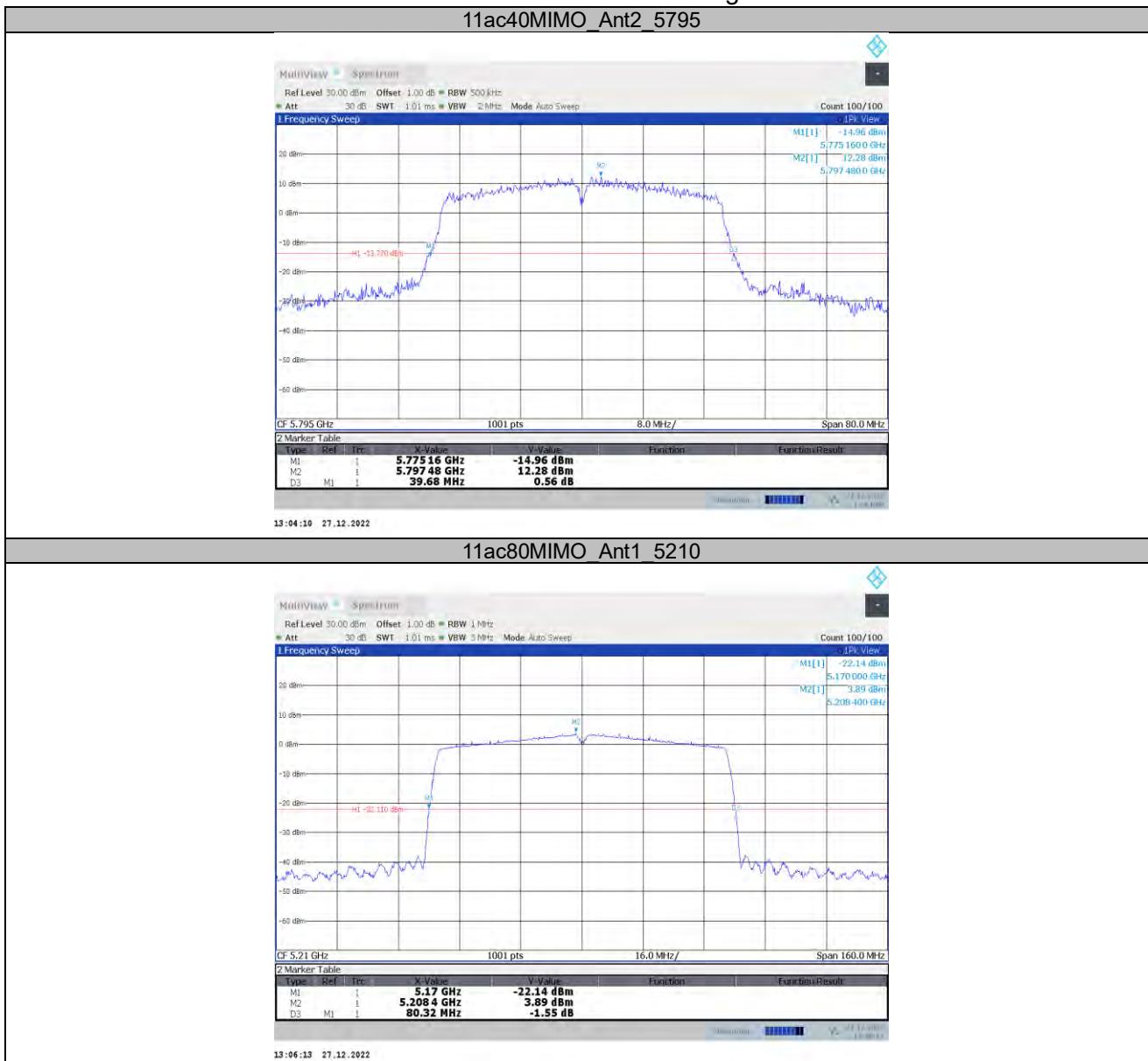
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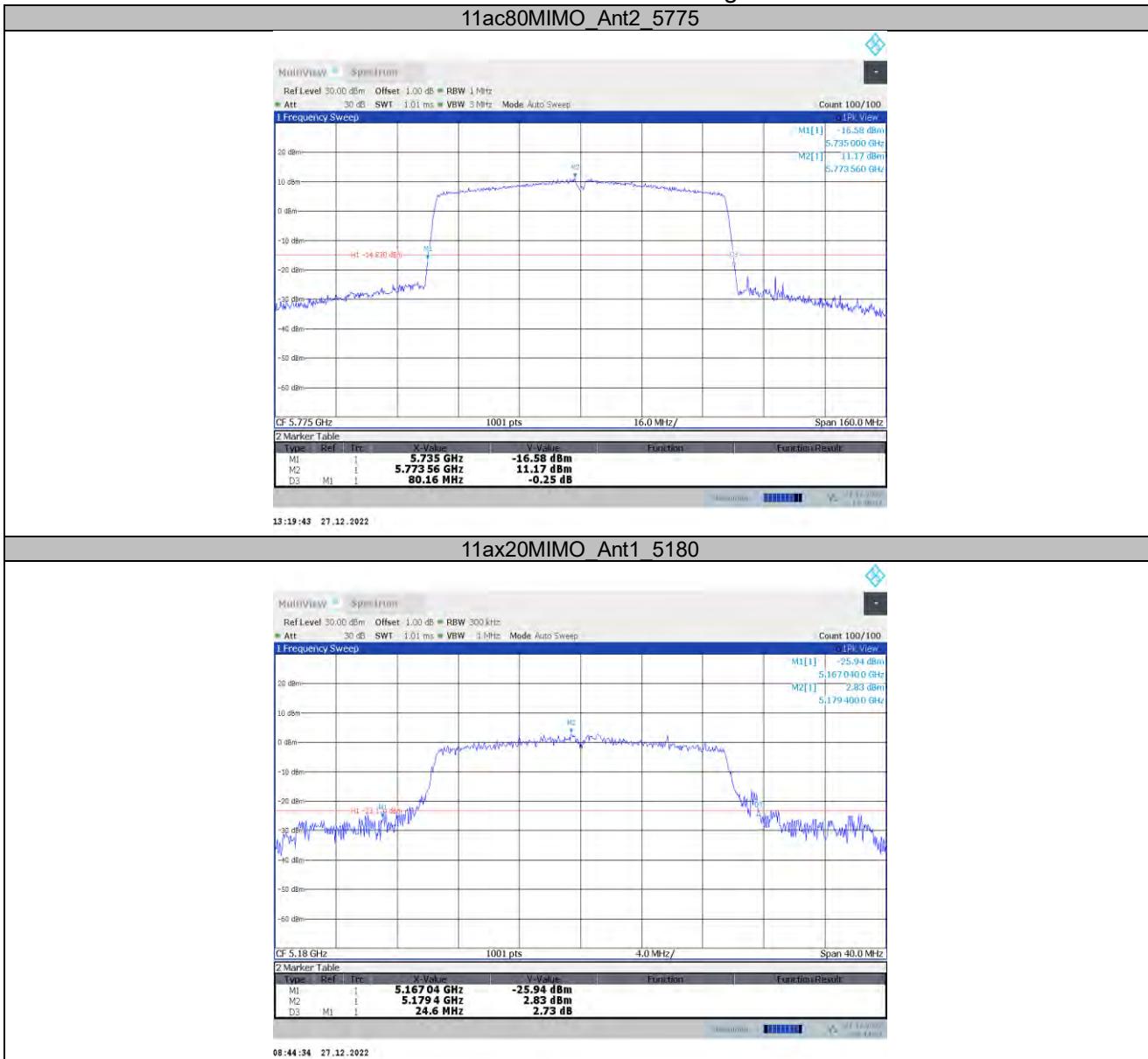
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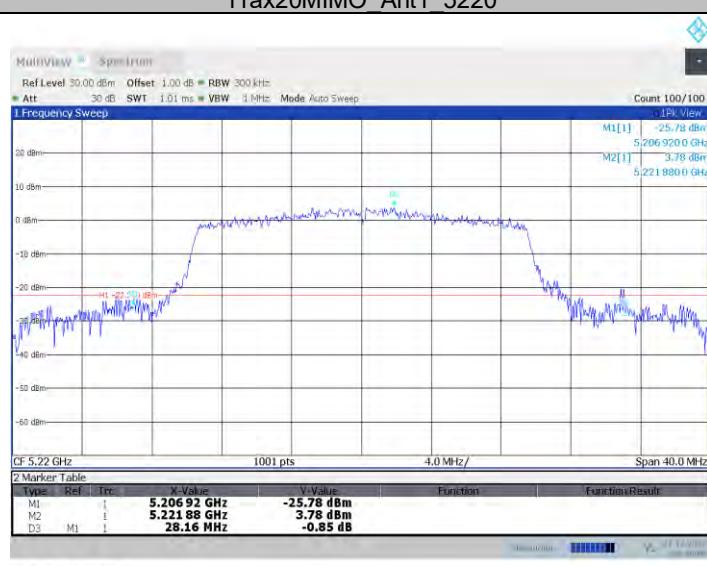
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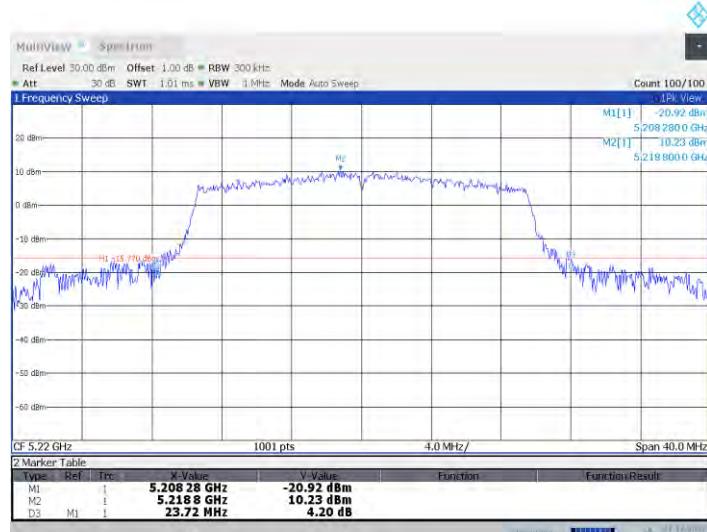
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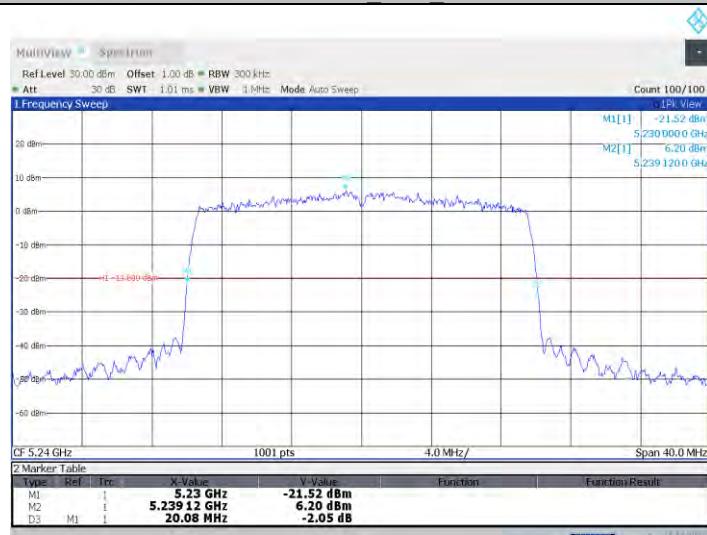
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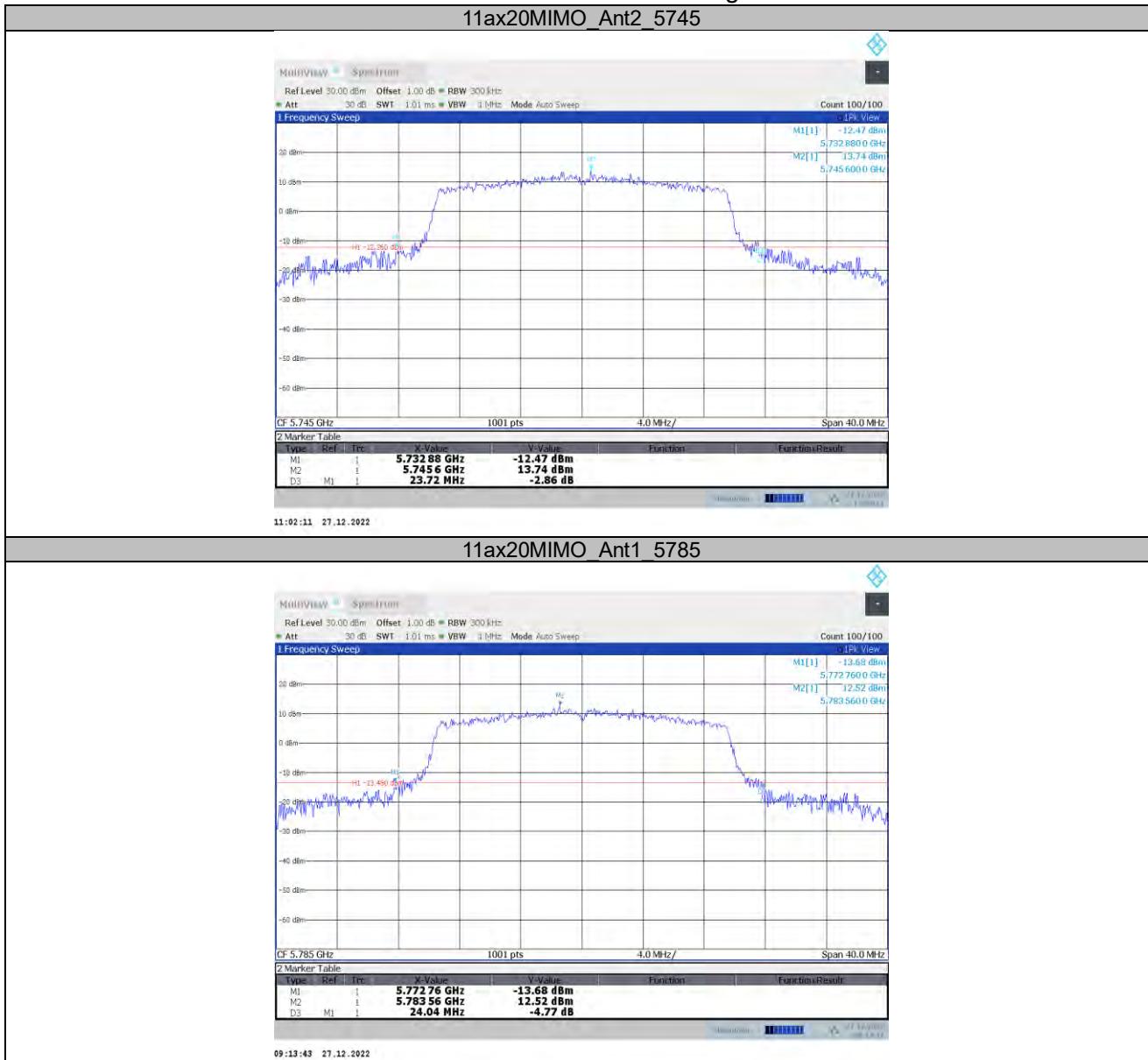
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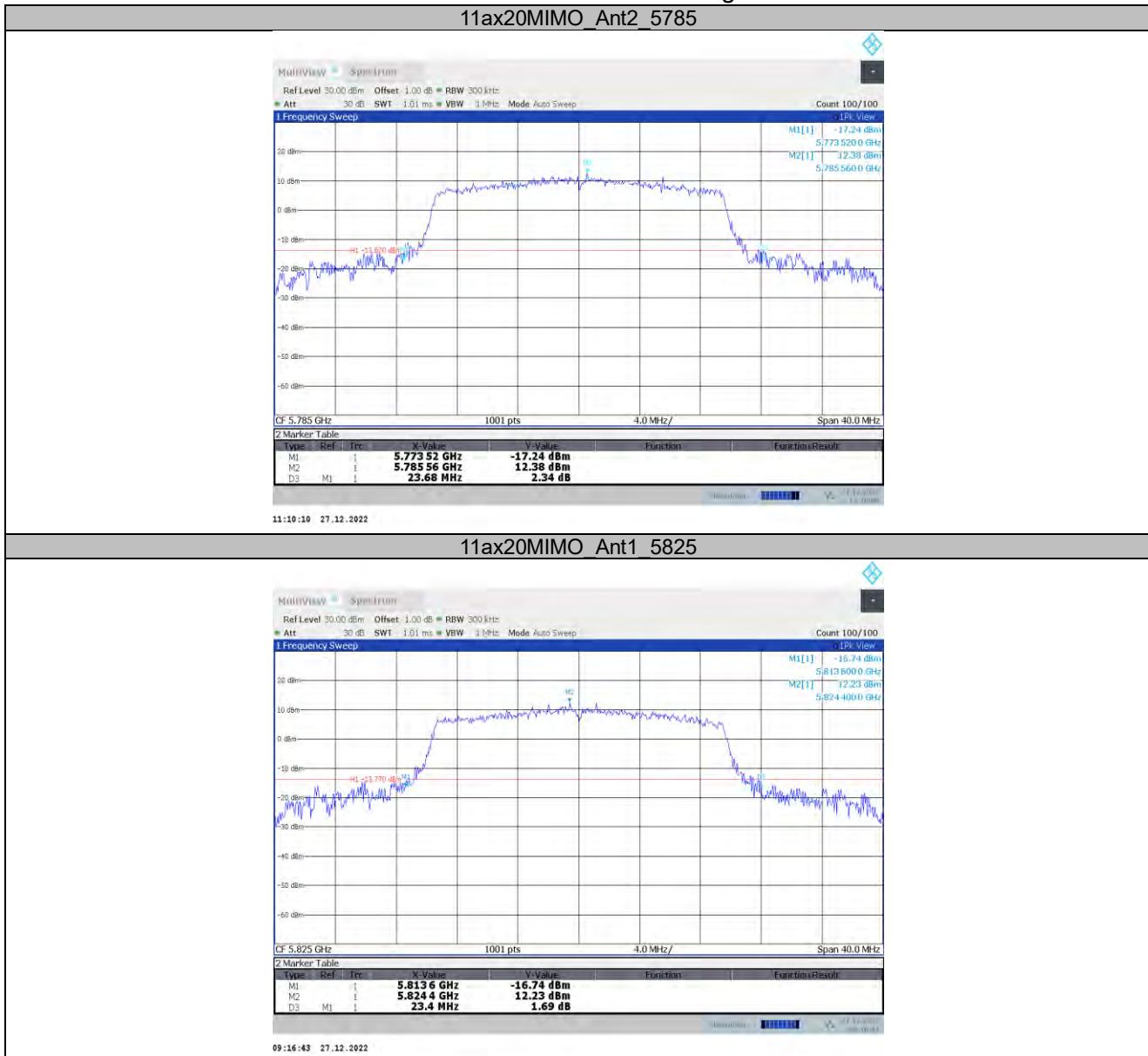
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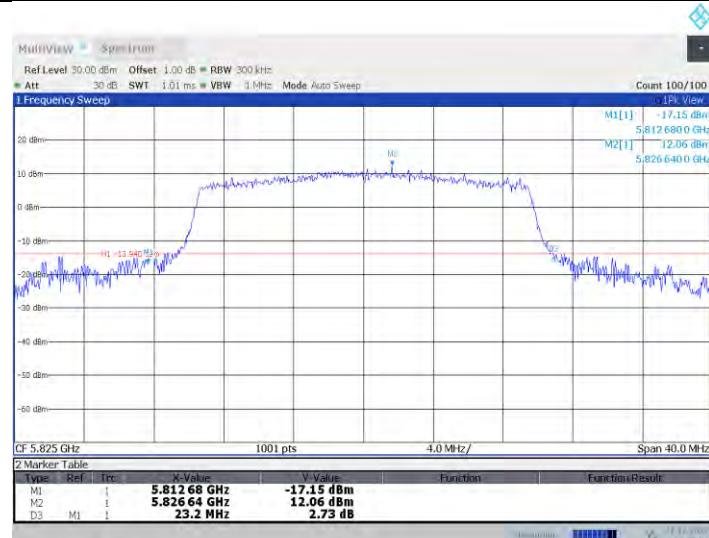
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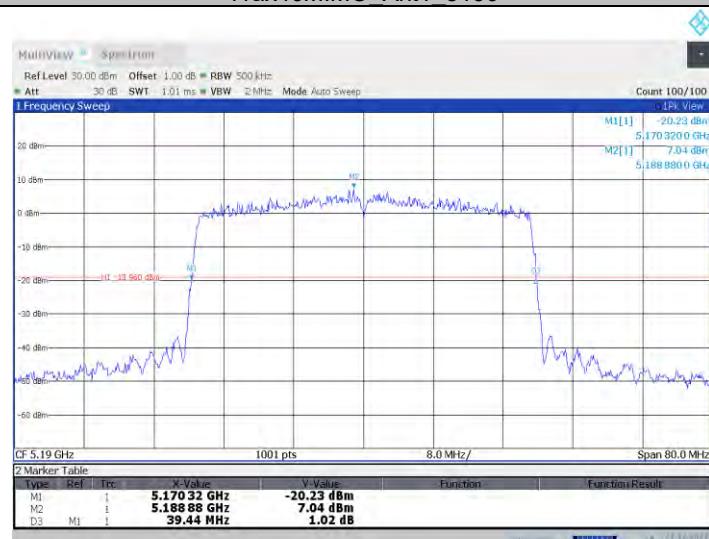
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11ax20MIMO_Ant2_5825



11:20:57 27.12.2022

11ax40MIMO_Ant1_5190



11:23:43 27.12.2022

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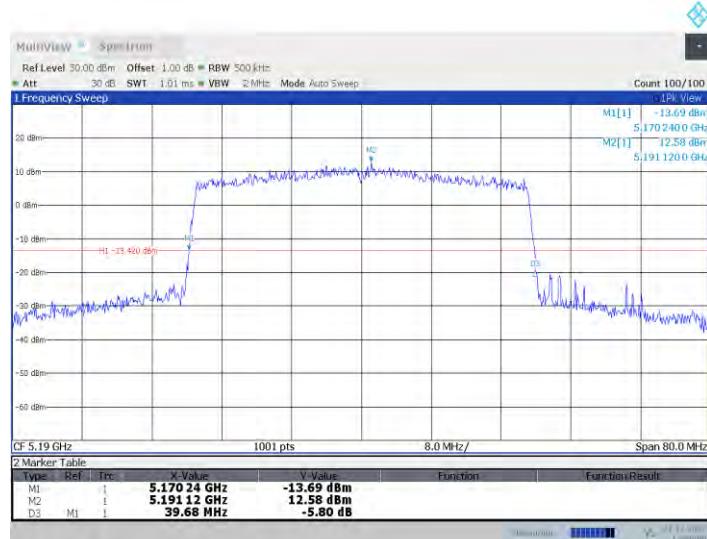
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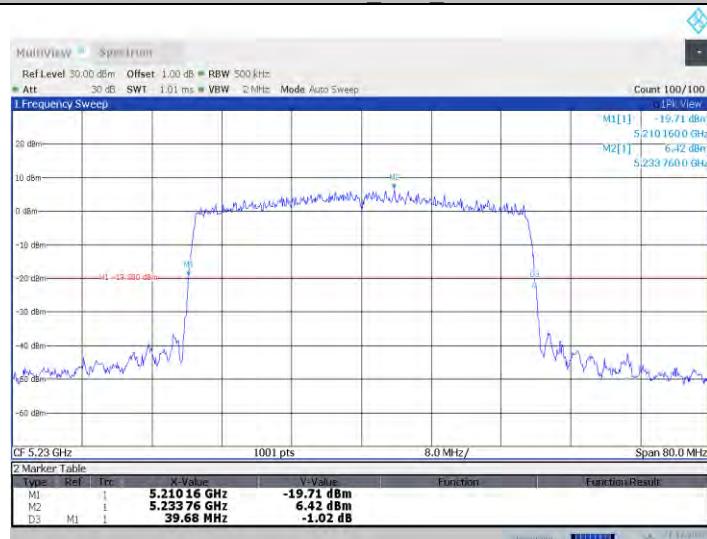
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11ax40MIMO_Ant1_5230

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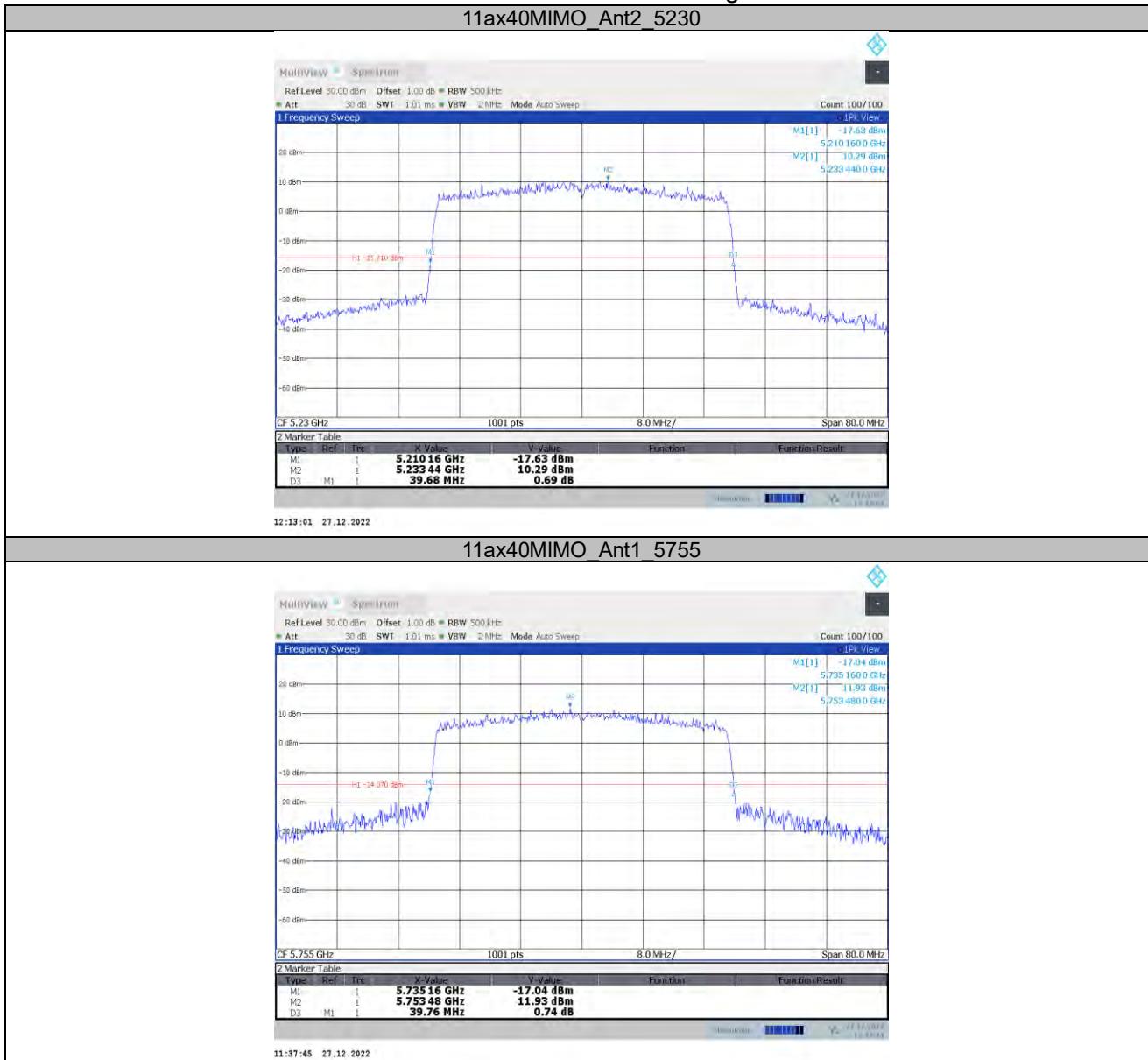
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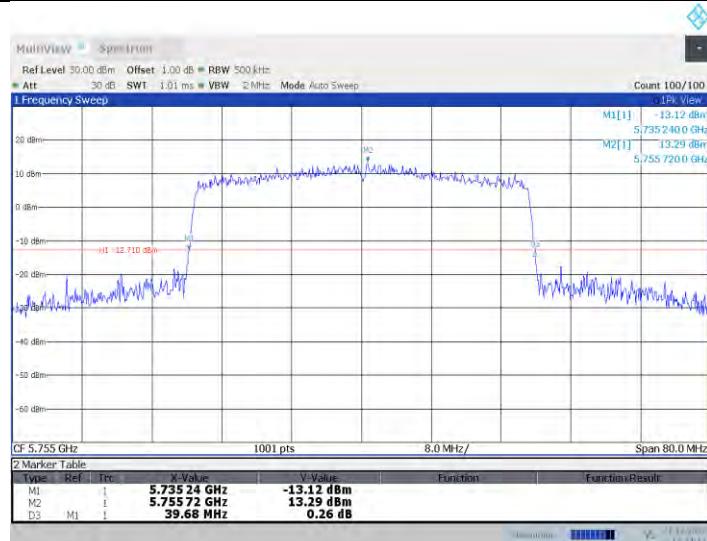
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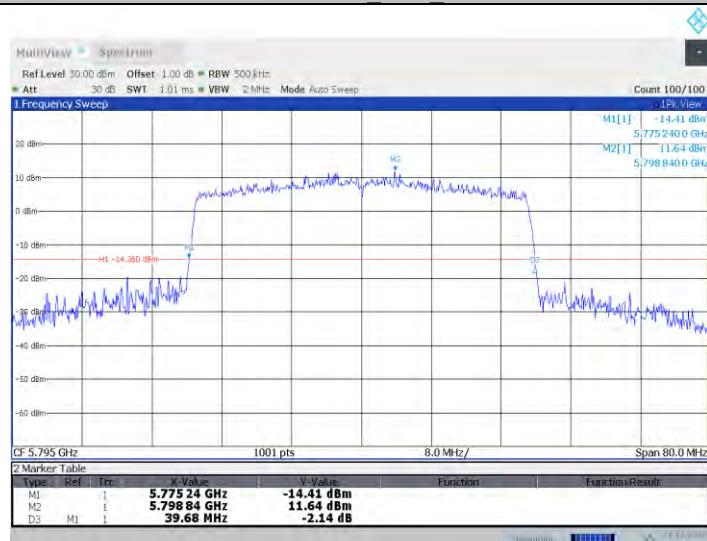
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12:14:11 27.12.2022

11ax40MIMO_Ant1_5795



11:40:27 27.12.2022

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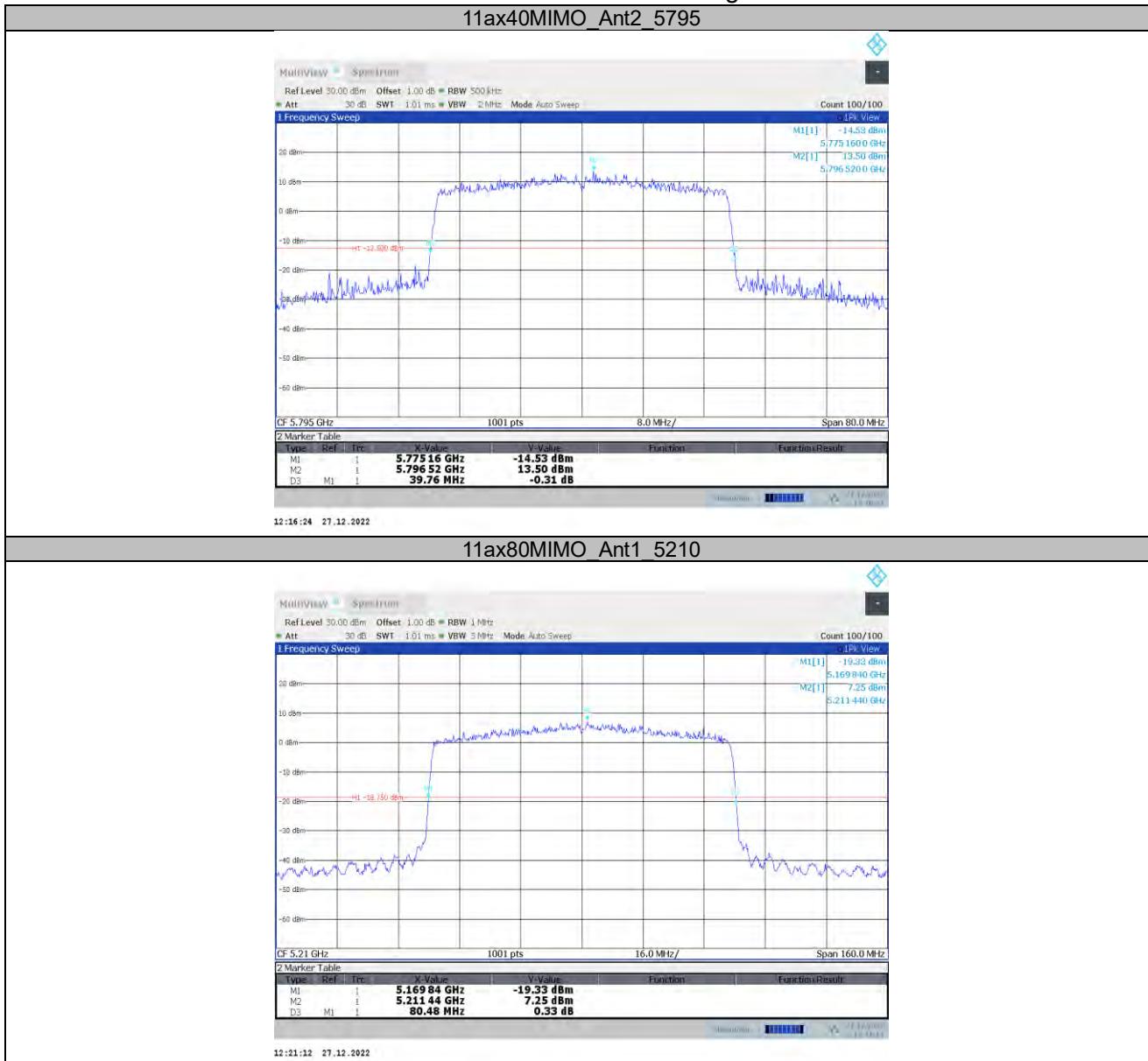
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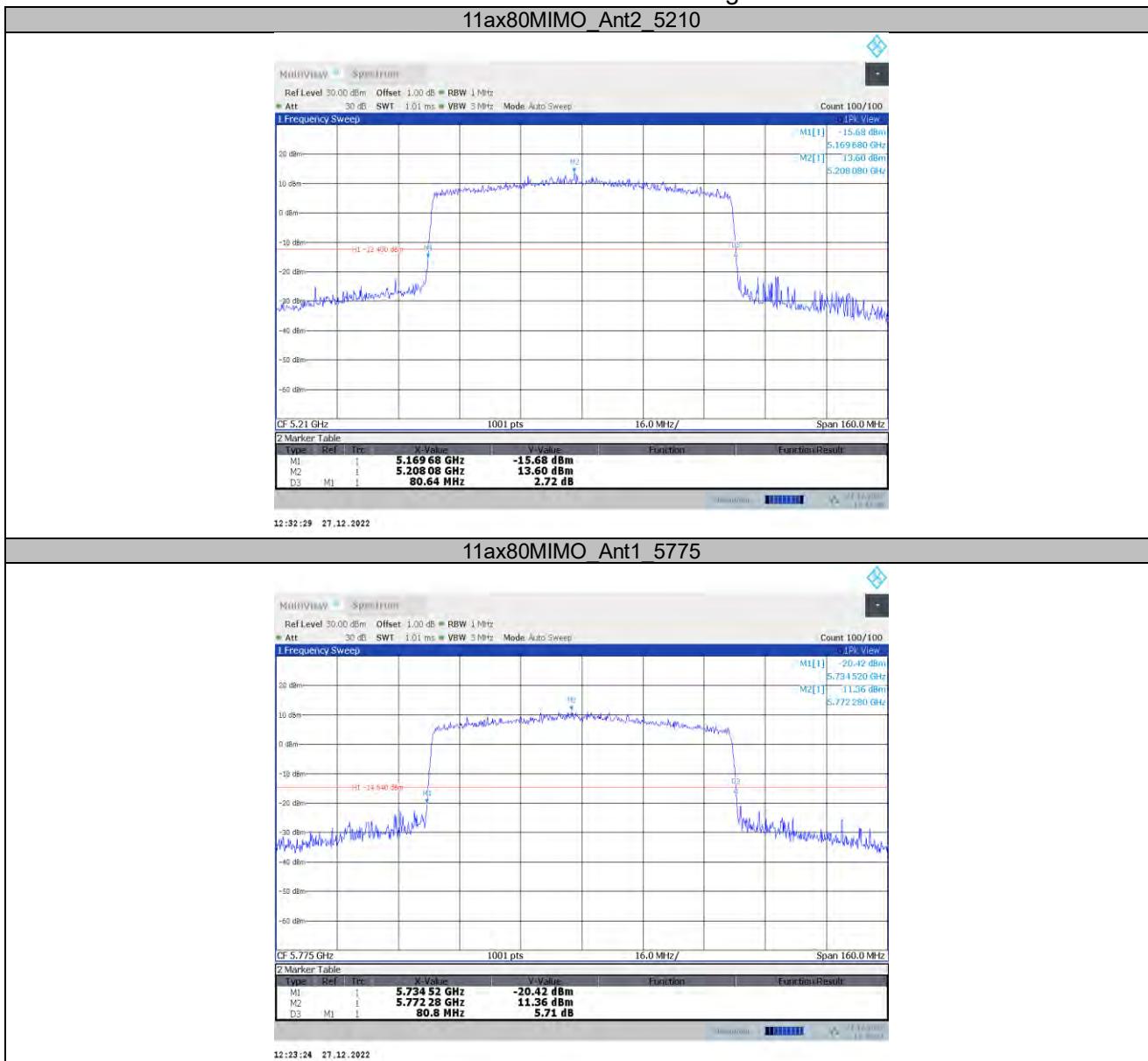
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	Ant2	5775	76.757	5736.717	5813.474	

Remark:

For WLAN 802.11a SISO mode, only select the antenna of power worst for test.



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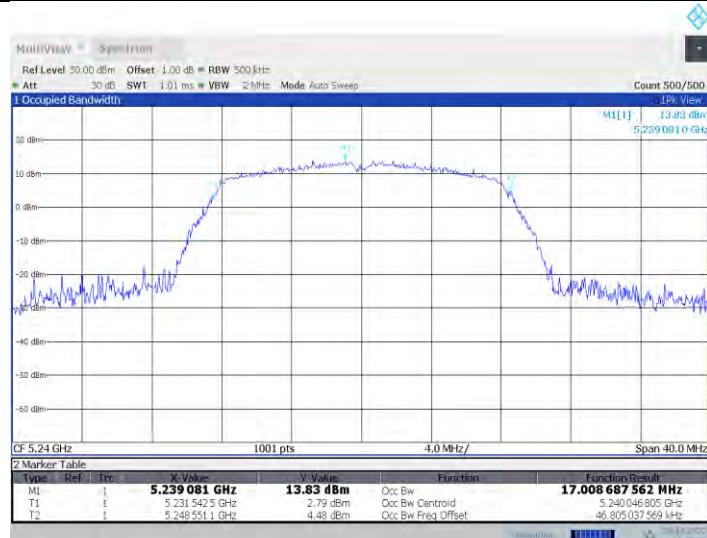
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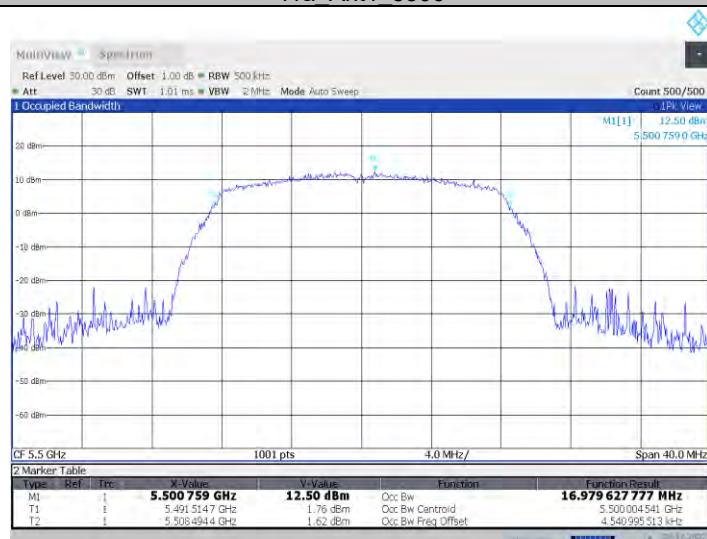
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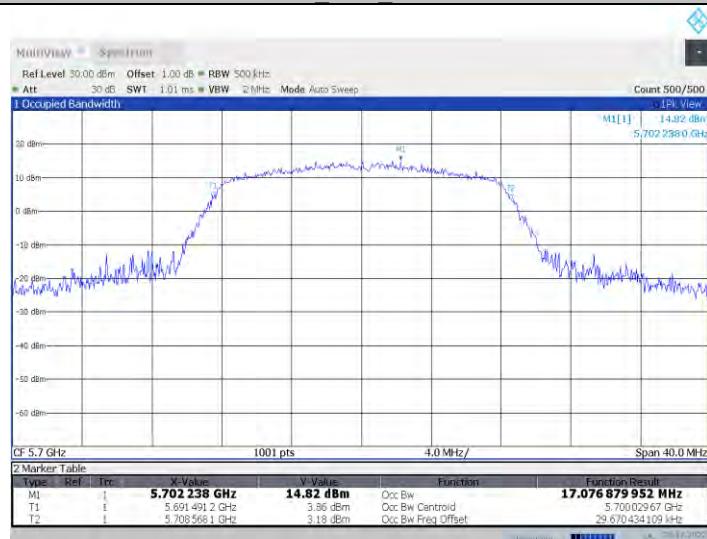
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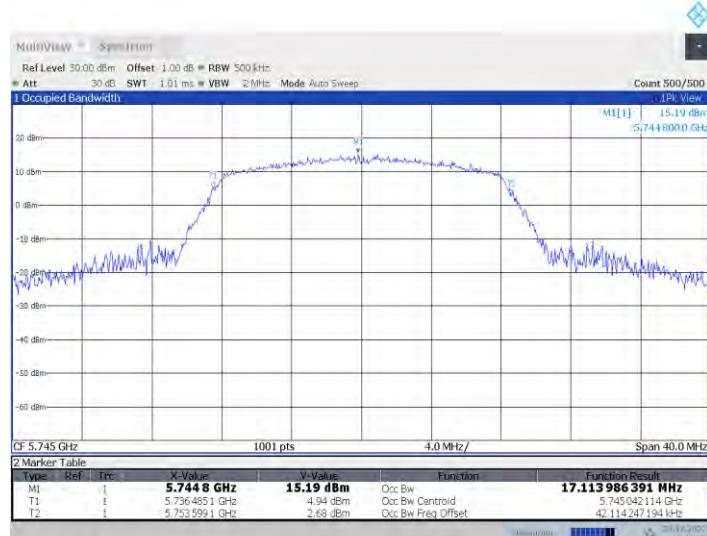
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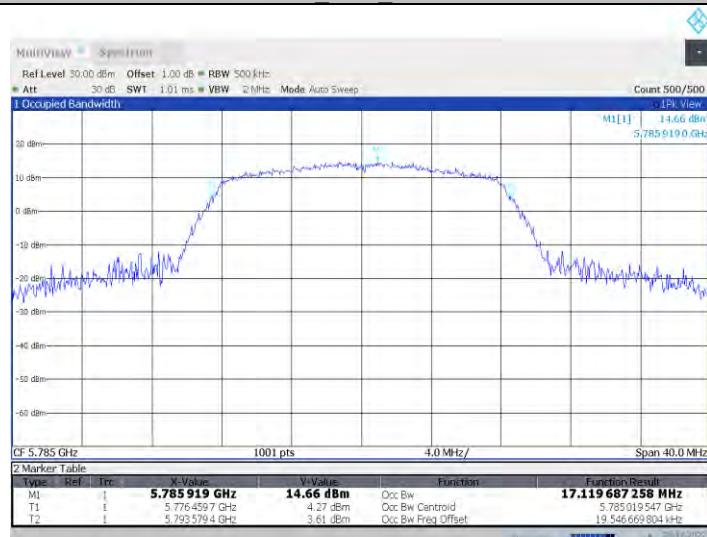
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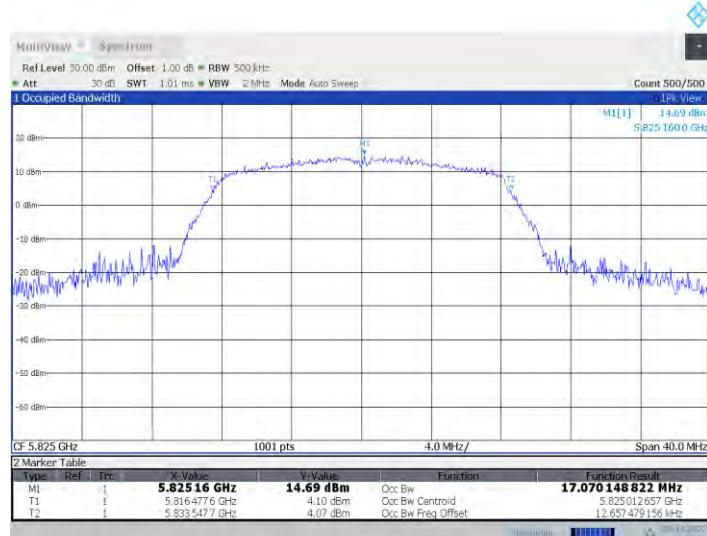
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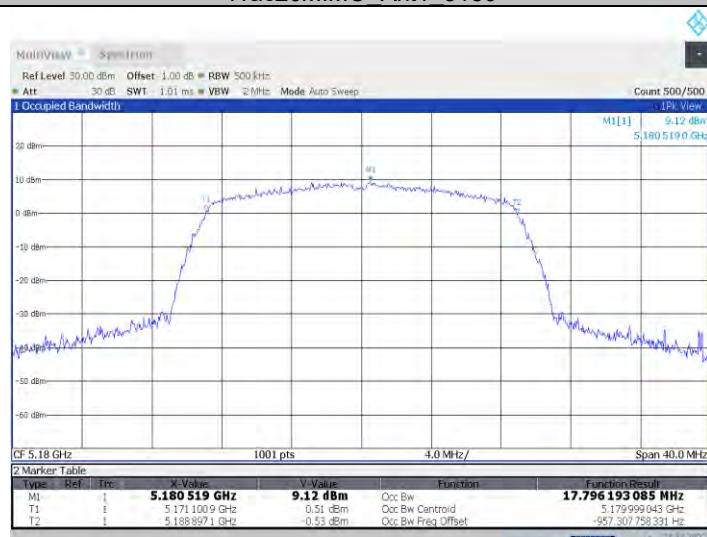
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11:52:18 20.12.2022

11ac20MIMO Ant1 5180

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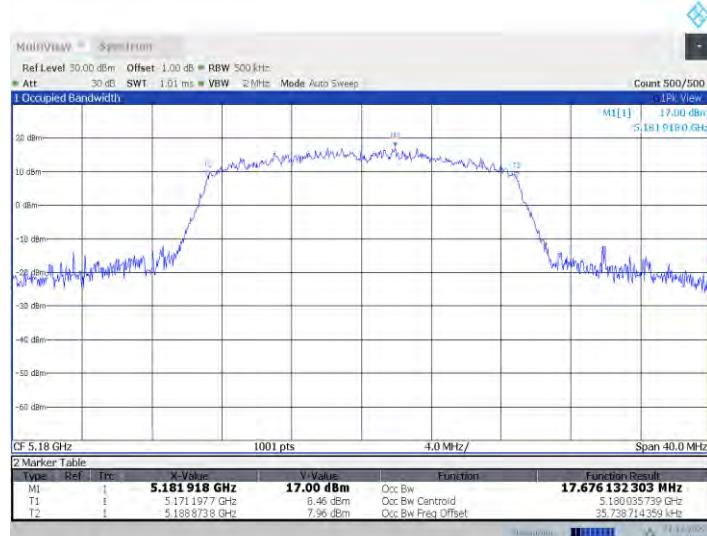
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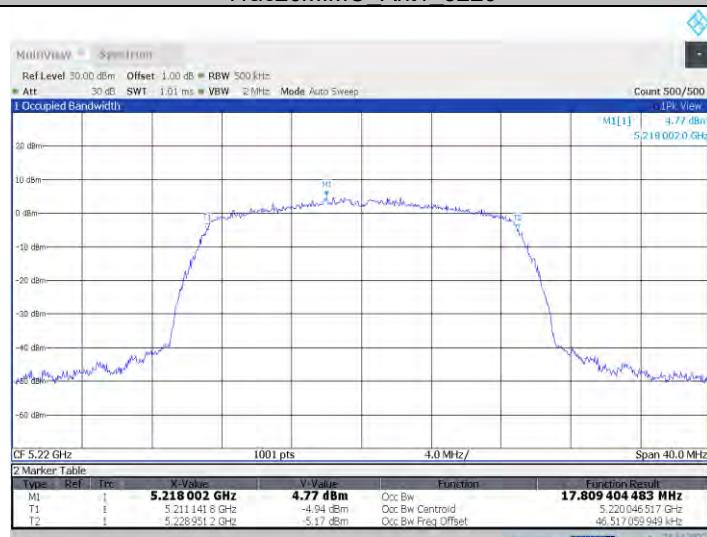
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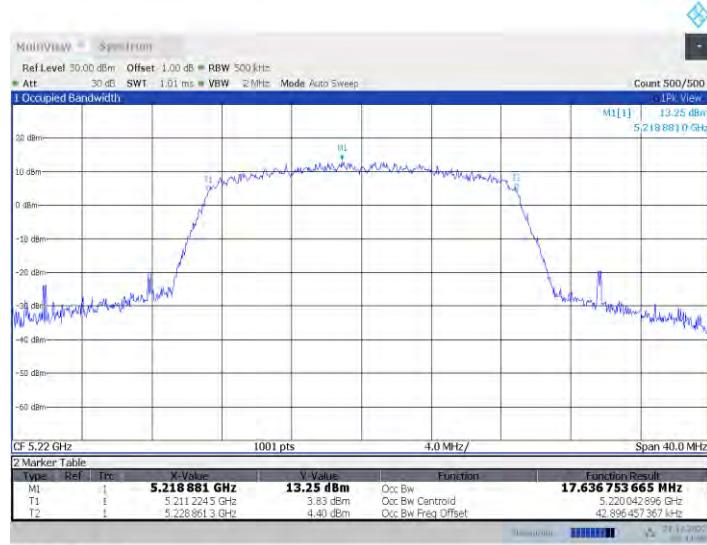
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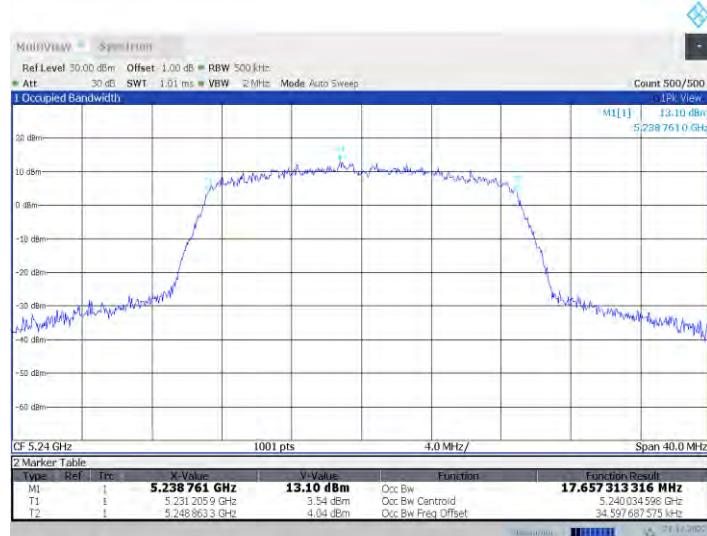
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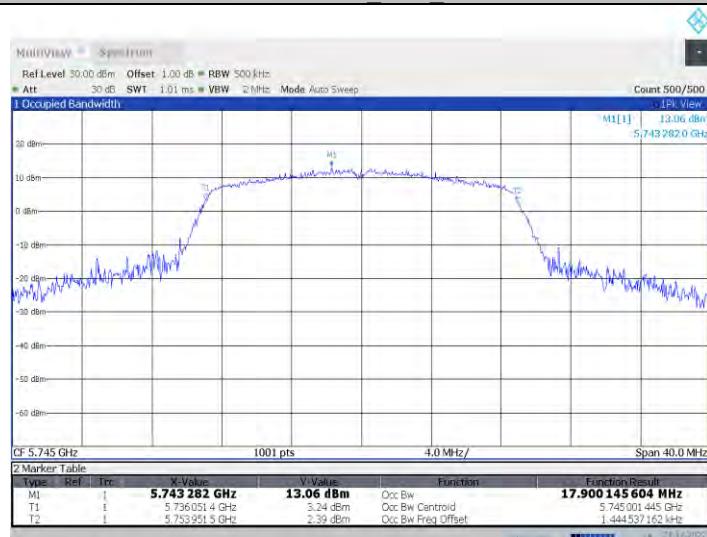
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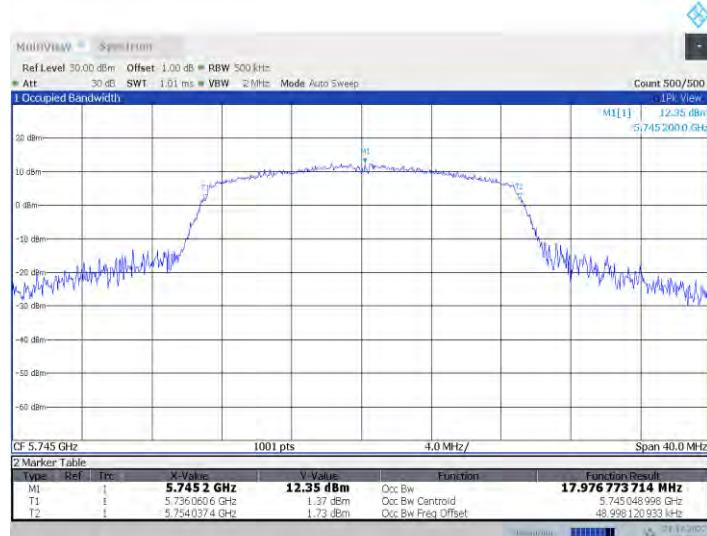
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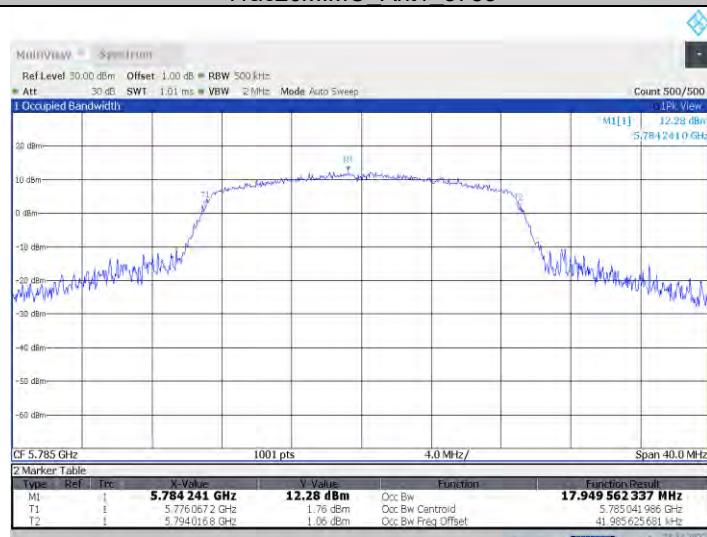
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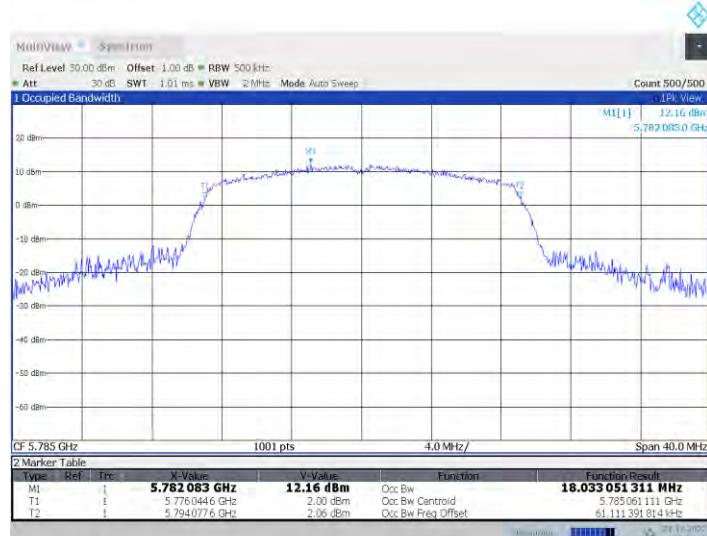
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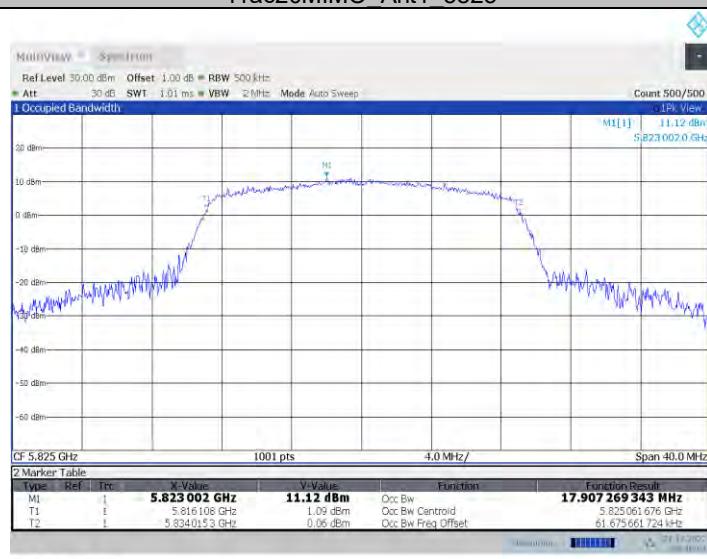
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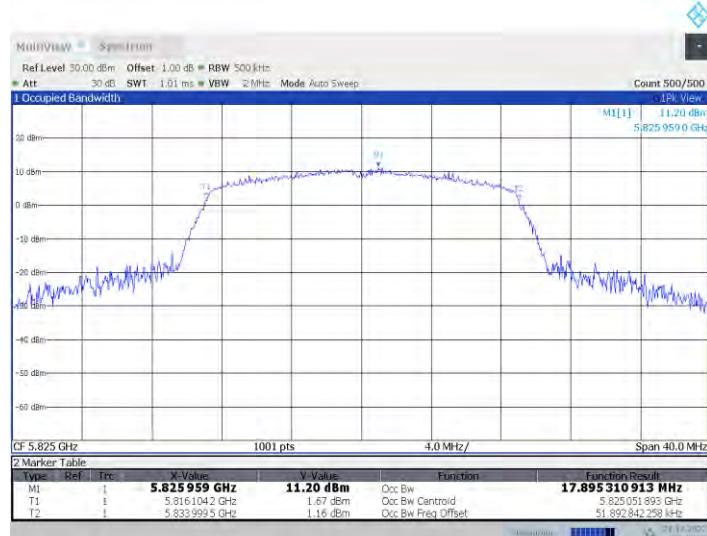
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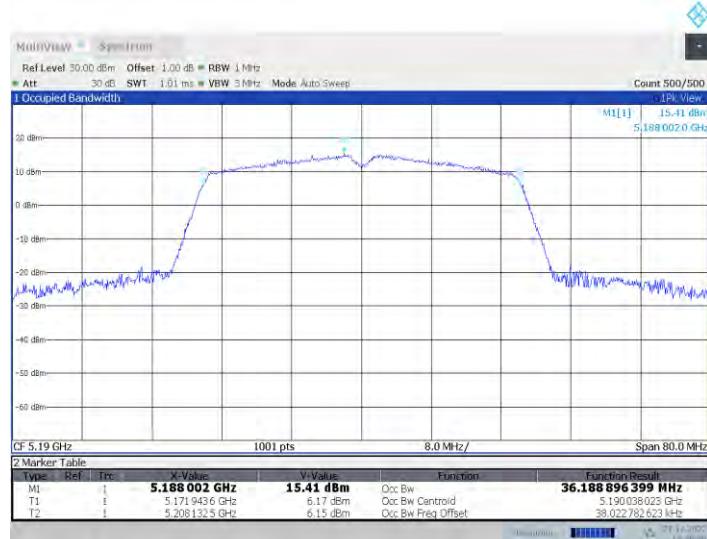
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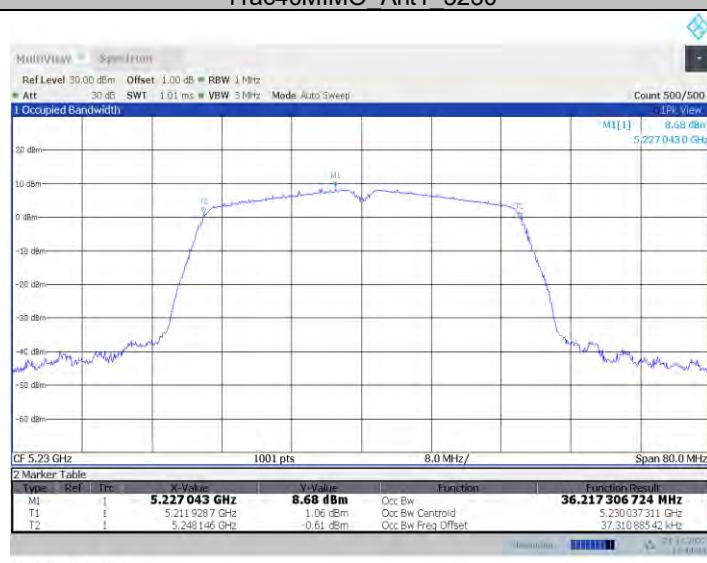
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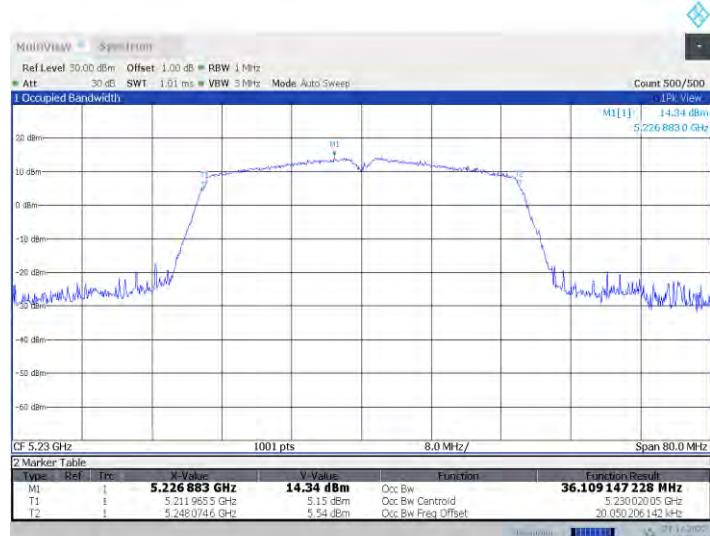
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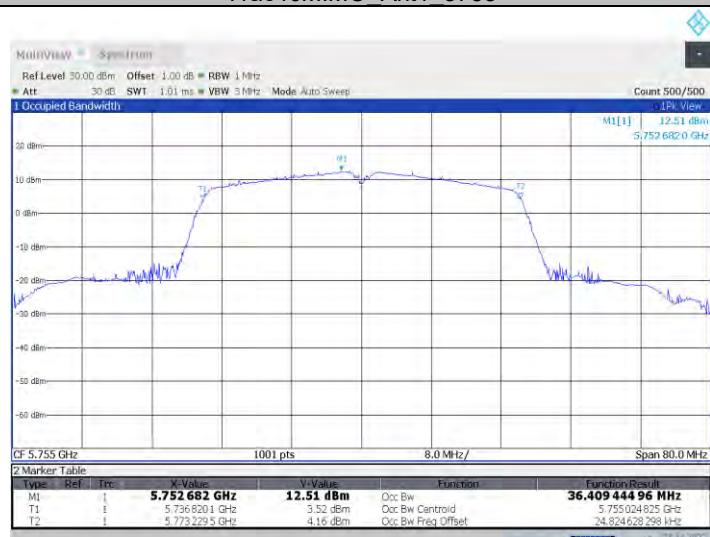
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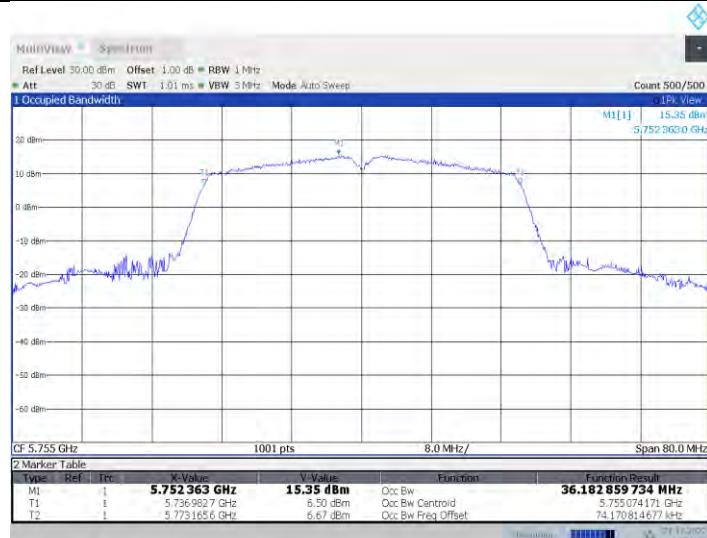
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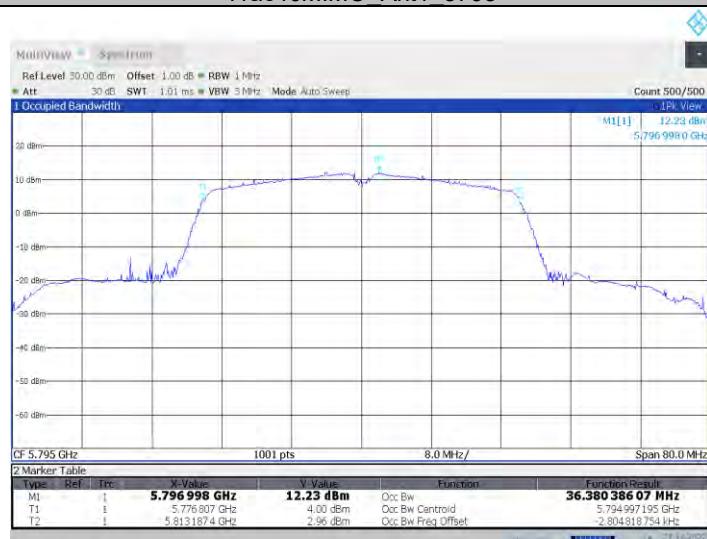
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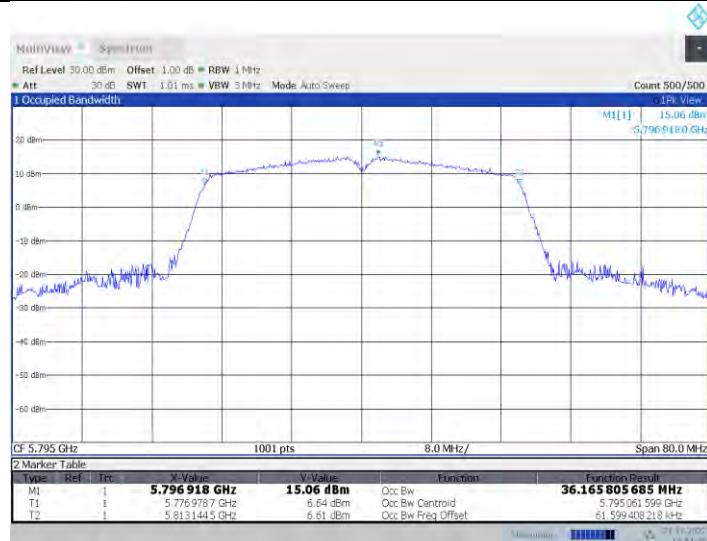
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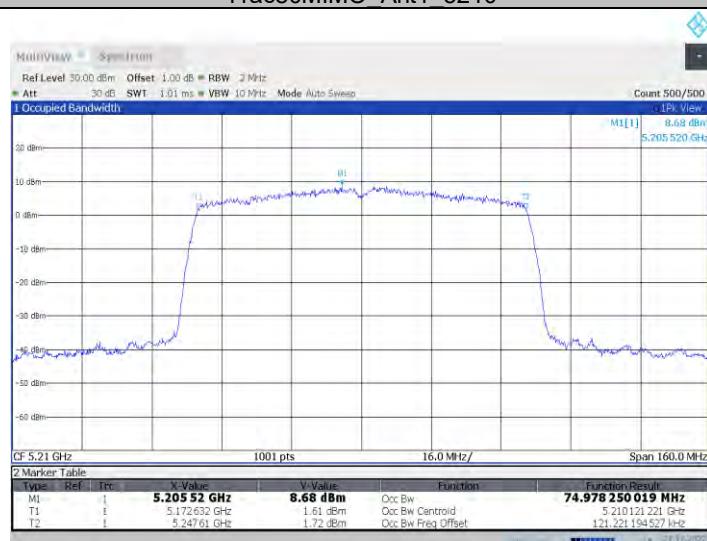
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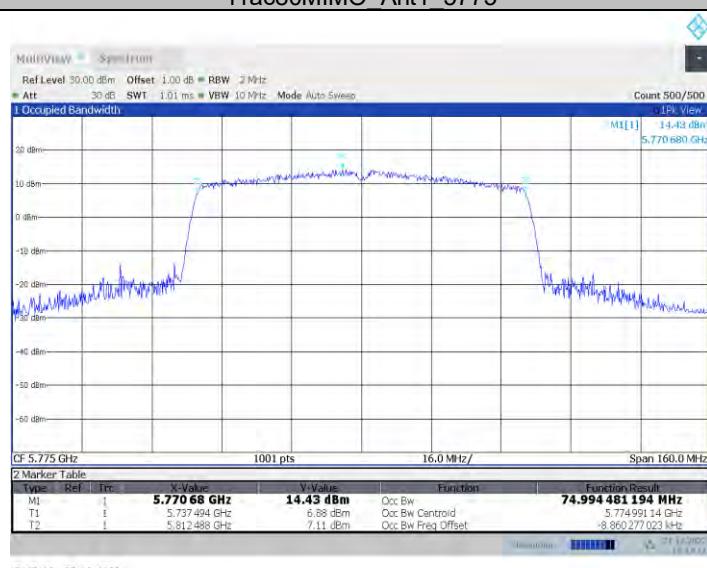
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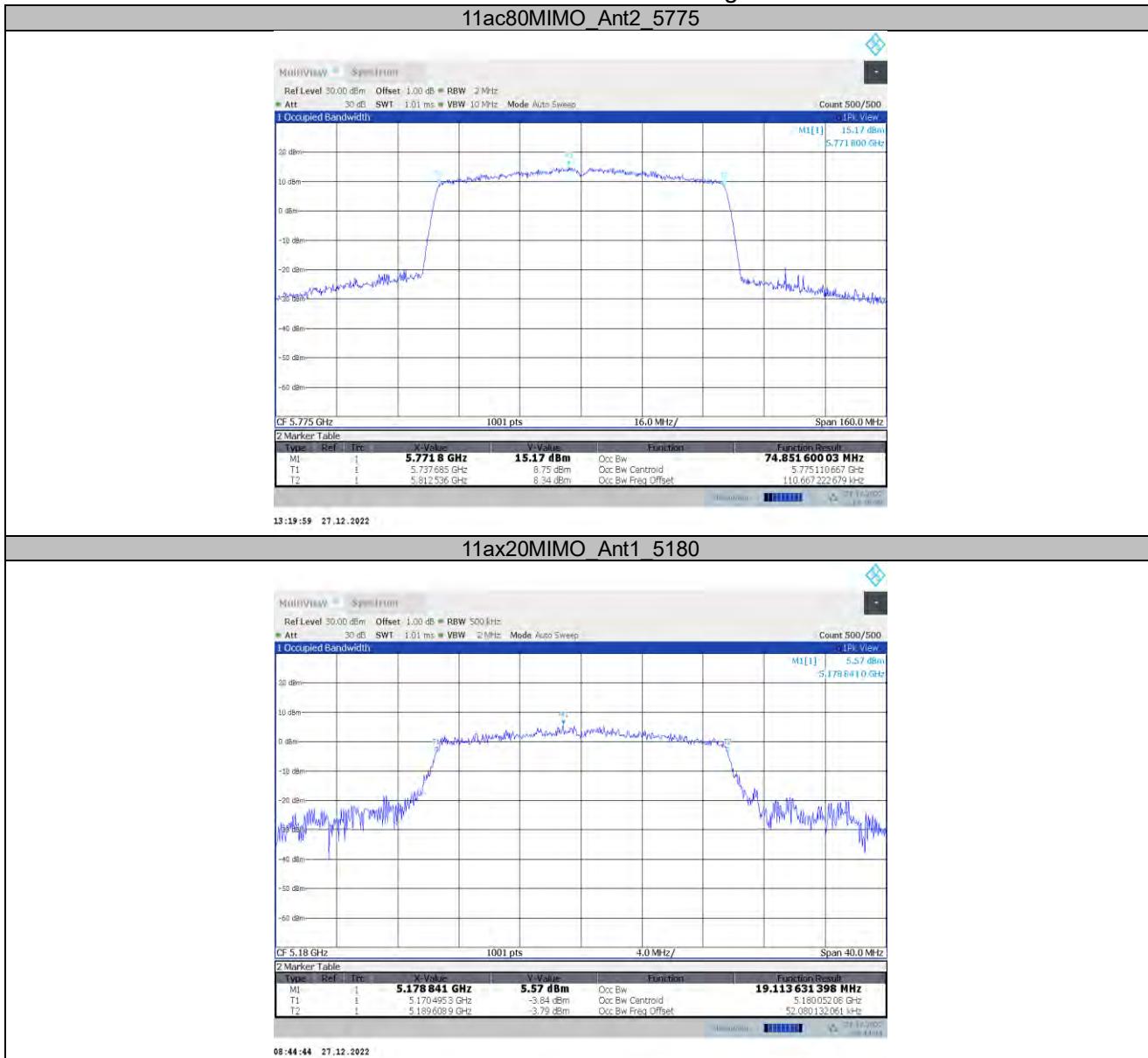
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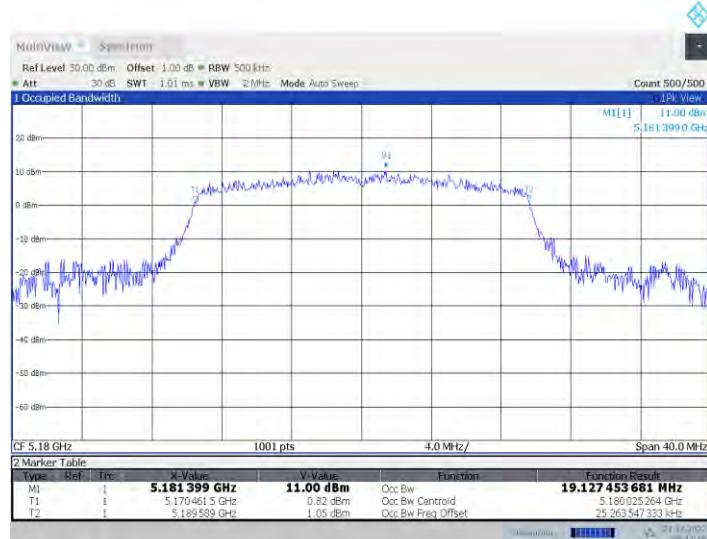
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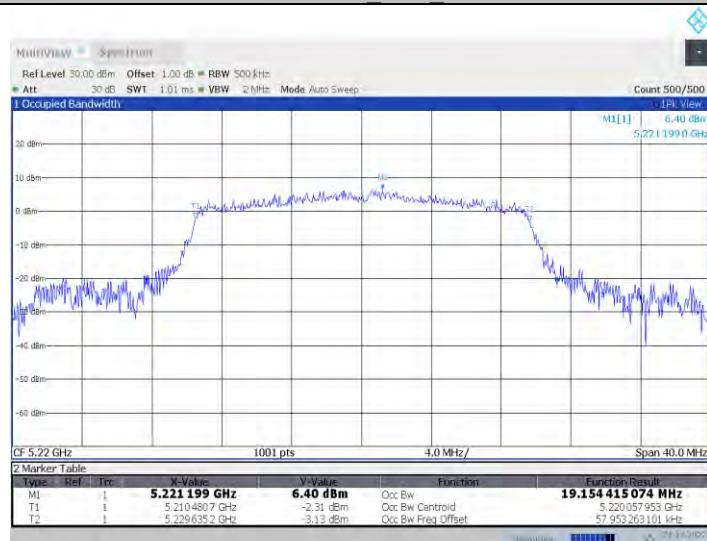
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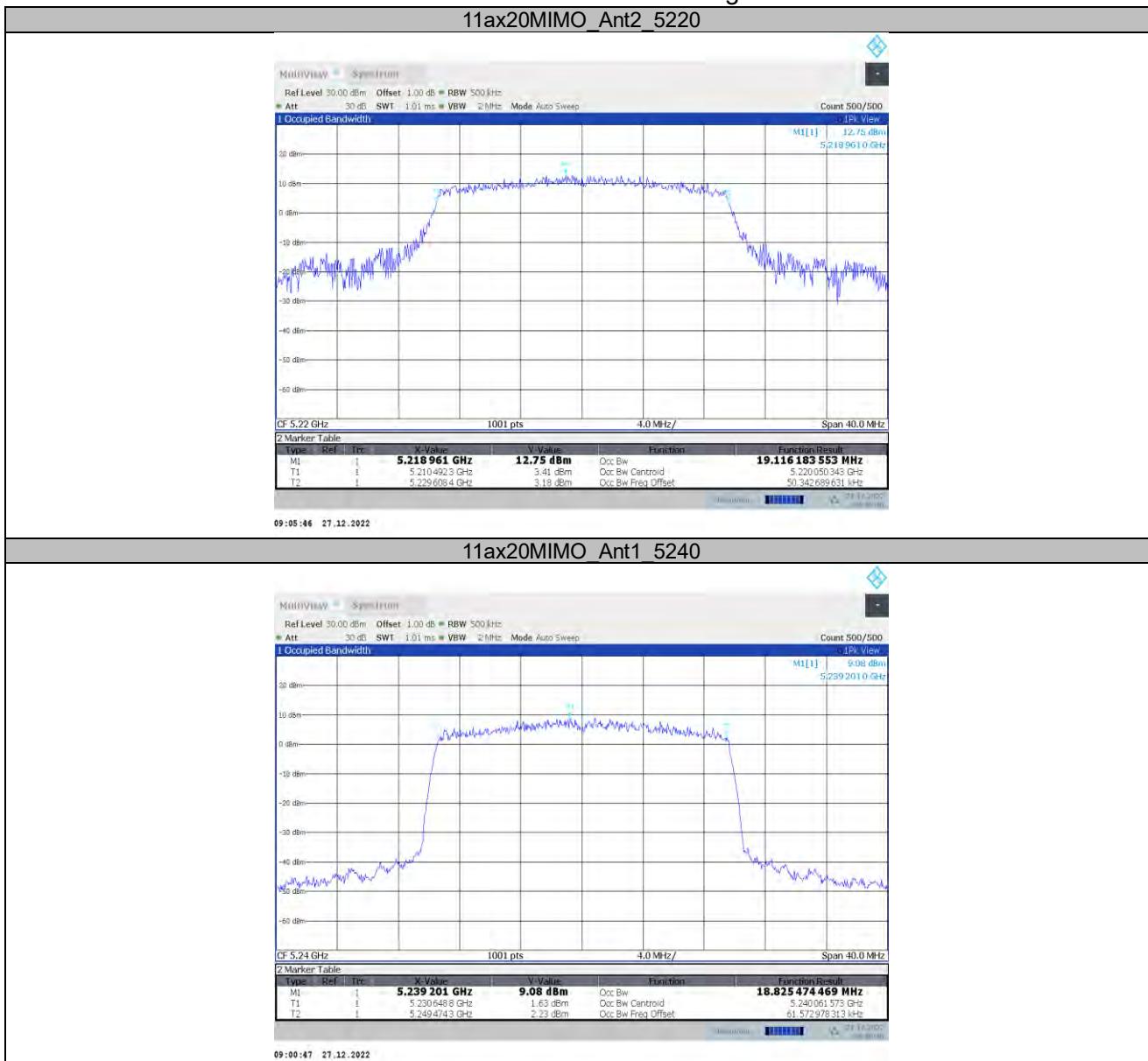
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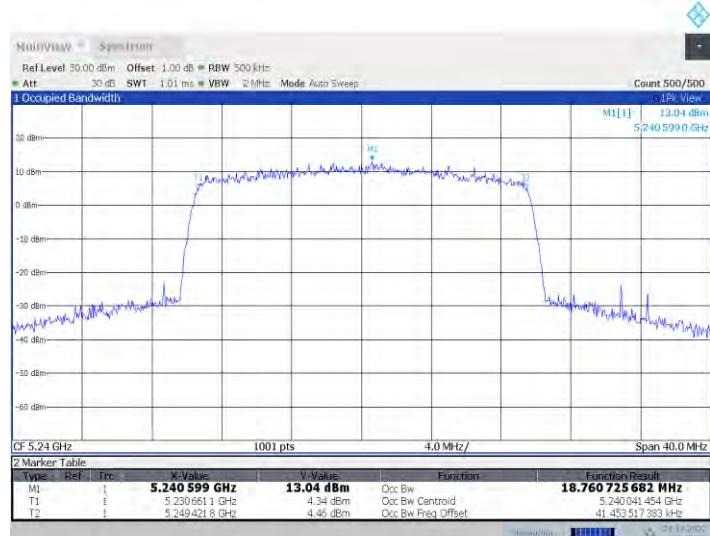
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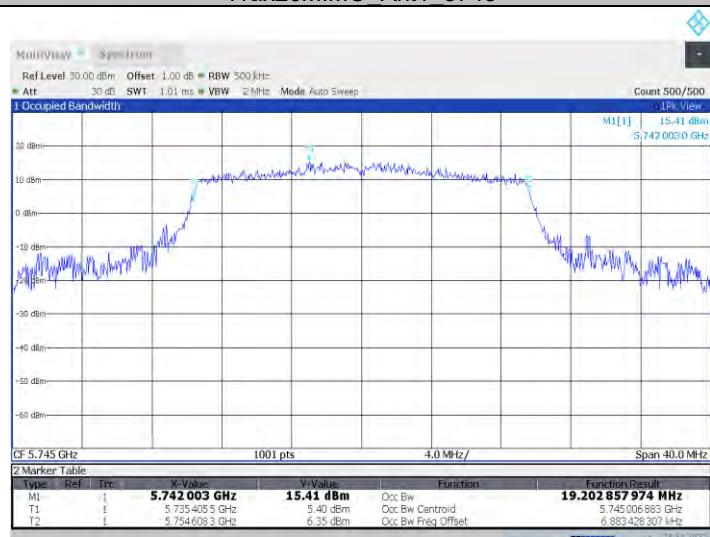
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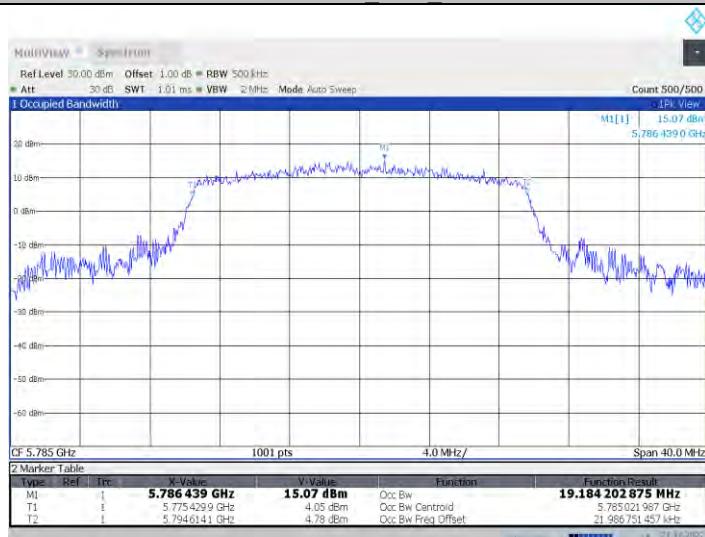
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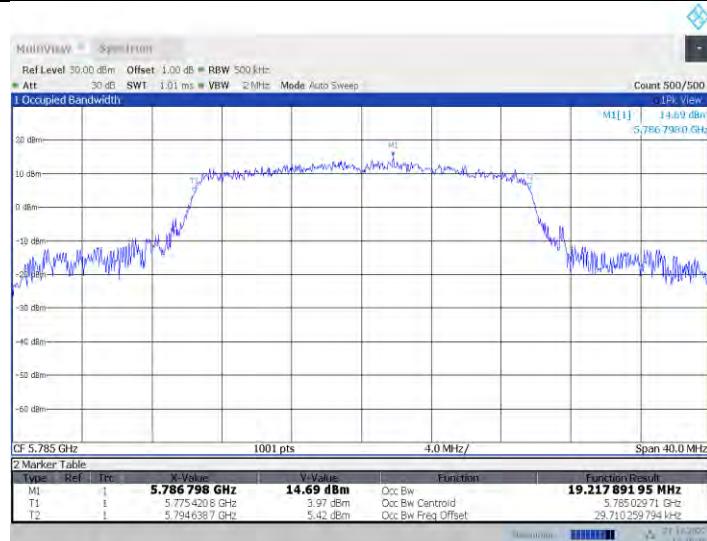
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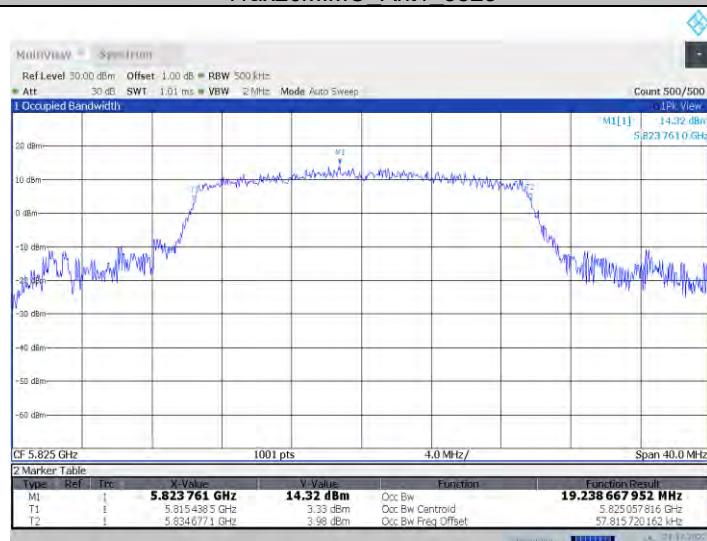
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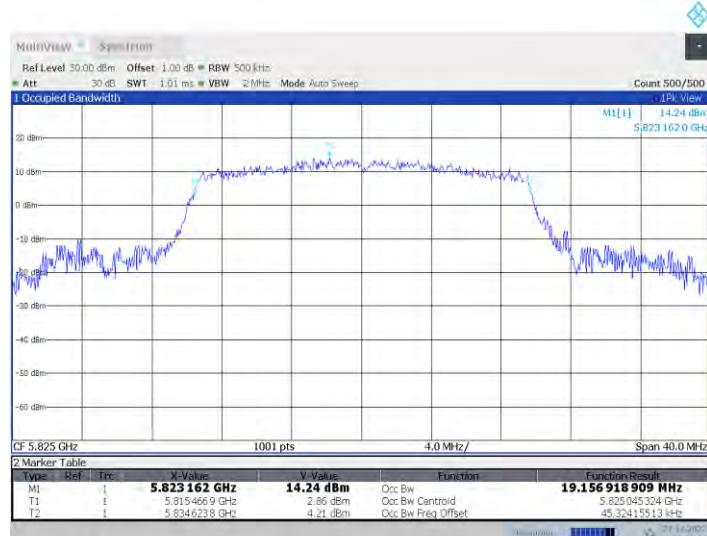
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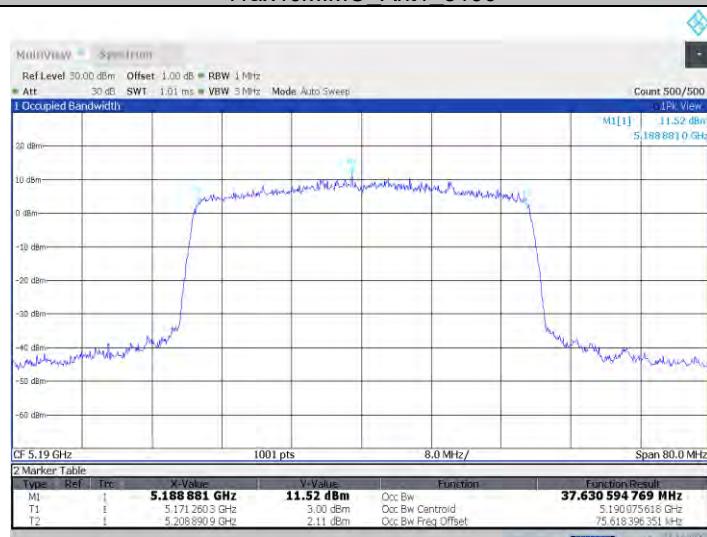
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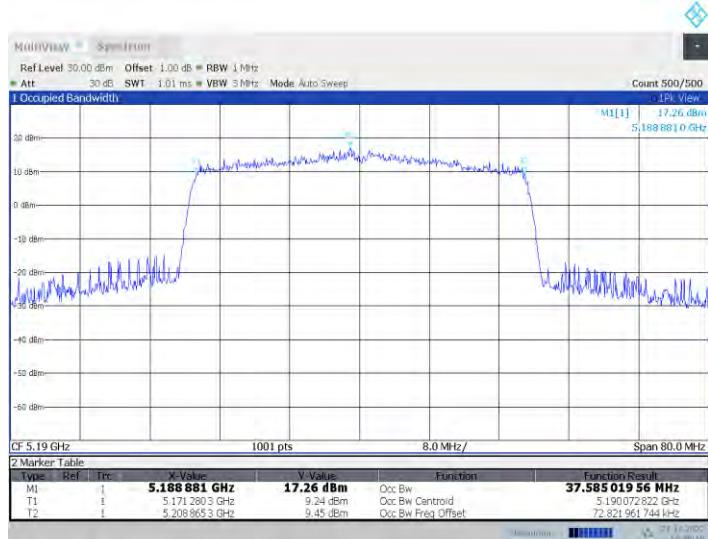
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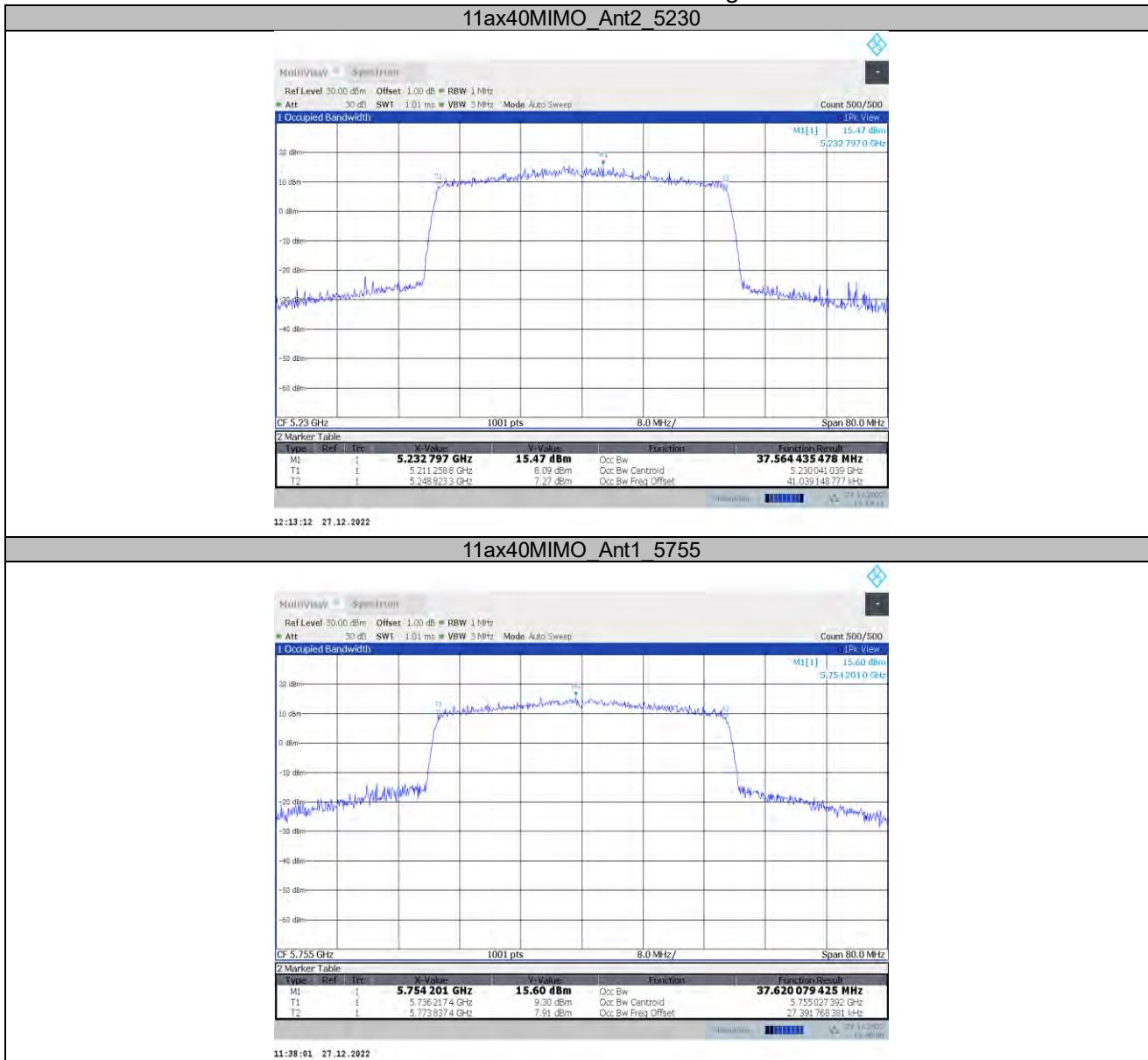
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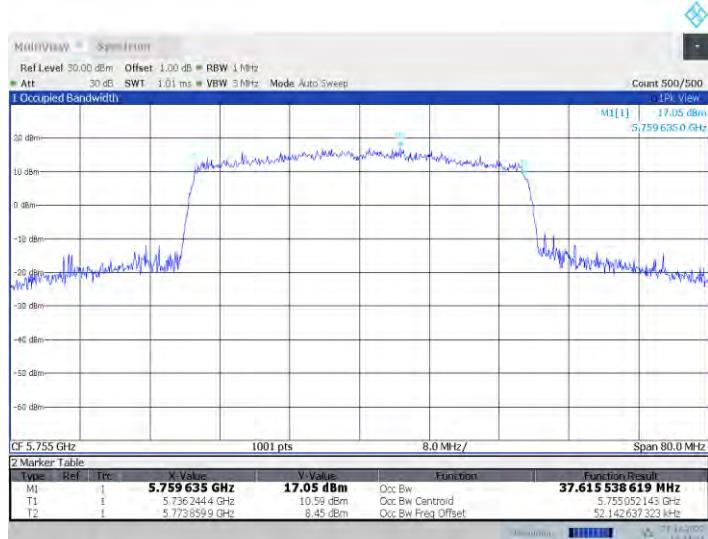
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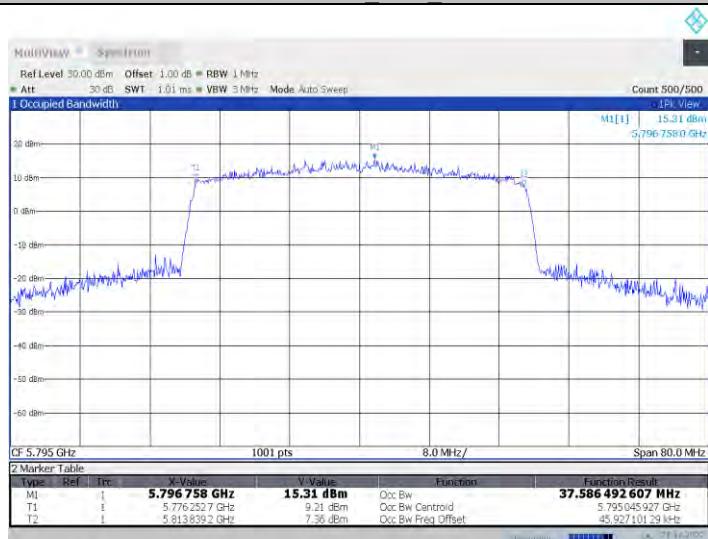
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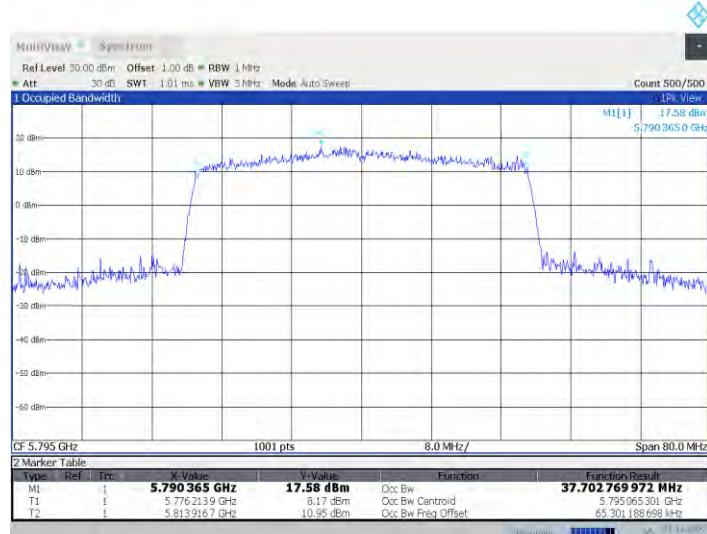
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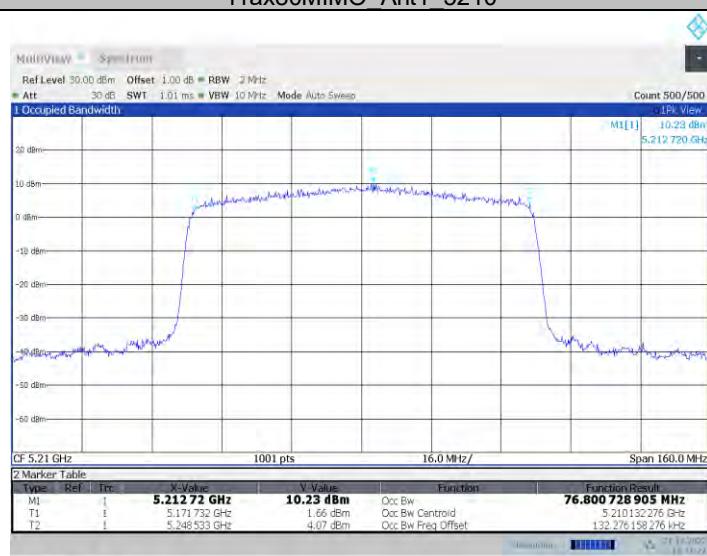
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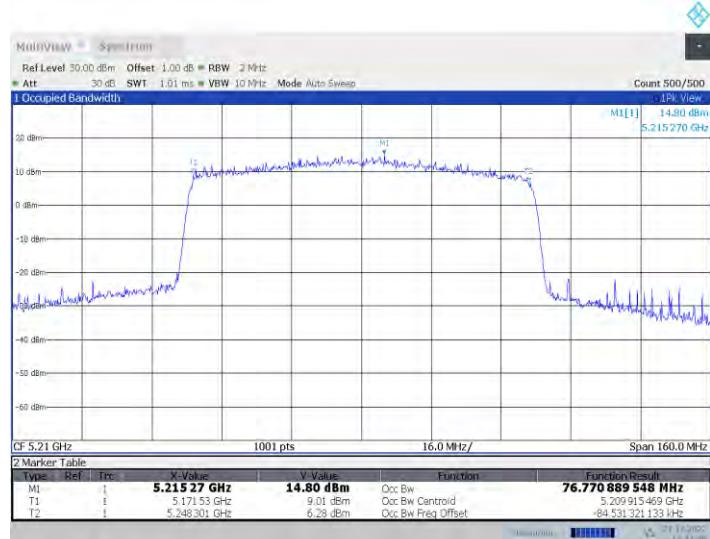
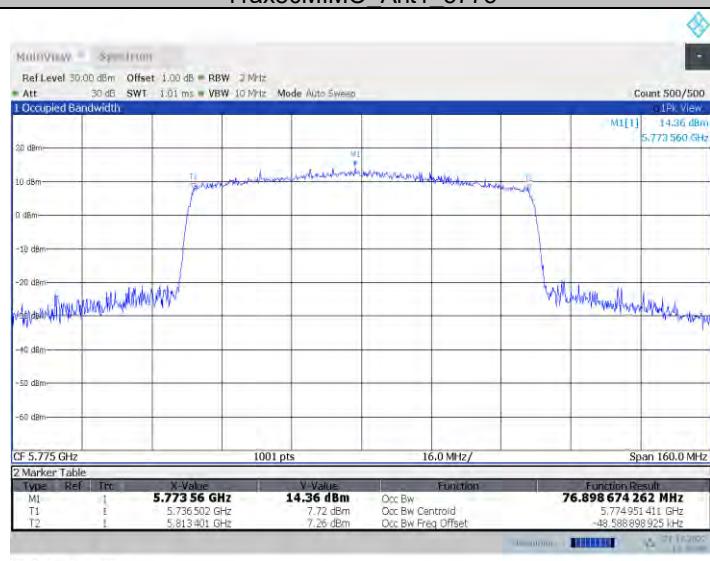
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11ax80MIMO_Ant2_5210**11ax80MIMO_Ant1_5775**

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6dB emission bandwidth**Test Result B4**

TestMode	Antenna	Frequency[MHz]	6dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11a	Ant1	5745	12.92	5738.68	5751.60	≥ 0.5	PASS
		5785	15.12	5777.44	5792.56	≥ 0.5	PASS
		5825	15.08	5817.48	5832.56	≥ 0.5	PASS
11ac20MIMO	Ant1	5745	13.96	5738.68	5752.64	≥ 0.5	PASS
	Ant2	5745	13.96	5738.68	5752.64	≥ 0.5	PASS
	Ant1	5785	13.92	5777.48	5791.40	≥ 0.5	PASS
	Ant2	5785	13.96	5778.68	5792.64	≥ 0.5	PASS
	Ant1	5825	15.12	5817.48	5832.60	≥ 0.5	PASS
	Ant2	5825	15.20	5817.48	5832.68	≥ 0.5	PASS
11ac40MIMO	Ant1	5755	34.00	5737.40	5771.40	≥ 0.5	PASS
	Ant2	5755	35.28	5737.40	5772.68	≥ 0.5	PASS
	Ant1	5795	32.80	5778.60	5811.40	≥ 0.5	PASS
	Ant2	5795	34.00	5778.68	5812.68	≥ 0.5	PASS
11ac80MIMO	Ant1	5775	75.36	5737.40	5812.76	≥ 0.5	PASS
	Ant2	5775	75.36	5737.40	5812.76	≥ 0.5	PASS
11ax20MIMO	Ant1	5745	16.60	5737.48	5754.08	≥ 0.5	PASS
	Ant2	5745	15.68	5737.40	5753.08	≥ 0.5	PASS
	Ant1	5785	17.12	5775.84	5792.96	≥ 0.5	PASS
	Ant2	5785	16.40	5776.24	5792.64	≥ 0.5	PASS
	Ant1	5825	15.20	5817.44	5832.64	≥ 0.5	PASS
	Ant2	5825	15.64	5817.00	5832.64	≥ 0.5	PASS
11ax40MIMO	Ant1	5755	35.28	5737.40	5772.68	≥ 0.5	PASS
	Ant2	5755	35.12	5737.48	5772.60	≥ 0.5	PASS
	Ant1	5795	31.68	5778.68	5810.36	≥ 0.5	PASS
	Ant2	5795	34.00	5777.40	5811.40	≥ 0.5	PASS
11ax80MIMO	Ant1	5775	75.36	5737.40	5812.76	≥ 0.5	PASS
	Ant2	5775	75.36	5737.40	5812.76	≥ 0.5	PASS

Remark:

For WLAN 802.11a SISO mode, only select the antenna of power worst for test.



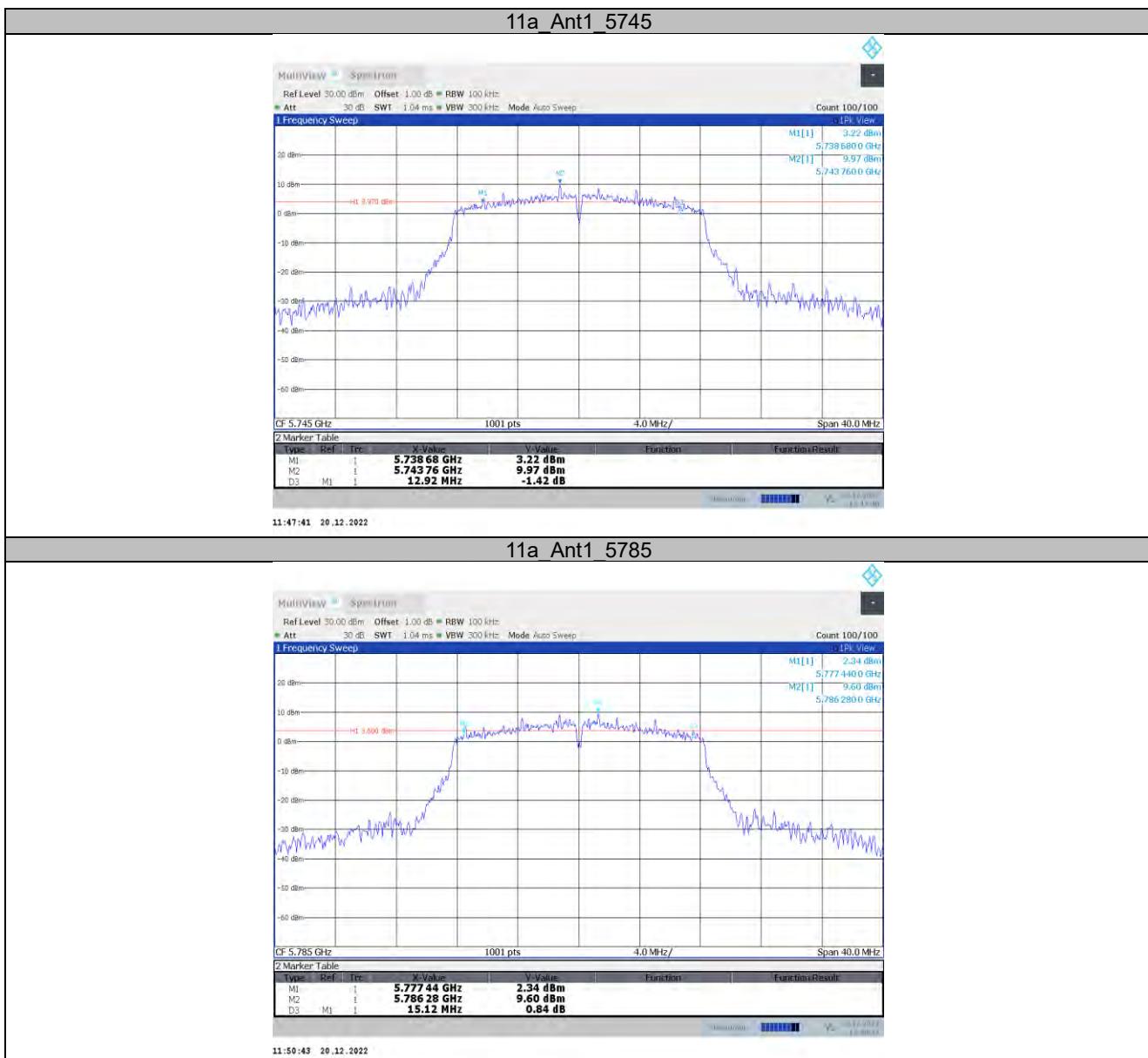
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Test Graphs B4



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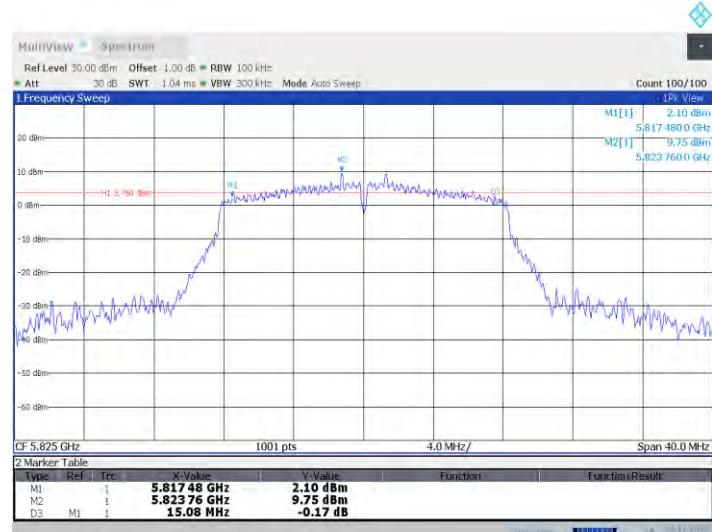
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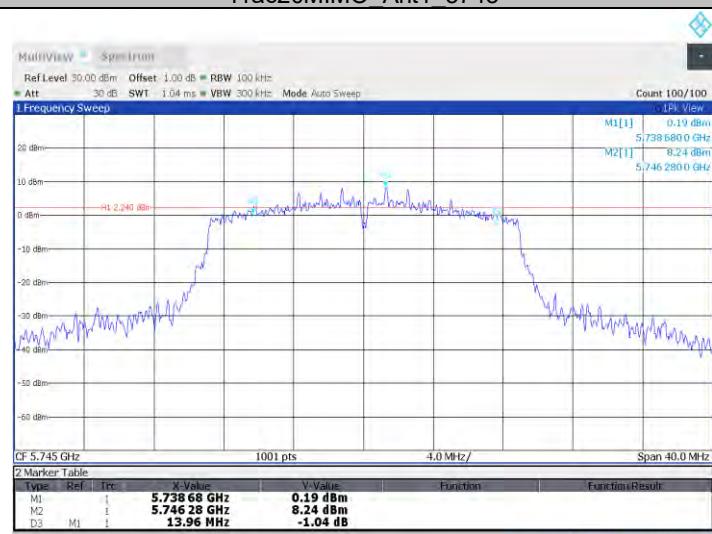
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11a_Ant1_5825



11:52:07 20 12 2022

11ac20MIMO_Ant1 5745



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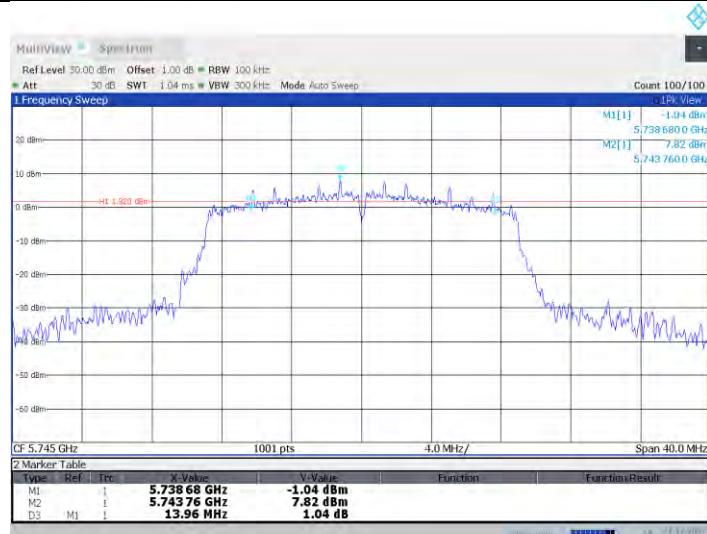
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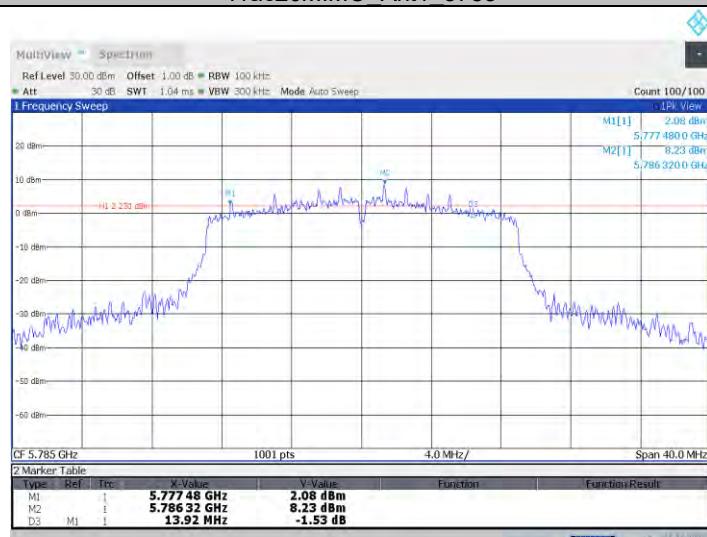
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11ac20MIMO_Ant2_5745



07:59:51 27.12.2022

11ac20MIMO_Ant1_5785



08:01:01 27.12.2022

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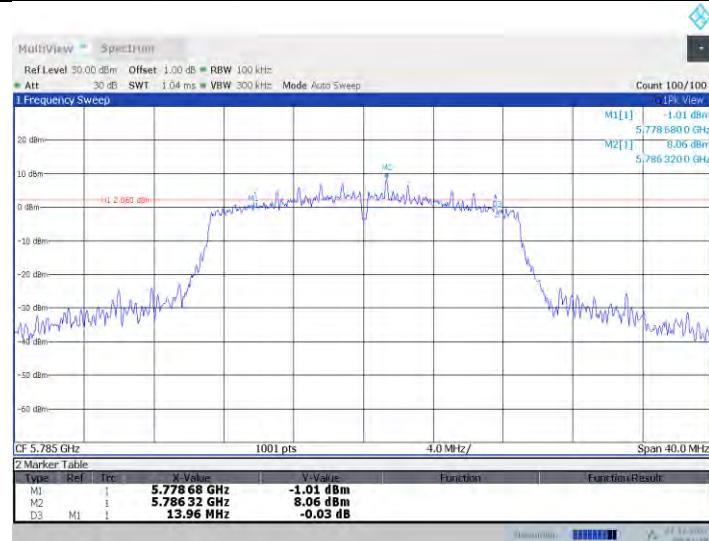
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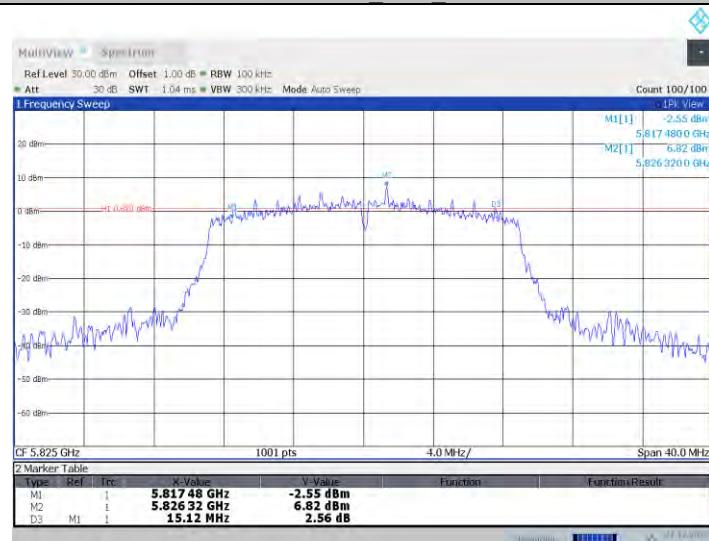
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11ac20MIMO_Ant2_5785

08:02:00 27.12.2022

11ac20MIMO_Ant1_5825

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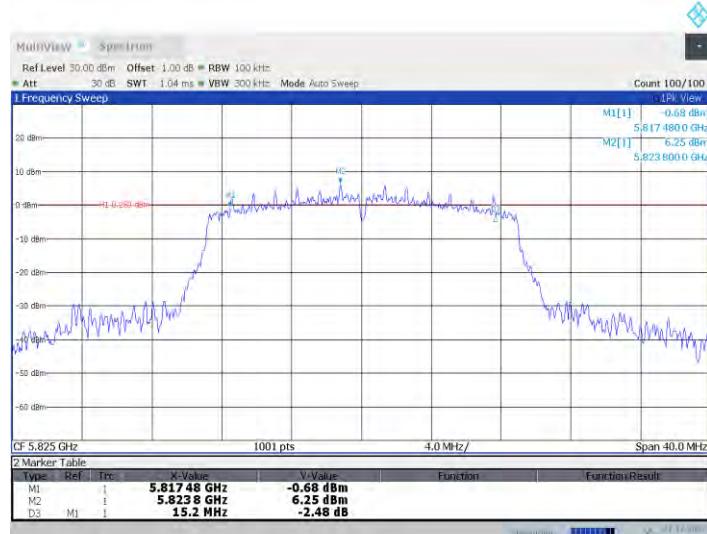
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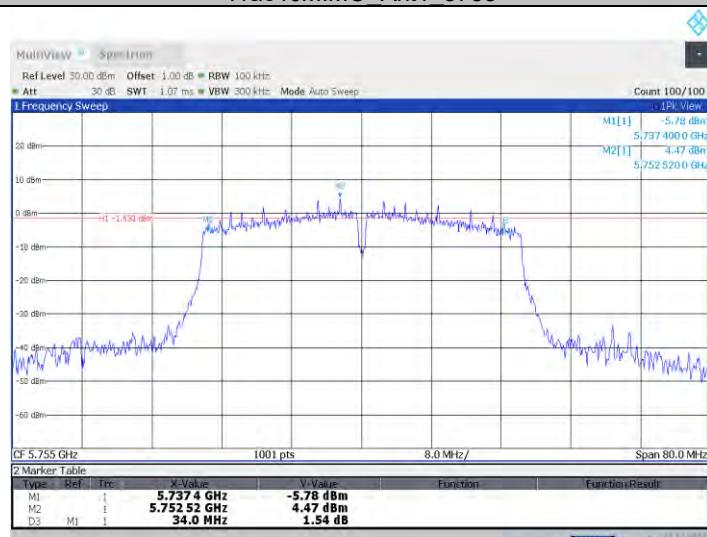
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11ac40MIMO Ant1 5755



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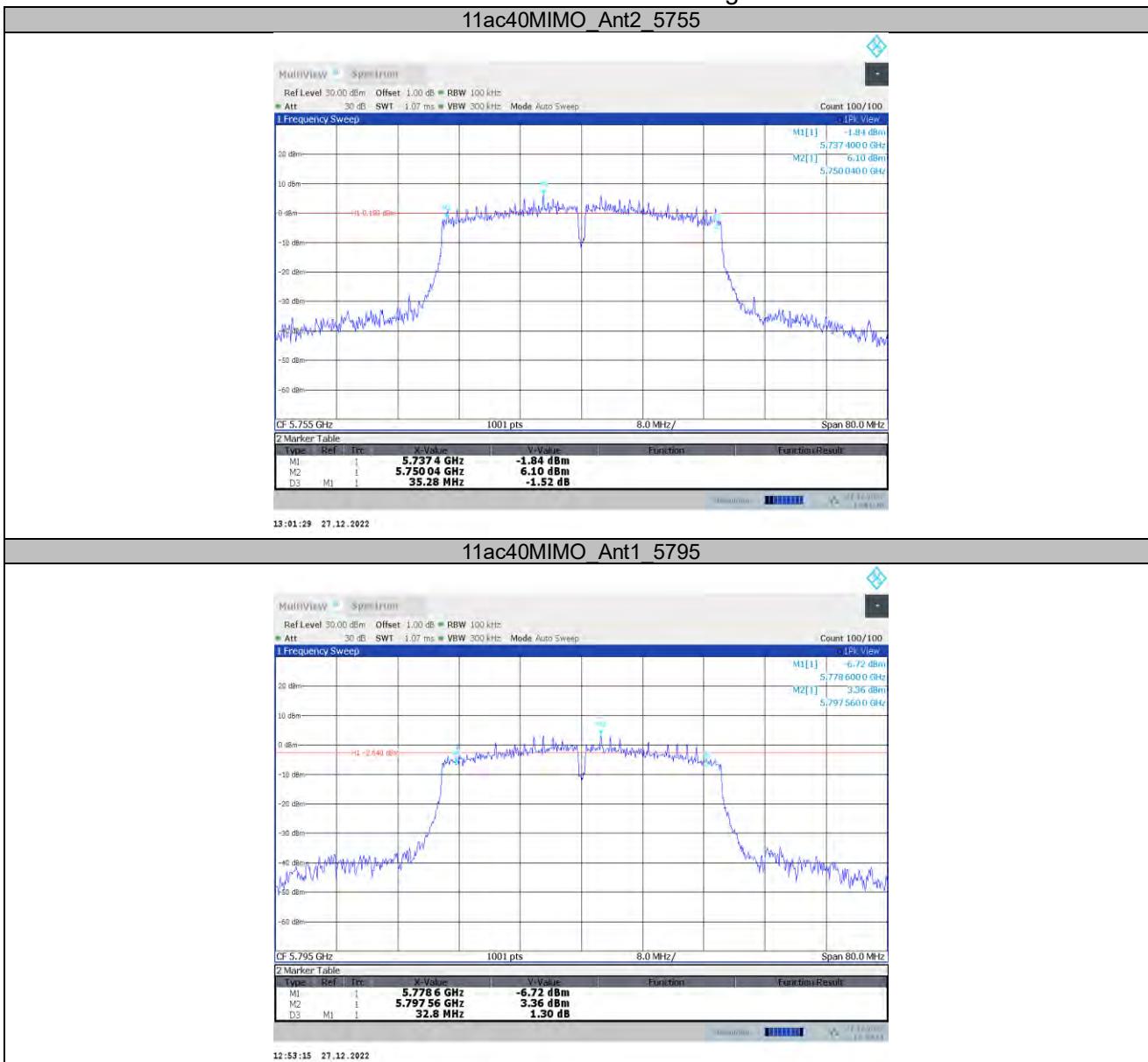
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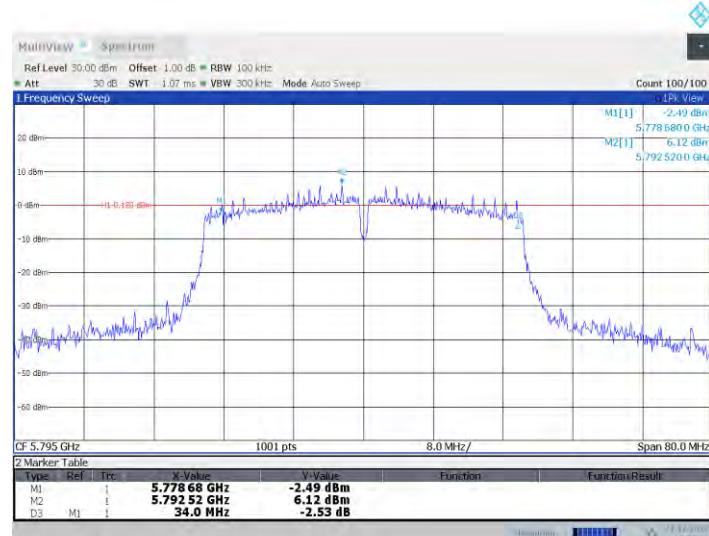
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13:04:15 27.12.2022

11ac80MIMO_Ant1_5775



13:13:02 27.12.2022

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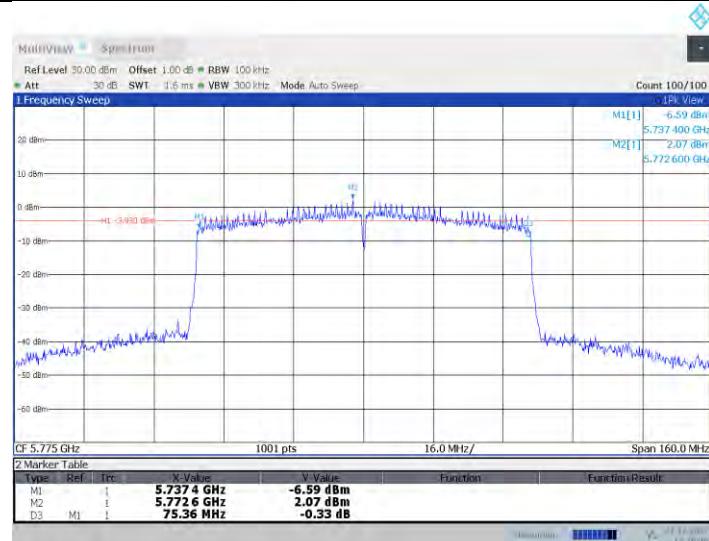
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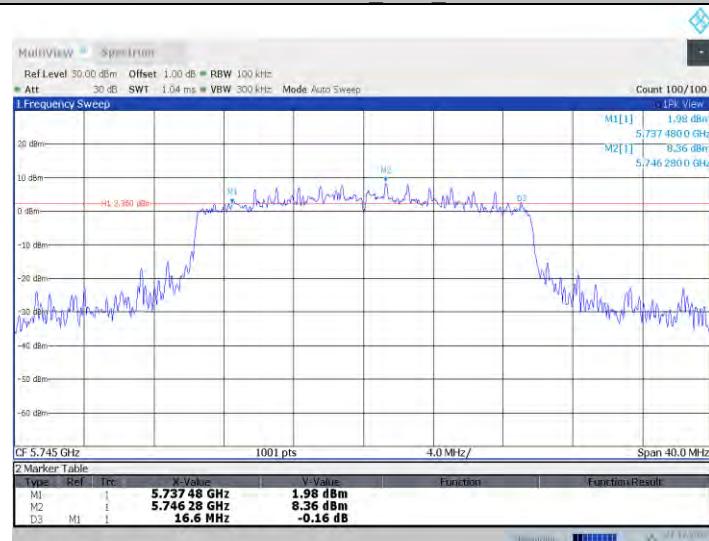
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11ax20MIMO_Ant1_5745



09:10:17 27.12.2022

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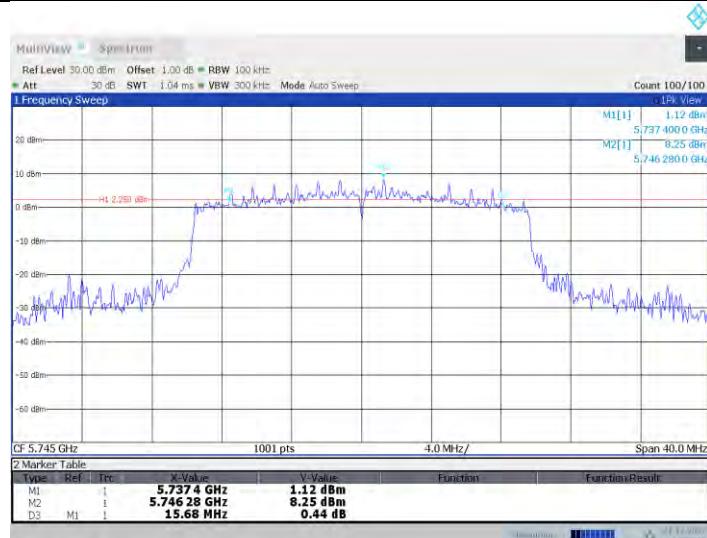
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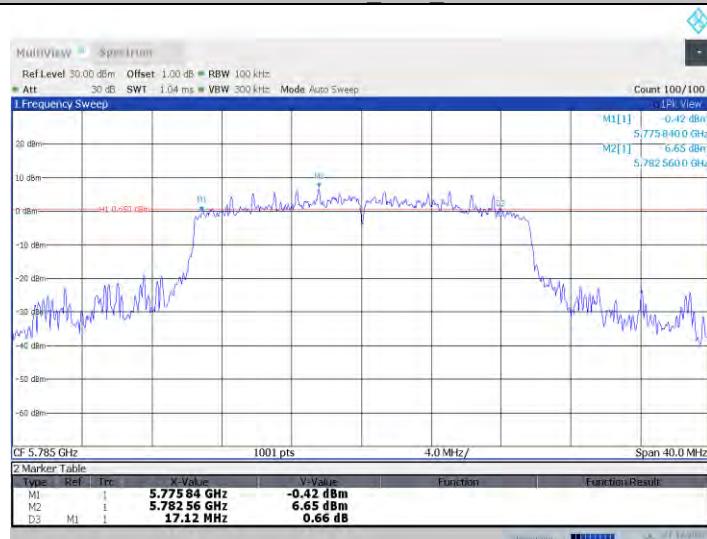
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11ax20MIMO_Ant2_5745



11:02:16 27.12.2022

11ax20MIMO_Ant1_5785



09:13:49 27.12.2022

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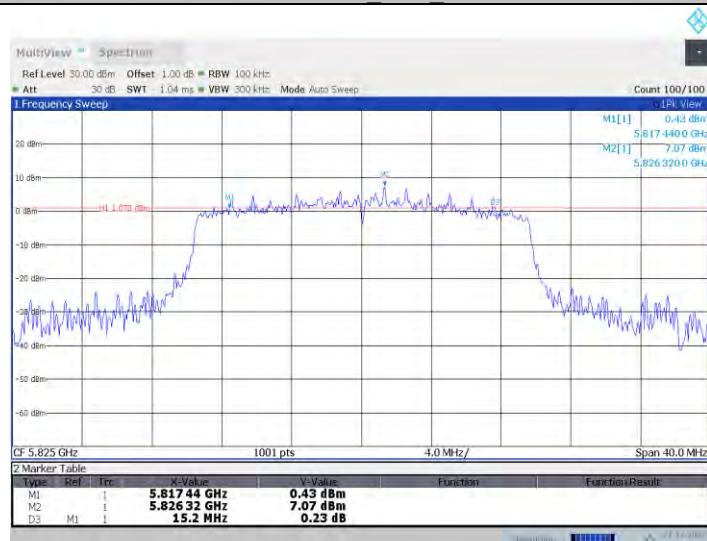
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11ax20MIMO_Ant2_5785

11:10:16 27.12.2022

11ax20MIMO_Ant1_5825

09:16:49 27.12.2022

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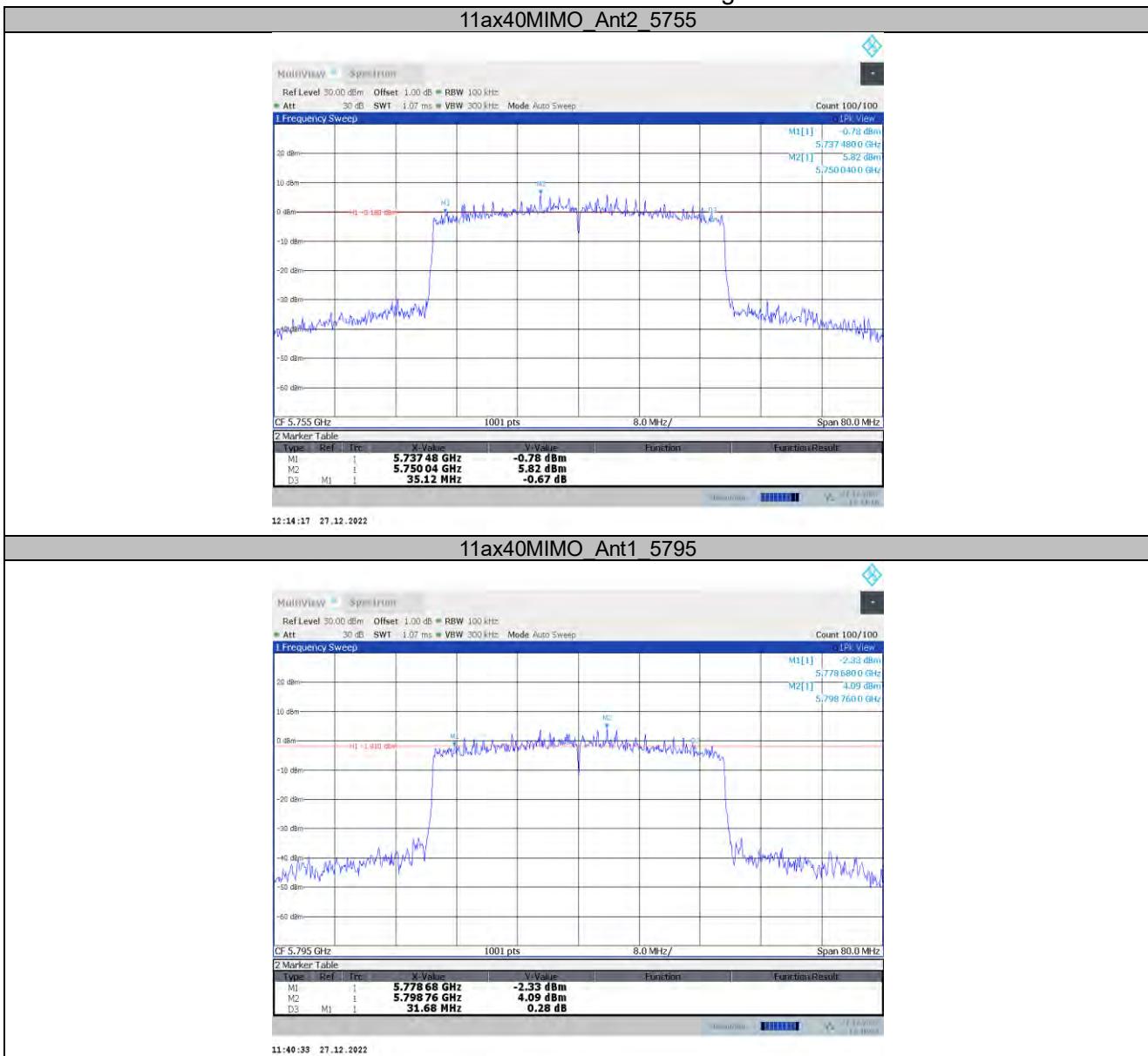


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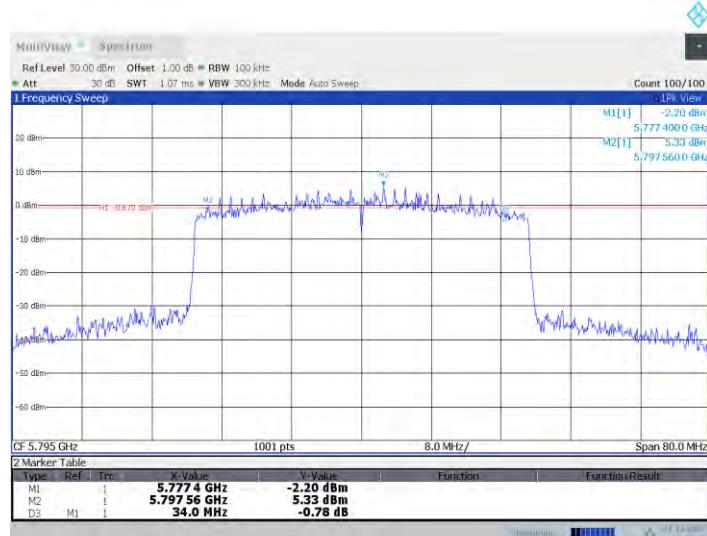
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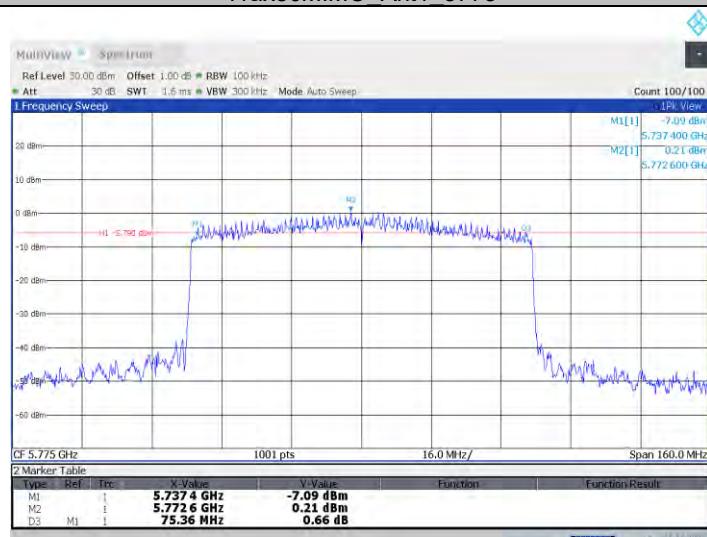
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11ax40MIMO_Ant2_5795



12:16:30 27.12.2022

11ax80MIMO_Ant1_5775



12:23:29 27.12.2022

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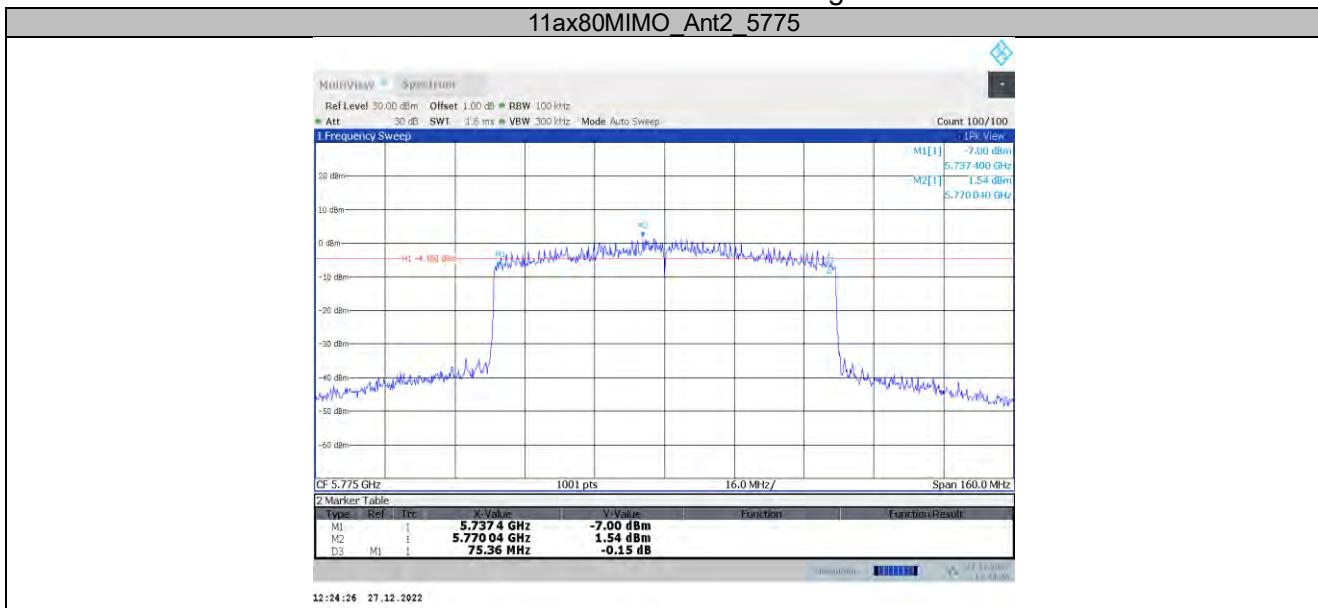
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Duty Cycle Test Result

TestMode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11a	Ant1	5180	1.39	1.45	95.86
11ac20MIMO	Ant1	5180	0.68	0.74	91.89
	Ant2	5180	0.68	0.74	91.89
11ac40MIMO	Ant1	5190	0.35	0.41	85.37
	Ant2	5190	0.35	0.41	85.37
11ac80MIMO	Ant1	5210	0.32	0.38	84.21
	Ant2	5210	0.32	0.38	84.21
11ax20MIMO	Ant1	5180	0.56	0.62	90.32
	Ant2	5180	0.56	0.62	90.32
11ax40MIMO	Ant1	5190	0.32	0.38	84.21
	Ant2	5190	0.32	0.38	84.21
11ax80MIMO	Ant1	5210	0.31	0.37	83.78
	Ant2	5210	0.31	0.37	83.78

Remark:

For WLAN 802.11a SISO mode, only select the antenna of power worst for test.

Test Result for AX Part RU

Test Mode	Antenna	Frequency[MHz]	Ru Size	Ru Index	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11ax20MIMO	Ant1	5220	26Tone	RU4	2.88	2.96	97.30
			52Tone	RU38	2.84	2.92	97.26
			106Tone	RU53	1.38	1.46	94.52
	Ant2	5220	26Tone	RU4	2.89	2.97	97.31
			52Tone	RU38	2.84	2.92	97.26
			106Tone	RU53	1.37	1.45	94.48
11ax40MIMO	Ant1	5190	242Tone	RU61	0.64	0.72	88.89
	Ant2	5190	242Tone	RU61	0.64	0.72	88.89
11ax80MIMO	Ant1	5210	484Tone	RU65	0.48	0.56	85.71
	Ant2	5210	484Tone	RU65	0.49	0.57	85.96



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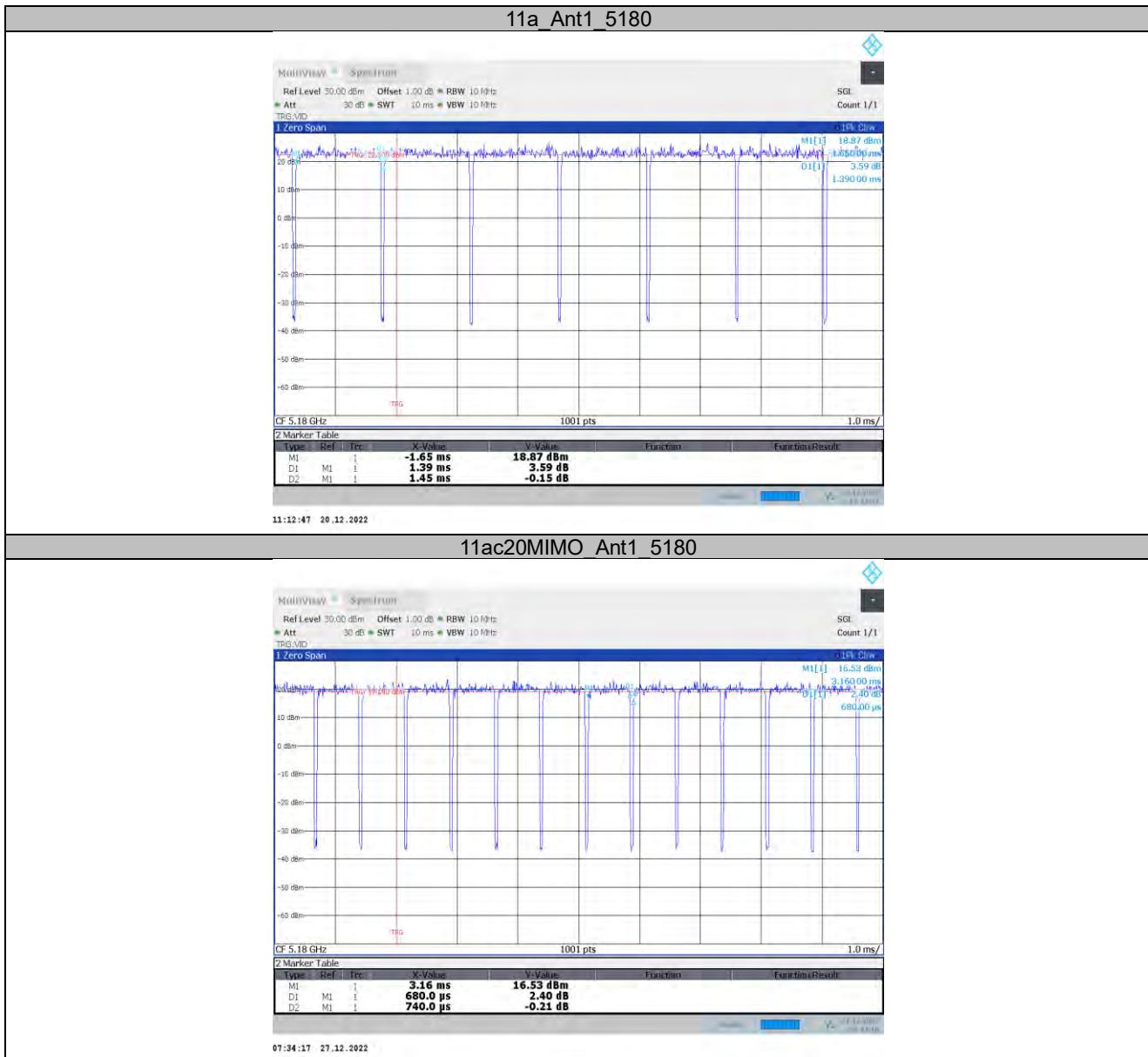
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Test Graphs



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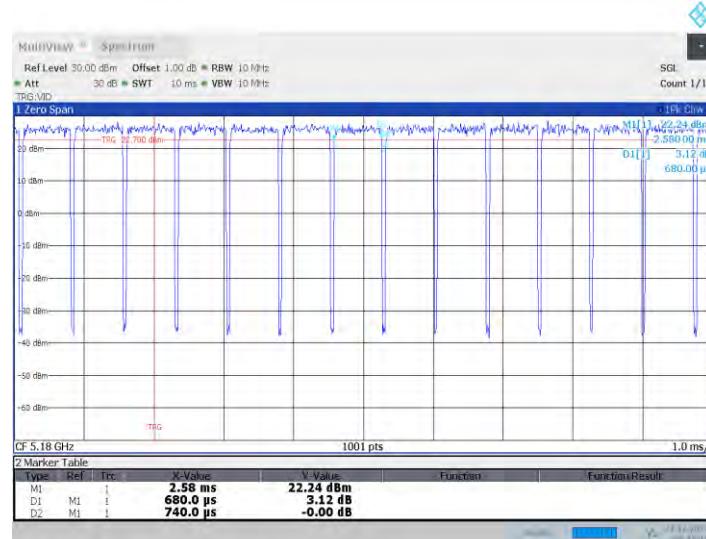
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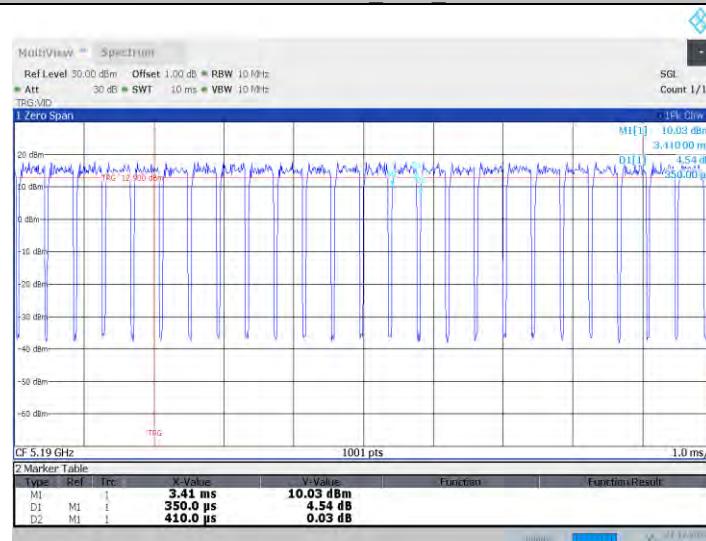
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11ac20MIMO_Ant2_5180



07:35:45 27.12.2022

11ac40MIMO_Ant1_5190



12:41:37 27.12.2022

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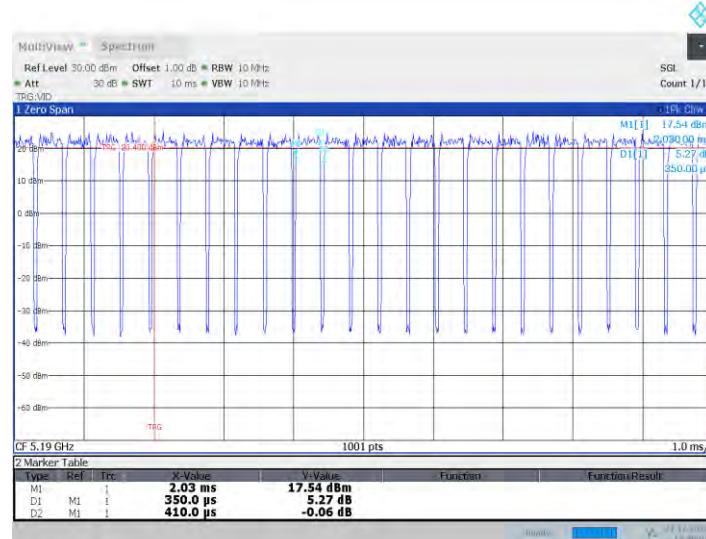
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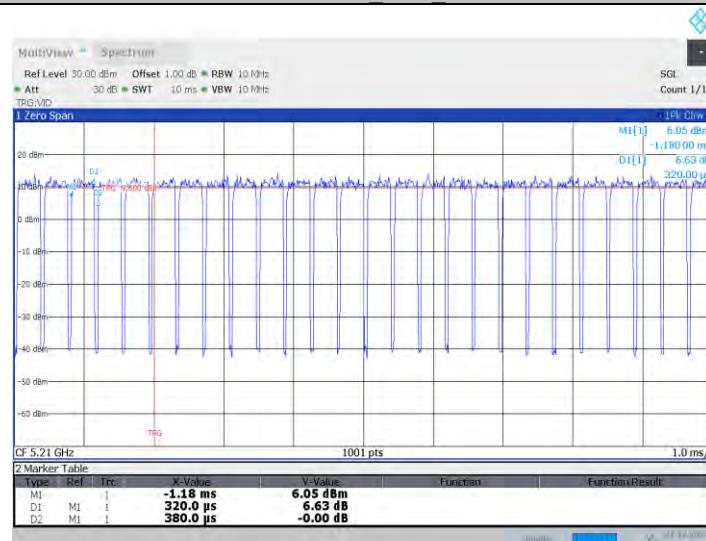
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11ac80MIMO_Ant1_5210



13:06:34 27.12.2022

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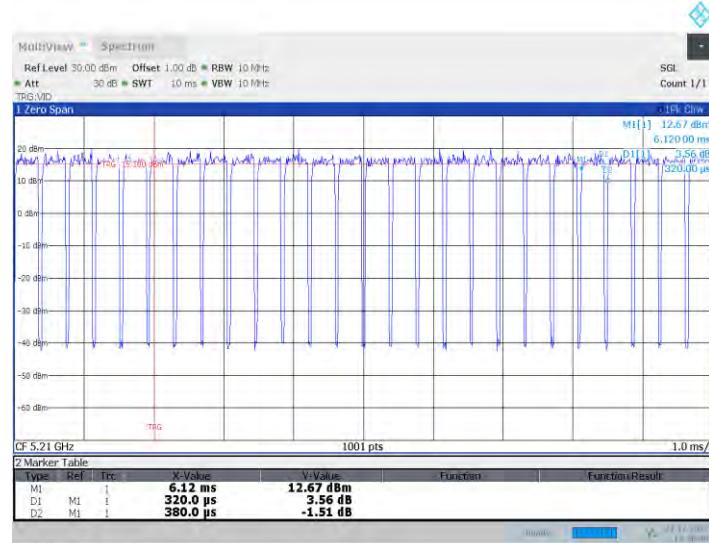
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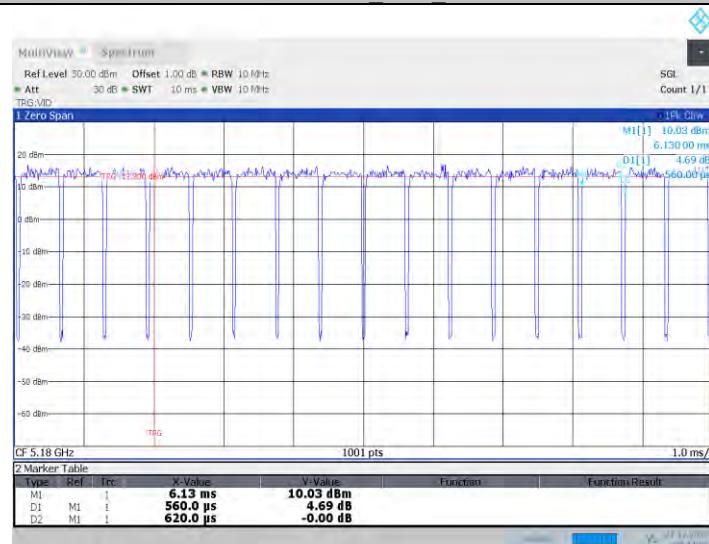
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13:18:29 27.12.2022

11ax20MIMO_Ant1_5180



08:44:55 27.12.2022

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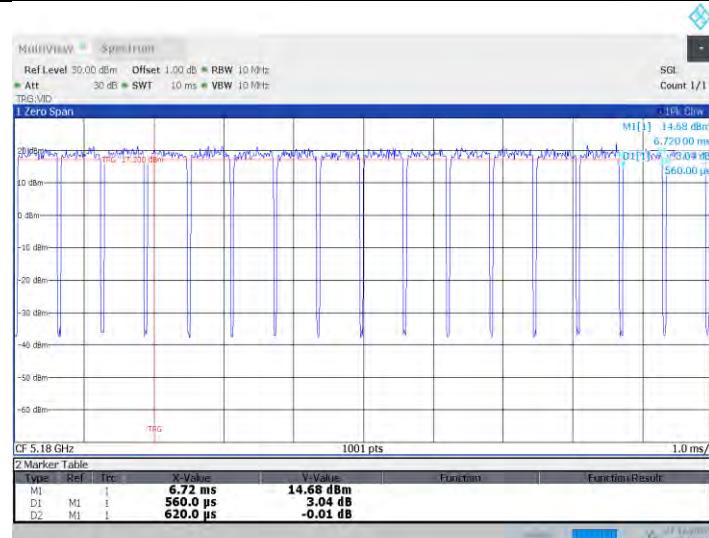
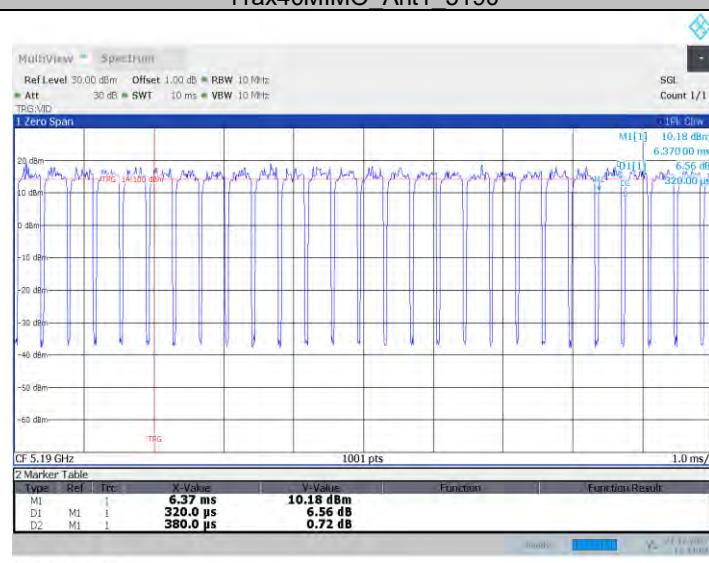


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