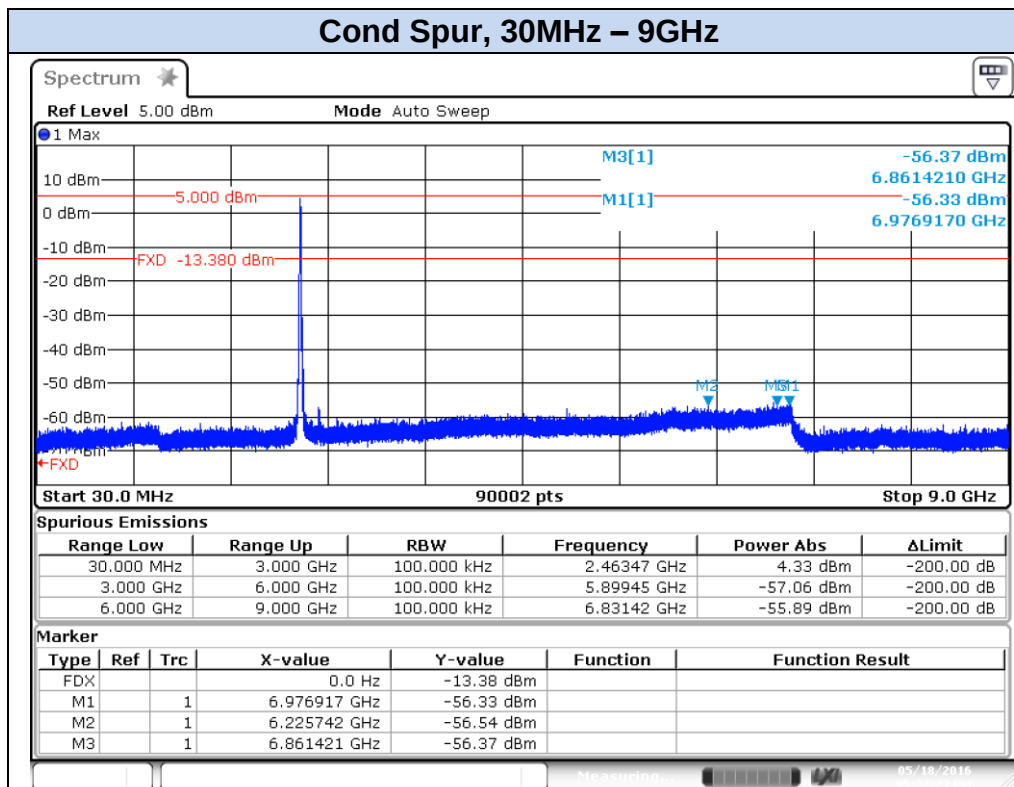


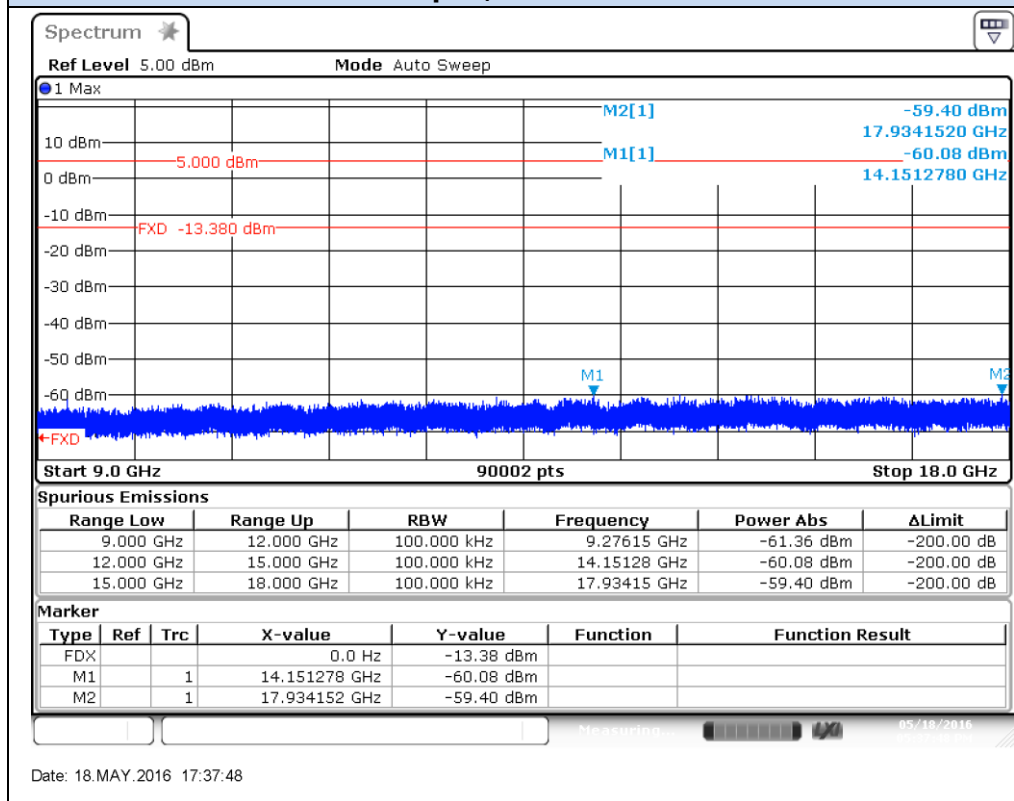
802.11b, 1Mbps – Chain A, CH11

Cond Spur, 30MHz – 9GHz

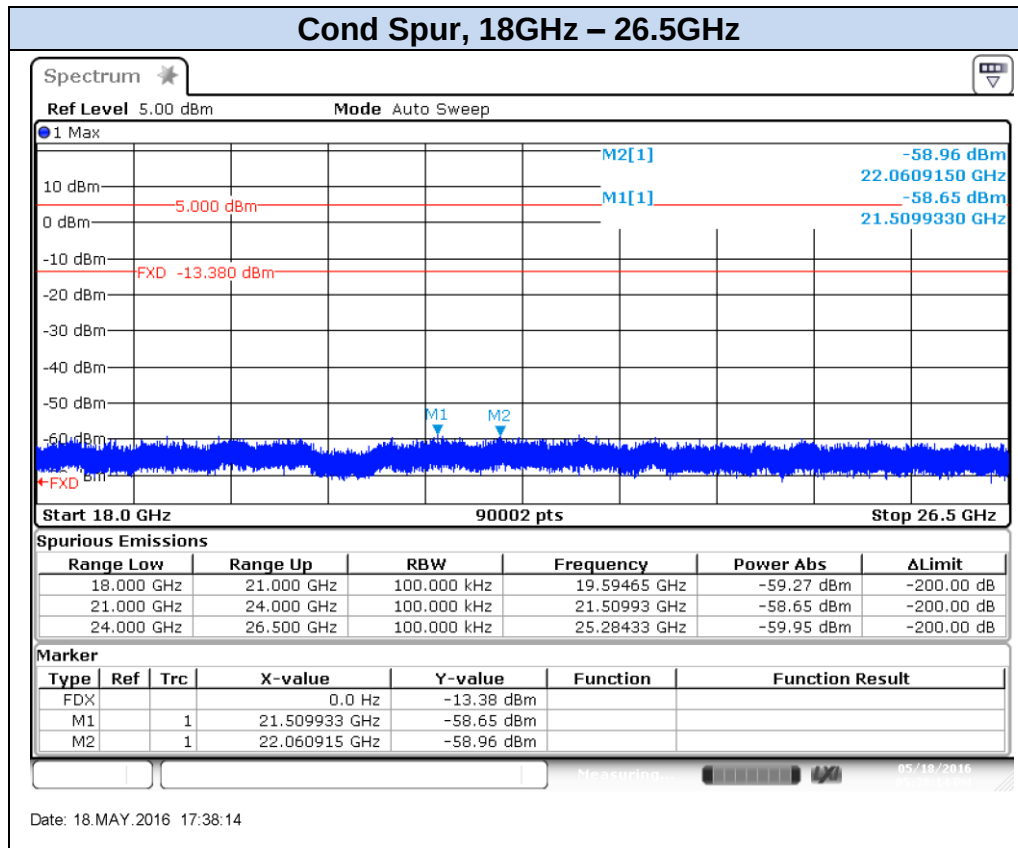


Date: 18.MAY.2016 17:37:22

Cond Spur, 9GHz – 18GHz

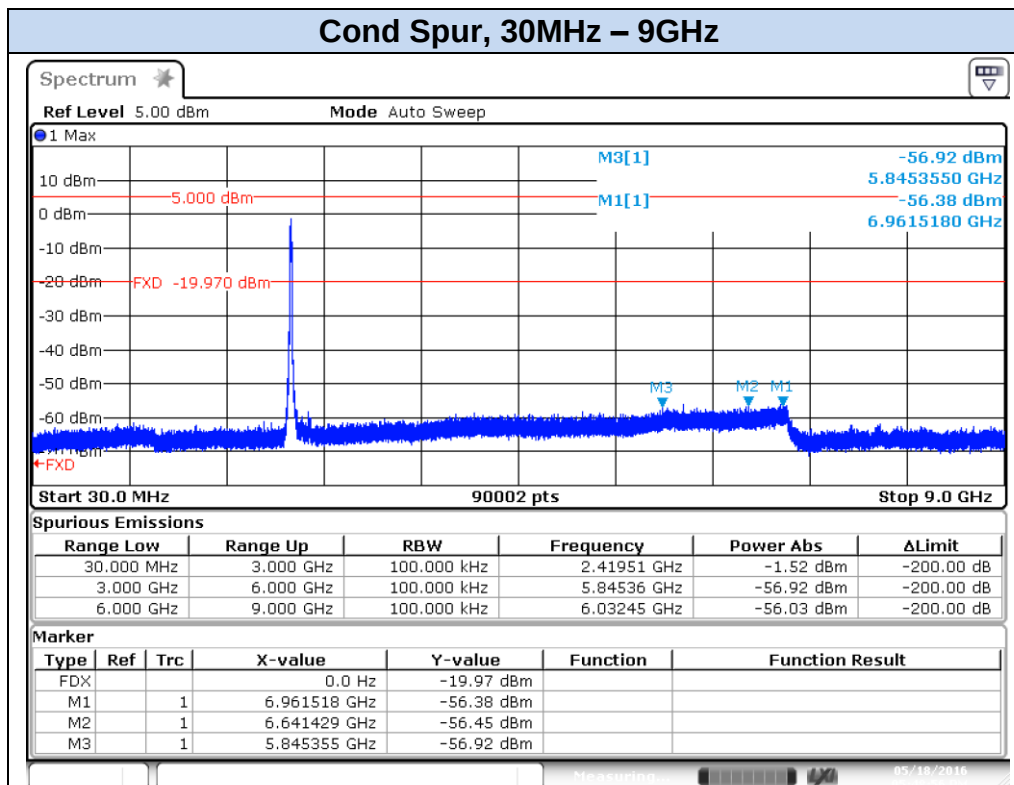


Date: 18.MAY.2016 17:37:48



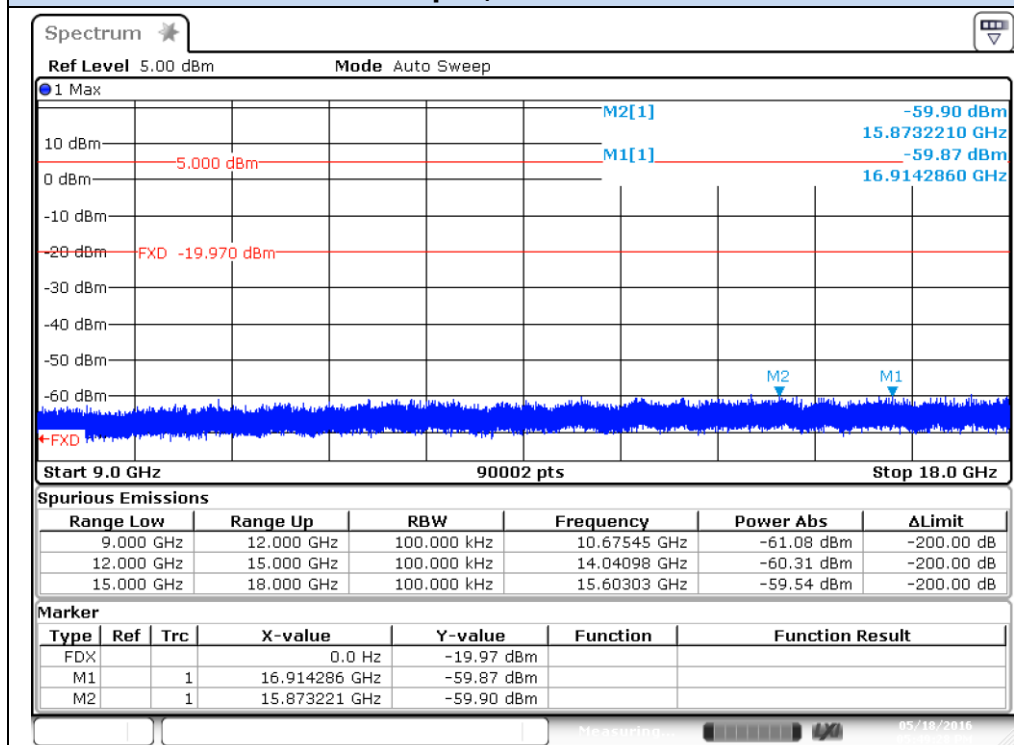
802.11g, 6Mbps – Chain A, CH1

Cond Spur, 30MHz – 9GHz

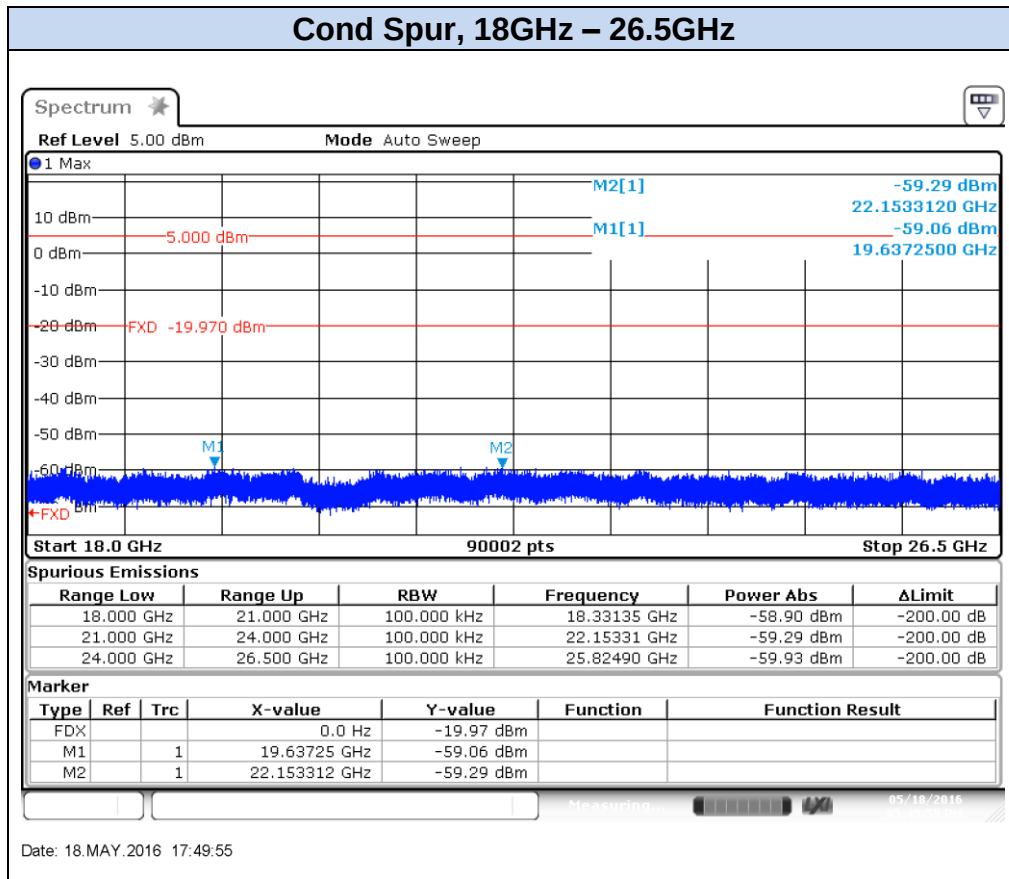


Date: 18.MAY.2016 17:48:56

Cond Spur, 9GHz – 18GHz

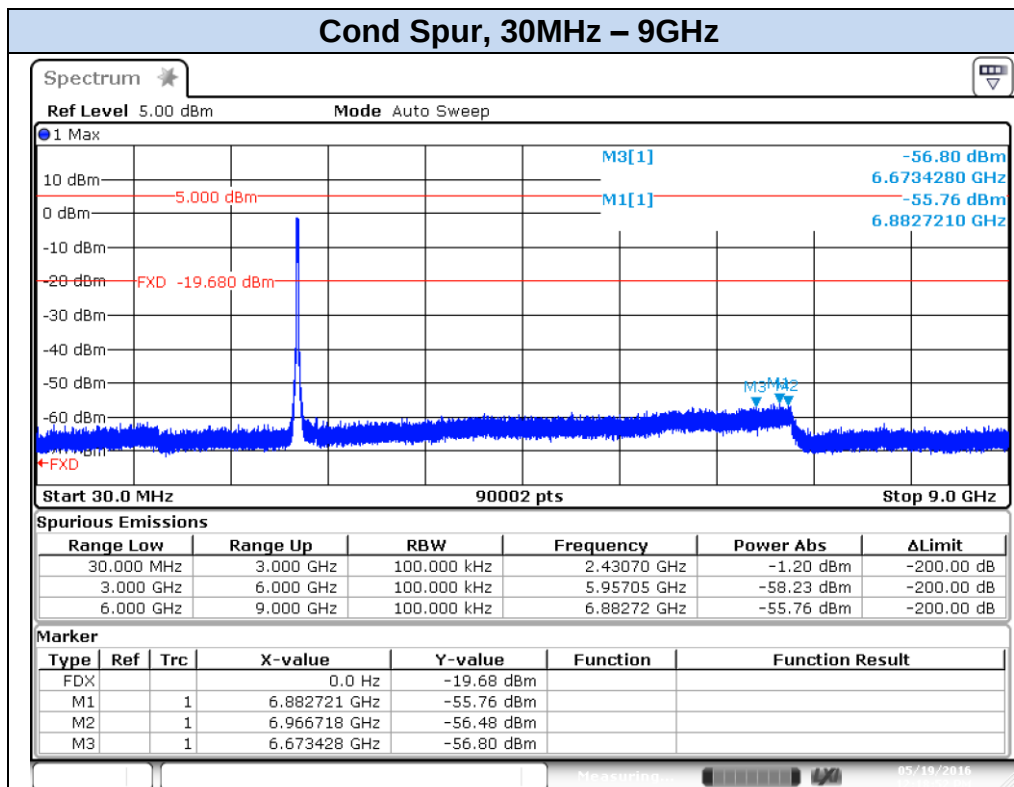


Date: 18.MAY.2016 17:49:28



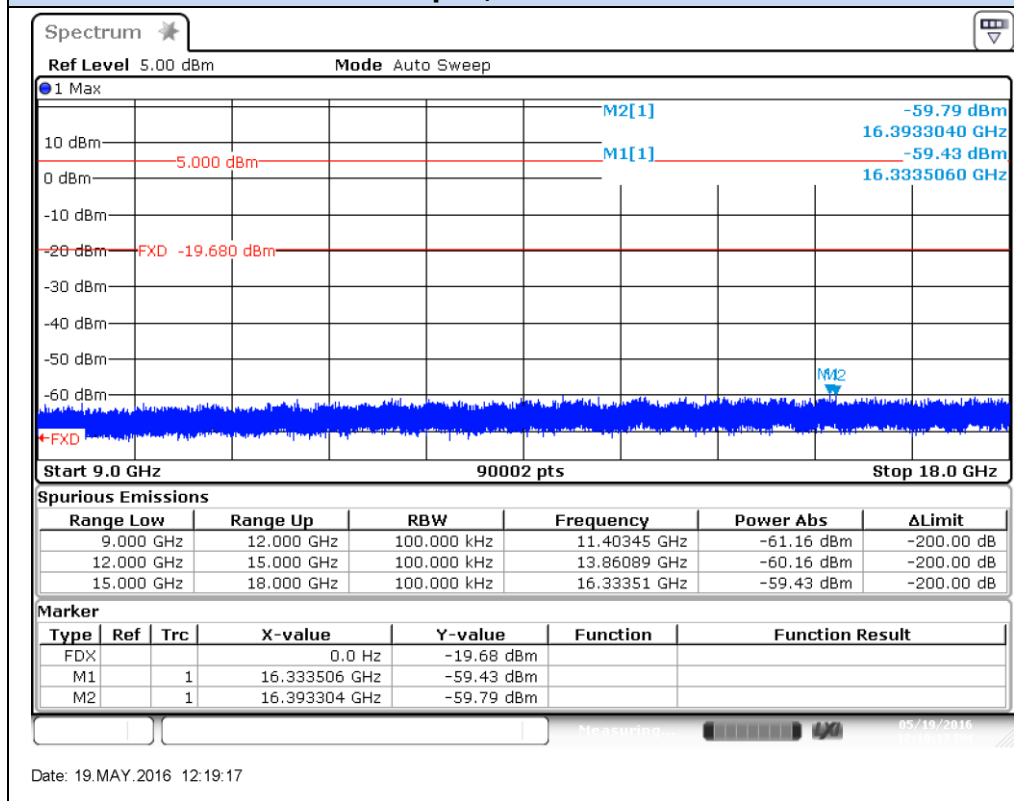
802.11g, 6Mbps, CH6

Cond Spur, 30MHz – 9GHz

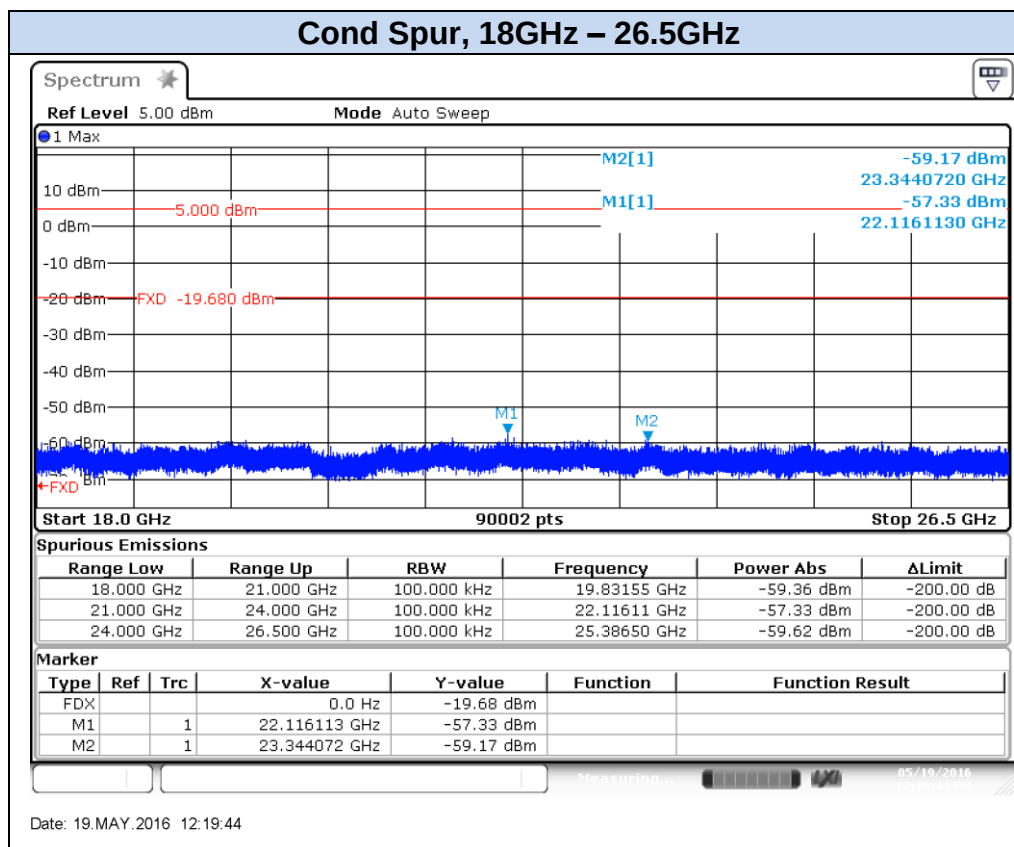


Date: 19.MAY.2016 12:18:53

Cond Spur, 9GHz – 18GHz

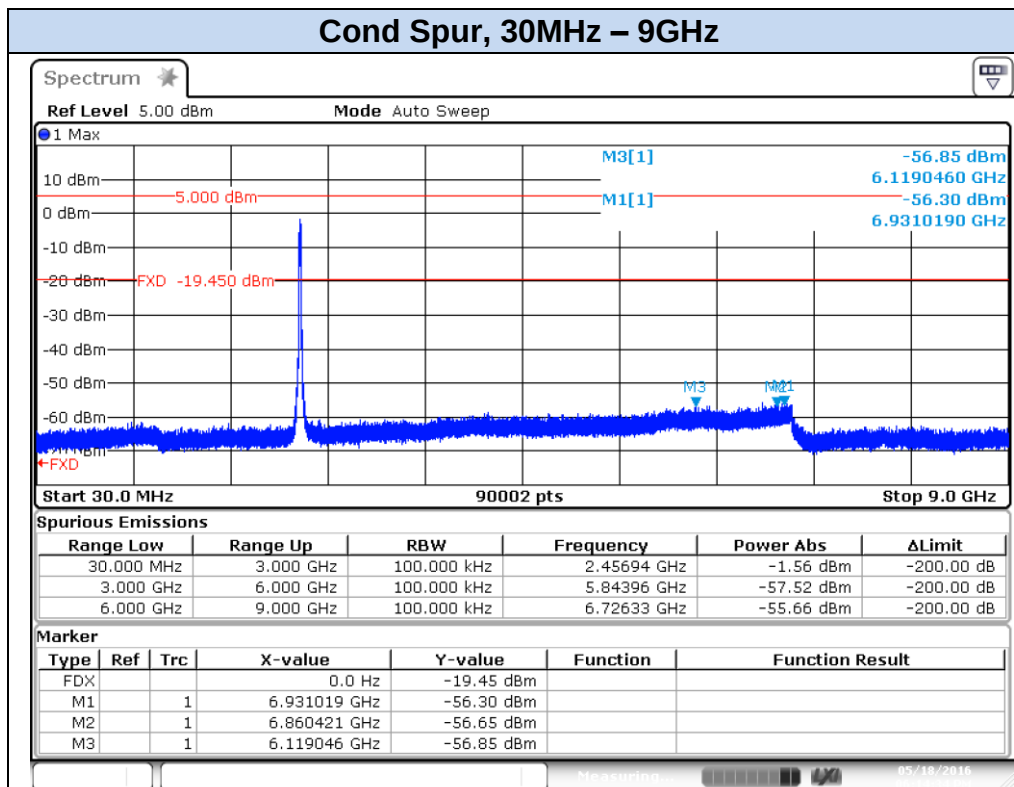


Date: 19.MAY.2016 12:19:17



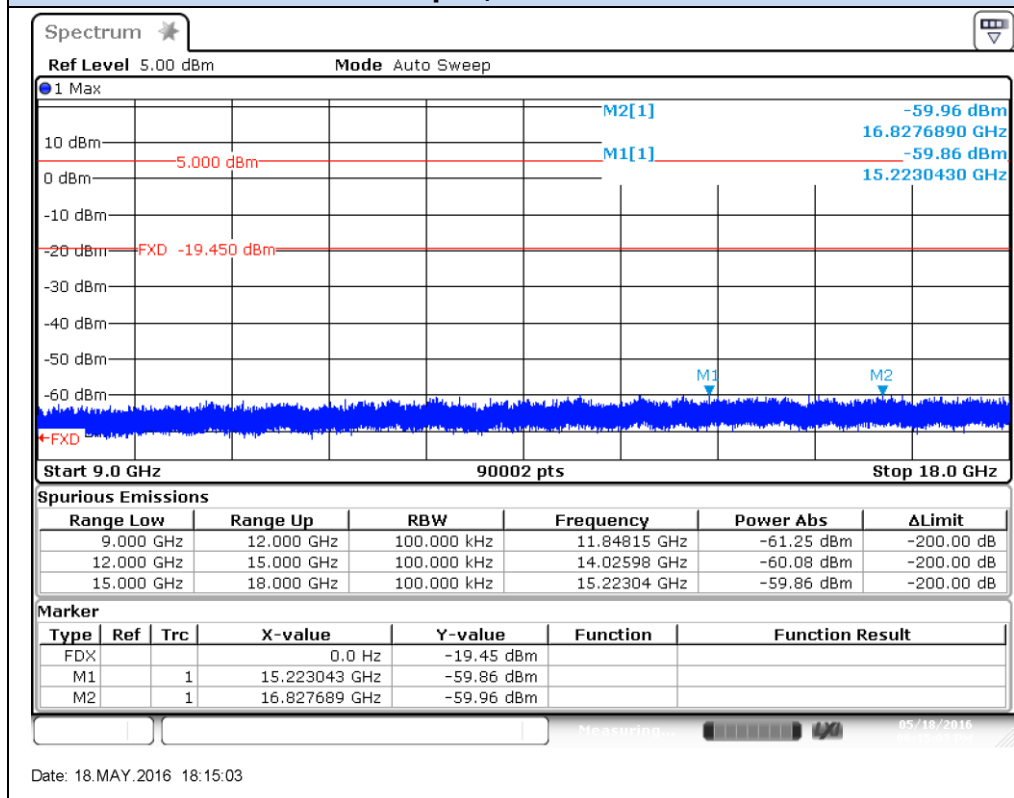
802.11g, 6Mbps , CH11

Cond Spur, 30MHz – 9GHz

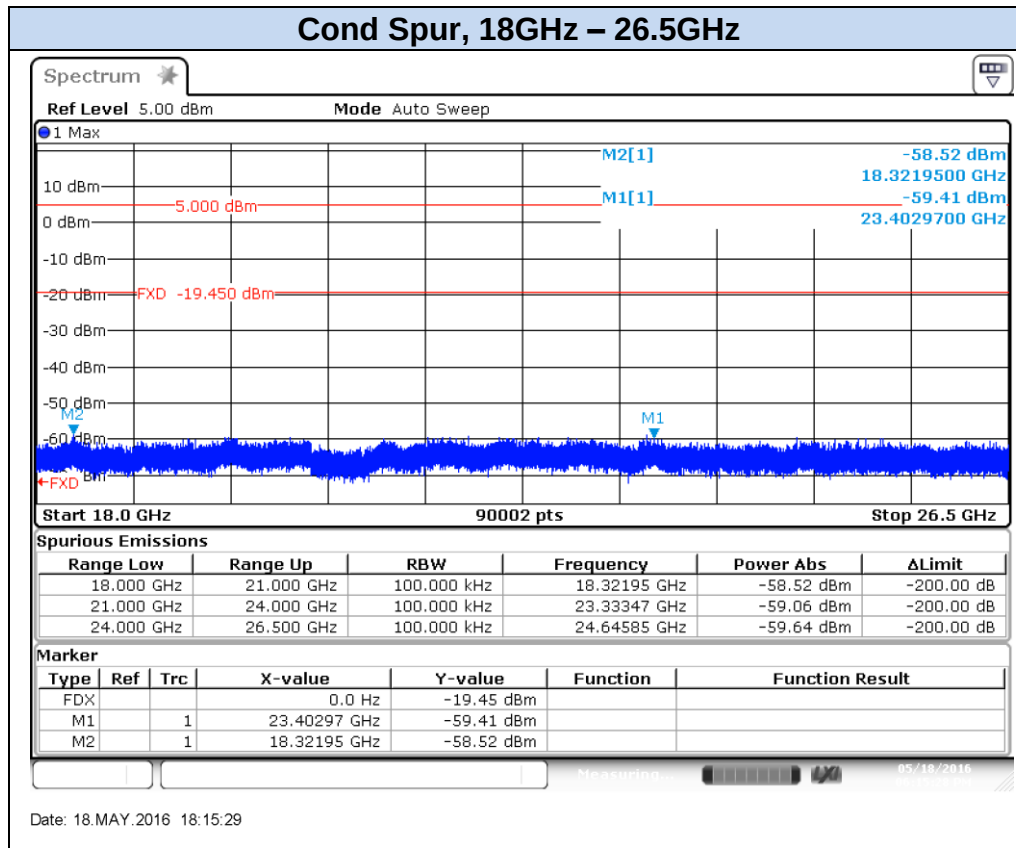


Date: 18.MAY.2016 18:14:34

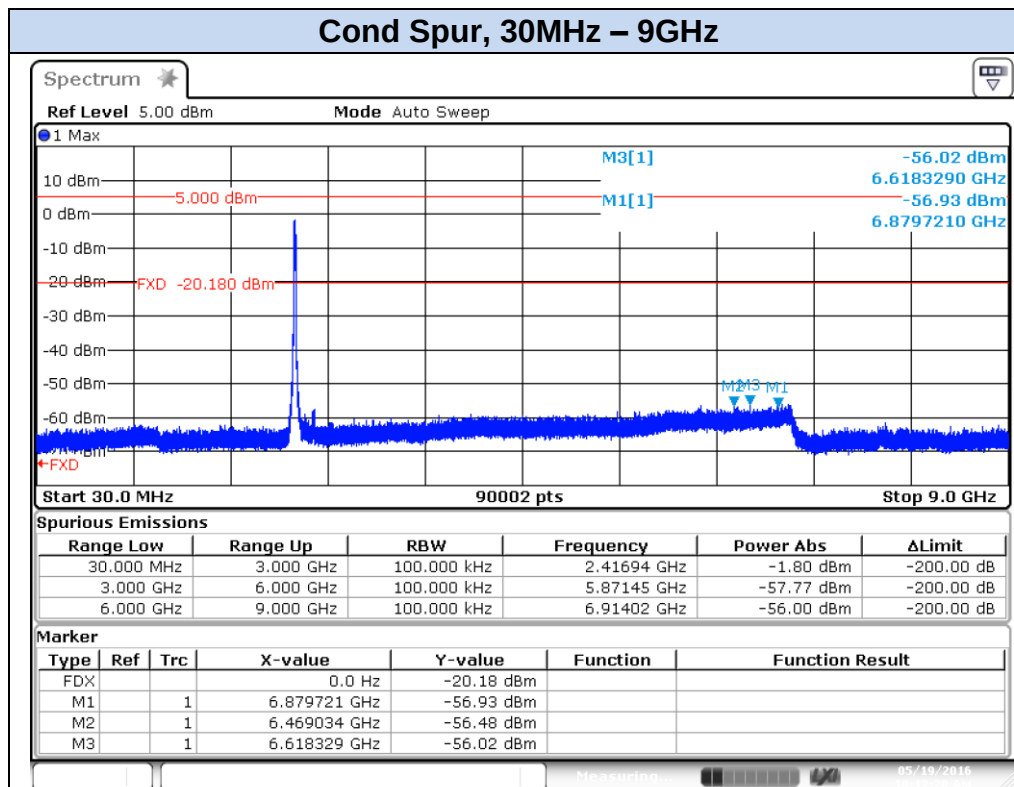
Cond Spur, 9GHz – 18GHz



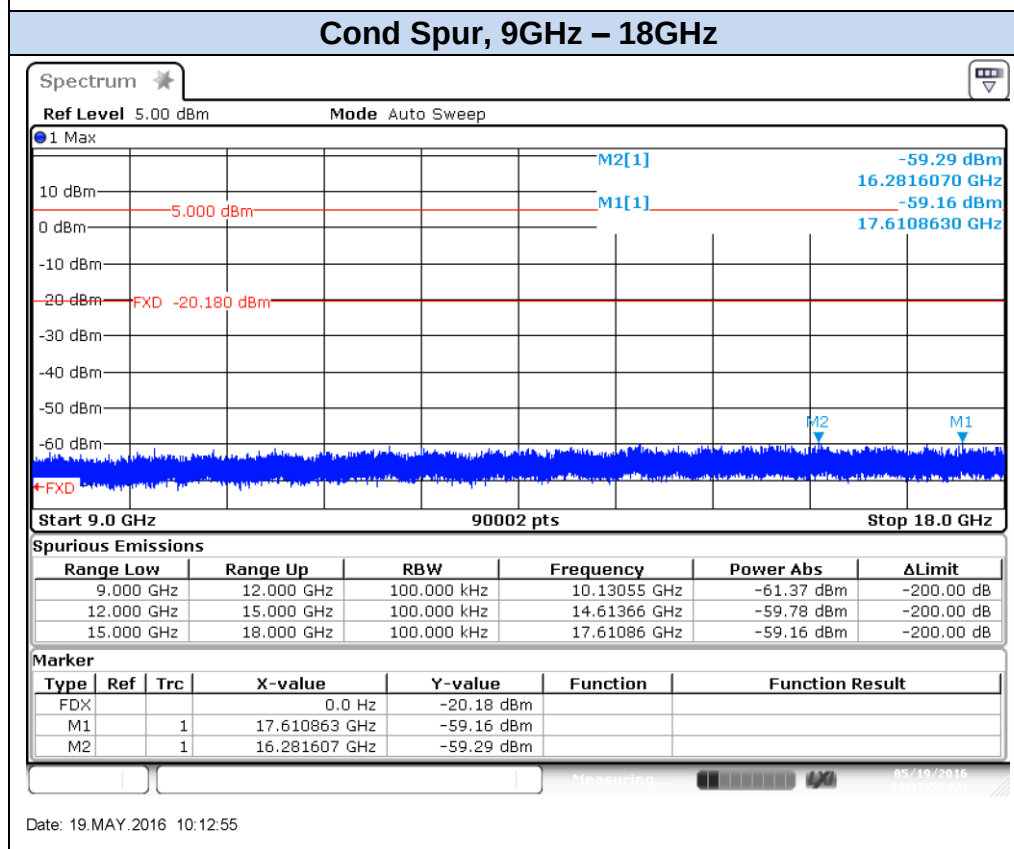
Date: 18.MAY.2016 18:15:03



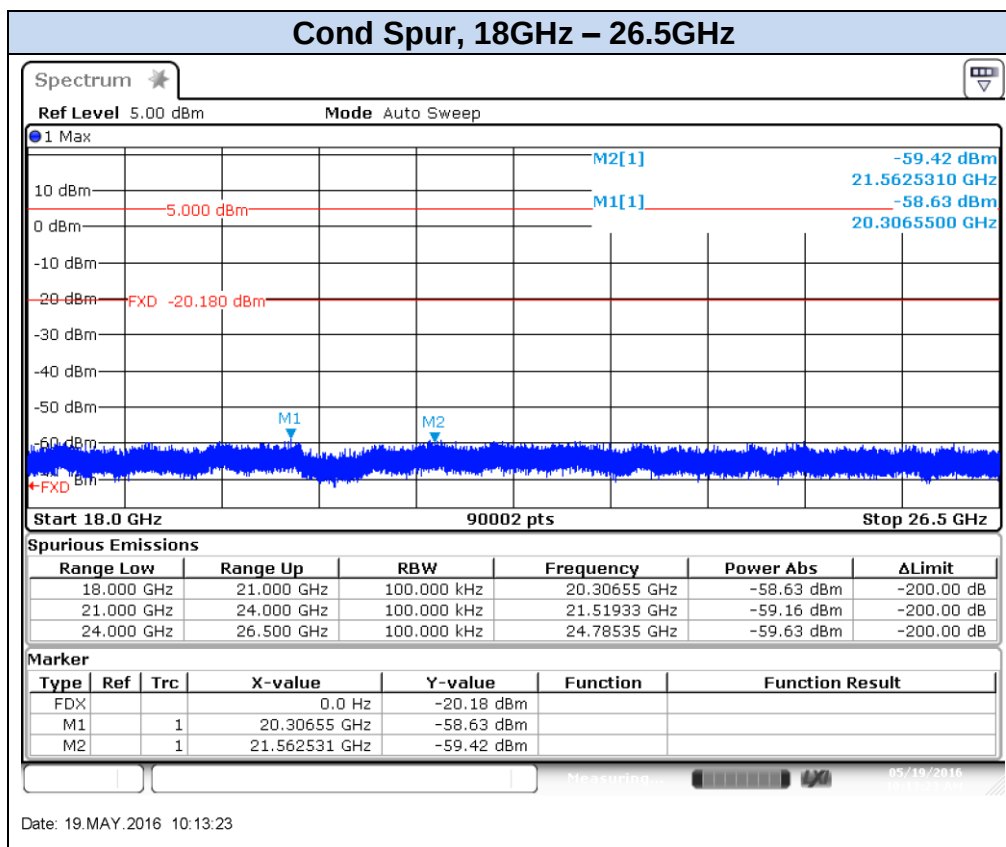
802.11n20, HT0 – Chain A, CH1



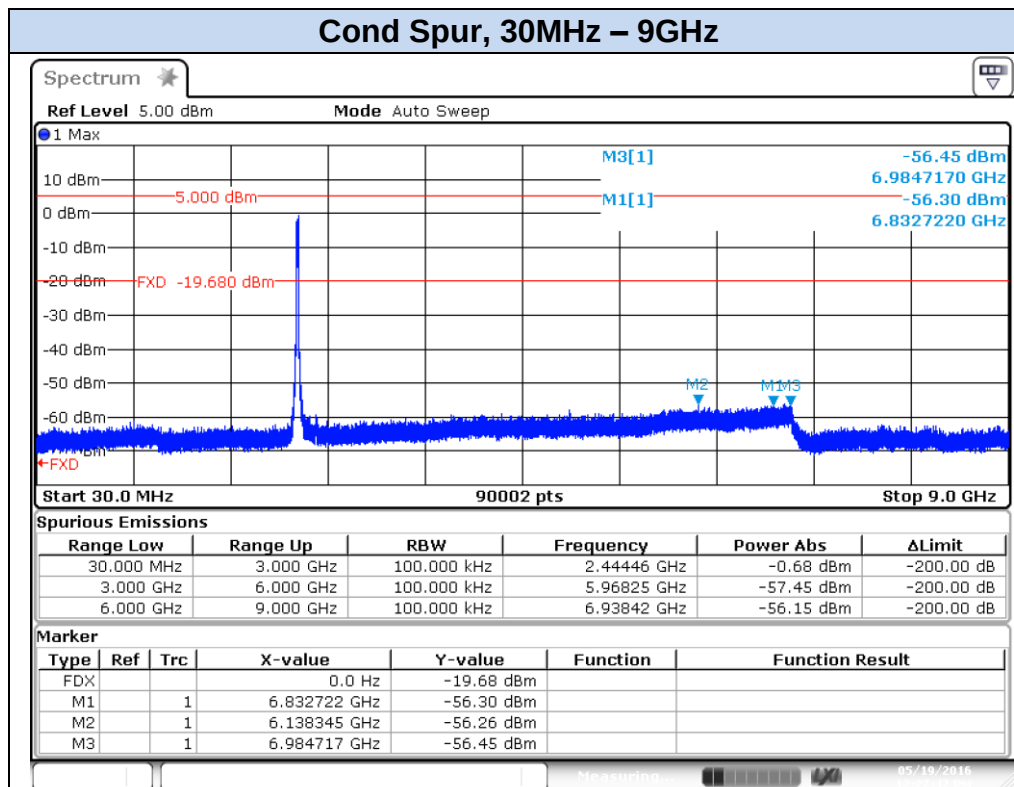
Date: 19.MAY.2016 10:12:28



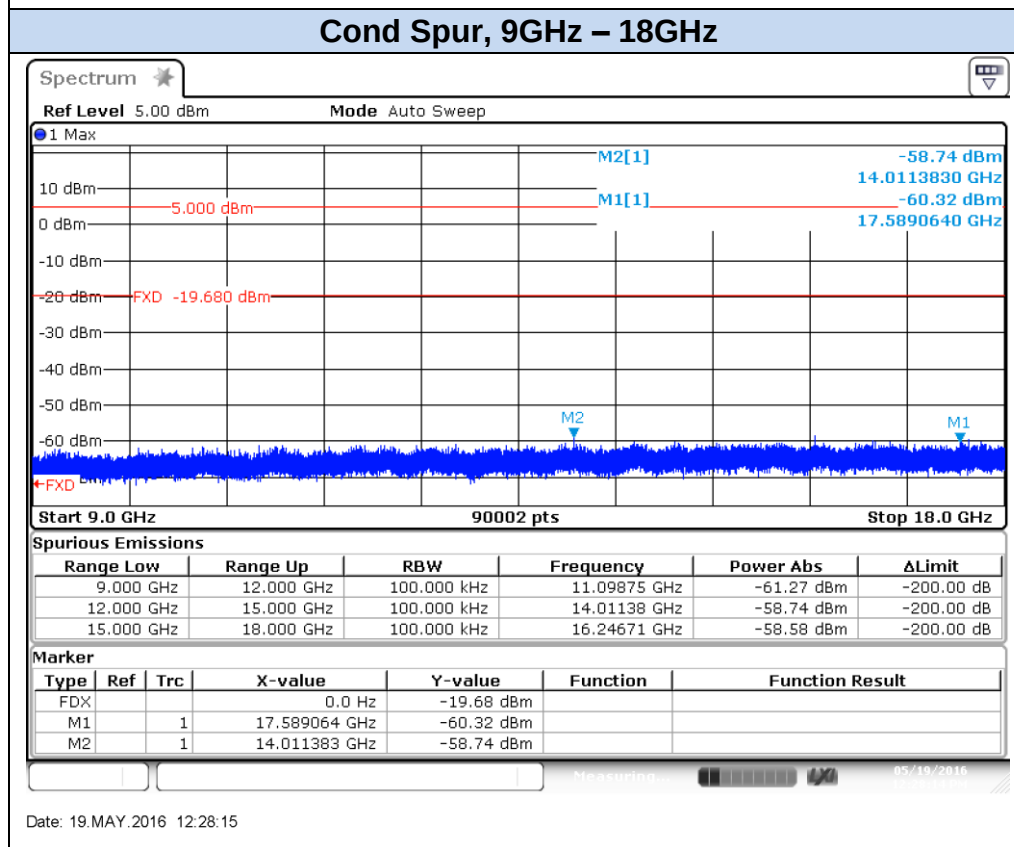
Date: 19.MAY.2016 10:12:55



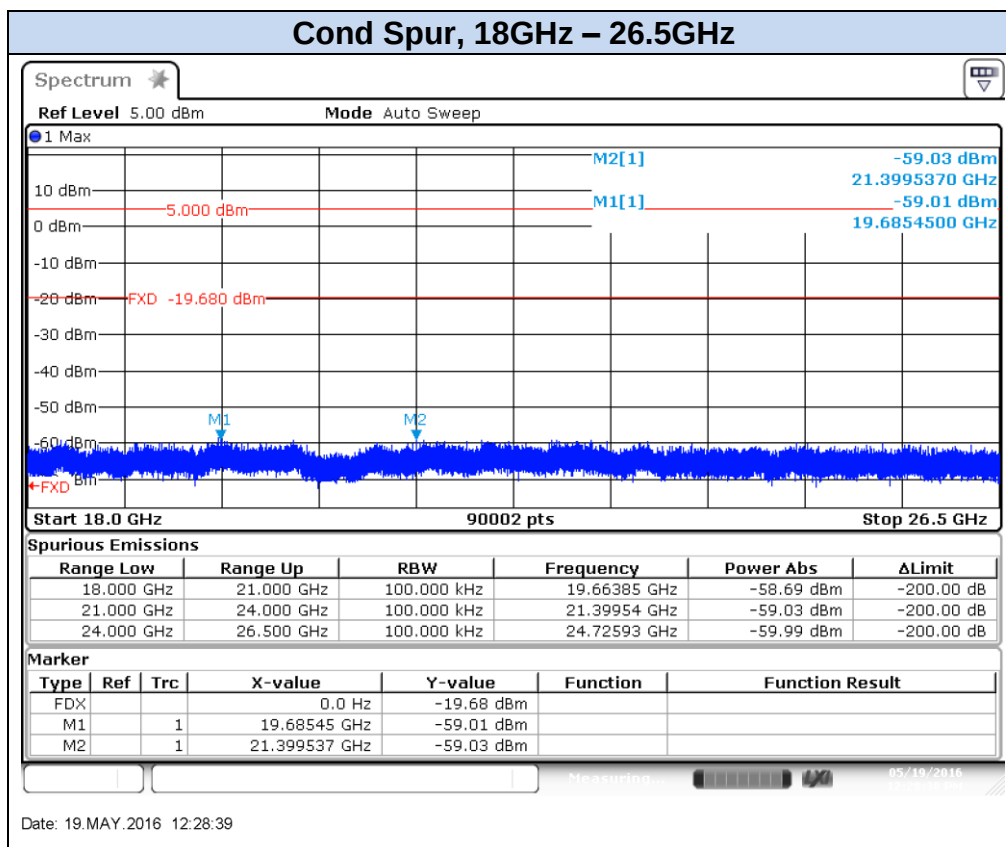
802.11n20, HT0 – Chain A, CH6



Date: 19.MAY.2016 12:27:47

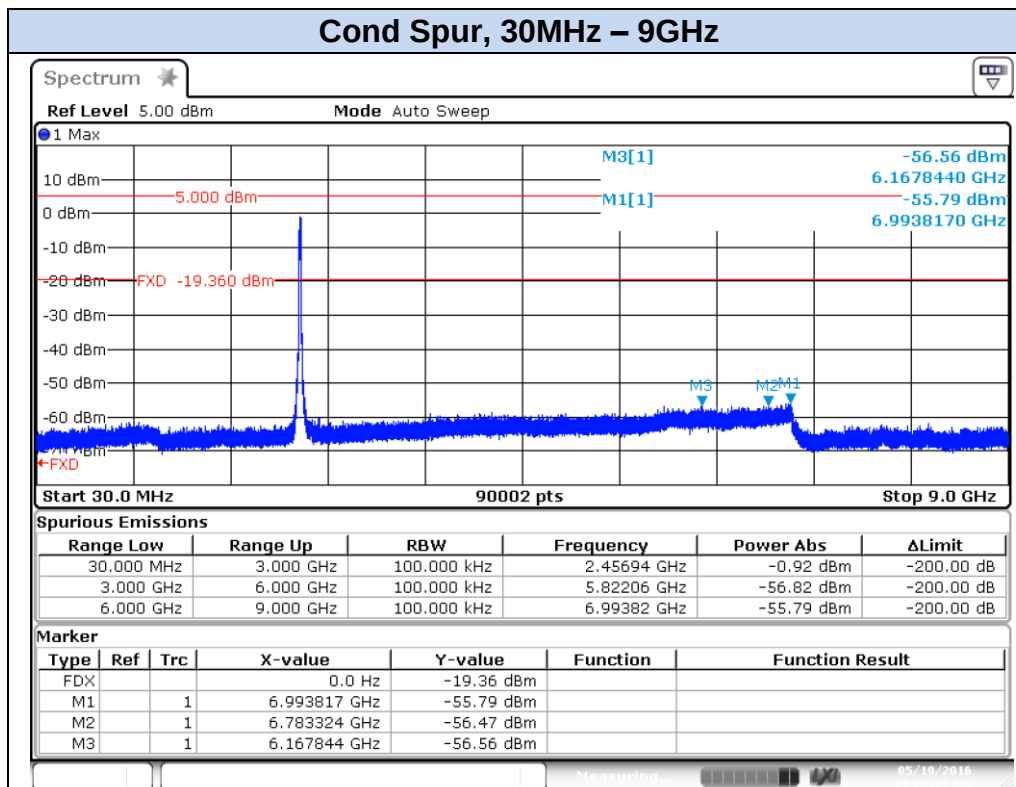


Date: 19.MAY.2016 12:28:15



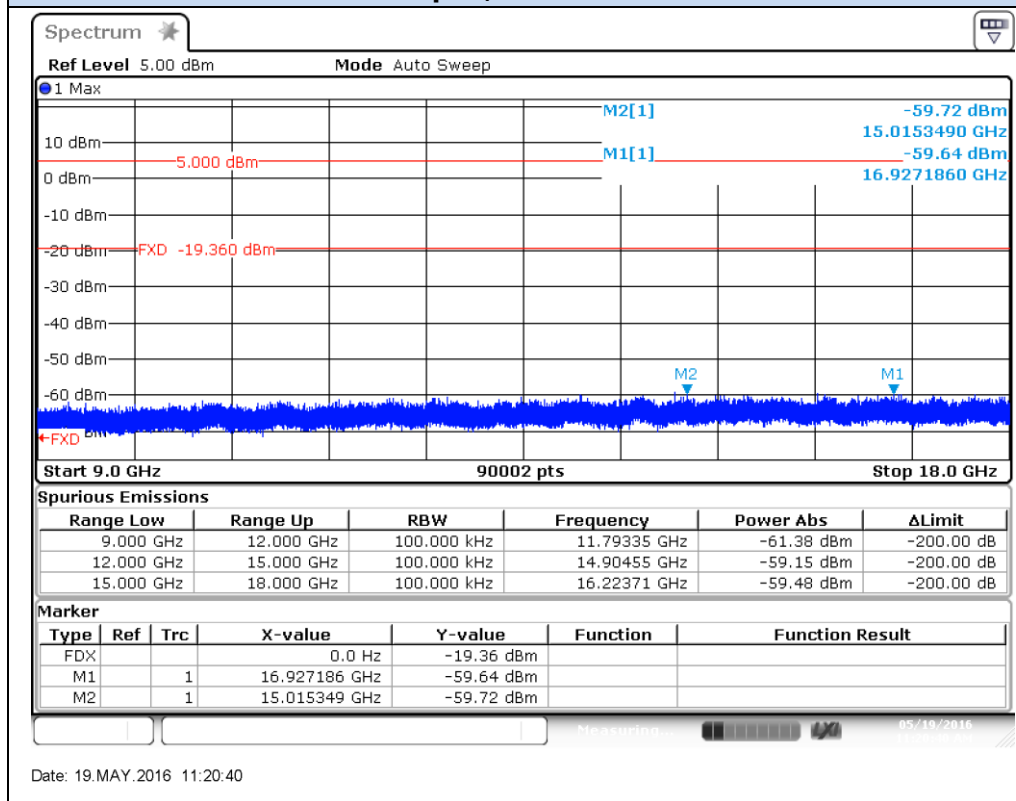
802.11n20, HT0 – Chain A, CH11

Cond Spur, 30MHz – 9GHz

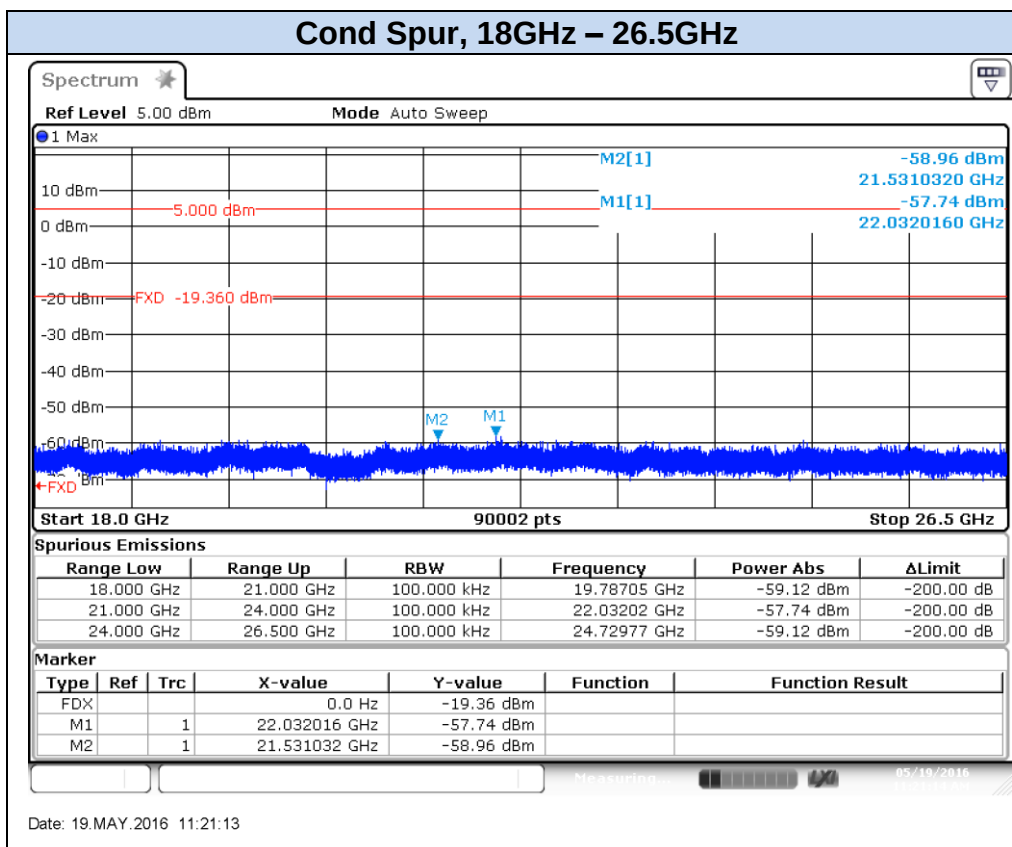


Date: 19.MAY.2016 11:20:11

Cond Spur, 9GHz – 18GHz



Date: 19.MAY.2016 11:20:40



B.4 Power Spectral Density

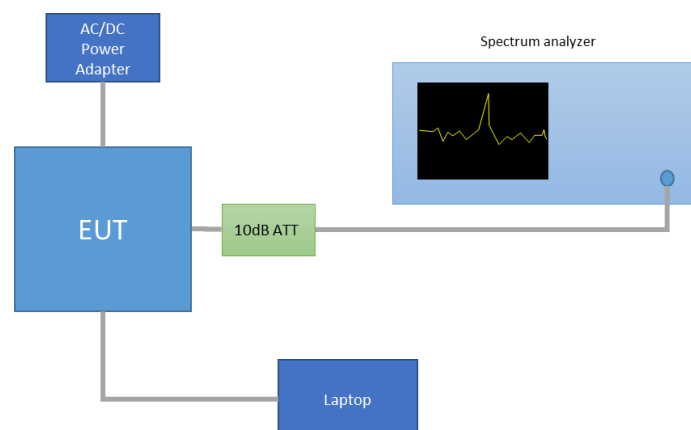
Test limits:

FCC part	Limits
15.247 (e)	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 802.11b, 802.11g and 802.11n20.

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.

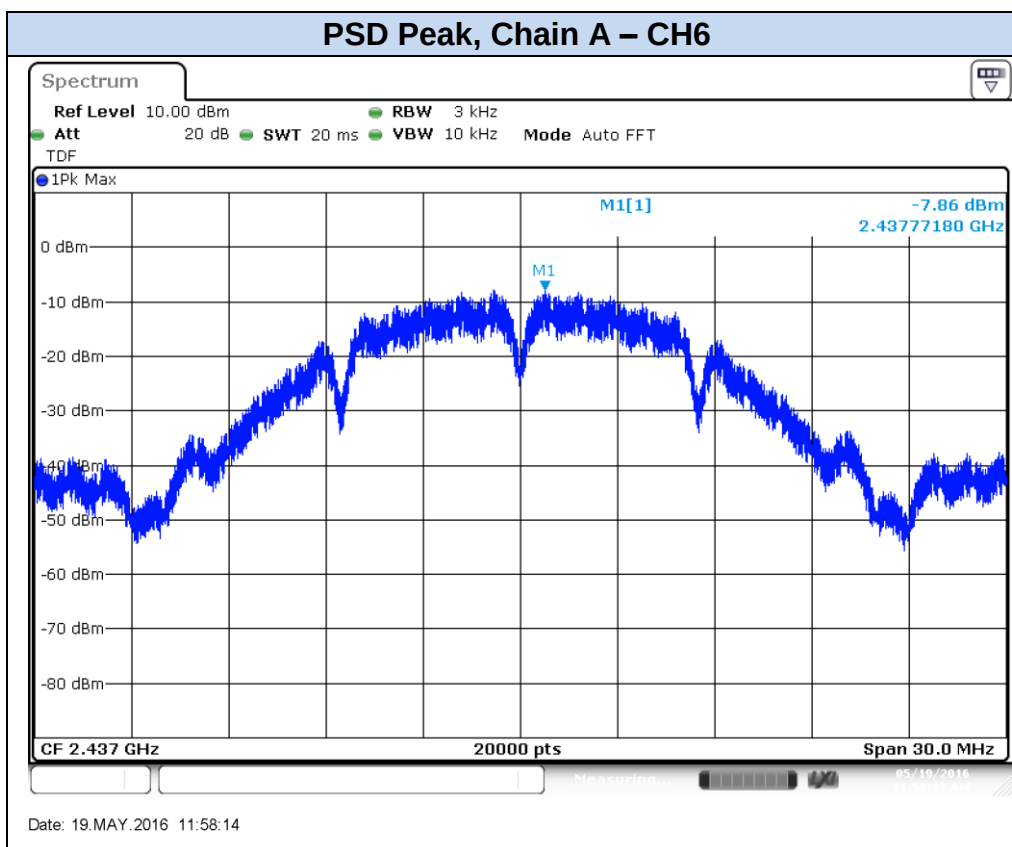
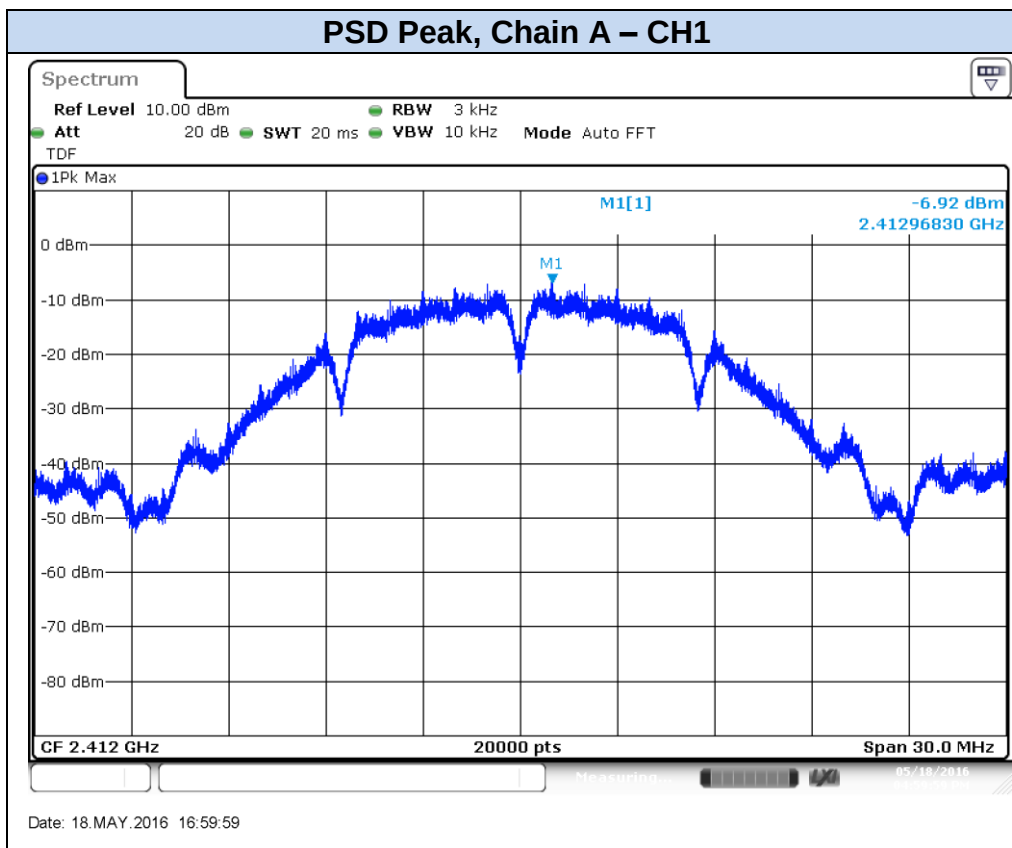


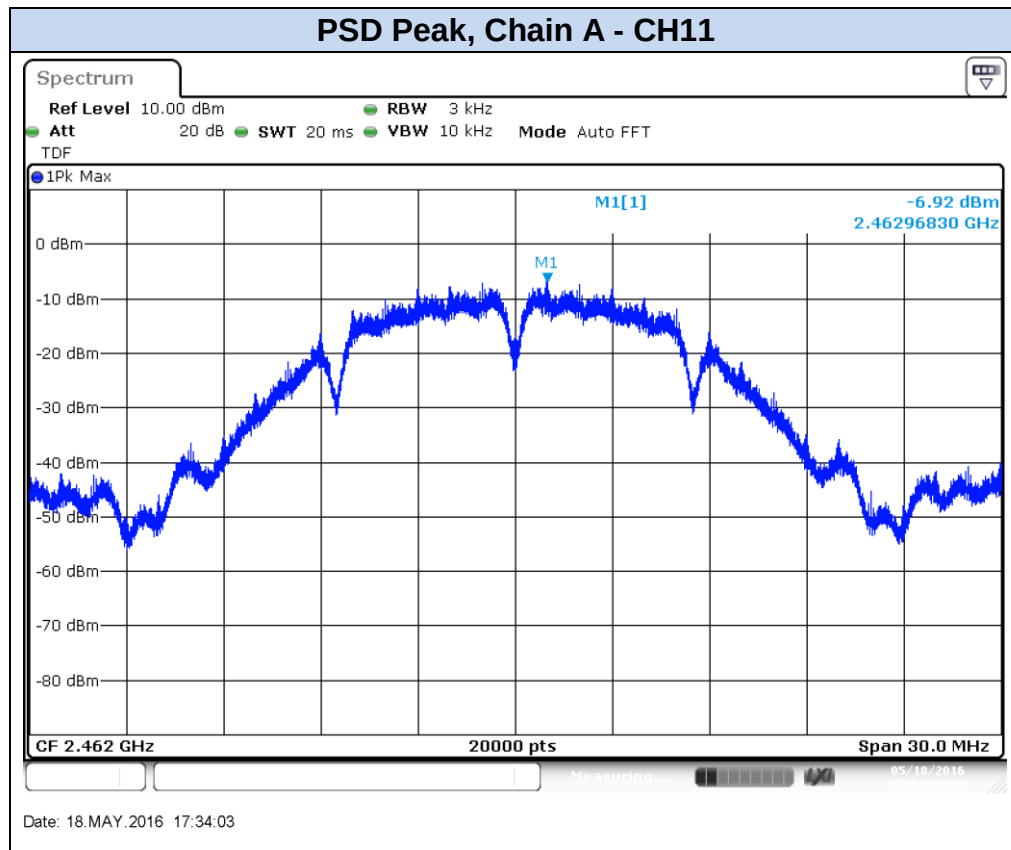
Results tables:

Mode	Rate	CH	Frequency [MHz]	Antenna	PSD Peak [dBm]
802.11b	1Mbps	1	2412	SISO CHAIN A	-6.92
		6	2437	SISO CHAIN A	-7.86
		11	2462	SISO CHAIN A	-6.92
802.11g	6Mbps	1	2412	SISO CHAIN A	-14.45
		6	2437	SISO CHAIN A	-12.22
		11	2462	SISO CHAIN A	-12.65
802.11n20	HT0	1	2412	SISO CHAIN A	-13.66
		6	2437	SISO CHAIN A	-13.55
		11	2462	SISO CHAIN A	-12.82

Results screenshot:

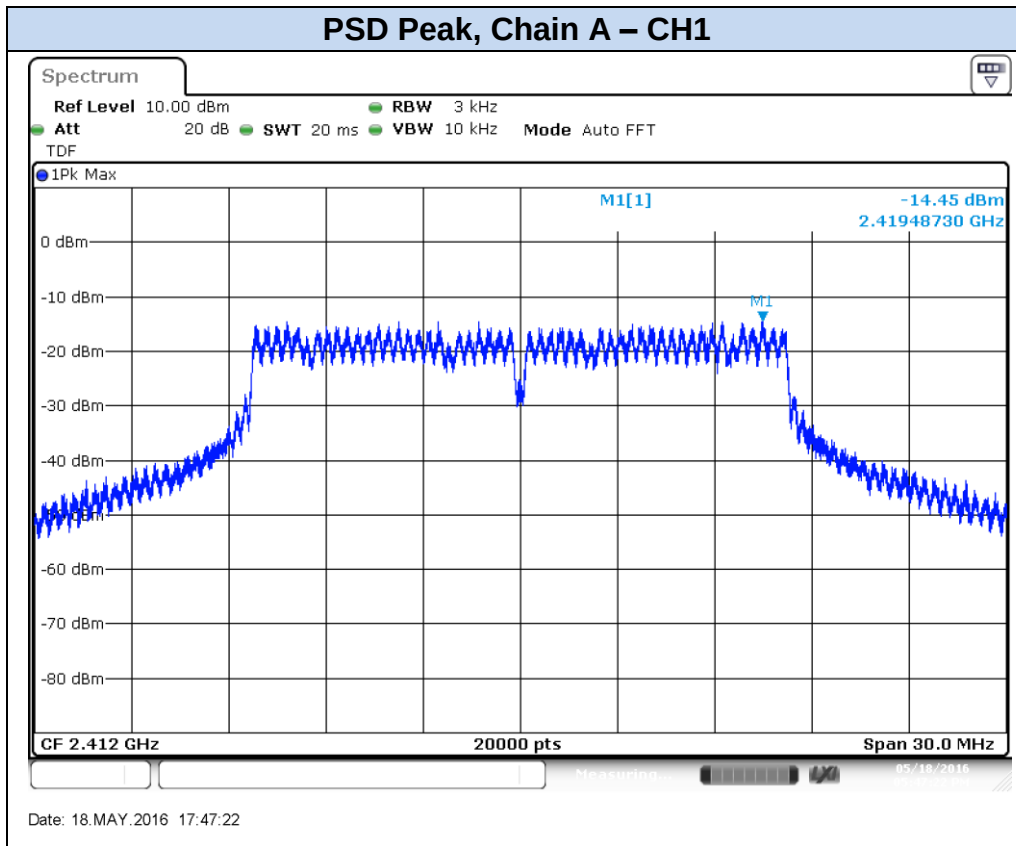
802.11b, 1Mbps



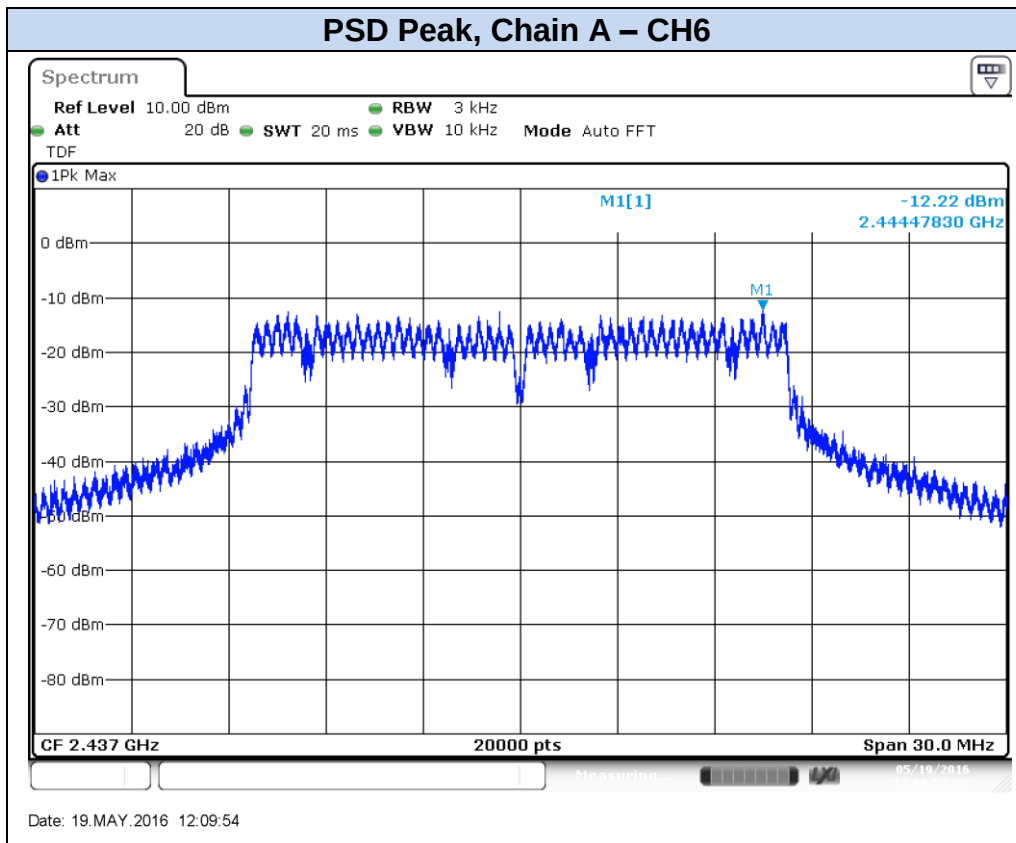


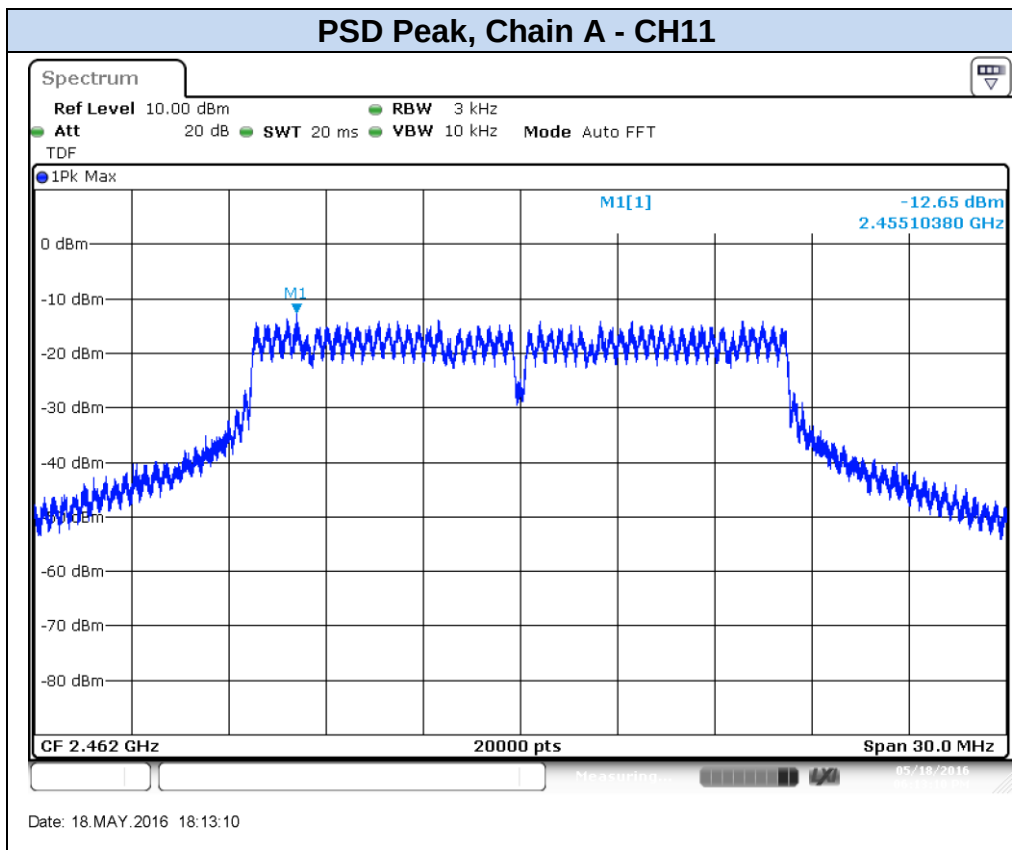
802.11g, 6Mbps

PSD Peak, Chain A – CH1

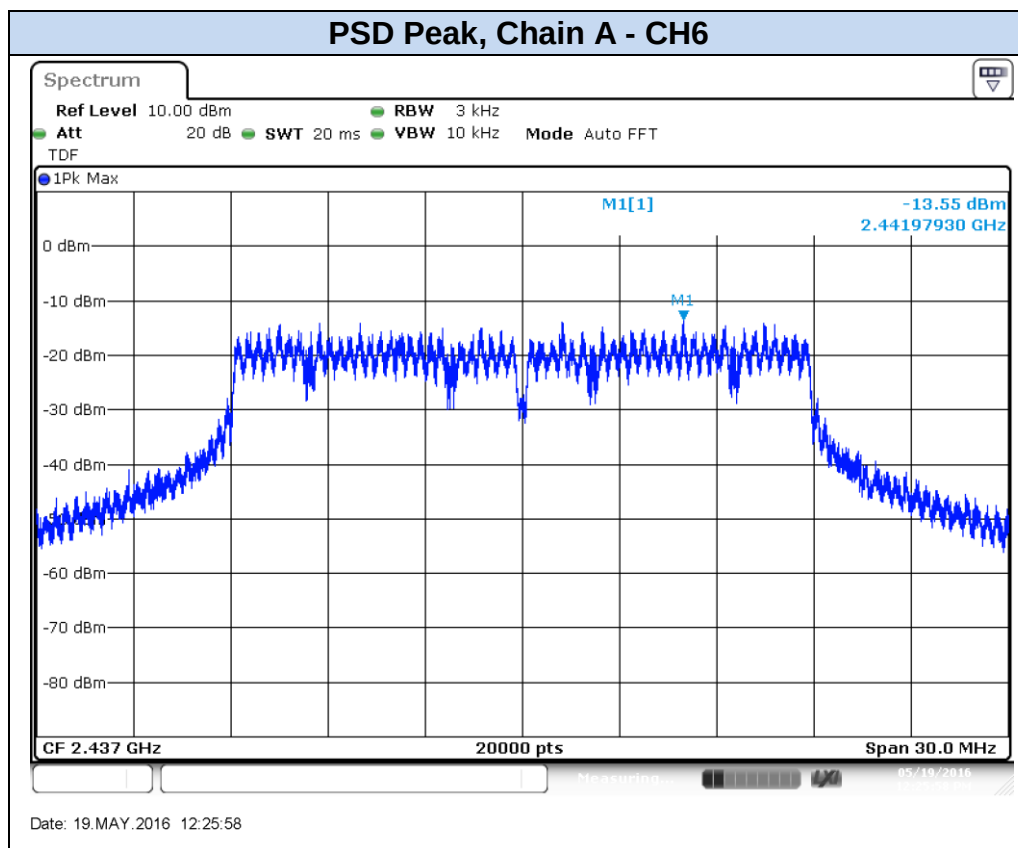
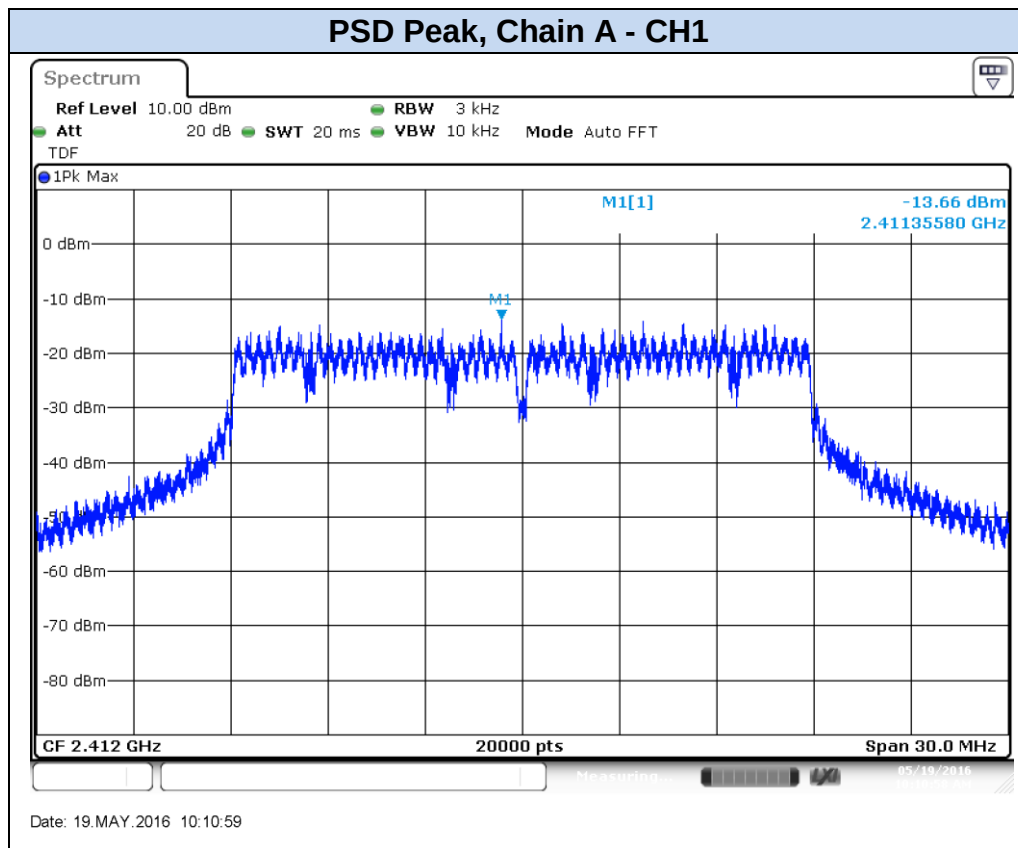


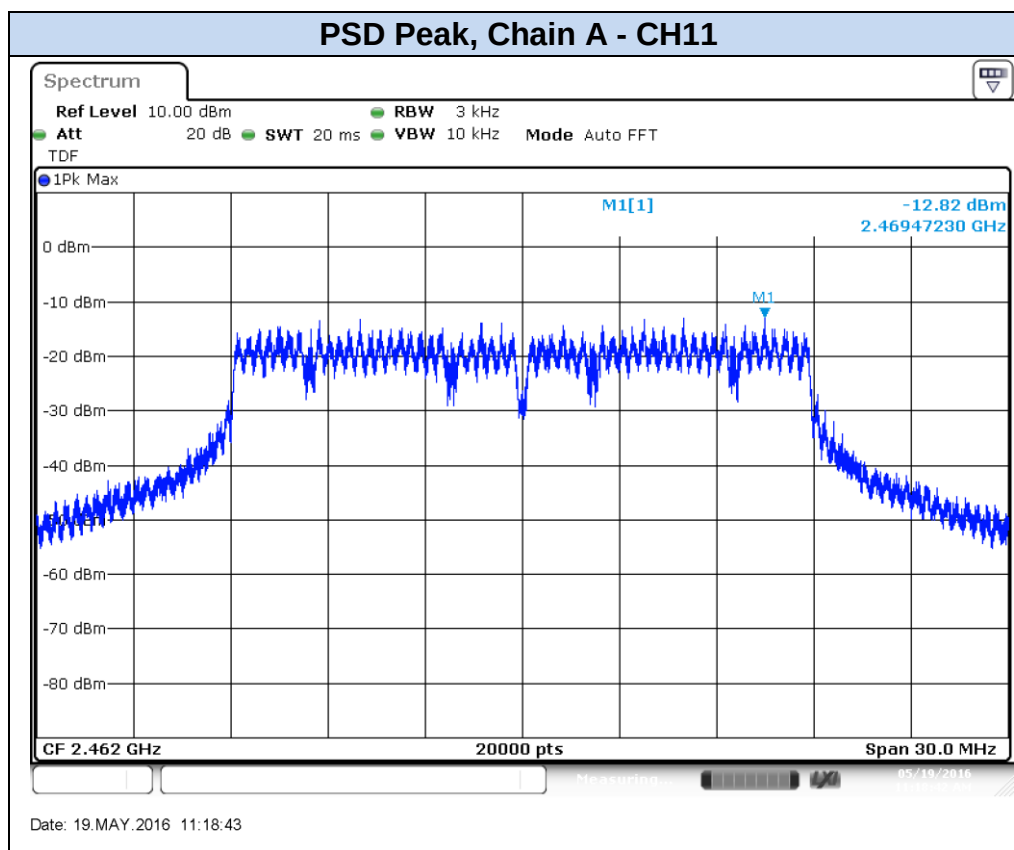
PSD Peak, Chain A – CH6





802.11n20, HT0





B.5 Radiated spurious emission

Standard references:

FCC part	Limits																																
15.247 (d)	Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a):																																
	<table><tr><th>Freq Range (MHz)</th><th>Field Strength (μV/m)</th><th>Field Strength (dBμV/m)</th><th>Meas. Distance (m)</th></tr><tr><td>0.009-0.490</td><td>2400/f(kHz)</td><td>-</td><td>300</td></tr><tr><td>0.490-1.705</td><td>24000/f(kHz)</td><td>-</td><td>300</td></tr><tr><td>1.705-30.0</td><td>30</td><td>-</td><td>30</td></tr><tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr><tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr><tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr><tr><td>960-25000</td><td>500</td><td>54</td><td>3</td></tr></table>	Freq Range (MHz)	Field Strength (μV/m)	Field Strength (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	960-25000	500	54	3
	Freq Range (MHz)	Field Strength (μV/m)	Field Strength (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																													
	960-25000	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 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.

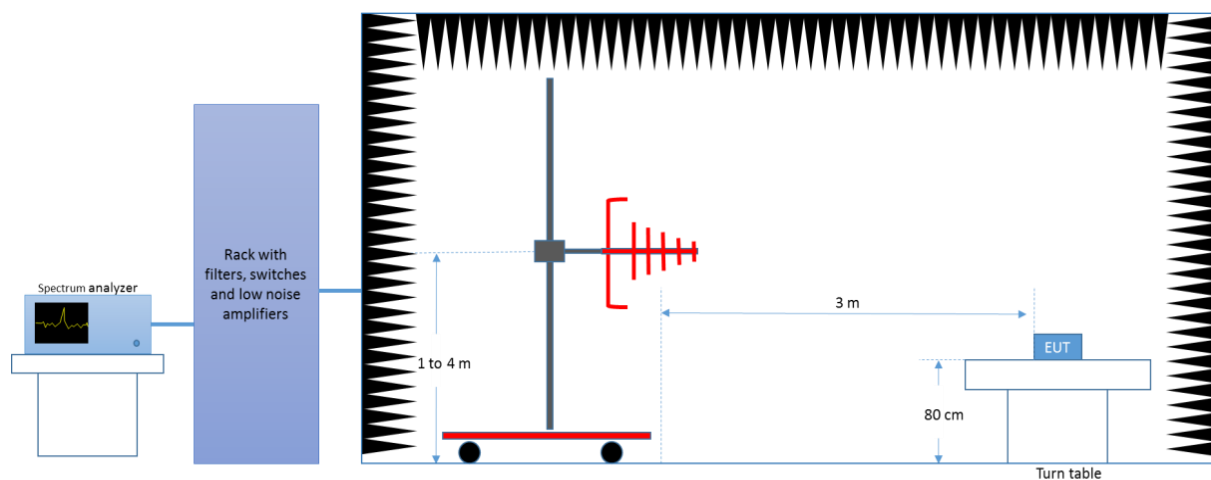
The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

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.

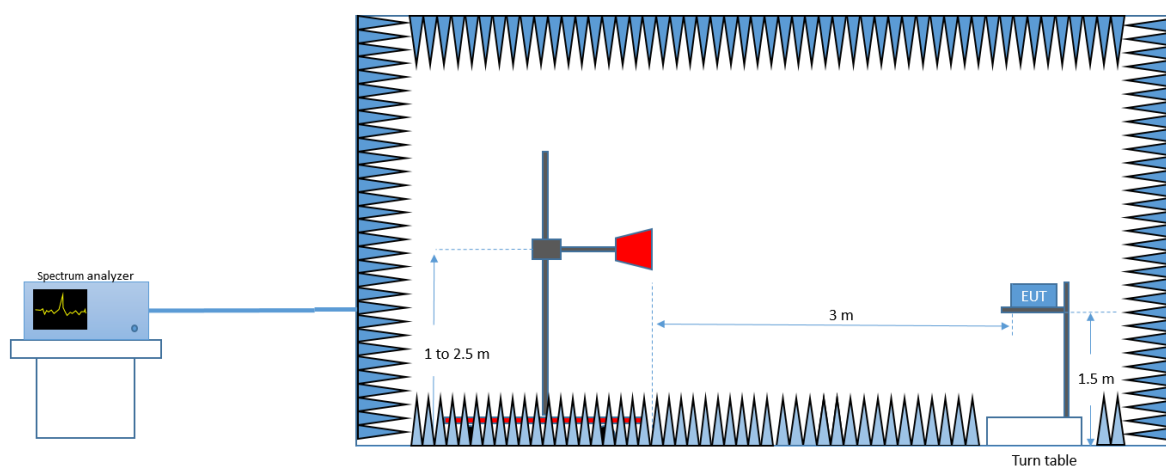
The resolution/video bandwidth used for the radiated measurement is as follows:

Freq. Range	RBW	VBW
30MHz – 1GHz	100kHz	300kHz
>1GHz	1MHz	3MHz

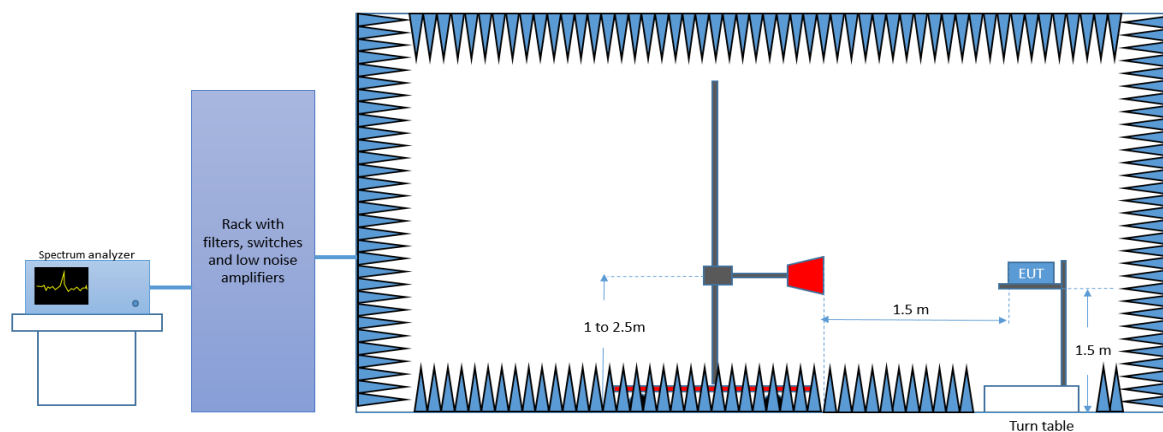
Radiated Setup < 1GHz



Radiated Setup 1GHz - 18GHz



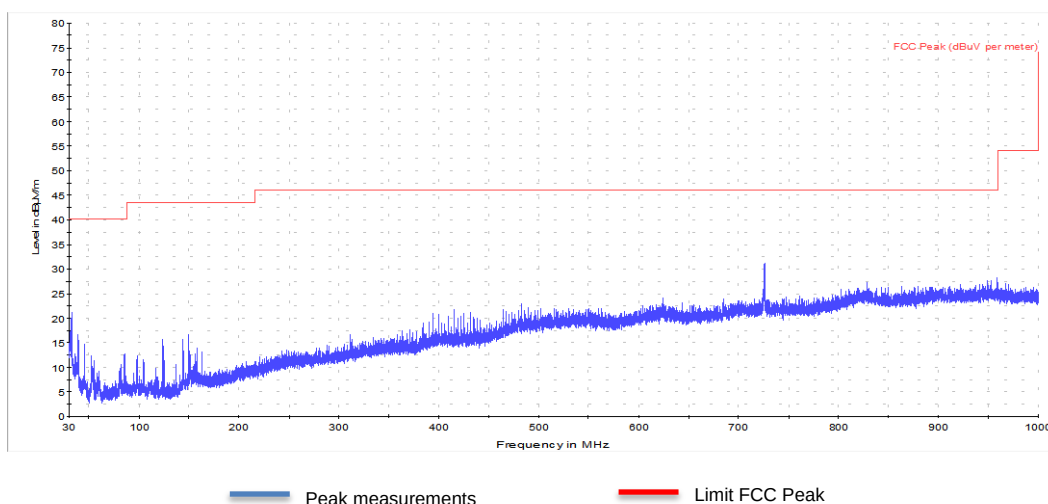
Radiated Setup > 18GHz



Test Results:

Radiated Spurious – 30MHz to 1GHz

Radiated Spurious – All Modes

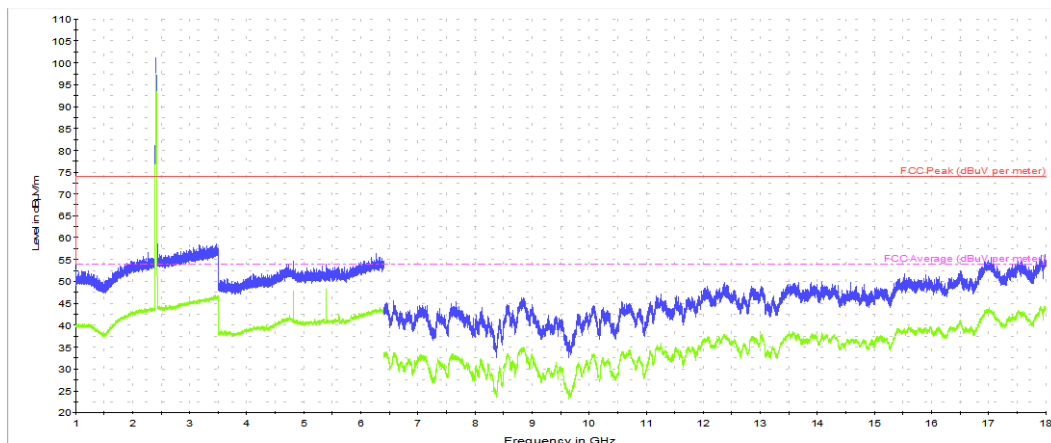


Frequency	Max Peak	Limit	Margin
MHz	dBµV/m	dBµV/m	dB
32	20.9	40	19.1

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

Radiated Spurious – 1 GHz to 18GHz 802.11b, 1Mbps

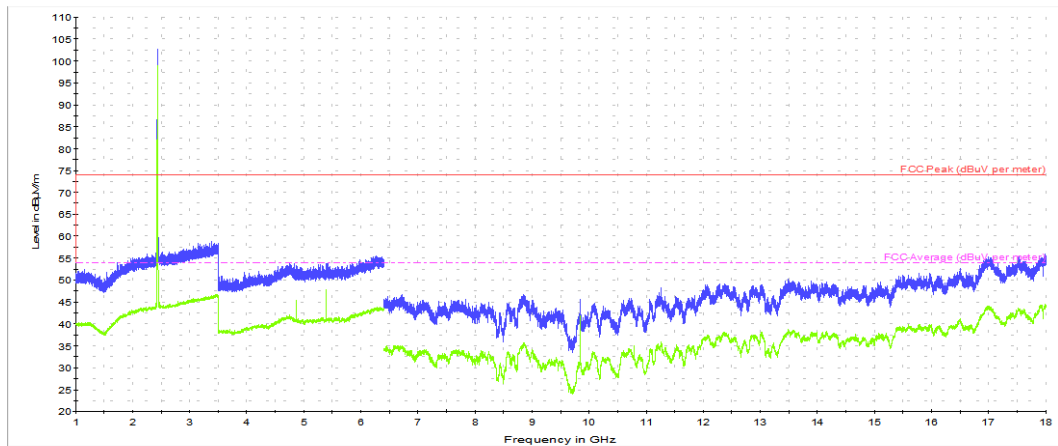
CH1



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

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
4823	54.4	-	74	18.6
4823	-	48.4	54	5.6
5400	55.6	-	74	18.4
5400	-	49.2	54	4.8

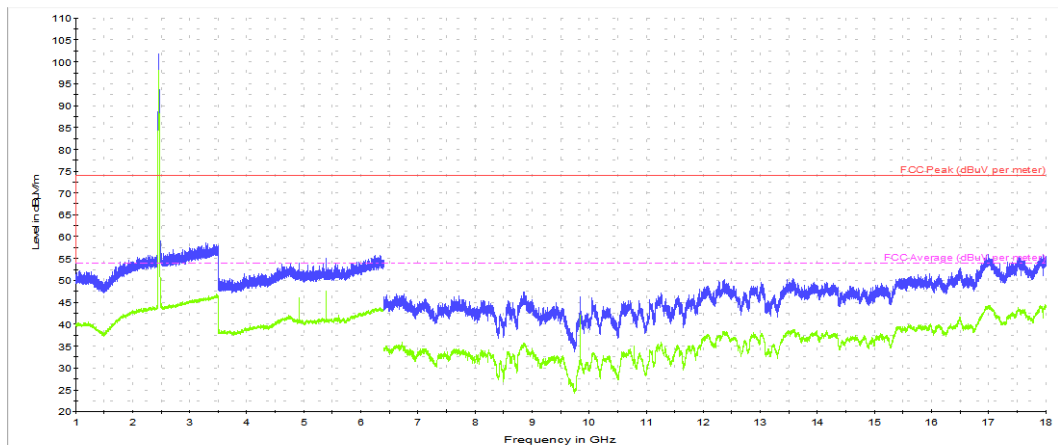
CH6



Peak measurements AVG measurements Limit FCC Peak Limit FCC AVG

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
5400	55.8	-	74	18.2
5400	-	49.0	54	5.0

CH11

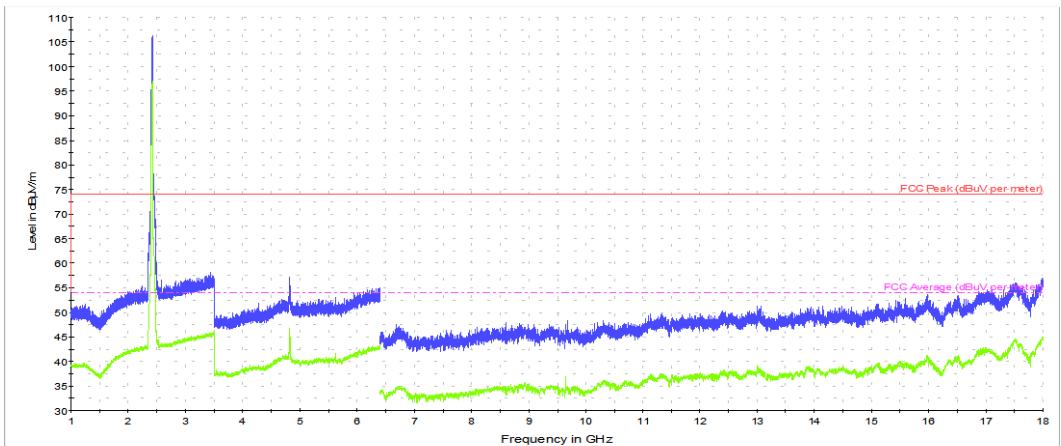


Peak measurements AVG measurements Limit FCC Peak Limit FCC AVG

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
4923	54.3	-	74	19.7
4923	-	45.8	54	8.2
5400	54.9	-	74	19.1
5400	-	49.6	54	4.4

Radiated Spurious – 1 GHz to 18GHz
802.11g, 6Mbps

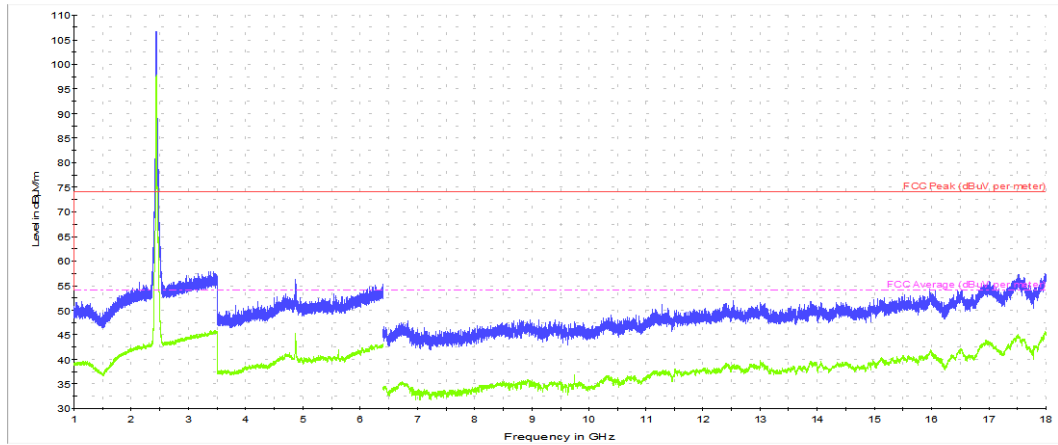
CH1



Peak measurements AVG measurements Limit FCC Peak Limit FCC AVG

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
4822	58.5	-	74	15.5
4822	-	46.1	54	7.9

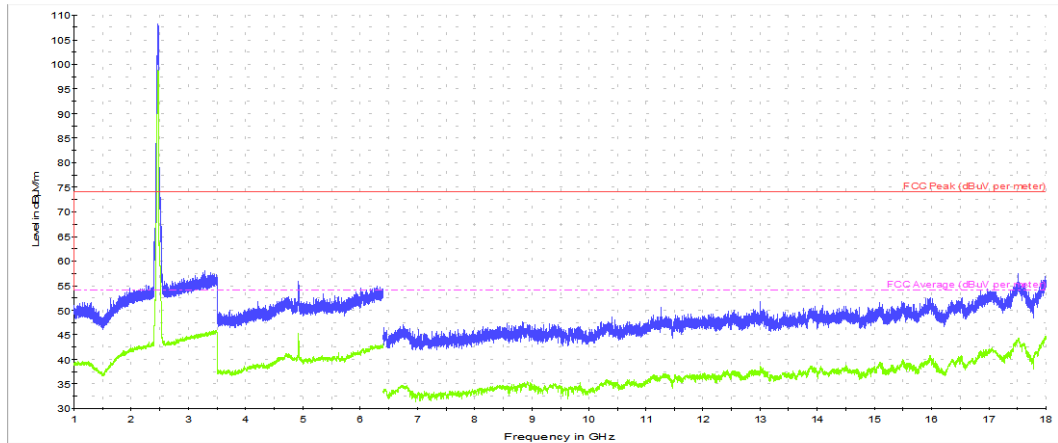
CH6



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

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
4874	56.4	-	74	17.6
4874	-	45.9	54	8.1

CH11

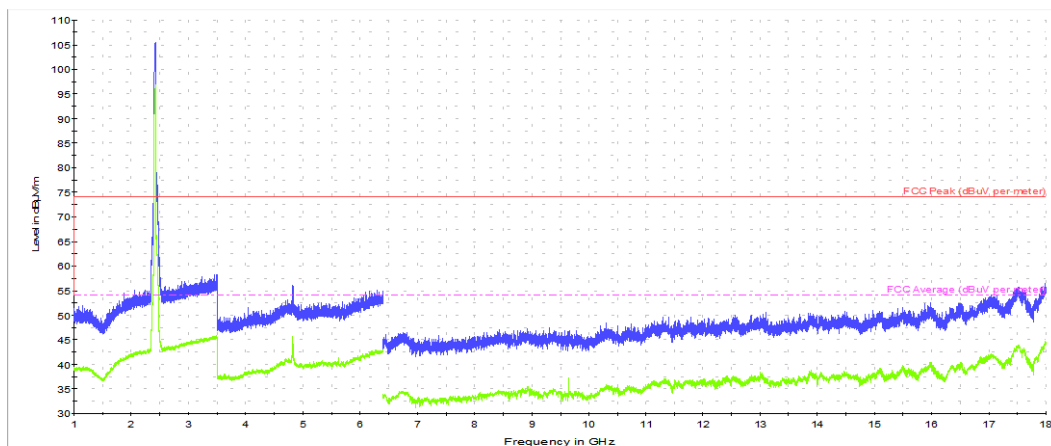


— Peak measurements
 — AVG measurements
 — Limit FCC Peak
 - - Limit FCC AVG

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
4922	57.0	-	74	17.0
4922	-	45.8	54	8.2

Radiated Spurious – 1 GHz to 18GHz 802.11n20, HT0

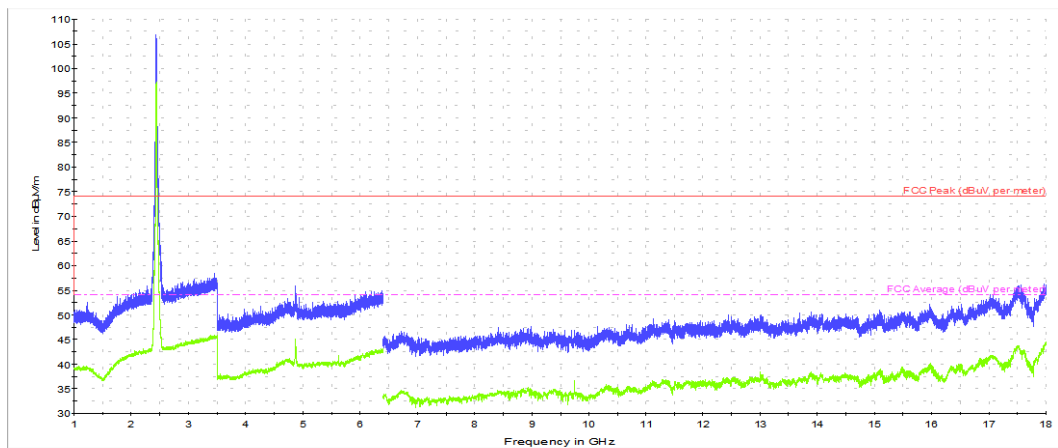
CH1



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

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
4824	56.4	-	74	17.6
4724	-	45.9	54	8.1

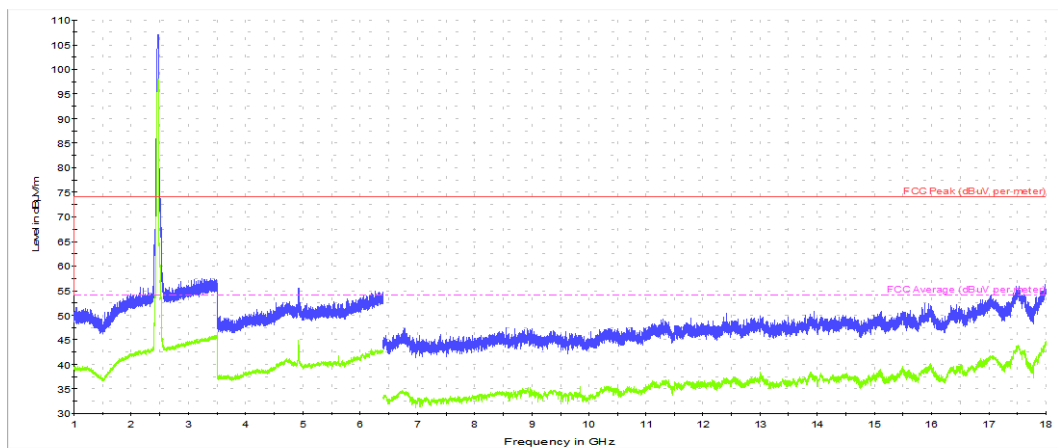
CH6



Peak measurements AVG measurements Limit FCC Peak Limit FCC AVG

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
4877	55.9	-	74	18.1
4870	-	45.3	54	8.7

CH11

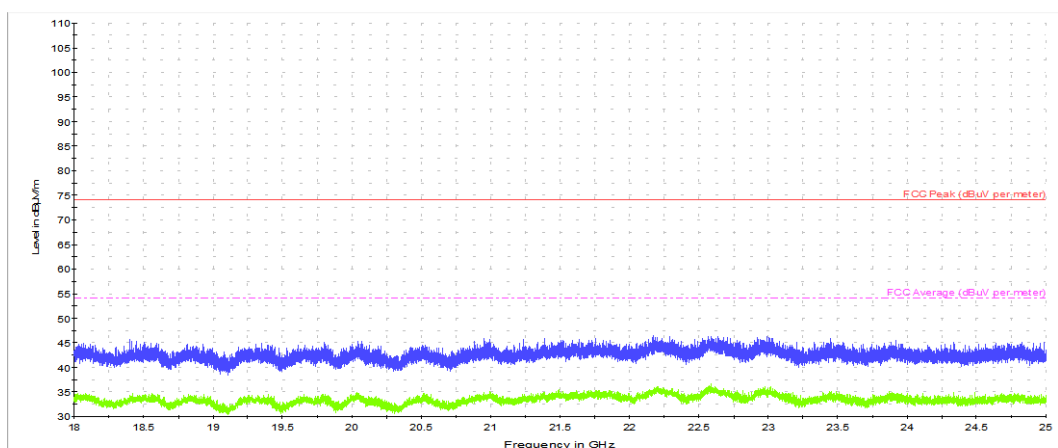


Peak measurements AVG measurements Limit FCC Peak Limit FCC AVG

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
4924	56.4	-	74	17.6
4926	-	44.9	54	9.1

Radiated Spurious – 18 GHz to 25 GHz

Radiated Spurious – All Modes



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

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
22169	46.5	---	74	17.5
22169	---	36.1	54	17.9

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

Annex C. Test Results BLE

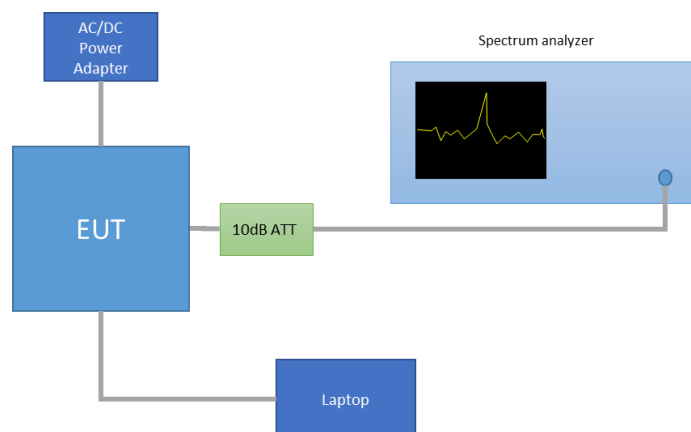
C.1 6dB & 99% Bandwidth

Test limits:

FCC part	Limits
15.247 (a) (2)	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.

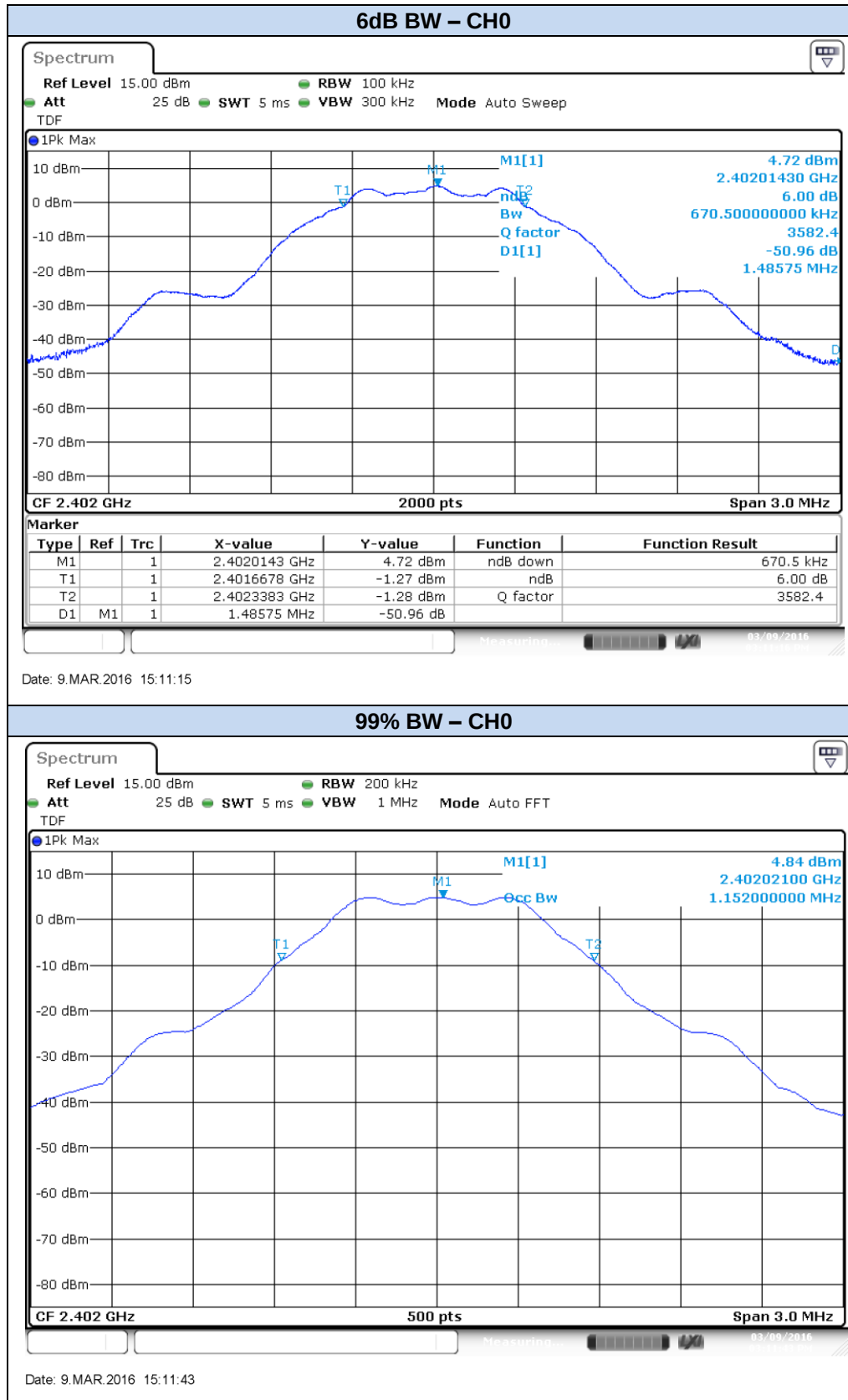


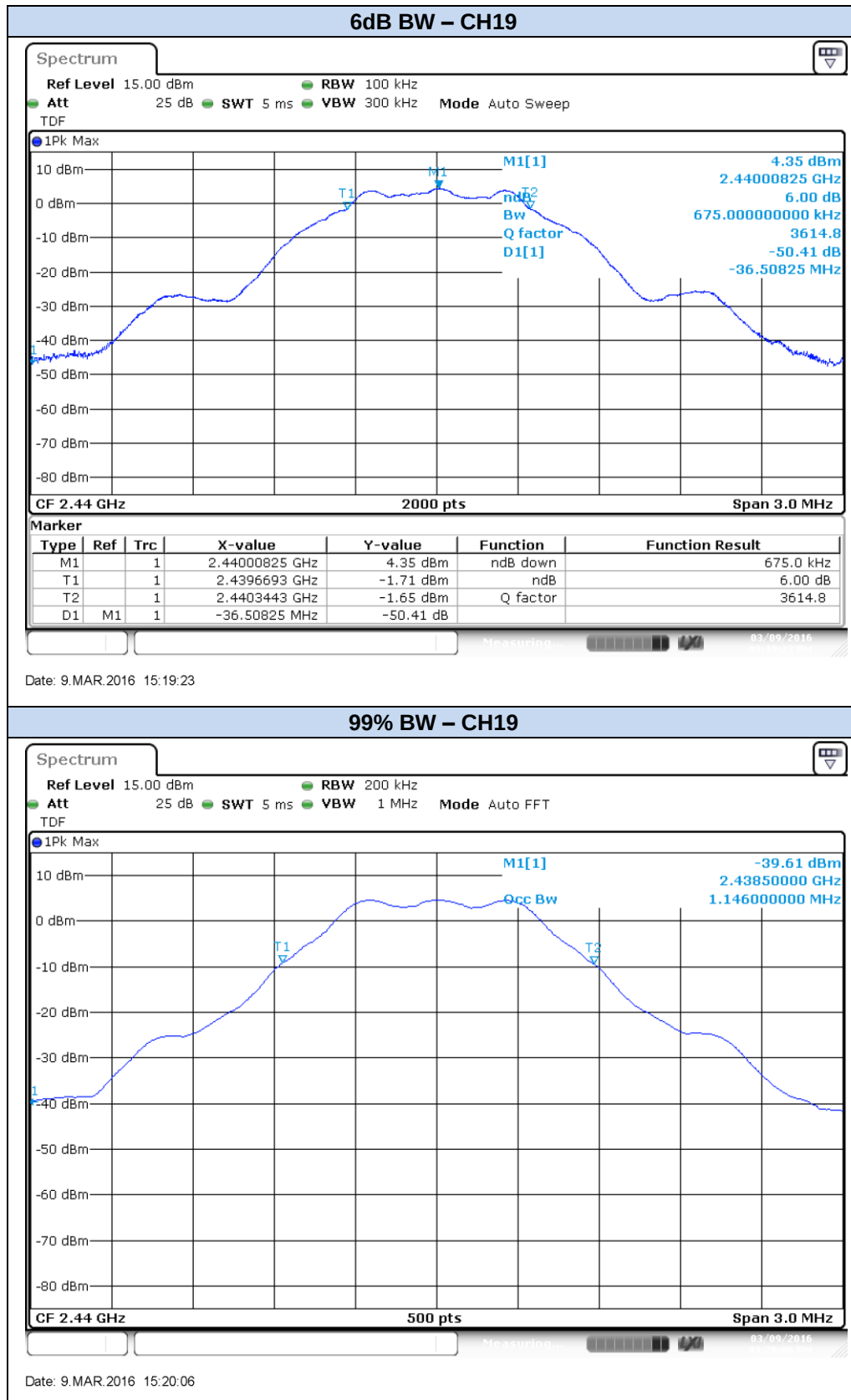
Results tables:

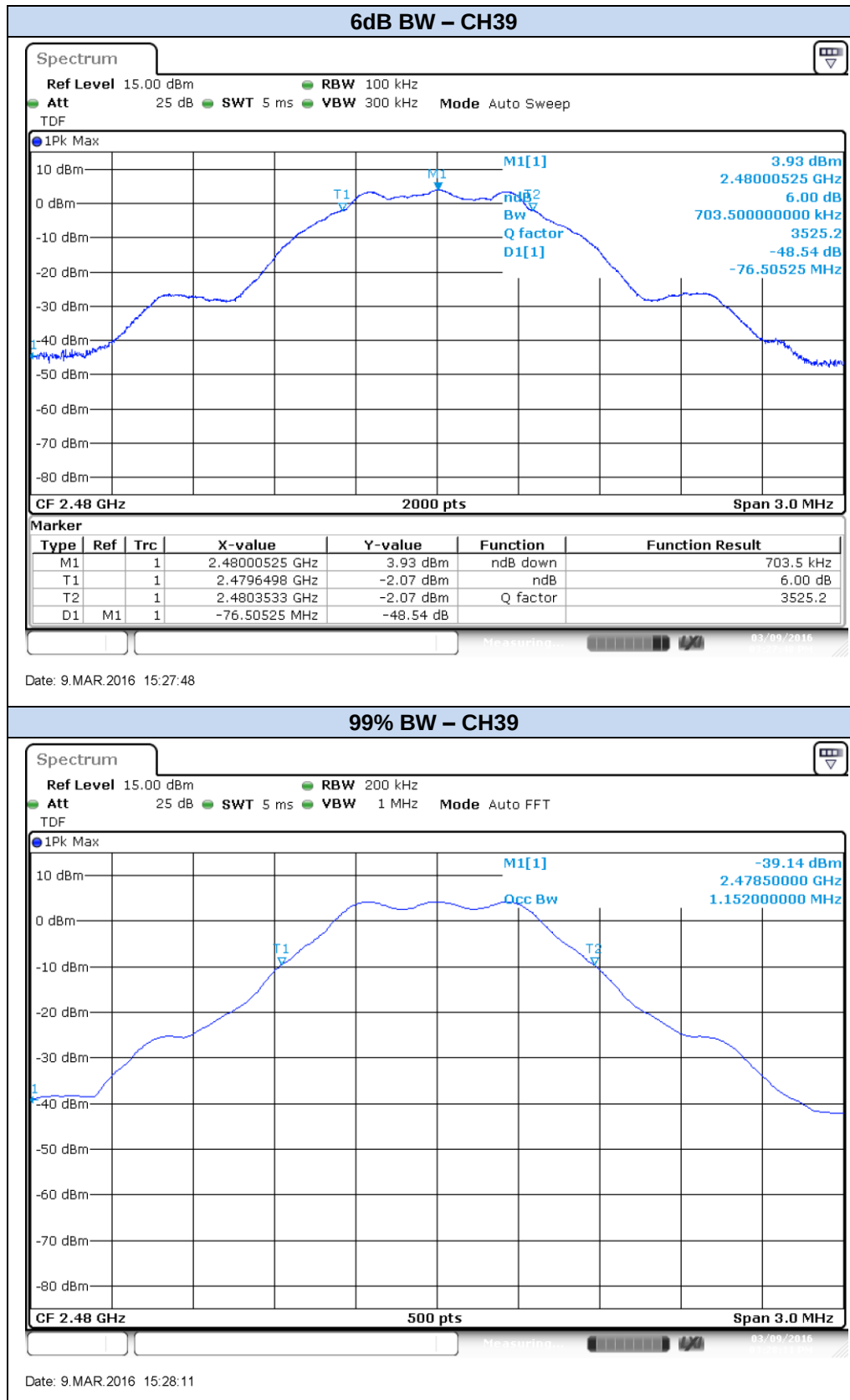
Mode	Channel	Frequency [MHz]	6dB BW [MHz]	99% BW [MHz]
BLE	0	2402	0.67	1.15
	19	2440	0.68	1.15
	39	2480	0.70	1.15

Results screenshot:

BLE







C.2 Maximum Output Power and antenna gain

Test limits:

FCC part	Limits
15.247 (b) (3)	(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.

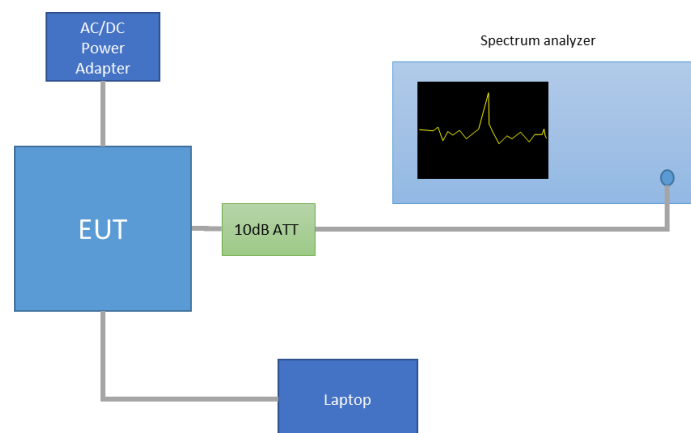
Test procedure:

The Maximum peak conducted output power was measured using the *RBW ≥ DTS bandwidth* method defined in paragraph 9.1.1 of FCC KDB 558074 D01 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

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 FCC KDB 558074 D01 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power. The maximum declared antenna gain is 1.5dBi.

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

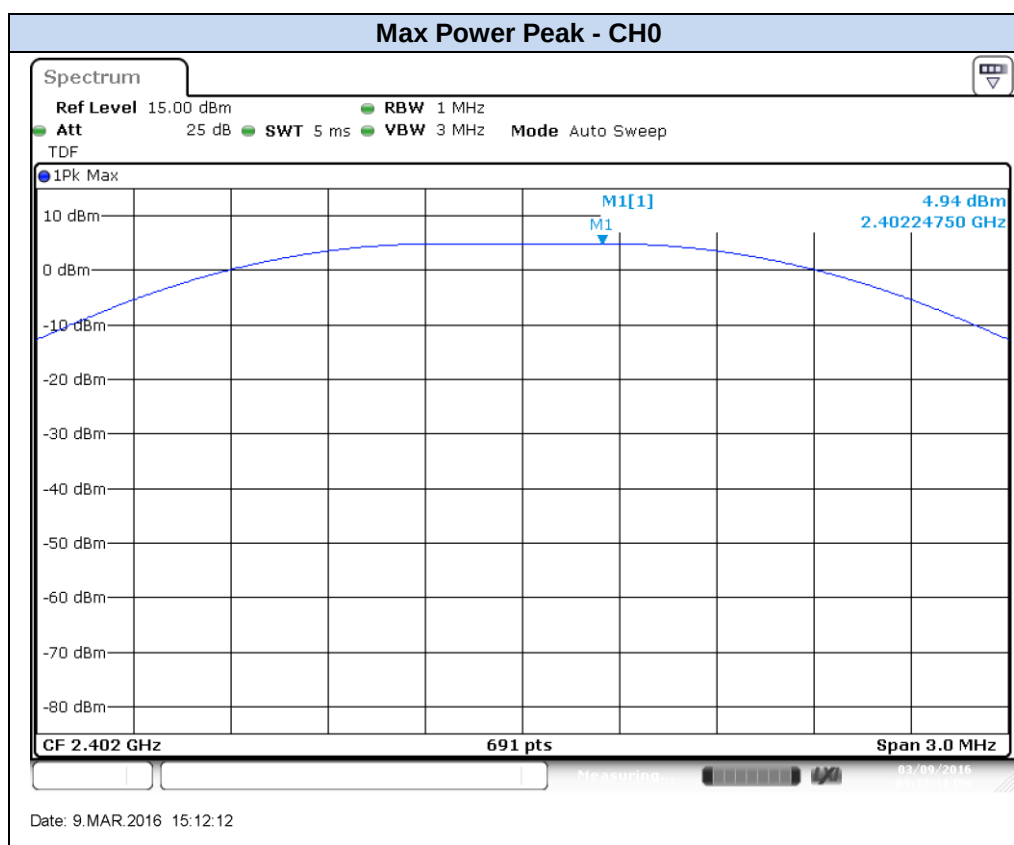
Mode	Meas. Duty Cycle [%]	CH	Frequency [MHz]	Peak Power [dBm]		Peak Output Power [mW]
				Measured Conducted Output Power	EIRP	
BLE	62.6	0	2402	4.94	6.44	3.12
		19	2440	4.61	6.11	2.89
		39	2480	4.21	5.71	2.64

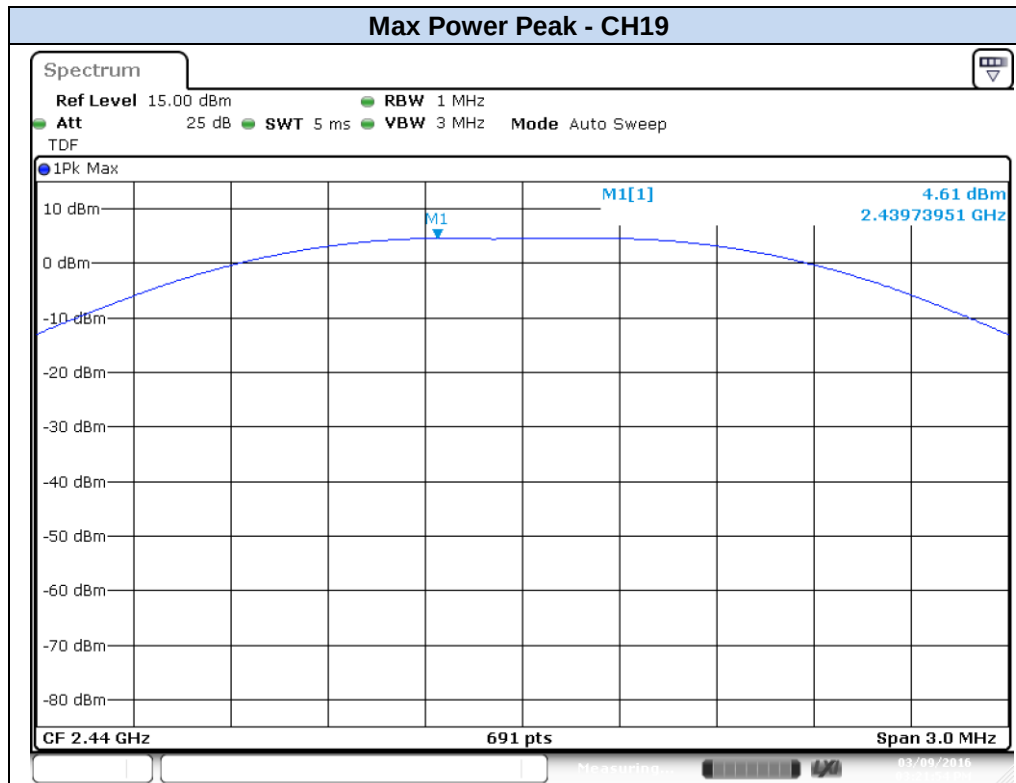
Max Value

Min Value

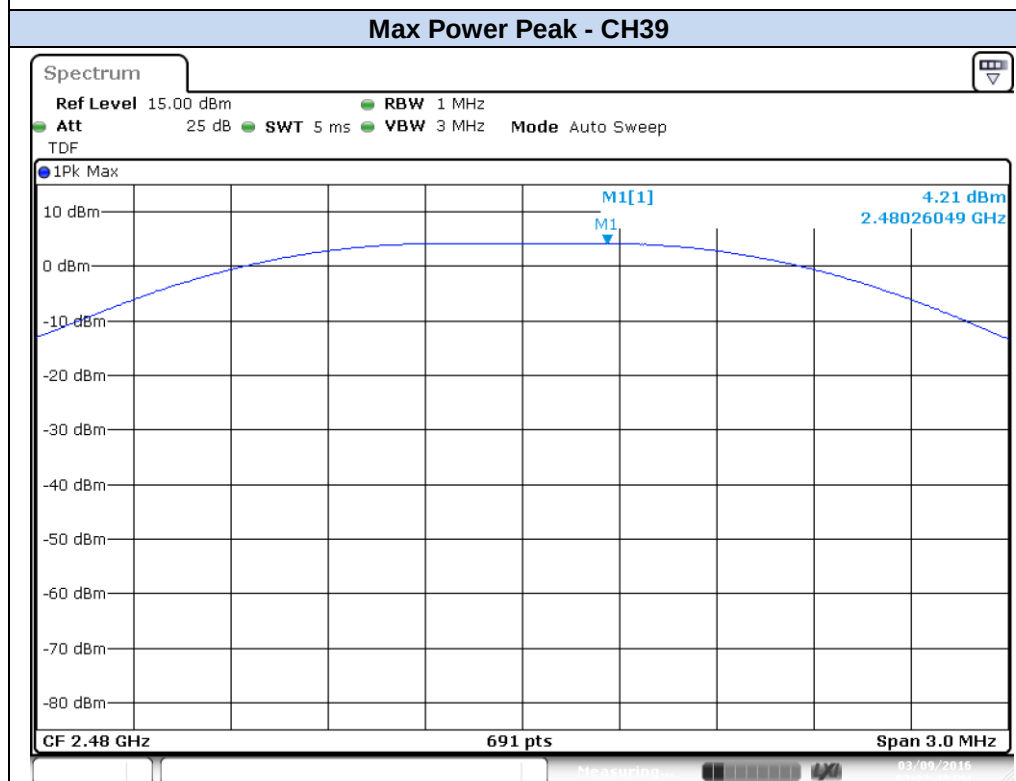
Results screenshot:

BLE





Date: 9.MAR.2016 15:21:55



Date: 9.MAR.2016 15:22:49

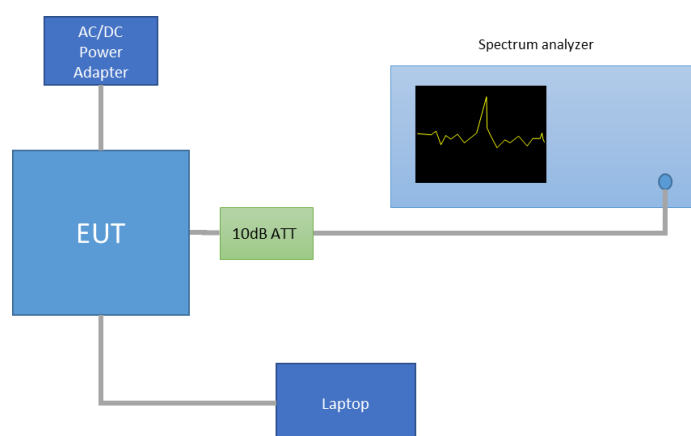
C.3 Out-of-band emissions (conducted)

Test limits:

FCC part	Limits																																
15.247 (d)	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	Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a): <table><tr><th>Freq Range (MHz)</th><th>Field Strength (μV/m)</th><th>Field Strength (dBμV/m)</th><th>Meas. Distance (m)</th></tr><tr><td>0.009-0.490</td><td>2400/f(kHz)</td><td>-</td><td>300</td></tr><tr><td>0.490-1.705</td><td>24000/f(kHz)</td><td>-</td><td>300</td></tr><tr><td>1.705-30.0</td><td>30</td><td>-</td><td>30</td></tr><tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr><tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr><tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr><tr><td>960-25000</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 Strength (μV/m)	Field Strength (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	960-25000	500	54	3
Freq Range (MHz)	Field Strength (μV/m)	Field Strength (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																														
960-25000	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 maximum declared antenna gain is 1.5dBi.

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 dB μ V/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	54.0	-41.2

The resolution/video bandwidth used for the conducted spurious measurement (delta method) is as follows:

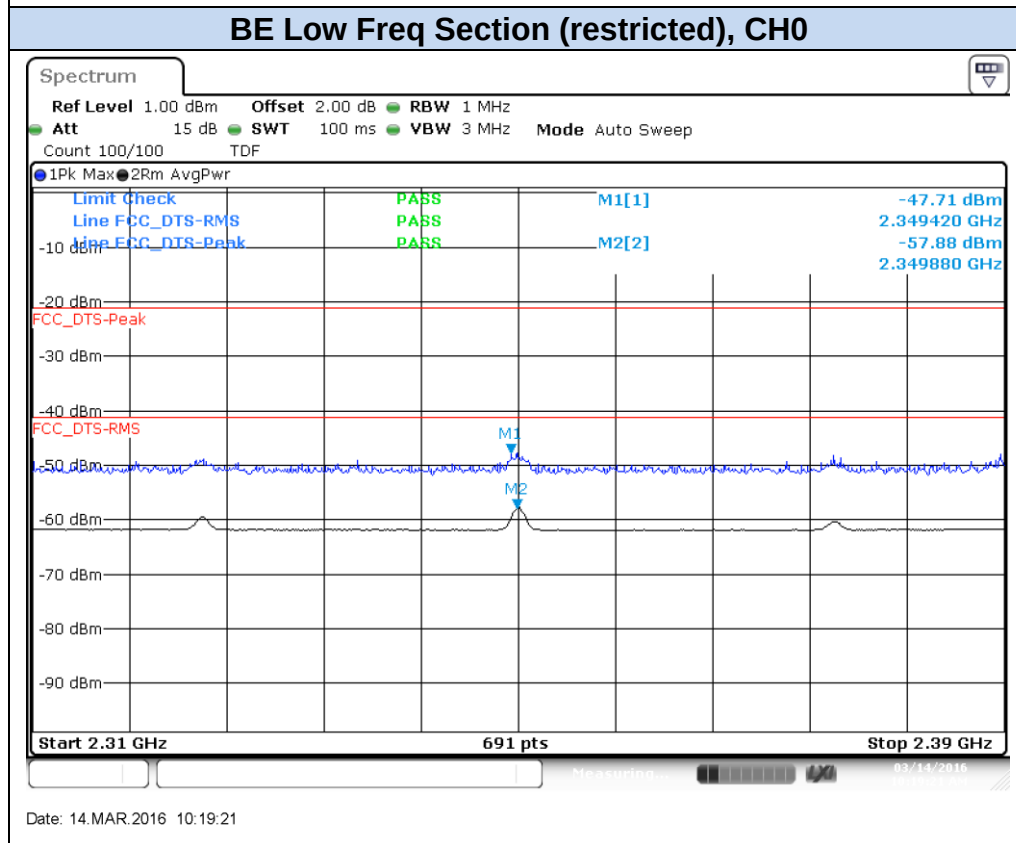
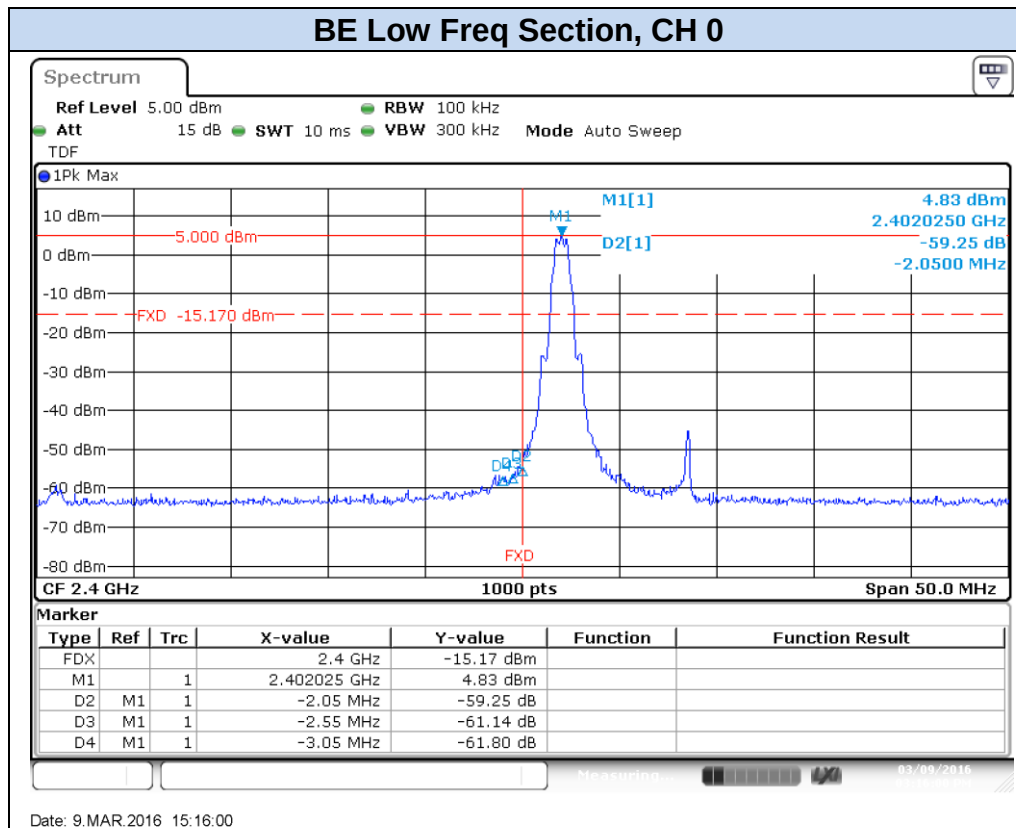
Freq. Range	RBW	VBW
30MHz – 26.5GHz	100kHz	300kHz

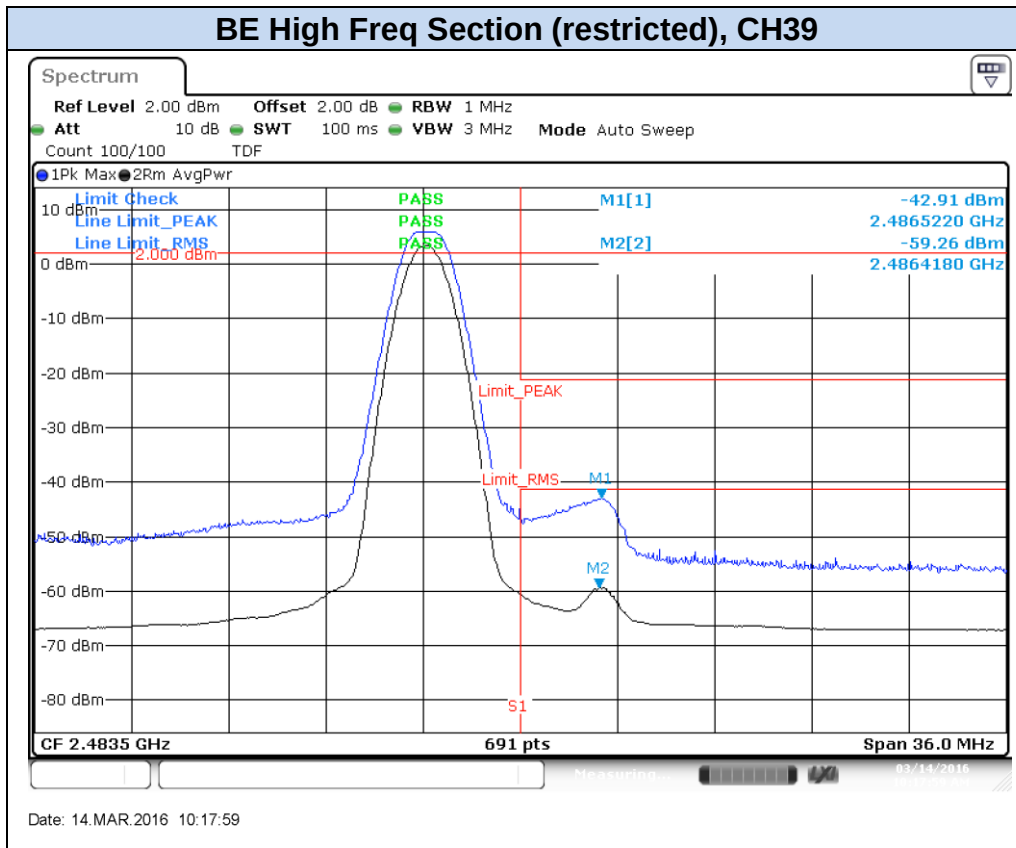
Note: the below PSD_{Peak} values are shown just as a reference for the compliance of the Out-of-band Measurements. Thus the RBW used for these measurements was 100 kHz.

Mode	CH	Frequency [MHz]	PSD Peak [dBm]
BLE	0	2402	4.72
	19	2440	4.35
	39	2480	4.72

Band Edge results Screenshot:

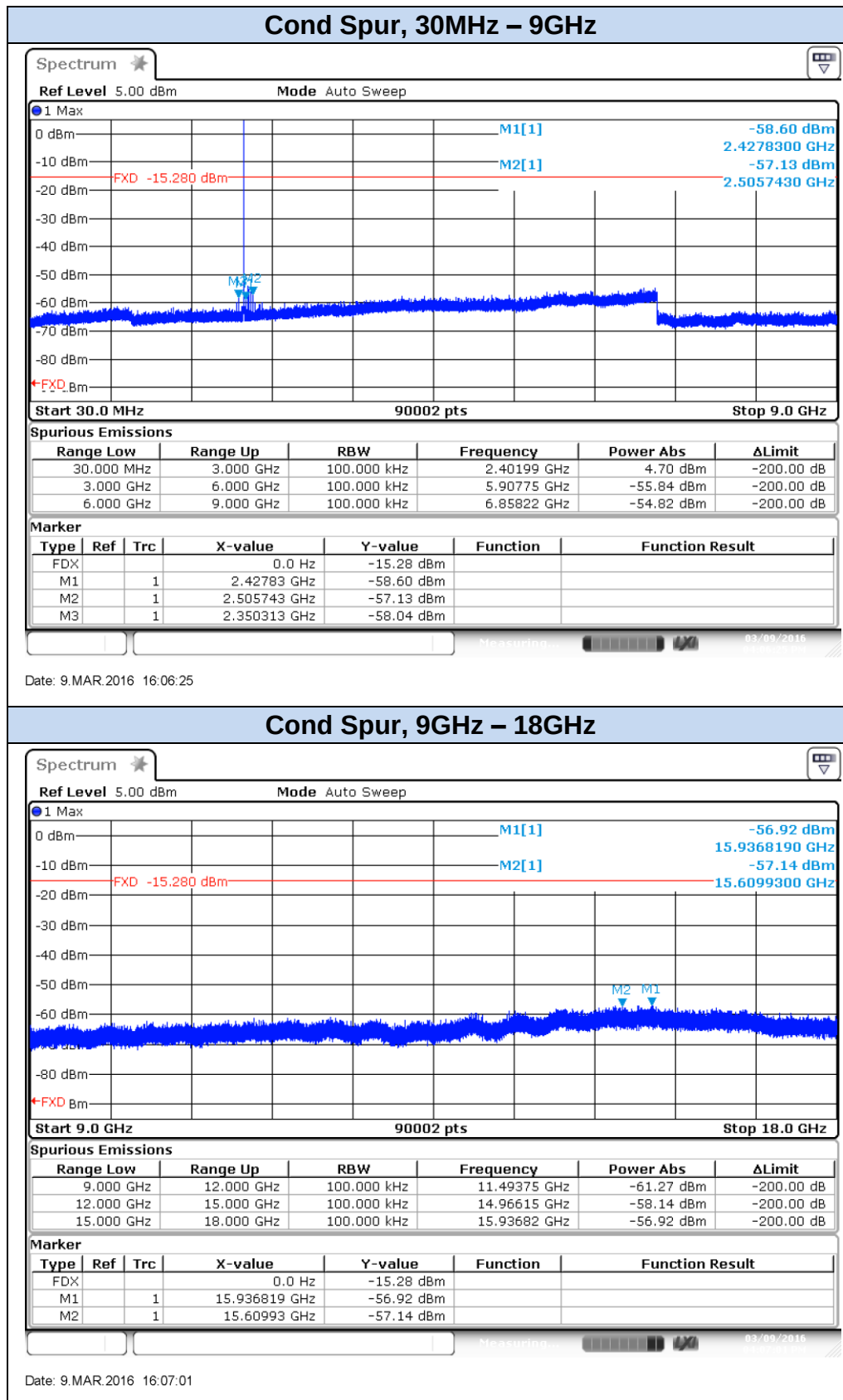
BLE

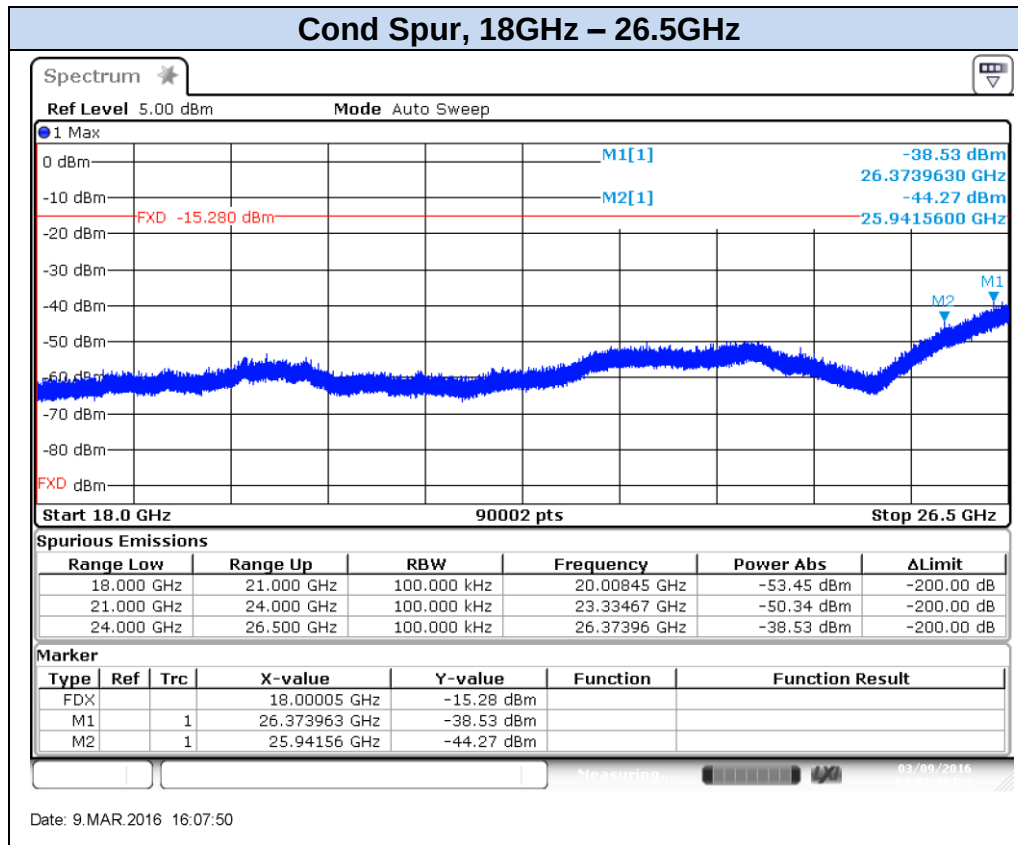




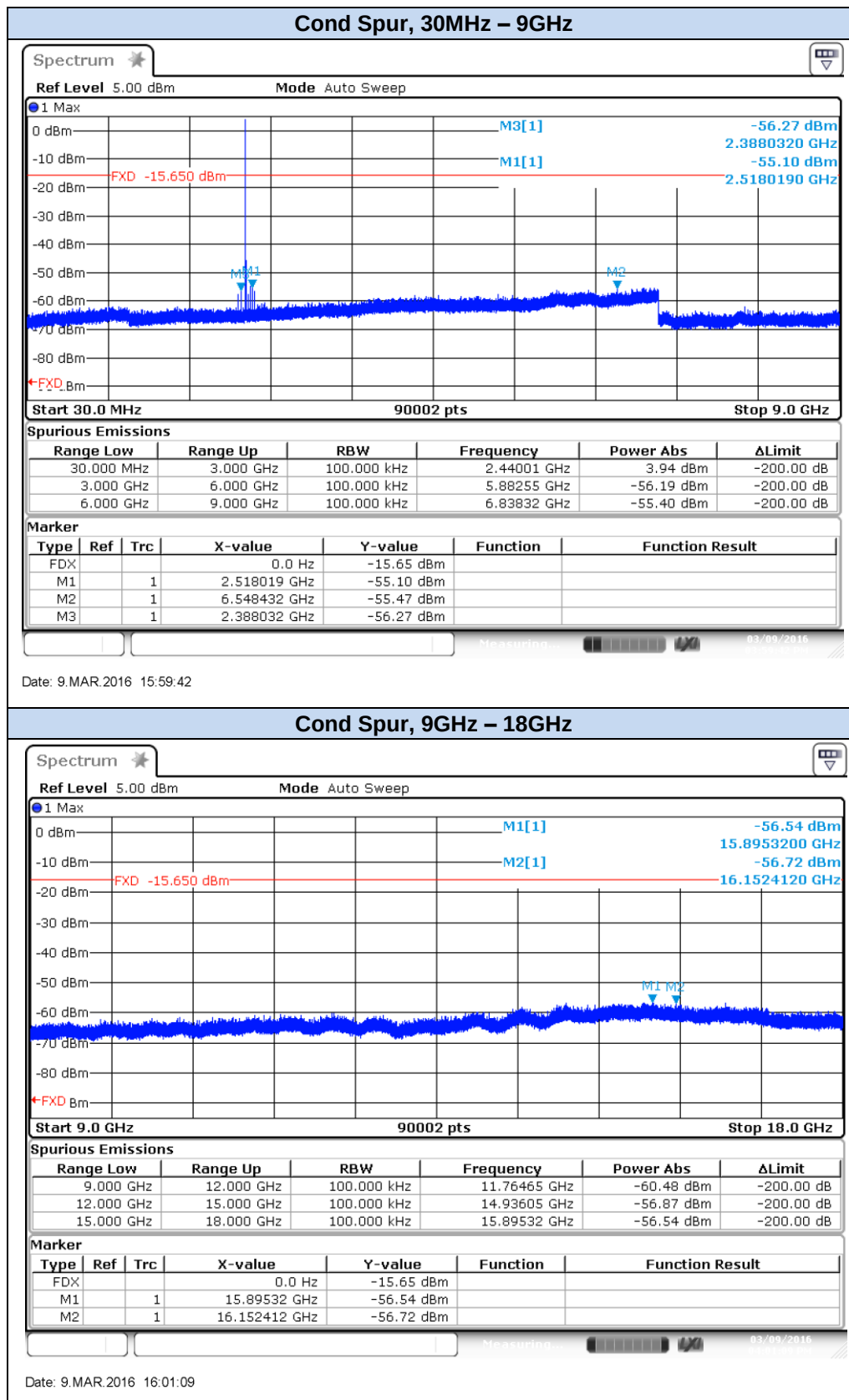
Spurious results Screenshot:

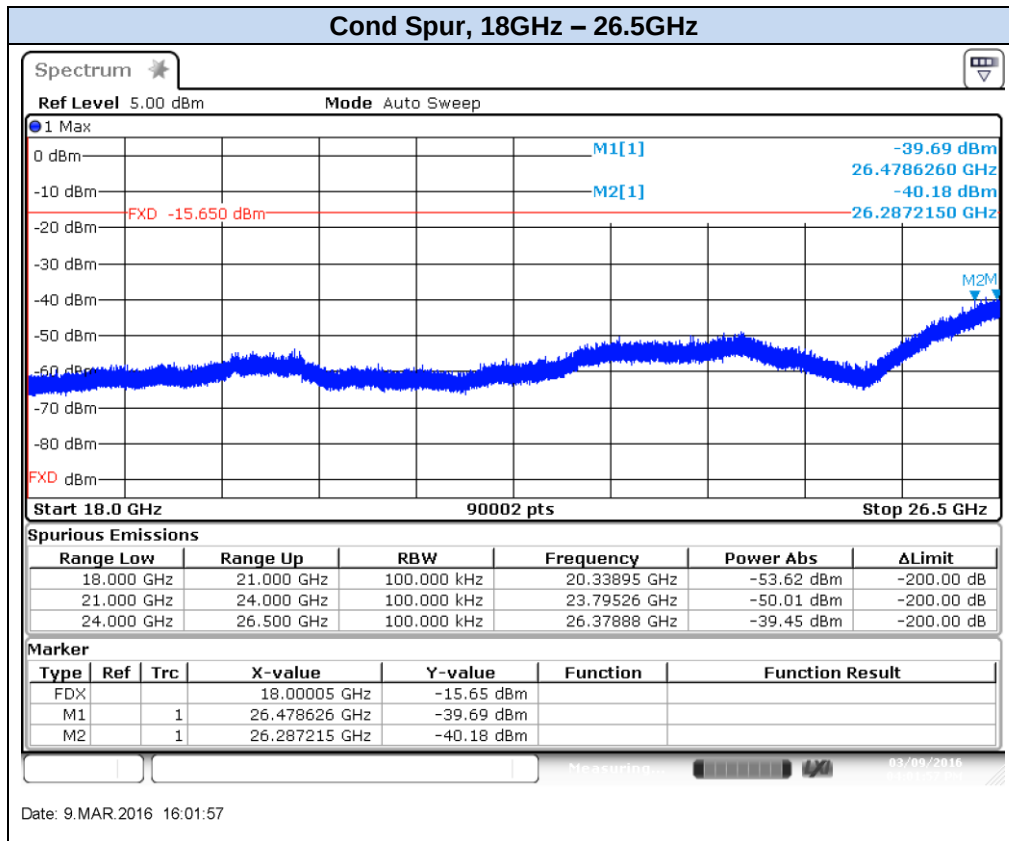
BLE, CH0



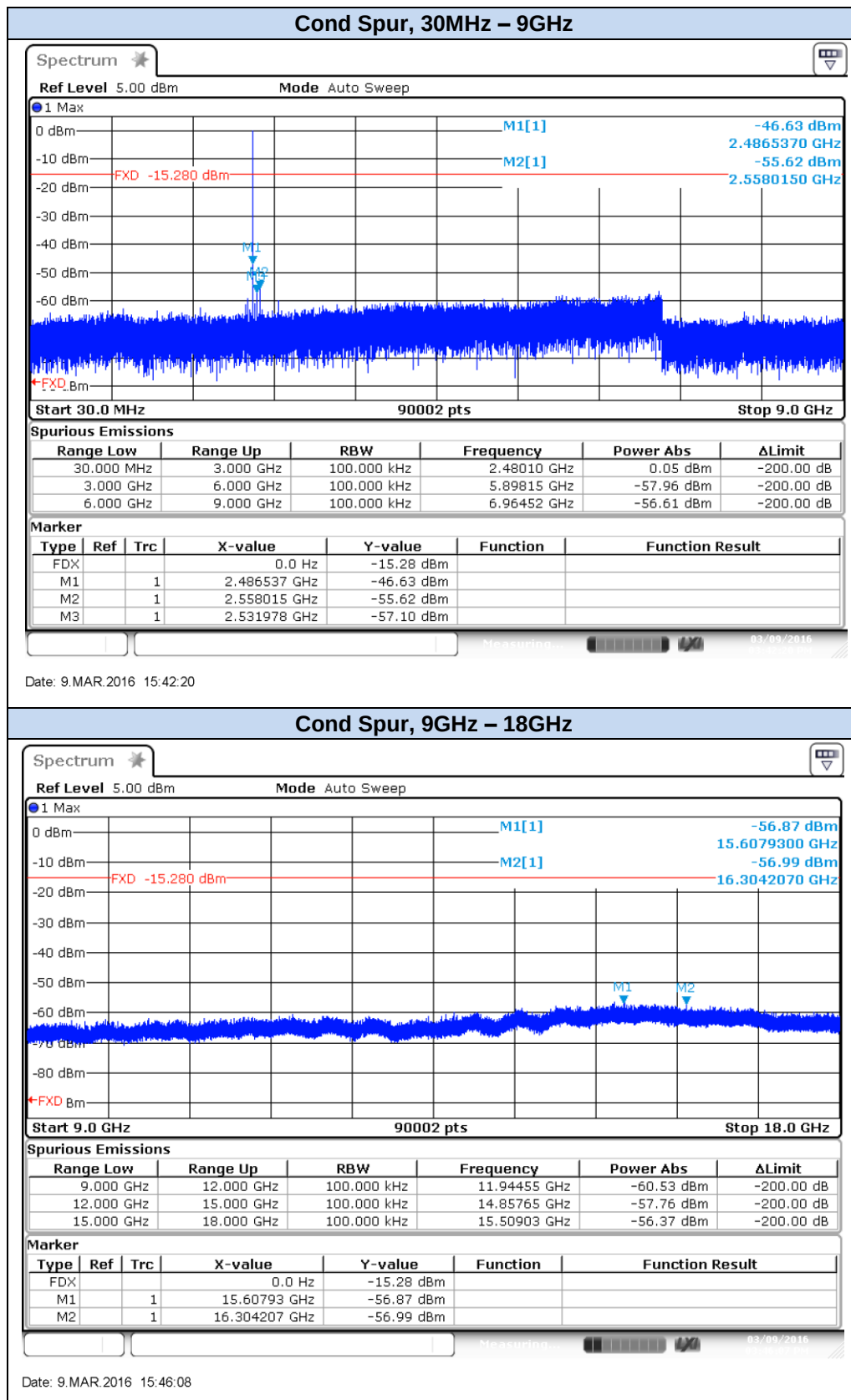


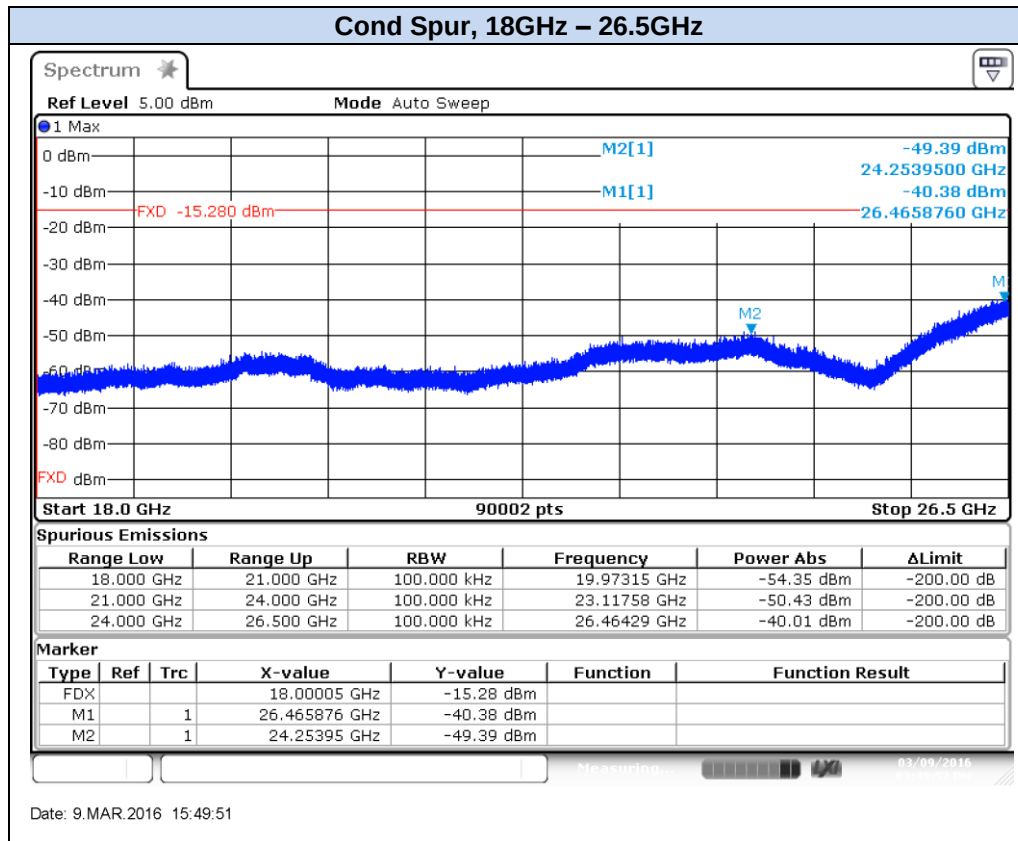
BLE, CH19





BLE, CH39





C.4 Power Spectral Density

Test limits:

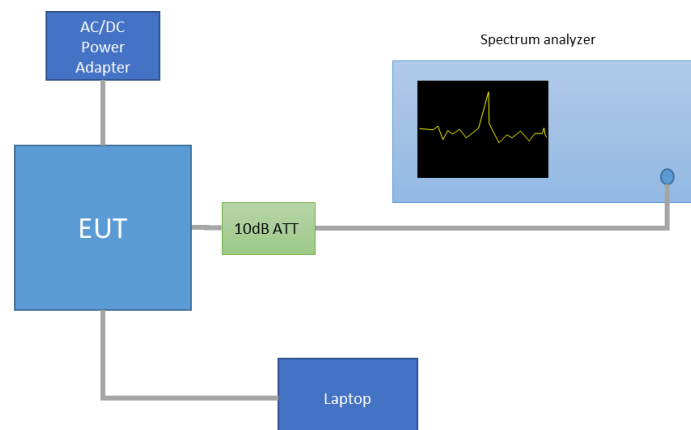
FCC part	Limits
15.247 (e)	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance 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 maximum peak power spectral density level of the fundamental emission was measured using the method PKPSD, defined in paragraph 10.2 of FCC KDB 558074 D01 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

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.

The maximum declared antenna gain is 1.5dBi.

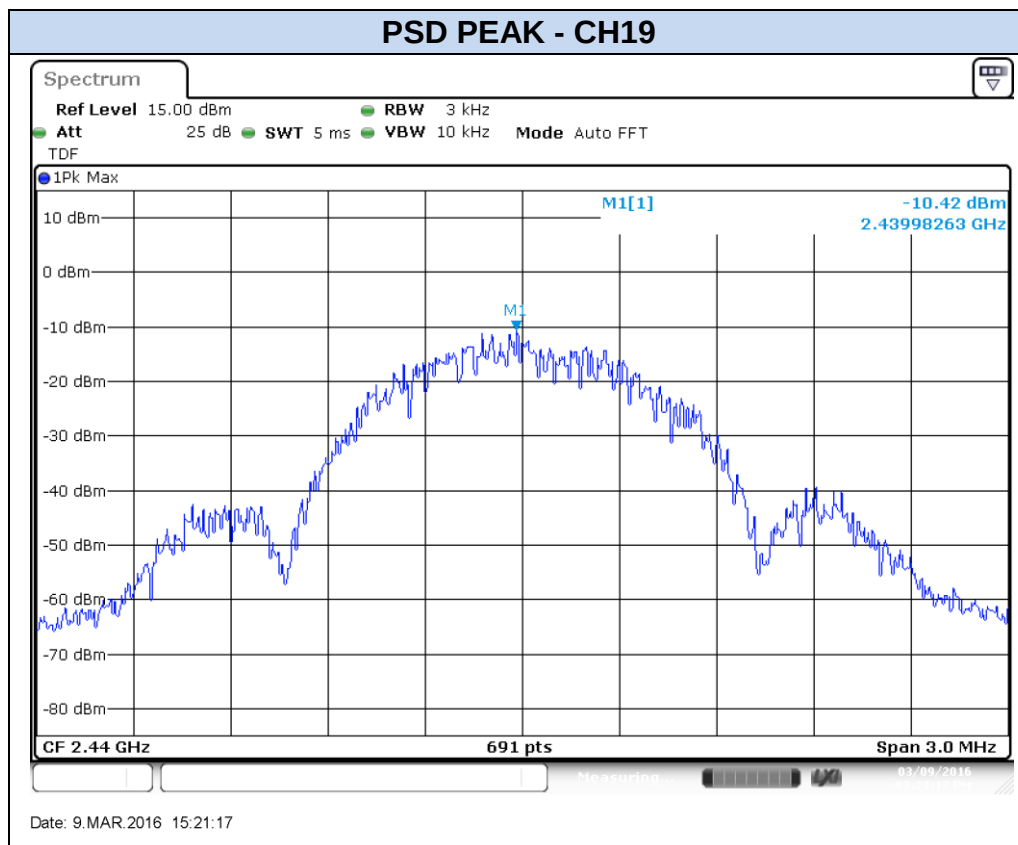
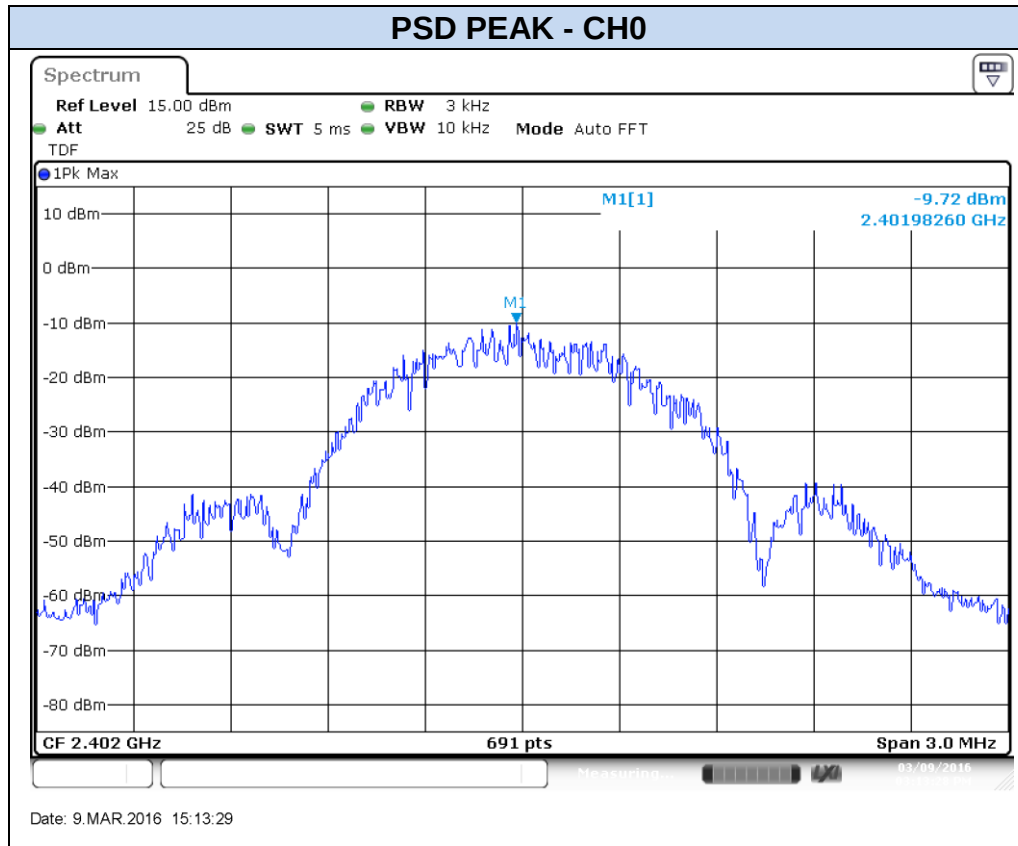


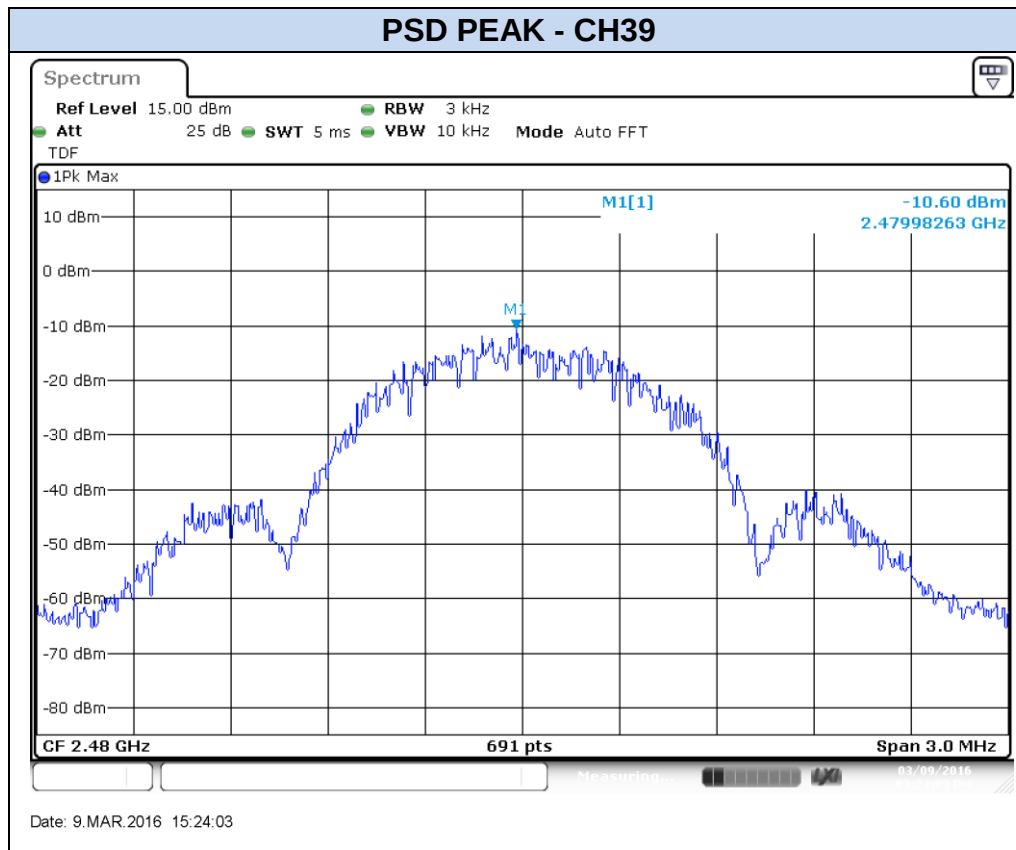
Results tables:

Mode	CH	Frequency [MHz]	PSD PEAK [dBm]
			Measured Conducted
BLE	0	2402	-9.72
	19	2440	-10.42
	39	2480	-10.60

Results screenshot:

BLE





C.5 Radiated spurious emission

Standard references:

FCC part	Limits			
15.247 (d)	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 Strength (μV/m)	Field Strength (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
	960-25000	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 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.

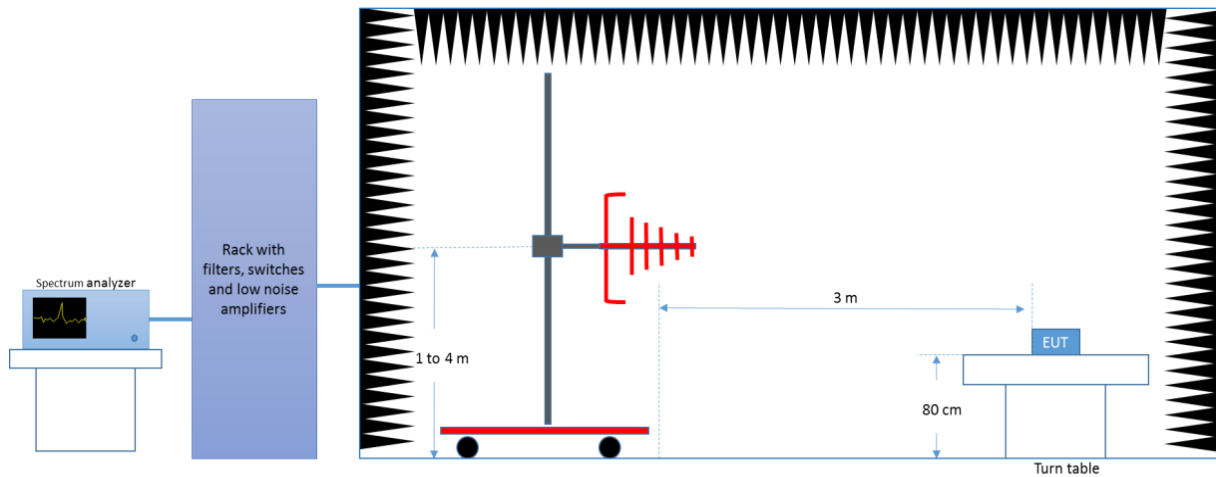
The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

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

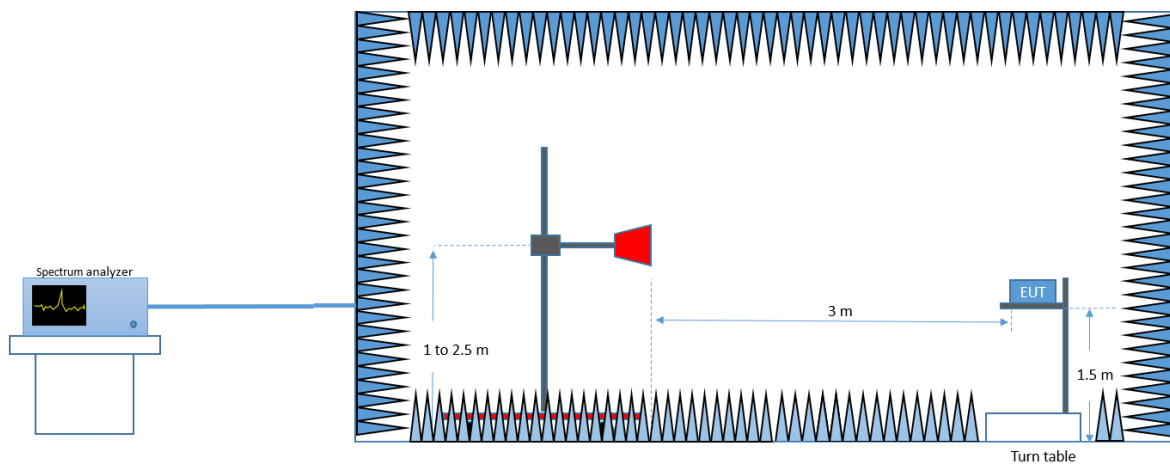
The resolution/video bandwidth used for the radiated measurement is as follows:

Freq. Range	RBW	VBW
30MHz – 1GHz	100kHz	300kHz
>1GHz	1MHz	3MHz

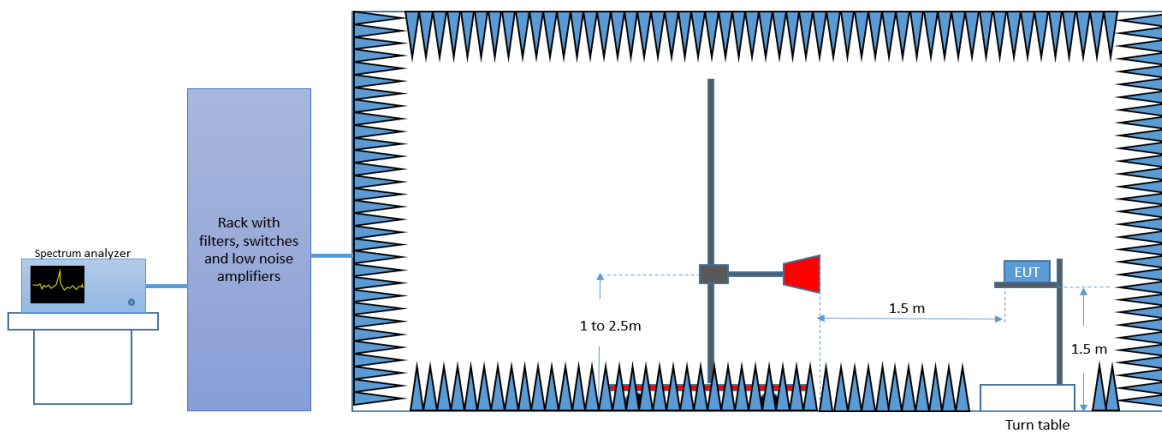
Radiated Setup < 1GHz



Radiated Setup 1GHz - 18GHz



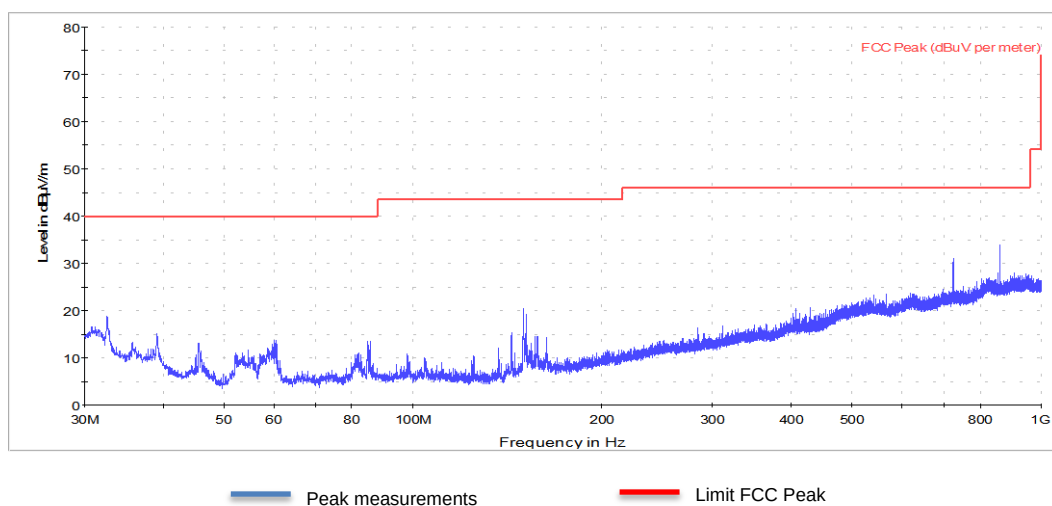
Radiated Setup > 18GHz



Test Results:

Radiated Spurious – 30MHz to 1GHz

Radiated Spurious – All Modes

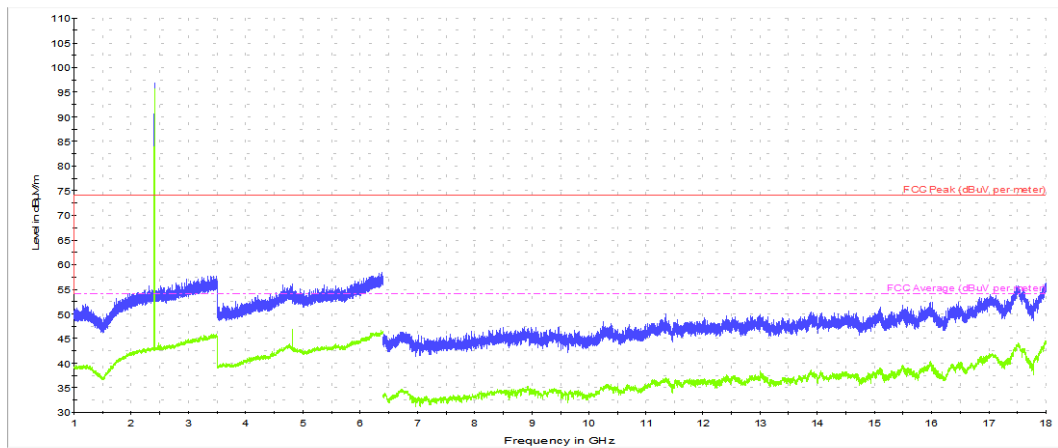


Frequency	Max Peak	Limit	Margin
MHz	dBμV/m	dBμV/m	dB
860	33.9	46	12.1

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

1 GHz – 18GHz, BLE

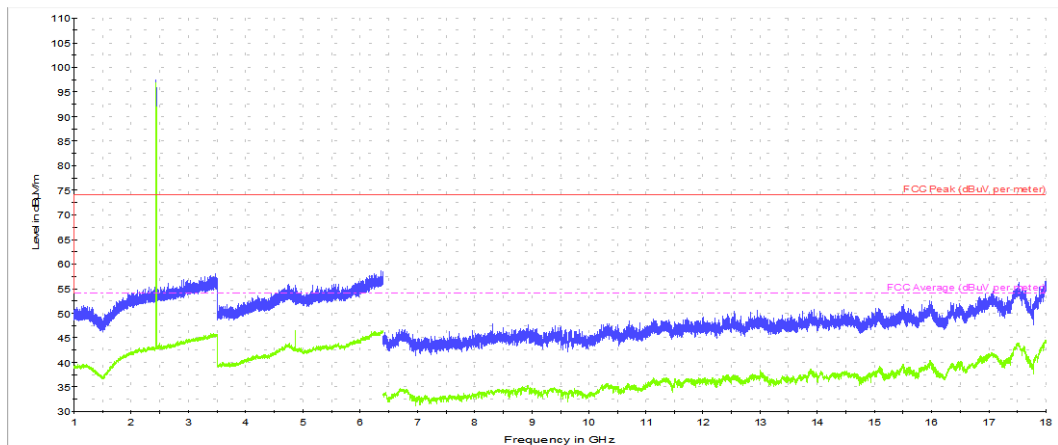
CH0



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

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
4808	54.0	-	74	20.0
4808	-	47.8	54	6.2

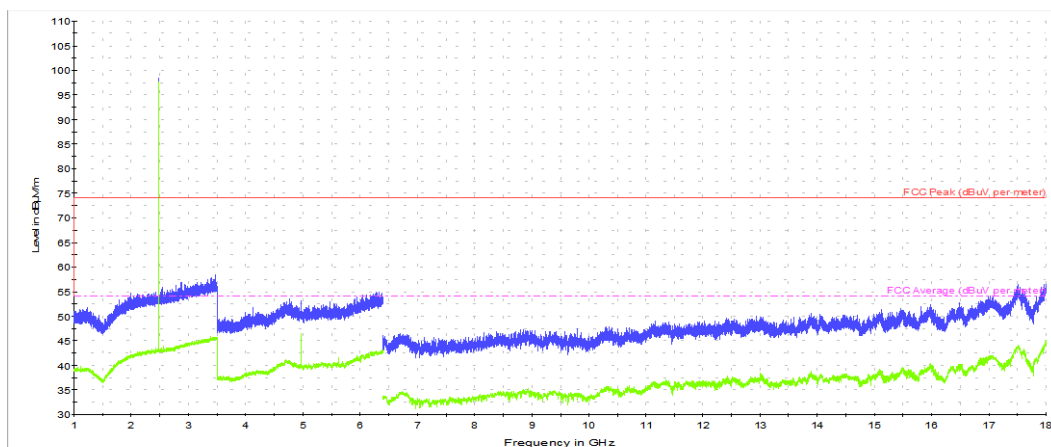
CH19



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

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
4879	55.3	-	74	18.7
4879	-	46.0	54	8.0

CH39

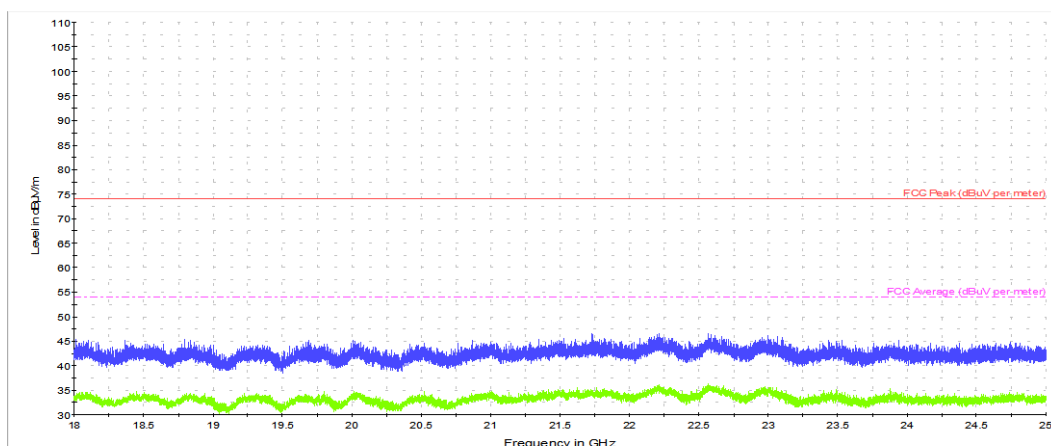


— Peak measurements
 — AVG measurements
 — Limit FCC Peak
 - - - Limit FCC AVG

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
4959	55.0	-	74	19.00
4959	-	46.1	54	7.9

Radiated Spurious – 18 GHz to 25 GHz

Radiated Spurious – All Modes



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

Frequency	Max Peak	AVG	Limit	Margin
MHz	dBμV/m	dBμV/m	dBμV/m	dB
22565	46.5	-	74	27.5
22565	-	36.4	54	17.6

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