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

Test limits:

FCC part	RSS Part	Limits
15.407 (a) (2)	RSS-247 Clause 6.2.3 (1)	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.

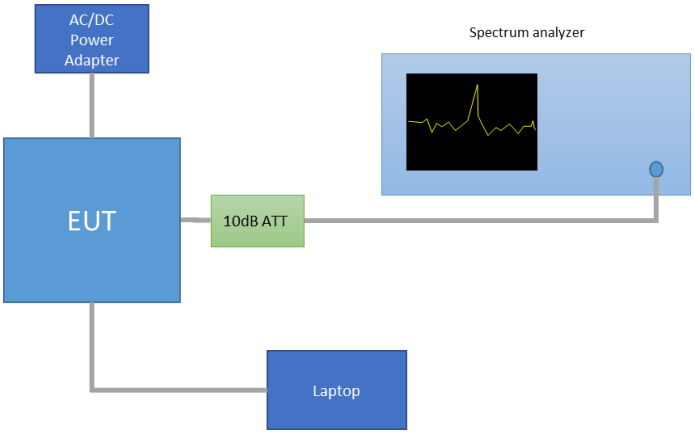
Test procedure:

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.

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.

For the overlapped channels between U-NII-2C and U-NII-3, and according to FCC KDB 644545 D03, the power is computed based on the portion of the emission bandwidth contained within that band. This rule is only applicable for those channels marked as overlapped.

Results tables:

						Power [dBm]				
Mode	**Rate**	**Meas. Duty Cycle [%]**	**CH**	**Freq. [MHz]**	**Antenna**	**Meas. Cond RMS**	**Duty cycle Compensated**	**EIRP**	**PSD Duty cycle Compensated**	**Power (mW)**
802.11a	6Mbps	98.4	100	5500	SISO CHAIN A	17.19	17.26	22.26	6.36	**53.22**
			120	5600		17.13	17.20	22.20	6.29	52.49
			140	5700		16.99	17.06	22.06	6.17	**50.82**
802.11n20	HT0	98.6	100	5500		17.10	17.16	22.16	6.07	52.03
			120	5600		17.00	17.06	22.06	5.97	**50.85**
			140	5700		17.37	17.43	22.43	6.35	**55.37**
			144*	5720		17.02	17.08	22.08	6.75	51.06
802.11n40	HT0	97.1	102F	5510		14.79	14.92	19.92	0.50	**31.04**
			118F	5590		16.91	17.04	22.04	2.61	50.58
			134F	5610		17.23	17.36	22.36	2.92	54.45
			142F*	5710		17.34	17.47	22.47	3.25	**55.82**
802.11ac80	VHT0	96	106ac80	5530		11.55	11.73	16.73	-5.74	**14.88**
			122ac80	5610		16.82	17.00	22.00	-0.41	50.07
			138ac80*	5690		17.58	17.76	22.76	0.42	**59.68**

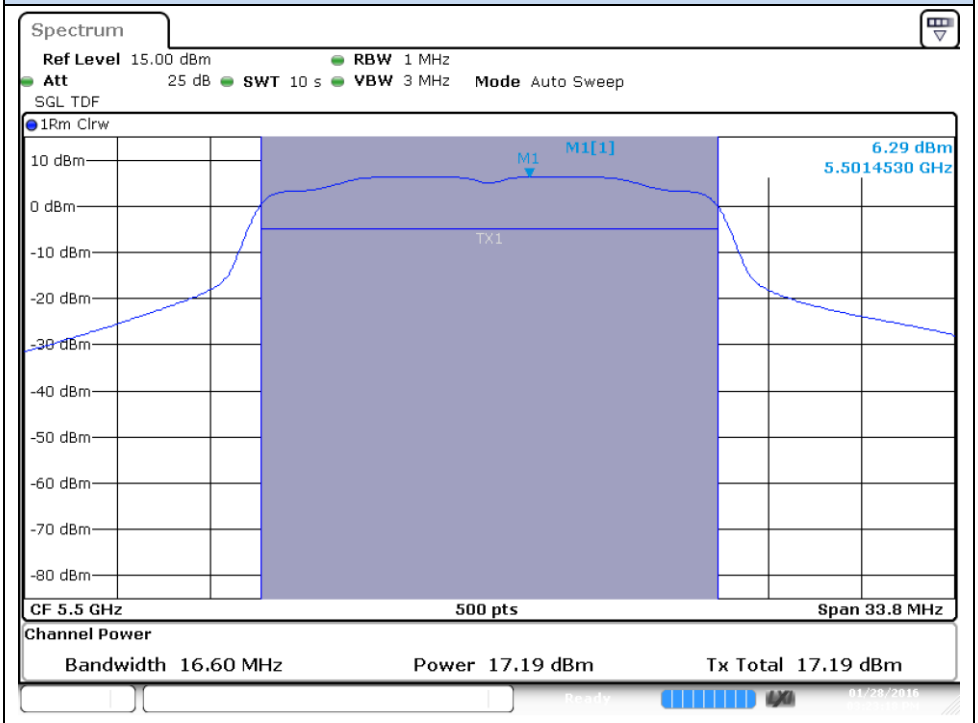
Max Value
Min Value

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

Results screenshot:

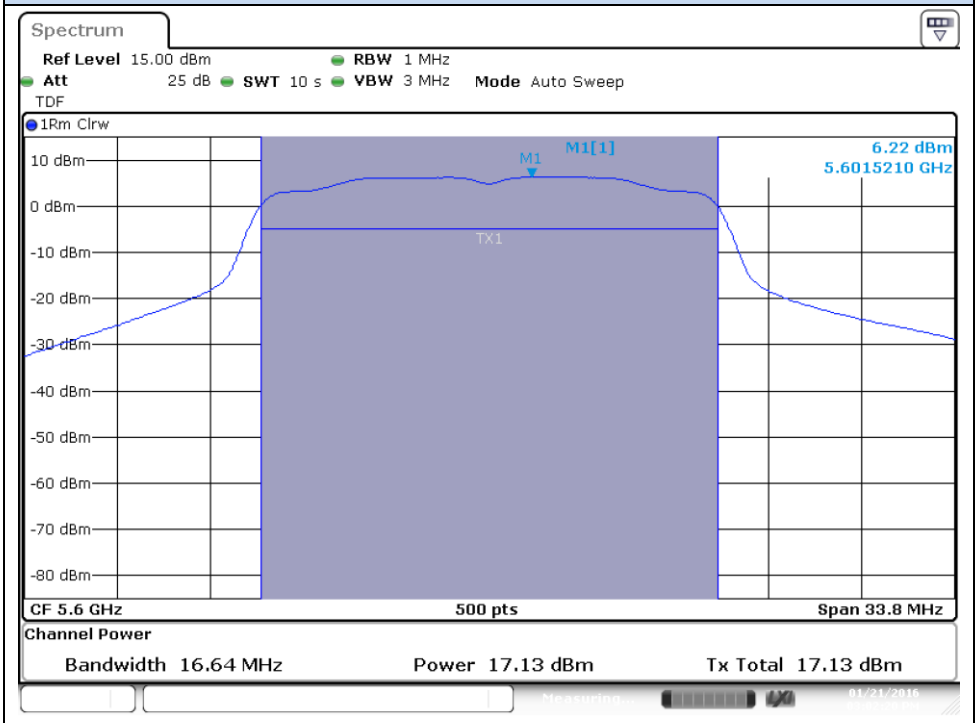
802.11a, 6Mbps

Max Power & PSD, Chain A – CH100



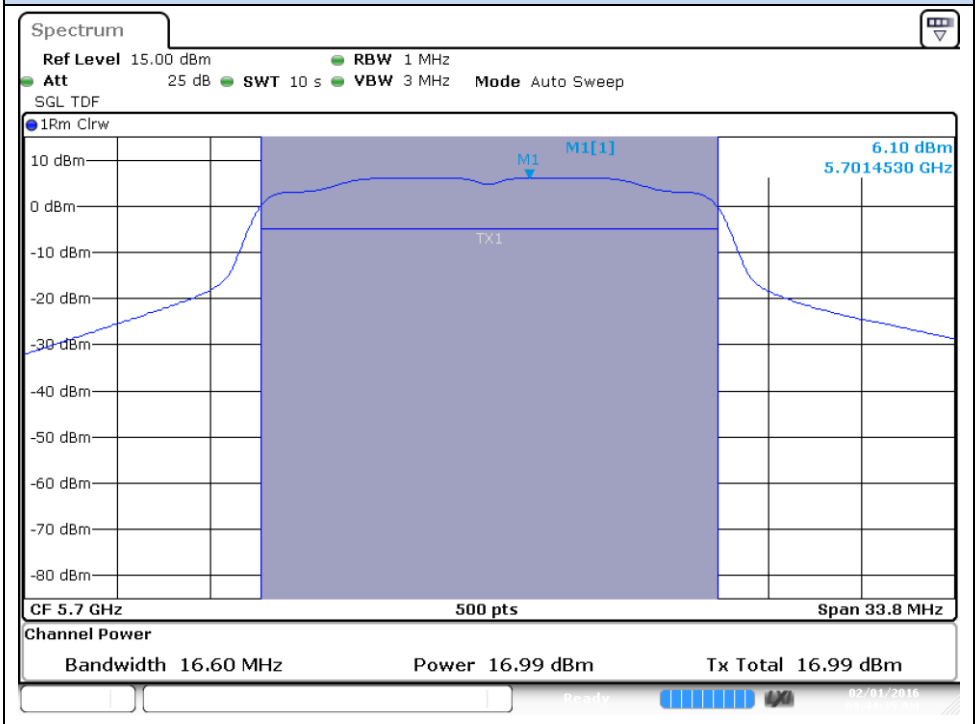
Date: 28.JAN.2016 15:23:18

Max Power & PSD, Chain A – CH120



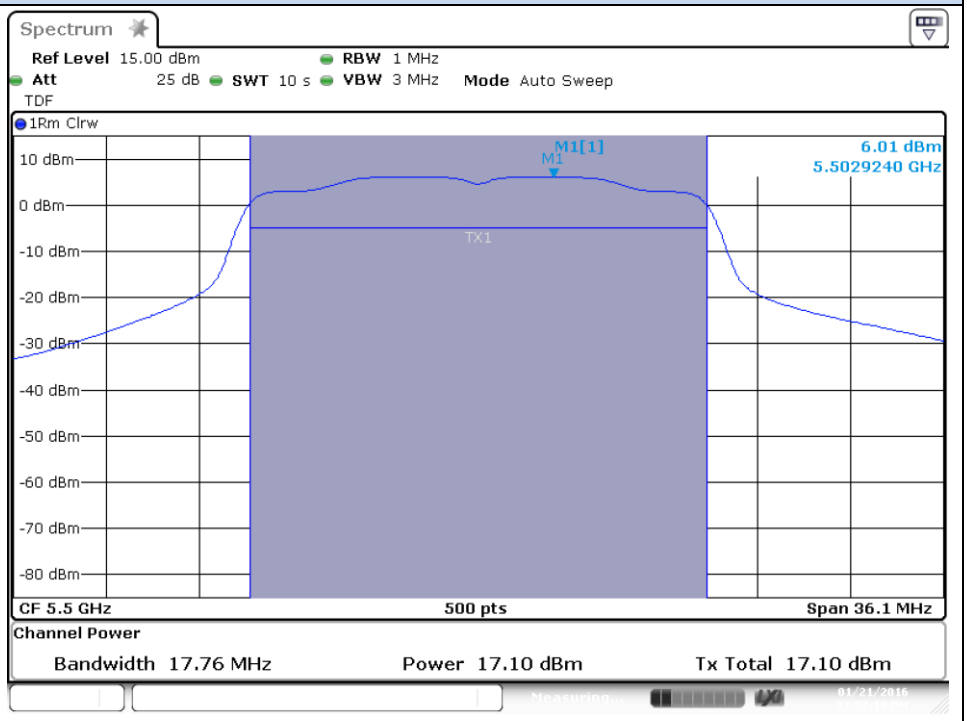
Date: 21.JAN.2016 15:02:20

Max Power & PSD, Chain A – CH140



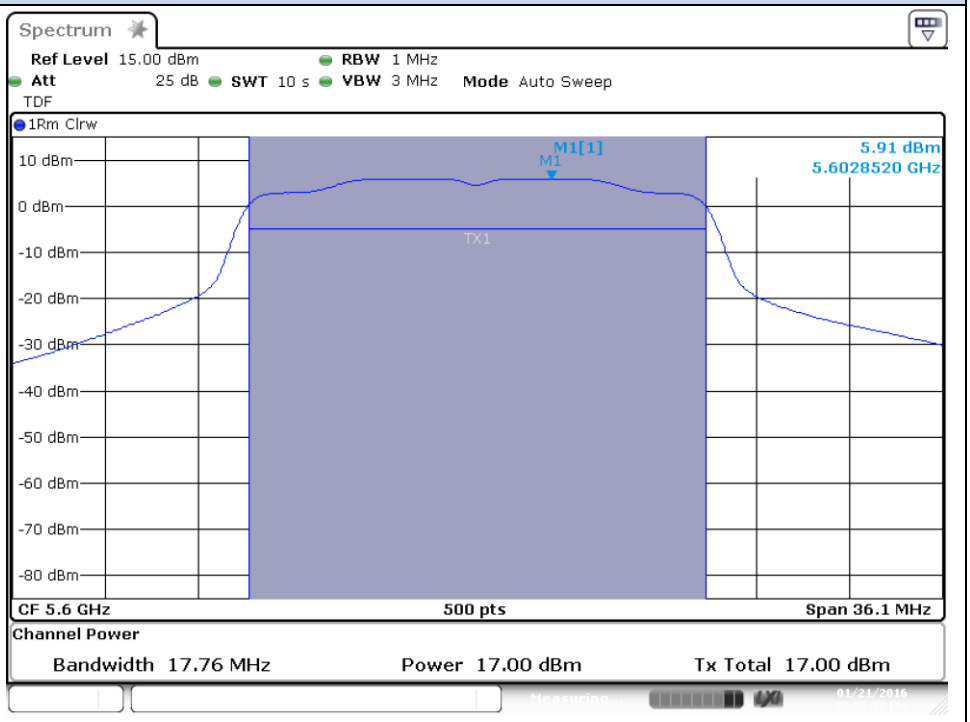
802.11n20, HT0 (SISO)

Max Power & PSD, Chain A – CH100



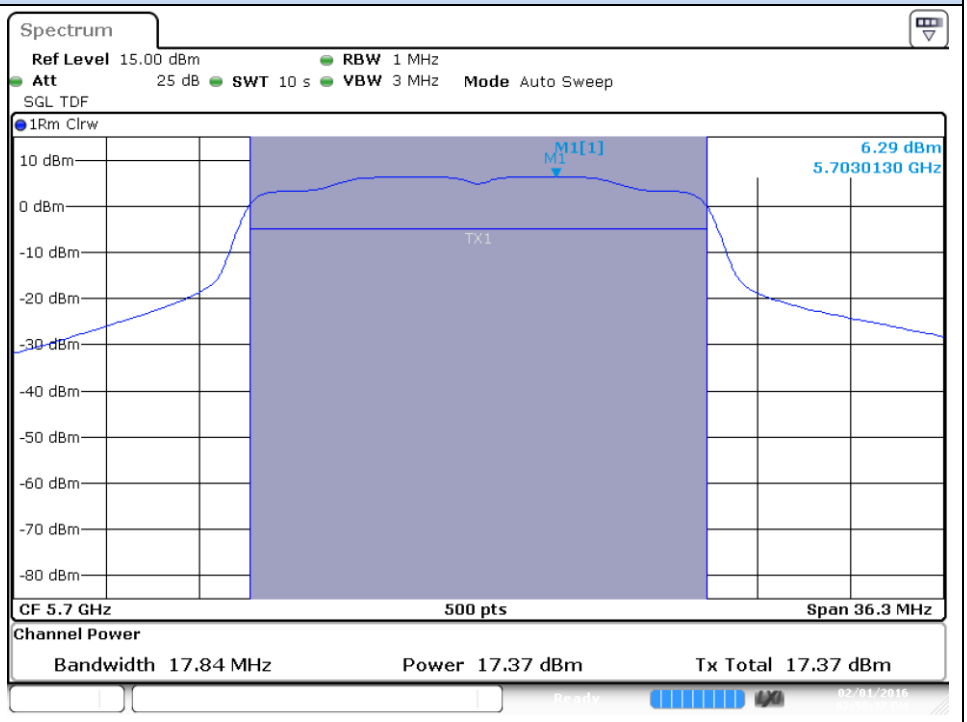
Date: 21.JAN.2016 15:52:20

Max Power & PSD, Chain A – CH120



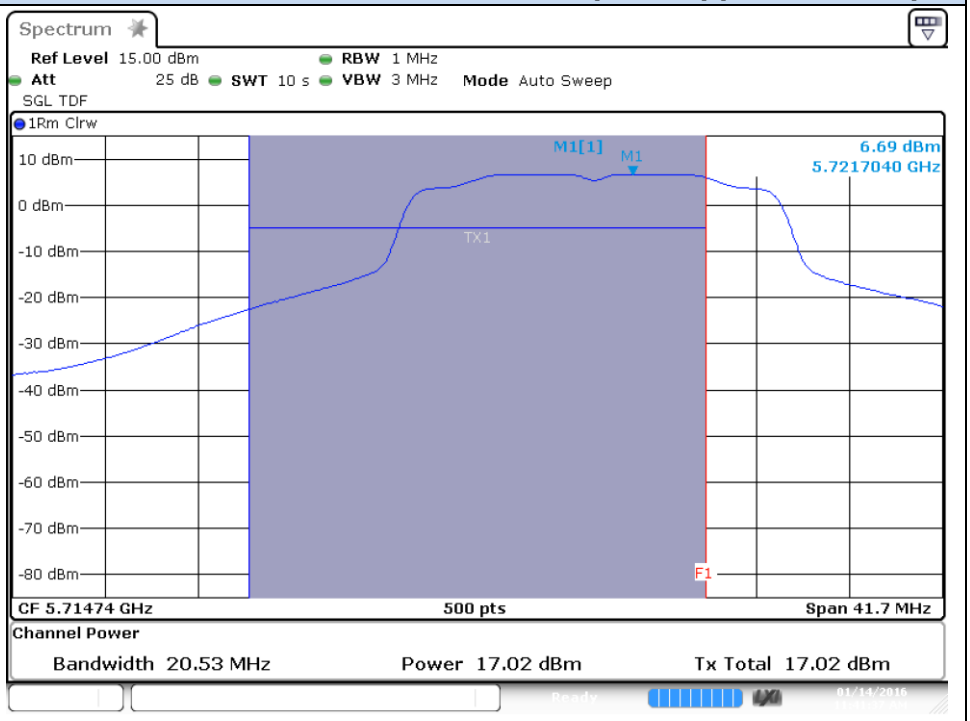
Date: 21.JAN.2016 15:55:53

Max Power & PSD, Chain A – CH140



Date: 1.FEB.2016 14:58:37

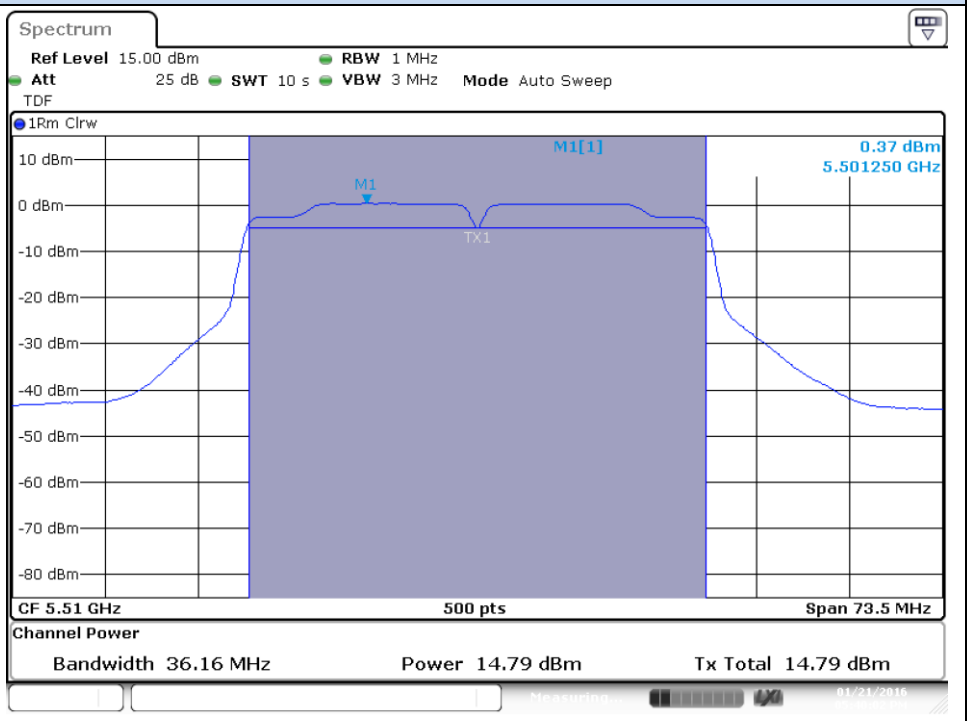
Max Power & PSD, Chain A – CH144 (Overlapped Channel)



Date: 14.JAN.2016 11:41:37

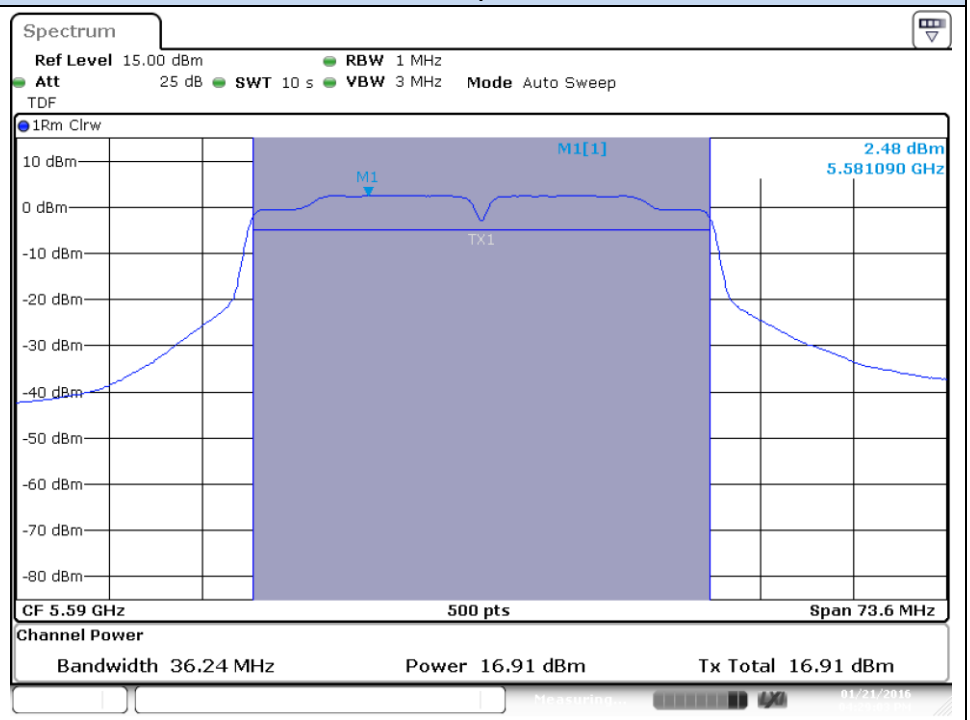
802.11n40, HT0

Max Power & PSD, Chain A – CH102



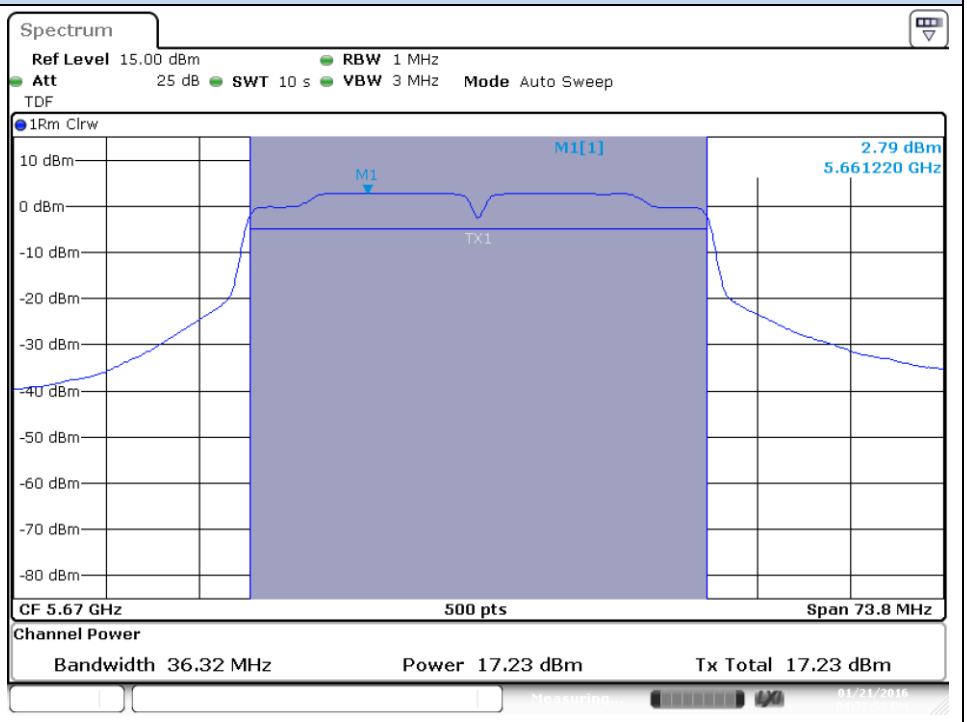
Date: 21.JAN.2016 17:40:02

Max Power & PSD, Chain A – CH118



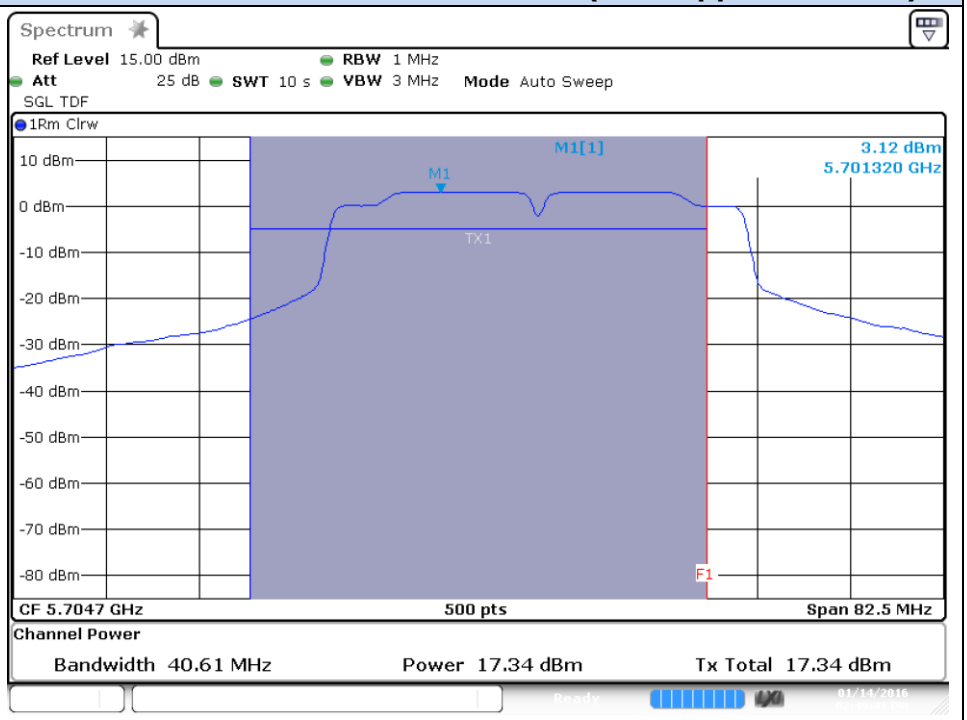
Date: 21.JAN.2016 16:29:03

Max Power & PSD, Chain A – CH134



Date: 21.JAN.2016 16:37:53

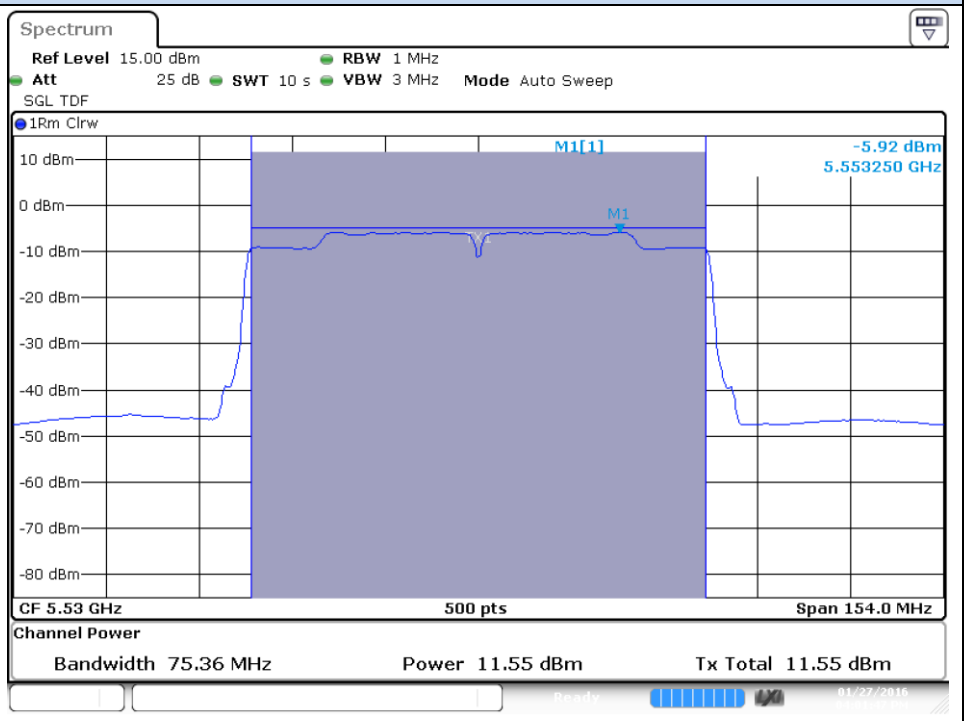
Max Power & PSD, Chain A – CH142 (Overlapped Channel)



Date: 14.JAN.2016 14:49:41

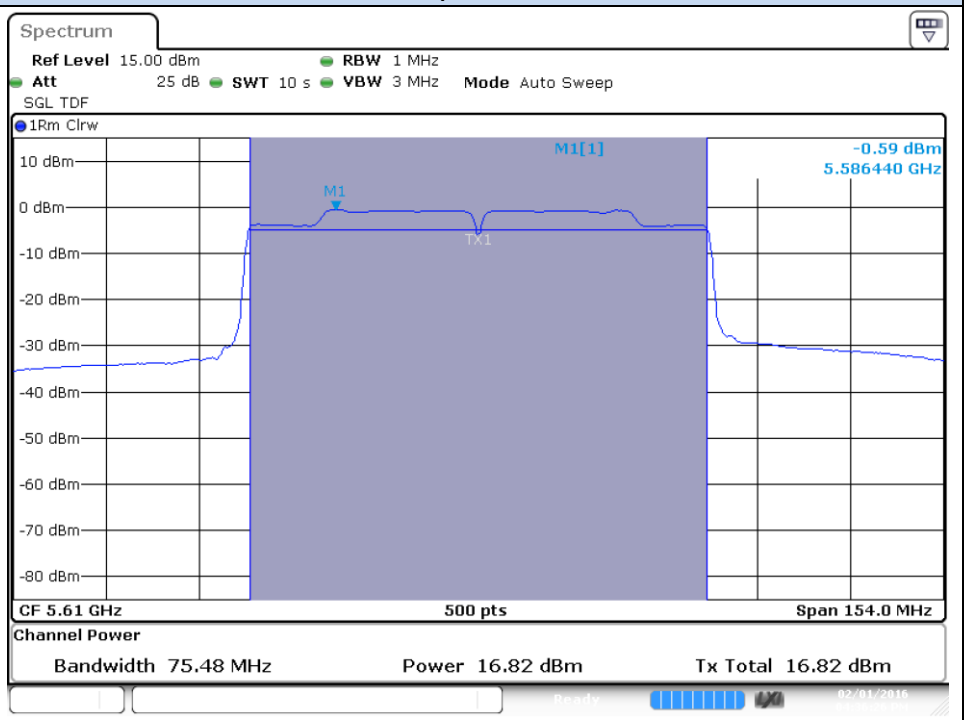
802.11ac80, VHT0 (SISO)

Max Power & PSD, Chain A – CH106ac80



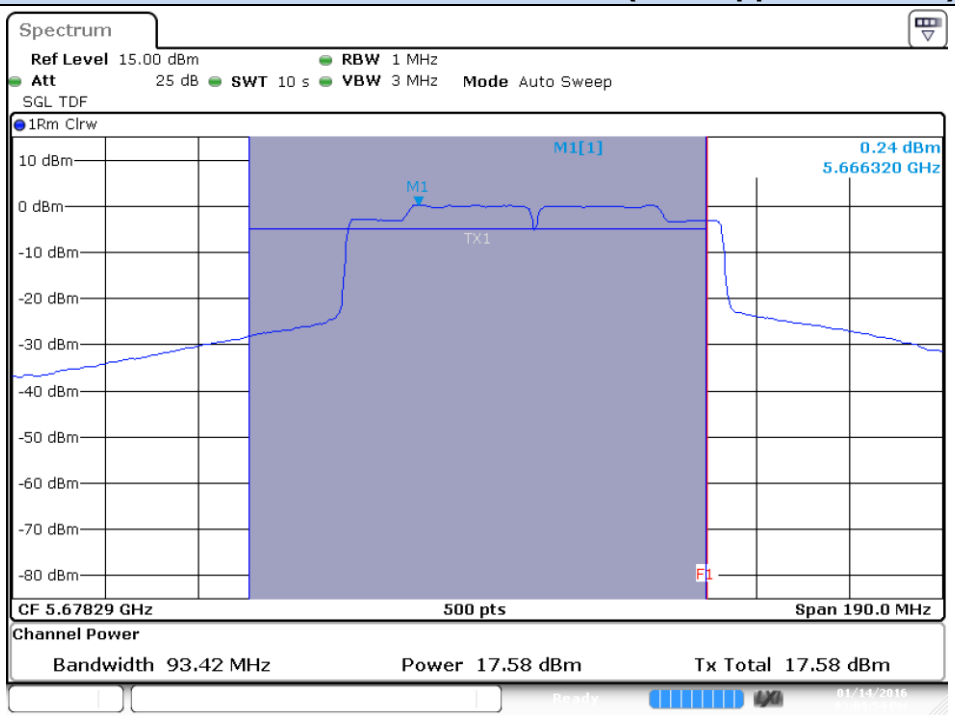
Date: 27.JAN.2016 16:01:47

Max Power & PSD, Chain A – CH122ac80



Date: 1.FEB.2016 16:36:26

Max Power & PSD, Chain A – CH138ac80 (Overlapped Channel)



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

Test limits:

<table>
<tr><th>FCC part</th><th>RSS Part</th><th>Limits</th></tr>
<tr><td>15.407 (b) (3)</td><td>RSS-247 Clause 6.2.3 (2)</td><td>For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.</td></tr>
<tr><td>15.209</td><td>RSS-247 Clause 6.2.3 (2)</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 Stregth (µV/m)</th><th>Field Stregth (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>960-25000</td><td>500</td><td>54</td><td>3</td></tr>
</table>
The emission limits shown in the table above 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.

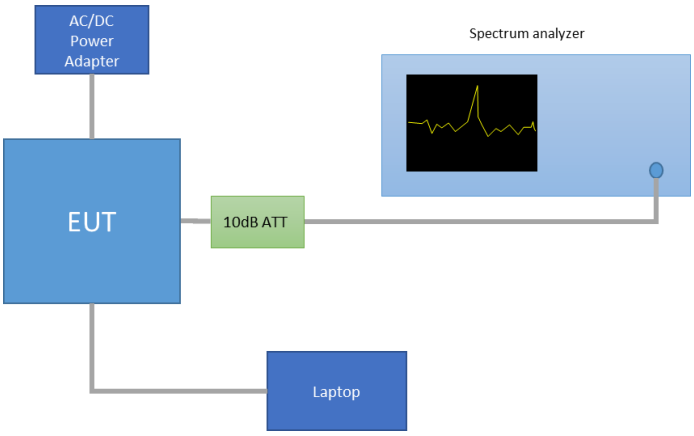
For the BE low RMS, we use the Video Bandwidth Method according to point G) 6) (KDB 789033 D02)

➔ When the duty cycle is > 98 %, we set VBW=10Hz

➔ When the duty cycle is < 98 %, we set 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.



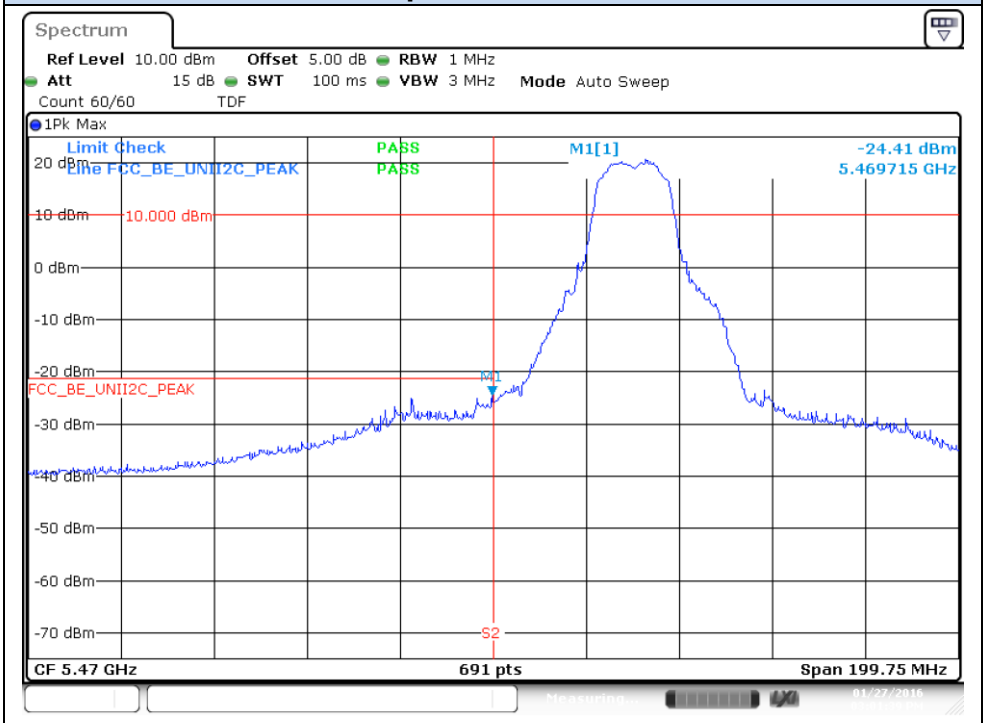
The following limits in dBm were applied for the average detector after the conversion from the limits detailed above in dBµV/m, according to FCC 47 CFR part 15 - Subpart C – §15.209(a). The limits in dBm for peak detector are 20dB above the indicated values in the table.

§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:

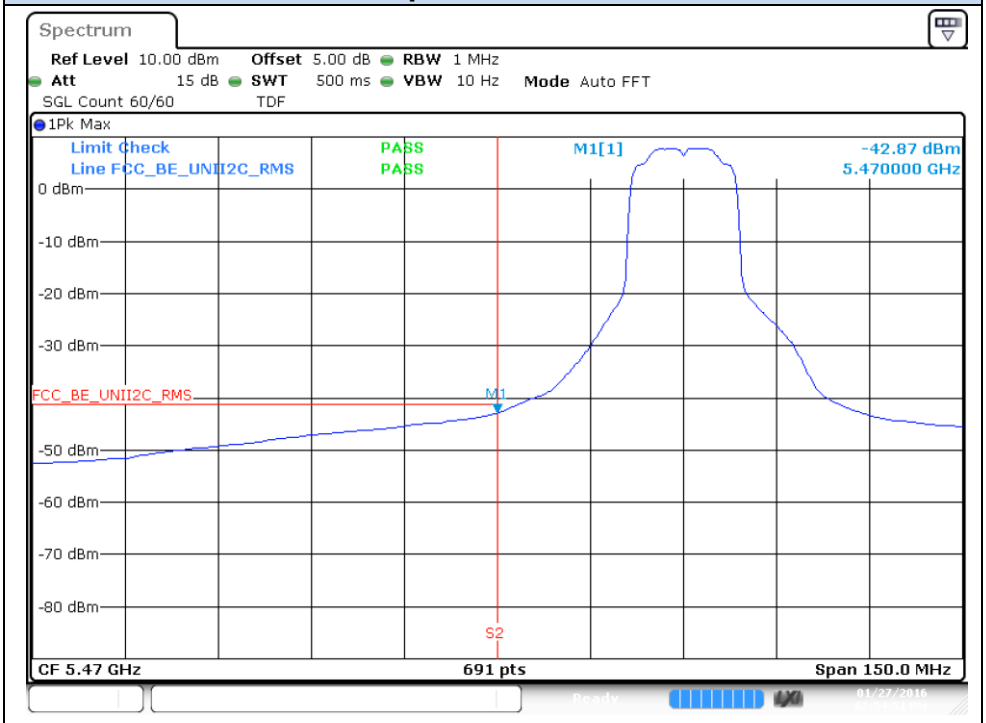
802.11a, 6Mbps – Chain A

BE Low Freq Section, Peak – CH100



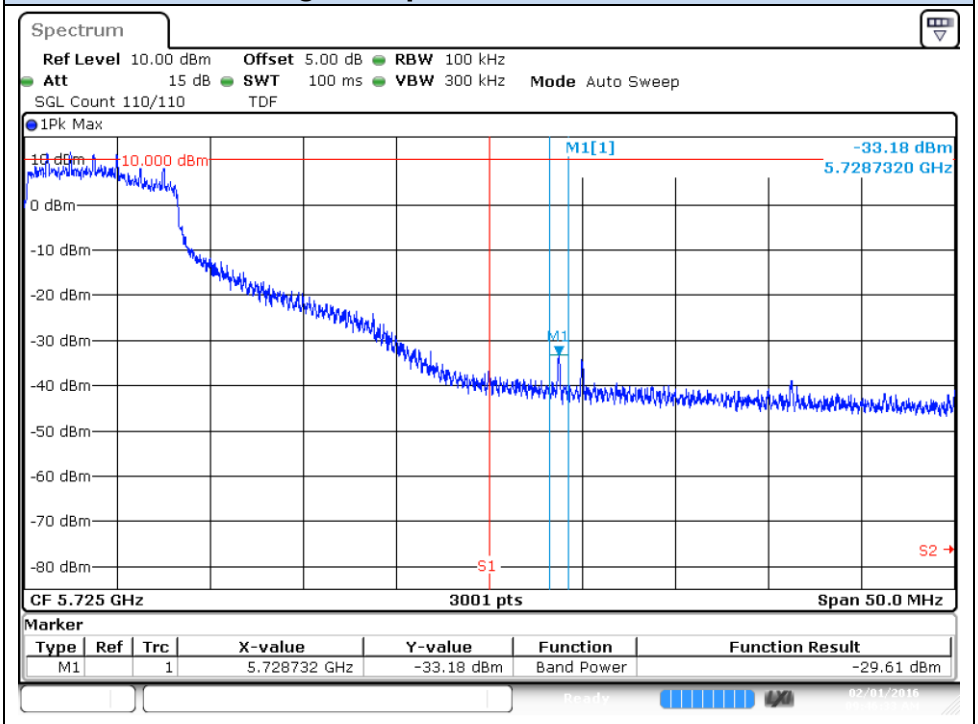
Date: 27.JAN.2016 15:01:40

BE Low Freq Section, RMS – CH100



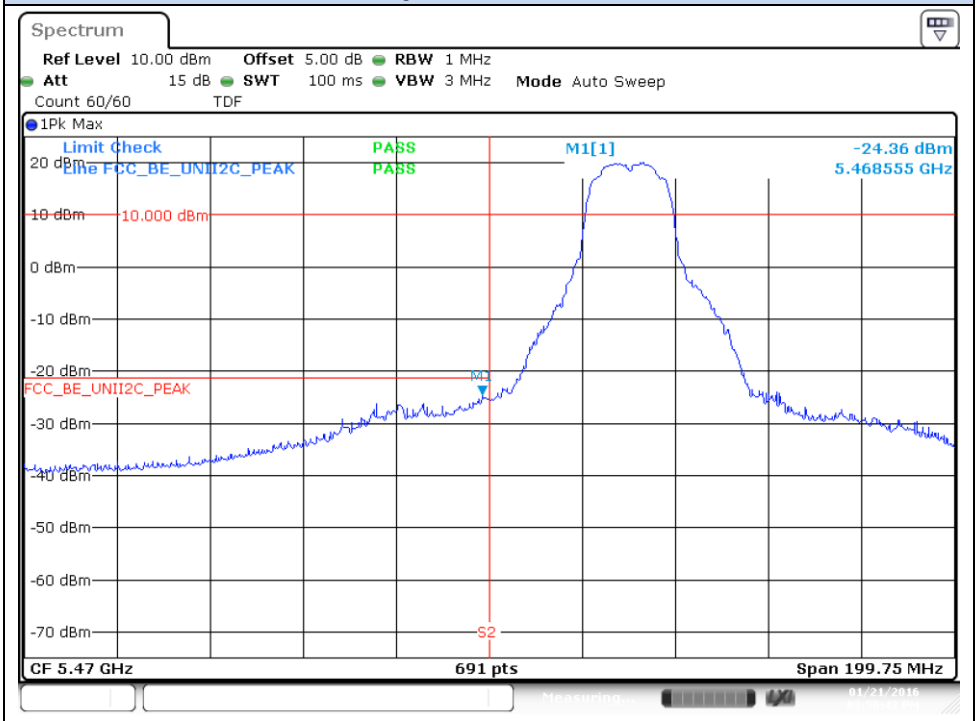
Date: 27.JAN.2016 14:54:51

BE High Freq Section, Peak – CH140



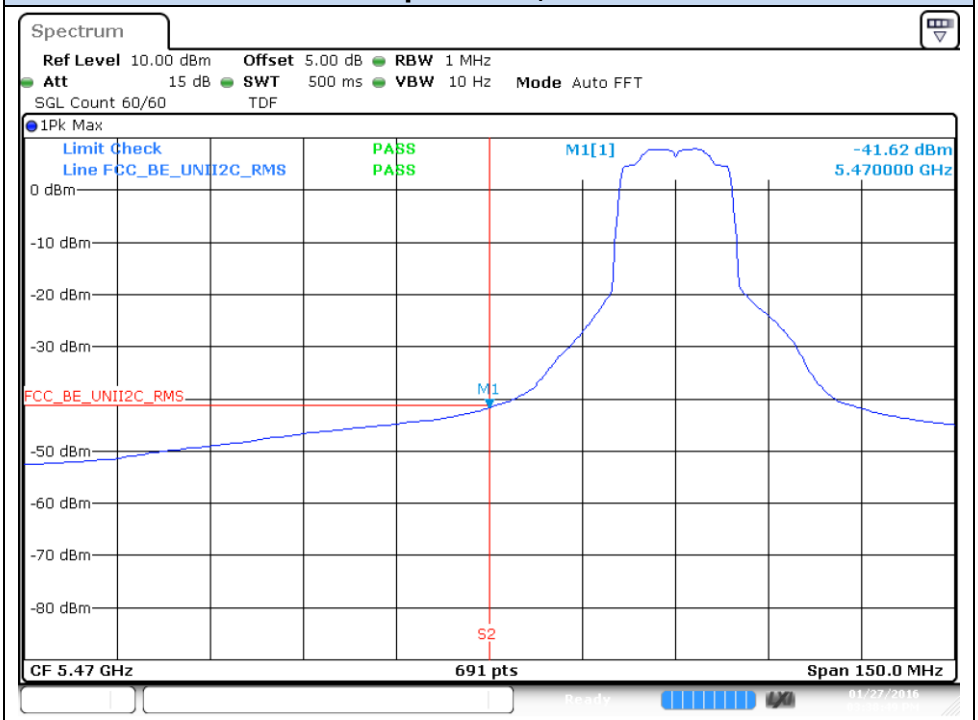
802.11n20, HT0 – Chain A

BE Low Freq Section, Peak – CH100



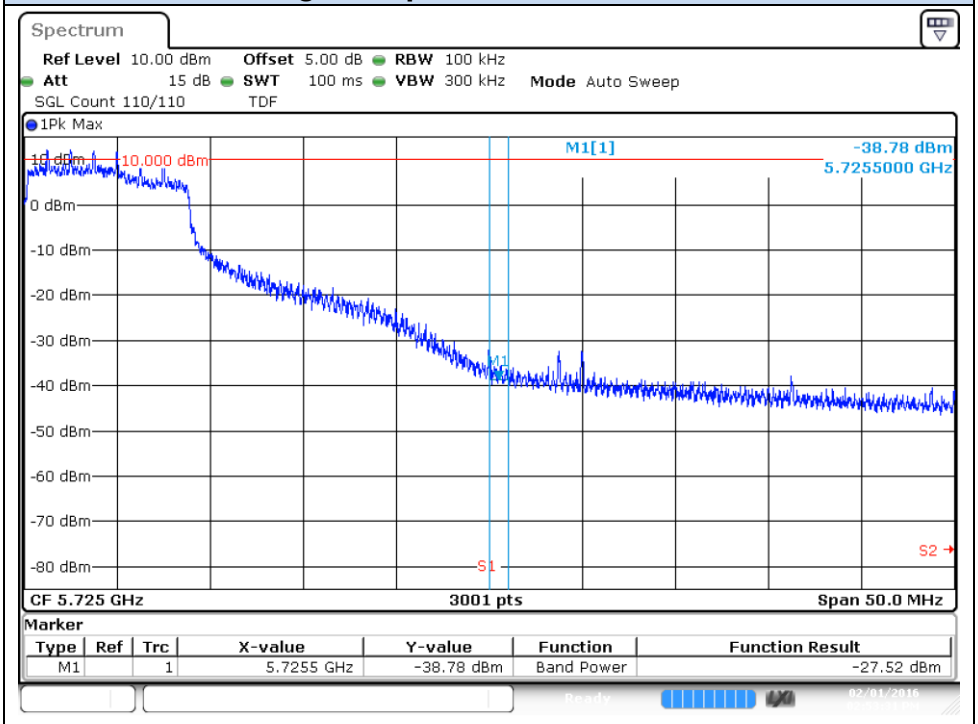
Date: 21.JAN.2016 15:50:42

BE Low Freq Section, RMS – CH100



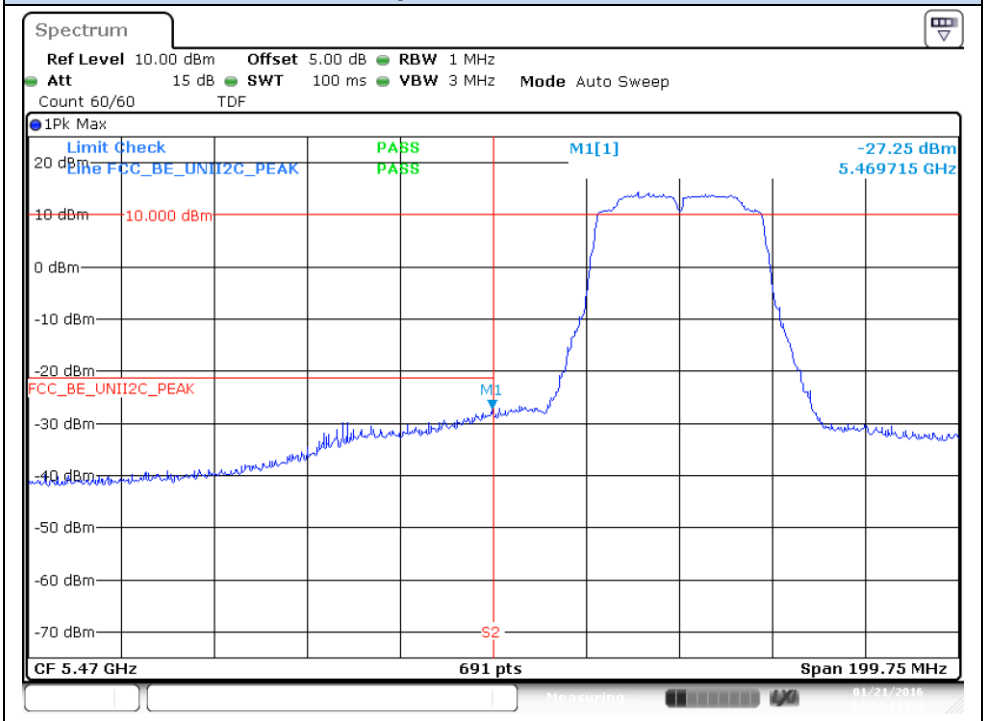
Date: 27.JAN.2016 15:38:49

BE High Freq Section, Peak – CH140



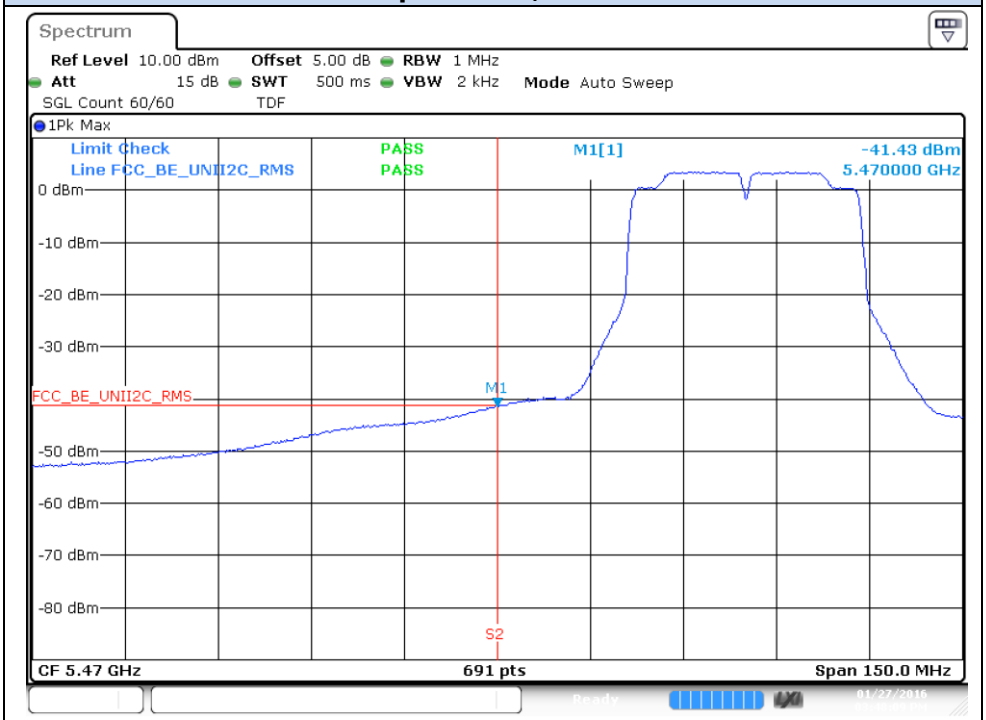
802.11n40, HT0 – Chain A

BE Low Freq Section, Peak – CH102F



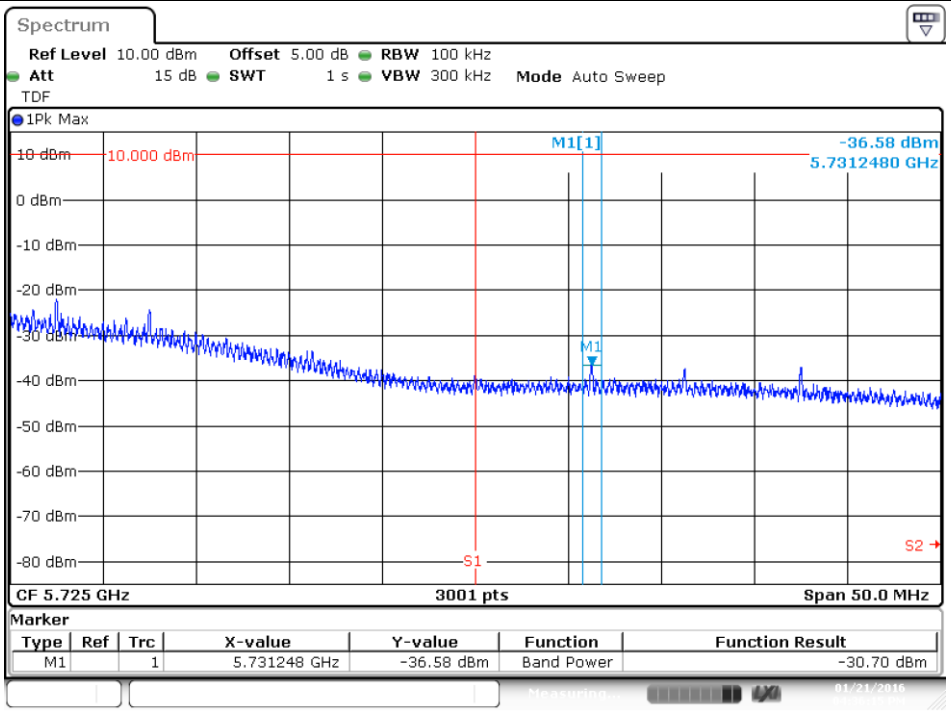
Date: 21.JAN.2016 16:24:32

BE Low Freq Section, RMS – CH102F



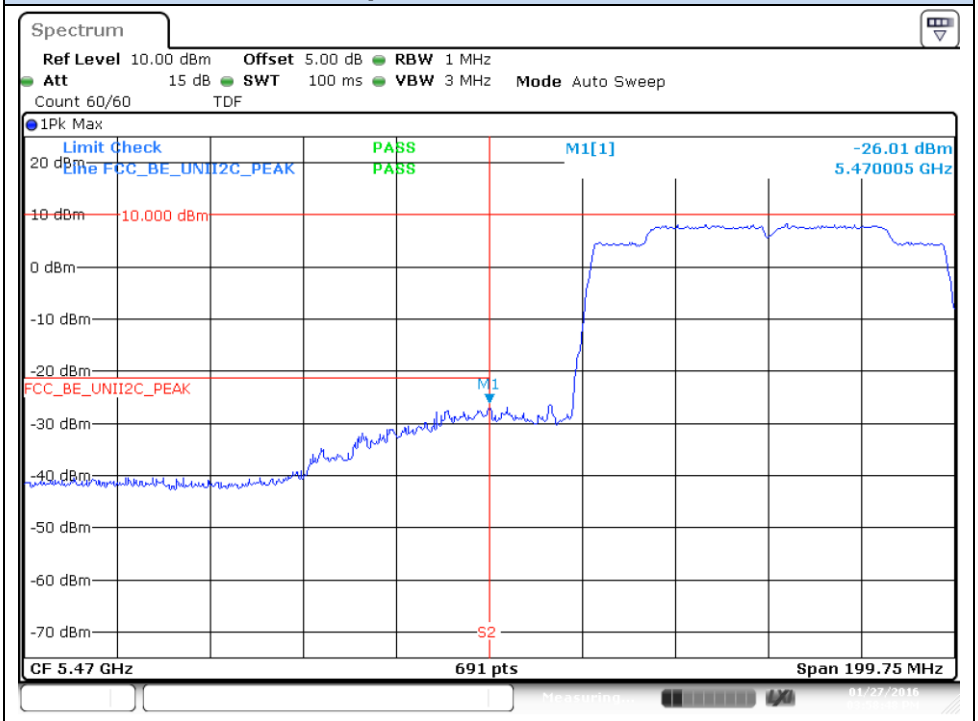
Date: 27.JAN.2016 15:48:09

BE High Freq Section, Peak – CH134F



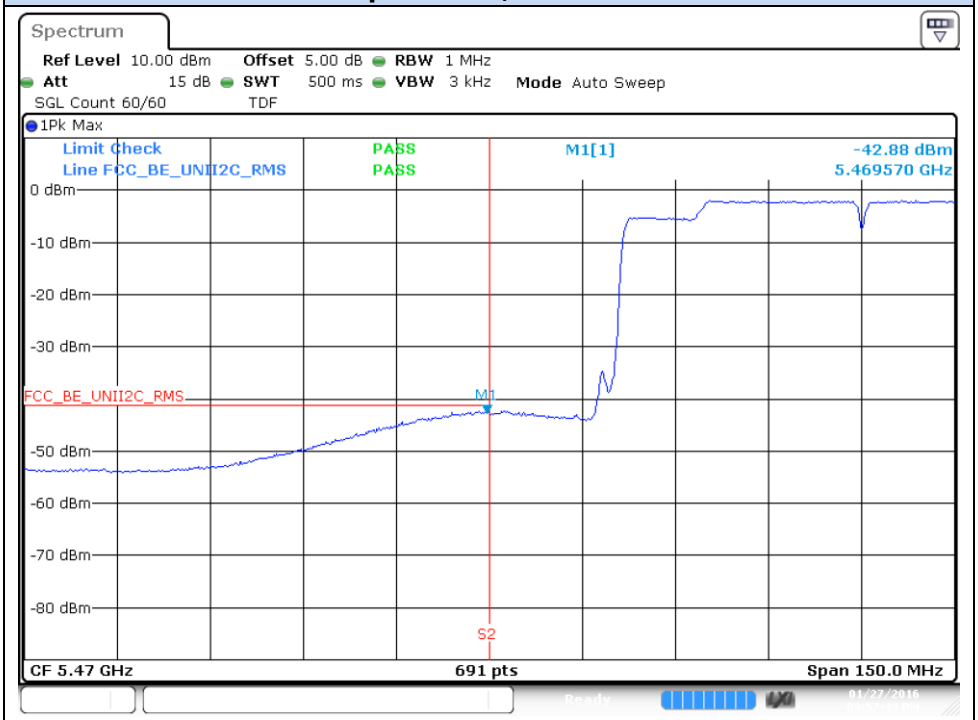
802.11ac80, VHT0 – Chain A

BE Low Freq Section, Peak – CH106ac80



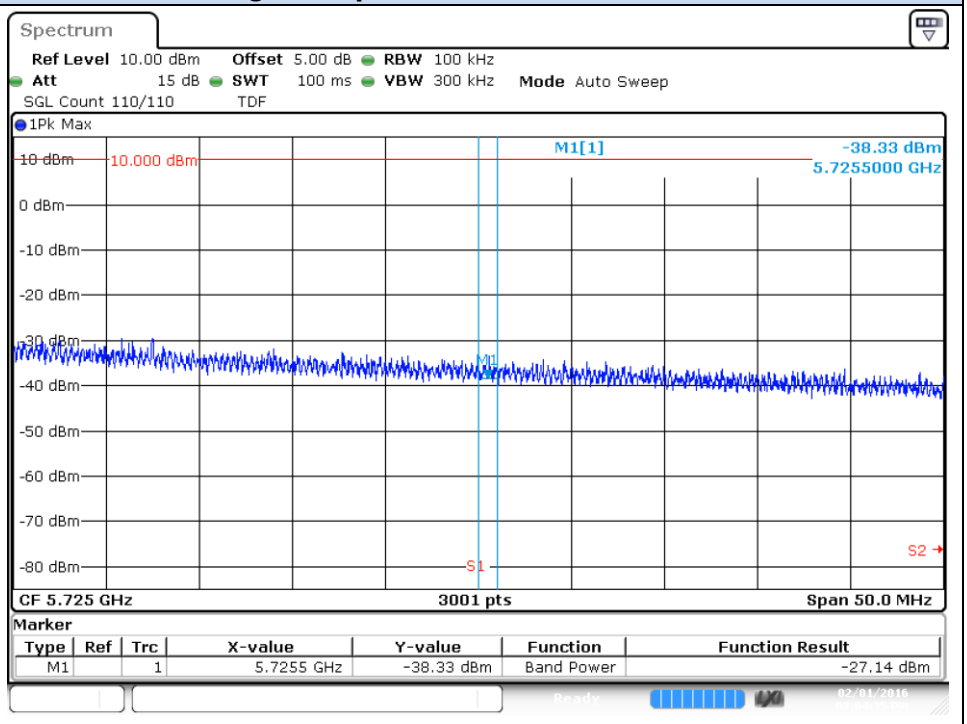
Date: 27.JAN.2016 15:58:48

BE Low Freq Section, RMS – CH106ac80



Date: 27.JAN.2016 15:57:43

BE High Freq Section, Peak – CH122ac80



D.4 Radiated spurious emission

Standard references:

<table>
<tr><th>FCC part</th><th>RSS part</th><th>Limits</th></tr>
<tr><td>15.407 (b) (3)
15.209</td><td>RSS-247
Clause 6.2.3
(2)</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):

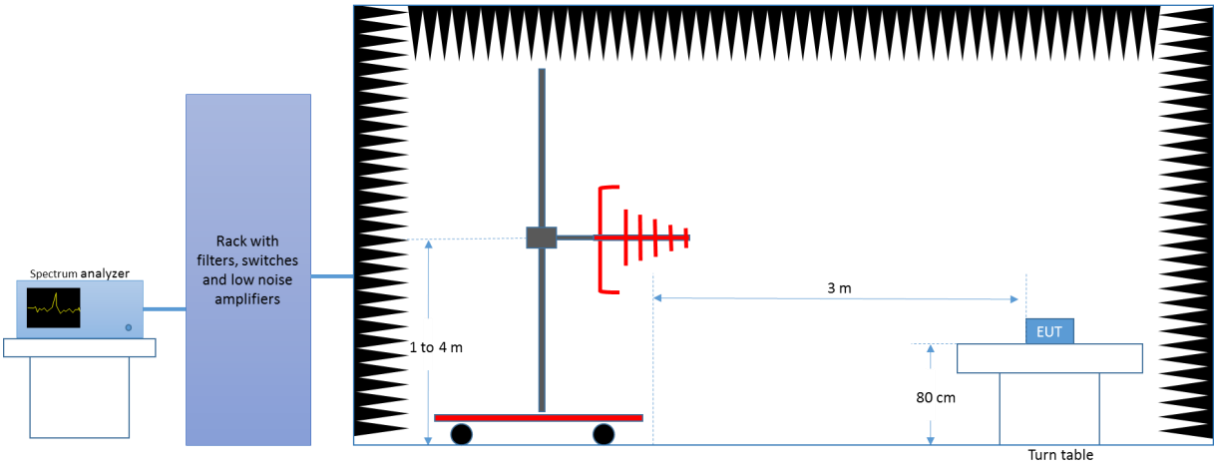
<table>
<tr><th>Freq Range (MHz)</th><th>Field Stregth (µV/m)</th><th>Field Stregth (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>0.009-0.490</td><td>2400/f(kHz)</td><td>-</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/f(kHz)</td><td>-</td><td>300</td></tr>
<tr><td>1.705-30.0</td><td>30</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:

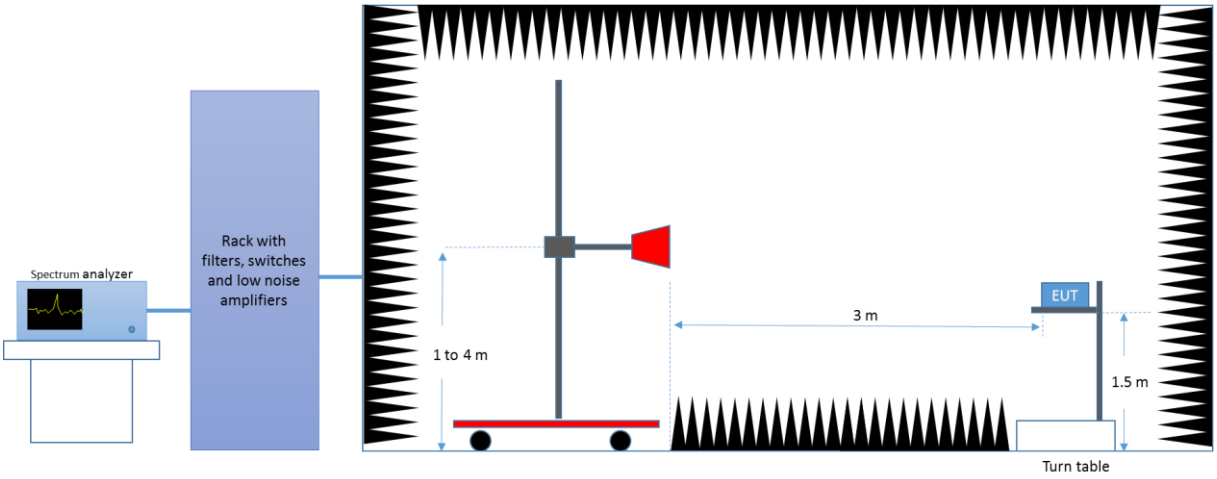
The below setups were used to measure the radiated spurious emissions.
Depending of the frequency range and bands being tested, different antennas and filters were used.
The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.
The radiated spurious emissions were measured on the worst case configuration selected from the chapter *0*

Power Limits. Maximum Output power & Peak power spectral density and using the lowest, middle and highest channels.

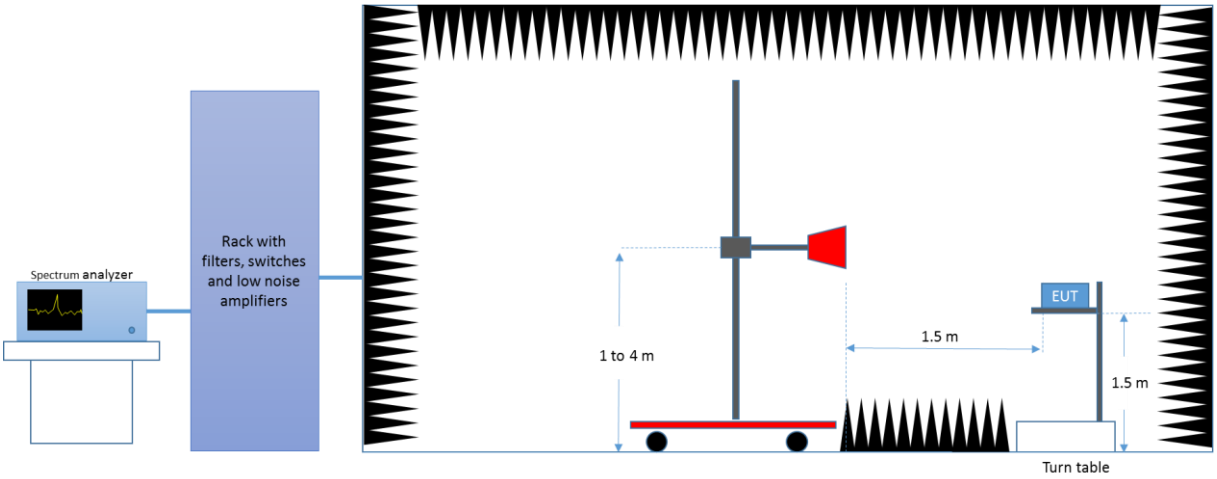
Radiated Setup < 1GHz



Radiated Setup 1 GHz - 18 GHz



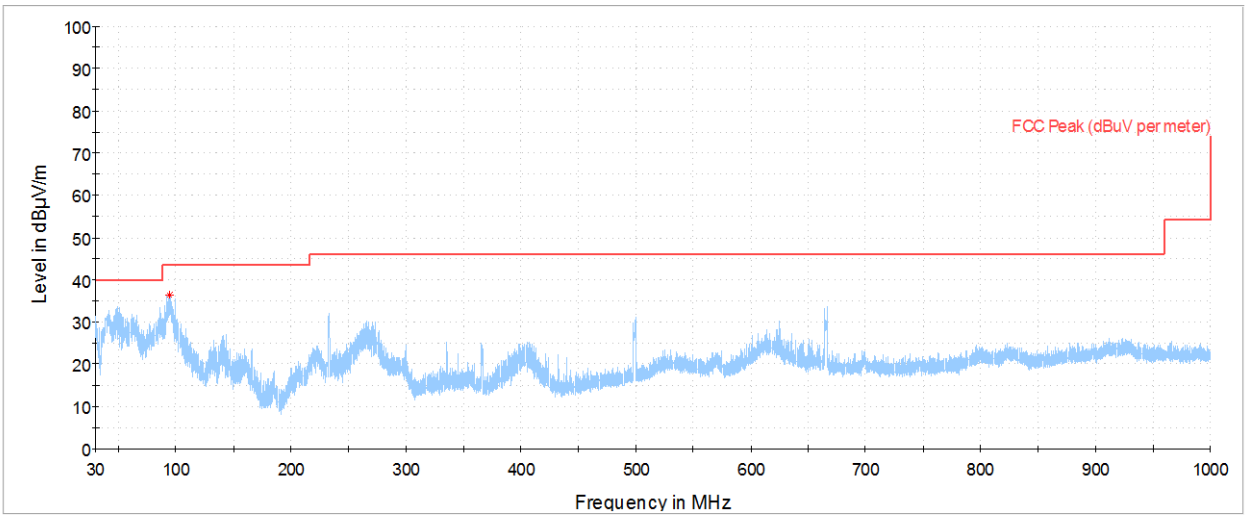
Radiated Setup > 18 GHz



Test Results:

Radiated Spurious – 30MHz to 1GHz

Radiated Spurious – All modes

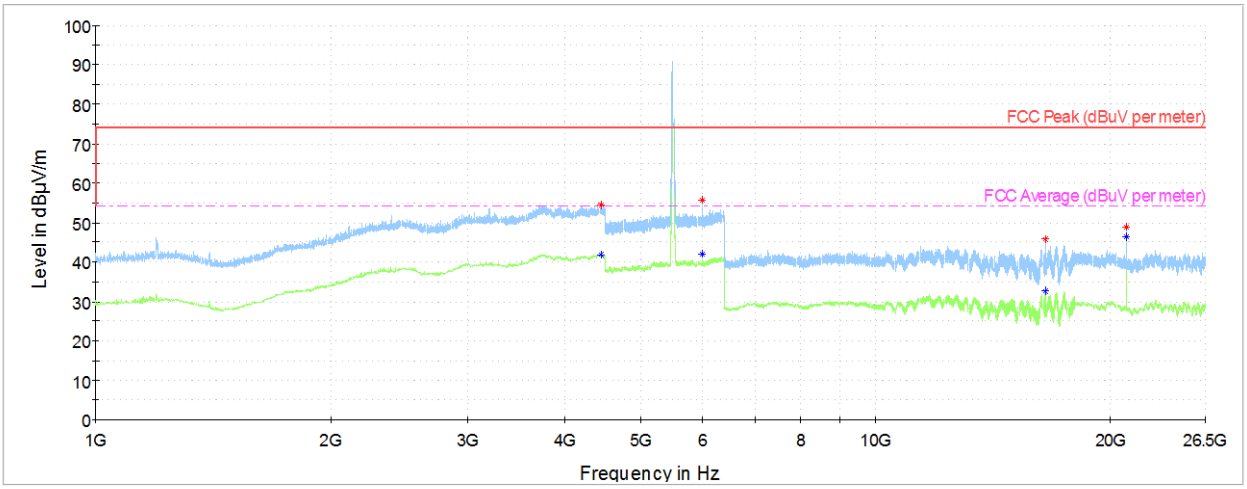


Frequency	MaxPeak	Limit	Margin
MHz	dBm	dBm	dB
94.87	36.40	43.56	7.15

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

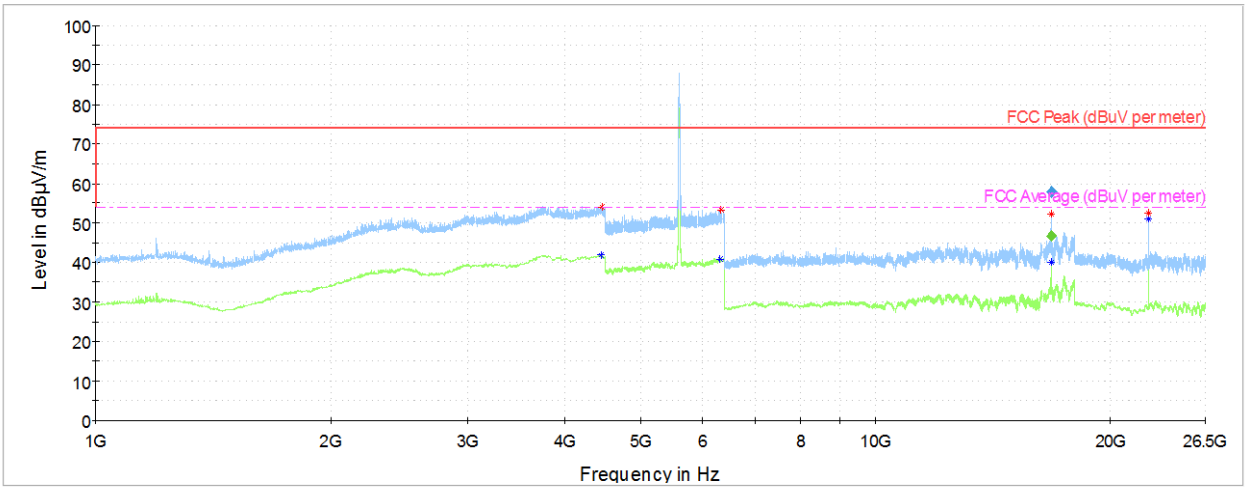
Radiated Spurious – CH100



Peak measurements AVG measurements Limit FCC Peak Limit FCC Avg

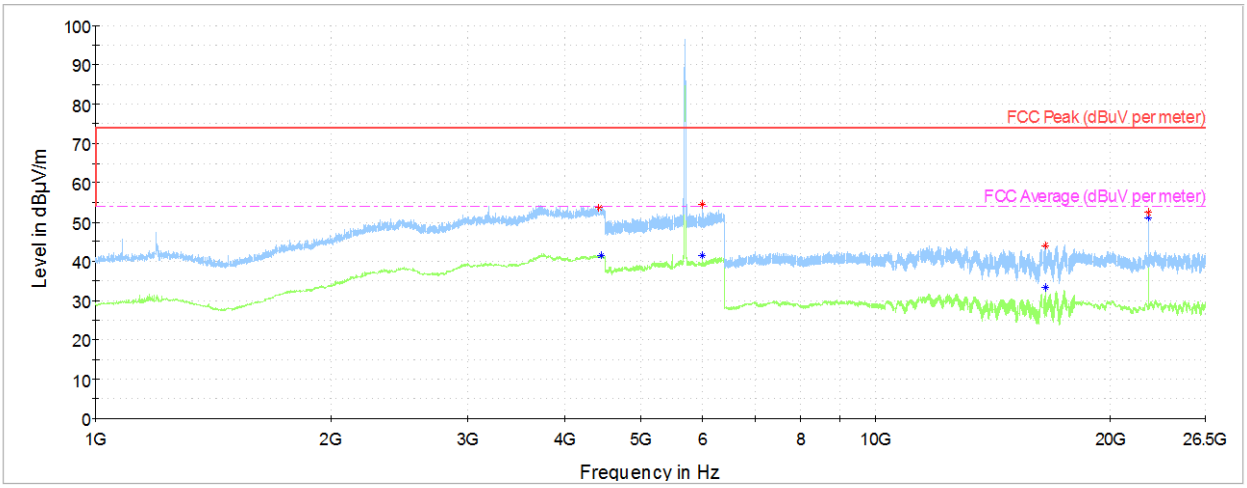
Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4444.00	---	41.74	54.06	12.32
4452.75	54.42	---	74.06	19.63
5995.56	---	41.92	54.06	12.13
5996.34	55.70	---	74.06	18.36
16501.86	---	32.76	54.06	21.30
16504.18	45.89	---	74.06	28.16
20959.93	48.76	---	74.06	25.30
20959.93	---	46.38	54.06	7.68

Radiated Spurious – CH120



Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4452.75	---	41.77	54.06	12.29
4458.44	54.13	---	74.06	19.92
6322.36	---	40.91	54.06	13.14
6344.21	53.18	---	74.06	20.88
16799.40	---	40.22	54.06	13.83
16806.36	52.37	---	74.06	21.69
22399.91	---	50.94	54.06	3.12
22399.91	52.49	---	74.06	21.57

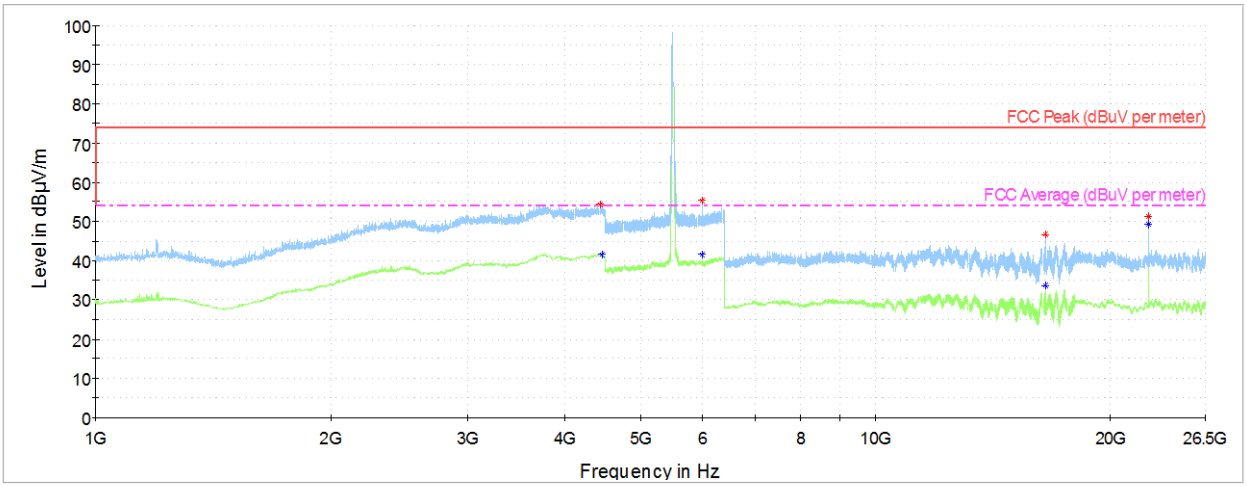
Radiated Spurious – CH140



Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4416.44	53.68	---	74.06	20.38
4451.88	---	41.41	54.06	12.65
5992.45	---	41.36	54.06	12.70
5999.10	54.47	---	74.06	19.59
16495.48	44.02	---	74.06	30.04
16504.76	---	33.43	54.06	20.63
22399.91	52.40	---	74.06	**21.66**
22399.91	---	51.09	54.06	**2.97**

1 GHz – 26.5GHz, 802.11n20, Chain A

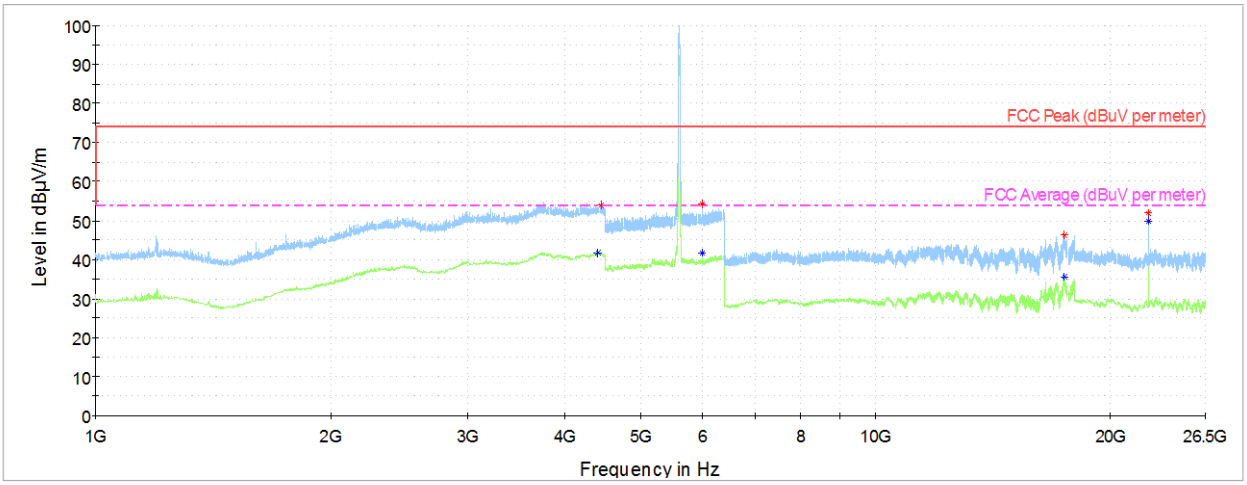
Radiated Spurious – CH100



Peak measurements AVG measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4428.25	54.40	---	74.06	19.66
4454.06	---	41.64	54.06	12.41
5991.41	---	41.66	54.06	12.40
5993.05	55.35	---	74.06	18.70
16498.38	---	33.65	54.06	20.41
16504.76	46.78	---	74.06	27.28
22399.91	---	49.31	54.06	4.75
22399.91	51.29	---	74.06	22.76

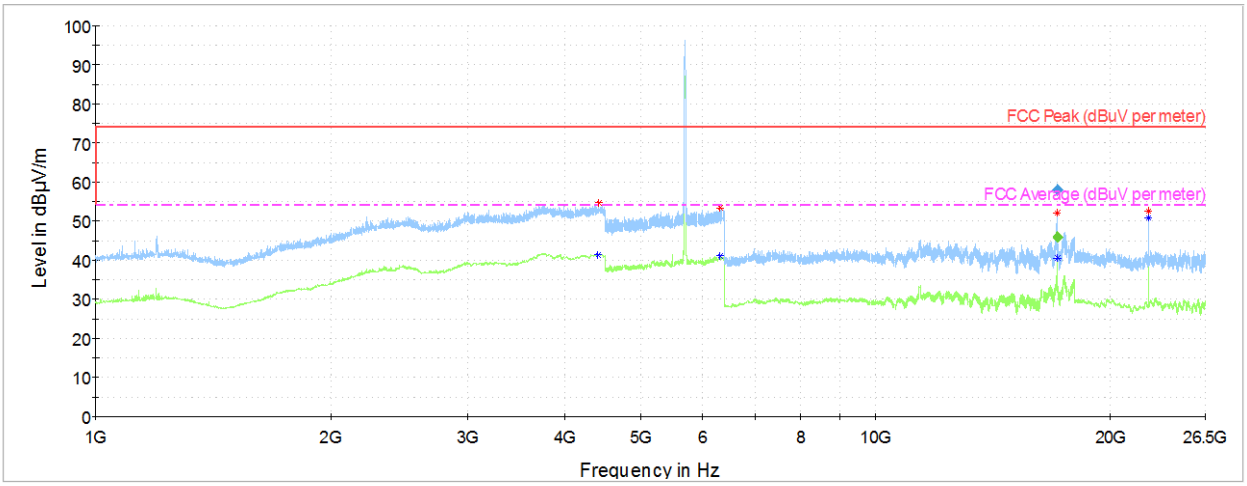
Radiated Spurious – CH120



Peak measurements AVG measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4406.38	---	41.65	54.06	12.40
4447.50	53.94	---	74.06	20.12
5988.05	54.28	---	74.06	19.78
5990.46	---	41.75	54.06	12.30
17477.42	46.40	---	74.06	27.66
17483.22	---	35.56	54.06	18.50
22399.91	---	49.93	54.06	4.13
22399.91	51.90	---	74.06	22.16

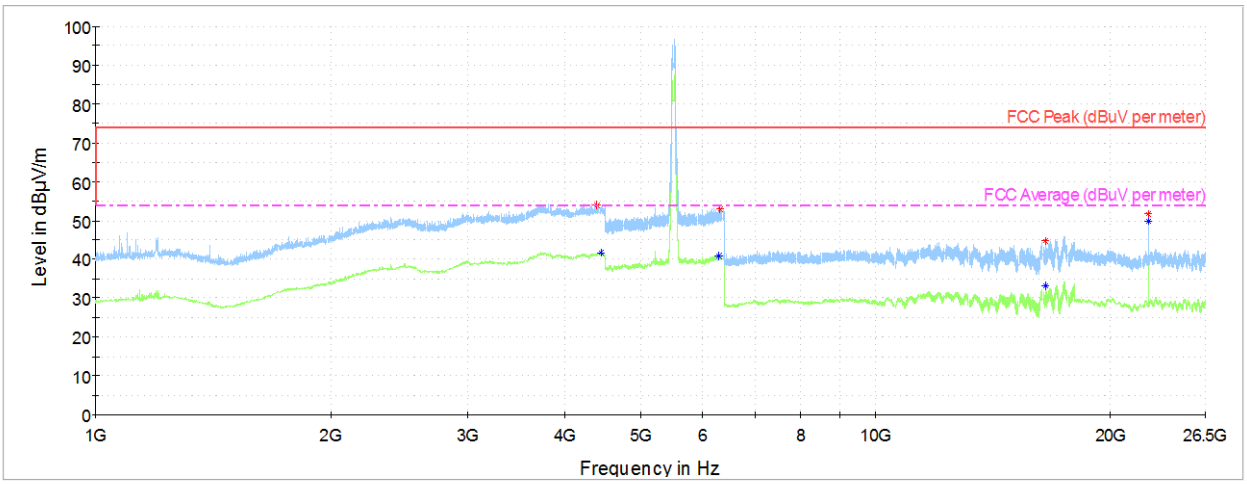
Radiated Spurious – CH140



Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4405.50	---	41.29	54.06	12.77
4423.88	54.51	---	74.06	19.55
6319.25	---	40.95	54.06	13.11
6322.10	53.42	---	74.06	20.64
17098.68	---	40.59	54.06	13.46
17102.16	52.04	---	74.06	22.02
22399.91	---	50.81	54.06	3.25
22399.91	52.50	---	74.06	21.56

1 GHz – 26.5GHz, 802.11n40, Chain A

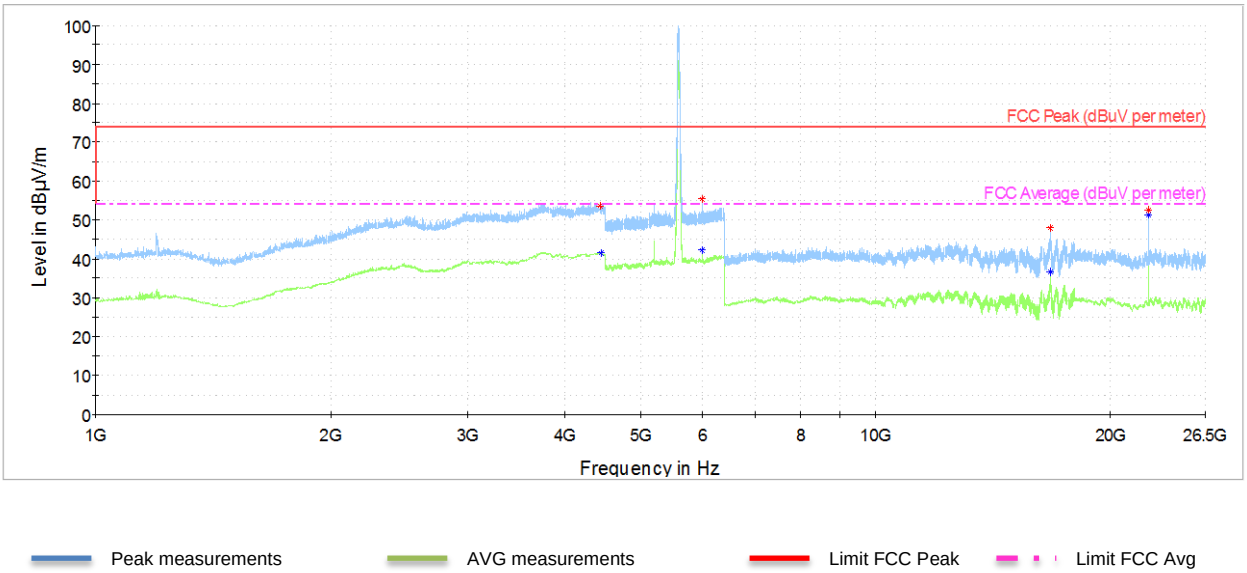
Radiated Spurious – CH102F



Peak measurements AVG measurements Limit FCC Peak Limit FCC Avg

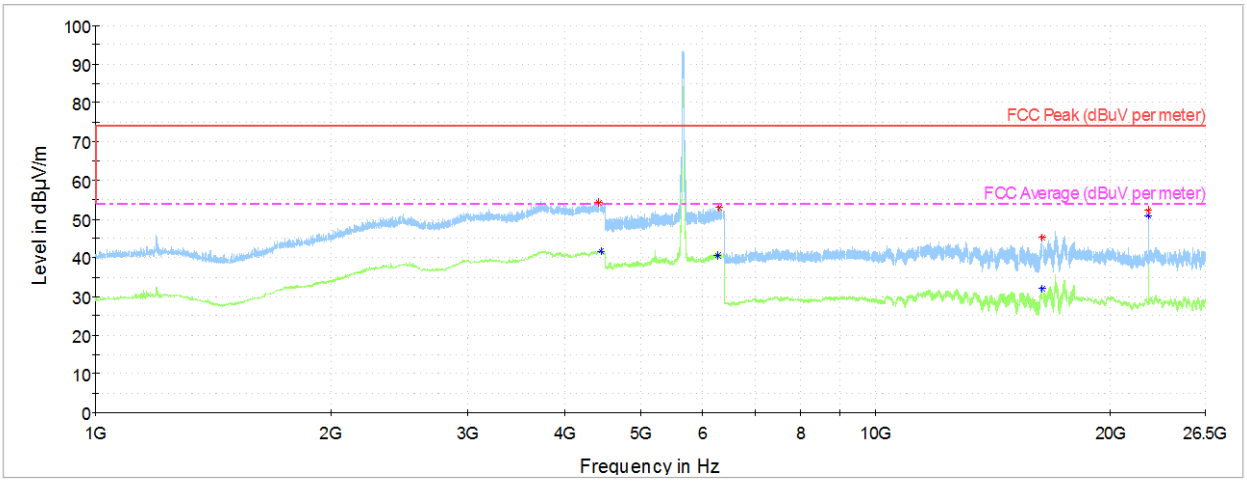
Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4400.69	54.09	---	74.06	19.97
4446.63	---	41.68	54.06	12.38
6299.39	---	40.98	54.06	13.08
6315.02	52.93	---	74.06	21.13
16534.92	44.82	---	74.06	29.23
16537.24	---	33.23	54.06	20.83
22399.91	---	49.98	54.06	4.08
22399.91	51.64	---	74.06	22.42

Radiated Spurious – CH118F



Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4437.00	53.67	---	74.06	20.39
4451.88	---	41.61	54.06	12.45
5990.81	55.50	---	74.06	18.55
5996.25	---	42.37	54.06	11.69
16753.58	47.88	---	74.06	26.17
16762.28	---	36.62	54.06	17.44
22399.91	---	51.20	54.06	**2.86**
22399.91	52.51	---	74.06	21.54

Radiated Spurious – CH134F

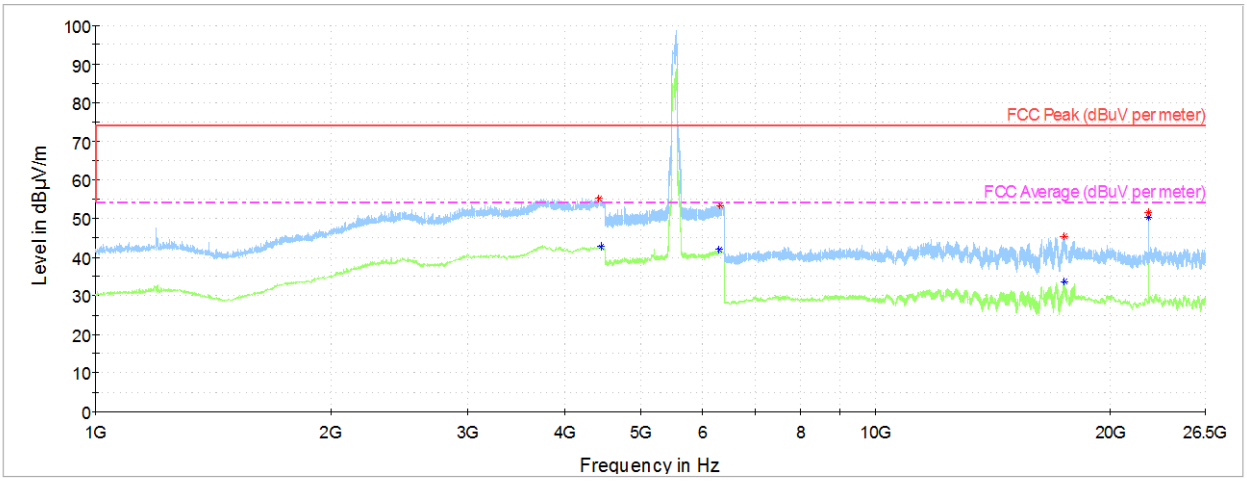


Peak measurements AVG measurements Limit FCC Peak Limit FCC Avg

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4415.56	54.26	---	74.06	19.80
4443.13	---	41.65	54.06	12.40
6277.62	---	40.64	54.06	13.42
6294.55	52.89	---	74.06	21.17
16358.02	45.32	---	74.06	28.74
16358.60	---	32.14	54.06	21.92
22399.91	---	51.02	54.06	3.04
22399.91	52.32	---	74.06	21.74

1 GHz – 26.5GHz, 802.11ac80, Chain A

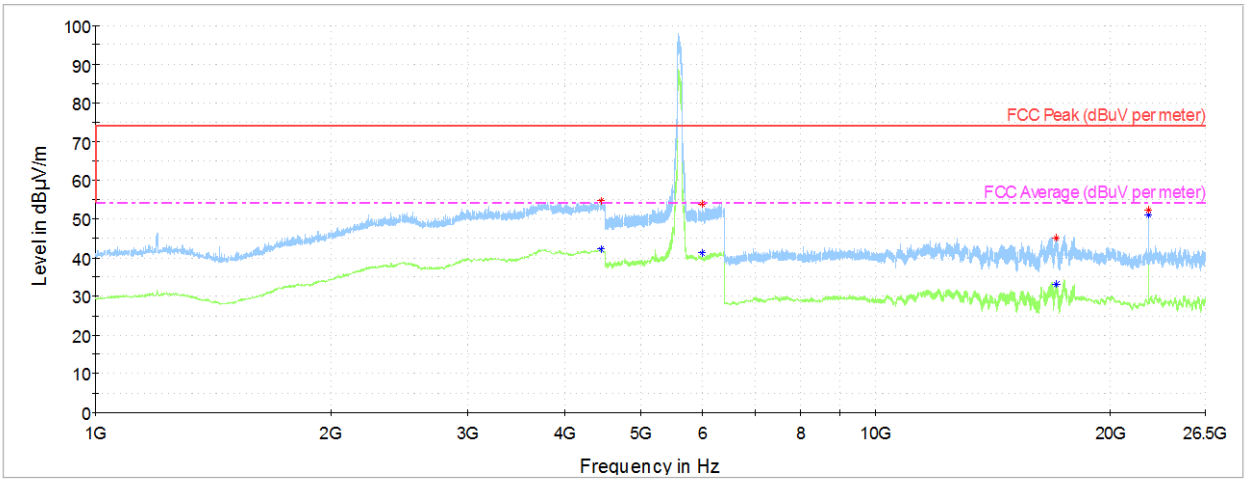
Radiated Spurious – CH106ac80



Peak measurements AVG measurements Limit FCC Peak Limit FCC Avg

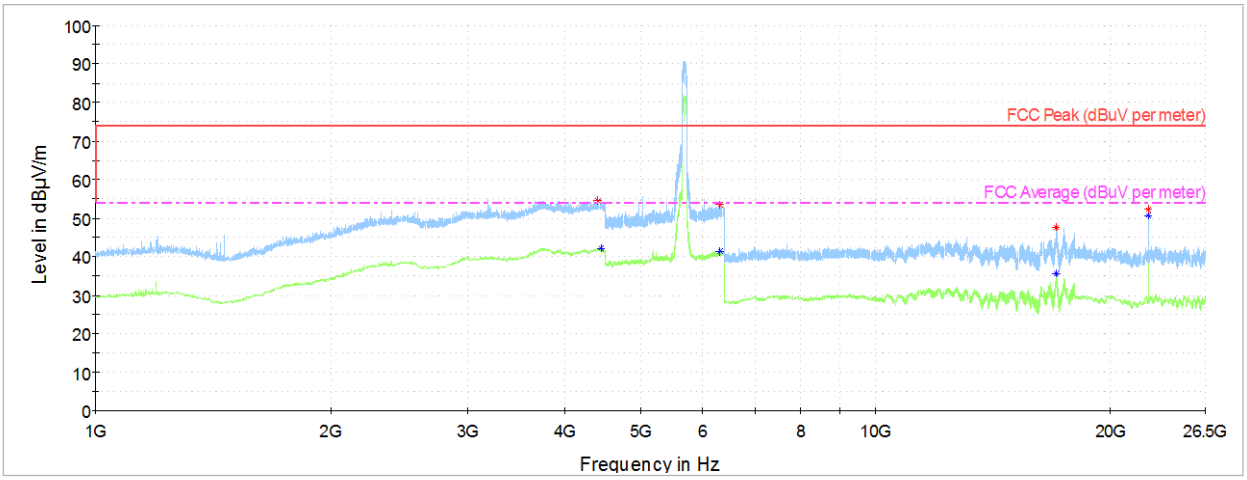
Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4414.69	55.10	---	74.06	18.96
4445.31	---	42.86	54.06	11.20
6309.84	---	42.01	54.06	12.05
6313.81	53.34	---	74.06	20.72
17480.32	45.24	---	74.06	28.82
17483.22	---	33.77	54.06	20.29
22399.91	51.60	---	74.06	22.46
22399.91	---	50.13	54.06	3.93

Radiated Spurious – CH122ac80



Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4450.56	---	42.15	54.06	11.91
4453.63	54.75	---	74.06	19.31
5993.23	---	41.29	54.06	12.77
5997.80	53.88	---	74.06	20.18
17065.62	45.03	---	74.06	29.03
17071.42	---	33.08	54.06	20.98
22399.91	---	51.07	54.06	**2.98**
22399.91	52.36	---	74.06	21.70

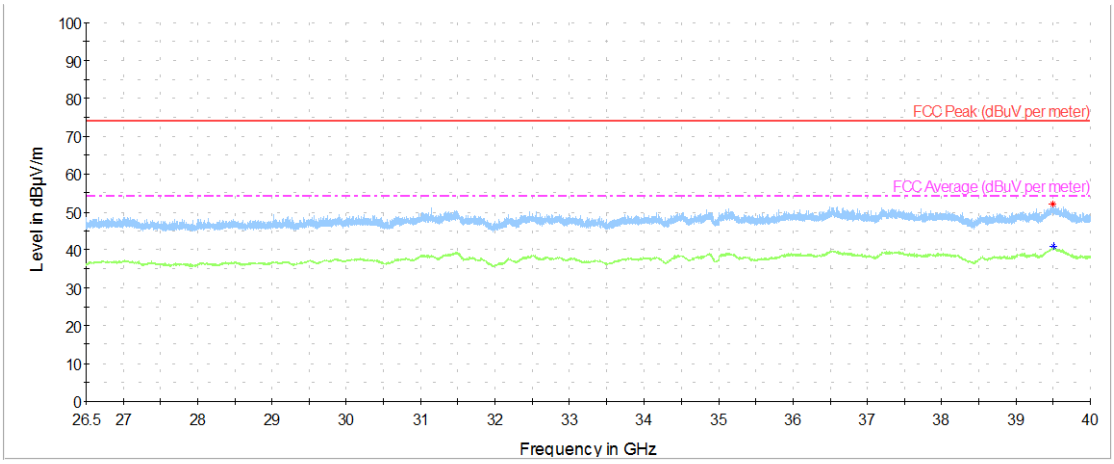
Radiated Spurious – CH138ac80



Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
4406.38	54.50	---	74.06	19.56
4446.63	---	42.00	54.06	12.05
6320.98	---	41.30	54.06	12.75
6321.84	53.52	---	74.06	20.54
17062.14	47.45	---	74.06	26.61
17072.58	---	35.50	54.06	18.56
22399.91	---	50.71	54.06	3.35
22399.91	52.27	---	74.06	21.79

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.