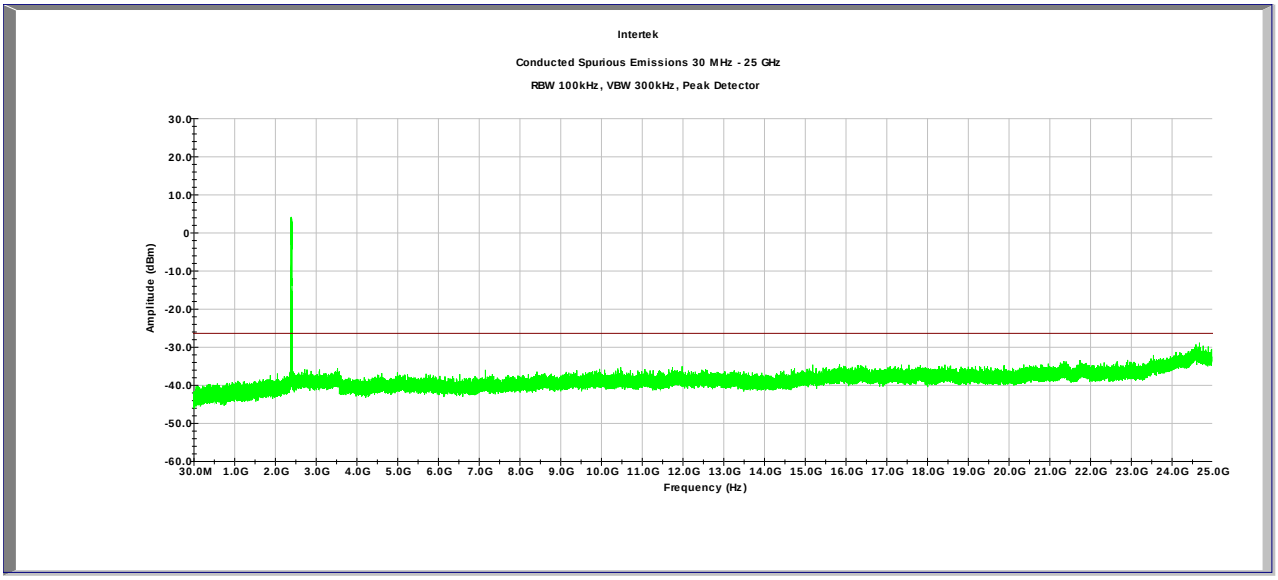
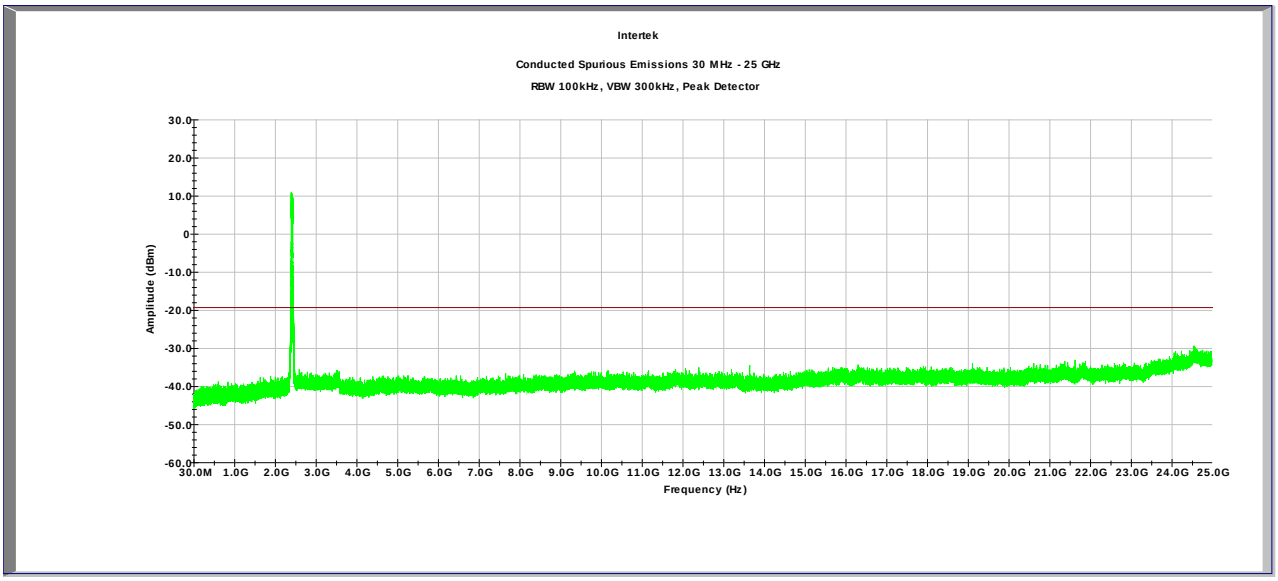
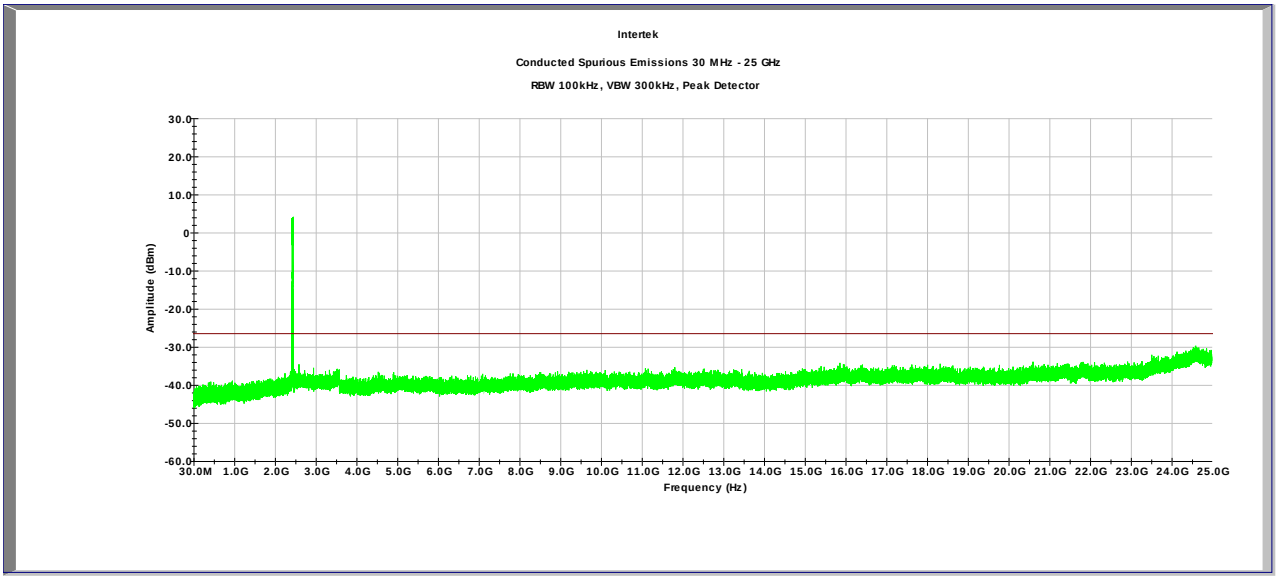
Plot 4.43
Ant 2, Tx @ 2412MHz 802.11n 40MHz



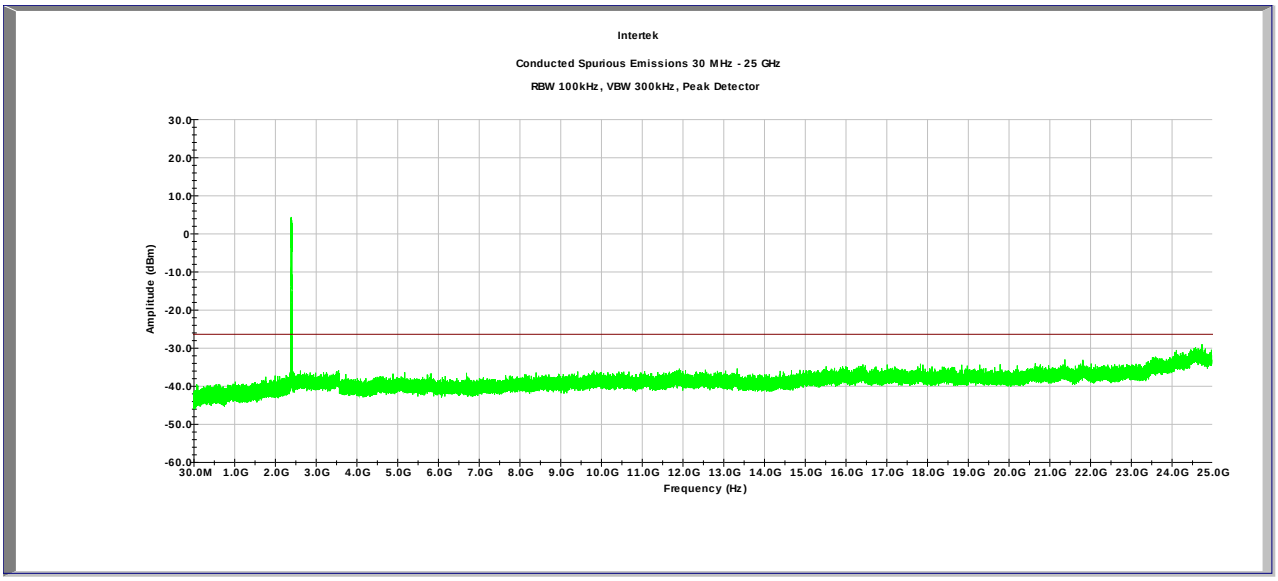
Plot 4.44
Ant 2, Tx @ 2437MHz 802.11n 40MHz



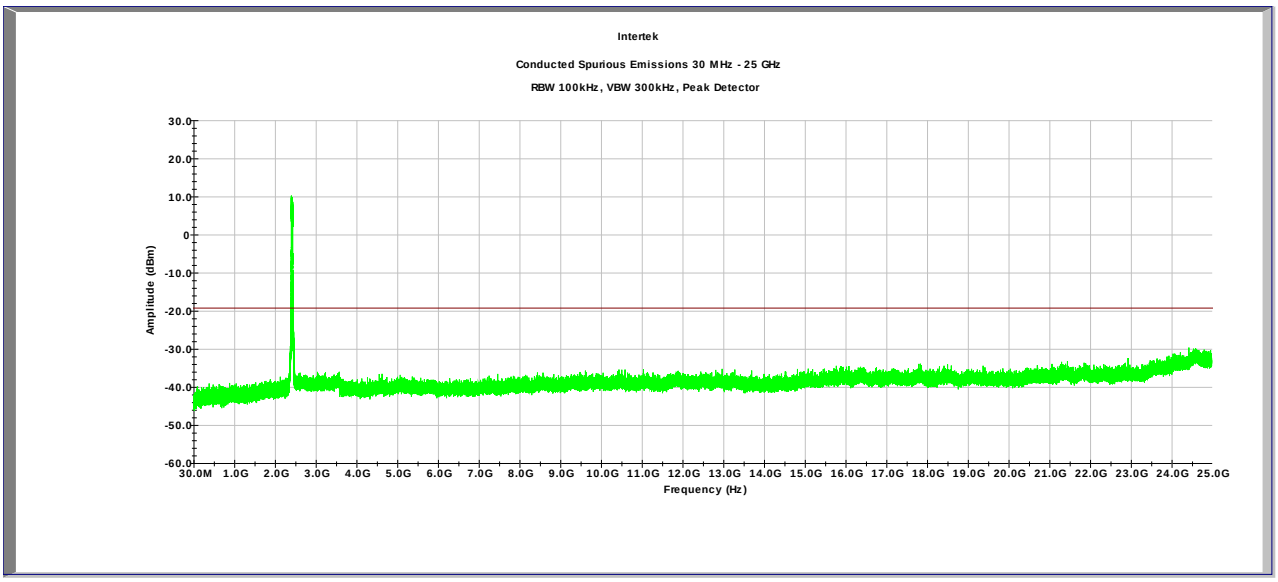
Plot 4.45
Ant 2, Tx @ 2462MHz 802.11n 40MHz



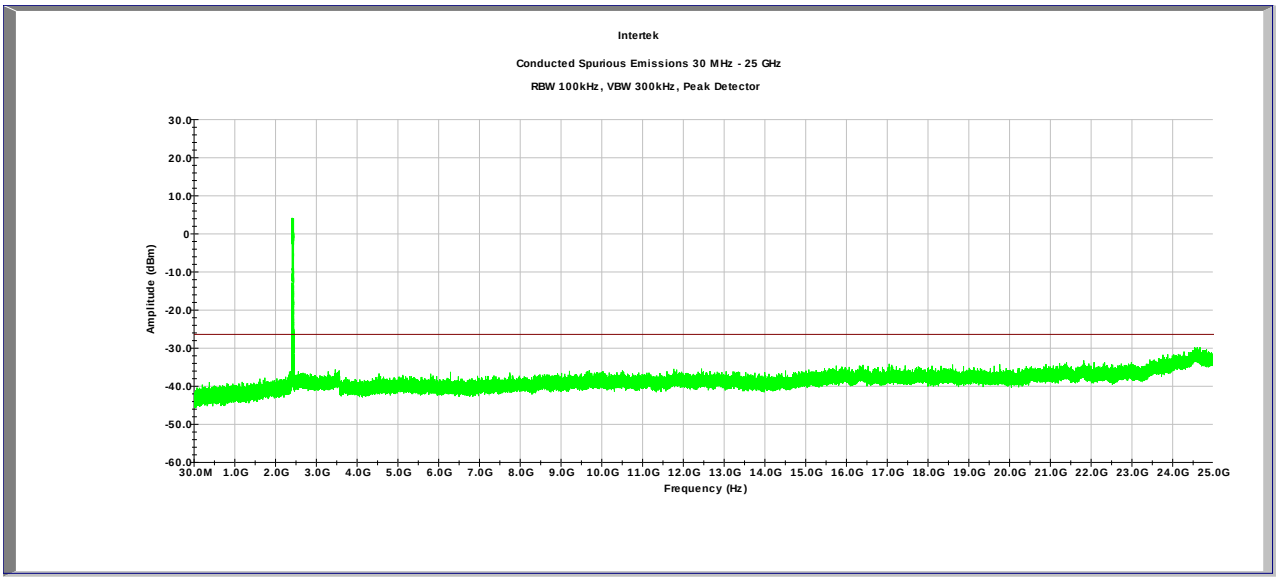
Plot 4.46
Ant 3, Tx @ 2412MHz 802.11n 40MHz



Plot 4.47
Ant 3, Tx @ 2437MHz 802.11n 40MHz



Plot 4.48
Ant 3, Tx @ 2462MHz 802.11n 40MHz



4.5 Transmitter Radiated Emissions
FCC Rule 15.247(d), 15.209, 15.205

4.5.1 Requirement

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) (see §15.205(c)).

For out of band radiated emissions (except for frequencies in restricted bands), in any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions.

4.5.2 Procedure – Radiated Emissions

Radiated emission measurements were performed from 30 MHz to 25 GHz according to the procedure described in ANSI C64.10. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz. Above 1000 MHz Peak and Average measurements were performed.

The EUT is placed on a plastic turntable that is 80 cm in height for below 1000MHz and 1.5m in height for above 1GHz. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 1 meter for Band Edge measurements. Radiated spurious emissions are taken at 3 meters for frequencies above 1 GHz and at 10 meters for frequencies below 1 GHz.

The 2.4GHz and 5GHz radio can transmit simultaneously; both of the transmitters are turned on during spurious emission to investigate for inter-modulation emission. Measurements made from 1 GHz to 18 GHz had a 2.4-2.5GHz and 5GHz (UNII-1 & UNII-3 band respectively) notch filter in place. A preamp was used from 30MHz to 26GHz.

All measurements were made with a Peak Detector and compared to QP limits for 30MHz – 1GHz. Peak and Average was investigated for 1GHz – 26GHz.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

4.5.3 Field Strength Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV); AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m).
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m.

Test Date:	September 26 – October 10, 2017

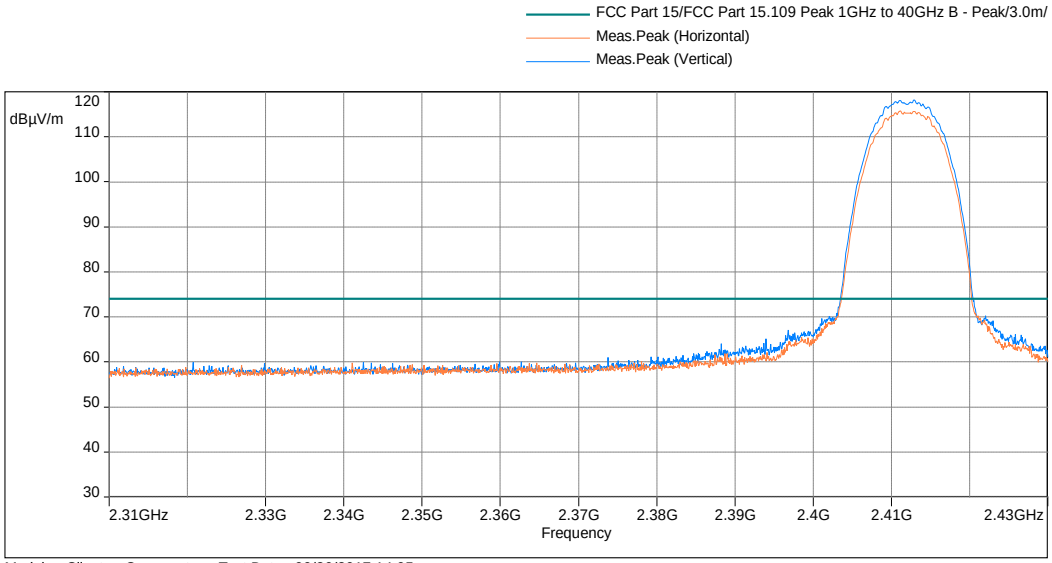
4.5.4 Test Results

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance where emissions are within 3dB of the limit.

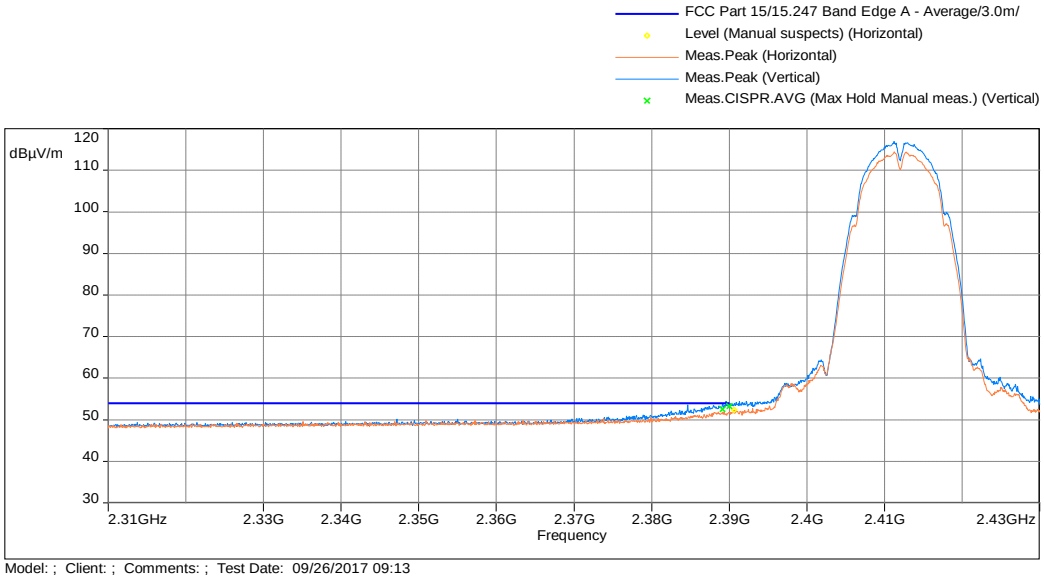
Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz.

Test Results: 15.209/15.205 Restricted Band Emissions

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11b, 2412 MHz



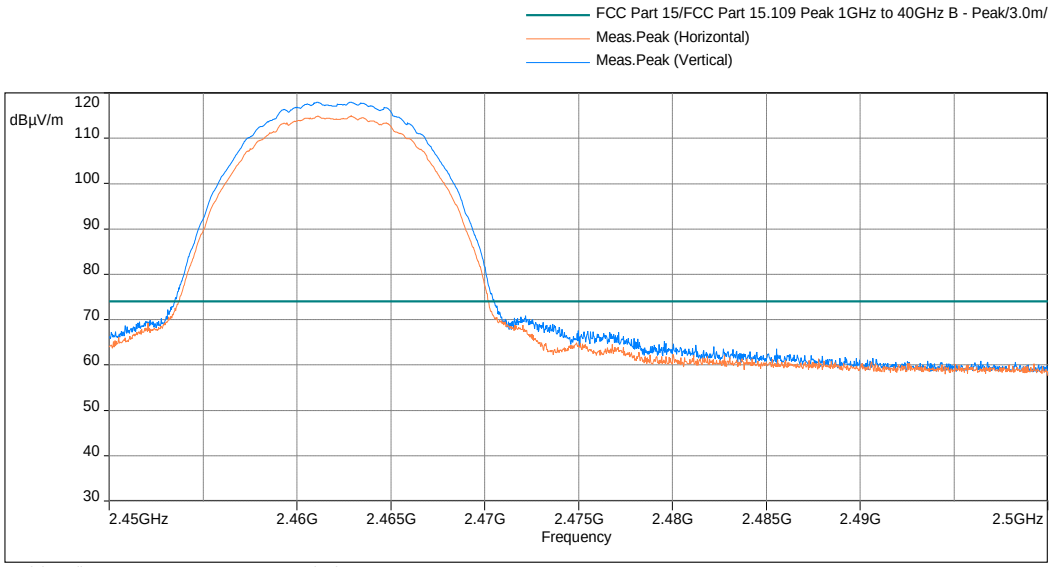
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 14:05



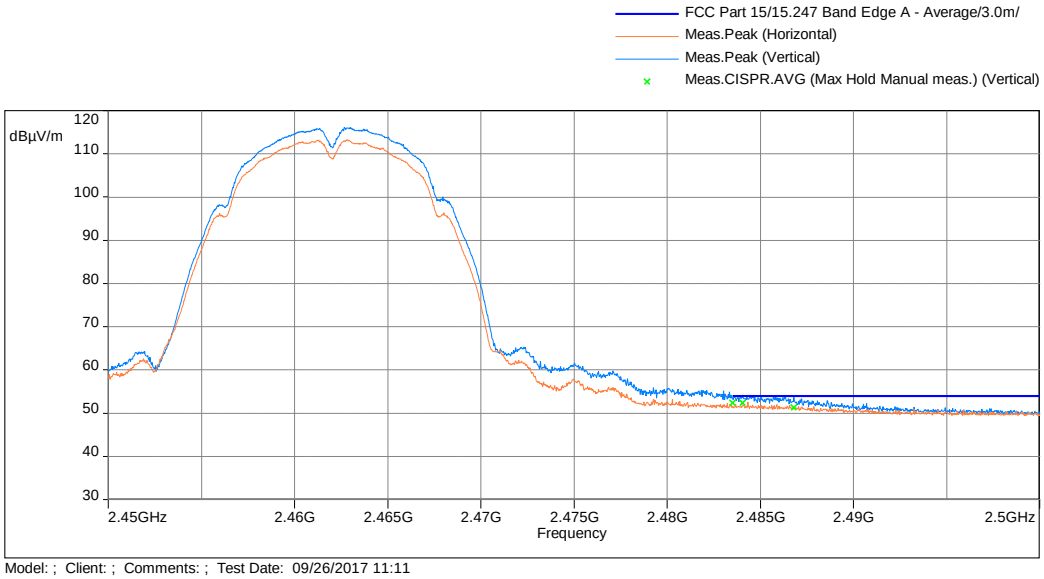
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 09:13

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2389.116	52.5	54.0	-1.5	1.8	135.8	Vertical	22.5
2390.000	53.3	54.0	-0.7	1.8	133.0	Vertical	22.5

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11b, 2462 MHz



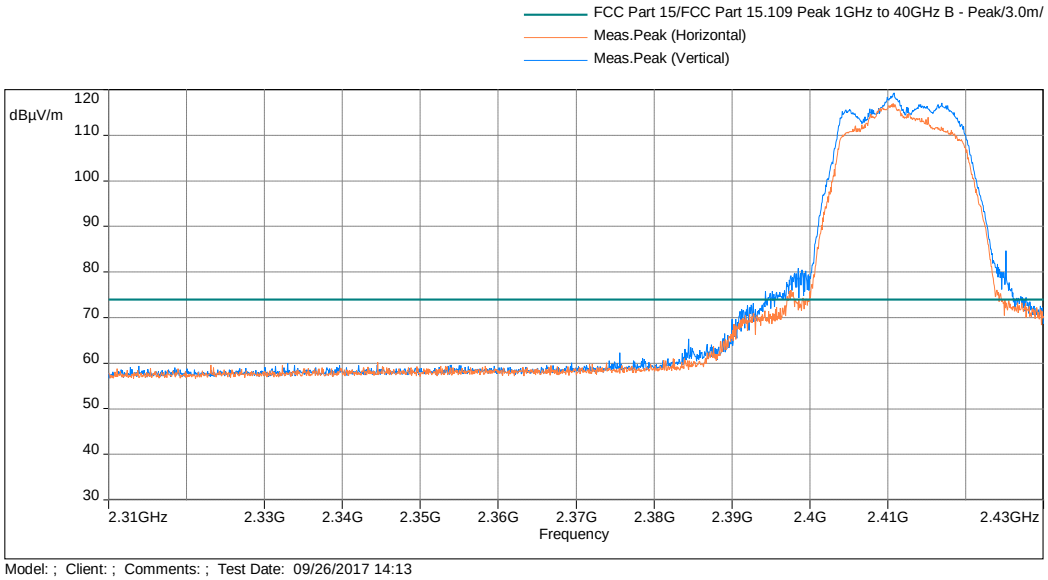
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 14:08



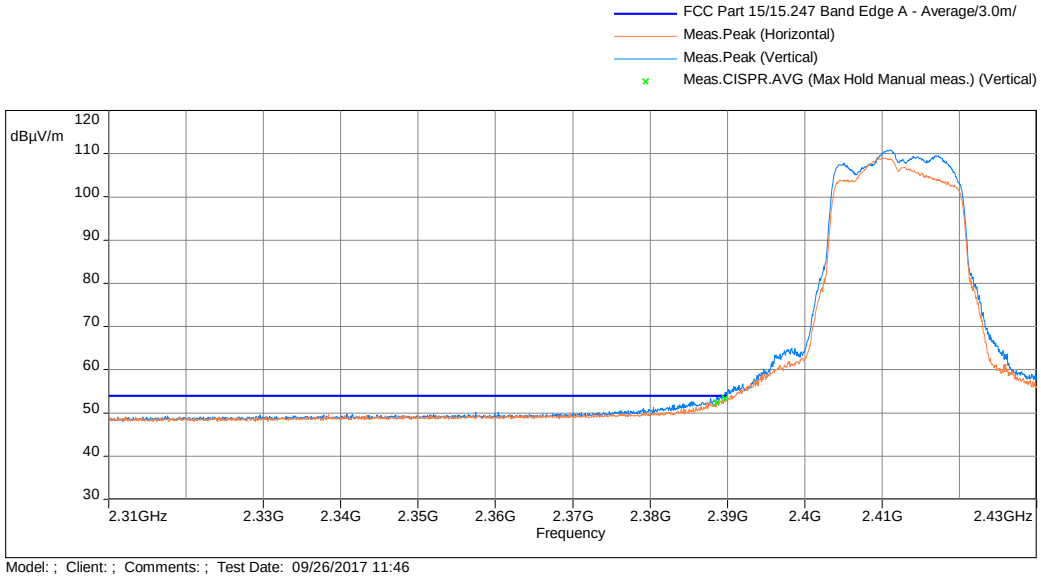
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 11:11

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.550	52.42	54	-1.58	1.81	134	Vertical	22.91
2484.170	52.43	54	-1.57	1.81	99.5	Vertical	22.91
2486.884	51.31	54	-2.69	1.81	104.75	Vertical	22.92

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11g, 2412 MHz



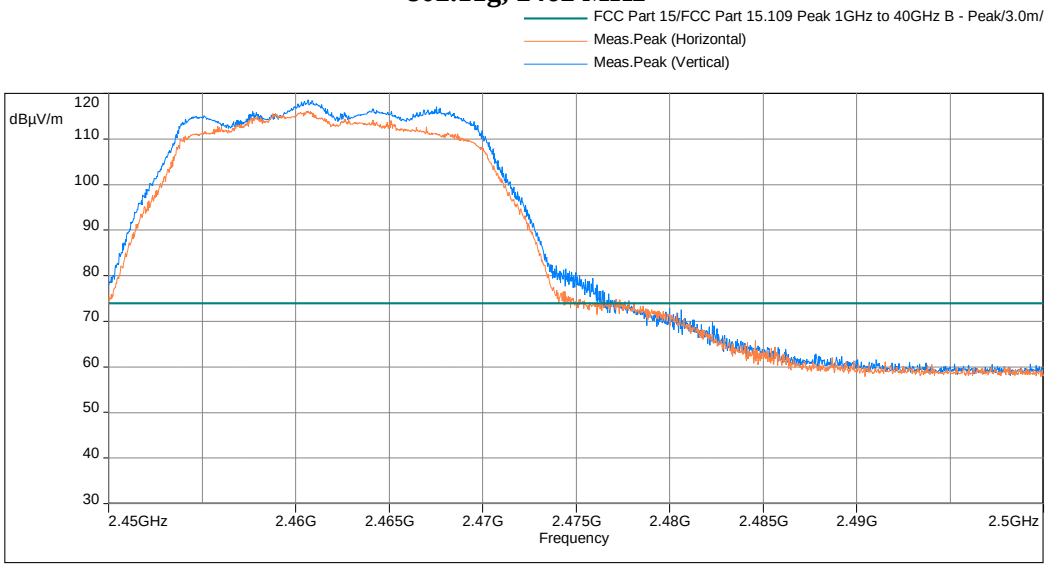
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 14:13



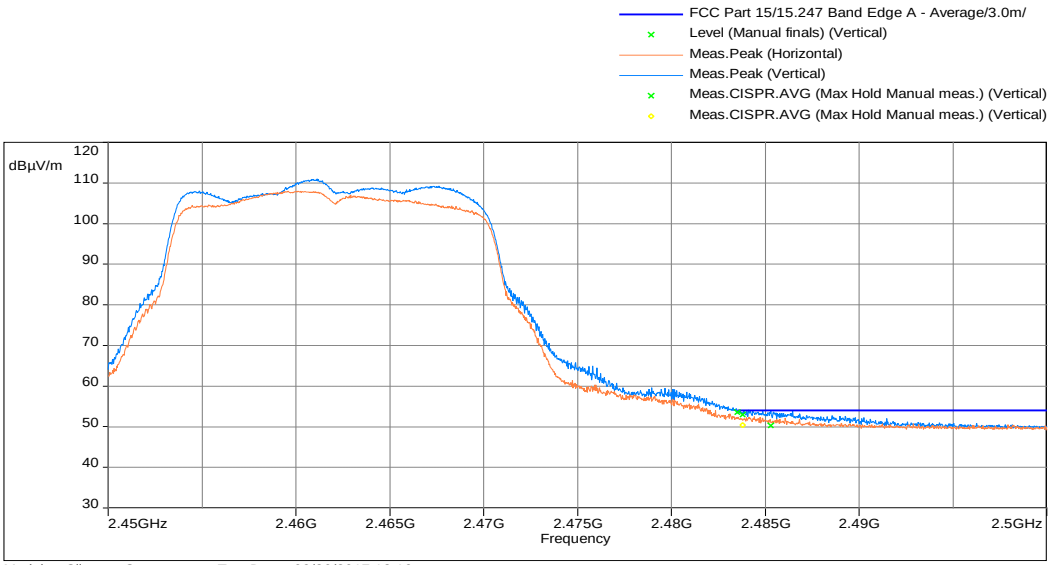
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 11:46

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2388.710	52.4	54.0	-1.6	1.8	138.0	Vertical	22.5
2389.831	53.3	54.0	-0.7	1.5	137.5	Vertical	22.5

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11g, 2462 MHz



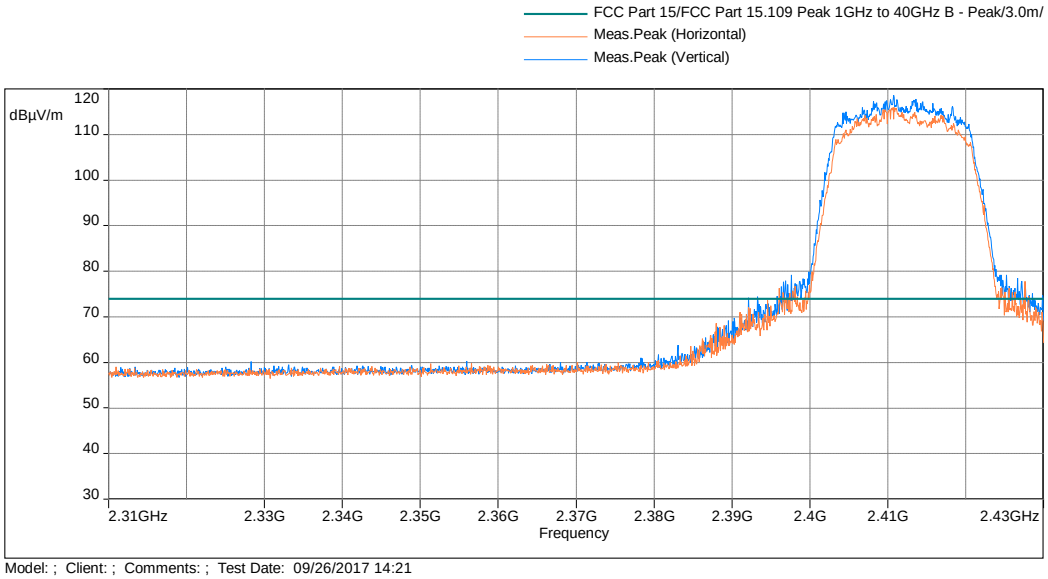
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 14:17



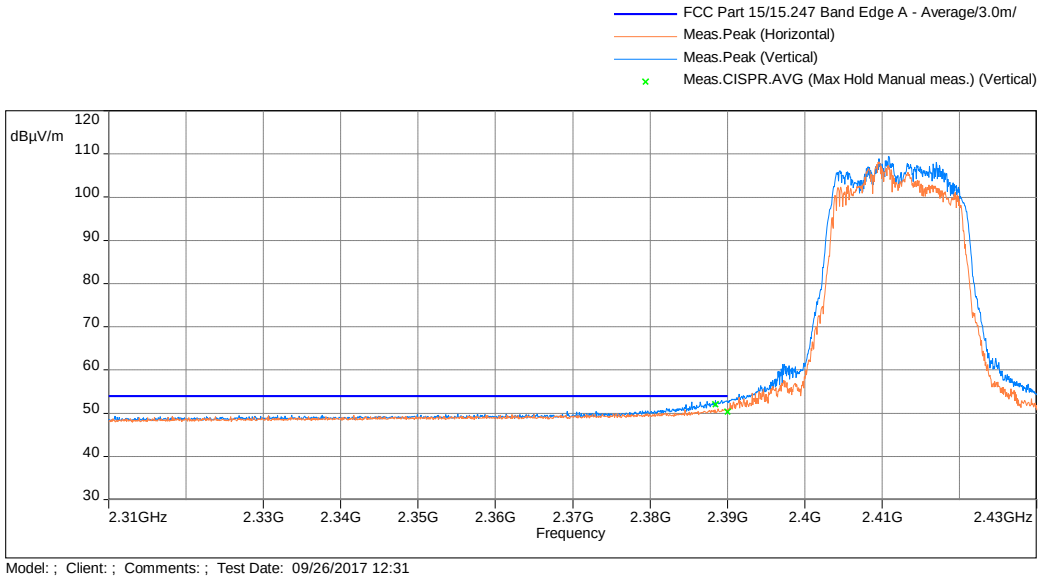
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 12:10

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.639	53.6	54.0	-0.4	1.9	142.5	Vertical	22.9
2485.514	50.3	54.0	-3.7	1.9	146.8	Vertical	22.9

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11n 20MHz, 2412 MHz



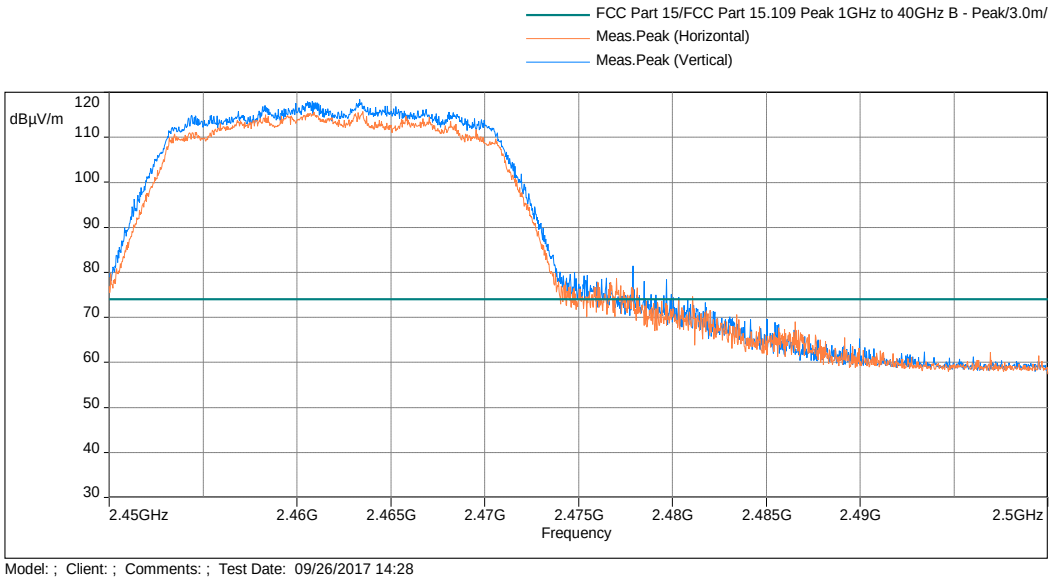
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 14:21



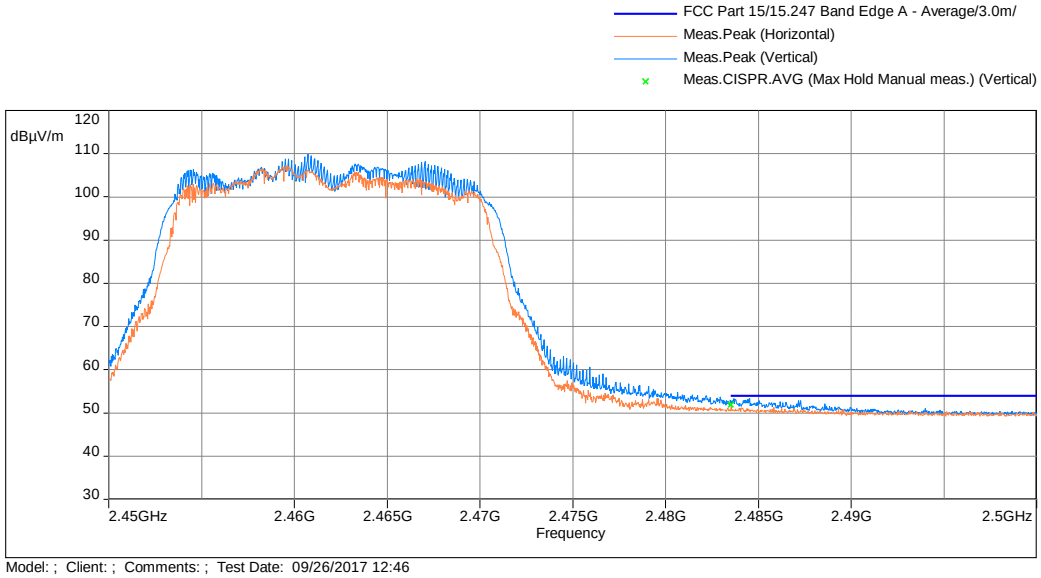
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 12:31

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2388.569	52.0	54.0	-2.0	1.8	133.5	Vertical	22.5
2390.000	50.4	54.0	-3.6	1.5	140.3	Vertical	22.5

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11n 20MHz, 2462 MHz



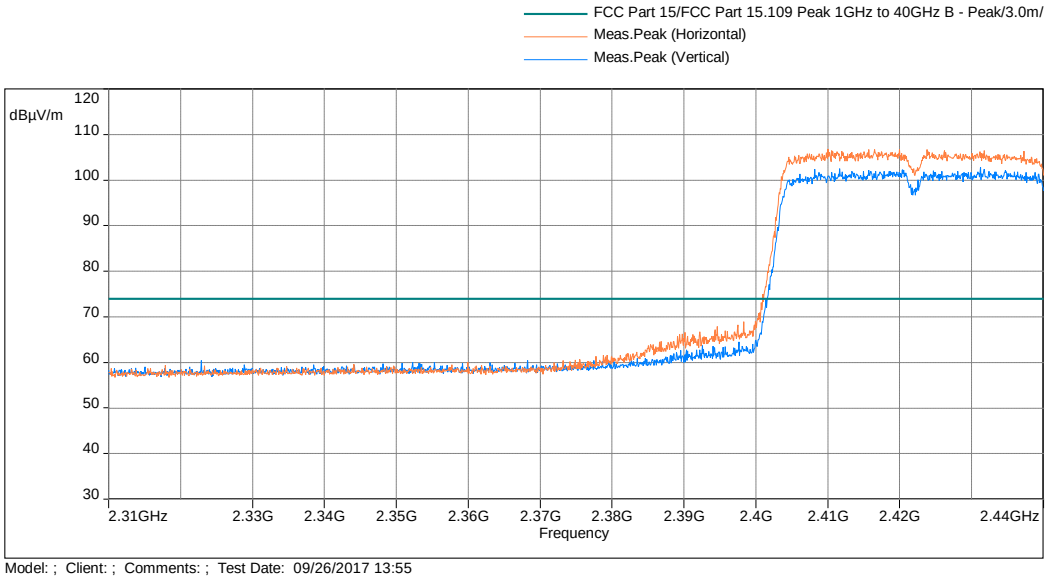
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 14:28



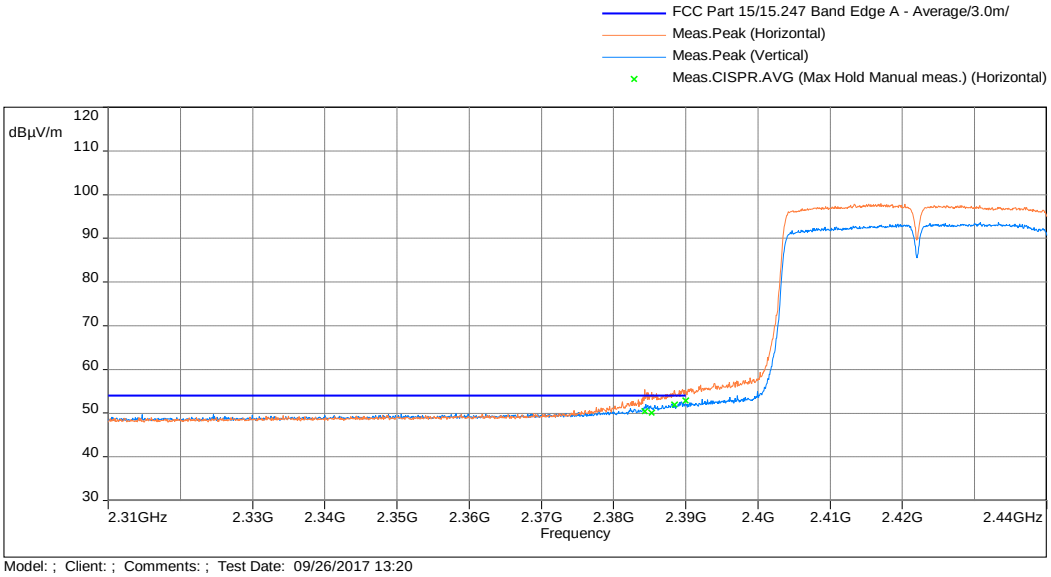
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 12:46

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.5	52.0	54.0	-2.0	1.8	138.3	Vertical	22.9

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11n 40MHz, 2412 MHz



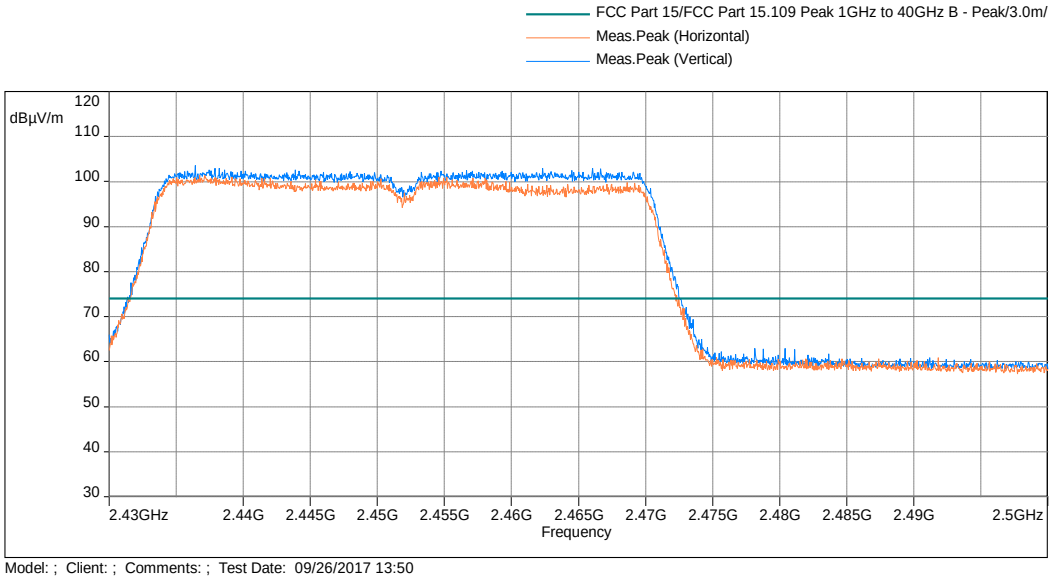
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 13:55



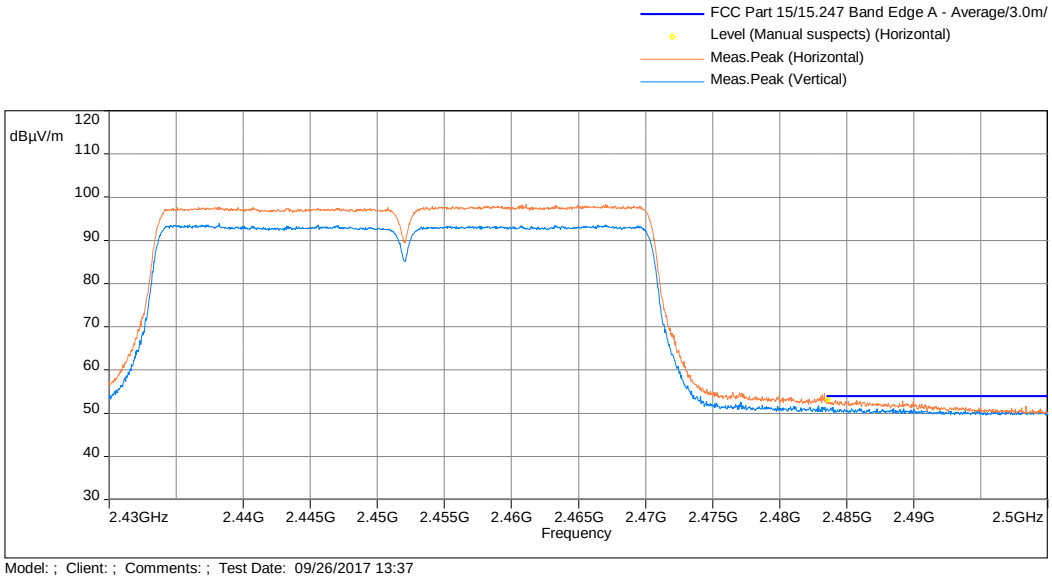
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 13:20

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2384.456	50.4	54.0	-3.6	2.3	331.0	Horizontal	22.4
2385.206	50.1	54.0	-3.9	1.7	340.5	Horizontal	22.5
2388.832	52.0	54.0	-2.0	1.7	340.5	Horizontal	22.5
2390.000	52.9	54.0	-1.1	2.2	331.0	Horizontal	22.5

Out-of-Band Radiated Spurious Emissions at the Band Edge @1m Distance
802.11n 40MHz, 2462 MHz



Model: ; Client: ; Comments: ; Test Date: 09/26/2017 13:50

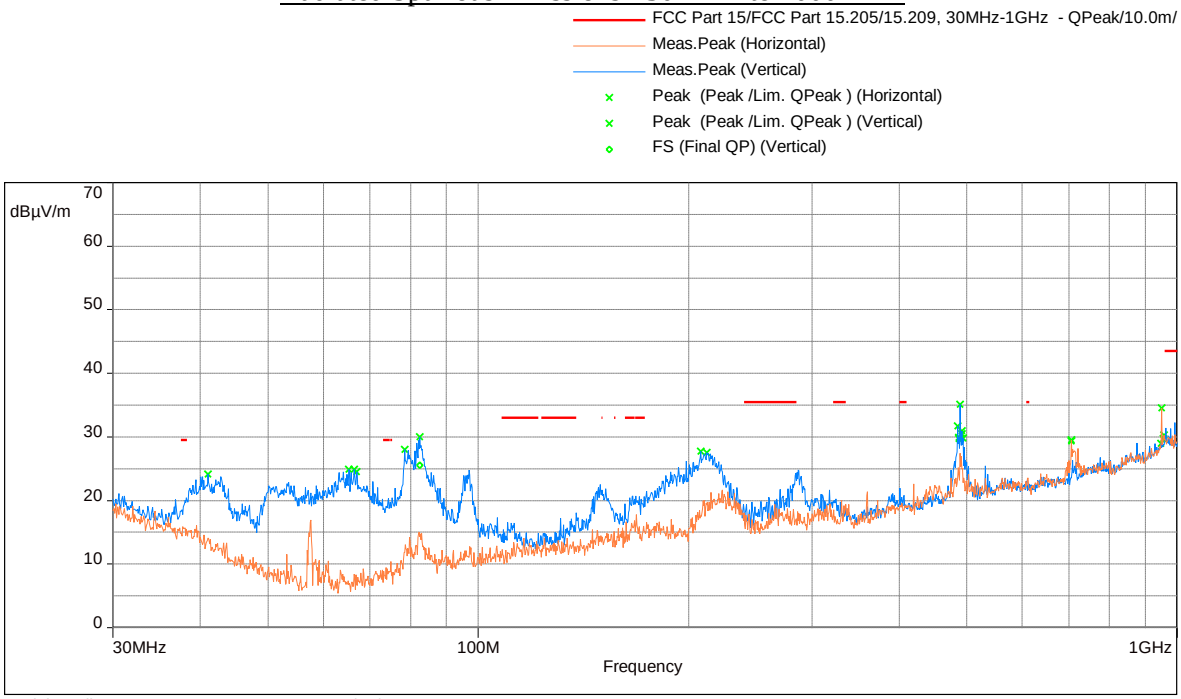


Model: ; Client: ; Comments: ; Test Date: 09/26/2017 13:37

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Polarization	Correction (dB)
2483.500	53.3	54.0	-0.7	1.5	324.0	Horizontal	22.9

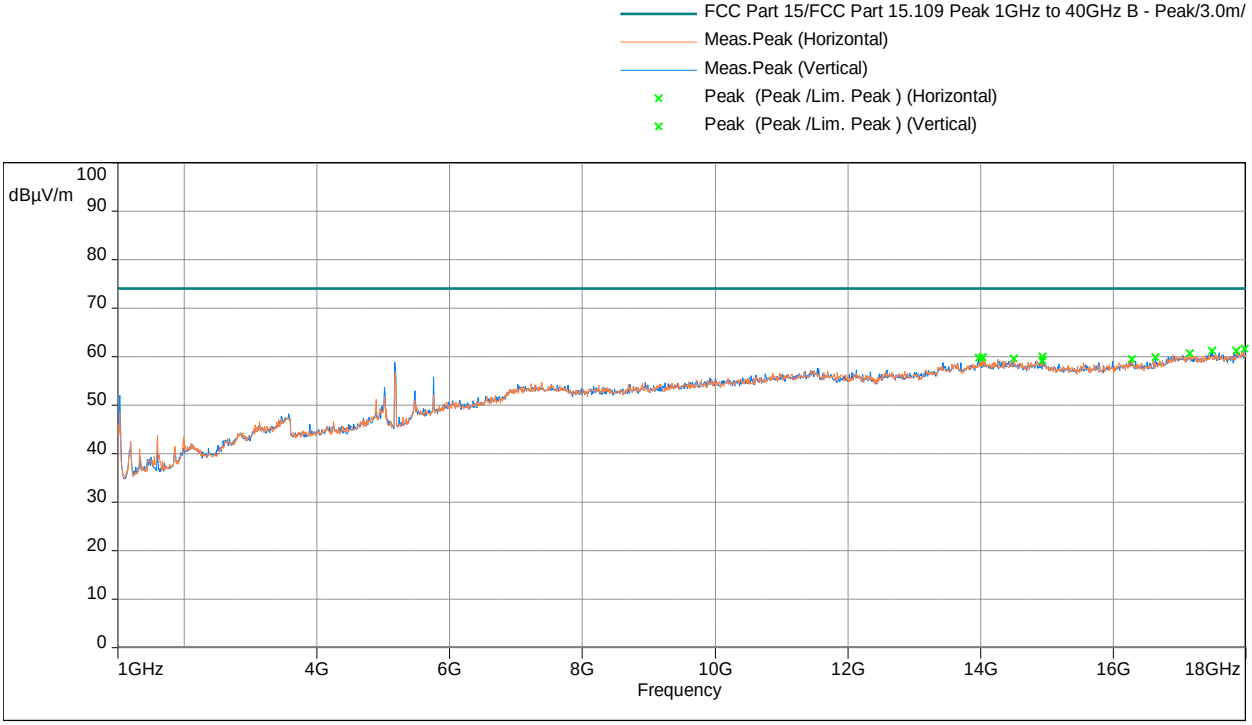
Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 802.11b 2412MHz, and 802.11a 5180MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



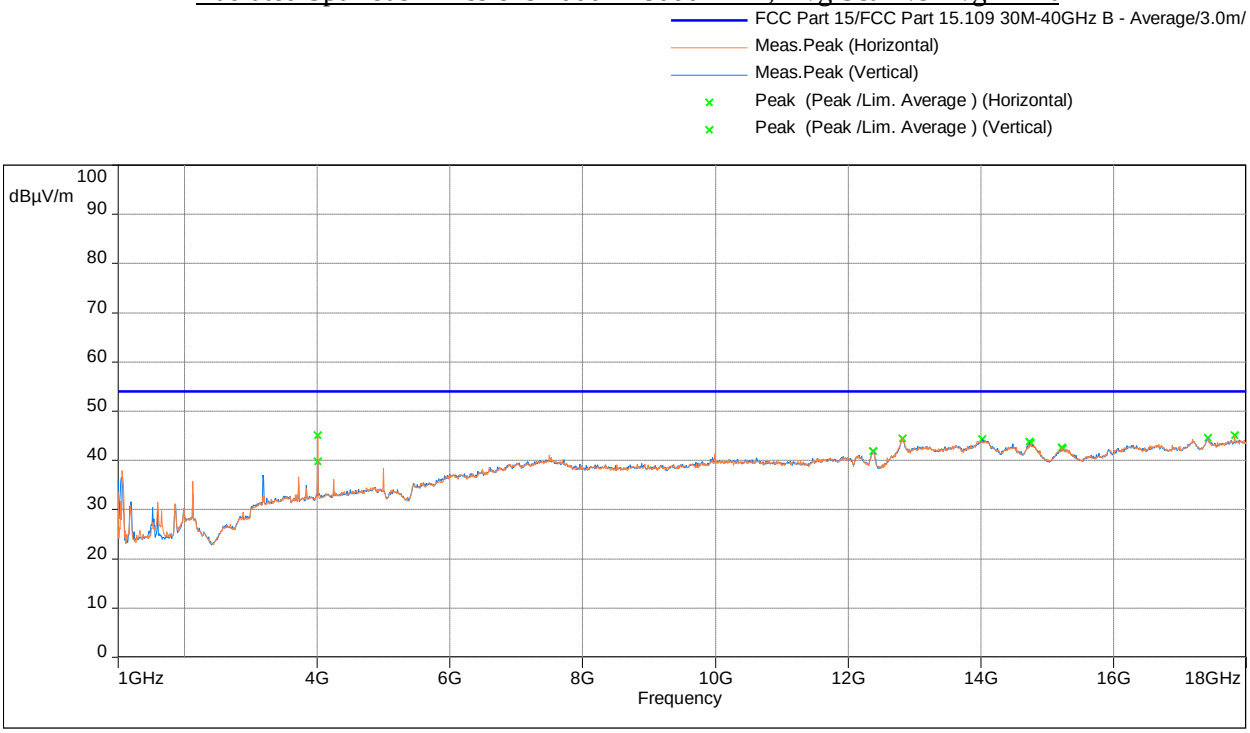
Model: ; Client: ; Comments: ; Test Date: 09/22/2017 16:00

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 10:56

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit

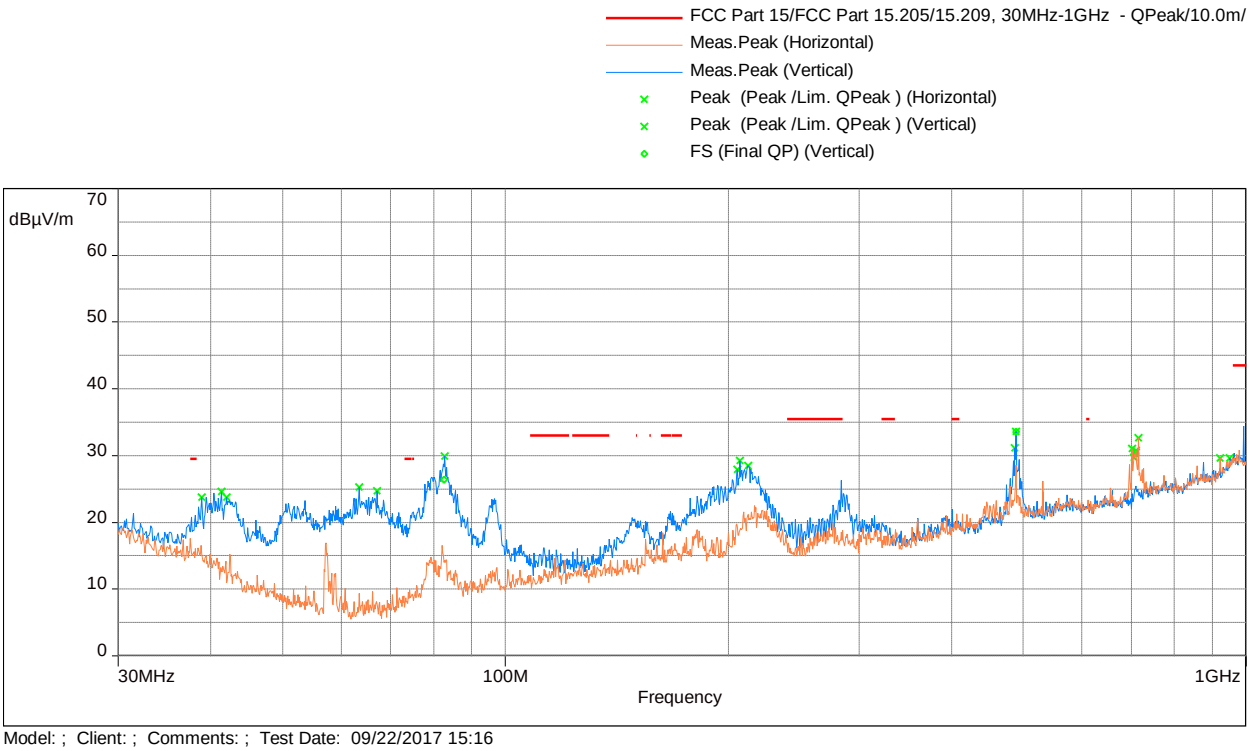


Model: ; Client: ; Comments: ; Test Date: 09/28/2017 11:56

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

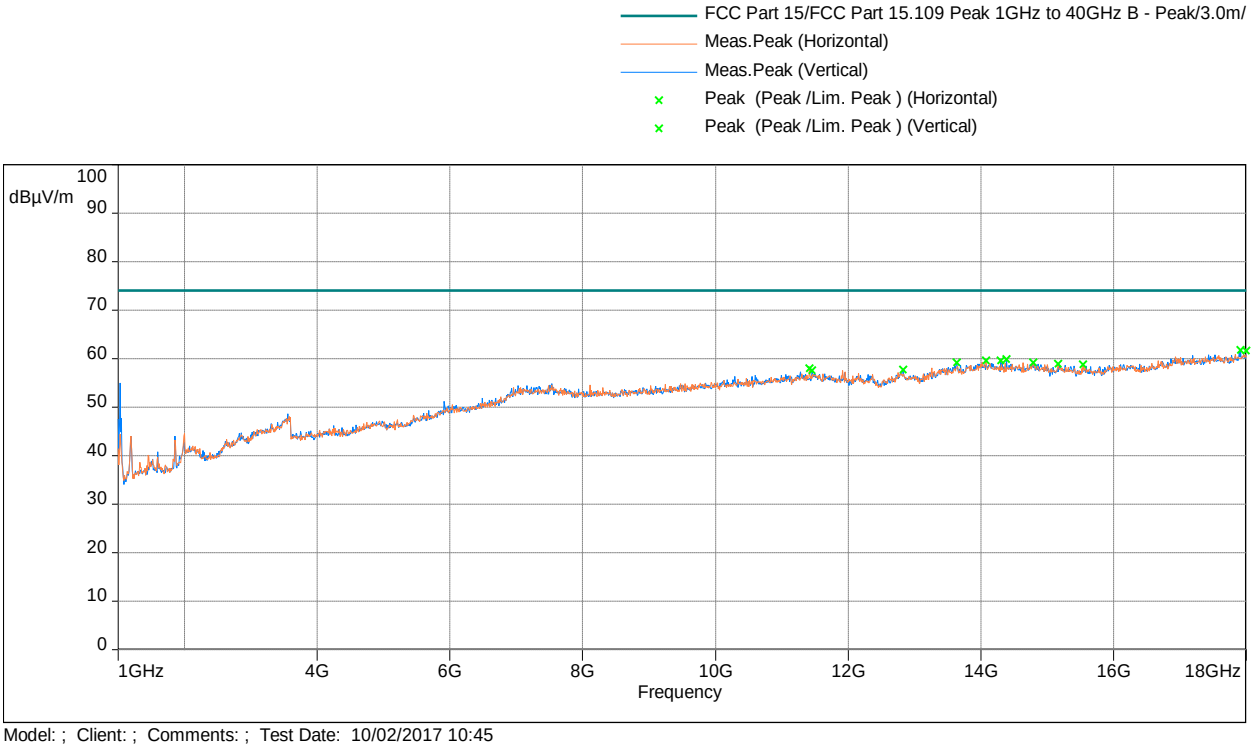
Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 802.11b 2437MHz, and 802.11a 5200MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



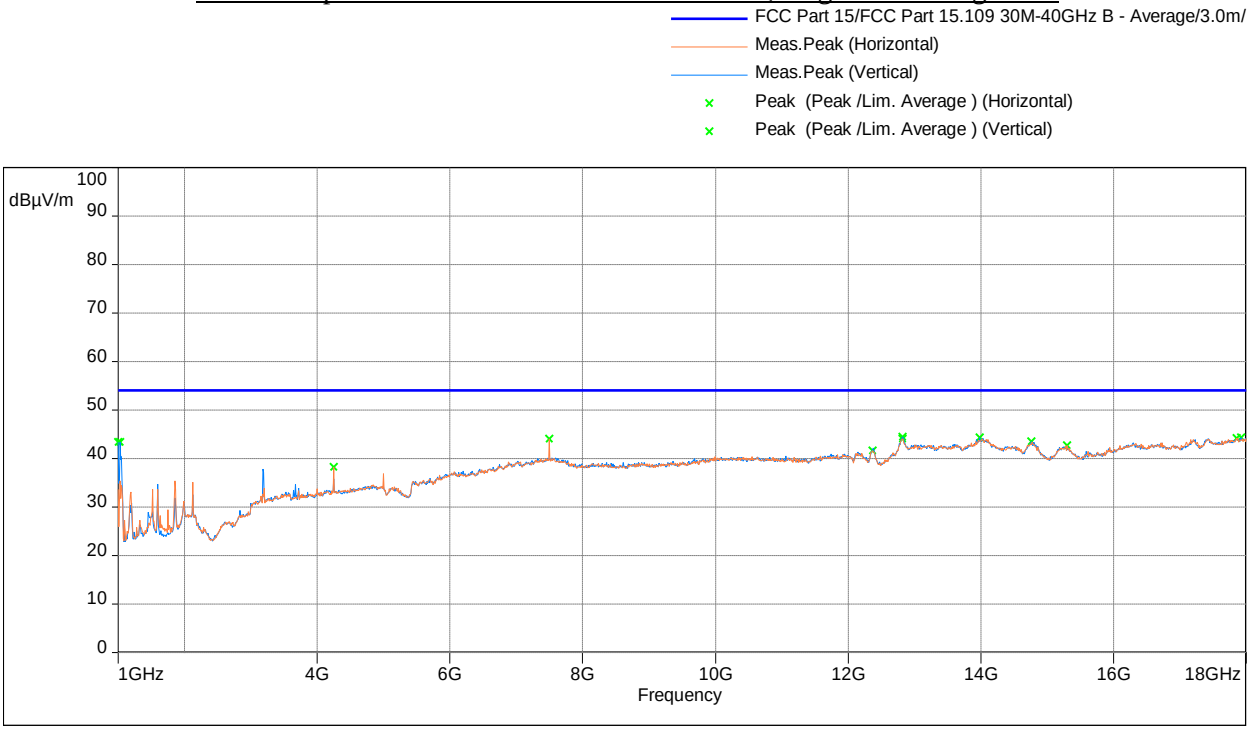
Model: ; Client: ; Comments: ; Test Date: 09/22/2017 15:16

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 10:45

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit

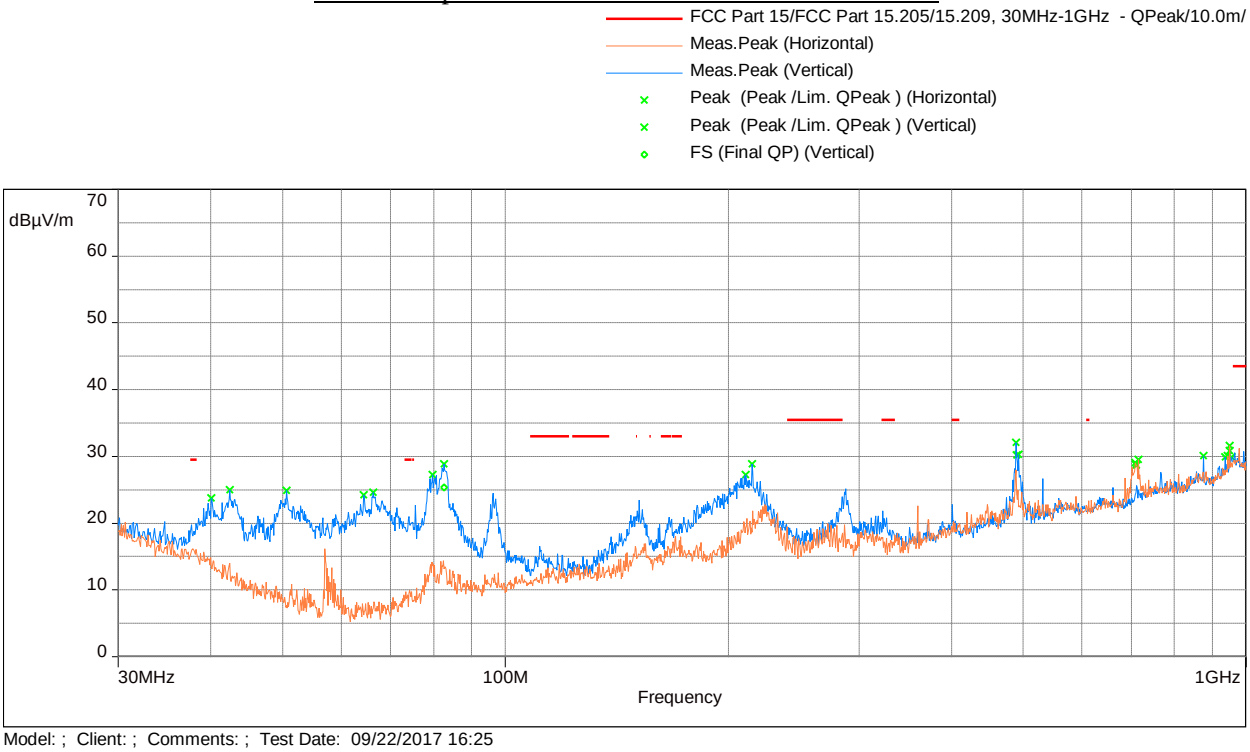


Model: ; Client: ; Comments: ; Test Date: 10/02/2017 10:32

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

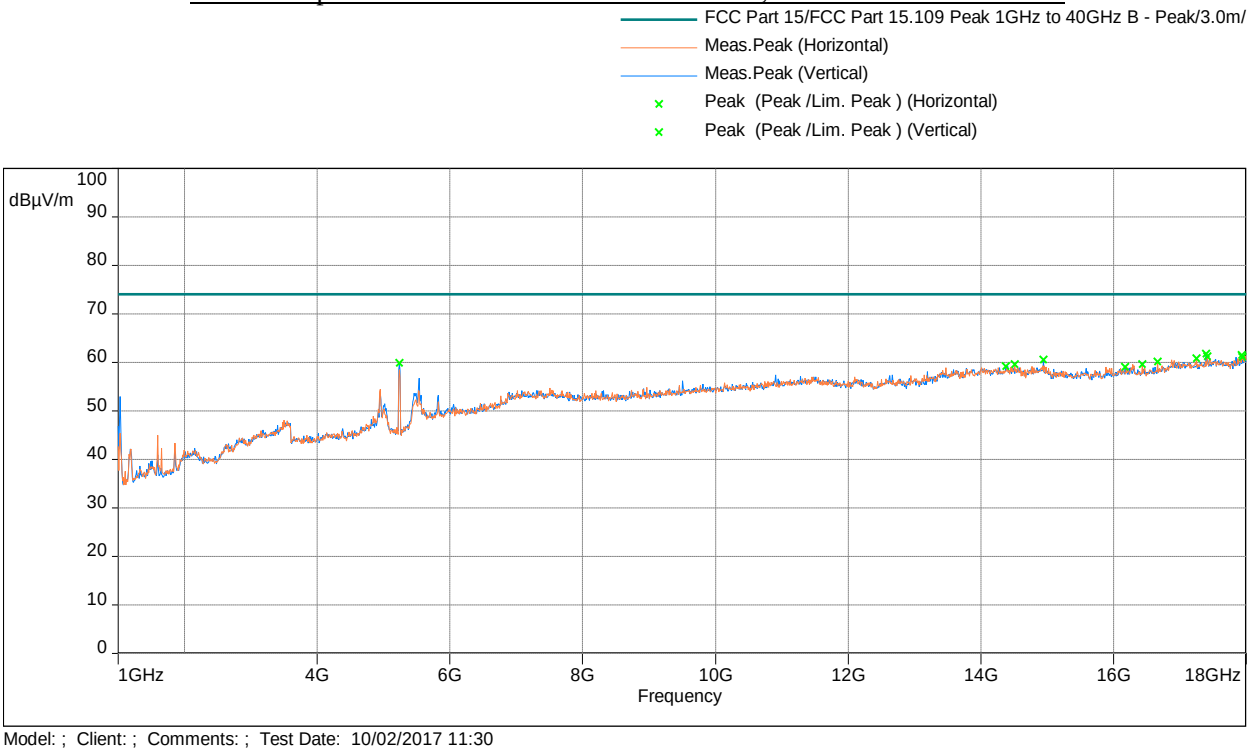
Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 802.11b 2462MHz, and 802.11a 5240MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



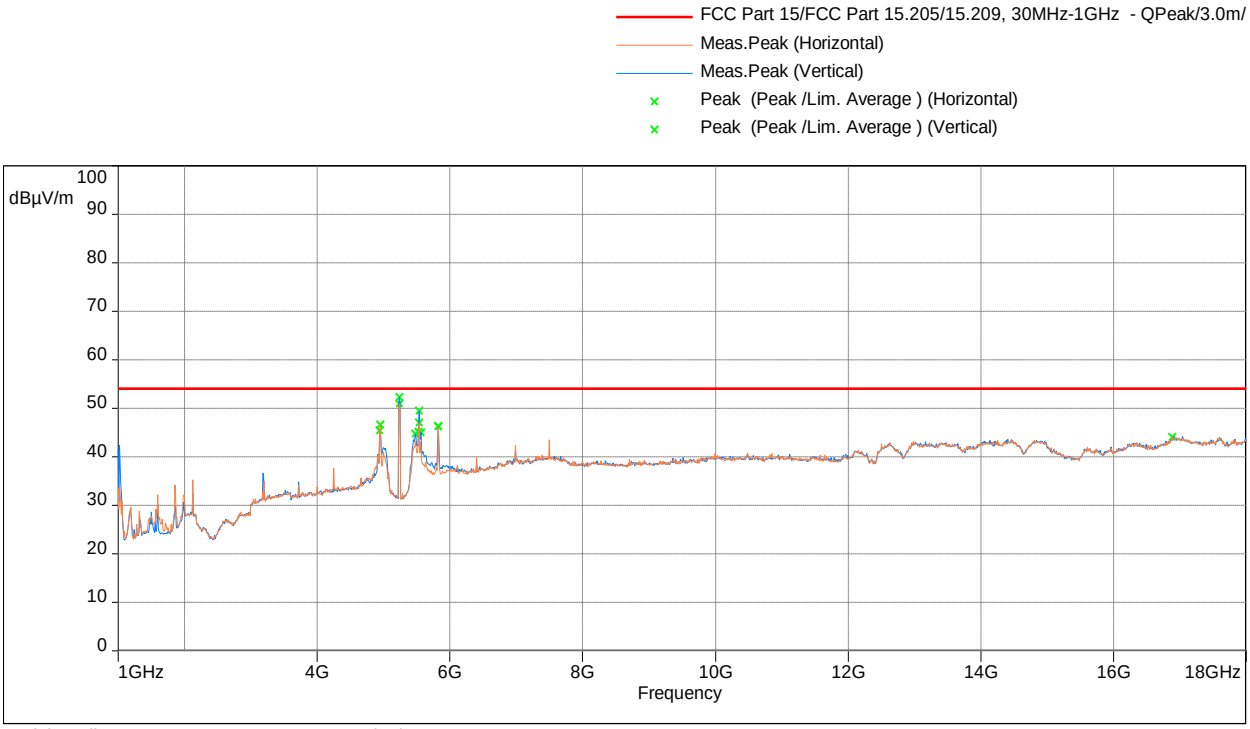
Model: ; Client: ; Comments: ; Test Date: 09/22/2017 16:25

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 11:30

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



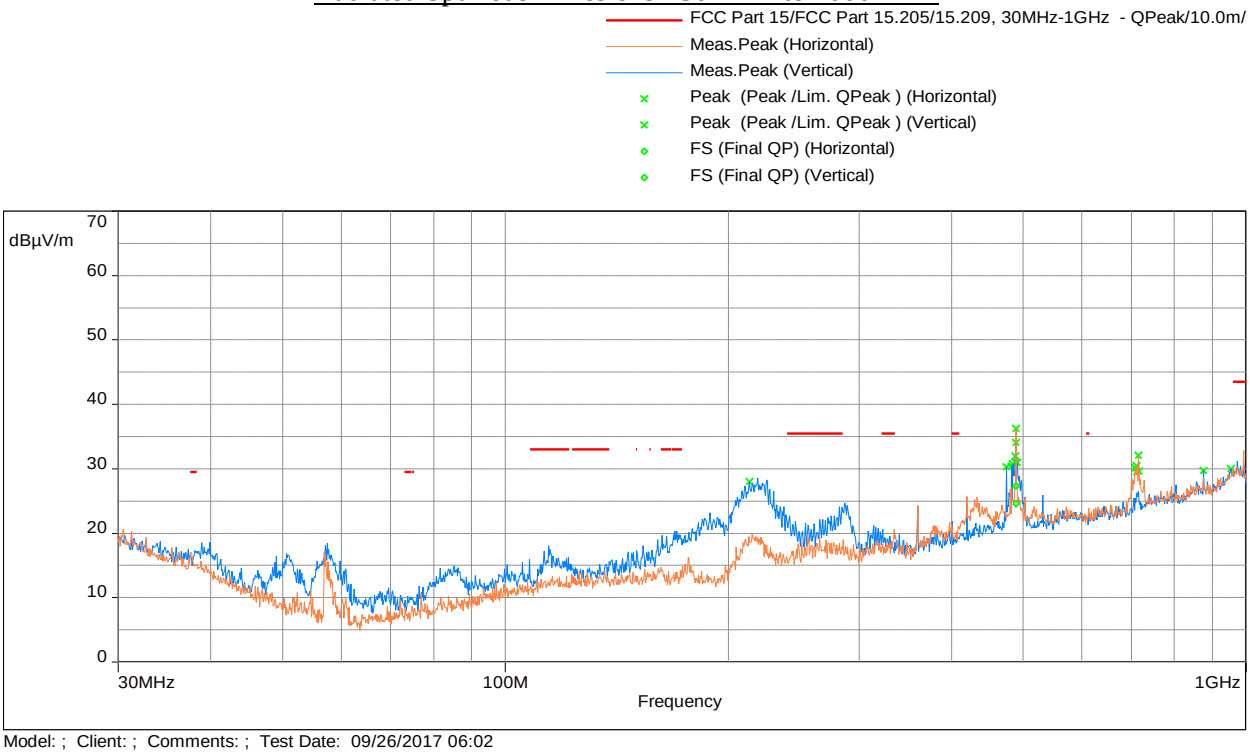
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 11:40

- Emission at 5537.3MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

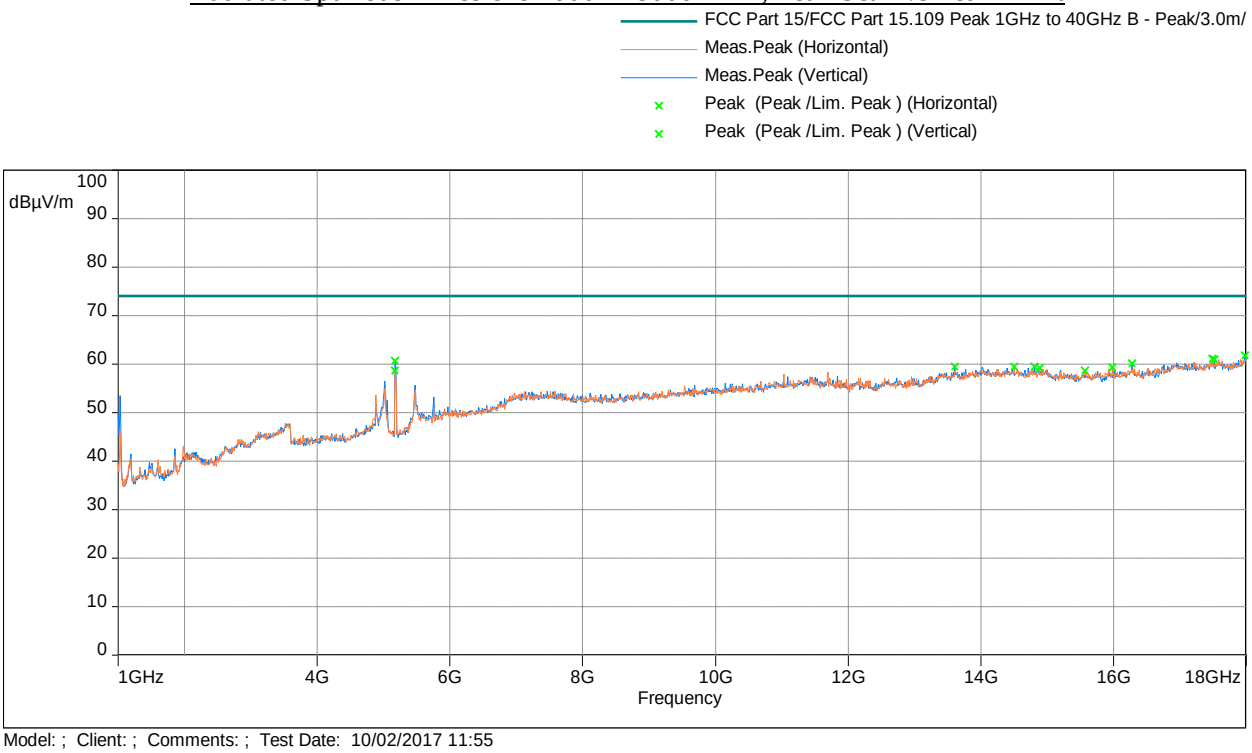
Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 802.11g 2412MHz, and 802.11n 20MHz 5180MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



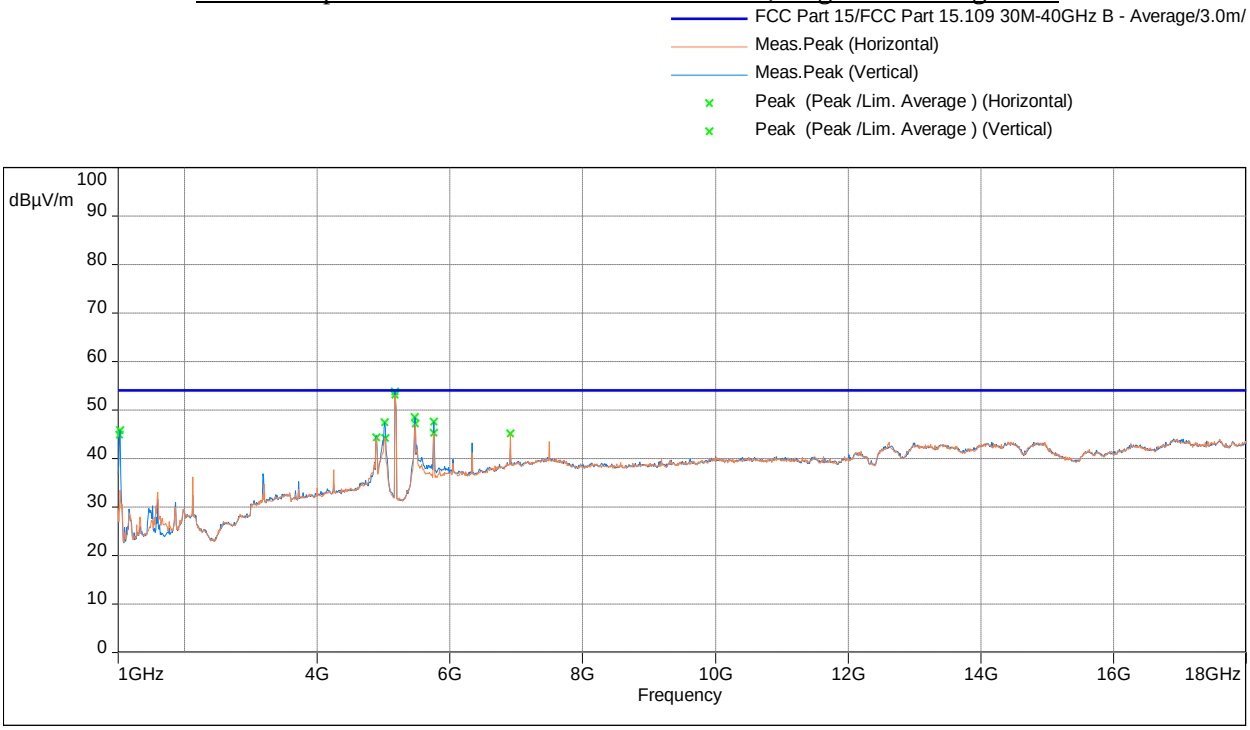
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 06:02

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 11:55

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



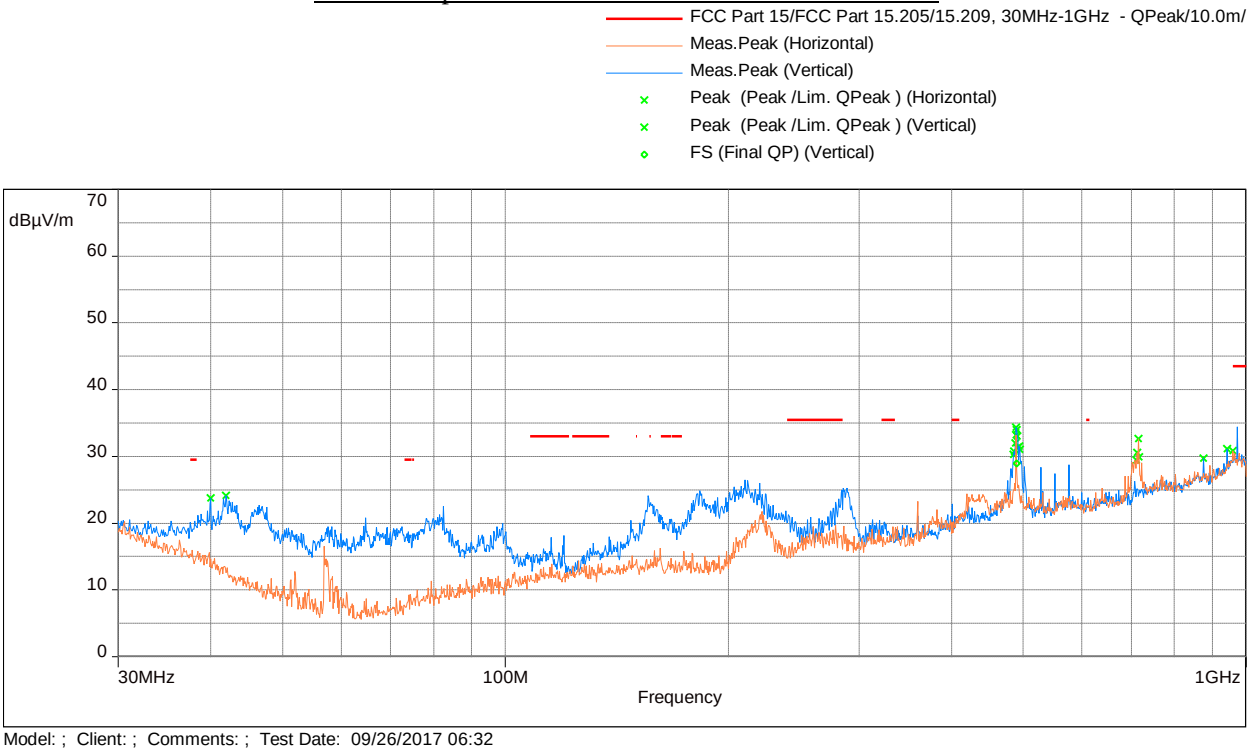
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 11:49

- Emission at 5472.7MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

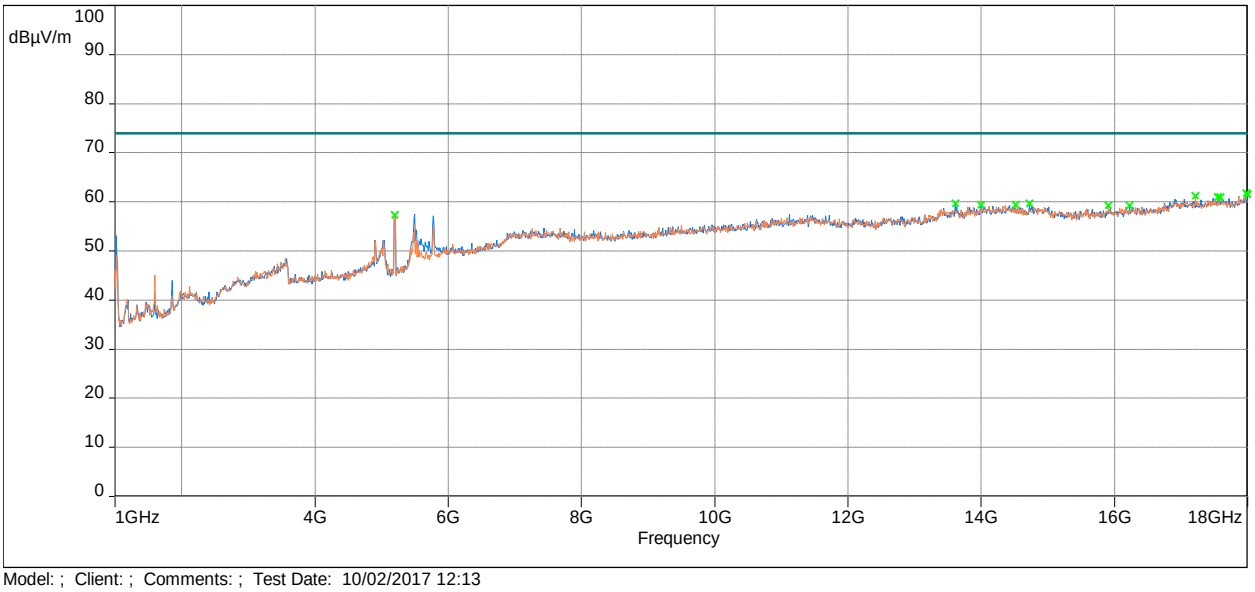
Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 802.11g 2437MHz, and 802.11n 20MHz 5200MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



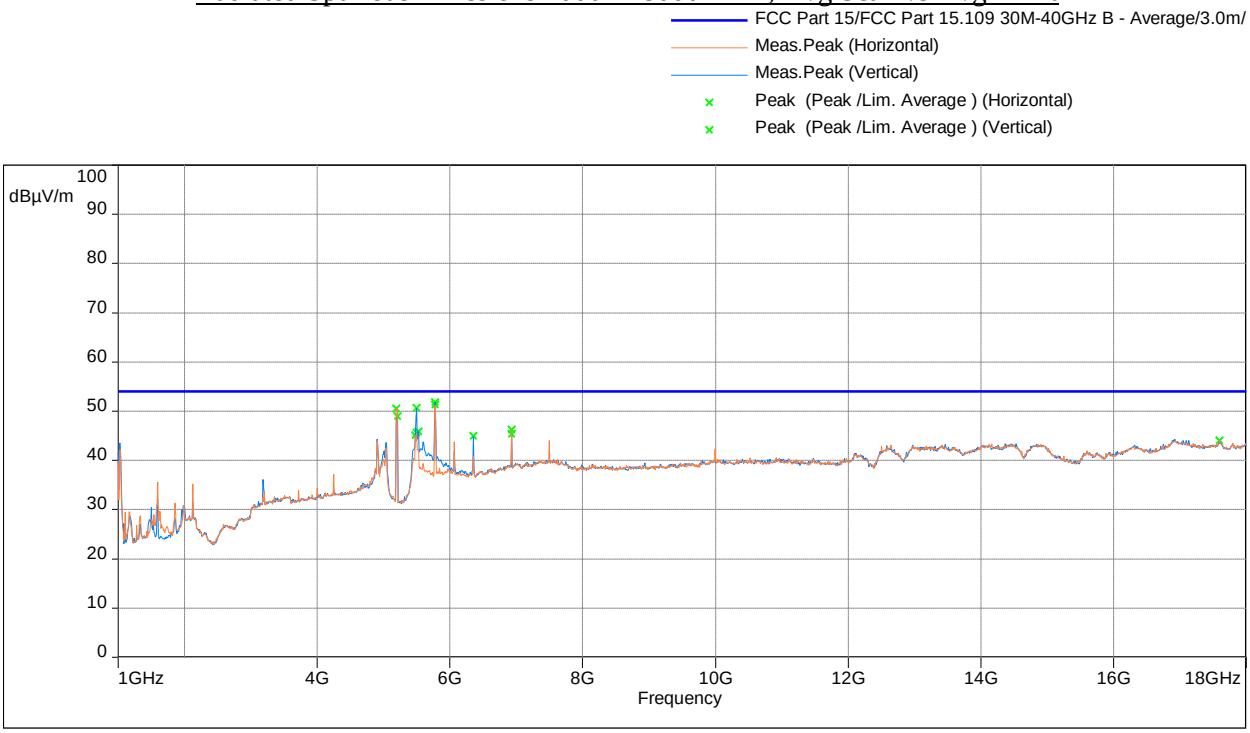
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 06:32

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 12:13

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



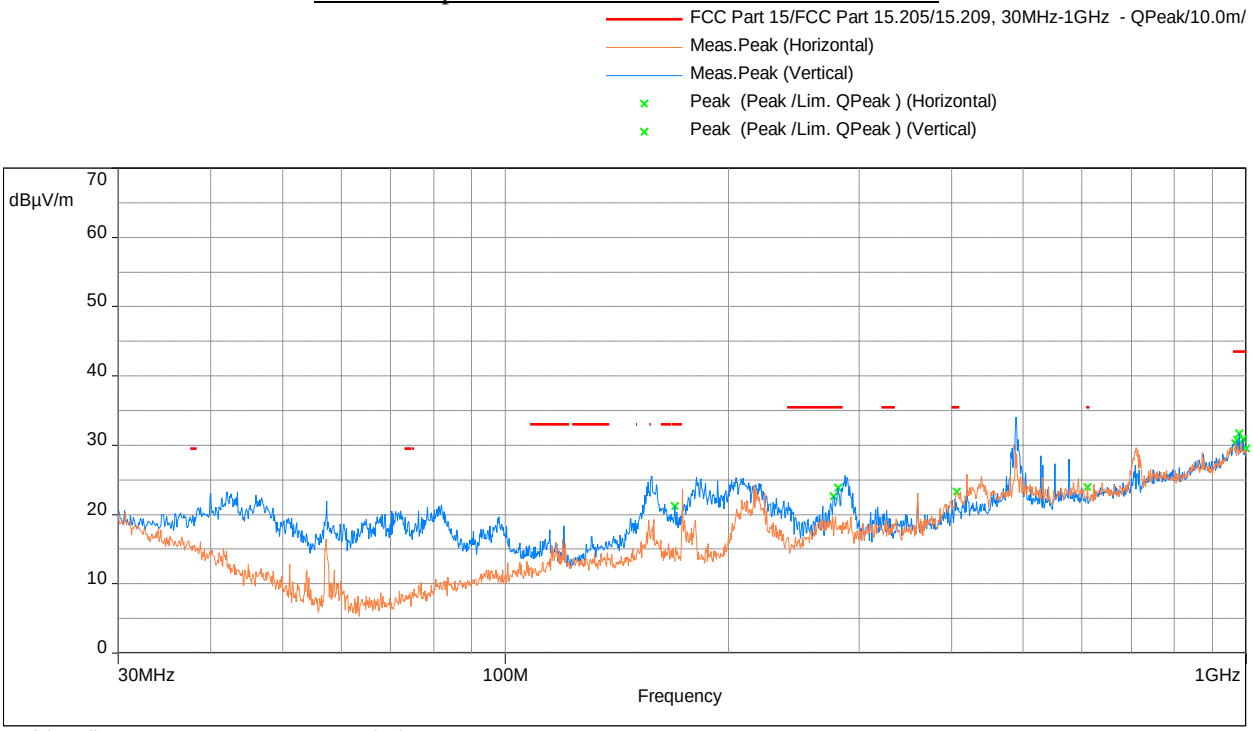
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 12:07

- Emission at 5525.4MHz and 5777MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

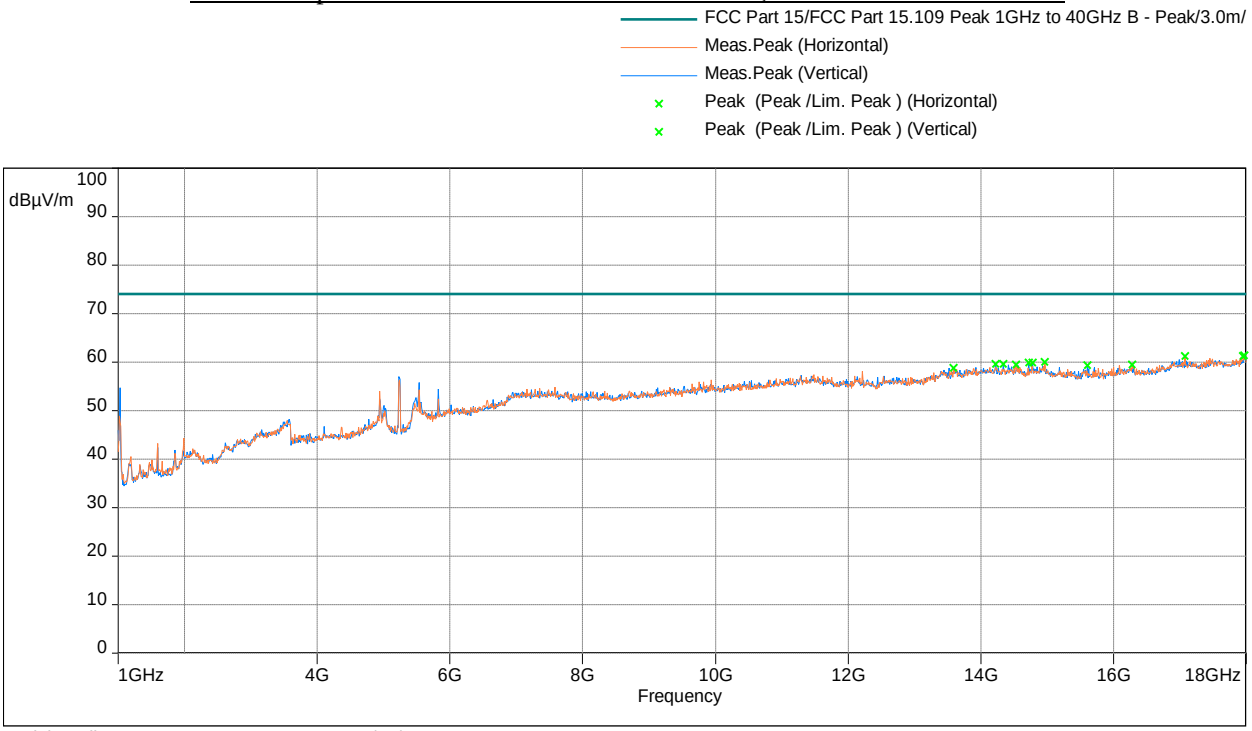
Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 802.11g 2462MHz, and 802.11n 20MHz 5240MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



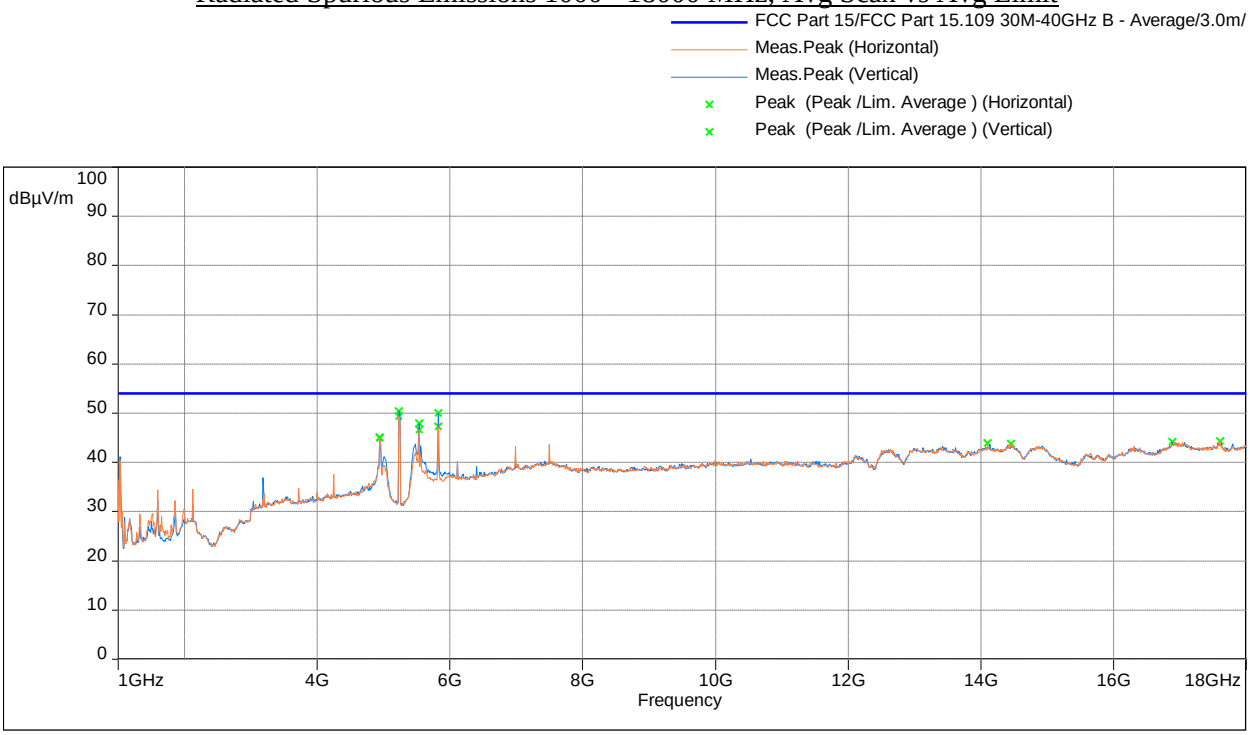
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 07:15

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 13:10

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



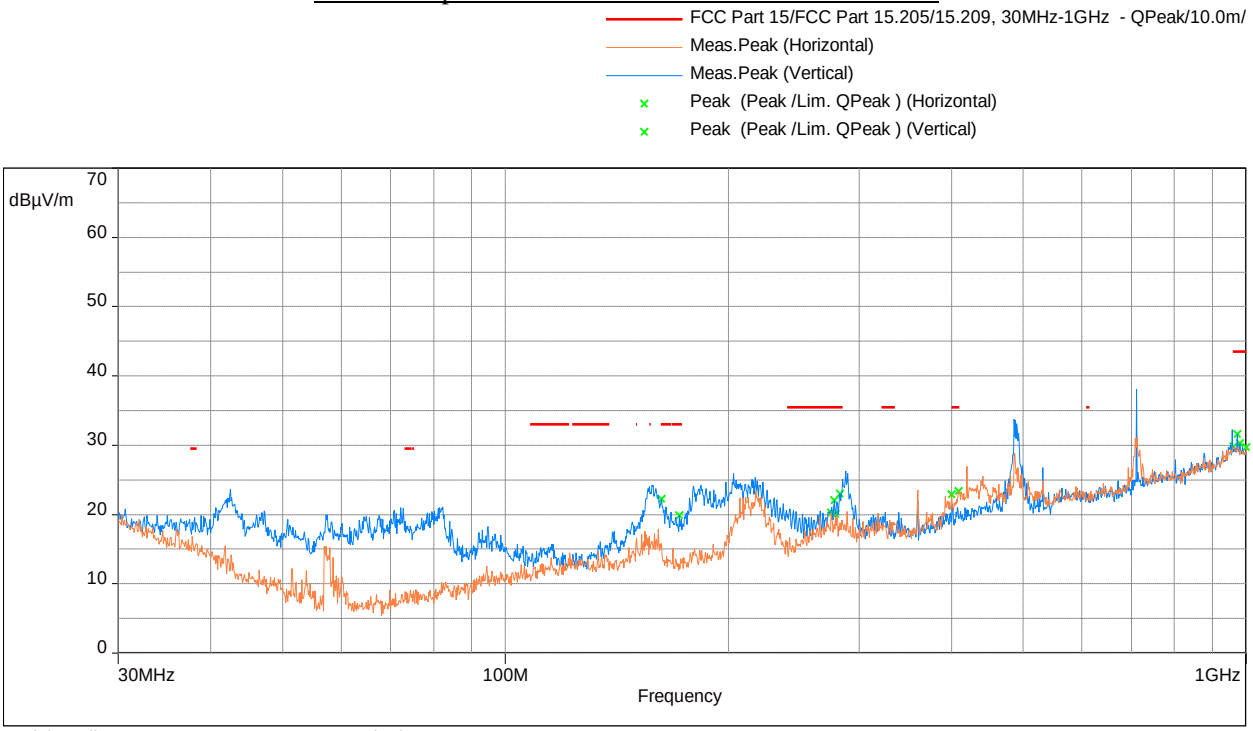
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 13:04

- Emission at 5539MHz and 5821MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

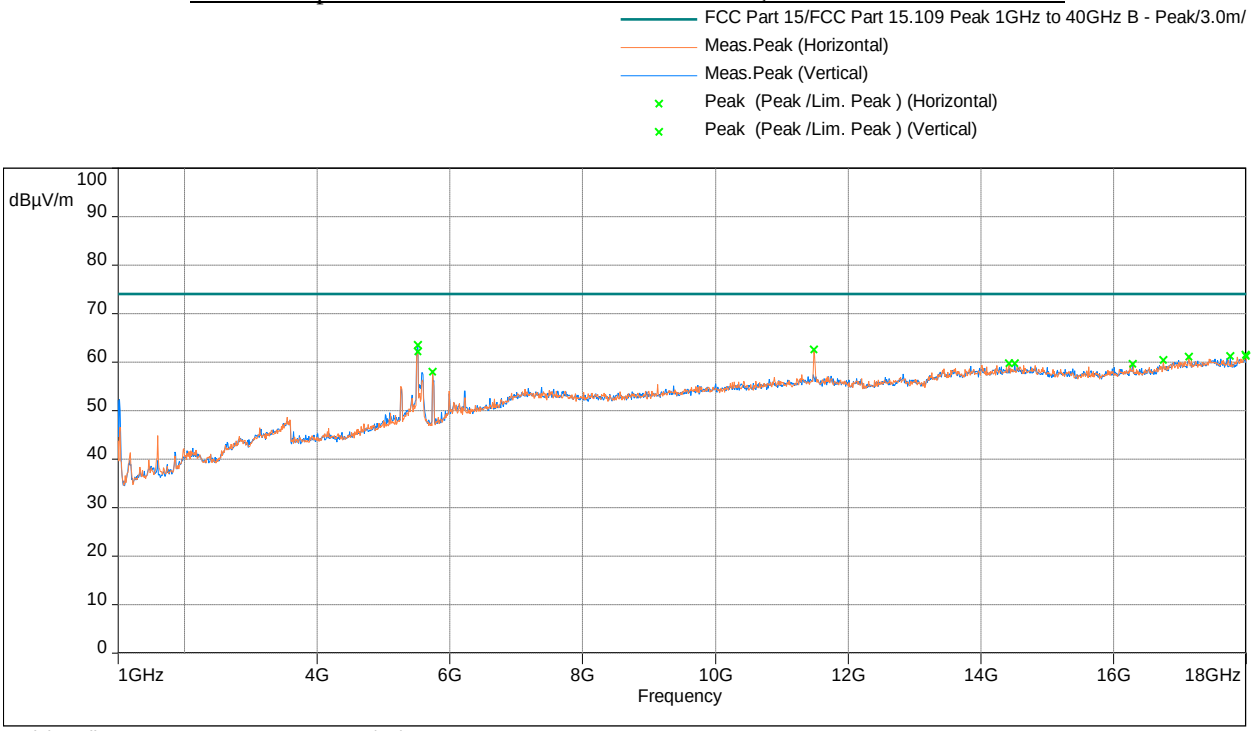
Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 802.11n 20MHz - CH 2412MHz, and 802.11n 20MHz – CH 5745MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



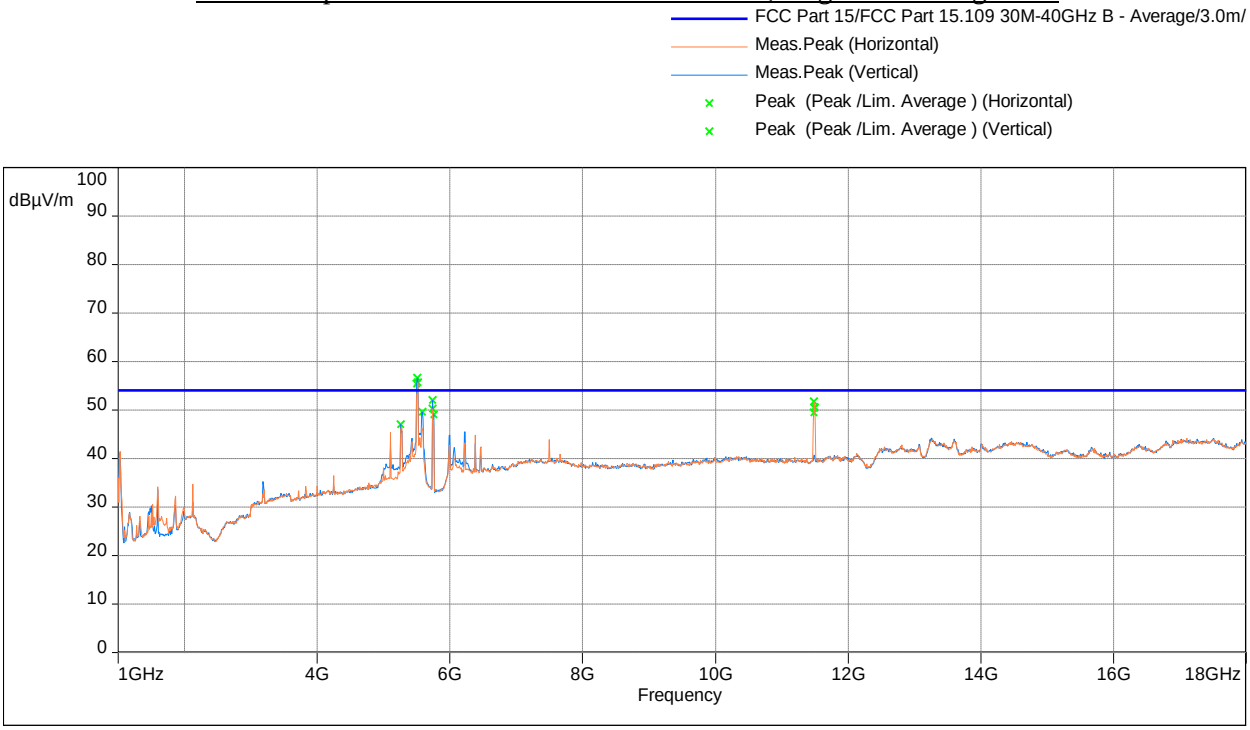
Model: ; Client: ; Comments: ; Test Date: 09/26/2017 07:49

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 13:35

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



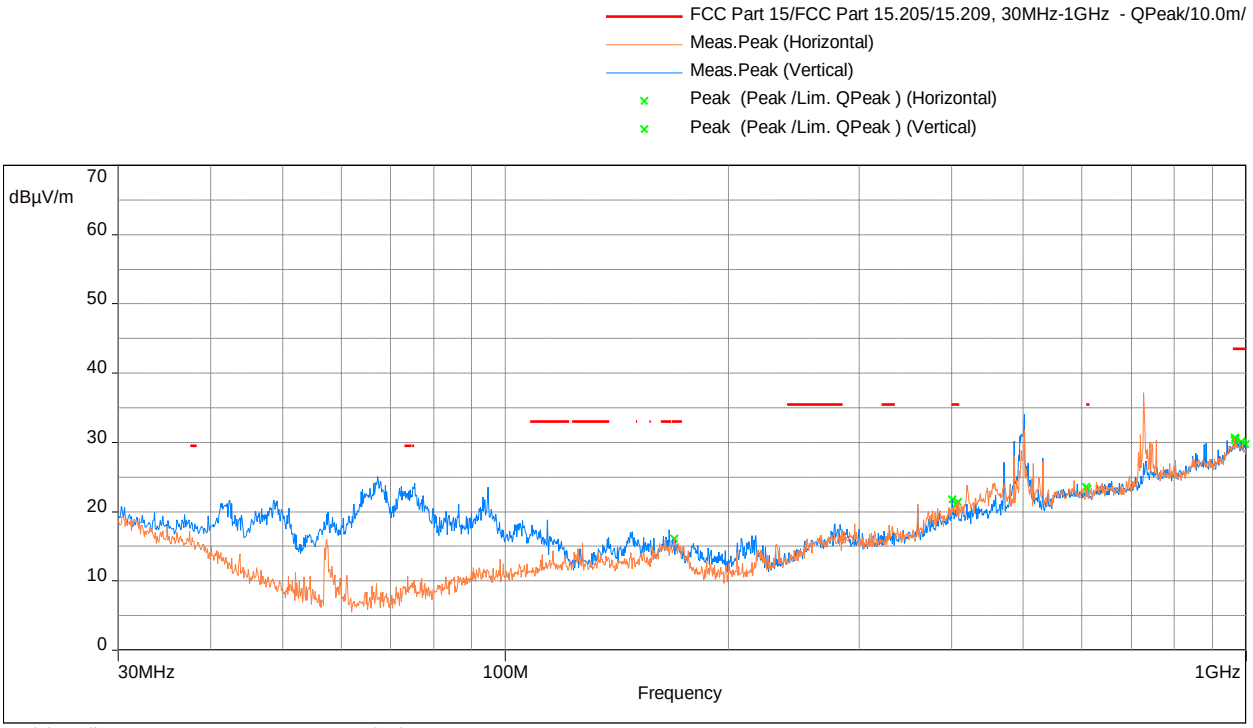
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 13:26

- Emission at 5511.8MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

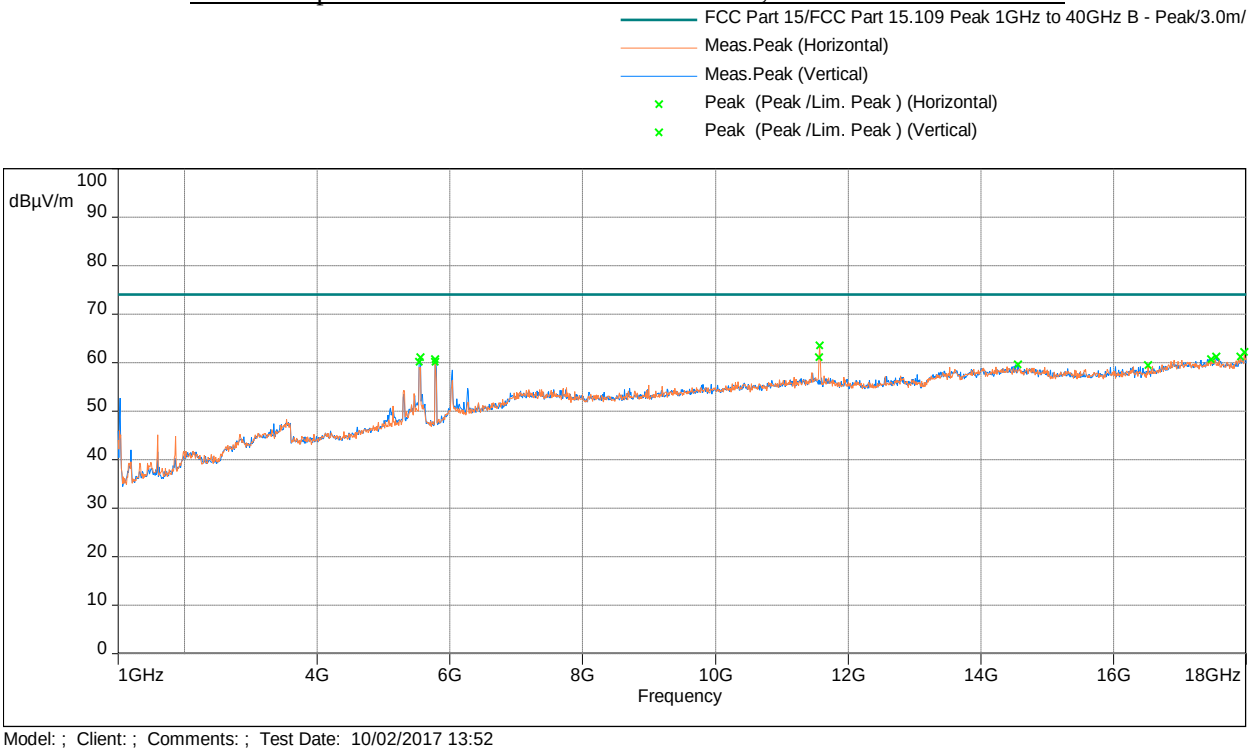
Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 802.11n 20MHz - CH 2437MHz, and 802.11n 20MHz – CH 5785MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



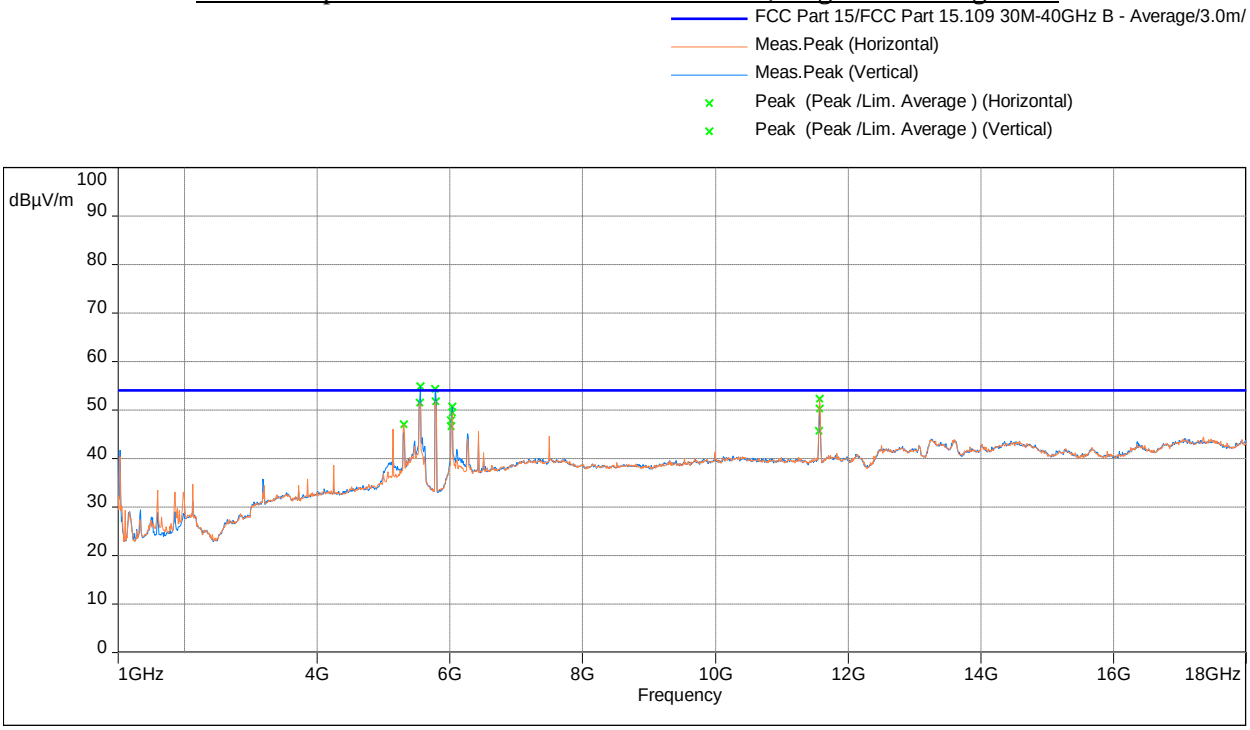
Model: ; Client: ; Comments: ; Test Date: 09/28/2017 10:12

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 13:52

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



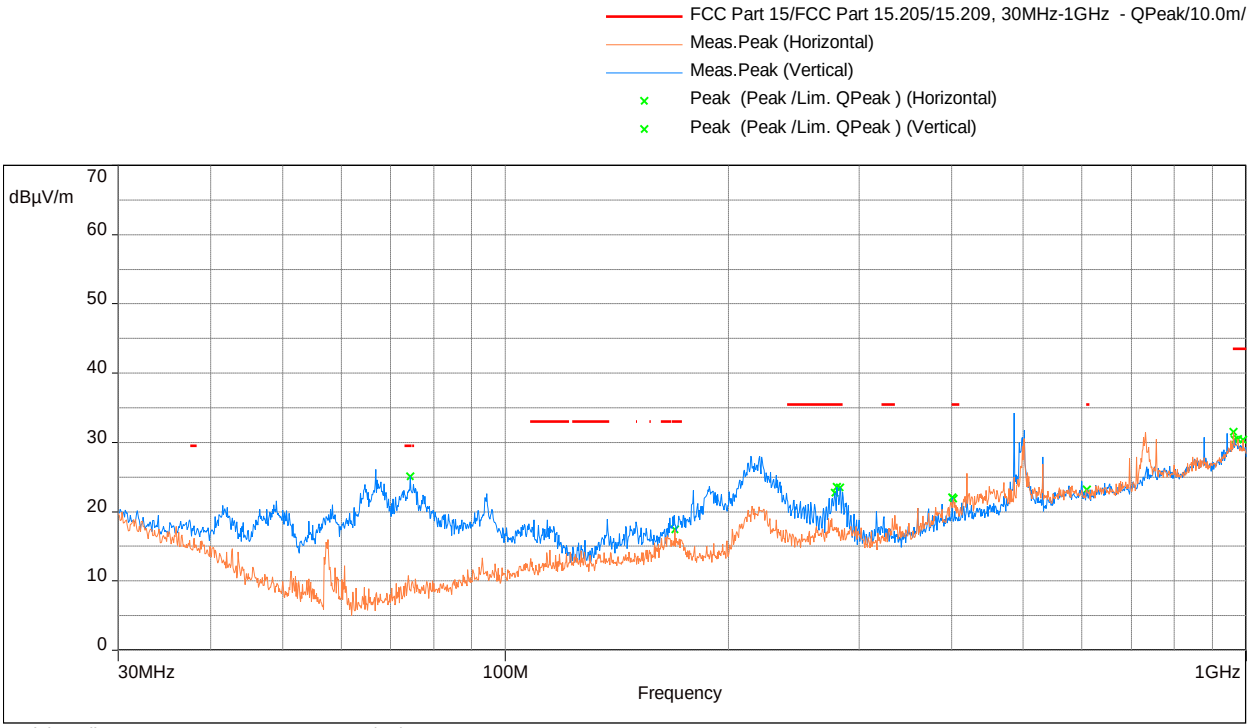
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 13:45

- 5785MHz is the 5GHz transmitter fundamental frequency.
- Emission at 5552.6MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

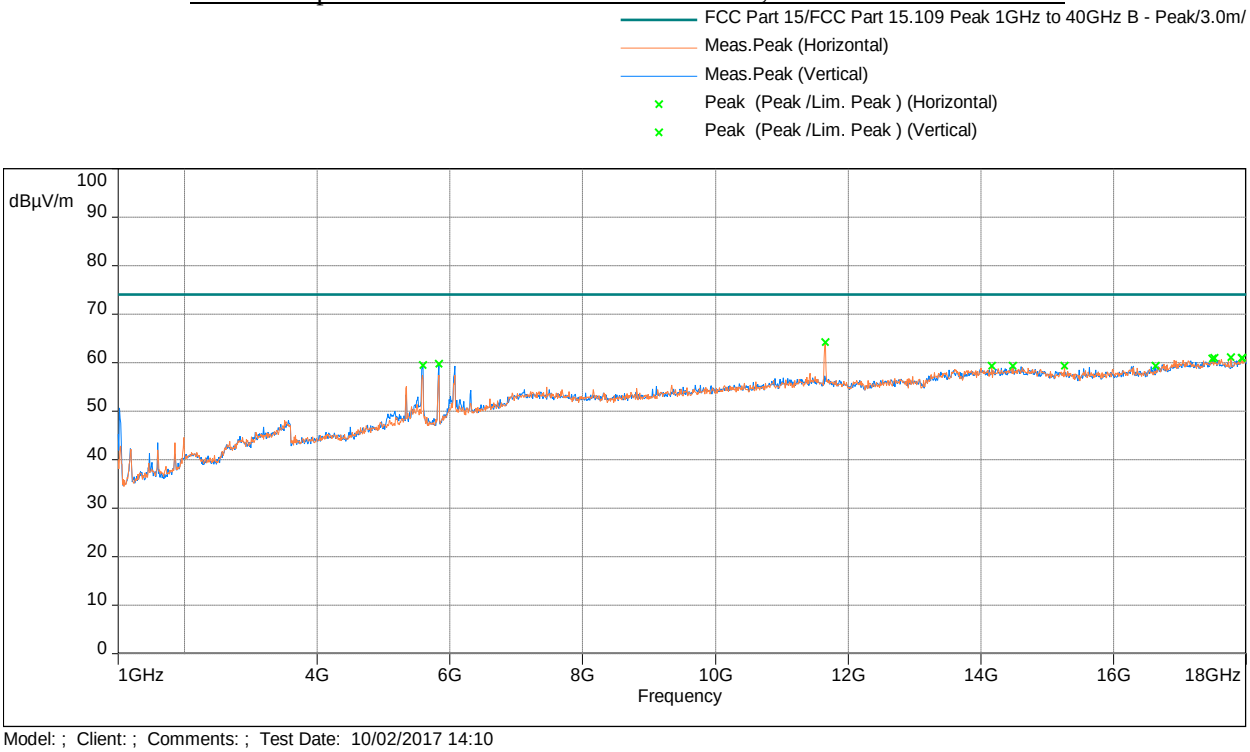
Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 802.11n 20MHz - CH 2462MHz, and 802.11n 20MHz – CH 5825MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



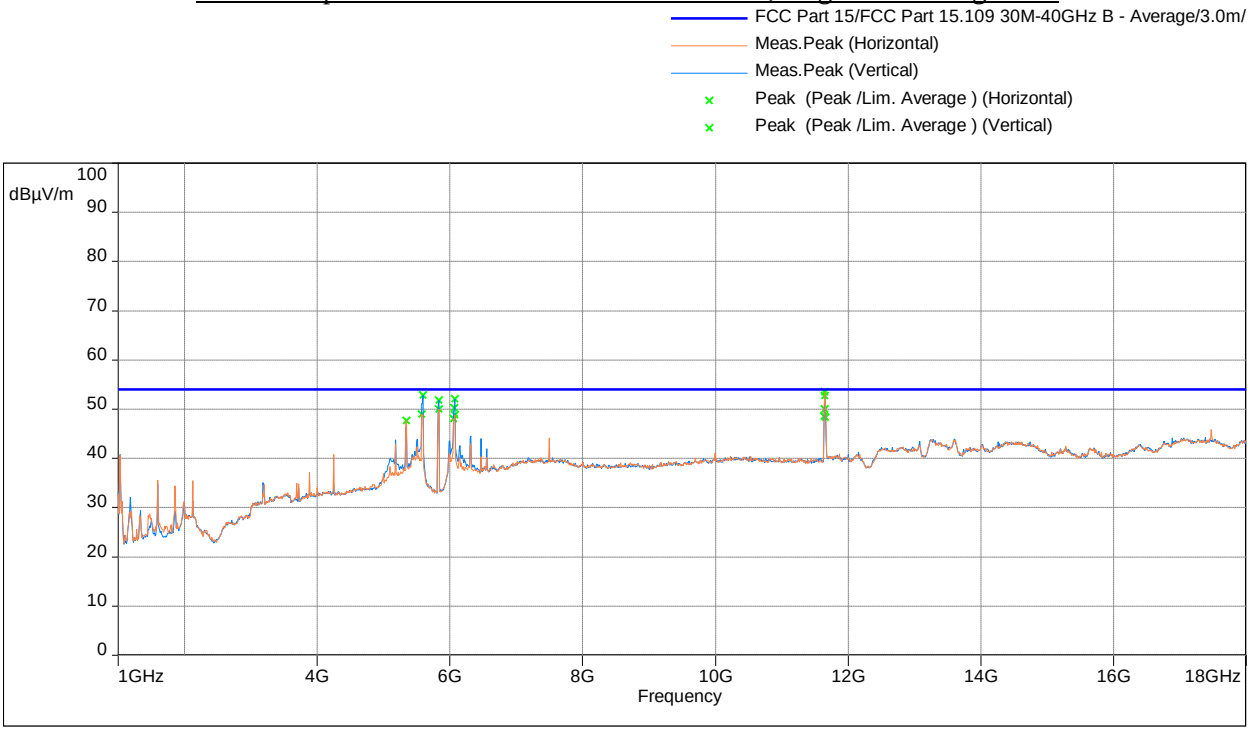
Model: ; Client: ; Comments: ; Test Date: 09/28/2017 10:26

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 14:10

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 14:04

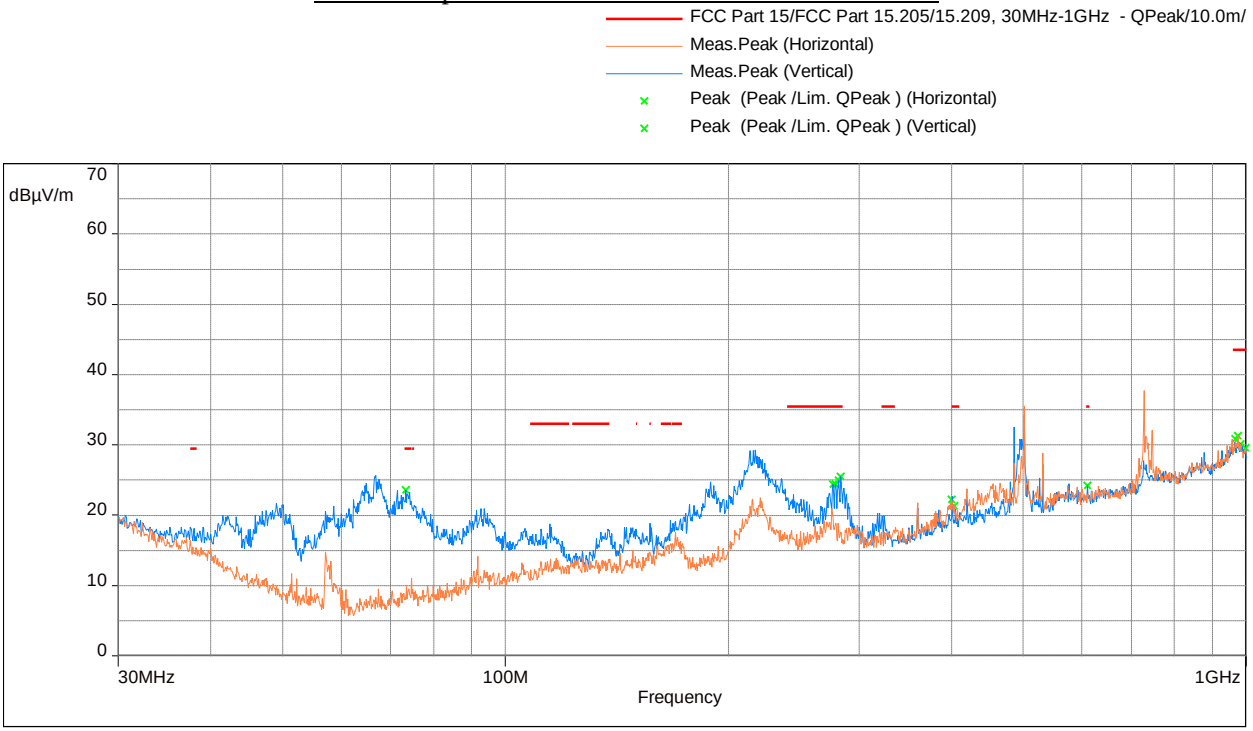
Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
11650	53.6	54.0	-0.4	3.5	360.0	Horizontal	14.9
11650	52.7	54.0	-1.3	3.5	0.5	Vertical	14.9

- Emission at 5590MHz and 6074.5MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

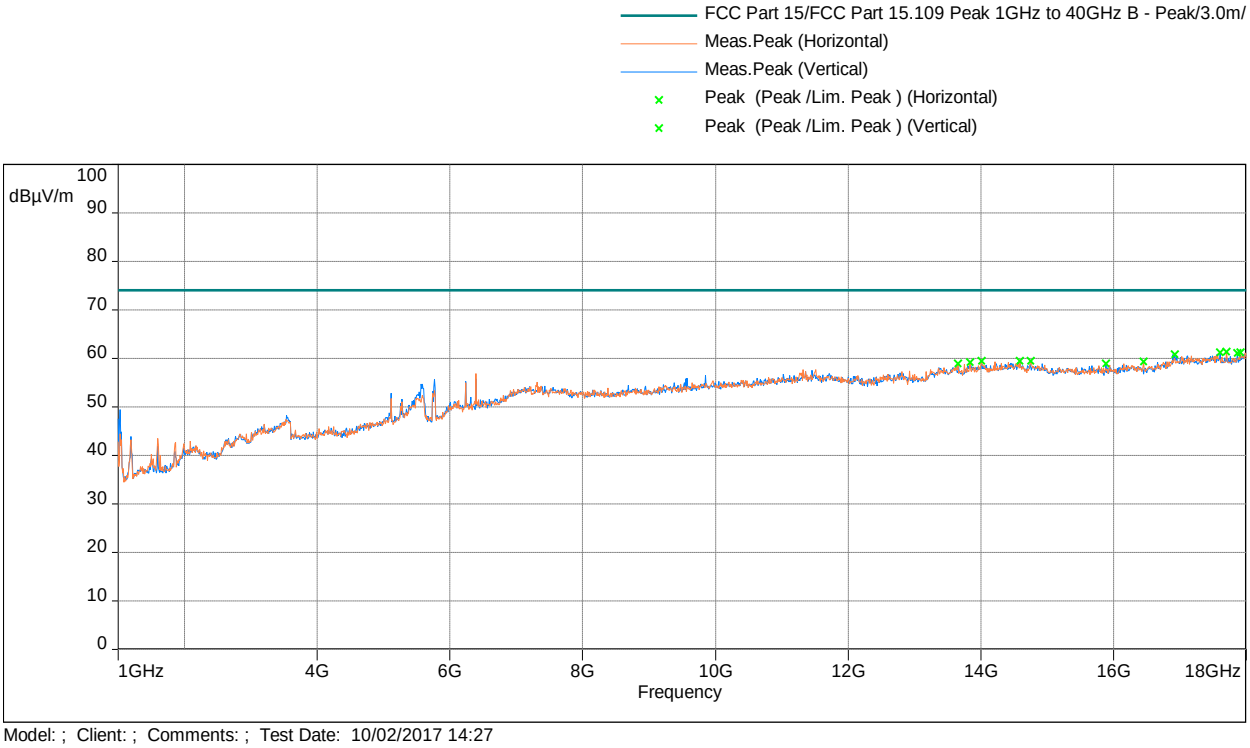
Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 802.11n 40MHz - CH 2422MHz, and 802.11n 40MHz – CH 5755MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



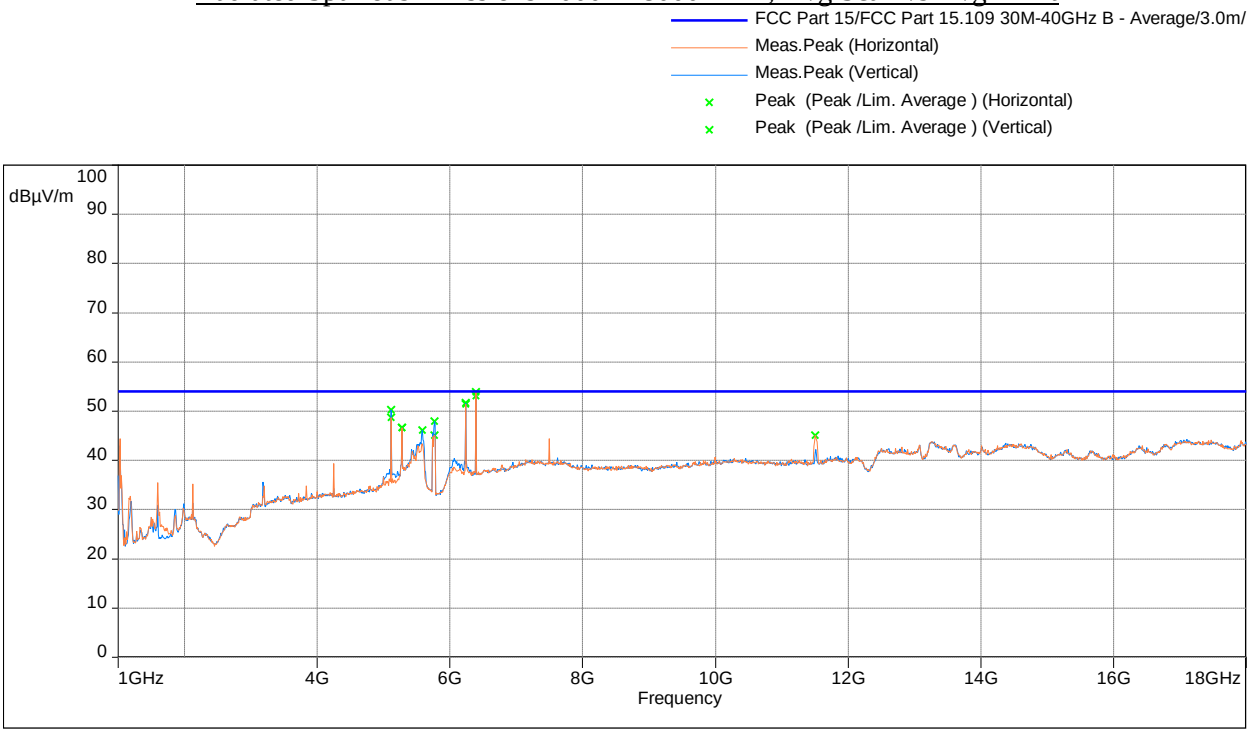
Model: ; Client: ; Comments: ; Test Date: 09/28/2017 10:39

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 14:27

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



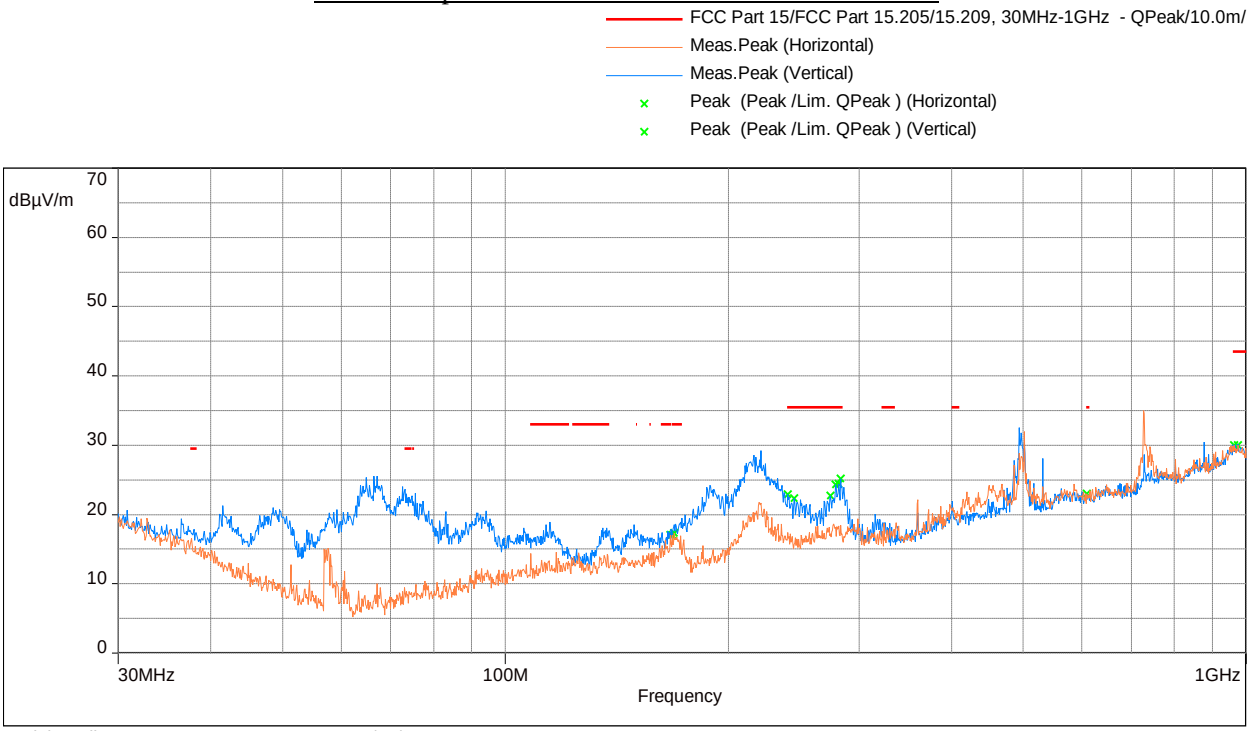
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 14:21

- Emission at 6394.1MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

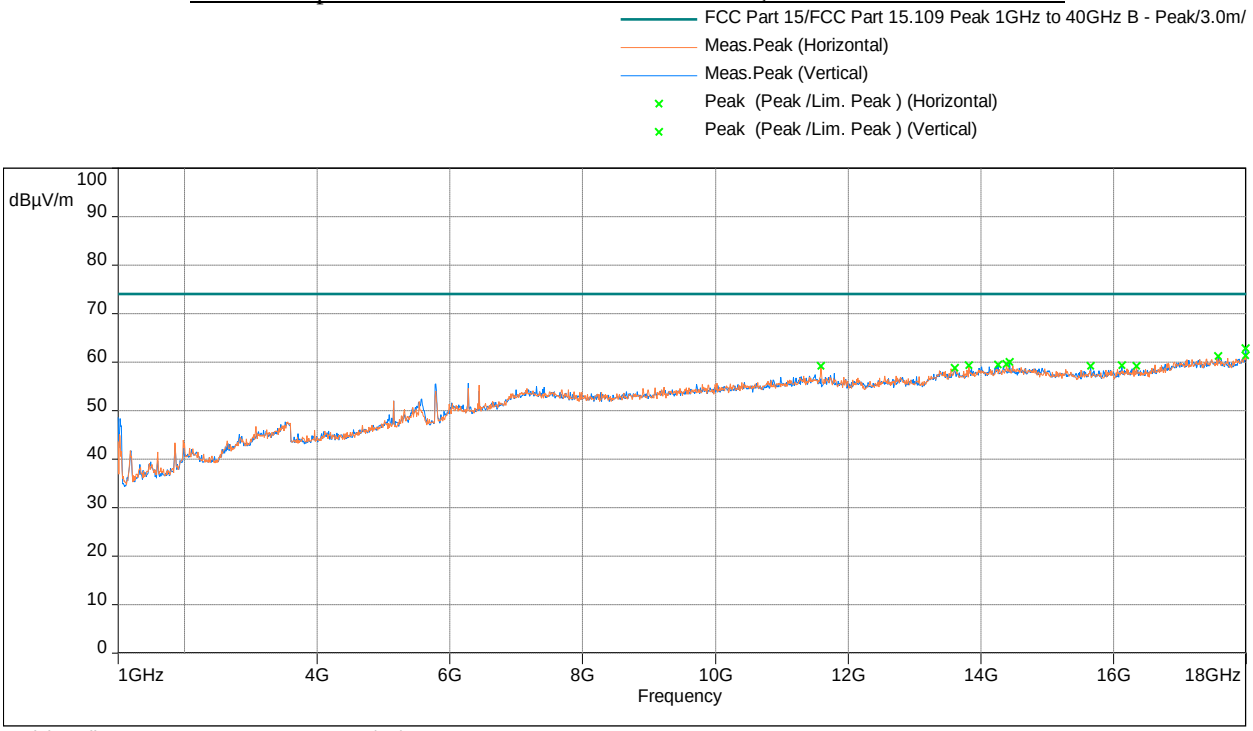
Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 802.11n 40MHz - CH 2437MHz, and 802.11n 40MHz – CH 5795MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



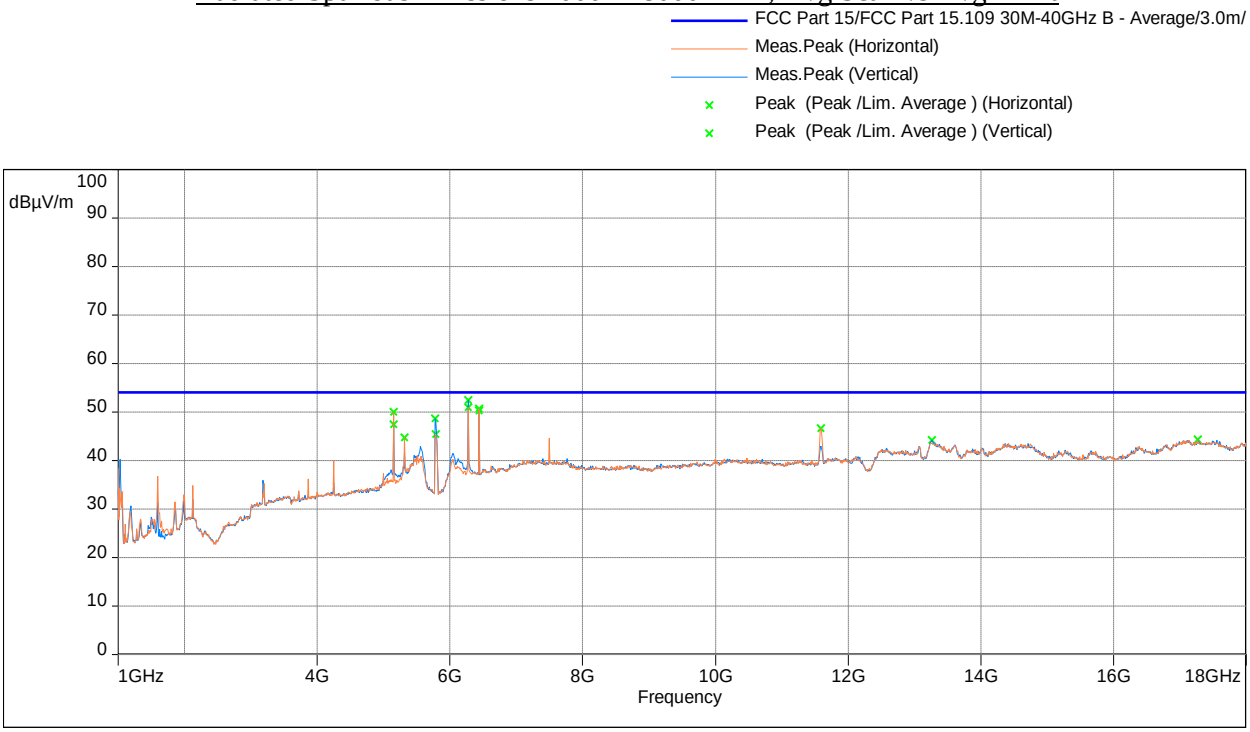
Model: ; Client: ; Comments: ; Test Date: 09/28/2017 10:50

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 14:47

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



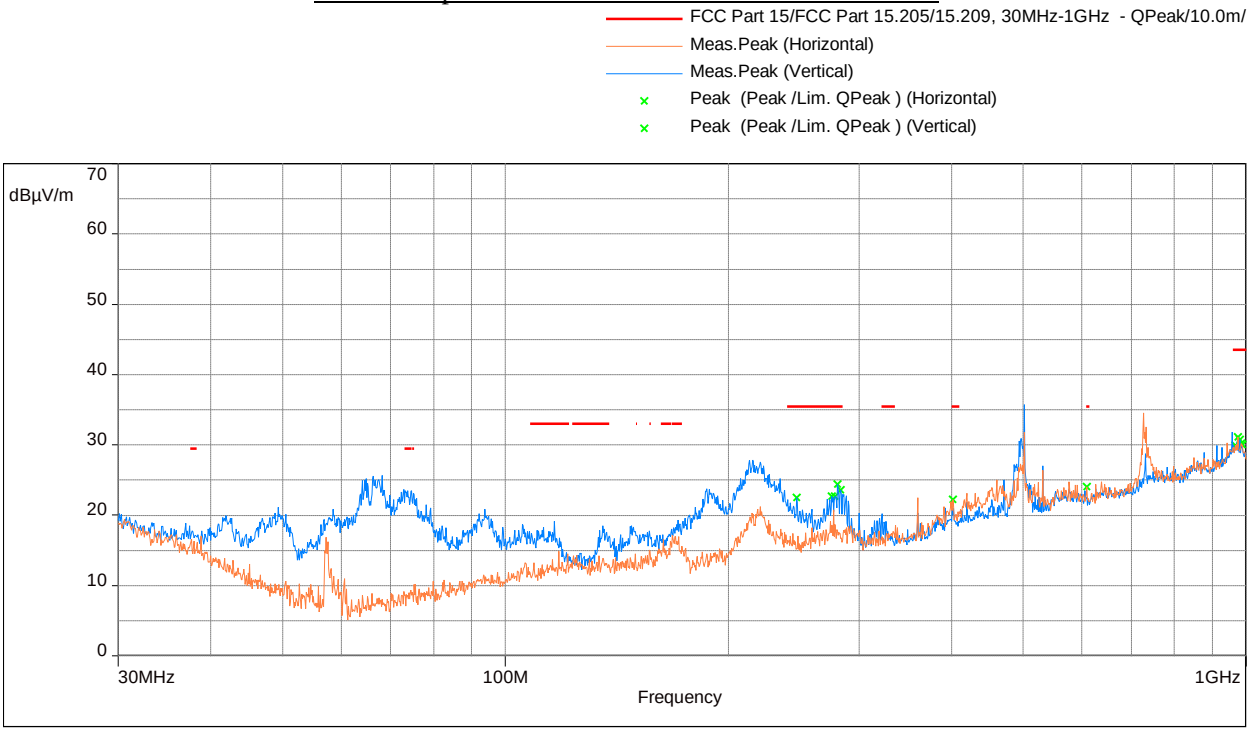
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 14:37

- Emission at 6276.8MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

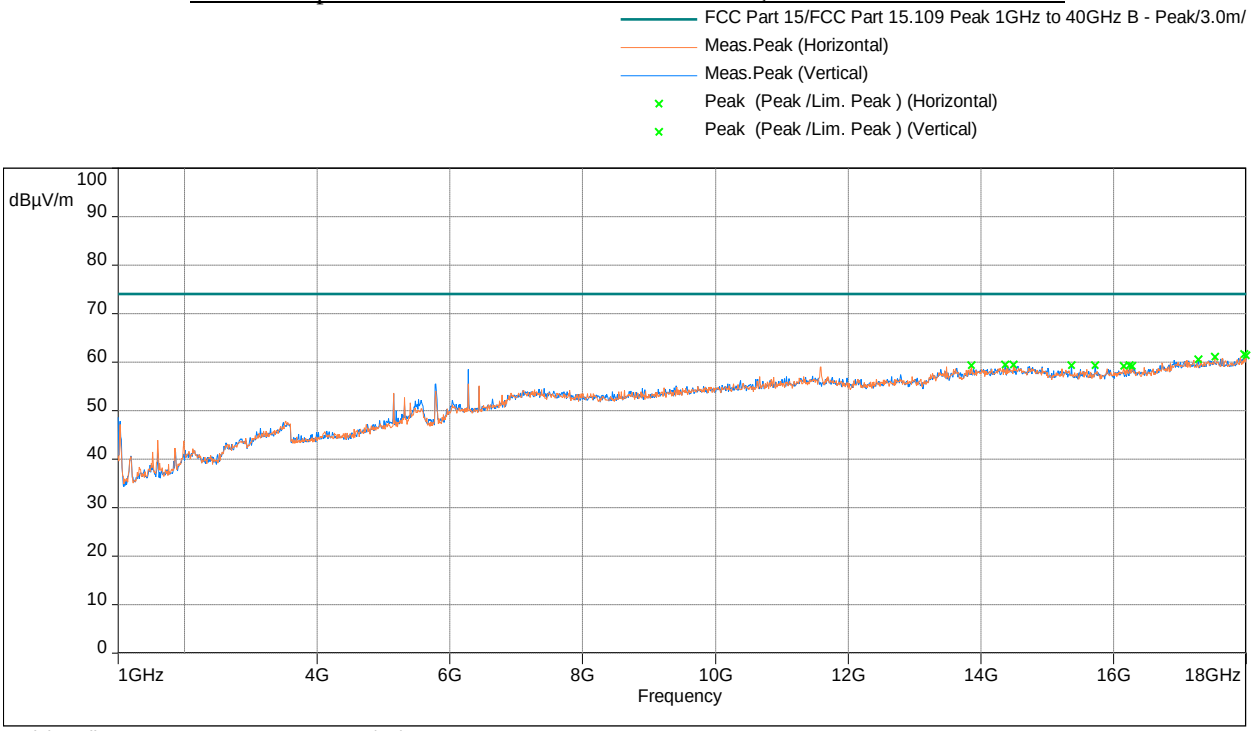
Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 802.11n 40MHz - CH 2452MHz, and 802.11n 40MHz – CH 5795MHz

Radiated Spurious Emissions - 30 MHz to 1000 MHz



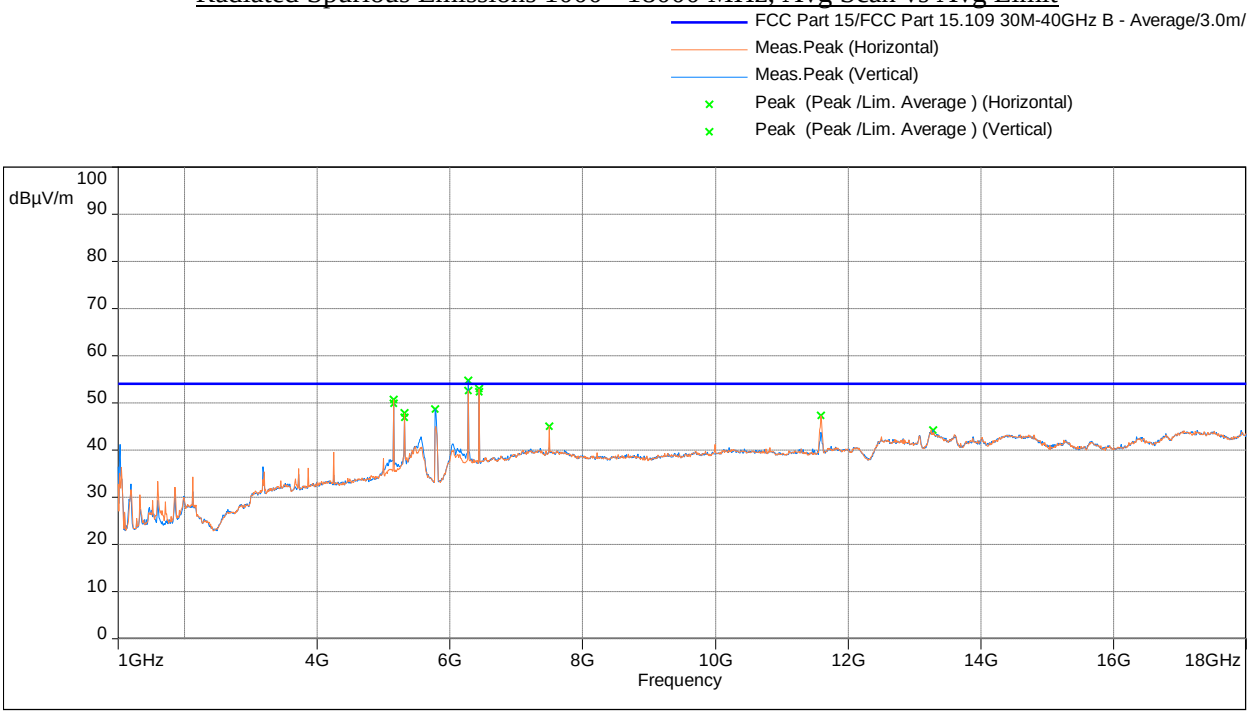
Model: ; Client: ; Comments: ; Test Date: 09/28/2017 10:59

Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 10/02/2017 15:04

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



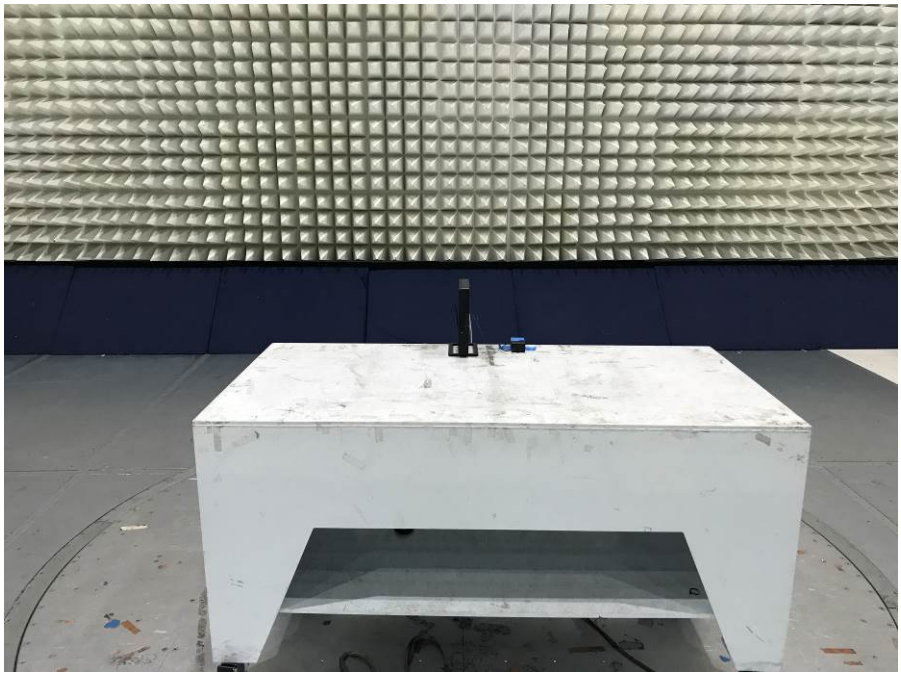
Model: ; Client: ; Comments: ; Test Date: 10/02/2017 14:58

- Emission at 6276.8MHz peak is not in restricted band (15.205). Therefore the limit of 15.209 does not apply to this particular frequency. Compliance for this frequency outside the restricted band is shown in report number 103224477MPK-002A; section 4.4.

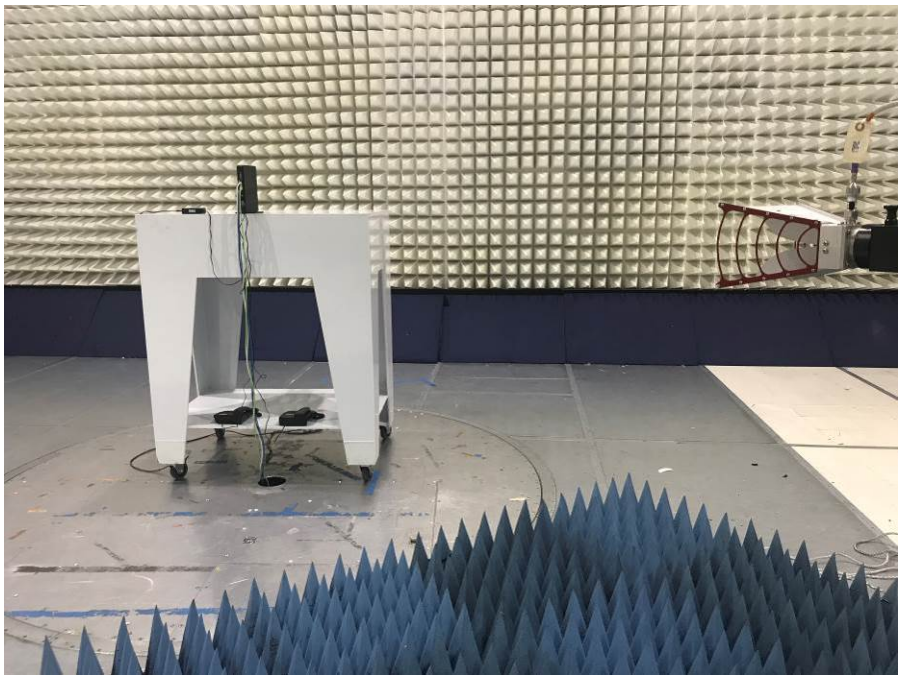
Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

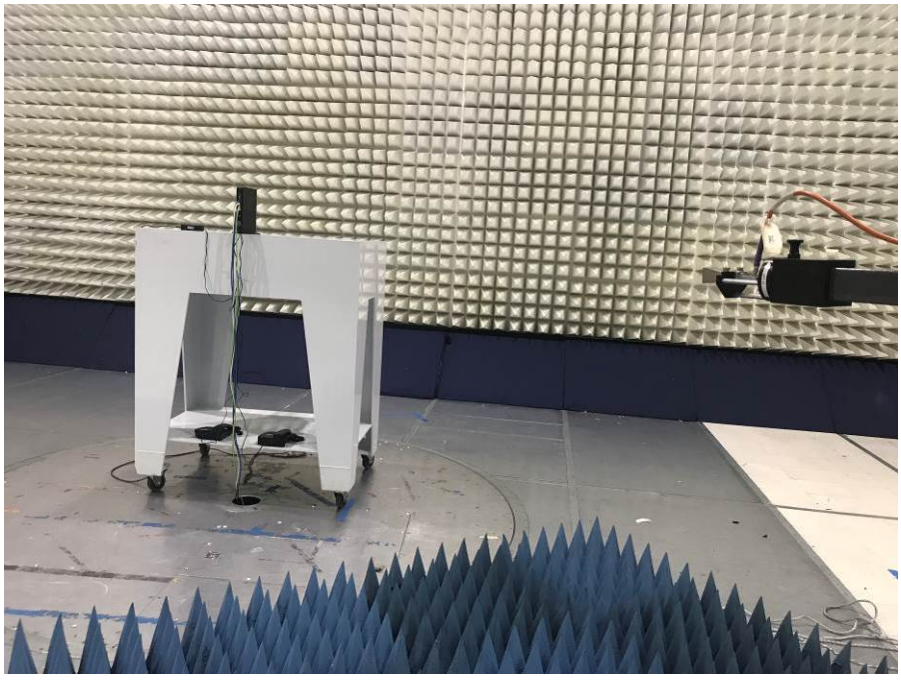
4.5.5 Test setup photographs

The following photographs show the testing configurations used.



4.5.5 Test setup photographs (Continued)





4.6 Radiated Emissions

FCC Ref: 15.109

4.6.1 Requirement

Limits for Electromagnetic Radiated Emissions FCC Section 15.109(b), ICES 003*, RSS GEN

Frequency (MHz)	**Class A at 10m dB(μV/m)**	**Class B at 3m dB(μV/m)**
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

4.6.2 Procedures

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

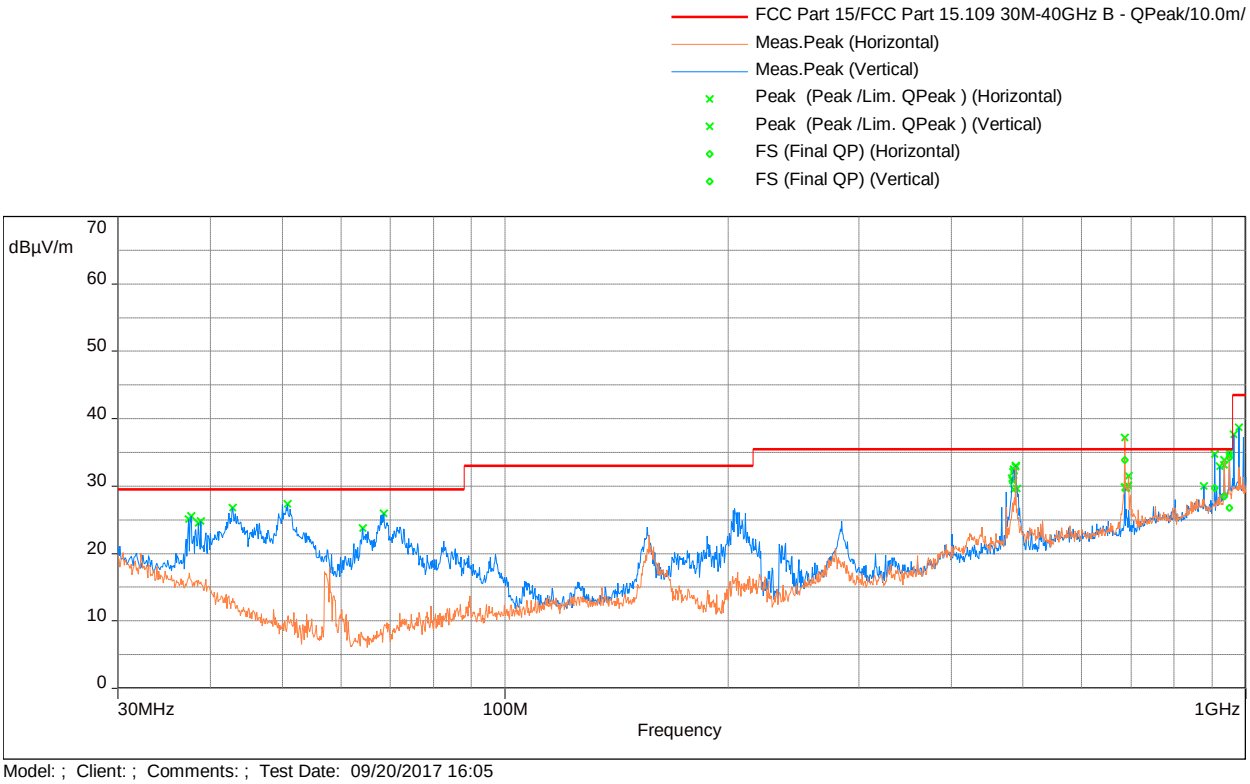
Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4 and EN 55022.

Test Date:	September 20 – September 21, 2017

4.6.3 Test Results

Test Results: Radiated Emissions 30 MHz – 1000 MHz

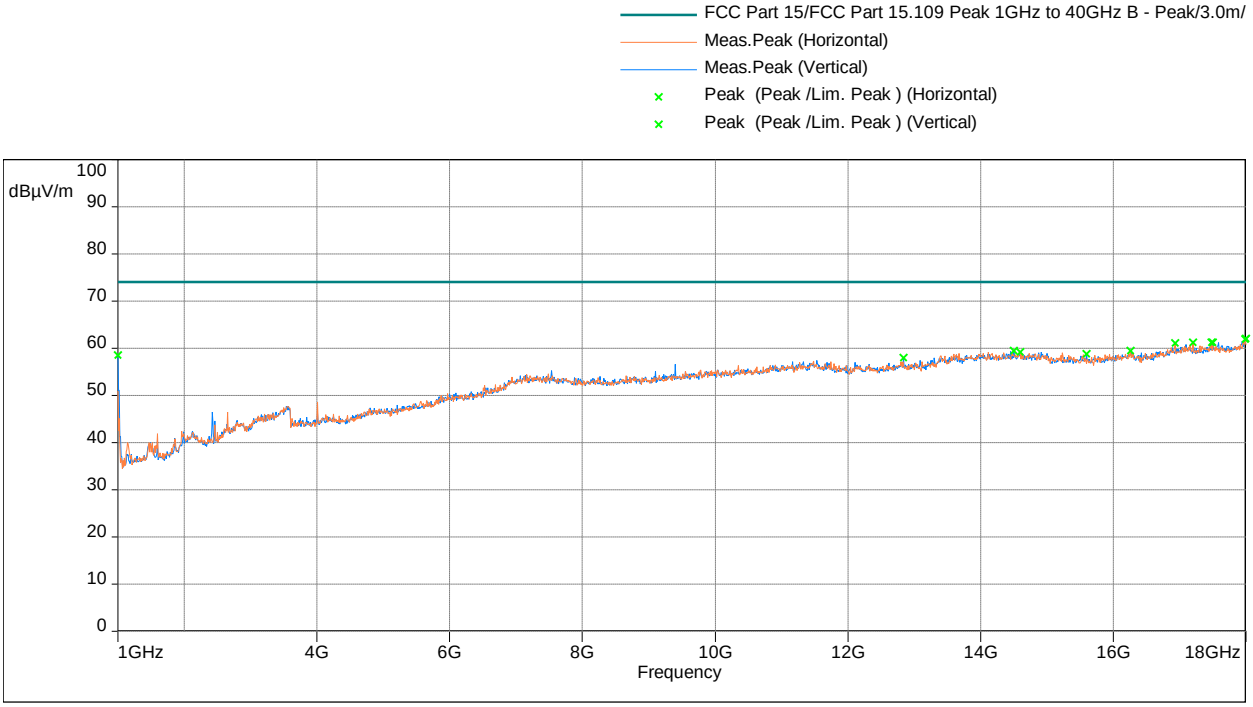


Model: ; Client: ; Comments: ; Test Date: 09/20/2017 16:05

Frequency	Quasi Pk FS	Limit	Margin	Azimuth	Height	Polarity	Raw	Correction
MHz	dB(uV/m)	dB(uV/m)	dB	deg	cm		dB(uV/m)	dB
686.664	33.9	35.5	-1.6	287.3	3.4	Horizontal	38.3	-4.4
935.455	28.5	35.5	-7.0	108.3	1.5	Horizontal	28.1	0.4
949.626	26.8	35.5	-8.7	315.5	3.7	Horizontal	25.4	1.3
42.901	26.8	29.5	-2.7	113.8	1.0	Vertical	42.0	-15.2
50.855	27.4	29.5	-2.1	12.8	4.0	Vertical	46.8	-19.4
489.004	33.1	35.5	-2.4	209.8	1.0	Vertical	40.8	-7.7
907.202	29.7	35.5	-5.8	149.0	2.0	Vertical	30.3	-0.7
935.592	33.2	35.5	-2.4	270.8	4.0	Vertical	32.7	0.4
949.449	34.2	35.5	-1.3	248.3	2.6	Vertical	32.9	1.3

4.6.3 Test Results (Continued)

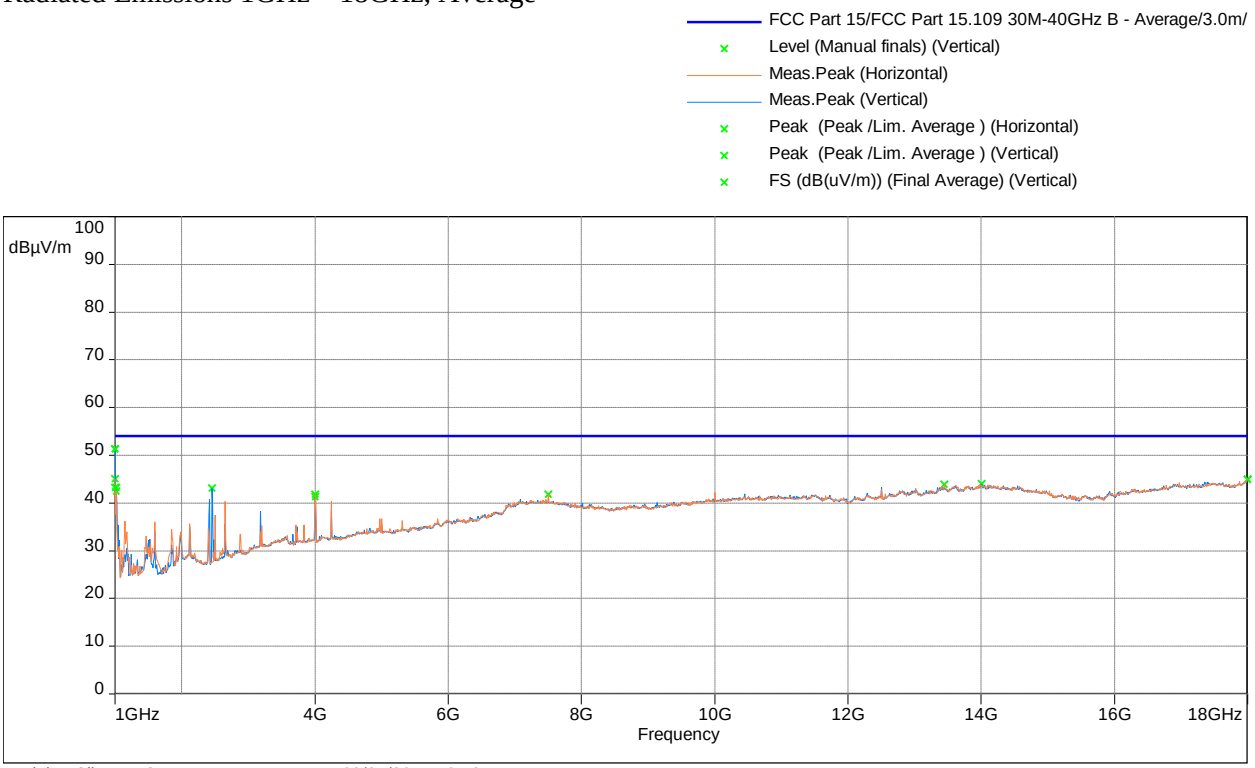
Radiated Emissions 1GHz – 18GHz, Peak



Model: ; Client: ; Comments: ; Test Date: 09/21/2017 10:56

Frequency (MHz)	Peak (dBµV/m)	Lim. Pk (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
1001.7	58.47	74	-15.5	1.0	24	Vertical	-6.5

Radiated Emissions 1GHz – 18GHz, Average

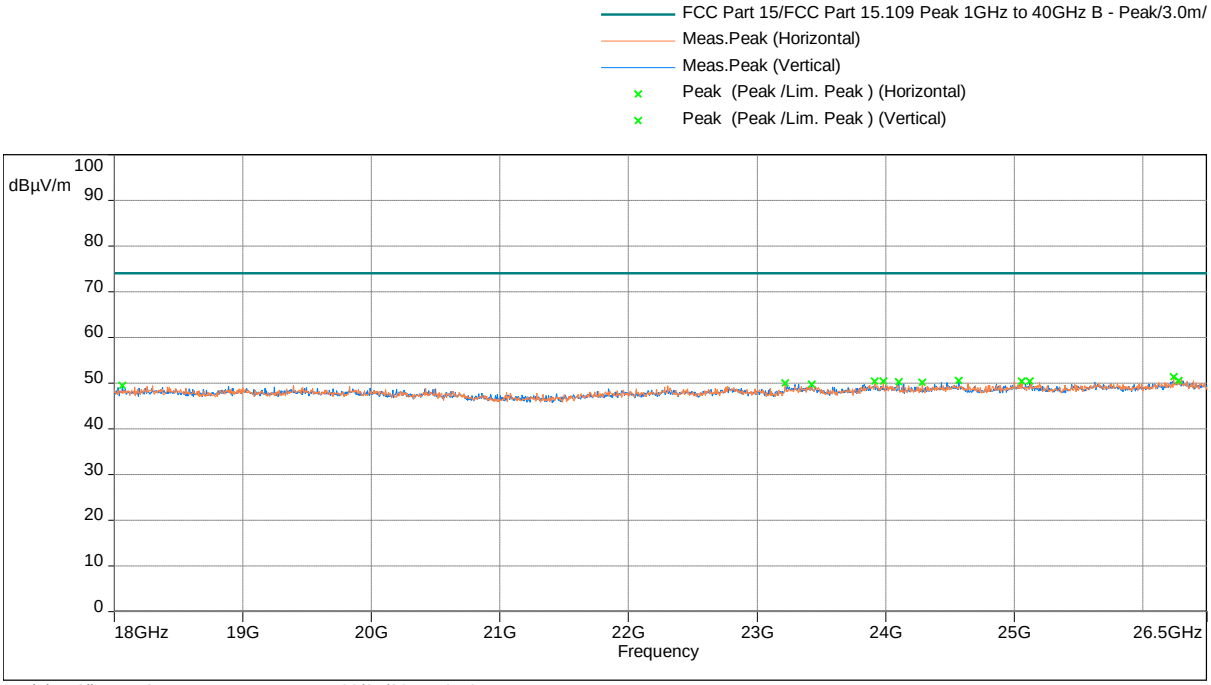


Model: ; Client: ; Comments: ; Test Date: 09/21/2017 10:12

Frequency (MHz)	Average (dBµV/m)	Lim. Avg (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Comment	Correction (dB)
1002.495	43.3	54.0	-10.7	2.1	0	Vertical	-6.5

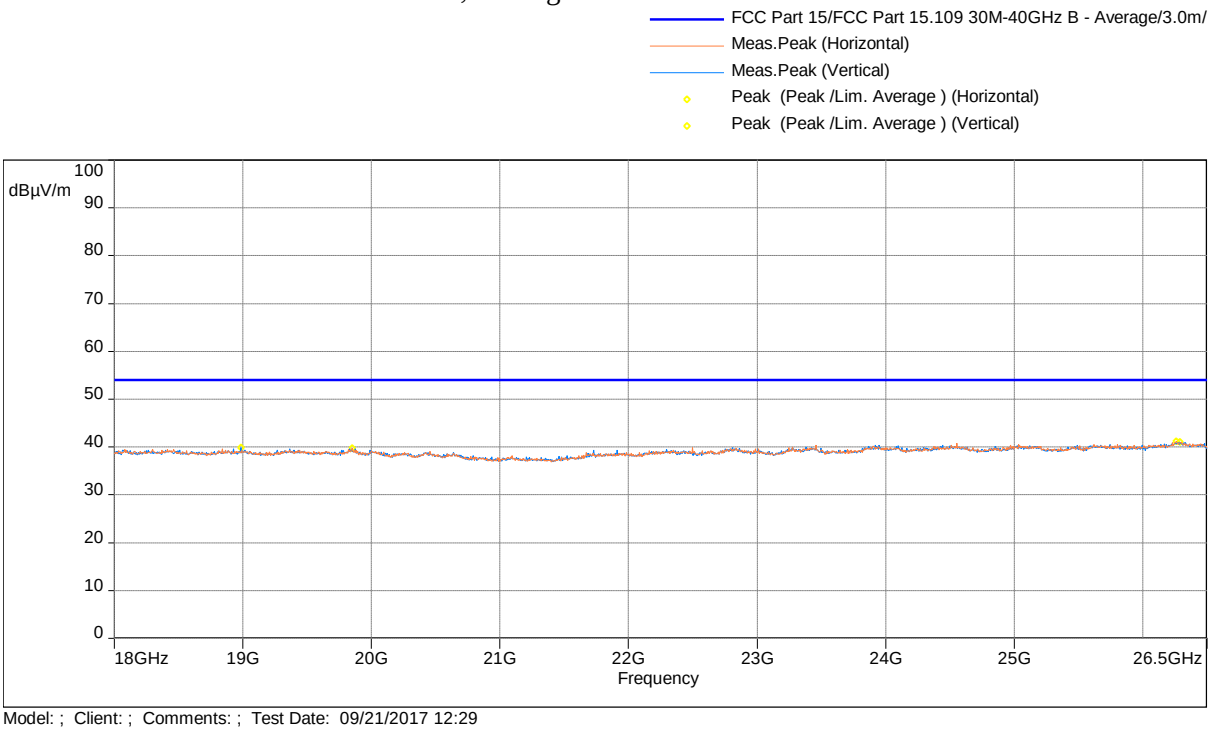
4.6.3 Test Results (Continued)

Radiated Emissions 18GHz – 26.5GHz, Peak



Model: ; Client: ; Comments: ; Test Date: 09/21/2017 13:59

Radiated Emissions 18GHz – 26.5GHz, Average



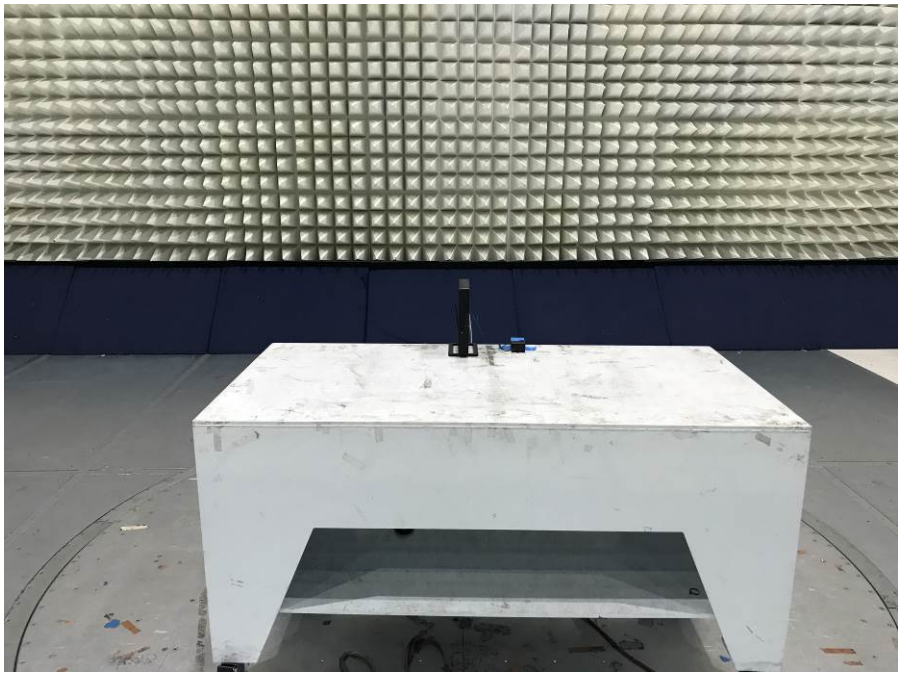
Model: ; Client: ; Comments: ; Test Date: 09/21/2017 12:29

Result: **Complies** by 1.3 dB

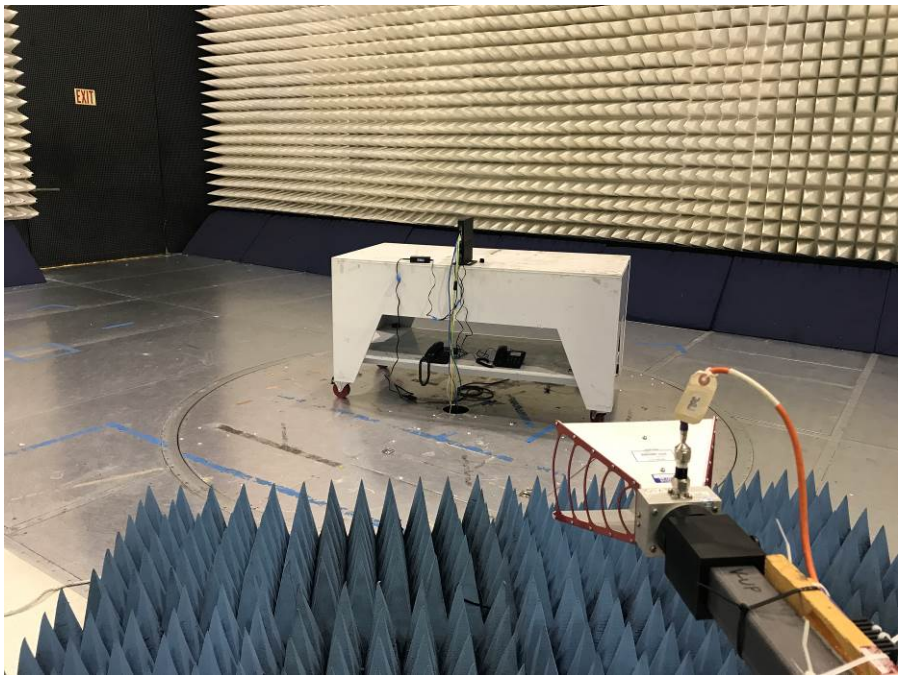
Note: Radiated emission measurements were performed up to 40GHz. No Emissions were identified when scanned from 26.5 GHz - 40 GHz.

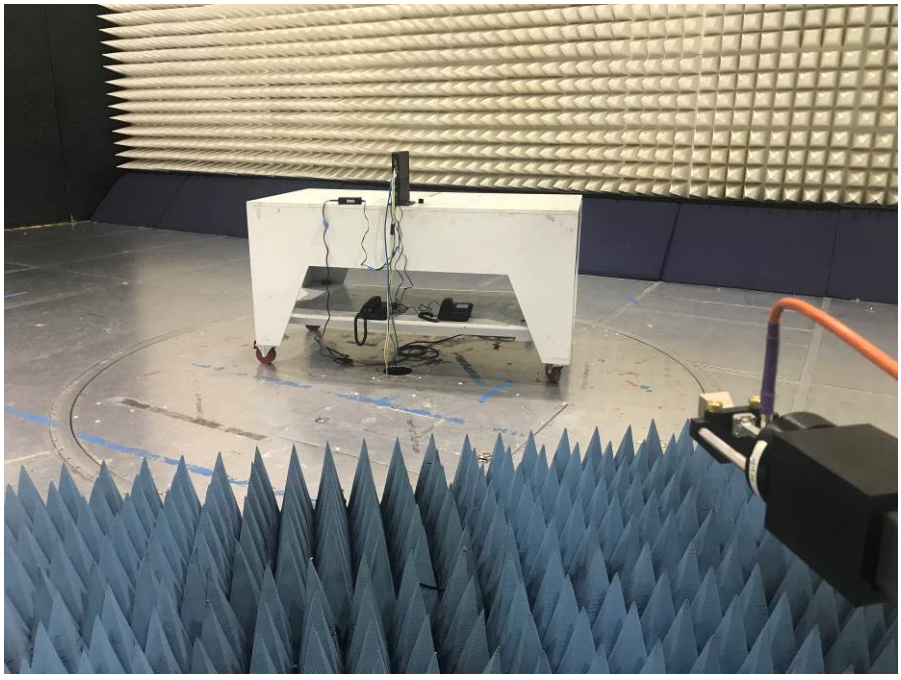
4.6.4 Test Configuration Photographs

The following photographs show the testing configurations used.



4.6.4 Test Configuration Photographs (Continued)





4.7 AC Line Conducted Emission
FCC: 15.207, 15.107

4.7.1 Requirement

Frequency Band MHz	Class B Limit dB(μV)		Class A Limit dB(μV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

*Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.*

4.7.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4: 2014 & ANSI C63.10-2013.

4.7.3 Test Result

Date of Test:	September 22, 2016
Results	**Complies**

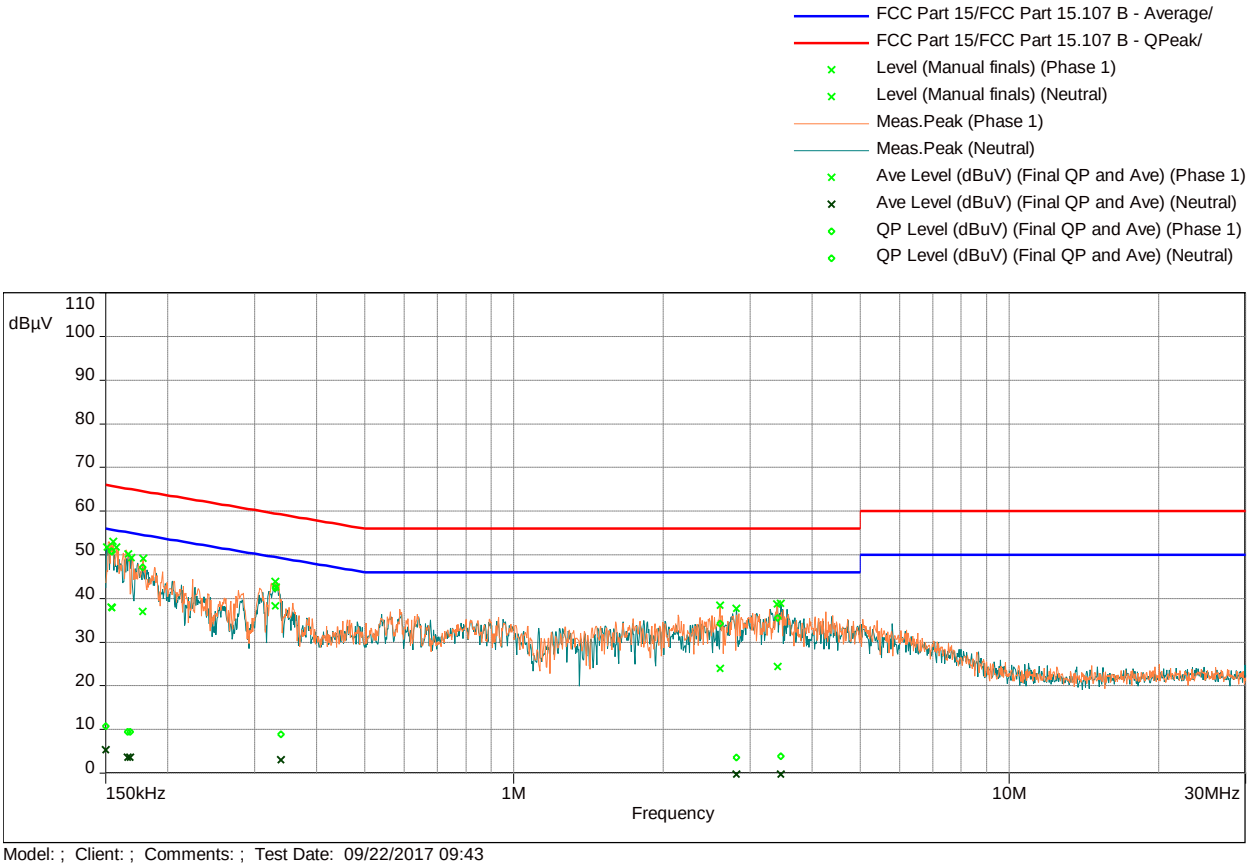
AC Line Conducted Emission Data, Digital

Model: ; Client: ; Comments: ; Test Date: 09/22/2017 09:22

Frequency (MHz)	Ave Level (dBuV)	QP Level (dBuV)	Ave Limit (dBuV)	QP Limit (dBuV)	Ave Margin (dB)	QP Margin (dB)	Line	Correction (dB)
0.152743	38.3	50.5	55.9	65.9	-17.5	-15.3	Phase 1	11.0
0.329951	36.8	40.9	49.5	59.5	-12.6	-18.6	Phase 1	11.1
3.200813	24.0	35.8	46.0	56.0	-22.0	-20.3	Phase 1	11.3
0.153599	37.9	49.9	55.8	65.8	-17.9	-15.9	Neutral	11.0
0.330223	36.8	40.8	49.5	59.5	-12.7	-18.7	Neutral	11.1
3.453977	23.6	36.1	46.0	56.0	-22.4	-19.9	Neutral	11.3

4.7.3 Test Result (Continued)

AC Line Conducted Emission Data, Tx On
Tx at 802.11n 20MHz - CH 2412MHz, and 802.11n 20MHz – CH 5180MHz



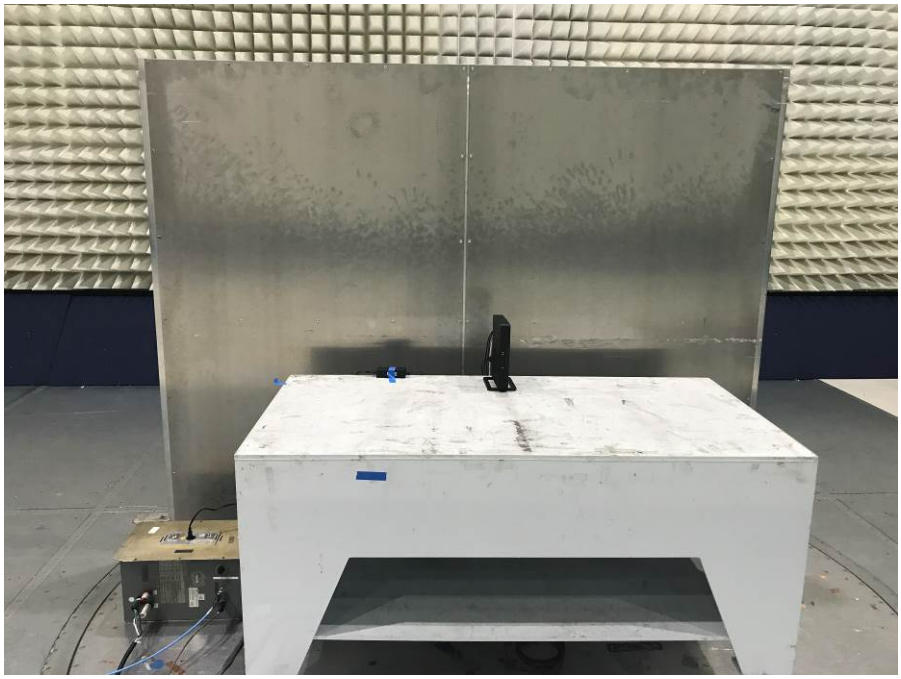
Model: ; Client: ; Comments: ; Test Date: 09/22/2017 09:43

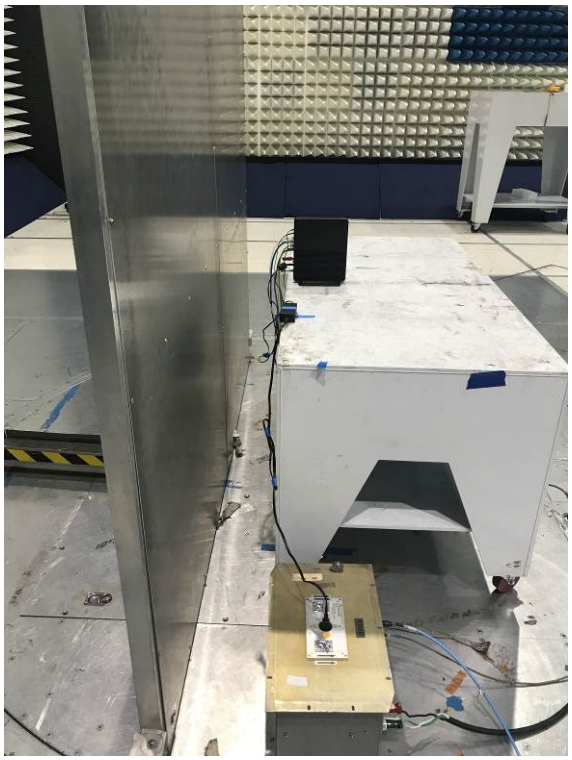
Frequency (MHz)	Ave Level (dBuV)	QP Level (dBuV)	Ave Limit (dBuV)	QP Limit (dBuV)	Ave Margin (dB)	QP Margin (dB)	Line	Correction (dB)
0.153993	38.0	50.8	55.8	65.8	-17.8	-14.9	Phase 1	11.0
0.178310	36.9	47.1	54.6	64.6	-17.6	-17.5	Phase 1	11.0
0.329424	38.3	42.4	49.5	59.5	-11.2	-17.1	Phase 1	11.1
3.408377	24.4	35.5	46.0	56.0	-21.6	-20.5	Phase 1	11.3
0.165899	37.4	50.2	55.2	65.2	-17.8	-15.0	Neutral	11.0
2.812124	24.6	37.6	46.0	56.0	-21.5	-18.4	Neutral	11.2
3.462294	24.4	38.9	46.0	56.0	-21.6	-17.1	Neutral	11.3

Results	**Complies** by 12.6 dB

4.7.4 Test Configuration Photographs

The following photographs show the testing configurations used.





5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset #	Cal Int	Cal Due
Spectrum Analyzer	Rohde and Schwarz	FSU	ITS 00913	12	01/12/18
EMI Receiver	Rohde and Schwarz	ESU	ITS 00961	12	07/10/18
Pyramidal Horn Antenna	EMCO	3160-09	ITS 00571	#	#
Pyramidal Horn Antenna	EMCO	3160-10	ITS 00572	#	#
Horn Antenna	ETS-Lindgren	3117	ITS 00982	12	02/03/18
BI-Log Antenna	Teseq	CBL 6111D	ITS 01058	12	08/11/18
Pre-Amplifier (18-40GHz)	Miteq	TTA1840-35-S-M	ITS 01393	12	04/18/18
Pre-Amplifier (1-18GHz)	Miteq	AMF-4D-001180-24-10P	ITS 00526	12	01/04/18
Pre-Amplifier	Sonoma Instrument	310	ITS 00942	12	01/19/18
Notch Filter	Micro-Tronics	BRM50702	ITS 01166	12	02/08/18
Notch Filter	Micro-Tronics	BRM50703	ITS 01167	12	01/19/18
Notch Filter	Micro-Tronics	BRM50705	ITS 01169	12	01/19/18
RF Cable	TRU Corporation	TRU CORE 300	ITS 01462	12	08/19/18
RF Cable	TRU Corporation	TRU CORE 300	ITS 01465	12	08/19/18
RF Cable	TRU Corporation	TRU CORE 300	ITS 01470	12	08/19/18
Attenuator	Mini Circuits	BW-N3W5+	ITS 01315	12	10/19/17
Attenuator	Narda	FSCM99899	ITS 01583	12	08/31/18
RF Cable	Megaphase	EMC1-K1K1-236	ITS 01538	12	06/13/18
RF Cable	Megaphase	TM40-K1K1-19	ITS 01154	12	01/26/18
RF Cable	Megaphase	TM40-K1K1-19	ITS 01155	12	01/26/18
Transient Limiter	COM-POWER	LIT-153A	ITS 01452	12	06/19/18
RF Cable	Megaphase	TM40-K1K1-59 RF	ITS 01156	12	01/26/18

No Calibration required

Software used for emission compliance testing utilized the following:

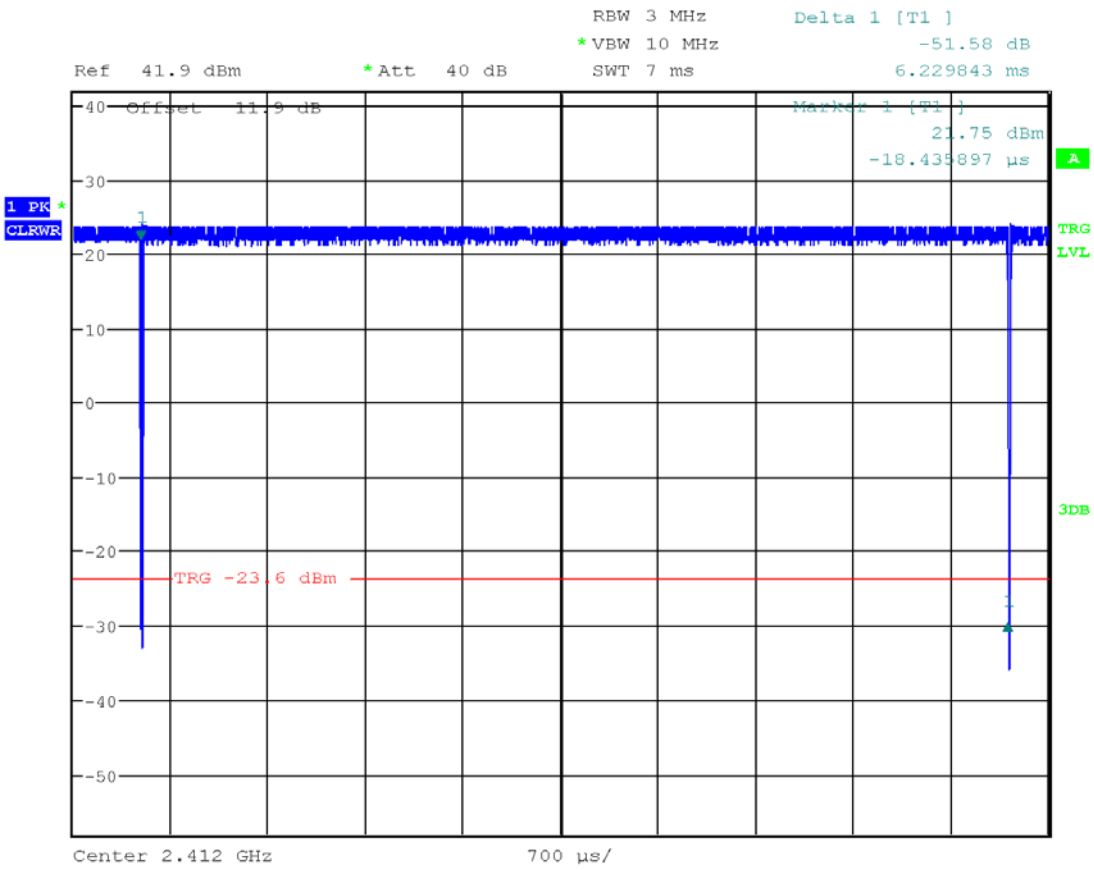
Name	Manufacturer	Version	Template/Profile
Tile	Quantum Change	3.4.K.22	Conducted Spurious_30M-26GHz
BAT-EMC	Nexio	3.16.0.64	Alticelabs, ML_9-20-17.bpp
RS Commander	Rohde Schwarz	1.6.4	Not Applicable (Screen grabber)

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewers Initials	Date	Change
1.0 / G103224477	ML	KV	October 18, 2017	Original document

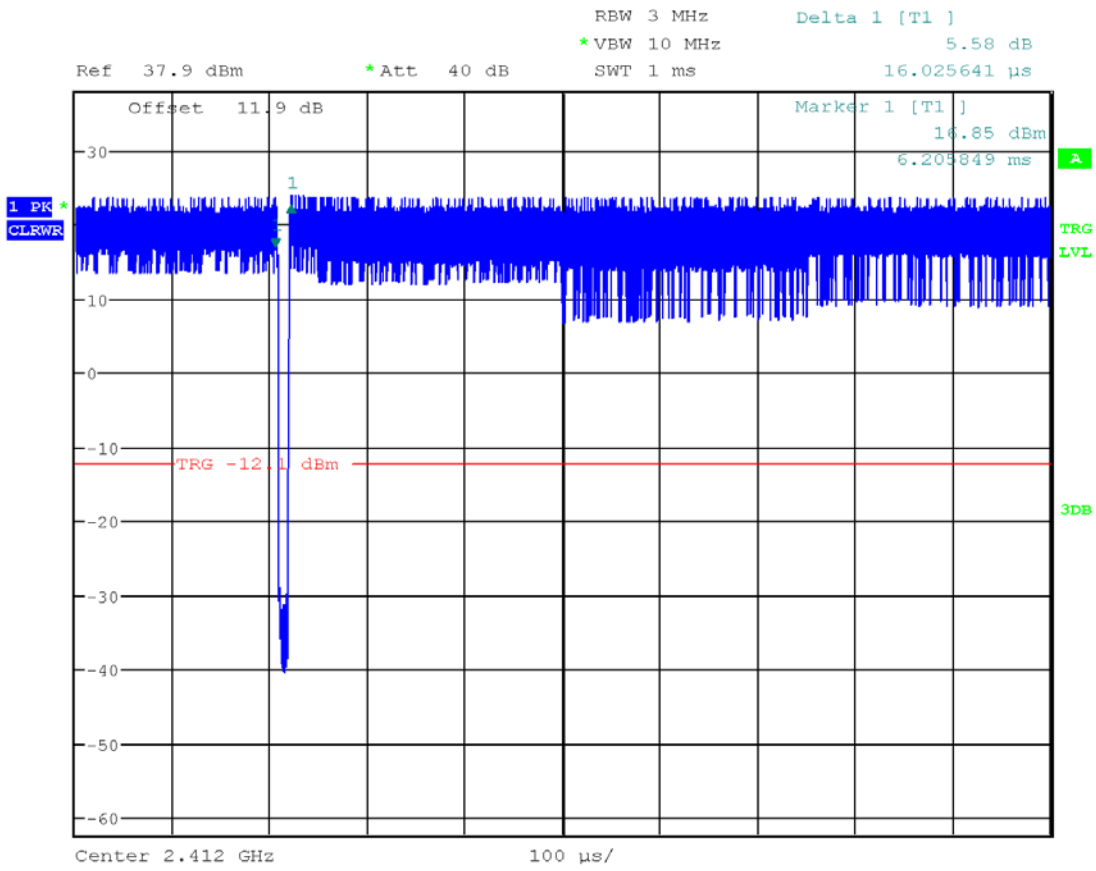
Annex A - Duty Cycle Measurement

IEEE 802.11b Period



Date: 29.SEP.2017 16:40:39

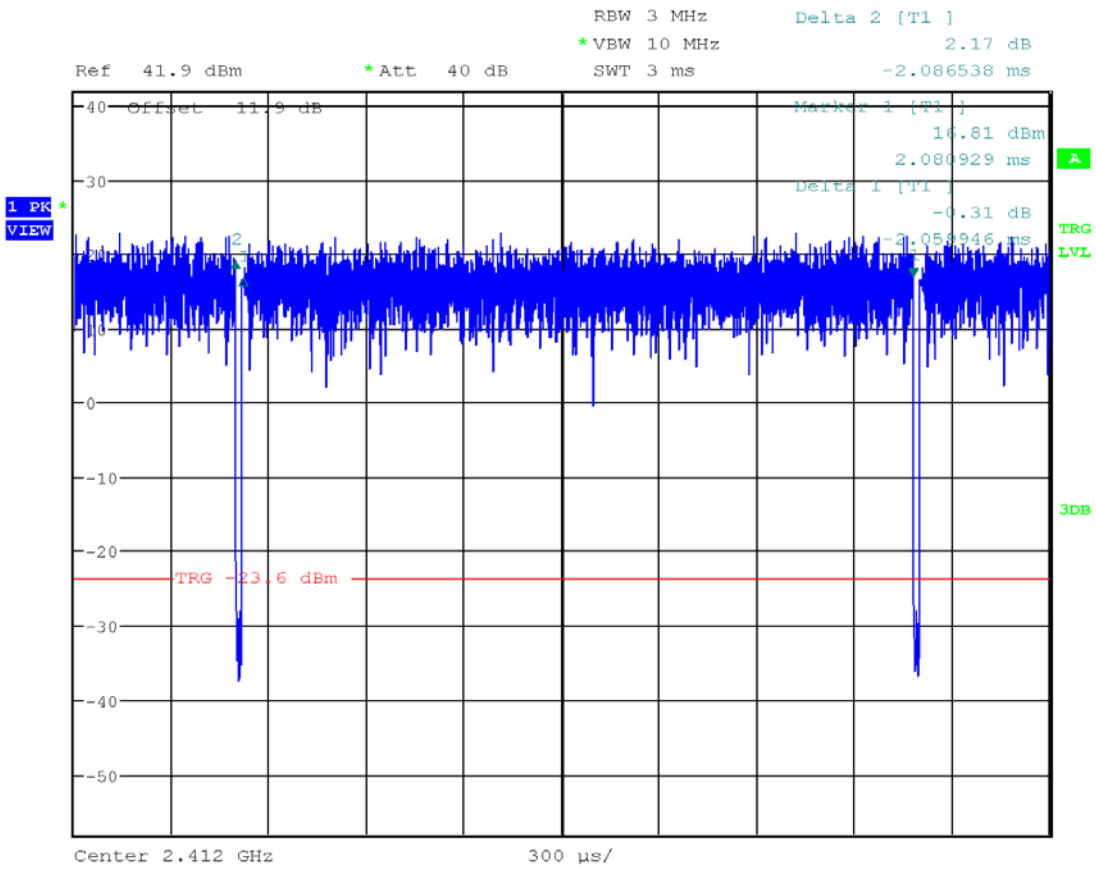
IEEE 802.11b Off Time



Date: 29.SEP.2017 16:16:59

Duty Cycle: DC = 0.016/ 6.229 = 0.997 or 99.7%

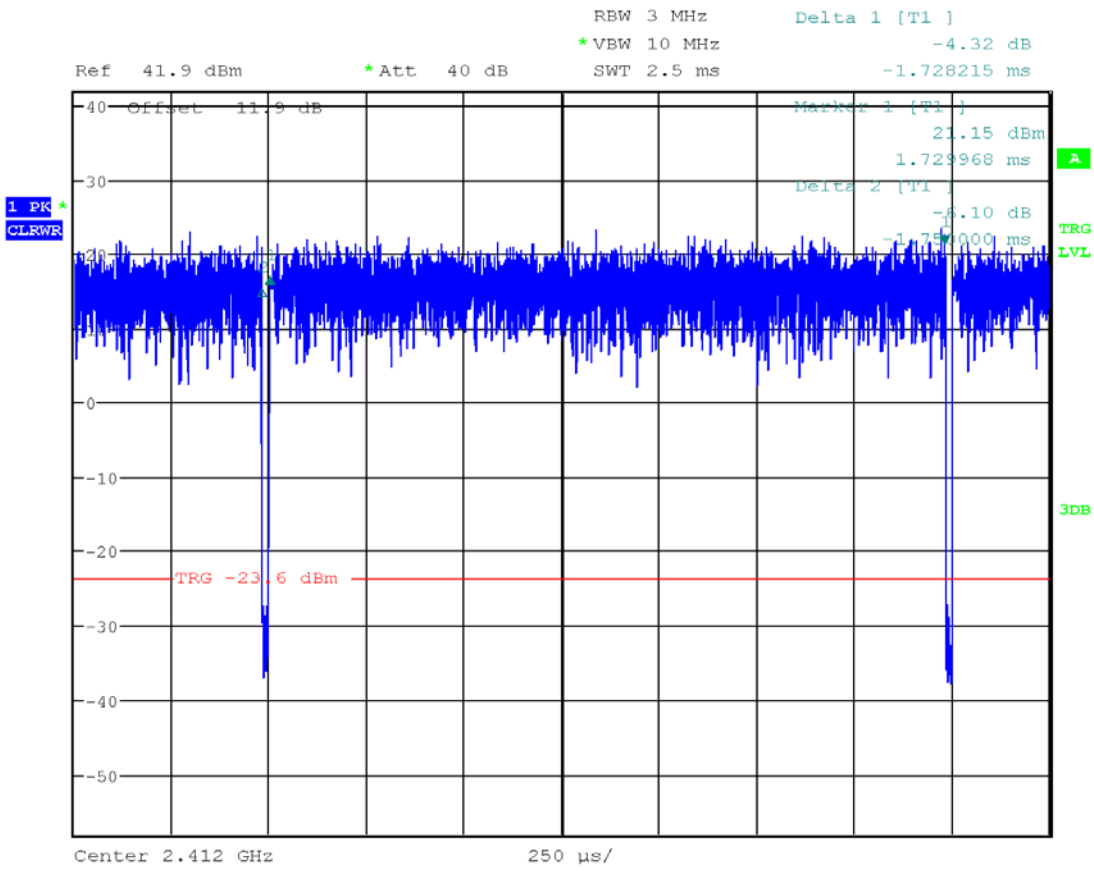
IEEE 802.11g



Date: 29.SEP.2017 16:38:38

Duty Cycle: DC = 2.06/ 2.08 = 0.99 or 99.0%

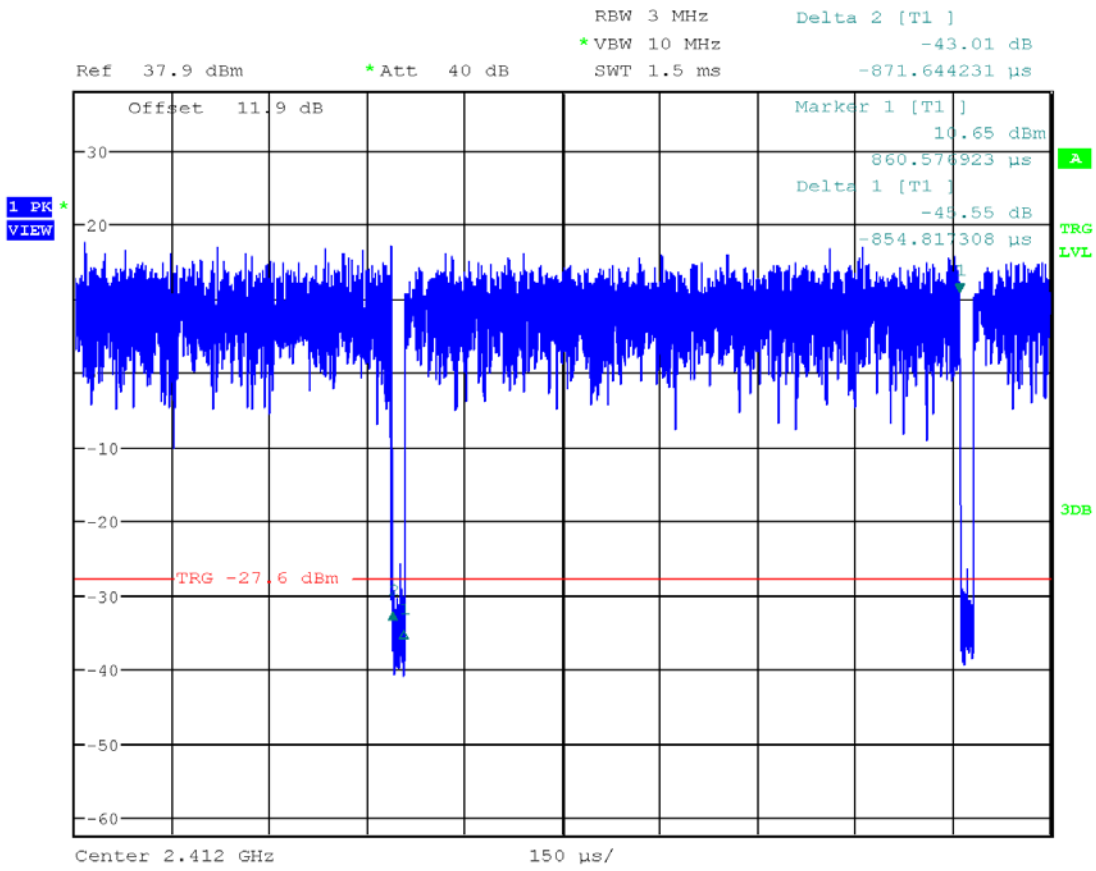
IEEE 802.11n 20MHz



Date: 29.SEP.2017 16:35:04

Duty Cycle: DC = 1.728/ 1.75 = 0.987 or 98.7%

IEEE 802.11n 40MHz



Date: 29.SEP.2017 16:30:29

Duty Cycle: DC = 854.8/ 871.65 = 0.981 or 98.1%