

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

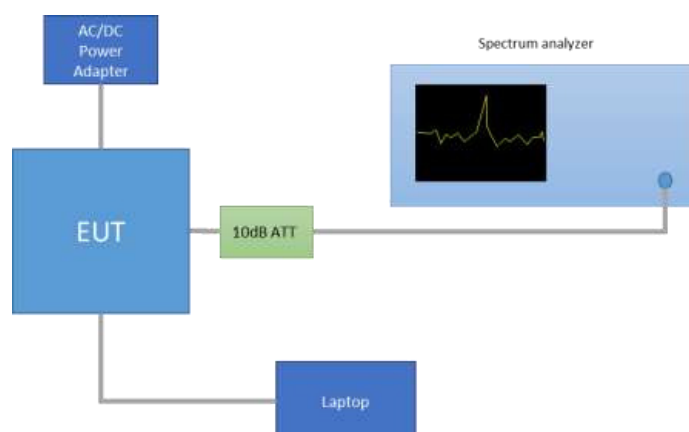
Test limits:

FCC part	Limits
15.407 (b) (4)	<p>(4) For transmitters operating in the 5.725-5.85 GHz band:</p> <p>(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.</p>

Test procedure:

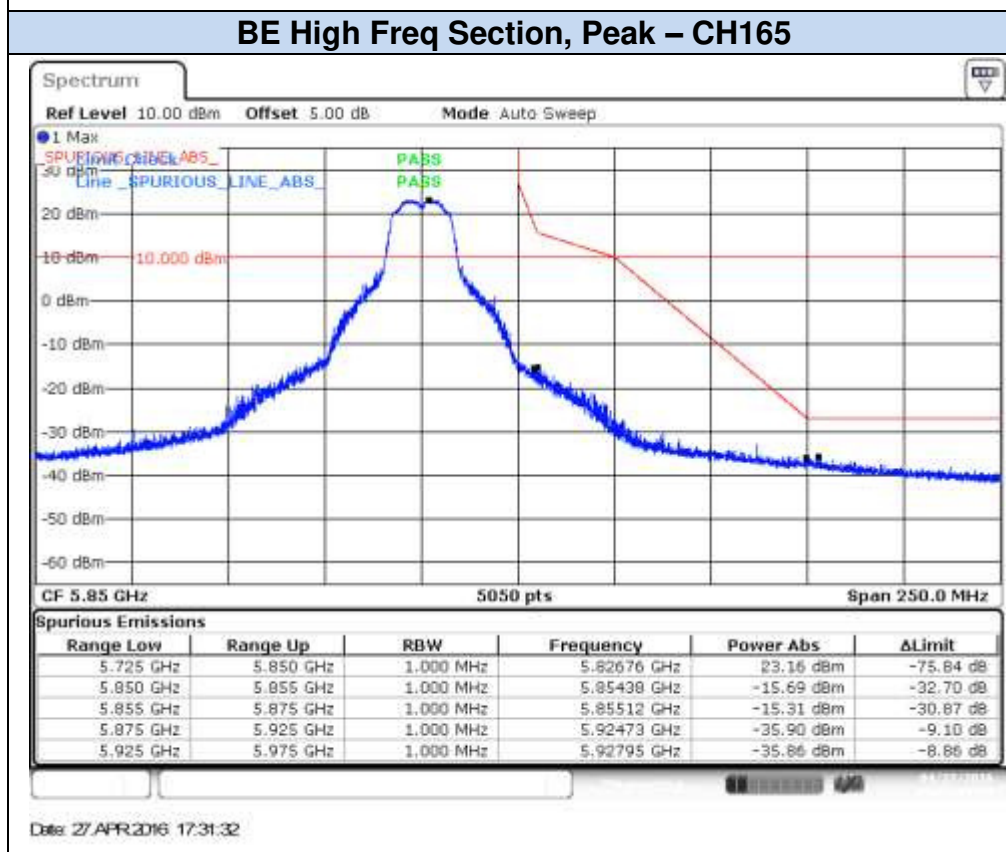
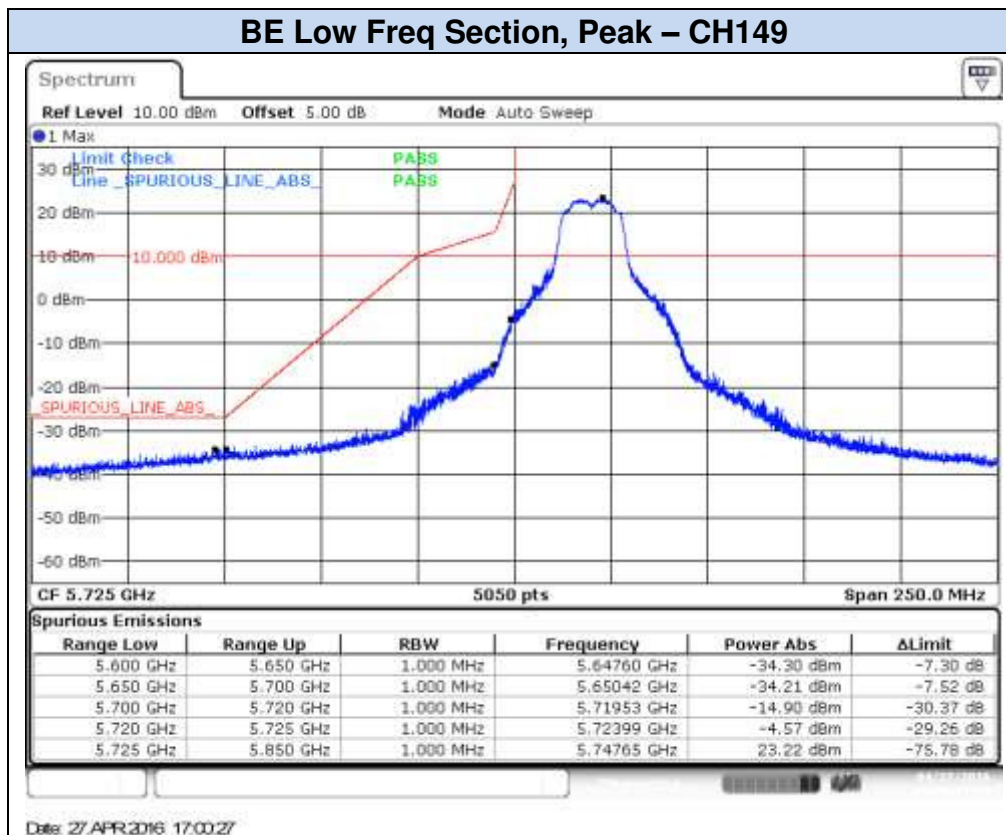
The setup below was used to measure undesirable emissions on the Band Edge domain. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss and the declared Antenna Gain.

The declared maximum antenna gain is 5dBi.



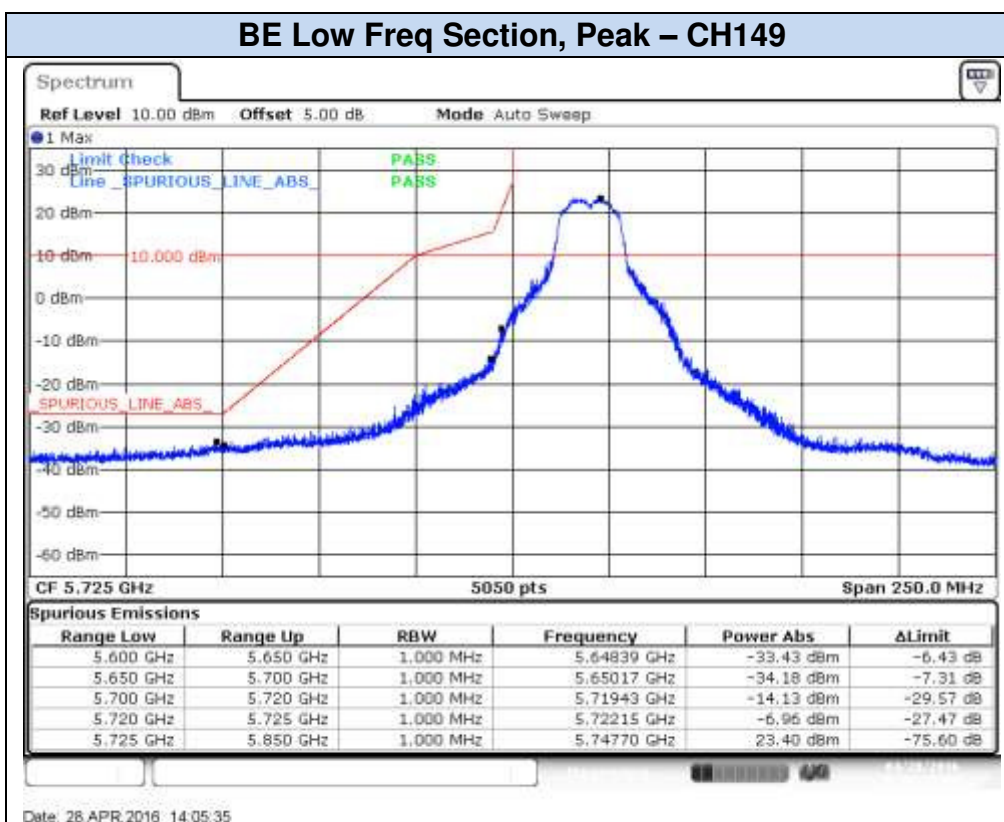
Results Screenshot:

802.11a, 6Mbps – Chain A

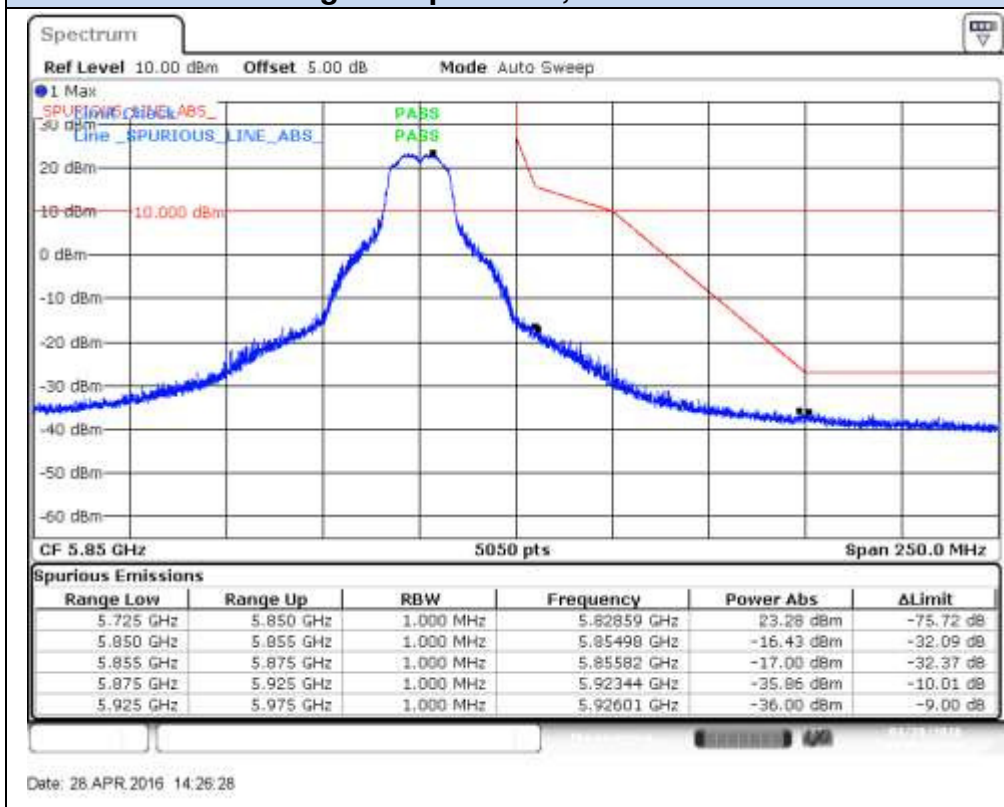


802.11a, 6Mbps – Chain B

BE Low Freq Section, Peak – CH149

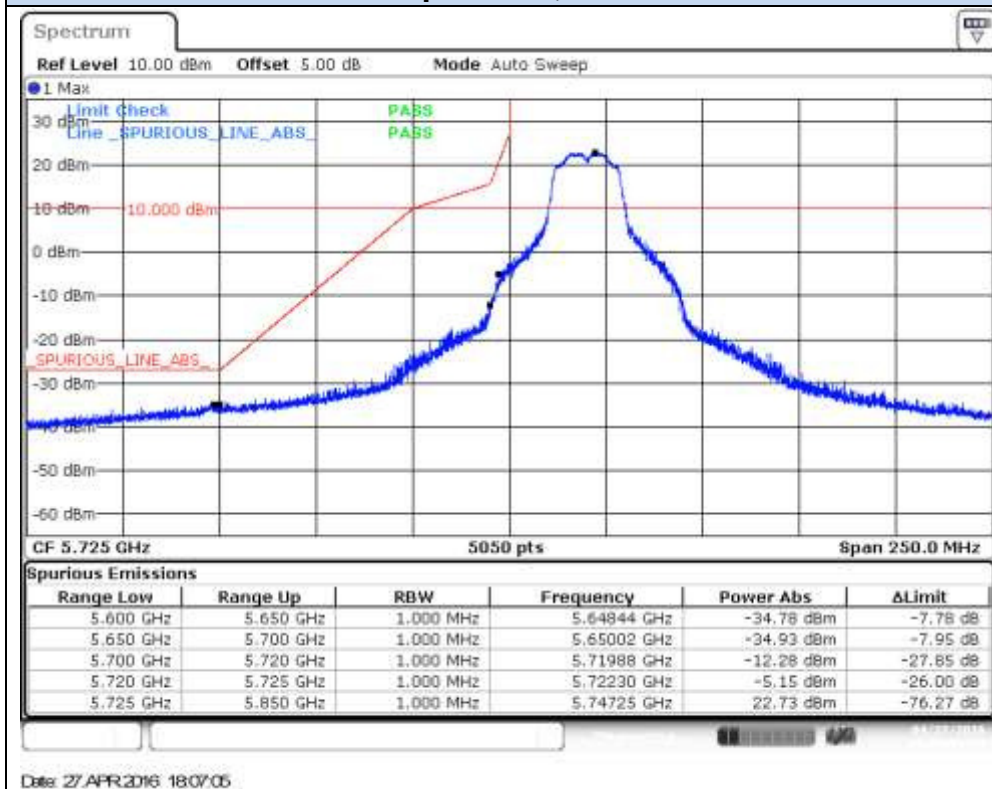


BE High Freq Section, Peak – CH165

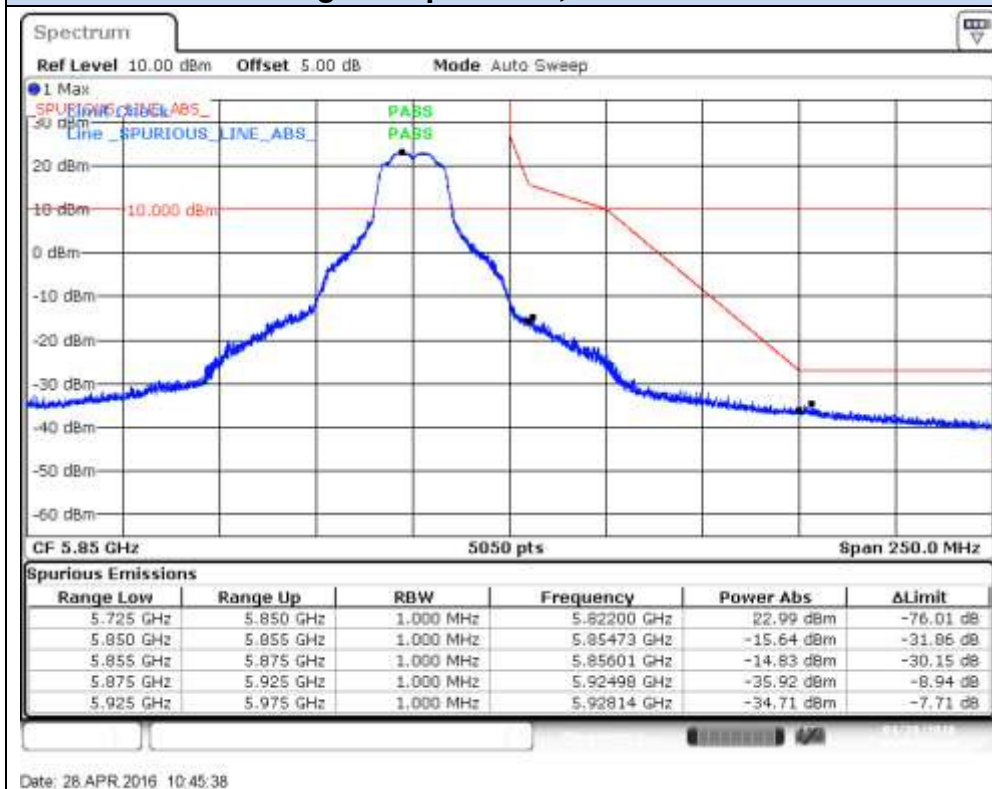


802.11n20, HT0 (SISO) – Chain A

BE Low Freq Section, Peak – CH149

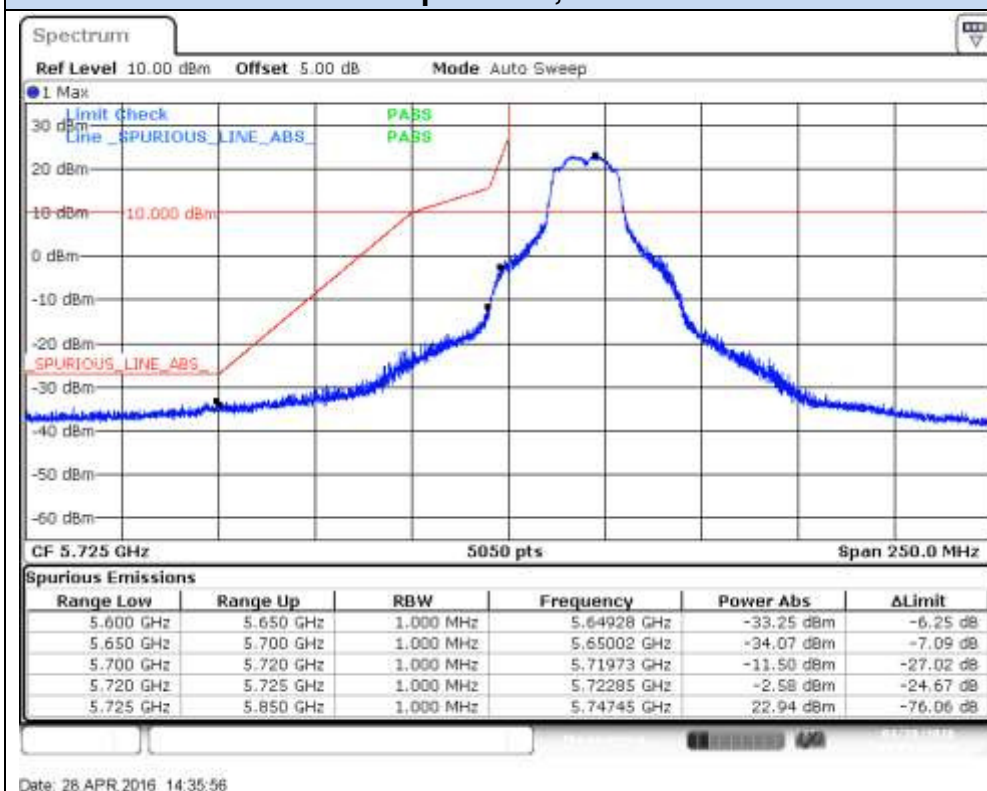


BE High Freq Section, Peak – CH165

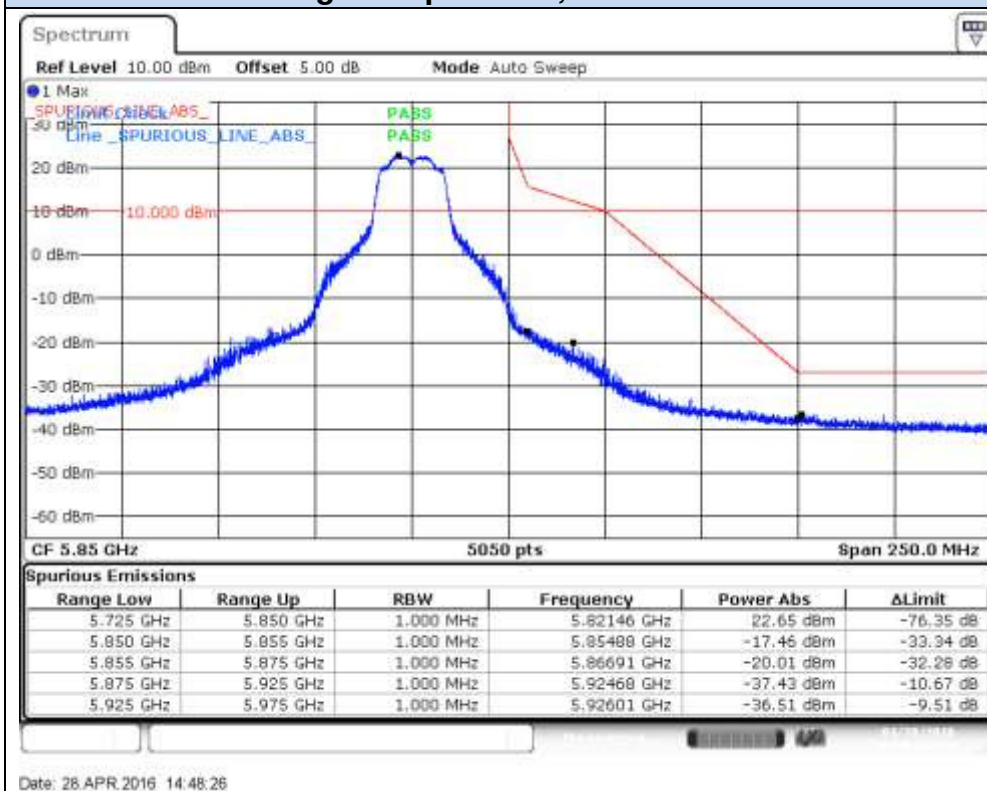


802.11n20, HT0 (SISO) – Chain B

BE Low Freq Section, Peak – CH149

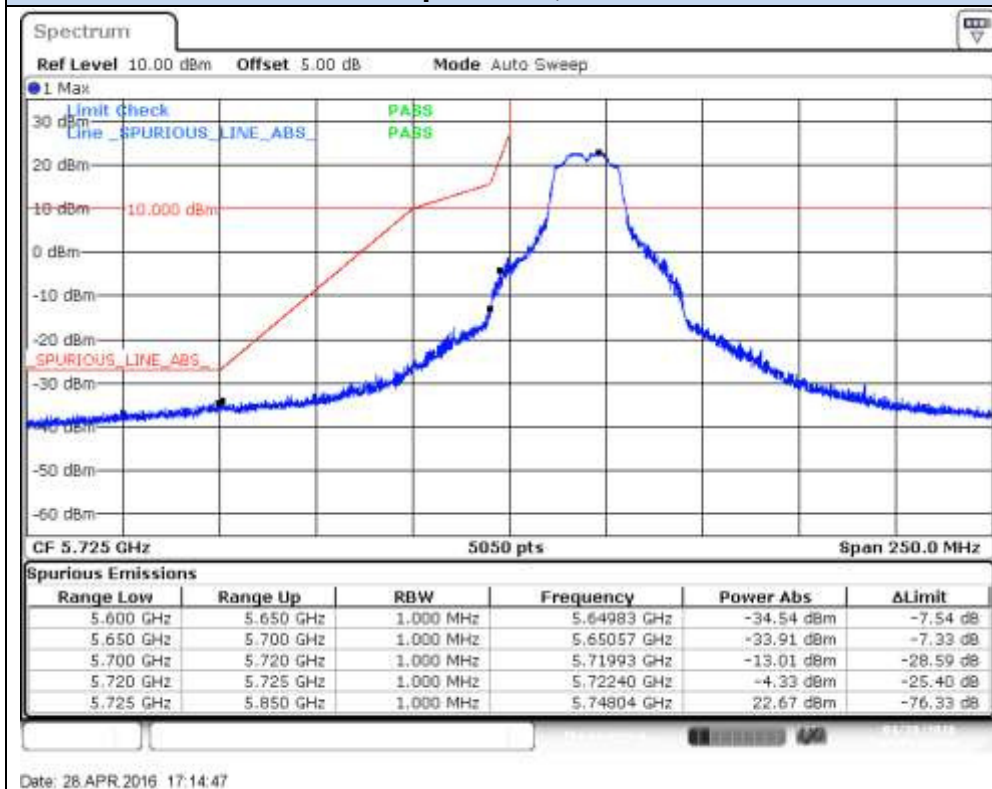


BE High Freq Section, Peak – CH165

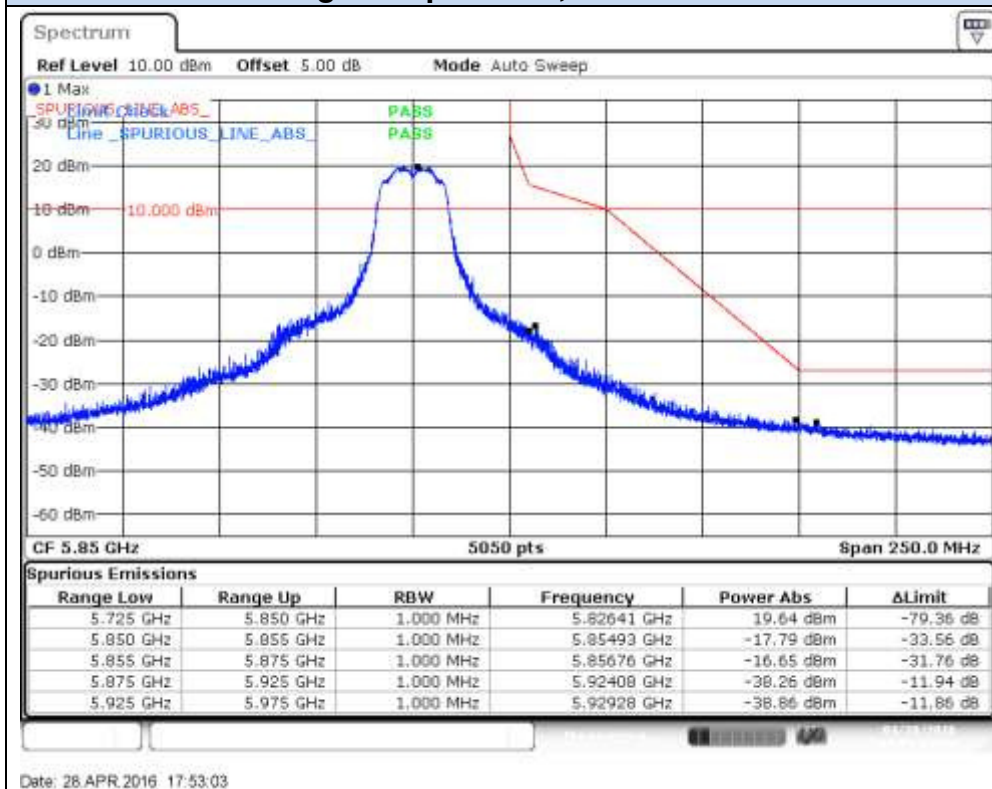


802.11n20, HT8 (MIMO) – Chain A

BE Low Freq Section, Peak – CH149

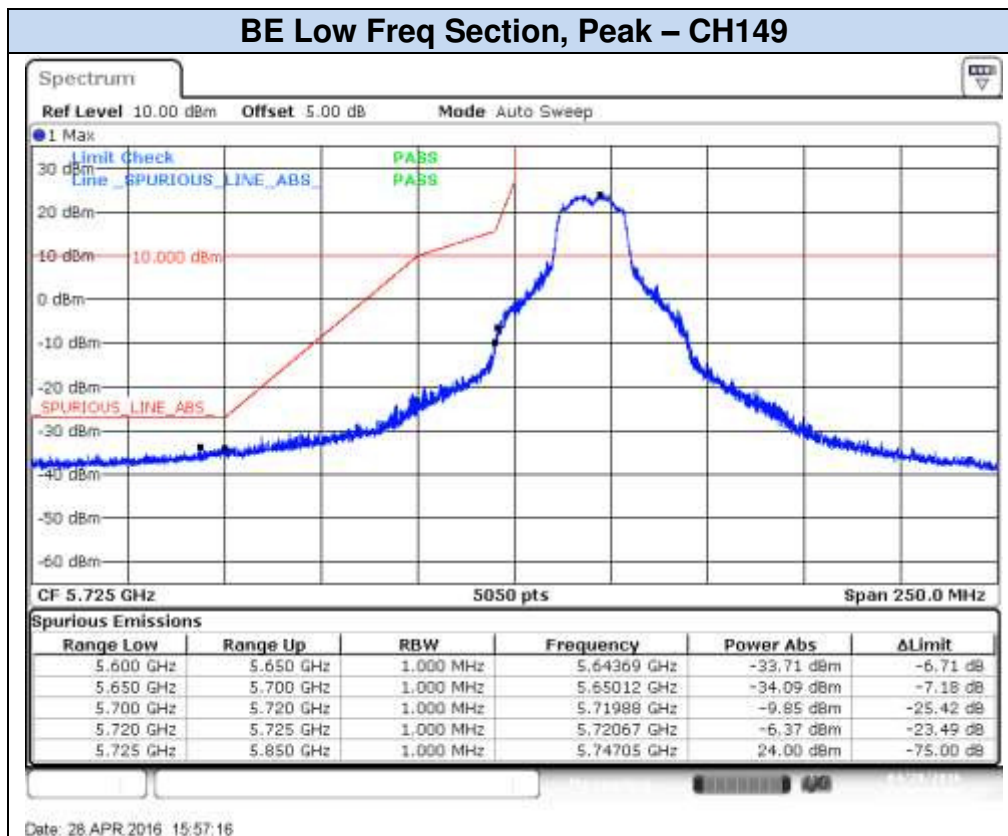


BE High Freq Section, Peak – CH165

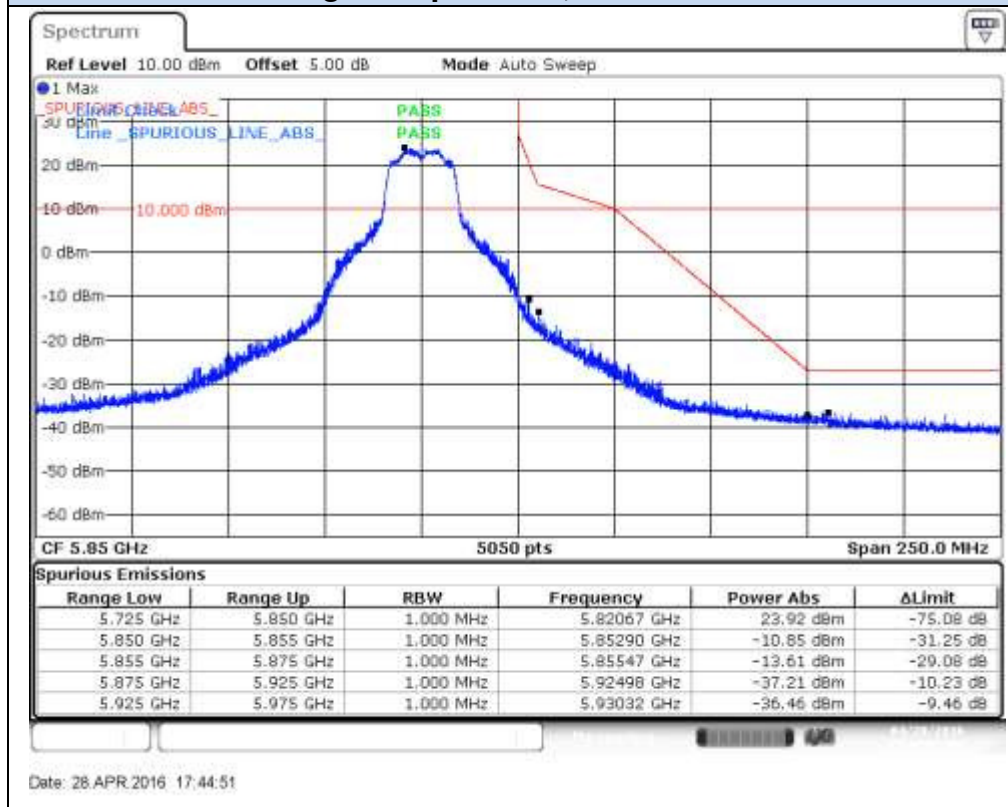


802.11n20, HT8 (MIMO) – Chain B

BE Low Freq Section, Peak – CH149

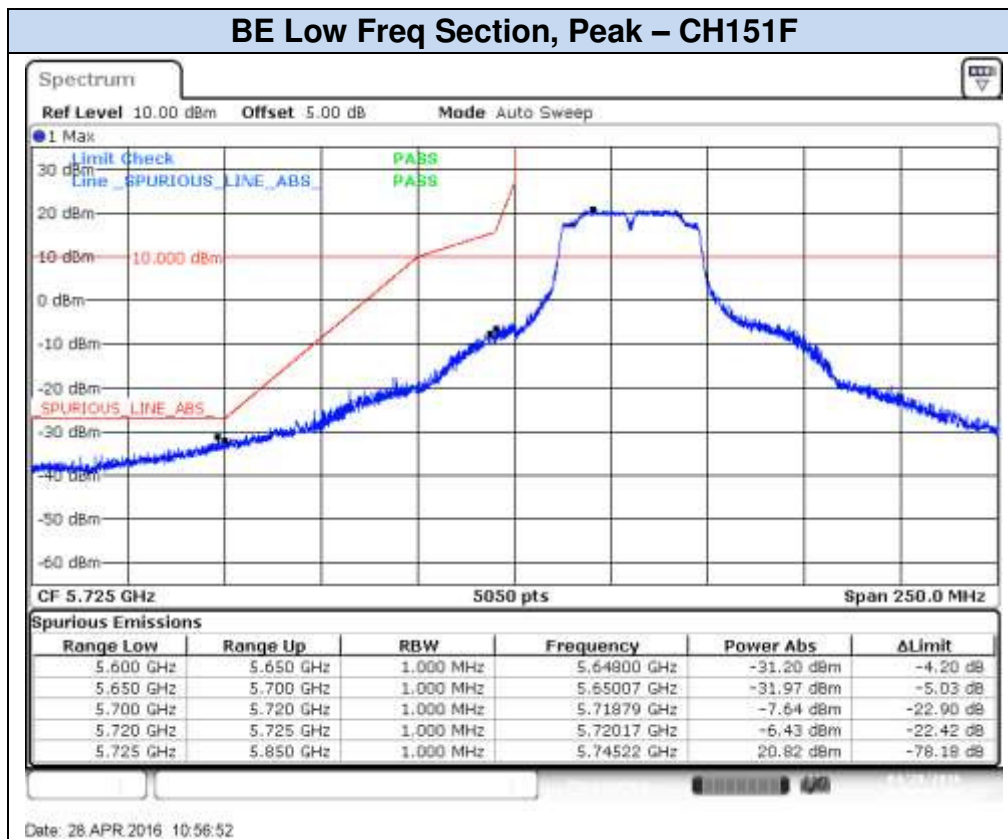


BE High Freq Section, Peak – CH165

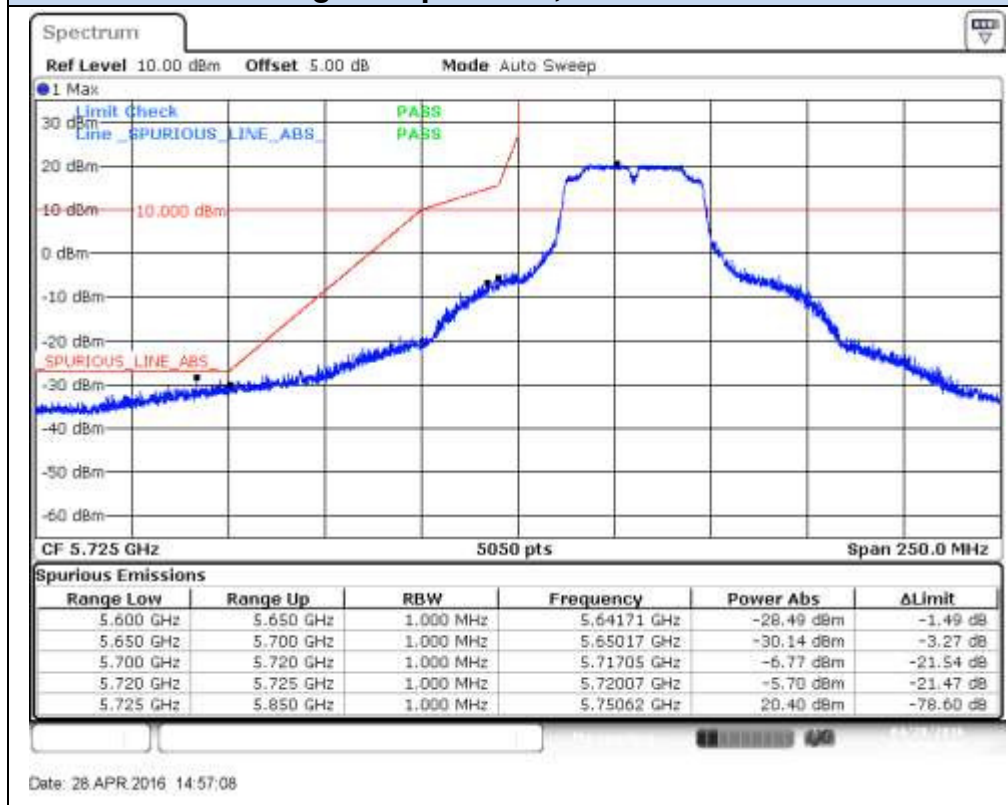


802.11n40, HT0 (SISO) – Chain A

BE Low Freq Section, Peak – CH151F

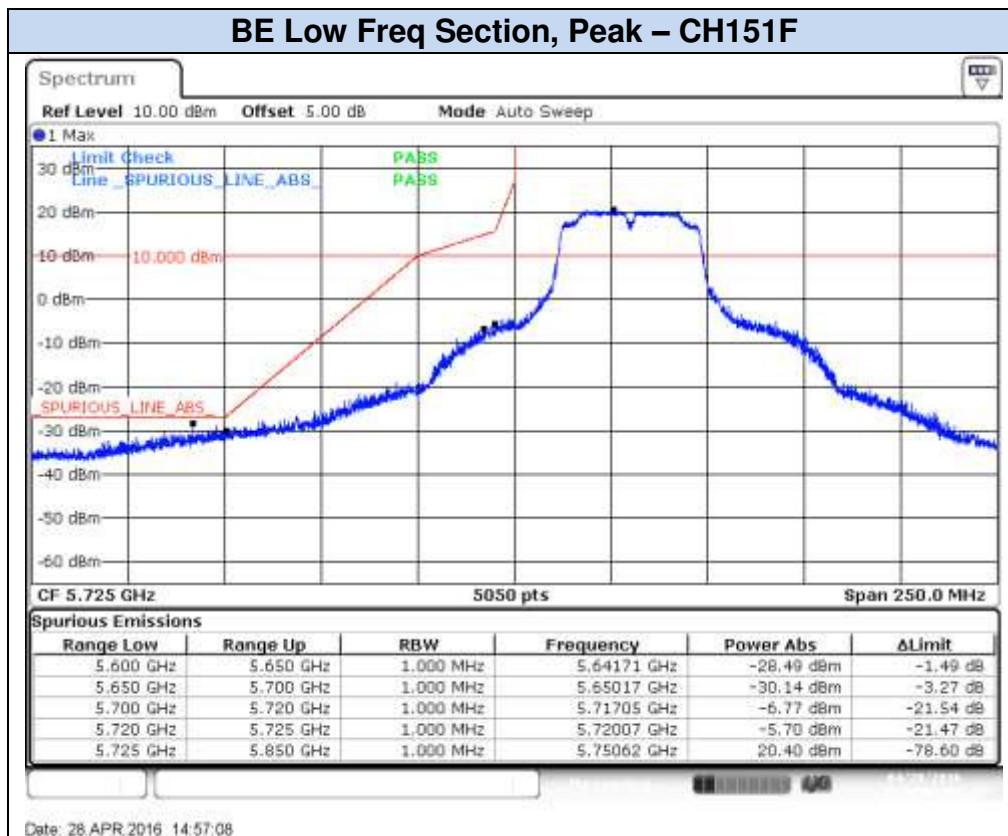


BE High Freq Section, Peak – CH159F

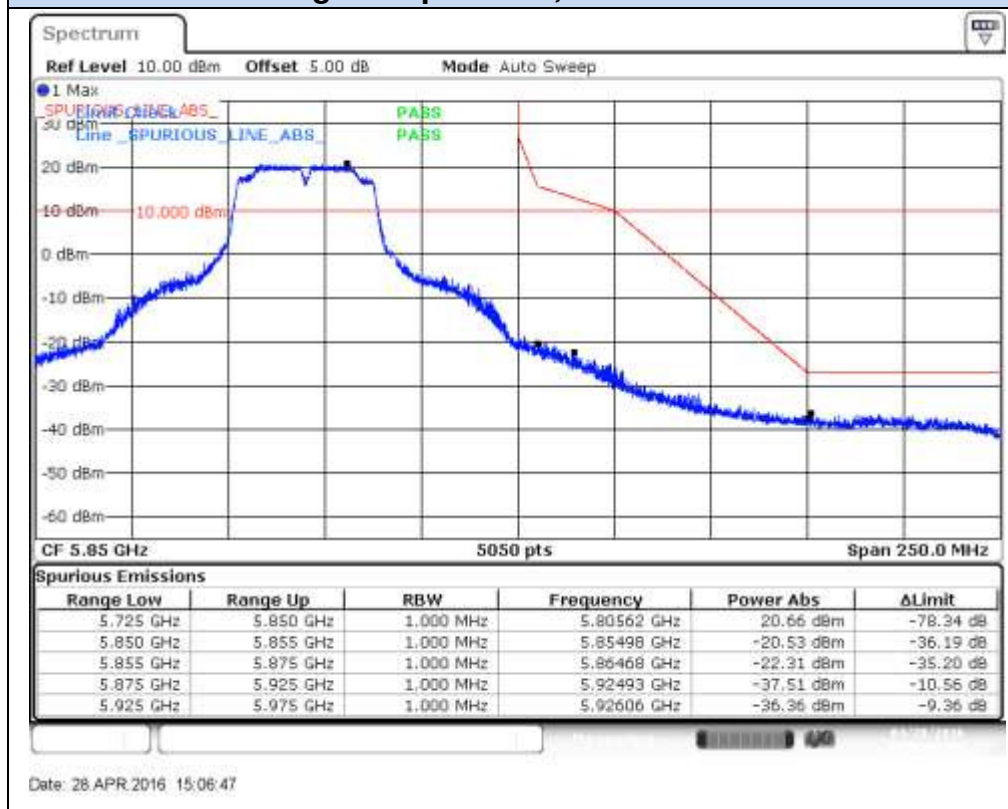


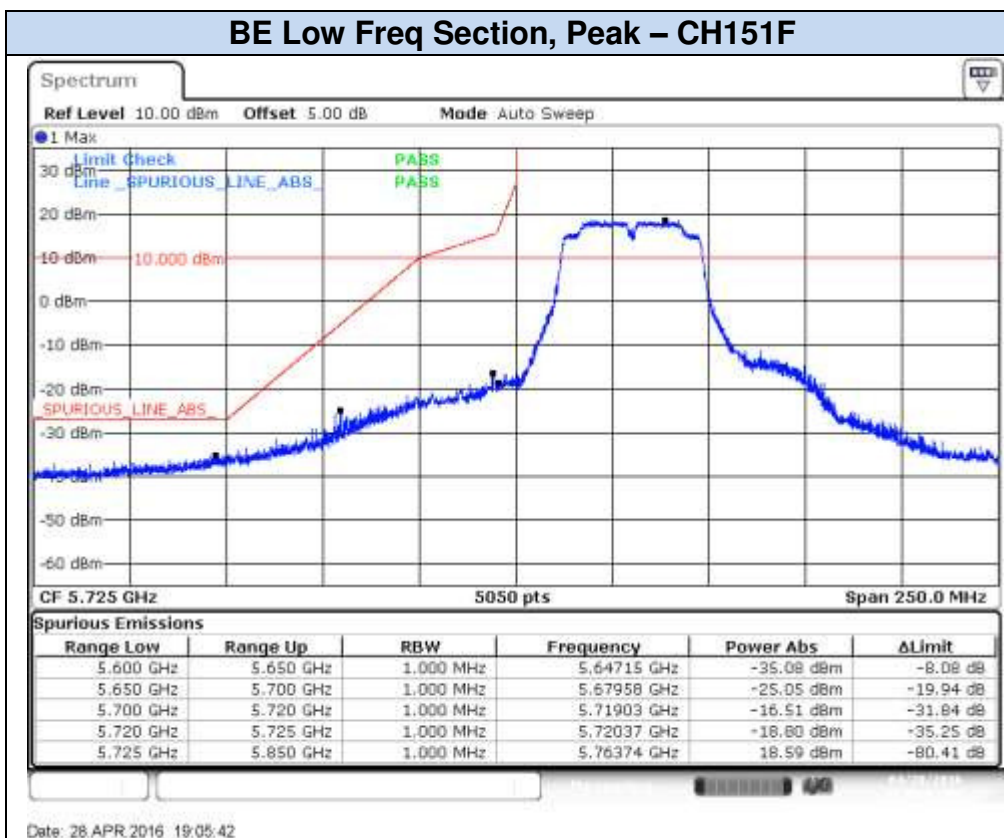
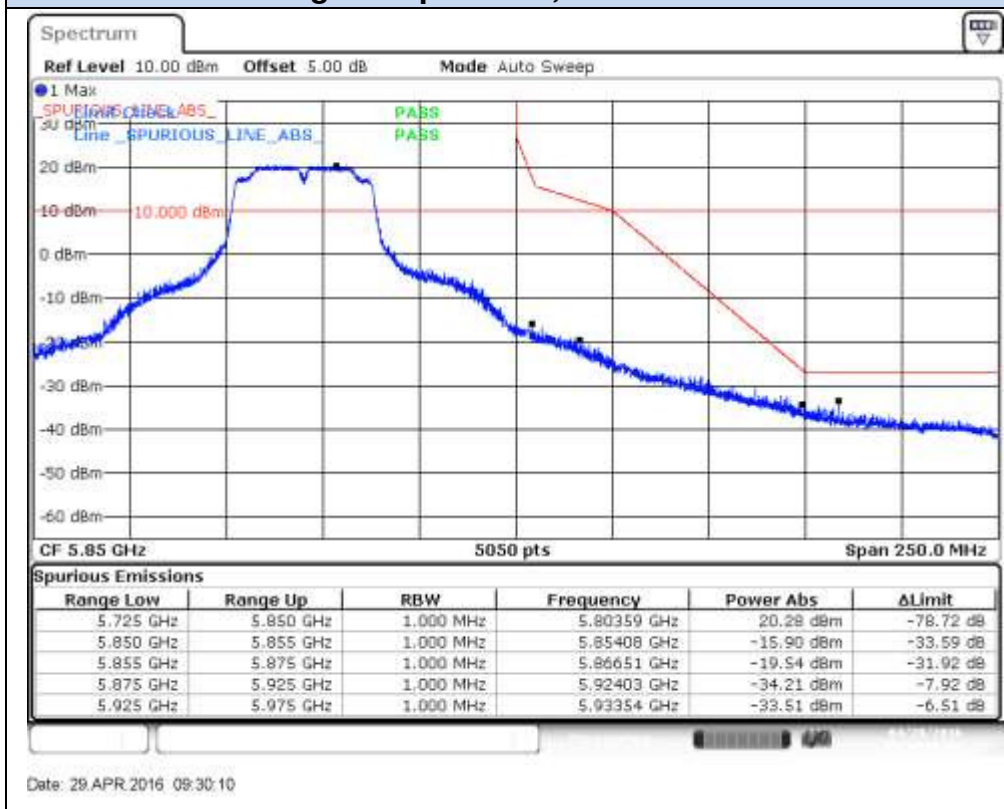
802.11n40, HT0 (SISO) – Chain B

BE Low Freq Section, Peak – CH151F



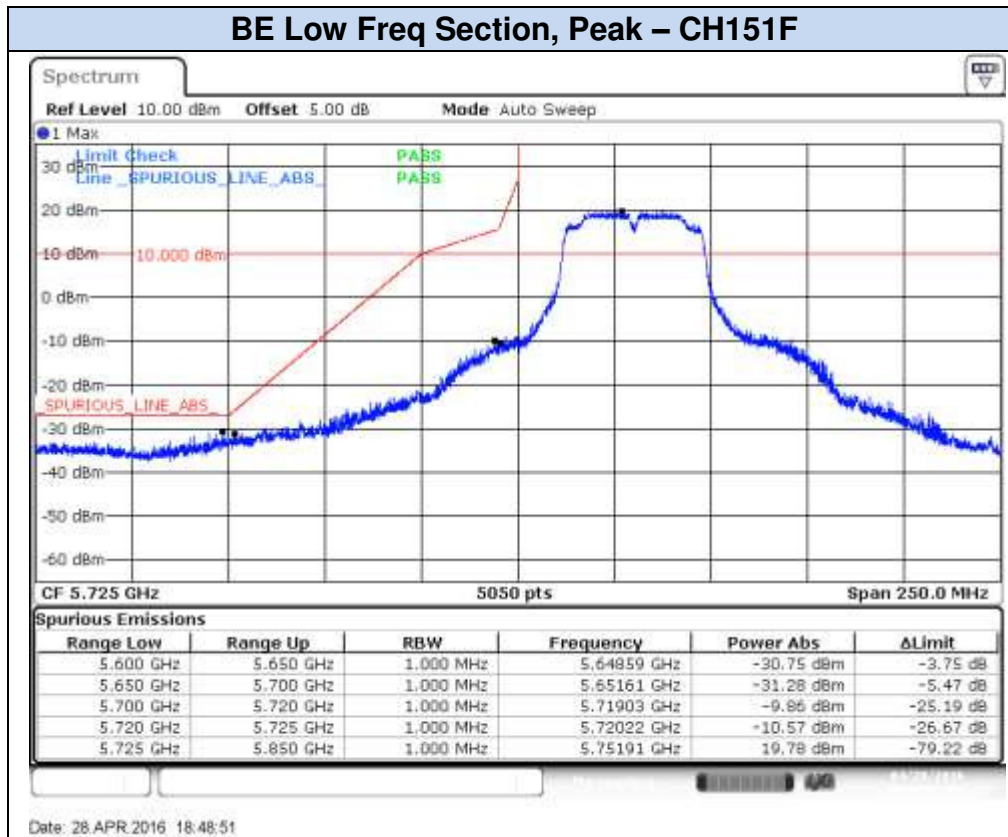
BE High Freq Section, Peak – CH159F



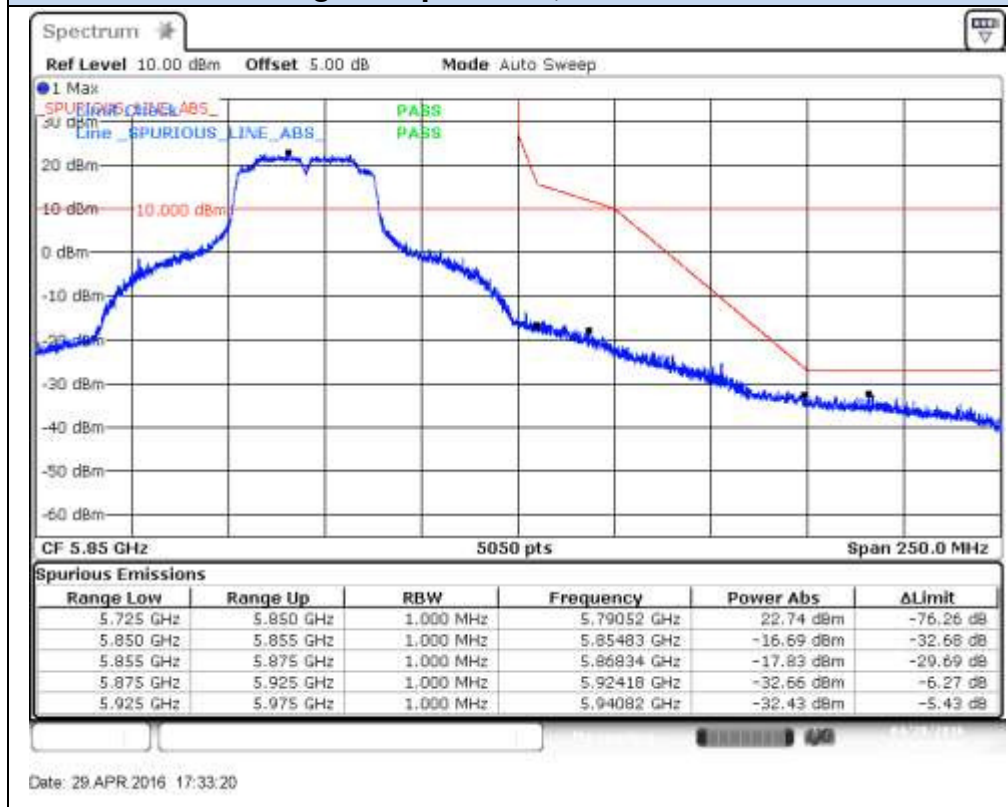
802.11n40, HT8 (MIMO) – Chain A**BE Low Freq Section, Peak – CH151F****BE High Freq Section, Peak – CH159F**

802.11n40, HT8 (MIMO) – Chain B

BE Low Freq Section, Peak – CH151F

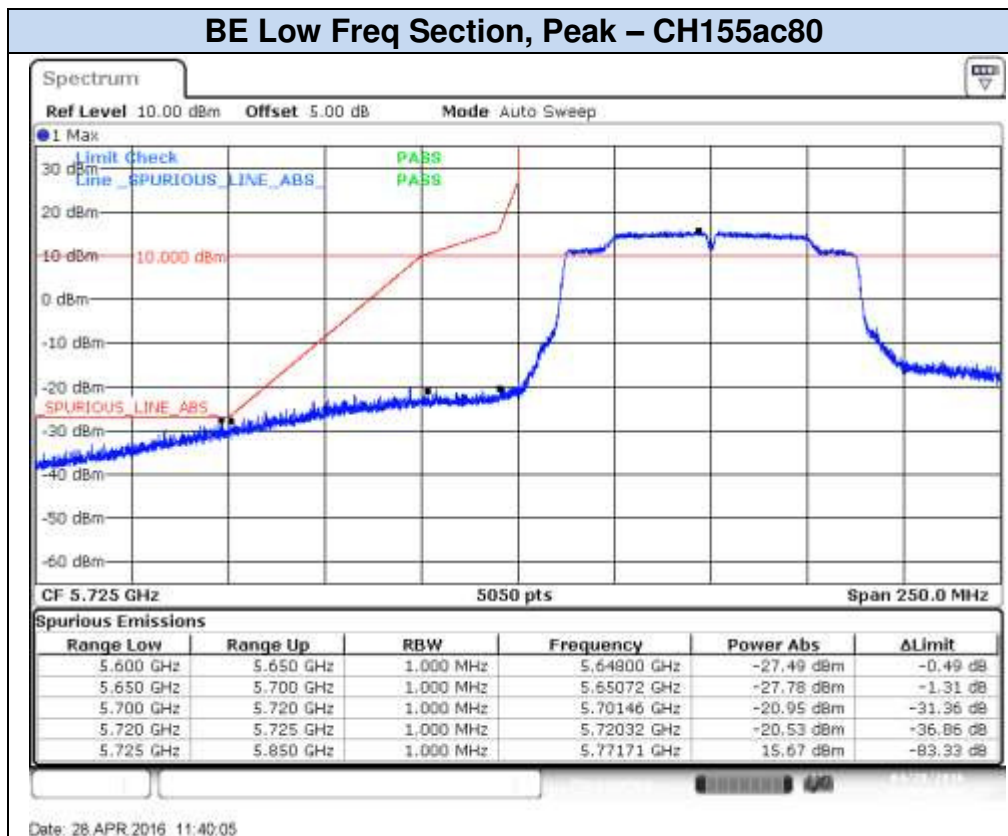


BE High Freq Section, Peak – CH159F

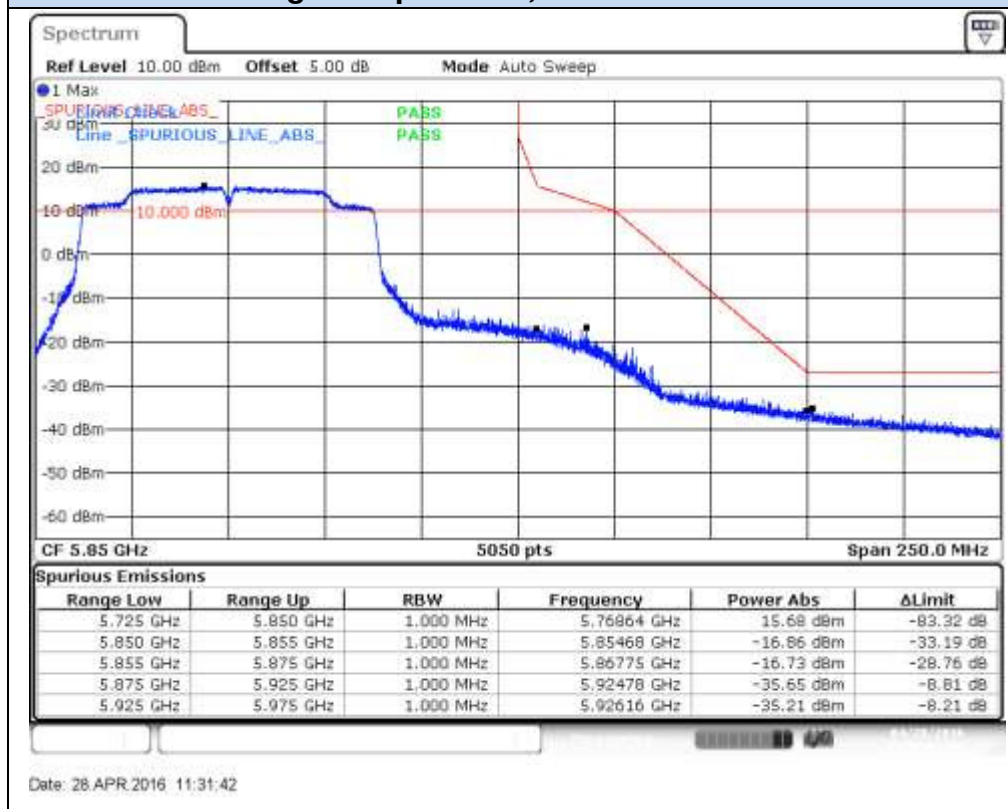


802.11ac80, VHT0 (SISO)- Chain A

BE Low Freq Section, Peak – CH155ac80

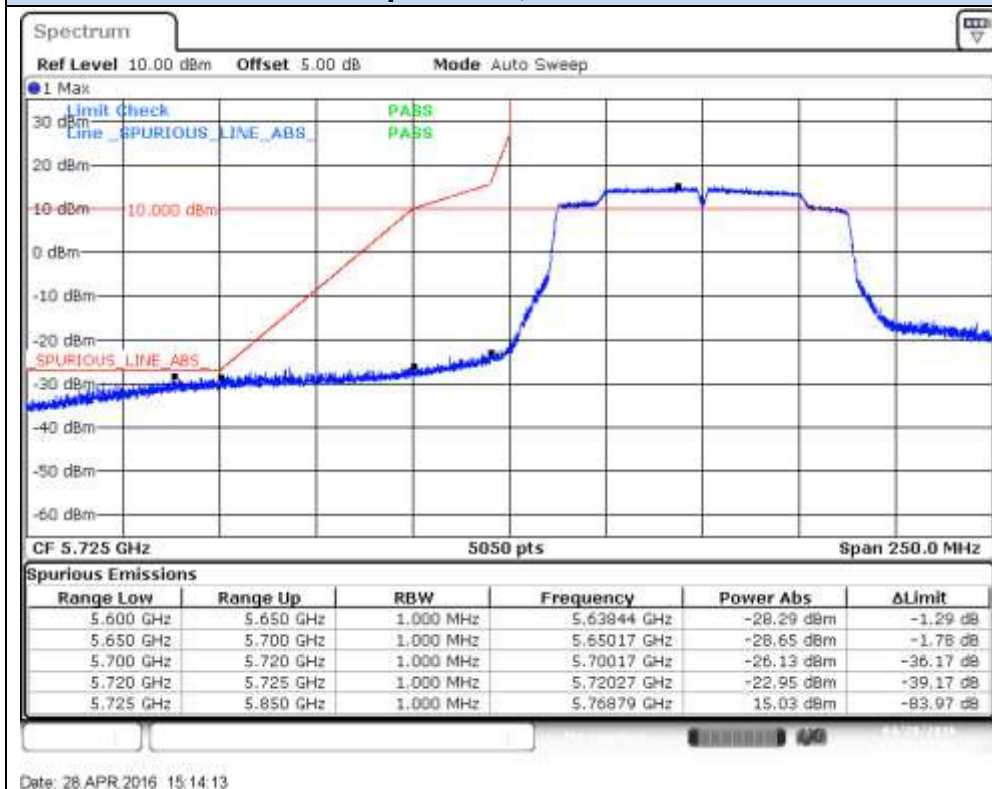


BE High Freq Section, Peak – CH155ac80

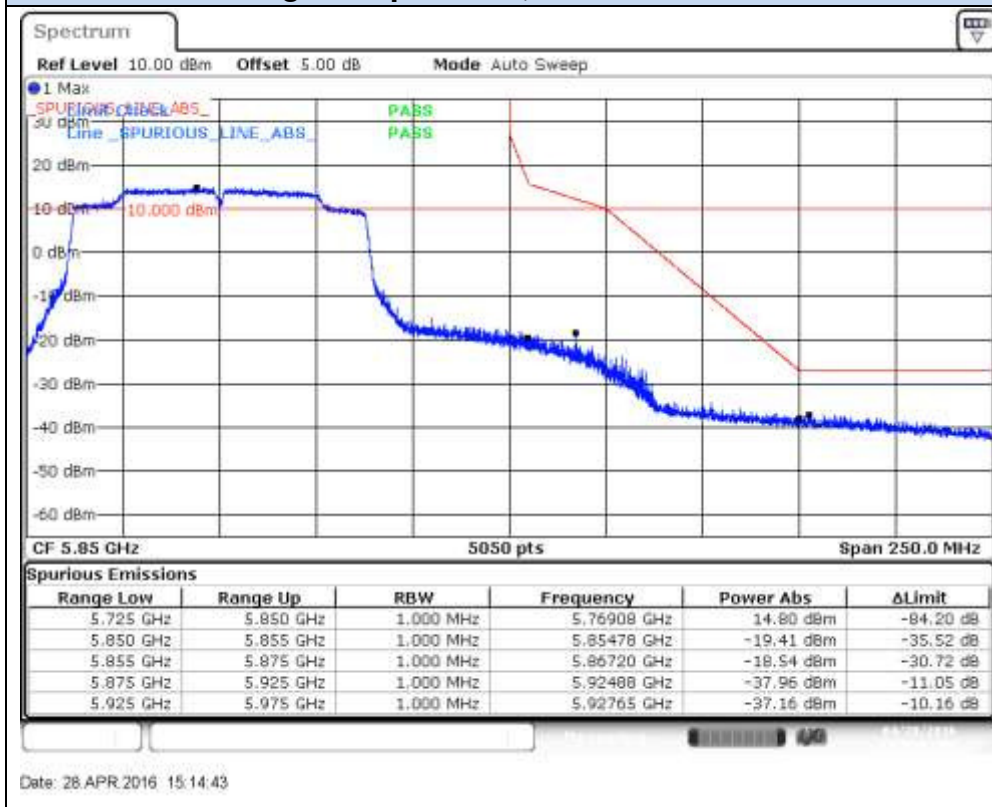


802.11ac80, VHT0 (SISO)- Chain B

BE Low Freq Section, Peak – CH155ac80

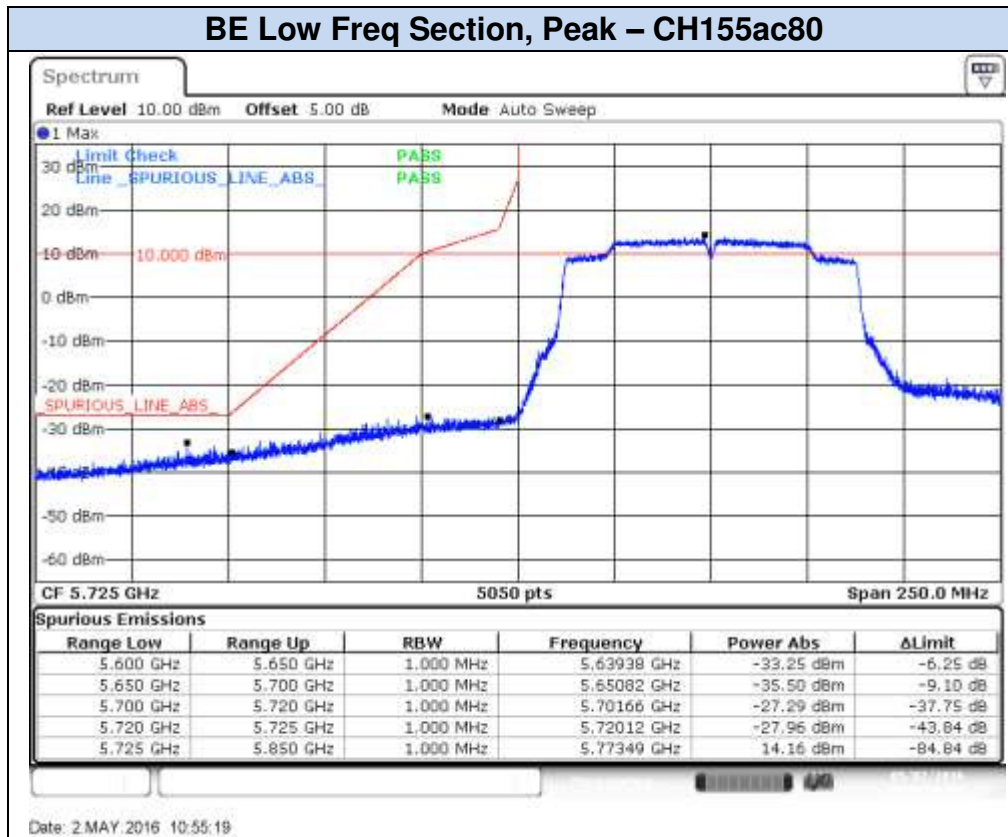


BE High Freq Section, Peak – CH155ac80

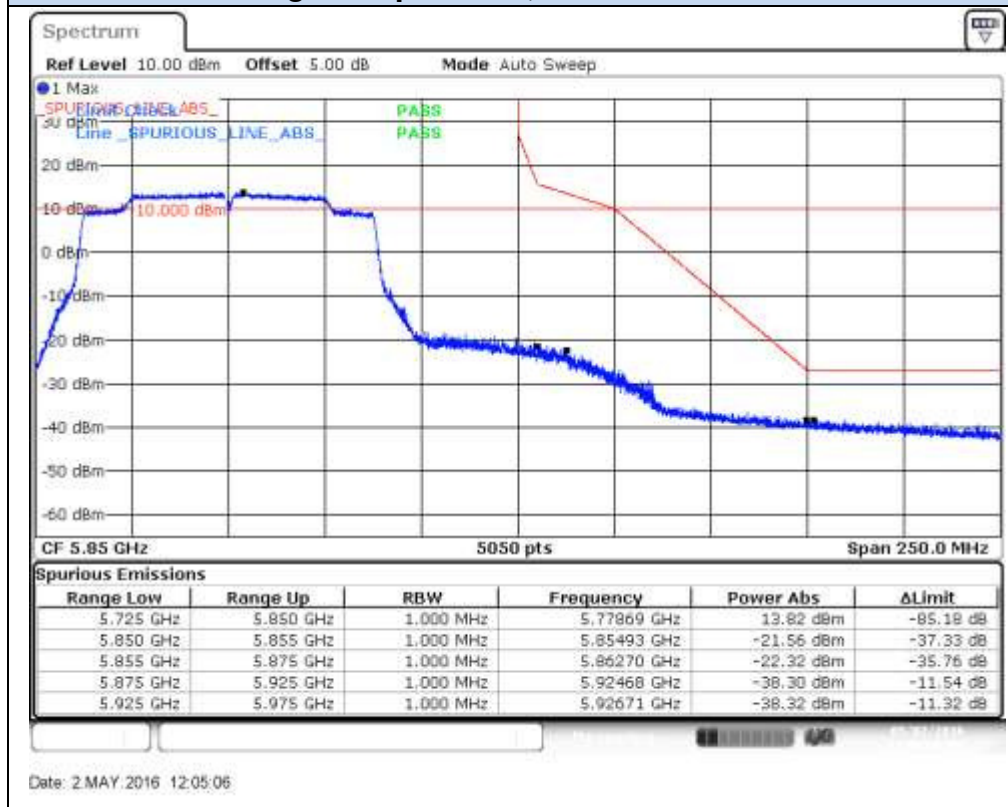


802.11ac80, VHT0 (MIMO)- Chain A

BE Low Freq Section, Peak – CH155ac80

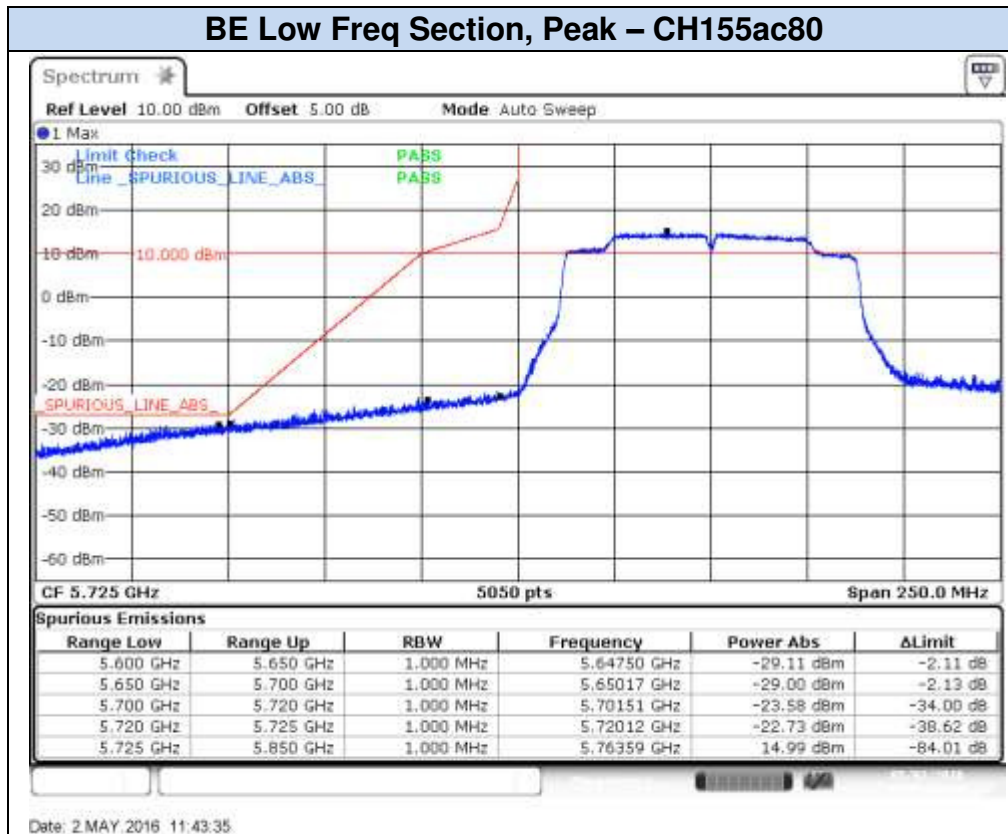


BE High Freq Section, Peak – CH155ac80

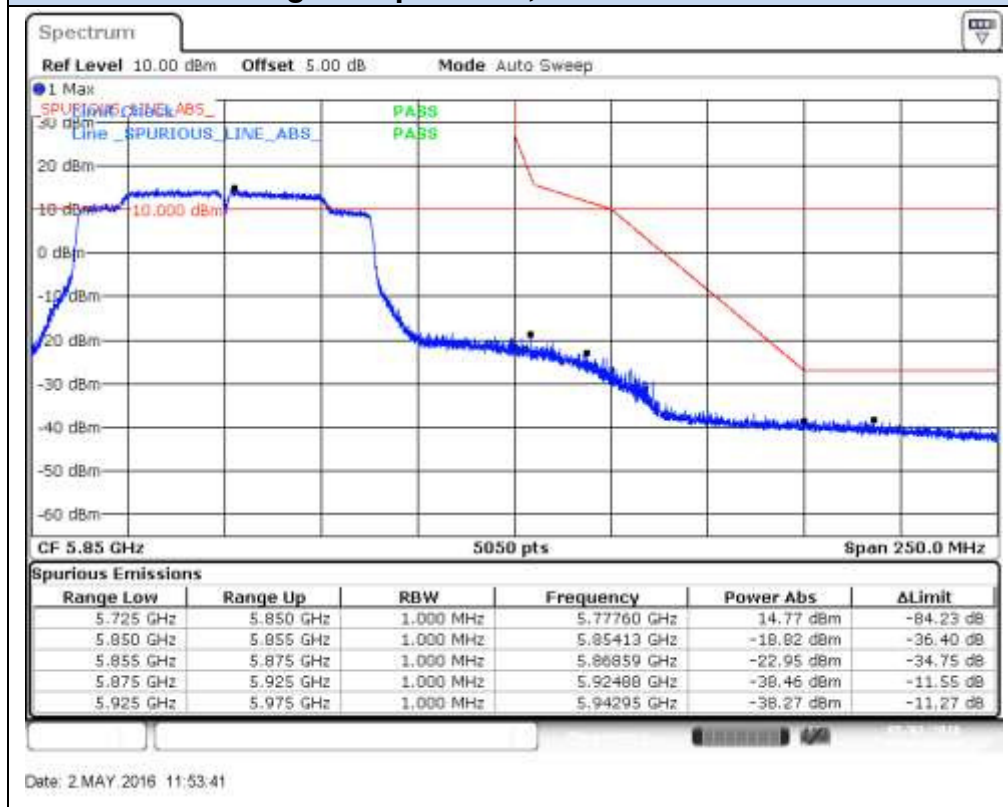


802.11ac80, VHT0 (MIMO)- Chain B

BE Low Freq Section, Peak – CH155ac80



BE High Freq Section, Peak – CH155ac80



E.4 Radiated spurious emission

Standard references:

FCC part	Limits																																
15.407 (b) (4) 15.209	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>	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																													
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:

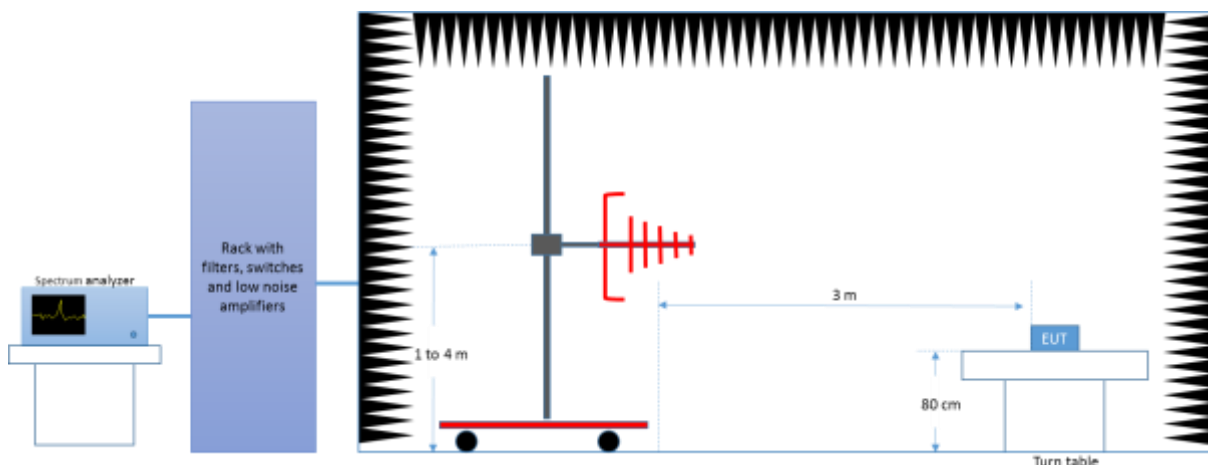
The below setups were used to measure the radiated spurious emissions.

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

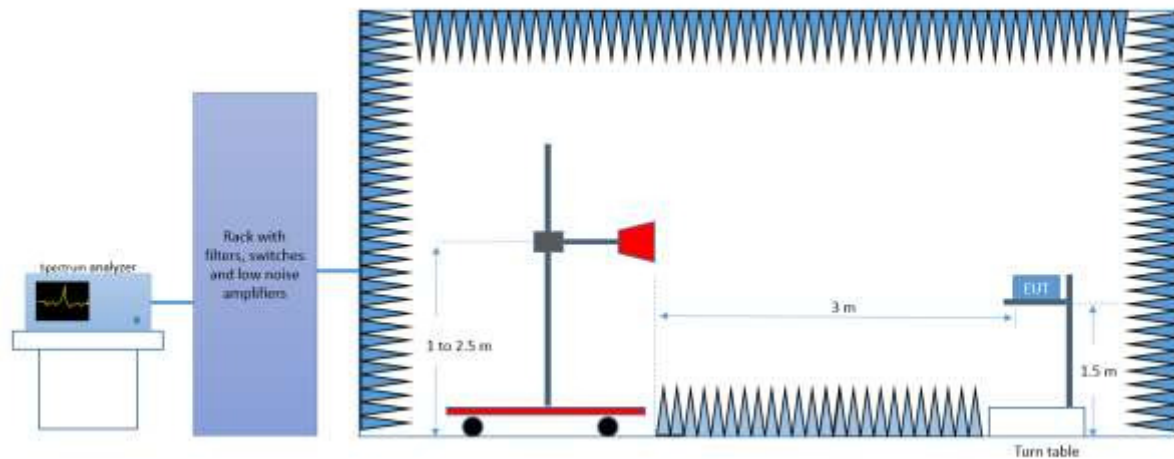
The final measurement is done by varying the antenna height, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

The radiated spurious emissions were measured on the worst case configuration selected from the chapter E.2 and using the lowest, middle and highest channels.

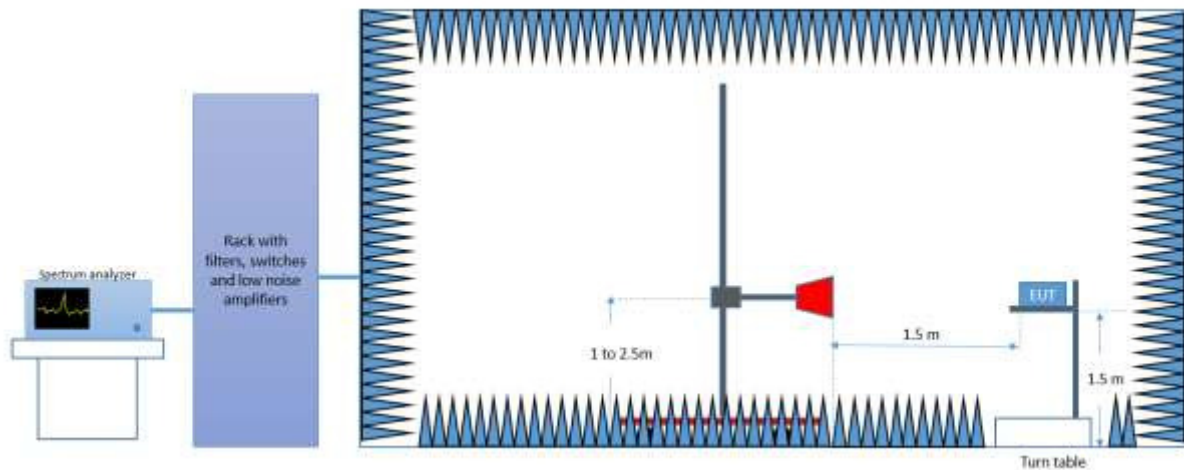
Radiated Setup < 1GHz



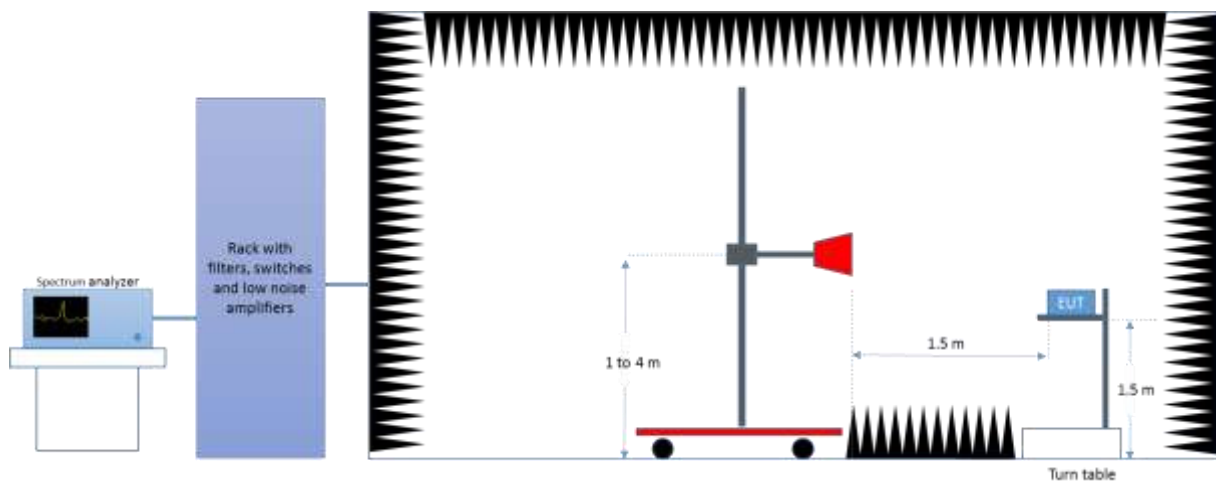
Radiated Setup 1 GHz - 18 GHz

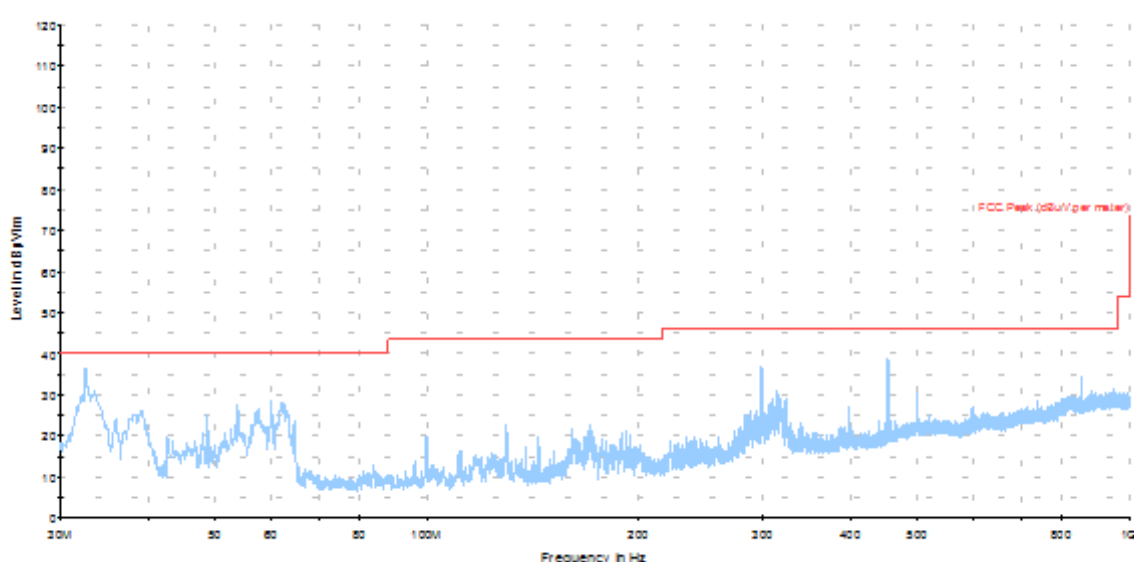


Radiated Setup 18 GHz - 26.5 GHz



Radiated Setup > 26.5 GHz



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

— Peak measurements

— AVG measurements

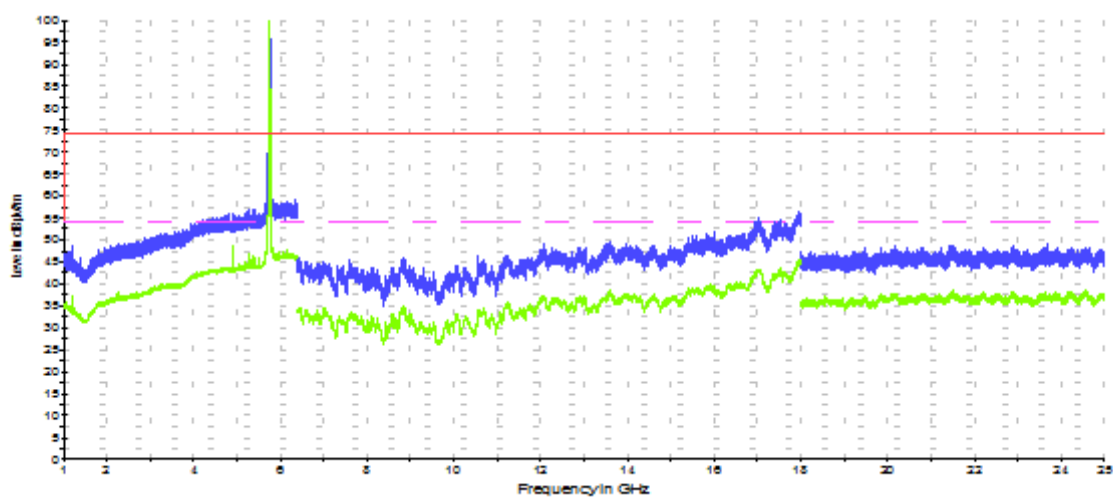
— Limit FCC Peak

Frequency	Max Peak	Limit	Margin
MHz	dBuV/m	dBuV/m	dB
32.61	38.81	40	1.19

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

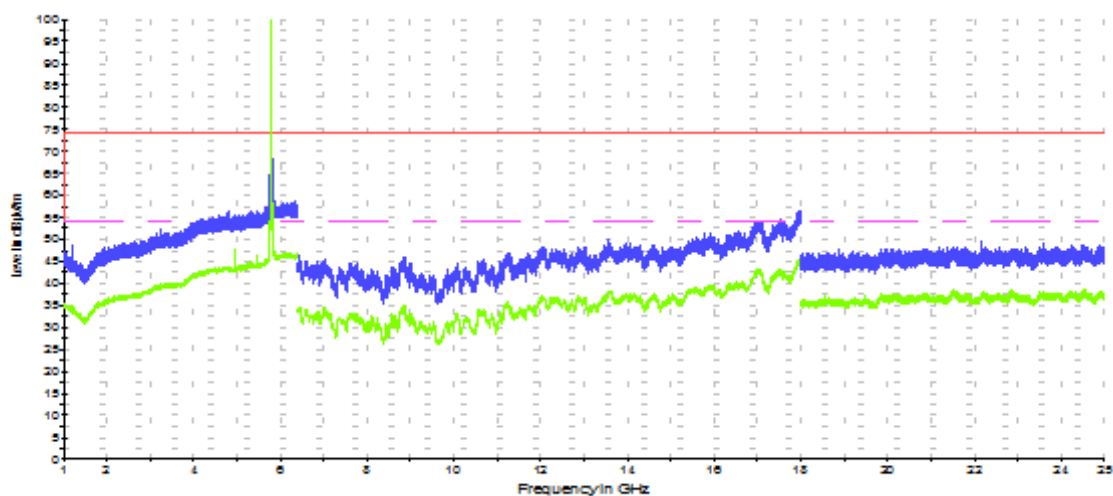
Radiated Spurious – CH149



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4924	58.6	-	74	15.4
4924	-	50.4	54	3.6

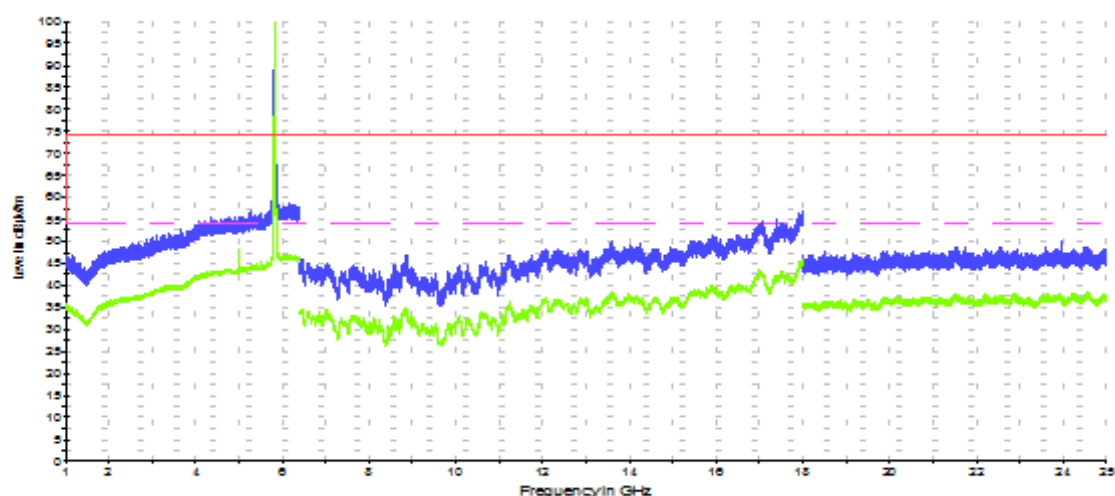
Radiated Spurious – CH157



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4958	58.3	-	74	15.7
4958	-	50.3	54	3.7

Radiated Spurious – CH165

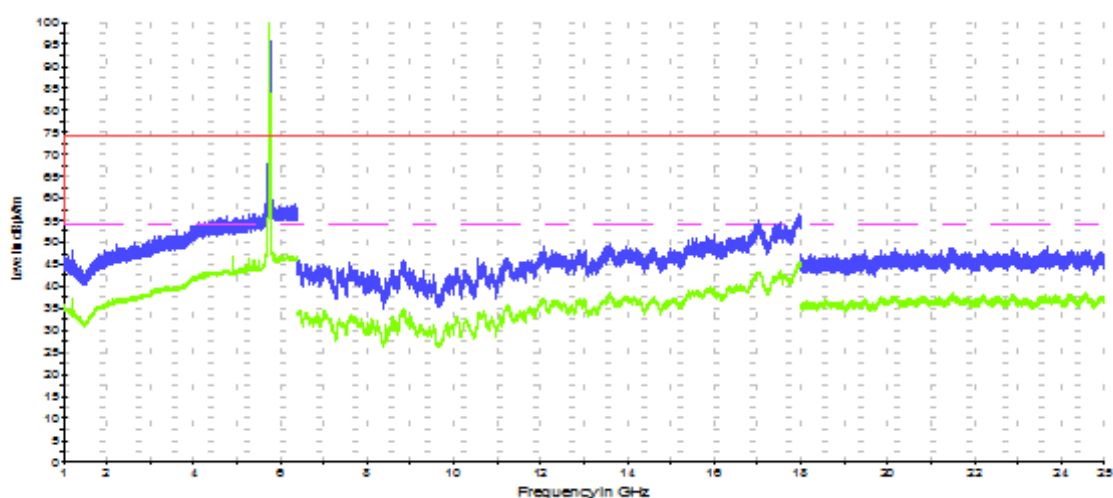


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4992	56.0	-	74	18
4992	-	50.4	54	3.6

1 GHz – 26.5GHz, 802.11a, Chain B

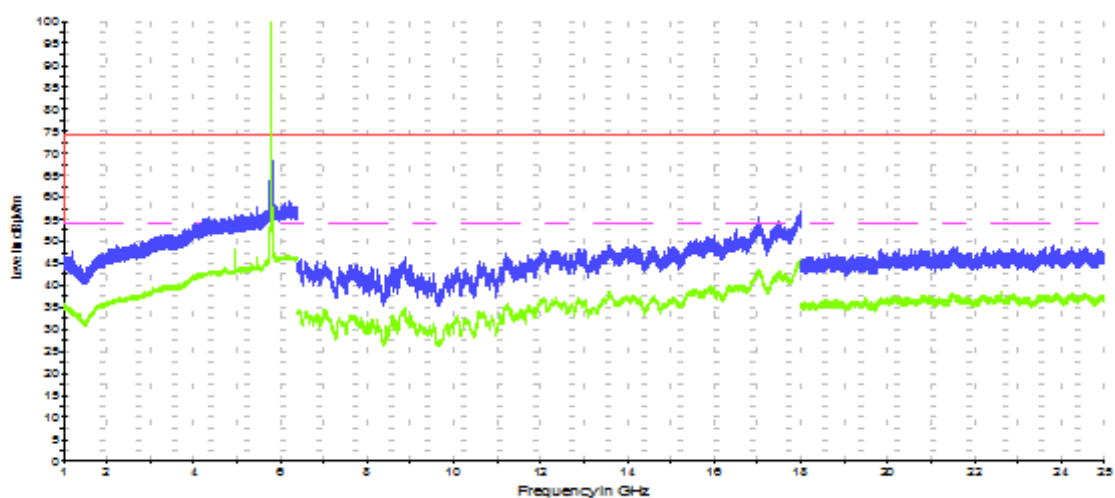
Radiated Spurious – CH149



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4924	55.0	-	74	19
4924	-	47.0	54	7

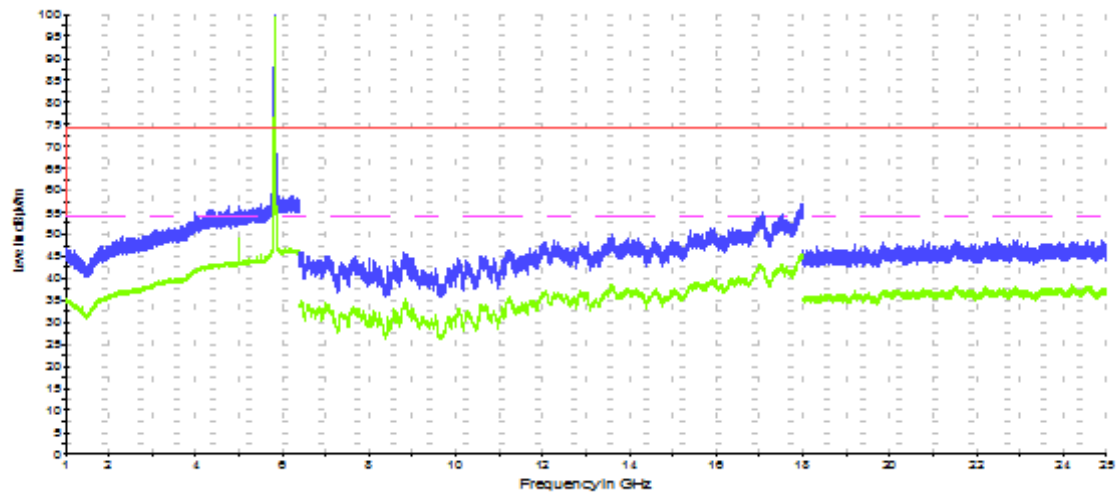
Radiated Spurious – CH157



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4958	57.1	-	74	16.9
4958	-	50.9	54	3.1

Radiated Spurious – CH165

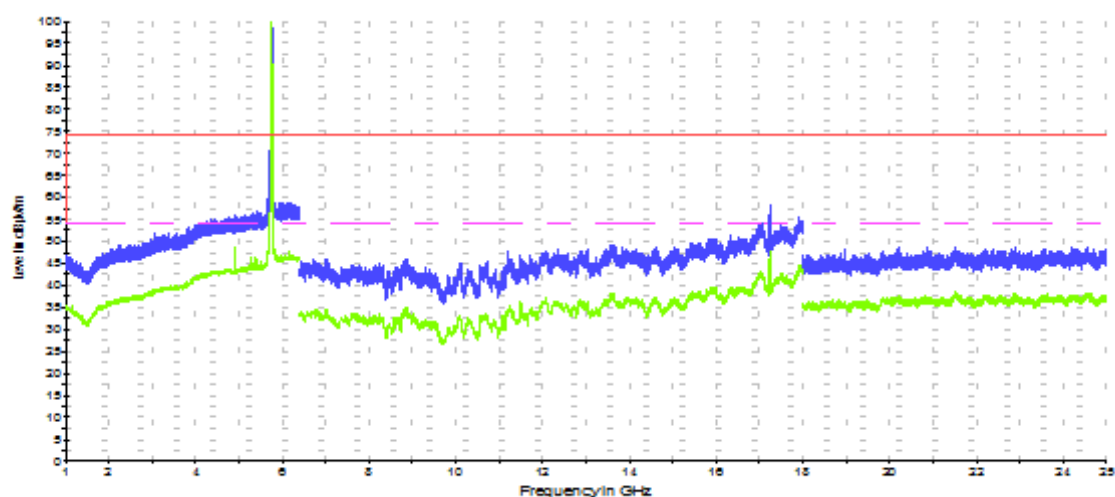


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4992	58.8	-	74	15.2
4992	-	50.6	54	3.4

1 GHz – 26.5GHz, 802.11n20, Chain A

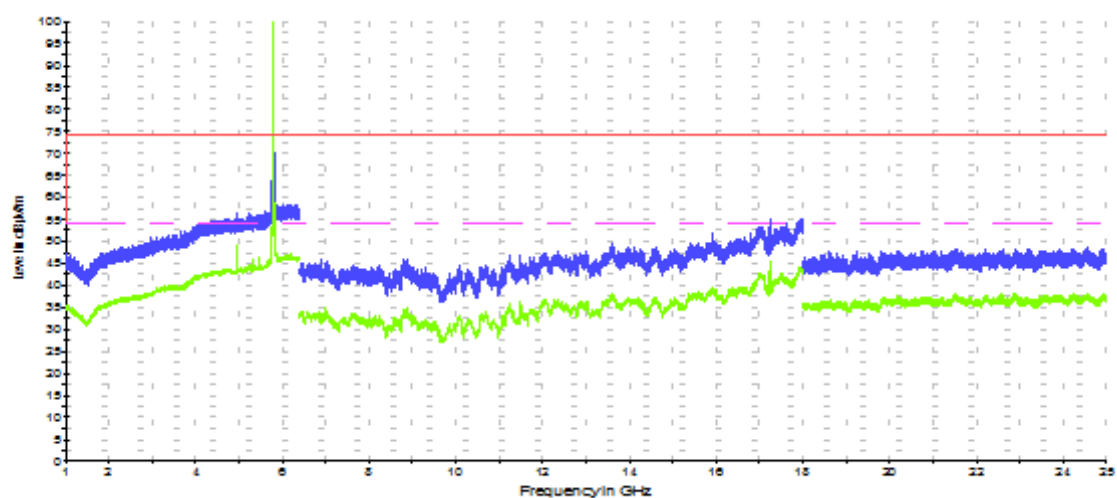
Radiated Spurious – CH149



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4924	54.1	-	74	19.9
4924	-	49.4	54	4.6
17236	61.4	-	74	12.6
17236	-	49.9	54	4.1

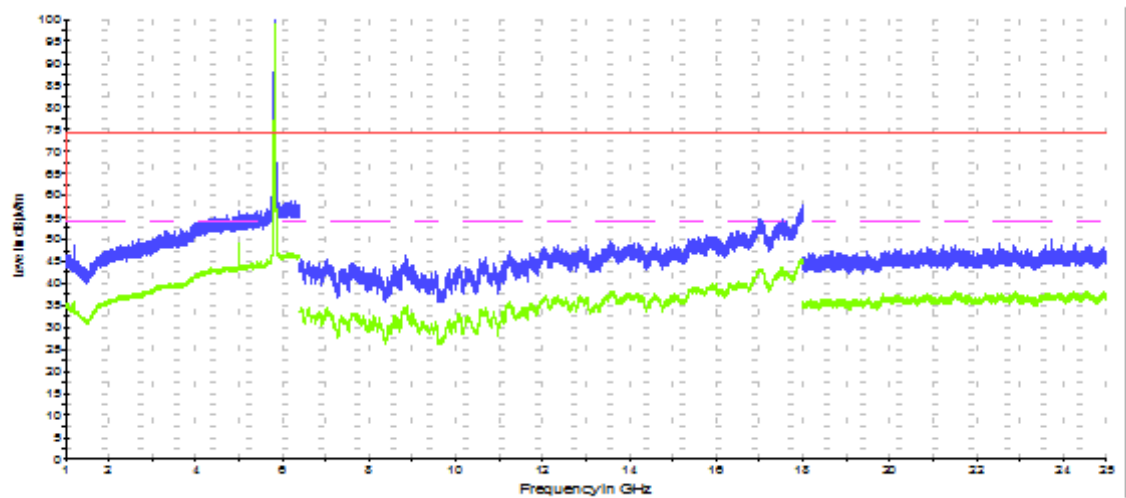
Radiated Spurious – CH157



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4957	57.4	-	74	16.6
4957	-	51.0	54	3.0
17240	61.9	-	74	12.1
17240	-	49.6	54	4.4

Radiated Spurious – CH165

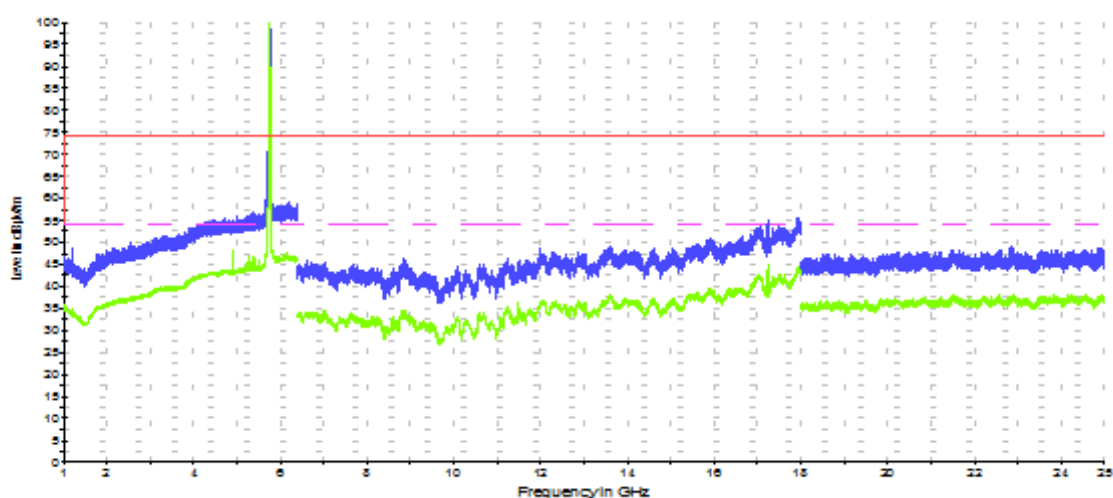


— Peak measurements
 — AVG measurements
 — Limit FCC Peak
 - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4992	57.5	-	74	16.5
4992	-	50.7	54	3.3

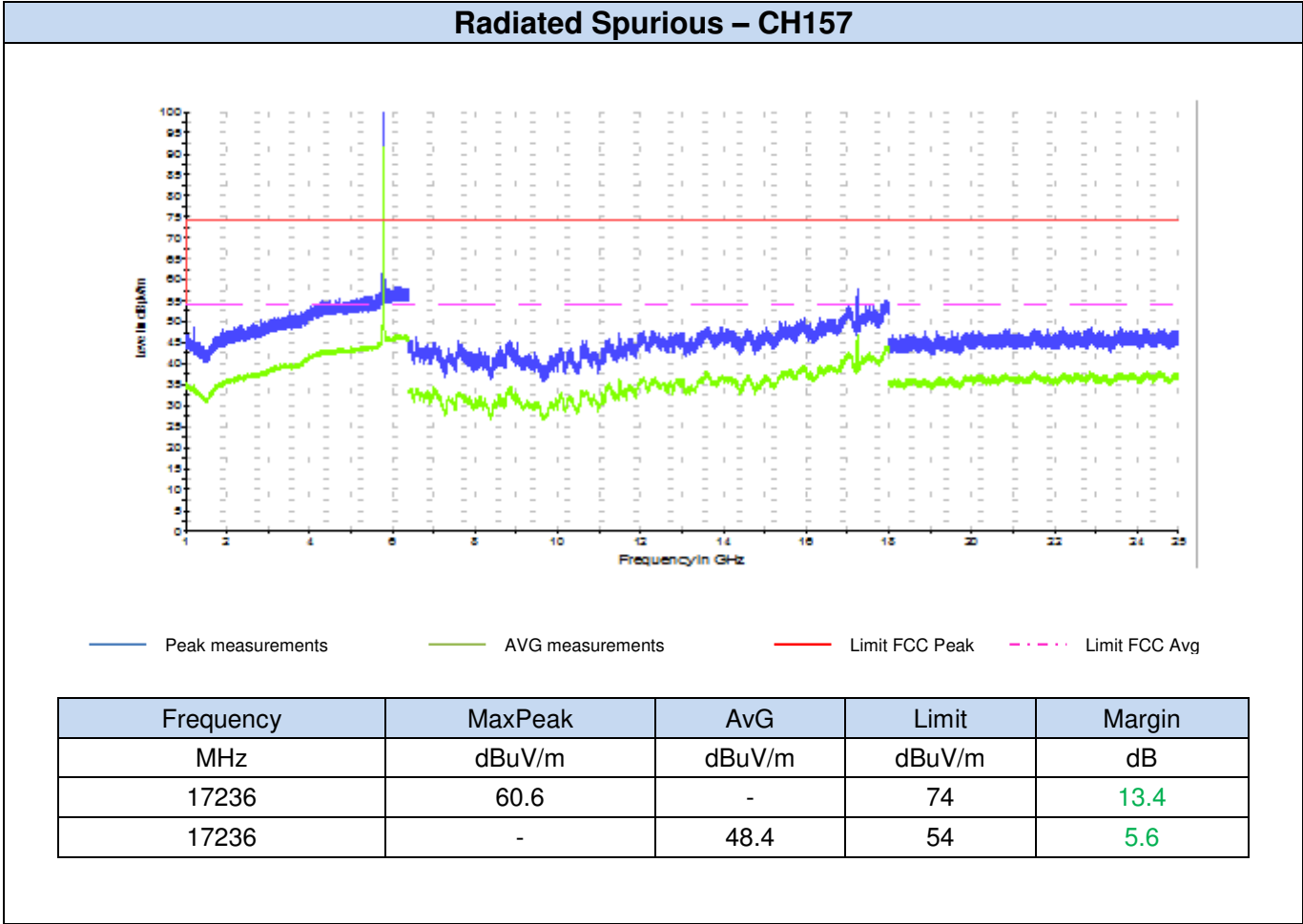
1 GHz – 26.5GHz, 802.11n20, Chain B

Radiated Spurious – CH149

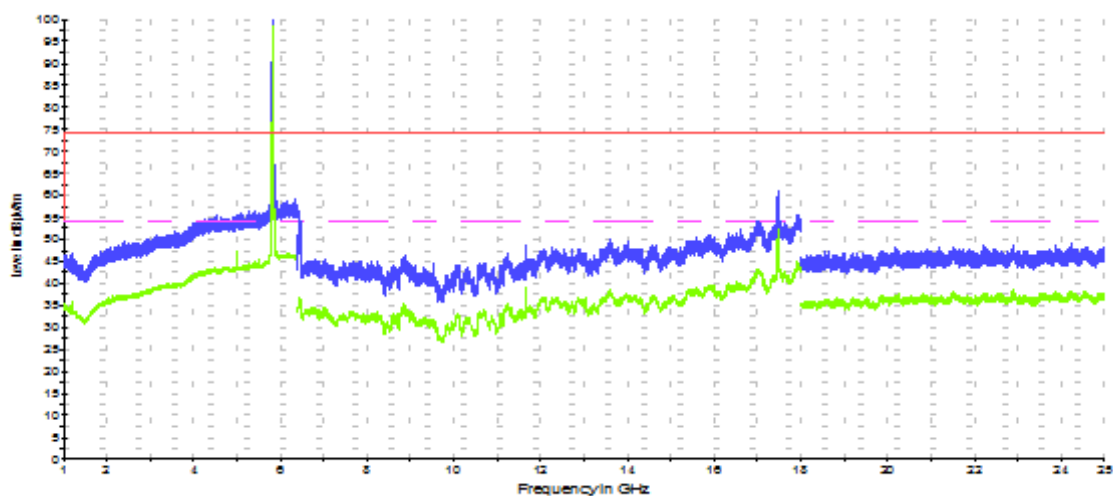


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4924	58.8	-	74	15.2
4924	-	50.0	54	4



Radiated Spurious – CH165

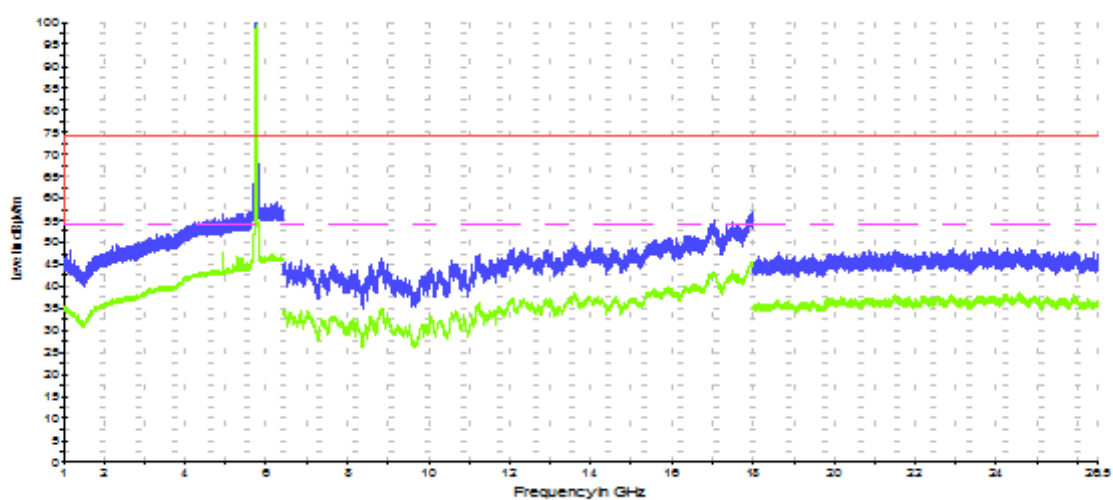


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4992	56.5	-	74	17.5
4992	-	50.3	54	3.7

1 GHz – 26.5GHz, 802.11n20, Chain A+B

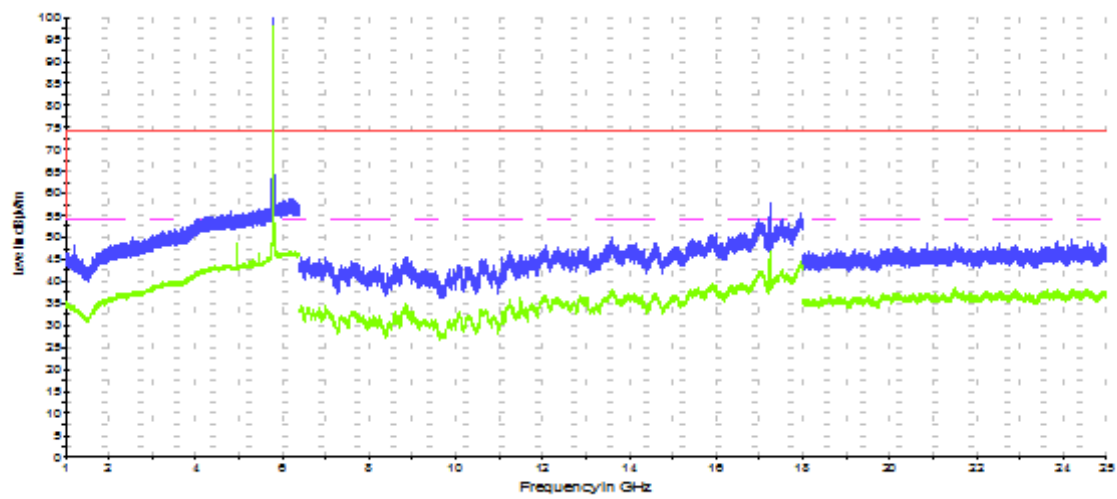
Radiated Spurious – CH149



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4924	57.5	-	74	16.5
4924	-	50.5	54	3.5

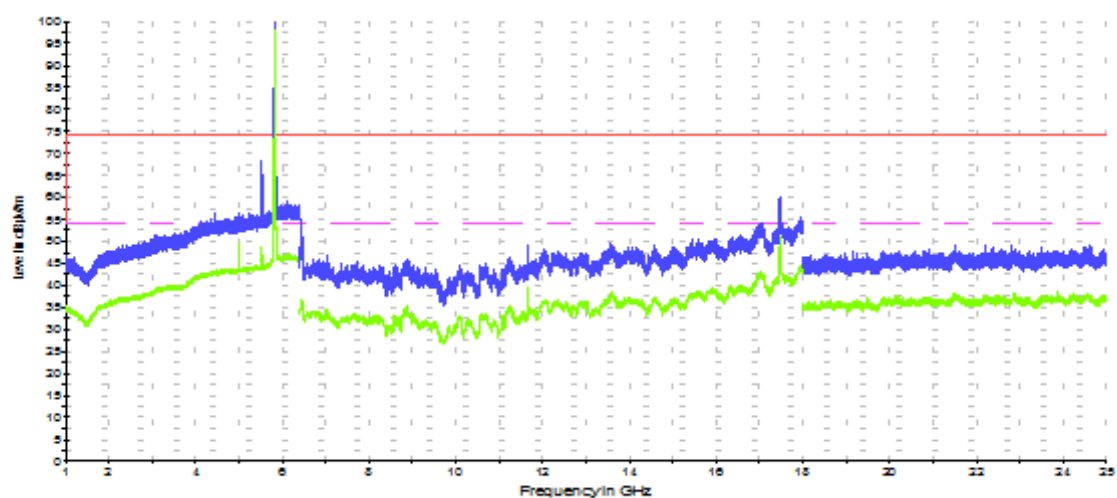
Radiated Spurious – CH157



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4858	57.8	-	74	16.2
4858	-	53.0	54	1
17229	58.9	-	74	15.1
17229	-	49.6	54	4.4

Radiated Spurious – CH165

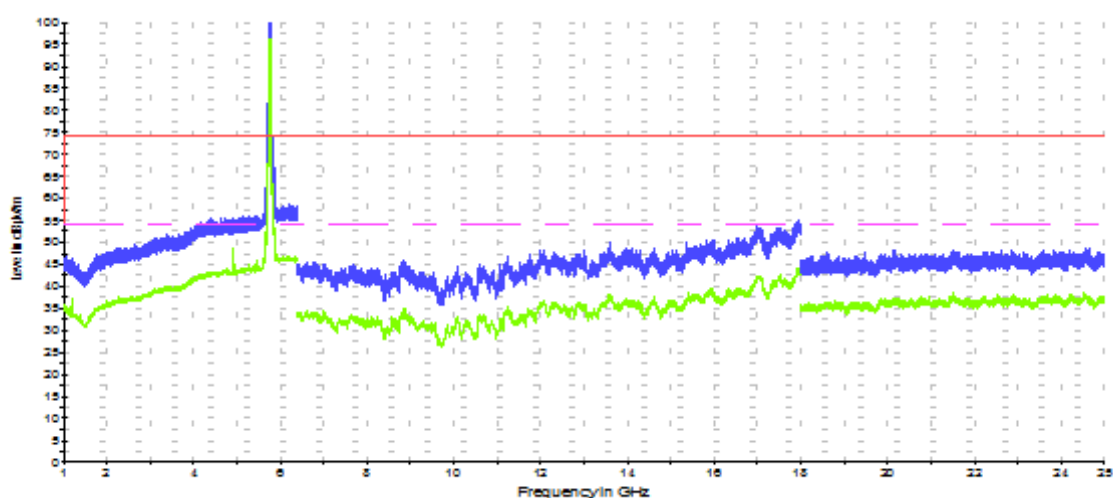


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4992	58.9	-	74	15.1
4992	-	52.6	54	1.4
5525	68.2	-	74	5.8
5525	-	51.2	54	2.8
17469	67.5	-	74	6.5
17469	-	52.9	54	1.1

1 GHz – 26.5GHz, 802.11n40, Chain A

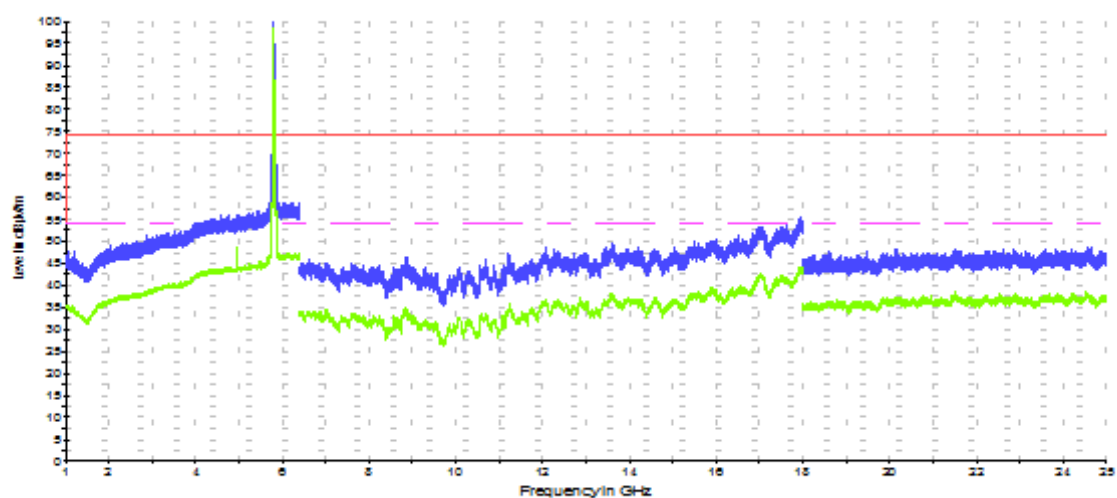
Radiated Spurious – CH151F



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4932	57.6	-	74	16.4
4932	-	50.5	54	3.5

Radiated Spurious – CH159F

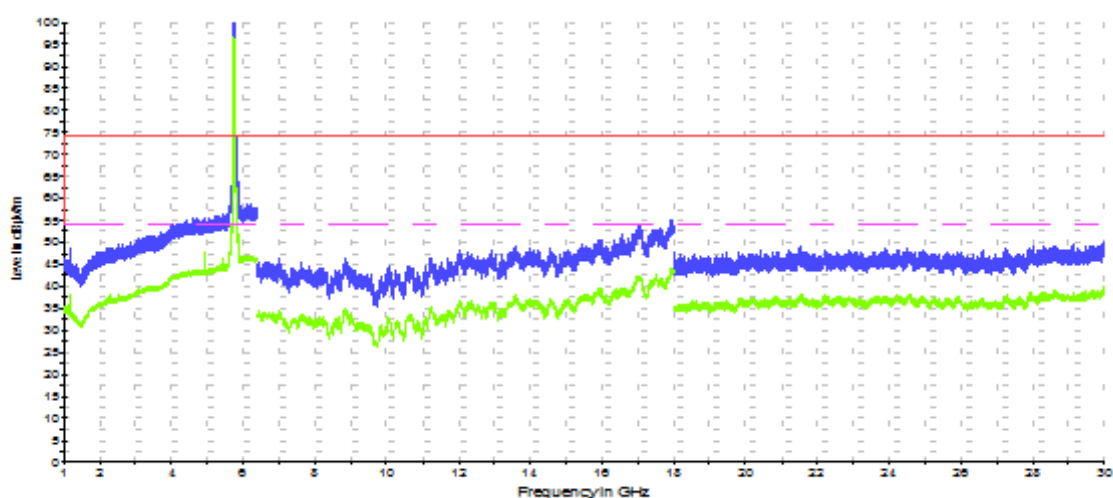


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4967	57.1	-	74	16.9
4967	-	47.3	54	6.7

1 GHz – 26.5GHz, 802.11n40, Chain B

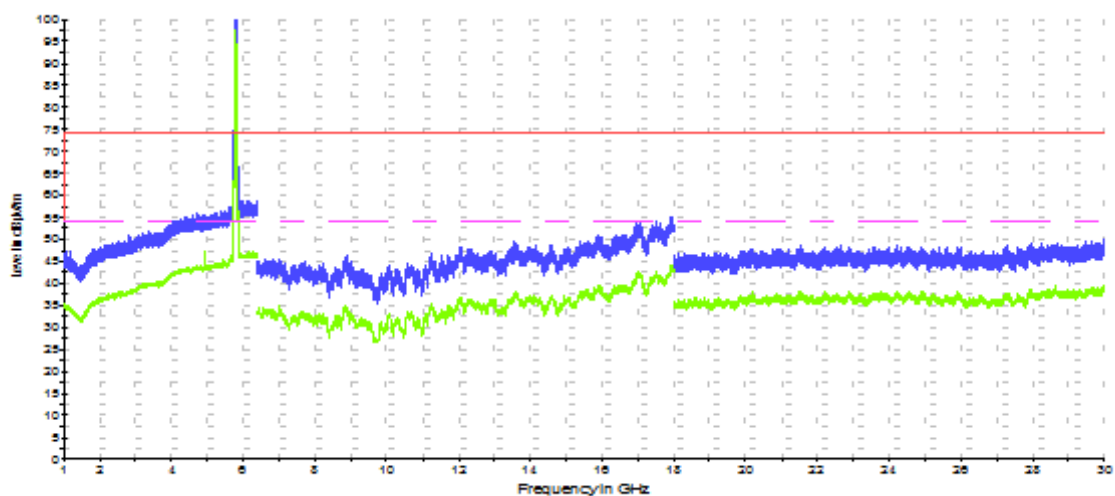
Radiated Spurious – CH151F



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4933	56.1	-	74	17.9
4933	-	49.4	54	4.6

Radiated Spurious – CH159F

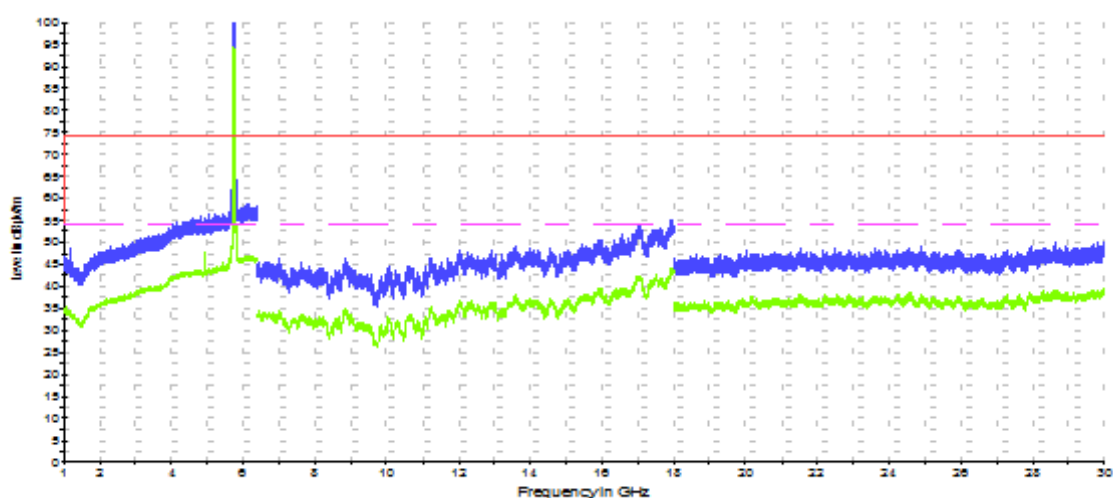


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4967	56.1	-	74	17.9
4967	-	48.4	54	5.6

1 GHz – 26.5GHz, 802.11n40, Chain A+B

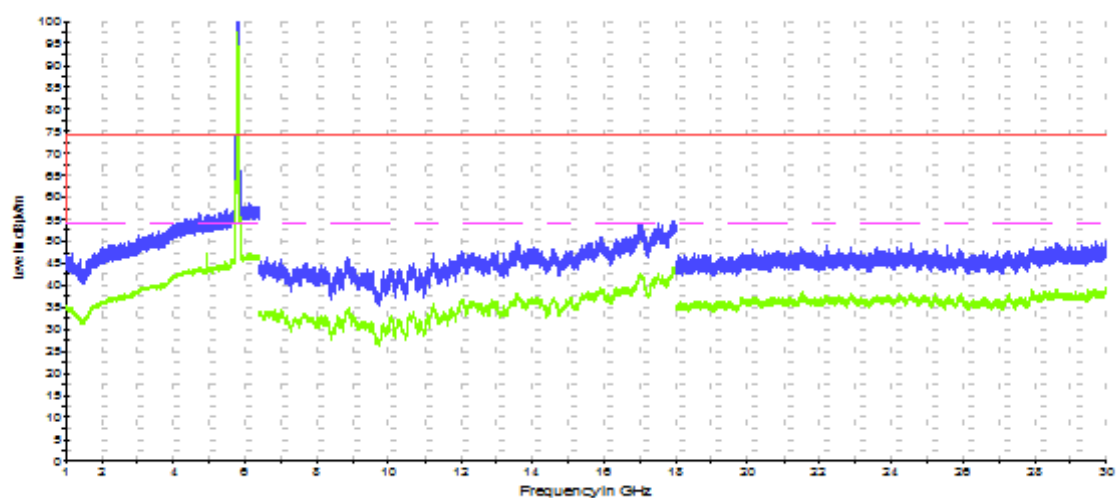
Radiated Spurious – CH151F



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

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4932	55.4	-	74	18.6
4932	-	50.5	54	3.5

Radiated Spurious – CH159F

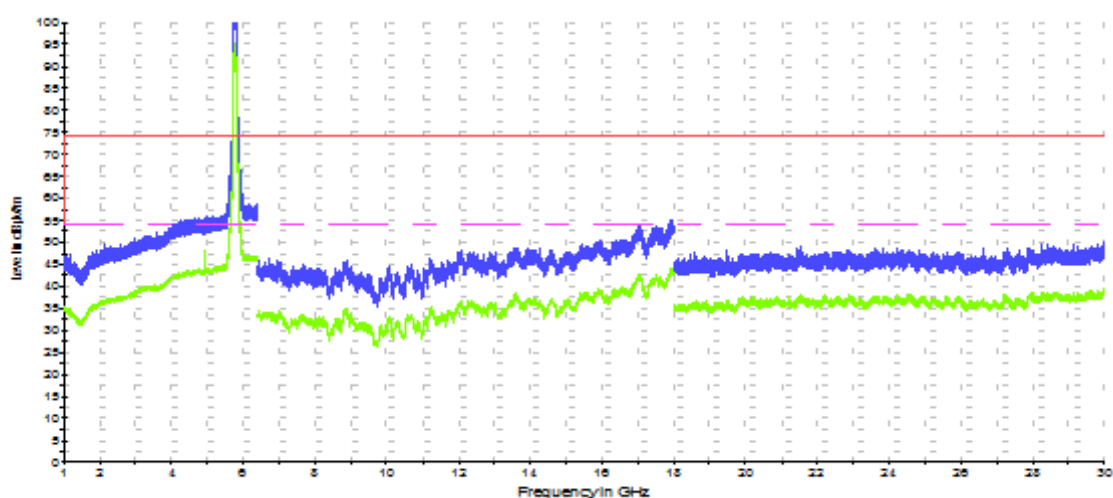


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4967	56.1	-	74	17.9
4967	-	48.4	54	5.6

1 GHz – 26.5GHz, 802.11ac80, Chain A

Radiated Spurious – CH155ac80

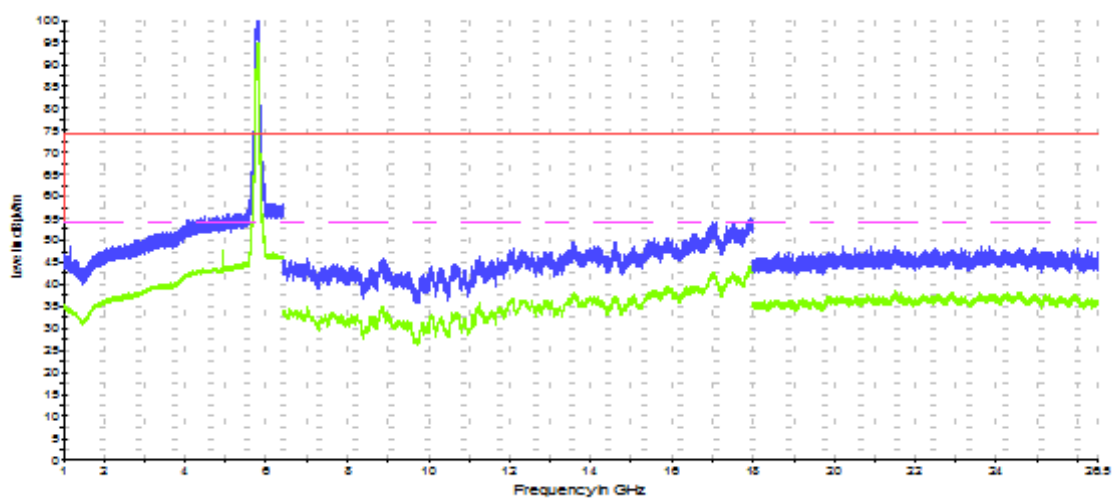


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4950	58.0	-	74	16.0
4950	-	48.9	54	5.0

1 GHz – 26.5GHz, 802.11ac80, Chain B

Radiated Spurious – CH155ac80

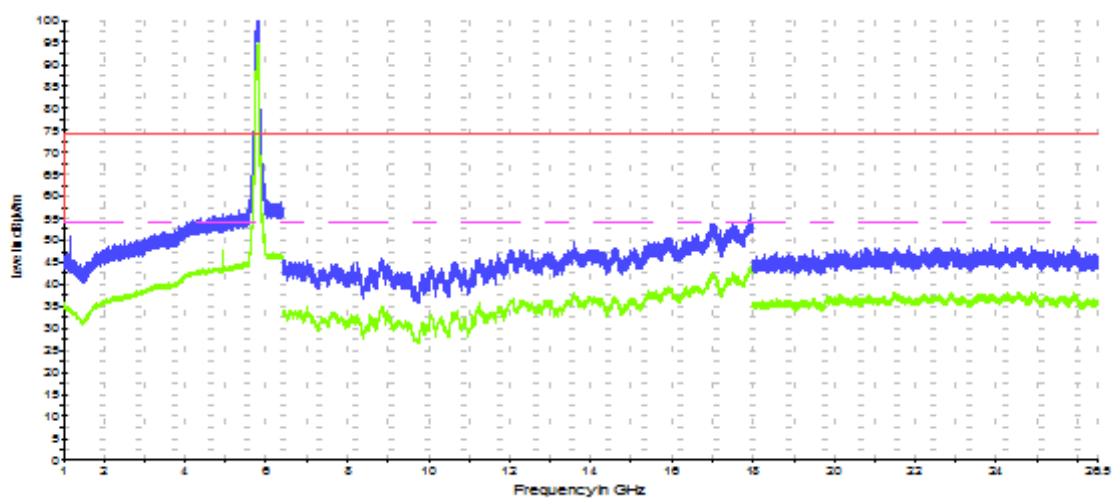


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4950	56.9	-	74	17.1
4950	-	48.8	54	5.2

1 GHz – 26.5GHz, 802.11ac80, Chain A+B

Radiated Spurious – CH155ac80

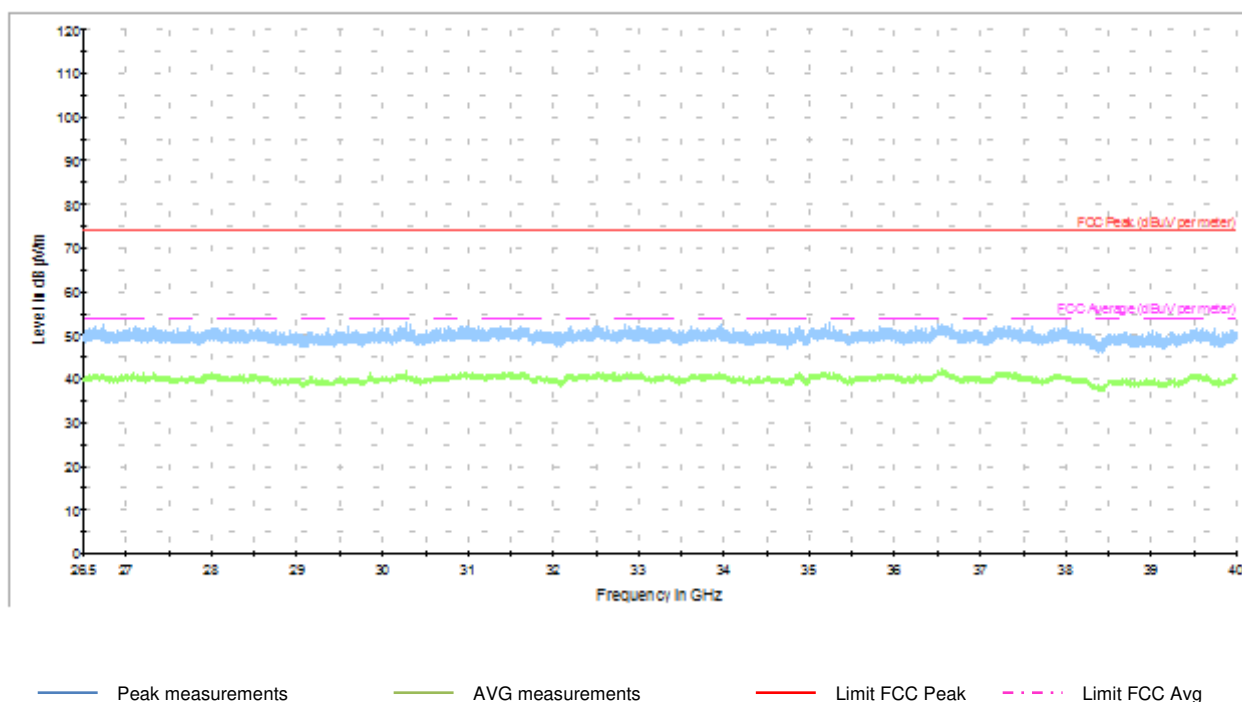


— Peak measurements — AVG measurements — Limit FCC Peak - - - Limit FCC Avg

Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4950	57.1	-	74	16.9
4950	-	48.8	54	5.2

26.5 GHz – 40GHz

Radiated Spurious – All modes



Frequency	MaxPeak	AvG	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
36530.01	52.36		74	21.64
36553.16		42.22	54	11.78

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