

Appendix C – Test result for 5.47 GHz – 5.725 GHz band



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TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 3.3 \text{ Vdc}$$

Type of power supply = DC voltage from NGFC 30x30 test board.

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna = 4.8 dBi

Operating frequencies in the sub-band 5.47-5.725 GHz.

-For IEEE 802.11a, the equipment uses channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140.

-For IEEE 802.11n, there are two bandwidths:

For 20 MHz bandwidth the equipment uses channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140.

For 40 MHz bandwidth the equipment uses channels 102, 110, 118, 126, 134.

- For IEEE 802.11ac, there are three bandwidths:

For 20 MHz bandwidth the equipment uses channels 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144.

For 40 MHz bandwidth the equipment uses channels 102, 110, 118, 126, 134, 142.

For 80 MHz bandwidth the equipment uses channels 106, 122, 138.

TEST FREQUENCIES:

For WiFi a/n20/ac20:

Lowest channel (100): 5500 MHz

Middle channel (120): 5600 MHz

Highest channel (140) 5700 MHz for 802.11n20 and 5720 MHz (144) for 802.11ac20

For WiFi n40/ac40:

Lowest channel (102): 5510 MHz

Middle channel (118): 5590 MHz

Highest channel (134) 5670 MHz for 802.11n40 and 5710 MHz (142) for 802.11ac40

For WiFi ac80:

Lowest channel (106): 5530 MHz

Middle channel (122): 5610 MHz

Highest channel (138): 5690 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.10: 2009 and FCC KDB 789033 D02 General UNII Test Procedures New Rules v01 dated 06/06/2014, FCC KDB 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013 and FCC KDB 644545 D03 Guidance for IEEE 802.11ac devices emission testing v01.

For 802.11a mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually but not simultaneously.

For 802.11n/ac modes 802.11n20/ac20 (20 MHz channel bandwidth), 802.11n40/ac40 (40MHz channel bandwidth) and 802.11ac80 (80MHz channel bandwidth) mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually and simultaneously.

For radio testing purposes the card was installed in a test fixture. The test fixture is connected to a laptop computer and dc power supplied. The laptop computer was used to configure the EUT to continuously transmit at a specified output power with different modes and modulation schemes.

The data rates of 6Mb/s for 802.11a, HT0 (SISO) for 802.11n20/ac20 and n40/ac40, and VHT0 (SISO) for 802.11ac80 were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and spurious levels at the band edges.

The field strength at the band edges was evaluated for each mode and on each chain individually on the lowest and highest channels at the rated power for the channel under test. Where the power at the edge channels was lower than the power at the center channels additional measurements were made at the adjacent channels. Single transmission at each chain and simultaneous transmission at both chains modes were fully evaluated

The PC was using the Intel test utility DRTU Version “DRTU 1.7.3-859”.

During transmitter test the EUT was being controlled by the Intel DRTU tool to operate in a continuous transmit mode on the test channels as required and in each of the different modulation modes.

The conducted RF output power at each chain was adjusted according to the client’s supplied Target values (see following table) using the Intel DRTU tool and measuring the power by using a calibrated average power meter. Measured values for adjustment were within -0.2 dB/+0.3 dB respect to the Target values.

RF conducted output power target values

	Mode	BW (MHz)	Channel / Freq.	SISO Chain A (dBm)	SISO Chain B (dBm)	MIMO at both ports A and B (dBm)
5.47–5.725 GHz Band	802.11a	20	100 / 5500	13.5	13.5	n/a
			104 / 5520	16	16.5	n/a
			120 / 5600	16	16.5	n/a
			136 / 5680	16	16.5	n/a
			140 / 5700	13	13	n/a
	802.11n	20	100 / 5500	13.5	13.5	10.50
			104 / 5520	16	16.5	14.50
			120 / 5600	16	16	14.50
			136 / 5680	16	16.5	14.50
			140 / 5700	13	13	11.00
	802.11n*	40	102 / 5510	13.5	14	11.50
			110 / 5550	16.5	16.5	16.50
			118 / 5590	16.5	16.5	16.50
			134 / 5670	16.5	16.5	16.50
	802.11ac	20	144 / 5720	16	15.5	13.50
	802.11ac	40	142 / 5710	16.5	16.5	16.50
	802.11ac	80	106 / 5530	13.5	13.5	11.50
			122 / 5610	16.5	16.5	16.50
		138 / 5690	16.5	16.5	16.50	

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyzer using low loss RF cables with sma type connectors. The reading in the spectrum analyzer is corrected taking into account the cable loss.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 1m for the frequency range 1 GHz-40 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360°.

Measurements were made in both horizontal and vertical planes of polarization.

99 % and 26 dB Bandwidth

RESULTS

1. 802.11a mode (see next plots).

CHAIN A

	Lowest frequency 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	17.34	17.50	17.34
26 dB bandwidth (MHz)	24.62	25.42	25.42
Measurement uncertainty (kHz)	±7		

CHAIN B

	Lowest frequency 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	17.38	17.62	17.38
26 dB bandwidth (MHz)	25.69	27.21	24.90
Measurement uncertainty (kHz)	±7		

2. 802.11 n20 MHz and 802.11 ac 20 MHz (except channel 144) modes. (see next plots).

CHAIN A

	Lowest frequency 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	18.34	18.38	18.34
26 dB bandwidth (MHz)	25.61	26.37	25.61
Measurement uncertainty (kHz)	±7		

CHAIN B

	Lowest frequency 5500 MHz	Middle frequency 5600 MHz	Highest frequency 5700 MHz
99% bandwidth (MHz)	18.34	18.50	18.38
26 dB bandwidth (MHz)	25.69	26.77	25.65
Measurement uncertainty (kHz)	±7		

Note: the test was performed with 802.11 n20 MHz mode which is the same modulation scheme as 802.11 ac 20 MHz.

802.11 ac 20MHz (channel 144):

CHAIN A

	Frequency 5720 MHz
99% bandwidth (MHz)	19.02
26 dB bandwidth (MHz)	18.26 in UNII_2C, 8.75 in UNII_3 and 26.25 (Total)
Measurement uncertainty (kHz)	±7

CHAIN B

	Frequency 5720 MHz
99% bandwidth (MHz)	18.90
26 dB bandwidth (MHz)	17.94 in UNII_2C, 7.99 in UNII_3 and 26.53 (Total)
Measurement uncertainty (kHz)	±7

3. 802.11 n40 MHz and 802.11 ac 40 MHz (except channel 142) modes. (see next plots).

CHAIN A

	Lowest frequency 5510 MHz	Middle frequency 5590 MHz	Highest frequency 5670 MHz
99% bandwidth (MHz)	36.46	36.66	36.66
26 dB bandwidth (MHz)	44.96	45.55	45.95
Measurement uncertainty (kHz)	±7		

CHAIN B

	Lowest frequency 5510 MHz	Middle frequency 5590 MHz	Highest frequency 5670 MHz
99% bandwidth (MHz)	36.56	36.66	36.66
26 dB bandwidth (MHz)	44.46	46.05	46.85
Measurement uncertainty (kHz)	±7		

Note: the test was performed with 802.11 n40 MHz mode which is the same modulation scheme as 802.11 ac 40 MHz.

802.11 ac 40MHz (channel 142):

CHAIN A

	Frequency 5710 MHz
99% bandwidth (MHz)	36.76
26 dB bandwidth (MHz)	37.66 in UNII_2C, 7.69 in UNII_3 and 45.55 (Total)
Measurement uncertainty (kHz)	±7

CHAIN B

	Frequency 5710 MHz
99% bandwidth (MHz)	36.76
26 dB bandwidth (MHz)	38.16 in UNII_2C, 7.89 in UNII_3 and 45.65 (Total)
Measurement uncertainty (kHz)	±7

4. 802.11 ac 80 MHz mode. (see next plots).

CHAIN A

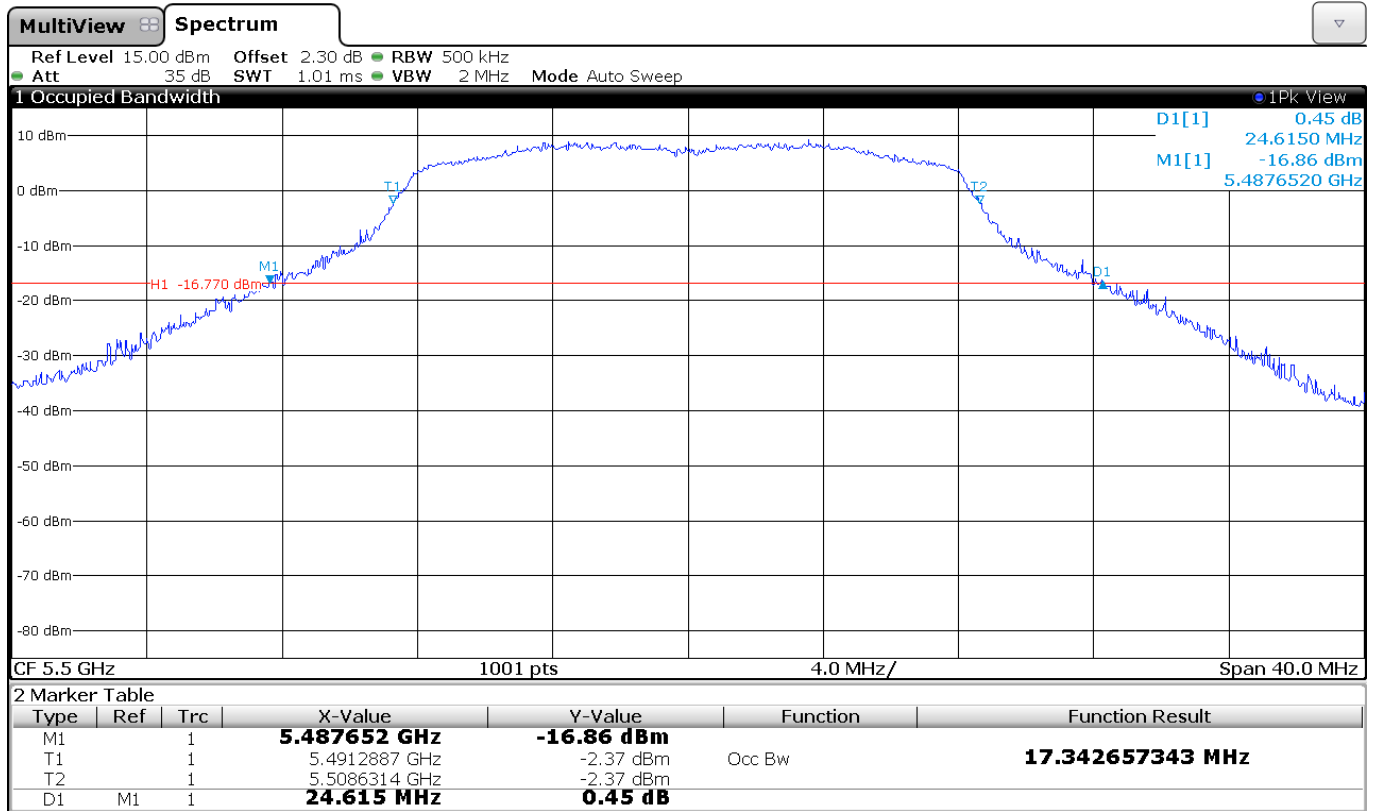
	Lowest frequency 5530 MHz	Highest frequency 5610 MHz	Highest frequency 5690 MHz
99% bandwidth (MHz)	75.37	75.67	75.67
26 dB bandwidth (MHz)	81.97	83.92	82.12 in UNII_2C, 15.88 in UNII_3 and 85.26 (Total)
Measurement uncertainty (kHz)	±7		

CHAIN B

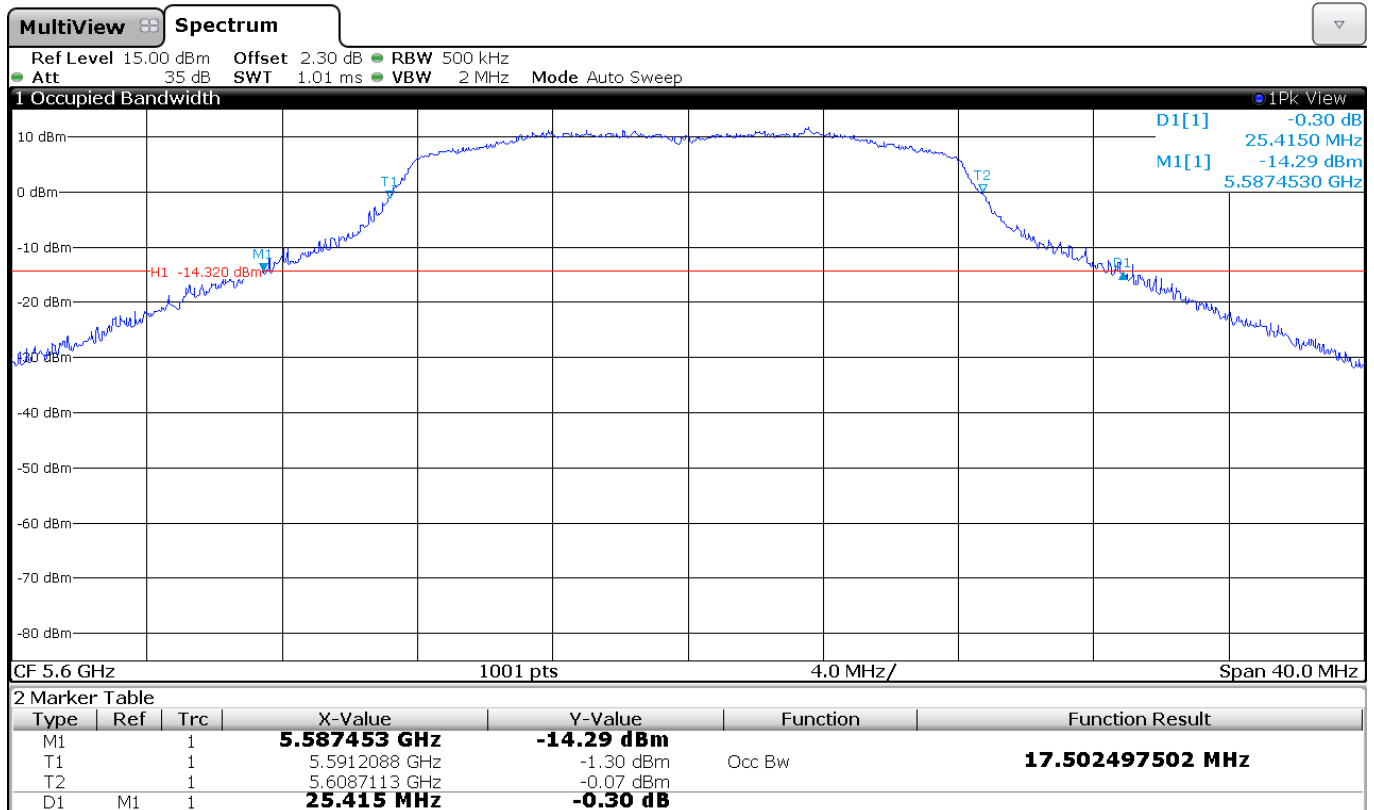
	Lowest frequency 5530 MHz	Highest frequency 5610 MHz	Highest frequency 5690 MHz
99% bandwidth (MHz)	75.37	75.67	75.67
26 dB bandwidth (MHz)	82.42	83.47	83.47 in UNII_2C, 11.54 in UNII_3 and 86.46 (Total)
Measurement uncertainty (kHz)	±7		

802.11a mode CHAIN A

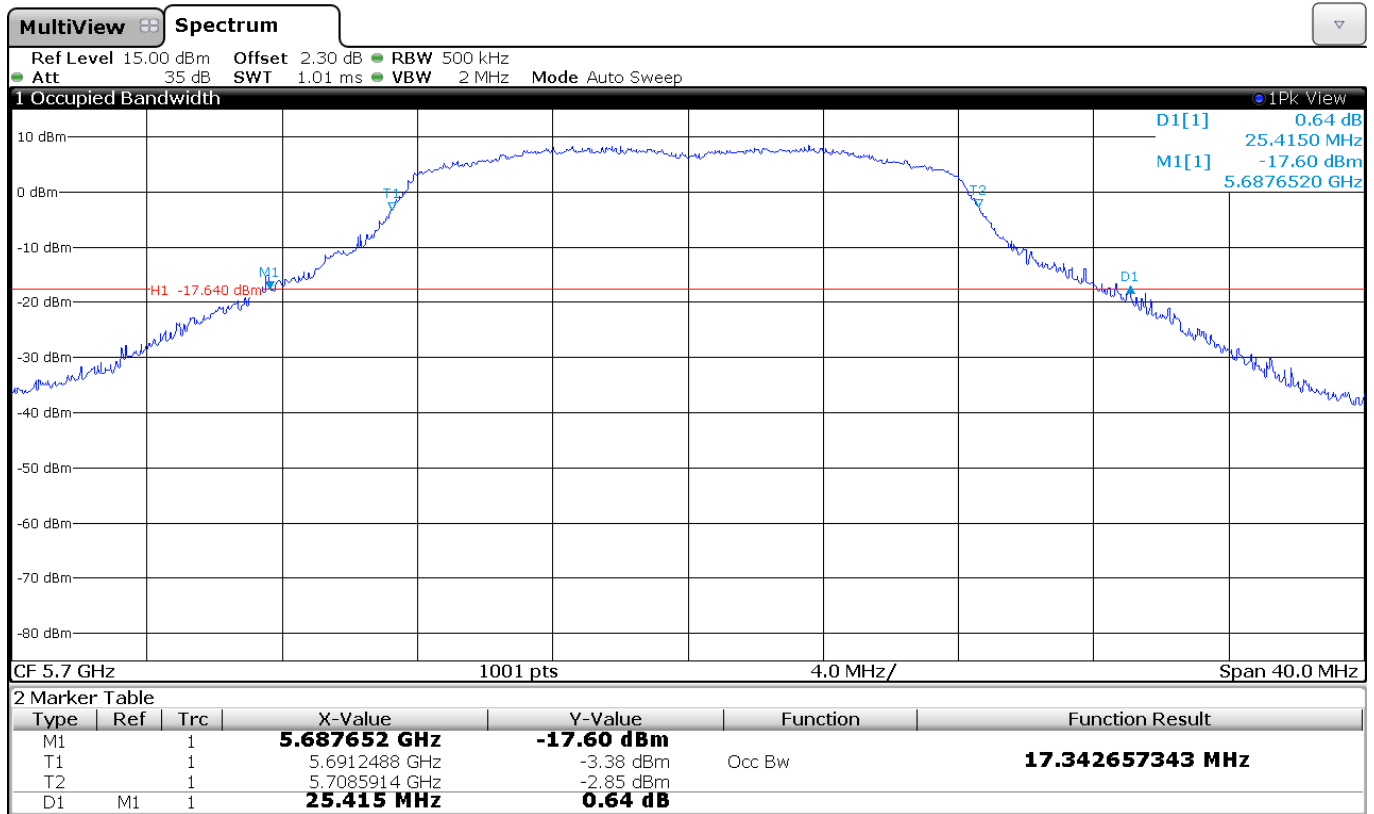
Lowest Channel



Middle Channel

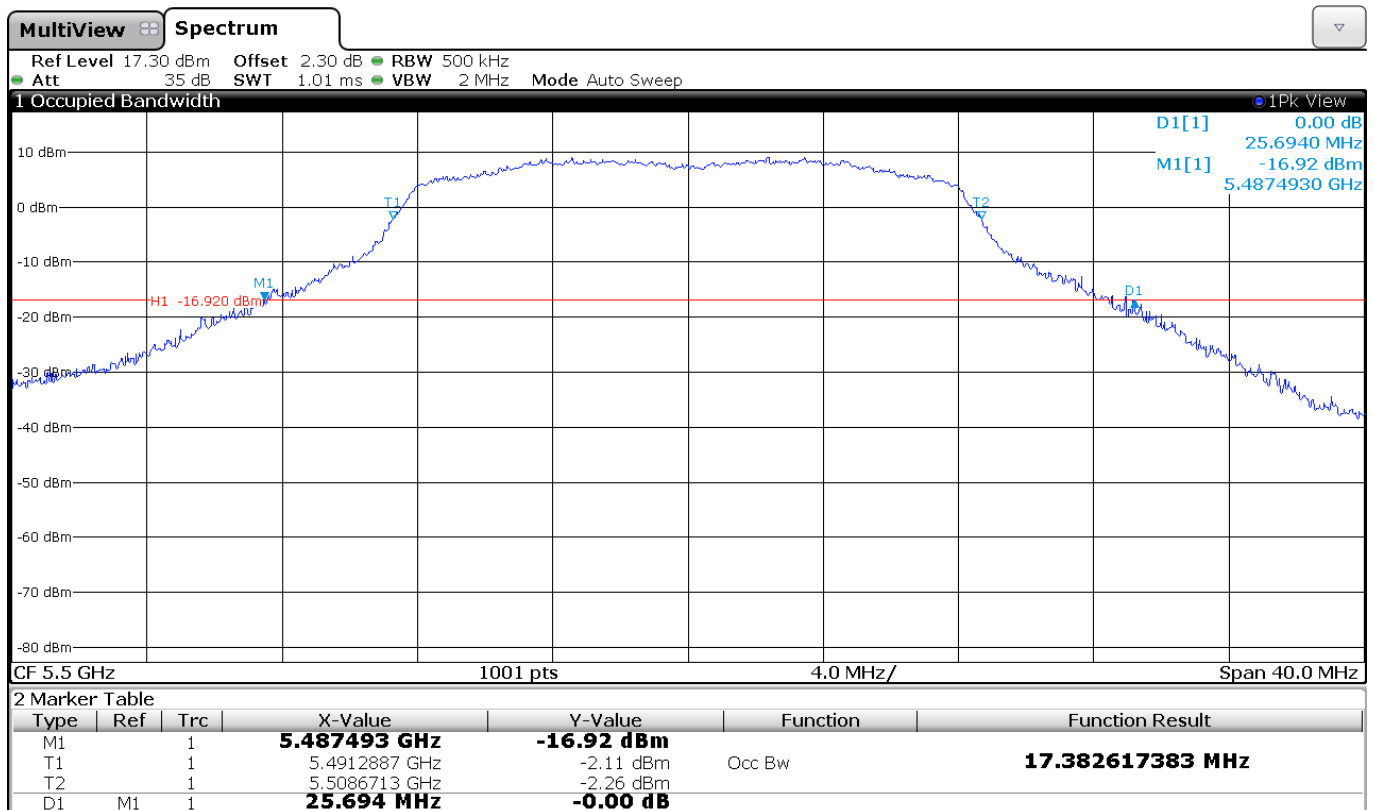


Highest Channel

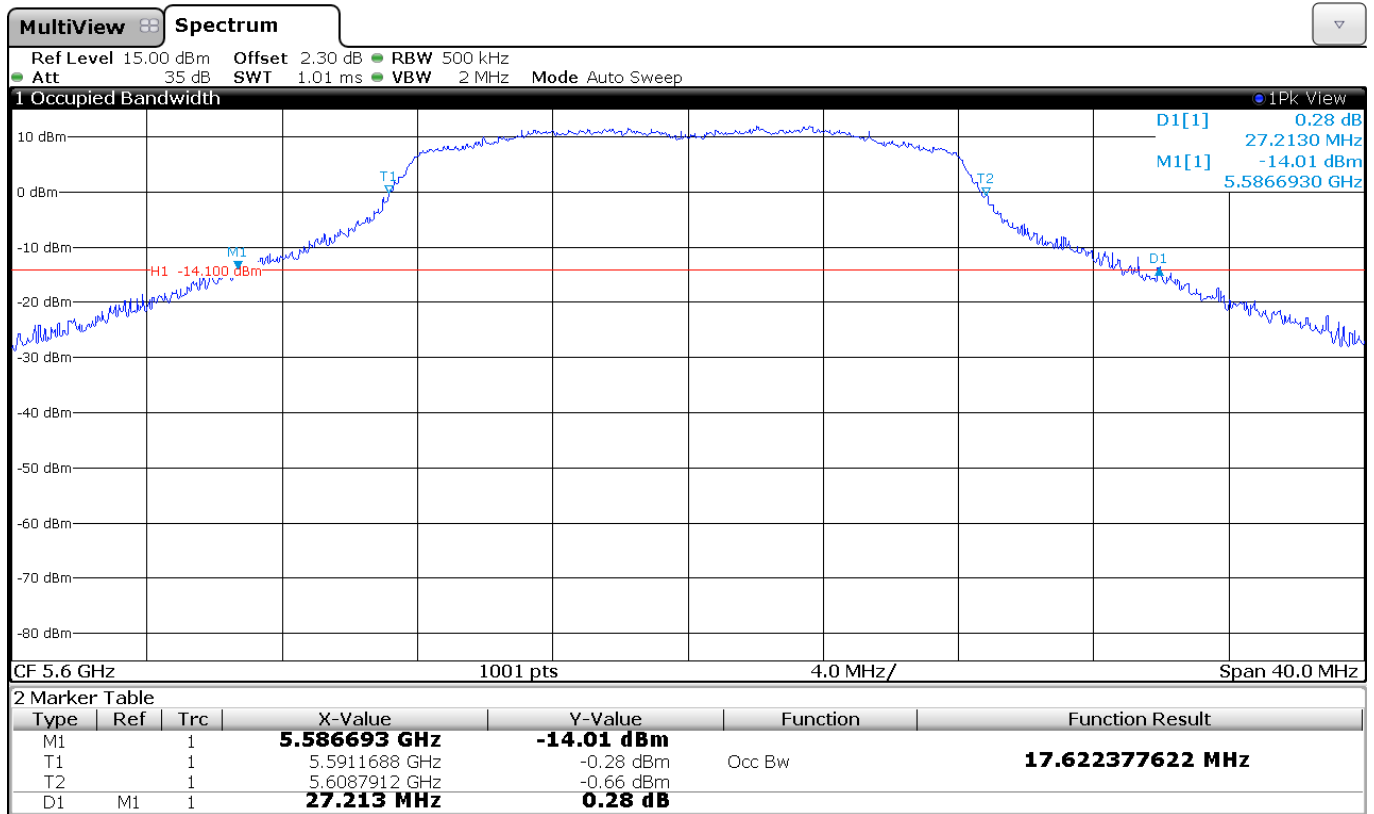


802.11a mode CHAIN B

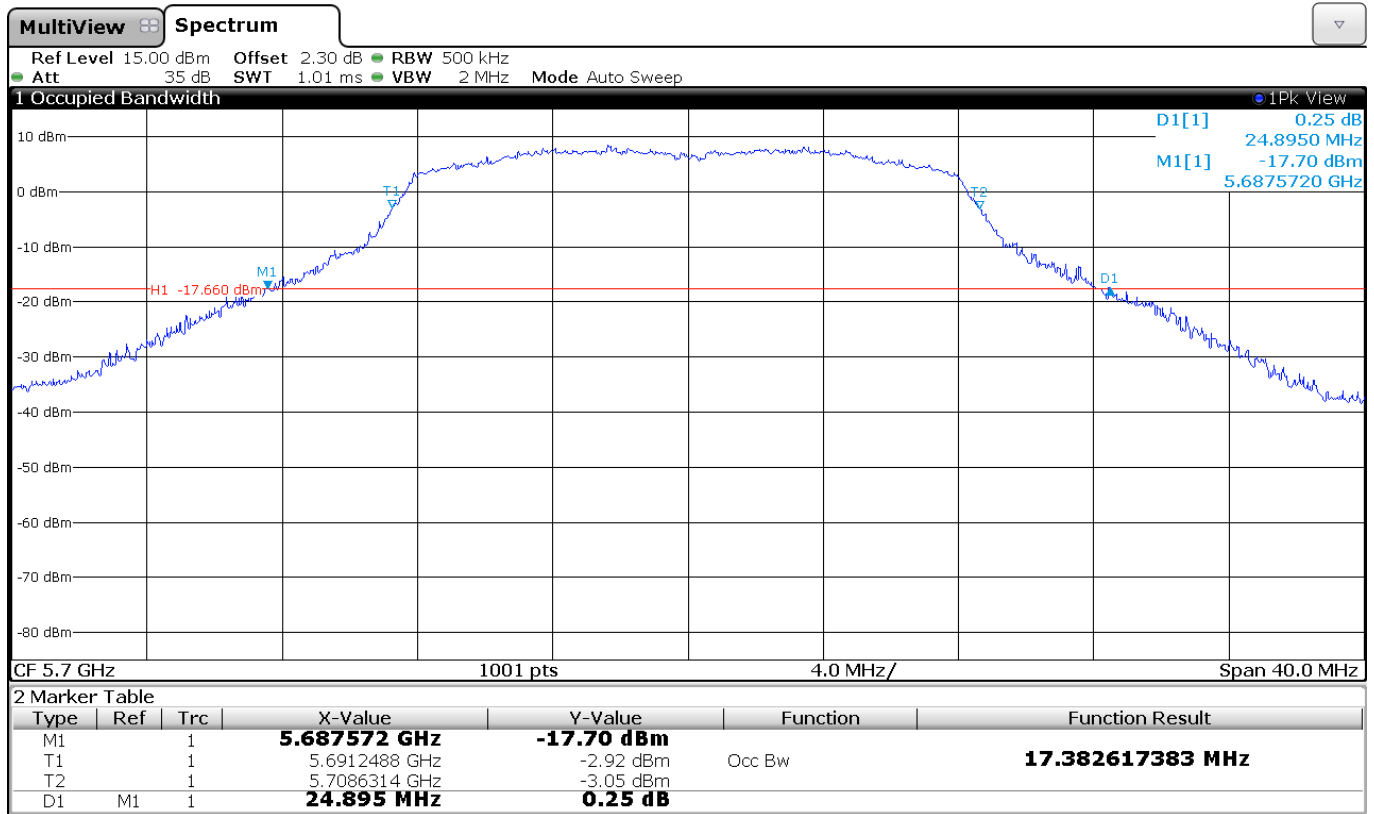
Lowest Channel



Middle Channel

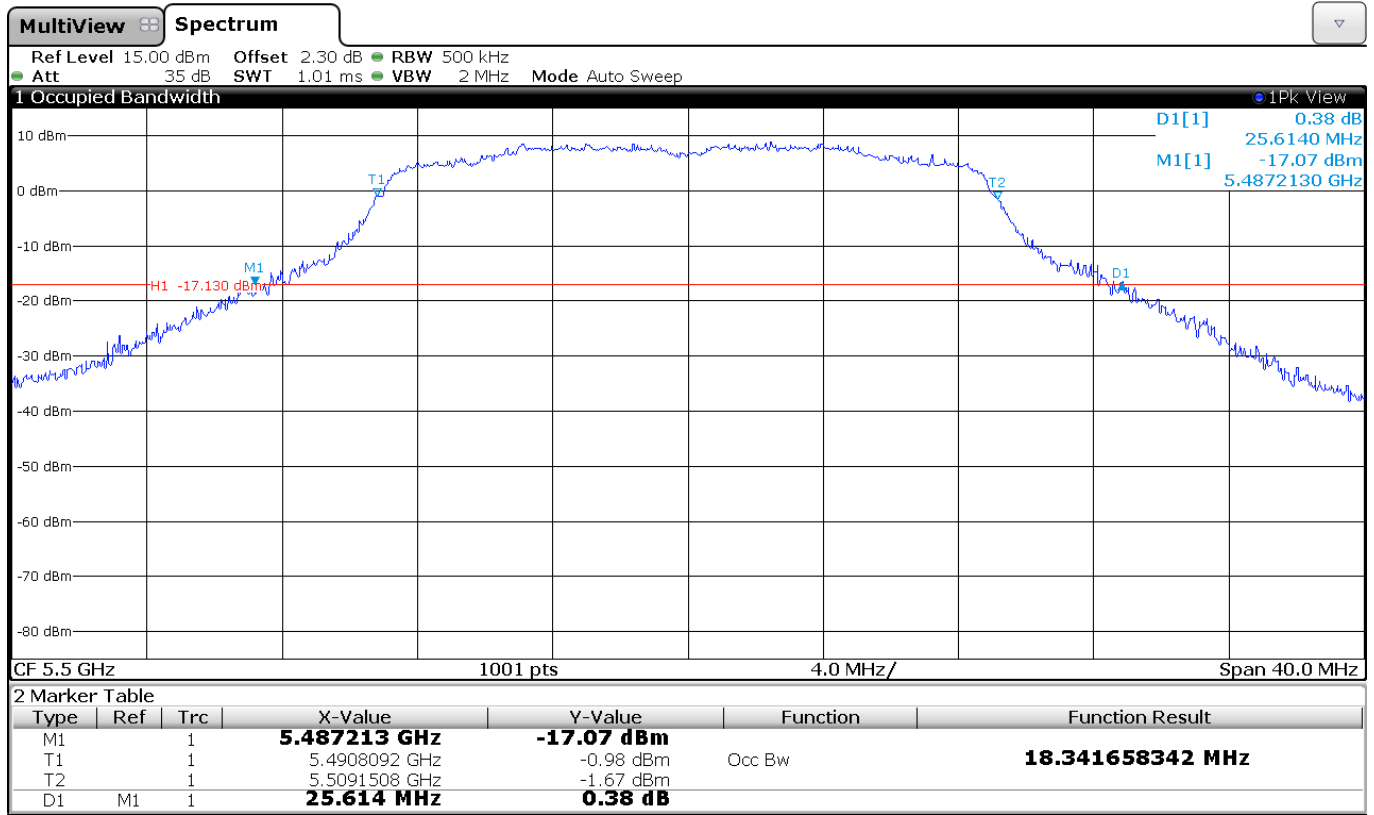


Highest Channel

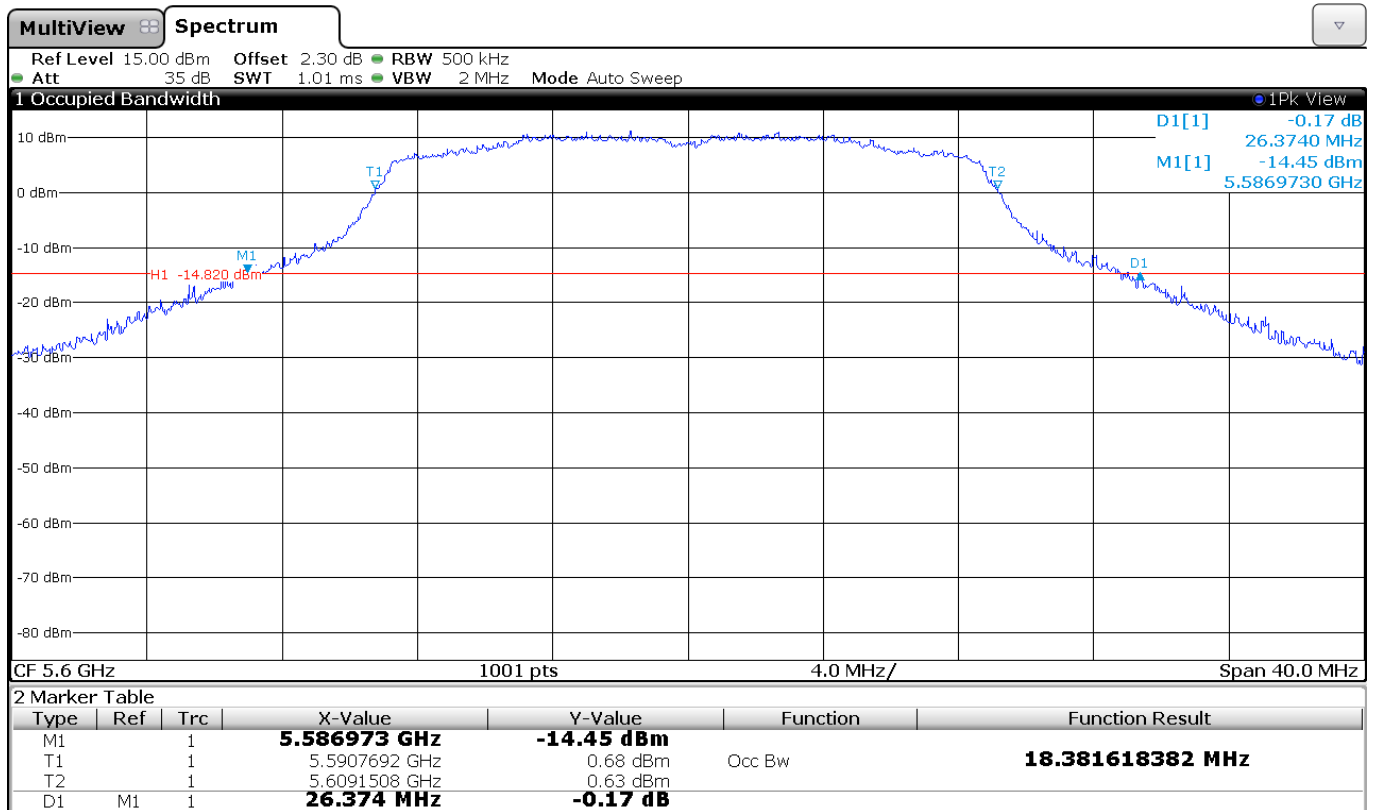


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) CHAIN A

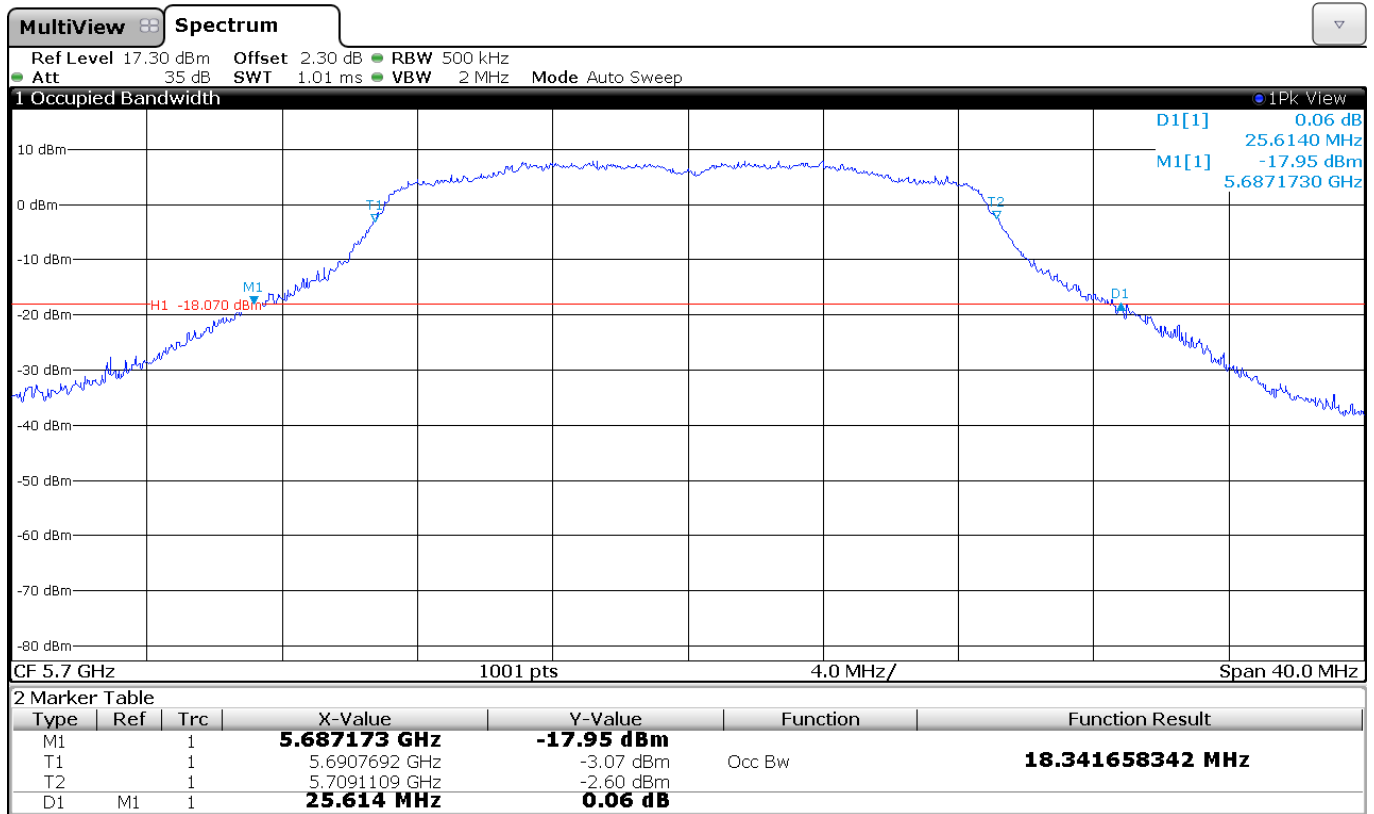
Lowest Channel



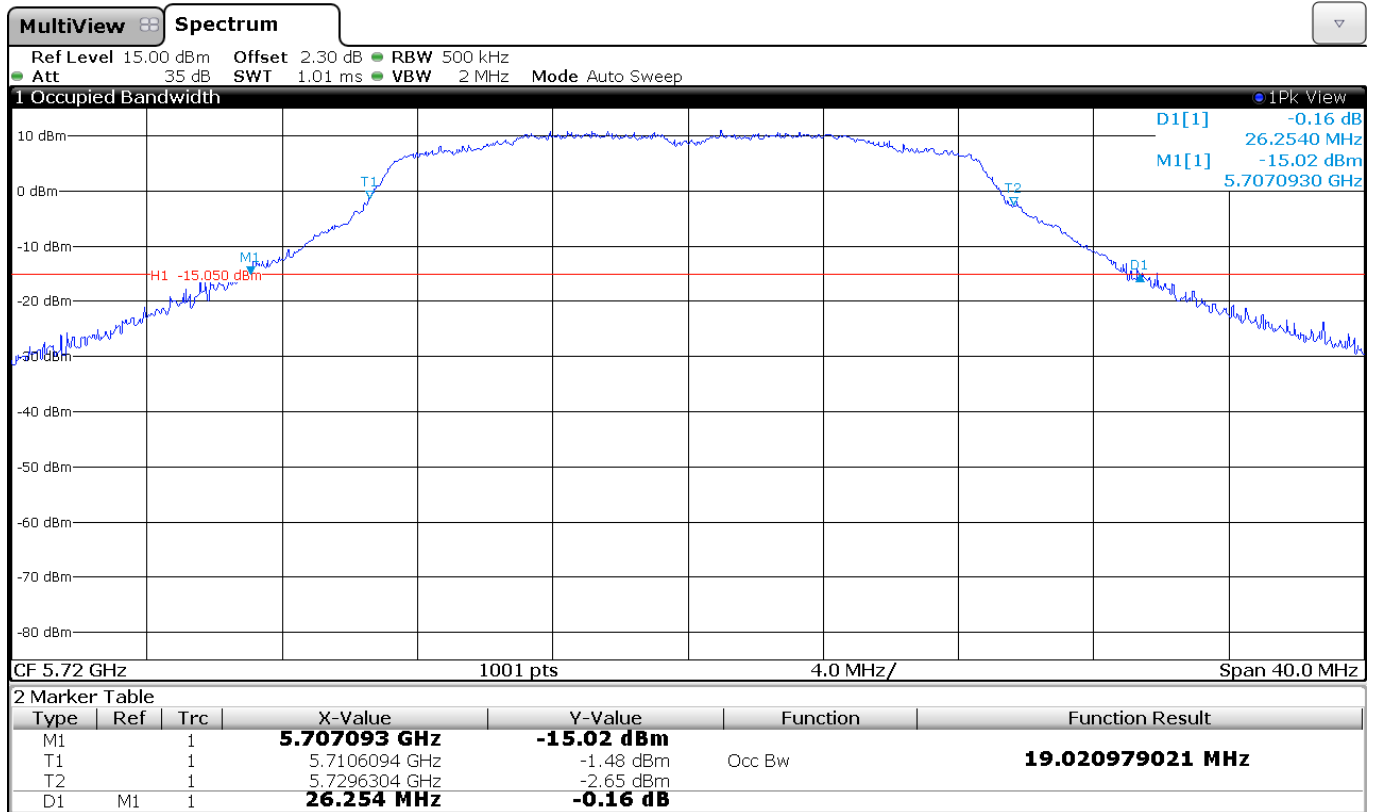
Middle Channel



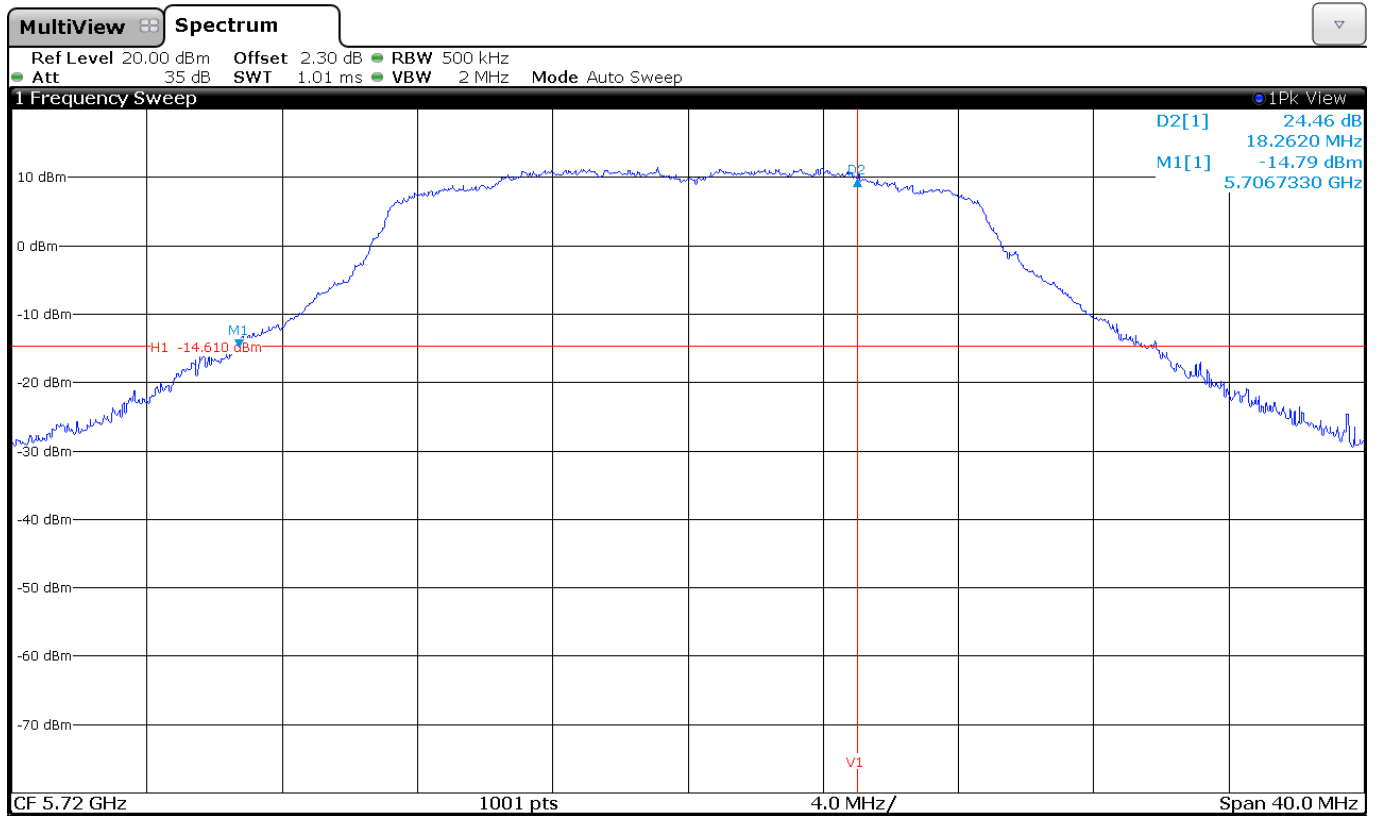
Highest Channel



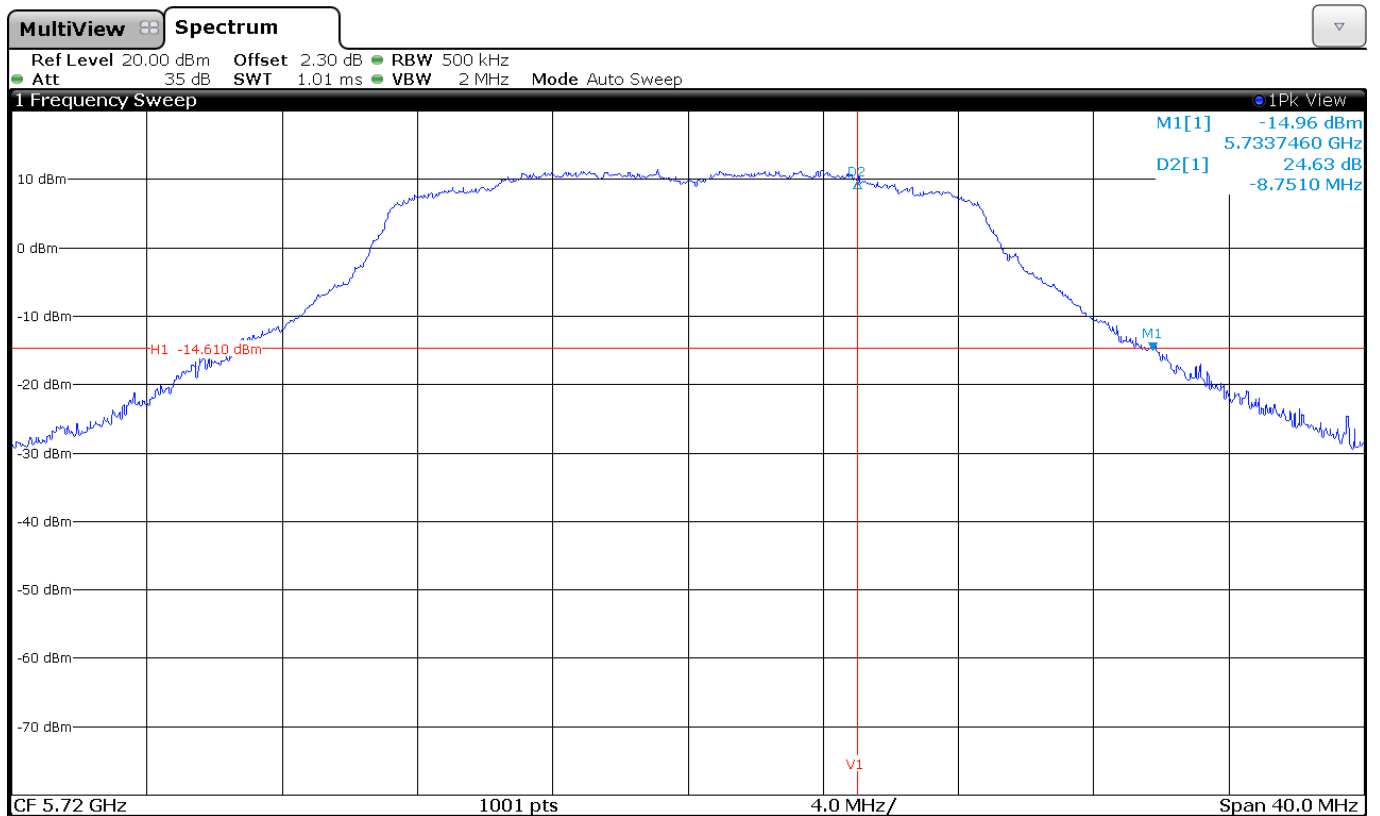
802.11 ac 20MHz: Channel 144. Total Bandwidth



26 dB BW inside UNII_2C sub-band:

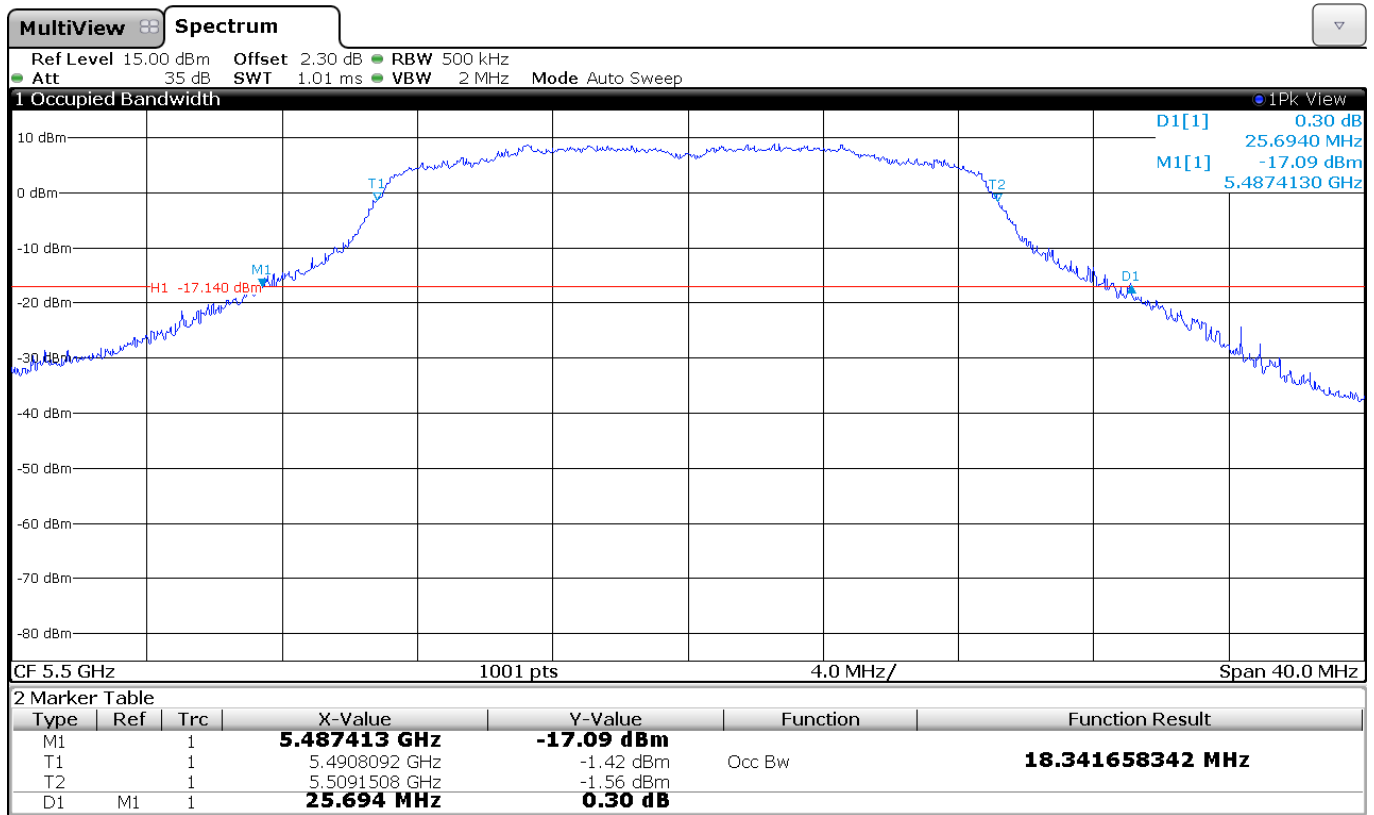


26 dB BW inside UNII_3 sub-band:

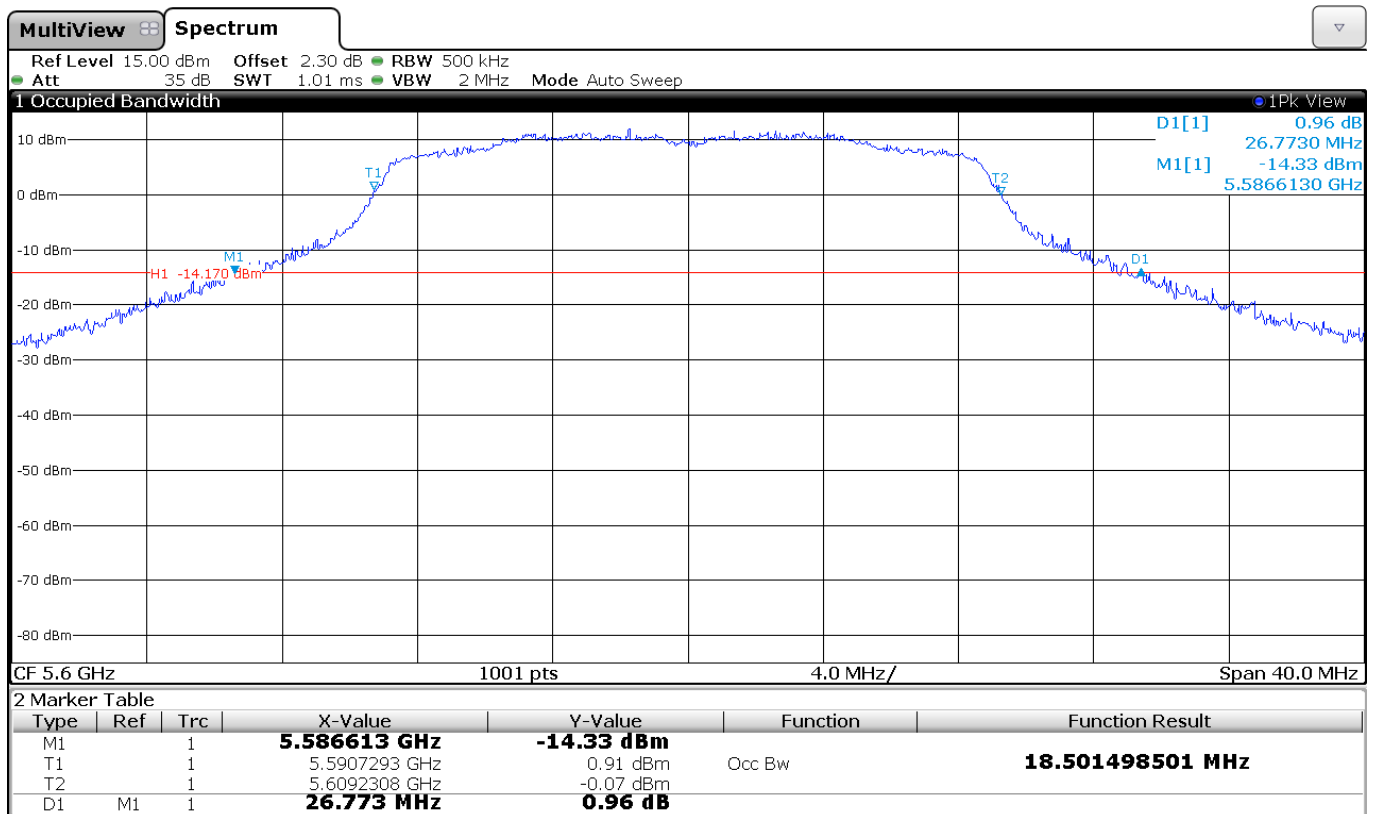


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) CHAIN B

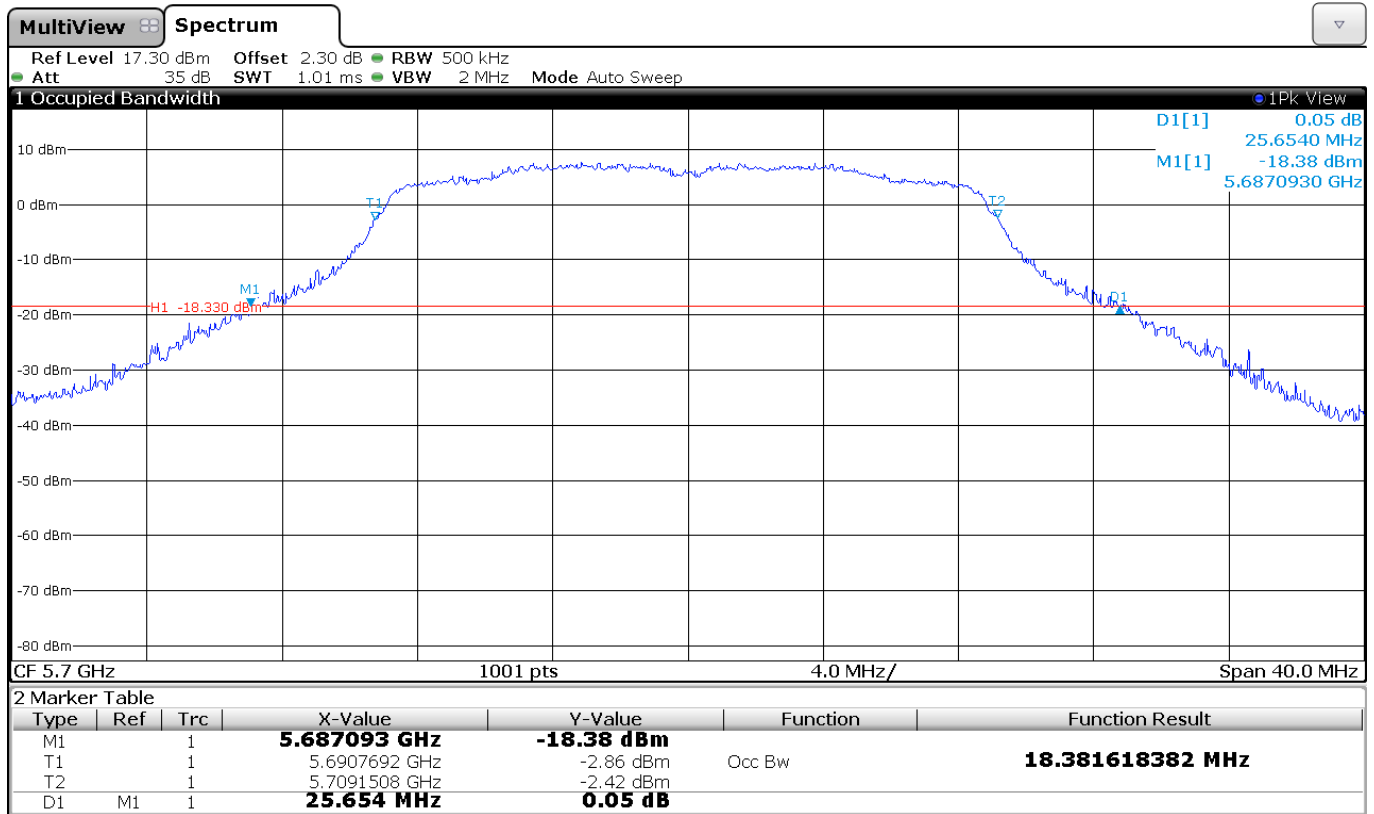
Lowest Channel



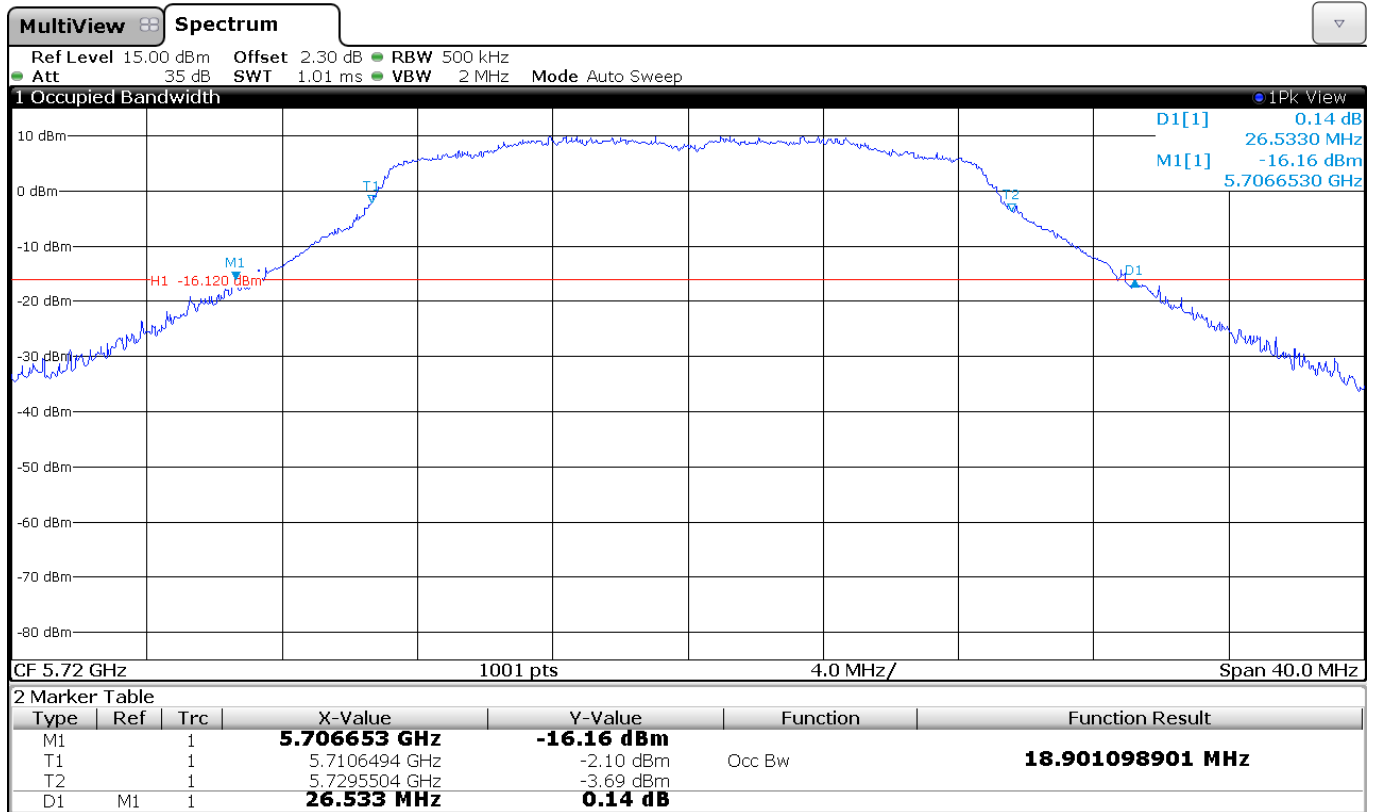
Middle Channel



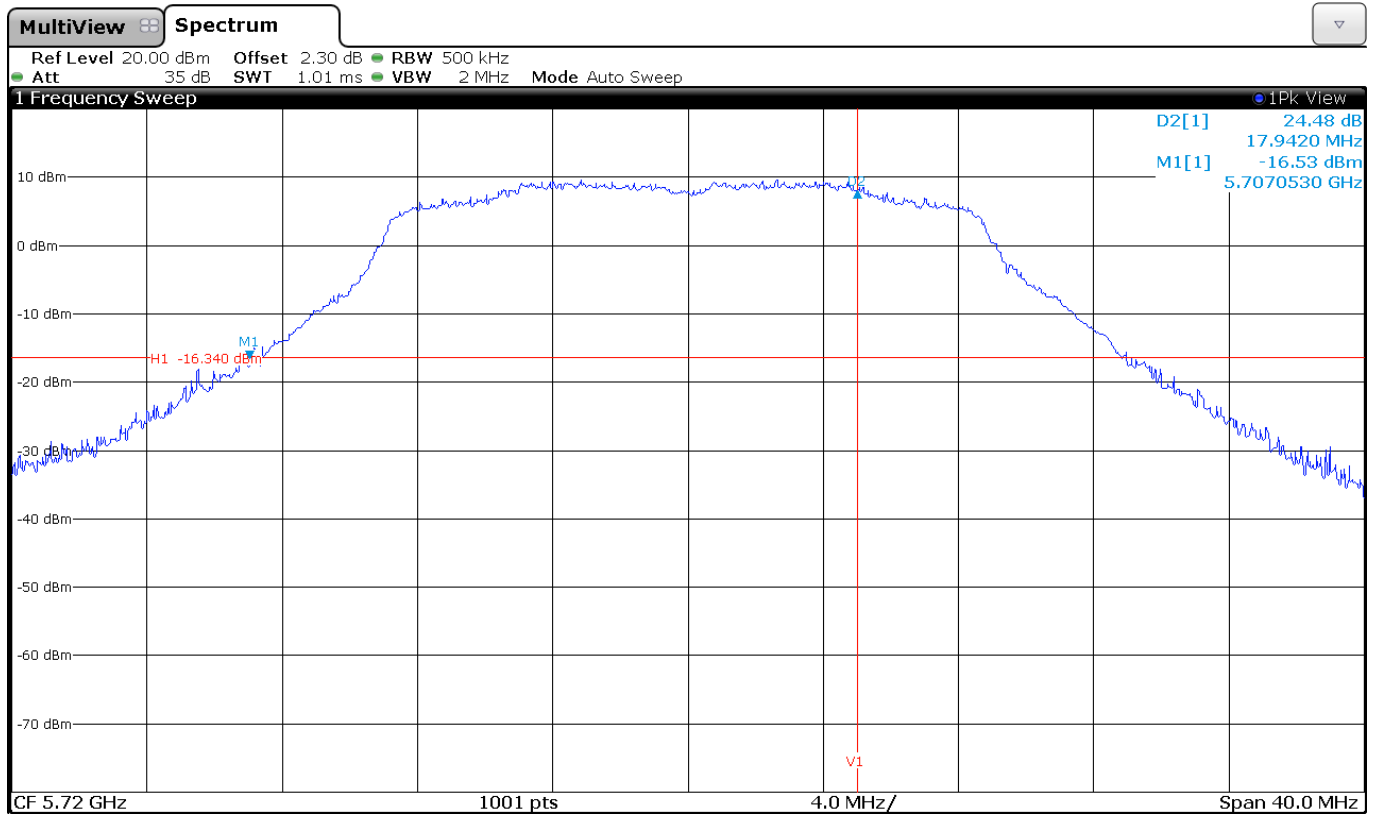
Highest Channel



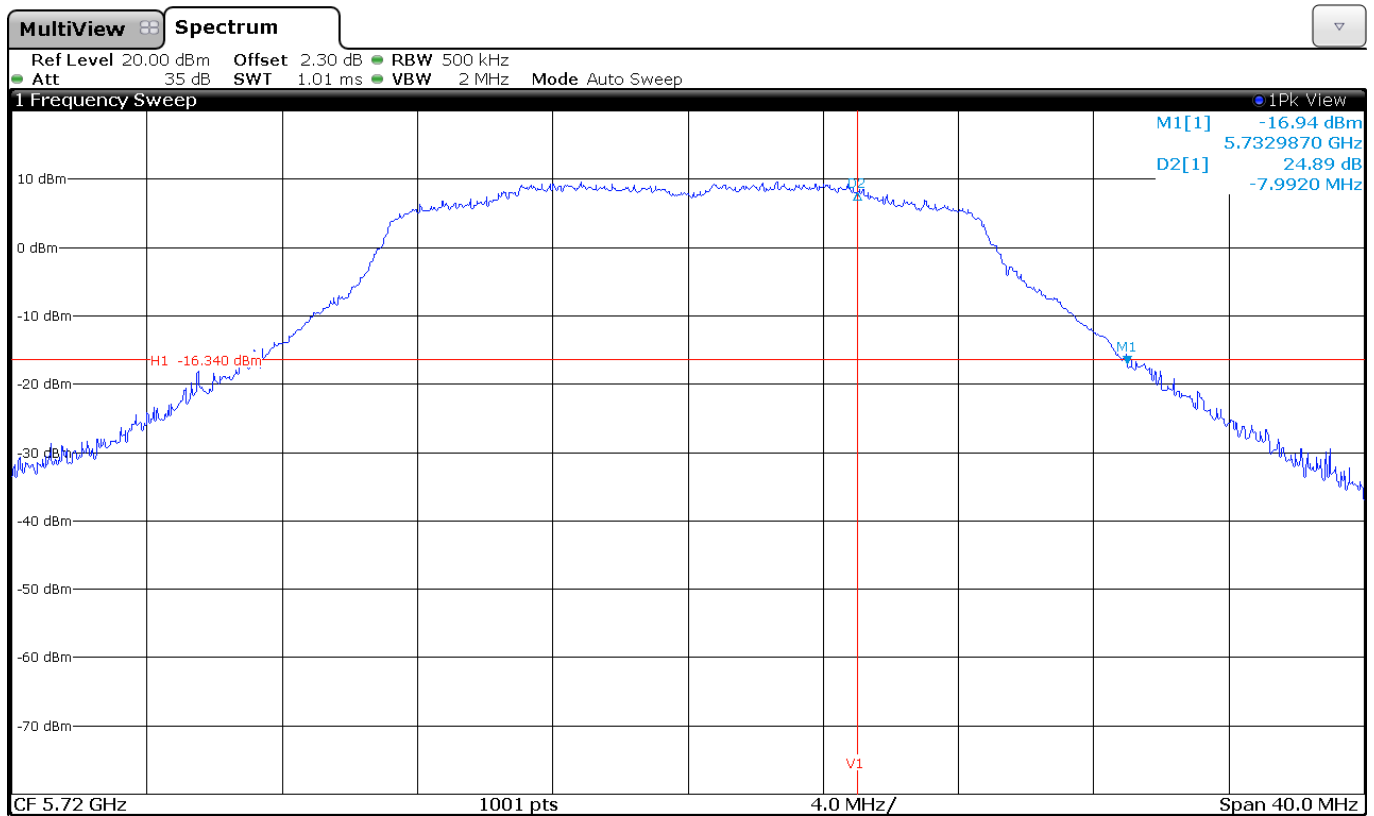
802.11 ac 20MHz: Channel 144. Total Bandwidth.



26 dB BW inside UNII_2C sub-band:

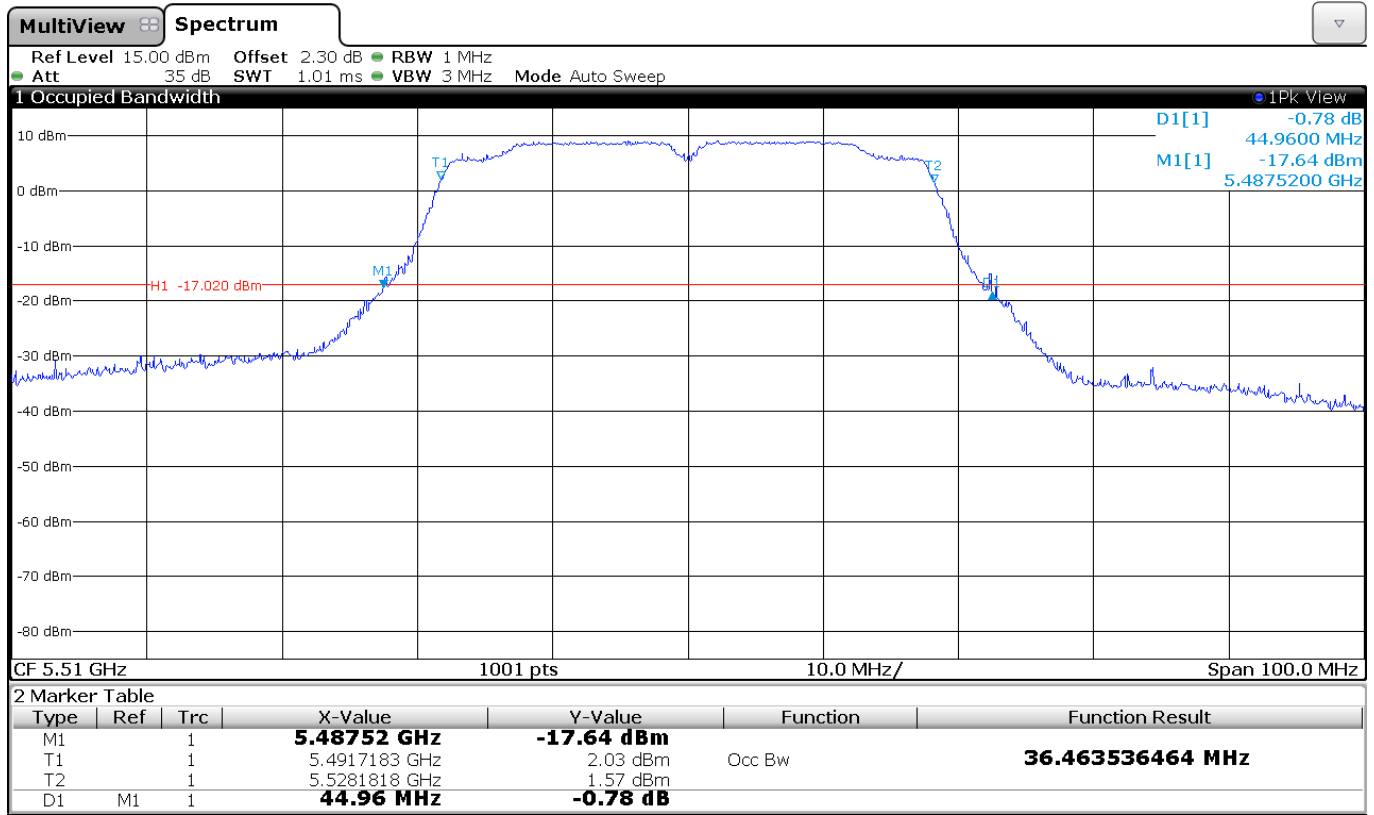


26 dB BW inside UNII_3 sub-band:

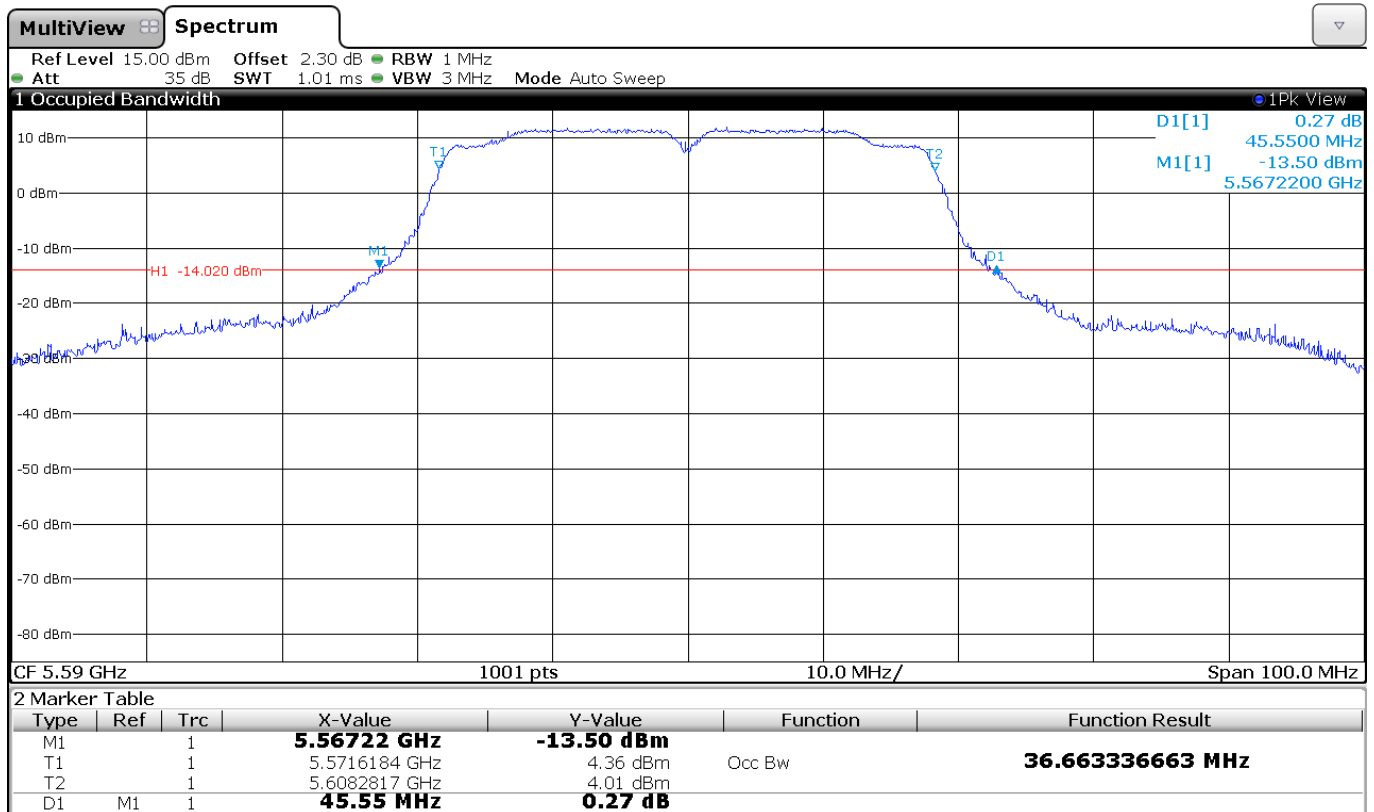


802.11 n40 MHz and 802.11 ac 40 MHz modes (except channel 142) CHAIN A

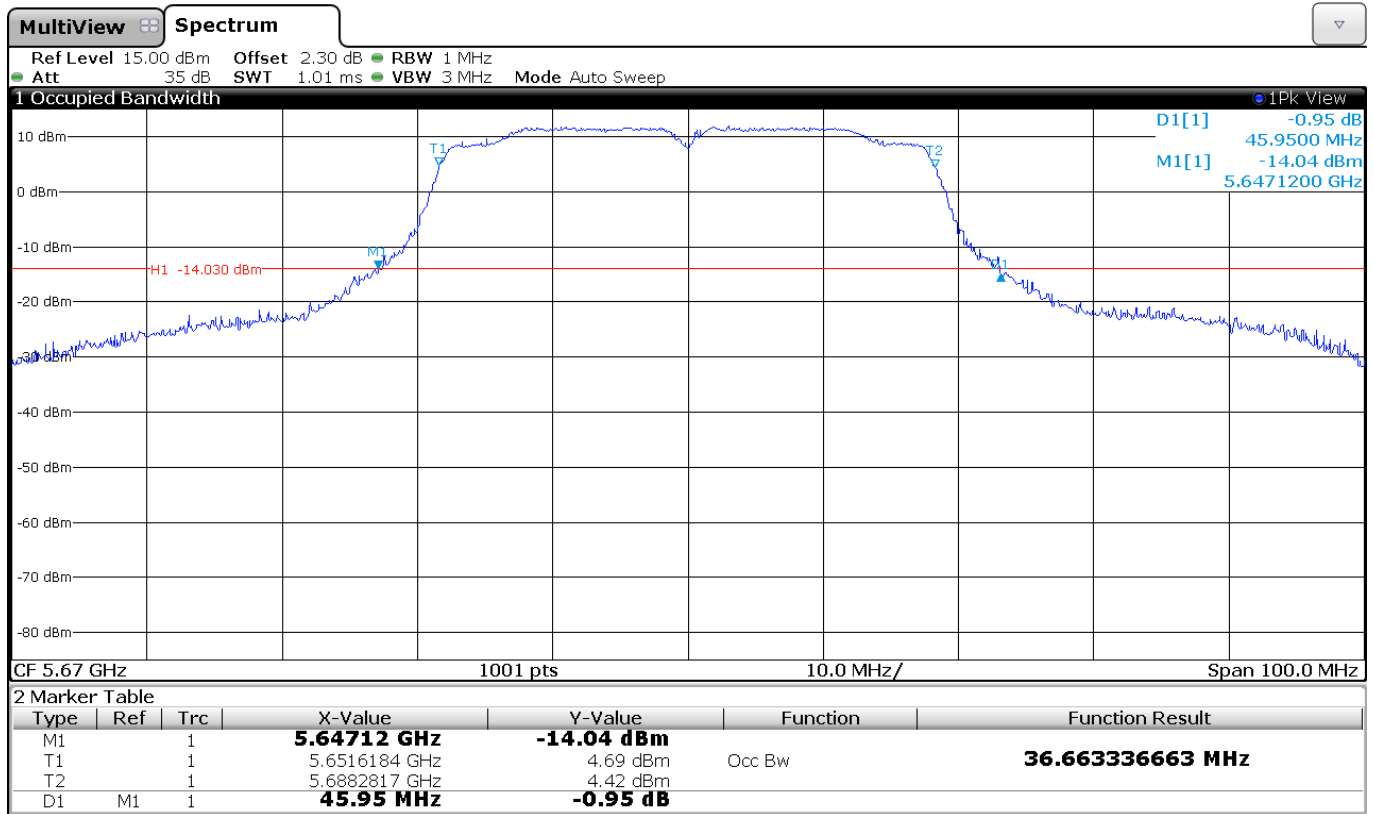
Lowest Channel



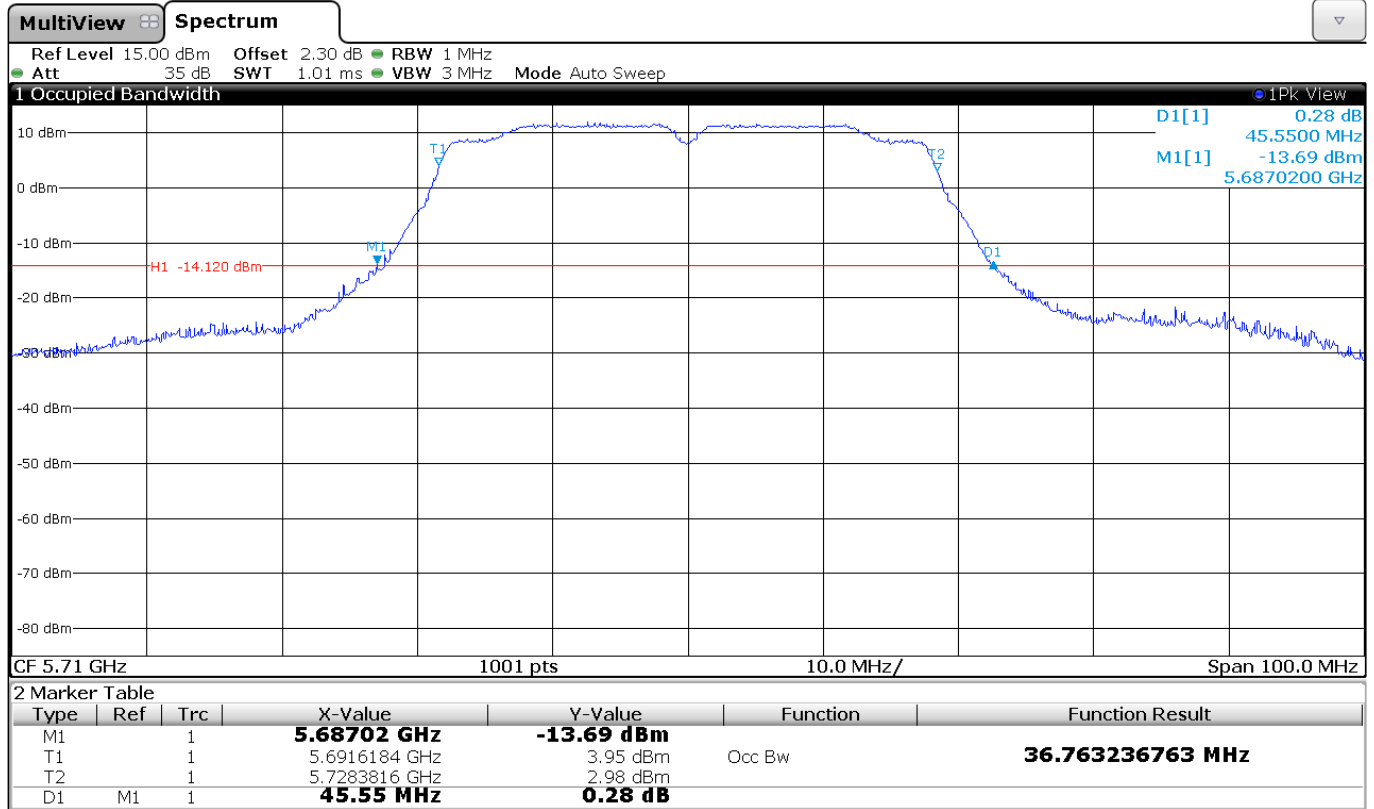
Middle Channel



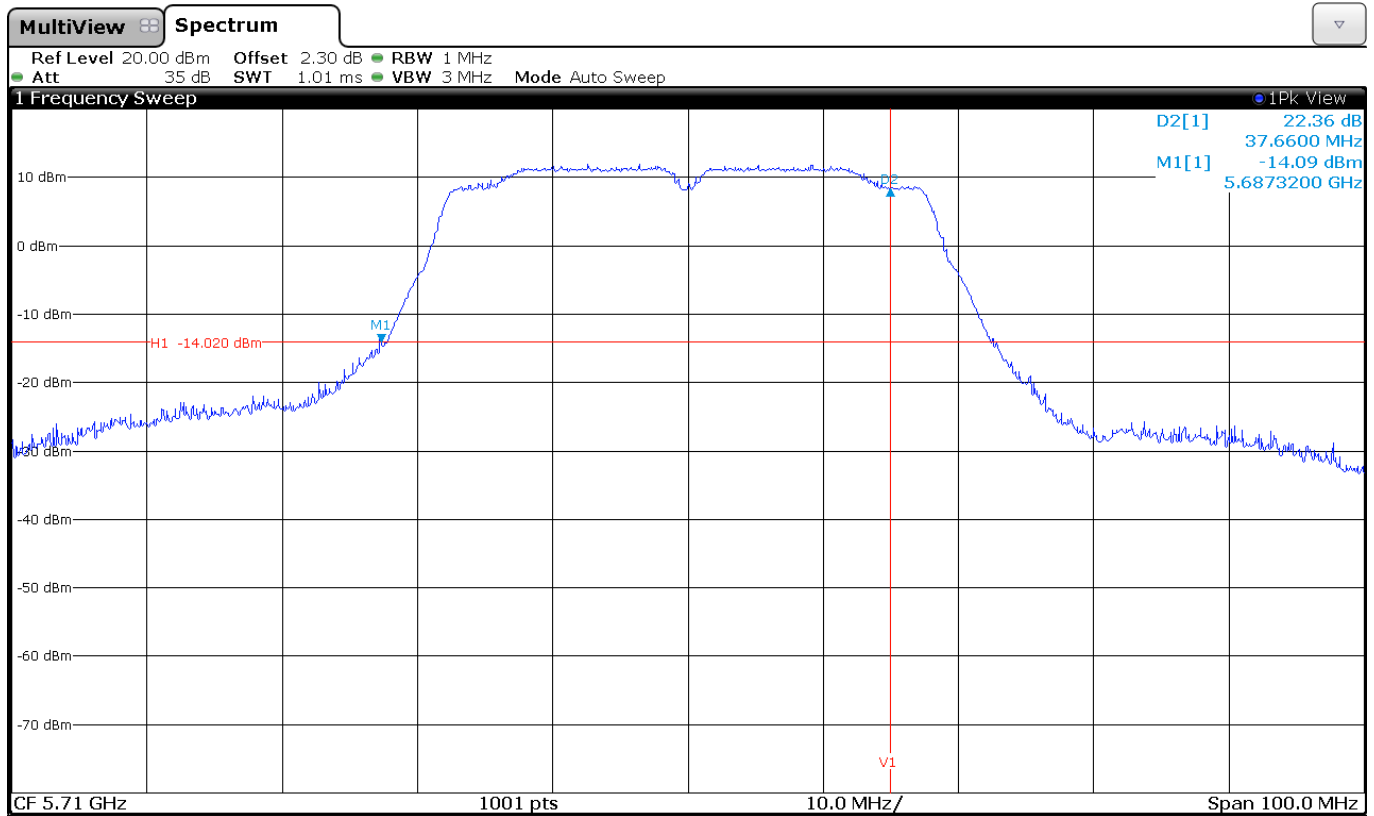
Highest Channel



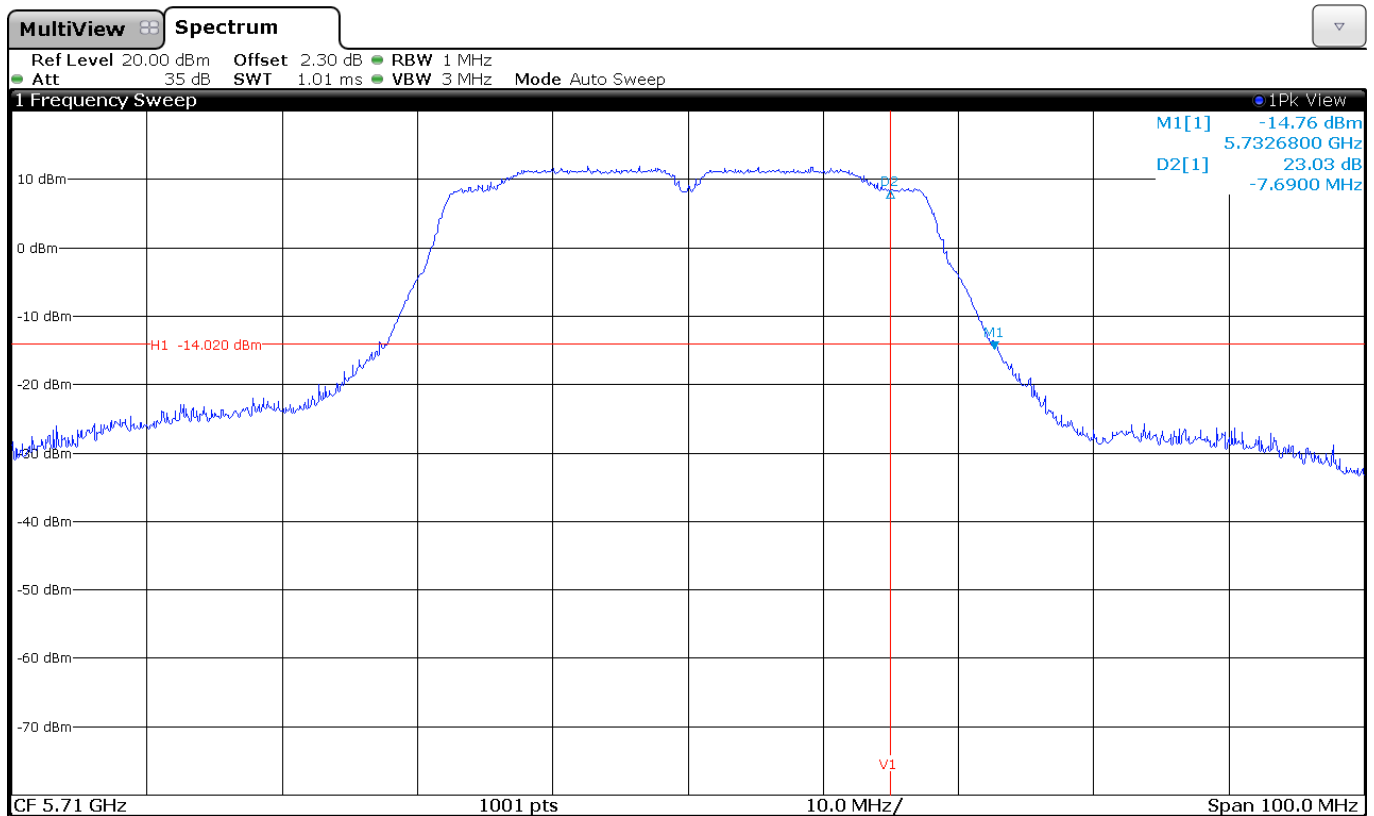
802.11 ac 40MHz: Channel 142. Total Bandwidth



26 dB BW inside UNII_2C sub-band:

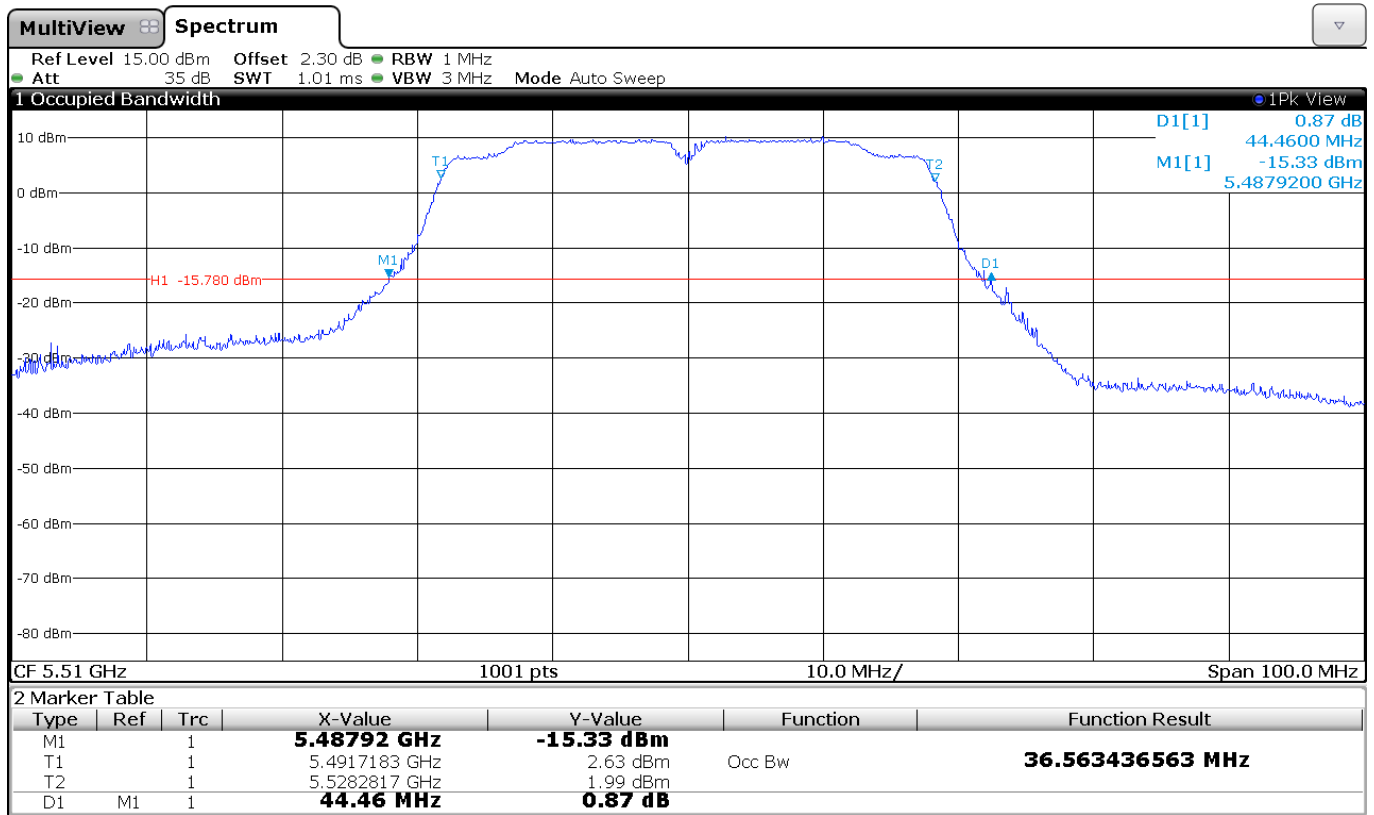


26 dB BW inside UNII_3 sub-band:

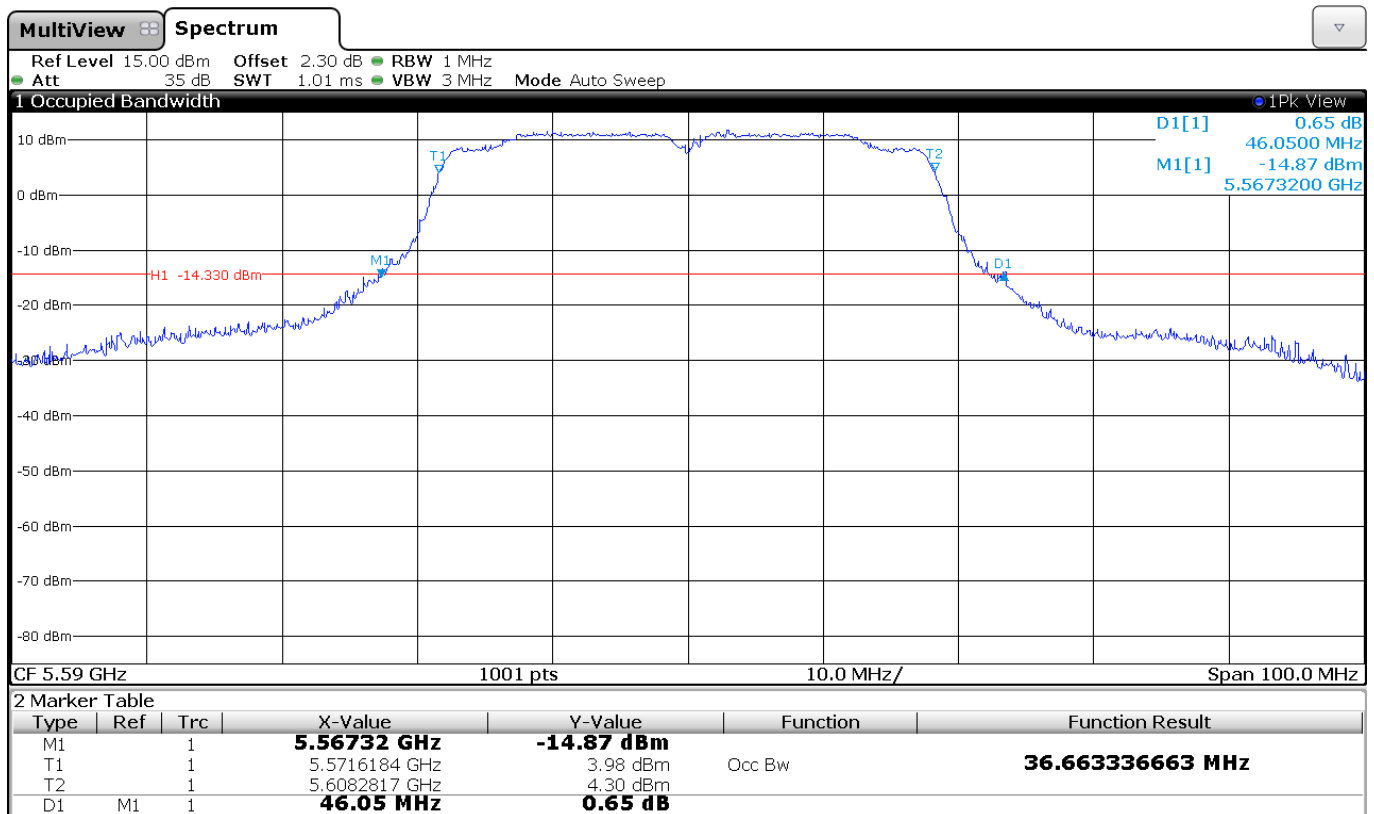


802.11 n40 MHz and 802.11 ac 40 MHz modes (except channel 142) CHAIN B

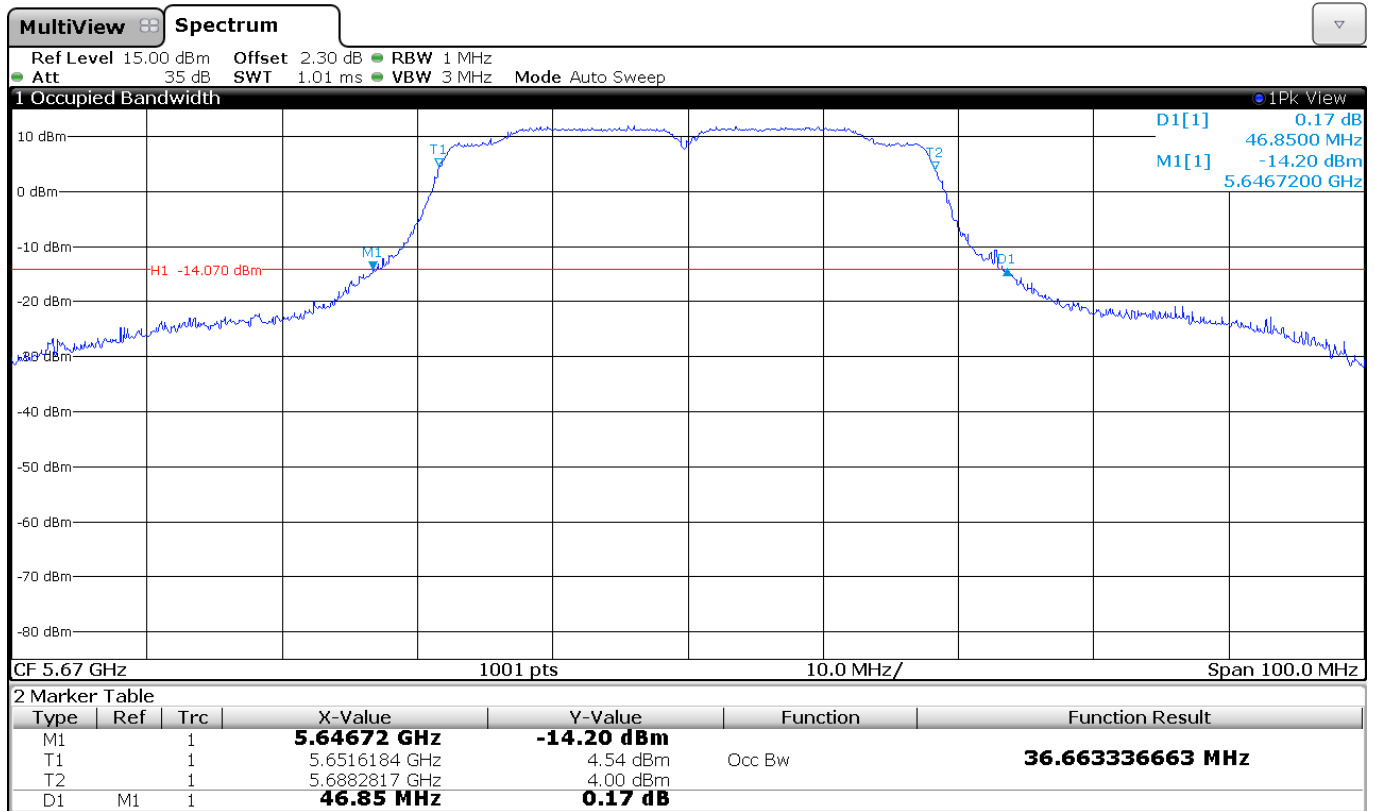
Lowest Channel



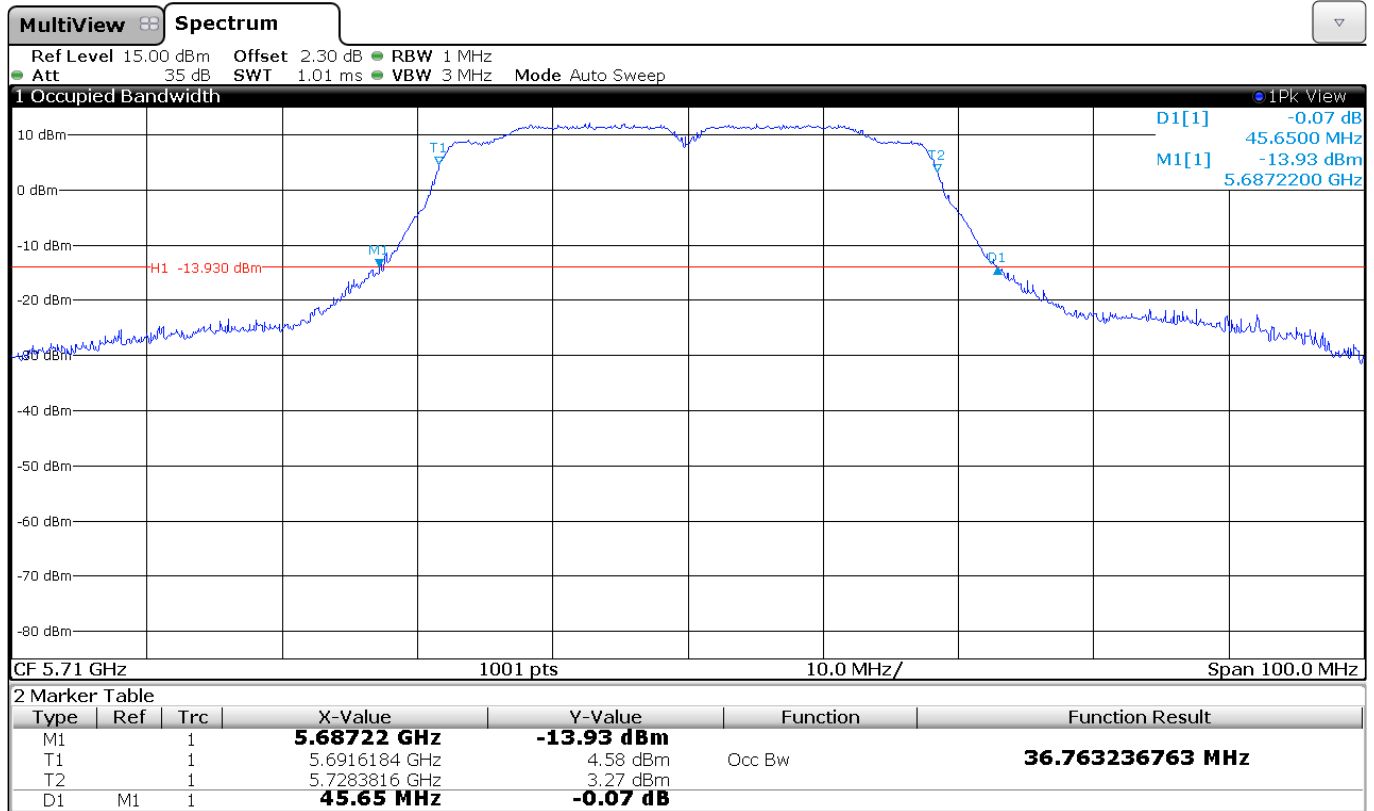
Middle Channel



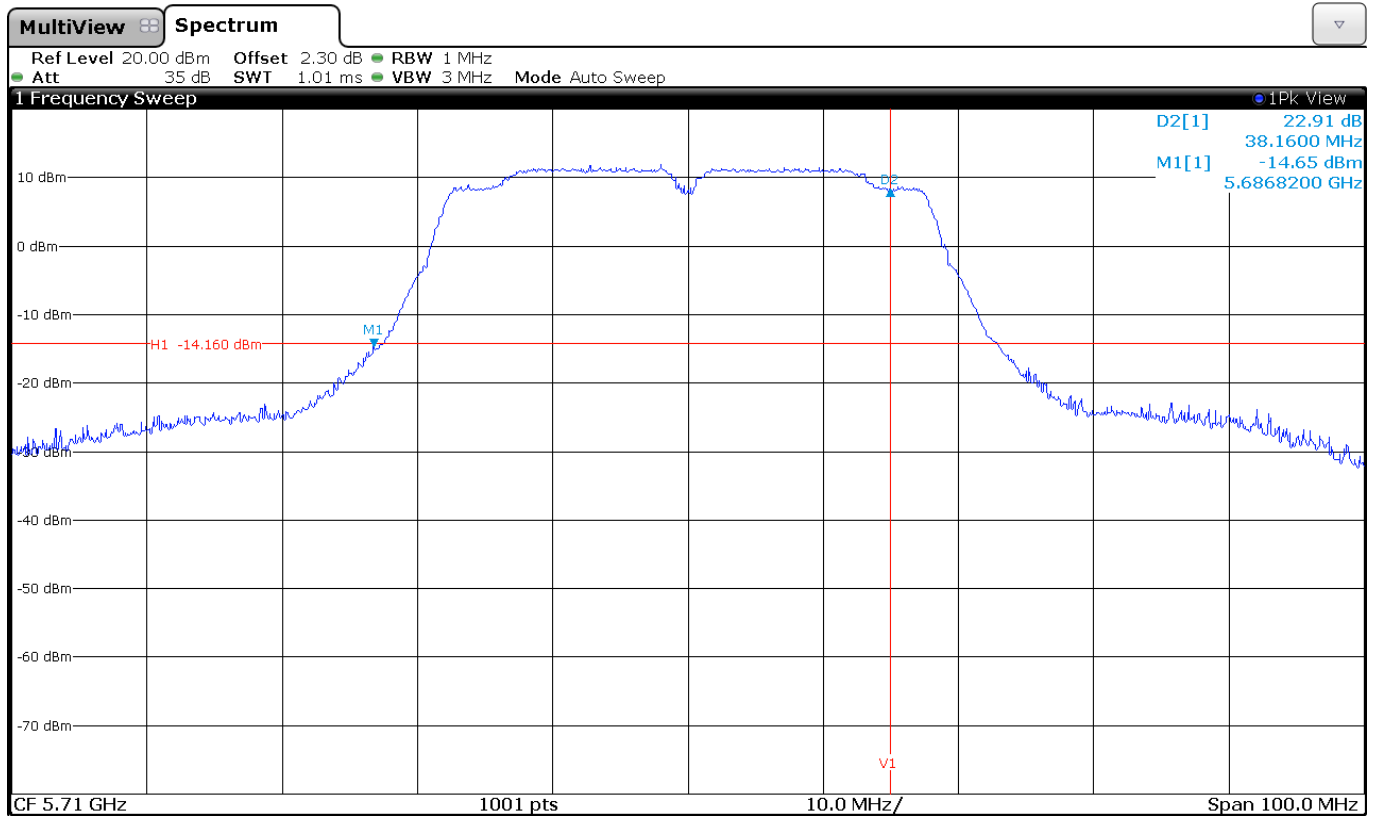
Highest Channel



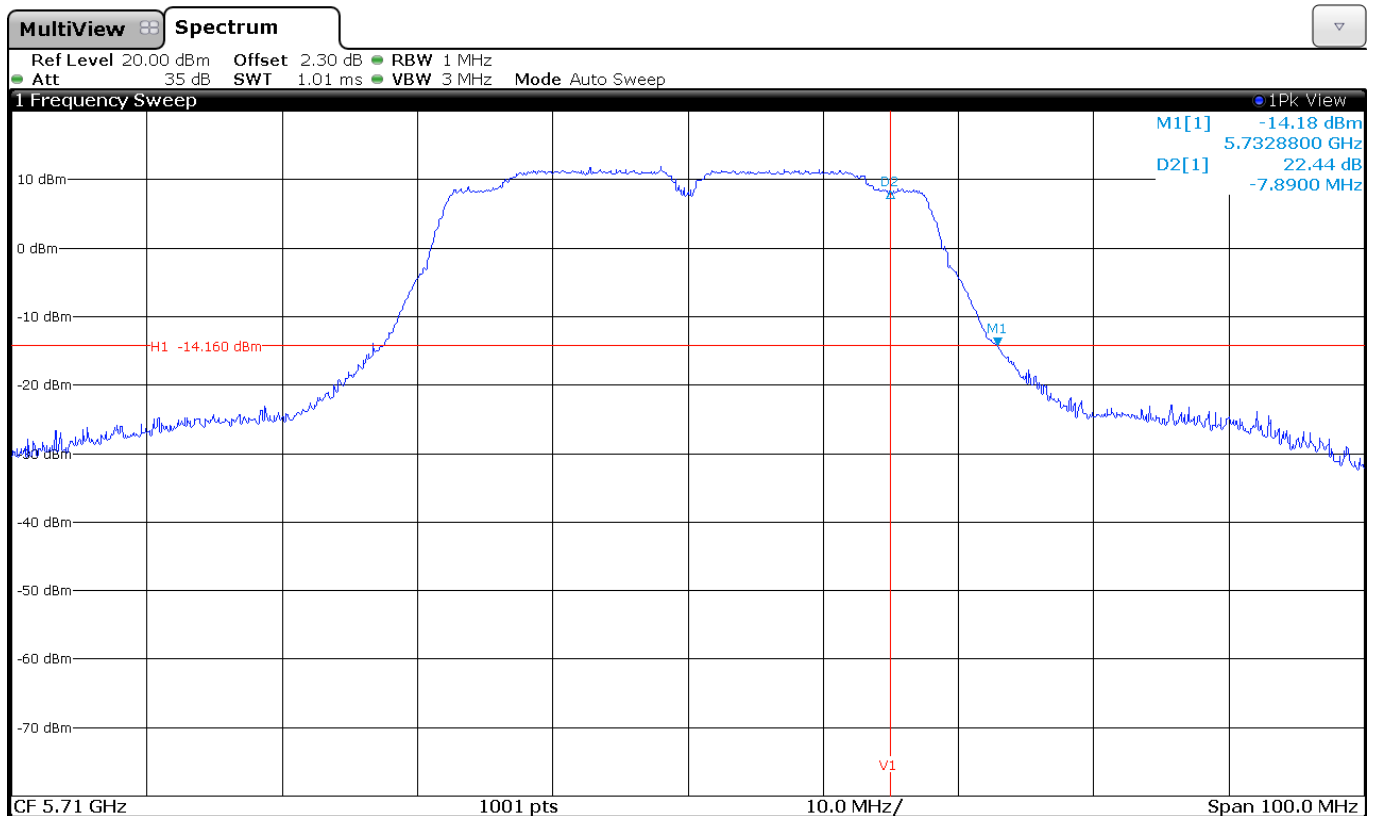
802.11 ac 40MHz: Channel 142. Total Bandwidth.



26 dB BW inside UNII_2C sub-band:

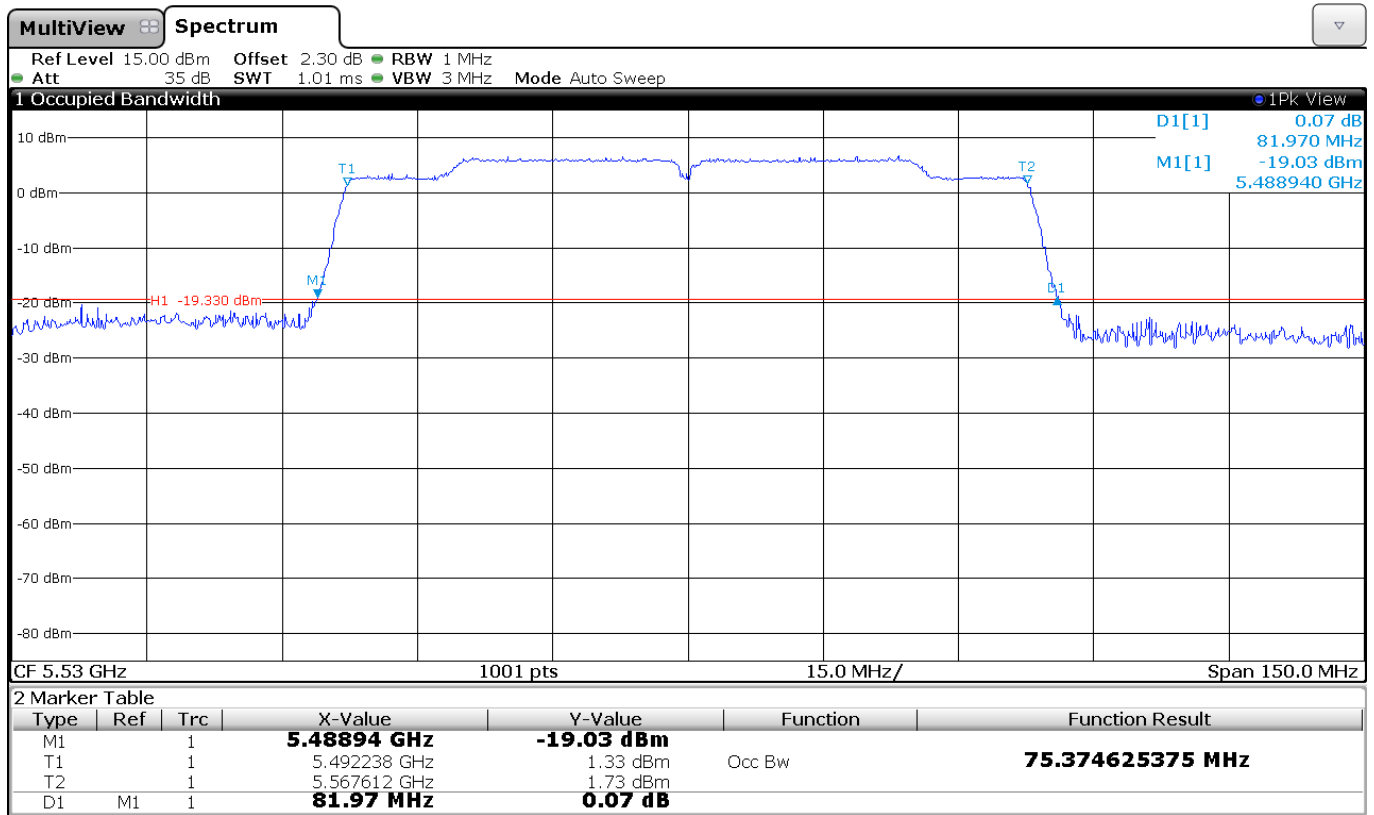


26 dB BW inside UNII_3 sub-band:

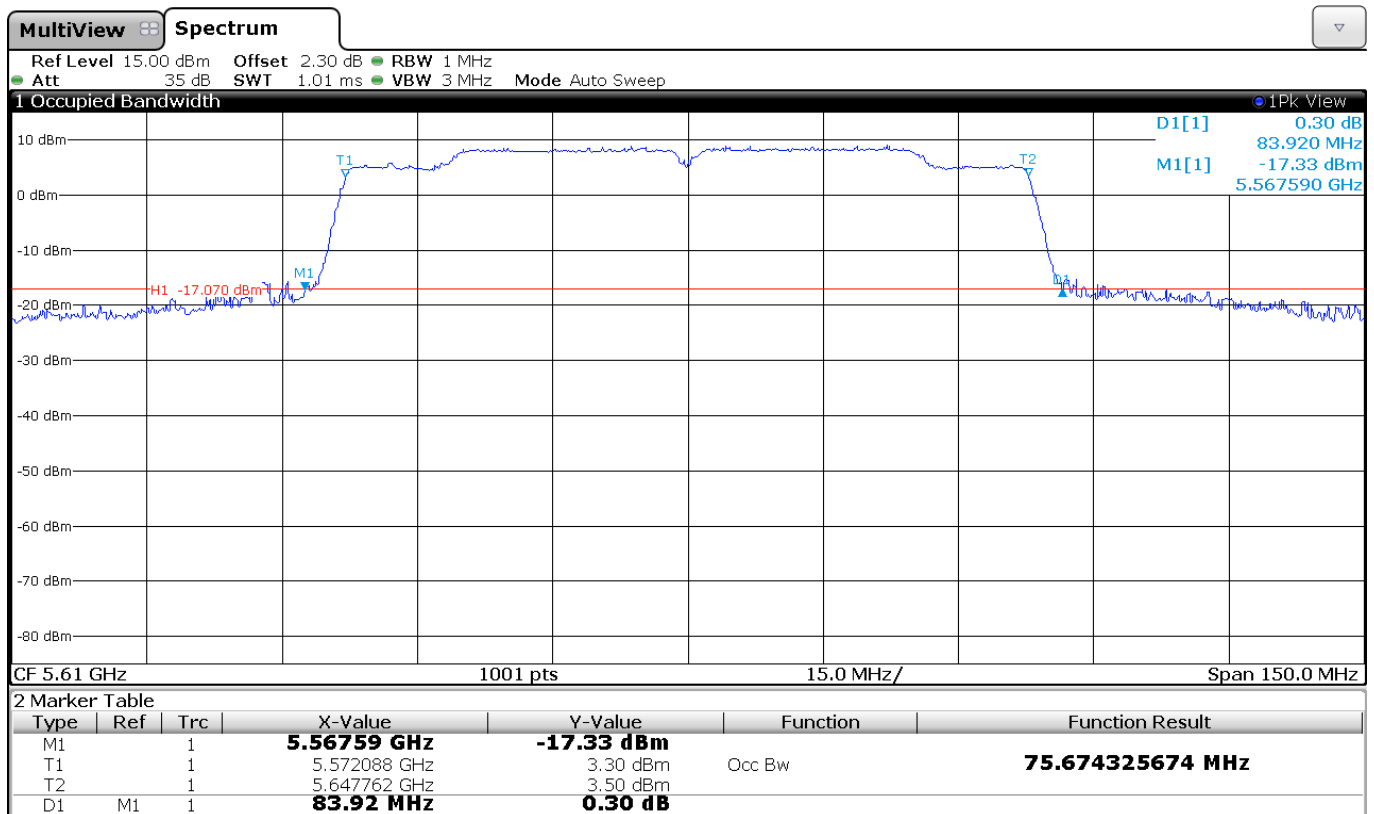


802.11 ac 80 MHz mode (except channel 138) CHAIN A

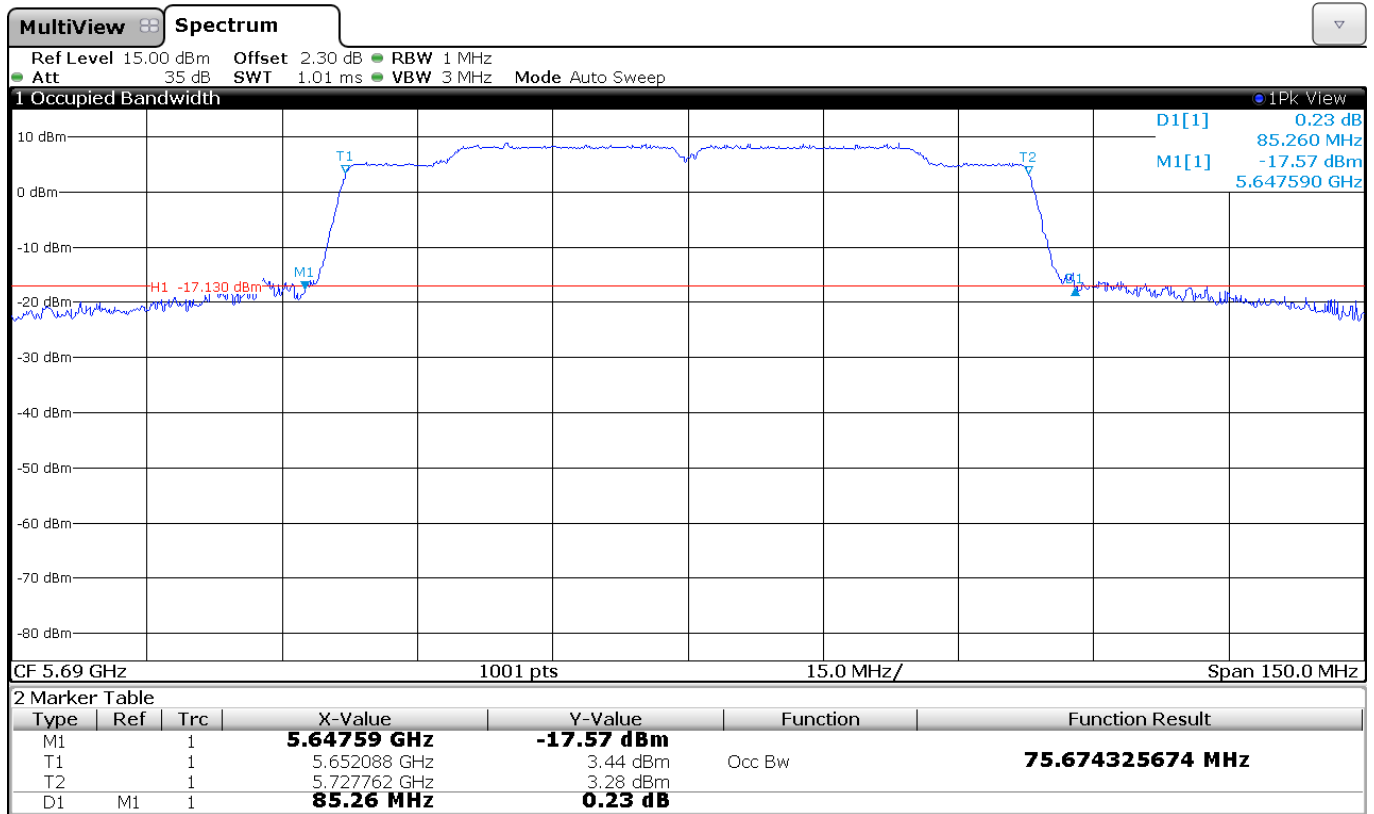
Lowest Channel



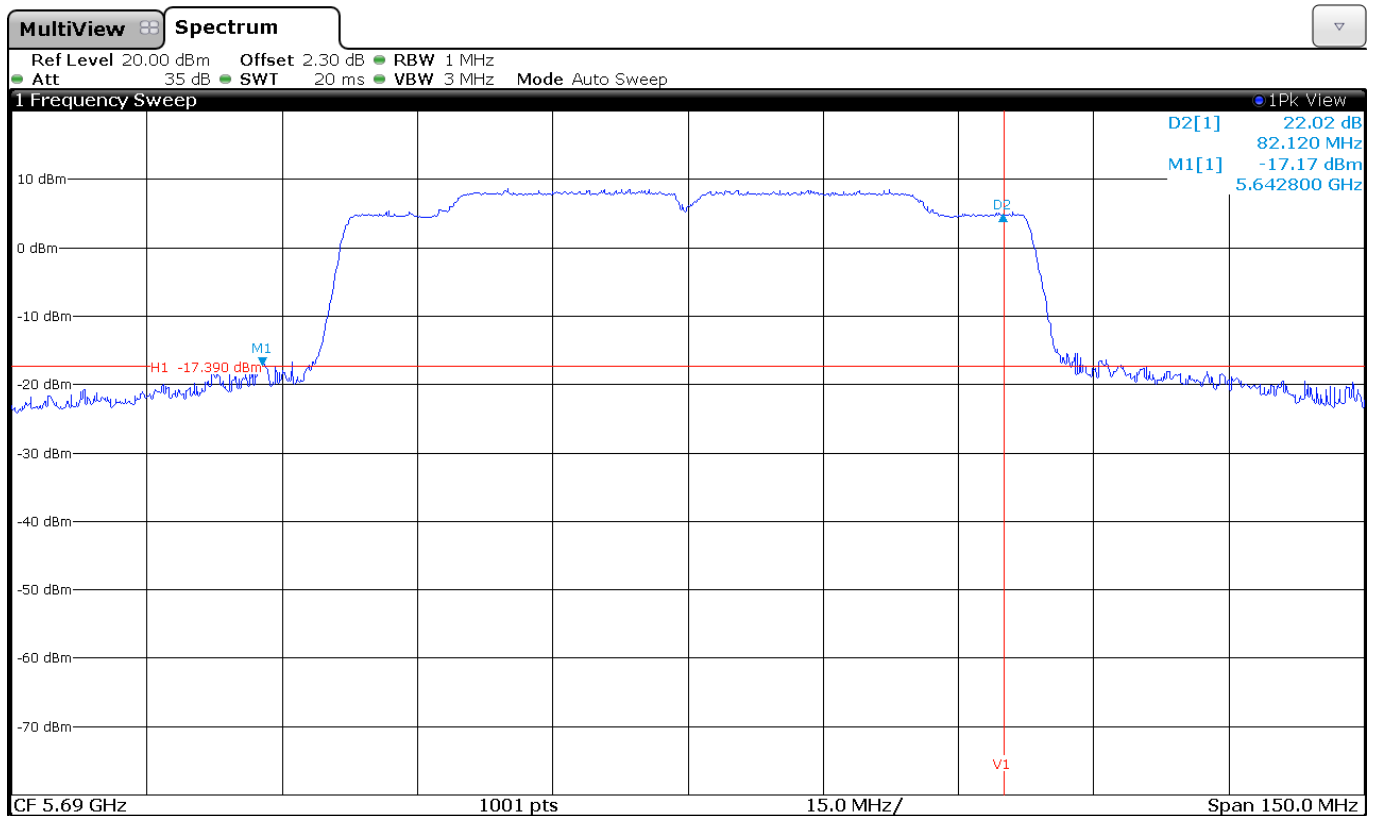
Middle Channel



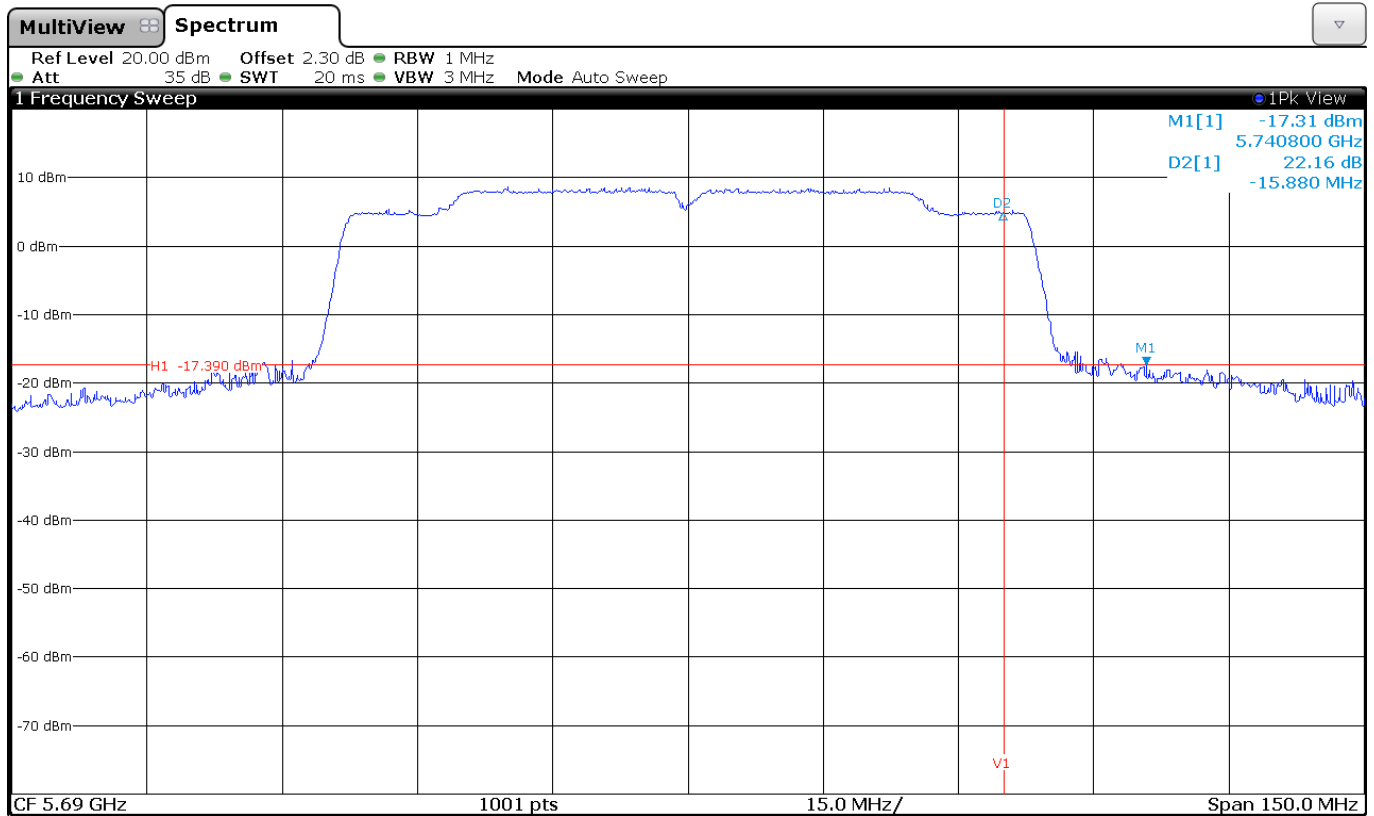
802.11 ac 80MHz: Channel 138. Total Bandwidth.



26 dB BW inside UNII_2C sub-band:

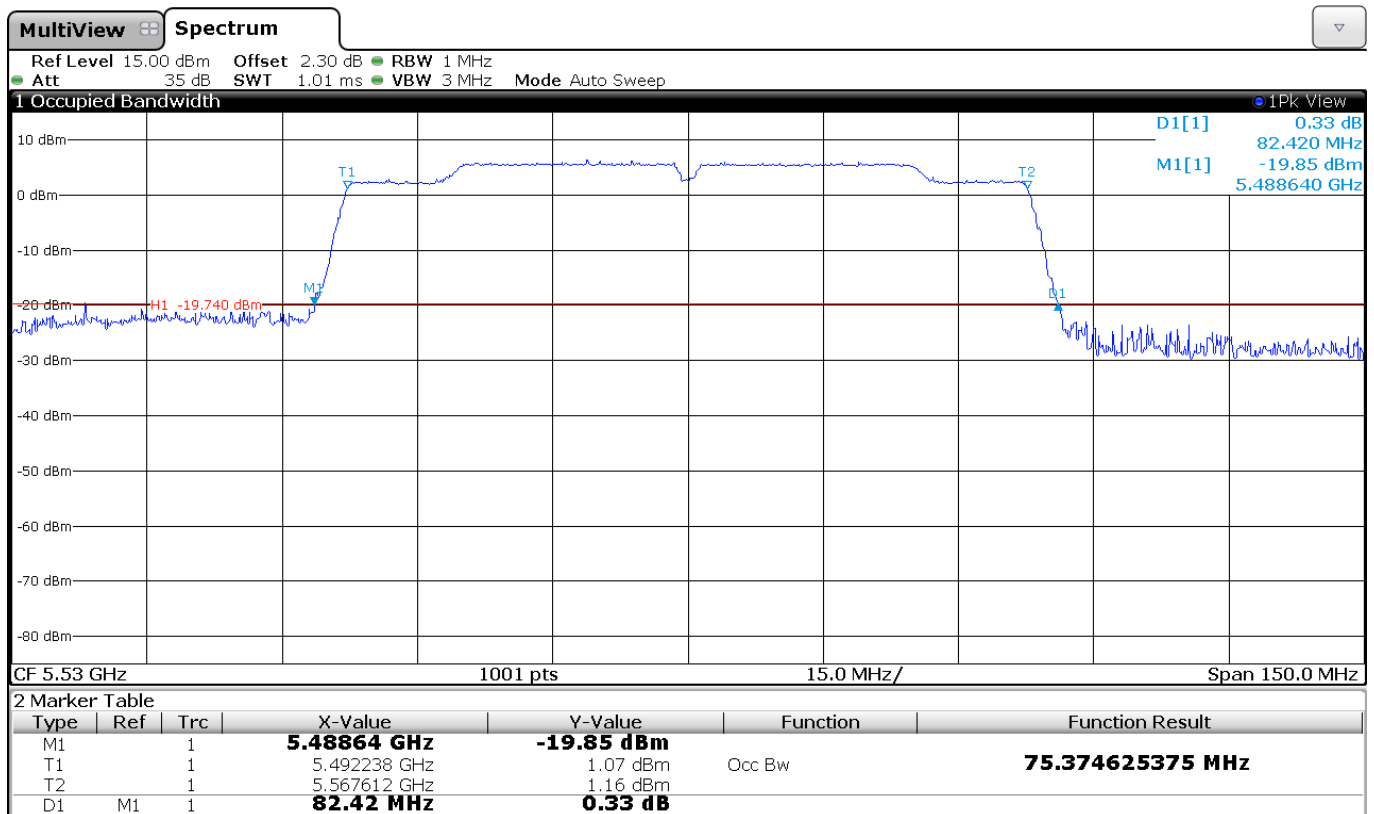


26 dB BW inside UNII_3 sub-band:

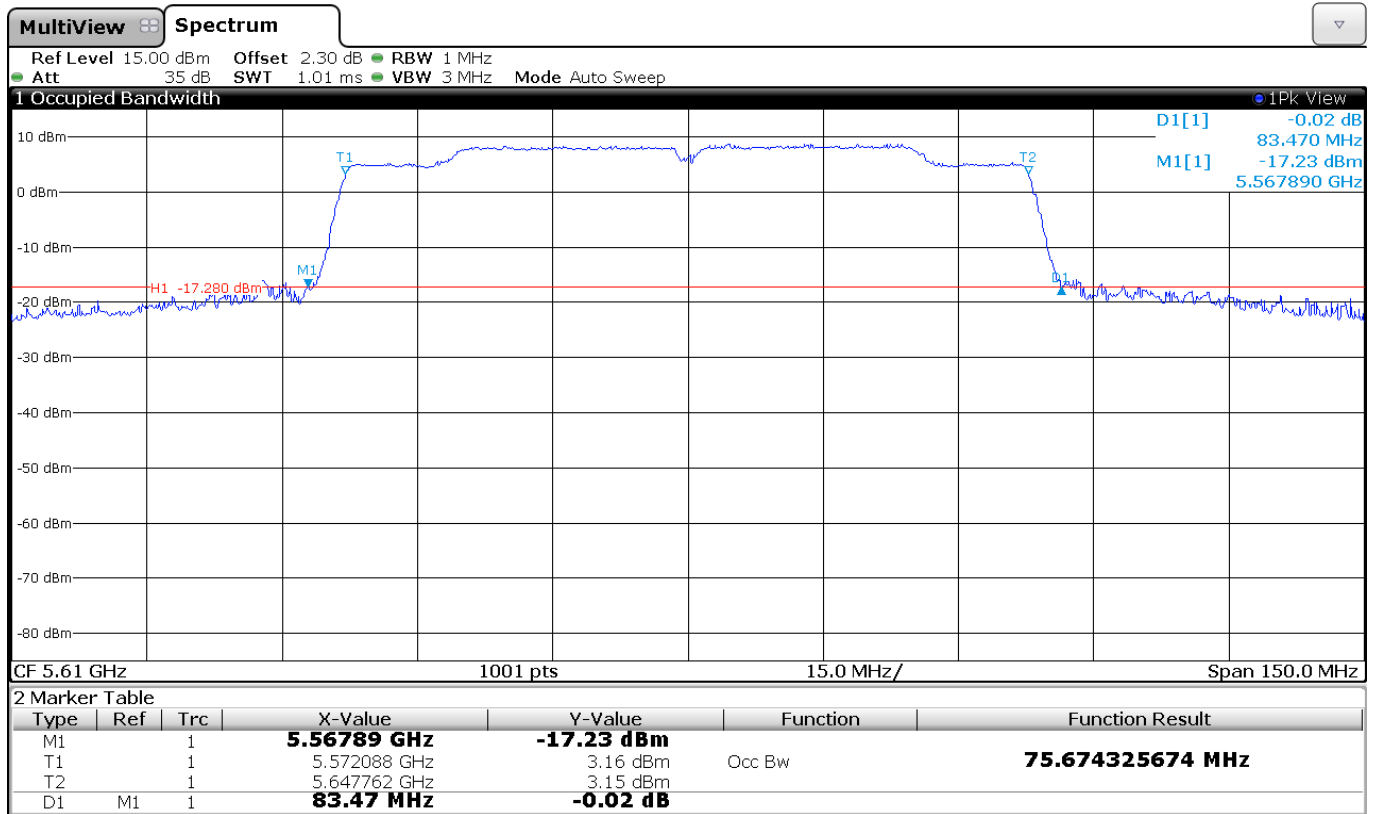


802.11 ac 80 MHz mode (except channel 138) CHAIN B

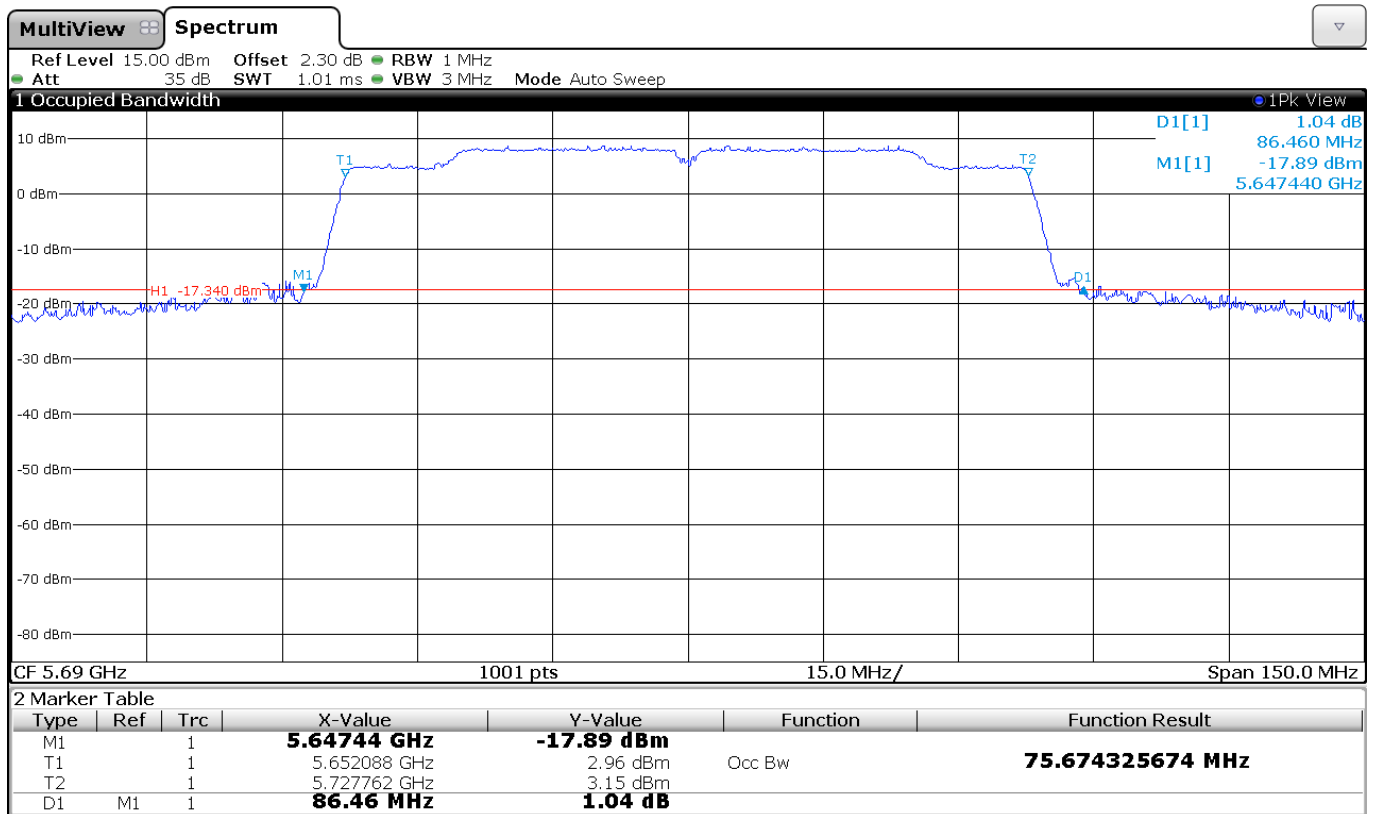
Lowest Channel



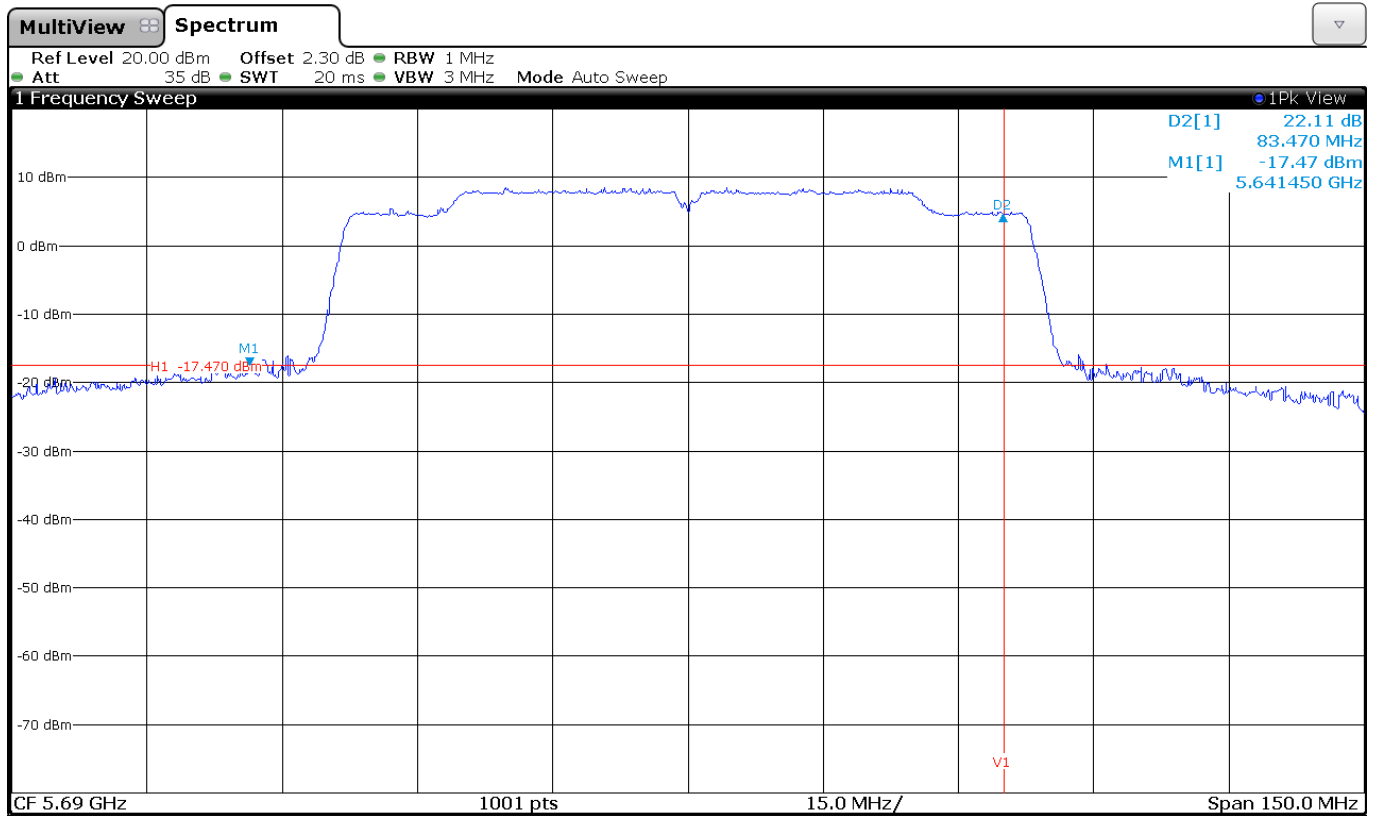
Middle Channel



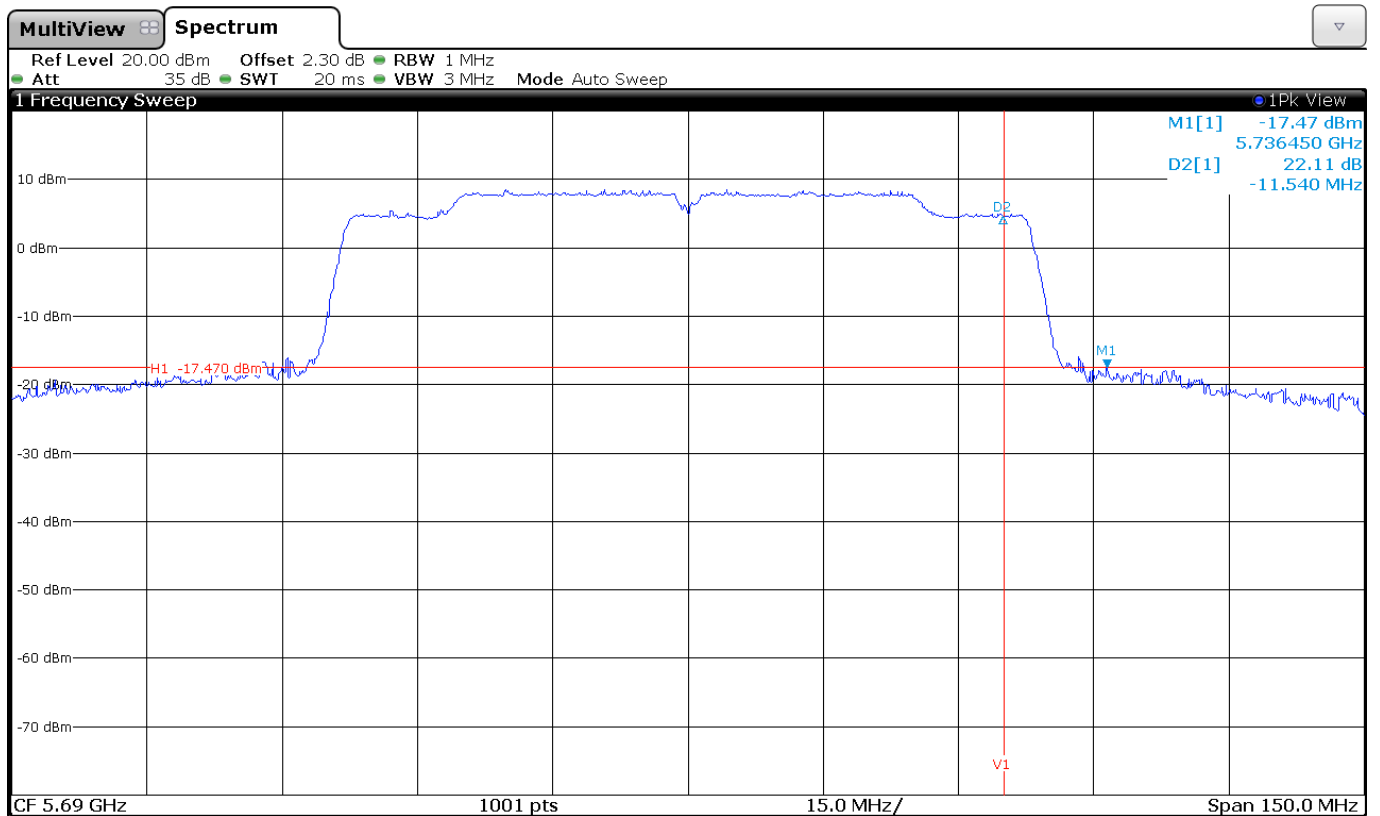
802.11 ac 80MHz: Channel 138. Total Bandwidth.



26 dB BW inside UNII_2C sub-band:



26 dB BW inside UNII_3 sub-band:



Section 15.407 Subclause (a) (2) / RSS-210 A9.2. (3). Maximum output power, Maximum power spectral density and antenna gain

SPECIFICATION

FCC 15.407: For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (23.97 dBm) or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

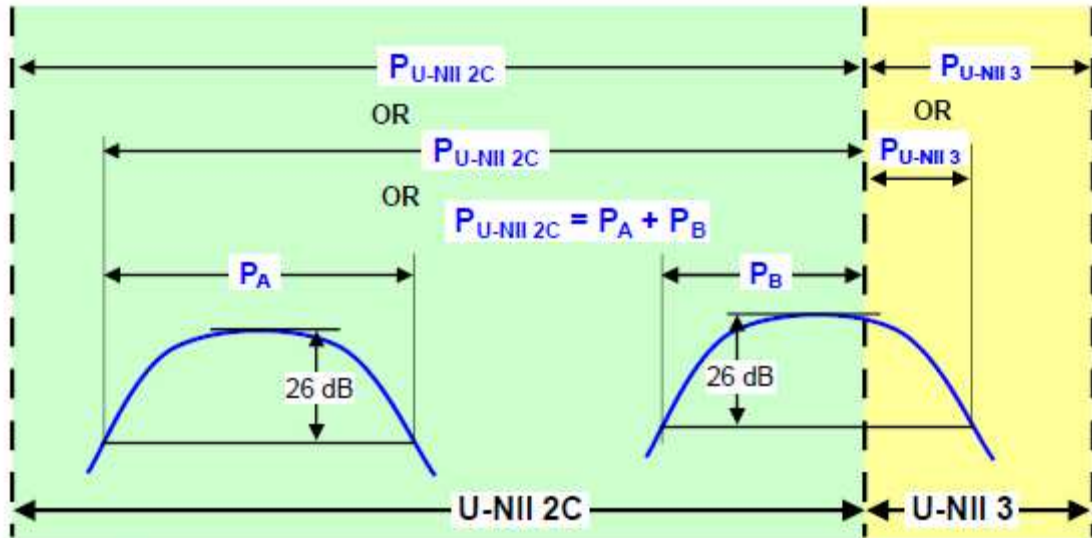
RSS-210: For the band 5.47-5.725 GHz the maximum conducted output power shall not exceed 250 mW (23.97 dBm) or $10 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 11dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 1.0 W (30 dBm) or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average ($10 \log_{10} B$) value by more than 3 dB, the permissible power spectral density shall be reduced by the excess amount.

RESULTS

The maximum conducted output power was measured using the channel power integration method according to point E) 2) b) (Method SA-1) of Guidance 789033 D02 General UNII Test Procedures New Rules v01.

For channel 144 ac20MHz, channel 142 ac40 MHz and channel 138 ac80MHz the maximum conducted output power was measured using the method according to point F) 2) b) (ii) (Integration across the entire U-NII band) of the Guidance for IEEE 802.11ac Device Emissions Testing “Guidance 644545 D03 for IEEE 802.11ac v01 dated 08/14/2014.



Conducted output power within a U-NII band: Integrate over the band, or integrate over a span including the 26 dB EBWs of transmission segments within the band, or integrate over 26 dB EBW of each transmission segment in the band and sum.

Figure 5. Conducted Output Power Measurement Examples

In the measure-and-sum approach for MIMO mode, the conducted emission level (*e.g.*, transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in linear power units (mW—not dBm).

The e.i.r.p. levels are calculated by adding the declared maximum antenna gain (dBi).

The maximum power spectral density (PSD) was measured using the method according to point F) (Method SA-1) of Guidance 789033 D02 General UNII Test Procedures New Rules v01.

The e.i.r.p. levels are calculated by adding the declared maximum antenna gain (dBi).

For MIMO mode, the Measure and add $10 \log(\text{NANT})$ dB, (where NANT is the number of outputs) technique was used according to the Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013.

With this technique, spectrum measurements are performed at each output of the device, and the quantity $10 \log(\text{NANT})$ dB is added to each spectrum value before comparing to the emission limit. Number of outputs = 2.

The number of transmit antennas (NANT) are 2 and the number of spatial streams (Nss) are 2 and therefore the Array Gain is 0 dB.

1. 802.11a mode (see next plots).

CHAIN A Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5500 MHz	13.63	18.43	3.23	8.03
5600 MHz	16.18	20.98	5.80	10.60
5700 MHz	13.18	17.98	2.83	7.63

CHAIN B Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5500 MHz	13.31	18.11	2.87	7.67
5600 MHz	16.51	21.31	6.14	10.94
5700 MHz	12.95	17.75	2.64	7.44

Measurement uncertainty = ± 1.2 dB

Verdict: PASS

2. 802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144). (see next plots).

Note: the test was performed with 802.11 n20 MHz mode which is the same modulation scheme as 802.11 ac 20 MHz.

CHAIN A Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5500 MHz	13.41	18.21	2.81	7.61
5600 MHz	16.17	20.97	5.74	10.54
5700 MHz	13.20	18.00	2.81	7.61

CHAIN B Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5500 MHz	13.48	18.28	2.91	7.71
5600 MHz	15.94	20.74	5.41	10.21
5700 MHz	12.87	17.67	2.43	7.23

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power Chain A (dBm)	Maximum conducted output power Chain B (dBm)	Total conducted output power (dBm) A+B	Total output power e.i.r.p. (dBm) A+B
5500 MHz	10.40	10.33	13.37	18.17
5600 MHz	14.43	14.44	17.44	22.24
5700 MHz	11.20	10.77	14.00	18.80

MIMO CHAIN A+B. PSD/MHz

Maximum declared antenna gain = 4.8 dBi

Frequency	PSD/MHz Chain A (dBm)	PSD/MHz Chain B (dBm)	Total PSD/MHz Chain A (dBm) ¹	Total PSD/MHz Chain B (dBm) ¹	Total PSD/MHz Chain A e.i.r.p. (dBm)	Total PSD/MHz Chain B e.i.r.p. (dBm)
5500 MHz	0.24	0.17	3.25	3.18	8.05	7.98
5600 MHz	4.31	4.31	7.32	7.32	12.12	12.12
5700 MHz	1.11	0.49	4.12	3.50	8.92	8.30

Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.2 dB

Verdict: PASS

802.11 ac 20MHz. Channel 144

CHAIN A Maximum declared antenna gain = 4.8 dBi

Frequency	PSD/MHz (dBm) per sub-band		PSD/MHz e.i.r.p. (dBm) per sub-band		Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5720 MHz	5.78	5.22	10.58	10.02	15.43	7.95	20.23	12.75

CHAIN B Maximum declared antenna gain = 4.8 dBi

Frequency	PSD/MHz (dBm) per sub-band		PSD/MHz e.i.r.p. (dBm) per sub-band		Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5720 MHz	5.11	4.39	9.91	9.19	14.85	6.98	19.65	11.78

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Frequency	Maximum conducted output power per sub-band Chain A (dBm)		Maximum conducted output power per sub-band Chain B (dBm)		Total conducted output power (dBm)		Total output power e.i.r.p. (dBm)	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5720 MHz	12.76	4.84	12.58	5.17	15.68	8.02	20.48	12.82

Measurement uncertainty = ±1.2 dB

Verdict: PASS

MIMO CHAIN A+B. PSD/MHz

Maximum declared antenna gain = 4.8 dBi

Freq.	PSD/MHz per sub-band Chain A (dBm)		PSD/MHz per sub-band Chain B (dBm)		Total PSD/MHz per sub-band Chain A (dBm) ¹		Total PSD/MHz per sub-band Chain B (dBm) ¹		Total PSD/MHz per sub-band Chain A e.i.r.p. (dBm)		Total PSD/MHz per sub-band Chain B e.i.r.p. (dBm)	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5720 MHz	3.21	2.80	3.33	3.06	6.22	5.81	6.34	6.07	11.02	10.61	11.14	10.87

Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

3. 802.11 n40 MHz and 802.11 ac 40 MHz modes (except channel 142). (see next plots).

Note: the test was performed with 802.11 n40 MHz mode which is the same modulation scheme as 802.11 ac 40 MHz.

CHAIN A

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5510 MHz	13.36	18.16	-0.12	4.68
5590 MHz	16.62	21.42	2.97	7.77
5670 MHz	16.66	21.46	3.09	7.89

CHAIN B

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5510 MHz	14.21	19.01	0.76	5.56
5590 MHz	16.45	21.25	2.84	7.64
5670 MHz	16.41	21.21	2.86	7.66

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power Chain A (dBm)	Maximum conducted output power Chain B (dBm)	Total conducted output power (dBm) A+B	Total output power e.i.r.p. (dBm) A+B
5510 MHz	11.64	11.57	14.62	19.42
5590 MHz	16.75	16.44	19.61	24.41
5670 MHz	16.60	16.38	19.50	24.30

Measurement uncertainty = ±1.2 dB

Verdict: PASS

MIMO CHAIN A+B. PSD/MHz

Maximum declared antenna gain = 4.8 dBi

Frequency	PSD/MHz Chain A (dBm)	PSD/MHz Chain B (dBm)	Total PSD/MHz Chain A (dBm) ¹	Total PSD/MHz Chain B (dBm) ¹	Total PSD/MHz Chain A e.i.r.p. (dBm)	Total PSD/MHz Chain B e.i.r.p. (dBm)
5510 MHz	-1.93	-2.08	1.08	0.93	5.88	5.73
5590 MHz	2.82	2.44	5.83	5.45	10.63	10.25
5670 MHz	2.65	2.42	5.66	5.43	10.46	10.23

Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.2 dB

Verdict: PASS

802.11 ac 40MHz. Channel 142.

CHAIN A Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PSD/MHz (dBm) per sub-band		PSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5710 MHz	16.13	3.50	20.93	8.30	2.99	2.60	7.79	7.40

CHAIN B Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PSD/MHz (dBm) per sub-band		PSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5710 MHz	16.19	3.26	20.99	8.06	3.01	2.31	7.81	7.11

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power per sub-band Chain A (dBm)		Maximum conducted output power per sub-band Chain B (dBm)		Total conducted output power (dBm) per sub-band		Total output power e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5710 MHz	16.34	4.43	16.12	4.38	19.24	7.41	24.04	12.21

Measurement uncertainty = ±1.5 dB

Verdict: PASS

MIMO CHAIN A+B. PSD/MHz

Maximum declared antenna gain = 4.8 dBi

Freq.	PSD/MHz per sub-band Chain A (dBm)		PSD/MHz per sub-band Chain B (dBm)		Total PSD/MHz per sub-band Chain A (dBm) ¹		Total PSD/MHz per sub-band Chain B (dBm) ¹		Total PSD/MHz per sub-band Chain A e.i.r.p. (dBm)		Total PSD/MHz Chain B e.i.r.p. per sub-band (dBm)	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5710 MHz	2.67	2.49	1.37	2.41	5.68	5.50	4.38	5.42	10.48	10.30	9.18	10.22

Note 1: The quantity $10 \cdot \log 2$ (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.5 dB

Verdict: PASS

4. 802.11 ac 80 MHz mode (except channel 138). (see next plots).

CHAIN A Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5530 MHz	13.61	18.41	-3.49	1.31
5610 MHz	16.62	21.42	-0.45	4.35

CHAIN B Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm)	Maximum output power e.i.r.p. (dBm)	PSD/MHz (dBm)	PSD/MHz e.i.r.p. (dBm)
5530 MHz	13.56	18.36	-3.51	1.29
5610 MHz	16.57	21.37	-0.50	4.30

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power Chain A (dBm)	Maximum conducted output power Chain B (dBm)	Total conducted output power (dBm) A+B	Total output power e.i.r.p. (dBm) A+B
5530 MHz	11.50	11.63	14.58	19.38
5610 MHz	16.77	16.46	19.62	24.42

Measurement uncertainty = ±1.2 dB

Verdict: PASS

MIMO CHAIN A+B. PSD/MHz

Maximum declared antenna gain = 4.8 dBi

Frequency	PSD/MHz Chain A (dBm)	PSD/MHz Chain B (dBm)	Total PSD/MHz Chain A (dBm) ¹	Total PSD/MHz Chain B (dBm) ¹	Total PSD/MHz Chain A e.i.r.p. (dBm)	Total PSD/MHz Chain B e.i.r.p. (dBm)
5530 MHz	-5.33	-5.09	-2.32	-2.08	2.48	2.72
5610 MHz	-0.26	-0.48	2.75	2.53	7.55	7.33

Note 1: The quantity $10 \cdot \log 2$ (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.2 dB

Verdict: PASS

802.11 ac 80MHz. Channel 138.

CHAIN A Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PSD/MHz (dBm) per sub-band		PSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5690 MHz	16.38	1.16	21.18	5.96	-0.25	0.13	4.55	4.93

CHAIN B Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power (dBm) per sub-band		Maximum output power e.i.r.p. (dBm) per sub-band		PSD/MHz (dBm) per sub-band		PSD/MHz e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5690 MHz	16.44	0.97	21.24	5.77	-0.22	-0.08	4.58	4.72

MIMO CHAIN A+B. MAXIMUM OUTPUT POWER

Maximum declared antenna gain = 4.8 dBi

Frequency	Maximum conducted output power per sub-band Chain A (dBm)		Maximum conducted output power per sub-band Chain B (dBm)		Total conducted output power (dBm) per sub-band		Total output power e.i.r.p. (dBm) per sub-band	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5690 MHz	16.58	1.27	16.46	1.14	19.53	4.22	24.33	9.02

Measurement uncertainty = ±1.5 dB

Verdict: PASS

MIMO CHAIN A+B. PSD/MHz

Maximum declared antenna gain = 4.8 dBi

Freq.	PSD/MHz per sub-band Chain A (dBm)		PSD/MHz per sub-band Chain B (dBm)		Total PSD/MHz per sub-band Chain A (dBm) ¹		Total PSD/MHz per sub-band Chain B (dBm) ¹		Total PSD/MHz per sub-band Chain A e.i.r.p. (dBm)		Total PSD/MHz per sub-band Chain B e.i.r.p. (dBm)	
	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3	UNII_2C	UNII_3
5690 MHz	-0.04	-0.61	0.29	0.24	2.97	2.40	3.30	3.25	7.77	7.20	8.10	8.05

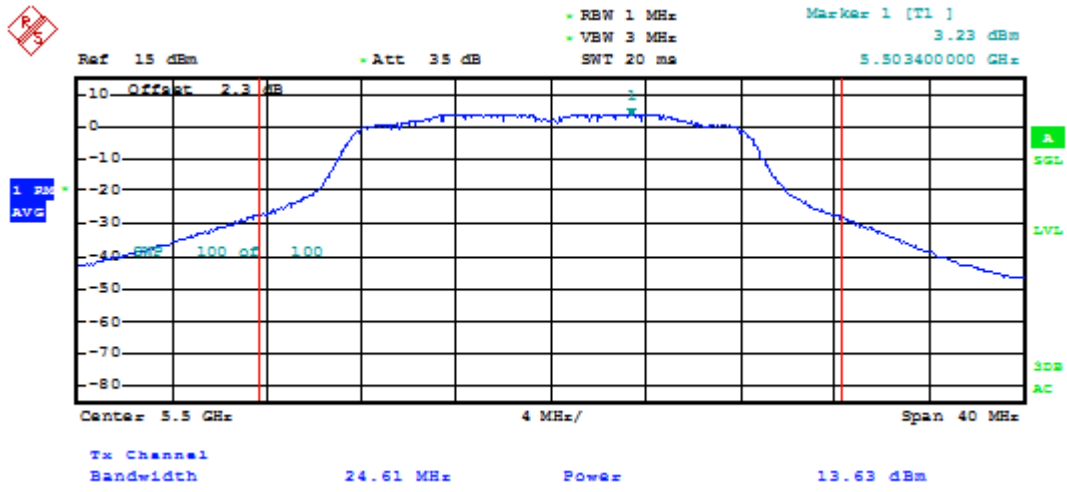
Note 1: The quantity 10*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Measurement uncertainty = ±1.5 dB

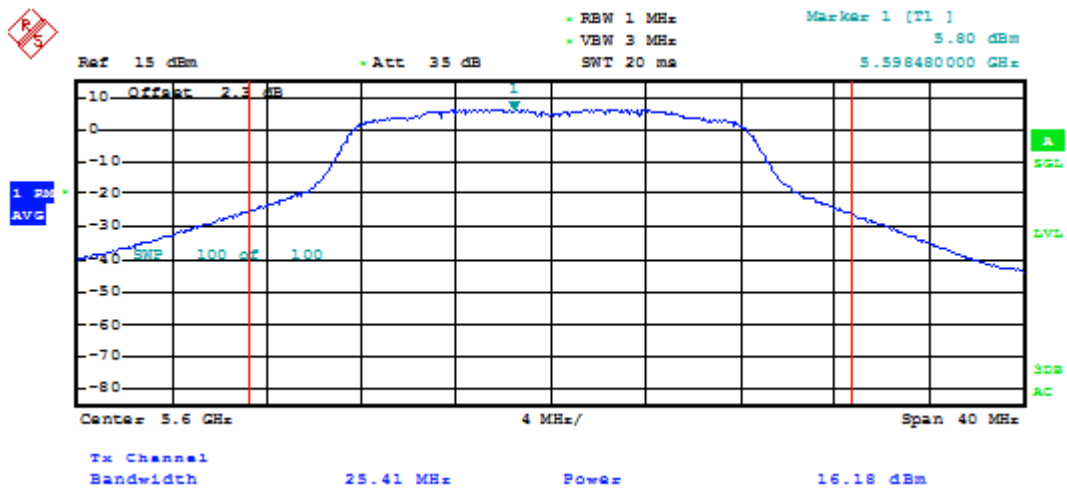
Verdict: PASS

802.11a mode CHAIN A

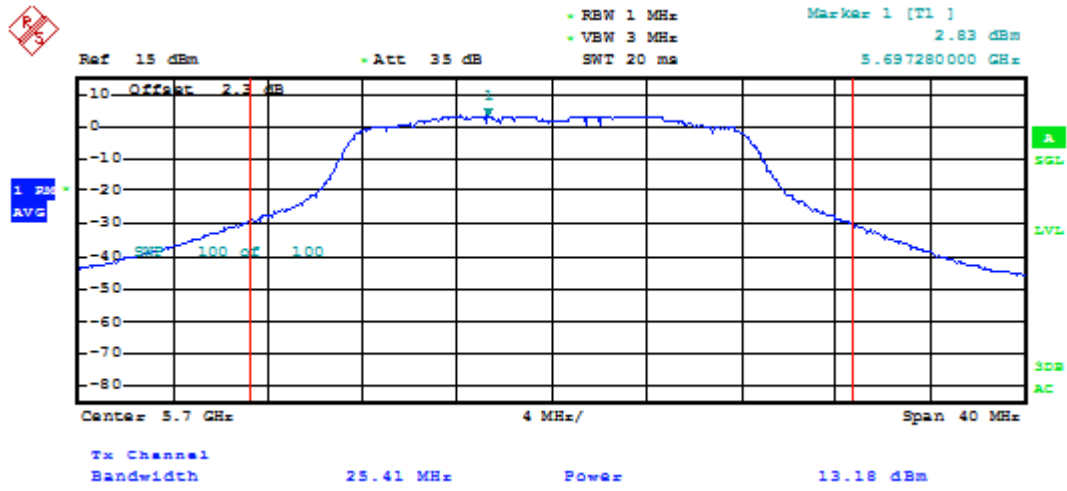
Lowest Channel



Middle Channel

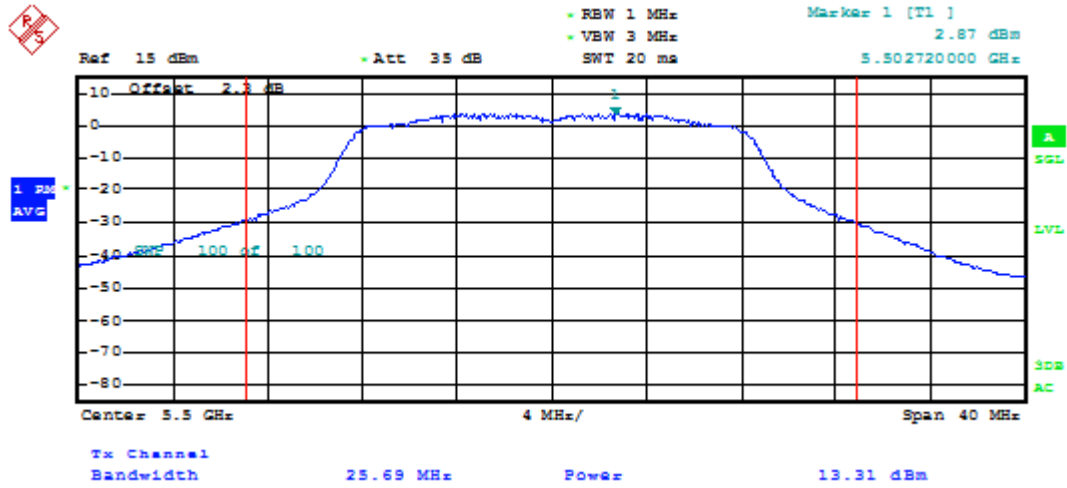


Highest Channel

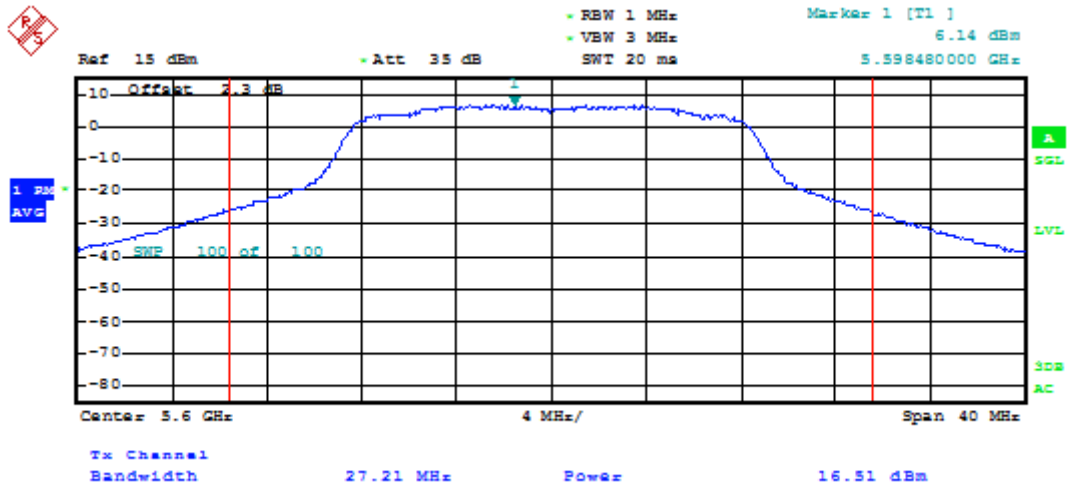


802.11a mode CHAIN B

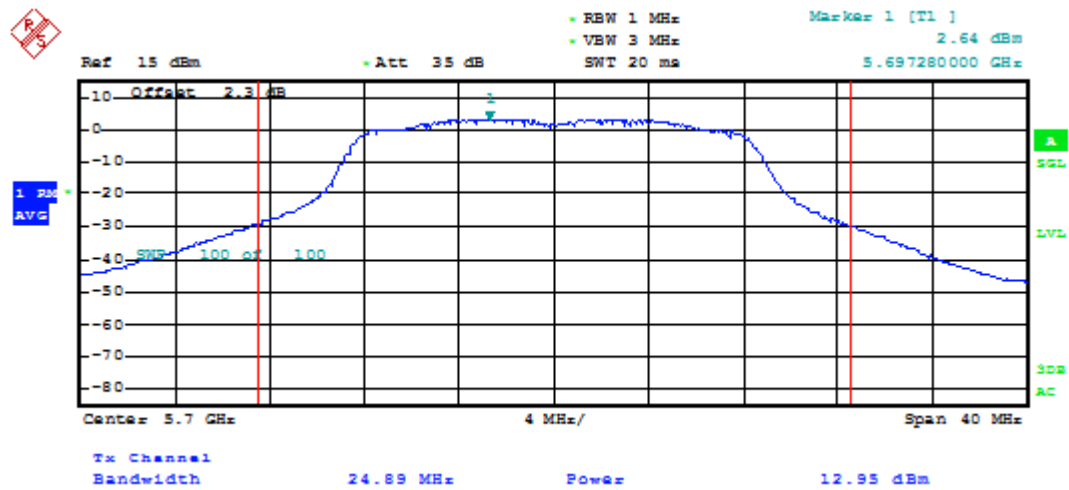
Lowest Channel



Middle Channel

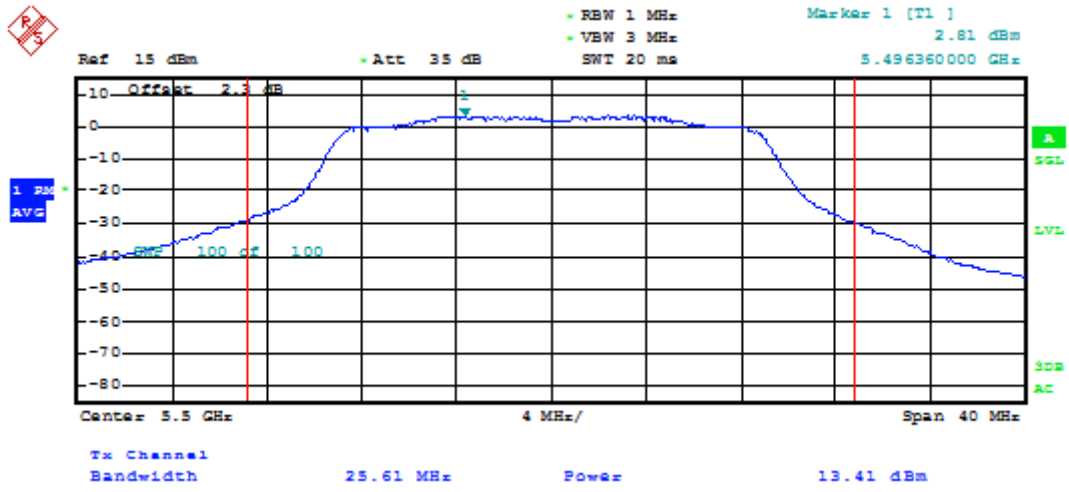


Highest Channel

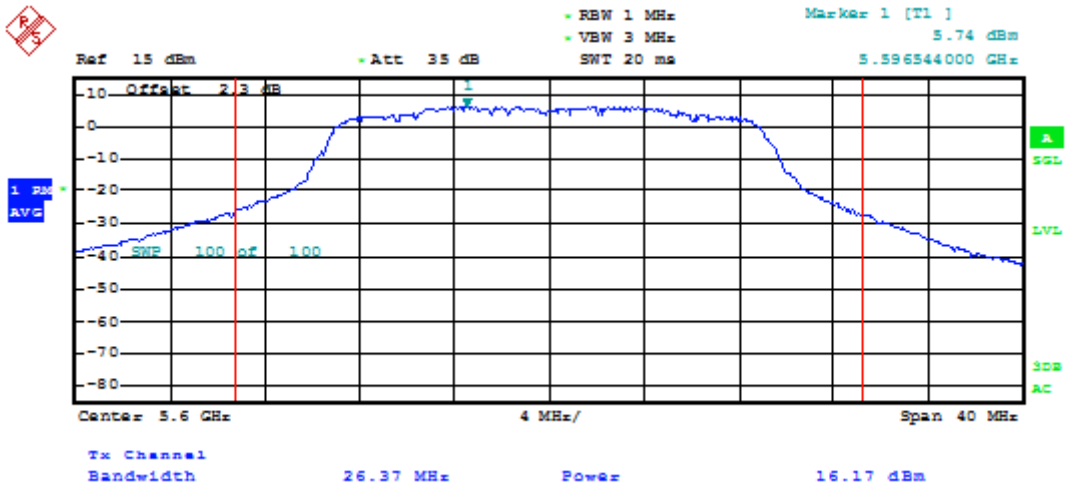


802.11 n20 MHz modes (except channel 144) CHAIN A

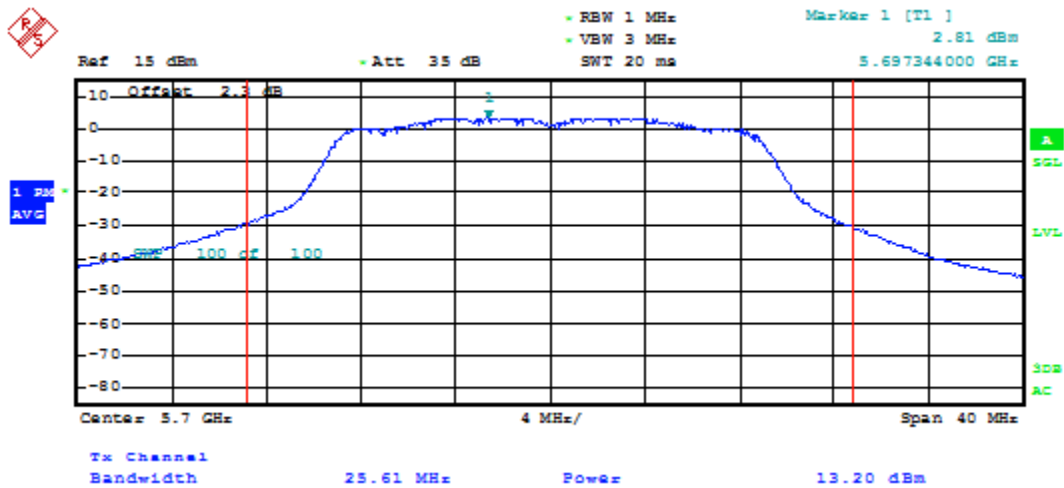
Lowest Channel



Middle Channel

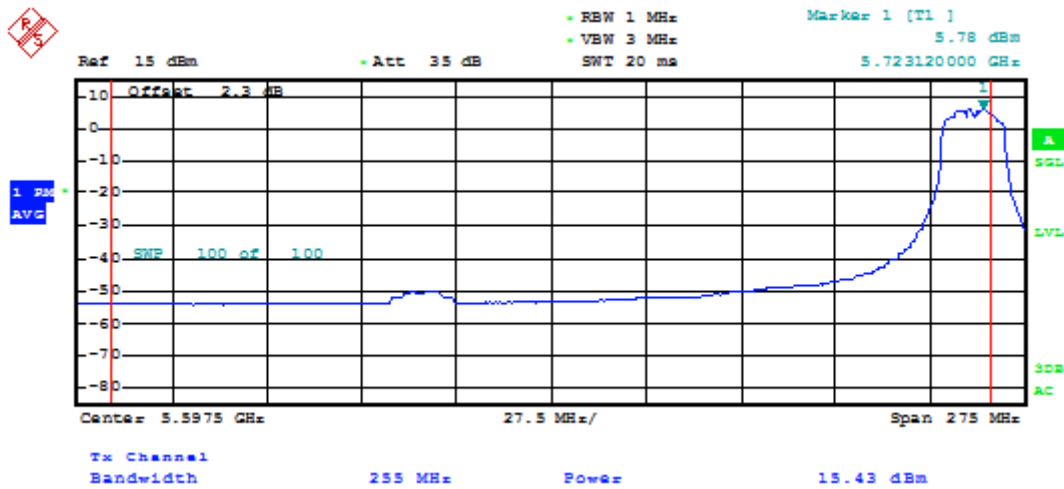


Highest Channel

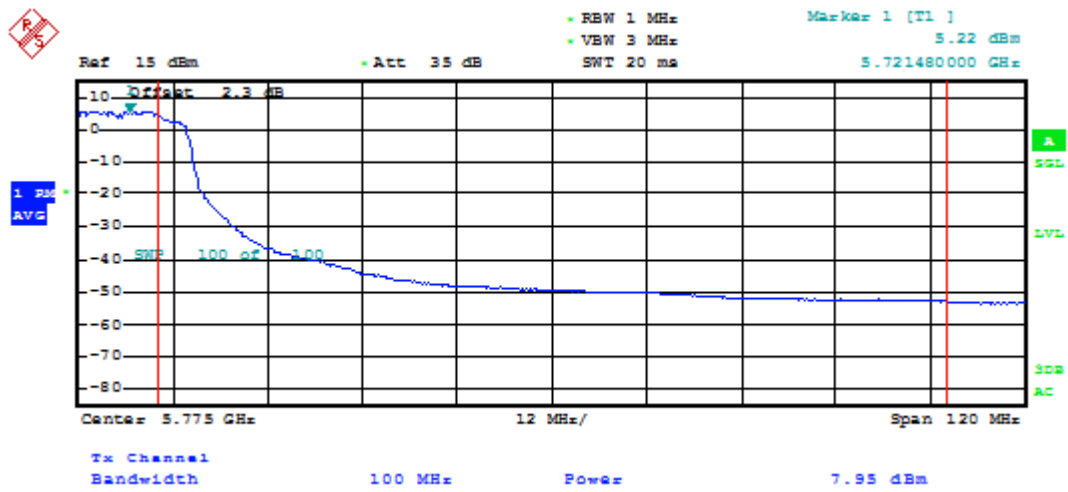


802.11 ac 20MHz : Channel 144

Power and PSD in sub-band UNII_2C:

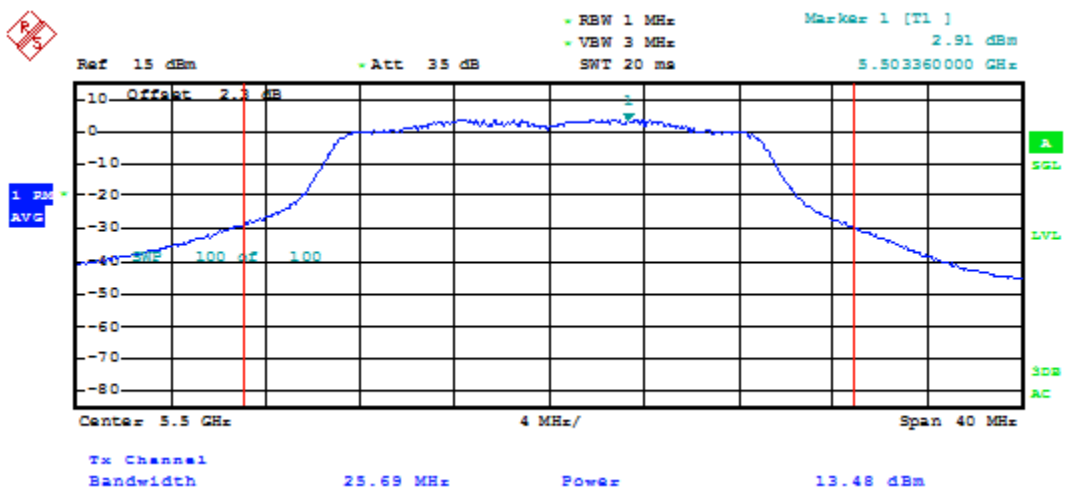


Power and PSD in sub-band UNII_3:

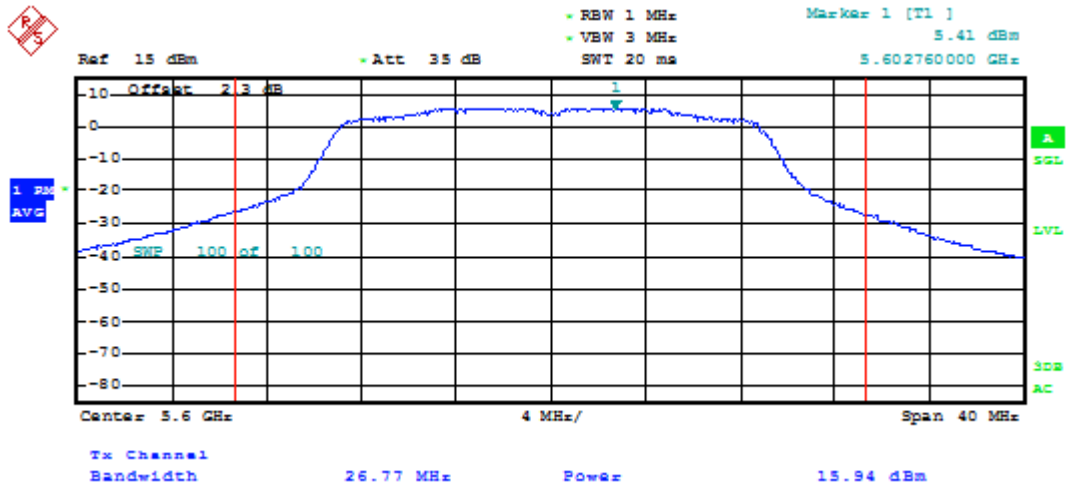


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) CHAIN B

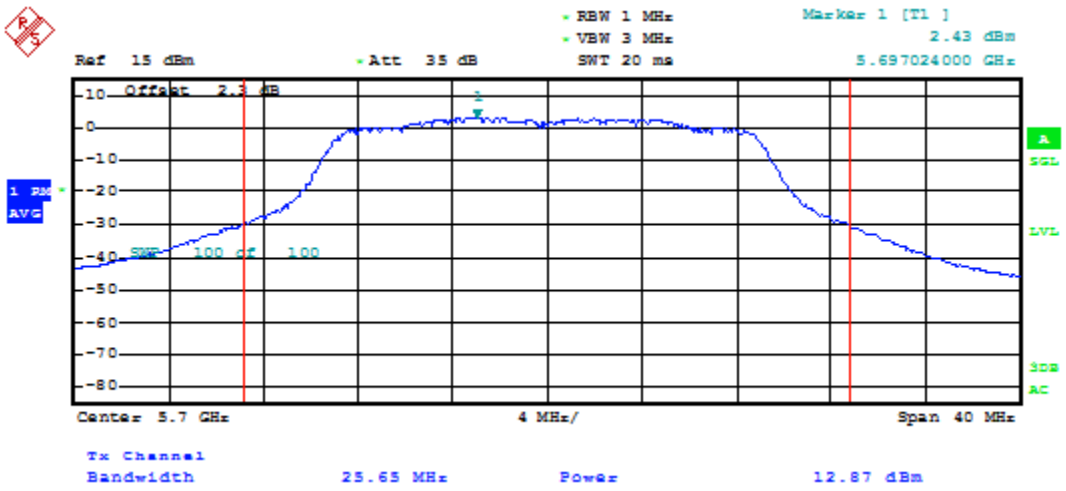
Lowest Channel



Middle Channel

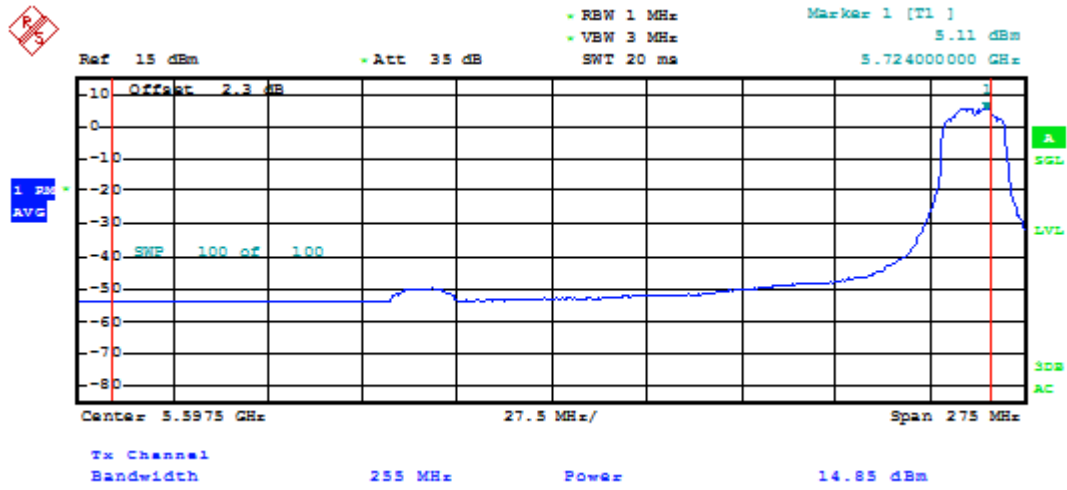


Highest Channel

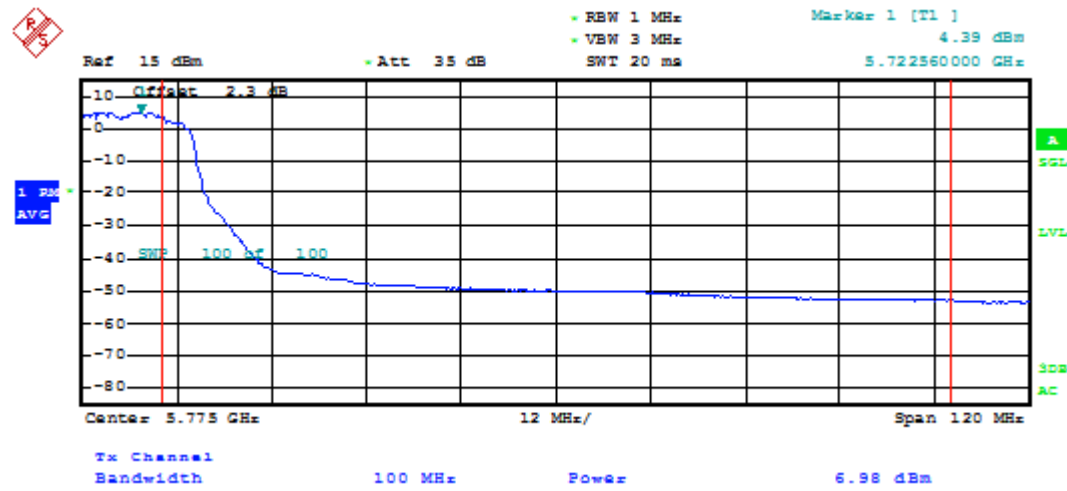


802.11 ac 20MHz : Channel 144

Power and PSD in sub-band UNII_2C :

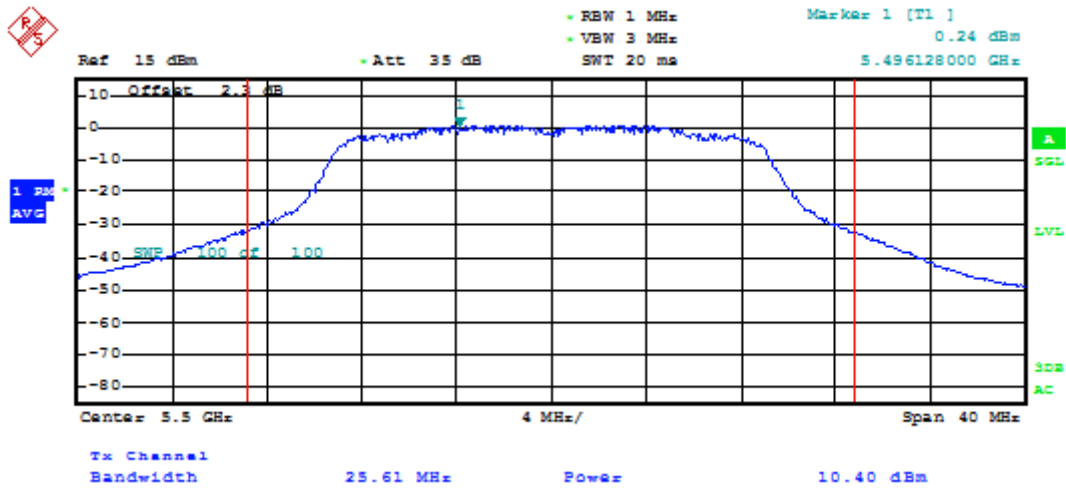


Power and PSD in sub-band UNII_3:

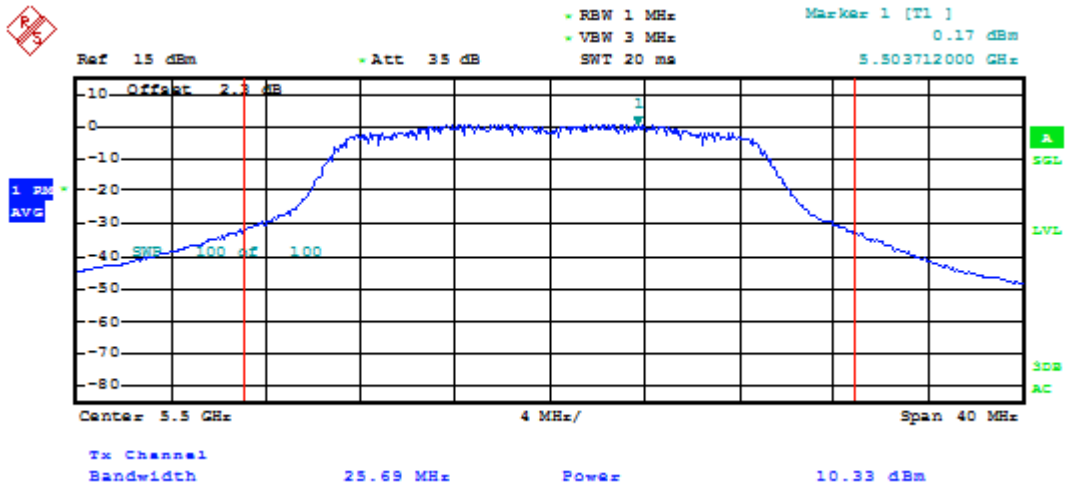


802.11 n20 MHz and 802.11 ac 20 MHz modes (except channel 144) MIMO CHAIN A+B

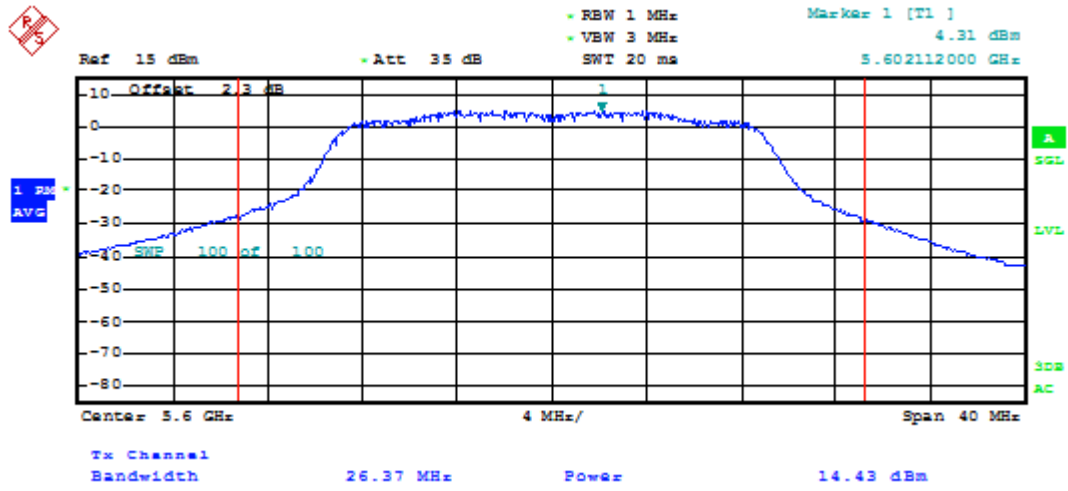
Lowest Channel. Chain A



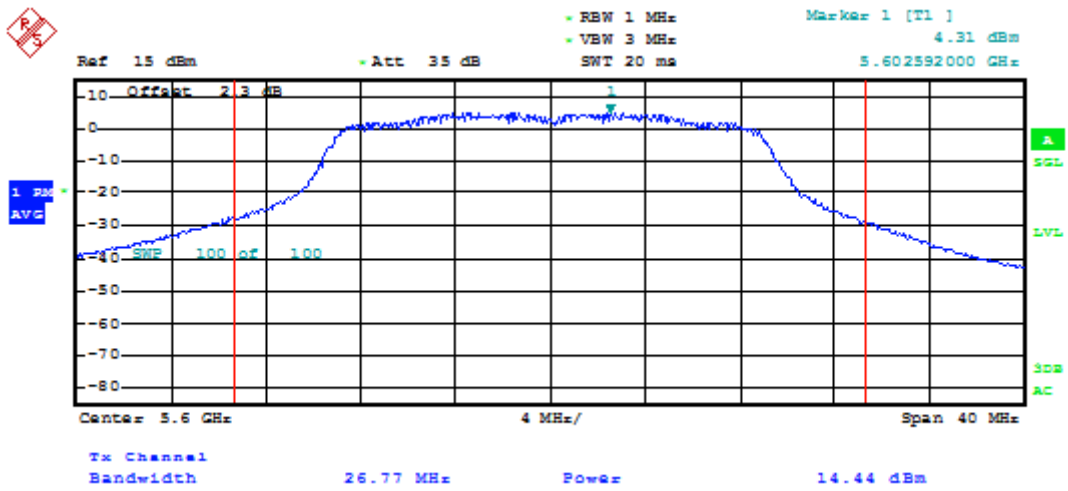
Lowest Channel. Chain B



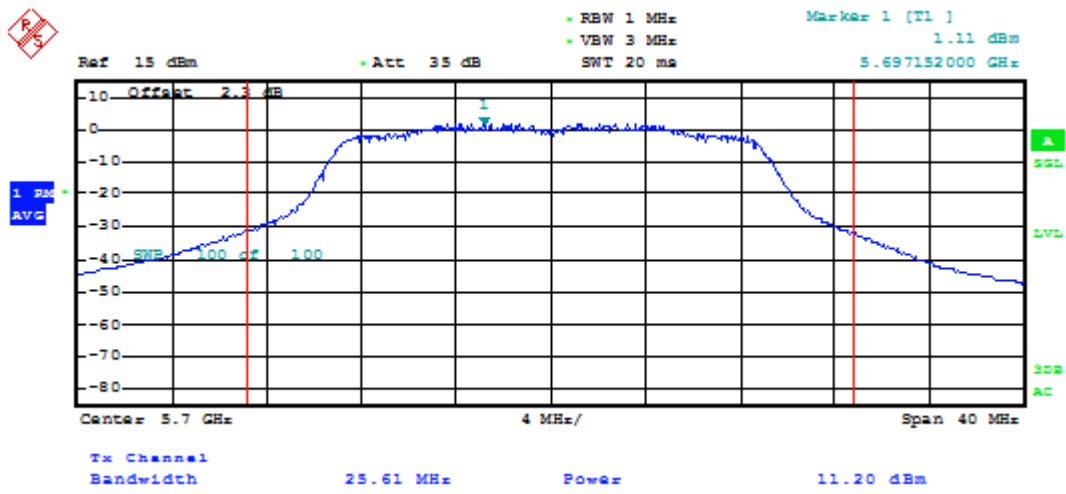
Middle Channel. Chain A



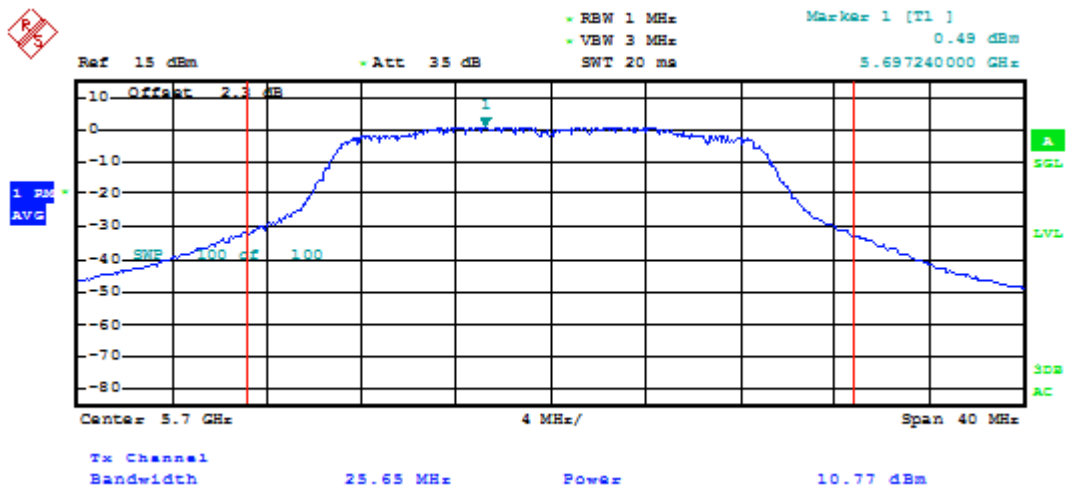
Middle Channel. Chain B



Highest Channel. Chain A

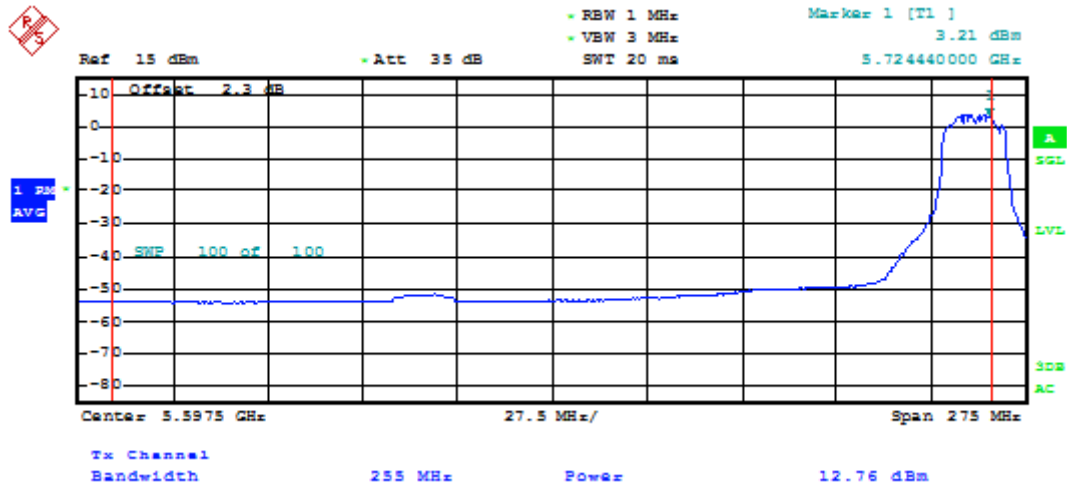


Highest Channel. Chain B

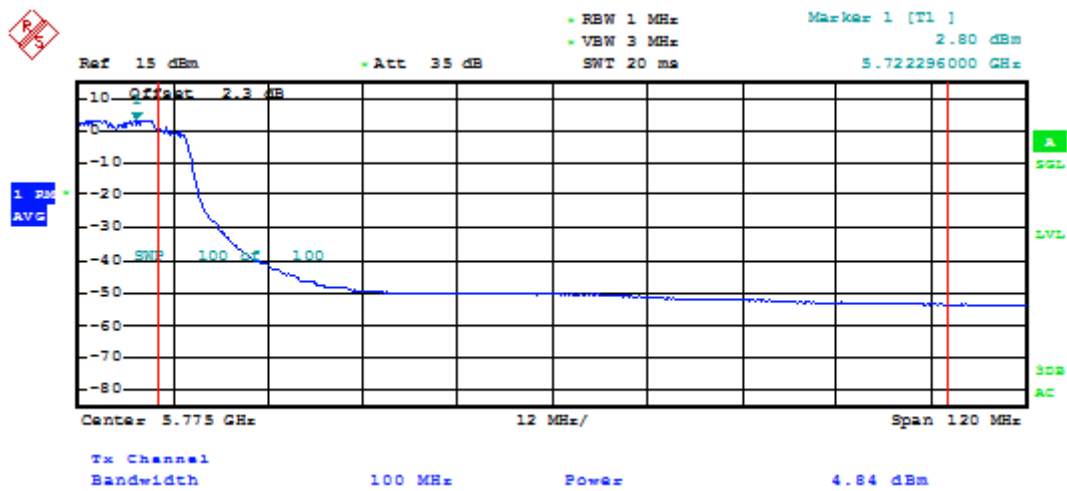


802.11 ac 20MHz : Channel 144

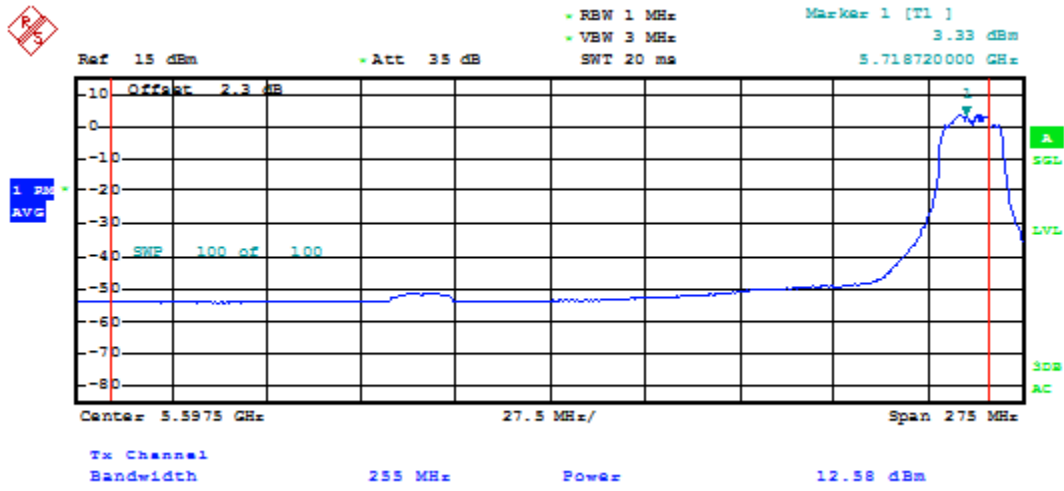
Power and PSD in sub-band UNII_2C: Chain A



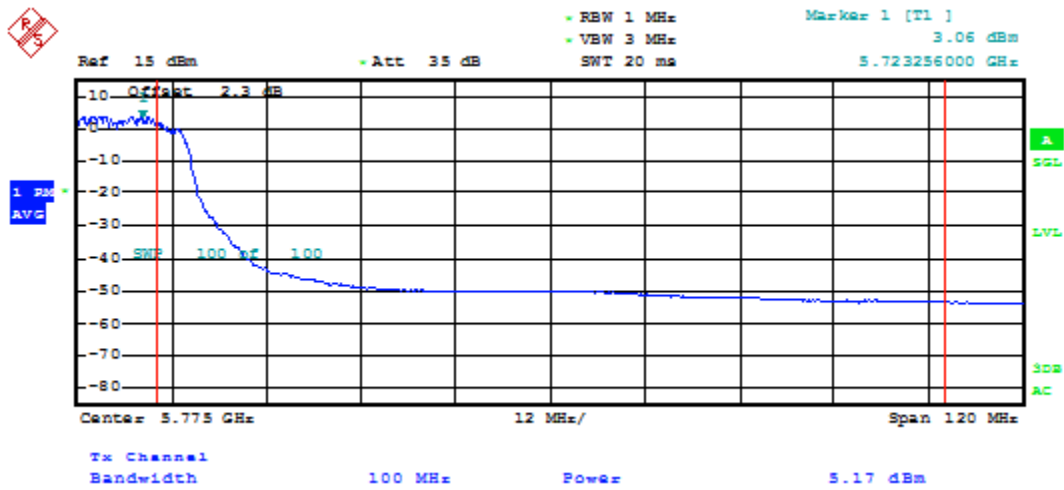
Power and PSD in sub-band UNII_3: Chain A



Power and PSD in sub-band UNII_2C: Chain B

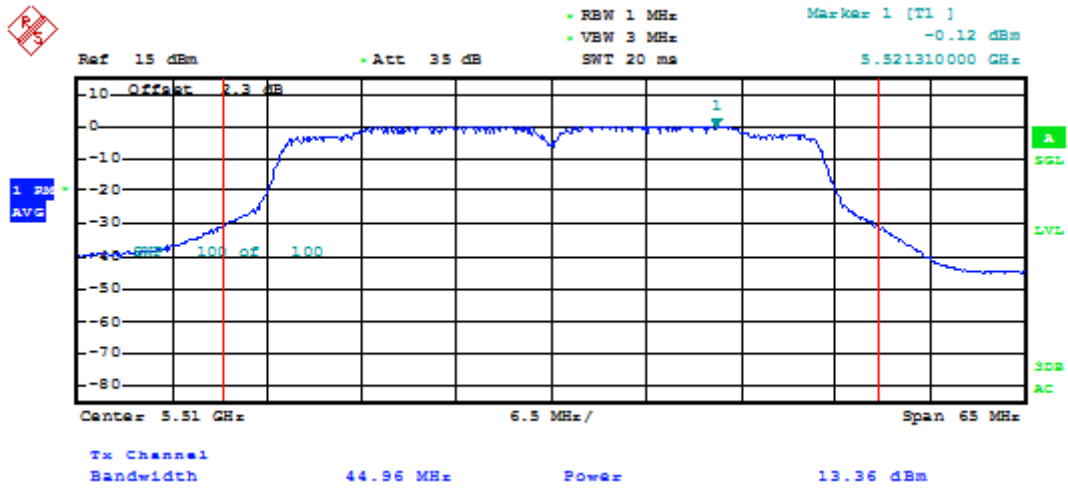


Power and PSD in sub-band UNII_3: Chain B

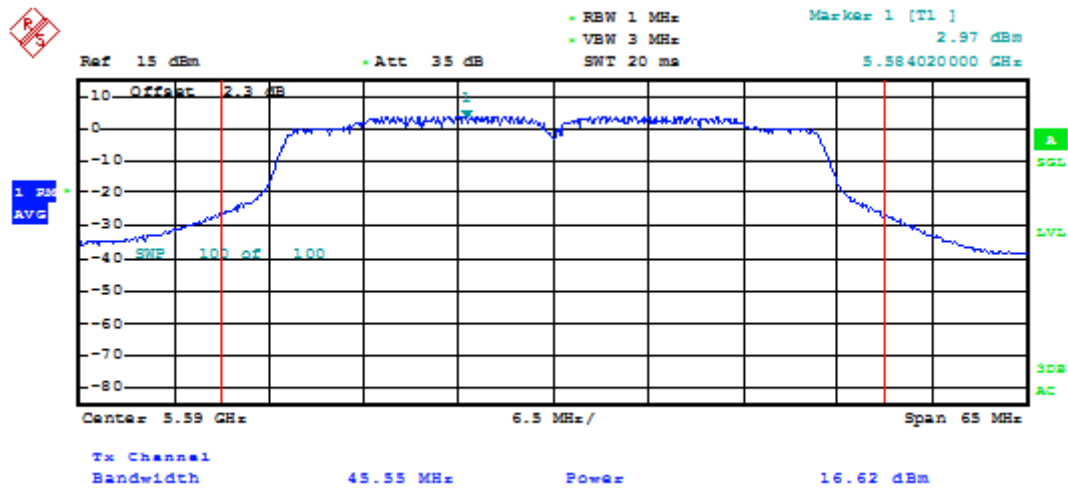


802.11 n40 MHz modes (except channel 142) CHAIN A

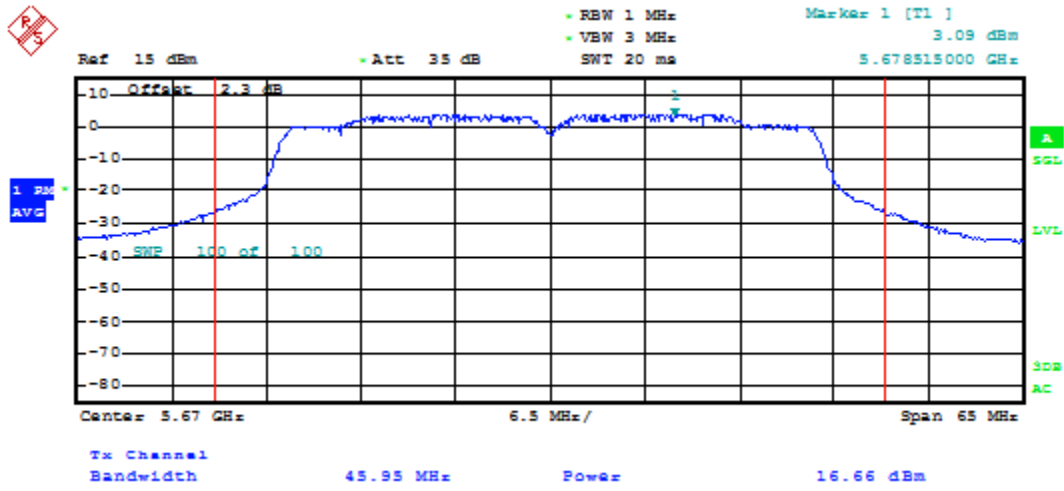
Lowest Channel



Middle Channel

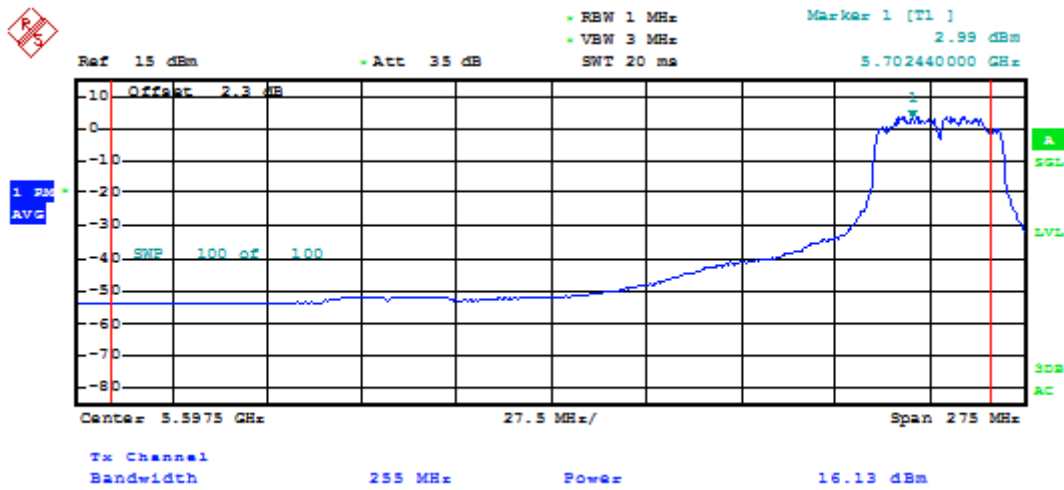


Highest Channel

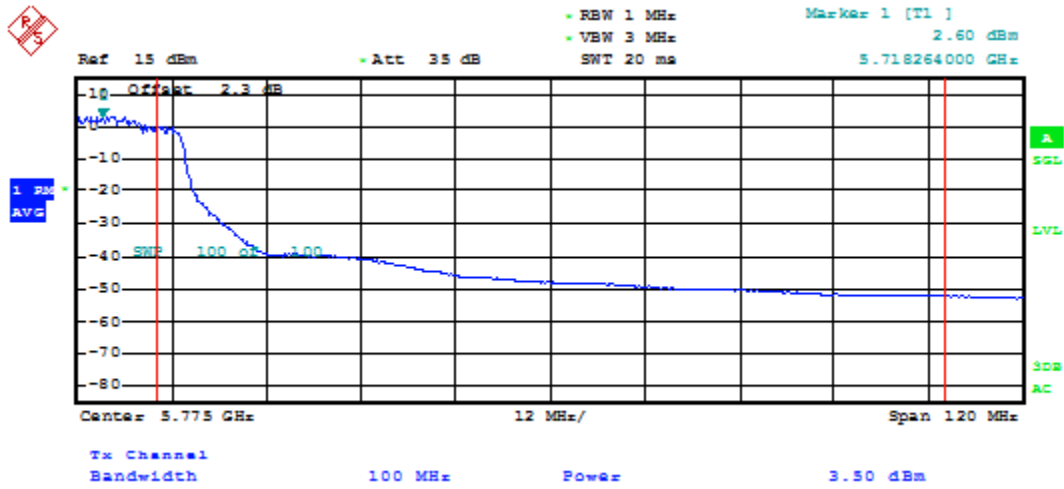


802.11 ac 40MHz : Channel 142

Power and PSD in sub-band UNII_2C:

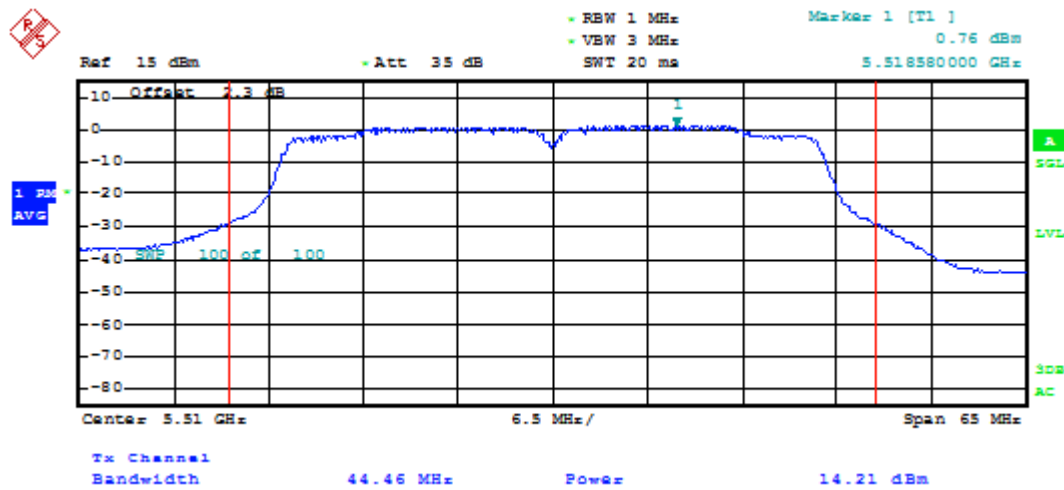


Power and PSD in sub-band UNII_3:

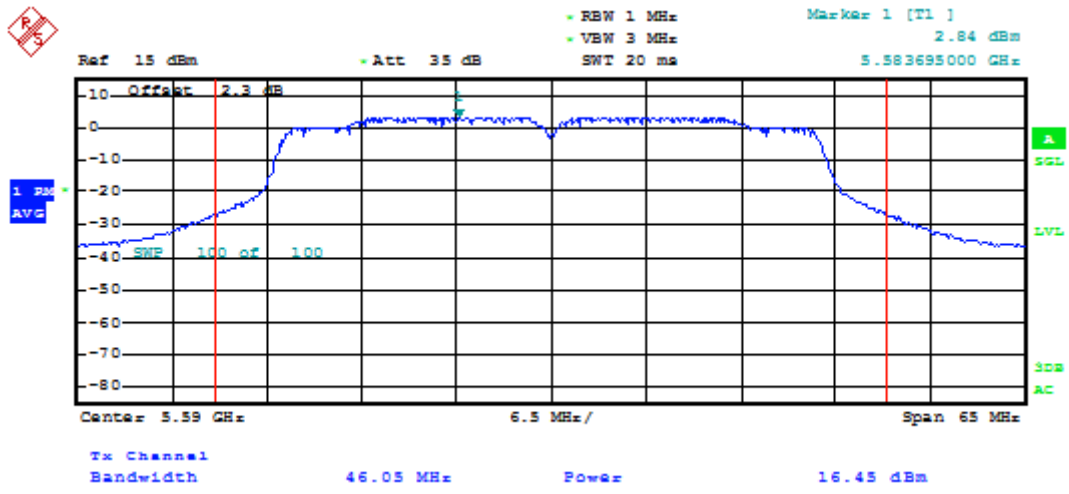


802.11 n40 MHz modes (except channel 142) CHAIN B

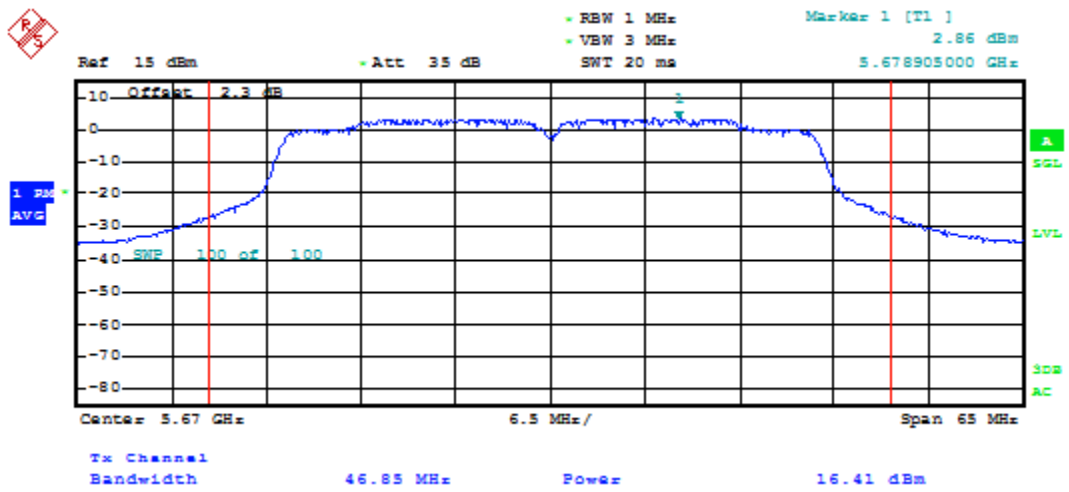
Lowest Channel



Middle Channel

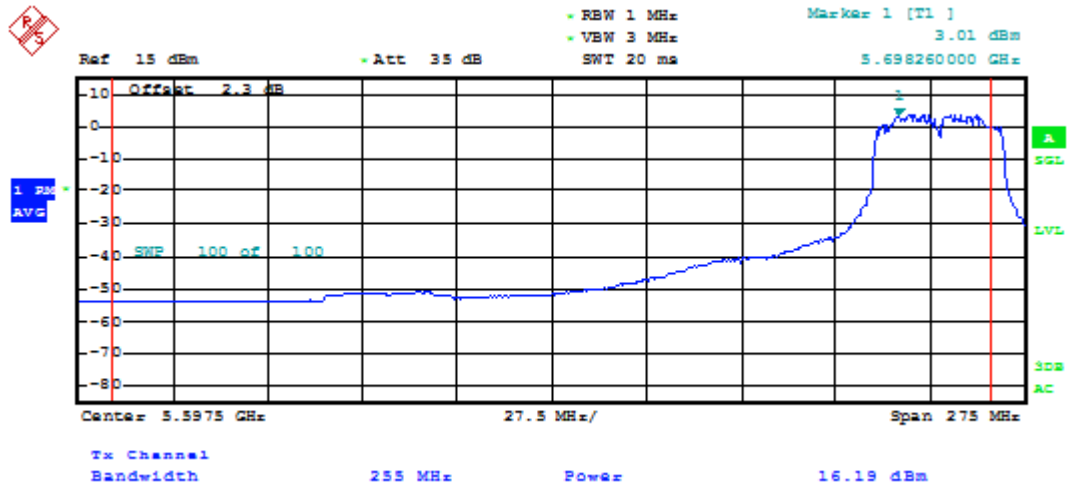


Highest Channel

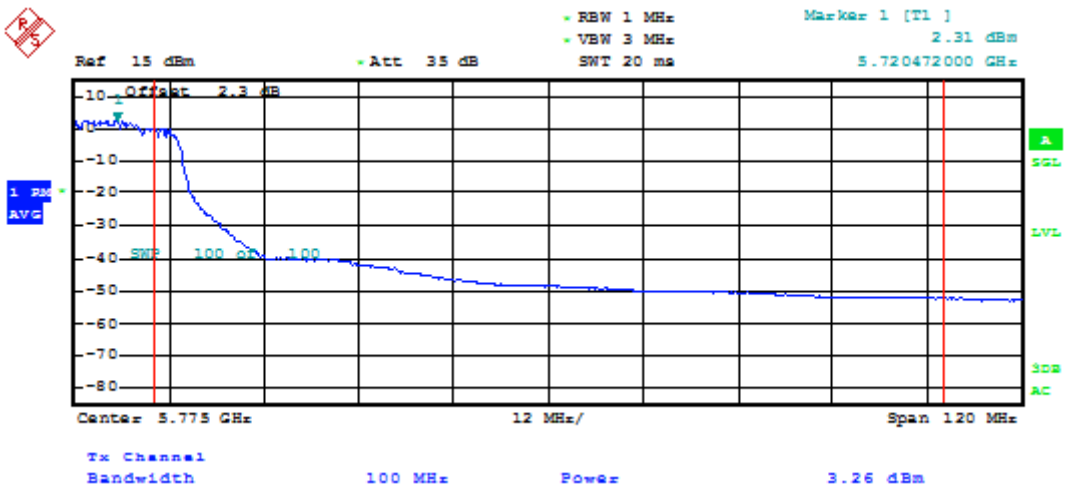


802.11 ac 40MHz : Channel 142

Power and PSD in sub-band UNII_2C:

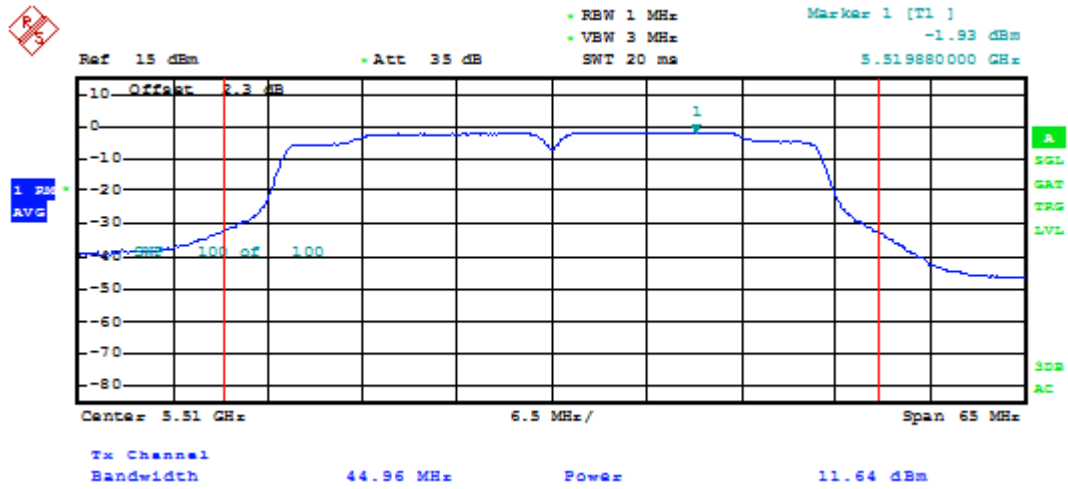


Power and PSD in sub-band UNII_3:

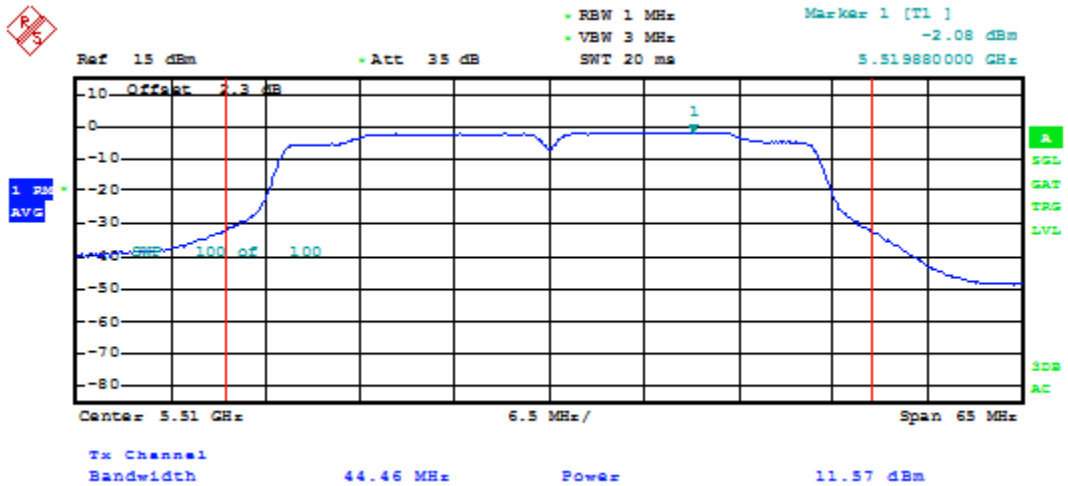


802.11 n40 MHz modes (except channel 142) CHAIN A+B

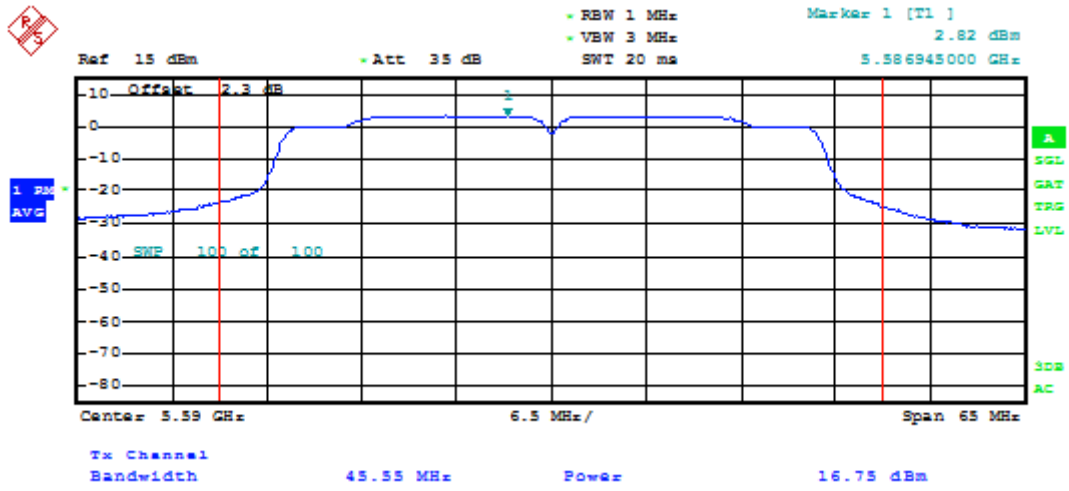
Lowest Channel. Chain A



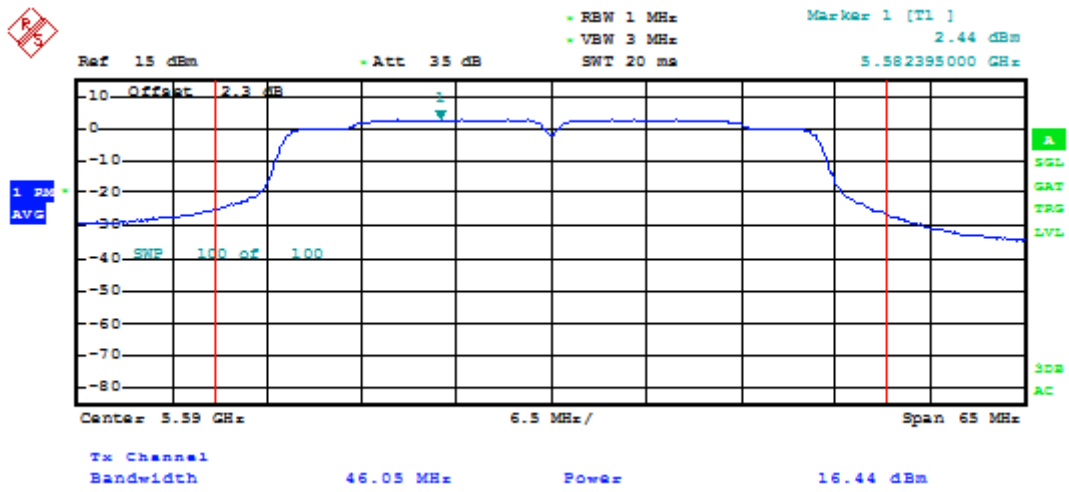
Lowest Channel. Chain B



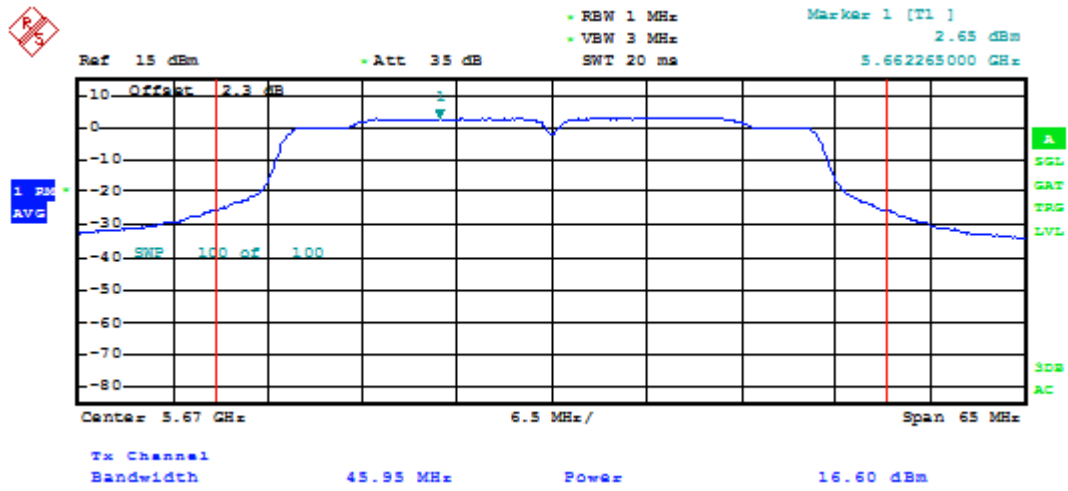
Middle Channel. Chain A



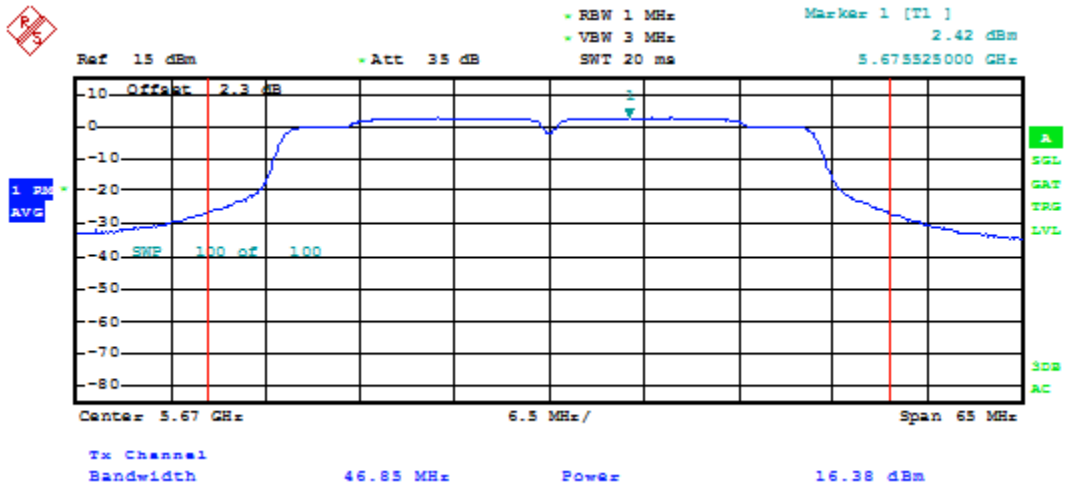
Middle Channel. Chain B



Highest Channel. Chain A

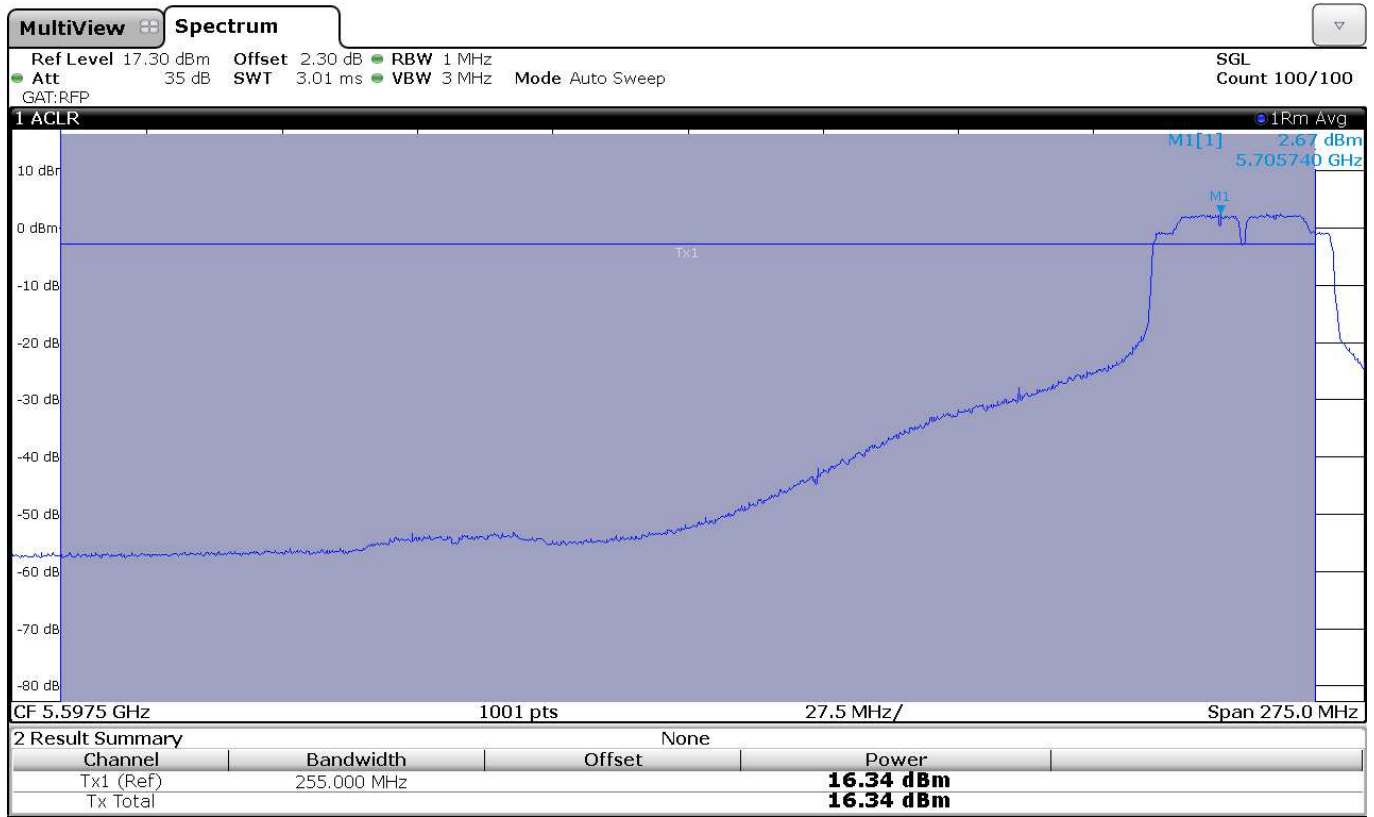


Highest Channel. Chain B

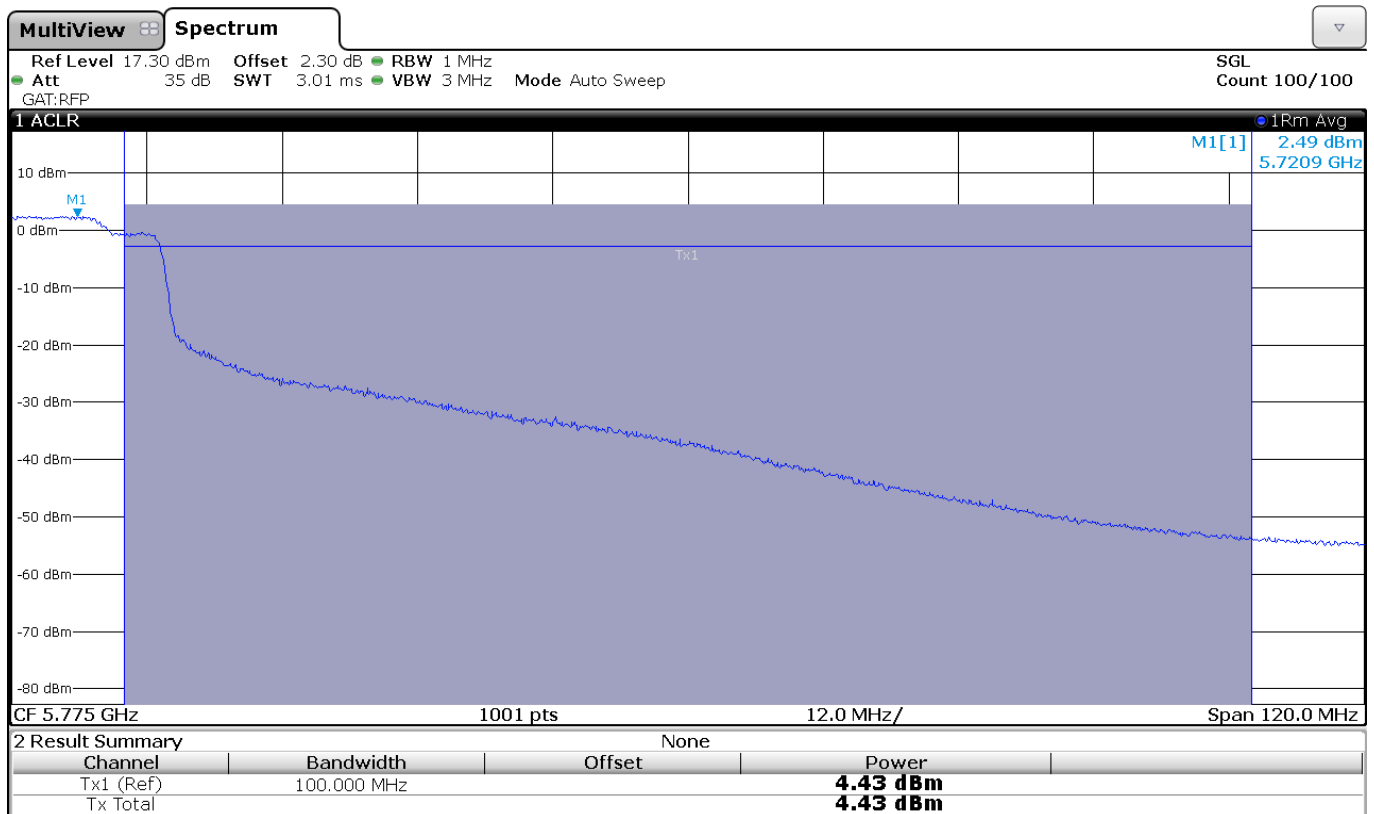


802.11 ac40MHz : Channel 142

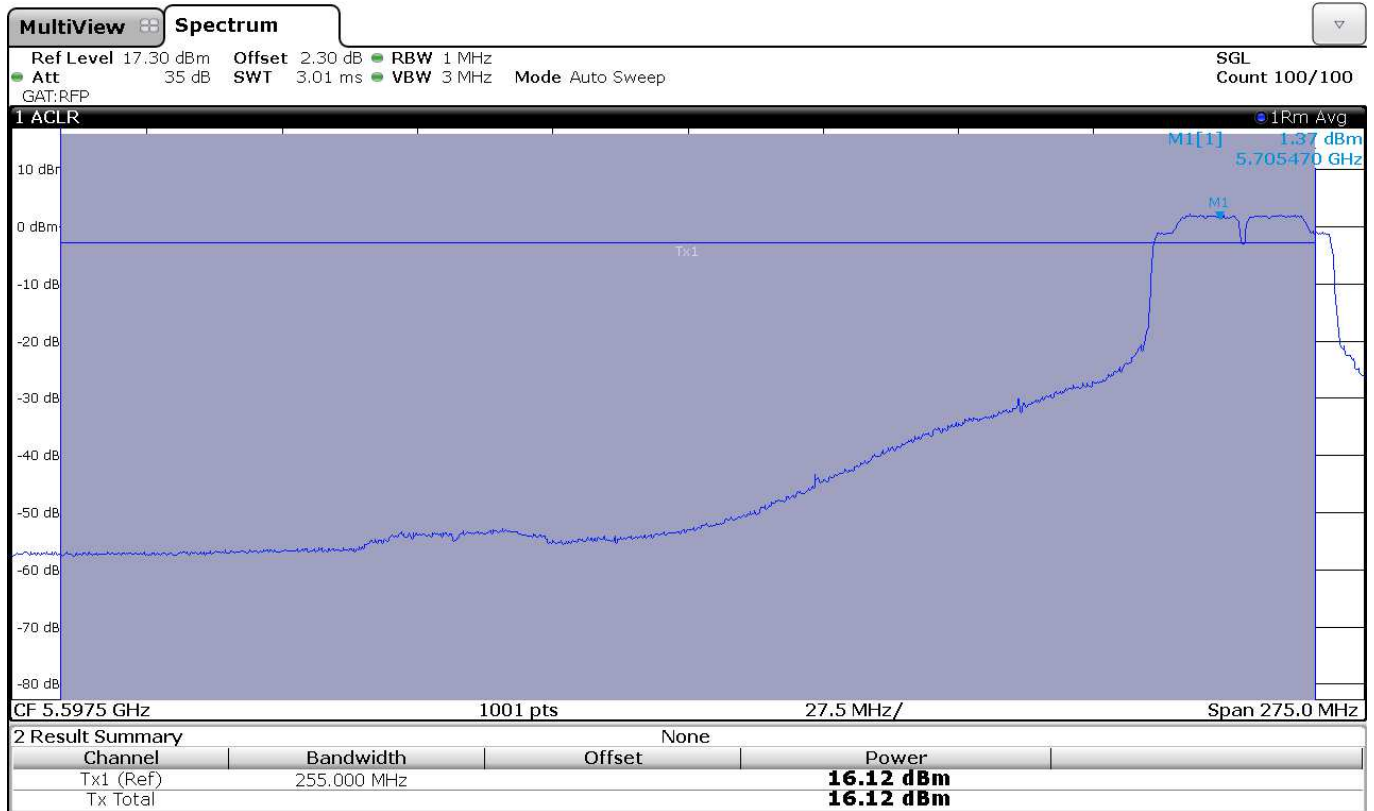
Power and PSD in sub-band UNII_2C: Chain A



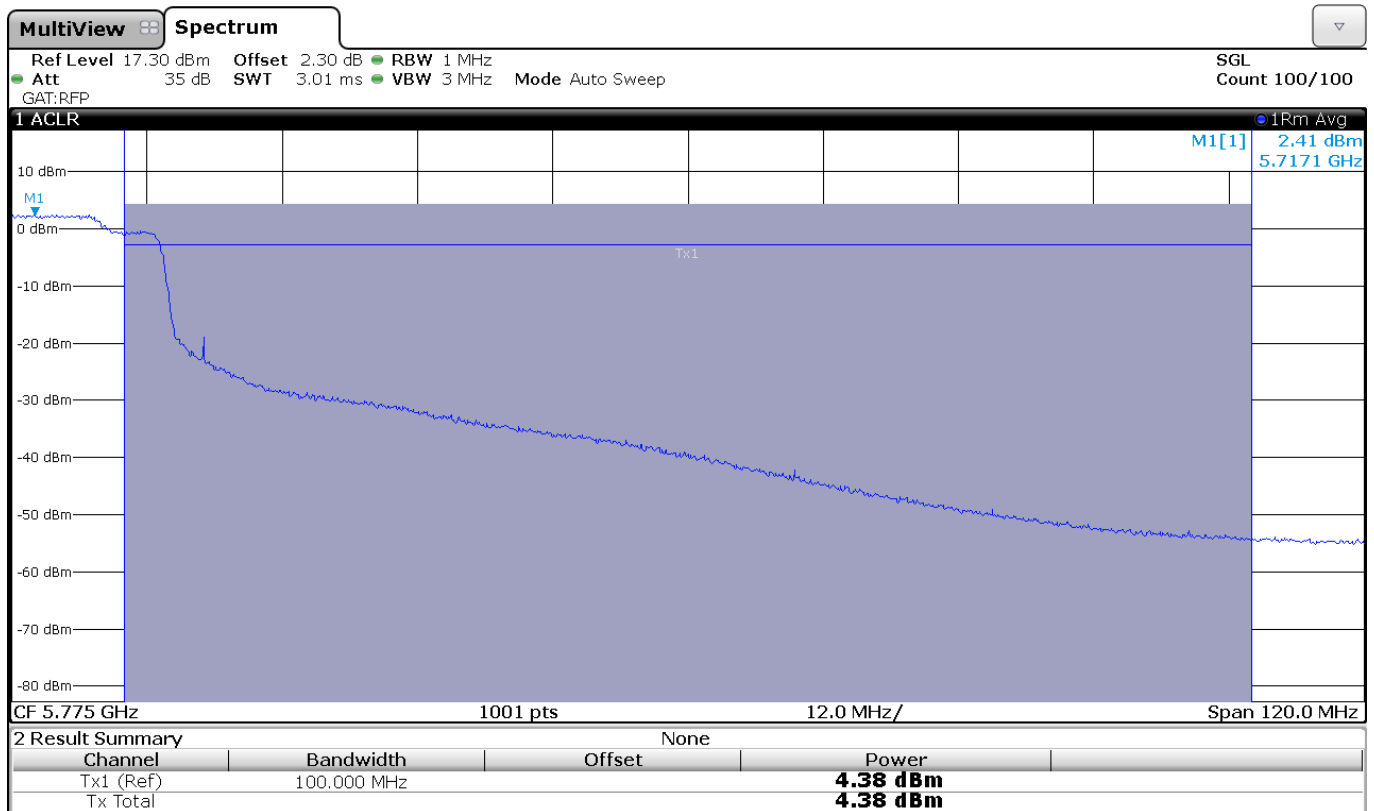
Power and PSD in sub-band UNII_3: Chain A



Power and PSD in sub-band UNII_2C: Chain B

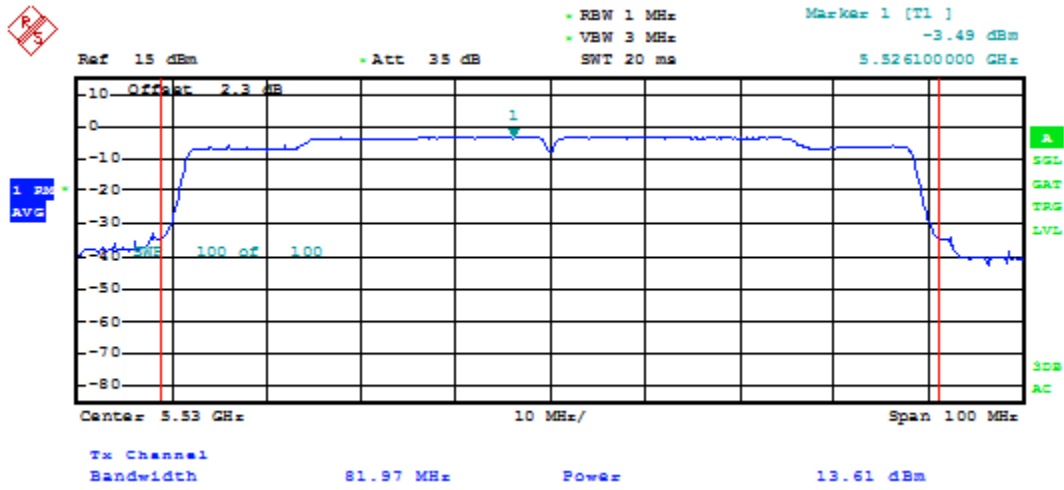


Power and PSD in sub-band UNII_3: Chain B

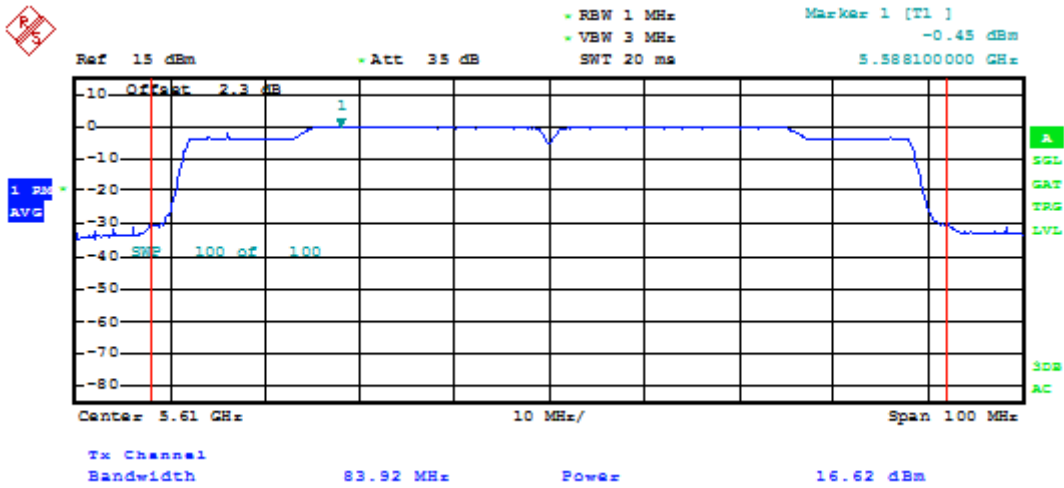


802.11 ac80 MHz modes (except channel 138) CHAIN A

Lowest Channel

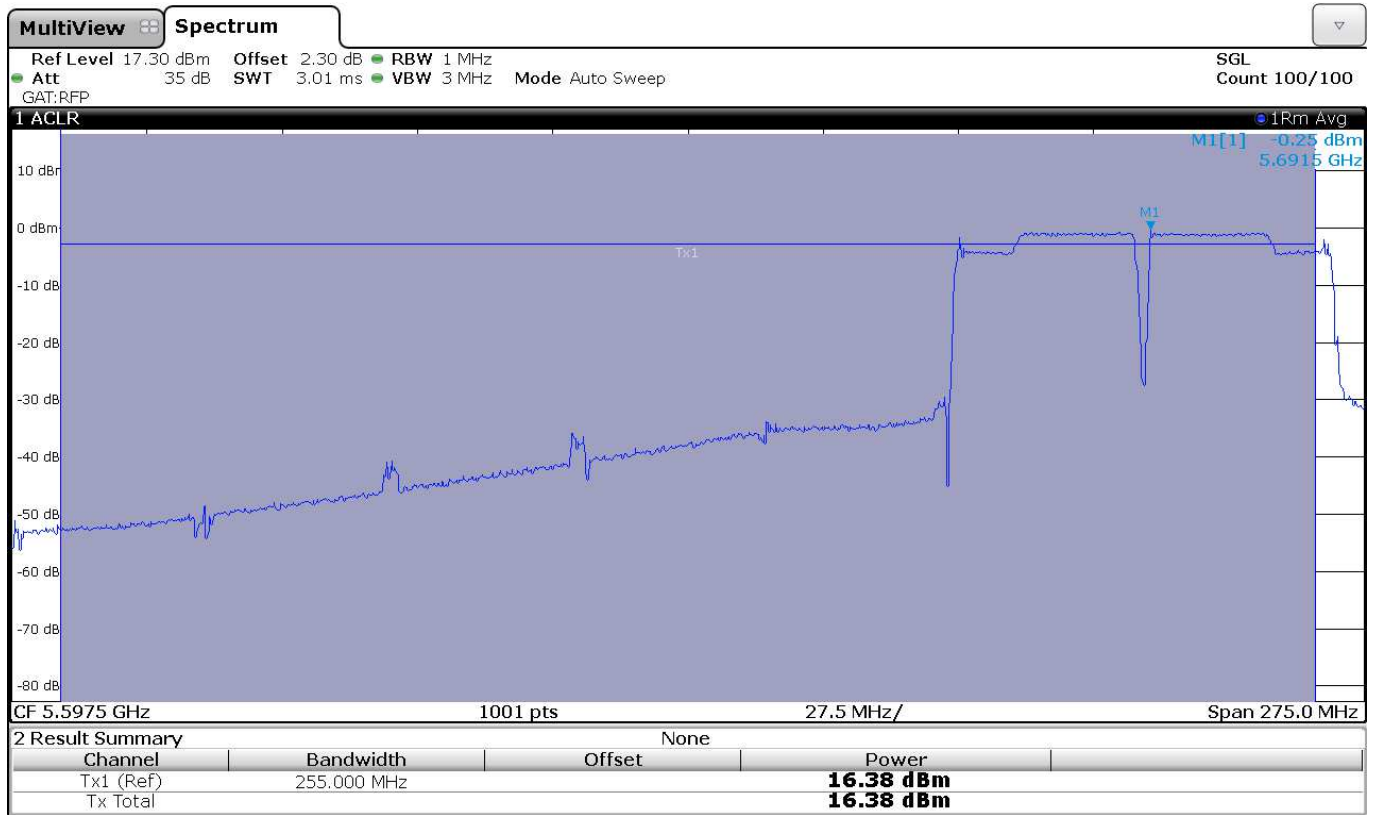


Middle Channel

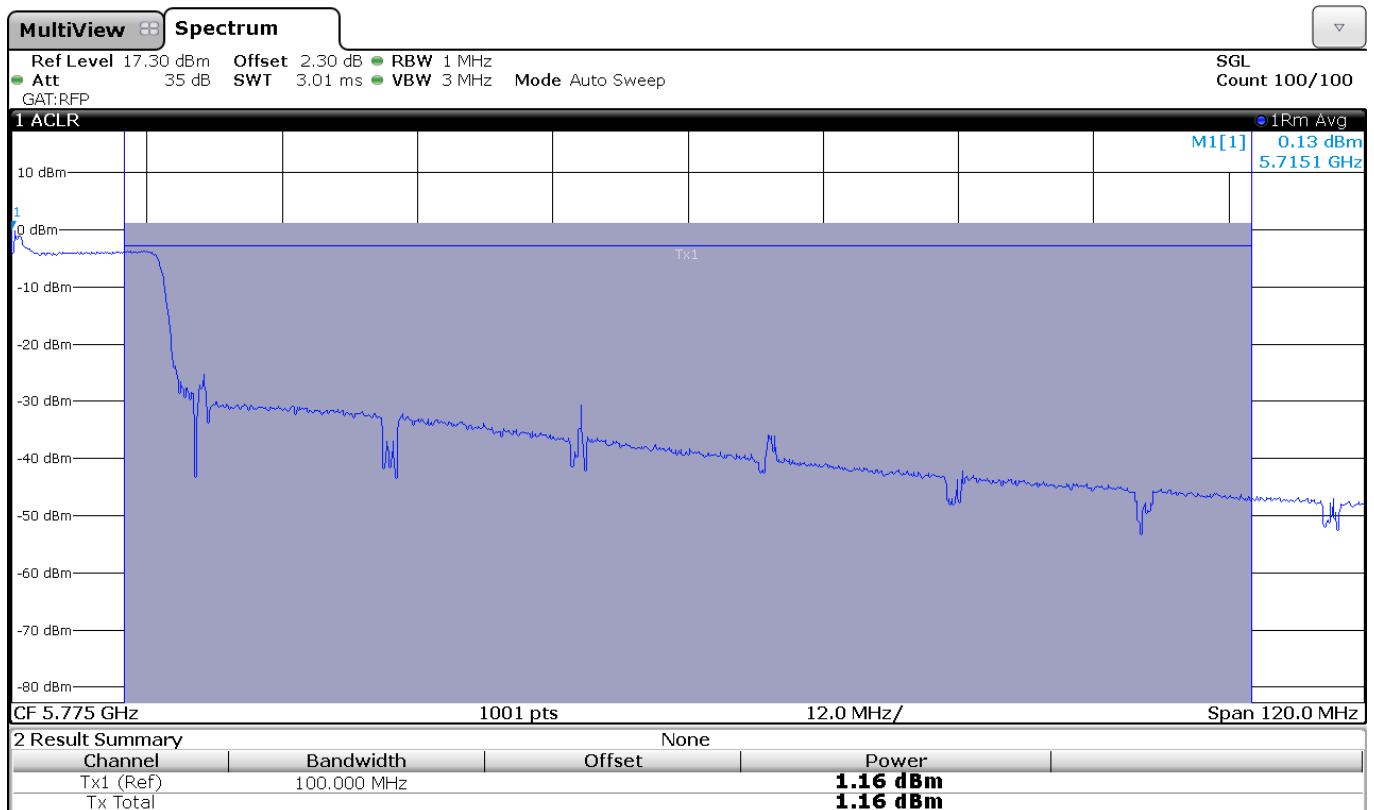


802.11 ac80MHz : Channel 138

Power and PSD in sub-band UNII_2C:

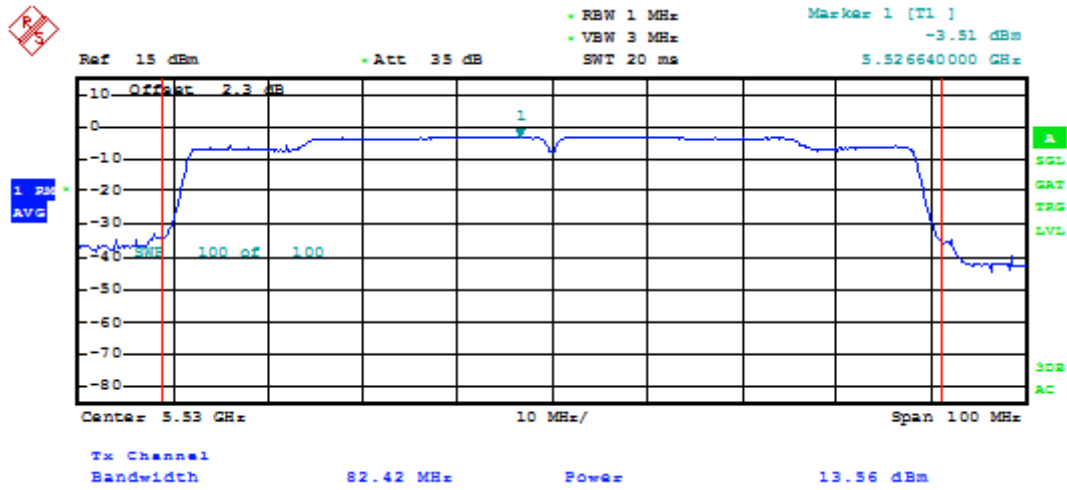


Power and PSD in sub-band UNII_3:

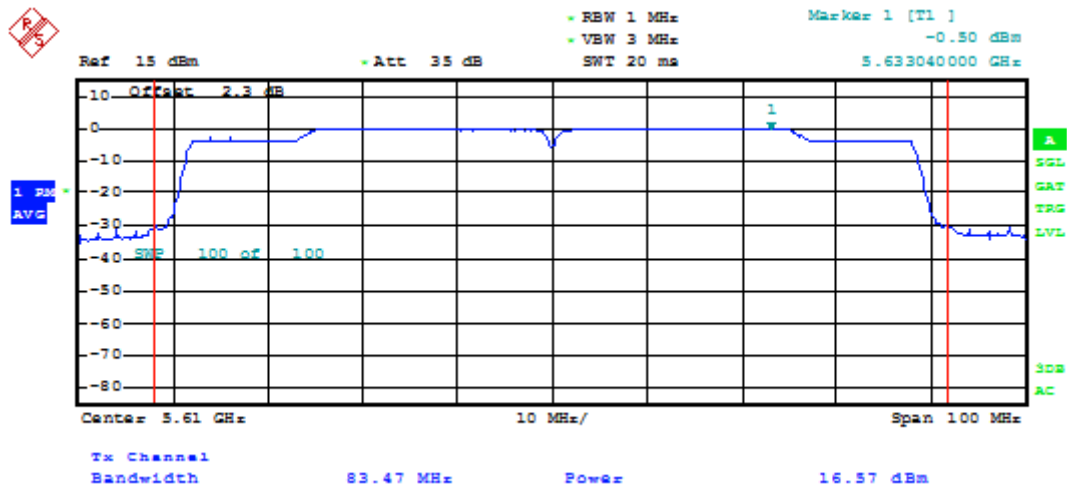


802.11 ac80 MHz modes (except channel 138) CHAIN B

Lowest Channel

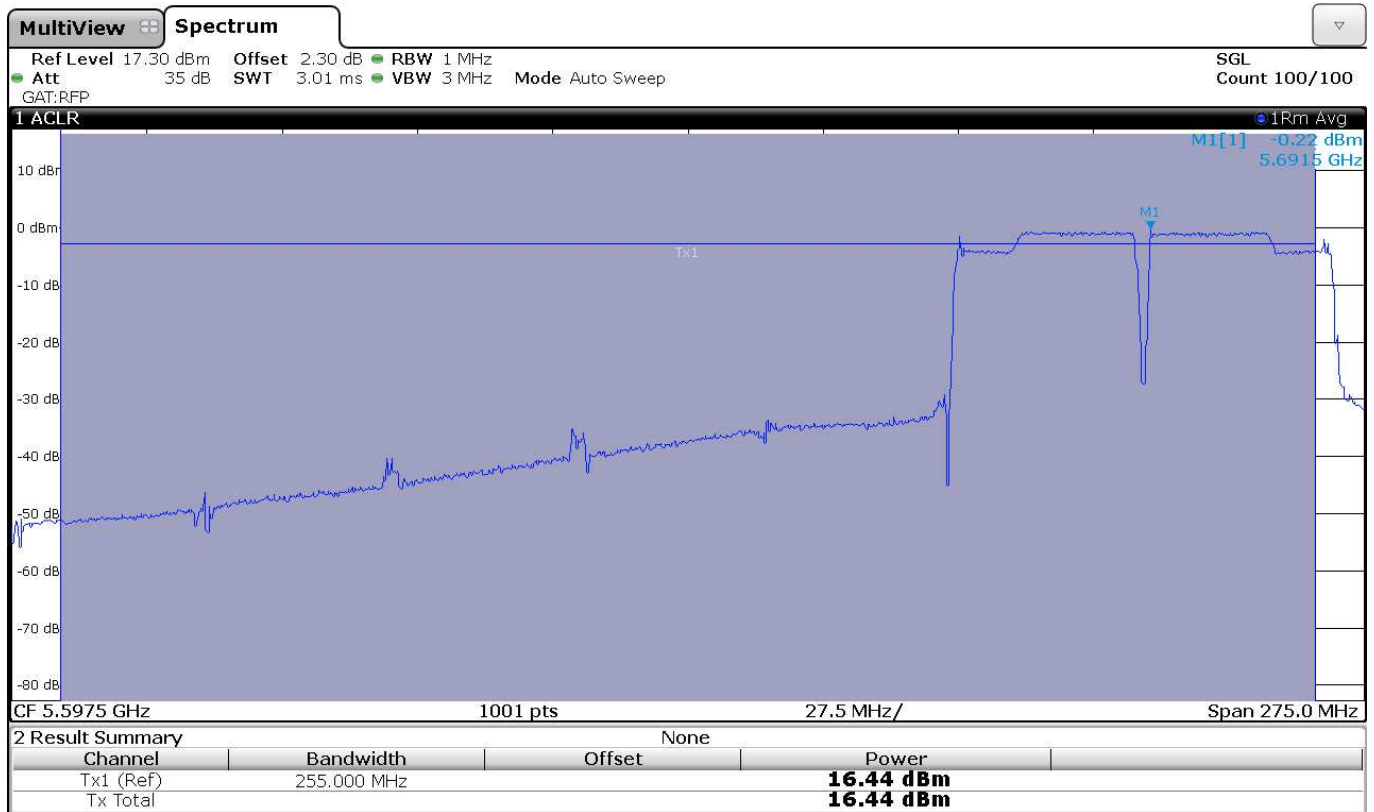


Middle Channel

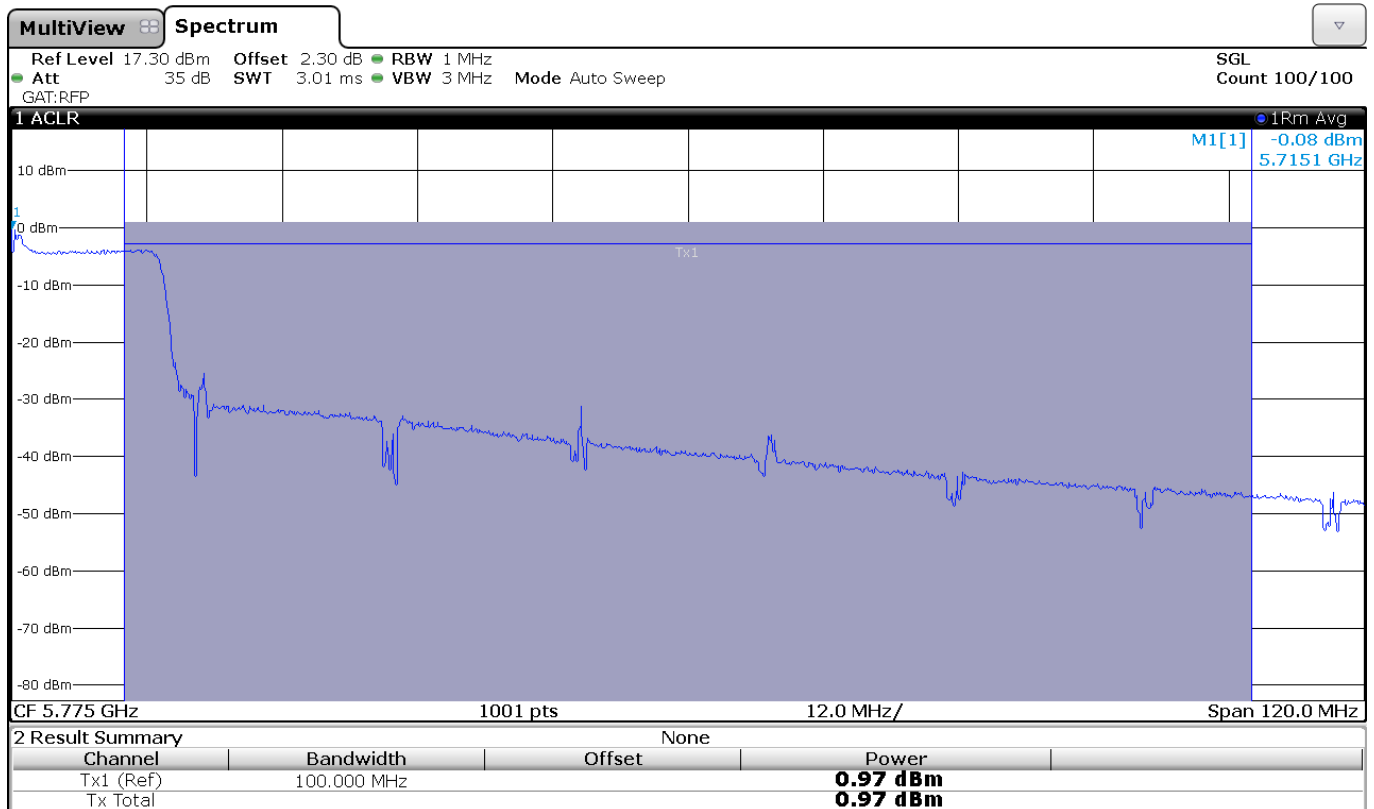


802.11 ac80MHz : Channel 138

Power and PSD in sub-band UNII_2C:

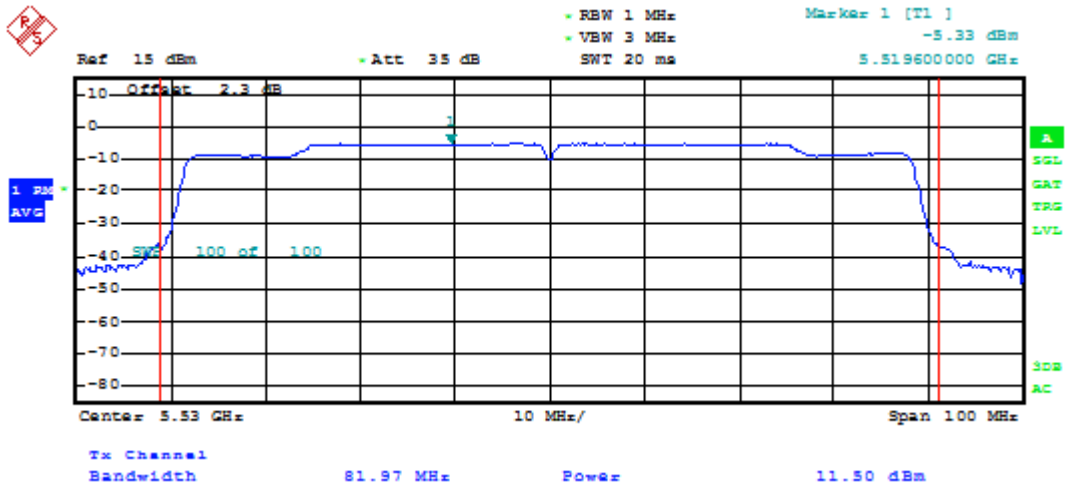


Power and PSD in sub-band UNII_3:

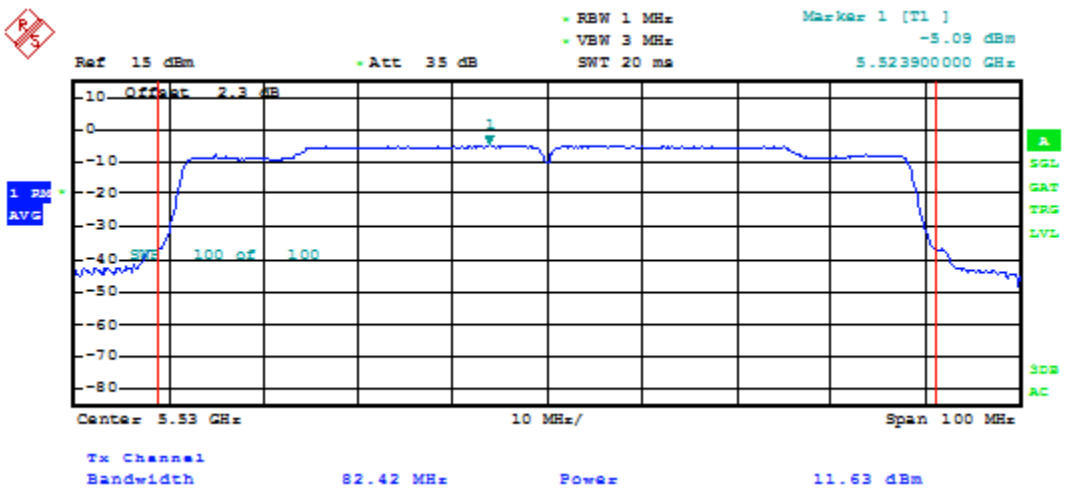


802.11 ac80 MHz modes (except channel 138) CHAIN A+B

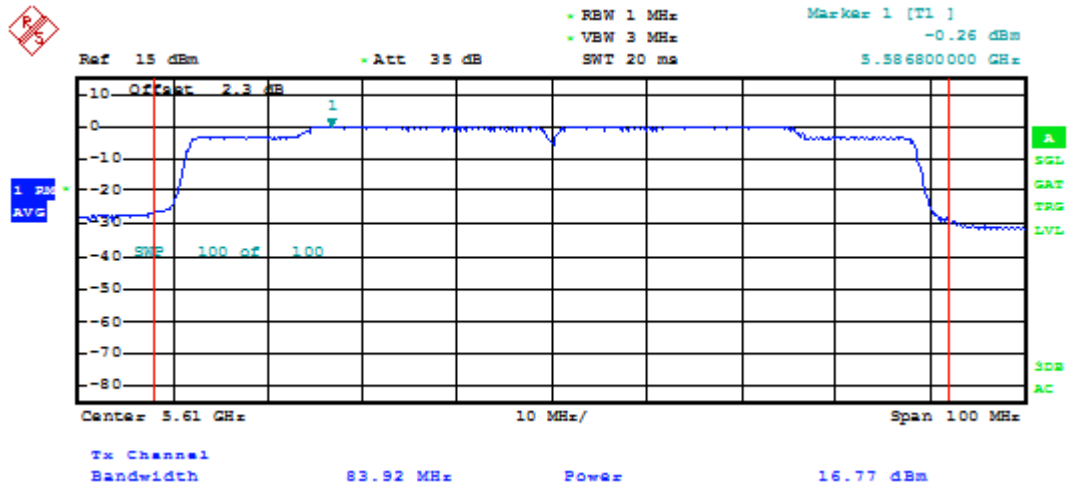
Lowest Channel. Chain A.



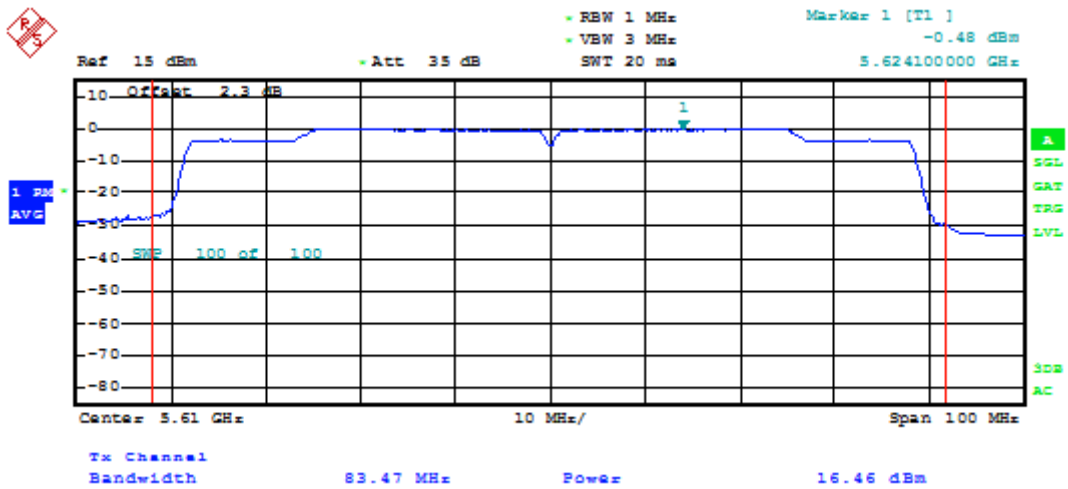
Lowest Channel. Chain B.



Middle Channel. Chain A.

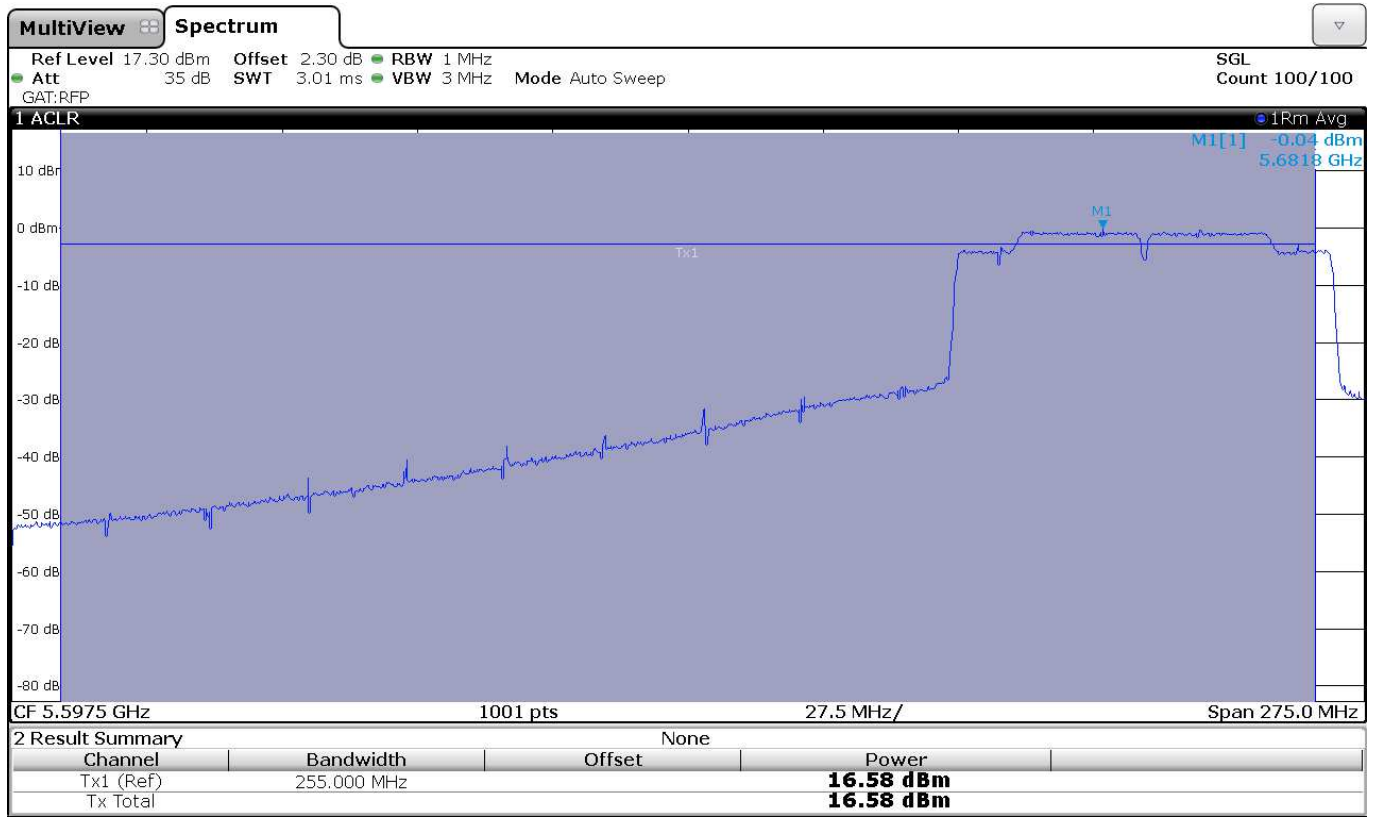


Middle Channel. Chain B.

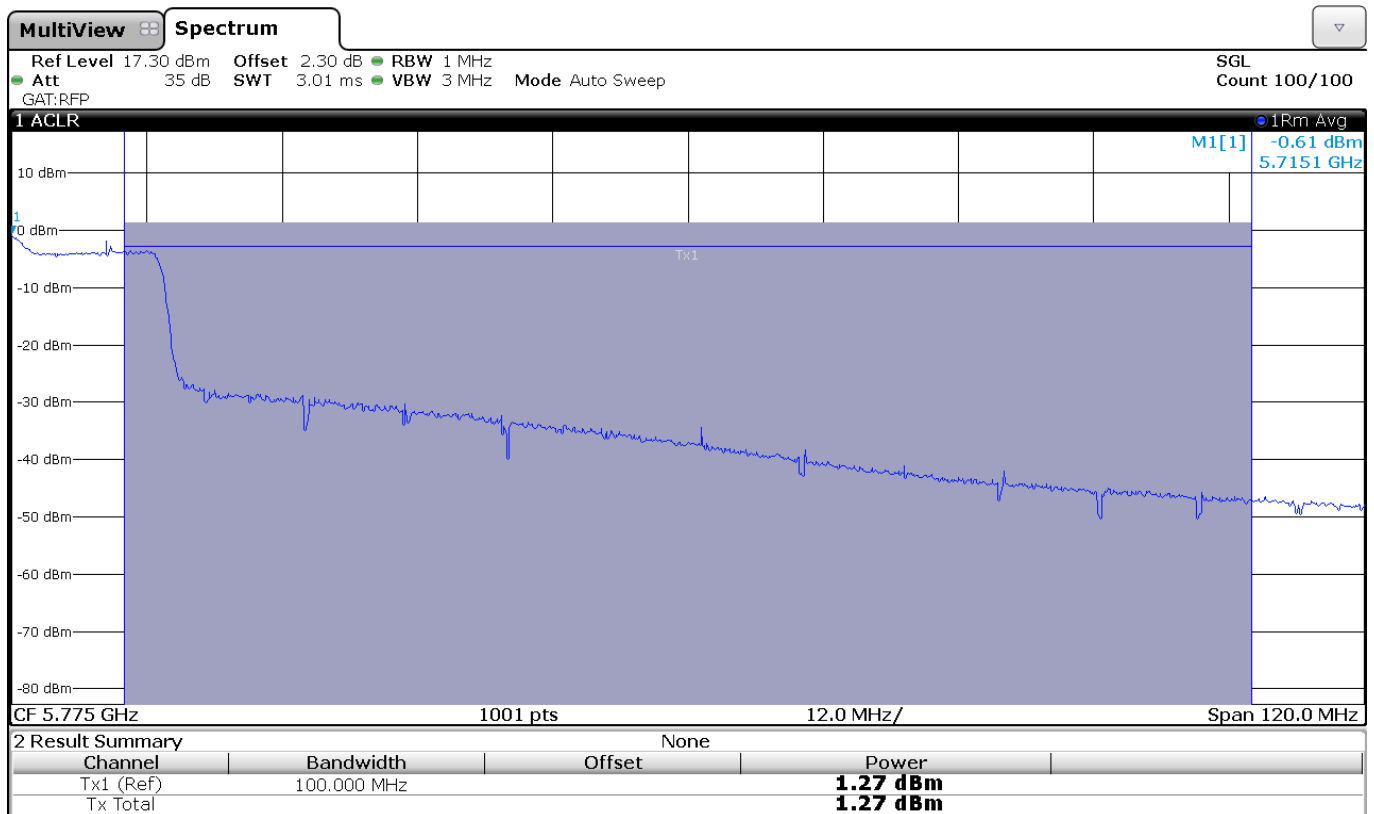


802.11 ac80MHz : Channel 138 CHAIN A+B

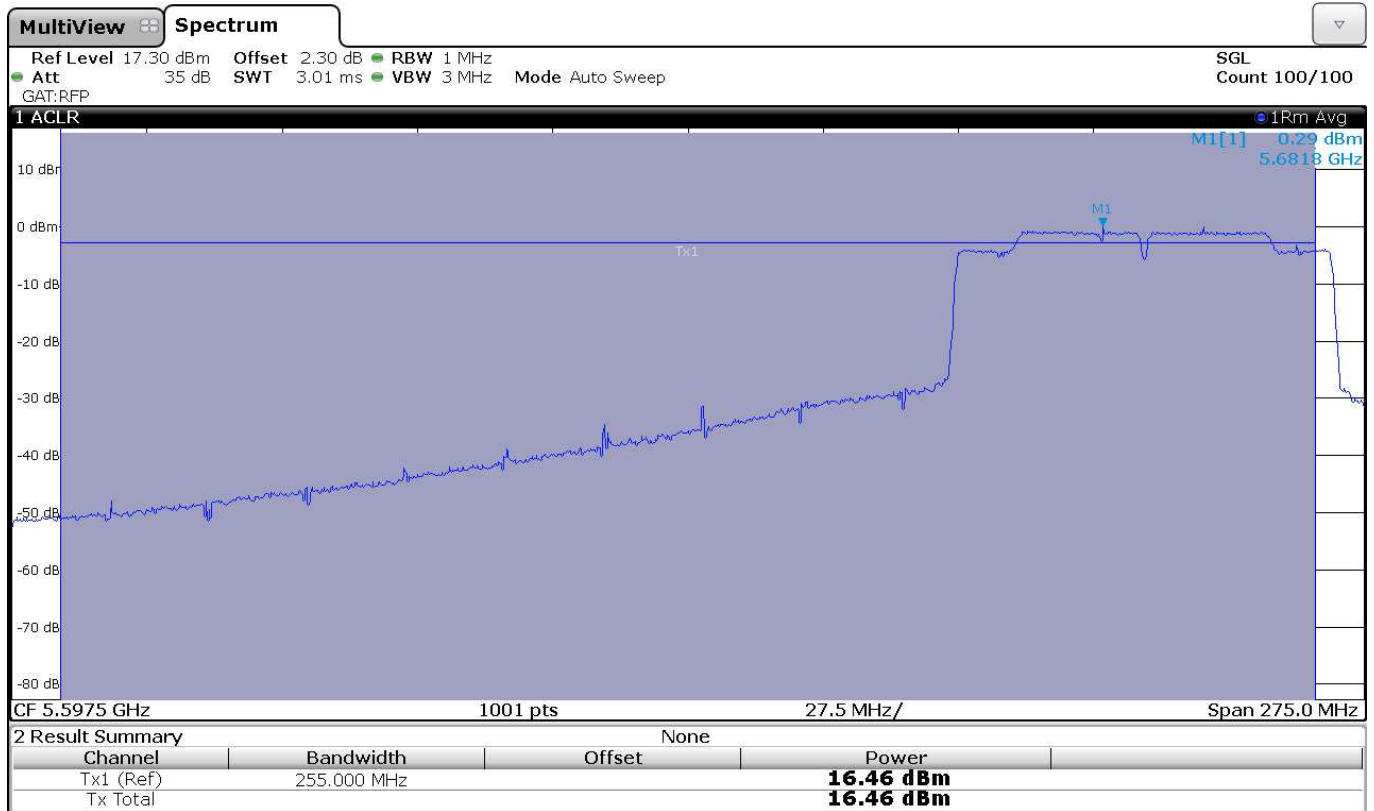
Power and PSD in sub-band UNII_2C: Chain A



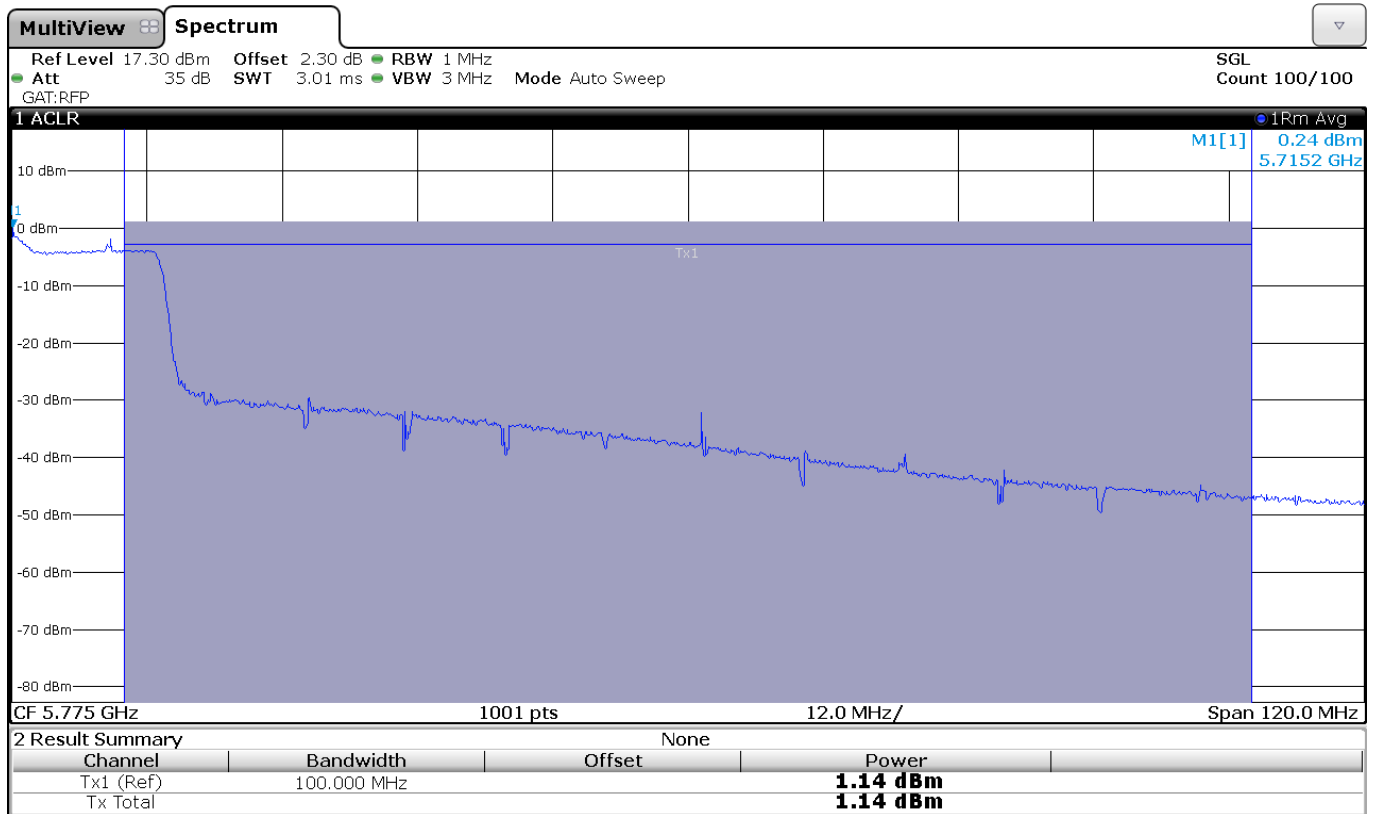
Power and PSD in sub-band UNII_3: Chain A



Power and PSD in sub-band UNII_2C: Chain B



Power and PSD in sub-band UNII_3: Chain B



Section 15.407 Subclause (b) (3) / RSS-210 A9.2. (3). Undesirable radiated emissions (Transmitter) 1 to 40 GHz

SPECIFICATION

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.23 dBμ V/m at 3 m distance).

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (μ V/m)	Field strength (dBμ V/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 40000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 1m for the frequency range 1 GHz-40 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

Frequency range 30 MHz-1 GHz

The spurious signals detected do not depend on either the operating channel or the modulation mode.

See test results in Appendix A for details.

Frequency range 1 GHz-40 GHz

The results in the next tables show the maximum measured levels in the 1-40 GHz range including the restricted band 5.35-5.46 GHz and adjacent bands 5.46-5.47 GHz and 5.725-5.825 GHz (see next plots).

For OFDM modulation modes (802.11a, 802.11n20, 802.11n40 and 802.11ac80), a preliminary measurement in the central channel in the range 1-18 GHz was performed to determine the worst case. The lowest channel was measured for out-of-band emissions for the worst case (802.11a). The highest channel was measured for out-of-band emissions for channel 144 (ac20 mode 5720 MHz) since the adjusted transmit power is higher than channel 140 (802.11a mode 5700 MHz) in both SISO and MIMO modes.

The field strength at the band edges was evaluated for each mode and on each chain individually on the lowest and highest channels at the rated power for the channel under test. Where the power at the edge channels was lower than the power at the center channels additional measurements were made at the adjacent channels. Single transmission at each chain and simultaneous transmission at both chains modes were fully evaluated.

Spurious signals with peak levels above the average limit (54 dB μ V/m at 3 m) are measured with an RMS average detector for checking compliance with the average limit.

1. WiFi 5GHz 802.11 a mode.

Lowest frequency (100) 5500 MHz. Out-of-band spurious in the 1-40 GHz range and inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.469838	V	Peak	56.11	± 4.00
		Average	43.66	± 4.00
16.49978	V	Peak	61.26	± 4.00
		Average	52.19	± 4.00
21.99987	V	Peak	46.23	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.419738	V	Peak	54.40	± 4.00
		Average	43.14	± 4.00
16.49942	V	Peak	60.92	± 4.00
		Average	51.99	± 4.00
21.99987	V	Peak	46.70	± 4.00

Middle frequency (120) 5600 MHz. Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
16.79825	V	Peak	64.87	± 4.00
		Average	53.85	± 4.00
22.39987	V	Peak	45.88	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
16.80008	V	Peak	64.02	± 4.00
		Average	53.13	± 4.00
22.40098	V	Peak	46.59	± 4.00

Highest frequency (140) 5700 MHz. Out-of-band spurious emissions in the 1-40 GHz range and inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.725325	V	Peak	57.53	± 4.00
		Average	44.68	± 4.00
17.10332	V	Peak	58.05	± 4.00
		Average	48.40	± 4.00
22.799984	V	Peak	47.59	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.725855	V	Peak	57.39	± 4.00
		Average	44.39	± 4.00
17.09818	V	Peak	56.90	± 4.00
		Average	48.14	± 4.00
22.799884	V	Peak	46.41	± 4.00

Channel 104 (5520 MHz): Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.458090	V	Peak	54.73	± 4.00
		Average	43.49	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.462434	V	Peak	55.08	± 4.00
		Average	43.69	± 4.00

Channel 136 (5680 MHz). Spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.803515	V	Peak	55.48	± 4.00
		Average	43.10	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.726475	V	Peak	55.32	± 4.00
		Average	44.33	± 4.00

Verdict: PASS

2. WiFi 5GHz 802.11 n20 mode

Lowest frequency (100) 5500 MHz. Spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46855	V	Peak	55.96	± 4.00
		Average	44.15	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46866	V	Peak	55.99	± 4.00
		Average	43.96	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.43317	V	Peak	54.29	± 4.00
		Average	43.24	± 4.00

Middle frequency (120) 5600MHz. Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.80008	V	Peak	64.73	± 4.00
		Average	53.72	± 4.00
22.39987	V	Peak	46.93	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.80045	V	Peak	63.56	± 4.00
		Average	53.70	± 4.00
22.40013	V	Peak	46.36	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
16.80375	V	Peak	63.29	± 4.00
		Average	53.93	± 4.00
22.399949	V	Peak	48.72	± 4.00

Highest frequency (140) 5700 MHz. Spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
5.72518	V	Peak	56.78	± 4.00
		Average	44.82	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
5.72628	V	Peak	56.89	± 4.00
		Average	44.66	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
5.72565	V	Peak	56.22	± 4.00
		Average	44.02	± 4.00

Channel 104 (5520 MHz): Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
5.46270	V	Peak	54.79	± 4.00
		Average	43.90	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46546	V	Peak	54.70	± 4.00
		Average	43.86	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46855	V	Peak	54.76	± 4.00
		Average	43.91	± 4.00

Channel 136 (5680 MHz). Out-of-band spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.72573	V	Peak	55.24	± 4.00
		Average	43.84	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.72818	V	Peak	55.27	± 4.00
		Average	44.45	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.72668	V	Peak	55.78	± 4.00
		Average	44.83	± 4.00

802.11 ac 20MHz:

Channel 144 (5720 MHz). Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.16418	V	Peak	62.32	± 4.00
		Average	53.03	± 4.00
22.87992	V	Peak	47.08	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.16125	V	Peak	58.44	± 4.00
		Average	49.80	± 4.00
22.87987	V	Peak	46.32	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
17.16345	V	Peak	58.34	± 4.09
		Average	49.05	± 4.09
22.879828	V	Peak	46.43	± 4.09

Verdict: PASS

3. WiFi 5GHz 802.11 n40 mode

Lowest frequency (102) 5510MHz. Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band. Highest levels in bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.46590	V	Peak	59.95	± 4.00
		Average	48.42	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46915	V	Peak	64.70	± 4.00
		Average	50.71	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46919	V	Peak	62.31	± 4.00
		Average	49.56	± 4.00

Middle frequency (118) 5590 MHz. Out-of-band spurious emissions in the 1-40 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.77258	V	Peak	62.15	± 4.00
		Average	51.86	± 4.00
22.359855	V	Peak	47.57	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.76928	V	Peak	61.29	± 4.00
		Average	52.33	± 4.00
22.36013	V	Peak	46.32	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
16.77772	V	Peak	64.13	± 4.00
		Average	53.39	± 4.00
22.359938	V	Peak	47.75	± 4.00

Highest frequency (134) 5670MHz. Out-of-band spurious emissions inside adjacent band 5.725-5.825 GHz.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.72529	V	Peak	55.13	± 4.00
		Average	44.88	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.72666	V	Peak	56.25	± 4.00
		Average	44.96	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.72759	V	Peak	66.75	± 4.00
		Average	55.51	± 4.00

Channel 110 (5550 MHz). 5510MHz. Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band. Highest spurious levels in bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46998	V	Peak	56.26	± 4.00
		Average	44.60	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46987	V	Peak	55.83	± 4.00
		Average	45.32	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
5.46907	V	Peak	61.42	± 4.00
		Average	49.20	± 4.00

802.11 ac 40MHz:

Channel 142 (5710 MHz). Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.13852	V	Peak	58.61	± 4.00
		Average	48.55	± 4.00
22.839925	V	Peak	46.73	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.13632	V	Peak	57.12	± 4.00
		Average	48.22	± 4.00
22.839705	V	Peak	46.55	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.12312	V	Peak	59.20	± 4.00
		Average	51.82	± 4.00
22.83987	V	Peak	46.39	± 4.00

Verdict: PASS

4. WiFi 5GHz 802.11 ac80 mode

Lowest frequency (106) 5530MHz. Out-of-band spurious emissions inside restricted band 5.35-5.46 GHz and 5.46-5.47 adjacent band. Highest spurious levels in bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.46449	V	Peak	63.86	± 4.00
		Average	51.67	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.46313	V	Peak	64.95	± 4.00
		Average	53.31	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.46530	V	Peak	56.70	± 4.00
		Average	43.95	± 4.00

Middle frequency (122) 5610MHz. Out-of-band spurious emissions in the 1-40 GHz range and emissions inside restricted band 5.35 - 5.46 GHz and 5.46 - 5.47 GHz, 5.725-5.825 GHz adjacent bands.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
5.461954	V	Peak	59.86	± 4.00
		Average	46.34	± 4.00
5.725335	V	Peak	57.00	± 4.00
		Average	45.16	± 4.00
16.82575	V	Peak	59.86	± 4.00
		Average	51.21	± 4.00
22.43987	V	Peak	48.39	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
5.460814	V	Peak	59.18	± 4.00
		Average	45.73	± 4.00
5.72601	V	Peak	57.08	± 4.00
		Average	45.39	± 4.00
16.82758	V	Peak	59.25	± 4.00
		Average	50.23	± 4.00
22.43960	V	Peak	48.55	± 4.00

Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
5.463598	V	Peak	60.46	± 4.00
		Average	48.57	± 4.00
5.72653	V	Peak	57.19	± 4.00
		Average	46.67	± 4.00
16.86278	V	Peak	61.04	± 4.00
		Average	52.00	± 4.00
22.43790	V	Peak	48.75	± 4.00

802.11 ac 80MHz:

Channel 138 (5690 MHz). Out-of-band spurious emissions in the 1-40 GHz range.

Chain A

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.09672	V	Peak	58.63	± 4.00
		Average	47.89	± 4.00
22.75987	V	Peak	45.22	± 4.00

Chain B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.06372	V	Peak	55.30	± 4.00
		Average	45.01	± 4.00
22.75987	V	Peak	45.53	± 4.00

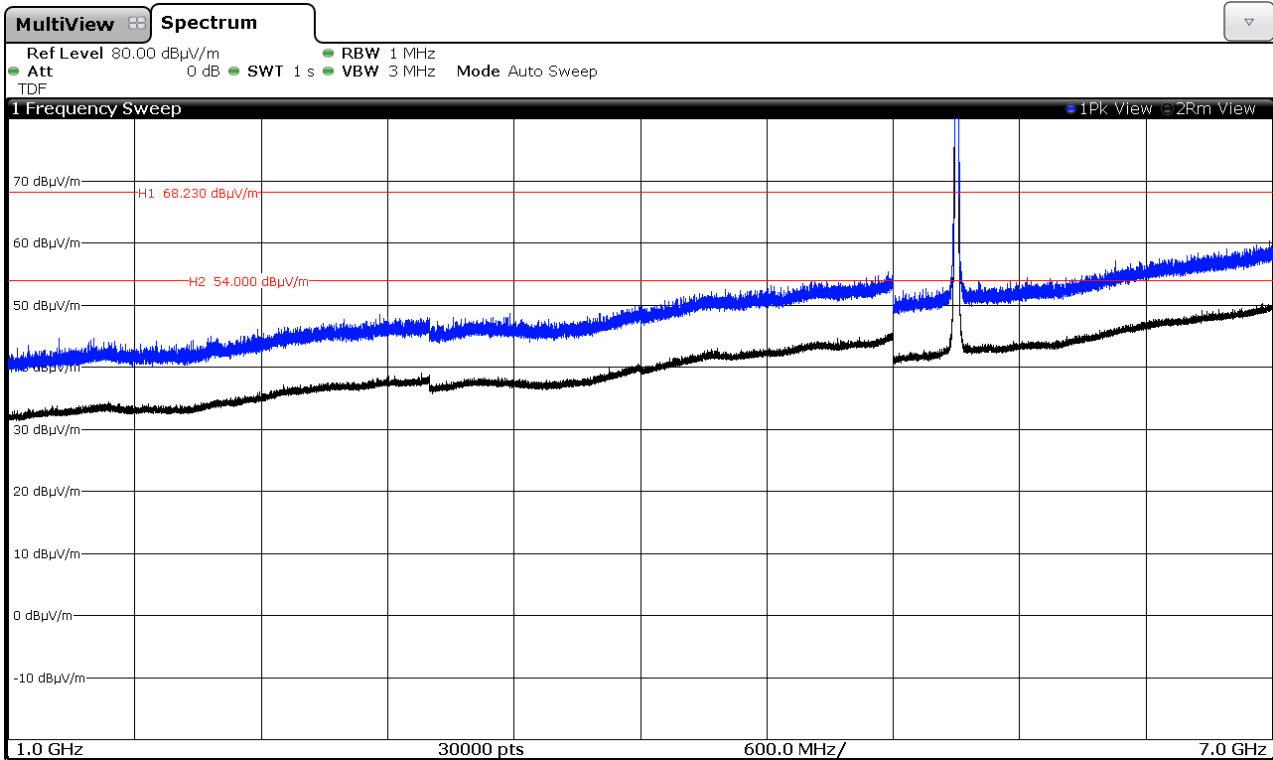
Chain A+B

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
17.10222	V	Peak	58.63	± 4.00
		Average	51.37	± 4.00
22.759902	V	Peak	45.90	± 4.00

Verdict: PASS

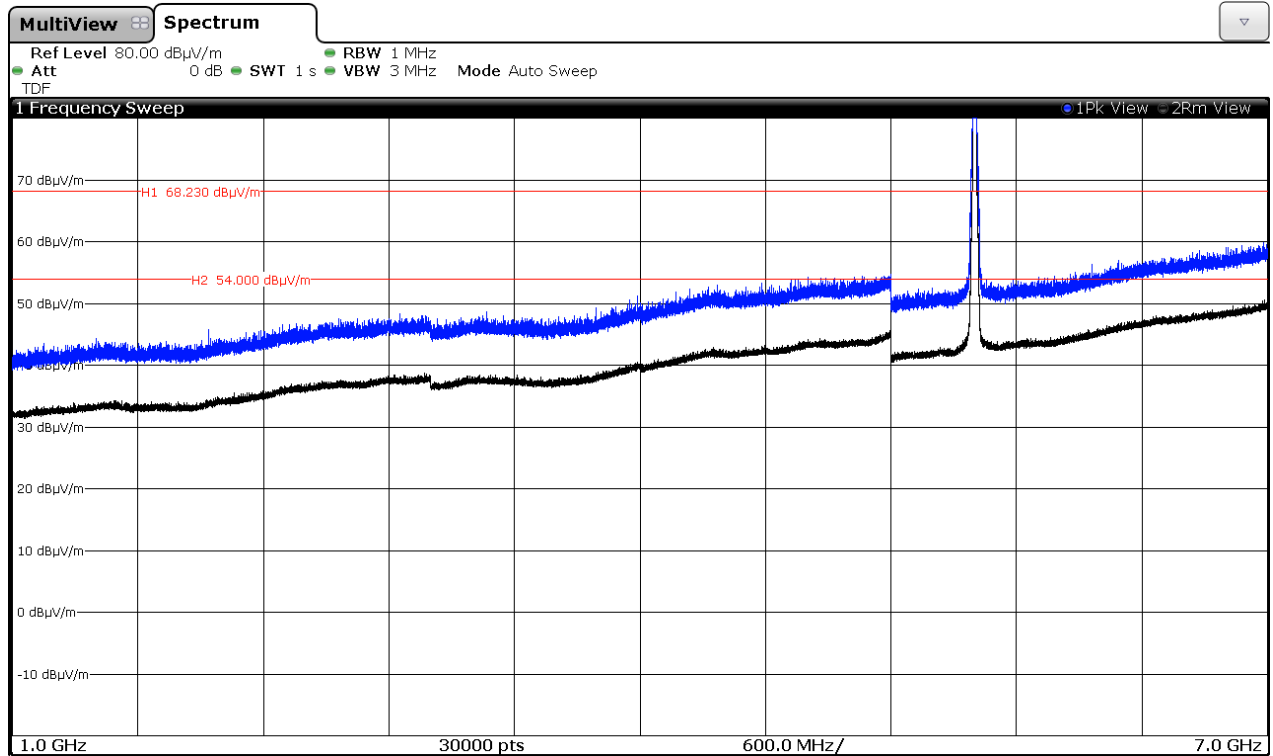
FREQUENCY RANGE 1 GHz to 7 GHz.
WiFi 5GHz 802.11 a mode

Lowest frequency (100) 5500 MHz.



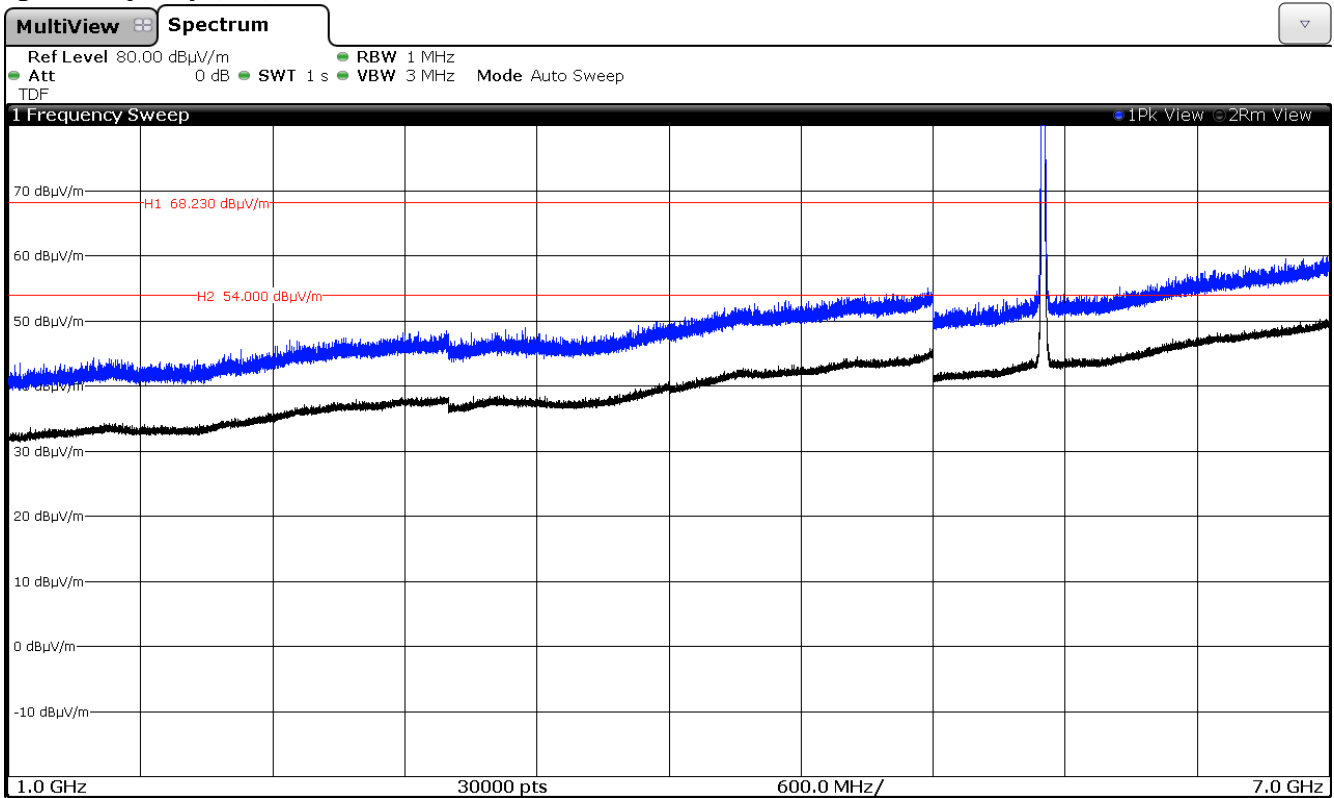
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

Middle frequency (120) 5600 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

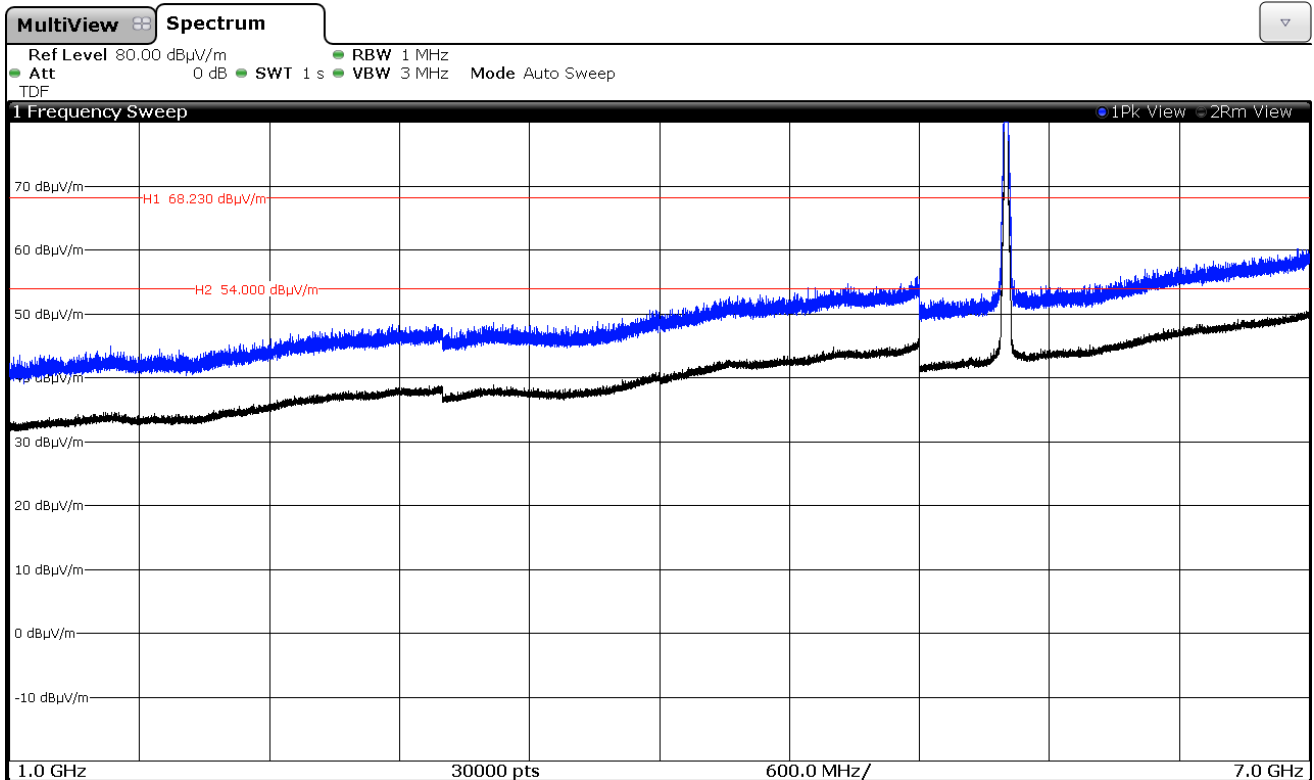
Highest frequency (140) 5700 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B.

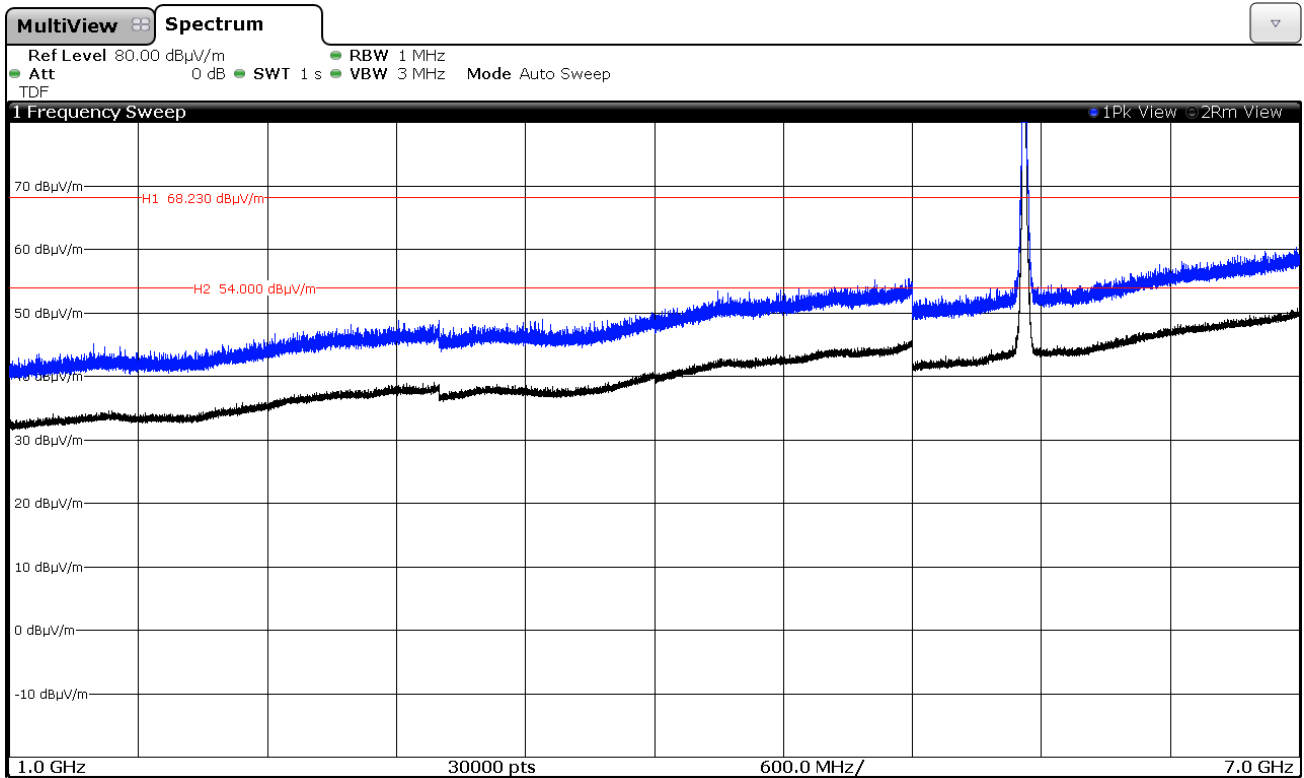
2. WiFi 5GHz 802.11 n20 mode

Middle frequency (120) 5600 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

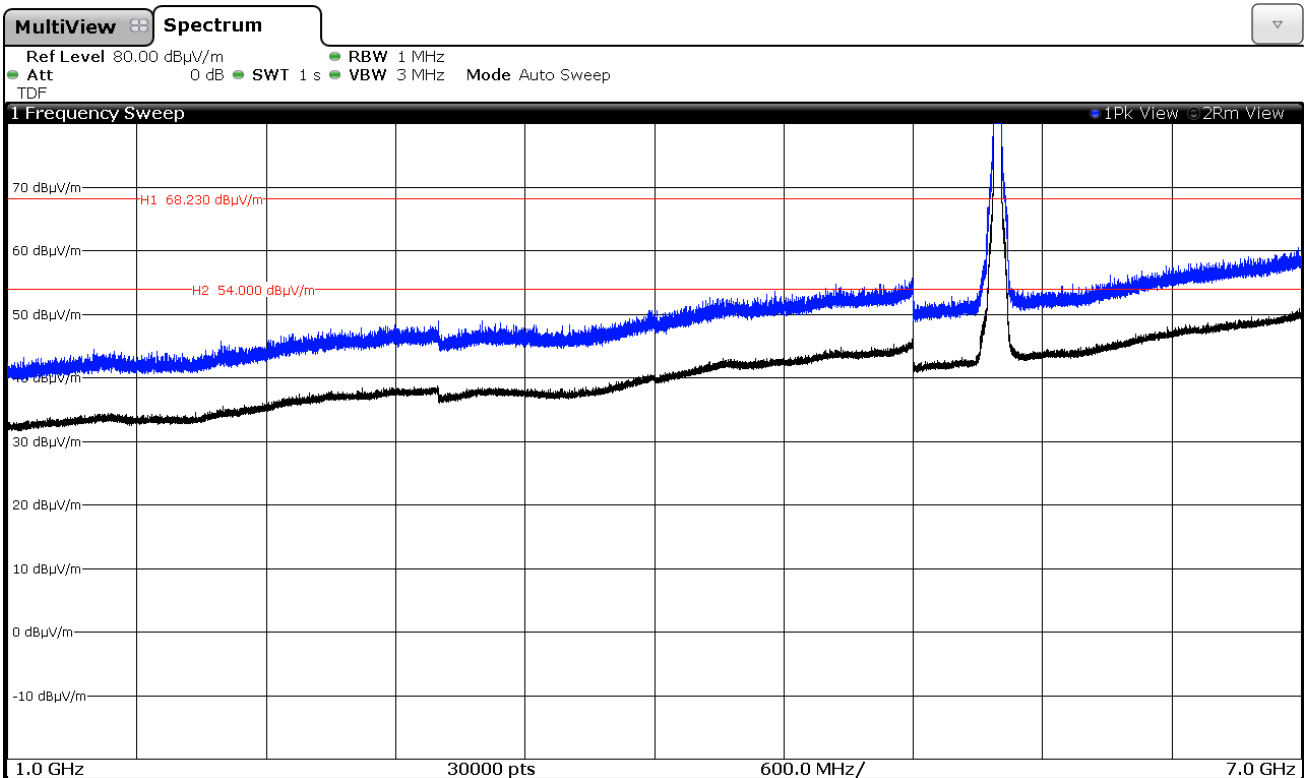
802.11ac20 mode: CH 144 5720 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

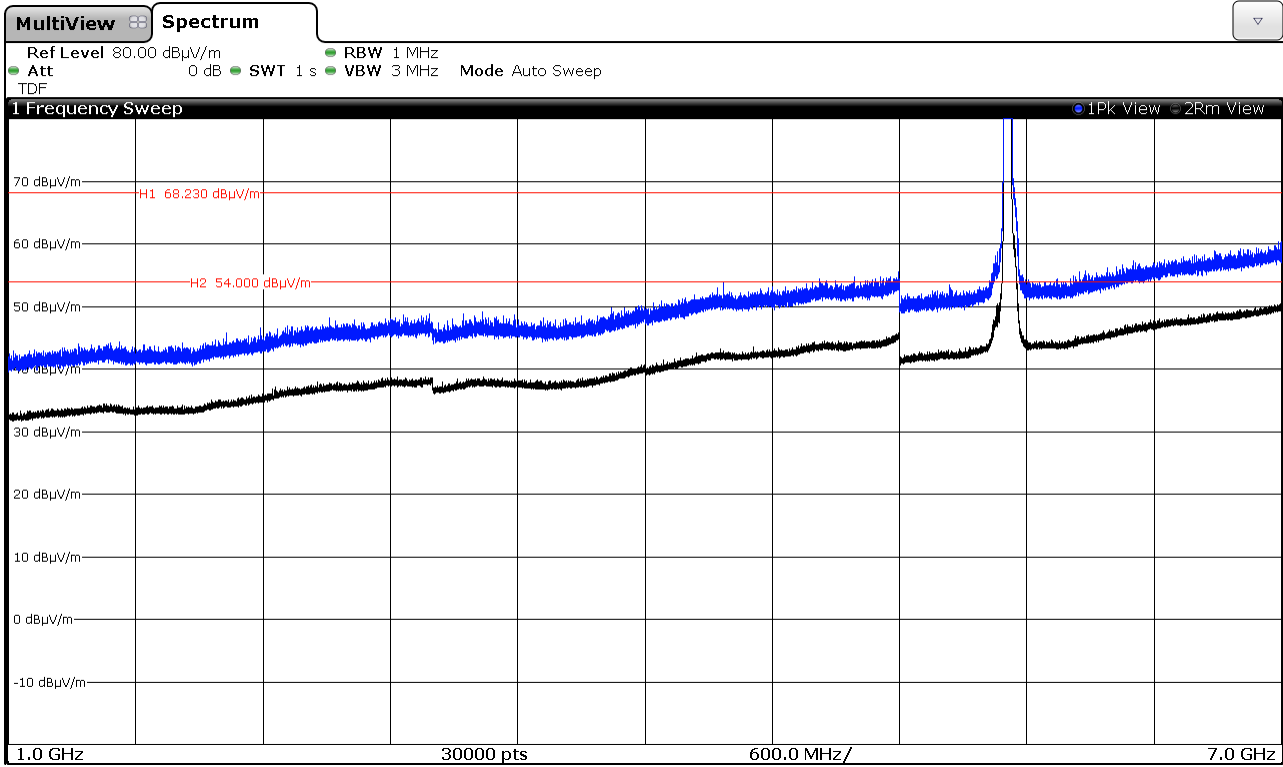
3. WiFi 5GHz 802.11 n40 mode

Middle frequency (118) 5590 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

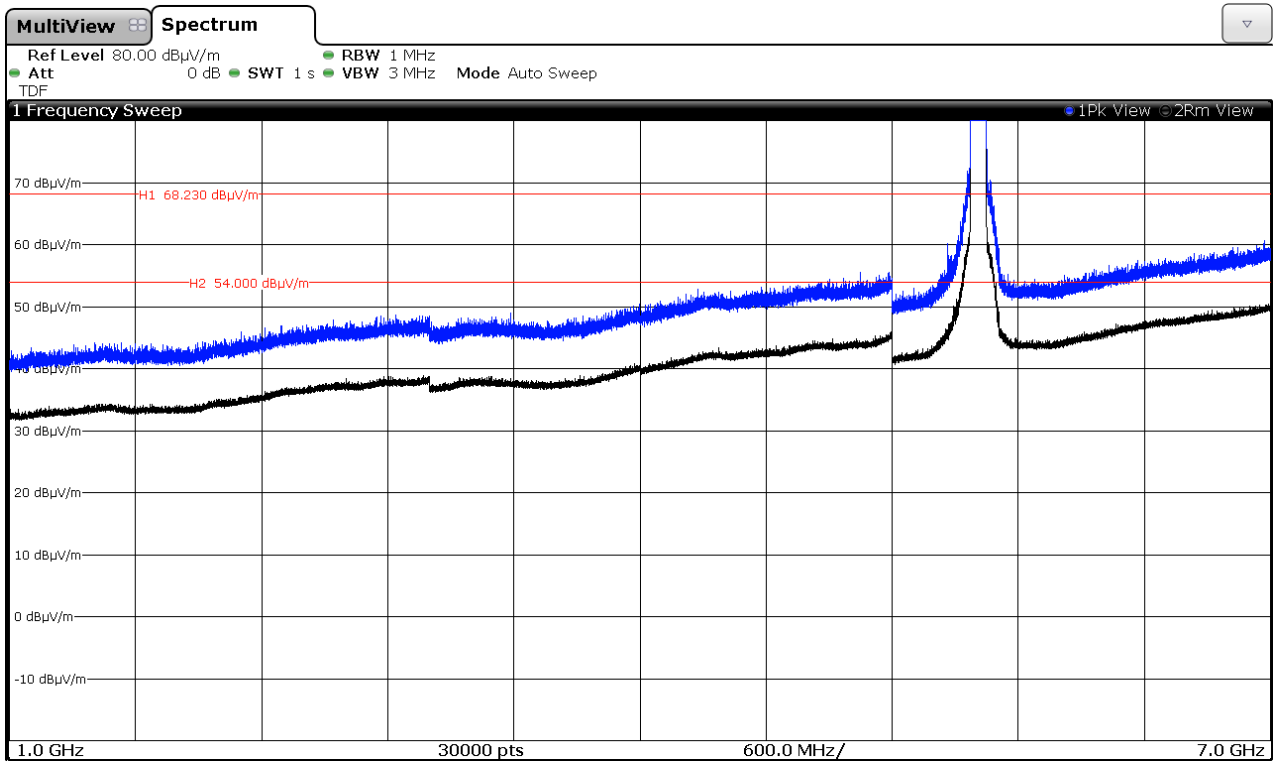
802.11ac40 mode: CH 142 5710 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

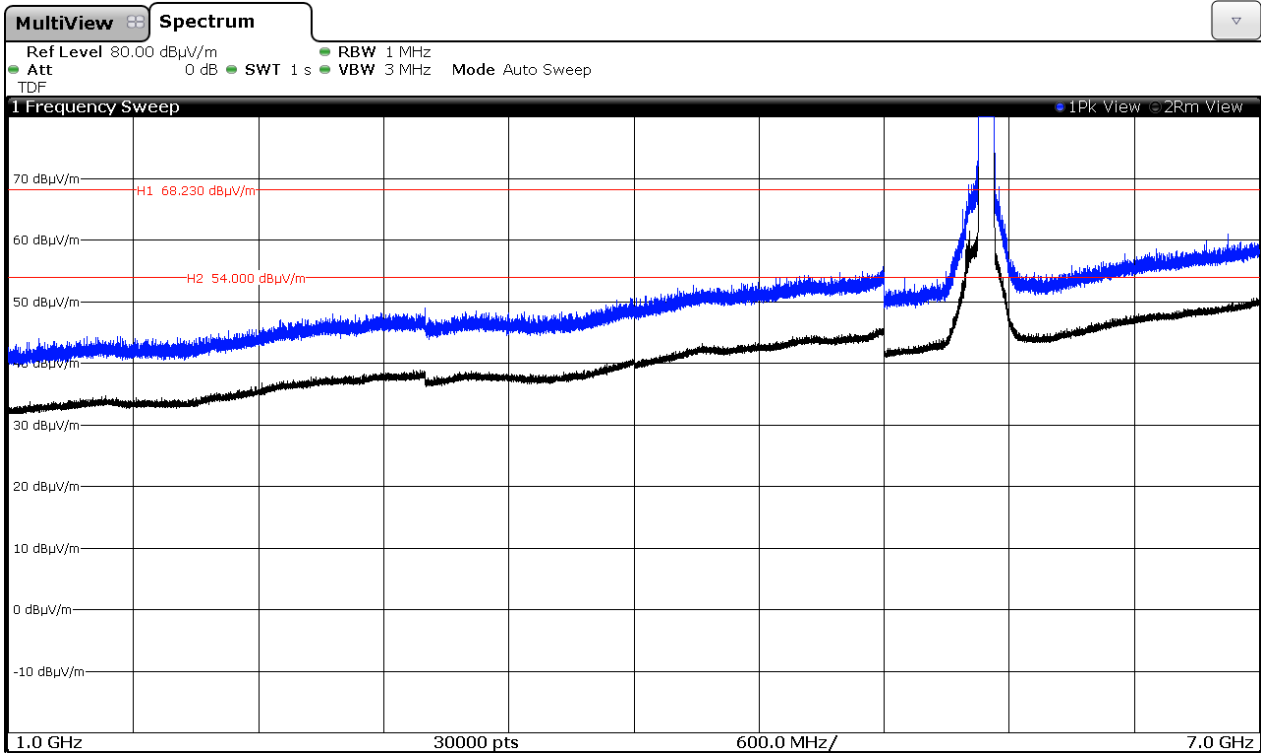
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency (122) 5610 MHz.



Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

802.11ac80 mode: CH 138 5690 MHz.



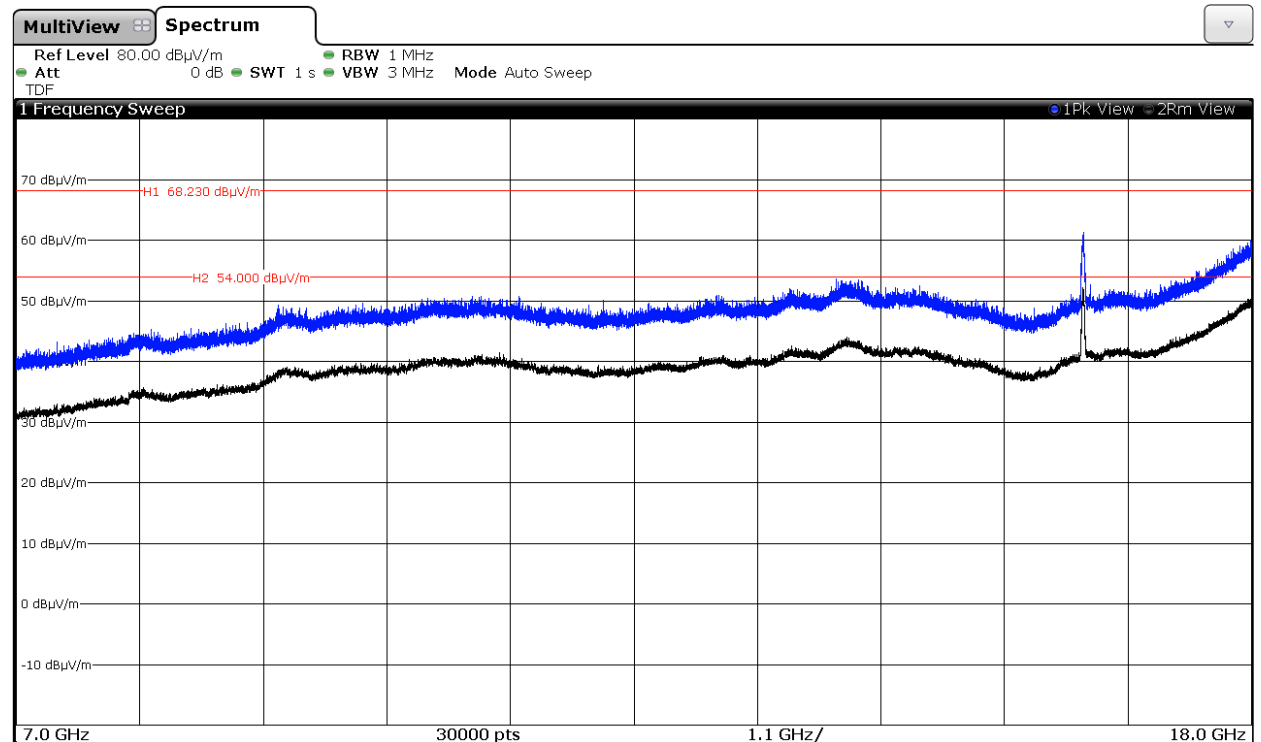
Note: The peak above the limit is the carrier frequency. This plot is valid for both Chain A and Chain B, Chain A+B.

FREQUENCY RANGE 7 GHz to 18 GHz.

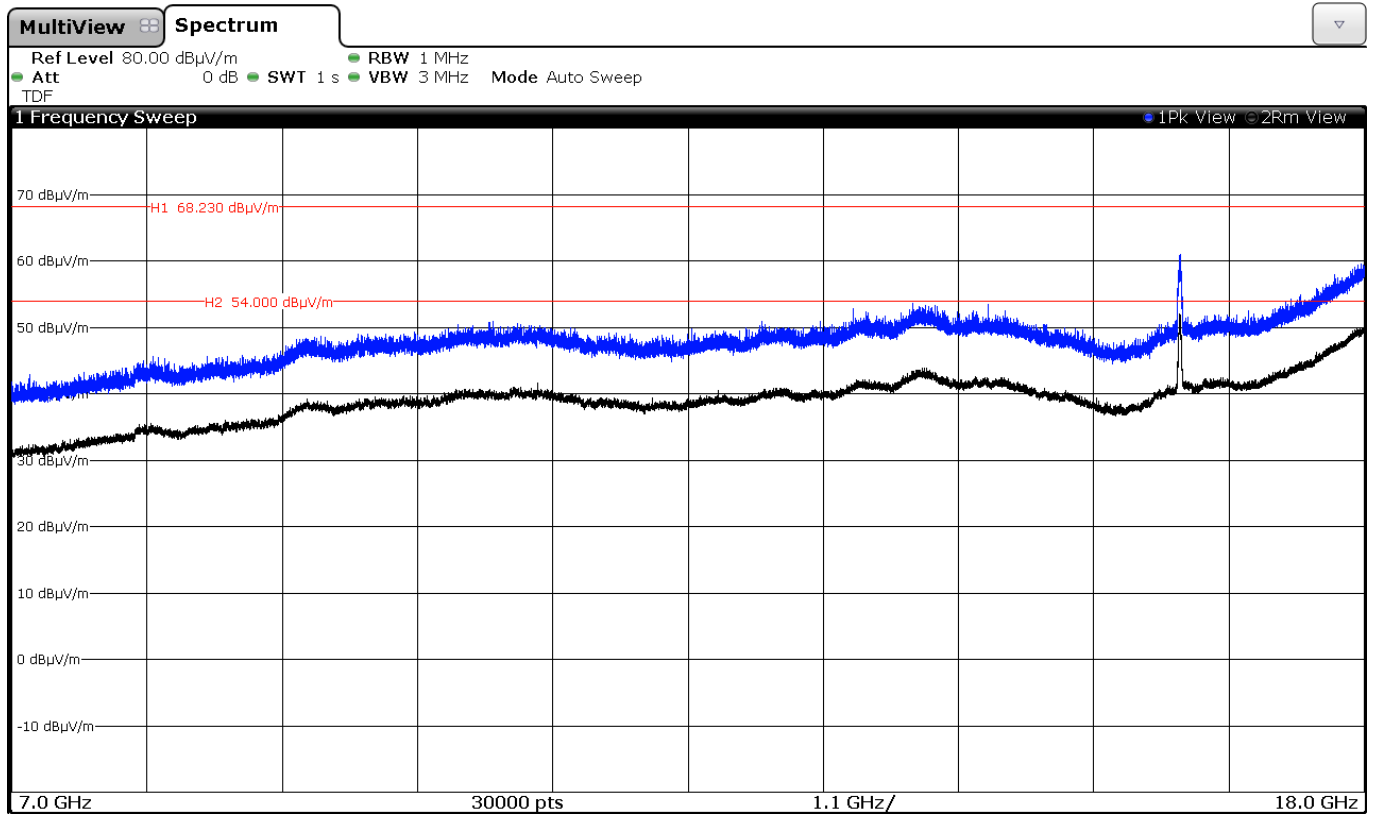
1. WiFi 5GHz 802.11 a mode

Lowest frequency (100) 5500 MHz.

Chain A

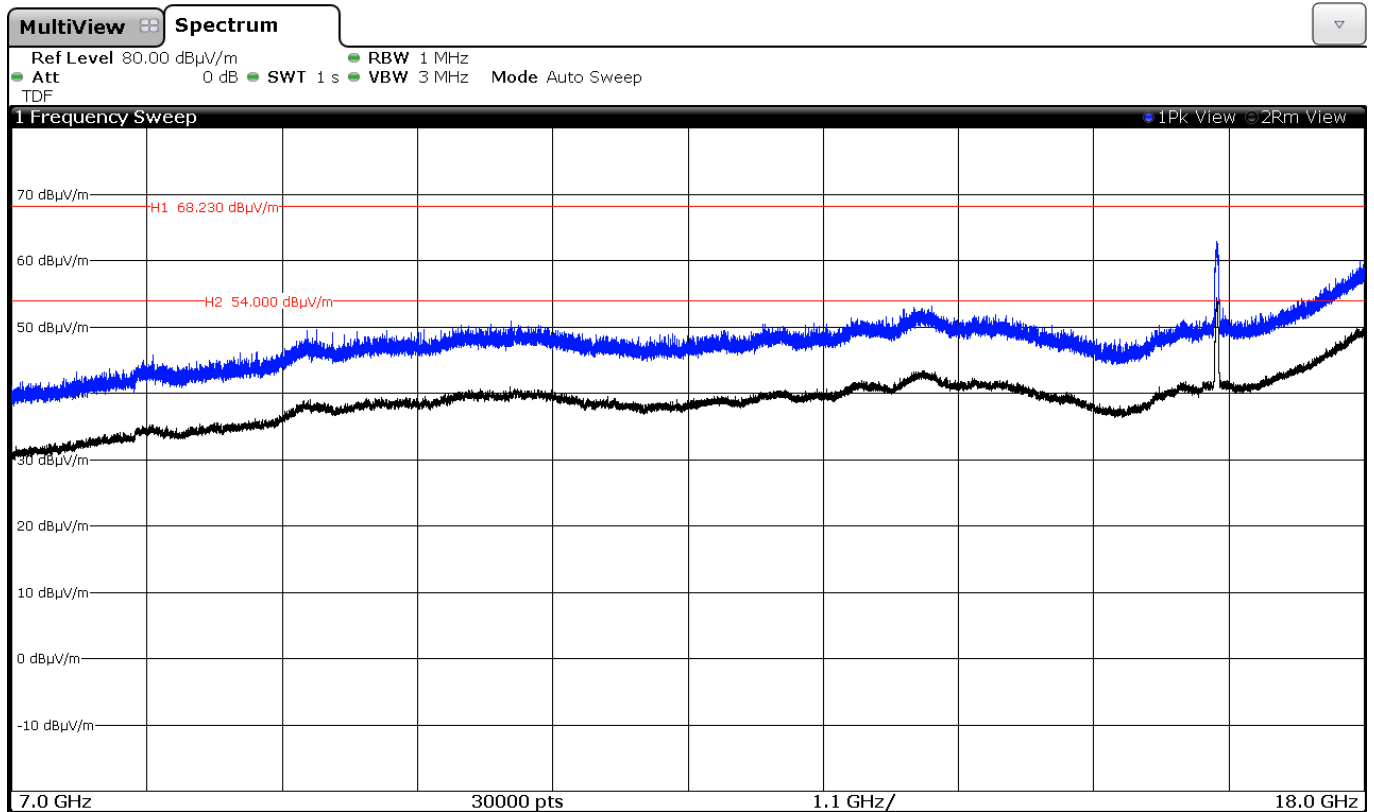


Chain B

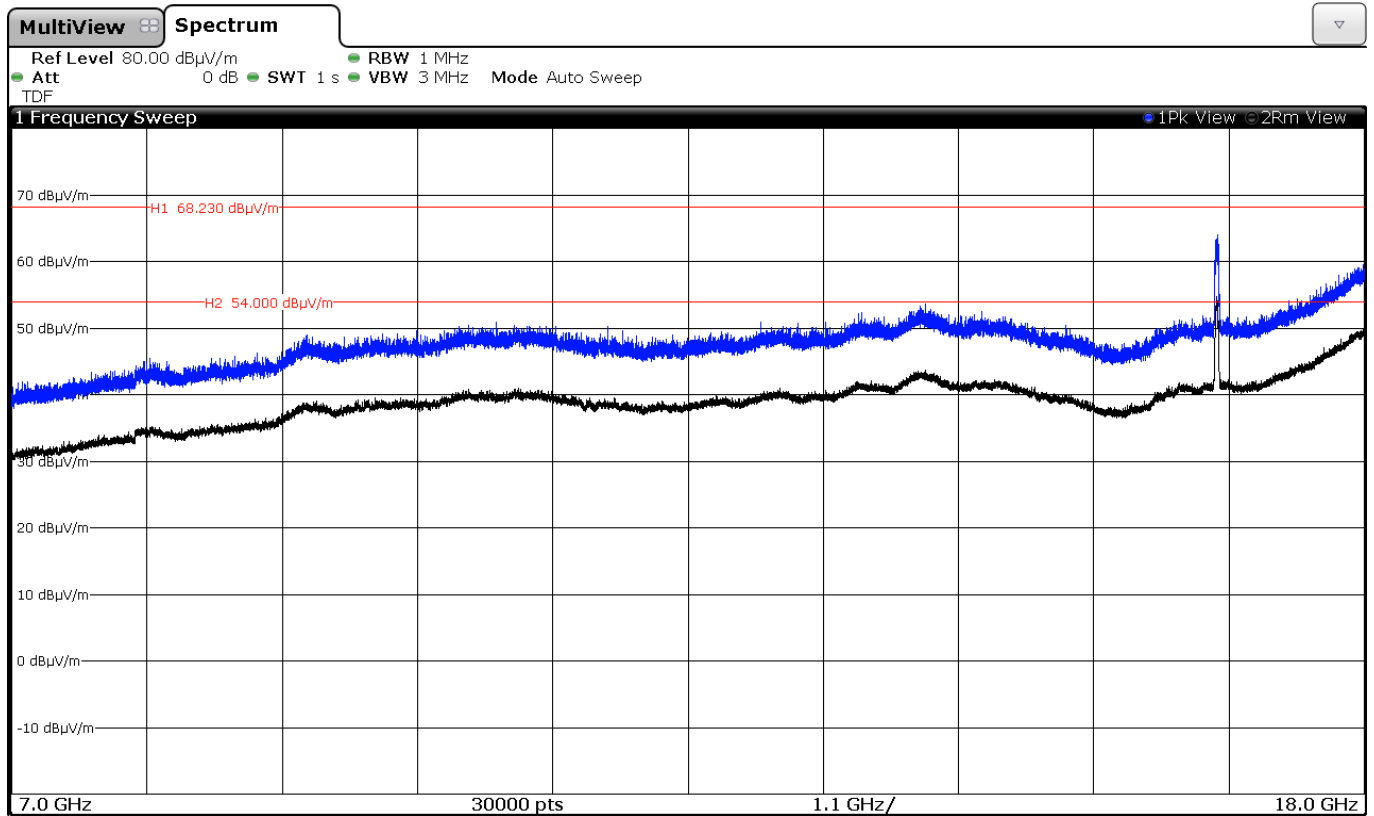


Middle frequency (120) 5600 MHz.

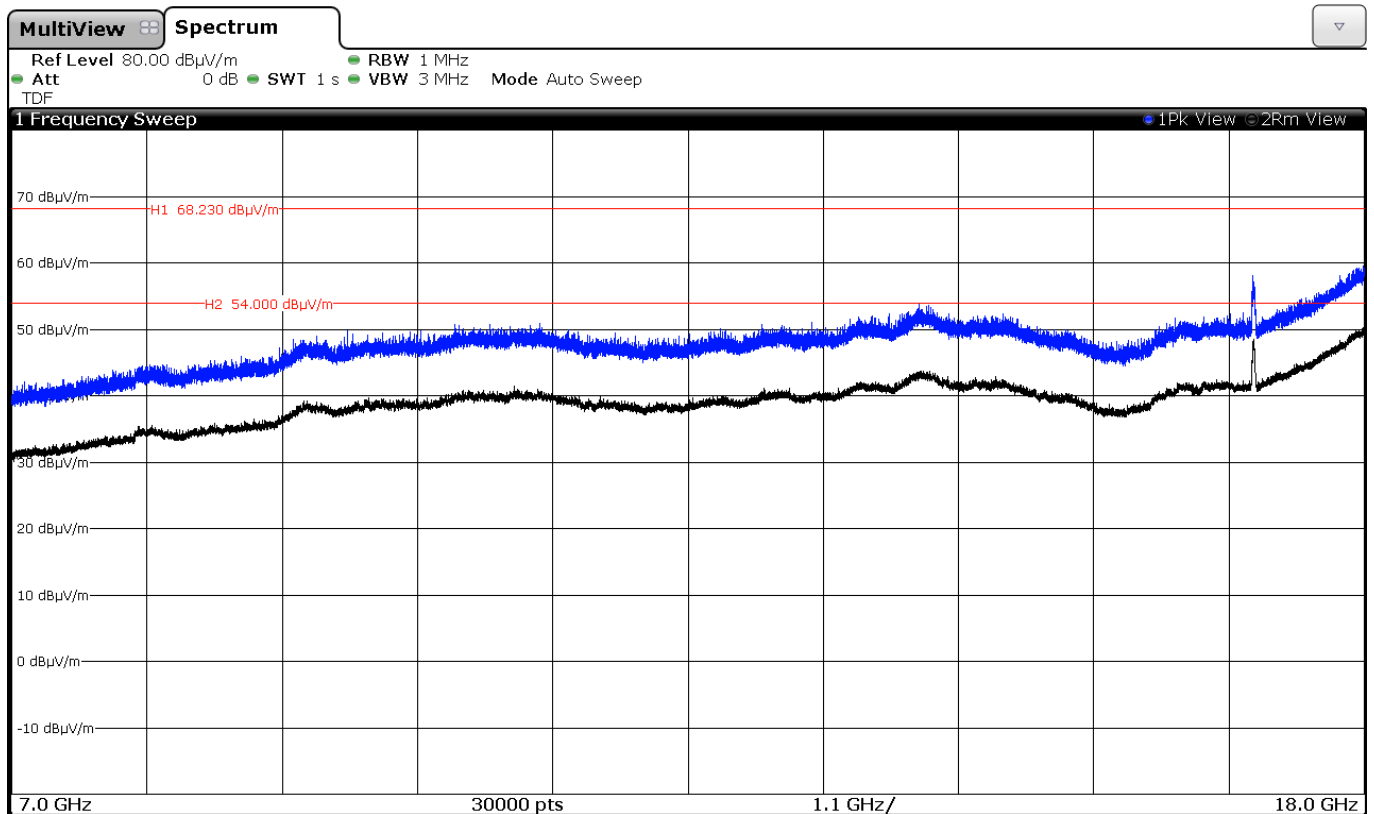
Chain A



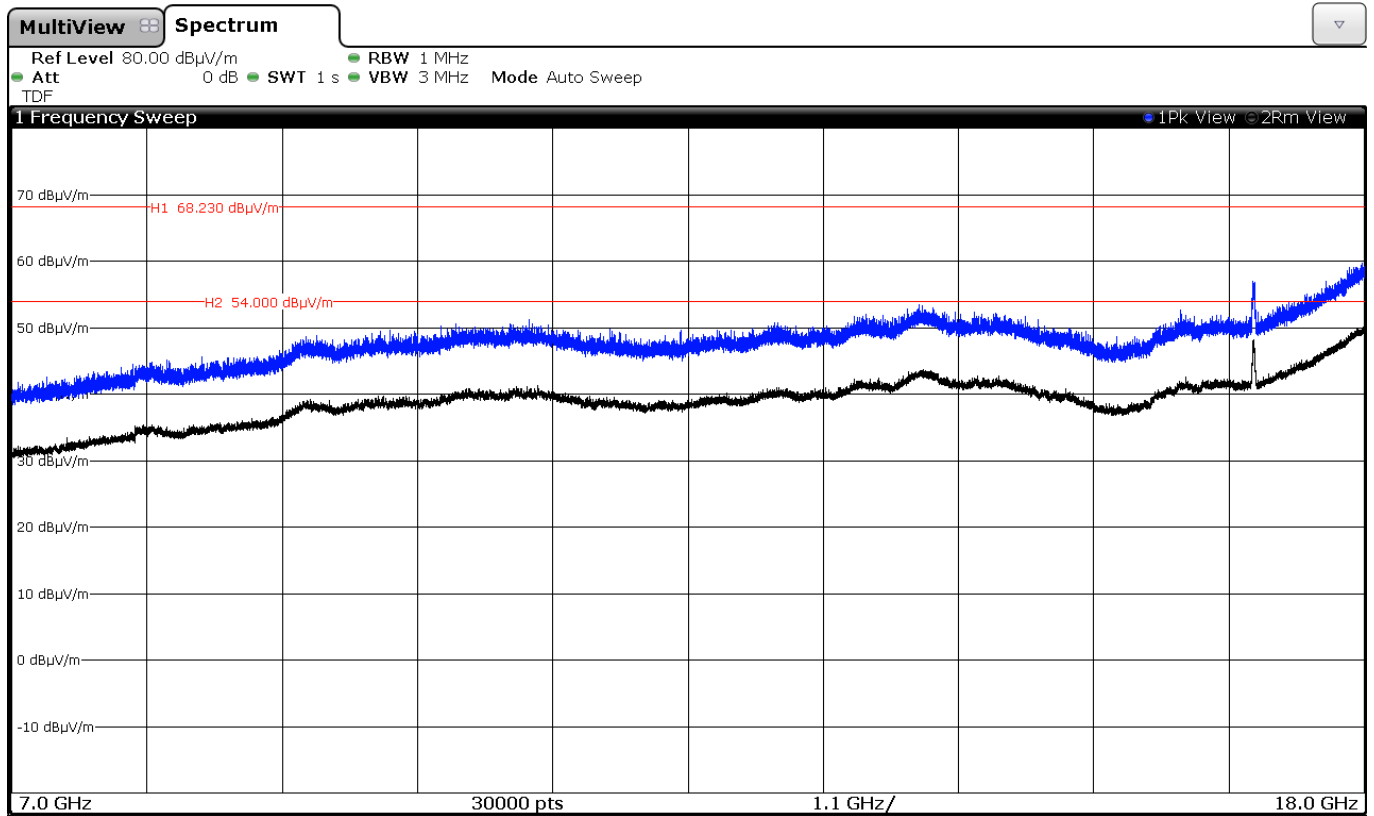
Chain B



Highest frequency (140) 5700 MHz.
 Chain A



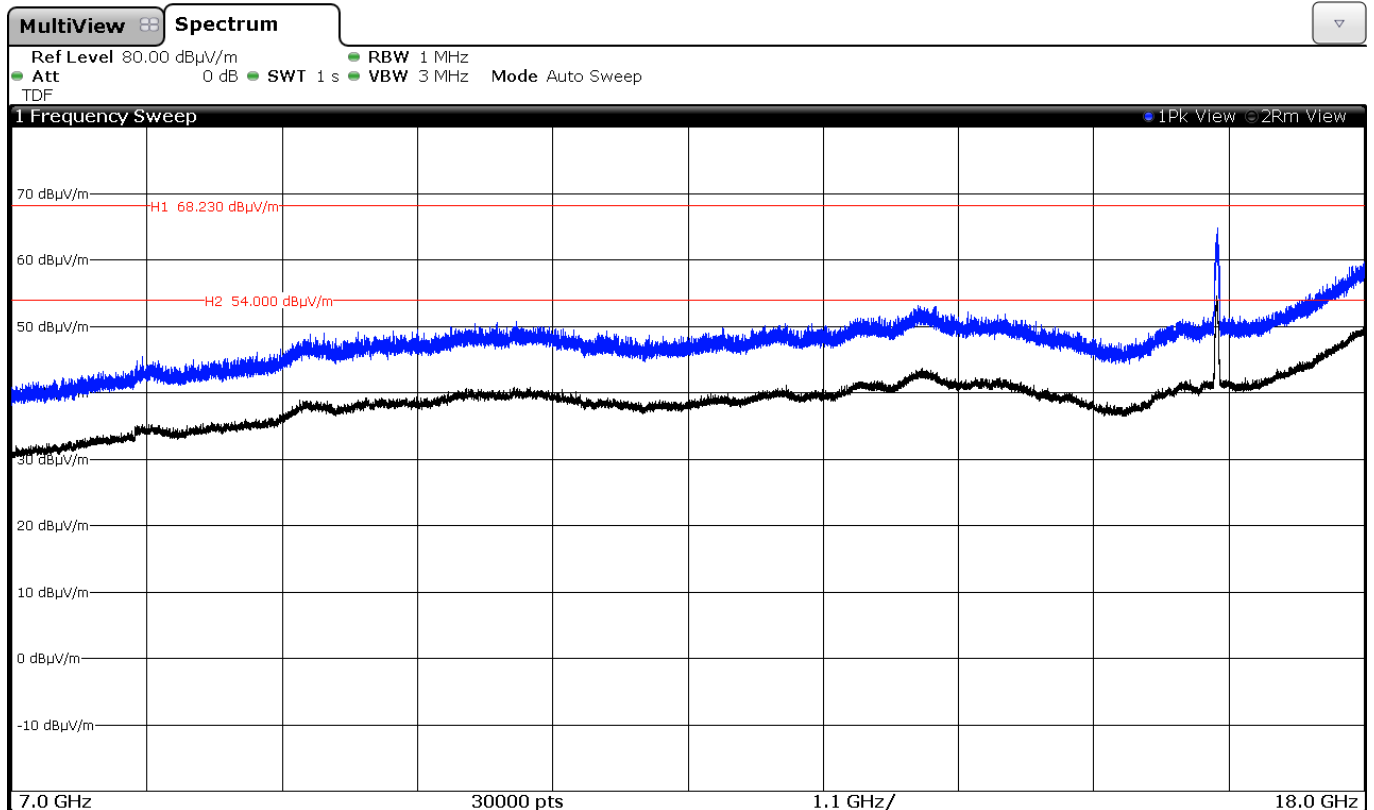
Chain B



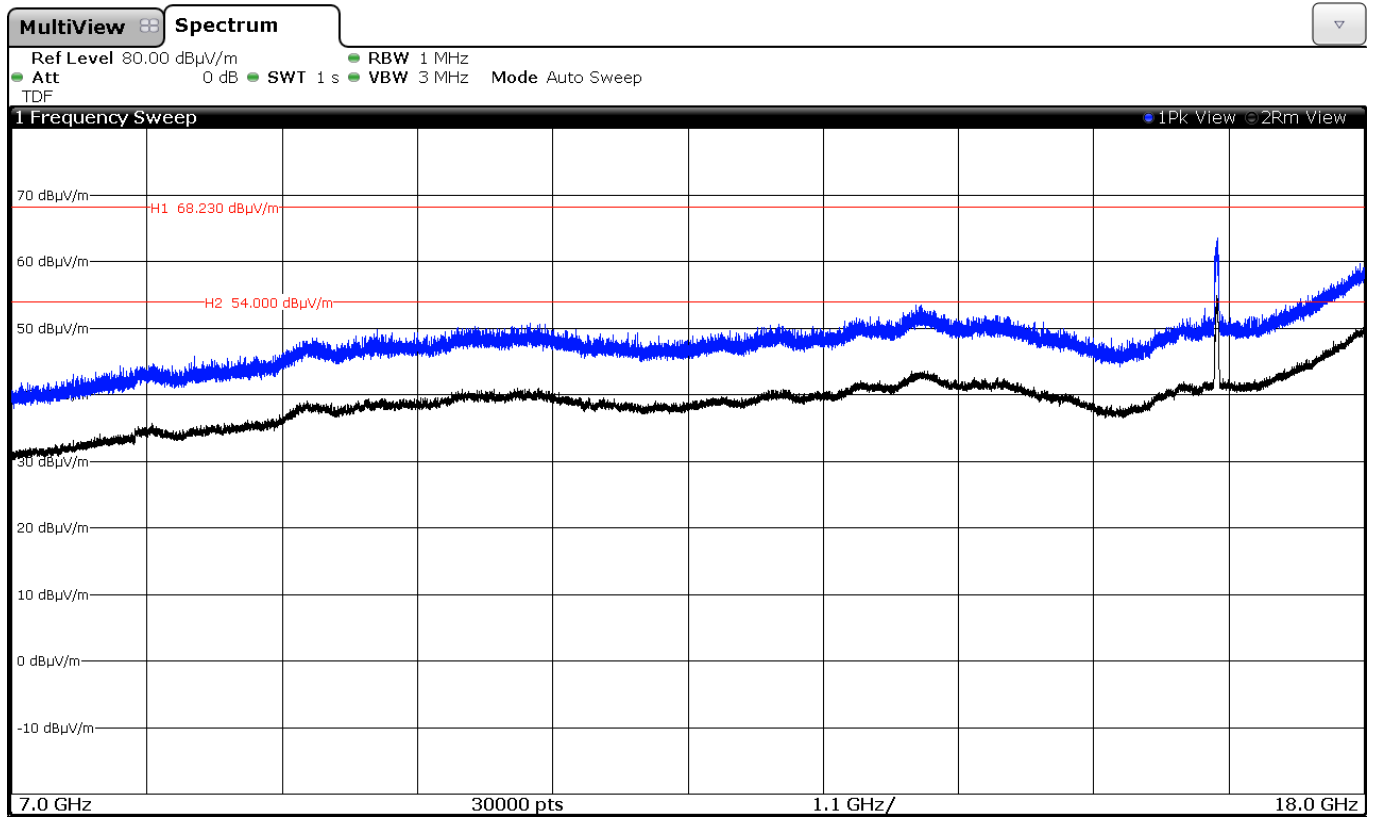
2. WiFi 5GHz 802.11 n20 mode

Middle frequency (120) 5600 MHz.

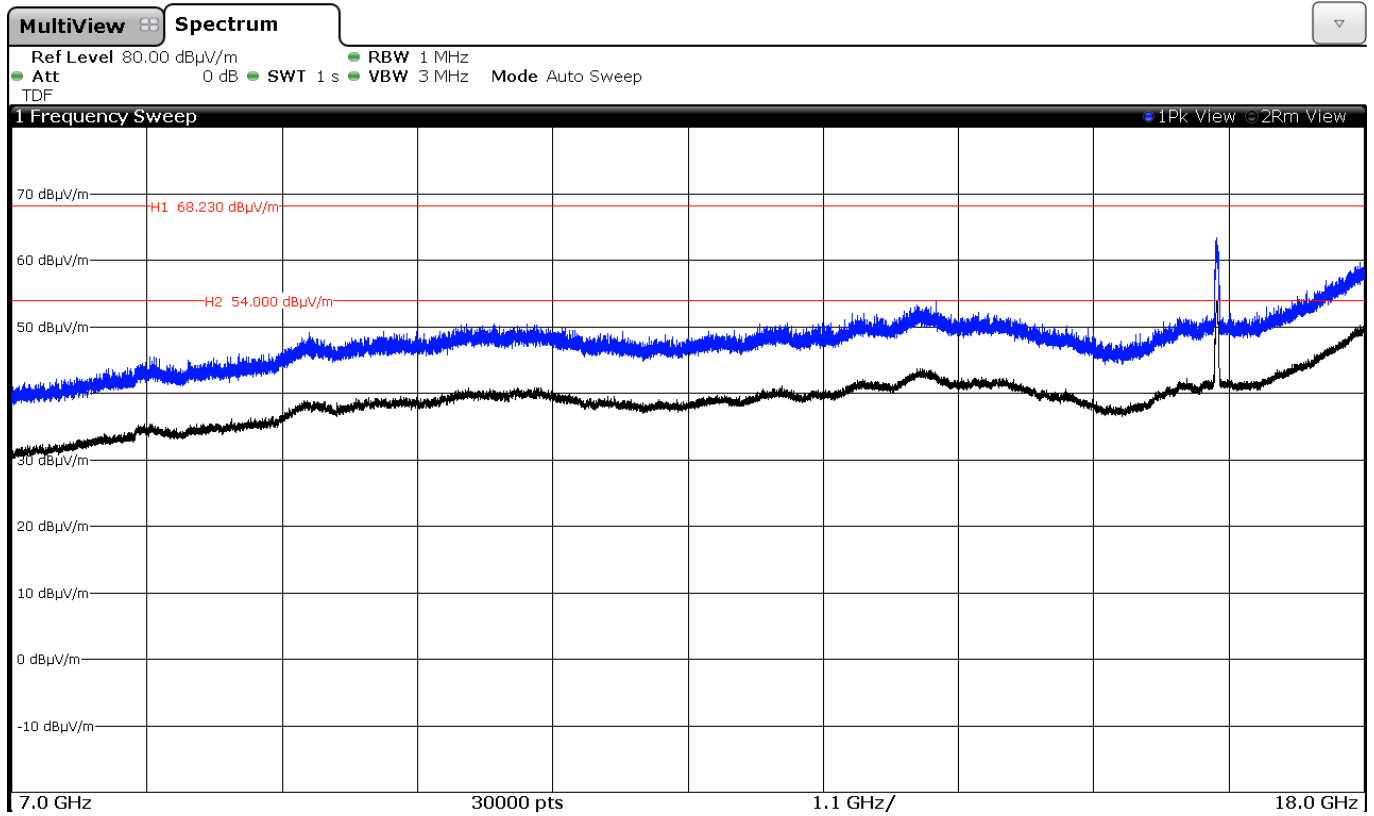
Chain A



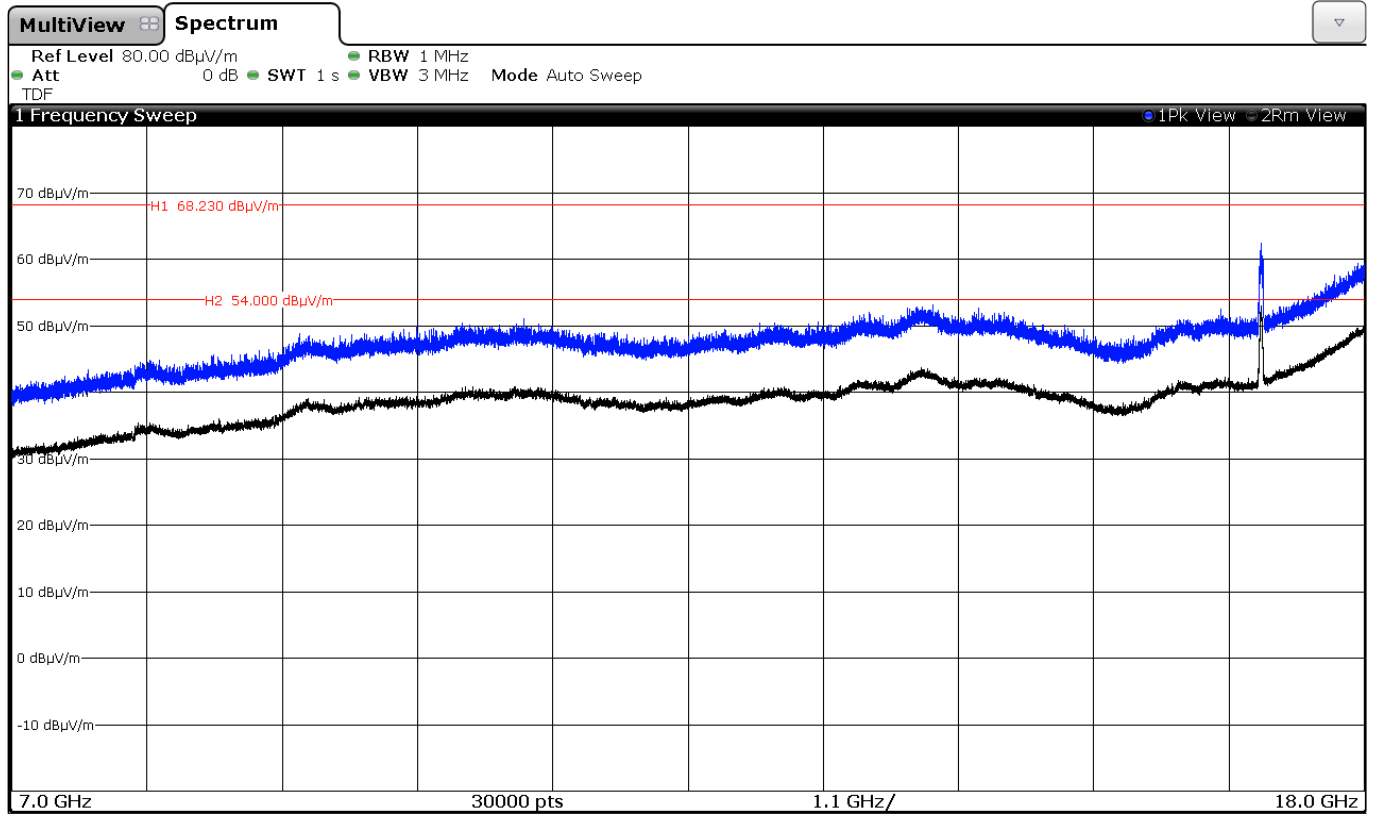
Chain B



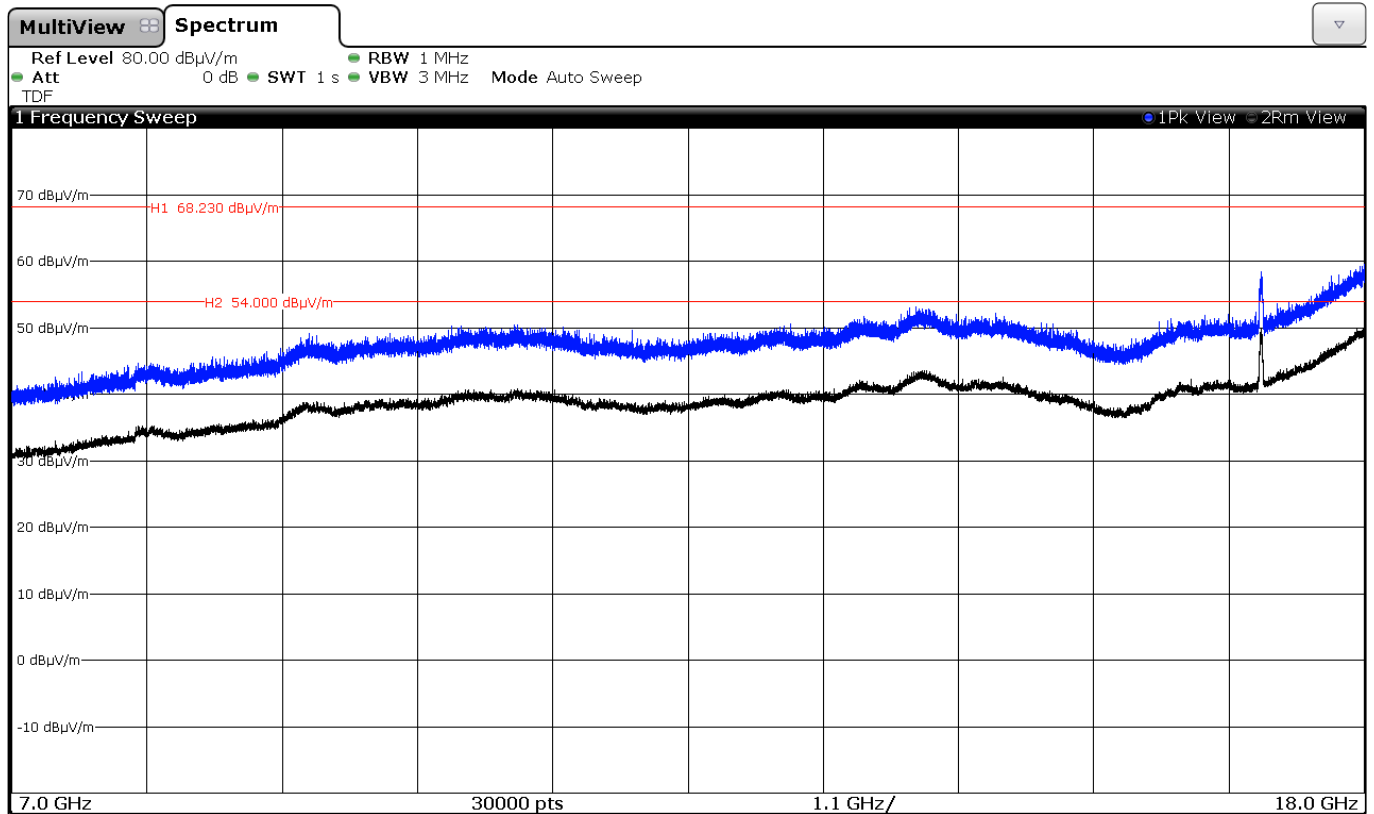
Chain A+B



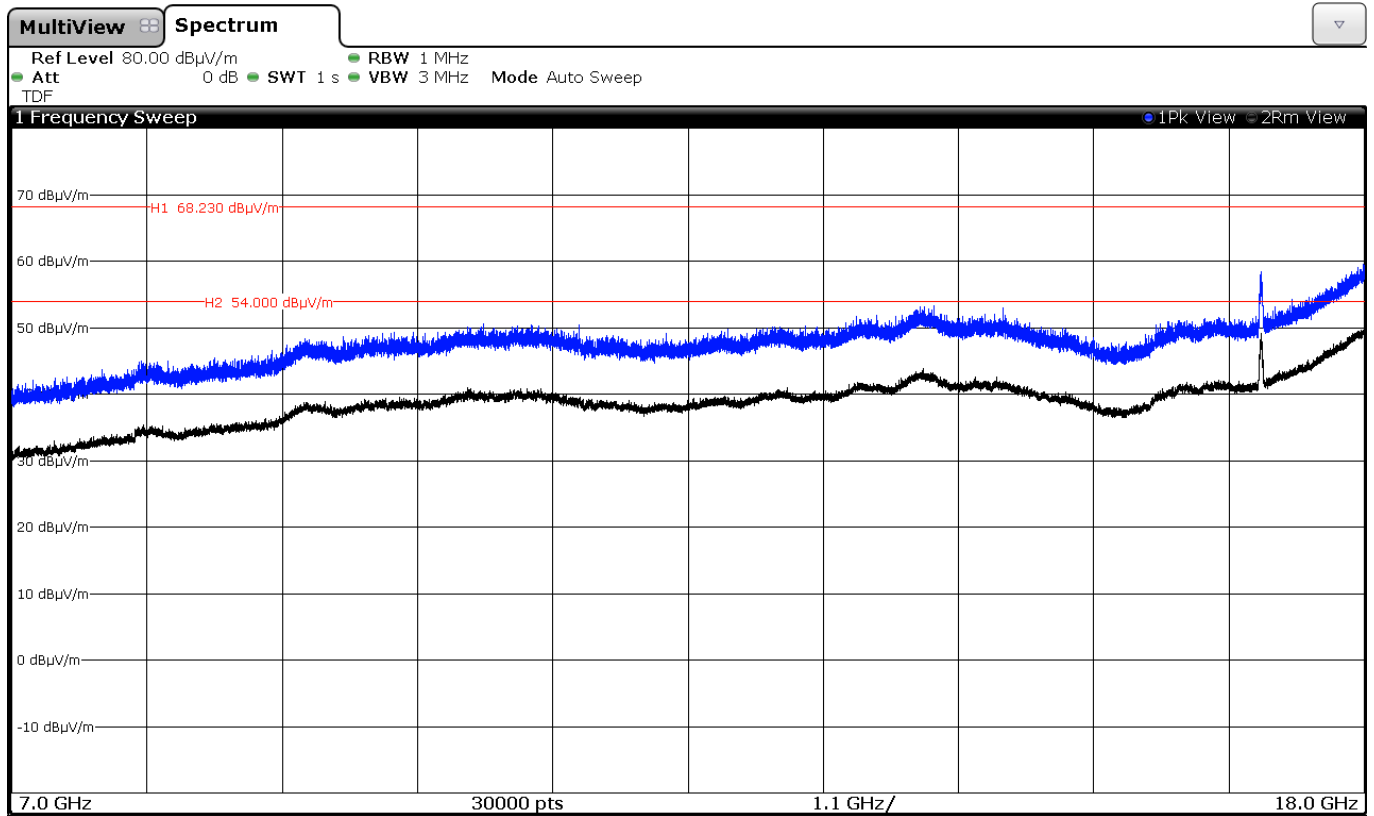
802.11ac20 mode: CH 144 (5720 MHz)
 Chain A



Chain B

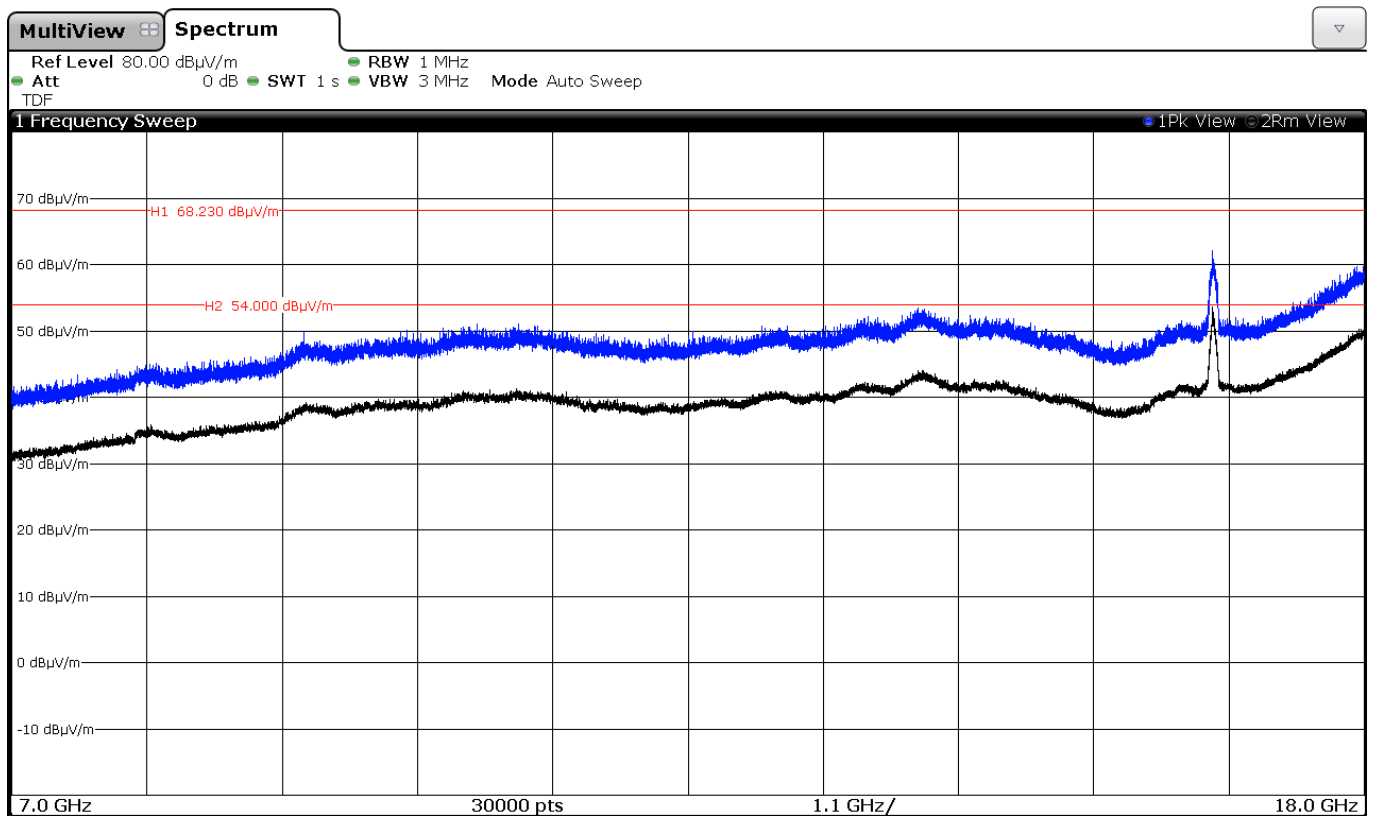


Chain A+B

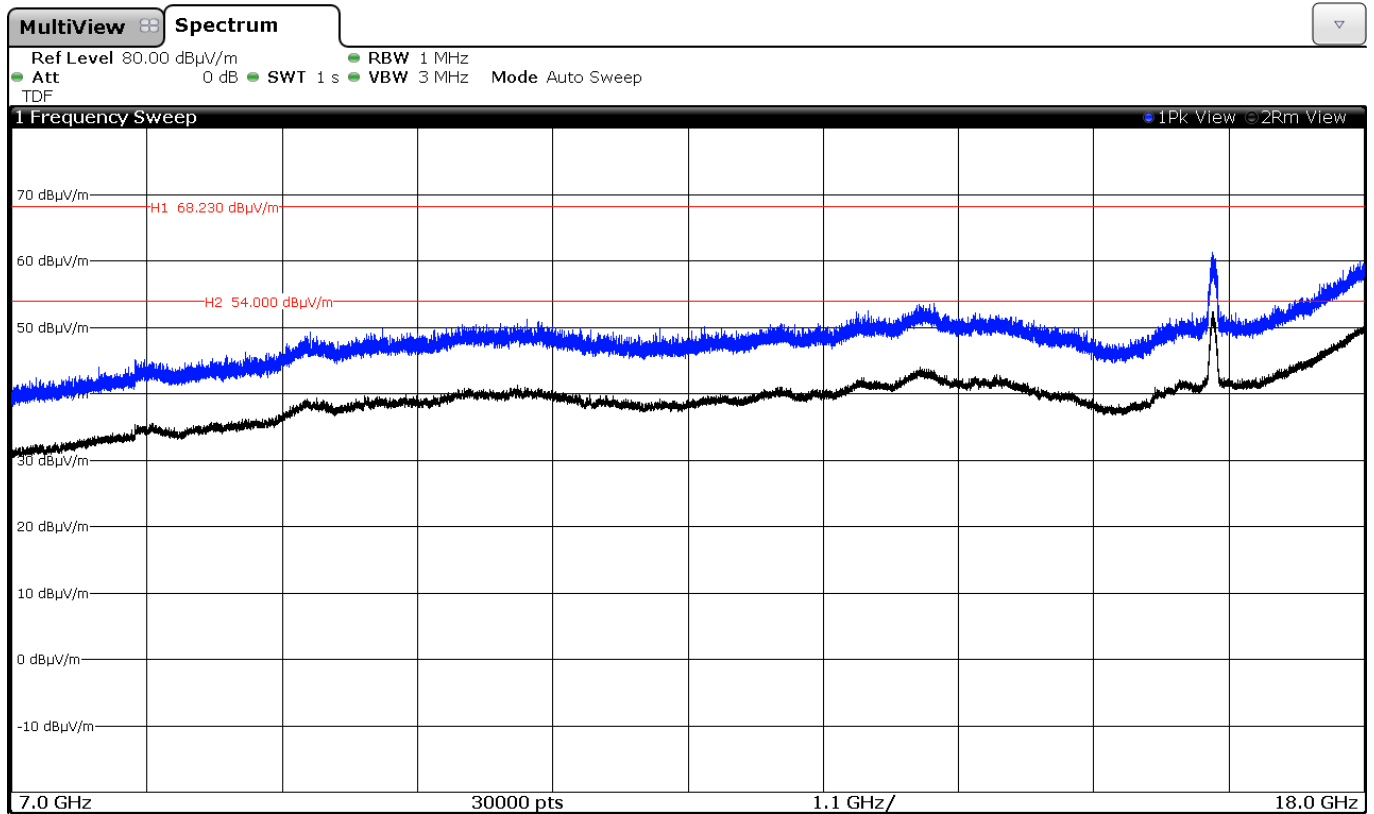


3. WiFi 5GHz 802.11 n40 mode

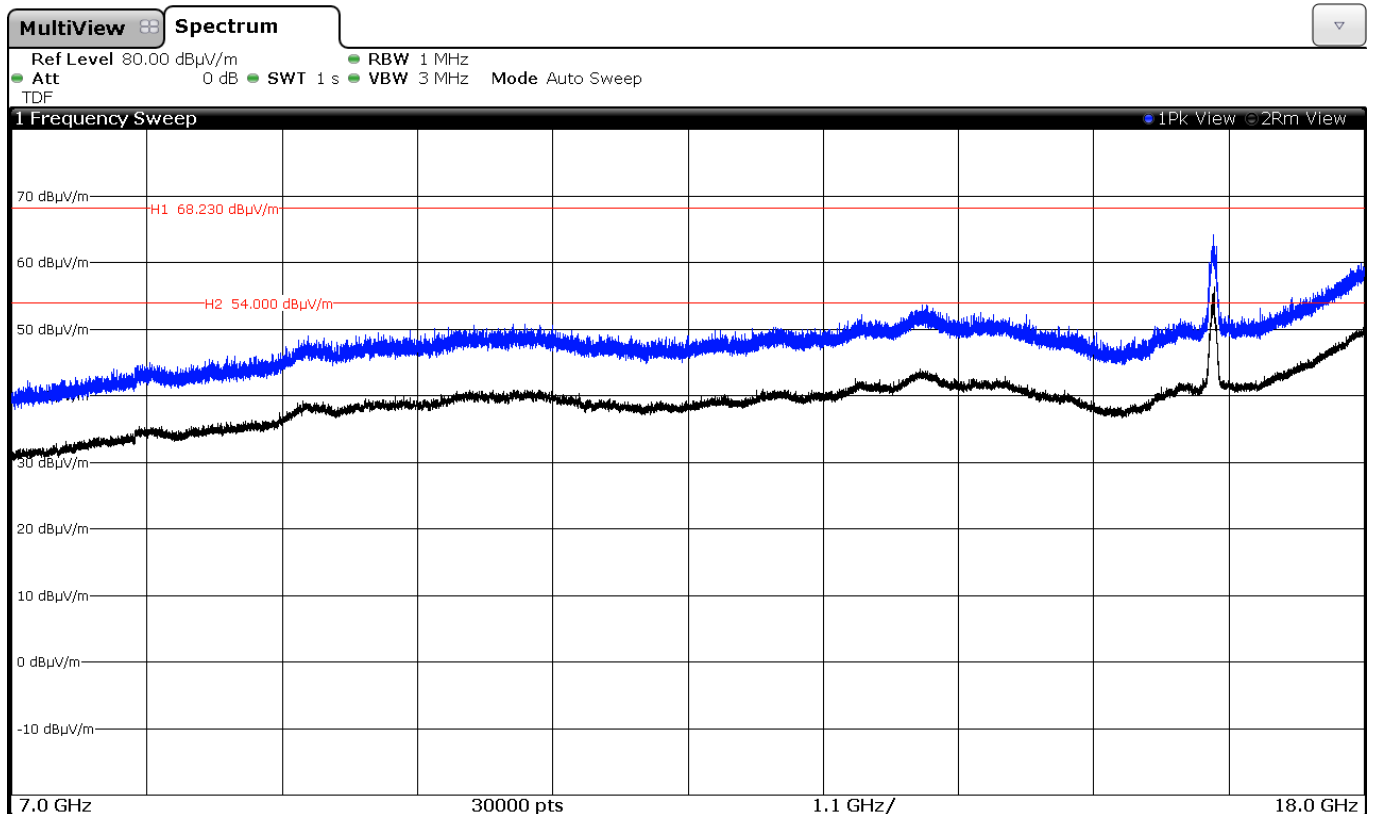
Middle frequency (118) 5590 MHz.
 Chain A



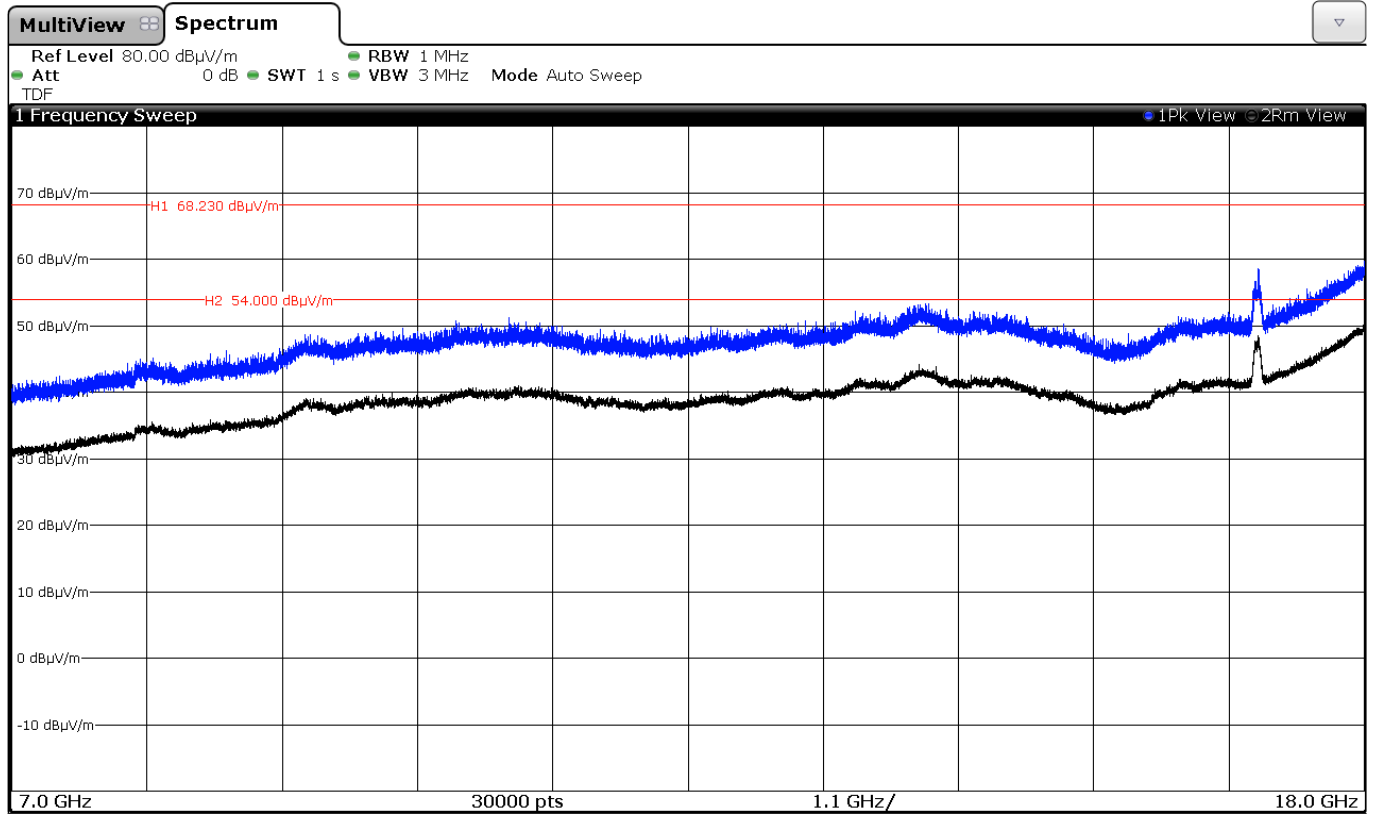
Chain B



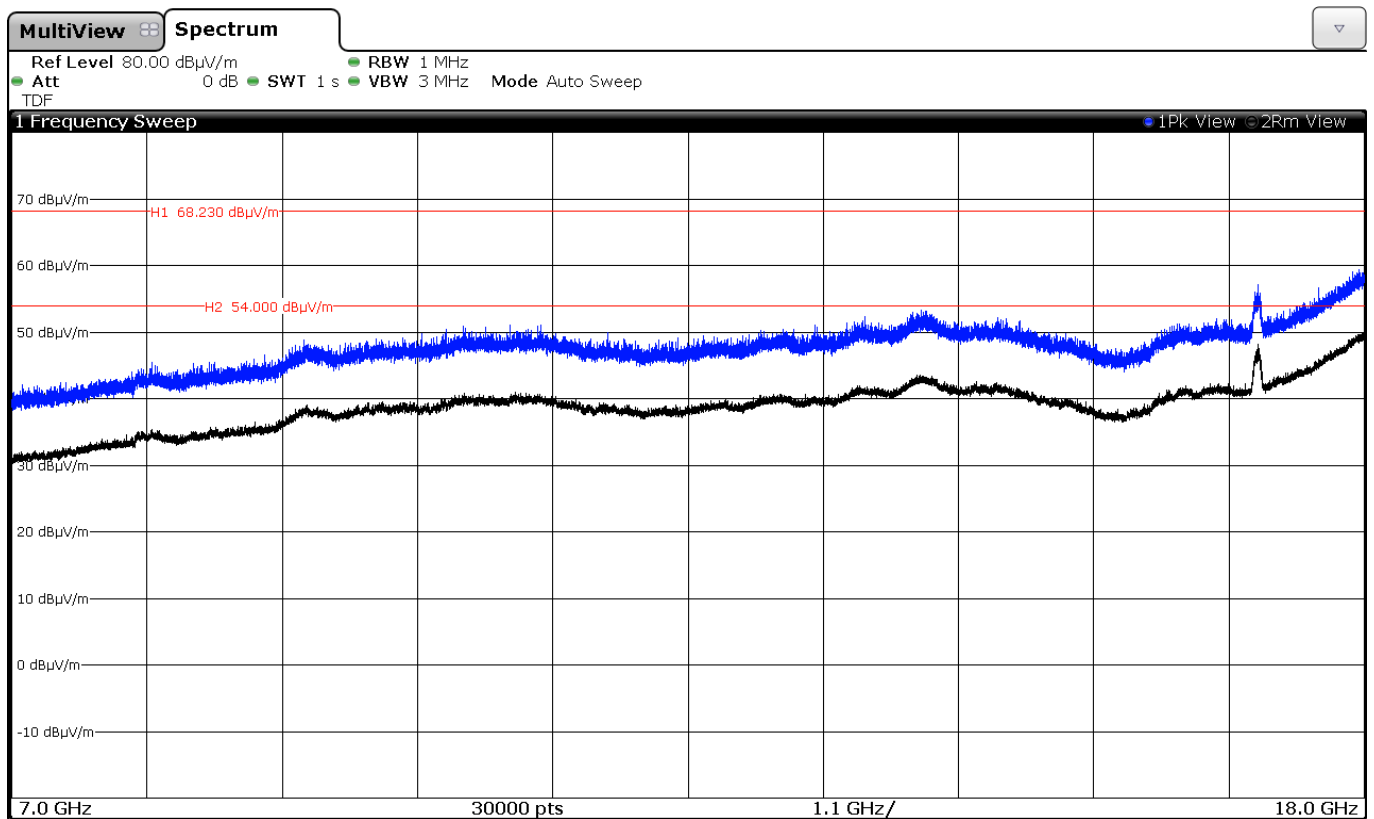
Chain A+B



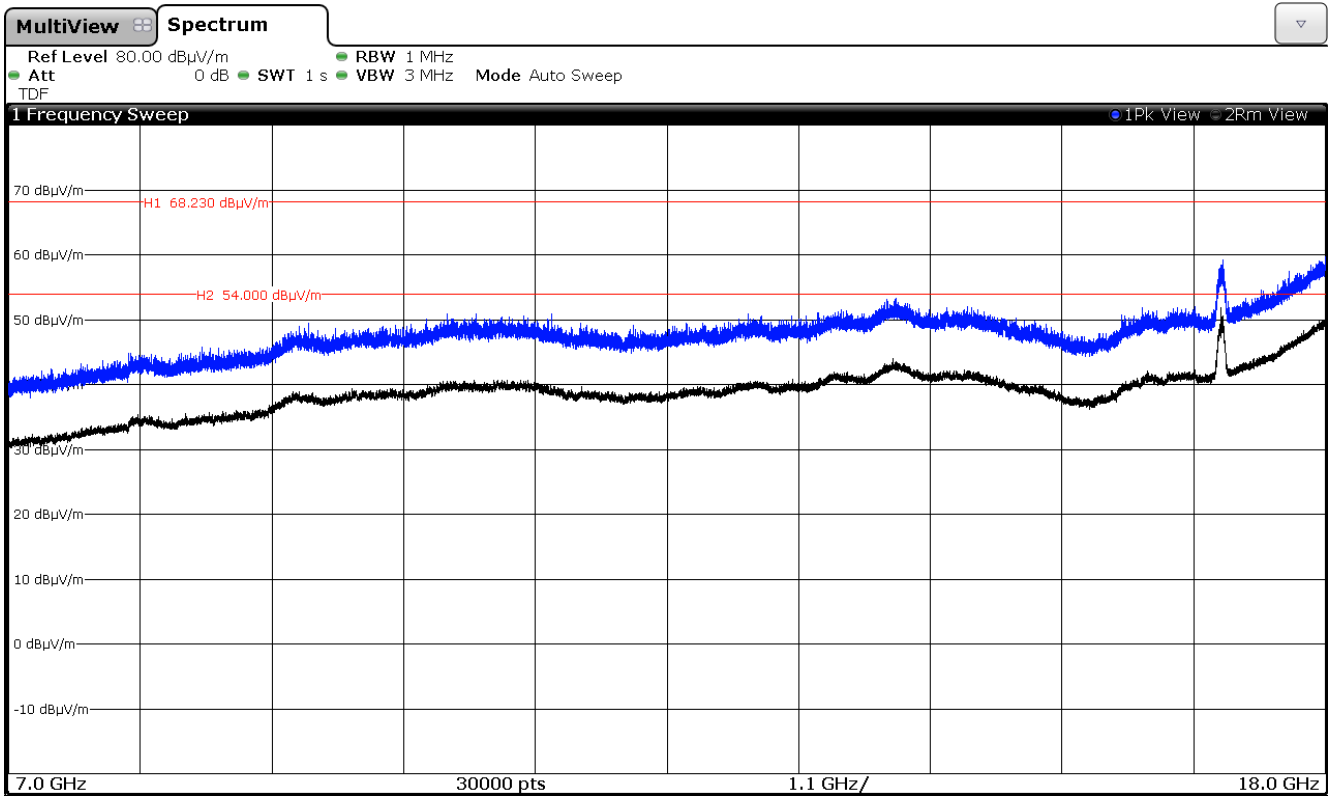
802.11ac40 mode: CH 142 (5710 MHz)
 Chain A



Chain B



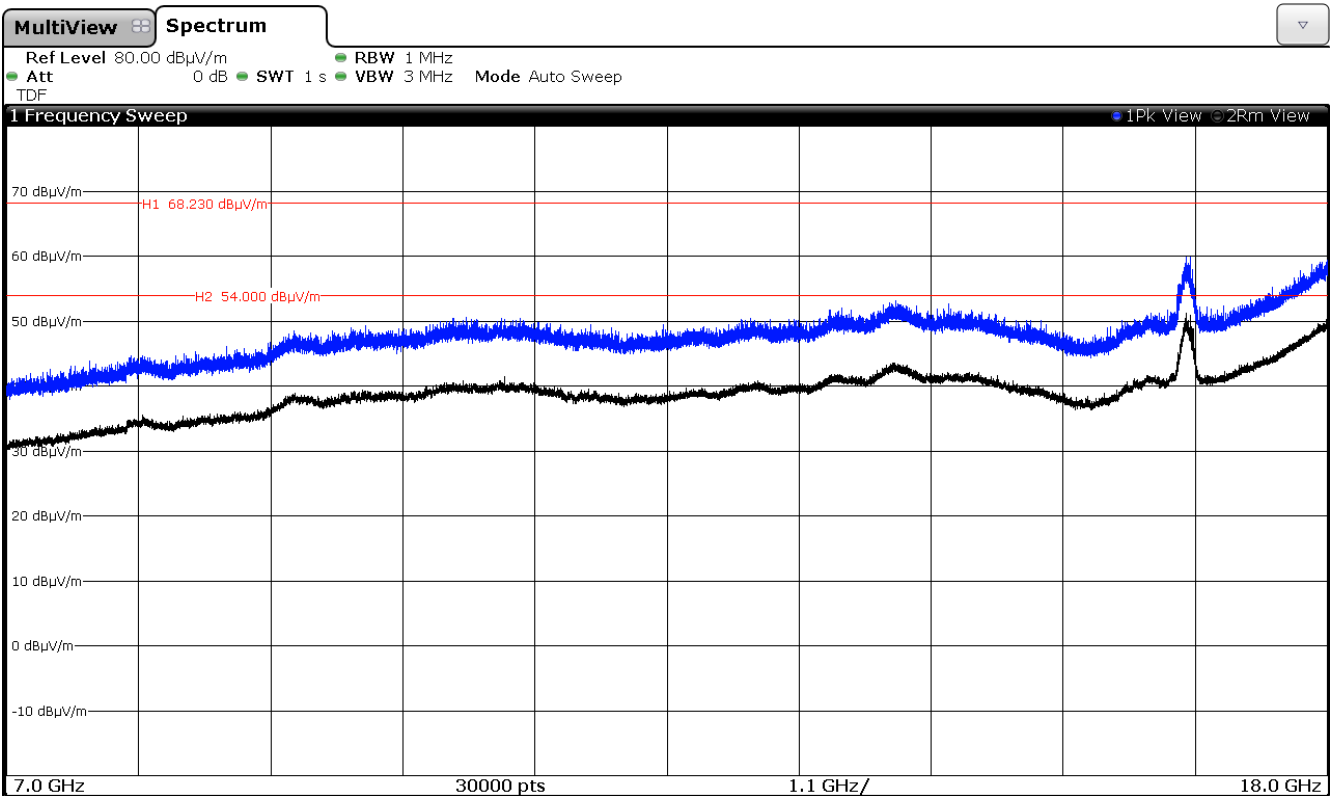
Chain A+B



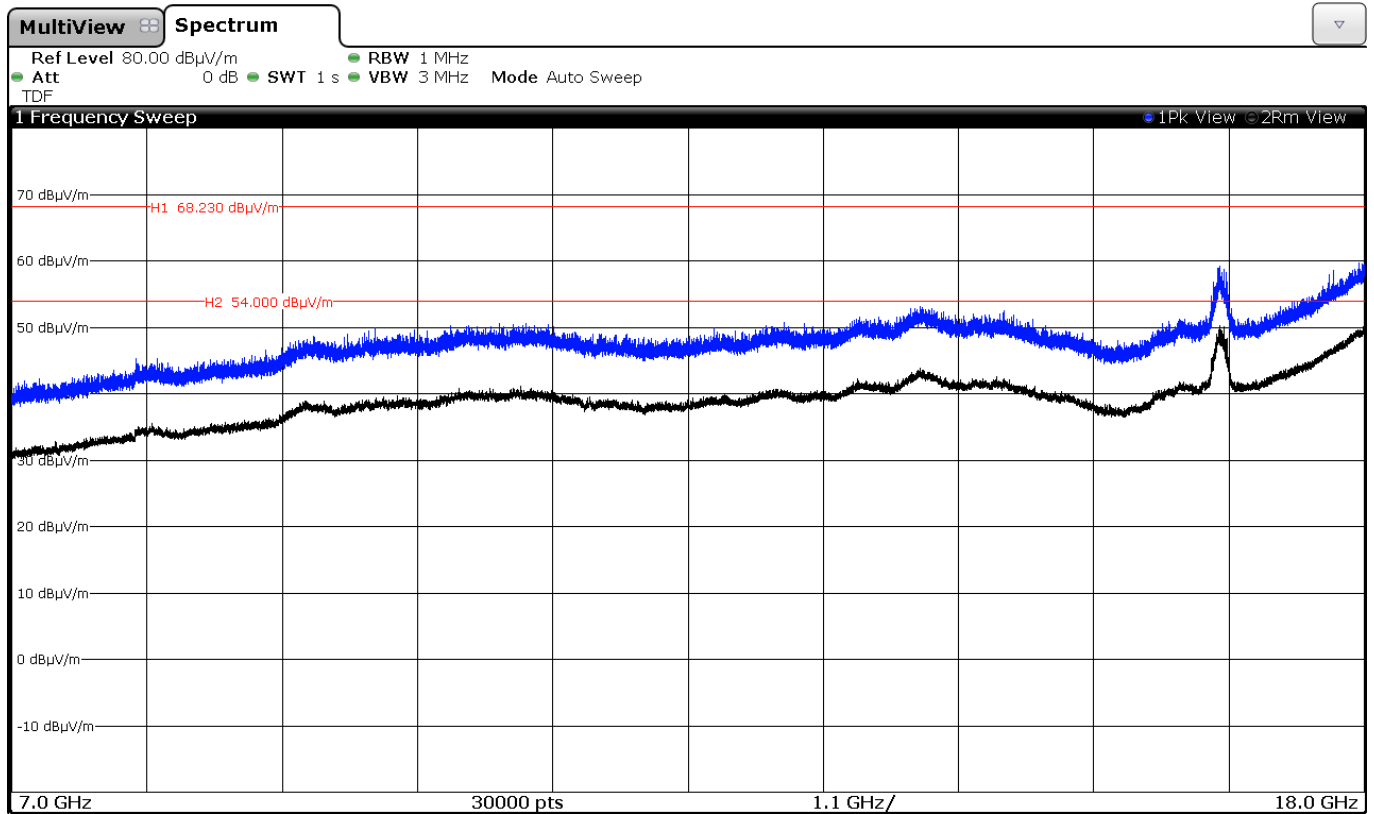
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency (122) 5610 MHz.

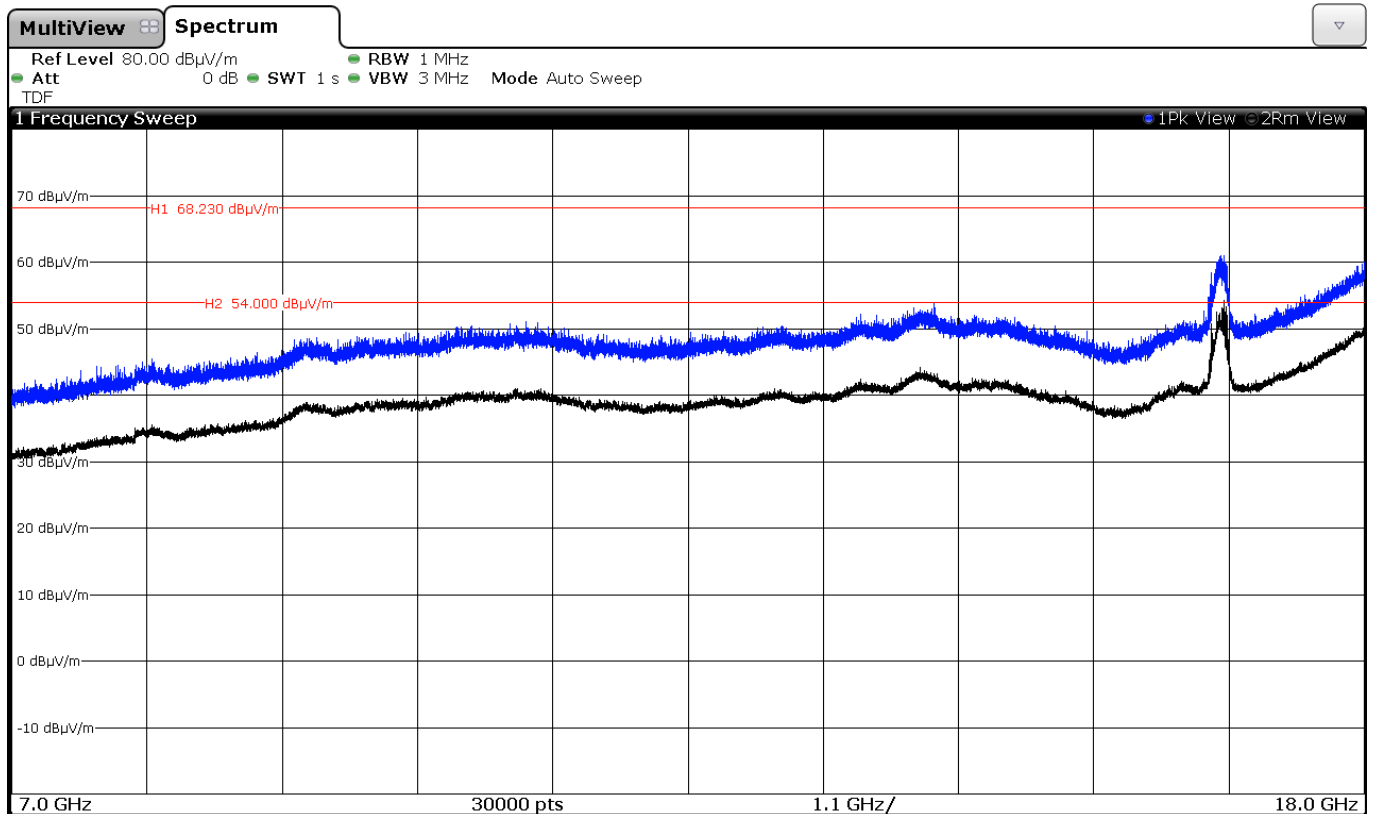
Chain A



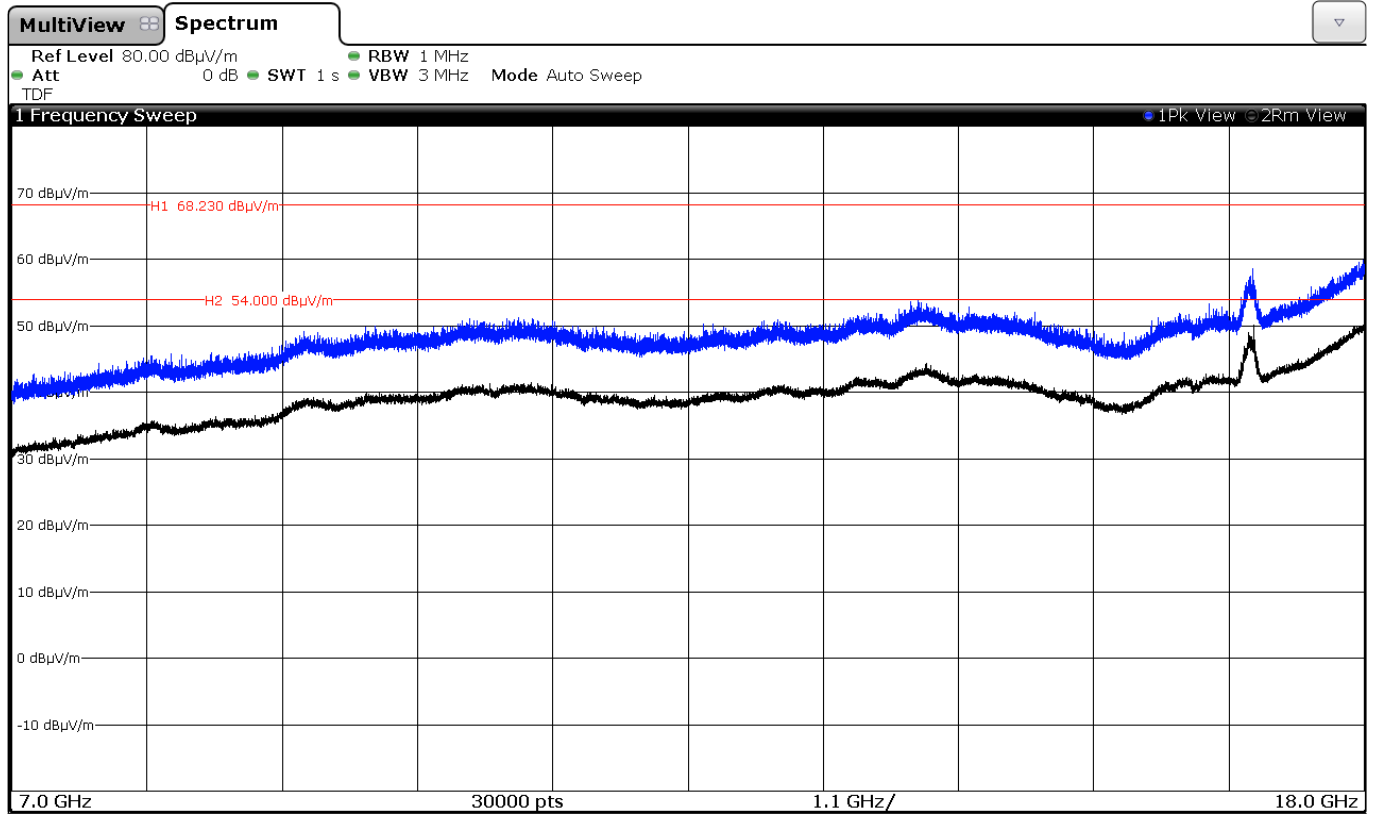
Chain B



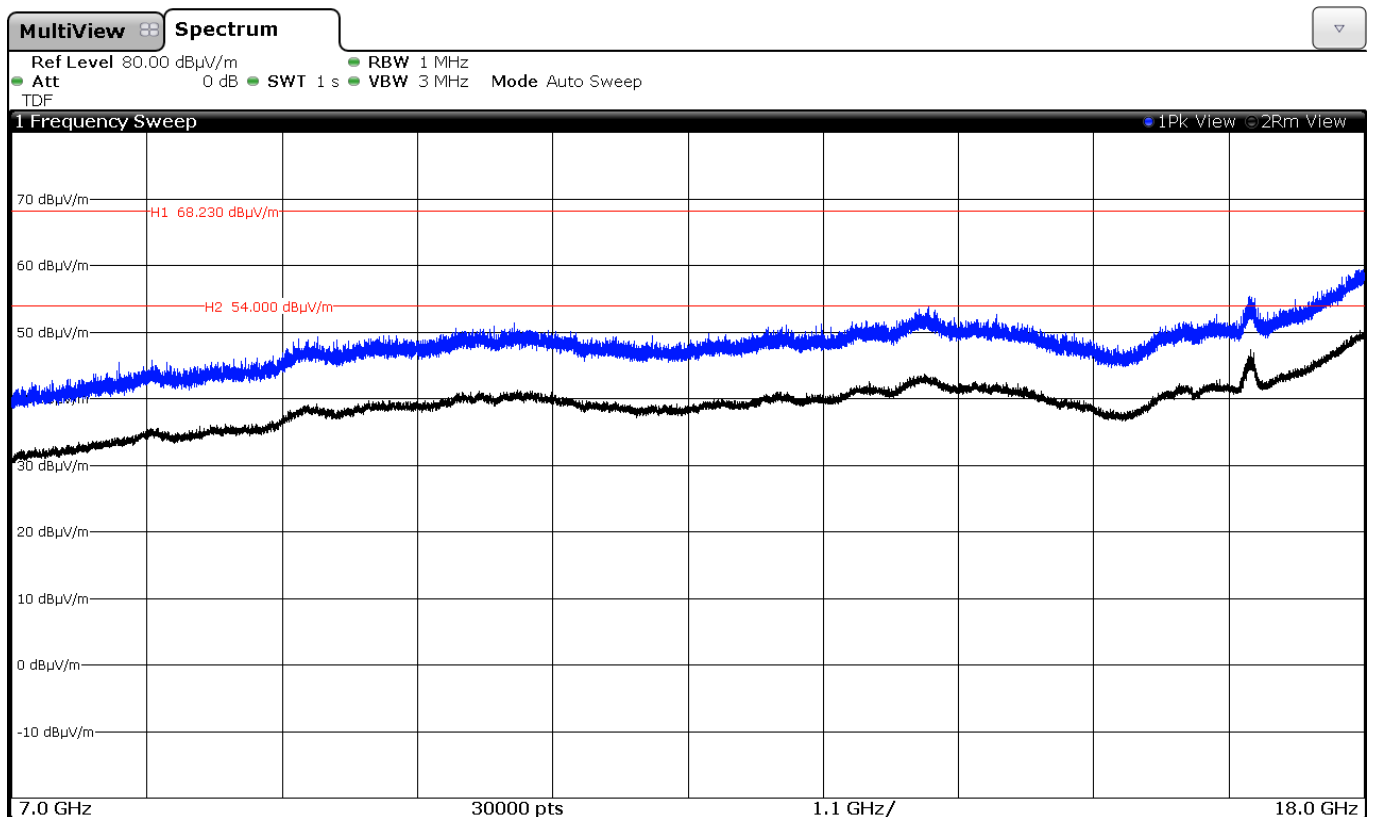
Chain A+B



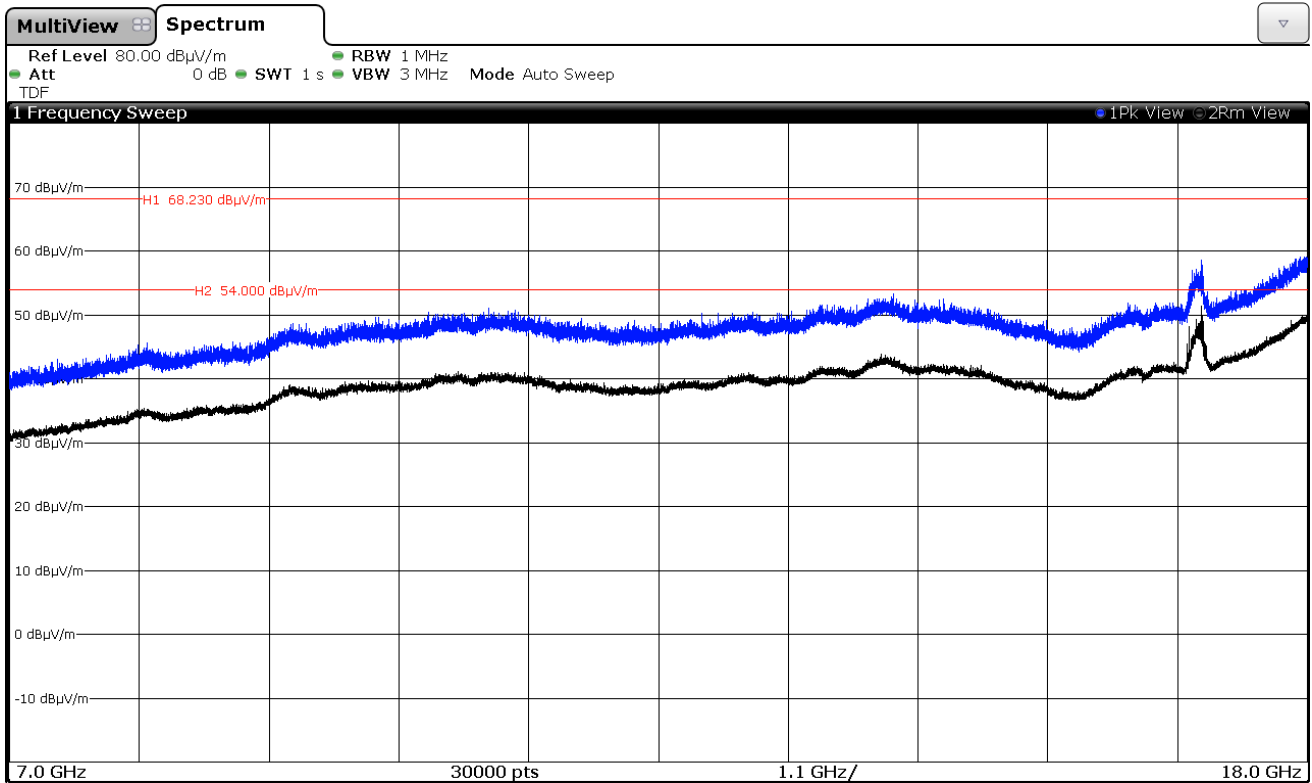
802.11ac80 mode: CH 138 (5690 MHz)
 Chain A



Chain B



Chain A+B

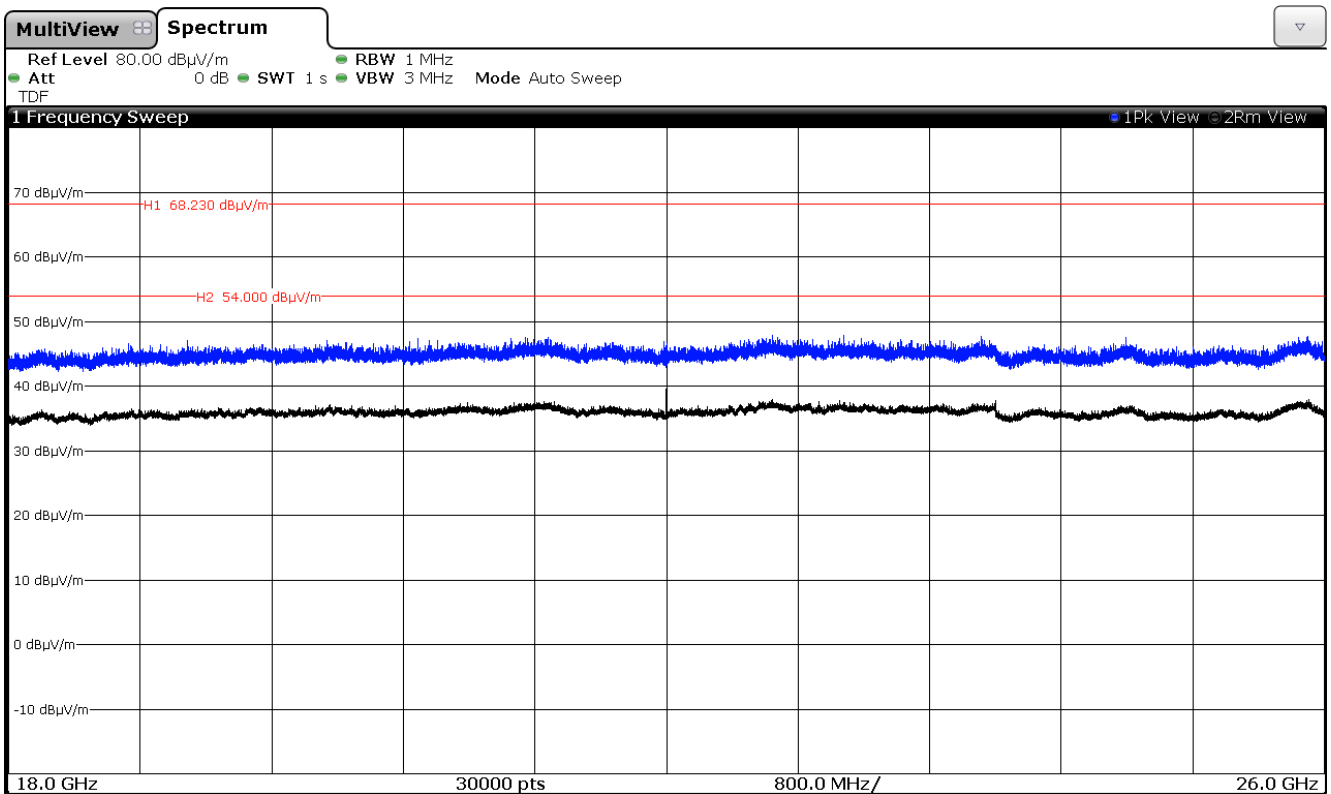


FREQUENCY RANGE 18 GHz to 26 GHz.

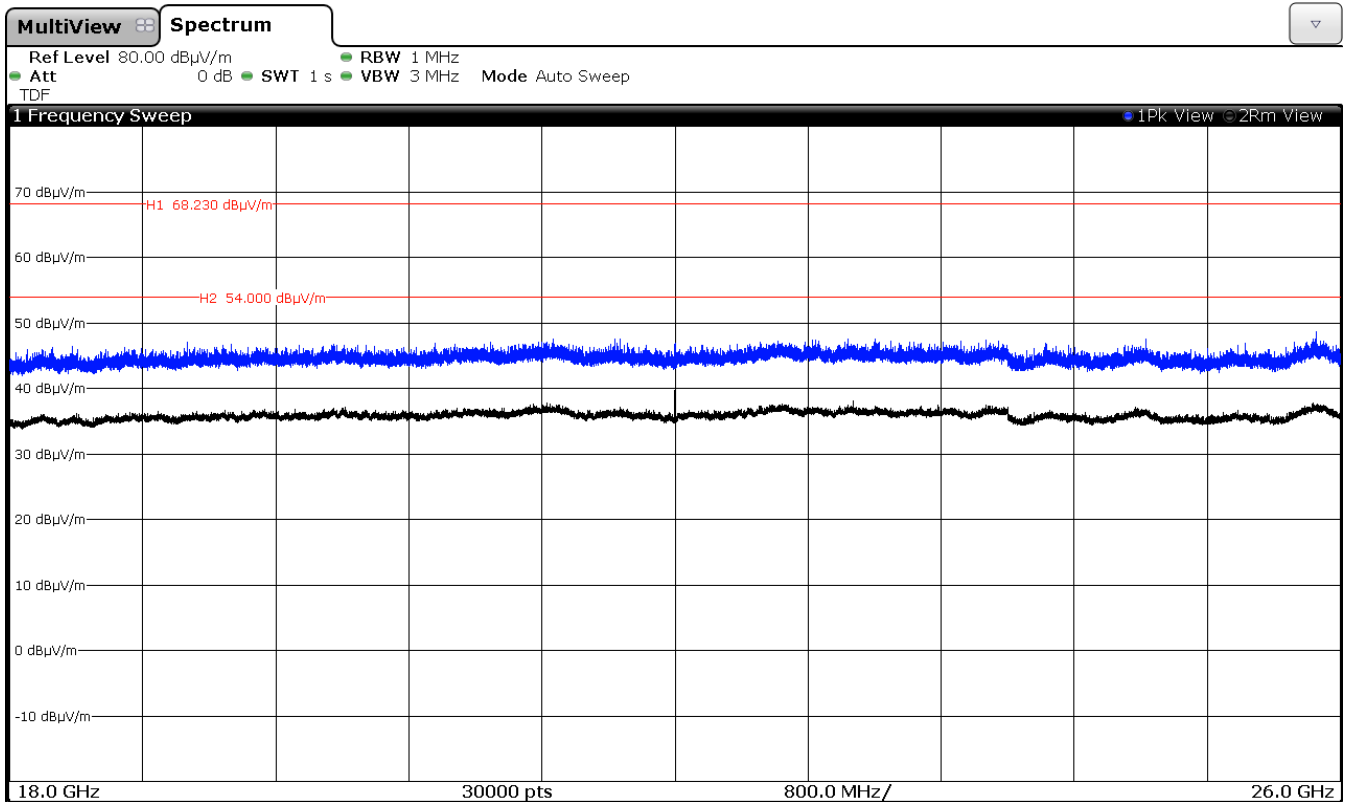
1. WiFi 5GHz 802.11 a mode

Lowest frequency (100) 5500 MHz.

Chain A

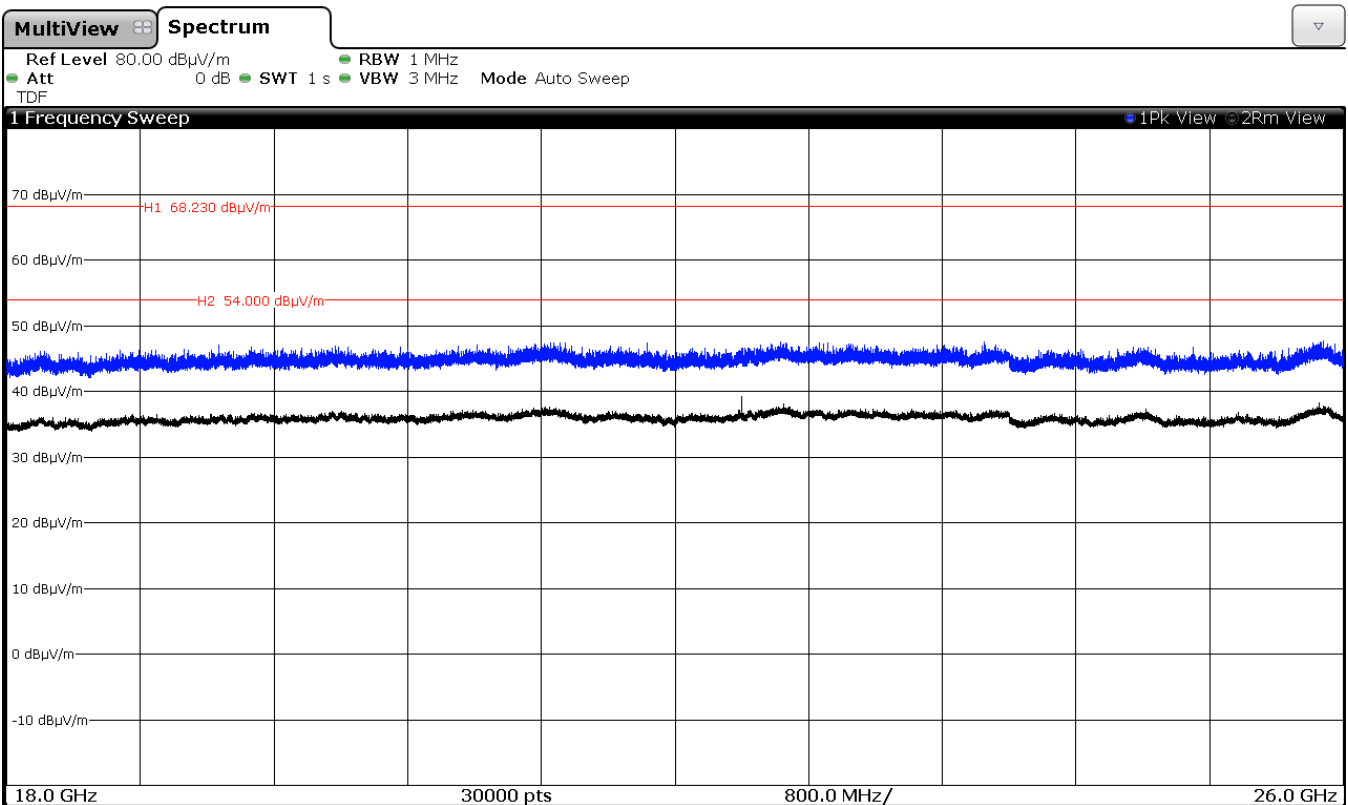


Chain B

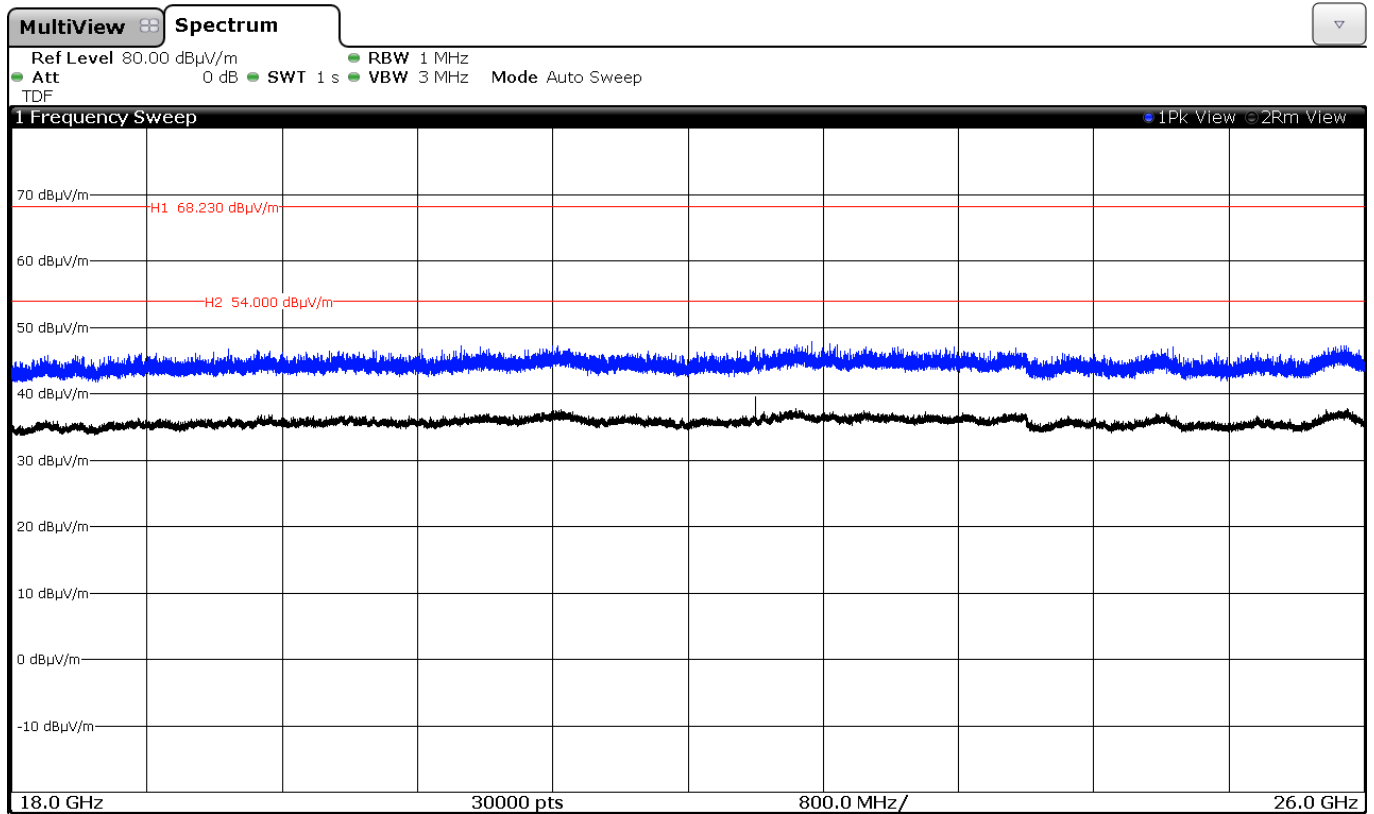


Middle frequency (120) 5600 MHz.

Chain A

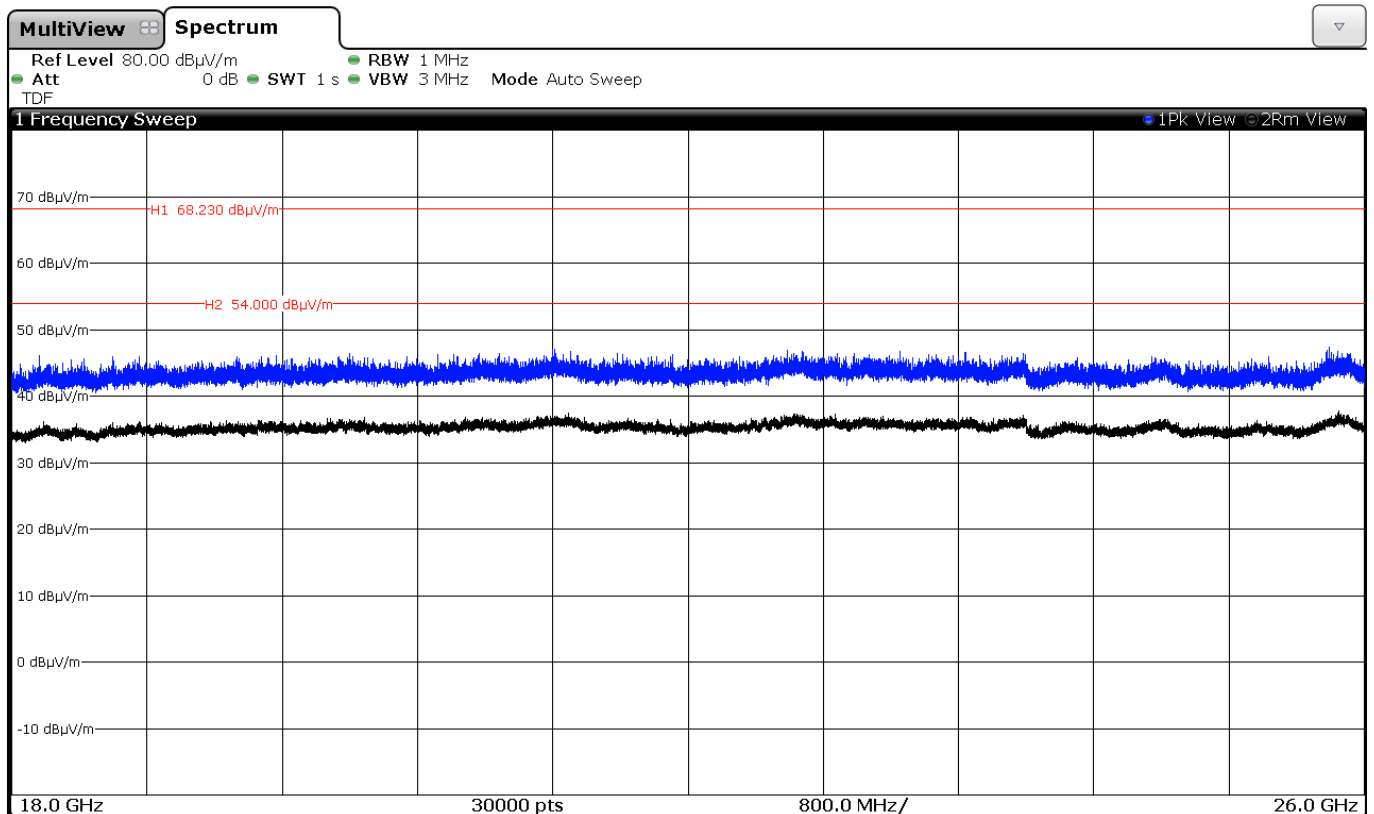


Chain B

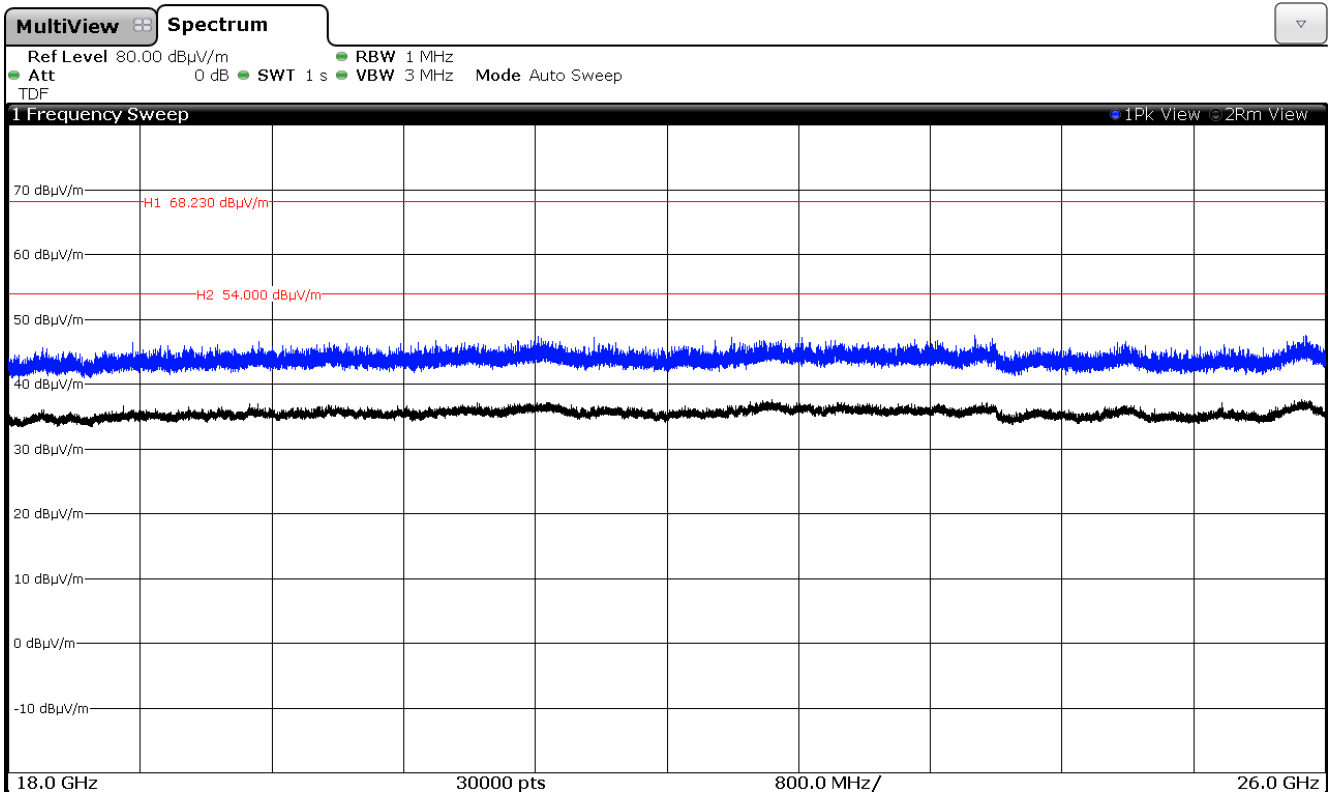


Highest frequency (140) 5700 MHz.

Chain A



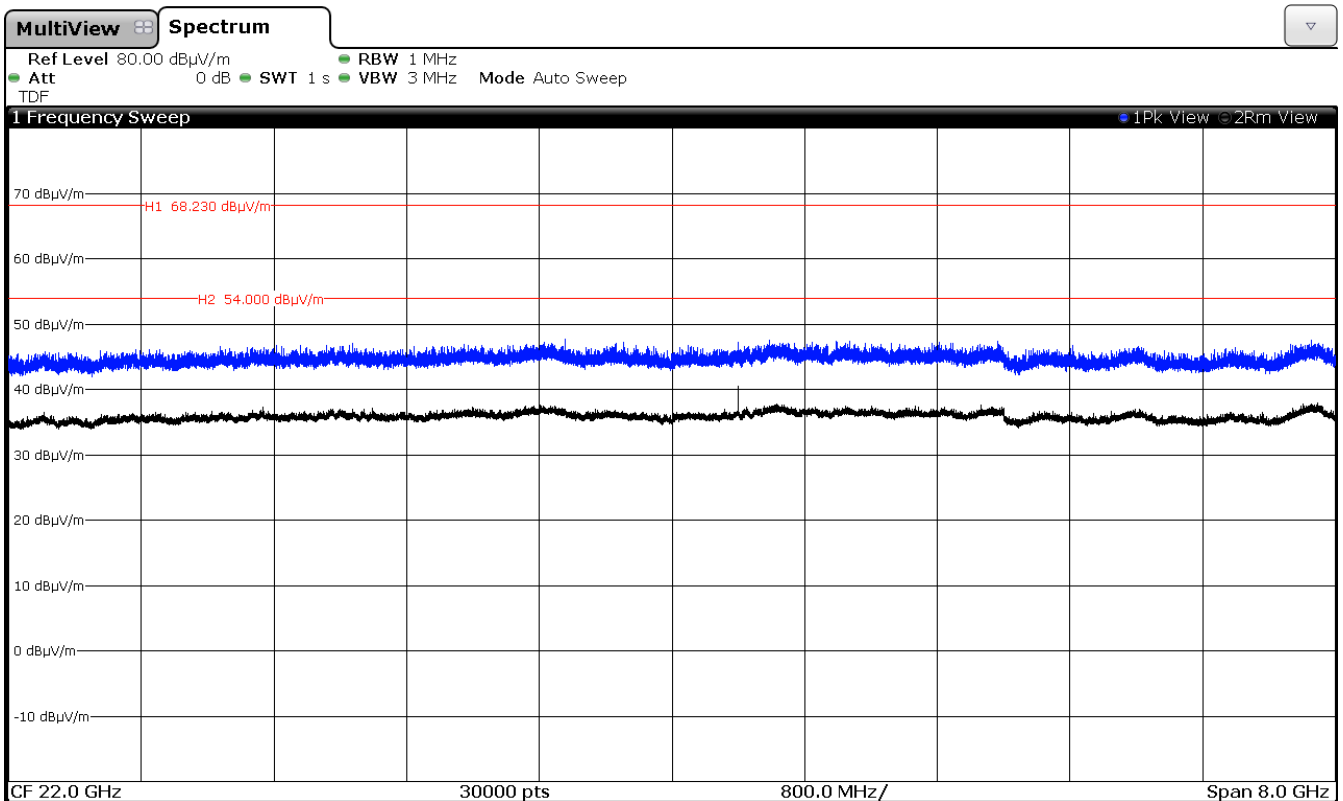
Chain B



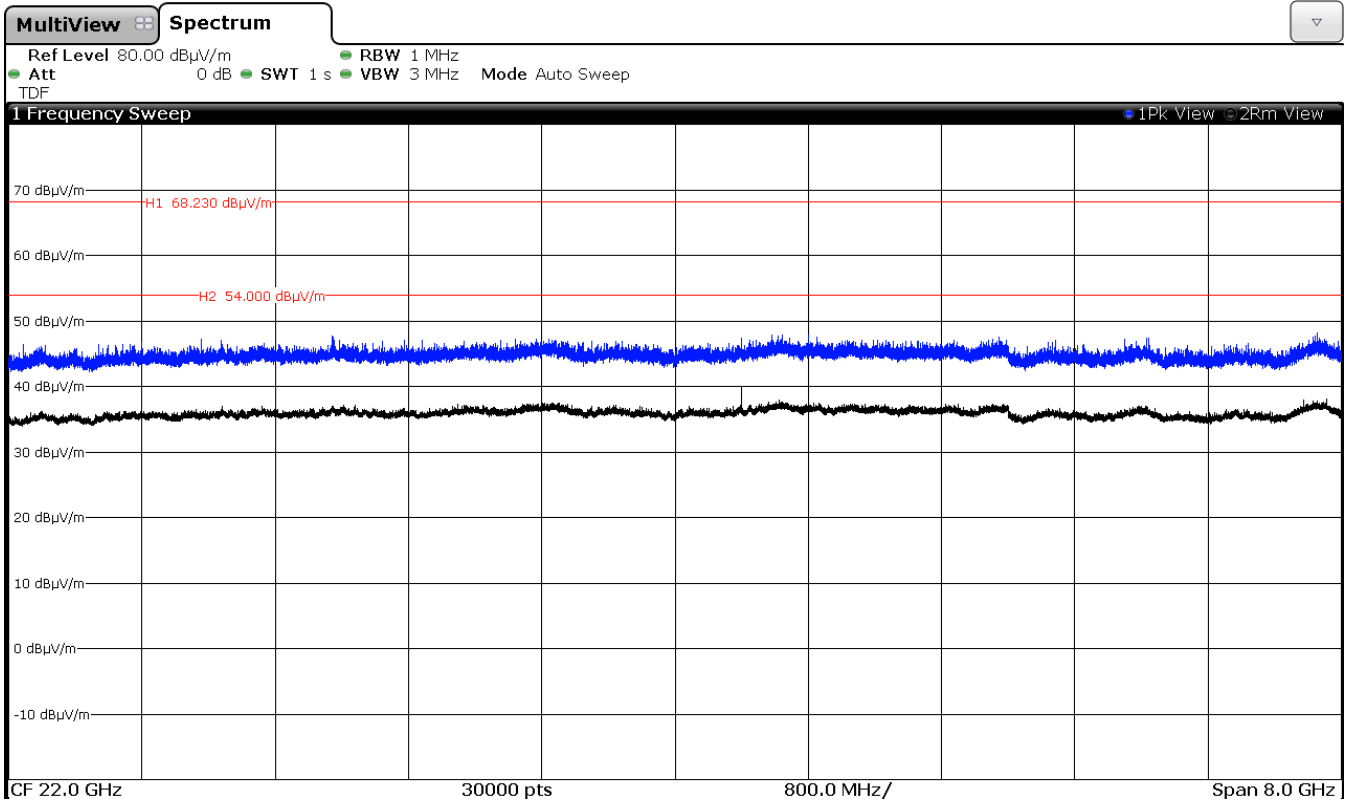
2. WiFi 5GHz 802.11 n20 mode

Middle frequency (120) 5600 MHz.

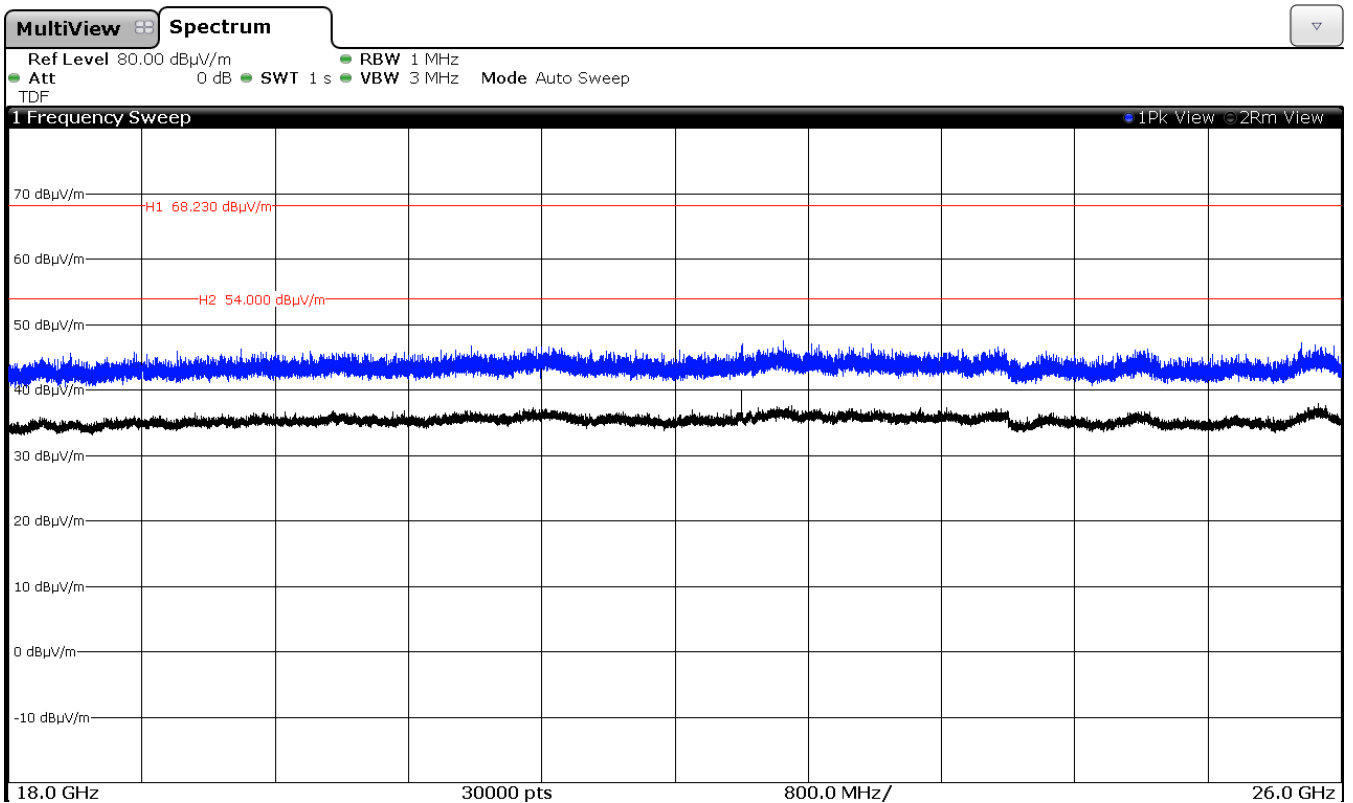
Chain A



Chain B

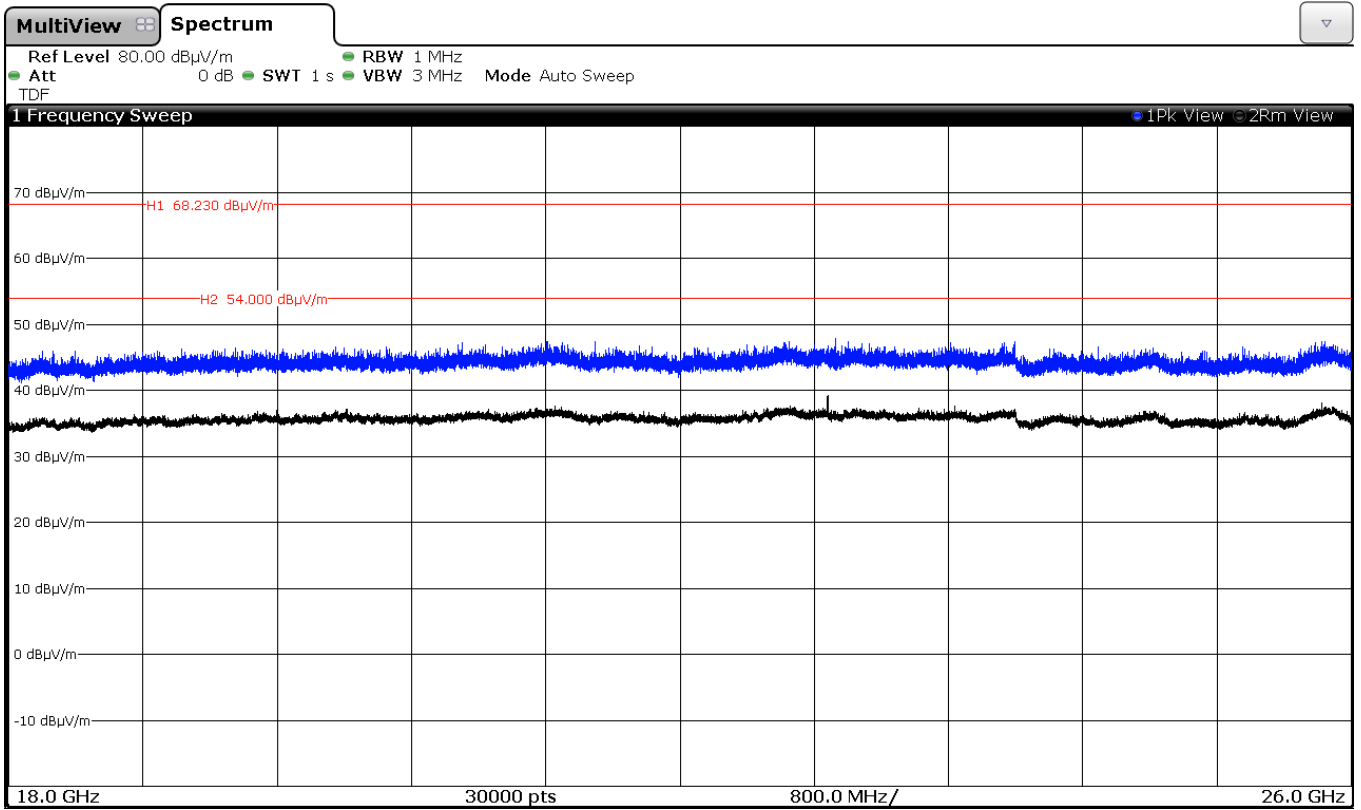


Chain A+B

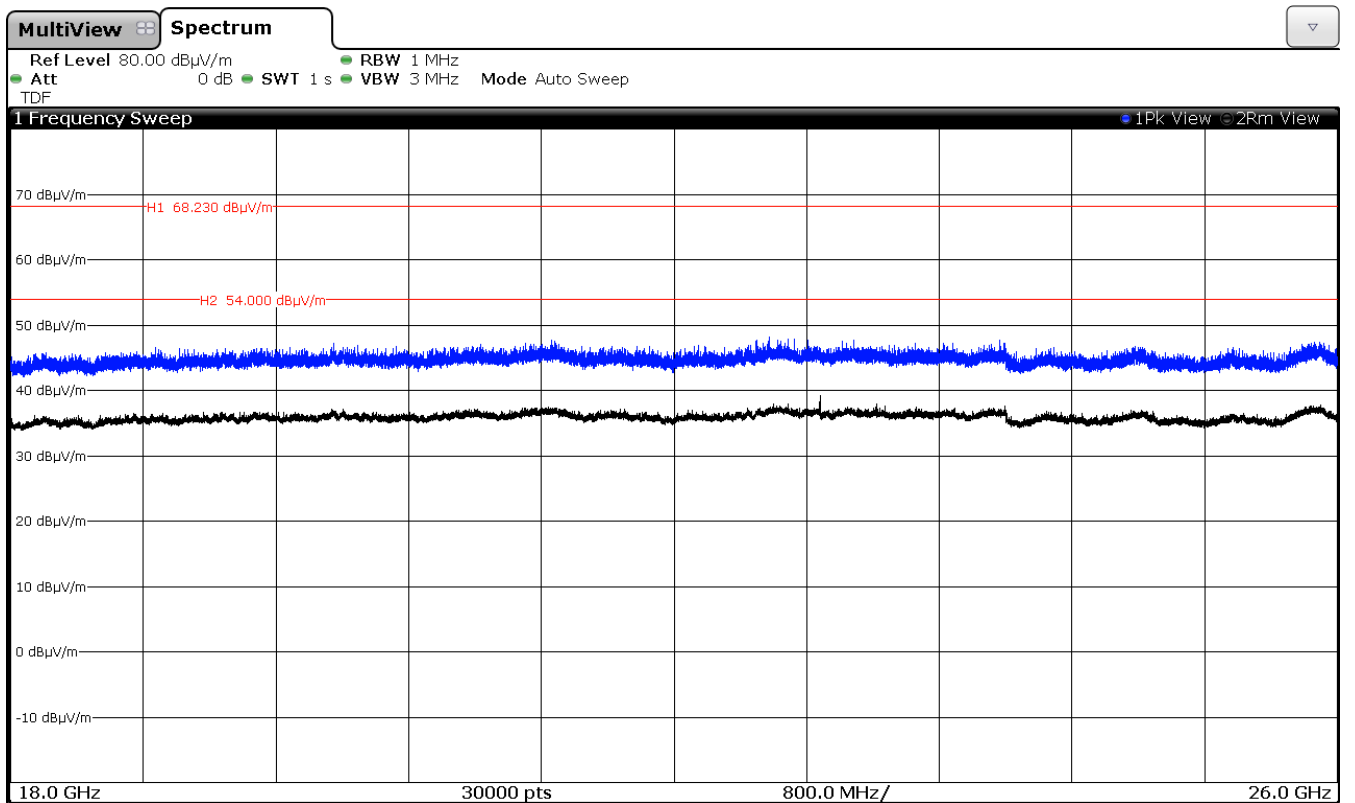


802.11ac20 mode: CH 144 (5720 MHz)

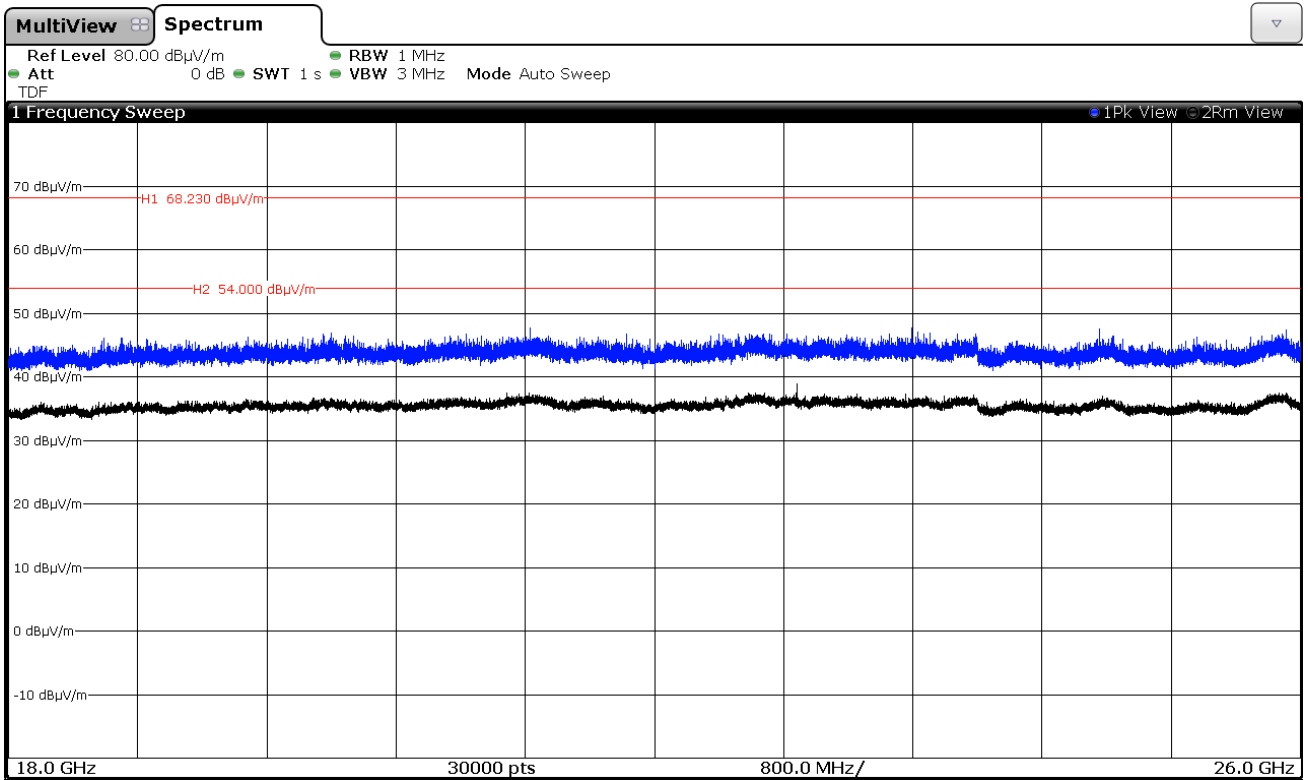
Chain A



Chain B



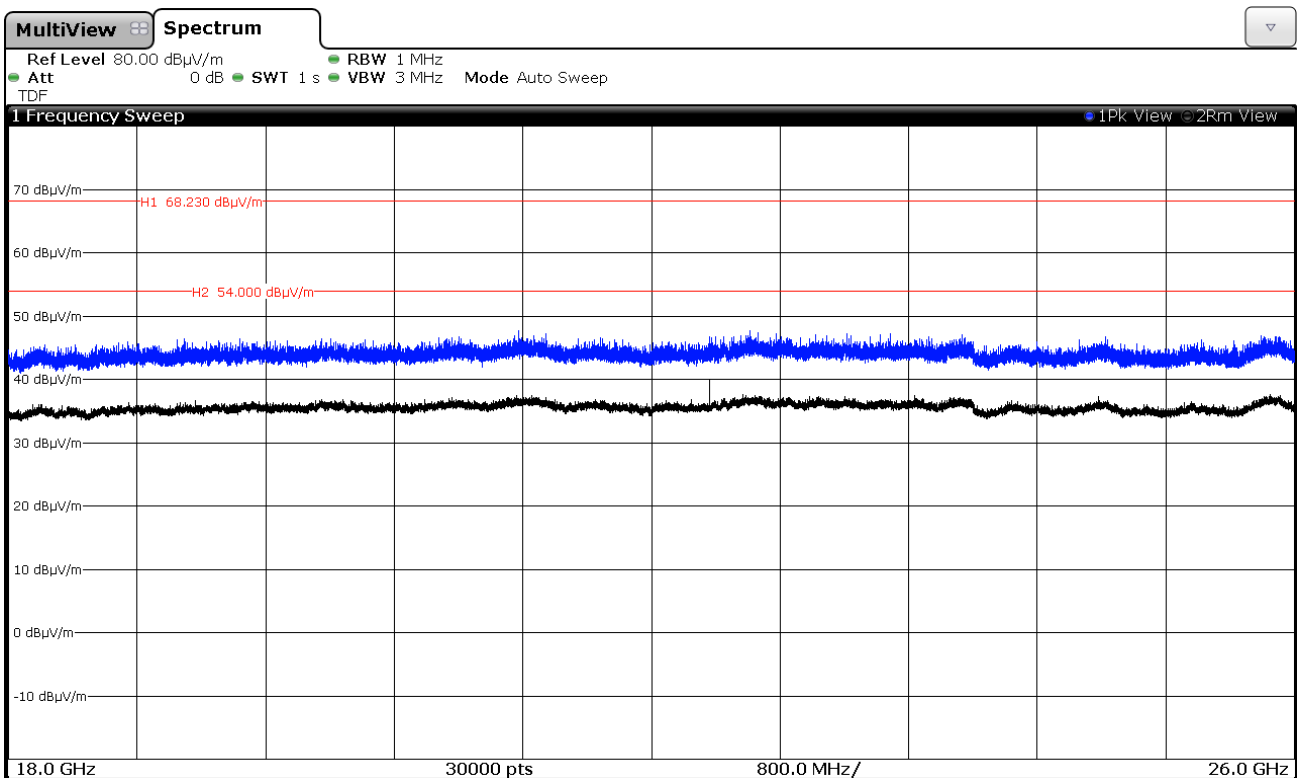
Chain A+B



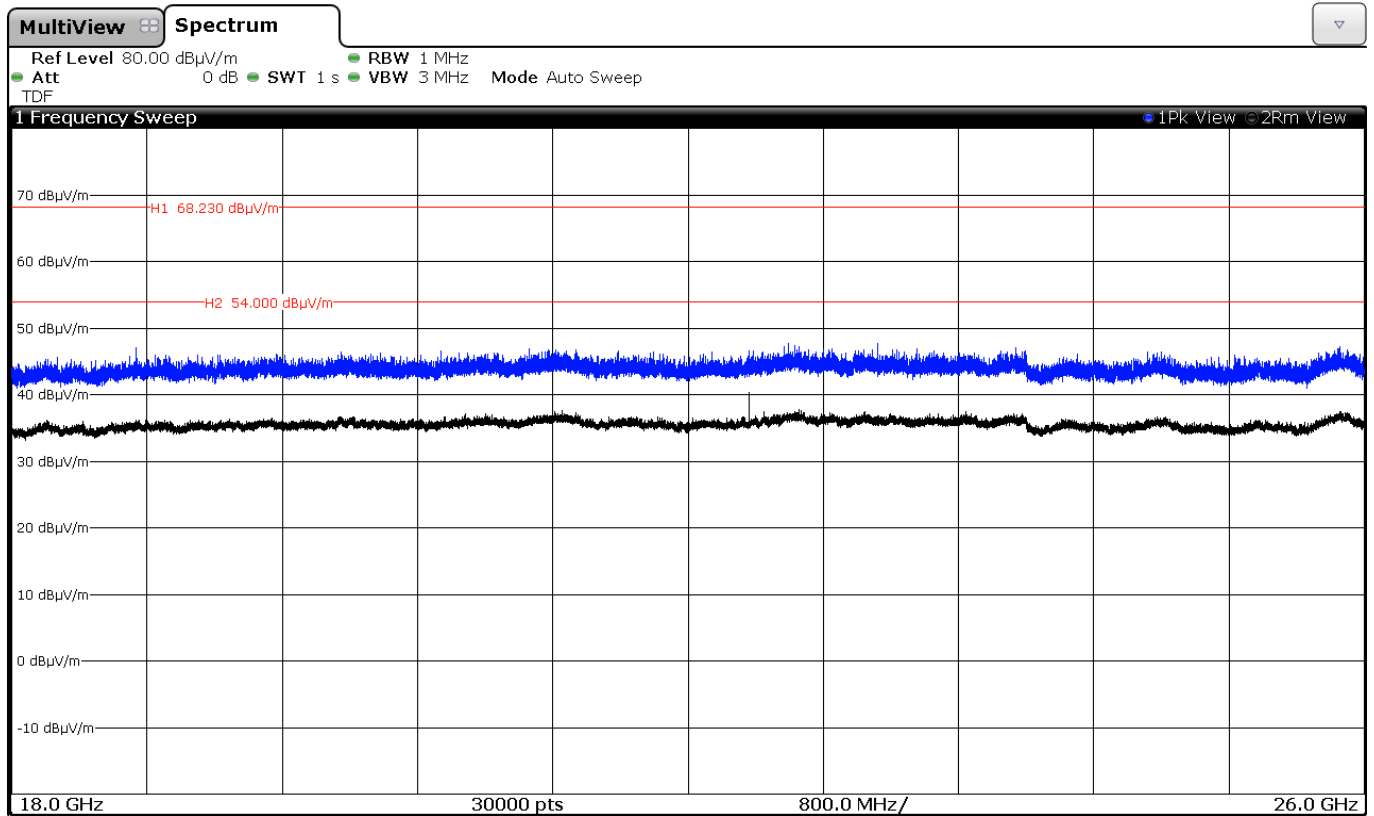
3. WiFi 5GHz 802.11 n40 mode

Middle frequency (118) 5590 MHz.

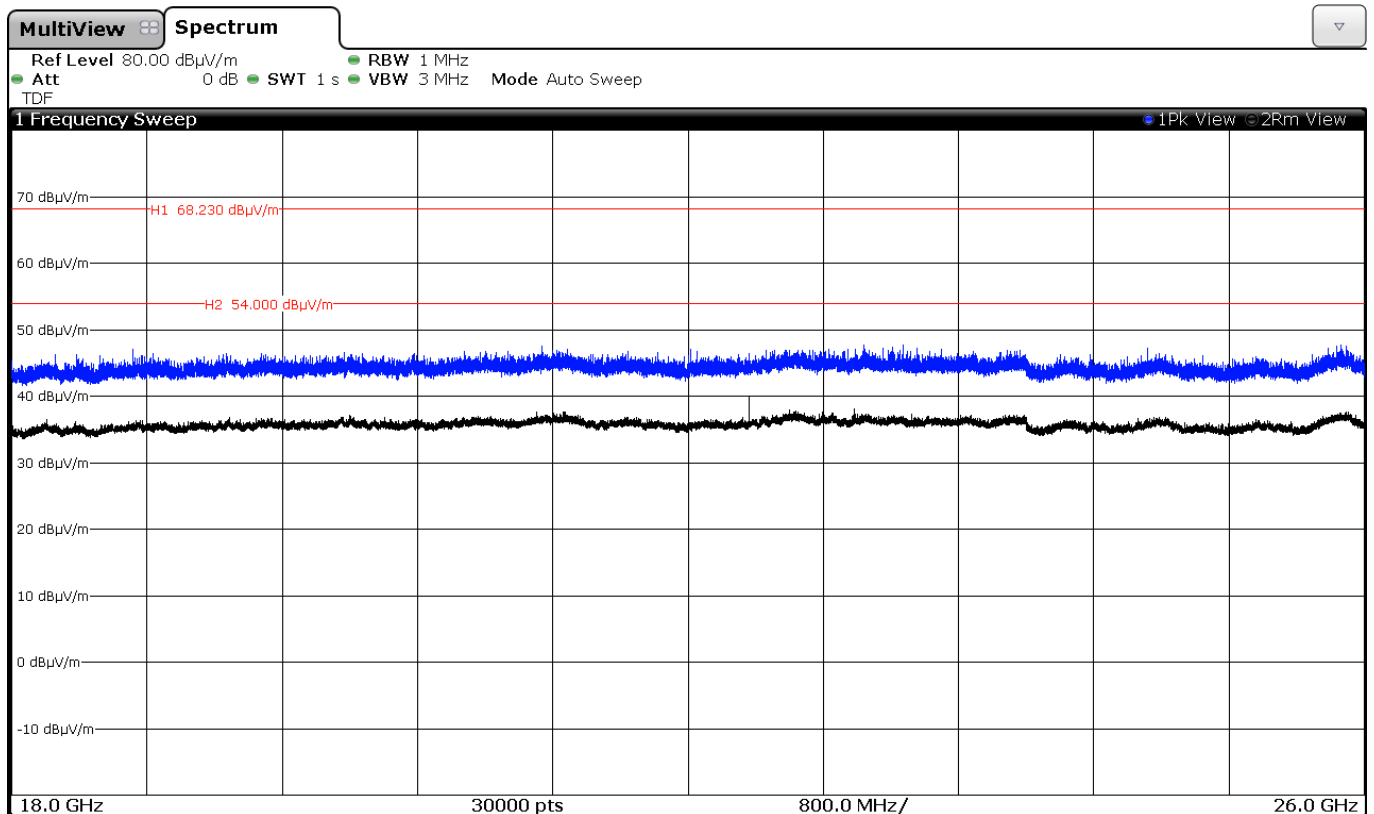
Chain A



Chain B

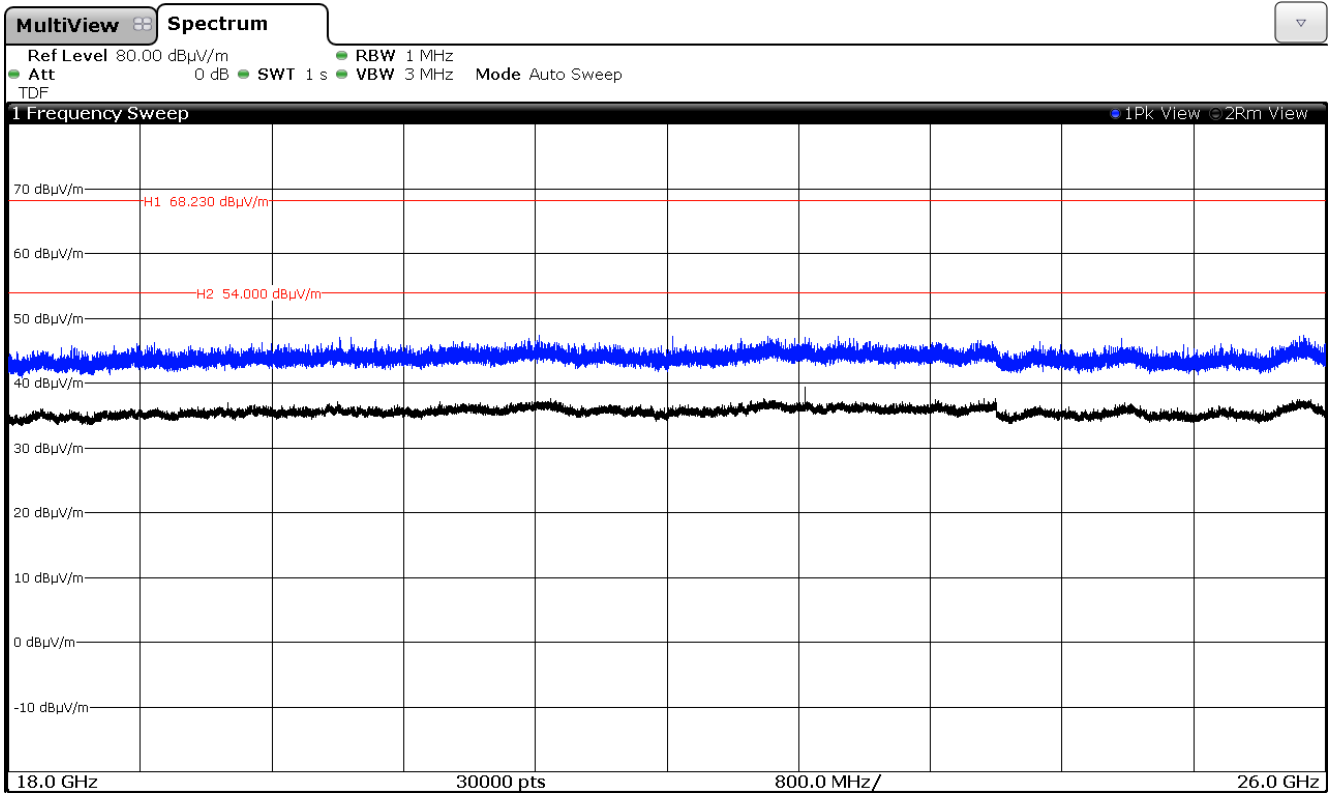


Chain A+B

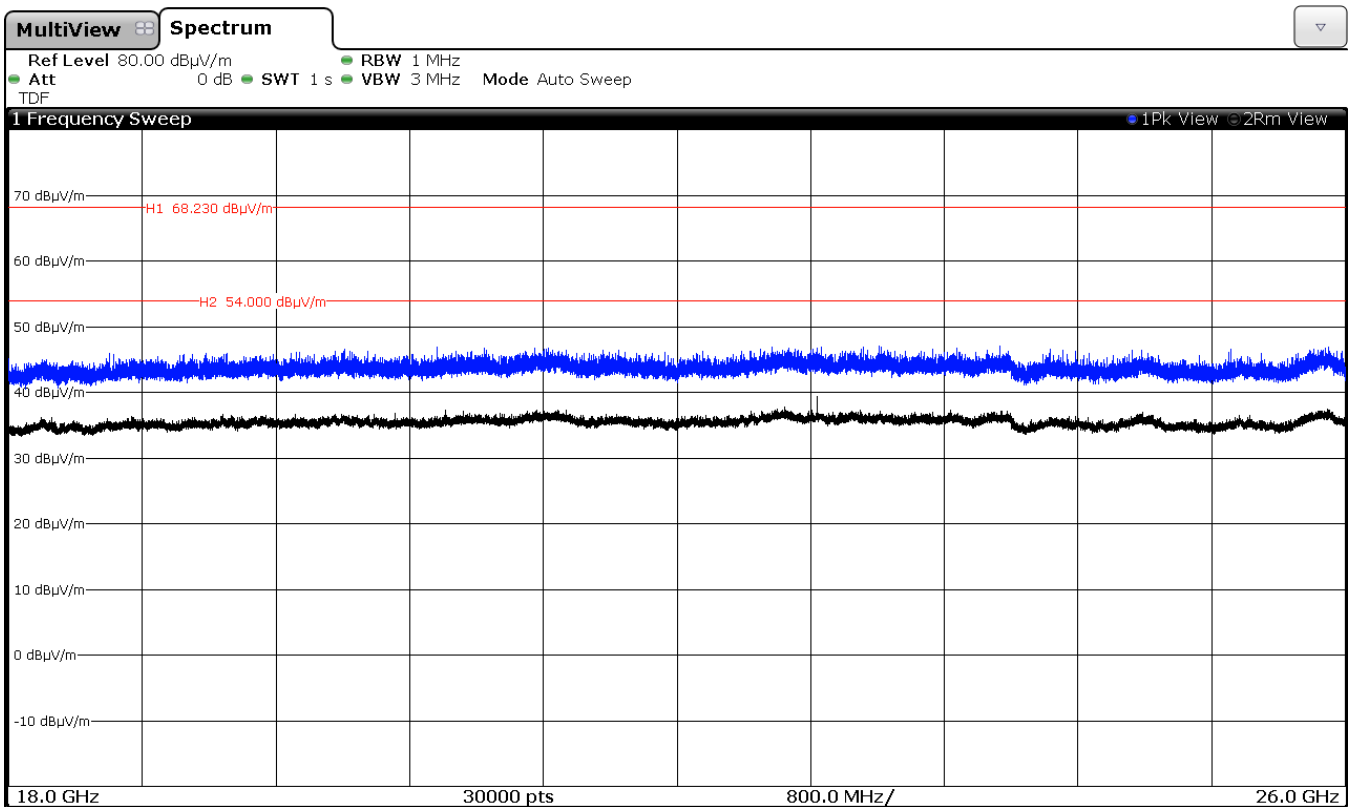


802.11ac40 mode: CH 142 (5710 MHz)

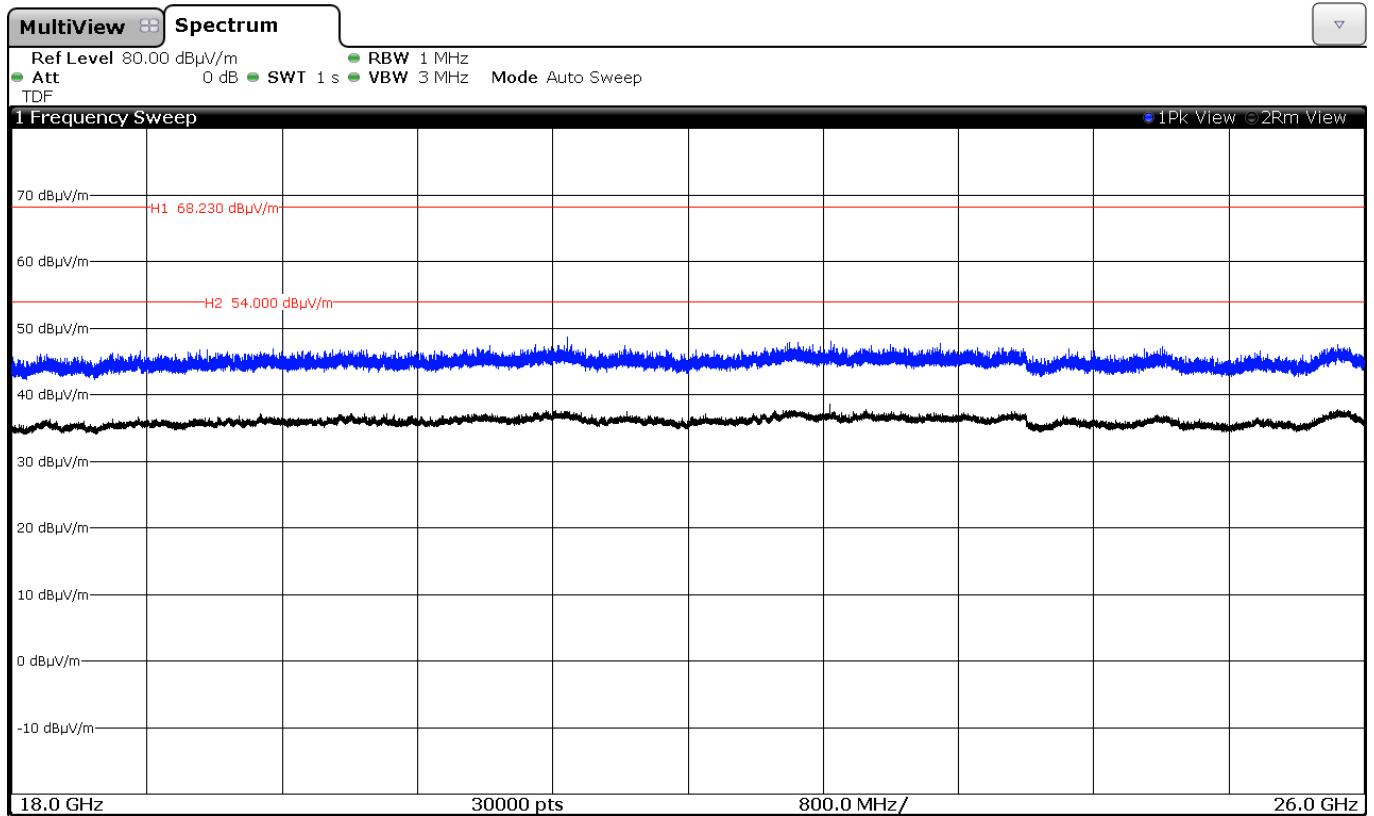
Chain A



Chain B



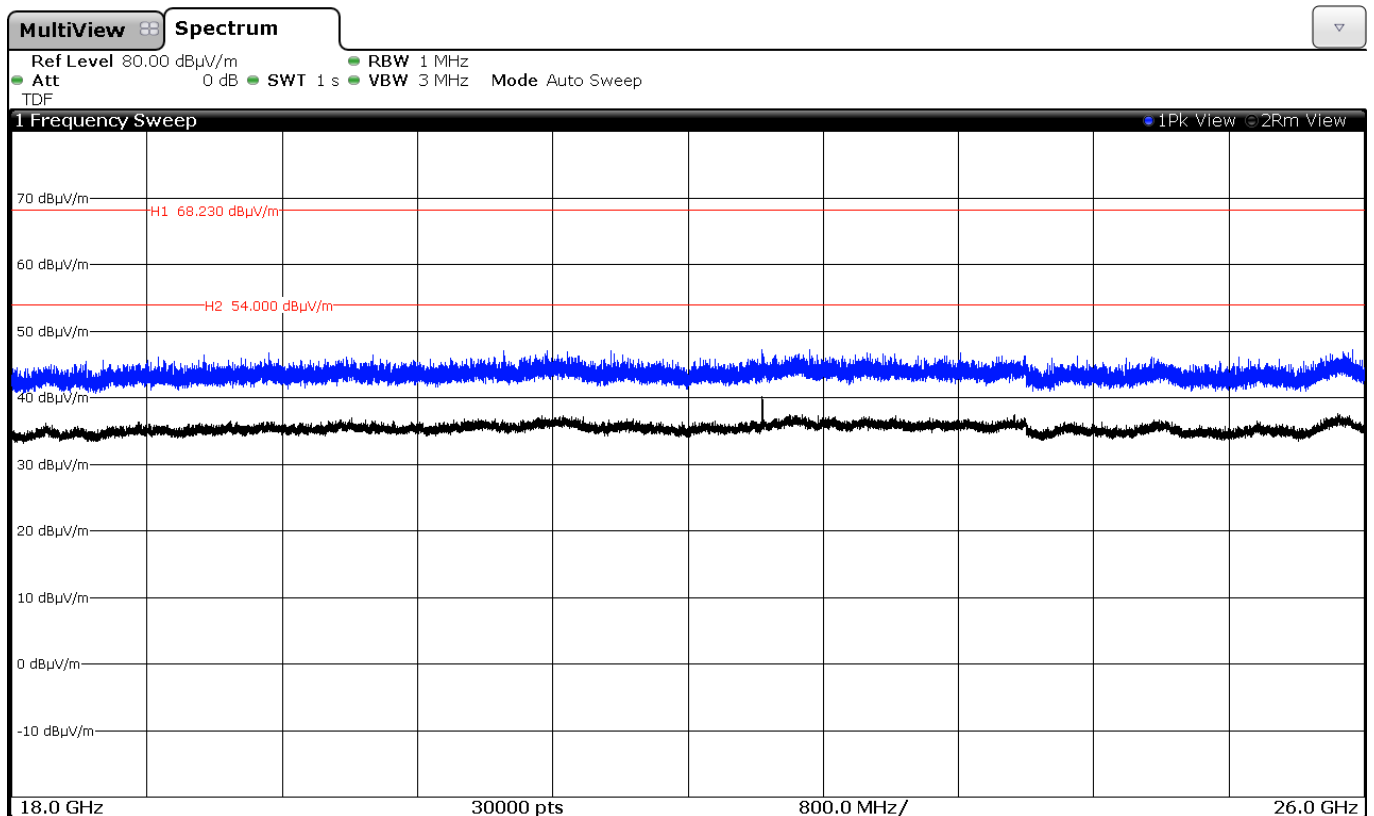
Chain A+B



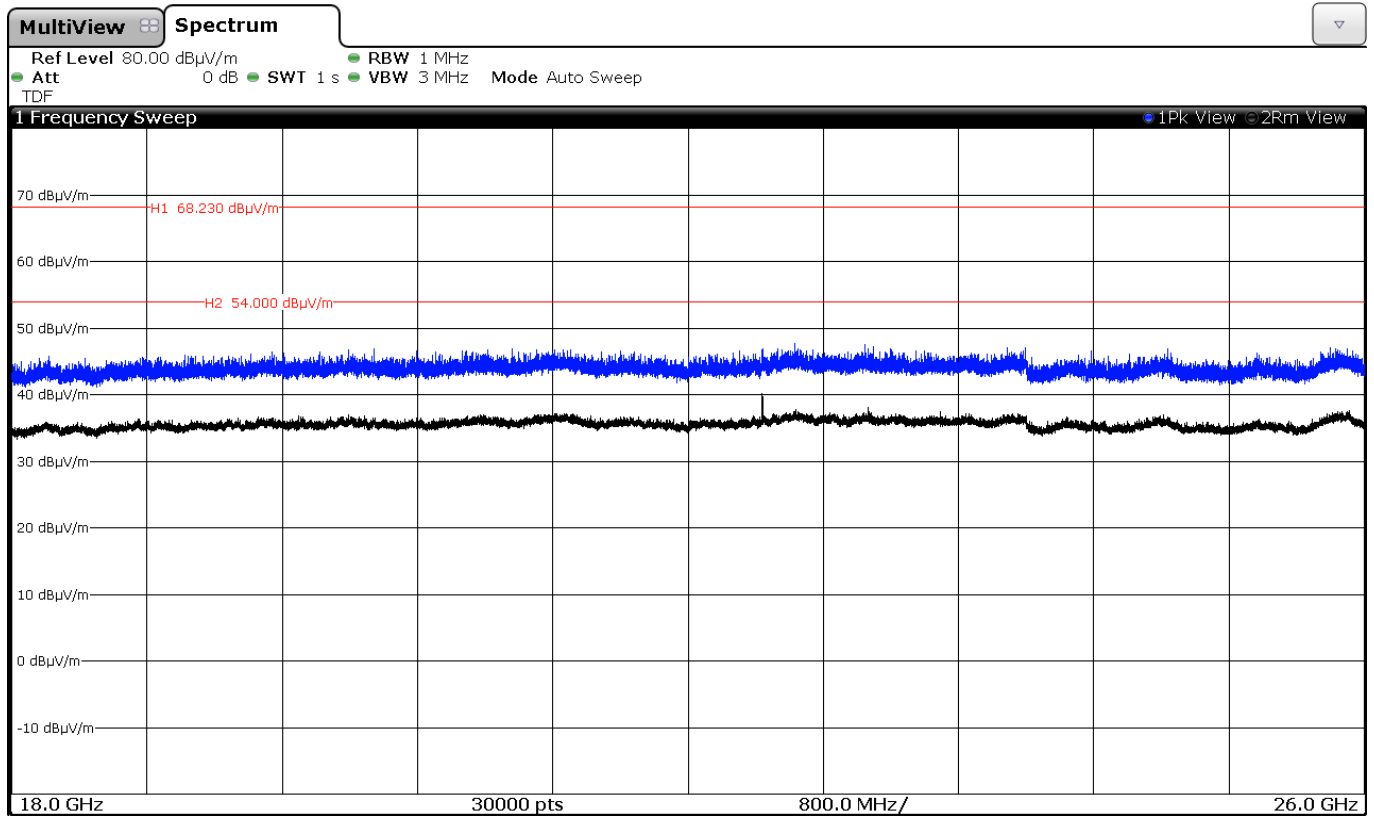
4. WiFi 5GHz 802.11 ac80 mode

Middle frequency (122) 5610 MHz.

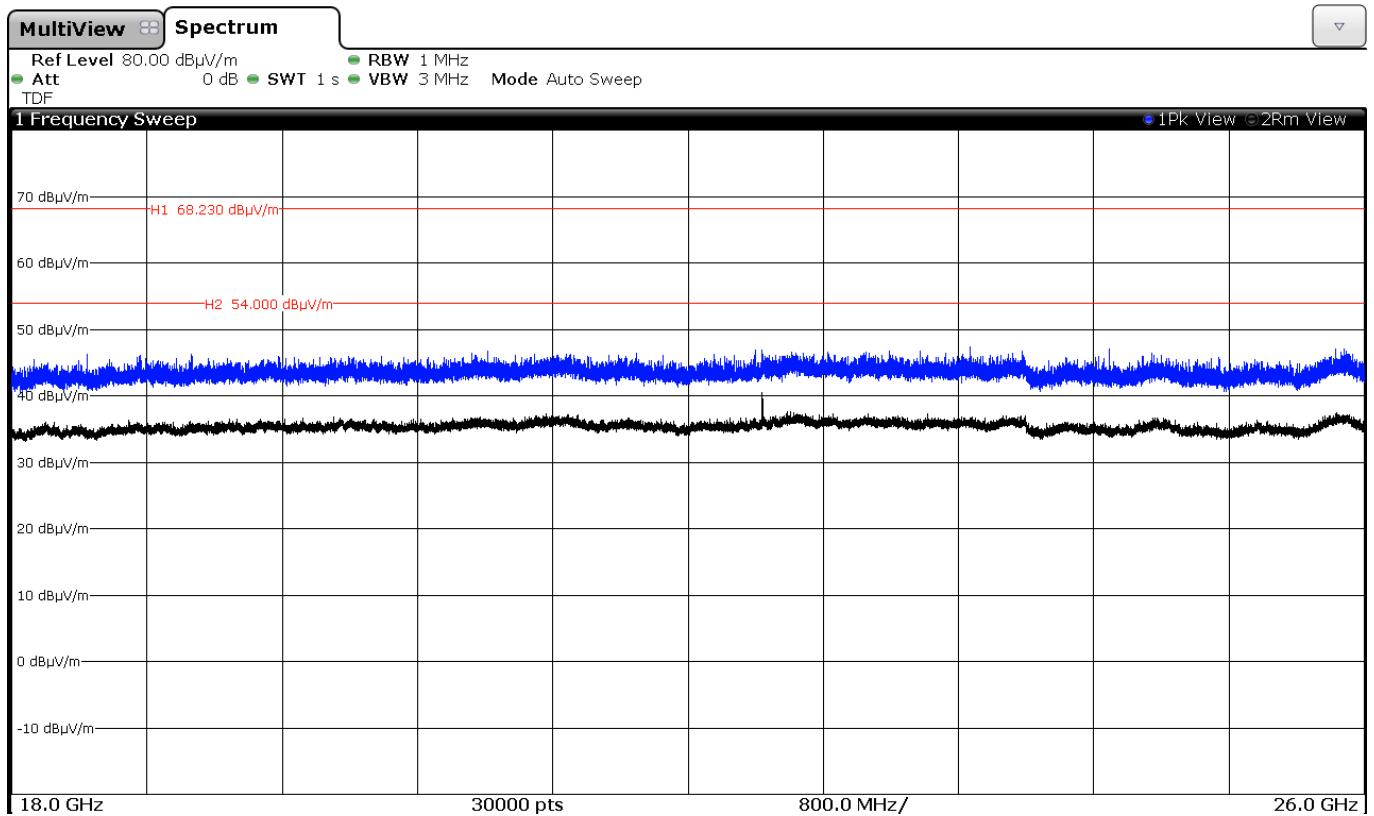
Chain A



Chain B

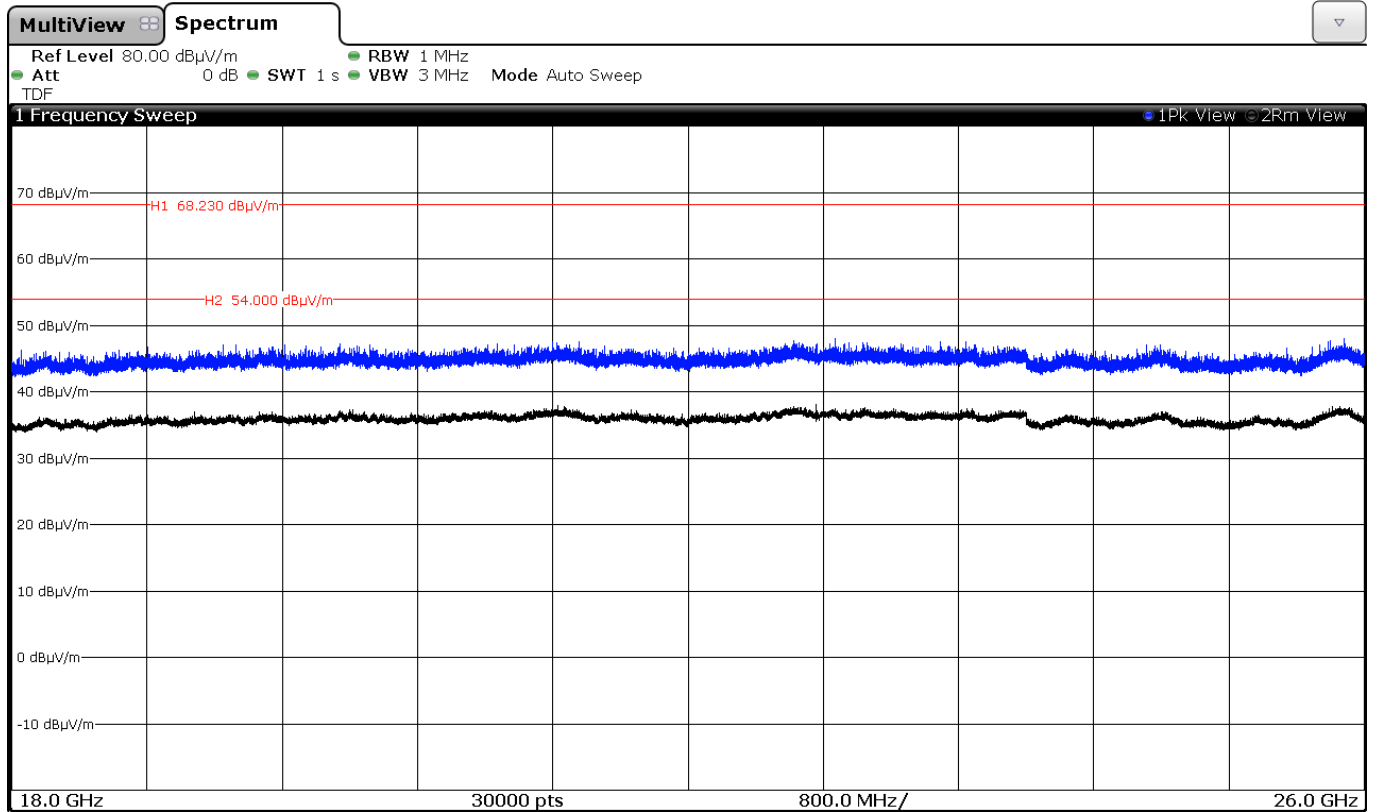


Chain A+B

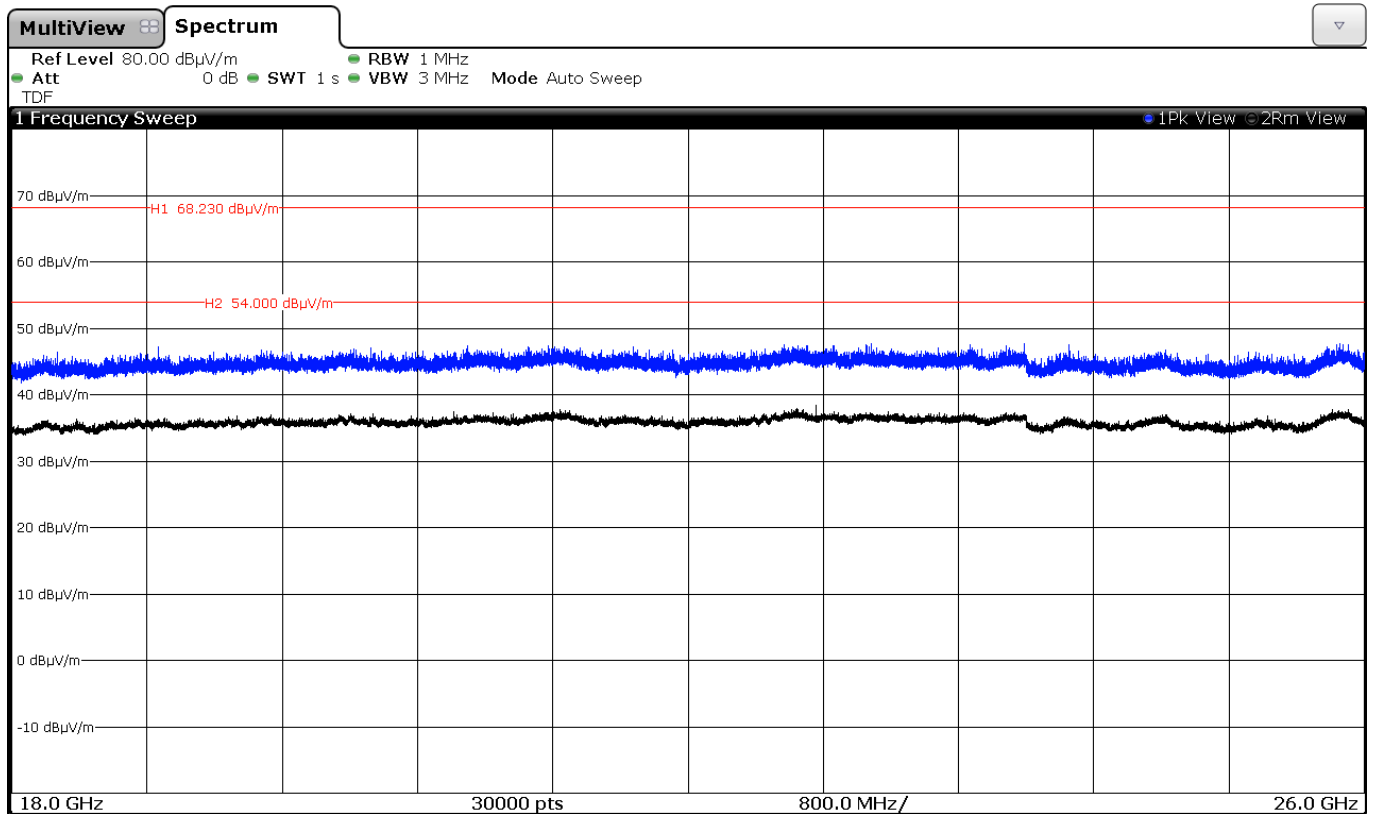


802.11ac80 mode: CH 138 (5690 MHz)

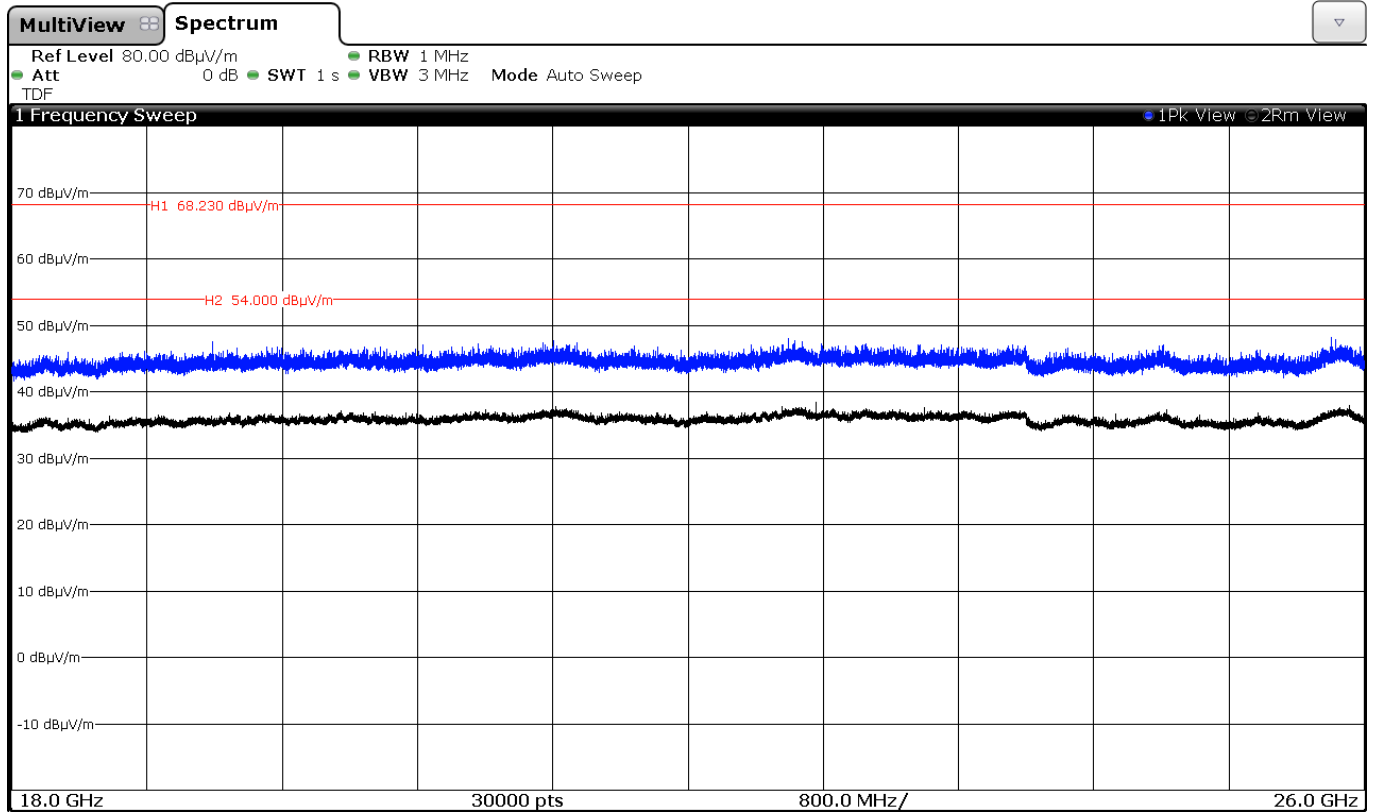
Chain A



Chain B

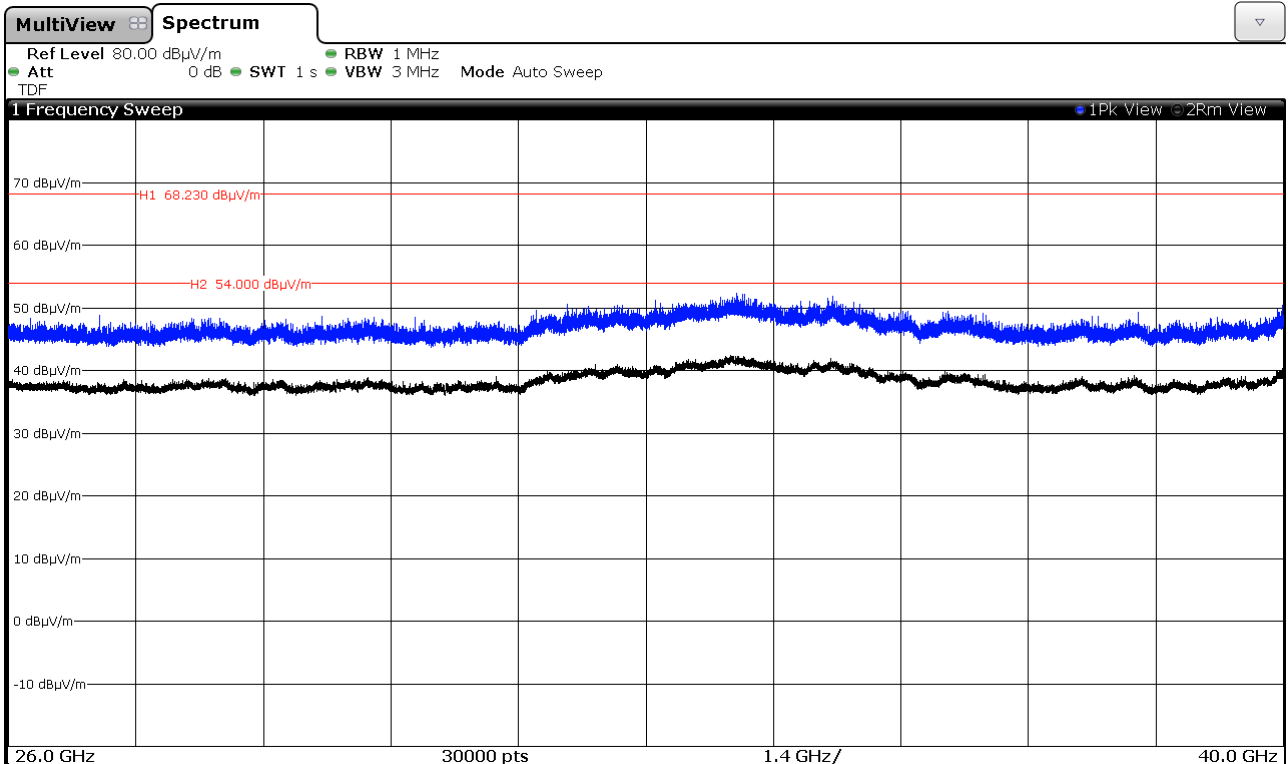


Chain A+B



FREQUENCY RANGE 26GHz to 40GHz.

No spurious signals were found in all modulations and channels tested.

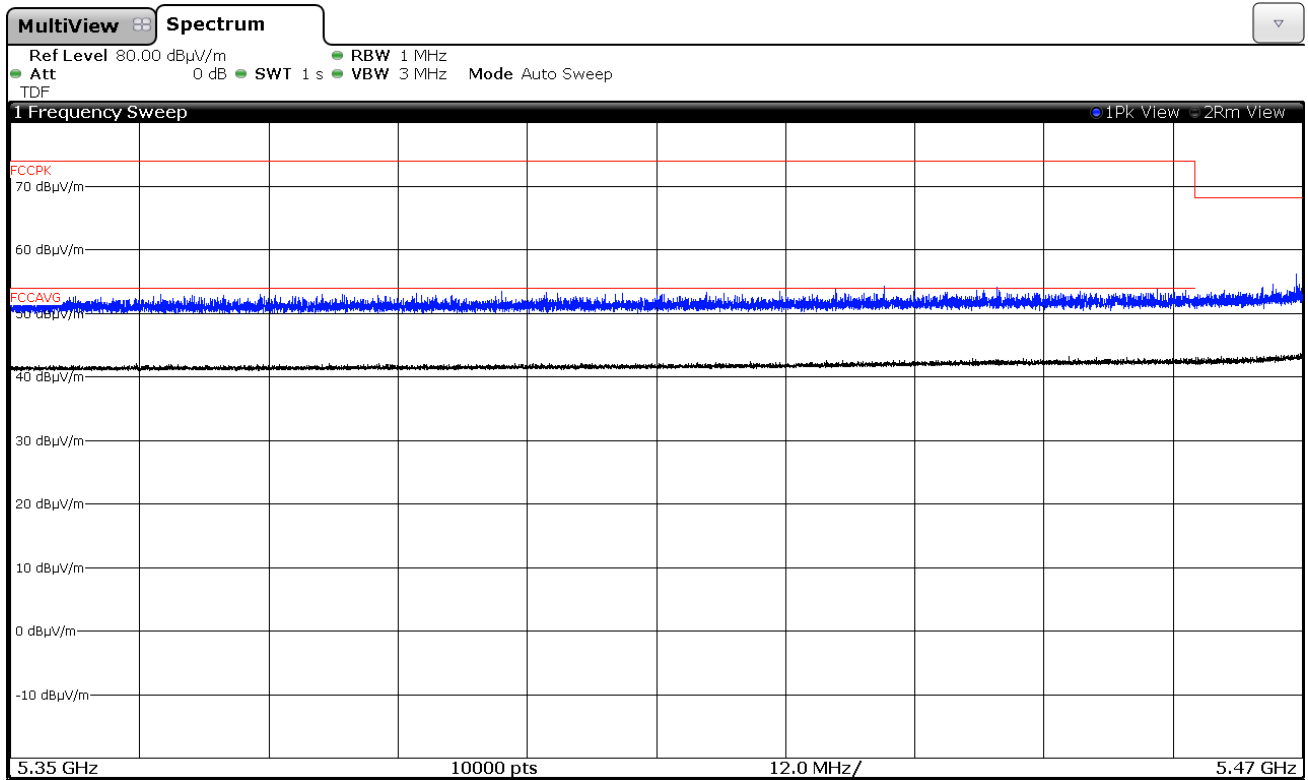


(This plot is valid for both SISO and MIMO).

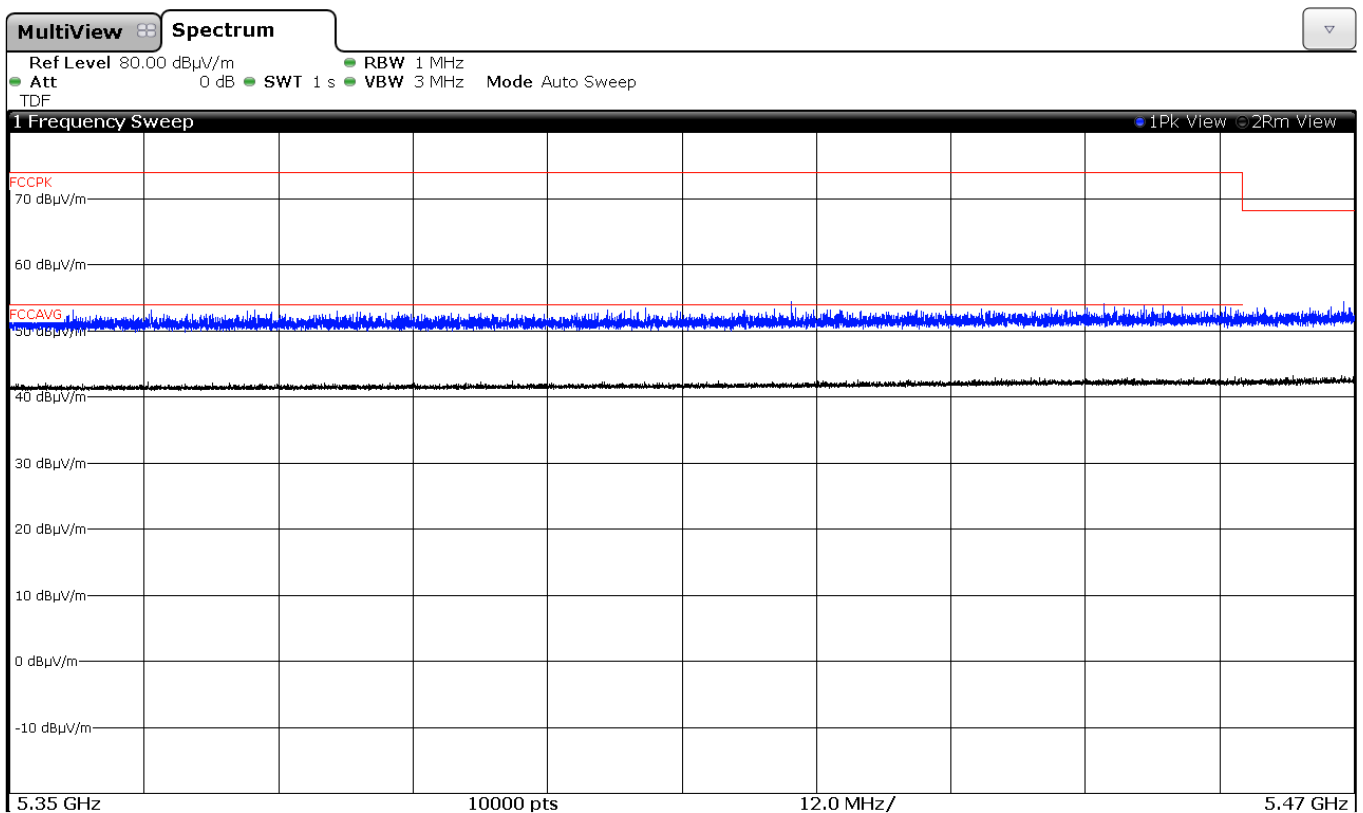
Radiated spurious emissions at band-edges and inside restricted band 5.35 – 5.46 GHz and adjacent band 5.46 – 5.47 GHz.

1. WiFi 5GHz 802.11 a mode

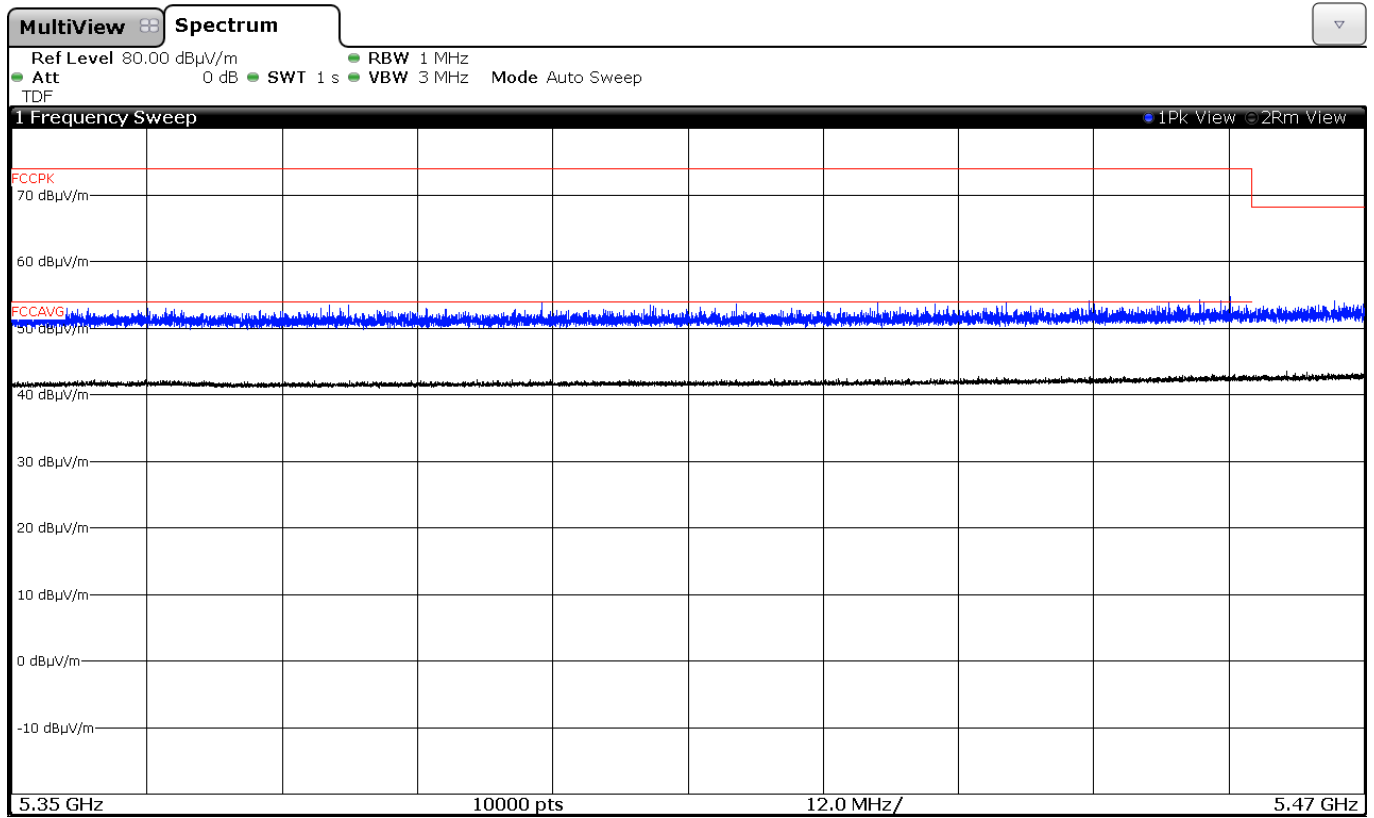
Lowest Channel (100) 5500 MHz. Chain A.



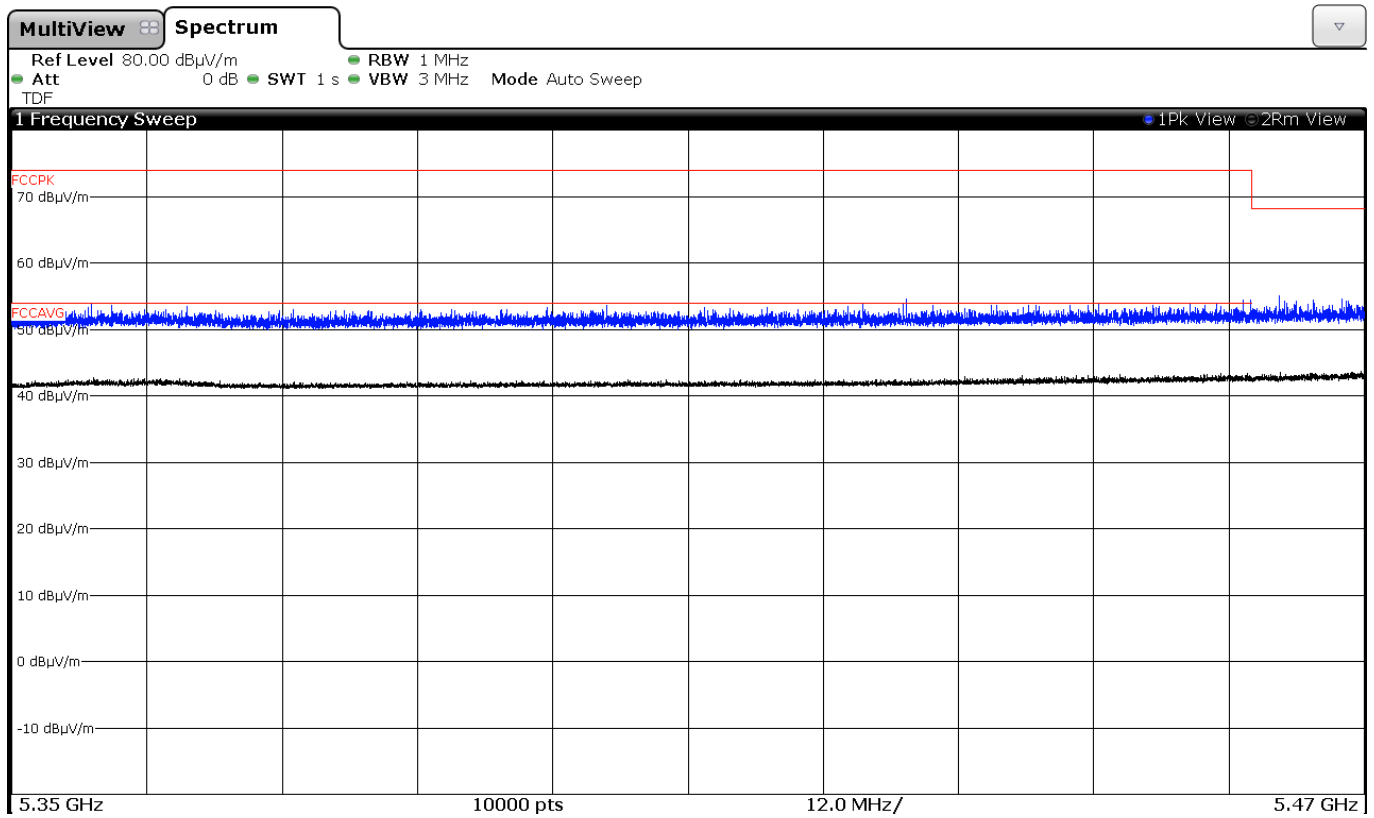
Lowest Channel (100) 5500MHz. Chain B.



Channel 104. 5520MHz. Chain A.

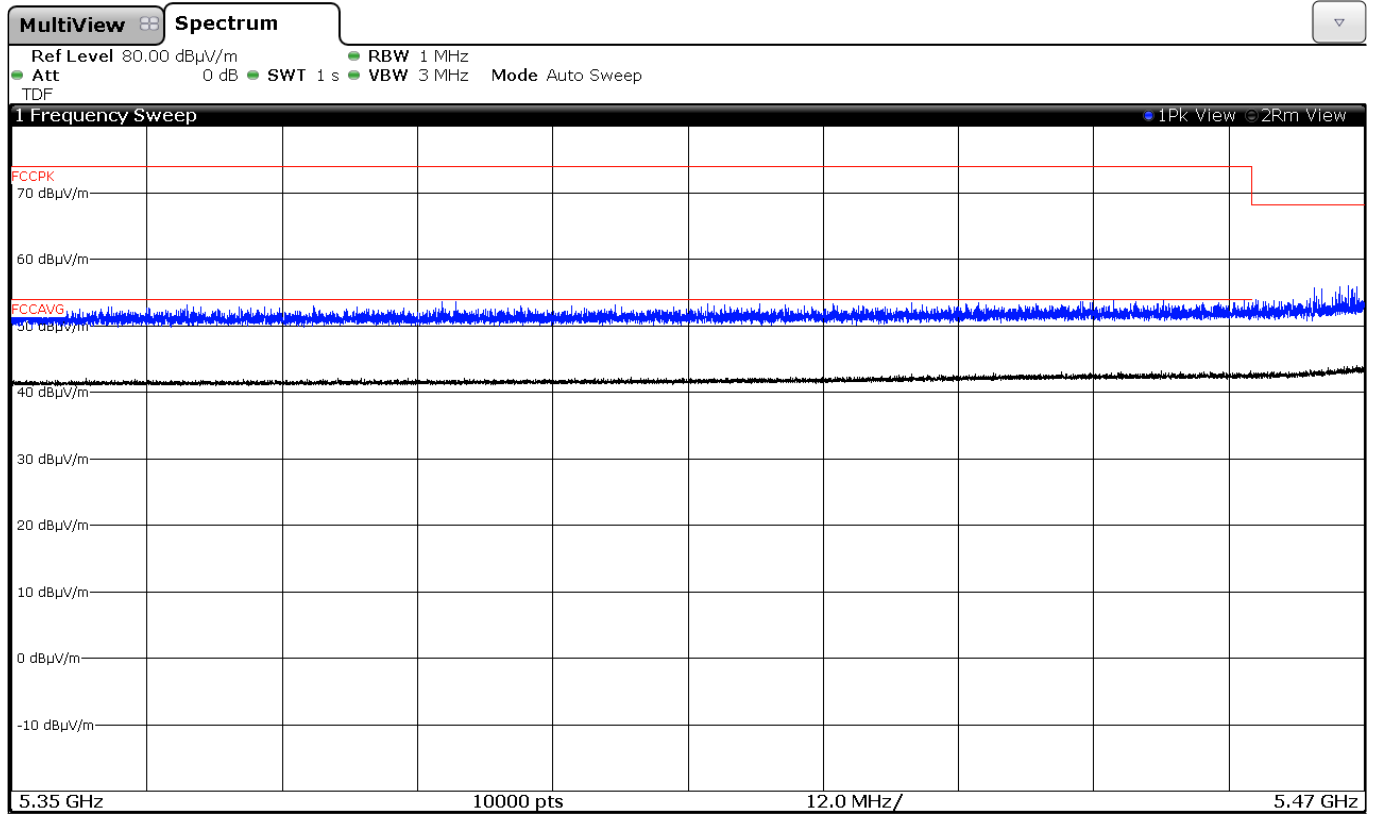


Channel 104. 5520MHz. Chain B.

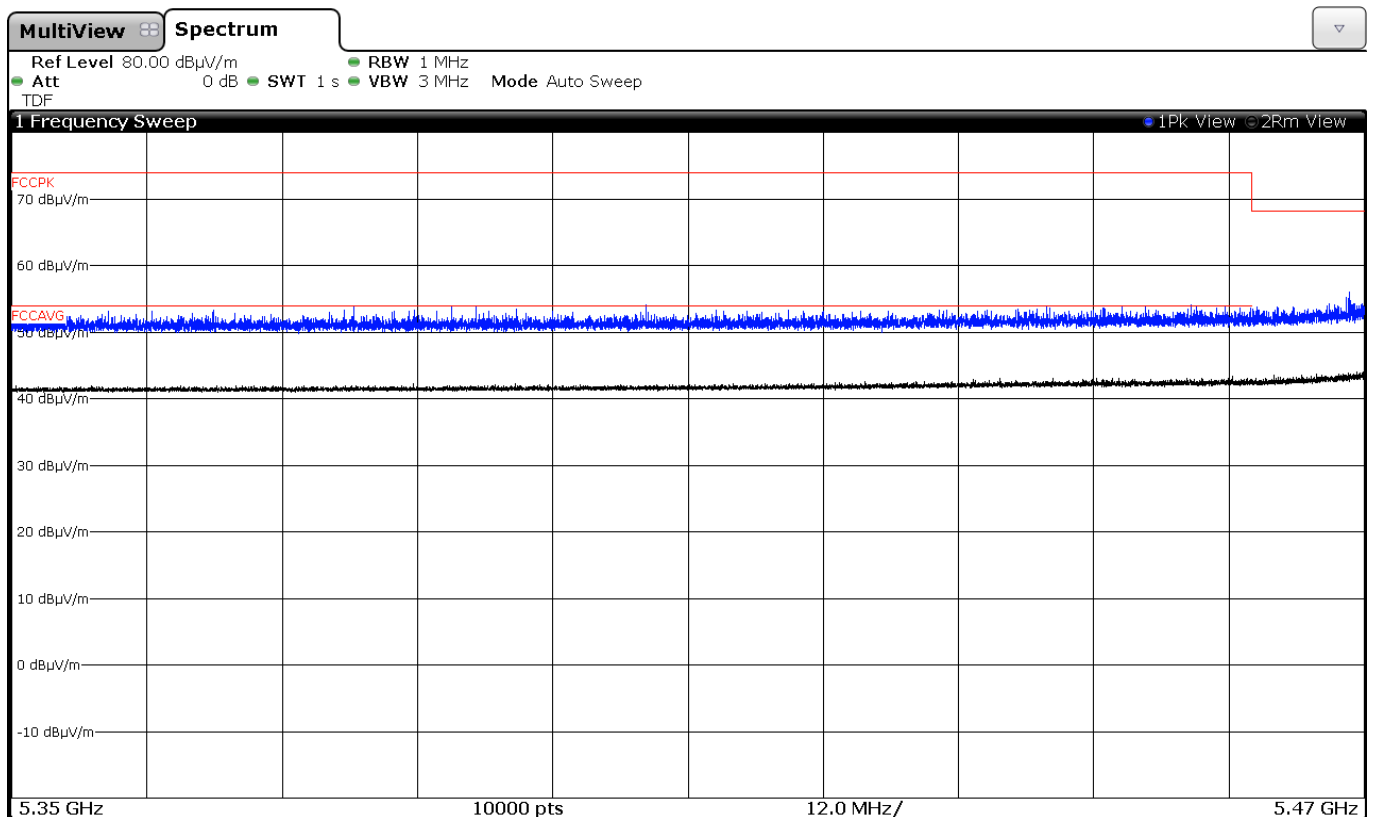


2. WiFi 5GHz 802.11 n20 mode

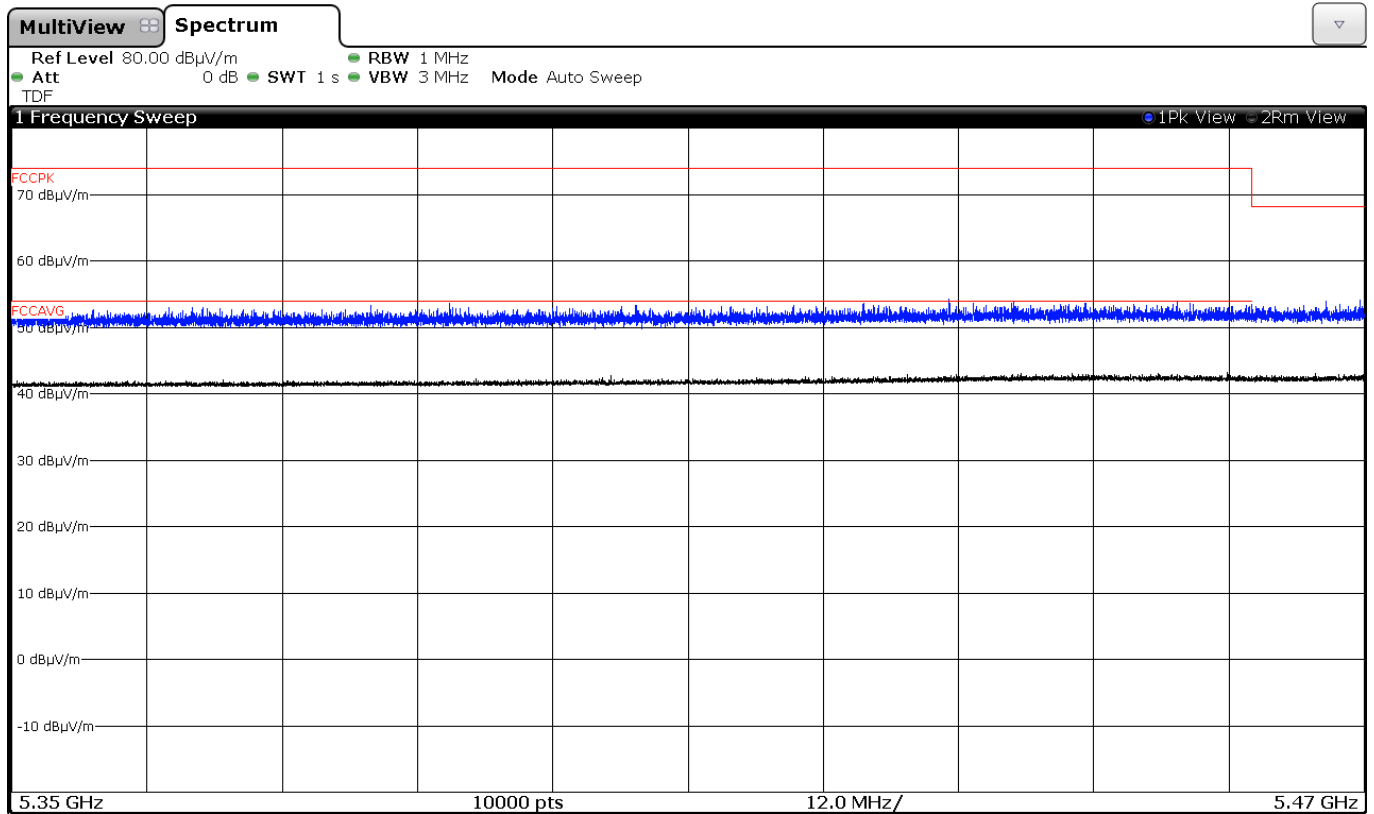
Lowest Channel (100) 5500MHz. Chain A.



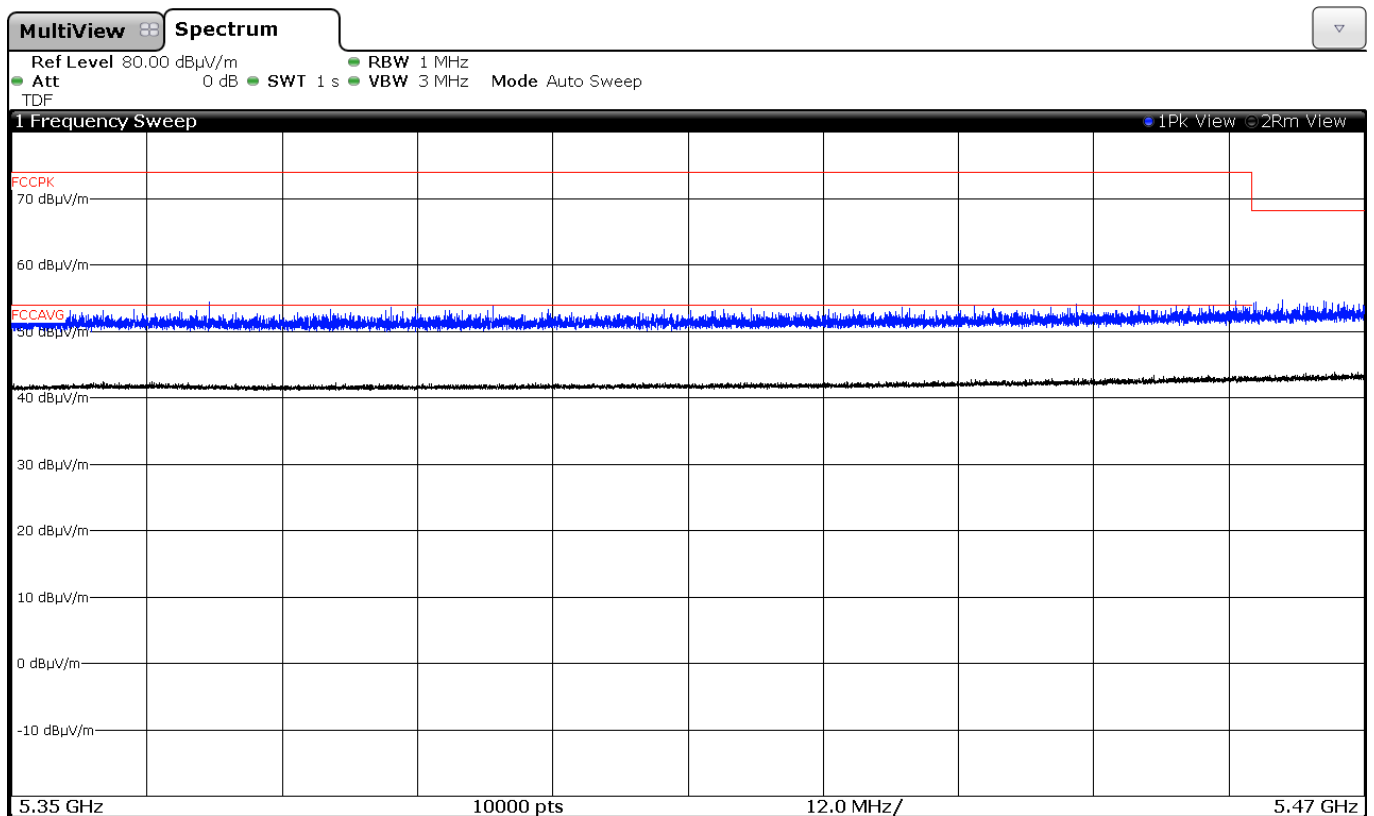
Lowest Channel (100) 5500MHz. Chain B.



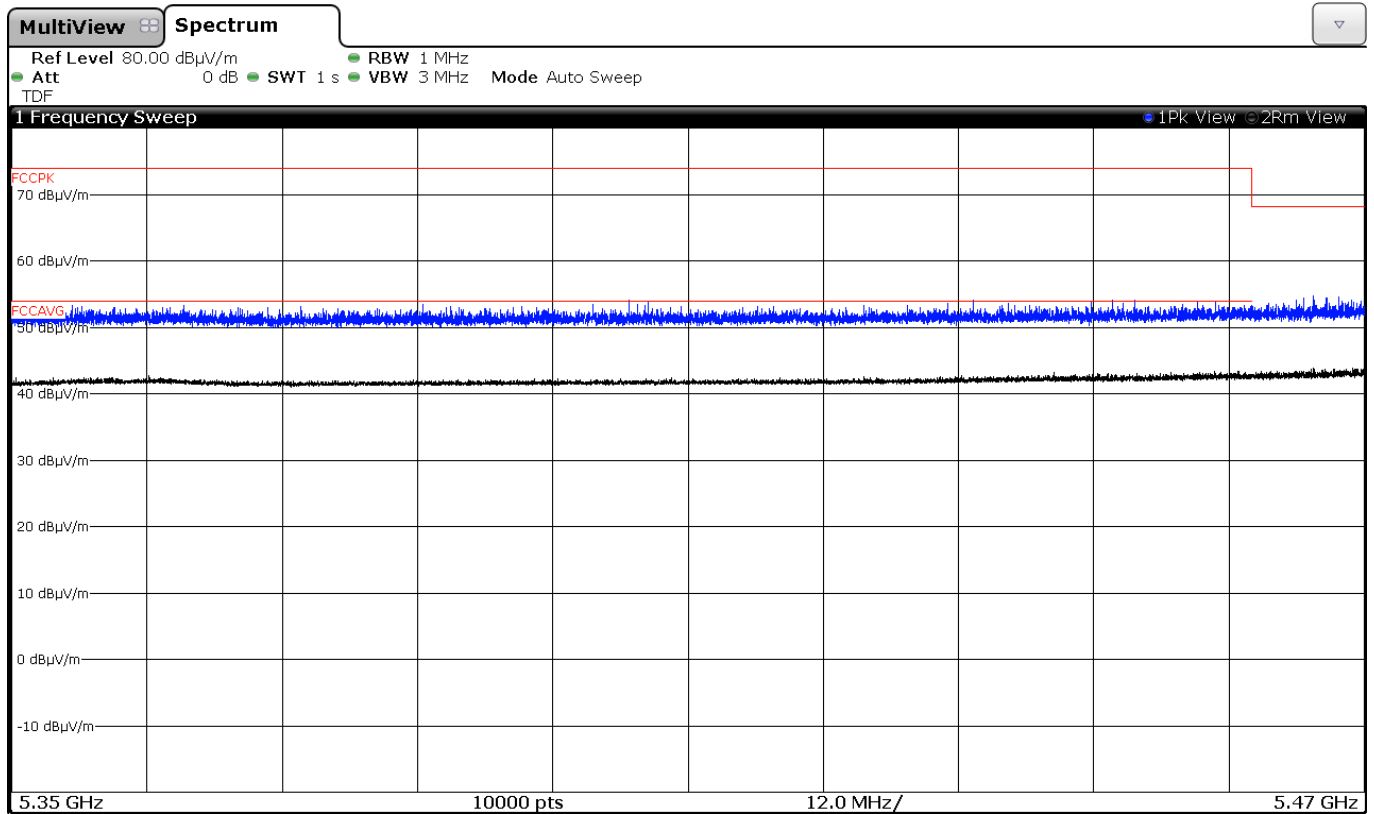
Lowest Channel (100) 5500MHz. Chain A+B.



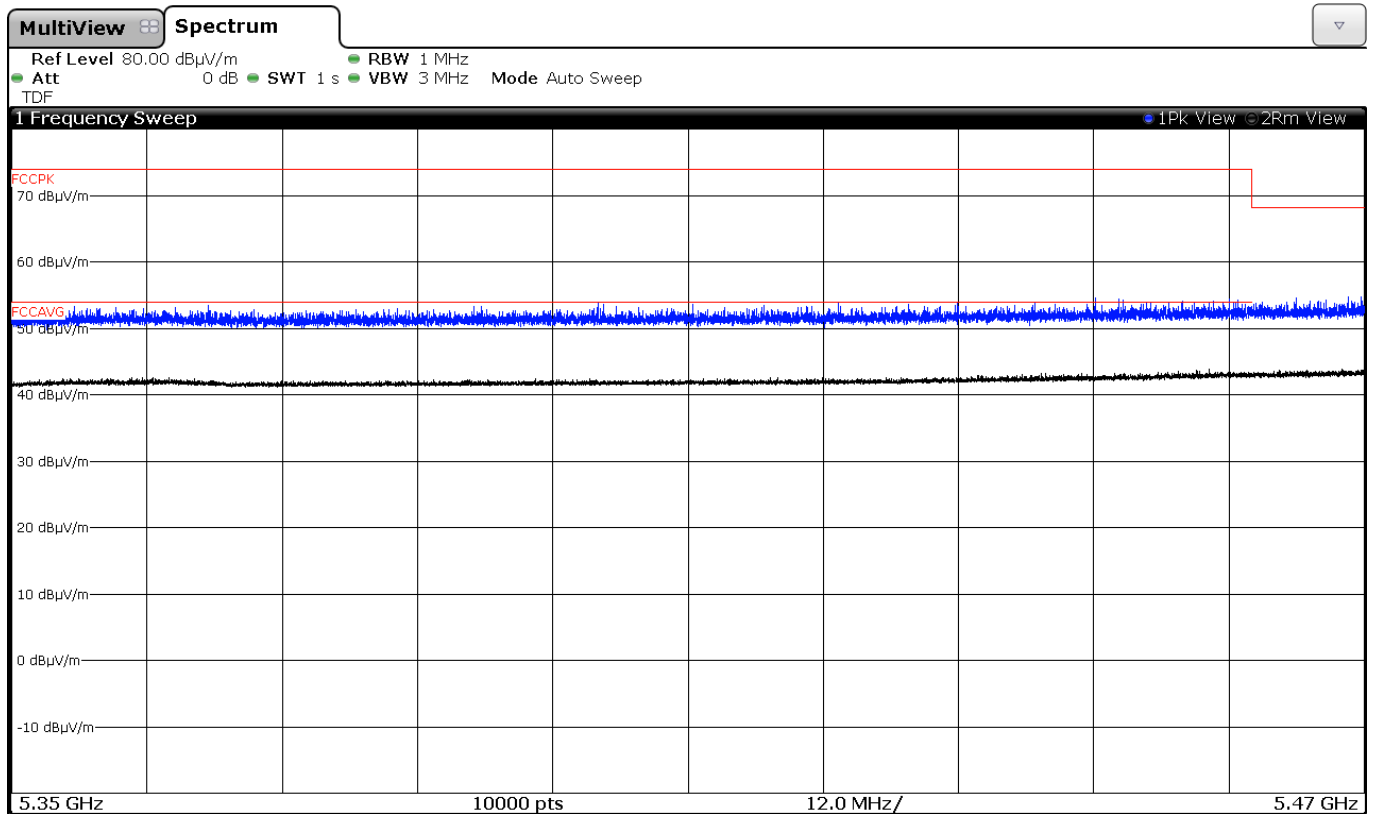
Channel 104. 5520MHz. Chain A.



Channel 104. 5520MHz. Chain B.

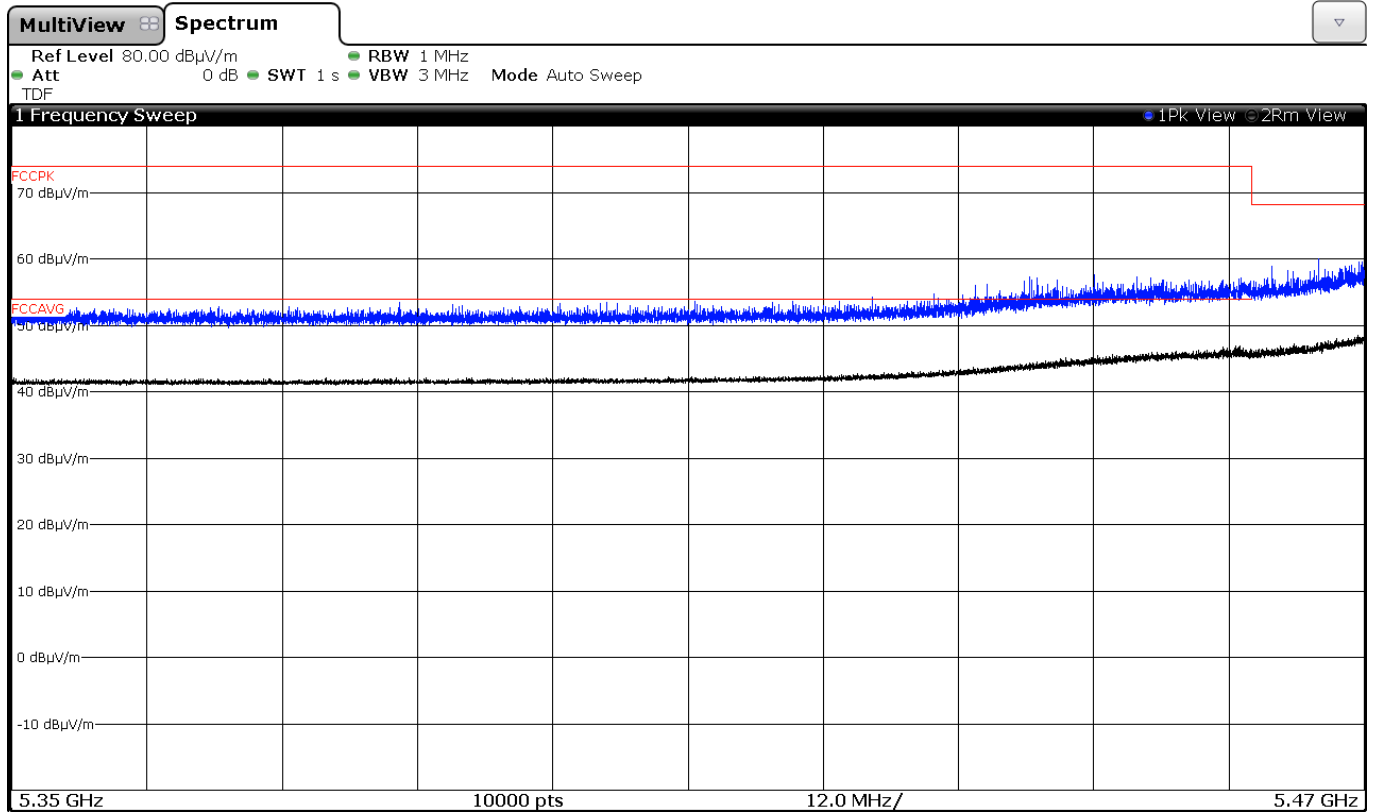


Channel 104. 5520MHz. Chain A+B.

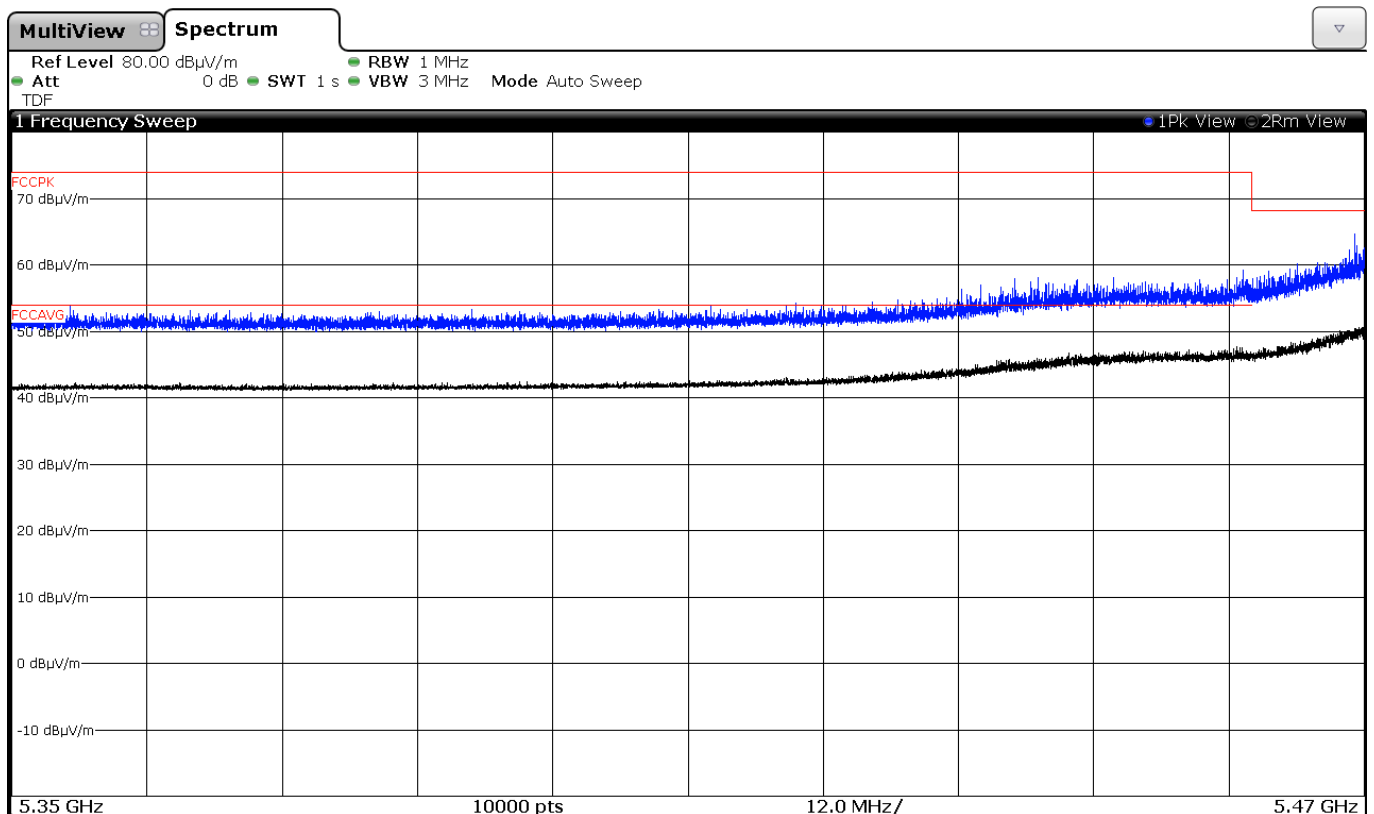


3. WiFi 5GHz 802.11 n40 mode

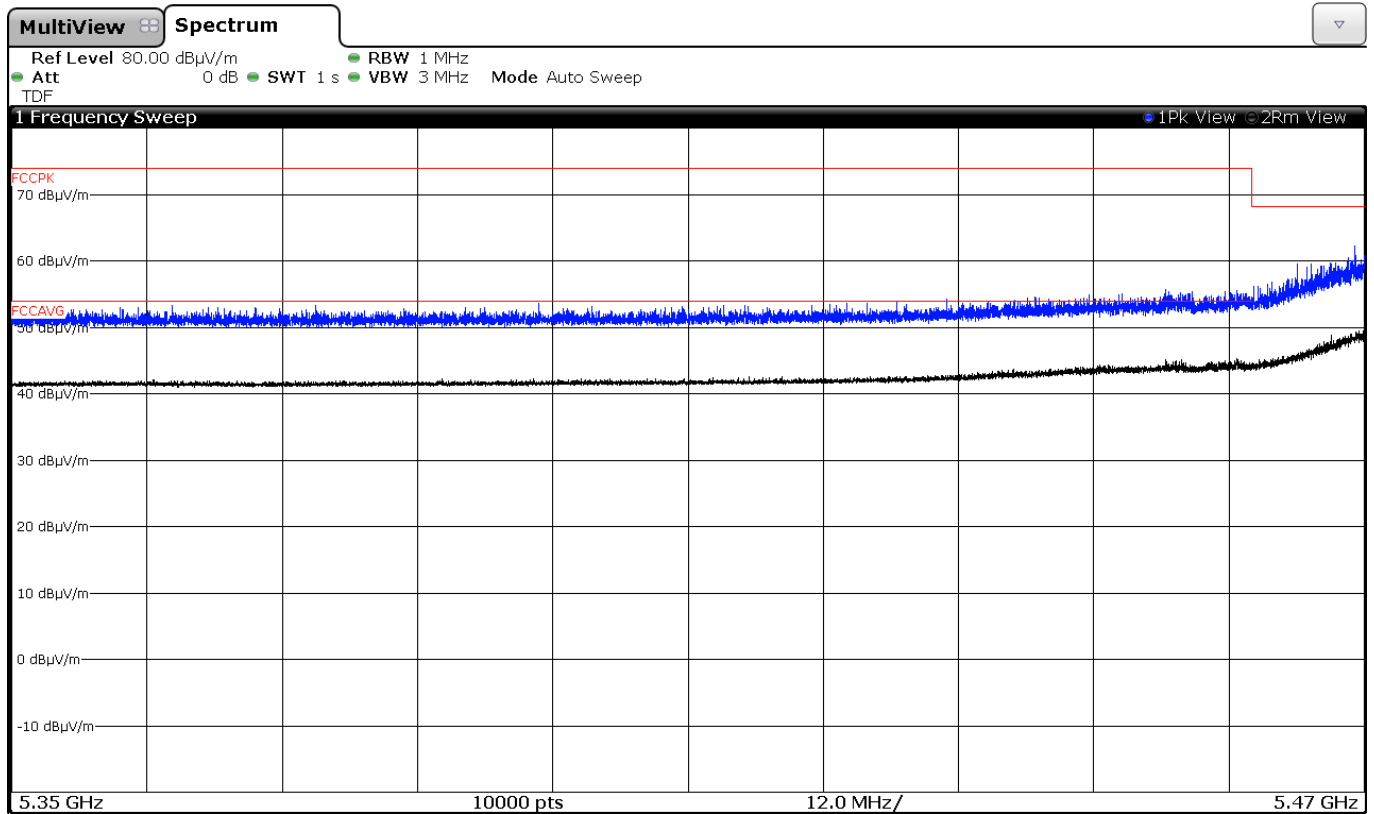
Lowest Channel (102F) 5510MHz. Chain A.



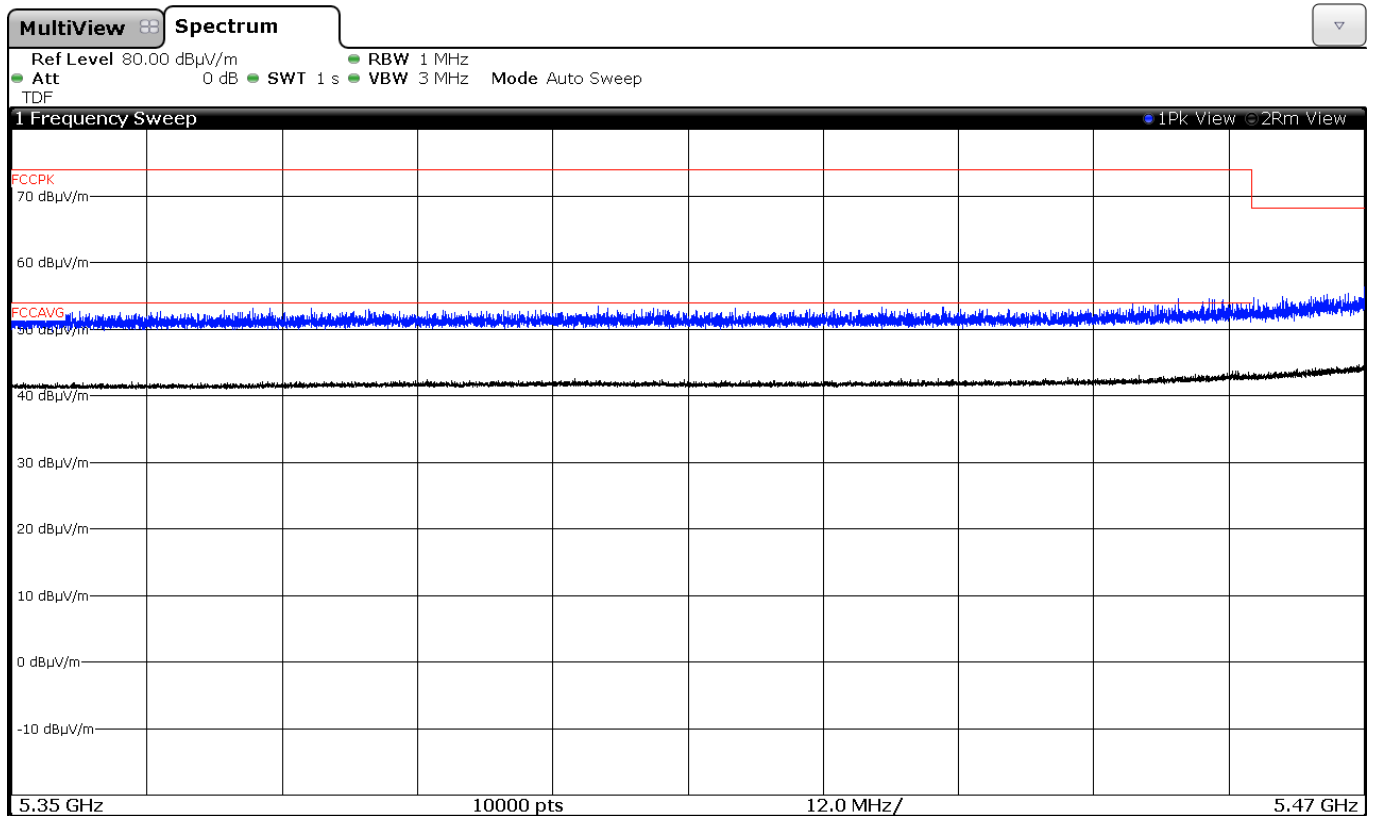
Lowest Channel (102F) 5510MHz. Chain B.



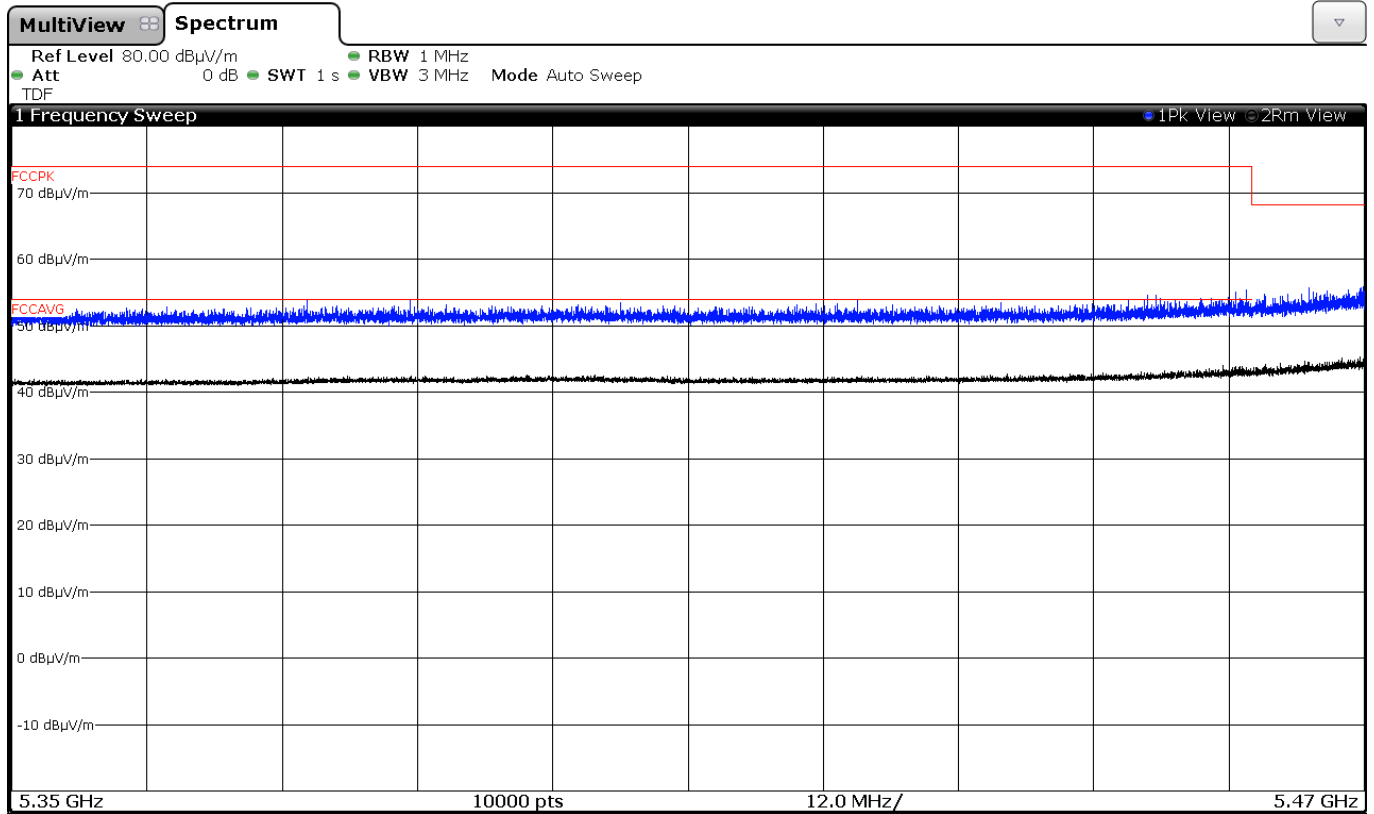
Lowest Channel (102F) 5510MHz. Chain A+B.



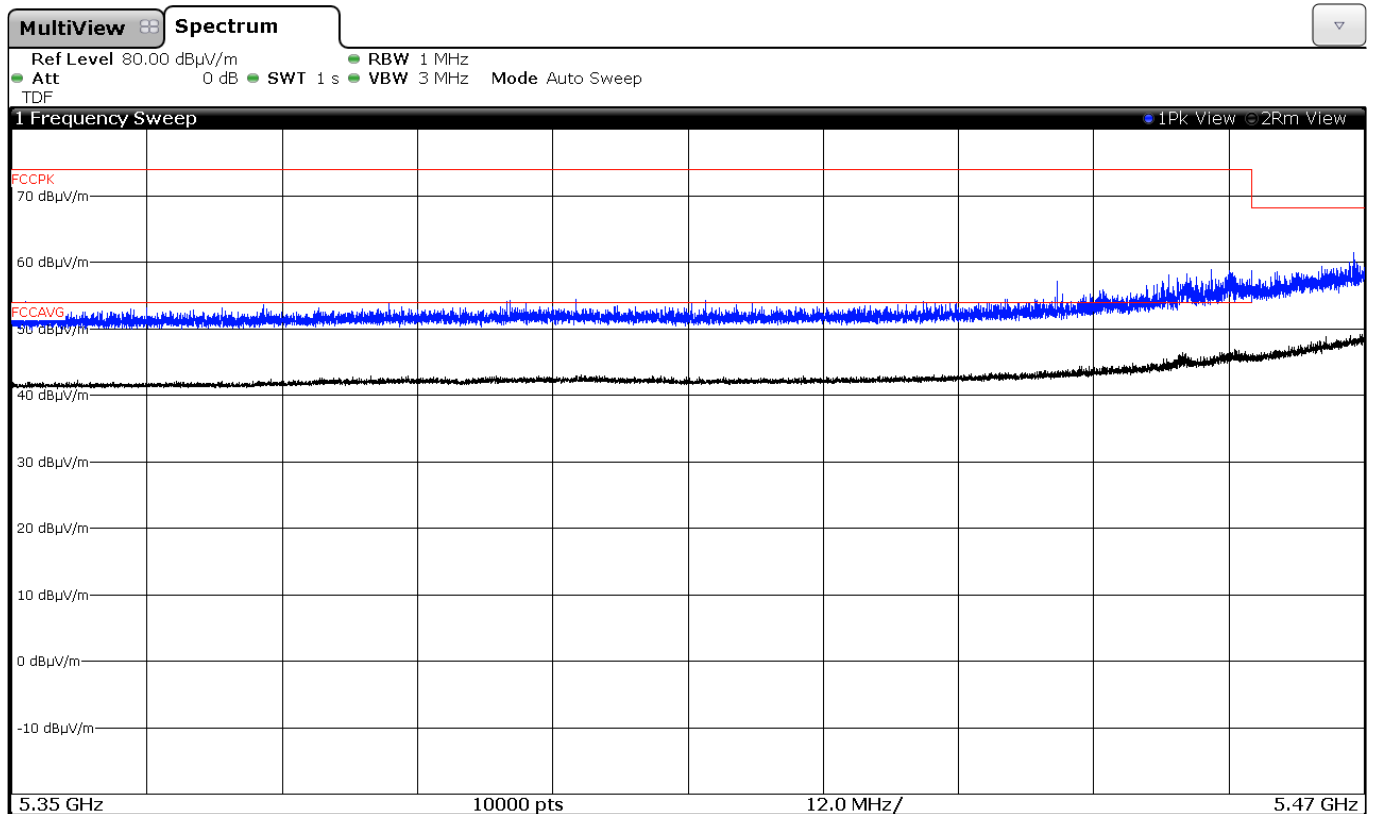
Channel 110F. 5550MHz. Chain A.



Channel 110F. 5550MHz. Chain B.

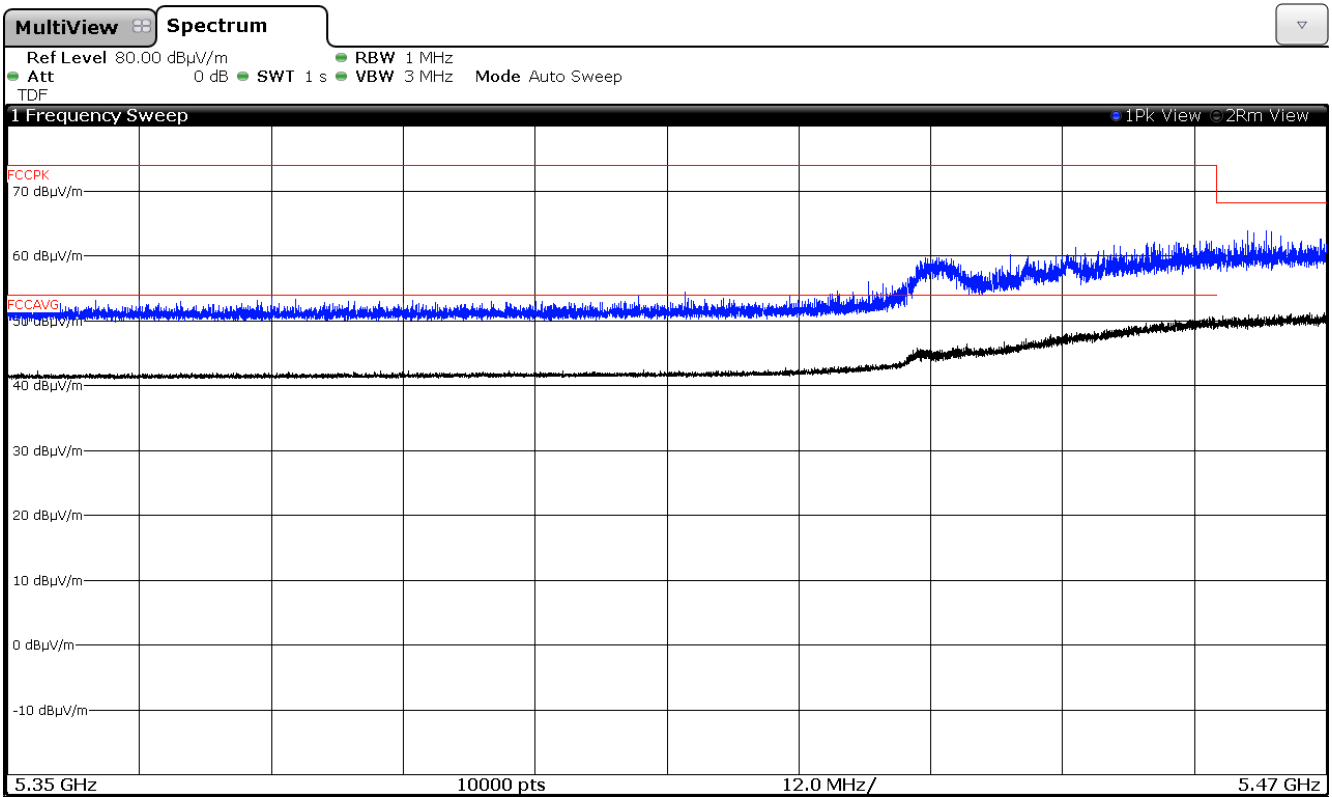


Channel 110F. 5550MHz. Chain A+B.

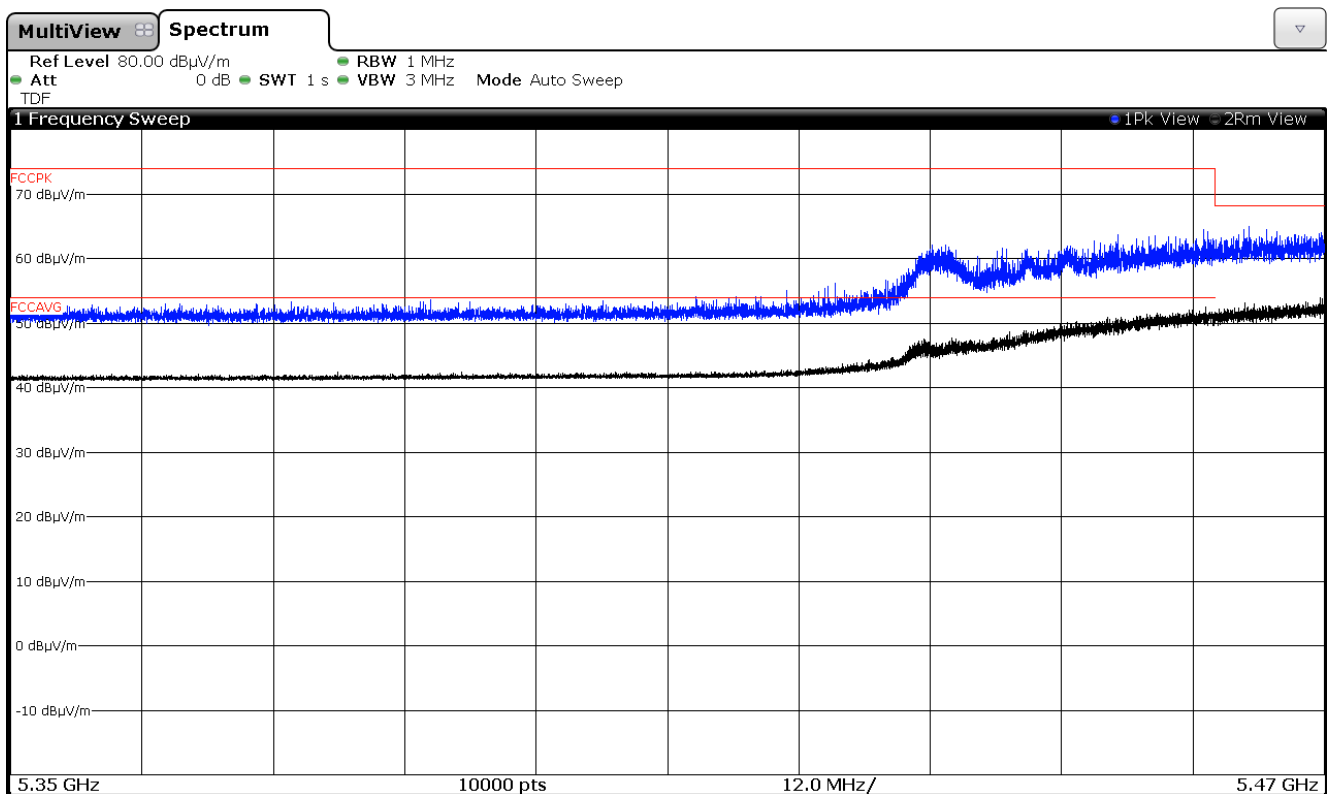


4. WiFi 5GHz 802.11 ac80 mode

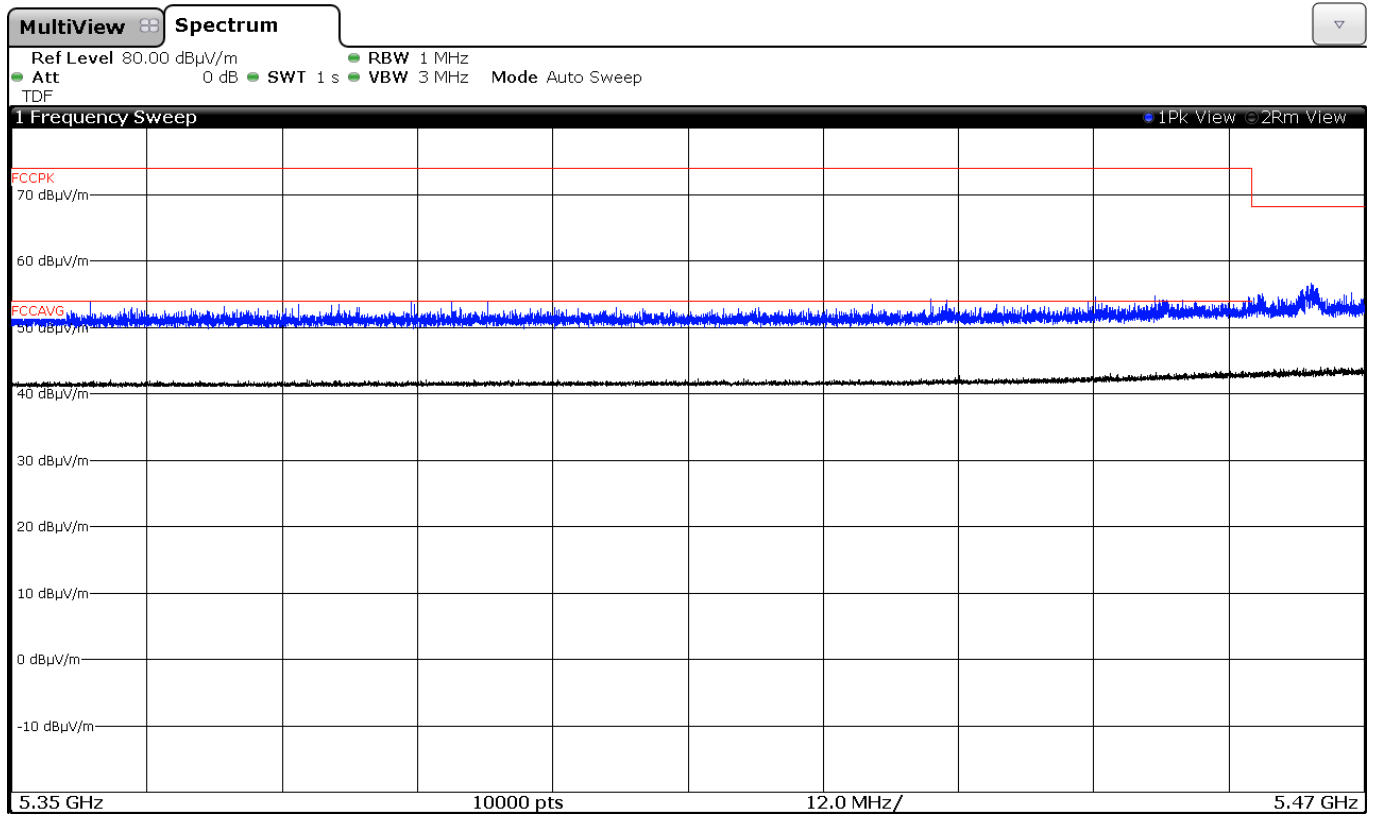
Lowest Channel (106) 5530MHz. Chain A.



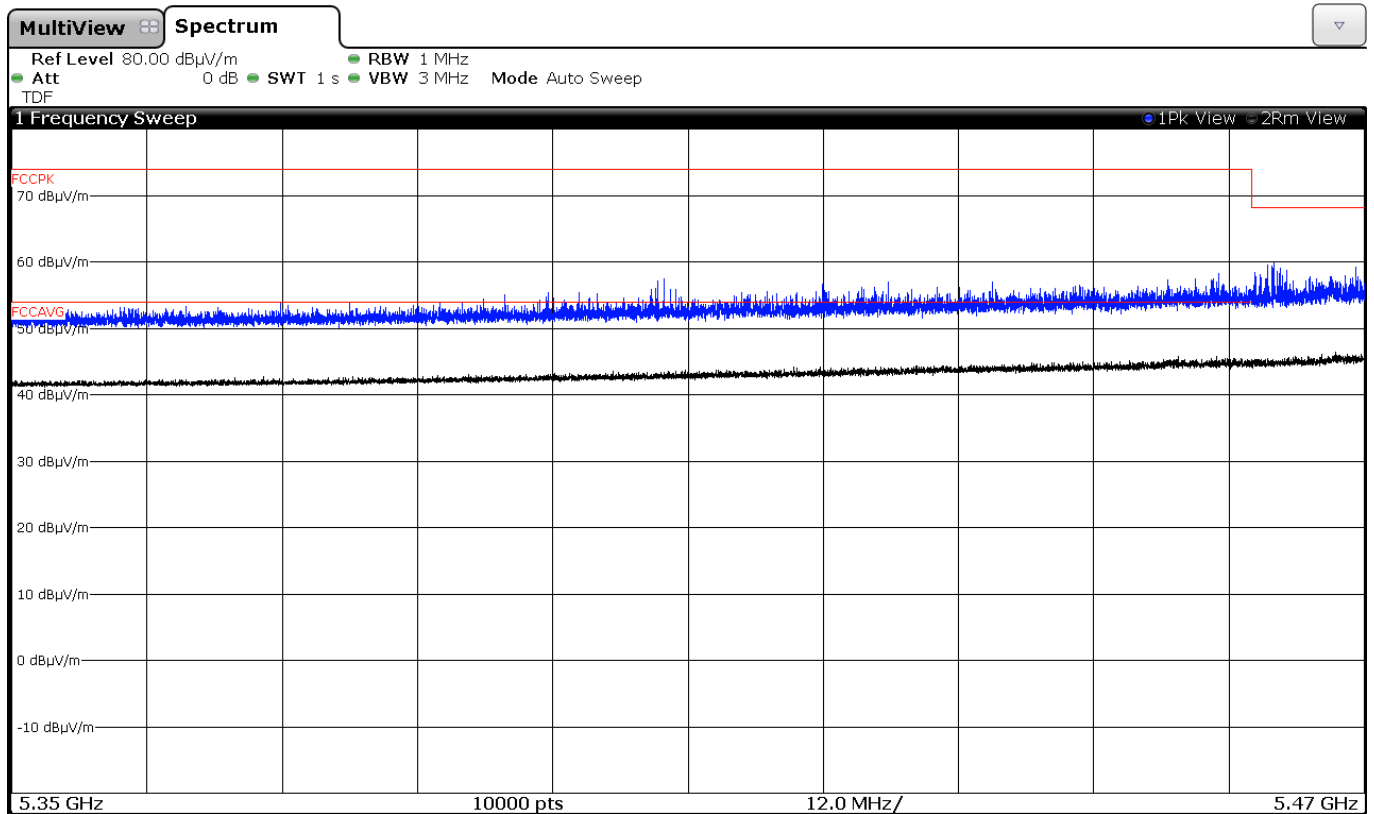
Lowest Channel (106) 5530MHz. Chain B.



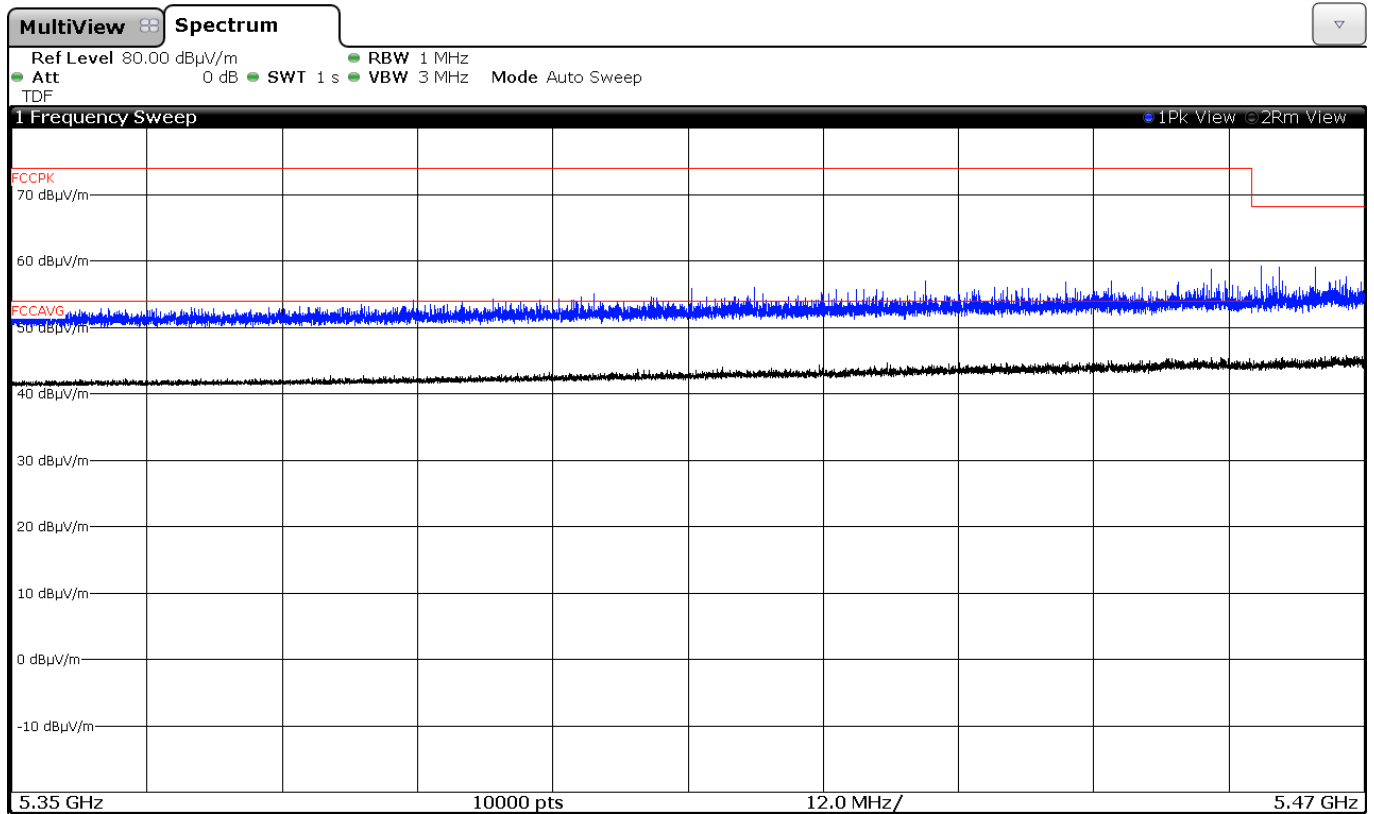
Lowest Channel (106) 5530MHz. Chain A+B.



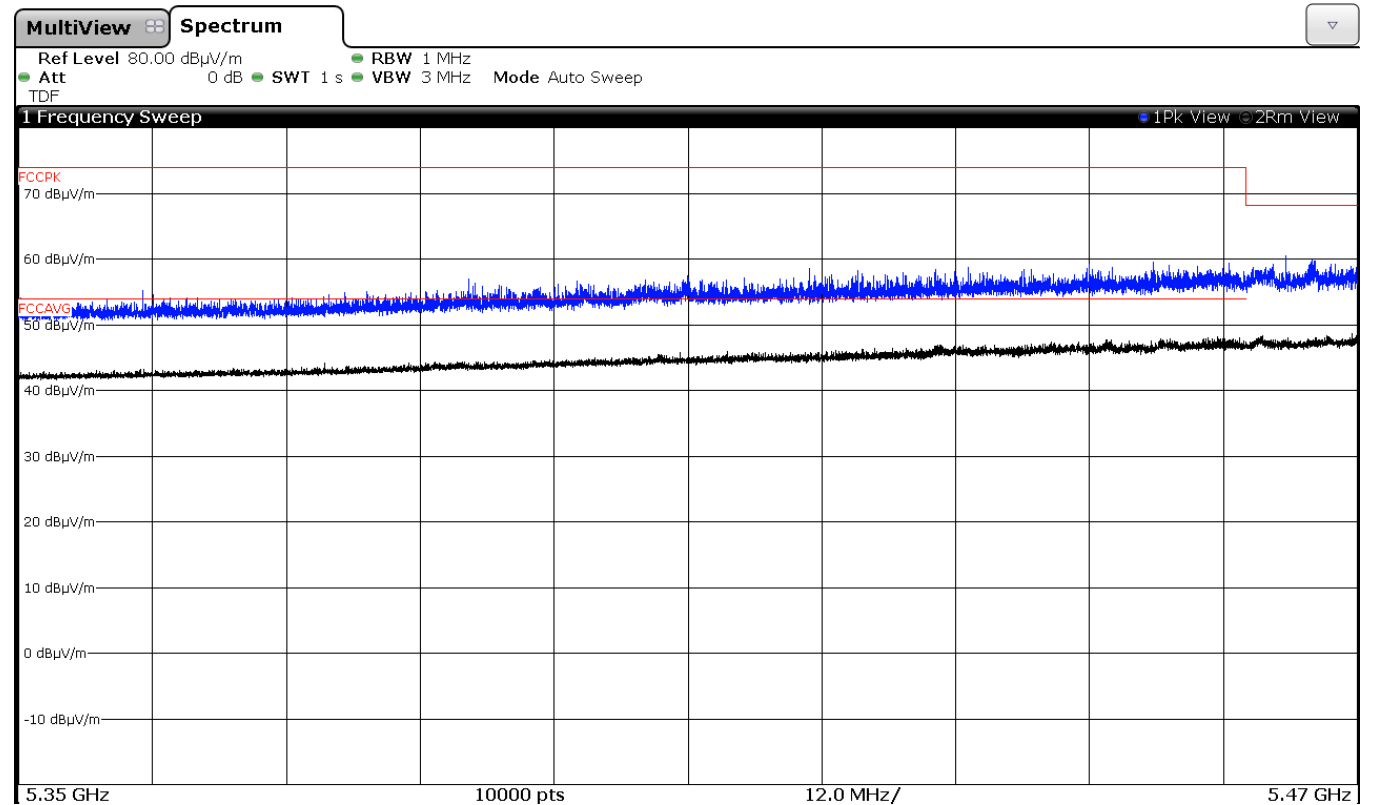
Middle Channel (122) 5610MHz. Chain A.



Middle Channel (122) 5610MHz. Chain B.



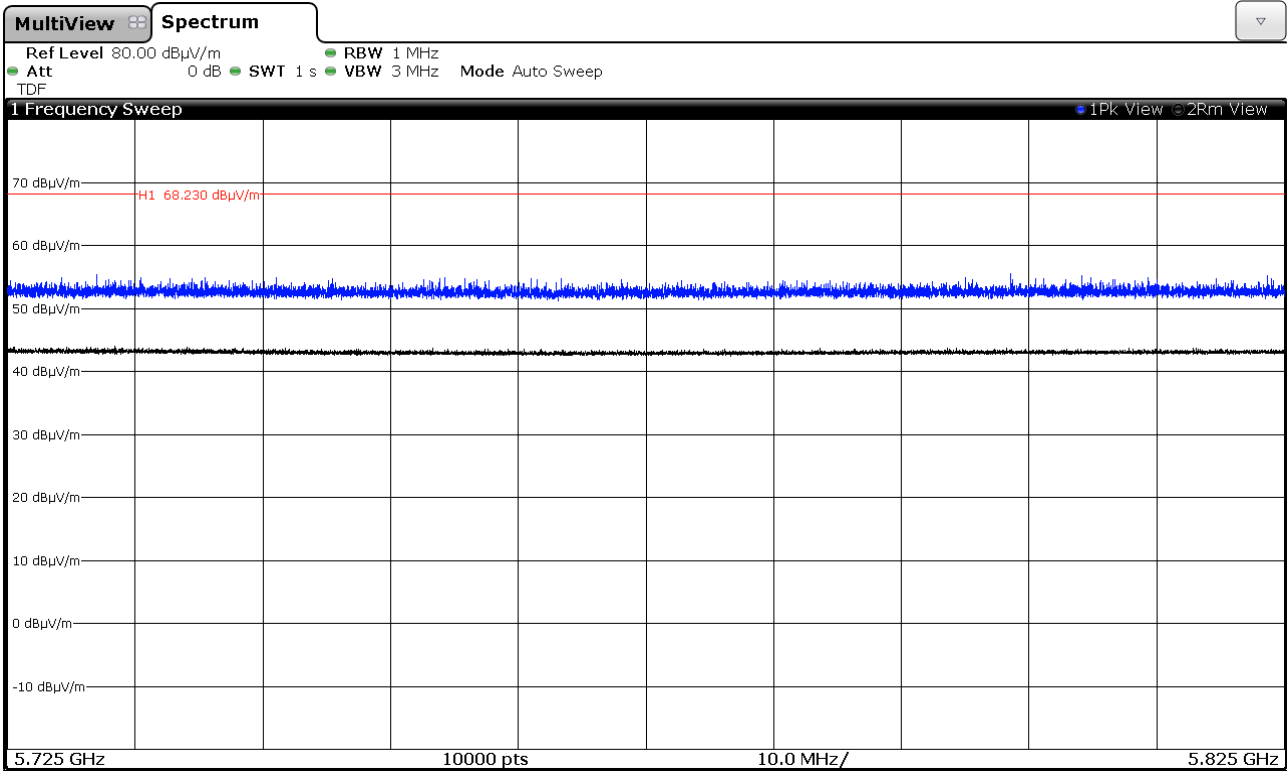
Middle Channel (122) 5610MHz. Chain A+B.



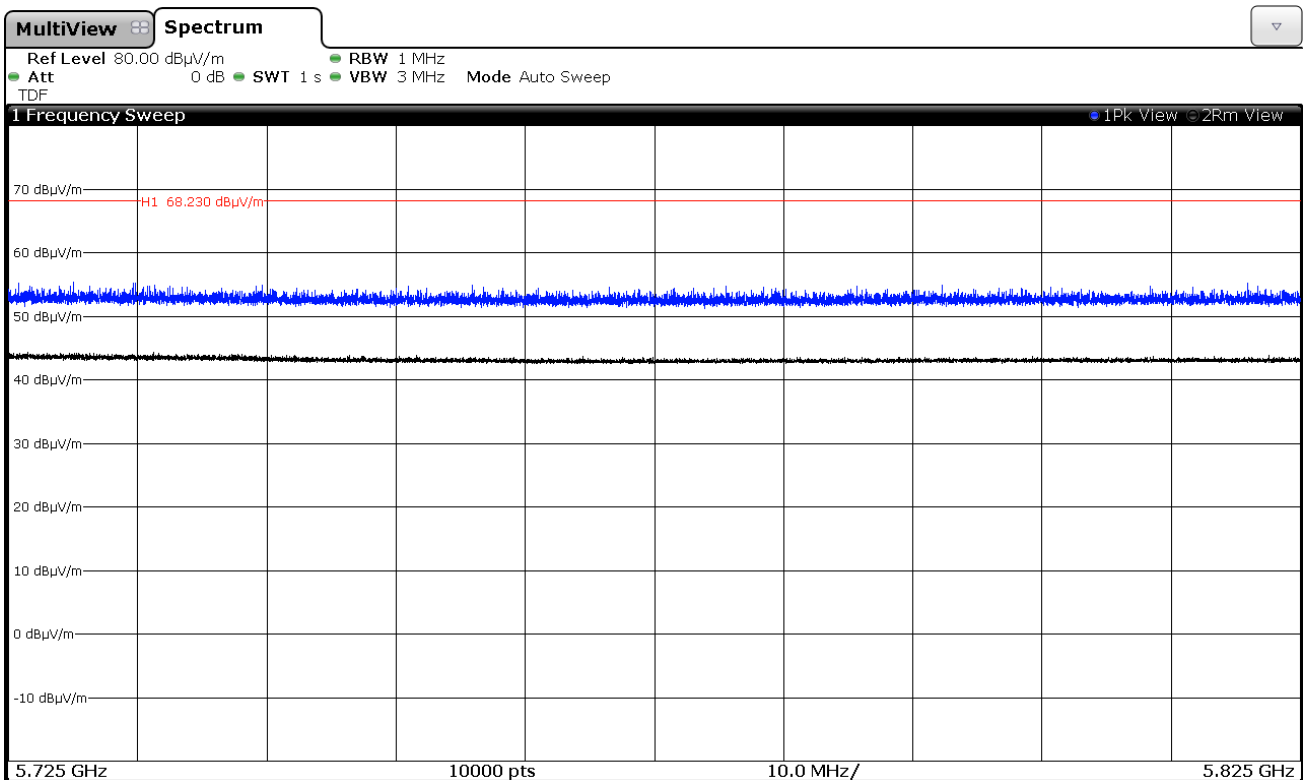
Radiated spurious emissions at band-edges and inside adjacent band 5.725 – 5.825 GHz.

1. WiFi 5GHz 802.11 a mode

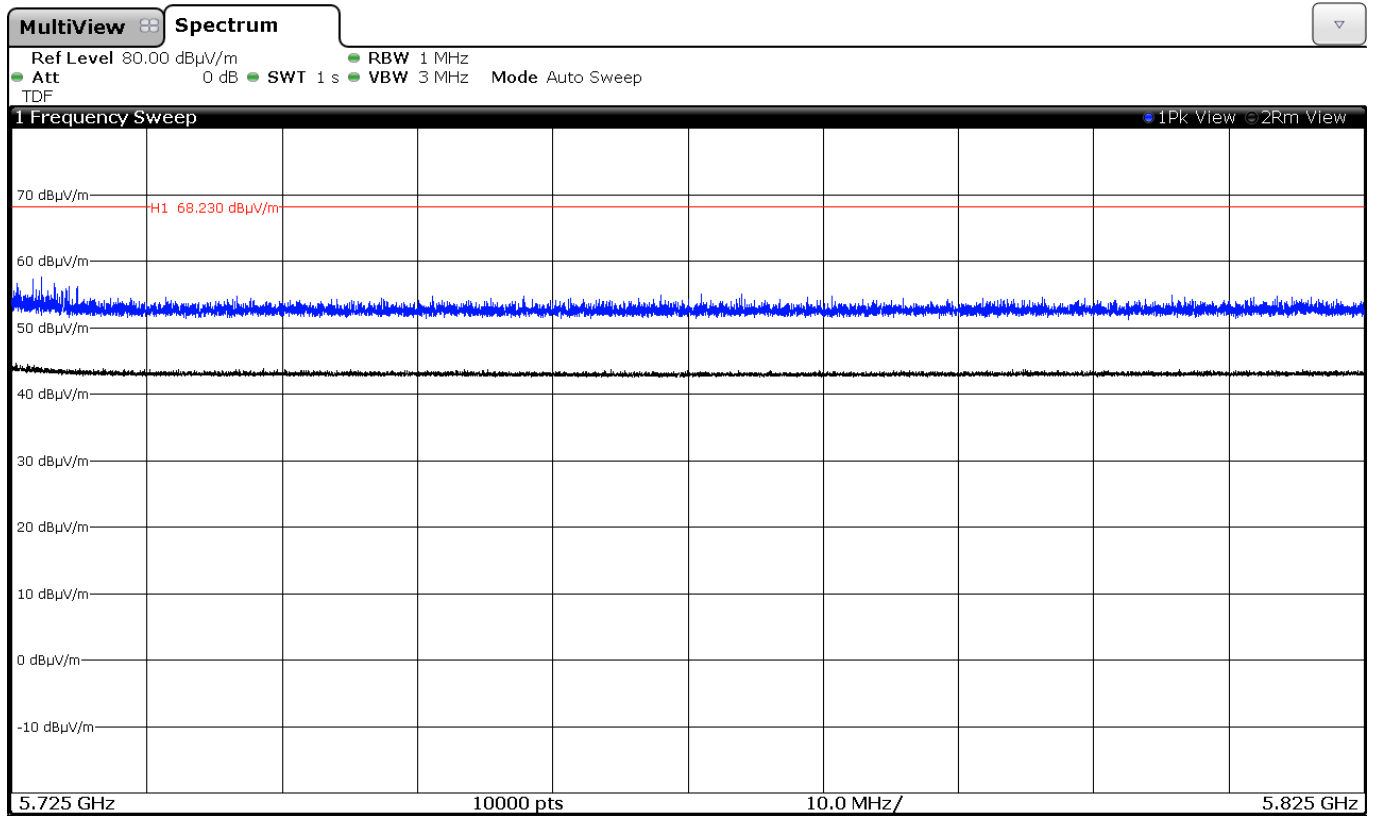
Channel 136. 5680MHz. Chain A.



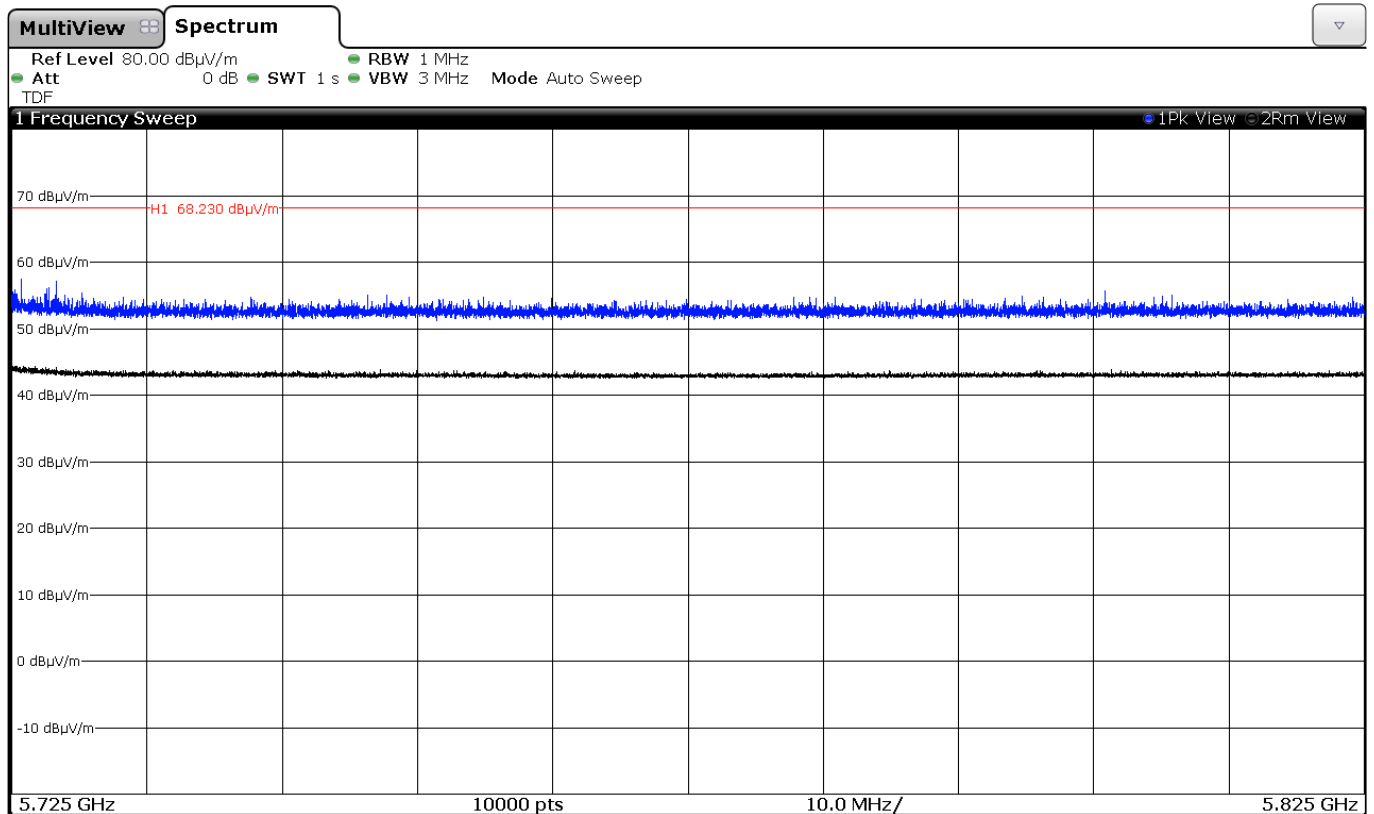
Channel 136. 5680MHz. Chain B.



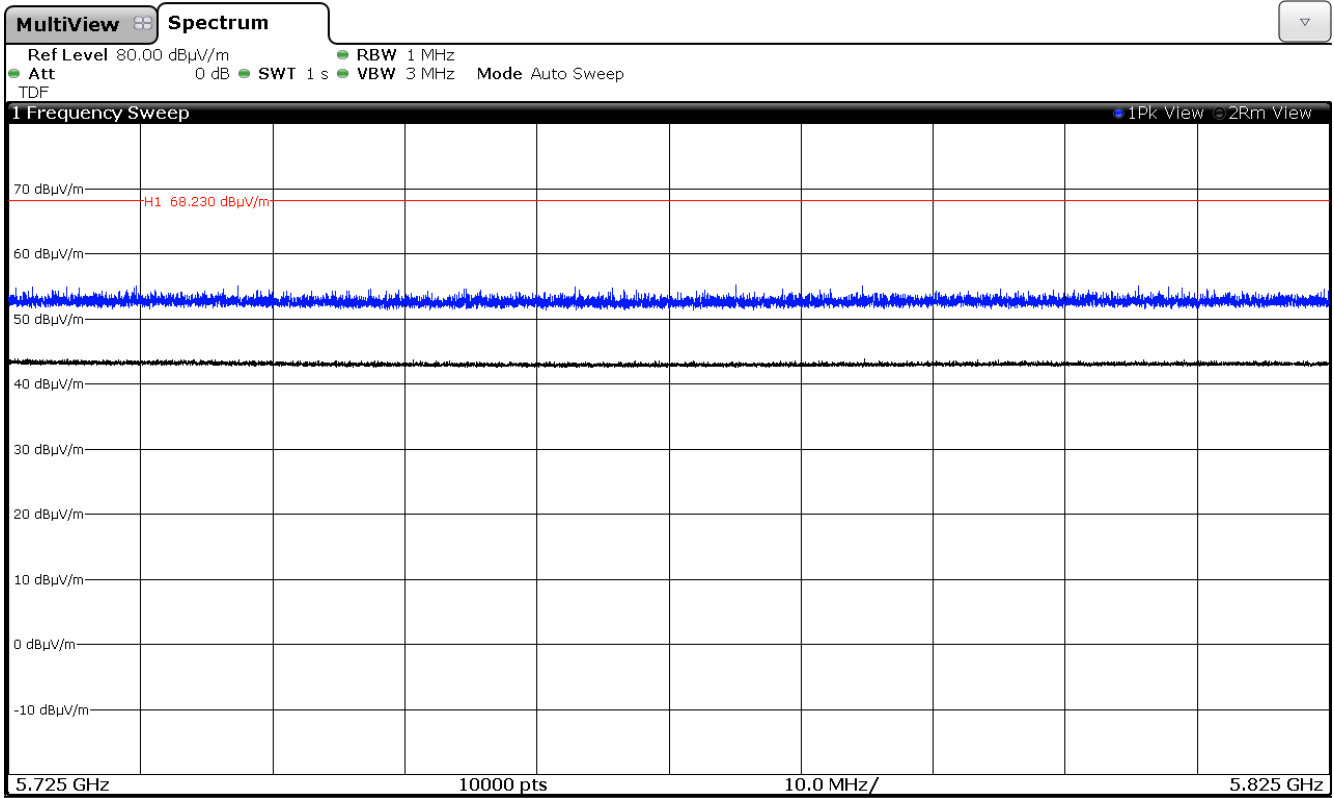
Highest Channel (140) 5700 MHz. Chain A.



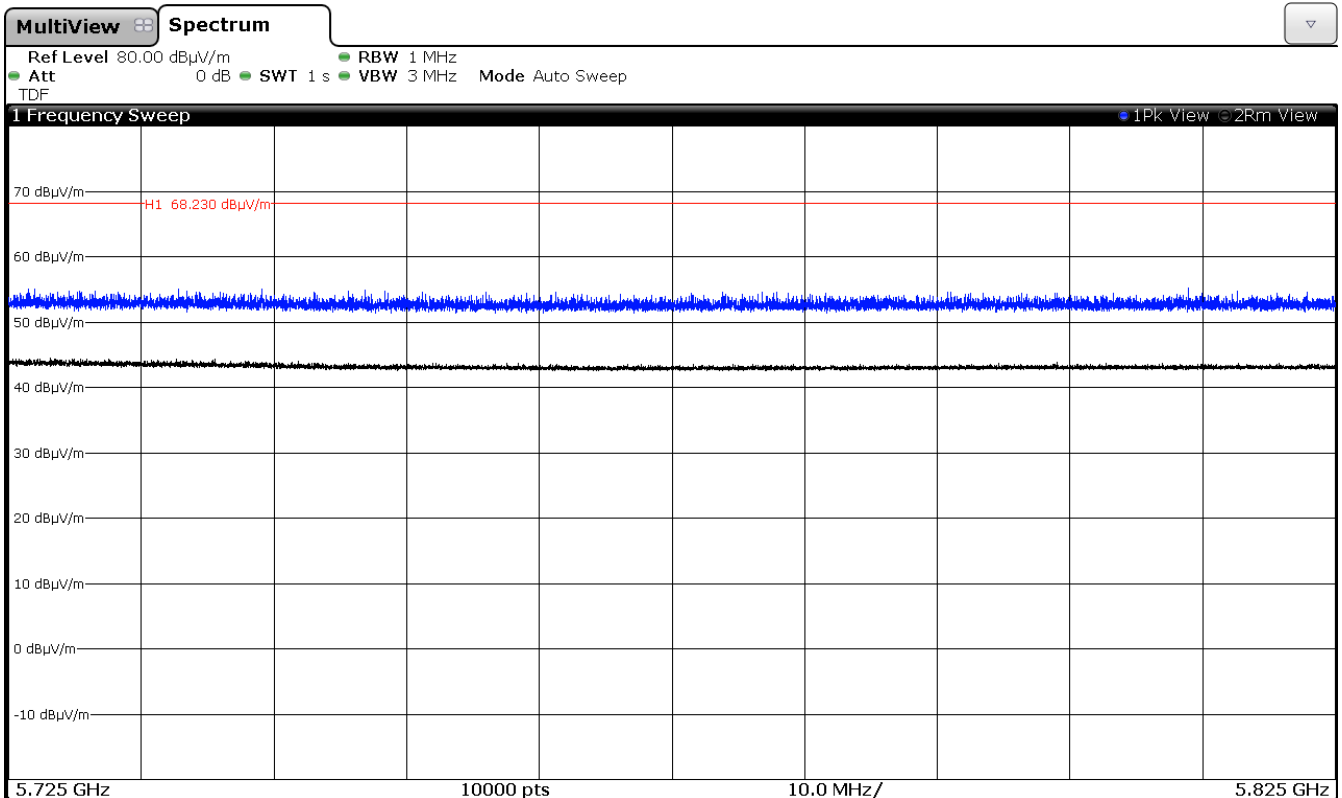
Highest Channel (140) 5700 MHz. Chain B.



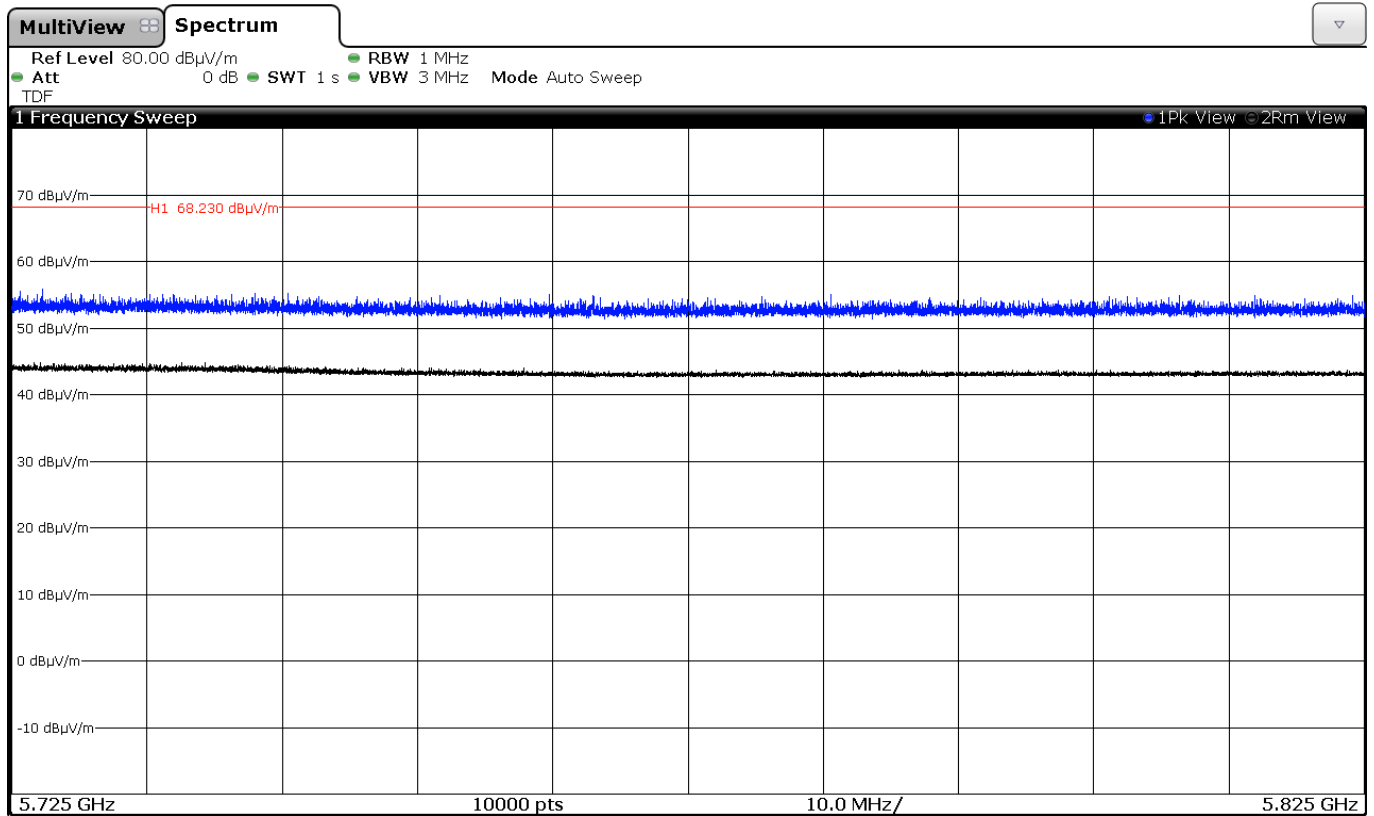
2. WiFi 5GHz 802.11 n20 mode
 Channel 136. 5680MHz. Chain A.



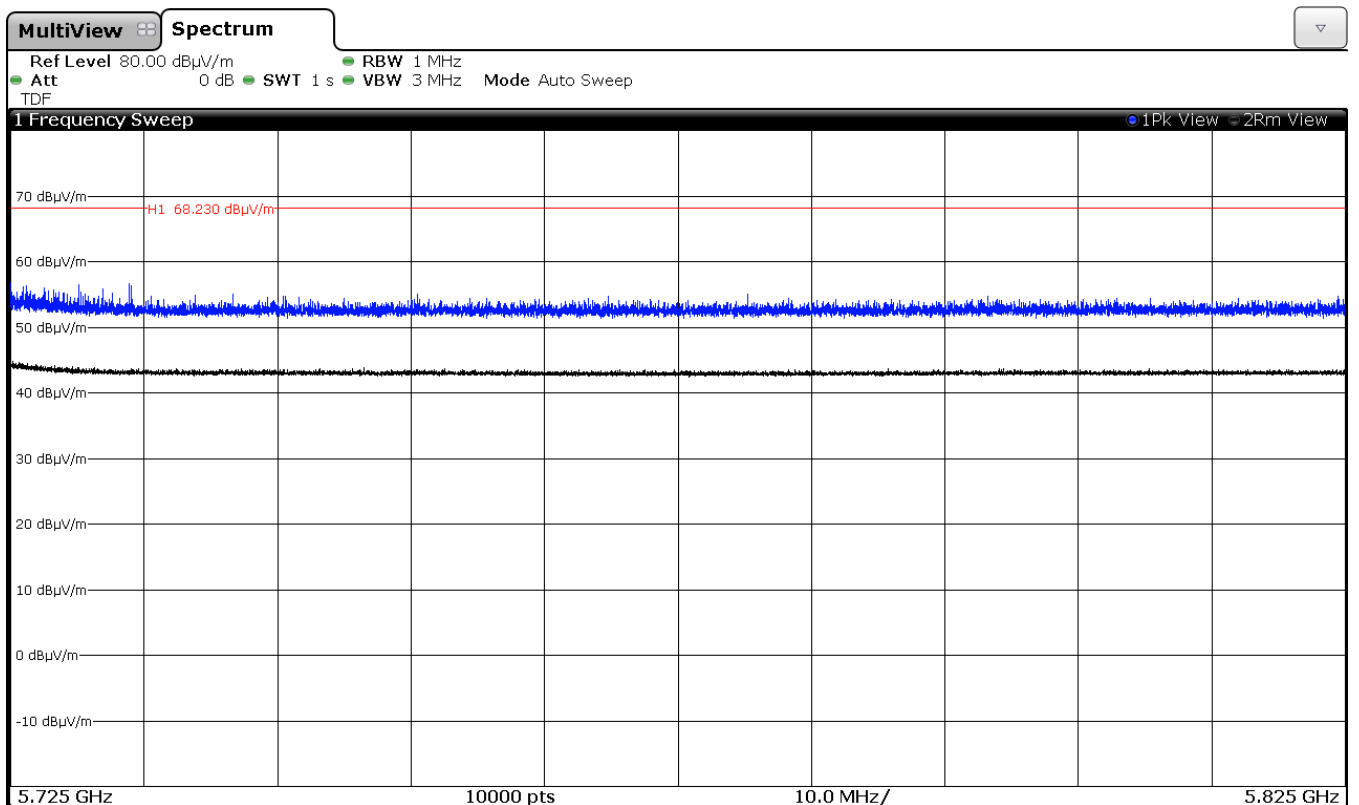
Channel 136. 5680MHz. Chain B.



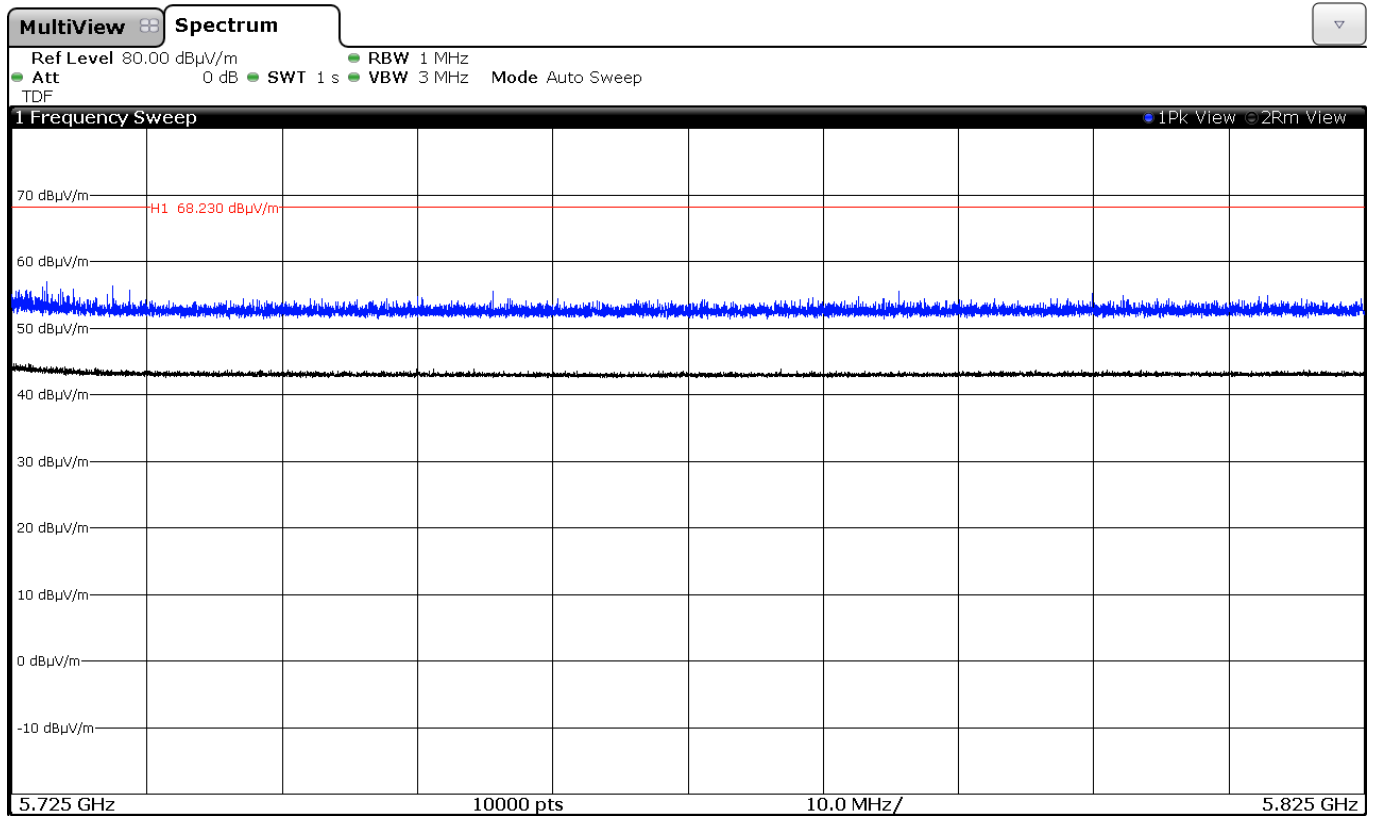
Channel 136. 5680MHz. Chain A+B.



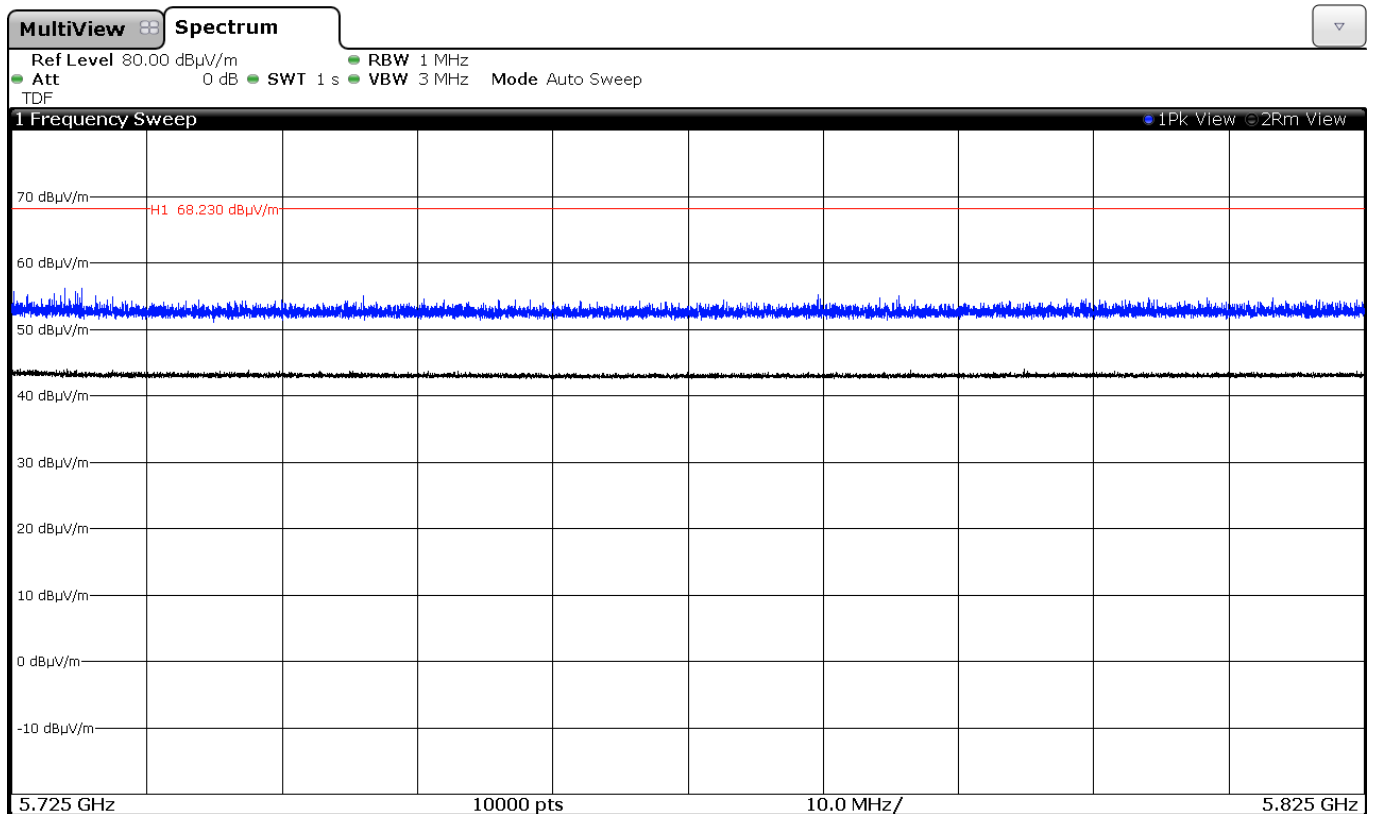
Highest Channel (140) 5700 MHz. Chain A.



Highest Channel (140) 5700 MHz. Chain B.

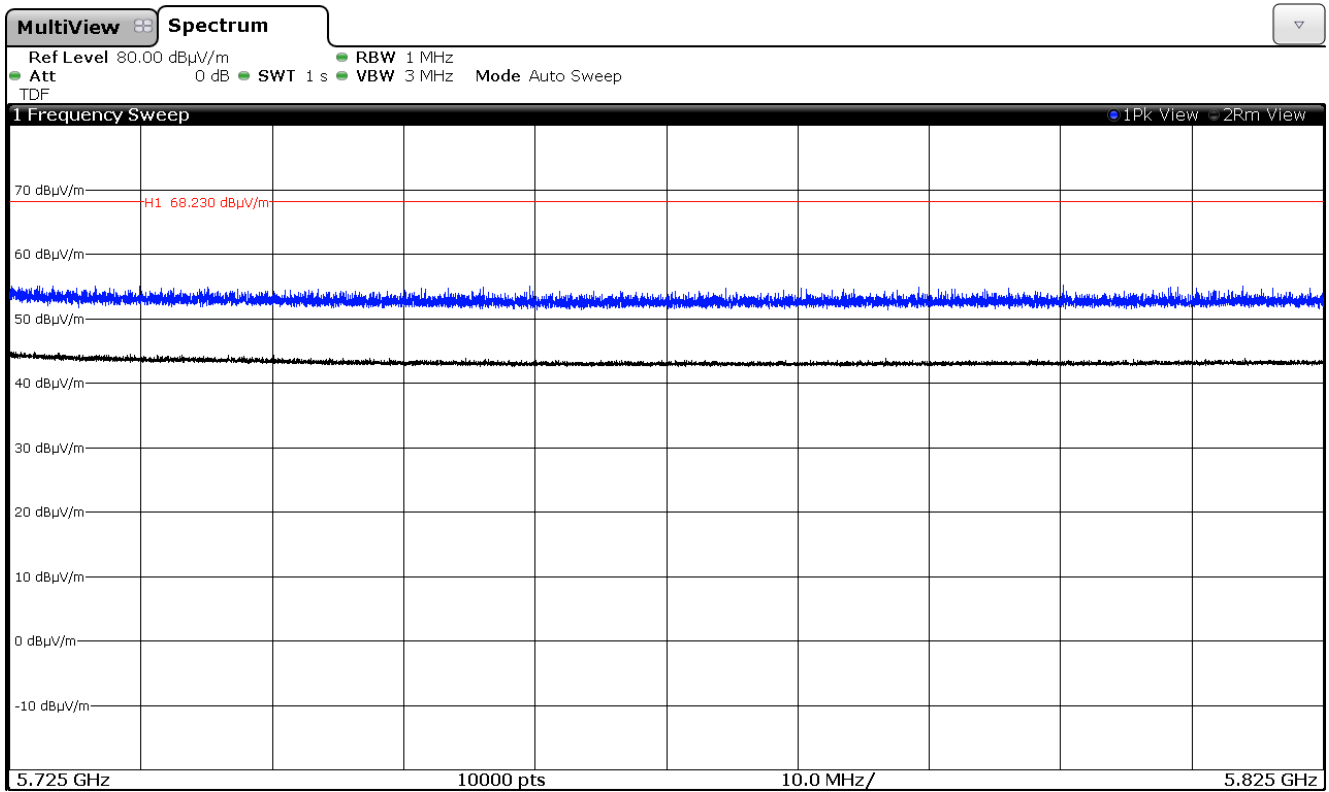


Highest Channel (140) 5700 MHz. Chain A+B.

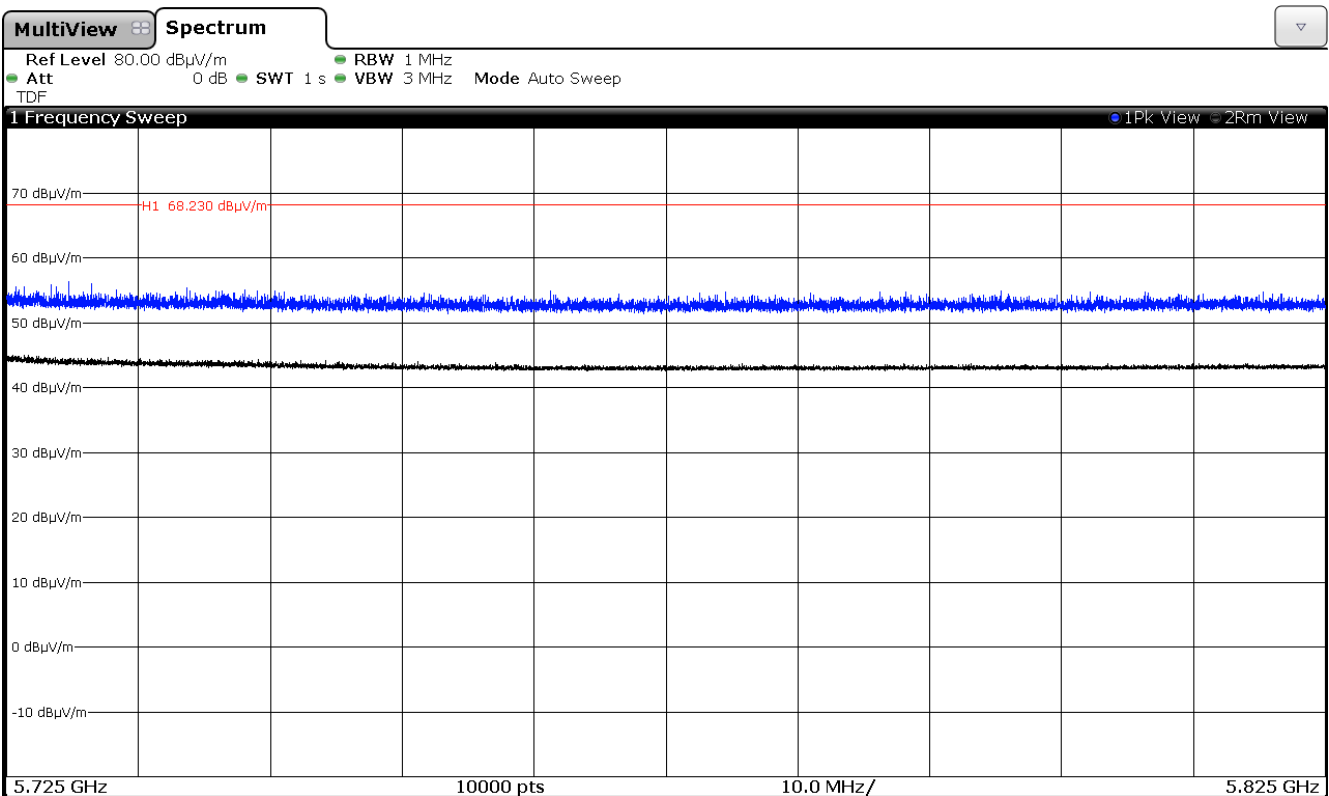


3. WiFi 5GHz 802.11 n40 mode

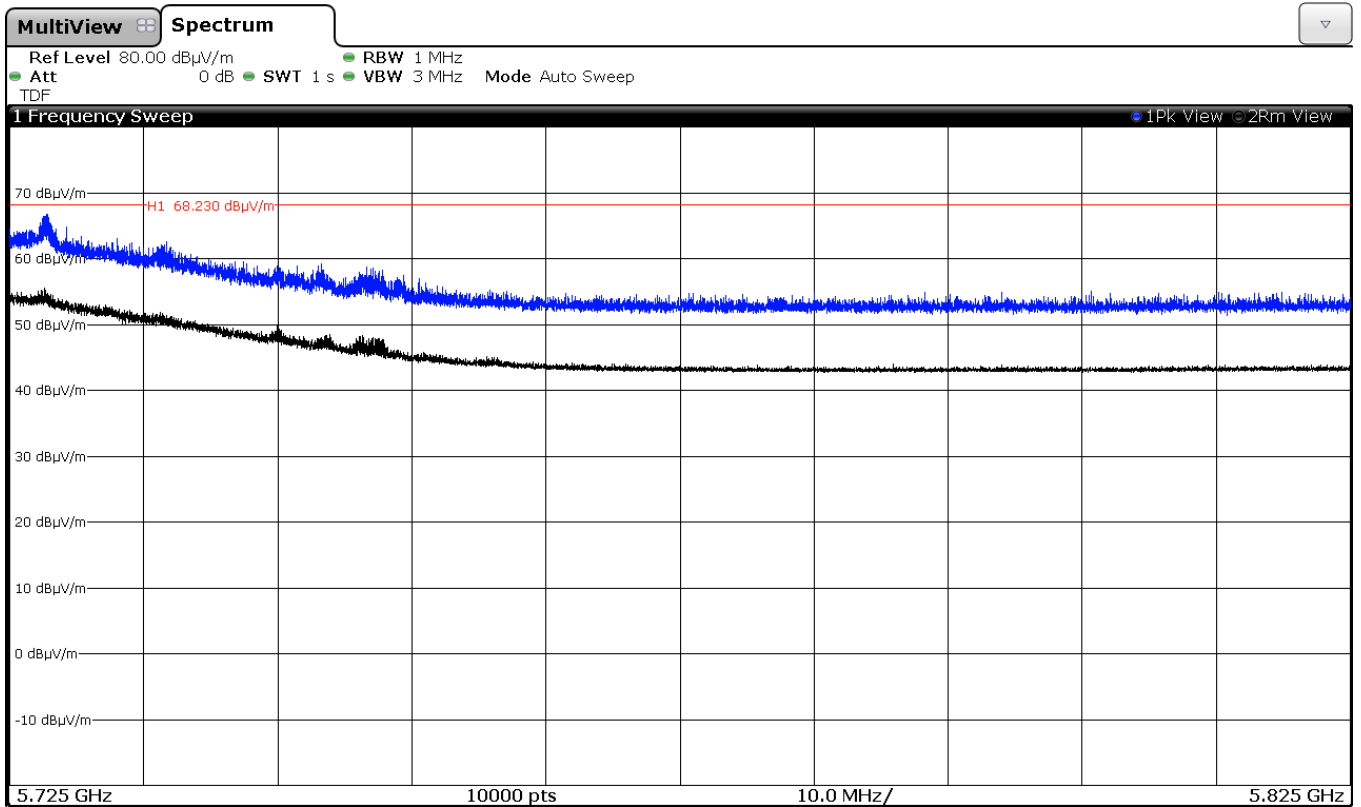
Highest Channel (134) 5670 MHz. Chain A.



Highest Channel (134) 5670 MHz. Chain B.

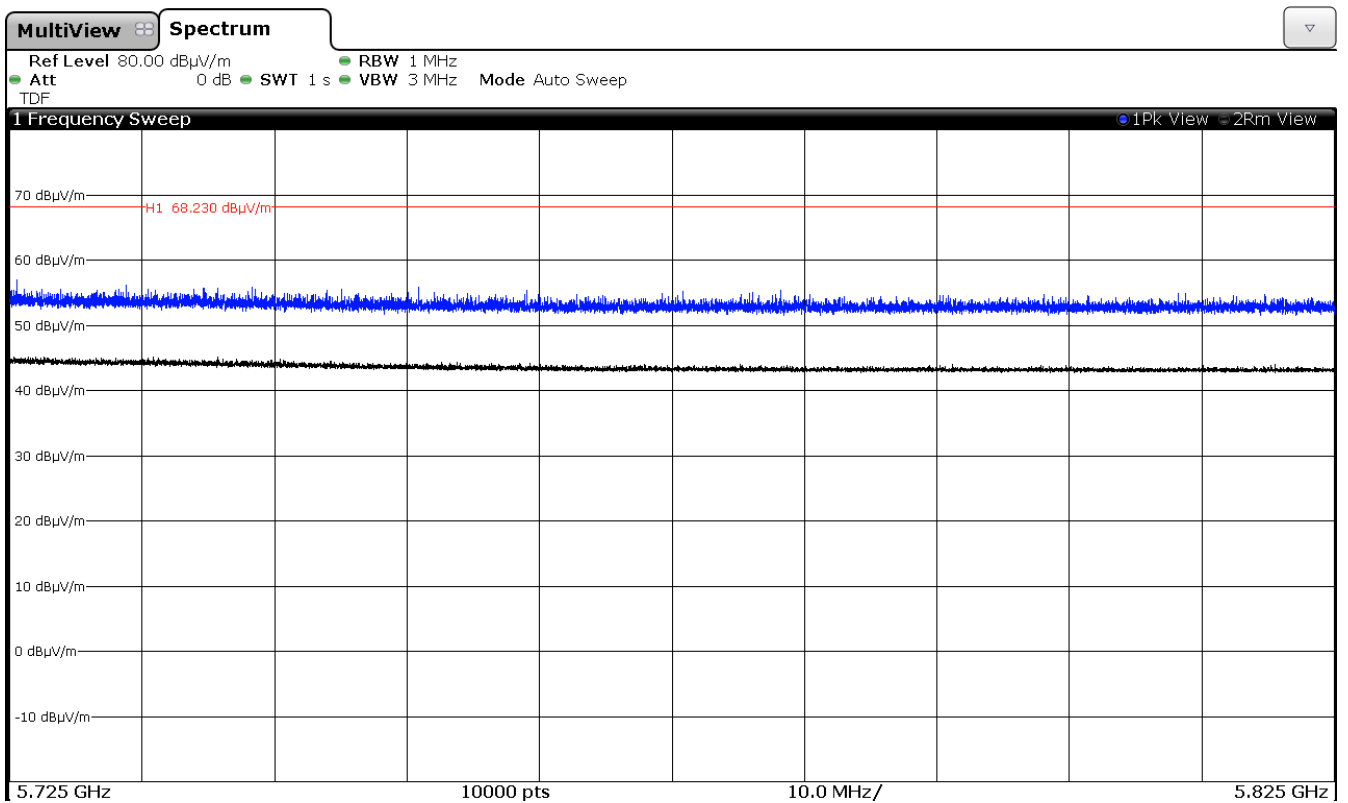


Highest Channel (134) 5670 MHz. Chain A+B.

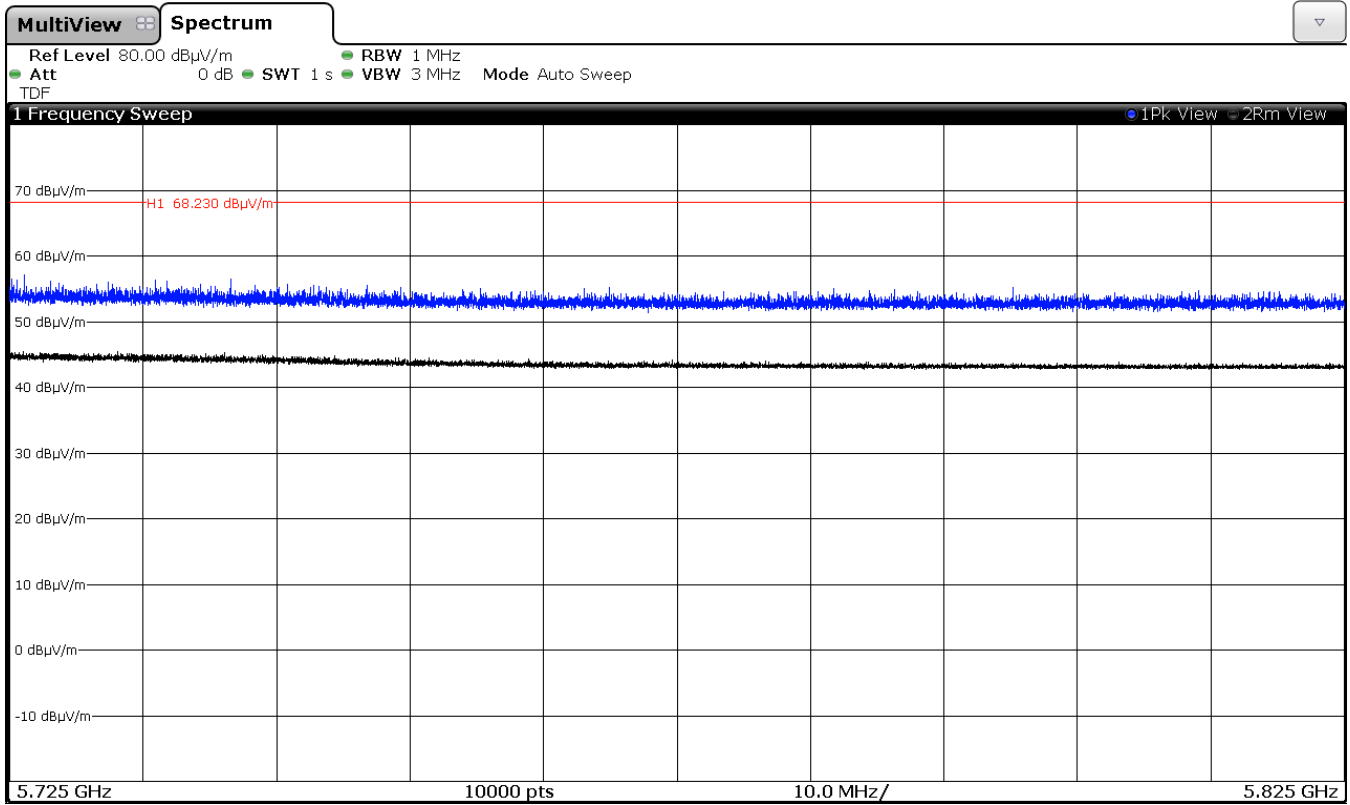


4. WiFi 5GHz 802.11 ac80 mode

Middle Channel (122) 5610 MHz. Chain A.



Middle Channel (122) 5610 MHz. Chain B.



Middle Channel (122) 5610 MHz. Chain A+B.

