

9.7 Conducted Band Edge Emissions

9.7.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (b)

Industry Canada RSS-247 [6.2]

9.7.2 Test Method:

Measurements were performed according to the procedures defined in KDBs 789033 D02-General UNII Test Procedures New Rules v01, 662911 D01 Multiple Transmitter Output v02r01, and ANSI C63.10 2013.

Spectrum Analyzer settings:

Band Edge Emissions:

RBW= 1 MHz

VBW $\geq$ 3 MHz

Detector= Peak

Sweep time= Auto

Span = 10MHz

Allow sweeps to continue until the trace stabilizes.

Measure and add $10 \log (N_{ANT})$,

where N_{ANT} is the number of transmit chains.

9.7.3 Limits:

All undesired emissions that fall outside of restricted bands shall maintain level $\leq -27\text{dBm/MHz}$

9.7.4 Test Result:

Pass.

9.7.5 Test Data:

9.7.5.1 802.11a Conducted Band Edge Emissions

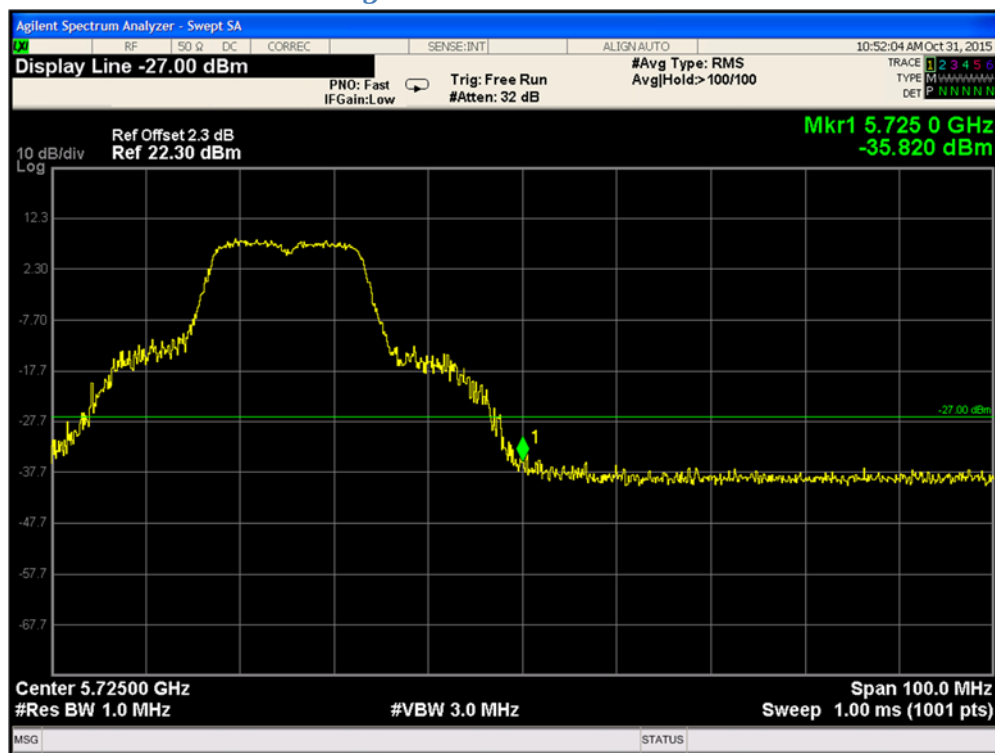


Figure 9-107. Conducted Band Edge 802.11a (Ch. 140)

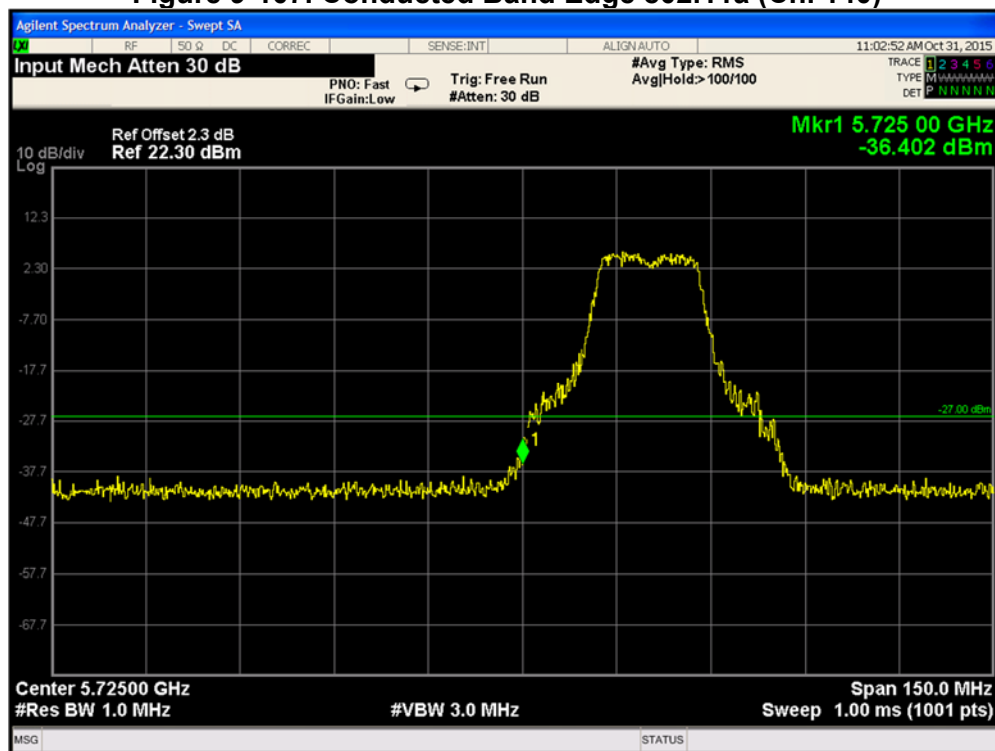


Figure 9-108. Conducted Band Edge 802.11a (Ch. 149)

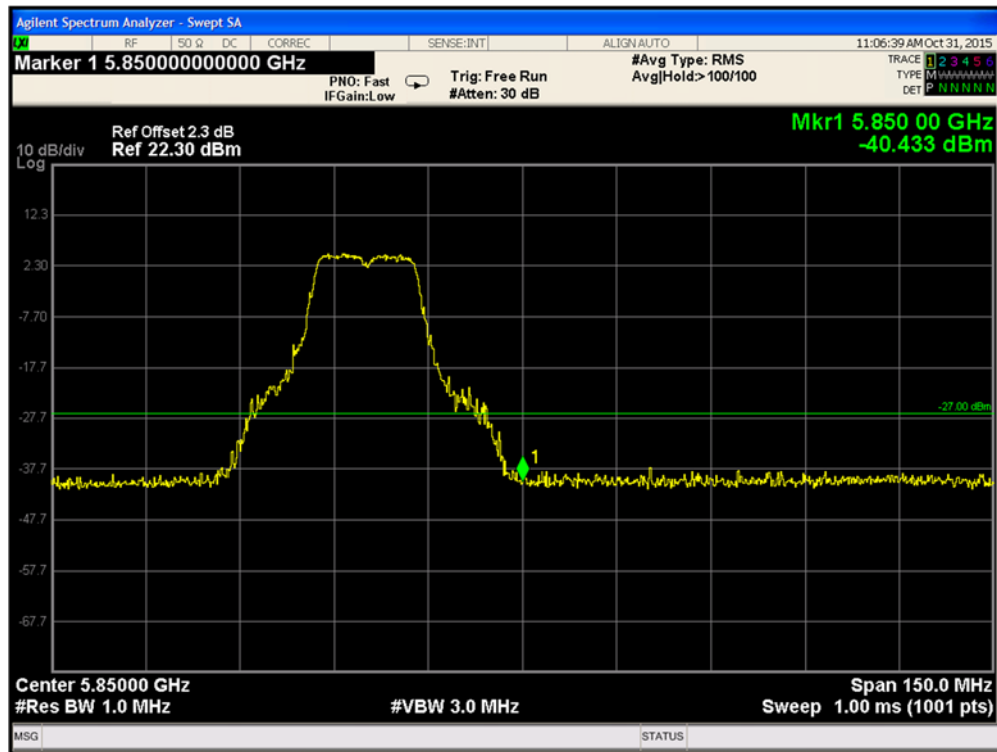


Figure 9-109. Conducted Band Edge 802.11a (Ch. 165)

9.7.5.2 802.11n HT20 Conducted Band Edge Emissions

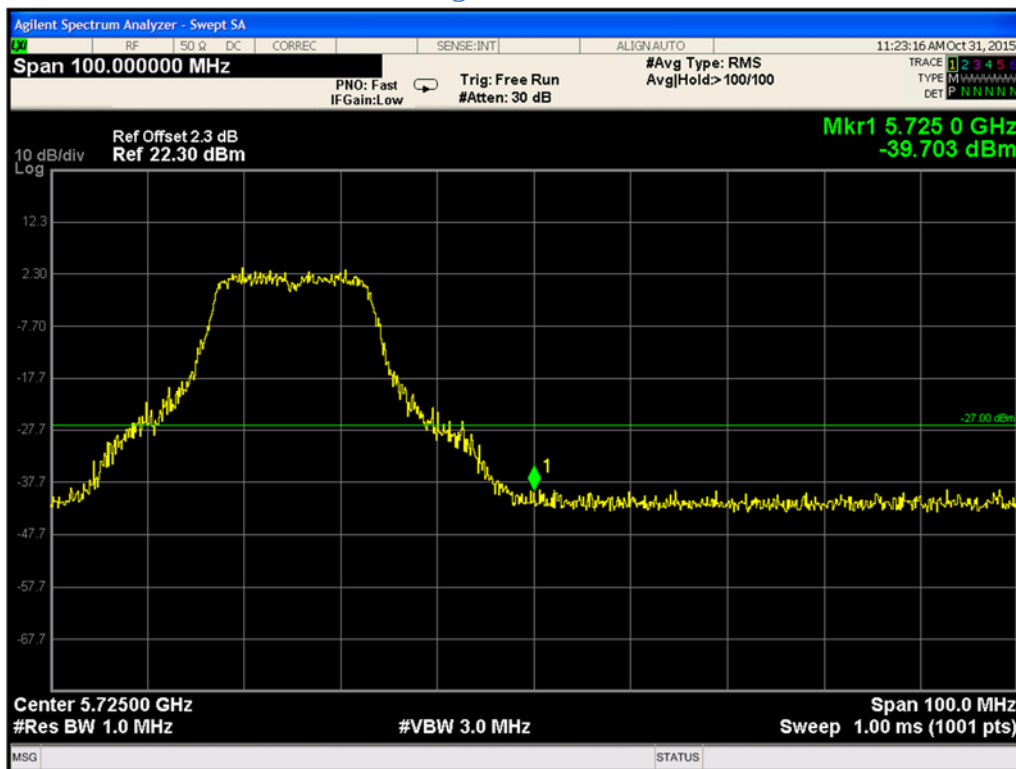


Figure 9-110. Conducted Band Edge 802.11n HT20 (Ch. 140)

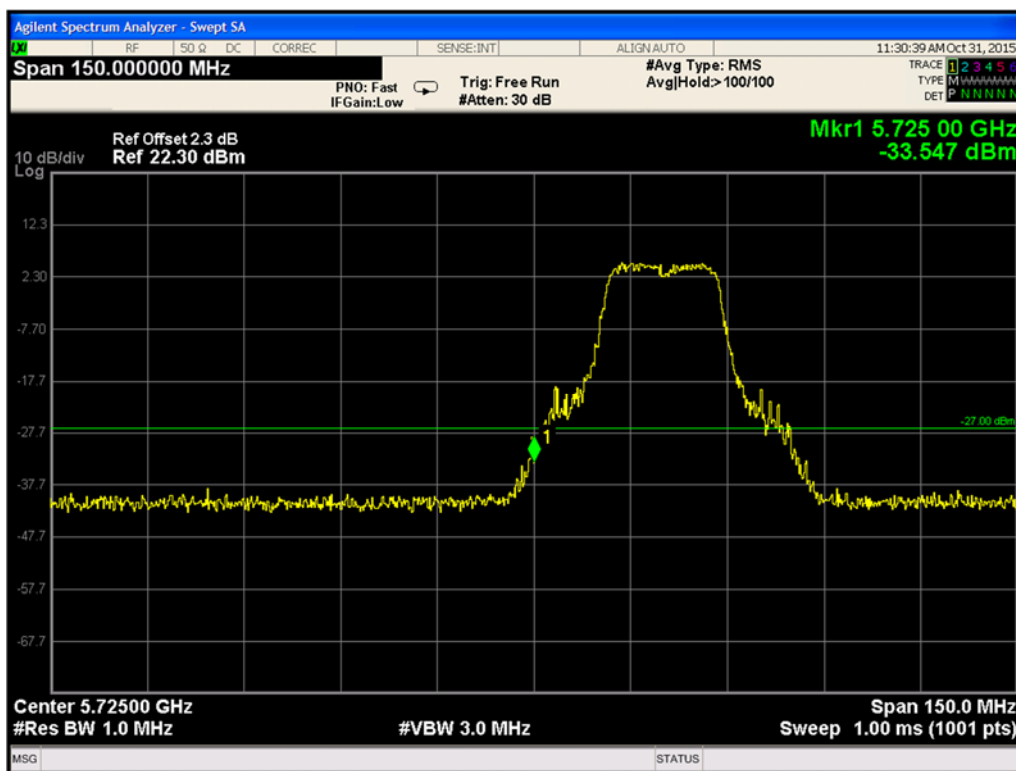


Figure 9-111. Conducted Band Edge 802.11n HT20 (Ch. 149)

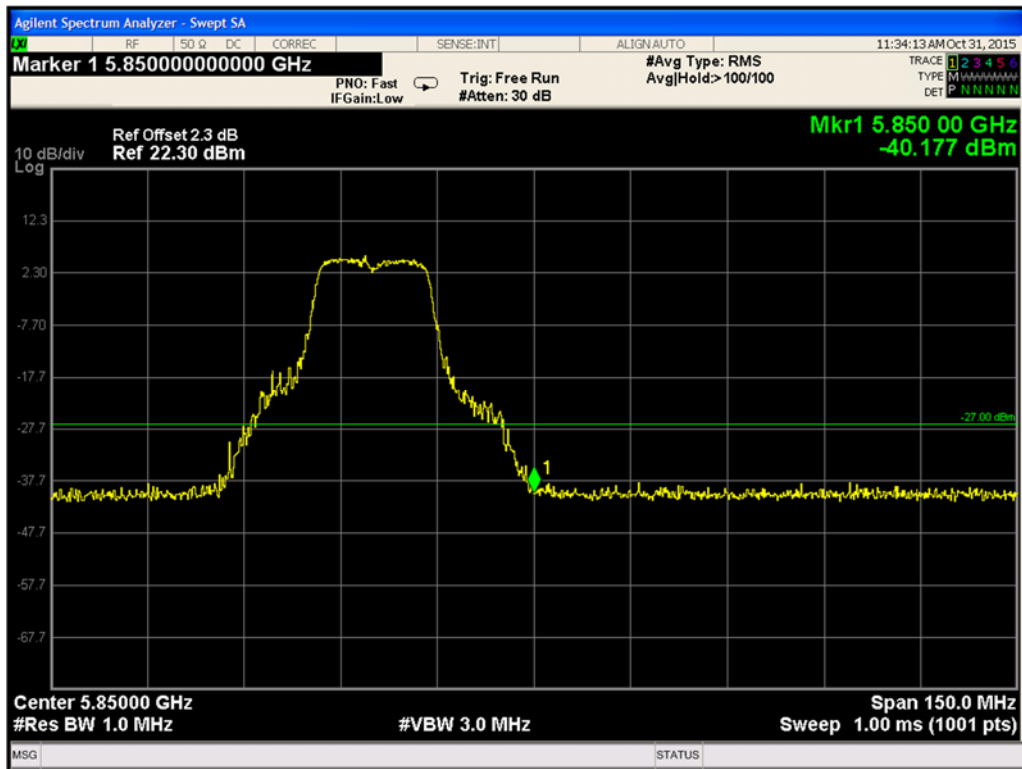


Figure 9-112. Conducted Band Edge 802.11n HT20 (Ch. 165)

9.8 Radiated Spurious and Band Edge Emissions

9.8.1 Test Requirement:

FCC CFR 47 Rule Part 15.407 (b)

Industry Canada RSS-247 [6.2] and RSS GEN [8.9]

9.8.2 Test Method:

Measurements were performed according to the procedures defined in KDB 789033 D02 General UNII Test Procedures New Rules v01 and ANSI C63.10 2013.

Radiated spurious measurements were made from 30MHz to the 10th harmonic of the fundamental frequency of the transmitter. The limit for radiated spurious emissions is per 15.209 and RSS-Gen. Additionally, emissions found in the restricted bands as listed in 15.205 were tested for compliance per limits 15.209 and RSS-Gen.

The EUT was tested near the low, middle and high channels of operation in each sub band. Guidelines in ANSI C63.10 2013 were followed with respect to maximizing the emissions. Emissions below 1 GHz were maximized by continuously scanning the unit in three orthogonal orientations. Measurements above 1 GHz were maximized by rotating the EUT about its vertical and horizontal axis. The horizontal axis was varied in 30 degree increments up to 150 degrees in accordance with ANSI C 63.10 2013. Both Horizontal and vertical polarizations were investigated. Worst case maximized data is shown in this test report. The EUT's maximum emissions for measurements below 1GHz were observed to be with the unit placed flat on the table.

A pre-amp and a high pass filter were required for this test, in order to provide the measuring system with sufficient sensitivity. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength.

Radiated Spurious Emissions

Spectrum Analyzer Settings:

30 MHz- 1 GHz:

RBW= 120 kHz

VBW $\geq$ 3 X RBW

Trace Mode: Peak Detector (Max Hold). Final measurements performed using QP Detector.

Span= 30 MHz- 1 GHz

Sweep time= Auto

Above 1 GHz:

RBW= 1 MHz

VBW= 3 MHz

Trace Mode: Peak Detector (Max Hold) and RMS Average Detector (Max Hold)

Span= 1- 18 GHz, 18- 26.5 GHz, and 26.5GHz – 40GHz

Sweep time= Auto

Restricted Band-Edge Emissions**Spectrum Analyzer Settings:**

RBW= 1 MHz

VBW= 3 MHz

Trace Mode: Peak Detector (Max Hold) and RMS Average Detector (Max Hold)

Span= 2310 – 2500 MHz

Sweep Points = 801

Sweep Time = Peak: Auto; Average: 100 s

Sample Calculation:

Field Strength Level: Amplitude (Analyzer level) + AFCL (Antenna Factor and Cable losses) –
Amplifier Gain = 50 dB μ V + 33 dB – 25 dB = 78dB μ V/m

9.8.3 Limits:

Frequency (MHz)	Field Strength (μ V/m)	Measurement Distance (meters)	Corrected Field Strength for 3m measurement distance (dB μ V/m)
0.009-0.490	2400/F (kHz)	300	48.5- 13.8
0.490-1.705	24000/F (kHz)	30	33.8- 23.0
1.705-30	30	30	29.5
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
960-1000	500	3	54
Above 1000	500	3	54 (Average) 74 (Peak)

9.8.4 Test Result:

Pass.

9.8.5 Test Data:

9.8.5.1 Radiated Emissions in 30 MHz- 1 GHz range

Worst case emissions from Ch 140 shown below.

RSE 30-1000 MHz					
Frequency (MHz)	Raw QP Amplitude (dB μ V/m)	Correction Factor (dB)	Corrected QP Field Strength (dB μ V/m)	QP Limit (dB μ V/m)	QP Margin (dB)
33.185000	36.46	-10.9	25.56	40.0	14.44
121.643709	39.22	-16.0	23.22	40.0	20.28
376.757054	37.75	-12.1	25.65	43.52	20.35
600.004546	33.95	-6.7	27.25	46.02	18.75
959.982146	36.21	-1.5	34.71	46.02	11.29

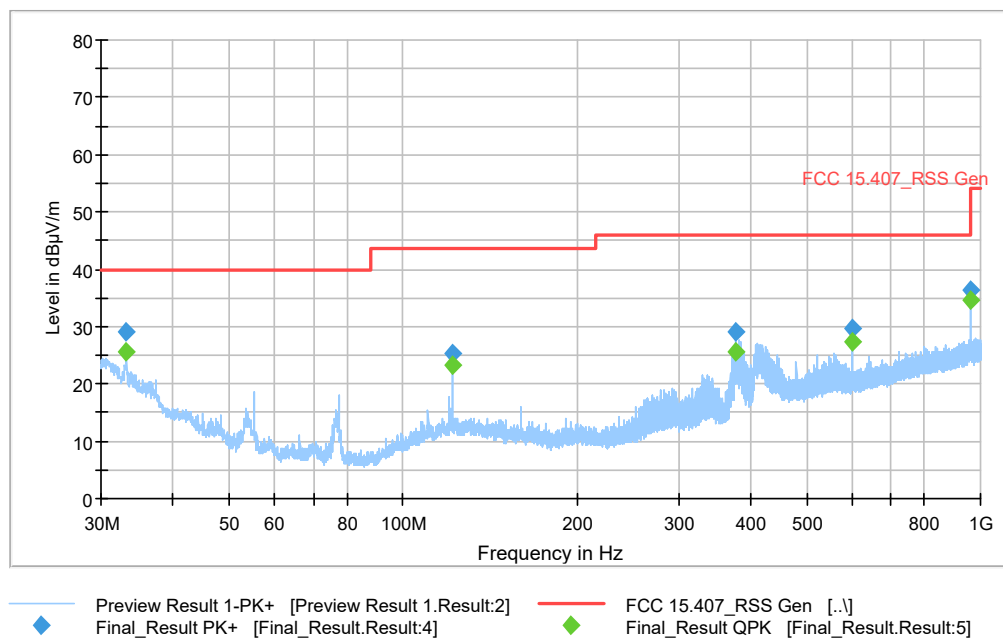


Figure 9-113. Radiated Spurious Emissions 30-1000 MHz Tx 802.11n (Ch. 140)

9.8.5.2 Radiated Emissions in 1-18 GHz range 802.11a

RSE - 18GHz Average Data – 802.11a							
Channel No.	Carrier Frequency (MHz)	Emission Frequency (MHz)	Raw Avg. Amplitude (dBμV)	Correction Factor (dB)	Corrected Avg. Field Strength (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)
36	5180	Noise floor					
40	5220	Noise floor					
48	5240	Noise floor					
52	5260	Noise floor					
60	5300	7066.5	30.63	12.6	43.23	54	10.77
64	5320	7093	31.72	12.2	43.92	54	10.08
64	5320	10645.9	23.39	15.6	38.99	54	10.08
100	5500	7333.4	35.99	11.8	47.79	54	6.21
100	5500	11000.1	30.88	15.7	46.58	54	7.42
116	5580	7439.9	37.33	12.0	49.33	54	4.67
116	5580	11160	27.83	16.5	44.33	54	9.67
140	5700	7599.9	36.08	12.5	48.58	54	5.42
140	5700	1902.3	28.37	11.2	39.57	54	14.43
140	5700	11399.7	25.05	15.8	40.85	54	13.15
149	5745	7659.9	34.04	12.9	46.94	54	7.06
149	5745	4806.7	25.32	16.3	41.62	54	12.38
149	5745	11489.6	23.61	16.1	39.71	54	14.29
149	5745	17220.3	26.36	16.1	42.46	54	11.54
157	5785	4860.8	23.97	16.4	40.37	54	13.63
157	5785	7713.4	27.15	12.7	39.85	54	14.15
157	5785	11569.6	29.15	16.4	45.55	54	8.45
165	5825	4862.5	25.25	16.4	41.65	54	12.35
165	5825	11648.6	23.83	16.6	40.43	54	13.57

RSE - 18GHz Peak Data – 802.11a							
Channel No.	Carrier Frequency (MHz)	Emission Frequency (MHz)	Raw Peak Amplitude (dBμV)	Correction Factor (dB)	Corrected Peak Field Strength (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)
36	5180	Noise floor					
40	5220	Noise floor					
48	5240	Noise floor					
52	5260	Noise floor					
60	5300	7066.50	38.09	12.6	50.69	74	23.31
64	5320	10645.9	36.81	15.6	52.41	74	23.31
64	5320	7093	37.14	12.2	49.34	74	24.66
100	5500	7333.4	39.16	11.8	50.96	74	23.04
100	5500	11000.9	43.94	15.7	59.64	74	14.36
116	5580	11155.7	39.35	16.5	55.85	74	18.15
116	5580	7439.9	41.56	12	53.56	74	20.44
140	5700	1904	38.73	11.2	49.93	74	24.07
140	5700	4767.5	42.06	16.4	58.46	74	15.54
140	5700	11402.5	37.21	15.8	53.01	74	20.99
140	5700	7599.9	40.84	12.5	53.34	74	20.66
149	5745	1760.5	34.67	10.3	44.97	74	29.03
149	5745	1766.8	35.75	10.3	46.05	74	27.95
149	5745	4803.9	48.54	16.3	64.84	74	9.16
149	5745	11488.6	35.41	16.1	51.51	74	22.49
149	5745	17237.8	36.33	20.9	57.23	74	16.77
149	5745	7660	38.55	12.9	51.45	74	22.55
157	5785	4834.5	47.45	16.4	63.85	74	10.15
157	5785	7705.8	33.12	12.8	45.92	74	28.08
157	5785	11570	42.47	16.4	58.87	74	15.13
165	5825	4857.3	51.44	16.4	67.84	74	6.16
165	5825	11650.4	34.4	16.5	50.9	74	23.1

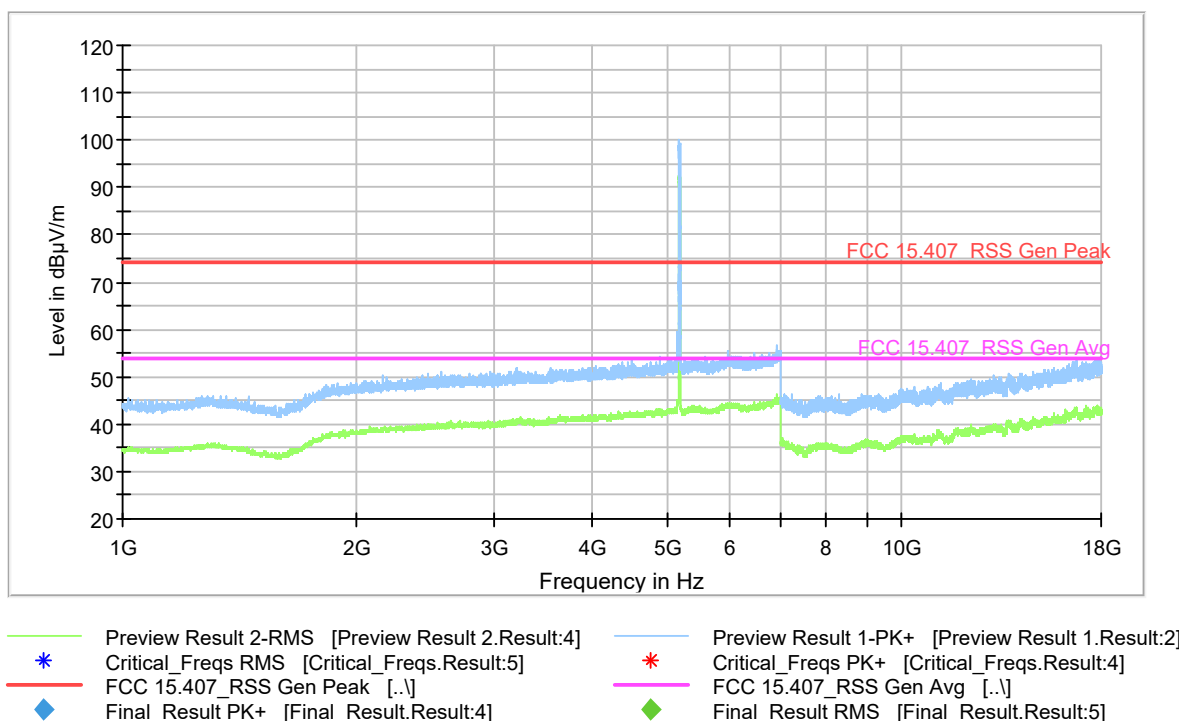


Figure 9-114. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 36)

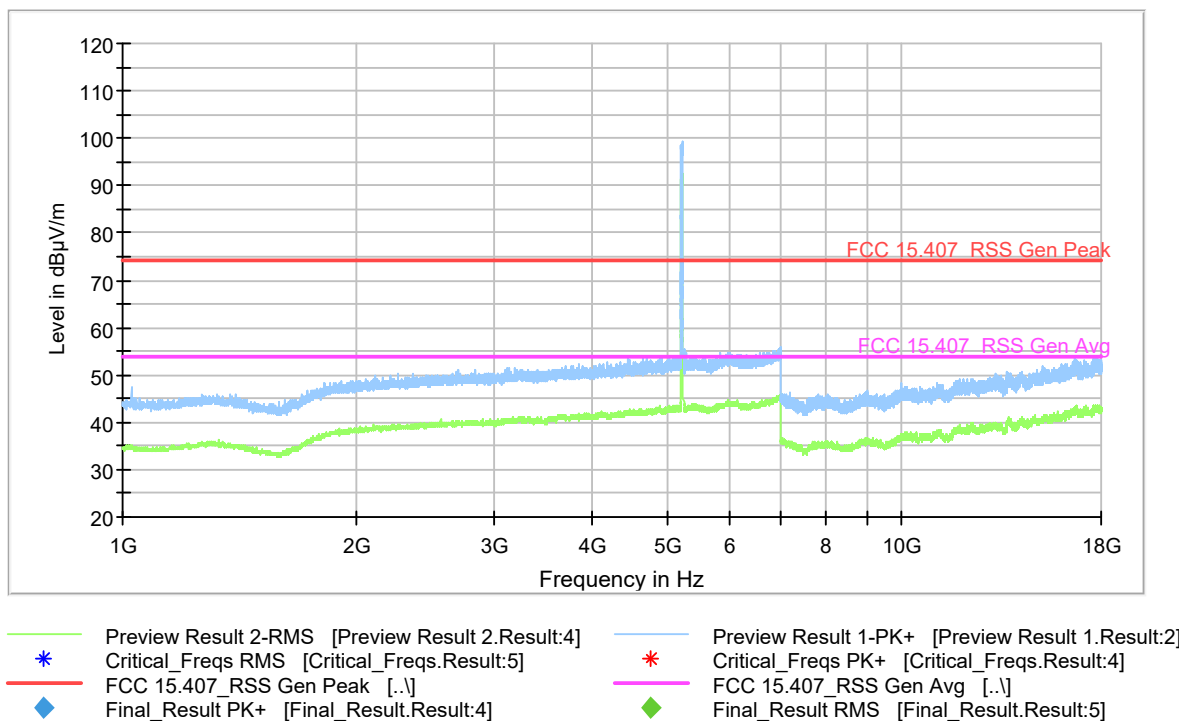


Figure 9-115. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 44)

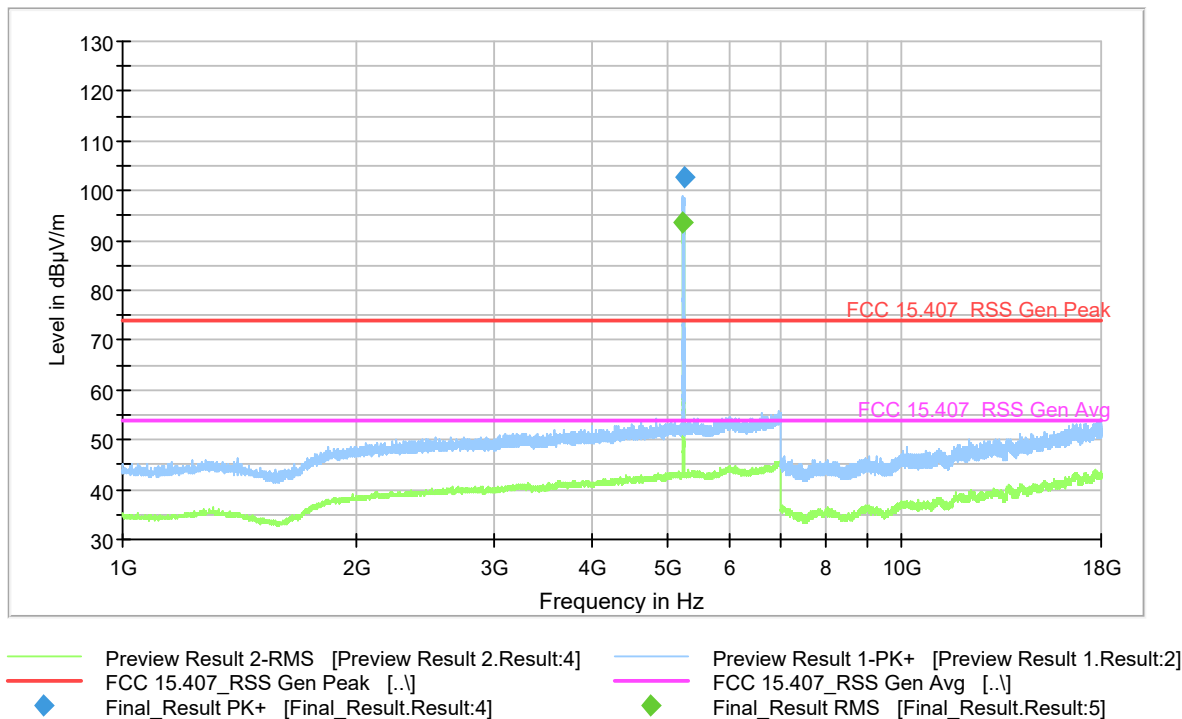


Figure 9-116. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 48)

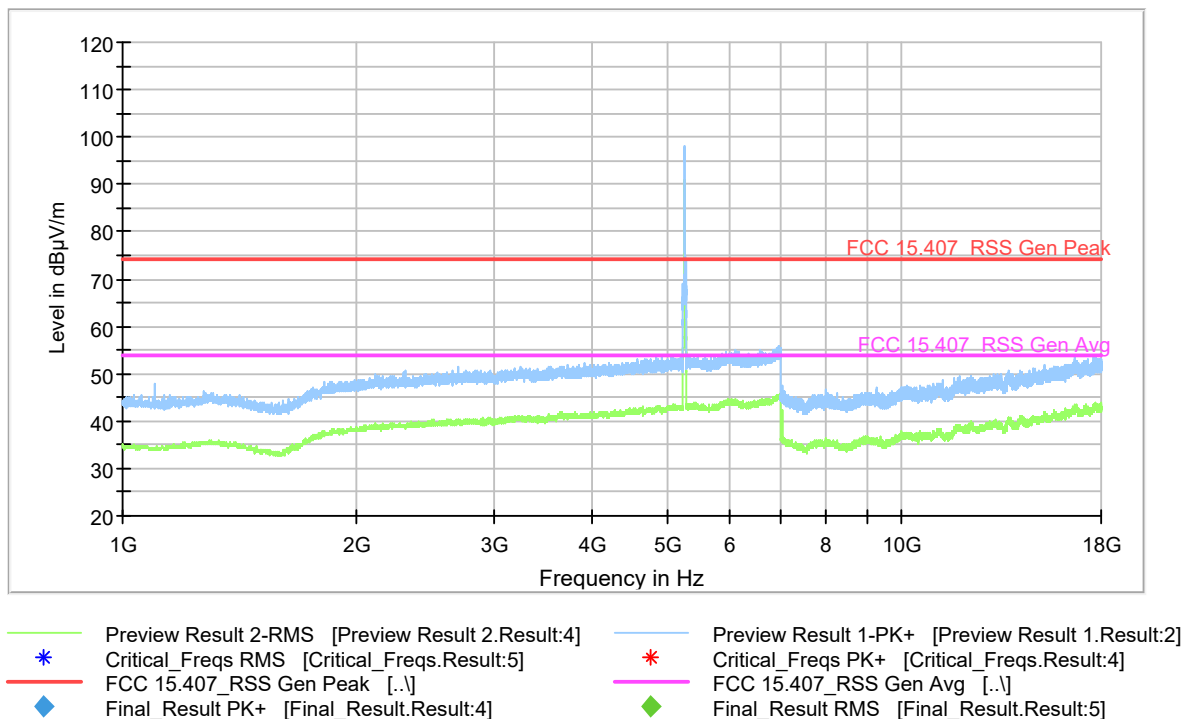


Figure 9-117. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 52)

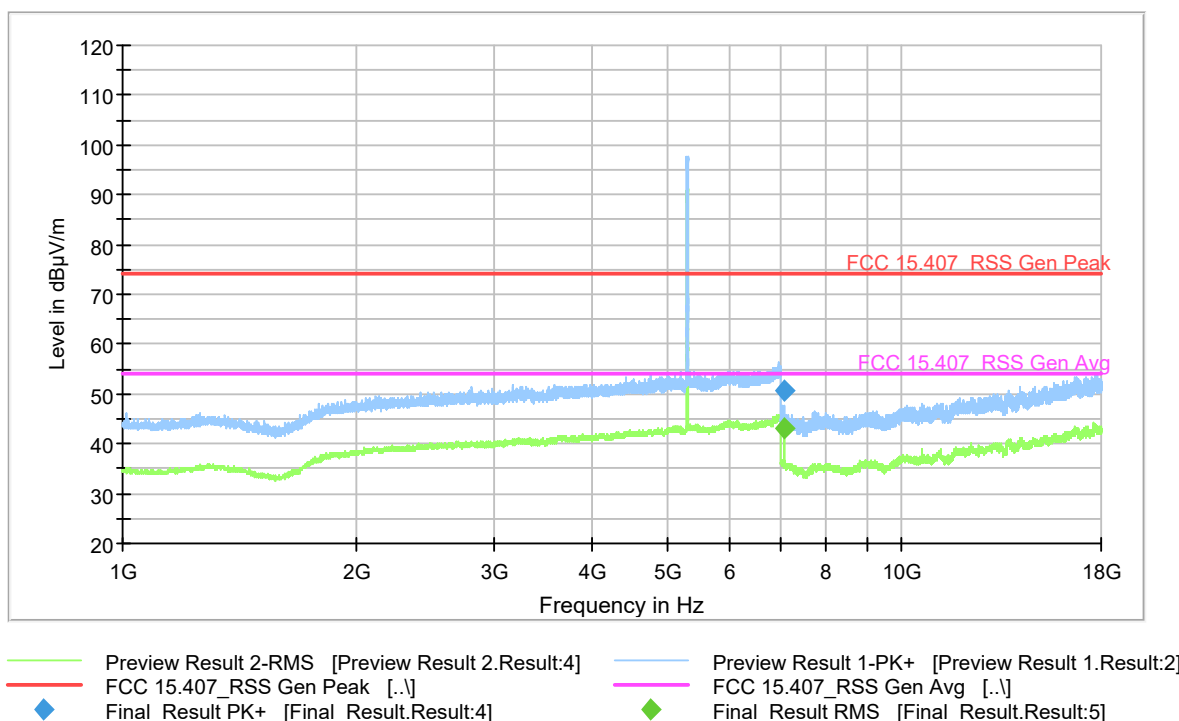


Figure 9-118. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 60)

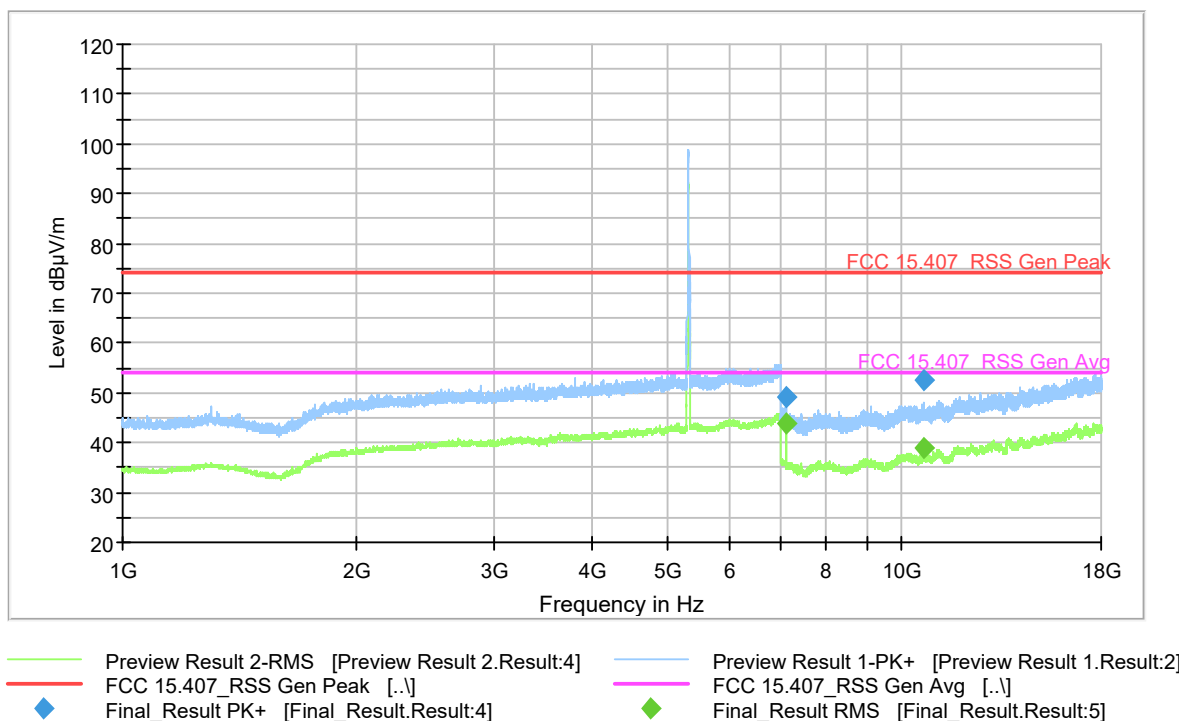


Figure 9-119. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 64)

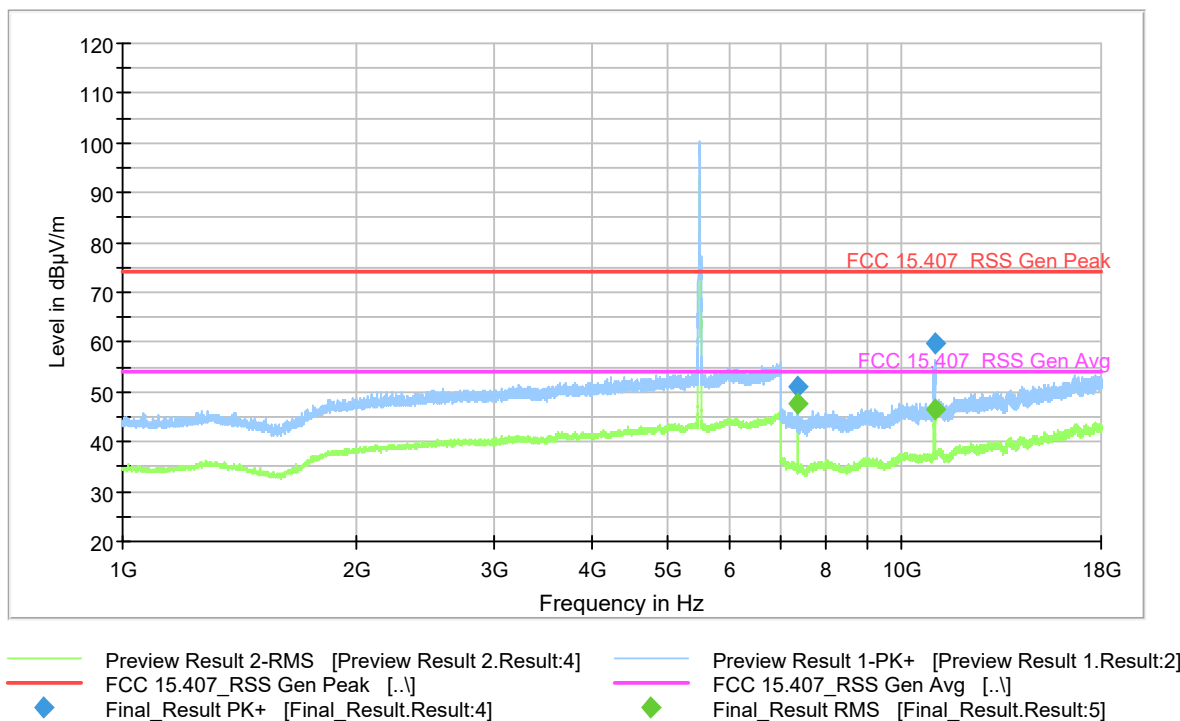


Figure 9-120. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 100)

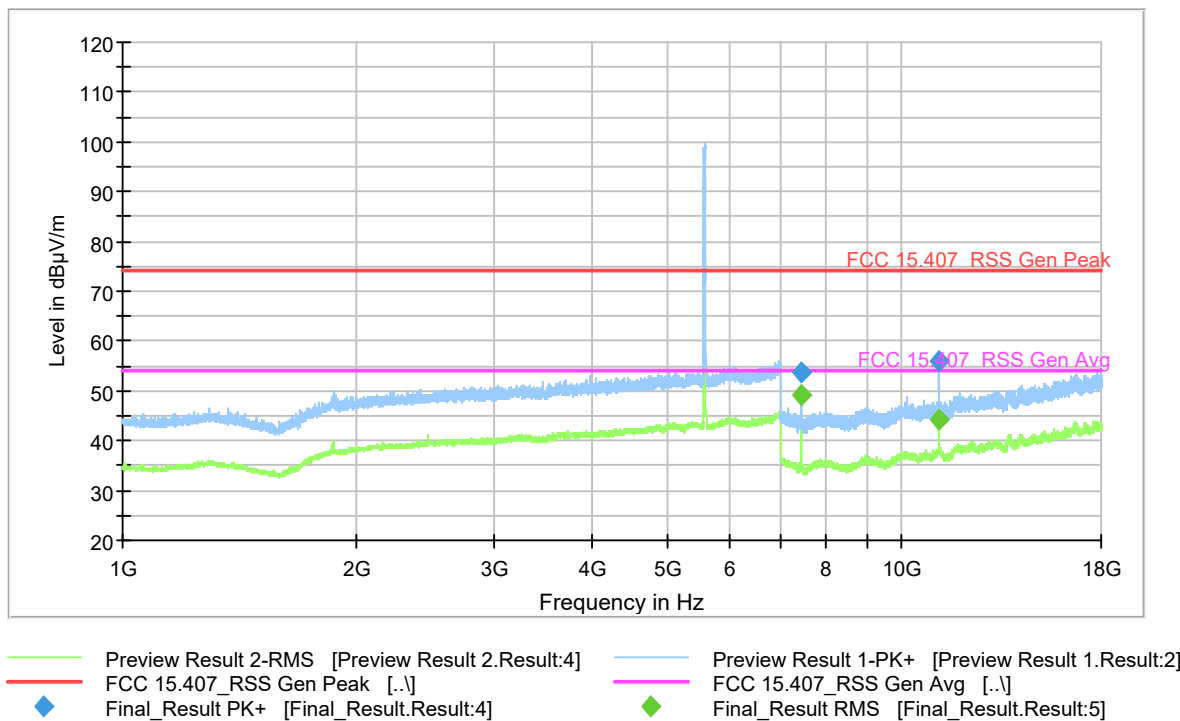


Figure 9-121. Radiated Spurious Emissions 1-18 GHz Tx B 802.11a (Ch. 116)

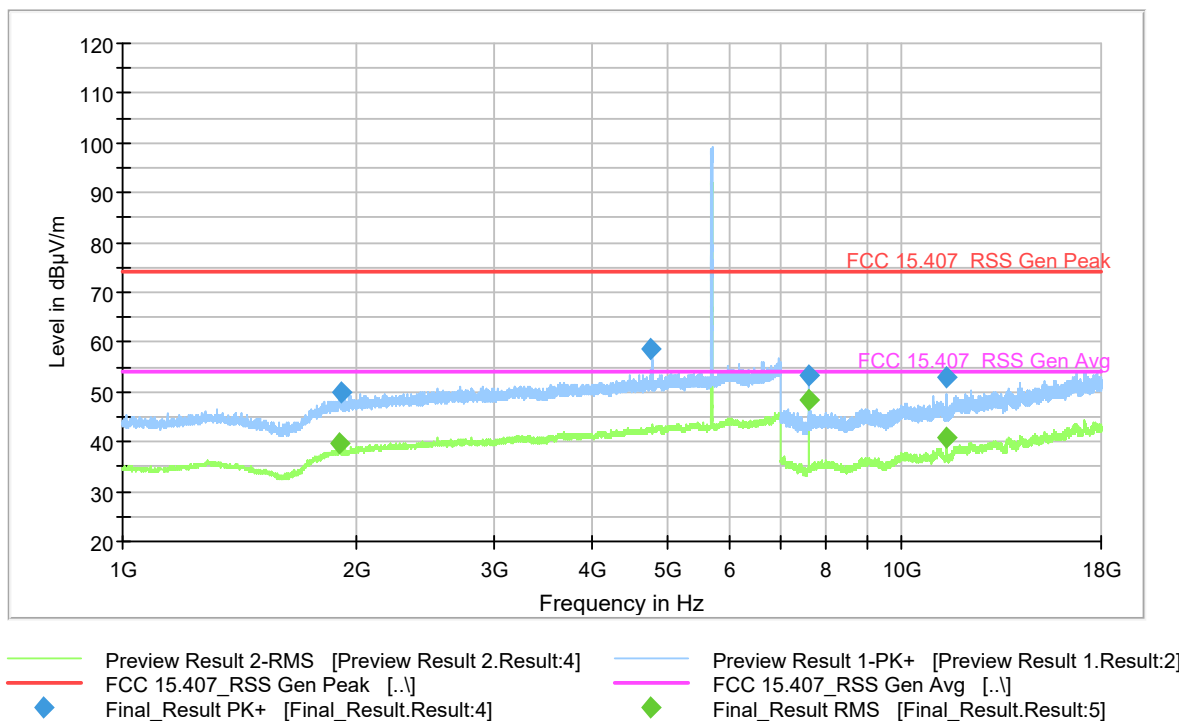


Figure 9-122. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 140)

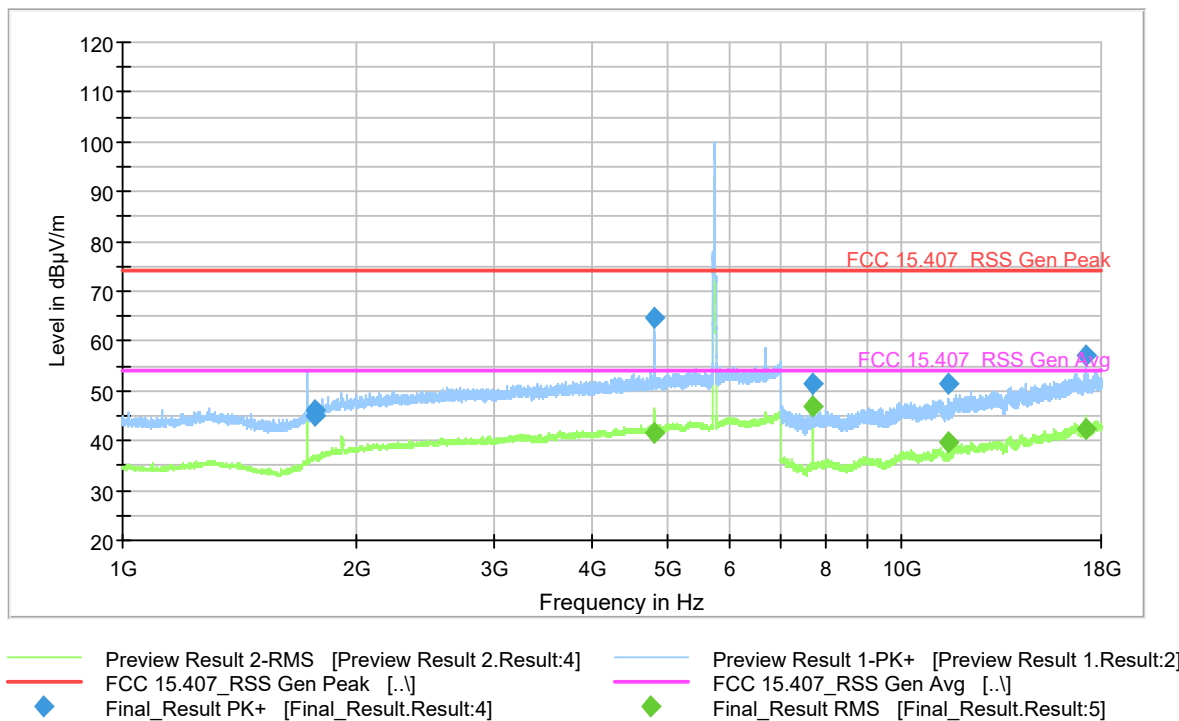


Figure 9-123. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 149)

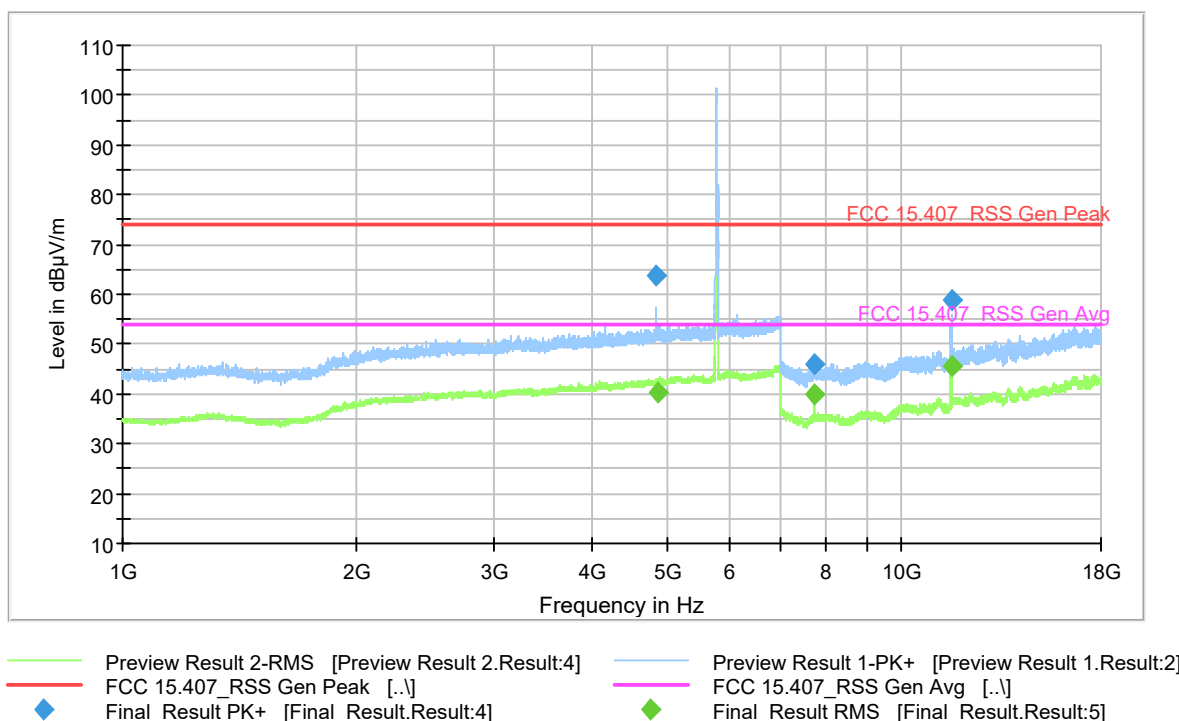


Figure 9-124. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 157)

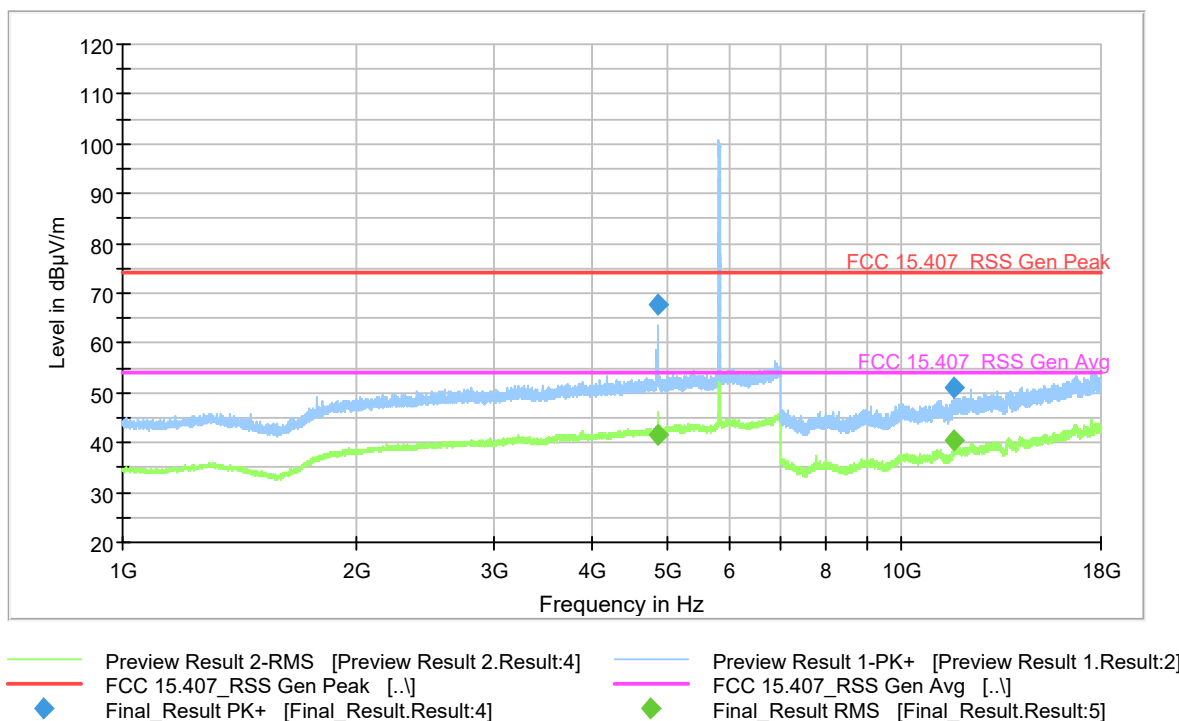


Figure 9-125. Radiated Spurious Emissions 1-18 GHz Tx 802.11a (Ch. 165)

9.8.5.3 Radiated Emissions in 1-18 GHz range 802.11n HT20

RSE - 18GHz Average Data – 802.11n HT20							
Channel No.	Carrier Frequency (MHz)	Emission Frequency (MHz)	Raw Avg. Amplitude (dBμV)	Correction Factor (dB)	Corrected Avg. Field Strength (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)
36	5180	Noise floor					
40	5220	Noise floor					
48	5240	Noise floor					
52	5260	Noise floor					
60	5300	Noise floor					
64	5320	Noise floor					
100	5500	11000.8	33.62	15.7	49.32	54	4.68
116	5580	11154.2	35.21	16.5	51.71	54	2.29
140	5700	11400	33.75	15.8	49.55	54	4.45
140	5700	7599.9	31.09	12.5	43.59	54	10.41
149	5745	11488.9	29.38	16.1	45.48	54	8.52
149	5745	7659.9	29.19	12.9	42.09	54	11.91
157	5785	11568.8	29.76	16.4	46.16	54	7.84
165	5825	4861	24.77	16.4	41.17	54	12.83
165	5825	11651	26.72	16.4	43.12	54	10.88

RSE - 18GHz Peak Data – 802.11n HT20							
Channel No.	Carrier Frequency (MHz)	Emission Frequency (MHz)	Raw Peak Amplitude (dBμV)	Correction Factor (dB)	Corrected Peak Field Strength (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)
36	5180	Noise floor					
40	5220	Noise floor					
48	5240	Noise floor					
52	5260	Noise floor					
60	5300	Noise floor					
64	5320	Noise floor					
100	5500	10997.9	45.79	15.7	61.49	74	12.51
116	5580	11154.2	48.56	16.5	65.06	74	8.94
140	5700	11402.8	46.73	15.8	62.53	74	11.47
149	5745	11491.4	43.45	16.1	59.55	74	14.45
157	5785	11570.3	39.52	16.4	55.92	74	18.08
165	5825	11648.5	36.92	16.6	53.52	74	20.48
165	5825	4861.8	50.16	16.4	66.56	74	7.44

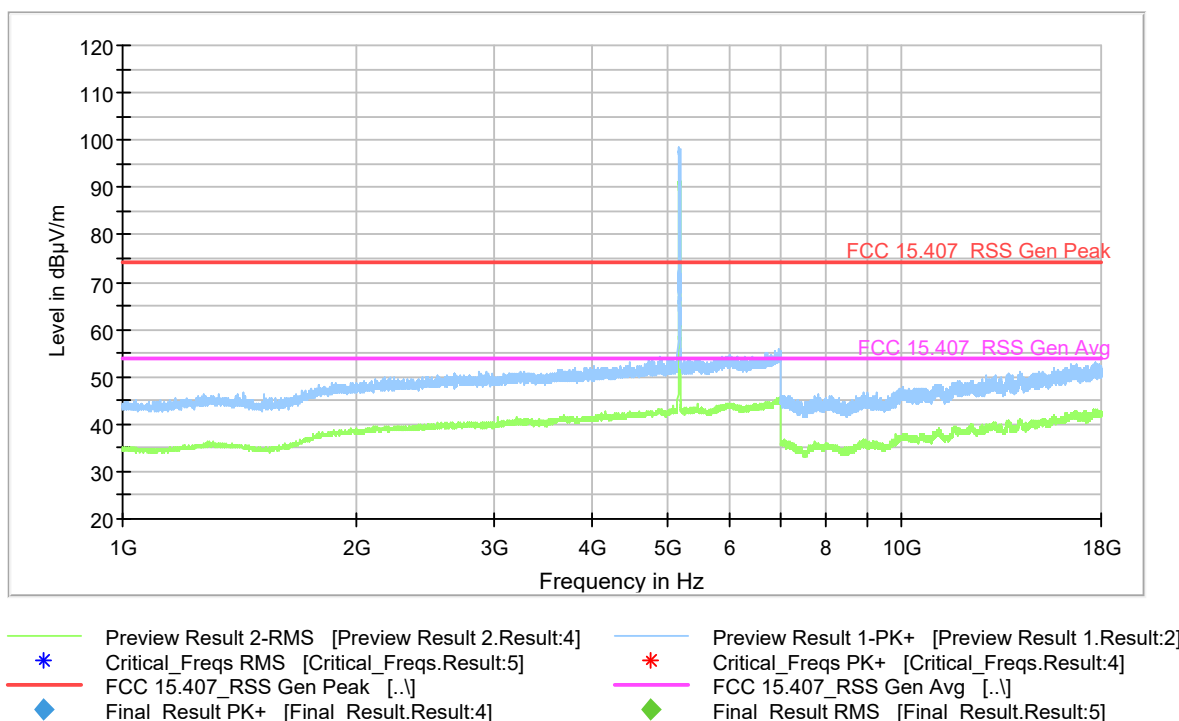


Figure 9-126. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 36)

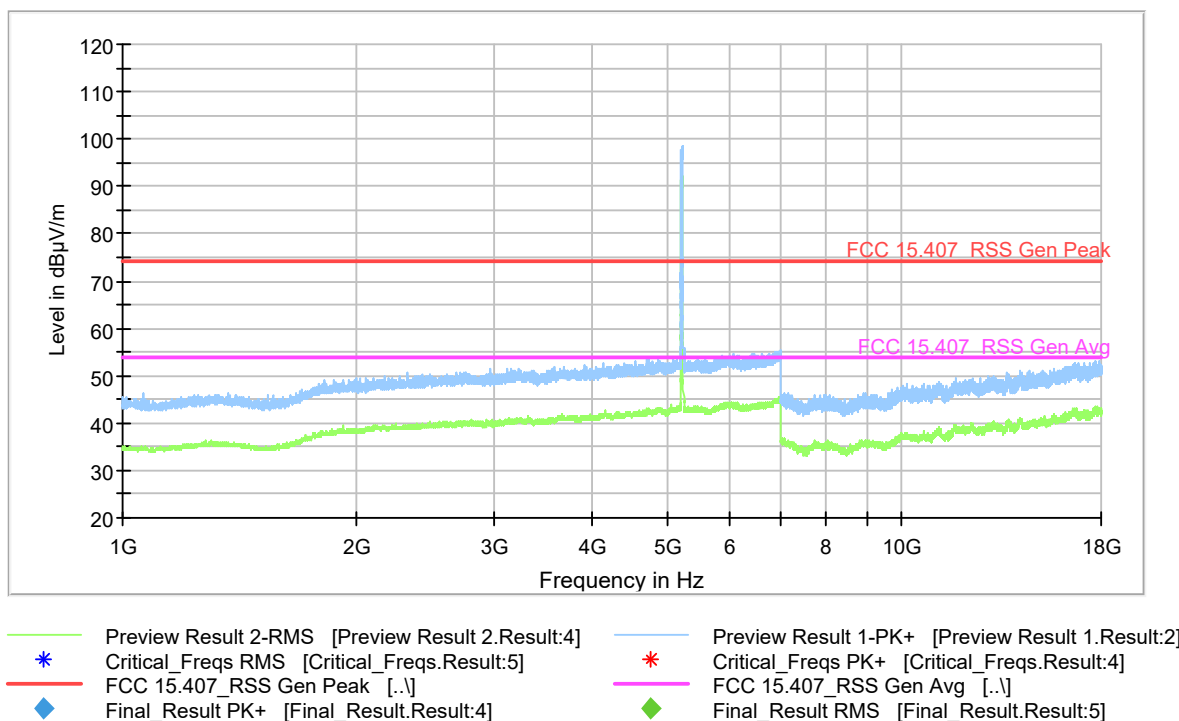


Figure 9-127. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 44)

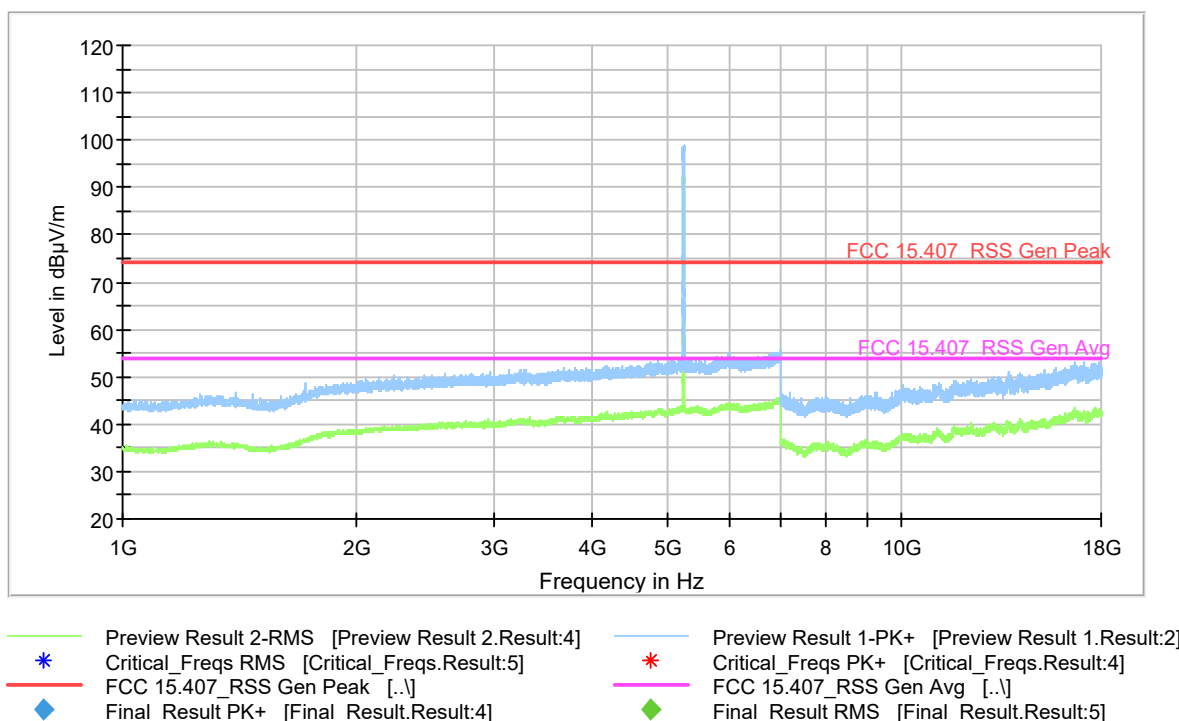


Figure 9-128. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 48)

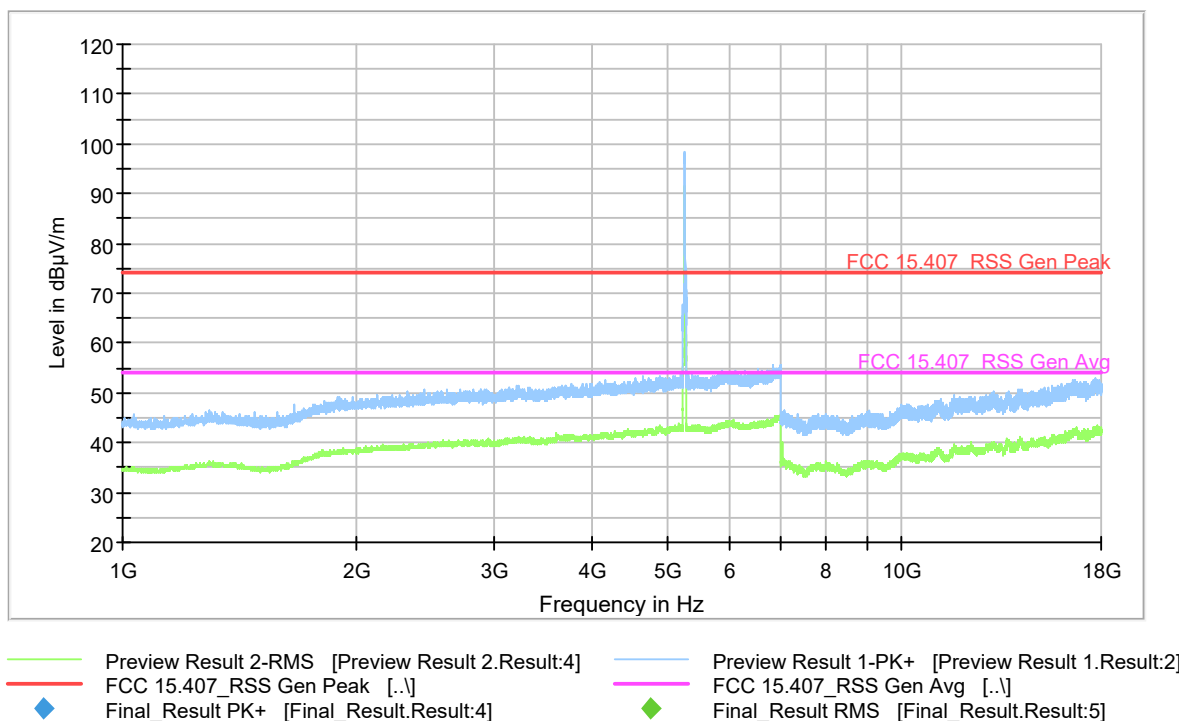


Figure 9-129. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 52)

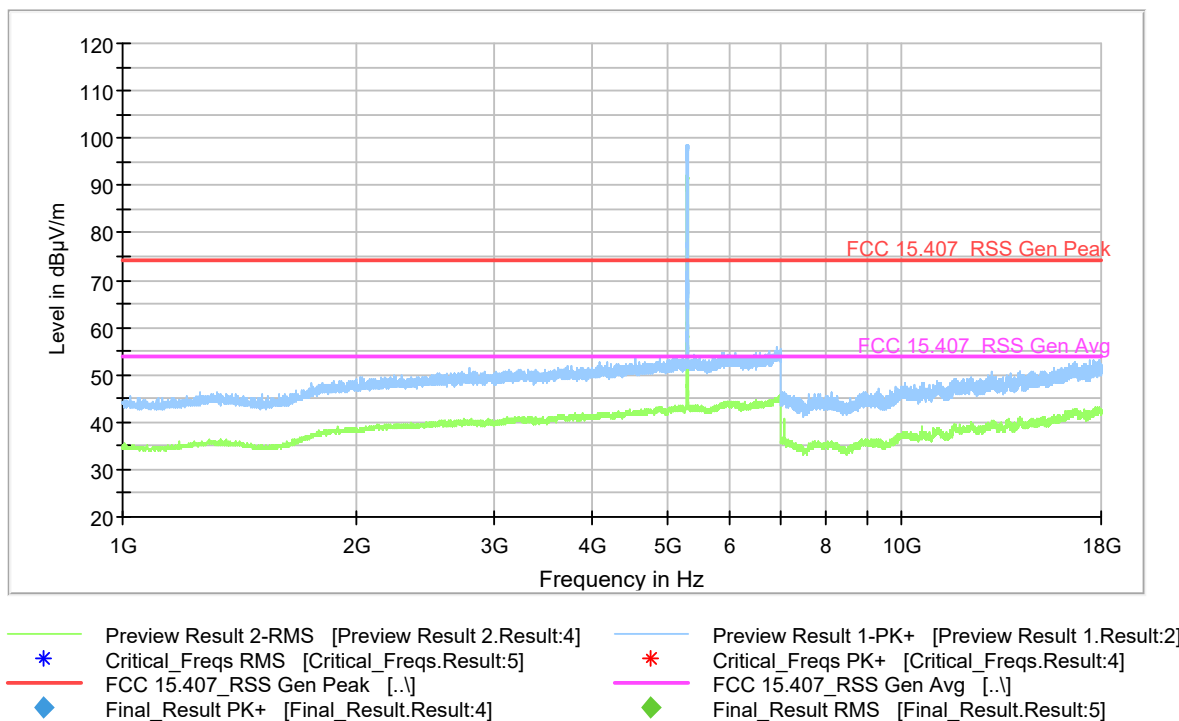


Figure 9-130. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 60)

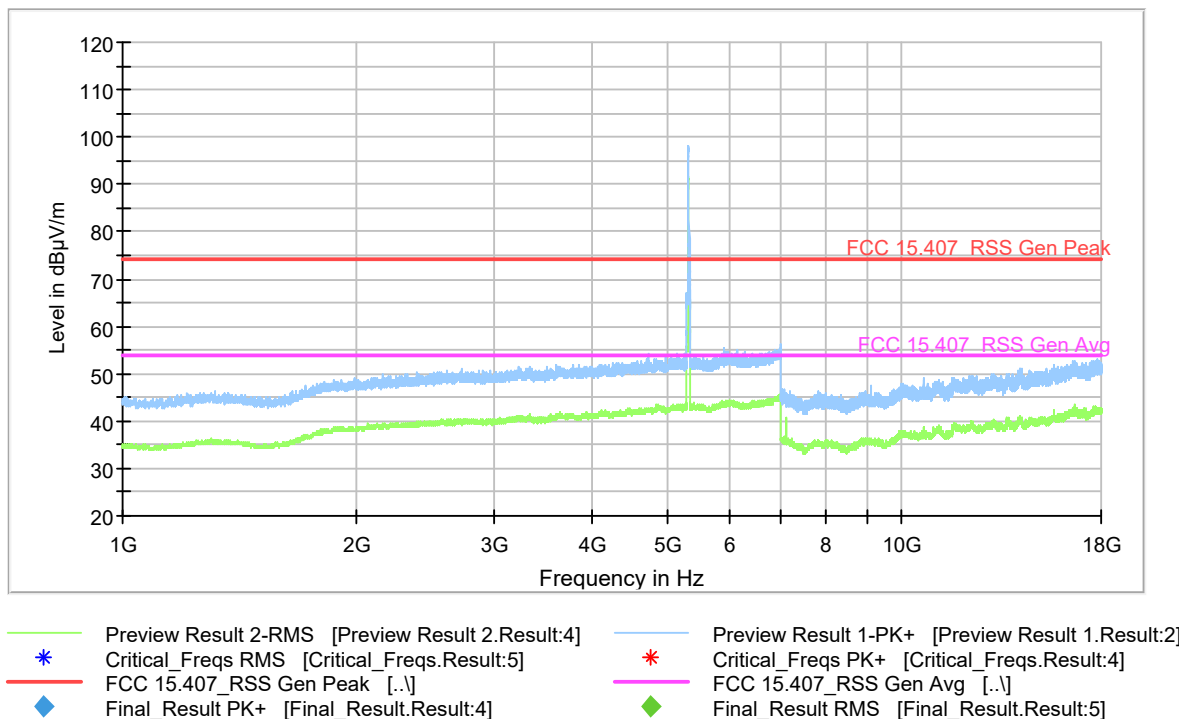


Figure 9-131. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 64)

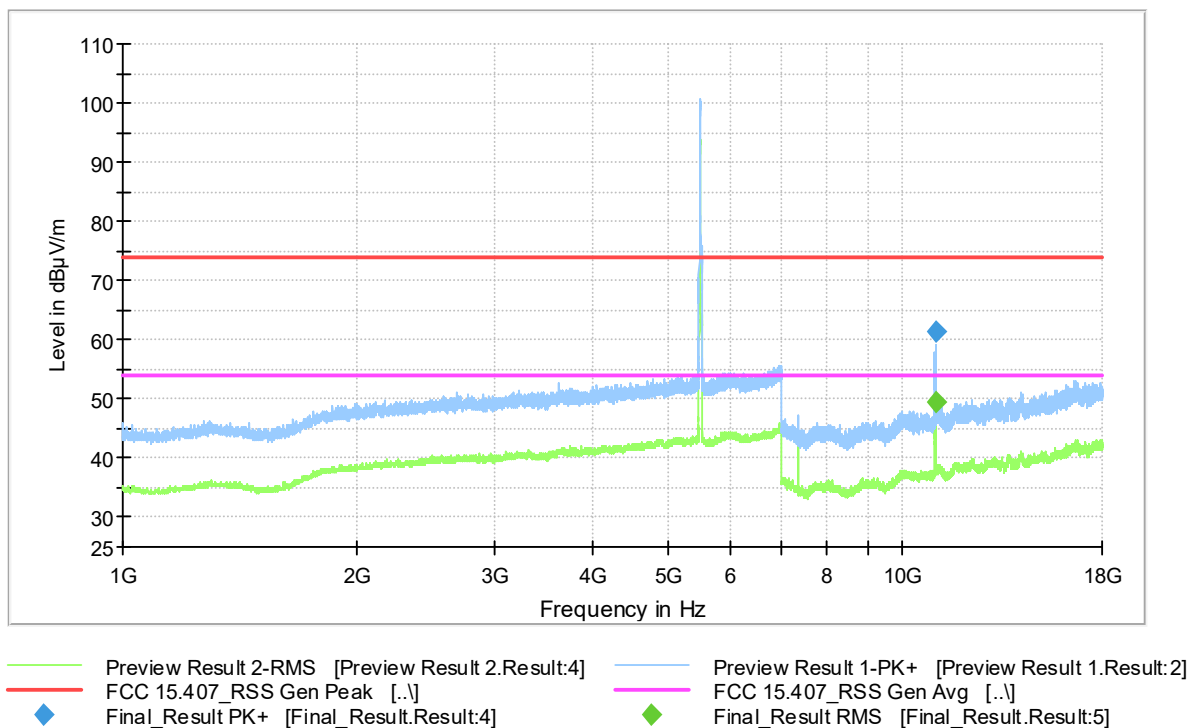


Figure 9-132. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 100)

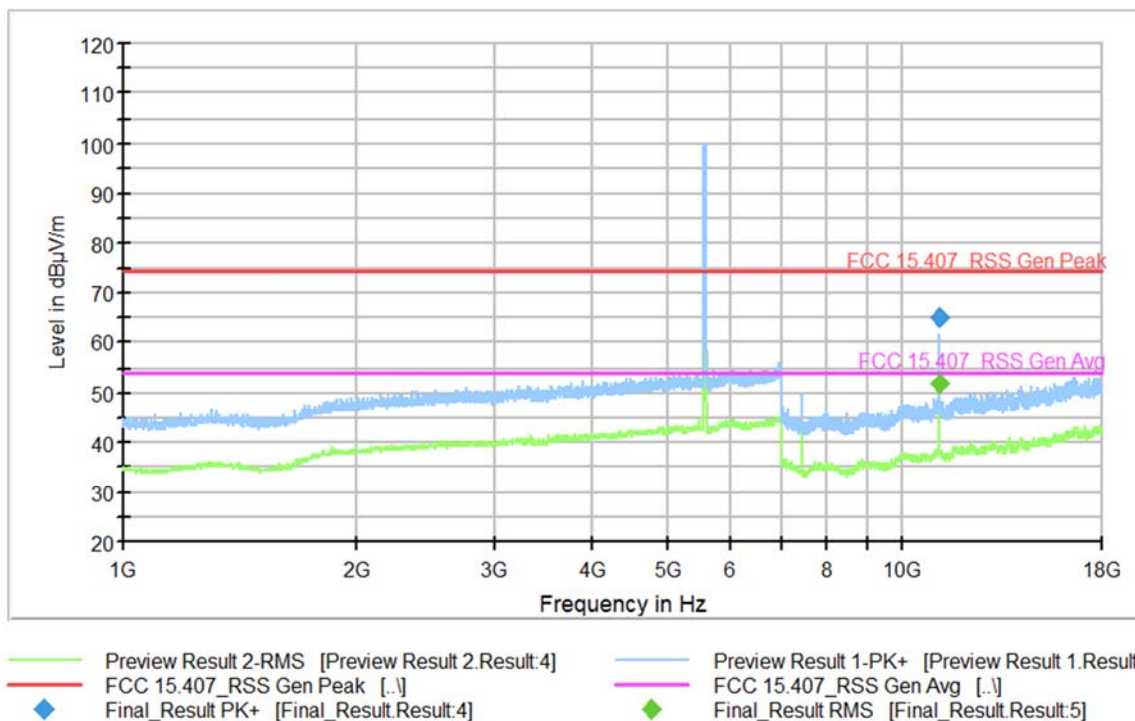


Figure 9-133. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 116)

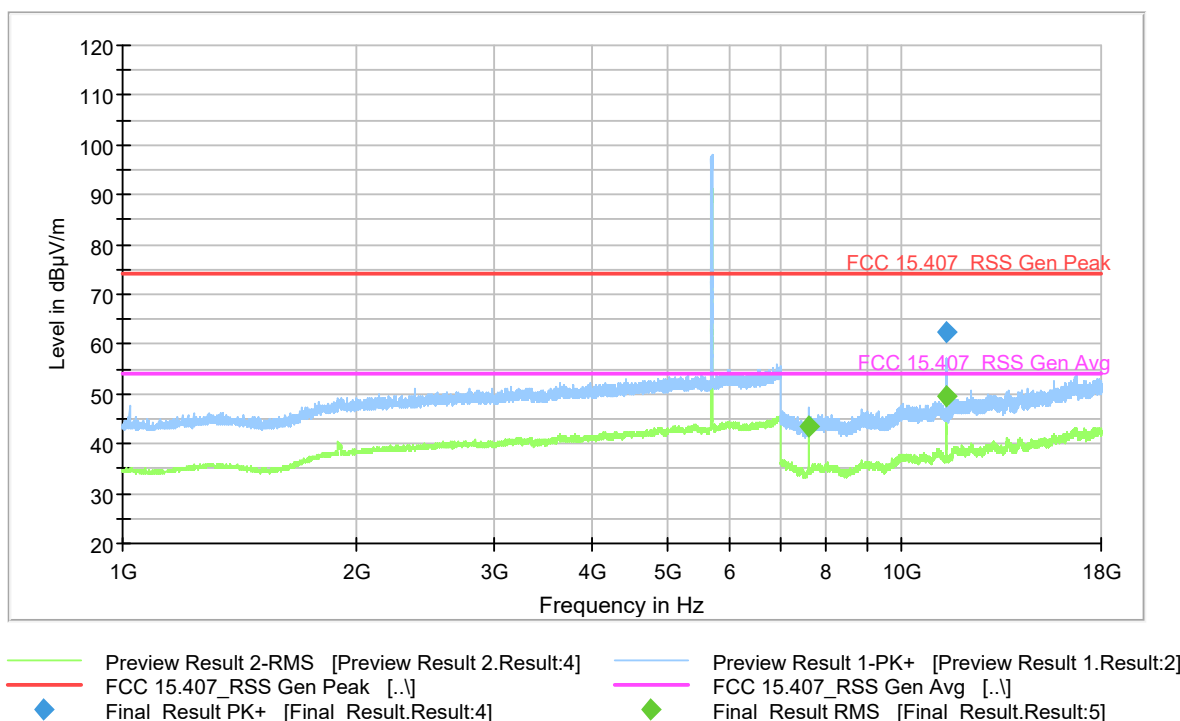


Figure 9-134. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 140)

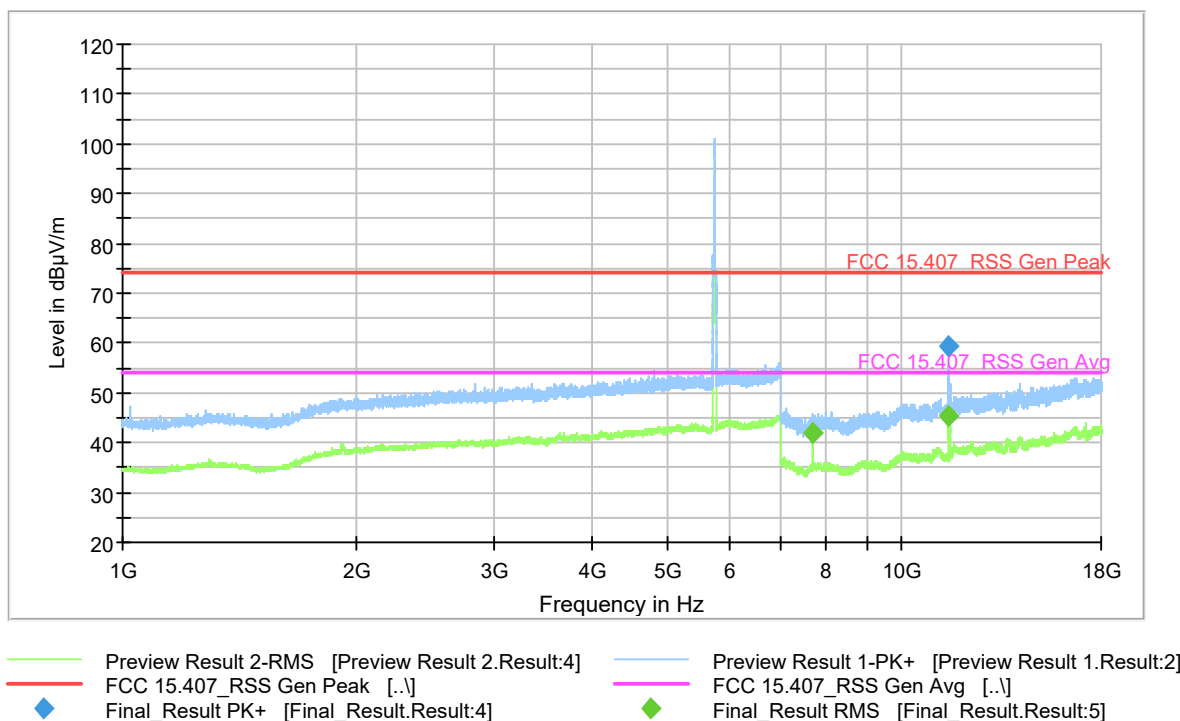


Figure 9-135. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 149)

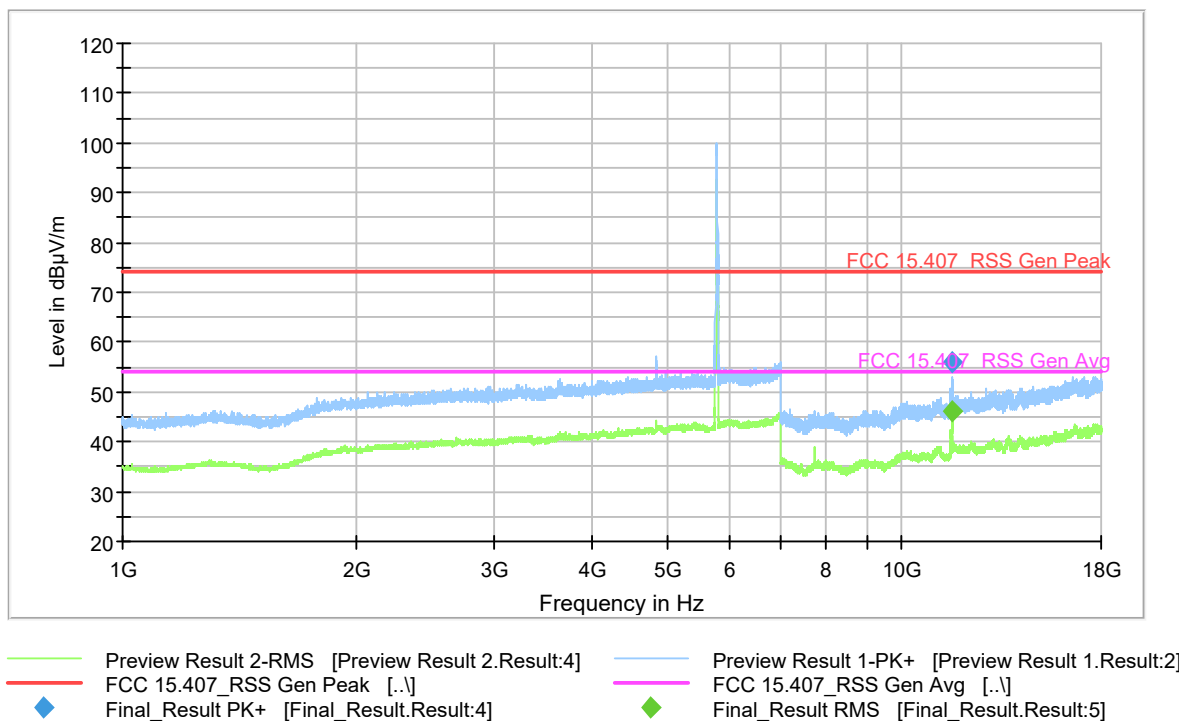


Figure 9-136. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 157)

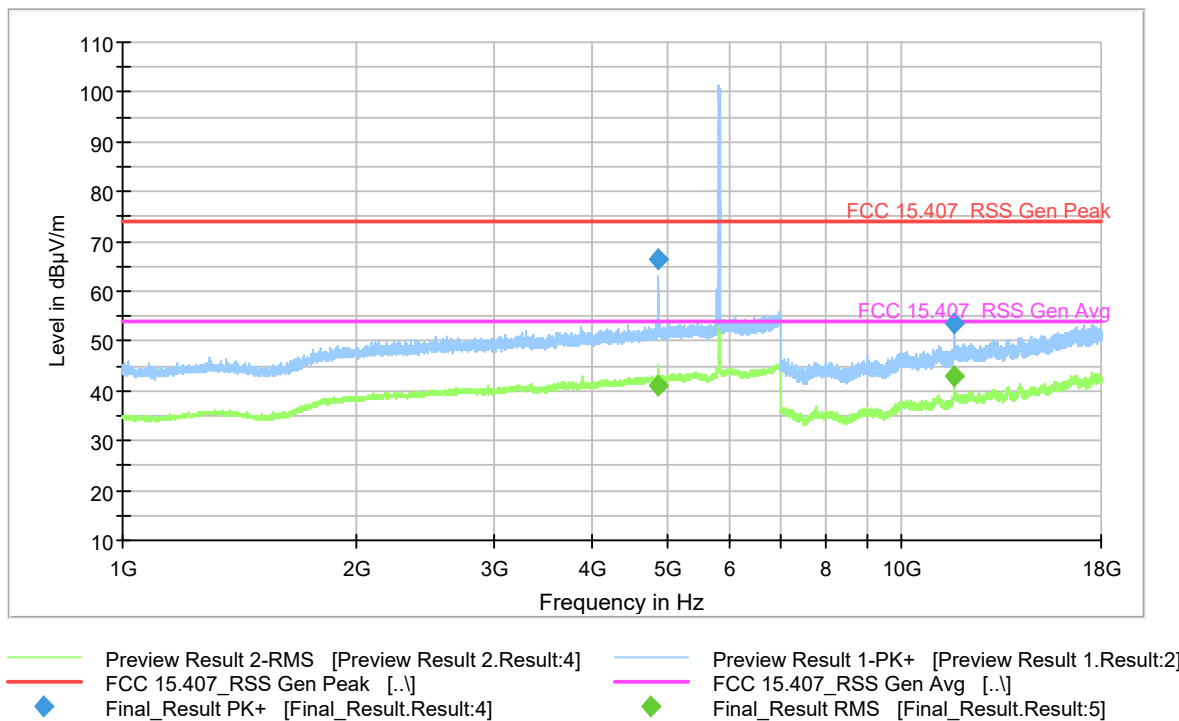


Figure 9-137. Radiated Spurious Emissions 1-18 GHz Tx 802.11n HT20 (Ch. 165)

9.8.5.4 Emissions in 18-26.5 GHz range

No significant emissions to report above noise floor.

Worst case data representation shown here.

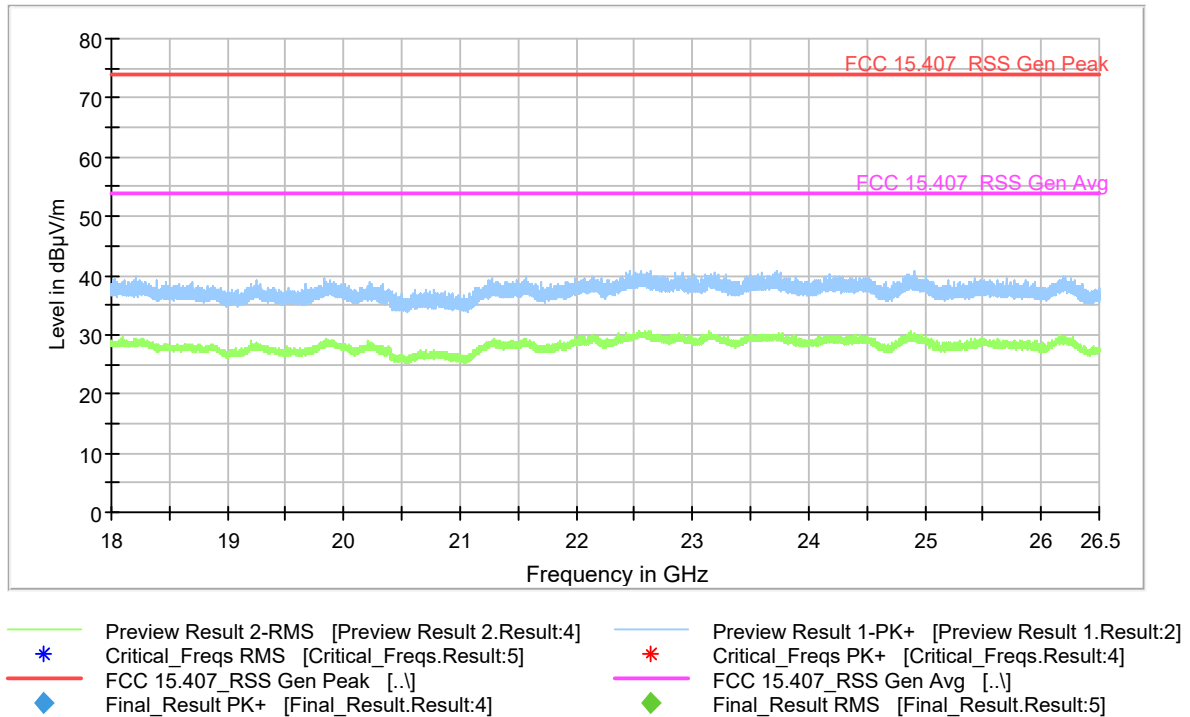


Figure 9-138. Radiated Spurious Emissions 18-26.5 GHz Tx 802.11a (Ch. 32)

9.8.5.5 Emissions in 18-26.5 GHz range

No significant emissions to report above noise floor.

Worst case data representation shown here.

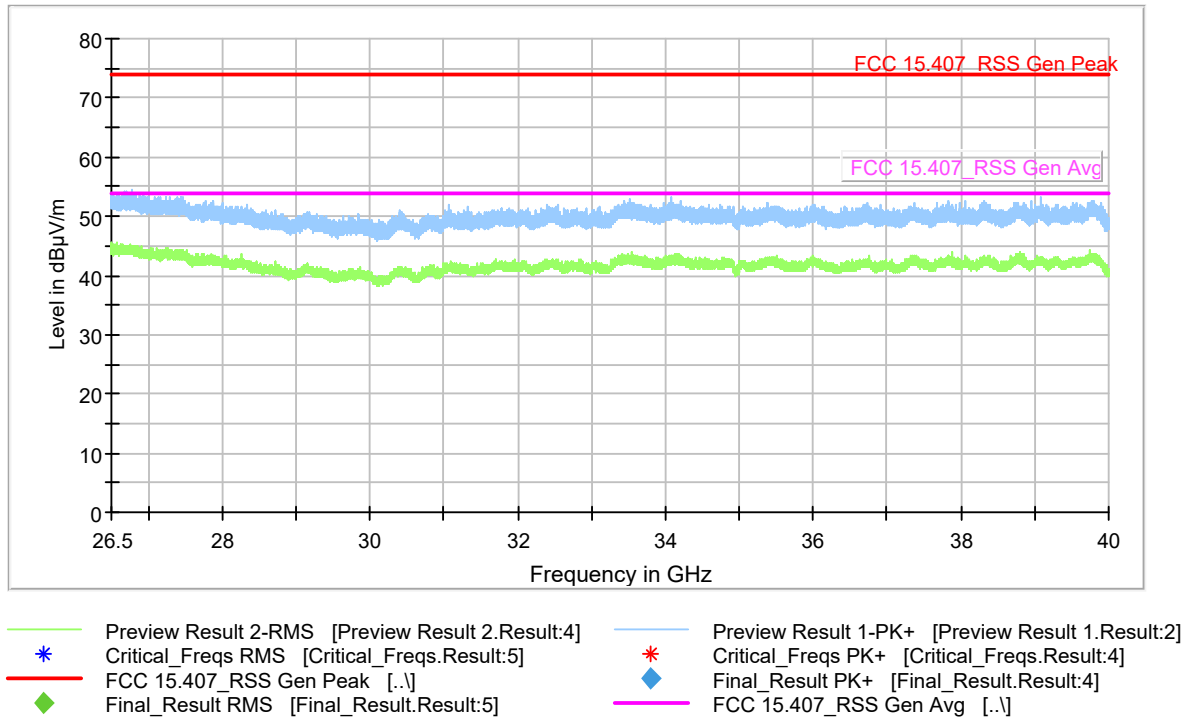


Figure 9-139. Radiated Spurious Emissions 18-26.5 GHz Tx 802.11a (Ch. 32)

9.8.5.6 Radiated Restricted Band-edge emissions 802.11a

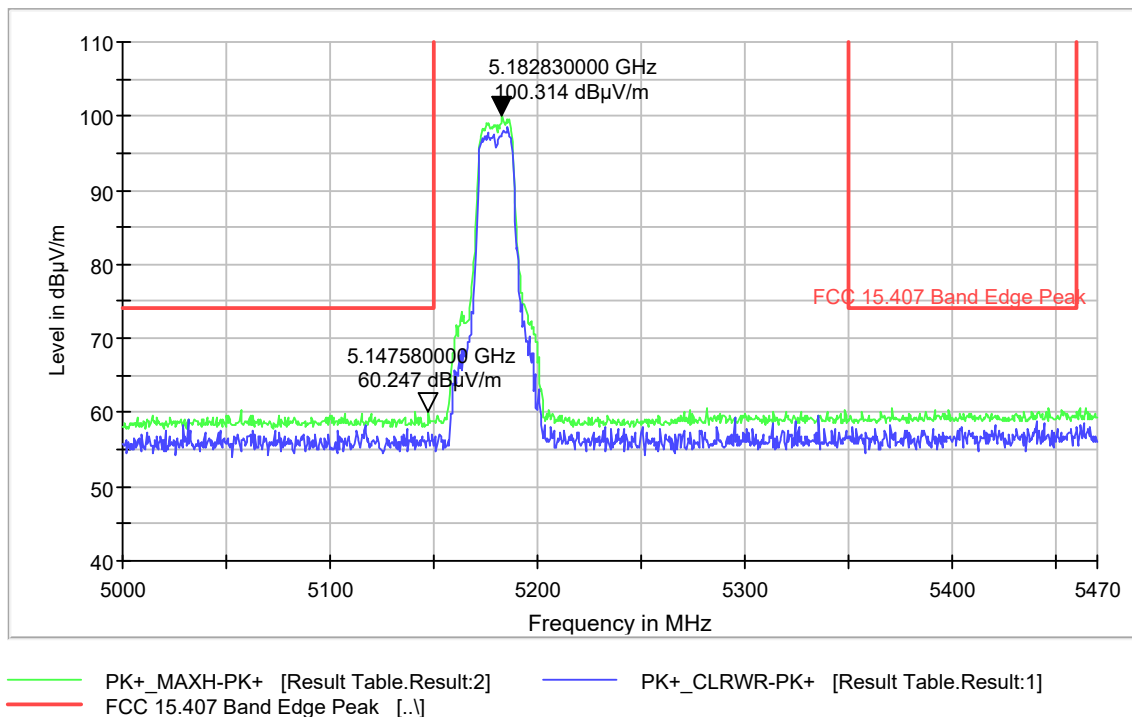


Figure 9-140. Peak Radiated Band Edge Emissions Tx 802.11a (Ch. 36)

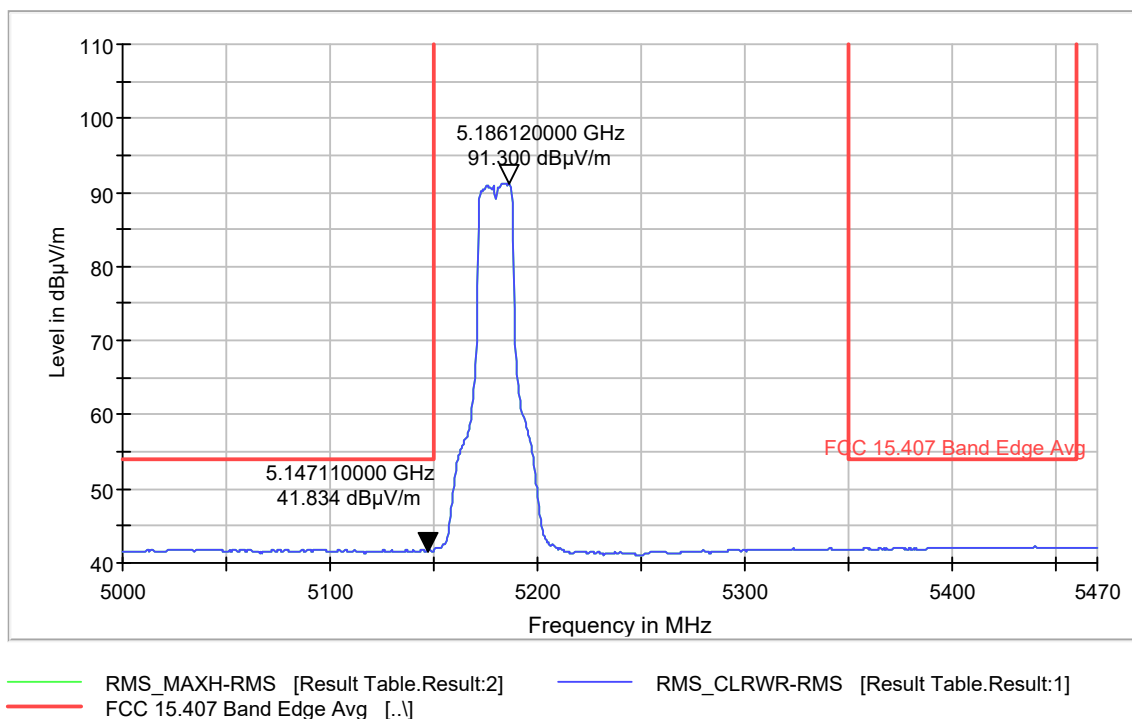


Figure 9-141. Average Radiated Band Edge Emissions Tx 802.11a (Ch. 36)

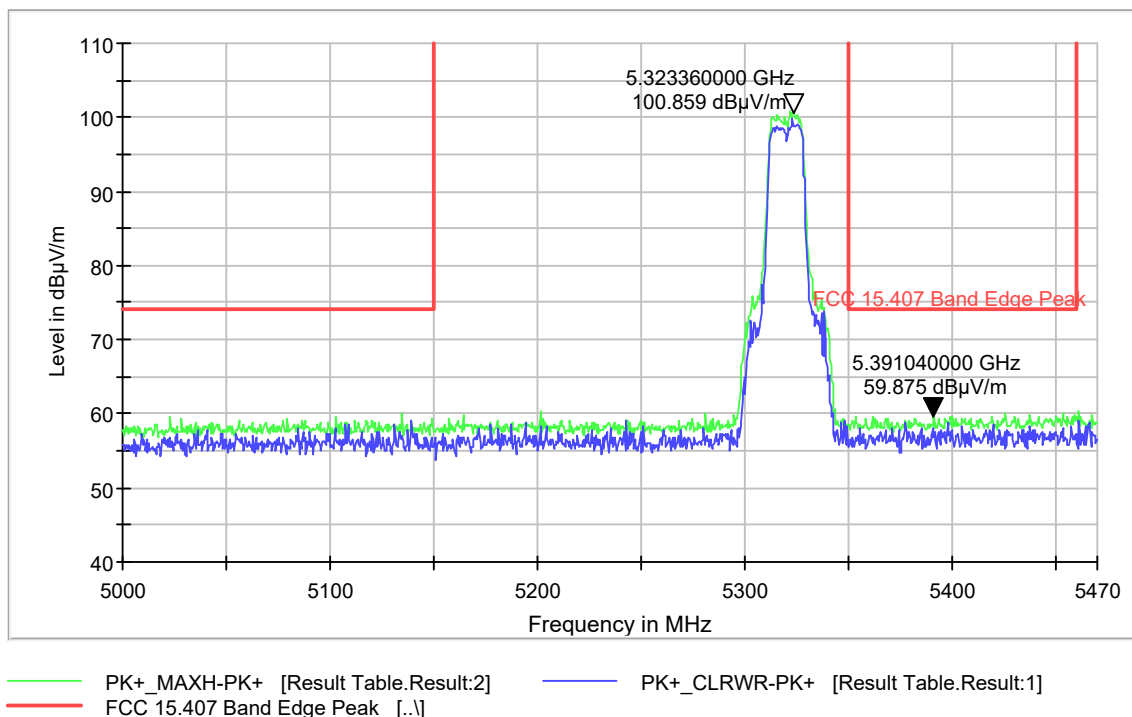


Figure 9-142. Peak Radiated Band Edge Emissions Tx 802.11a (Ch. 64)

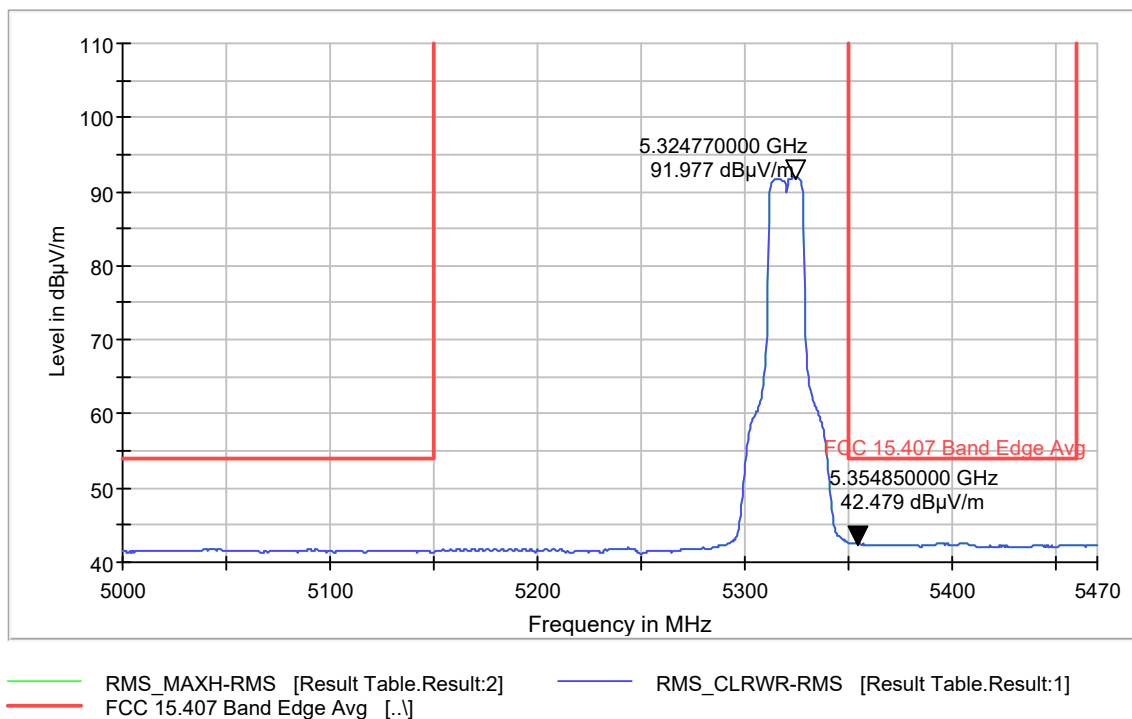


Figure 9-143. Average Radiated Band Edge Emissions Tx 802.11a (Ch. 64)

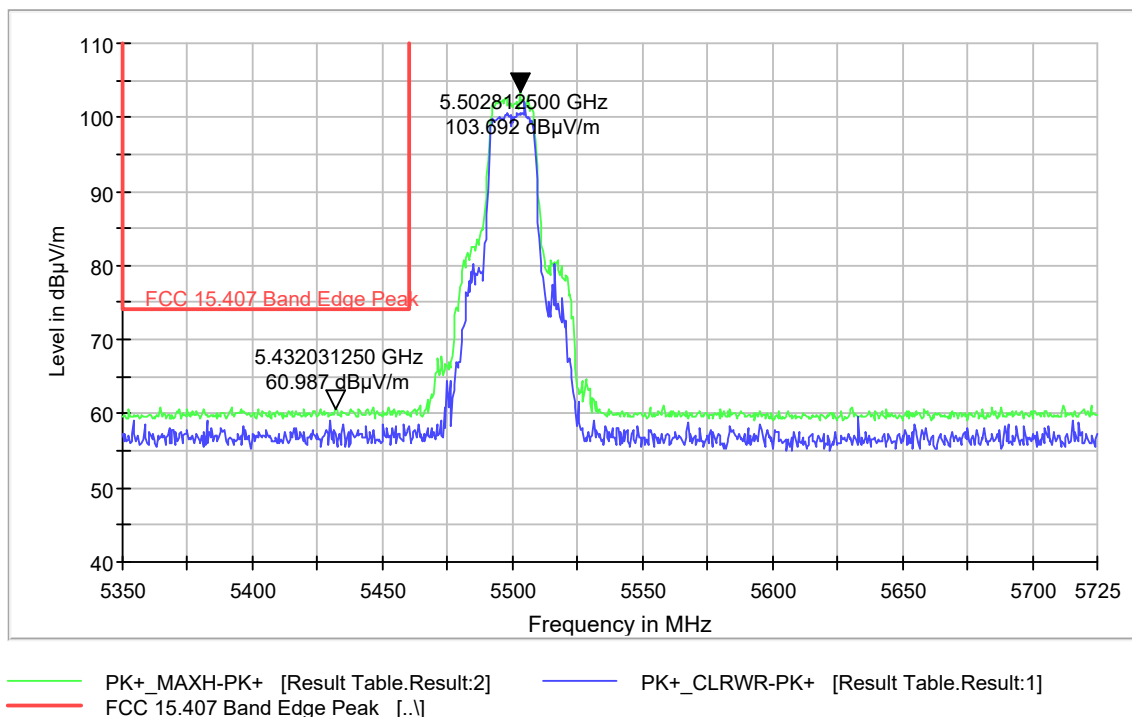


Figure 9-144. Peak Radiated Band Edge Emissions Tx 802.11a (Ch. 100)

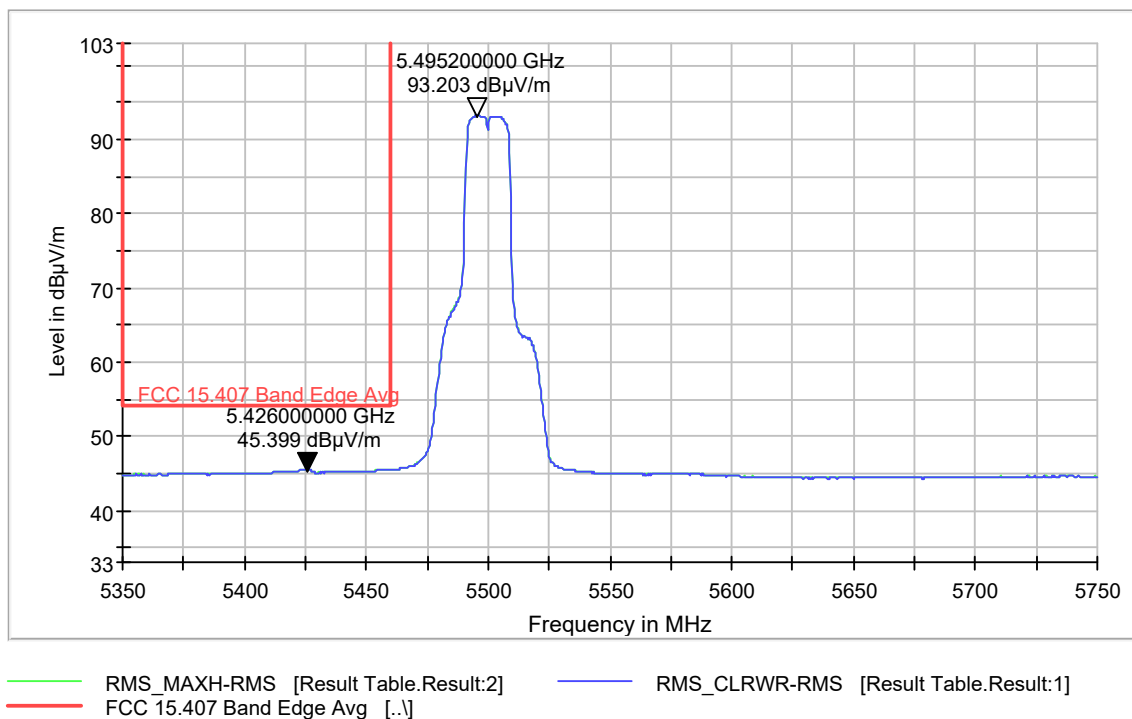


Figure 9-145. Average Radiated Band Edge Emissions Tx 802.11a (Ch. 100)

9.8.5.7 Radiated Restricted Band-edge emissions 802.11n HT20

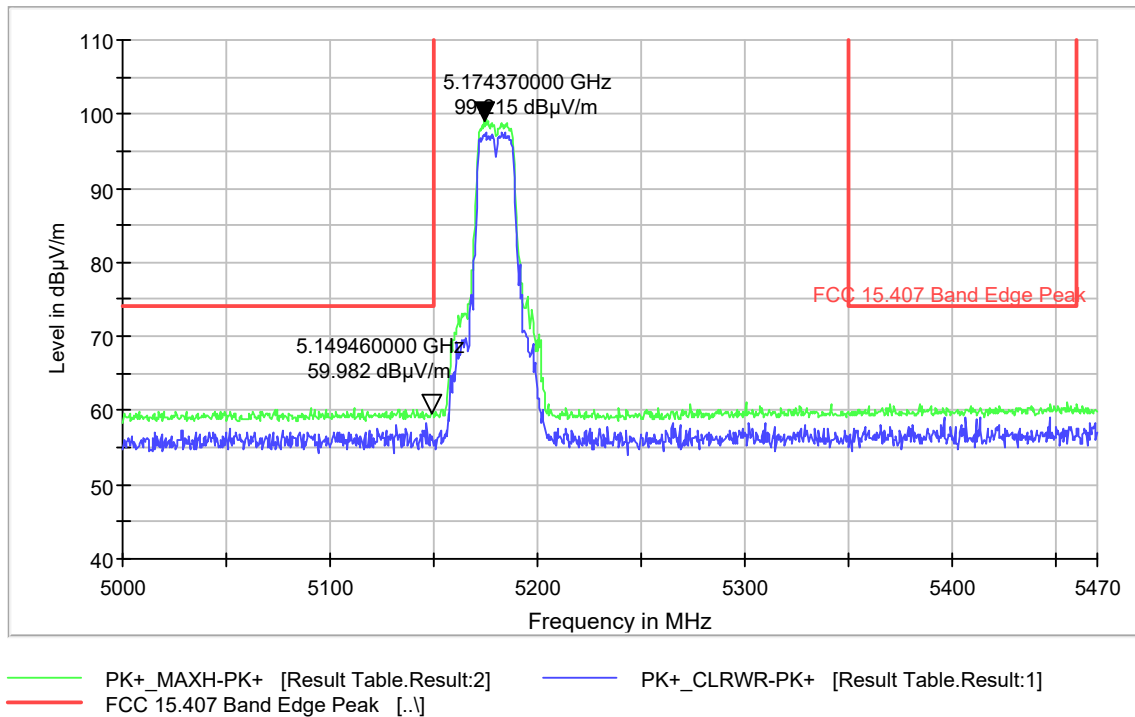


Figure 9-146. Peak Radiated Band Edge Emissions Tx 802.11n HT20 (Ch. 36)

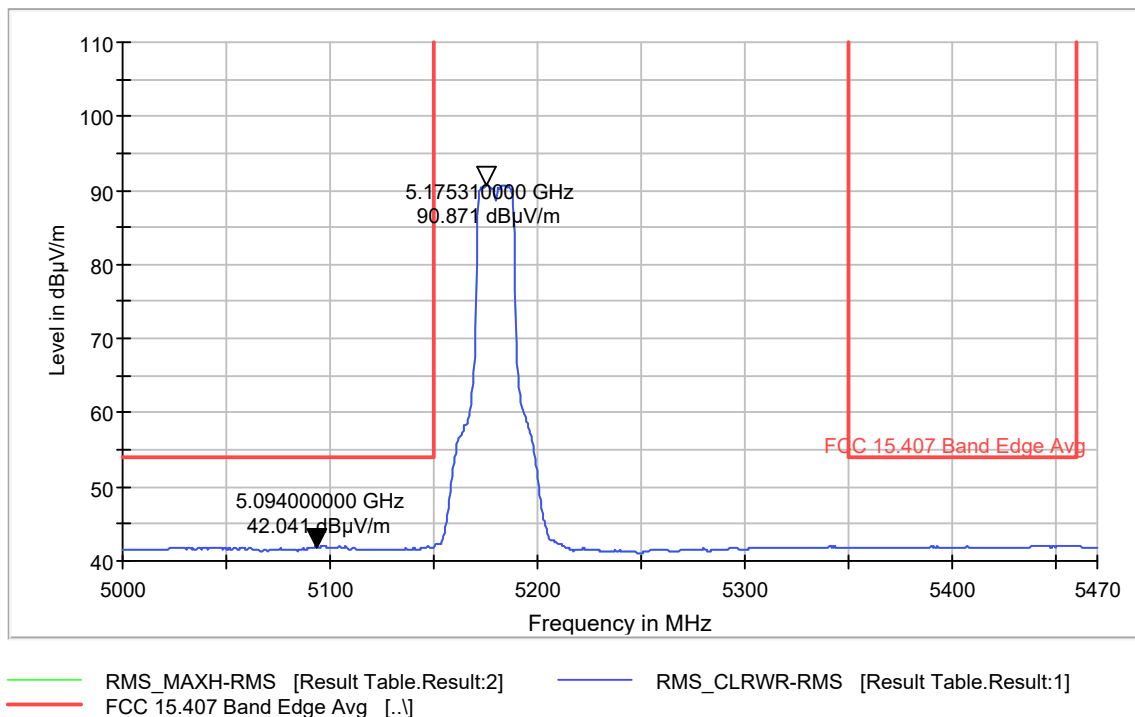


Figure 9-147. Average Radiated Band Edge Emissions Tx 802.11n HT20 (Ch. 36)

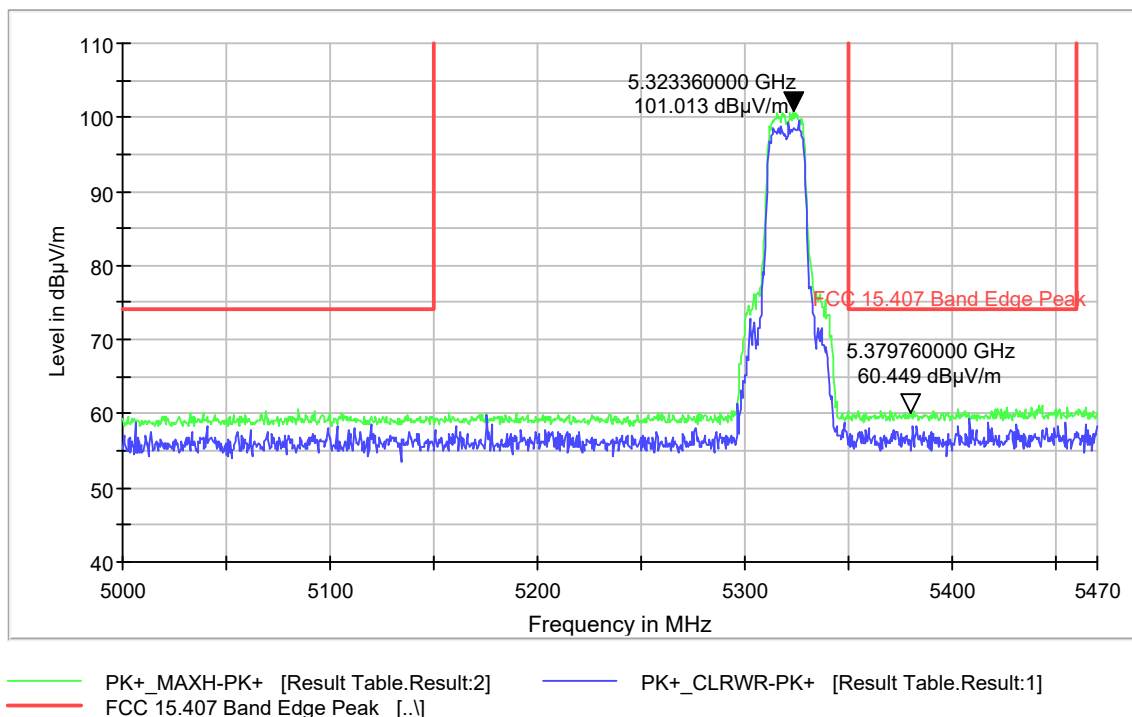


Figure 9-148. Peak Radiated Band Edge Emissions Tx 802.11n HT20 (Ch. 64)

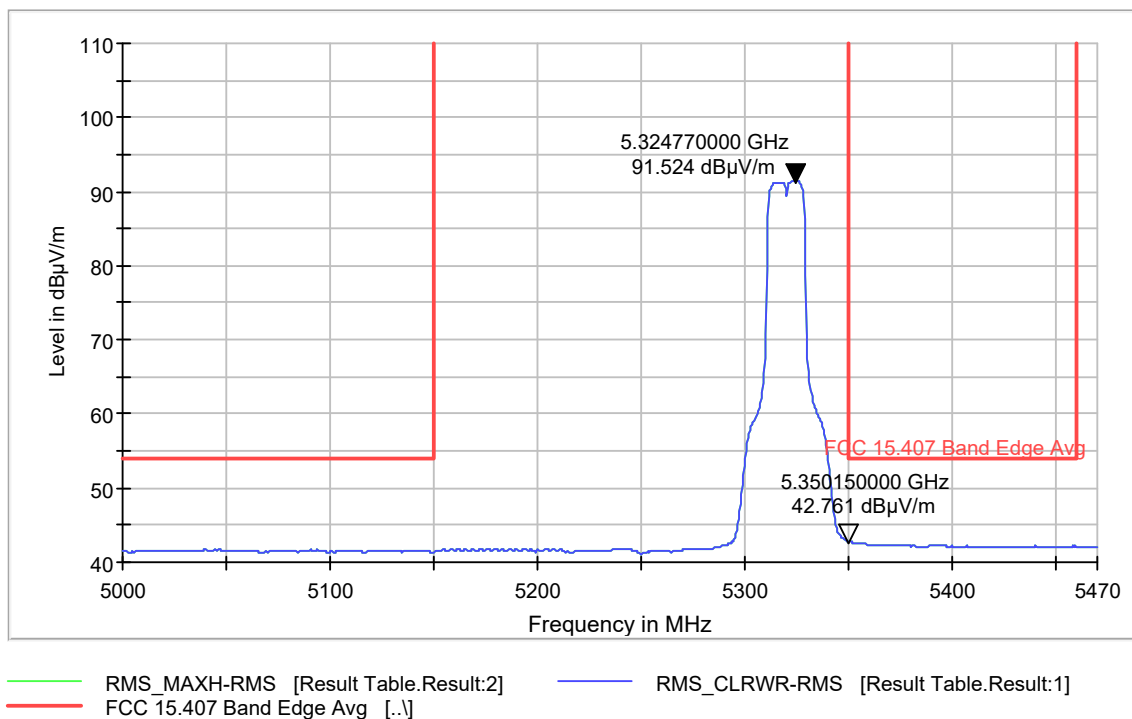


Figure 9-149. Average Radiated Band Edge Emissions Tx 802.11n HT20 (Ch. 64)

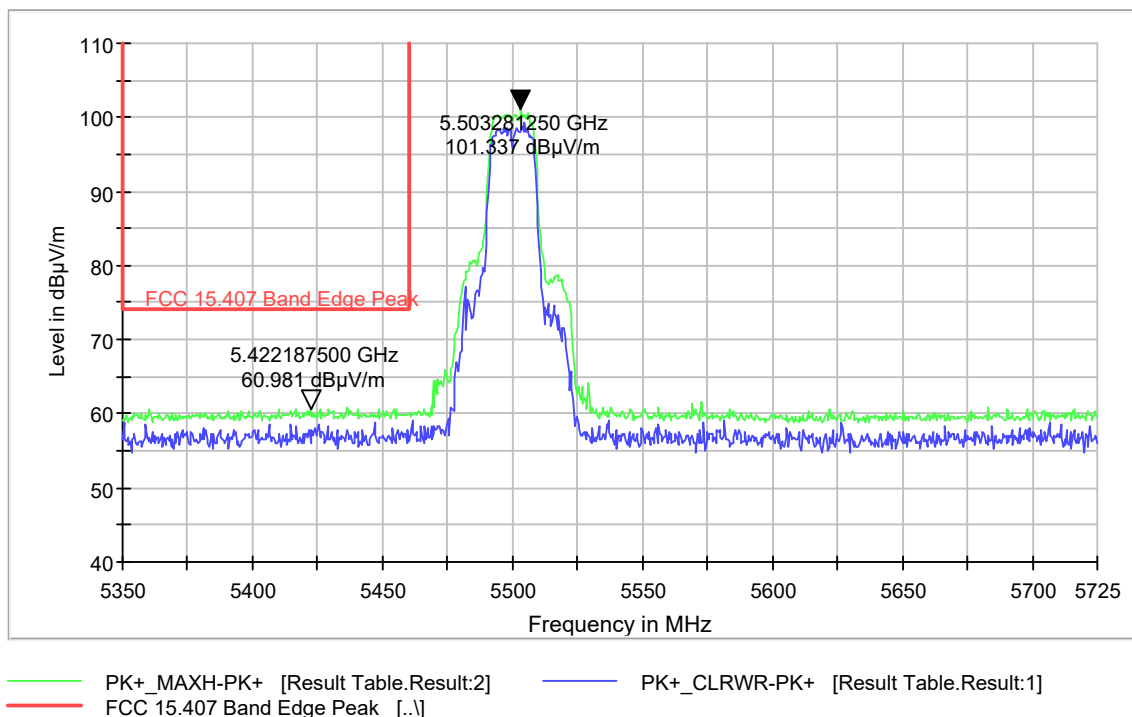


Figure 9-150. Peak Radiated Band Edge Emissions Tx 802.11n HT20 (Ch. 100)

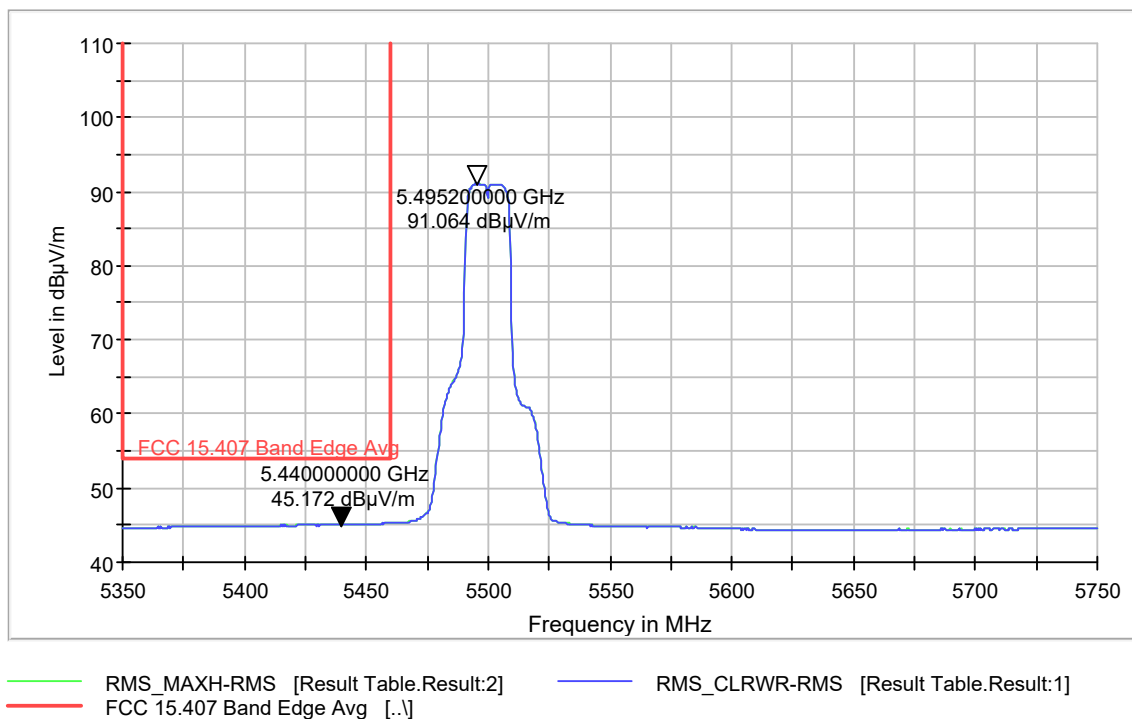


Figure 9-151. Average Radiated Band Edge Emissions Tx 802.11n HT20 (Ch. 100)

9.9 AC Line Conducted Emissions

9.9.1 Test Requirements

FCC CFR 47 Rule Part 15.207 (a)

Industry Canada RSS Gen [8.8]

9.9.2 Test Method

Conducted power line measurements were made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment was tested with the power cords that were used under normal operating conditions. The following measurements were made using a LISN (Line Impedance Stabilization Network). AC powered peripherals were attached to a second LISN with the 50 ohm measurement port terminated by a 50 ohm resistive load.

EMI Receiver Settings:

150 kHz – 30 MHz:

RBW= 9 kHz

VBW $\geq 3 \times$ RBW

Trace Mode: Peak Detector (Max Hold).

Final measurements were performed using Quasi-Peak and Average Detectors.

Span= 150 kHz – 30 MHz

Sweep time= Auto

9.9.3 Limit

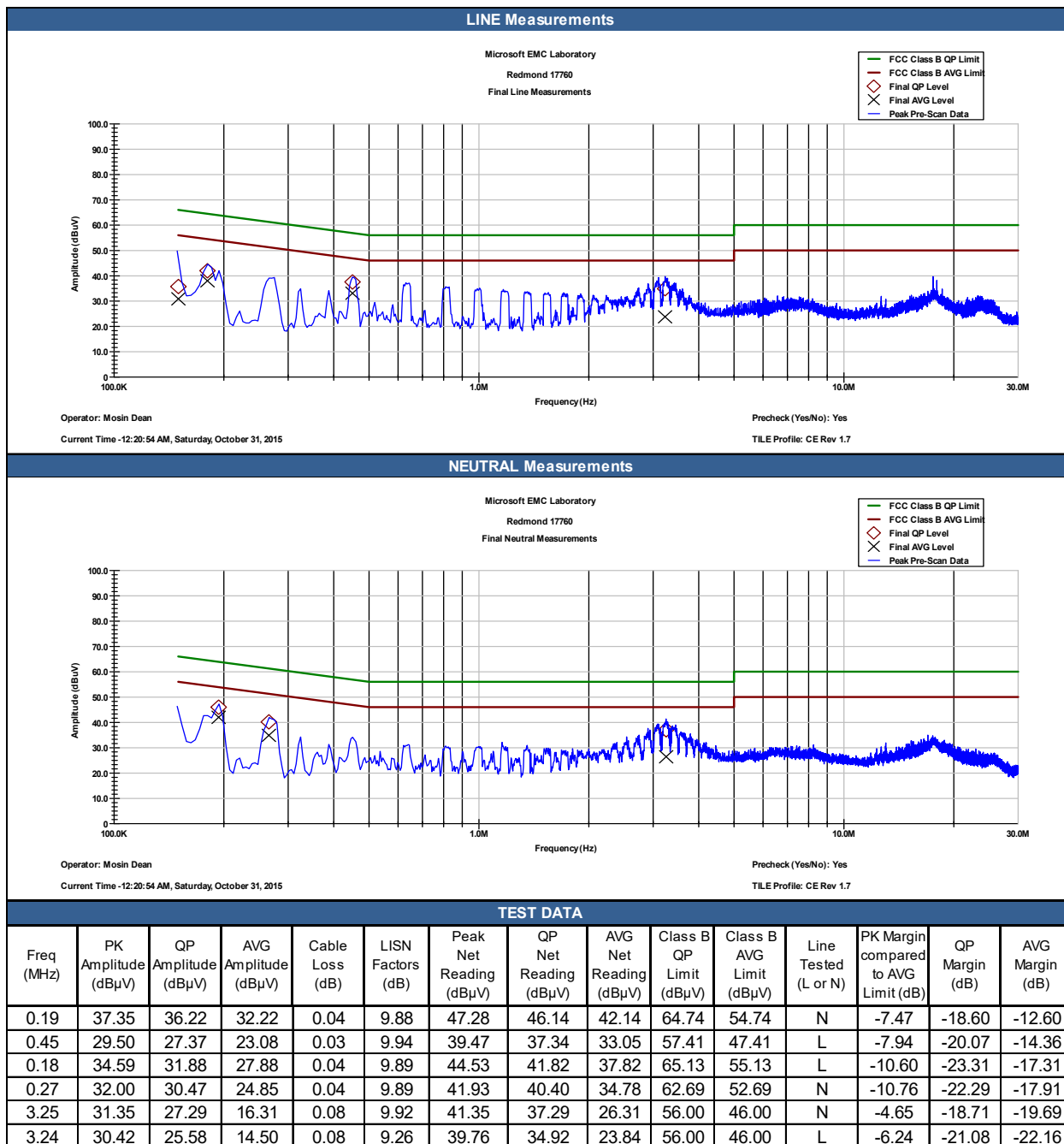
Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

9.9.4 Test Result:

Pass

9.9.5 Test Data:

CONDUCTED EMISSIONS TEST DATASHEET				
MICROSOFT EMC LAB Rev 2.1				
Model Number:	1770		Date:	10/30/2015
Serial Number:	EMC-444-102915-01, EMC-444-102915-02, EMC-444-102915-03, EMC-444-102915-04		Tested By:	Mosin Dean
Product Build Phase:	PV		Customer:	Chaitrali Limaye
Task #:	R209		Temperature (°C):	24.9
Scan:	1		Humidity(%RH):	46.7
Power:	120V AC/60Hz		Bar Pres. (kPa):	100.58
Test Site:	Redmond 17760 Rm 1310		Result:	Pass
TEST EQUIPMENT				
Description	ID	Model	Manufacturer	Calibration/Veridication Due
Analyzer/ Receiver:	EMC-669	ESR 3	Rhode & Schwarz	11/3/2015
EUT LISN:	EMC-057	NNB 51	Teseq	5/9/2016
AE LISN:	EMC-187	NNB 51	Teseq	9/25/2016
Cable:	EMC-367	UFA210A-1-1800-50U50U	Micro-Coax	8/6/2016
TILE Profile:	7.1.0.15	Rev 2.0	ETS-Lindgren	N/A
Environmental Monitor:	EMC-837	PRHTemp2000	Madge Tech	6/24/2016
TEST SPECIFICATIONS/TEST METHOD				
FCC 15.109(g)/ANSI C63.4:2009				
DEVIATION FROM TEST METHOD				
None.				
EUT OPERATING MODES / CONFIGS				
EUT Details: E-444-102915-01; M/N: 1770; S/N: 02990000583529 E-444-102915-02; M/N: 1770; S/N: 02990000133529 E-444-102915-03; M/N: 1770; S/N: 02990000293529 E-444-102915-04; M/N: 1770; S/N: 02990000723529				
EUT Software/ Firmware: FW: 2.0.2383.0				
Support Equipment/ Peripherals: Host; E-444-102915-20; S/N: 08340341022688251148 Host Sensor; E-444-102915-16; S/N: 087418733647 Host PSU; E-444-102915-13; M/N: A12-220P2A; S/N: 1C21Q037562333 Viewsonic External Monitor 27" 4k UHD; E-444-102915-19; M/N: VP2780-4K; S/N: U8K145200038 - connected via HDMI OUT port on console Headset; E-444-102915-07; S/N: P-DVA-427 Headset; E-444-102915-08; S/N: P-DVA-420 Headset; E-444-102915-09; S/N: P-DVA-400 Headset; E-444-102915-10 LG Blu-ray player; E-444-102915-17; M/N: BP730; S/N: 303INXJ376594 - connected via HDMI IN port on console IR Blaster; E-444-102915-18 - connected to console D-Link Router; M/N: E630; S/N: QBNM1C5000474 Test Control Laptop; S/N: PC-056TWP				
Test Software: Test.SRA app; used only to monitor controllers were transmitting button presses continuously via WLAN WLAN 5GHz (all 4 controllers wirelessly paired with xbox one console)				



End of Report