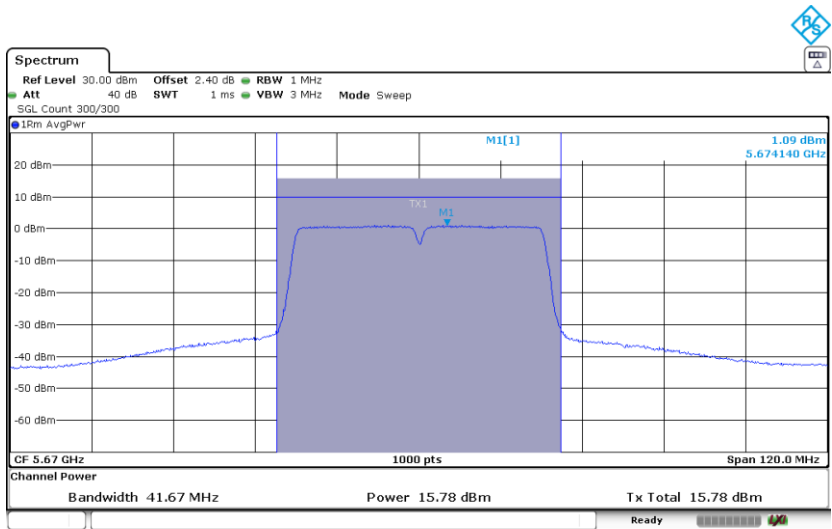
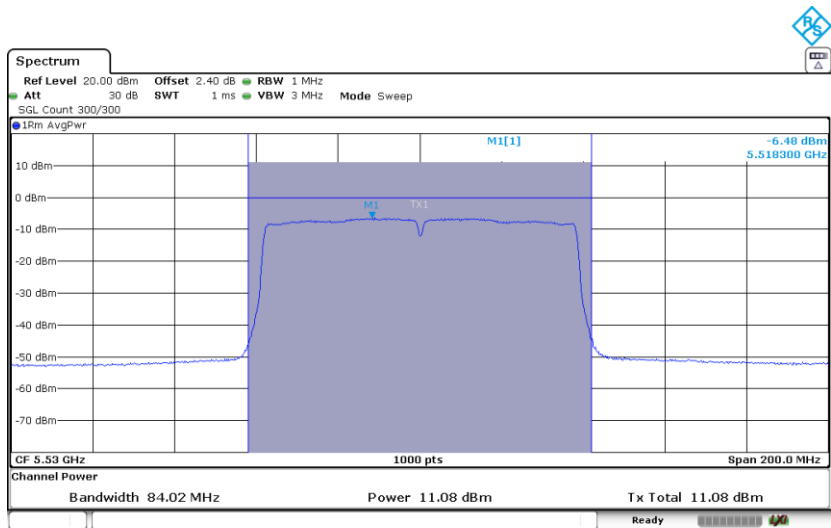


Channel 134

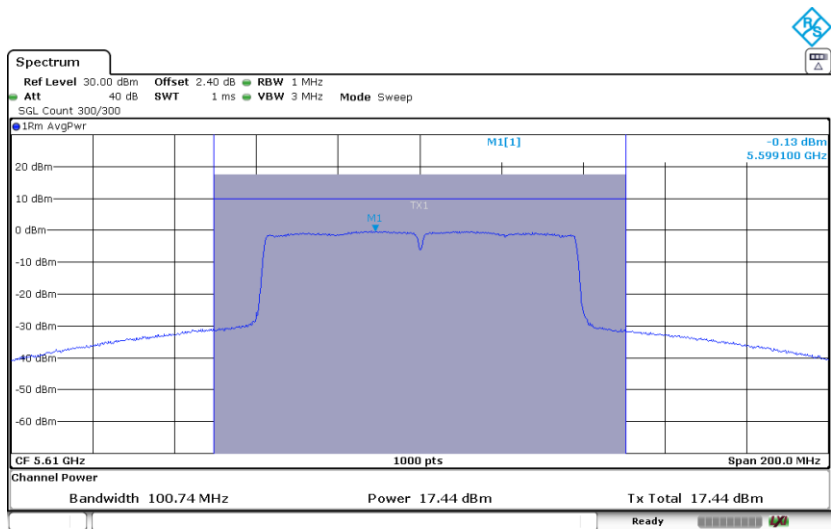


Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

Channel 106



Channel 122



Transmitter Maximum Conducted Output Power (Straddle Channels)

Mode : 802.11a - 20MHz – SISO – CORE Aux

Declared antenna gain: 4.56 dBi

	channel 144 5720 MHz
Max. conducted power (dBm)	20.49
Conducted Power Limit (dBm)	24
Margin (dB)	3.51
Maximum EIRP power (dBm)	25.05
EIRP power Limit (dBm)	30
Margin (dB)	4.95
Measurement uncertainty (dB)	<±1.20

Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

Declared antenna gain: 4.56 dBi

	channel 144 5720 MHz
Max. conducted power (dBm)	20.47
Conducted Power Limit (dBm)	24
Margin (dB)	3.53
Maximum EIRP power (dBm)	25.03
EIRP power Limit (dBm)	30
Margin (dB)	4.97
Measurement uncertainty (dB)	<±1.20

Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

Declared antenna gain: 4.56 dBi

	channel 142 5710 MHz
Max. conducted power (dBm)	21.93
Conducted Power Limit (dBm)	24
Margin (dB)	2.07
Maximum EIRP power (dBm)	26.49
EIRP power Limit (dBm)	30
Margin (dB)	3.51
Measurement uncertainty (dB)	<±1.20

Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

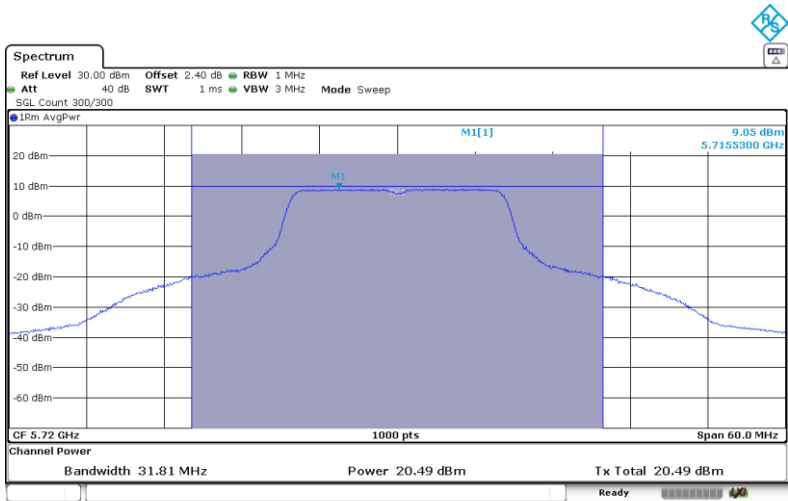
Declared antenna gain: 4.56 dBi

	channel 138 5690 MHz
Max. conducted power (dBm)	20.14
Duty Cycle Correction Factor (dB)	0.18
Max. conducted power corrected (dBm)	20.32
Conducted Power Limit (dBm)	24
Margin (dB)	3.68
Maximum EIRP power (dBm)	24.88
EIRP power Limit (dBm)	30
Margin (dB)	5.12
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

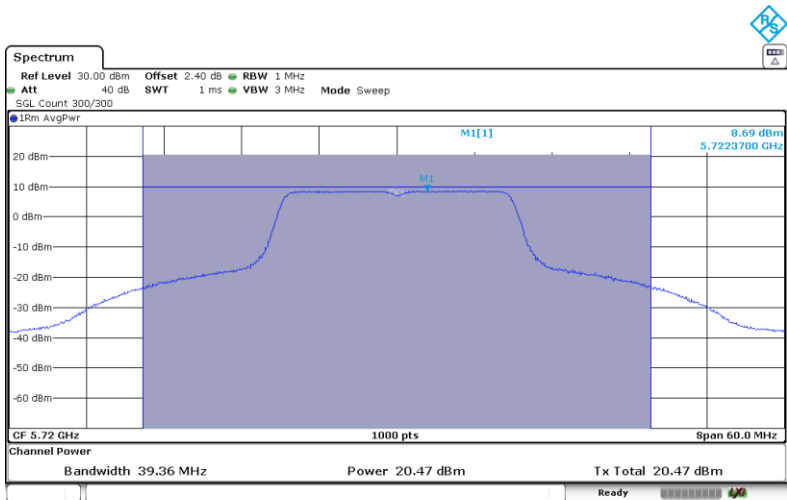
Mode : 802.11a - 20MHz – SISO – CORE Aux

Channel 144



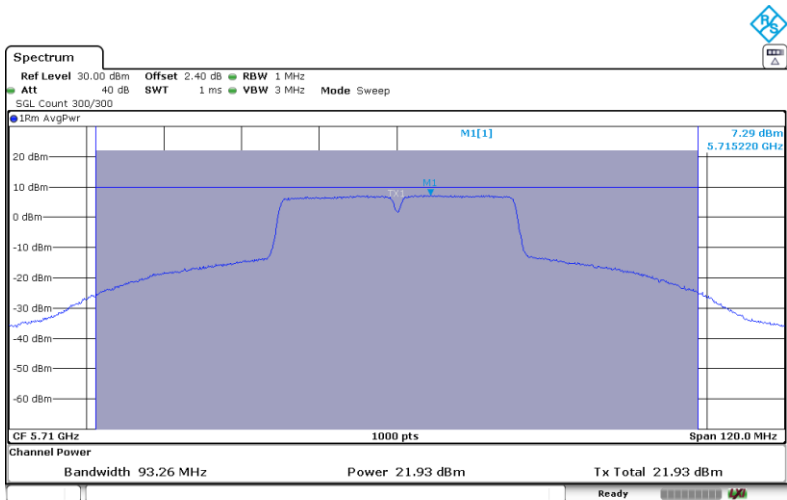
Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

Channel 144



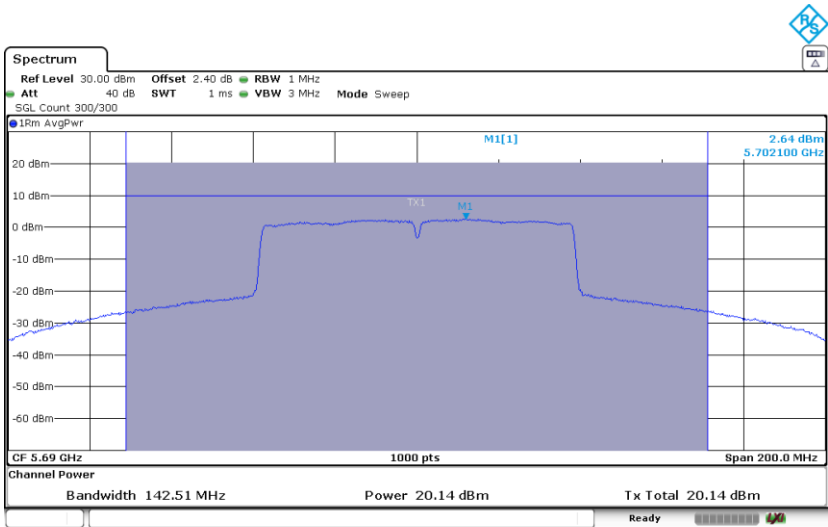
Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

Channel 142



Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

Channel 138



FCC Section 15.407 Subclause (a) (2) / RSS-247 6.2.3.1 Transmitter Peak Power Spectral Density

FCC 15.407: The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz 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.

RSS-247: The e.i.r.p. spectral density shall not exceed 11 dBm in any 1.0 MHz band.

RESULTS

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

For all SISO modes of operation, the antenna gain is < 6 dBi.

The PSD test uses the same setup than the transmitter maximum conducted output power test. The result of the Peak PSD was measured by collocation a marker on the peak of the signal and the results are in the tables below.

Straddling channels in the U-NII-2C and U-NII-3 at 5725 MHz (144, 162 and 138) shall meet the requirements of both bands. Compliance is shown against the more stringent limit in band U-NII-2C and therefore is also compliant with the requirements for band U-NII-3.

FCC and Canada power setting

Mode : 802.11a - 20MHz – SISO – CORE Aux

	Channel 100 5500 MHz	Channel116 5580 MHz	Channel 140 5700 MHz
PSD (dBm/MHz)	1.36	9.11	1.99
PSD Limit (dBm/MHz)	11		
Margin (dB)	9.64	1.89	9.01
Measurement uncertainty (dB)	<±1.20		

Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

	Channel 100 5500 MHz	Channel116 5580 MHz	Channel 140 5700 MHz
PSD (dBm/MHz)	1.21	8.54	1.55
PSD Limit (dBm/MHz)	11		
Margin (dB)	9.79	2.46	9.45
Measurement uncertainty (dB)	<±1.20		

Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

	Channel 102 5510 MHz	Channel 110 5550MHz	Channel 118 5590 MHz	Channel 134 5670 MHz
PSD (dBm/MHz)	-3.37	7.07	6.87	1.09
PSD Limit (dBm/MHz)	11			
Margin (dB)	-3.37	3.93	4.13	9.91
Measurement uncertainty (dB)	<±1.20			

Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

	Channel 106 5530 MHz	Channel 122 5610 MHz
PSD (dBm/MHz)	-6.48	-0.13
Duty Cycle Correction Factor (dB)	0.18	0.18
PSD Corrected (dBm/MHz)	-6.30	-0.51
PSD Limit (dBm/MHz)	11	
Margin (dB)	17.30	11.51
Measurement uncertainty (dB)	<±1.20	

Verdict: PASS

PSD (Straddle Channels)

Mode : 802.11a - 20MHz – SISO – CORE Aux

	Channel 144 5720 MHz
PSD (dBm/MHz)	9.05
PSD Limit (dBm/MHz)	11
Margin (dB)	1.95
Measurement uncertainty (dB)	<±1.20

Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

	Channel 144 5720 MHz
PSD (dBm/MHz)	8.69
PSD Limit (dBm/MHz)	11
Margin (dB)	2.31
Measurement uncertainty (dB)	<±1.20

Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

	Channel 142 5710 MHz
PSD (dBm/MHz)	7.29
PSD Limit (dBm/MHz)	11
Margin (dB)	3.71
Measurement uncertainty (dB)	<±1.20

Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

	Channel 138 5690 MHz
PSD (dBm/MHz)	2.64
Duty Cycle Correction Factor (dB)	0.18
PSD Corrected (dBm/MHz)	2.82
PSD Limit (dBm/MHz)	11
Margin (dB)	8.18
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

FCC Section 15.407(b)(3)(6) /RSS-247 6.2.3.2. Transmitter Out of Band Radiated Emissions

SPECIFICATION

For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.23 dB μ V/m at 3 m distance).

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 3 m for the frequency range 30 MHz-40 GHz.

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.

Core Aux allows the simultaneous Wi-Fi transmission in both bands (2.4 GHz and 5GHz).Core Aux shares the third antenna from the main radio and cannot operate completely independently from the main radio.

The tests were performed in worst case with the equipment transmitting with Core Aux (802.11n HT20) in channel 100 (5000MHz) and with WiFi 2.4GHz (802.11 n HT20 MIMO 3Tx)) in channel 13 (2472MHz).

Mode : 802.11n HT20 – Core Aux (5500MHz) + 802.11n HT20 – CDD – 20MHz – MIMO – CORE 0 & CORE 1 & CORE 2 (2472MHz)

Frequency range 30 MHz-1000 MHz.

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

Spurious levels operating (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Uncertainty (dB)
36.192	Vertical	Quasi-Peak	22.7	40	17.3	± 3.88
144.864	Vertical	Quasi-Peak	28.5	43.5	15	± 3.88
167.433	Horizontal	Quasi-Peak	34.2	43.5	9.3	± 3.88
180.431	Horizontal	Quasi-Peak	30.2	43.5	13.3	± 3.88
191.295	Horizontal	Quasi-Peak	31.6	43.5	11.9	± 3.88

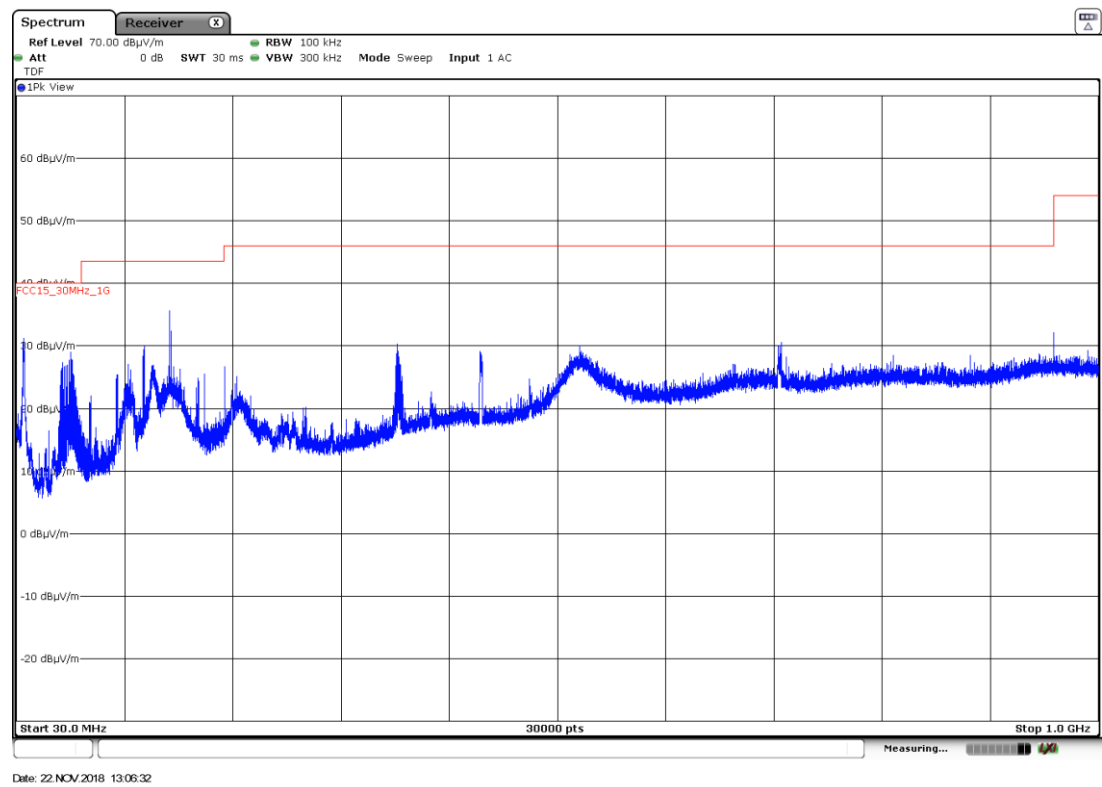
Frequency range 1 GHz-40 GHz

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

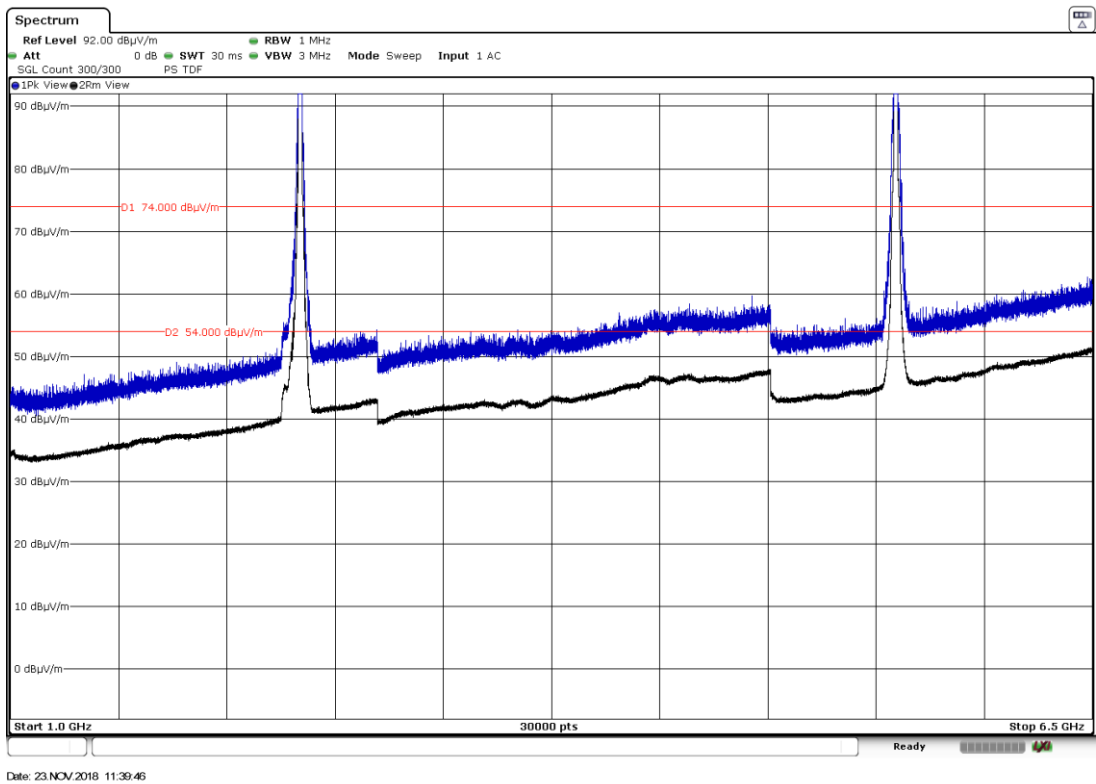
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Uncertainty (dB)
7408.43	Horizontal	Peak	53.20	74	20.8	± 3.05
7418.24		Average	41.17	54	12.8	± 3.05

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

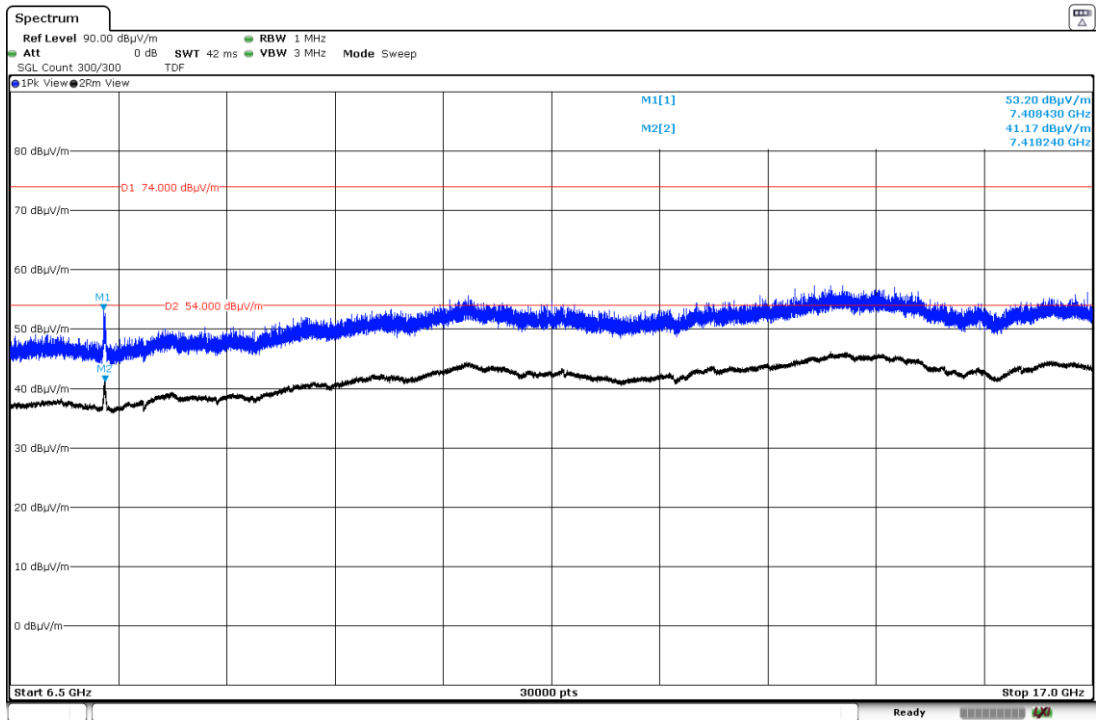


FREQUENCY RANGE 1 GHz to 6.5 GHz.

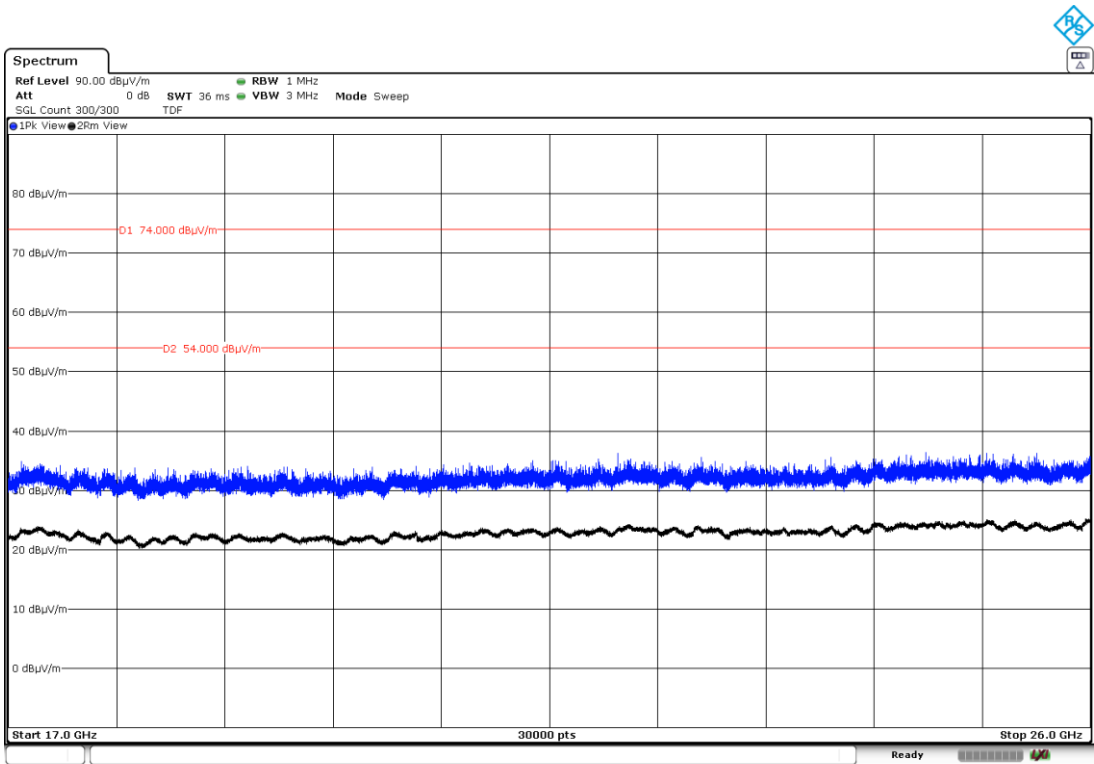


Note: The peak shown in the plot above the limit is the carrier frequency.

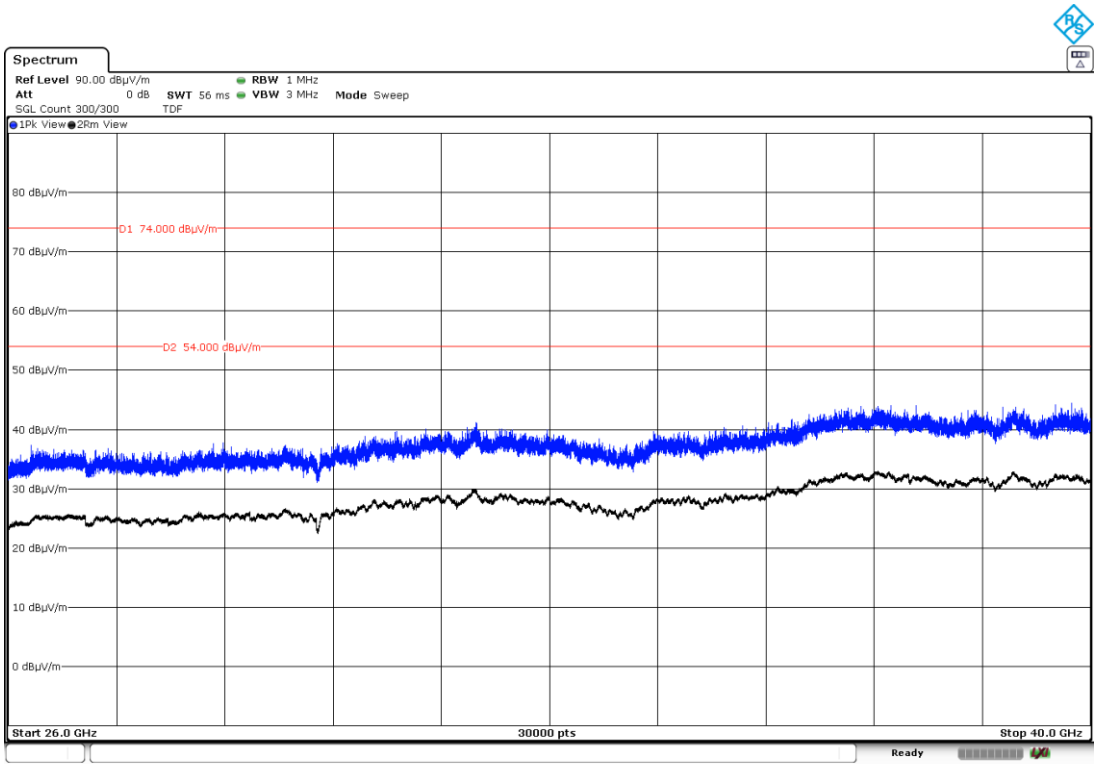
FREQUENCY RANGE 6.5 GHz to 17 GHz.



FREQUENCY RANGE 17 GHz to 26 GHz.



FREQUENCY RANGE 26 GHz to 40 GHz.



FCC Section 15.407 Subclause (b) (2) / RSS-247 6.2.3.2. Transmitter Band Edge Radiated Emissions.

SPECIFICATION

For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of –27 dBm/MHz (68.23 dBμV/m at 3 m distance).

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.

All emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of -27dBm/MHz. There are restricted bands of operation below band edge at 5.35-5.46GHz therefore the provision of FCC Part 15.205 apply.

Field strength measurements using peak and average detector performed in the restricted bands below 5.47 GHz and above 5.725 GHz.

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

- 802.11a: 6 Mbit/s / SISO on Core Aux
- 802.11n HT20: MCS0 / SISO on Core Aux
- 802.11n HT40: MCS0 / SISO on Core Aux
- 802.11ac VHT80: MCS0x1 / SISO on Core Aux

Results for Mode: 802.11a - 20 MHz – SISO – Core Aux

Results: Peak / Channel 100

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5469.800	Vertical	62.96	68.20	5.24	<± 3.05	PASS

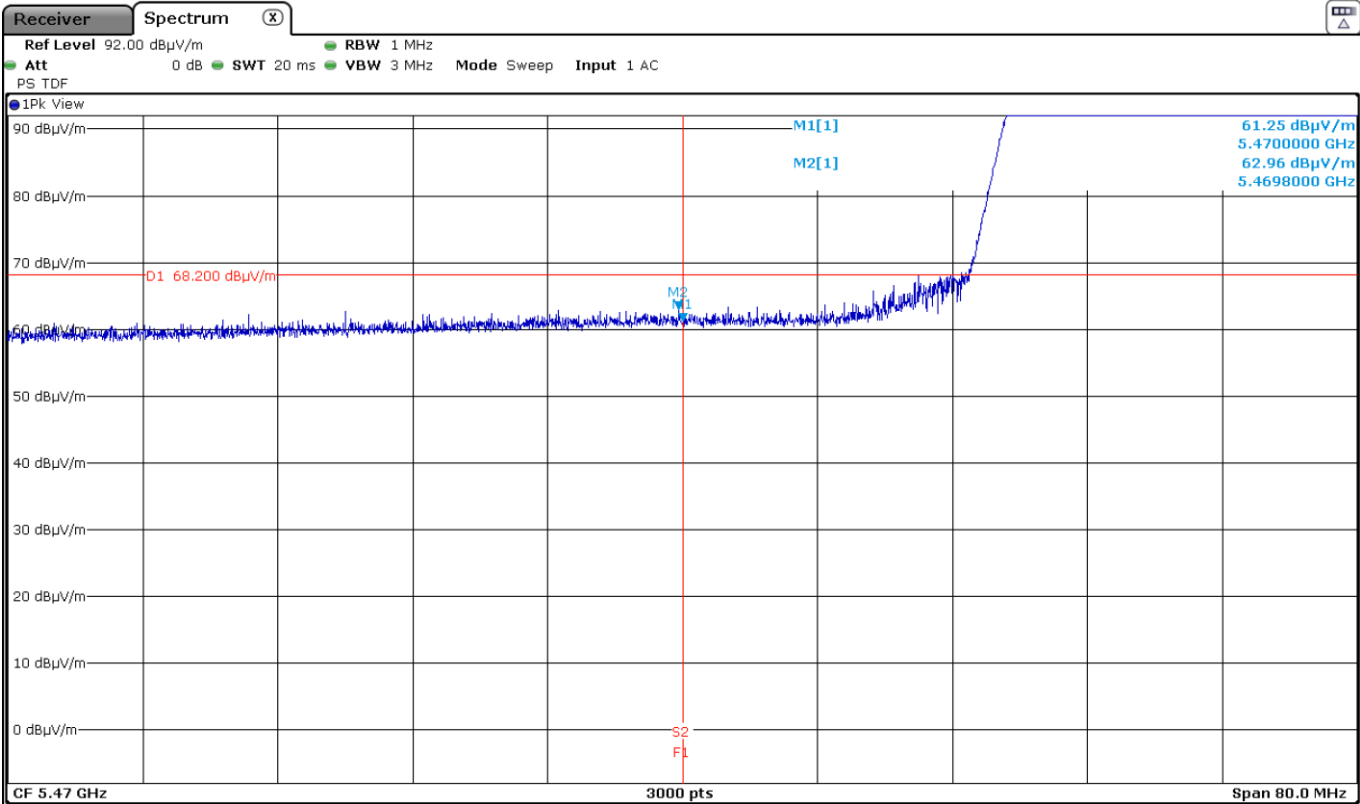
Results: Peak / Channel 140

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5725.120	Vertical	63.16	68.20	5.04	<± 3.05	PASS

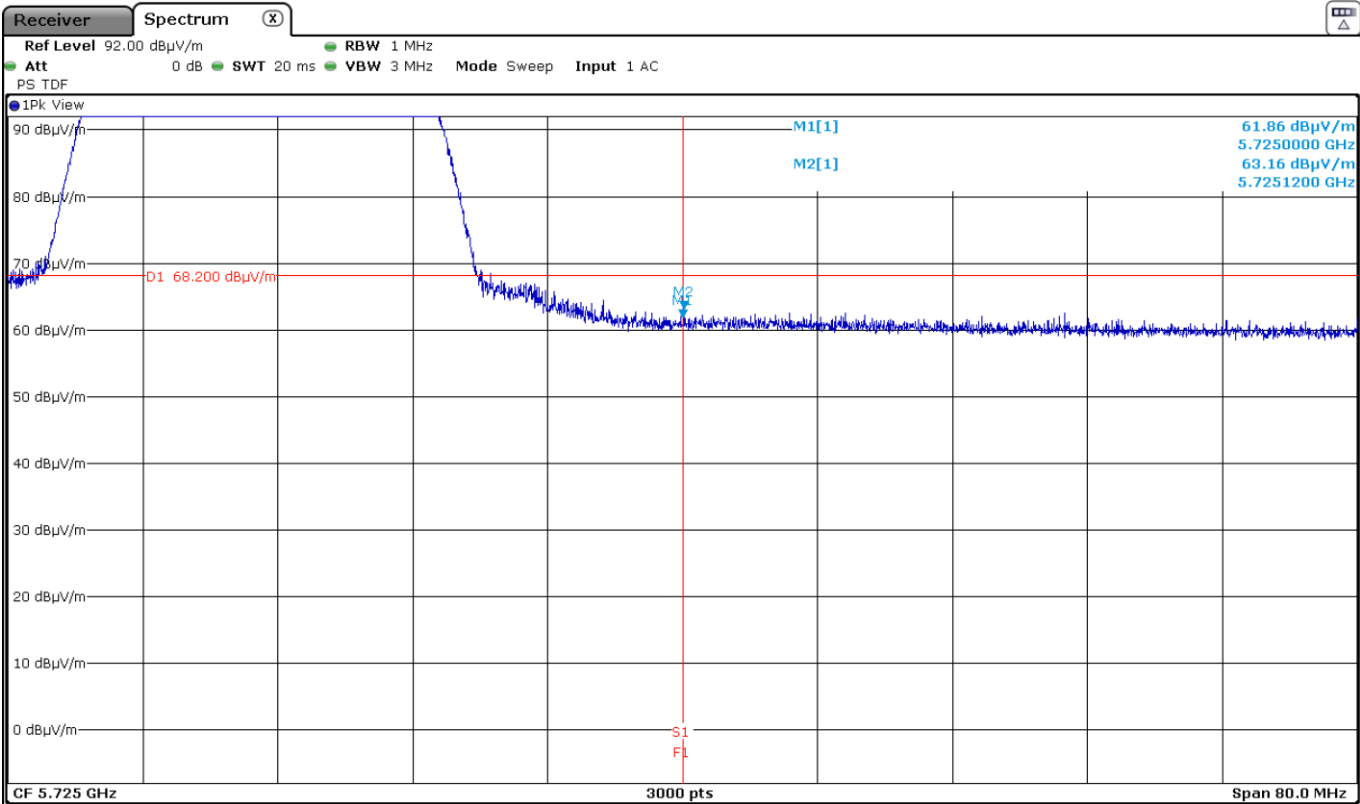
Results: Peak / Straddle Channel 144

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5937.540	Vertical	62.40	68.20	5.80	<± 3.05	PASS

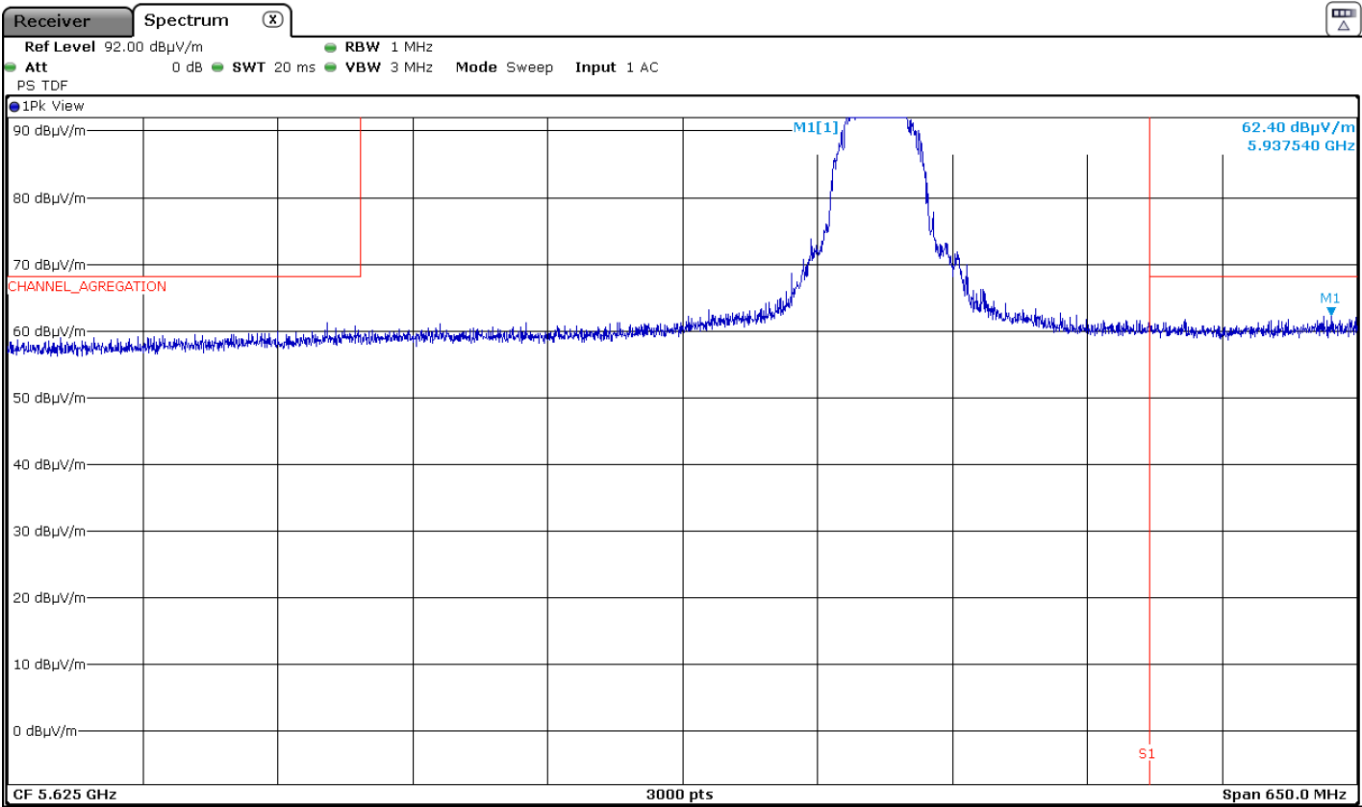
Lower Band Edge Channel 100



Upper Band Edge Channel 140



Lower Band Edge and Upper Band Edge Straddle Channel 144



Results: 802.11n HT20 - 20 MHz – SISO - Core Aux

Results: Peak / Channel 100

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5469.800	Vertical	63.10	68.20	5.10	<± 3.05	PASS

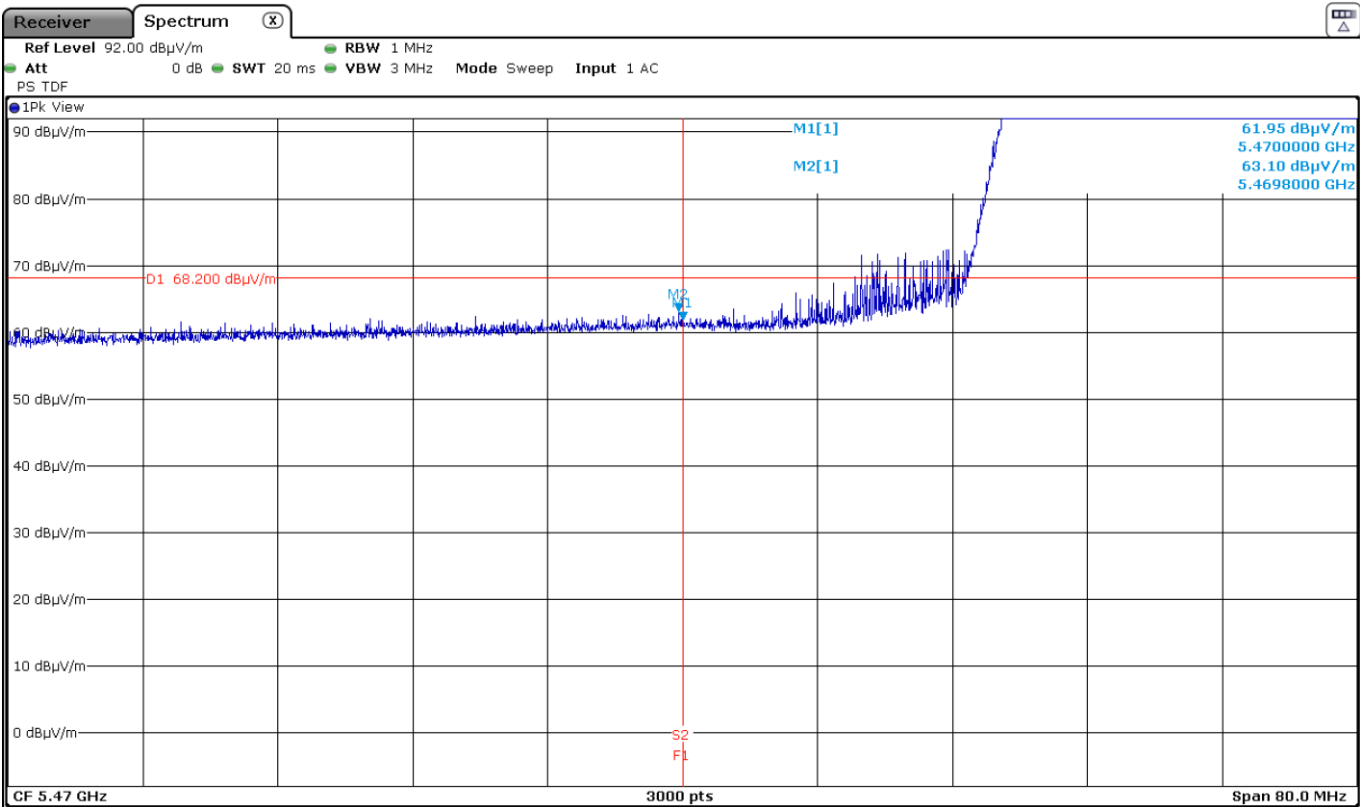
Results: Peak / Channel 140

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5725	Vertical	61.05	68.20	7.15	<± 3.05	PASS
5735.173	Vertical	62.99	68.20	5.21	<± 3.05	PASS

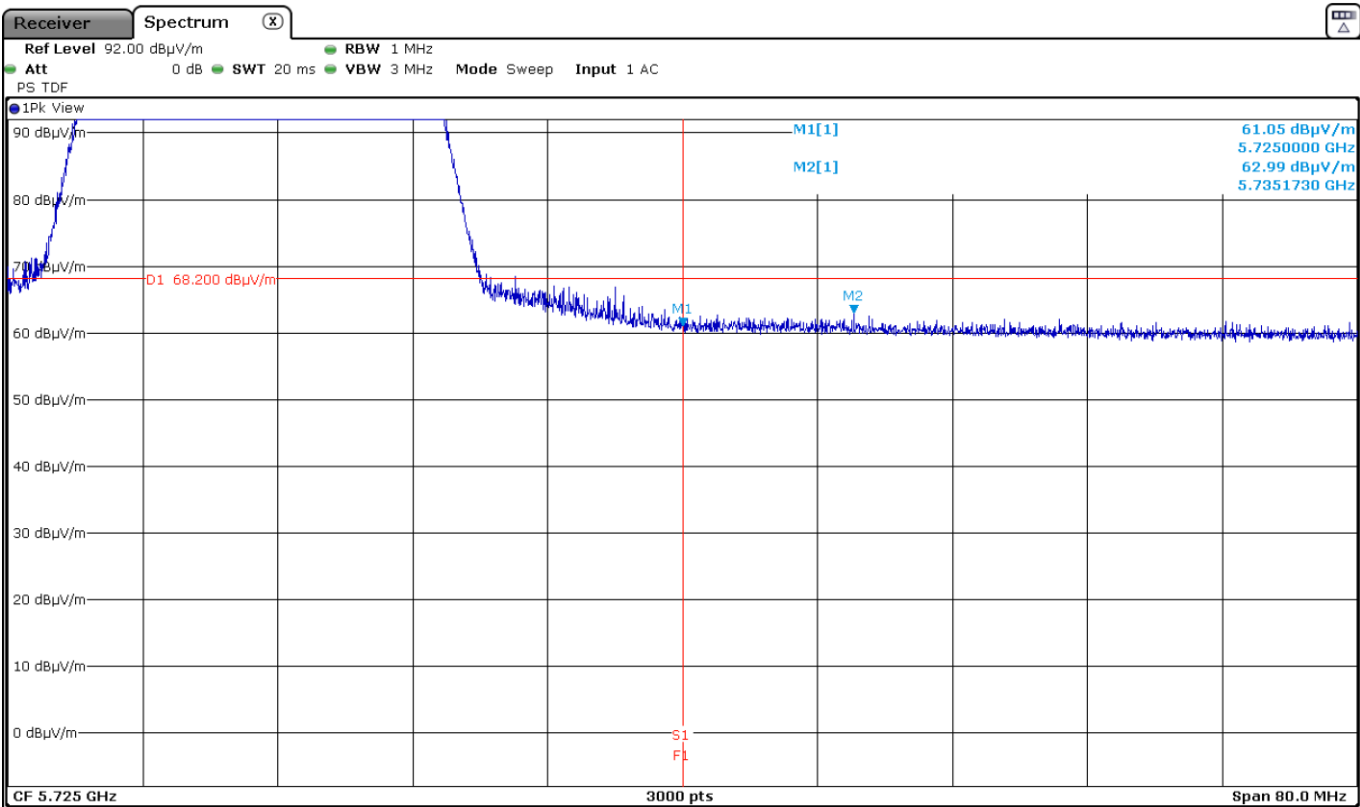
Results: Peak / Straddle Channel 144

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5854.340	Vertical	62.30	68.20	5.90	<± 3.05	PASS

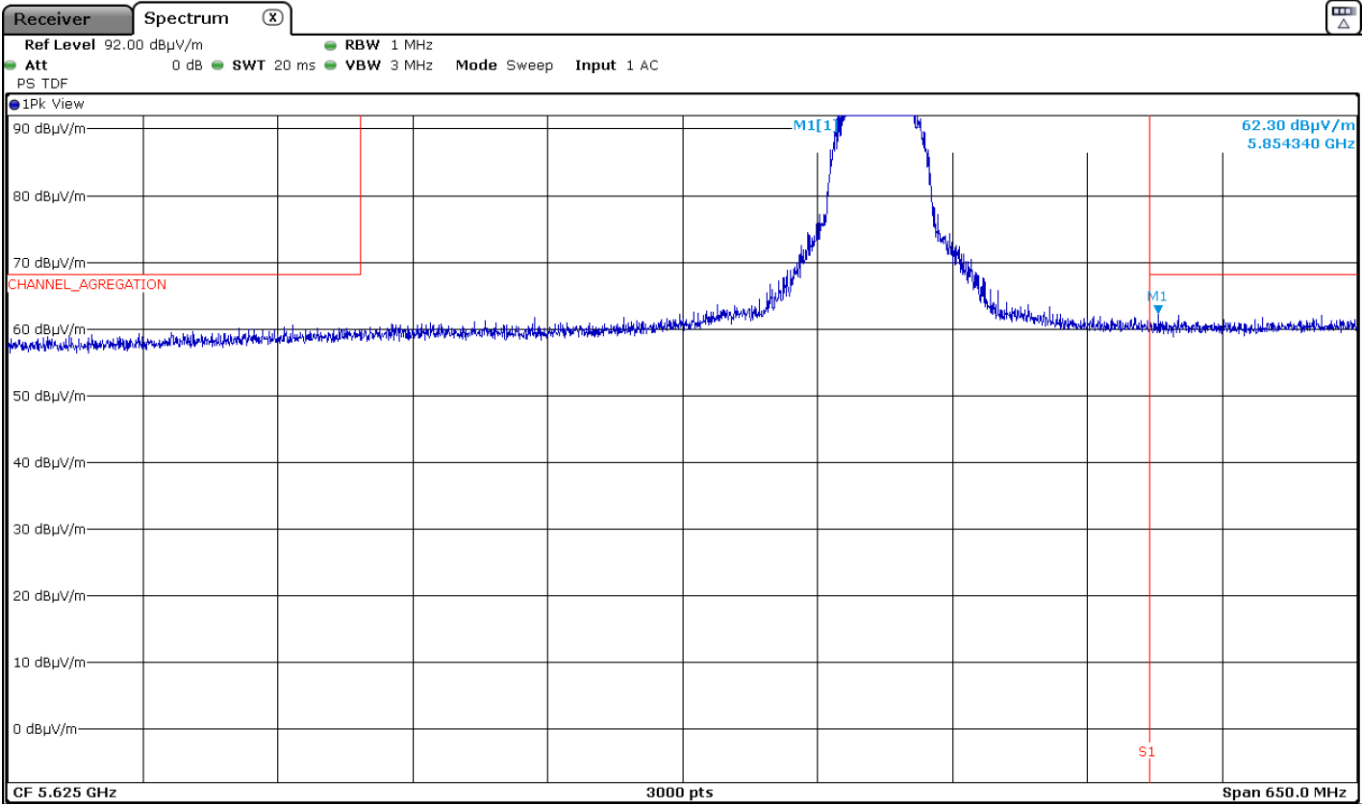
Lower Band Edge Channel 100



Upper Band Edge Channel 140



Lower Band Edge and Upper Band Edge Straddle Channel 144



Results for Mode: 802.11n HT40 - 40 MHz – SISO - Core Aux

Results: Peak / Channel 102

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5469.540	Vertical	63.14	68.20	5.06	<± 3.05	PASS

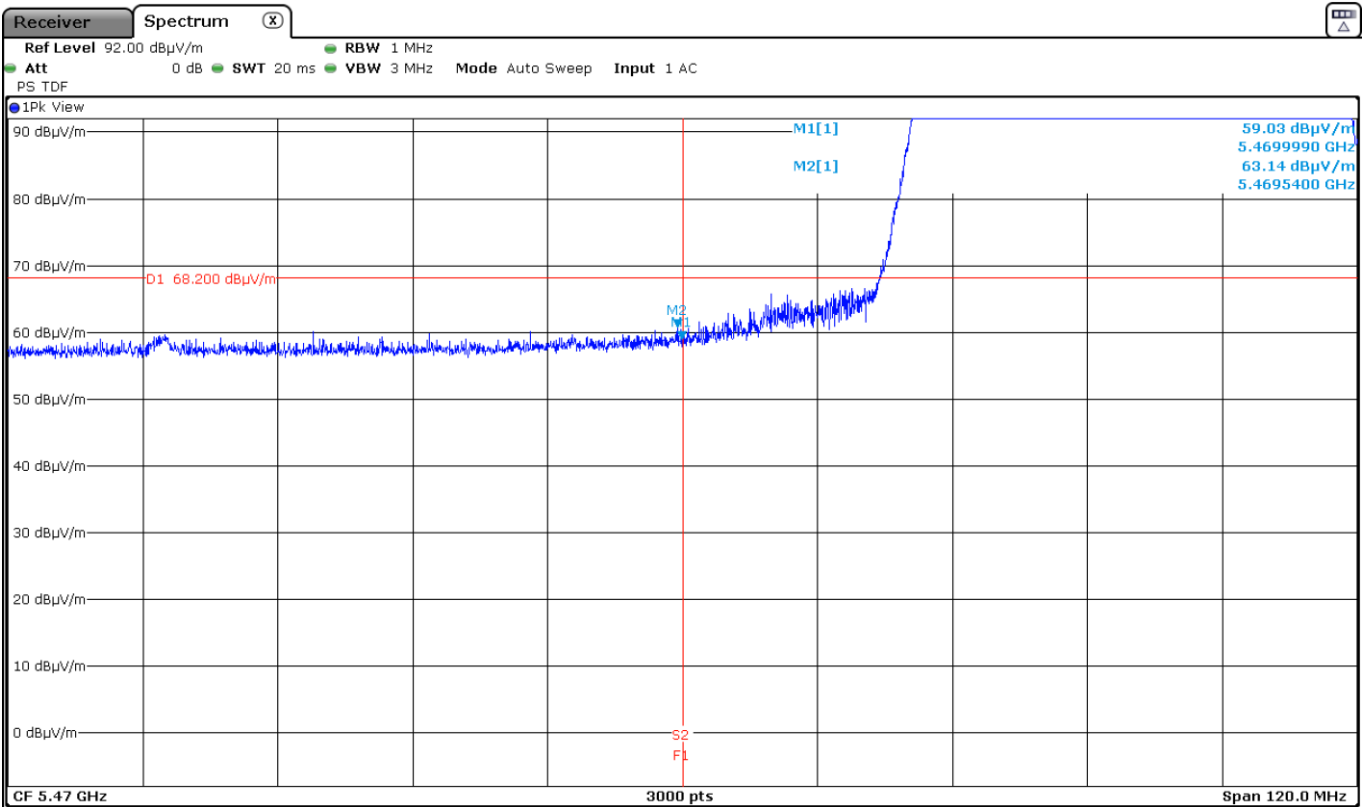
Results: Peak / Channel 134

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5725	Vertical	60.83	68.20	7.37	<± 3.05	PASS
5741.175	Vertical	62.82	68.20	5.38	<± 3.05	PASS

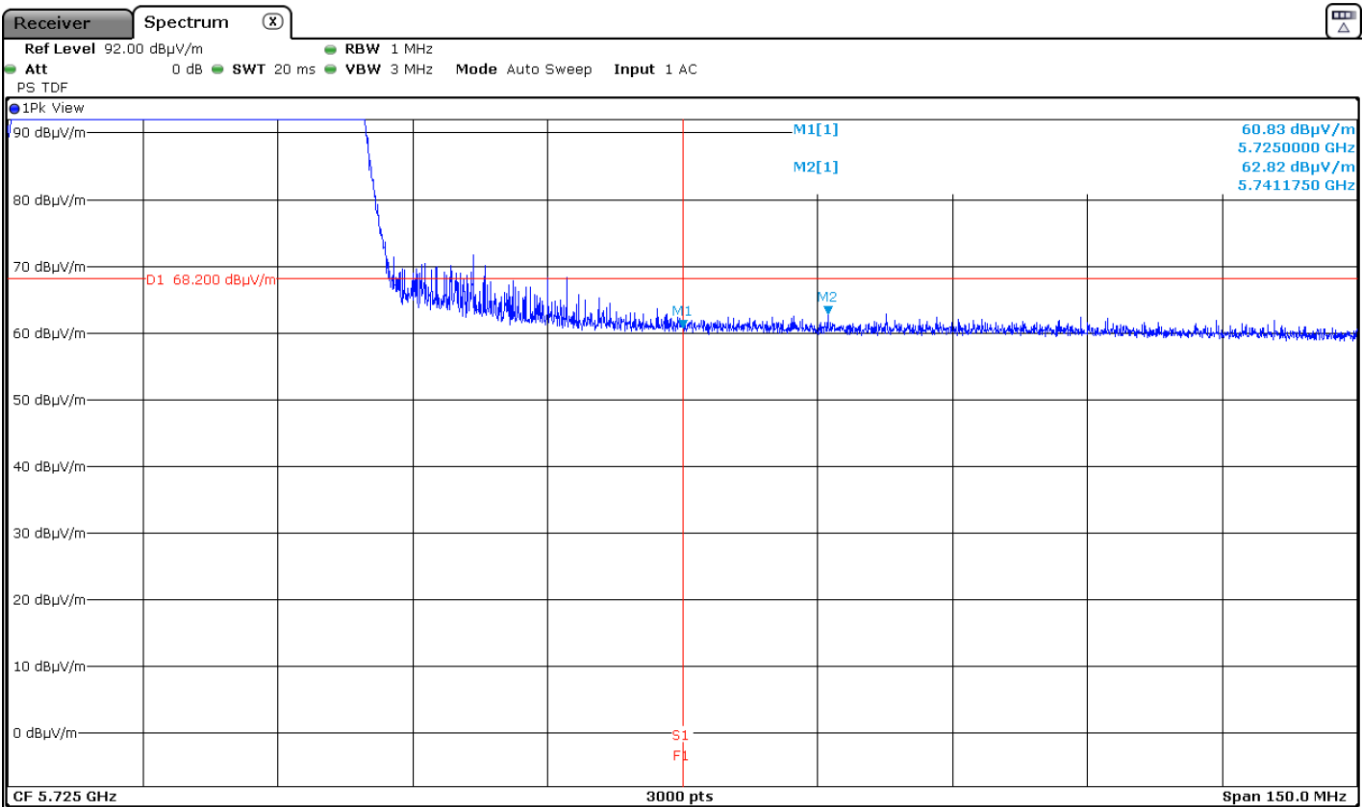
Results: Peak / Straddle Channel 142

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5940.100	Vertical	63.14	68.20	5.06	<± 3.05	PASS

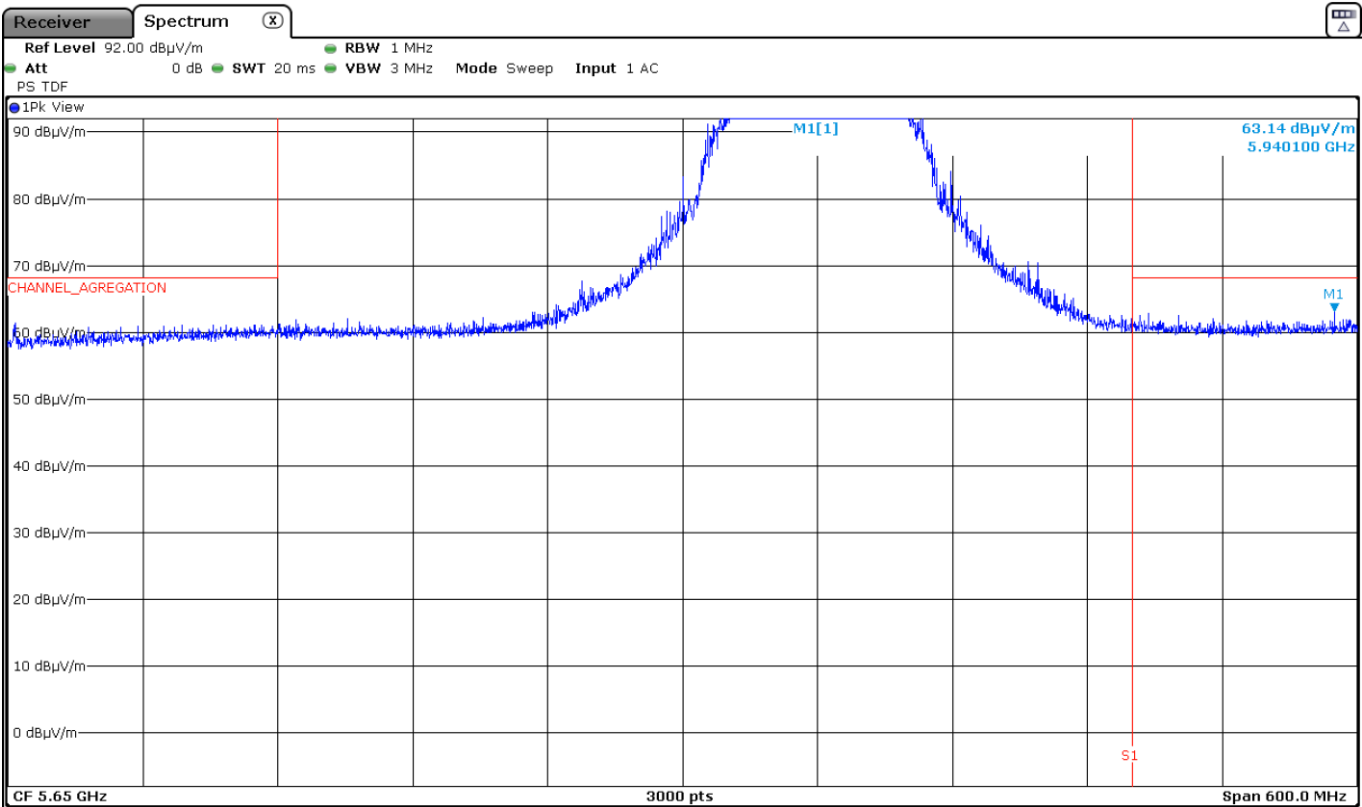
Lower Band Edge Channel 102



Upper Band Edge Channel 134



Lower Band Edge and Upper Band Edge Straddle Channel 142



Results for Mode 802.11ac VHT80 – 80MHz – SISO – Core Aux

Results: Peak / Channel 106

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5470	Vertical	59.27	68.20	8.93	<± 3.05	PASS
5460.433	Vertical	61.96	68.20	6.24	<± 3.05	PASS

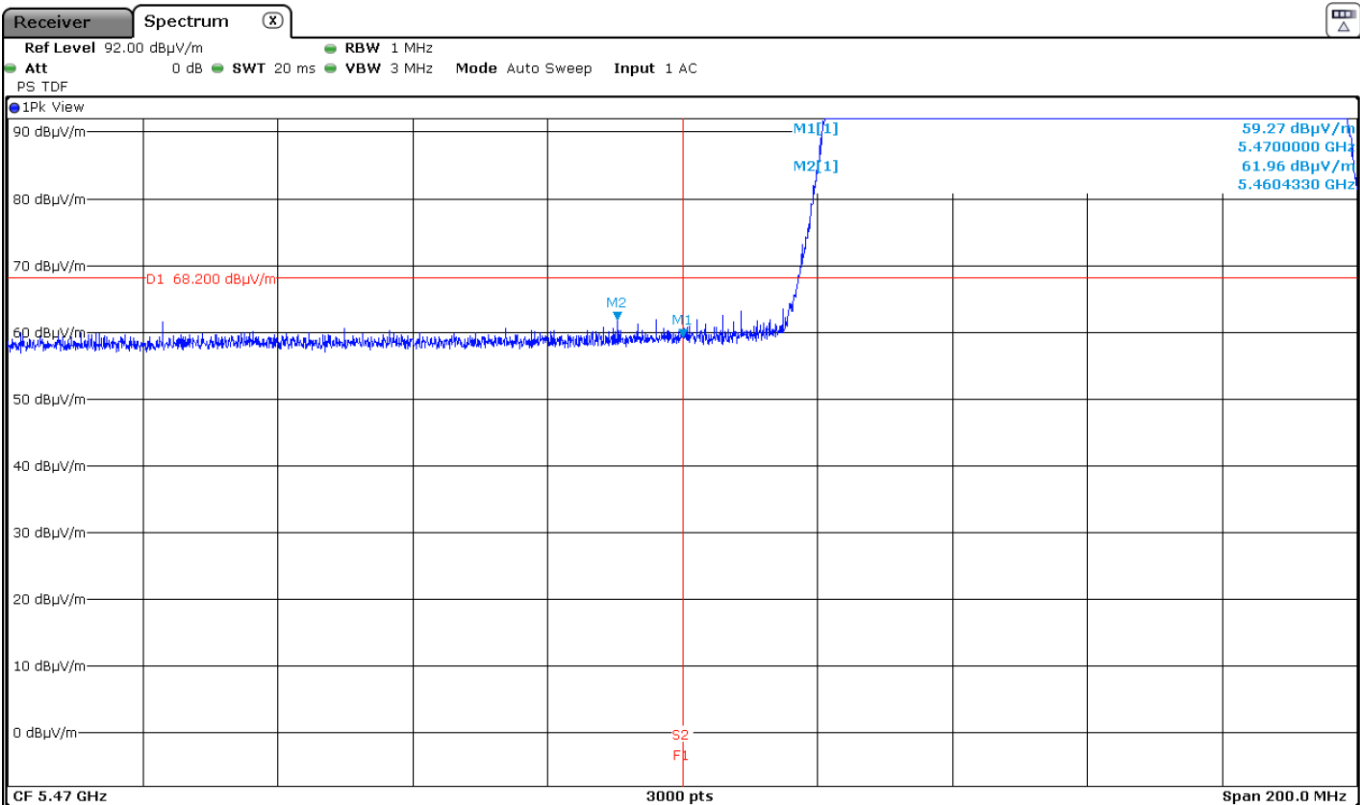
Results: Peak / Channel 122

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5725	Vertical	62.33	68.20	5.87	<± 3.05	PASS
5730.740	Vertical	62.55	68.20	5.65	<± 3.05	PASS

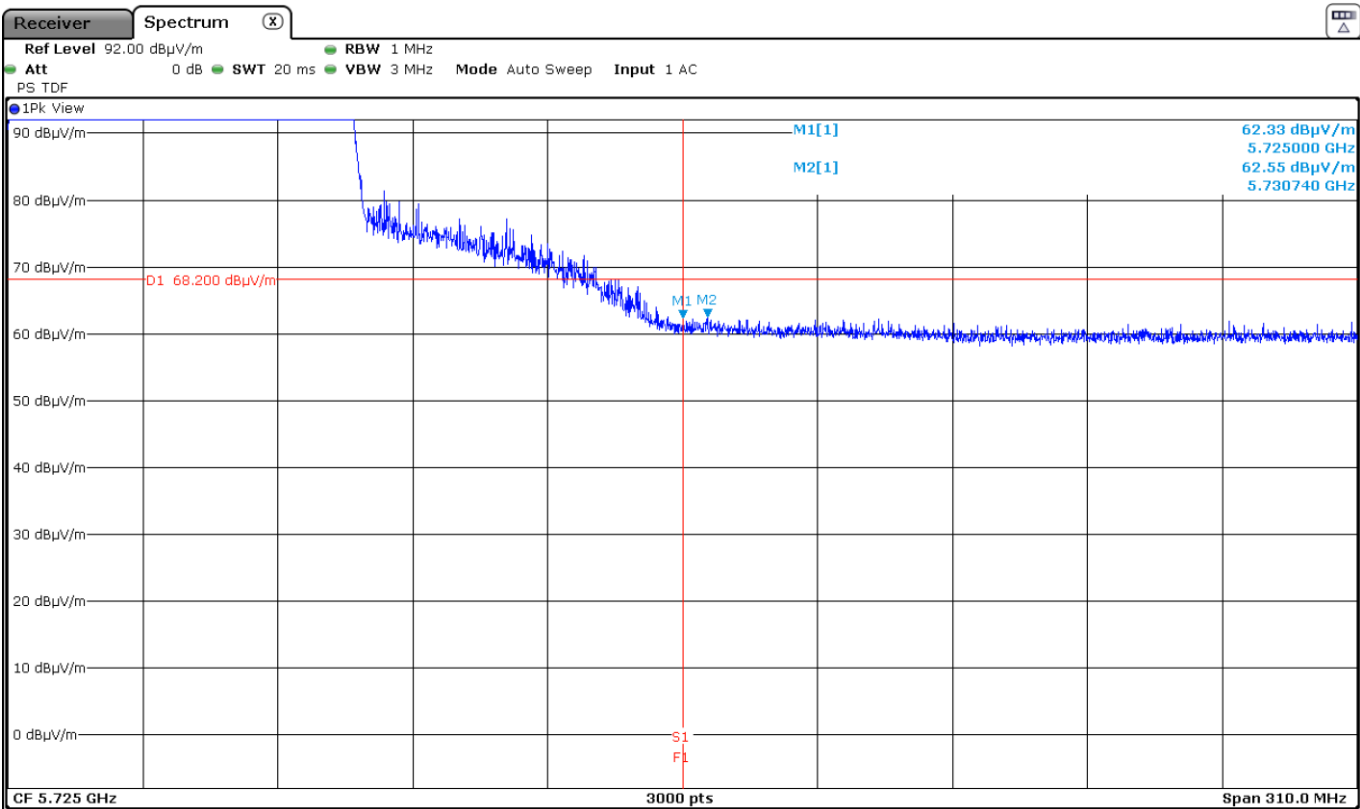
Results: Peak / Straddle Channel 138

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5866.100	Vertical	62.86	68.20	5.34	<± 3.05	PASS

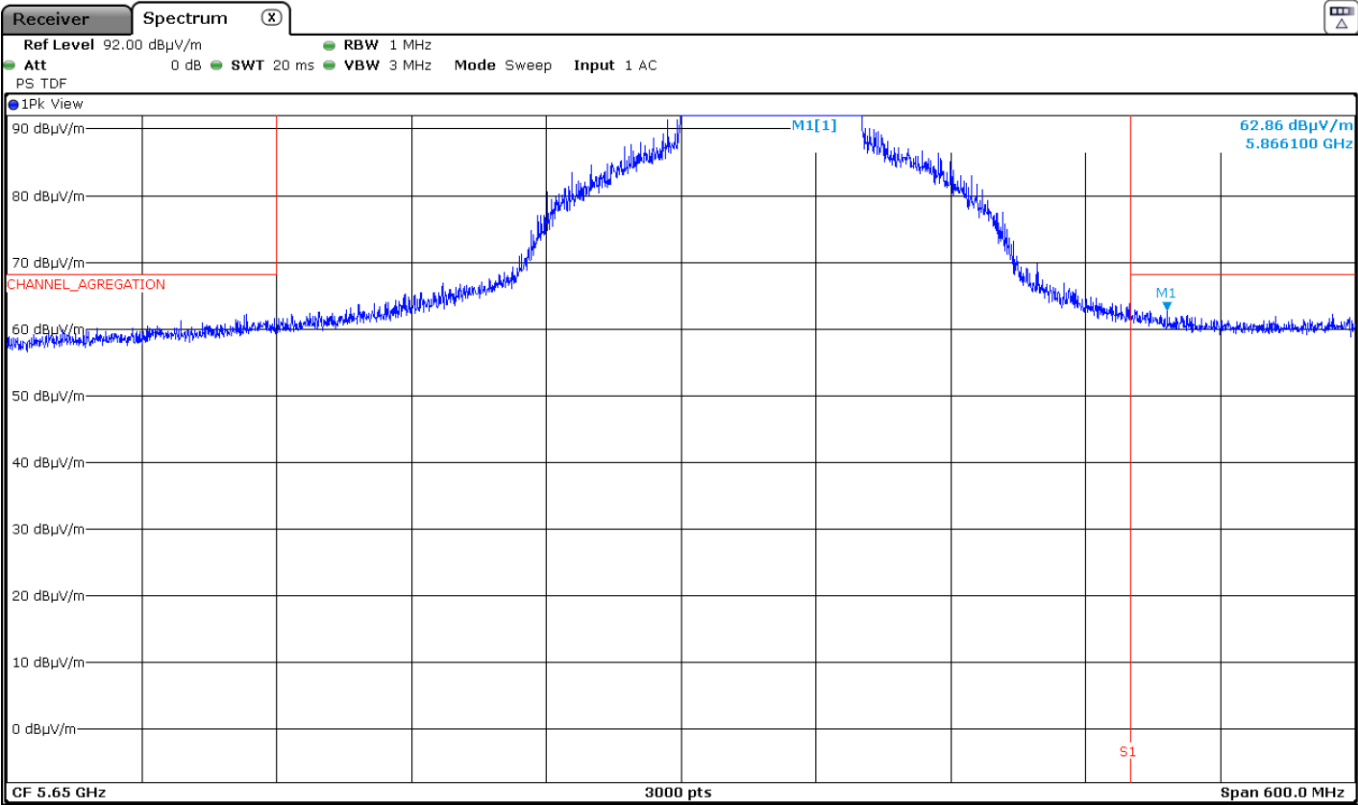
Lower Band Edge Channel 106



Upper Band Edge Channel 122



Lower Band Edge and Upper Band Edge Straddle Channel 138



Appendix E: Test result for 5.725GHz – 5.850GHz.

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TEST CONDITIONS

Power supply (V):

Vnominal = 120 Vac

Type of power supply = AC voltage main supply.

Type of antenna = Internal antenna.

Declared Gain for antenna (maximum):

G_{COREAUX} = 4.42 dBi

Technology Tested:	WLAN (IEEE 802.11 a,n,ac) / U-NII	
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps (SISO)	
	802.11n HT20: MCS0 to MCS7	
	802.11n HT40: MCS0 to MCS7	
	802.11ac VHT20: MCS0 to MCS8	
	802.11ac VHT40: MCS0 to	
	802.11ac VHT80: MCS0 to MCS9)	
Setting of cores / ports:	Aux	
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
Channels that straddle the UNII-2C and UNII-3 bands at 5725MHz.	Single:144	5720
Channel Spacing:	40 MHz	
Transmit Channels	Channel	Channel Frequency (MHz)
	Lowest: 151	5755
	Highest: 159	5795
Channels that straddle the UNII-2C and UNII-3 bands at 5725MHz.	Single:142	5710
Channel Spacing:	80 MHz	
Transmit Channels	Middle: 155	5775
Channels that straddle the UNII-2C and UNII-3 bands at 5725MHz.	Single:138	5690

The test set-up was made in accordance to the general provisions of FCC Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 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 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 customer declared the worst case SISO for testing which were:

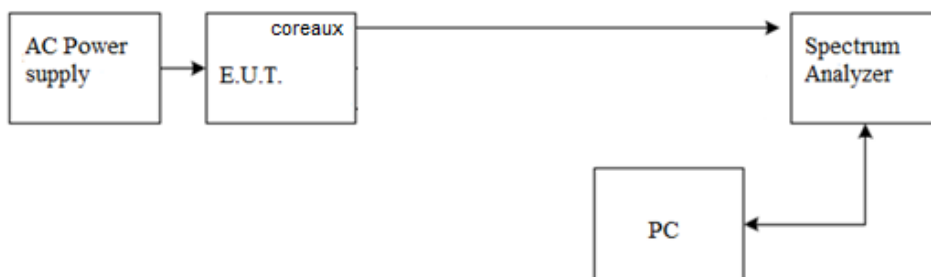
- 802.11a: 6 Mbit/s / SISO on Core Aux
- 802.11n HT20: MCS0 / SISO on Core Aux
- 802.11n HT40: MCS0 / SISO on Core Aux
- 802.11ac VHT80: MCS0x1 / SISO on Core Aux

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 AC supply voltage is applied using an external power supply.

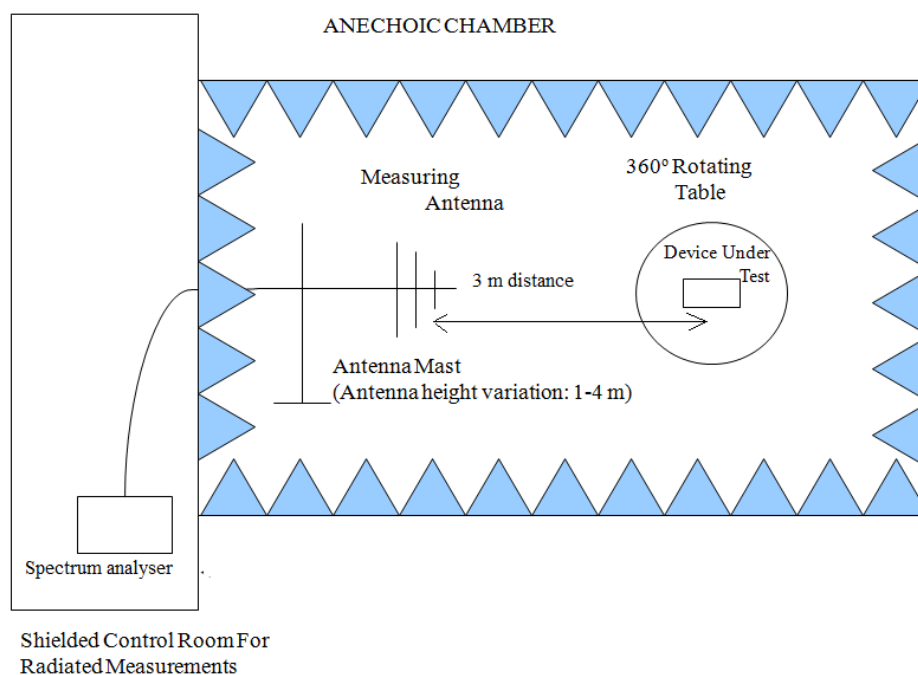
RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the center of the chamber turntable to perform the measurements below 1GHz and The EUT was placed at a height of 1.5 meters above the test chamber floor in the center of the chamber turntable to perform the measurements above 1GHz. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

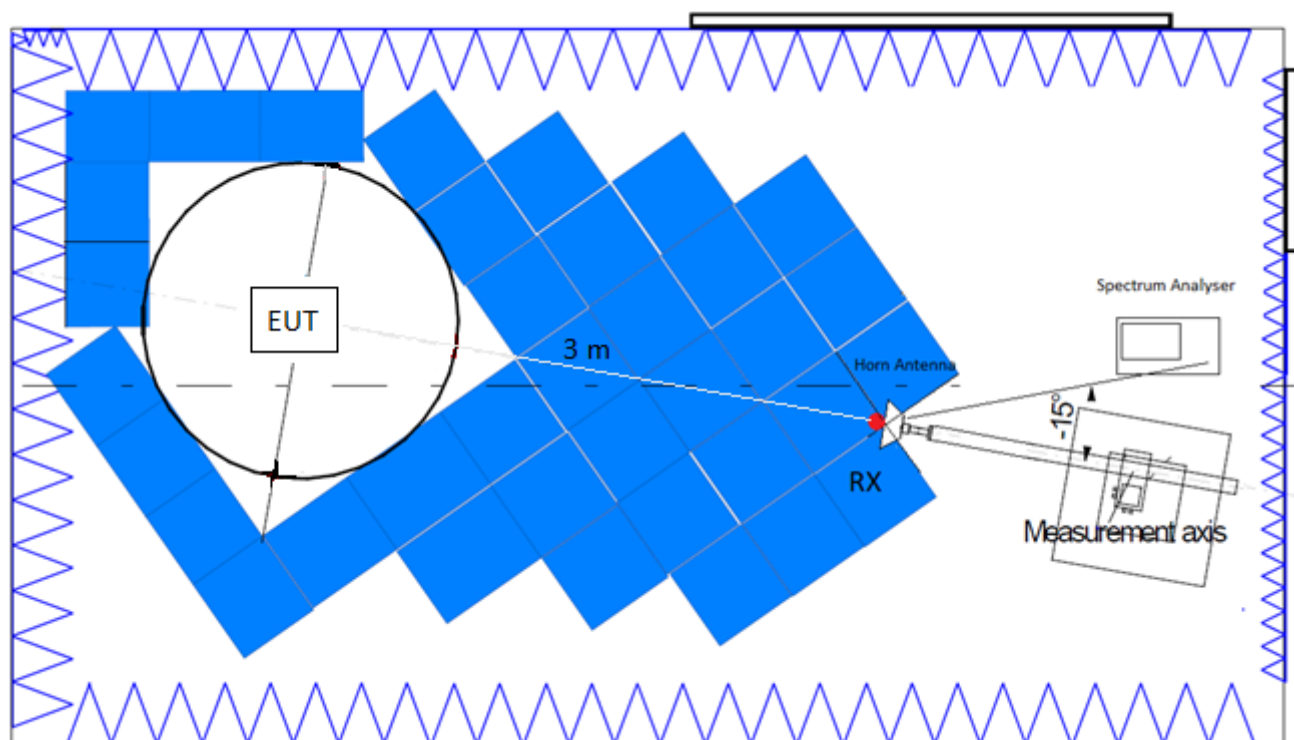
Measurements were made in both horizontal and vertical planes of polarization.

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 $f > 1$ GHz



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

SPECIFICATION

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

RESULTS:

6 dB Bandwidth (see next plots).

The customer declared the worst case SISO for testing which were:

- 802.11a: 6 Mbit/s / SISO on Core Aux
- 802.11n HT20: MCS0 / SISO on Core Aux
- 802.11n HT40: MCS0 / SISO on Core Aux
- 802.11ac VHT80: MCS0x1 / SISO on Core Aux

Mode : 802.11a - 20MHz – SISO – CORE Aux

(Straddle Channel)

	Channel 144 5720 MHz
6 dB bandwidth (MHz)	3.249
Measurement uncertainty (kHz)	<± 25.02

(5725-5850 Channels)

	Channel 149 5745 MHz	Channel 157 5785 MHz	Channel 165 5825 MHz
6 dB bandwidth (MHz)	16.383	16.408	16.386
Measurement uncertainty (kHz)	<± 25.02		

Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

(Straddle Channel)

	Channel 144 5720 MHz
6 dB bandwidth (MHz)	3.879
Measurement uncertainty (kHz)	<± 25.02

(5725-5850 Channels)

	Channel 149 5745 MHz	Channel 157 5785 MHz	Channel 165 5825 MHz
6 dB bandwidth (MHz)	17.588	17.657	17.668
Measurement uncertainty (kHz)	<± 25.02		

Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

(Straddle Channel)

	Channel 142 5710 MHz
6 dB bandwidth (MHz)	3.271
Measurement uncertainty (kHz)	<± 40.04

(5725-5850 Channels)

	Channel 151 5775 MHz	Channel 159 5795 MHz
6 dB bandwidth (MHz)	36.346	36.452
Measurement uncertainty (kHz)	<± 40.04	

Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

(Straddle Channel)

	Channel 138 5690 MHz
6 dB bandwidth (MHz)	3.250
Measurement uncertainty (kHz)	<± 70.07

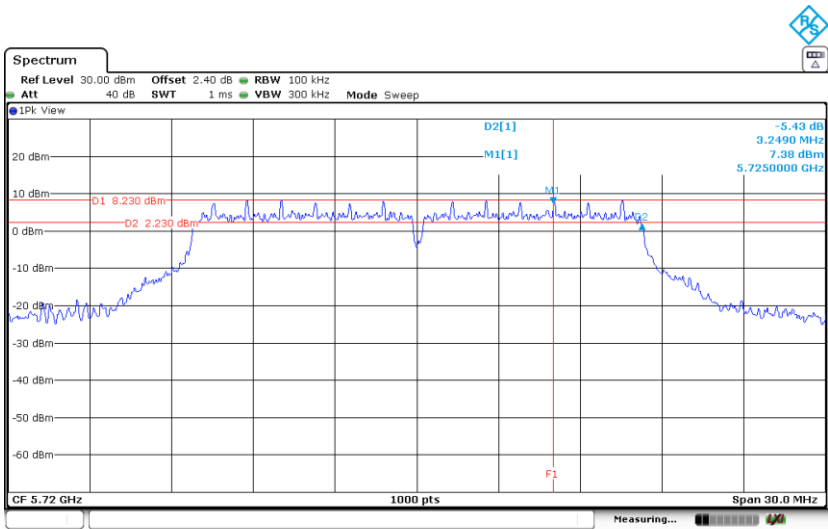
(5725-5850 Channels)

	Channel 155 5775 MHz
6 dB bandwidth (MHz)	76.28
Measurement uncertainty (kHz)	<± 70.07

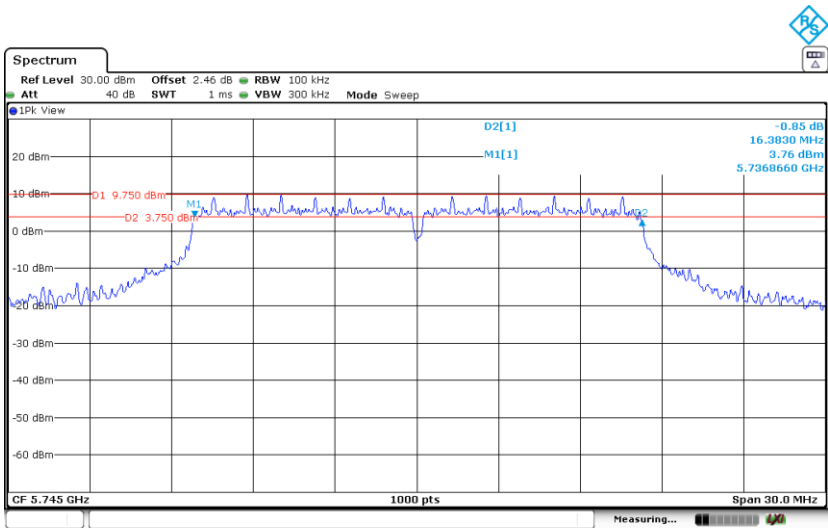
Verdict: PASS

Mode : 802.11a - 20MHz – SISO – CORE Aux

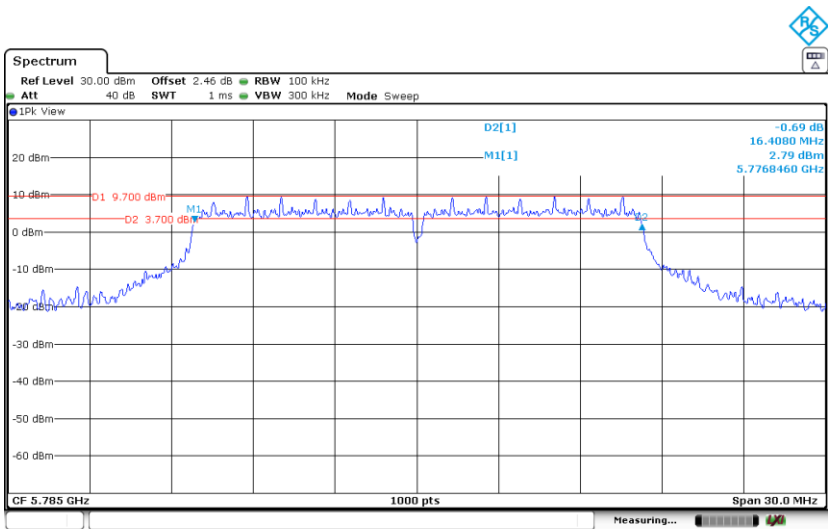
Channel 144



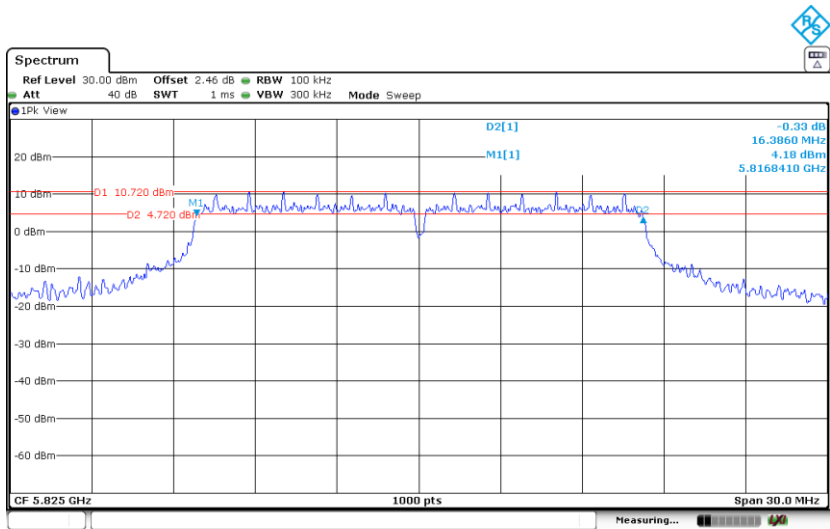
Channel 149



Channel 157

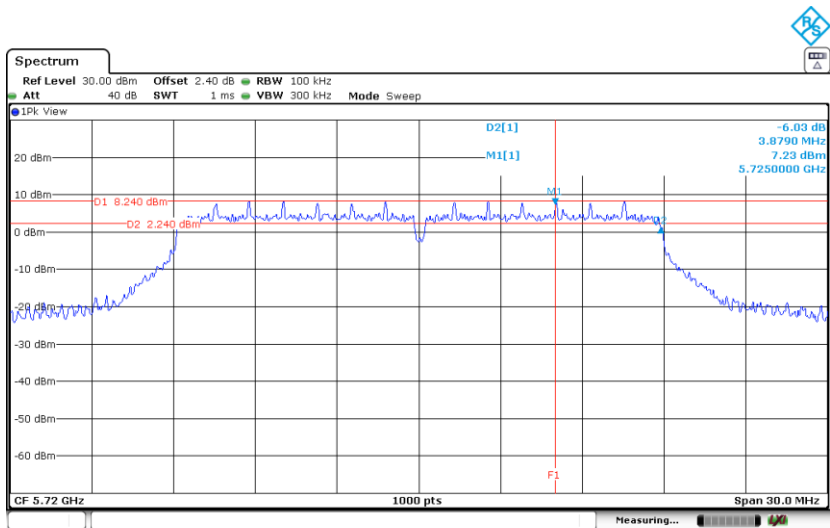


Channel 165

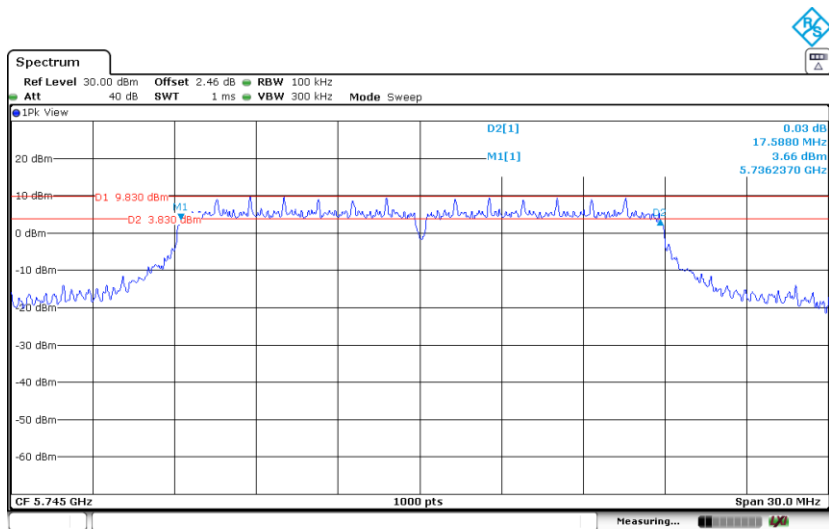


Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

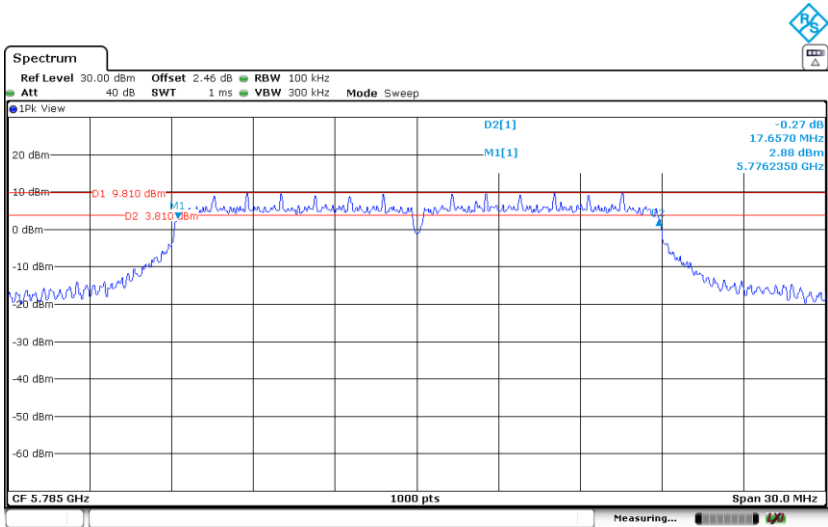
Channel 144



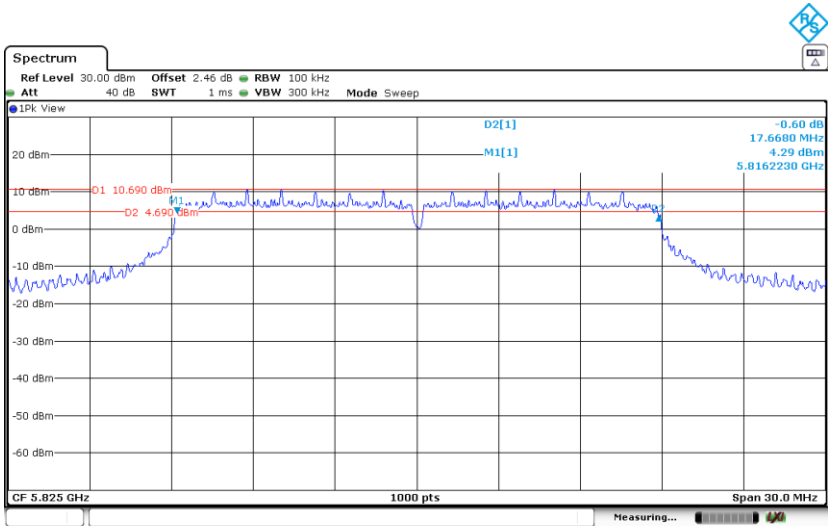
Channel 149



Channel 157

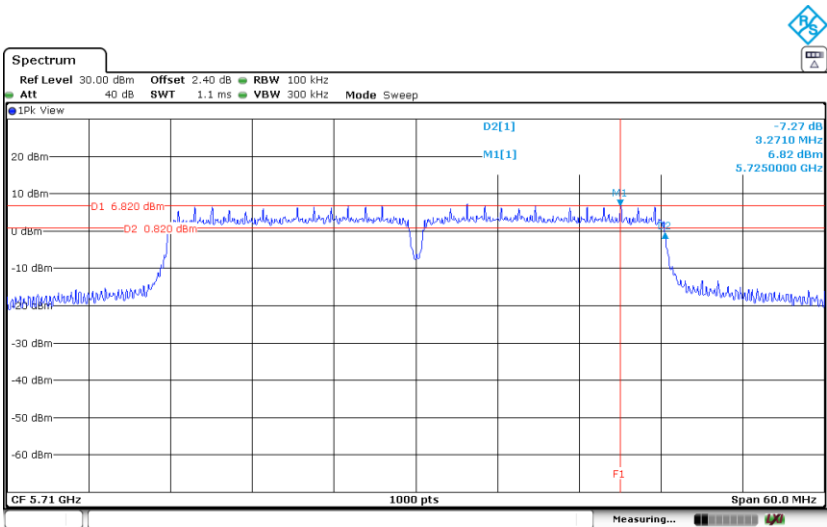


Channel 165

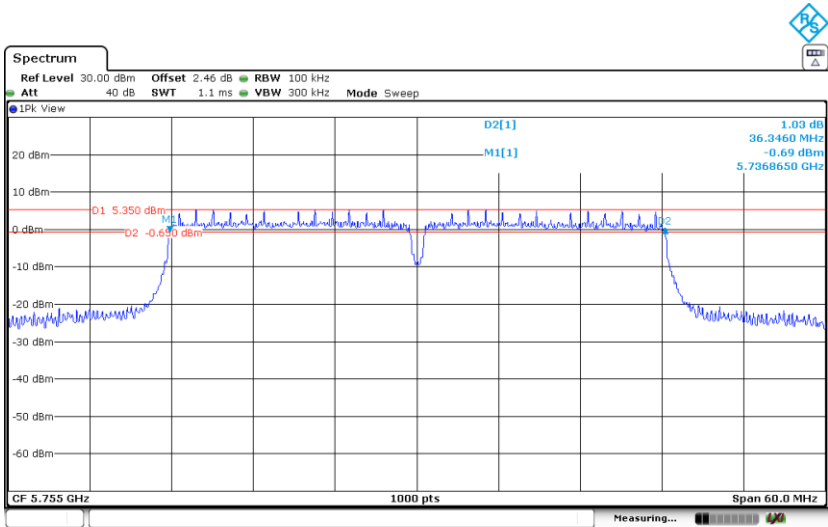


Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

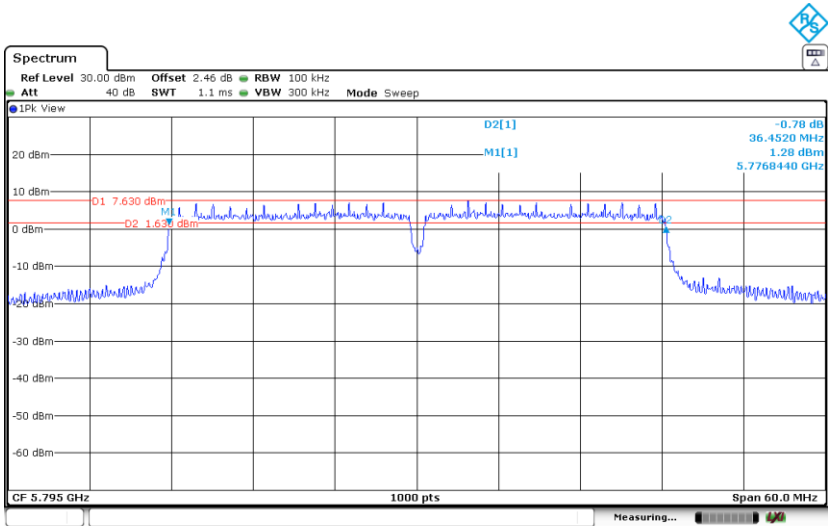
Channel 142



Channel 151

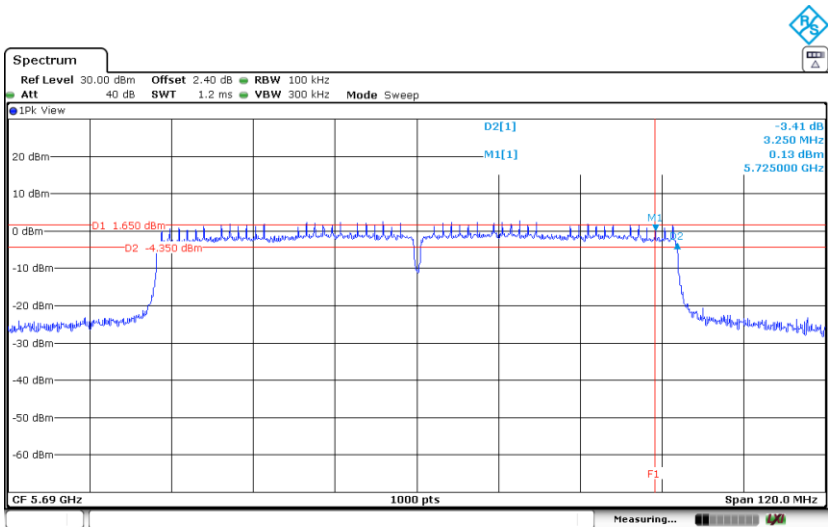


Channel 159

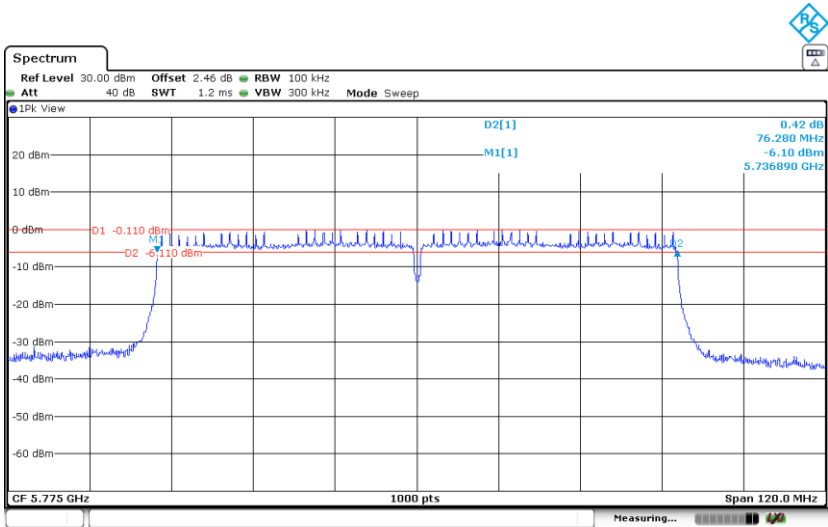


Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

Channel 138



Channel 155



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

SPECIFICATION

FCC 15.407/RSS-247: 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.

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

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

FCC and Canada power setting

Mode : 802.11a - 20MHz – SISO – CORE Aux

Declared antenna gain: 4.42 dBi

	Channel 149 5745 MHz	Channel 157 5785 MHz	Channel 165 5825 MHz
Max. conducted power (dBm)	21.90	21.92	21.94
Conducted Peak Power Limit (dBm)	30		
Margin (dB)	8.10	8.08	8.06
Maximum EIRP power (dBm)	26.32	26.34	26.36
EIRP power Limit (dBm)	36		
Margin (dB)	9.68	9.66	9.64
Measurement uncertainty (dB)	<±1.20		

Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

Declared antenna gain: 4.42 dBi

	Channel 149 5745 MHz	Channel 157 5785 MHz	Channel 165 5825 MHz
Max. conducted power (dBm)	21.84	21.92	21.61
Conducted Peak Power Limit (dBm)	30		
Margin (dB)	8.16	8.08	8.39
Maximum EIRP power (dBm)	26.26	26.34	26.03
EIRP power Limit (dBm)	36		
Margin (dB)	9.74	9.66	9.97
Measurement uncertainty (dB)	<±1.20		

Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

Declared antenna gain: 4.42 dBi

	Channel 151 5755 MHz	Channel 159 5795 MHz
Max. conducted power (dBm)	19.86	21.98
Conducted Peak Power Limit (dBm)	30	
Margin (dB)	10.14	8.02
Maximum EIRP power (dBm)	24.28	26.40
EIRP power Limit (dBm)	36	
Margin (dB)	11.72	9.60
Measurement uncertainty (dB)	<±1.20	

Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

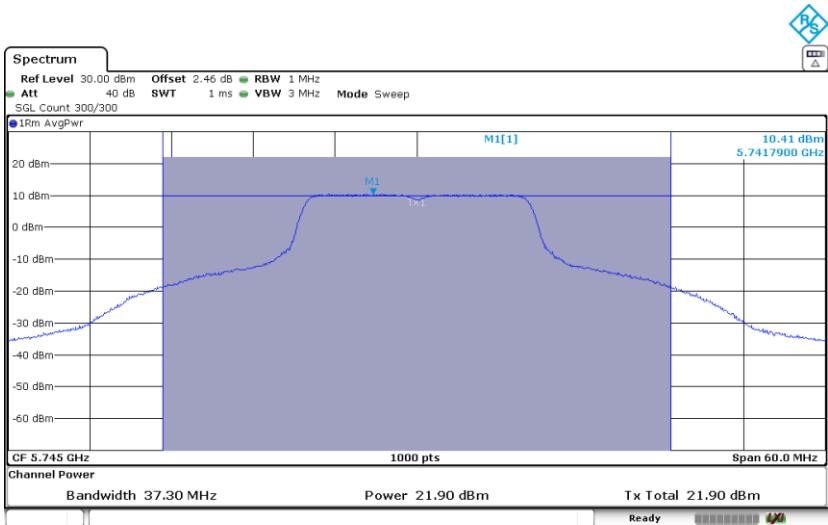
Declared antenna gain: 4.42 dBi

	channel 155 5775 MHz
Max. conducted power (dBm)	16.64
Duty Cycle Correction Factor (dB)	0.18
Max. conducted power corrected (dBm)	16.82
Conducted Peak Power Limit (dBm)	30
Margin (dB)	13.18
Maximum EIRP power (dBm)	21.24
EIRP power Limit (dBm)	36
Margin (dB)	14.76
Measurement uncertainty (dB)	<±1.20

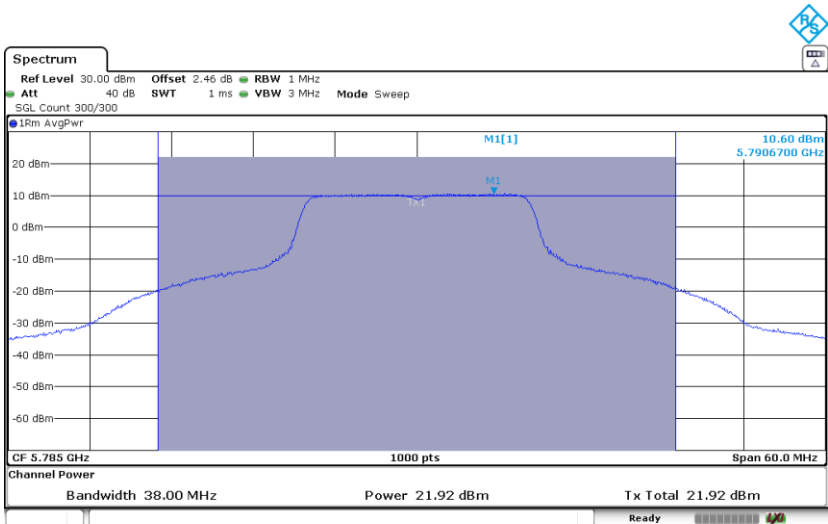
Verdict: PASS

Mode : 802.11a - 20MHz – SISO – CORE Aux

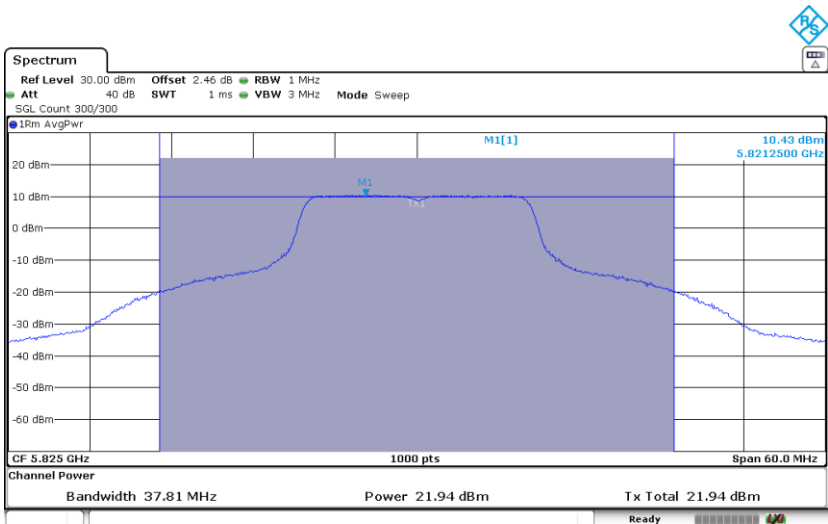
Channel 149



Channel 157

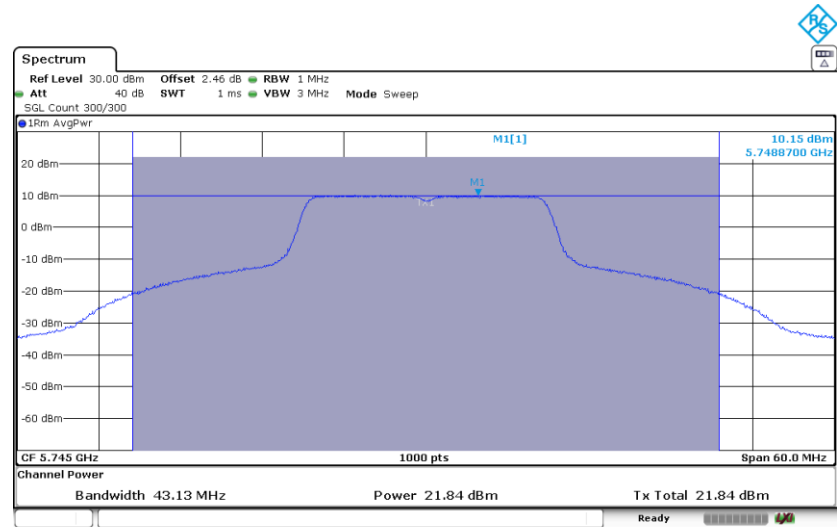


Channel 165

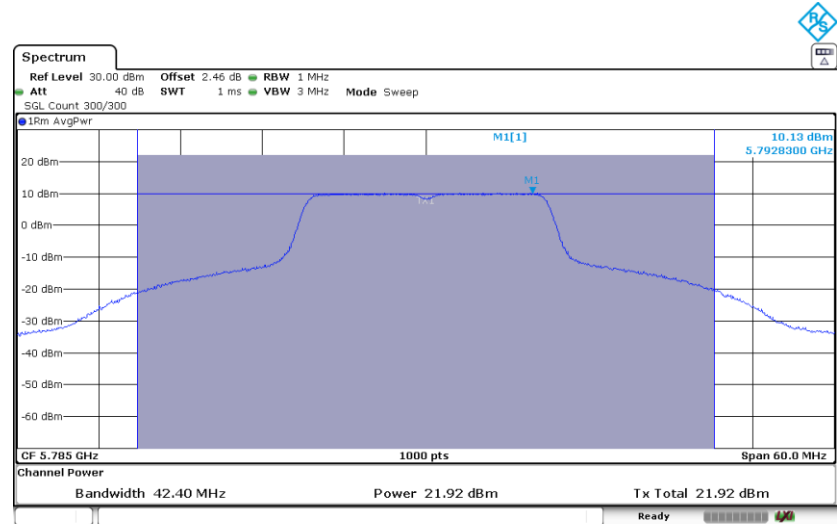


Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

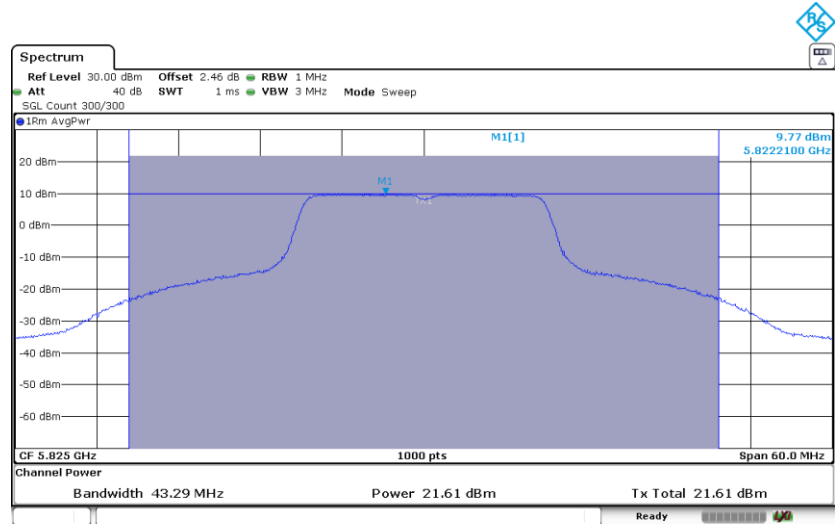
Channel 149



Channel 157

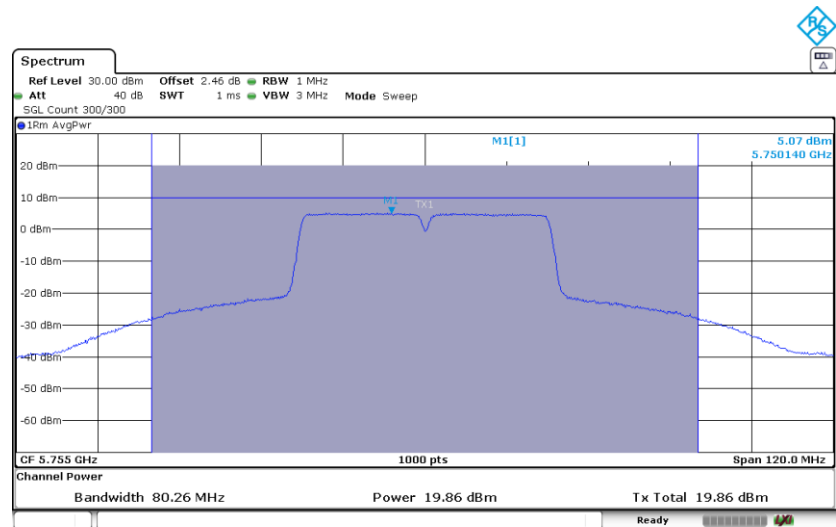


Channel 165

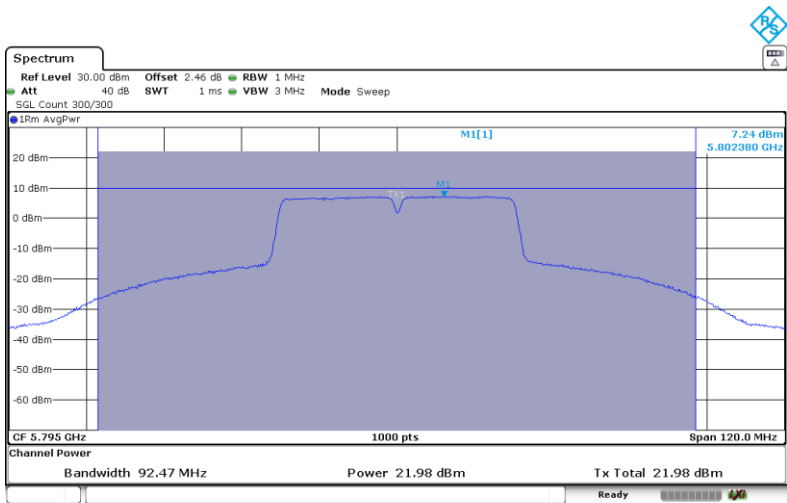


Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

Channel 151

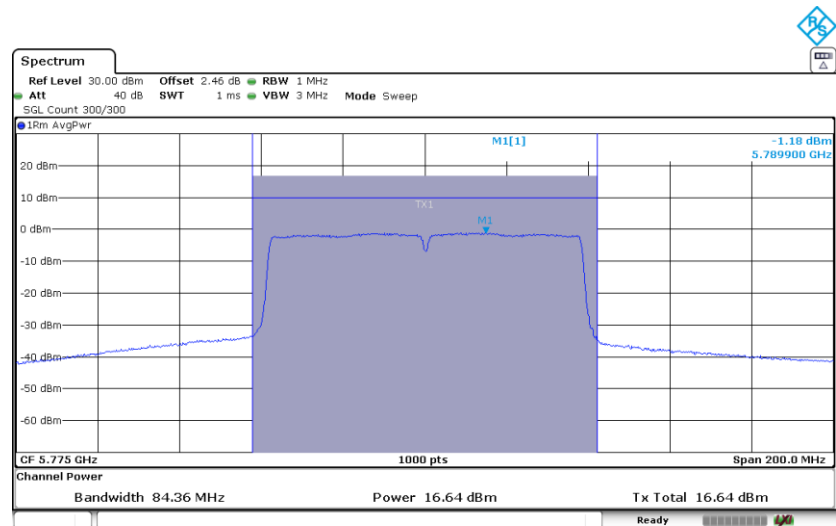


Channel 159



Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

Channel 155



FCC Section 15.407 Subclause (a)(3)/ RSS-247 6.2.4.1 Transmitter Peak Power Spectral Density

FCC 15.407/RSS-247: 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) and E.2.b) (Method SA-2) of Guidance 789033 D02 General UNII Test Procedures New Rules v02r01.

In accordance with ANSI C63.10 Section 4.1.4.1, use of bandwidths greater than those specified can produce higher readings. Compliance against the applicable limits is shown using a 1 MHz resolution bandwidth. This was deemed worst case.

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

The PSD test uses the same setup than the transmitter maximum conducted output power test. The result of the Peak PSD was measured by collocation a meter on the peak of the signal and the results are in the tables below.

FCC and Canada power setting

Mode : 802.11a - 20MHz – SISO – CORE Aux

	Channel 149 5745 MHz	Channel 157 5785 MHz	Channel 165 5825 MHz
PSD (dBm/MHz)	10.41	10.60	10.43
PSD Limit (dBm/500KHz)	30		
Margin (dB)	19.59	19.40	19.57
Measurement uncertainty (dB)	<±1.20		

Mode : 802.11n HT20 - 20MHz – SISO – CORE Aux

	Channel 149 5745 MHz	Channel 157 5785 MHz	Channel 165 5825 MHz
PSD (dBm/MHz)	10.15	10.13	9.77
PSD Limit (dBm/500KHz)	30		
Margin (dB)	19.85	19.87	20.23
Measurement uncertainty (dB)	<±1.20		

Mode : 802.11n HT40 - 40MHz – SISO – CORE Aux

	Channel 151 5755 MHz	Channel 159 5795 MHz
PSD (dBm/MHz)	5.07	7.24
PSD Limit (dBm/500KHz)	30	
Margin (dB)	24.93	22.76
Measurement uncertainty (dB)	<±1.20	

Mode : 802.11ac VHT80 - 80MHz – SISO – CORE Aux

	Channel 155 5775 MHz
PSD (dBm/MHz)	-1.18
Duty Cycle Correction Factor (dB)	0.18
PSD Corrected (dBm/MHz)	-1
PSD Limit (dBm/500KHz)	30
Margin (dB)	31
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

FCC Section 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 3 m for the frequency range 30 MHz-40 GHz.

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.

Core Aux allows the simultaneous Wi-Fi transmission in both bands (2.4GHz and 5GHz).Core Aux shares the third antenna from the main radio and cannot operate completely independently from the main radio.

The tests were performed in worst case with the equipment transmitting with Core Aux (802.11n HT20) in channel 165 (5825MHz) and with WiFi 2.4GHz (802.11 n HT20 MIMO 3Tx) in channel 13 (2472MHz).

Mode: 802.11n HT20 – Core Aux (5825MHz) + 802.11n HT20 – CDD – 20MHz – MIMO – CORE 0 & CORE 1 & CORE 2 (2472MHz)

Frequency range 30 MHz-1000 MHz.

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

Spurious levels operating (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Uncertainty (dB)
36.321	Vertical	Quasi-Peak	23.8	40	16.2	± 3.88
144.832	Horizontal	Quasi-Peak	28.7	43.5	14.8	± 3.88
167.401	Horizontal	Quasi-Peak	37	43.5	6.5	± 3.88
180.431	Horizontal	Quasi-Peak	30	43.5	13.5	± 3.88
192.621	Horizontal	Quasi-Peak	28.9	43.5	14.6	± 3.88

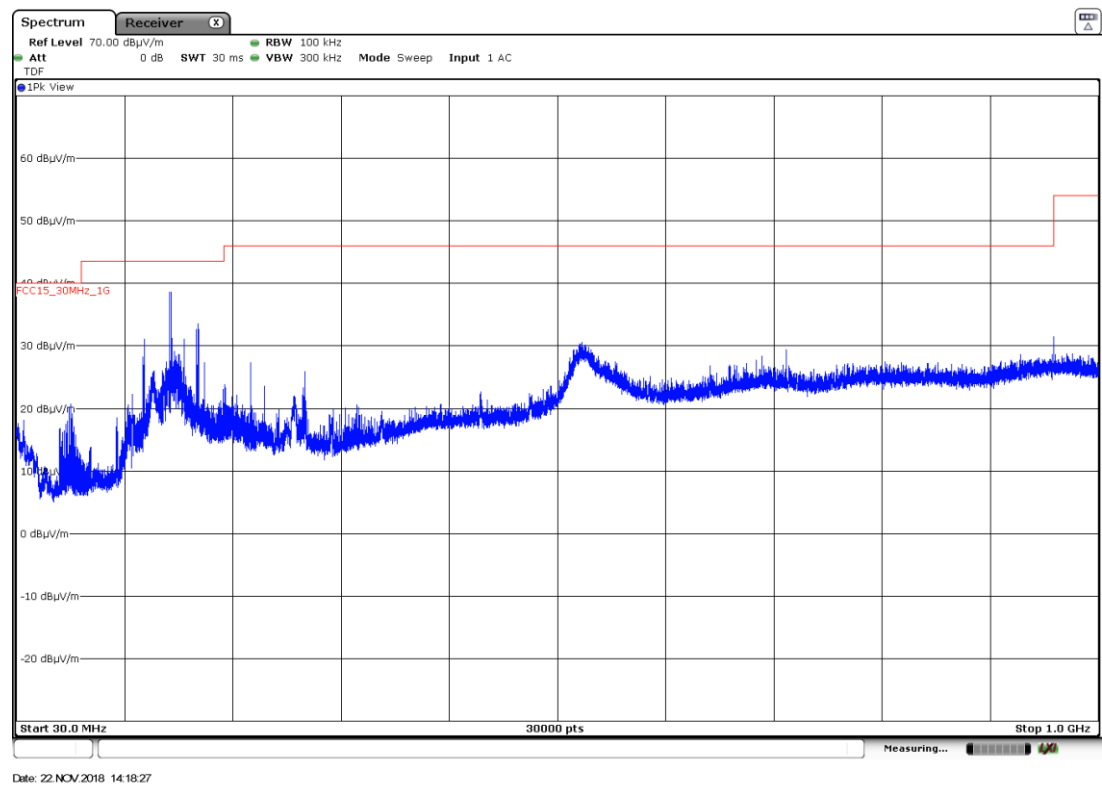
Frequency range 1 GHz-40 GHz

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

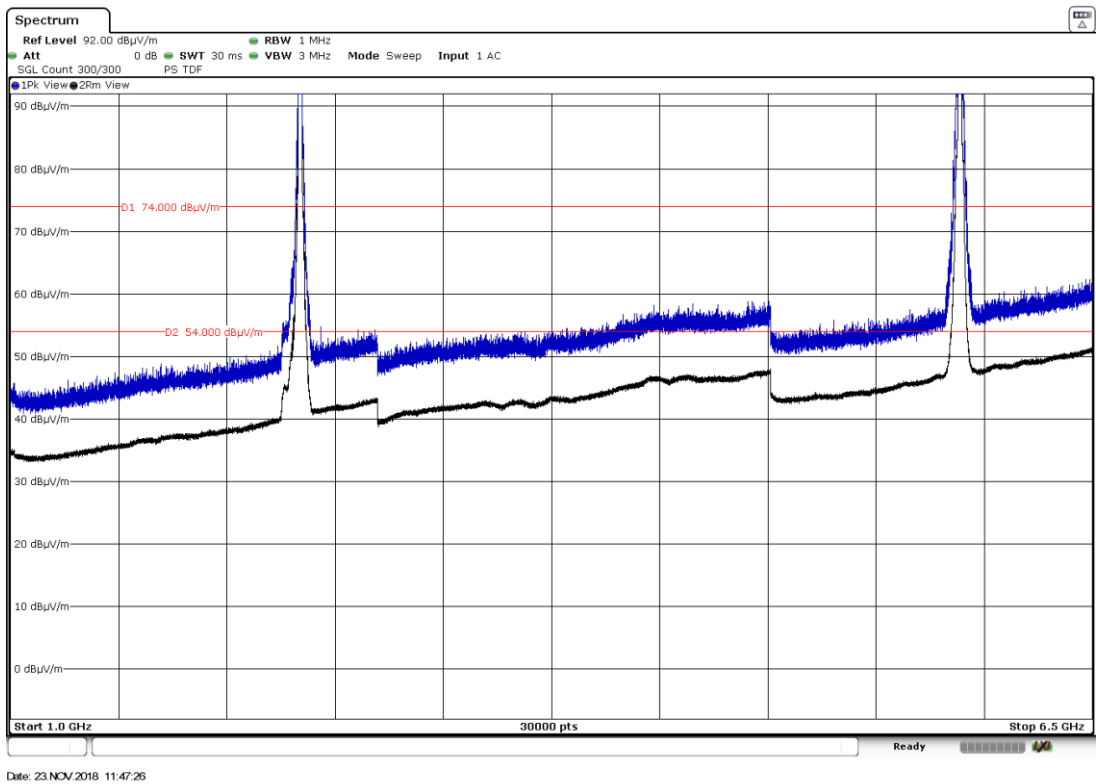
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Uncertainty (dB)
7421.380	Horizontal	Peak	50.14	74	23.86	± 3.05
7418.223		Average	39.72	54	14.28	± 3.05

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

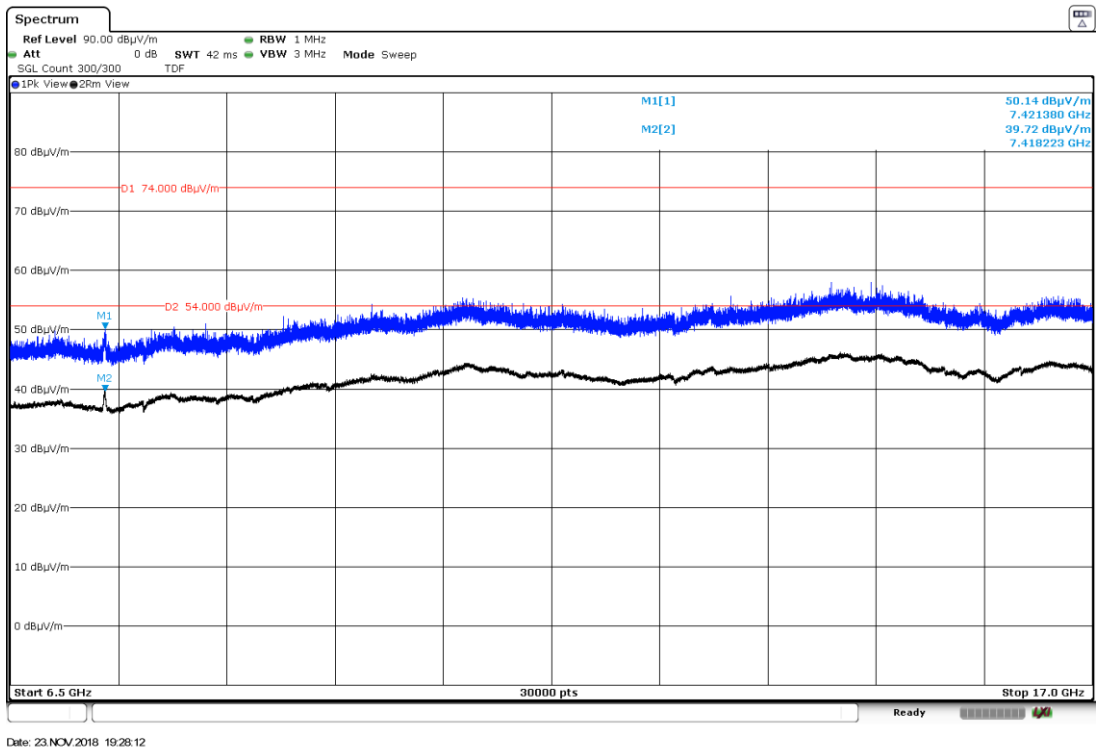


FREQUENCY RANGE 1 GHz to 6.5 GHz.

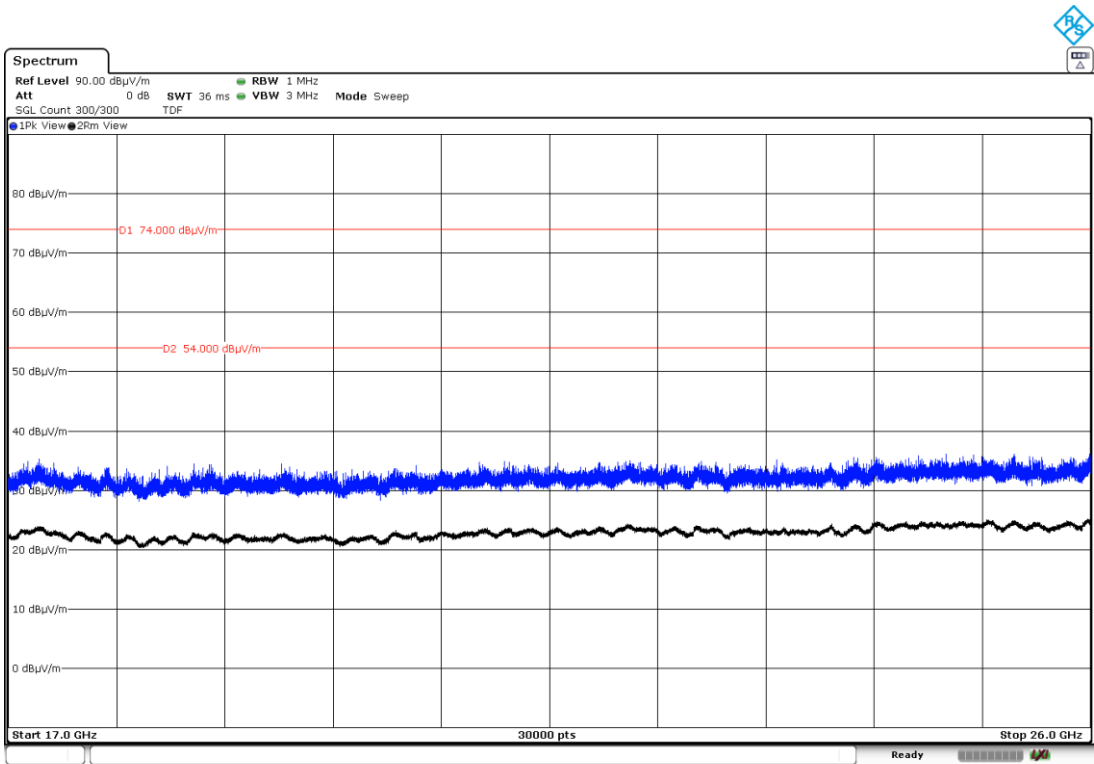


Note: The peak shown in the plot above the limit is the carrier frequency.

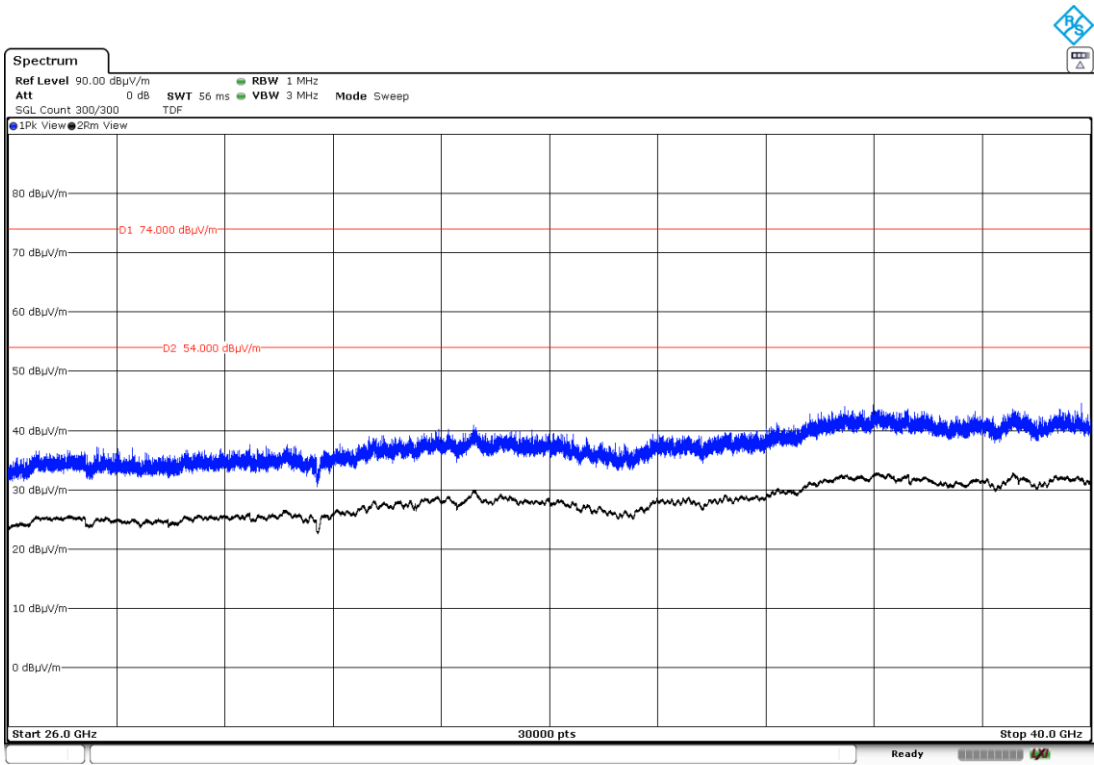
FREQUENCY RANGE 6.5 GHz to 17 GHz.



FREQUENCY RANGE 17 GHz to 26 GHz.



FREQUENCY RANGE 26 GHz to 40 GHz.



FCC Section 15.407 Subclause (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:

- 802.11a: 6 Mbit/s / SISO on Core Aux
- 802.11n HT20: MCS0 / SISO on Core Aux
- 802.11n HT40: MCS0 / SISO on Core Aux
- 802.11ac VHT80: MCS0x1 / SISO on Core Aux

Results for Mode: 802.11a - 20 MHz – SISO – CORE Aux

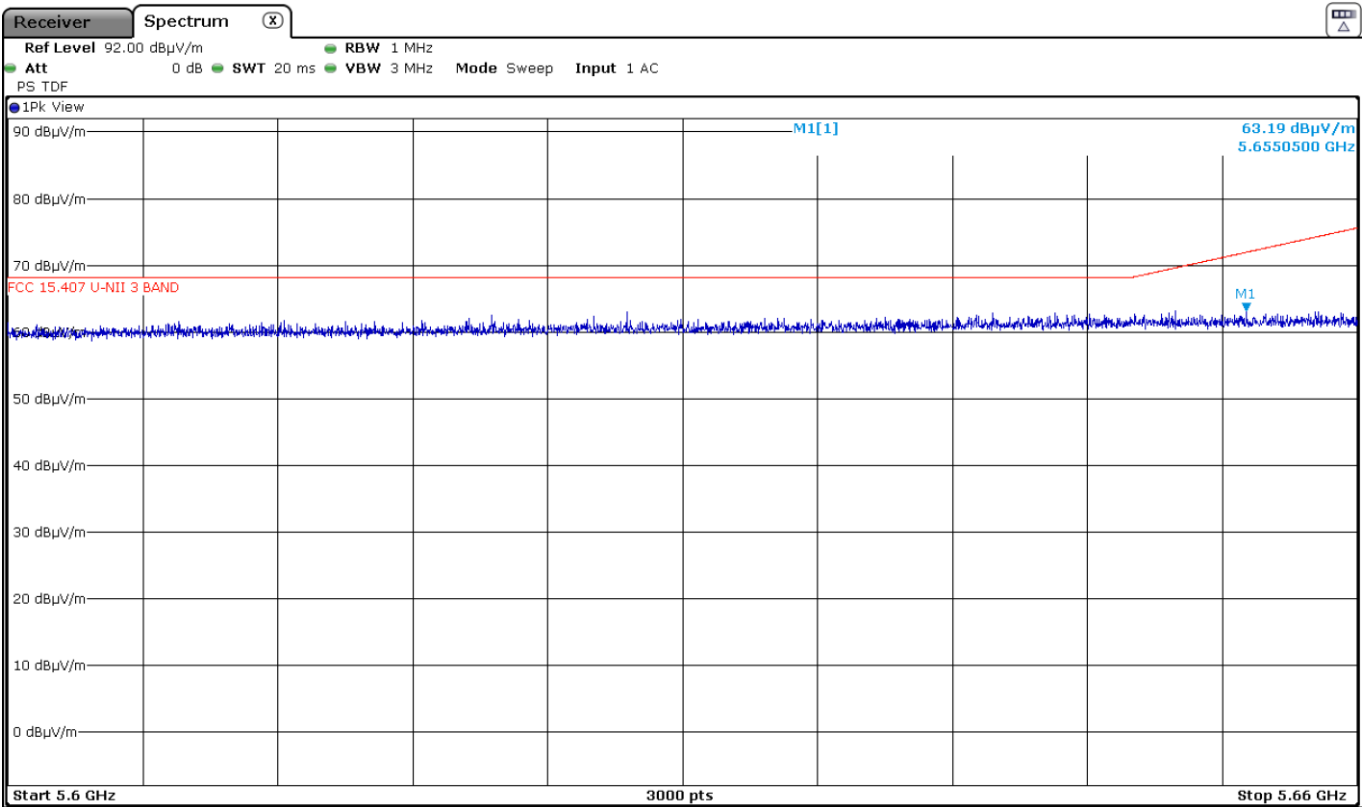
Results: Peak / Channel 149

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5724.963	Vertical	94.51	121.92	27.41	<± 3.05	PASS

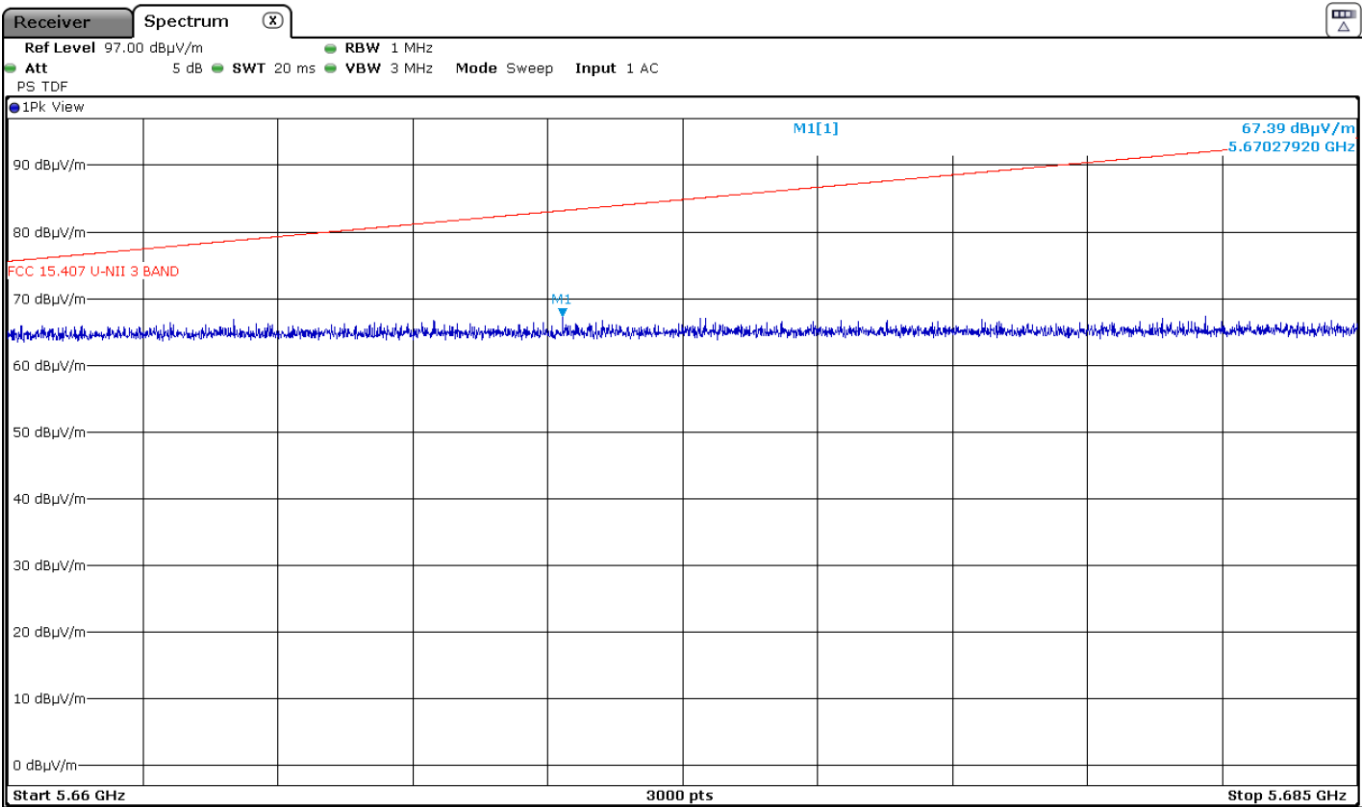
Results: Peak / Channel 165

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5850.338	Vertical	91.77	121.23	29.46	<± 3.05	PASS

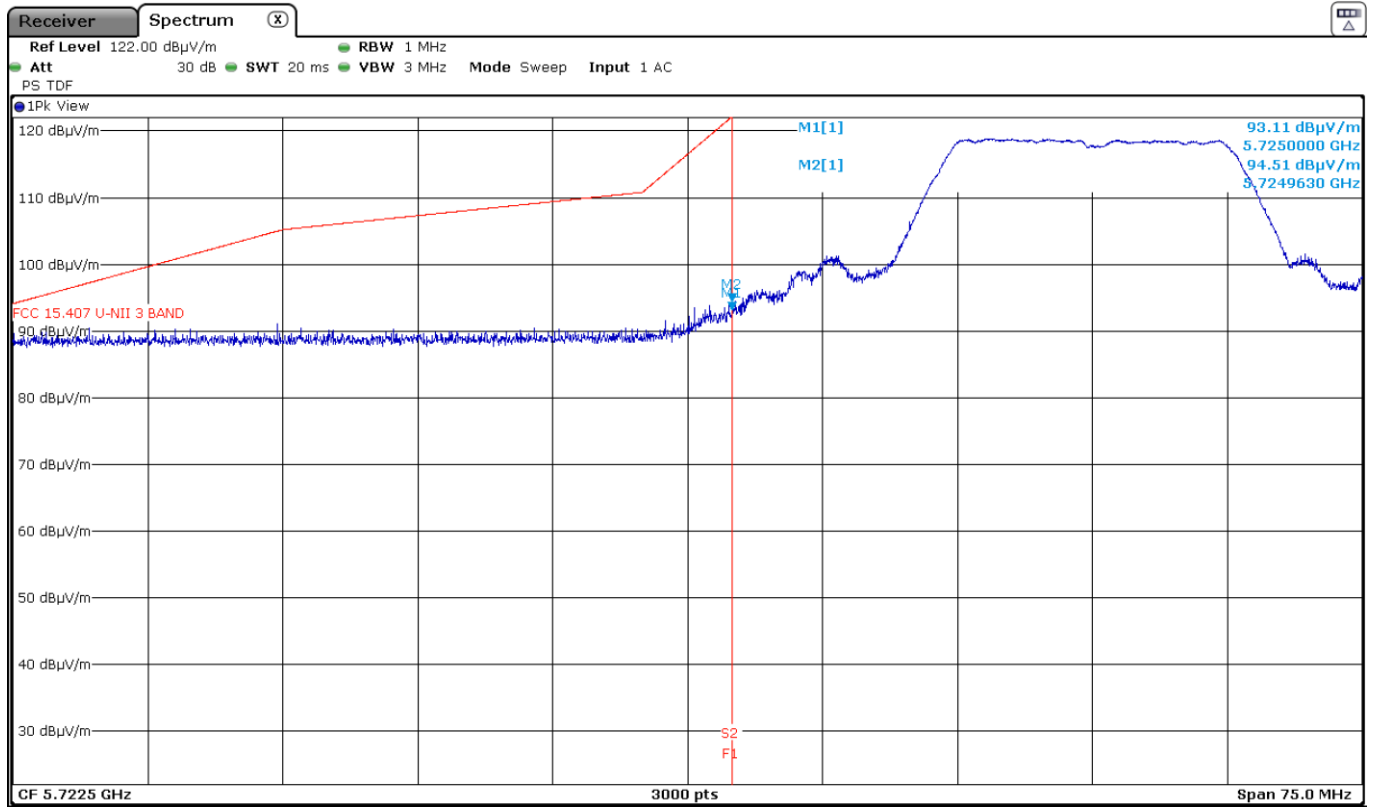
Lower Band Edge Channel 149 Plot 1



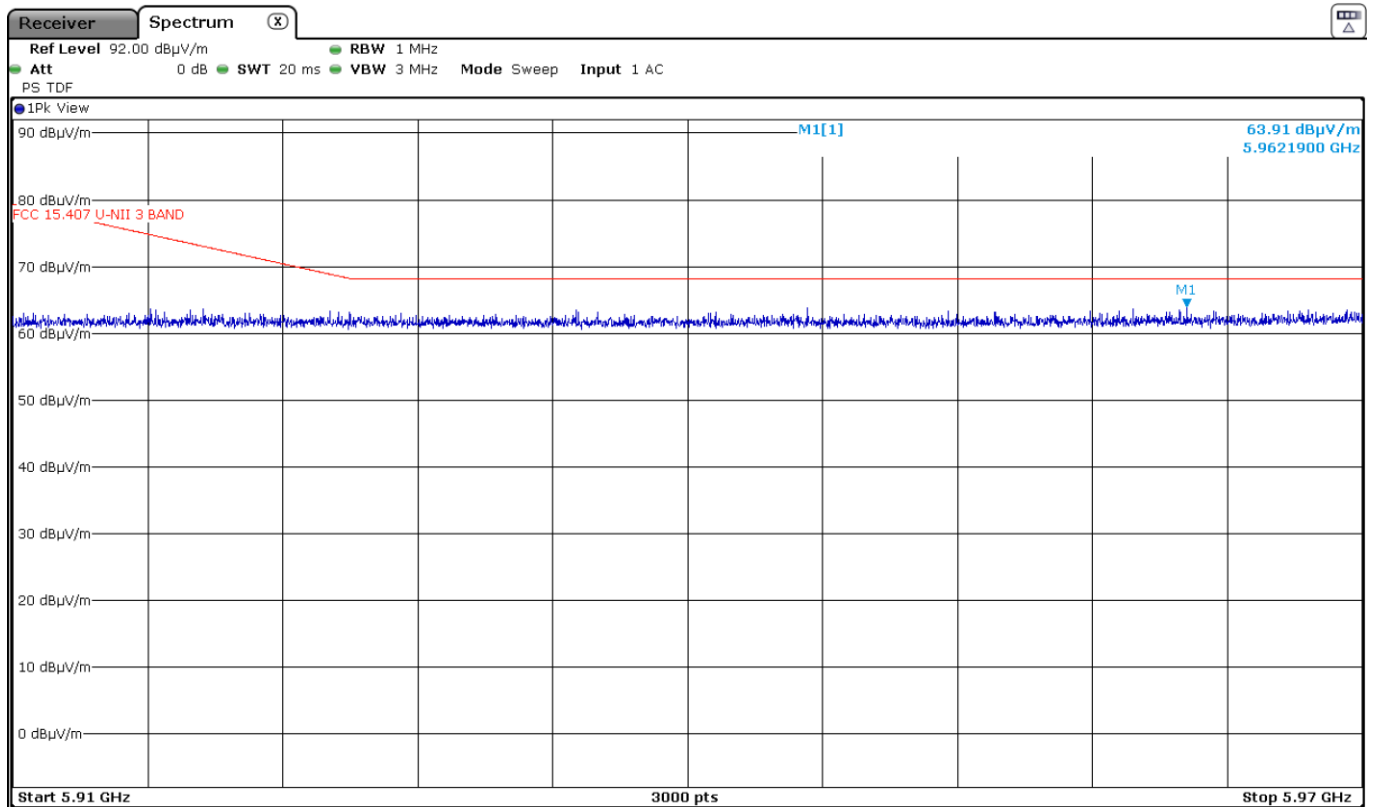
Lower Band Edge Channel 149 Plot 2



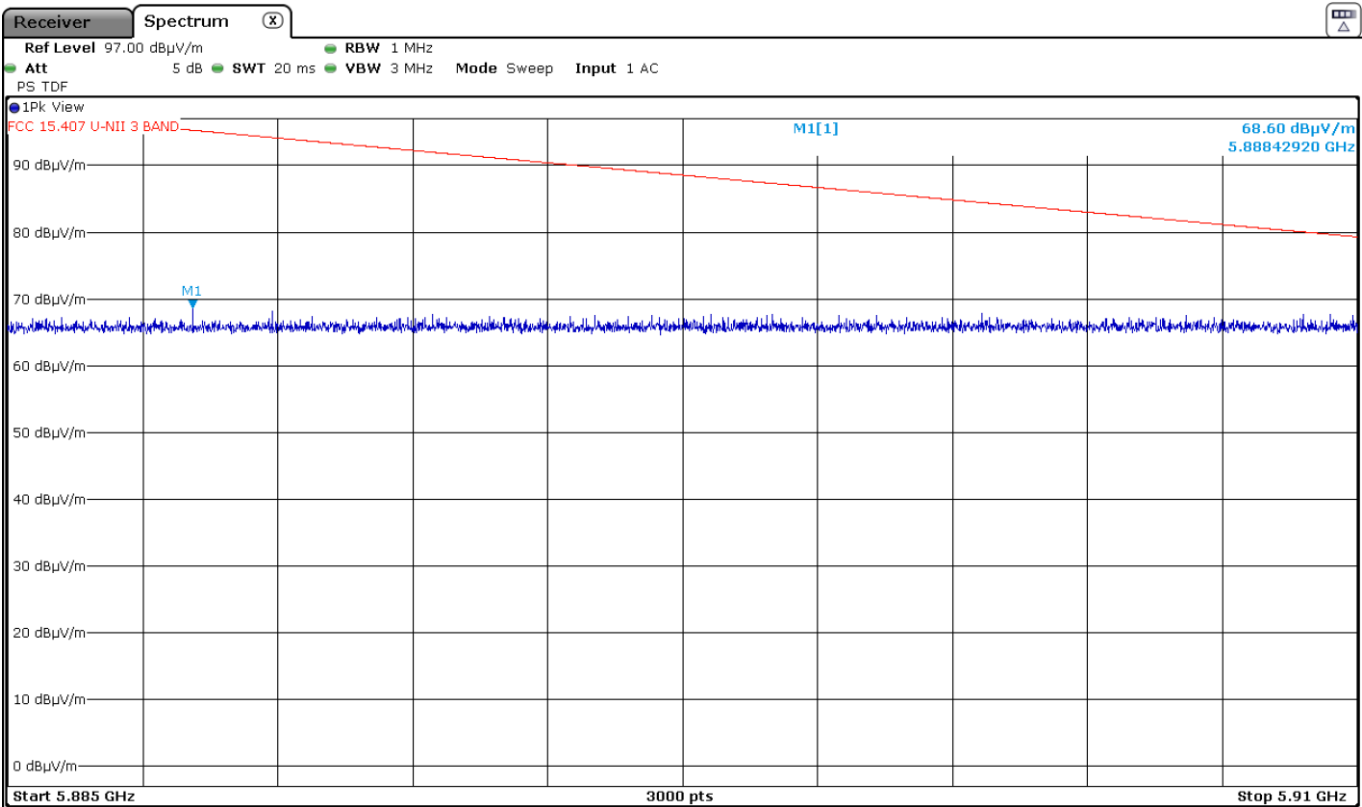
Lower Band Edge Channel 149 Plot 3



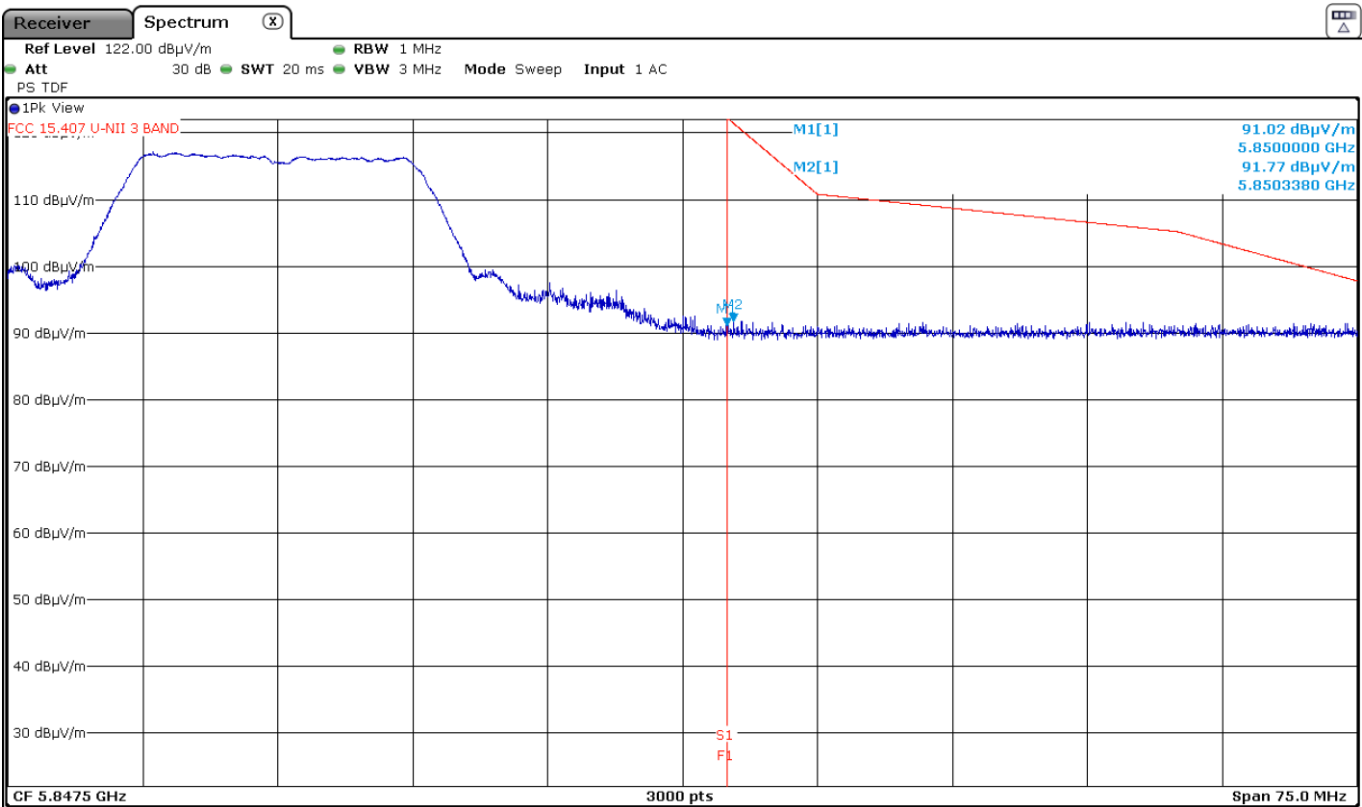
Upper Band Edge Channel 165 Plot 1



Upper Band Edge Channel 165 Plot 2



Upper Band Edge Channel 165 Plot 3



Results: 802.11n HT20 - 20 MHz – SISO - CORE Aux

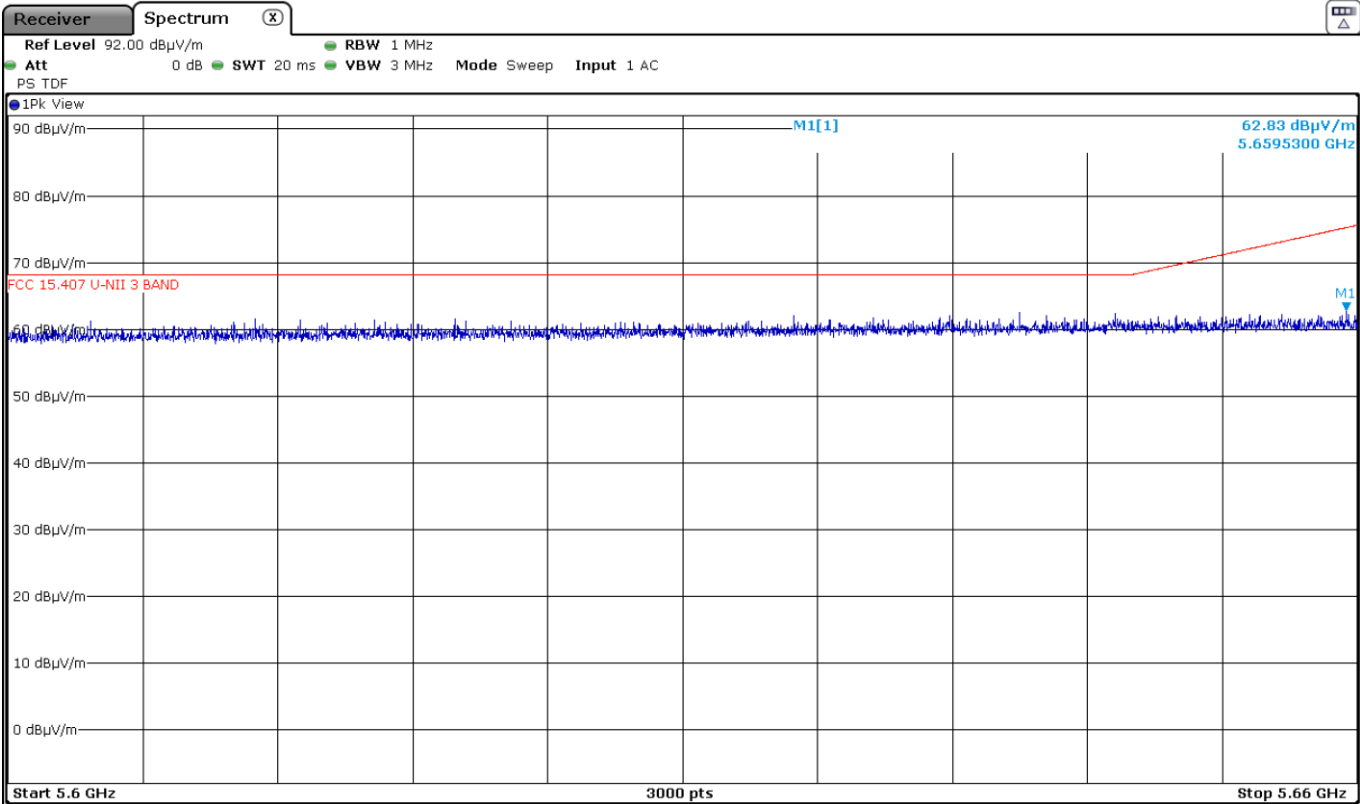
Results: Peak / Channel 149

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5724.963	Vertical	97.08	121.92	24.84	<± 3.05	PASS

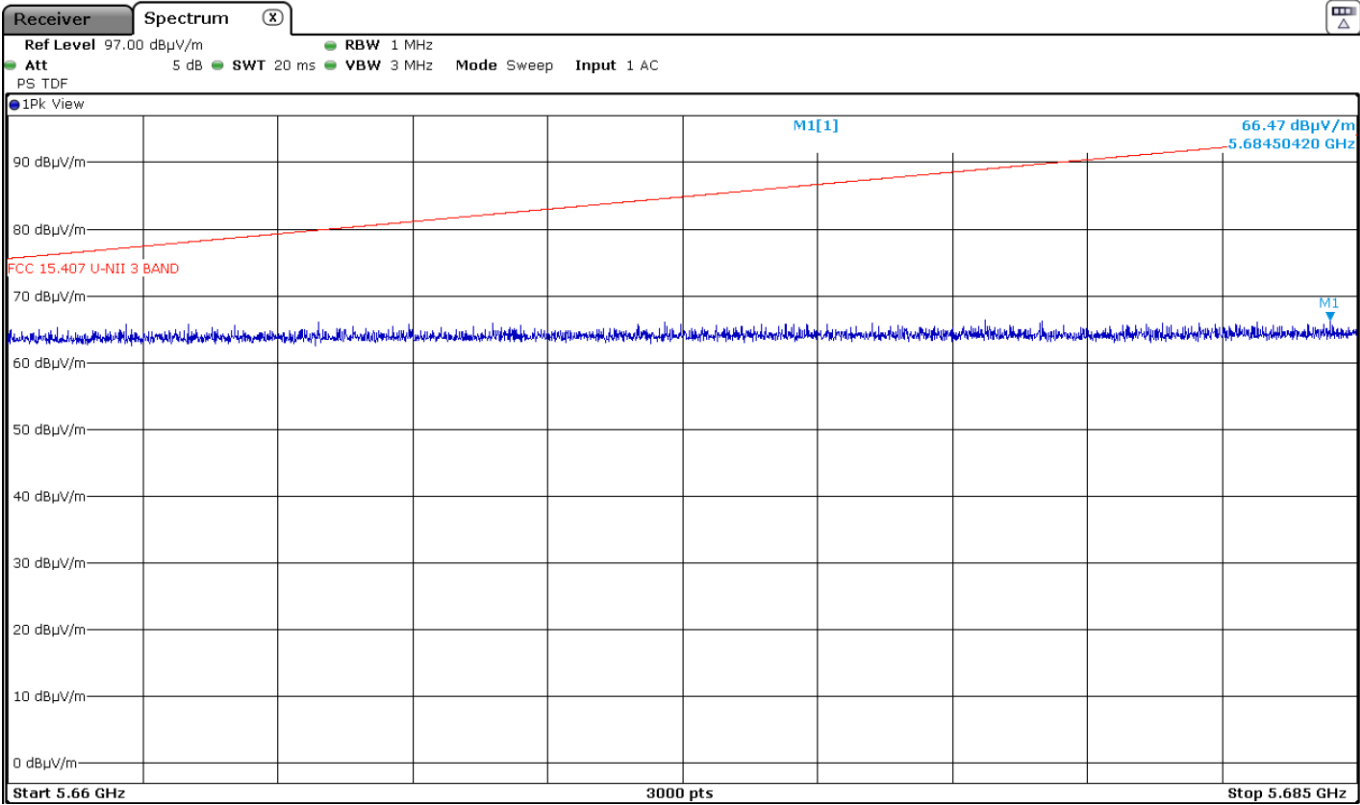
Results: Peak / Channel 165

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5858.488	Vertical	92.17	109.82	17.65	<± 3.05	PASS

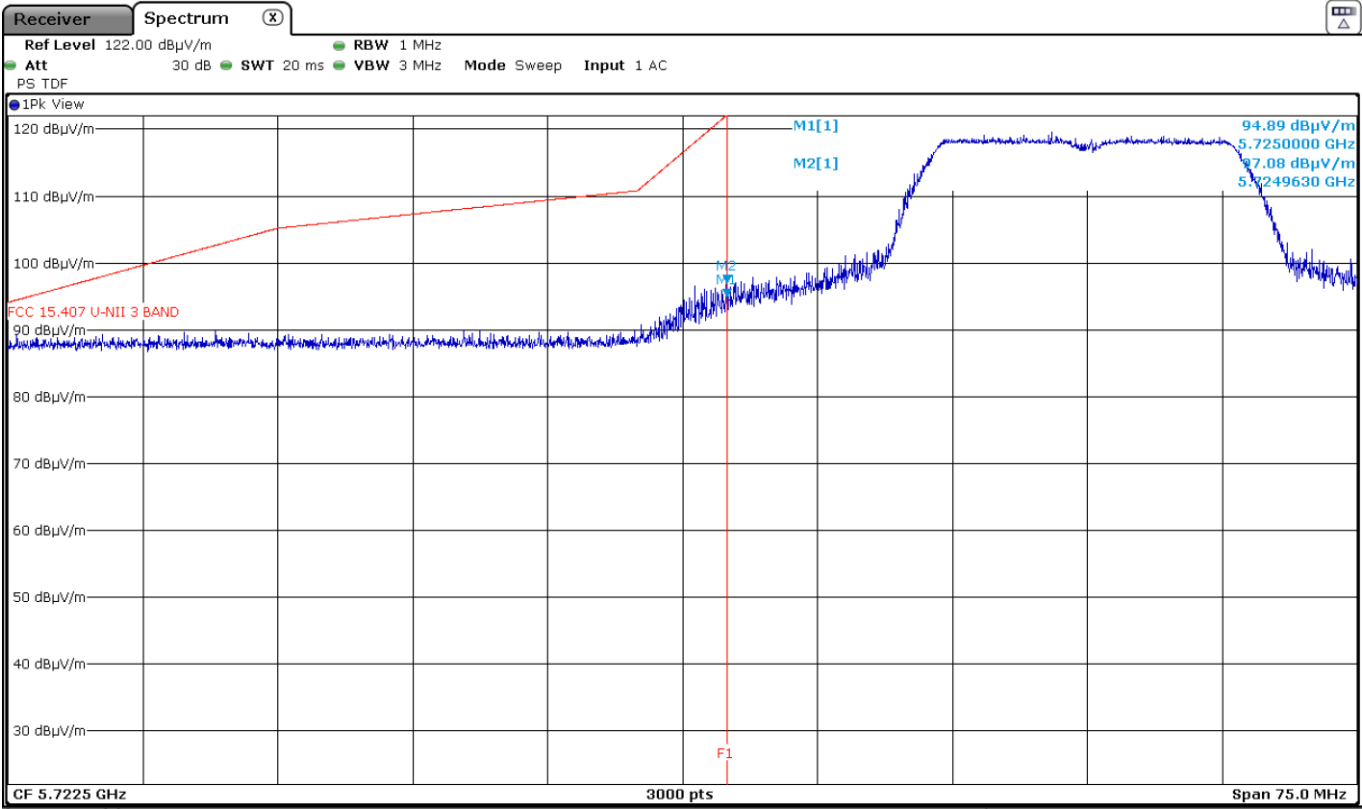
Lower Band Edge Channel 149 Plot 1



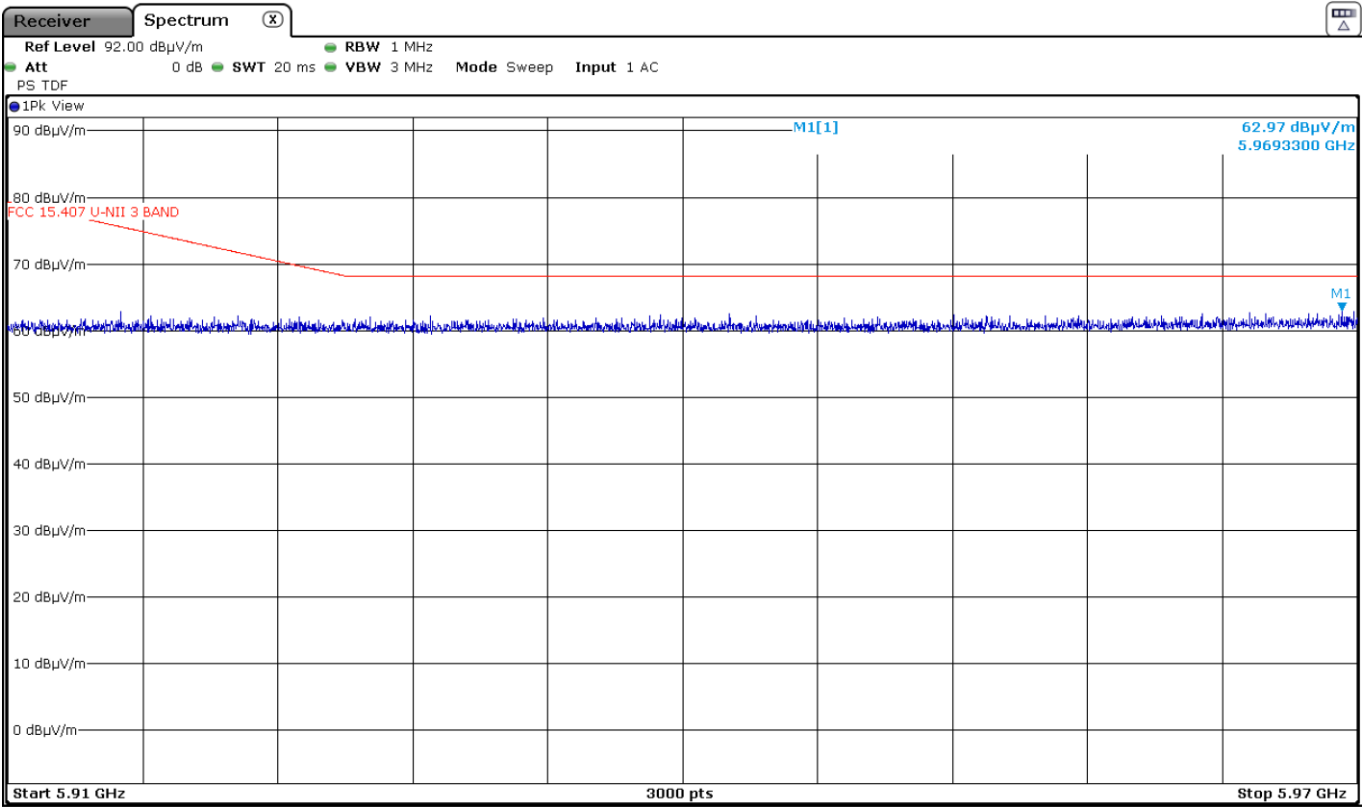
Lower Band Edge Channel 149 Plot 2



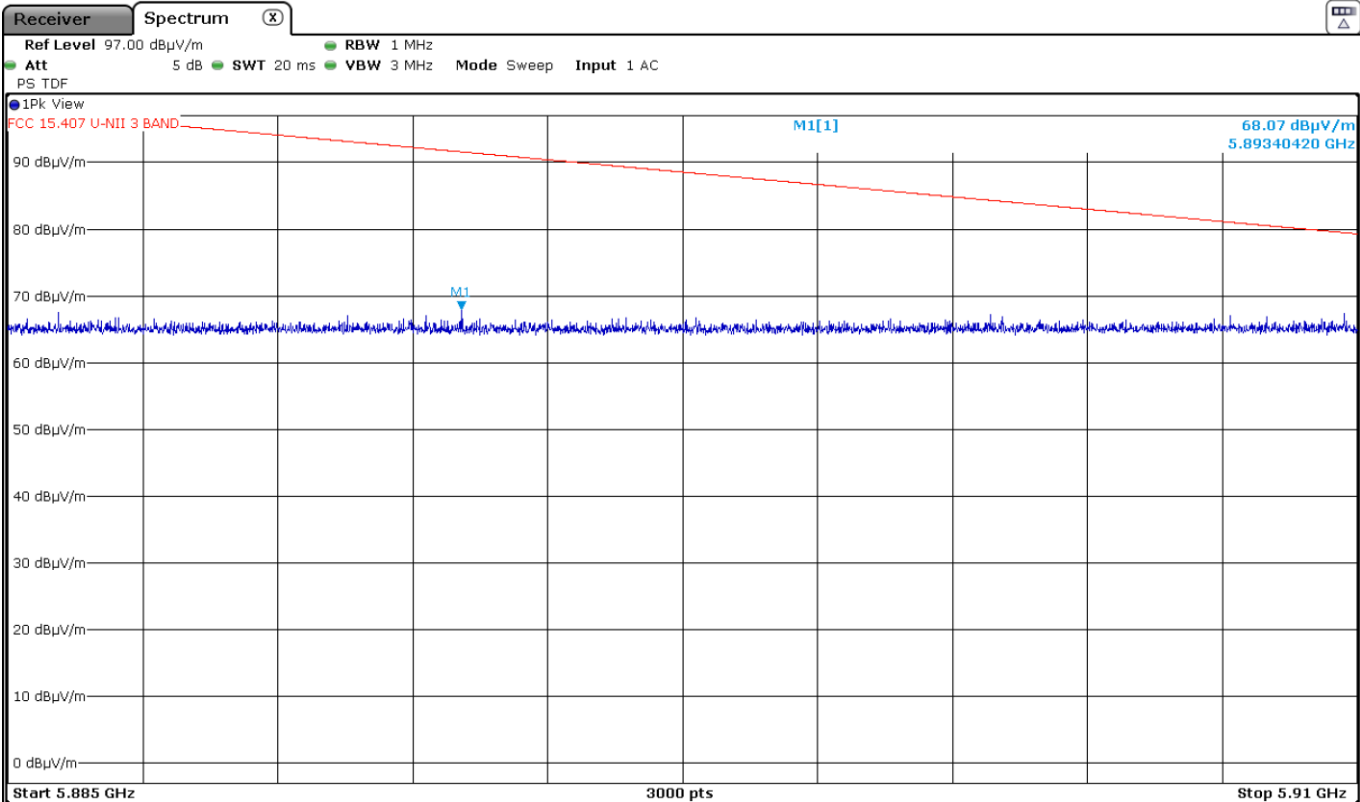
Lower Band Edge Channel 149 Plot 3



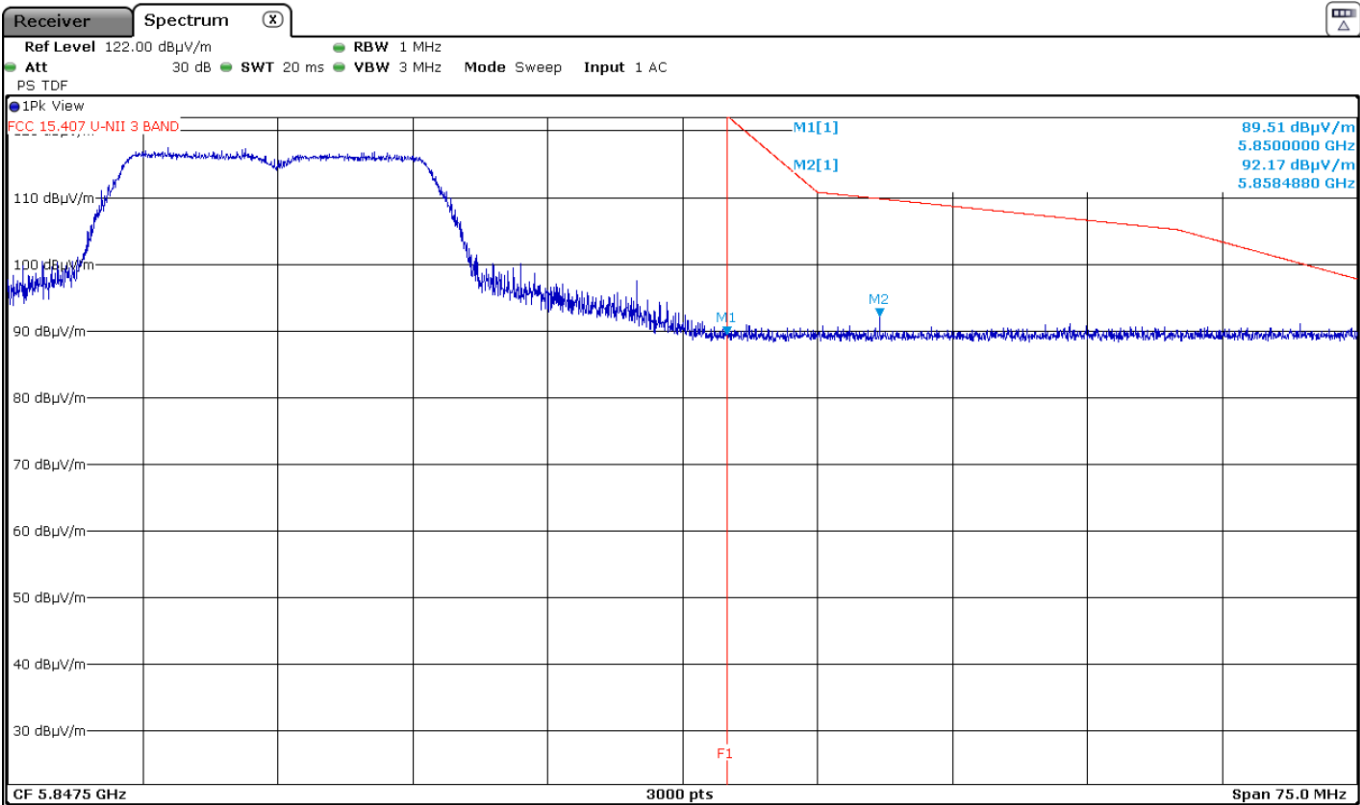
Upper Band Edge Channel 165 Plot 1



Upper Band Edge Channel 165 Plot 2



Upper Band Edge Channel 165 Plot 3



Results for Mode: 802.11n HT40 - 40 MHz – SISO - Core Aux

Results: Peak / Channel 151

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5650.790	Vertical	66.64	74.67	8.03	<± 3.08	PASS

Results: Peak / Channel 159

Frequency (MHz)	Antenna Polarity	Peak Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement uncertainty (dB)	Verdict
5912.550	Vertical	66.17	77.41	11.24	<± 3.08	PASS