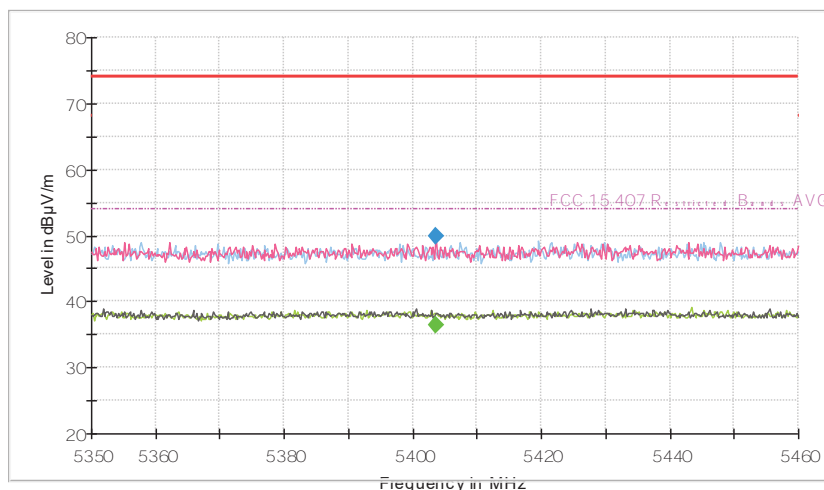


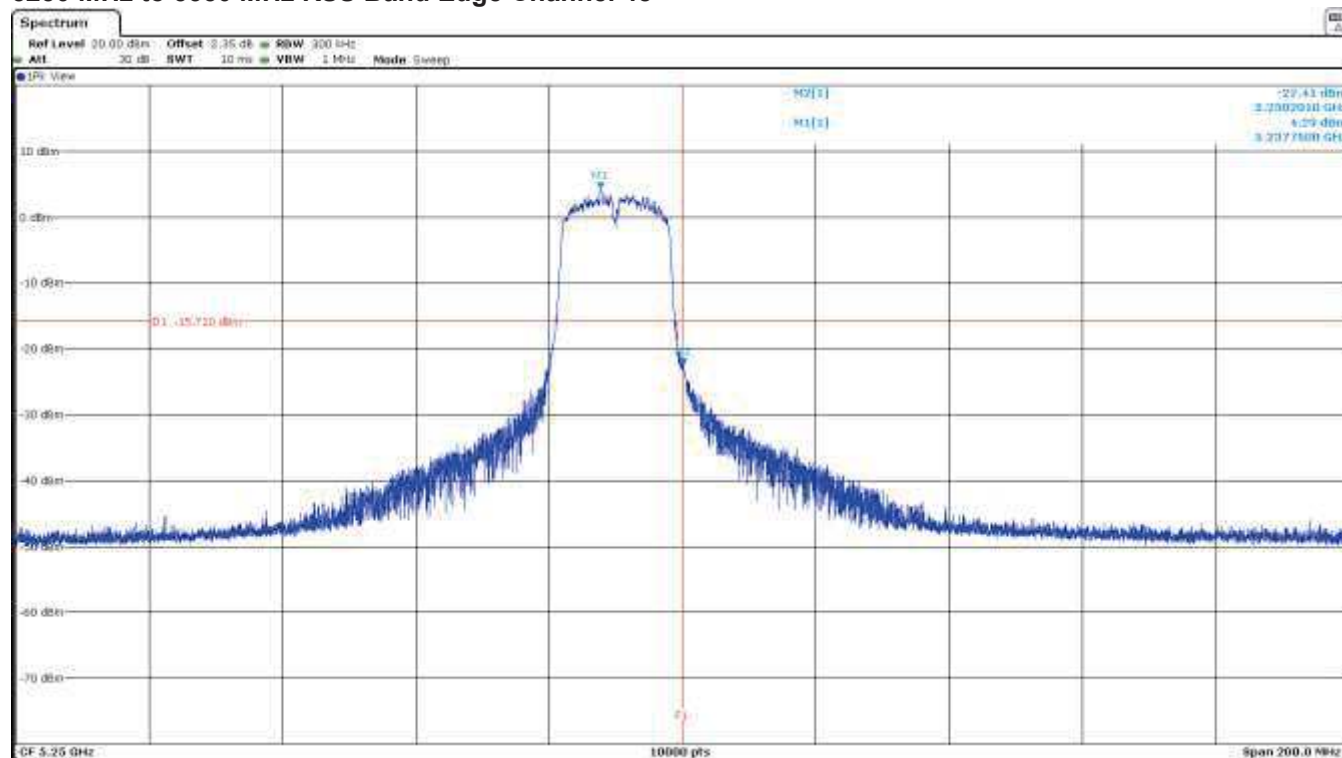
- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.4036	49.78	V	Peak	<±3.98



— P_{RE} R_{ES} 2H-AVG
 — P_{RE} R_{ES} 1H-PK+
 — P_{RE} R_{ES} 2V-AVG
 — P_{RE} R_{ES} 1V-PK+
 — FCC 15.407 Restricted Band: PK UNII-1 and UNII-2
 — FCC 15.407 Restricted Band: AVG
 ◆ Fix₁ R_{ES} PK+
 ◆ Fix₁ R_{ES} AVG

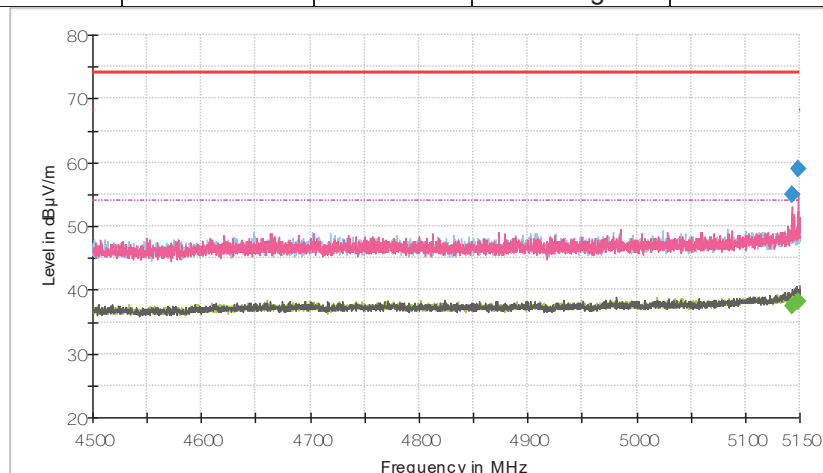
5250 MHz to 5350 MHz RSS Band Edge Channel 48



• **Mode 802.11 n20 (HT20)**

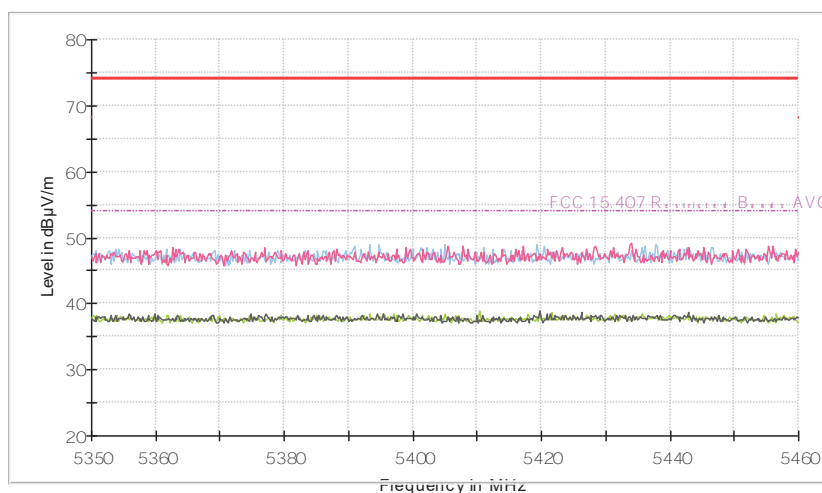
- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1490	59.02	V	Peak	<±3.98
	38.19		Average	



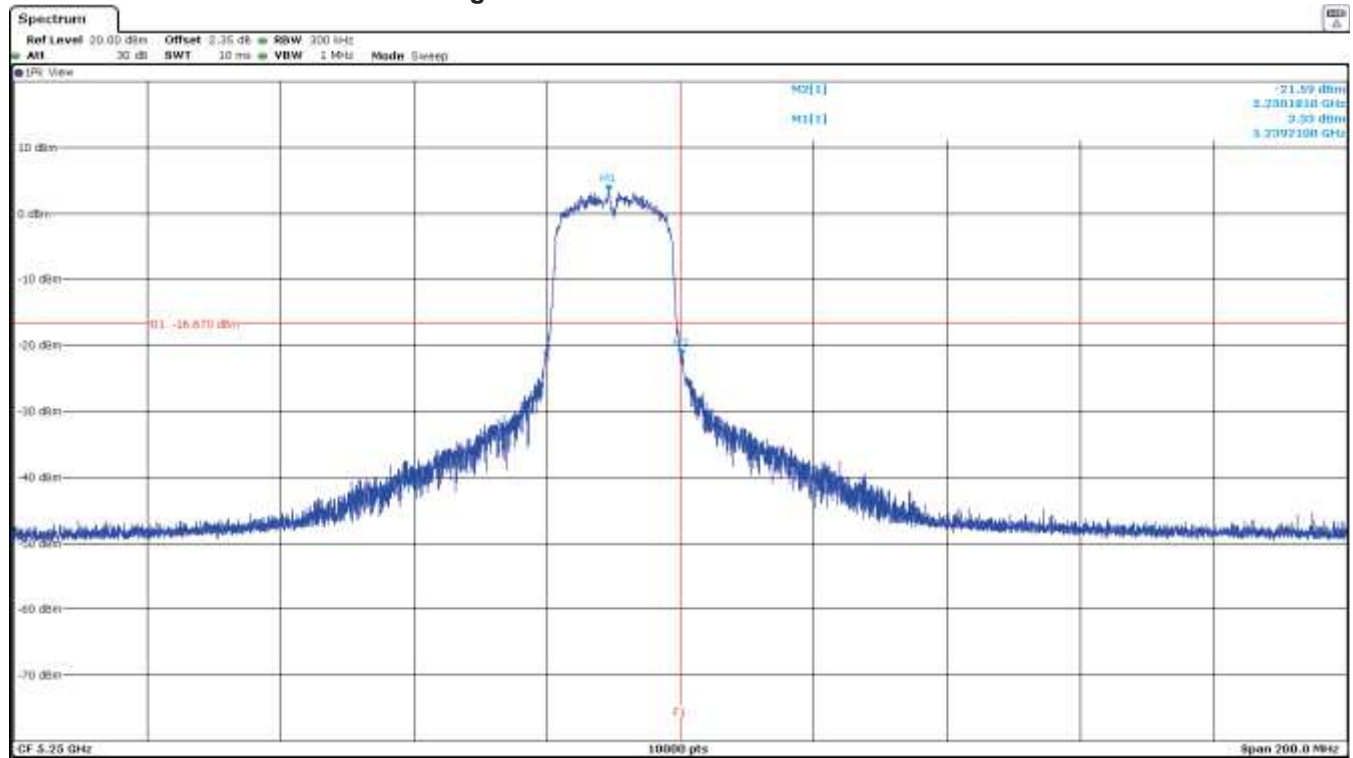
Pre-test Result 2H-AVG
 Pre-test Result 1H-PK+
 Pre-test Result 2V-AVG
 Pre-test Result 1V-PK+
 FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 FCC 15.407 Restricted Bands AVG
 Final Result PK+
 Final Result AVG

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.
No spurious frequencies at less than 20 dB below the limit.



Pre-test Result 2H-AVG
 Pre-test Result 1H-PK+
 Pre-test Result 2V-AVG
 Pre-test Result 1V-PK+
 FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 FCC 15.407 Restricted Bands AVG
 Final Result PK+
 Final Result AVG

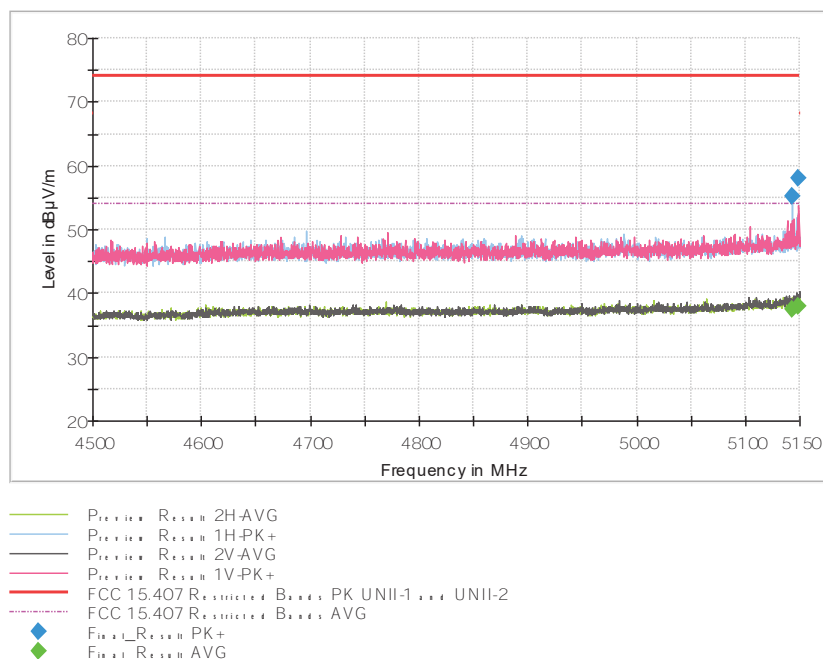
5250 MHz to 5350 MHz RSS Band Edge Channel 48



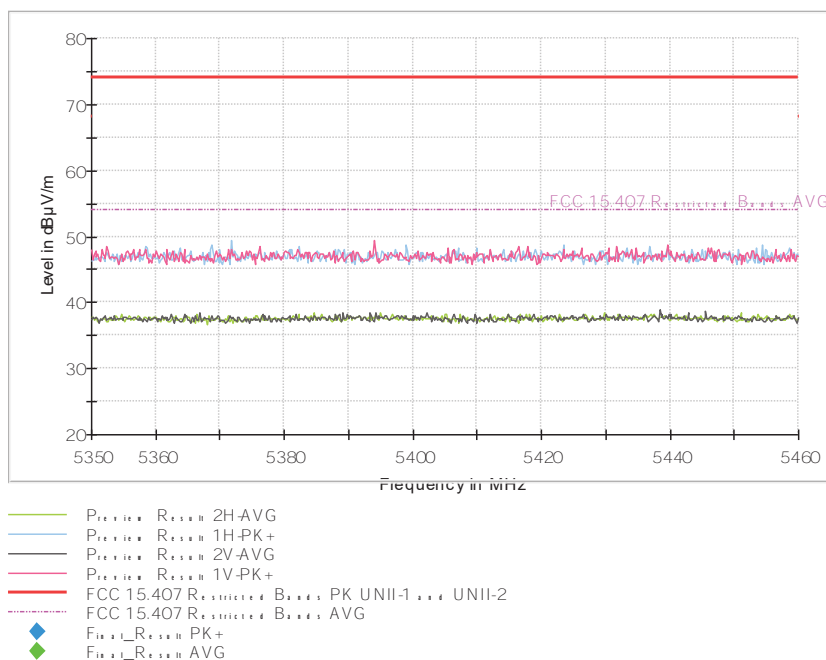
• **Mode 802.11 ac20 (HT20)**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

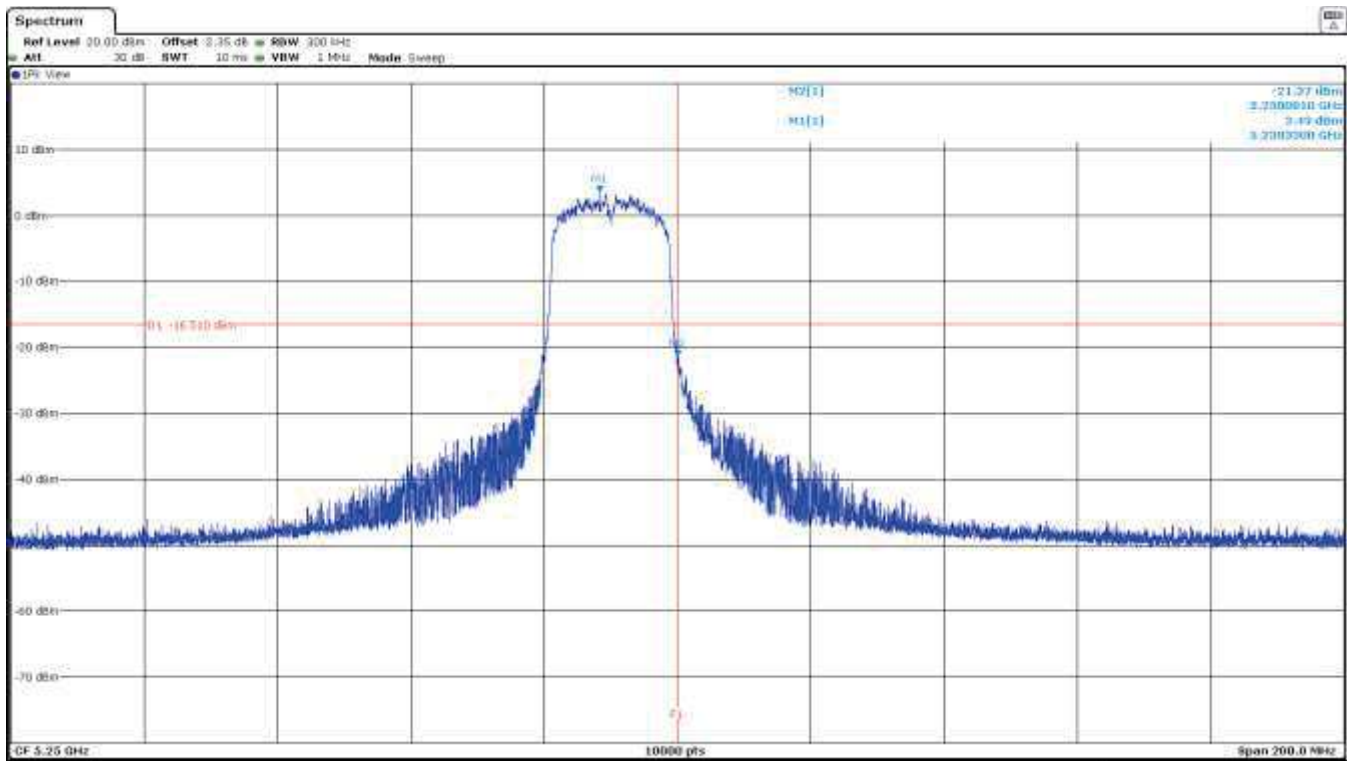
Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1492	58.00	V	Peak	<±3.98
	37.90		Average	



- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.
No spurious frequencies at less than 20 dB below the limit.



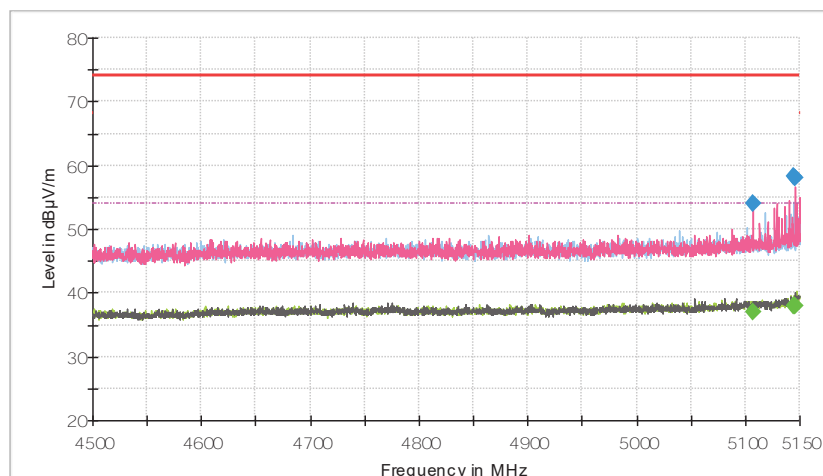
5250 MHz to 5350 MHz RSS Band Edge Channel 48



• **Mode 802.11 n40 (HT40)**

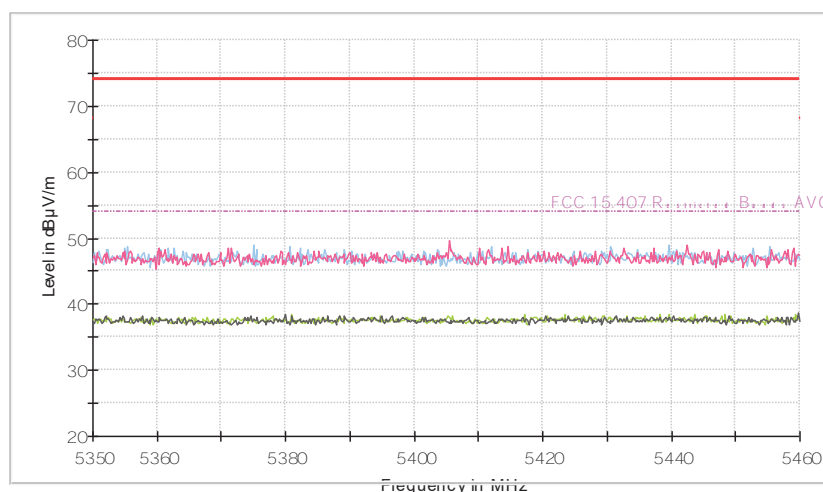
- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1076	53.94	V	Peak	<±3.98
5.1446	58.38	H	Peak	<±3.98
	37.92		Average	



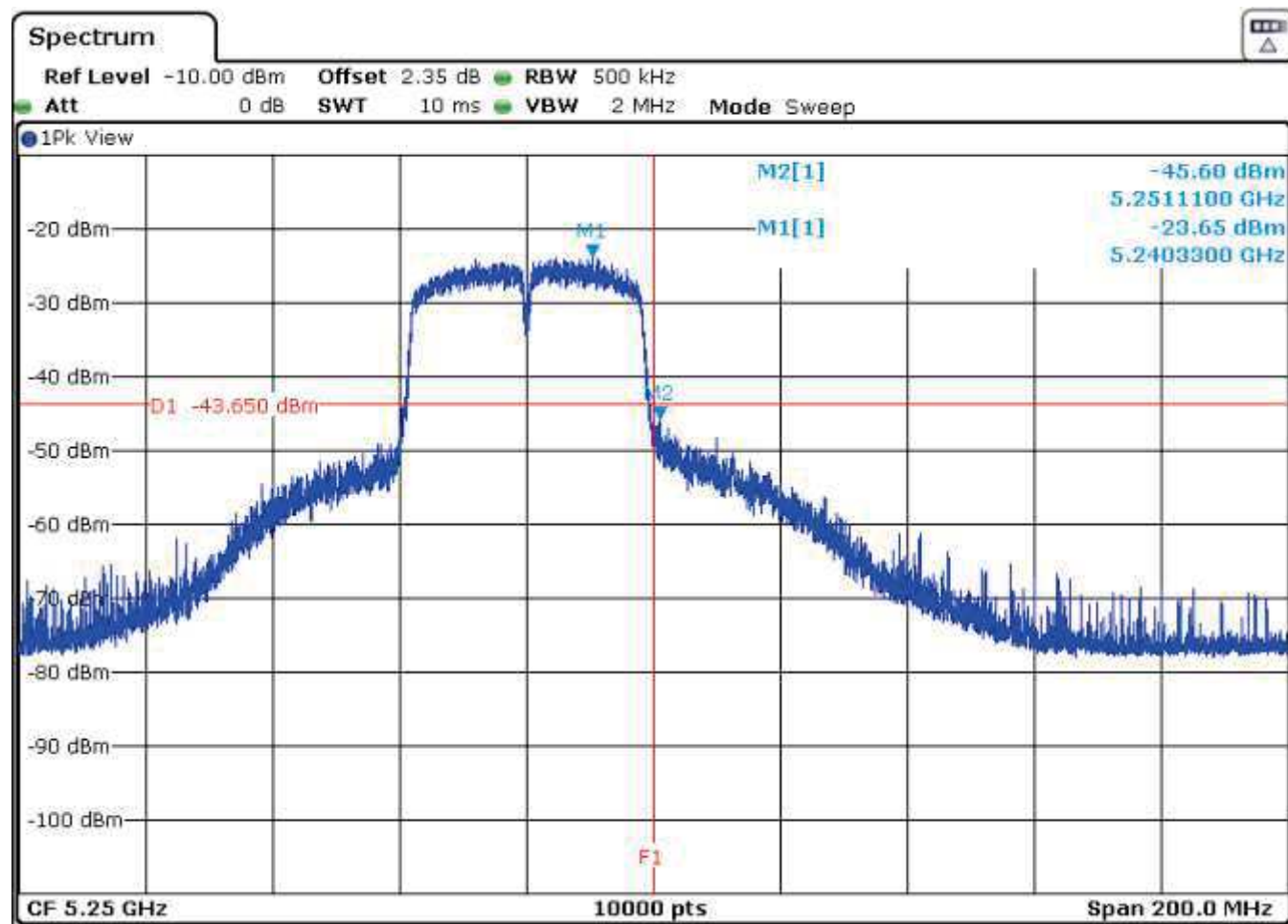
— Pre-Test Result 2H-AVG
 — Pre-Test Result 1H-PK+
 — Pre-Test Result 2V-AVG
 — Pre-Test Result 1V-PK+
 — FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 - - - - - FCC 15.407 Restricted Bands AVG
 ◆ Final Result PK+
 ◆ Final Result AVG

- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.
No spurious frequencies at less than 20 dB below the limit.



— Pre-Test Result 2H-AVG
 — Pre-Test Result 1H-PK+
 — Pre-Test Result 2V-AVG
 — Pre-Test Result 1V-PK+
 — FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 - - - - - FCC 15.407 Restricted Bands AVG
 ◆ Final Result PK+
 ◆ Final Result AVG

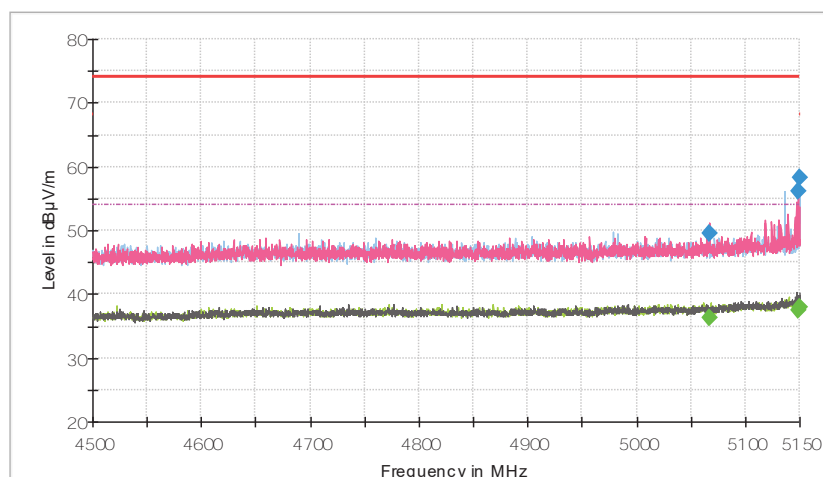
5250 MHz to 5350 MHz RSS Band Edge Channel 46



• **Mode 802.11 ac40 (VHT40)**

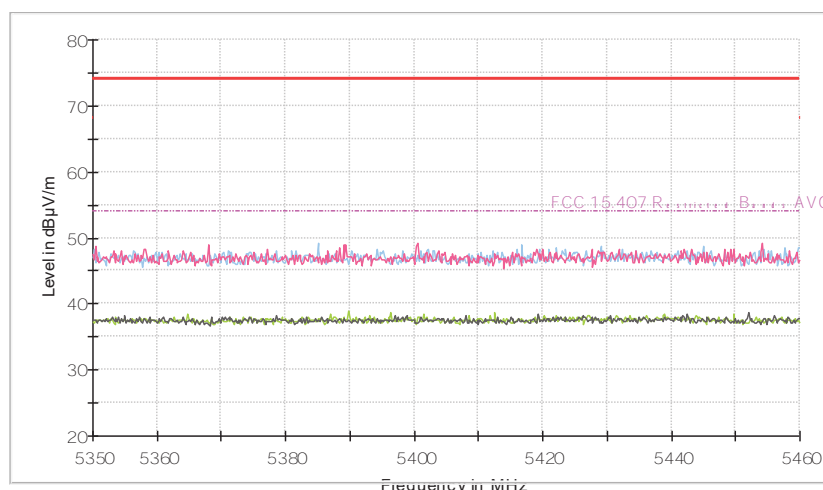
- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.0666	49.44	V	Peak	<±3.98
5.1498	58.29	H	Peak	<±3.98
	37.91		Average	



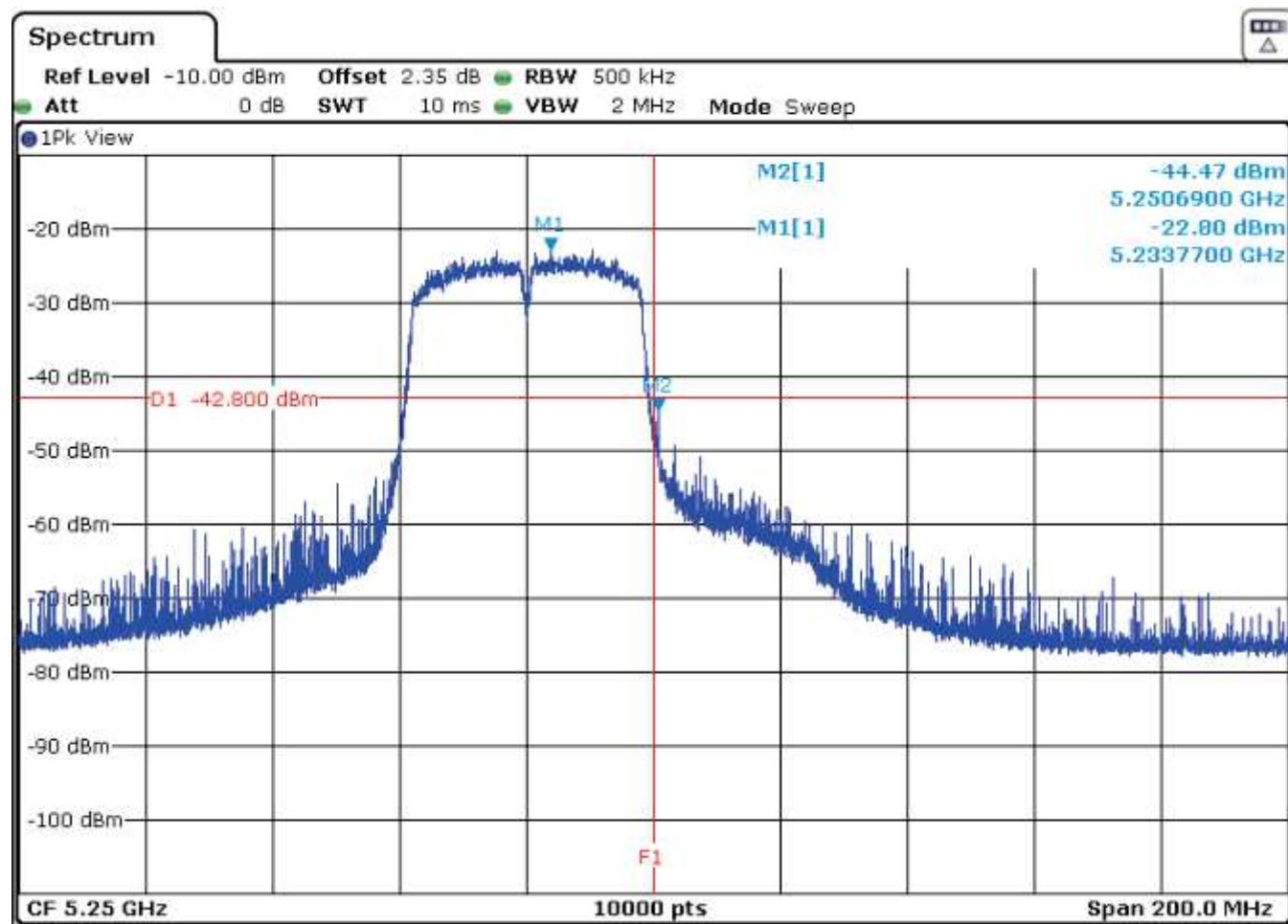
— Pre-Test Result 2H-AVG
 — Pre-Test Result 1H-PK+
 — Pre-Test Result 2V-AVG
 — Pre-Test Result 1V-PK+
 — FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 - - - - - FCC 15.407 Restricted Bands AVG
 ◆ Final Result PK+
 ◆ Final Result AVG

- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.
No spurious frequencies at less than 20 dB below the limit.



— Pre-Test Result 2H-AVG
 — Pre-Test Result 1H-PK+
 — Pre-Test Result 2V-AVG
 — Pre-Test Result 1V-PK+
 — FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 - - - - - FCC 15.407 Restricted Bands AVG
 ◆ Final Result PK+
 ◆ Final Result AVG

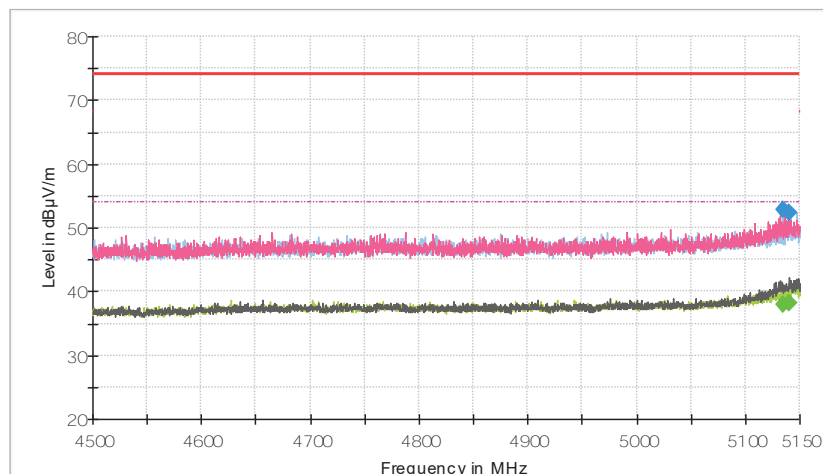
5250 MHz to 5350 MHz RSS Band Edge Channel 46



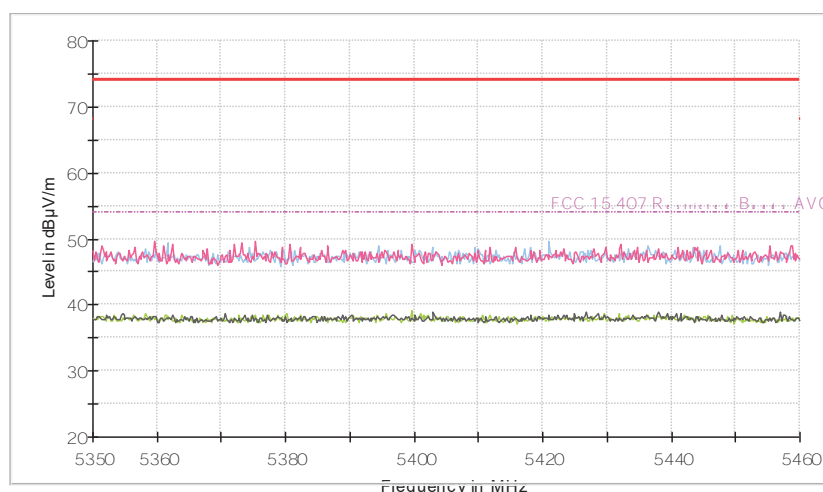
• **Mode 802.11 ac80 (VHT80)**

- Middle Channel 42 (5210 MHz): Inside band spurious emissions in 4.50-5.15 GHz and 5.35-5.46 GHz adjacent bands.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1350	52.78	H	Peak	<±3.98
5.1406	52.27	V	Peak	<±3.98

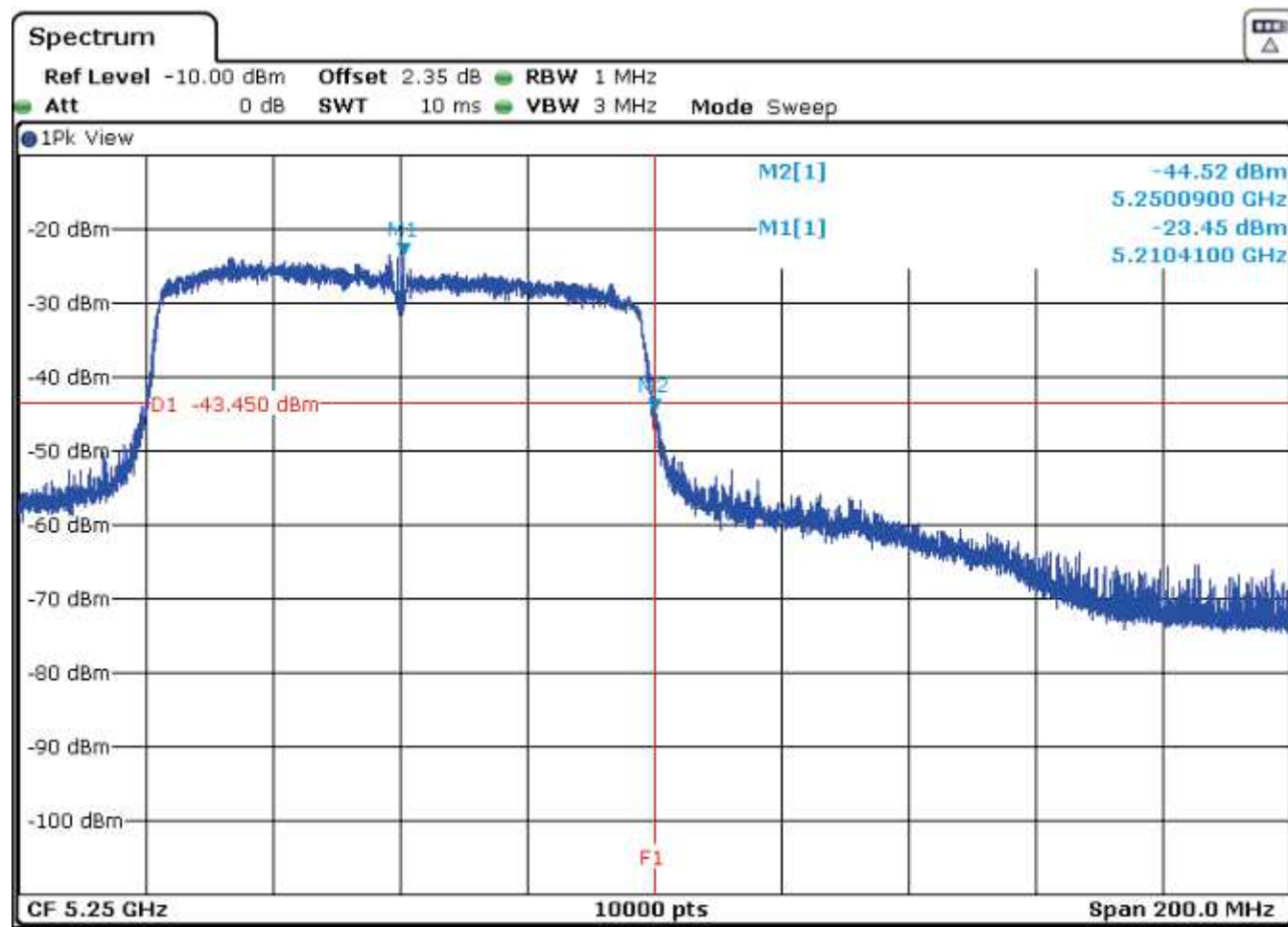


Pre-Test Result 2H-AVG
 Pre-Test Result 1H-PK+
 Pre-Test Result 2V-AVG
 Pre-Test Result 1V-PK+
 FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 FCC 15.407 Restricted Bands AVG
 Final Result PK+
 Final Result AVG



Pre-Test Result 2H-AVG
 Pre-Test Result 1H-PK+
 Pre-Test Result 2V-AVG
 Pre-Test Result 1V-PK+
 FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 FCC 15.407 Restricted Bands AVG
 Final Result PK+
 Final Result AVG

5250 MHz to 5350 MHz RSS Band Edge Channel 42



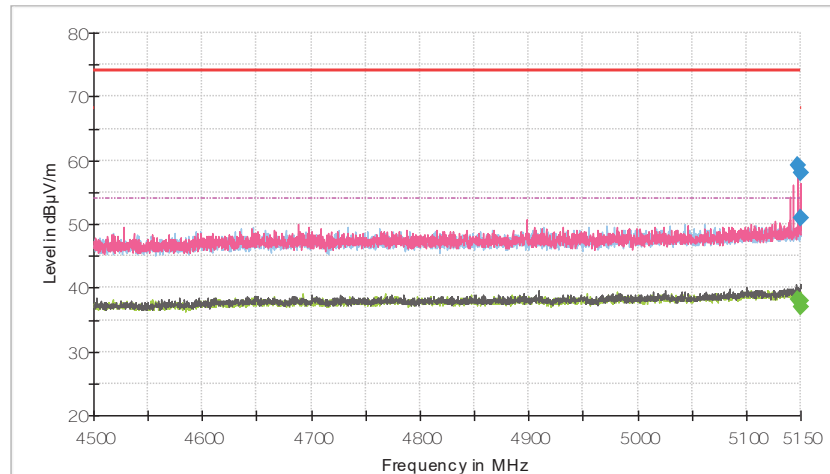
Verdict: PASS

OUTDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: +0.6 dBi

• **Mode 802.11 a20**

- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

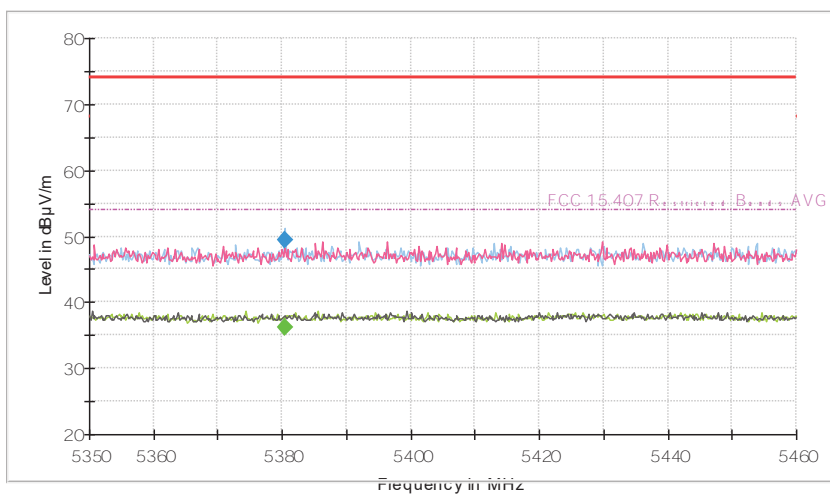
Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1478	59.21	V	Peak	<±3.98
	38.20		Average	



Pre-Res 2H-AVG
 Pre-Res 1H-PK+
 Pre-Res 2V-AVG
 Pre-Res 1V-PK+
 FCC 15.407 Restricted Band PK UNII-1 and UNII-2
 FCC 15.407 Restricted Band AVG
 Final-Res PK+
 Final-Res AVG

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3804	49.44	H	Peak	<±3.98

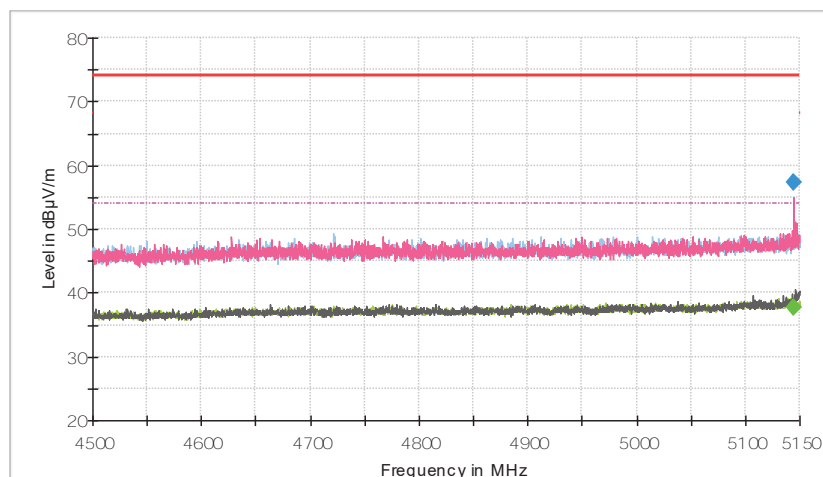


Pre-Res 2H-AVG
 Pre-Res 1H-PK+
 Pre-Res 2V-AVG
 Pre-Res 1V-PK+
 FCC 15.407 Restricted Band PK UNII-1 and UNII-2
 FCC 15.407 Restricted Band AVG
 Final-Res PK+
 Final-Res AVG

• **Mode 802.11 n20 (HT20)**

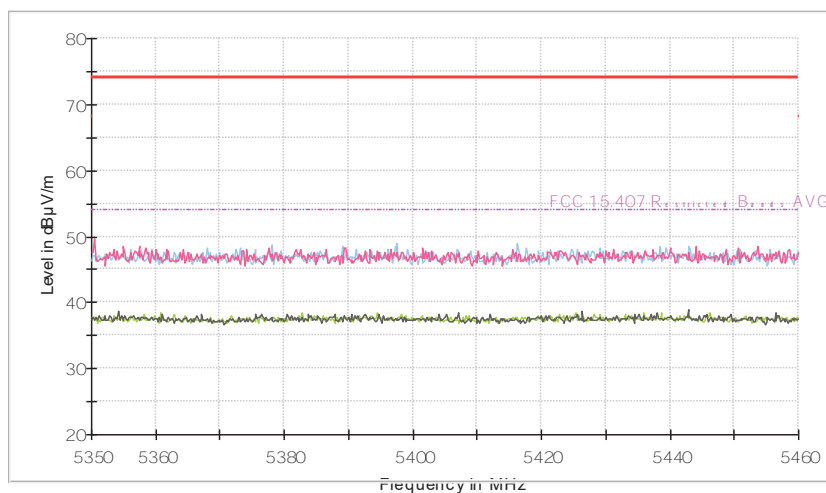
- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1444	57.61	V	Peak	<±3.98
	37.75		Average	



Pre-Test Result 2H-AVG
 Pre-Test Result 1H-PK+
 Pre-Test Result 2V-AVG
 Pre-Test Result 1V-PK+
 FCC 15.407 Restricted Band PK UNII-1 and UNII-2
 FCC 15.407 Restricted Band AVG
 Final Result PK+
 Final Result AVG

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band
No spurious frequencies at less than 20 dB below the limit.

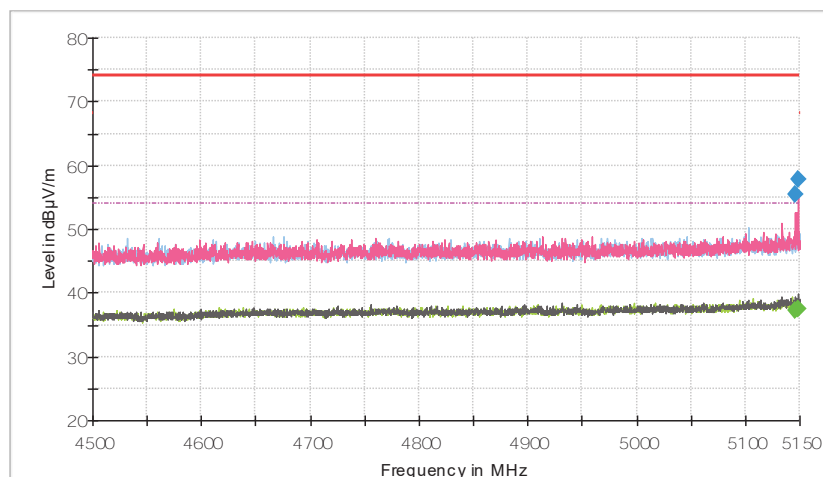


Pre-Test Result 2H-AVG
 Pre-Test Result 1H-PK+
 Pre-Test Result 2V-AVG
 Pre-Test Result 1V-PK+
 FCC 15.407 Restricted Band PK UNII-1 and UNII-2
 FCC 15.407 Restricted Band AVG
 Final Result PK+
 Final Result AVG

• **Mode 802.11 ac20 (HT20)**

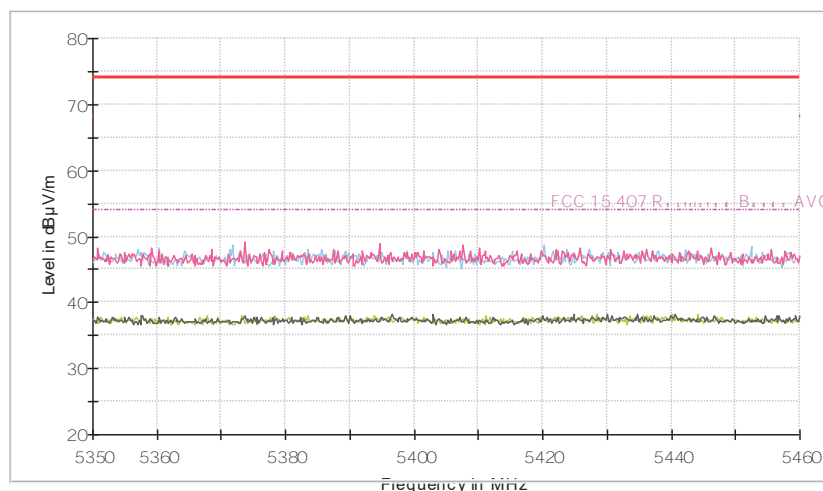
- Lower Band Edge Channel 36 (5180 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1484	57.90	V	Peak	<±3.98
	37.49		Average	



Pre-Test Result 2H-AVG
 Pre-Test Result 1H-PK+
 Pre-Test Result 2V-AVG
 Pre-Test Result 1V-PK+
 FCC 15.407 Restricted Band PK UNII-1 and UNII-2
 FCC 15.407 Restricted Band AVG
 Final Result PK+
 Final Result AVG

- Upper Band Edge Channel 48 (5240 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band
No spurious frequencies at less than 20 dB below the limit.

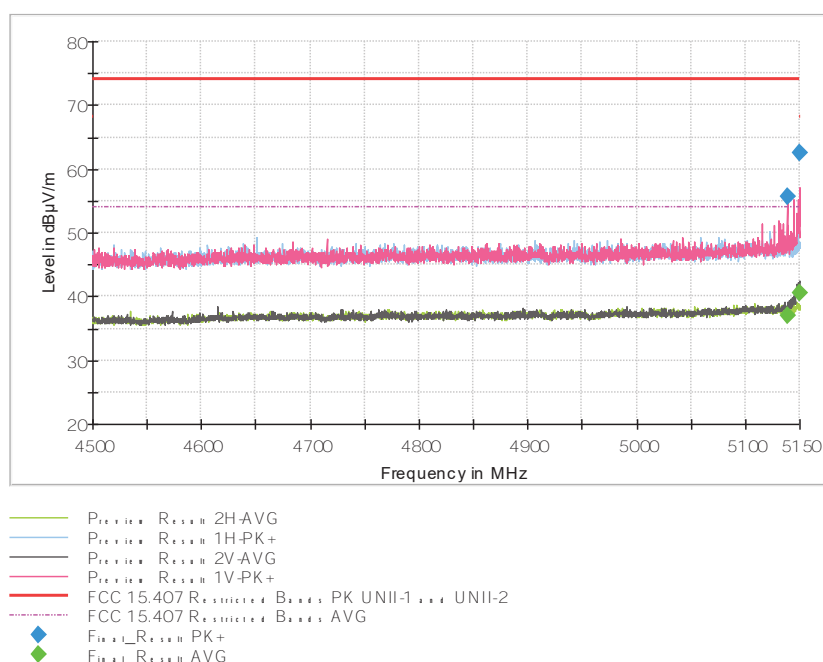


Pre-Test Result 2H-AVG
 Pre-Test Result 1H-PK+
 Pre-Test Result 2V-AVG
 Pre-Test Result 1V-PK+
 FCC 15.407 Restricted Band PK UNII-1 and UNII-2
 FCC 15.407 Restricted Band AVG
 Final Result PK+
 Final Result AVG

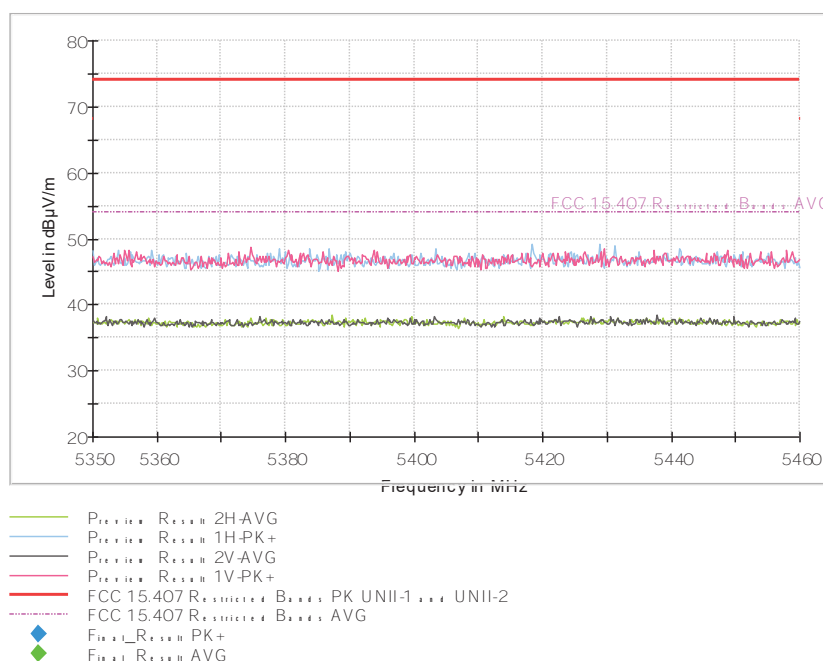
• **Mode 802.11 n40 (HT40)**

- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1384	55.58	V	Peak	<±3.98
	39.96		Average	
5.1496	62.43	V	Peak	<±3.98
	40.59		Average	



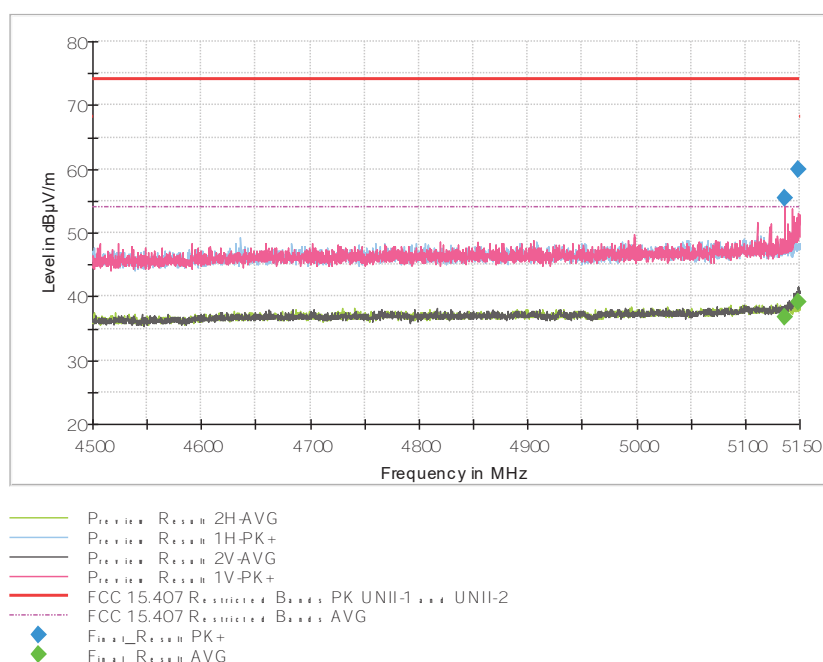
- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.
No spurious frequencies at less than 20 dB below the limit.



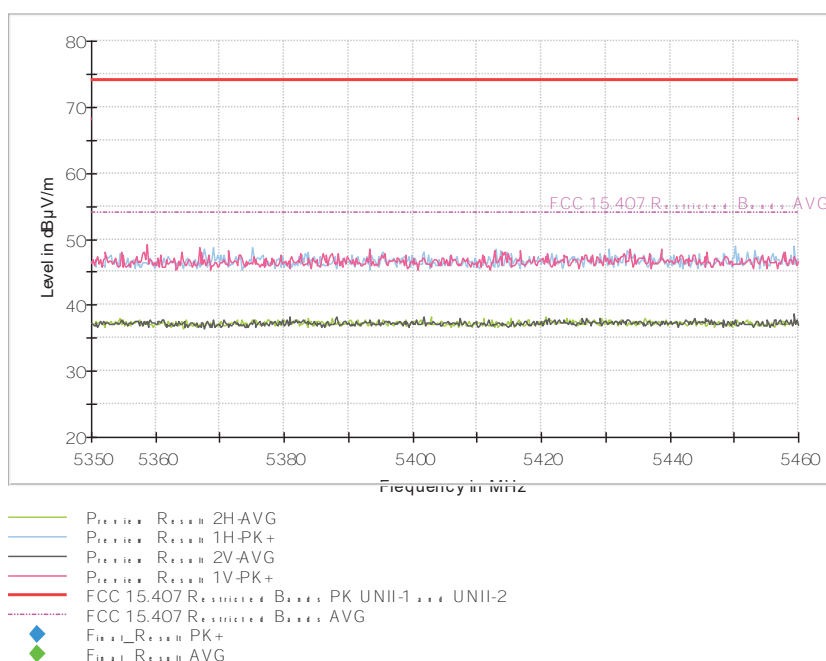
• **Mode 802.11 ac40 (VHT40)**

- Lower Band Edge Channel 38 (5190 MHz): Inside band spurious emissions in 4.50-5.15 GHz adjacent band.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1366	55.40	V	Peak	<±3.98
	36.86		Average	
5.1490	60.00	V	Peak	<±3.98
	39.25		Average	



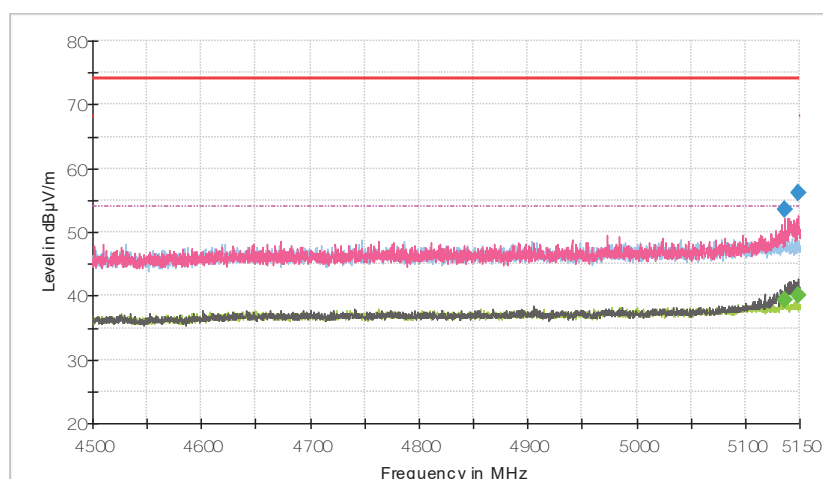
- Upper Band Edge Channel 46 (5230 MHz): Inside band spurious emissions in 5.35-5.46 GHz adjacent band.
No spurious frequencies at less than 20 dB below the limit.



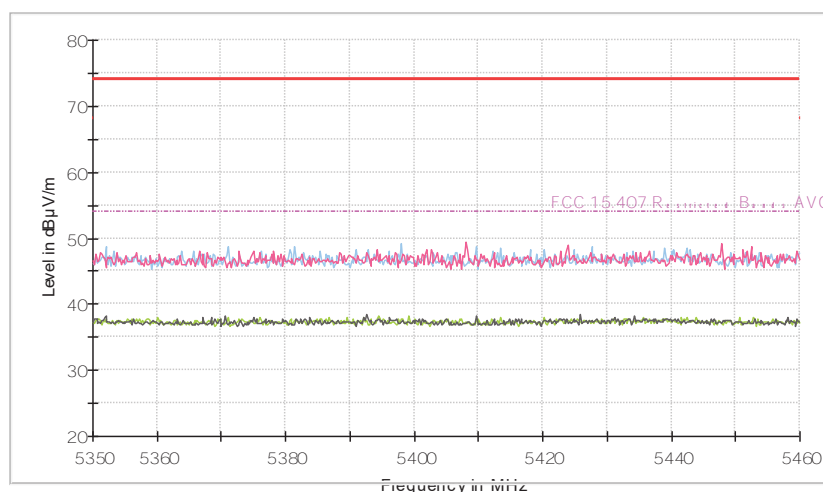
• **Mode 802.11 ac80 (VHT80)**

- Middle Channel 42 (5210 MHz): Inside band spurious emissions in 4.50-5.15 GHz and 5.35-5.46 GHz adjacent bands.

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.1366	53.56	V	Peak	<±3.98
5.1484	56.22	V	Peak	<±3.98
	39.97		Average	



——— P_{REMI} R_{ES}ult 2H-AVG
 ——— P_{REMI} R_{ES}ult 1H-PK+
 ——— P_{REMI} R_{ES}ult 2V-AVG
 ——— P_{REMI} R_{ES}ult 1V-PK+
 ——— FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 - - - - - FCC 15.407 Restricted Bands AVG
 ◆ Final_R_{ES}ult PK+
 ◆ Final_R_{ES}ult AVG



——— P_{REMI} R_{ES}ult 2H-AVG
 ——— P_{REMI} R_{ES}ult 1H-PK+
 ——— P_{REMI} R_{ES}ult 2V-AVG
 ——— P_{REMI} R_{ES}ult 1V-PK+
 ——— FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
 - - - - - FCC 15.407 Restricted Bands AVG
 ◆ Final_R_{ES}ult PK+
 ◆ Final_R_{ES}ult AVG

Verdict: PASS

Appendix C: Test results for the U-NII-3 Band 5.725 – 5.85 GHz

INDEX

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FCC 15.407 (a)(3) / RSS-247 6.2.4.1 Transmitter Maximum Conducted Output Power	90
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FCC 15.407 (b)(4) / RSS-247 6.2.4.2 Transmitter Band Edge Radiated Emissions	110

TEST CONDITIONS

POWER SUPPLY (V):

V nominal: 12 Vdc.
Type of Power Supply: External power supply (Car Battery).

ANTENNA:

Type of Antenna: Indoor the vehicle.
Outdoor the vehicle.

Max. Declared Gain: Indoor: -1.9 dBi.
Outdoor: -3.0 dBi.

Technology Tested:	WLAN (IEEE 802.11 a/n/ac): U-NII-3 band	
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps	
	802.11n HT20: MCS0 to MCS7	
	802.11n HT40: MCS0 to MCS7	
	802.11ac VHT20: MCS0 to MCS8	
	802.11ac VHT40: MCS0 to MCS9	
	802.11ac VHT80: MCS0 to MCS9	
Setting of cores / ports:	One port.	
Beamforming:	No	
Frequency Range:	5725 MHz to 5850 MHz	
Channel Spacing:	20 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Lowest: 149	5745
	Middle: 157	5785
	Highest: 165	5825
Channel Spacing:	40 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Lowest: 151	5755
	Highest: 159	5795
Channel Spacing:	80 MHz	
Transmit Channels	Middle: 155	5775

802.11 a20: Adjustment of Maximum RF Output Power: +12 dBm
802.11 n20/ac20: Adjustment of Maximum RF Output Power: +12 dBm
802.11 n40/ac40: Adjustment of Maximum RF Output Power: +11 dBm
802.11 ac80: Adjustment of Maximum RF Output Power: +9 dBm

The test set-up was made in accordance to the general provisions of ANSI C63.10: 2013 and FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 dated 12/14/2017.

The EUT was tested in the following operating mode:

- Continuously transmitting with a modulated carrier at maximum power in all required channels using the supported data rates/modulations types.

The field strength at the band edges was evaluated for each mode individually on the lowest and highest channels at the rated power for the channel under test.

For all modes, the EUT was configured in test mode using a software application. The application was used to enable a continuous transmission and to select the test channels as required. The client supplied scripts to configure the EUT. The customer supplied a document containing the setup instructions.

The worst cases for testing were identified for output power and spurious levels at the band edges which were selected based on preliminary testing that correspond to next data rates:

- 802.11a20: 6 Mbits
- 802.11n HT20: MCS0
- 802.11n HT40: MCS0
- 802.11ac VHT20: MCS0
- 802.11ac VHT40: MCS0
- 802.11ac VHT80: MCS0

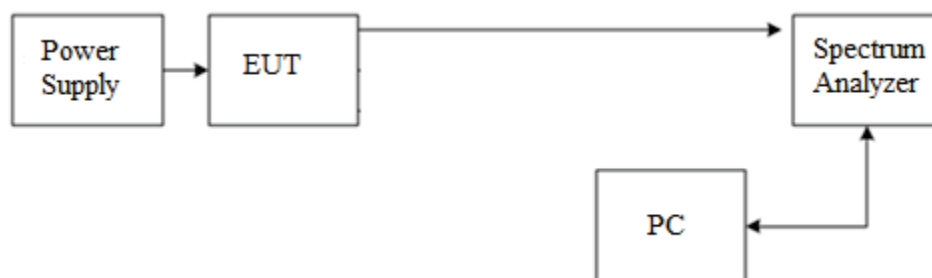
The conducted test sample has only one connector. The client provided the antenna gains for both antennas (including the losses of lines and switches). The client considered the transmission lines and rf switches as part of the indoor and outdoor antenna.

The client supplied U.FL RF cables with the EUT in order to perform conducted measurements. The measured additional path loss was included in any path loss calculations.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and connected to the spectrum analyzer using a low loss RF cable. The reading in the spectrum analyzer is corrected taking into account the internal and external RF cable loss.

For all modes:



The DC supply voltage is applied using an external power supply.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) and 1 GHz-18 GHz Double ridge horn antenna is situated at a distance of 3 m and a distance of 1 m for the frequency range 17 GHz-40 GHz (18 GHz-40 GHz horn antenna).

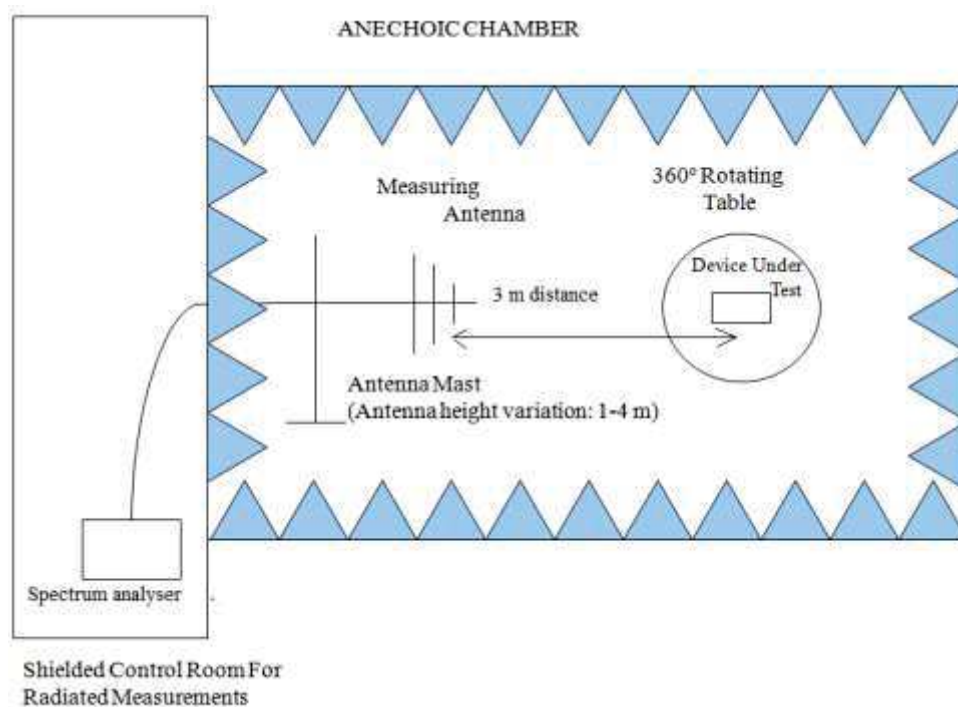
For radiated emissions in the range 17 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

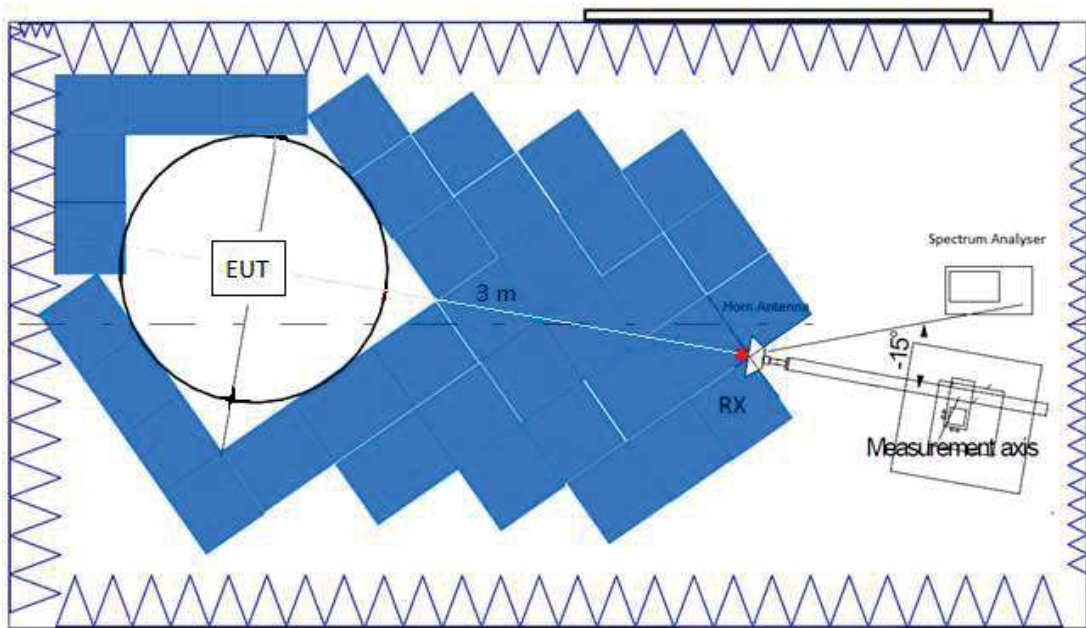
Measurements were made in both horizontal and vertical planes of polarization.

The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.

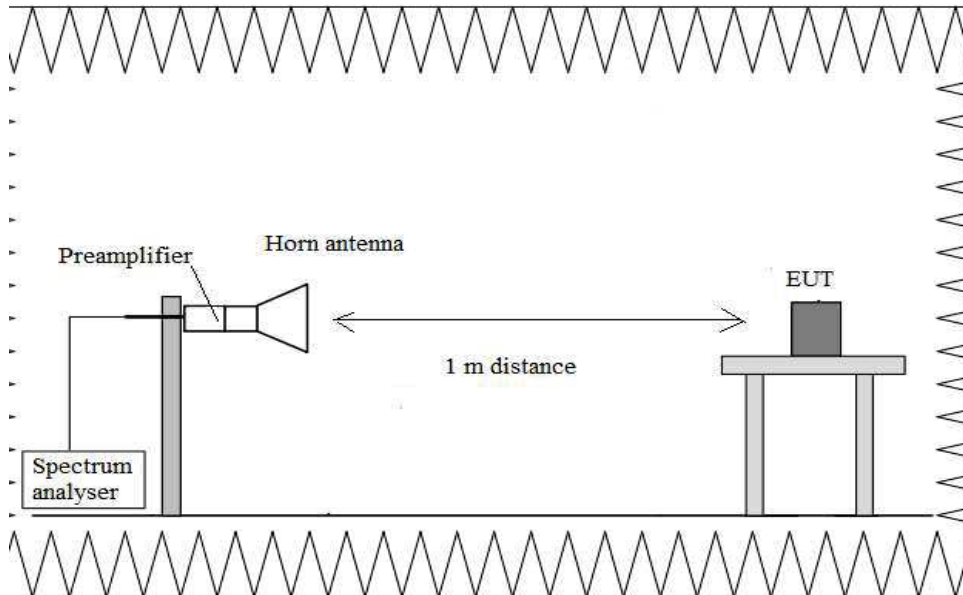
Radiated measurements setup $f < 1$ GHz



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz up to 40 GHz:



FCC 15.247 (e) / RSS-247 6.2.4.1 6 dB Bandwidth

SPECIFICATION:

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS:

The following modes and data rates were selected based on preliminary testing that identified those corresponding to the worst cases:

- 802.11a20: 6 Mbps
- 802.11n HT20: MCS0
- 802.11n HT40: MCS0
- 802.11ac VHT80: MCS0

Mode 802.11 a20

	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
6 dB Bandwidth (MHz)	15.250	15.250	15.250
Measurement uncertainty (%)	<±1.13		

Mode 802.11 n20 (HT20)

	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
6 dB Bandwidth (MHz)	15.250	15.250	15.250
Measurement uncertainty (%)	<±1.13		

Mode 802.11 n40 (HT40)

	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
6 dB Bandwidth (MHz)	35.150	35.150
Measurement uncertainty (%)	<±1.13	

Mode 802.11 ac80 (VHT80)

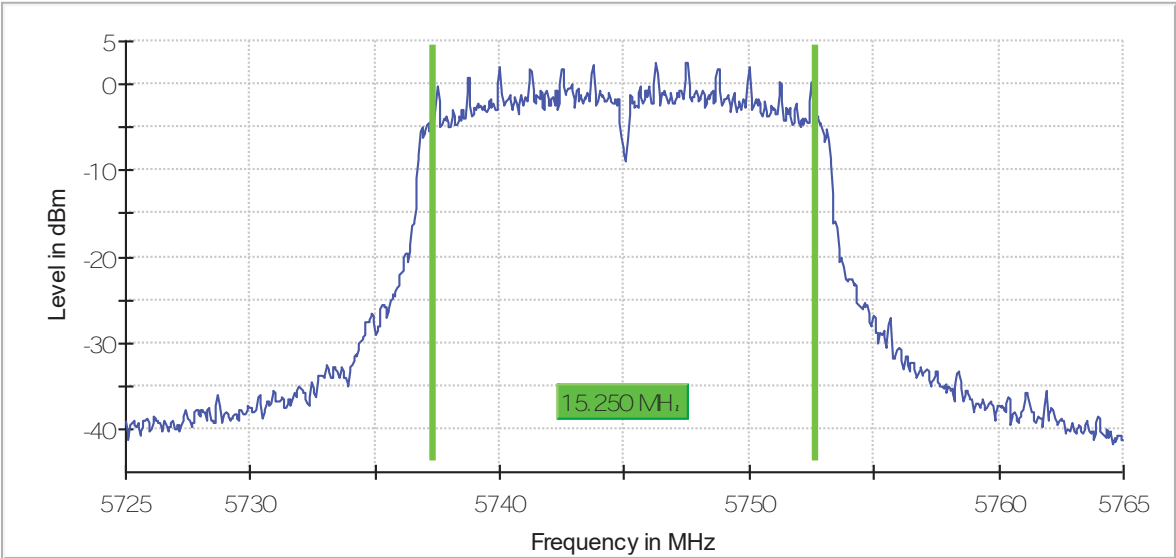
	Single Channel 155 (5775 MHz)
6 dB bandwidth (MHz)	75.150
Measurement uncertainty (%)	<±1.13

Verdict: PASS

Mode 802.11 a20

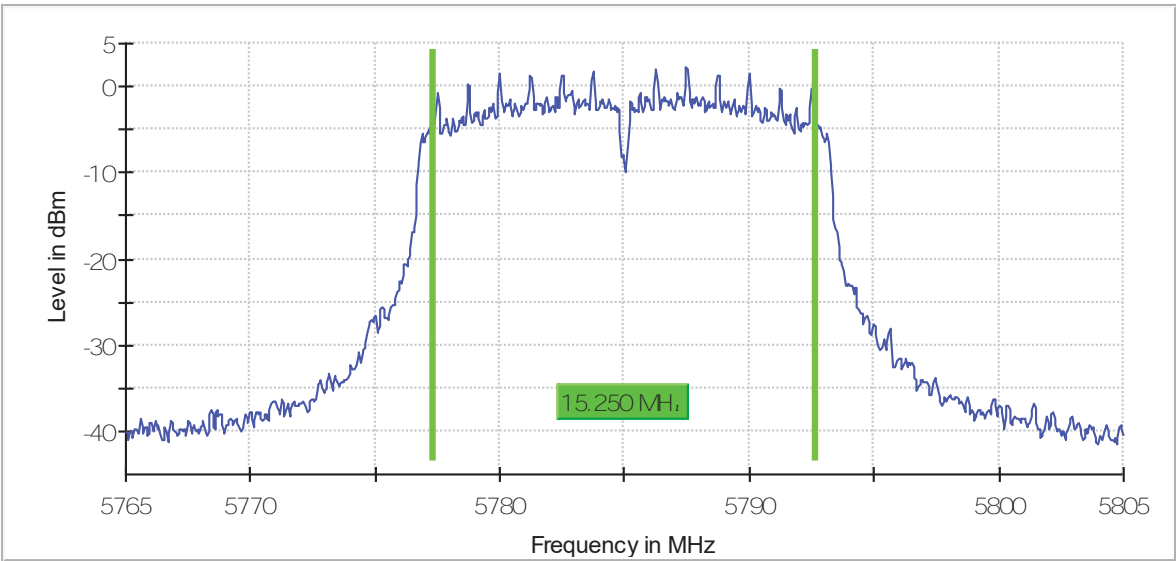
Low Channel 149

6 dB Bandwidth



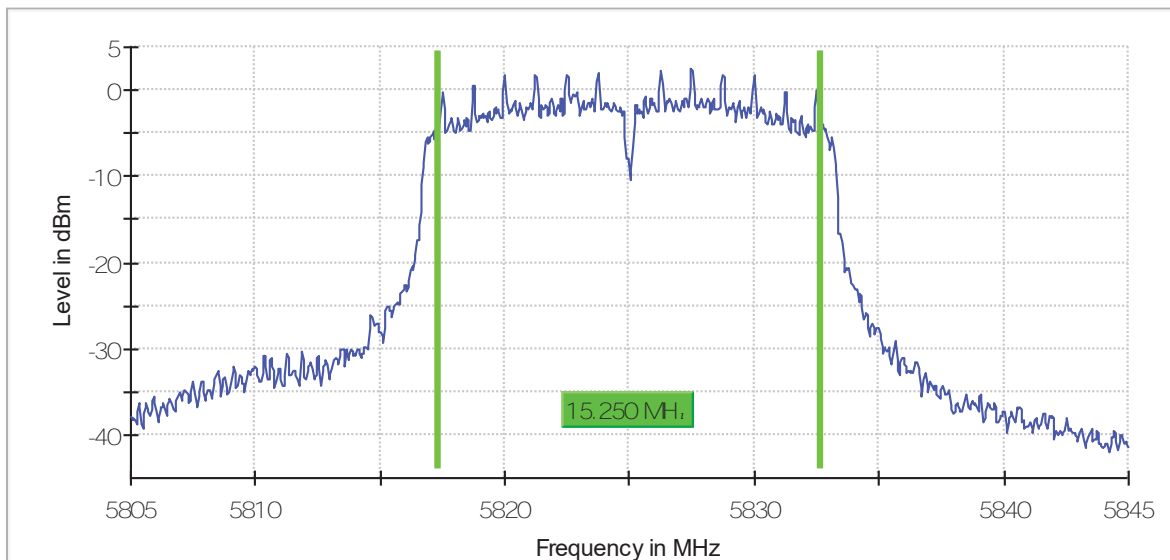
Middle Channel 157

6 dB Bandwidth



High Channel 165

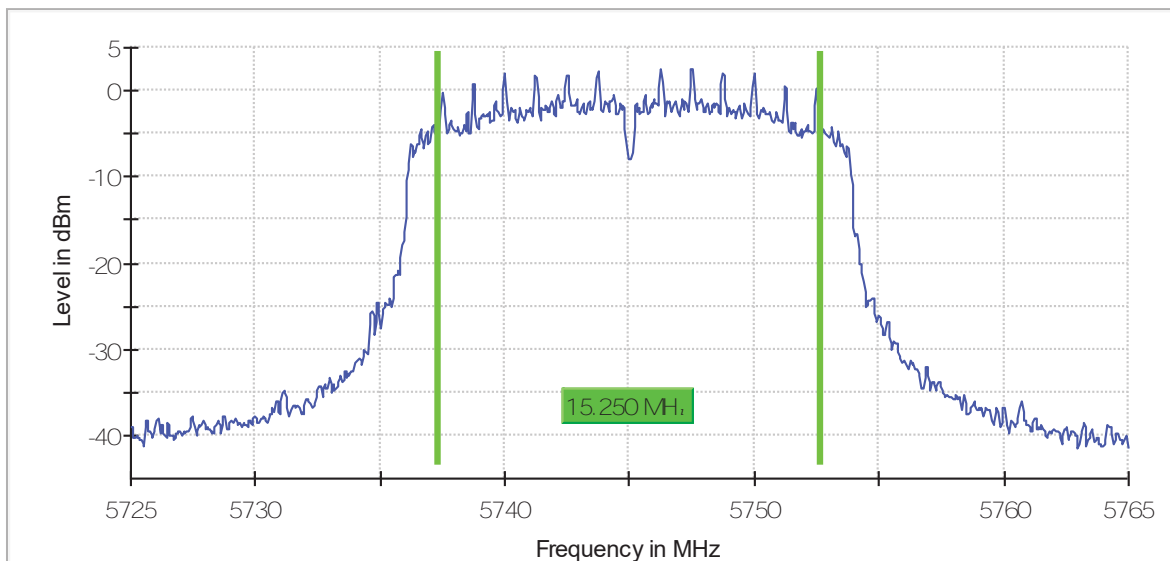
6 dB Bandwidth



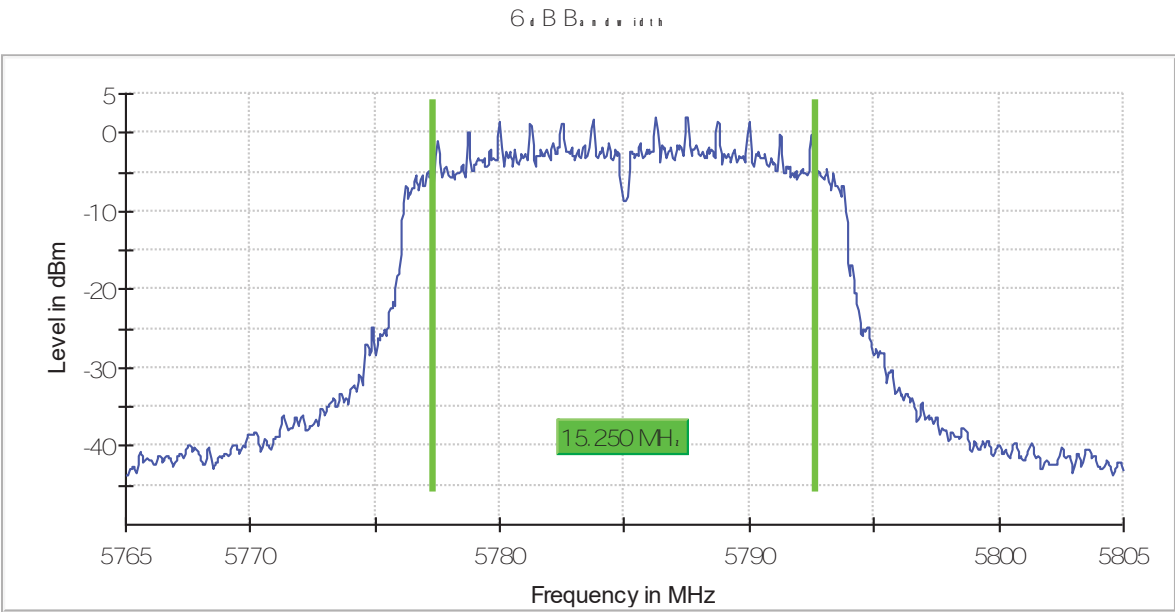
Mode 802.11 n20 (HT20)

Low Channel 149

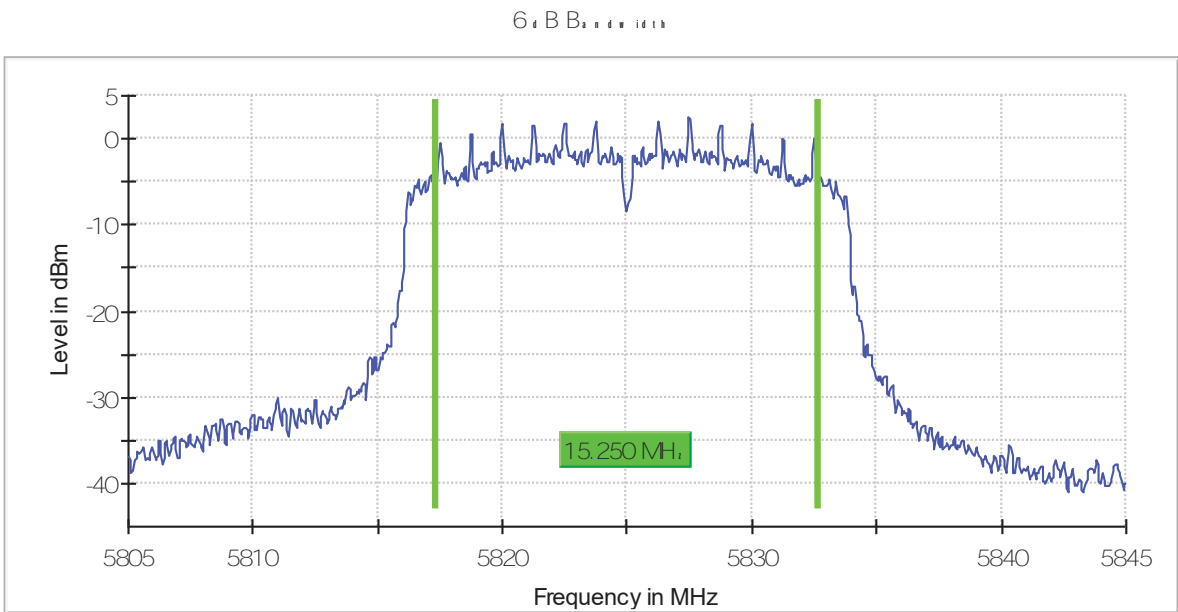
6 dB Bandwidth



Middle Channel 157

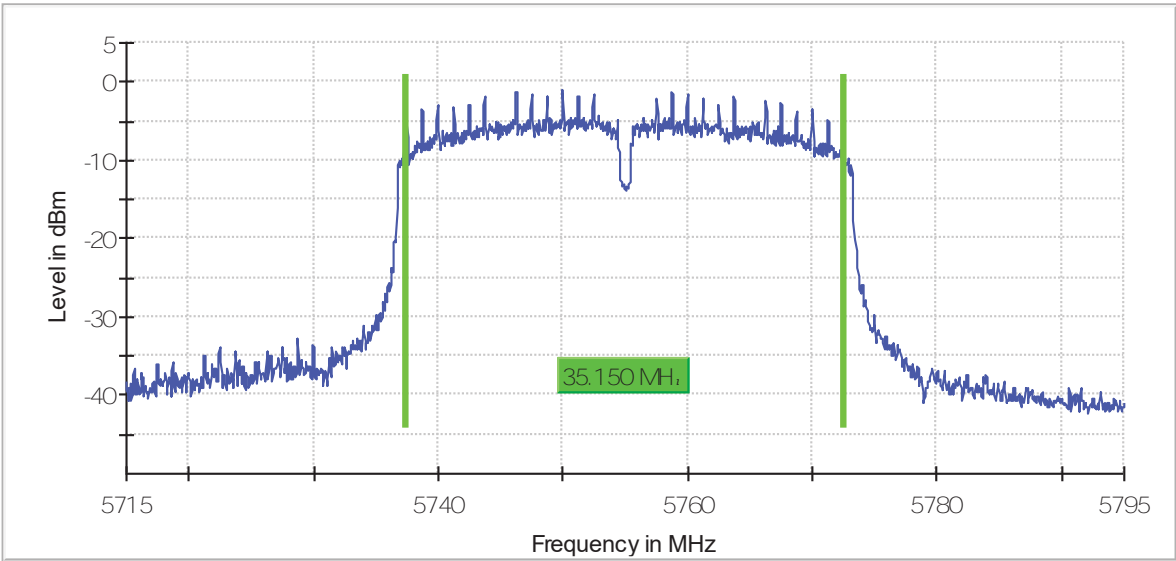


High Channel 165



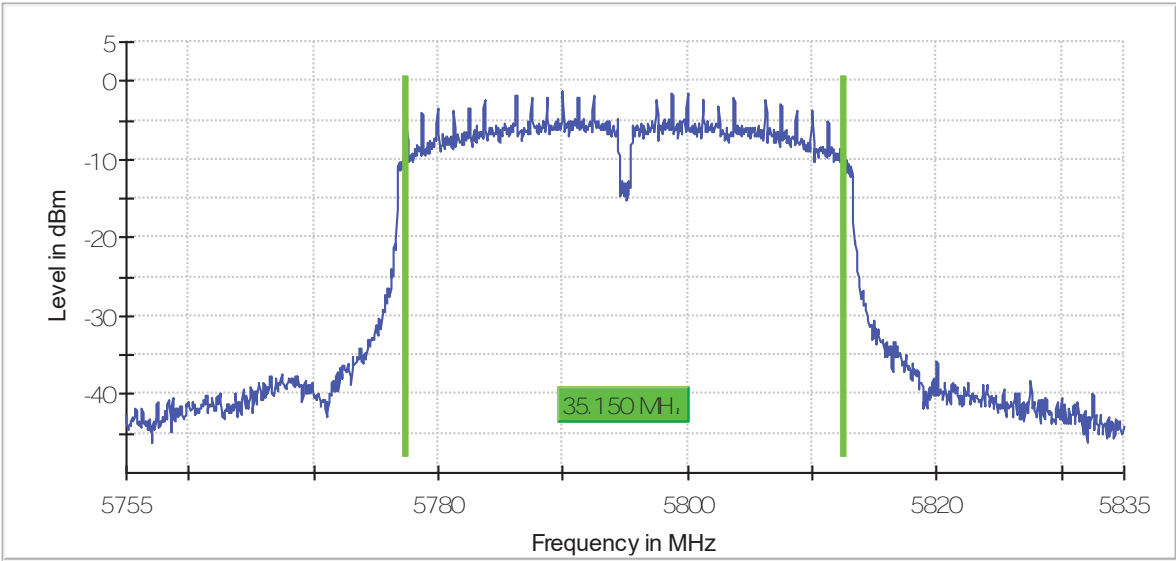
Mode 802.11 n40 (HT40)
Low Channel 151

6 dB Bandwidth



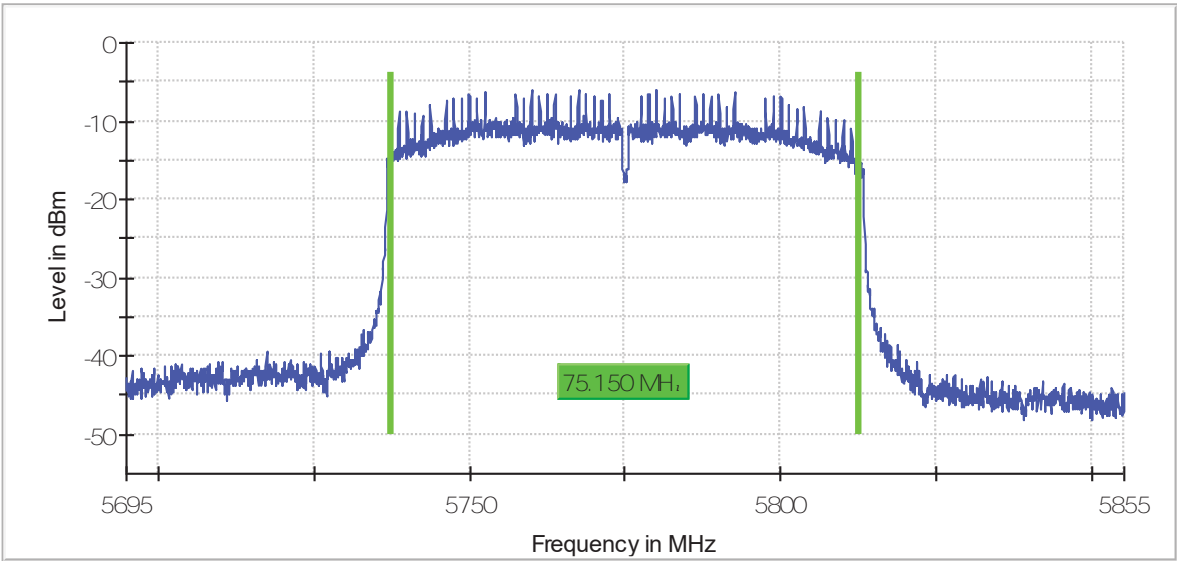
High Channel 159

6 dB Bandwidth



Mode 802.11 ac80 (VHT80)
Middle Channel 155

6 dB Bandwidth



FCC 15.407 (a)(3) / RSS-247 6.2.4.1 Transmitter Maximum Conducted Output Power

SPECIFICATION:

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W (30 dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS:

The maximum conducted output power was measured using the channel power integration method according to point E) 2) b) (Method SA-1) of 789033 D02 General UNII Test Procedures New Rules v02r01 when the duty cycle is >98% and the channel power integration method according to point E) 2) d) (Method SA-2) of 789033 D02 General UNII Test Procedures New Rules v02r01 when the duty cycle is <98%.

For data rates where the EUT was transmitting at <98% duty cycle, the duty calculated in Appendix A was added to the measured power in order to calculate the total average power during the actual transmission time.

The e.i.r.p. levels are calculated by adding the declared maximum antenna gain (dBi).

For all modes of operation, the antenna gain is less than 6 dBi.

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: -1.9 dBi

Mode 802.11 a20

	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Conducted Power Corrected (dBm)	13.111	12.300	12.623
Maximum EIRP power Corrected (dBm)	11.2	10.4	10.7
Measurement uncertainty (dB)	<±0.99		

Mode 802.11 n20 (HT20)

	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Max. Conducted Power Corrected (dBm)	12.884	12.072	12.384
Maximum EIRP power Corrected (dBm)	11.0	10.2	10.5
Measurement uncertainty (dB)	<±0.99		

Mode 802.11 n40 (HT40)

	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Max. Conducted Power Corrected (dBm)	12.252	11.685
Maximum EIRP power Corrected (dBm)	10.4	9.8
Measurement uncertainty (dB)	<±0.99	

Mode 802.11 ac80 (VHT80)

	Low Channel 155 (5775 MHz)
Max. Conducted Power Corrected (dBm)	9.896
Maximum EIRP power Corrected (dBm)	8.0
Measurement uncertainty (dB)	<±0.99

Verdict: PASS

FCC 15.407 (a)(3) / RSS-247 6.2.4.1 Transmitter Maximum Power Spectral Density

SPECIFICATION:

The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS:

The maximum power spectral density (PSD) was measured using the method according to point F) referencing E.2.b) (Method SA-1) of Guidance 789033 D02 General UNII Test Procedures New Rules v02r01.

For all modes of operation, the antenna gain is less than 6 dBi.

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: -1.9 dBi (Antenna gain plus antenna cable loss).

Mode 802.11 a20

	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Maximum EIRP PSD Corrected (dBm/MHz)	-0.993	-1.611	-1.406
Measurement uncertainty (dB)	<±0.99		

Mode 802.11 n20 (HT20)

	Low Channel 149 (5745 MHz)	Middle Channel 157 (5785 MHz)	High Channel 165 (5825 MHz)
Maximum EIRP PSD Corrected (dBm/MHz)	-1.482	-2.151	-1.974
Measurement uncertainty (dB)	<±0.99		

Mode 802.11 n40 (HT40)

	Low Channel 151 (5755 MHz)	High Channel 159 (5795 MHz)
Maximum EIRP PSD Corrected (dBm/MHz)	-5.396	-5.666
Measurement uncertainty (dB)	<±0.99	

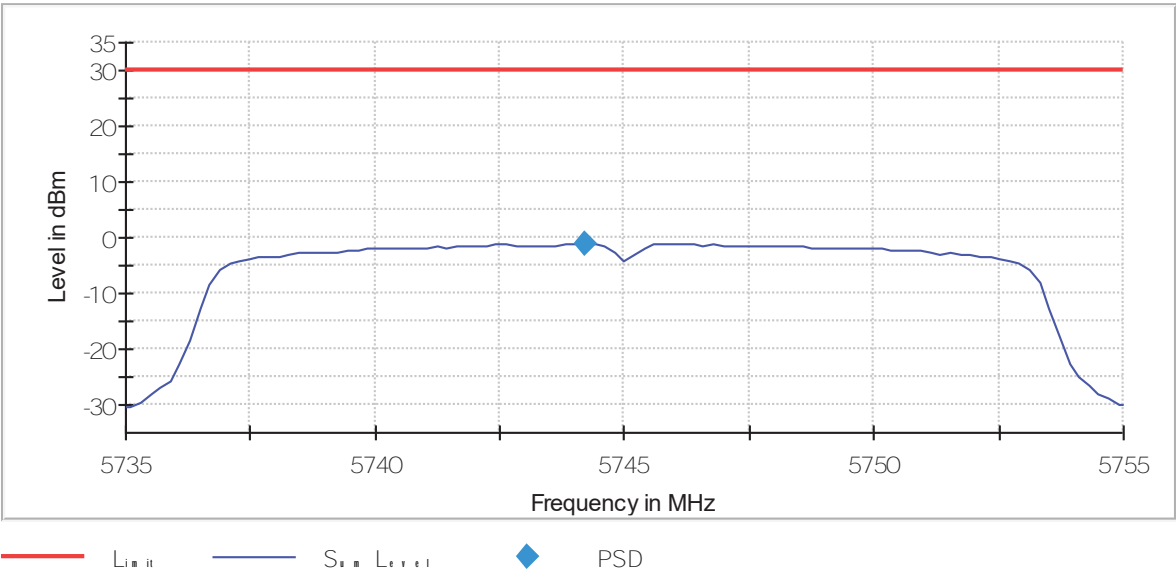
Mode 802.11 ac80 (VHT80)

	Middle Channel 155 (5775 MHz)
Maximum EIRP PSD Corrected (dBm/MHz)	-11.292
Measurement uncertainty (dB)	<±0.99

Verdict: PASS

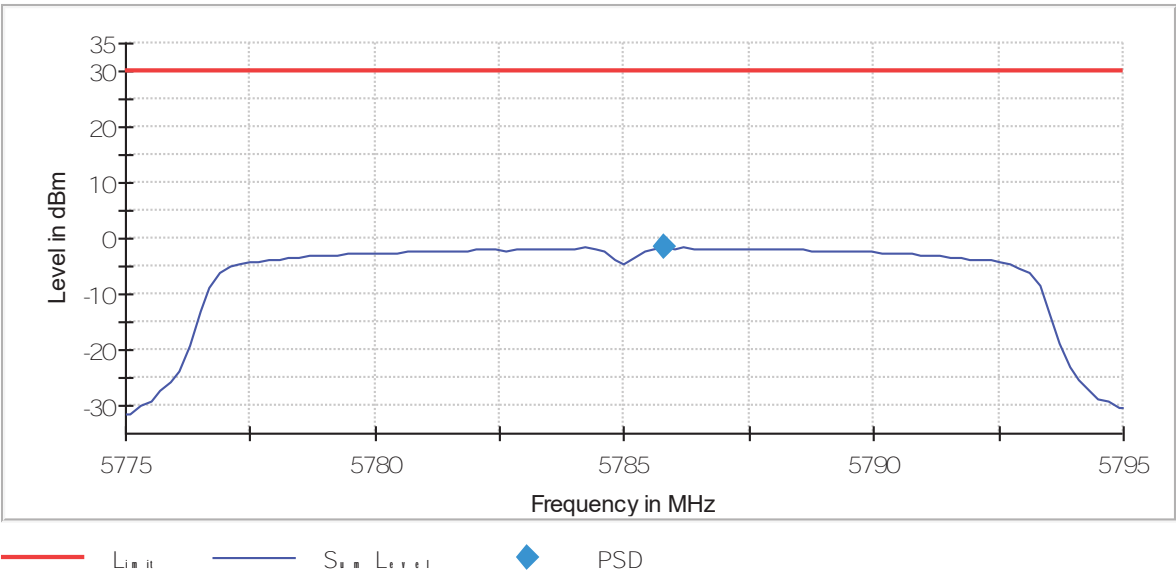
Mode 802.11 a20
Low Channel 149

Power Spectral Density (SA-1)

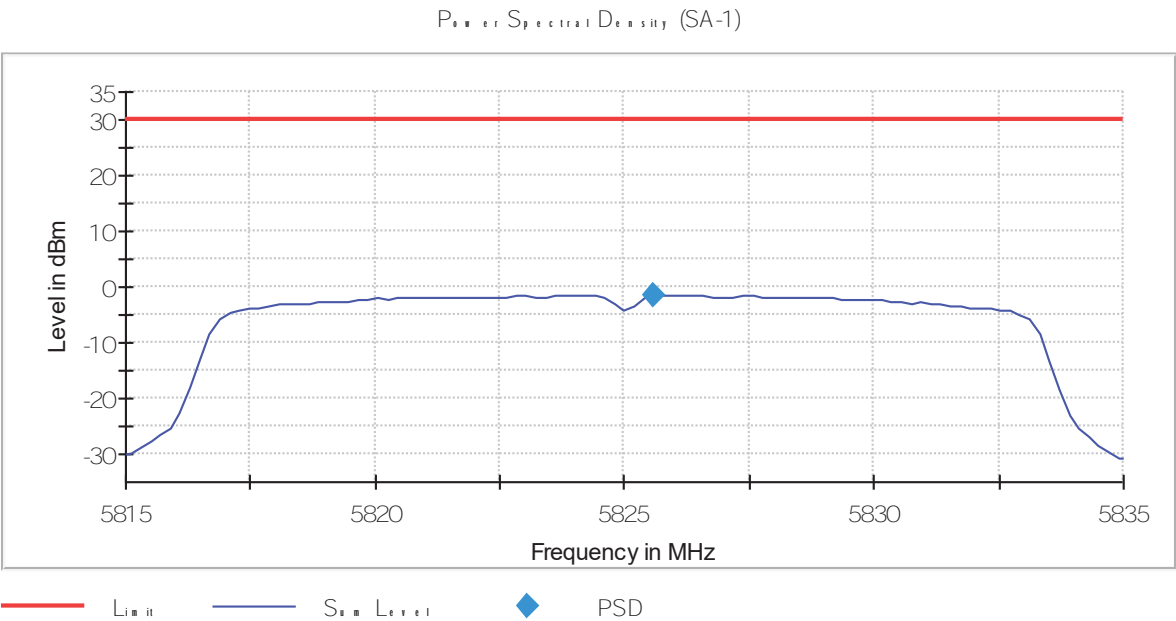


Middle Channel 157

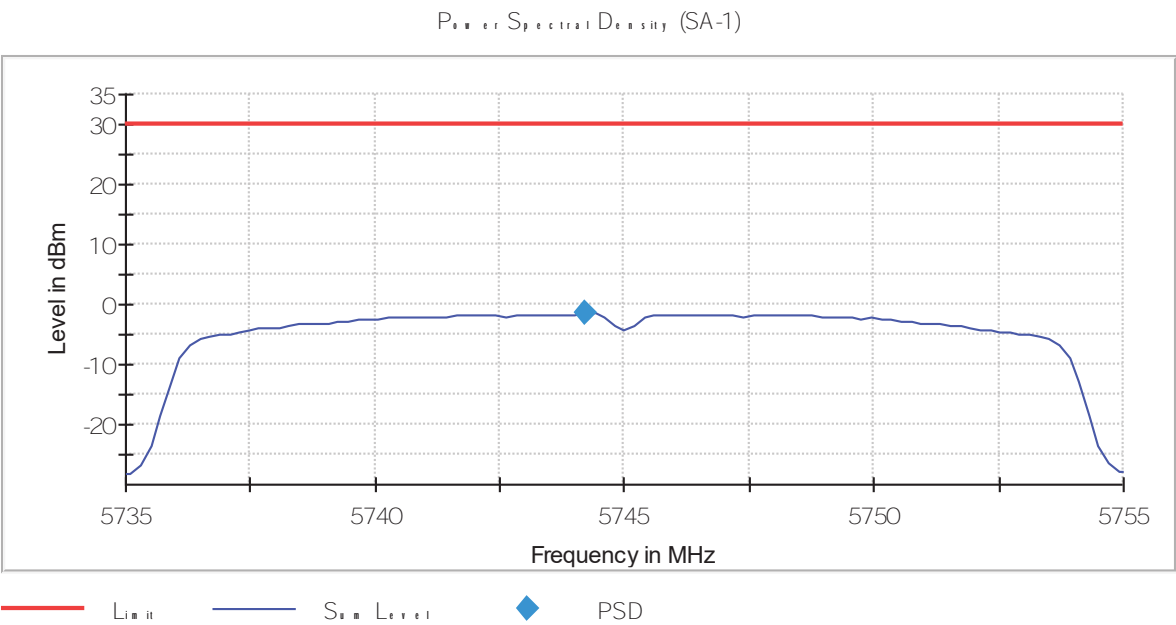
Power Spectral Density (SA-1)



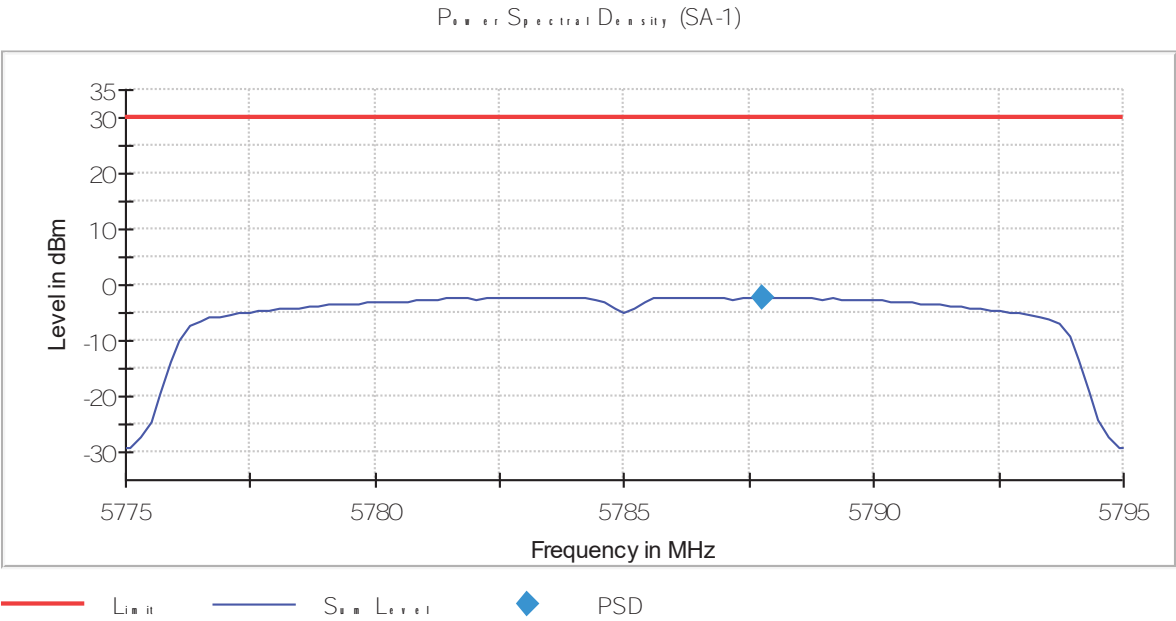
High Channel 165



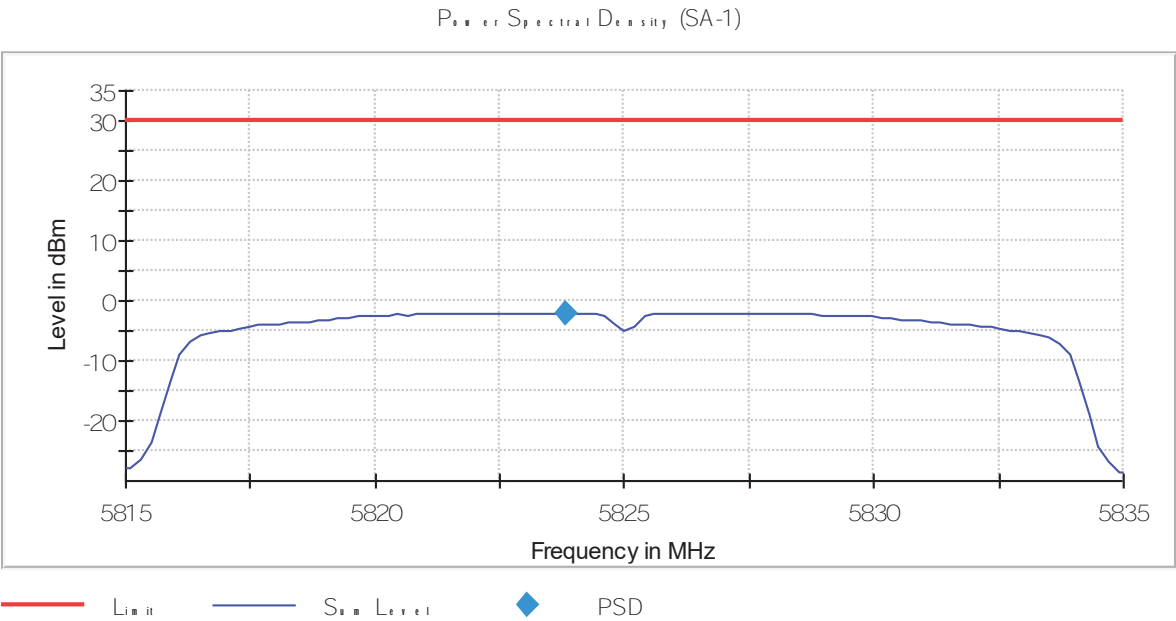
Mode 802.11 n20 (HT20)
Low Channel 149



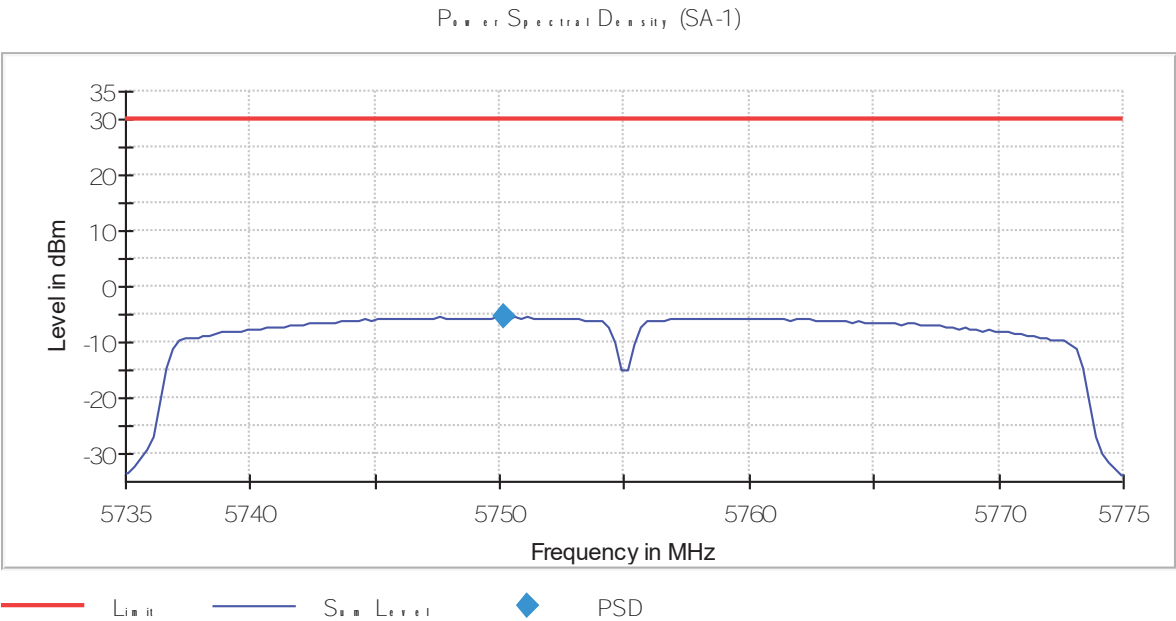
Middle Channel 157



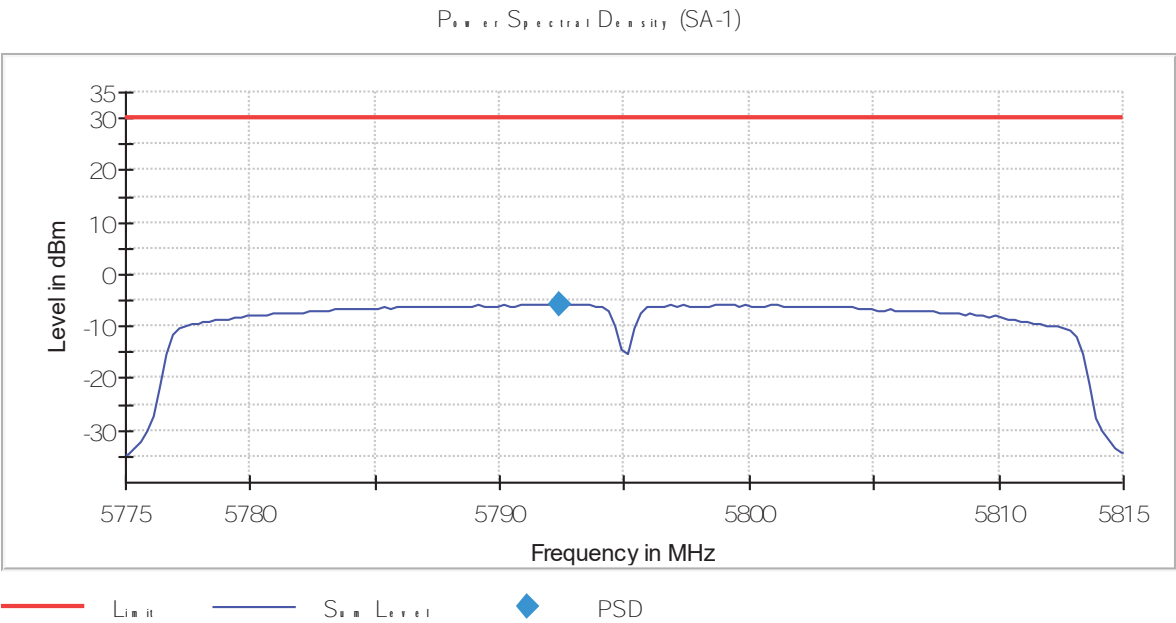
High Channel 165



Mode 802.11 n40 (HT40)
Low Channel 151

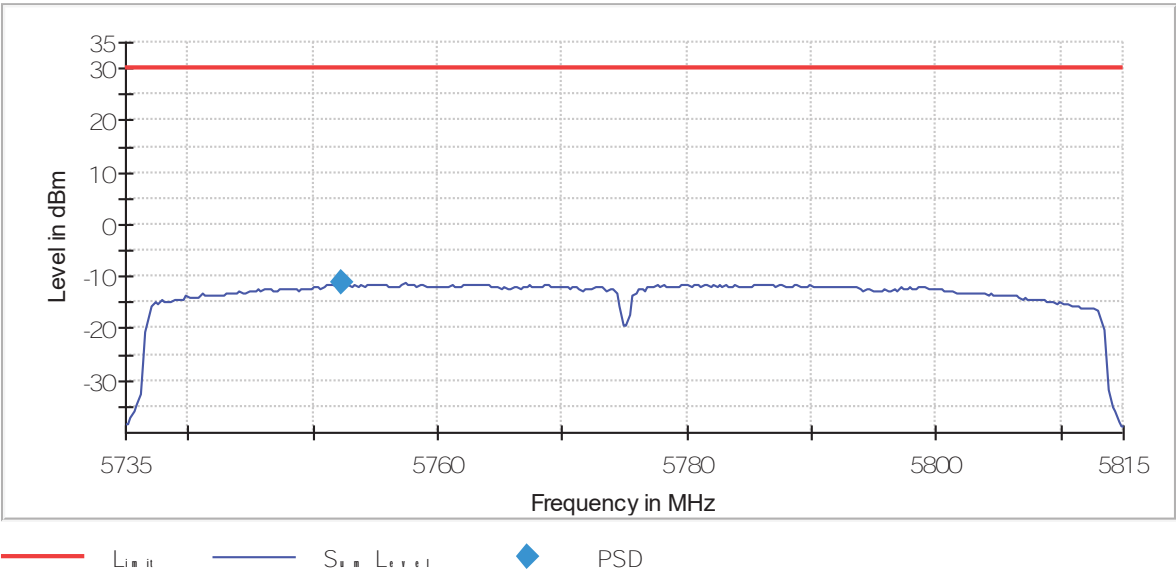


High Channel 159



Mode 802.11 ac80 (VHT80)
Middle Channel 155

Power Spectral Density (SA-1)



FCC 15.407 (b)(4)(6) / RSS-247 6.2.4.2 Transmitter Out of Band Radiated Emissions

SPECIFICATION:

For transmitters operating in the 5.725–5.85 GHz band:

All emissions shall be limited to a level of -27 dBm/MHz (68.23 dB μ V/m at 3 m distance) at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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)):

Frequency Range (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m)	Measurement 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 - 40000	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 corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 1m for the frequency range 17 GHz-40 GHz and a distance of 3m for frequency range 30MHz-17GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Test performed on the following worst case:

- 802.11a20: 6Mbps. For outdoor Antenna
- 802.11a20: 6Mbps. For indoor Antenna

The worst case was determined by measuring the eirp density (radiated).

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: -1.9 dBi.

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

No spurious frequencies operating (radiated) at less than 20 dB below the limit.

Frequency range 1 - 40 GHz

The results in the next tables show the maximum measured levels in the 1-40 GHz range except the 5.65-5.725 GHz and 5.85-5.925GHz adjacent bands. The results in the adjacent bands was evaluated on the next section.

The Low, Middle and High Channels were measured for out-of-band emissions for the worst mode.

Spurious frequencies with peak levels above the average limit (54 dB μ V/m at 3 m) are measured with an average detector for checking compliance with the average limit.

- Mode 802.11 a20 (worst case)**

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector
7.6595	47.48	V	Peak
11.4905	54.04	V	Peak
	40.57		Average

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector
7.7130	48.39	V	Peak
11.5685	52.22	V	Peak

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

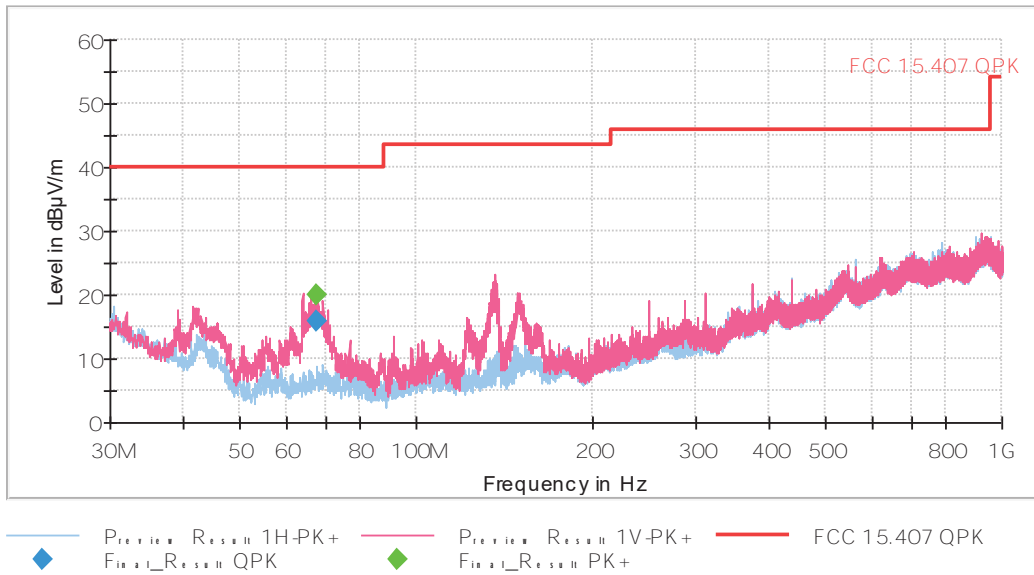
Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector
7.7665	45.80	V	Peak
11.6500	50.35	V	Peak

Measurement Uncertainty (dB) 30MHz to 1GHz <±4.99
1GHz to 17GHz<±4.98
17GHz to 26GHz <±5.08
26GHz to 40GHz <±5.13

Verdict: PASS

Frequency range 30 MHz - 1 GHz

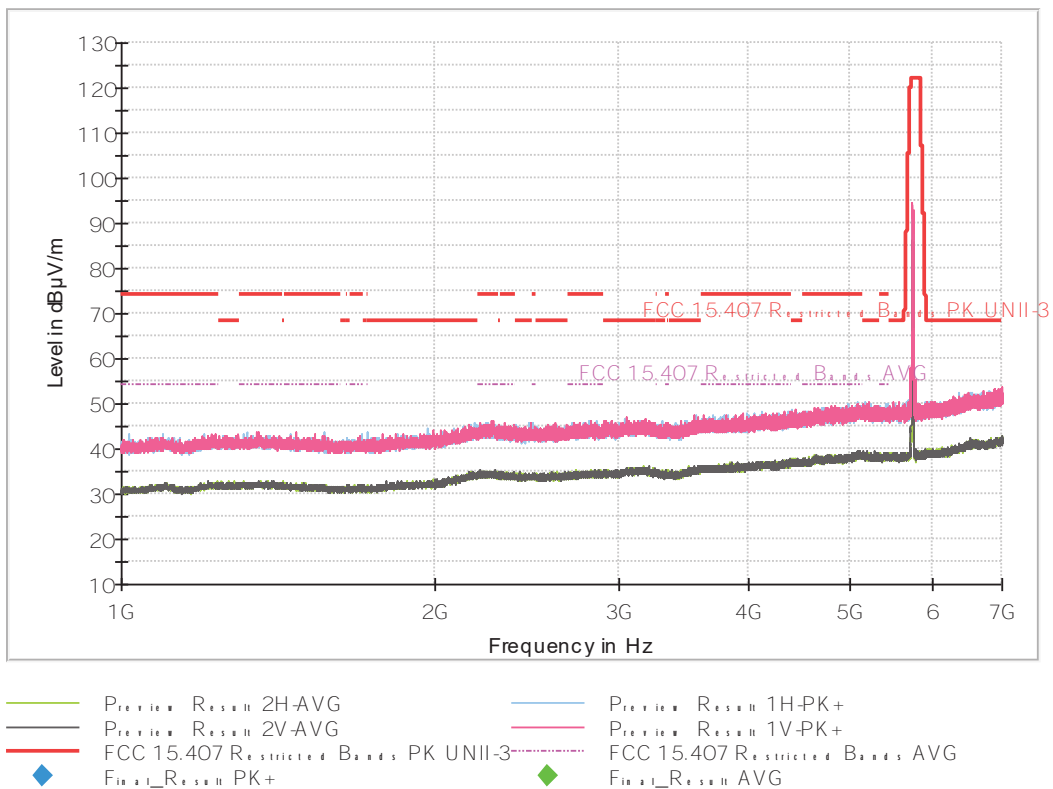
This plot is valid for all channels



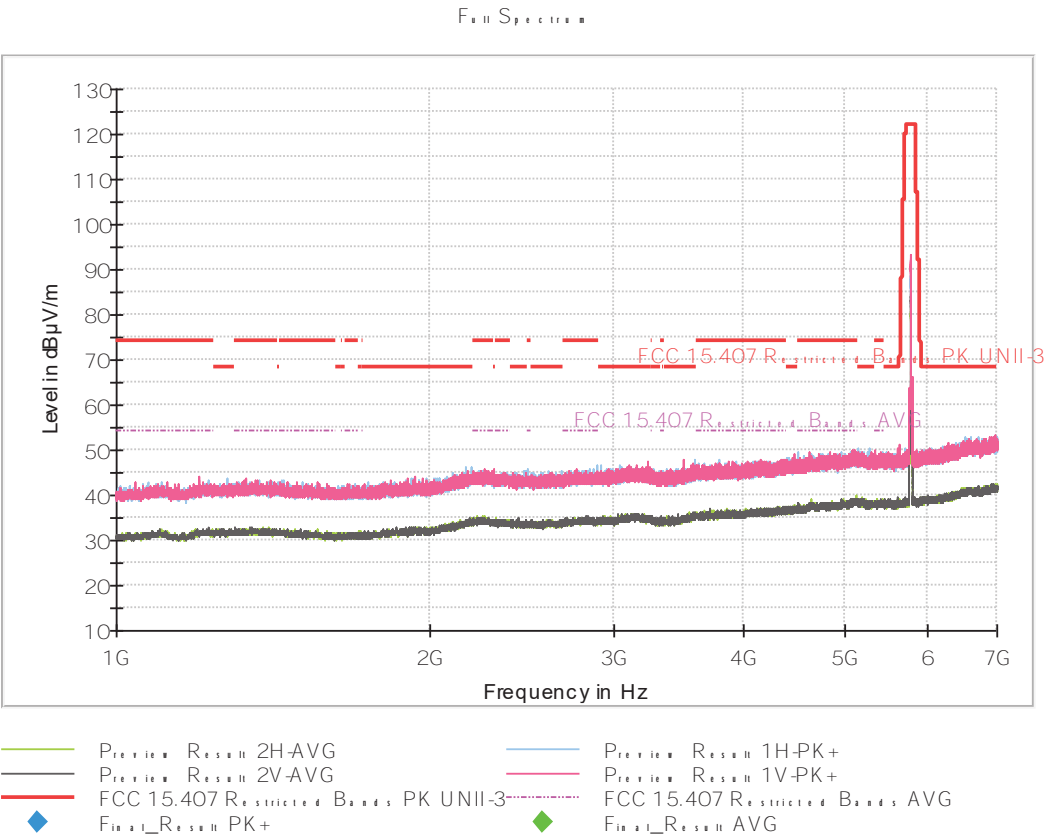
Frequency range 1 - 7 GHz

LOW CHANNEL

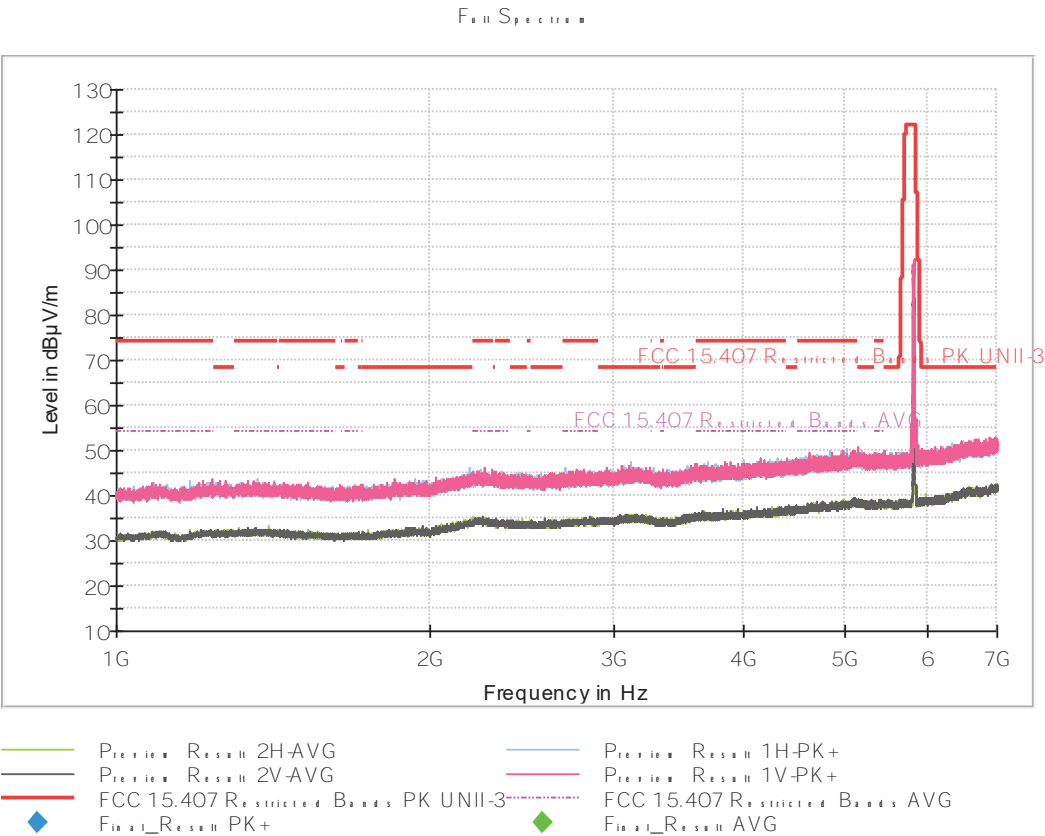
Full Spectrum



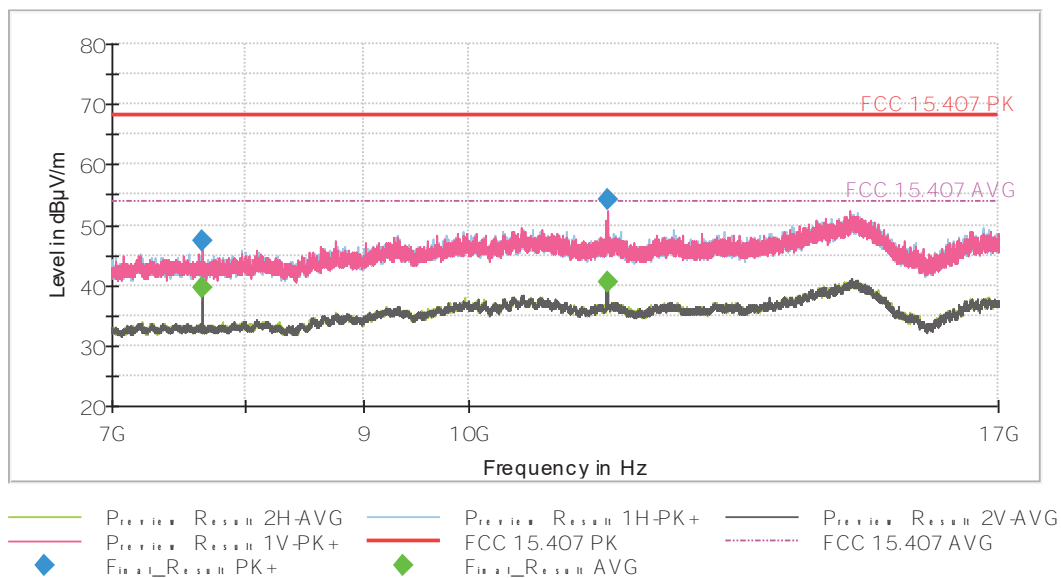
MIDDLE CHANNEL



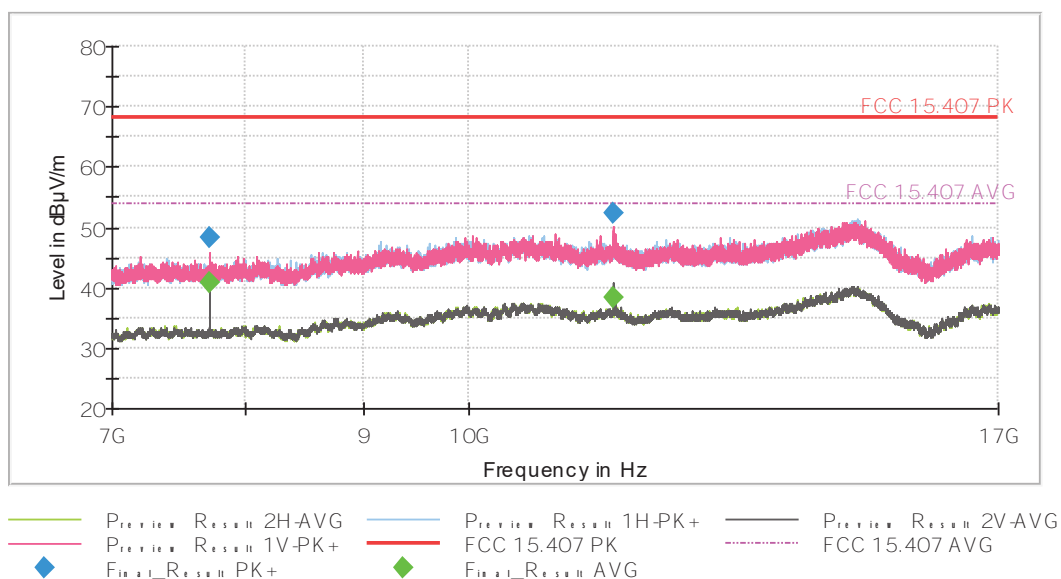
HIGH CHANNEL



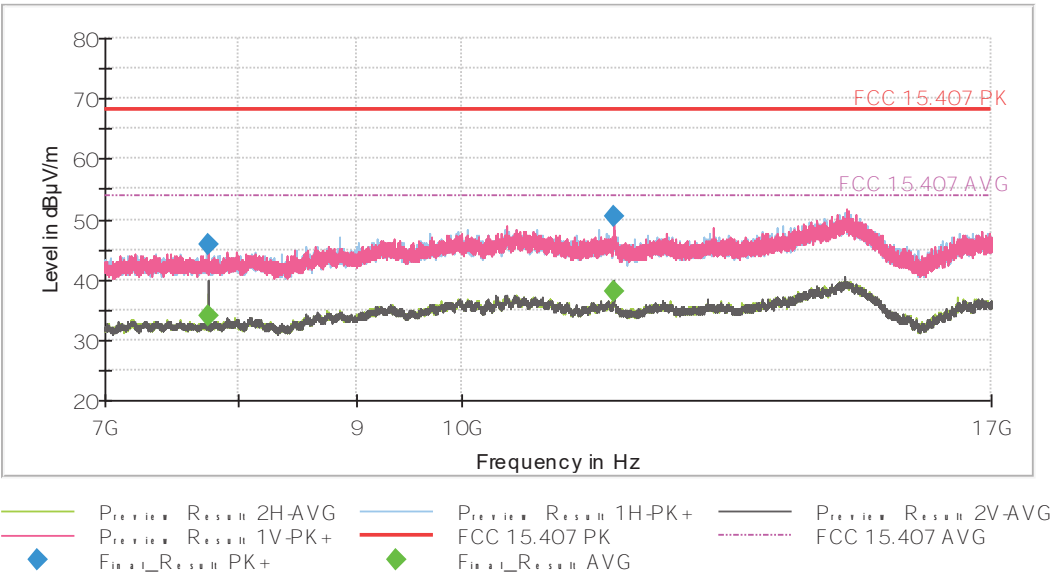
Frequency range 7 - 17 GHz LOW CHANNEL



MIDDLE CHANNEL

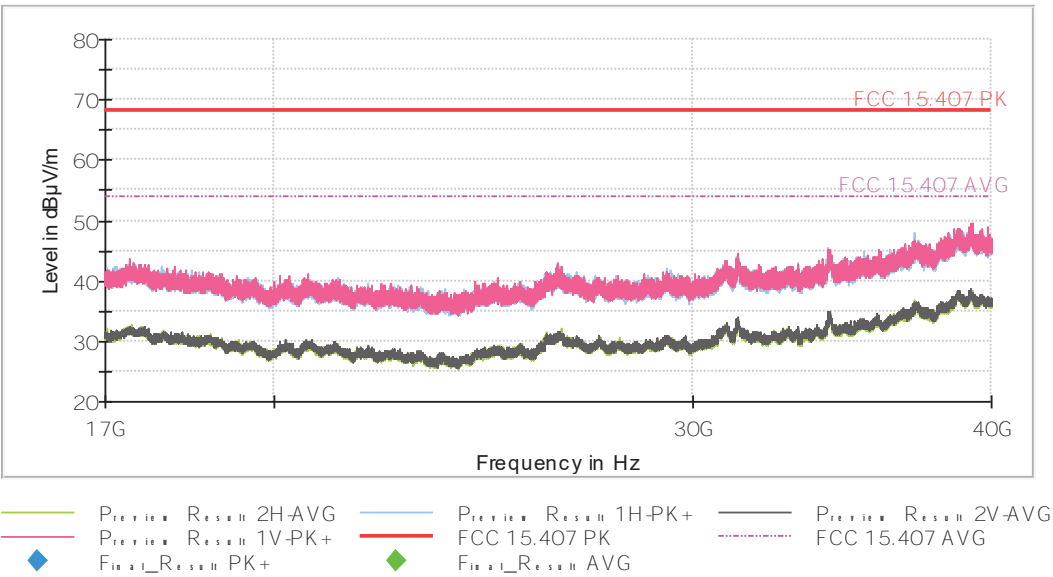


HIGH CHANNEL



Frequency range 17 - 40 GHz

This plot is valid for all channels



OUTDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: -3.0 dBi.

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

No spurious frequencies detected at less than 20 dB below the limit.

Frequency range 1 - 40 GHz

The results in the next tables show the maximum measured levels in the 1-40 GHz frequency range.

The Low, Middle and High Channels were measured for out-of-band emissions for the worst mode.

Spurious frequencies in the restricted bands with peak levels above the average limit (54 dBµV/m at 3 m) are measured with an average detector for checking compliance with the average limit.

- **Mode 802.11 a20** (worst case)

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector
7.6600	48.58	V	Peak
11.4900	51.53	V	Peak

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector
7.7130	48.38	V	Peak
11.5700	50.85	V	Peak

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

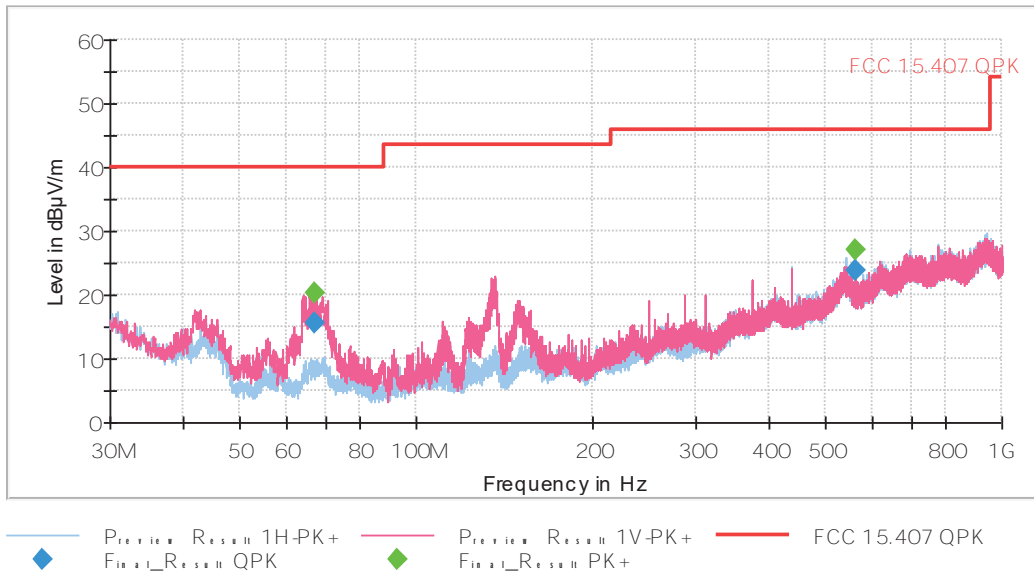
Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector
7.7665	48.46	V	Peak
11.6500	47.34	V	Peak

Measurement Uncertainty (dB) 30MHz to 1GHz <±4.99
 1GHz to 17GHz<±4.98
 17GHz to 26GHz <±5.08
 26GHz to 40GHz <±5.13

Verdict: PASS

Frequency range 30 MHz - 1 GHz

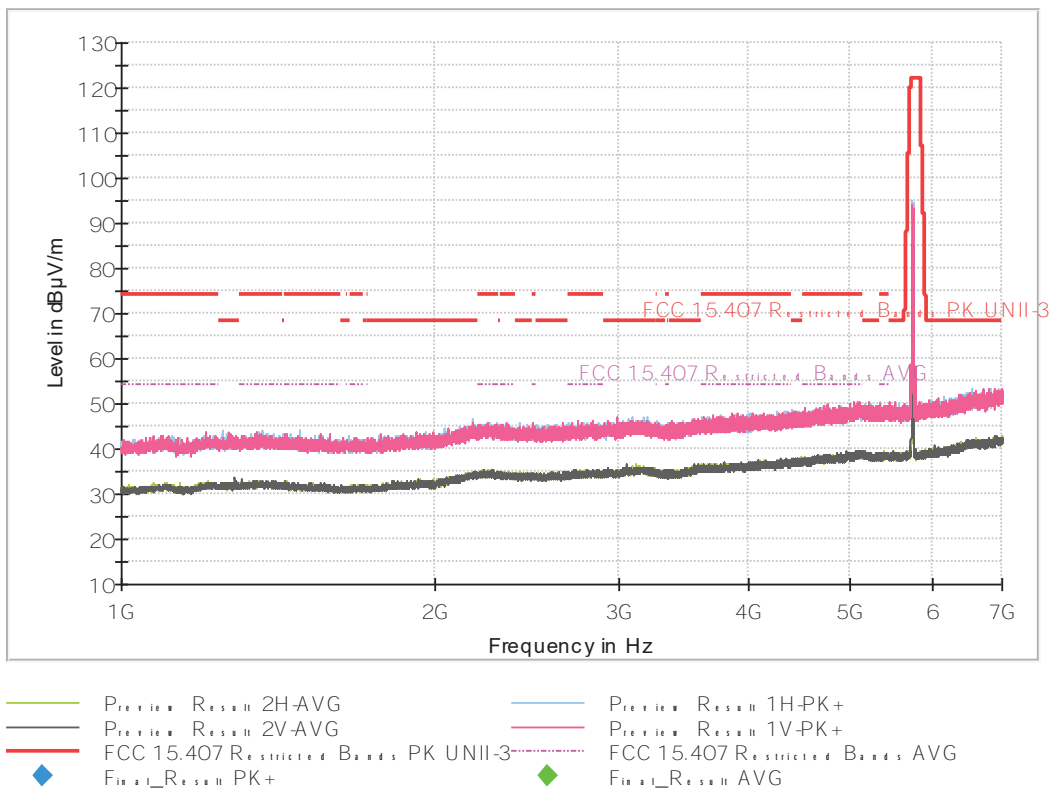
This plot is valid for all channels



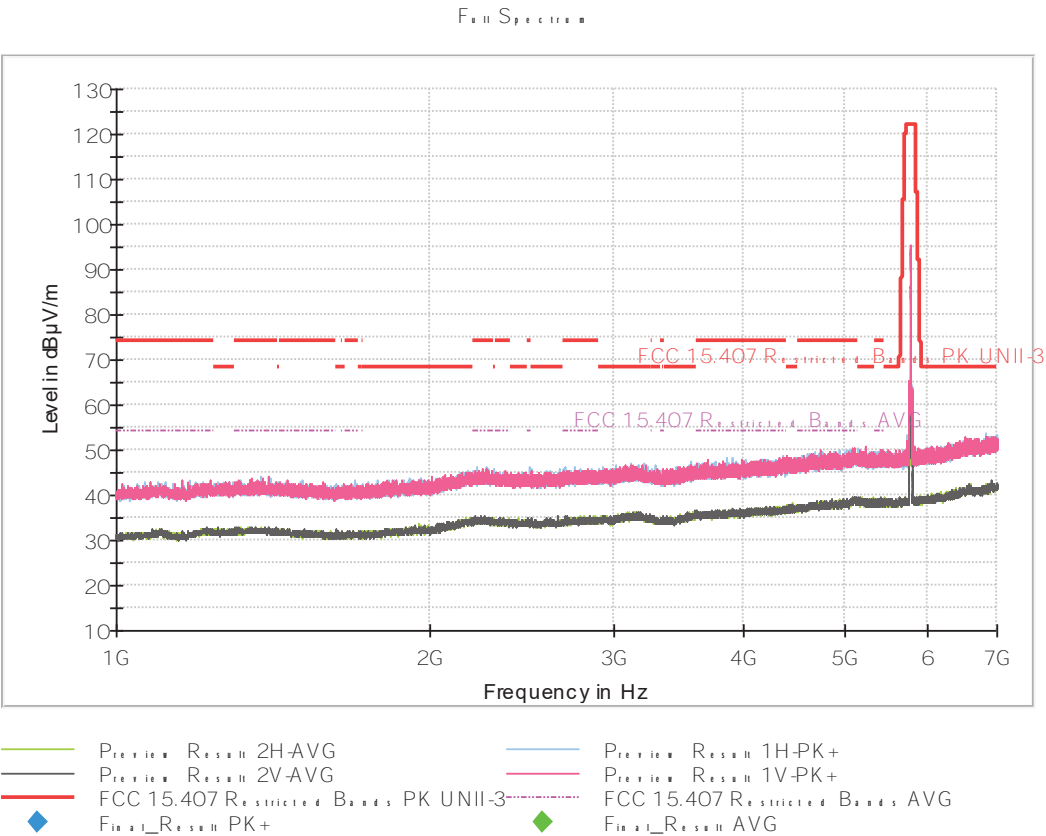
Frequency range 1 - 7 GHz

LOW CHANNEL

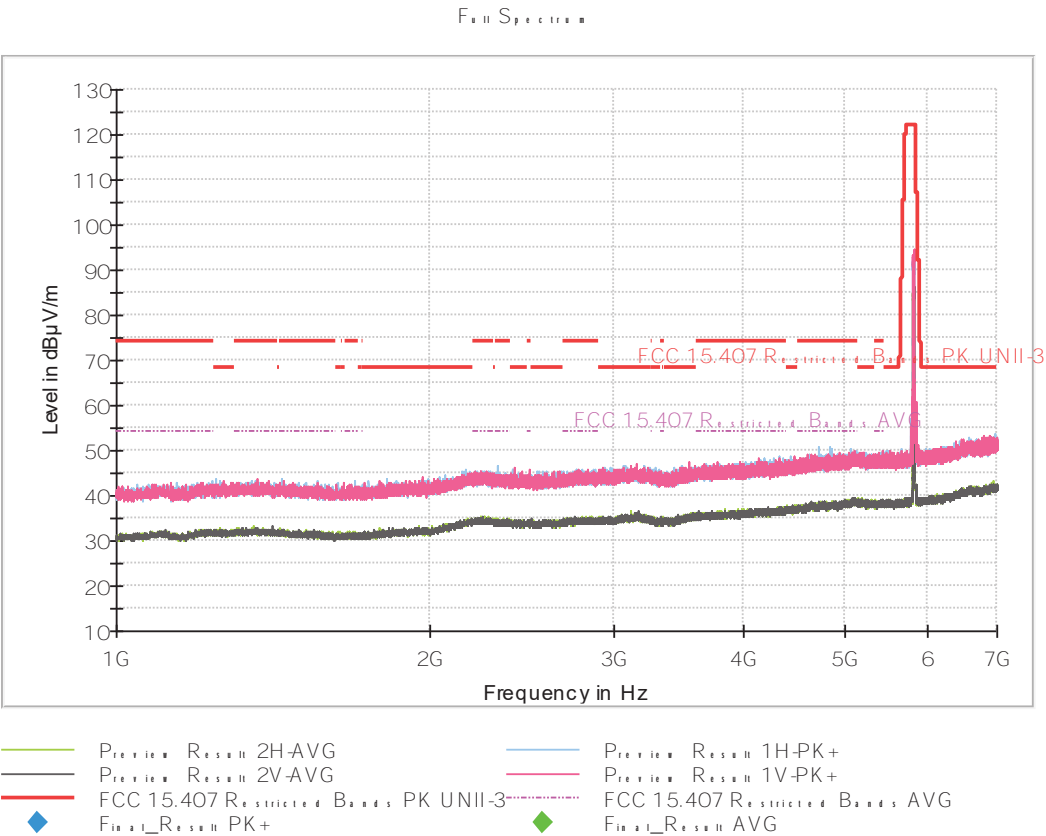
Full Spectrum



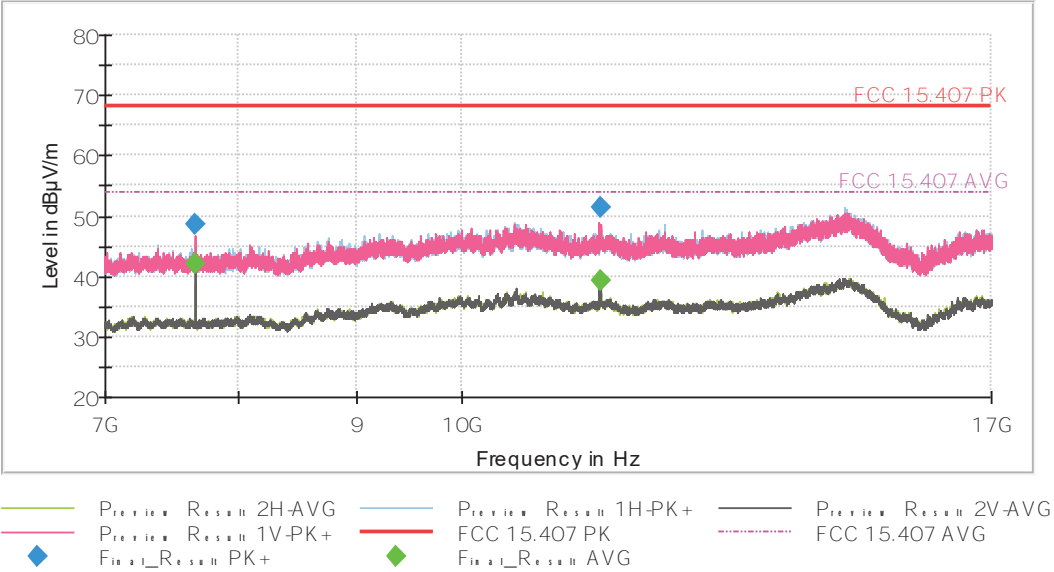
MIDDLE CHANNEL



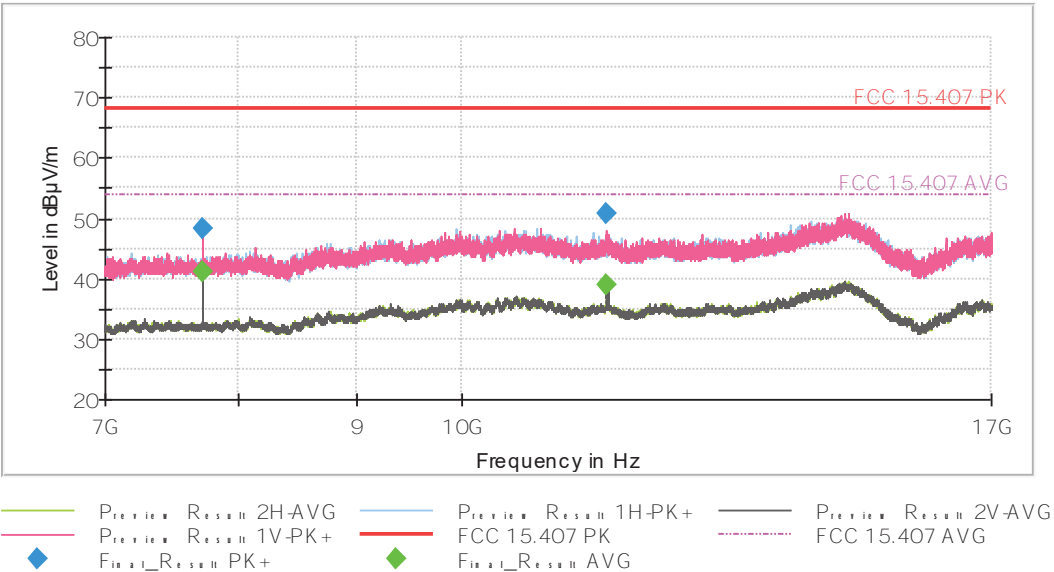
HIGH CHANNEL



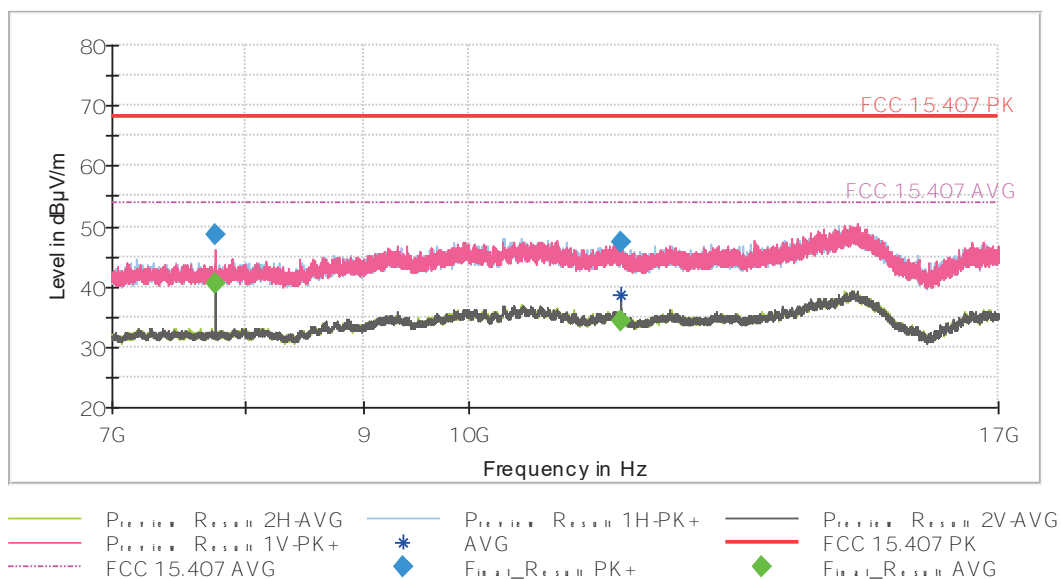
Frequency range 7 - 17 GHz
LOW CHANNEL



MIDDLE CHANNEL

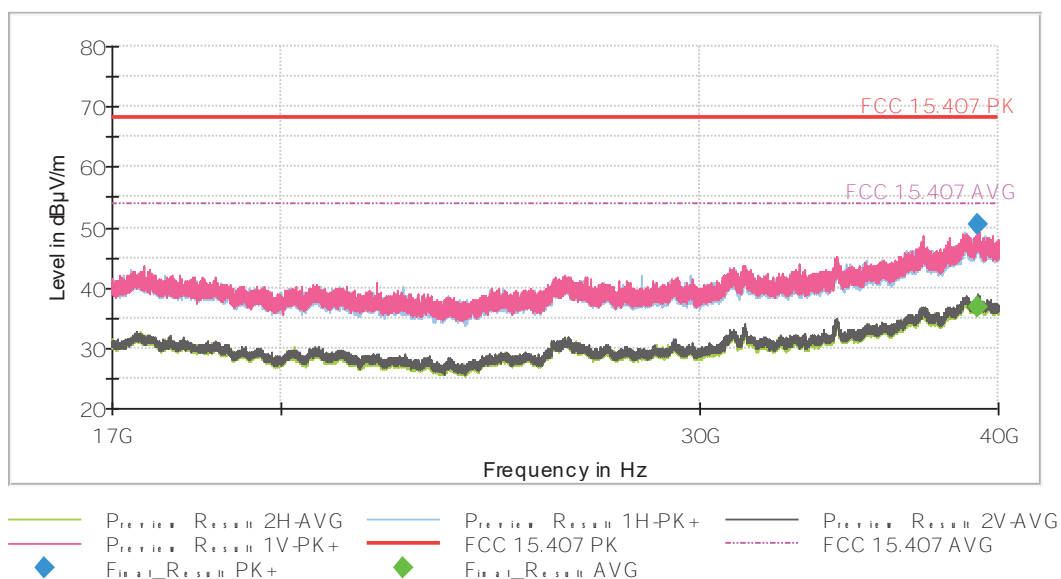


HIGH CHANNEL



Frequency range 17 - 40 GHz

This plot is valid for all channels



FCC 15.407 (b)(4) / RSS-247 6.2.4.2 Transmitter Band Edge Radiated Emissions

SPECIFICATION:

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz (68.23 dBμV/m at 3 m distance) at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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)):

Frequency Range (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement 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 - 40000	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 corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Test performed on the following worst cases modes in all relevant tests channels:

- 802.11a20: 6 Mbits
- 802.11n HT20: MCS0
- 802.11n HT40: MCS0
- 802.11ac VHT80: MCS0

INDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: -1.9 dBi.

Mode 802.11 a20

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 149 (5745 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- Middle Channel 157 (5785 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 165 (5825 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 ac20 (VHT20)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 149 (5745 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- Middle Channel 157 (5785 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 165 (5825 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 n20 (HT20)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 149 (5745 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- Middle Channel 157 (5785 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 165 (5825 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 ac40 (VHT40)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 151 (5755 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 159 (5795 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 n40 (HT40)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 151 (5755 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 159 (5795 MHz): No spurious frequencies detected at less than 20 dB below the limit.

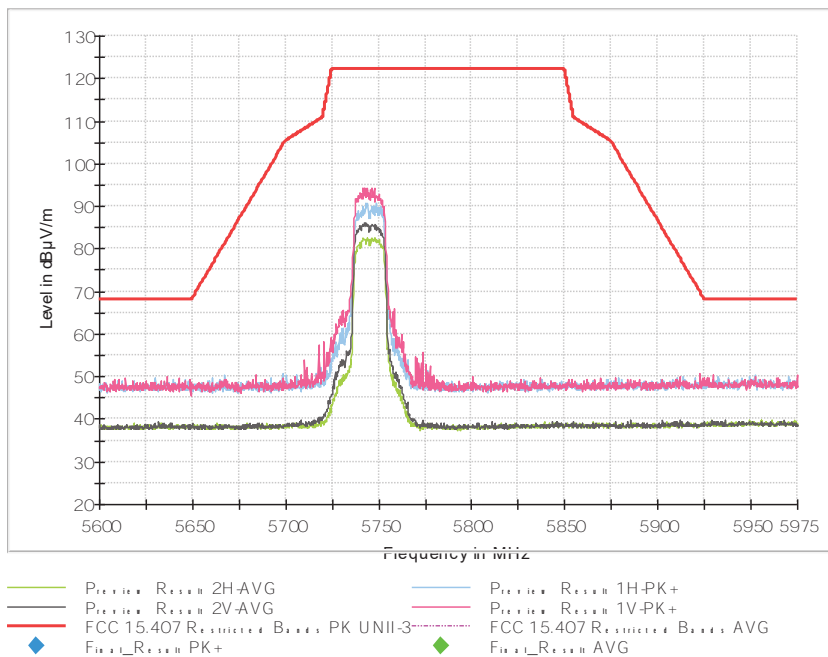
Mode 802.11 ac80 (VHT80)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

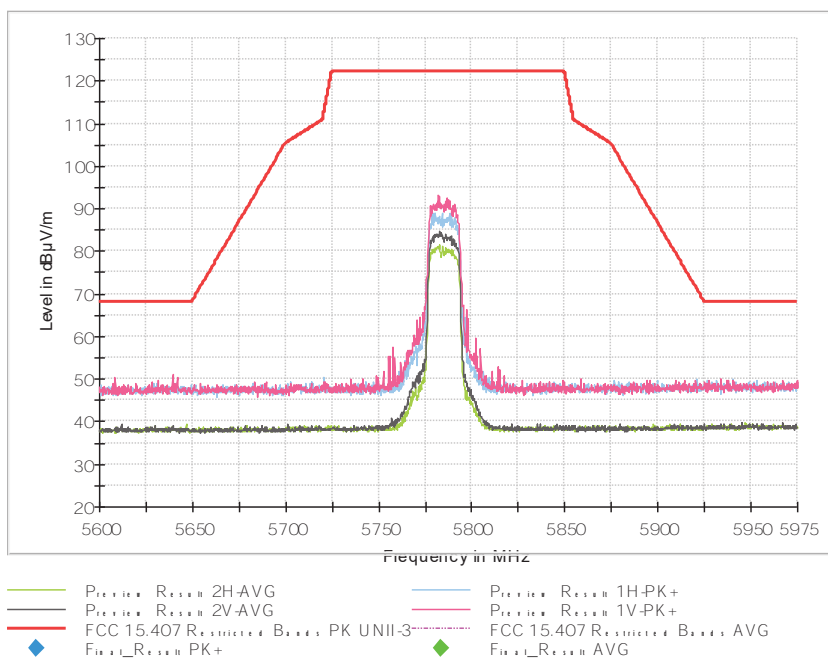
- Middle Channel 155 (5775 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Measurement Uncertainty (dB) $\leq \pm 3.98$
Verdict: PASS

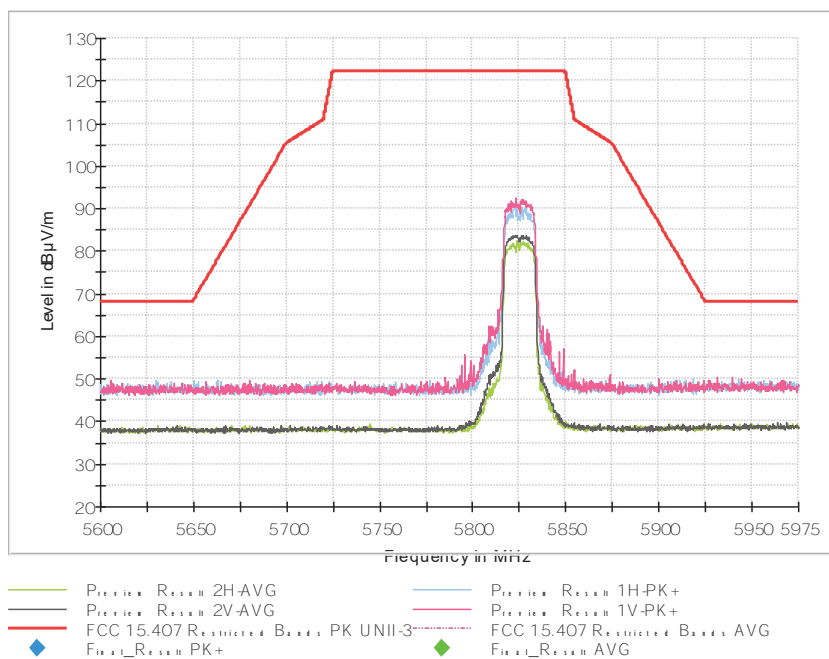
Mode 802.11 a20
Low Channel 149



Middle Channel 157

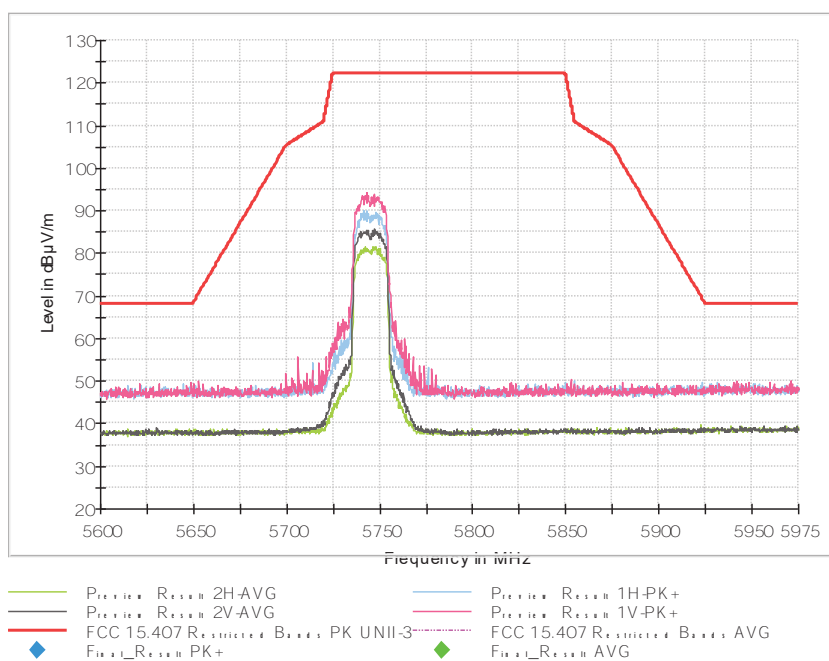


High Channel 165

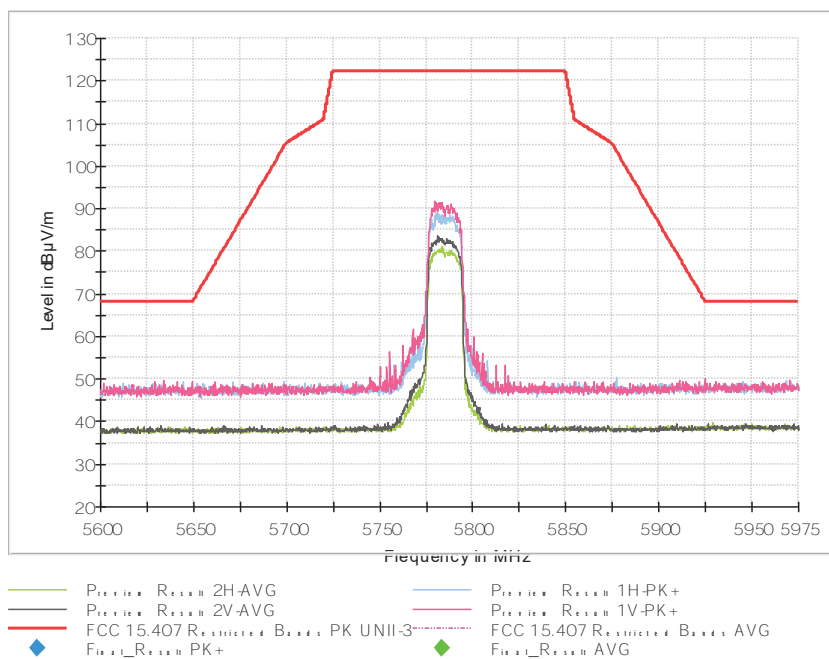


Mode 802.11 ac20 (VHT20)

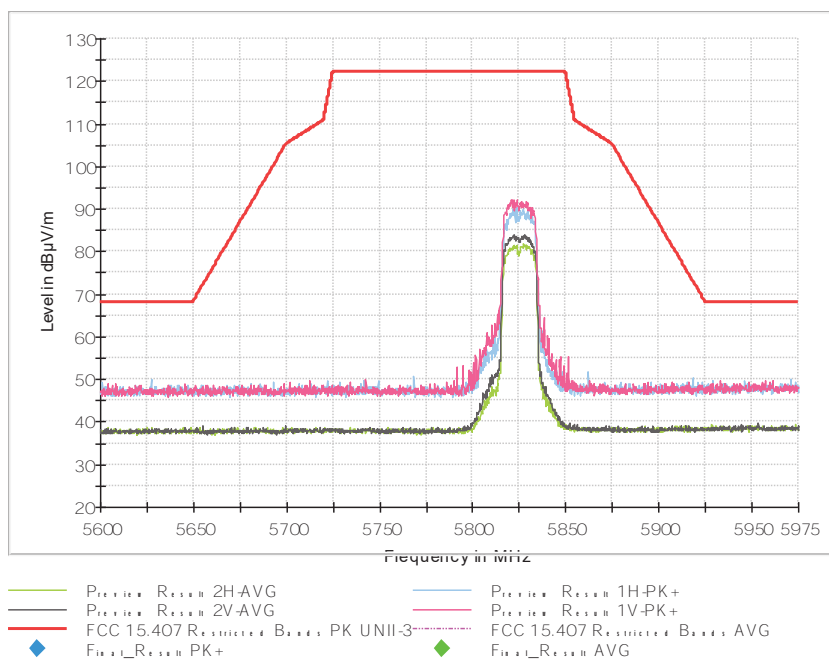
Low Channel 149



Middle Channel 157

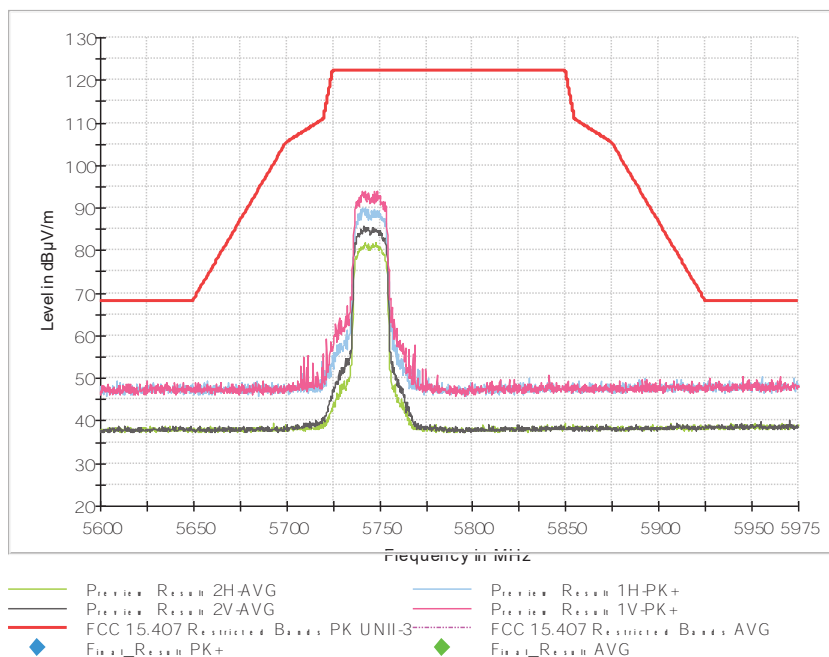


High Channel 165

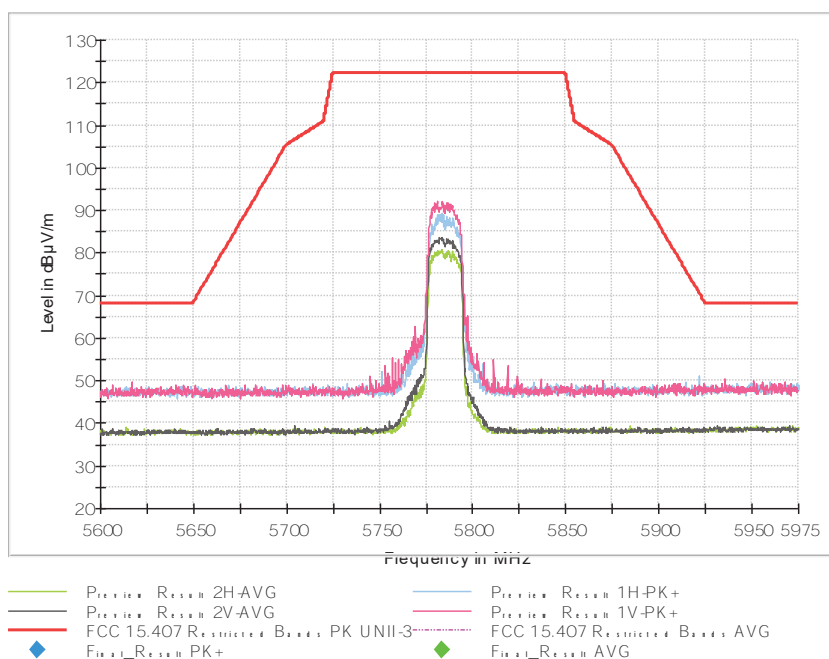


Mode 802.11 n20 (HT20)

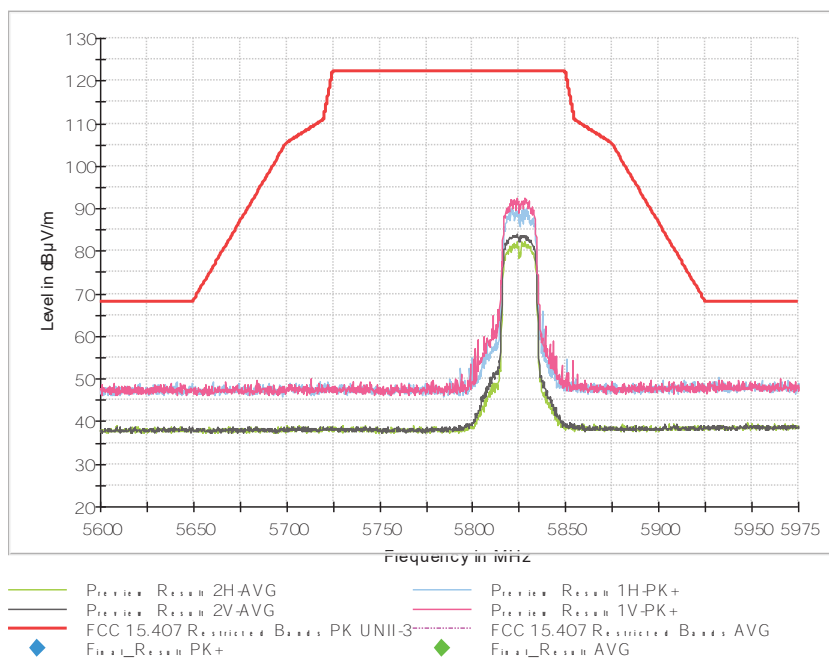
Low Channel 149



Middle Channel 157

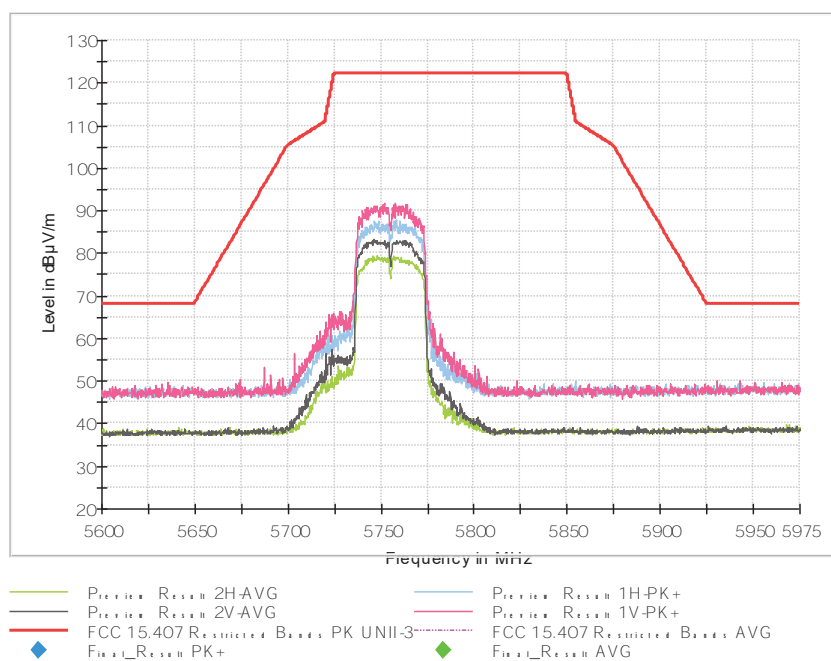


High Channel 165

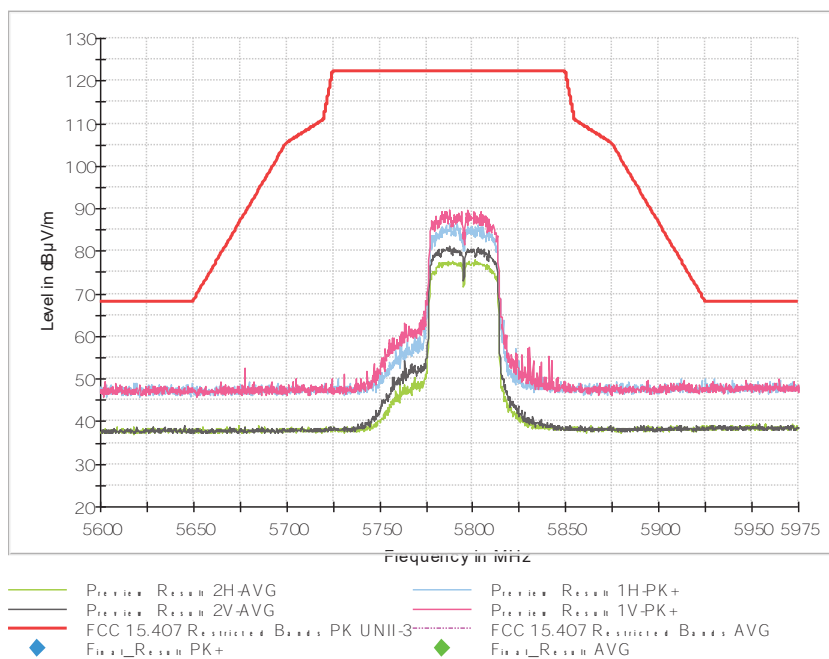


Mode 802.11 ac40 (VHT40)

Low Channel 151

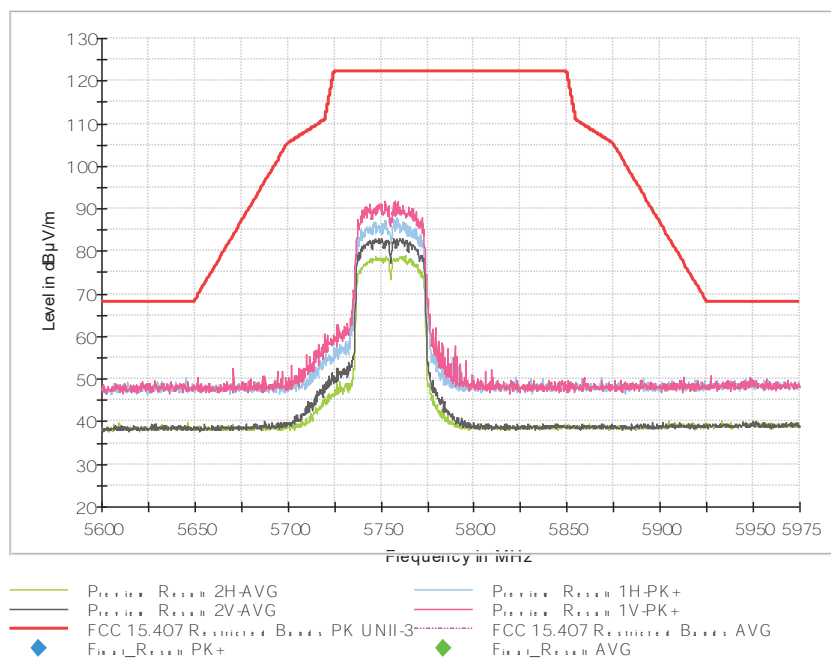


High Channel 159

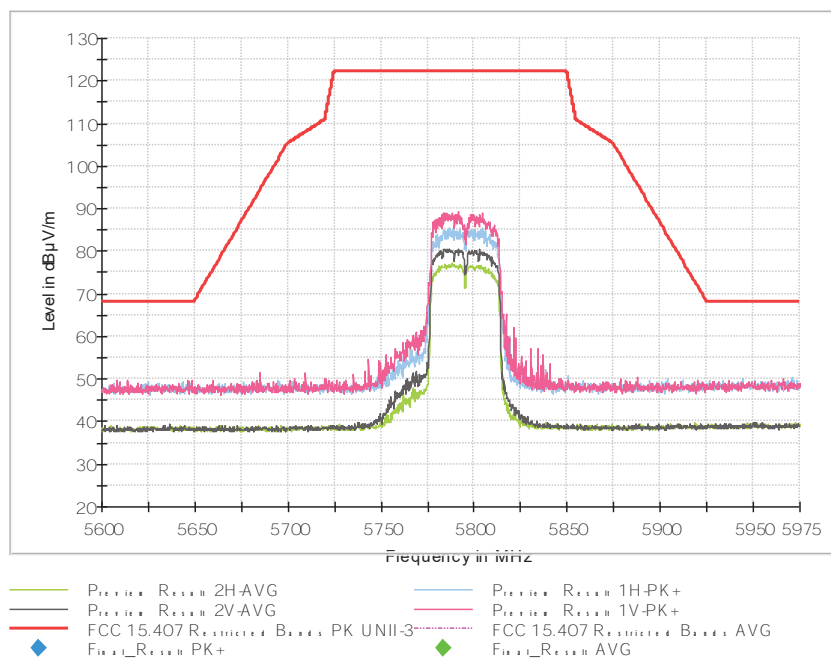


Mode 802.11 n40 (HT40)

Low Channel 151

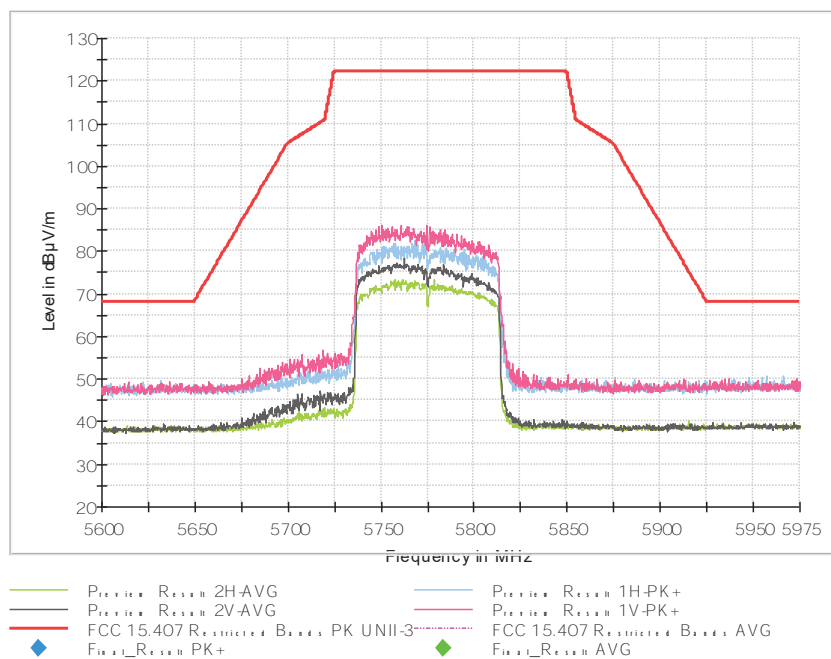


High Channel 159



Mode 802.11 ac80 (VHT80)

Middle Channel 155



OUTDOOR ANTENNA: Maximum Declared Assembly Antenna Gain: -3.0 dBi.

Mode 802.11 a20

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 149 (5745 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- Middle Channel 157 (5785 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 165 (5825 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 ac20 (VHT20)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 149 (5745 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- Middle Channel 157 (5785 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 165 (5825 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 n20 (HT20)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 149 (5745 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- Middle Channel 157 (5785 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 165 (5825 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 ac40 (VHT40)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 151 (5755 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 159 (5795 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 n40 (HT40)

Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Low Channel 151 (5755 MHz): No spurious frequencies detected at less than 20 dB below the limit.
- High Channel 159 (5795 MHz): No spurious frequencies detected at less than 20 dB below the limit.

Mode 802.11 ac80 (VHT80)

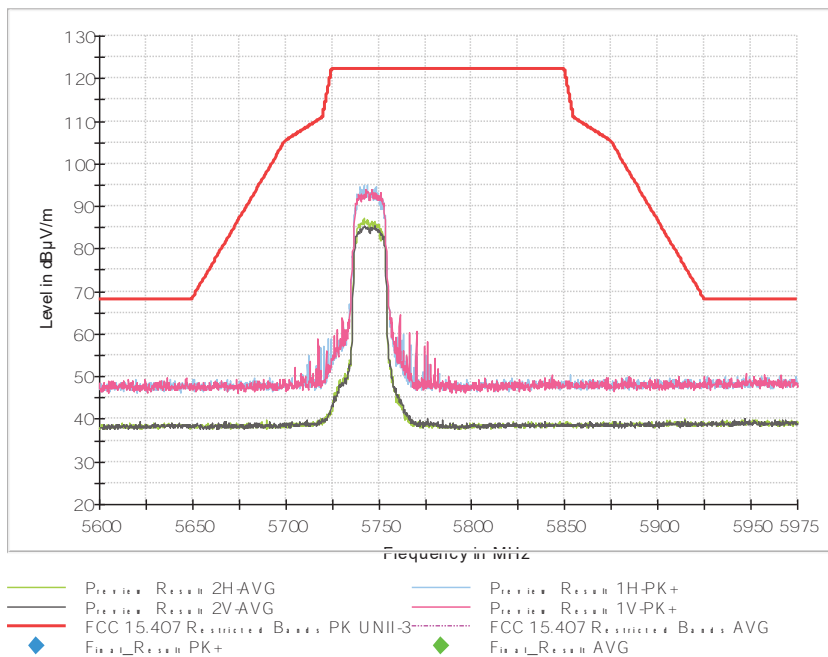
Inside band radiated spurious emissions in 5.65-5.925 GHz adjacent band.

- Middle Channel 155 (5775 MHz): No spurious frequencies detected at less than 20 dB below the limit.

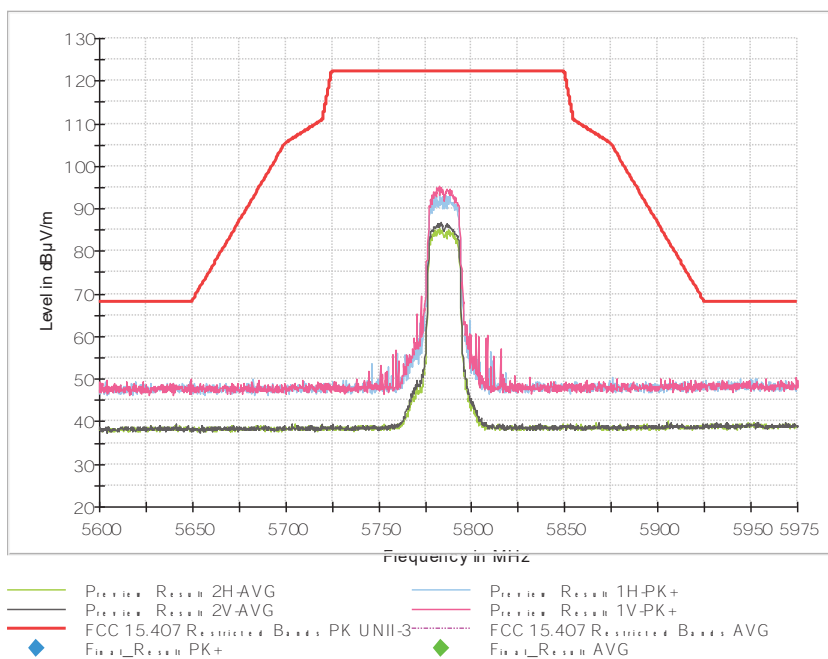
Measurement Uncertainty (dB) $\leq \pm 3.98$

Verdict: PASS

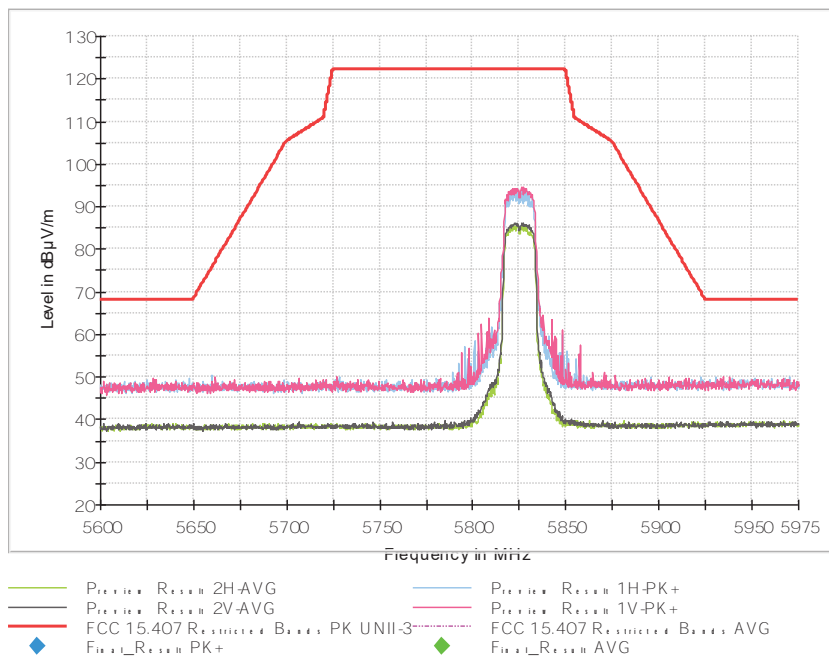
Mode 802.11 a20
Low Channel 149



Middle Channel 157

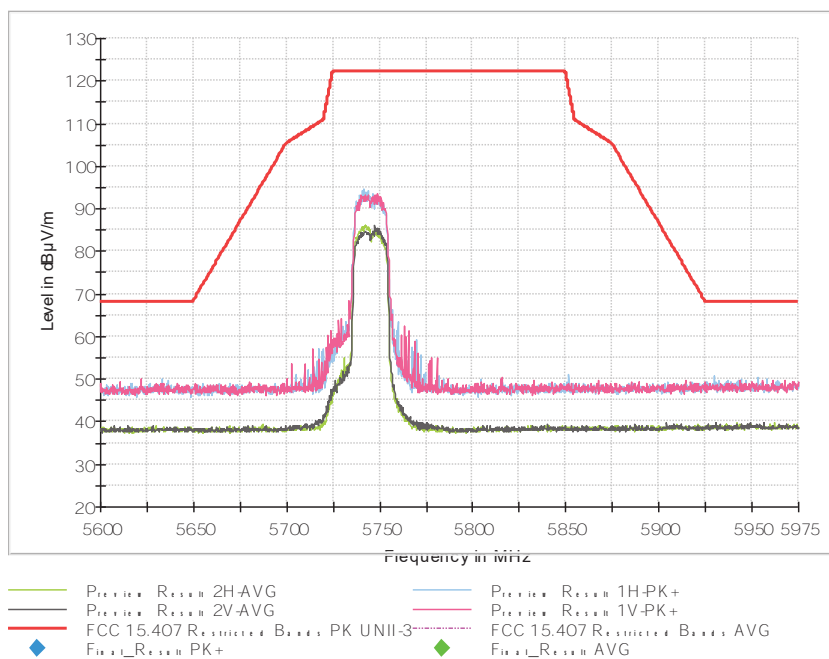


High Channel 165

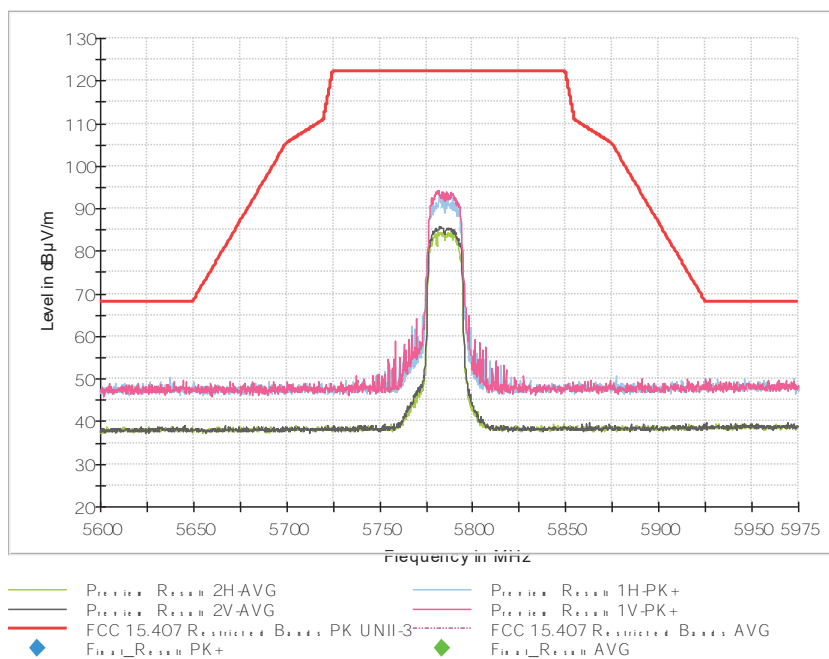


Mode 802.11 ac20 (VHT20)

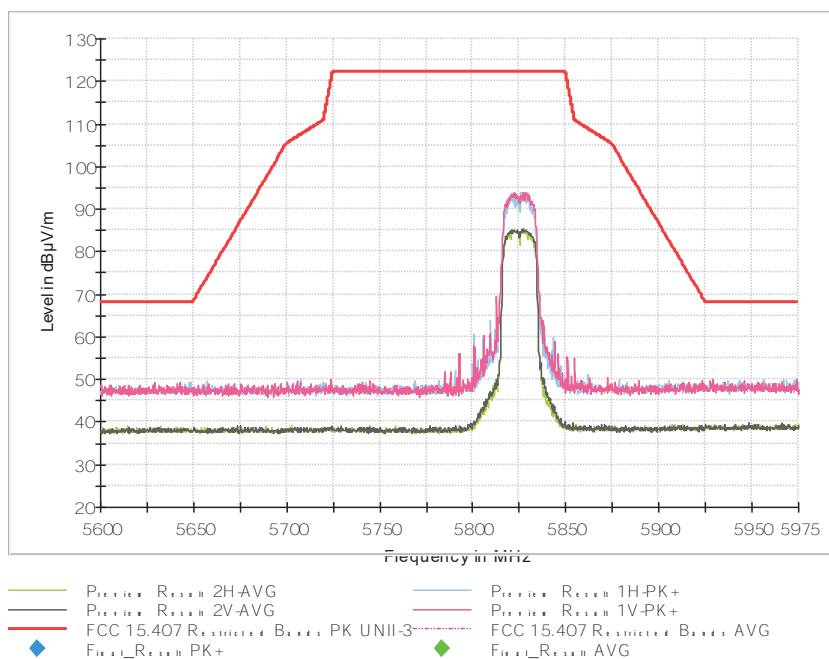
Low Channel 149



Middle Channel 157

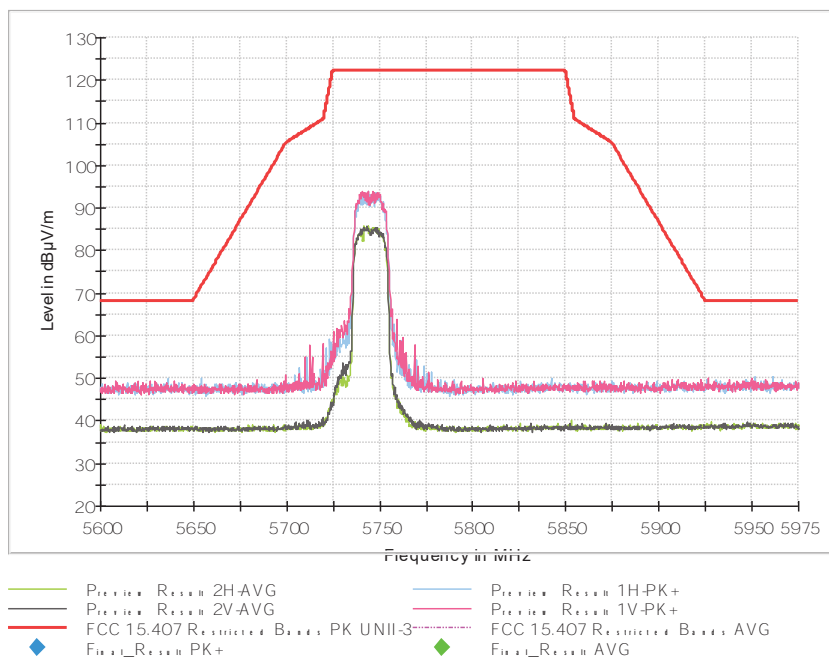


High Channel 165

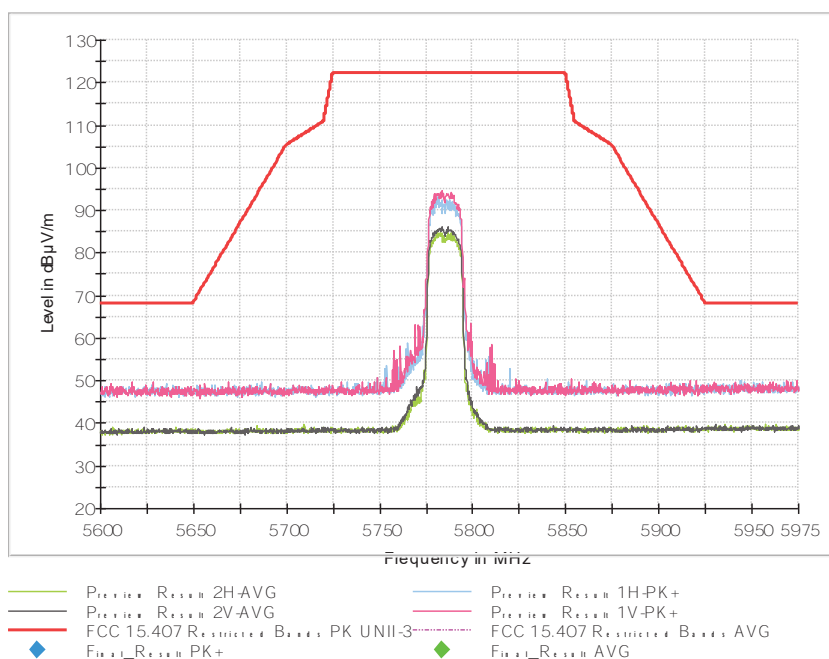


Mode 802.11 n20 (HT20)

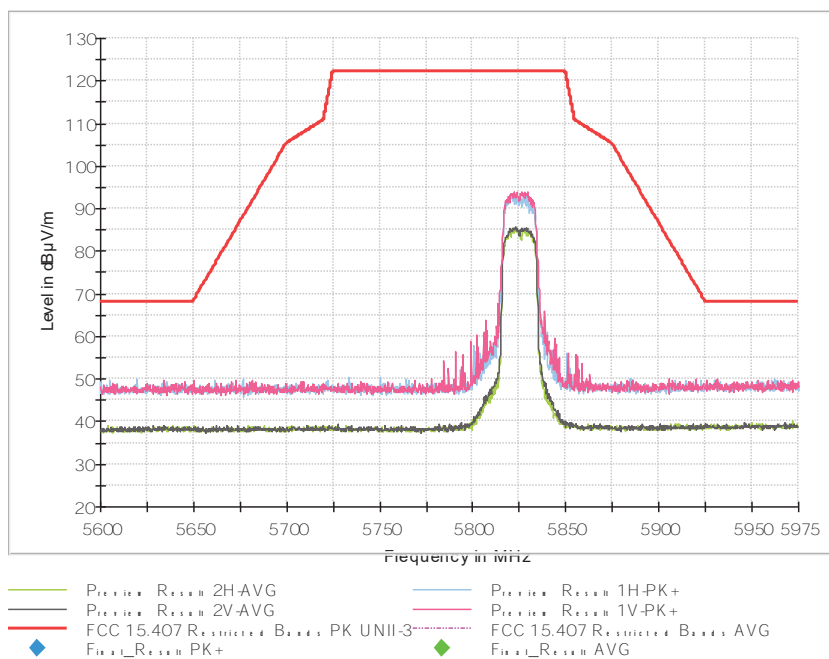
Low Channel 149



Middle Channel 157

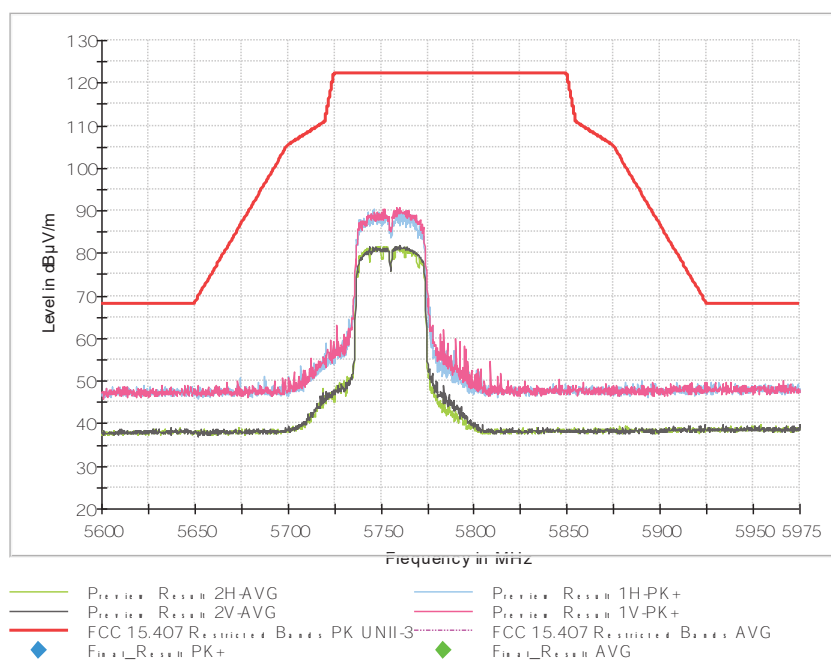


High Channel 165

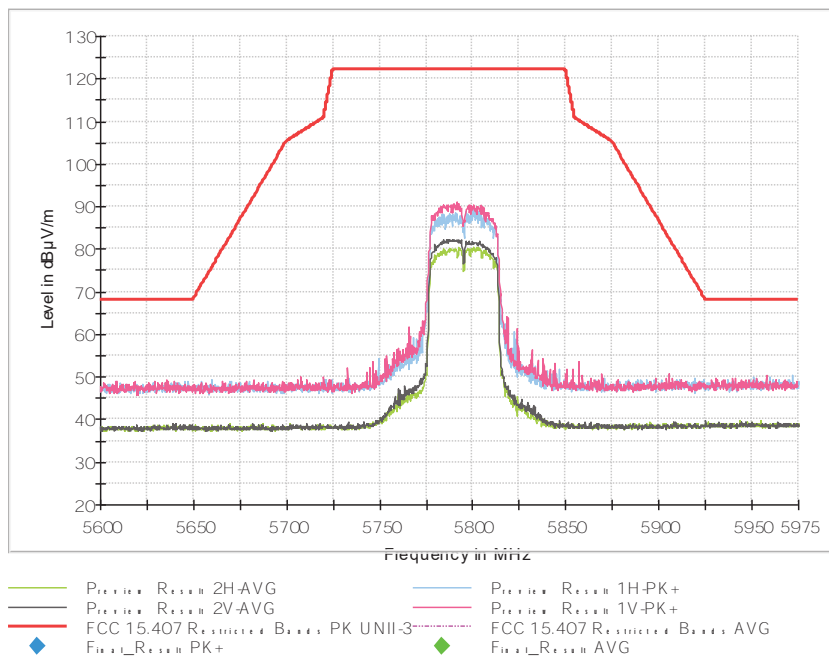


Mode 802.11 ac40 (VHT40)

Low Channel 151

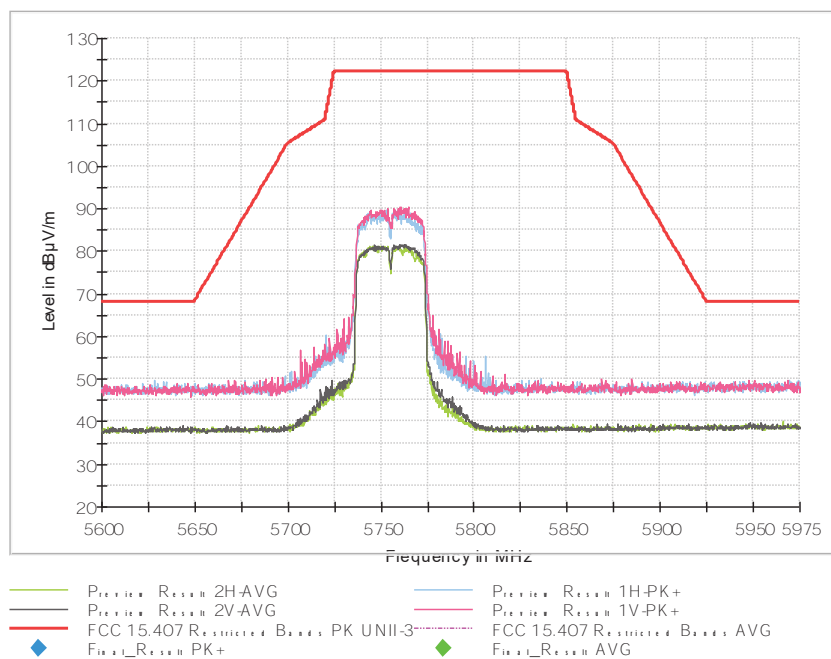


High Channel 159

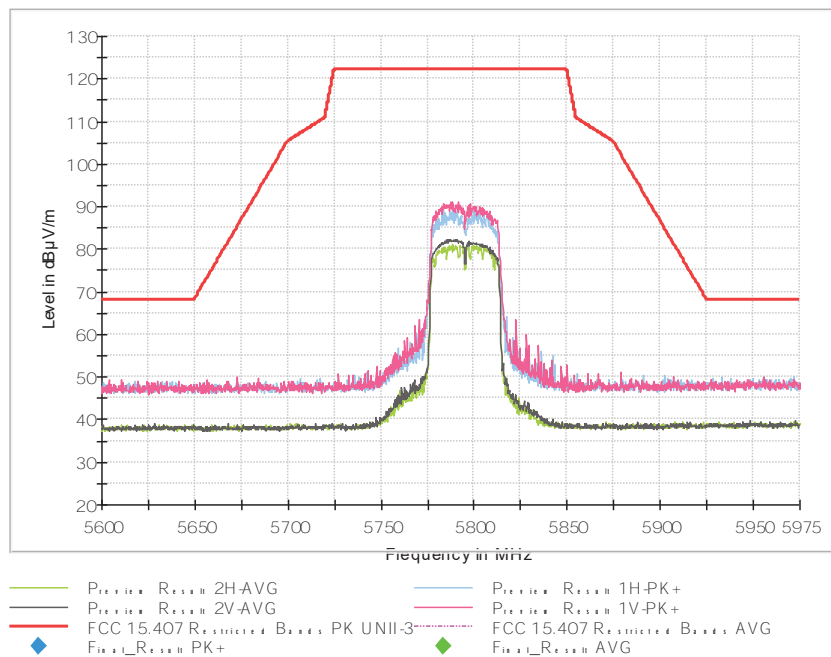


Mode 802.11 n40 (HT40)

Low Channel 151



High Channel 159



Mode 802.11 ac80 (VHT80) Middle Channel 155

