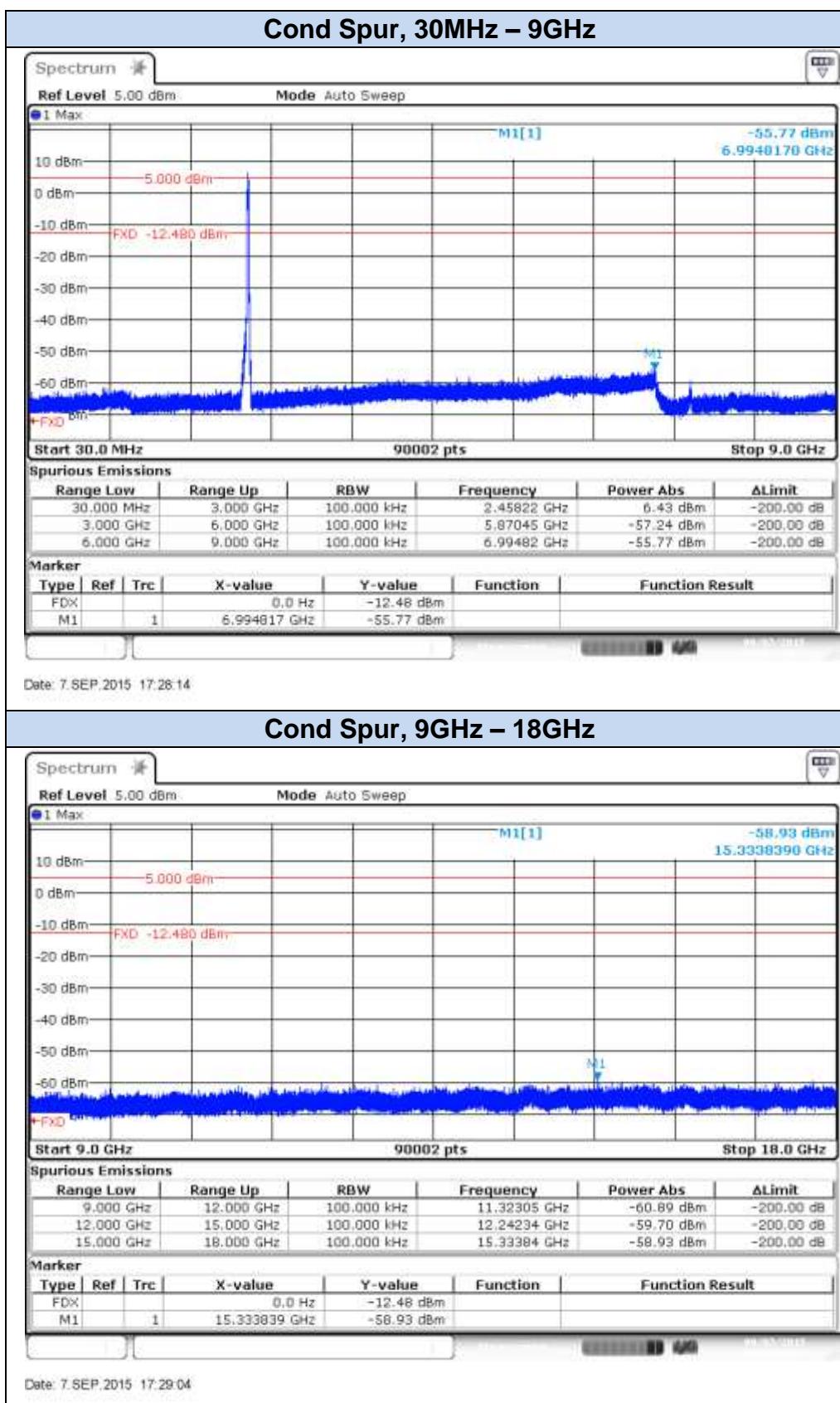
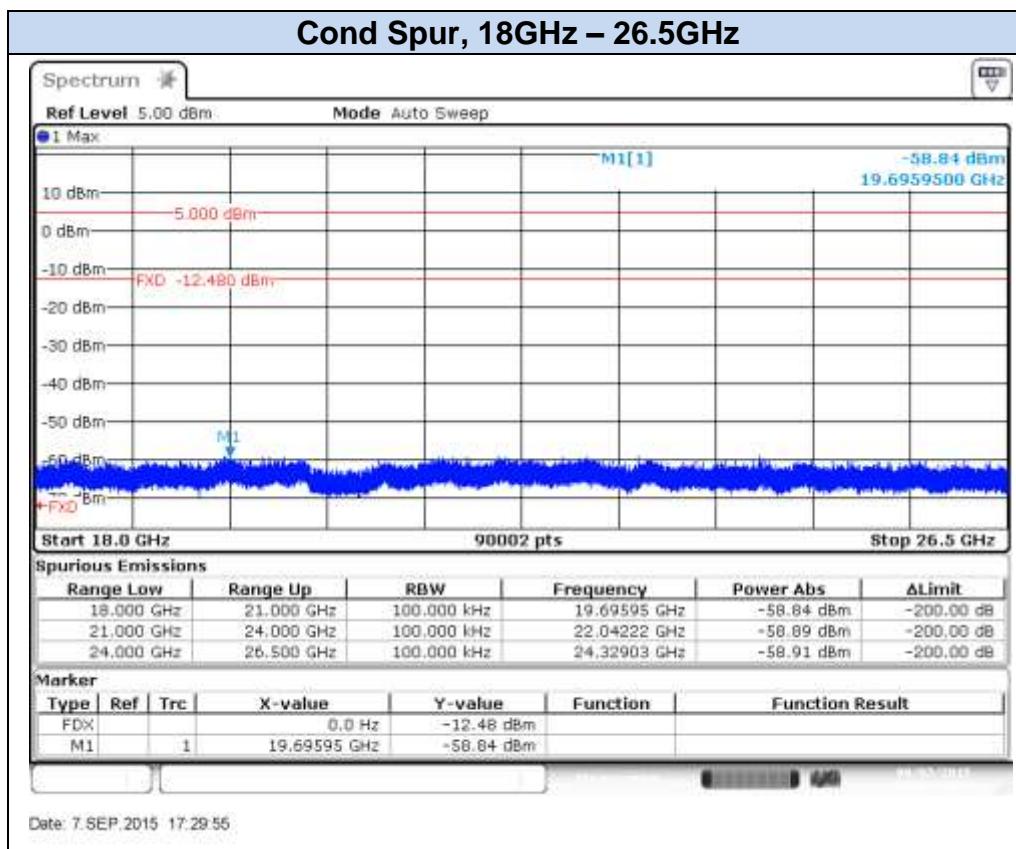
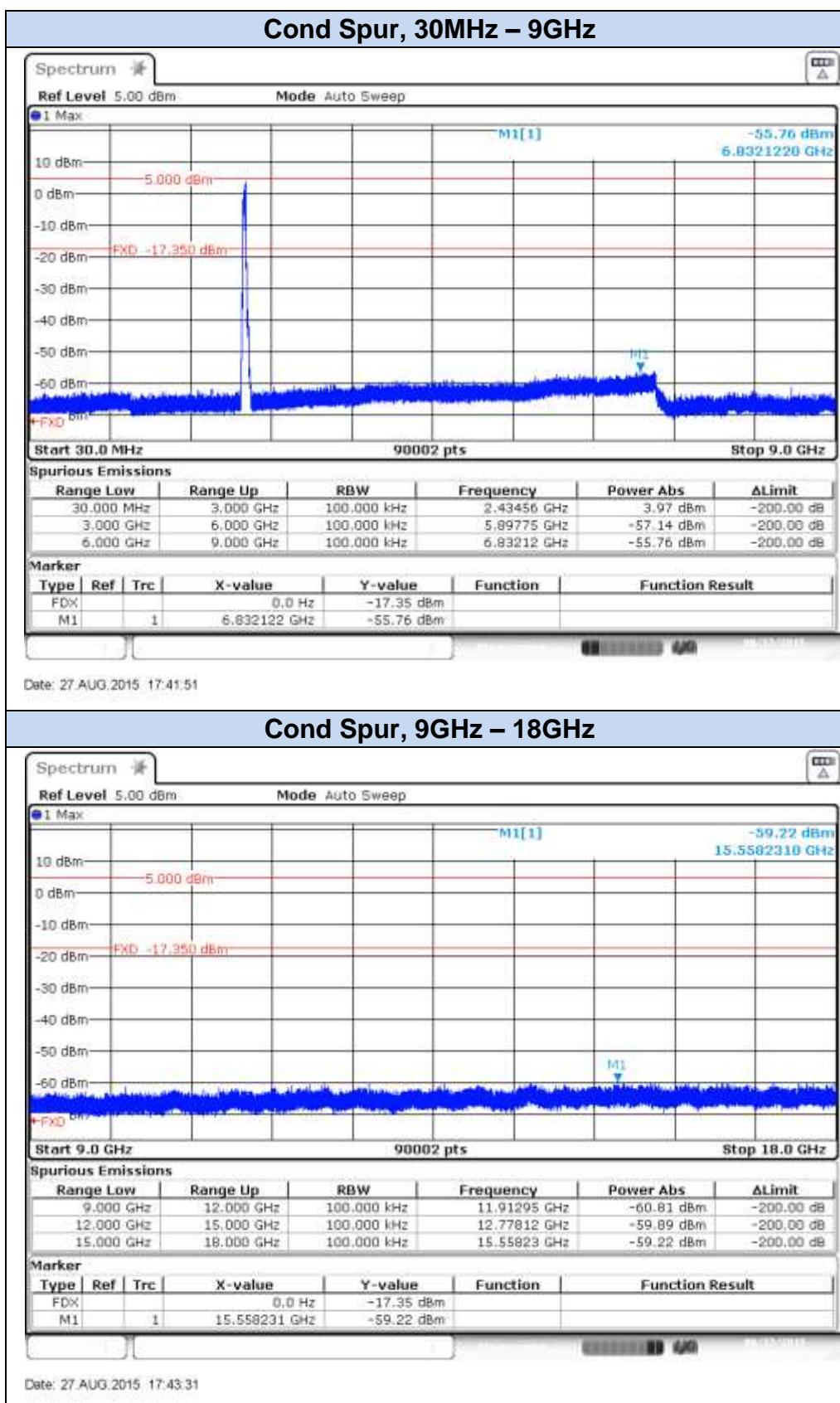


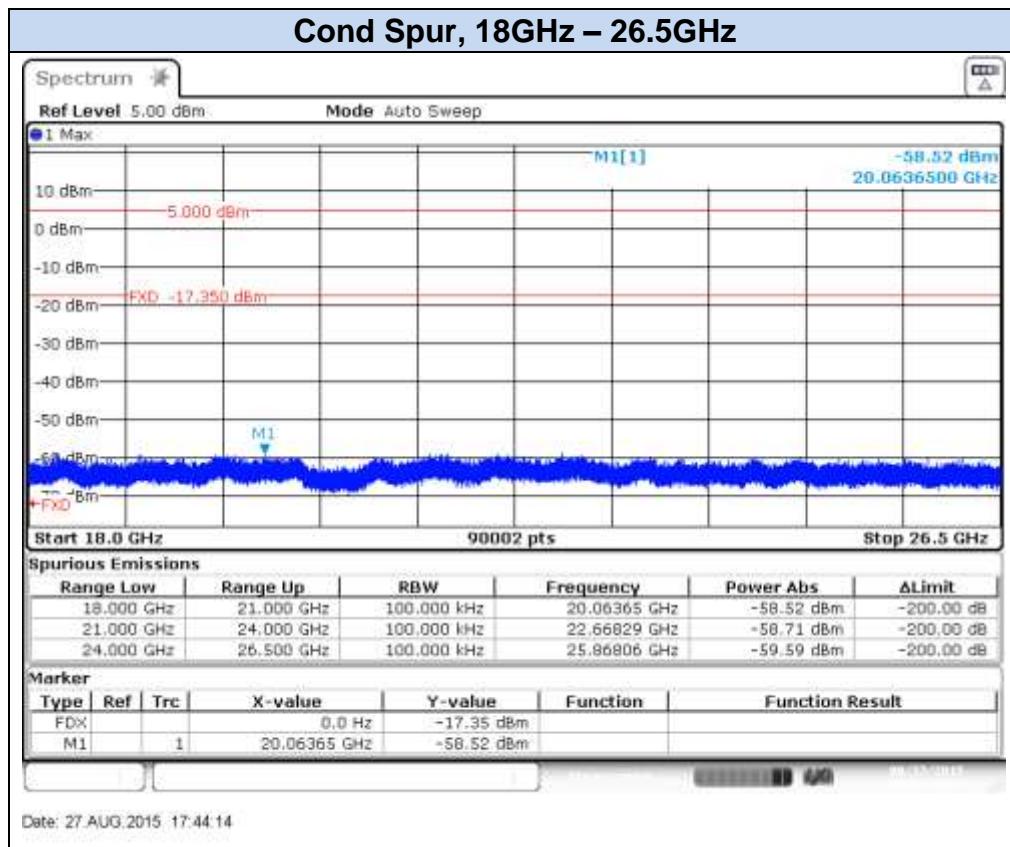
802.11n20, HT8 (MIMO) – Chain B, CH11



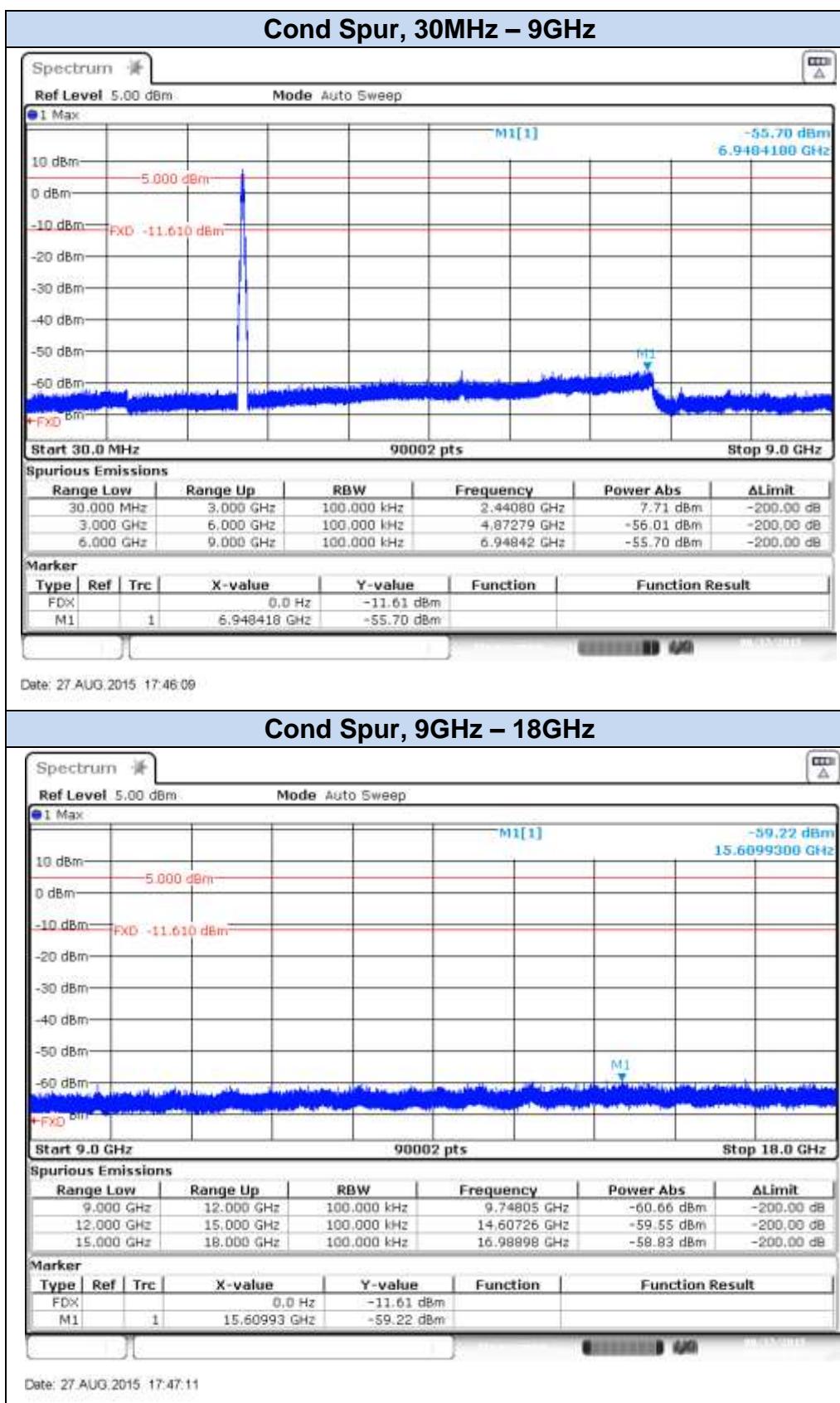


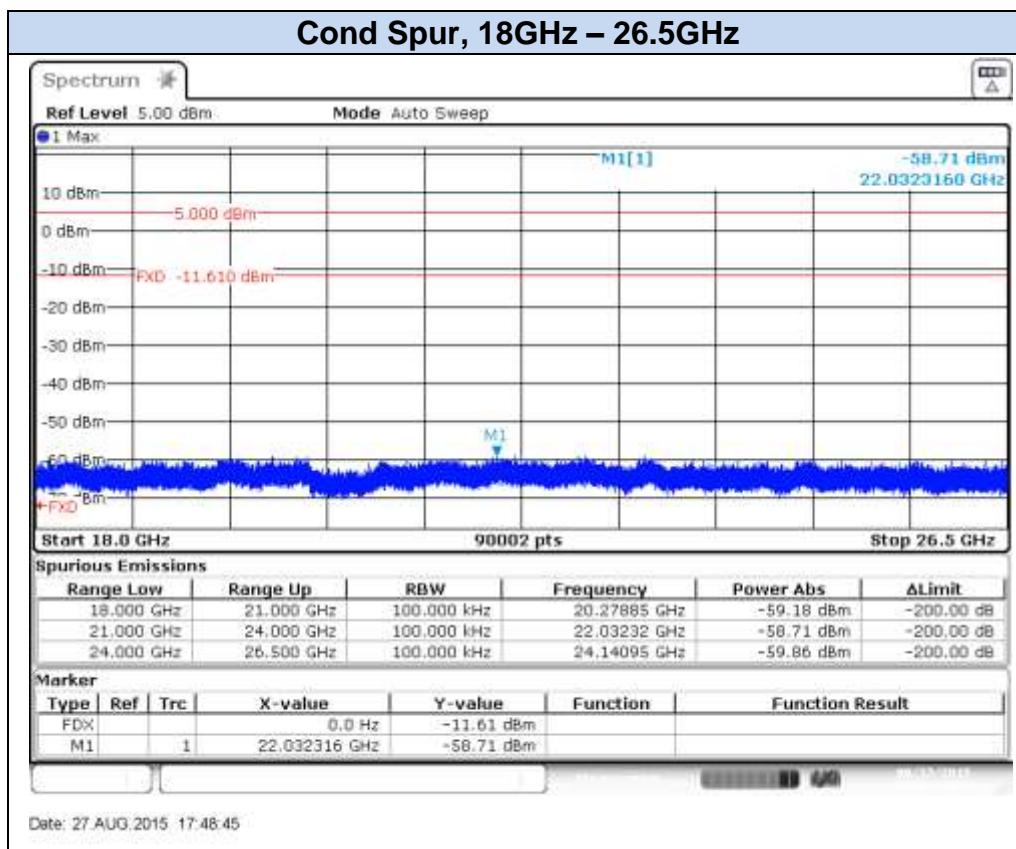
802.11n40, HT0 (SISO) – Chain A, CH3F



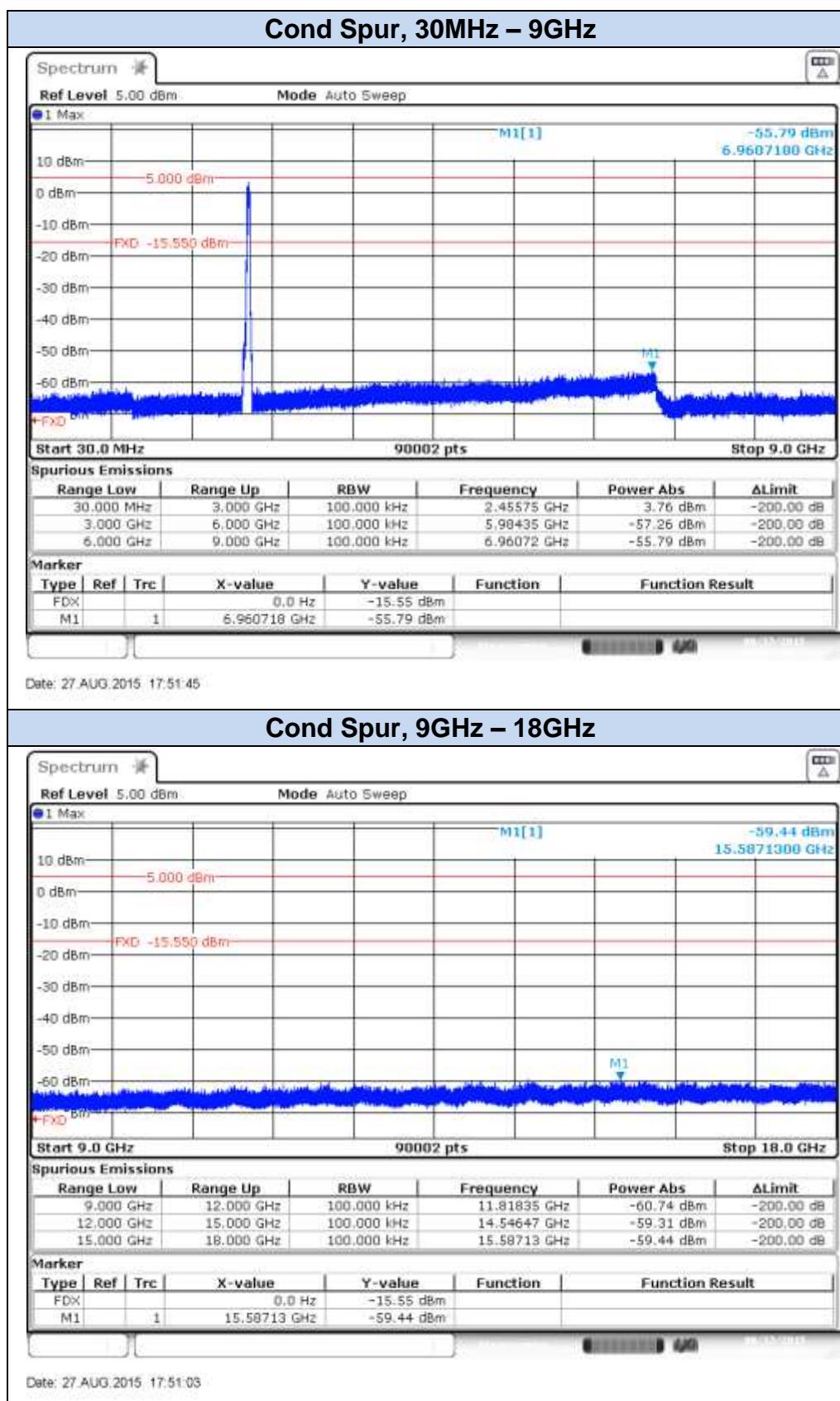


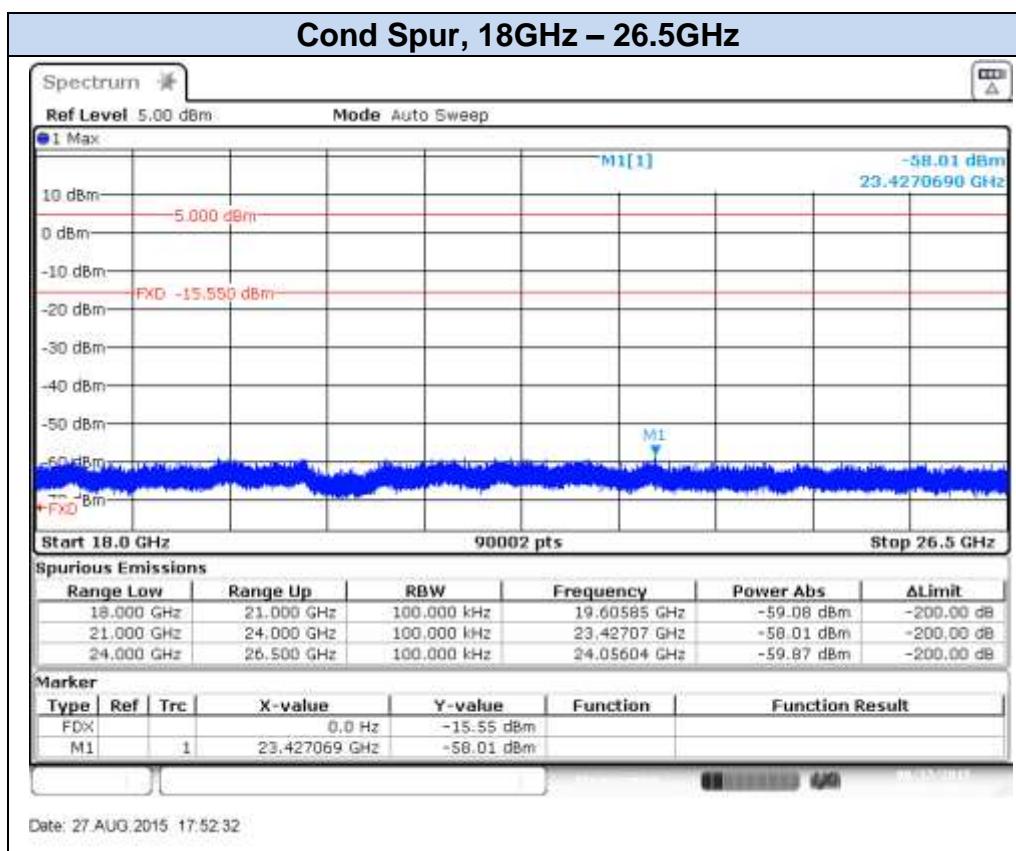
802.11n40, HT0 (SISO) – Chain A, CH6F



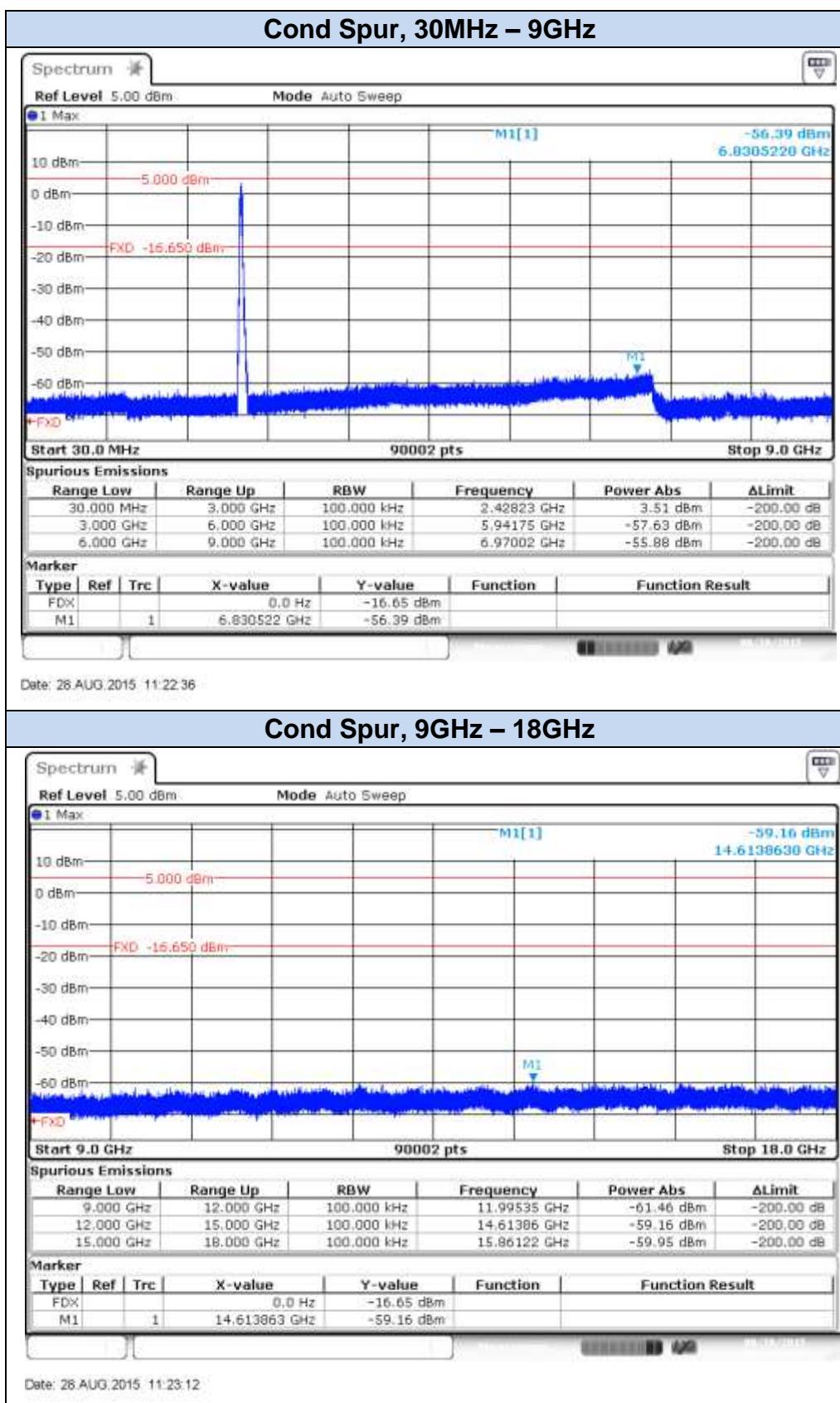


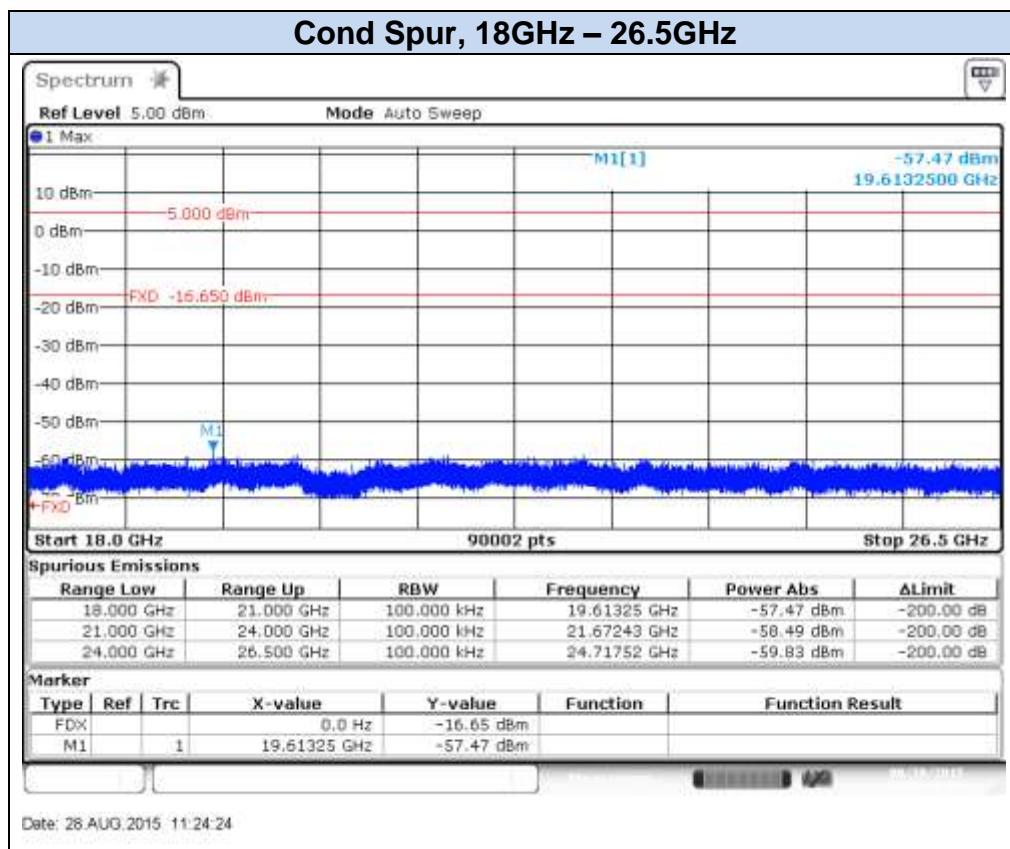
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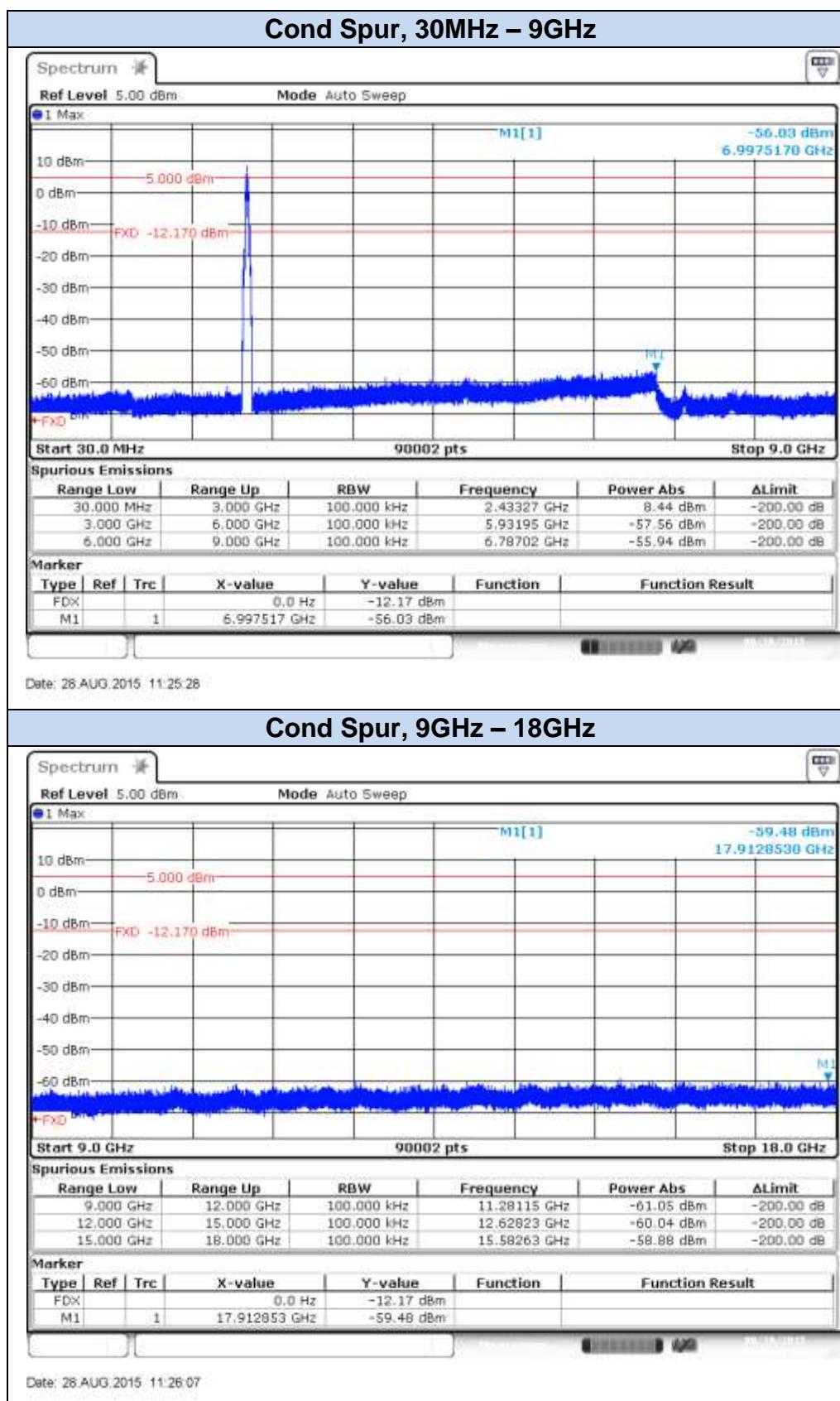


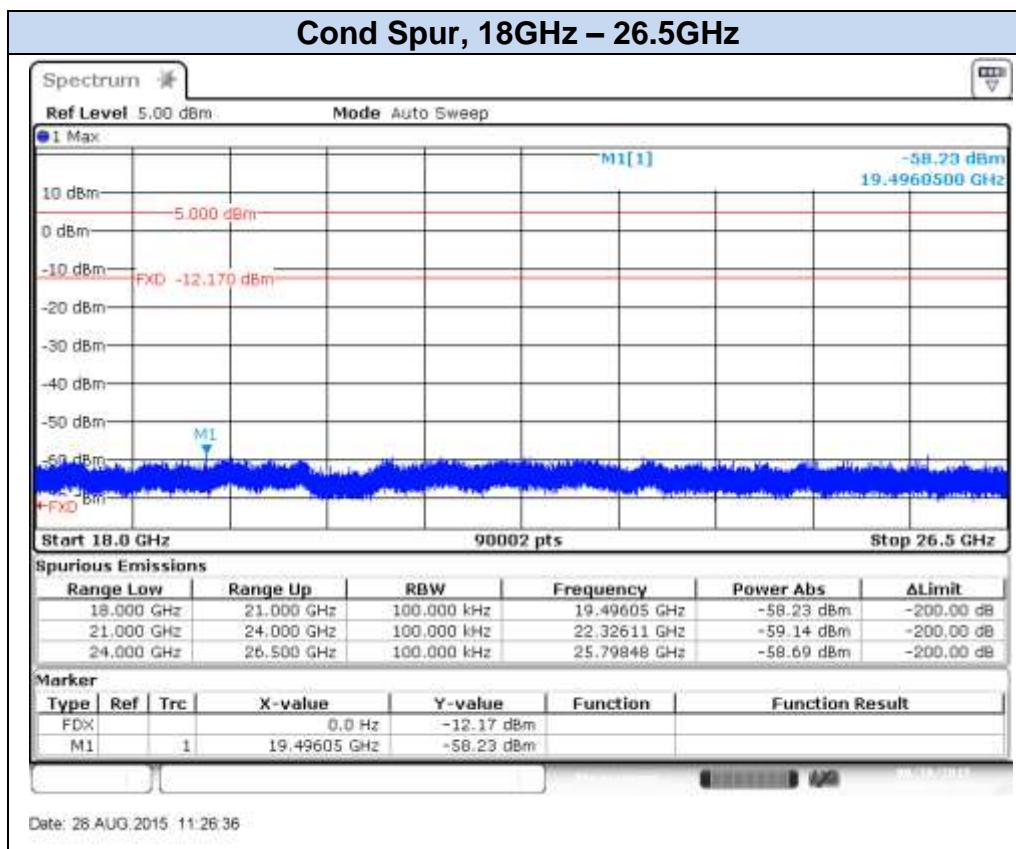
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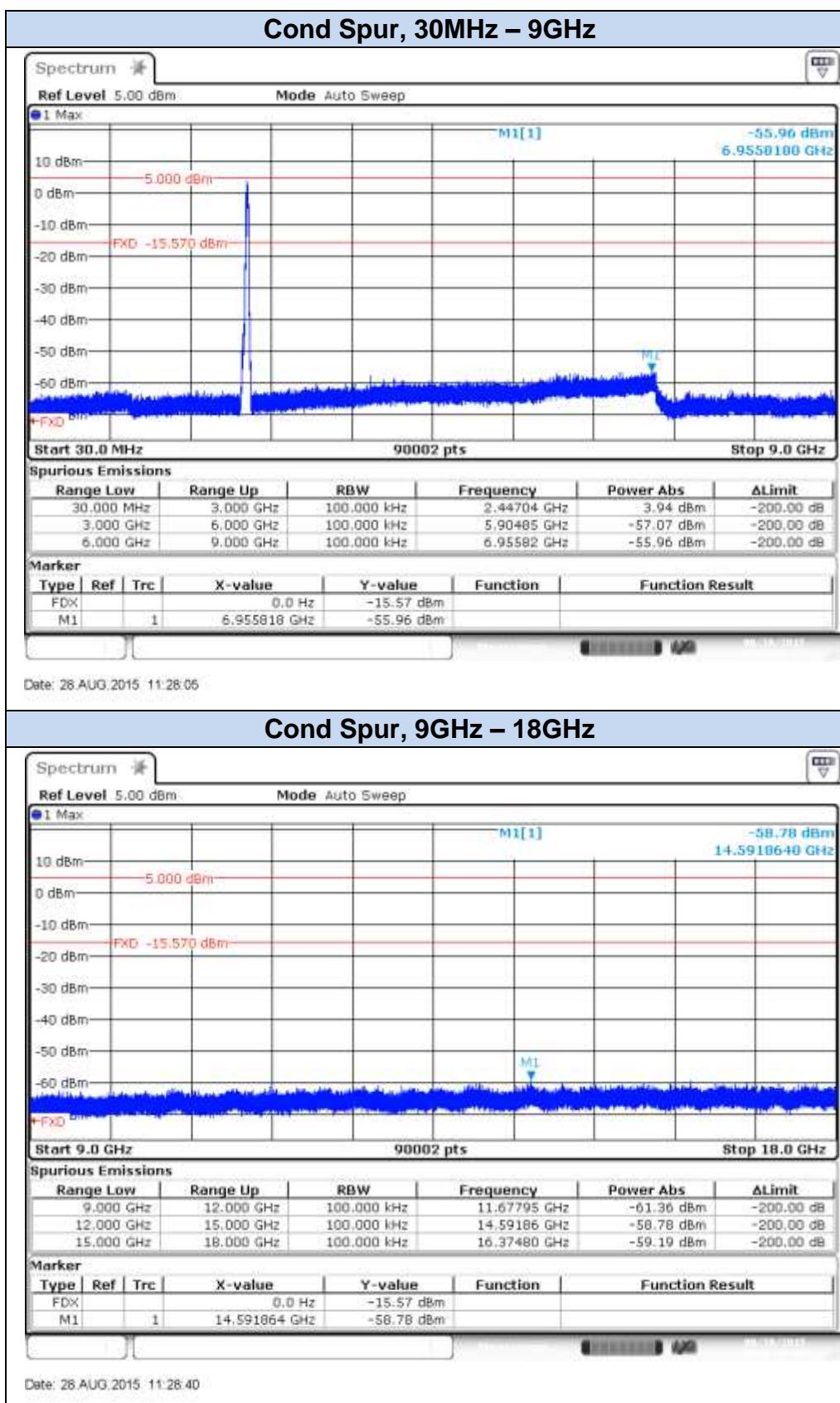


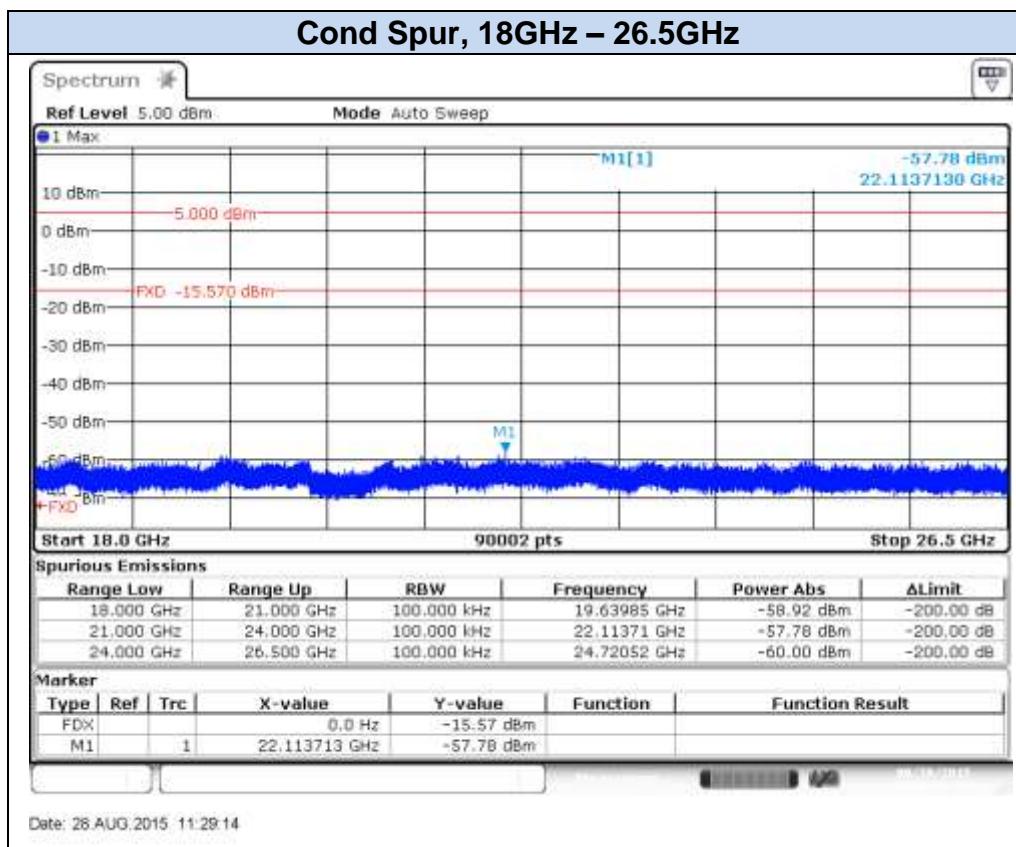
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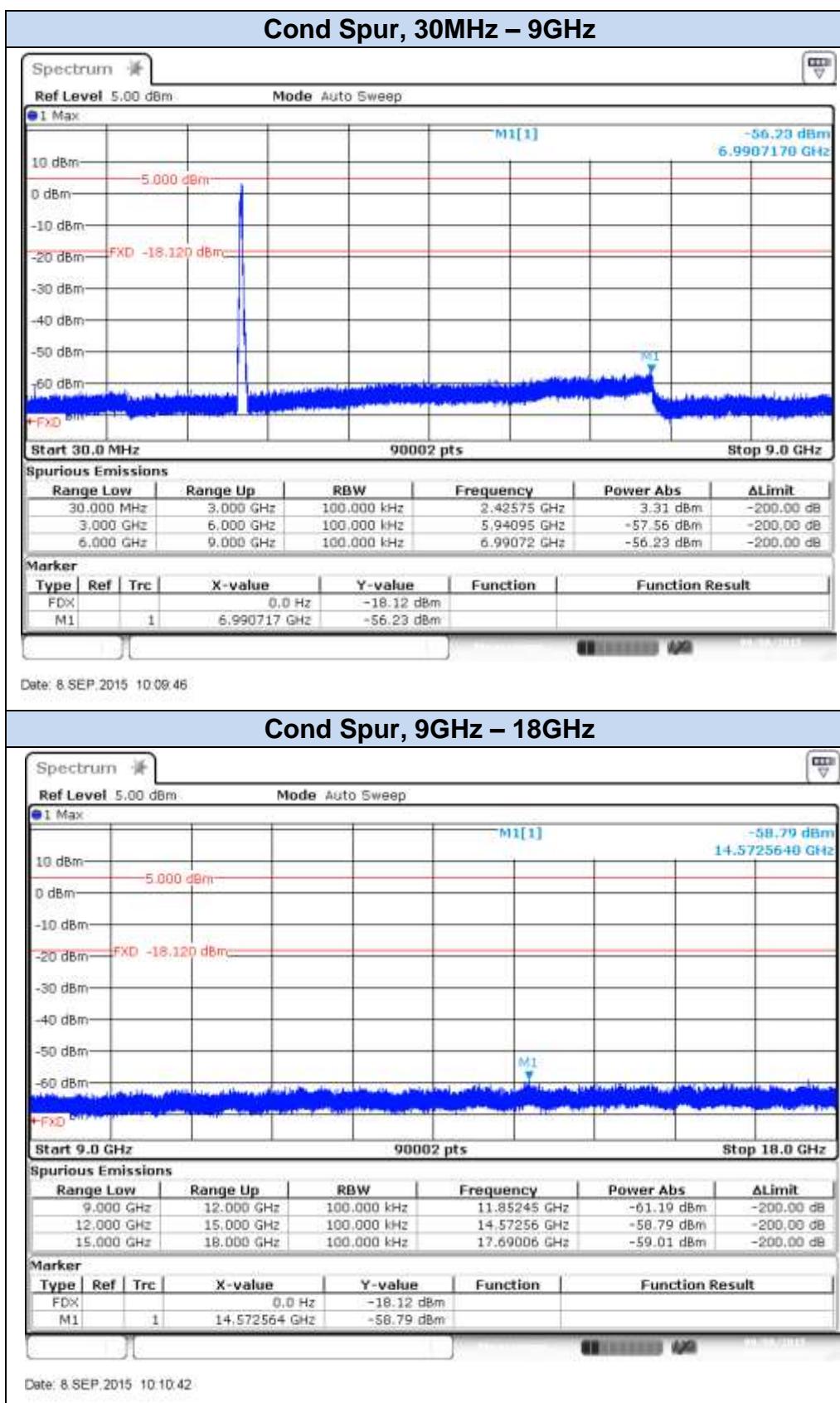


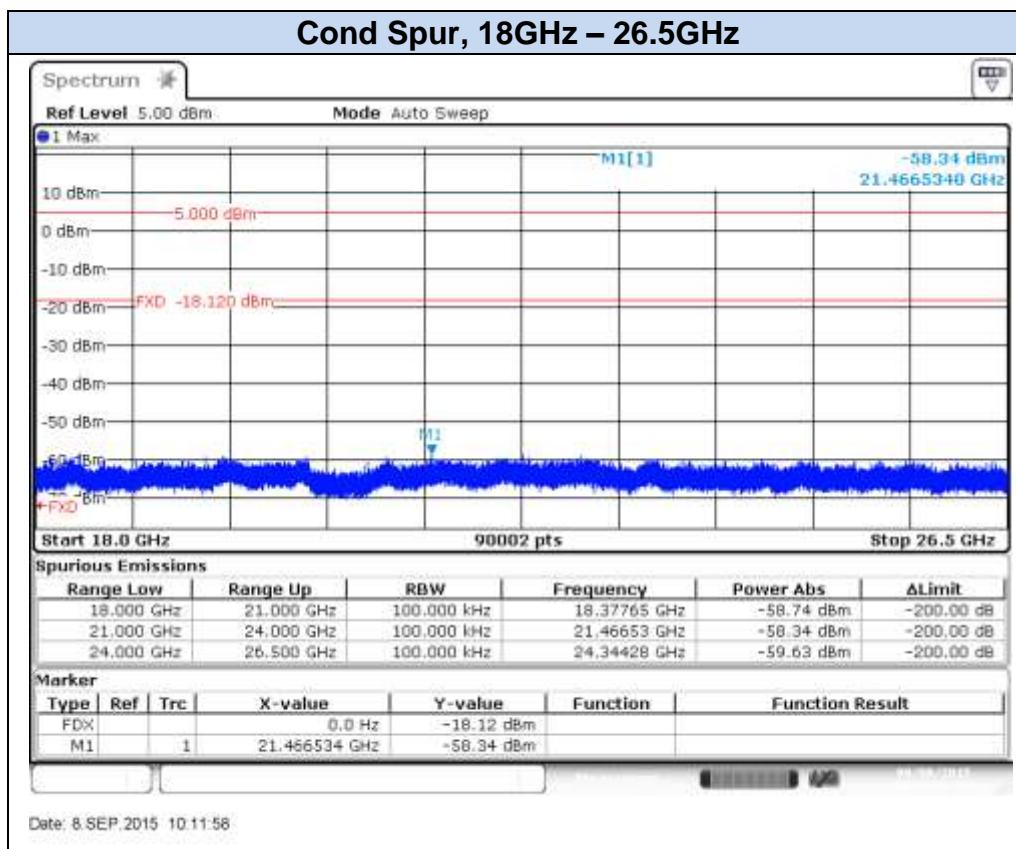
802.11n40, HT0 (SISO) – Chain B, CH9F



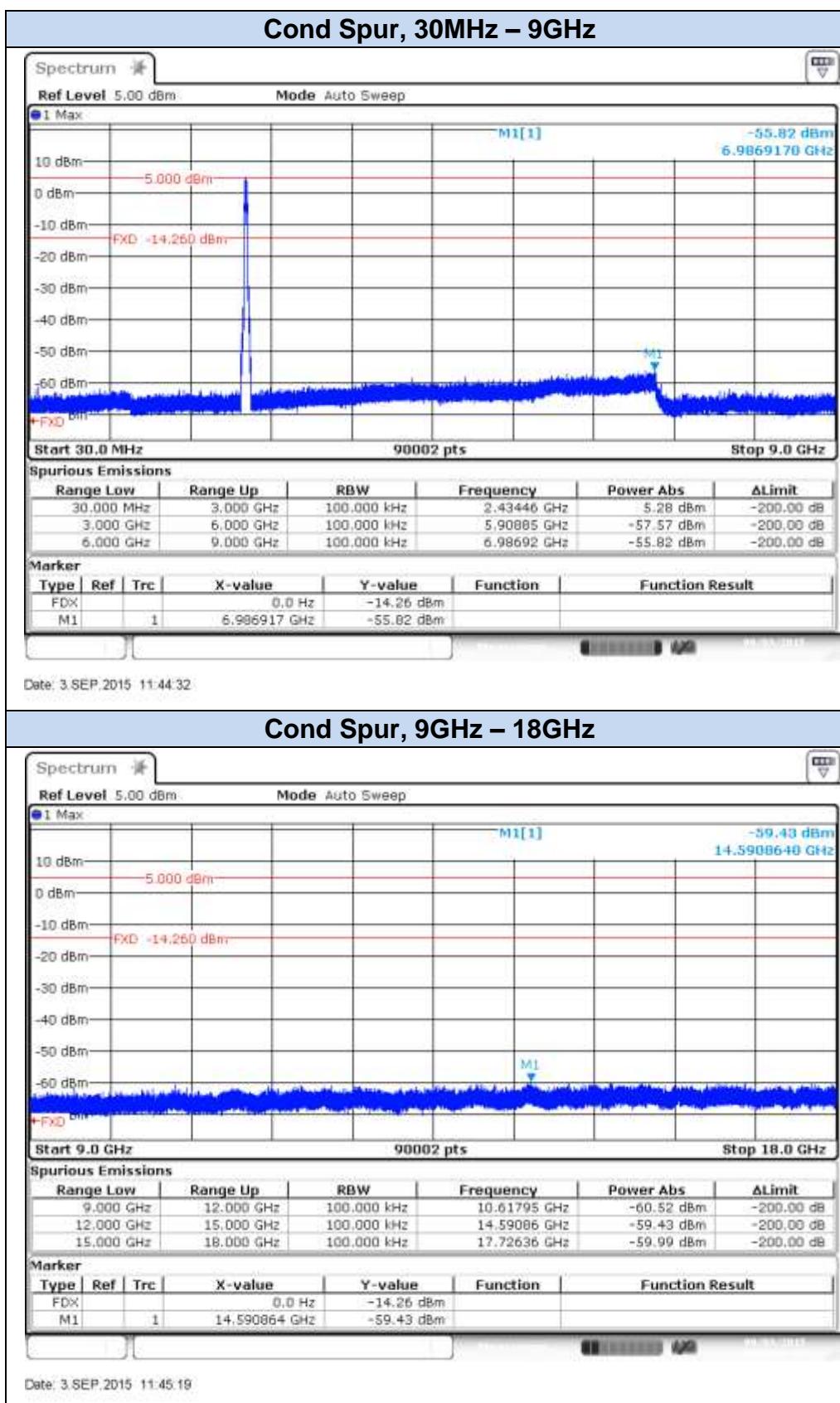


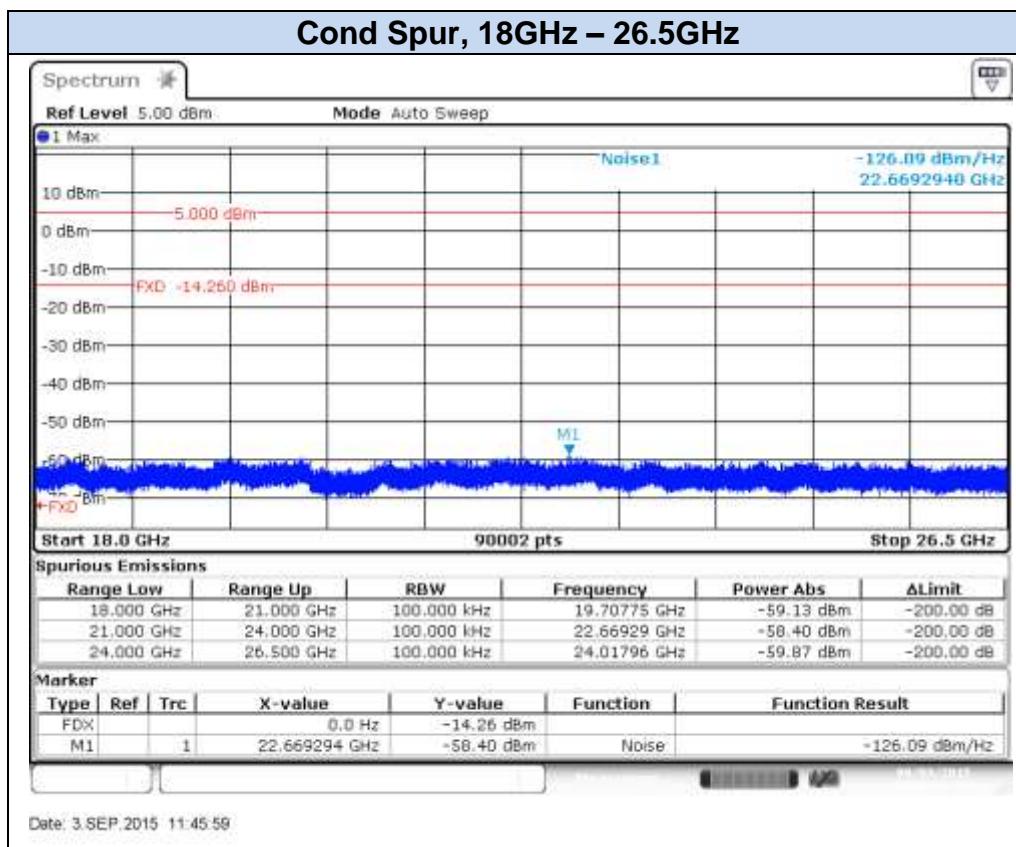
802.11n40, HT8 (MIMO) – Chain A, CH3F



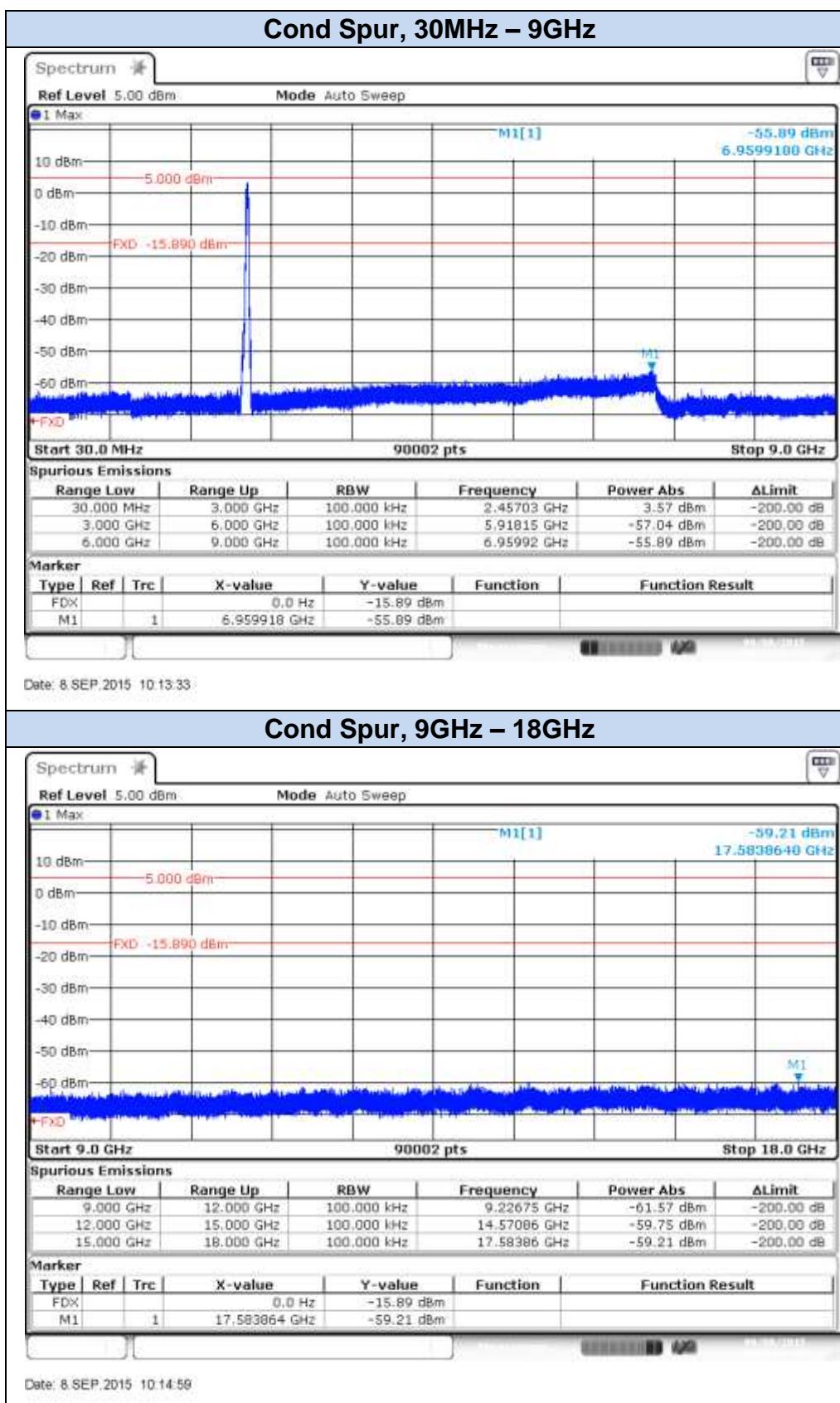


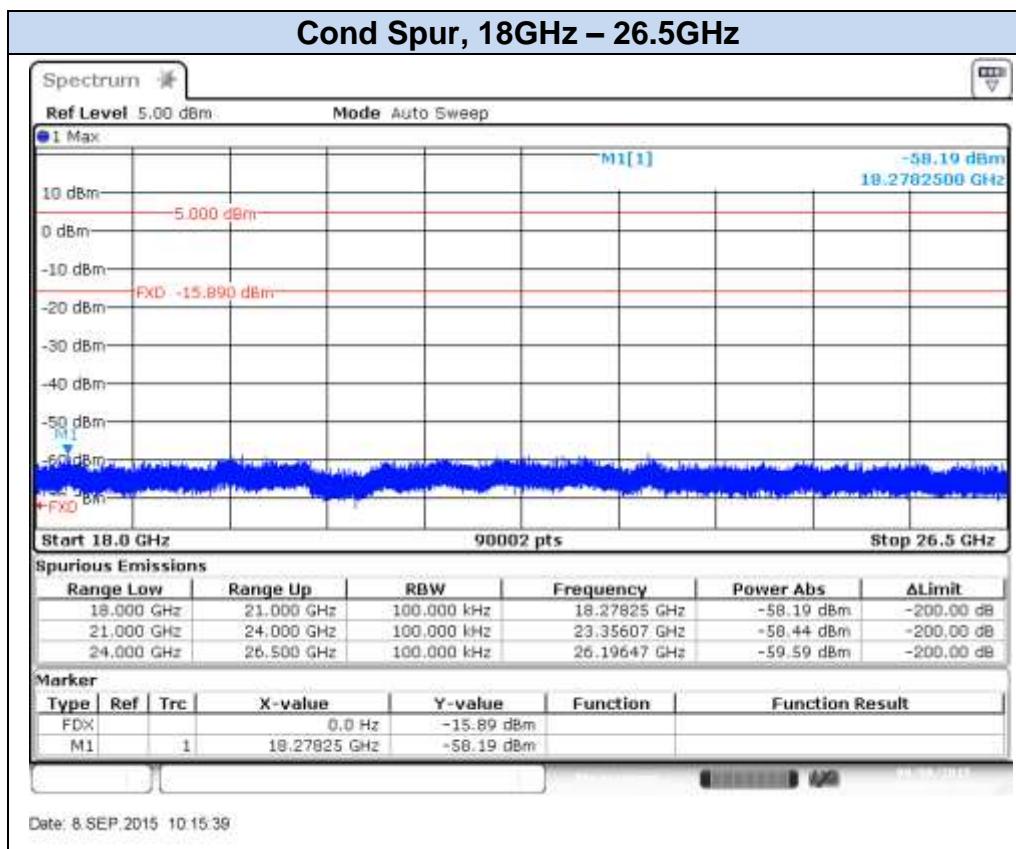
802.11n40, HT8 (MIMO) – Chain A, CH6F



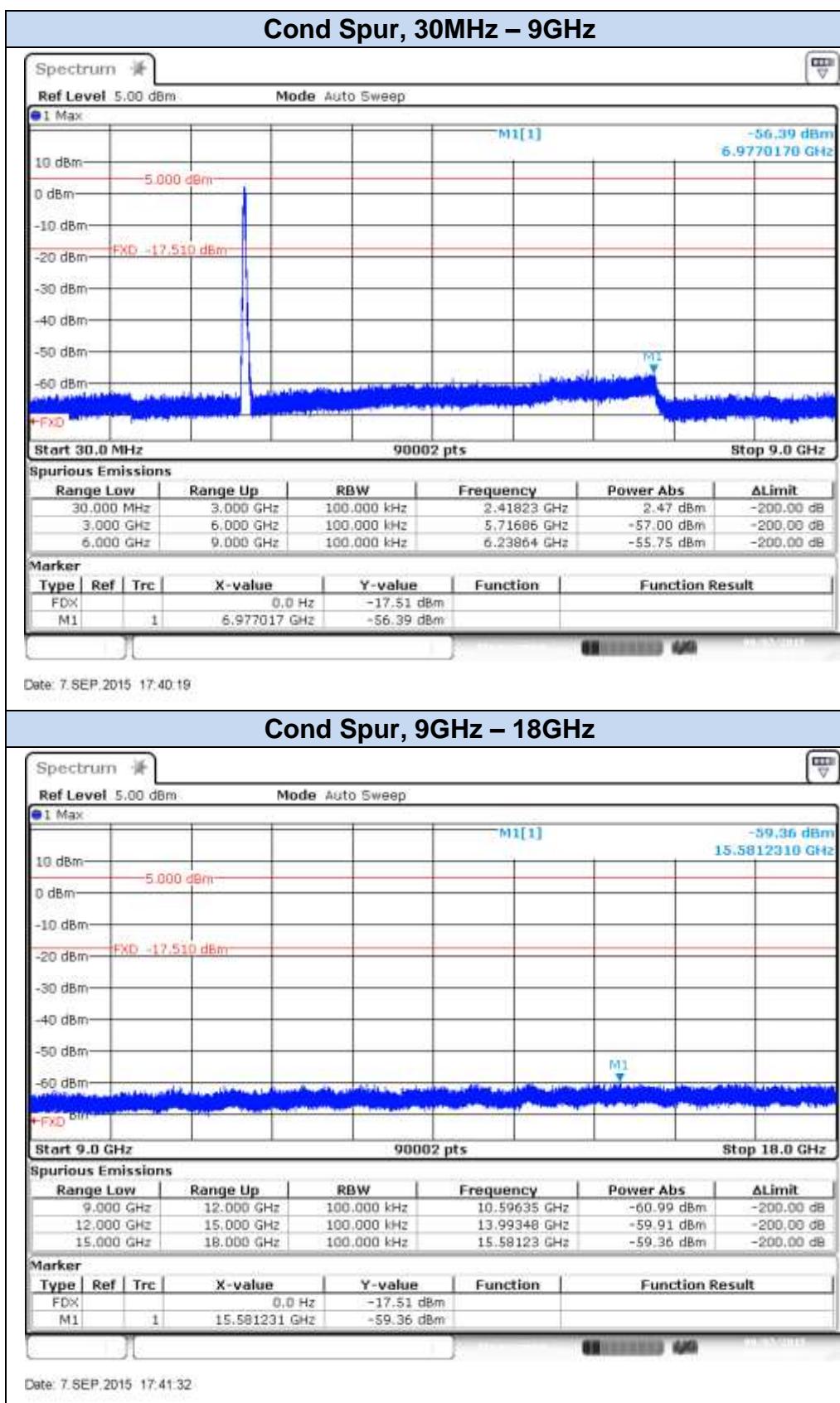


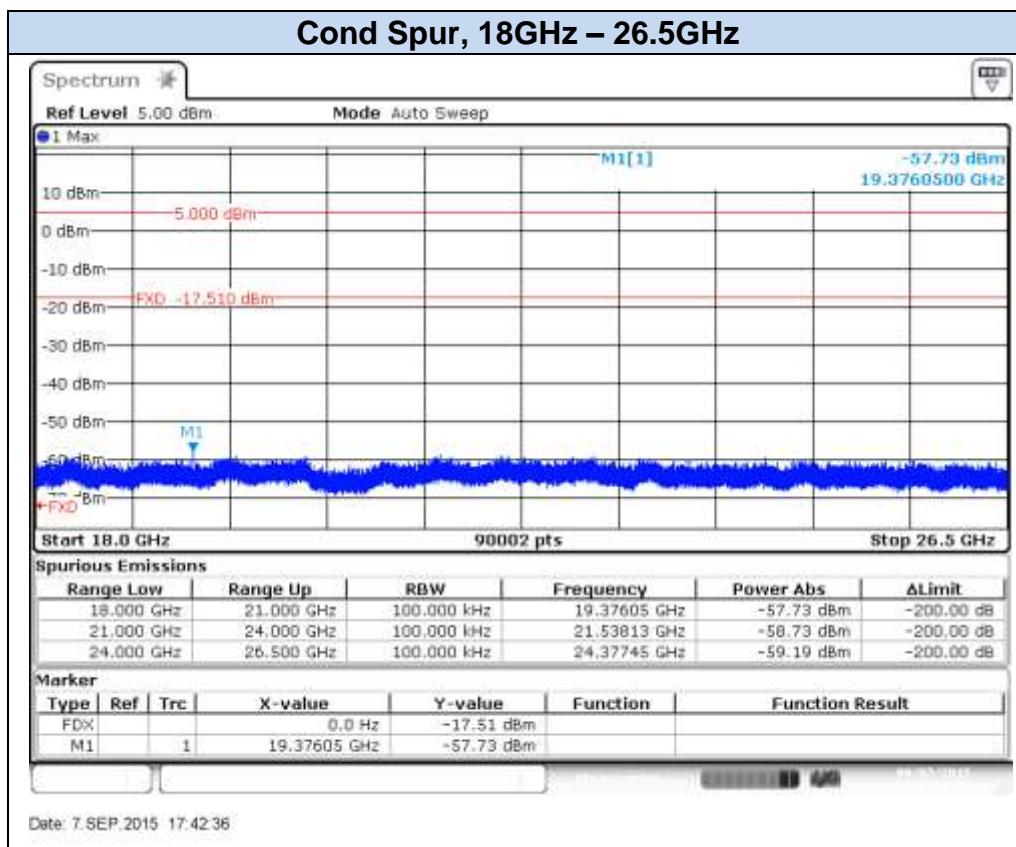
802.11n40, HT8 (MIMO) – Chain A, CH9F



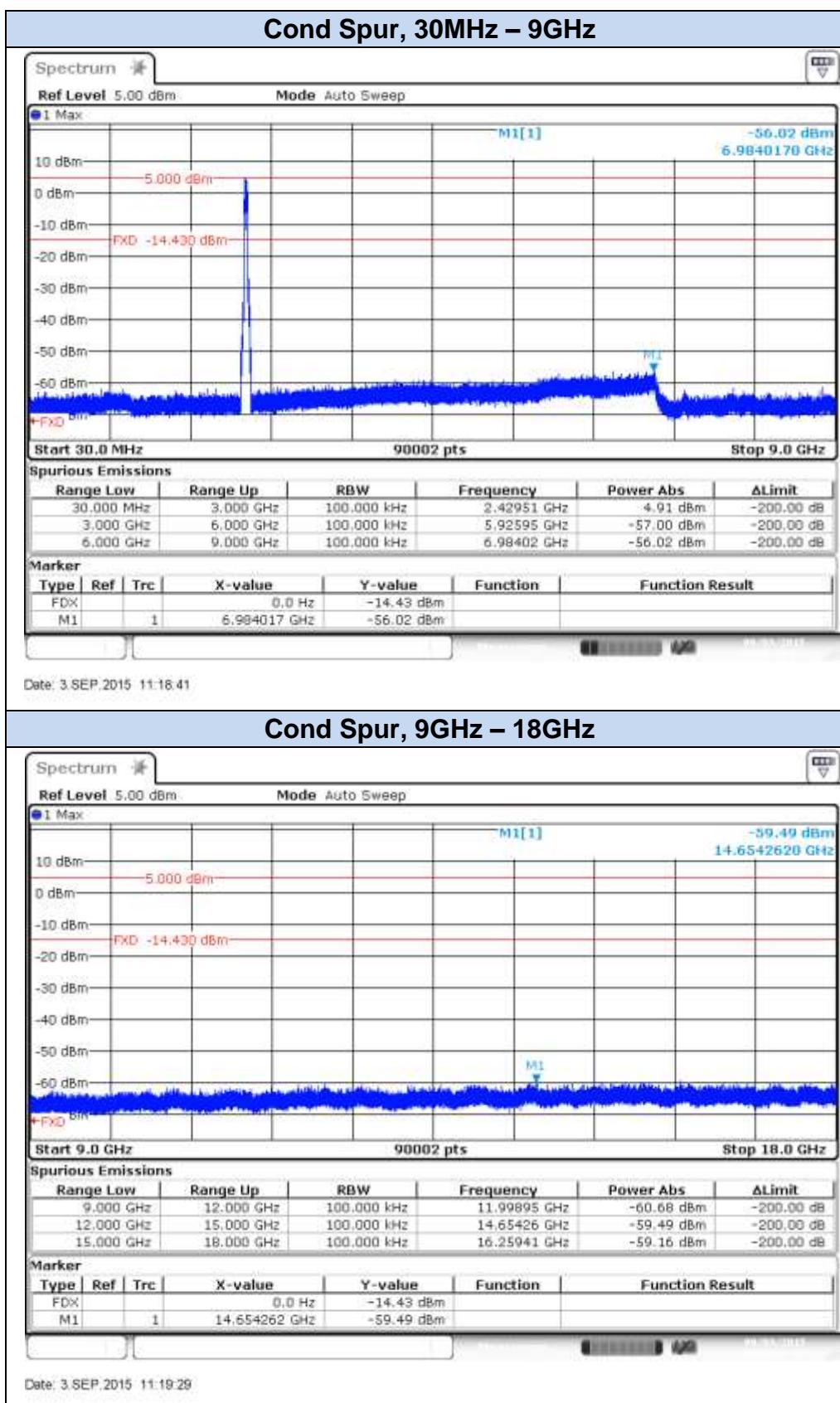


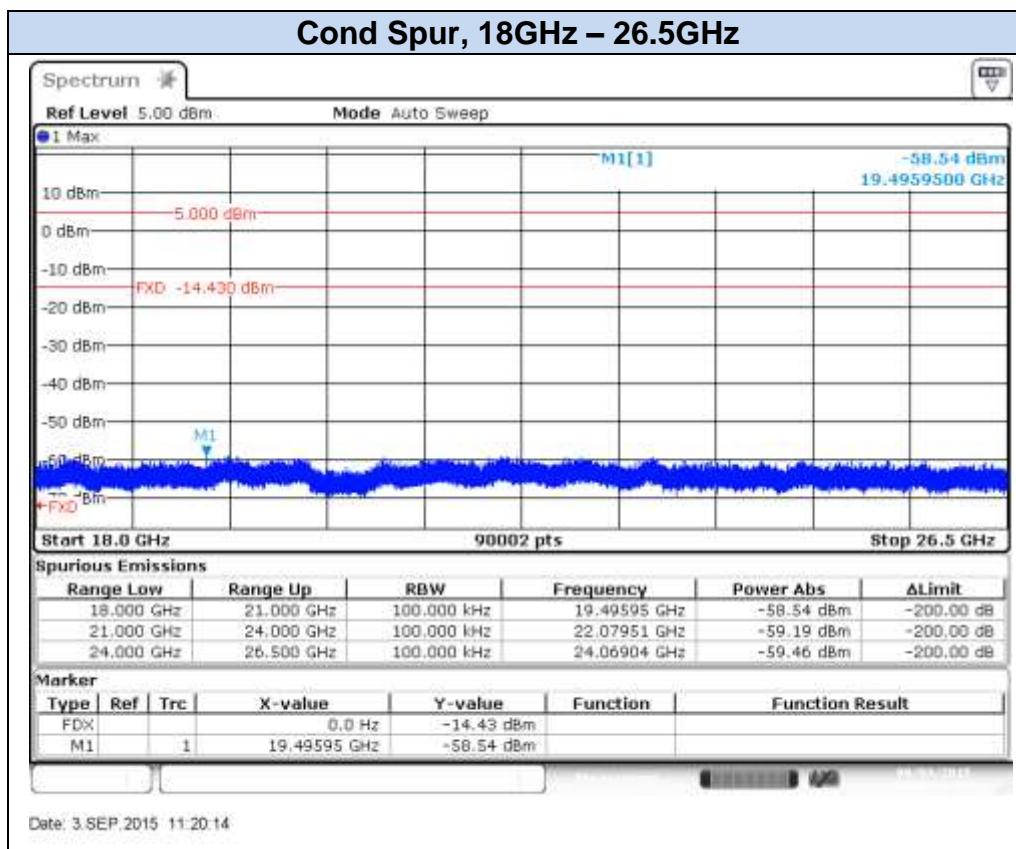
802.11n40, HT8 (MIMO) – Chain B, CH3F



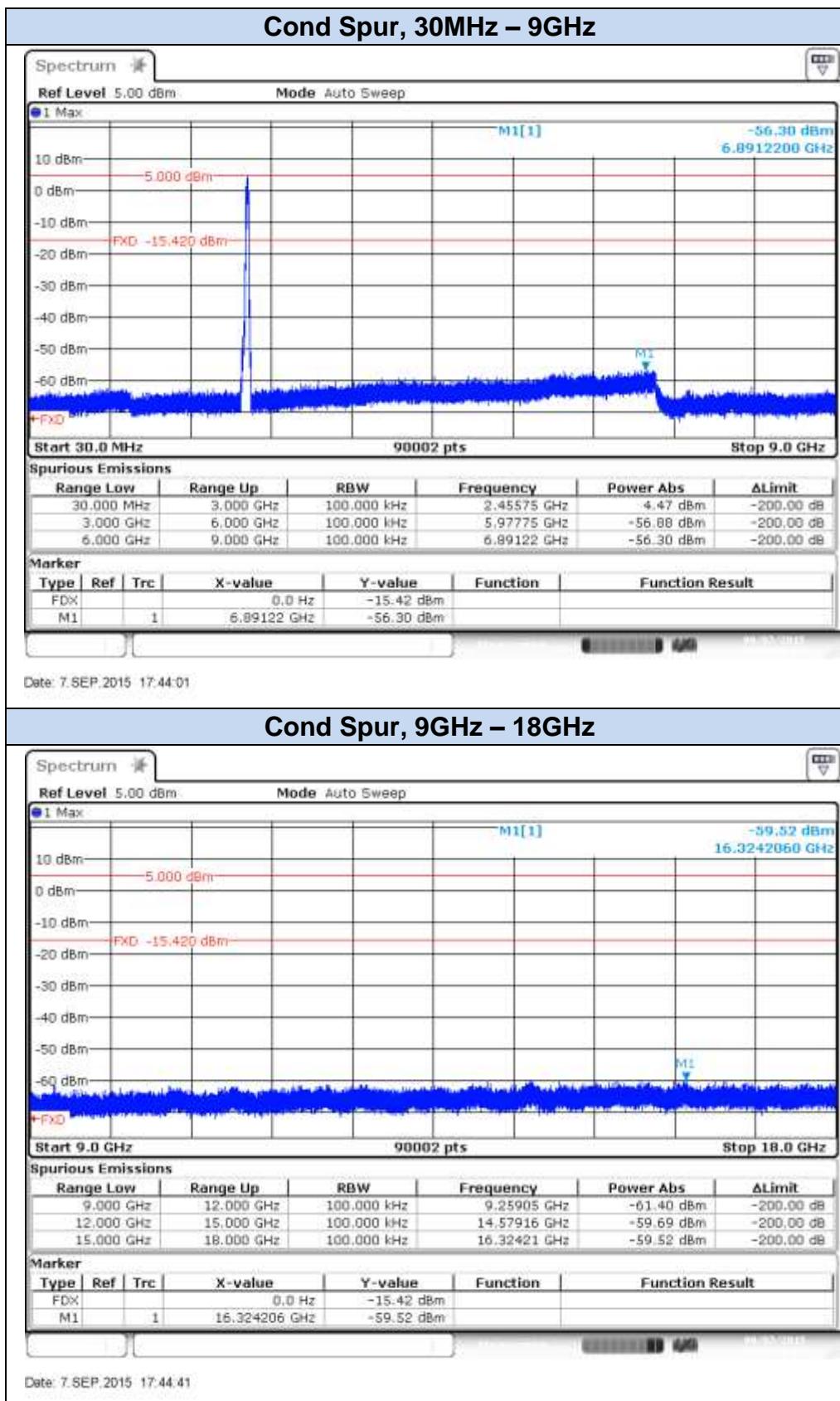


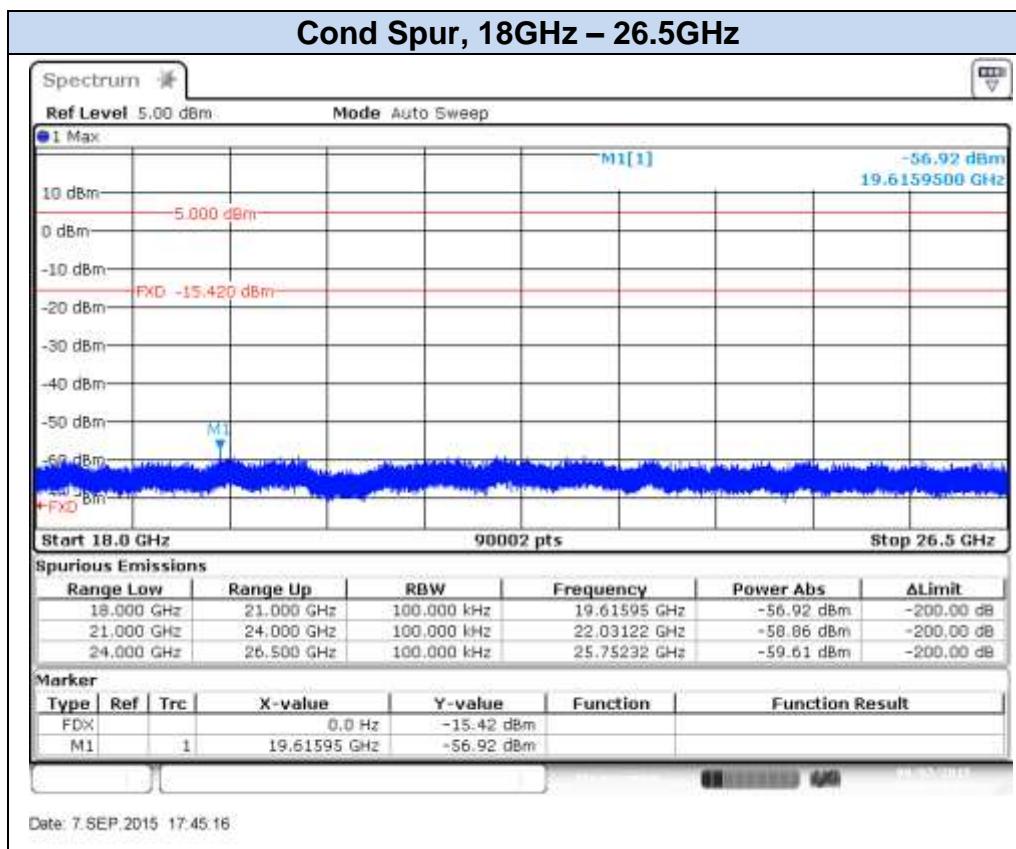
802.11n40, HT8 (MIMO) – Chain B, CH6F





802.11n40, HT8 (MIMO) – Chain B, CH9F





B.4 Power Spectral Density

Test limits:

FCC part	RSS part	Limits
15.247 (e)	RSS-247 Clause 5.2 (2)	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

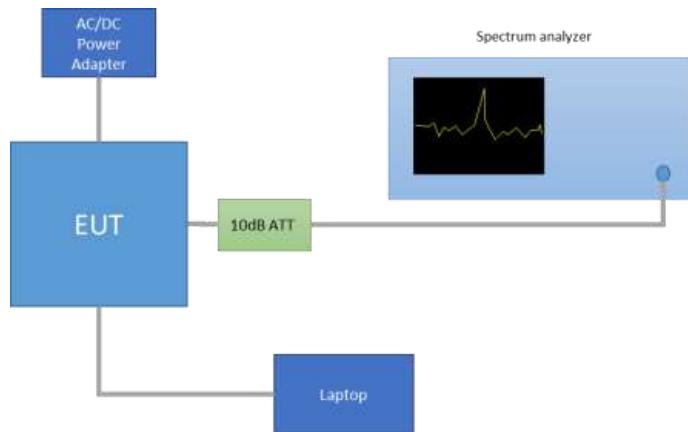
Test procedure:

The peak power spectral density level in the fundamental emission was measured using the method of trace averaging with EUT transmitting at full power throughout each sweep according to point 10.2 of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r02 dated 2014/06/05. This method was used for 802.11b, 802.11g, 802.11n20 and 802.11n40 modes. The peak power spectral density level was used as reference from the marker-delta method measurement of the out of band emissions.

For MIMO mode, the *Measure and add $10 \log(N_{ANT})$ dB*, (where N_{ANT} 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 2013/10/31.

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

The setup below was used to measure the power spectral density. 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:
PSD RMS

SISO modes						PSD RMS [dBm]	
Mode	Rate	Meas. Duty Cycle [%]	CH	Frequency [MHz]	Antenna	Measured Conducted	Duty cycle Compensated
802.11b	1Mbps	98.0	1	2412	SISO CHAIN A	-9.16	-9.07
					SISO CHAIN B	-9.44	-9.35
			6	2437	SISO CHAIN A	-9.01	-8.92
					SISO CHAIN B	-9.21	-9.12
			11	2462	SISO CHAIN A	-10.38	-10.29
					SISO CHAIN B	-11.35	-11.26
			12	2467	SISO CHAIN A	-14.08	-13.99
					SISO CHAIN B	-15.50	-15.41
			13	2472	SISO CHAIN A	-20.84	-20.75
					SISO CHAIN B	-21.56	-21.47
802.11g	6Mbps	98.1	1	2412	SISO CHAIN A	-15.71	-15.63
					SISO CHAIN B	-15.90	-15.82
			6	2437	SISO CHAIN A	-12.97	-12.89
					SISO CHAIN B	-13.05	-12.97
			11	2462	SISO CHAIN A	-15.66	-15.58
					SISO CHAIN B	-15.87	-15.79
			12	2467	SISO CHAIN A	-21.25	-21.17
					SISO CHAIN B	-20.64	-20.56
			13	2472	SISO CHAIN A	-35.99	-35.91
					SISO CHAIN B	-37.88	-37.80
802.11n20	HT0	98.0	1	2412	SISO CHAIN A	-16.61	-16.52
					SISO CHAIN B	-16.13	-16.04
			6	2437	SISO CHAIN A	-13.06	-12.97
					SISO CHAIN B	-12.80	-12.71
			11	2462	SISO CHAIN A	-16.67	-16.58
					SISO CHAIN B	-16.37	-16.28
			12	2467	SISO CHAIN A	-22.27	-22.18
					SISO CHAIN B	-21.33	-21.24
			13	2472	SISO CHAIN A	-36.88	-36.79
					SISO CHAIN B	-38.46	-38.37

SISO modes						PSD RMS [dBm]	
Mode	Rate	Meas. Duty Cycle [%]	CH	Frequency [MHz]	Antenna	Measured Conducted	Duty cycle Compensated
802.11n40	HT0	96.4	3F	2422	SISO CHAIN A	-17.90	-17.74
					SISO CHAIN B	-17.19	-17.03
			6F	2437	SISO CHAIN A	-15.4	-15.21
					SISO CHAIN B	-15.24	-15.08
			9F	2452	SISO CHAIN A	-18.31	-18.15
					SISO CHAIN B	-18.32	-18.16
			10F	2457	SISO CHAIN A	-25.54	-25.38
					SISO CHAIN B	-25.29	-25.13
			11F	2462	SISO CHAIN A	-38.80	-38.64
					SISO CHAIN B	-39.19	-39.03

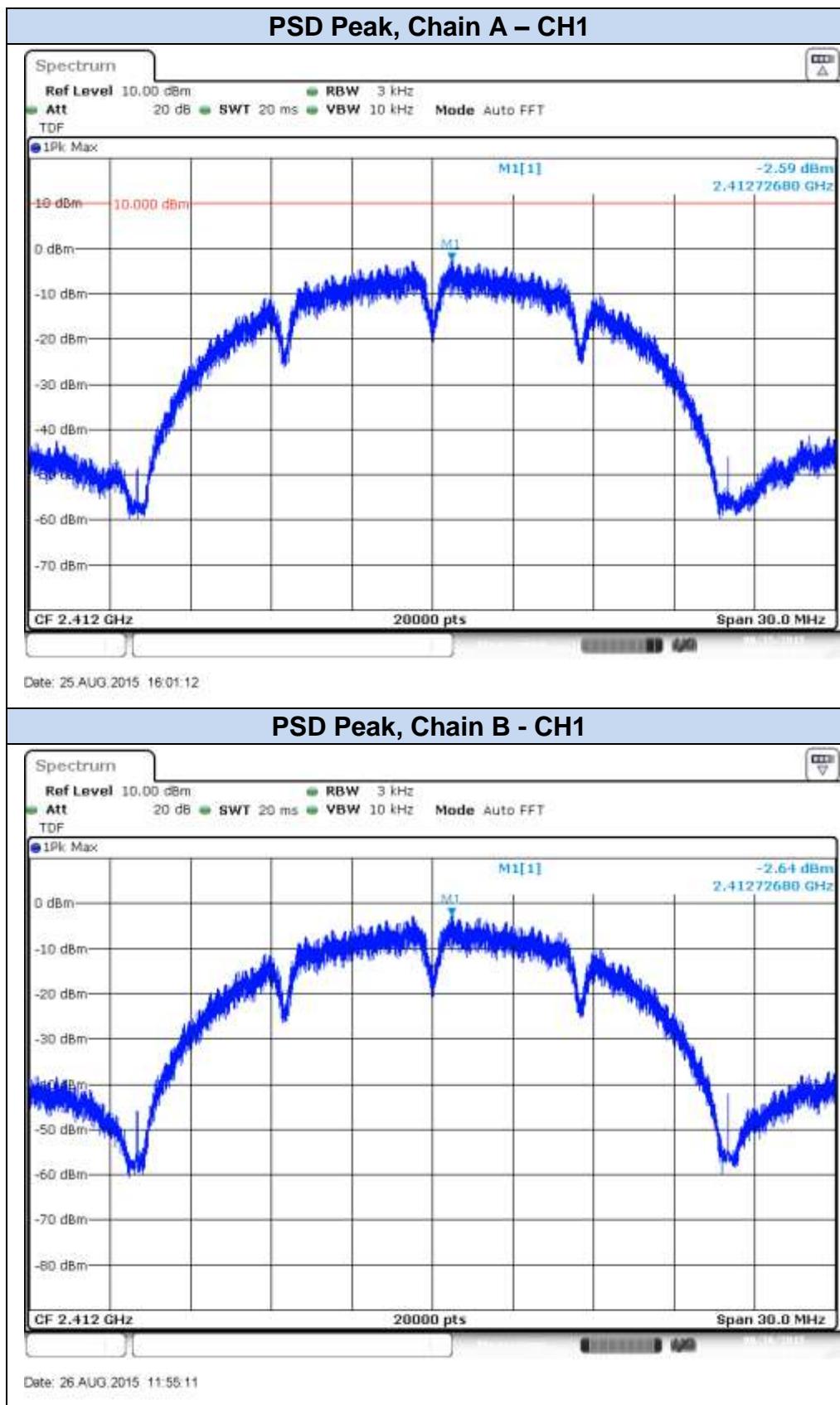
MIMO modes						PSD RMS [dBm]		
Mode	Rate	Meas. Duty Cycle [%]	CH	Freq. [MHz]	Antenna	Measured Conducted	Duty cycle Compensated	MIMO Compensated +10-log(N _{ant})
802.11n20	HT8	95.5	1	2412	CHAIN A	-16.94	-16.74	-13.74
					CHAIN B	-15.90	-15.70	-12.7
			6	2437	CHAIN A	-14.82	-14.62	-11.62
					CHAIN B	-14.96	-14.76	-11.76
			11	2462	CHAIN A	-15.52	-15.32	-12.32
					CHAIN B	-15.38	-15.18	-12.18
			12	2467	CHAIN A	-21.98	-21.78	-18.78
					CHAIN B	-22.01	-21.81	-18.81
			13	2472	CHAIN A	-36.54	-36.34	-33.34
					CHAIN B	-37.88	-37.68	-34.68
802.11n40	HT8	91.9	3F	2422	CHAIN A	-17.96	-17.60	-14.60
					CHAIN B	-16.90	-16.54	-13.54
			6F	2437	CHAIN A	-15.26	-14.90	-11.90
					CHAIN B	-16.04	-15.68	-12.68
			9F	2452	CHAIN A	-16.93	-16.57	-13.57
					CHAIN B	-17.22	-16.86	-13.86
			10F	2457	CHAIN A	-24.04	-23.68	-20.68
					CHAIN B	-24.93	-24.57	-21.57
			11F	2462	CHAIN A	-36.99	-36.63	-33.63
					CHAIN B	-38.99	-38.63	-35.63

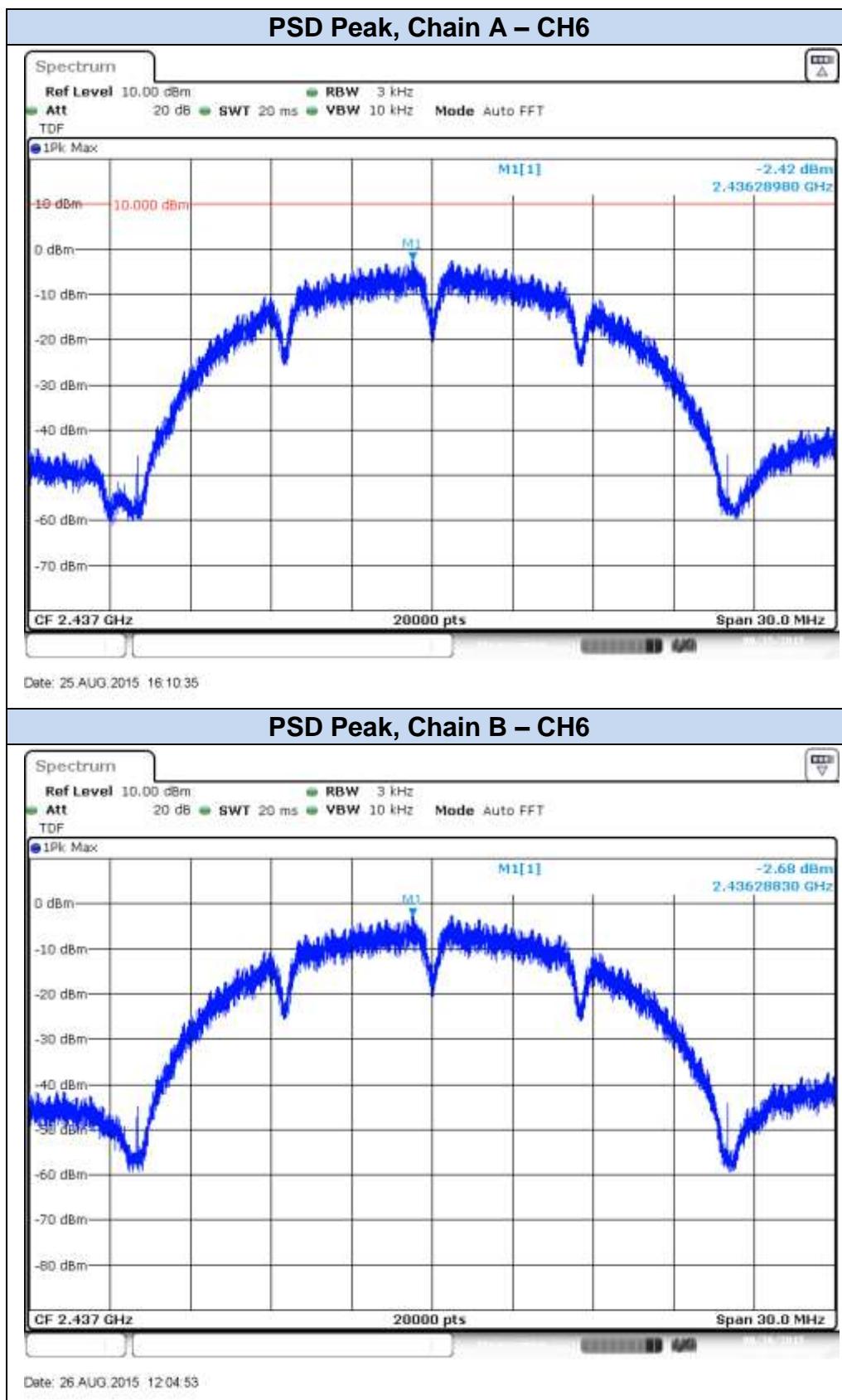
PSD Peak

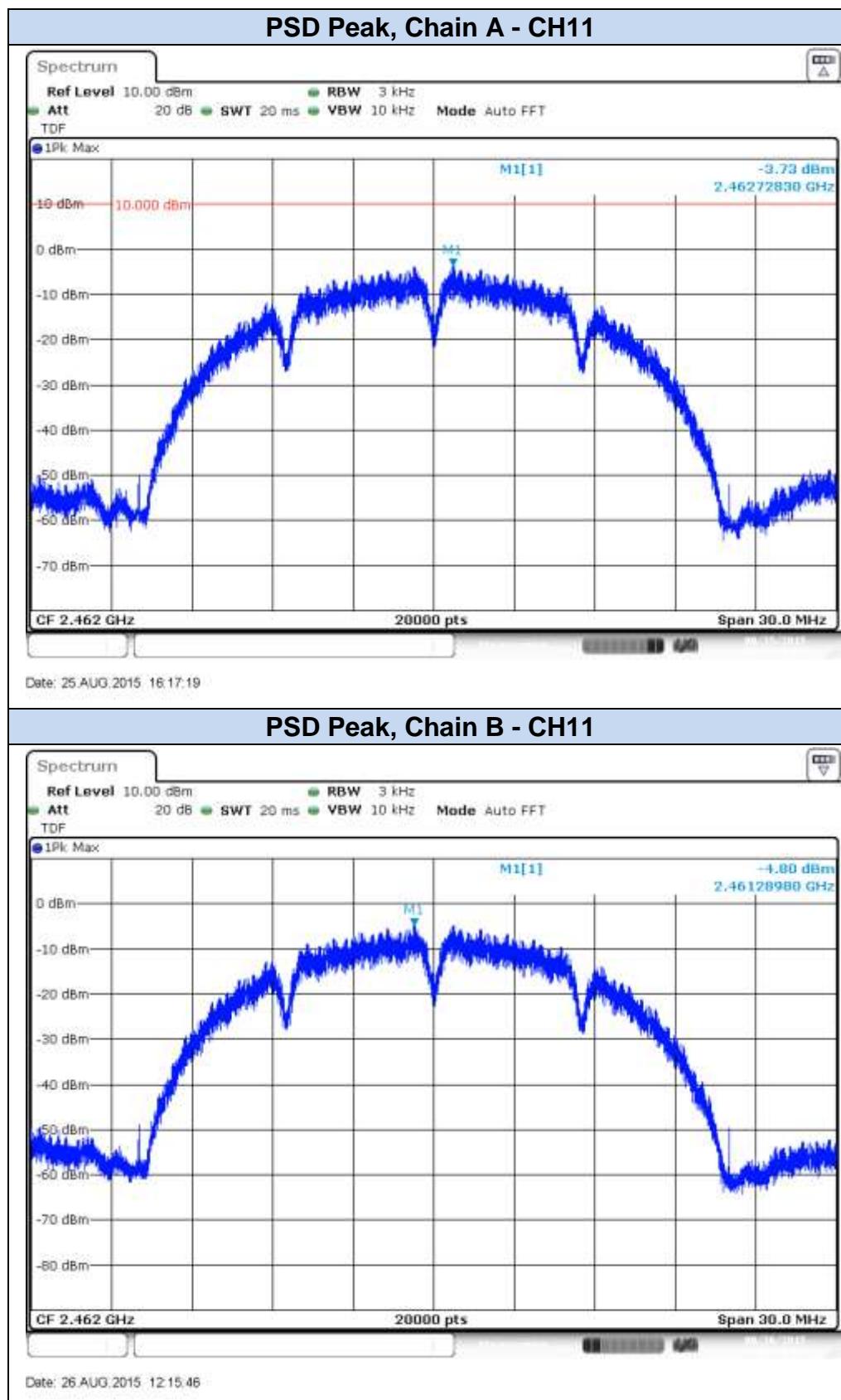
SISO modes

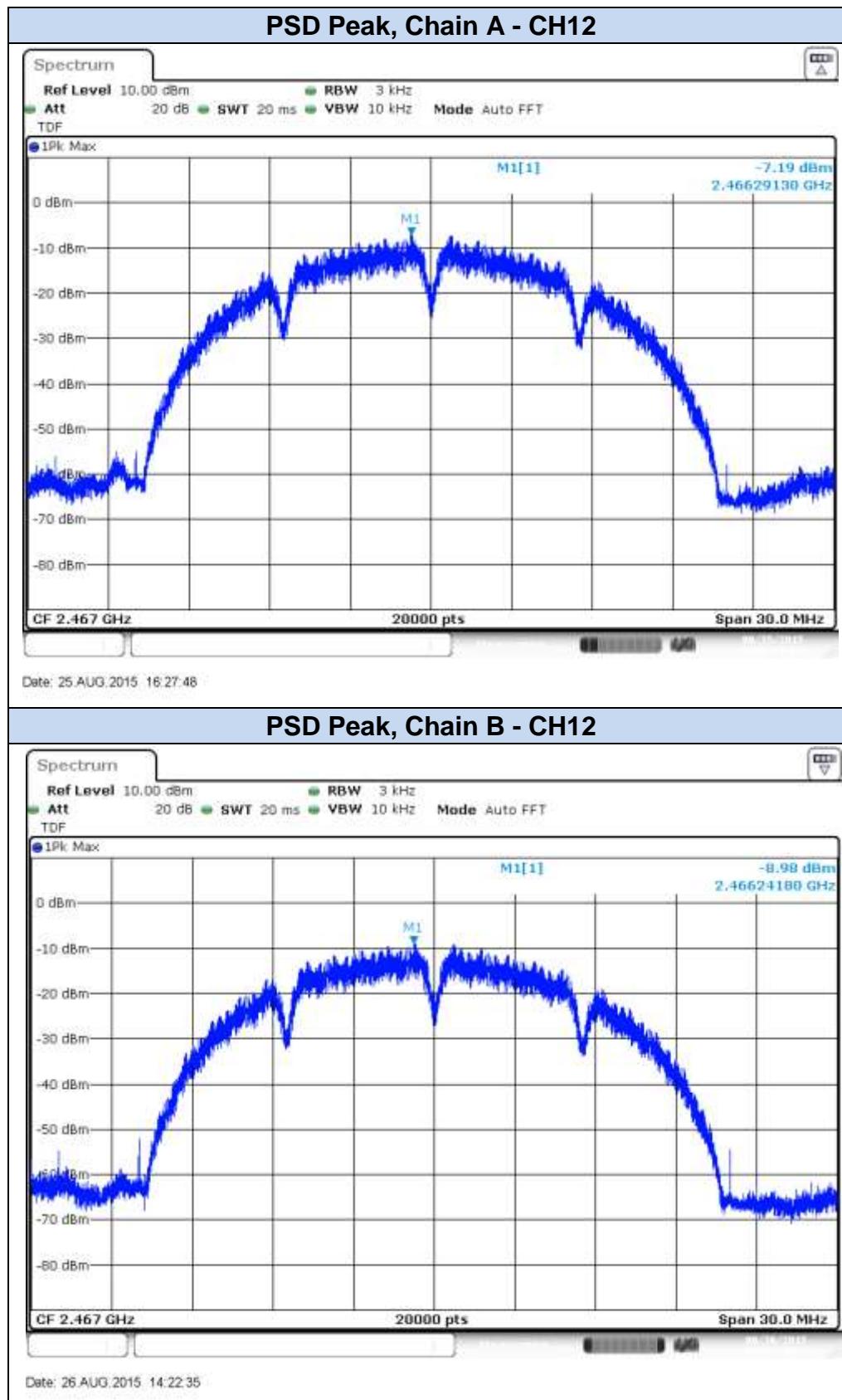
Mode	Rate	Measured Duty Cycle [%]	Channel	Frequency [MHz]	Antenna	PSD Peak [dBm]
802.11b	1Mbps	98.0	1	2412	SISO CHAIN A	-2.59
					SISO CHAIN B	-2.64
			6	2437	SISO CHAIN A	-2.42
					SISO CHAIN B	-2.68
			11	2462	SISO CHAIN A	-3.73
					SISO CHAIN B	-4.80
			12	2467	SISO CHAIN A	-7.19
					SISO CHAIN B	-8.98
			13	2472	SISO CHAIN A	-13.85
					SISO CHAIN B	-14.85
802.11g	6Mbps	98.1	1	2412	SISO CHAIN A	-5.73
					SISO CHAIN B	-5.89
			6	2437	SISO CHAIN A	-2.30
					SISO CHAIN B	-3.03
			11	2462	SISO CHAIN A	-5.71
					SISO CHAIN B	-5.66
			12	2467	SISO CHAIN A	-10.86
					SISO CHAIN B	-10.89
			13	2472	SISO CHAIN A	-25.49
					SISO CHAIN B	-27.79
802.11n20	HT0	98.0	1	2412	SISO CHAIN A	-5.19
					SISO CHAIN B	-4.33
			6	2437	SISO CHAIN A	-1.61
					SISO CHAIN B	-1.66
			11	2462	SISO CHAIN A	-5.22
					SISO CHAIN B	-4.83
			12	2467	SISO CHAIN A	-11.03
					SISO CHAIN B	-10.05
			13	2472	SISO CHAIN A	-26.62
					SISO CHAIN B	-27.44
802.11n40	HT0	96.4	3F	2422	SISO CHAIN A	-9.68
					SISO CHAIN B	-9.60
			6F	2437	SISO CHAIN A	-5.68
					SISO CHAIN B	-6.01
			9F	2452	SISO CHAIN A	-9.50
					SISO CHAIN B	-9.63
			10F	2457	SISO CHAIN A	-16.89
					SISO CHAIN B	-16.25
			11F	2462	SISO CHAIN A	-29.65
					SISO CHAIN B	-29.92

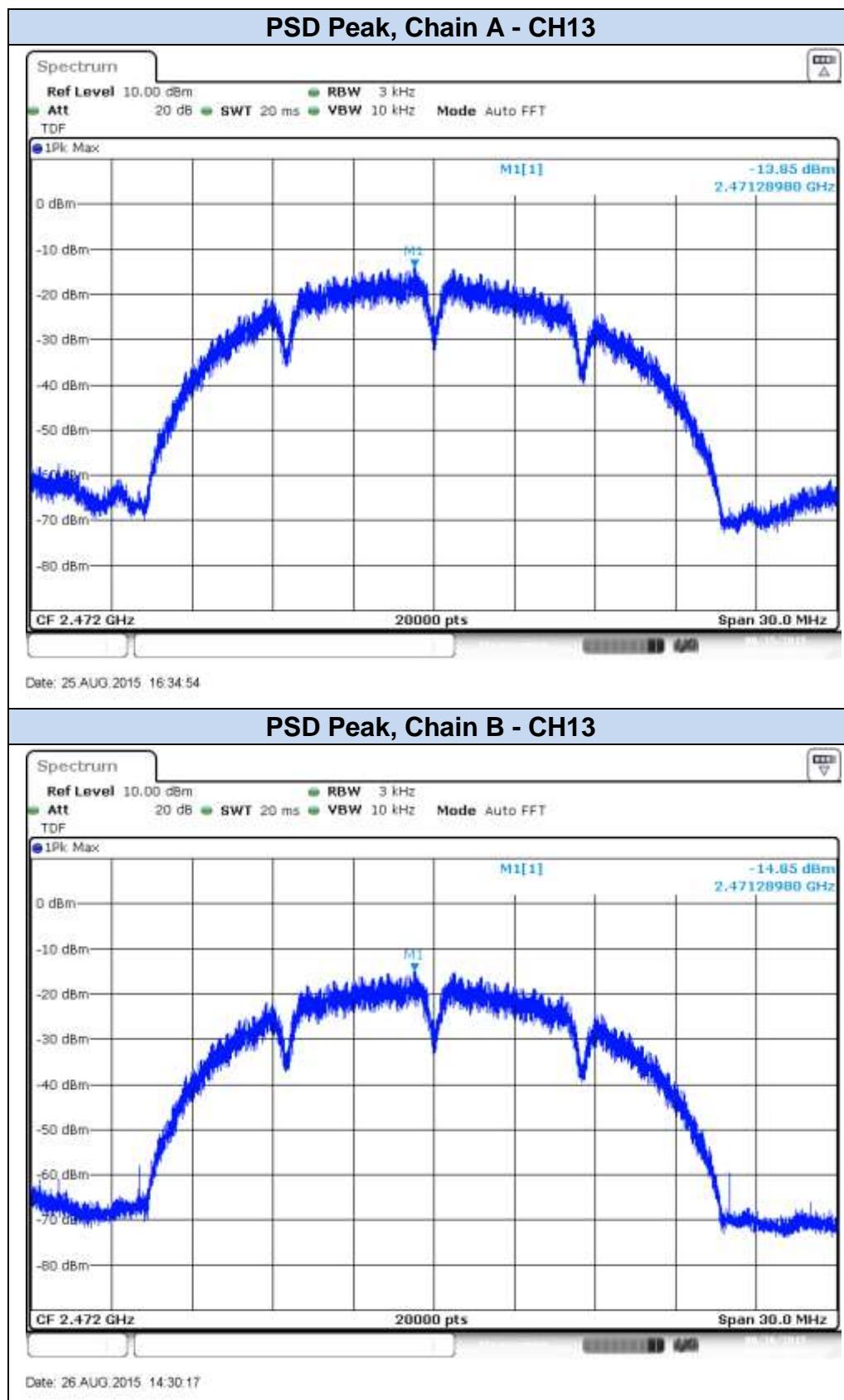
MIMO modes						PSD Peak [dBm]	
Mode	Rate	Meas. Duty Cycle [%]	CH	Freq. [MHz]	Antenna	Measured Conducted	MIMO Compensated +10-log(N _{ant})
802.11n20	HT8	95.5	1	2412	CHAIN A	-6.72	-3.72
					CHAIN B	-5.70	-2.70
			6	2437	CHAIN A	-5.33	-2.33
					CHAIN B	-5.31	-2.31
			11	2462	CHAIN A	-5.62	-2.62
					CHAIN B	-5.89	-2.89
			12	2467	CHAIN A	-16.54	-13.54
					CHAIN B	-12.16	-9.16
			13	2472	CHAIN A	-26.64	-23.64
					CHAIN B	-28.18	-25.18
802.11n40	HT8	91.9	3F	2422	CHAIN A	-10.12	-7.12
					CHAIN B	-8.90	-5.90
			6F	2437	CHAIN A	-8.35	-5.35
					CHAIN B	-7.86	-4.86
			9F	2452	CHAIN A	-9.42	-6.42
					CHAIN B	-8.42	-5.42
			10F	2457	CHAIN A	-16.70	-13.70
					CHAIN B	-16.12	-13.12
			11F	2462	CHAIN A	-29.59	-26.59
					CHAIN B	-29.89	-26.89

**Results screenshot:****802.11b, 1Mbps**

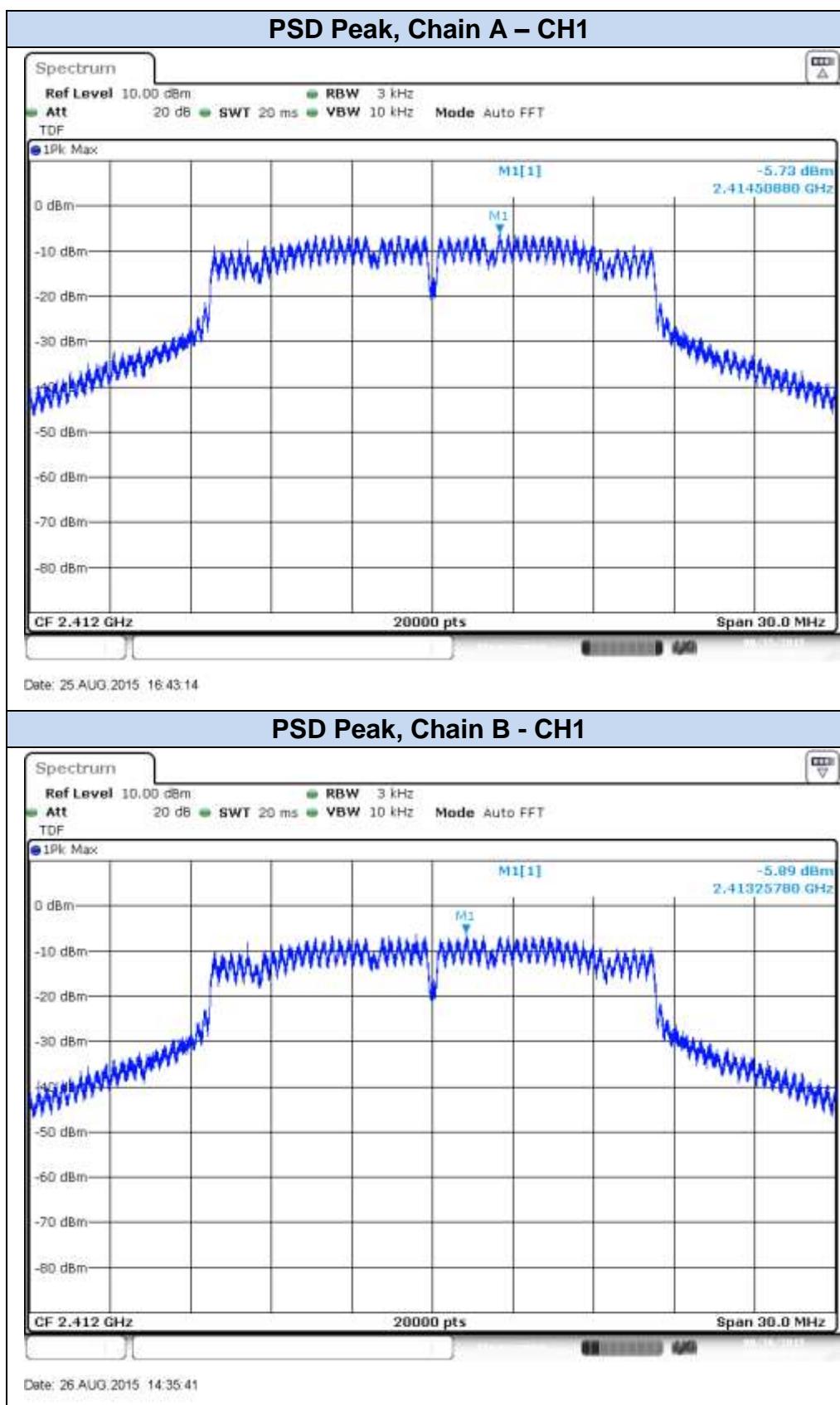


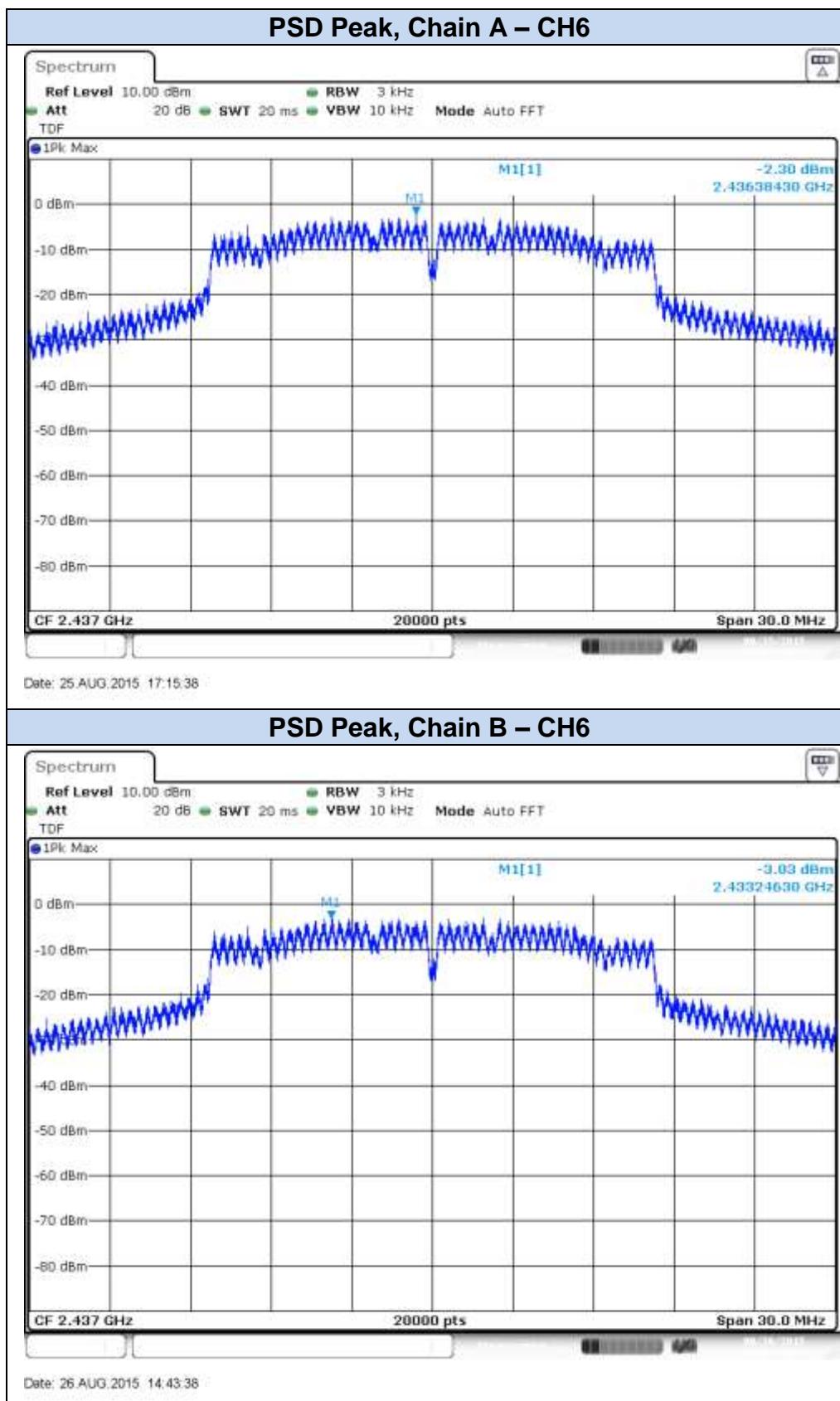


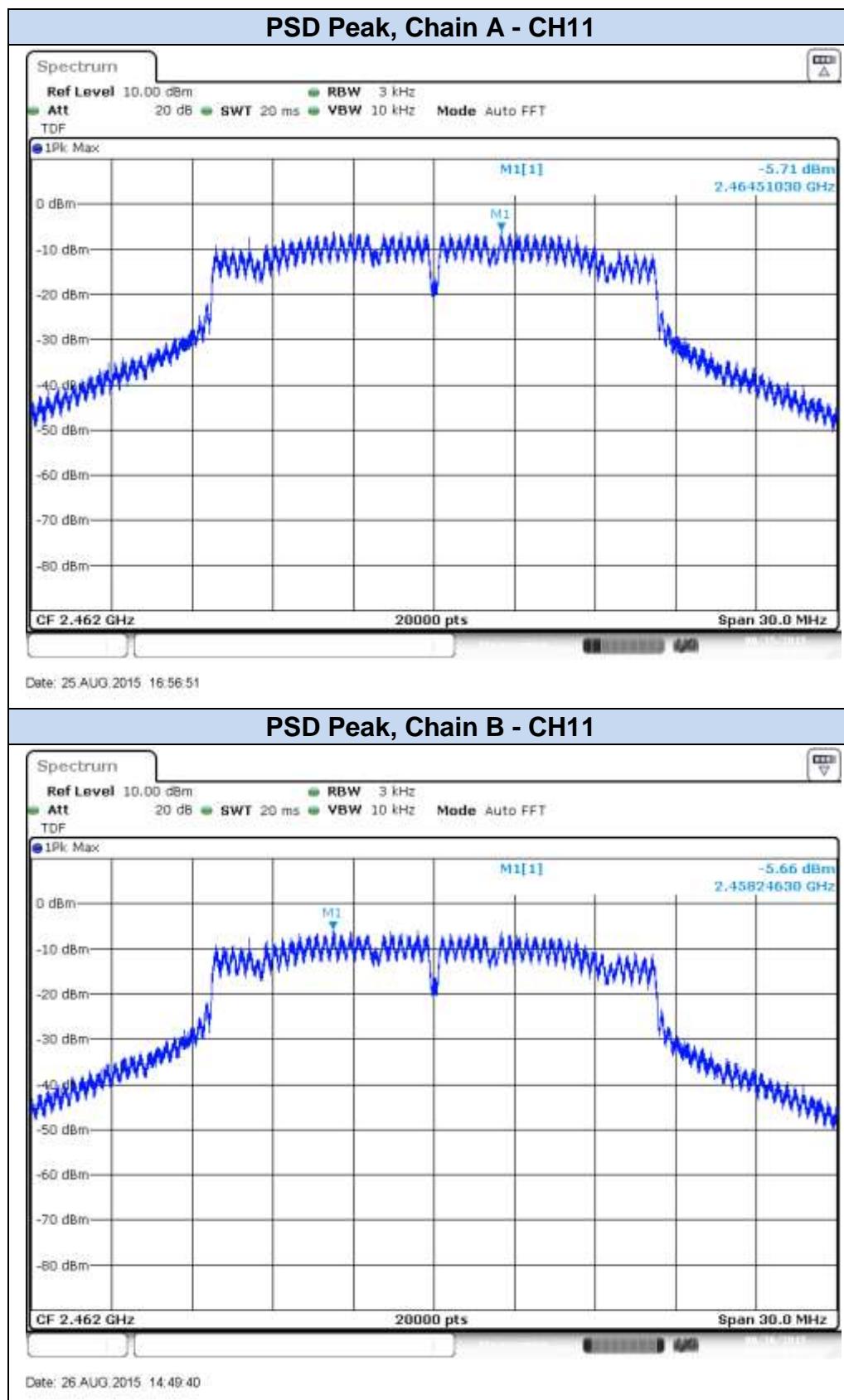


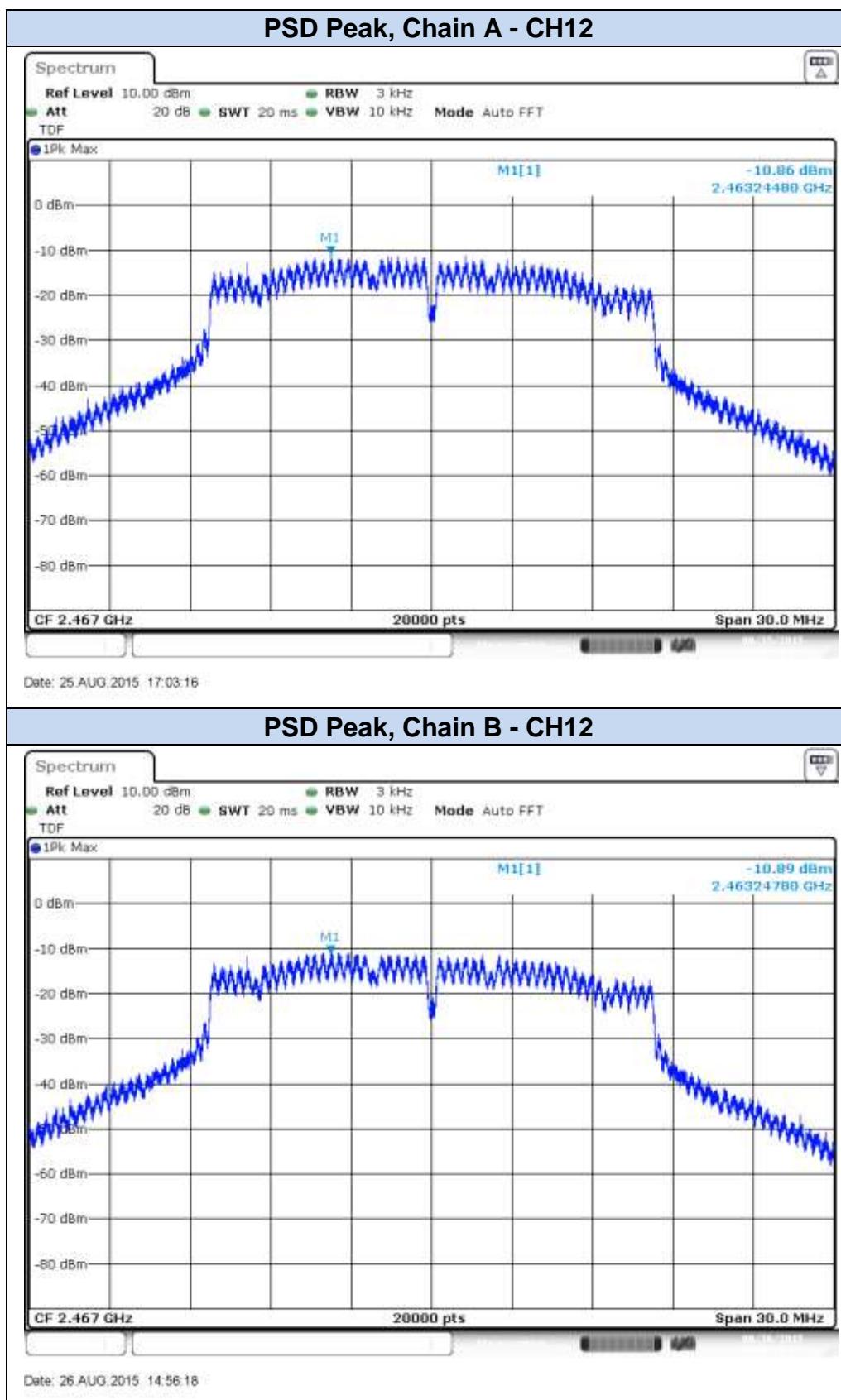


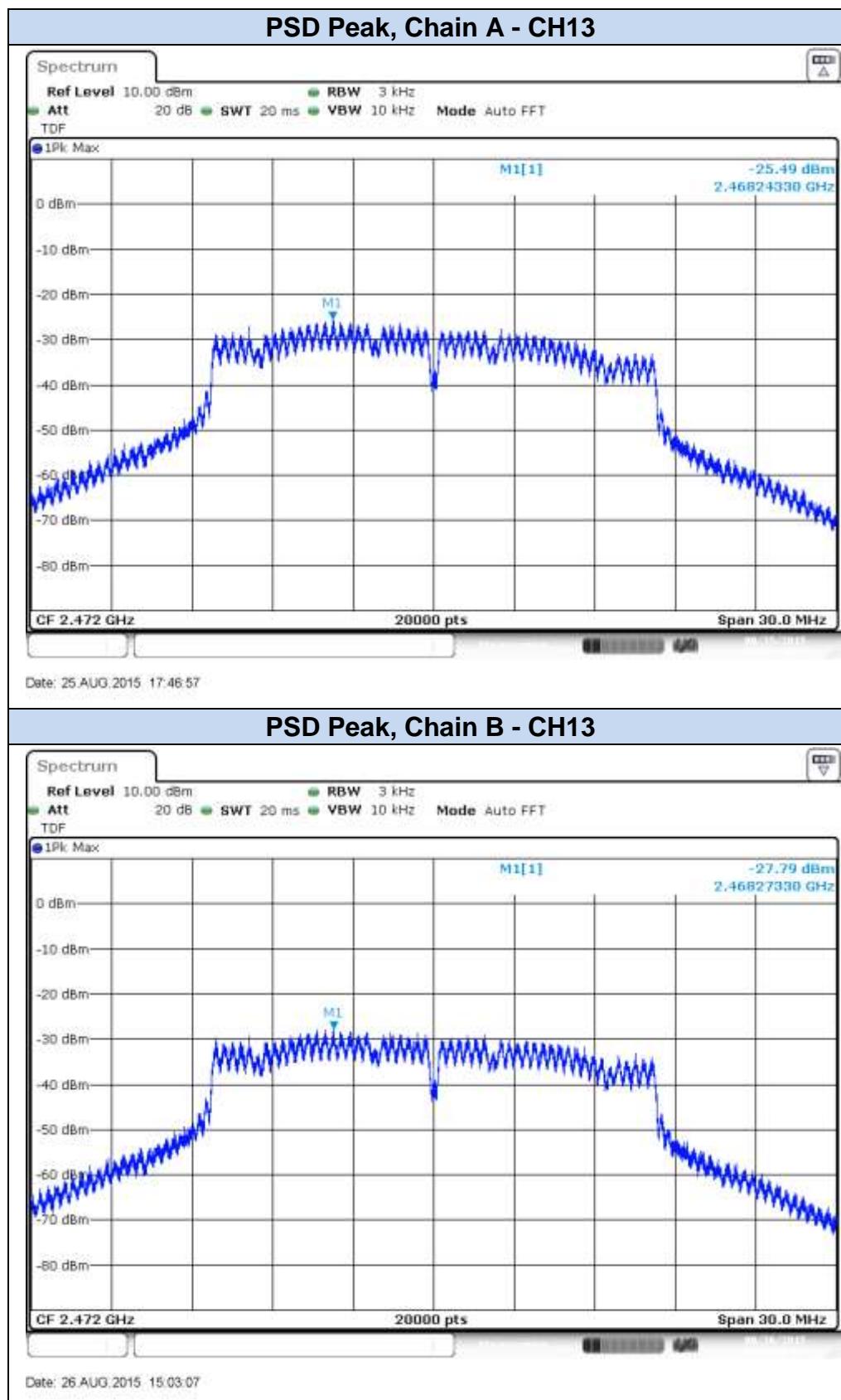
802.11g, 6Mbps





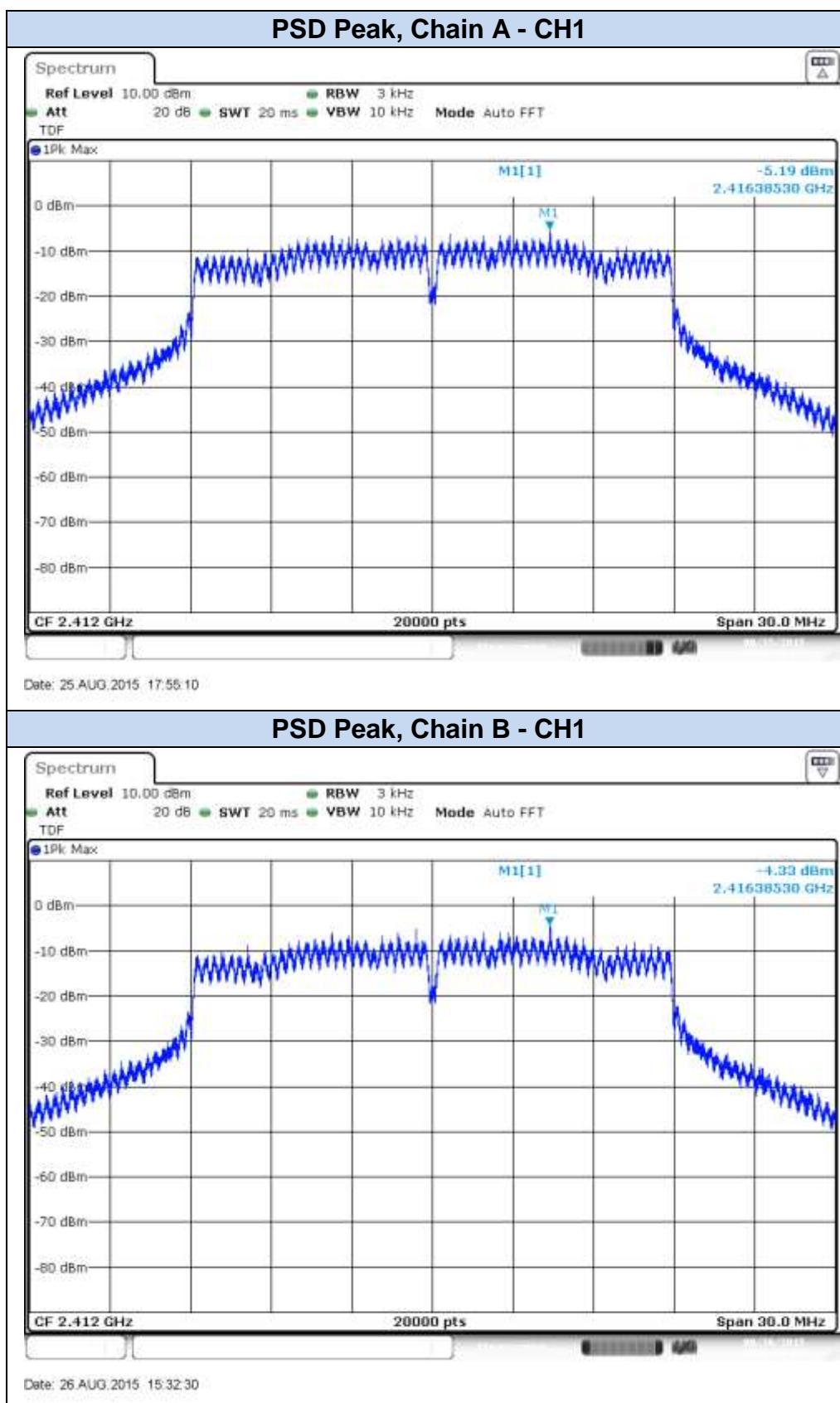


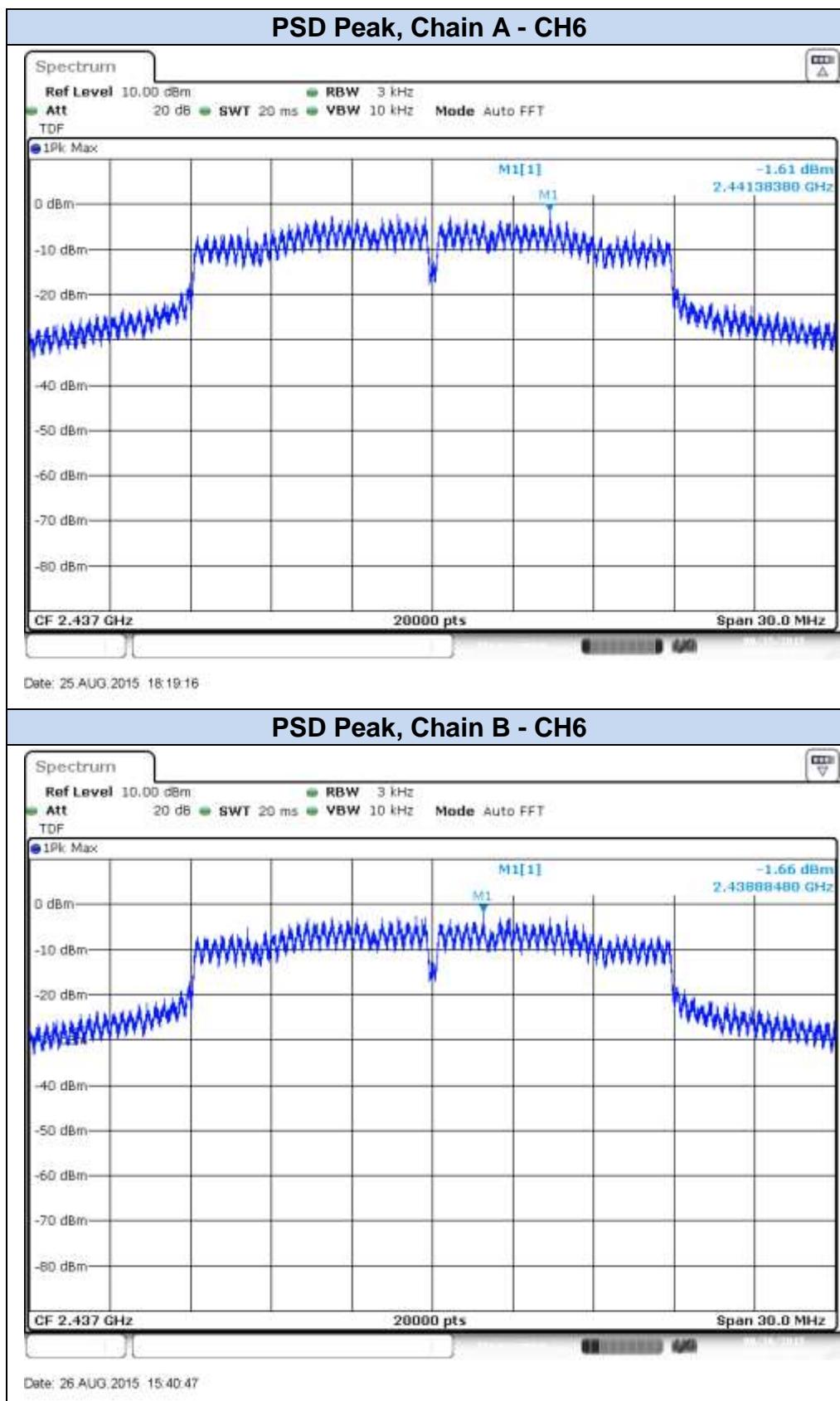


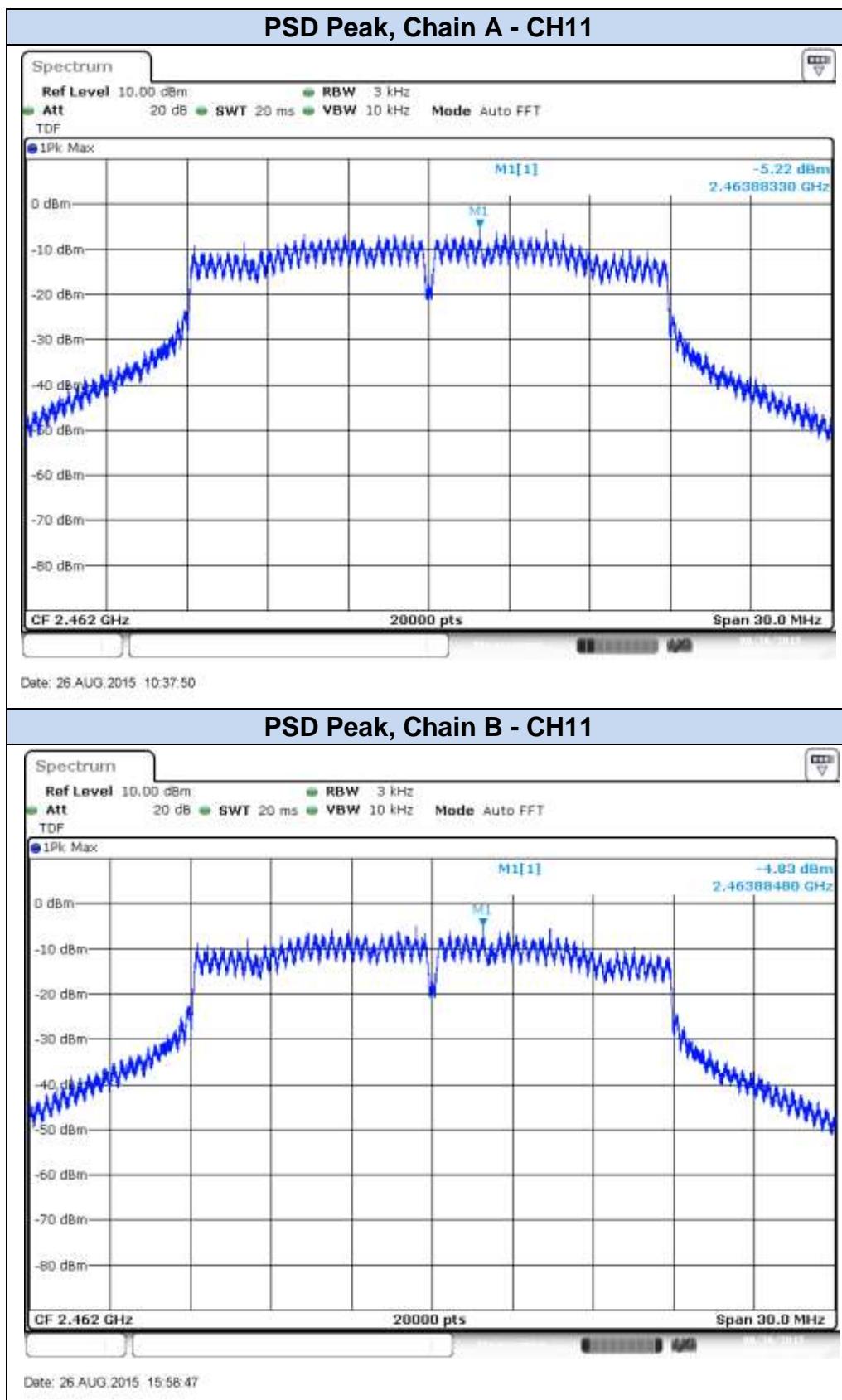


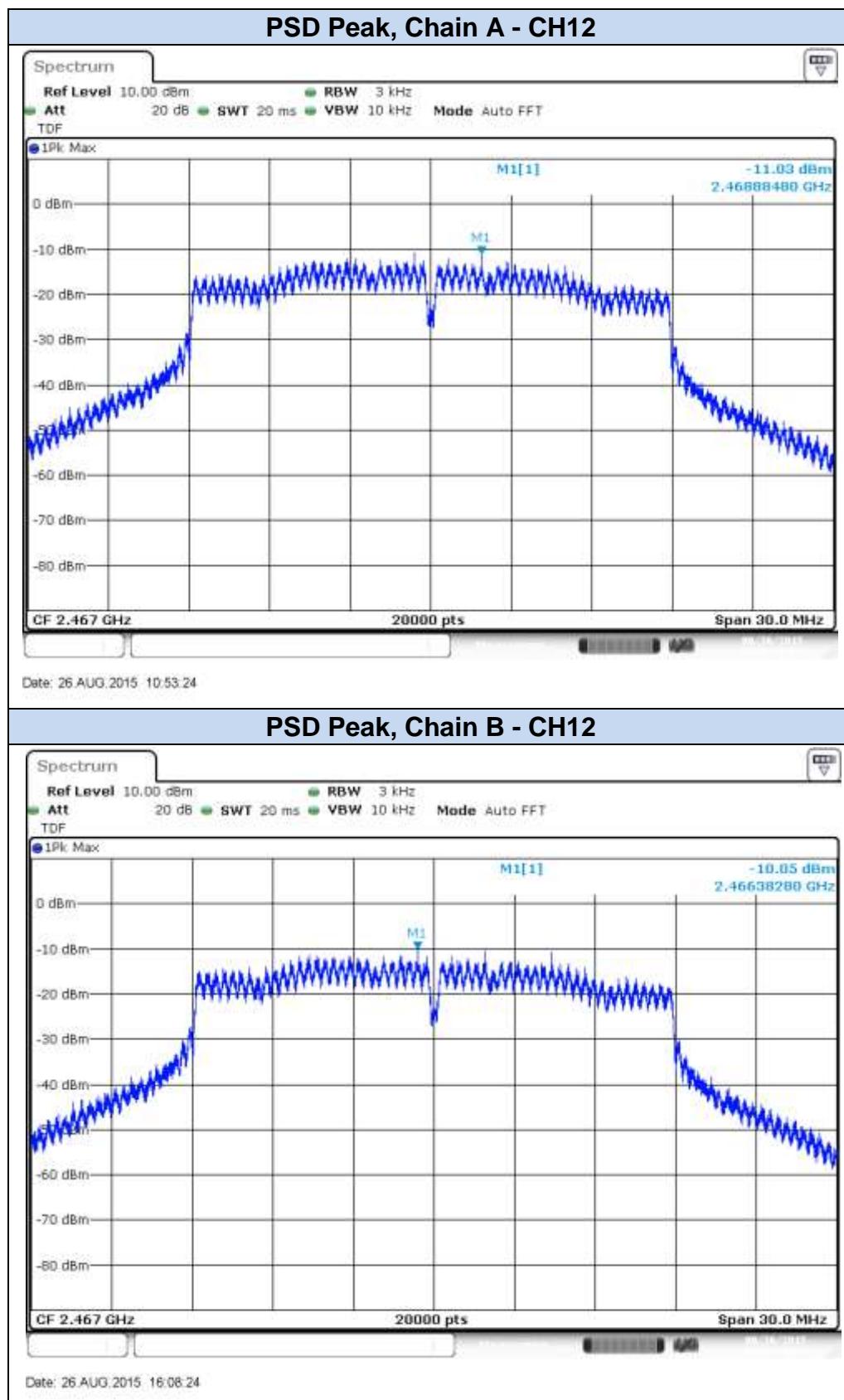


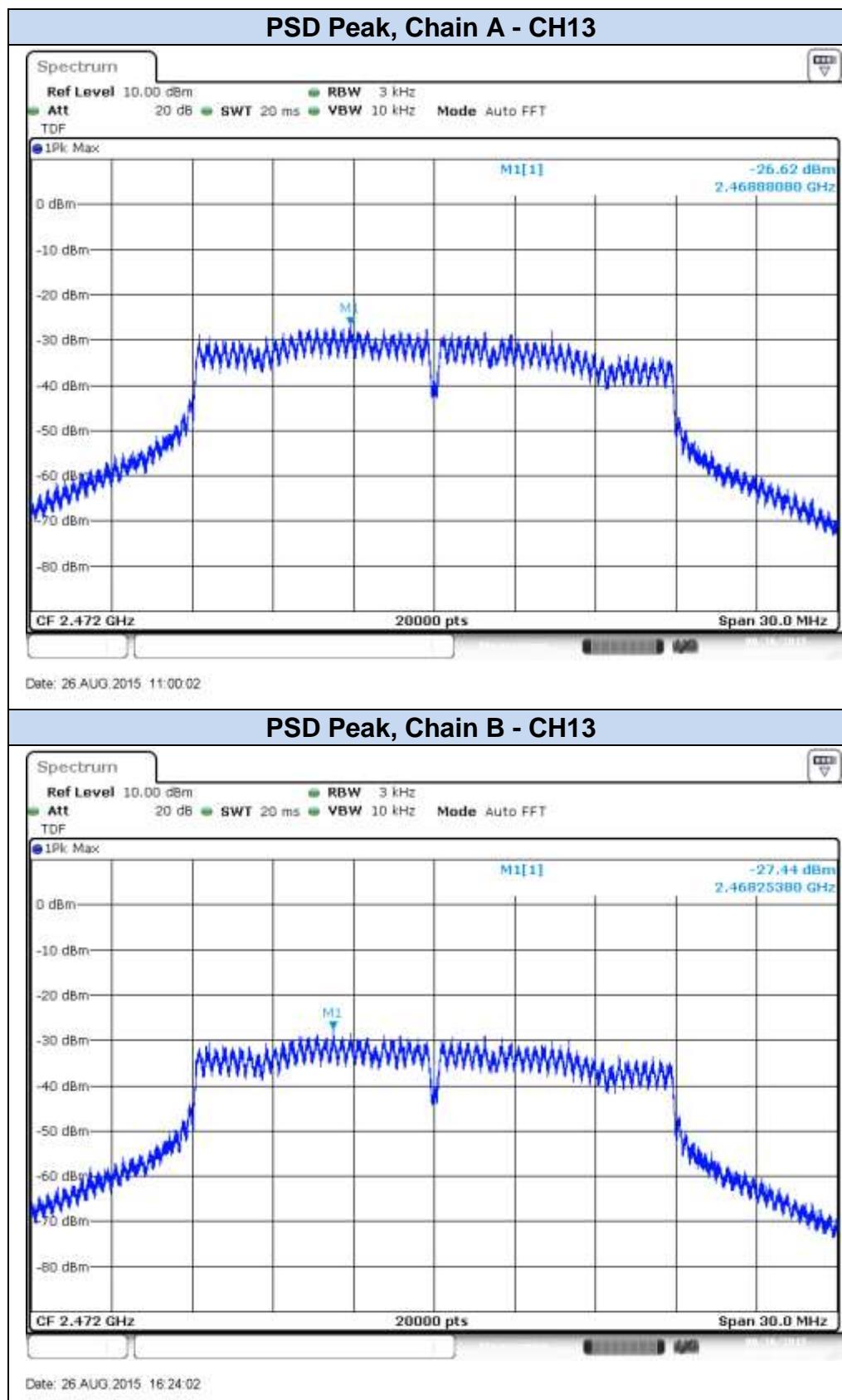
802.11n20, HT0 (SISO)





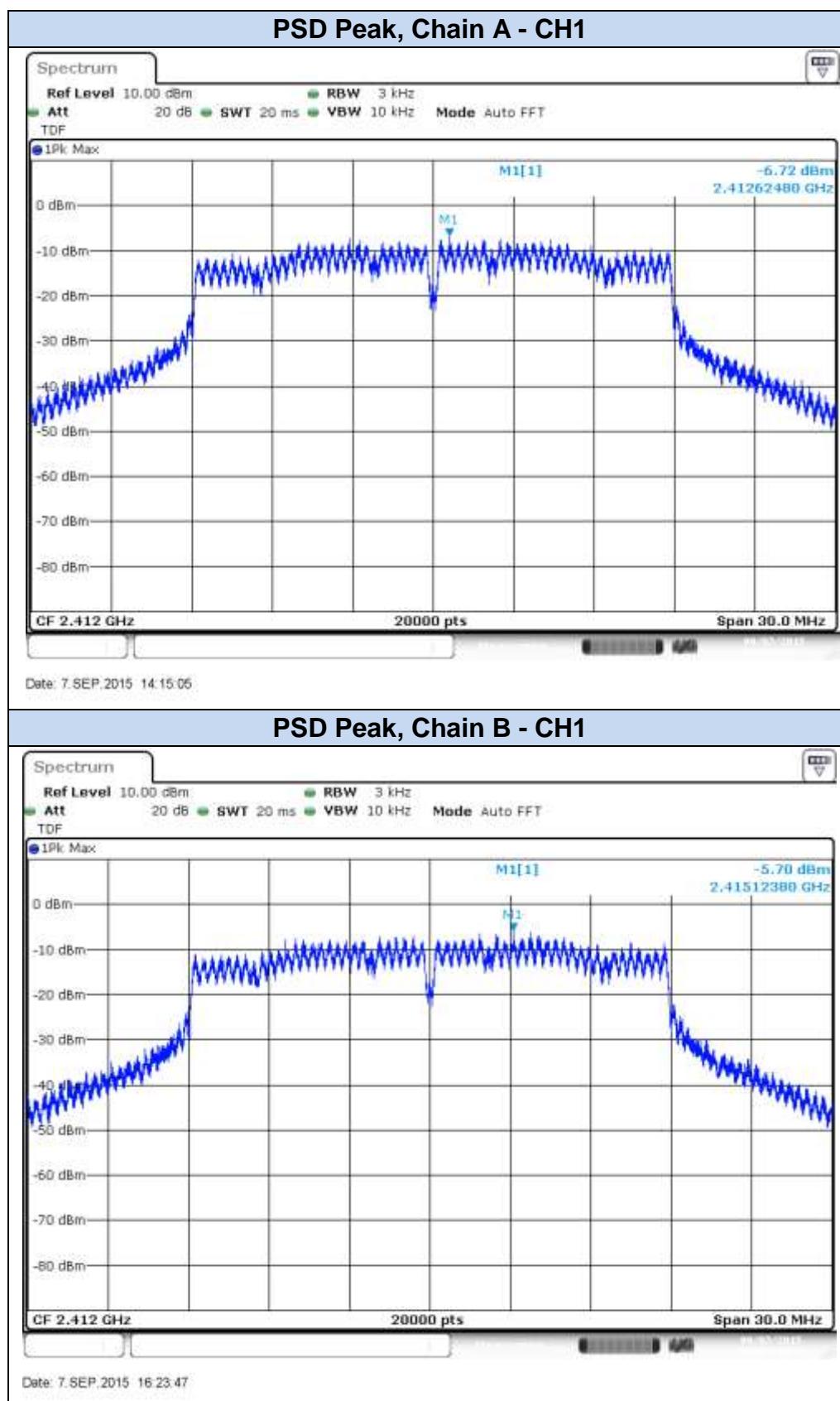


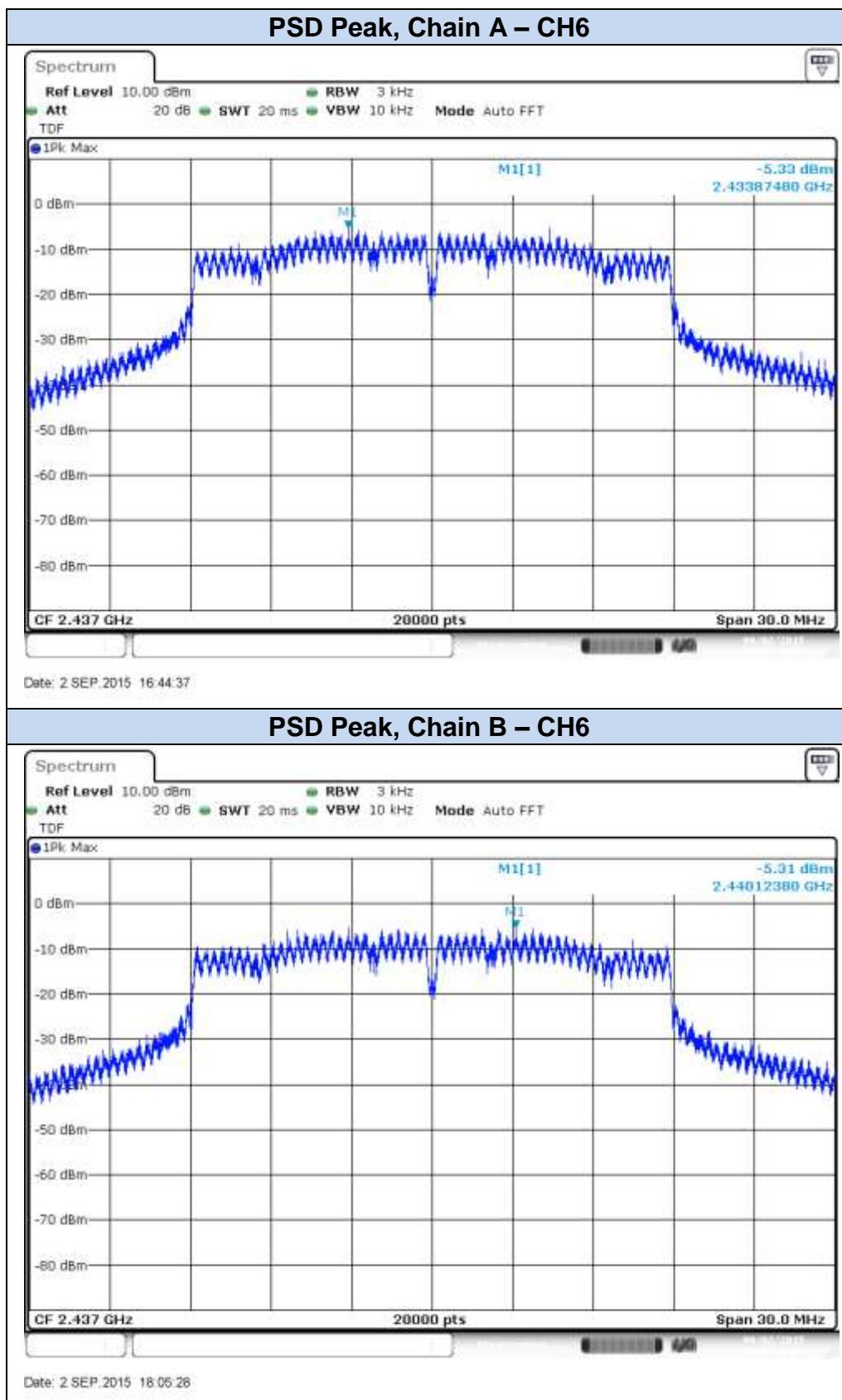


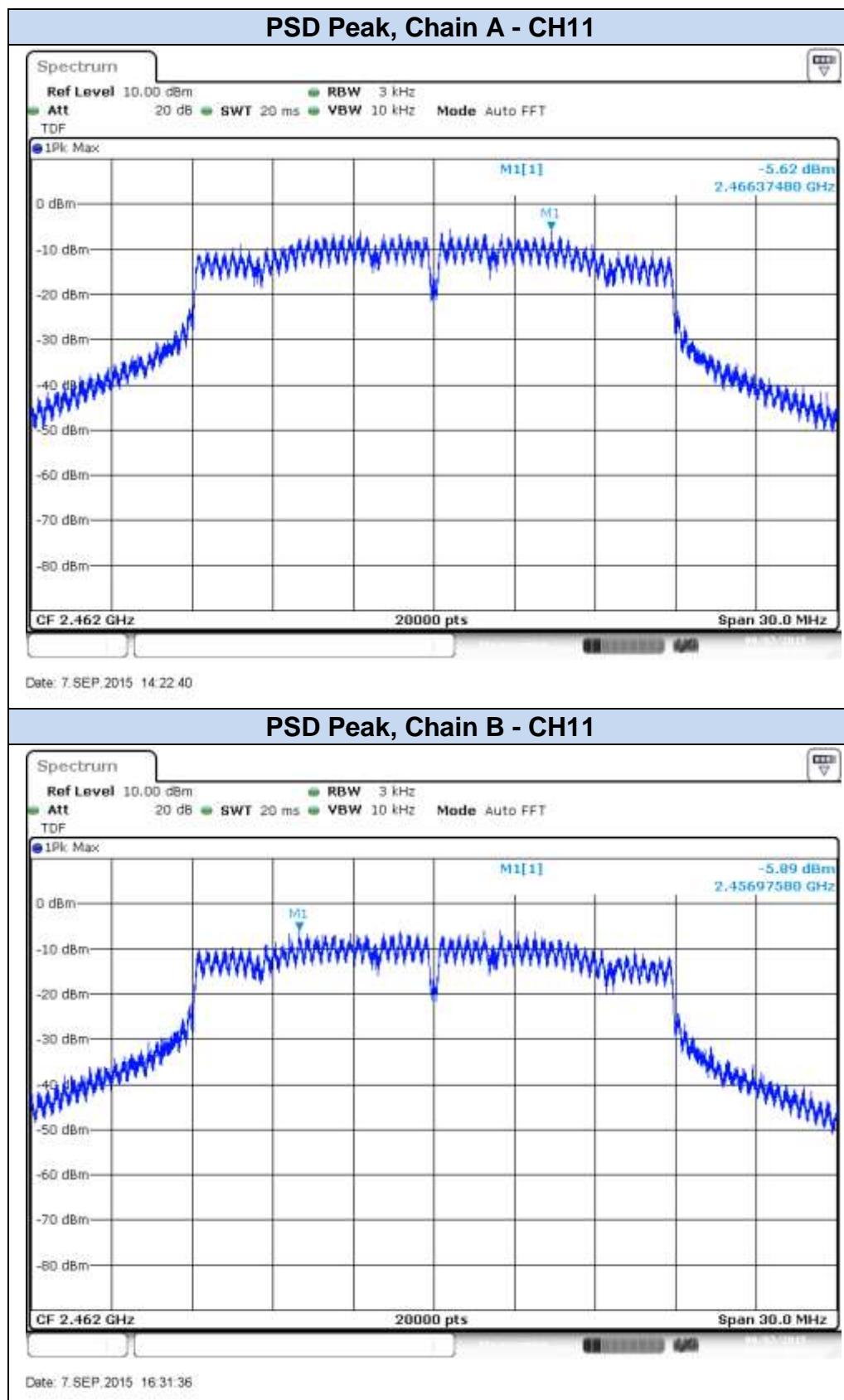


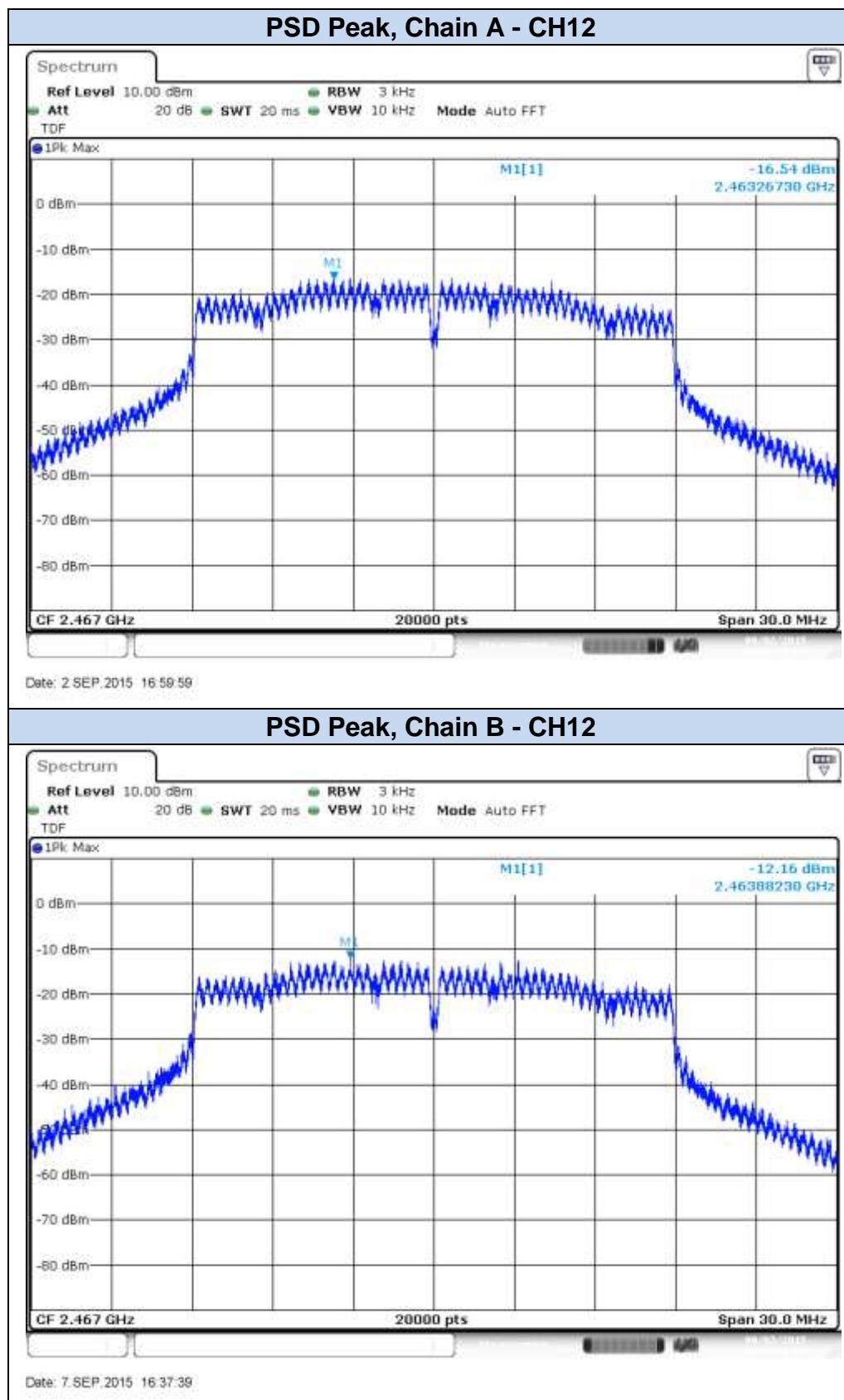


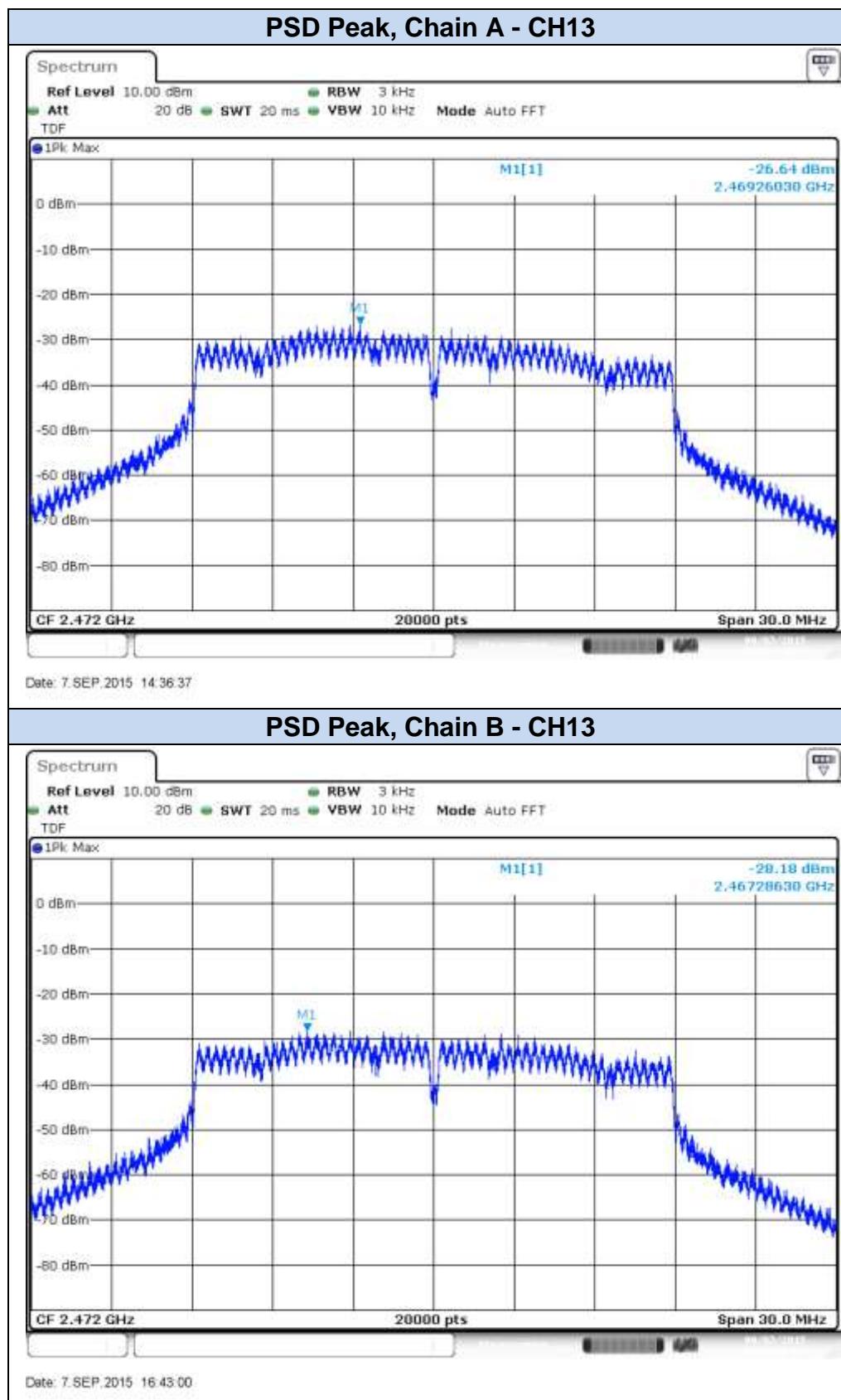
802.11n20, HT8 (MIMO)



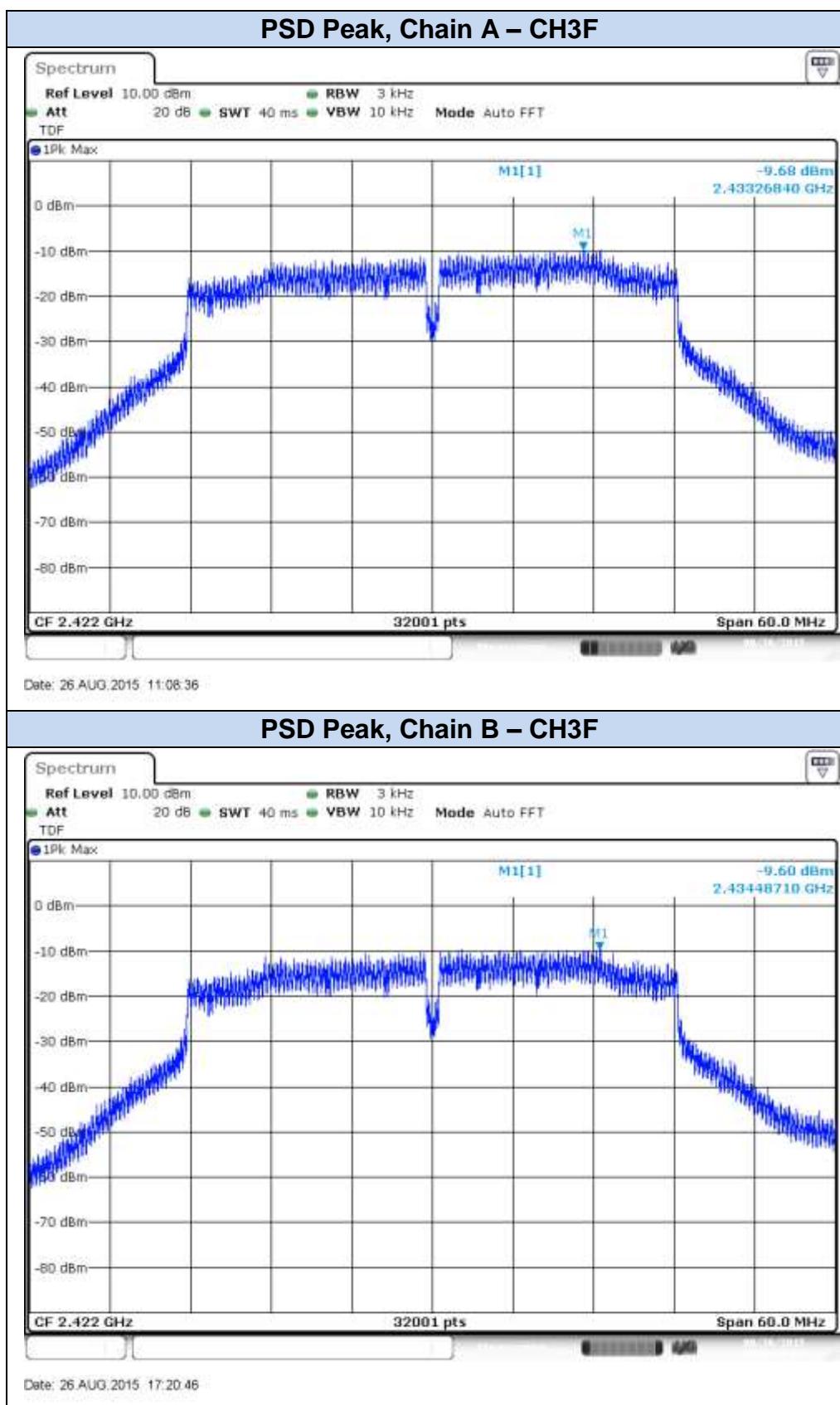


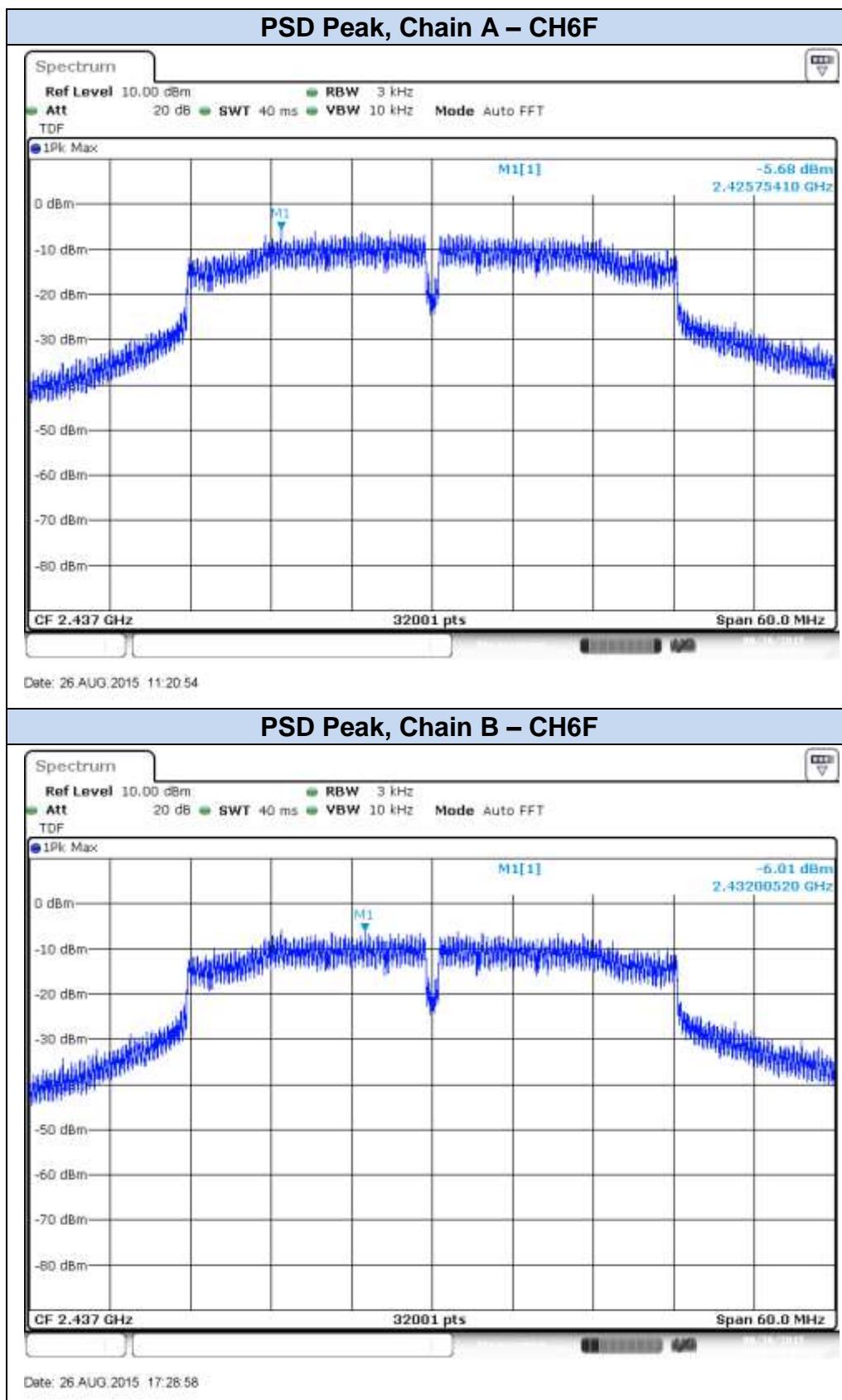


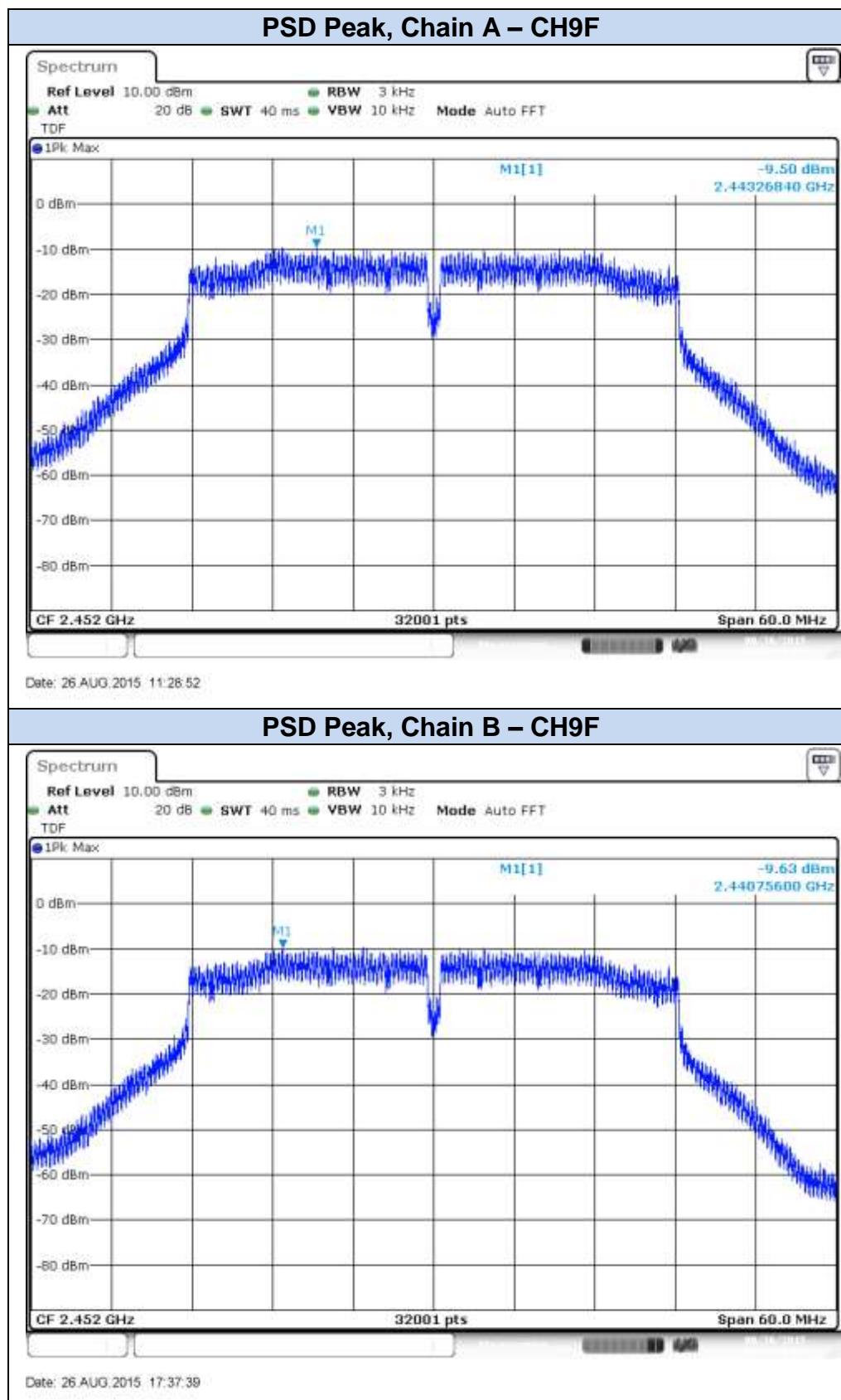


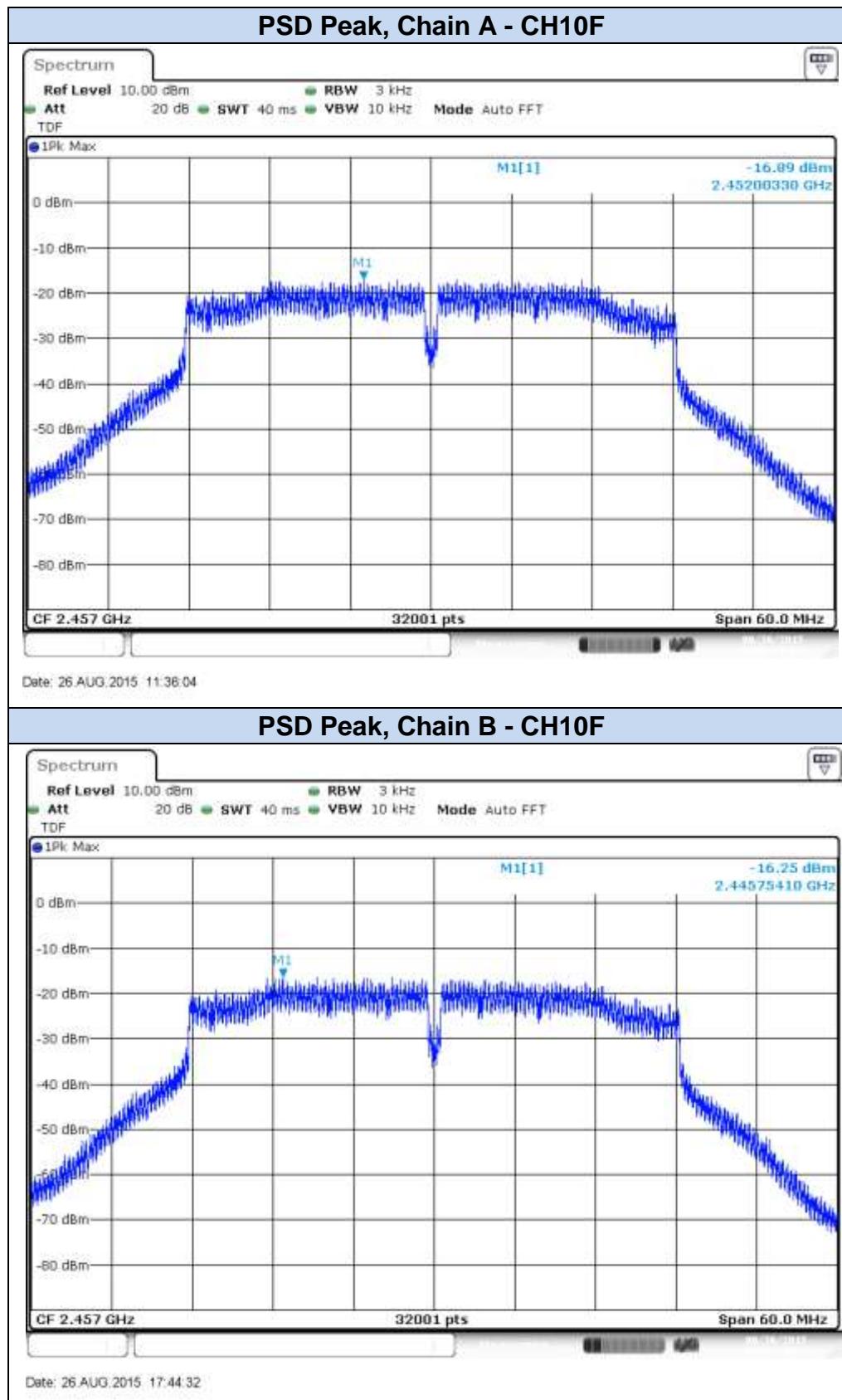


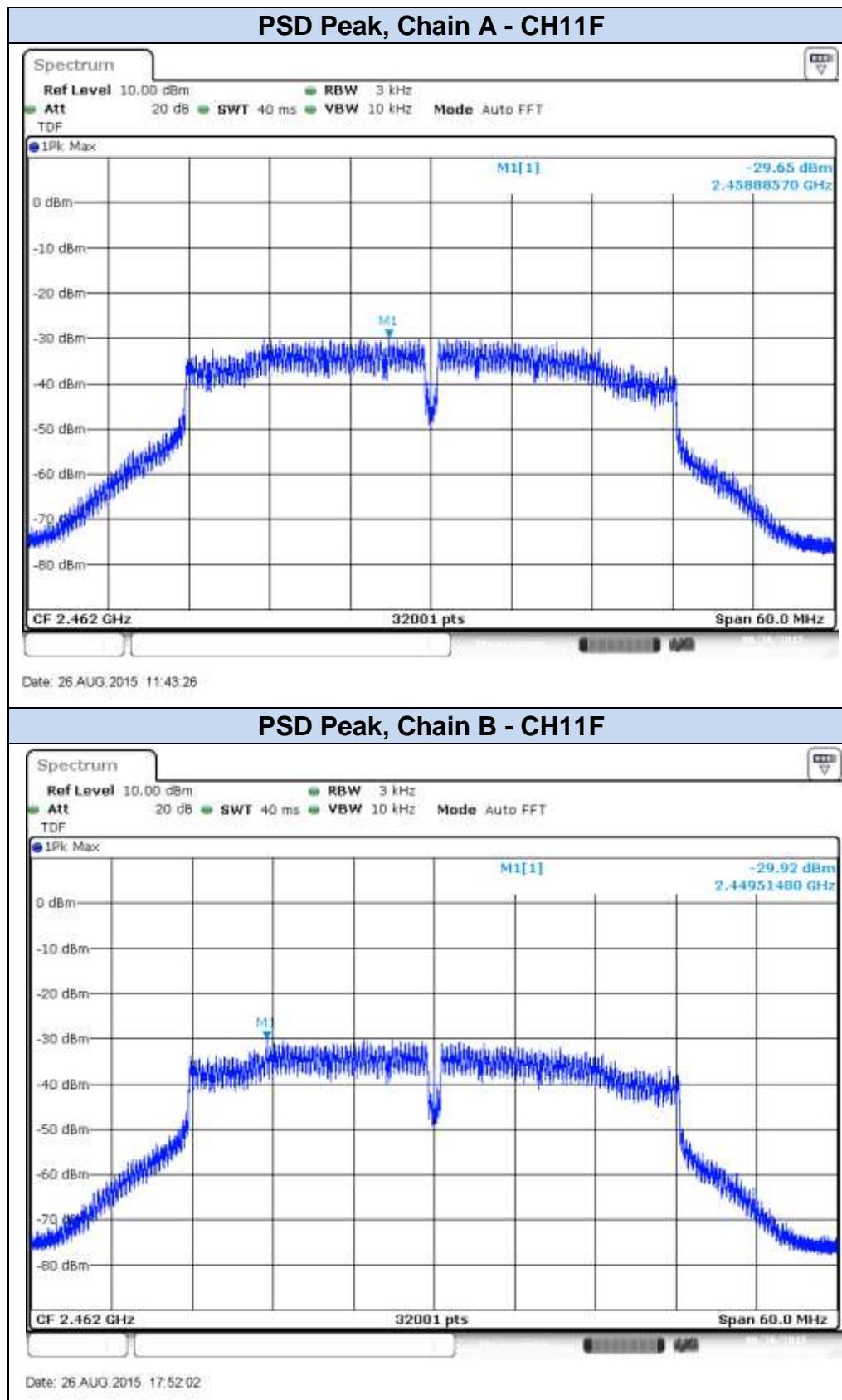
802.11n40, HT0 (SISO)



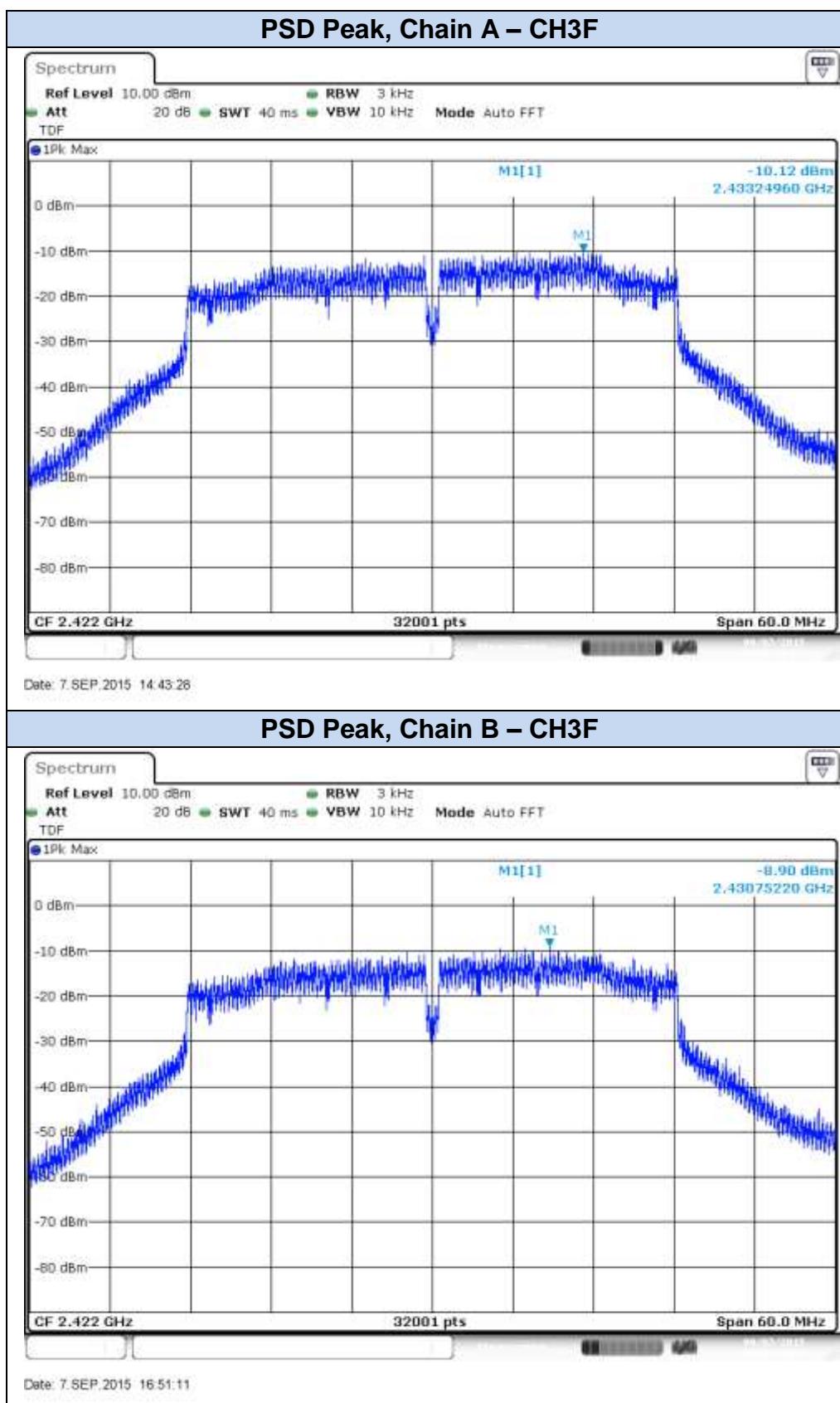


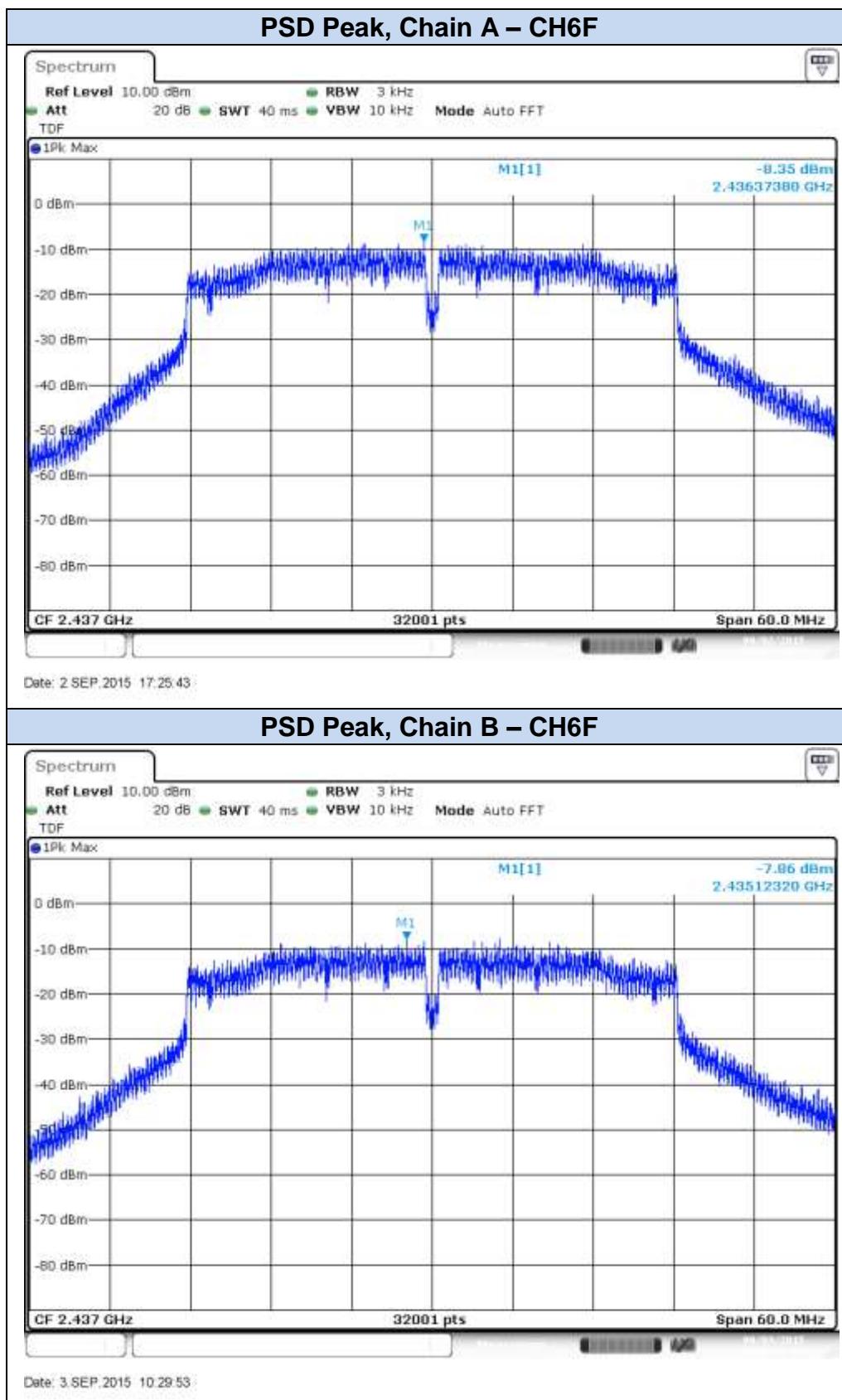


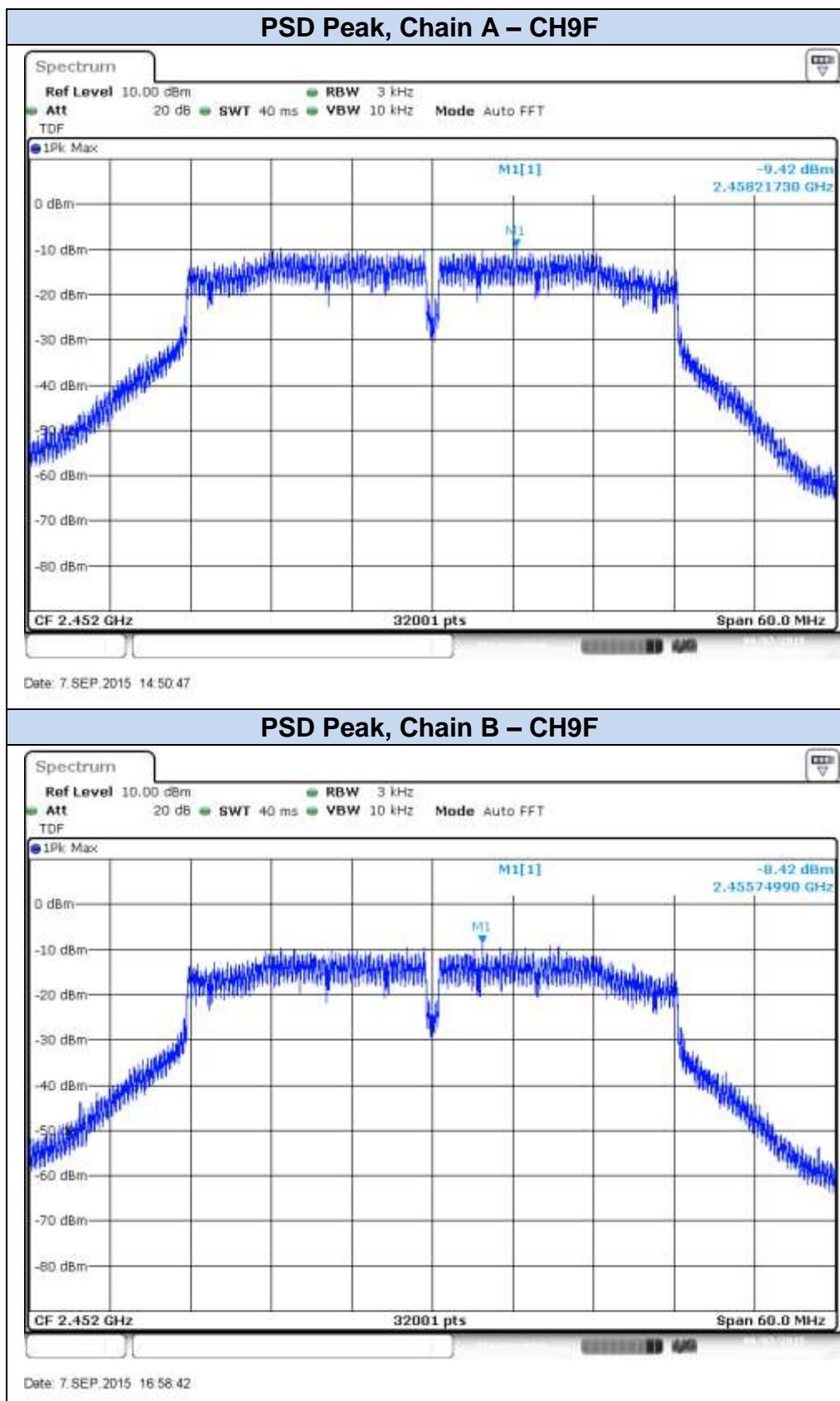


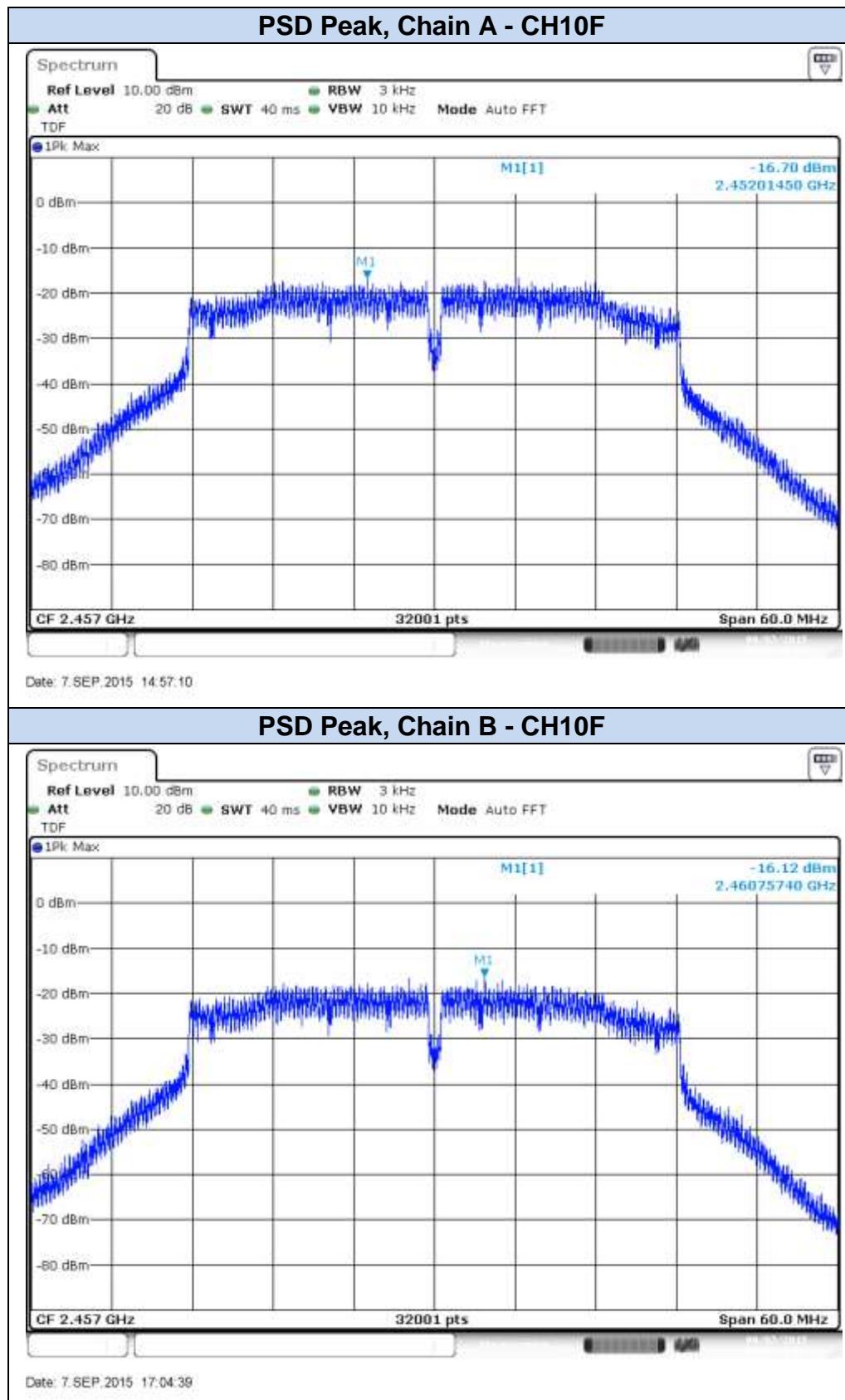


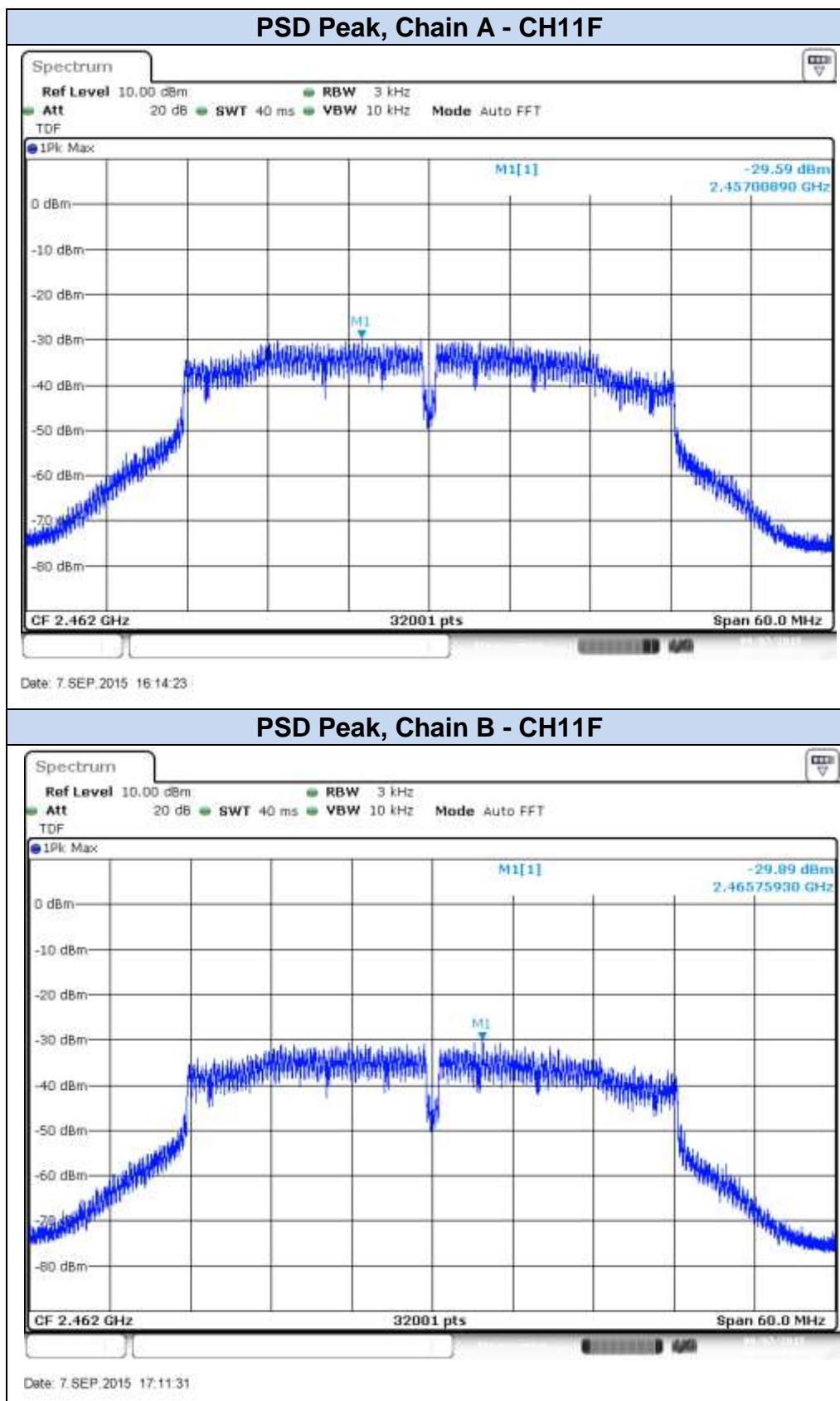
802.11n40. HT8 (MIMO)











B.5 Radiated spurious emission

Standard references:

FCC part	RSS part	Limits																																			
15.247 (d)	RSS-247 Clause 5.5	<p>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):</p> <table border="1"> <thead> <tr> <th>Freq Range (MHz)</th> <th>Field Strength (μV/m)</th> <th>Field Strength ($\text{dB}\mu$V/m)</th> <th>Meas. Distance (m)</th> </tr> </thead> <tbody> <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>960-25000</td> <td>500</td> <td>54</td> <td>3</td> </tr> </tbody> </table> <p>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.</p>				Freq Range (MHz)	Field Strength (μ V/m)	Field Strength ($\text{dB}\mu$ V/m)	Meas. 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	960-25000	500	54	3
Freq Range (MHz)	Field Strength (μ V/m)	Field Strength ($\text{dB}\mu$ V/m)	Meas. 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																																		
960-25000	500	54	3																																		

Test procedure:

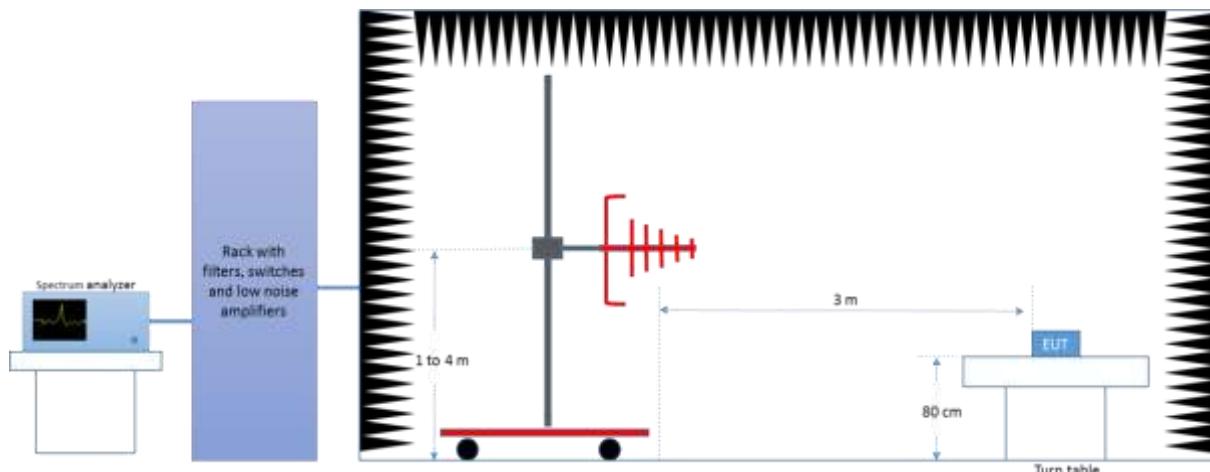
The setups below were used to measure the radiated spurious emissions.

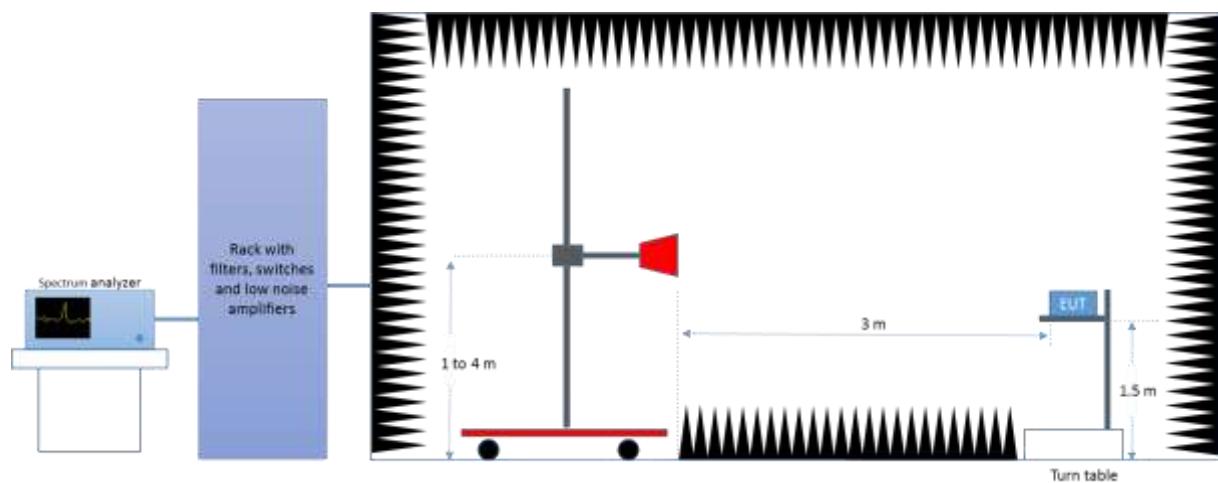
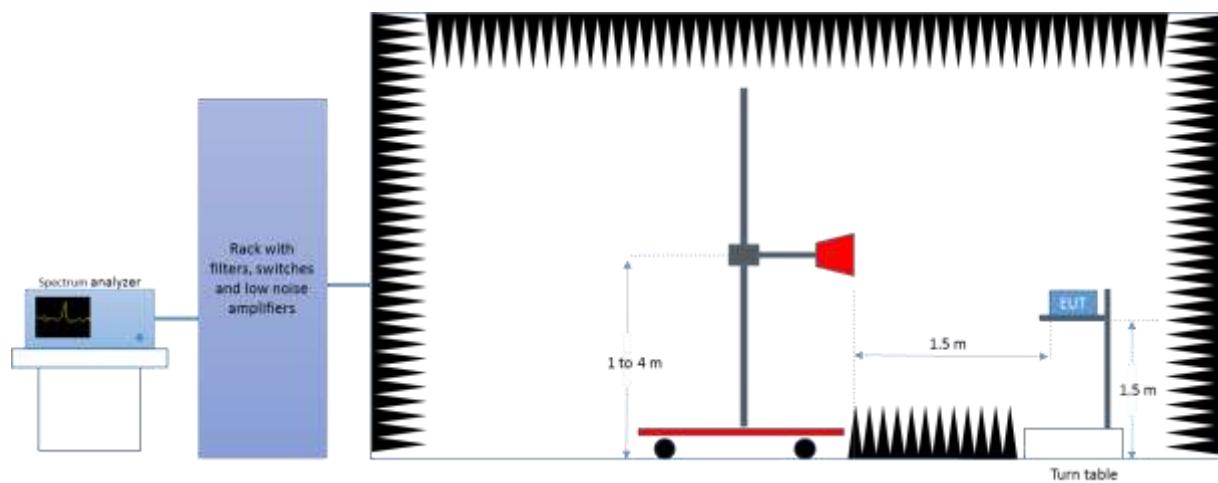
Depending of the frequency range and bands being tested, different antennas and filters were used.

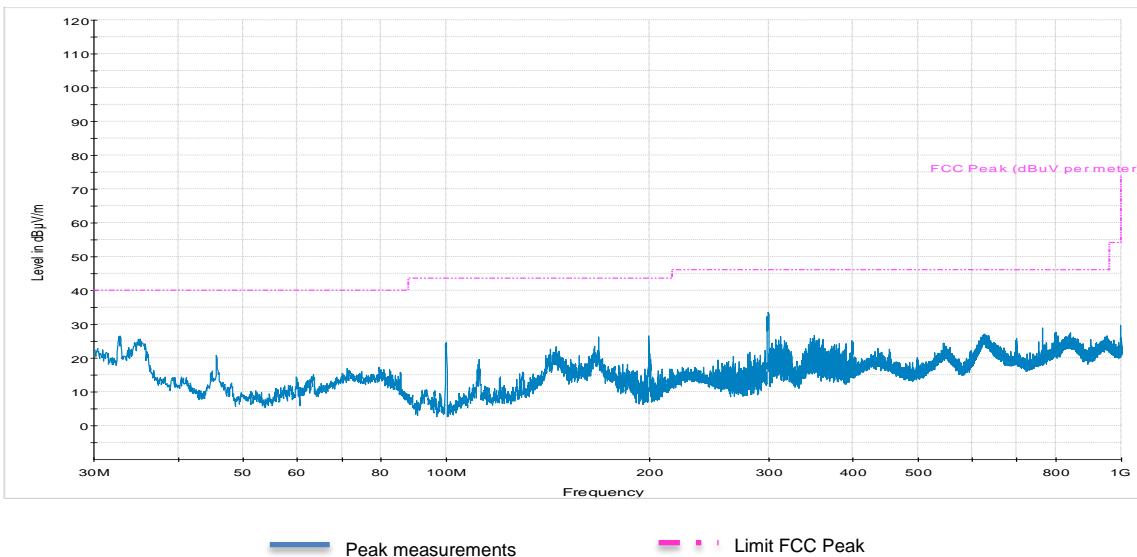
The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

The radiated spurious emissions were measured on the worst case configuration selected from the chapter *B.2 Maximum Output Power and antenna gain* and using the lowest, middle and highest channels.

Radiated Setup < 1GHz



Radiated Setup 1GHz - 18GHz*Radiated Setup > 18GHz*

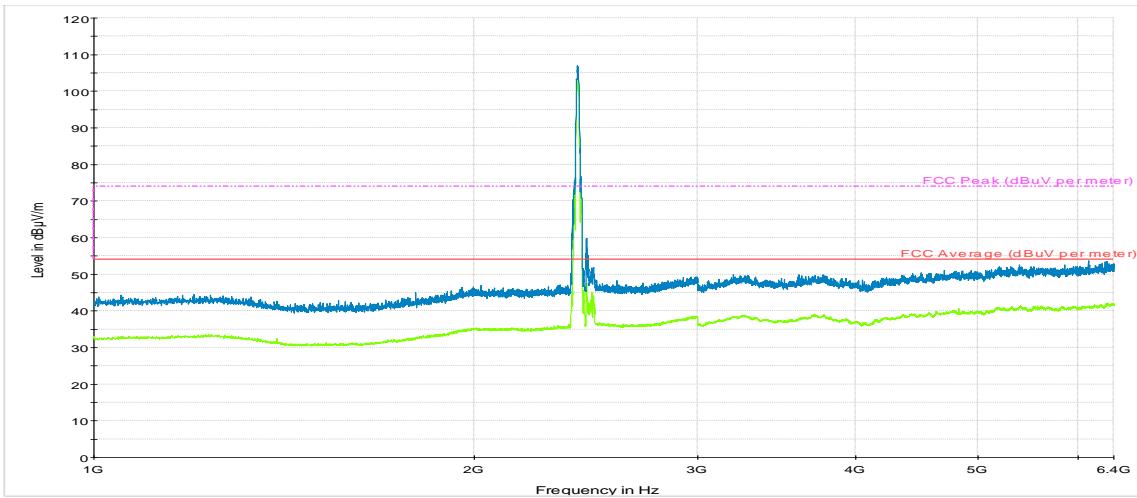
Test Results:**All modes****Radiated Spurious – 30MHz - 1GHz**

Frequency	Max Peak	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB
299	33	46	13

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

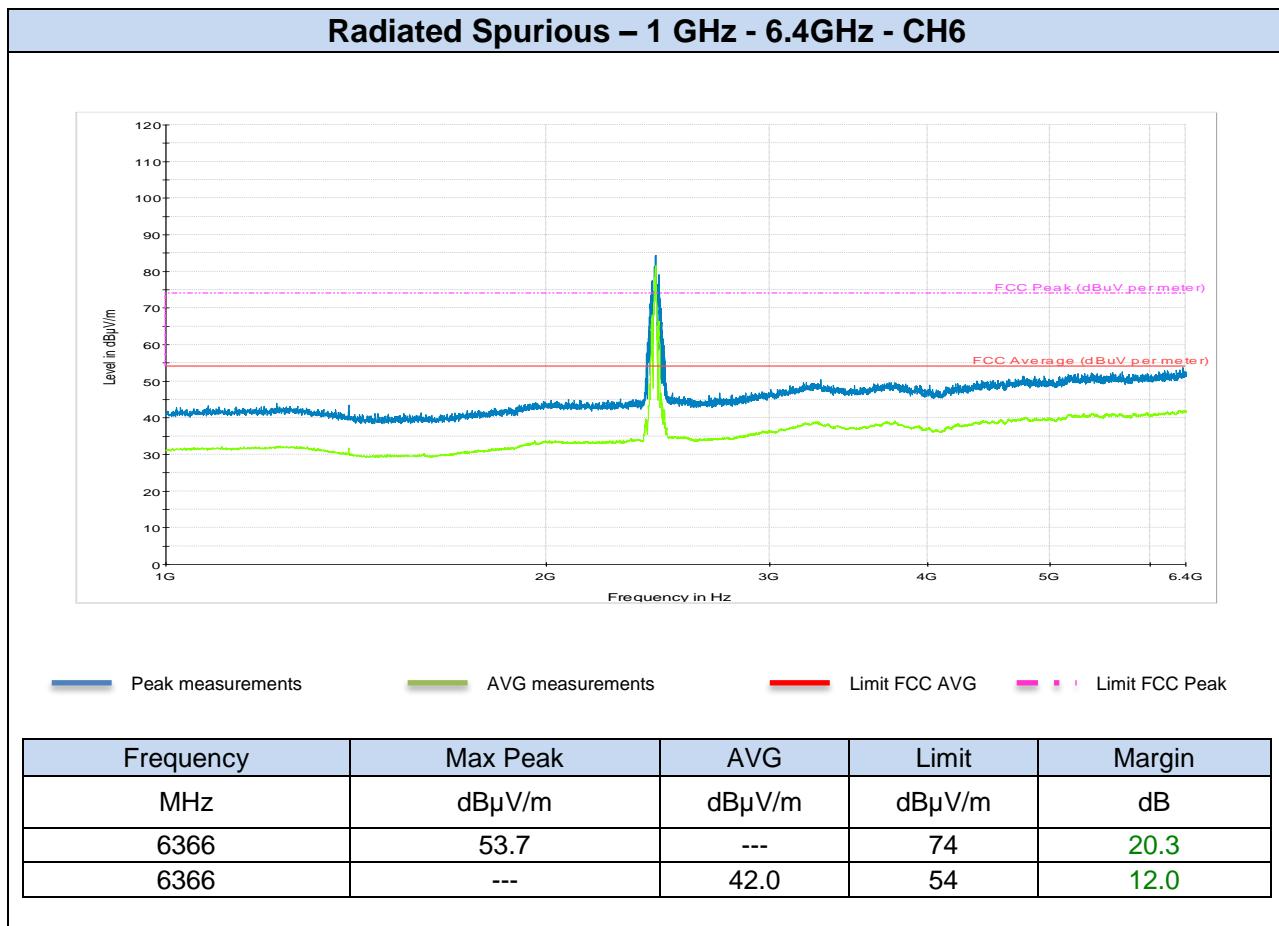
Note 2: No spurious signals were found in all modulations and channels tested.

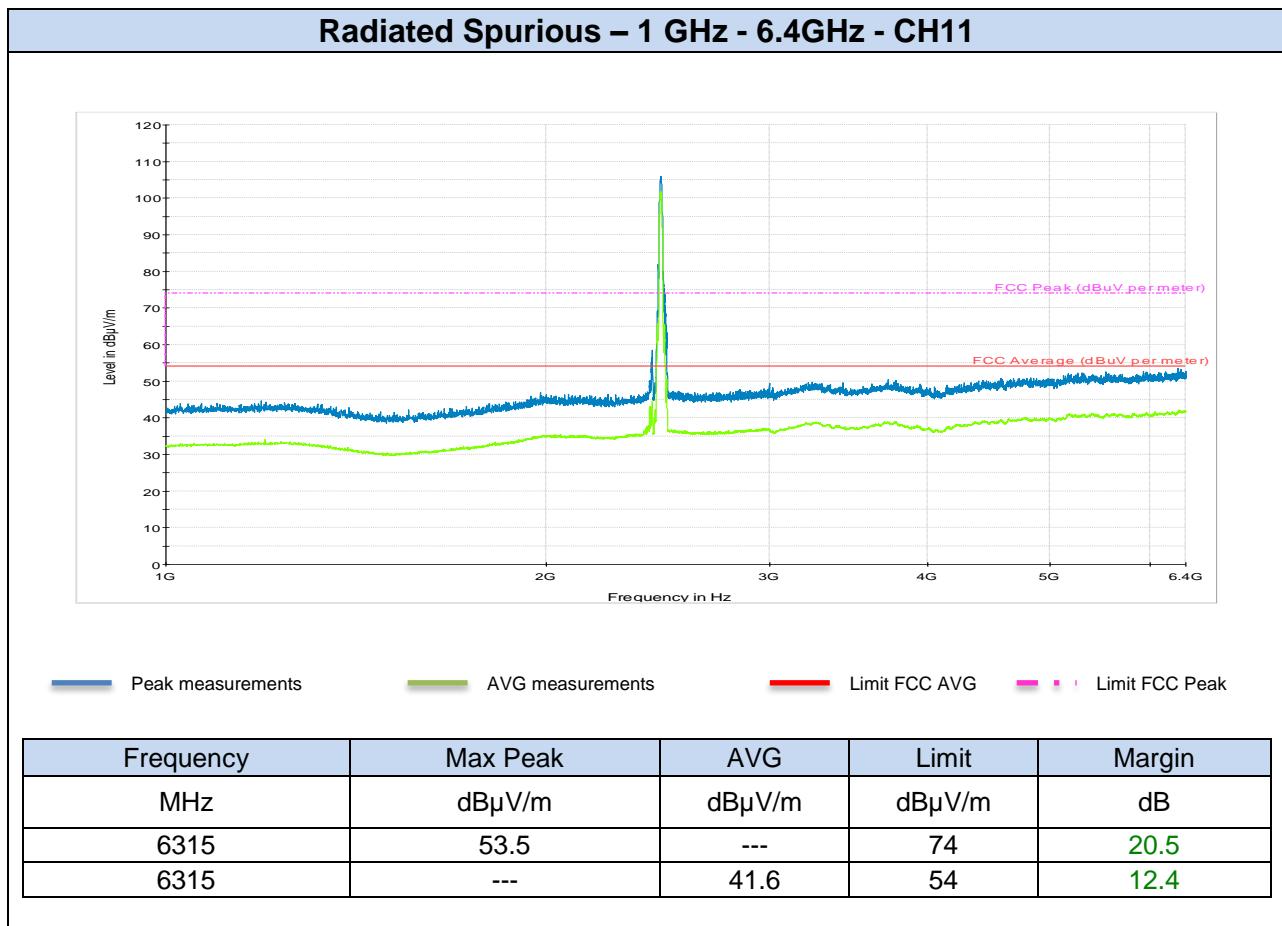
Note 3: This plot is valid for both SISO and MIMO modes.

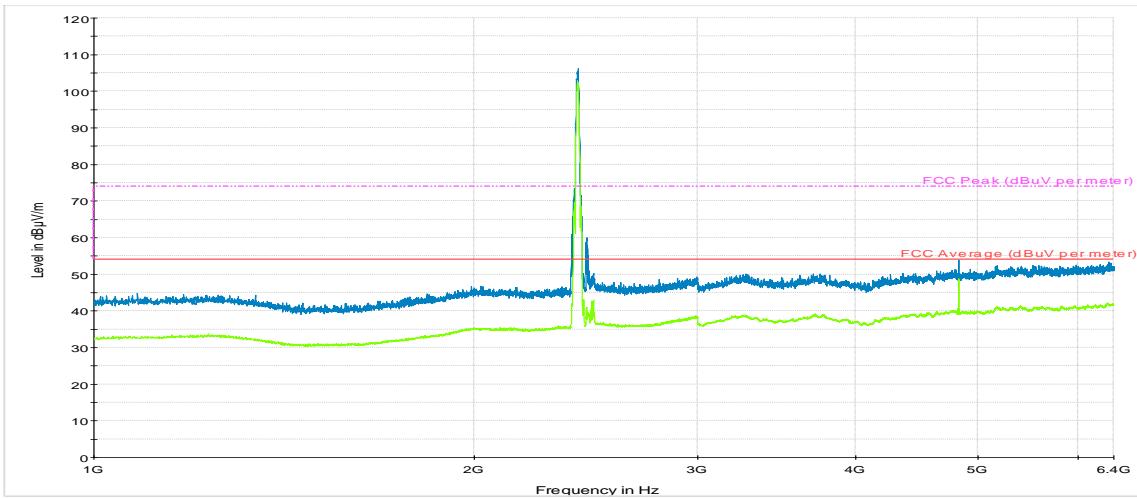
802.11b, 1Mbps, Chain A**Radiated Spurious – 1 GHz - 6.4GHz - CH1**

— Peak measurements — AVG measurements — Limit FCC AVG — Limit FCC Peak

Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
2964	49.2	---	74	24.8
2964	---	38.5	54	15.5

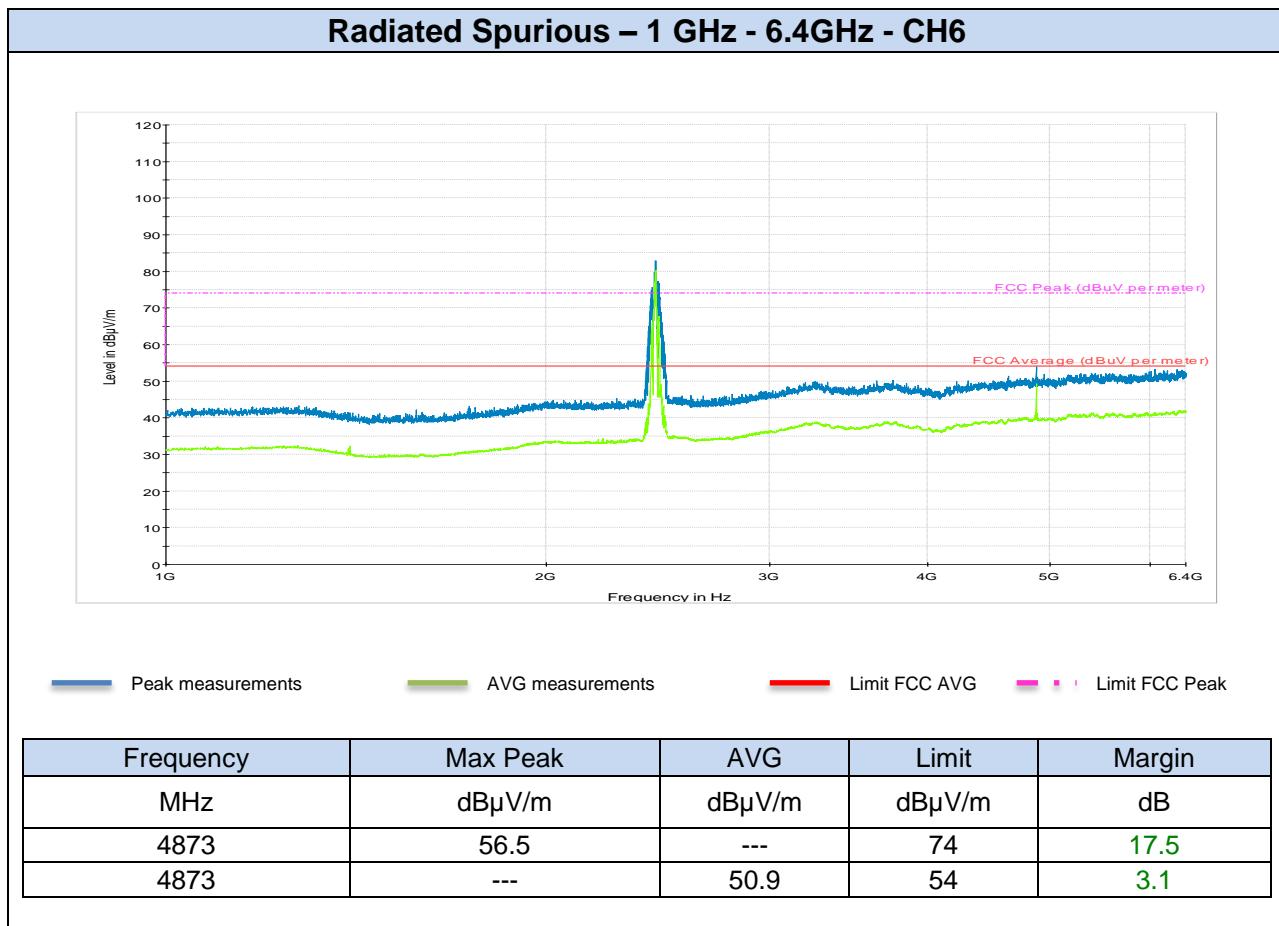


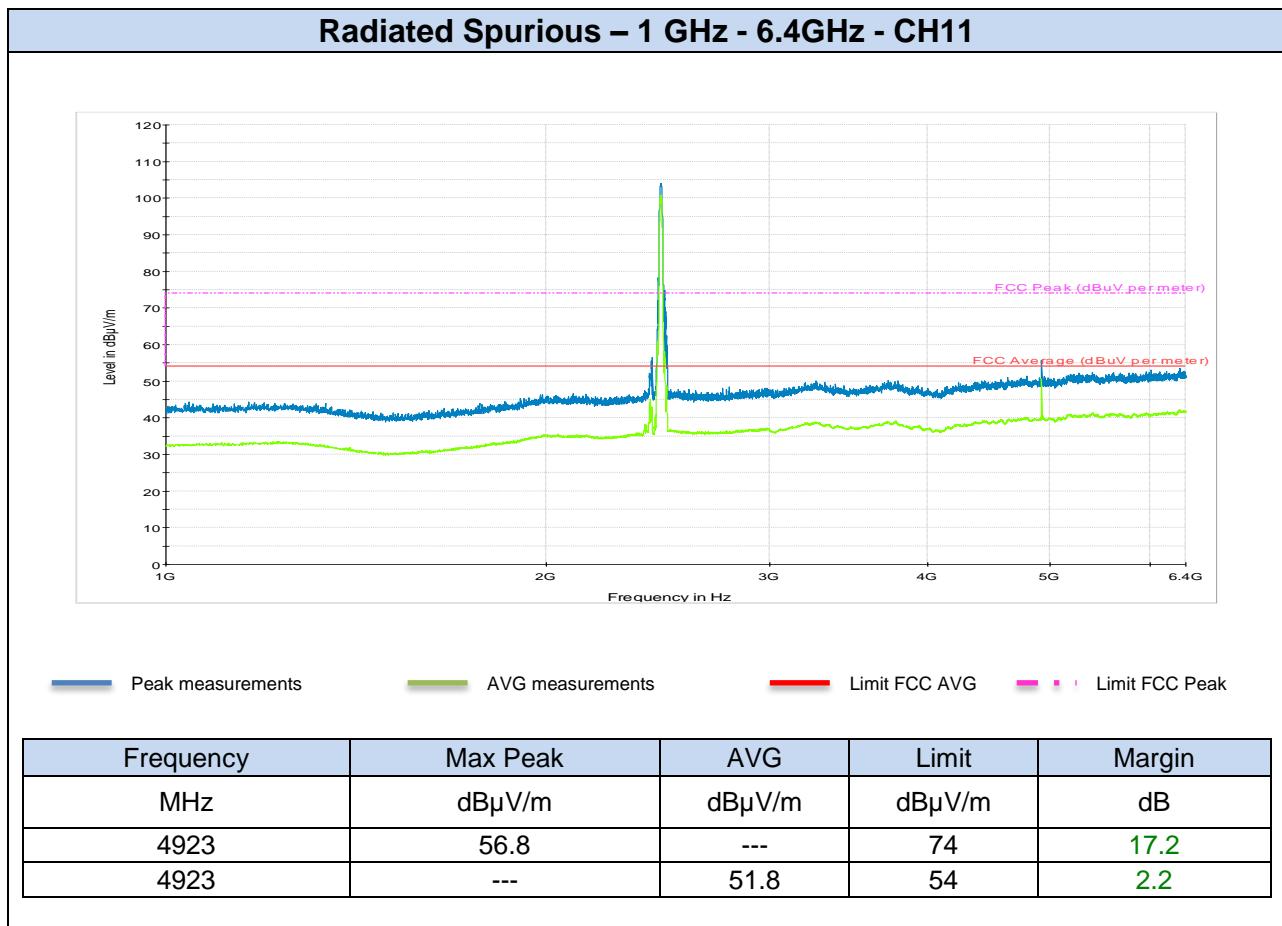


802.11b, 1Mbps, Chain B**Radiated Spurious – 1 GHz - 6.4GHz - CH1**

— Peak measurements — AVG measurements — Limit FCC AVG — Limit FCC Peak

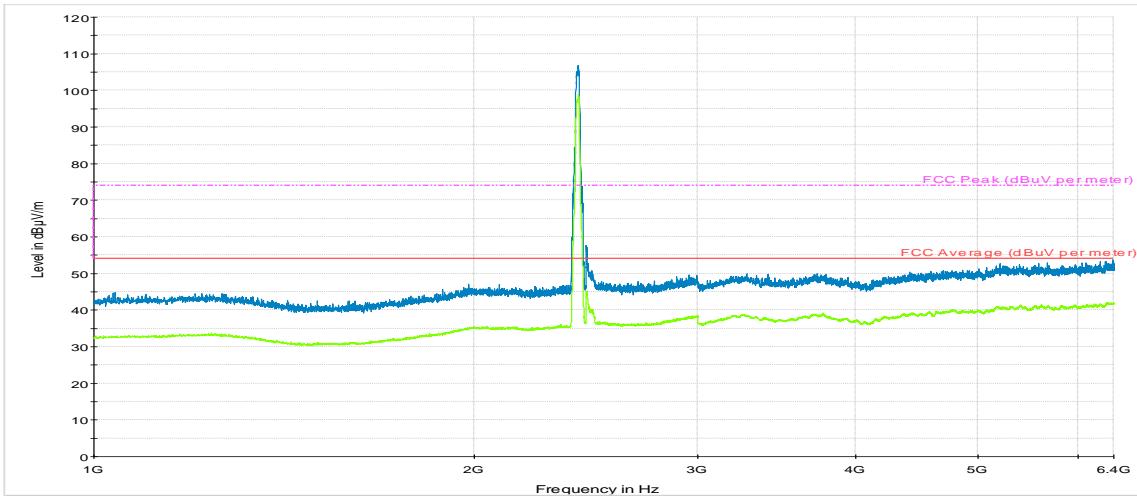
Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
4823	56.1	---	74	17.9
4823	---	50.8	54	3.2





802.11g, 6Mbps, Chain A

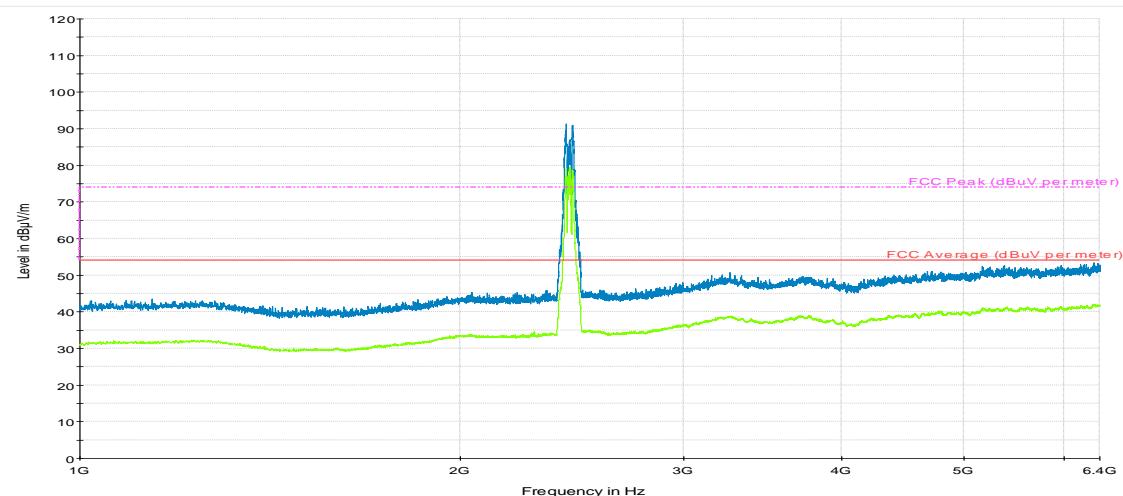
Radiated Spurious – 1 GHz - 6.4GHz - CH1



— Peak measurements — AVG measurements — Limit FCC AVG — Limit FCC Peak

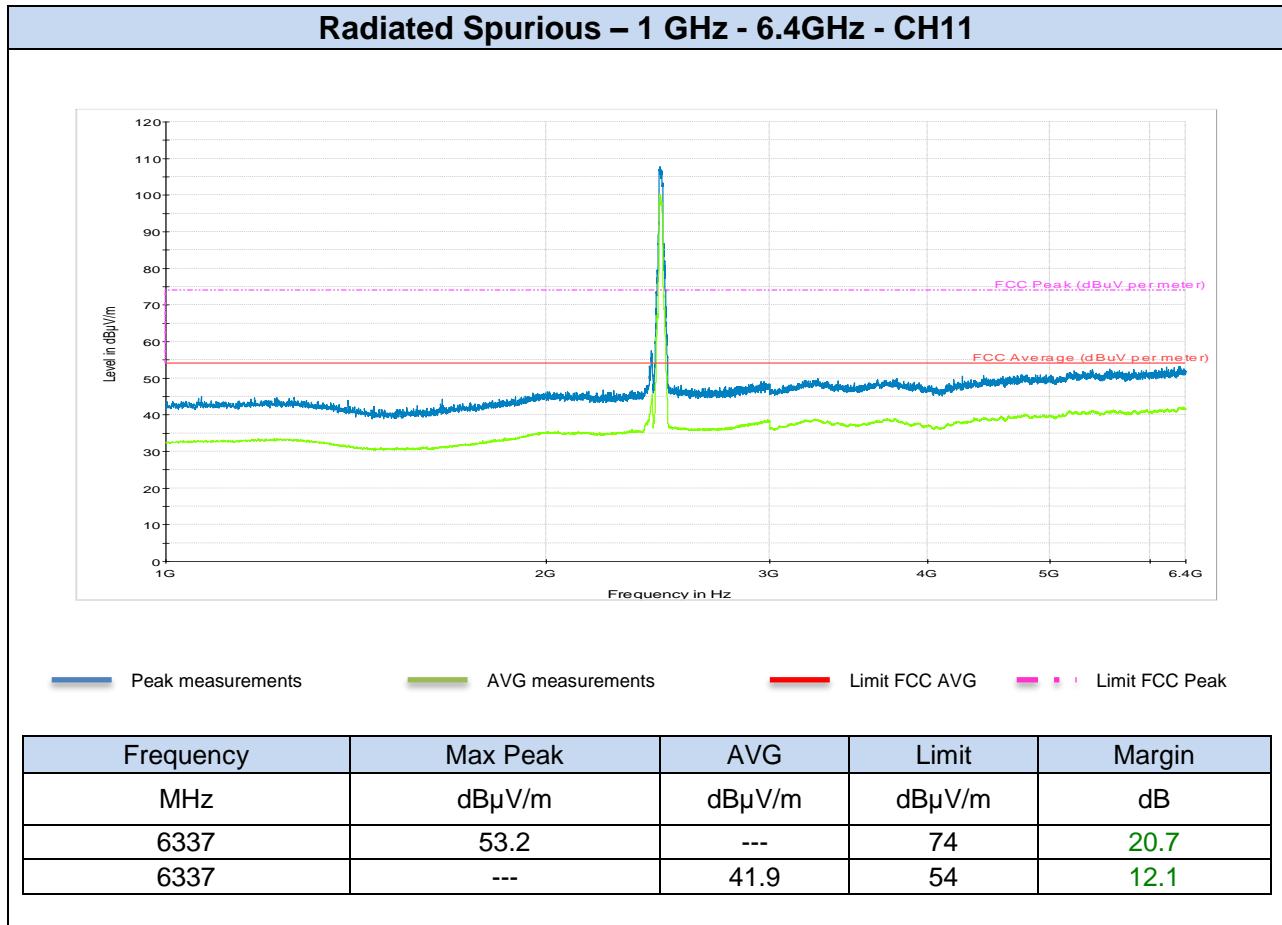
Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6306	53.2	---	74	20.8
6306	---	42.0	54	12.0

Radiated Spurious – 1 GHz - 6.4GHz - CH6



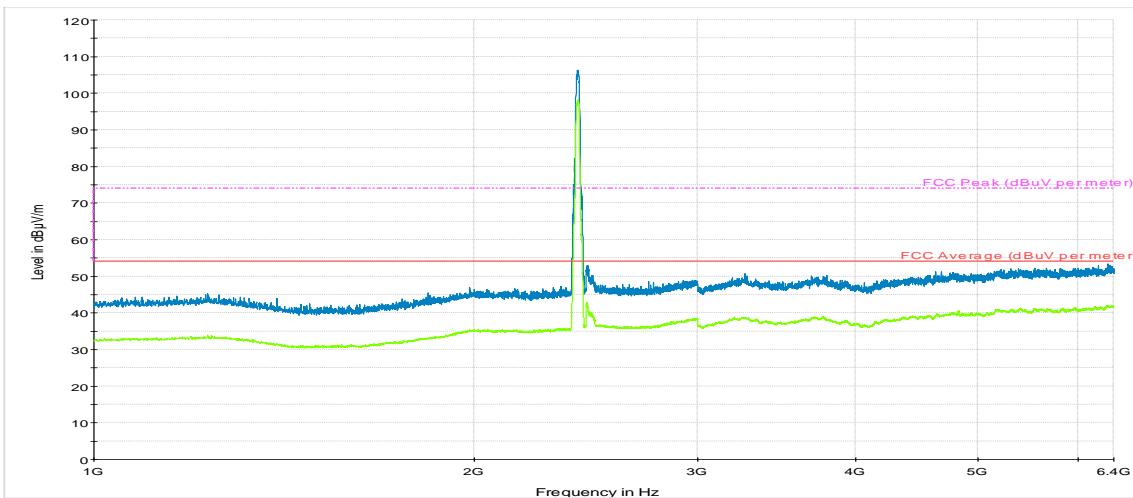
— Peak measurements — AVG measurements — Limit FCC AVG — Limit FCC Peak

Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6326	53.4	---	74	20.6
6326	---	42.0	54	12.0



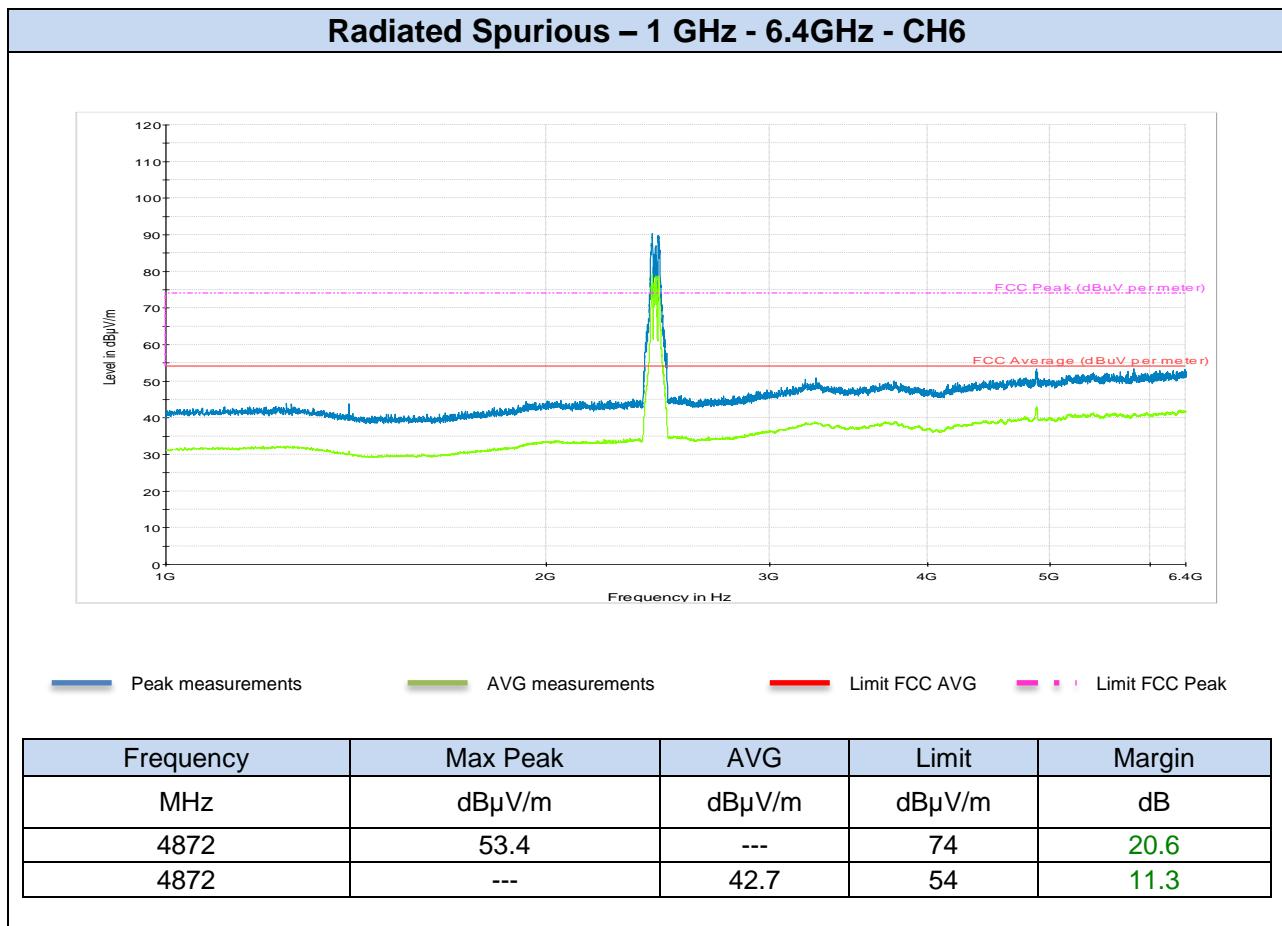
802.11g, 6Mbps, Chain B

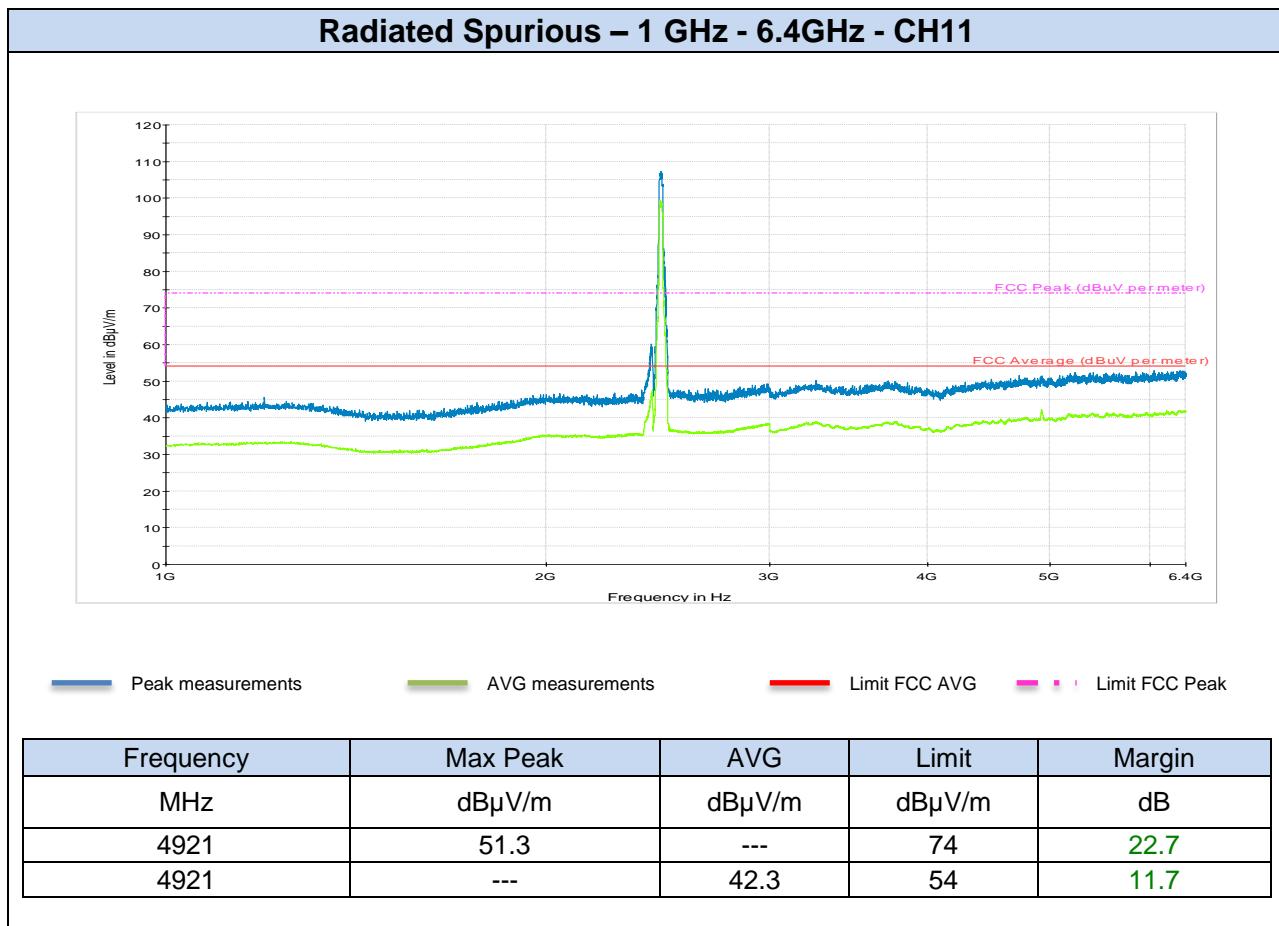
Radiated Spurious – 1 GHz - 6.4GHz - CH1



— Peak measurements — AVG measurements — Limit FCC AVG — Limit FCC Peak

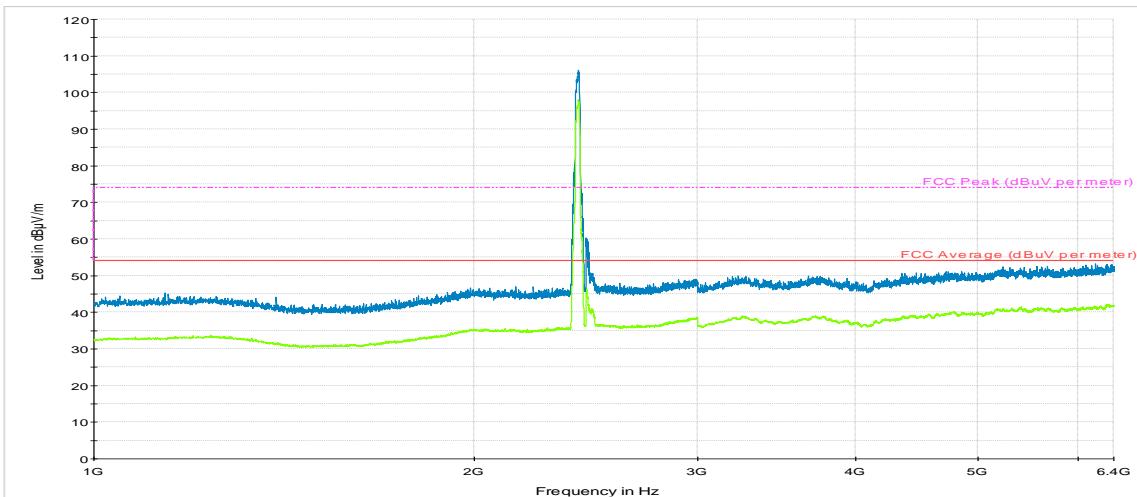
Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6332	53.4	---	74	20.6
6332	---	42.0	54	12.0





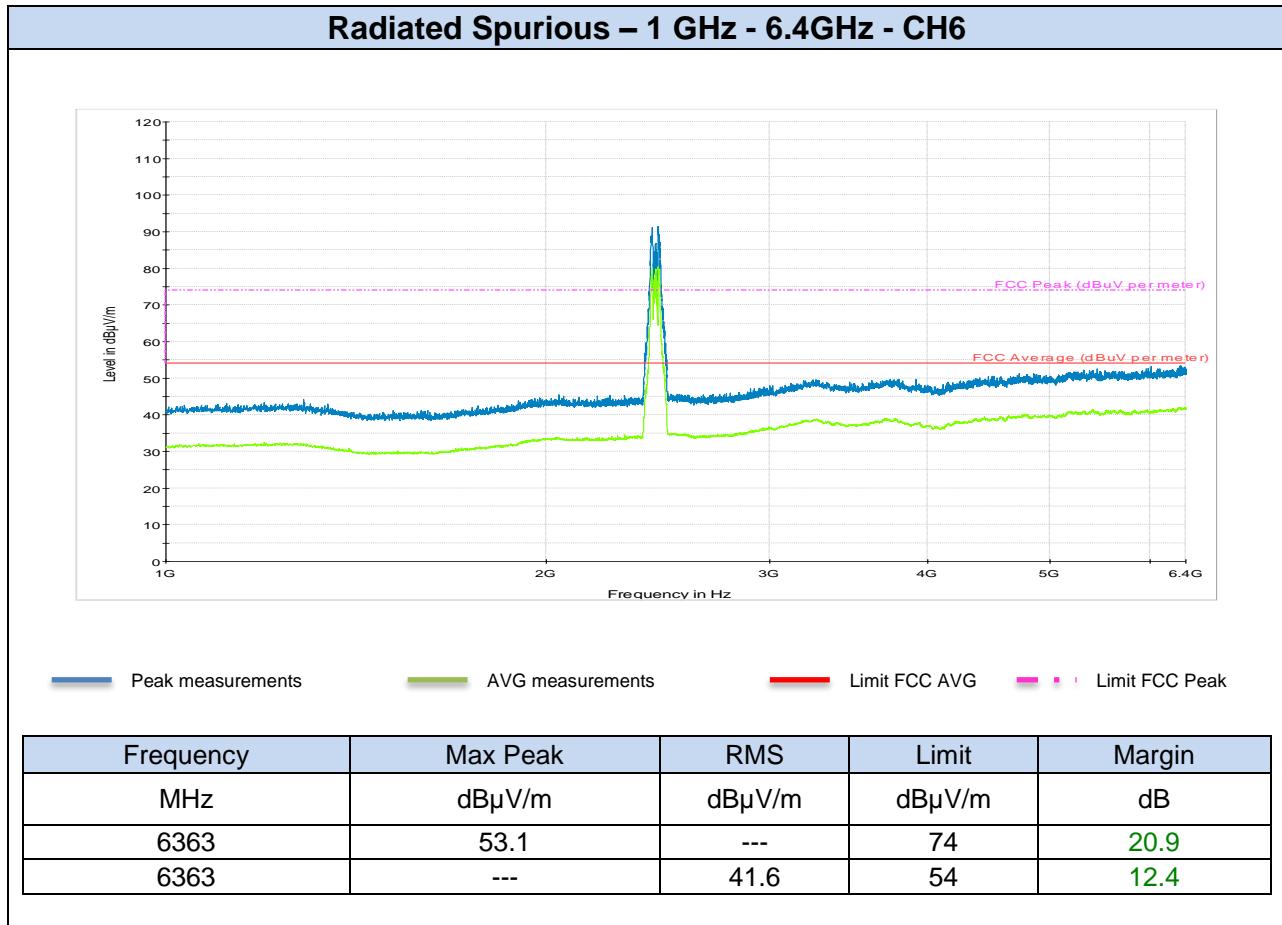
802.11n20, HT0 (SISO), Chain A

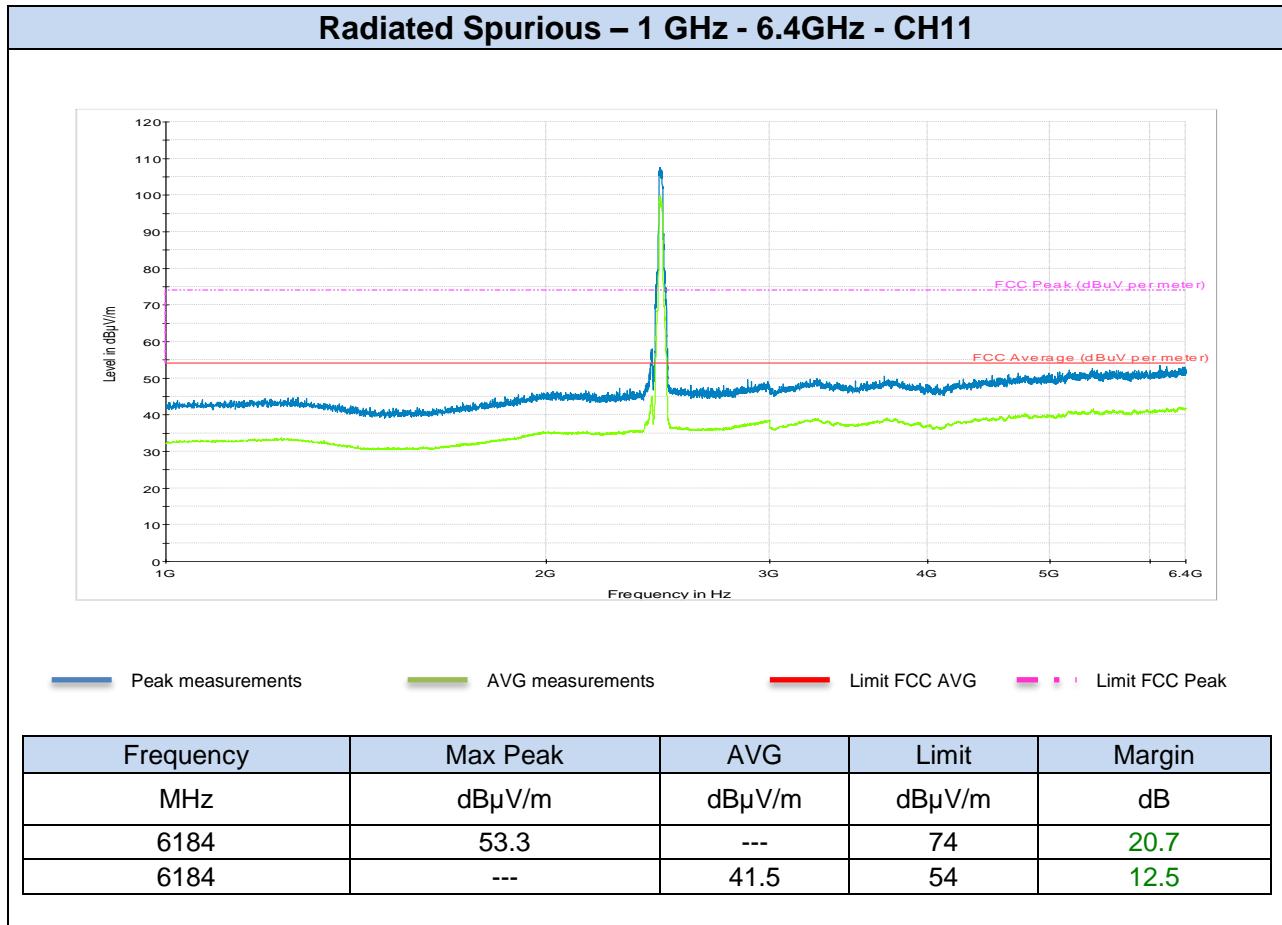
Radiated Spurious – 1 GHz - 6.4GHz - CH1

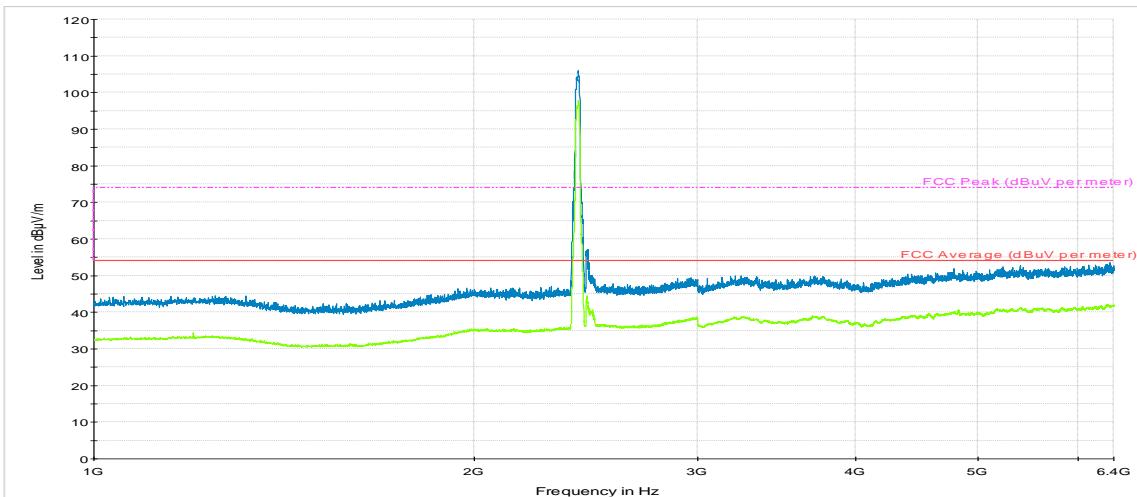


— Peak measurements — AVG measurements — Limit FCC AVG - - - Limit FCC Peak

Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6323	53.1	---	74	20.9
6323	---	42.0	54	12.0

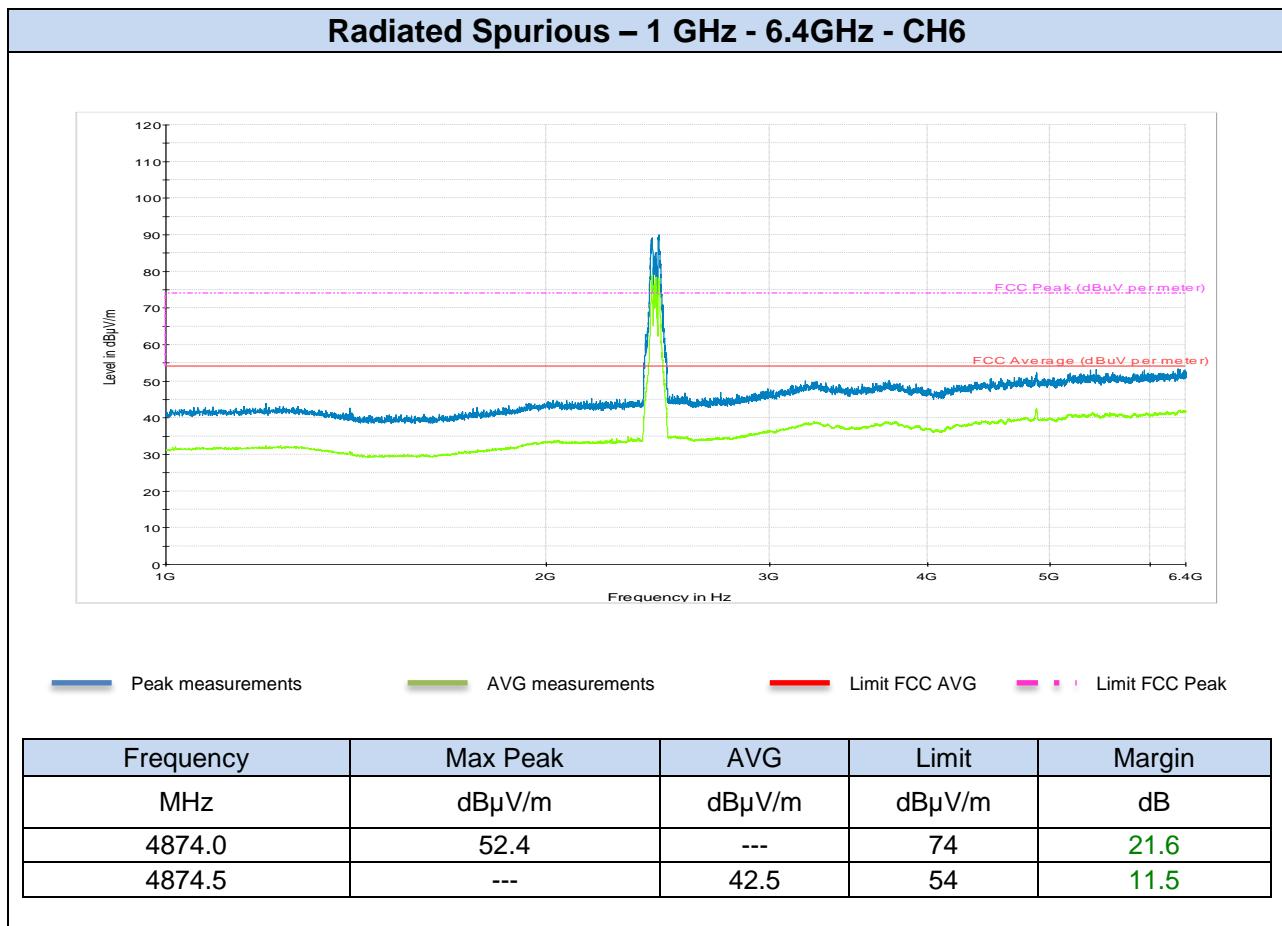


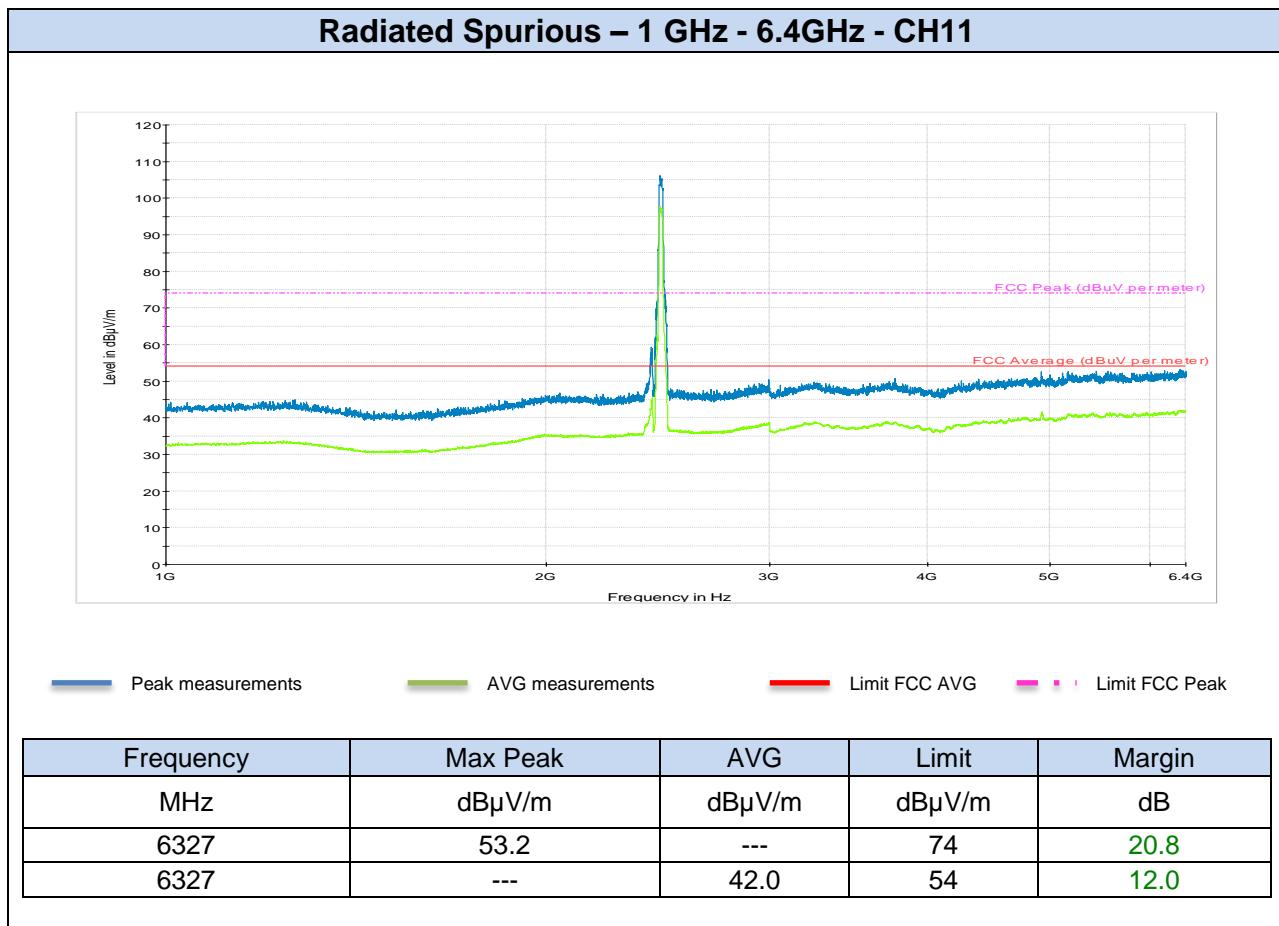


802.11n20, HT0 (SISO), Chain B**Radiated Spurious – 1 GHz - 6.4GHz - CH1**

— Peak measurements — AVG measurements — Limit FCC AVG - - - Limit FCC Peak

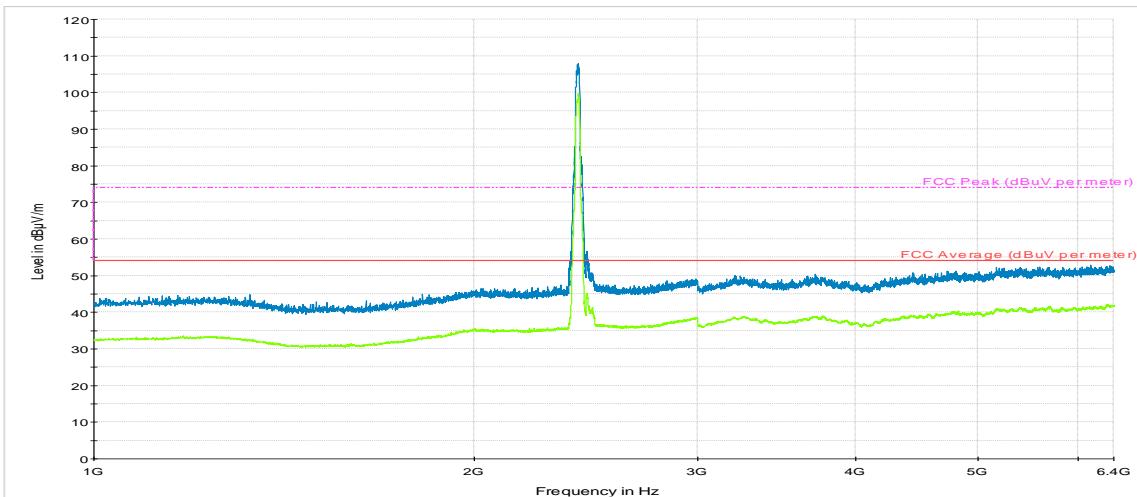
Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6345	53.6	---	74	20.4
6345	---	41.8	54	12.2





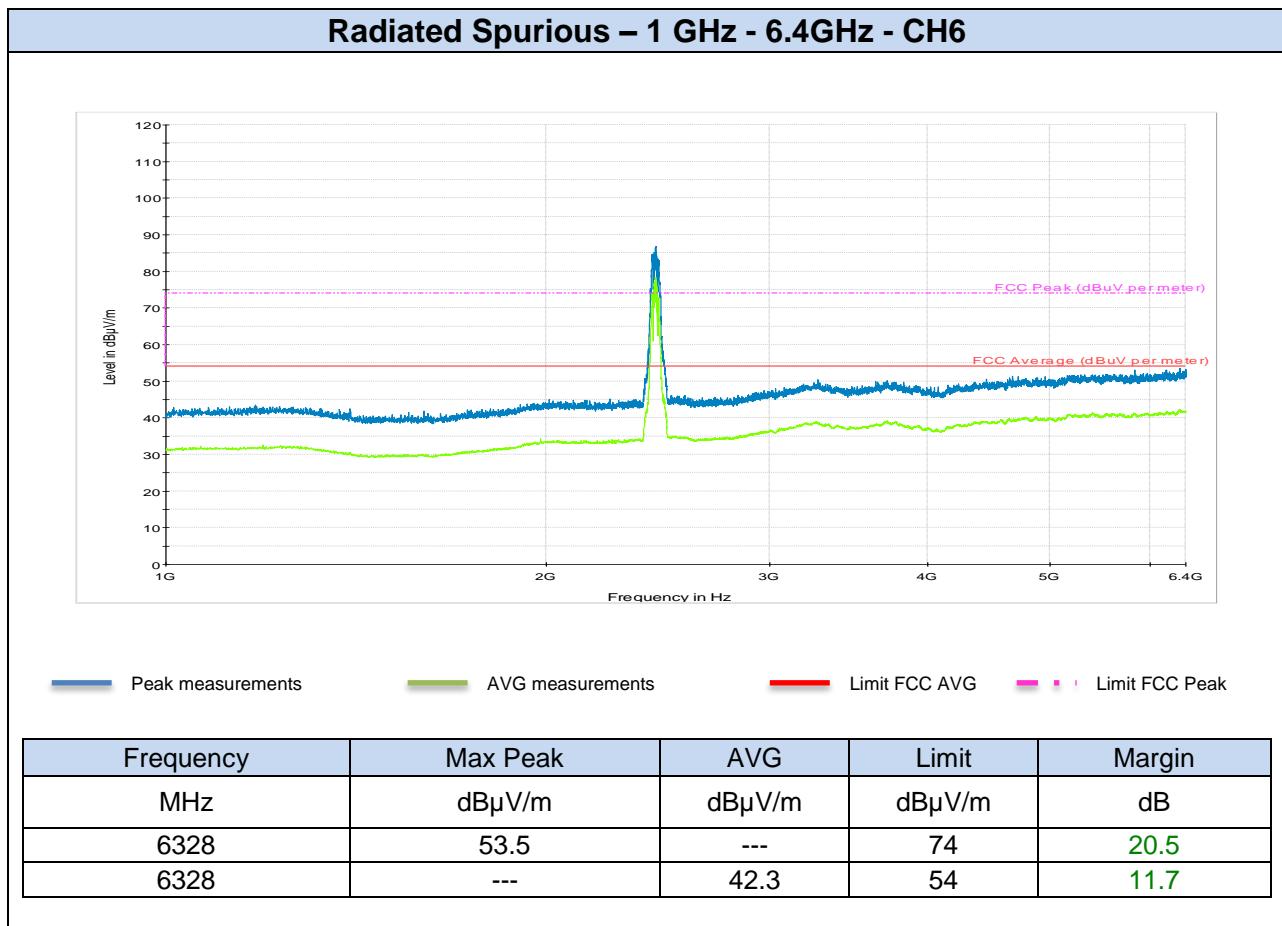
802.11n20, HT8 (MIMO), Chain A+B

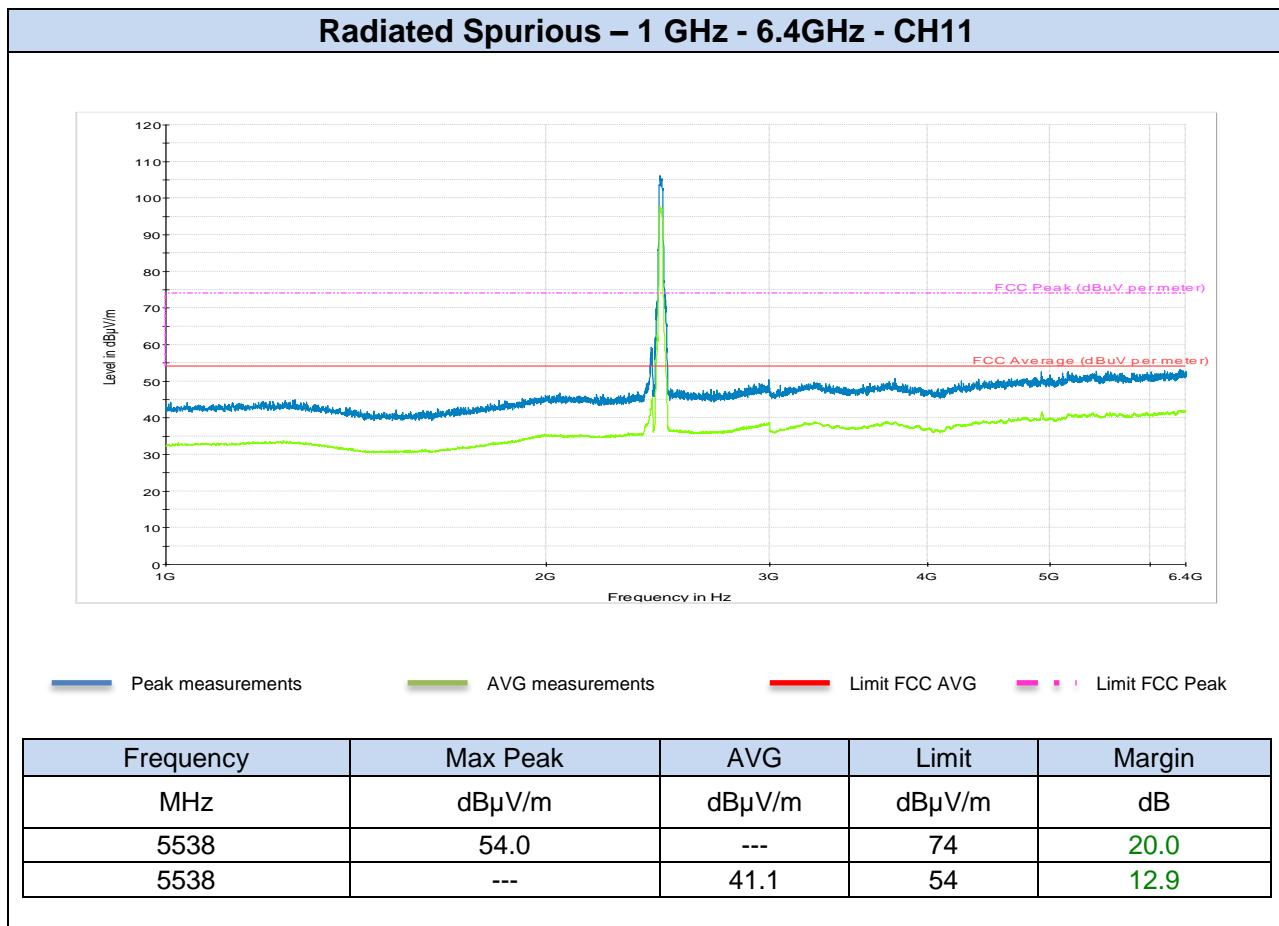
Radiated Spurious – 1 GHz - 6.4GHz - CH1



— Peak measurements — AVG measurements — Limit FCC AVG - - - Limit FCC Peak

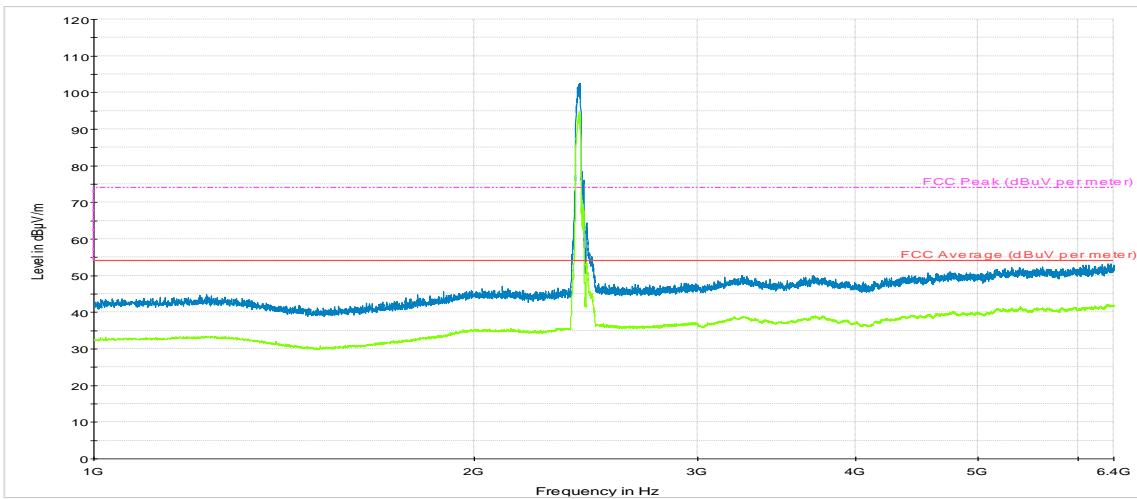
Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6354	52.6	---	74	21.4
6354	---	41.8	54	12.2





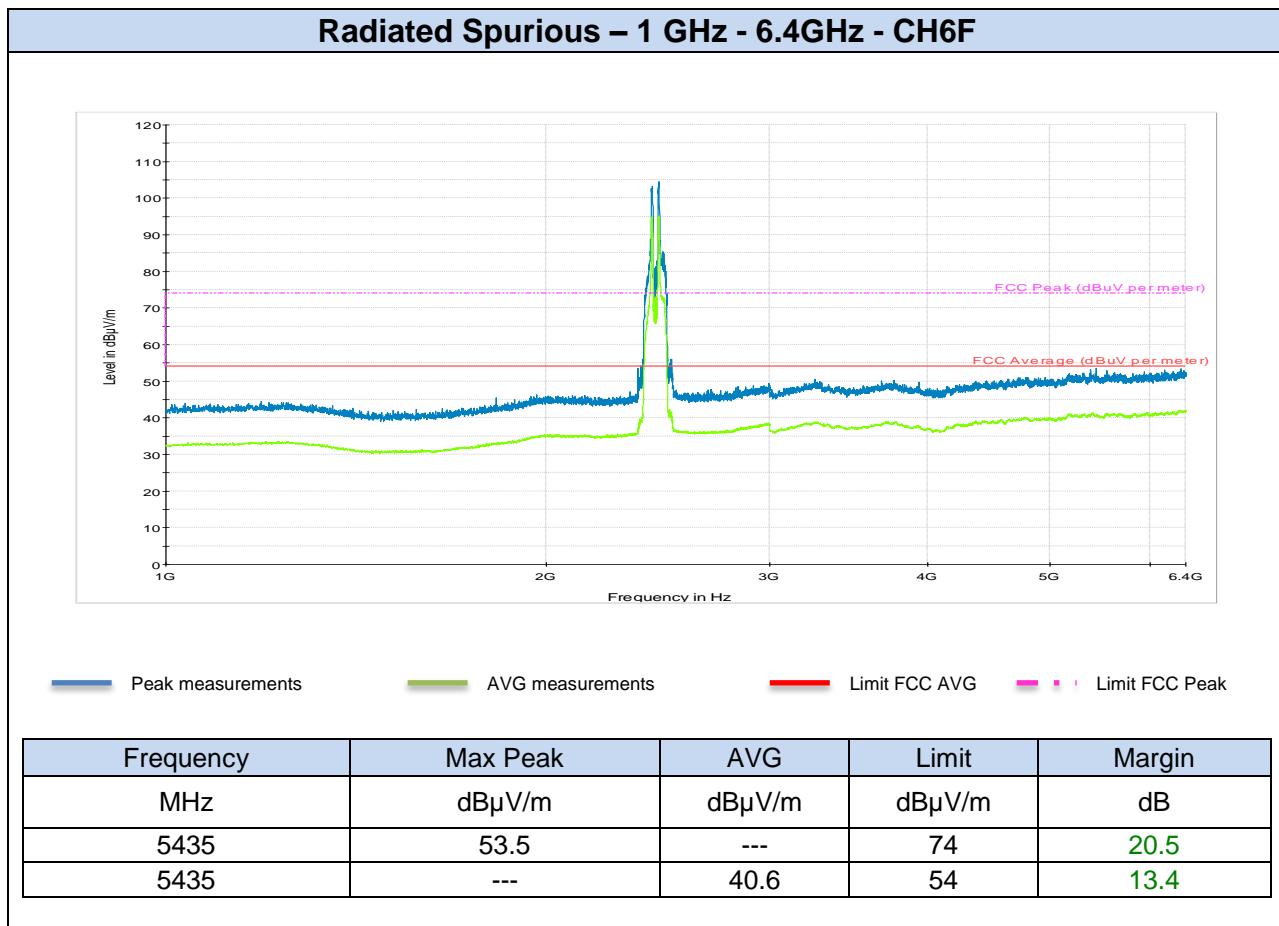
802.11n40, HT0 (SISO), Chain A

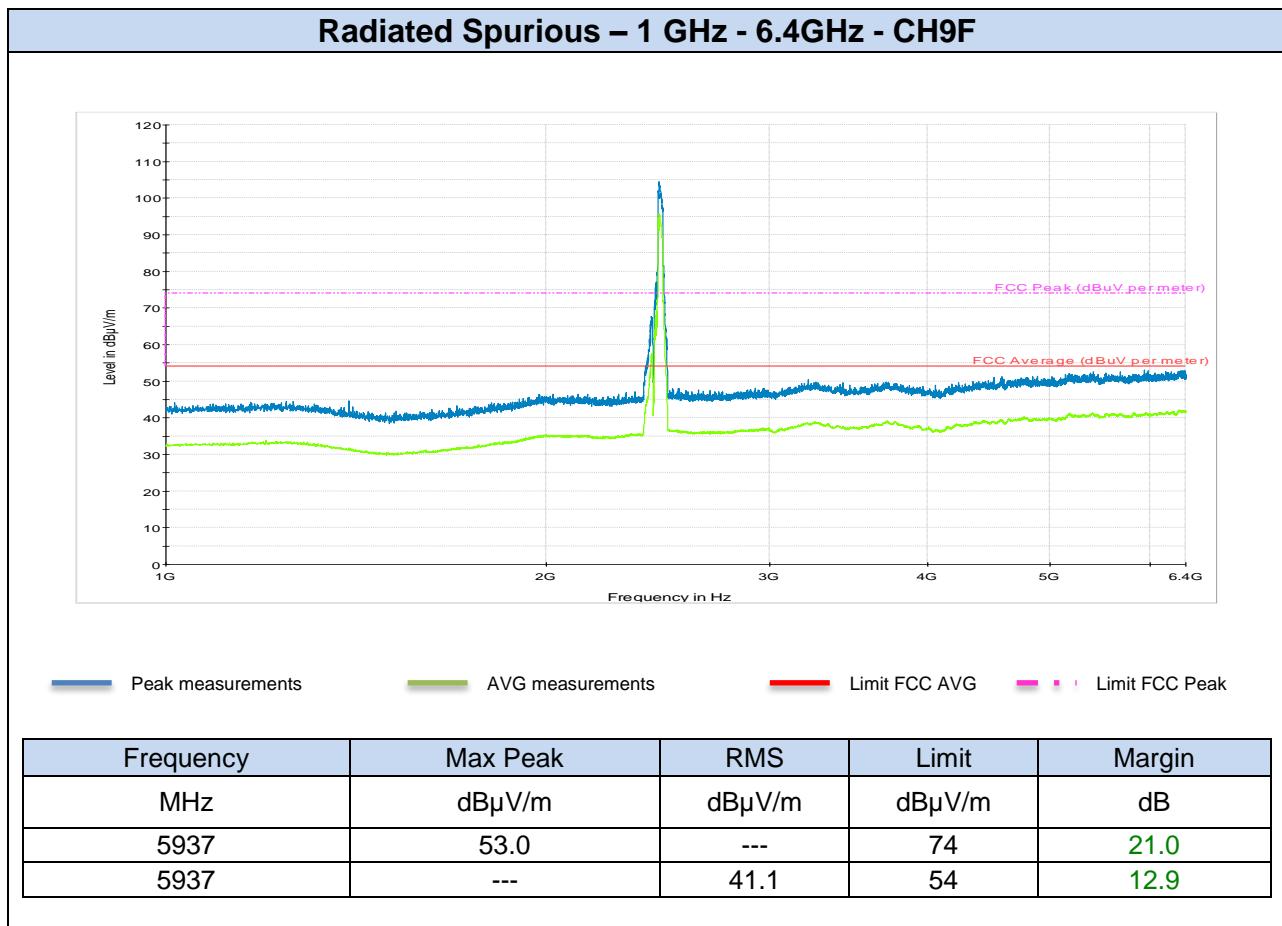
Radiated Spurious – 1 GHz - 6.4GHz - CH3F



— Peak measurements — AVG measurements — Limit FCC AVG - - - Limit FCC Peak

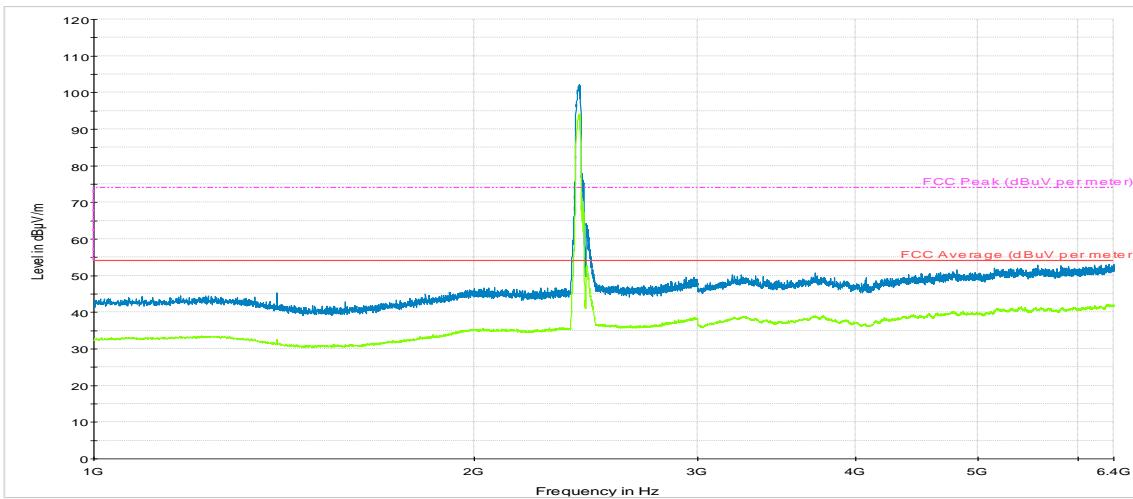
Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6337	53.3	---	74	20.7
6337	---	41.9	54	12.1





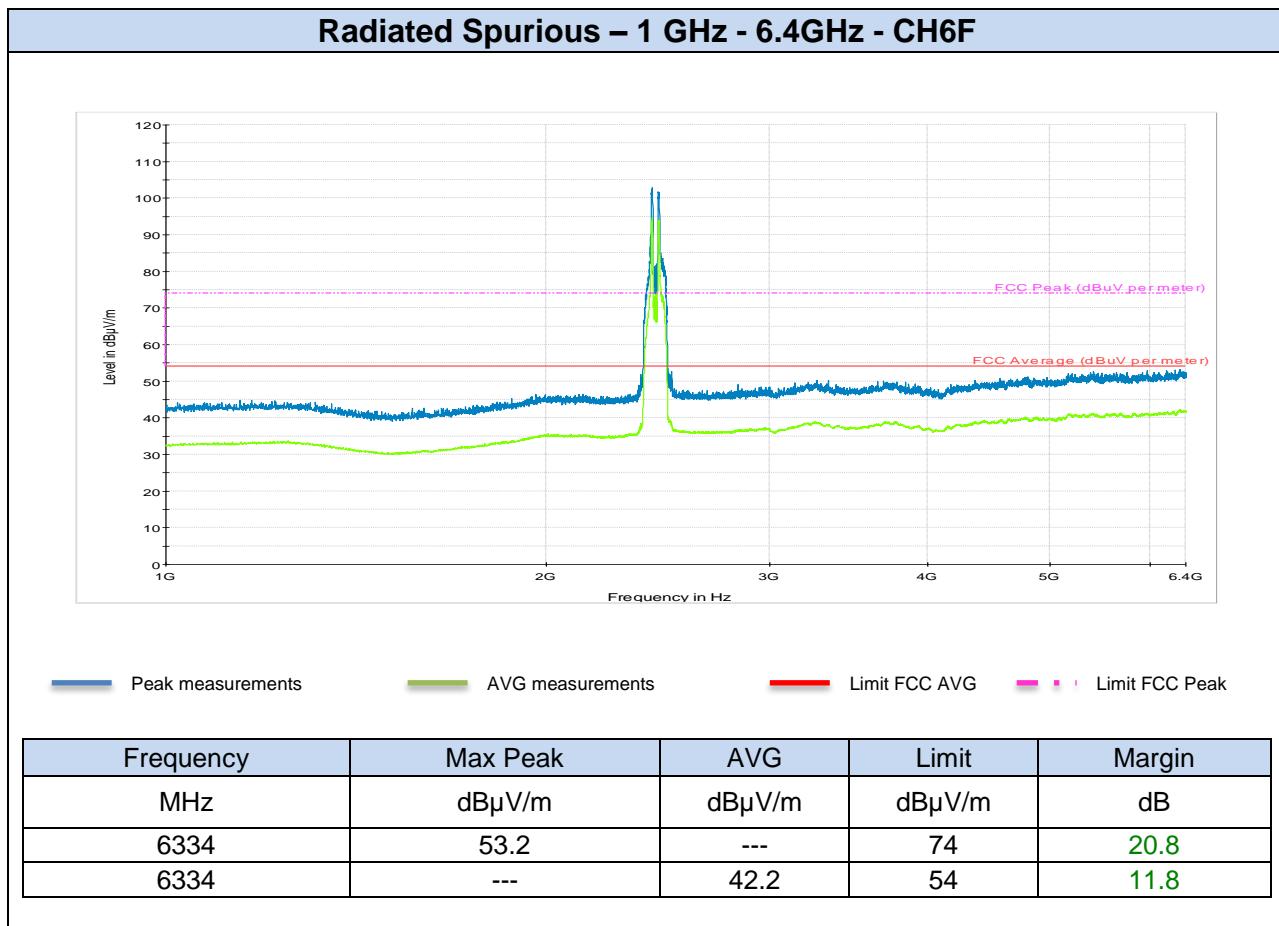
802.11n40, HT0 (SISO), Chain B

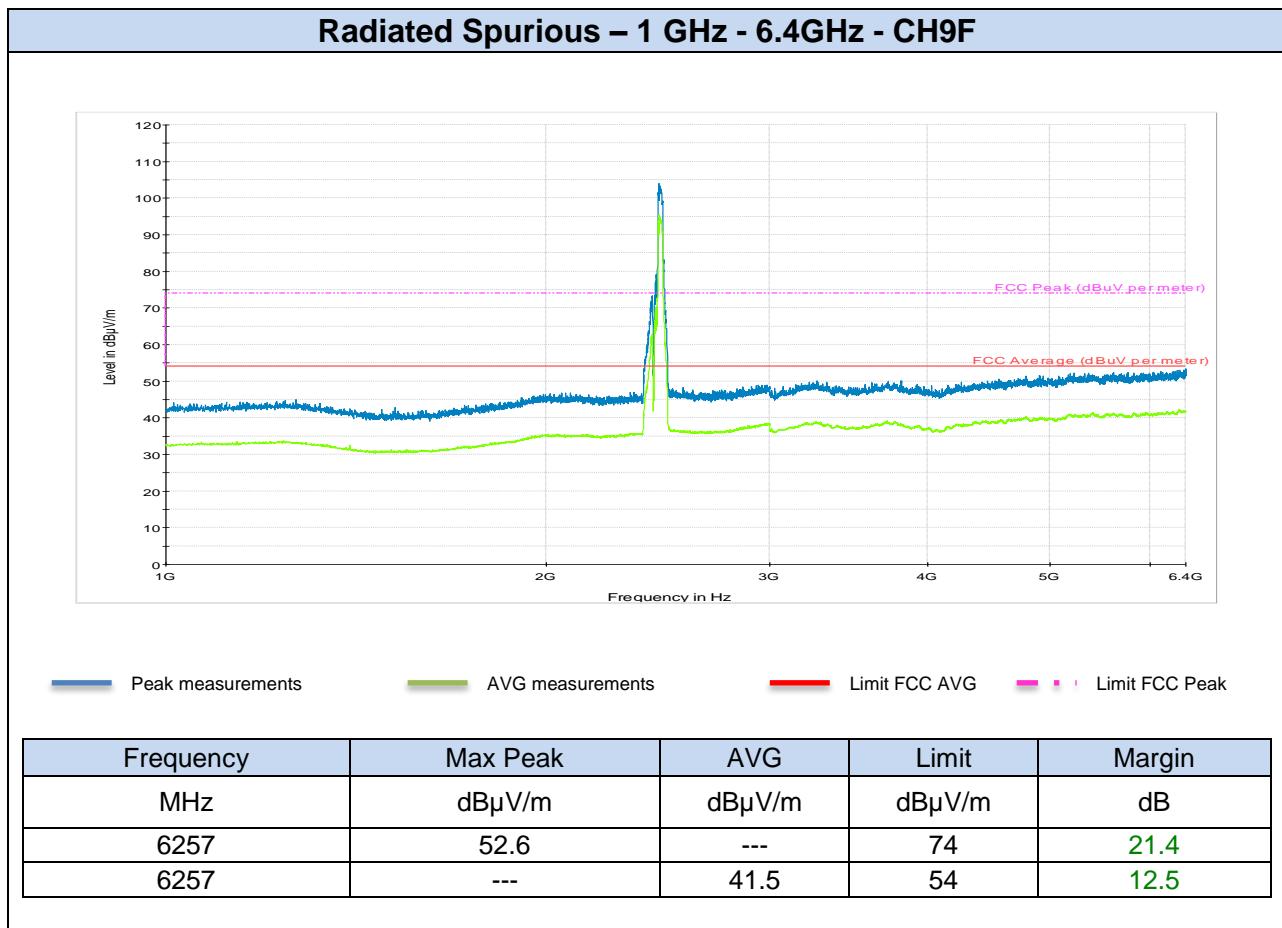
Radiated Spurious – 1 GHz - 6.4GHz - CH3F



— Peak measurements — AVG measurements — Limit FCC AVG - - - Limit FCC Peak

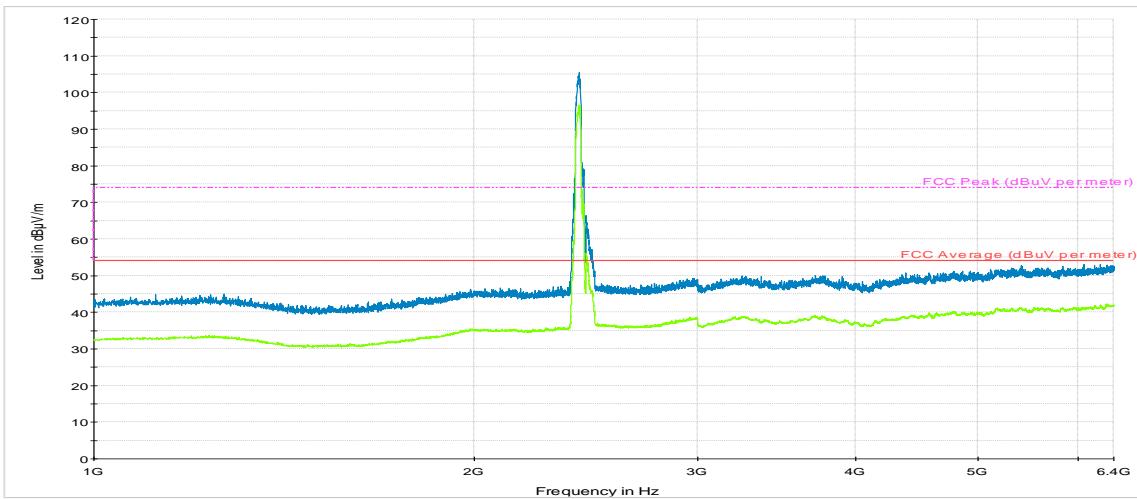
Frequency	Max Peak	RMS	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6344	53.0	---	74	21.0
6344	---	42.0	54	12.0





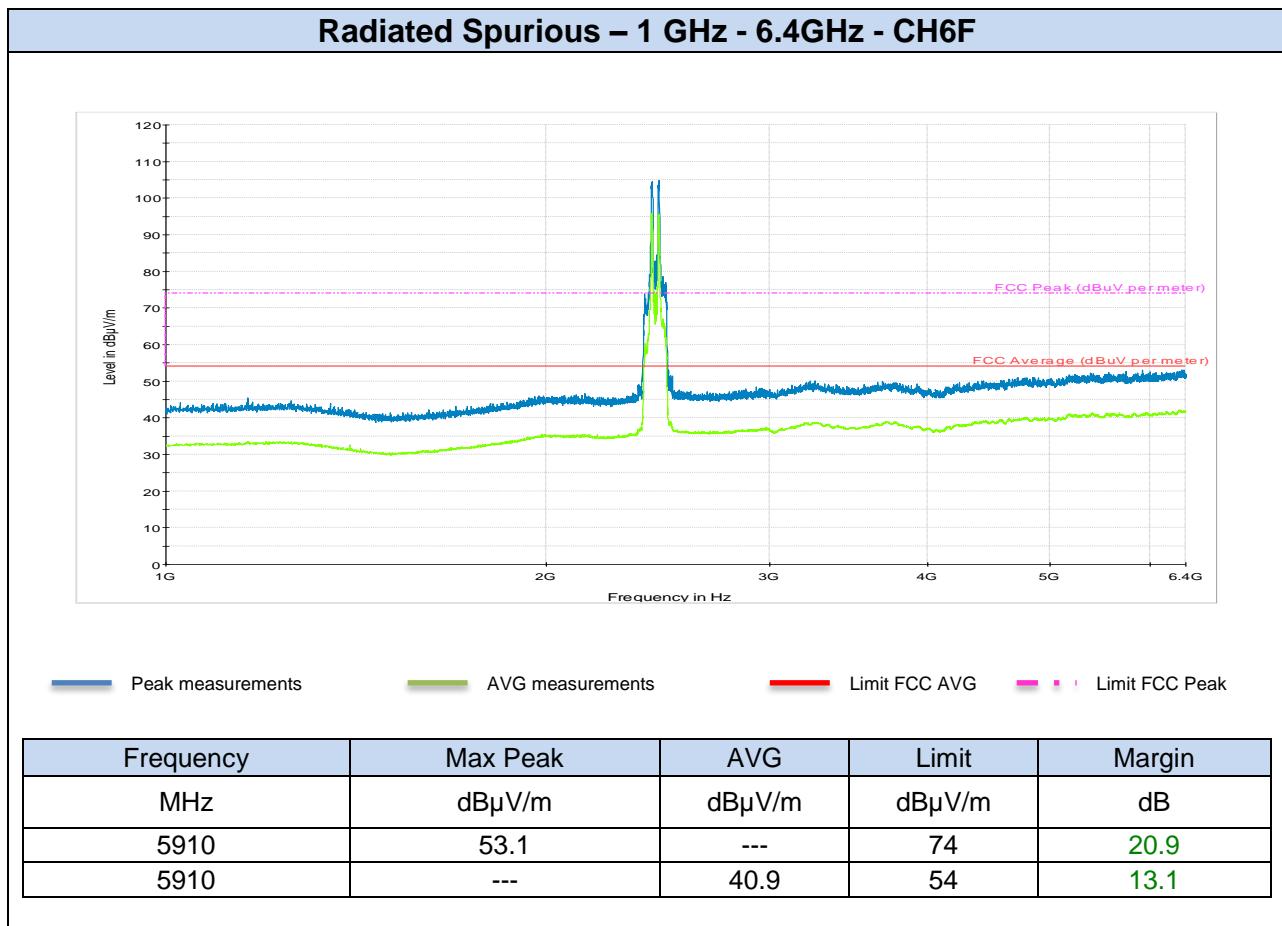
802.11n40, HT8 (MIMO), Chain A+B

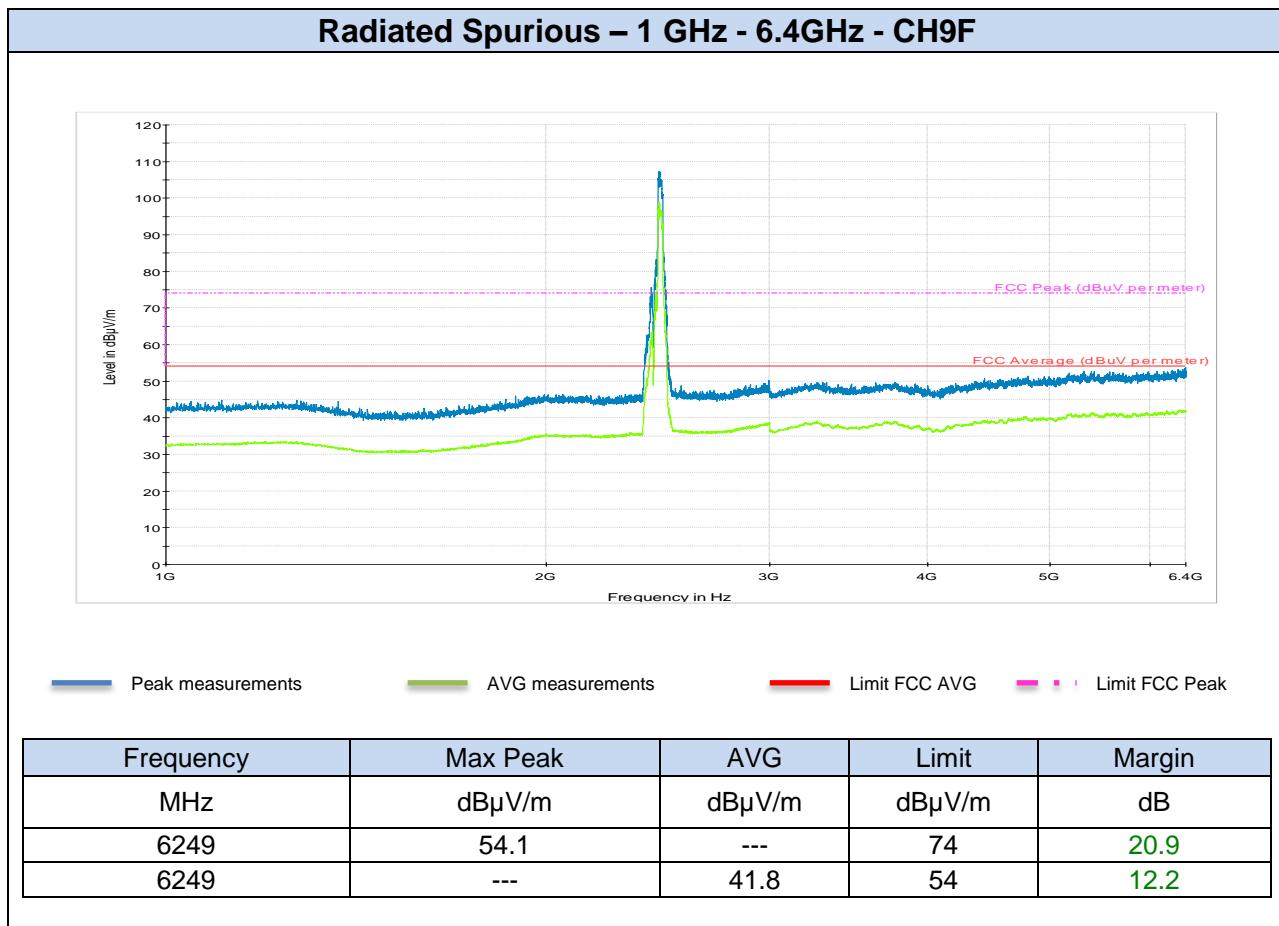
Radiated Spurious – 1 GHz - 6.4GHz - CH3F



— Peak measurements — AVG measurements — Limit FCC AVG - - - Limit FCC Peak

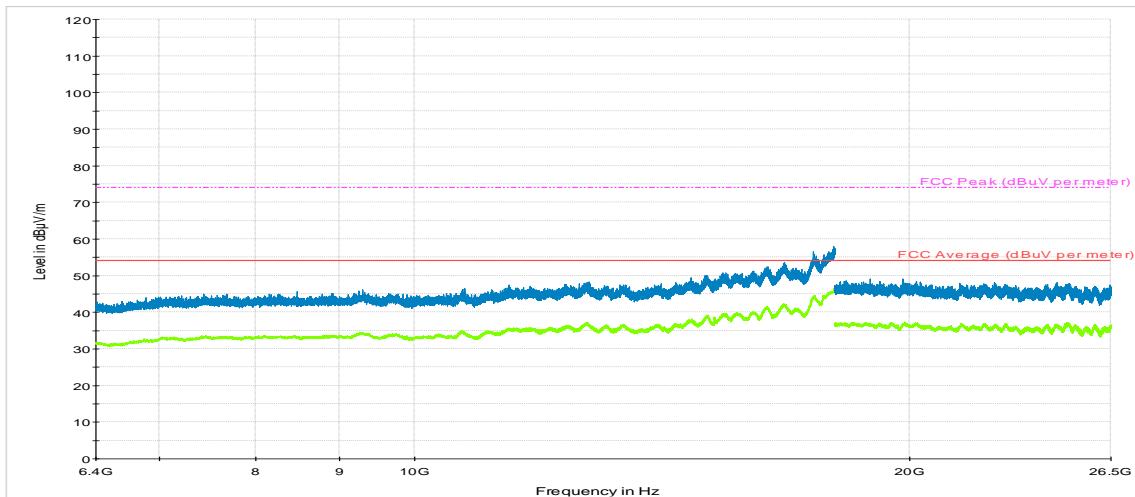
Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
6248	53.0	---	74	21
6248	---	41.4	54	12.6





All modes

Radiated Spurious – 6.4GHz – 26.5GHz



— Peak measurements — AVG measurements — Limit FCC AVG - - - Limit FCC Peak

Frequency	Max Peak	AVG	Limit	Margin
MHz	dB μ V/m	dB μ V/m	dB μ V/m	dB
18000	56.5	---	74	17.5
18000	---	46.4	54	7.6
18185	48.3	---	74	25.7
18185	---	36.6	54	17.4

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

Note 2: No spurious signals were found in all modulations and channels tested.

Note 3: This plot is valid for both SISO and MIMO modes.

Annex C. Test Results BLE

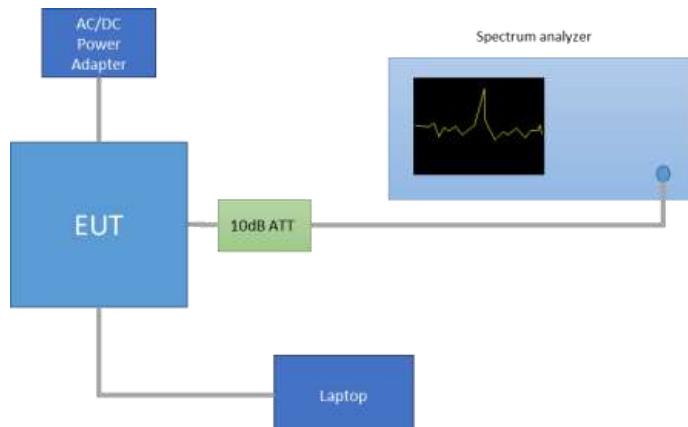
C.1 6dB & 99% Bandwidth

Test limits:

FCC part	RSS part	Limits
15.247 (a) (2)	RSS-247 Clause 5.2 (1)	Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure:

The setup below was used to measure the 6dB & 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	Channel	Frequency [MHz]	6dB BW [MHz]	99% BW [MHz]
BLE	0	2402	0.666	1.14
	19	2440	0.660	1.14
	39	2480	0.678	1.13

Results screenshot: