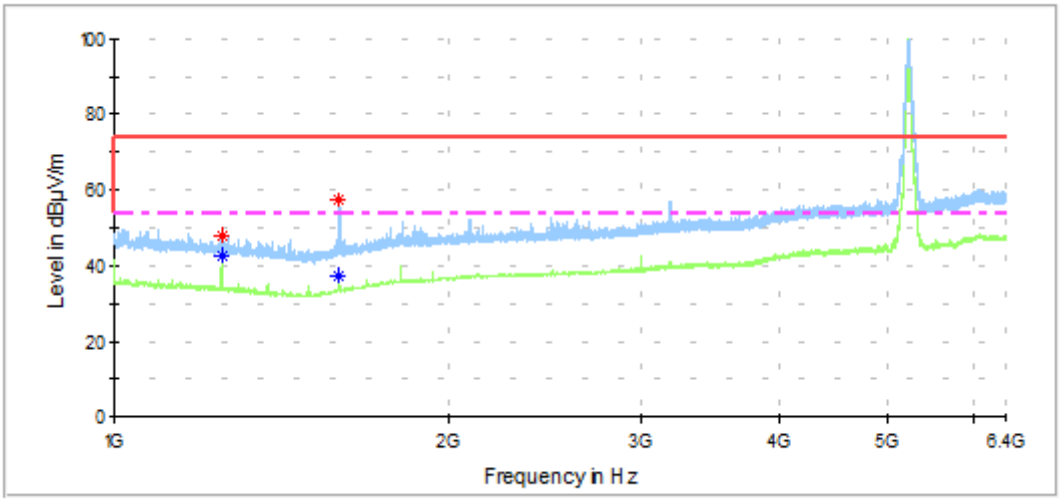
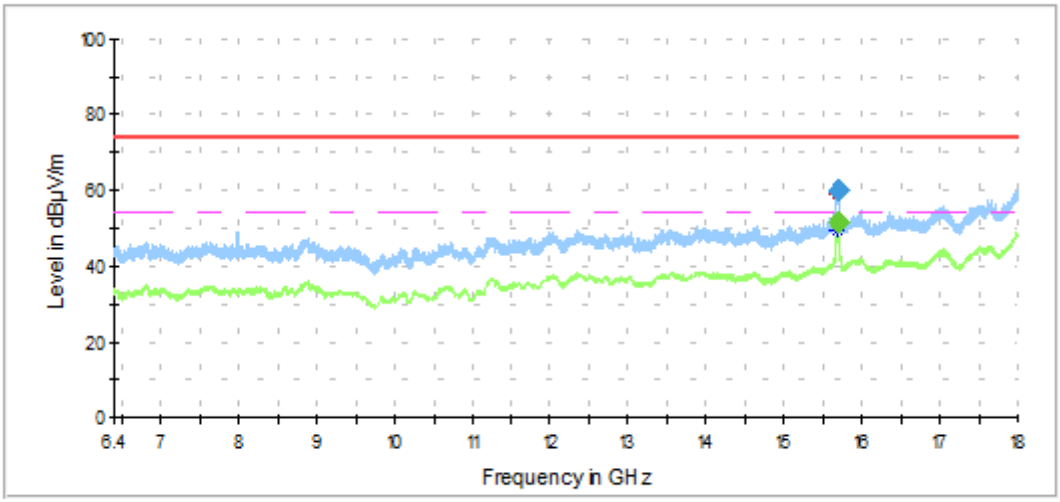
Radiated Spurious – CH46F



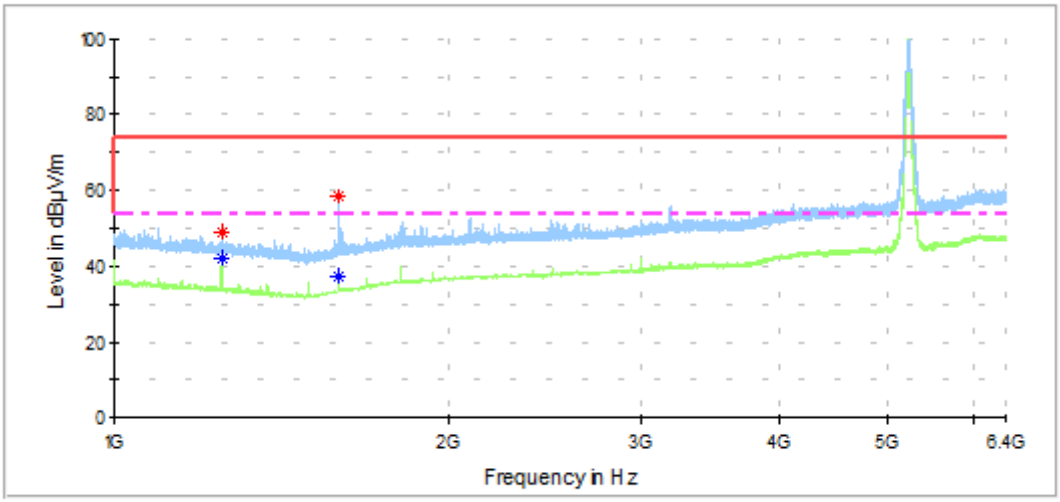


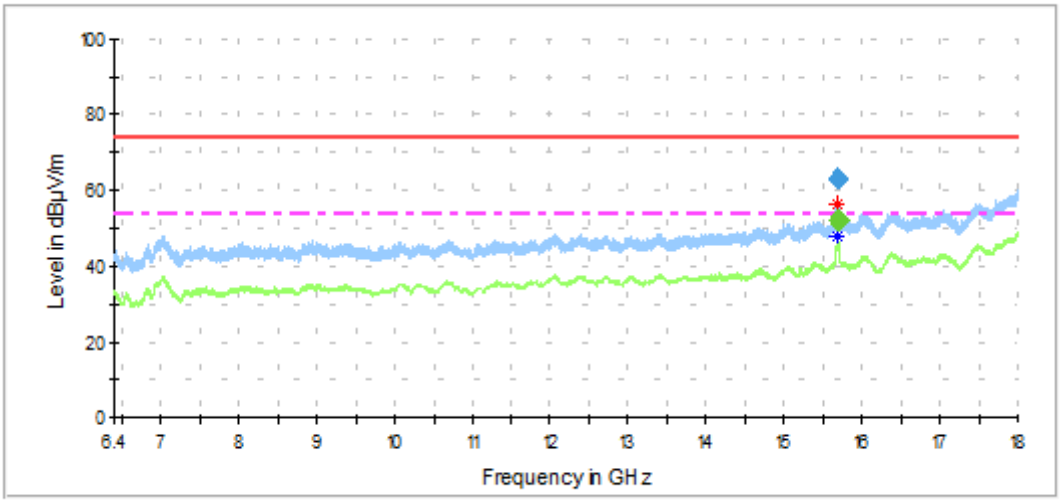
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1250.1	---	42.7	54	11.3
1250.1	48.0	---	74	26.0
1594.0	---	37.3	54	16.7
1594.7	57.5	---	74	16.5
15691.6	60.2	---	74	13.8
15694.3	---	51.5	54	**2.5**

1 GHz – 18 GHz, 802.11n40, HT8, Chain A+B

Radiated Spurious – CH46F



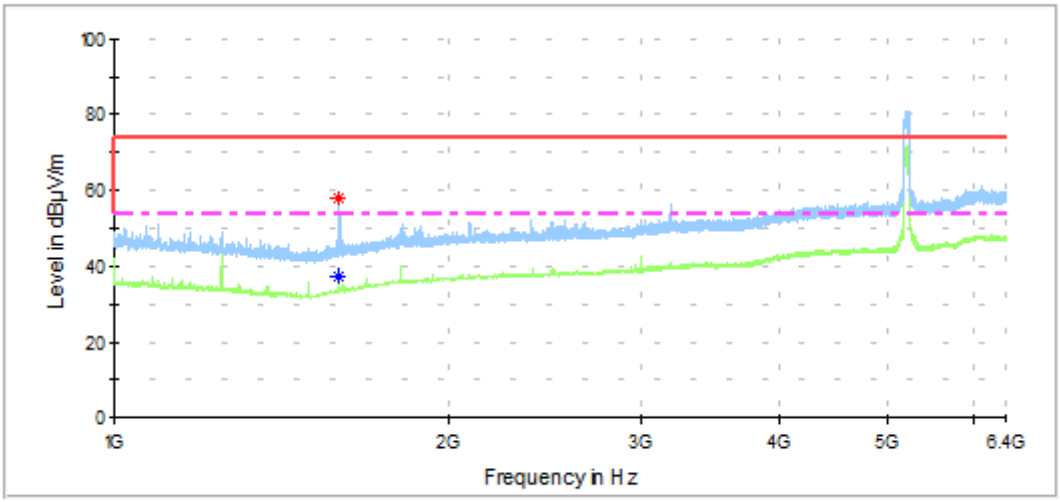


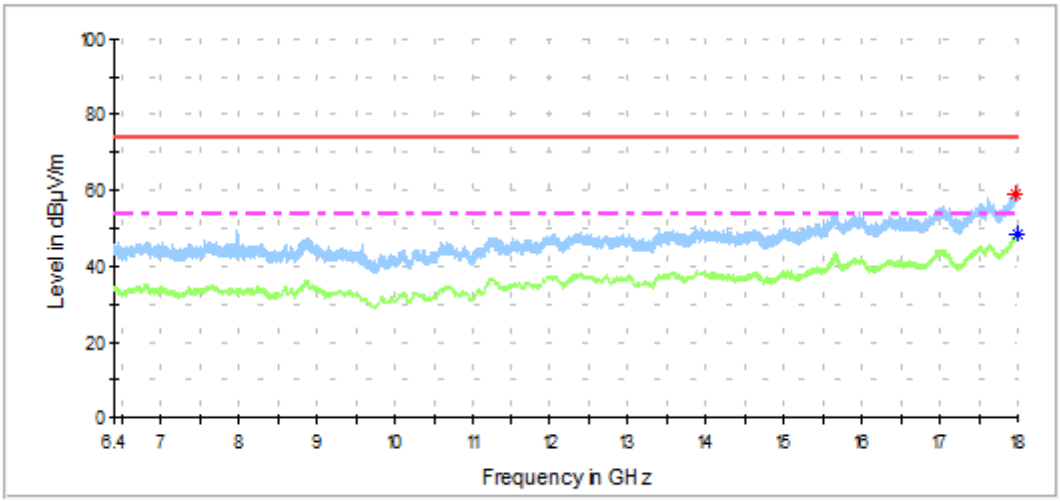
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	48.7	---	74	25.3
1250.1	---	42.3	54	11.7
1594.0	58.4	---	74	15.6
1594.2	---	37.2	54	16.8
15695.0	63.1	---	74	10.9
15696.9	---	51.9	54	**2.1**

1 GHz – 18 GHz, 802.11ac80, HT0, Chain A

Radiated Spurious – CH42ac80



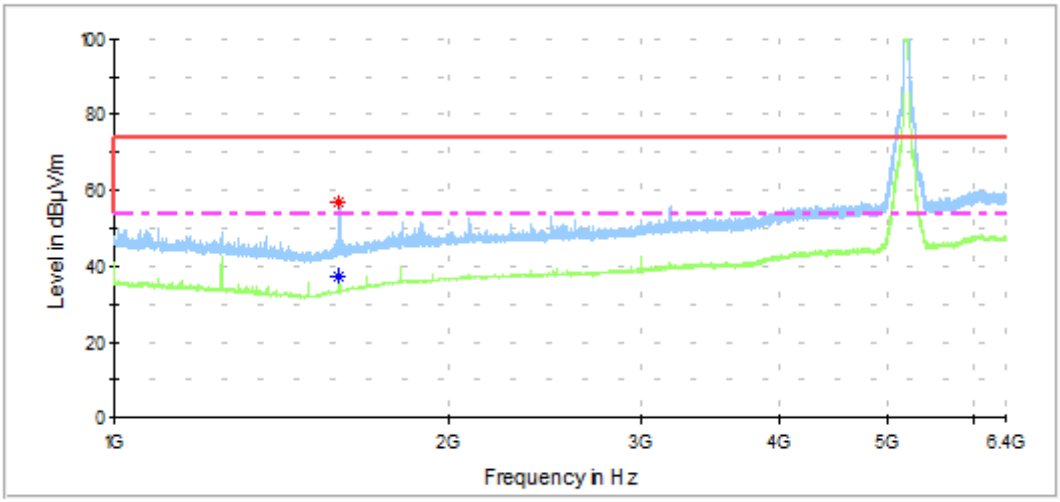


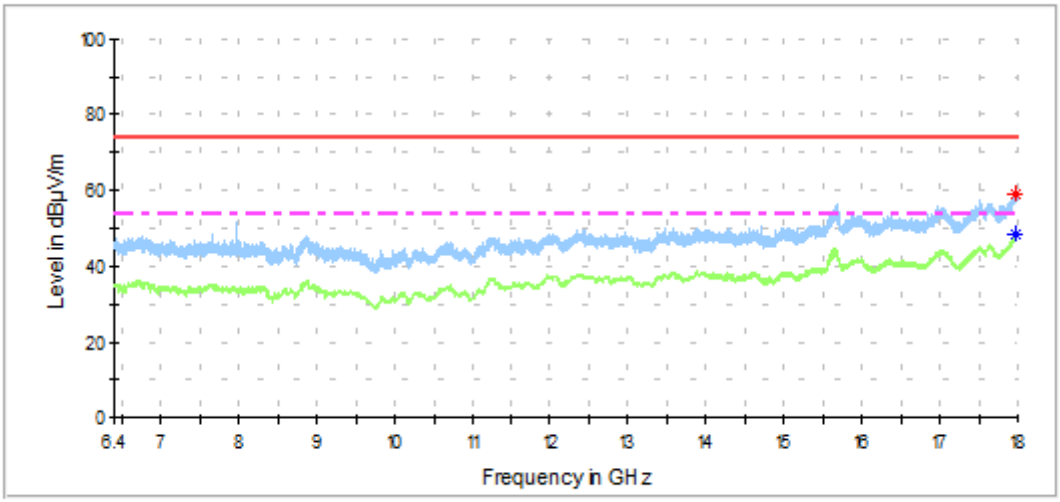
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1595.2	---	37.5	54	16.5
1595.2	57.8	---	74	16.2
17971.4	58.9	---	74	15.1
17992.4	---	48.6	54	5.4

1 GHz – 18 GHz, 802.11ac80, HT0, Chain B

Radiated Spurious – CH42ac80



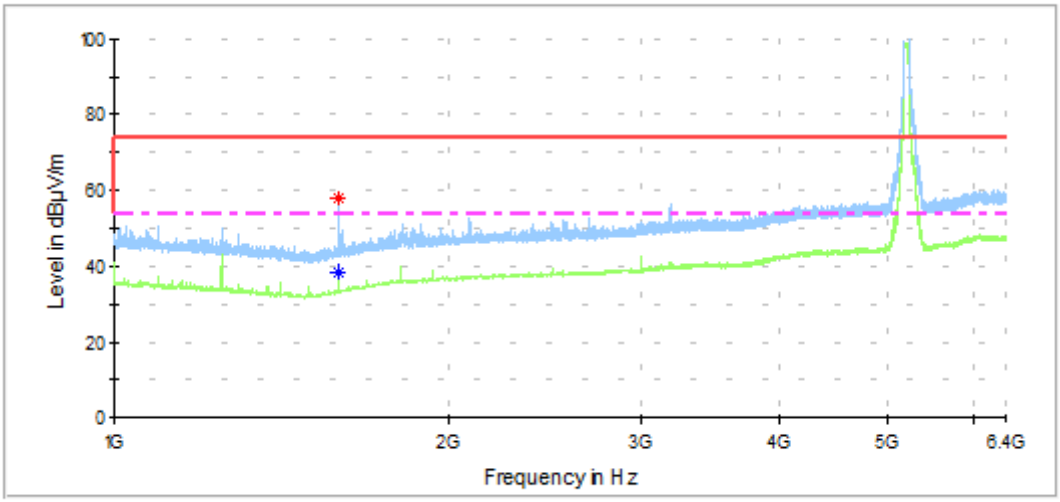


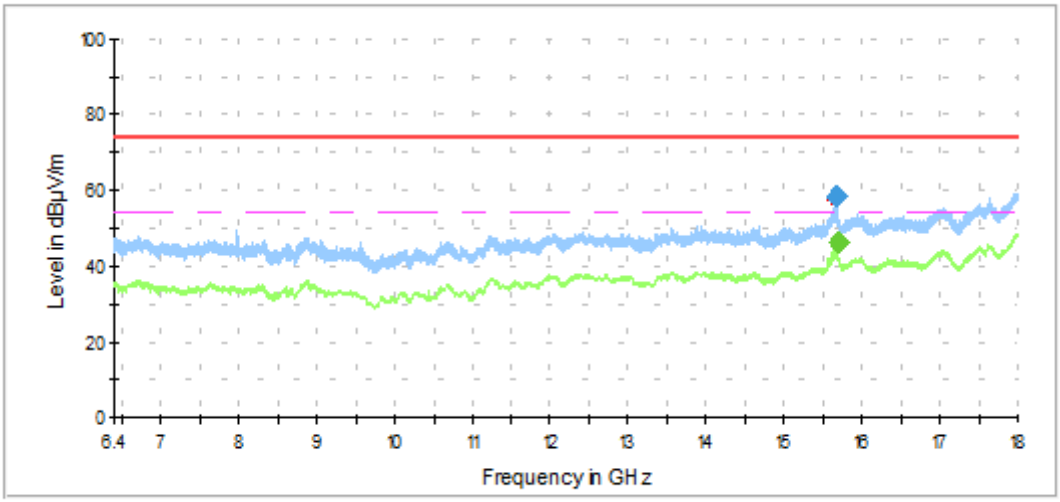
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1596.5	---	37.2	54	16.1
1596.5	56.8	---	74	17.2
17973.2	59.1	---	74	14.9
17975.9	---	48.2	54	5.8

1 GHz – 18 GHz, 802.11ac80, HT8, Chain A+B

Radiated Spurious – CH42ac80



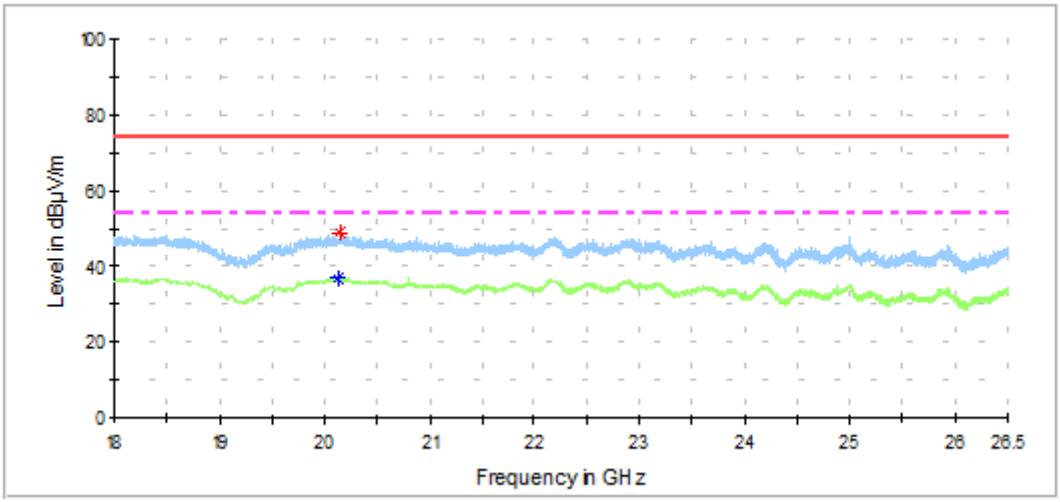


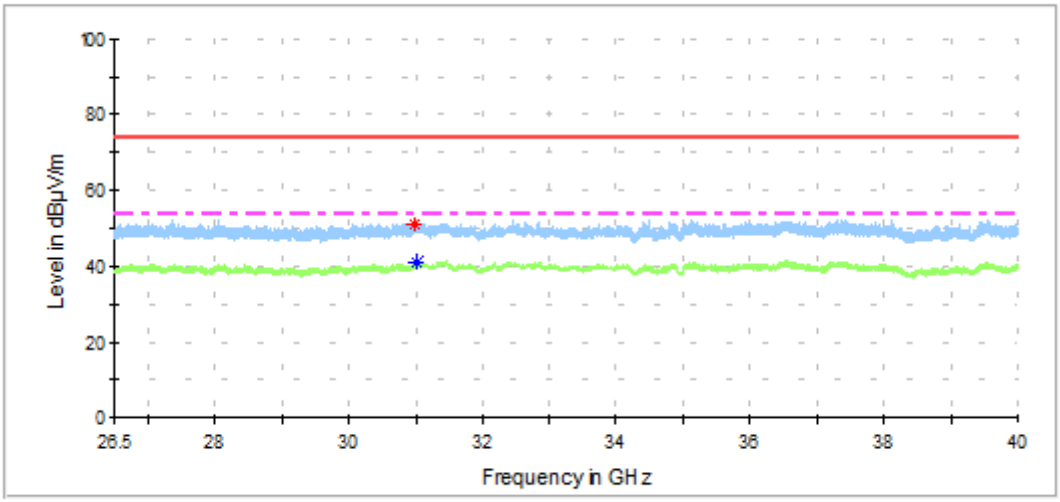
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1593.0	---	38.3	54	15.7
1593.8	57.7	---	74	16.3
15663.0	58.5	---	74	15.5
15682.7	---	46.5	54	7.5

18GHz – 40GHz

Radiated Spurious – All modes





Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
20135.4	---	37.1	54	16.9
20155.2	49.0	---	74	25.0
30968.0	51.3	---	74	22.7
31009.0	---	41.2	54	12.8

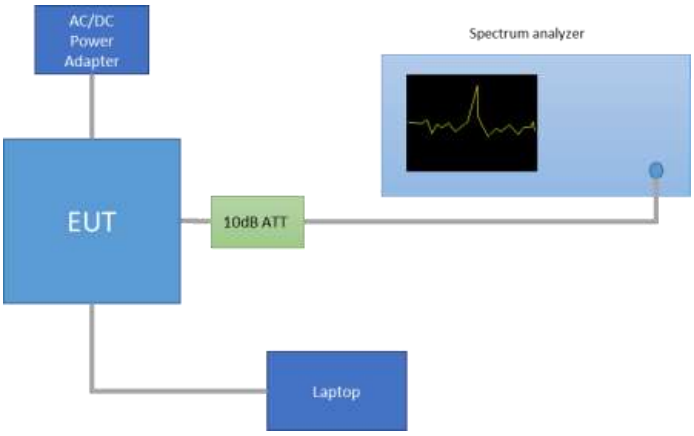
Note 1: The spurious signals detected do not depend on either the operating channel or the modulation mode.

Annex C. Test Results U-NII-2A

C.1 26dB & 99% Bandwidth

Test procedure:

The setup below was used to measure the 26dB & 99% Bandwidth. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.



Results tables:

Mode	Rate	Antenna	Channel	Frequency [MHz]	26dB BW [MHz]	99% BW [MHz]
802.11a	6Mbps	SISO CHAIN A	52	5260	29.70	18.48
			56	5280	29.90	18.36
			64	5320	26.00	17.00
		SISO CHAIN B	52	5260	30.60	18.60
			56	5280	28.20	17.60
			64	5320	24.65	16.68
802.11n20	HT0	SISO CHAIN A	52	5260	30.85	19.04
			56	5280	27.95	18.08
			64	5320	26.25	17.96
		SISO CHAIN B	52	5260	30.80	18.88
			56	5280	30.05	18.40
			64	5320	25.75	17.84
	HT8	MIMO CHAIN A	52	5260	27.55	18.16
			56	5280	28.80	18.12
			64	5320	24.95	17.76
		MIMO CHAIN B	52	5260	25.75	18.08
			56	5280	25.60	17.92
			64	5320	24.40	17.76
802.11n40	HT0	SISO CHAIN A	54F	5270	54.18	37.36
			62F	5310	45.81	36.24
		SISO CHAIN B	54F	5270	53.55	37.12
			62F	5310	45.90	36.24
	HT8	MIMO CHAIN A	54F	5270	48.60	36.72
			62F	5310	44.91	36.32
		MIMO CHAIN B	54F	5270	46.89	36.24
			62F	5310	44.01	36.16
802.11ac80	VHT0	SISO CHAIN A	58ac80	5290	84.93	75.00
		SISO CHAIN B	58ac80	5290	85.88	74.88
		MIMO CHAIN A	58ac80	5290	85.69	75.00
		MIMO CHAIN B	58ac80	5290	84.55	74.88

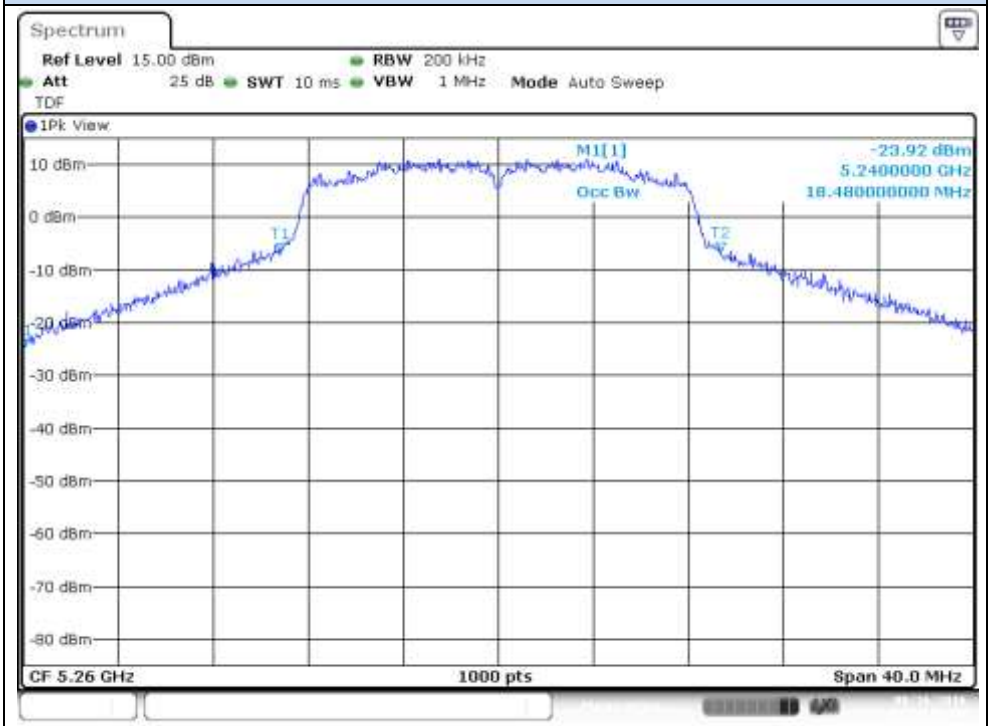
Max Value

Results screenshot:

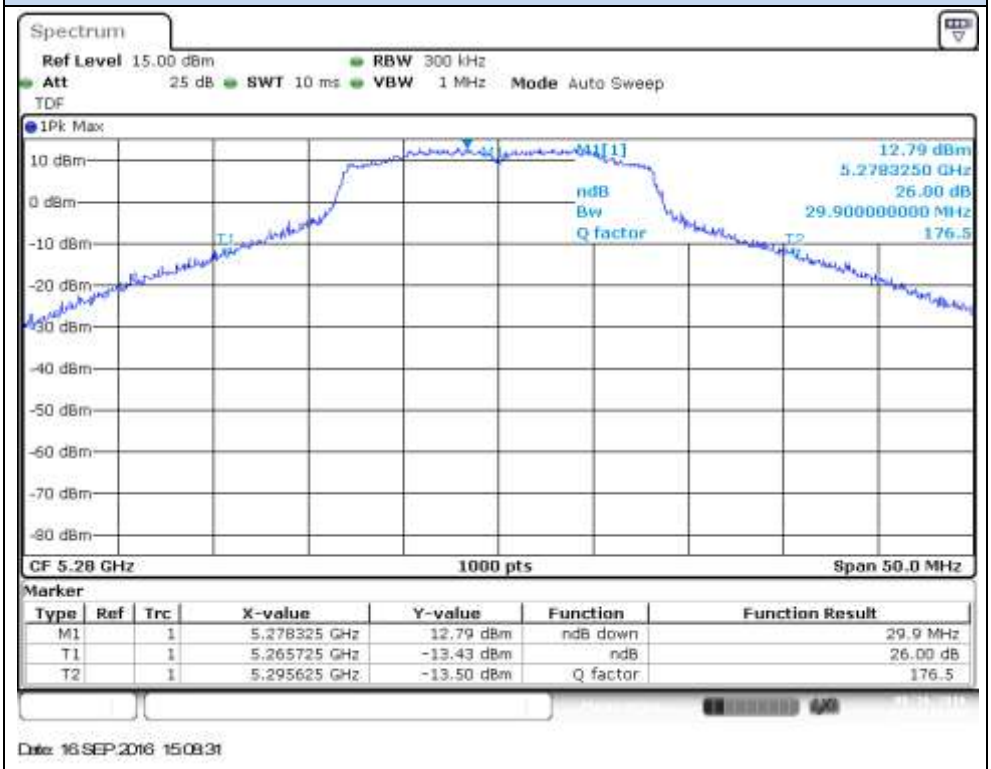
802.11a, 6Mbps – Chain A

26dB BW – CH52

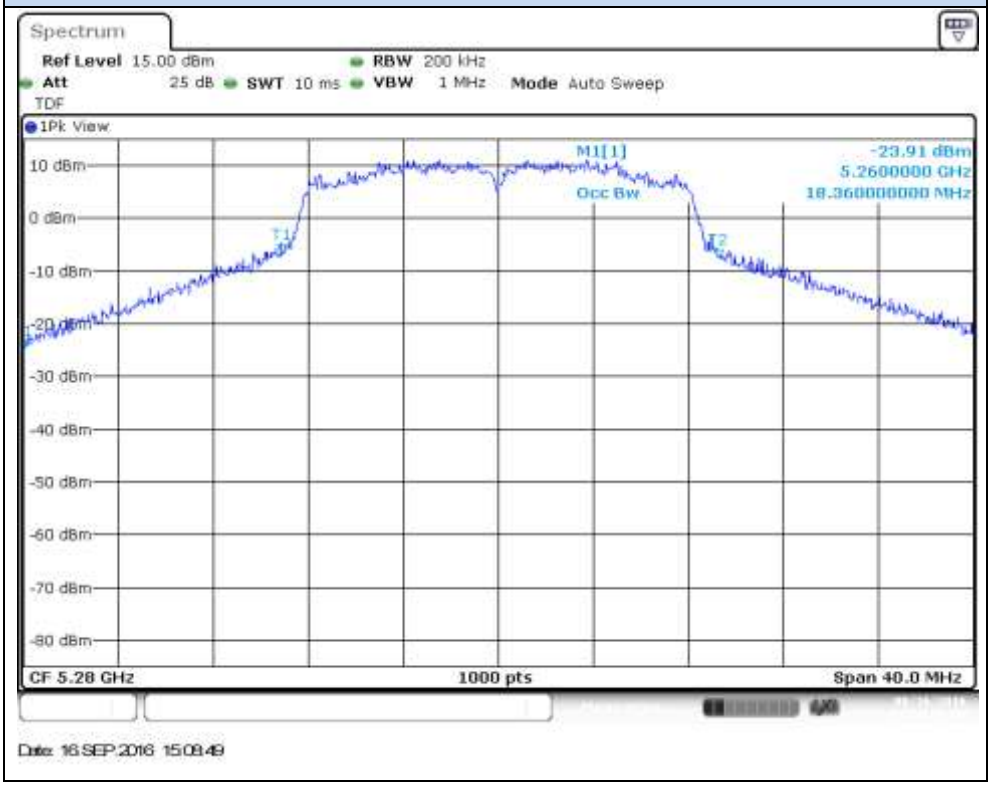
99% BW – CH52



26dB BW – CH56

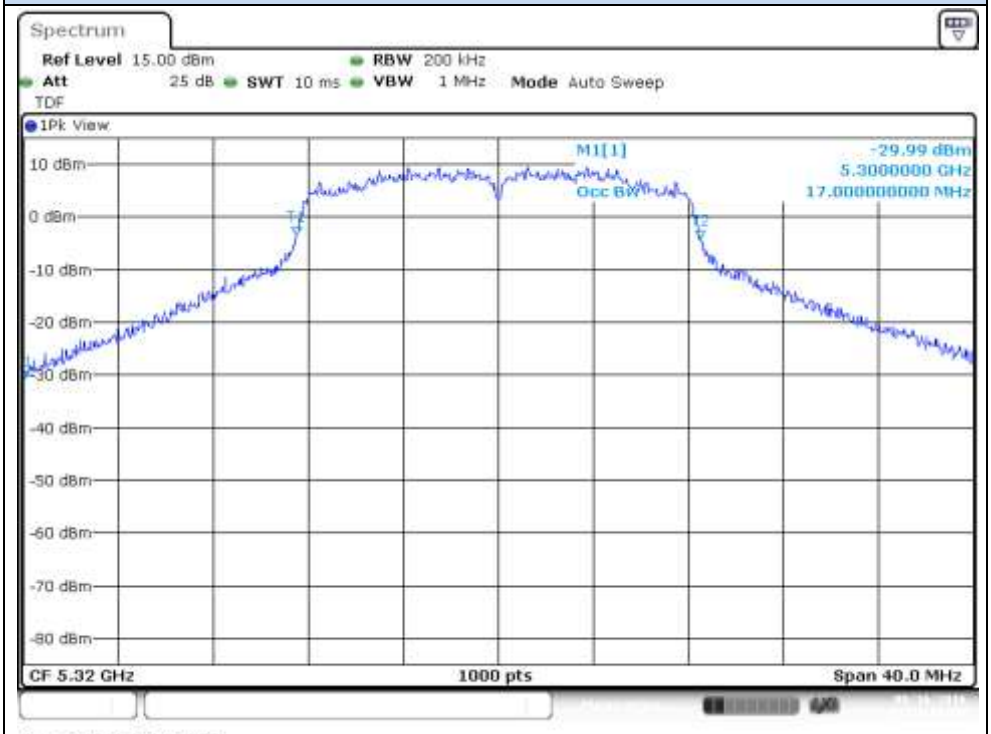


99% BW – CH56



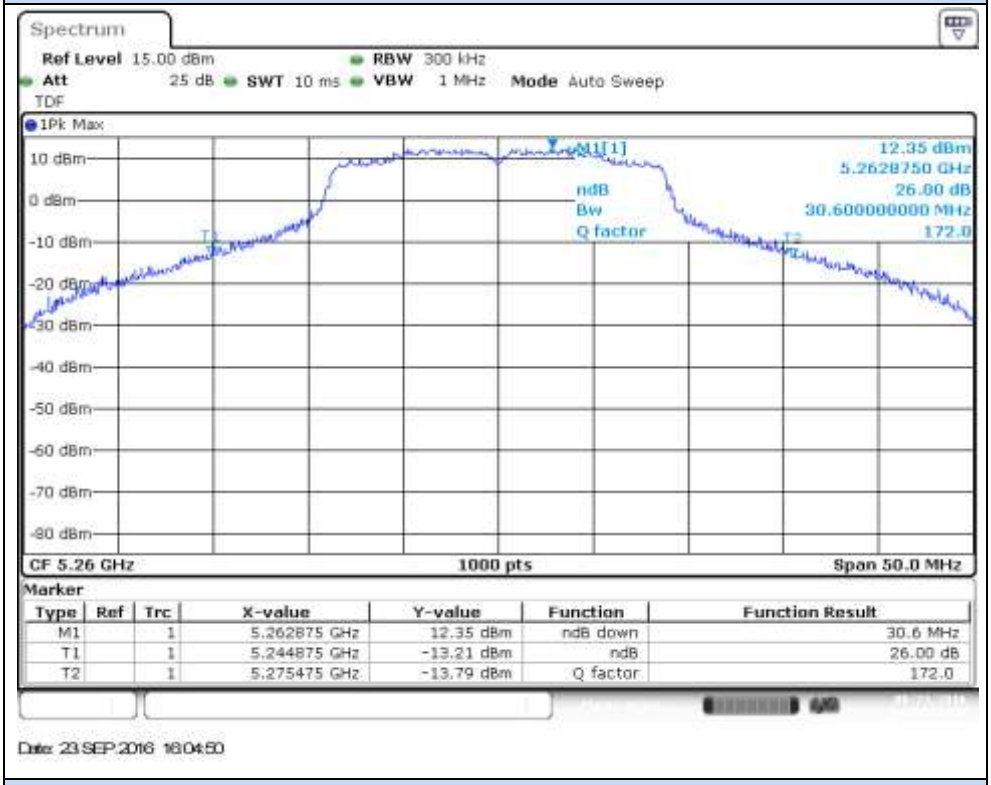
26dB BW – CH64

99% BW – CH64

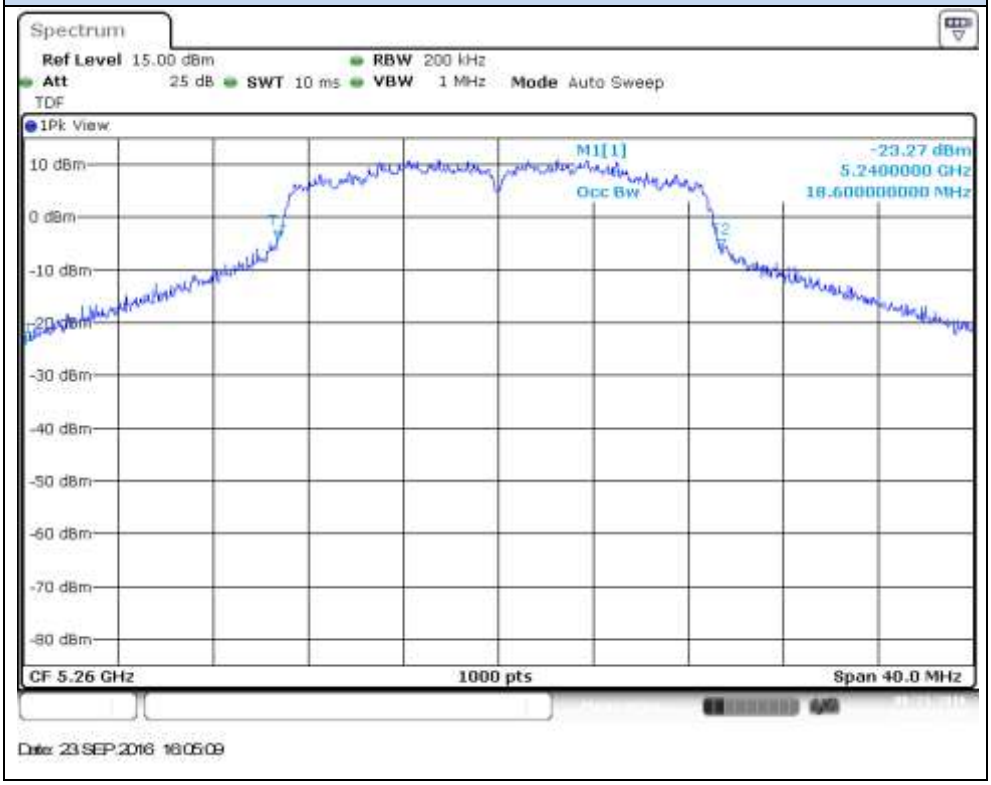


802.11a, 6Mbps – Chain B

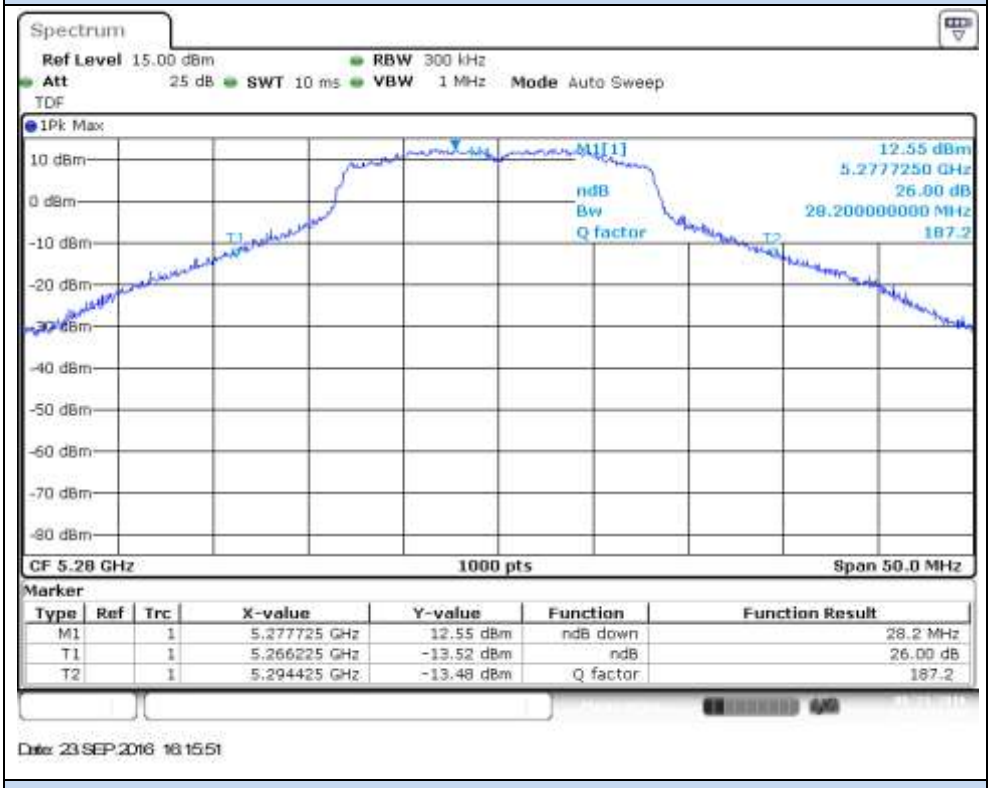
26dB BW – CH52



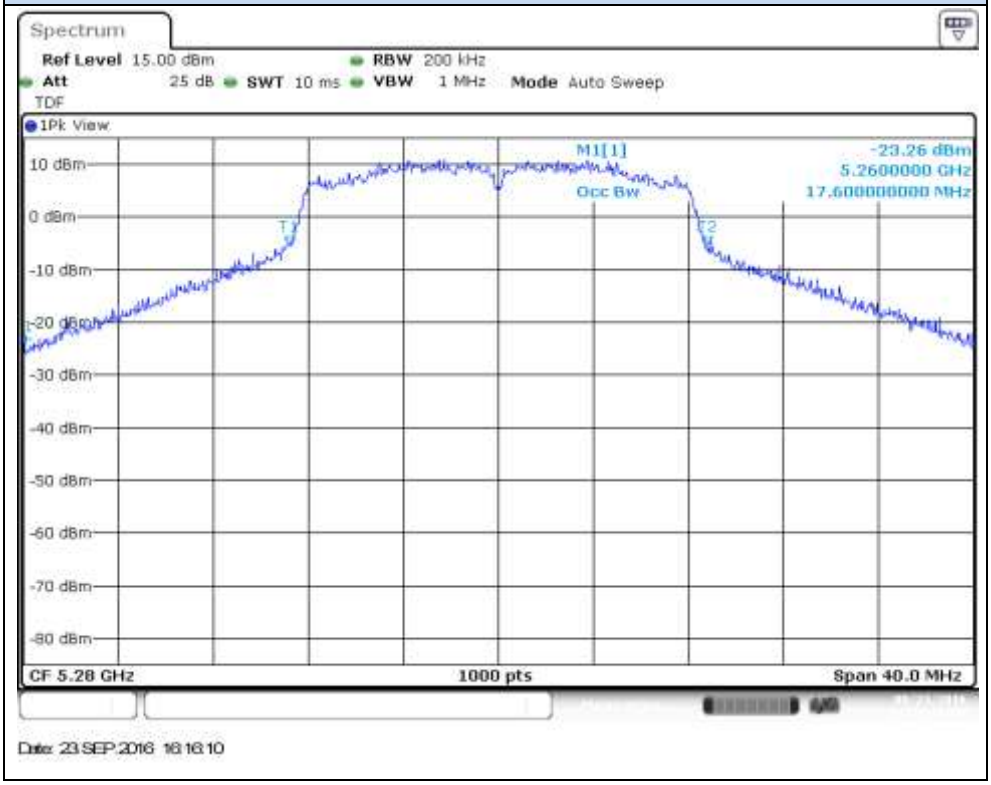
99% BW – CH52



26dB BW – CH56

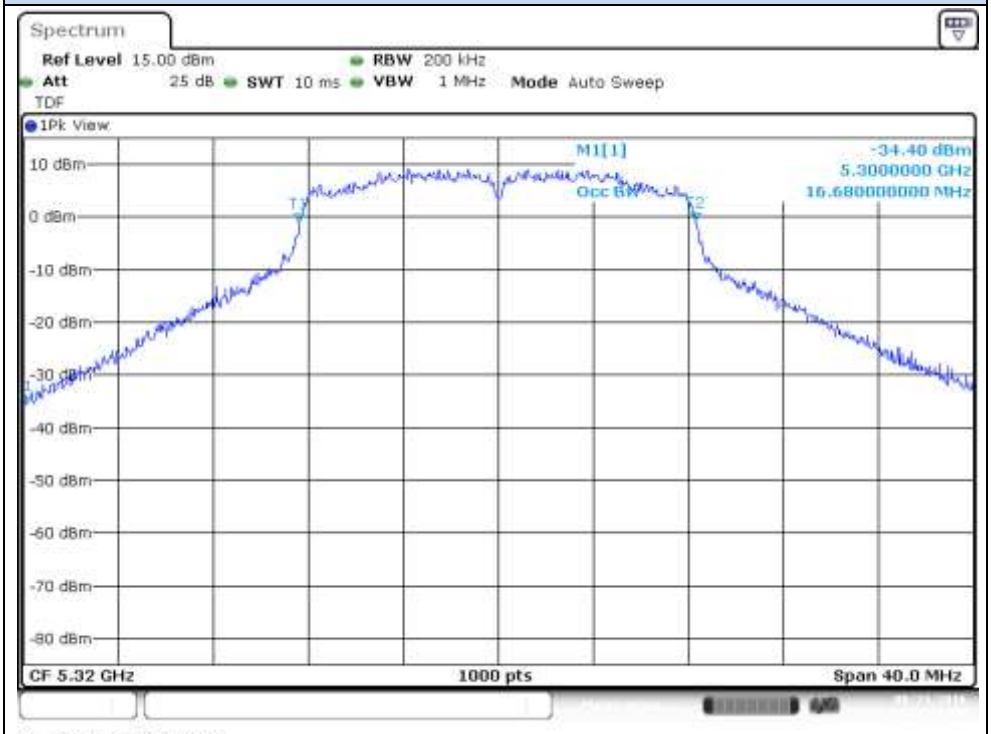


99% BW – CH56



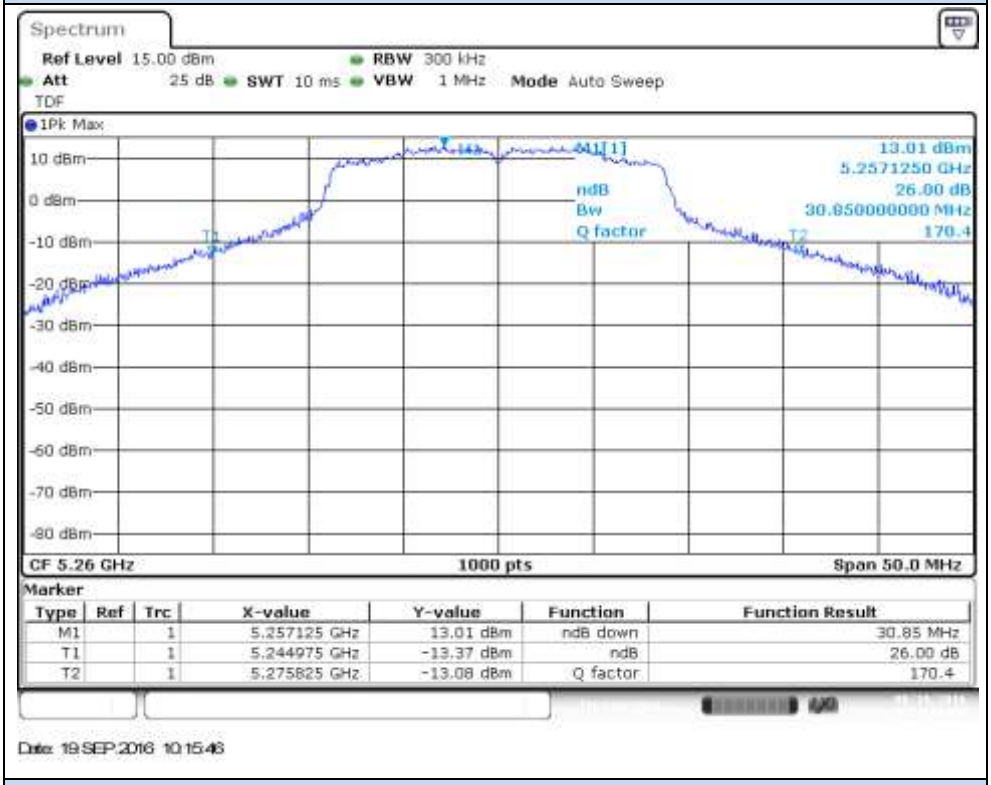
26dB BW – CH64

99% BW – CH64

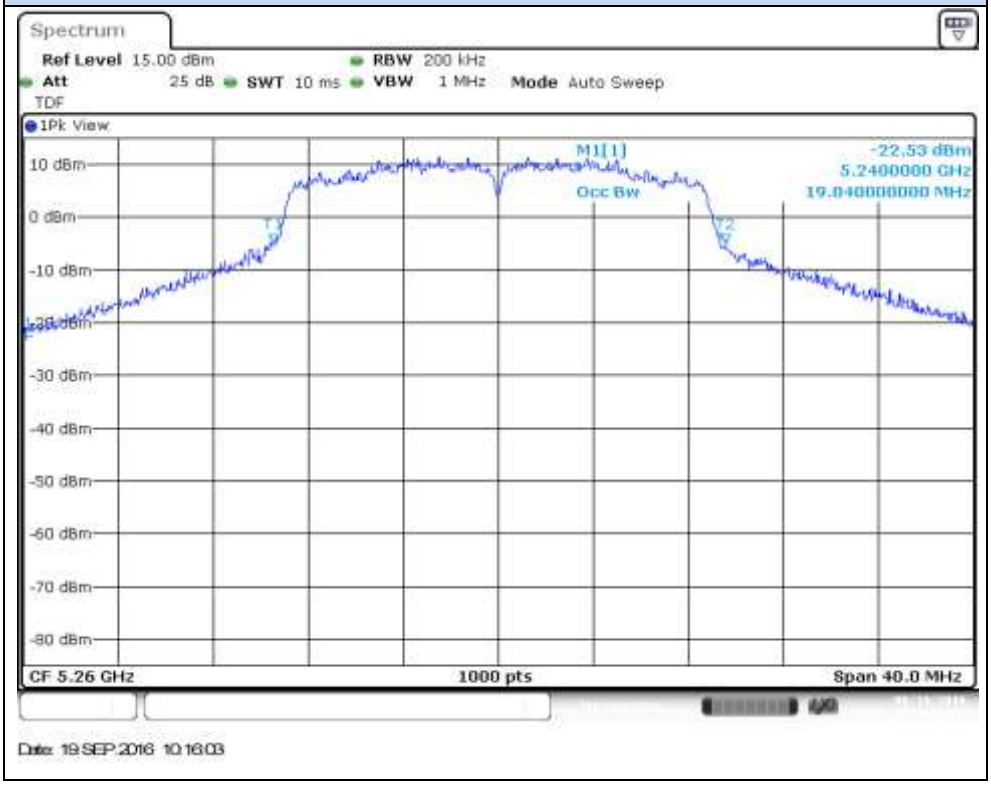


802.11n20, HT0 (SISO) – Chain A

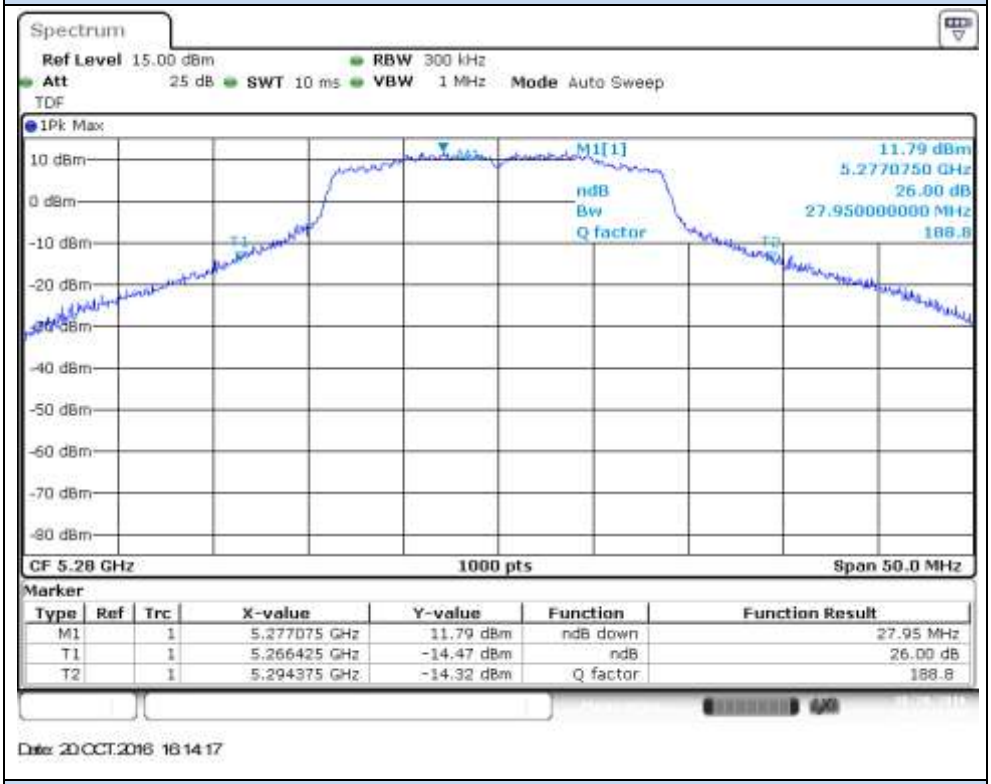
26dB BW – CH52



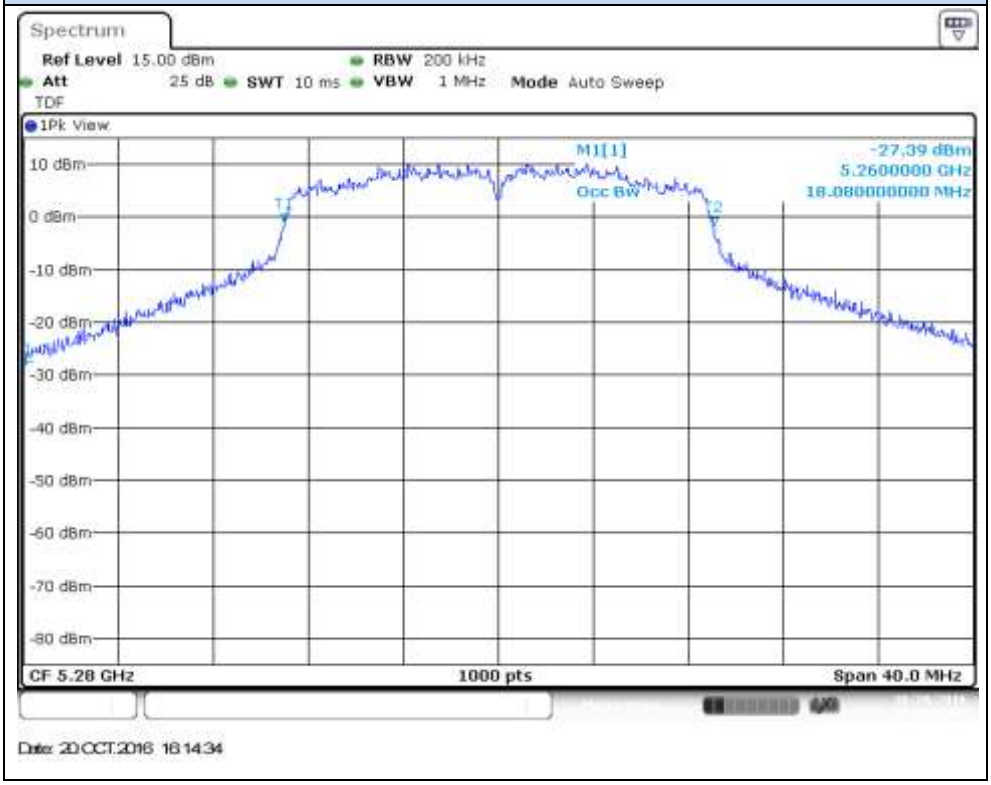
99% BW – CH52



26dB BW – CH56

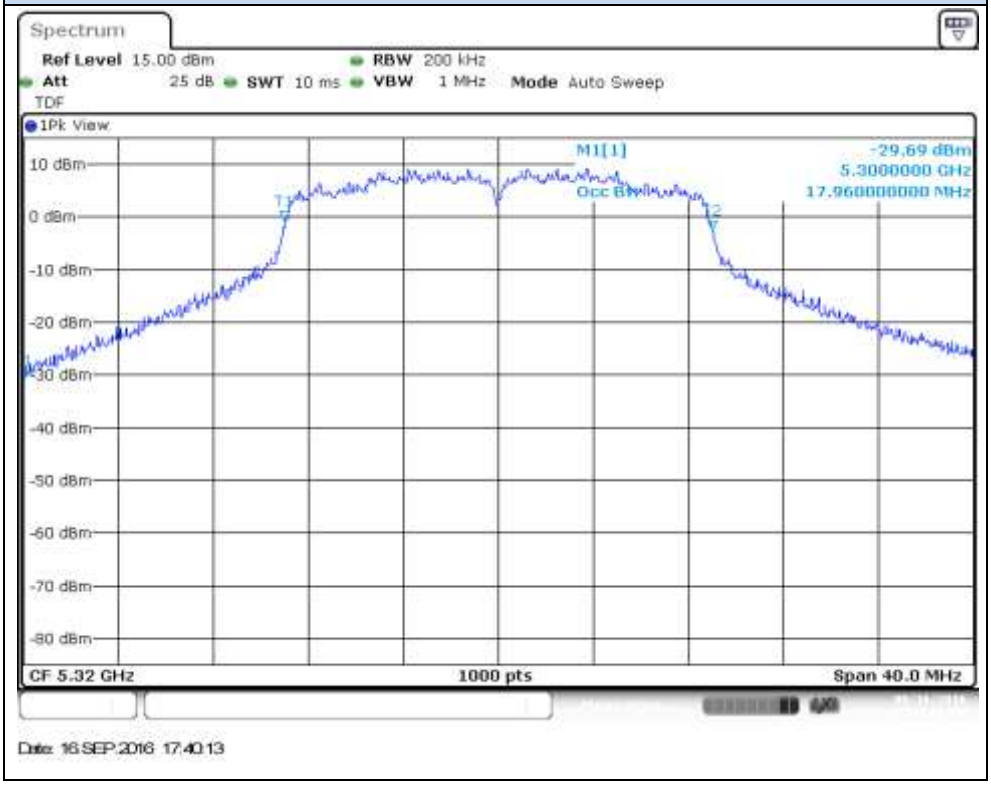


99% BW – CH56



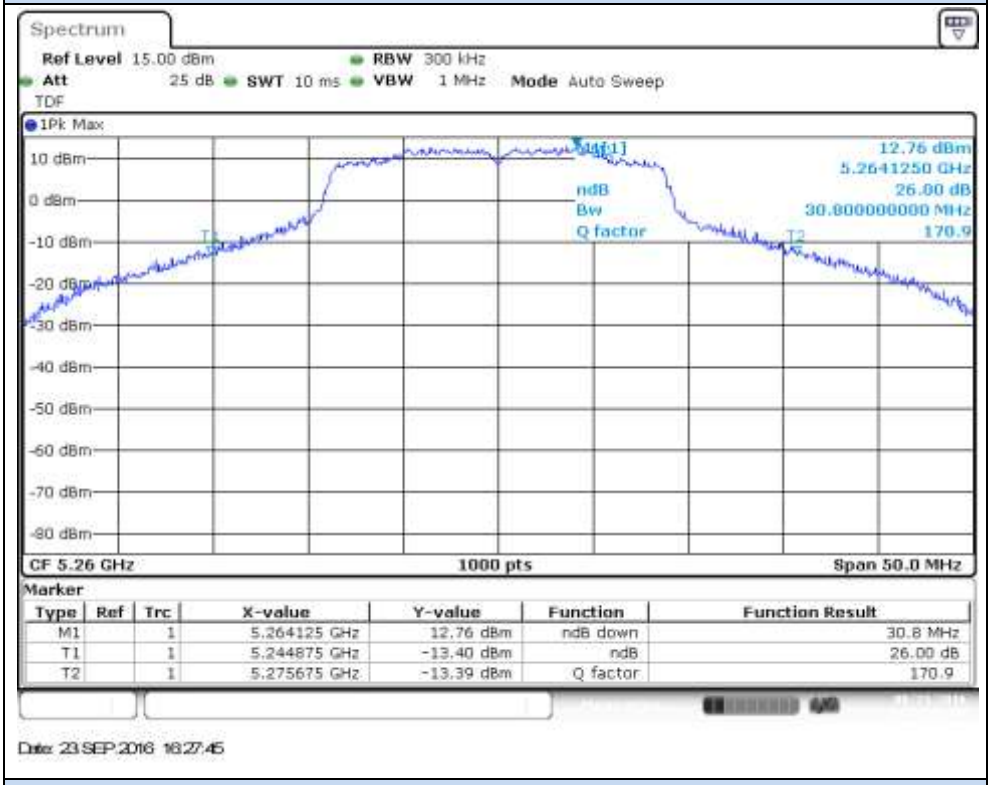
26dB BW – CH64

99% BW – CH64

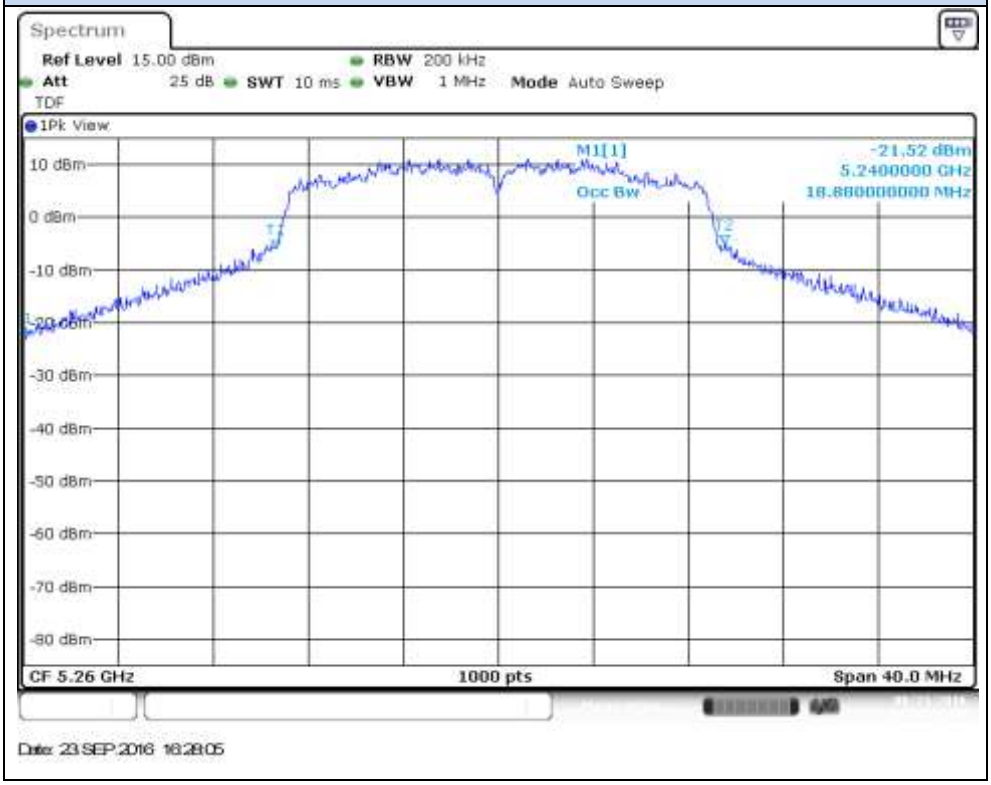


802.11n20, HT0 (SISO) – Chain B

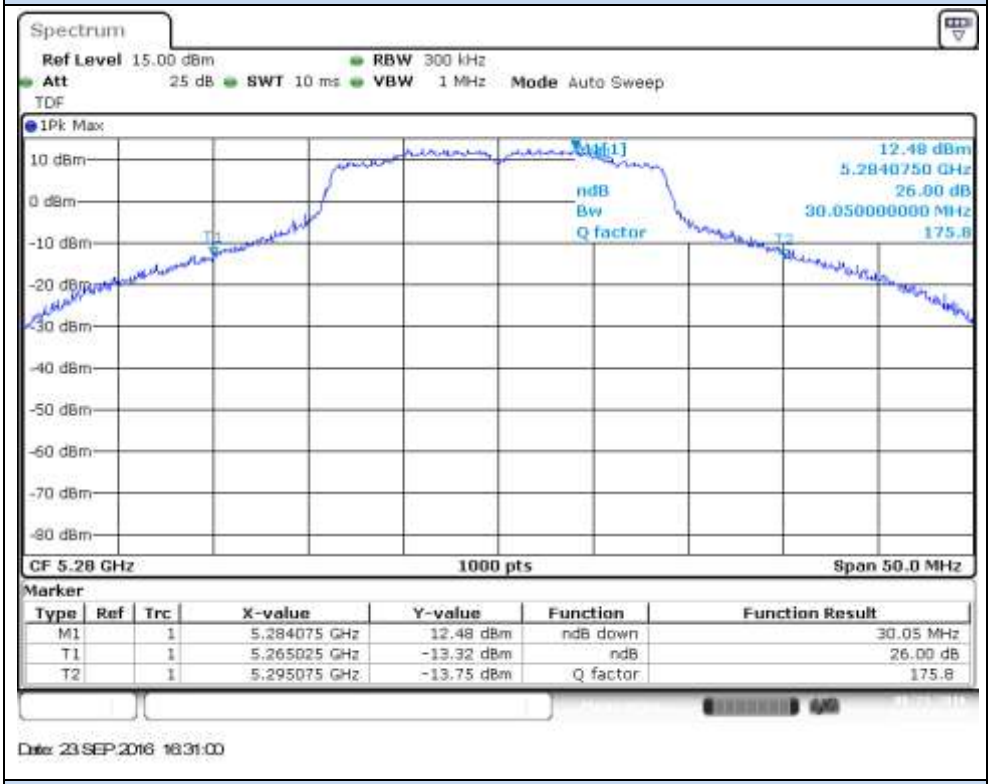
26dB BW – CH52



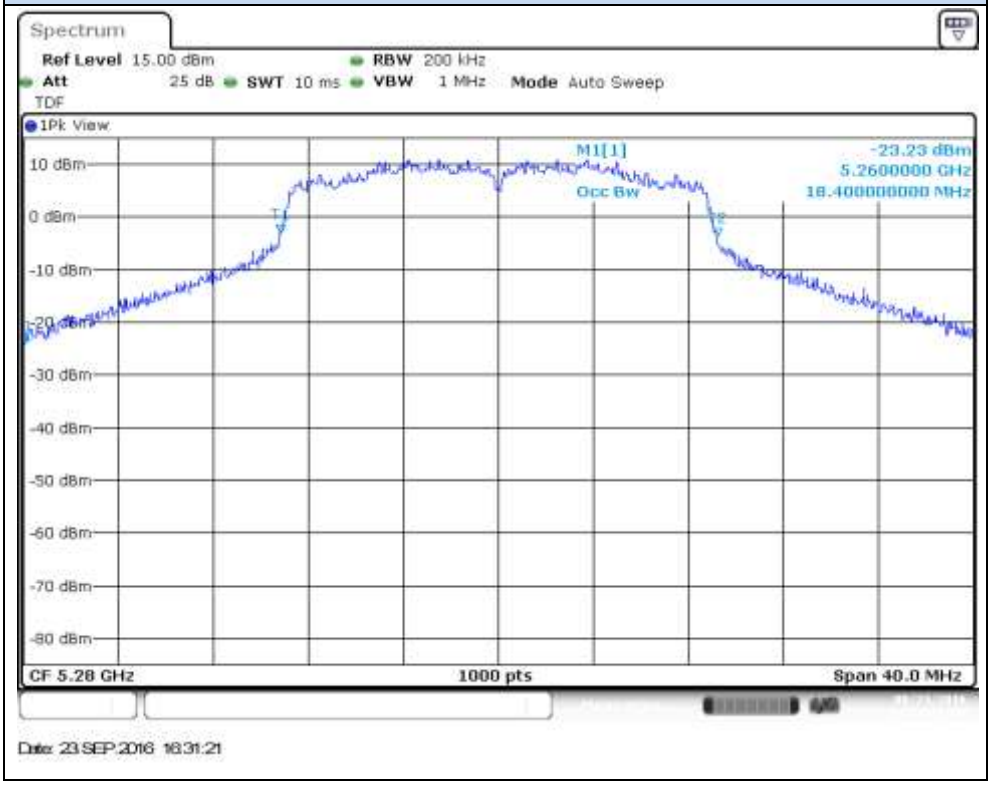
99% BW – CH52



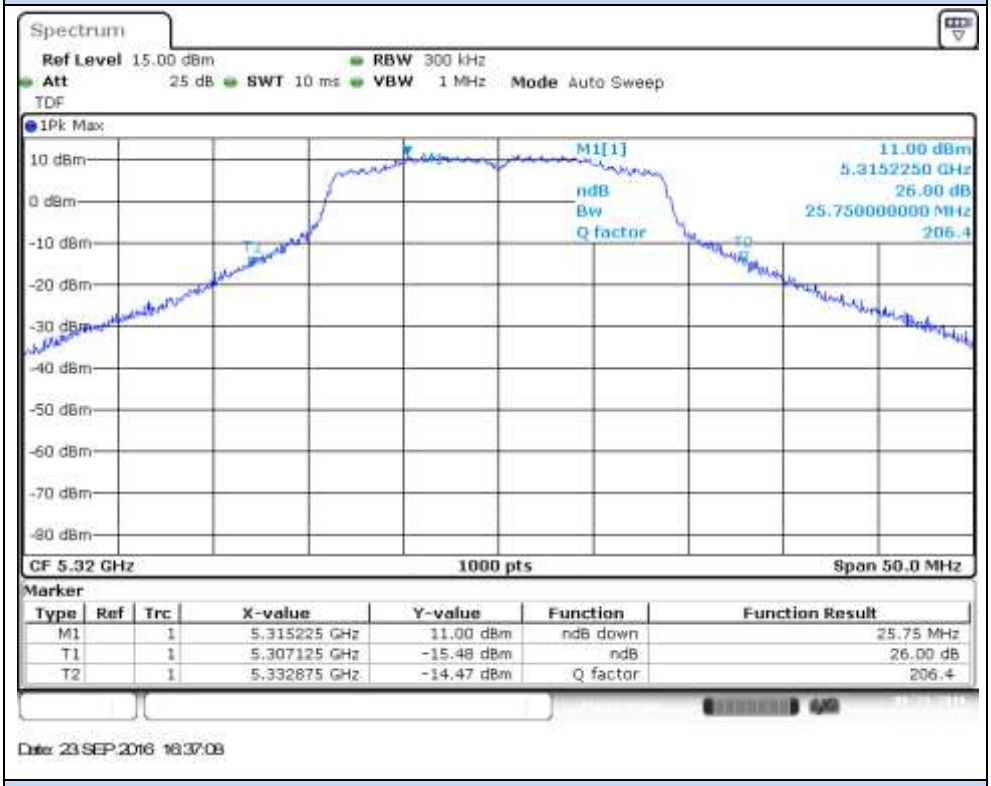
26dB BW – CH56



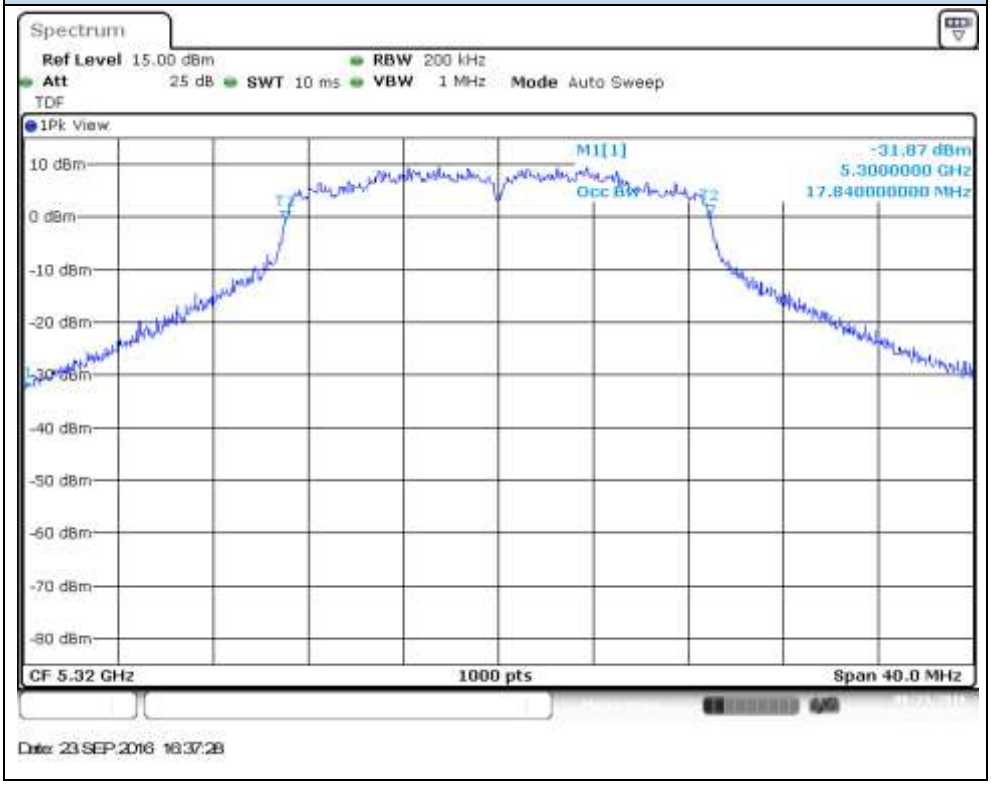
99% BW – CH56



26dB BW – CH64

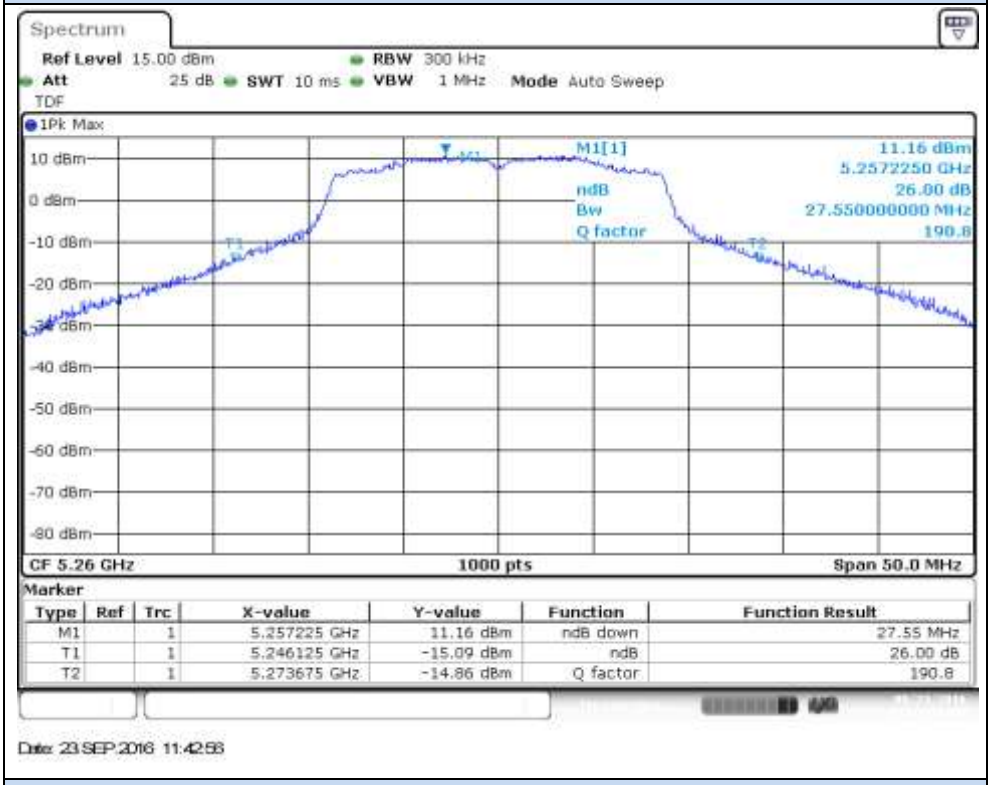


99% BW – CH64

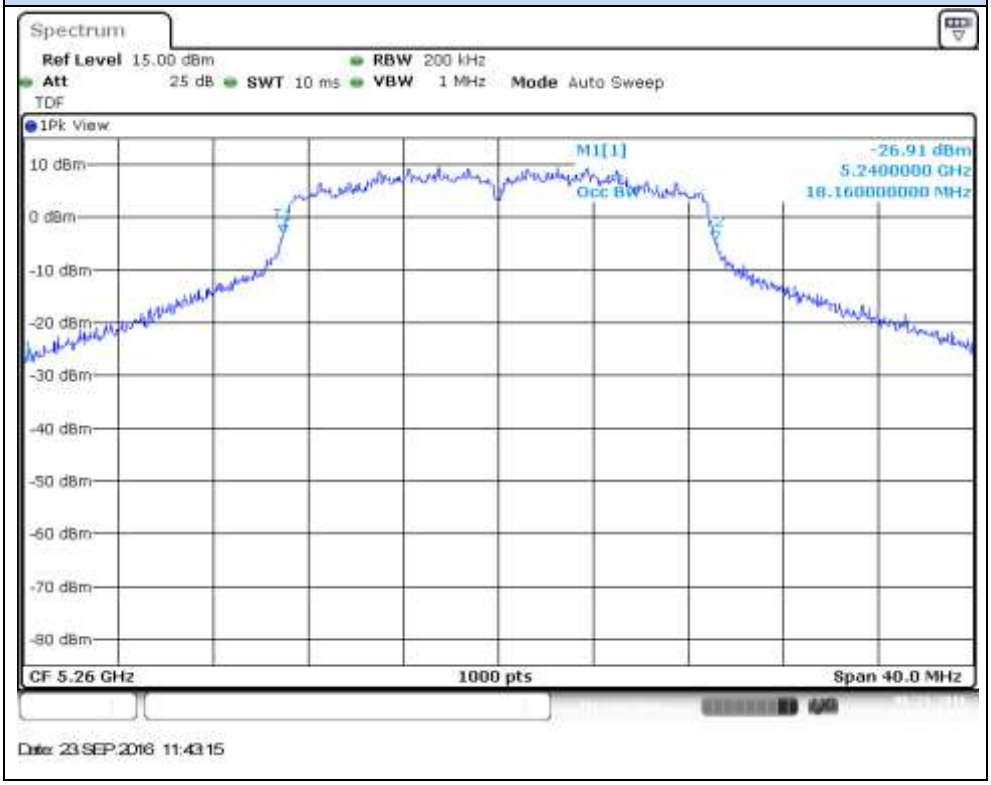


802.11n20, HT8 (MIMO) – Chain A

26dB BW – CH52



99% BW – CH52

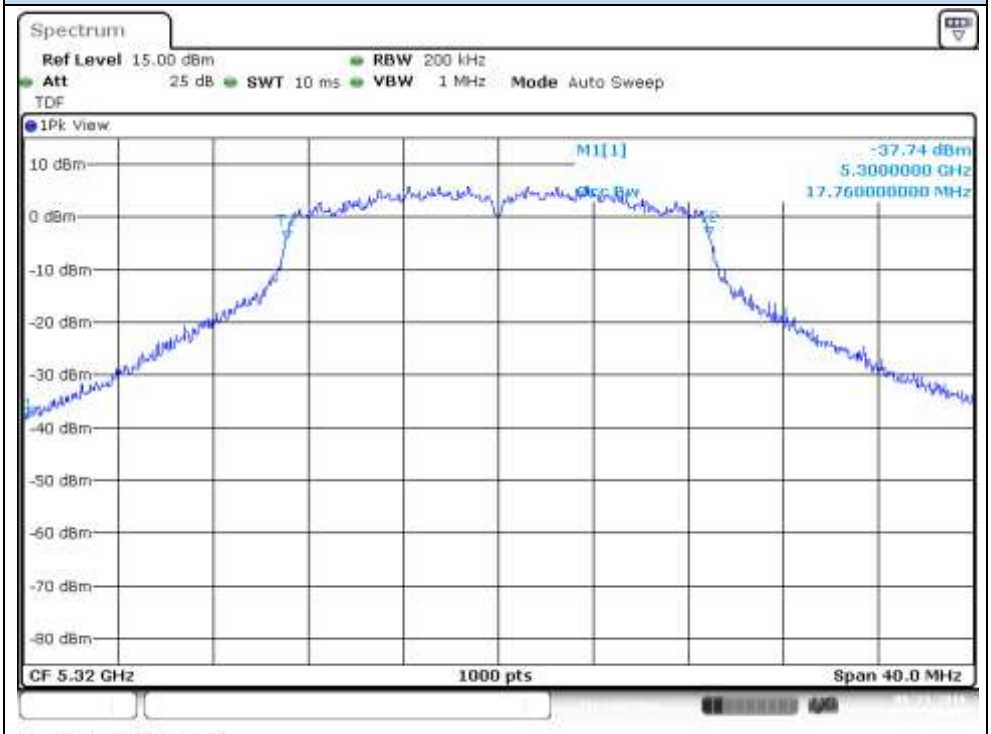


26dB BW – CH56

99% BW – CH56

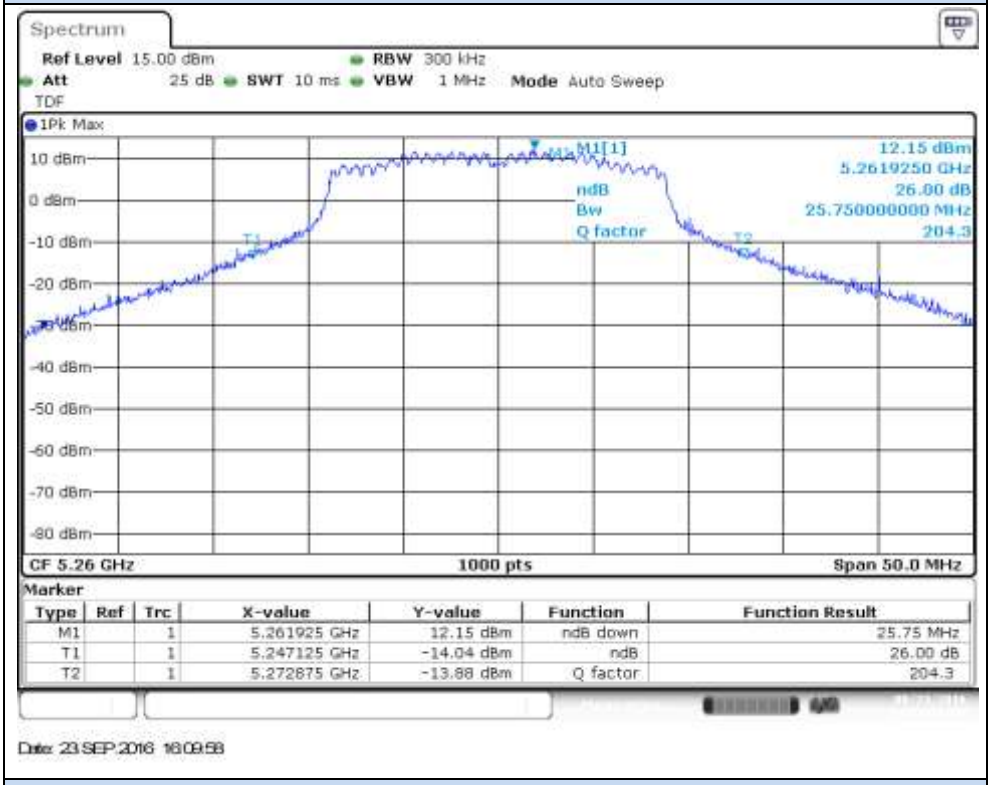
26dB BW – CH64

99% BW – CH64

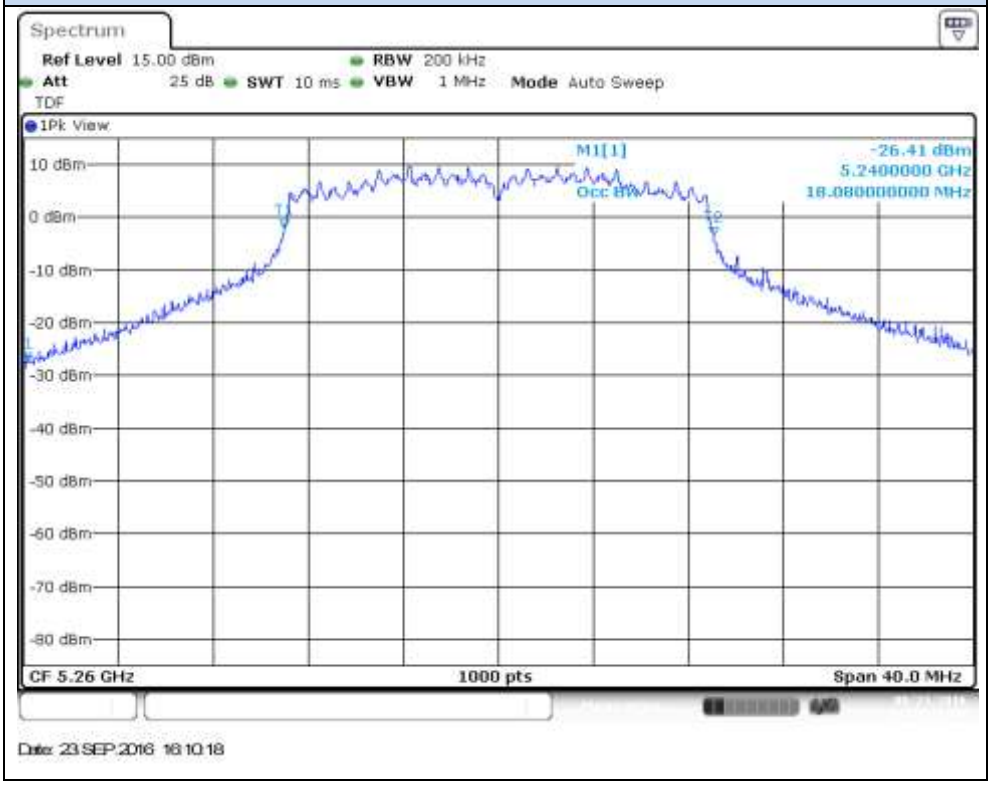


802.11n20, HT8 (MIMO) – Chain B

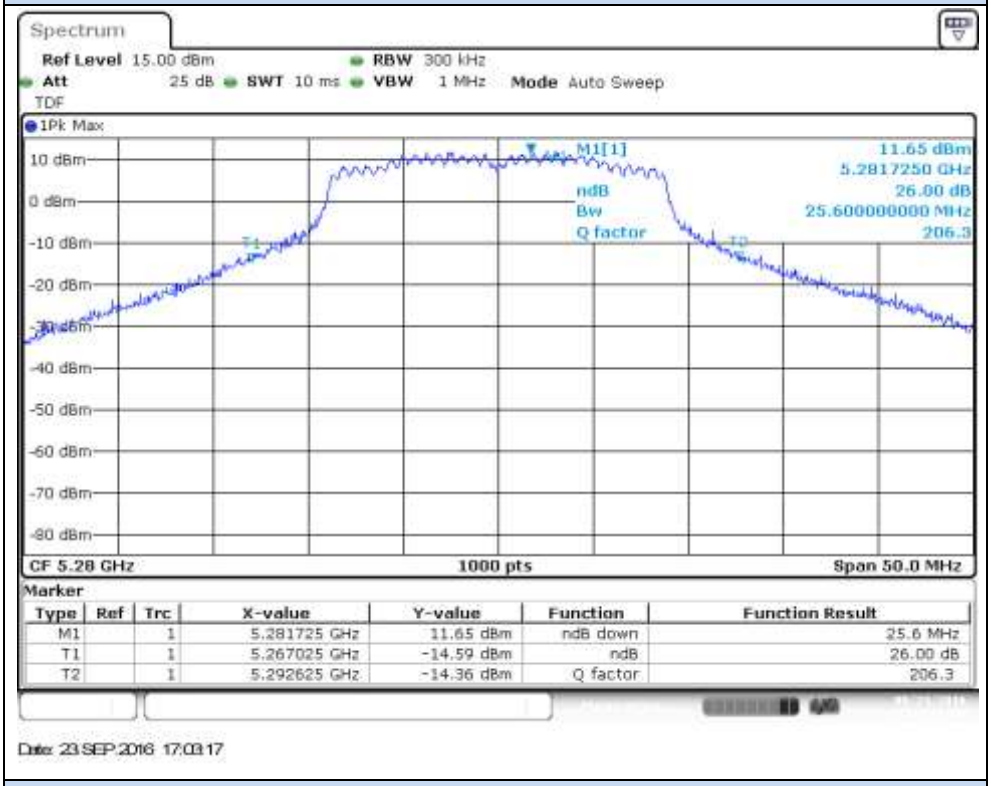
26dB BW – CH52



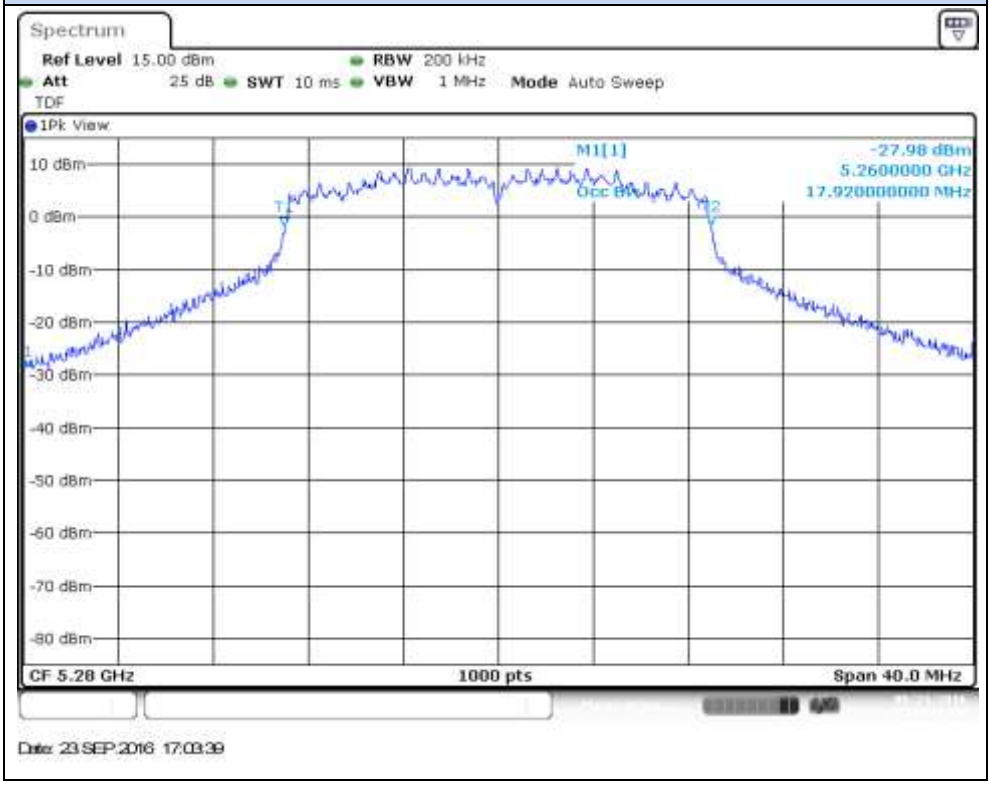
99% BW – CH52



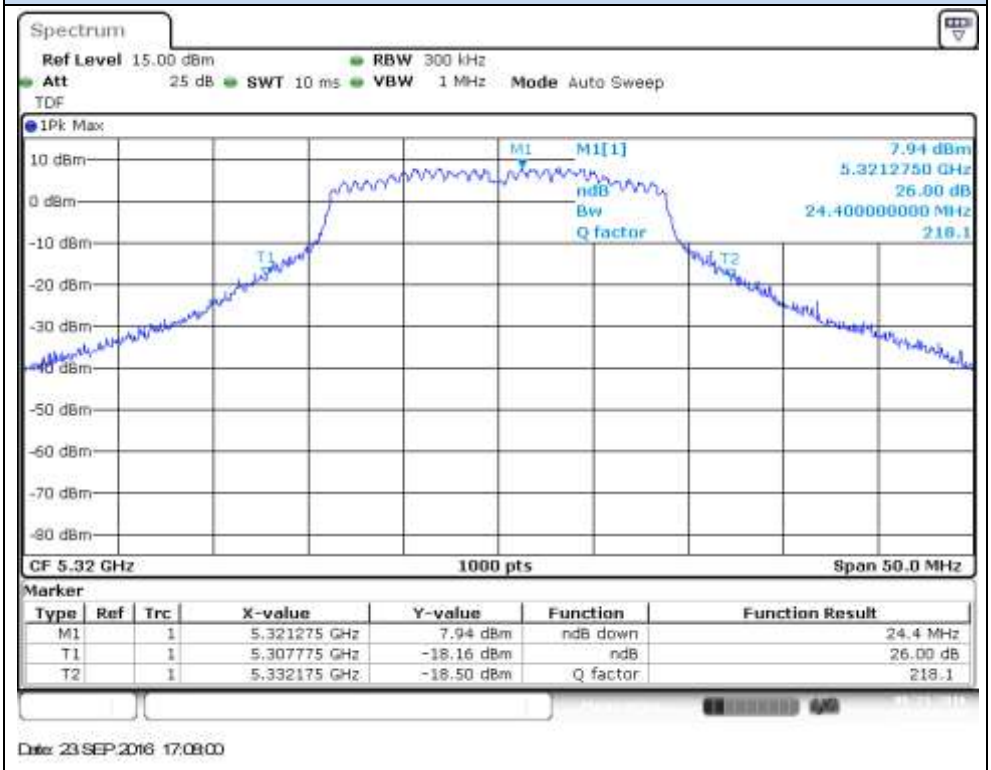
26dB BW – CH56



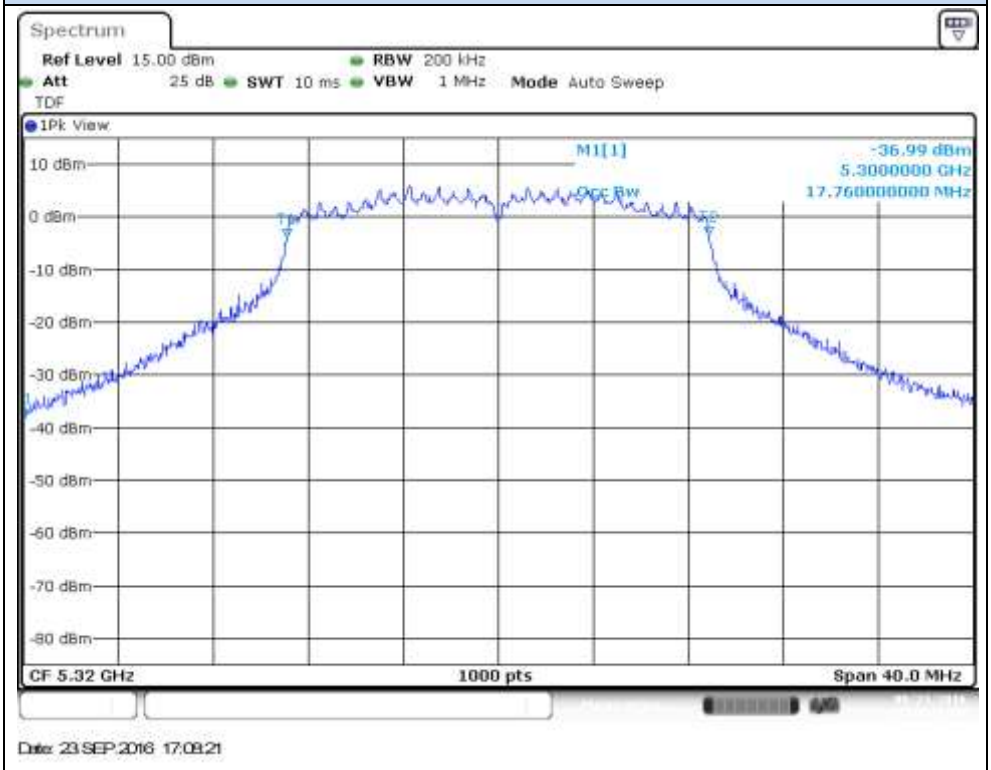
99% BW – CH56



26dB BW – CH64

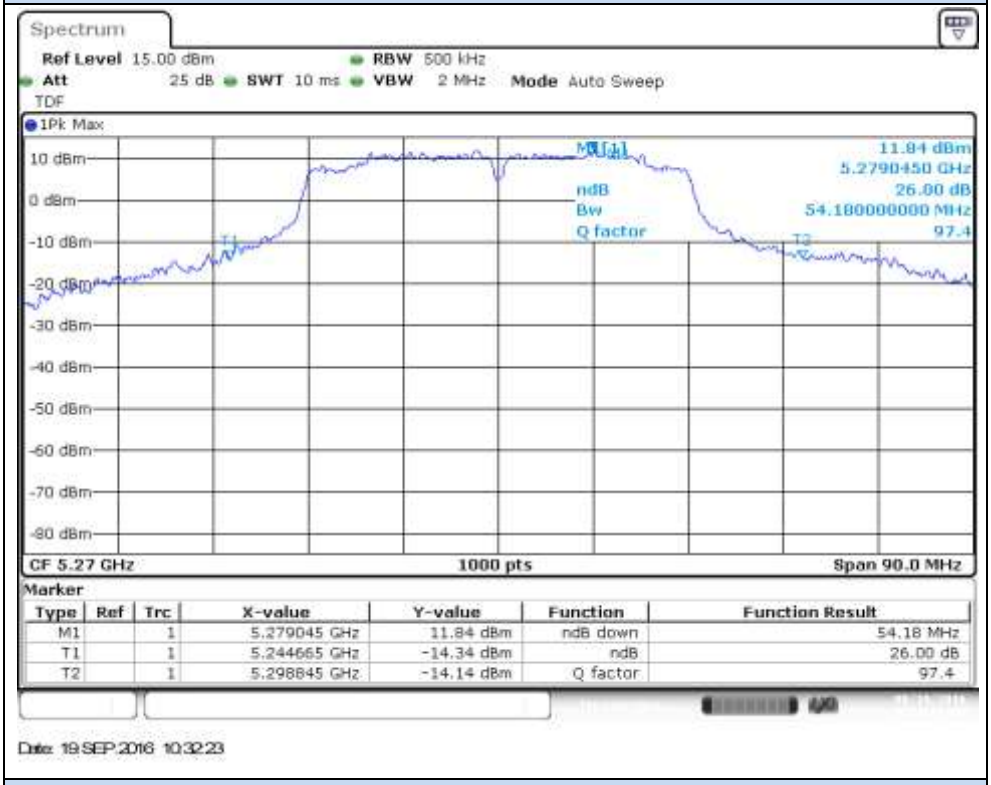


99% BW – CH64

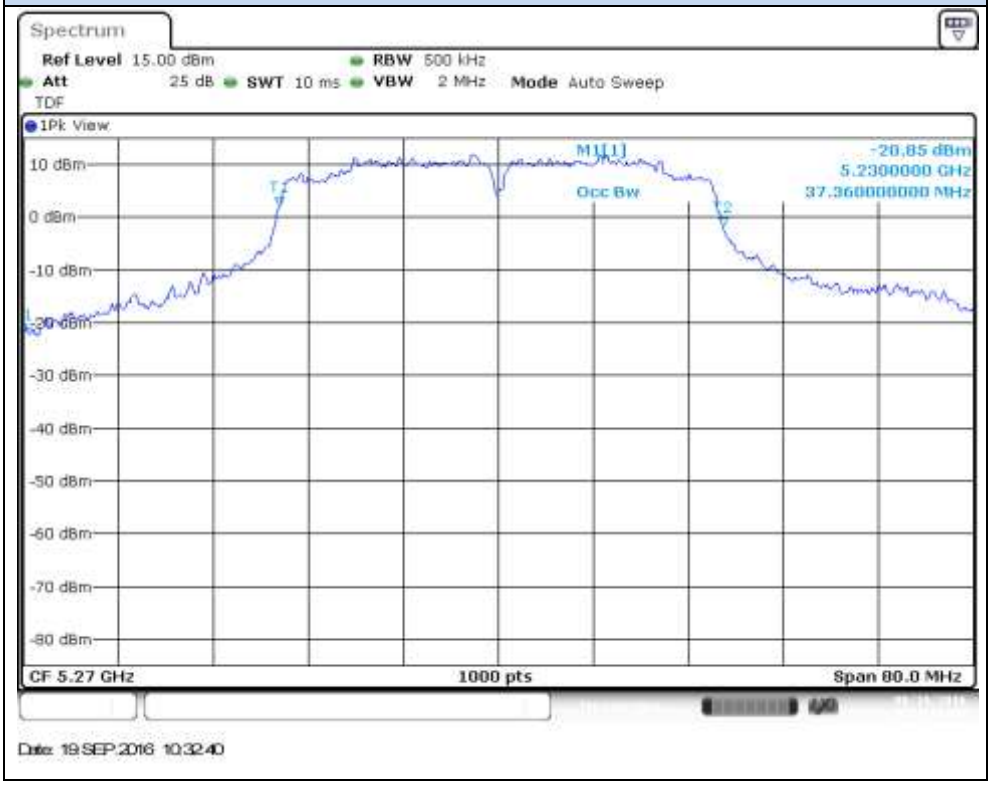


802.11n40, HT0 (SISO) – Chain A

26dB BW – CH54F

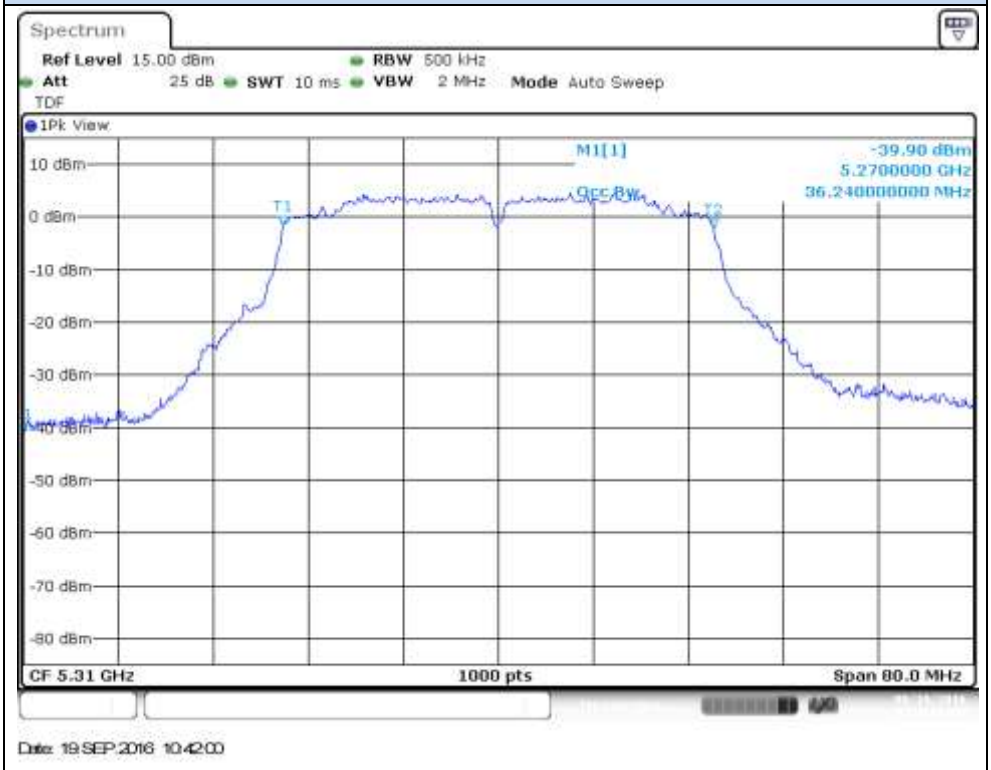


99% BW – CH54F



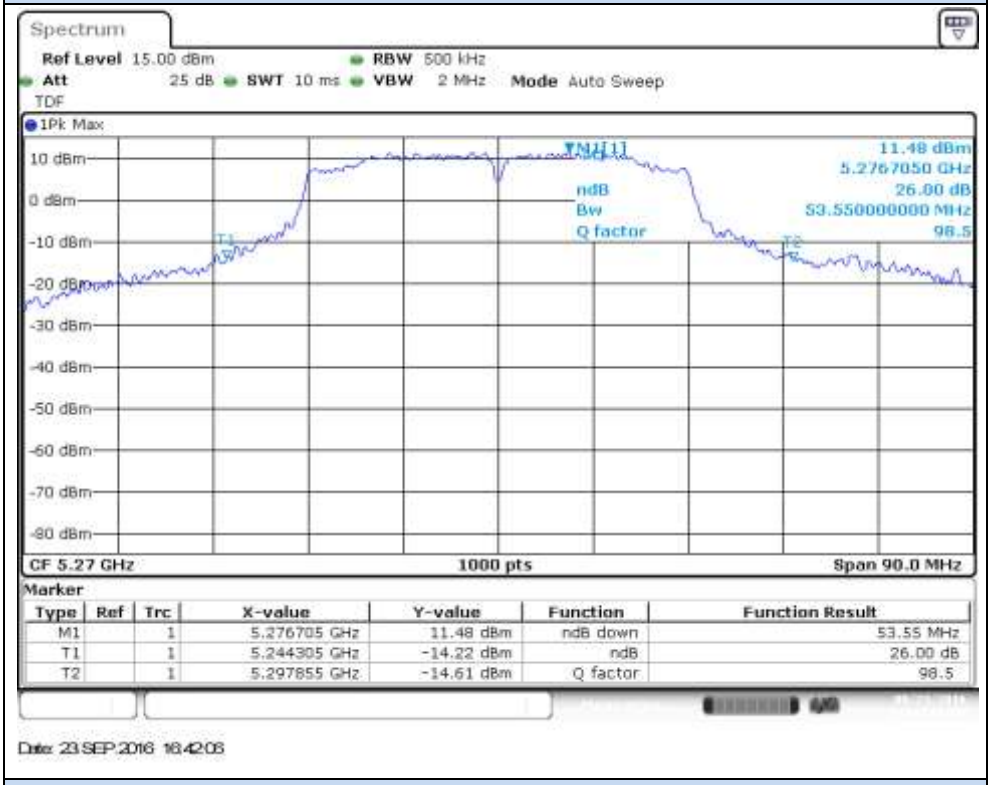
26dB BW – CH62F

99% BW – CH62F

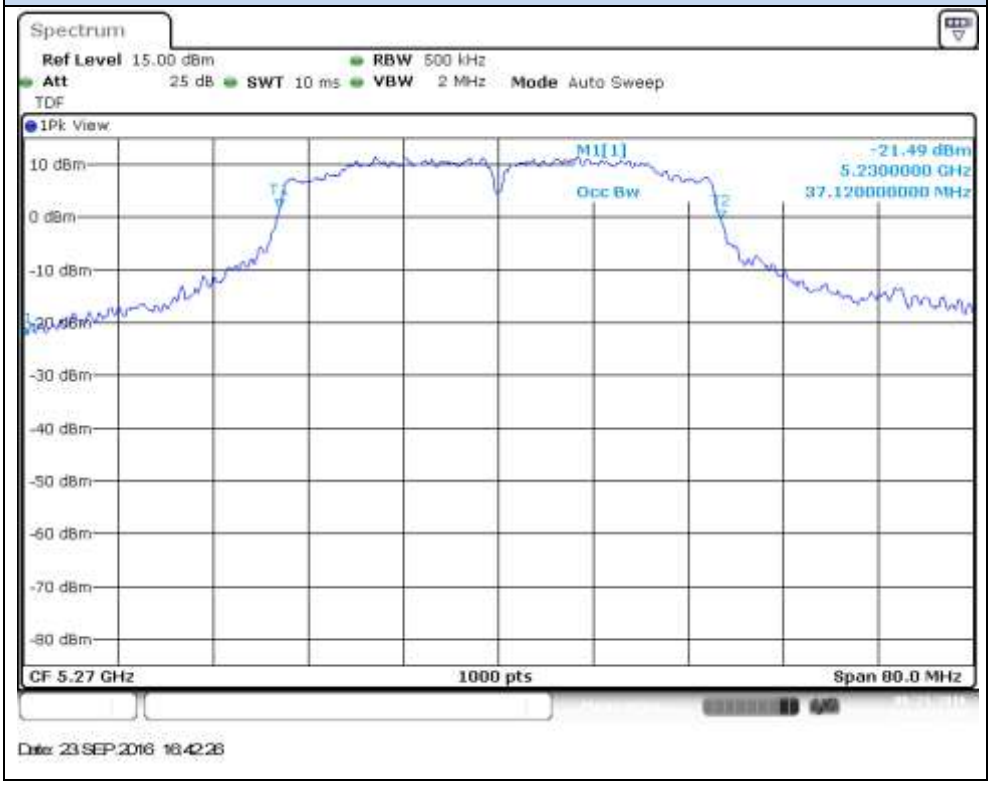


802.11n40, HT0 (SISO) – Chain B

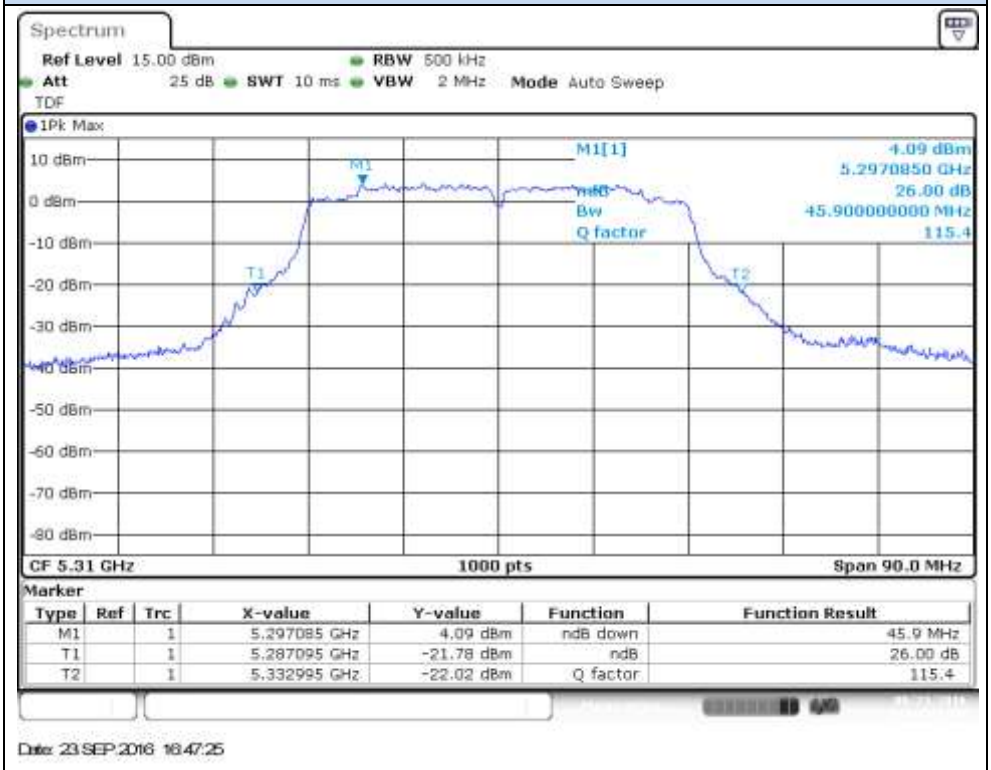
26dB BW – CH54F



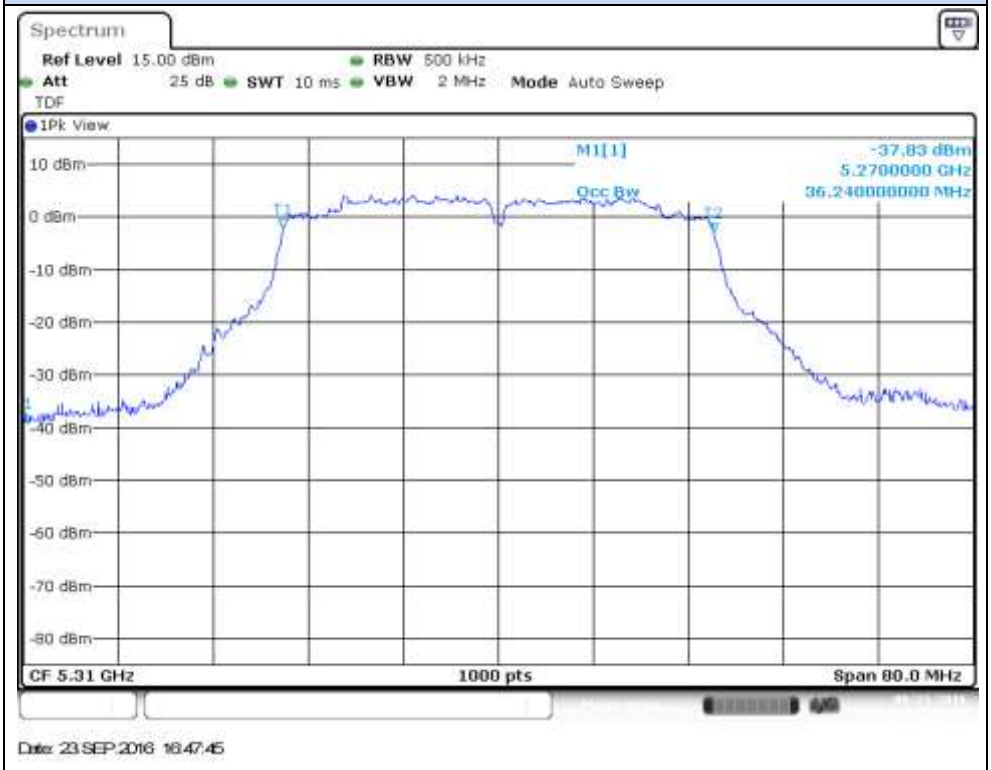
99% BW – CH54F



26dB BW – CH62F

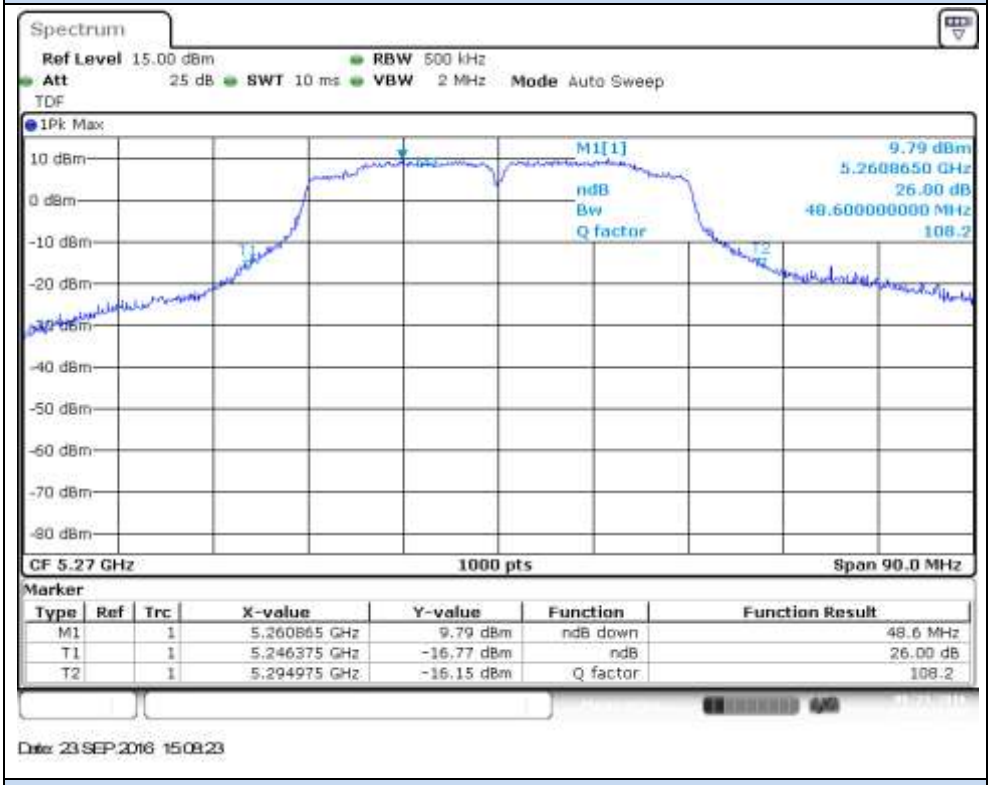


99% BW – CH62F

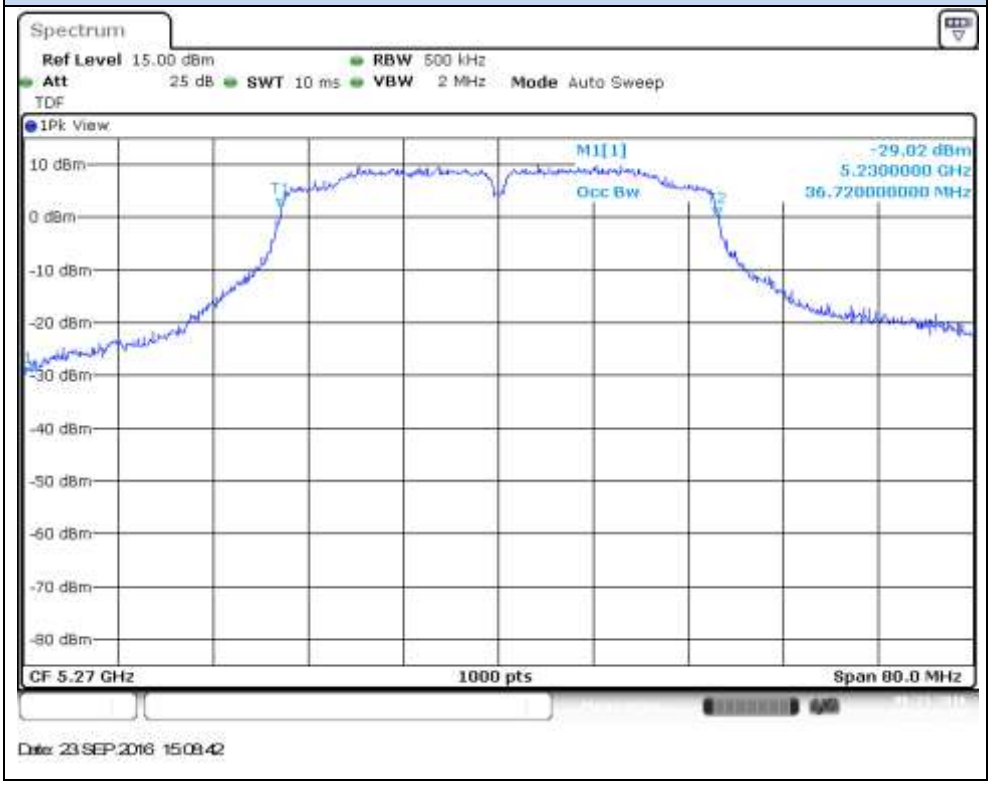


802.11n40, HT8 (MIMO) – Chain A

26dB BW – CH54F



99% BW – CH54F

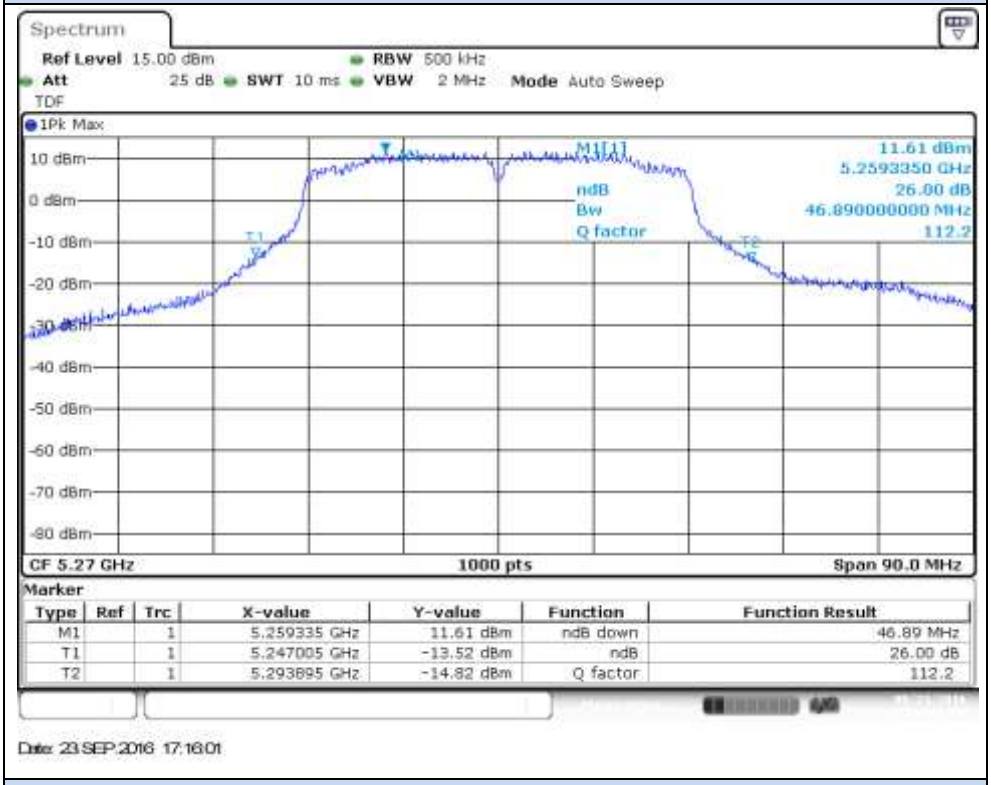


26dB BW – CH62F

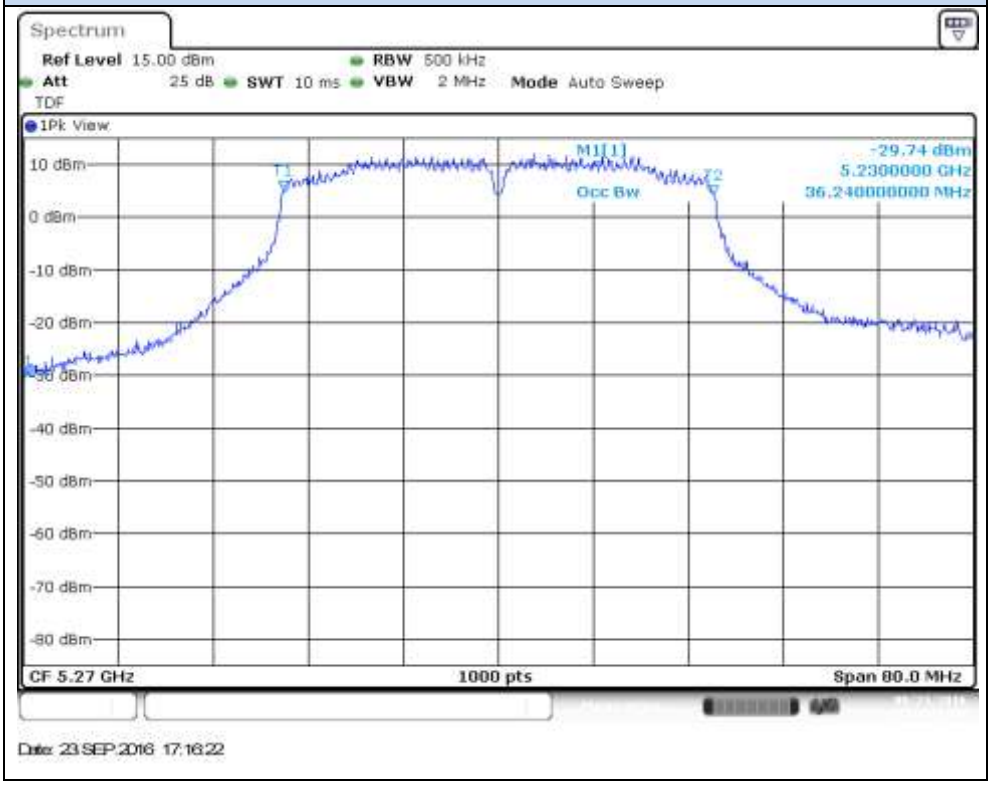
99% BW – CH62F

802.11n40, HT8 (MIMO) – Chain B

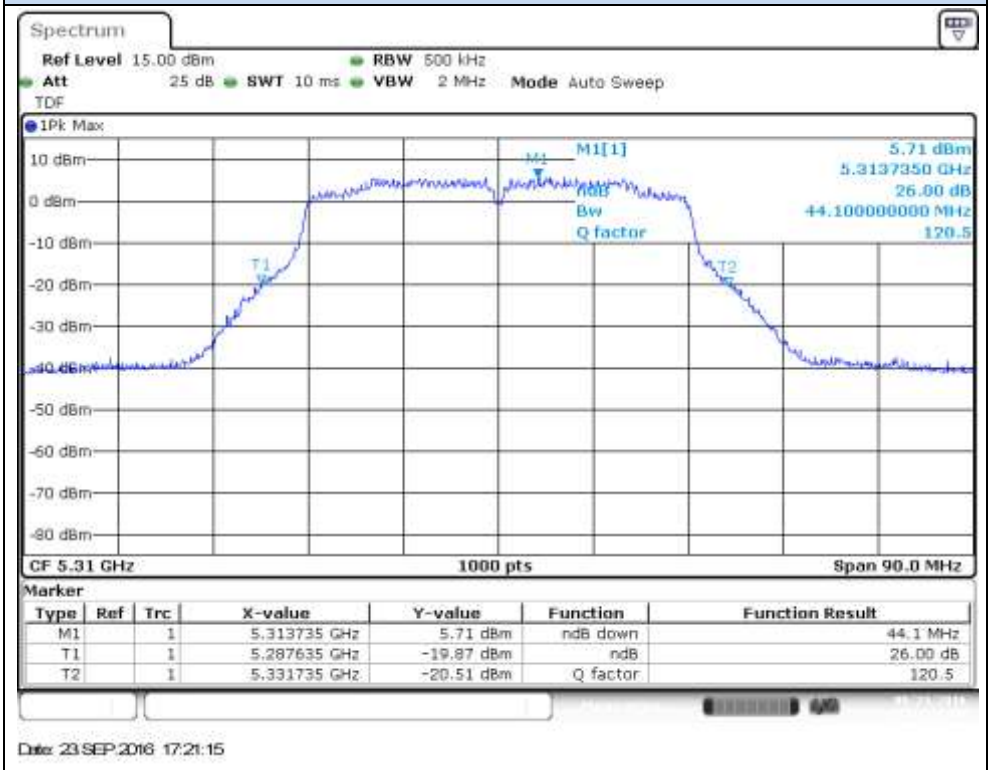
26dB BW – CH54F



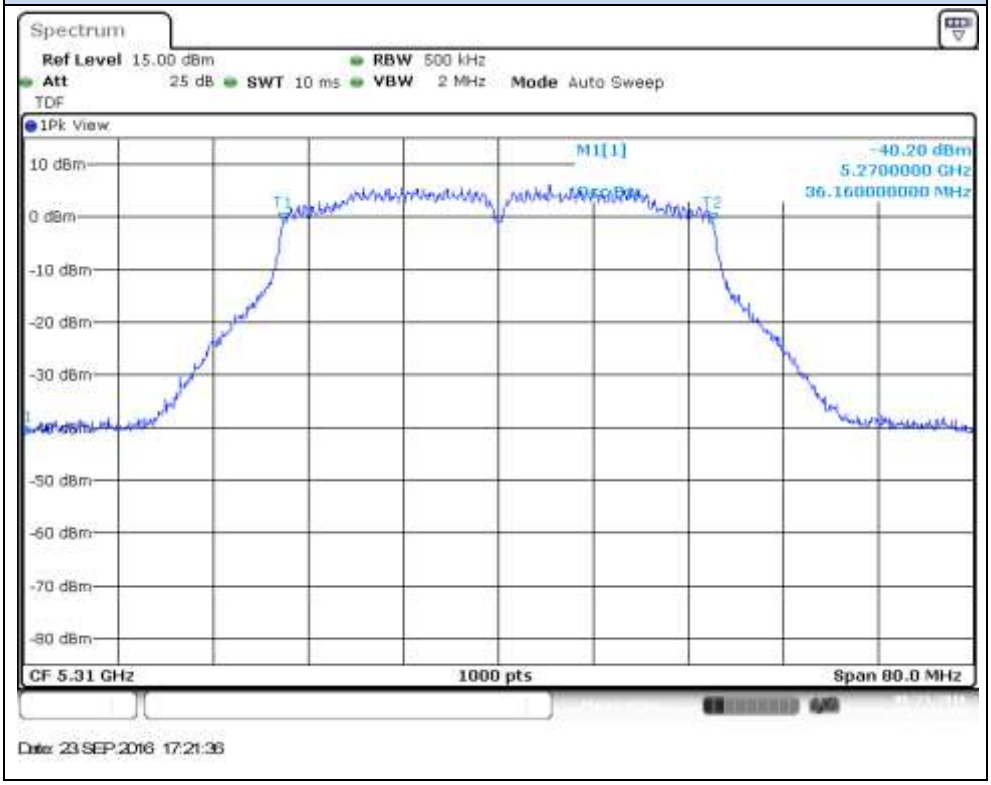
99% BW – CH54F



26dB BW – CH62F

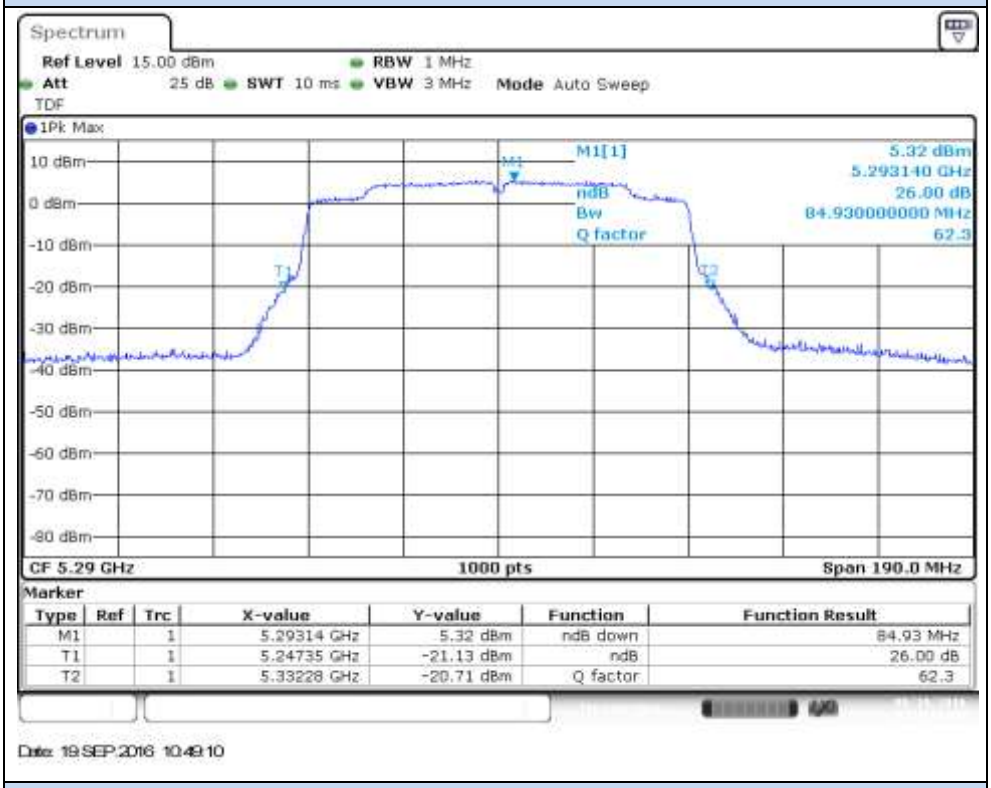


99% BW – CH62F

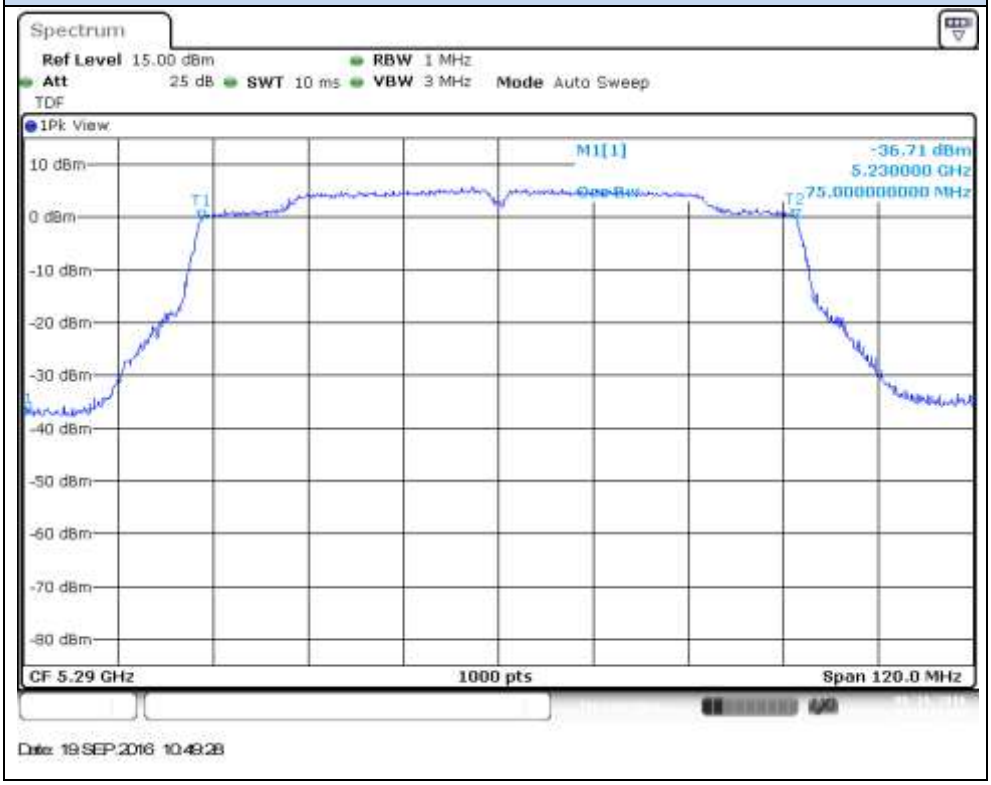


802.11ac80, VHT0 (SISO) – Chain A

26dB BW – CH58ac80

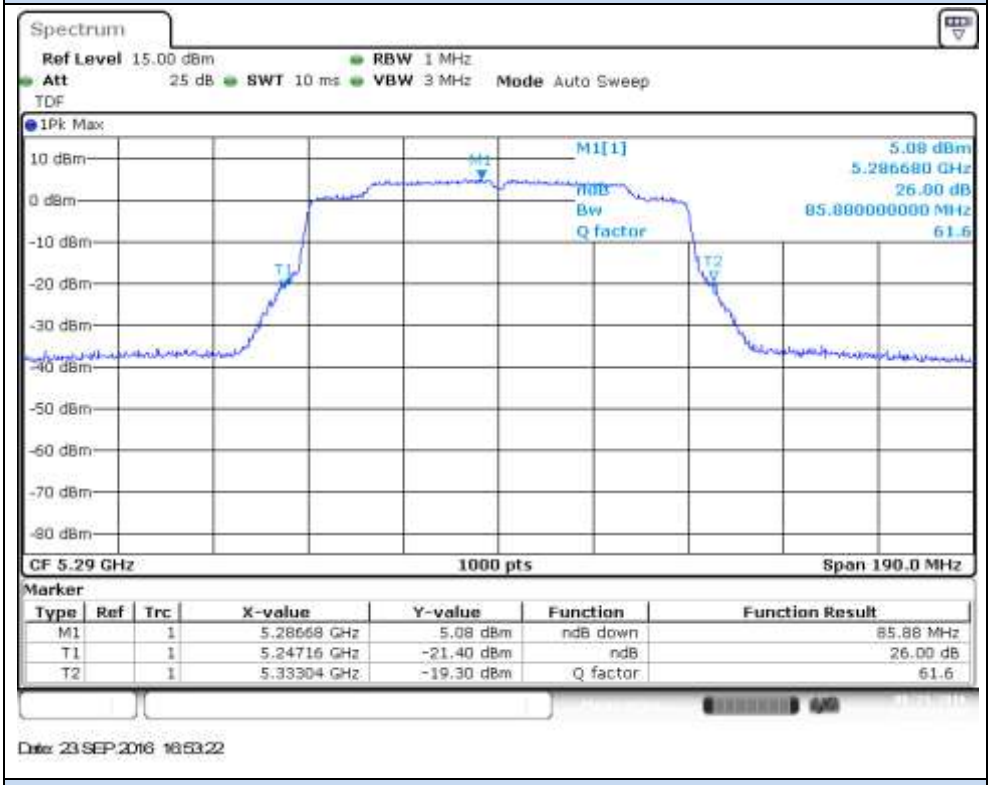


99% BW – CH58ac80

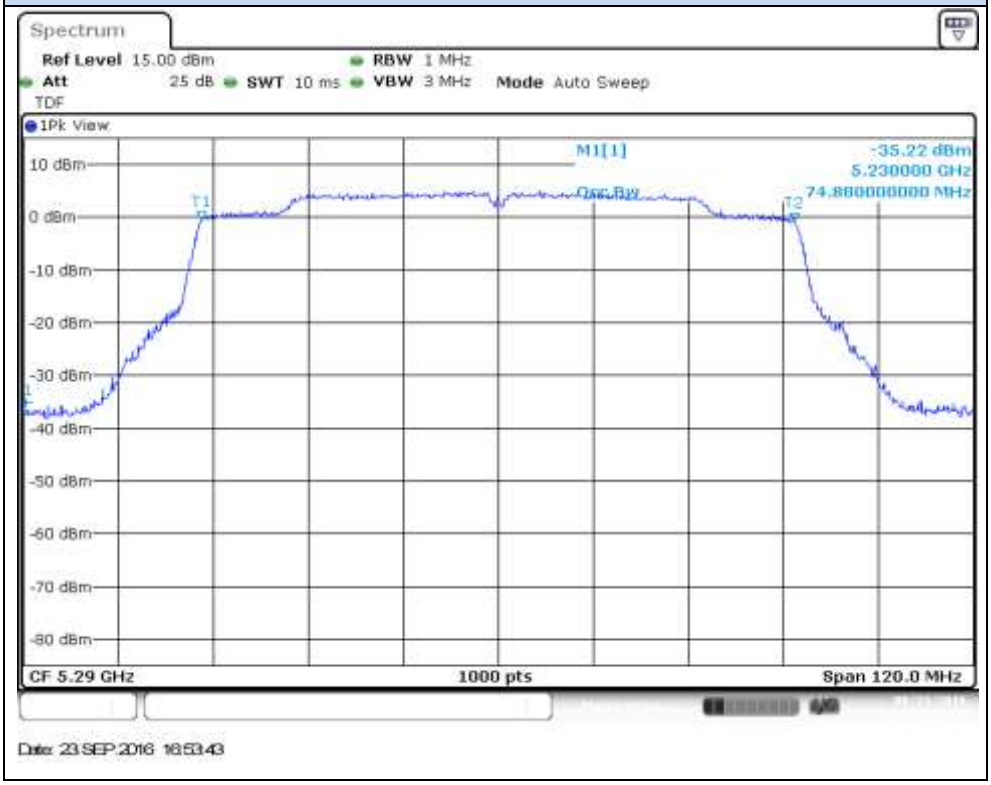


802.11ac80, VHT0 (SISO) – Chain B

26dB BW – CH58ac80

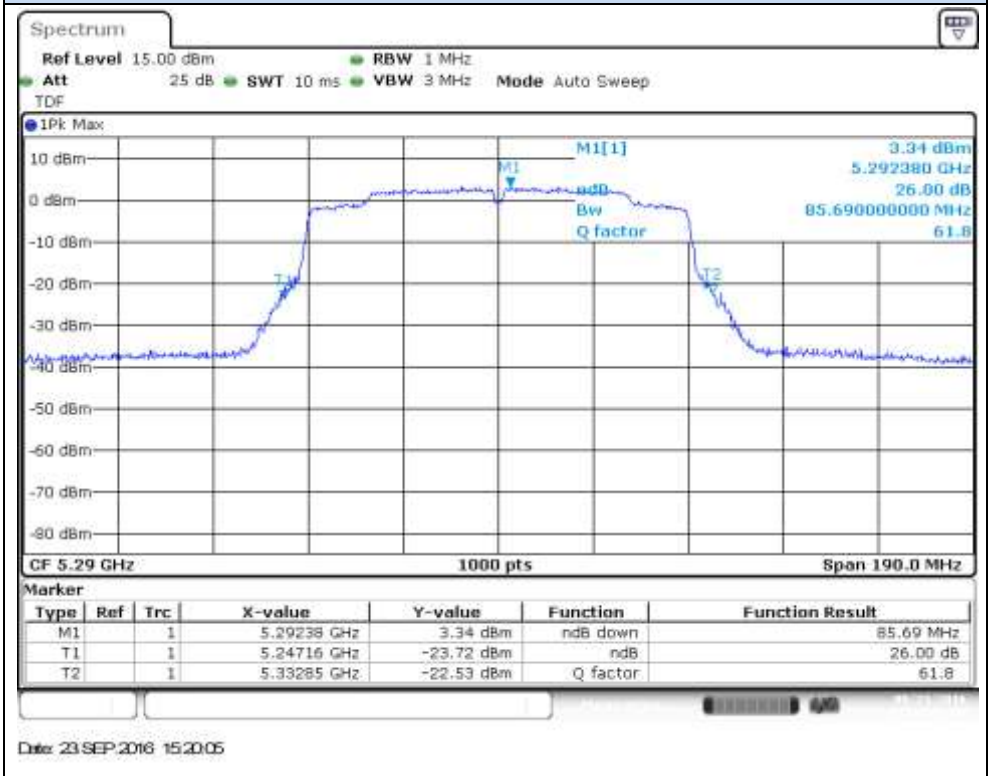


99% BW – CH58ac80

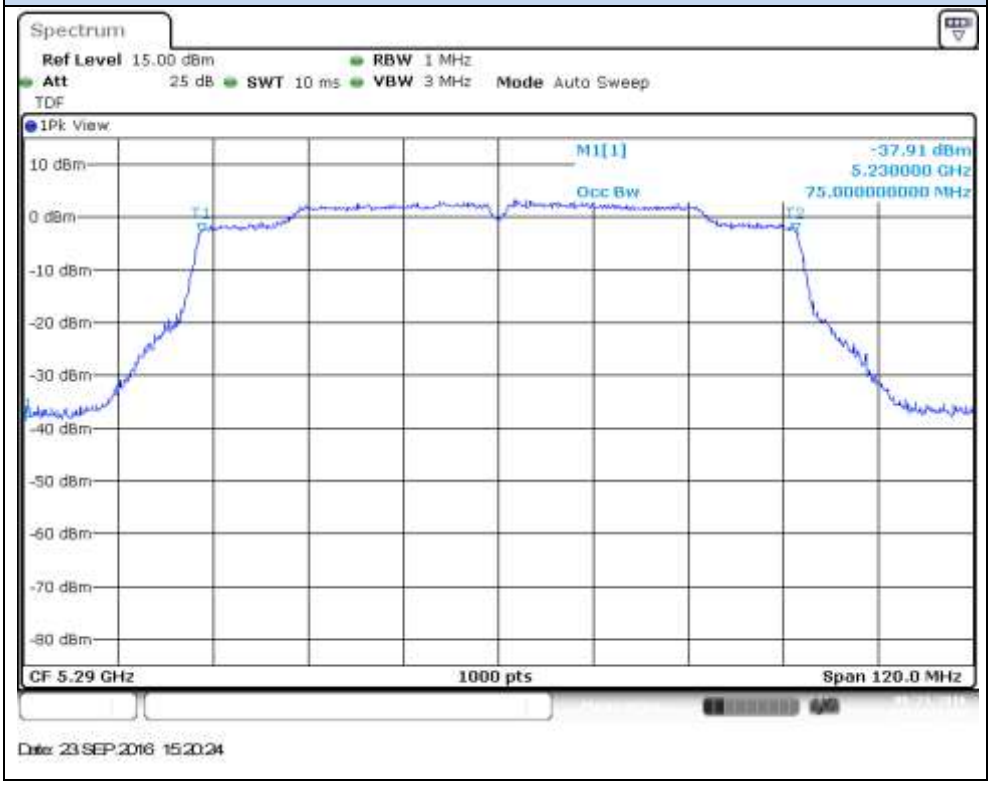


802.11ac80, VHT0 (MIMO) – Chain A

26dB BW – CH58ac80

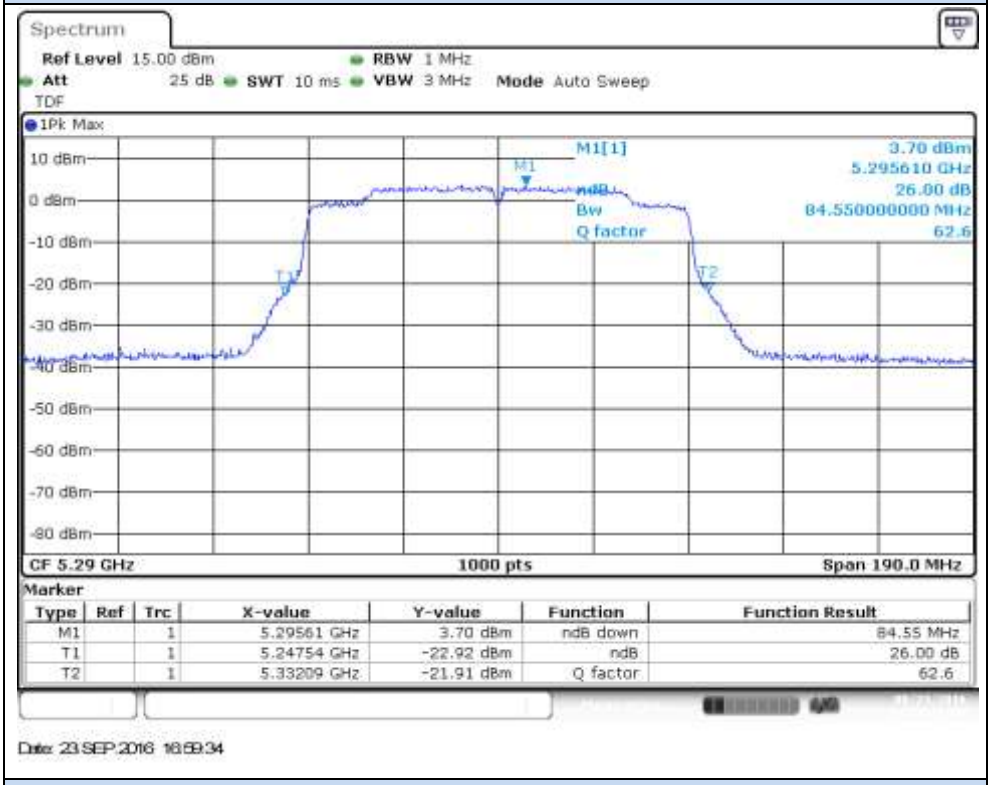


99% BW – CH58ac80

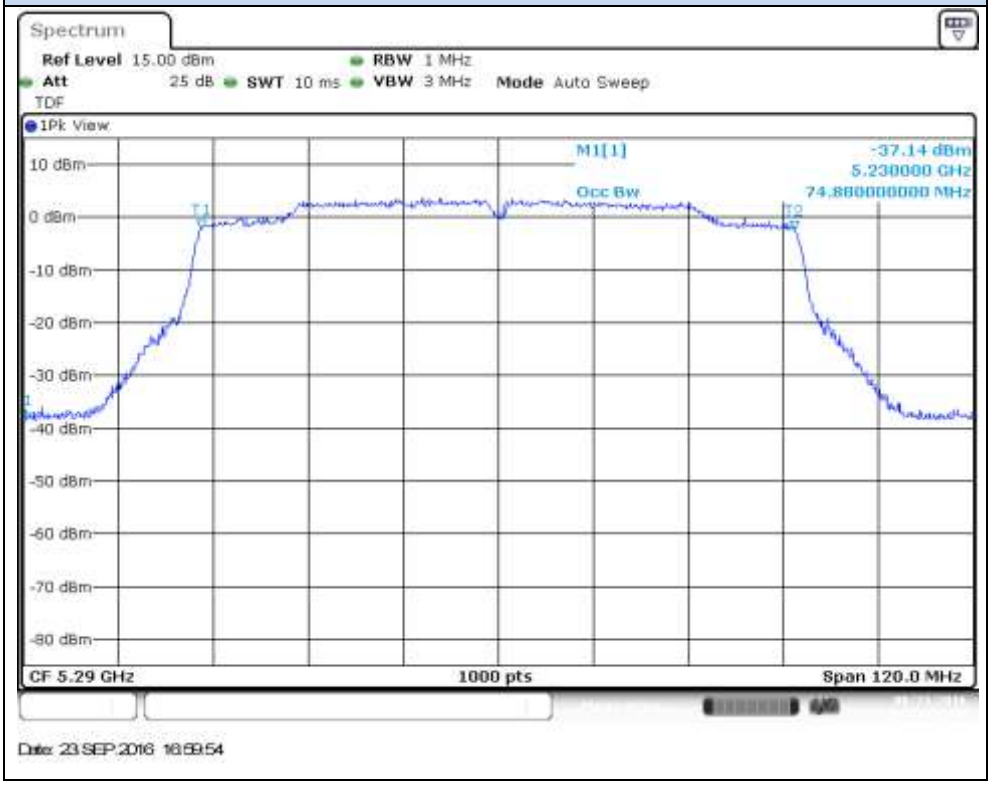


802.11ac80, VHT0 (MIMO) – Chain B

26dB BW – CH58ac80



99% BW – CH58ac80



C.2 Power Limits. Maximum Output power & Peak power spectral density

Test limits:

FCC part	Limits
15.407 (a) (2)	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 or 11 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.

Test procedure:

The Maximum Conducted Output Power was measured using the channel integration method according to point E) 2) e) (Method SA-2 Alternative) of KDB 789033 D02.

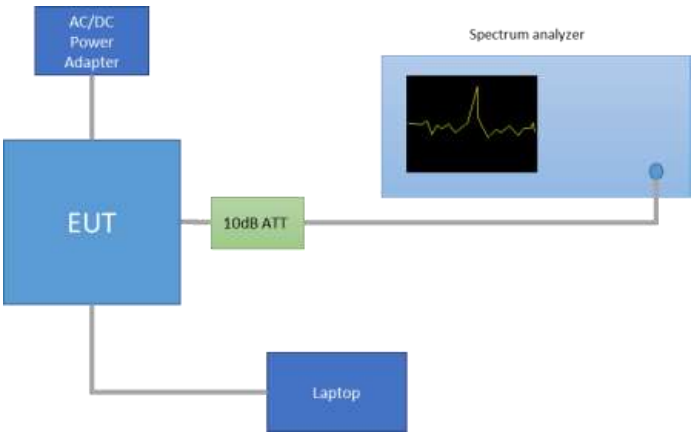
The maximum power spectral density (PSD) was measured using the method according to point F) (Method SA-2 Alternative) of KDB 789033 D02.

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 in linear power units to determine the total emission level from the device.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

The setup below was used to measure the maximum conducted output power and power spectral density. The antenna terminal of the EUT is connected to the spectrum analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

The declared maximum antenna gain is 5dBi.



Results tables:

Duty cycle

Mode	Rate	Antenna	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
802.11a	6Mbps	SISO-A	2.03	2.07	98.0%
		SISO-B	2.04	2.07	98.2%
802.11n20	HT0	SISO-A	1.90	1.93	98.4%
		SISO-B	1.90	1.94	98.2%
	HT8	MIMO-A	0.97	1.01	96.1%
		MIMO-B	0.97	1.01	96.1%
802.11n40	HT0	SISO-A	0.93	0.96	96.5%
		SISO-B	0.94	0.97	96.8%
	HT8	MIMO-A	0.49	0.53	92.3%
		MIMO-B	0.49	0.53	92.1%
802.11ac80	VHT0	SISO-A	0.46	0.49	93.5%
		SISO-B	0.45	0.49	93.2%
		MIMO-A	0.26	0.29	87.3%
		MIMO-B	0.25	0.29	86.6%

Maximum output power

Mode	Rate	Channel	Freq. [MHz]	Antenna	Average Conducted Output Power [dBm]	Maximum* Conducted Output Power [dBm]	Maximum* Conducted Output Power [mW]	Maximum* EIRP [dBm]
802.11a	6Mbps	52	5260	SISO CHAIN A	20.30	20.30	**107.15**	25.30
				SISO CHAIN B	20.10	20.10	102.33	25.10
		56	5280	SISO CHAIN A	20.24	20.24	105.68	25.24
				SISO CHAIN B	20.09	20.09	102.09	25.09
		64	5320	SISO CHAIN A	18.56	18.56	71.78	23.56
				SISO CHAIN B	18.40	18.40	**69.18**	23.40
802.11n20	HT0	52	5260	SISO CHAIN A	20.54	20.54	113.24	25.54
				SISO CHAIN B	20.22	20.22	105.20	25.22
		56	5280	SISO CHAIN A	19.23	19.23	83.75	24.23
				SISO CHAIN B	20.12	20.12	102.80	25.12
		64	5320	SISO CHAIN A	18.31	18.31	67.76	23.31
				SISO CHAIN B	18.60	18.60	72.44	23.60
	HT8	52	5260	MIMO CHAIN A	18.35	18.52	71.19	23.52
				MIMO CHAIN B	18.51	18.68	73.85	23.68
				Combined A+B	21.44	21.61	**145.04**	26.61
		56	5280	MIMO CHAIN A	18.30	18.52	71.19	23.52
				MIMO CHAIN B	18.37	18.54	71.50	23.54
				Combined A+B	21.37	21.54	142.70	26.54
		64	5320	MIMO CHAIN A	14.92	15.08	32.24	20.08
				MIMO CHAIN B	14.76	14.93	31.14	19.93
				Combined A+B	17.85	18.02	**63.38**	23.02
802.11n40	HT0	54F	5270	SISO CHAIN A	20.47	20.62	115.42	25.62
				SISO CHAIN B	20.45	20.59	114.55	25.59
		62F	5310	SISO CHAIN A	13.38	13.53	22.56	18.53
				SISO CHAIN B	13.18	13.32	**21.48**	18.32
	HT8	54F	5270	MIMO CHAIN A	18.06	18.41	69.34	23.41
				MIMO CHAIN B	18.30	18.66	73.44	23.66
				Combined A+B	21.19	21.55	**142.79**	26.55
		62F	5310	MIMO CHAIN A	12.03	12.38	17.30	17.38
				MIMO CHAIN B	12.29	12.65	18.41	17.65
				Combined A+B	15.17	15.53	35.70	20.53
802.11ac80	VHT0	58ac80	5290	SISO CHAIN A	12.93	13.22	21.00	18.22
				SISO CHAIN B	12.37	12.68	**18.52**	17.68
				MIMO CHAIN A	10.07	10.66	11.65	15.66
				MIMO CHAIN B	10.20	10.82	12.09	15.82
				Combined A+B	13.15	13.75	**23.73**	18.75

* Maximum values are the duty cycle compensated values calculated from the average (measured) values

Max Value

Min Value

Maximum Power Spectral Density (PSD)

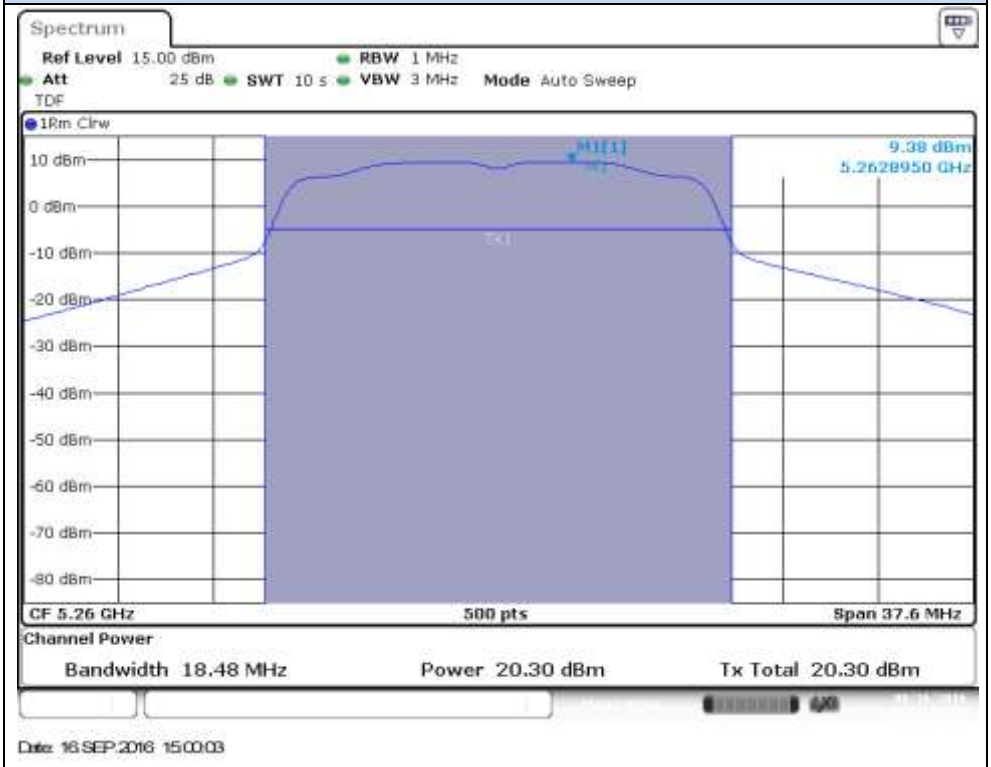
Mode	Rate	Channel	Freq. [MHz]	Antenna	Average conducted PSD [dBm/MHz]	Maximum* conducted PSD [dBm/MHz]
802.11a	6Mbps	52	5260	SISO CHAIN A	9.38	9.38
				SISO CHAIN B	8.98	8.98
		56	5300	SISO CHAIN A	9.36	9.36
				SISO CHAIN B	9.17	9.13
		64	5320	SISO CHAIN A	7.67	7.67
				SISO CHAIN B	7.48	7.48
802.11n20	HT0	52	5260	SISO CHAIN A	9.43	9.43
				SISO CHAIN B	9.10	9.10
		56	5300	SISO CHAIN A	8.19	8.19
				SISO CHAIN B	8.98	8.99
		64	5320	SISO CHAIN A	7.25	7.25
				SISO CHAIN B	7.52	7.52
	HT8	52	5260	MIMO CHAIN A	7.29	7.46
				MIMO CHAIN B	7.44	7.61
				Combined A+B	10.38	10.55
		56	5300	MIMO CHAIN A	7.27	7.46
				MIMO CHAIN B	7.31	7.48
				Combined A+B	10.31	10.48
		64	5320	MIMO CHAIN A	3.89	4.06
				MIMO CHAIN B	3.70	3.87
				Combined A+B	6.81	6.98
802.11n40	HT0	54F	5270	SISO CHAIN A	6.15	6.30
				SISO CHAIN B	6.12	6.26
		62F	5310	SISO CHAIN A	-0.92	-0.77
				SISO CHAIN B	-1.25	-1.11
	HT8	54F	5270	MIMO CHAIN A	3.70	4.06
				MIMO CHAIN B	3.95	4.31
				Combined A+B	6.84	7.20
		62F	5310	MIMO CHAIN A	-2.33	-1.99
				MIMO CHAIN B	-1.99	-1.63
				Combined A+B	0.85	1.20
802.11ac80	VHT0	58ac80	5290	SISO CHAIN A	-4.17	-3.88
				SISO CHAIN B	-4.69	-4.38
				MIMO CHAIN A	-6.96	-6.34
				MIMO CHAIN B	-6.70	-6.08
				Combined A+B	-3.80	-3.20

* Maximum values are the duty cycle compensated values calculated from the measured average values

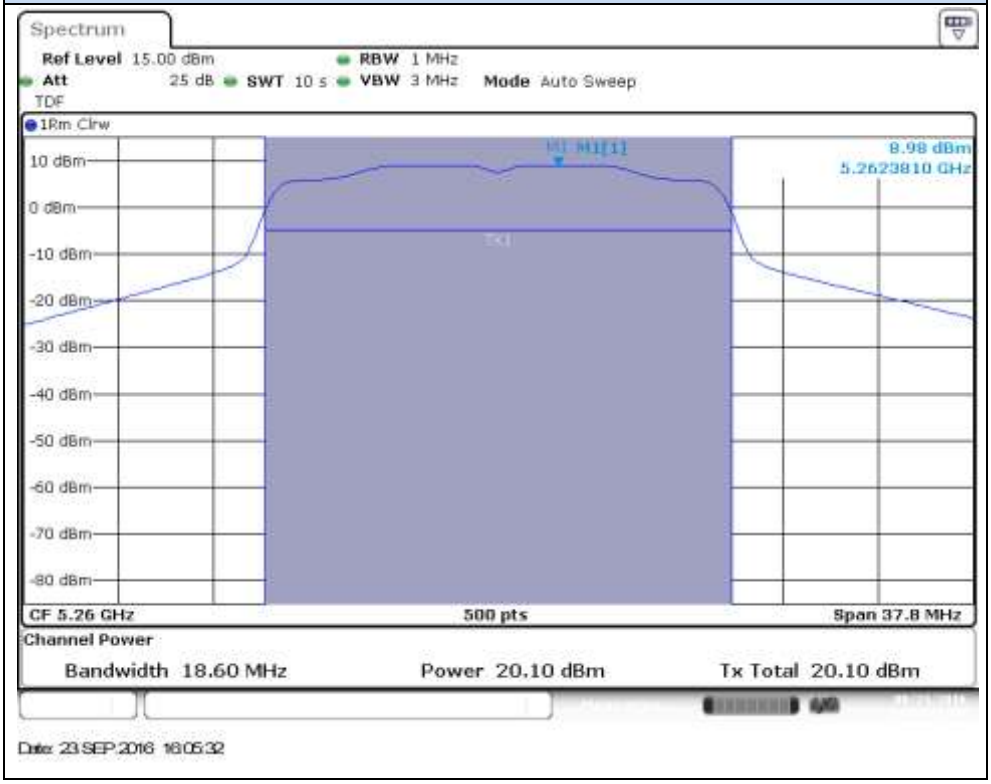
Results screenshot:

802.11a, 6Mbps

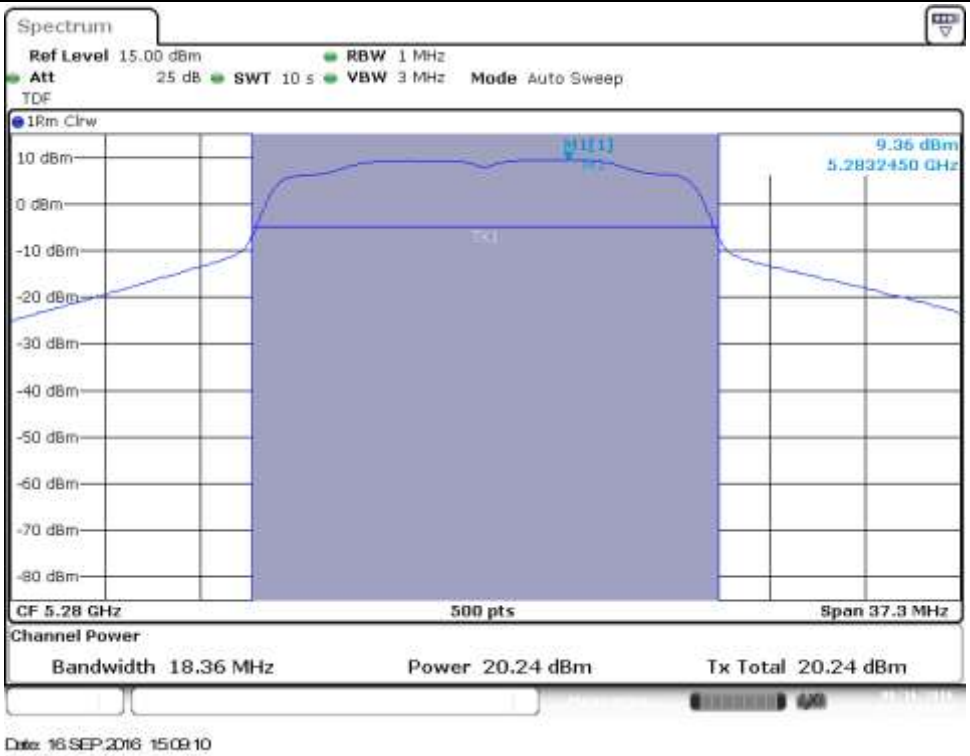
Max Power & PSD, Chain A – CH52



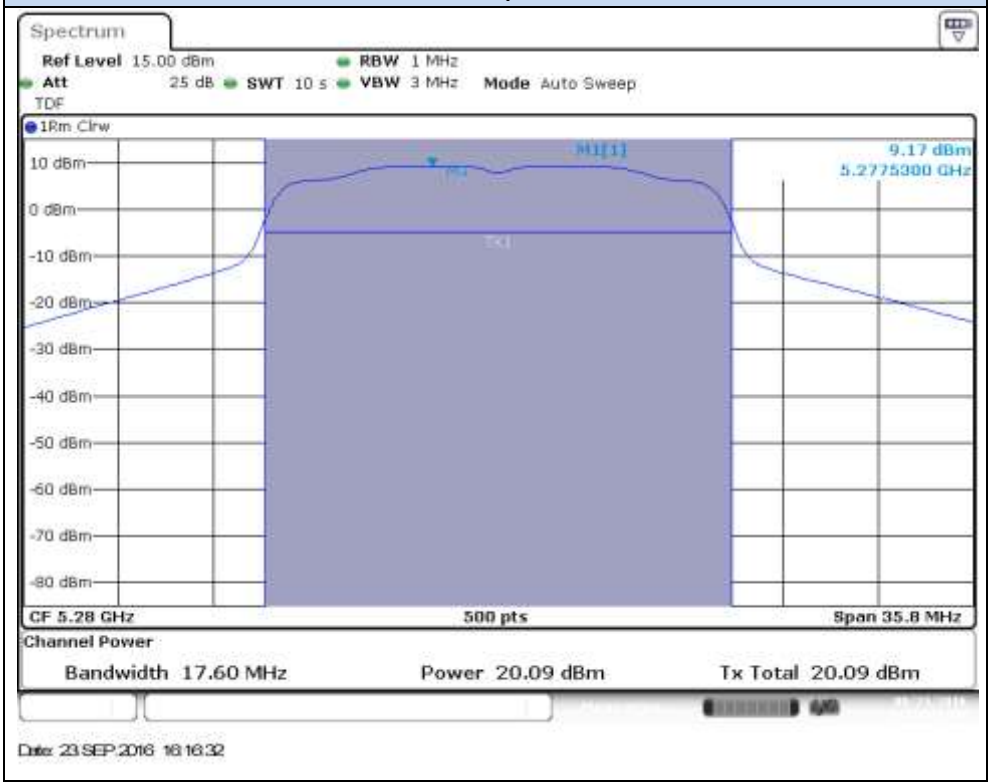
Max Power & PSD, Chain B – CH52



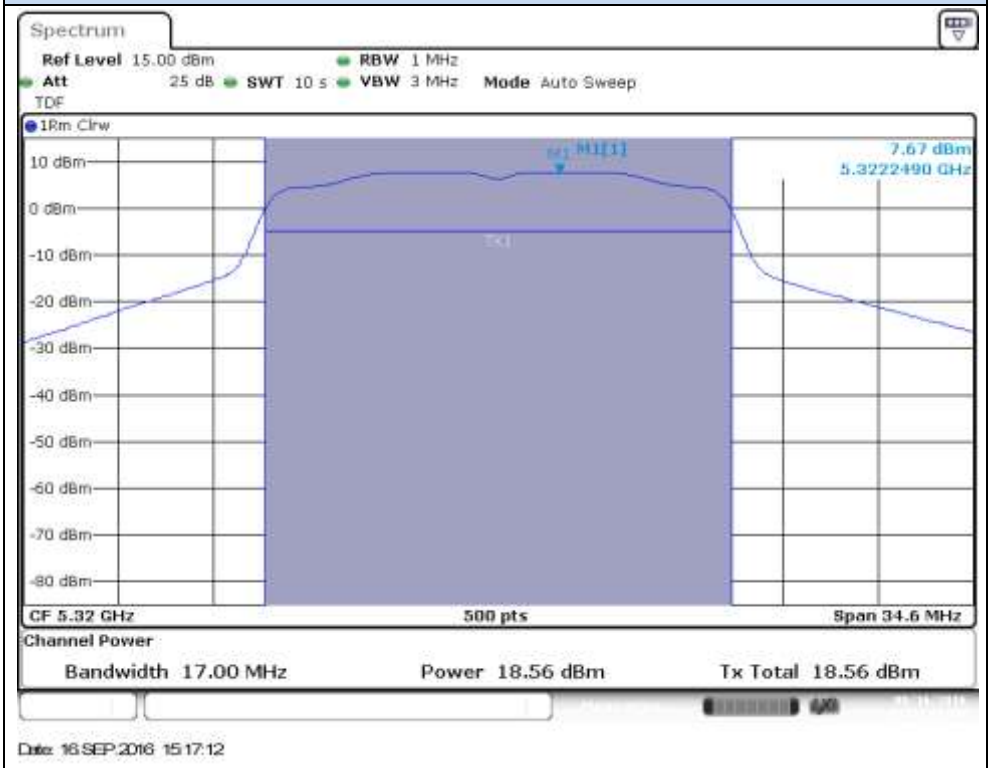
Max Power & PSD, Chain A – CH56



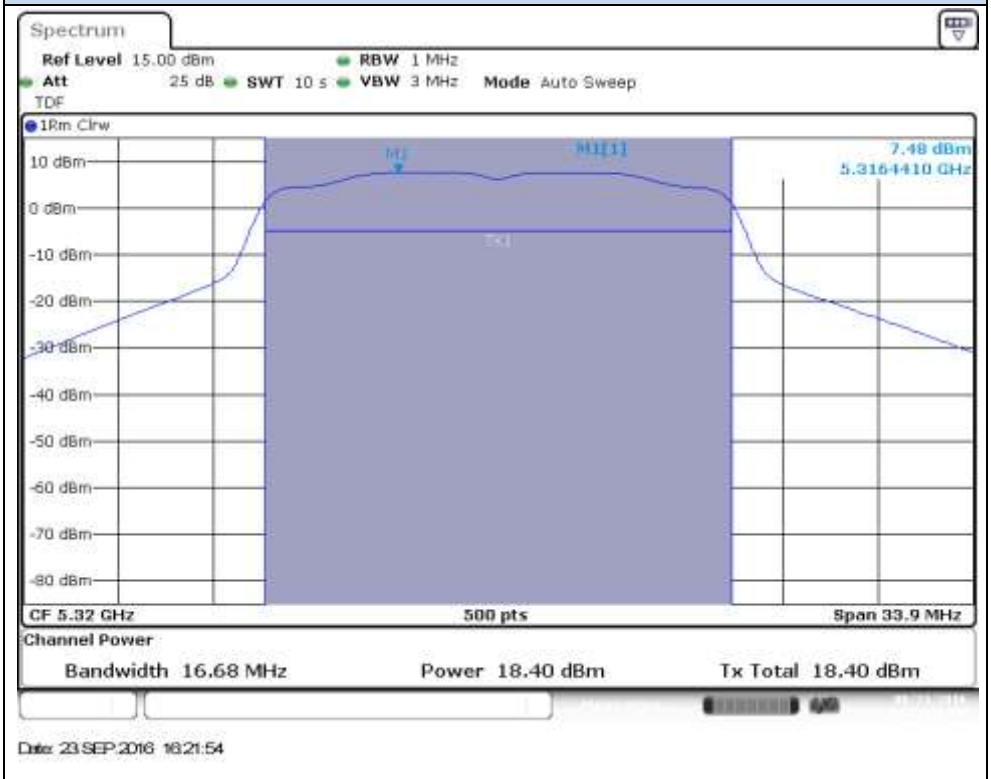
Max Power & PSD, Chain B – CH56



Max Power & PSD, Chain A – CH64

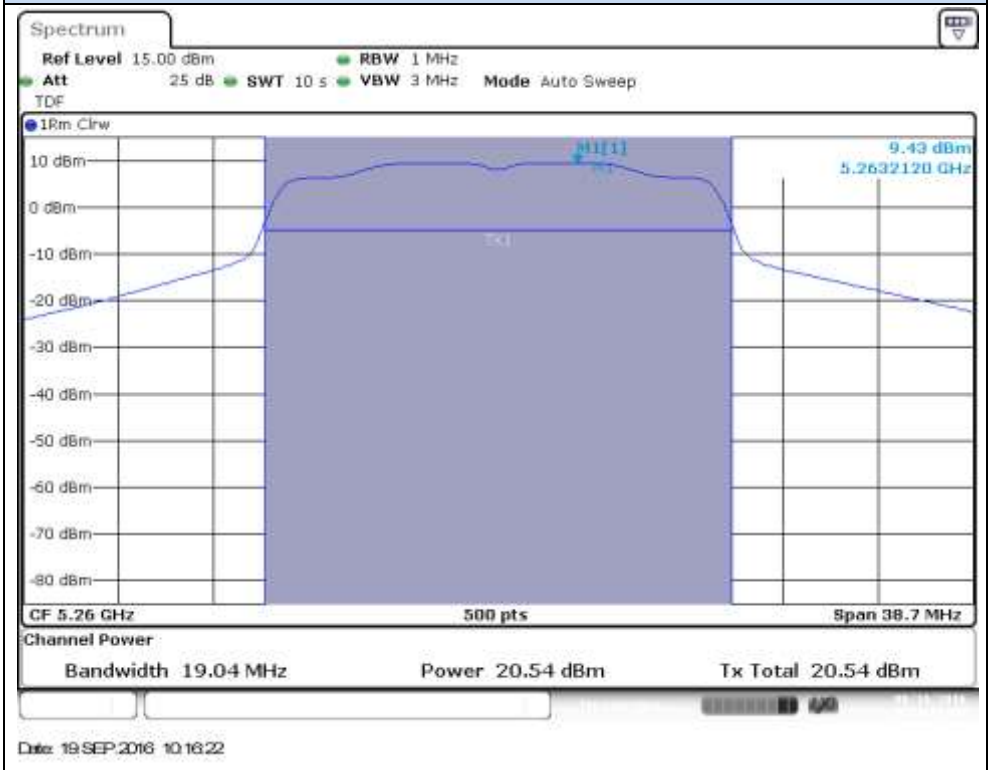


Max Power & PSD, Chain B – CH64



802.11n20, HT0 (SISO)

Max Power & PSD, Chain A – CH52



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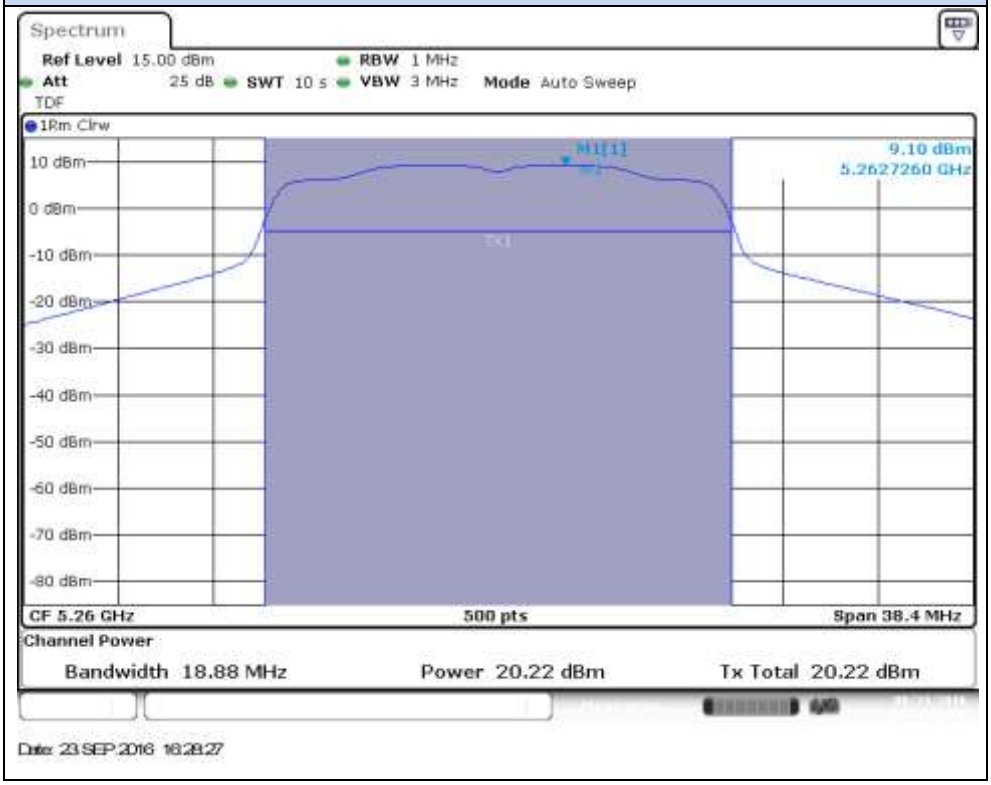
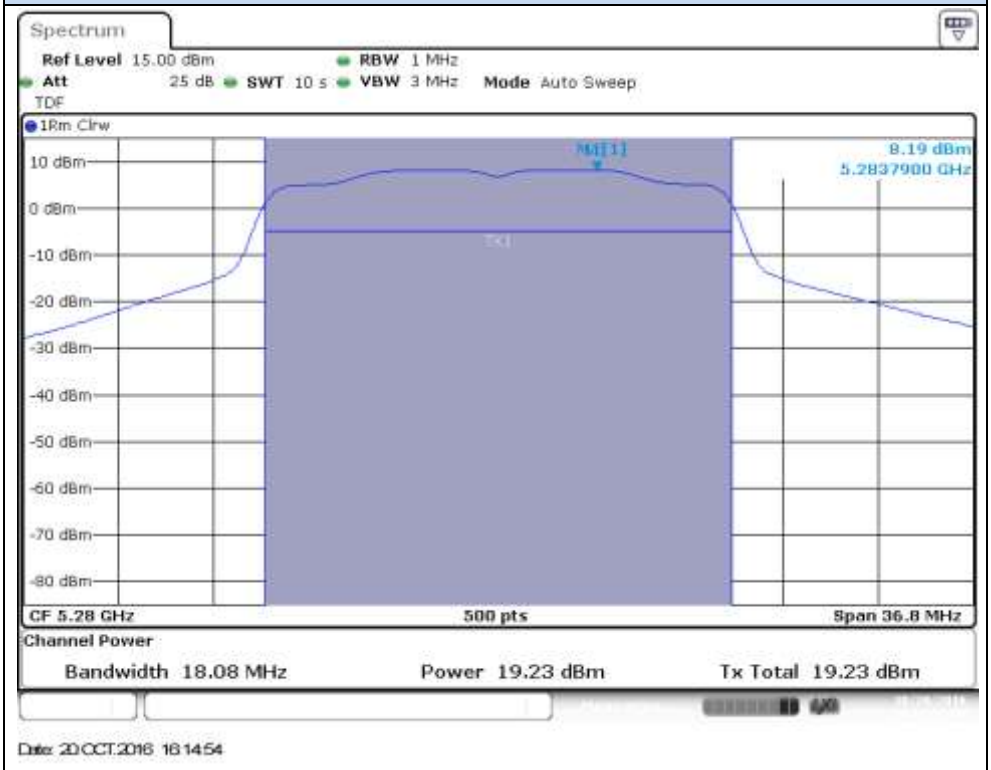


Max Power & PSD, Chain A – CH56



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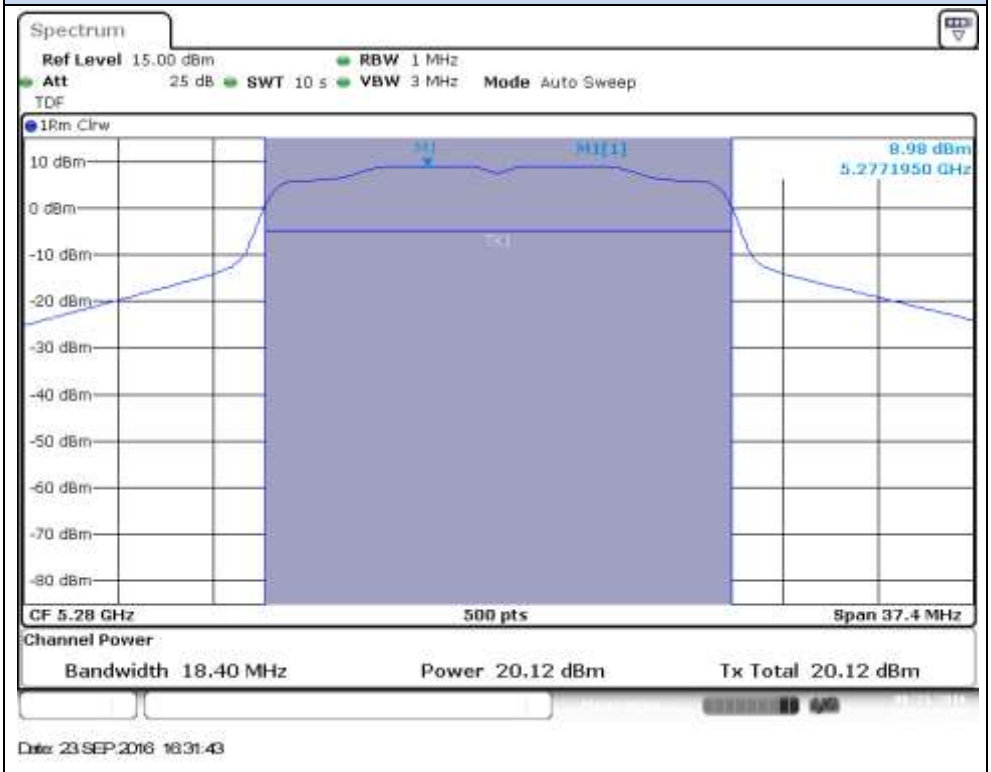
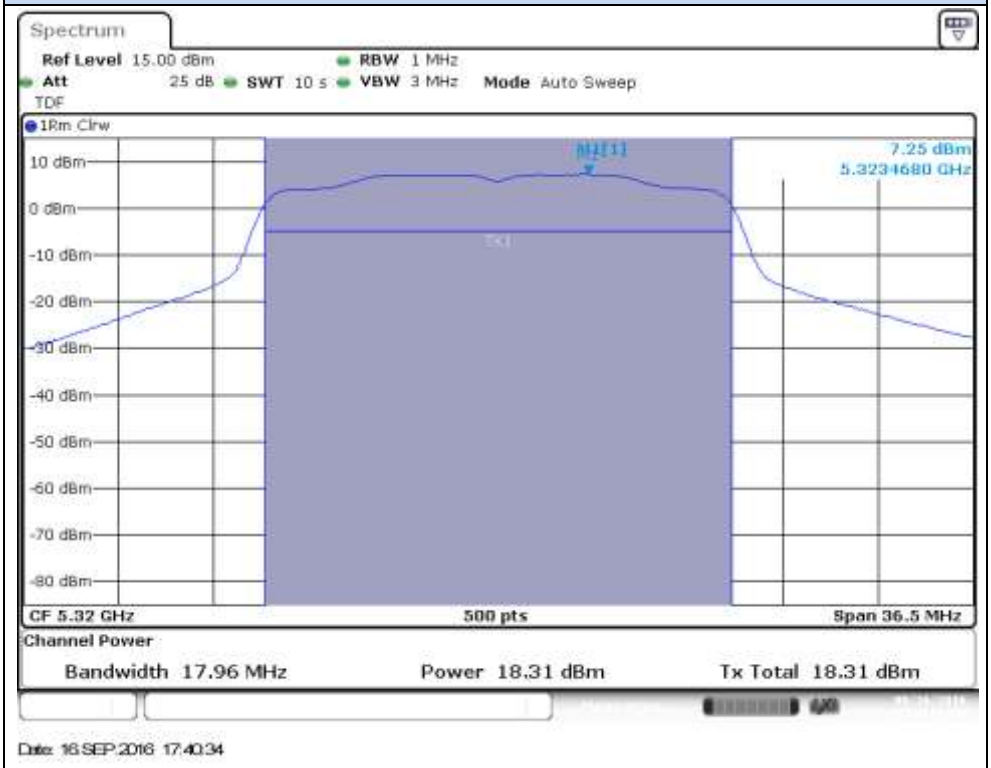
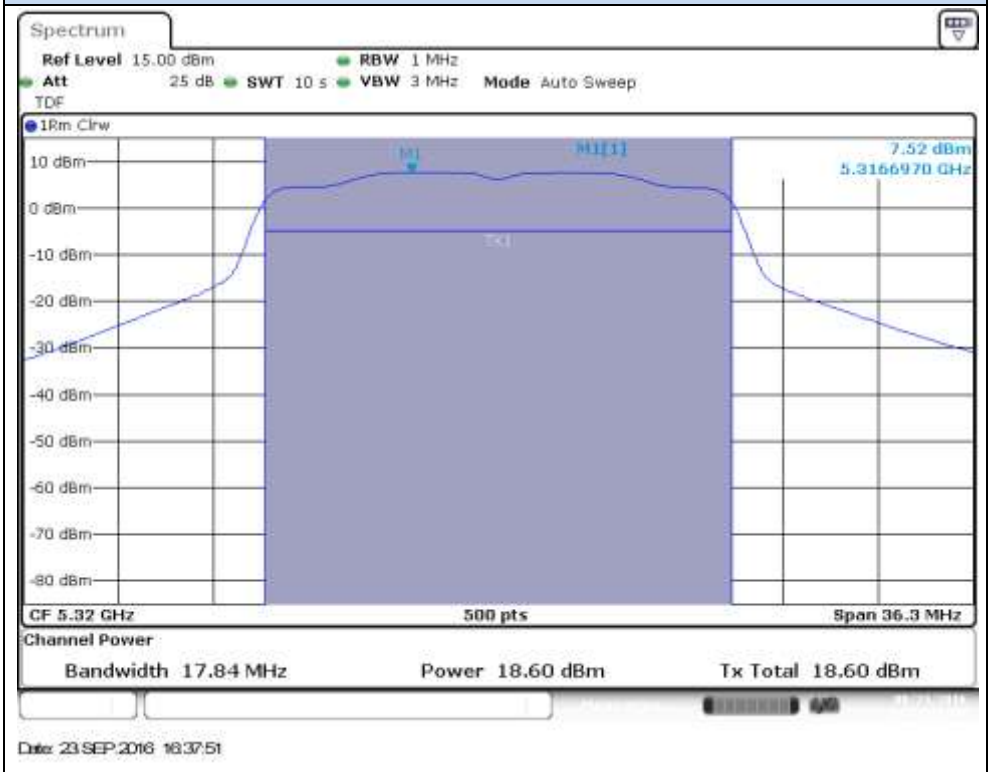


Max Power & PSD, Chain A – CH64

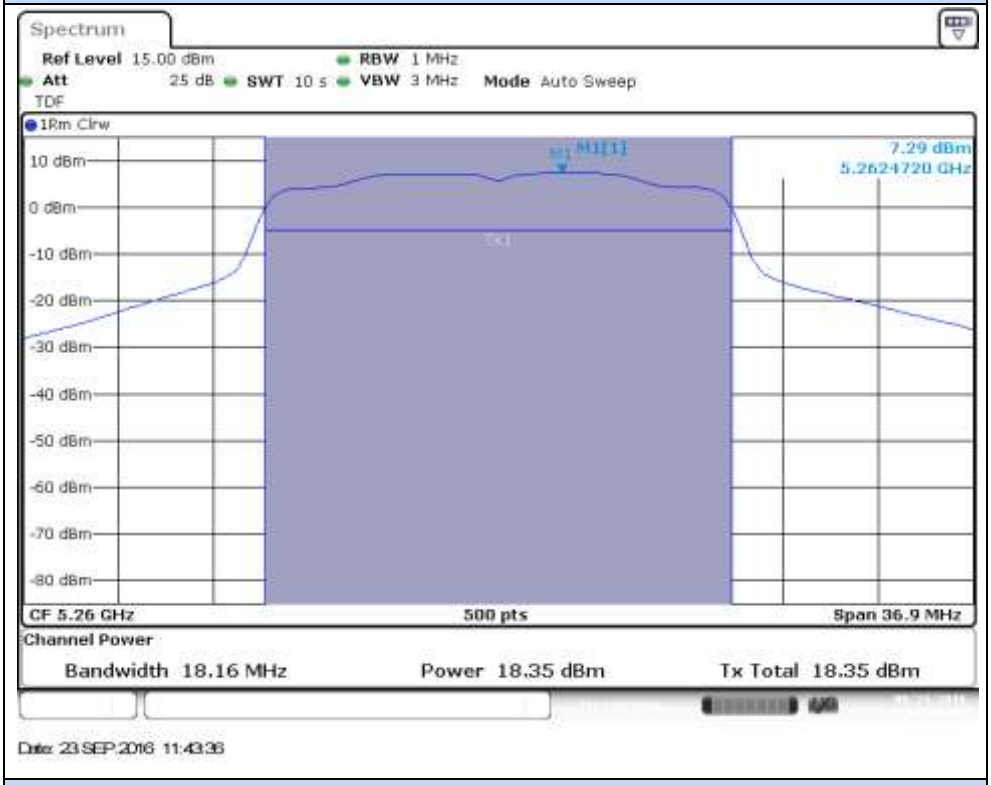


Max Power & PSD, Chain B – CH64

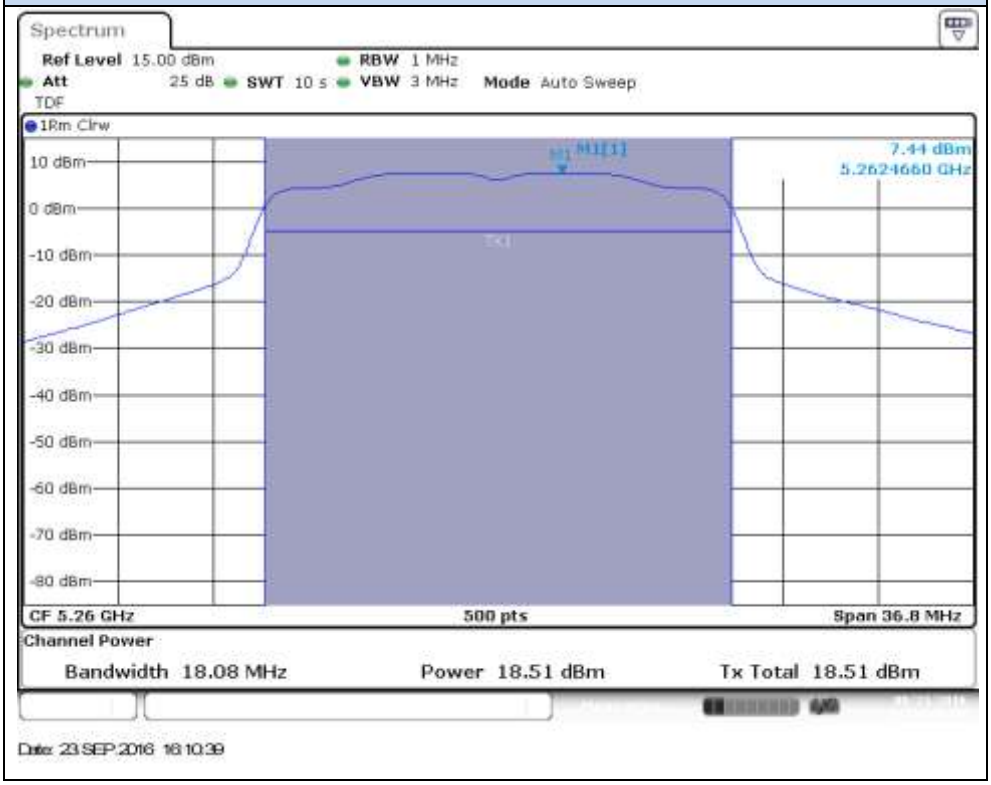


802.11n20, HT8 (MIMO)

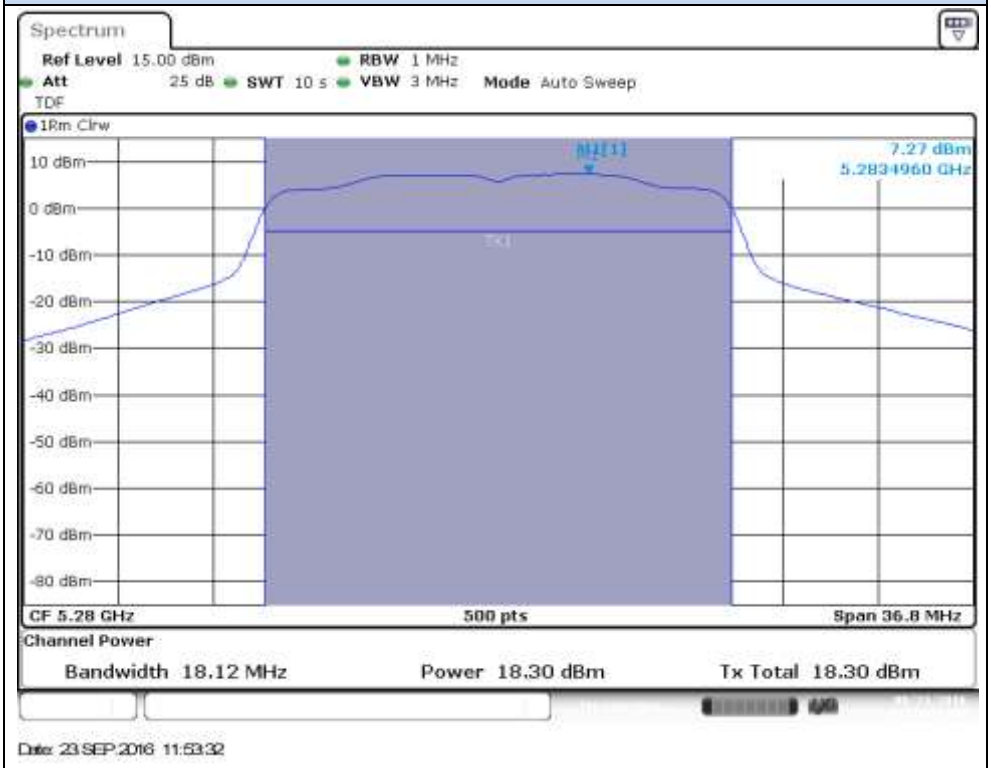
Max Power & PSD, Chain A – CH52



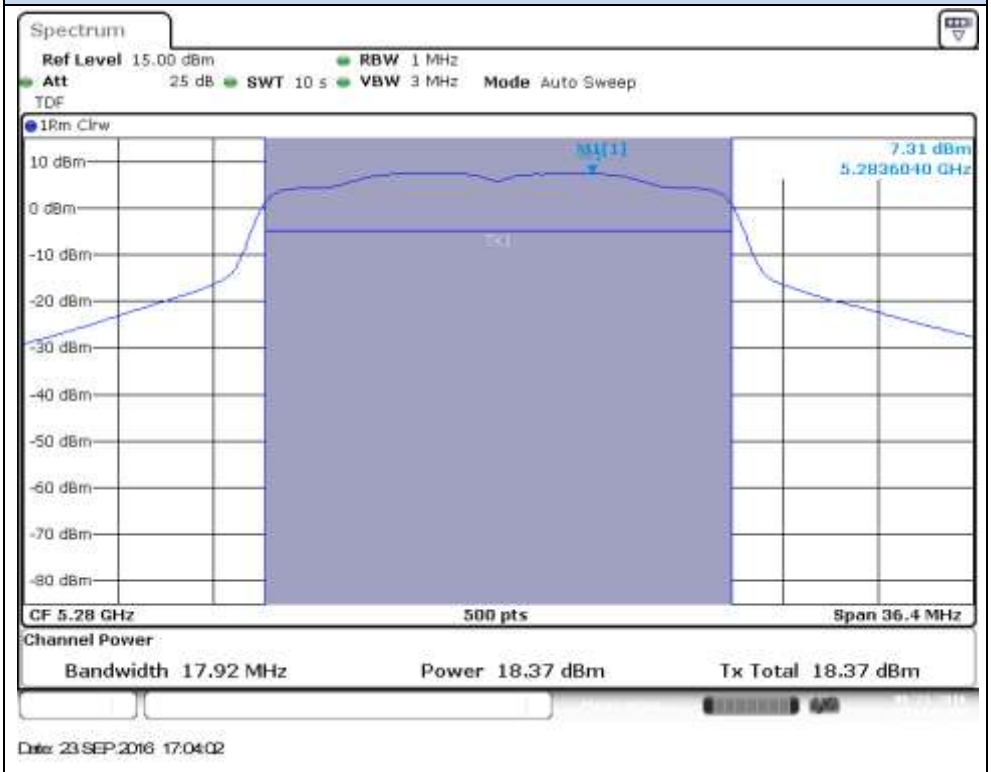
Max Power & PSD, Chain B – CH52



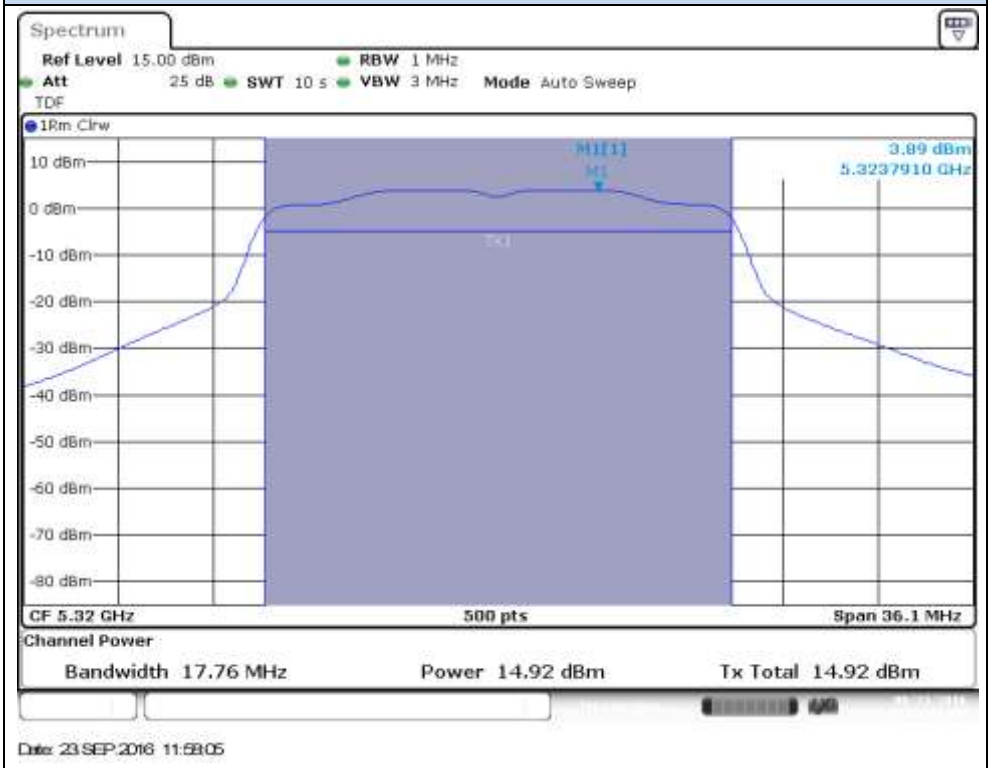
Max Power & PSD, Chain A – CH56



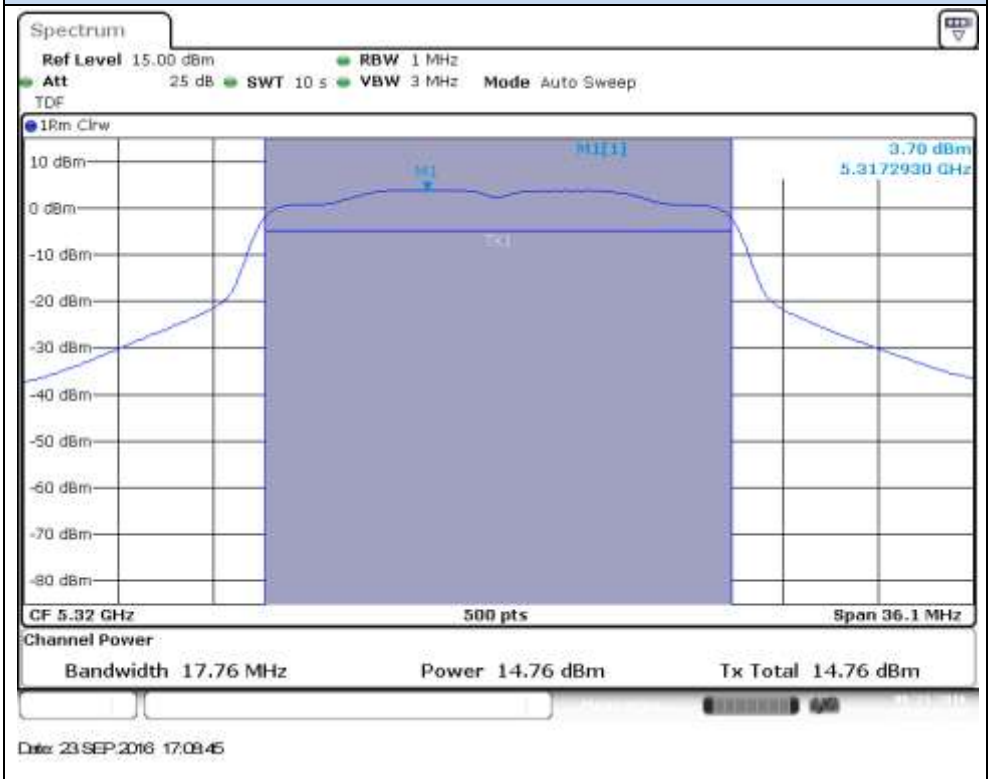
Max Power & PSD, Chain B – CH56



Max Power & PSD, Chain A – CH64

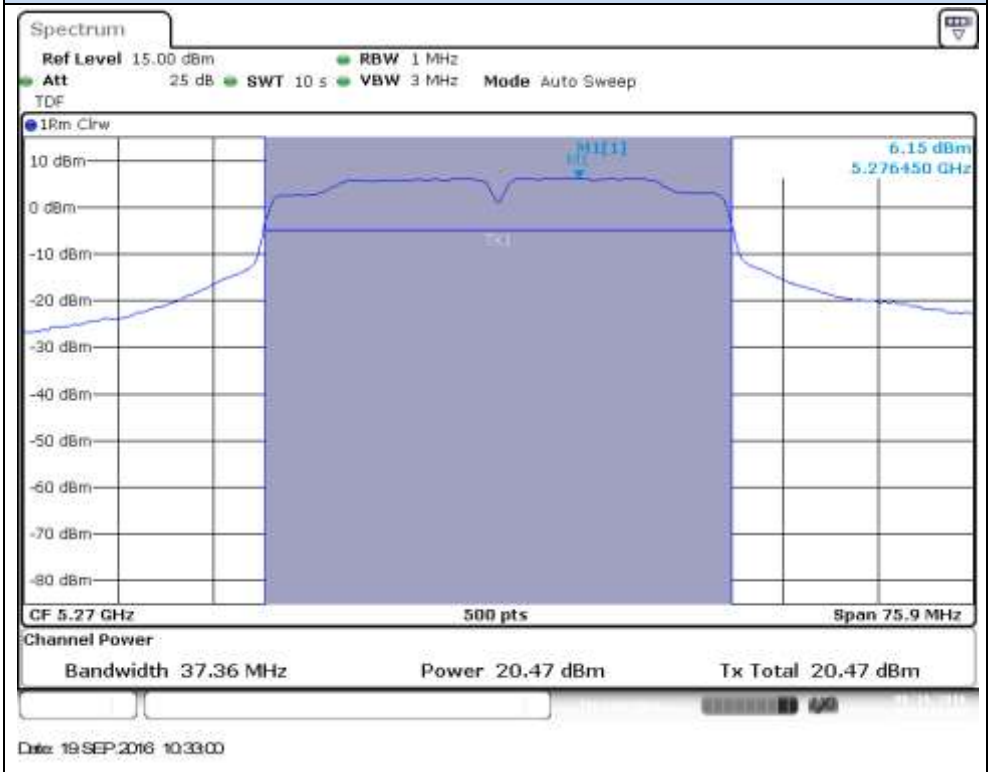


Max Power & PSD, Chain B – CH64

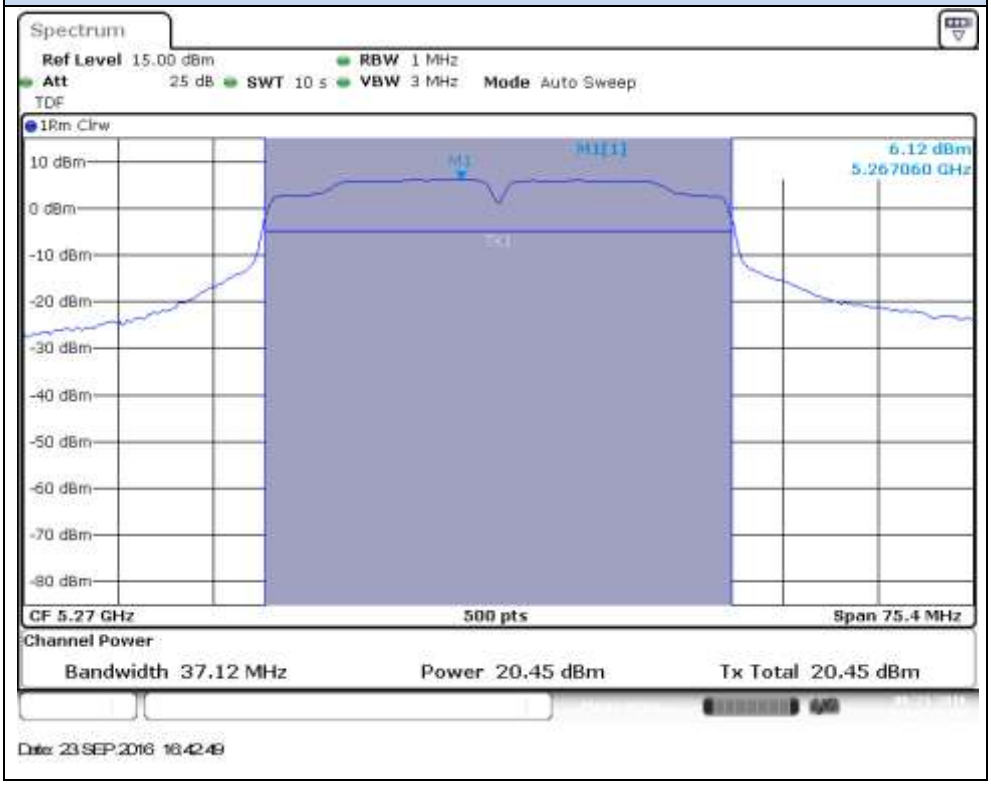


802.11n40, HT0 (SISO)

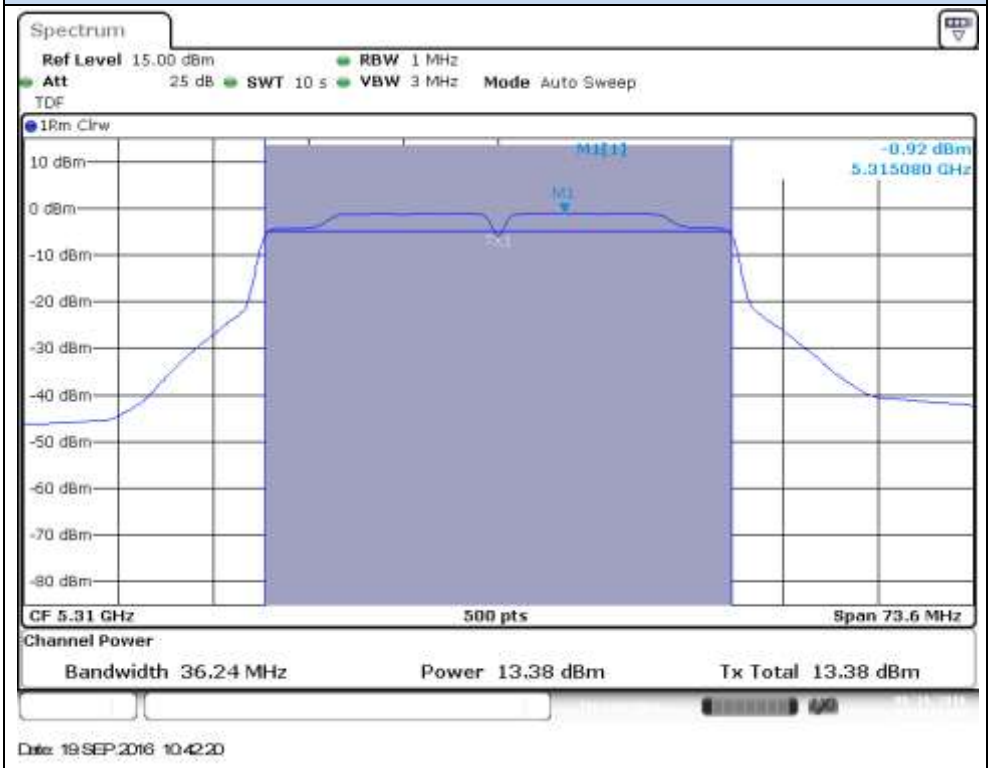
Max Power & PSD, Chain A – CH54F



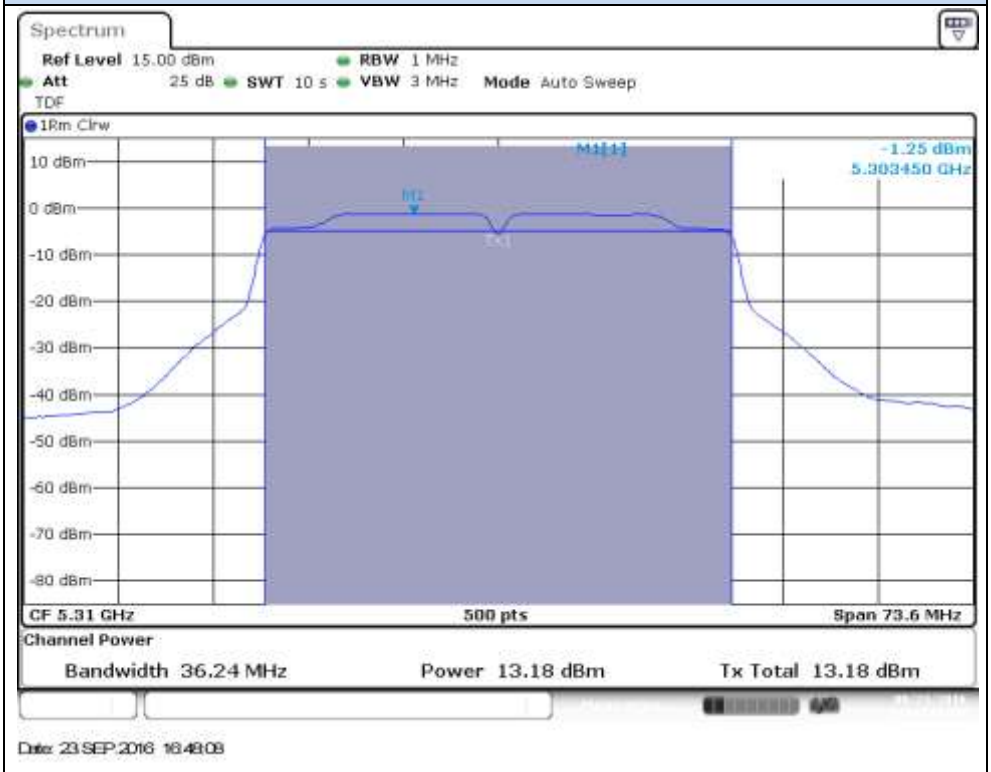
Max Power & PSD, Chain B – CH54F



Max Power & PSD, Chain A – CH62F

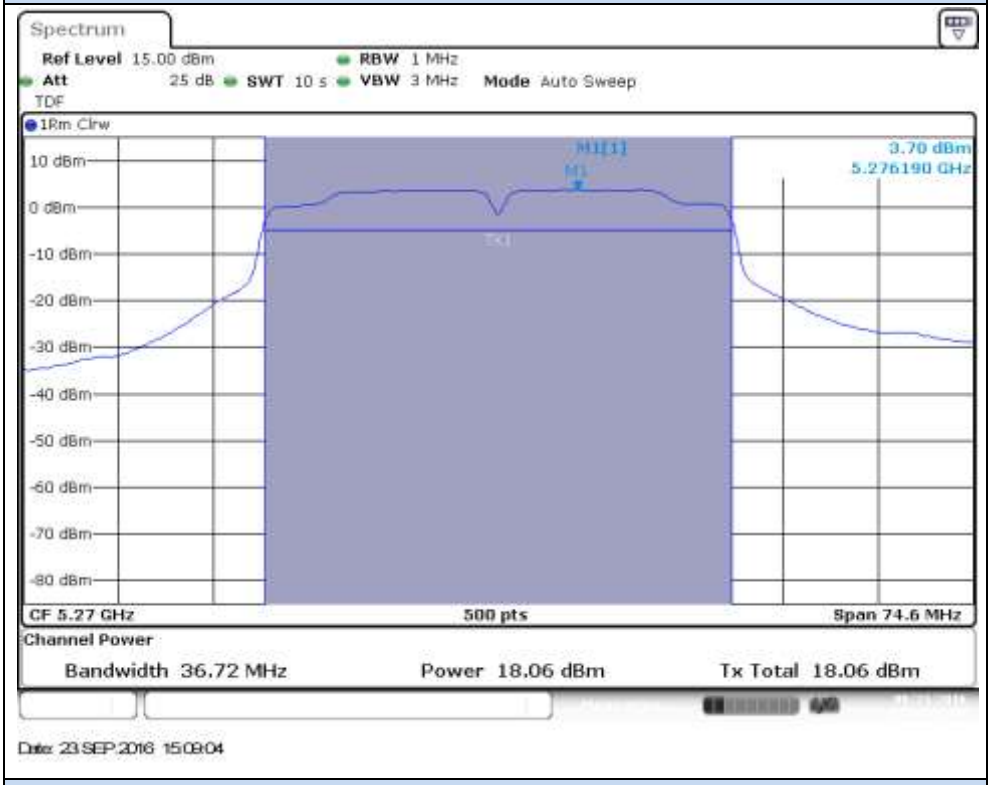


Max Power & PSD, Chain B – CH62F

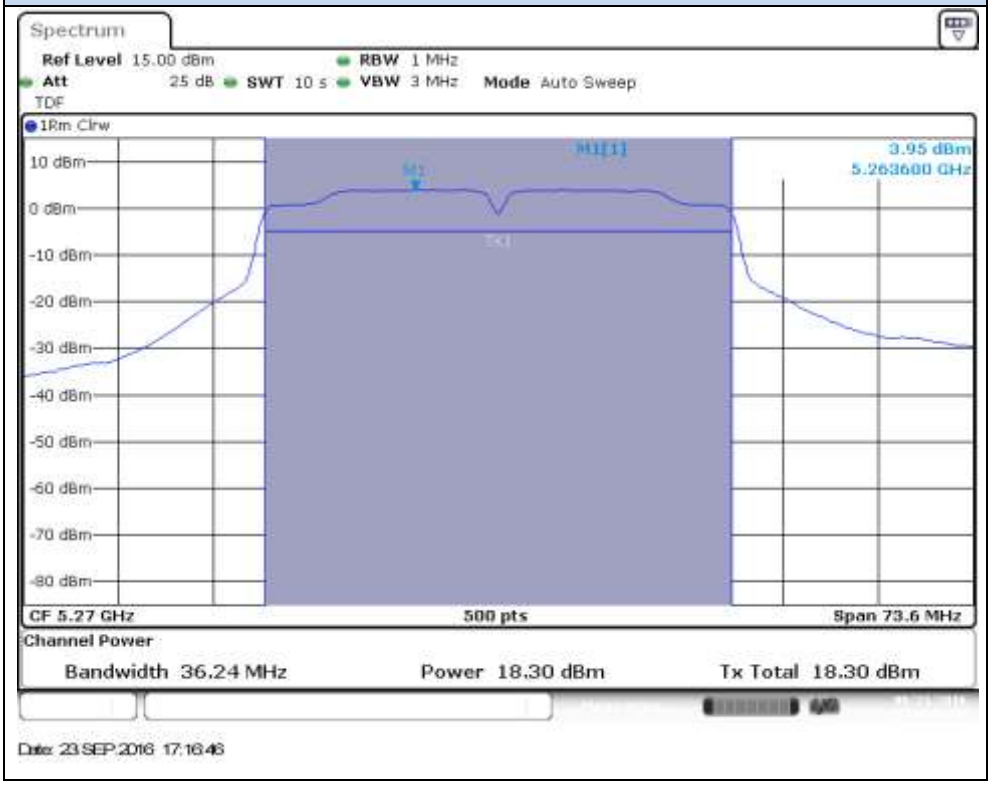


802.11n40, HT8 (MIMO)

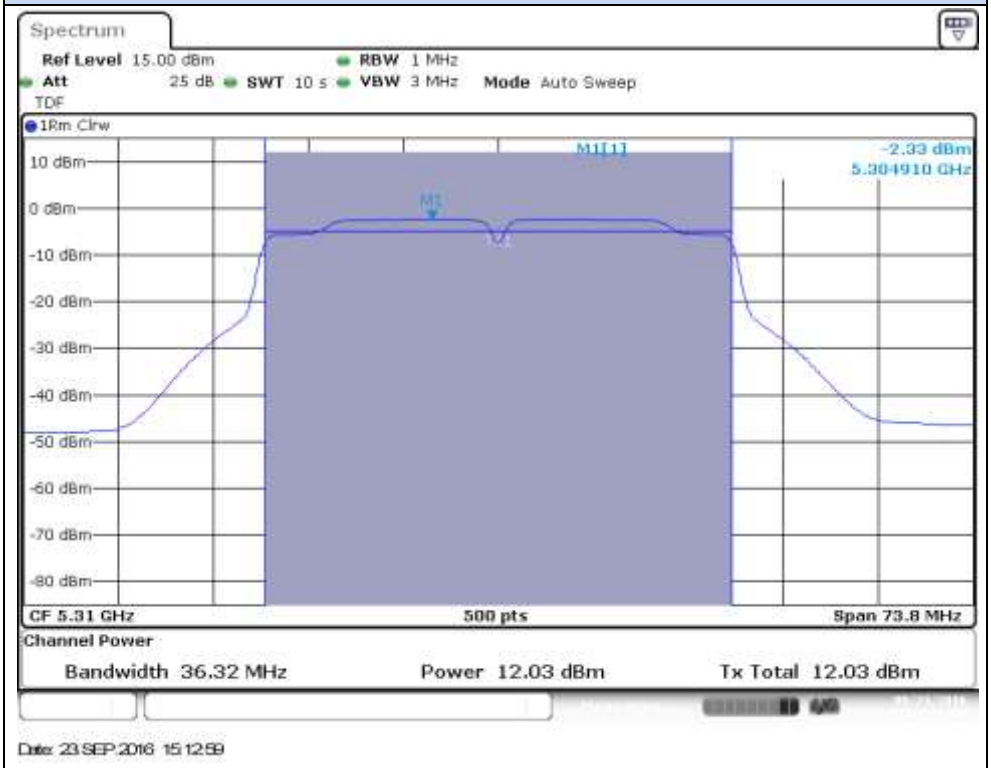
Max Power & PSD, Chain A – CH54F



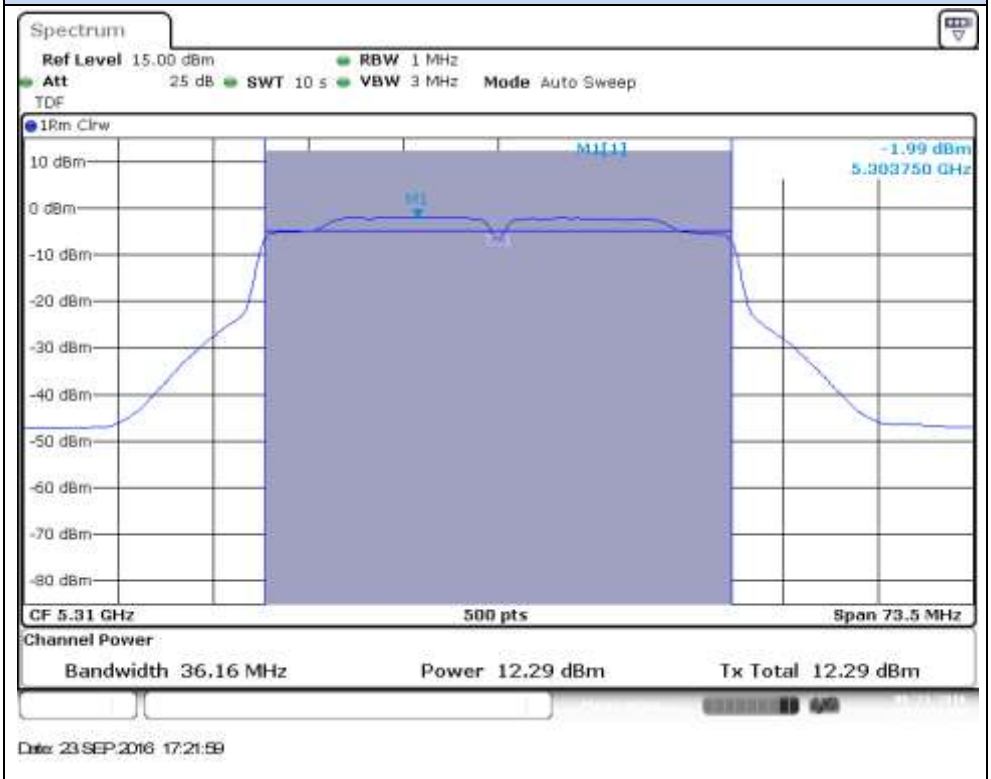
Max Power & PSD, Chain B – CH54F



Max Power & PSD, Chain A – CH62F

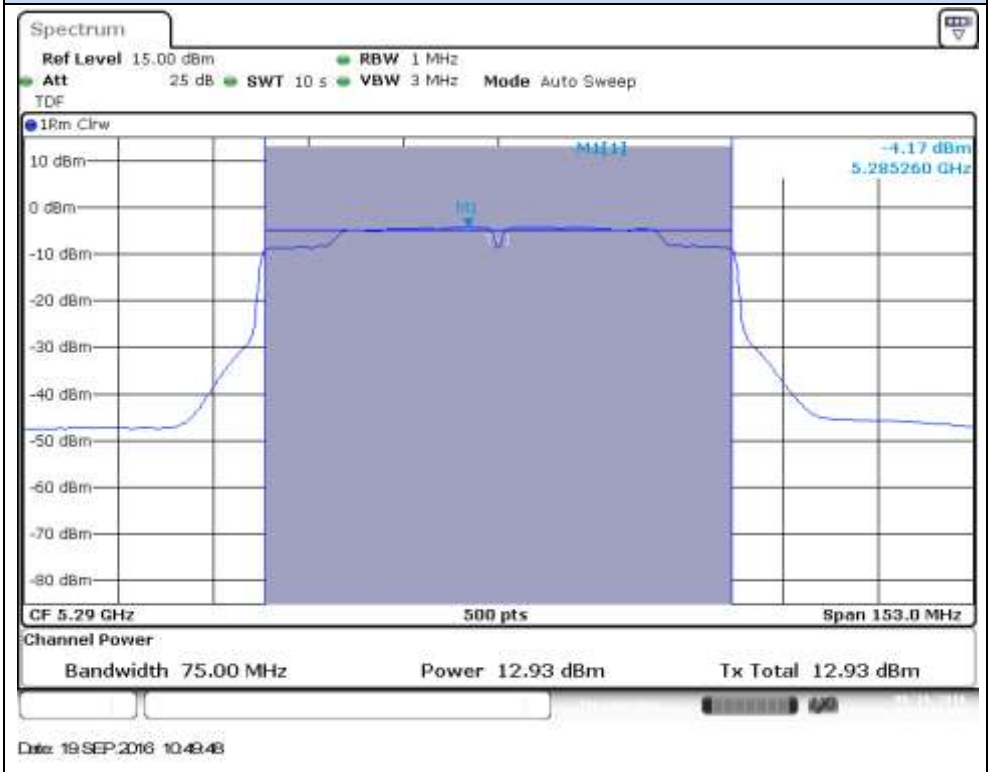


Max Power & PSD, Chain B – CH62F

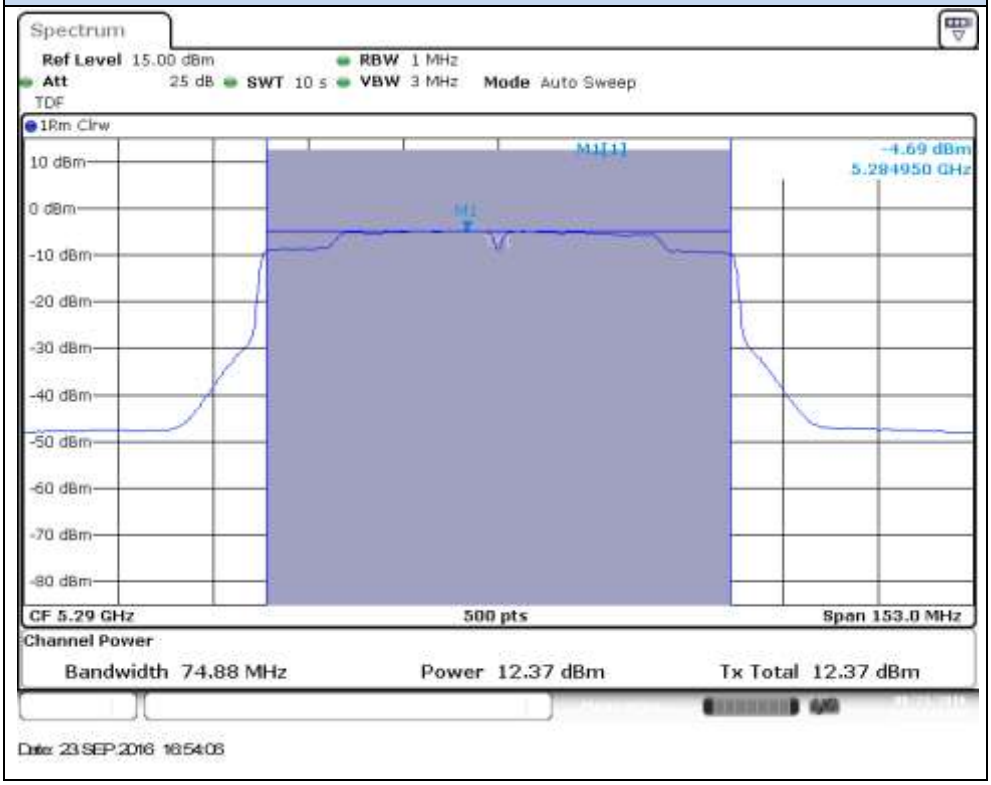


802.11ac80, VHT0 (SISO)

Max Power & PSD, Chain A – CH58ac80

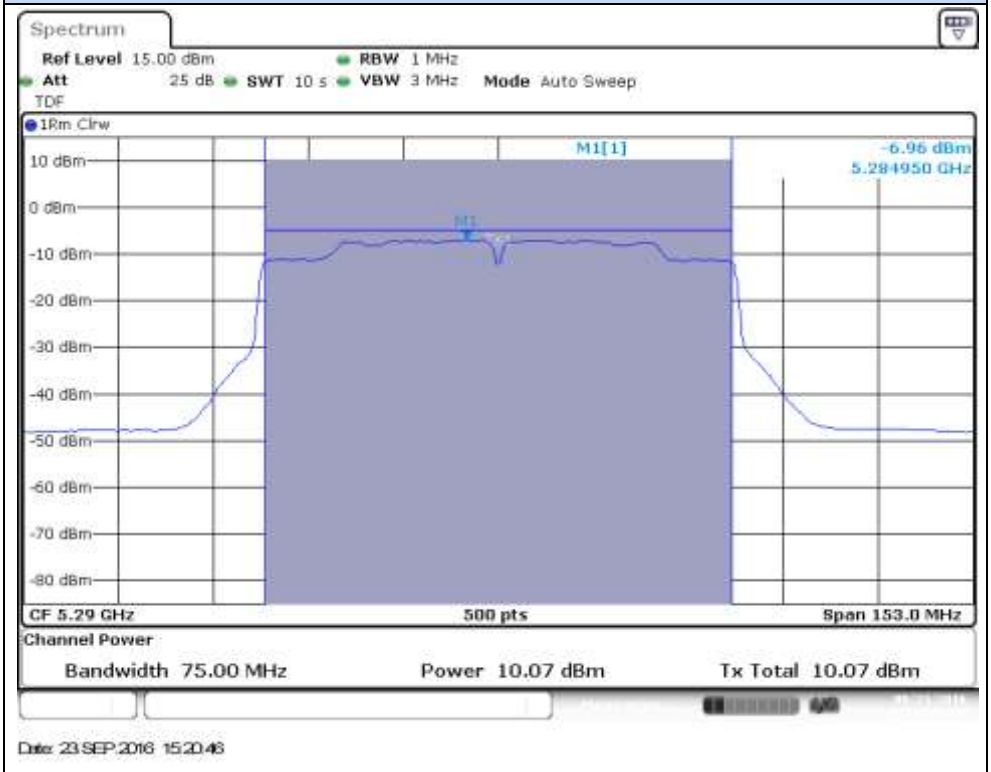


Max Power & PSD, Chain B – CH58ac80

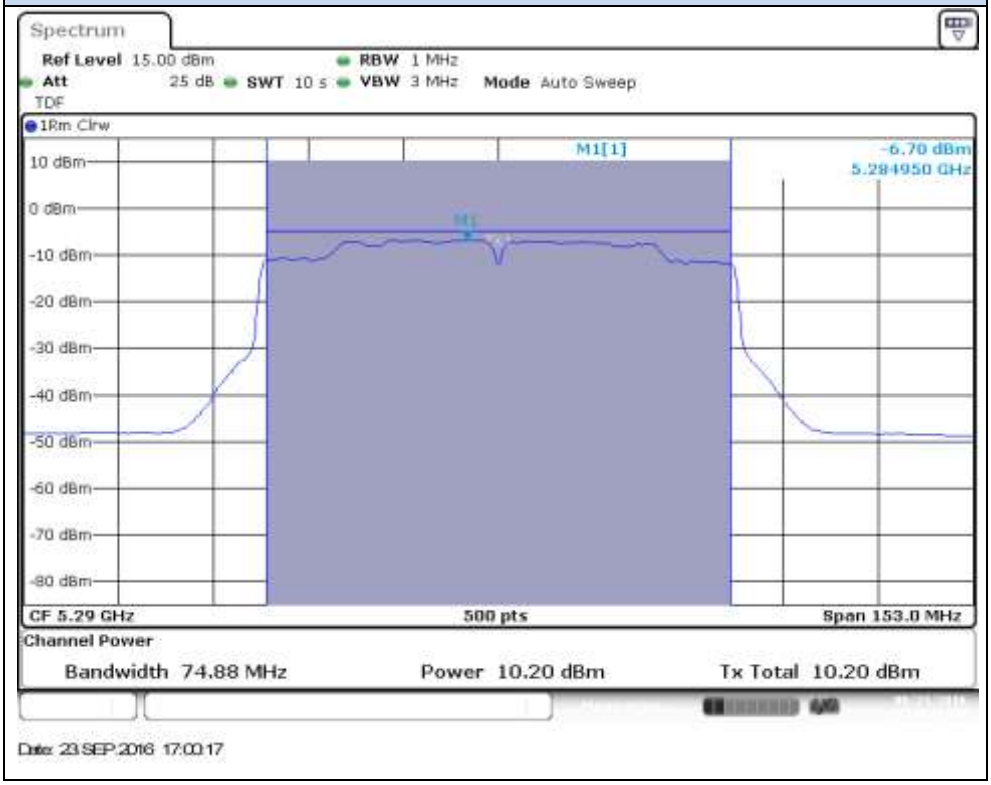


802.11ac80, VHT0 (MIMO)

Max Power & PSD, Chain A – CH58ac80



Max Power & PSD, Chain B – CH58ac80



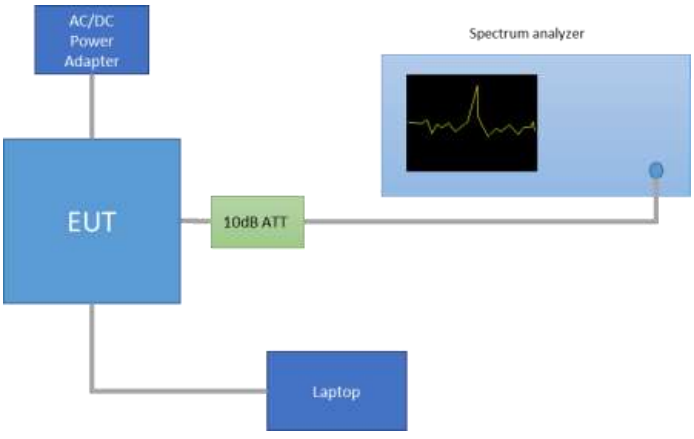
C.3 Undesirable emissions limits: Band Edge (conducted)

Test limits:

<table>
<tr><th>FCC part</th><th>Limits</th></tr>
<tr><td>15.407 (b) (2)</td><td>For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.</td></tr>
<tr><td>15.209</td><td>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):
<table>
<tr><th>Freq Range (MHz)</th><th>Field Strength (µV/m)</th><th>Field Strength (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>0.009-0.490</td><td>2400/f(kHz)</td><td>-</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/f(kHz)</td><td>-</td><td>300</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>-</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
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 specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</td></tr>
</table>

Test procedure:

The setup below was used to measure undesirable emissions on the Band Edge domain. The antenna terminal of the EUT is connected to the spectrum analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss and the declared Antenna Gain.



Band Edge measurements in average mode on the high frequency section was done with the primary and the Video Bandwidth Method according to section G) 6) (KDB 789033 D02), with the following parameters:

- When the duty cycle is > 98 %, VBW = 10Hz
- When the duty cycle is < 98 %, VBW > 1/T, where T is defined in section II.B.1.a

In case of Band Edge measurements falling in restricted bands, the declared Antenna Gain is also compensated in the graph. The declared maximum antenna gain is 5dBi.

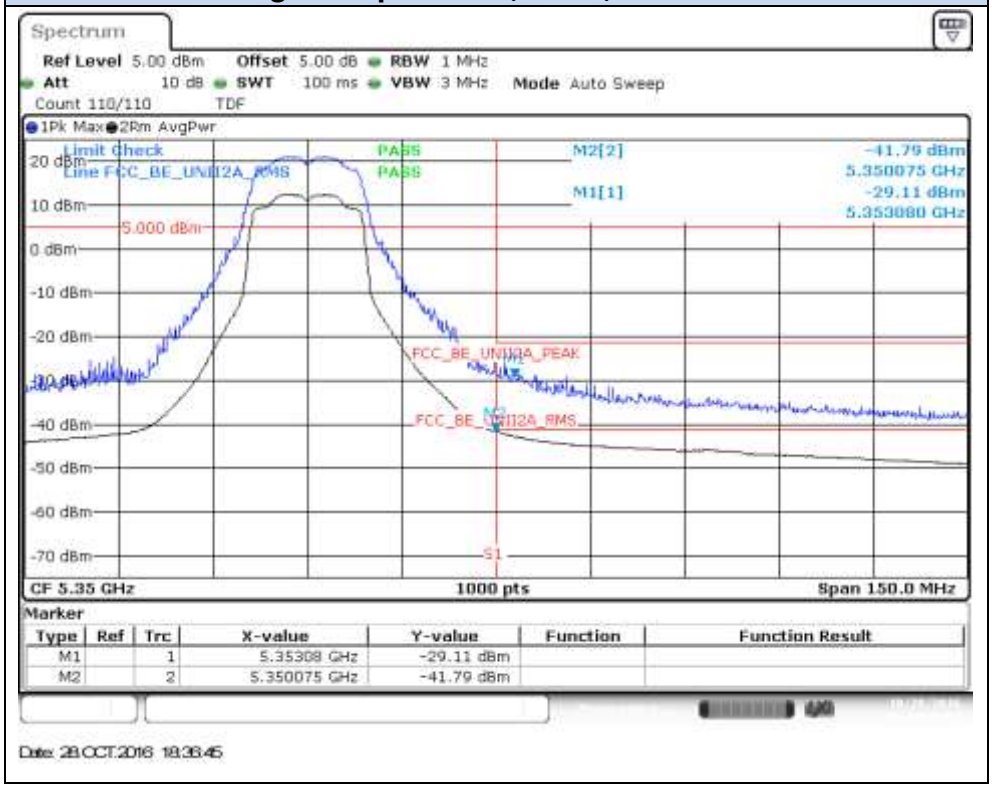
The following limits in dBm were applied for the average detector after the conversion from the limits detailed above in dBµV/m, according to FCC 47 CFR part 15 - Subpart C – §15.209(a). The limits in dBm for peak detector are 20dB above the indicated values in the table.

§15.209(a)			Converted values	
Freq Range (MHz)	Distance (m)	Field strength (microvolts/meter)	Field strength (dB microvolts/meter)	Power (dBm)
960-25000	3	500	53.98	-41.2

Results Screenshot:

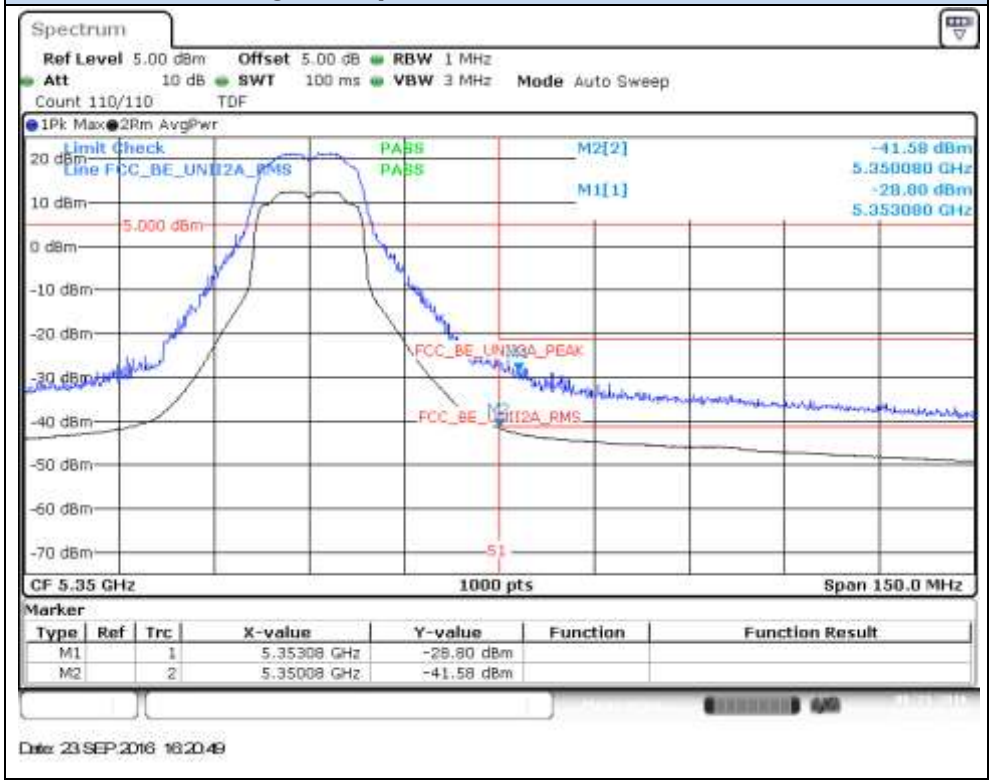
802.11a, 6Mbps – Chain A

BE High Freq Section, Peak, RMS – CH64



802.11a, 6Mbps – Chain B

BE High Freq Section, Peak, RMS – CH64



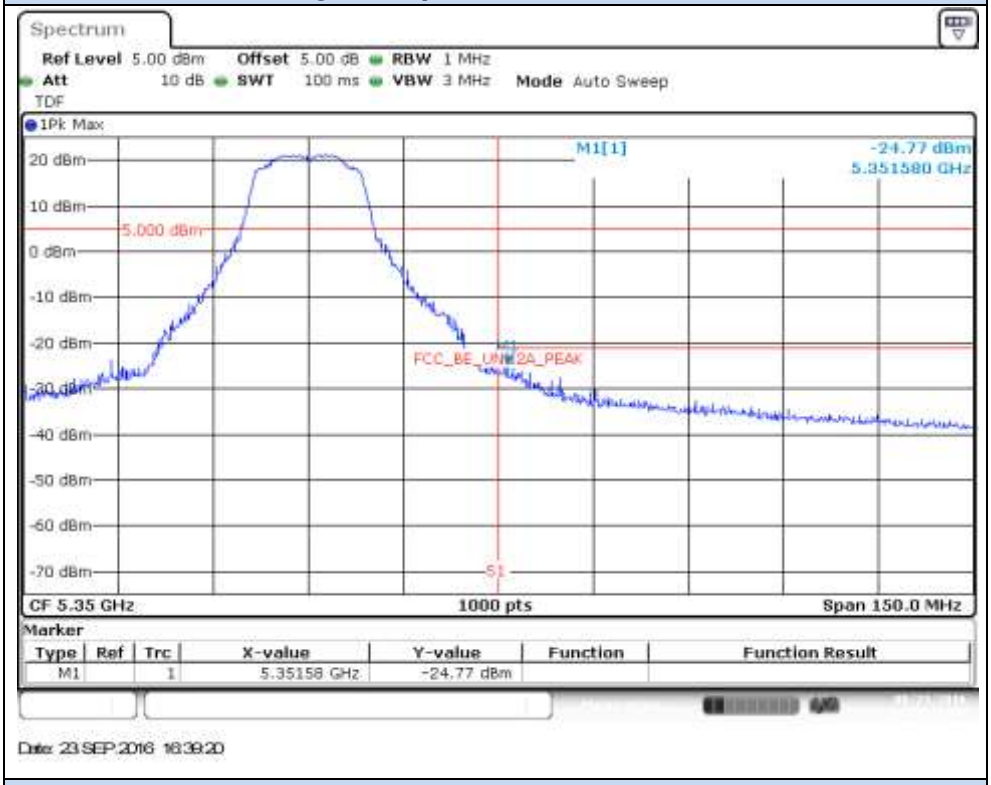
802.11n20, HT0 (SISO) – Chain A

BE High Freq Section, Peak – CH64

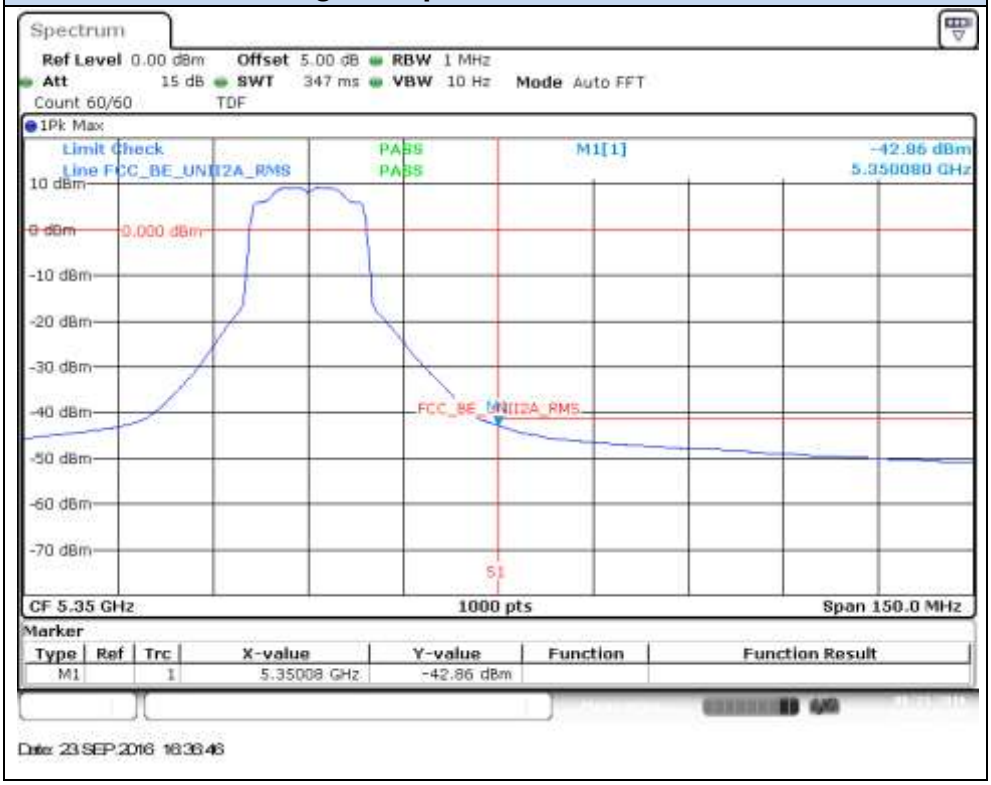
BE High Freq Section, RMS – CH64

802.11n20, HT0 (SISO) – Chain B

BE High Freq Section, Peak – CH64

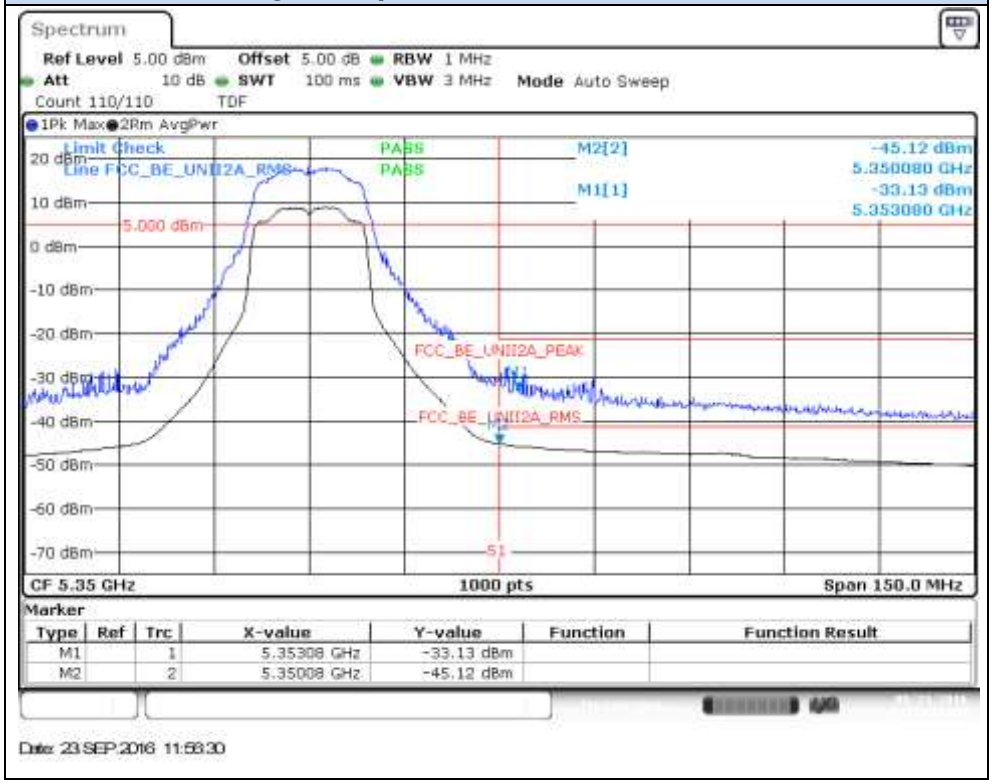


BE High Freq Section, RMS – CH64



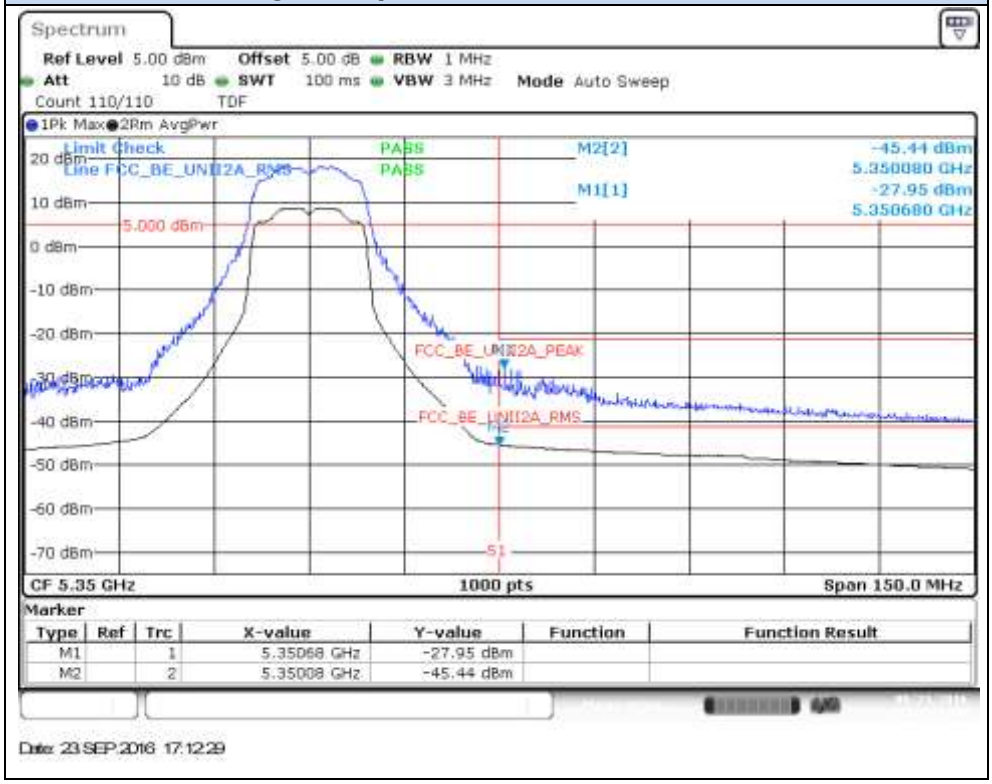
802.11n20, HT8 (MIMO) – Chain A

BE High Freq Section, Peak, RMS – CH64



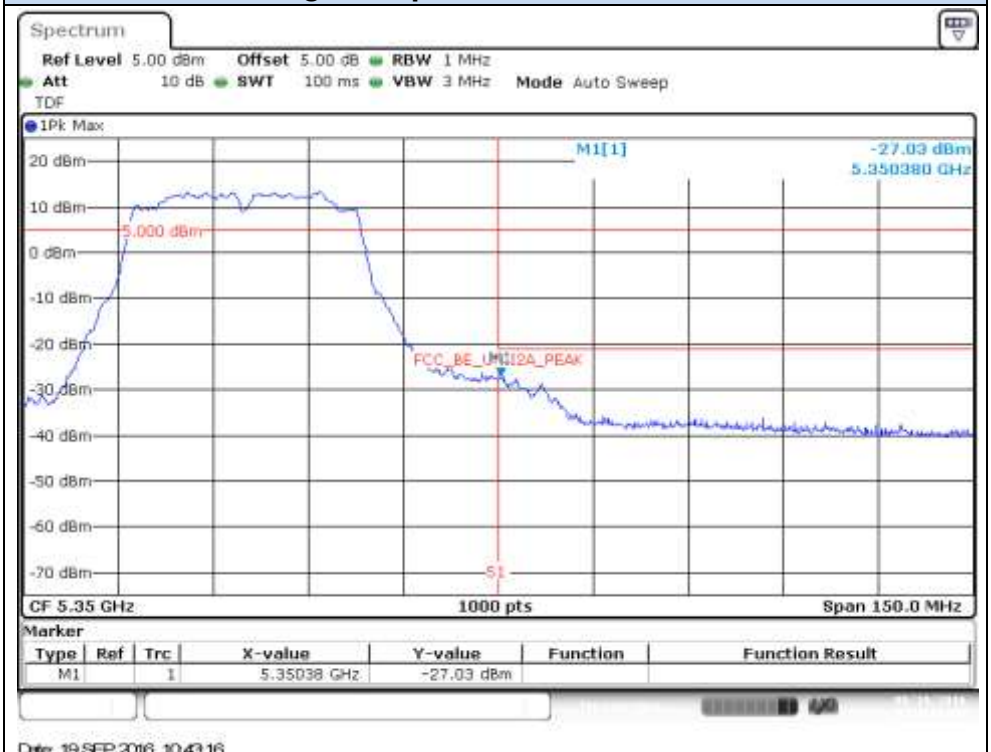
802.11n20, HT8 (MIMO) – Chain B

BE High Freq Section, Peak, RMS – CH64



802.11n40, HT0 (SISO) – Chain A

BE High Freq Section, Peak – CH62F



BE High Freq Section, RMS – CH62F

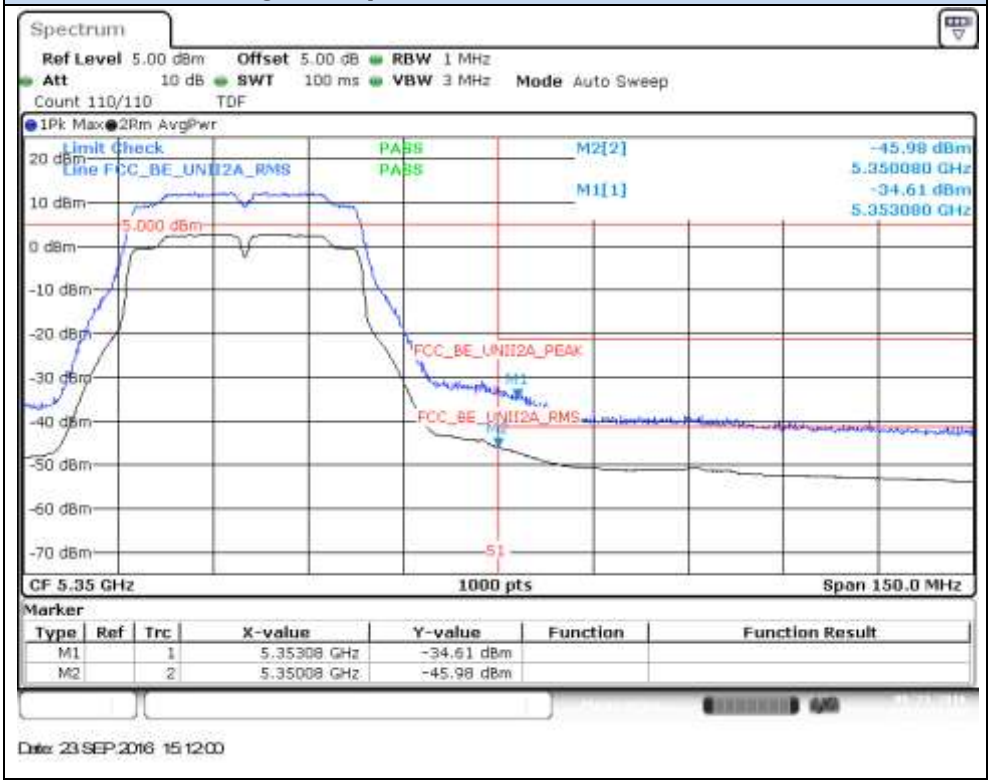
802.11n40, HT0 (SISO) – Chain B

BE High Freq Section, Peak – CH62F

BE High Freq Section, RMS – CH62F

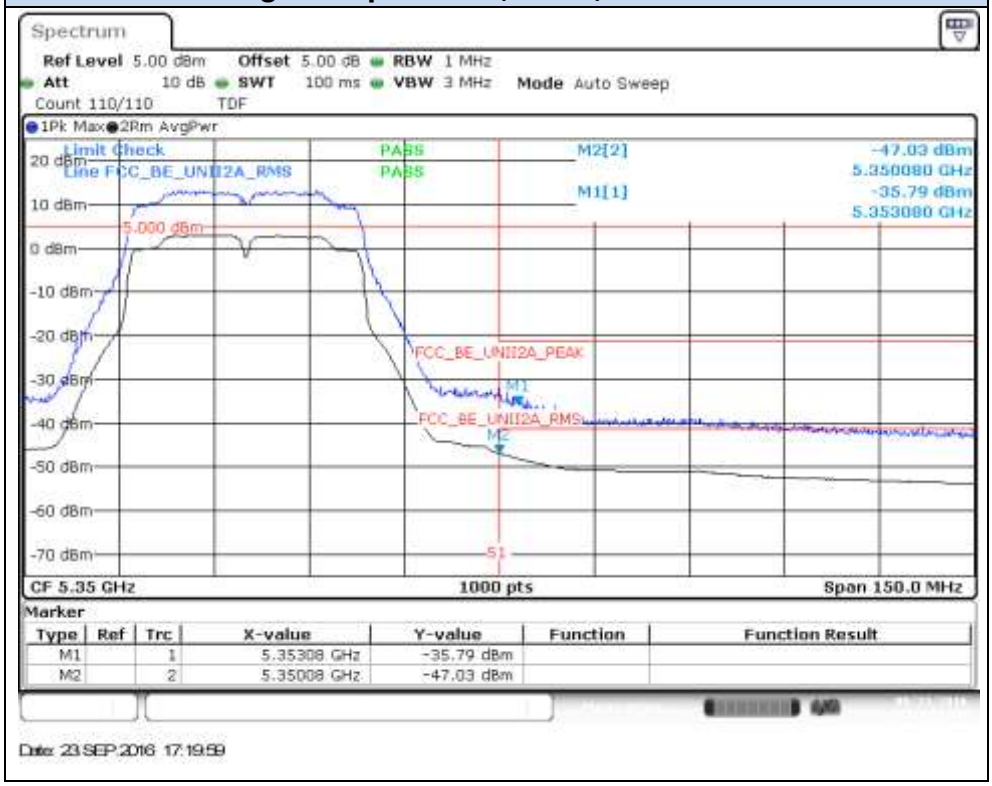
802.11n40, HT8 (MIMO) – Chain A

BE High Freq Section, Peak, RMS – CH62F



802.11n40, HT8 (MIMO) – Chain B

BE High Freq Section, Peak, RMS – CH62F



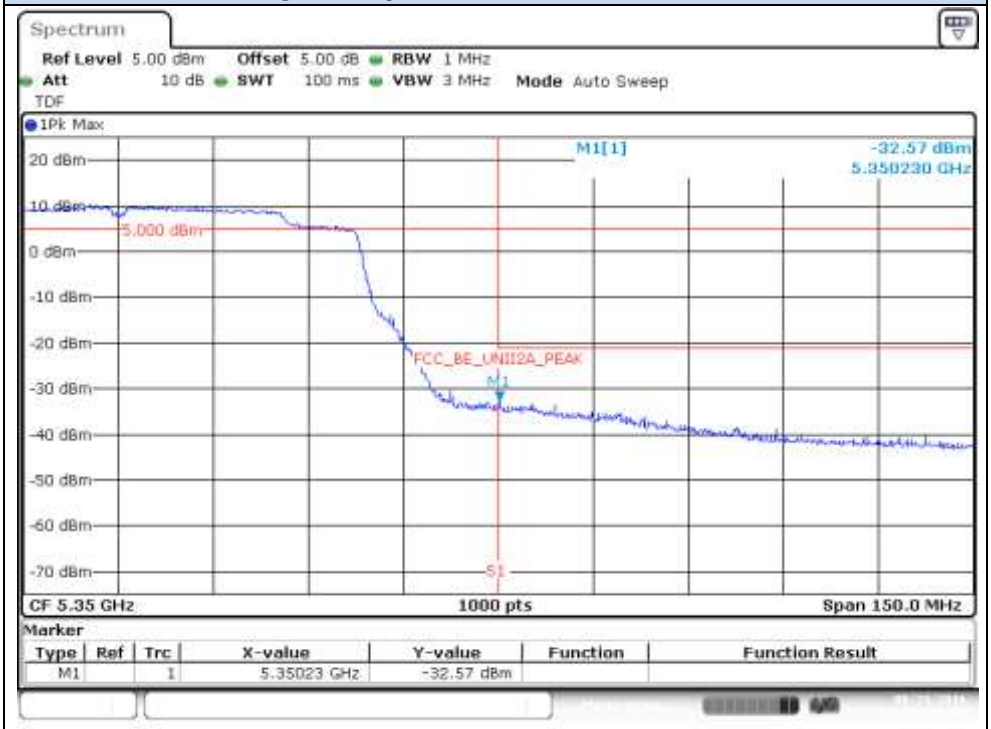
802.11ac80, VHT0 (SISO)- Chain A

BE High Freq Section, Peak – CH58ac80

BE High Freq Section, RMS – CH58ac80

802.11ac80, VHT0 (SISO)- Chain B

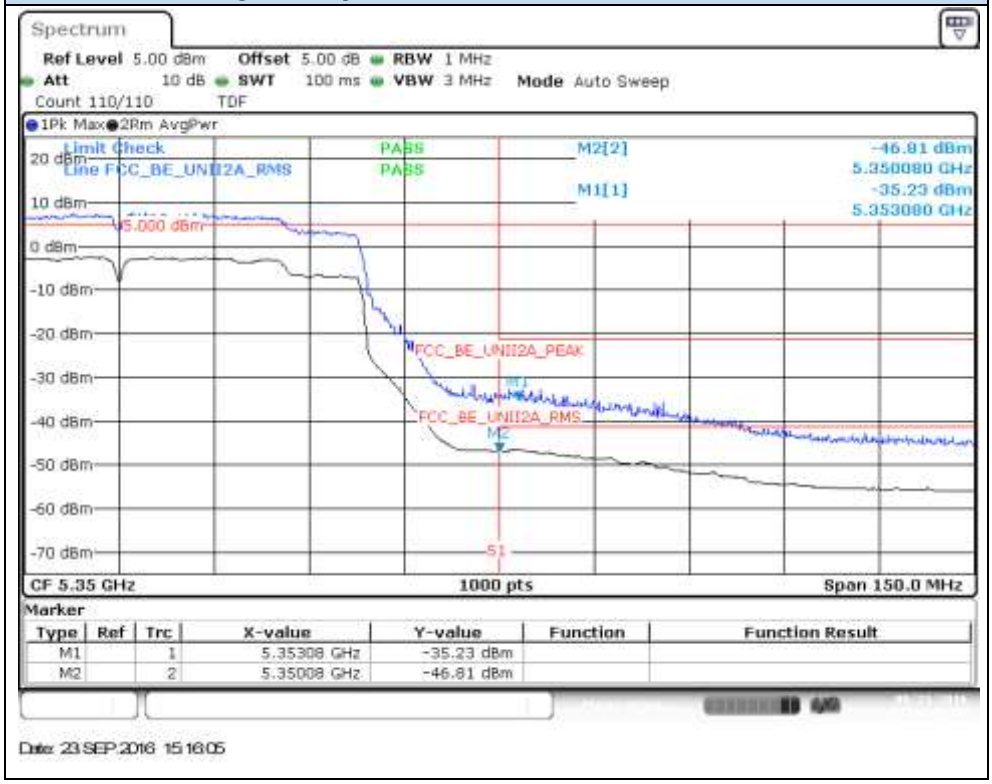
BE High Freq Section, Peak – CH58ac80



BE High Freq Section, RMS – CH58ac80

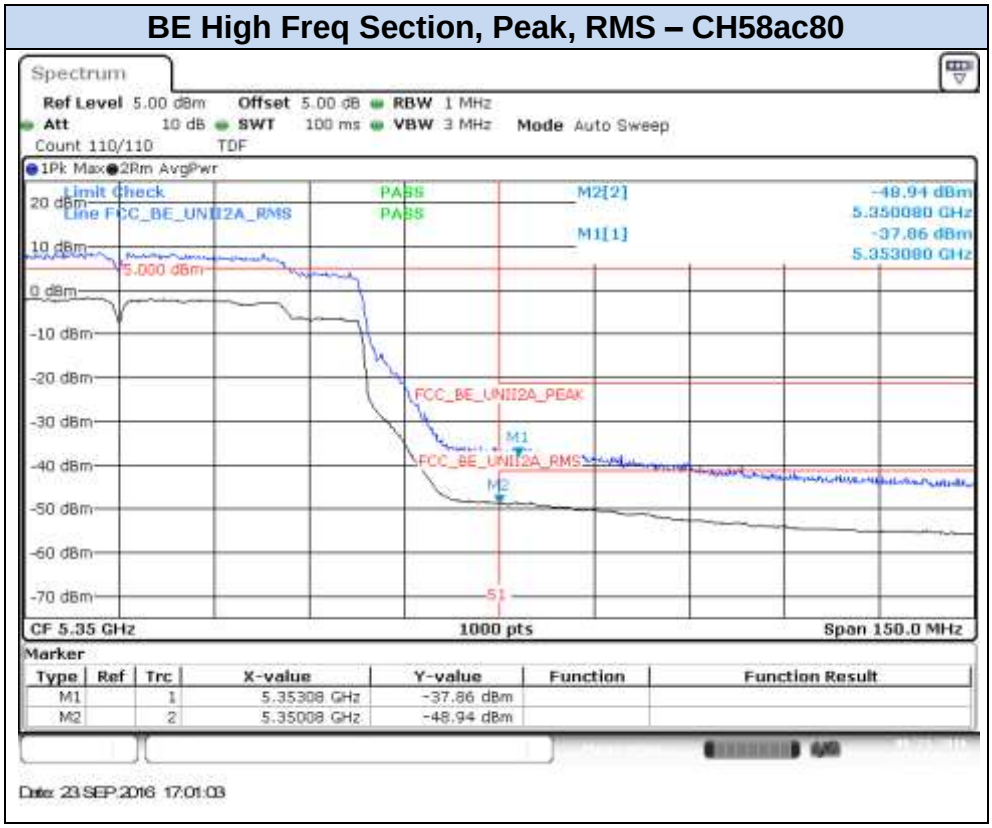
802.11ac80, VHT0 (MIMO)- Chain A

BE High Freq Section, Peak, RMS – CH58ac80



802.11ac80, VHT0 (MIMO)- Chain B

BE High Freq Section, Peak, RMS – CH58ac80



C.4 Radiated spurious emission

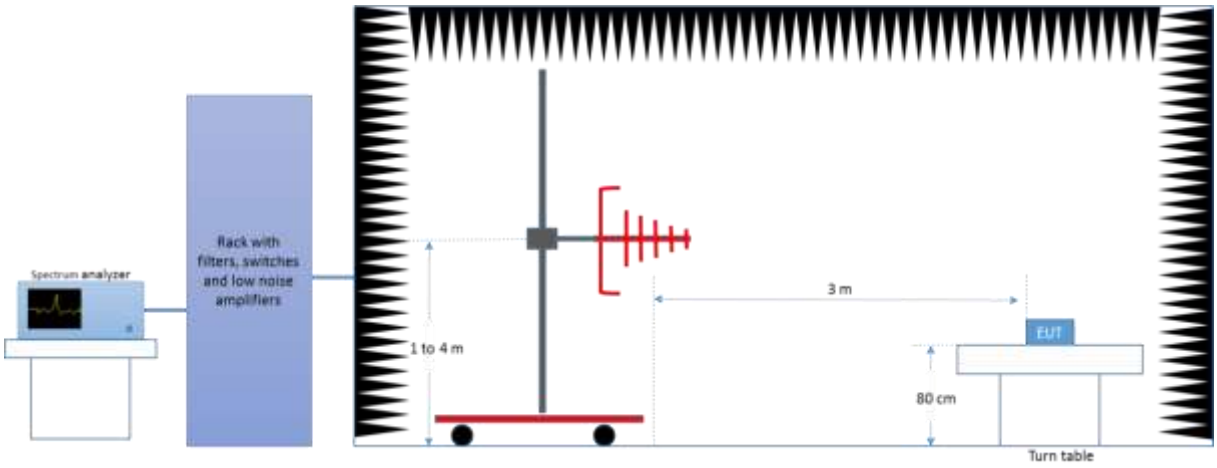
Standard references:

<table>
<tr><th>FCC part</th><th>Limits</th></tr>
<tr><td>15.407 (a) (2)</td><td>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 or 11 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.</td></tr>
<tr><td>15.209</td><td>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):
<table>
<tr><th>Freq Range (MHz)</th><th>Field Strength (µV/m)</th><th>Field Strength (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>0.009-0.490</td><td>2400/f(kHz)</td><td>-</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/f(kHz)</td><td>-</td><td>300</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>-</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
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 specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</td></tr>
</table>

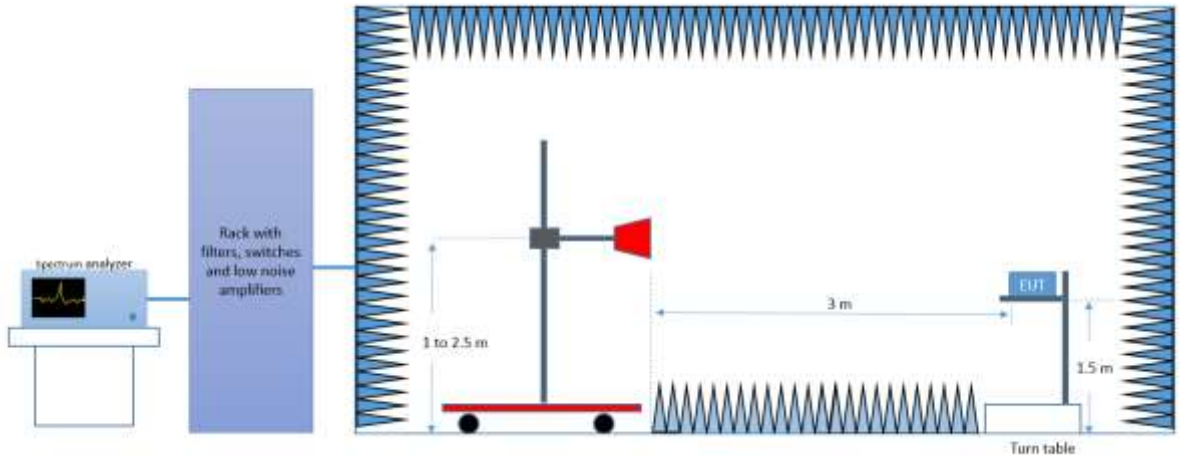
Test procedure:

The below setups were used to measure the radiated spurious emissions.
Depending of the frequency range and bands being tested, different antennas and filters were used.
The final measurement is done by varying the antenna height, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.
The radiated spurious emissions were measured on the worst case configuration selected from the chapter C.2 and using the lowest, middle and highest channels.
For technologies 802.n20, 802.n40 and 802.ac80 the worst case in terms of spurious emissions found among the low, mid and high channels when tested on chain A and B separately is used to perform the test in MIMO mode (Chain A+B).

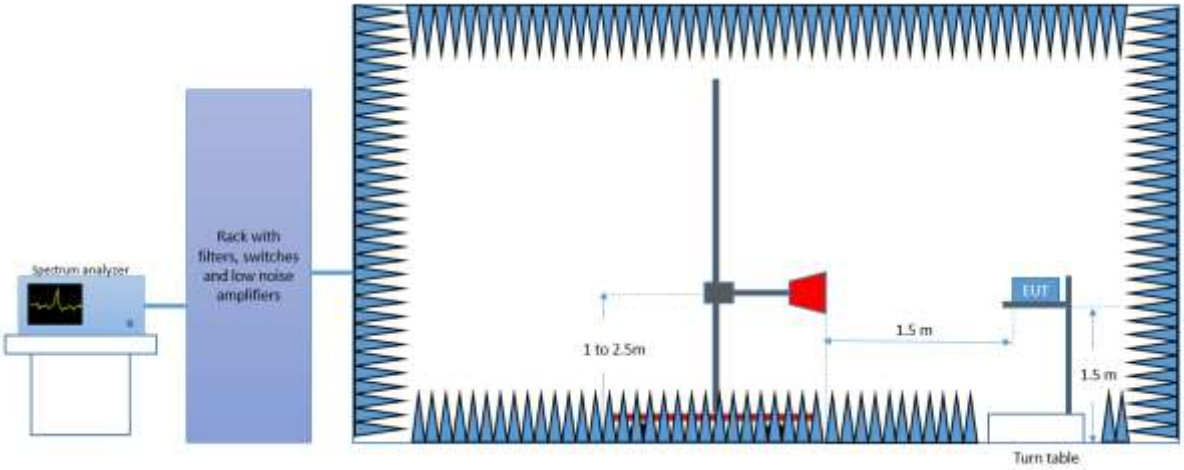
Radiated Setup < 1GHz



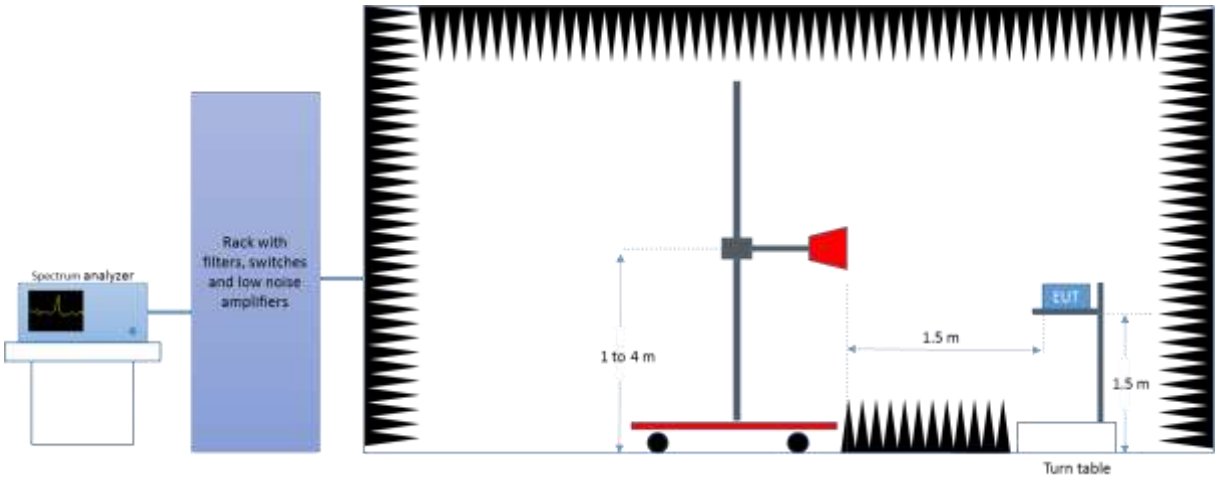
Radiated Setup 1 GHz - 18 GHz



Radiated Setup 18 GHz - 26.5 GHz



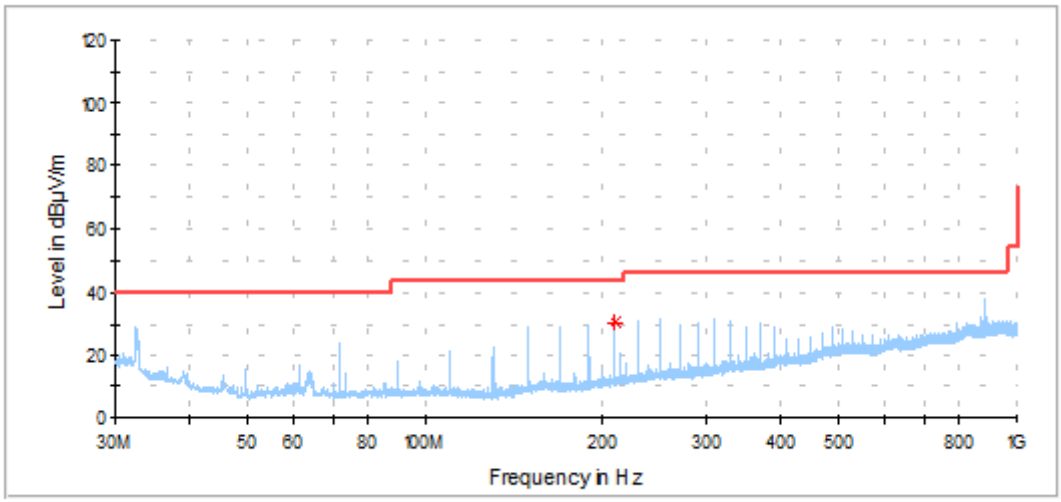
Radiated Setup > 26.5 GHz



Test Results:

Radiated Spurious – 30MHz to 1GHz

Radiated Spurious – All modes

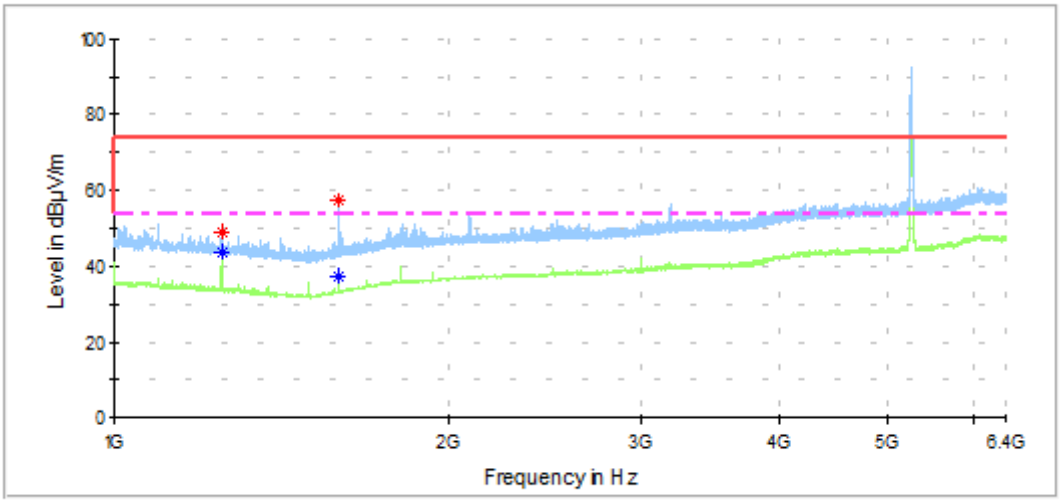


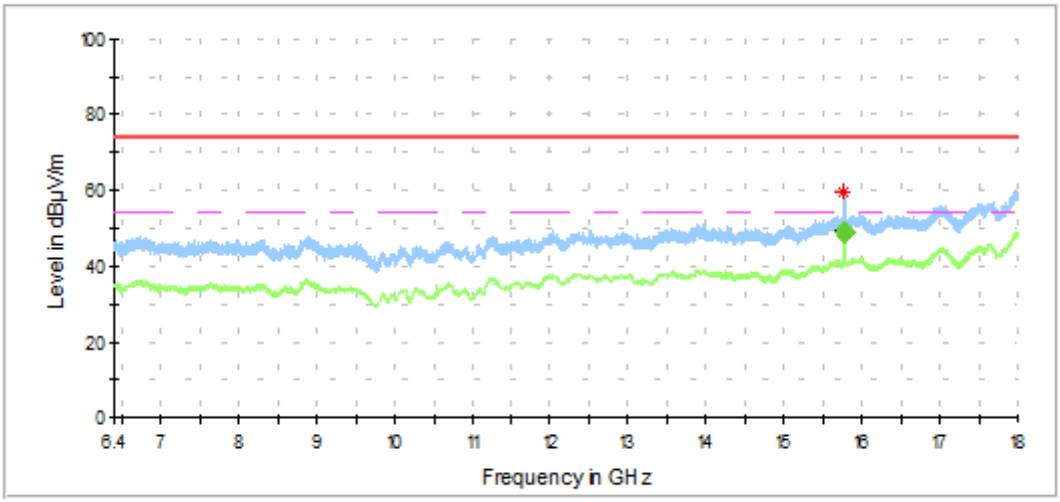
Frequency	MaxPeak	Limit	Margin
MHz	dBuV/m	dBuV/m	dB
210.0	30.1	43.6	13.5

Note 1: The spurious signals detected do not depend on either the operating channel or the modulation mode.

1 GHz – 18GHz, 802.11a, 6Mbps, Chain A

Radiated Spurious – CH52

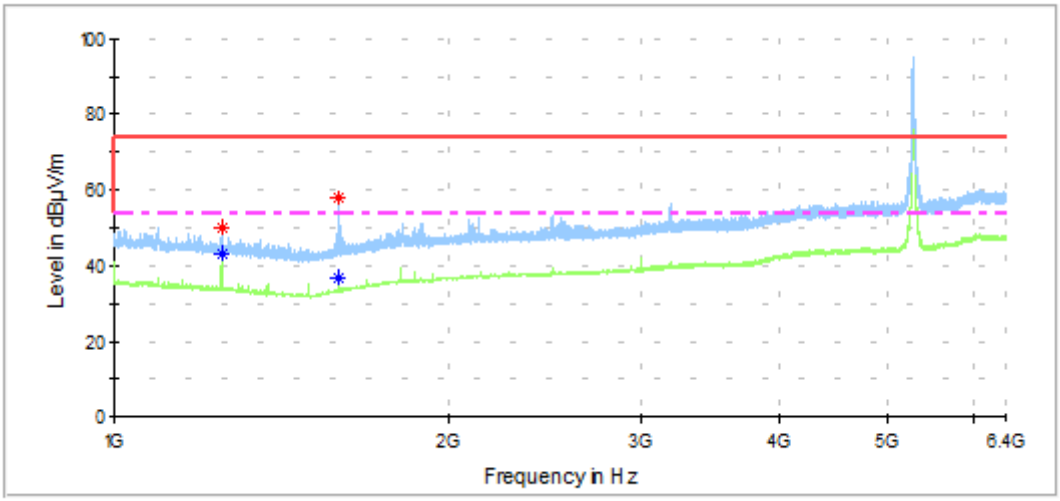


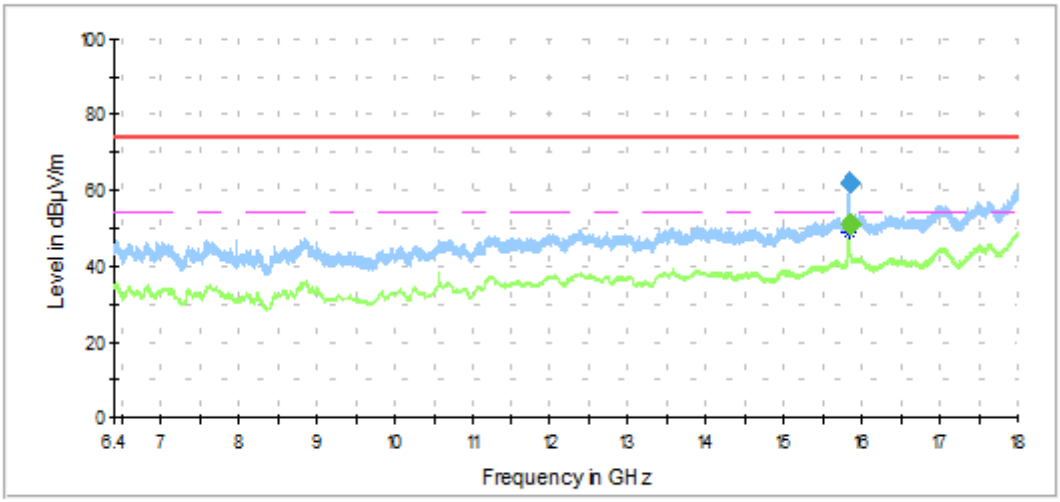


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	---	43.5	54	10.5
1249.9	49.0	---	74	25.0
1594.5	---	37.1	54	16.9
1595.7	57.3	---	74	16.7
15776.4	59.4	---	74	14.6
15777.7	---	49.3	54	4.7

Radiated Spurious – CH56

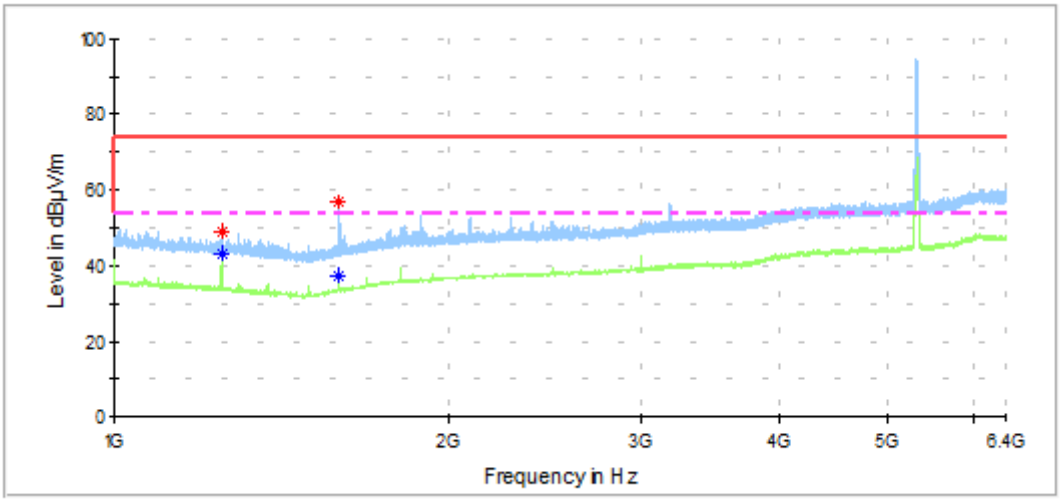


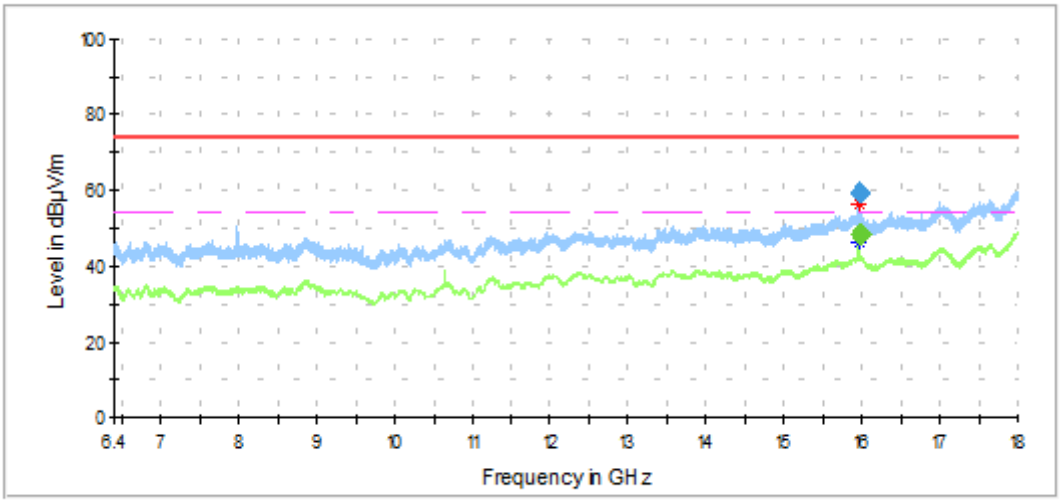


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	---	42.9	54	11.1
1250.1	49.9	---	74	24.1
1595.5	58.0	---	74	16.0
1595.7	---	36.7	54	17.3
15837.5	62.1	---	74	11.9
15840.2	---	51.0	54	3.0

Radiated Spurious – CH64



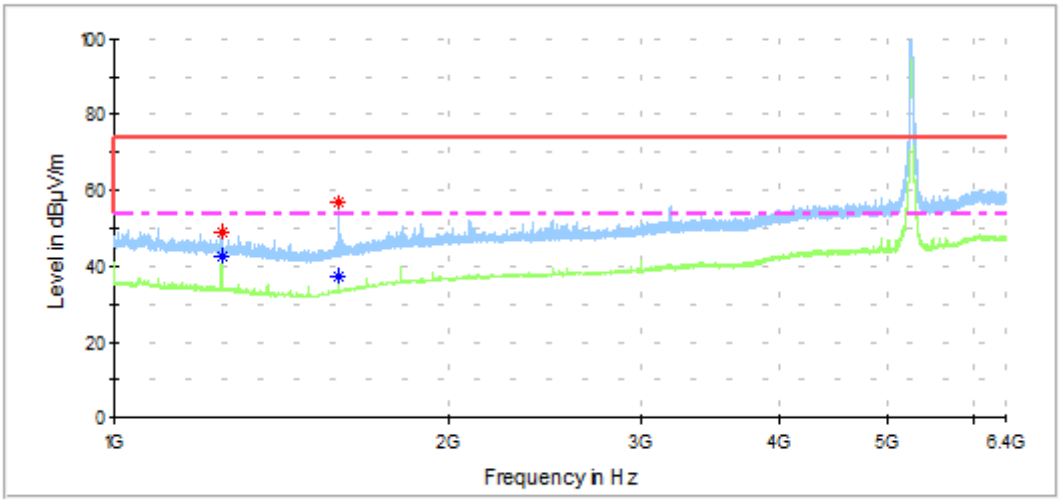


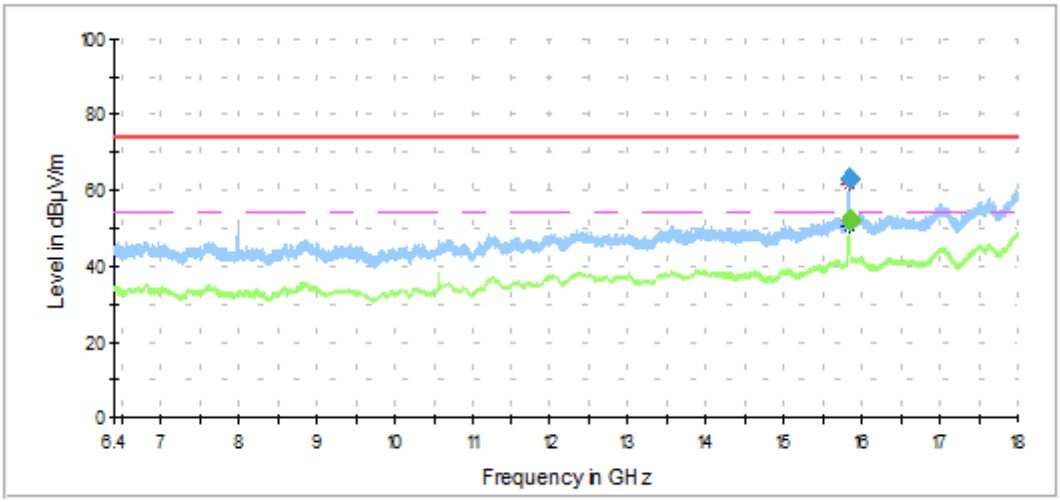
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	---	43.1	54	10.9
1249.9	48.9	---	74	25.1
1596.0	---	37.1	54	16.9
1596.0	57.1	---	74	16.9
15960.6	---	48.6	54	5.4
15960.6	59.3	---	74	14.7

1 GHz – 18GHz, 802.11a, 6Mbps, Chain B

Radiated Spurious – CH52

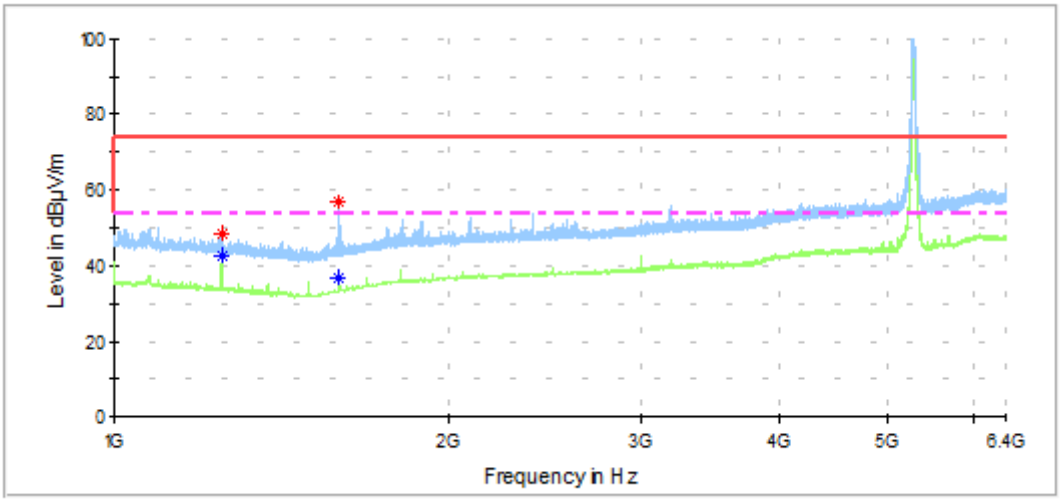


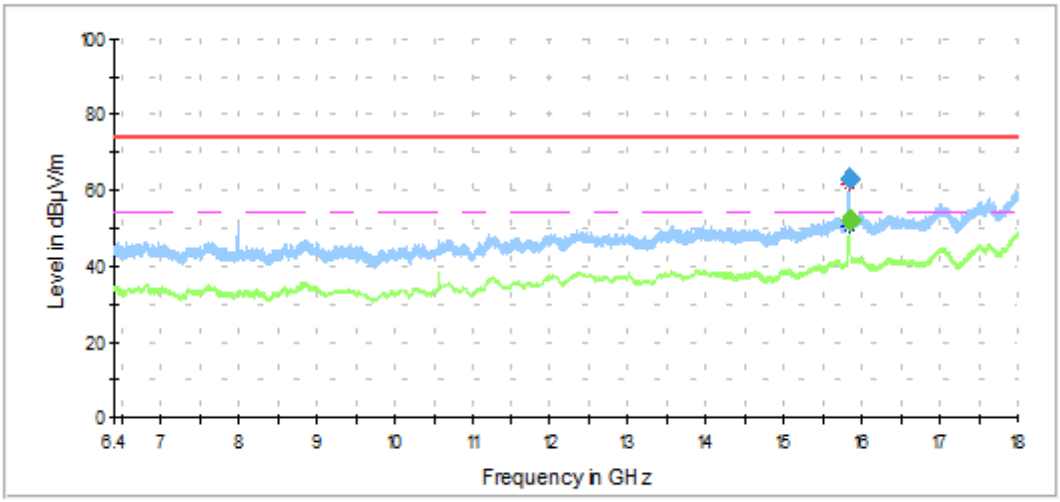


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1250.1	---	42.6	54	11.4
1250.1	48.8	---	74	25.2
1594.7	56.7	---	74	17.3
1596.2	---	37.1	54	16.9
15834.8	63.2	---	74	10.8
15840.6	---	52.0	54	**2.0**

Radiated Spurious – CH56

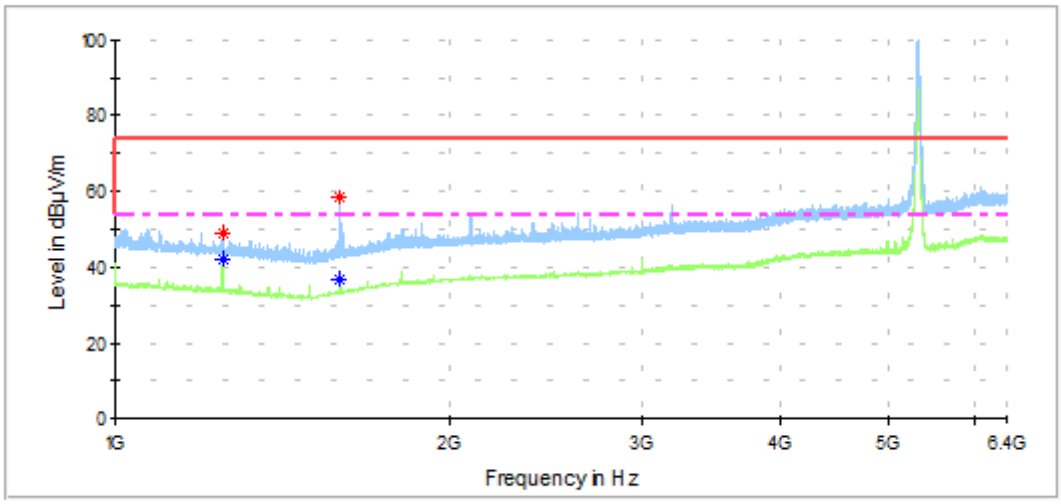


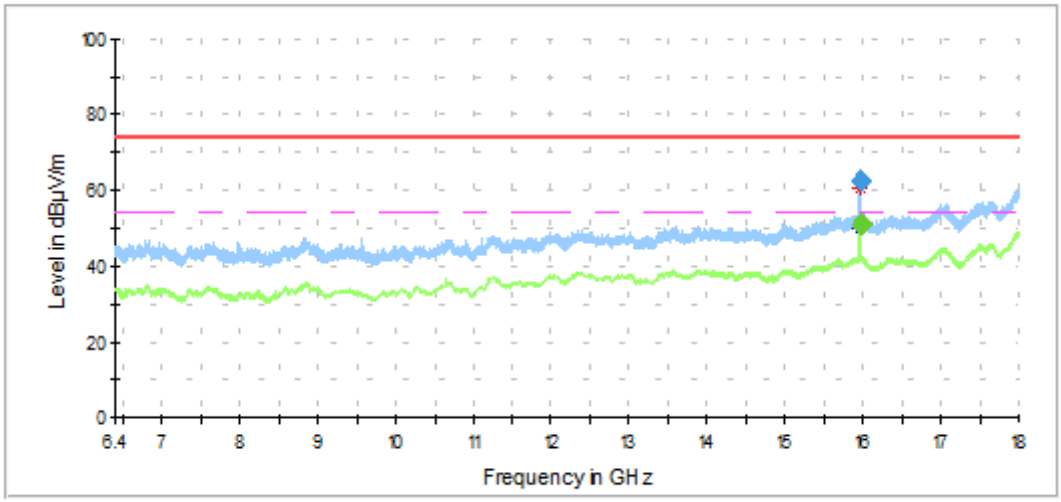


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	48.3	---	74	25.7
1250.1	---	42.7	54	11.3
1594.5	56.8	---	74	17.2
1595.7	---	36.9	54	17.1
15834.8	63.2	---	74	10.8
15840.6	---	52.0	54	**2.0**

Radiated Spurious – CH64



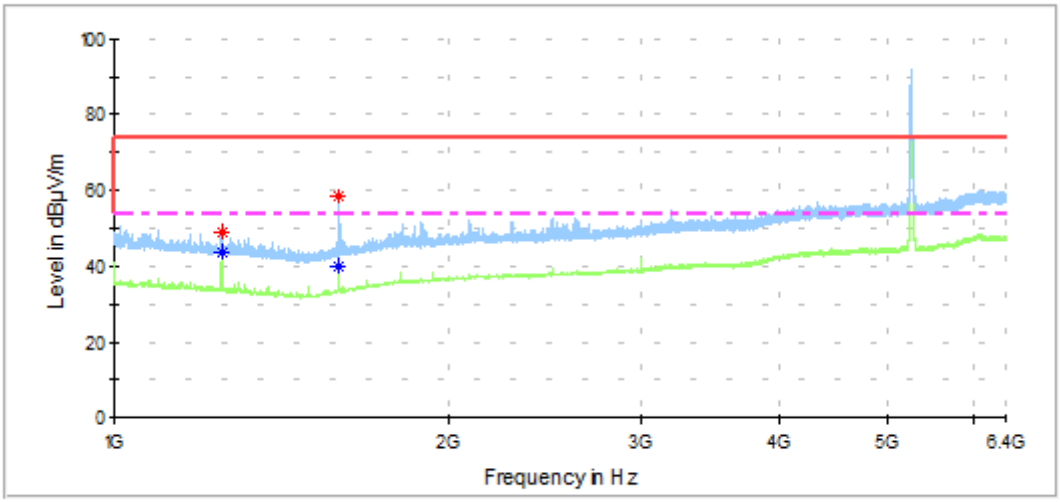


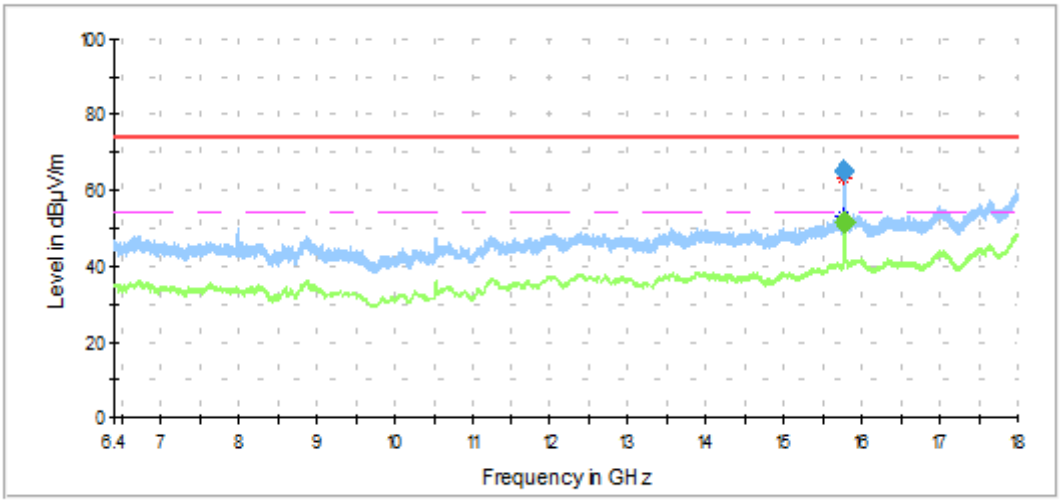
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1250.1	---	42.0	54	12.0
1250.1	49.1	---	74	24.9
1594.2	---	36.9	54	17.1
1596.2	58.2	---	74	15.8
15959.7	---	50.9	54	3.1
15963.8	62.7	---	74	11.3

1 GHz – 18GHz, 802.11n20, HT0, Chain A

Radiated Spurious – CH52

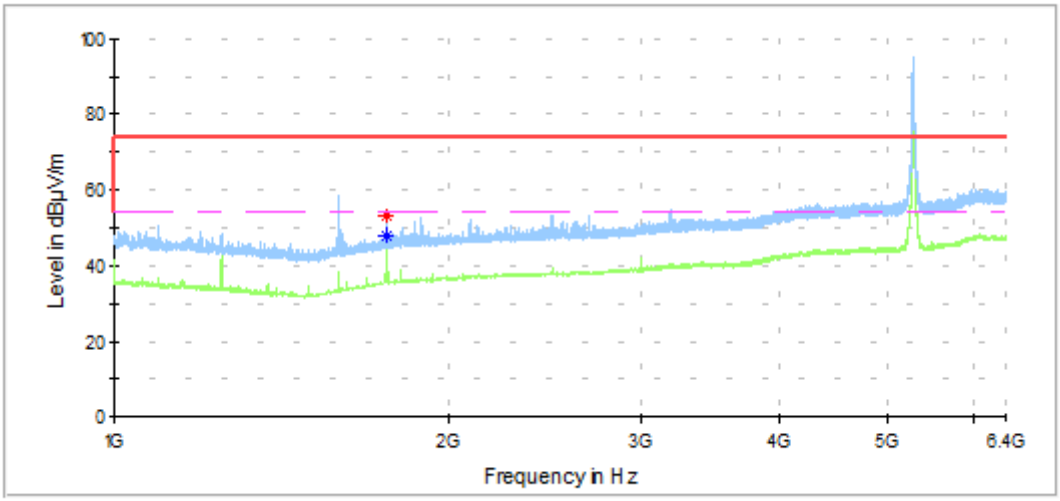


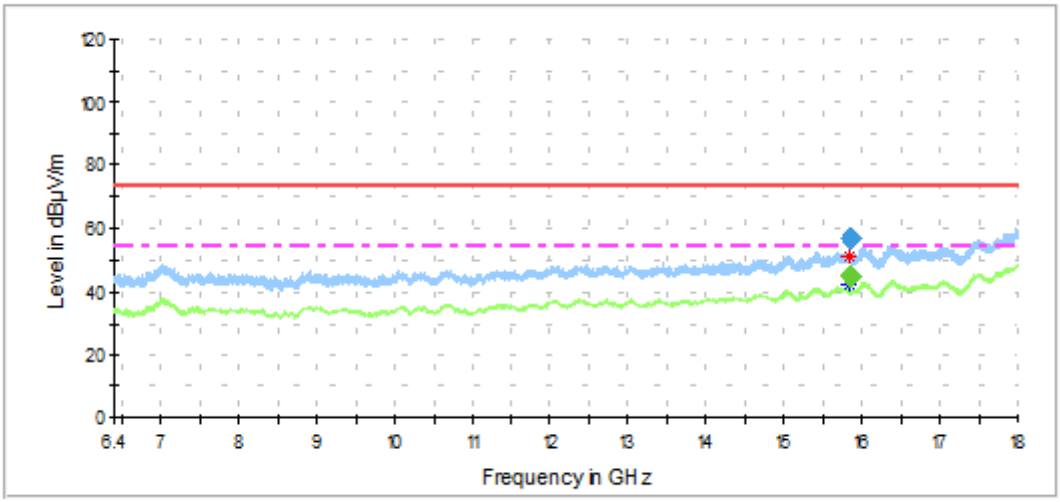


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	---	43.6	54	10.4
1250.1	49.0	---	74	25.0
1593.3	58.6	---	74	15.4
1594.7	---	39.8	54	14.2
15775.5	65.2	---	74	8.8
15779.5	---	51.6	54	**2.4**

Radiated Spurious – CH56

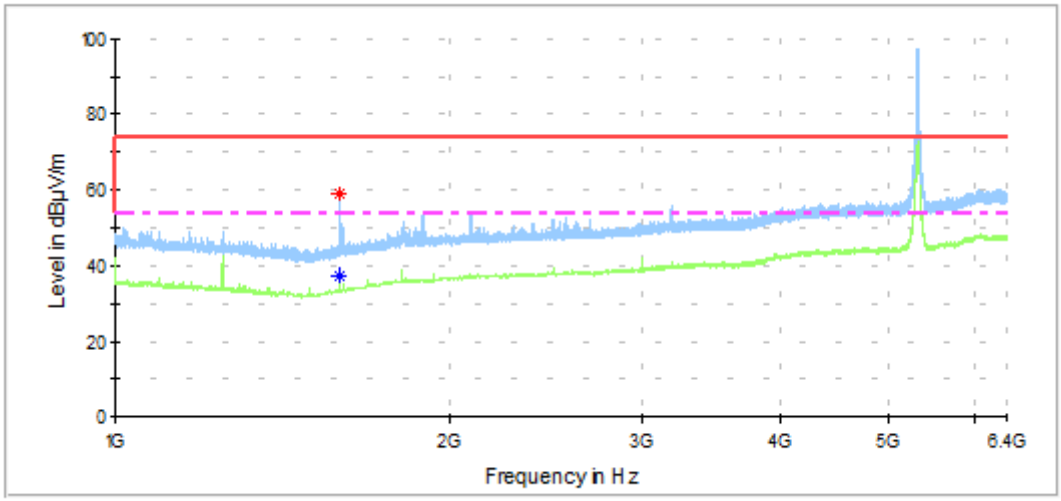


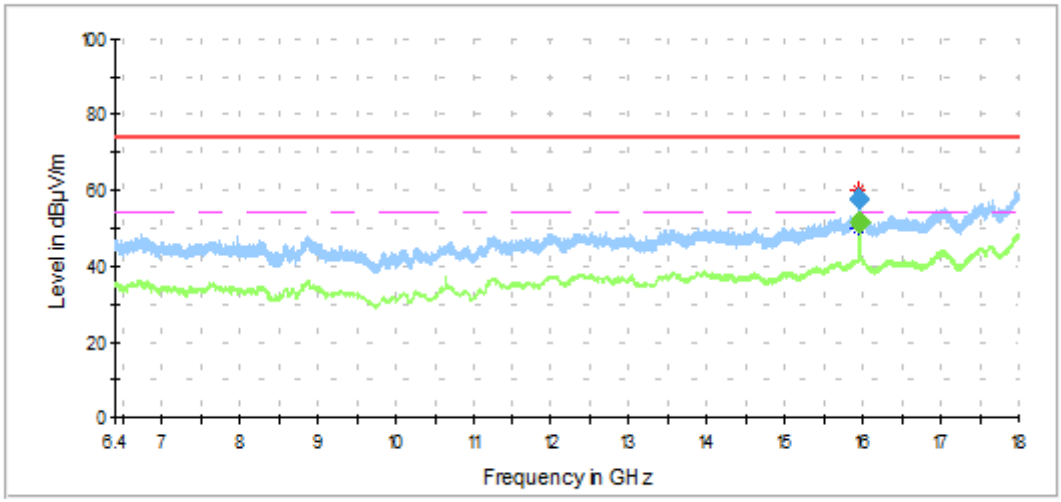


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1764.3	---	47.7	54	6.3
1764.3	53.3	---	74	20.7
15839.5	56.8	---	74	17.2
15838.5	---	44.8	54	9.2

Radiated Spurious – CH64



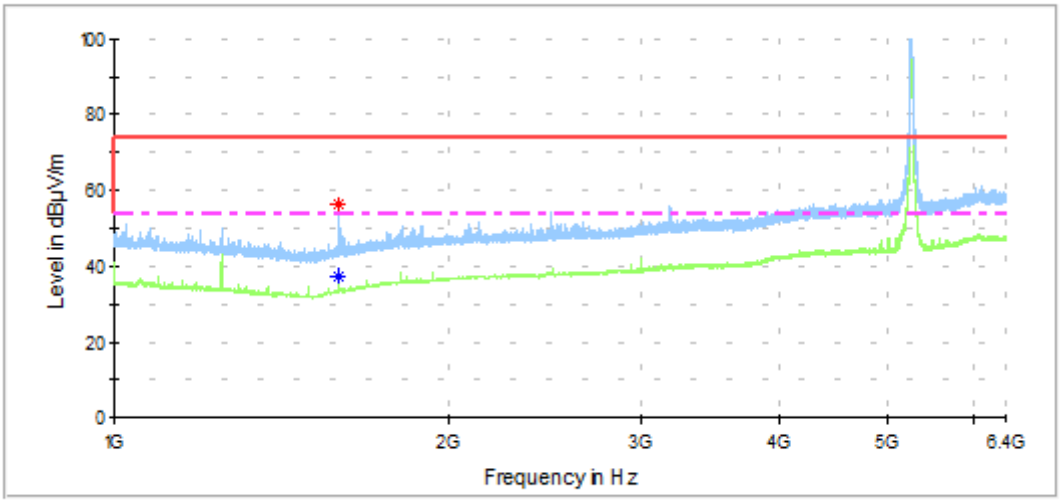


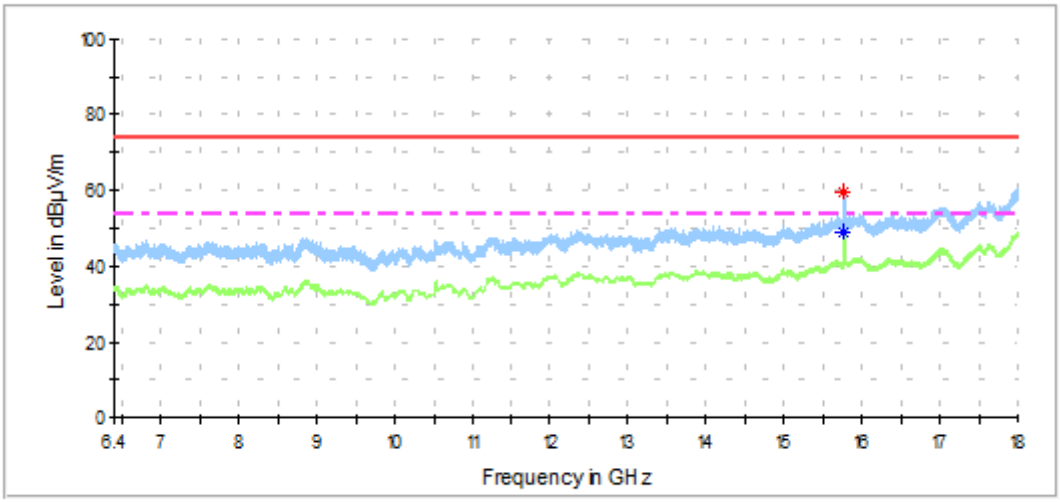
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1594.0	58.7	---	74	15.3
1596.5	---	37.6	54	16.4
15956.2	---	51.8	54	**2.2**
15959.3	58.1	---	74	**15.9**

1 GHz – 18GHz, 802.11n20, HT0, Chain B

Radiated Spurious – CH52

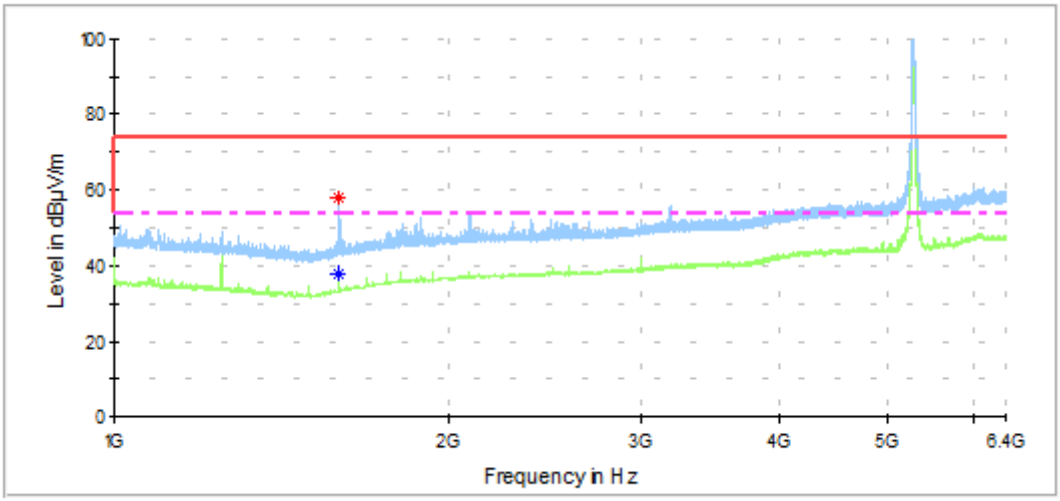


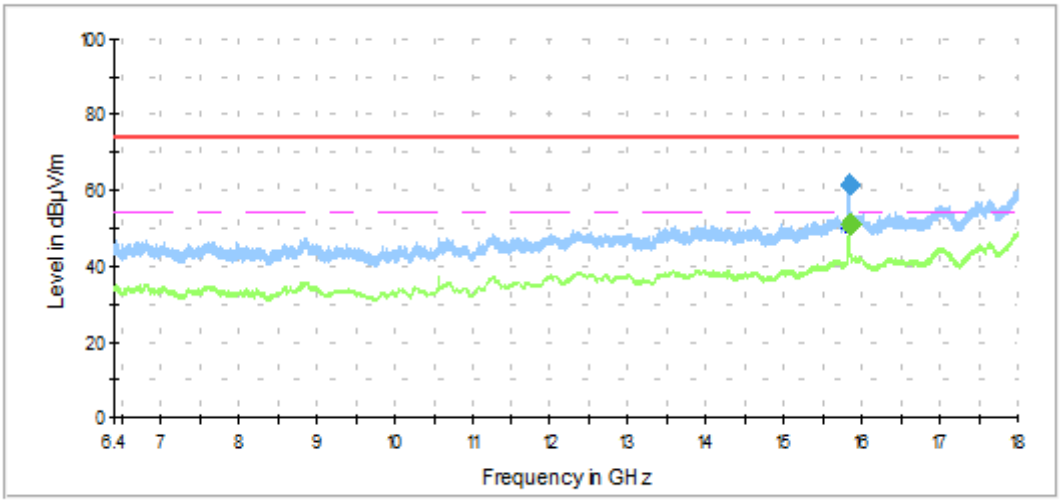


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1593.8	56.4	---	74	17.6
1596.0	---	37.5	54	16.5
15775.9	59.3	---	74	14.7
15779.5	---	48.8	54	5.2

Radiated Spurious – CH56

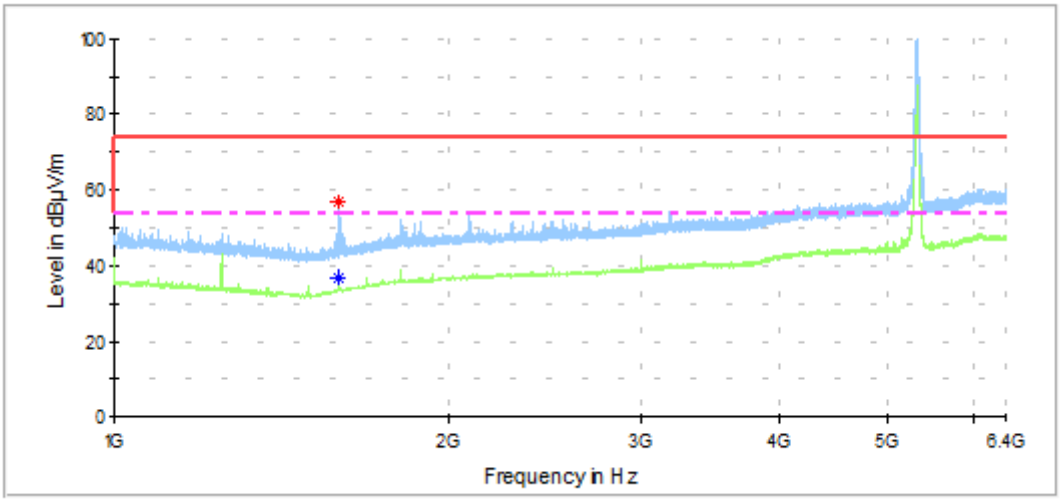


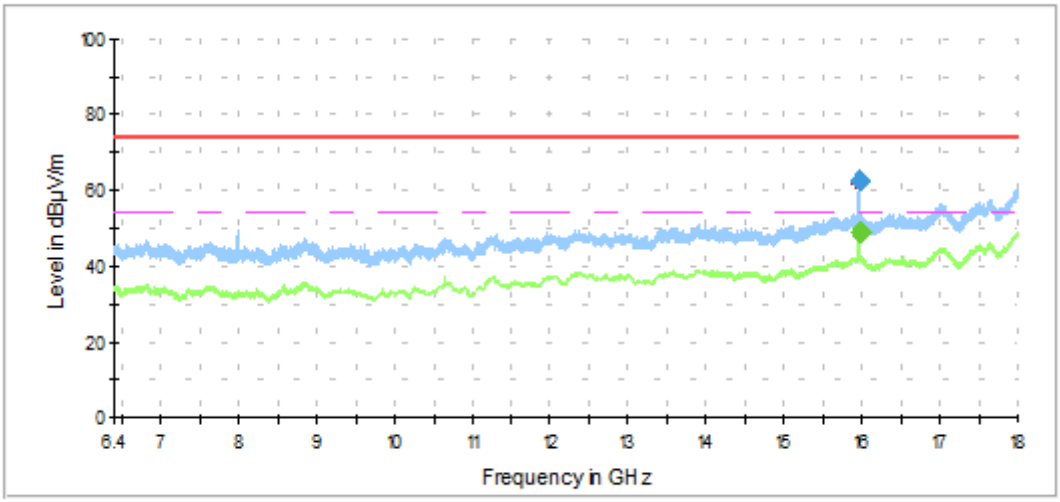


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1593.3	57.9	---	74	16.1
1595.7	---	37.7	54	16.3
15834.4	61.7	---	74	12.3
15841.5	---	51.0	54	3.0

Radiated Spurious – CH64



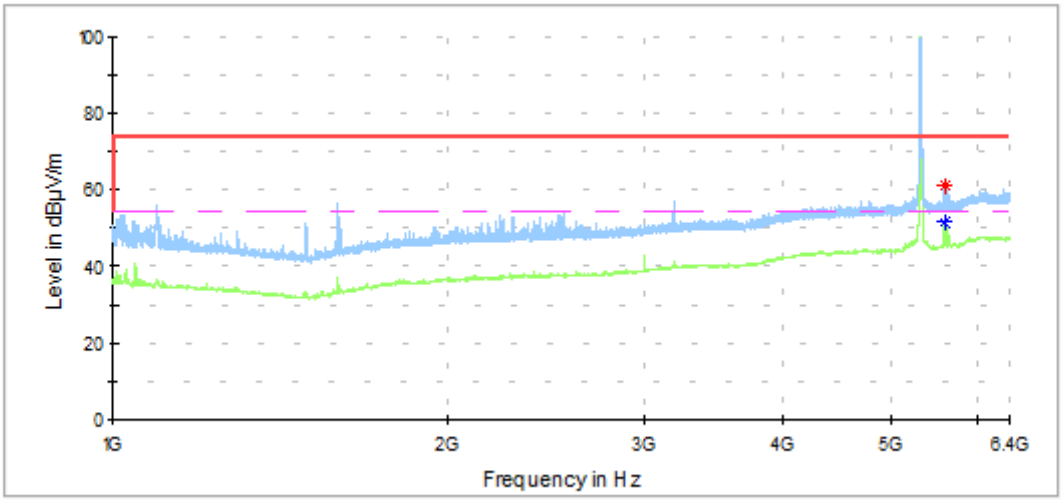


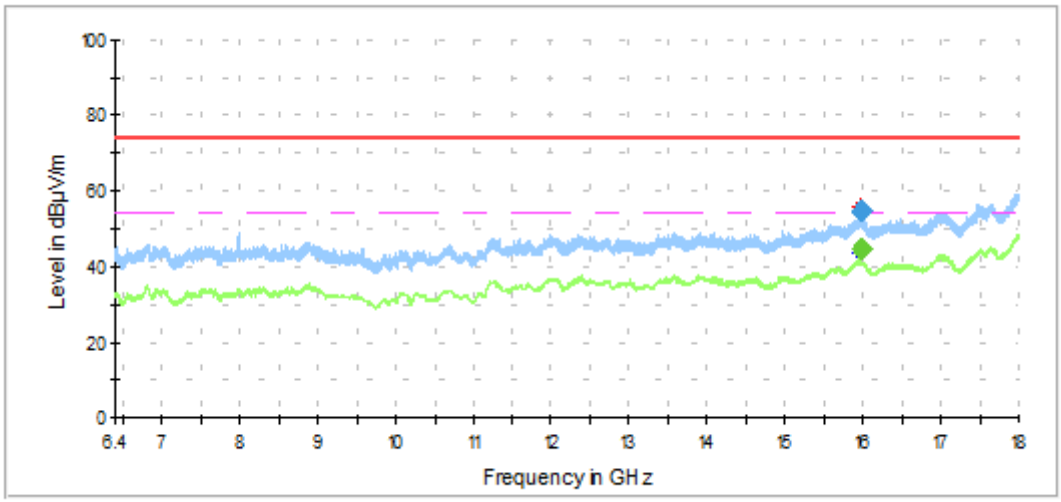
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1596.0	---	36.6	54	17.4
1596.0	57.0	---	74	17.0
15962.9	62.4	---	74	11.6
15963.8	---	48.9	54	5.1

1 GHz – 18GHz, 802.11n20, HT8, Chain A+B

Radiated Spurious – CH64



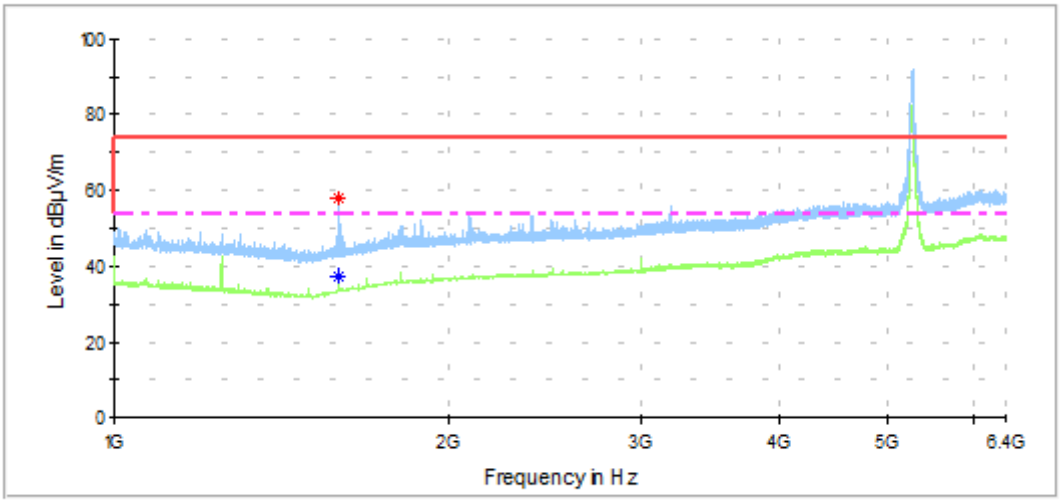


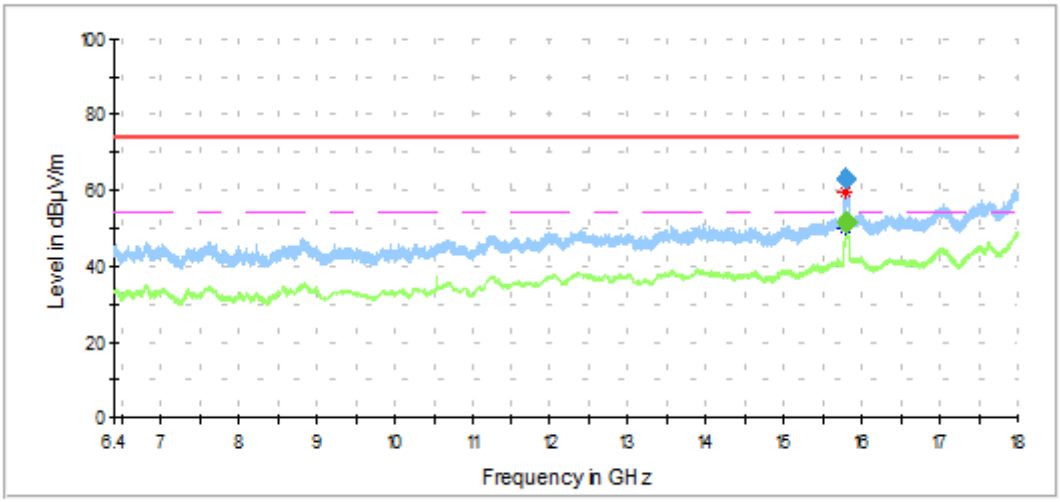
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
5591.7	---	51.5	54.1	**2.5**
5592.5	61.0	---	74.1	13.1
15962.9	---	45.0	54.1	9.1
15970.4	54.9	---	74.1	19.2

1 GHz – 18GHz, 802.11n40, HT0, Chain A

Radiated Spurious – CH54F

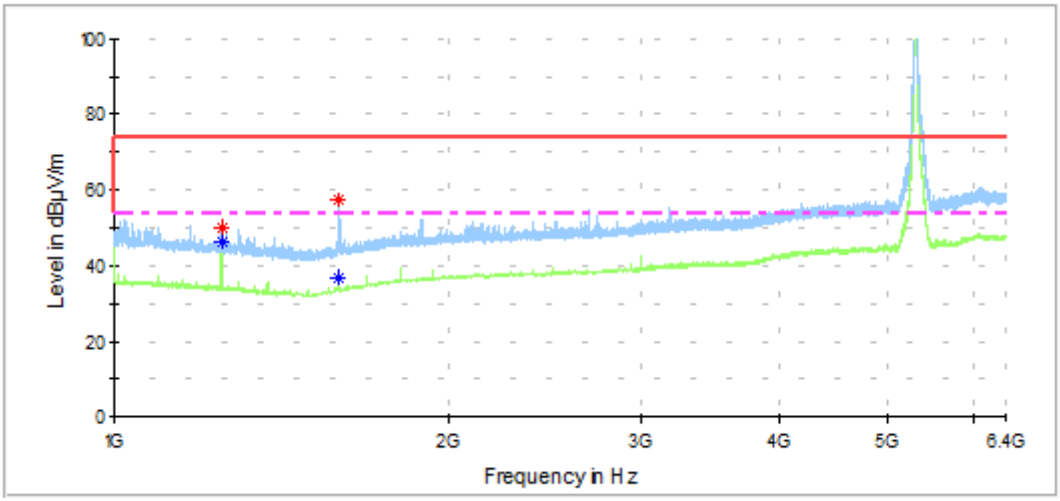


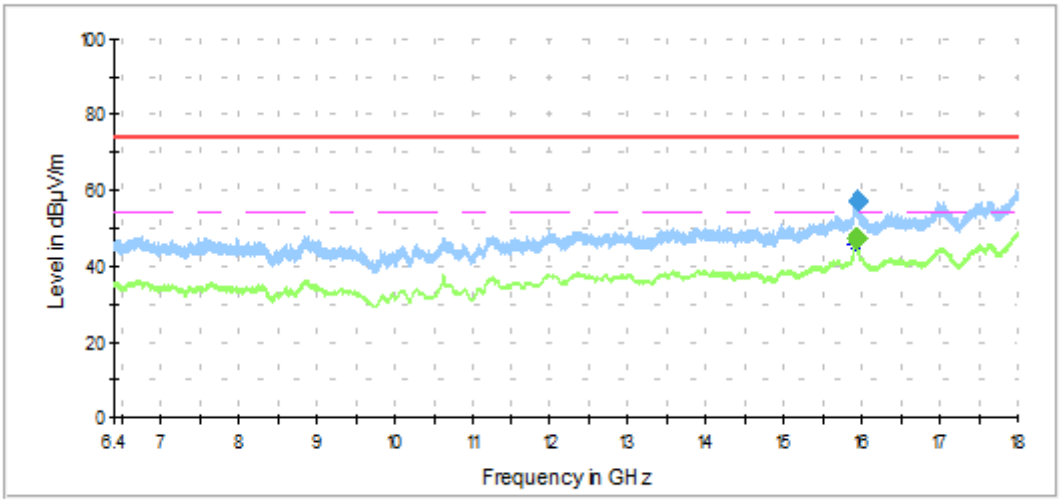


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1593.3	57.7	---	74	16.3
1596.0	---	37.6	54	16.4
15804.5	---	51.6	54	**2.4**
15805.4	62.9	---	74	**11.1**

Radiated Spurious – CH62F



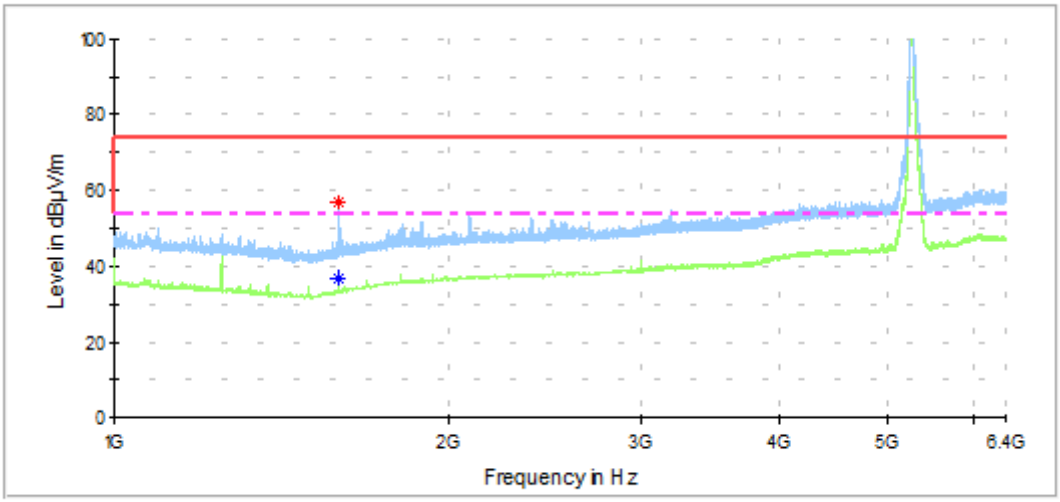


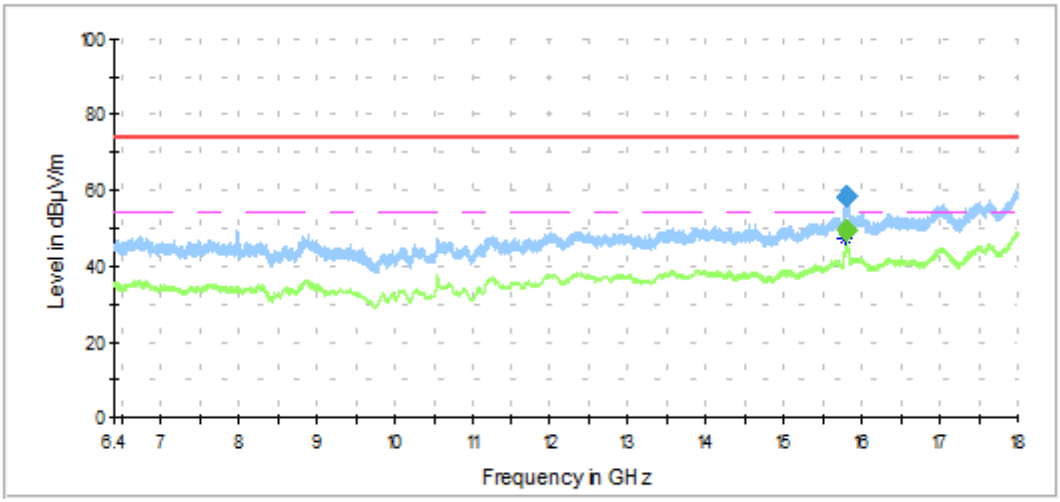
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1250.1	---	46.2	54	7.8
1250.1	49.8	---	74	24.2
1595.0	---	36.6	54	17.4
1595.2	57.2	---	74	16.8
15929.4	---	47.4	54	6.6
15937.4	57.4	---	74	16.6

1 GHz – 18GHz, 802.11n40, HT0, Chain B

Radiated Spurious – CH54F

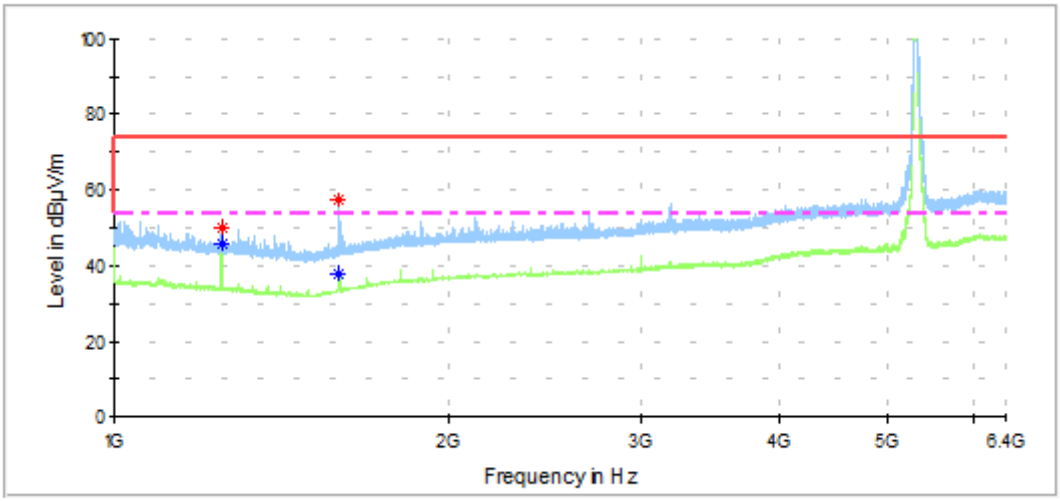


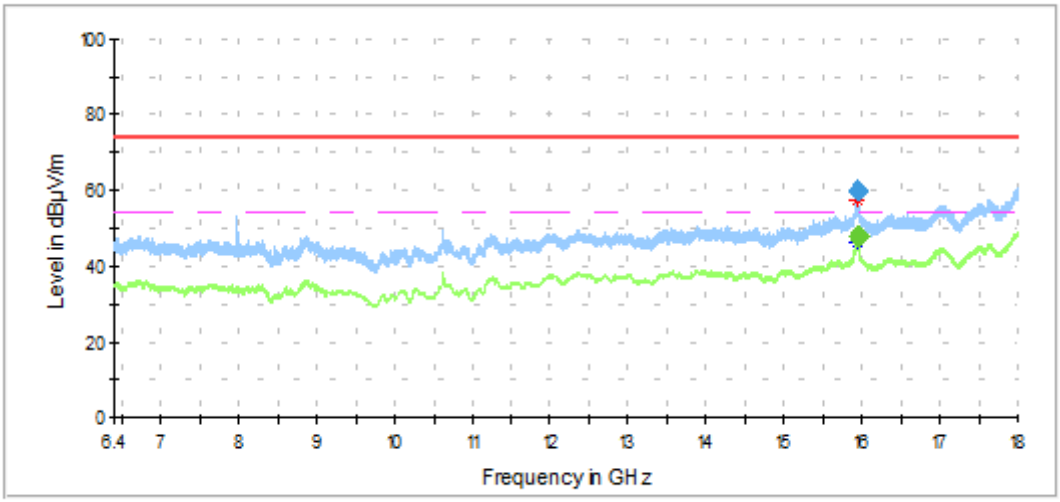


Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1593.0	---	37.1	54	16.9
1596.0	56.6	---	74	17.4
15804.9	58.3	---	74	15.7
15805.4	---	49.6	54	4.4

Radiated Spurious – CH62F



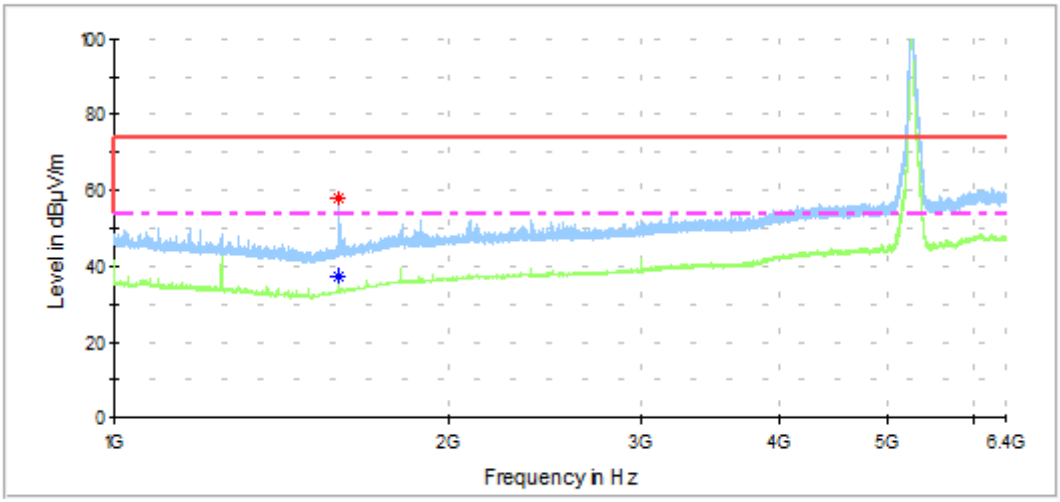


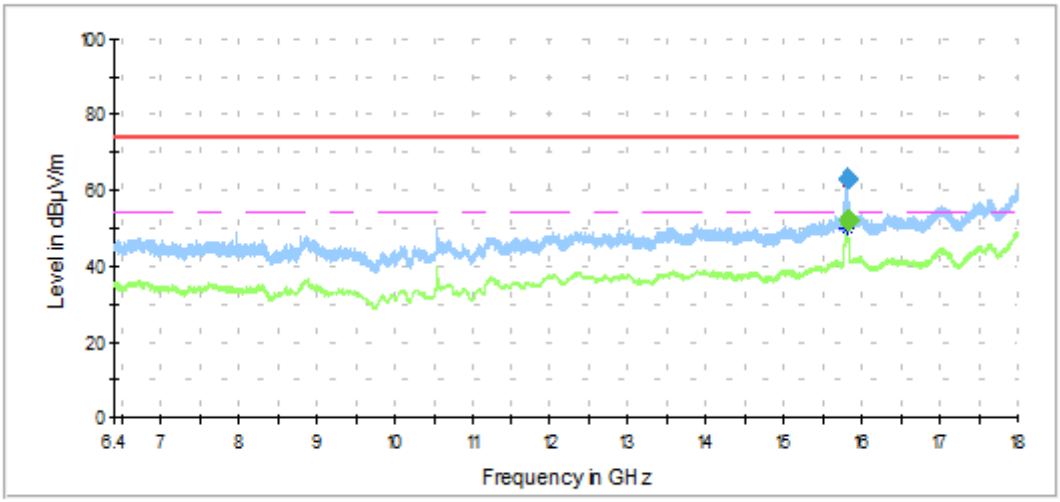
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	50.3	---	74	23.7
1250.1	---	45.6	54	8.4
1593.3	---	38.0	54	16.0
1594.2	57.5	---	74	16.5
15938.3	---	47.8	54	6.2
15945.9	59.9	---	74	14.1

1 GHz – 18GHz, 802.11n40, HT8, Chain A+B

Radiated Spurious – CH54F



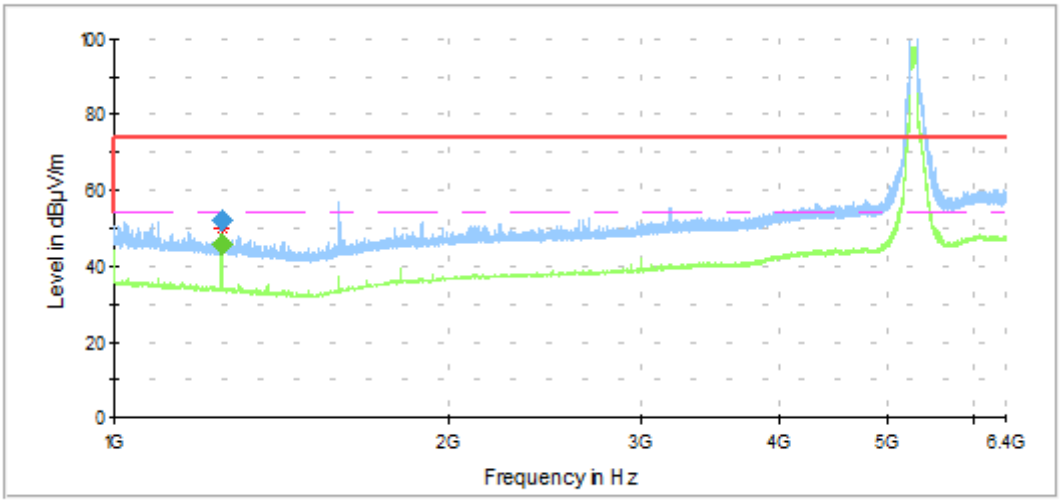


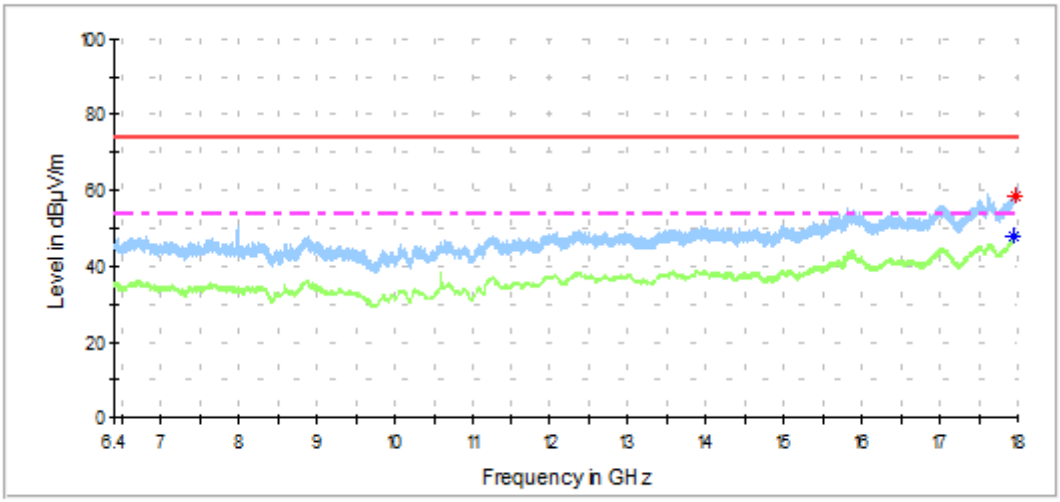
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1593.5	58.1	---	74	15.9
1596.0	---	37.4	54	16.6
15806.7	---	52.2	54	**1.8**
15808.0	62.9	---	74	**11.1**

1 GHz – 18GHz, 802.11ac80, HT0, Chain A

Radiated Spurious – CH58ac80



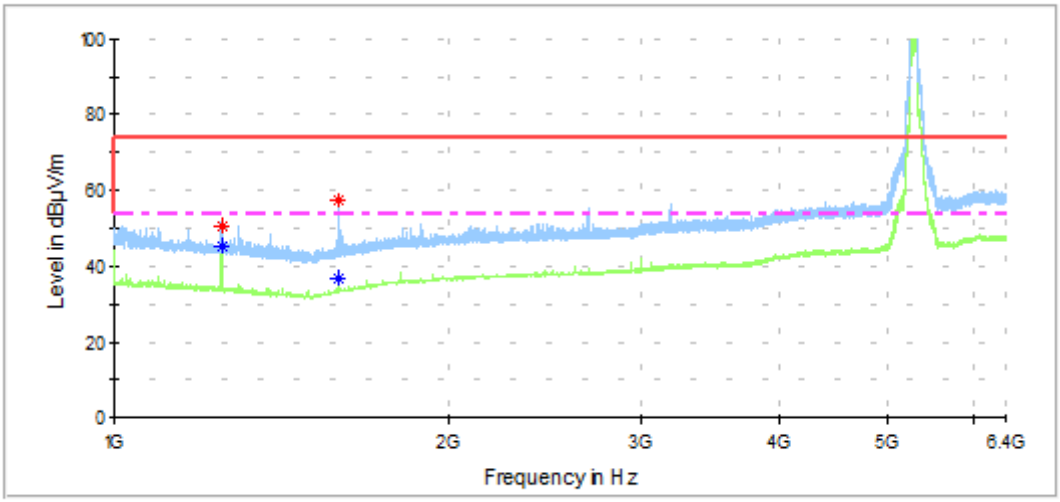


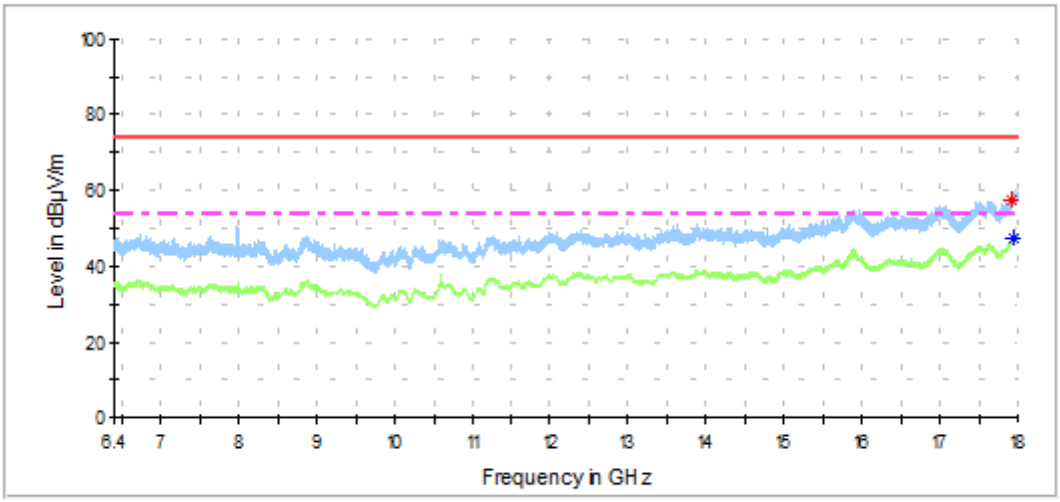
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	---	46.0	54	8.0
1250.1	52.0	---	74	22.0
17953.6	---	47.7	54	6.3
17967.0	58.6	---	74	15.4

1 GHz – 18GHz, 802.11ac80, HT0, Chain B

Radiated Spurious – CH58ac80



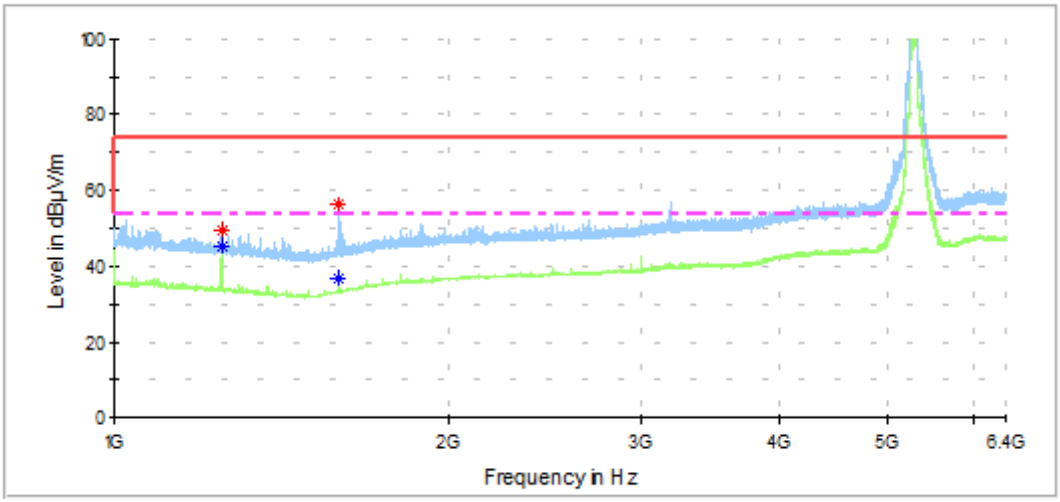


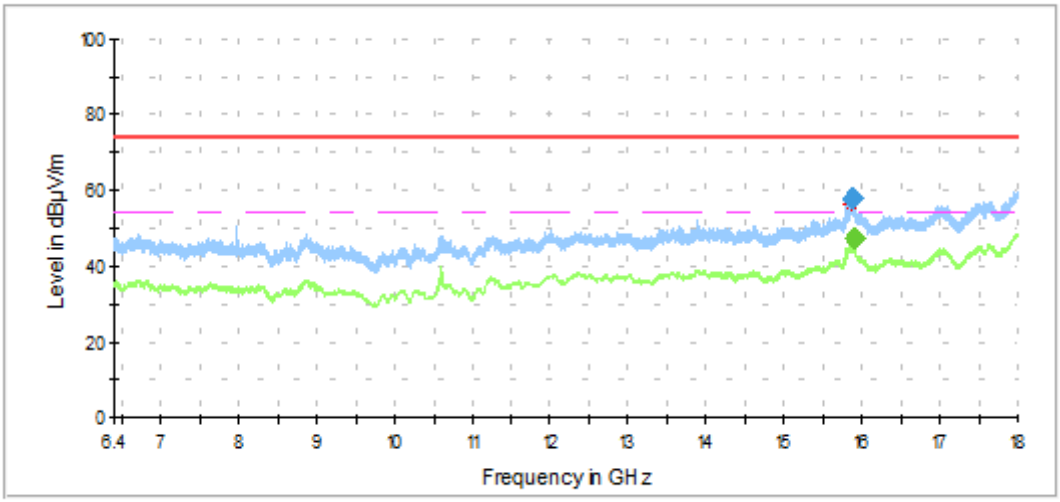
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	---	45.3	54	8.2
1249.9	50.4	---	74	23.6
1595.7	---	37.0	54	17.0
1595.7	57.2	---	74	16.8
17931.7	57.4	---	74	16.6
17944.2	---	47.4	54	6.6

1 GHz – 18GHz, 802.11ac80, HT8, Chain A+B

Radiated Spurious – CH58ac80



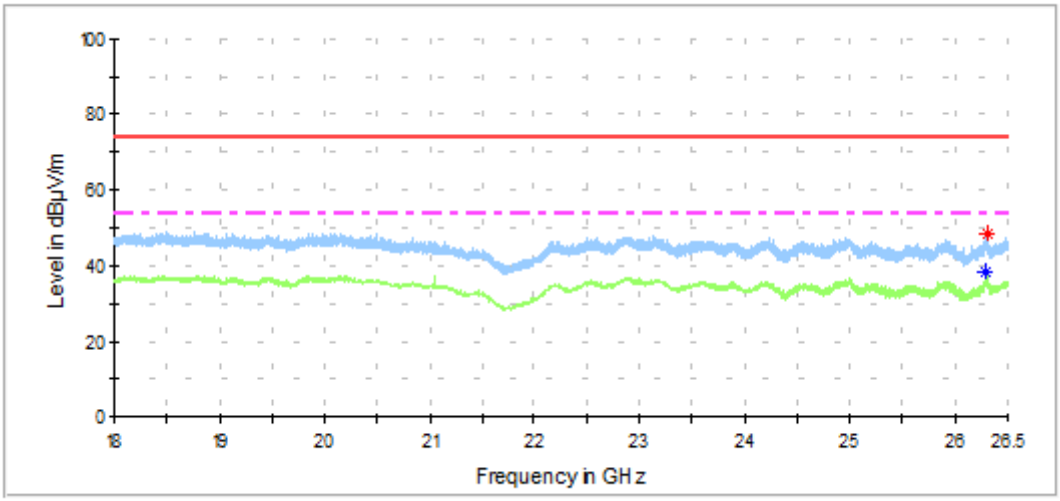


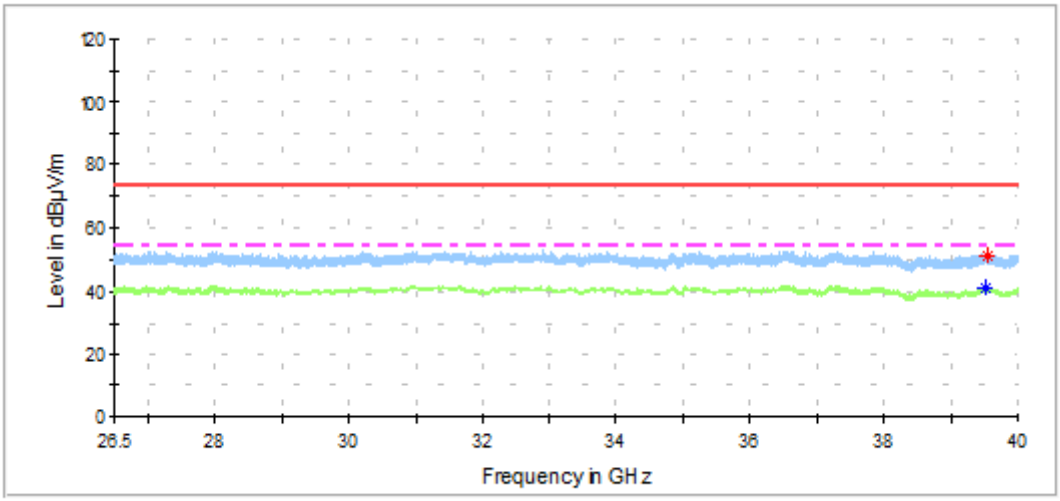
Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
1249.9	49.4	---	74	24.6
1250.1	---	45.0	54	9.0
1592.8	---	36.9	54	17.1
1593.5	56.4	---	74	17.6
15864.7	57.8	---	74	16.2
15902.6	---	47.2	54	6.8

18GHz – 40GHz

Radiated Spurious – All modes





Peak measurements Avg measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
26297.9	---	38.6	54	15.4
26304.0	48.7	---	74	25.3
39526.1	---	41.0	54	13.0
39551.1	51.1	---	74	22.9

Note 1: The spurious signals detected do not depend on either the operating channel or the modulation mode.