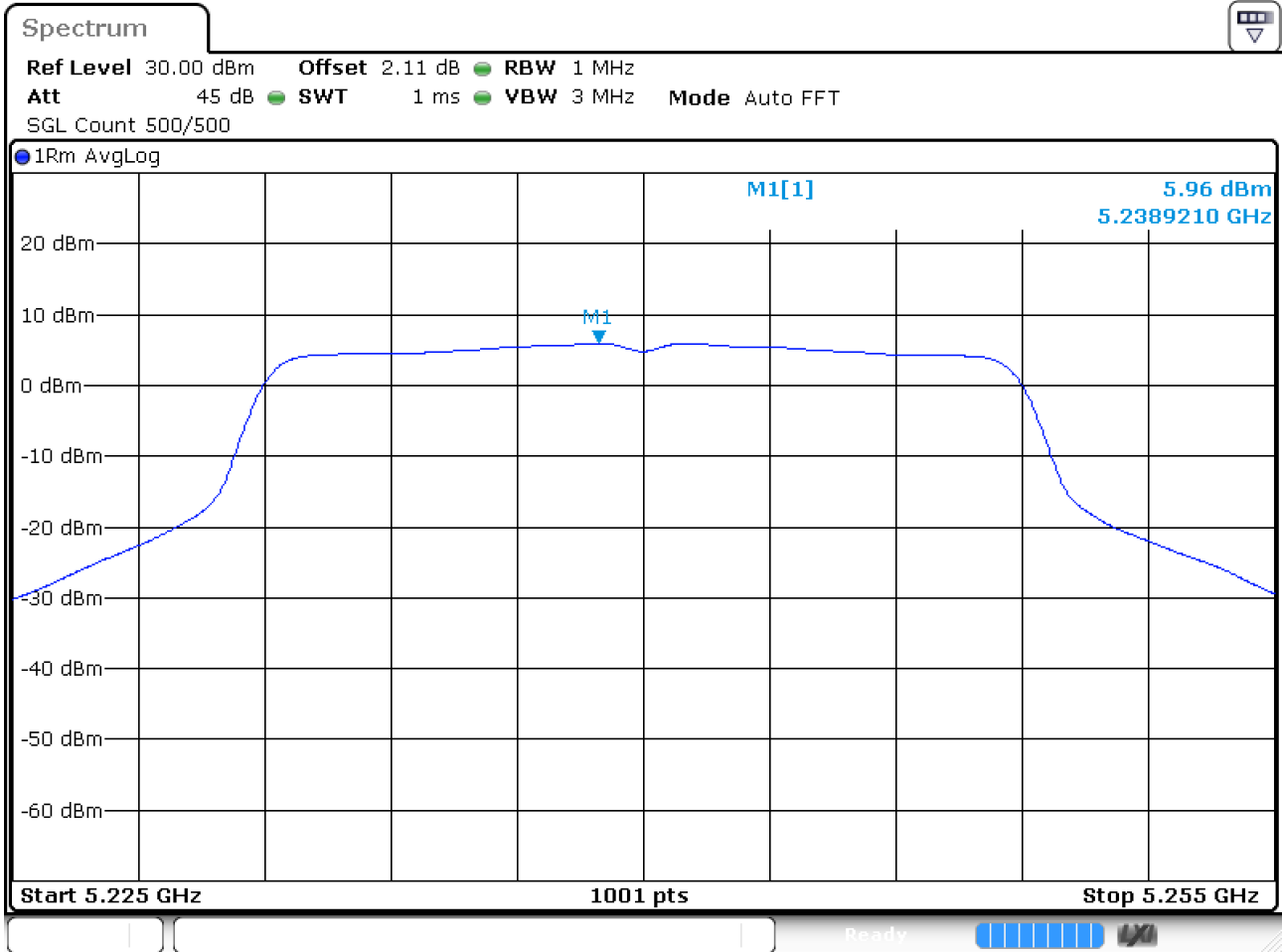


4.8.2.15 11N20_48 ANT 1



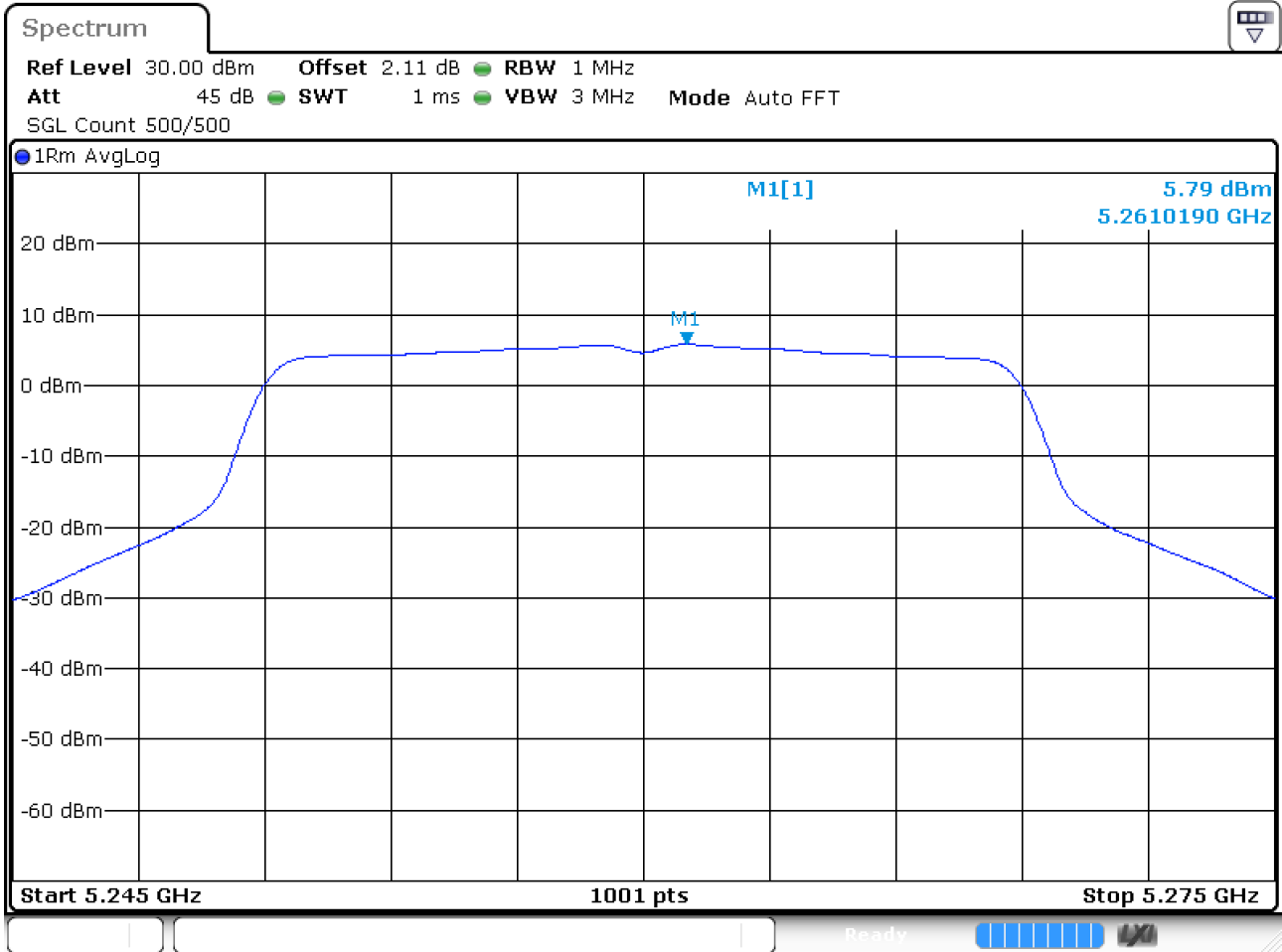
Date: 21.AUG.2020 17:03:22



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4.8.2.16 11N20_52 ANT 1



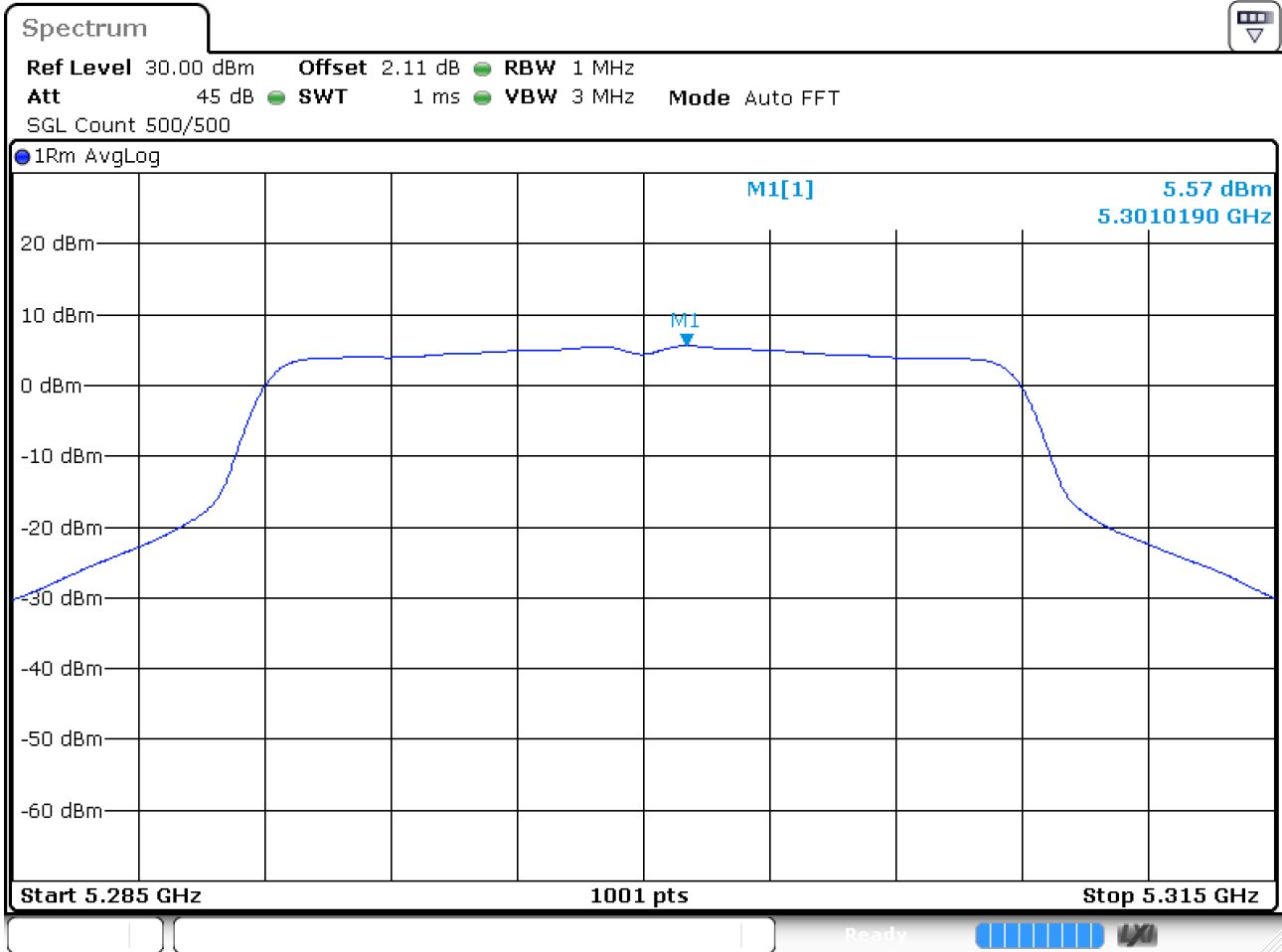
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4.8.2.17 11N20_60 ANT 1



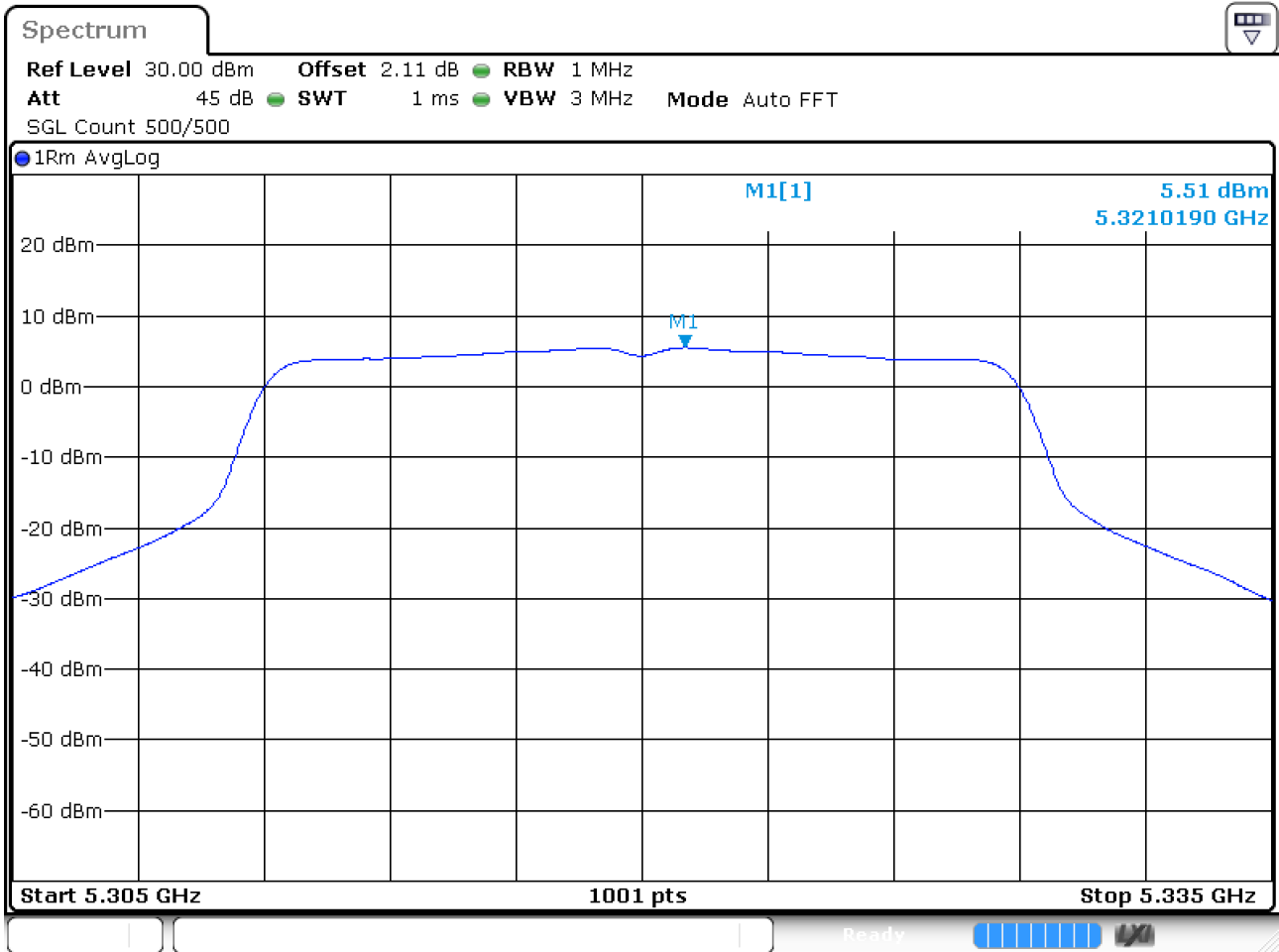
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4.8.2.18 11N20_64 ANT 1



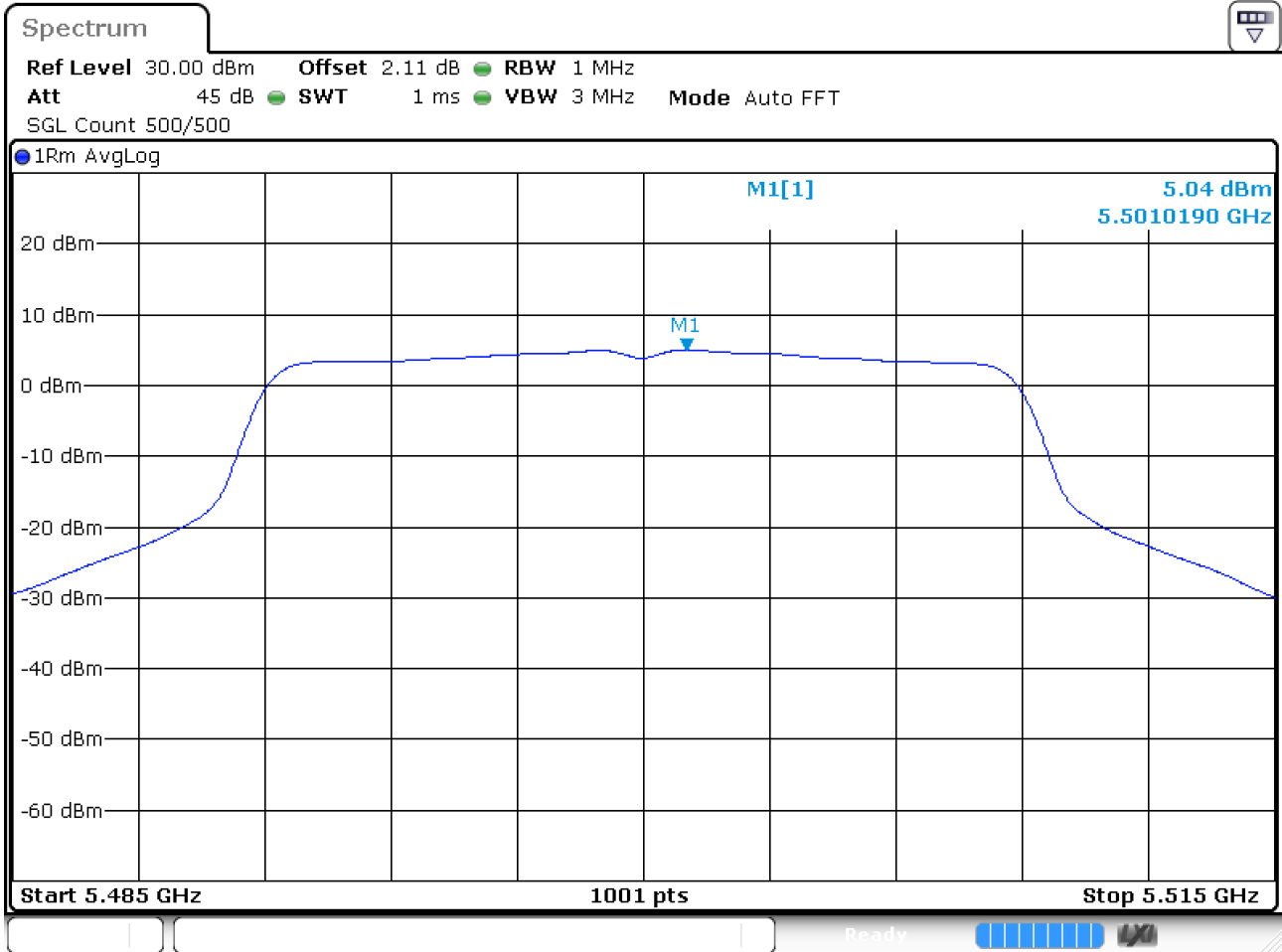
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4.8.2.19 11N20_100 ANT 1



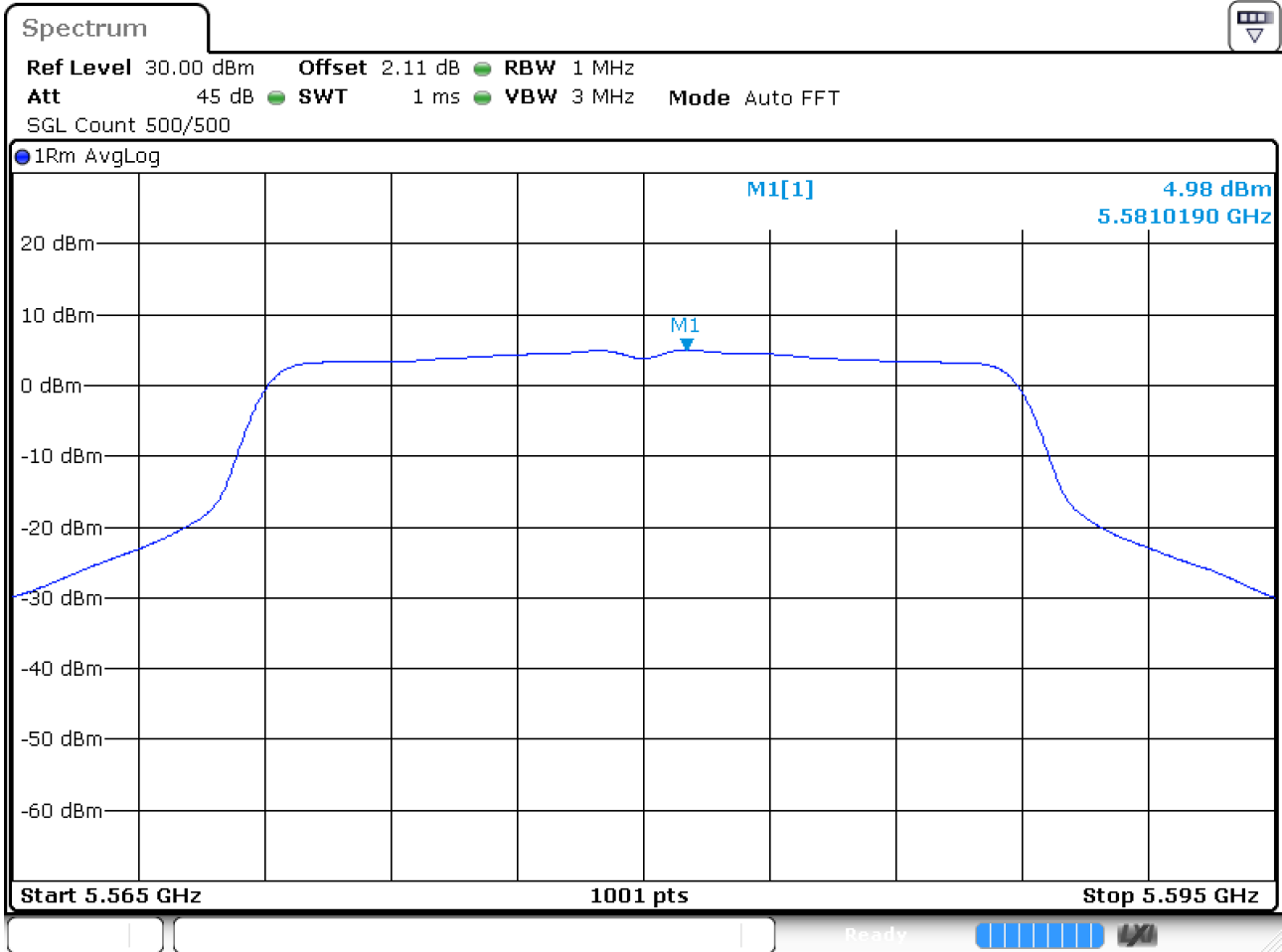
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4.8.2.20 11N20_116 ANT 1



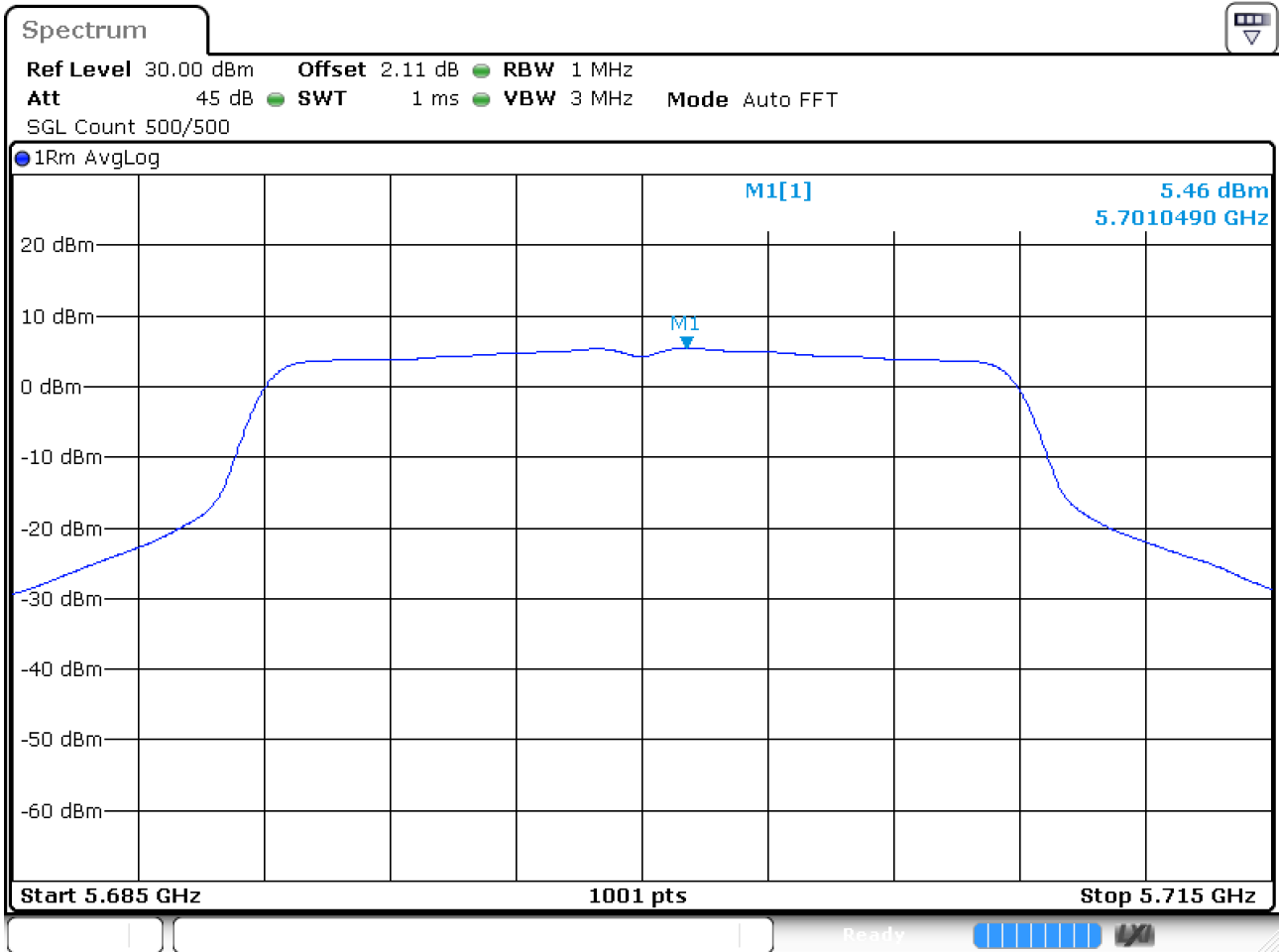
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4.8.2.21 11N20_140 ANT 1



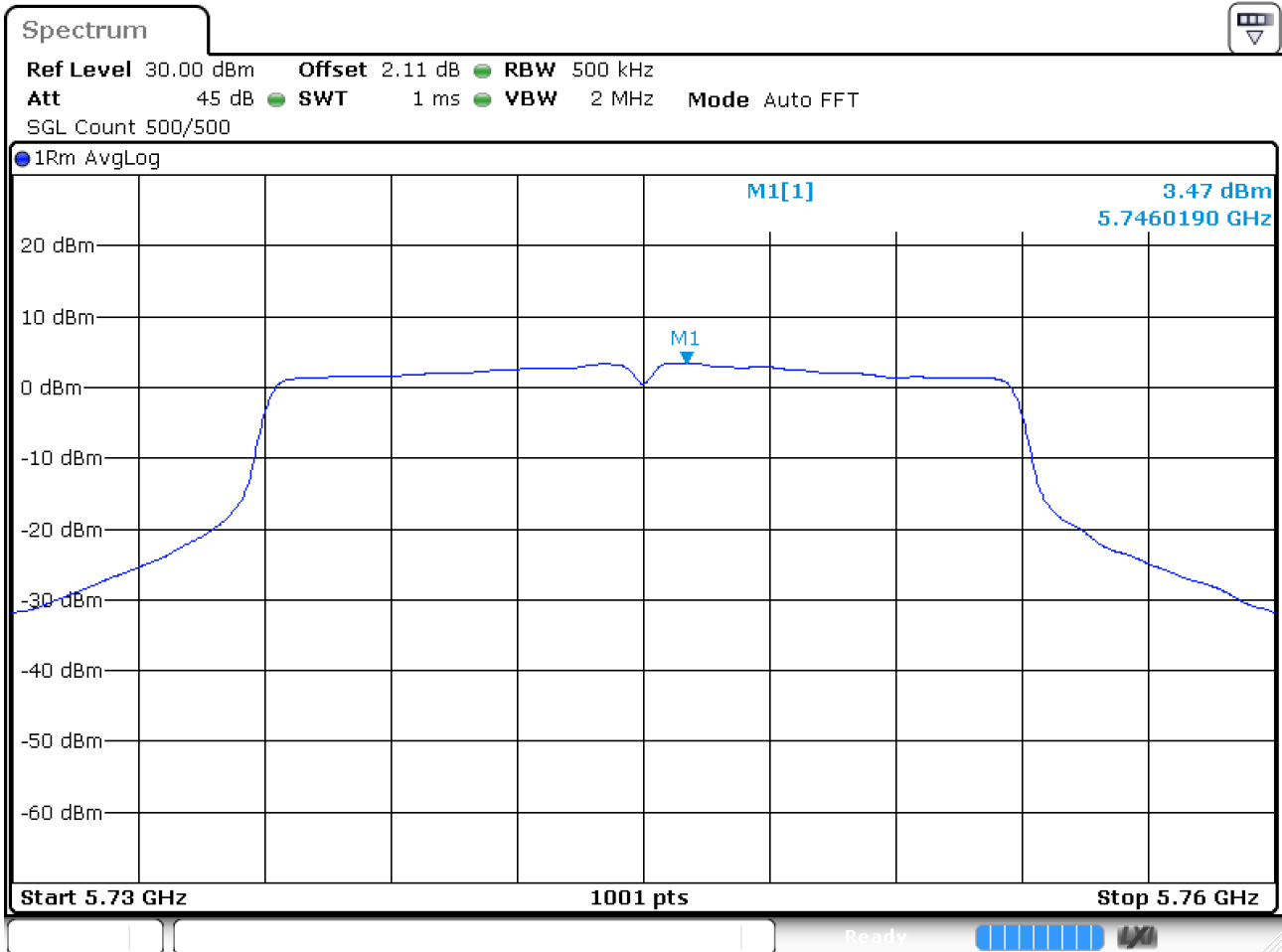
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4.8.2.22 11N20_149 ANT 1



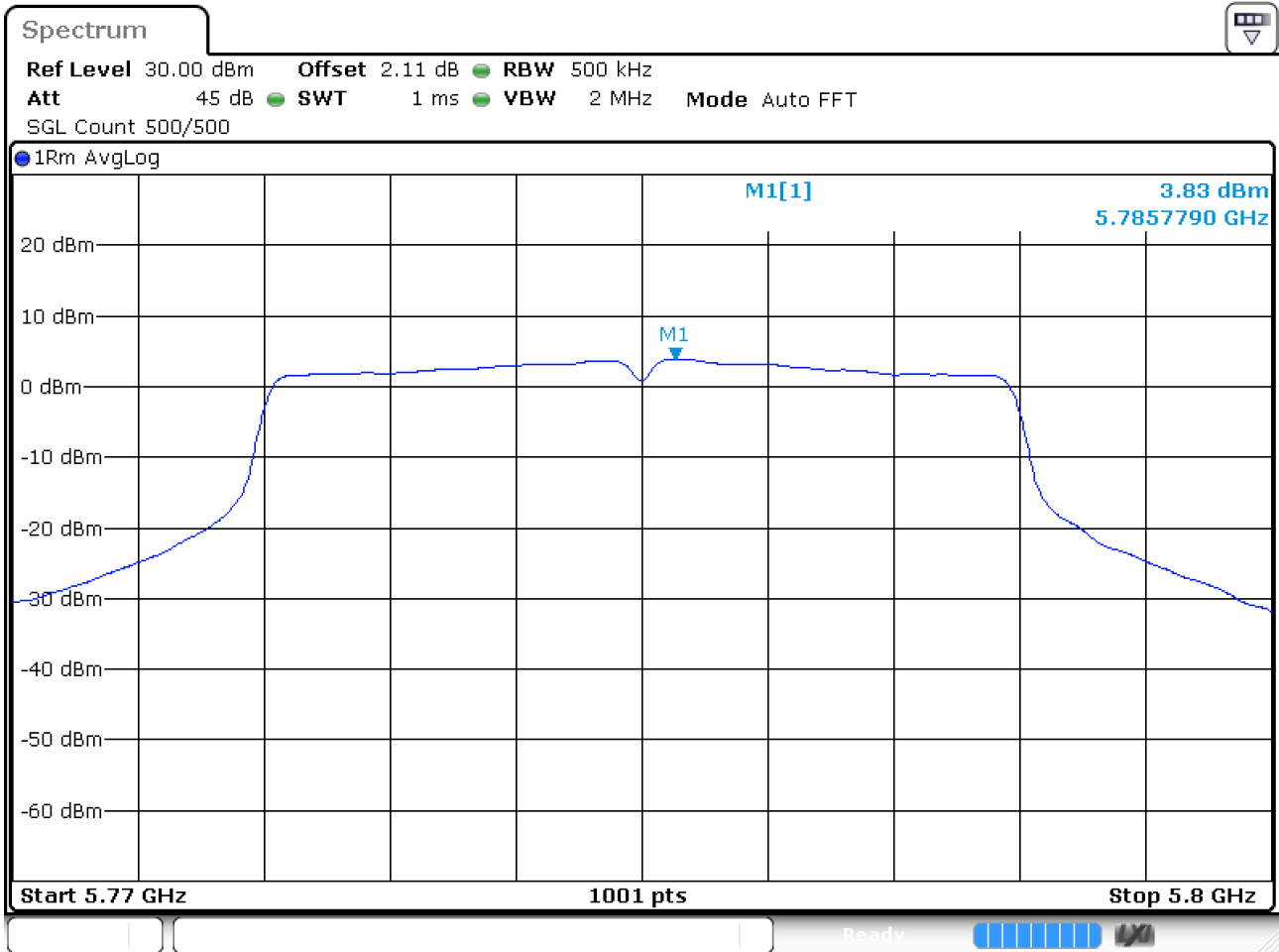
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4.8.2.23 11N20_157 ANT 1



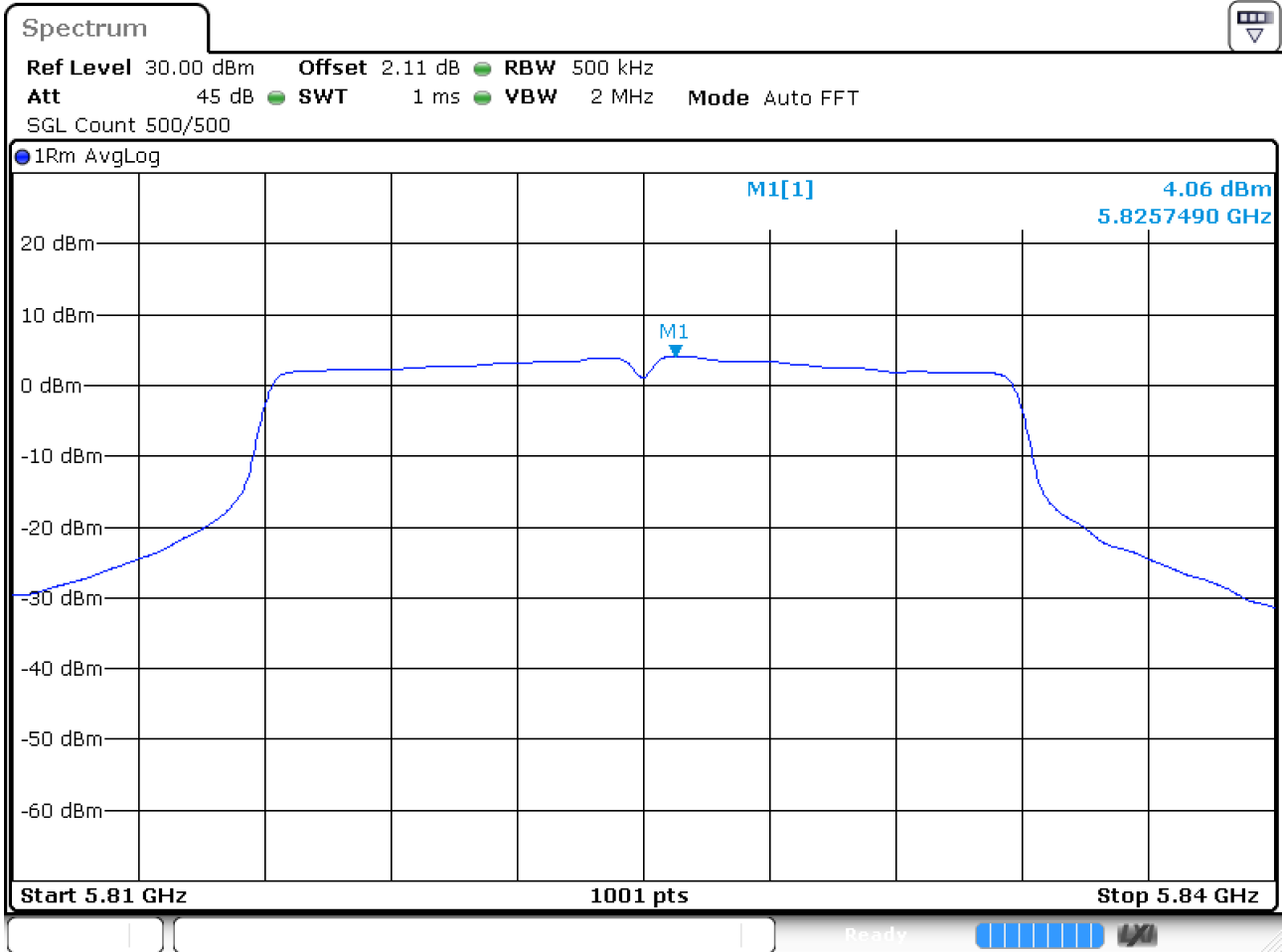
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4.8.2.24 11N20_165 ANT 1



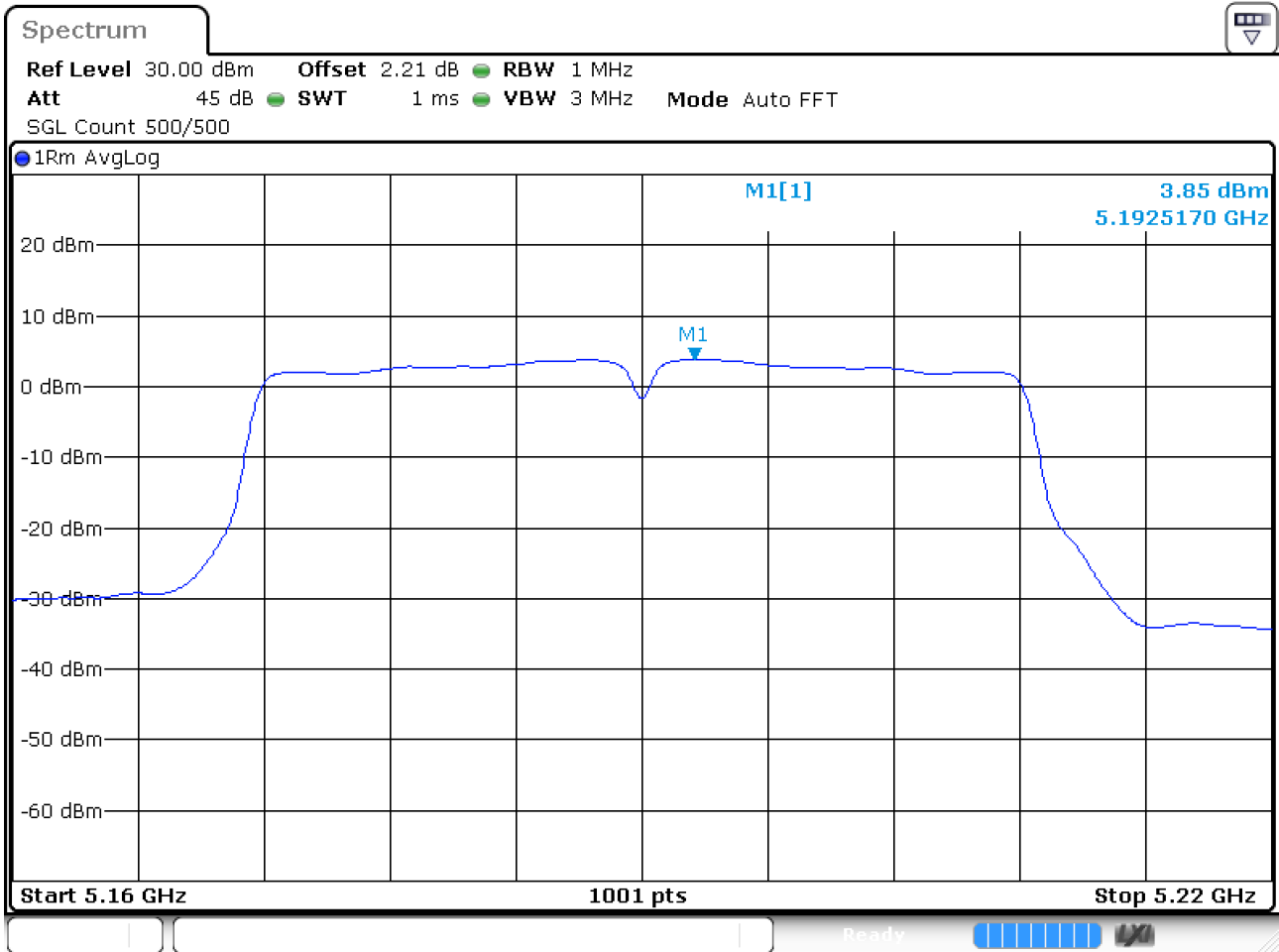
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4.8.2.25 11N40_38 ANT 1



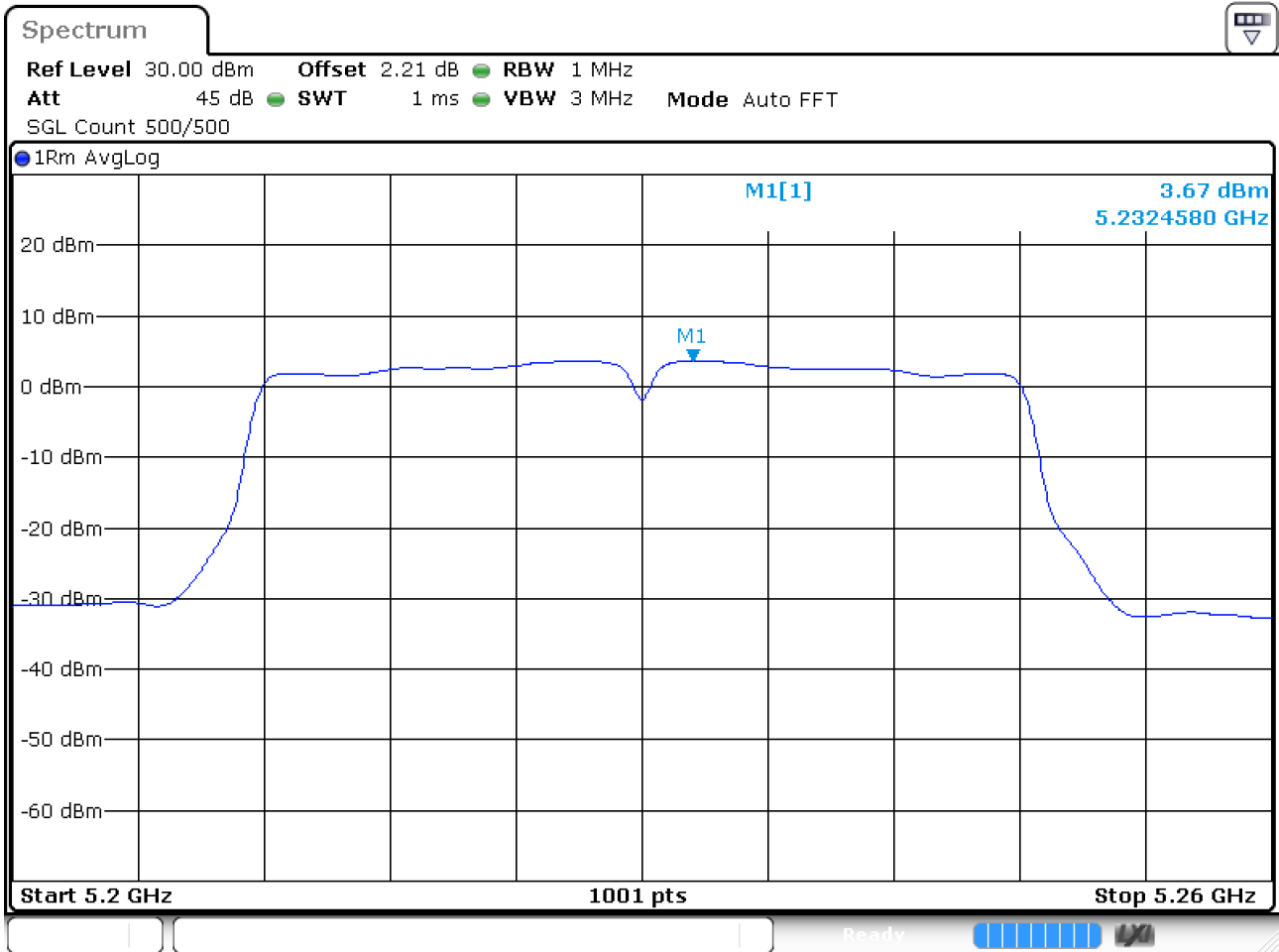
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4.8.2.26 11N40_46 ANT 1



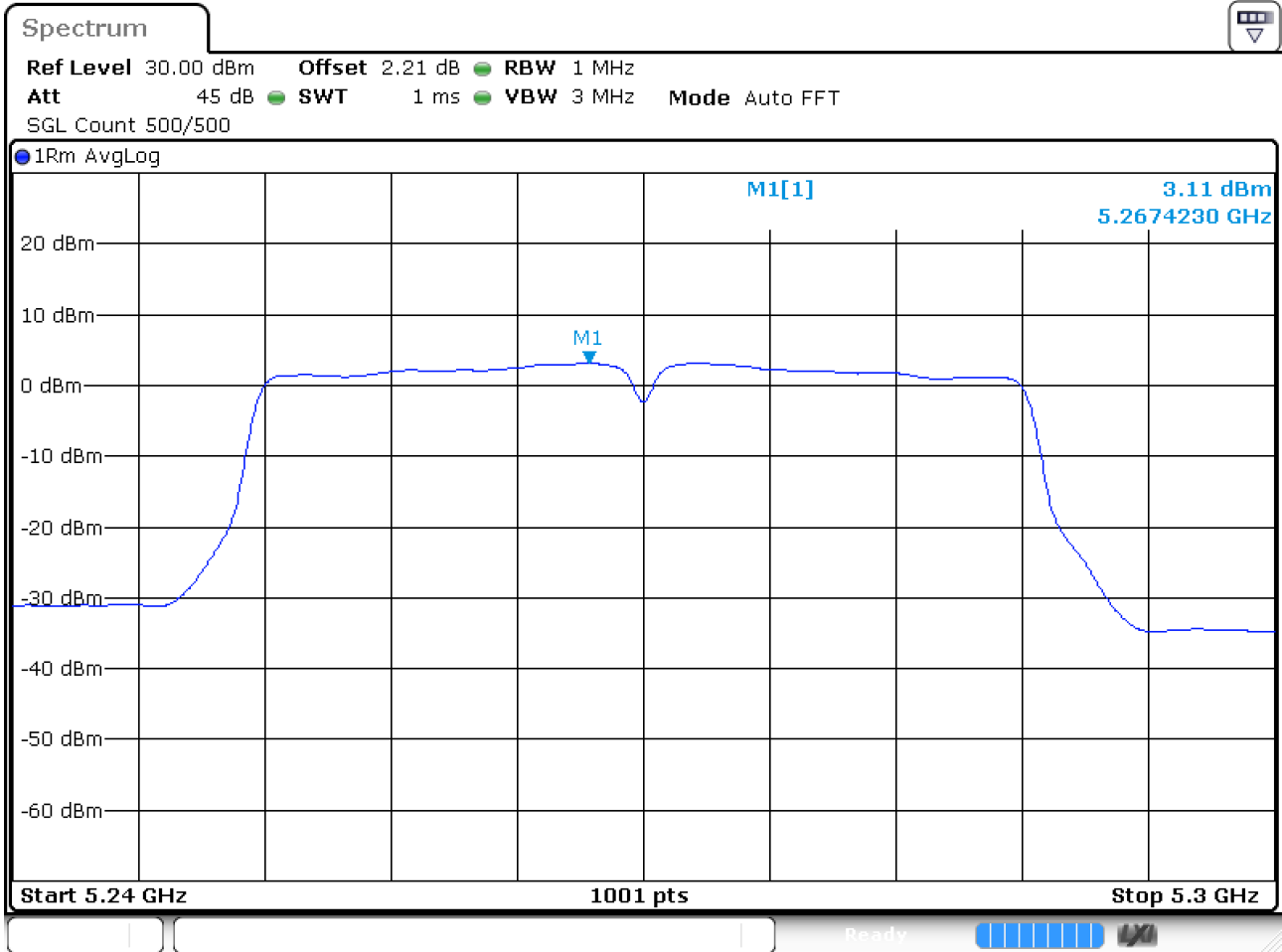
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4.8.2.27 11N40_54 ANT 1



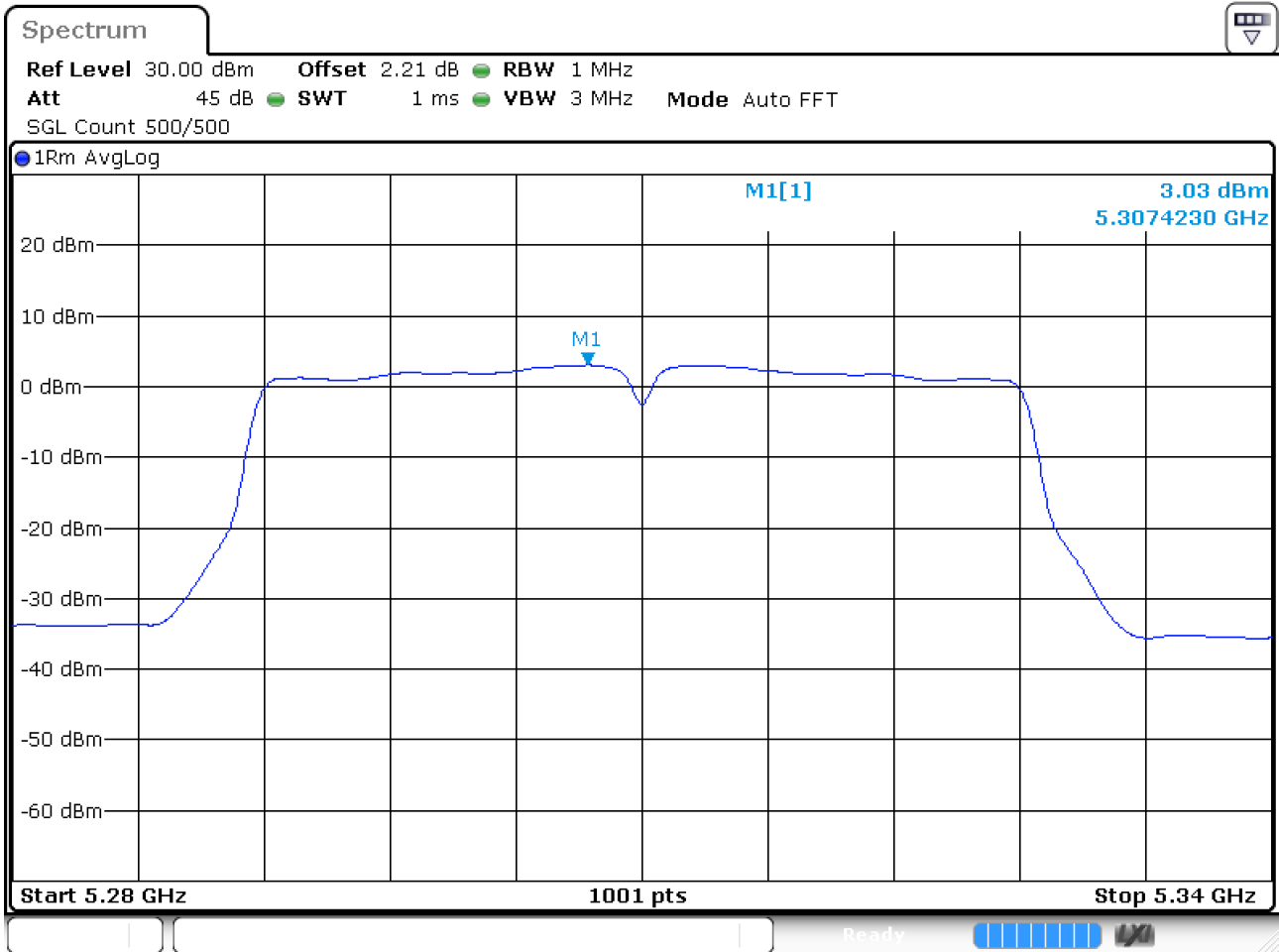
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4.8.2.28 11N40_62 ANT 1



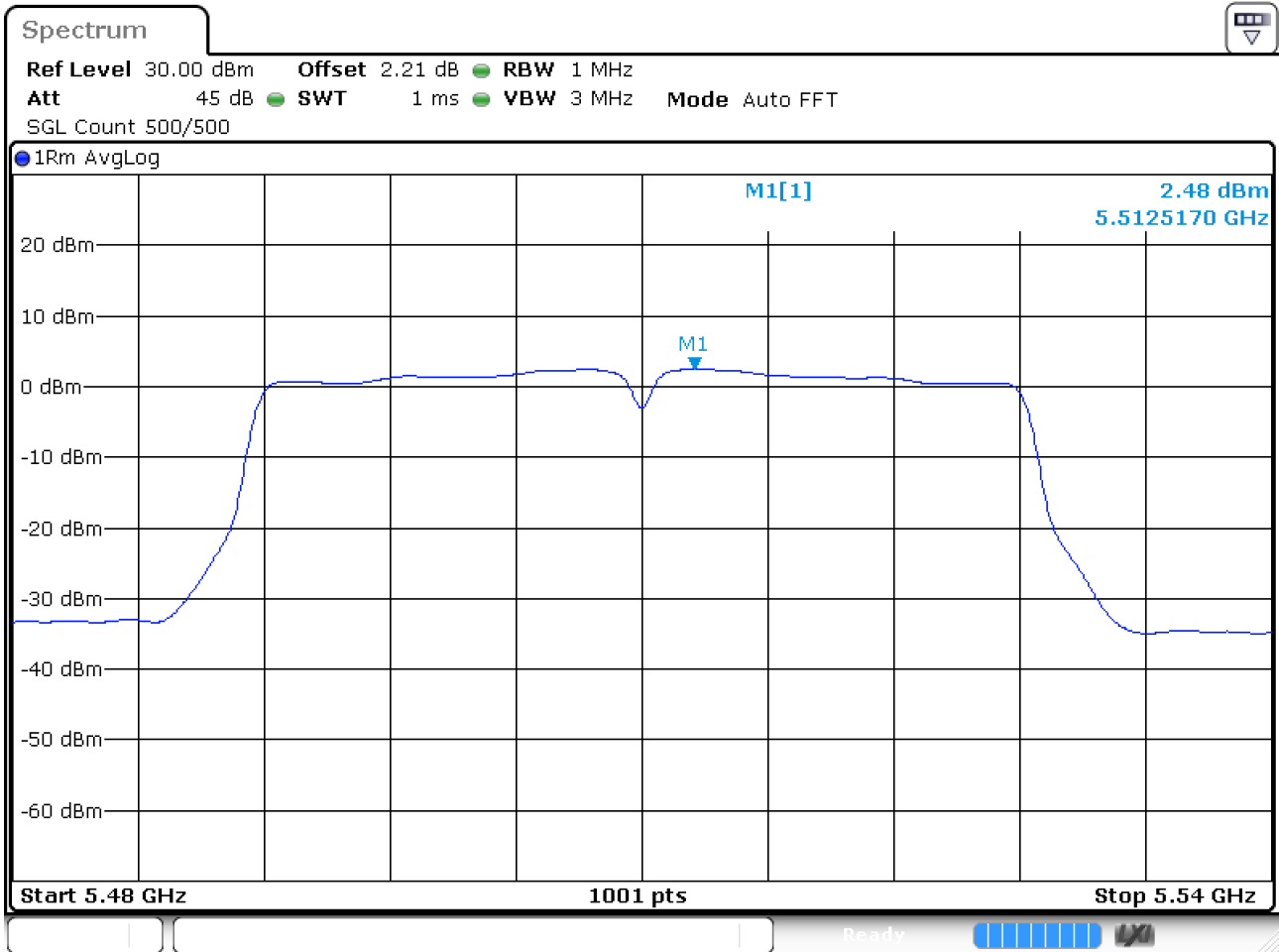
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4.8.2.29 11N40_102 ANT 1



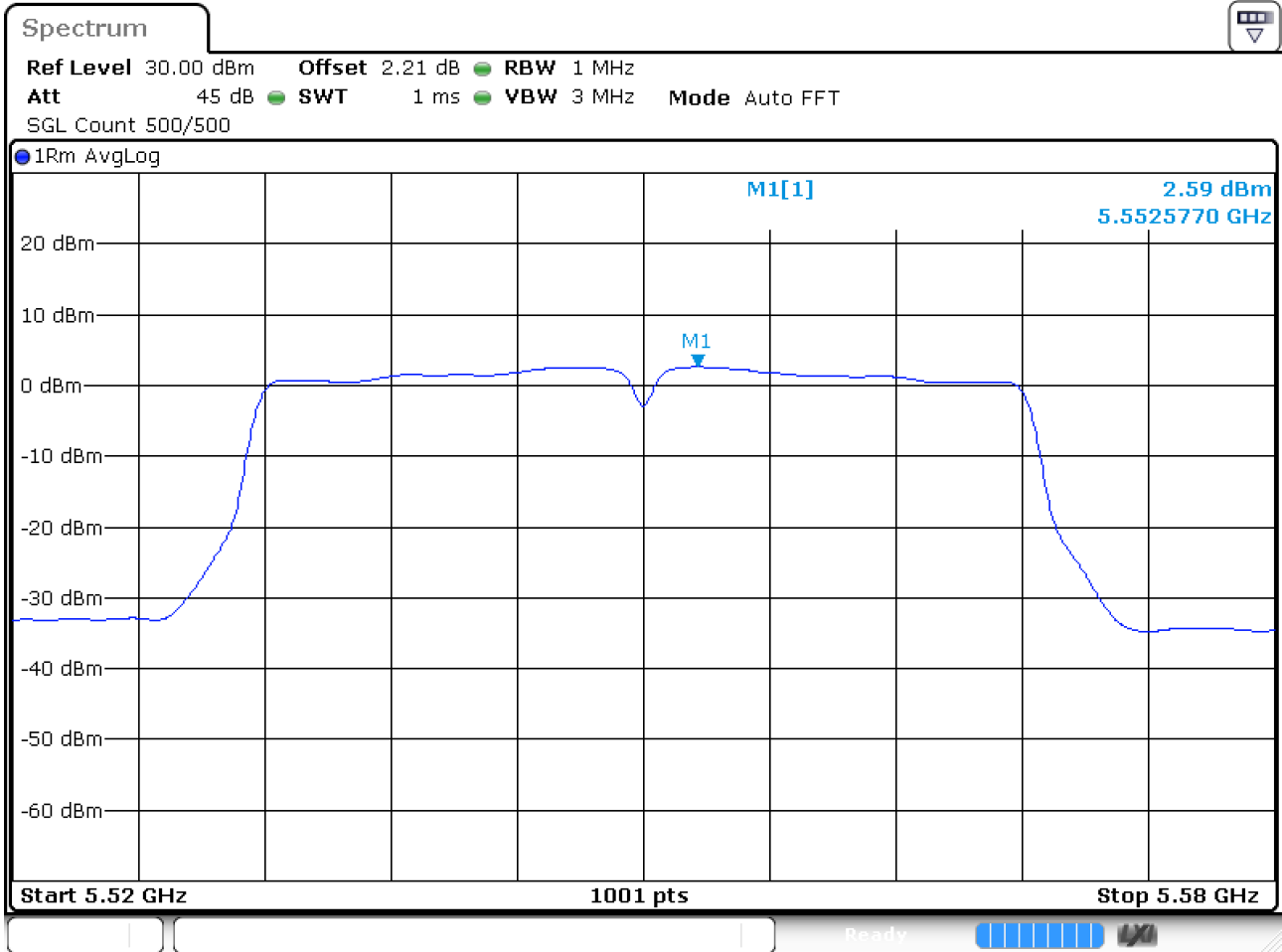
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4.8.2.30 11N40_110 ANT 1



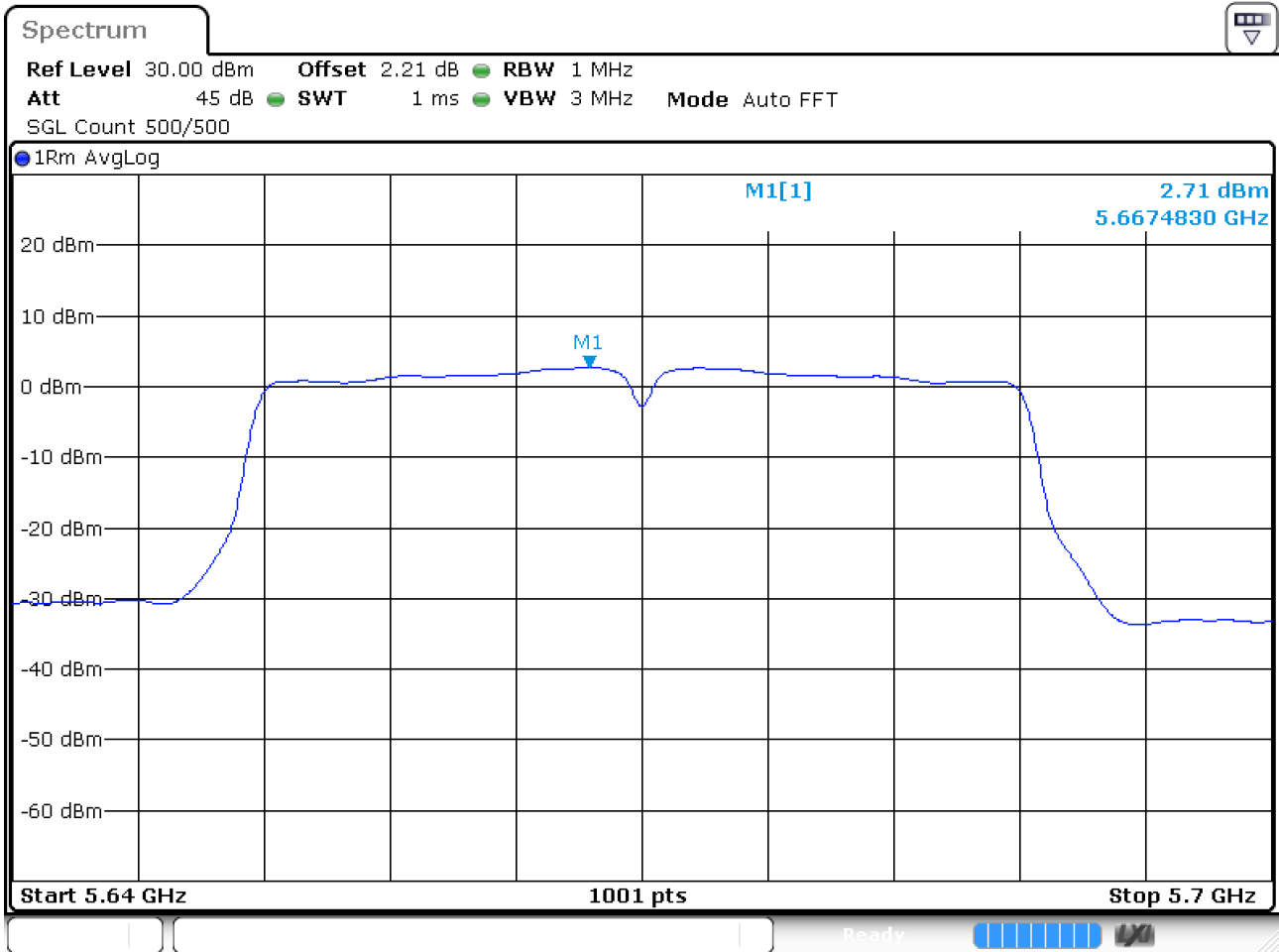
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4.8.2.31 11N40_134 ANT 1



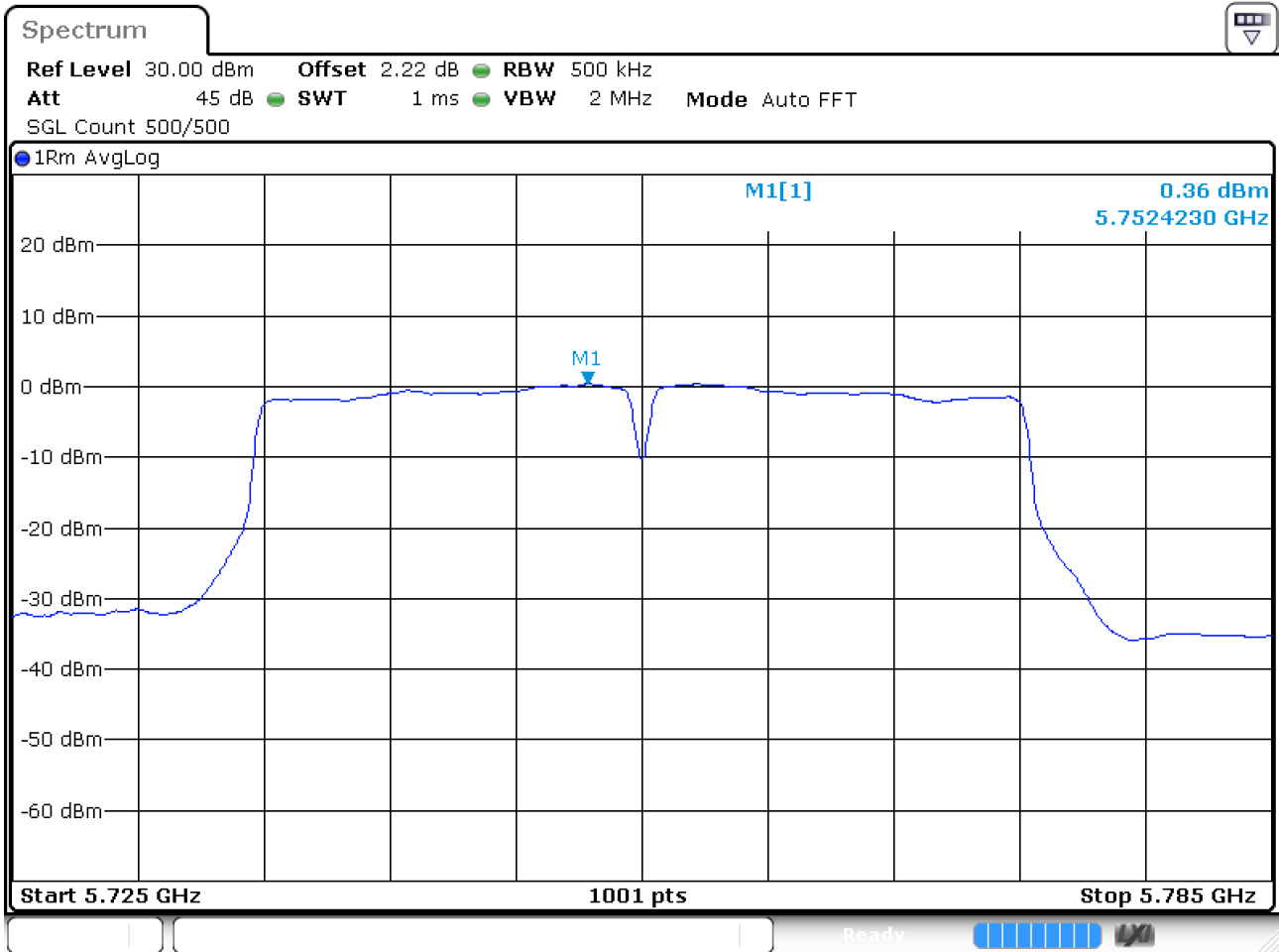
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4.8.2.32 11N40_151 ANT 1



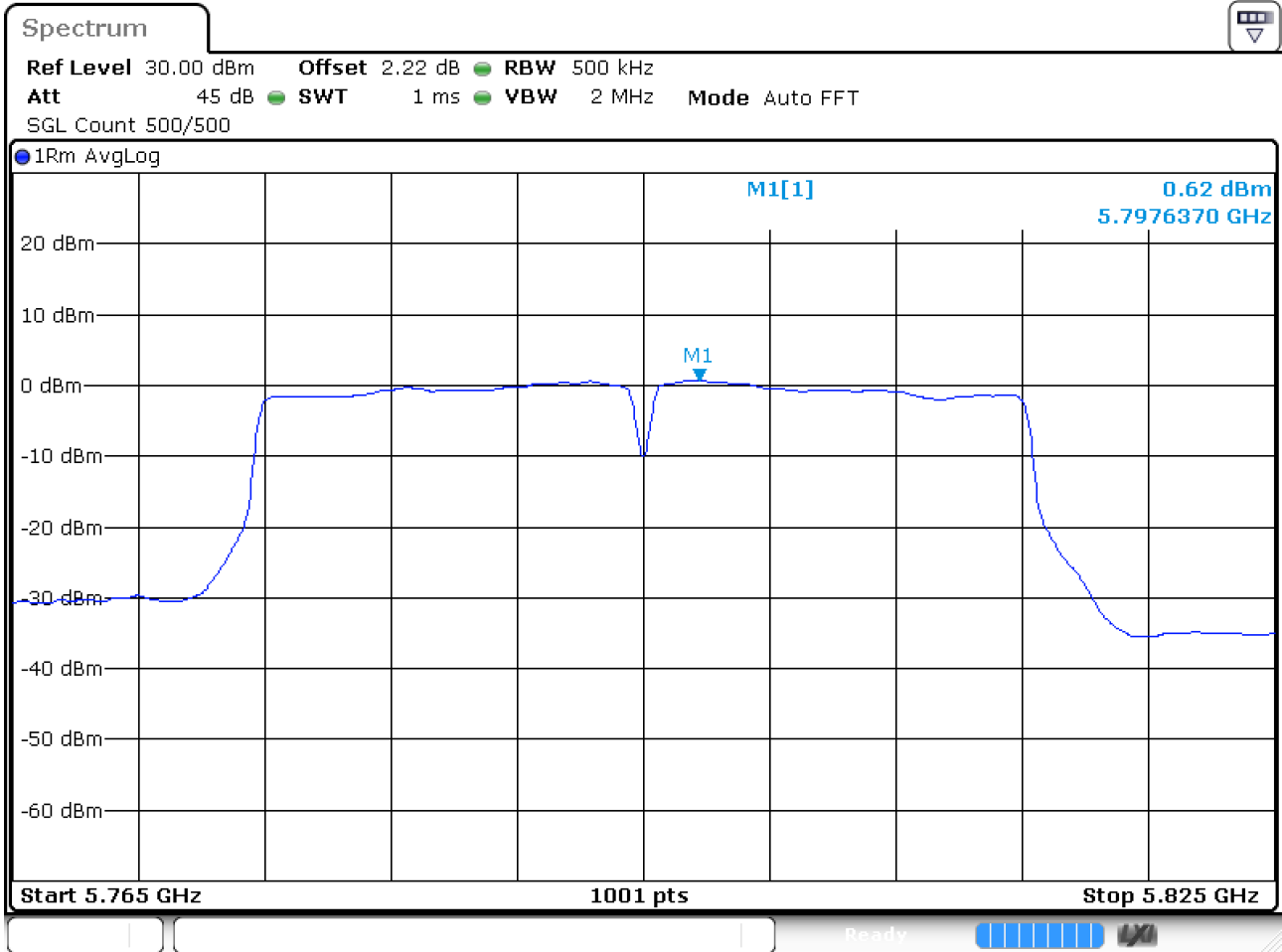
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4.8.2.33 11N40_159 ANT 1



Date: 1.SEP.2020 21:34:06

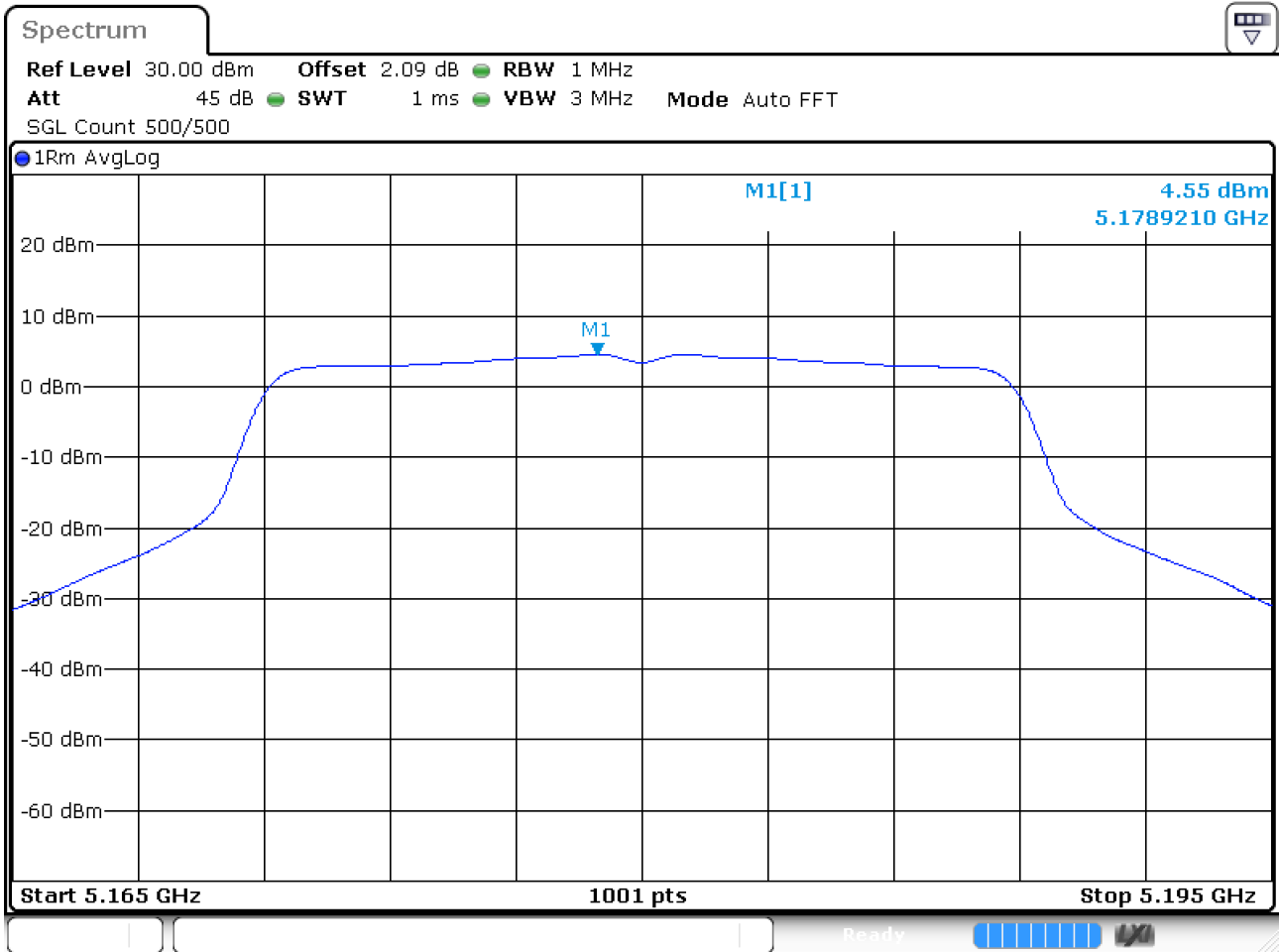


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4.8.2.34 11AC20_36 ANT 1



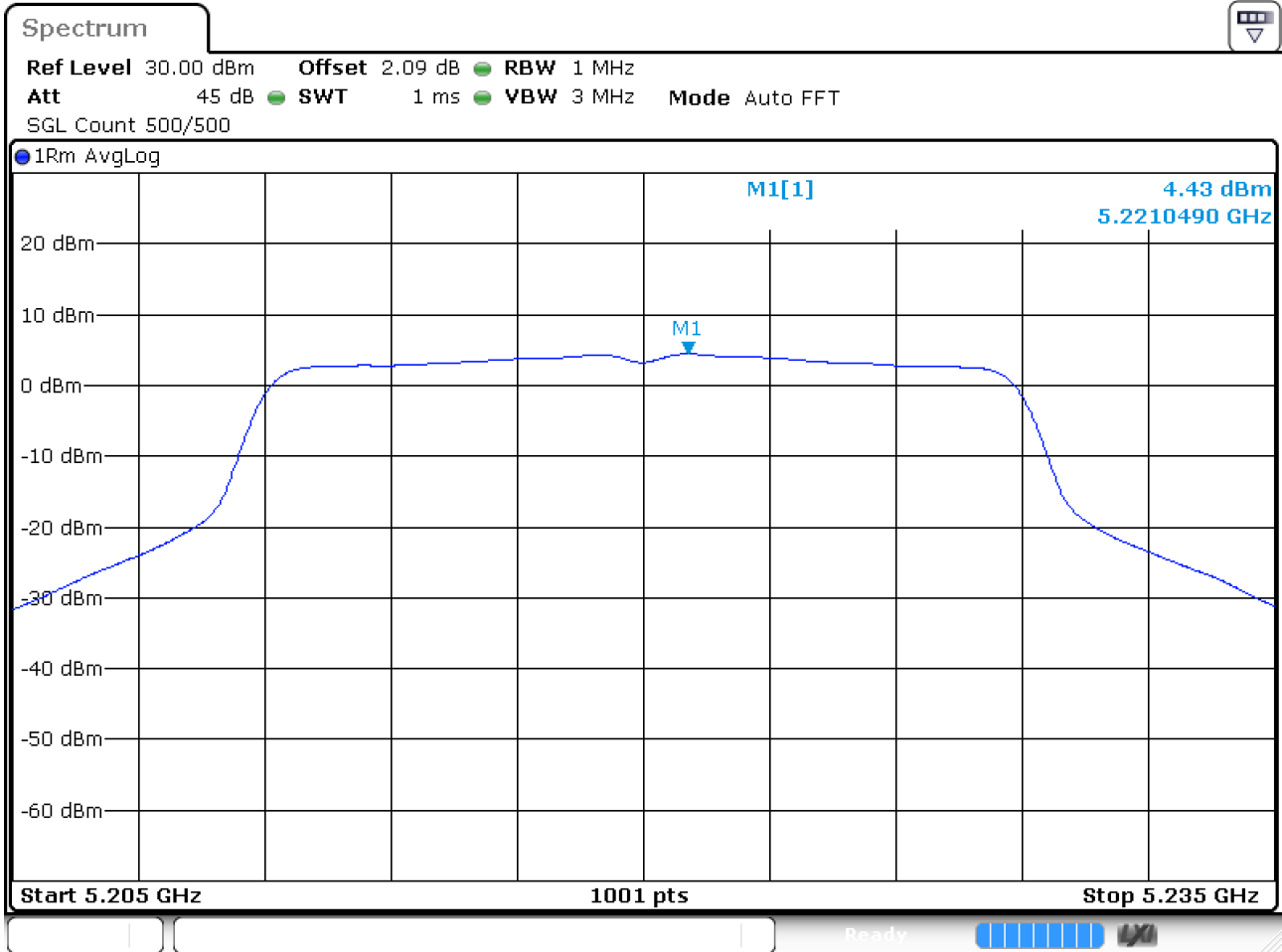
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4.8.2.35 11AC20_44 ANT 1



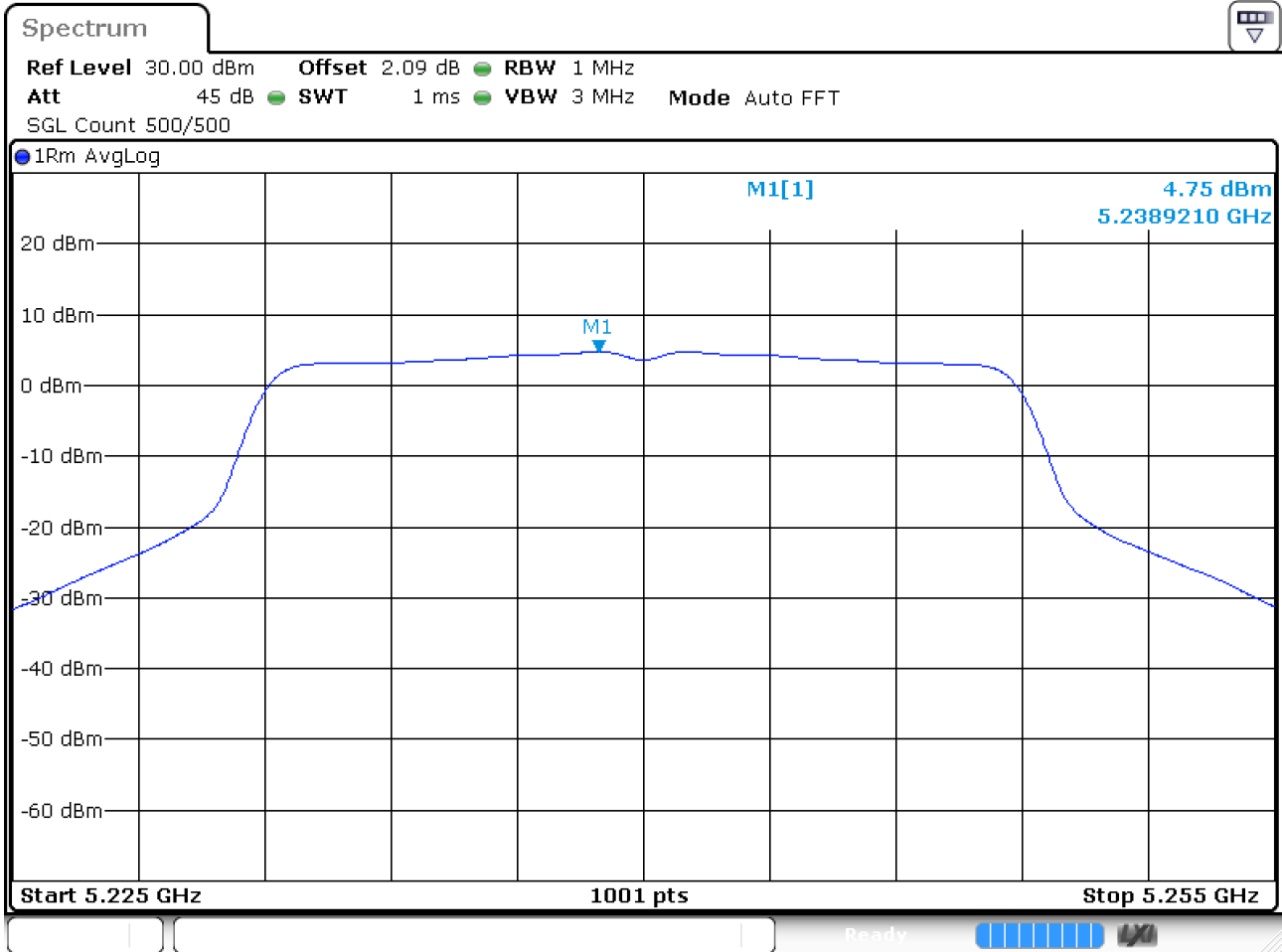
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4.8.2.36 11AC20_48 ANT 1



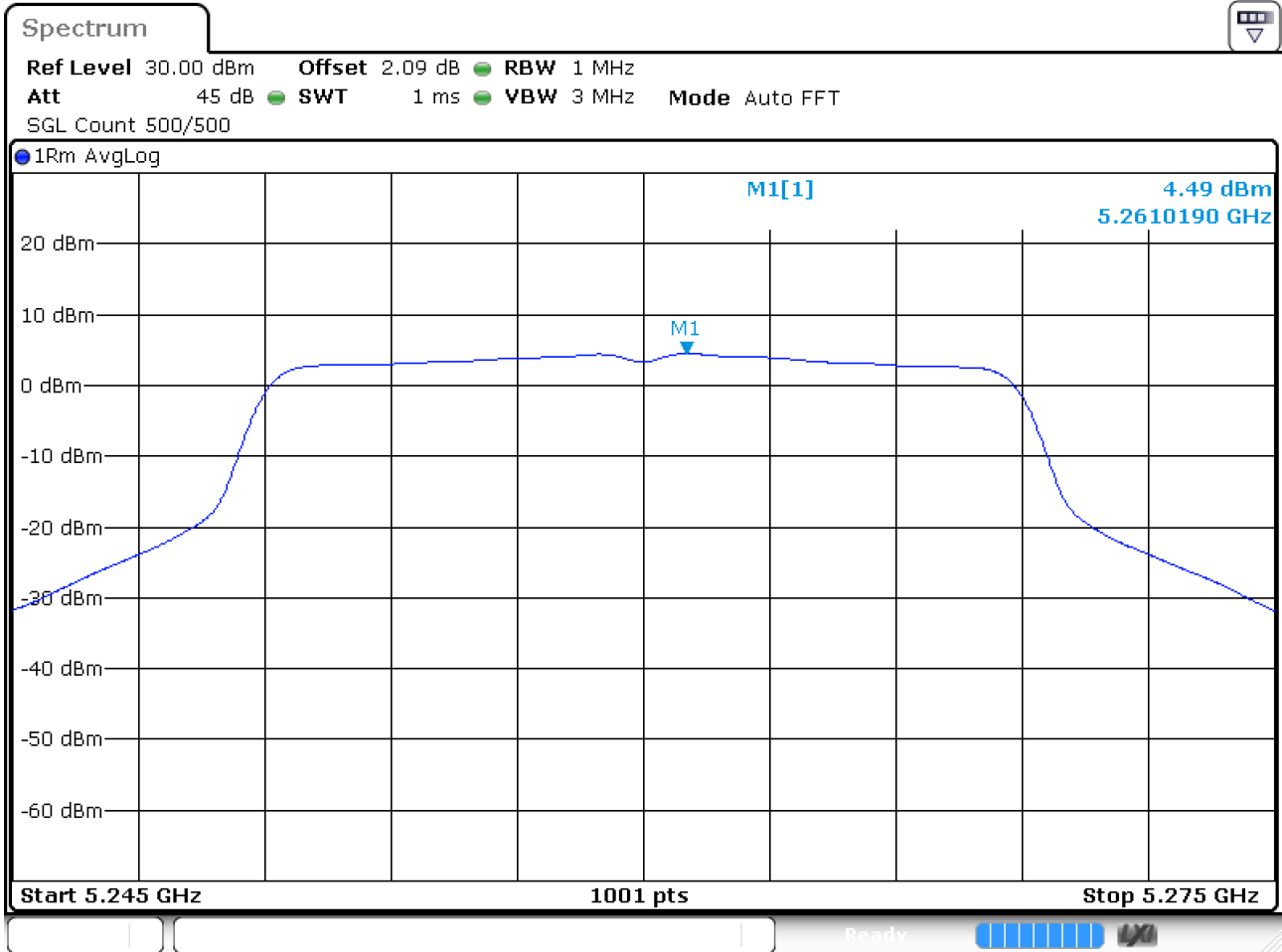
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4.8.2.37 11AC20_52 ANT 1



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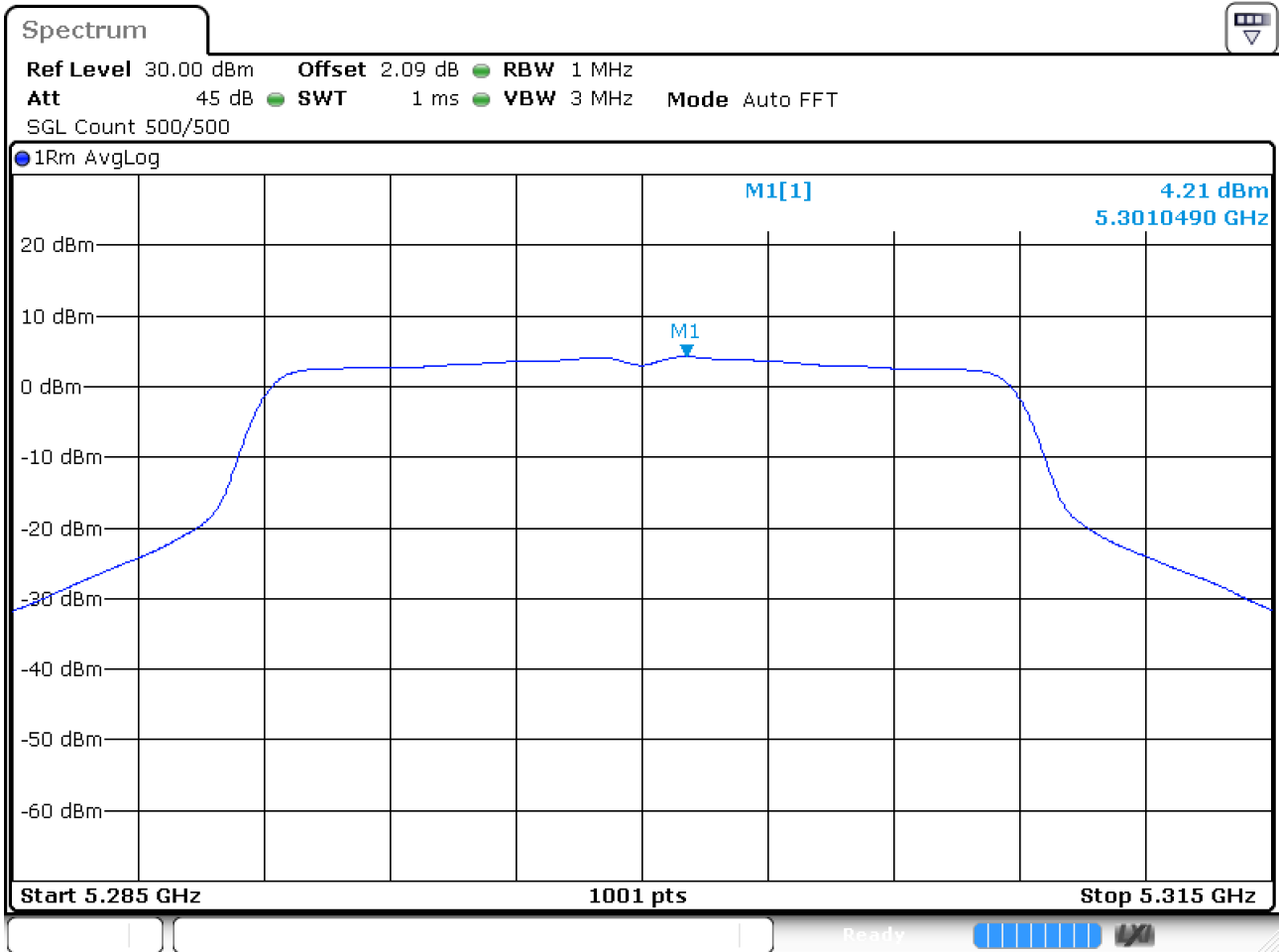
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4.8.2.38 11AC20_60 ANT 1



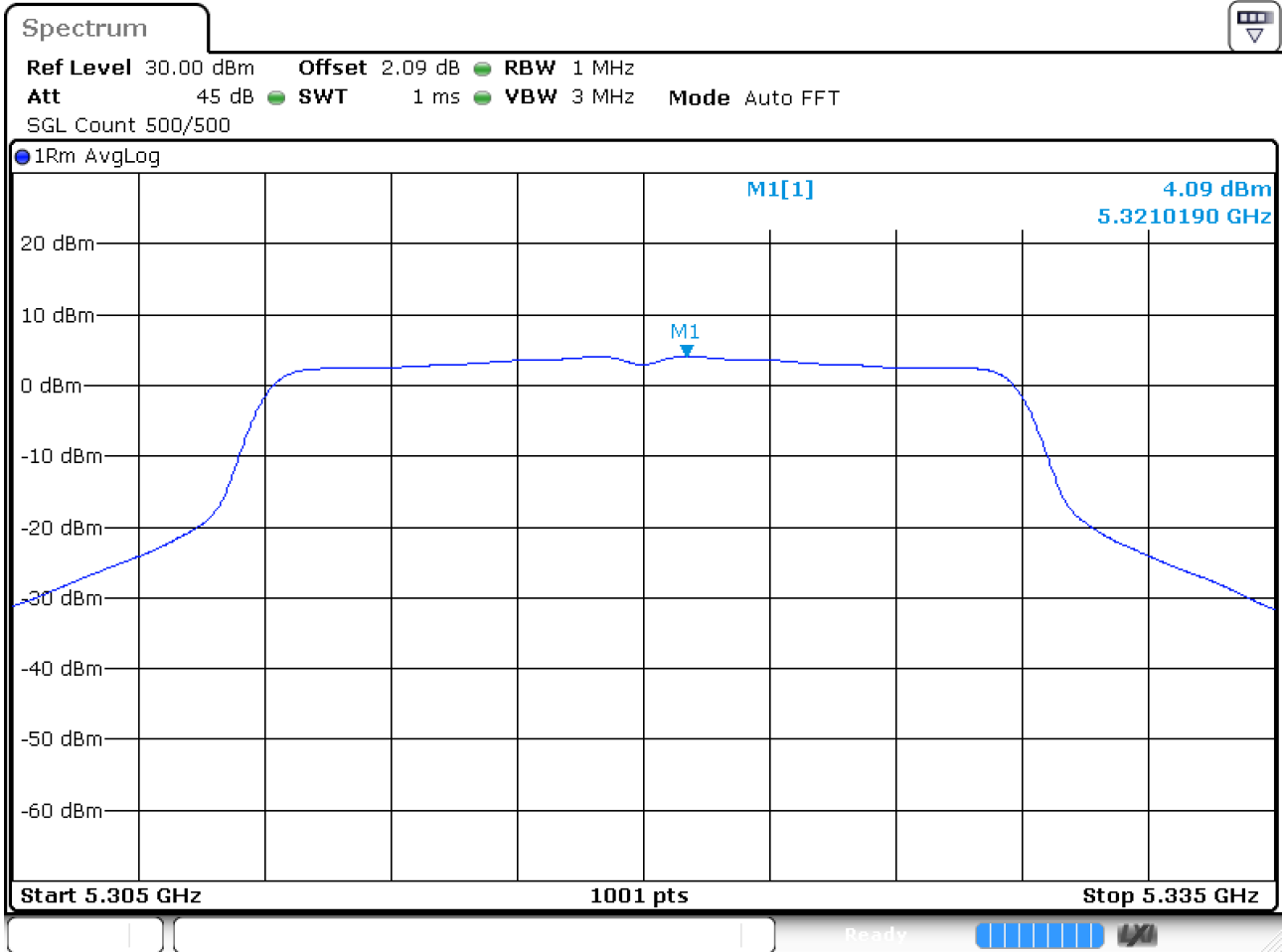
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4.8.2.39 11AC20_64 ANT 1



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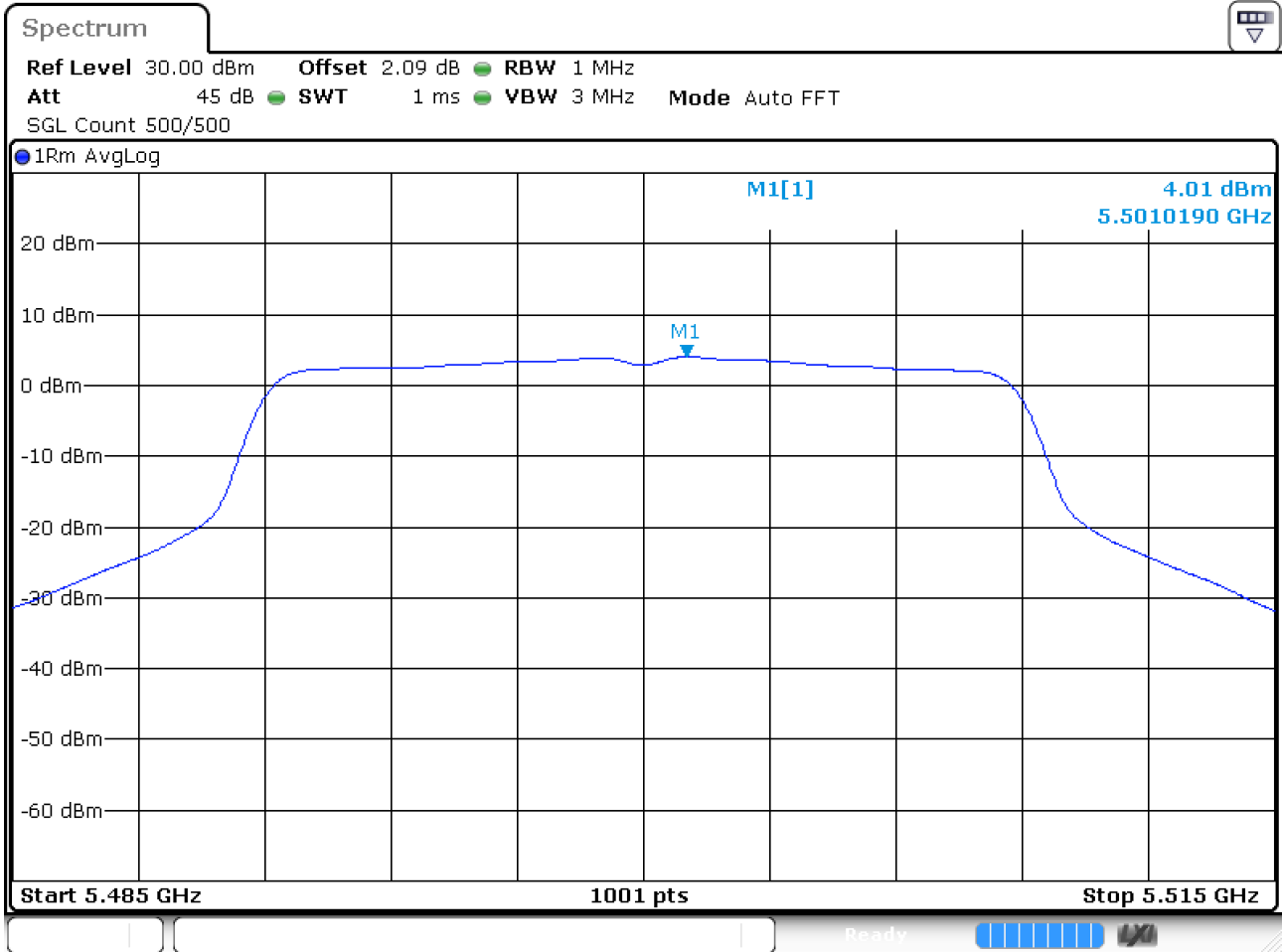
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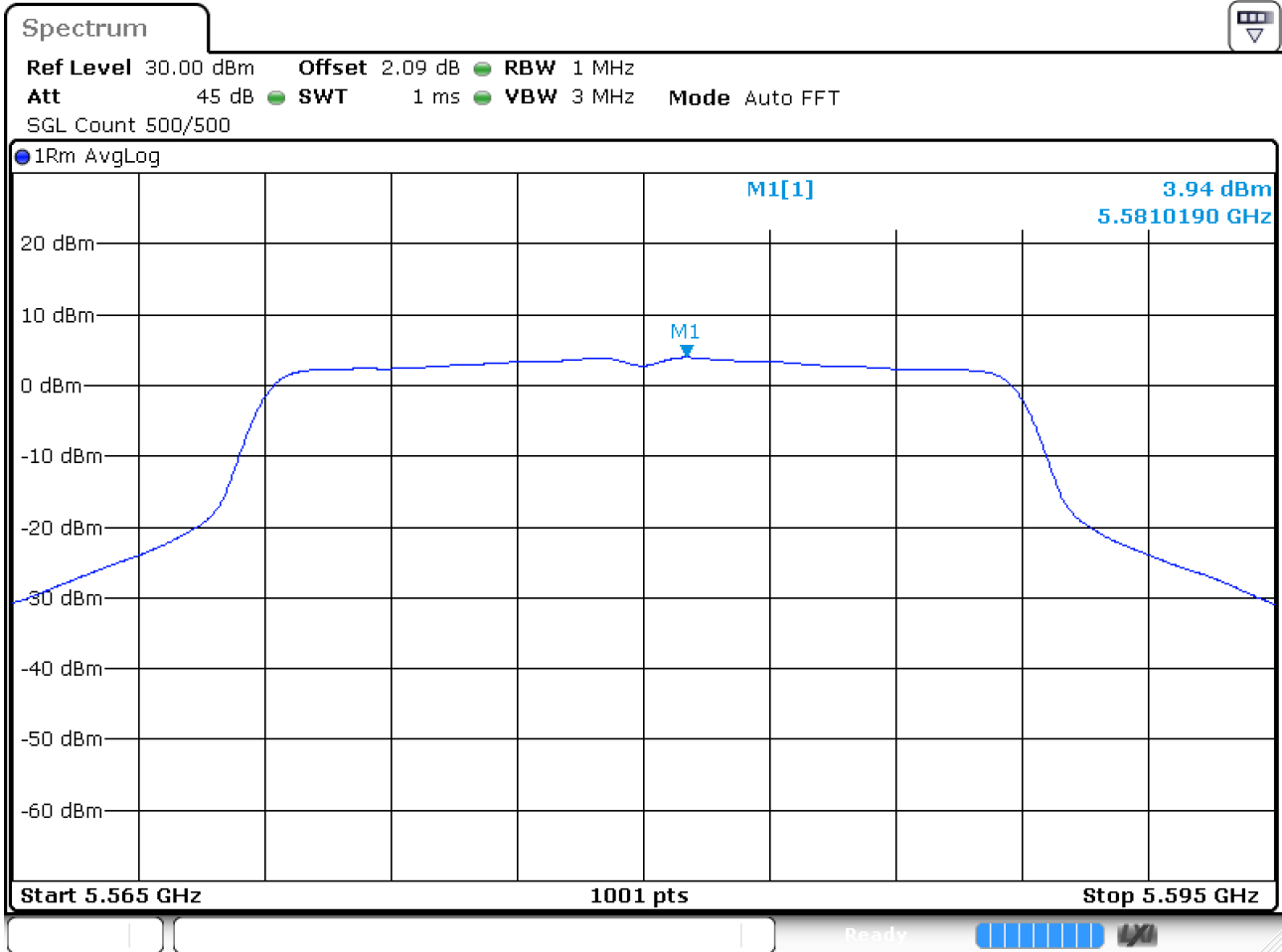
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4.8.2.41 11AC20_116 ANT 1



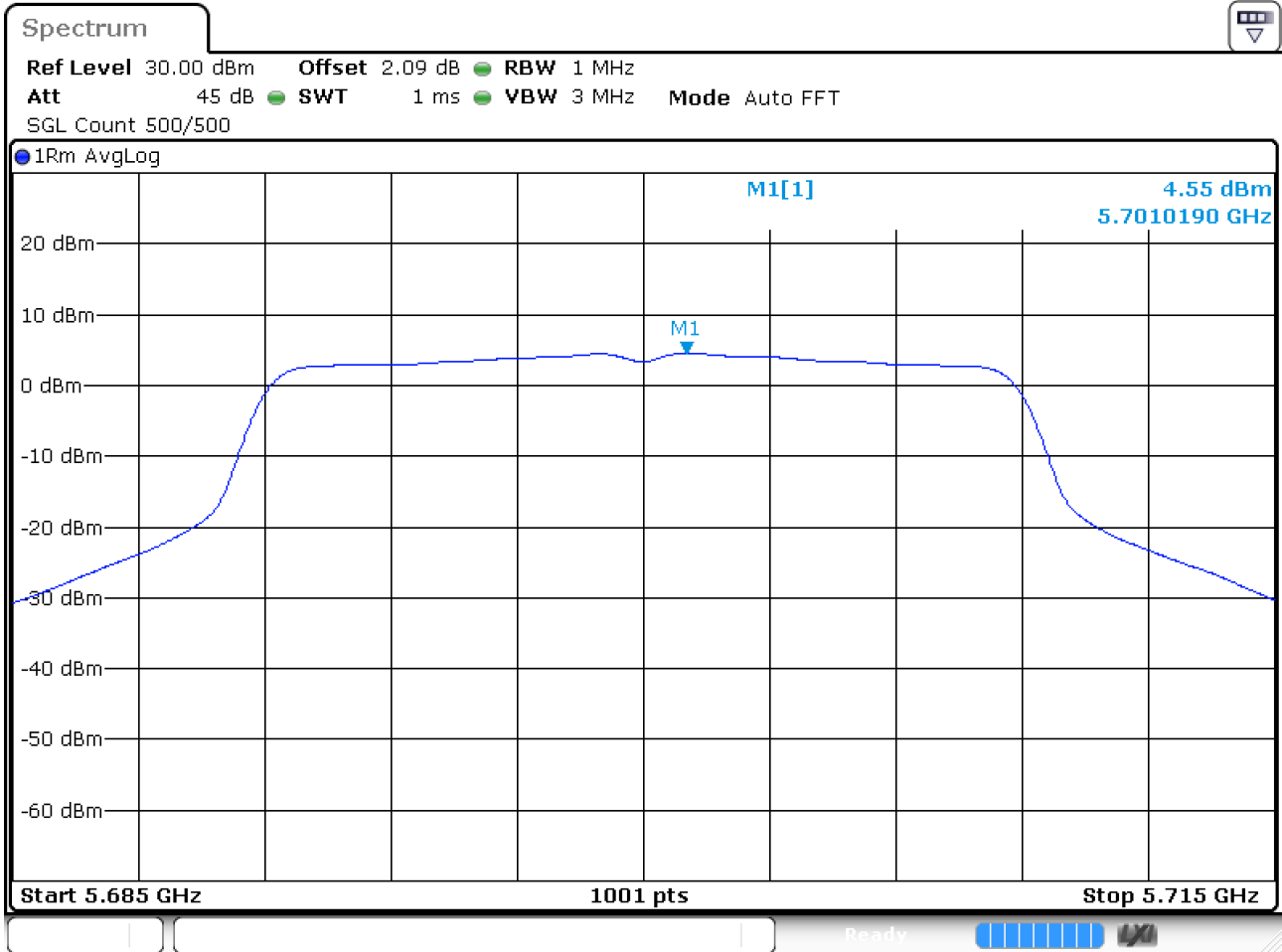
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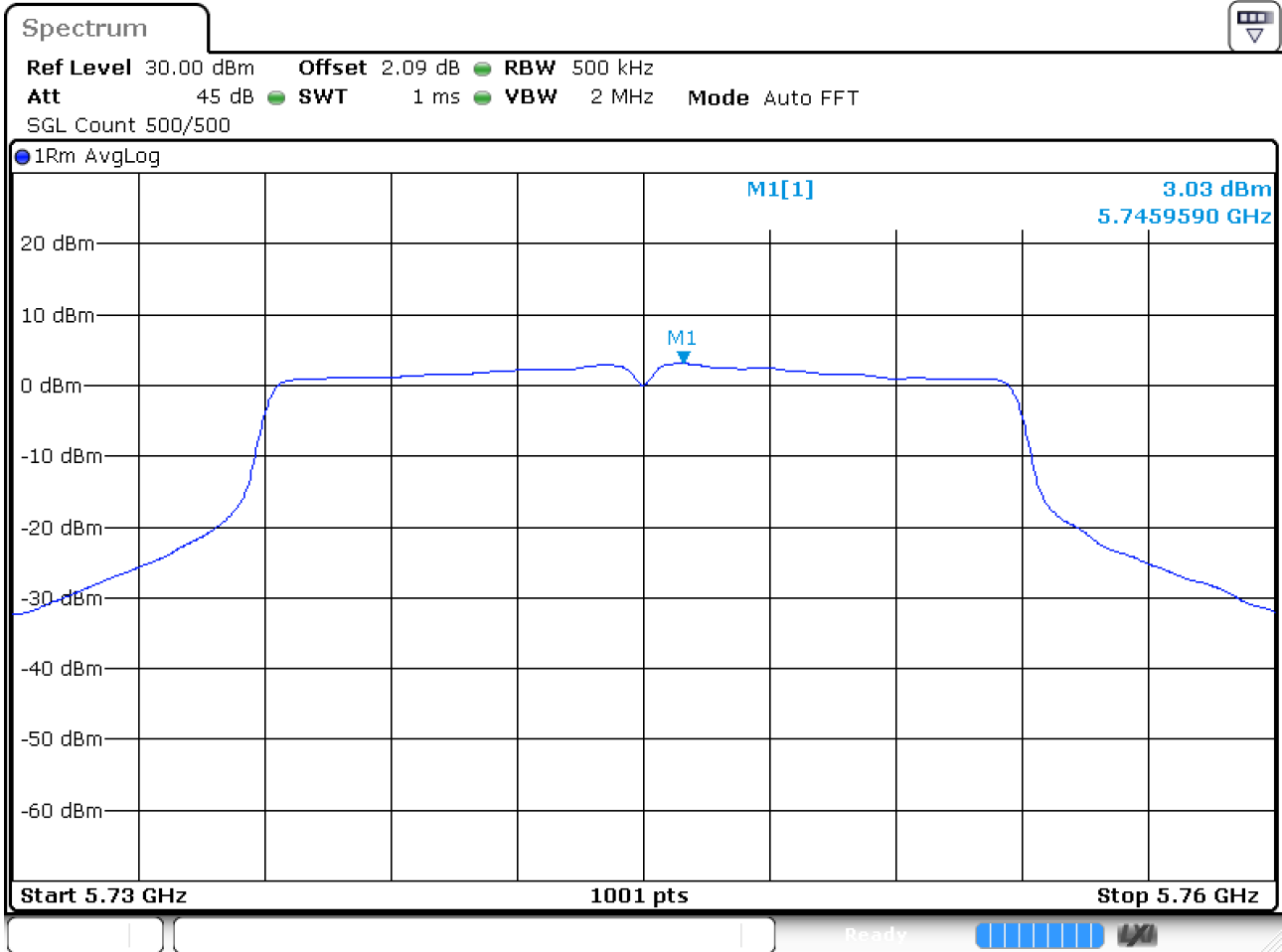
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4.8.2.43 11AC20_149 ANT 1



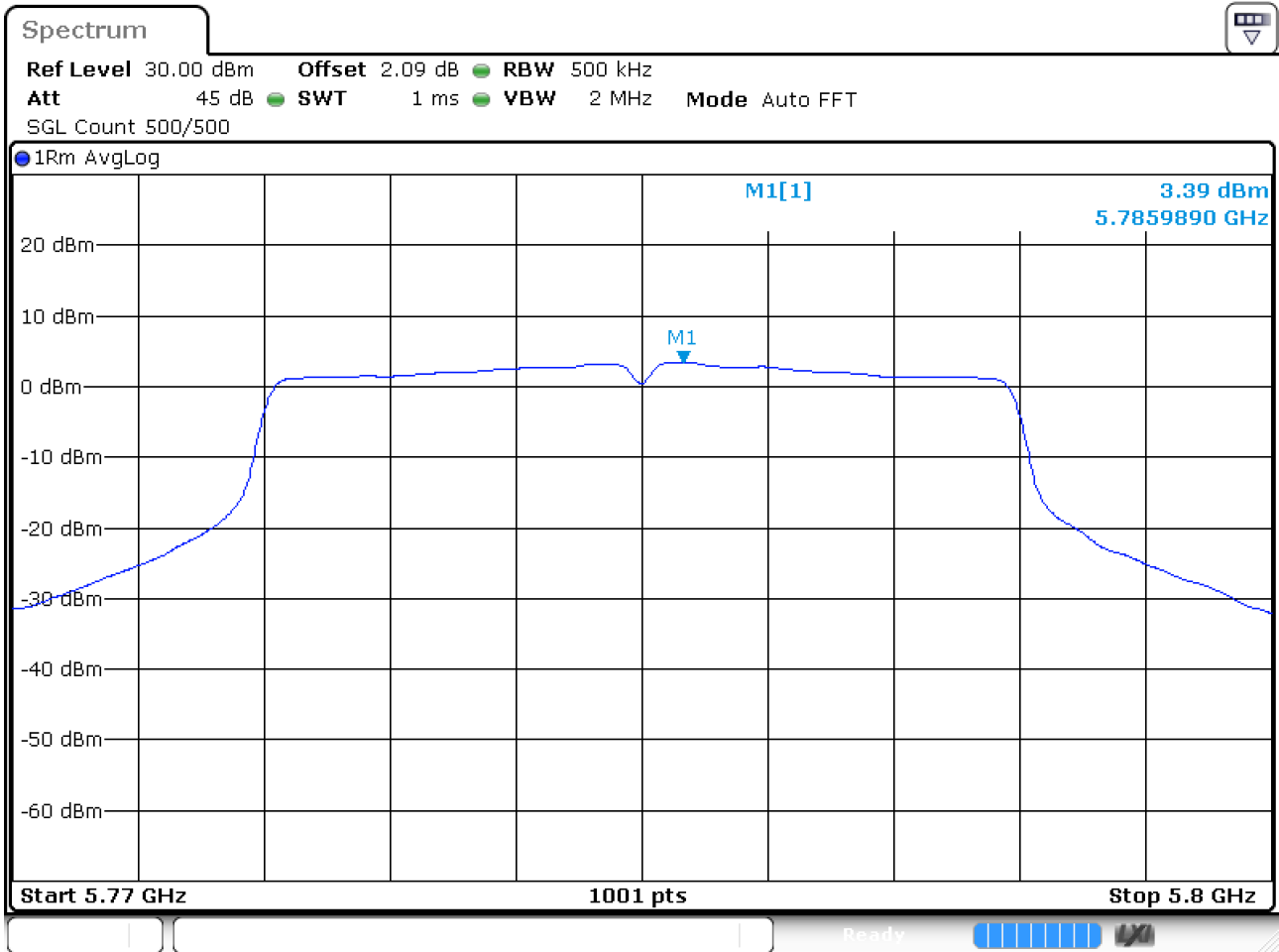
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4.8.2.44 11AC20_157 ANT 1



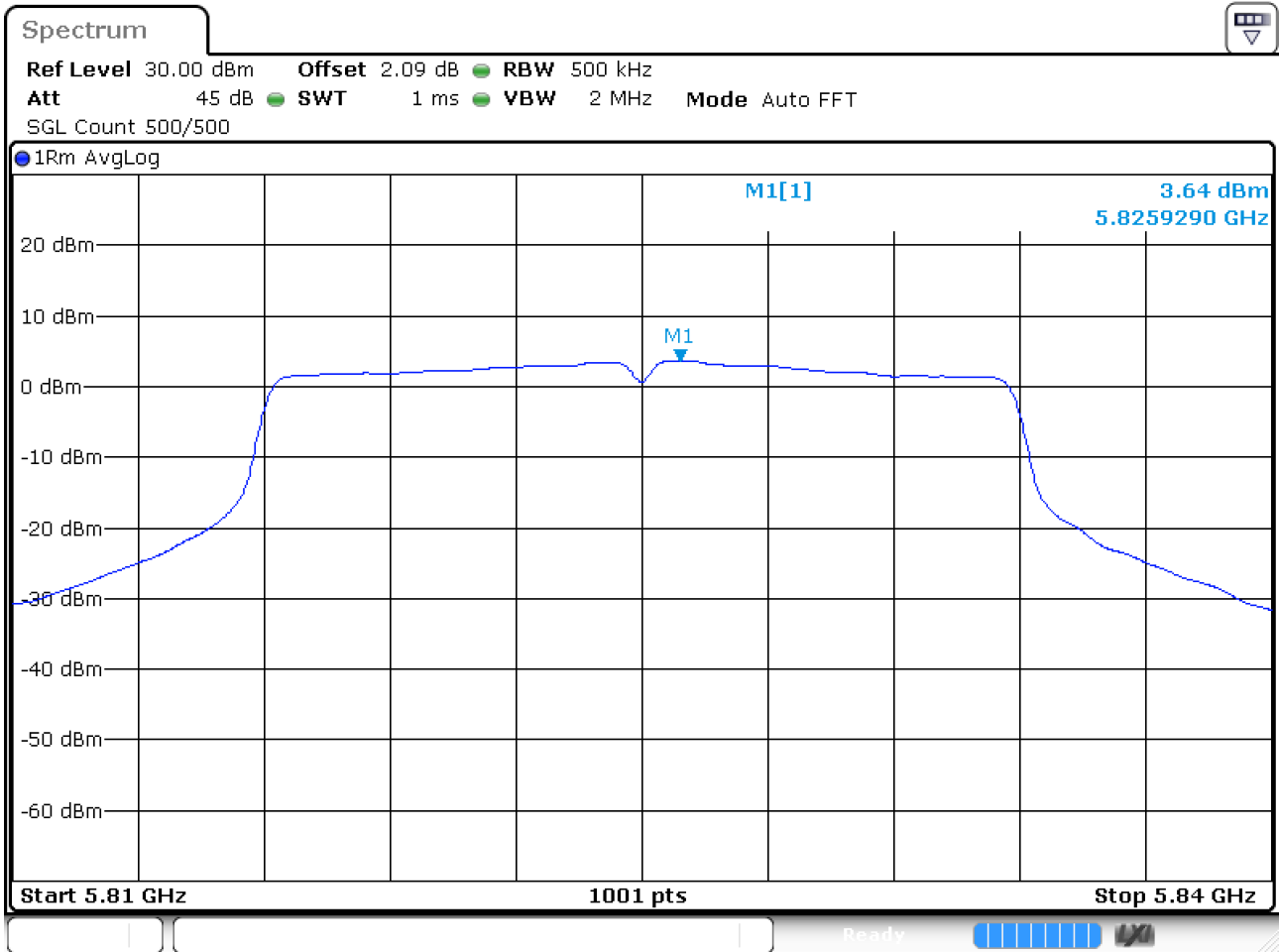
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4.8.2.45 11AC20_165 ANT 1



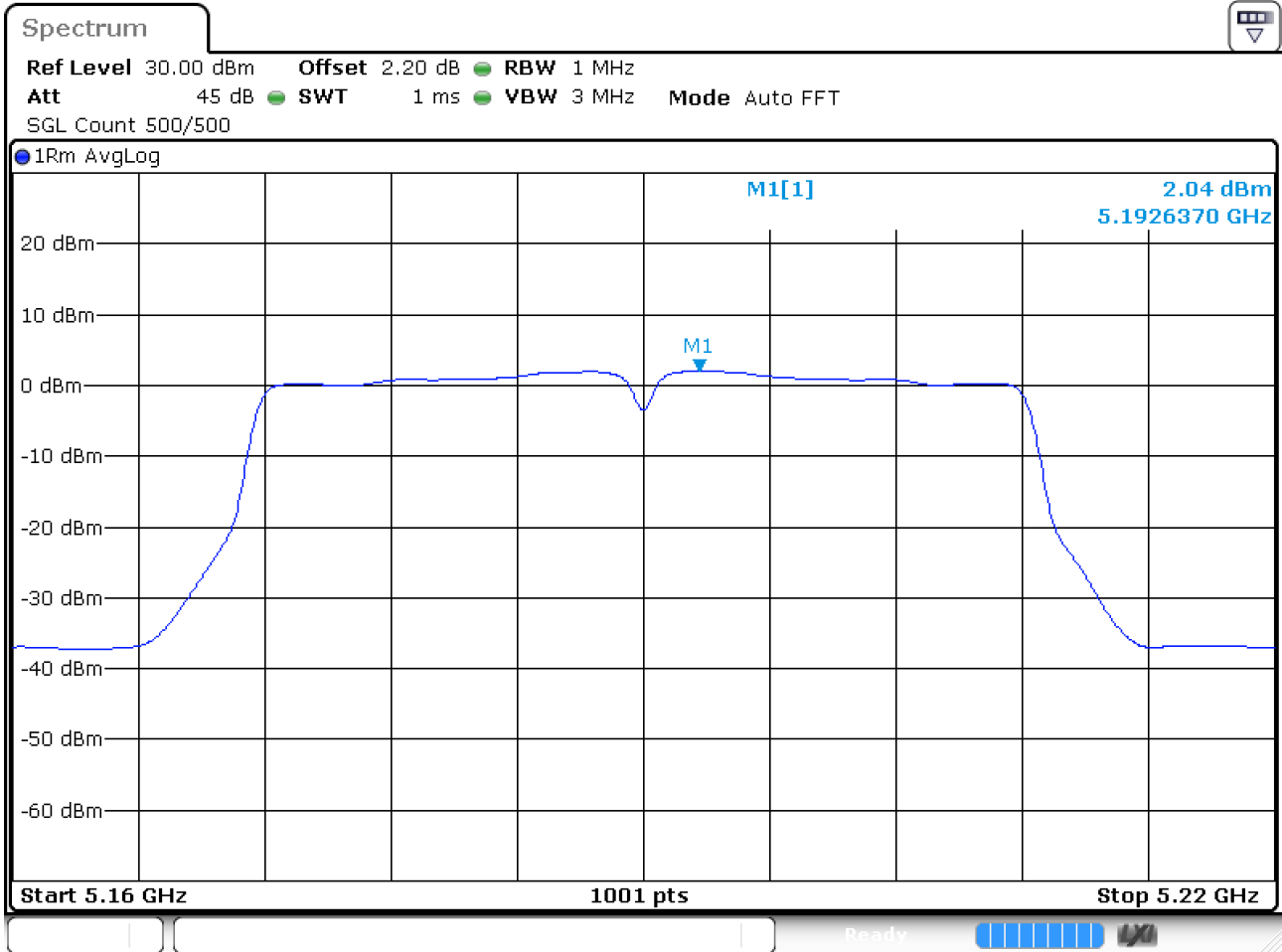
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4.8.2.46 11AC40_38 ANT 1



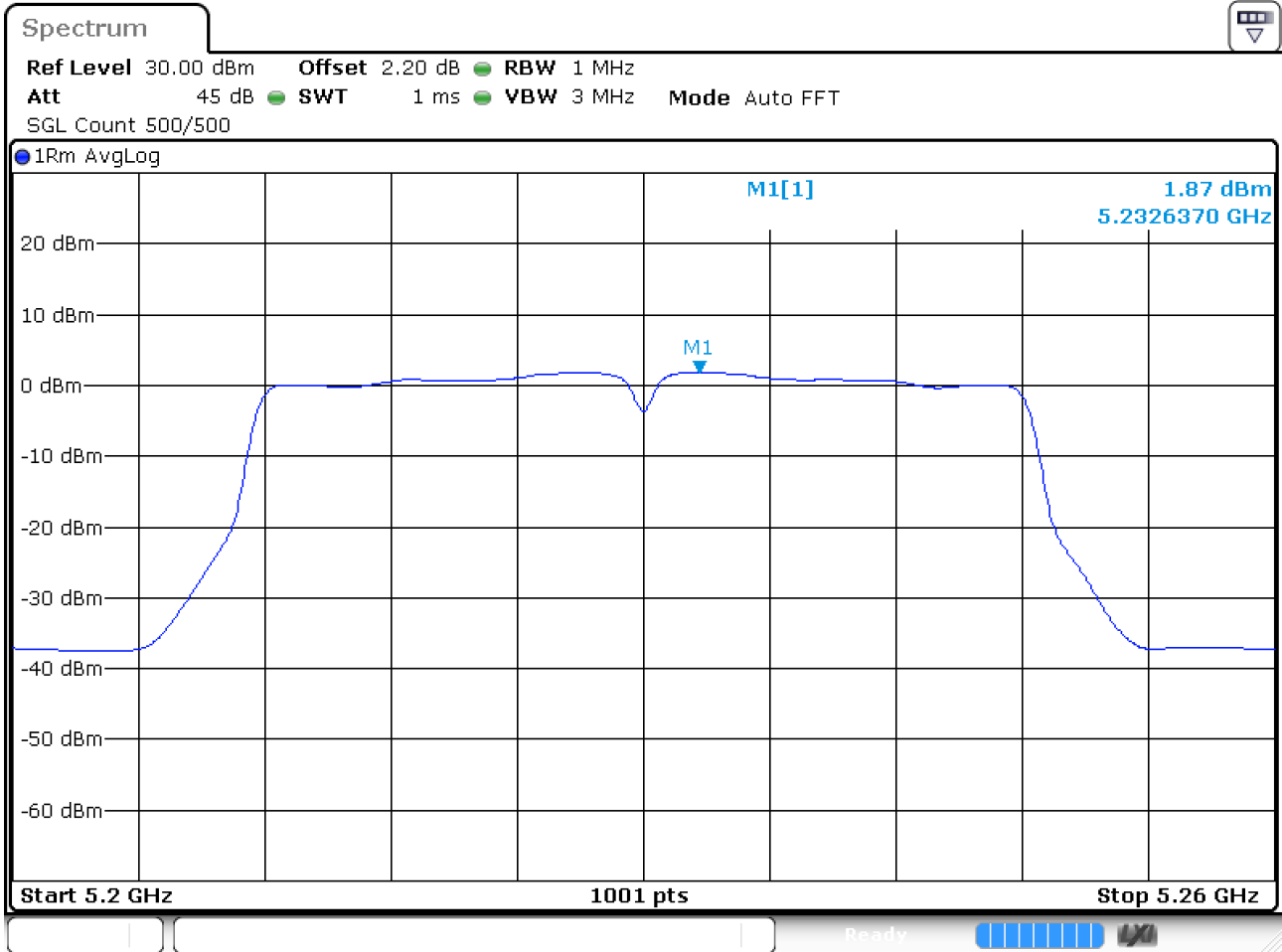
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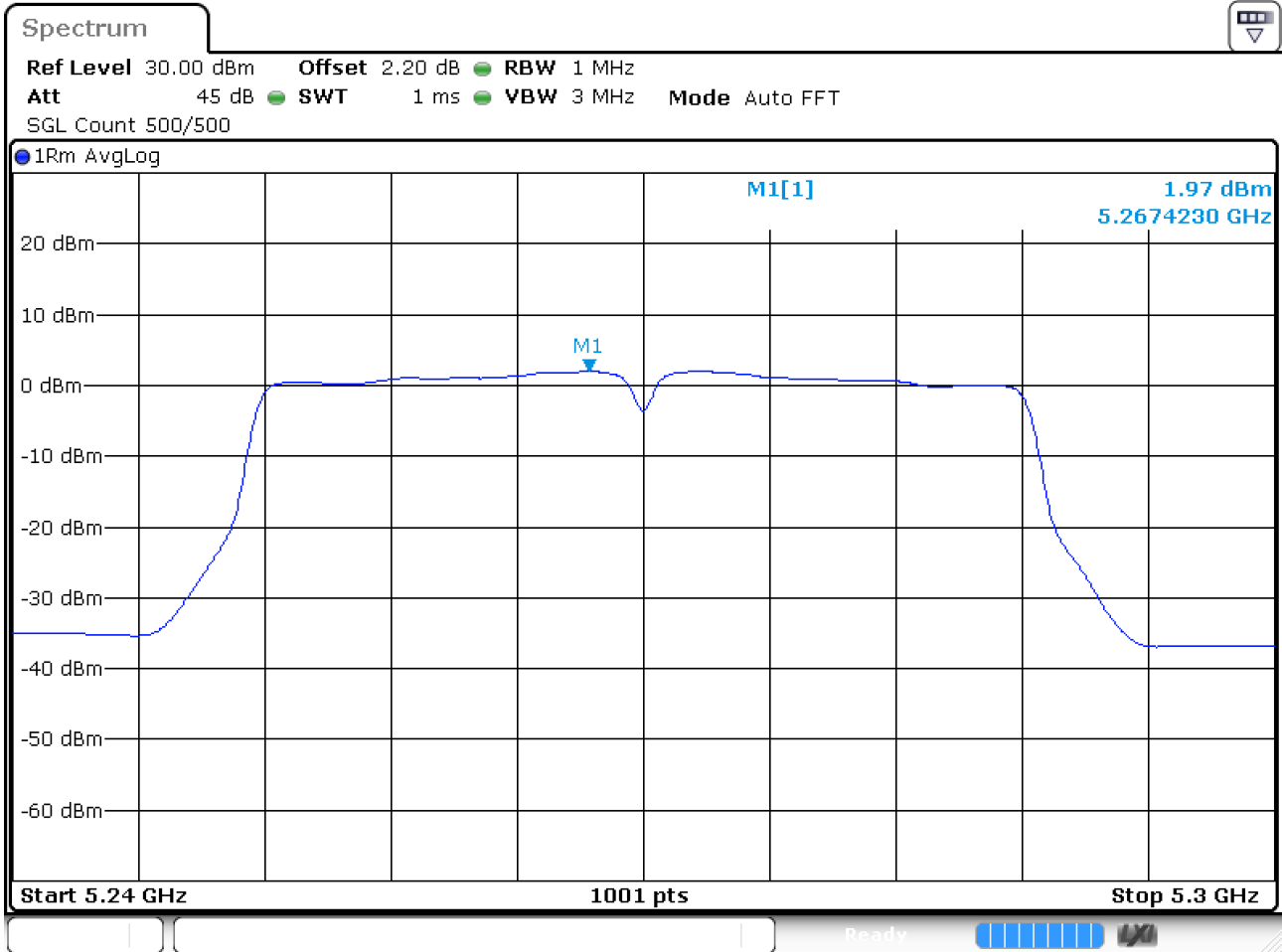
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4.8.2.48 11AC40_54 ANT 1



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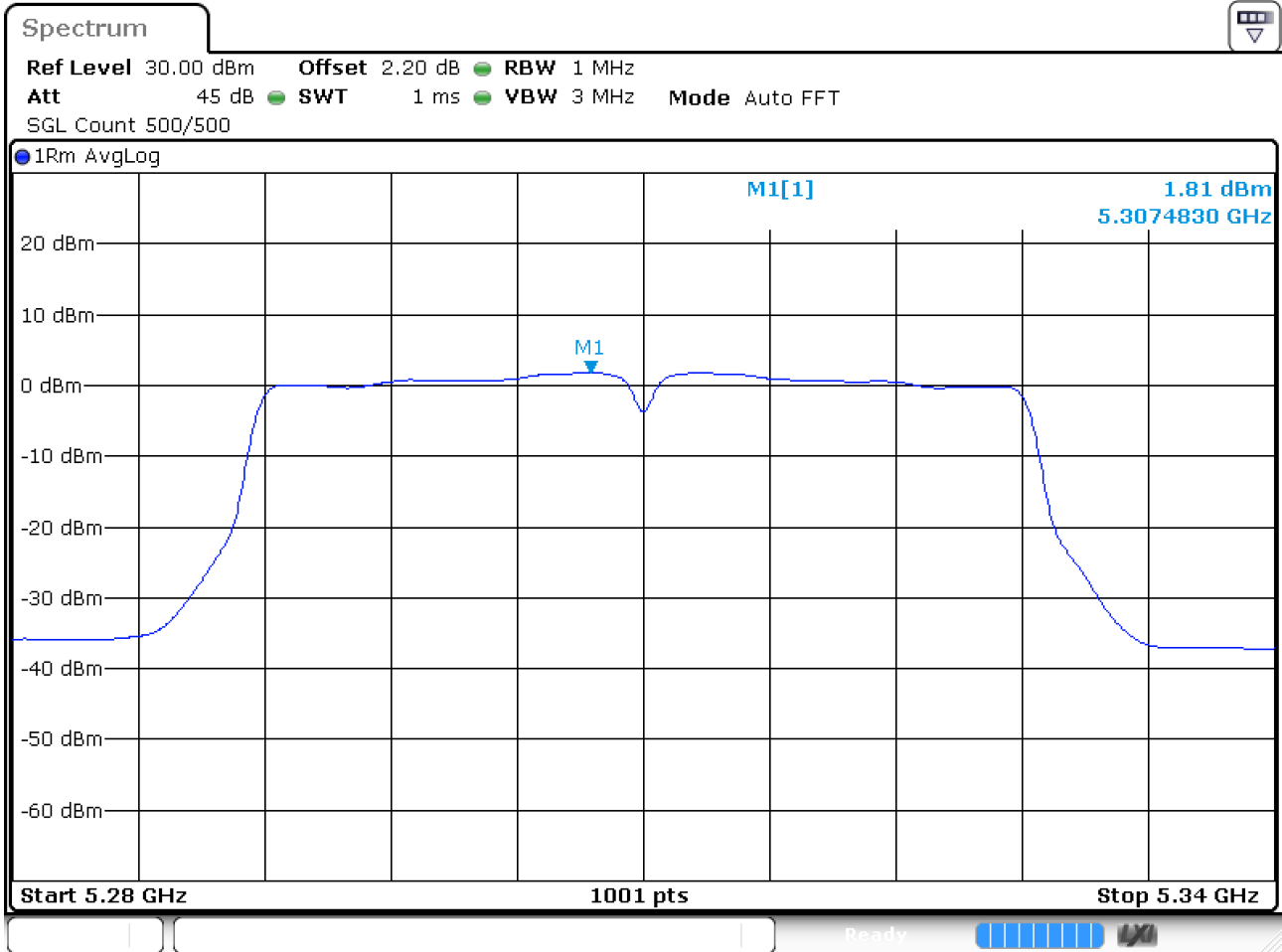


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4.8.2.49 11AC40_62 ANT 1



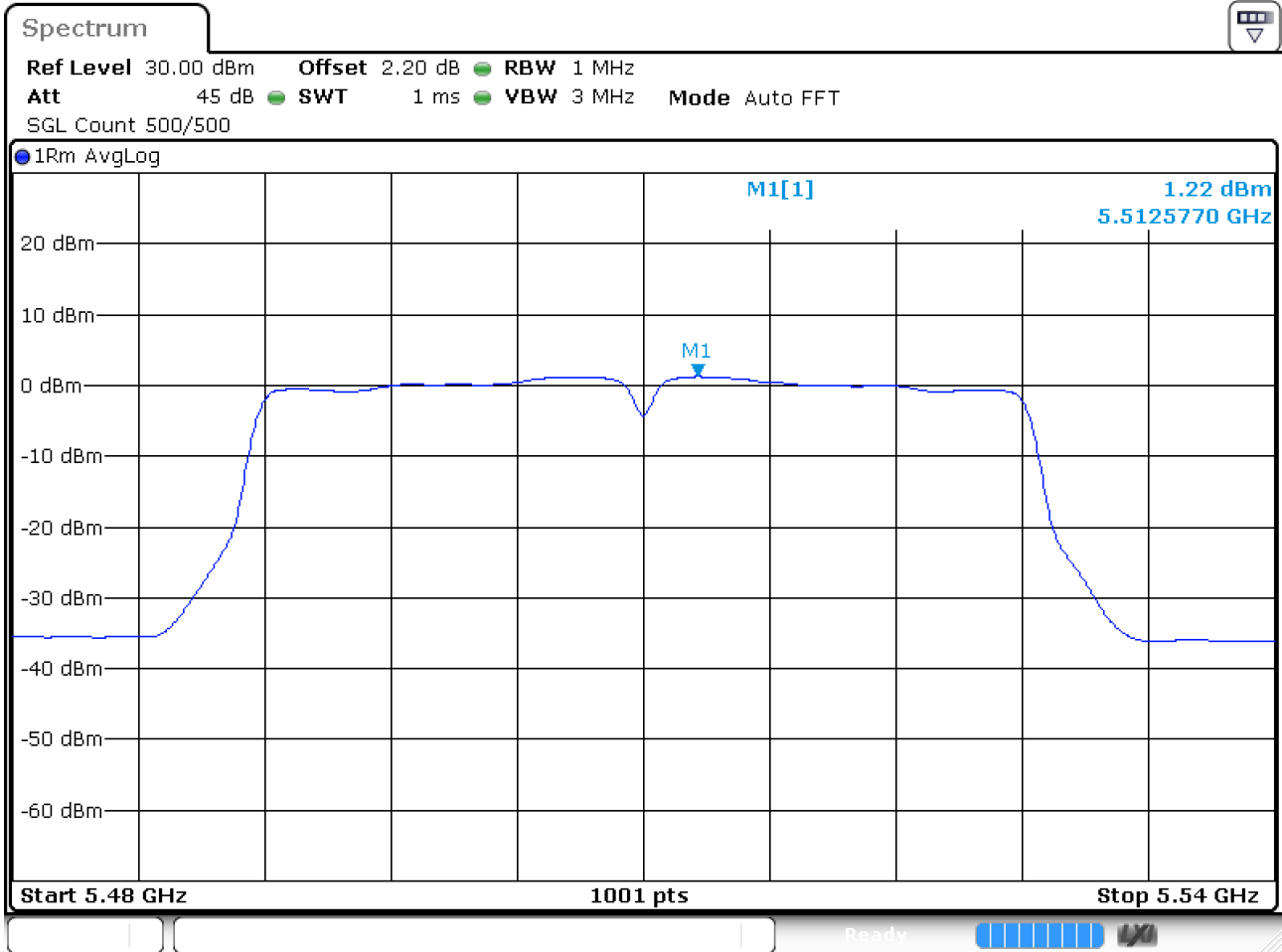
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4.8.2.50 11AC40_102 ANT 1



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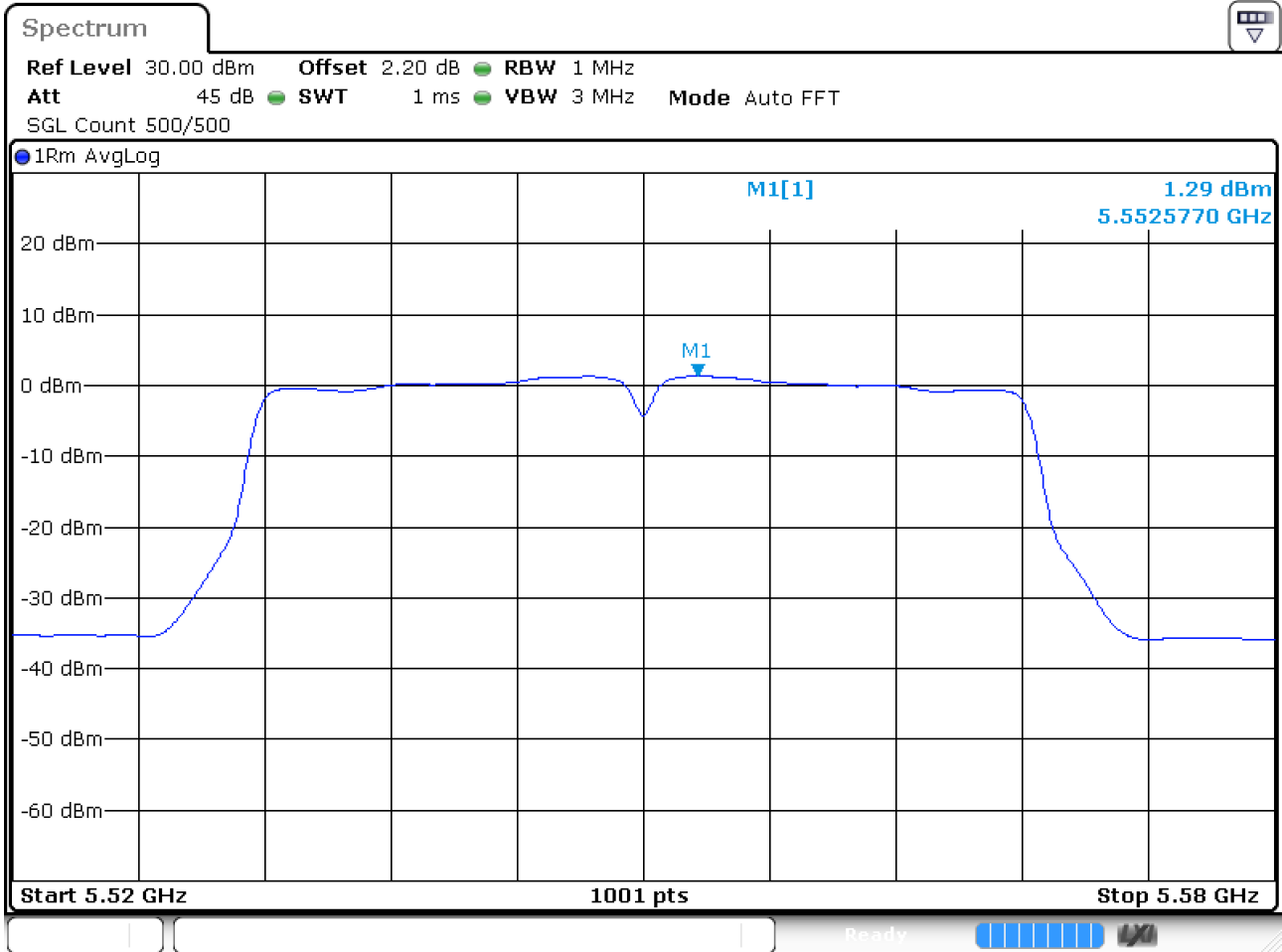
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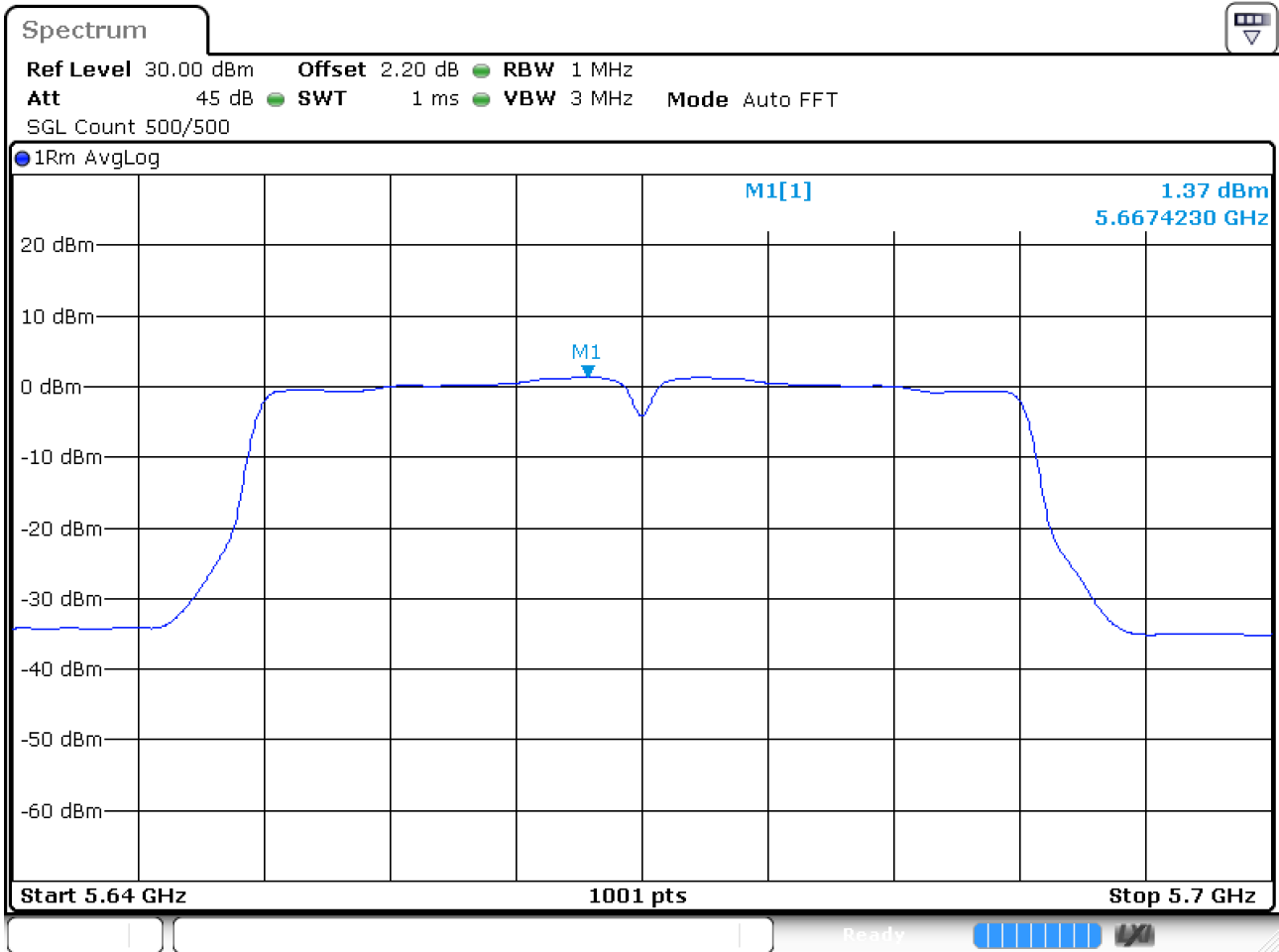
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4.8.2.52 11AC40_134 ANT 1



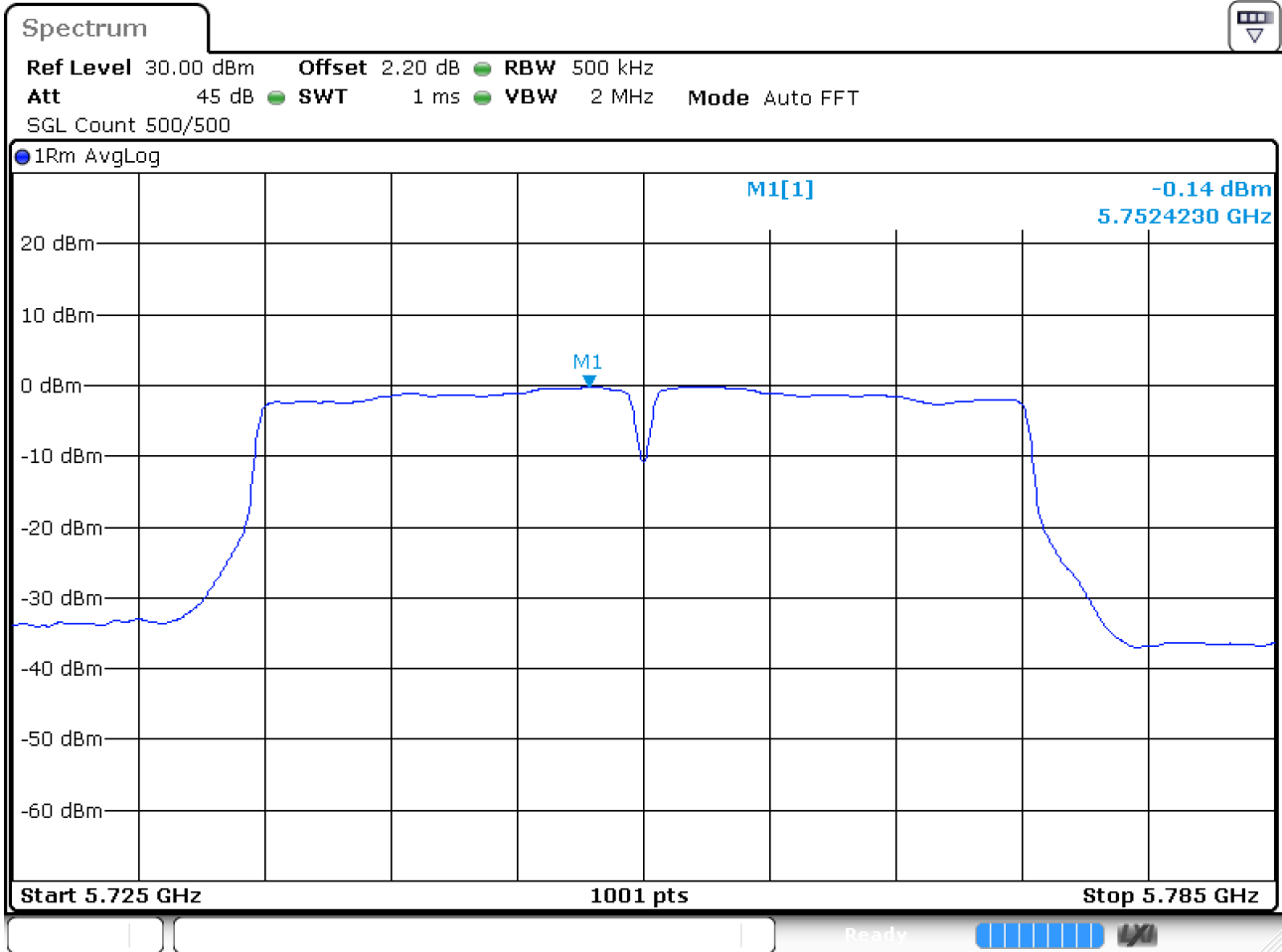
Date: 21.AUG.2020 18:38:21



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4.8.2.53 11AC40_151 ANT 1



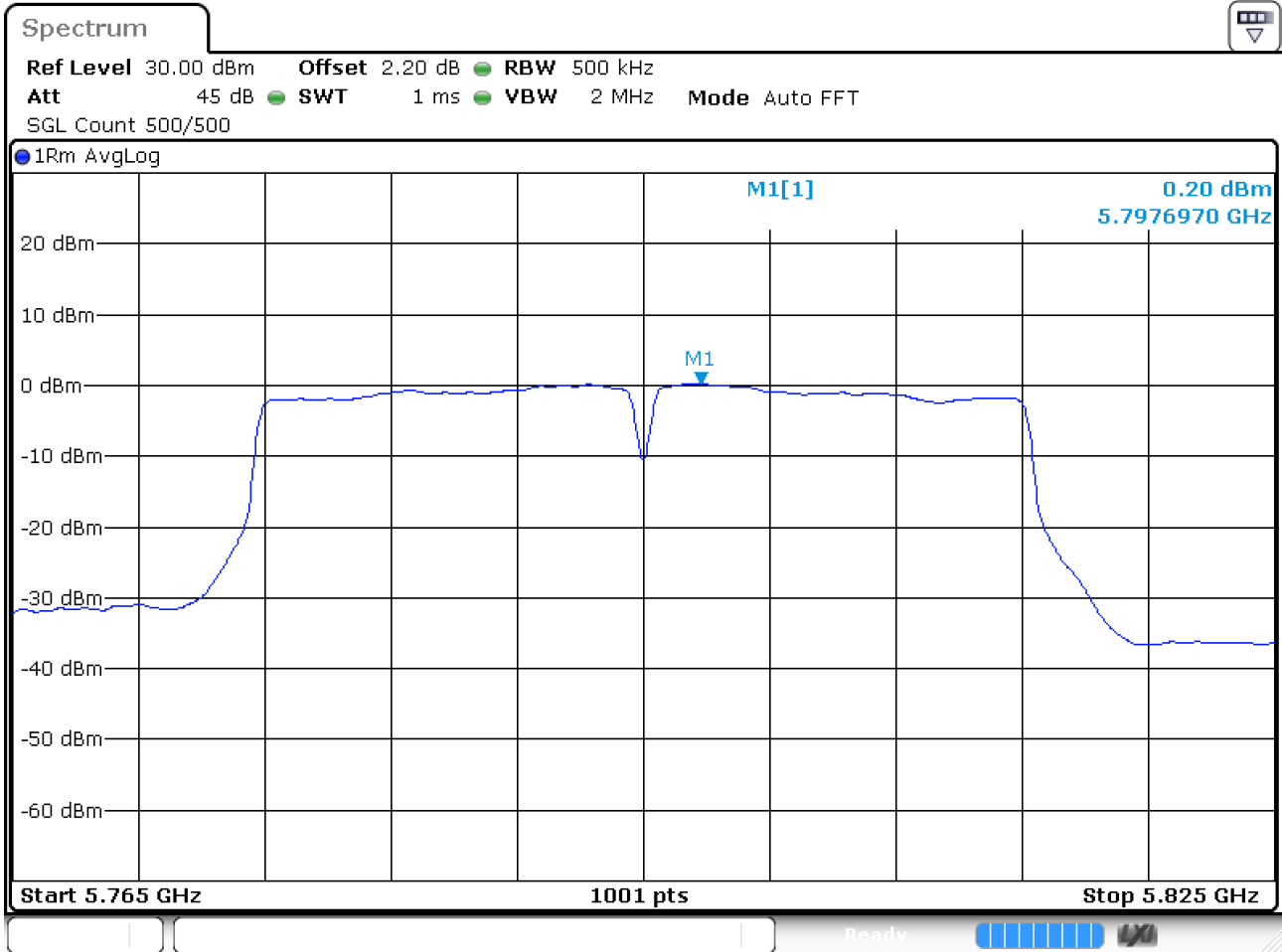
Date: 1.SEP.2020 21:36:20



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4.8.2.54 11AC40_159 ANT 1



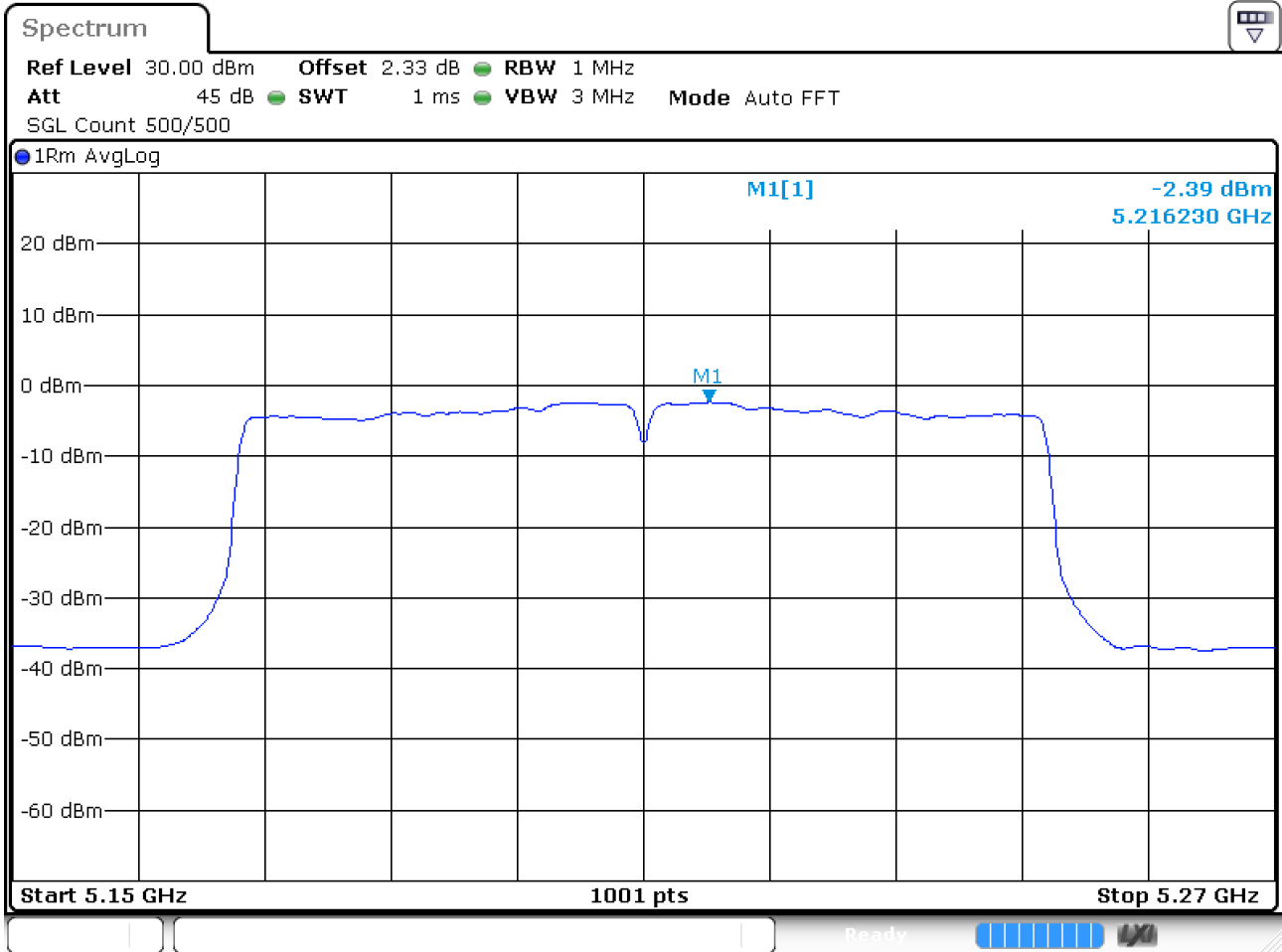
Date: 1.SEP.2020 21:37:39



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4.8.2.55 11AC80_42 ANT 1



Date: 21.AUG.2020 18:46:54

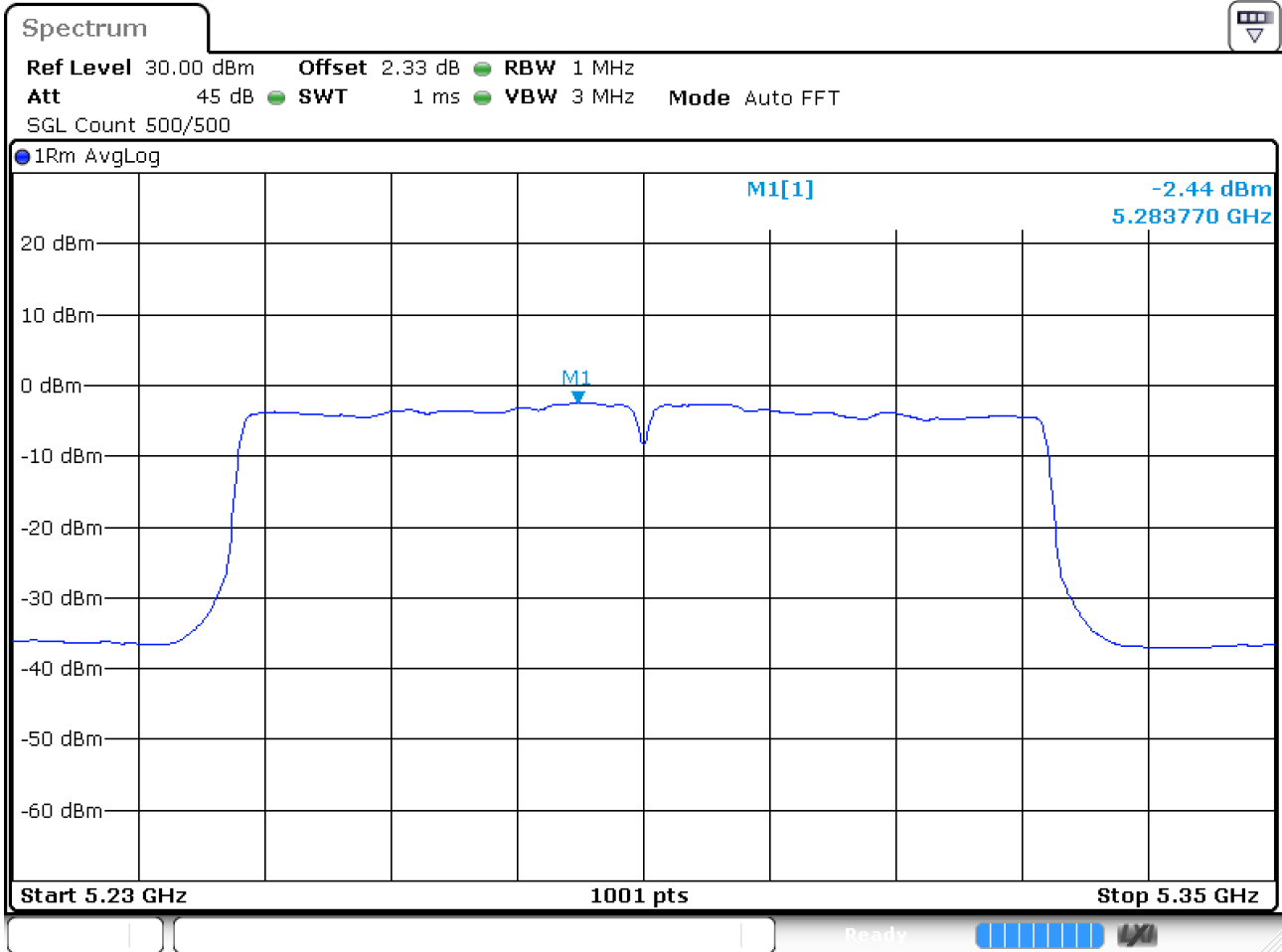


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Shenzhen Branch Testing Center EEC Laboratory

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4.8.2.56 11AC80_58 ANT 1



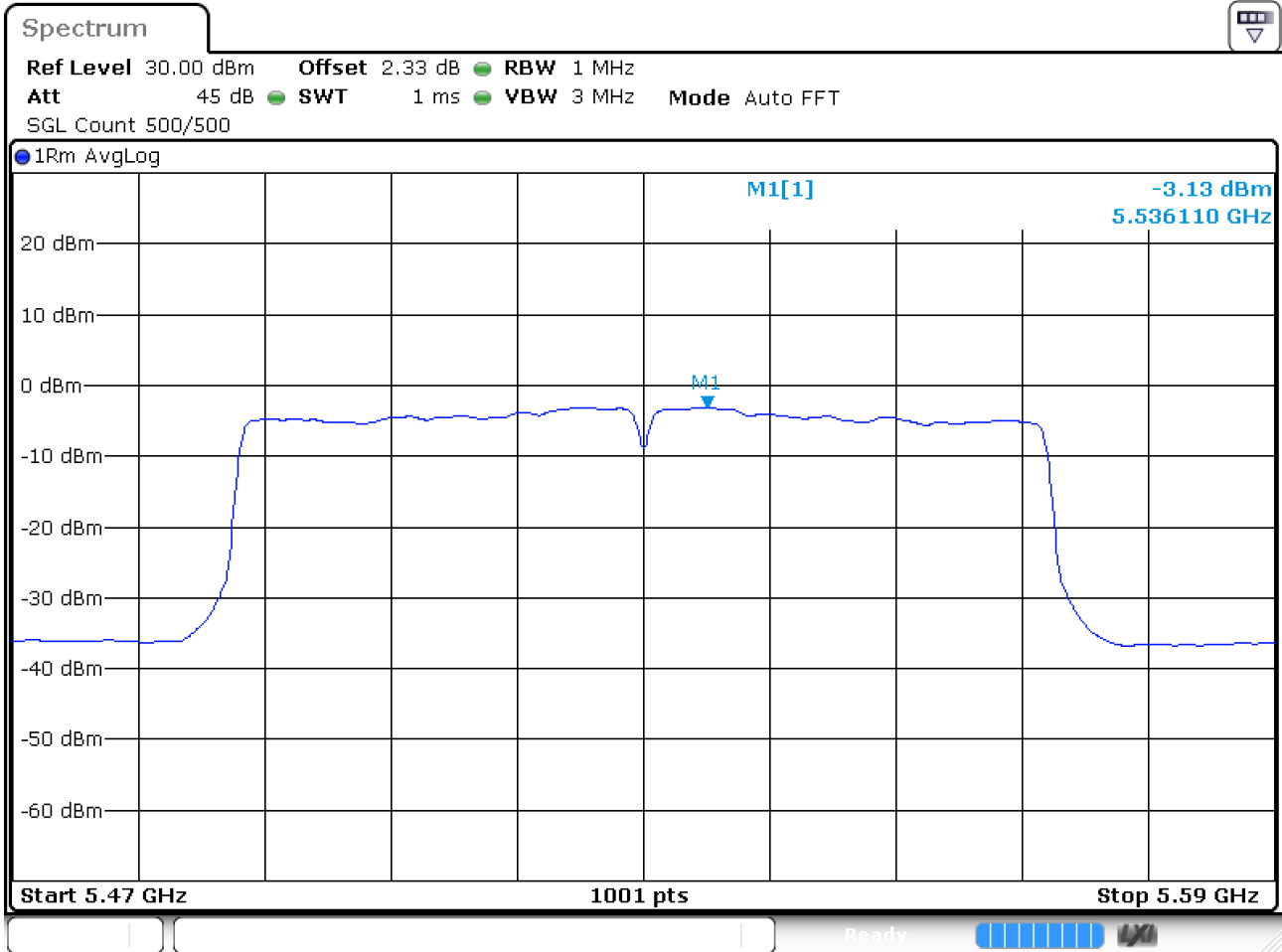
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4.8.2.57 11AC80_106 ANT 1



Date: 21.AUG.2020 18:56:20



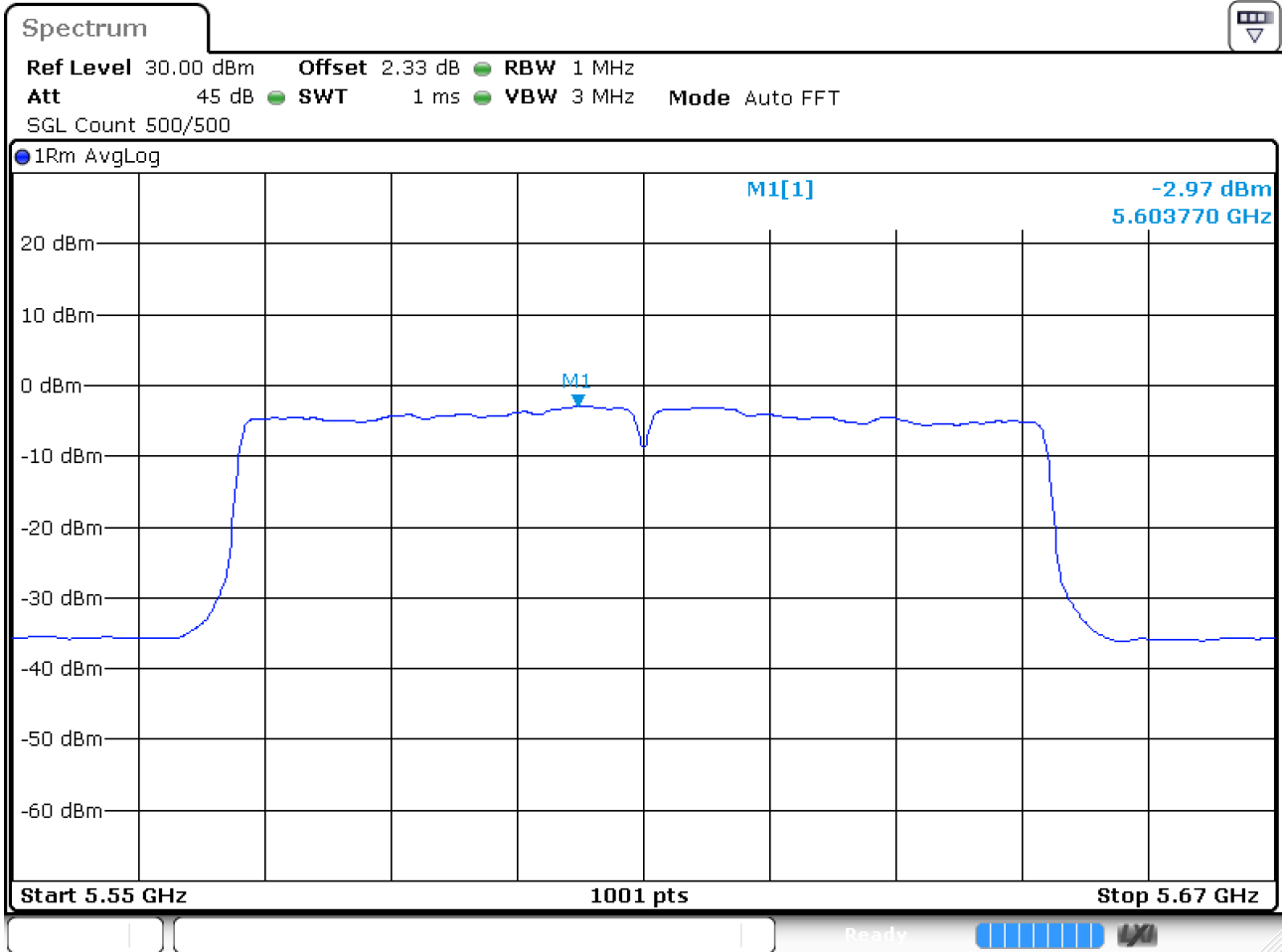
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4.8.2.58 11AC80_122 ANT 1



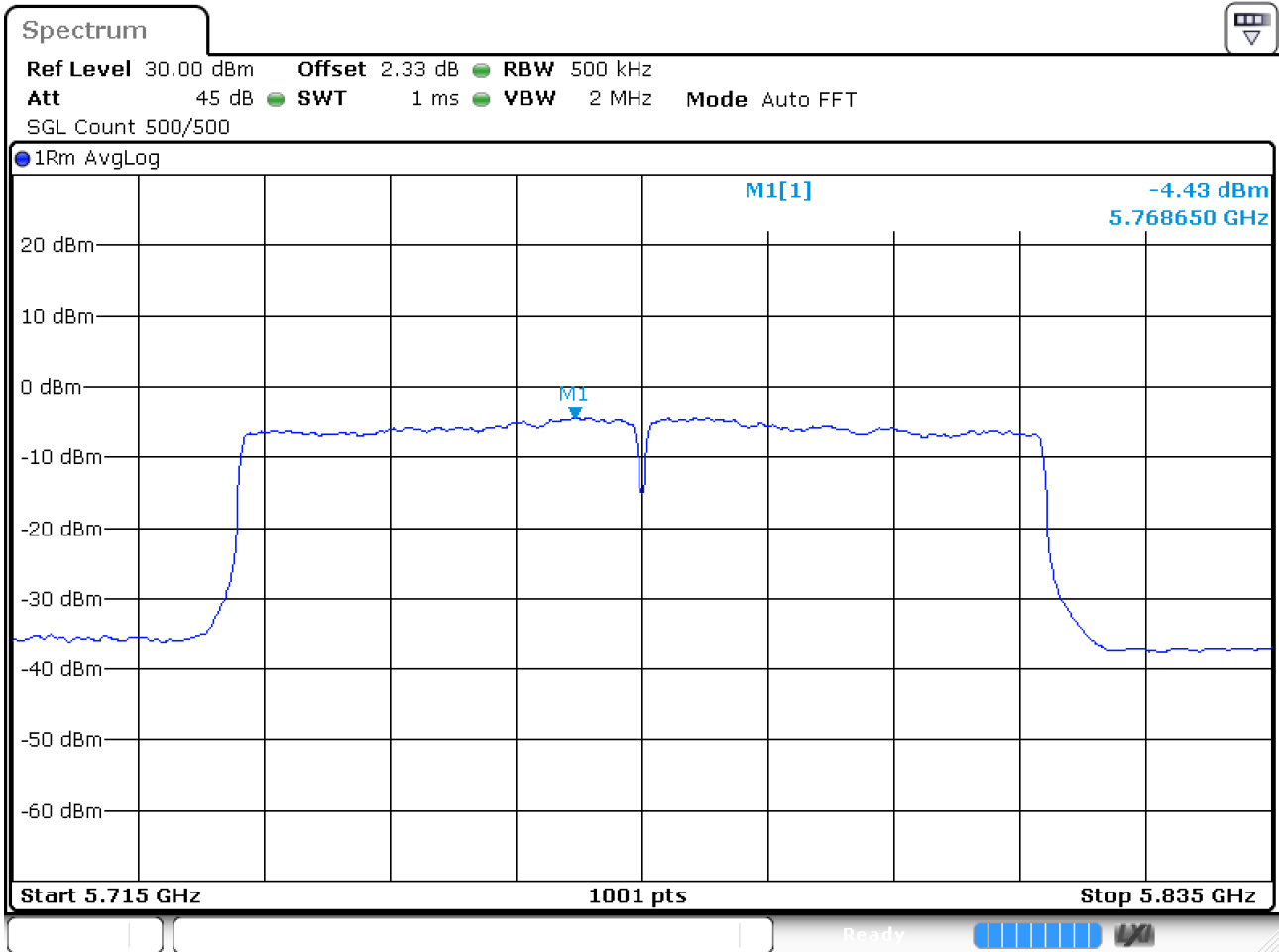
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4.8.2.59 11AC80_155 ANT 1



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4.9 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15 Section 15.407(b)
Test Method:	ANSI C63.10: 2013
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)
Test Setup:	

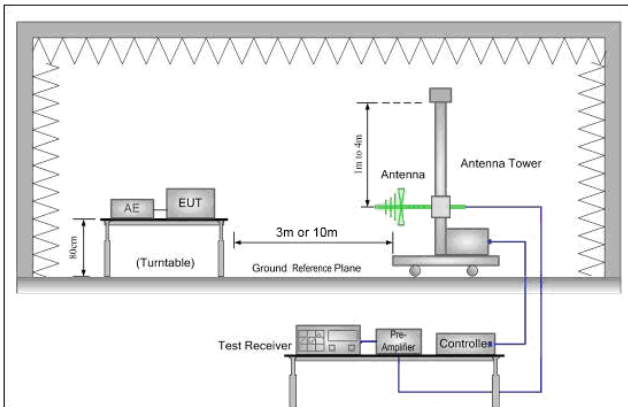


Figure 1. 30MHz to 1GHz

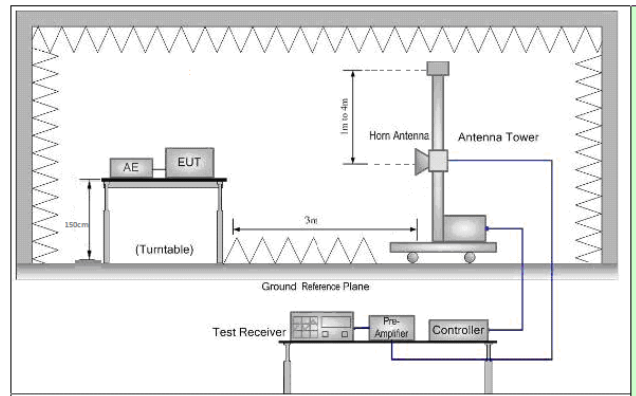


Figure 2. Above 1 GHz

<p>Test Procedure:</p>	<ol style="list-style-type: none"> For below 1GHz test, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. For above 1GHz test, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Test the EUT in the outermost channels. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
-------------------------------	--



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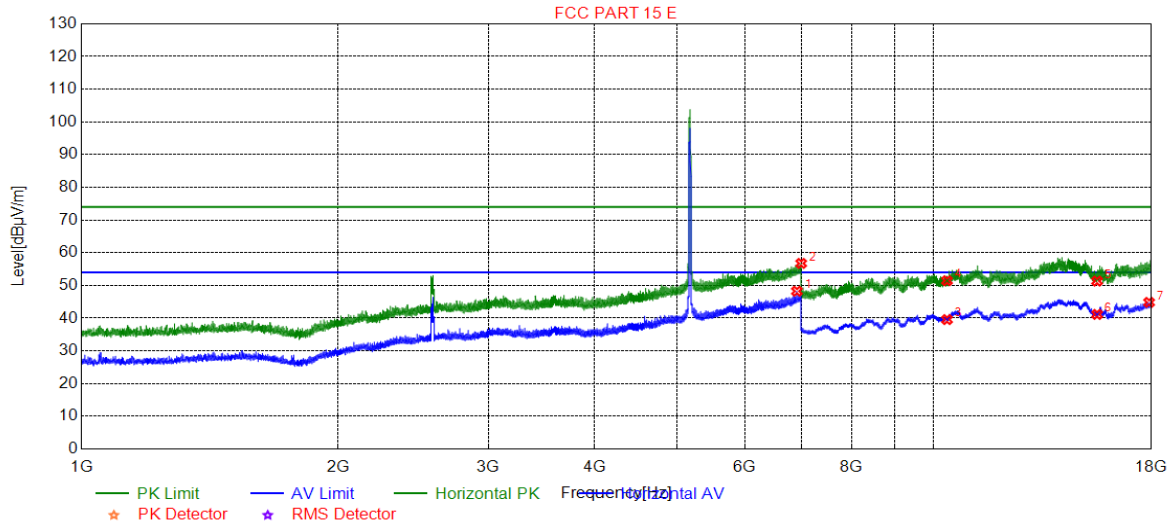
	i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates.
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a; MCS0 of rate is the worst case of 802.11n(HT20); MCS0 of rate is the worst case of 802.11n(HT40); MCS0 of rate is the worst case of 802.11ac(HT20); MCS0 of rate is the worst case of 802.11ac(HT40); MCS0 of rate is the worst case of 802.11ac(HT80) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11a at lowest channel is the worst case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass



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4.9.1.1 802.11AC20_Channel 36

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	6906.69	48.26	20.87	54.00	5.74	127	18	Horizontal
2	6987.09	56.75	21.27	74.00	17.25	100	219	Horizontal
3	10360.0	39.58	-3.63	54.00	14.42	192	18	Horizontal
4	10360.0	51.46	-3.63	74.00	22.54	232	321	Horizontal
5	15540.0	51.35	0.46	74.00	22.65	209	18	Horizontal
6	15540.0	41.16	0.46	54.00	12.84	169	119	Horizontal
7	17885.0	44.84	-1.51	54.00	9.16	146	321	Horizontal

Final Data List



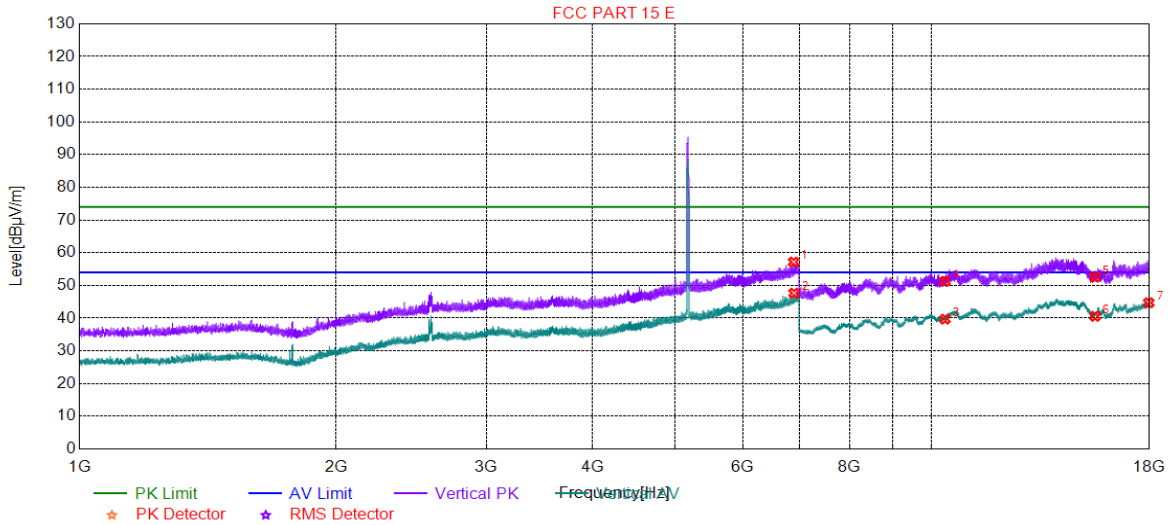
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4.9.1.2 802.11AC20_Channel 36

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	6882.39	57.18	20.84	74.00	16.82	239	241	Vertical
2	6890.79	47.65	20.82	54.00	6.35	245	89	Vertical
3	10360.0	39.71	-3.63	54.00	14.29	290	292	Vertical
4	10360.0	51.29	-3.63	74.00	22.71	178	0	Vertical
5	15540.0	52.54	0.46	74.00	21.46	284	142	Vertical
6	15540.0	40.57	0.46	54.00	13.43	206	142	Vertical
7	17963.1	44.72	-1.29	54.00	9.28	179	292	Vertical

Final Data List

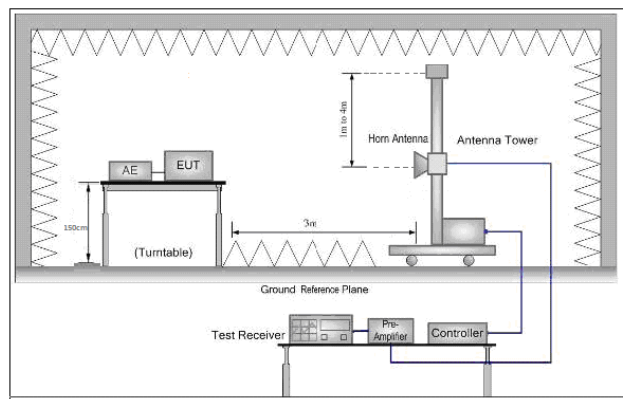
Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
- 2) Scan from 9kHz to 40GHz, The disturbance between 9kHz to 30MHz and 18GHz to 40GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported .
- 3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.
- 4) All modes have been tested, but only the worst case data displayed in this report.



4.10 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15 Section 15.407(b)		
Test Method:	ANSI C63.10: 2013		
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			



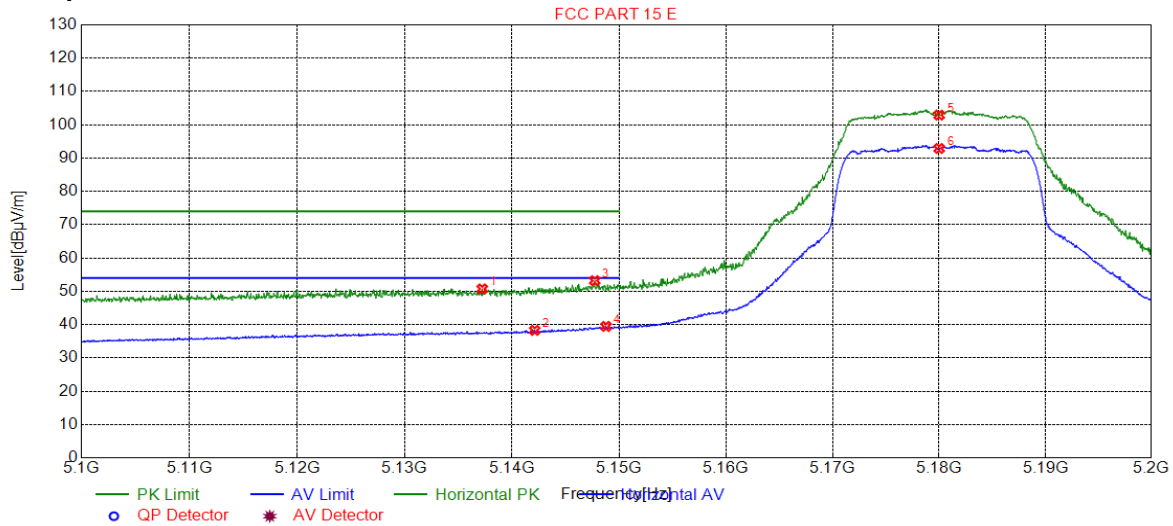
<p>Test Procedure:</p>	<ol style="list-style-type: none"> a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the 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 channel g. Test the EUT in the outermost channels. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. i. Repeat above procedures until all frequencies measured was complete.
<p>Exploratory Test Mode:</p>	<p>Transmitting with all kind of modulations, data rates.</p>
<p>Final Test Mode:</p>	<p>Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a; MCS0 of rate is the worst case of 802.11n(HT20); MCS0 of rate is the worst case of 802.11n(HT40); MCS0 of rate is the worst case of 802.11ac(HT20); MCS0 of rate is the worst case of 802.11ac(HT40); MCS0 of rate is the worst case of 802.11ac(HT80); Only the worst case is recorded in the report.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Test Results:</p>	<p>Pass</p>



4.11 Restricted bands around fundamental frequency

4.11.1.1 802.11AC20_Channel 36

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	5137.21	50.74	15.41	74.00	23.26	221	40	Horizontal
2	5142.12	38.30	15.45	54.00	15.70	140	24	Horizontal
3	5147.72	53.21	15.50	74.00	20.79	157	34	Horizontal
4	5148.77	39.48	15.51	54.00	14.52	182	24	Horizontal
5	5180.00	102.91	15.56	0.00	-102.91	206	29	Horizontal
6	5180.00	92.89	15.56	0.00	-92.89	143	24	Horizontal

Final Data List

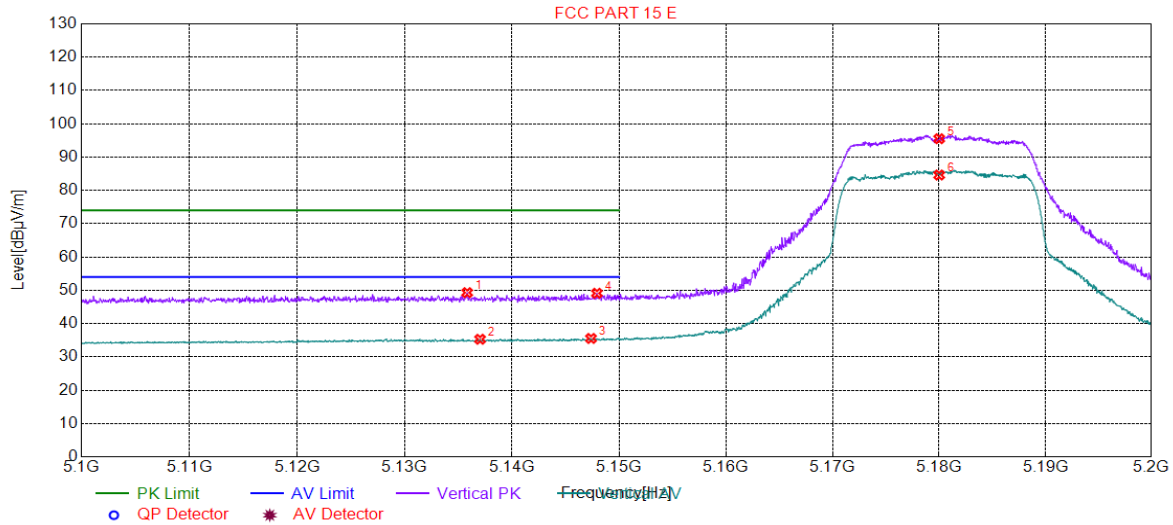


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4.11.1.2 802.11AC20_Channel 36

Test Graph



Suspected List

Suspected List								
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	5135.81	49.32	15.40	74.00	24.68	277	1	Vertical
2	5137.01	35.33	15.41	54.00	18.67	179	346	Vertical
3	5147.37	35.57	15.50	54.00	18.43	173	346	Vertical
4	5147.92	49.13	15.50	74.00	24.87	192	259	Vertical
5	5180.00	95.52	15.56	0.00	-95.52	281	5	Vertical
6	5180.00	84.62	15.56	0.00	-84.62	218	5	Vertical

Final Data List

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$

All modes have been tested, but only the worst case data displayed in this report.



4.12 Frequencies Stability

4.12.1 Frequency Error vs. Voltage:

Test Conditions	Measured Frequency (MHz)	
	5180	5825
V nom(V)	5180.004369	5825.002322
V max(V)	5180.006574	5825.003182
V min(V)	5180.015686	5825.008992
Max. Deviation Frequency	0.015686	0.008992
Max. Frequency Error (ppm)	3.028178	1.543737

4.12.2 Frequency Error vs. Temperature:

Test Conditions(°C)	Measured Frequency (MHz)	
	5180	5825
-5	5180.005007	5825.004242
5	5180.014568	5825.006813
15	5180.016431	5825.014283
25	5180.026046	5825.017913
35	5180.033603	5825.020536
45	5180.038990	5825.027154
50	5180.039142	5825.027787
Max. Deviation Frequency	0.039142	0.027787
Max. Frequency Error (ppm)	7.556327	4.770380



4.13 Dynamic Frequency Selection

4.13.1 DFS Overview

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
<i>Non-Occupancy Period</i>	Yes	Not required	Yes
<i>DFS Detection Threshold</i>	Yes	Not required	Yes
<i>Channel Availability Check Time</i>	Yes	Not required	Not required
<i>U-NII Detection Bandwidth</i>	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
<i>DFS Detection Threshold</i>	Yes	Not required
<i>Channel Closing Transmission Time</i>	Yes	Yes
<i>Channel Move Time</i>	Yes	Yes
<i>U-NII Detection Bandwidth</i>	Yes	Not required
Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
<i>U-NII Detection Bandwidth and Statistical Performance Check</i>	All BW modes must be tested	Not required
<i>Channel Move Time and Channel Closing Transmission Time</i>	Test using widest BW mode available	Test using the widest BW mode available for the link
<i>All other tests</i>	Any single BW mode	Not required
<p>Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.</p>		



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4.13.2 DFS Detection Thresholds

Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP \geq 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
<p>Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p>Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.</p> <p>Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.</p>	

4.13.3 Response Requirements

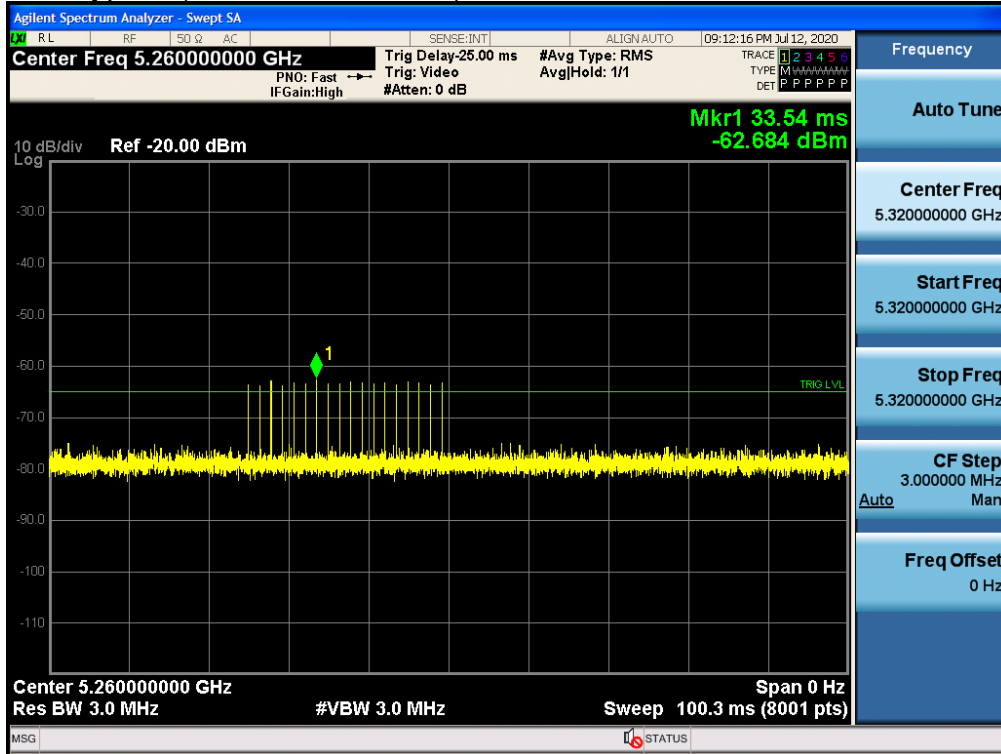
Table 4: DFS Response Requirement Values

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds See Note 1.
<i>Channel Closing Transmission Time</i>	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
<p>Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.</p> <p>Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.</p> <p>Note 3: During the <i>U-NII Detection Bandwidth</i> detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.</p>	



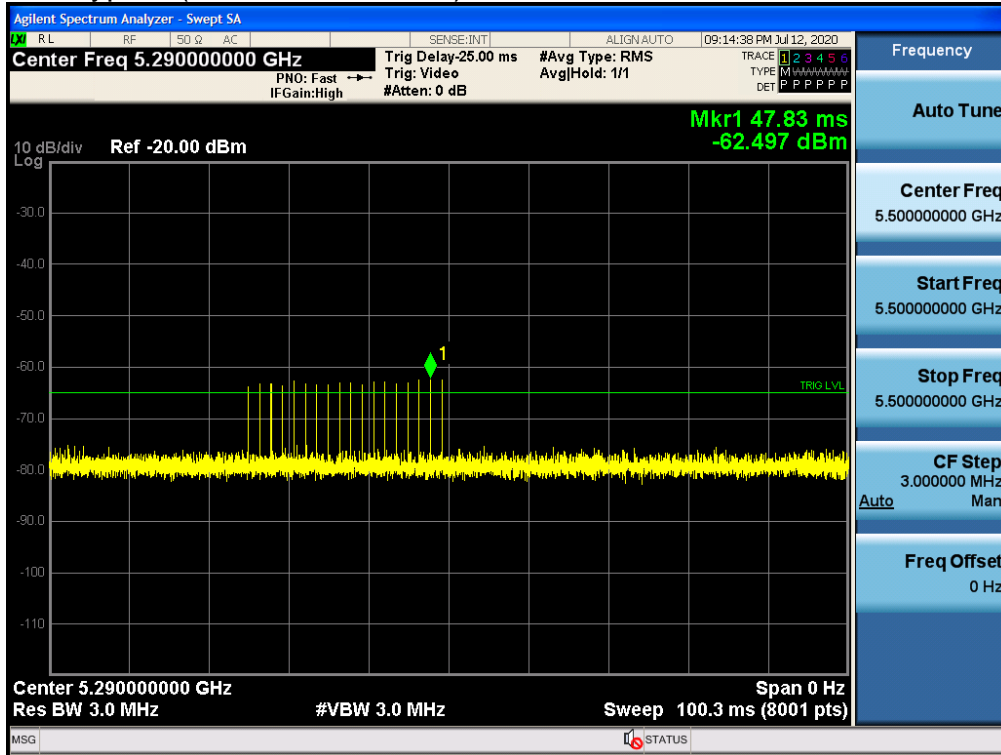
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4.13.4 Test plots
 4.13.4.1 Radar Waveform Calibration Result
 Radar Type 0 (20MHz / 5260MHz)



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Radars Type 0 (80MHz / 5290MHz)



4.13.5 Test Data:

BW/Channel	Test Item	Test Result	Limit	Results
20MHz / 5260MHz	Channel Move Time	0.25s	<10s	Pass
	Channel Closing Transmission Time	40.3ms	<60ms	Pass
80MHz / 5290MHz	Channel Move Time	0.28s	<10s	Pass
	Channel Closing Transmission Time	41.6ms	<60ms	Pass

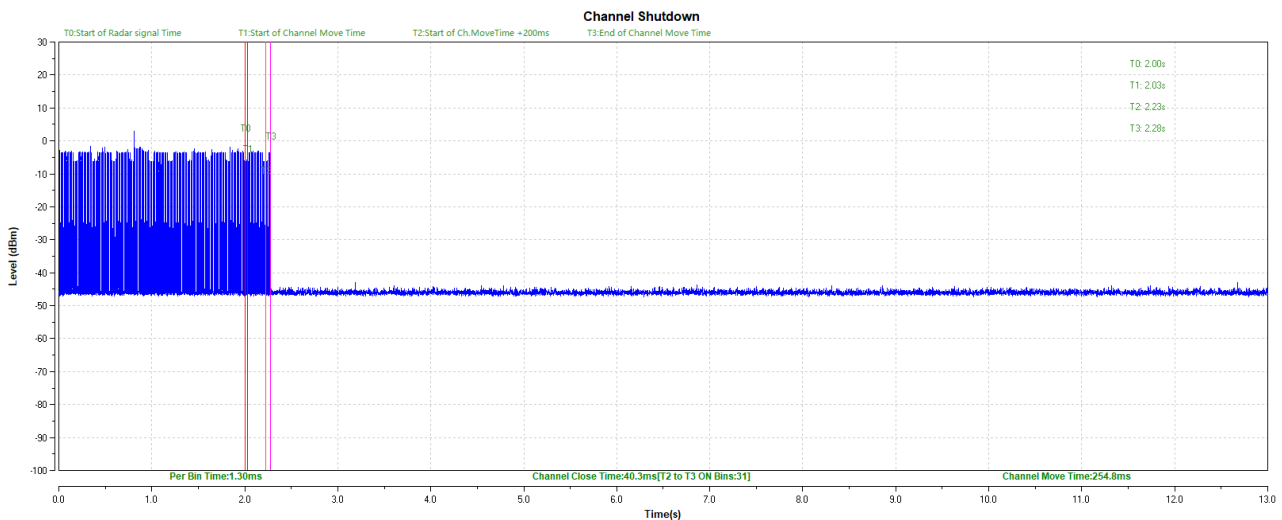
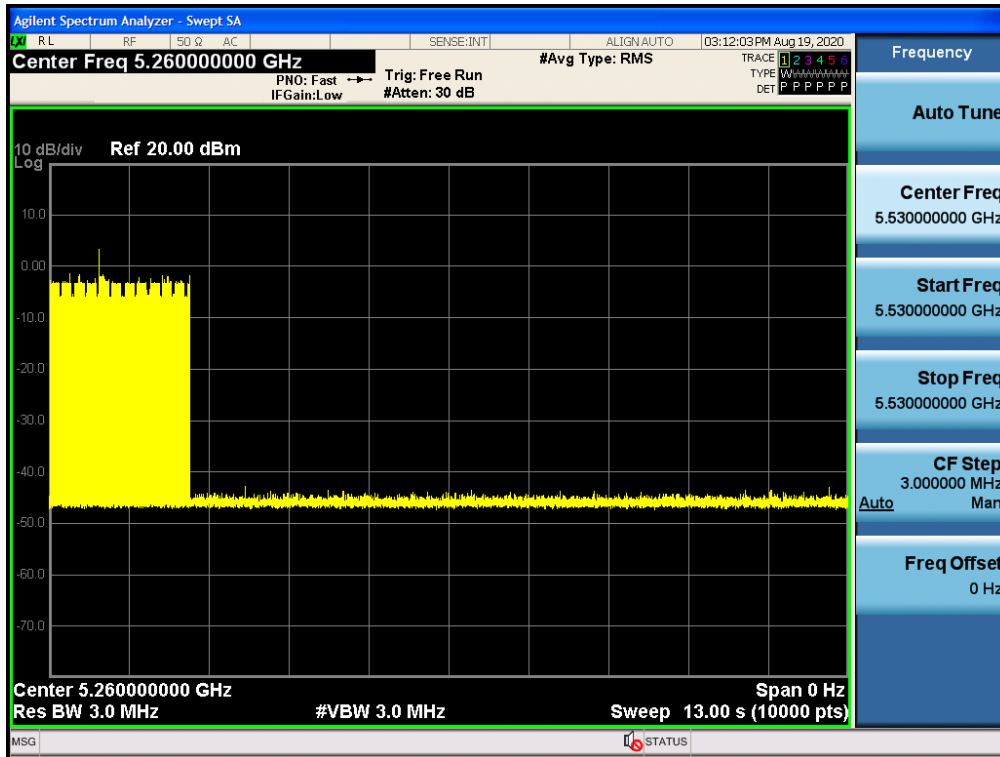


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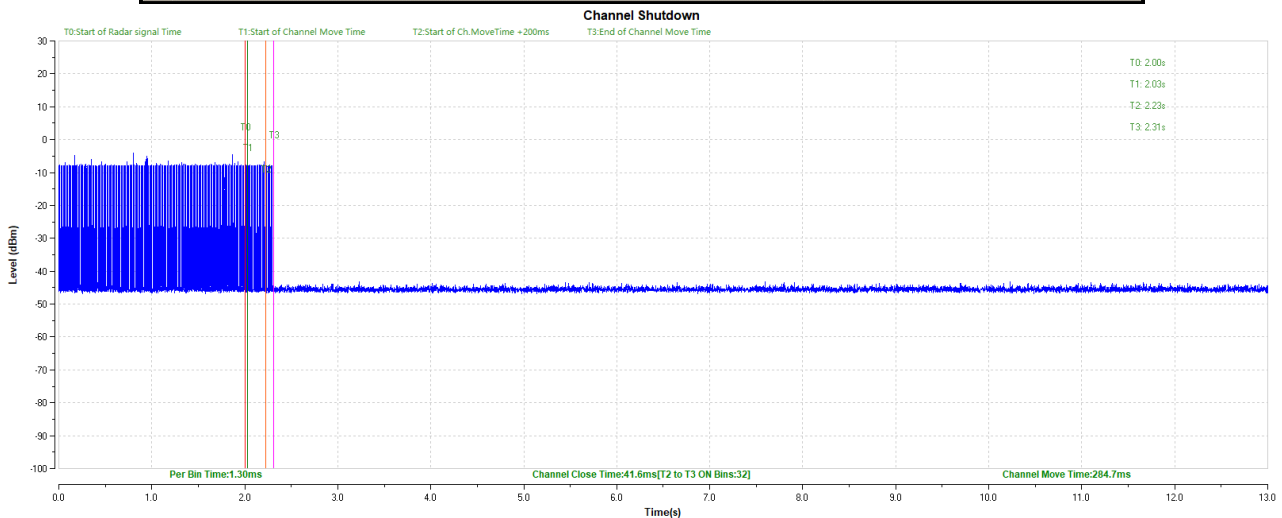
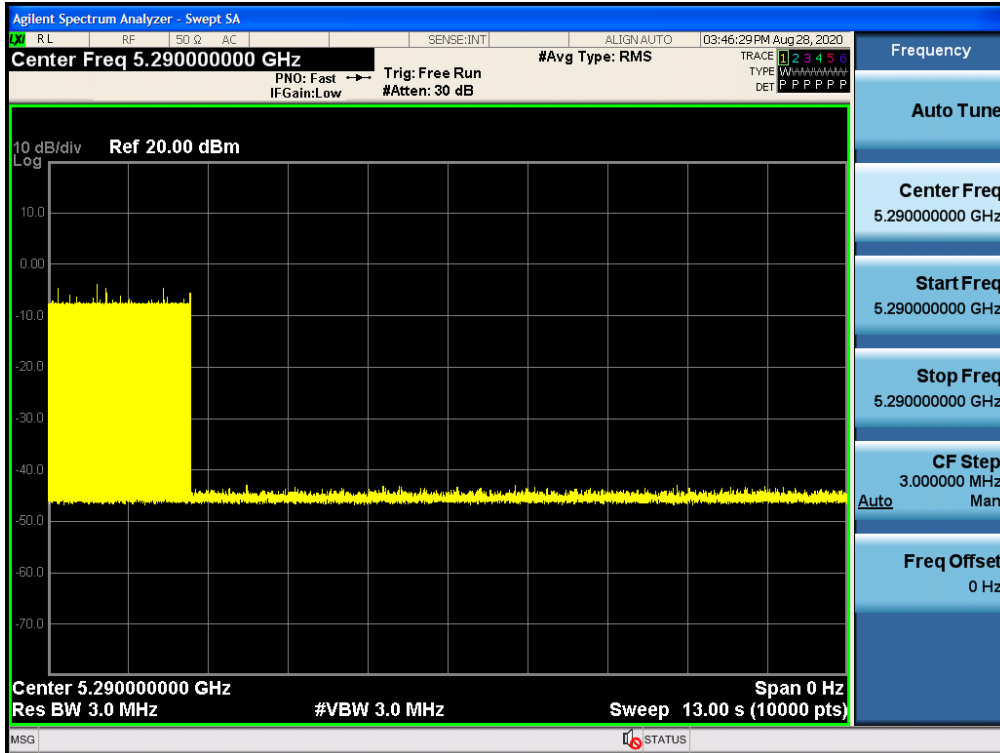
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4.13.5.1 Test plots

4.13.5.1.1 Test Bandwidth/Channel= 20MHz / 5260MHz



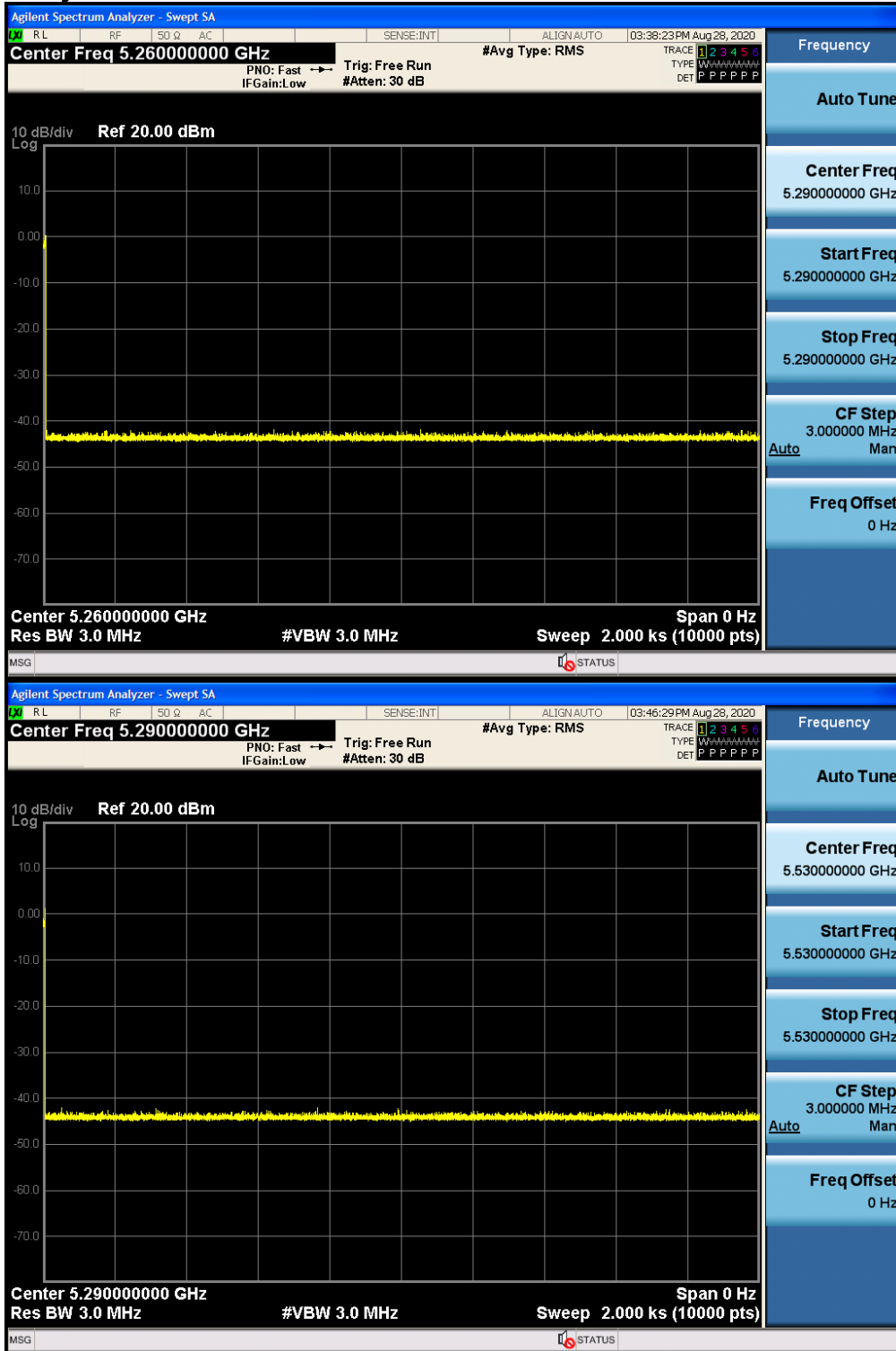
4.13.5.1.2 Test Bandwidth/ Channel =80MHz/5290MHz



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No-occupancy Period:



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

Lab A:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB
4	Temperature test	±1°C
5	Humidity test	±3%
6	DC and low frequency voltages	±0.5%

Lab B:

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0dB (150kHz to 30MHz)
2	Radiated Emission	± 4.8dB (Below 1GHz)
		± 4.8dB (1GHz to 6GHz)
		± 4.5dB (6GHz to 18GHz)
		± 5.02dB (Above 18GHz)



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6 Equipment List

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2020/7/14	2021/7/14
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2020/3/2	2021/3/1
Coaxial Cable	SGS	N/A	SEM031-01	2020/6/12	2021/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020/7/14	2021/7/14
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2019/10/27	2020/10/27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2020/7/14	2021/7/14
Master Device	Linksys pte.Ltd	WRT32X	FCC ID:Q87-WRT3200AC M IC ID:3839A-WRT3200AC M	N/A	N/A

CE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-05	2020-04-12	2021-04-11
Artificial network	ROHDE&SCHWARZ	ENV216	XAW01-04-01	2020-08-04	2021-08-03
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-12-06	2020-12-05
Measurement Software	Tonscend	TS+ CE V2.5	XAW02-05-02	NCR	NCR





RSE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Semi-Anechoic Chamber	Brilliant-emc	N/A	XAW03-35-01	2019-09-11	2022-09-10
MXA signal analyzer	Keysight	N9020A	XAW01-06-01	2020-04-02	2021-04-01
Spectrum Analyzer	Keysight	N9020B	XAW01-11-03	2020-04-15	2021-04-14
Test receiver	ROHDE&SCHWARZ	ESR	XAW01-08-05	2020-04-12	2021-04-11
Receiving antenna (30MHz-3GHz)	Schwarzbeck	VULB 9163	XAW01-09-01	2019-10-13	2021-10-12
Receiving antenna (1GHz~18GHz)	Schwarzbeck	BBHA 9120D	XAW01-09-02	2019-10-13	2021-10-12
Receiving antenna (15GHz~40GHz)	Schwarzbeck	BBHA 9170	XAW01-09-03	2019-10-13	2021-10-12
Directional antenna rack controller	Max-Full	MF-7802BS	XAW03-03-01	NCR	NCR
High-speed antenna rack controller	Max-Full	MF-7802	XAW03-04-01	NCR	NCR
Filter bank	Tonscend	JS0806-F	XAW03-05-01	NCR	NCR
Filter bank	Tonscend	JS0806s	XAW03-05-02	NCR	NCR
Amplifier	Tonscend	TAP00903040	XAW01-41-01	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP01018048	XAW01-41-02	2019-11-18	2020-11-17
Amplifier	Tonscend	TAP18040048	XAW01-41-03	2019-12-03	2020-12-02
Amplifier	Shanghai Steed	YX28980930	XAW01-41-06	2019-11-18	2020-11-17
Temperature and humidity meter	MingGao	TH101B	XAW01-01-01	2019-11-28	2020-11-28
Measurement Software	Tonscend	TS+ RSE V3.0.0.2	XAW02-05-01	NCR	NCR



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7 Photographs - EUT Test Setup Details

Refer to Appendix A - Photographs of EUT Test Setup Details for ZR/2020/80074.

The End

