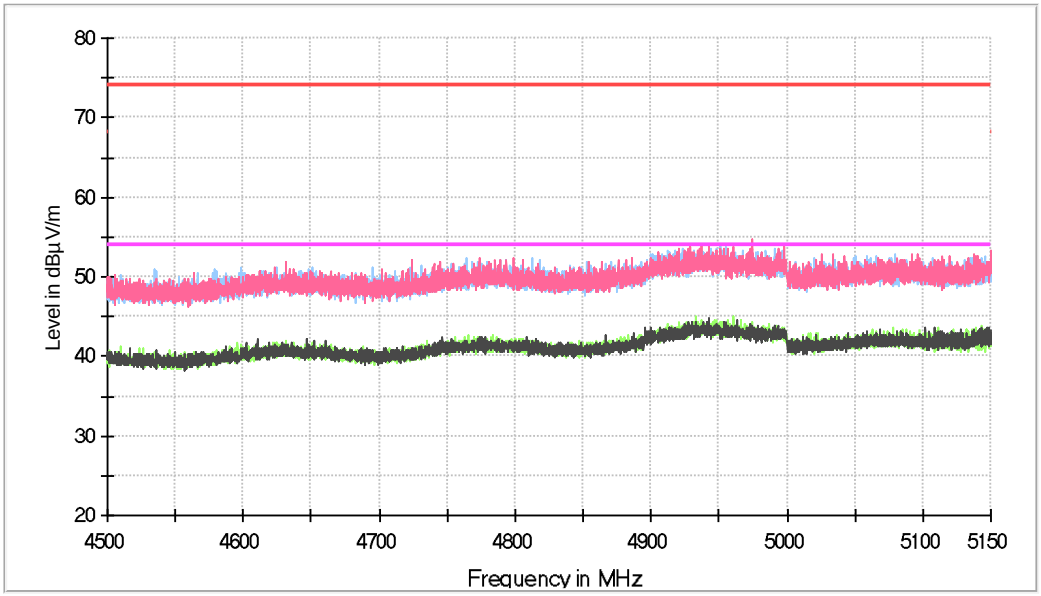
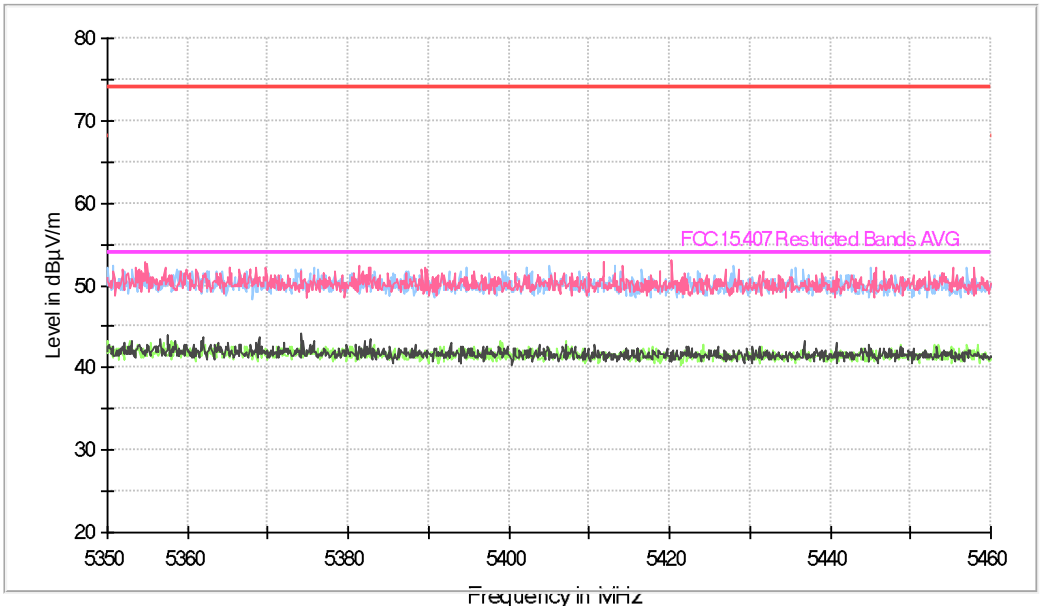
- Lower Band Edge and Upper Band Edge – High Channel (Restricted Bands)



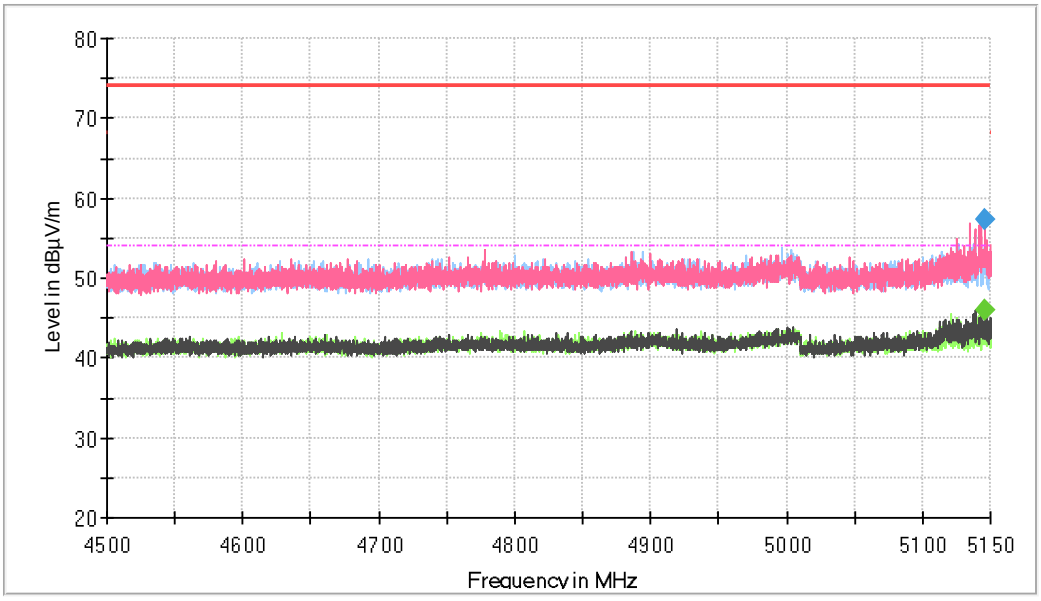
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG



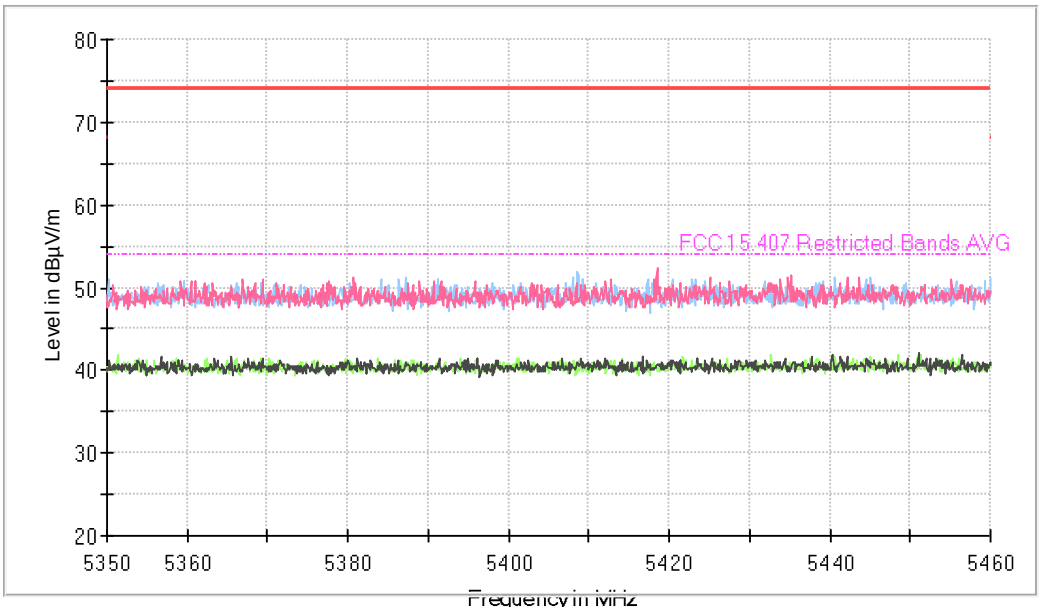
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- **SISO 802.11 ac80 (Chain 1):**

  - Lower Band Edge and Upper Band Edge – Single Channel (Restricted Bands)



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview 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



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview 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

MIMO

- **MIMO 802.11 n20:**

- LOW CHANNEL:

- Lower Band Edge. Spurious emissions inside the Restricted Band 4.50-5.15 GHz:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
5106.300000	58.67	V	Peak
	44.37		Average

- Upper Band Edge. No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- HIGH CHANNEL:

- Lower Band Edge. No spurious emissions found inside the Restricted Band 4.50-5.15 GHz:
- Upper Band Edge. No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **MIMO 802.11 ac20:**

- LOW CHANNEL:

- Lower Band Edge. No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.
- Upper Band Edge. No spurious emissions inside the Restricted Band 5.35-5.46 GHz.

- HIGH CHANNEL:

- Lower Band Edge. No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.
- Upper Band Edge. No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **MIMO 802.11 n40:**

- LOW CHANNEL:

- Lower Band Edge. Spurious emissions inside the Restricted Band 4.50-5.15 GHz:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
5141.700000	64.86	V	Peak
	47.30		Average

- Upper Band Edge. No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- HIGH CHANNEL:

- Lower Band Edge. No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.
- Upper Band Edge. No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **MIMO 802.11 ac40:**

- LOW CHANNEL:

- Lower Band Edge. No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.
- Upper Band Edge. No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- HIGH CHANNEL:

- Lower Band Edge. No spurious emissions found inside the Restricted Band 4.50-5.15 GHz.
- Upper Band Edge. No spurious emissions found inside the Restricted Band 5.35-5.46 GHz.

- **MIMO 802.11 ac80:**

- SINGLE CHANNEL:

- Lower Band Edge. Spurious emissions inside the Restricted Band 4.50-5.15 GHz:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
5142.000000	59.25	V	Peak
	44.70		Average

- Upper Band Edge. No spurious emissions inside the Restricted Band 5.35-5.46 GHz.

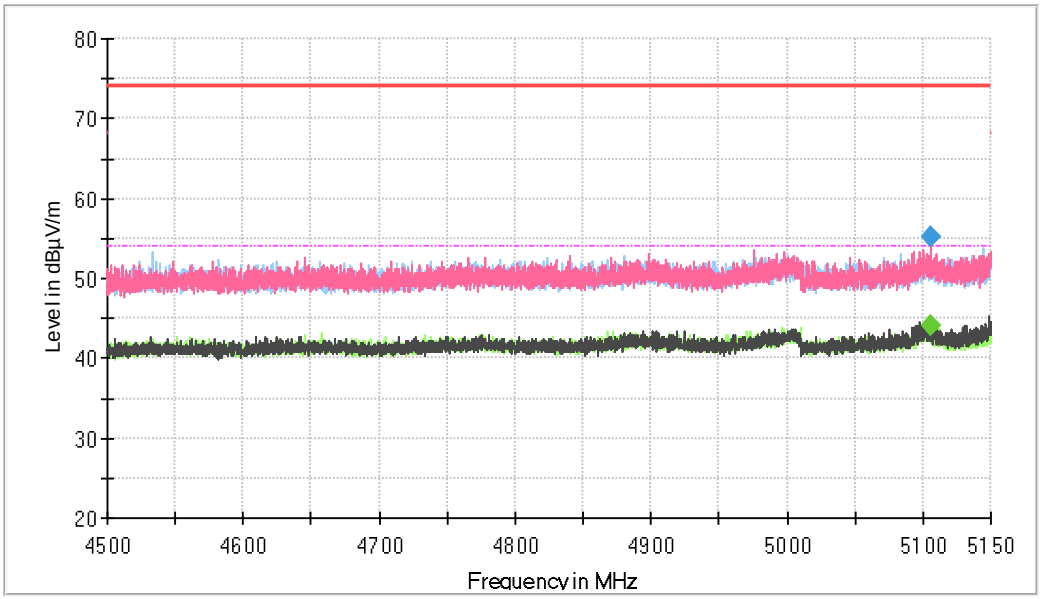
Verdict: PASS

The measurement settings for band edge measurements is as follows:

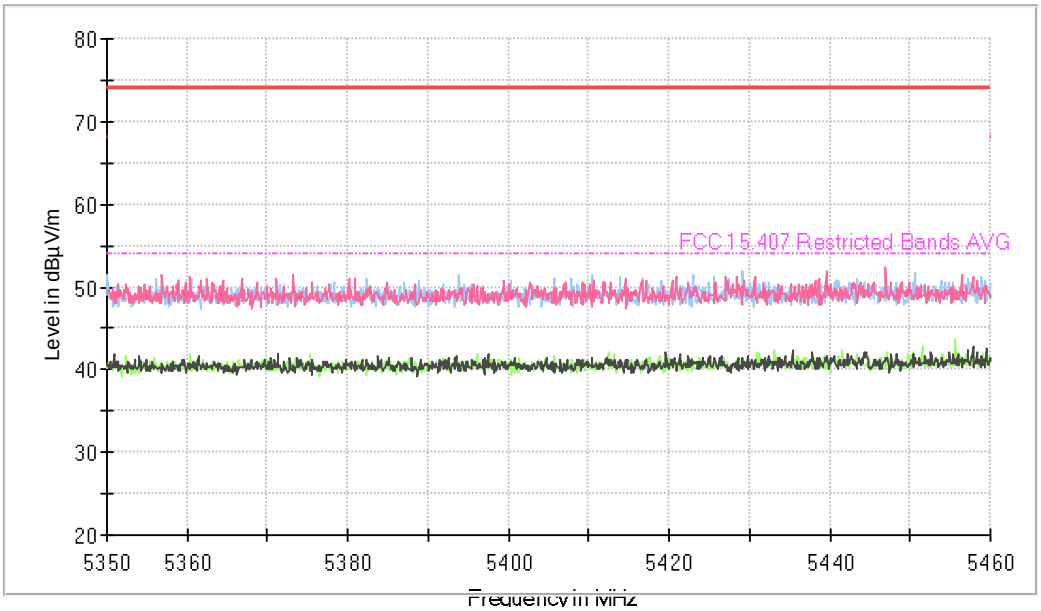
Subrange	**Step Size**	**Detectors**	**Bandwidth**	**Sweep Time**	**Preamp**
Receiver: [FSW 50]					
1 GHz - 6,5 GHz	100 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

- **MIMO 802.11 n20:**

  - Lower Band Edge and Upper Band Edge – Low Channel (Restricted Bands)

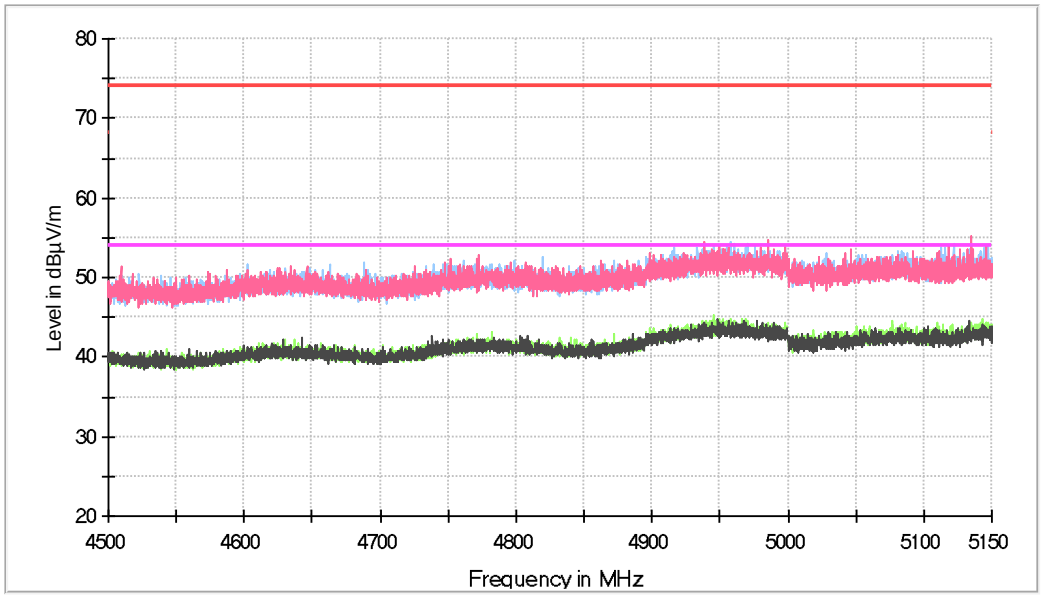


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

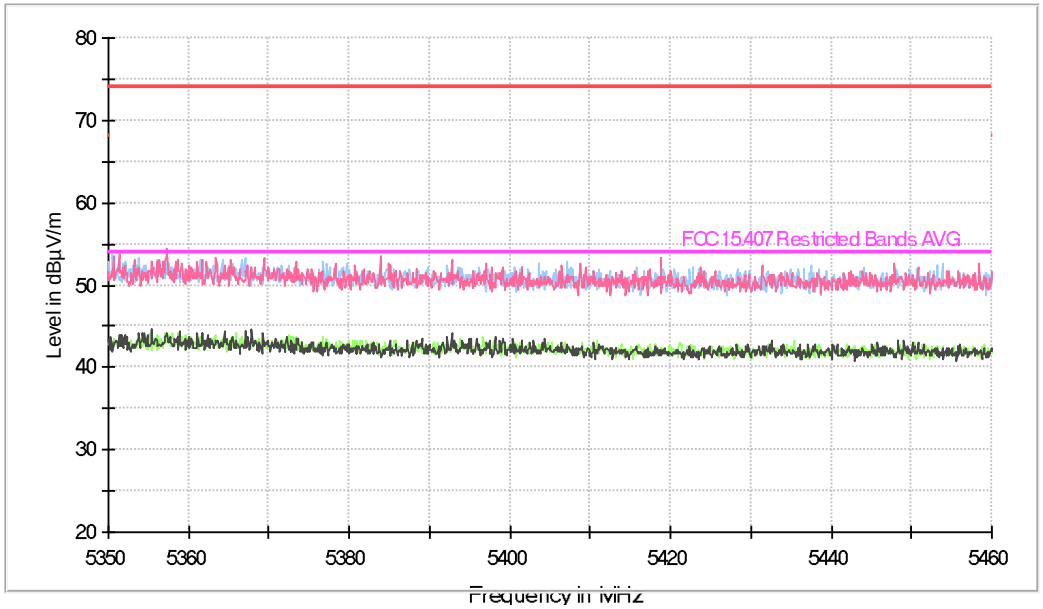


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- Lower Band Edge and Upper Band Edge – High Channel (Restricted Bands)



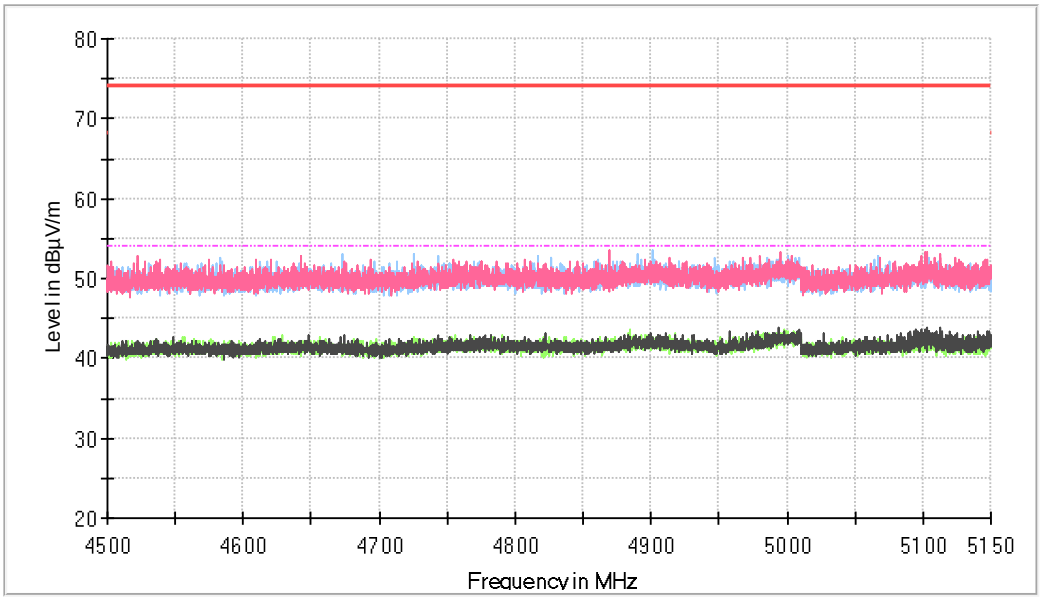
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG



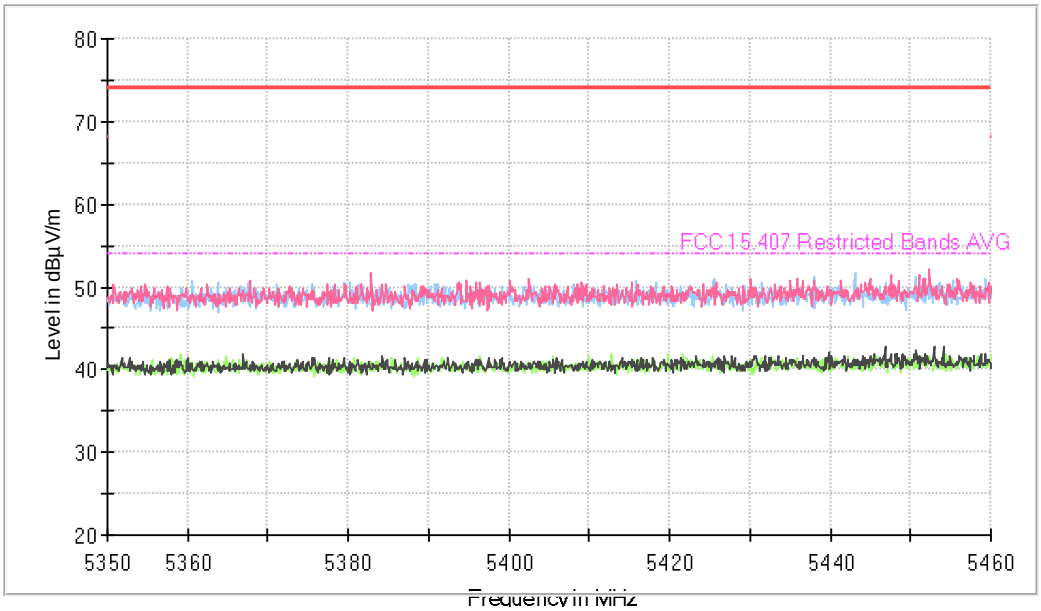
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- **MIMO 802.11 ac20:**

  - Lower Band Edge and Upper Band Edge – Low Channel (Restricted Bands)

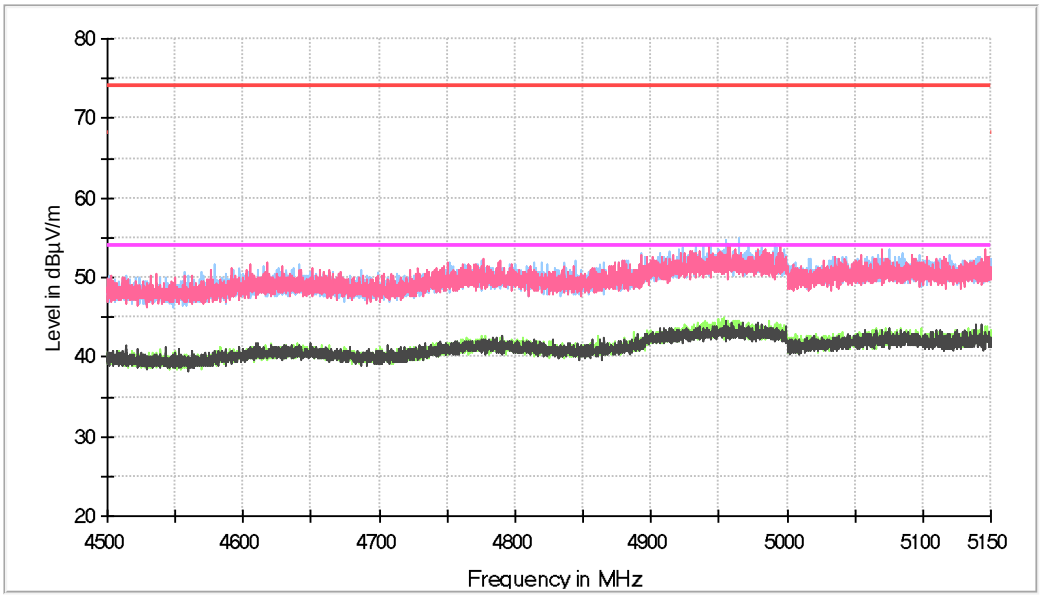


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

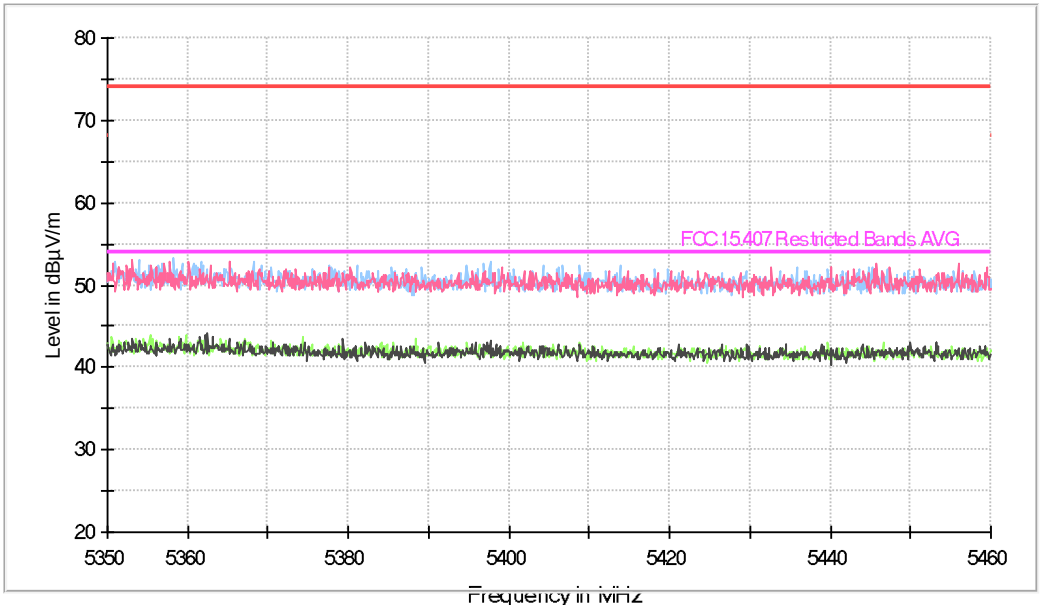


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- Lower Band Edge and Upper Band Edge – High Channel (Restricted Bands)



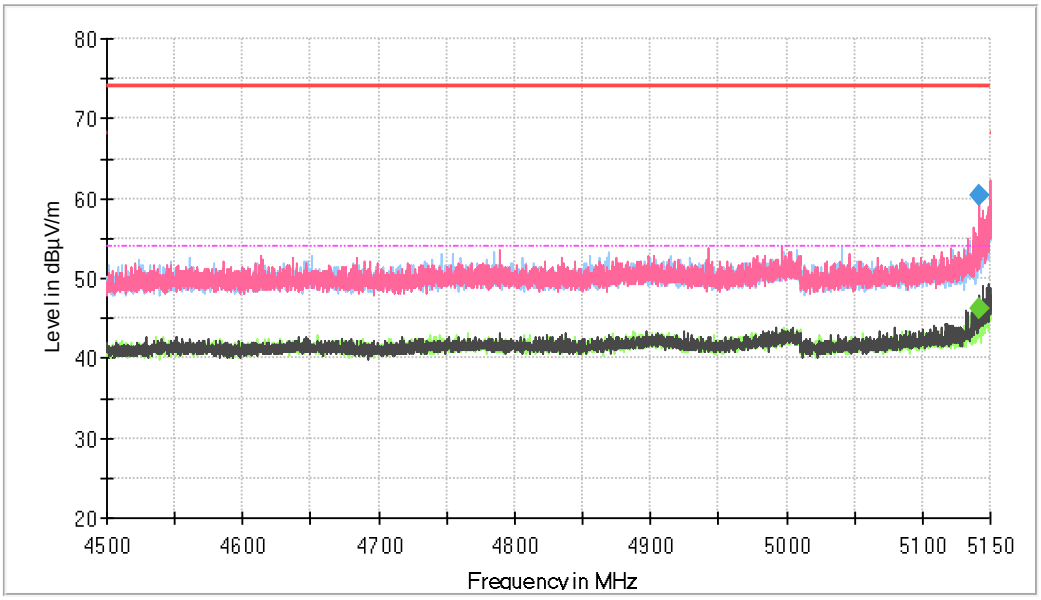
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG



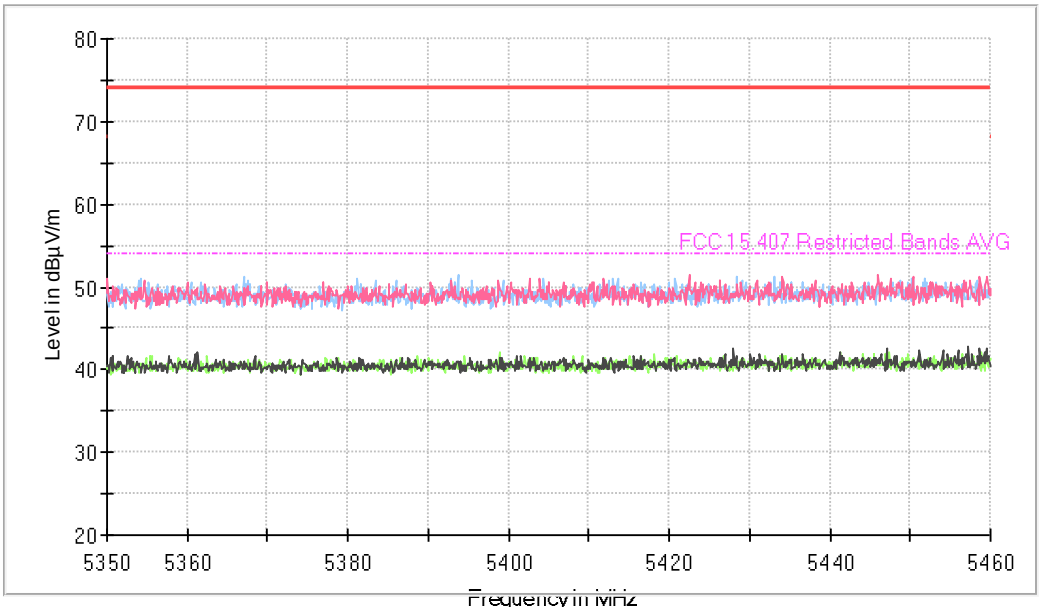
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- **MIMO 802.11 n40:**

  - Lower Band Edge and Upper Band Edge – Low Channel (Restricted Bands)

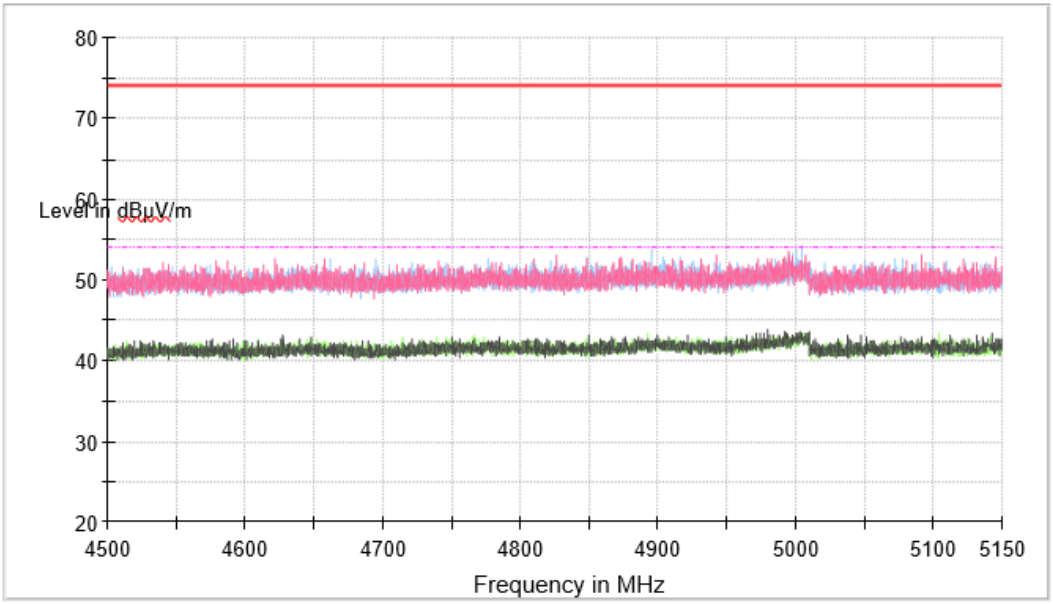


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

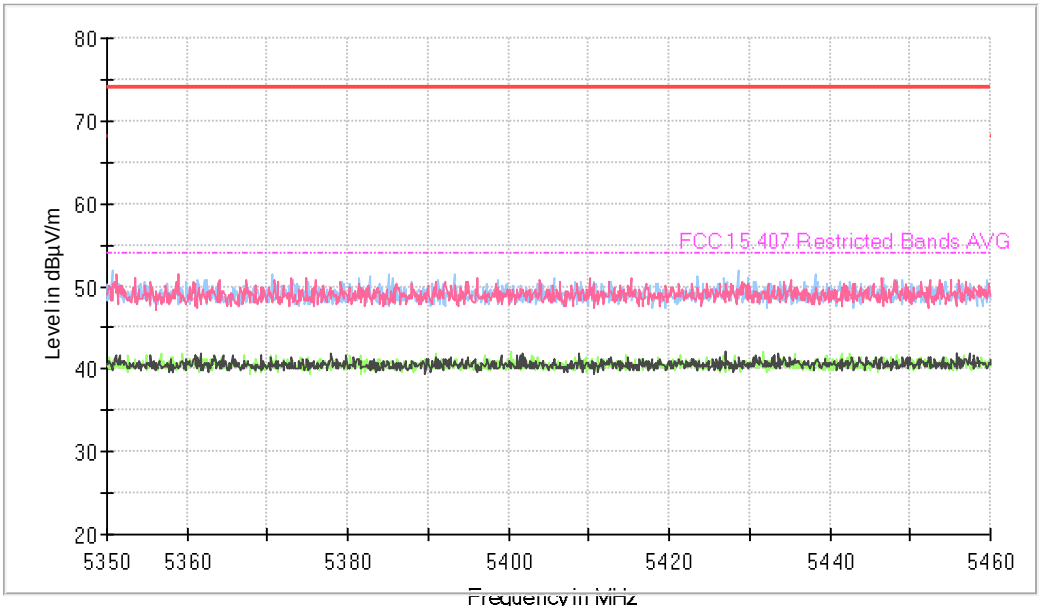


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- Lower Band Edge and Upper Band Edge – High Channel (Restricted Bands)



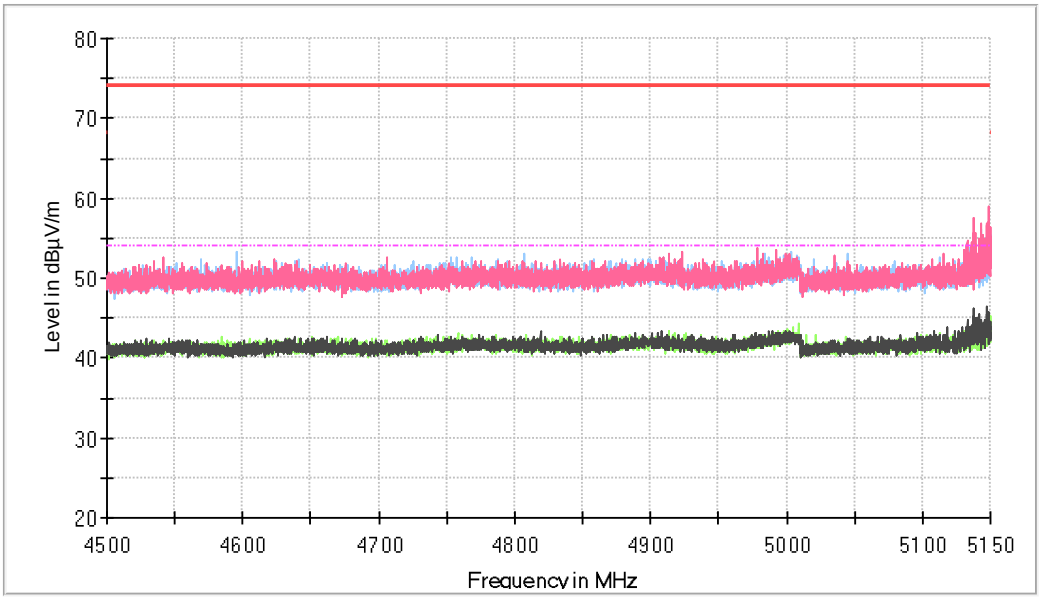
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG



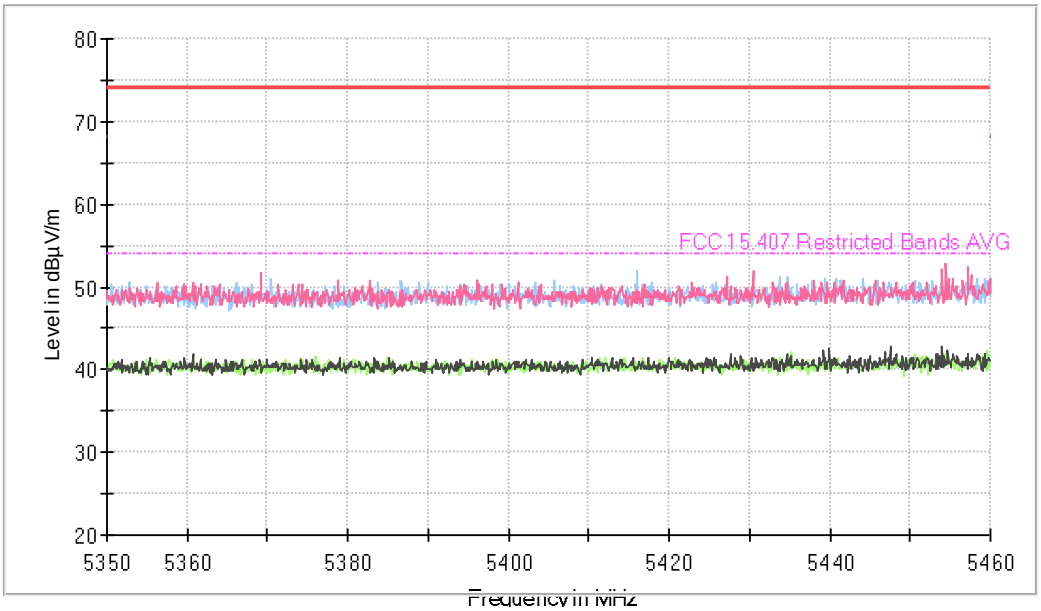
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- **MIMO 802.11 ac40:**

  - Lower Band Edge and Upper Band Edge – Low Channel (Restricted Bands)

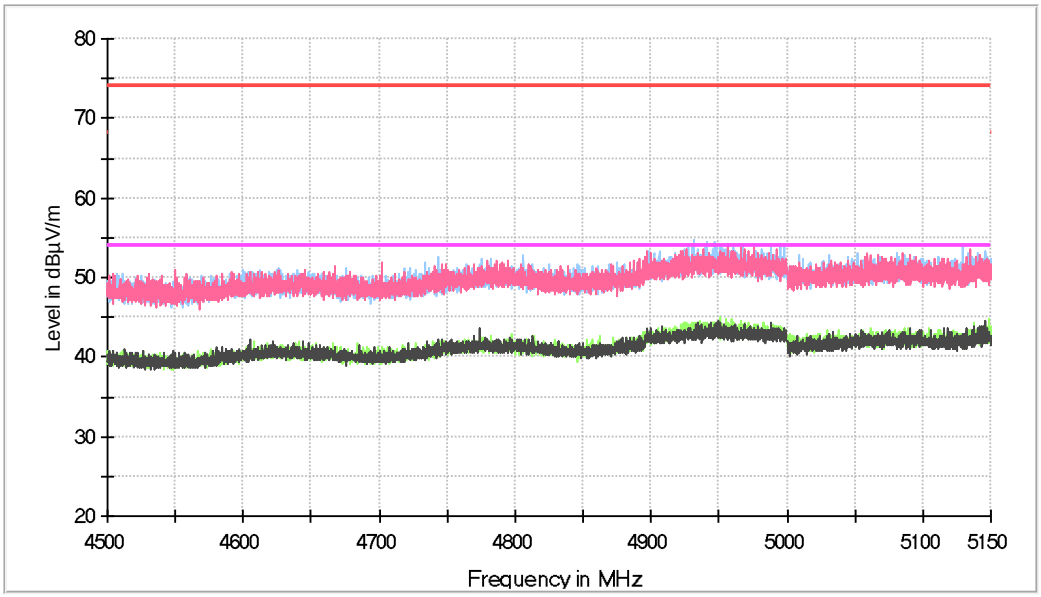


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

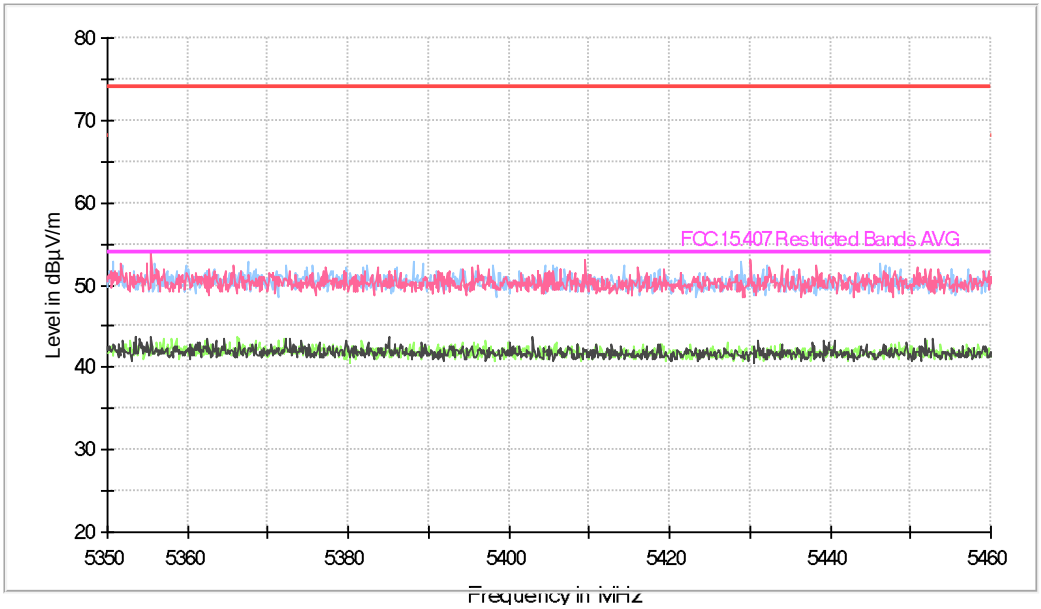


Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- Lower Band Edge and Upper Band Edge – High Channel (Restricted Bands)



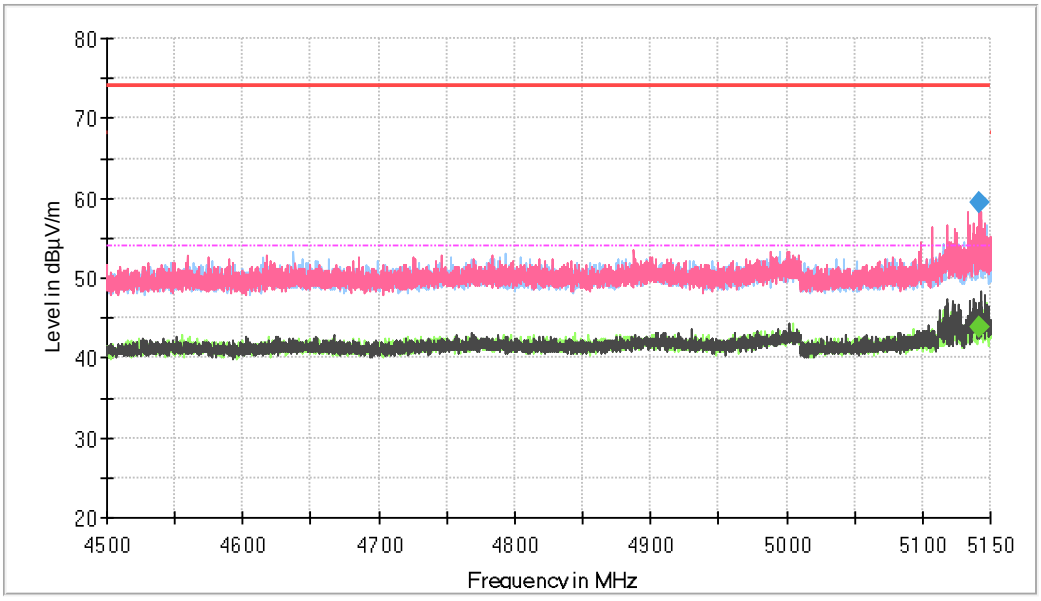
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG



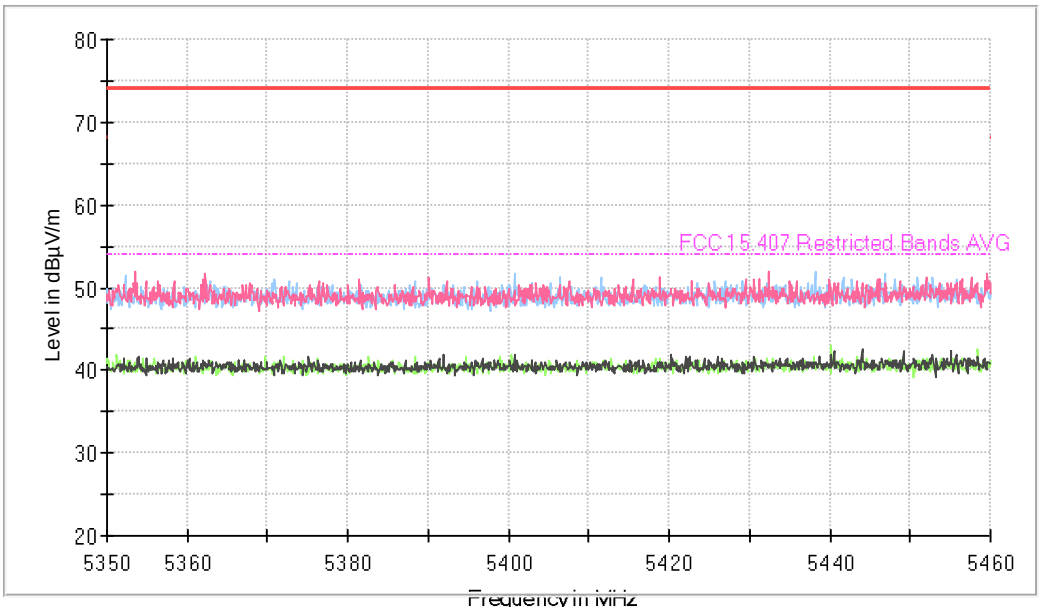
Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview Result 1V-PK+
FCC 15.407 Restricted Bands PK UNII-1 and UNII-2
FCC 15.407 Restricted Bands AVG
Final_Result PK+
Final_Result AVG

- **MIMO 802.11 ac80:**

  - Lower Band Edge and Upper Band Edge – Single Channel (Restricted Bands)



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview 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



Preview Result 2H-AVG
Preview Result 1H-PK+
Preview Result 2V-AVG
Preview 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

Appendix C: Tests results for the U-NII-2A: 5.25 GHz – 5.35 GHz Band

INDEX

TEST CONDITIONS

(*) Declared by the Client.

POWER SUPPLY (*):

Vnominal:	115 Vac
Type of Power Supply:	AC power

ANTENNA (*):

Type of Antennas:	Monopoles (printed on PCB). 2 antennas.
Maximum Declared Antenna Gain Chain 0:	+3.1 dBi
Maximum Declared Antenna Gain Chain 1:	+5.0 dBi

Directional Antenna Gain Calculations for CDD MIMO In-Band Measurements:

U-NII-1, U-NII-2A, U-NII-2C & U-NII-3:

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f)(ii) y F)2)e)ii), directional gain, directional gain was calculated as follows:

$N_{SS} = 1$, $N_{ANT} = 2$, $G_{ANT0} = +3.1$ dBi, $G_{ANT1} = +5.0$ dBi

$$\text{Directional Gain} = 10\log\left[\frac{\sum_{j=1}^{N_{SS}}\left(\sum_{k=1}^{N_{ANT}} g_{j,k}\right)^2}{N_{ANT}}\right] = 10\log\left[\frac{\sum_{j=1}^{1}\left(\sum_{k=1}^{2} g_{j,k}\right)^2}{2}\right]$$

$$= 10\log\left[\frac{(g_{1,1}+g_{1,2})^2}{2}\right] = 10\log\left[\frac{\left(10^{\frac{G_1}{20}}+10^{\frac{G_2}{20}}\right)^2}{2}\right] = 10\log\left[\frac{\left(10^{\frac{3.1}{20}}+10^{\frac{5.0}{20}}\right)^2}{2}\right] = 7.12 \text{ dBi}$$

TEST FREQUENCIES (*):

Technology Tested:	WLAN (IEEE 802.11 a20 / n2040 / ac204080 1x1 & 2x2)
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps (SISO)
	802.11n HT20: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD).
	802.11n HT40: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chain MIMO CDD).
	802.11ac VHT20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).
	802.11ac VHT40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).
	802.11ac VHT80: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).
Setting of cores / ports:	Chain 0, Chain 1, Chain 0 & 1
Beamforming:	No.

Band U-NII-2A:

Operating Channel Bandwidth:	20 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low (52)	5260
	Middle (56)	5280
	Middle (60)	5300
	High (64)	5320
Operating Channel Bandwidth:	40 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low (54)	5270
	High (62)	5310
Operating Channel Bandwidth:	80 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Single (58)	5290

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:

- 802.11a: 6 Mbps SISO 1Tx on Chain 0 and 1Tx on Chain 1.
- 802.11n HT20: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11n HT40: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ac VHT20: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ac VHT40: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.
- 802.11ac VHT80: MCS0 SISO 1Tx on Chain 0 and 1Tx on Chain 1 / MIMO 2Tx on Chain 0 & 1.

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and connected to the TS8997 using a low-loss RF cable. The reading in the spectrum analyzer is corrected considering the internal and external RF cable loss.

For all modes:

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 1.5 m for the frequency range 17 GHz-40 GHz (18 GHz-40 GHz horn antenna).

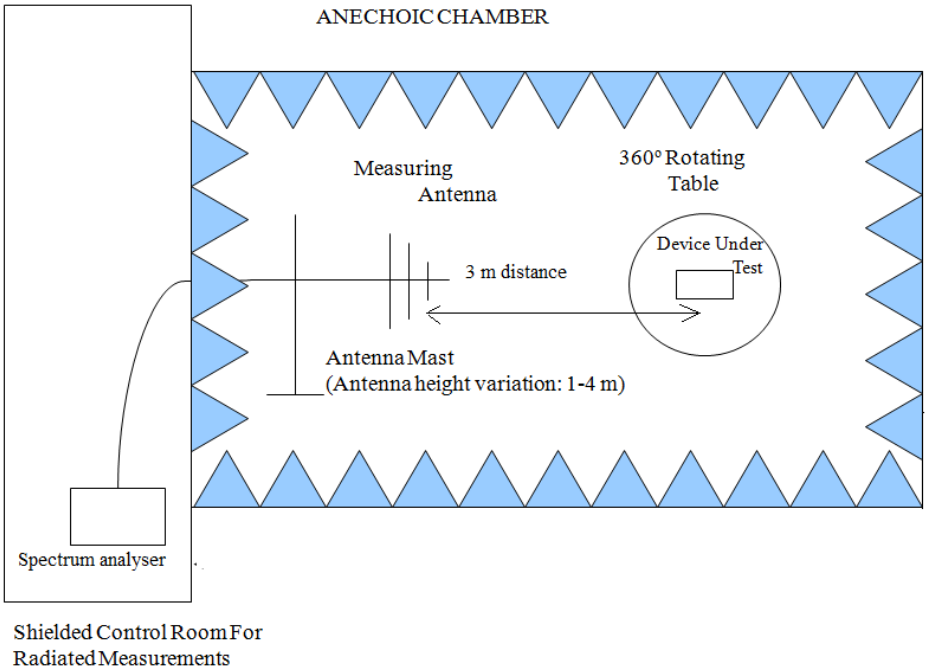
For radiated emissions in the range 17 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 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.

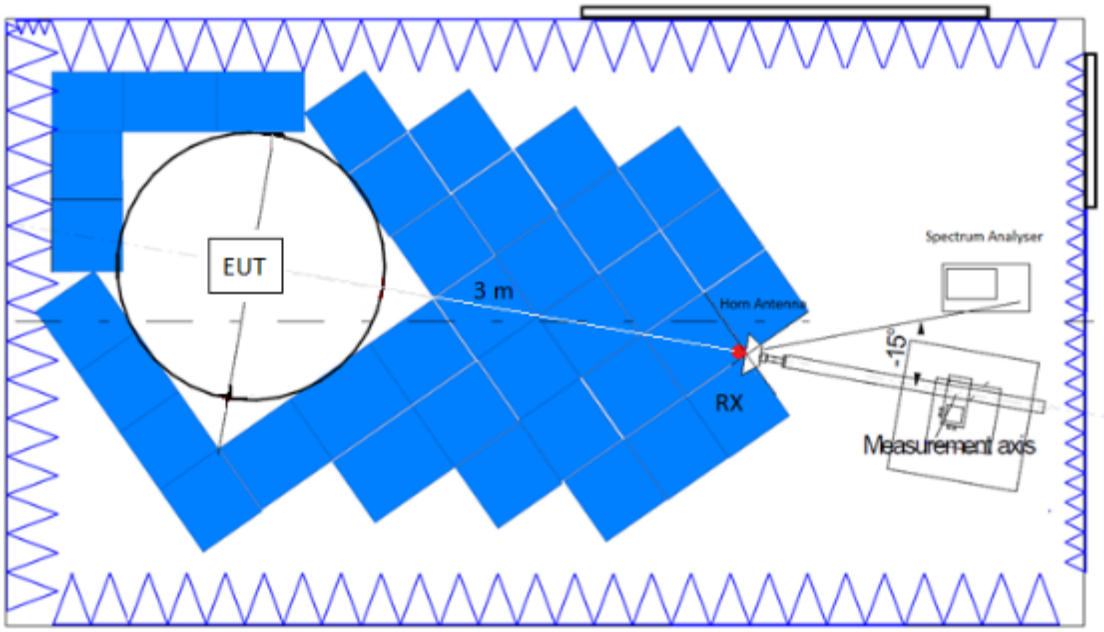
Measurements were made in both horizontal and vertical planes of polarization.

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

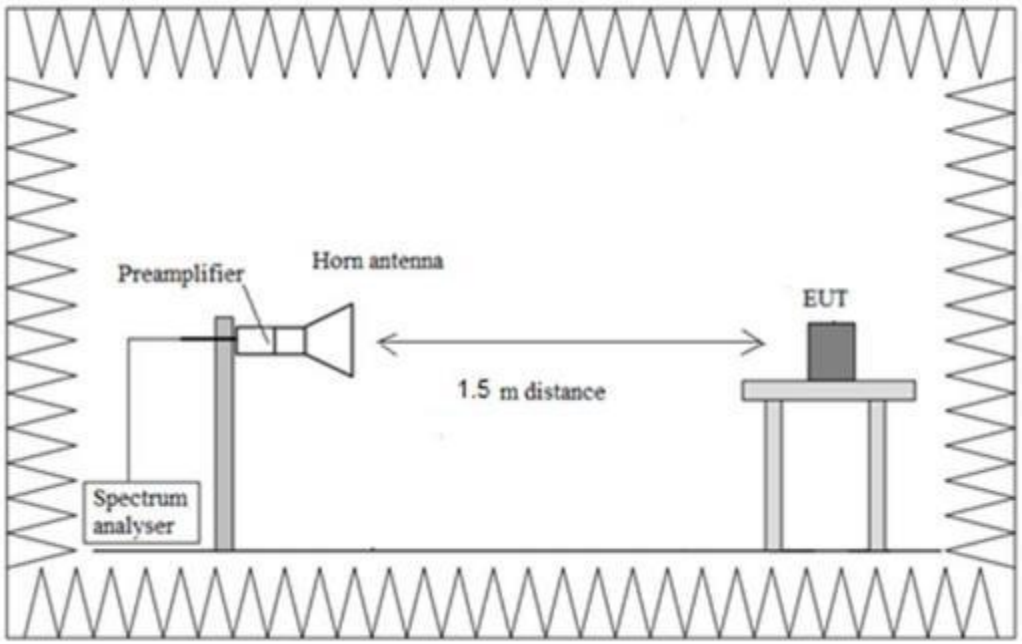
Radiated measurements setup f < 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



FCC 15.407 (a)(2) Transmitter Maximum Conducted Output Power / RSS-247 6.2.2.1 Transmitter Maximum Equivalent Isotropically Radiated Power

SPECIFICATION:

FCC 15.407 (a)(2): For the 5.25-5.35 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 6.2.2.1: Devices, other than devices installed in vehicles, shall comply with the following:

a. The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$ B, dBm, whichever is less;
b. 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.

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 cycle 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).

Preliminary tests determined the SISO worst case: Chain 1.
Preliminary tests determined the MIMO worst case: Chain 0+1.

Antenna Gain:

- SISO Antenna – Chain 0: +3.1 dBi
- SISO Antenna – Chain 1: +5.0 dBi
- MIMO Antennas – Chain 0 & 1: +7.12 dBi

For the SISO technique, the antenna gain is less than 6 dBi.
For the MIMO technique, the antenna gain is higher than 6 dBi.

SISO worst-case:

- Preliminary tests determined the SISO worst-case: Chain 1.

SISO 802.11 a20:

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Corrected Conducted Power (dBm)	13.35	13.87	13.69
Maximum EIRP Corrected Conducted Power (dBm)	18.35	18.87	18.69

SISO 802.11 n20 (HT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Corrected Conducted Power (dBm)	13.44	13.88	13.67
Maximum EIRP Corrected Conducted Power (dBm)	18.44	18.88	18.67

SISO 802.11 ac20 (VHT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Corrected Conducted Power (dBm)	12.79	13.23	13.13
Maximum EIRP Corrected Conducted Power (dBm)	17.79	18.23	18.13

SISO 802.11 n40 (HT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Corrected Conducted Power (dBm)	15.00	14.92
Maximum EIRP Corrected Conducted Power (dBm)	20.00	19.92

SISO 802.11 ac40 (VHT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Corrected Conducted Power (dBm)	12.82	12.95
Maximum EIRP Corrected Conducted Power (dBm)	17.82	17.95

SISO 802.11 ac80 (VHT80):

U-NII-2A (5250-5350 MHz):

Channel	Single Channel 58 (5290 MHz)
Maximum Corrected Conducted Power (dBm)	12.64
Maximum EIRP Corrected Conducted Power (dBm)	17.64

Verdict: PASS

MIMO worst-case:

- Preliminary tests determined the MIMO worst-case: Chain 0+1.

MIMO 802.11 n20 (HT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Corrected Conducted Power (dBm)	12.08	12.46	12.51
Maximum EIRP Corrected Conducted Power (dBm)	19.20	19.58	19.63

MIMO 802.11 ac20 (VHT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Corrected Conducted Power (dBm)	13.01	13.09	13.38
Maximum EIRP Corrected Conducted Power (dBm)	20.13	20.21	20.50

MIMO 802.11 n40 (HT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Corrected Conducted Power (dBm)	13.88	13.54
Maximum EIRP Corrected Conducted Power (dBm)	21.00	20.66

MIMO 802.11 ac40 (VHT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Corrected Conducted Power (dBm)	13.42	13.35
Maximum EIRP Corrected Conducted Power (dBm)	20.54	20.47

MIMO 802.11 ac80 (VHT80):

U-NII-2A (5250-5350 MHz):

Channel	Single Channel 58 (5290 MHz)
Maximum Corrected Conducted Power (dBm)	13.48
Maximum EIRP Corrected Conducted Power (dBm)	20.60

Verdict: PASS

FCC 15.407 (a)(2) Transmitter Maximum Power Spectral Density / RSS-247 6.2.2.1. Transmitter EIRP Spectral Density

SPECIFICATION:

FCC 15.407 (a)(2): For the 5.25-5.35 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 6.2.2.1: Devices, other than devices installed in vehicles, shall comply with the following:

a. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;
b. The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, 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.

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 789 033 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 cycle was added to the measured power spectral density in order to calculate the total average power spectral density during the actual transmission time.

The PSD test uses the same setup as the transmitter maximum conducted output power test.

The result of the Peak PSD was measured by colocating a marker on the peak of the signal and the results are in the tables below.

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

Preliminary tests determined the SISO worst case: Chain 1.

Antenna Gain:

- SISO Antenna – Chain 0: +3.1 dBi
- SISO Antenna – Chain 1: +5.0 dBi
- MIMO Antennas – Chain 0 & 1: +7.12 dBi

For the SISO technique, the antenna gain is less than 6 dBi.
For the MIMO technique, the antenna gain is higher than 6 dBi.

SISO worst-case:

- Preliminary tests determined the SISO worst-case: Chain 1.

SISO 802.11 a20:

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Conducted PSD (dBm)	0.91	1.43	2.39

SISO 802.11 n20 (HT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Conducted PSD (dBm)	0.73	1.17	2.05

SISO 802.11 ac20 (VHT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Conducted PSD (dBm)	-1.12	-0.49	-0.42

SISO 802.11 n40 (HT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Conducted PSD (dBm)	-0.98	0.16

SISO 802.11 ac40 (VHT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Conducted PSD (dBm)	-4.55	-3.73

SISO 802.11 ac80 (VHT80):

U-NII-2A (5250-5350 MHz):

Channel	Single Channel 58 (5290 MHz)
Maximum Conducted PSD (dBm)	-7.49

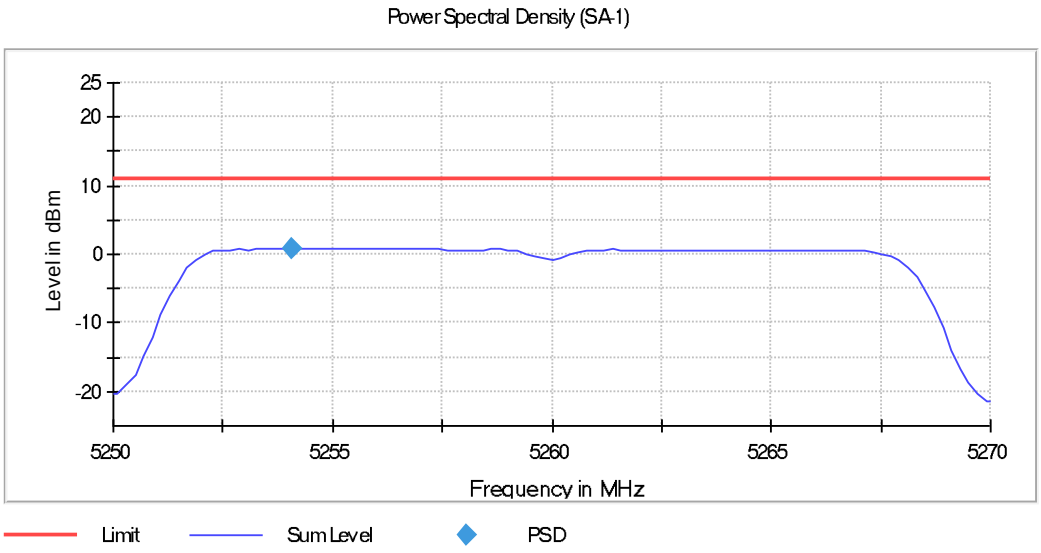
Verdict: PASS

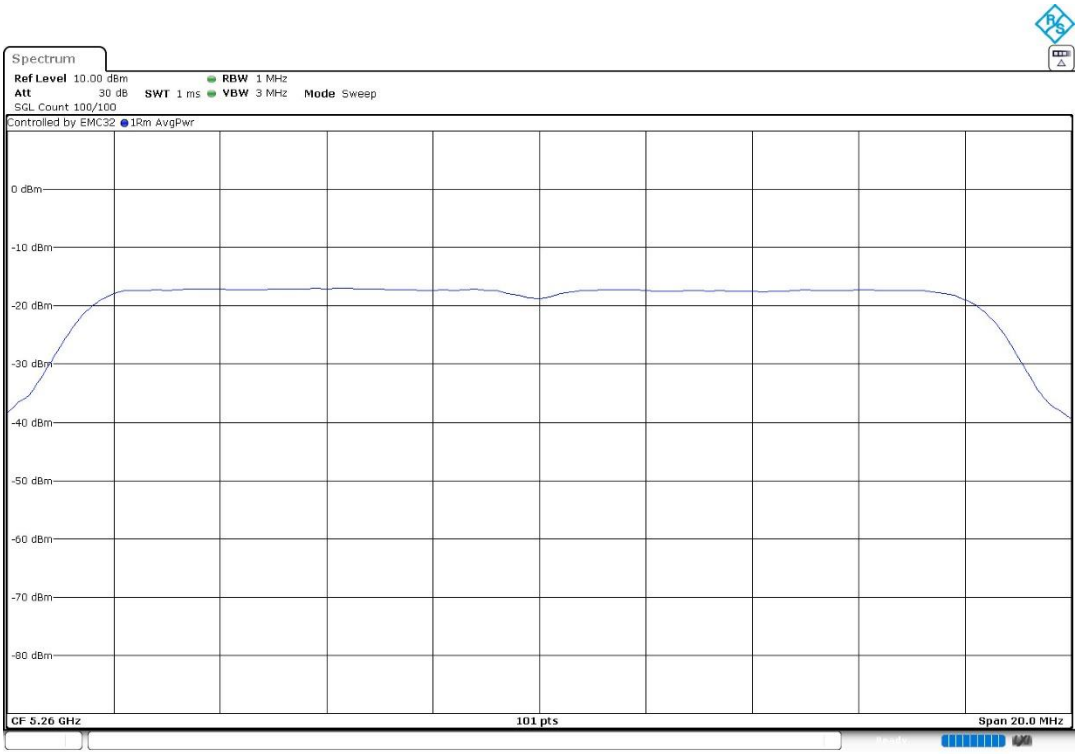
SISO worst-case:

SISO 802.11 a20:

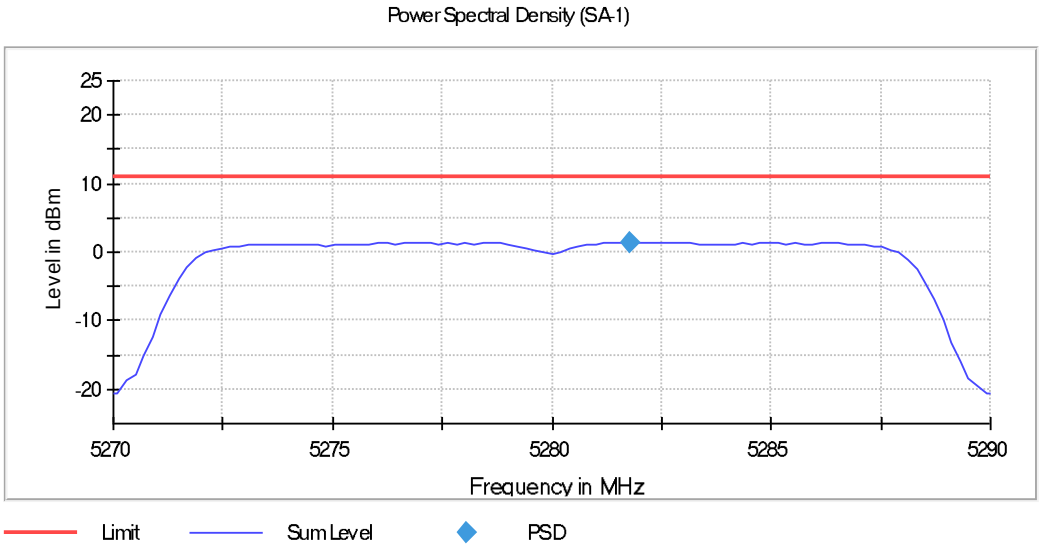
U-NII-2A (5250-5350 MHz)

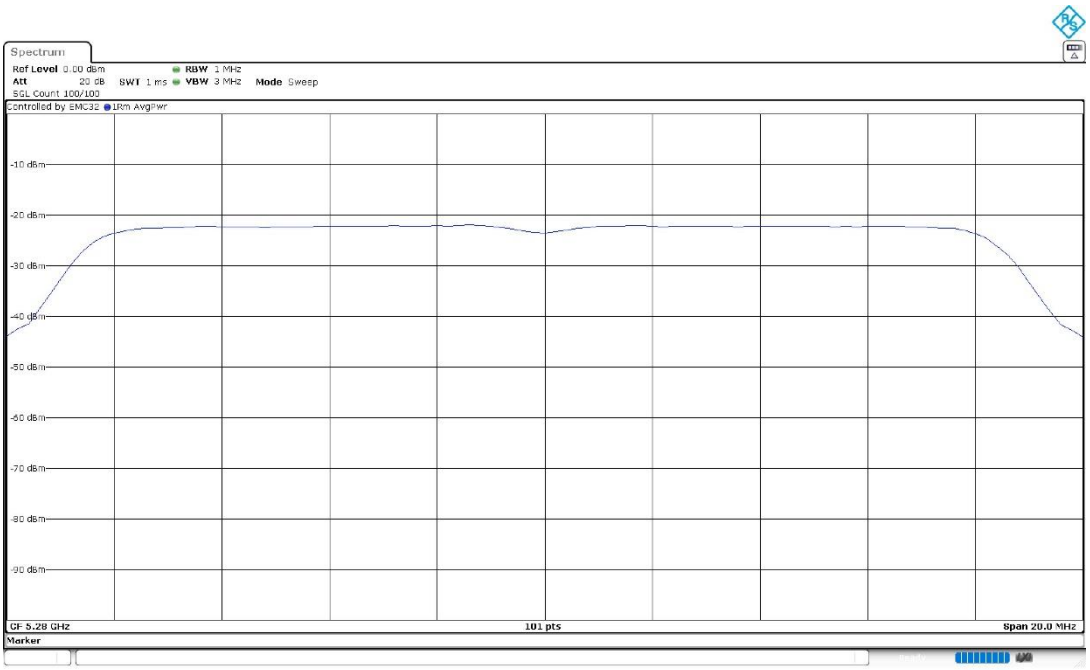
- Low Channel 52 (5260 MHz):



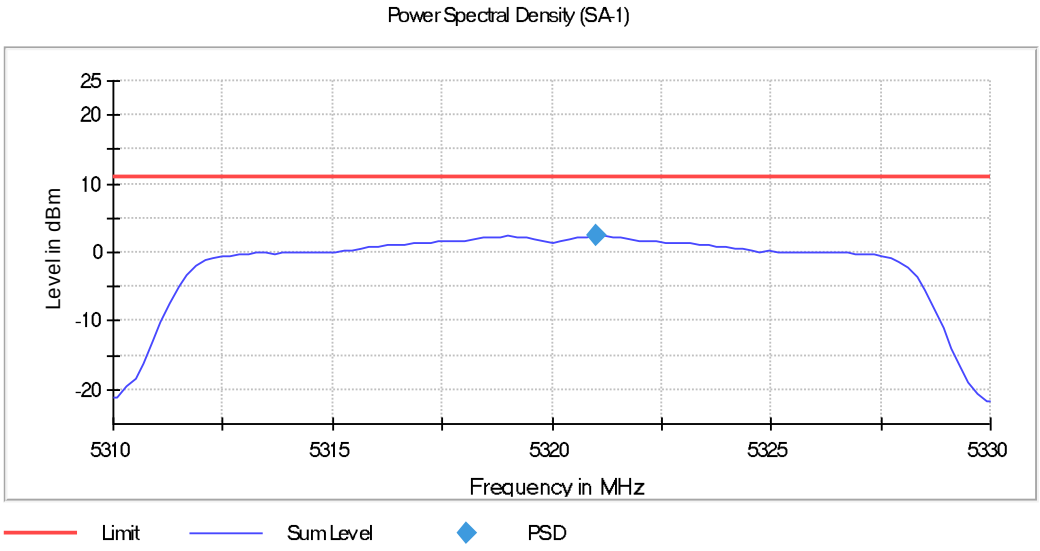


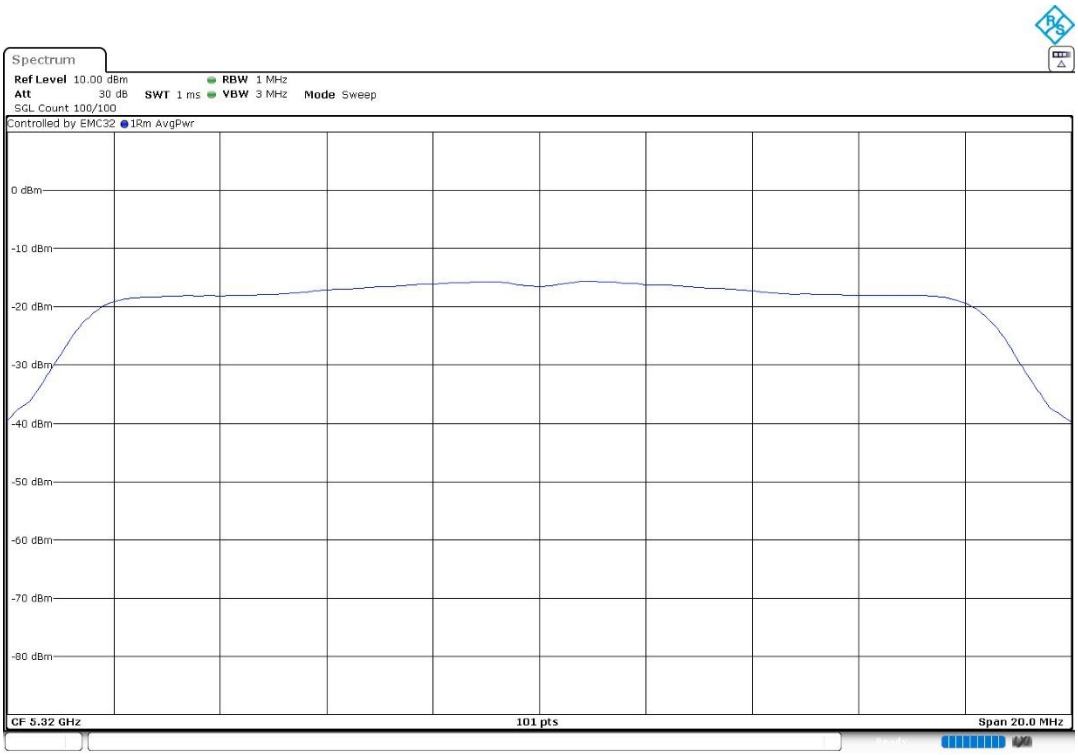
- Low+1 Channel 56 (5280 MHz):





- High Channel 64 (5320 MHz):

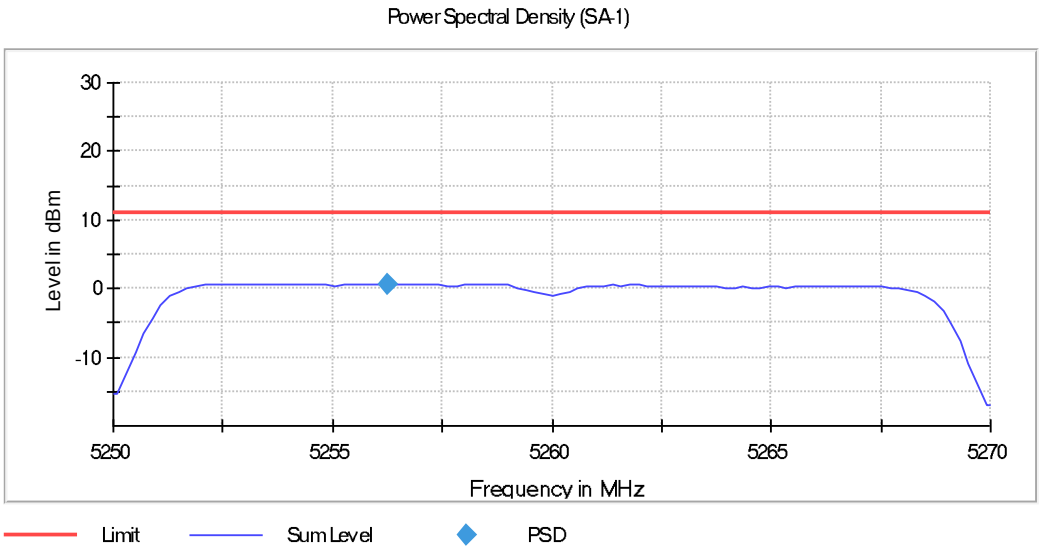


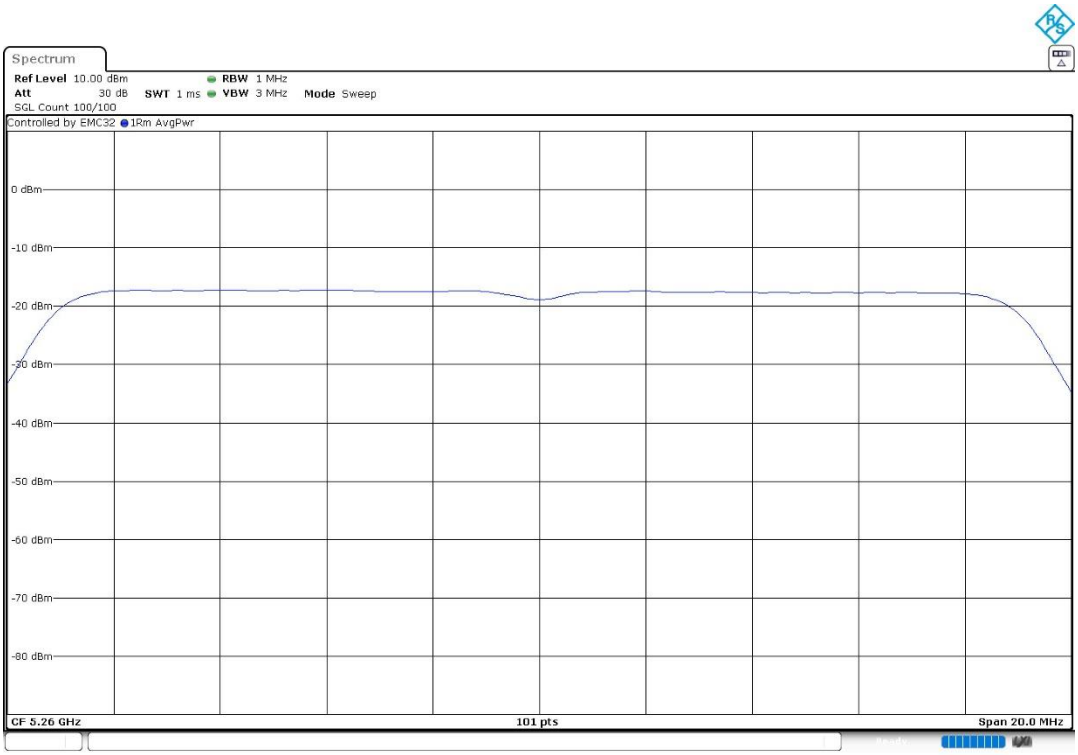


SISO 802.11 n20 (HT20):

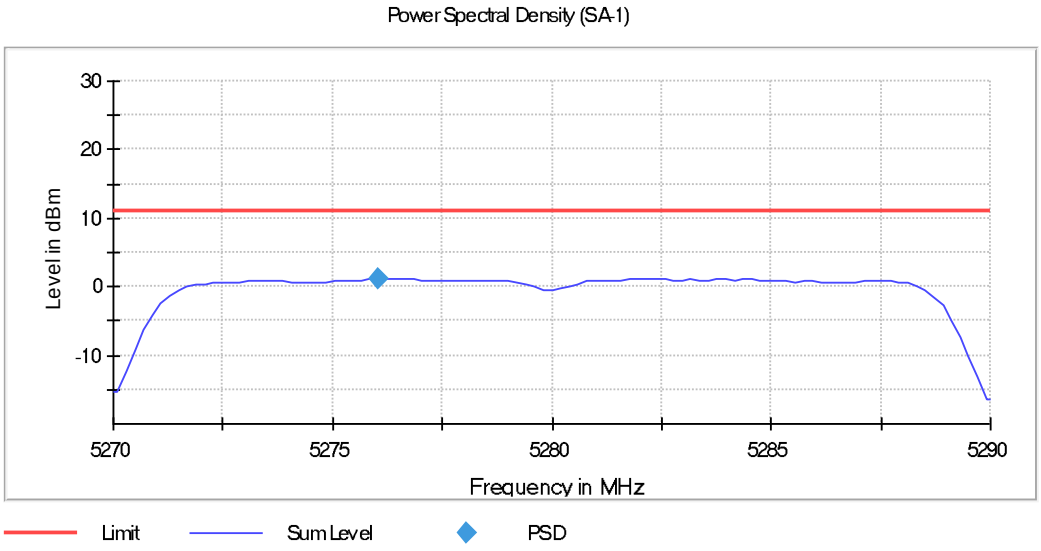
U-NII-2A (5250-5350 MHz)

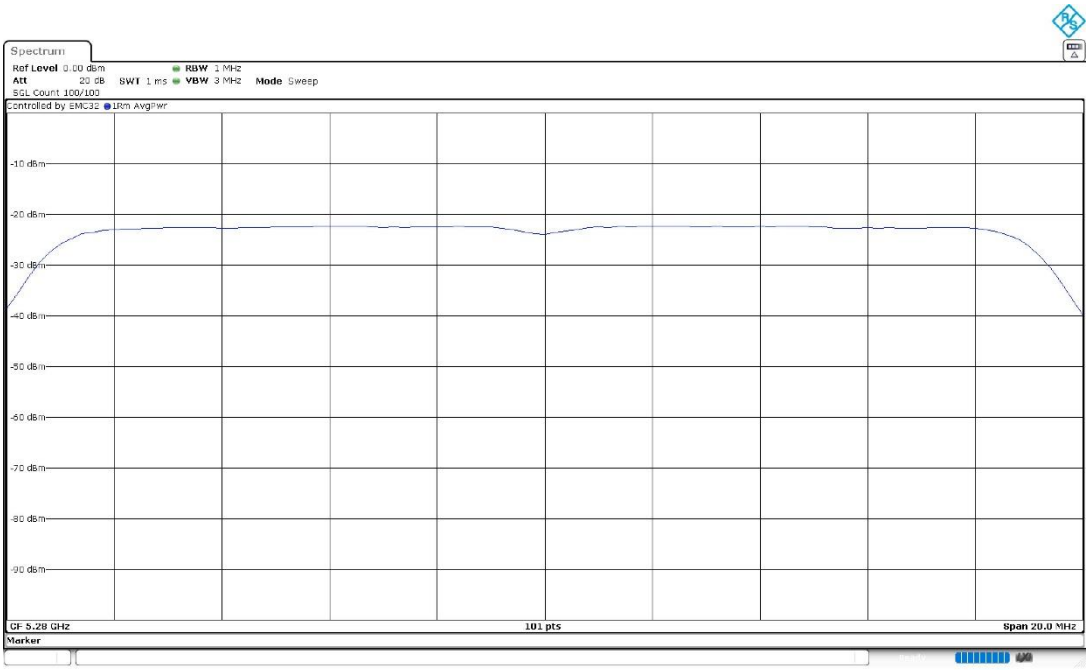
- Low Channel 52 (5260 MHz):



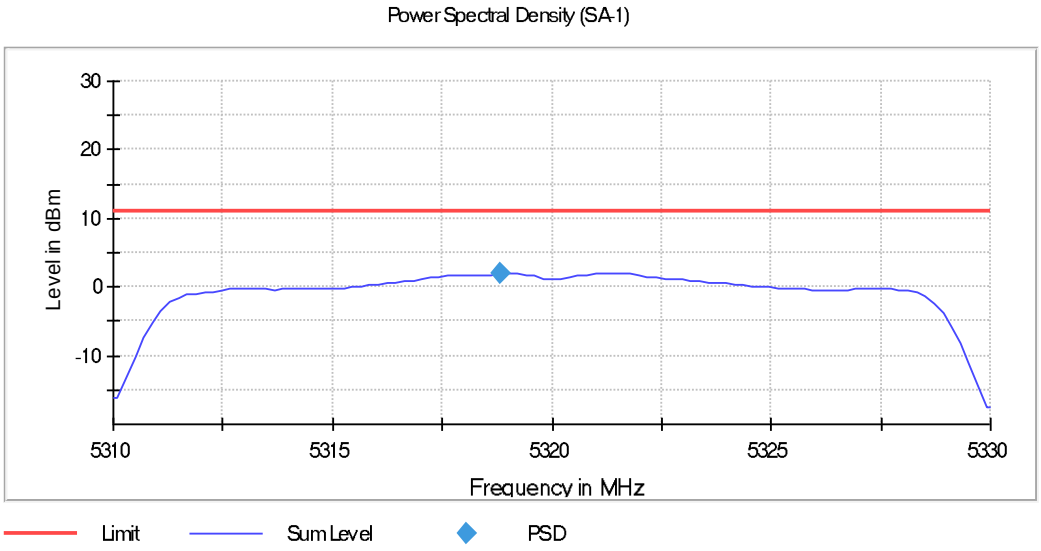


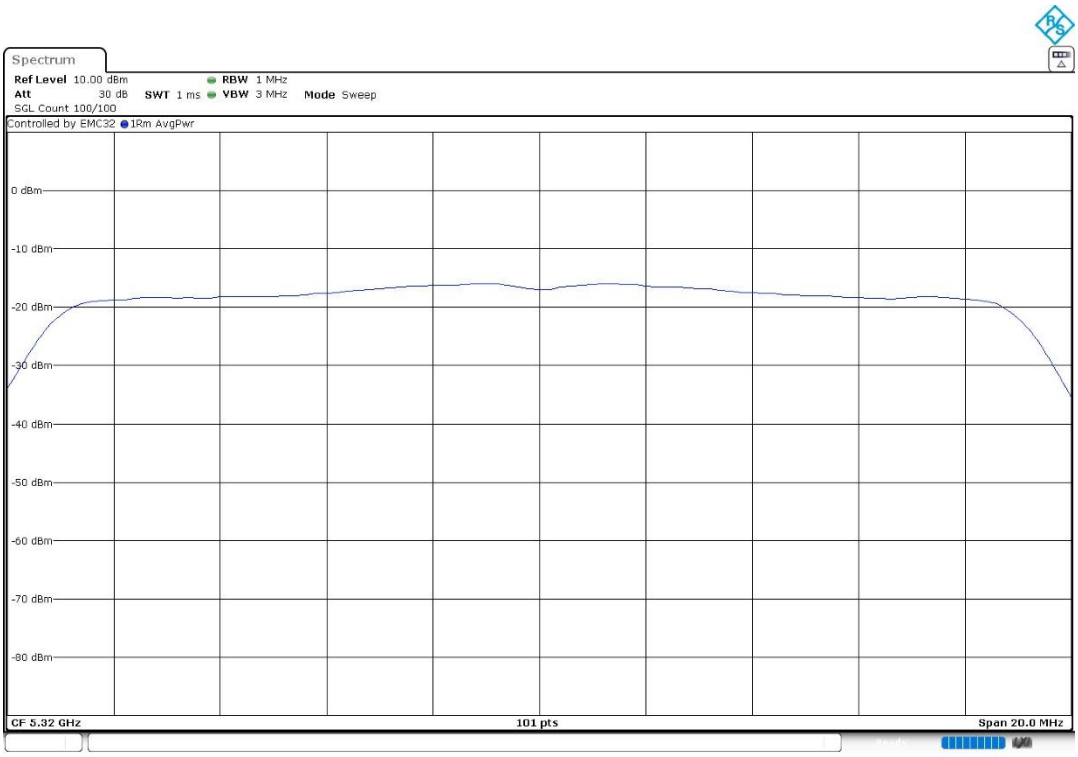
- Low+1 Channel 56 (5280 MHz):





- High Channel 64 (5320 MHz):

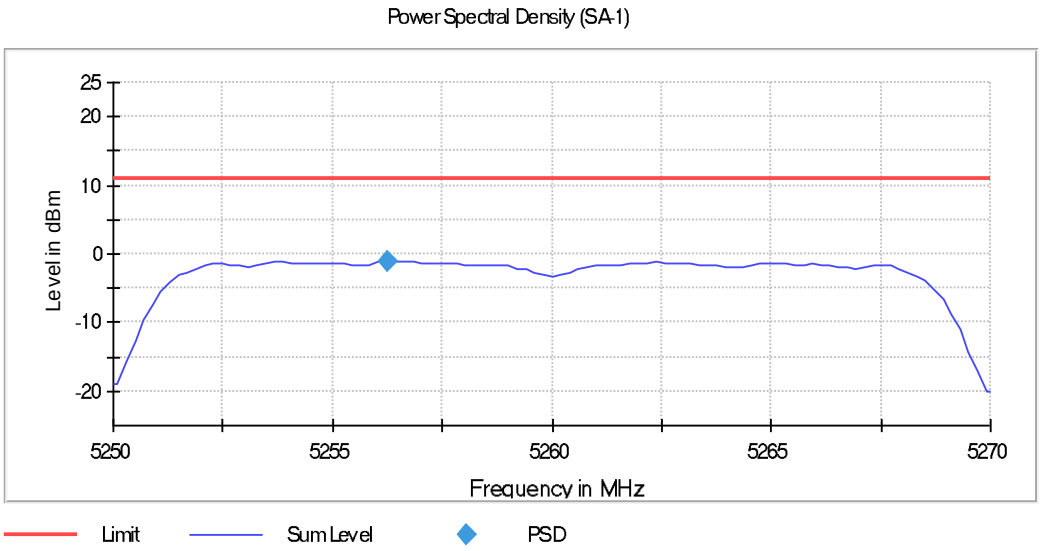


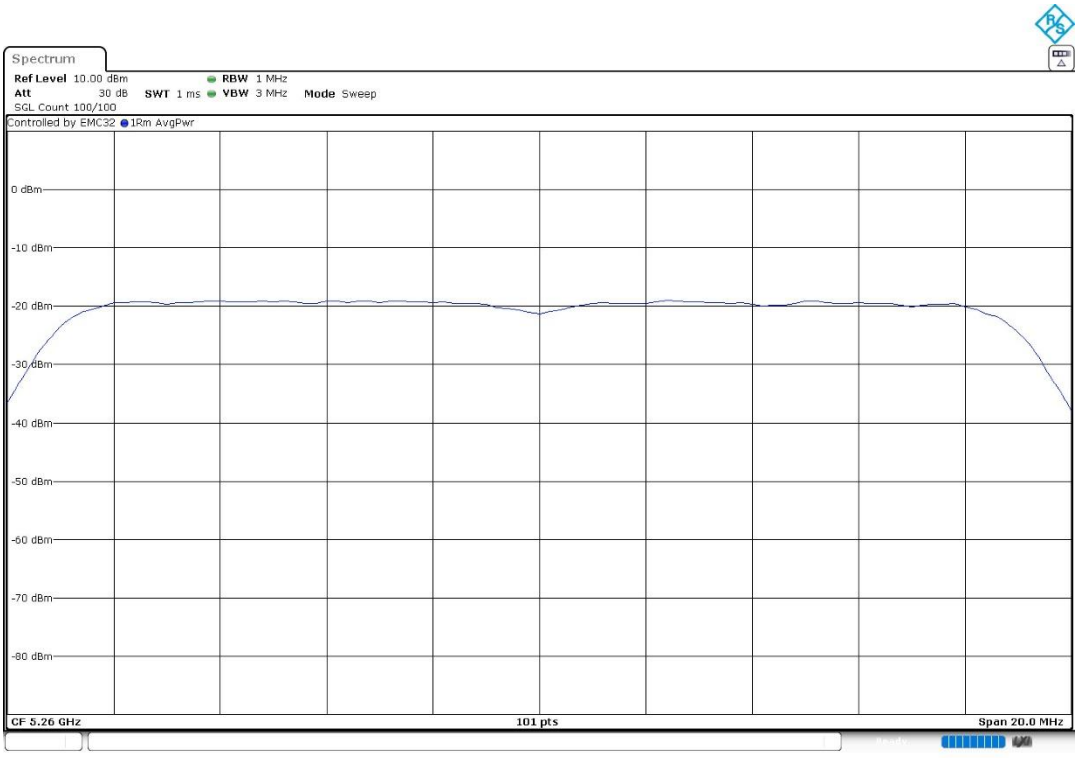


SISO 802.11 ac20 (VHT20):

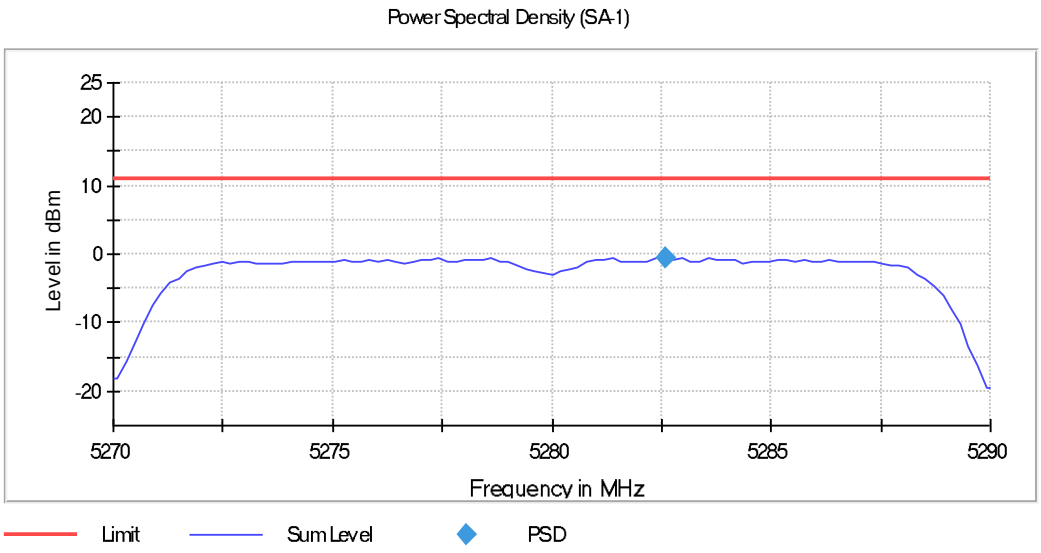
U-NII-2A (5250-5350 MHz)

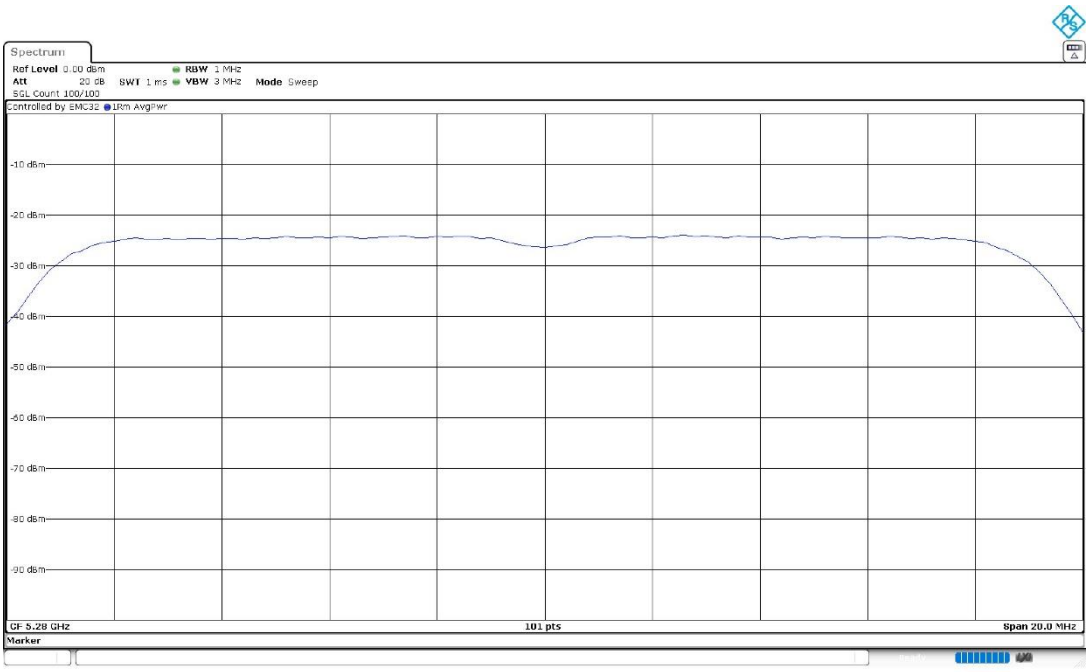
- Low Channel 52 (5260 MHz):



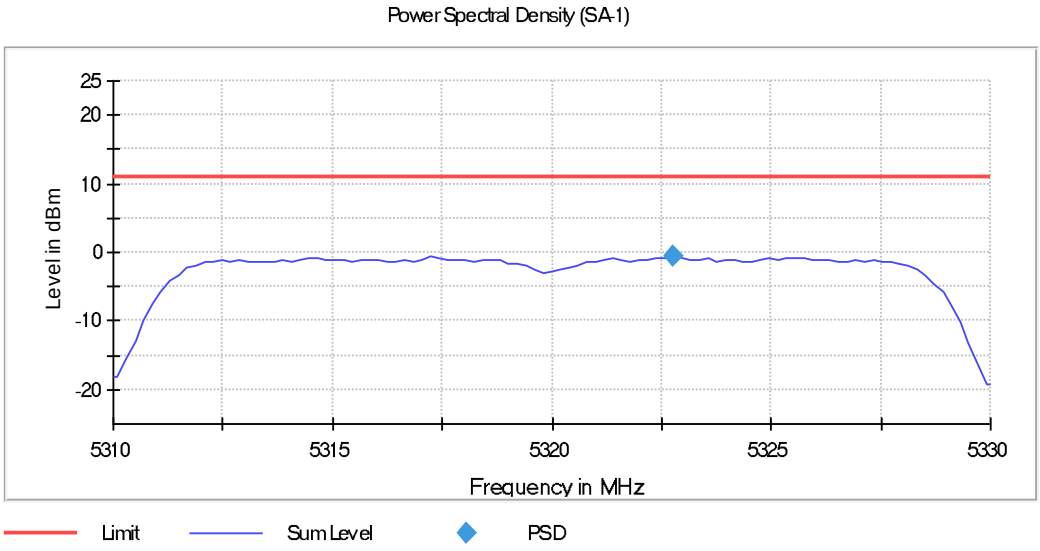


- Low+1 Channel 56 (5280 MHz):



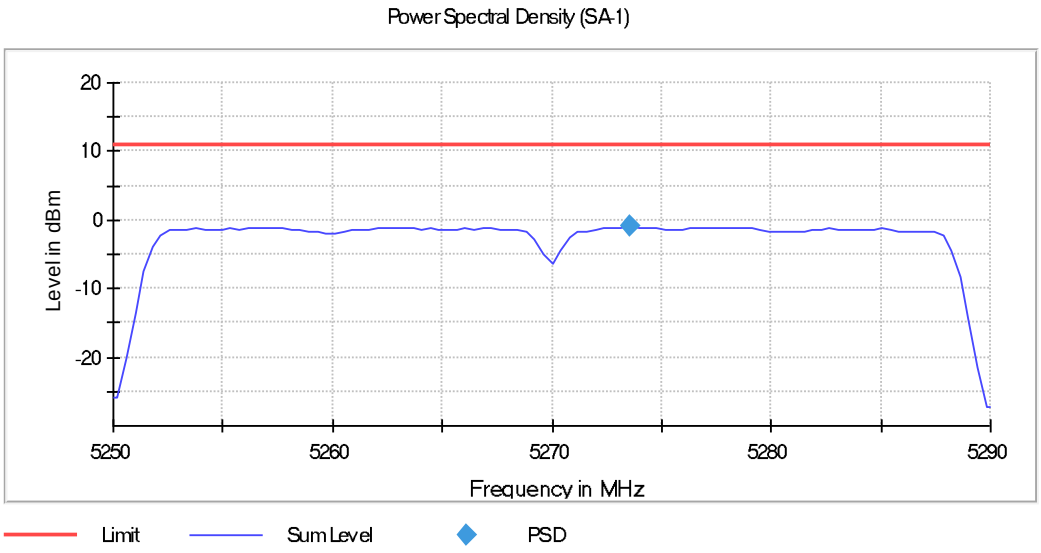


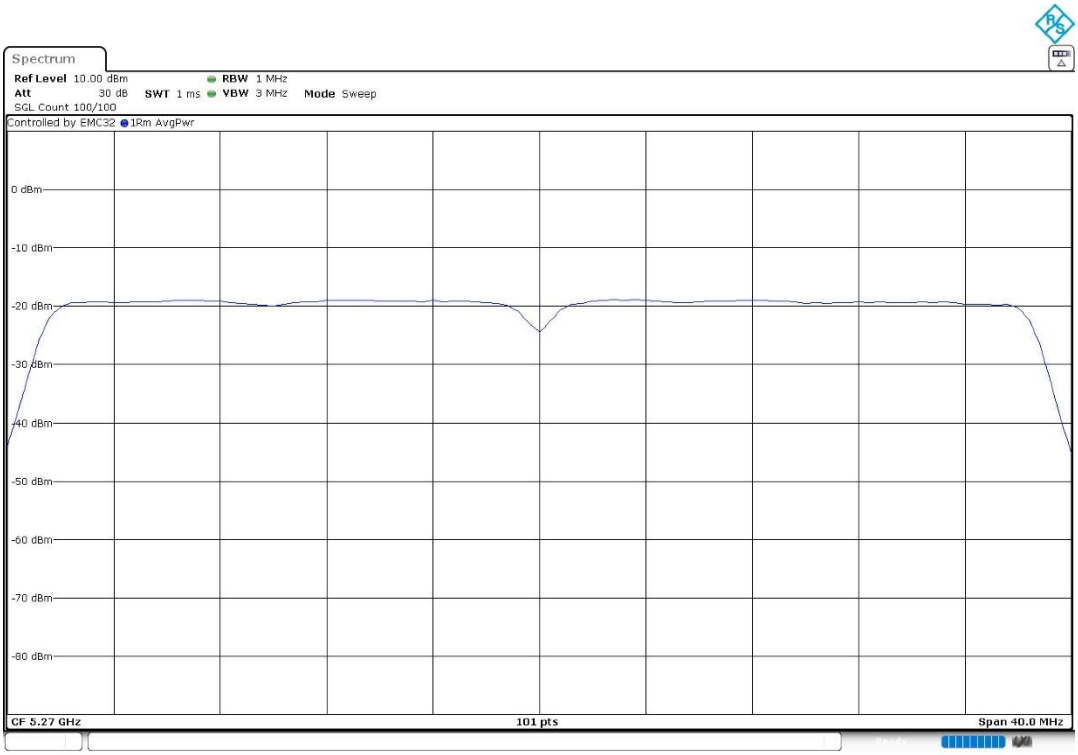
- High Channel 64 (5320 MHz):



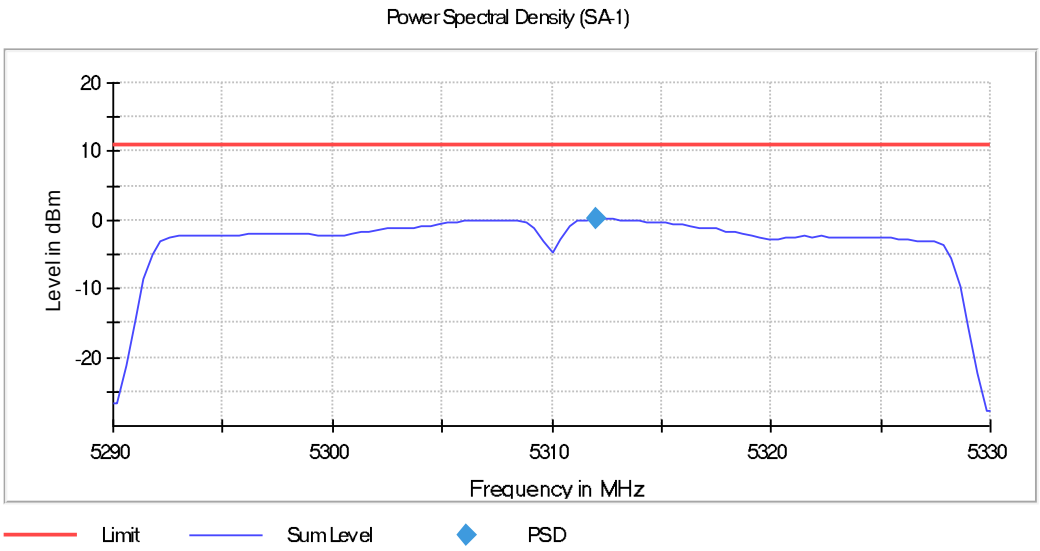
SISO 802.11 n40 (HT40):

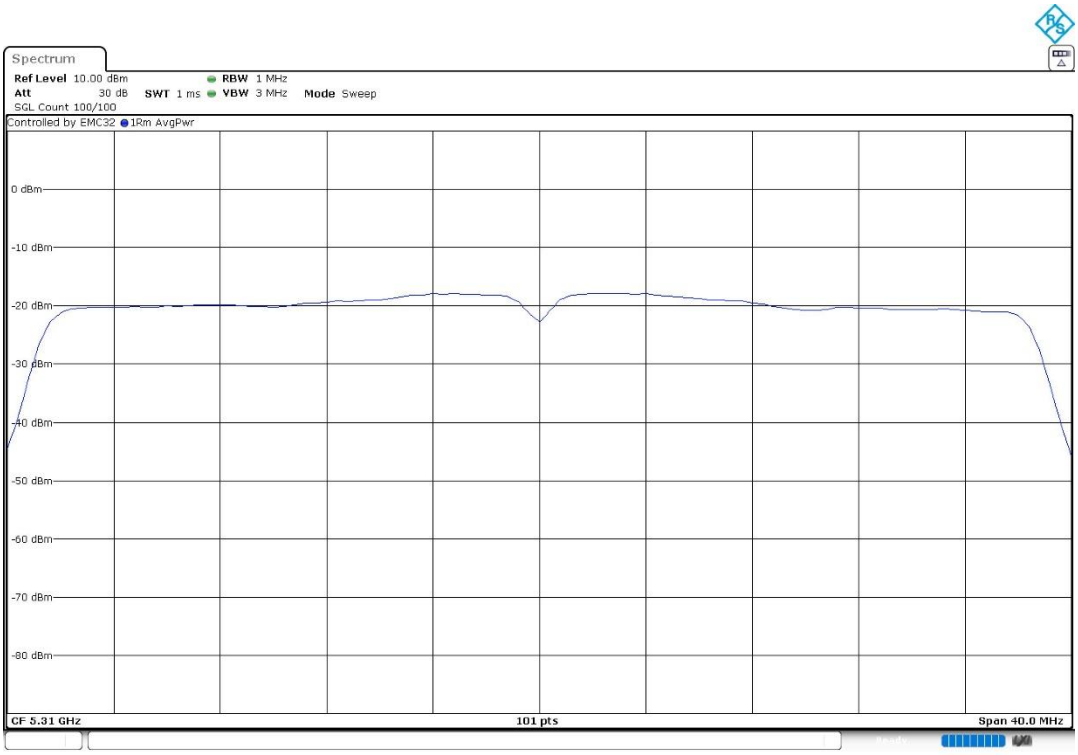
- Low Channel 54 (5270 MHz):





- High Channel 62 (5310 MHz):

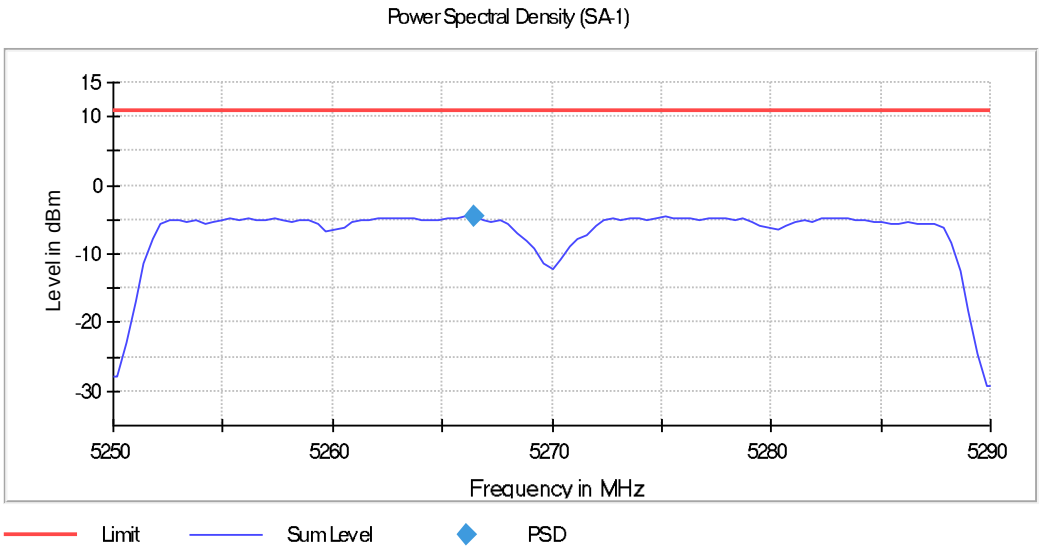


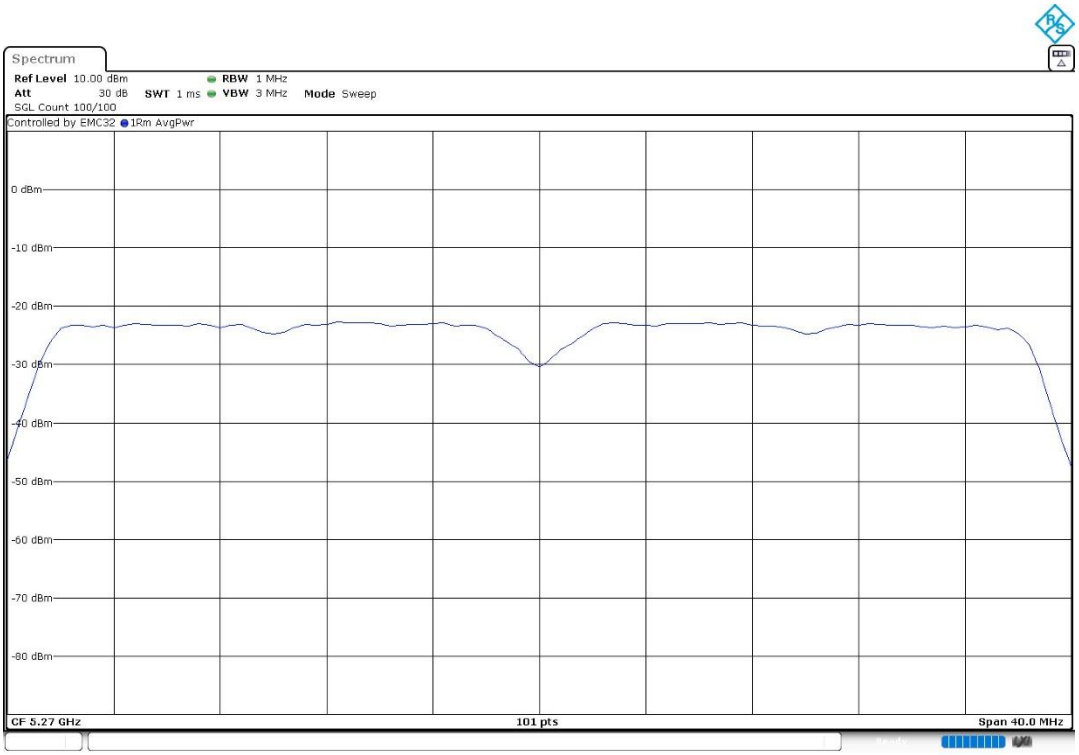


SISO 802.11 ac40 (VHT40):

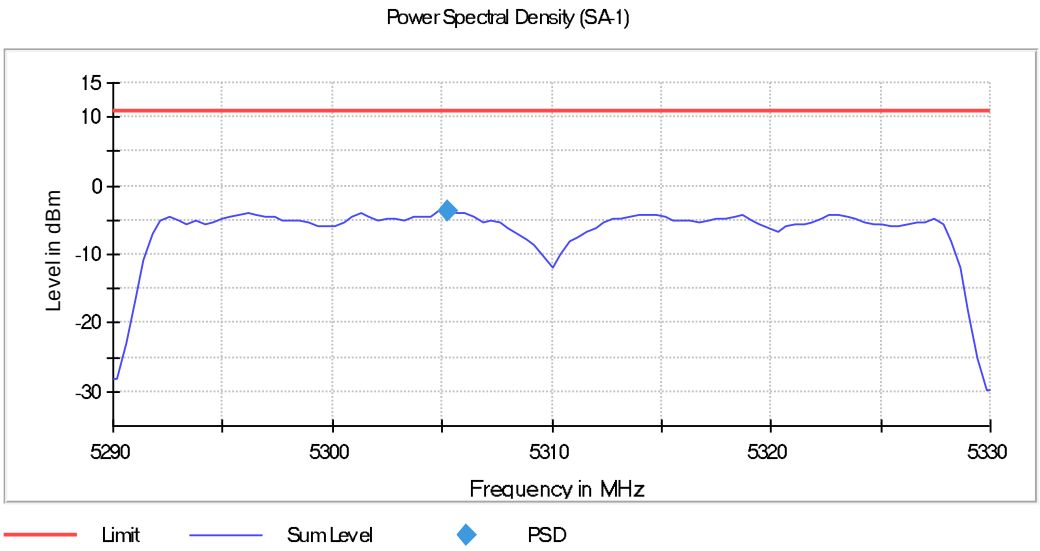
U-NII-2A (5250-5350 MHz)

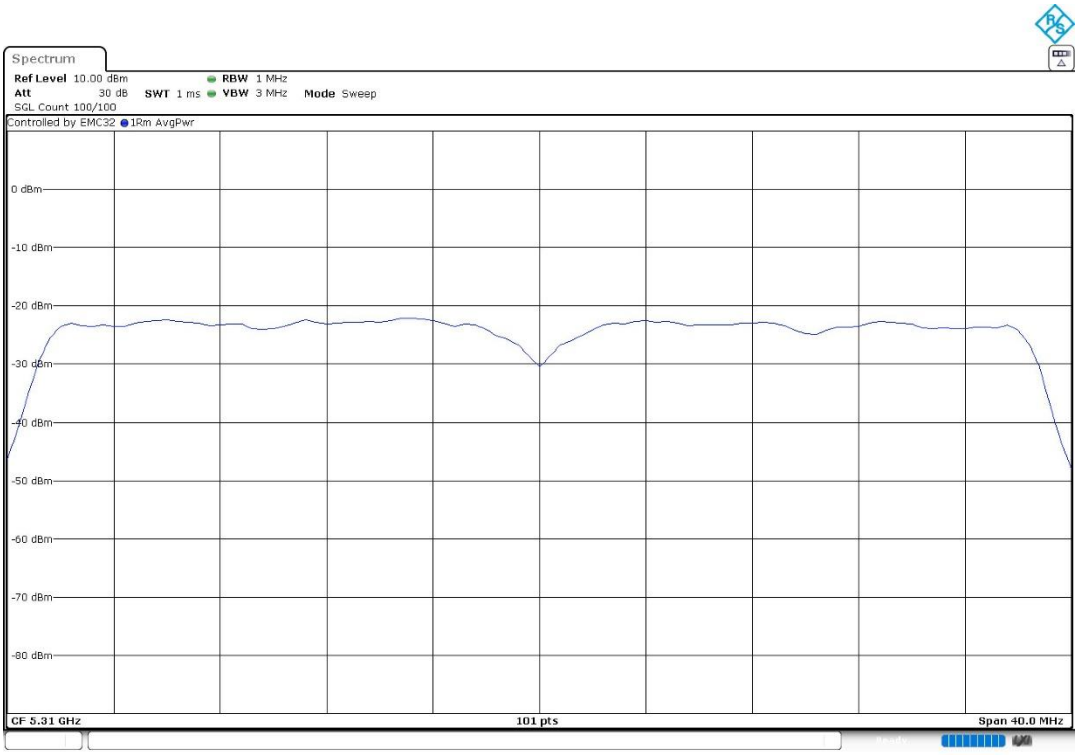
- Low Channel 54 (5270 MHz):





- High Channel 62 (5310 MHz):

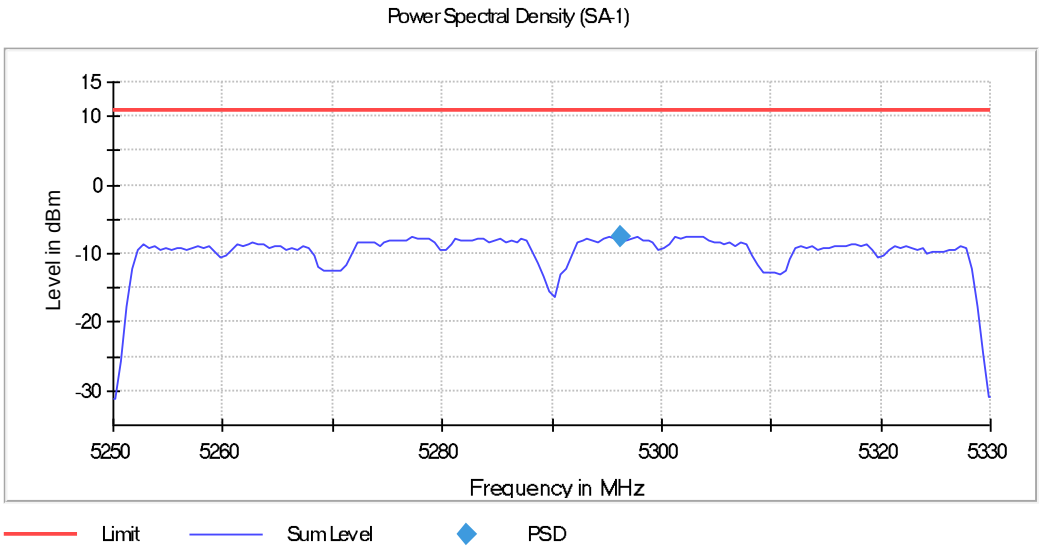


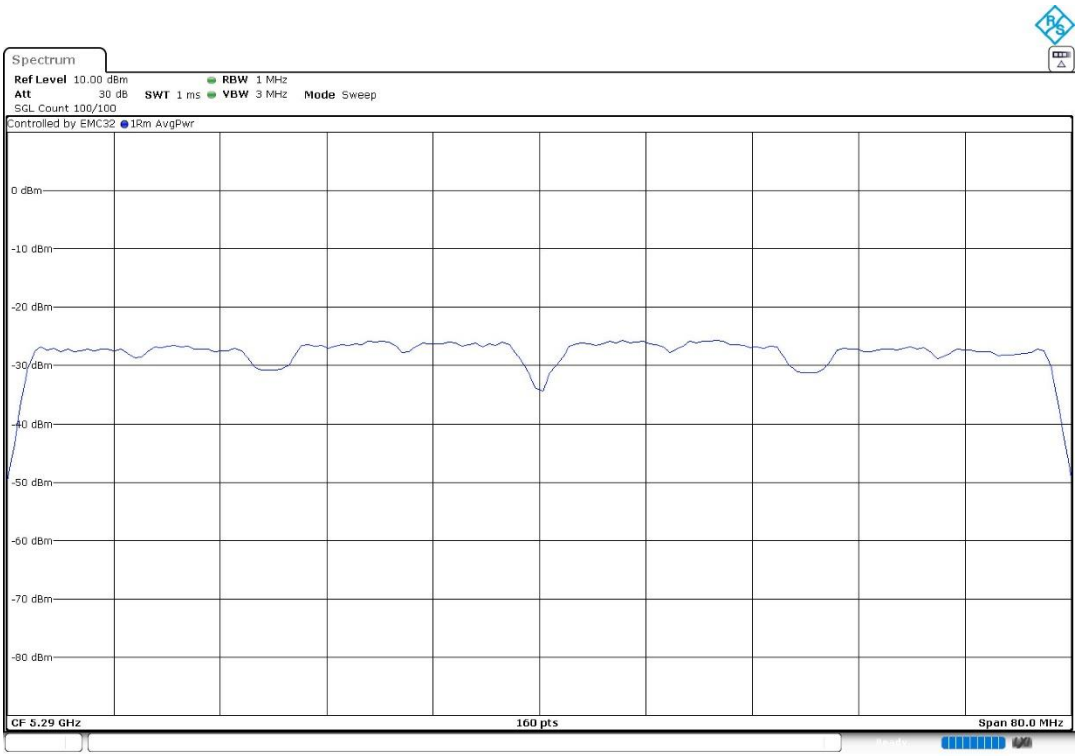


SISO 802.11 ac80 (VHT80):

U-NII-2A (5250-5350 MHz)

- Single Channel 58 (5290 MHz):





MIMO worst-case:

- Preliminary tests determined the MIMO worst-case: Chain 0+1.

MIMO 802.11 n20 (HT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Conducted PSD (dBm)	-0.49	-0.14	0.84

MIMO 802.11 ac20 (VHT20):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 52 (5260 MHz)	Low+1 Channel 56 (5280 MHz)	High Channel 64 (5320 MHz)
Maximum Conducted PSD (dBm)	-0.62	-0.80	-0.40

MIMO 802.11 n40 (HT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Conducted PSD (dBm)	-2.04	-1.32

MIMO 802.11 ac40 (VHT40):

U-NII-2A (5250-5350 MHz):

Channels	Low Channel 54 (5270 MHz)	High Channel 62 (5310 MHz)
Maximum Conducted PSD (dBm)	-3.83	-3.64

MIMO 802.11 ac80 (VHT80):

U-NII-2A (5250-5350 MHz):

Channel	Single Channel 58 (5290 MHz)
Maximum Conducted PSD (dBm)	-6.45

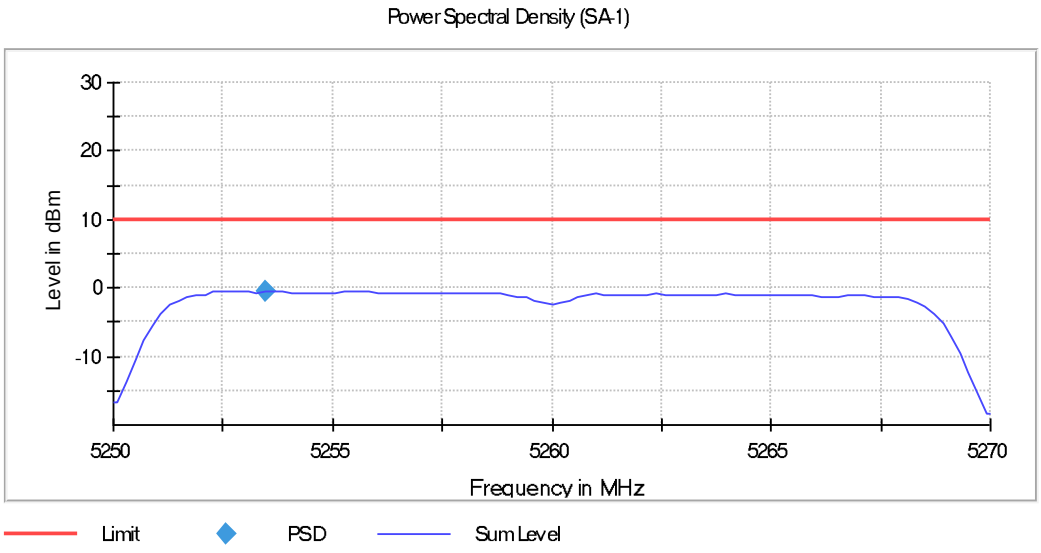
Verdict: PASS

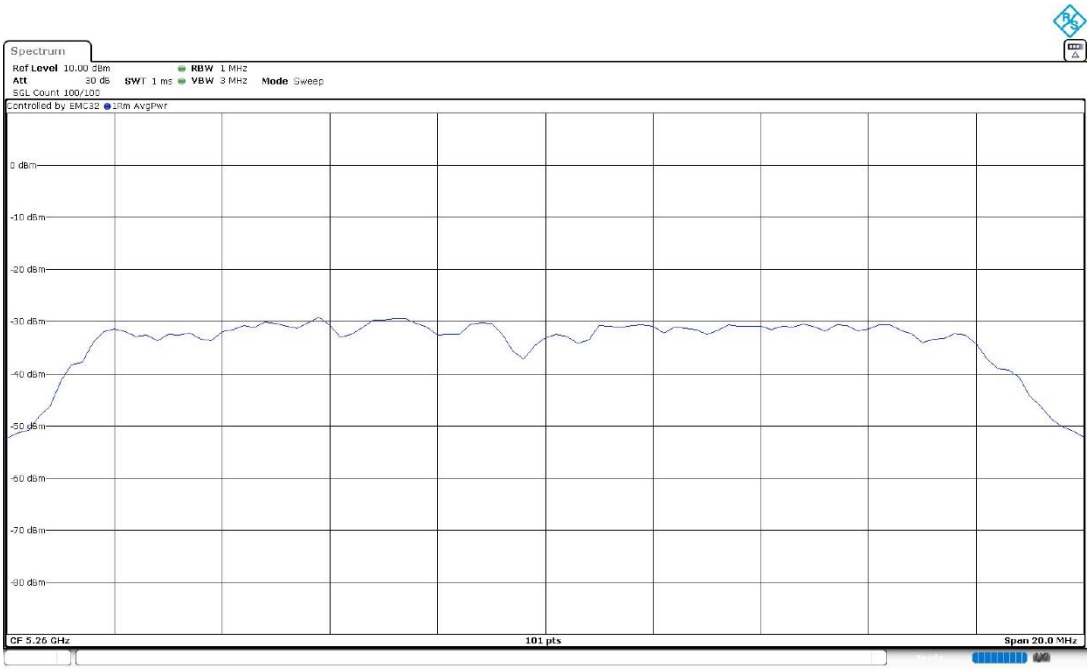
MIMO worst-case:

MIMO 802.11 n20 (HT20):

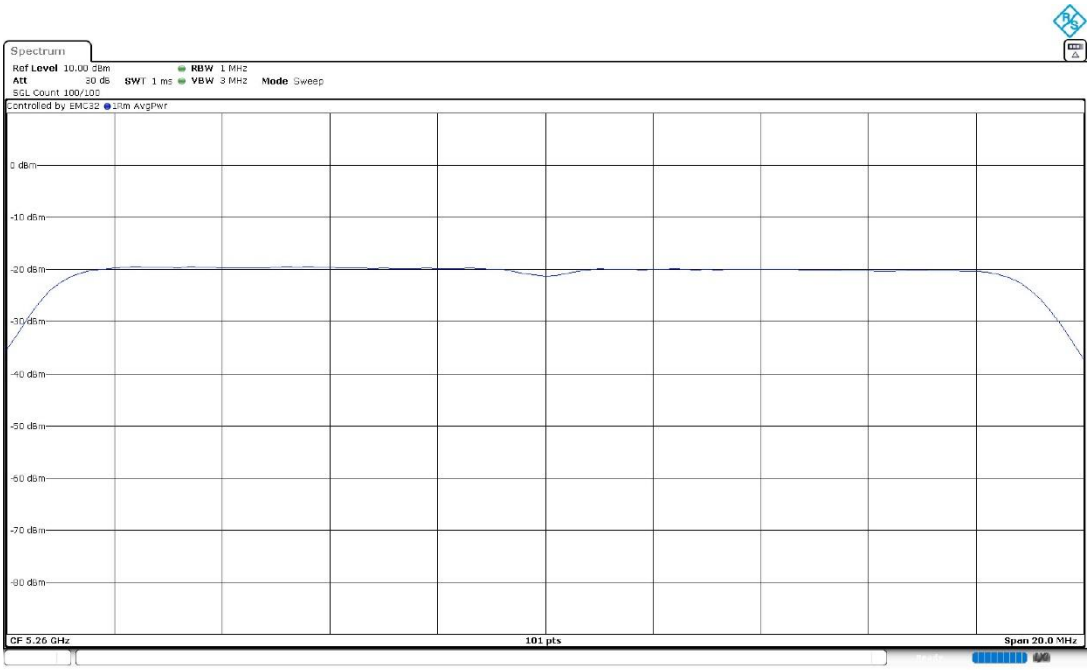
U-NII-2A (5250-5350 MHz)

- Low Channel 52 (5260 MHz):



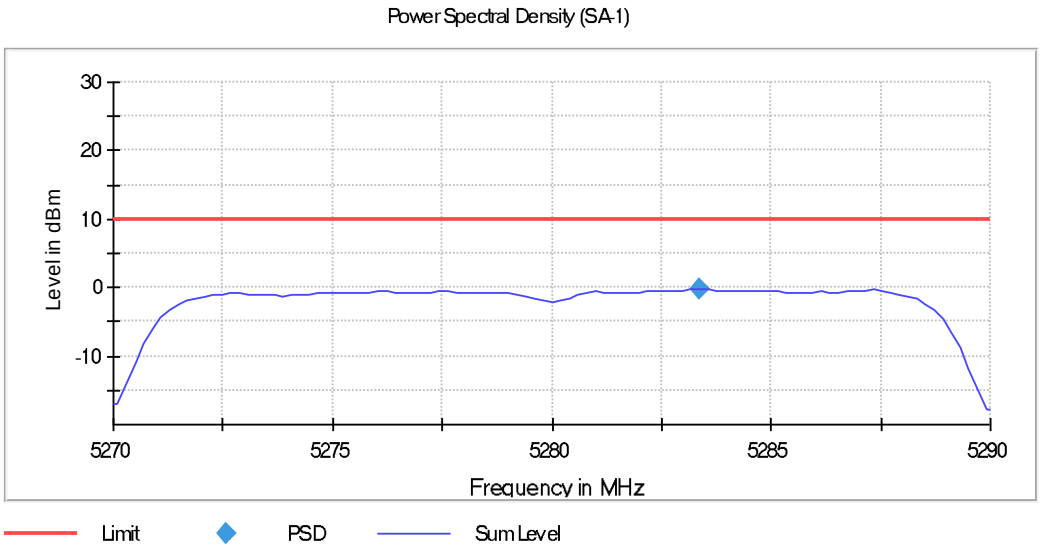


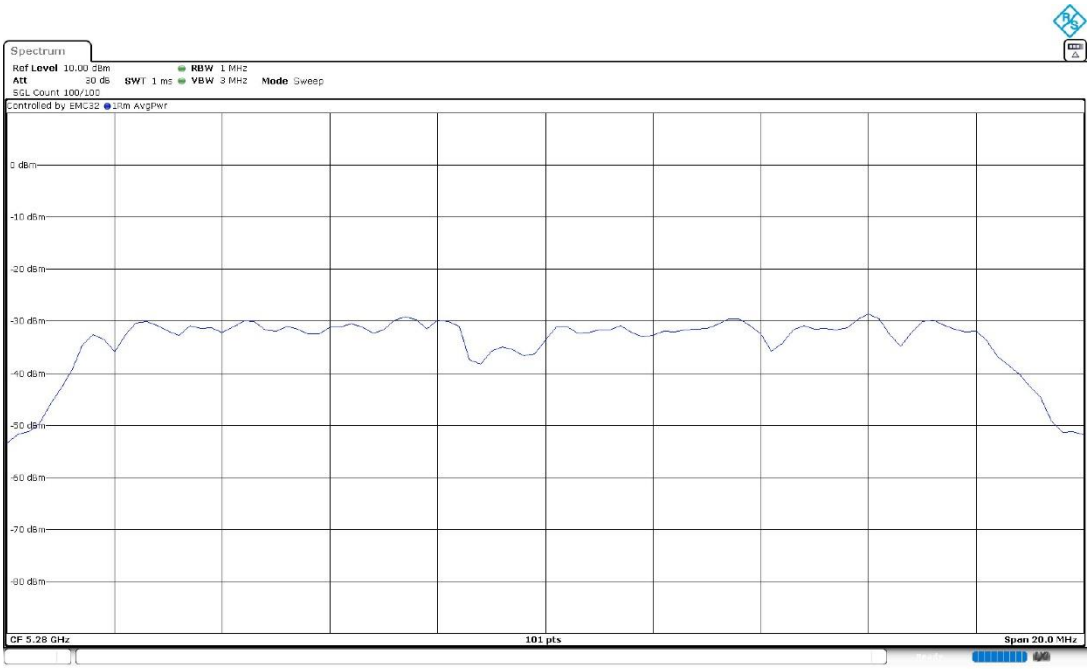
PSD Connector 1



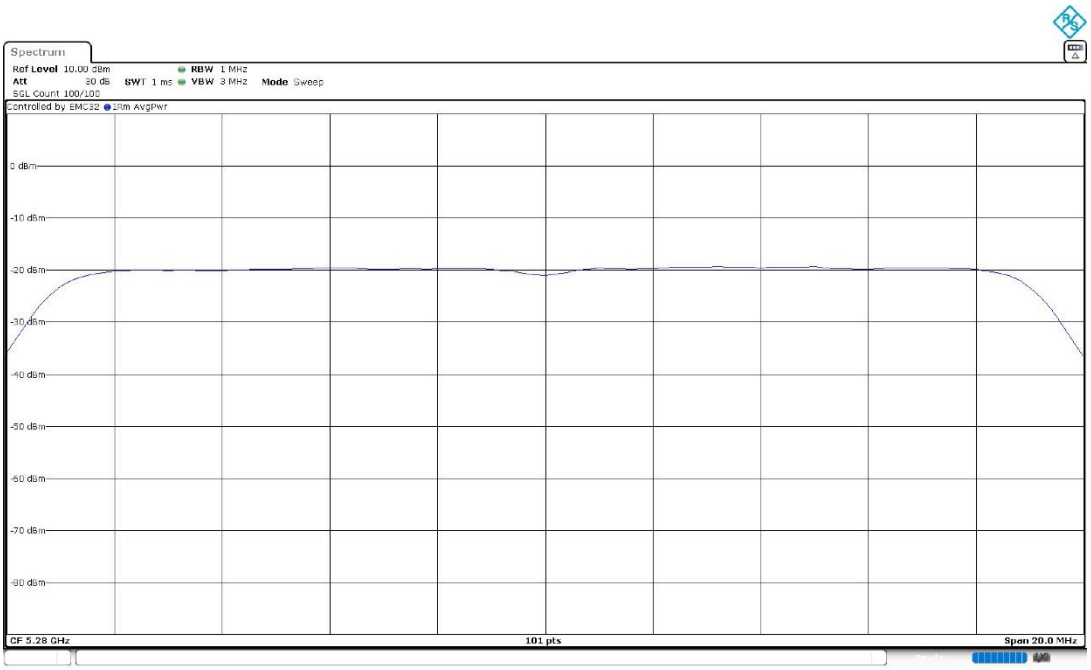
PSD Connector 2

- Low+1 Channel 56 (5280 MHz):



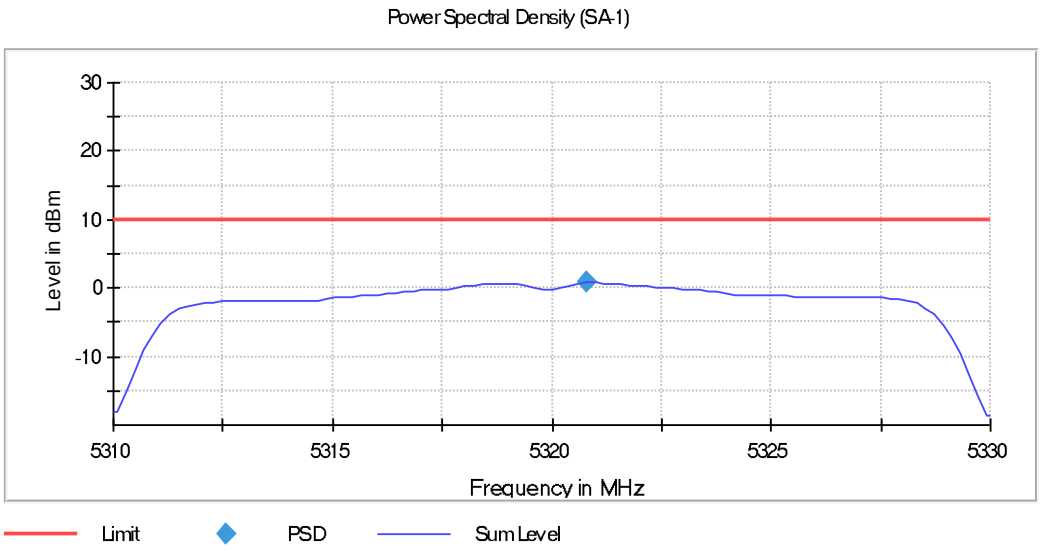


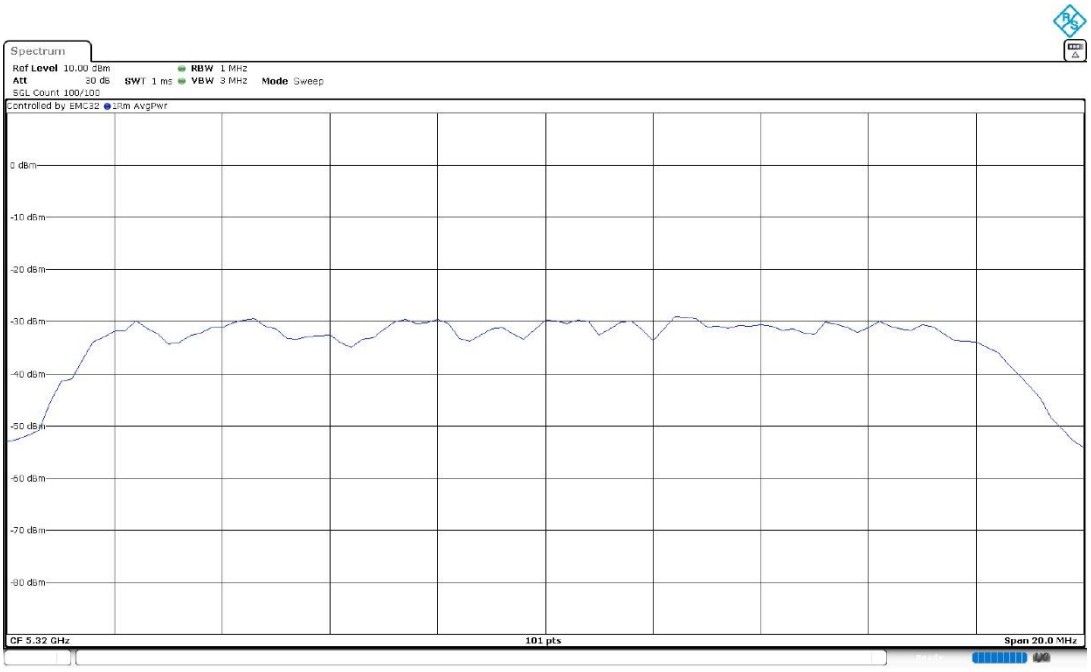
PSD Connector 1



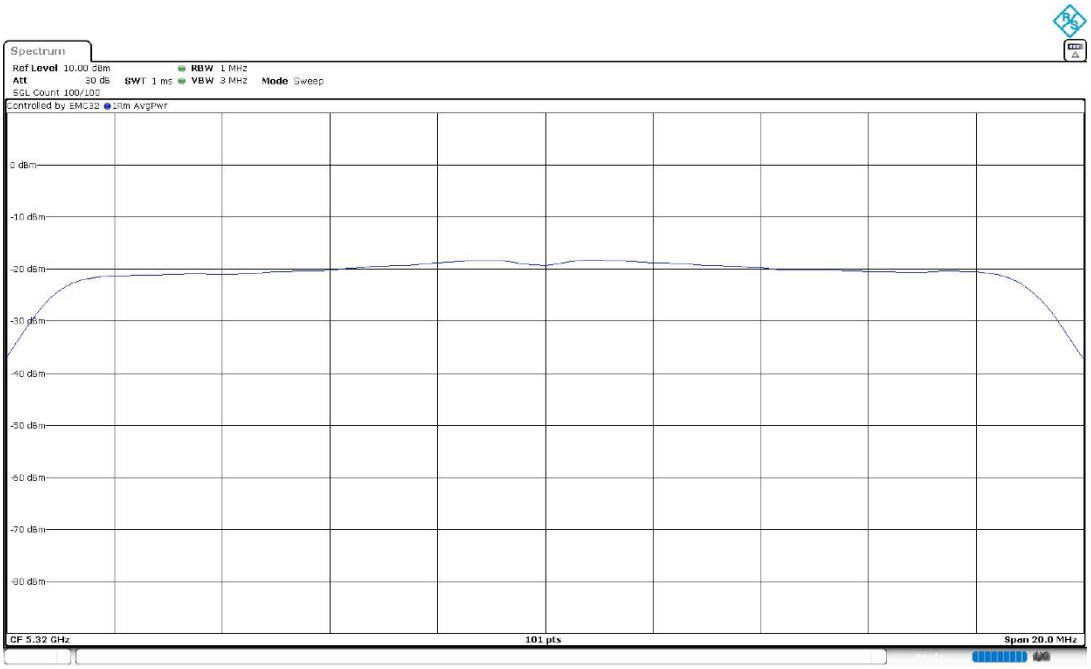
PSD Connector 2

- High Channel 64 (5320 MHz):





PSD Connector 1

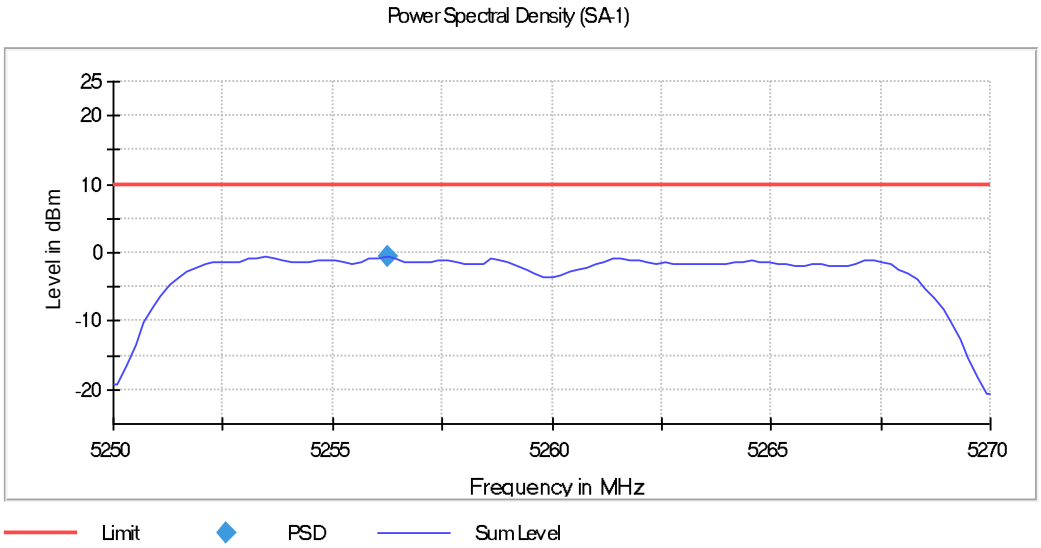


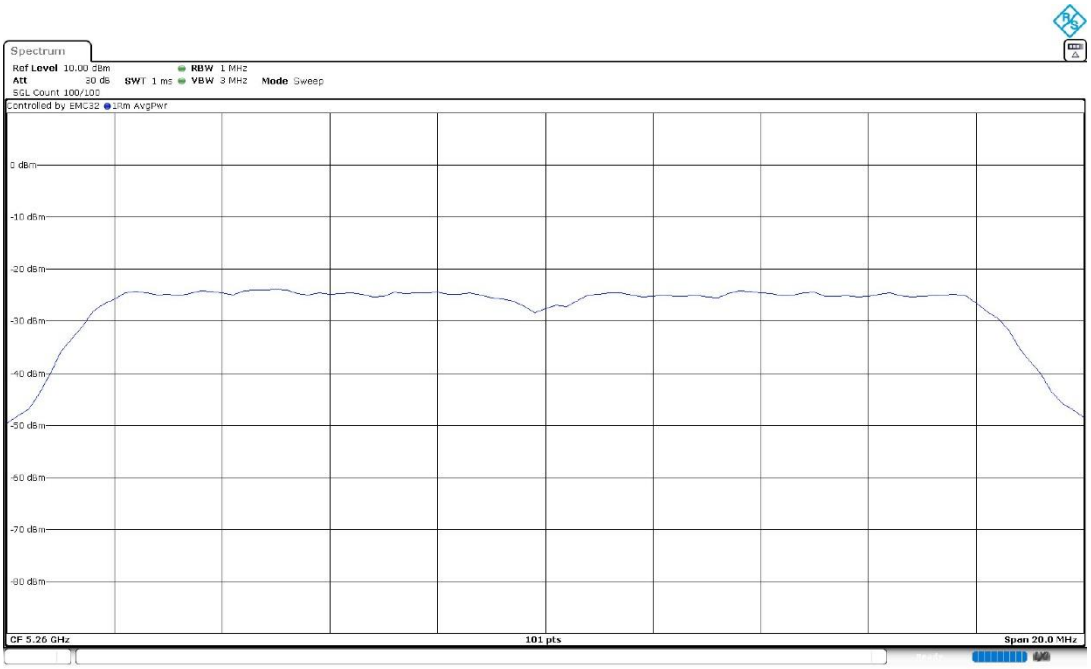
PSD Connector 2

MIMO 802.11 ac20 (VHT20):

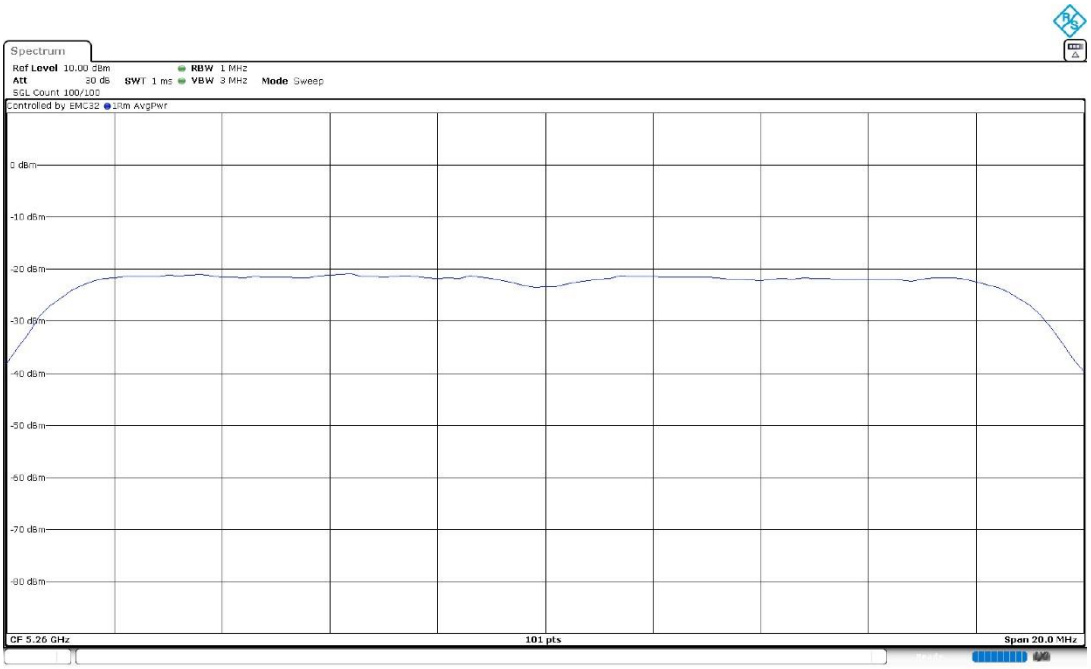
U-NII-2A (5250-5350 MHz)

- Low Channel 52 (5260 MHz):



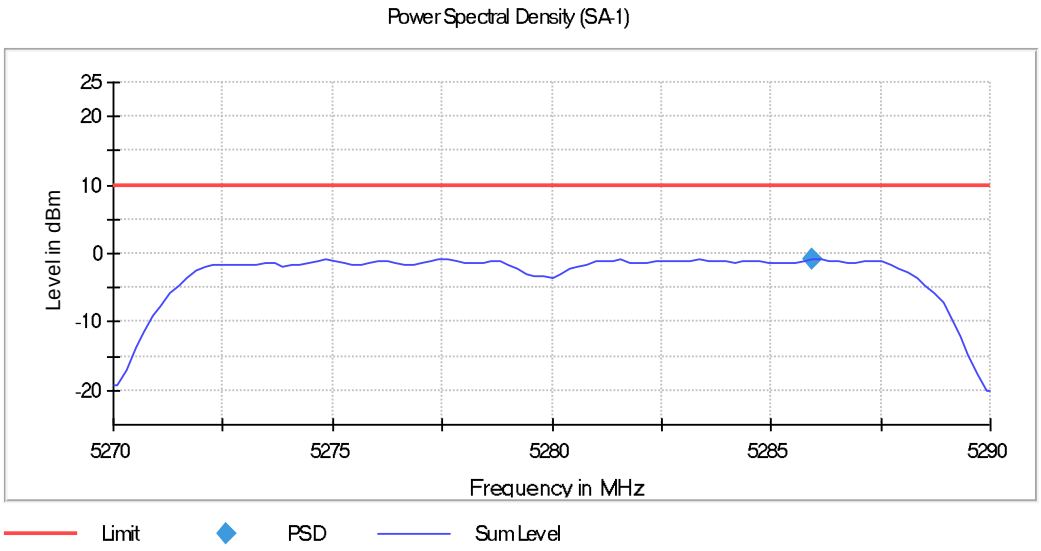


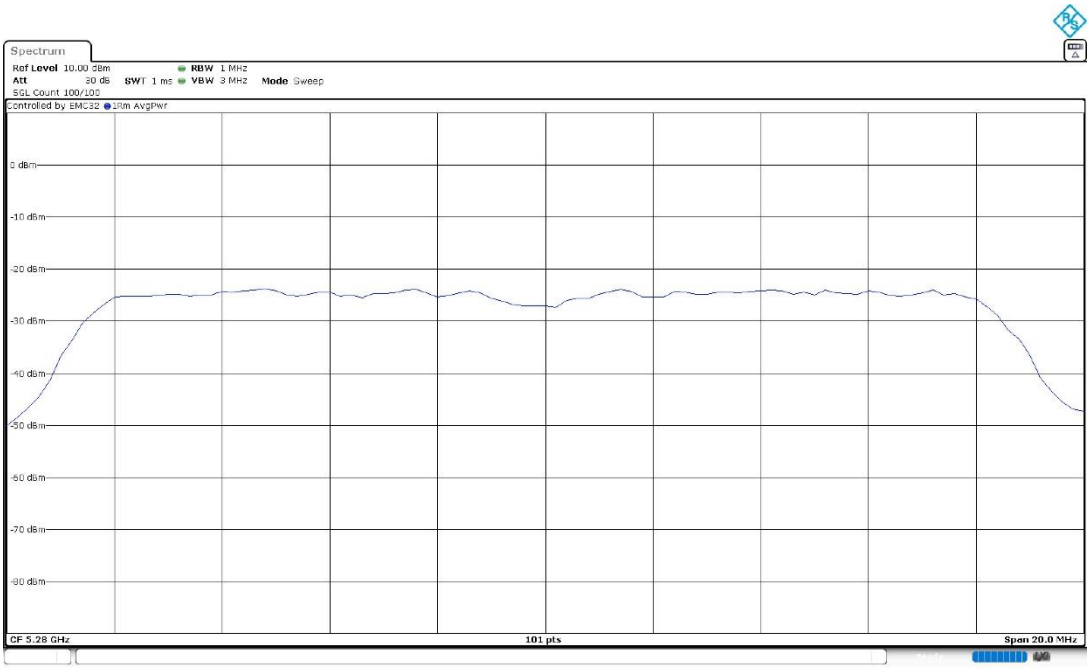
PSD Connector 1



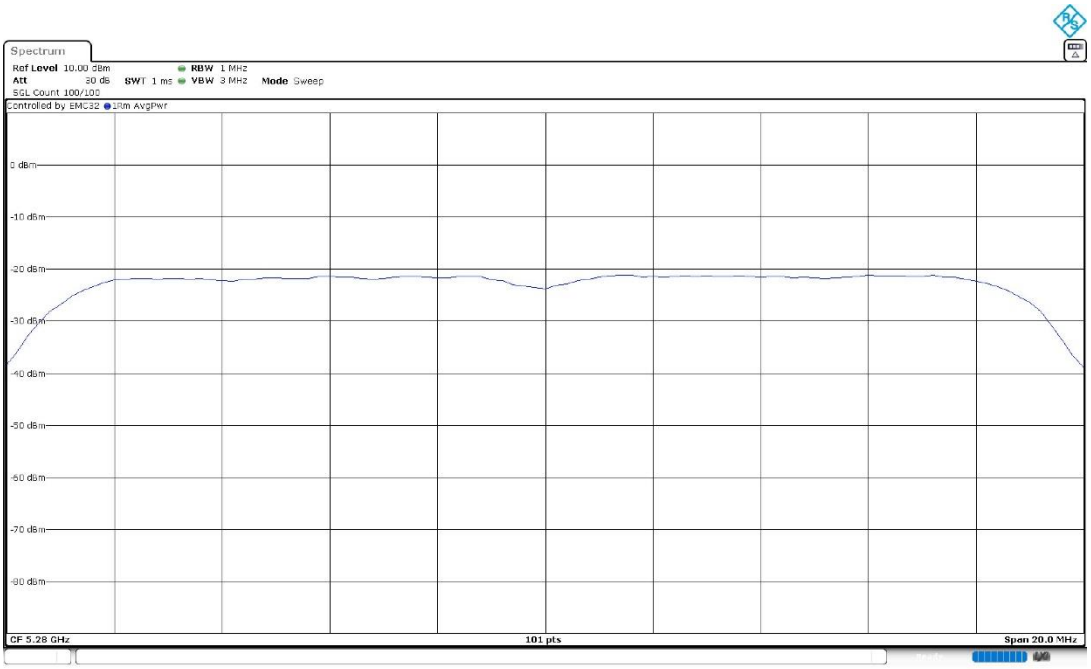
PSD Connector 2

- Low+1 Channel 56 (5280 MHz):



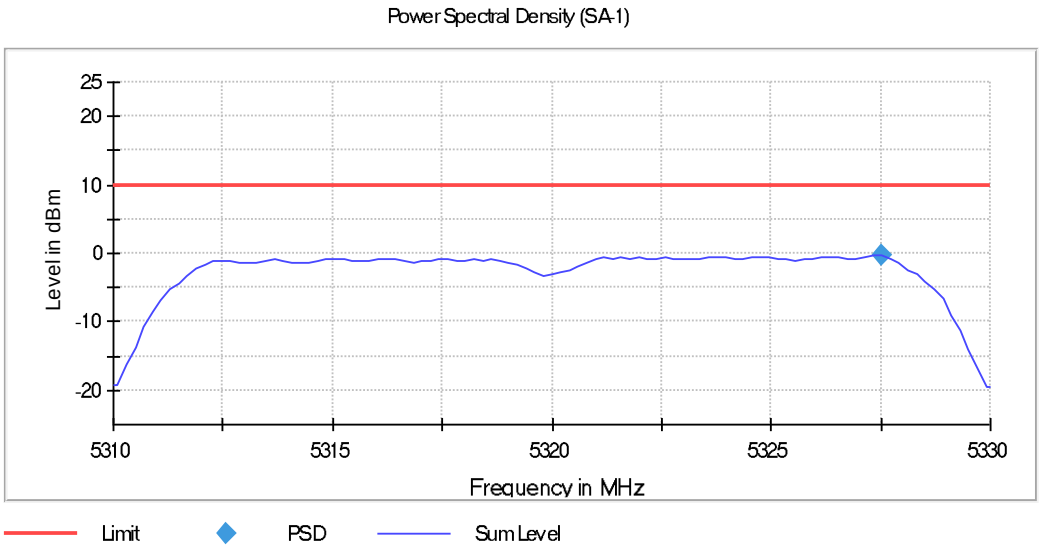


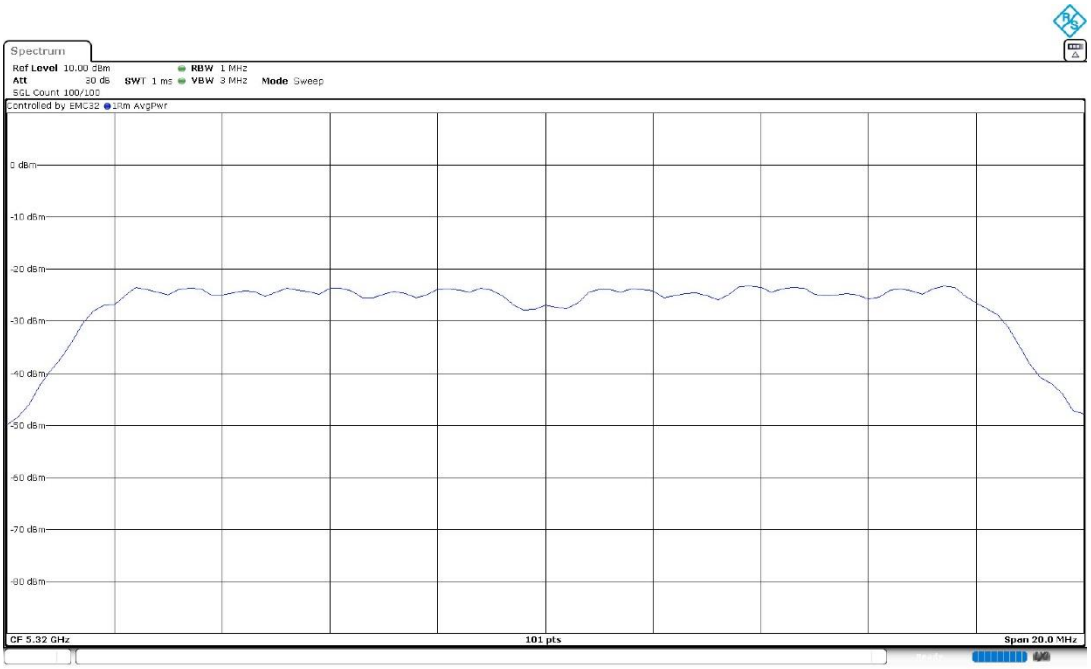
PSD Connector 1



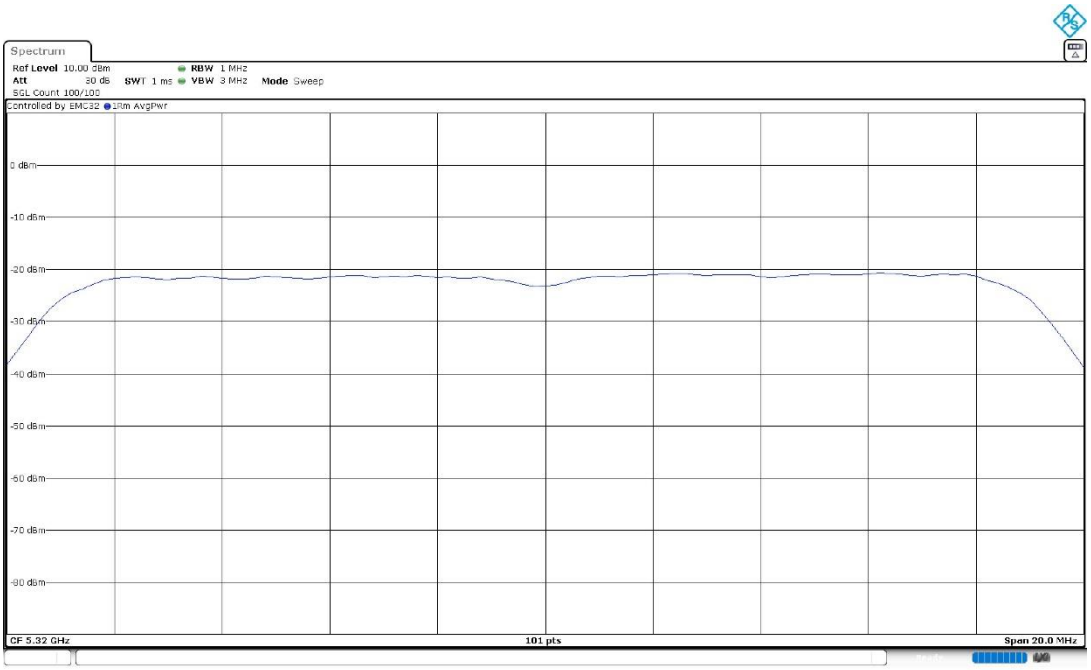
PSD Connector 2

- High Channel 64 (5320 MHz):





PSD Connector 1

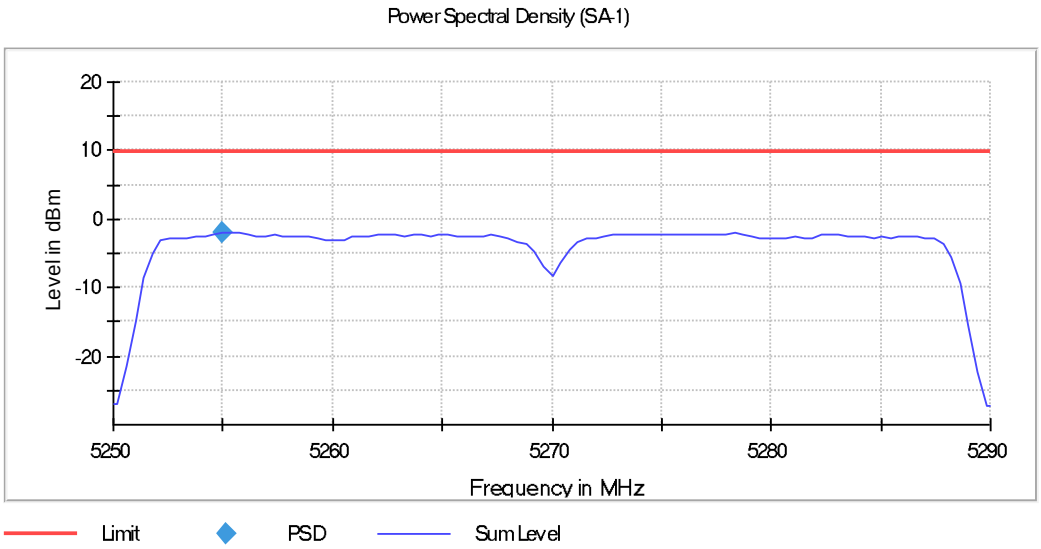


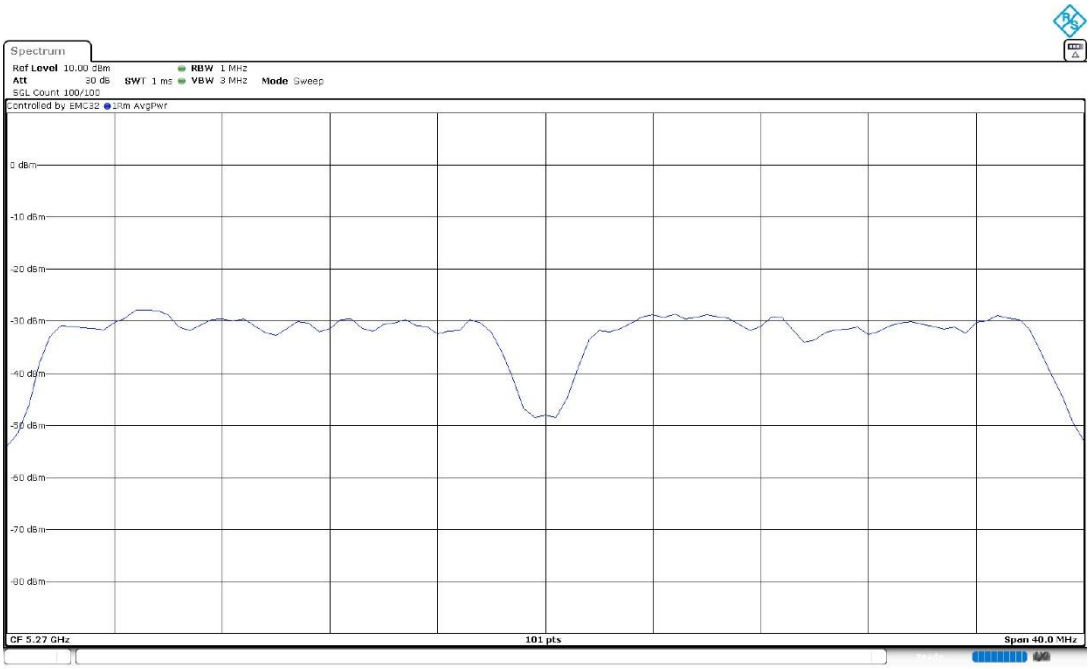
PSD Connector 2

MIMO 802.11 n40 (HT40):

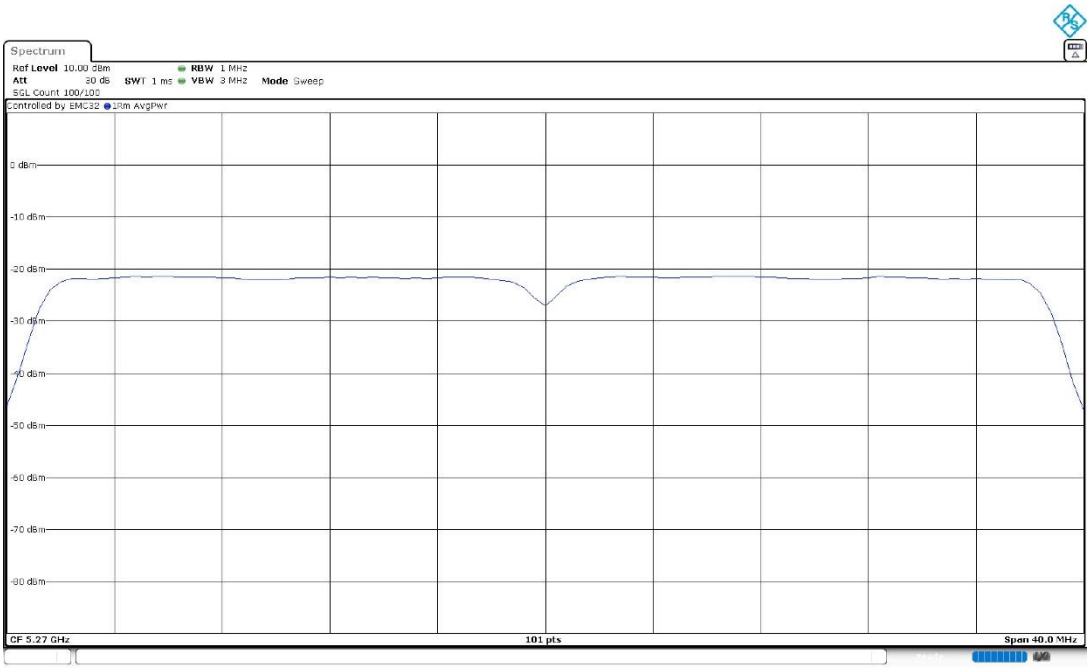
U-NII-2A (5250-5350 MHz)

- Low Channel 54 (5270 MHz):



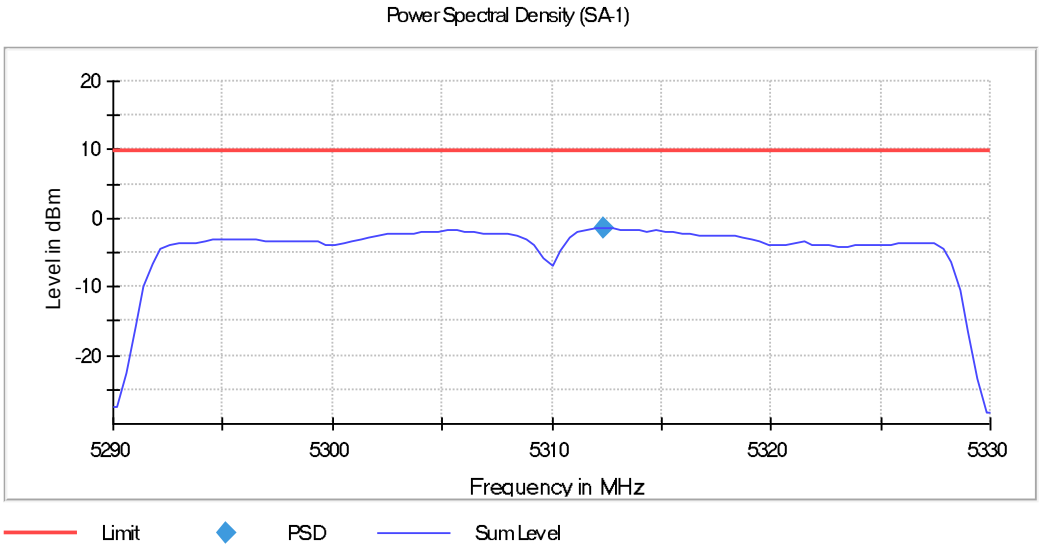


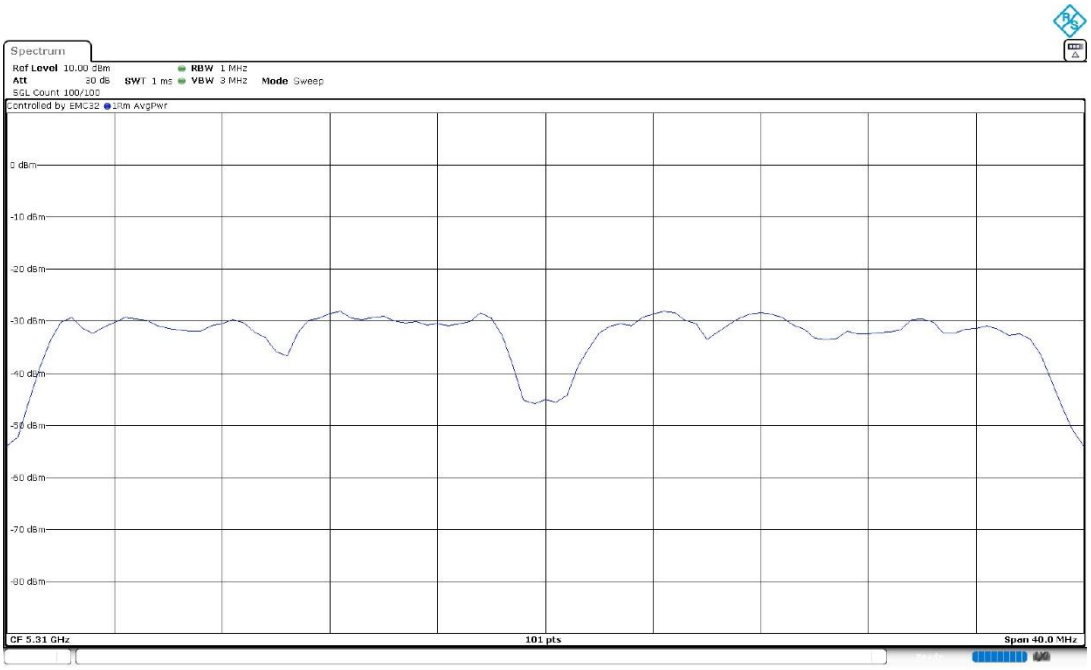
PSD Connector 1



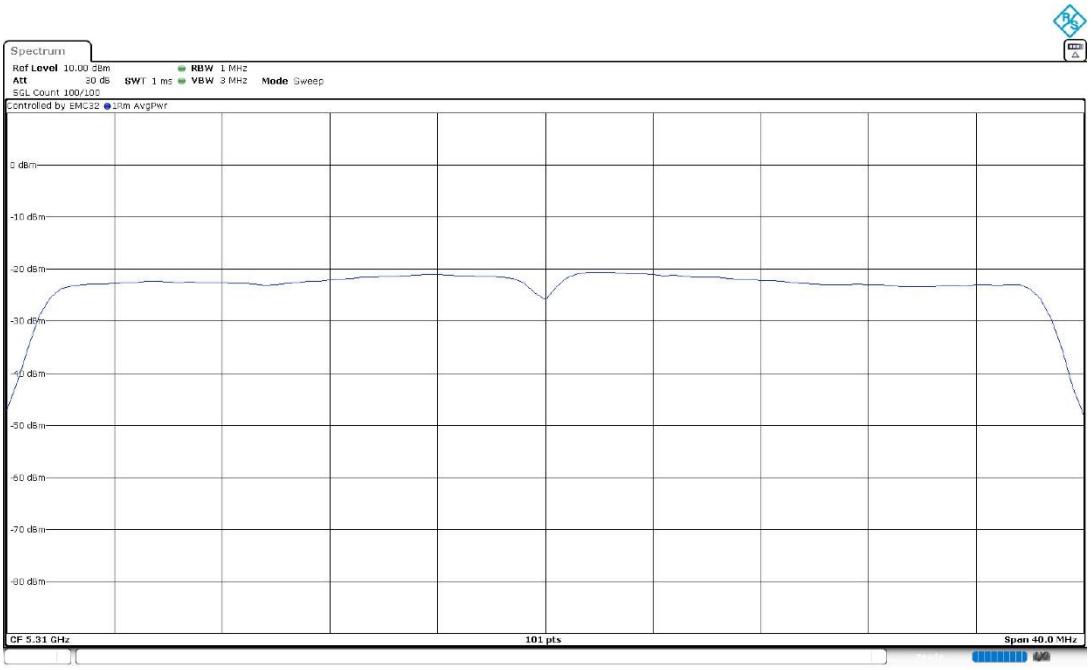
PSD Connector 2

- High Channel 62 (5310 MHz):





PSD Connector 1

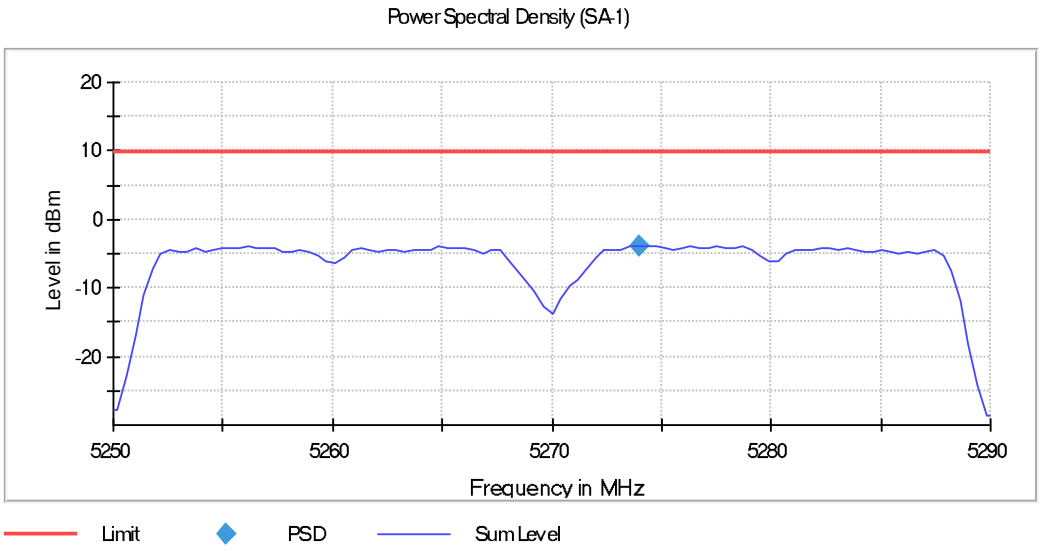


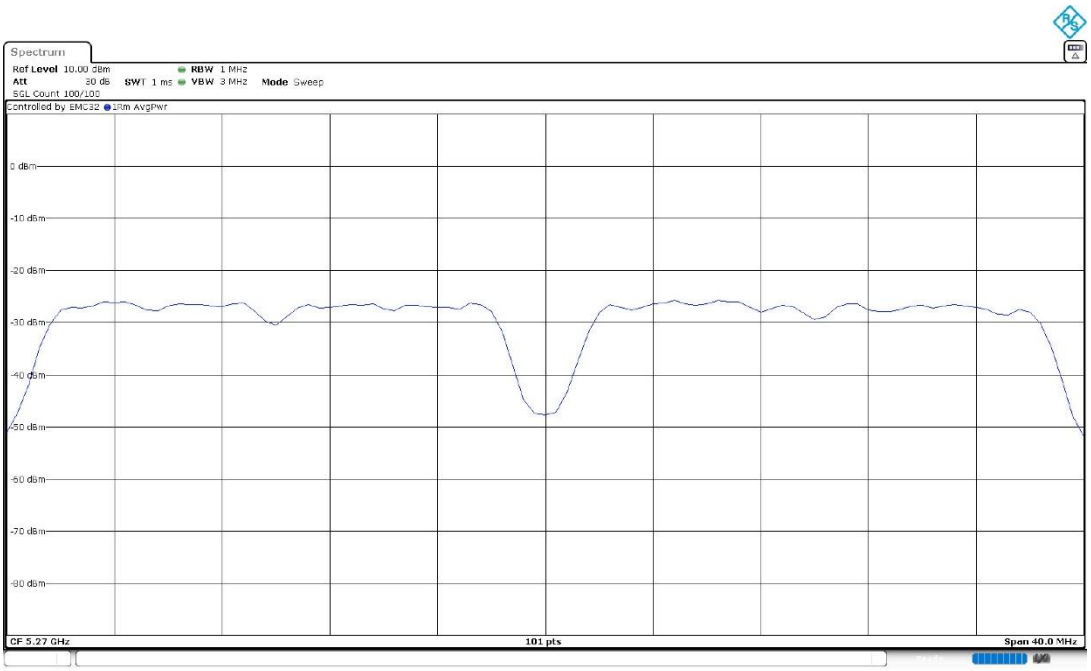
PSD Connector 2

MIMO 802.11 ac40 (VHT40):

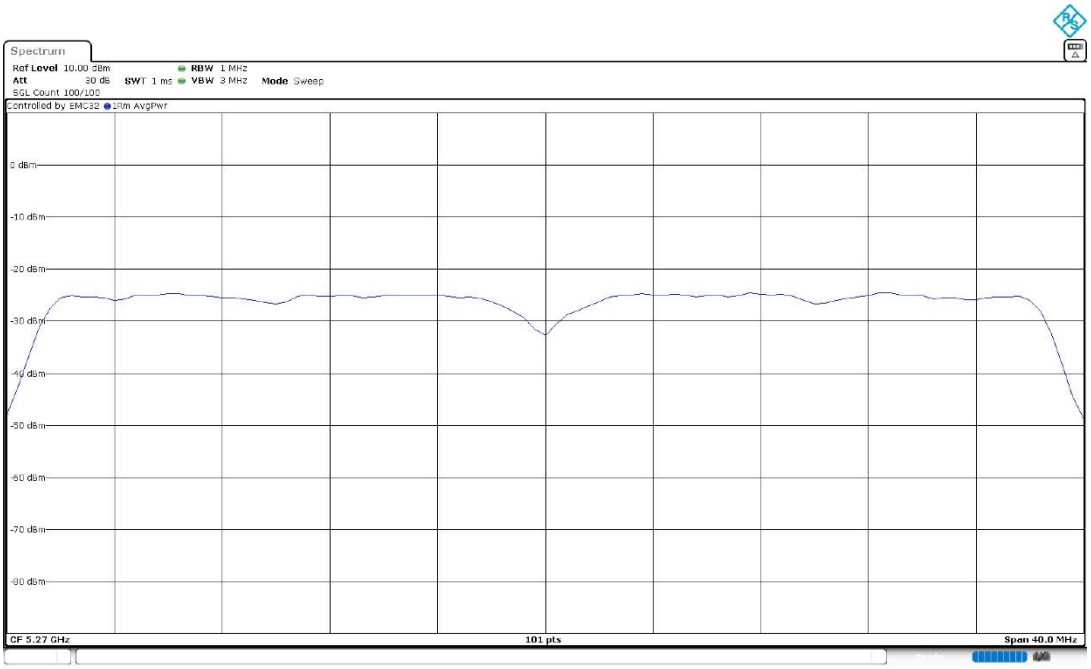
U-NII-2A (5250-5350 MHz)

- Low Channel 54 (5270 MHz):



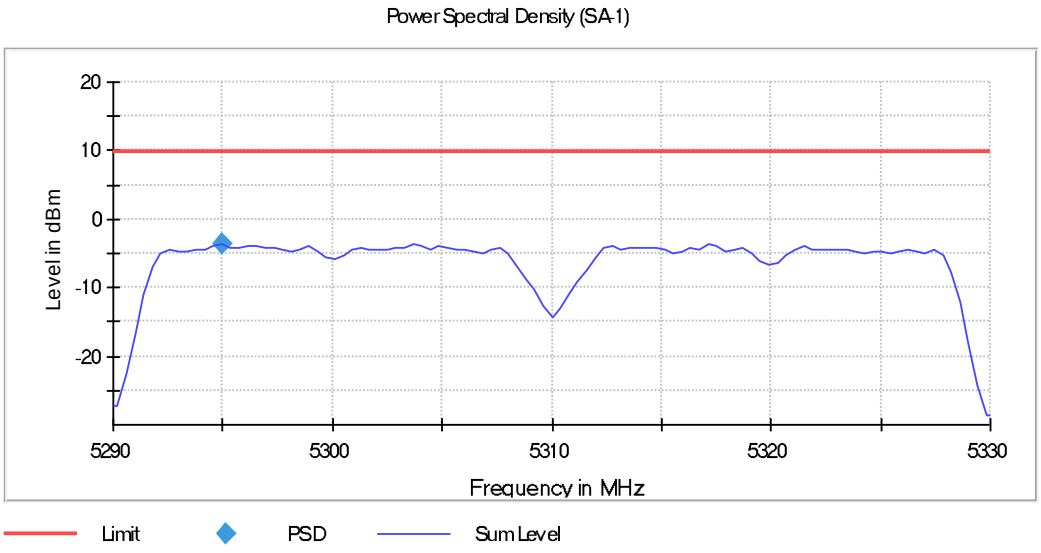


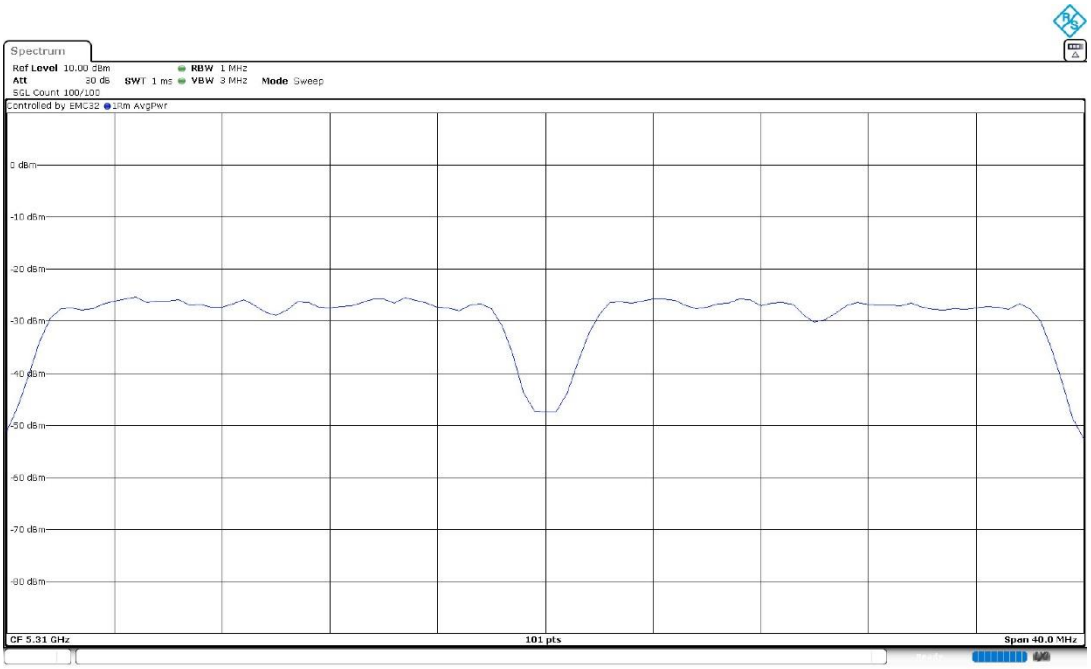
PSD Connector 1



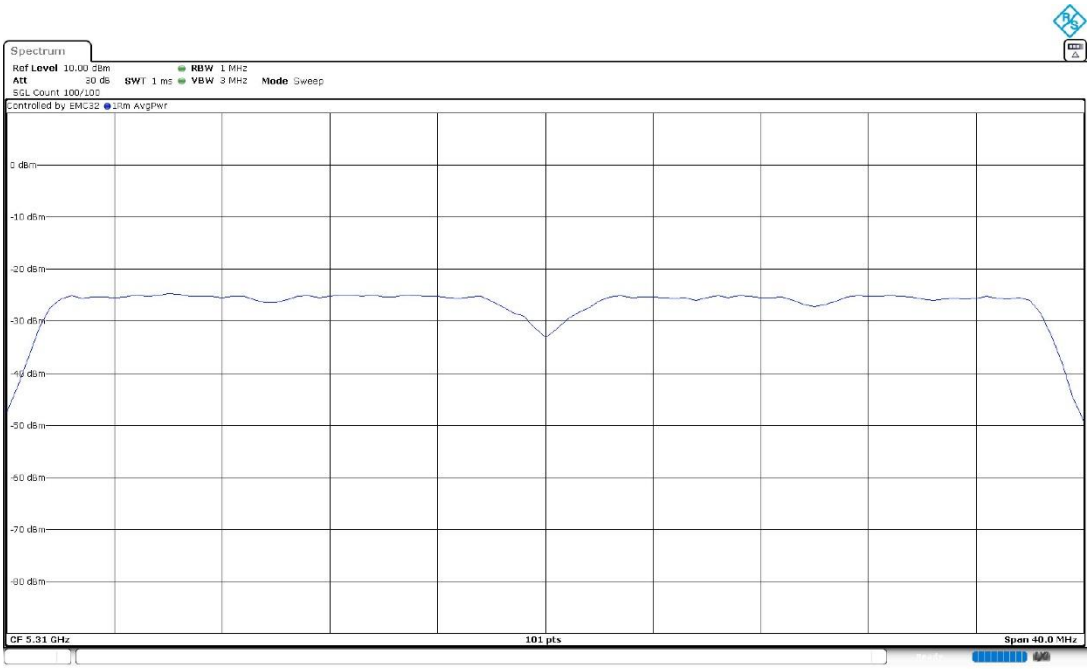
PSD Connector 2

- High Channel 62 (5310 MHz):





PSD Connector 1

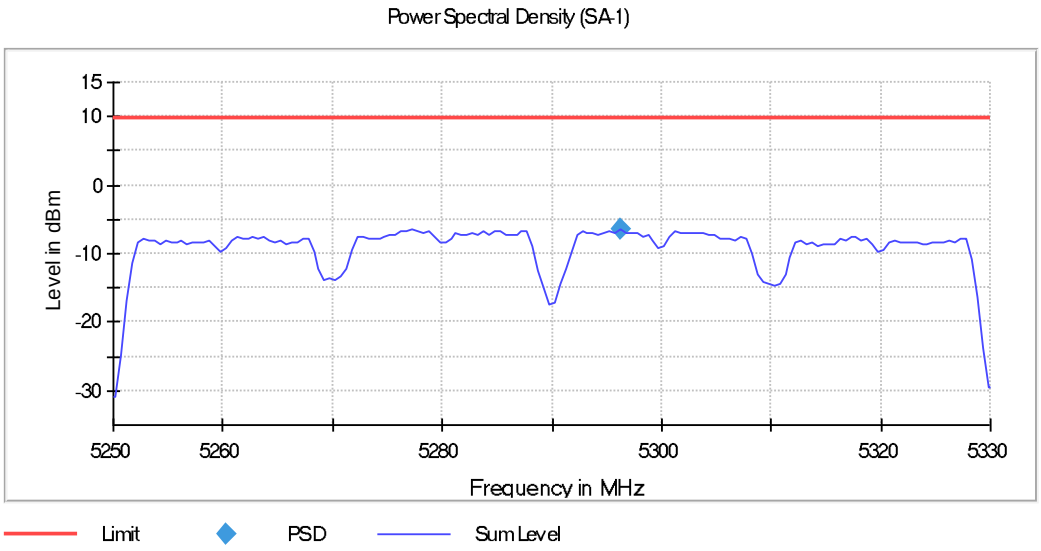


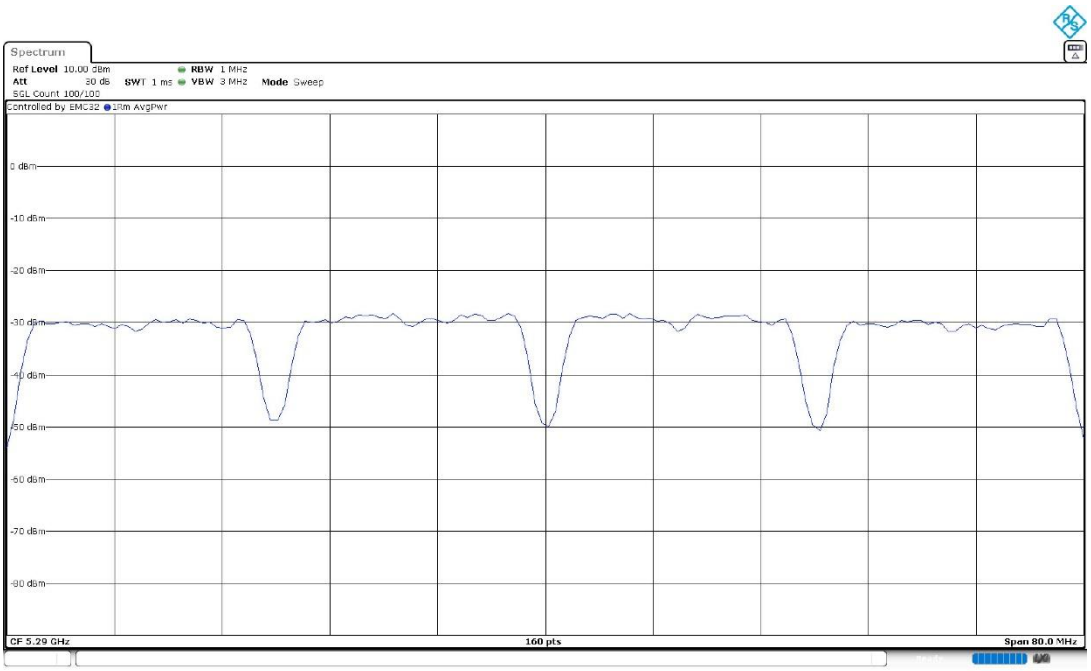
PSD Connector 2

MIMO 802.11 ac80 (VHT80):

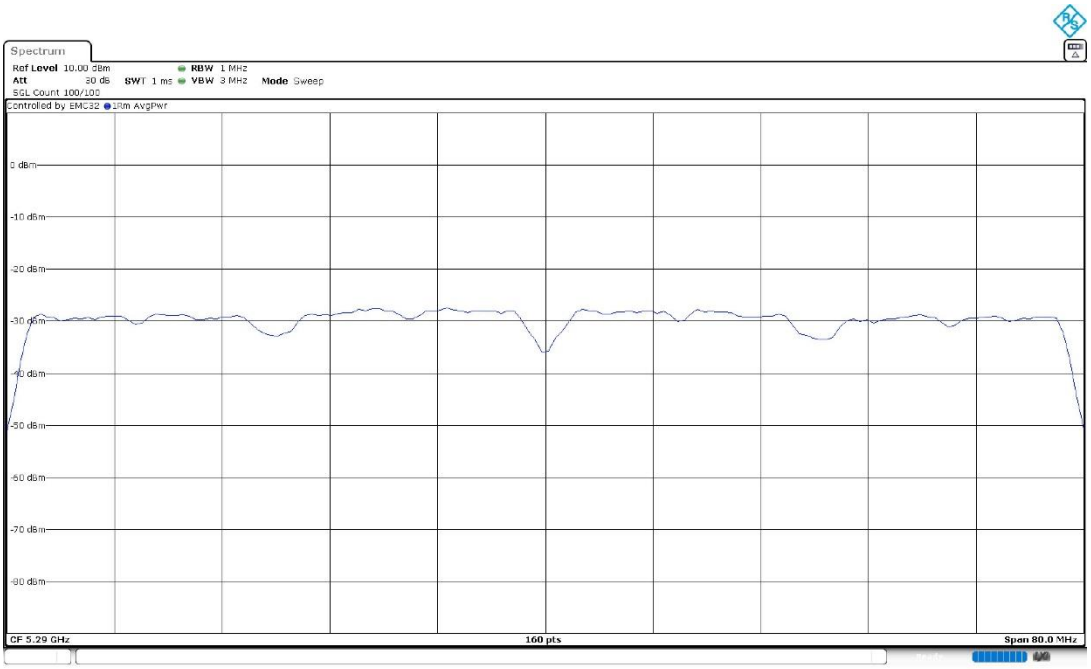
U-NII-2A (5250-5350 MHz)

- Single Channel 58 (5290 MHz):

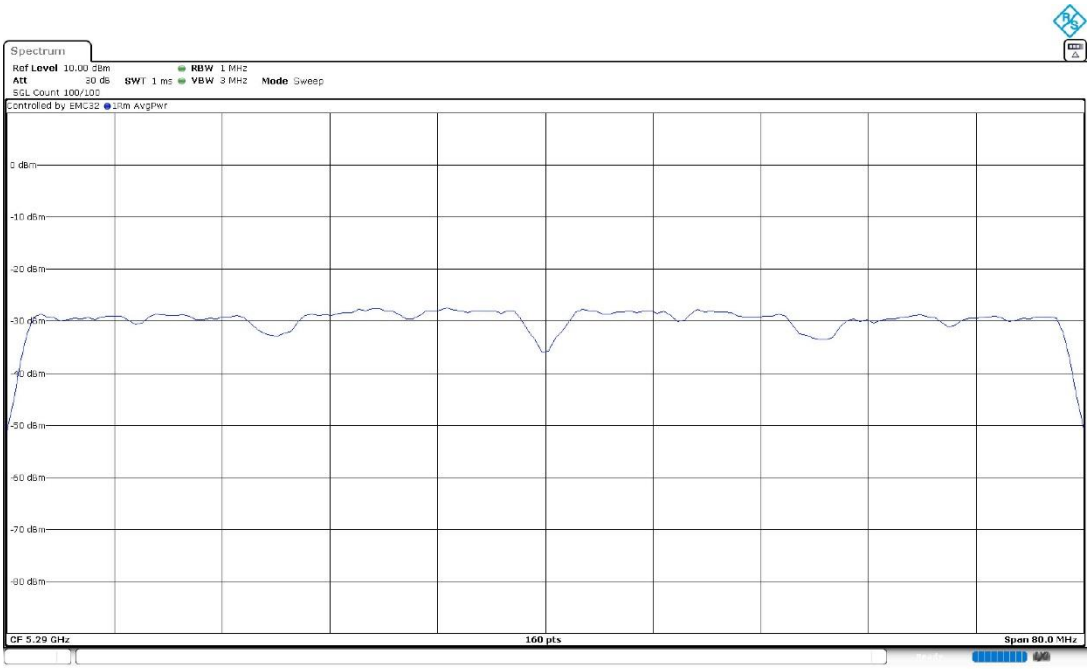




PSD Connector 1



PSD Connector 2



PSD Connector 2

FCC 15.407 (b)(1) / RSS-247 6.2.1.2. Out of Band Radiated Emissions

SPECIFICATION:

For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 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)	-	30
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 360º 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 1 GHz-40 GHz and a distance of 3m for frequency range 30MHz-1GHz.

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.

The worst-case was determined by measuring the eirp density (radiated). Test performed on the worst-case:

SISO worst-case:

- Preliminary tests determined the SISO worst-case: Chain 0.

  Worst-case: 802.11 a20.

Frequency range 30 MHz - 1 GHz (SISO worst-case):

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

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector
34.637813	24.48	V	Peak
	21.32		QP
39.487813	32.81	V	Peak
	28.54		QP
45.732188	30.25	V	Peak
	25.70		QP
53.855938	34.25	V	Peak
	30.10		QP
64.768438	27.99	V	Peak
	23.53		QP
86.047813	36.46	V	Peak
	33.62		QP
101.870938	33.65	V	Peak
	29.72		QP
108.812500	33.91	V	Peak
	30.37		QP
143.277813	33.55	V	Peak
	29.80		QP
162.495938	30.58	V	Peak
	23.60		QP
332.852188	38.65	V	Peak
	33.21		QP
841.344375	39.28	V	Peak
	31.08		QP

Frequency range 1 - 40 GHz (SISO worst-case):

Spurious frequencies 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.

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

Verdict: PASS

The measurement settings for each range of frequency is as follows:

Subrange	**Step Size**	**Detectors**	**Bandwidth**	**Sweep Time**	**Preamp**
Receiver: [ESW 44]					
30 MHz - 1 GHz	30,312 kHz	PK+	100 kHz	1 s	30 dB
Subrange	**Step Size**	**Detectors**	**Bandwidth**	**Sweep Time**	**Preamp**
Receiver: [FSW 50]					
1 GHz - 6,5 GHz	100 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
Subrange	**Step Size**	**Detectors**	**Bandwidth**	**Sweep Time**	**Preamp**
Receiver: [ESW 44]					
6,5 GHz - 17 GHz	105 kHz	PK+ ; AVG	1 MHz	1 s	30 dB
Subrange	**Step Size**	**Detectors**	**Bandwidth**	**Sweep Time**	**Preamp**
Receiver: [ESU 40]					
17 GHz - 28,5 GHz	383,333 kHz	PK+ ; AVG	1 MHz	1 s	0 dB
28,5 GHz - 40 GHz	383,333 kHz	PK+ ; AVG	1 MHz	1 s	0 dB