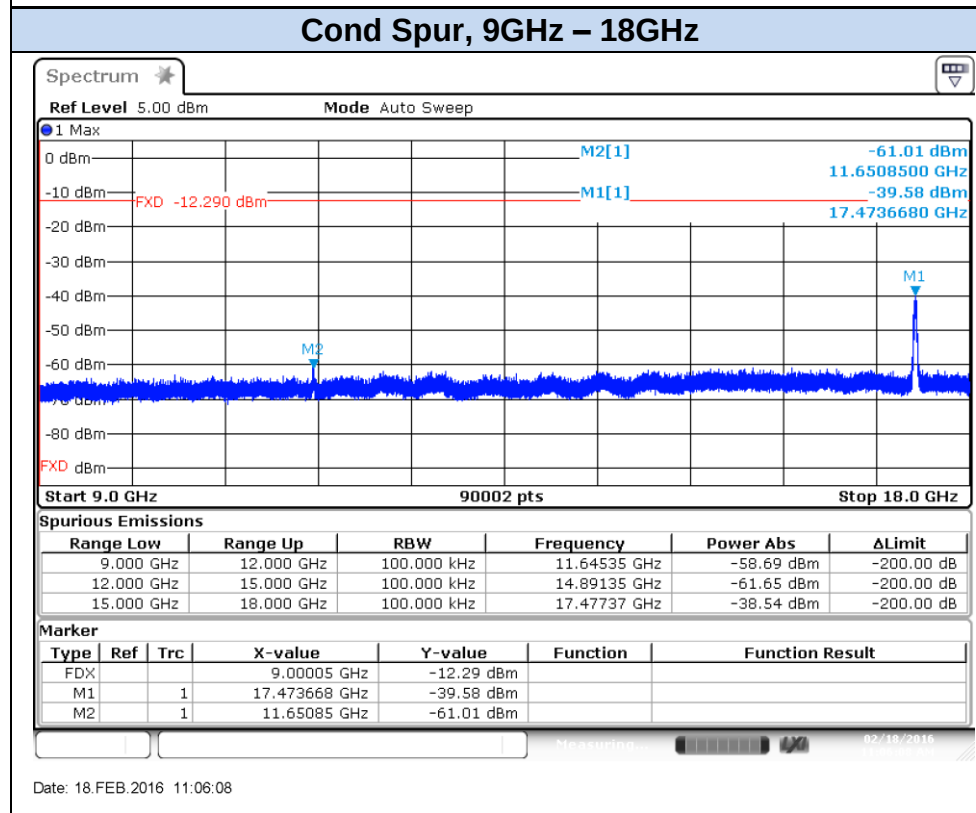
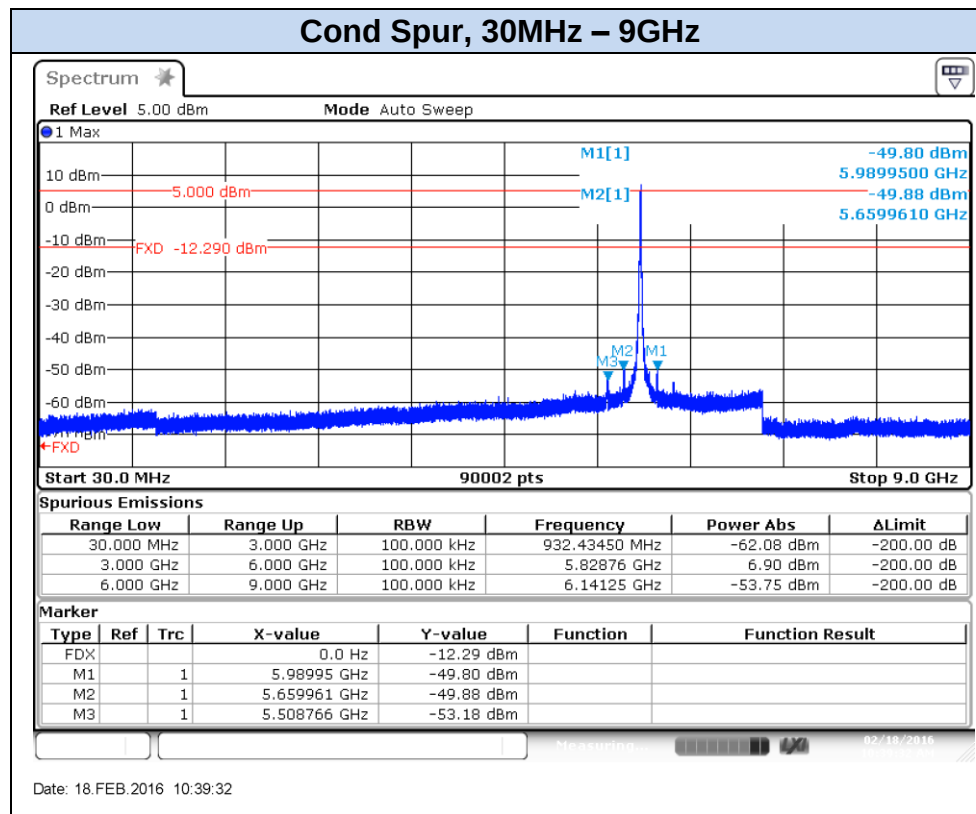
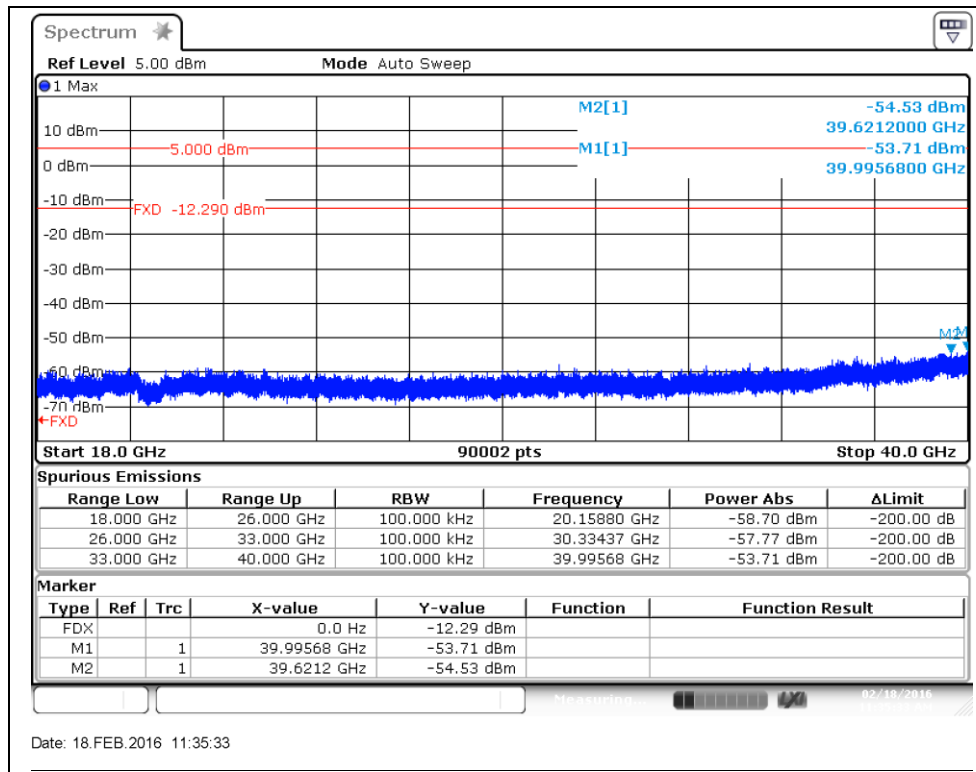


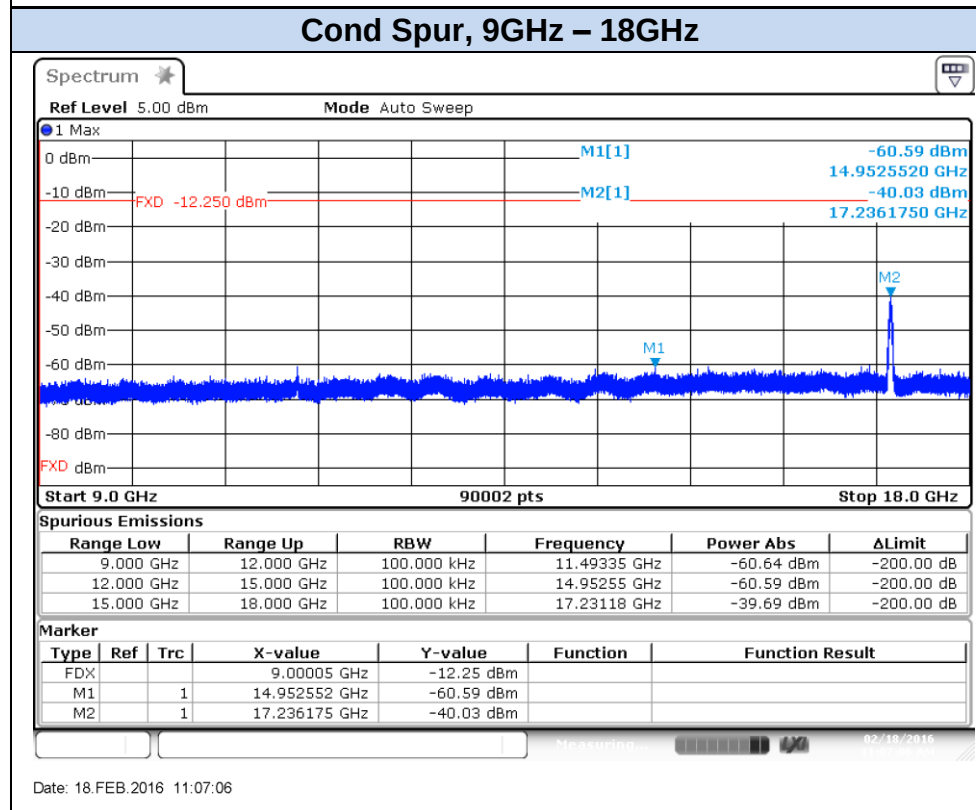
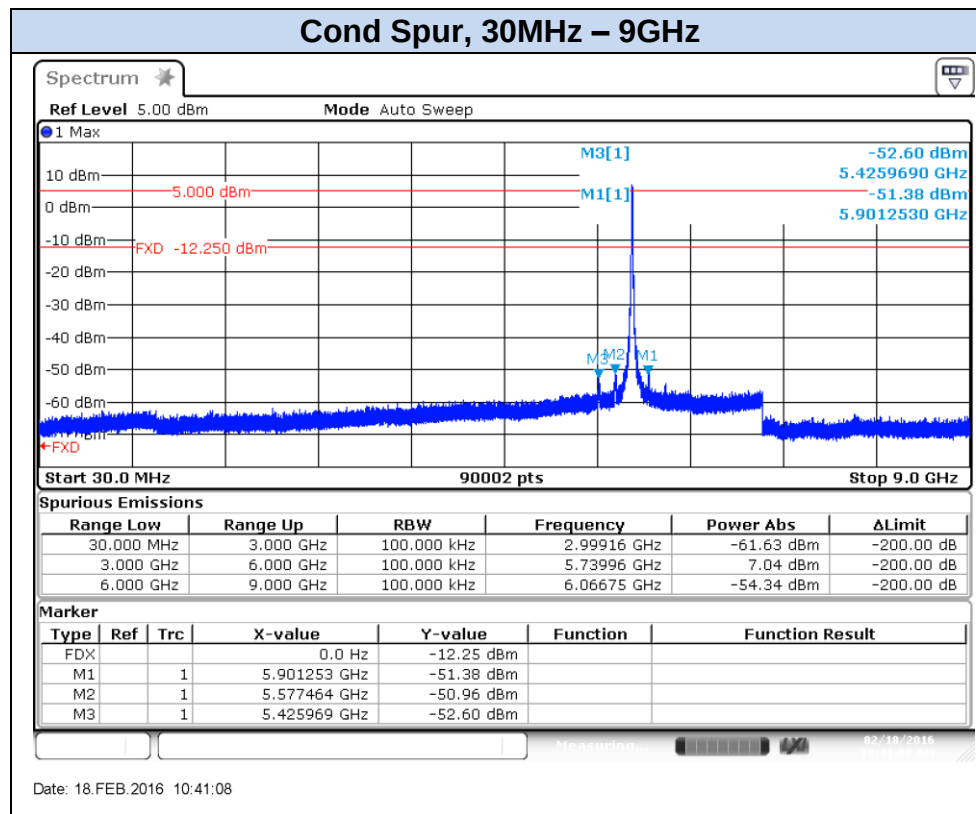
802.11a, 6Mbps – Chain A, CH165



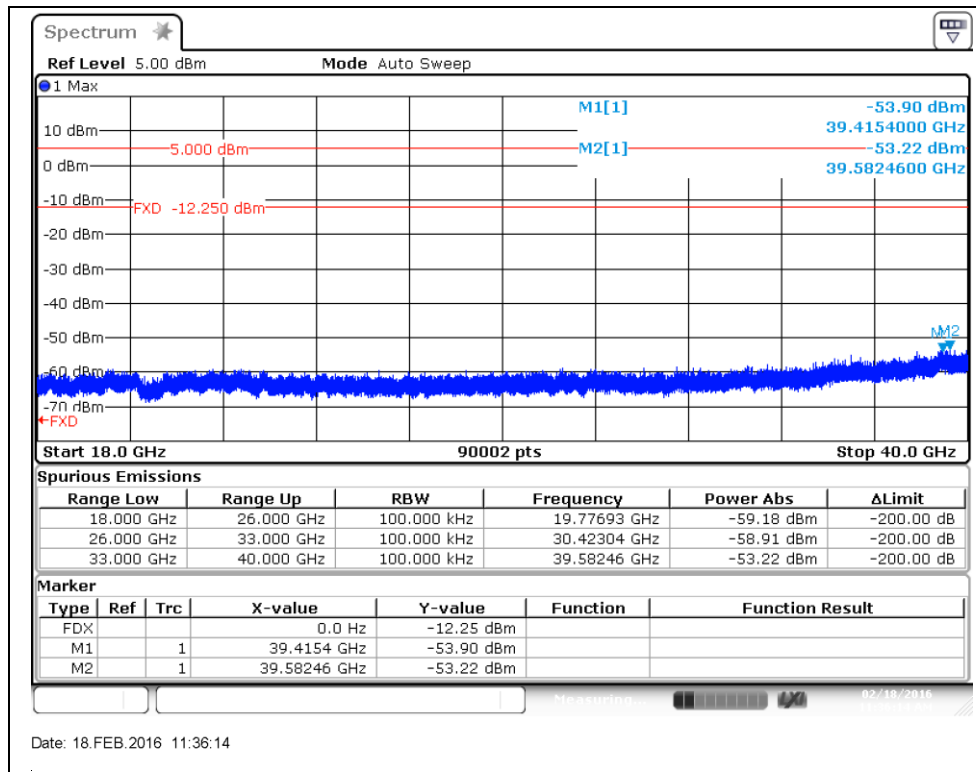
Cond Spur, 18GHz – 40GHz



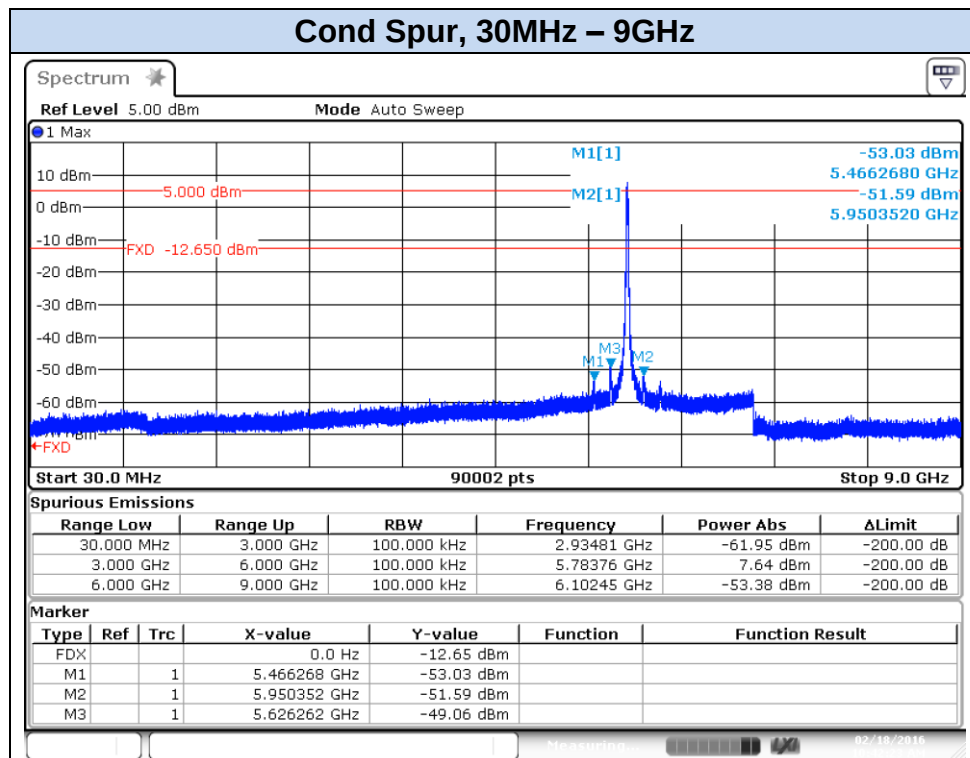
802.11n20, HT0 – Chain A, CH149



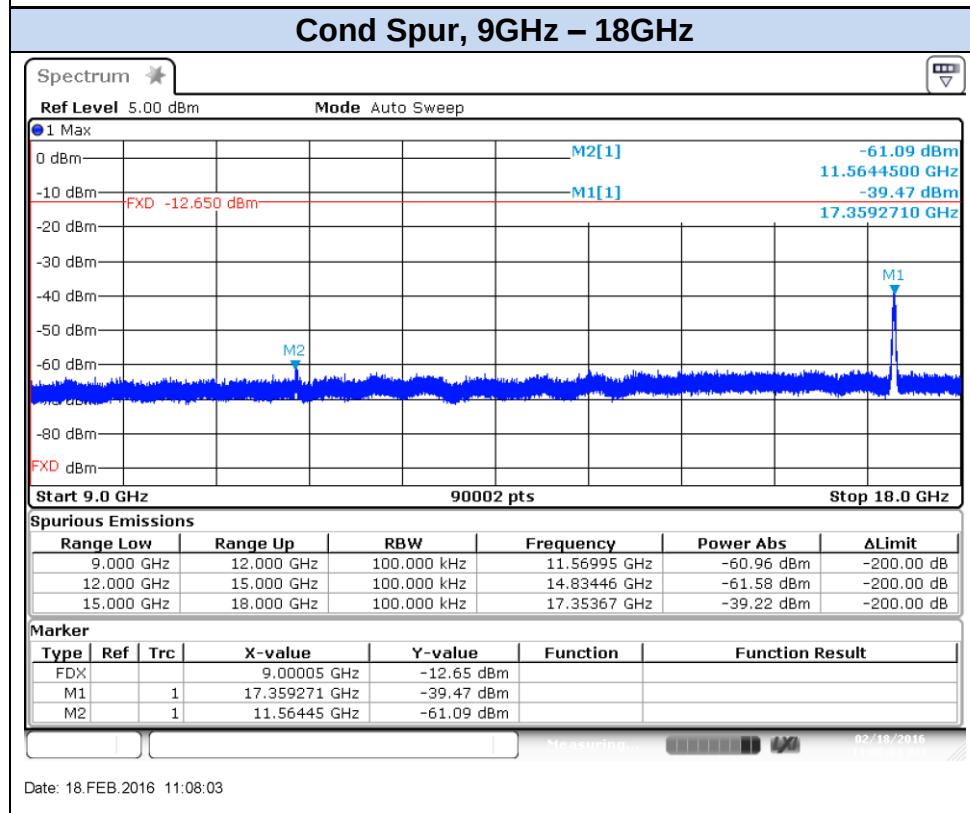
Cond Spur, 18GHz – 40GHz



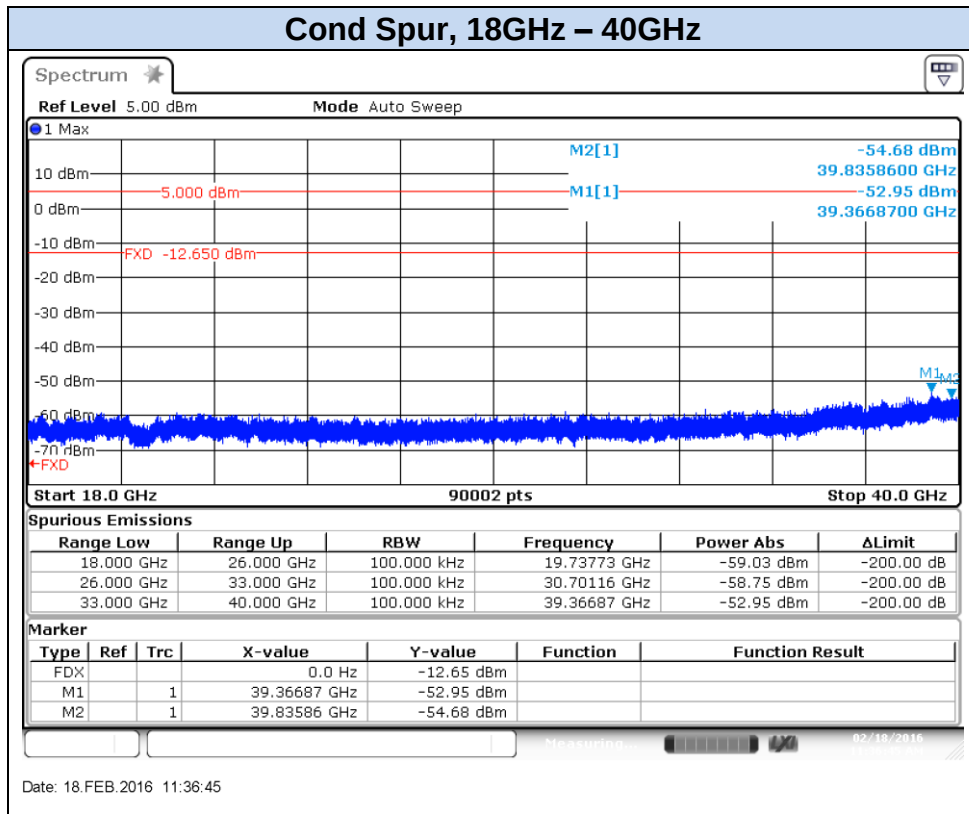
802.11n20,HT0 – Chain A, CH157



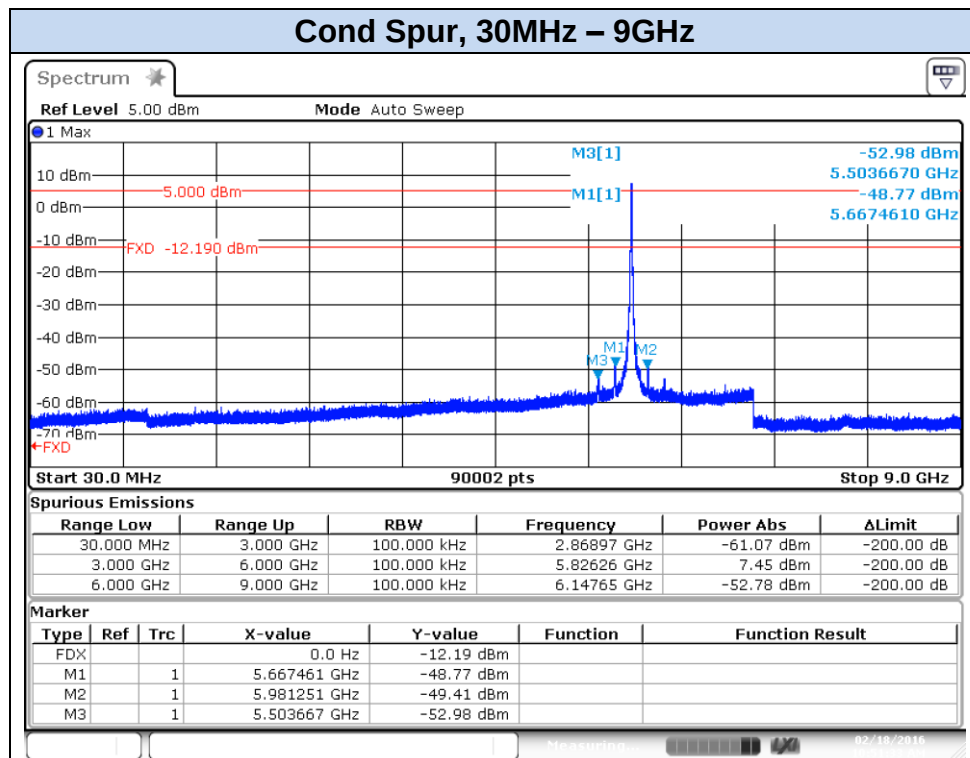
Date: 18.FEB.2016 10:42:23



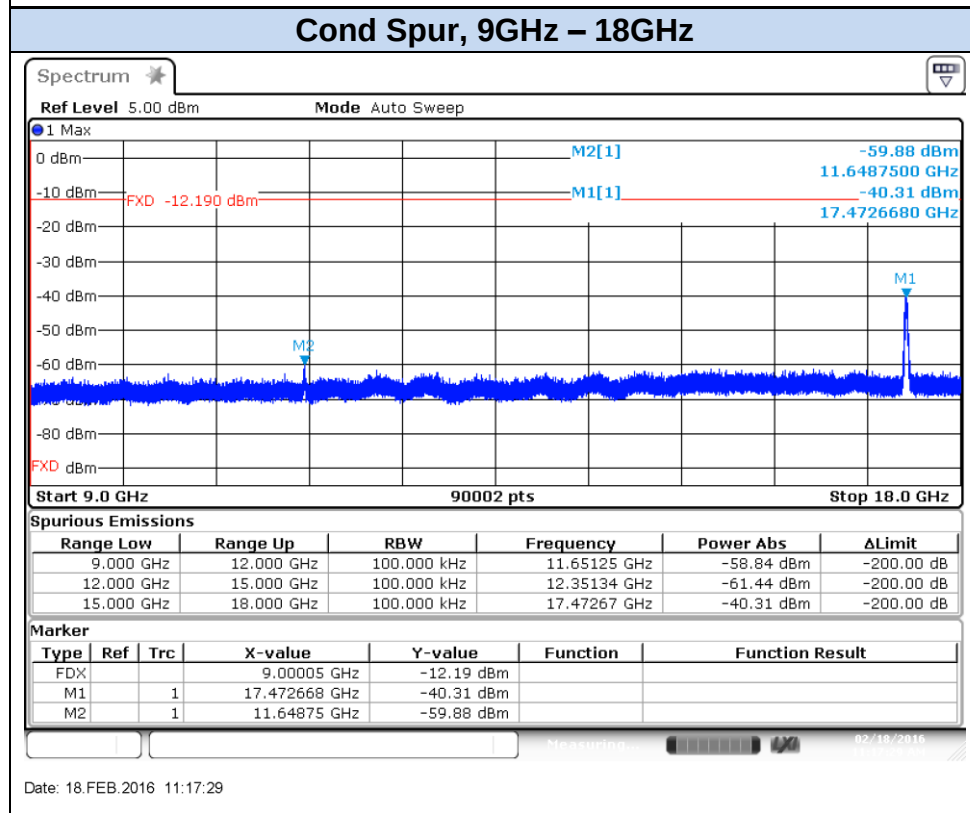
Date: 18.FEB.2016 11:08:03



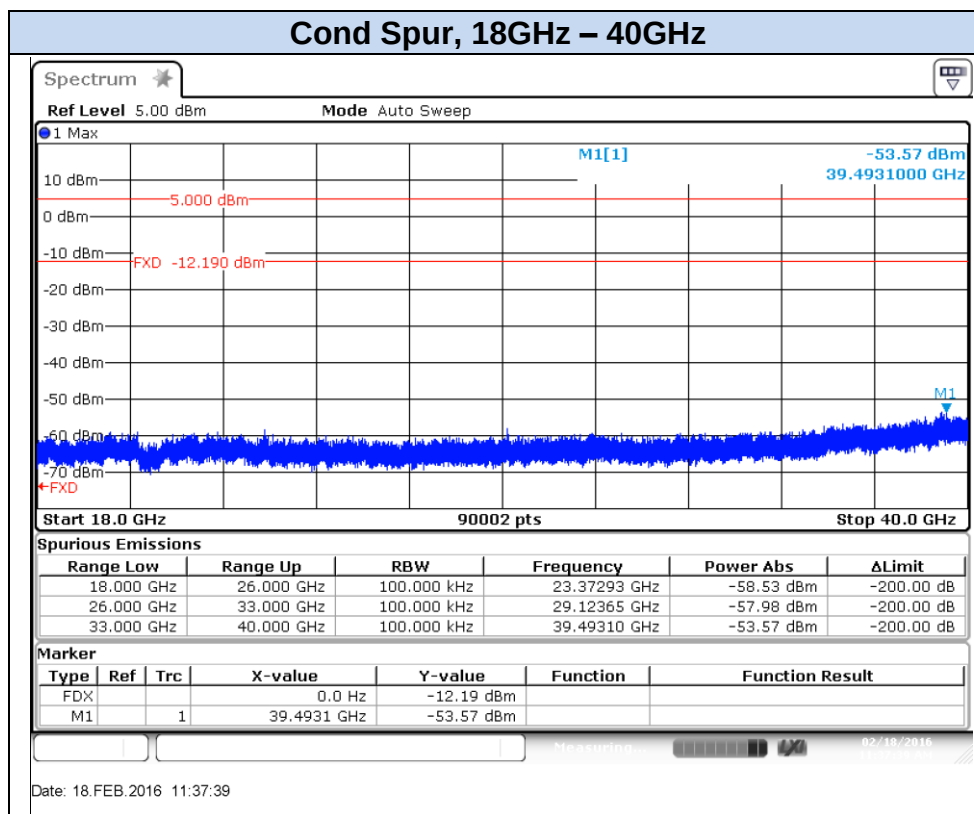
802.11n20, HT0 – Chain A, CH165



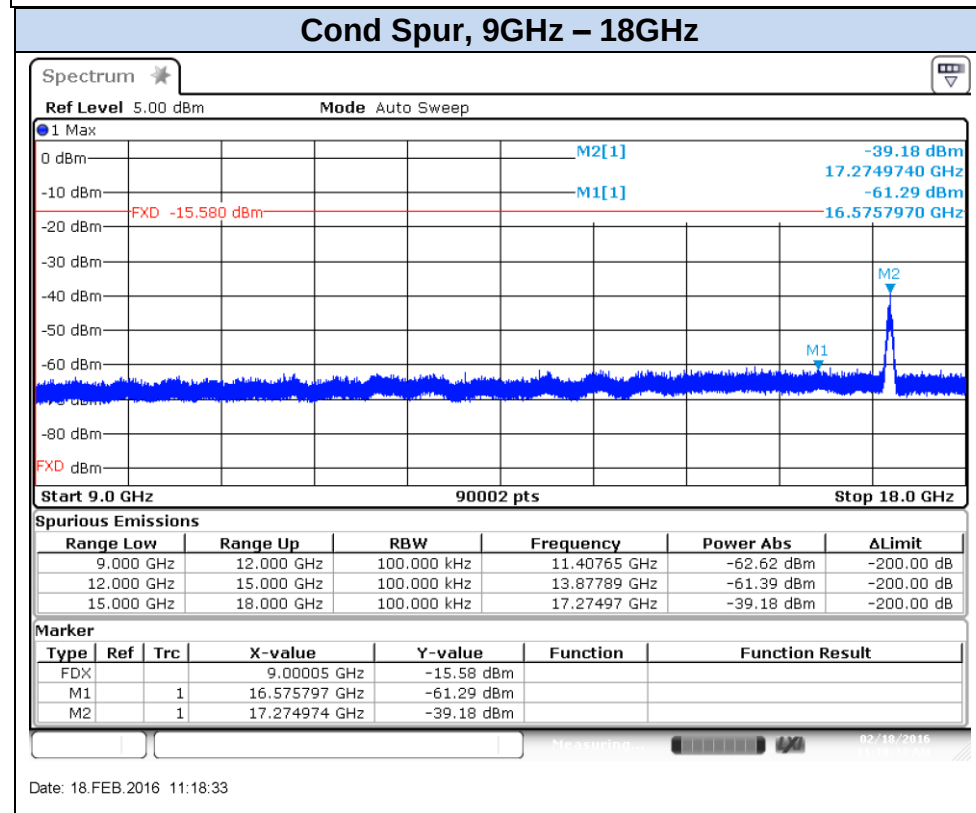
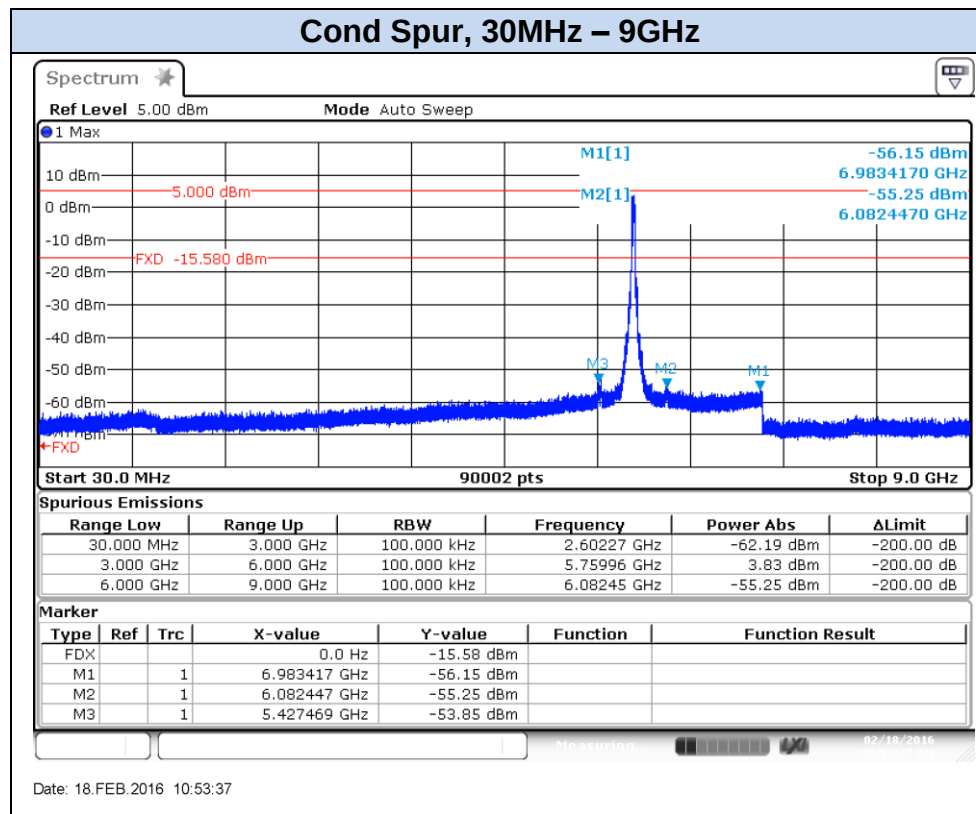
Date: 18.FEB.2016 10:51:33

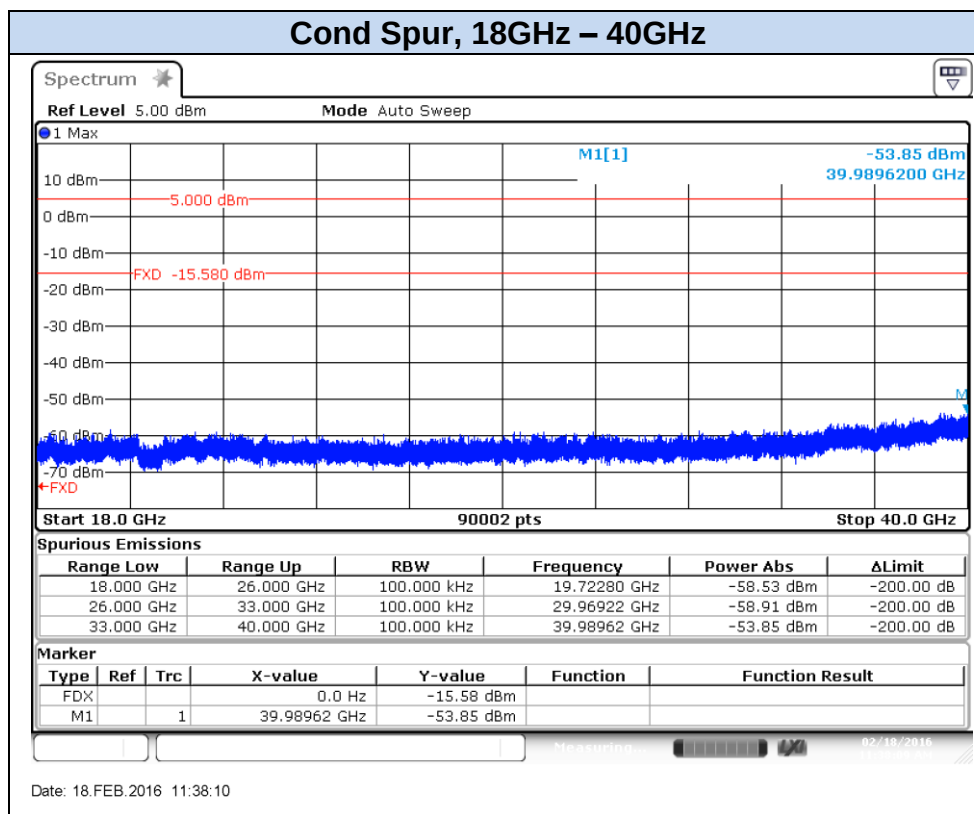


Date: 18.FEB.2016 11:17:29



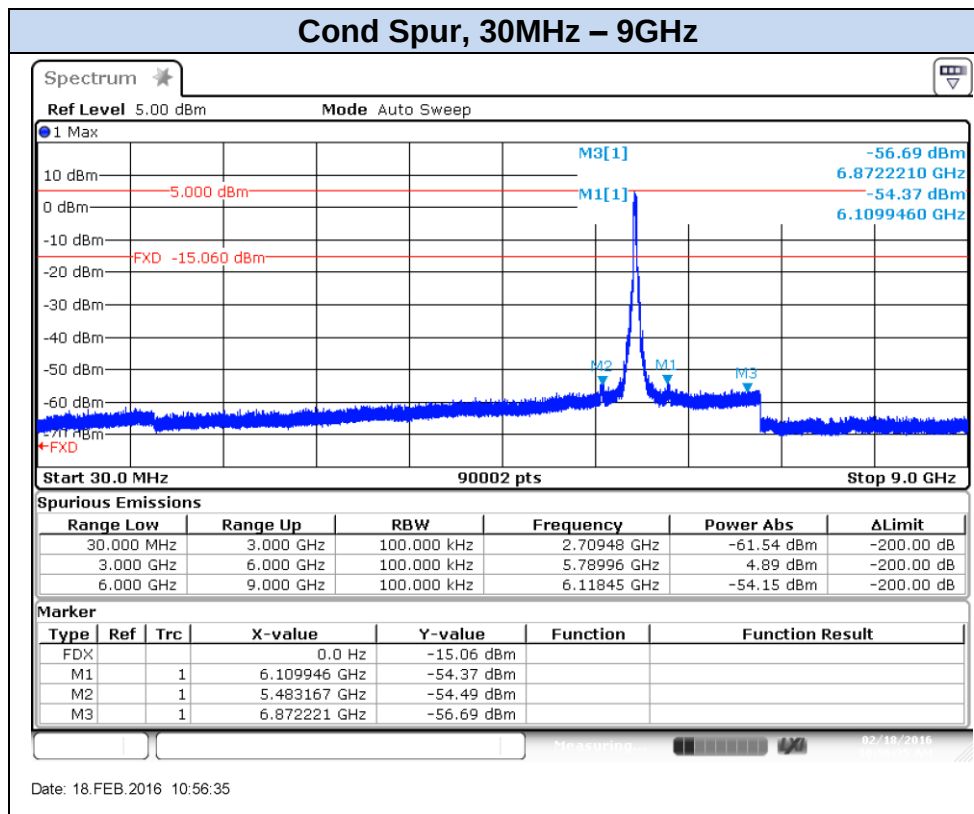
802.11n40, HT0 – Chain A, CH151F



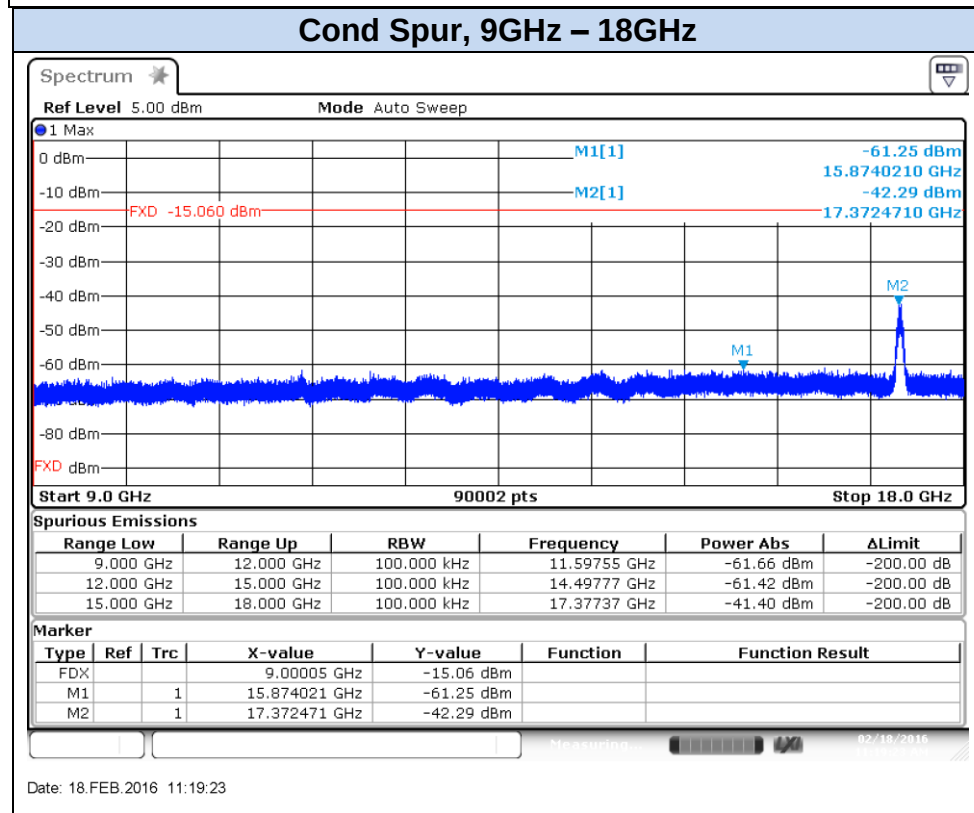


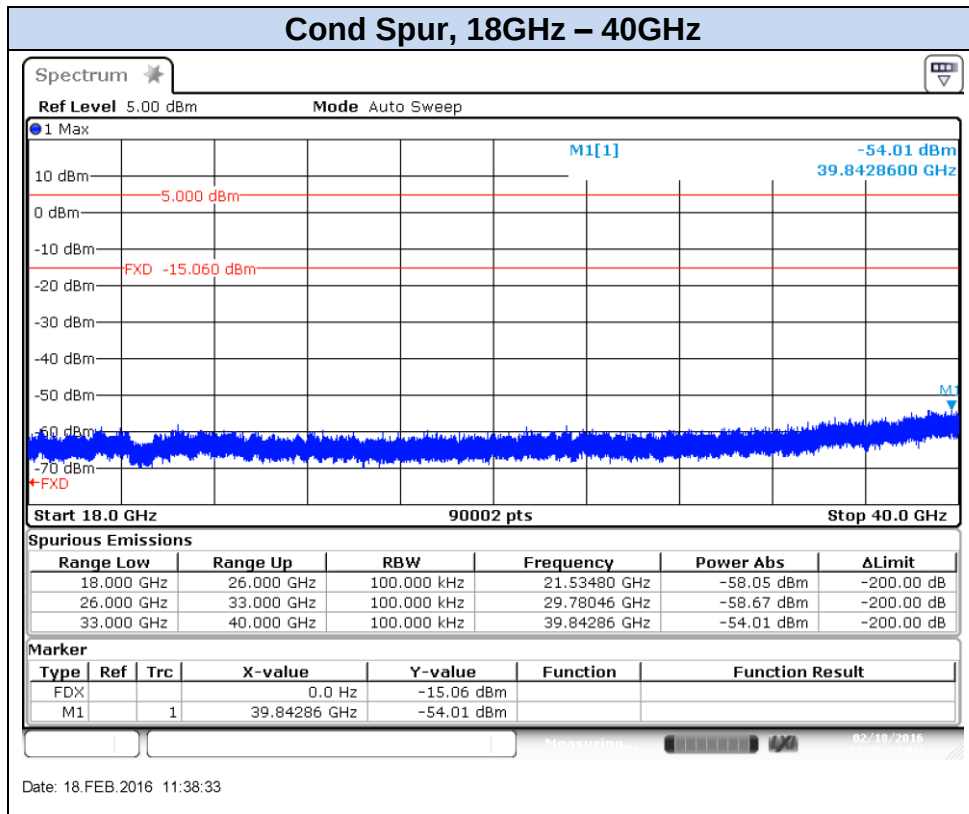
802.11n40, HT0 – Chain A, CH159F

Cond Spur, 30MHz – 9GHz

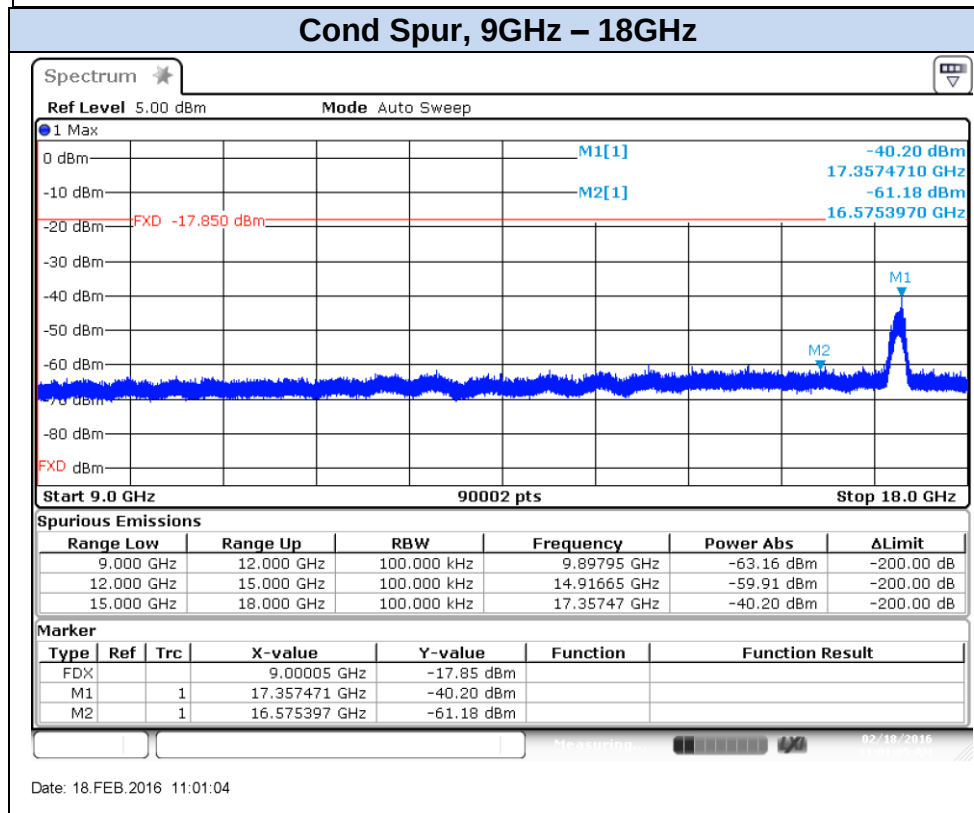
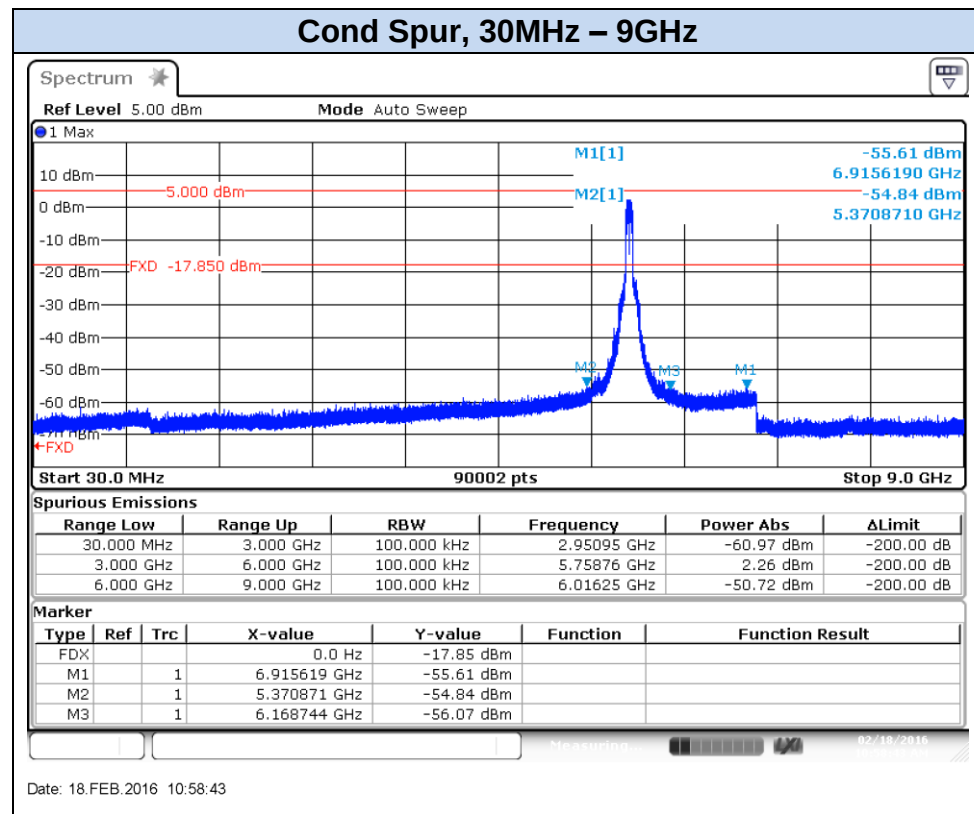


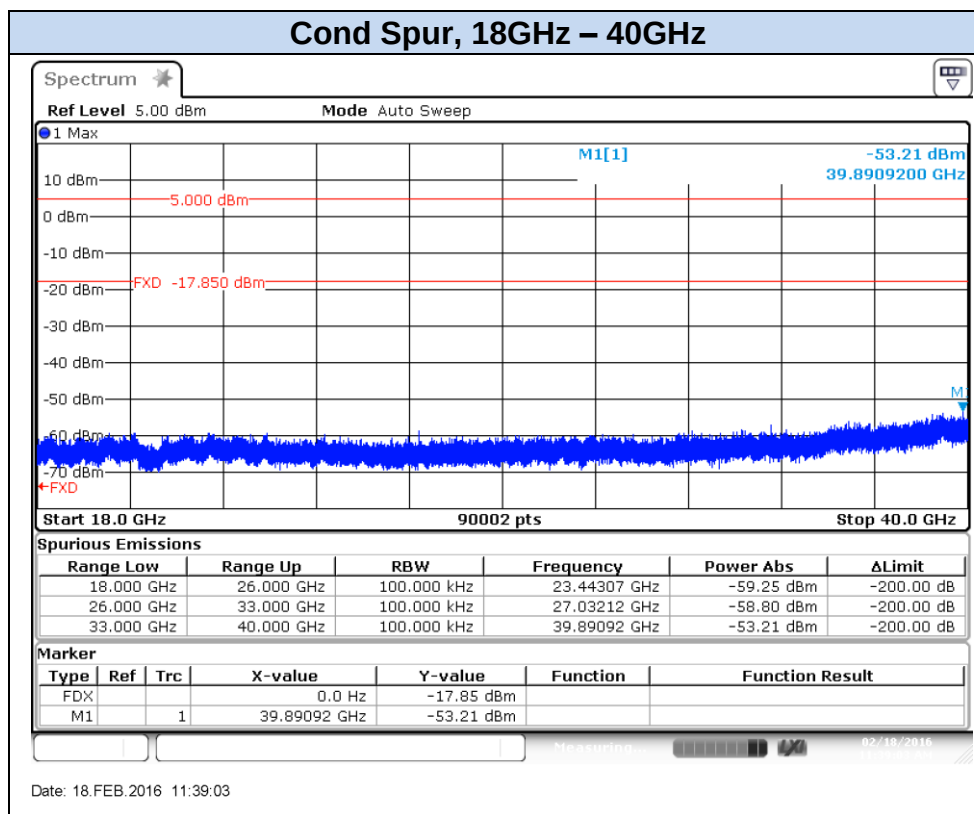
Cond Spur, 9GHz – 18GHz





802.11n80, VHT0 – Chain A, CH155ac80





C.4 Power Spectral Density

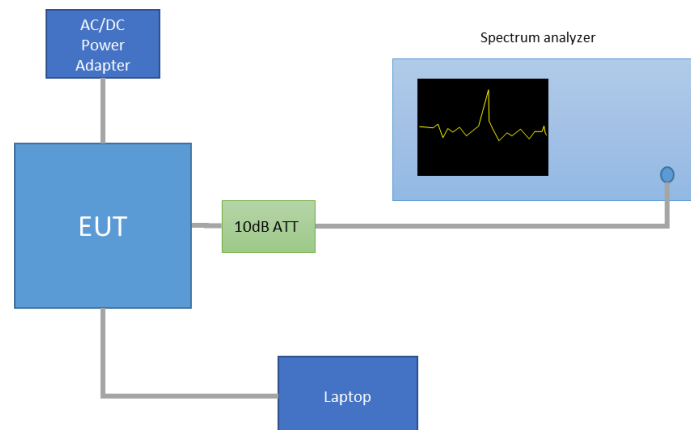
Test limits:

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 PKPSD (peak PSD)* according to point 10.2 of KDB 558074 D01 DTS Meas Guidance. This method was used for 802.11a, 802.11n20, 802.11n40, and 802.11ac80 modes.

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.



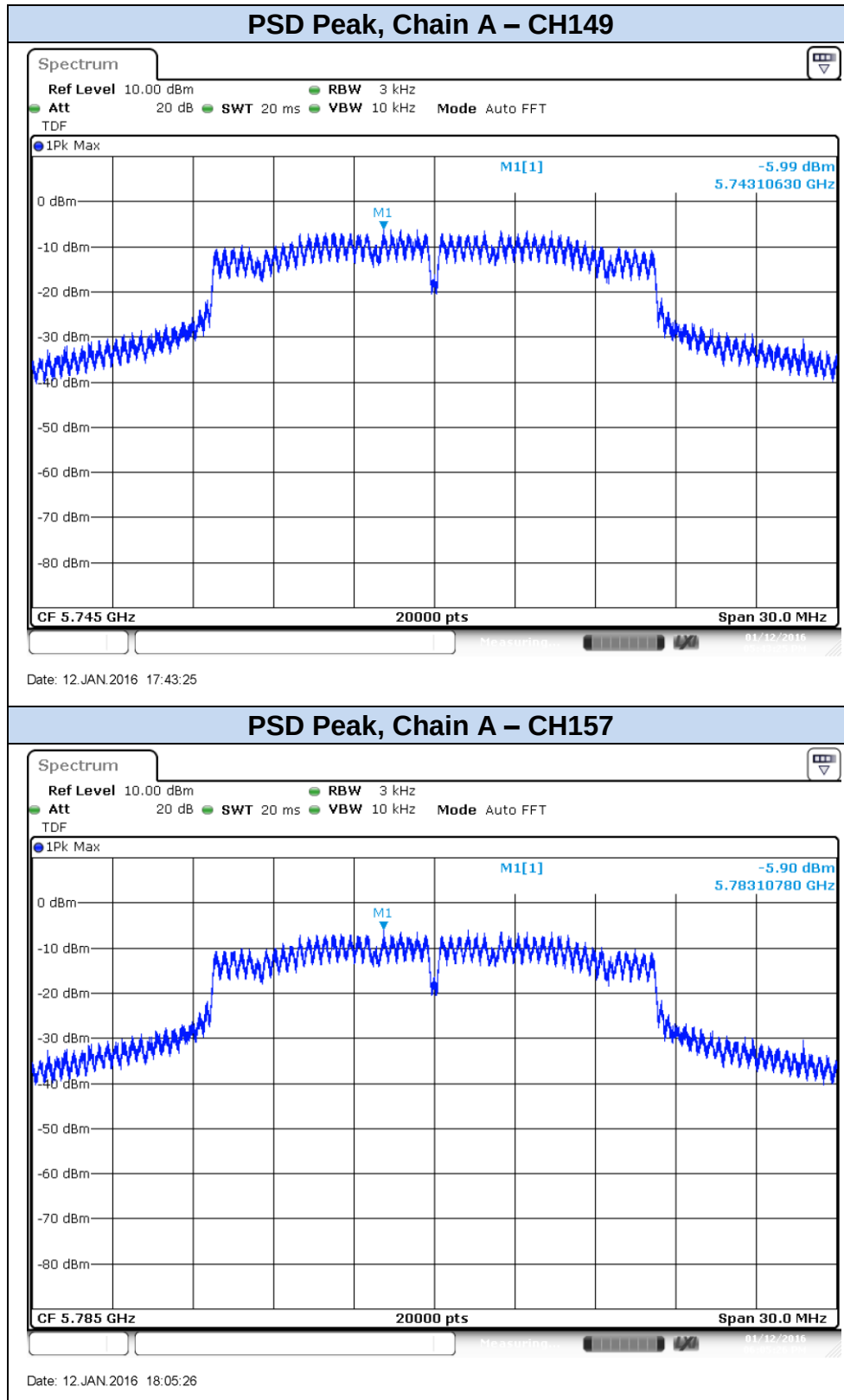
Results tables:

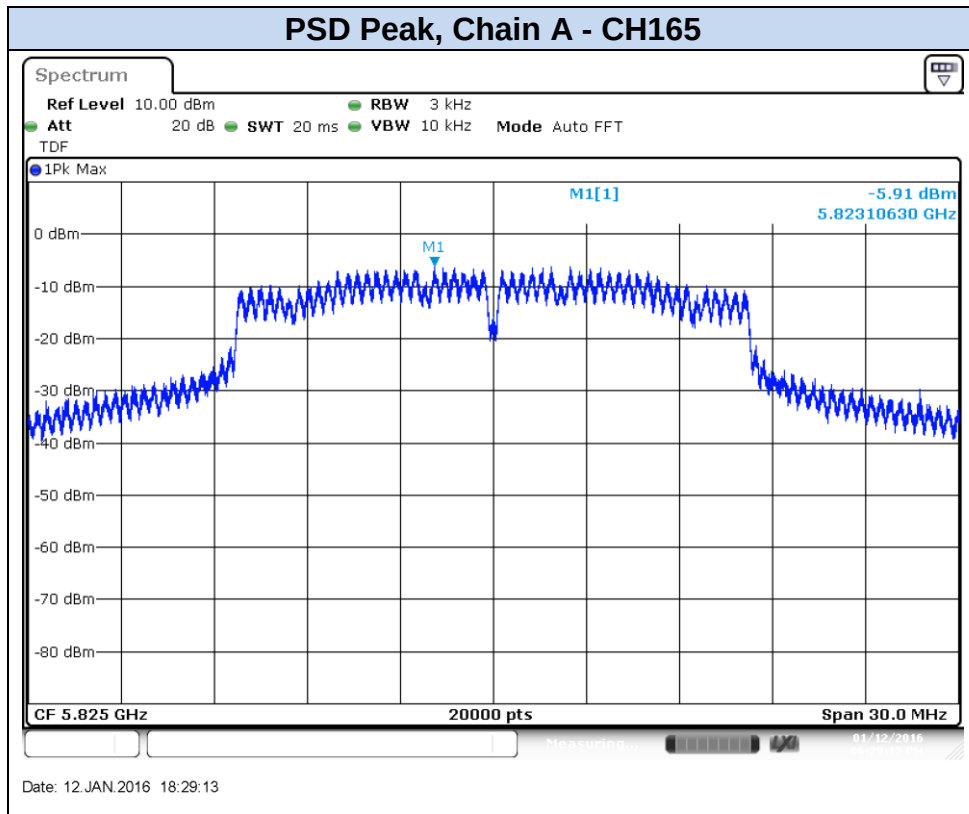
Mode	Rate	Measured Duty Cycle [%]	Channel	Frequency [MHz]	Antenna	PSD Peak [dBm]
802.11a	6Mbps	97.1	149	5745	SISO CHAIN A	-5.99
			157	5785	SISO CHAIN A	-5.90
			165	5825	SISO CHAIN A	-5.91
802.11n20	HT0	97.8	144*	5720	SISO CHAIN A	-8.43
			149	5745	SISO CHAIN A	-4.66
			157	5785	SISO CHAIN A	-5.50
			165	5825	SISO CHAIN A	-4.78
802.11n40	HT0	97.4	142F*	5710	SISO CHAIN A	-12.07
			151F	5755	SISO CHAIN A	-8.86
			159F	5795	SISO CHAIN A	-8.73
802.11ac80	VHT0	96	138ac80*	5690	SISO CHAIN A	-10.98
			155ac80	5775	SISO CHAIN A	-5.97

** Overlapped channels between U-NII-2C and 5.8 GHz DTS*

Results screenshot:

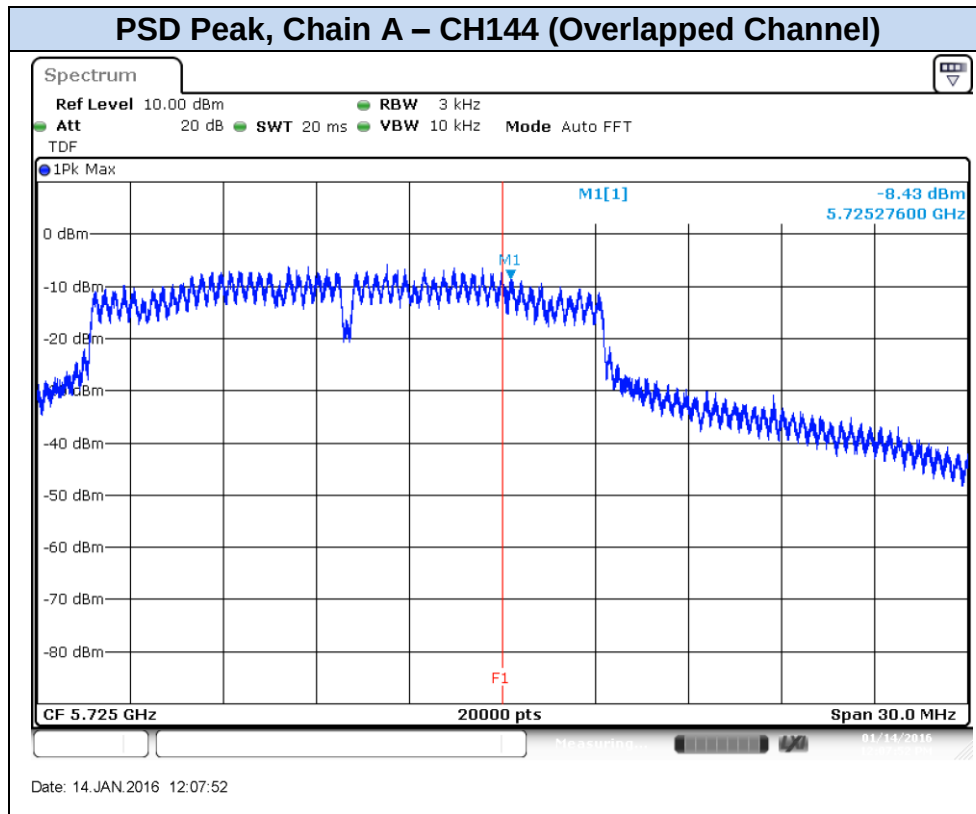
802.11a, 6Mbps



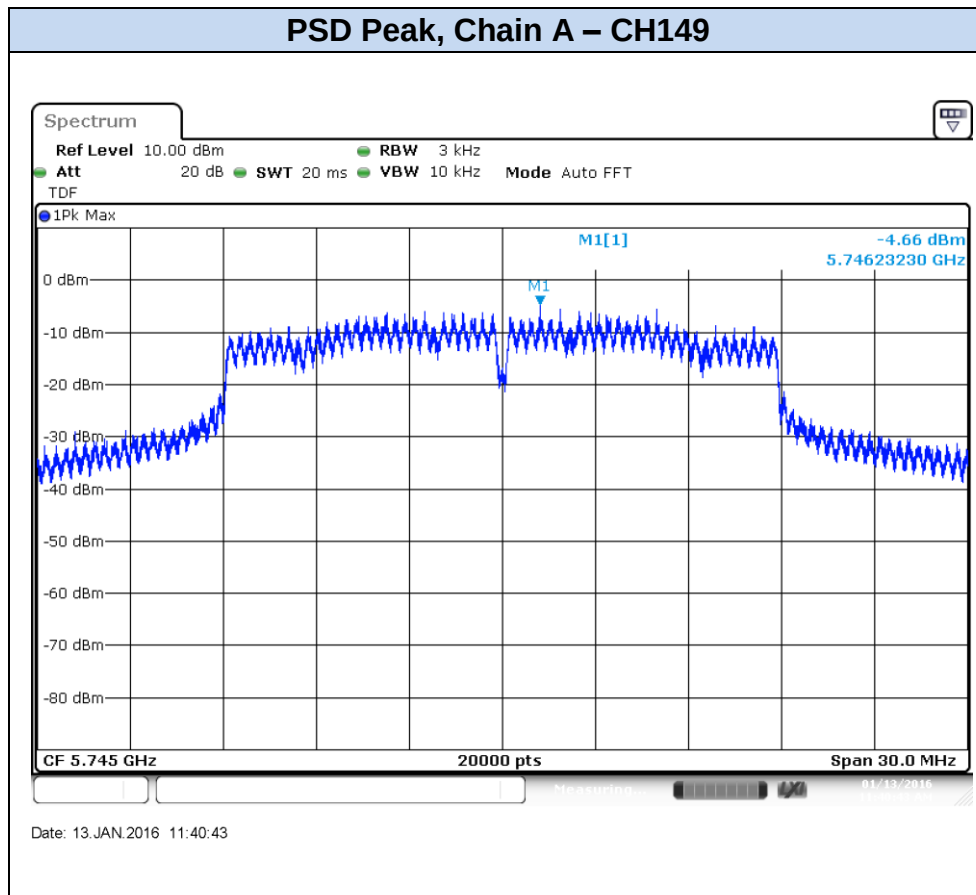


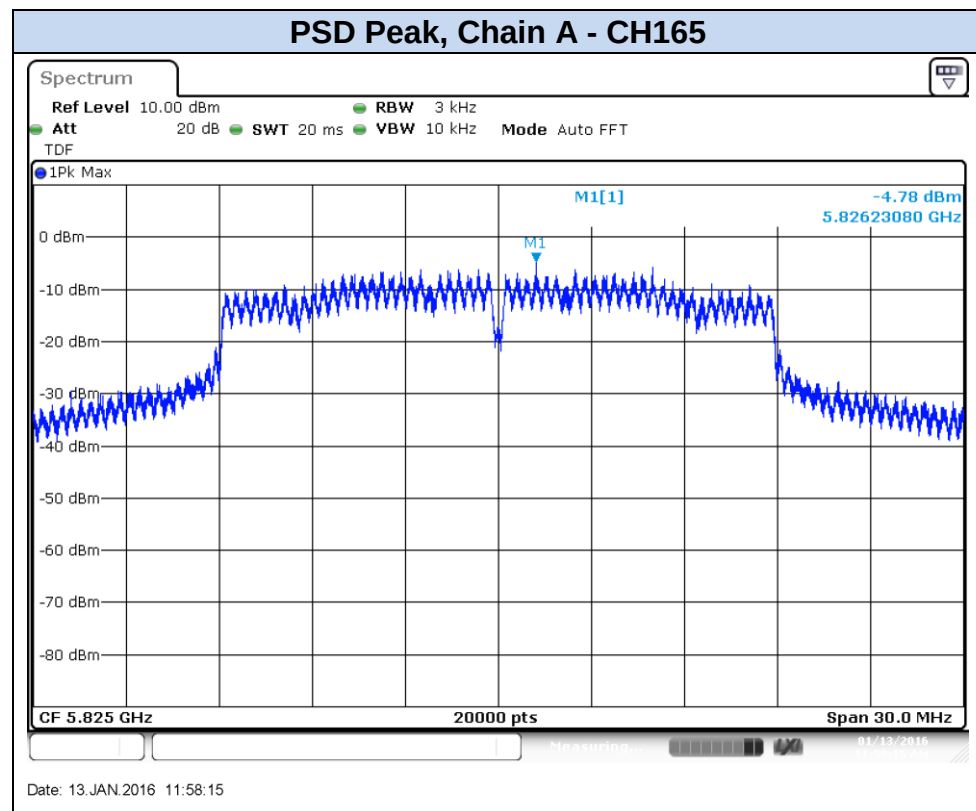
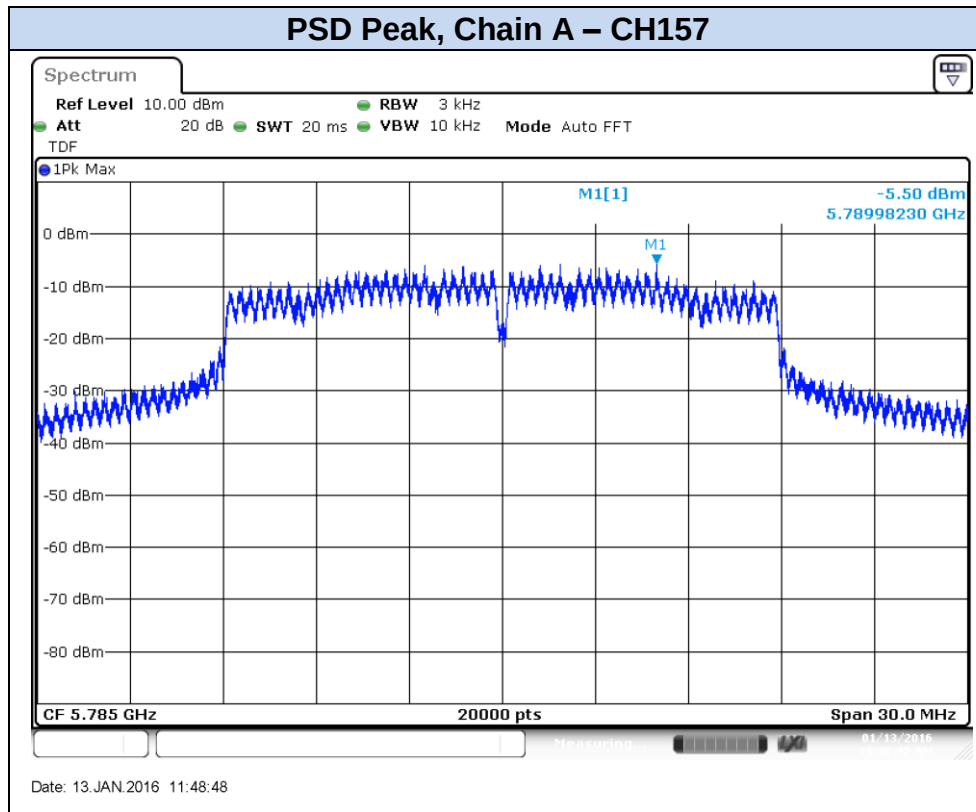
802.11n20, HT0

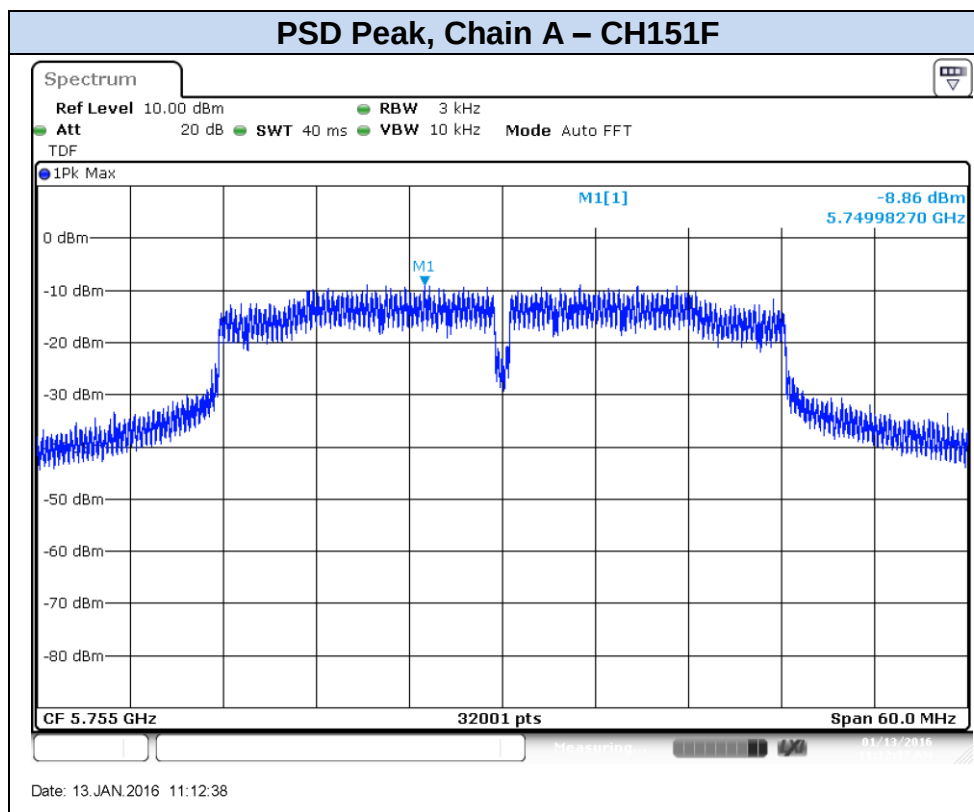
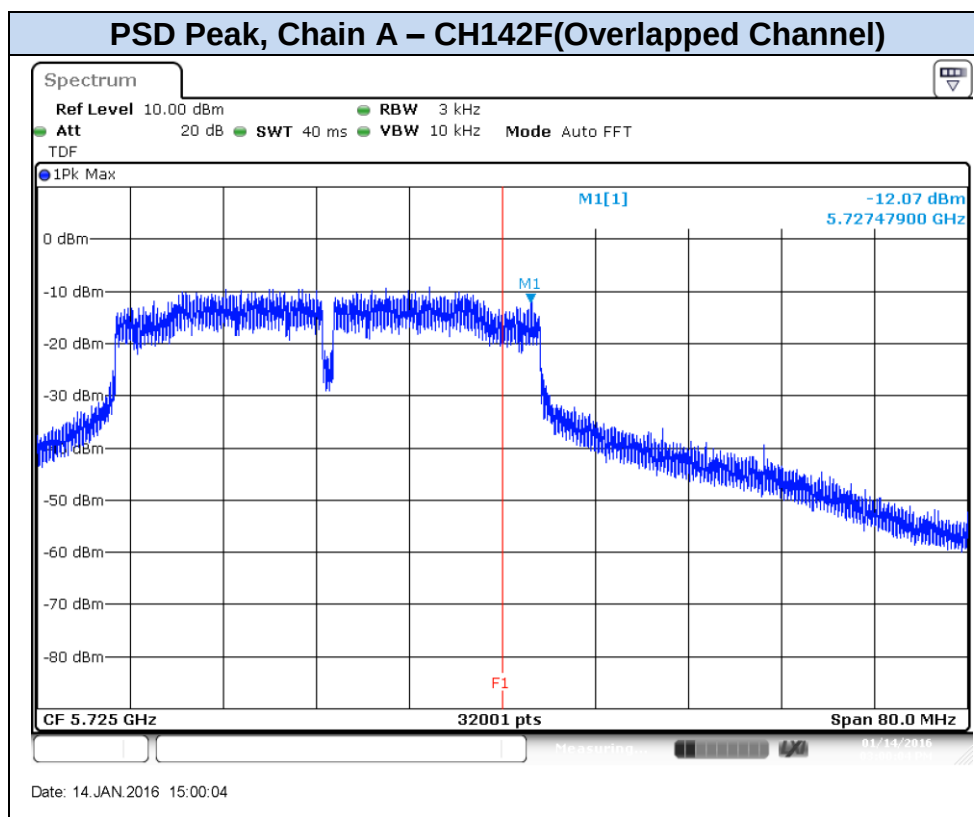
PSD Peak, Chain A – CH144 (Overlapped Channel)

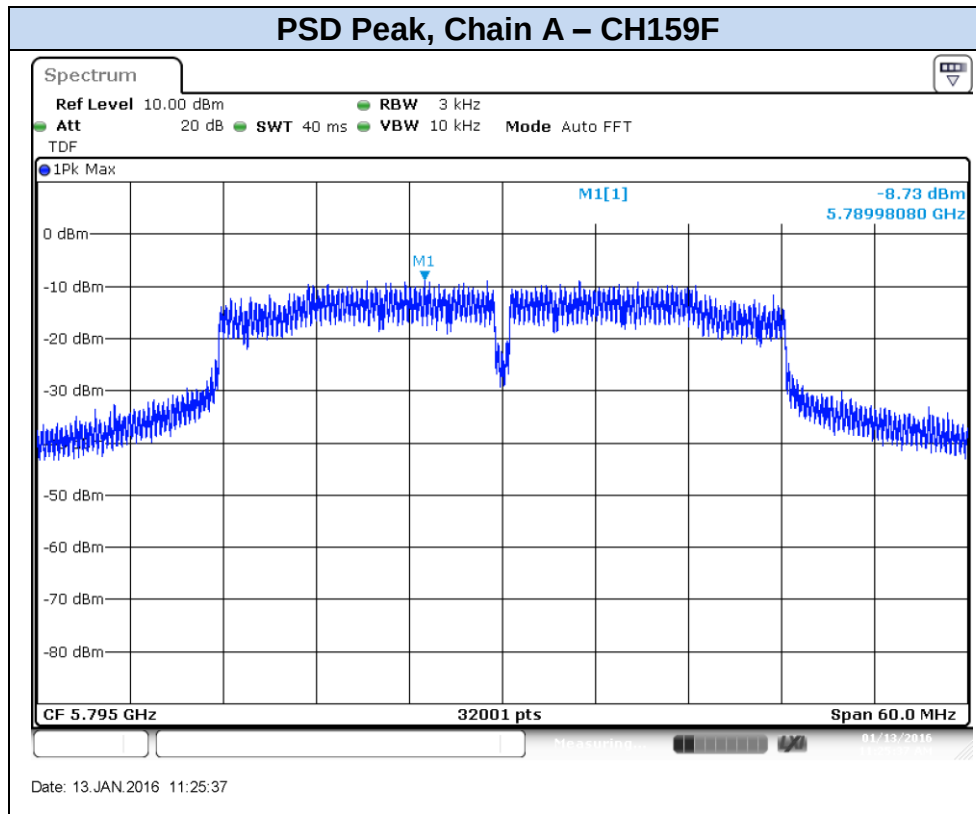


PSD Peak, Chain A – CH149

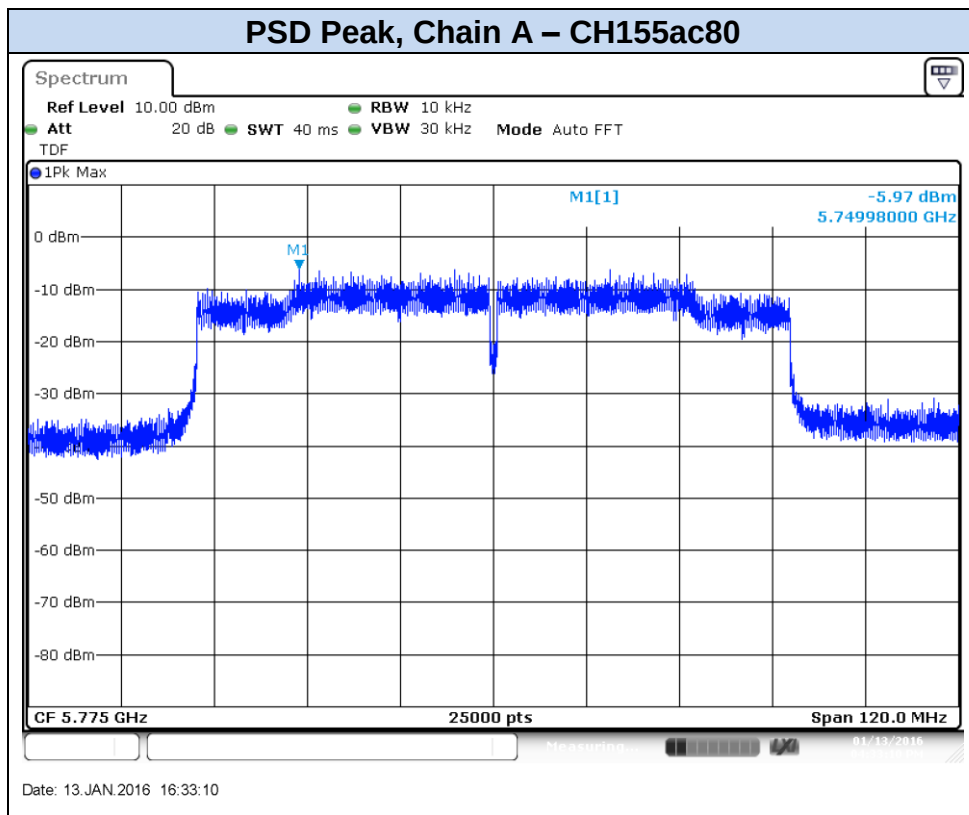
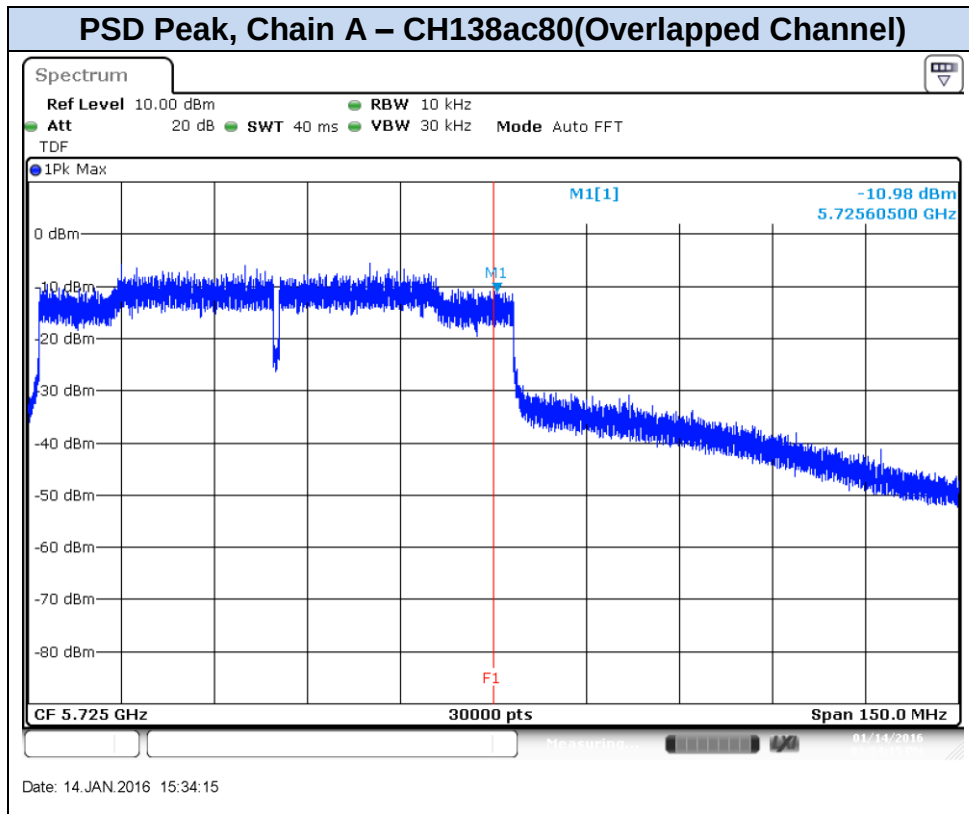




802.11n40, HT0



802.11ac80, VHT0



C.5 Radiated spurious emission

Standard references:

FCC part	RSS part	Limits			
15.407 (b) (4) 15.209	RSS-247 Clause 6.2.4 (2)	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):			
		Freq Range (MHz)	Field Streghth (μV/m)	Field Streghth (dBμV/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
		Above 960	500	54	3
		The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.			

Test procedure:

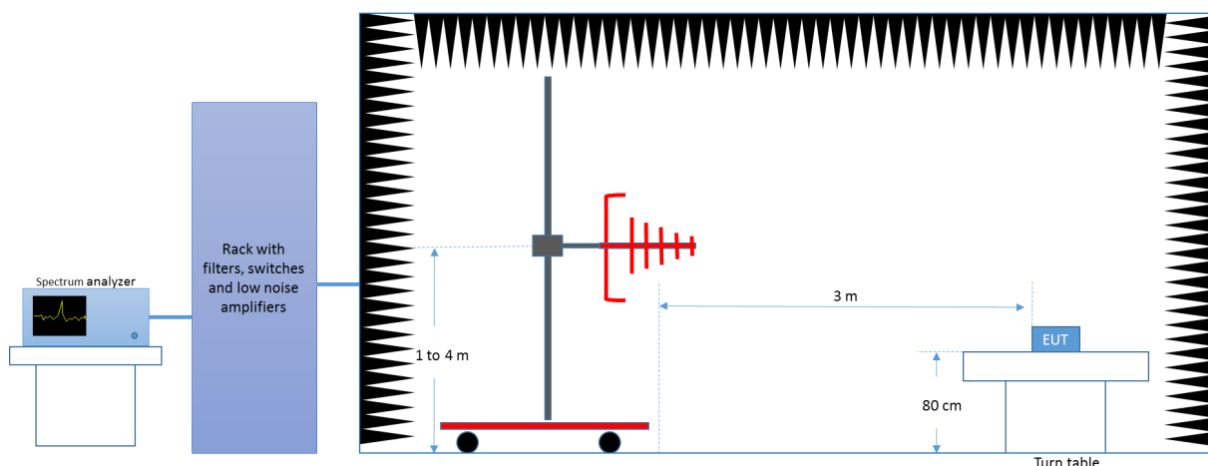
The below setups were used to measure the radiated spurious emissions.

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

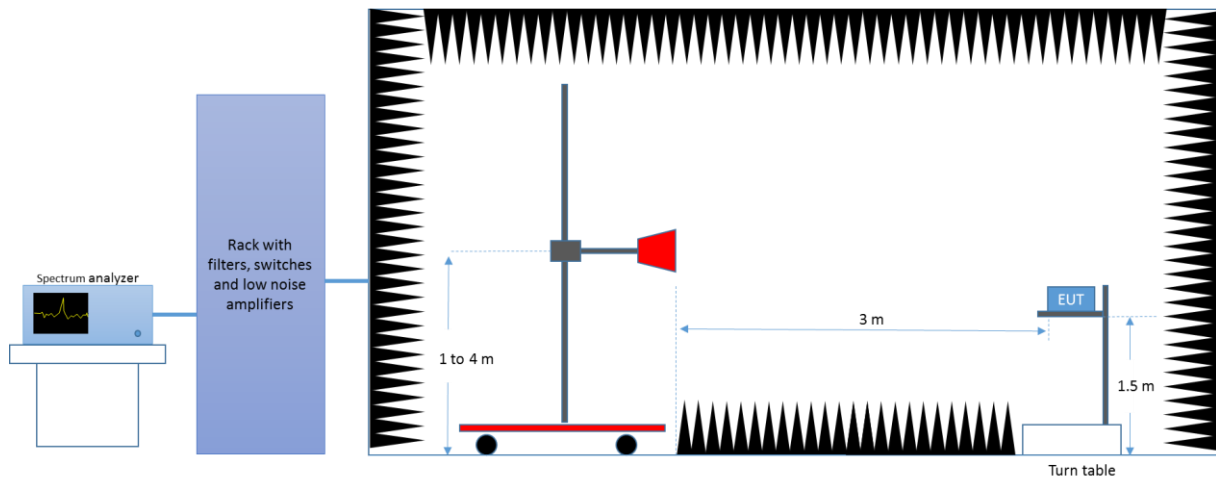
The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

The radiated spurious emissions were measured on the worst case configuration selected from the chapter C.2 Maximum Output Power and E.I.R.P. and using the lowest, middle and highest channels.

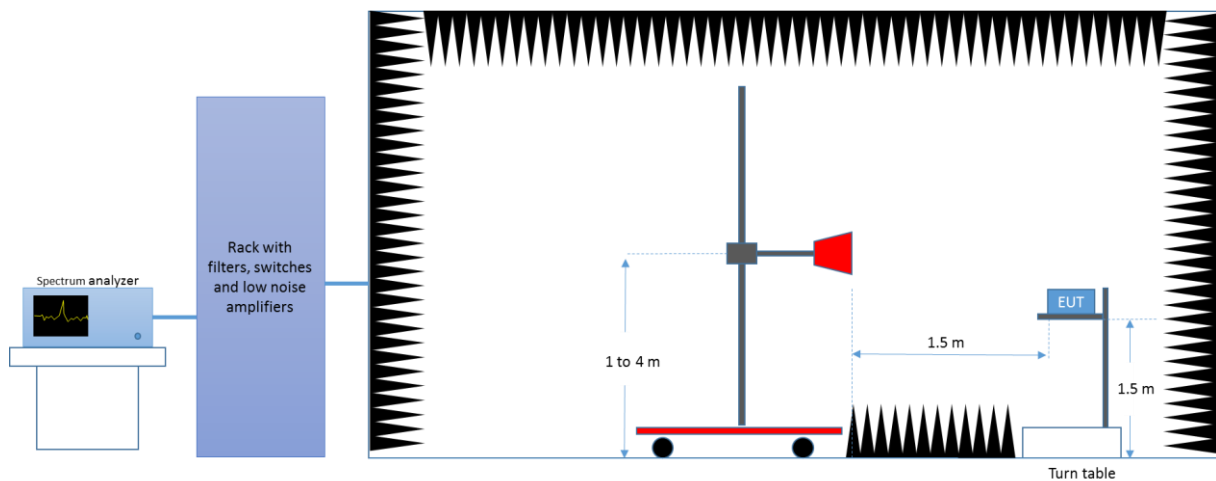
Radiated Setup < 1GHz

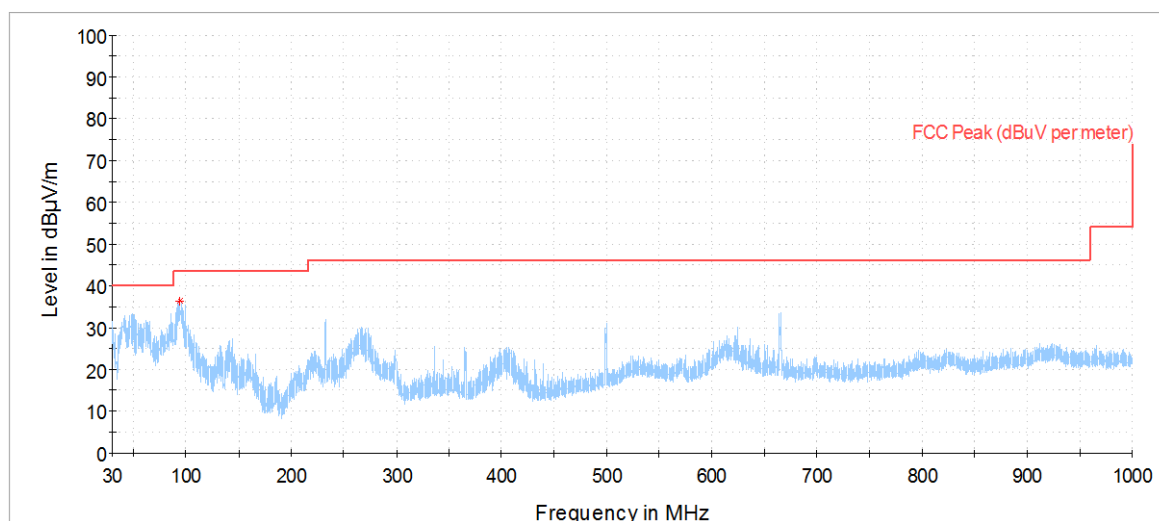


Radiated Setup 1 GHz - 18 GHz



Radiated Setup > 18 GHz



Test Results:
Radiated Spurious – 30MHz – 1GHz
Radiated Spurious – All Modes

 Peak measurements

 AVG measurements

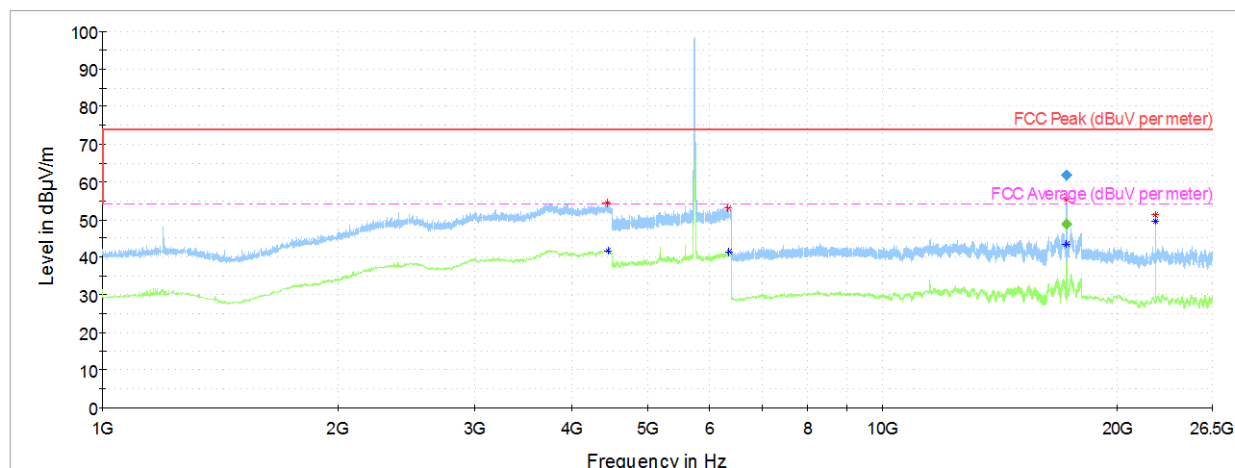
 Limit FCC Peak

Frequency	Max Peak	Limit	Margin
MHz	dBuV/m	dBuV/m	dB
94.87	36.40	43.56	7.15

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

1 GHz – 26.5GHz, 802.11a, Chain A

Radiated Spurious – CH149


 Peak measurements

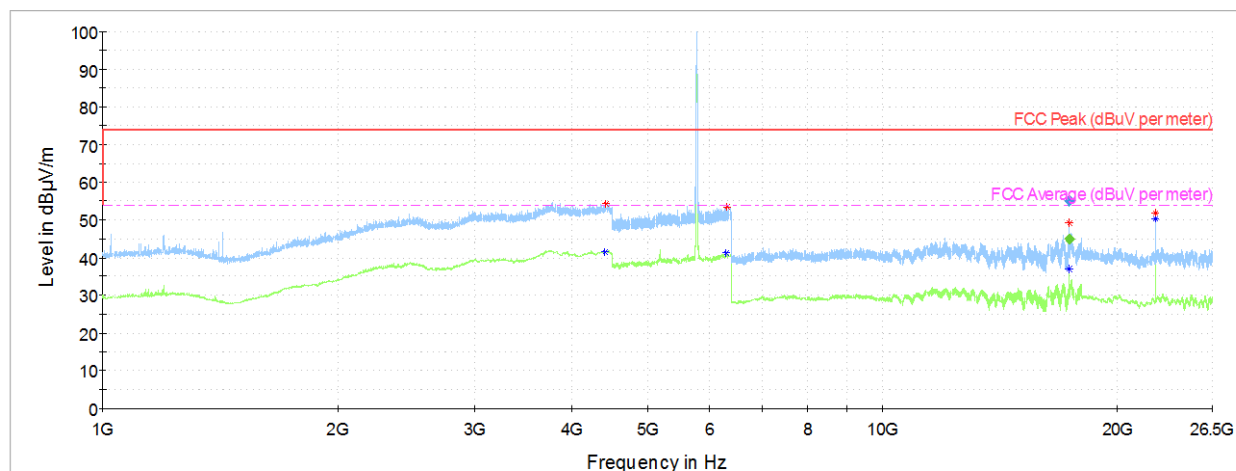
 AVG measurements

 Limit FCC Peak

 Limit FCC Avg

Frequency MHz	MaxPeak dBuV/m	AvG dBuV/m	Limit dBuV/m	Margin dB
4438.31	54.41	---	74.06	19.65
4440.94	---	41.57	54.06	12.48
6332.46	53.13	---	74.06	20.92
6361.22	---	41.27	54.06	12.79
17233.24	61.68	---	74.06	12.38
17236.14	---	48.86	54.06	5.20
22399.91	---	49.69	54.06	4.37
22399.91	51.32	---	74.06	22.74

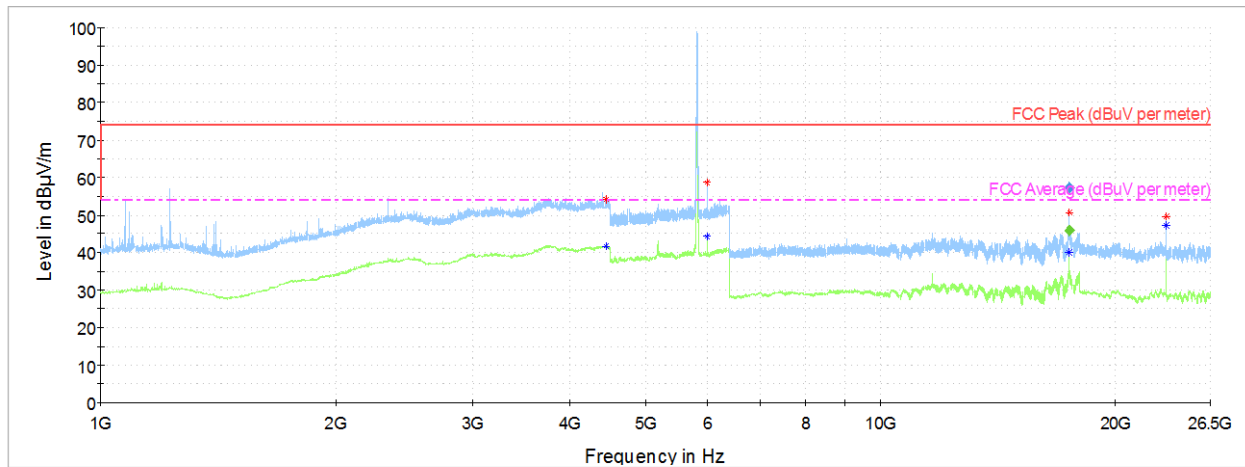
Radiated Spurious – CH157



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4405.50	---	41.57	54.06	12.49
4419.50	54.21	---	74.06	19.84
6307.50	---	41.20	54.06	12.86
6318.73	53.43	---	74.06	20.63
17353.88	---	45.01	54.06	9.05
17363.74	55.14	---	74.06	18.92
22399.91	---	50.19	54.06	3.87
22399.91	51.76	---	74.06	22.30

Radiated Spurious – CH165

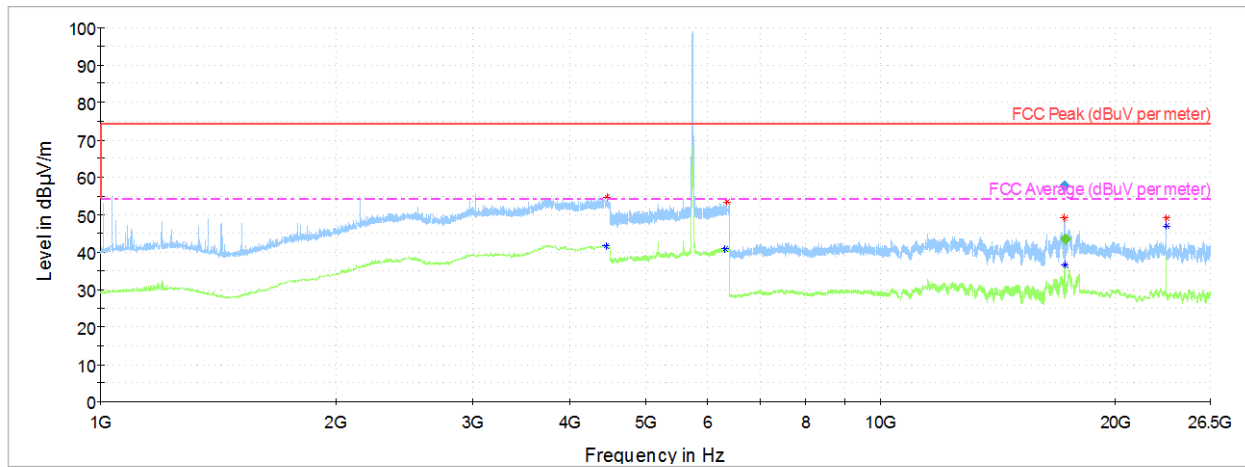


— Peak measurements
 — AVG measurements
 — Limit FCC Peak
 - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4447.06	54.16	---	74.06	19.90
4452.31	---	41.64	54.06	12.42
5992.28	---	44.24	54.06	9.82
5993.92	58.55	---	74.06	15.50
17473.94	57.24	---	74.06	16.82
17473.94	---	45.89	54.06	8.17
23299.75	49.54	---	74.06	24.52
23300.14	---	47.07	54.06	6.99

1 GHz – 26.5GHz, 802.11n20, Chain A

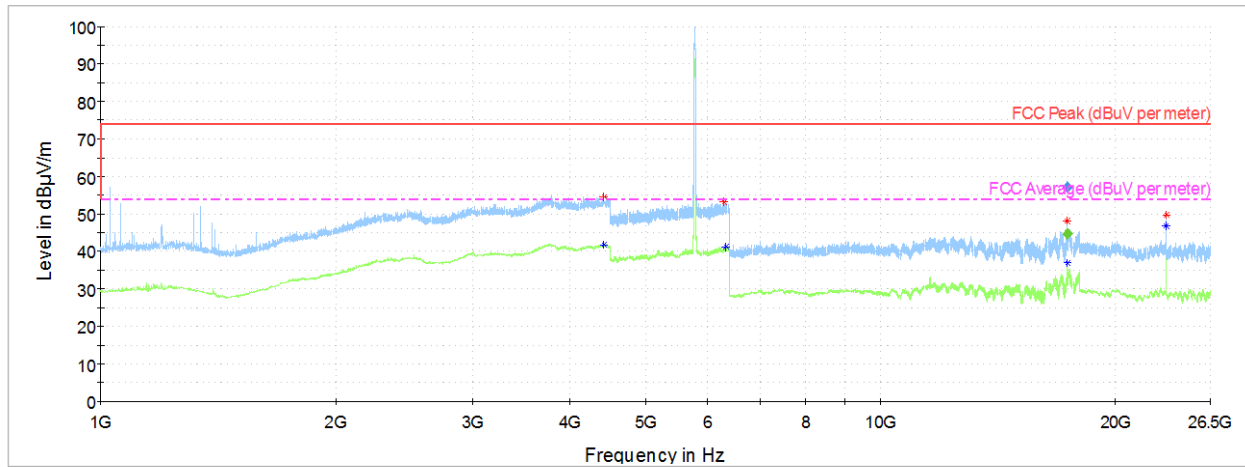
Radiated Spurious – CH149



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4451.88	---	41.66	54.06	12.39
4456.69	54.74	---	74.06	19.32
6324.00	---	40.89	54.06	13.17
6352.59	53.29	---	74.06	20.77
17236.14	57.55	---	74.06	16.51
17239.62	---	43.50	54.06	10.56
23299.75	49.17	---	74.06	24.88
23300.14	---	47.05	54.06	7.01

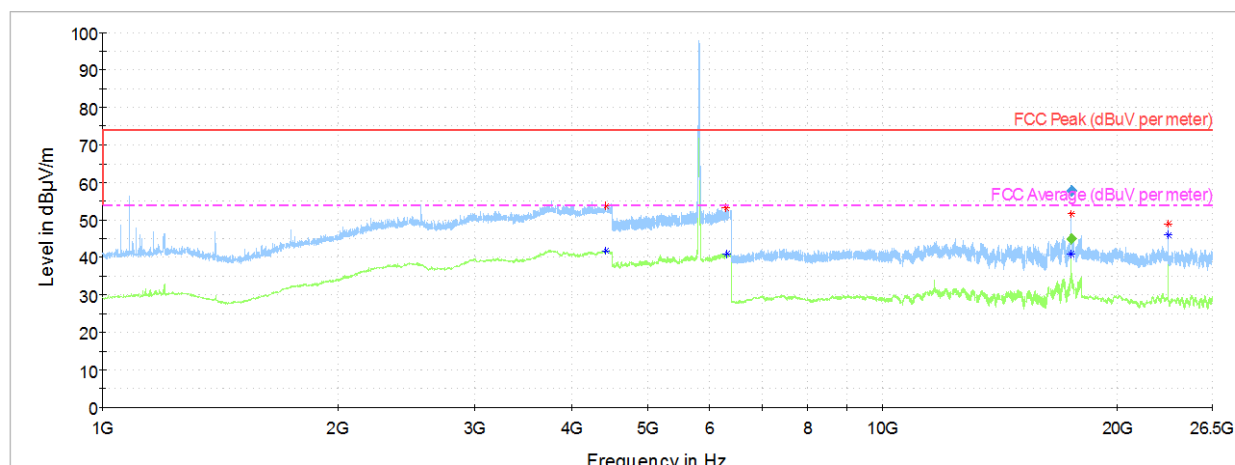
Radiated Spurious – CH157



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4416.88	54.51	---	74.06	19.55
4420.81	---	41.58	54.06	12.48
6304.14	53.15	---	74.06	20.91
6333.67	---	41.26	54.06	12.80
17357.36	---	44.72	54.06	9.34
17360.26	57.30	---	74.06	16.76
23300.14	---	46.91	54.06	7.15
23300.14	49.68	---	74.06	24.38

Radiated Spurious – CH165

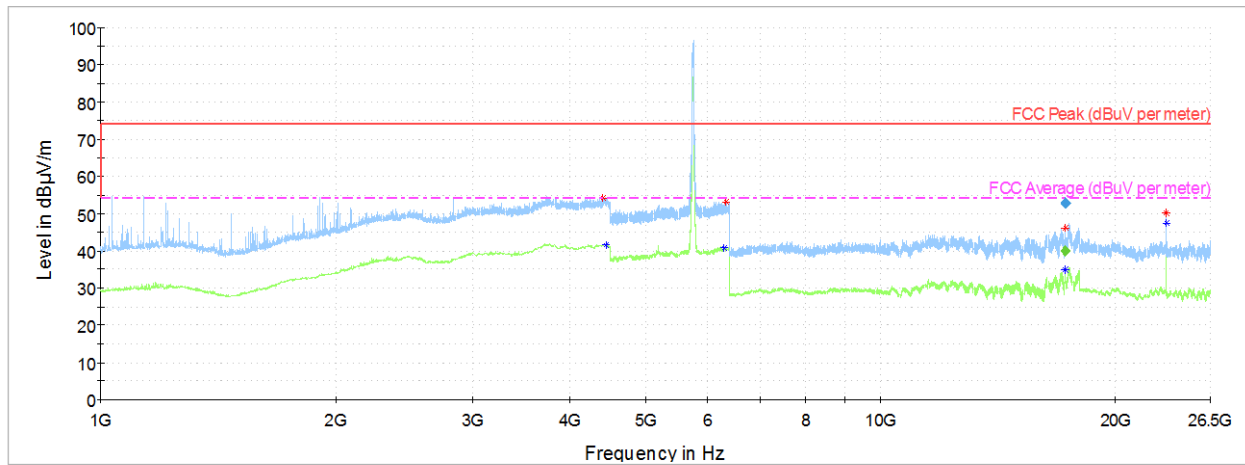


— Peak measurements
 — AVG measurements
 — Limit FCC Peak
 - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4420.81	---	41.58	54.06	12.48
4426.06	53.82	---	74.06	20.24
6311.39	53.30	---	74.06	20.76
6322.19	---	40.88	54.06	13.17
17470.46	57.78	---	74.06	16.28
17473.94	---	44.85	54.06	9.21
23300.14	---	46.01	54.06	8.05
23300.14	48.81	---	74.06	25.25

1 GHz – 26.5GHz, 802.11n40, Chain A

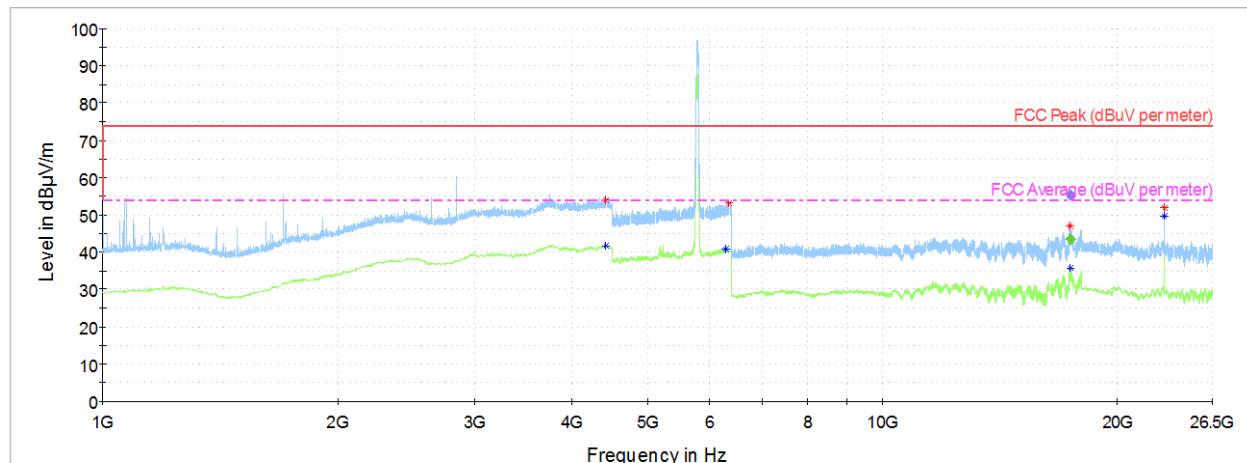
Radiated Spurious – CH151F



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4411.19	54.16	---	74.06	19.90
4451.88	---	41.66	54.06	12.39
6307.33	---	40.84	54.06	13.22
6331.08	53.12	---	74.06	20.94
17266.30	---	39.89	54.06	14.17
17269.78	52.83	---	74.06	21.23
23300.14	---	47.38	54.06	6.67
23300.14	50.05	---	74.06	24.01

Radiated Spurious – CH159F

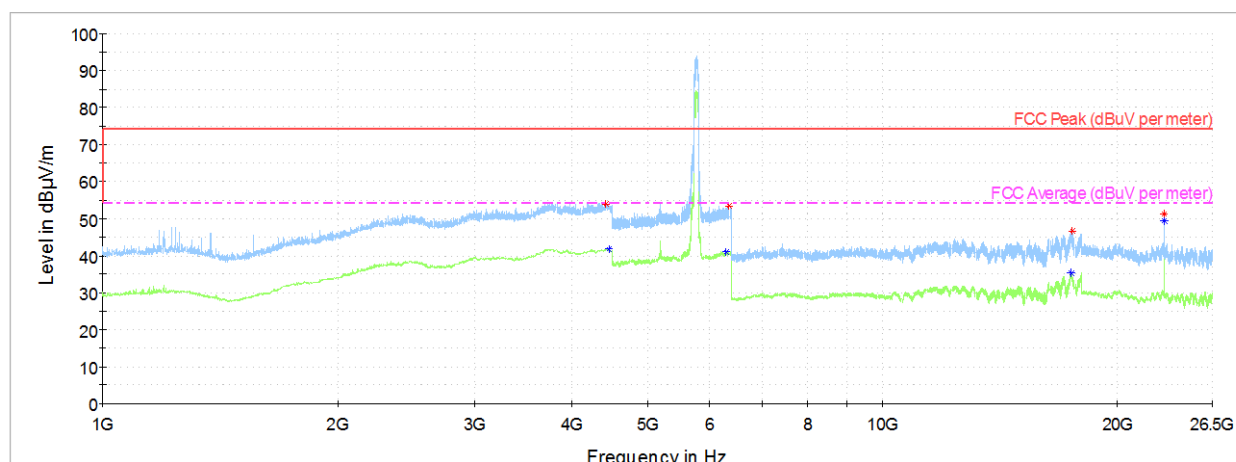


— Peak measurements
 — AVG measurements
 — Limit FCC Peak
 - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4421.25	54.01	---	74.06	20.05
4421.69	---	41.61	54.06	12.44
6307.68	---	40.99	54.06	13.07
6351.38	53.15	---	74.06	20.91
17395.06	---	43.55	54.06	10.51
17408.98	55.27	---	74.06	18.79
23020.02	---	49.78	54.06	4.28
23020.02	51.77	---	74.06	22.29

1 GHz – 26.5GHz, 802.11ac80, Chain A

Radiated Spurious – CH155ac80

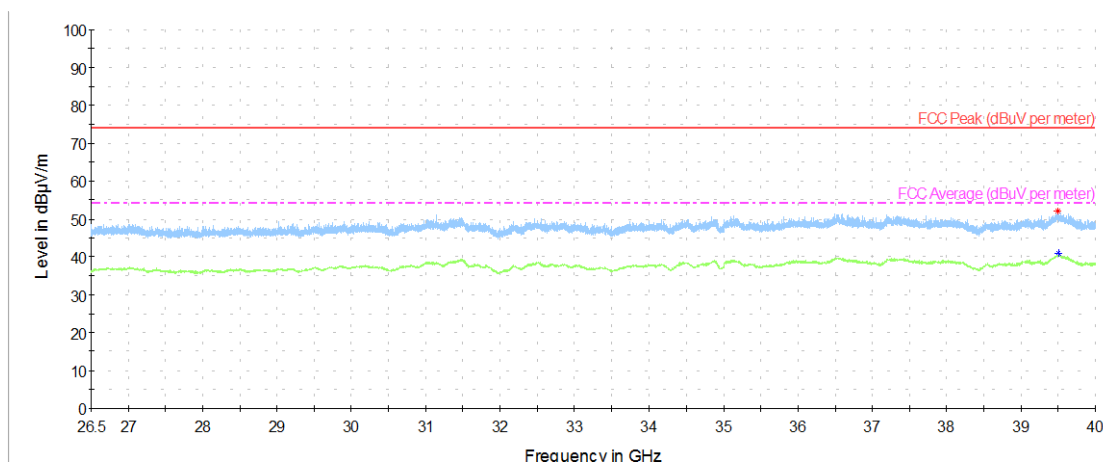


— Peak measurements
 — AVG measurements
 --- Limit FCC Peak
 --- Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4418.19	53.91	---	74.06	20.14
4466.75	---	41.91	54.06	12.15
6297.49	---	40.87	54.06	13.19
6352.33	53.31	---	74.06	20.75
17476.84	---	35.44	54.06	18.61
17523.82	46.68	---	74.06	27.38
23019.64	51.28	---	74.06	22.77
23020.02	---	49.37	54.06	4.69

26.5 GHz – 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
39496.87	51.94	---	74.06	22.12
39503.10	---	40.87	54.06	13.19

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

Annex D. Test Results - BLE

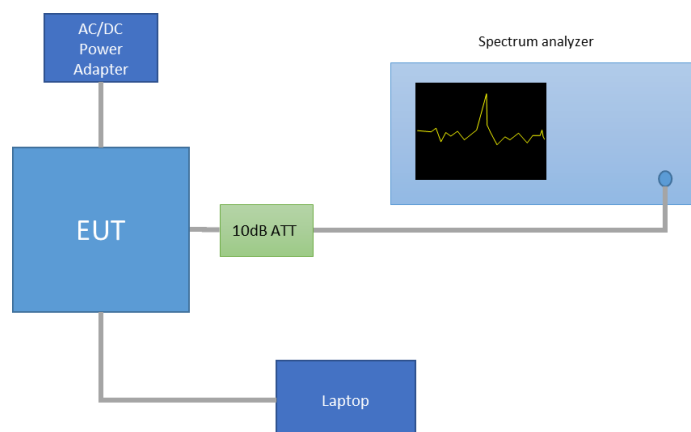
D.1 6dB & 99% Bandwidth

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 analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

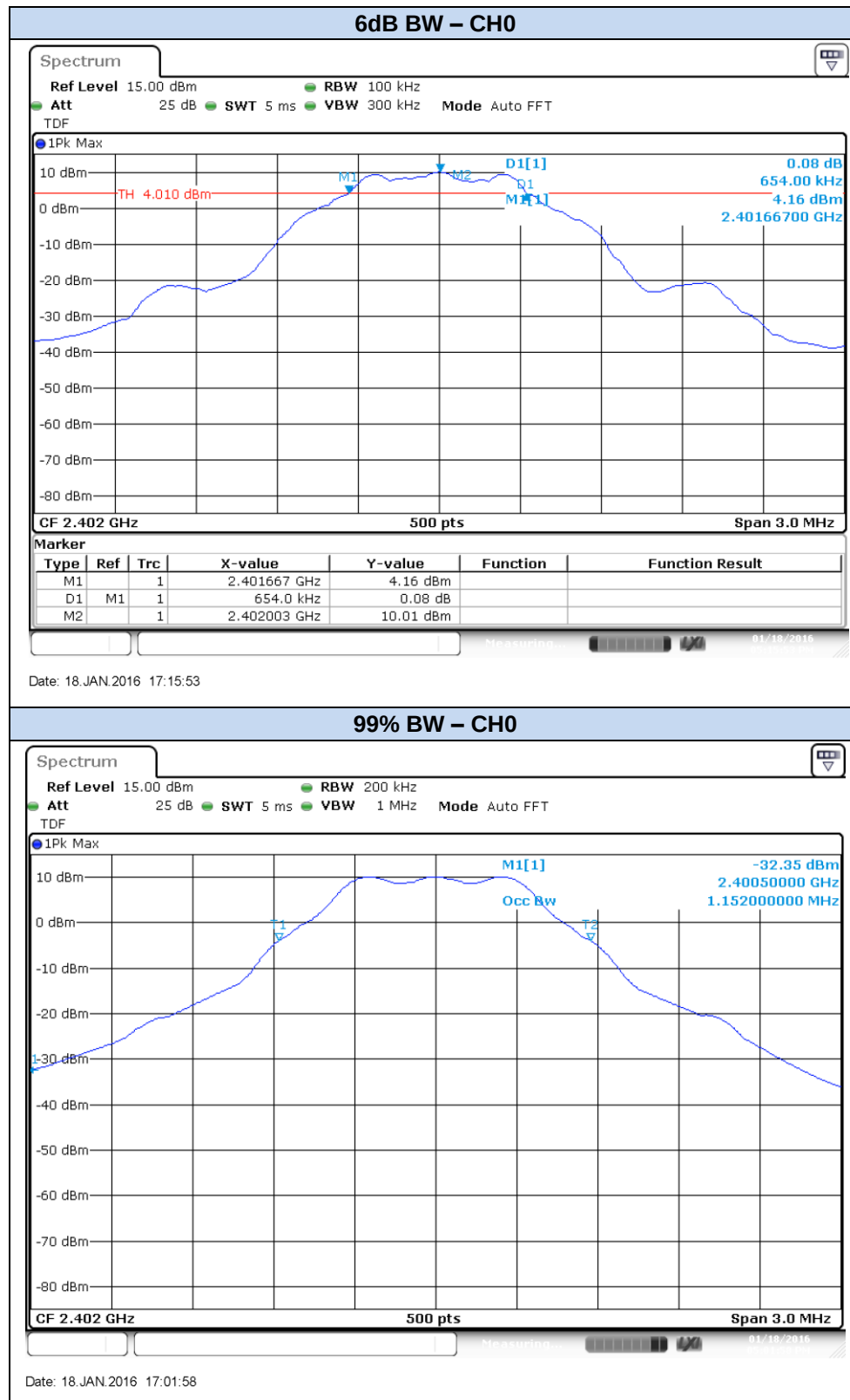


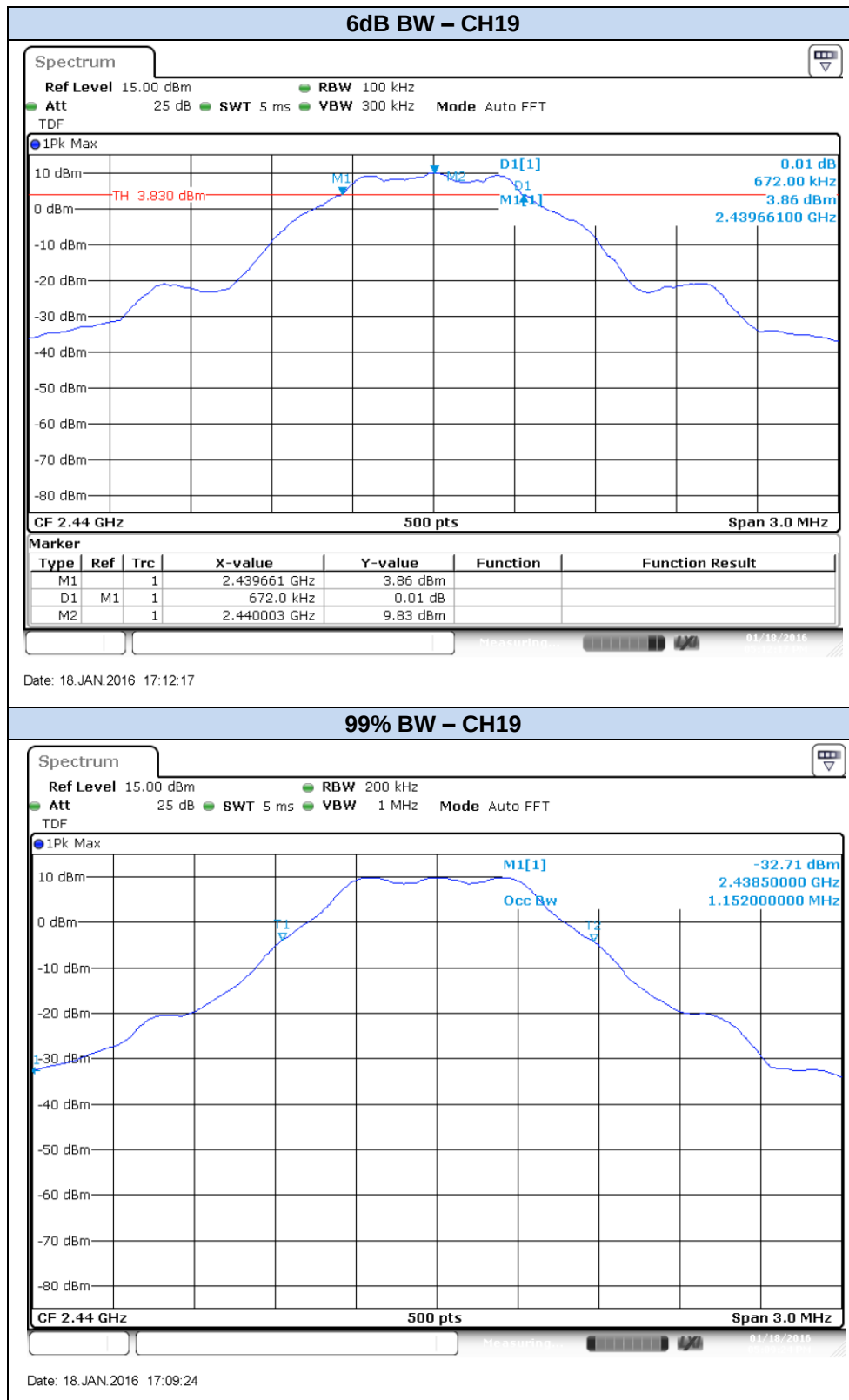
Results tables:

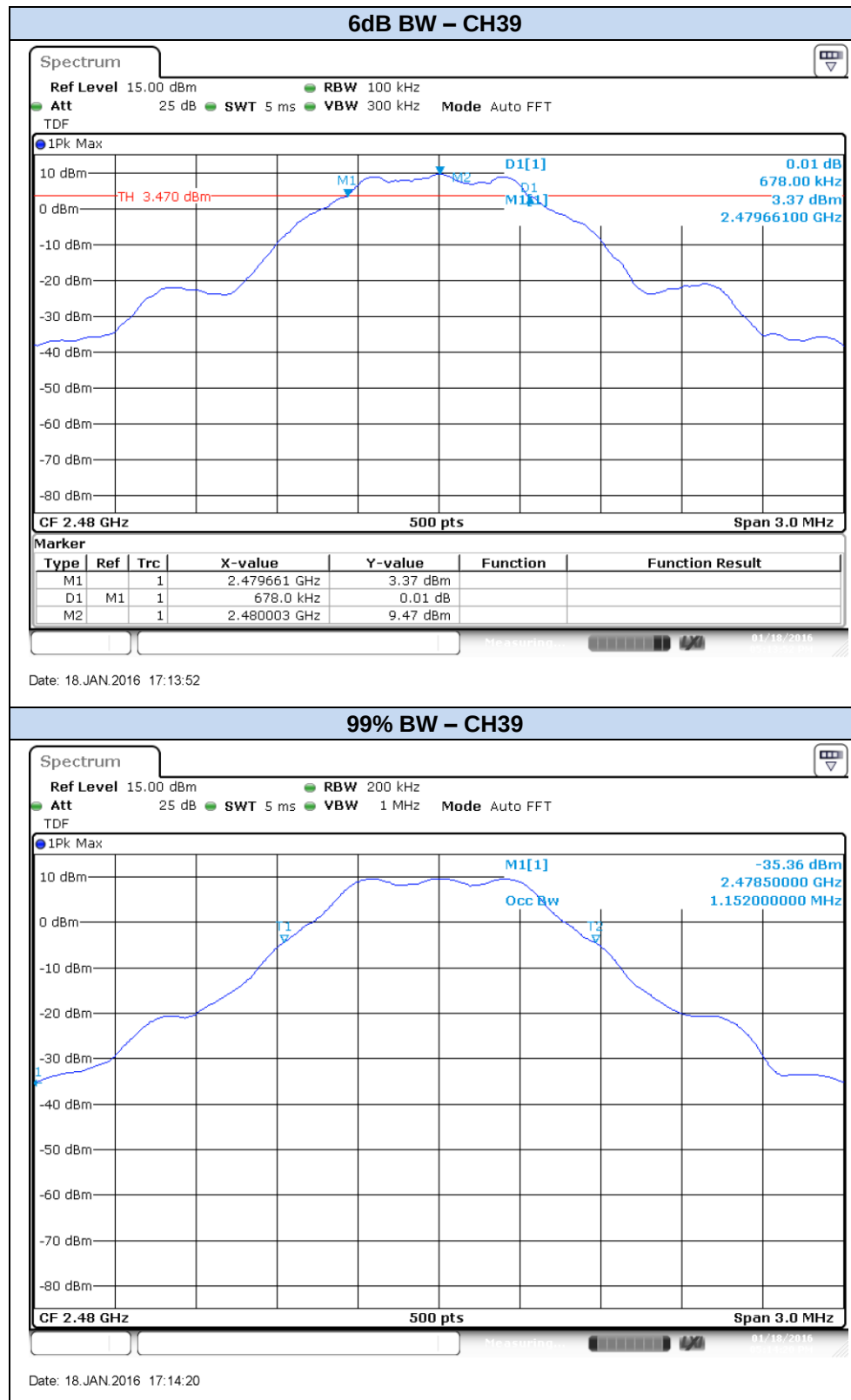
Mode	Channel	Frequency [MHz]	6dB BW [MHz]	99% BW [MHz]
BLE	0	2402	0.654	1.152
	19	2440	0.672	1.152
	39	2480	0.678	1.152

Results screenshot:

BLE







D.2 Maximum Output Power and E.I.R.P.

Test limits:

FCC part	RSS part	Limits
15.247 (b) (3)	RSS-247 Clause 5.4 (4)	(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

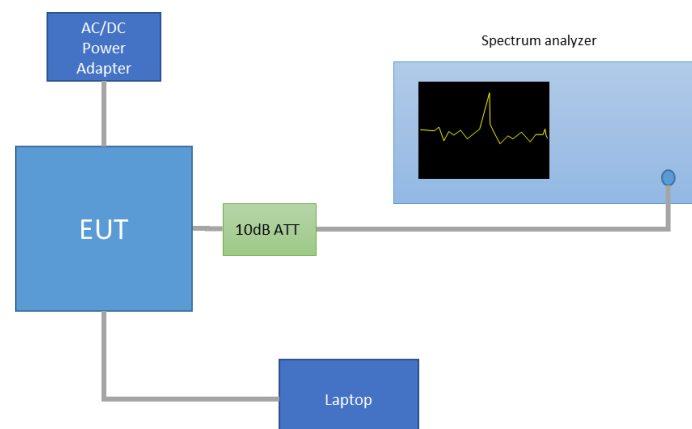
Test procedure:

The Maximum peak conducted output power was measured using the $RBW \geq DTS$ bandwidth method defined in paragraph 9.1.1 of KDB 558074 D01.

The Maximum conducted average output power was measured using the channel integration method according to Method AVGSA-2, defined in paragraph 9.2.2.4 of KDB 558074 D01.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power. The declared maximum antenna gain is 3dBi.

The setup below was used to measure the maximum conducted output power. 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.



Results tables:

Maximum Peak Conducted Output Power values

Mode	Meas. Duty Cycle [%]	CH	Frequency [MHz]	Measured Conducted Peak Output power [dBm]	EIRP [dBm]	Peak Output Power [mW]
BLE	62.9	0	2402	10.15	13.15	10.35
		19	2440	9.95	12.95	9.89
		39	2480	9.61	12.61	9.14

Max Value

Min Value

Maximum (average) Conducted Output Power values (for informative purposes only)

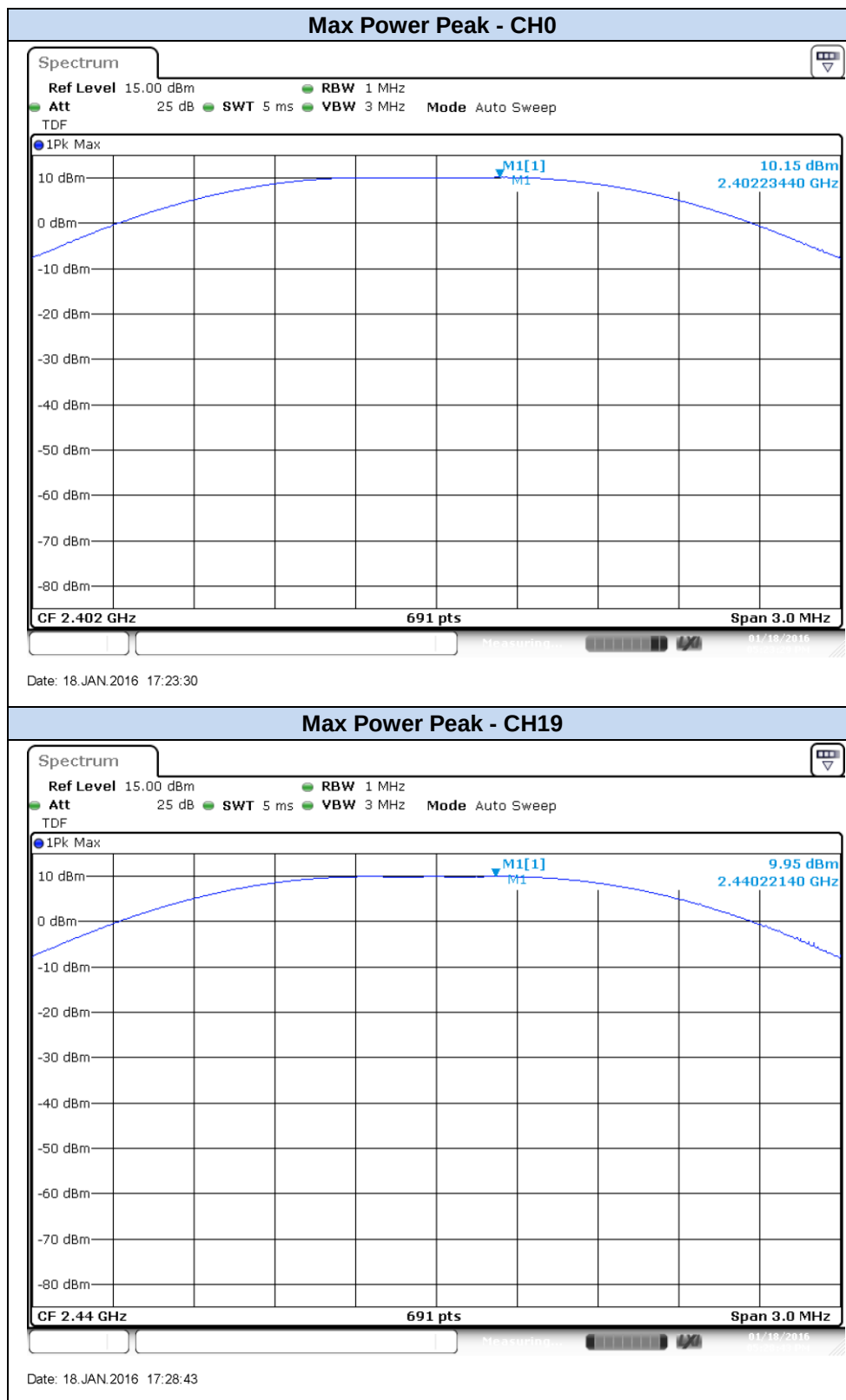
Mode	Meas. Duty Cycle [%]	CH	Frequency [MHz]	Maximum (average) Conducted Output Power [dBm]	Duty cycle Compensated*	EIRP [dBm]	Average Output Power [mW]
BLE	62.9	0	2402	8.10	10.11	13.11	10.26
		19	2440	7.91	9.92	12.92	9.82
		39	2480	7.57	9.58	12.58	9.08

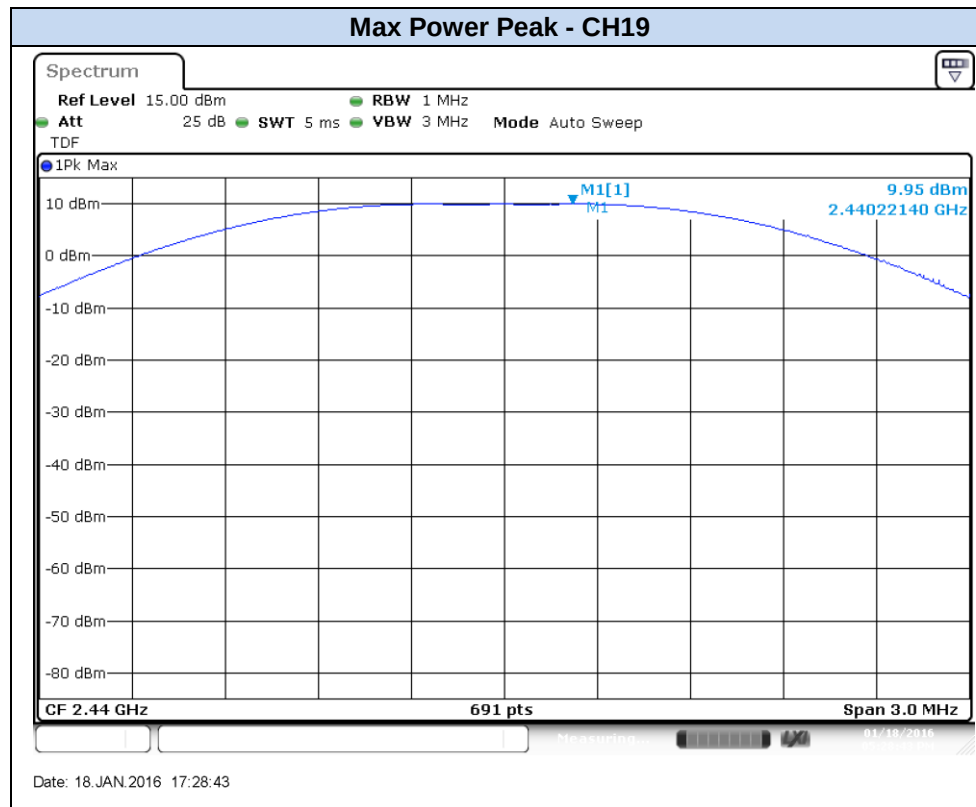
Max Value

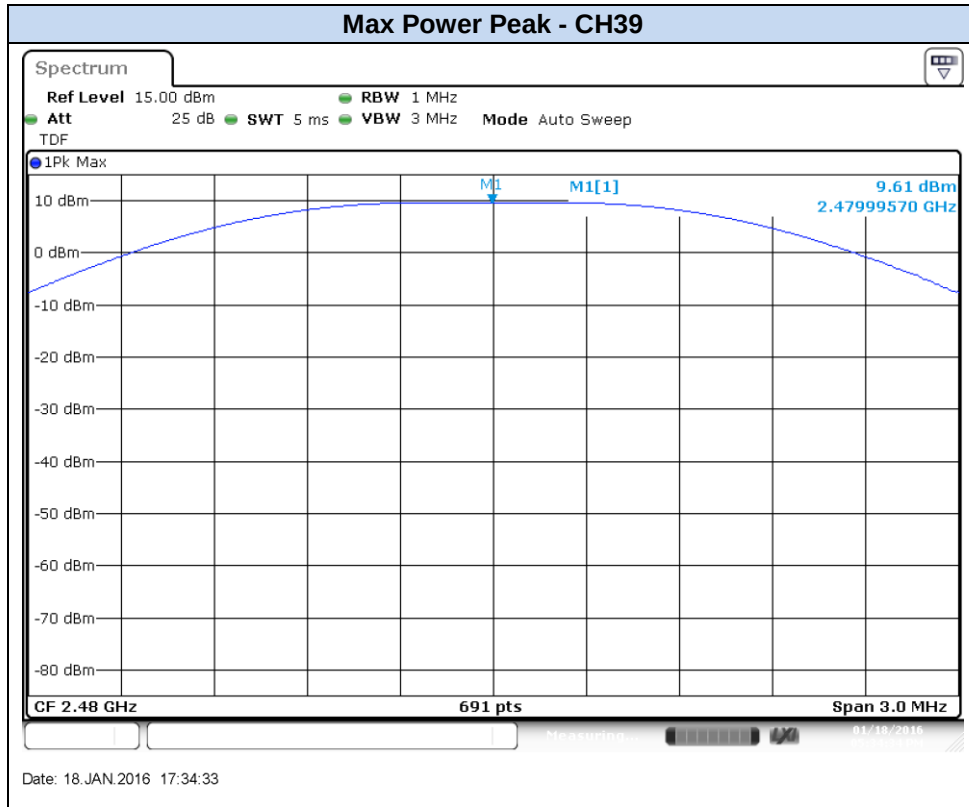
Min Value

Results screenshot:

BLE







D.3 Out-of-band emissions (conducted)

Test limits:

FCC part	RSS part	Limits																																
15.247 (d)	RSS-247 Clause 5.5	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.																																
15.209	RSS-247 Clause 6.2.2 (2)	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 Streghth (μV/m)</th><th>Field Streghth (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.	Freq Range (MHz)	Field Streghth (μV/m)	Field Streghth (dBμV/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	Above 960	500	54	3
Freq Range (MHz)	Field Streghth (μV/m)	Field Streghth (dBμV/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																															
Above 960	500	54	3																															

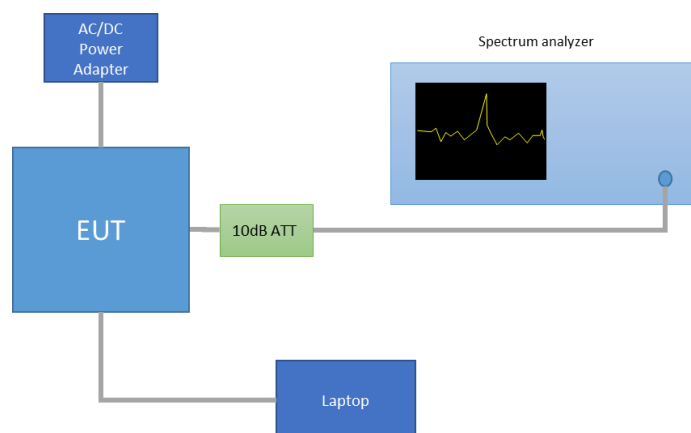
Test procedure:

The setup below was used to measure the out-of-band emissions. 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.

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 3dBi.

For Band Edge measurements falling in restricted bands, 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)
Above 960	3	500	54.0	-41.2

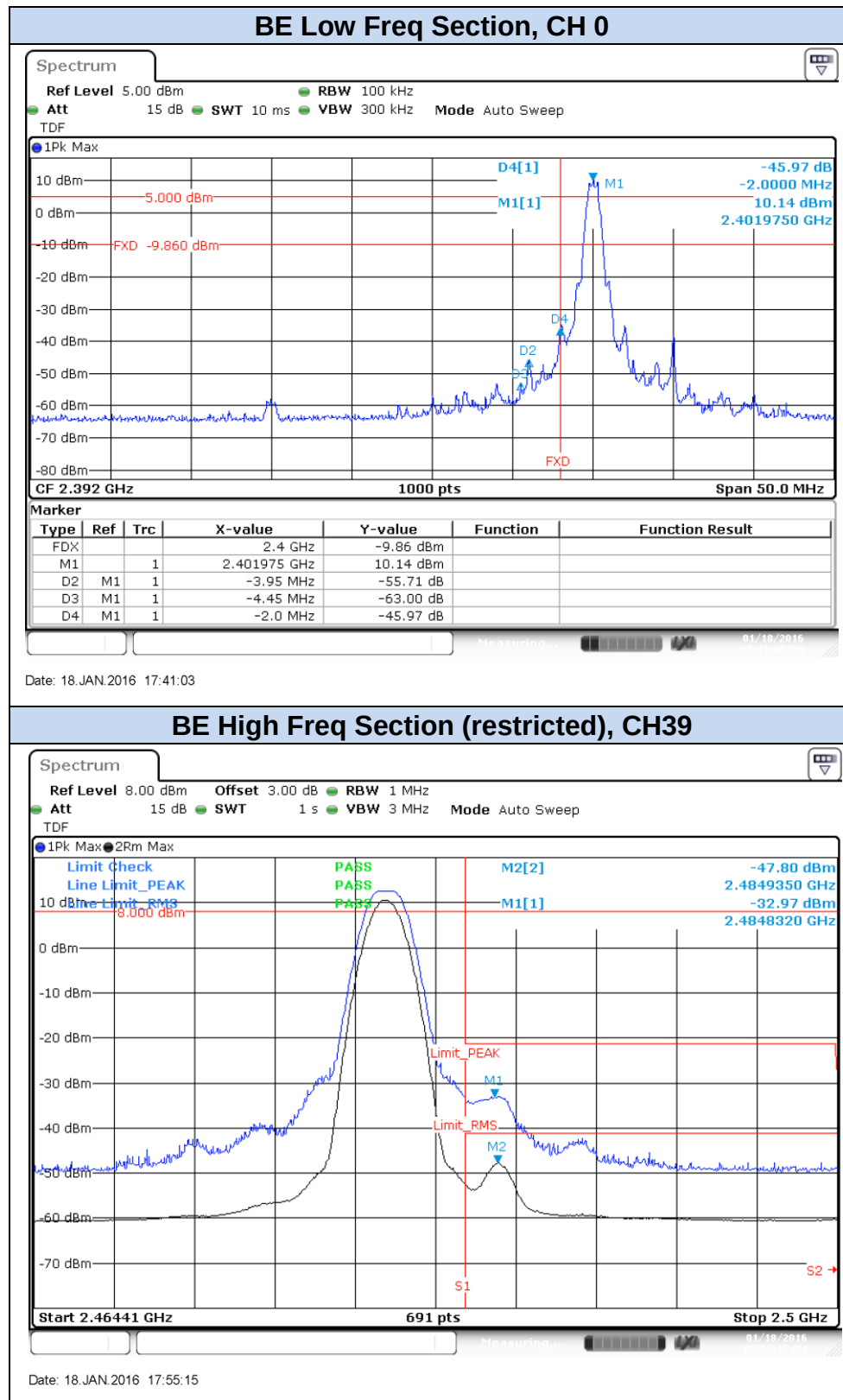


Note: these PSD_{Peak} values are shown just as a reference for the compliance of the Out-of-band Measurements. Thus the RBW used for these measurements was 100 kHz.

Mode	CH	Frequency [MHz]	PSD PEAK [dBm]
			Measured Conducted
BLE	0	2402	10.11
	19	2440	9.92
	39	2480	9.49

Band Edge results Screenshot:

BLE



Spurious results Screenshot:

BLE, CH0

