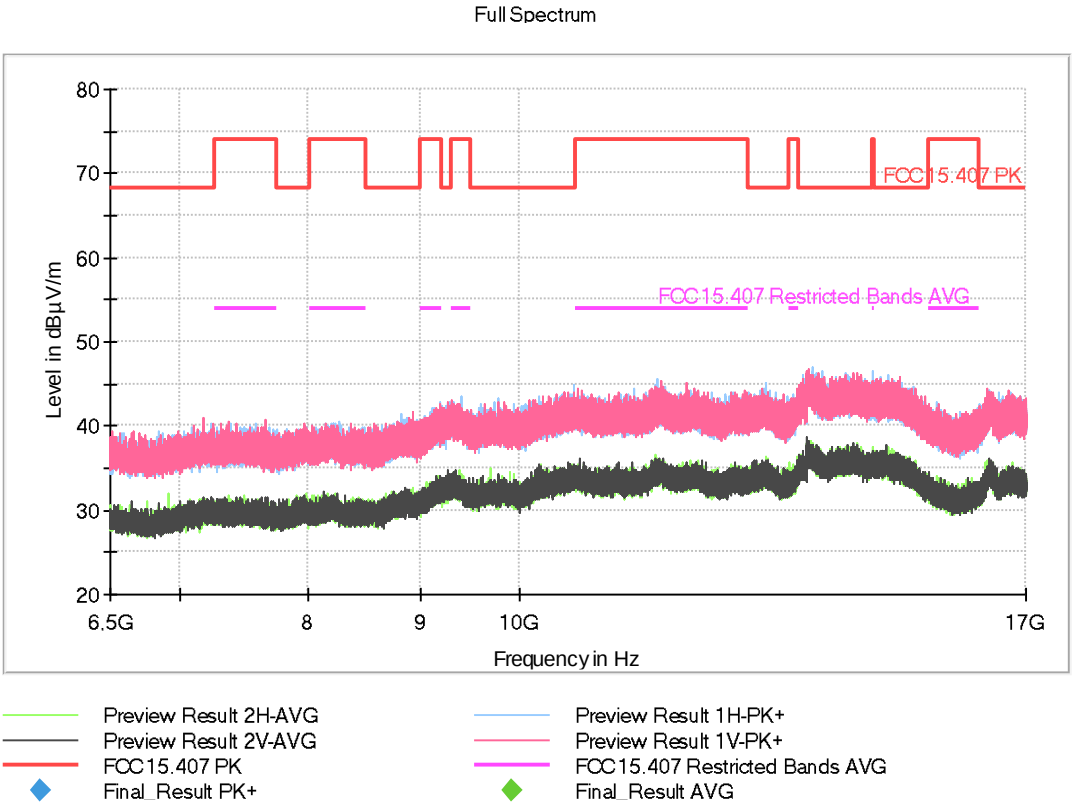
Active Port = 1 Frequency Range GHz = [6.5, 17]

Frequency MHz = 5270.00000 Modulation = 802.11n HT40 (OFDM MCS0)

MIMO Mode = SISO

Images:



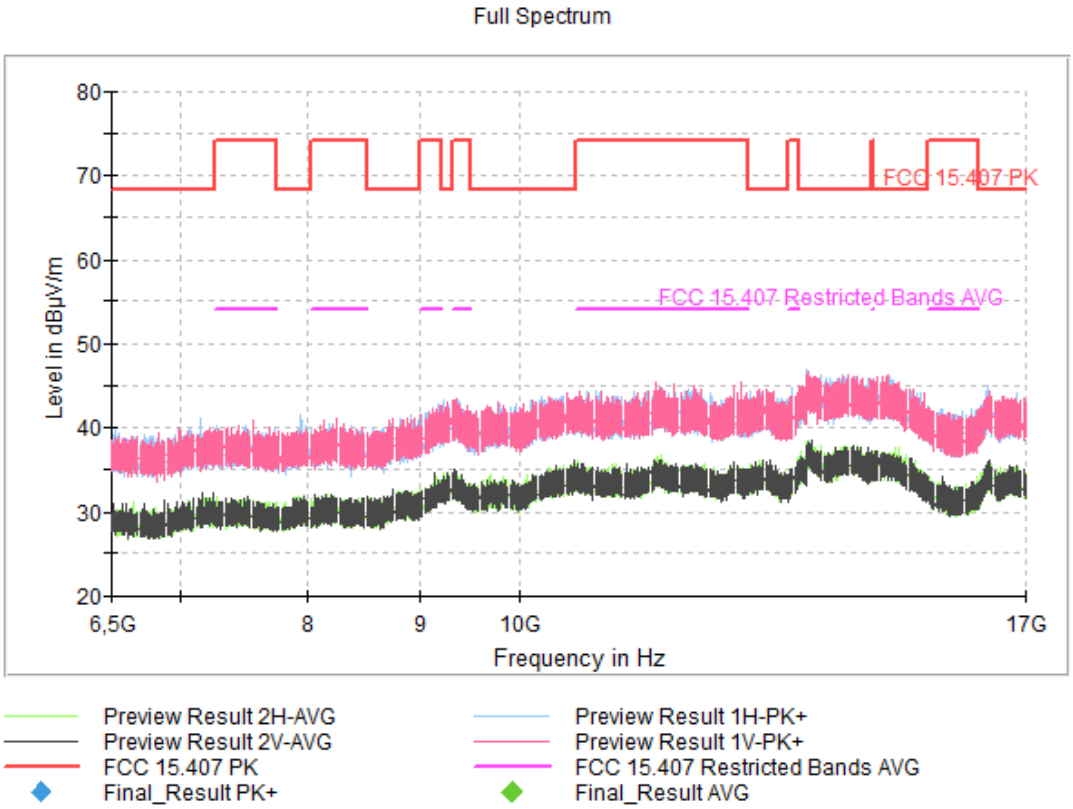
Firmado digitalmente por 53680346W JOSE MANUEL GOMEZ (C:A29507456)

Active Port = 1 Frequency Range GHz = [6.5, 17]

Frequency MHz = 5310.00000 Modulation = 802.11n HT40 (OFDM MCS0)

MIMO Mode = SISO

Images:

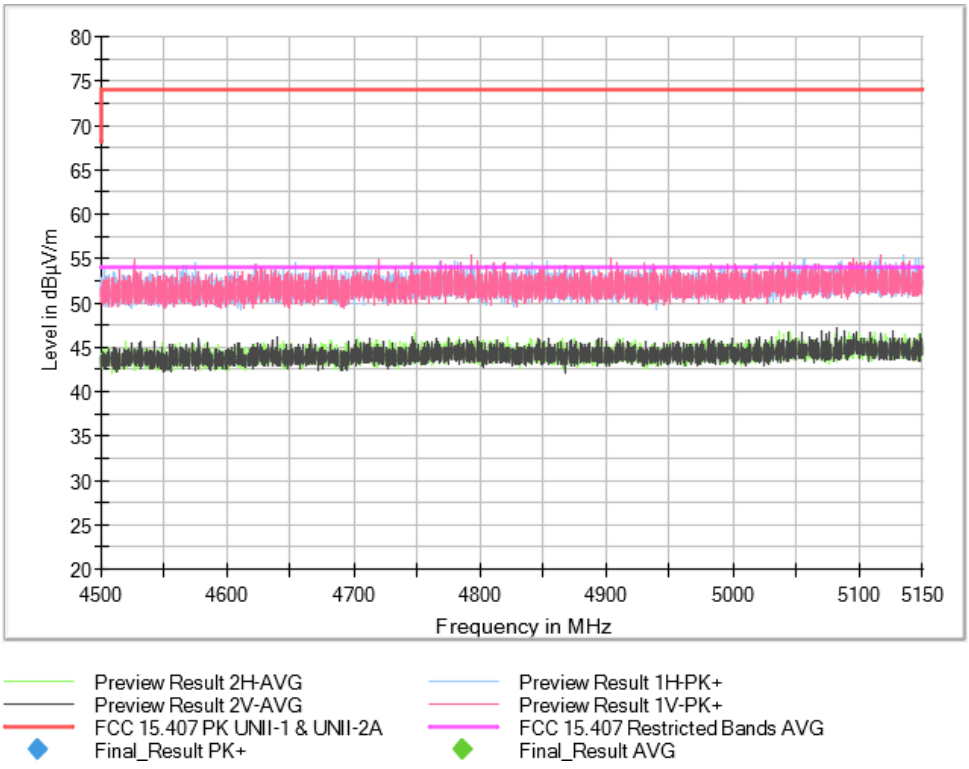


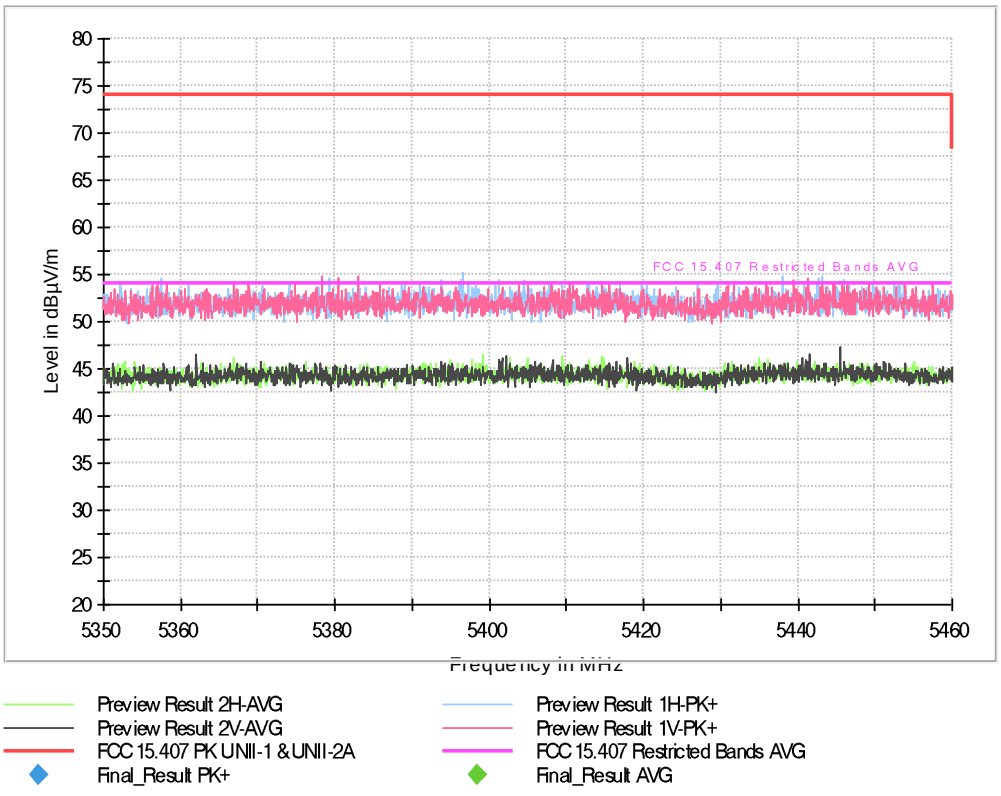
Active Port = 1 Frequency Range GHz = [1, 6.5]

Frequency MHz = 5260.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)

MIMO Mode = SISO

Images:



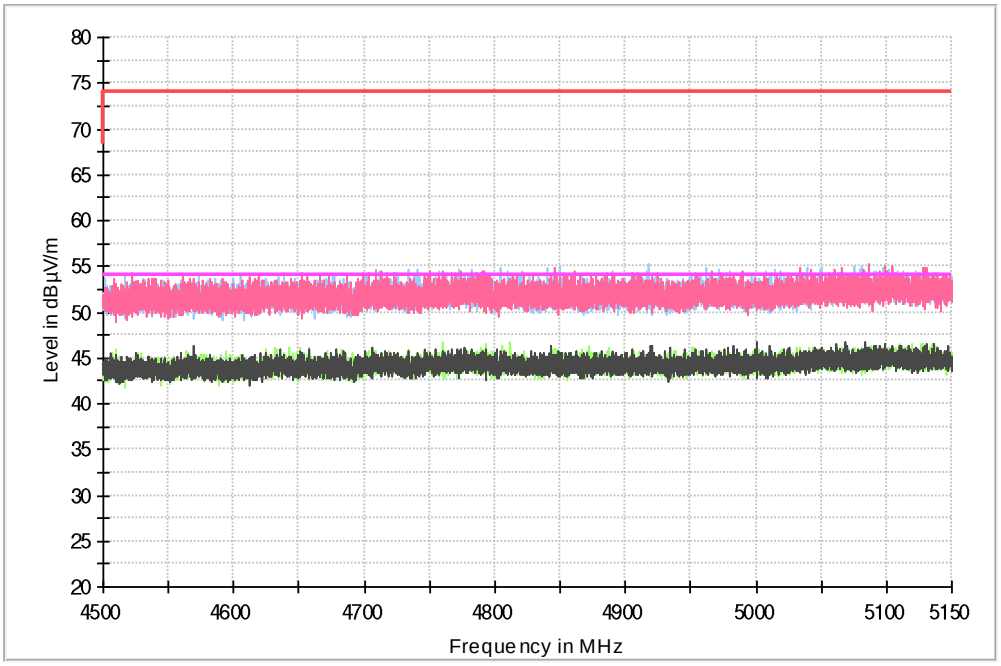


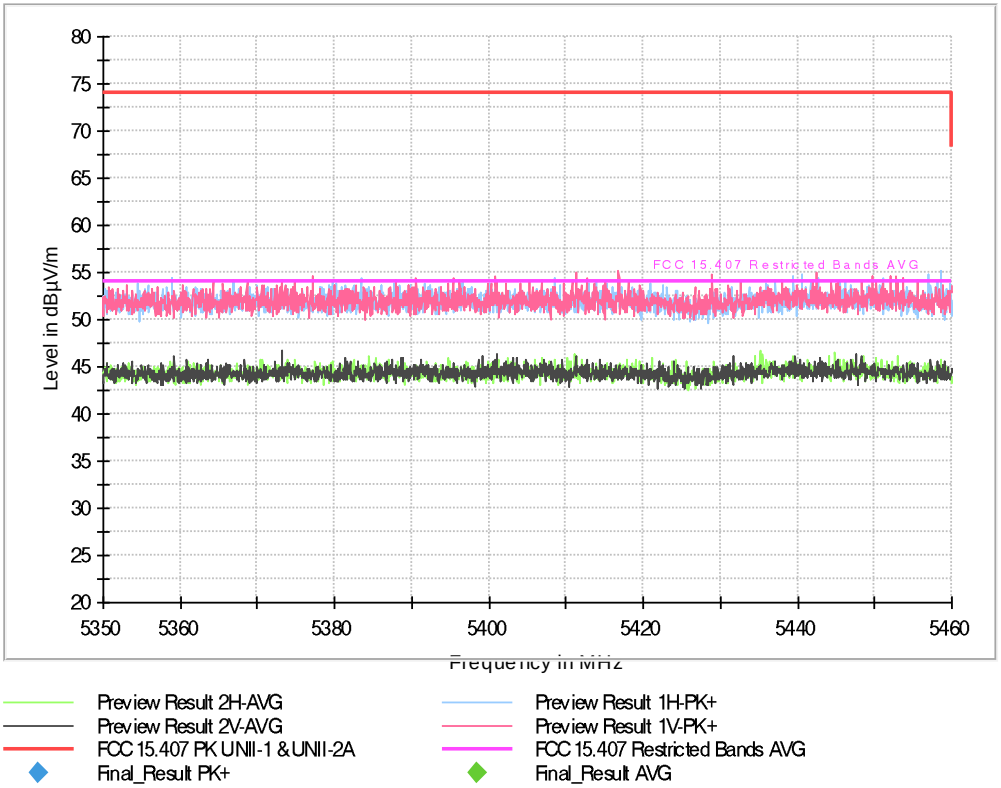
Active Port = 1 Frequency Range GHz = [1, 6.5]

Frequency MHz = 5280.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)

MIMO Mode = SISO

Images:



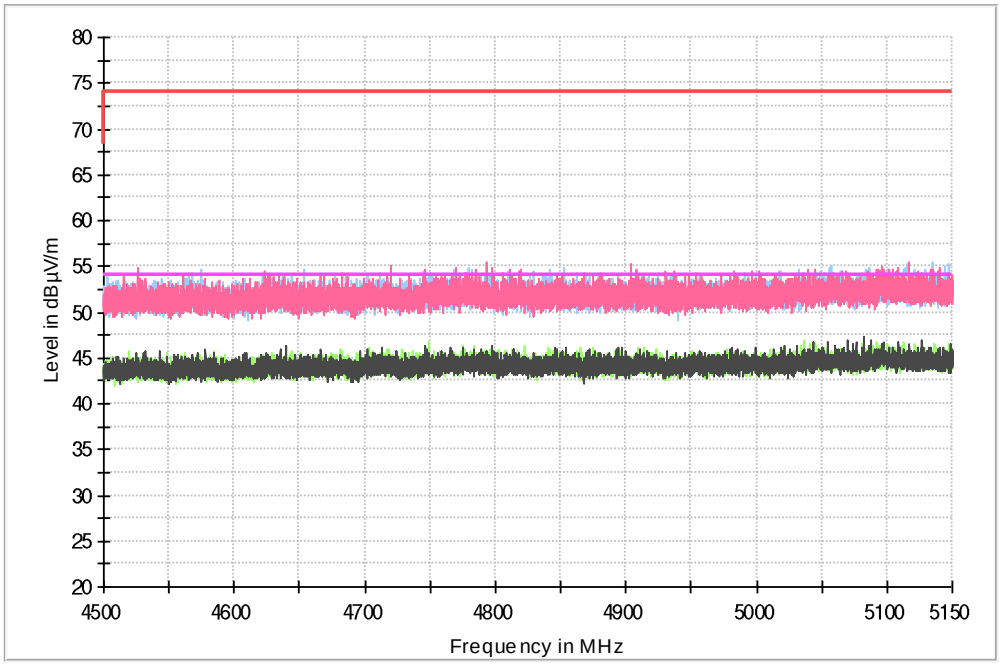


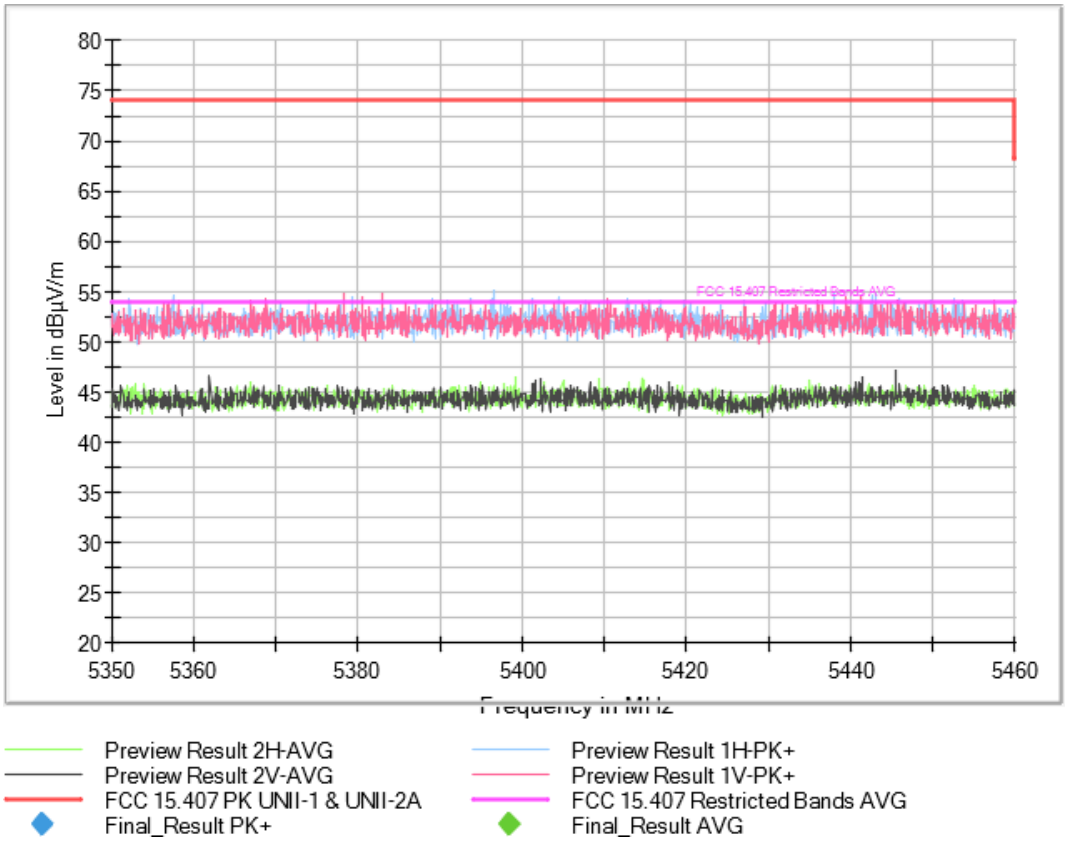
Active Port = 1 Frequency Range GHz = [1, 6.5]

Frequency MHz = 5320.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)

MIMO Mode = SISO

Images:



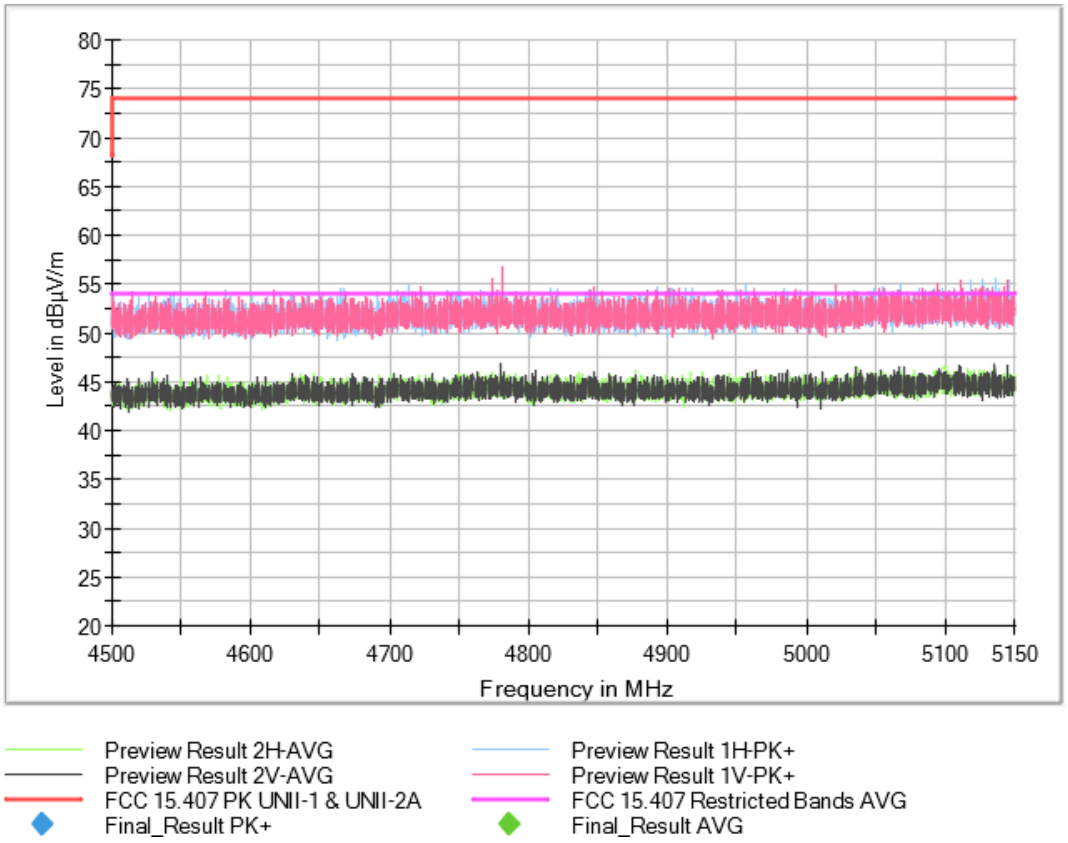


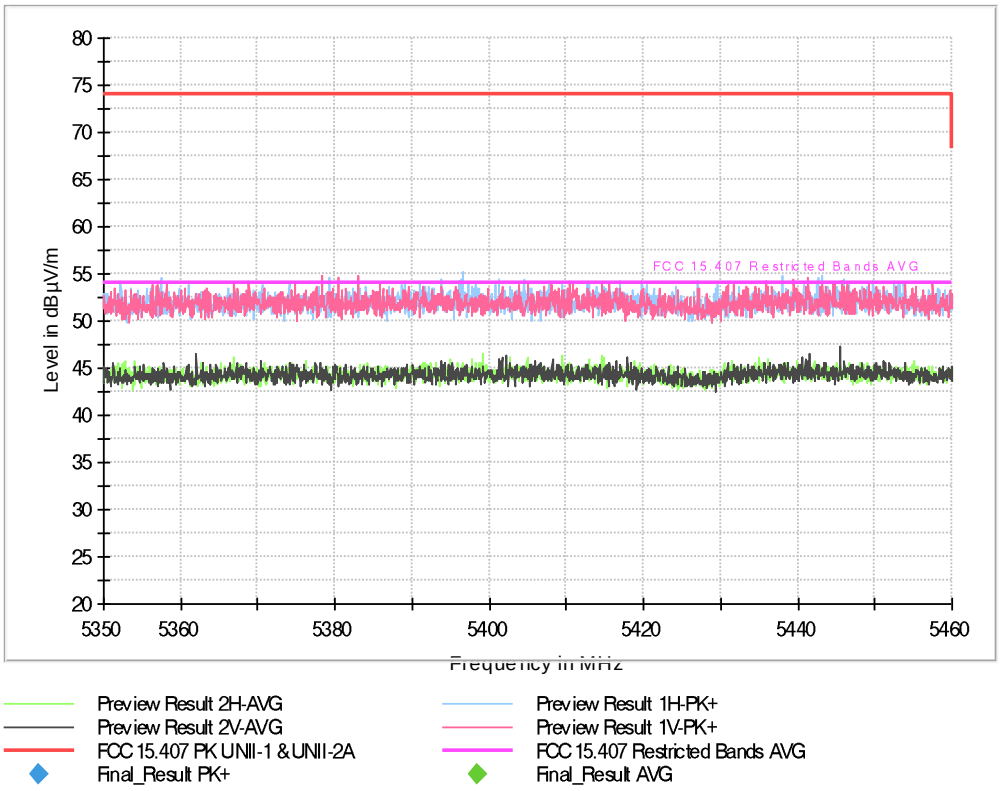
Active Port = 1 Frequency Range GHz = [1, 6.5]

Frequency MHz = 5270.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)

MIMO Mode = SISO

Images:



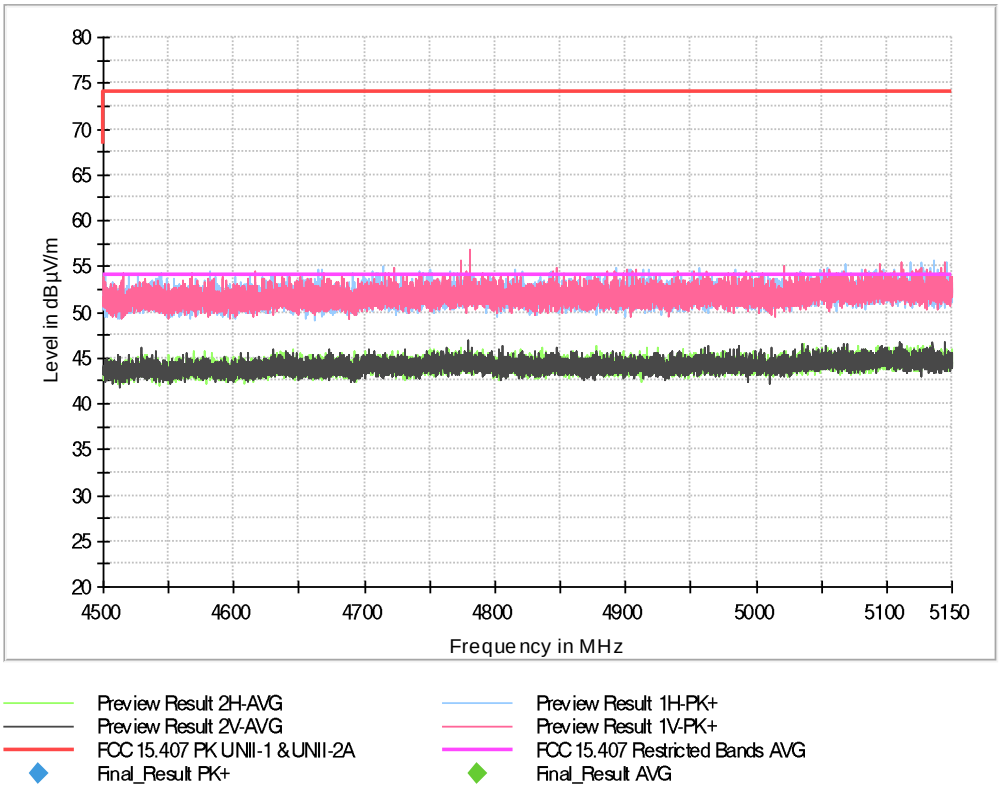


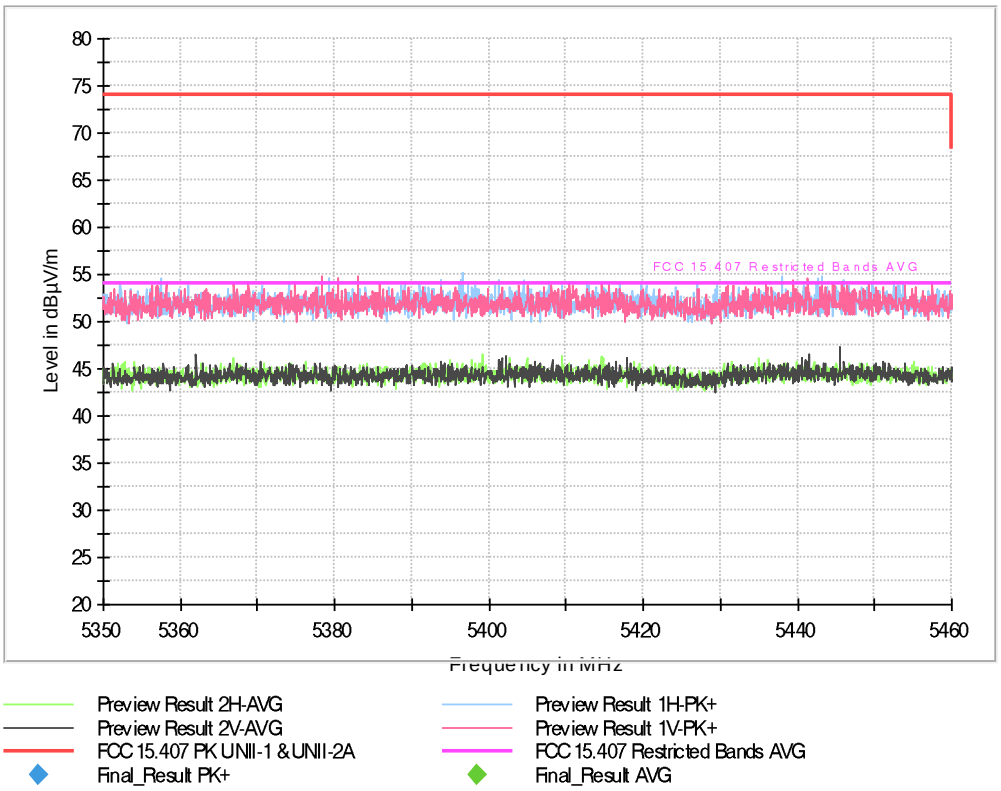
Active Port = 1 Frequency Range GHz = [1, 6.5]

Frequency MHz = 5310.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)

MIMO Mode = SISO

Images:



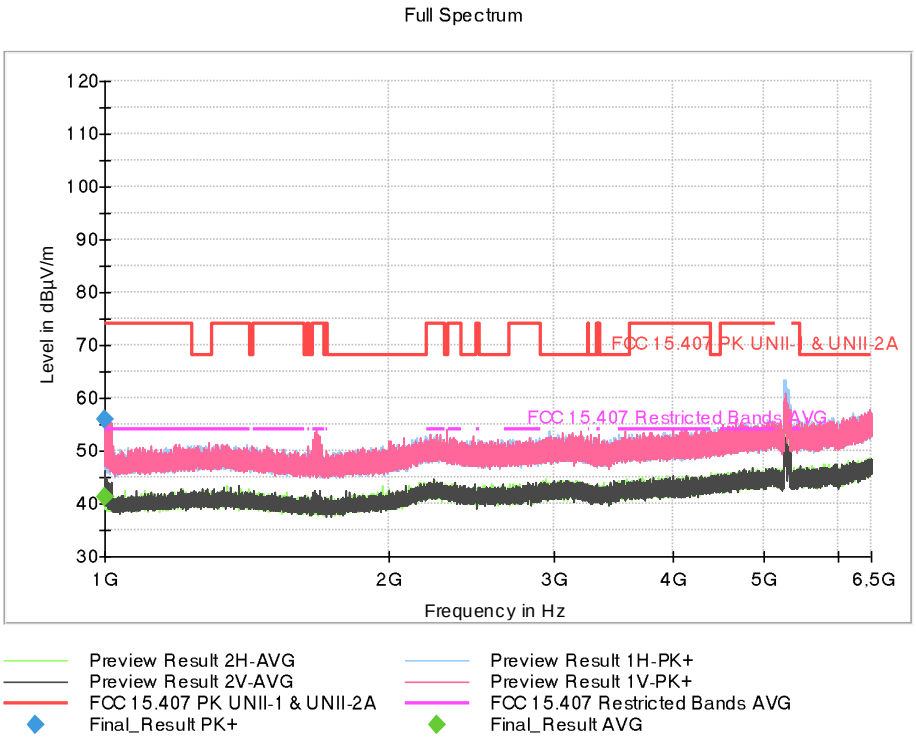


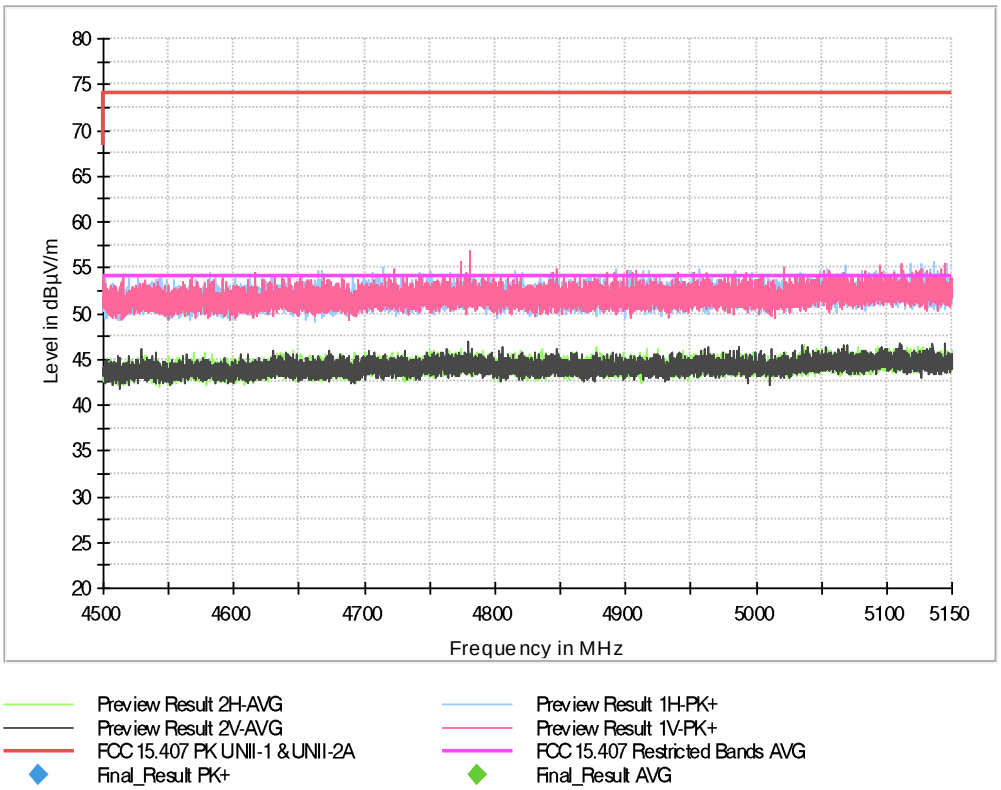
Active Port = 1 Frequency Range GHz = [1, 6.5]

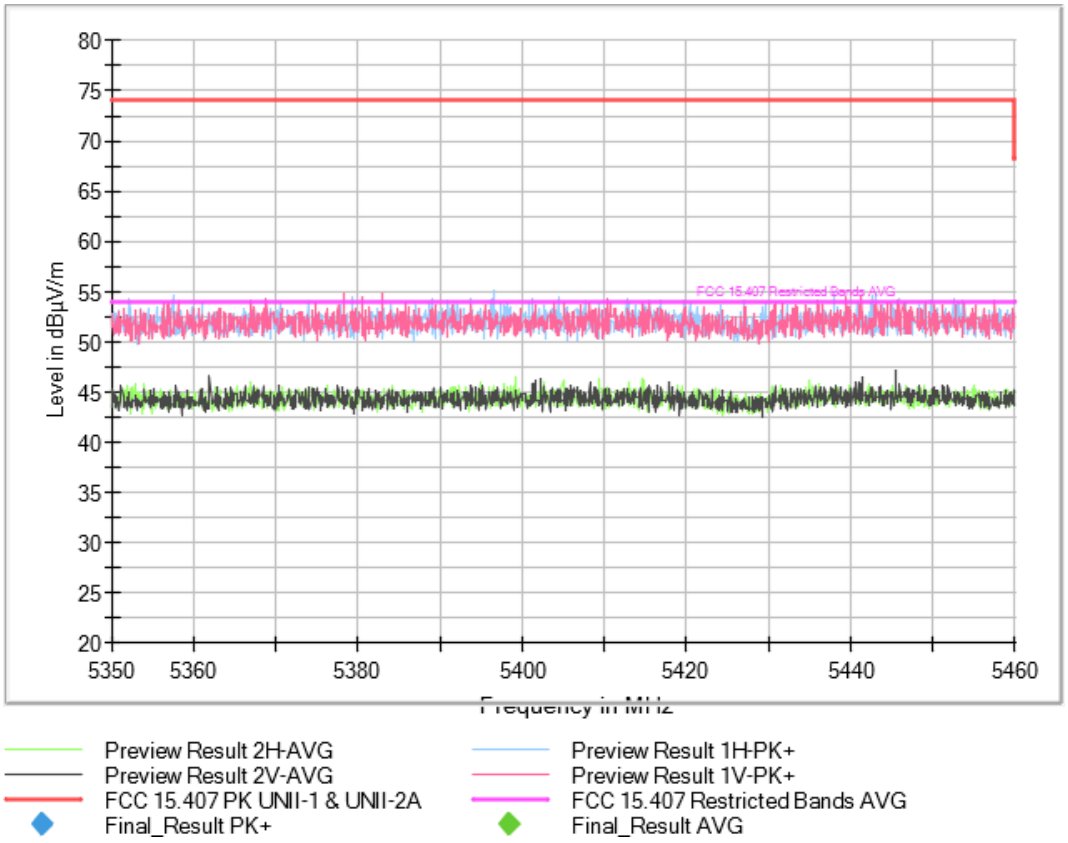
Frequency MHz = 5290.00000 Modulation = 802.11ac VHT80 (OFDM MCS0)

MIMO Mode = SISO

Images:





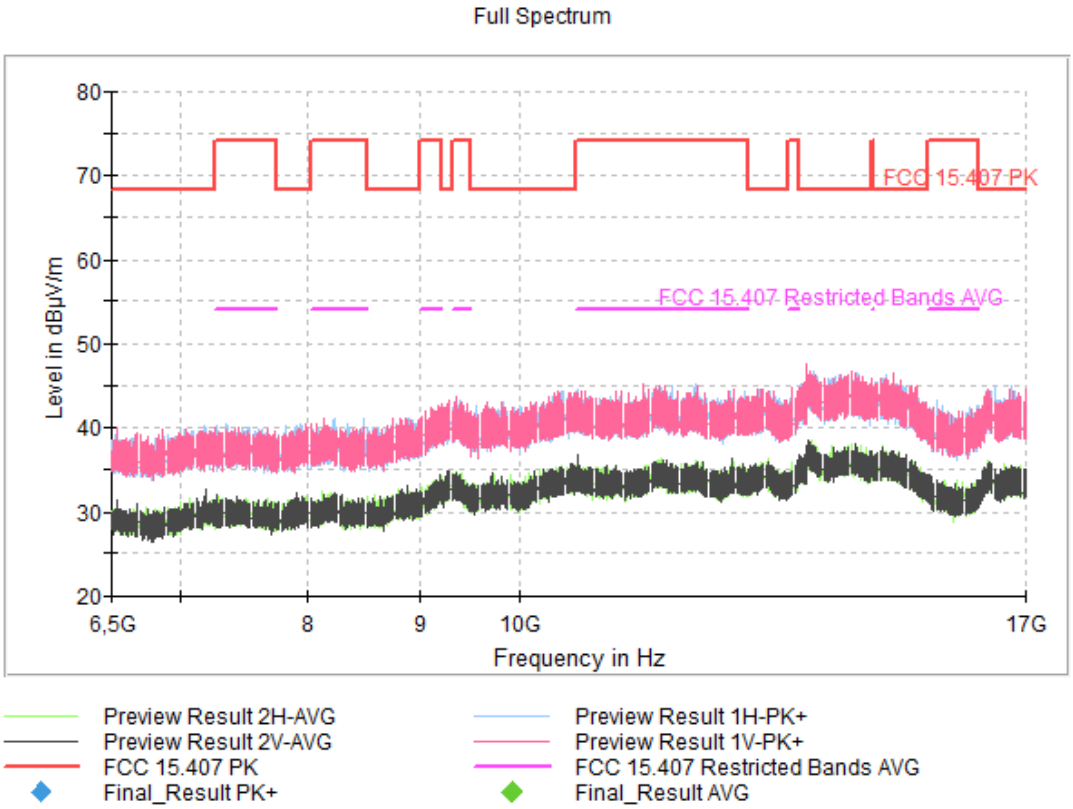

80
75
70
65
60
55
50
45
40
35
30
25
20
Level in dBµV/m
5350
5360
5380
5400
5420
5440
5460
Preview Result 2H-AVG
Preview Result 2V-AVG
FCC 15.407 PK UNII-1 & UNII-2A
Final_Result PK+
Preview Result 1H-PK+
Preview Result 1V-PK+
FCC 15.407 Restricted Bands AVG
Final_Result AVG

Active Port = 1 Frequency Range GHz = [6.5, 17]

Frequency MHz = 5290.00000 Modulation = 802.11ac VHT80 (OFDM MCS0)

MIMO Mode = SISO

Images:



Frequency Range GHz = [17, 40]

The spurious frequencies detected do not depend on the channel neither the modulation

Results

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

Verdict

Pass

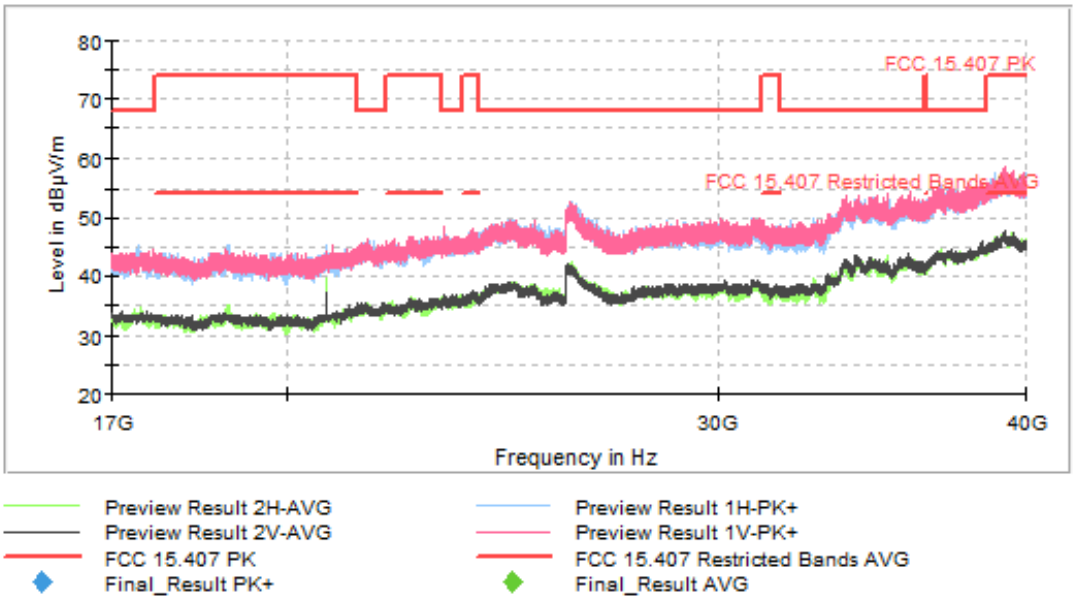
Attachments

Active Port = 1 Frequency Range GHz = [17, 40]

The spurious frequencies detected do not depend on the transmission Band or the Modulation

MIMO Mode = SISO

Images:



Appendix C: **Test result for 5.47 GHz - 5.725 GHz**

INDEX

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	12 V DC
Type of Power Supply:	External power supply

ANTENNA (*):

Type of Antenna:	External
Maximum Declared Antenna Gain:	3.05

TEST FREQUENCIES (*):

Technology Tested:	WLAN (IEEE 802.11 n2040 / ac80 1x1) / U-NII-2C	
	802.11 n HT20: MCS0 to MCS23 (SISO)	
	802.11 n HT40: MCS0 to MCS23 (SISO)	
	802.11 ac VHT80: MCS0 to MCS9 (SISO)	
Setting of cores / ports:	WLAN1	
Beamforming:	No.	
Frequency Range:	5470 - 5725 MHz	
Power Settings:	Conducted tests: 19 dBm. Radiated tests: 13 dBm.	
Operating Channel Bandwidth:	20 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low: 100	5500
	Middle: 116	5580
	High: 140	5700
Operating Channel Bandwidth:	40 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low: 102	5510
	High: 134	5670
Operating Channel Bandwidth:	80 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low: 106	5530

POWER SETTING (*):

For 802.11 a, the power level is always 10 dBm and the modulation group is 1.
For 802.11 n, the power level is always 10 dBm and the modulation group is 1.
For 802.11 ac, the power level is always 6 dBm and the modulation group is 1.

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 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 instructions 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:

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

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.

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-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1.5 m for the frequency range 17 GHz-26 GHz (17 GHz-40 GHz horn antenna).

For radiated emissions in the range 17 GHz-26 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.

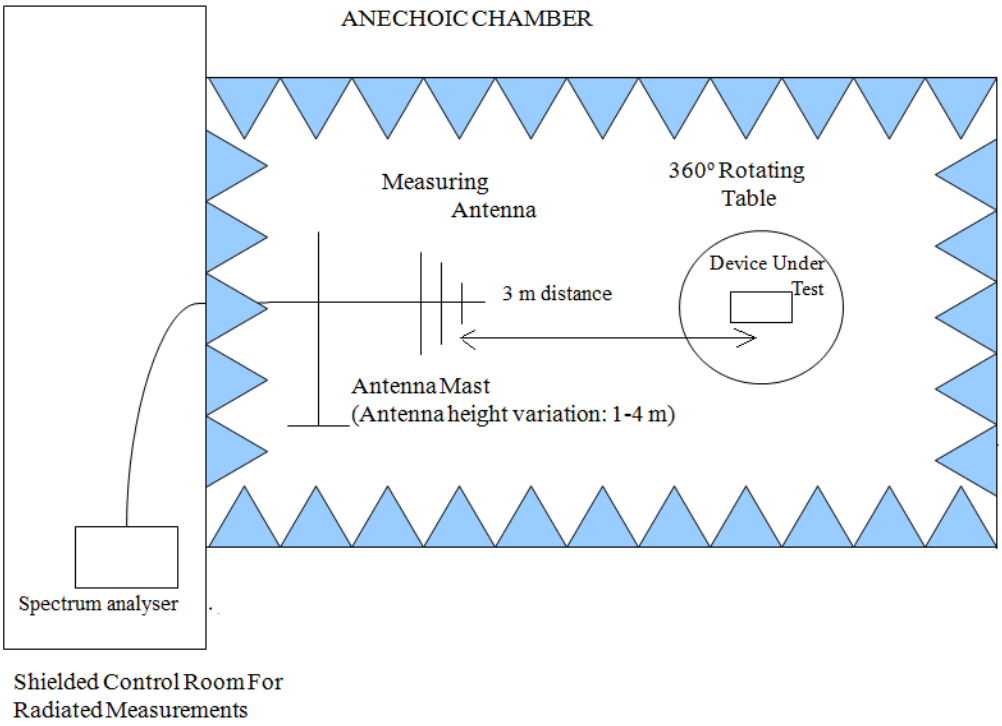
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

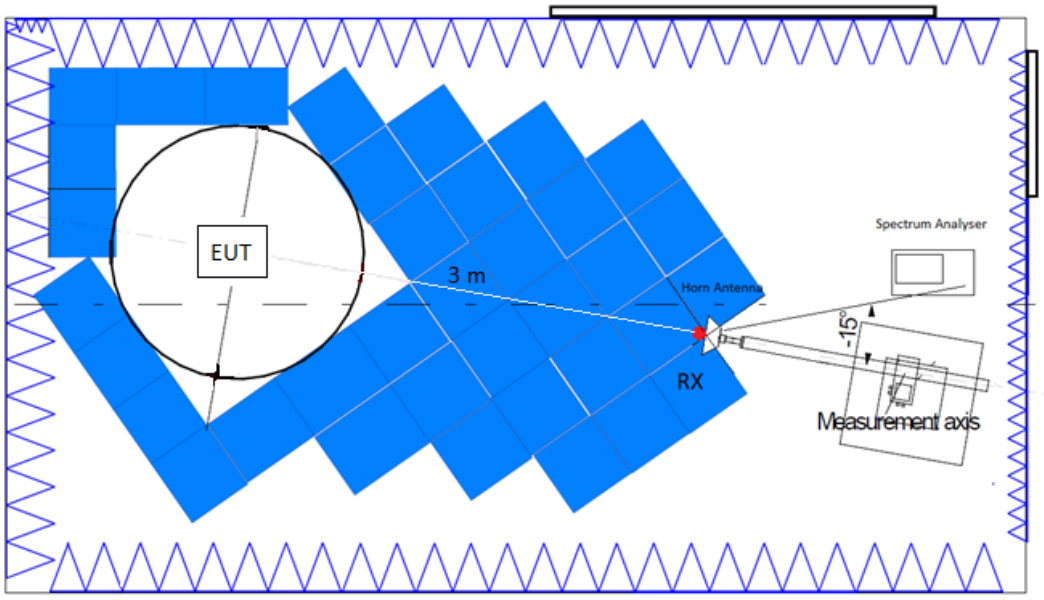
The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor and cable loss.

A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

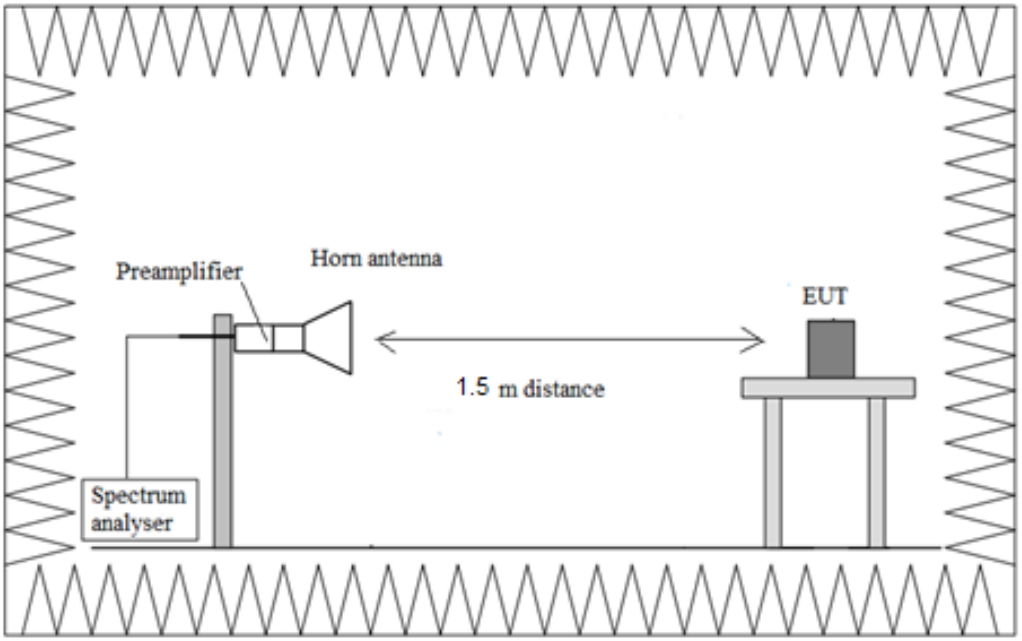
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



RSS-247 6.2.2.1 / FCC 15.407 (a) (2) [Avcp] Maximum Conducted output power U-NII-2C

Limits

* FCC 15.407 (a)(2): For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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 6.2.3.1: The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$ B, dBm, whichever is less.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$ B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Modulation: 802.11n HT20 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Avg Power (dBm)	Max EIRP (dBm)
1	5500.00000	No	5.45	8.45
	5580.00000		4.95	8.00
	5720.00000		4.98	8.03

Modulation: 802.11n HT40 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Avg Power (dBm)	Max EIRP (dBm)
1	5510.00000	No	5.29	8.34
	5550.00000		5.33	8.38
	5710.00000		5.01	8.06

Modulation: 802.11a (OFDM 6 Mbit/s)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Avg Power (dBm)	Max EIRP (dBm)
1	5500.00000	No	5.66	8.71
	5580.00000		5.25	8.30
	5720.00000		5.19	8.24

Modulation: 802.11ac VHT20 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Avg Power (dBm)	Max EIRP (dBm)
1	5500.00000	No	1.25	4.29
	5580.00000		0.85	3.90
	5720.00000		0.93	3.98

Modulation: 802.11ac VHT40 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Avg Power (dBm)	Max EIRP (dBm)
1	5510.00000	No	1.31	4.36
	5550.00000		5.36	8.41
	5710.00000		1.04	4.09

Modulation: 802.11ac VHT80 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Avg Power (dBm)	Max EIRP (dBm)
1	5530.00000	No	1.05	4.10
	5690.00000		1.06	4.11

Verdict

Pass

RSS-247 6.2.2.1 / FCC 15.407 (a) (2) [Psd] Transmitter Maximum Power Spectral Density U-NII-2C

Limits

* FCC 15.407 (a)(2): For the 5.47-5.725 GHz band, 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 6.2.3.1: The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$ B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Modulation: 802.11n HT20 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
1	5500.00000	No	5497.821782	-6.85
	5580.00000		5577.425743	-7.35
	5720.00000		5722.574257	-7.80

Verdict

Pass

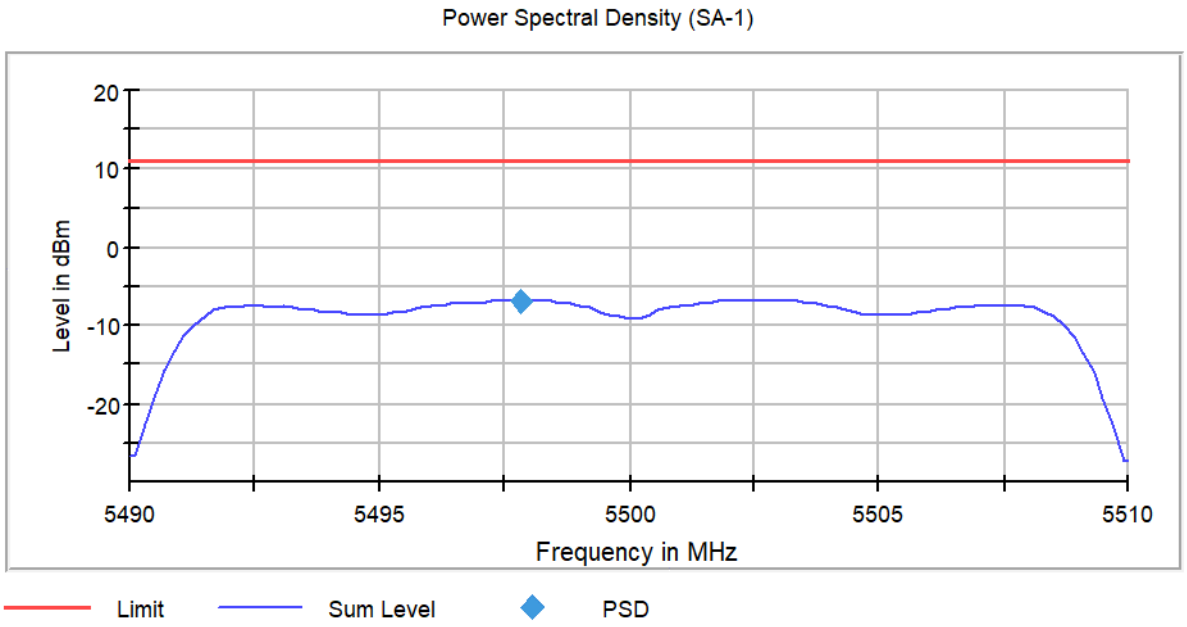
Attachments

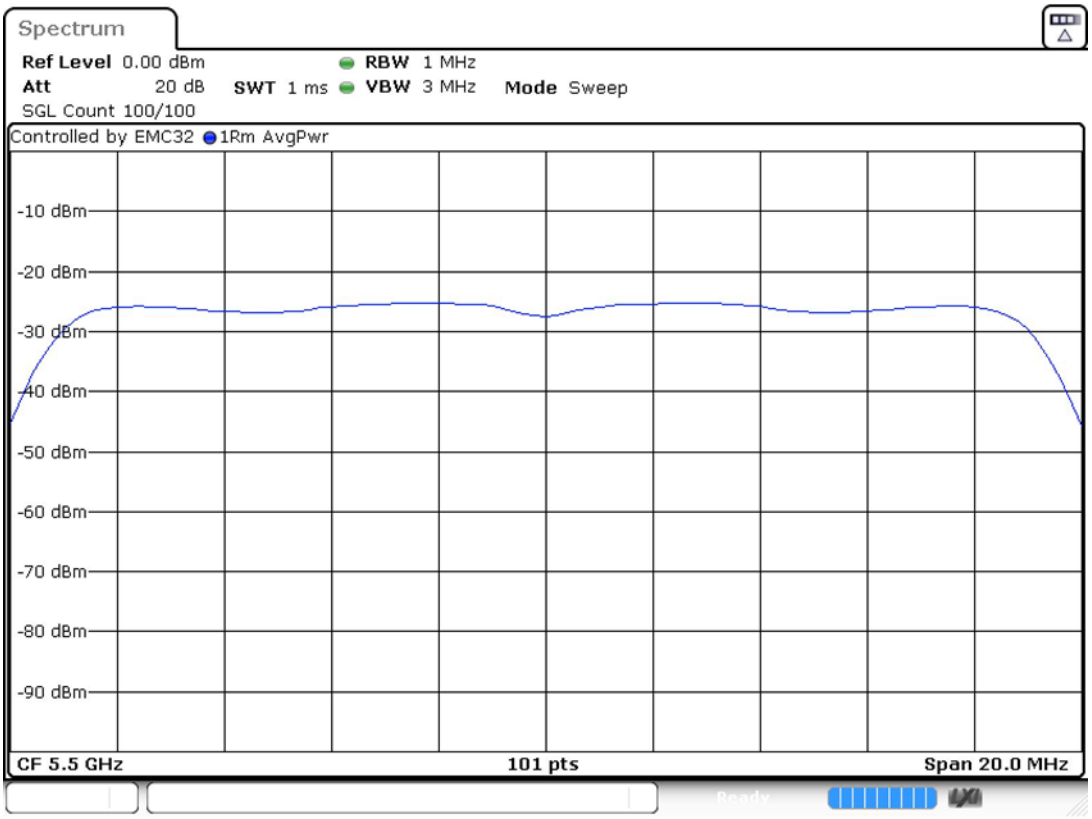
Active Port = 1 Frequency MHz = 5500.00000

Modulation = 802.11n HT20 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



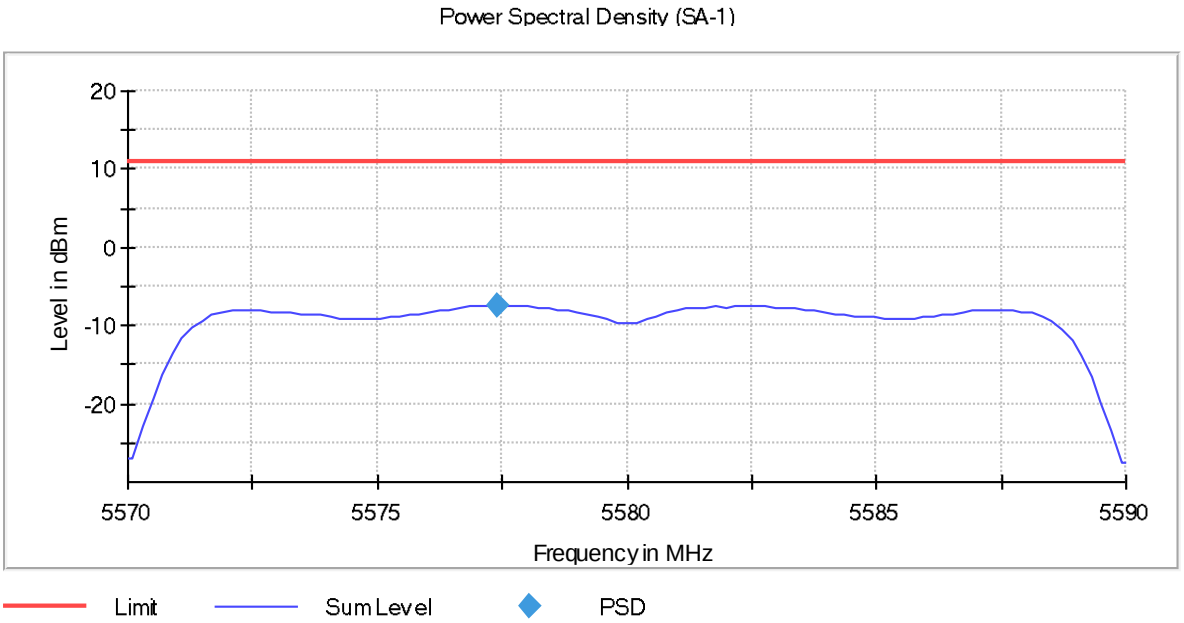


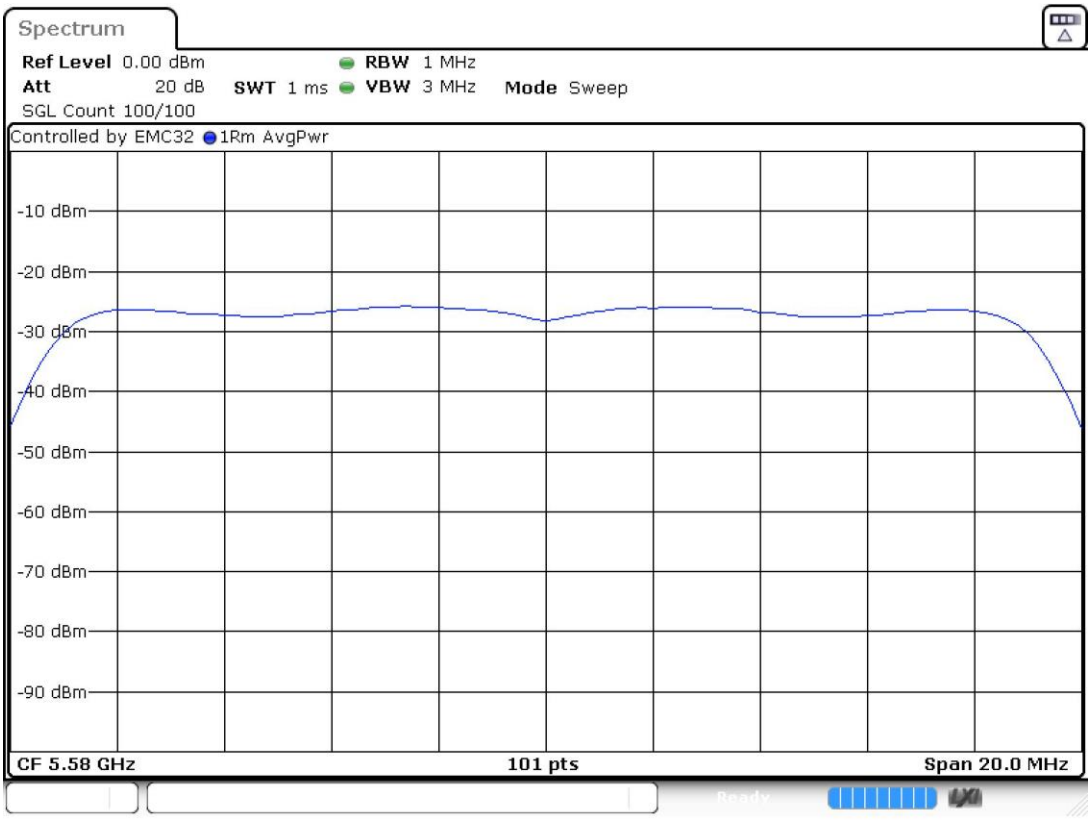
Active Port = 1 Frequency MHz = 5580.00000

Modulation = 802.11n HT20 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



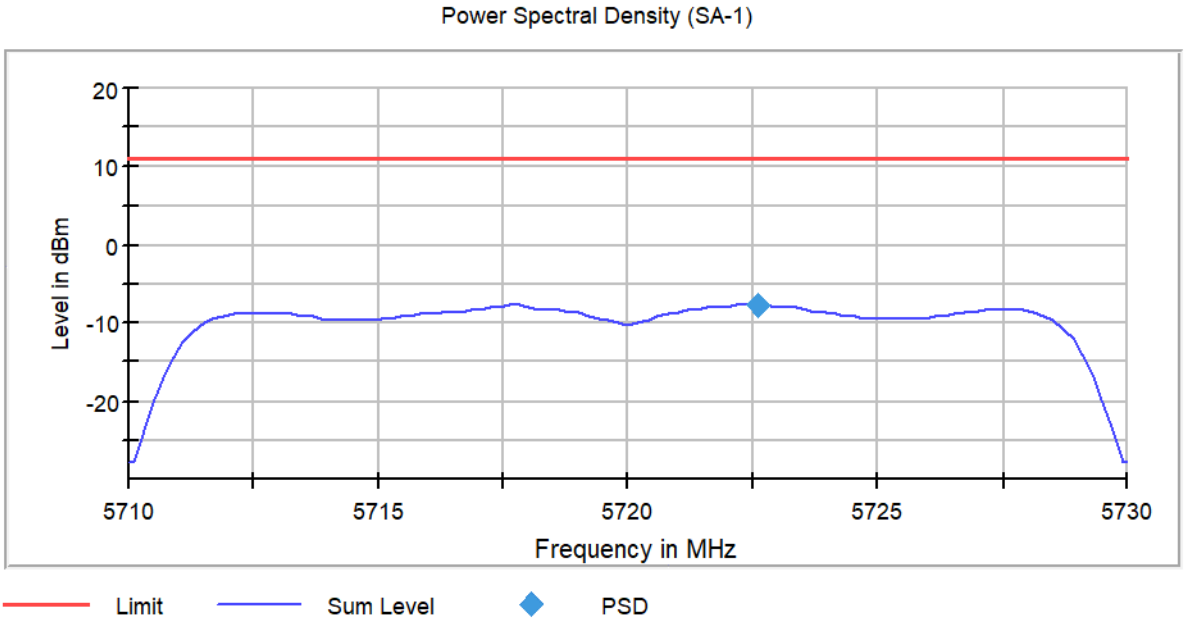


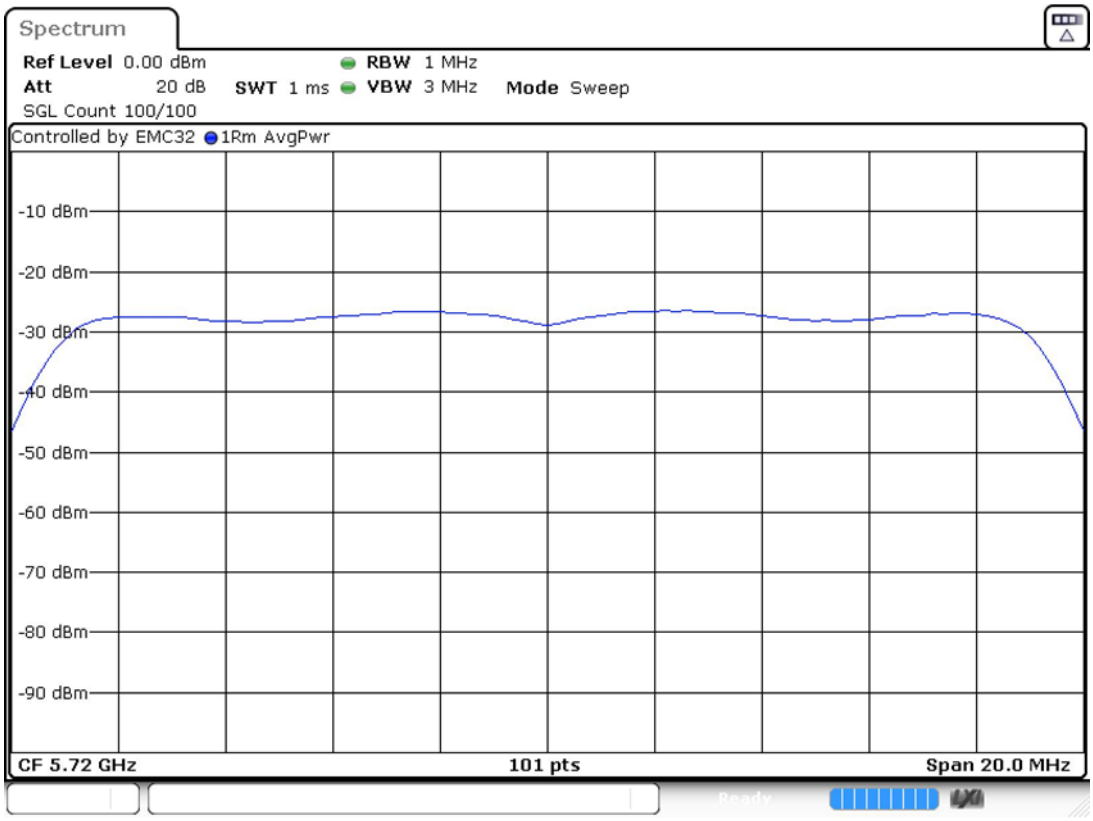
Active Port = 1 Frequency MHz = 5720.00000

Modulation = 802.11n HT20 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:





Modulation: 802.11n HT40 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
1	5510.00000	No	5506.039604	-10.41
	5550.00000		5555.148515	-10.16
	5710.00000		5705.247525	-10.83

Verdict

Pass

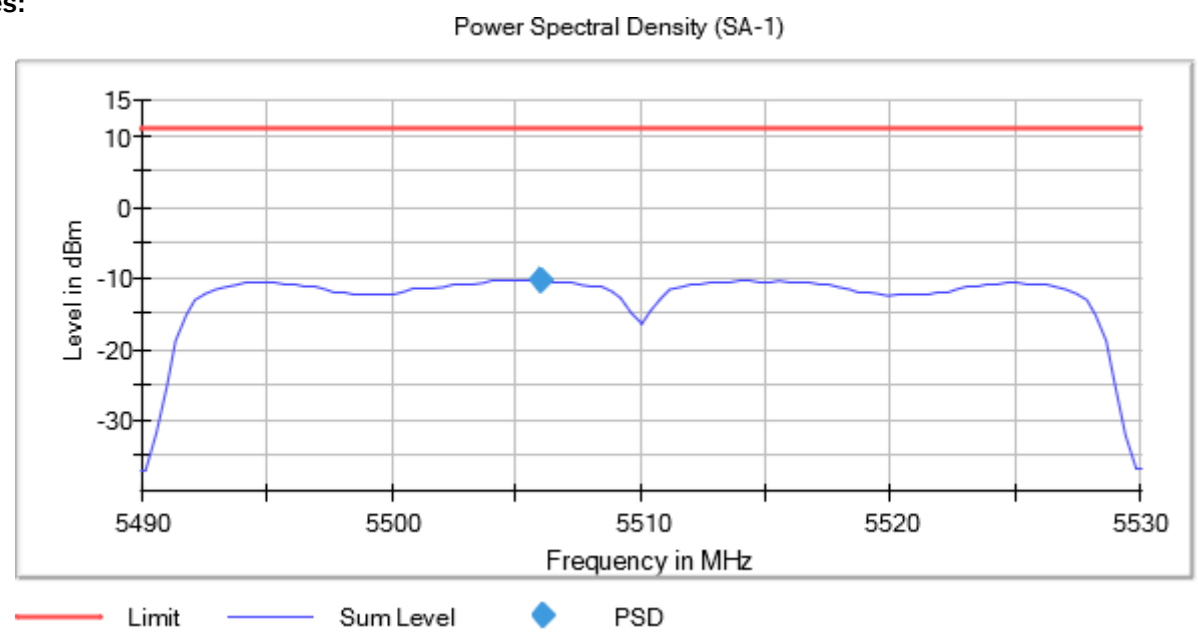
Attachments

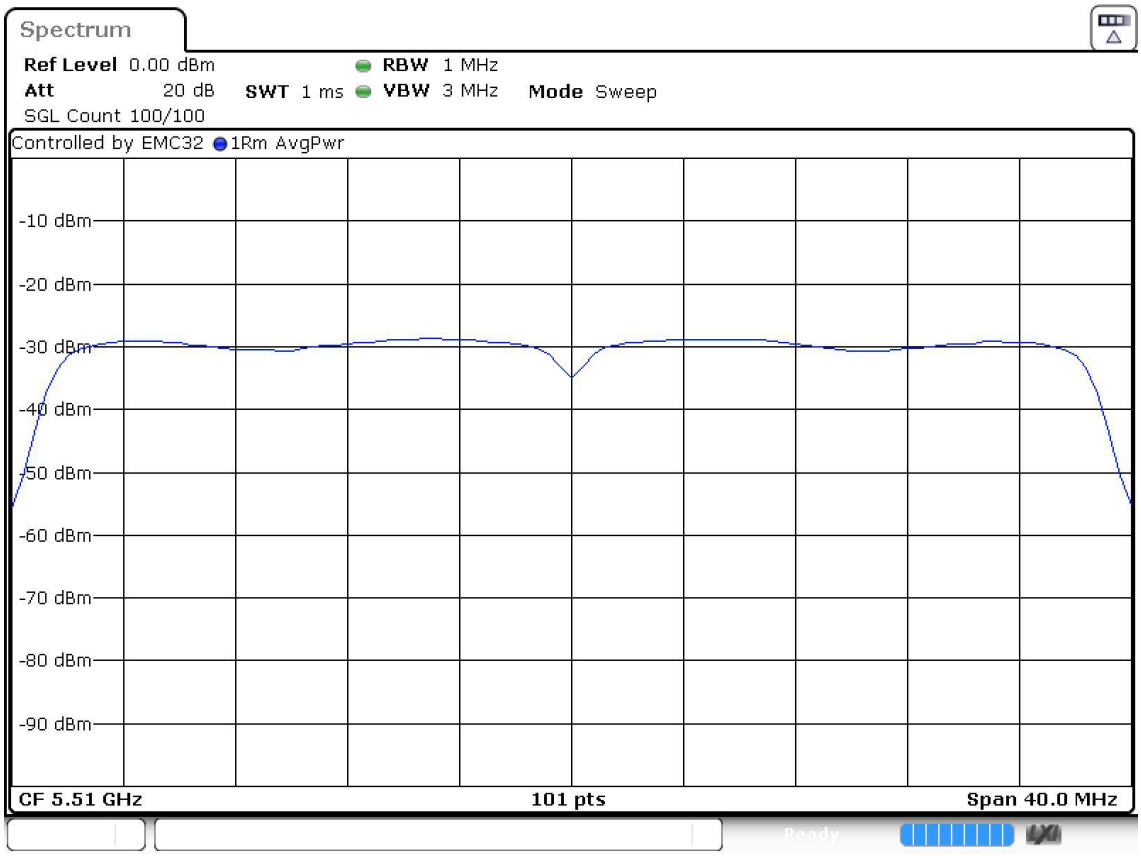
Active Port = 1 Frequency MHz = 5510.00000

Modulation = 802.11n HT40 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



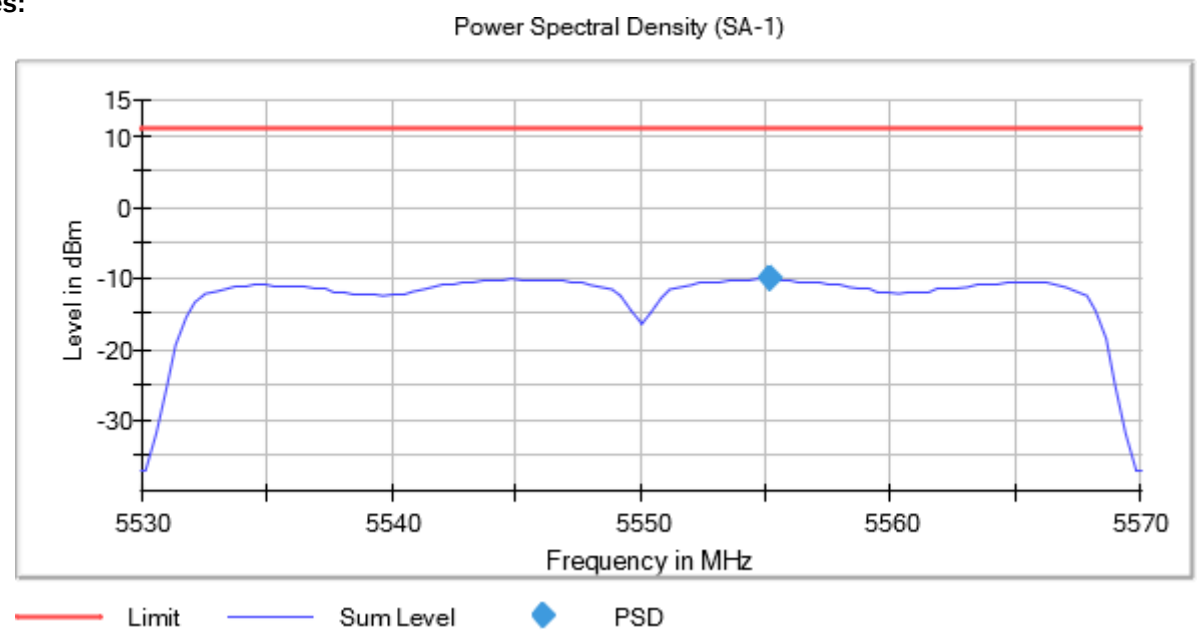


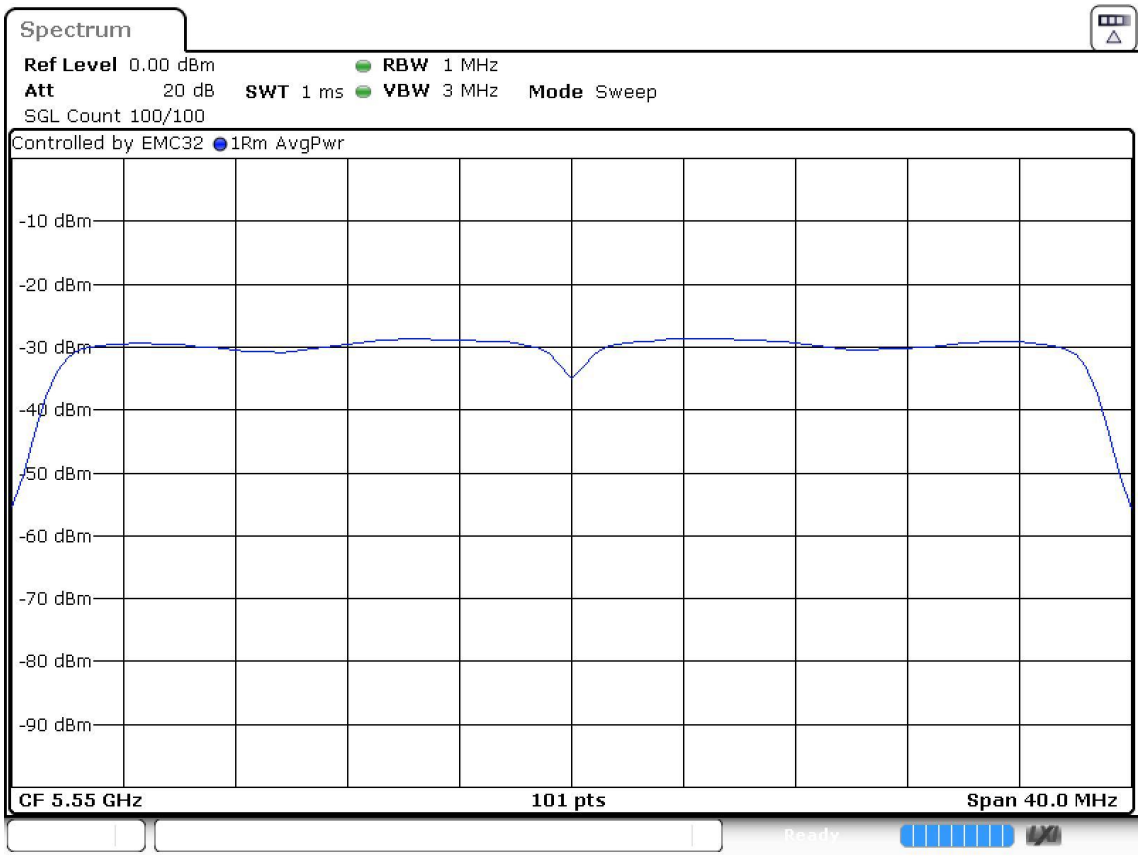
Active Port = 1 Frequency MHz = 5550.00000

Modulation = 802.11n HT40 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



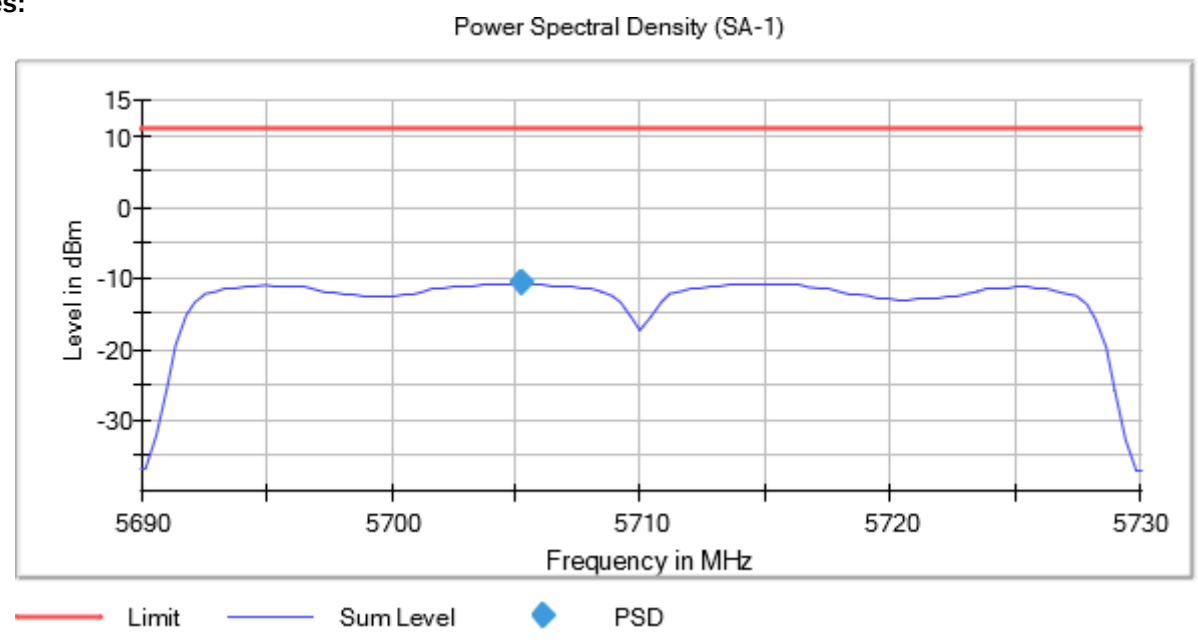


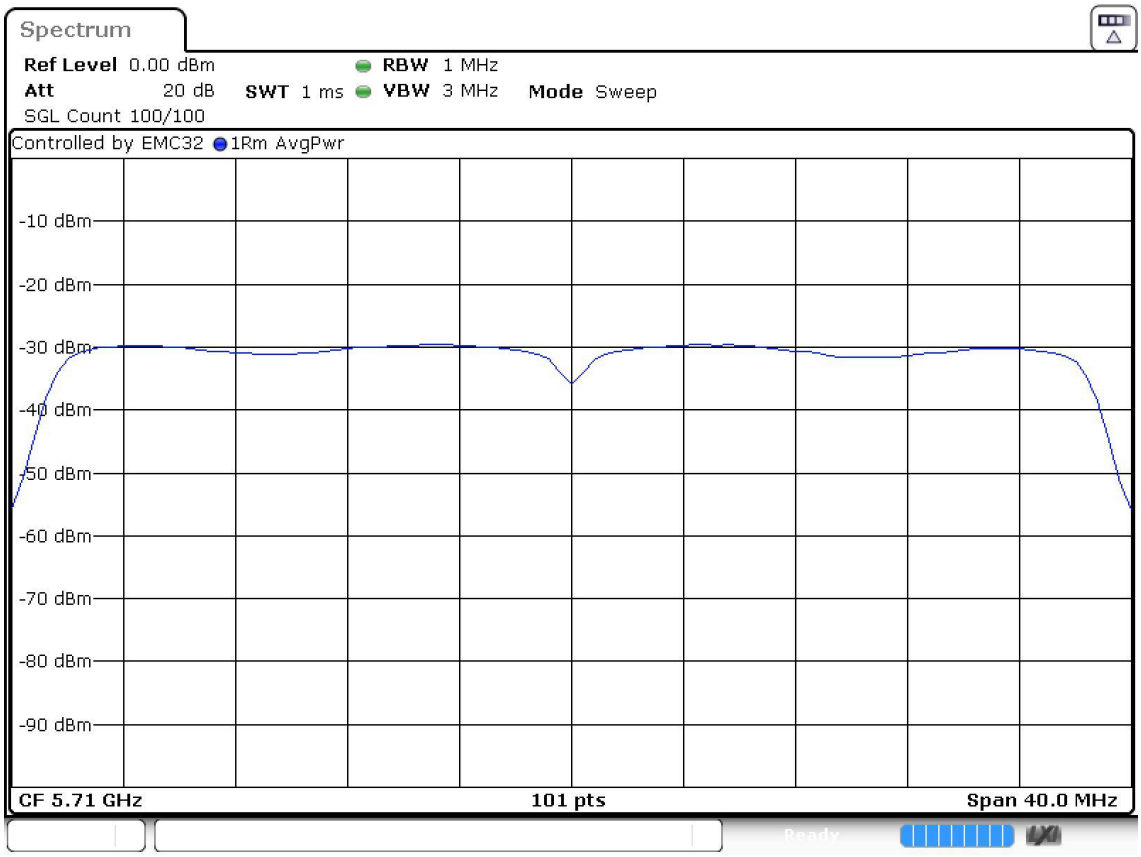
Active Port = 1 Frequency MHz = 5710.00000

Modulation = 802.11n HT40 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:





Modulation: 802.11a (OFDM 6 Mbit/s)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
1	5500.00000	No	5502.376238	-6.42
	5580.00000		5577.623762	-6.78
	5720.00000		5722.574257	-7.16

Verdict

Pass

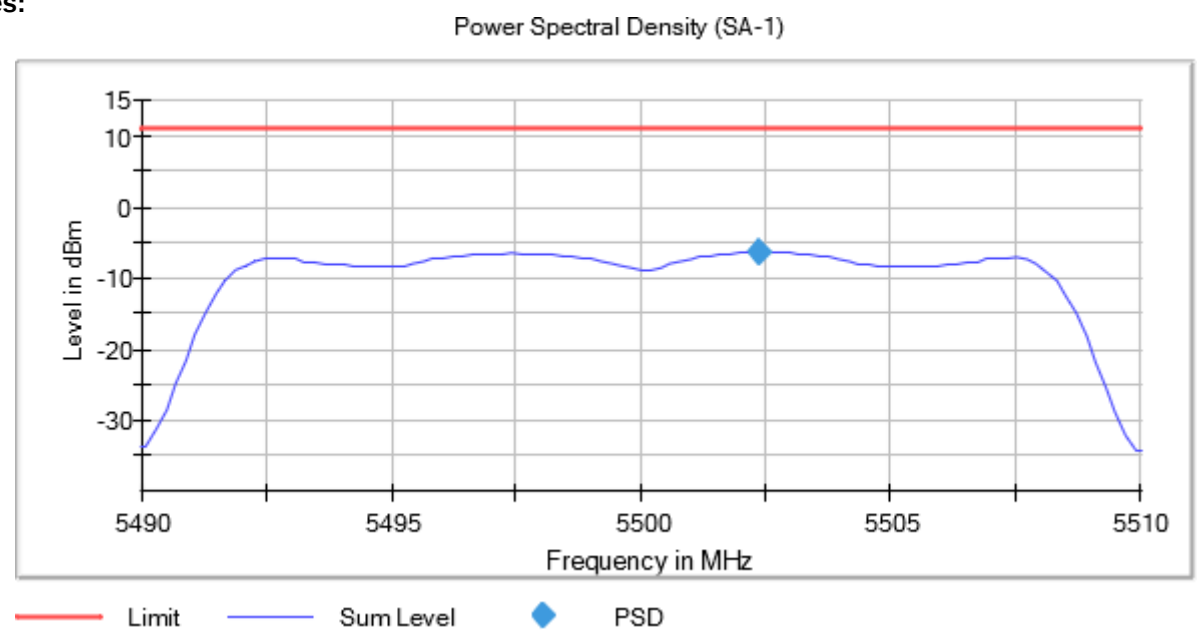
Attachments

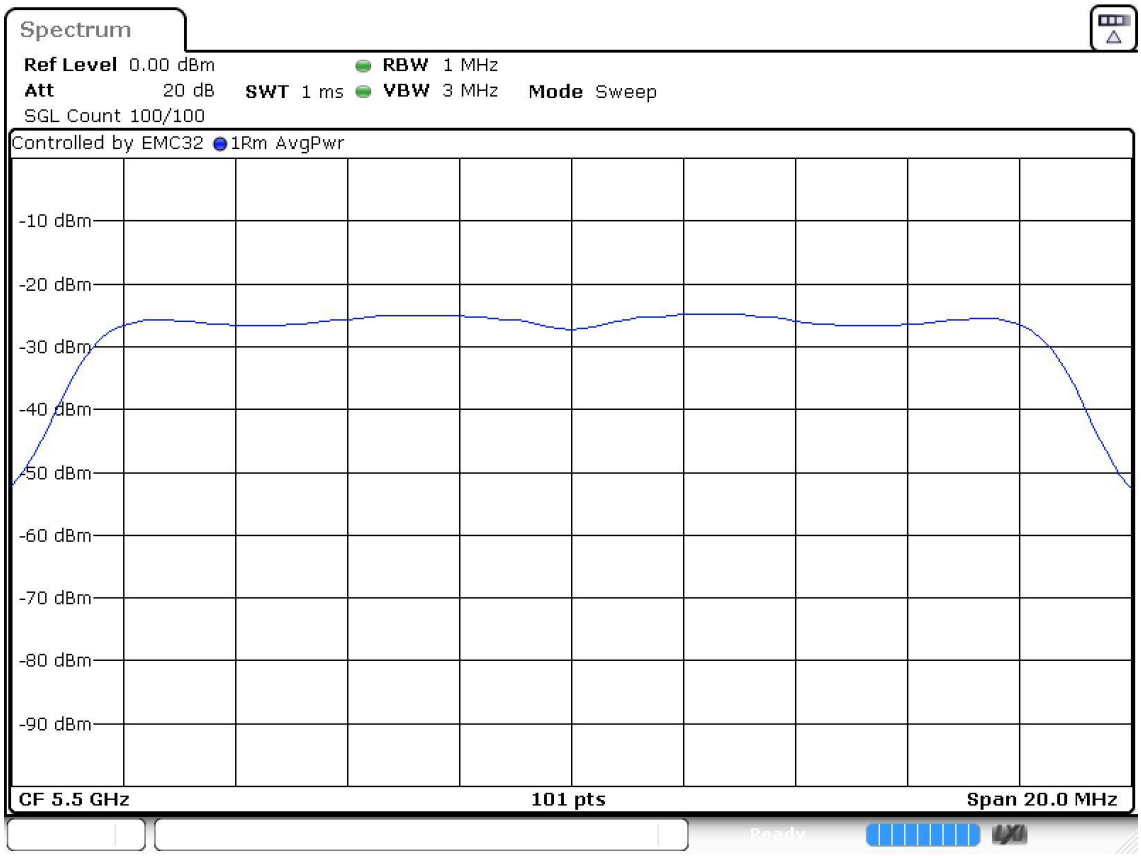
Active Port = 1 Frequency MHz = 5500.00000

Modulation = 802.11a (OFDM 6 Mbit/s) TPC = No

MIMO Mode = SISO

Images:



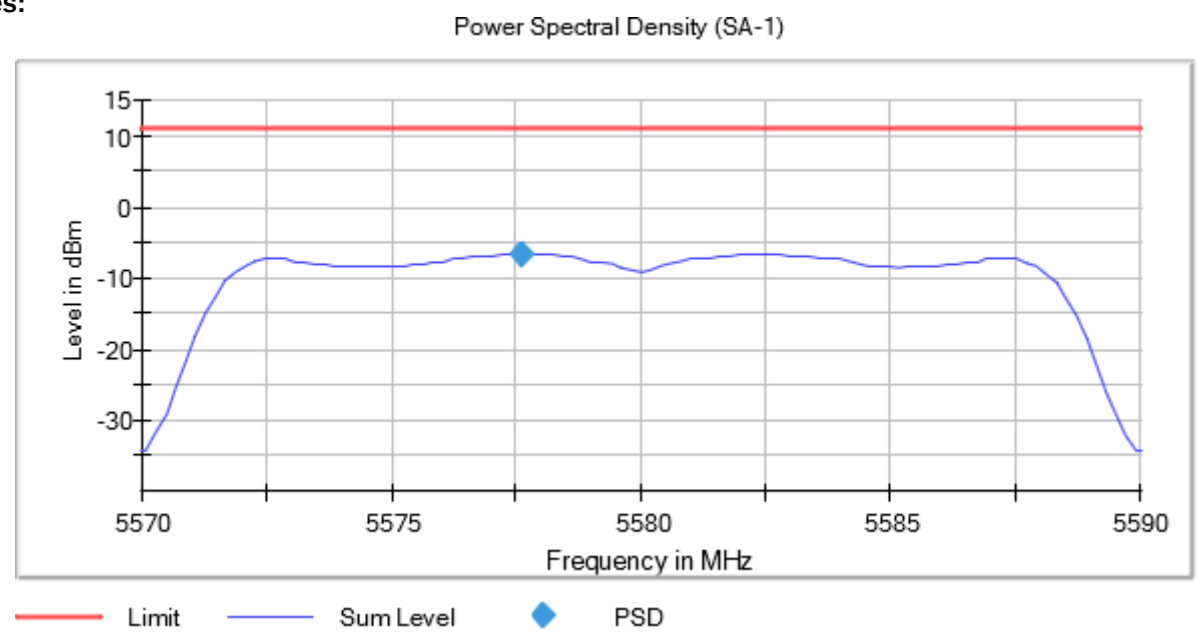


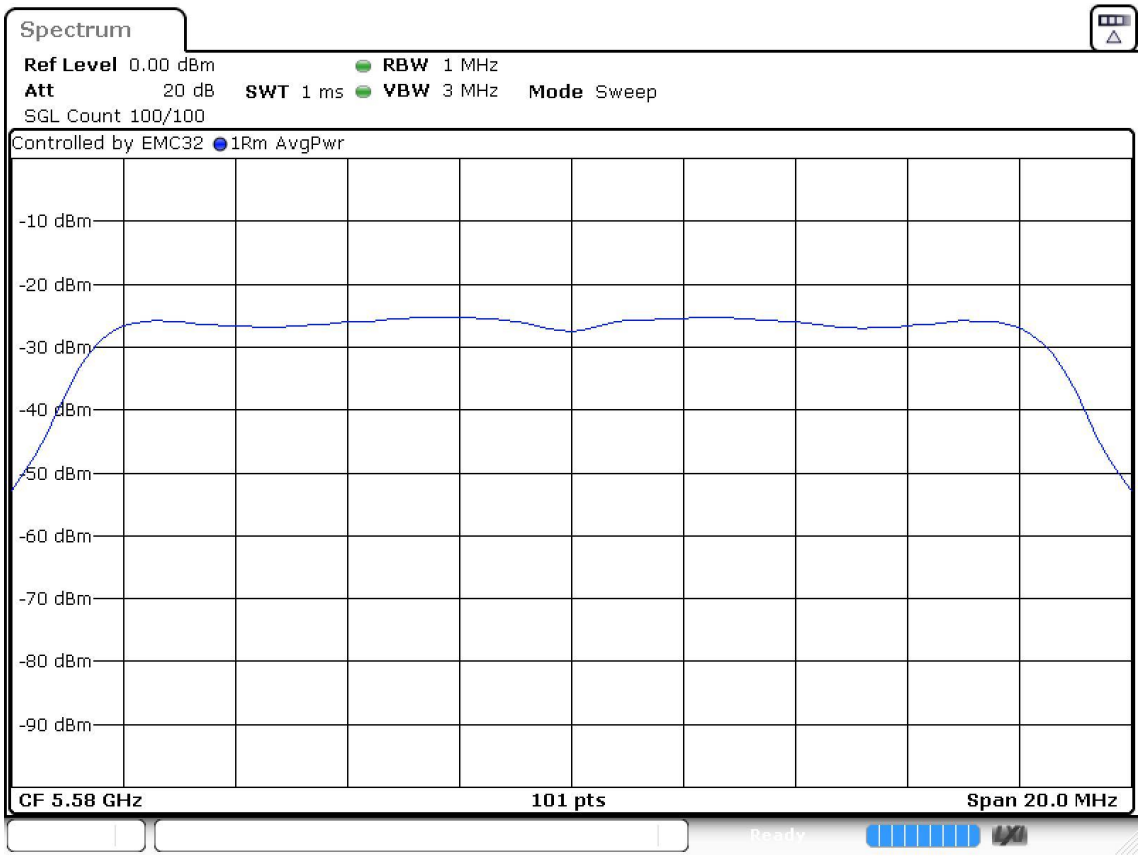
Active Port = 1 Frequency MHz = 5580.00000

Modulation = 802.11a (OFDM 6 Mbit/s) TPC = No

MIMO Mode = SISO

Images:



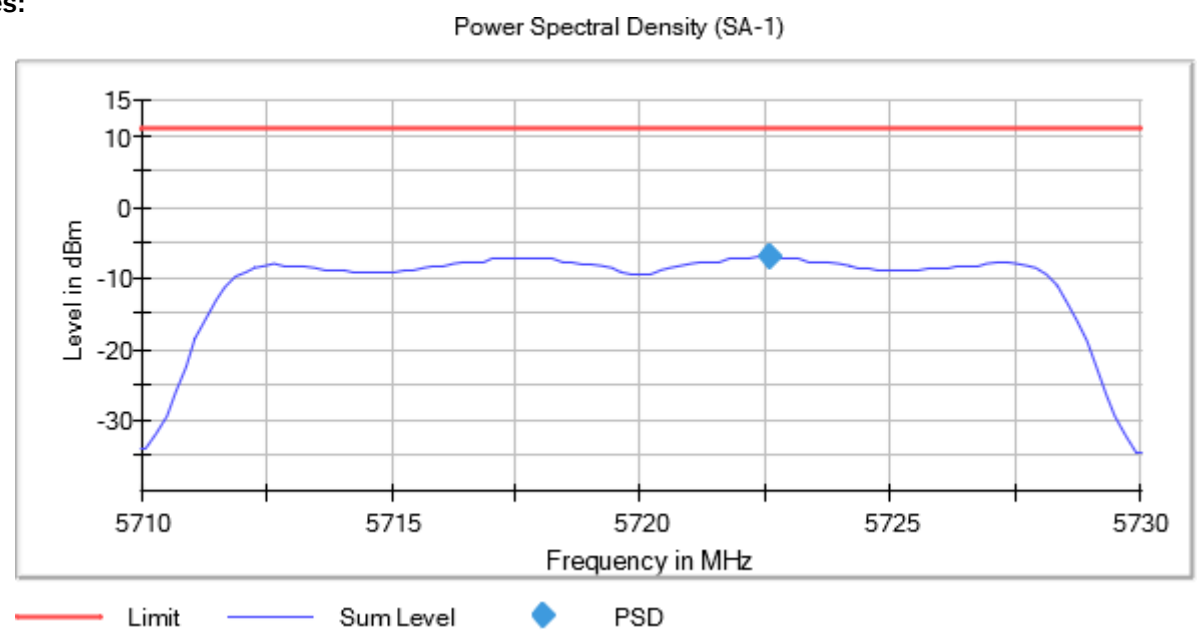


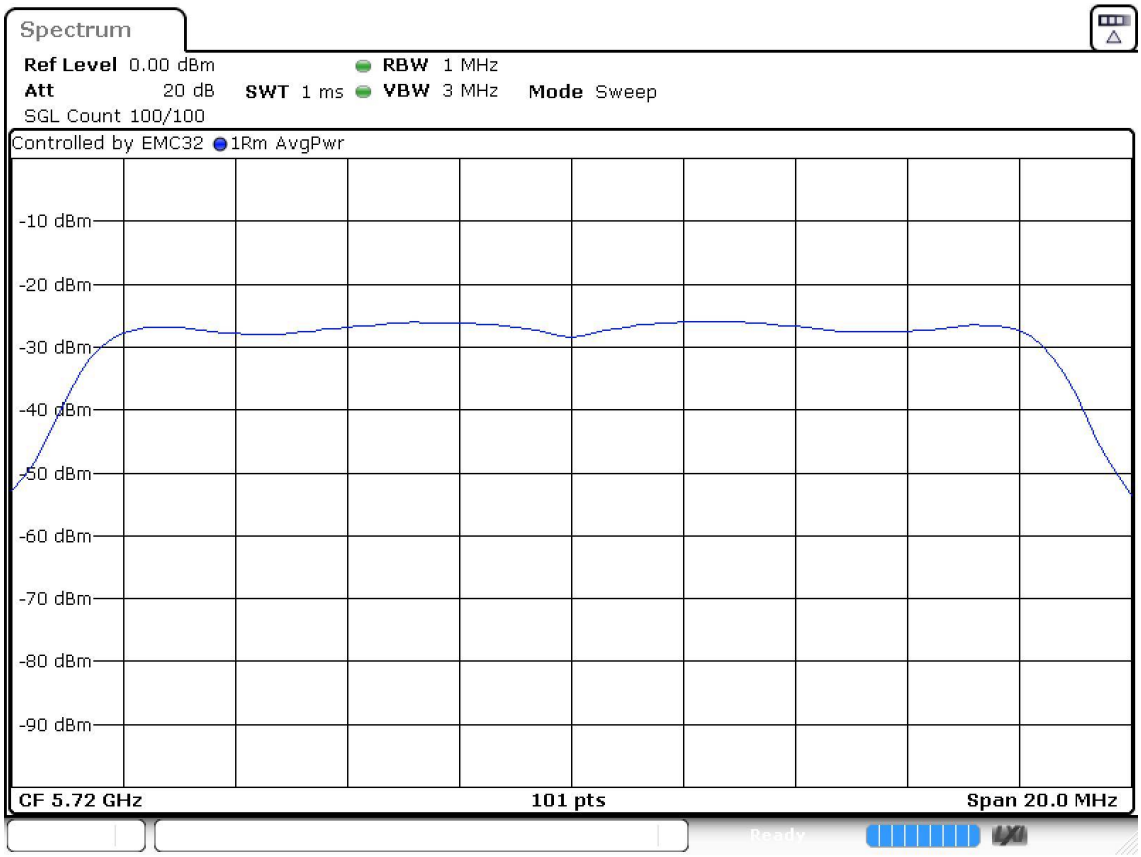
Active Port = 1 Frequency MHz = 5720.00000

Modulation = 802.11a (OFDM 6 Mbit/s) TPC = No

MIMO Mode = SISO

Images:





Modulation: 802.11ac VHT20 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
1	5500.00000	No	5502.376238	-11.05
	5580.00000		5577.623762	-11.52
	5720.00000		5722.376238	-11.69

Verdict

Pass

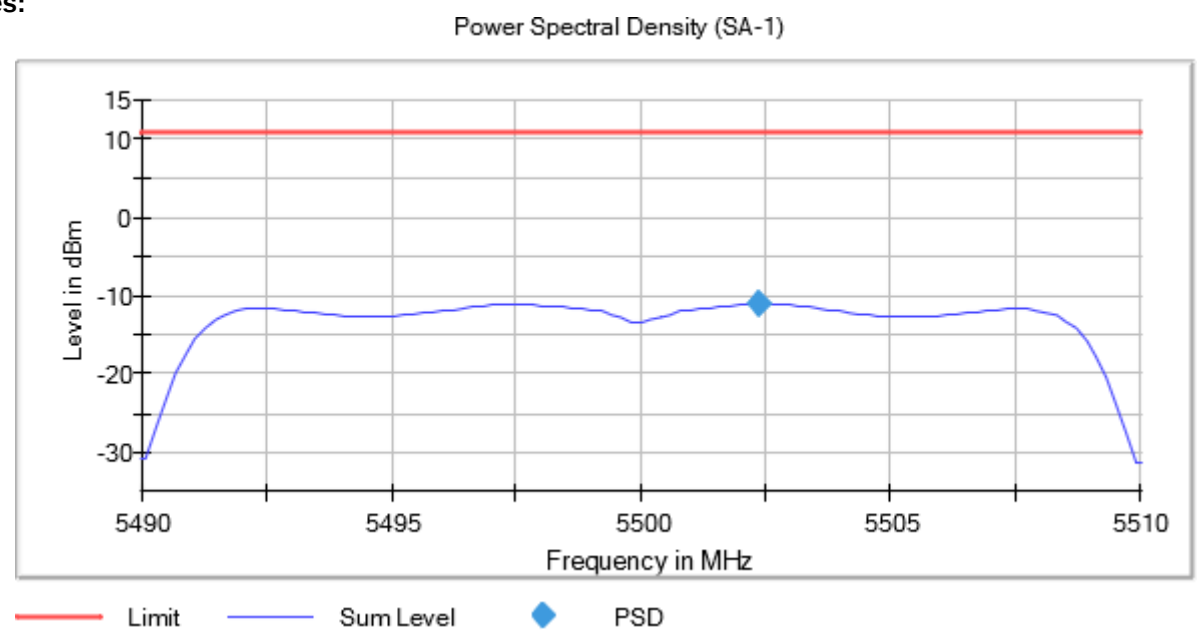
Attachments

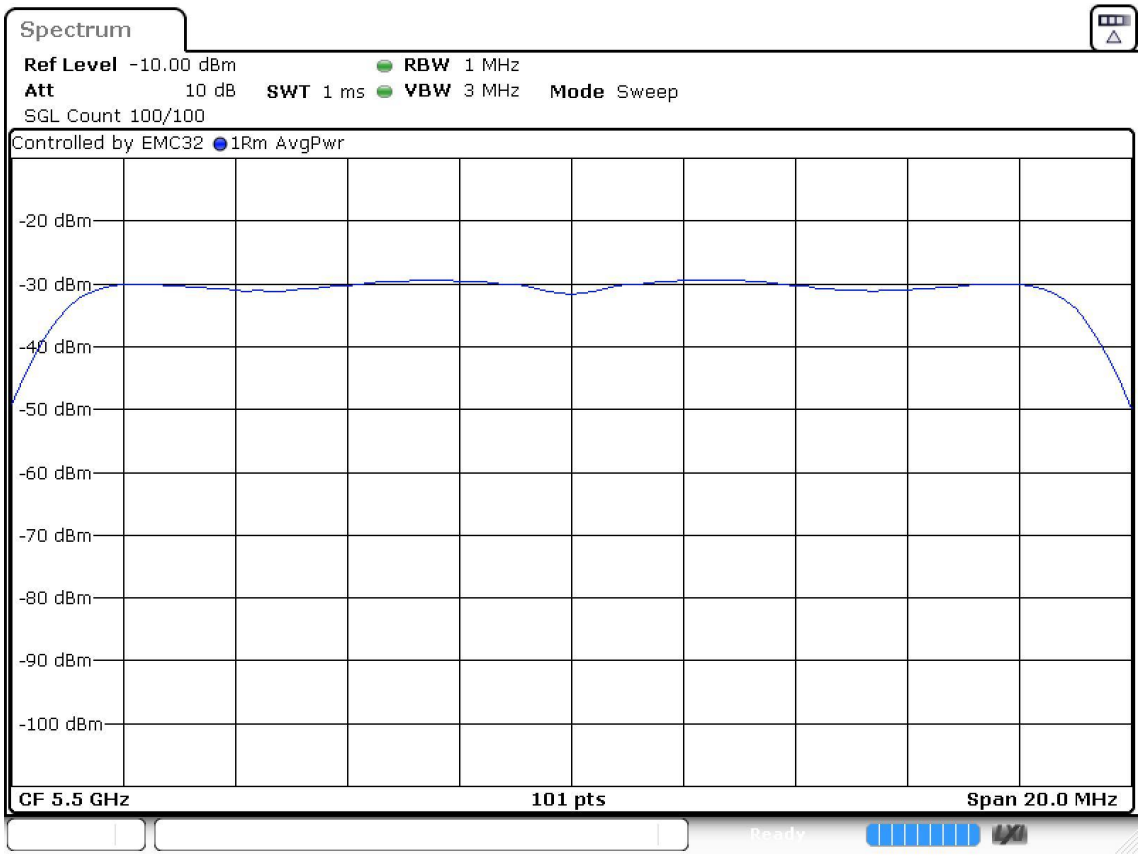
Active Port = 1 Frequency MHz = 5500.00000

Modulation = 802.11ac VHT20 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



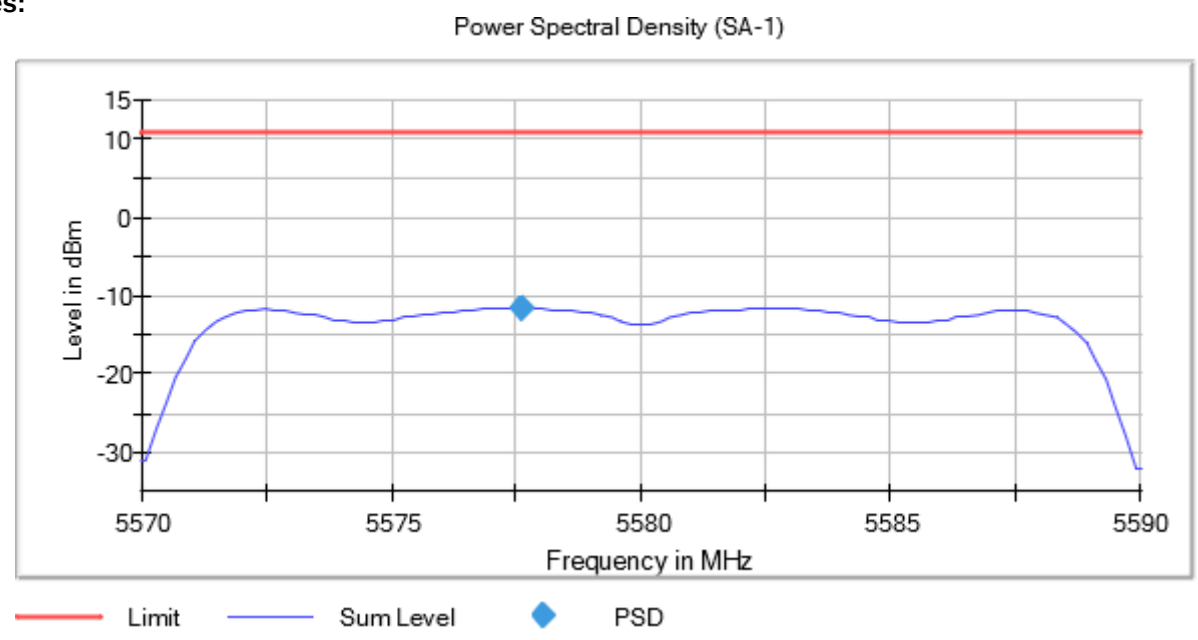


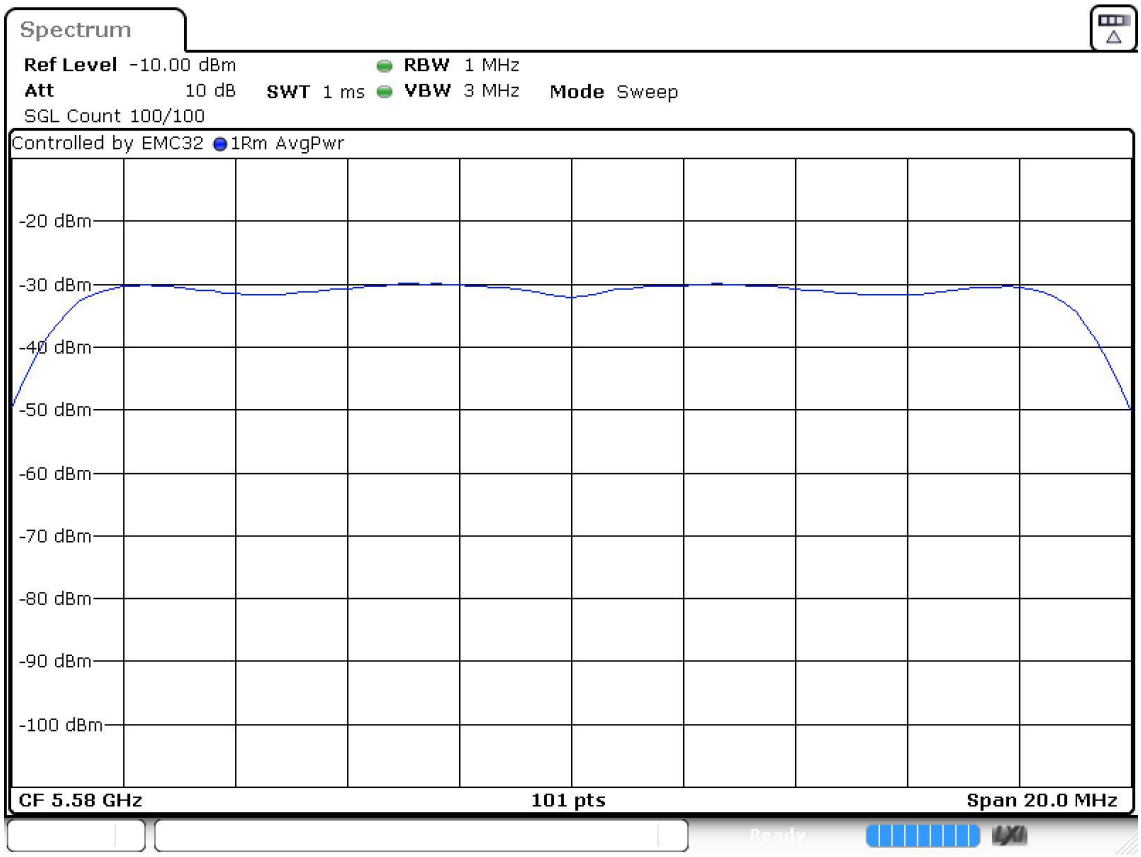
Active Port = 1 Frequency MHz = 5580.00000

Modulation = 802.11ac VHT20 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



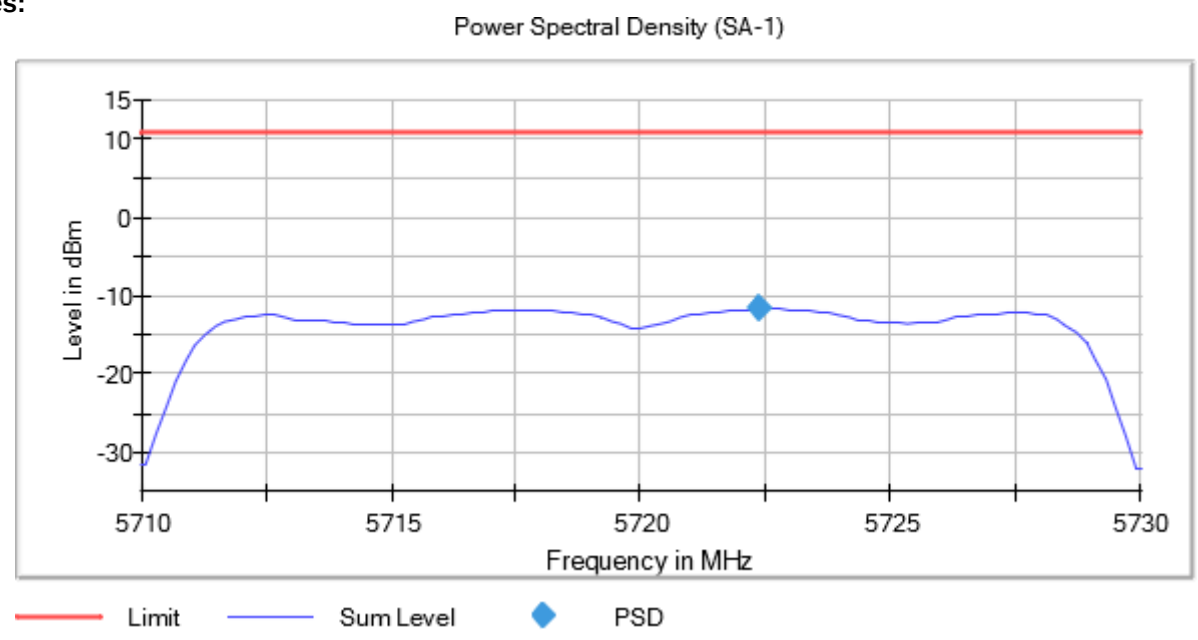


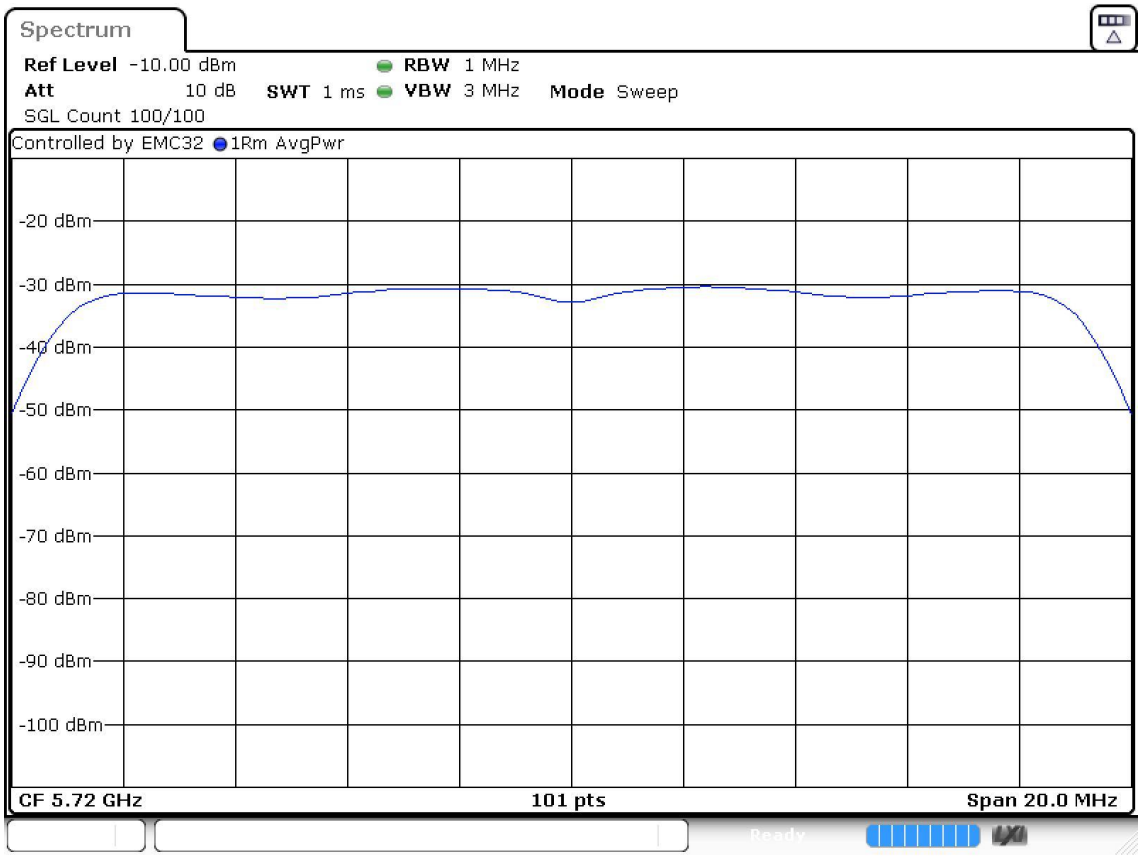
Active Port = 1 Frequency MHz = 5720.00000

Modulation = 802.11ac VHT20 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:





Modulation: 802.11ac VHT40 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
1	5510.00000	No	5505.247525	-14.08
	5550.00000		5544.851485	-10.14
	5710.00000		5704.851485	-14.64

Verdict

Pass

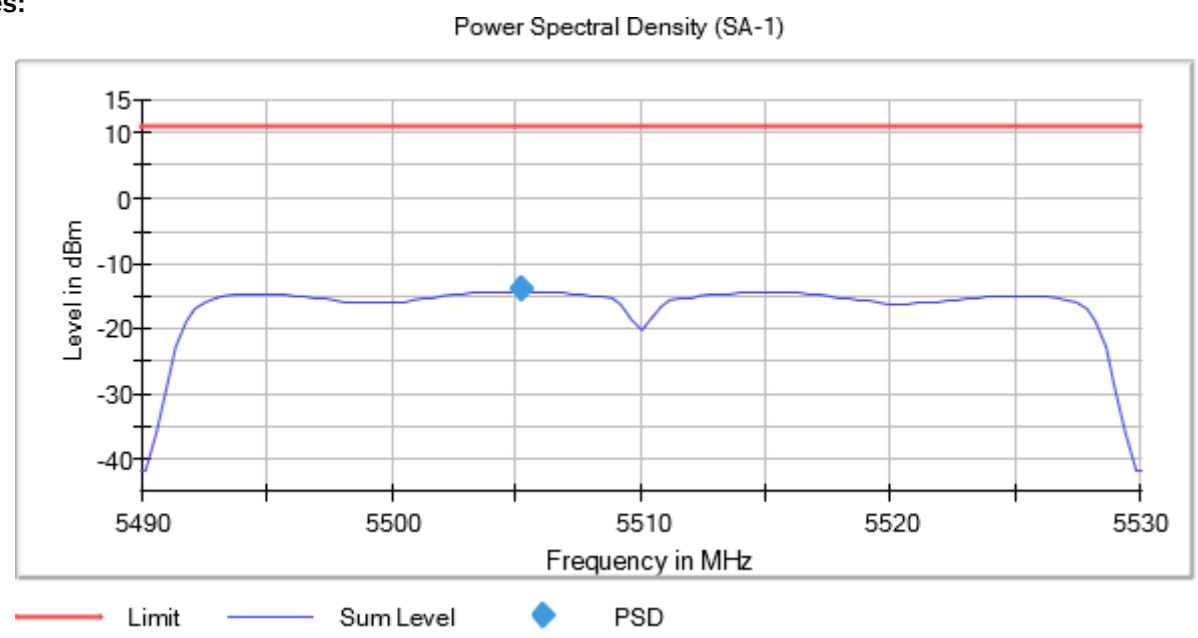
Attachments

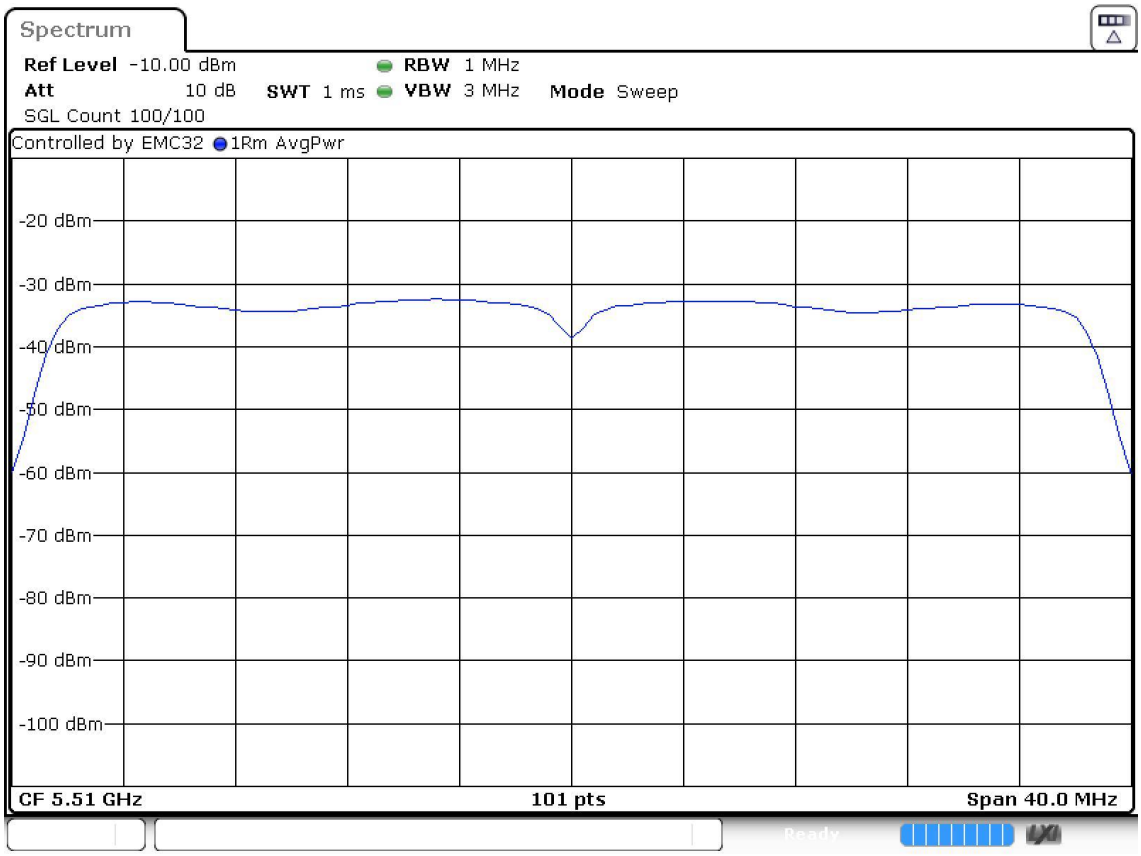
Active Port = 1 Frequency MHz = 5510.00000

Modulation = 802.11ac VHT40 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



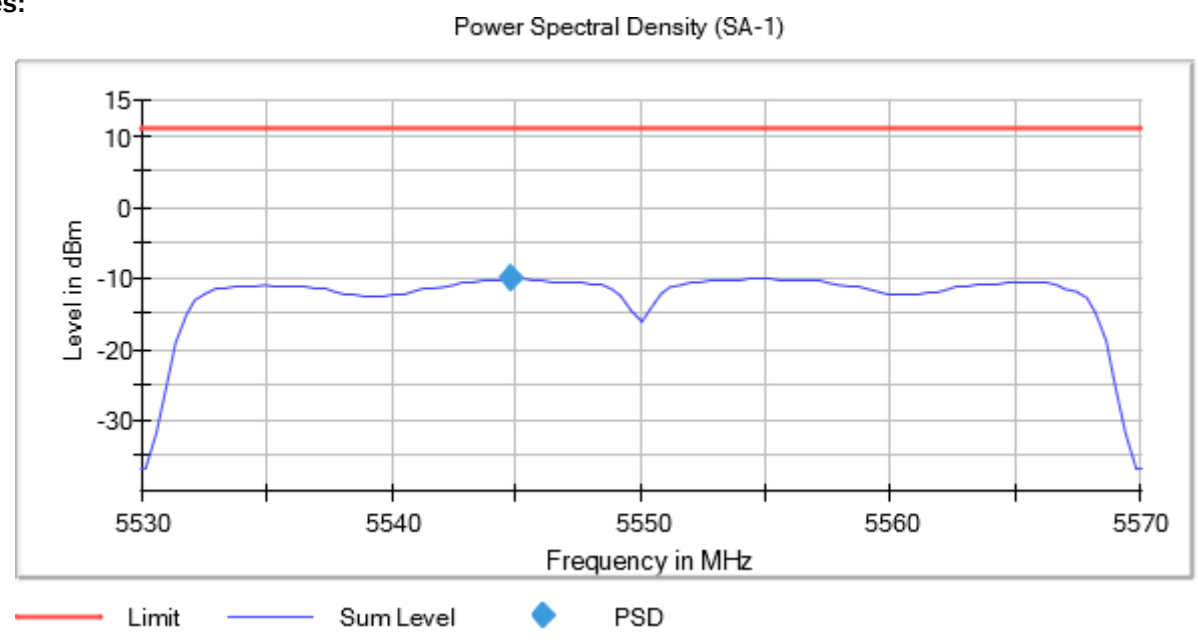


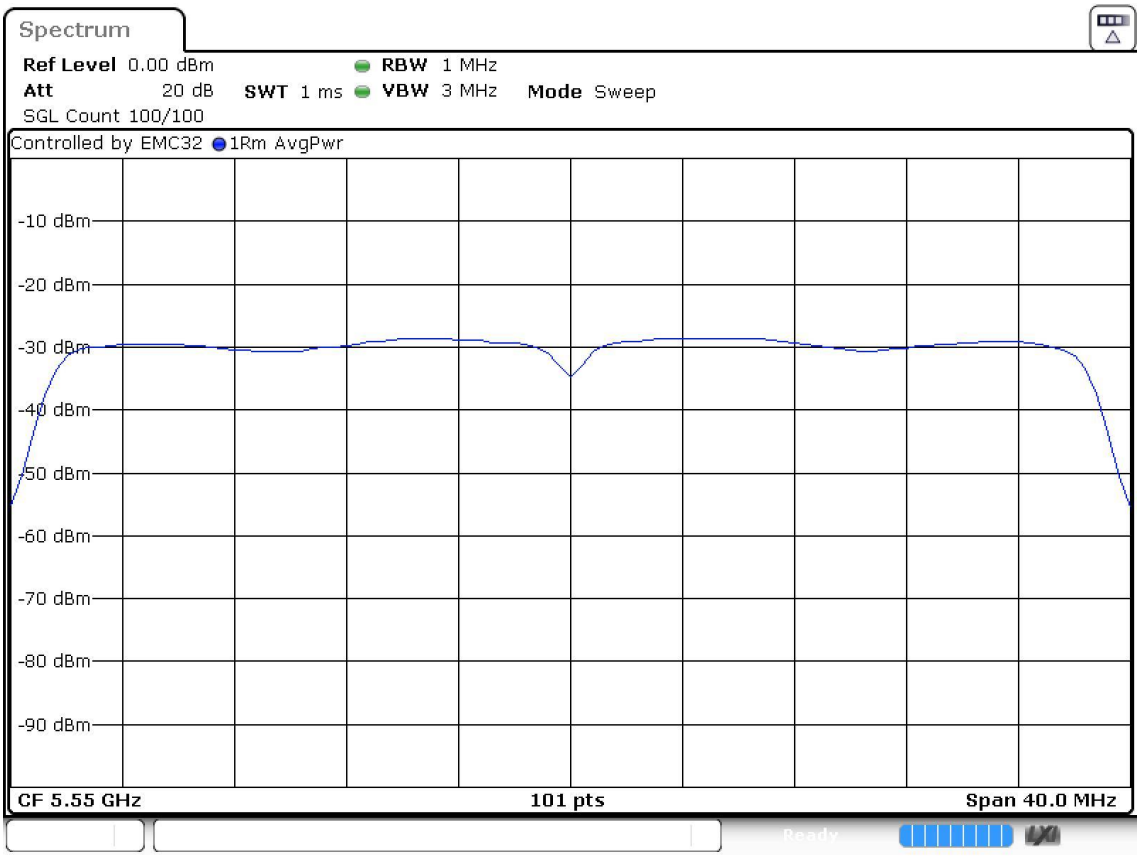
Active Port = 1 Frequency MHz = 5550.00000

Modulation = 802.11ac VHT40 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



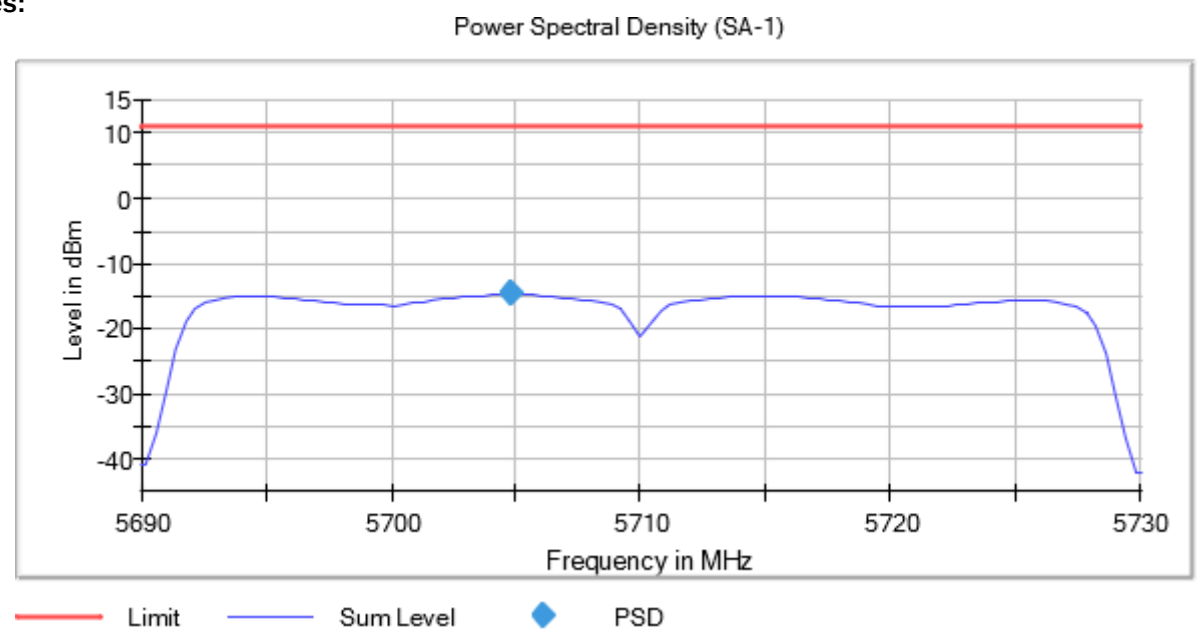


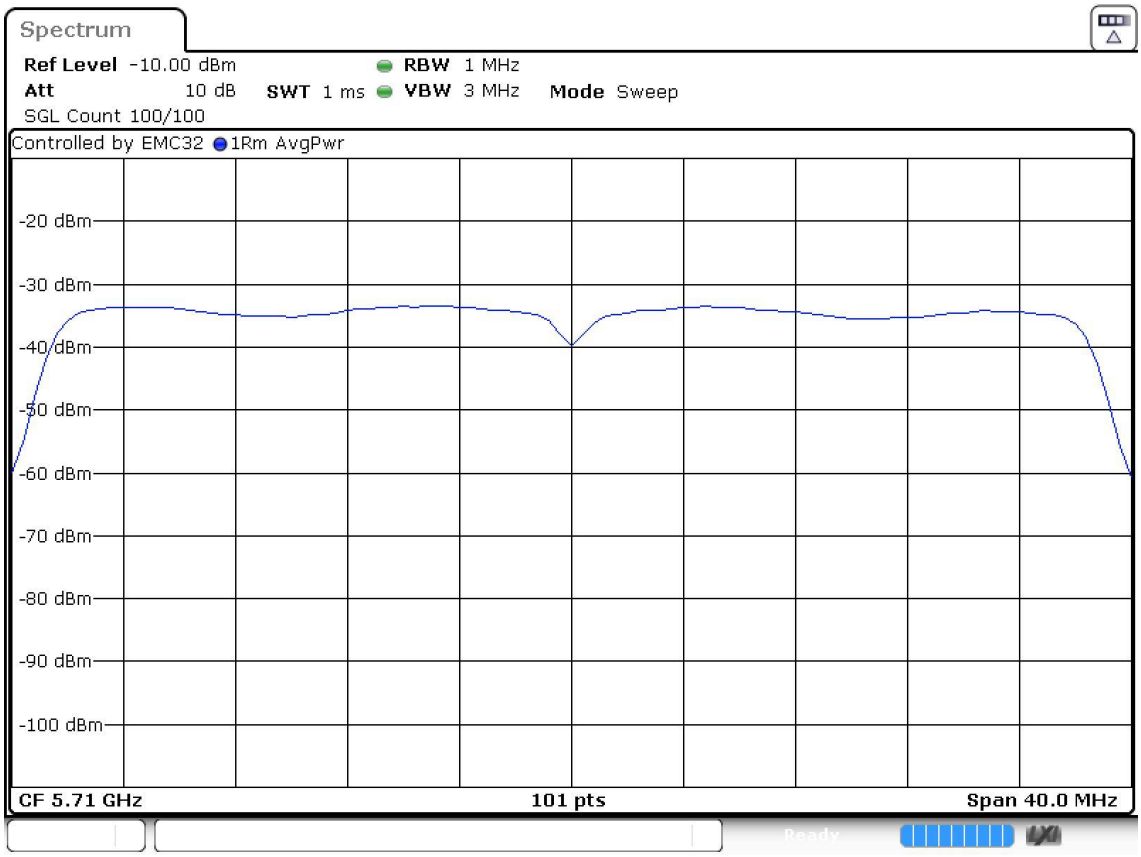
Active Port = 1 Frequency MHz = 5710.00000

Modulation = 802.11ac VHT40 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:





Modulation: 802.11ac VHT80 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
1	5530.00000	No	5563.750000	-18.20
	5690.00000		5687.750000	-18.24

Verdict

Pass

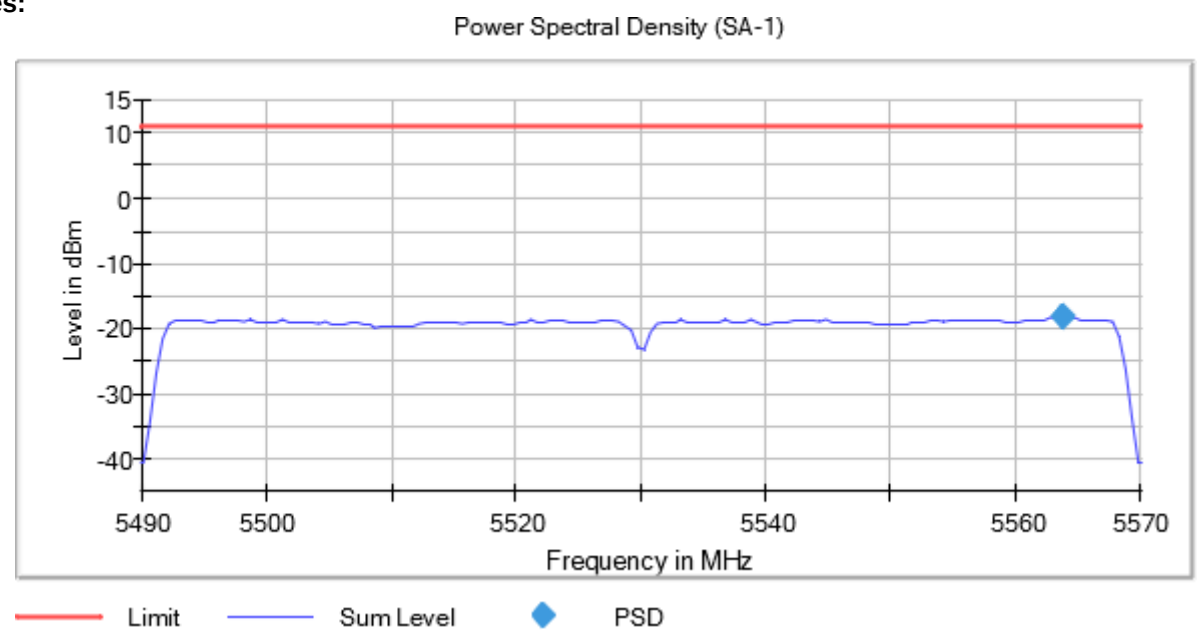
Attachments

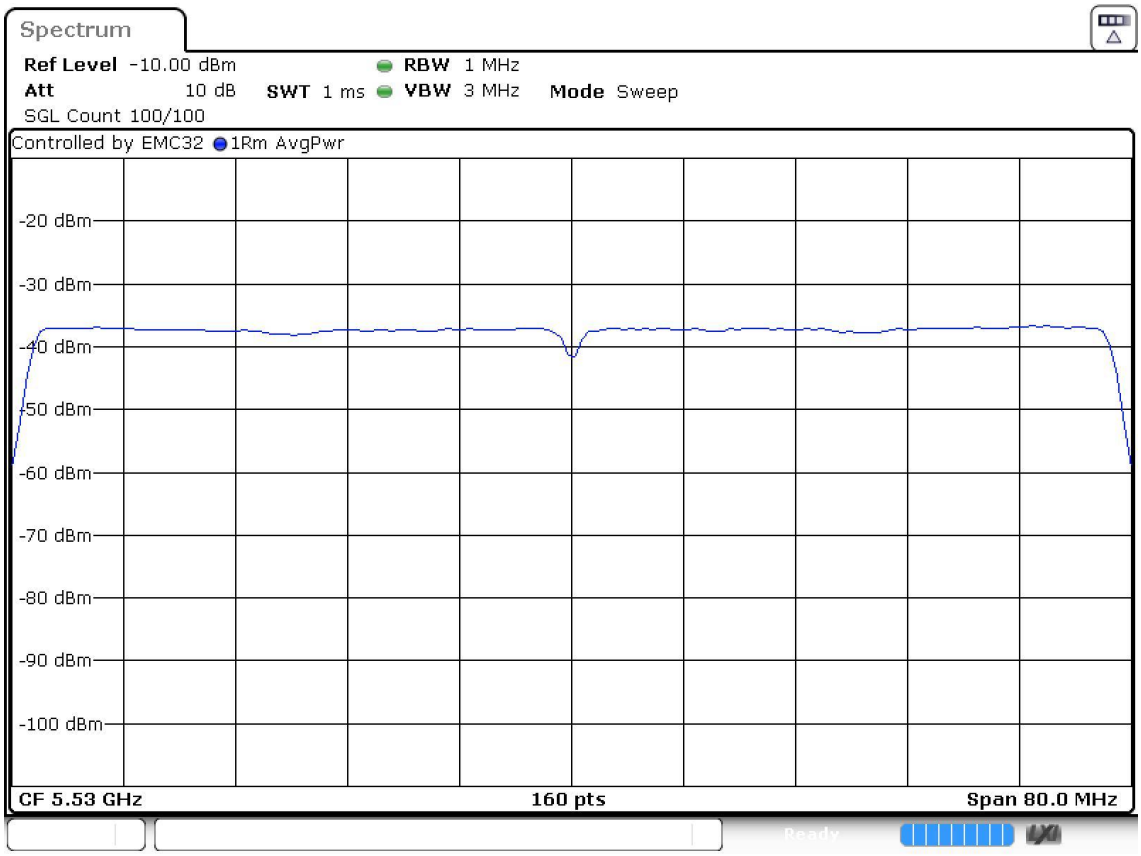
Active Port = 1 Frequency MHz = 5530.00000

Modulation = 802.11ac VHT80 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:



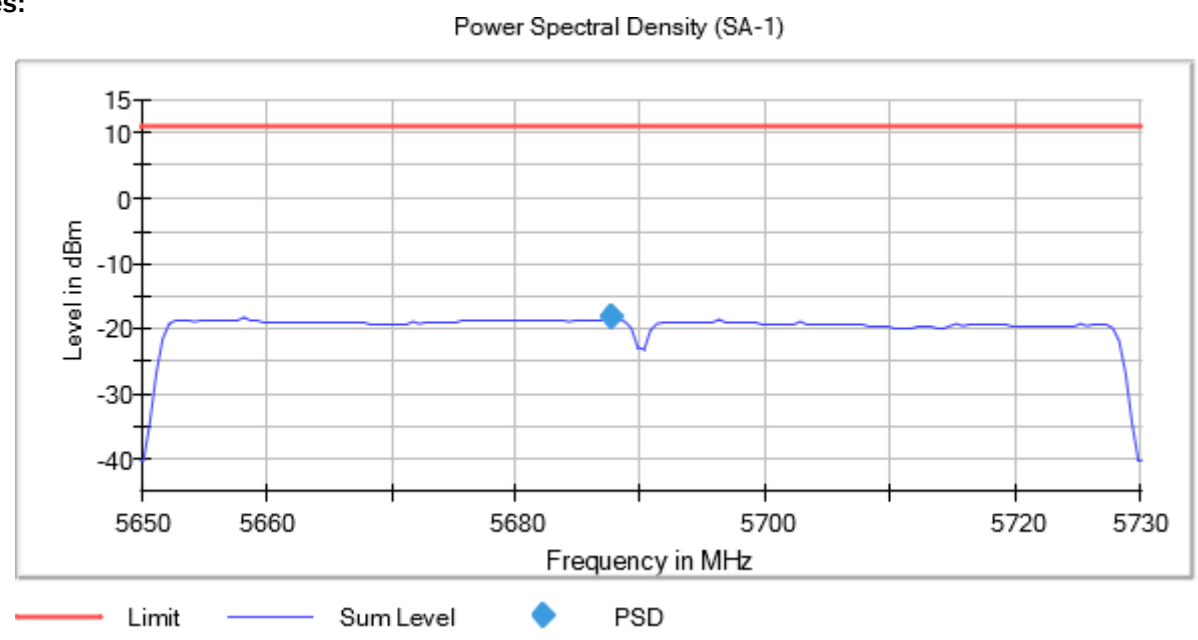


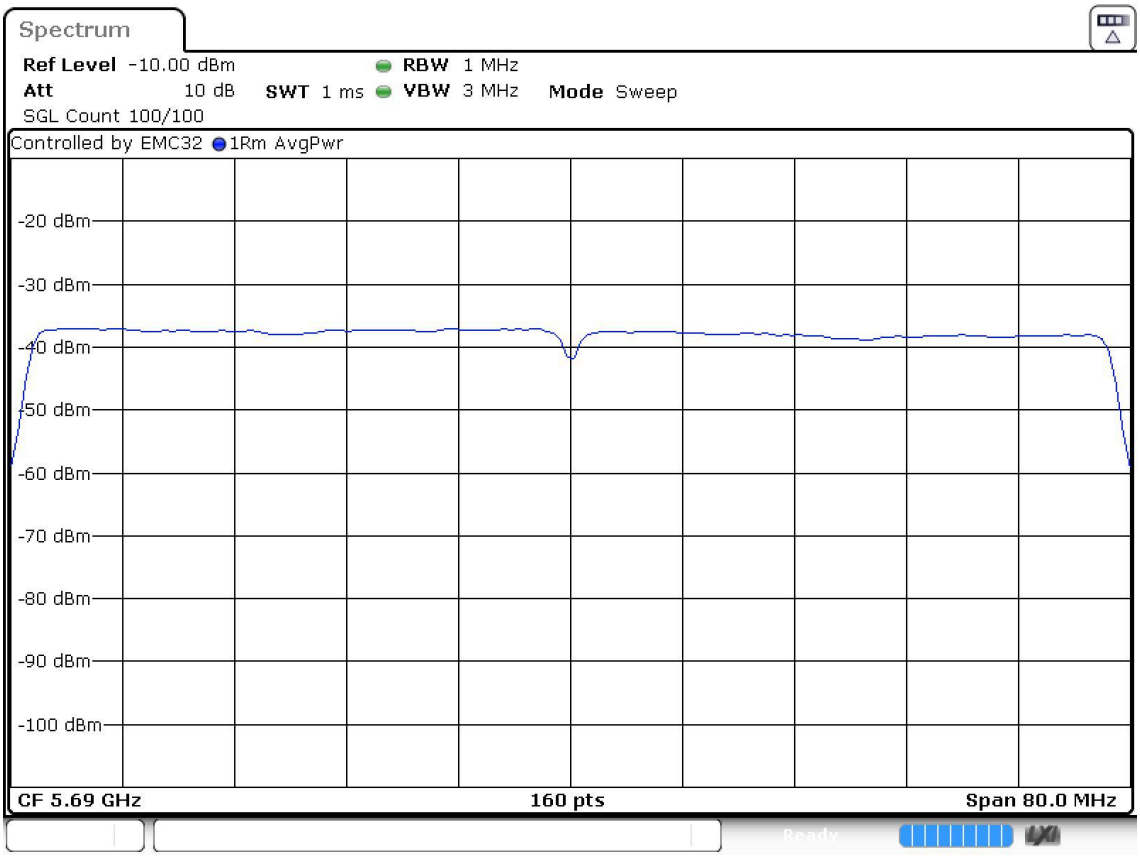
Active Port = 1 Frequency MHz = 5690.00000

Modulation = 802.11ac VHT80 (OFDM MCS0) TPC = No

MIMO Mode = SISO

Images:





RSS-247 6.2.3.2 / FCC 15.407 (b) (3) [Bndedge] Transmitter Band Edge Radiated Emissions for U-NII-2C

Limits

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 (68.20 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.

Modulation: 802.11n HT20 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	Freq (MHz)	Lvl (dBm)
1	5500.00000	5466.750000	-46.18
1	5500.00000	5468.250000	-46.39
1	5500.00000	5469.750000	-46.40
1	5500.00000	5467.750000	-46.53
1	5500.00000	5469.250000	-46.56
1	5500.00000	5468.750000	-46.88
1	5500.00000	5466.250000	-46.94
1	5500.00000	5465.750000	-47.99
1	5500.00000	5467.250000	-48.23
1	5500.00000	5465.250000	-48.24
1	5500.00000	5464.750000	-49.07
1	5500.00000	5463.750000	-49.13
1	5500.00000	5461.250000	-49.37
1	5500.00000	5463.250000	-49.63
1	5500.00000	5464.250000	-49.71

Port	Freq (MHz)	Freq (MHz)	Lvl (dBm)
1	5720.00000	5864.750000	-56.53
1	5720.00000	5876.750000	-56.83
1	5720.00000	5873.250000	-56.89
1	5720.00000	5873.750000	-56.91
1	5720.00000	5862.250000	-57.15
1	5720.00000	5877.750000	-57.15
1	5720.00000	5863.750000	-57.21
1	5720.00000	5876.250000	-57.22
1	5720.00000	5861.750000	-57.29
1	5720.00000	5866.750000	-57.32
1	5720.00000	5860.750000	-57.43
1	5720.00000	5869.250000	-57.46
1	5720.00000	5862.750000	-57.51
1	5720.00000	5870.750000	-57.52
1	5720.00000	5871.750000	-57.63

Verdict

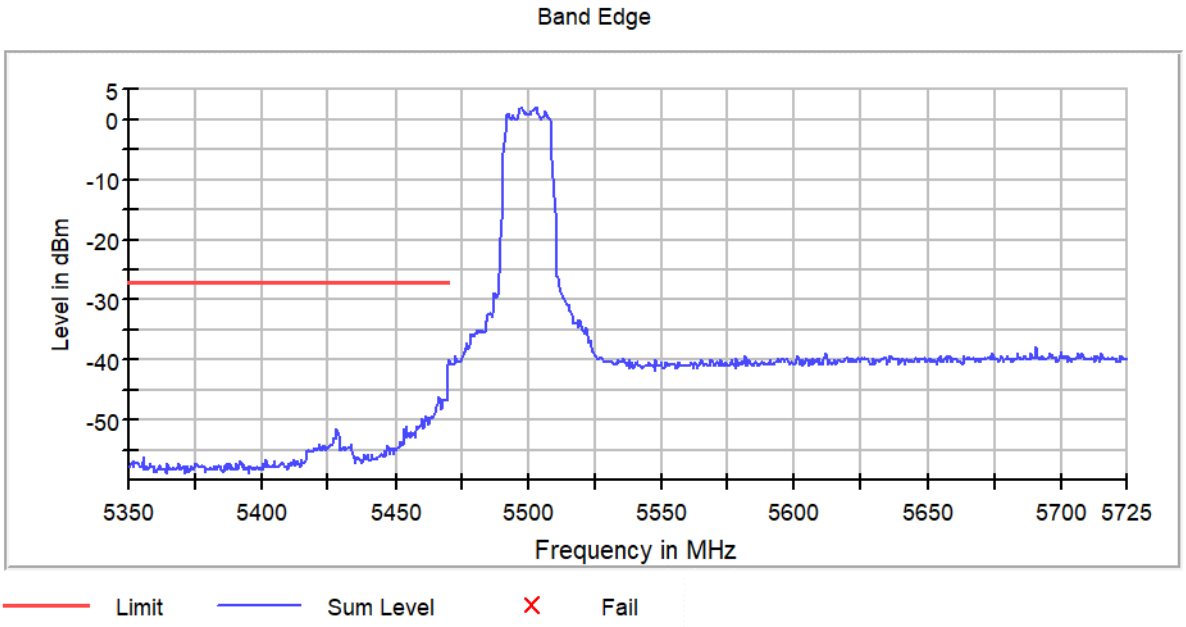
Pass

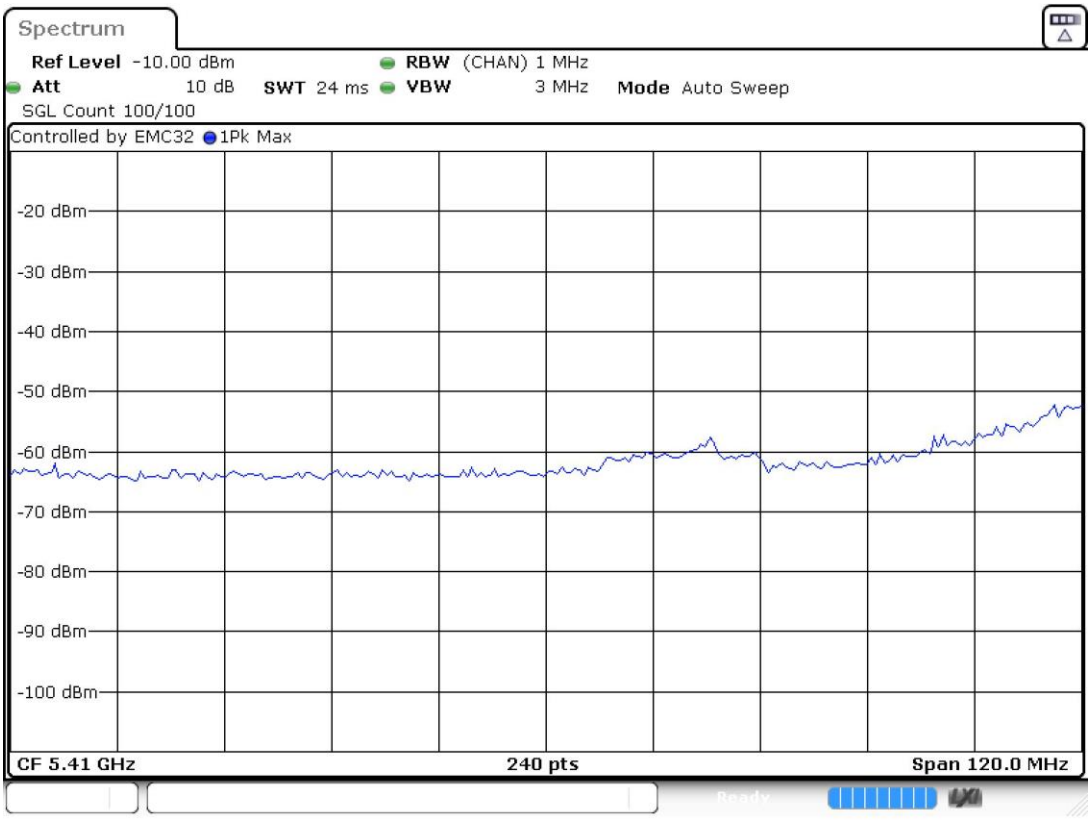
Attachments

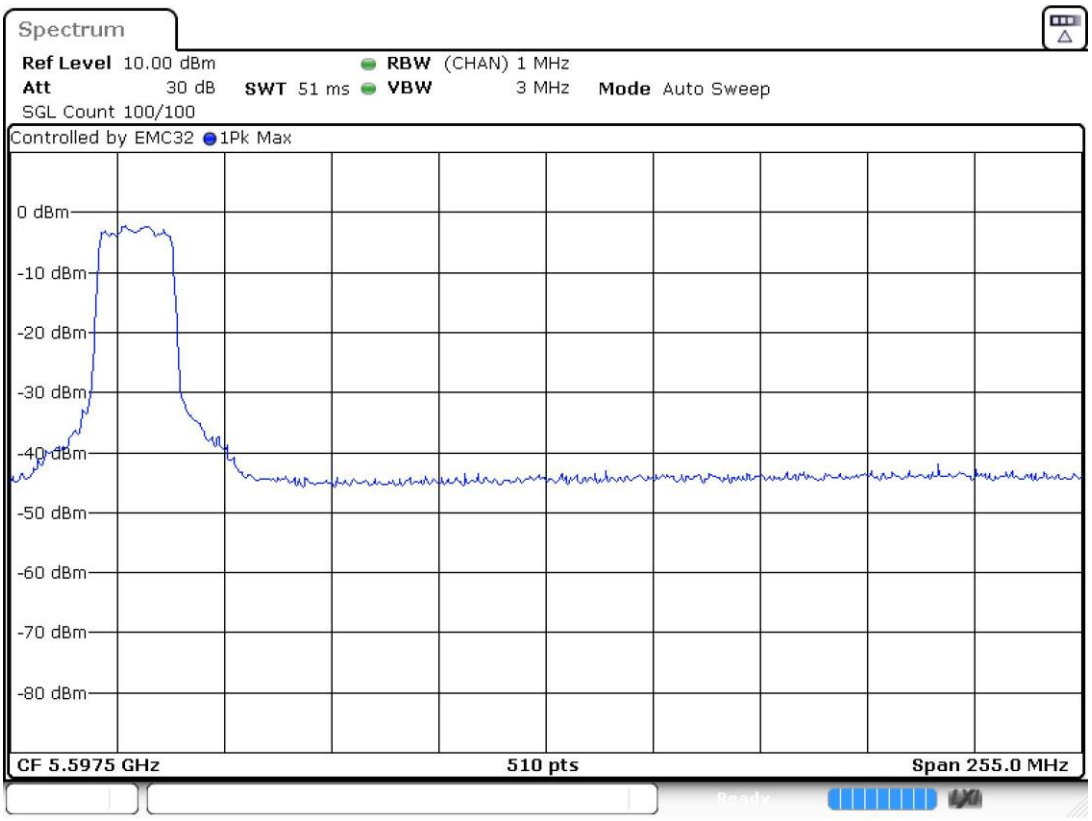
Active Port = 1 Frequency MHz = 5500.00000

Modulation = 802.11n HT20 (OFDM MCS0) MIMO Mode = SISO

Images:





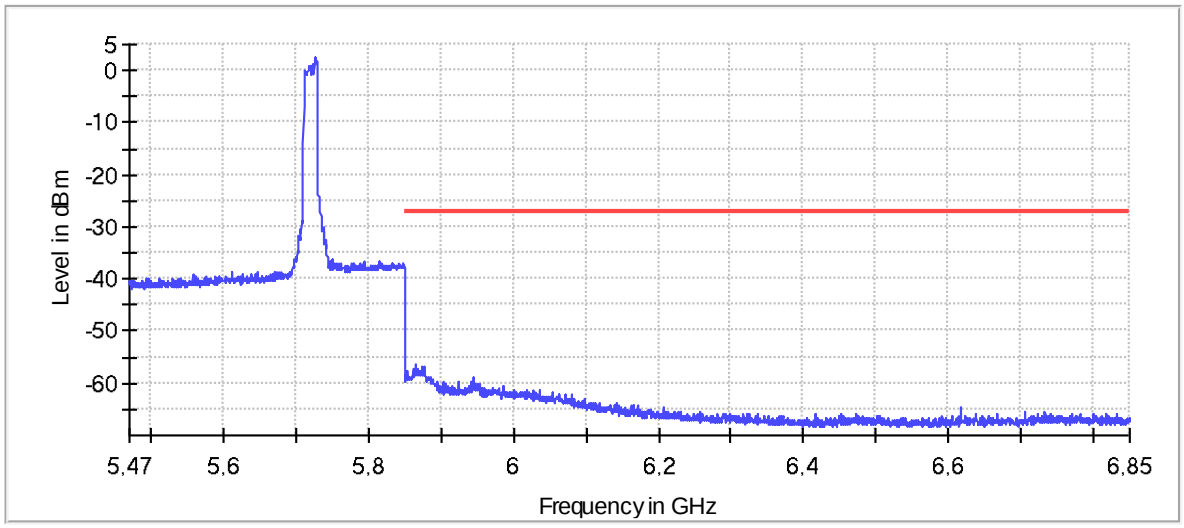

Spectrum
Ref Level 10.00 dBm
RBW (CHAN) 1 MHz
Att 30 dB
SWT 51 ms
VBW 3 MHz
Mode Auto Sweep
SGL Count 100/100
Controlled by EMC32
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 5.5975 GHz
510 pts
Span 255.0 MHz
Ready

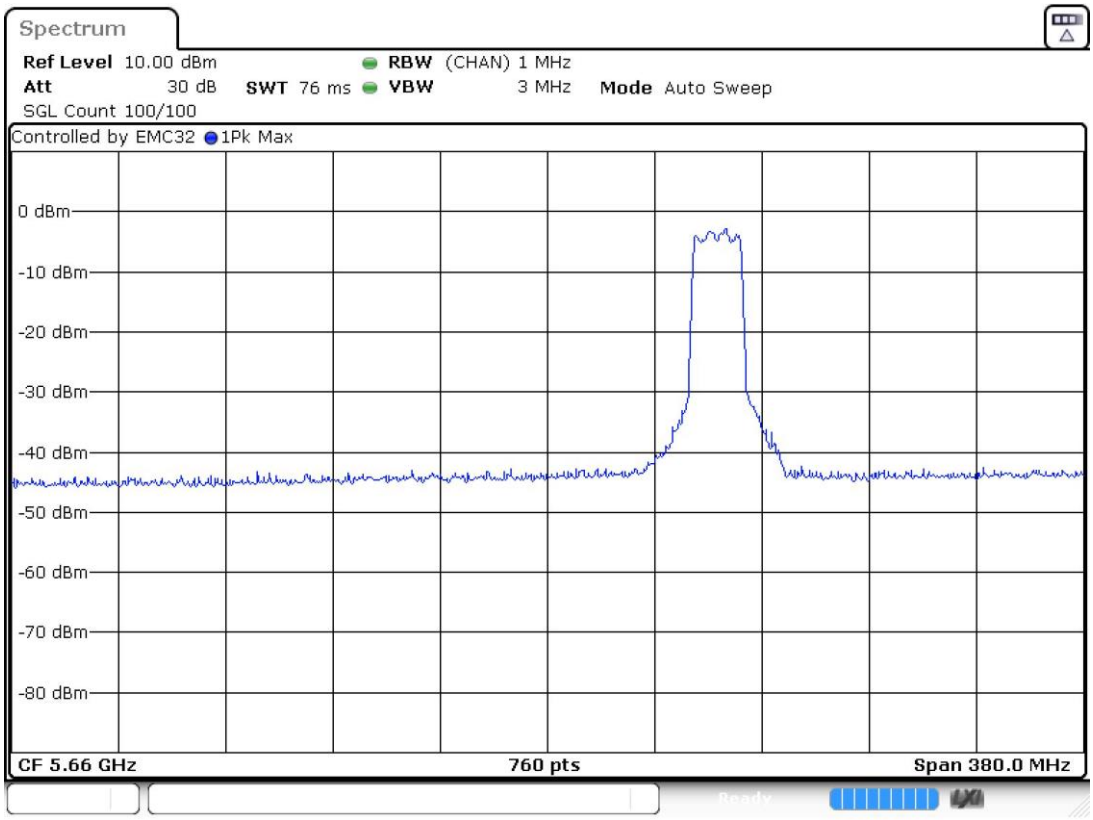
Active Port = 1 Frequency MHz = 5720.00000

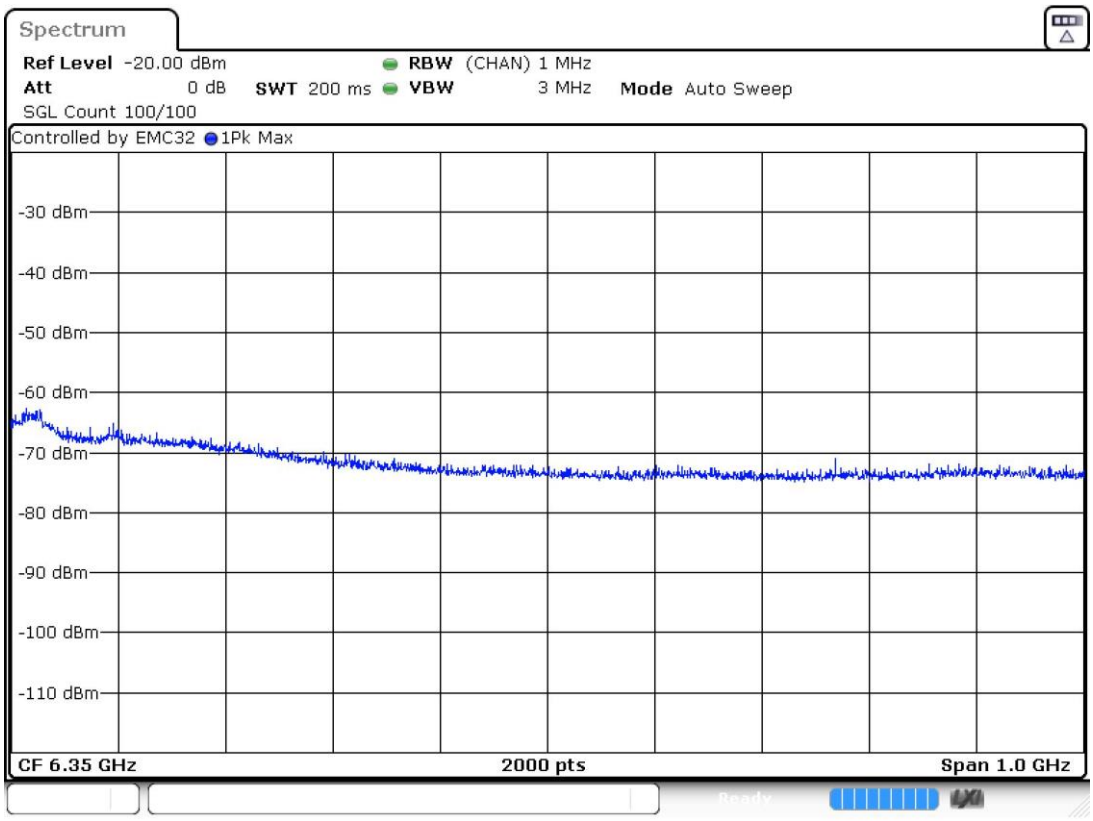
Modulation = 802.11n HT20 (OFDM MCS0) MIMO Mode = SISO

Images:

Band Edge






Spectrum
Ref Level -20.00 dBm
RBW (CHAN) 1 MHz
Att 0 dB
SWT 200 ms
VBW 3 MHz
Mode Auto Sweep
SGL Count 100/100
Controlled by EMC32
1Pk Max
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
-100 dBm
-110 dBm
CF 6.35 GHz
2000 pts
Span 1.0 GHz
Ready

Modulation: 802.11n HT40 (OFDM MCS0)

MIMO Mode: SISO

Results

Port	Freq (MHz)	Freq (MHz)	Lvl (dBm)
1	5510.00000	5468.750000	-33.4
1	5510.00000	5469.750000	-34.4
1	5510.00000	5469.250000	-34.4
1	5510.00000	5468.250000	-34.7
1	5510.00000	5467.750000	-34.9
1	5510.00000	5466.250000	-35.0
1	5510.00000	5466.750000	-35.1
1	5510.00000	5467.250000	-35.4
1	5510.00000	5465.250000	-35.8
1	5510.00000	5465.750000	-36.1
1	5510.00000	5464.750000	-36.1
1	5510.00000	5464.250000	-36.9
1	5510.00000	5463.750000	-37.4
1	5510.00000	5463.250000	-38.1
1	5510.00000	5462.750000	-38.4
1	5710.00000	5853.750000	-59.4
1	5710.00000	5853.250000	-59.5
1	5710.00000	5852.750000	-59.5
1	5710.00000	5855.250000	-59.6
1	5710.00000	5851.750000	-59.6
1	5710.00000	5854.750000	-59.6
1	5710.00000	5855.750000	-59.6
1	5710.00000	5852.250000	-59.7
1	5710.00000	5854.250000	-60.1
1	5710.00000	5857.250000	-60.6
1	5710.00000	5856.250000	-61.0
1	5710.00000	5857.750000	-61.5
1	5710.00000	5862.750000	-61.5
1	5710.00000	5856.750000	-61.5
1	5710.00000	5851.250000	-61.6

Verdict

Pass

Attachments

Active Port = 1 Frequency MHz = 5510.00000

Modulation = 802.11n HT40 (OFDM MCS0) MIMO Mode = SISO

Images: