



3.6 POWER SPECTRAL DENSITY MEASUREMENT

3.6.1 LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT(FCC)

Operation Band	EUT Category		LIMIT
U-NII-1		Outdoor Access Point	17dBm/ MHz
		Fixed point-to-point Access Point	
		Indoor Access Point	
	√	Mobile and Portable client device	11dBm/ MHz
U-NII-2A	√		11dBm/ MHz
U-NII-2C	√		11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

Note:

Directional gain and the maximum output power limit:

Operation Band	Chain 0 Antenna Gain(dBi)	Chain 1 Antenna Gain(dBi)	DG For Power (dBi)	Power Limit Reduction
U-NII-1	5.3	5.3	8.31	2.31
U-NII-2A	4.4	4.4	7.41	1.41
U-NII-2C	3.0	3.0	6	0
U-NII-3	3.2	3.2	6.21	0.21

MIMO mode:

FCC KDB 662911 D01 Multiple Transmitter Output V02r01

For CDD transmissions, directional gain is calculated as

Directional Gain= GANT+ Array Gain, where Array Gain is as follows.

For power spectral density(PSD) measurements on all devices.

Array Gain=10 log(NANT/NSS=1)

For power measurements on IEEE802.11 devices,

Array Gain=0 dB (i.e, no array gain) for NANT<=4.

The directional gain "DG" is calculated as following table.



3.6.2 . LIMITS OF PEAK POWER SPECTRAL DENSITY MEASUREMENT(IC)

FREQUENCY BAND	LIMIT(dBm)
5.15 ~ 5.25GHz	EIRP spectral density shall not exceed 10 dBm in any 1.0 MHz band.
5.25 ~ 5.35GHz and 5.470 ~ 5.725GHz	Power spectral density shall not exceed 11 dBm in any 1.0 MHz band.
5.725~5825GHz	Power spectral density shall not exceed 30 dBm in any 500 kHz band.

Note:

Directional gain and the maximum output power limit:

Operation Band	Chain 0 Antenna Gain(dBi)	Chain 1 Antenna Gain(dBi)	DG For Power (dBi)	Power Limit Reduction
U-NII-1	5.3	5.3	8.31	2.31
U-NII-2A	4.4	4.4	7.41	1.41
U-NII-2C	3.0	3.0	6	0
U-NII-3	3.2	3.2	6.21	0.21

MIMO mode:

FCC KDB 662911 D01 Multiple Transmitter Output V02r01

For CDD transmissions, directional gain is calculated as

Directional Gain= GANT+ 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)

For power measurements on IEEE802.11 devices,

Array Gain=0 dB (i.e, no array gain) for NANT<=4.

The directional gain "DG" is calculated as following table.

3.6.3 TEST PROCEDURE

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-2

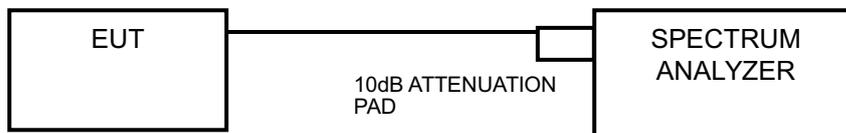
- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 1MHz, Set VBW =3 MHz, Detector = AV
- 3) Set Channel power measure = 1MHz
- 4) Sweep time = auto, trigger set to "free run".
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

Using method SA-2

- 1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
- 2) Set RBW = 300 kHz, Set VBW =1 MHz, Detector = AV
- 3) Set Channel power measure = 1MHz
- 4) Sweep time = auto, trigger set to "free run".
- 5) Trace average at least 100 traces in power averaging mode.
- 6) Record the max value and add 10 log (1/duty cycle)

3.6.4 TEST SETUP



3.6.5 TEST RESULT

Refer to Appendix E

3.7 FREQUENCY STABILITY

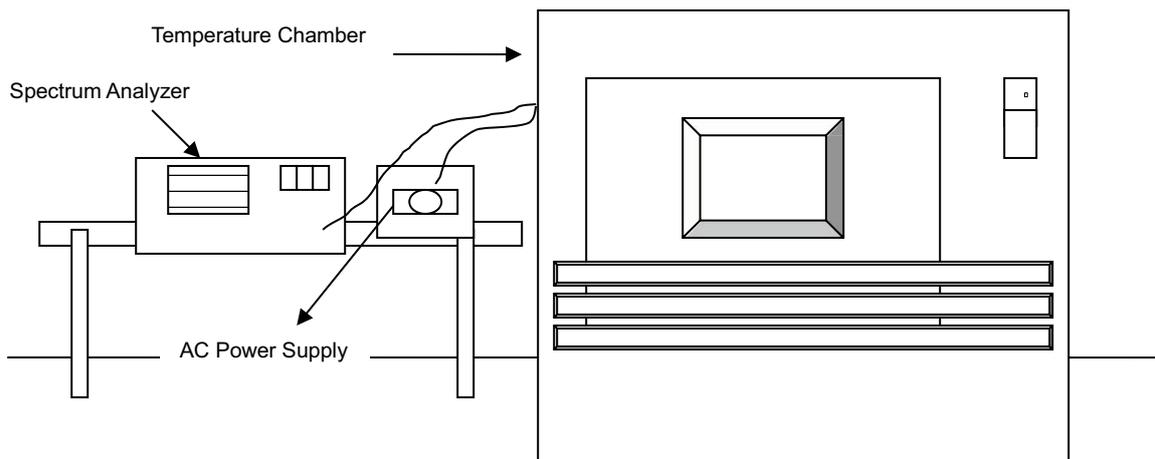
3.7.1 LIMITS OF FREQUENCY STABILITY

The frequency of the carrier signal shall be maintained within band of operation.

3.7.2 TEST PROCEDURES

- a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- b. Turn the EUT on and couple its output to a spectrum analyzer.
- c. Turn the EUT off and set the chamber to the highest temperature specified.
- d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
- e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

3.7.3 TEST SETUP





3.7.4 TEST RESULTS

Refer to Appendix F



4 PHOTOGRAPHS OF TEST SETUP

Please refer to the attached file (Test Setup Photo).



5 Appendix

5.1 Appendix A: 26DB EMISSION BANDWIDTH

5.1.1 Test Result

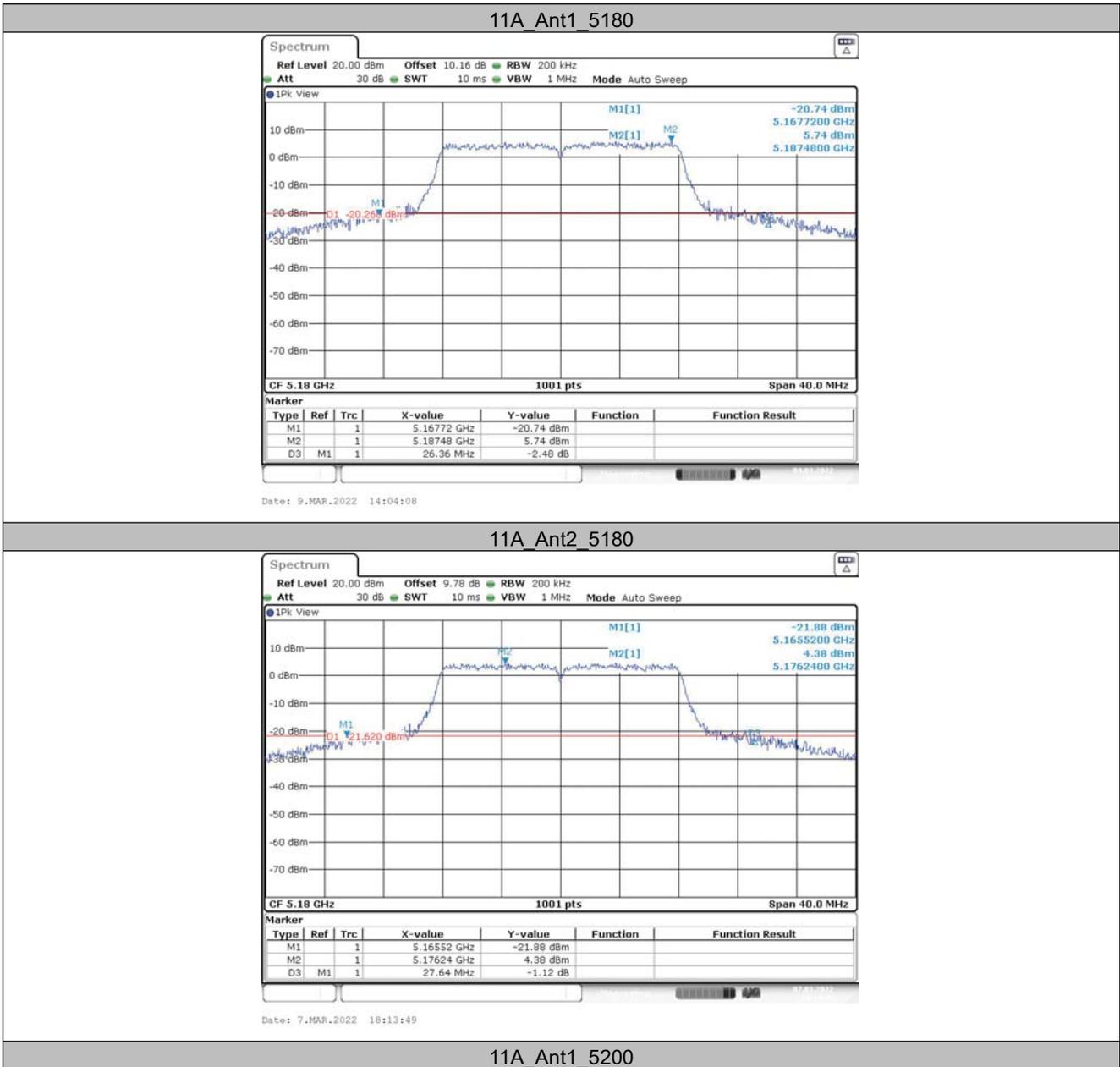
TestMode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	26.36	5167.72	5194.08	---	---
	Ant2	5180	27.64	5165.52	5193.16	---	---
	Ant1	5200	28.68	5184.84	5213.52	---	---
	Ant2	5200	29.40	5184.76	5214.16	---	---
	Ant1	5240	28.24	5224.92	5253.16	---	---
	Ant2	5240	27.84	5225.72	5253.56	---	---
	Ant1	5260	29.32	5245.40	5274.72	---	---
	Ant2	5260	28.72	5245.52	5274.24	---	---
	Ant1	5280	28.04	5265.52	5293.56	---	---
	Ant2	5280	26.56	5265.96	5292.52	---	---
	Ant1	5320	26.96	5305.52	5332.48	---	---
	Ant2	5320	28.76	5305.44	5334.20	---	---
	Ant1	5500	29.48	5484.64	5514.12	---	---
	Ant2	5500	26.96	5487.20	5514.16	---	---
	Ant1	5580	29.04	5565.08	5594.12	---	---
	Ant2	5580	29.16	5564.60	5593.76	---	---
	Ant1	5700	27.96	5685.52	5713.48	---	---
	Ant2	5700	27.08	5685.52	5712.60	---	---
	Ant1	5720	27.68	5704.92	5732.60	---	---
	Ant2	5720	27.72	5705.72	5733.44	---	---
	Ant1	5720_UNII-2C	20.08	5704.92	5725	---	---
	Ant2	5720_UNII-2C	19.28	5705.72	5725	---	---
	Ant1	5720_UNII-3	7.6	5725	5732.60	---	---
	Ant2	5720_UNII-3	8.44	5725	5733.44	---	---
	Ant1	5745	27.96	5731.20	5759.16	---	---
	Ant2	5745	27.32	5731.80	5759.12	---	---
	Ant1	5785	28.92	5770.16	5799.08	---	---
	Ant2	5785	26.72	5770.84	5797.56	---	---
	Ant1	5825	28.32	5810.00	5838.32	---	---
	Ant2	5825	28.52	5810.56	5839.08	---	---
11N20MIMO	Ant1	5180	28.52	5167.04	5195.56	---	---
	Ant2	5180	29.72	5165.72	5195.44	---	---
	Ant1	5200	31.32	5185.24	5216.56	---	---
	Ant2	5200	29.84	5184.64	5214.48	---	---
	Ant1	5240	29.40	5225.56	5254.96	---	---
	Ant2	5240	27.52	5225.96	5253.48	---	---
	Ant1	5260	29.36	5245.68	5275.04	---	---
	Ant2	5260	29.20	5245.72	5274.92	---	---
	Ant1	5280	28.12	5265.84	5293.96	---	---
	Ant2	5280	26.52	5266.16	5292.68	---	---
	Ant1	5320	28.28	5306.16	5334.44	---	---
	Ant2	5320	28.96	5306.16	5335.12	---	---
	Ant1	5500	28.92	5486.48	5515.40	---	---
	Ant2	5500	28.56	5486.40	5514.96	---	---
	Ant1	5580	30.16	5565.52	5595.68	---	---
	Ant2	5580	30.52	5565.16	5595.68	---	---
	Ant1	5700	28.40	5686.40	5714.80	---	---

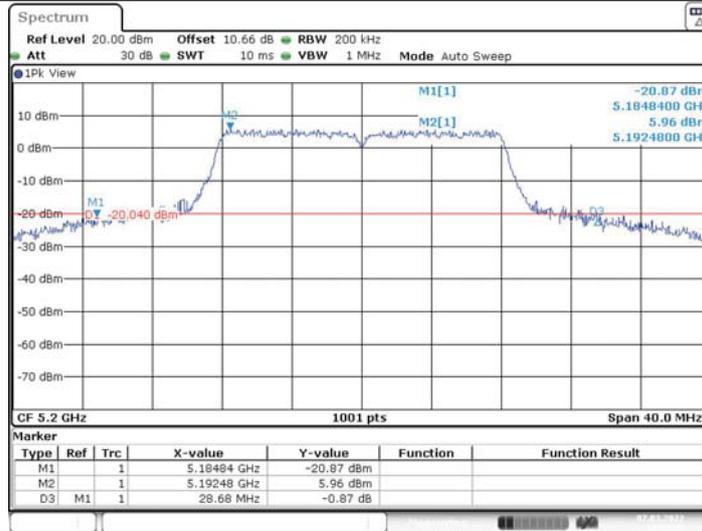


	Ant2	5700	29.72	5684.00	5713.72	---	---	
	Ant1	5720	29.96	5705.40	5735.36	---	---	
	Ant2	5720	29.96	5705.20	5735.16	---	---	
	Ant1	5720_UNII-2C	19.6	5705.40	5725	---	---	
	Ant2	5720_UNII-2C	19.8	5705.20	5725	---	---	
	Ant1	5720_UNII-3	10.36	5725	5735.36	---	---	
	Ant2	5720_UNII-3	10.16	5725	5735.16	---	---	
	Ant1	5745	26.80	5731.44	5758.24	---	---	
	Ant2	5745	26.68	5732.04	5758.72	---	---	
	Ant1	5785	29.00	5771.40	5800.40	---	---	
	Ant2	5785	28.24	5770.80	5799.04	---	---	
	Ant1	5825	30.72	5808.96	5839.68	---	---	
	Ant2	5825	27.76	5810.80	5838.56	---	---	
	11N40MIMO	Ant1	5190	60.24	5158.56	5218.80	---	---
Ant2		5190	54.08	5164.40	5218.48	---	---	
Ant1		5230	59.68	5201.28	5260.96	---	---	
Ant2		5230	53.92	5196.40	5250.32	---	---	
Ant1		5270	57.44	5242.00	5299.44	---	---	
Ant2		5270	50.24	5240.24	5290.48	---	---	
Ant1		5310	58.72	5278.32	5337.04	---	---	
Ant2		5310	49.92	5289.12	5339.04	---	---	
Ant1		5510	60.96	5476.00	5536.96	---	---	
Ant2		5510	48.64	5490.16	5538.80	---	---	
Ant1		5550	60.56	5520.40	5580.96	---	---	
Ant2		5550	49.60	5520.24	5569.84	---	---	
Ant1		5670	60.24	5640.40	5700.64	---	---	
Ant2		5670	50.80	5650.48	5701.28	---	---	
Ant1		5710	58.64	5682.08	5740.72	---	---	
Ant2		5710	47.36	5681.84	5729.20	---	---	
Ant1		5710_UNII-2C	42.92	5682.08	5725	---	---	
Ant2		5710_UNII-2C	43.16	5681.84	5725	---	---	
Ant1		5710_UNII-3	15.72	5725	5740.72	---	---	
Ant2		5710_UNII-3	4.2	5725	5729.20	---	---	
Ant1		5755	60.16	5725.80	5785.96	---	---	
Ant2		5755	52.08	5729.16	5781.24	---	---	
Ant1		5795	59.28	5764.92	5824.20	---	---	
Ant2		5795	52.72	5768.76	5821.48	---	---	
11AC80MIMO		Ant1	5210	88.80	5165.20	5254.00	---	---
		Ant2	5210	84.32	5168.56	5252.88	---	---
		Ant1	5290	93.60	5241.36	5334.96	---	---
		Ant2	5290	87.52	5245.36	5332.88	---	---
	Ant1	5530	88.64	5486.64	5575.28	---	---	
	Ant2	5530	84.32	5488.88	5573.20	---	---	
	Ant1	5610	94.24	5565.20	5659.44	---	---	
	Ant2	5610	87.20	5565.84	5653.04	---	---	
	Ant1	5690	90.56	5645.84	5736.40	---	---	
	Ant2	5690	88.16	5647.12	5735.28	---	---	
	Ant1	5690_UNII-2C	79.16	5645.84	5725	---	---	
	Ant2	5690_UNII-2C	77.88	5647.12	5725	---	---	
	Ant1	5690_UNII-3	11.4	5725	5736.40	---	---	
	Ant2	5690_UNII-3	10.28	5725	5735.28	---	---	
	Ant1	5775	89.92	5730.04	5819.96	---	---	
	Ant2	5775	83.36	5734.20	5817.56	---	---	



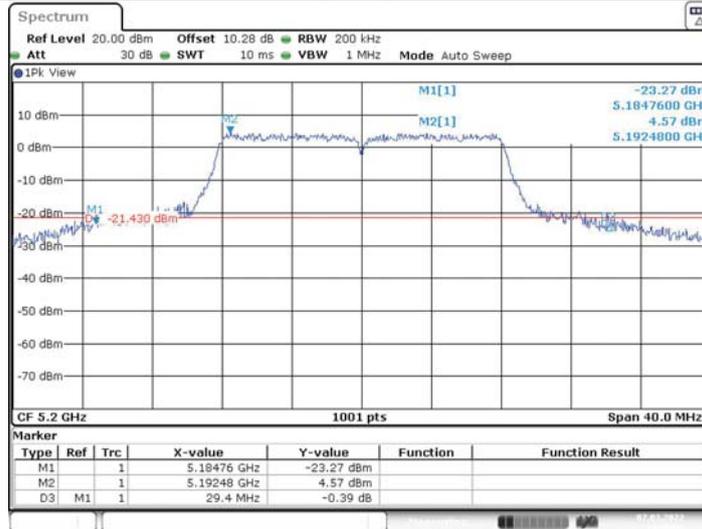
5.1.2 Test Graphs





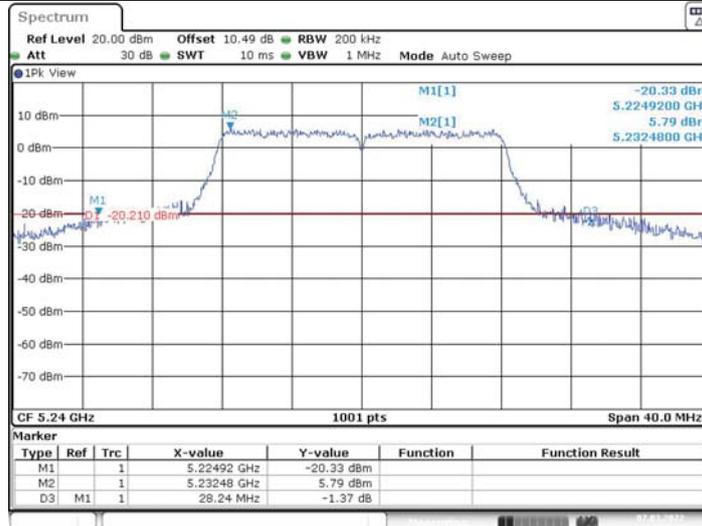
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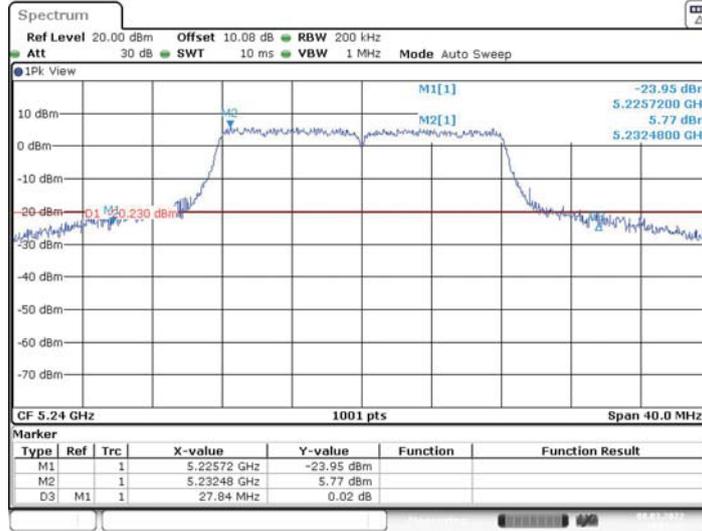
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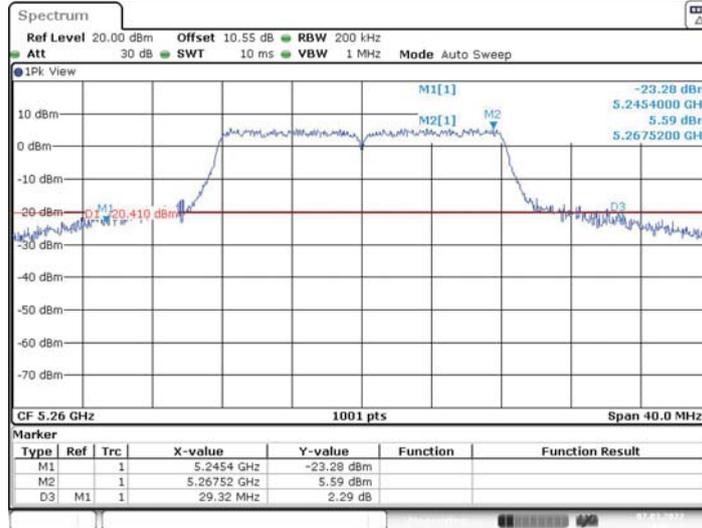


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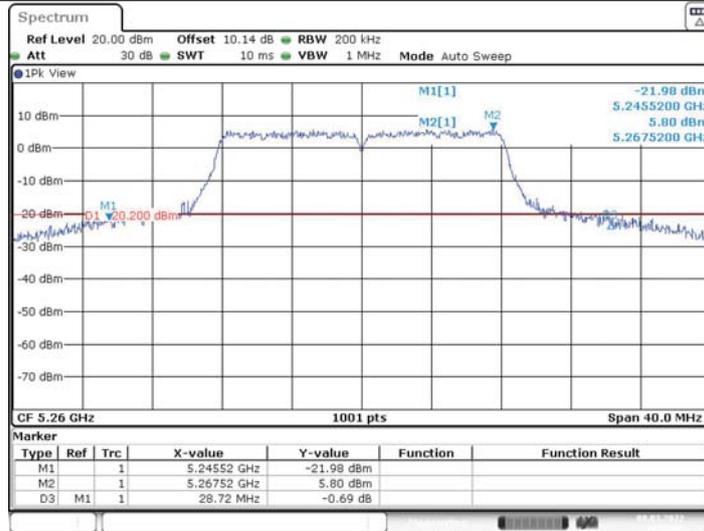
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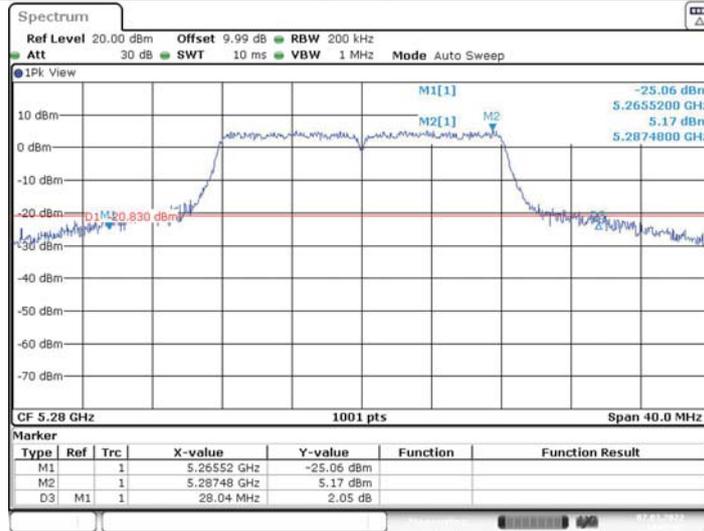
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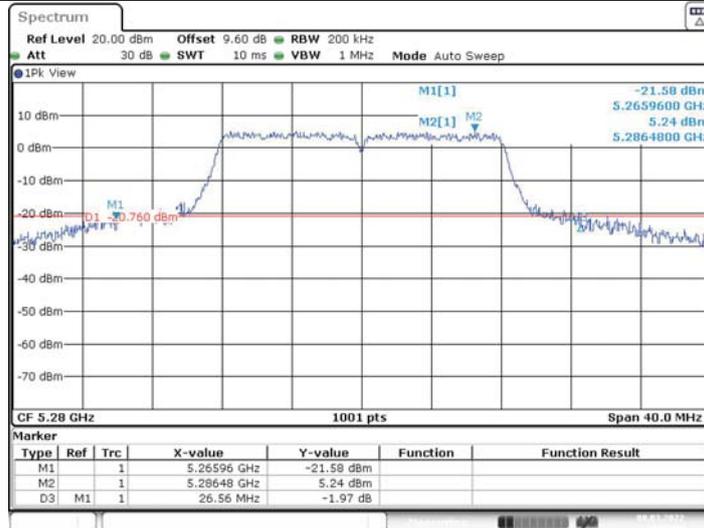
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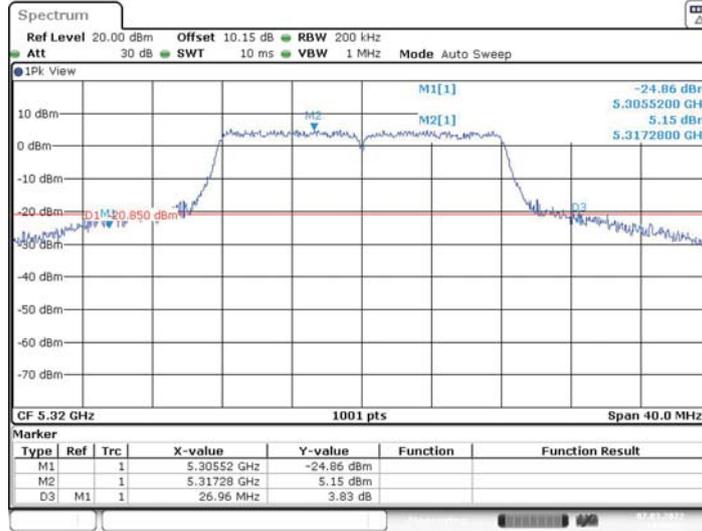
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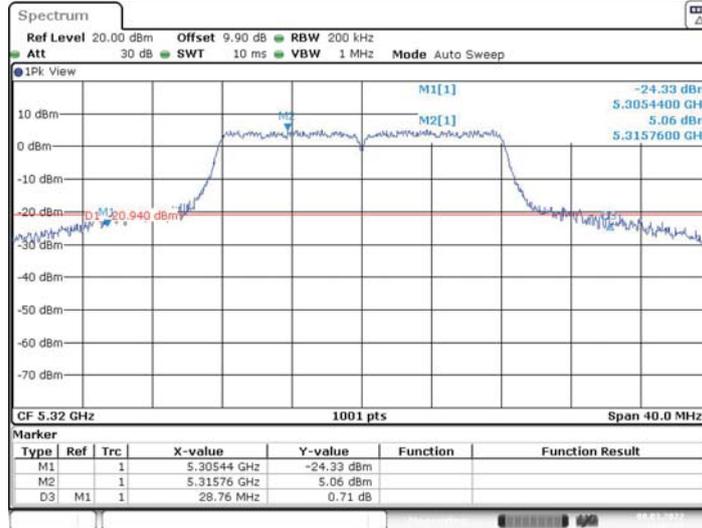


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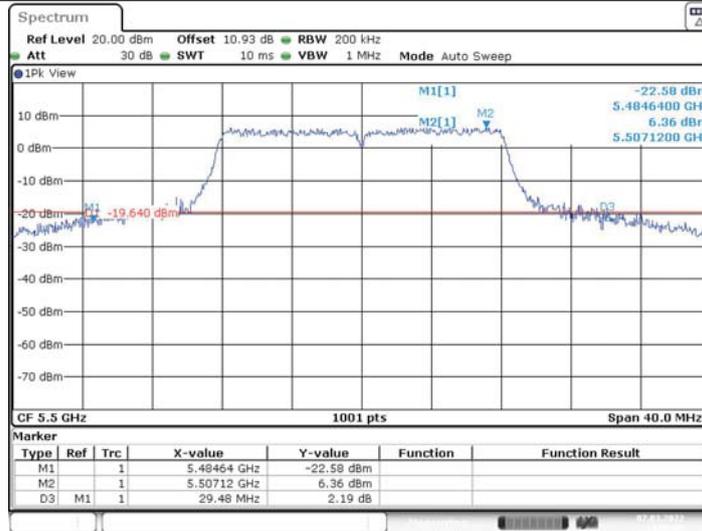
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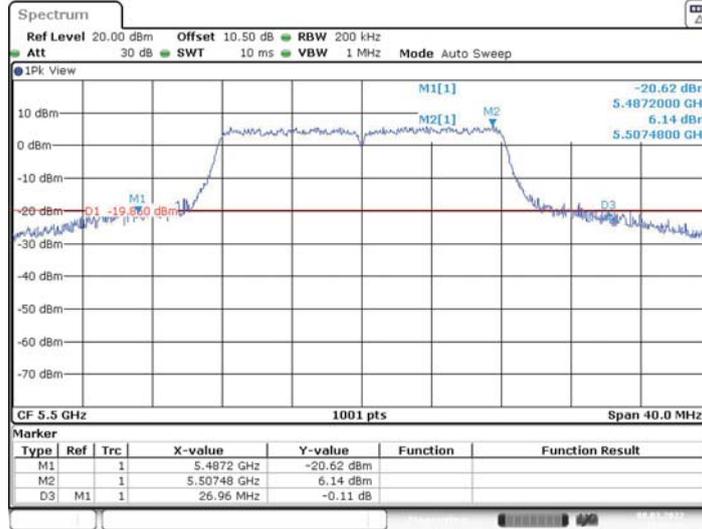
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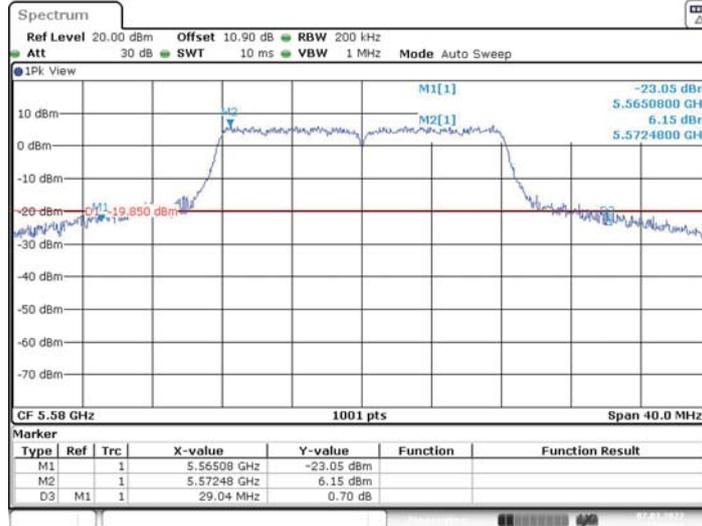
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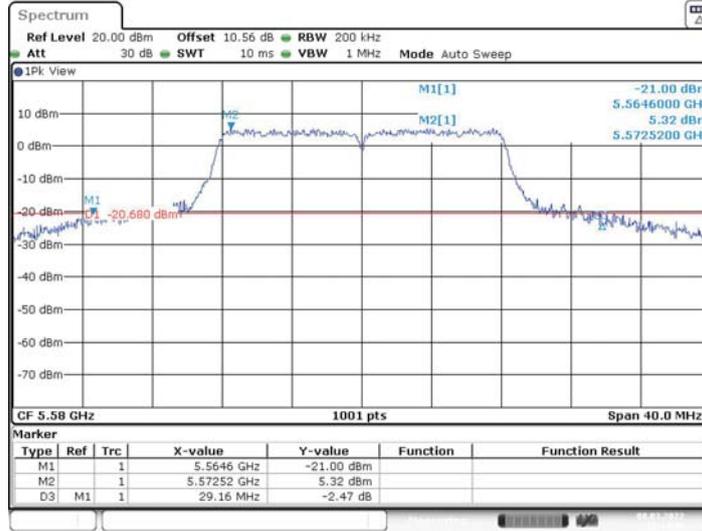
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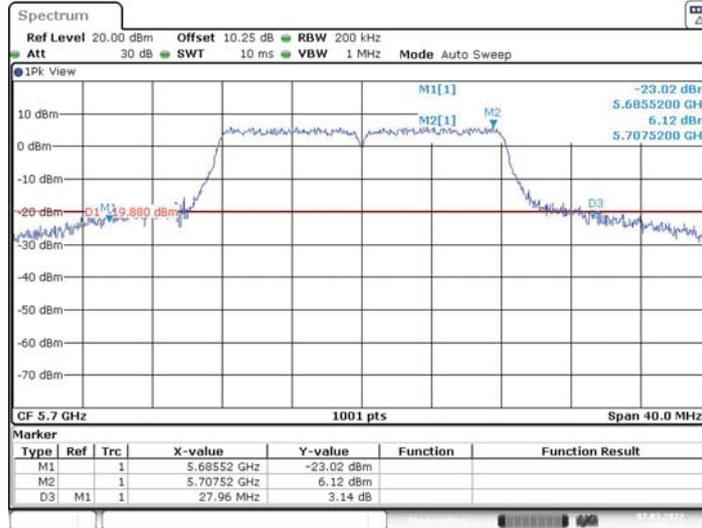


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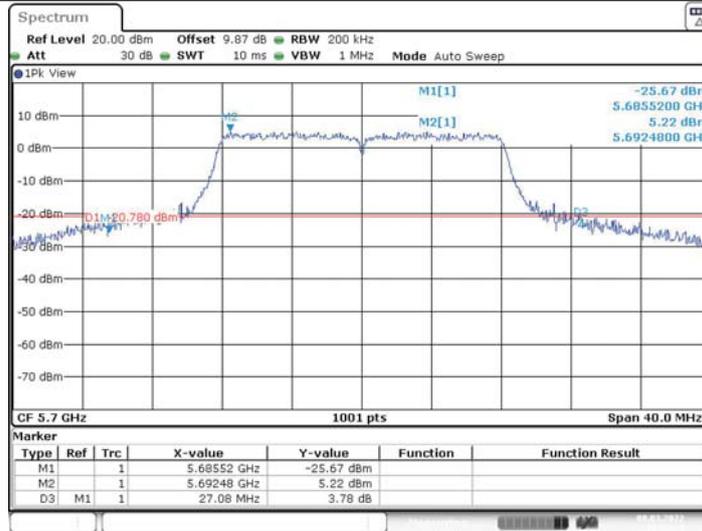
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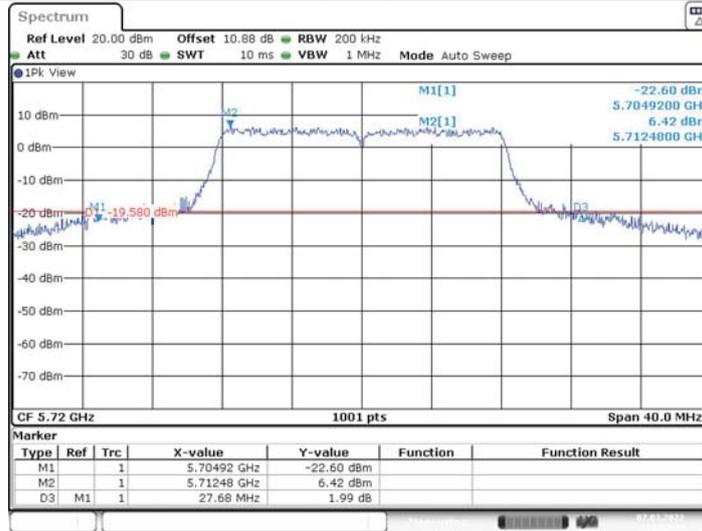
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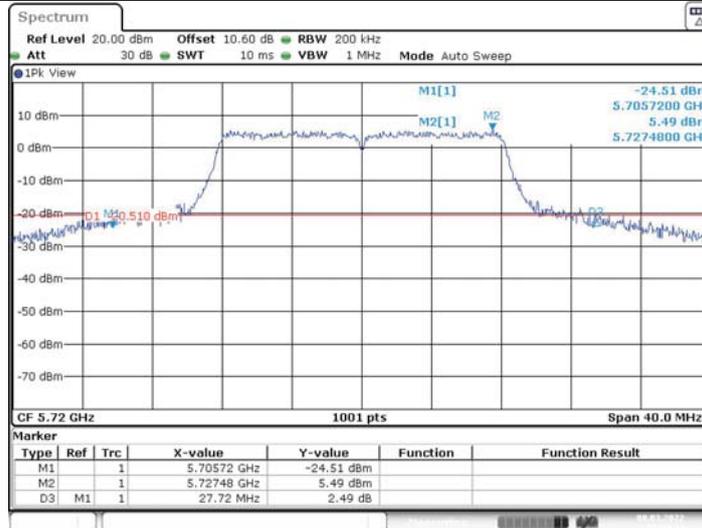
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11A Ant1 5720



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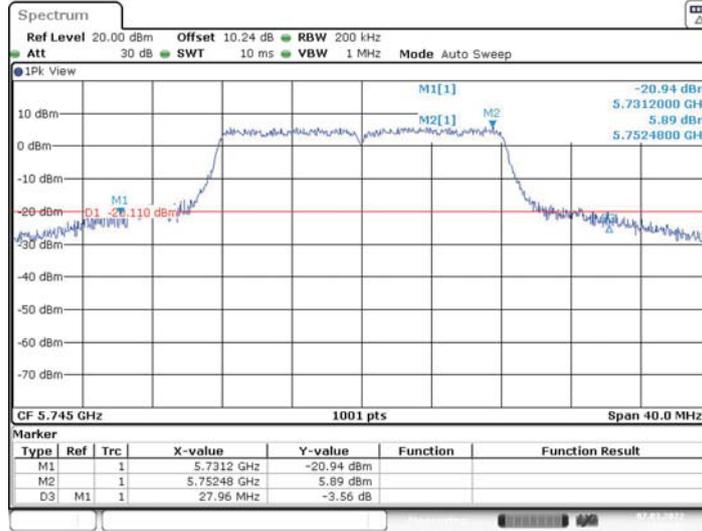
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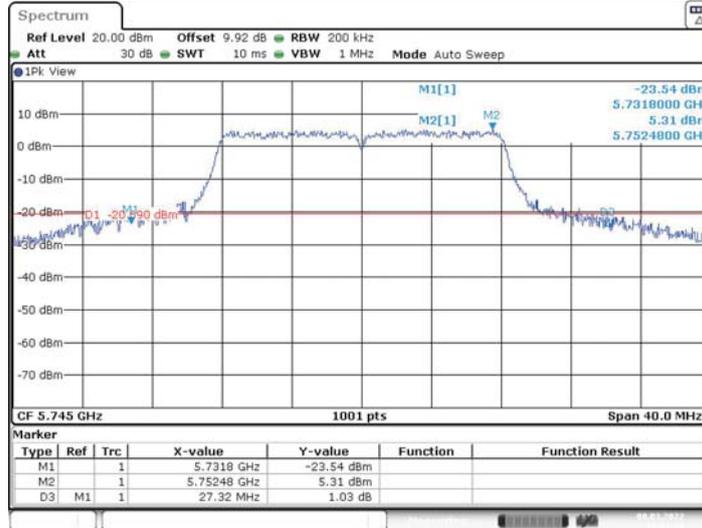


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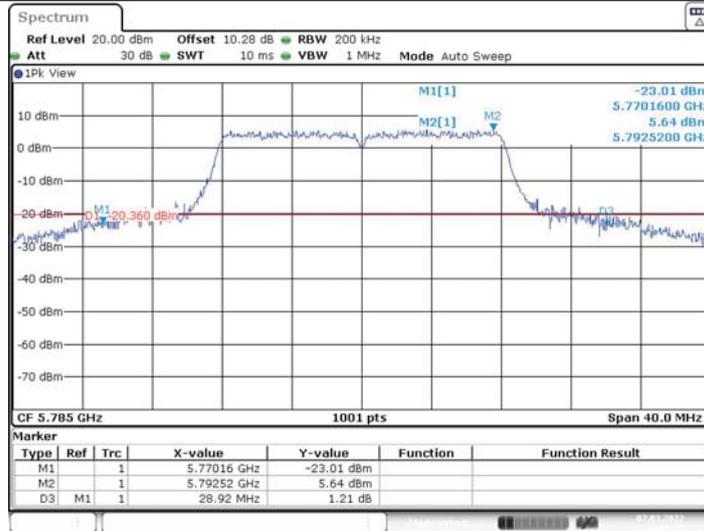
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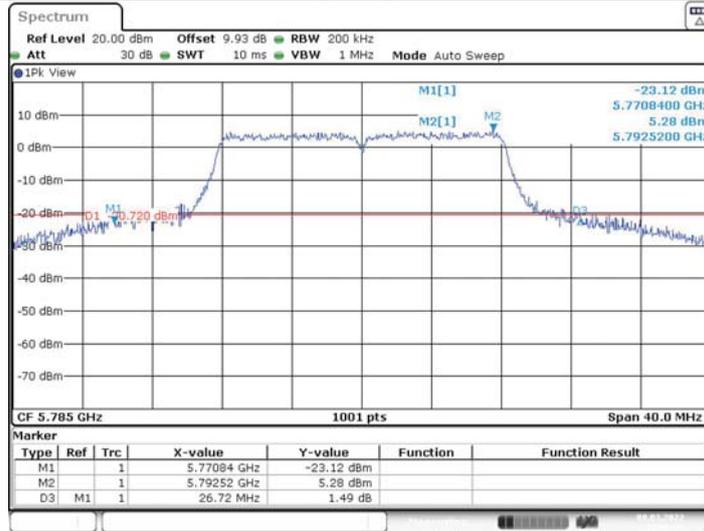
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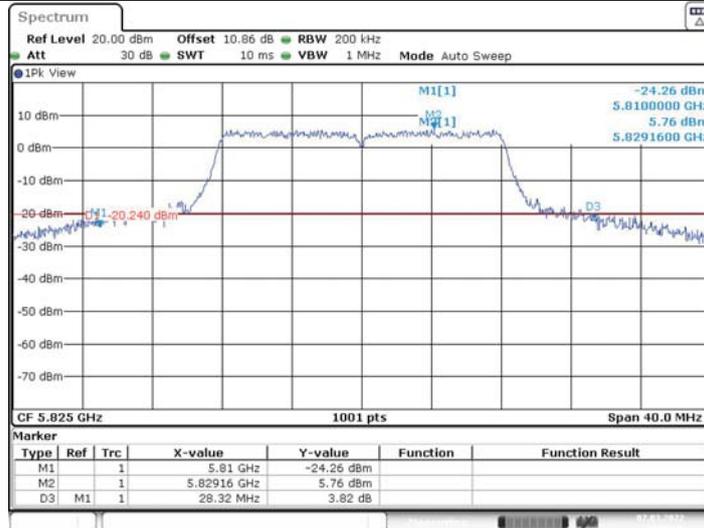
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11A Ant2 5785



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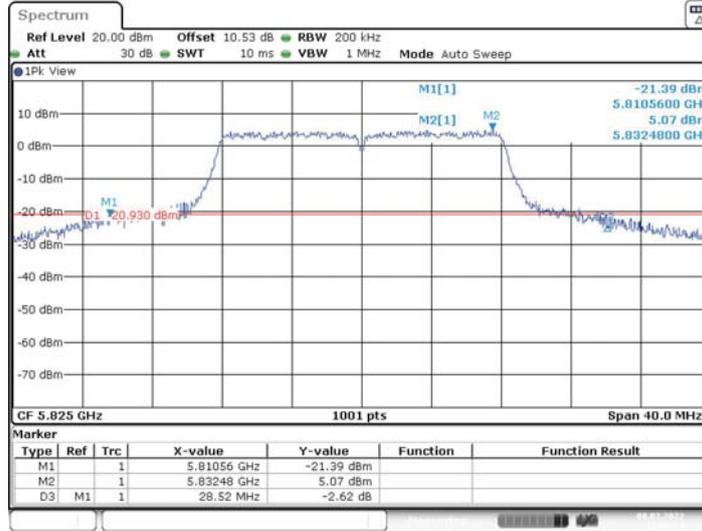
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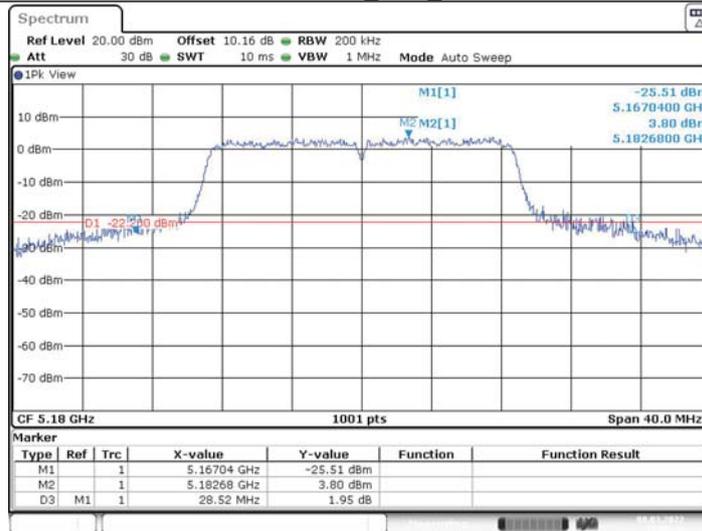
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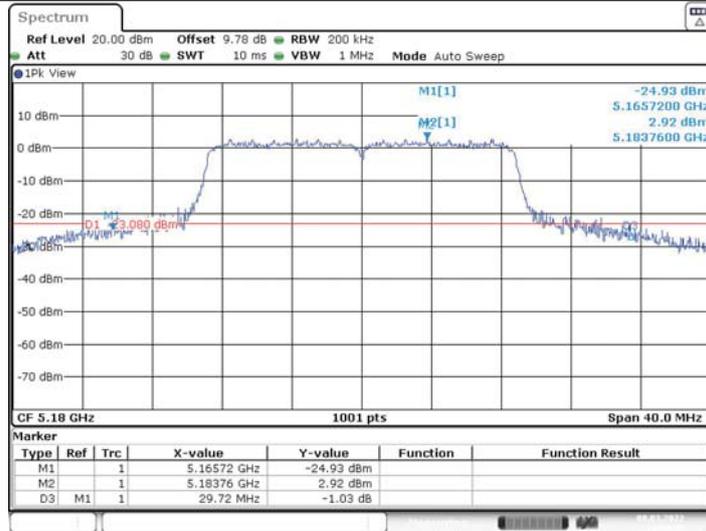
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11N20MIMO_Ant1_5180

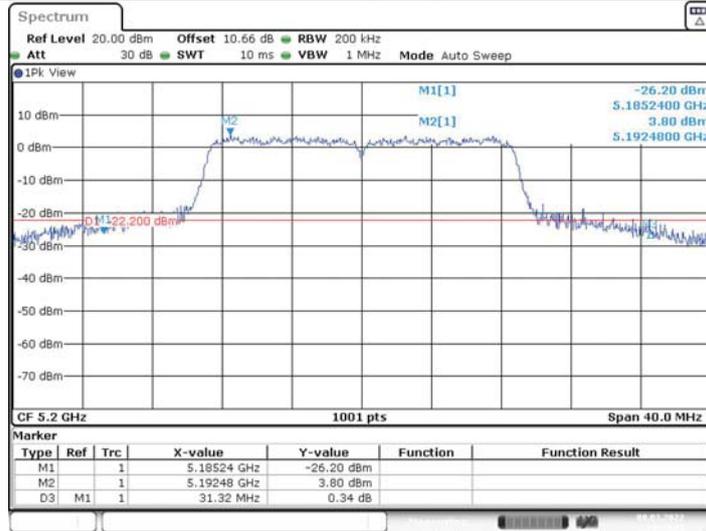


11N20MIMO_Ant2_5180



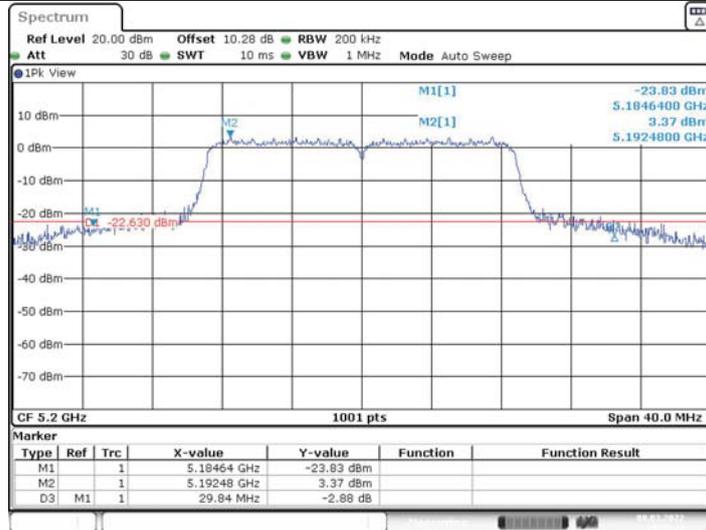
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11N20MIMO_Ant1_5200



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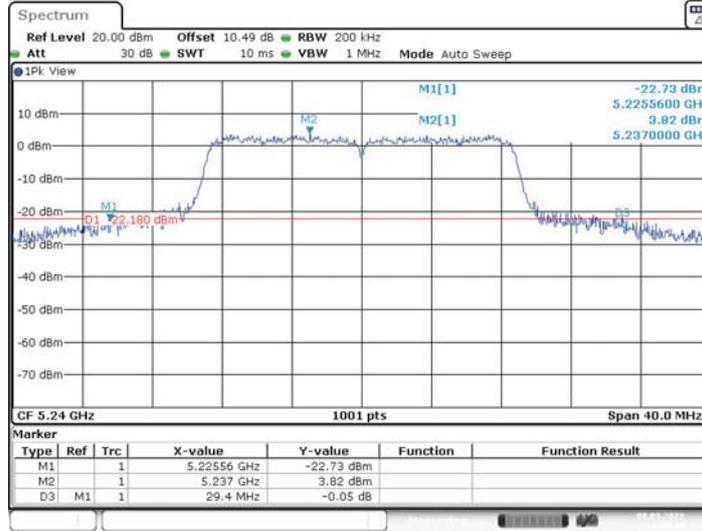
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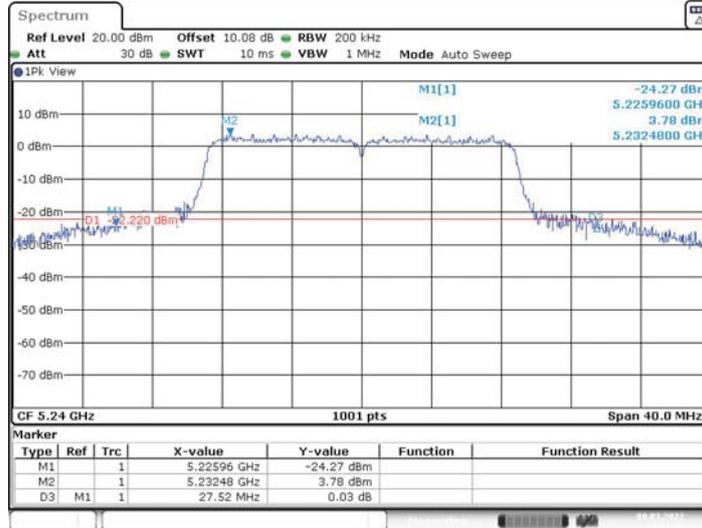


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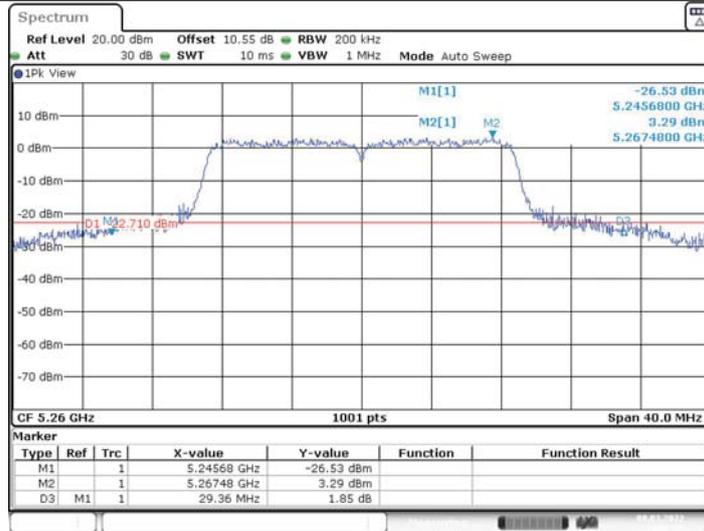
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11N20MIMO_Ant2_5240



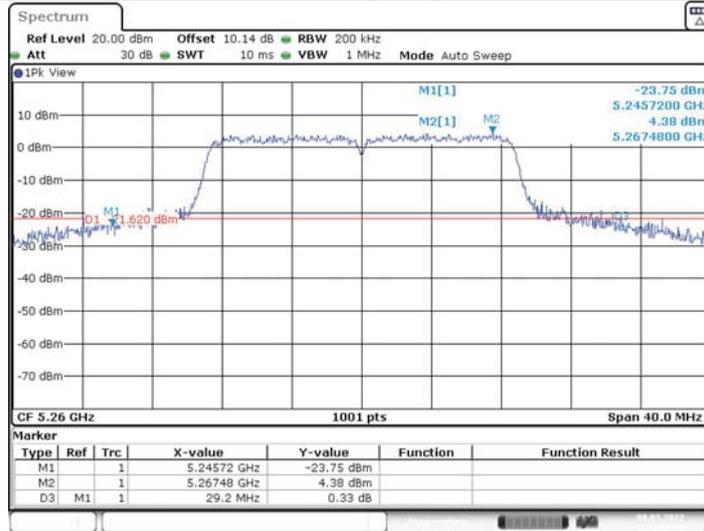
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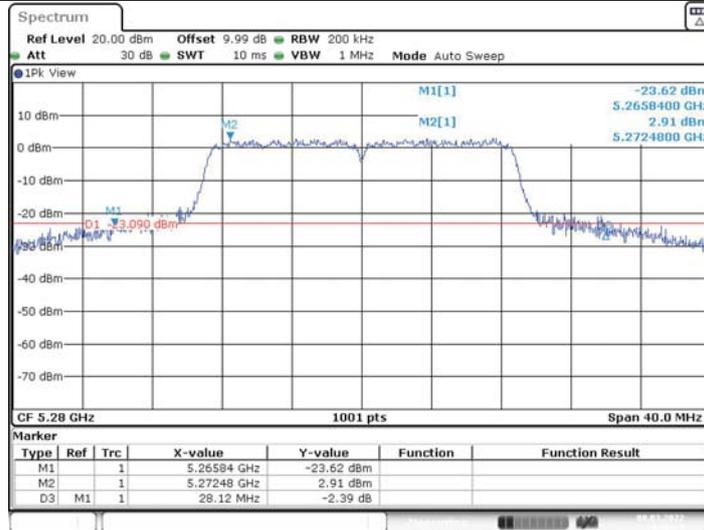
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11N20MIMO_Ant2_5260



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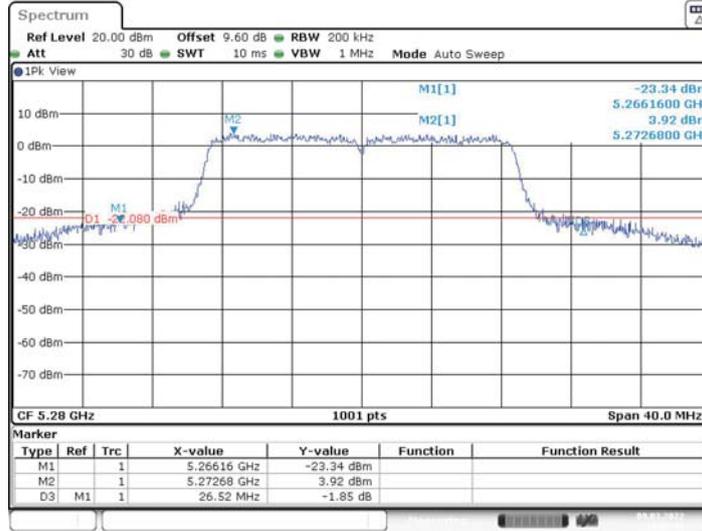
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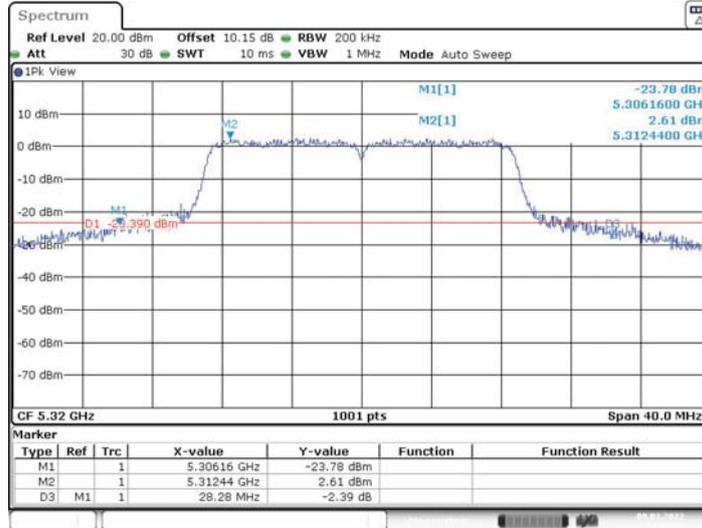


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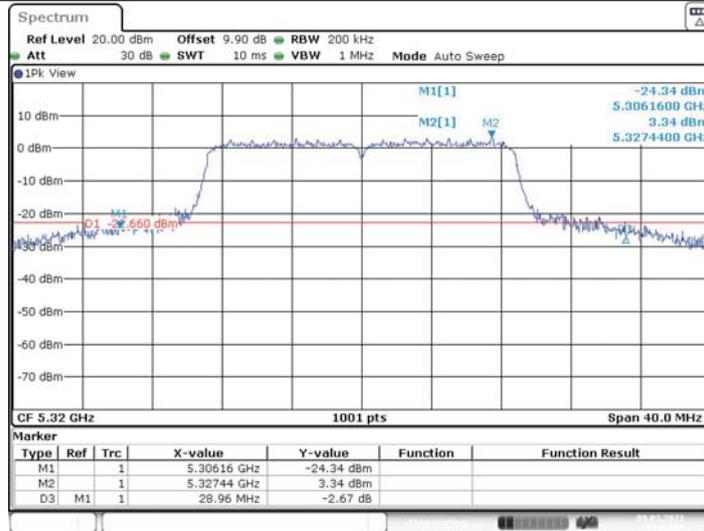
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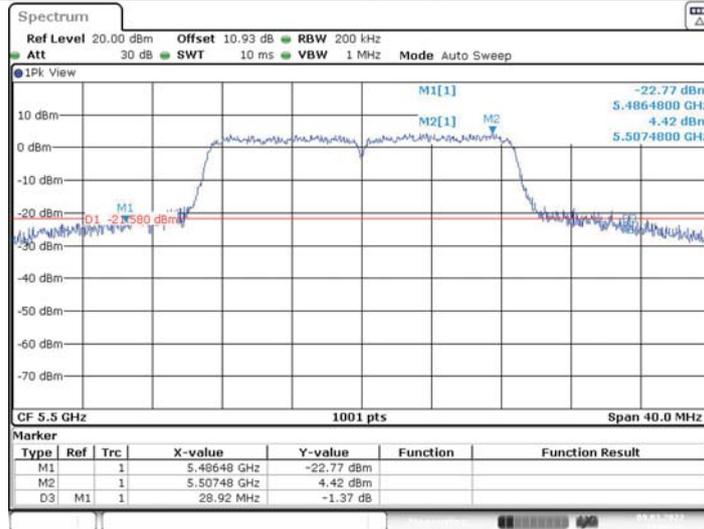
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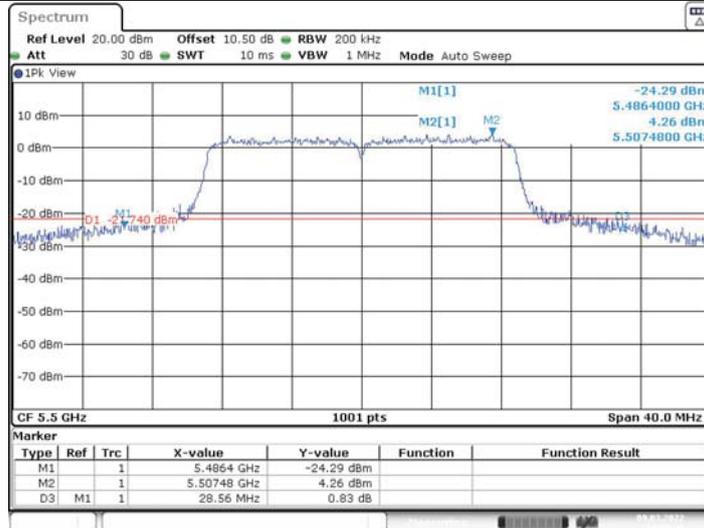
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11N20MIMO_Ant1_5500



Date: 9.MAR.2022 17:59:21

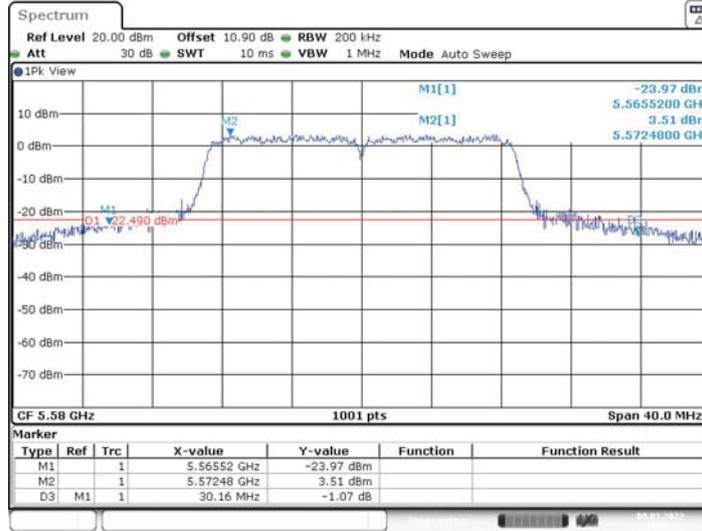
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Date: 9.MAR.2022 18:09:38

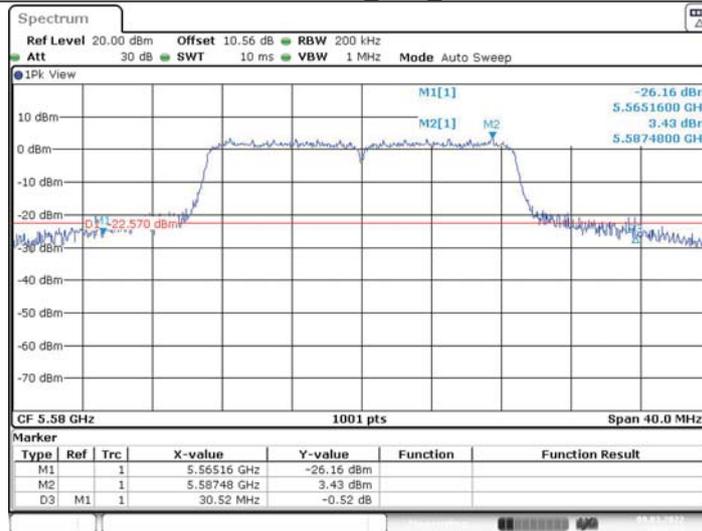


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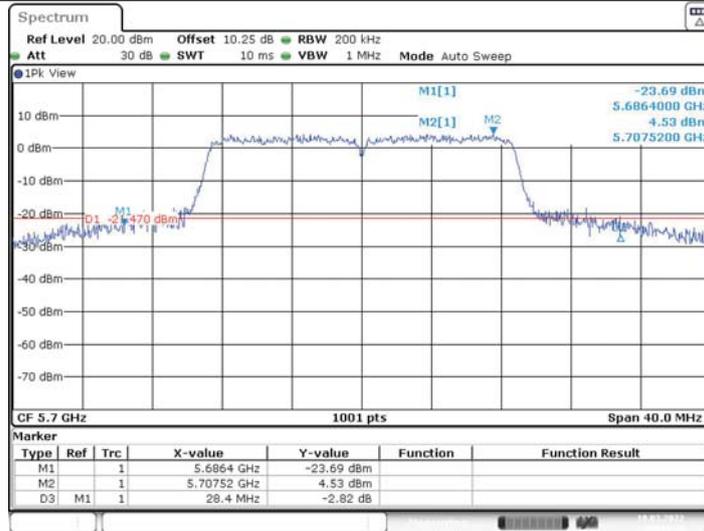
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11N20MIMO_Ant2_5580



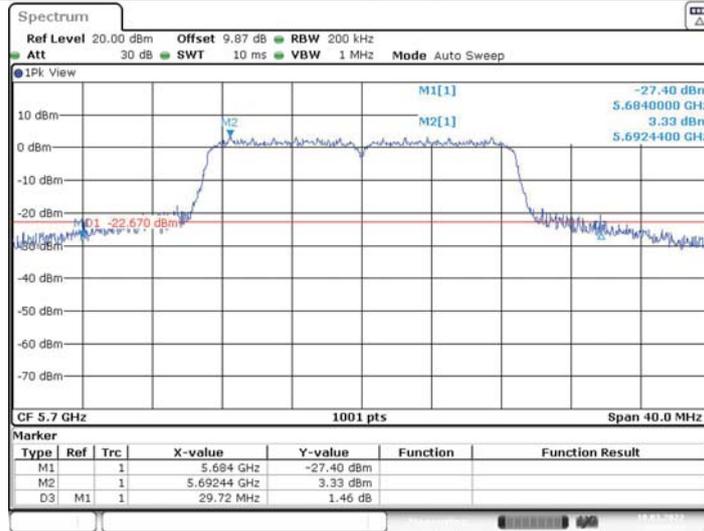
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11N20MIMO_Ant1_5700



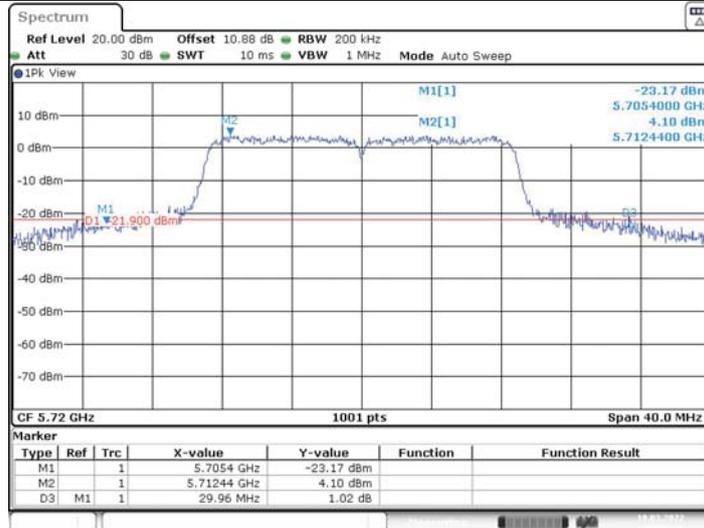
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11N20MIMO_Ant2_5700



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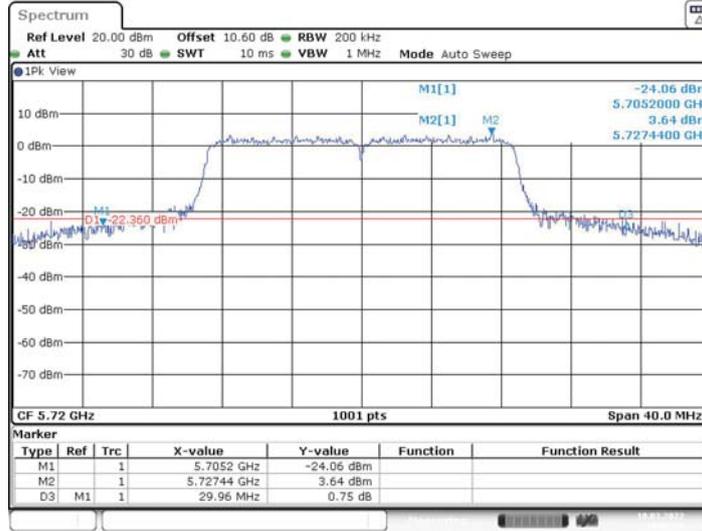
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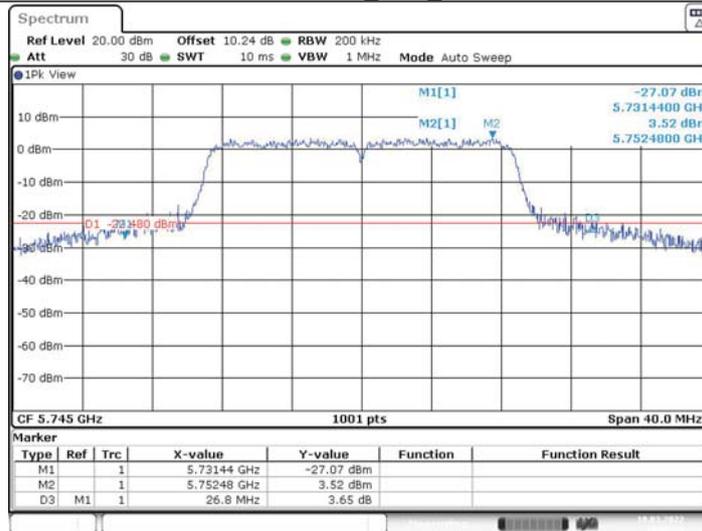
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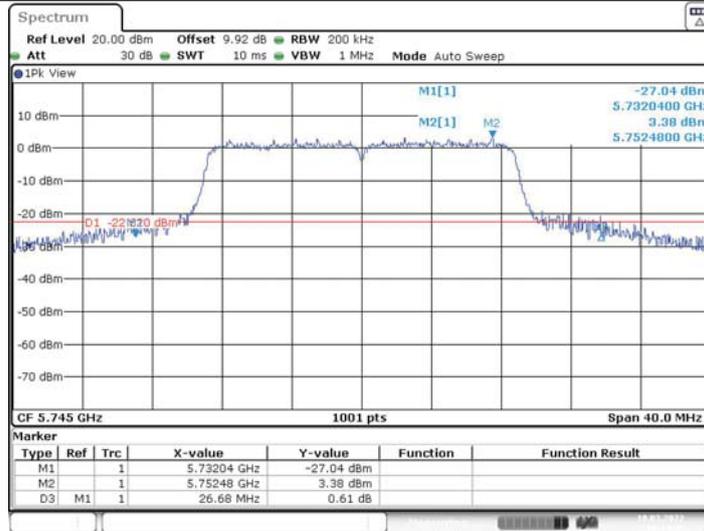
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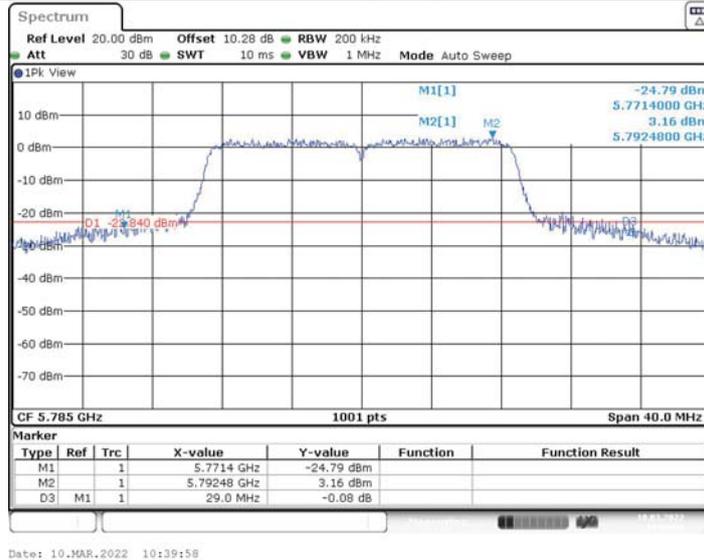
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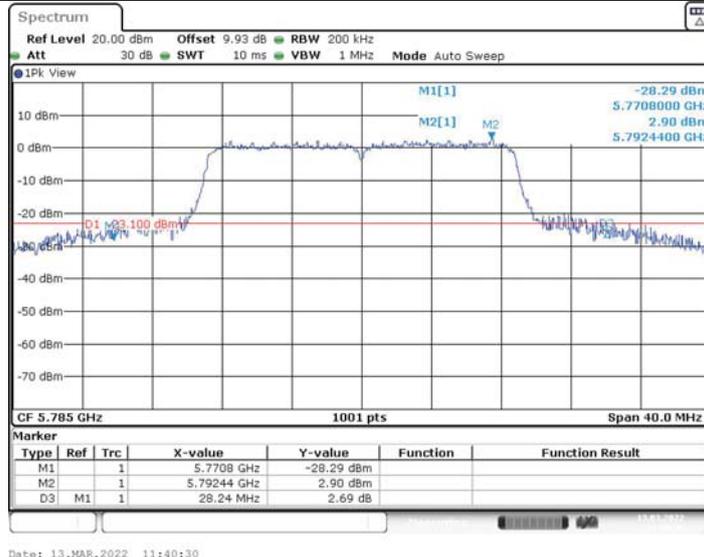
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11N20MIMO_Ant1_5785

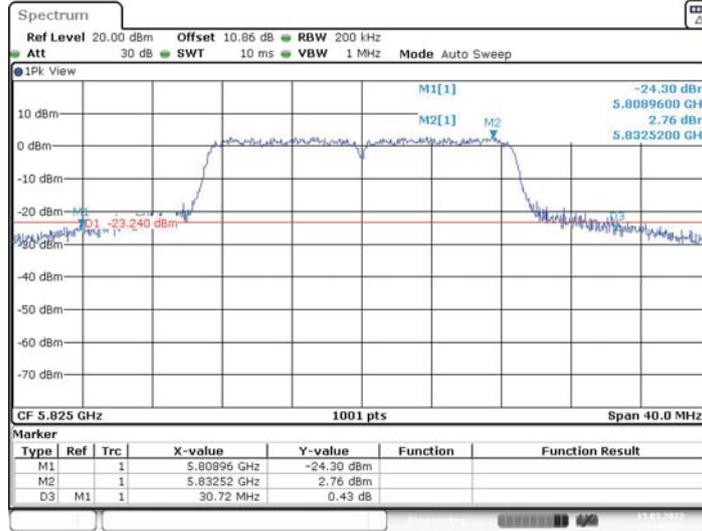


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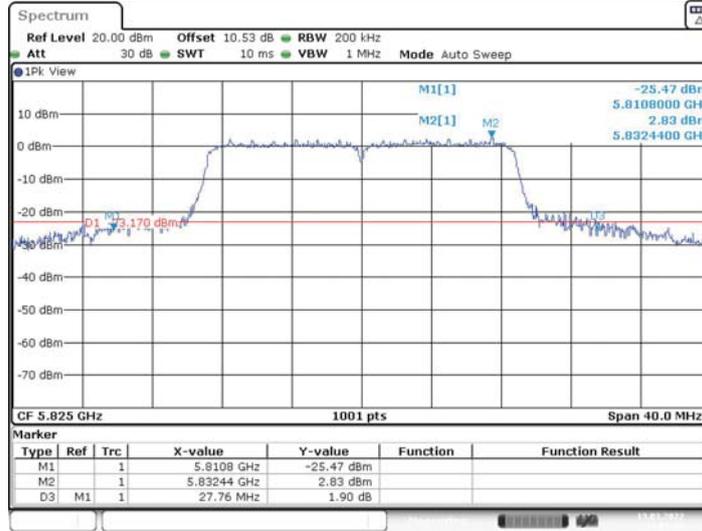




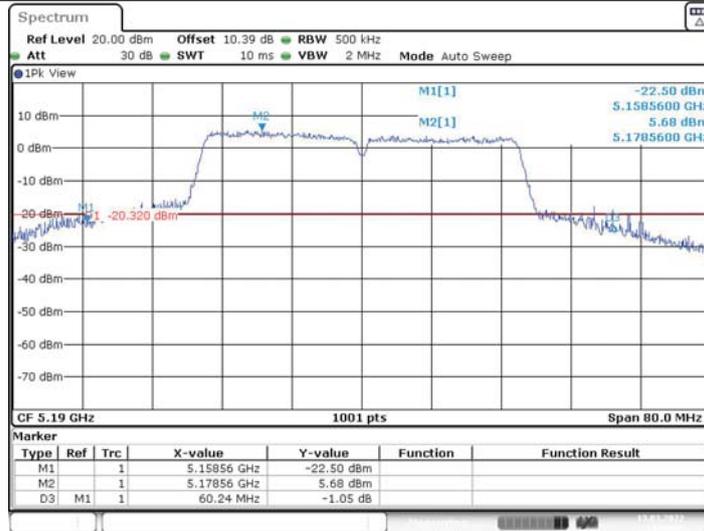
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11N20MIMO_Ant2_5825

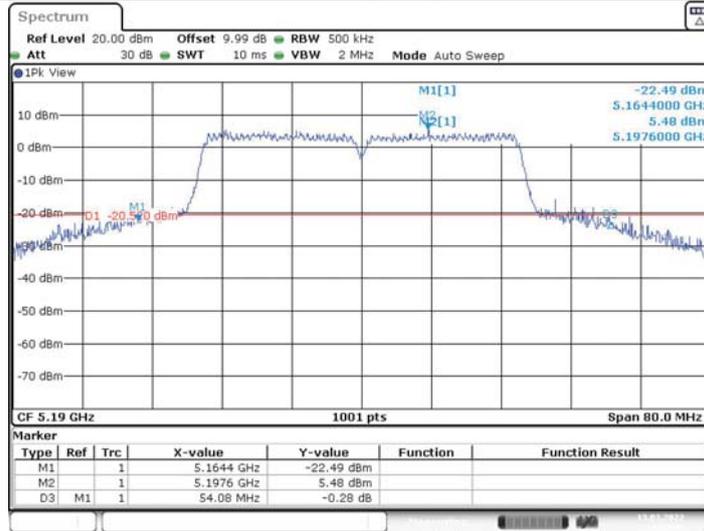


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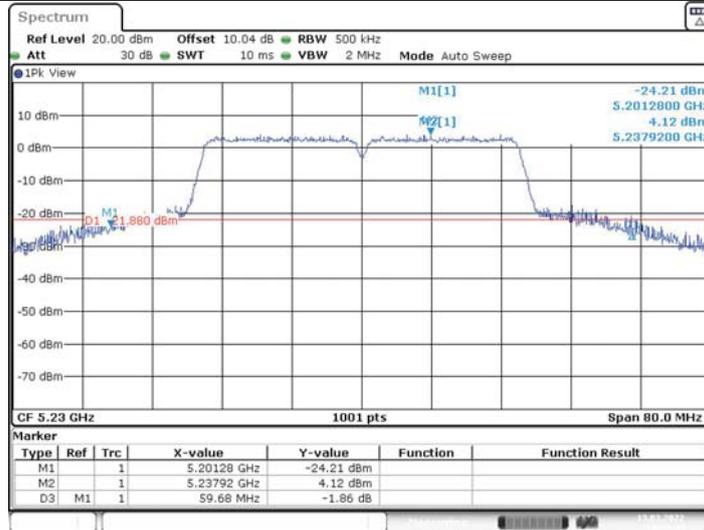
Date: 13.MAR.2022 14:09:10

11N40MIMO_Ant2_5190



Date: 13.MAR.2022 14:10:46

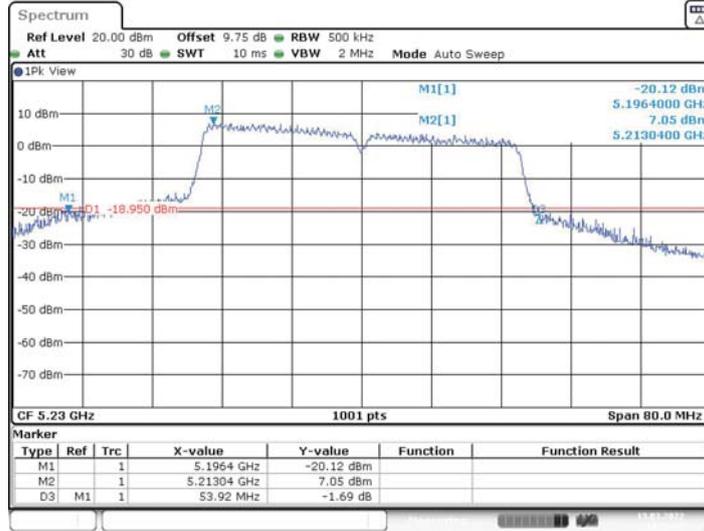
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Date: 13.MAR.2022 14:14:14

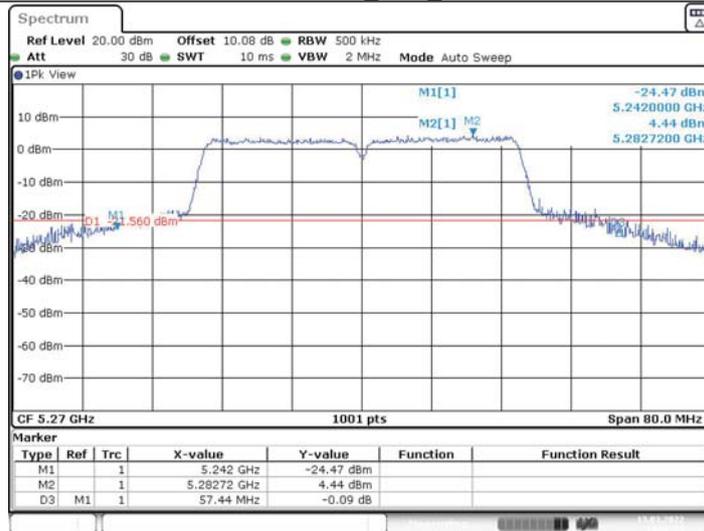


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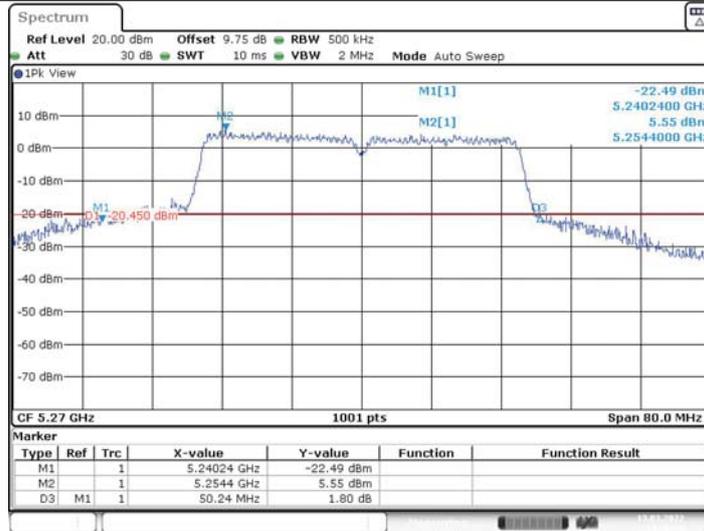
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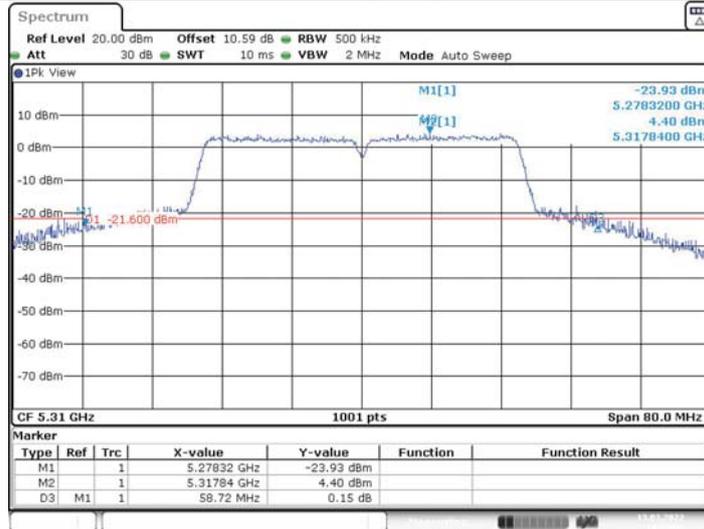
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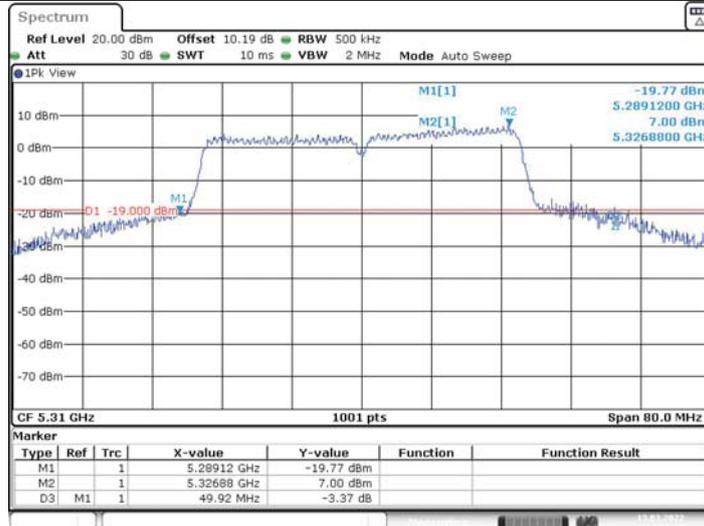
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11N40MIMO_Ant1_5310



Date: 13.MAR.2022 14:20:09

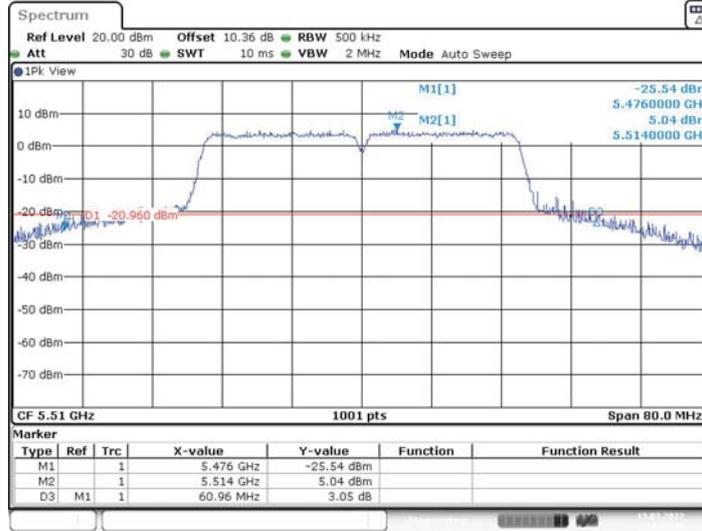
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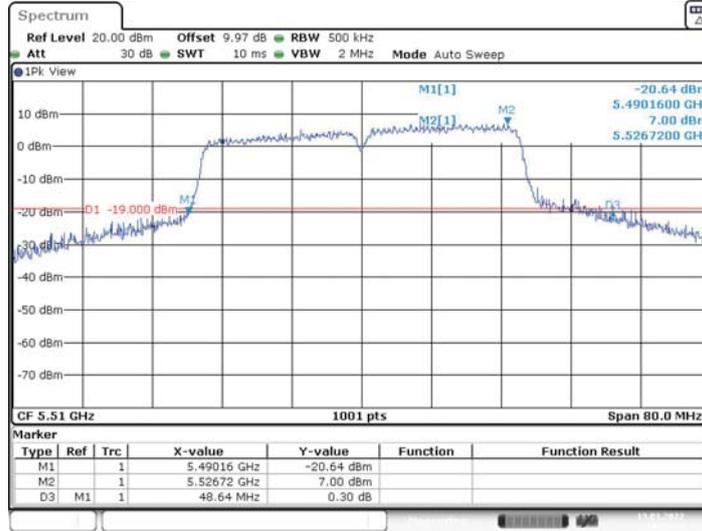
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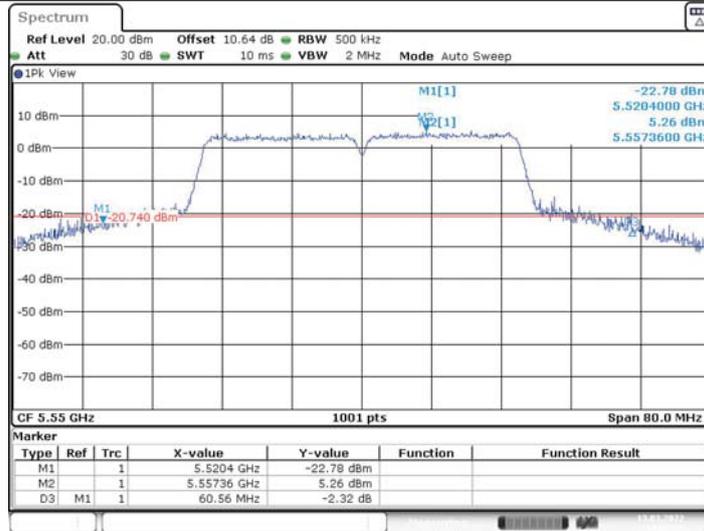
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11N40MIMO_Ant2_5510

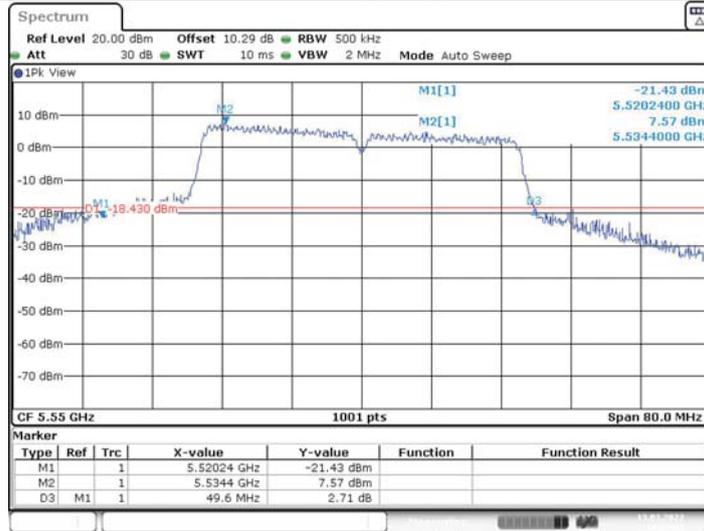


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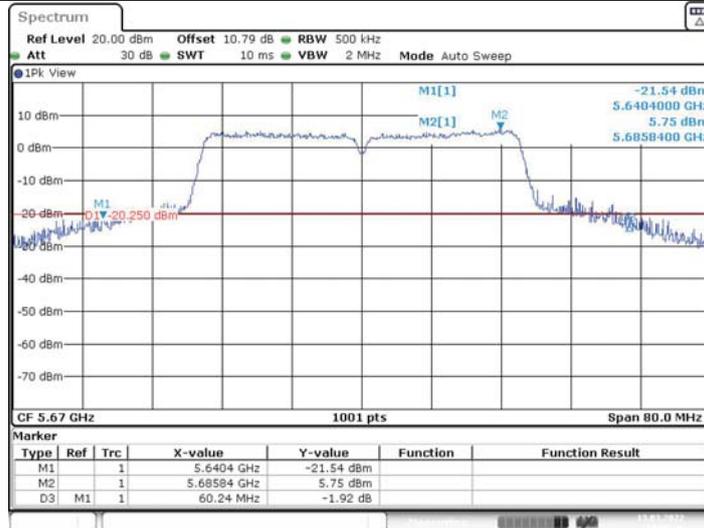
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11N40MIMO_Ant2_5550



Date: 13.MAR.2022 14:28:52

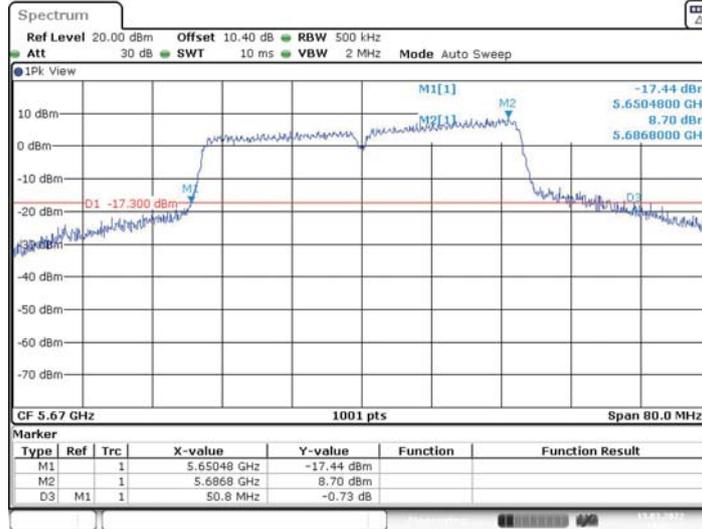
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Date: 13.MAR.2022 14:30:26

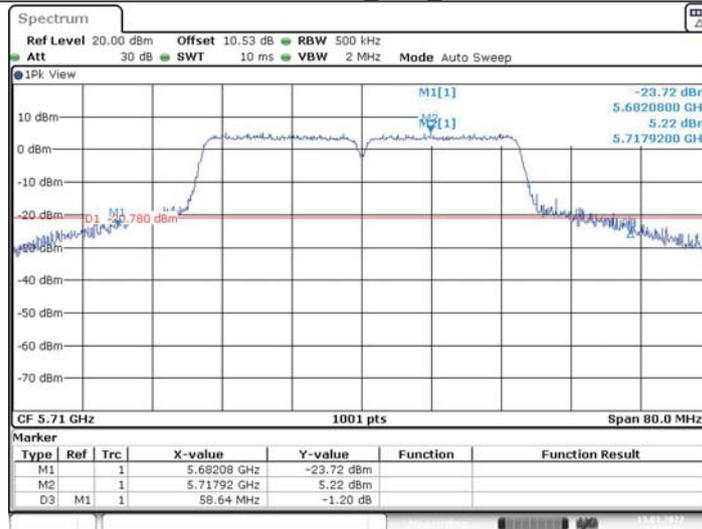


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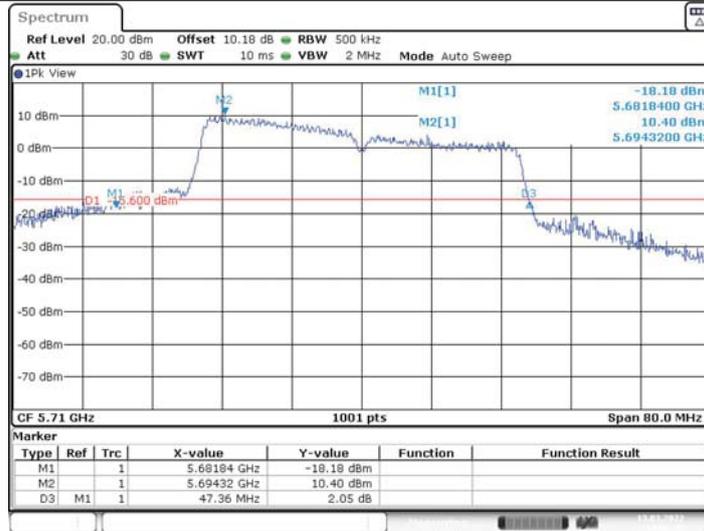
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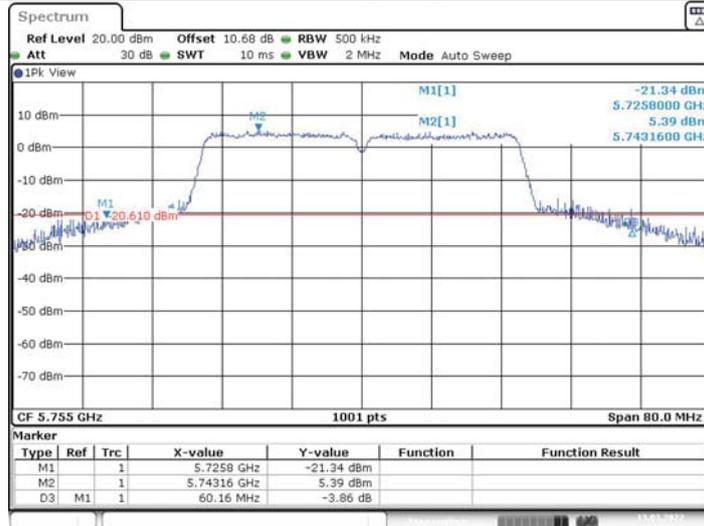
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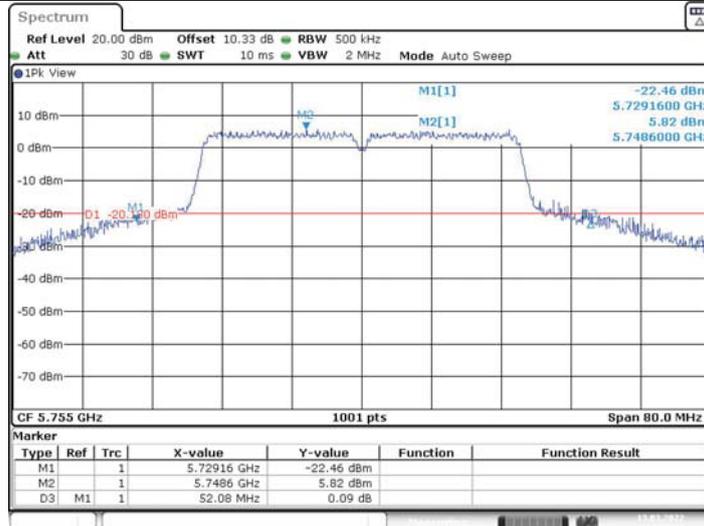
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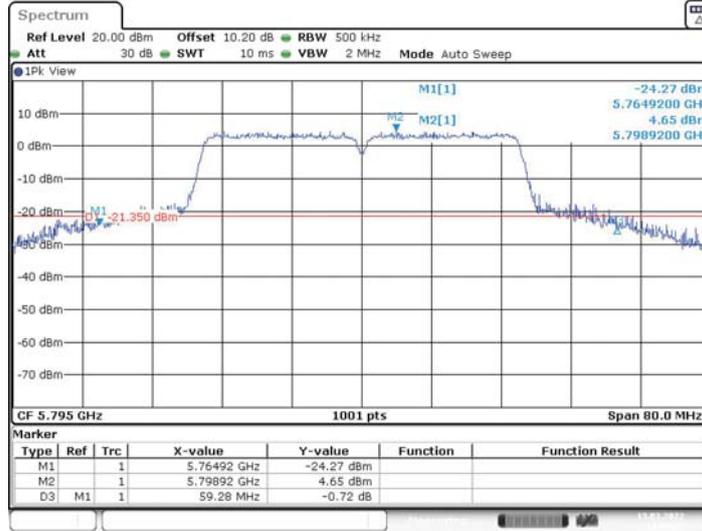
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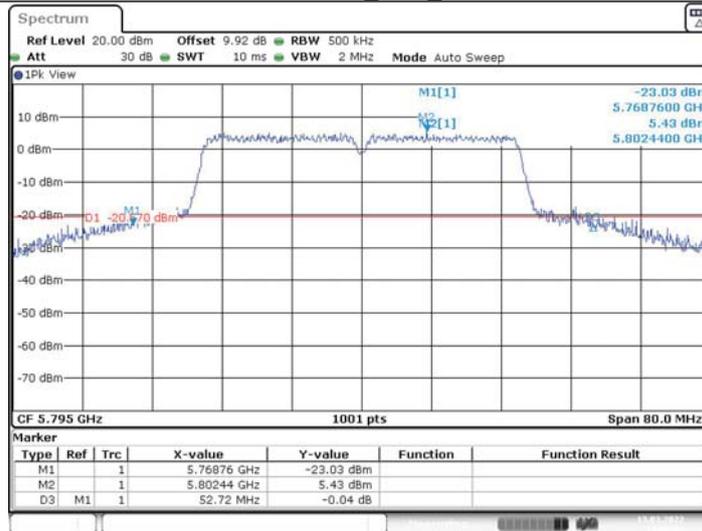


11N40MIMO_Ant1_5795



Date: 13.MAR.2022 14:50:28

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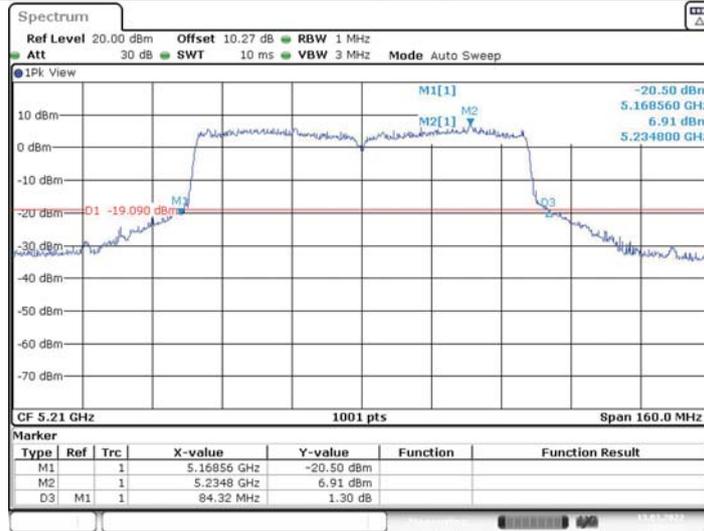
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11AC80MIMO_Ant1_5210



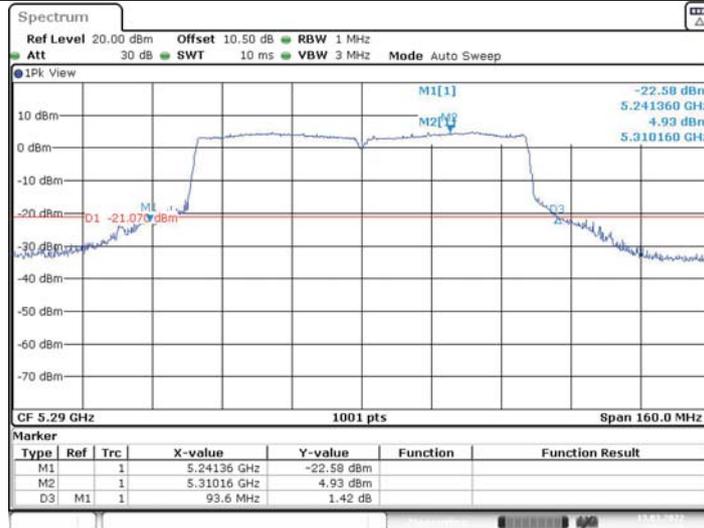
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Date: 13.MAR.2022 15:07:22

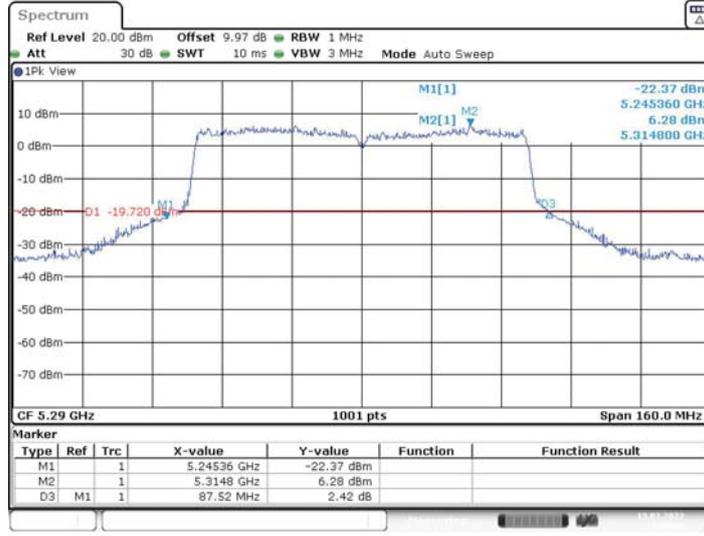
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Date: 13.MAR.2022 15:12:58



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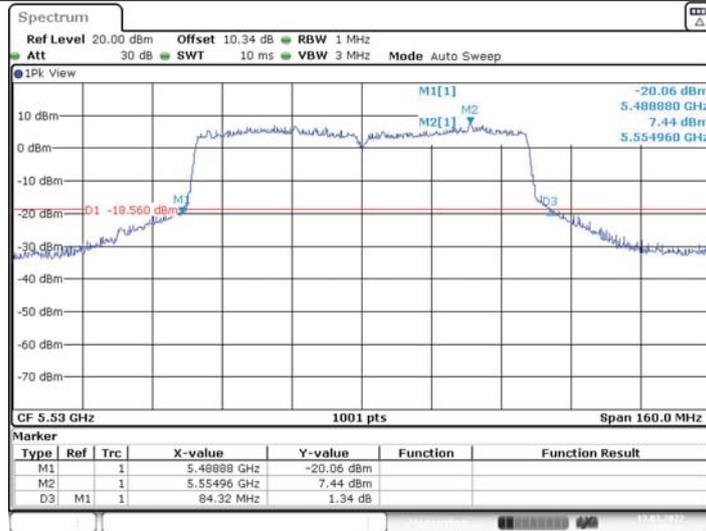
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11AC80MIMO_Ant1_5530



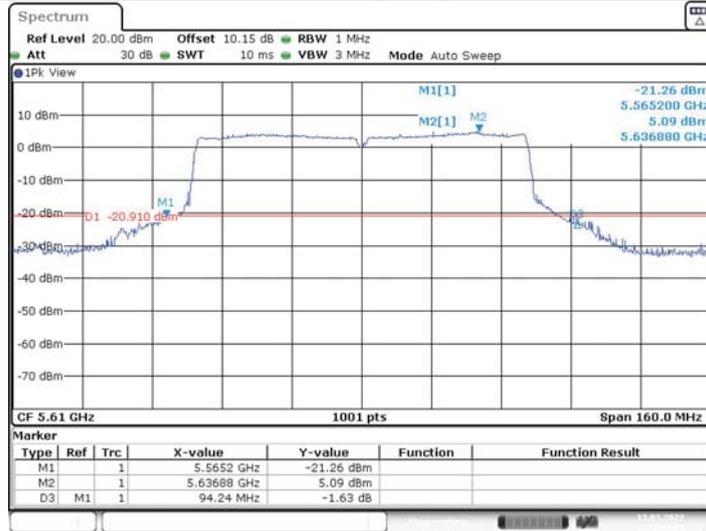
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11AC80MIMO_Ant2_5530



Date: 13.MAR.2022 15:29:17

11AC80MIMO_Ant1_5610



Date: 13.MAR.2022 15:34:32

11AC80MIMO_Ant2_5610



Date: 13.MAR.2022 15:39:35