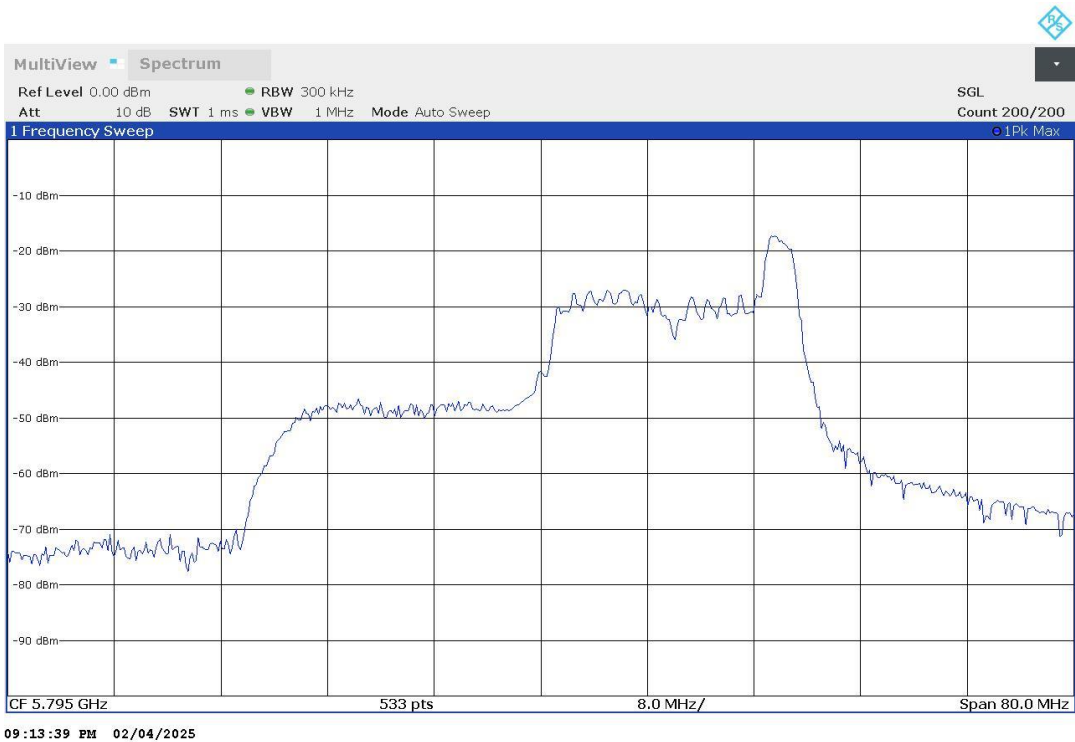
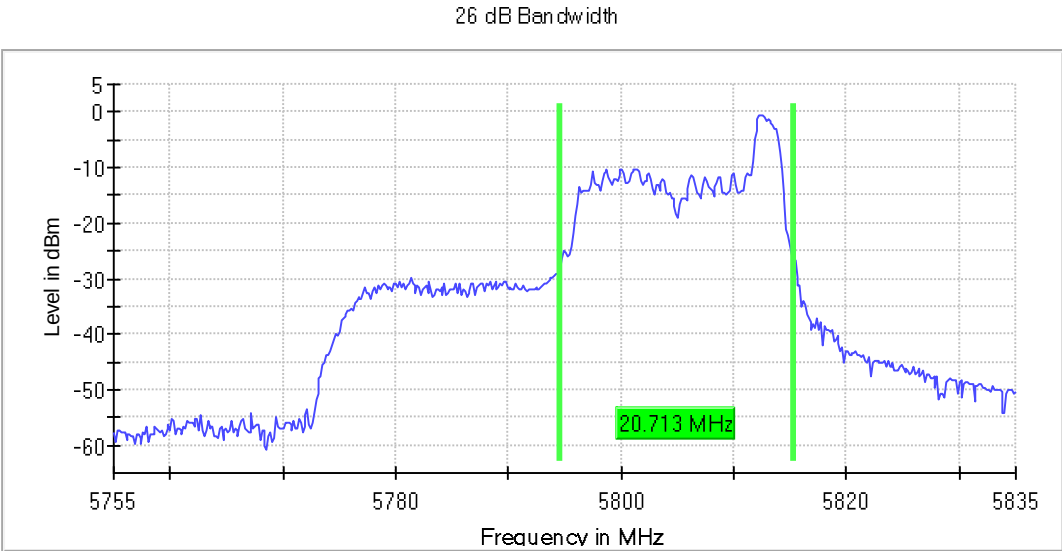


Operation Band MHz = [5725, 5850] Active Port = 3+2
Frequency MHz = 5795.00000 Modulation = 802.11ax HE40 (OFDMA MCS0) RU26
Antenna Configuration = MIMO

Images:



Modulation: 802.11ax HE80 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	Ebw (MHz)
[5725, 5850]	3+2	5775.00000	26.000

Verdict

Pass

Attachments

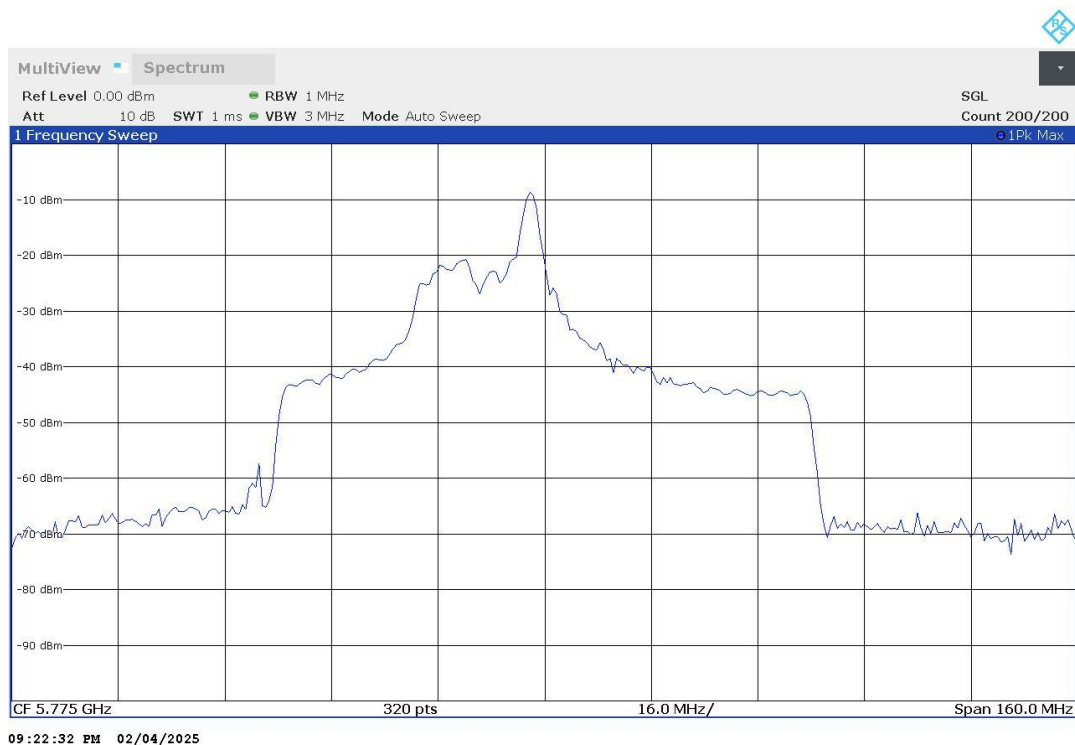
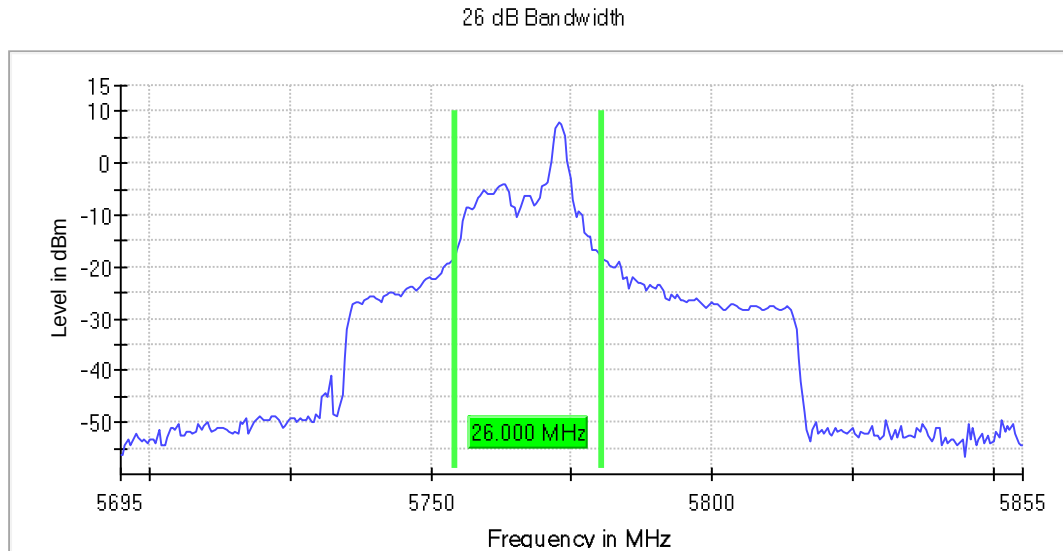
Operation Band MHz = [5725, 5850] Active Port = 3+2

Frequency MHz = 5775.00000

Modulation = 802.11ax HE80 (OFDMA MCS0) RU26

Antenna Configuration = MIMO

Images:



Appendix B: Tests results for the U-NII-1: 5.15 GHz – 5.25 GHz Band

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TEST CONDITIONS

(*) Declared by the Client.

POWER SUPPLY (*):

Vnominal: 12 Vdc
Type of Power Supply: External power supply (Vehicle Battery)

ANTENNA (*):

Type of Antennas: External

		Effective Antenna Gain
UNII-1	RF Output Port (Chain 0): Port 3	+7.70 dBi
	RF Output Port (Chain 1): Port 2	+2.38 dBi
UNII-3	RF Output Port (Chain 0): Port 3	+7.70 dBi
	RF Output Port (Chain 1): Port 2	+2.38 dBi

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

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:

$$\begin{aligned}
 N_{SS} &= 1, N_{ANT} = 2, G_{ANT0} = 7.70, G_{ANT1} = 2.38 \\
 \text{Directional Gain} &= 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{k=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right] = 10 \log \left[\frac{\sum_{j=1}^1 \left(\sum_{k=1}^2 g_{j,k} \right)^2}{2} \right] \\
 &= 10 \log \left[\frac{(g_{1,1} + g_{1,2})^2}{2} \right] = 10 \log \left[\frac{(10^{\frac{7.70}{20}} + 10^{\frac{2.38}{20}})^2}{2} \right] = 10 \log \left[\frac{(10^{\frac{7.70}{20}} + 10^{\frac{2.38}{20}})^2}{2} \right] = 8.45 \text{ dBi}
 \end{aligned}$$

For the SISO and MIMO techniques, the antenna gain are higher than 6 dBi.

POWER ADJUSTMENT (*):

Modes:	Power Adjustment SISO Port 3:	Power Adjustment MIMO (Port 3 + Port 2):
A20	15	15
N20	15	15
N40	15	15
AC20	15	15
AC40	15	15
AC80	15	15
AX20 SU	15	15
AX20 RU26	15	15
AX40 SU	15	15
AX40 RU26	15	15
AX80 SU	15	15
AX80 RU26	15	15

TEST FREQUENCIES (*):

Technology Tested:	WLAN (IEEE 802.11 a20 / n2040 / ac204080 / ax204080 1x1 & 2x2)
Modes:	802.11a: 6, 9, 12, 18, 24, 36, 48 & 54 Mbps (1 or 2 spatial stream with either SISO or 2 chains MIMO CDD).
	802.11n HT20: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chains MIMO CDD).
	802.11n HT40: MCS0 to MCS23 (1 or 2 spatial stream with either SISO or 2 chains 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).
	802.11ax HE20: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).
	802.11ax HE40: MCS0 to MCS9 (1 or 2 spatial stream) (SISO, or MIMO with CDD without TxBF).
	802.11ax HE80: 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-1:

Frequency Range:	5150 - 5250 MHz	
Operating Channel Bandwidth:	20 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low (36)	5180
	Middle (40)	5200
	Middle (44)	5220
	High (48)	5240
Operating Channel Bandwidth:	40 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Low (38)	5190
	High (46)	5230
Operating Channel Bandwidth:	80 MHz	
Transmission Channels:	Channels	Channel Frequency (MHz)
	Single (42)	5210

These tests were performed on all the supported modes of the EUT, in the worst data rates after preliminary testing.

SISO tests were performed on determined SISO Chain 0 (Port 3) as it is the worst-case after preliminary testing.

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 on 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.

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).

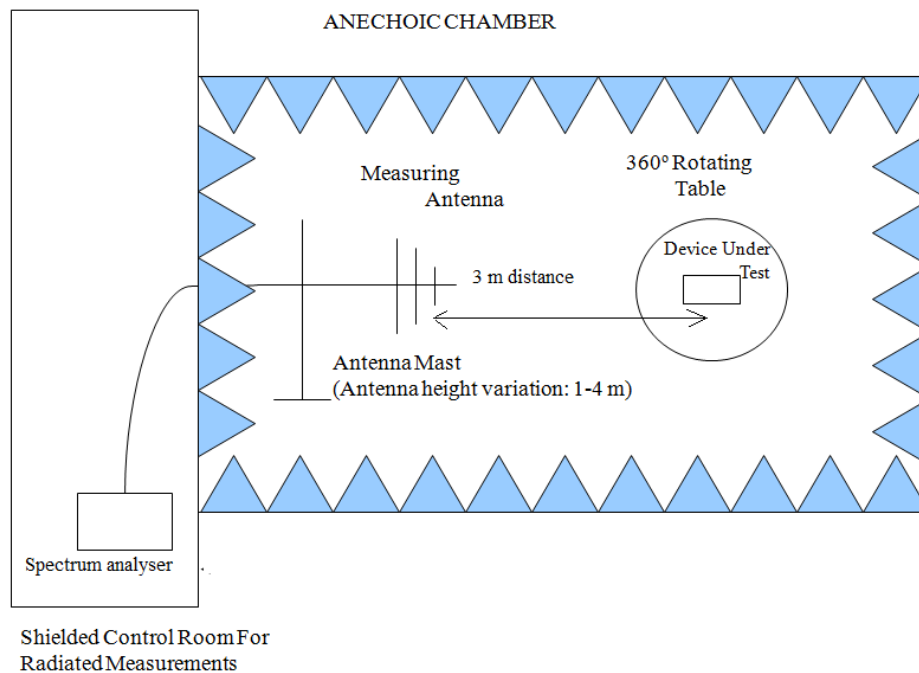
For radiated emissions in the range 17 GHz-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

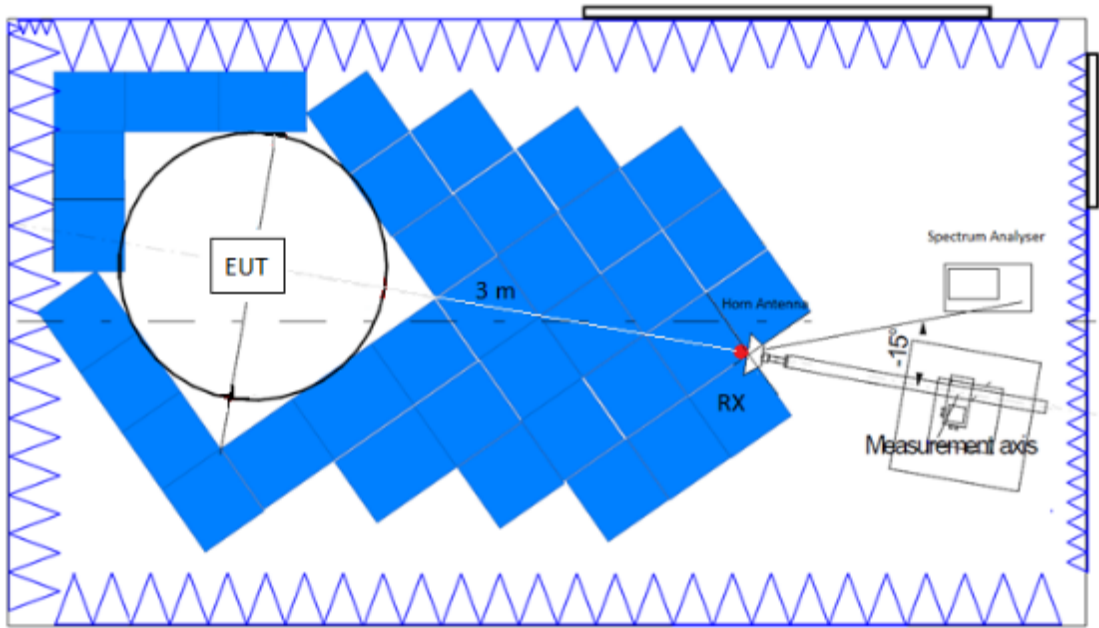
Measurements were made in both horizontal and vertical planes of polarization.

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

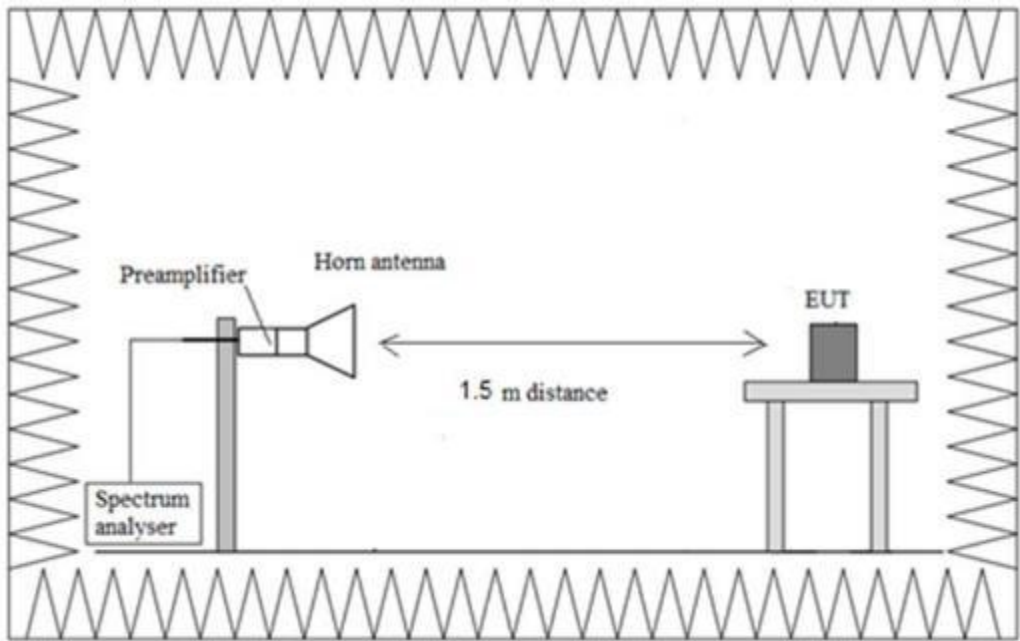
Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



FCC 15.407 (a)(1)(iv) Transmitter Maximum Conducted Output Power

Limit:

FCC 15.407:
For client devices in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.
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.

The maximum conducted output power was measured using the method according to clause E) 3) b) (Method PM-G) of 789033 D02 General UNII Test Procedures New Rules v02r01.

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

Results

SISO (Port 3) (worst-case)

Modulation: 802.11a (OFDM 6 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5180.00000	No	12.81	5.11
		5220.00000		13.15	5.45
		5240.00000		13.13	5.43

Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5180.00000	No	12.78	5.08
		5220.00000		13.12	5.42
		5240.00000		13.13	5.43

Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5190.00000	No	11.82	4.12
		5230.00000		12.33	4.63

Modulation: 802.11ac VHT20 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5180.00000	No	12.78	5.08
		5220.00000		13.11	5.41
		5240.00000		13.12	5.42

Modulation: 802.11ac VHT40 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5190.00000	No	11.78	4.08
		5230.00000		12.32	4.61

Modulation: 802.11ac VHT80 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5210.00000	No	12.20	4.50

Modulation: 802.11ax HE20 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5180.00000	No	10.55	2.85
		5220.00000		11.23	3.53
		5240.00000		11.33	3.63

Modulation: 802.11ax HE20 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5180.00000	No	10.11	2.41
		5220.00000		11.64	3.94
		5240.00000		11.07	3.37

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5180MHz):	0
	Middle (5220MHz):	3
	Highest (5240MHz):	8
[5725, 5850]	Lowest (5745MHz):	0
	Middle (5785MHz):	3
	Highest (5825MHz):	8

Modulation: 802.11ax HE40 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5190.00000	No	10.87	3.17
		5230.00000		11.31	3.61

Modulation: 802.11ax HE40 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5190.00000	No	9.21	1.51
		5230.00000		10.09	2.39

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5190MHz):	0
	Highest (5230MHz):	17
[5725, 5850]	Lowest (5755MHz):	0
	Highest (5795MHz):	17

Modulation: 802.11ax HE80 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5210.00000	No	11.13	3.43

Modulation: 802.11ax HE80 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3	5210.00000	No	9.09	1.39

Offset RU used in each channel:

Operation Band (MHz)	Channel	Offset
[5150, 5250]	Single (5190MHz):	18
[5725, 5850]	Single (5755MHz):	18

Verdict

Pass

MIMO (Port 3 + Port 2)

Modulation: 802.11a (OFDM 6 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5180.00000	No	18.17	9.72
		5220.00000		18.56	10.11
		5240.00000		18.79	10.34

Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5180.00000	No	18.18	9.73
		5220.00000		18.55	10.10
		5240.00000		18.87	10.42

Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5190.00000	No	18.14	9.69
		5230.00000		18.68	10.23

Modulation: 802.11ac VHT20 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5180.00000	No	18.22	9.77
		5220.00000		18.55	10.10
		5240.00000		18.83	10.38

Modulation: 802.11ac VHT40 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5190.00000	No	18.19	9.74
		5230.00000		18.66	10.21

Modulation: 802.11ac VHT80 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5210.00000	No	18.55	10.10

Modulation: 802.11ax HE20 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5180.00000	No	16.41	7.96
		5220.00000		16.88	8.43
		5240.00000		17.19	8.74

Modulation: 802.11ax HE20 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5180.00000	No	15.72	7.27
		5220.00000		16.98	8.53
		5240.00000		16.09	7.64

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5180MHz):	0
	Middle (5220MHz):	3
	Highest (5240MHz):	8
[5725, 5850]	Lowest (5745MHz):	0
	Middle (5785MHz):	3
	Highest (5825MHz):	8

Modulation: 802.11ax HE40 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5190.00000	No	18.11	9.66
		5230.00000		17.11	8.66

Modulation: 802.11ax HE40 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5190.00000	No	14.90	6.45
		5230.00000		15.45	7.00

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5190MHz):	0
	Highest (5230MHz):	17
[5725, 5850]	Lowest (5755MHz):	0
	Highest (5795MHz):	17

Modulation: 802.11ax HE80 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5210.00000	No	15.35	8.48

Modulation: 802.11ax HE80 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Max EIRP (dBm)	Avg Power (dBm)
[5150, 5250]	3+2	5210.00000	No	16.42	7.97

Offset RU used in each channel:

Operation Band (MHz)	Channel	Offset
[5150, 5250]	Single (5190MHz):	18
[5725, 5850]	Single (5755MHz):	18

Verdict

Pass

FCC 15.407 (a)(1)(iv) Transmitter EIRP Spectral Density

Limit:

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.

Results

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

The result of PSD was measured by setting a marker on the peak of the signal on the spectrum analyzer. The results are in the tables below.

SISO (Port 3) (worst-case)

Modulation: 802.11a (OFDM 6 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5180.00000	No	5180.990099	1.09
		5220.00000		5220.990099	0.84
		5240.00000		5239.207921	0.99

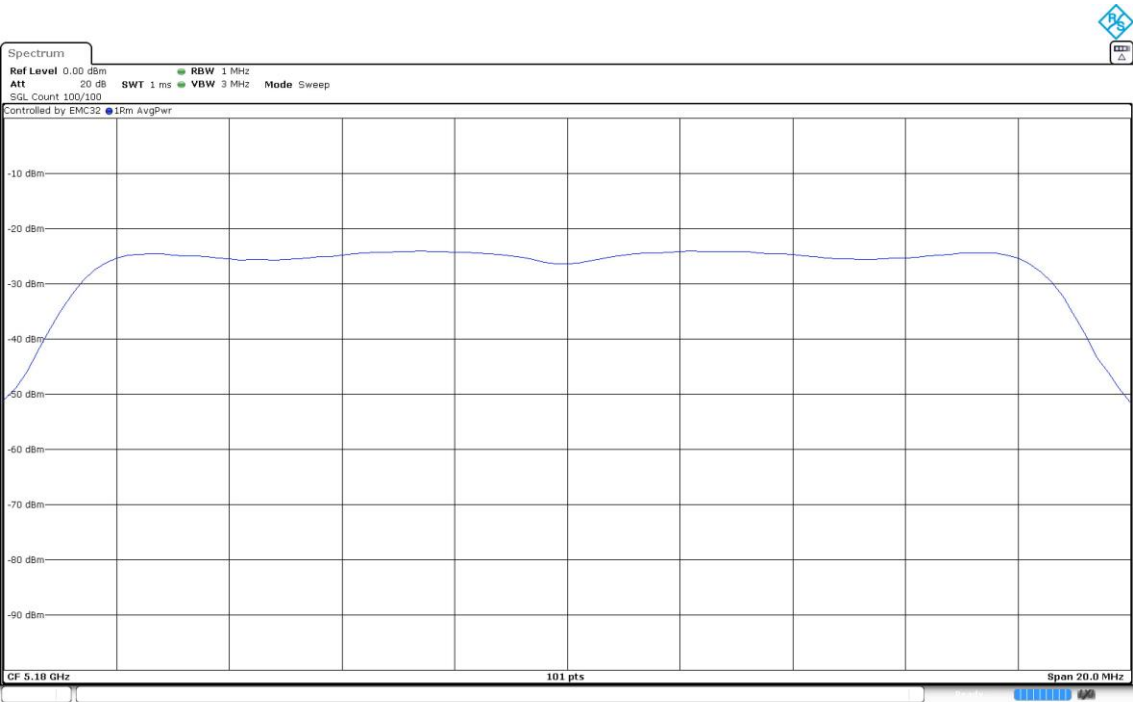
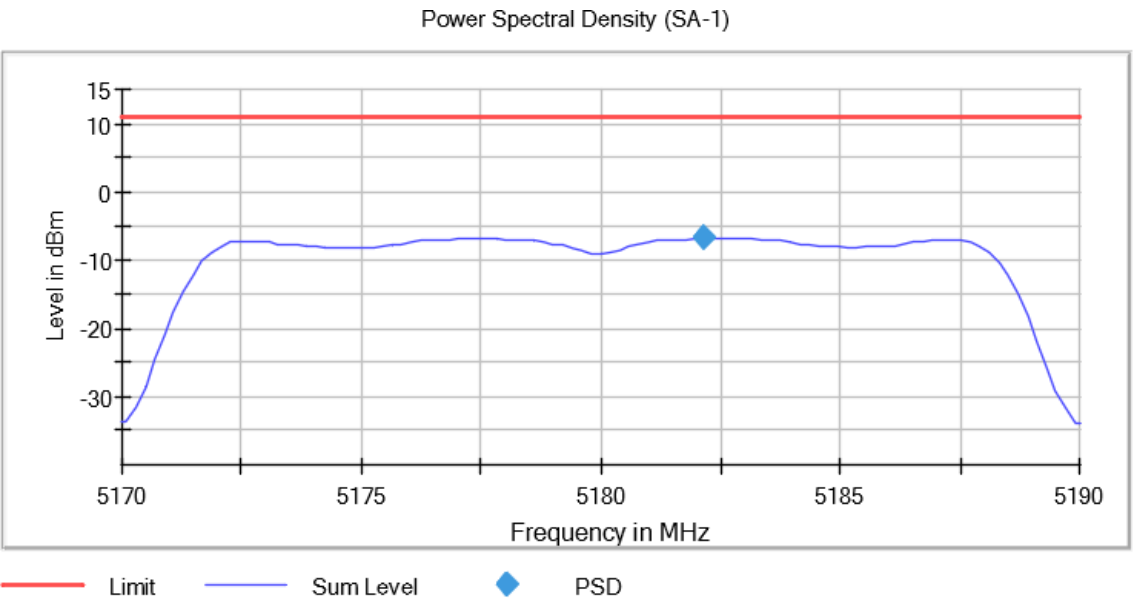
Verdict

Pass

Attachments

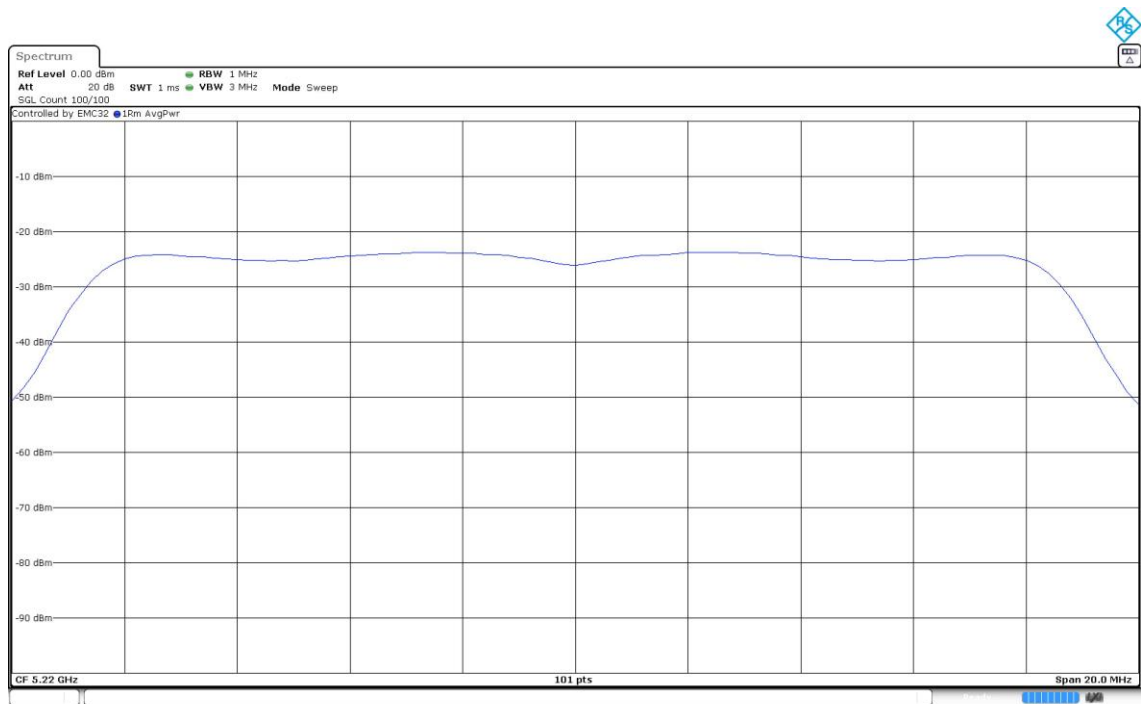
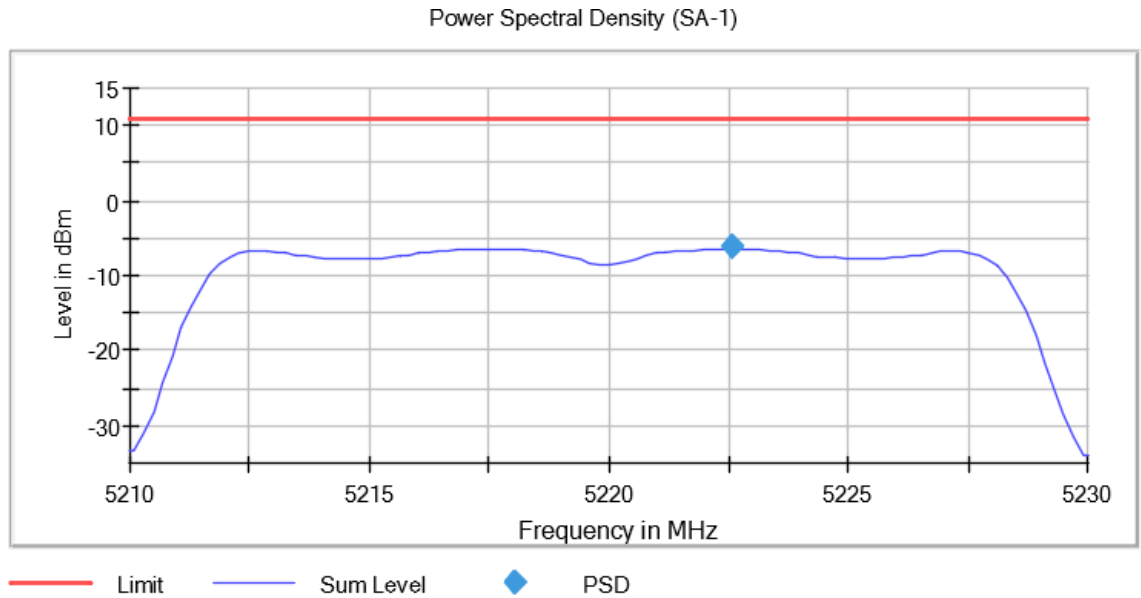
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5180.00000 Modulation = 802.11a (OFDM 6 Mbit/s)
TPC = No Antenna Configuration = SISO

Images:



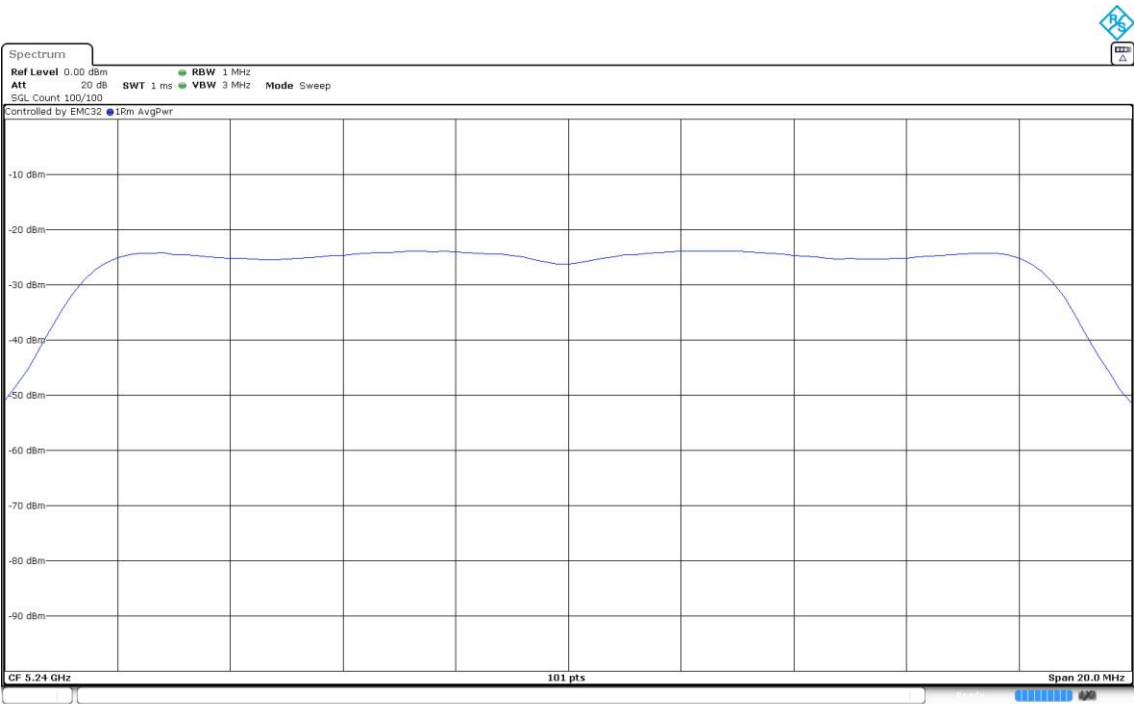
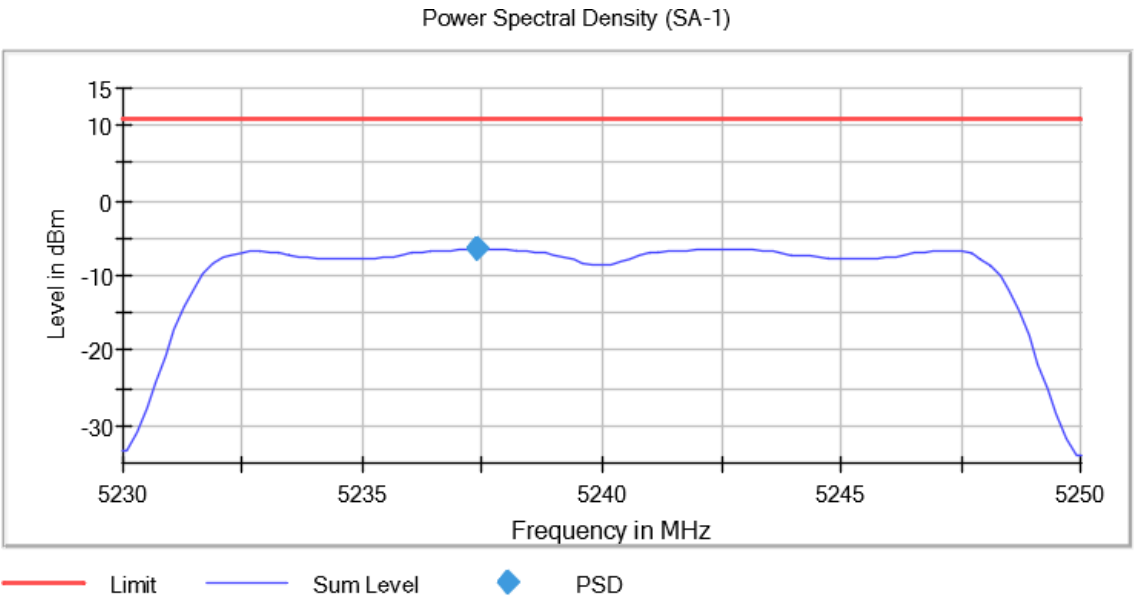
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5220.00000 Modulation = 802.11a (OFDM 6 Mbit/s)
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5240.00000 Modulation = 802.11a (OFDM 6 Mbit/s)
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5180.00000	No	5182.376238	-6.99
		5220.00000		5222.574257	-6.64
		5240.00000		5242.376238	-6.59

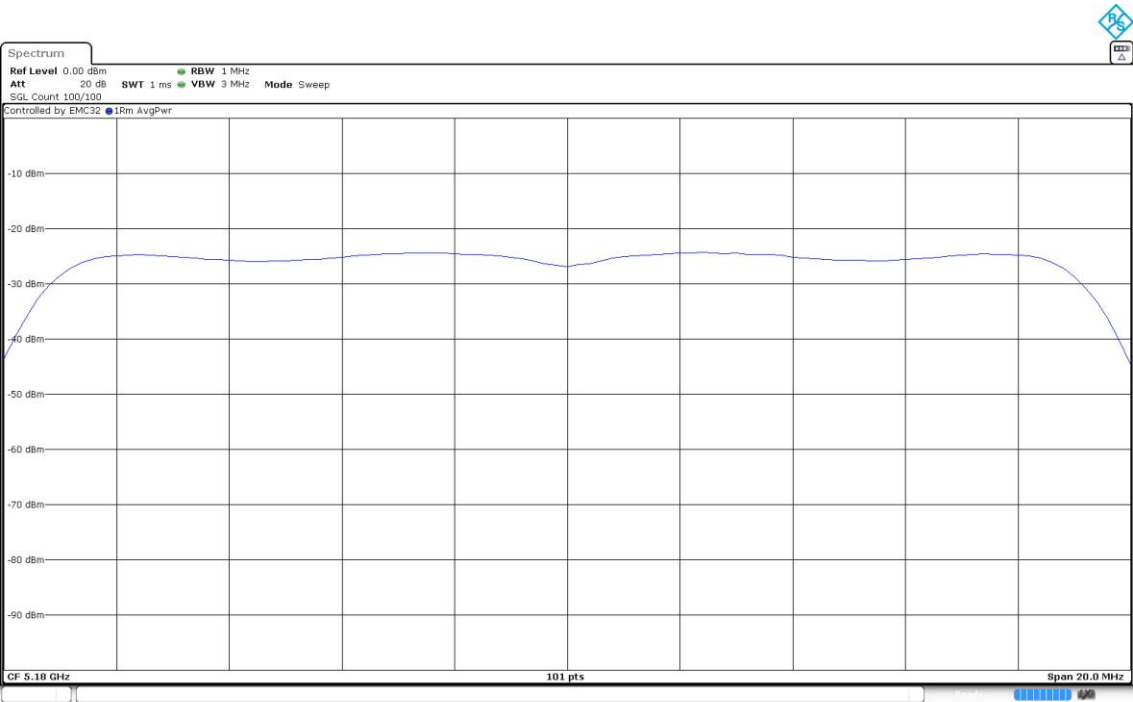
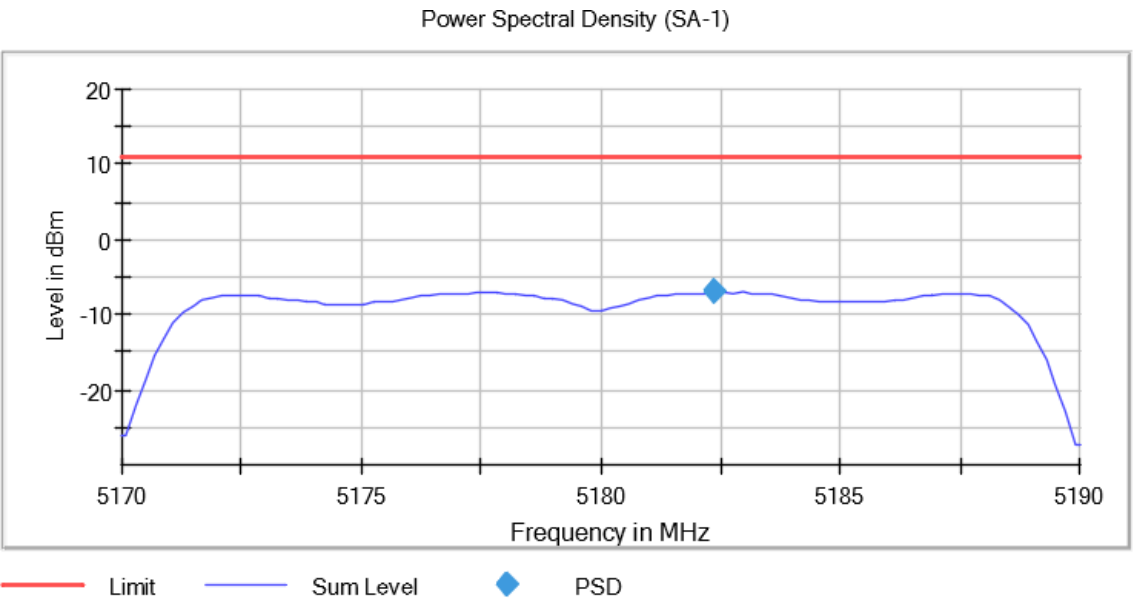
Verdict

Pass

Attachments

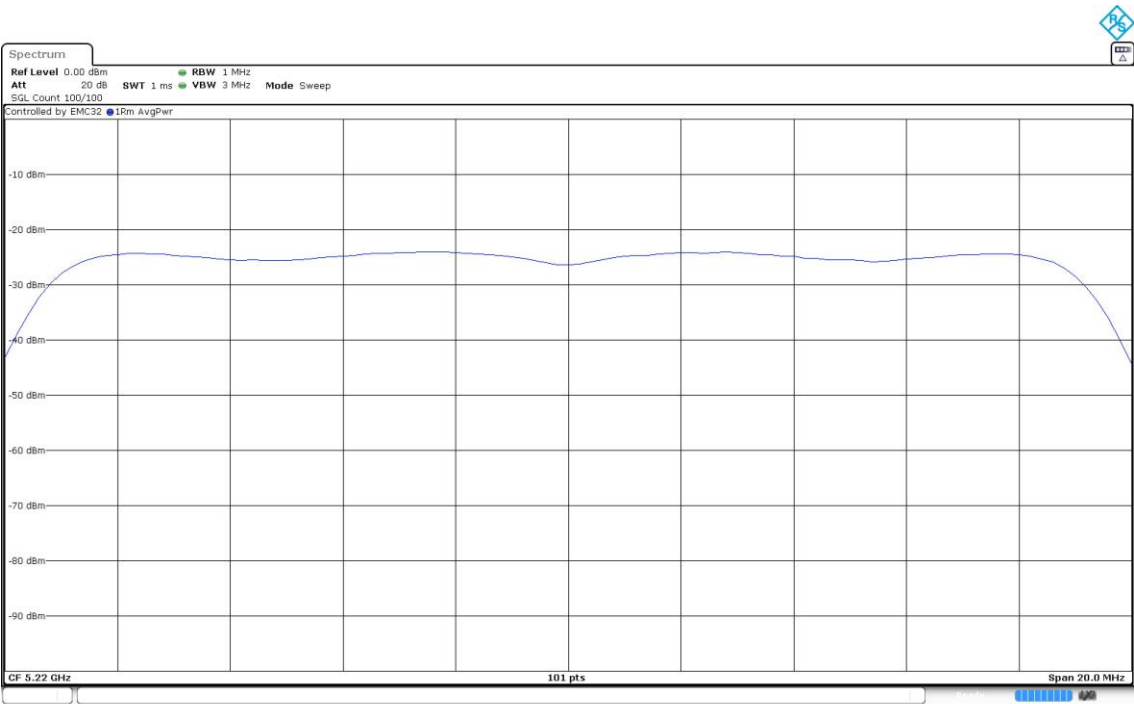
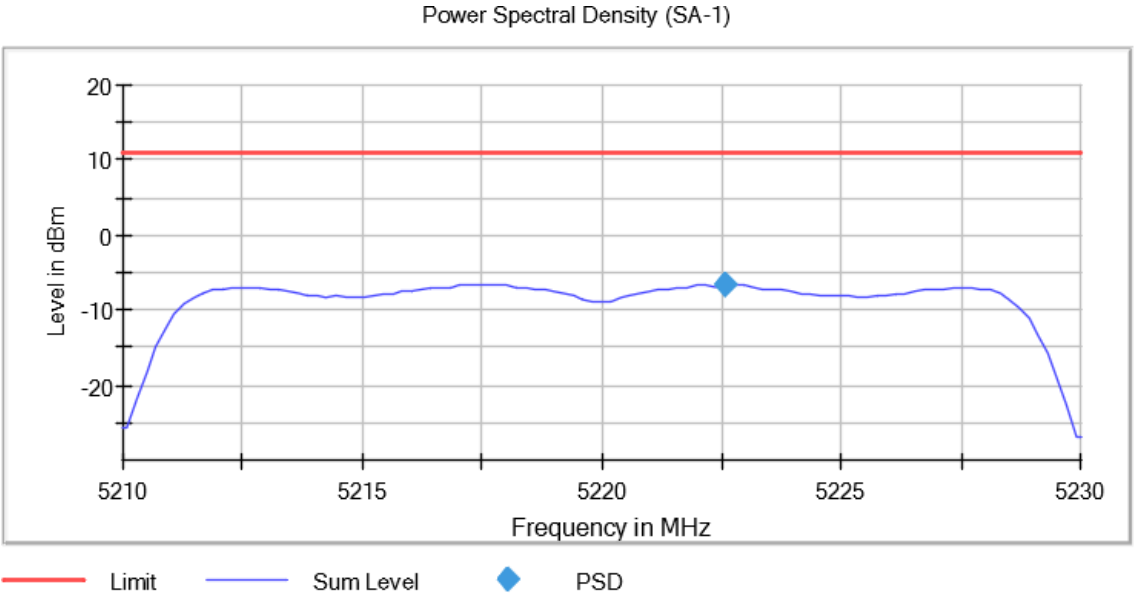
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5180.00000 Modulation = 802.11n HT20 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



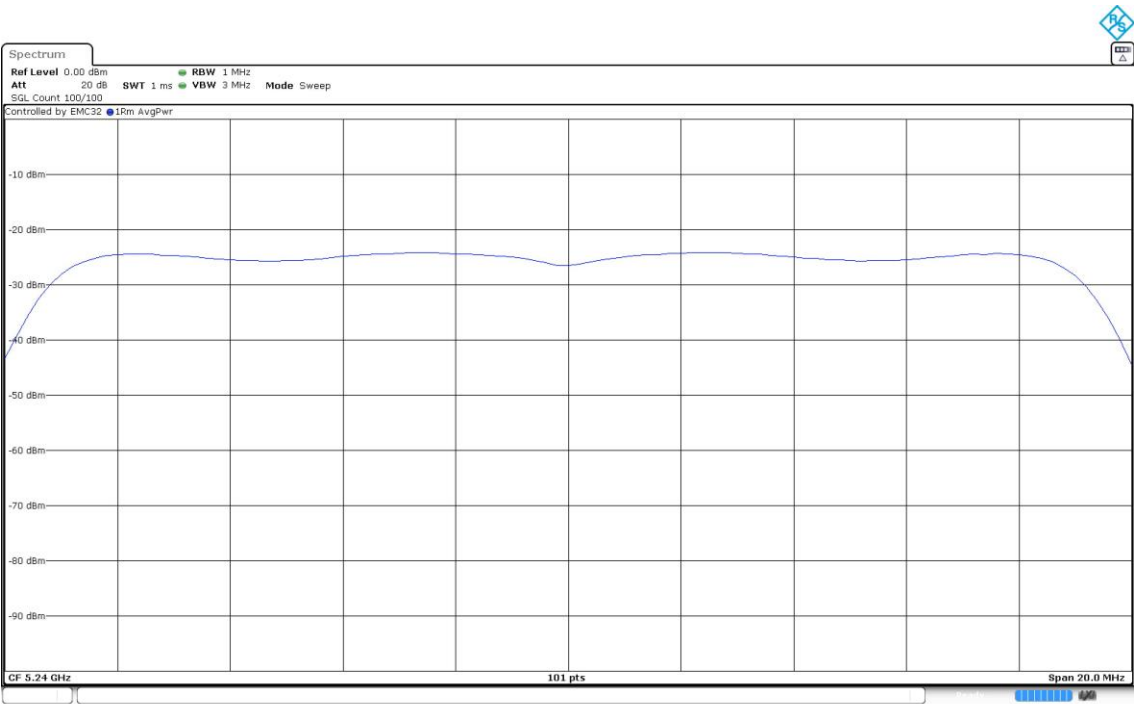
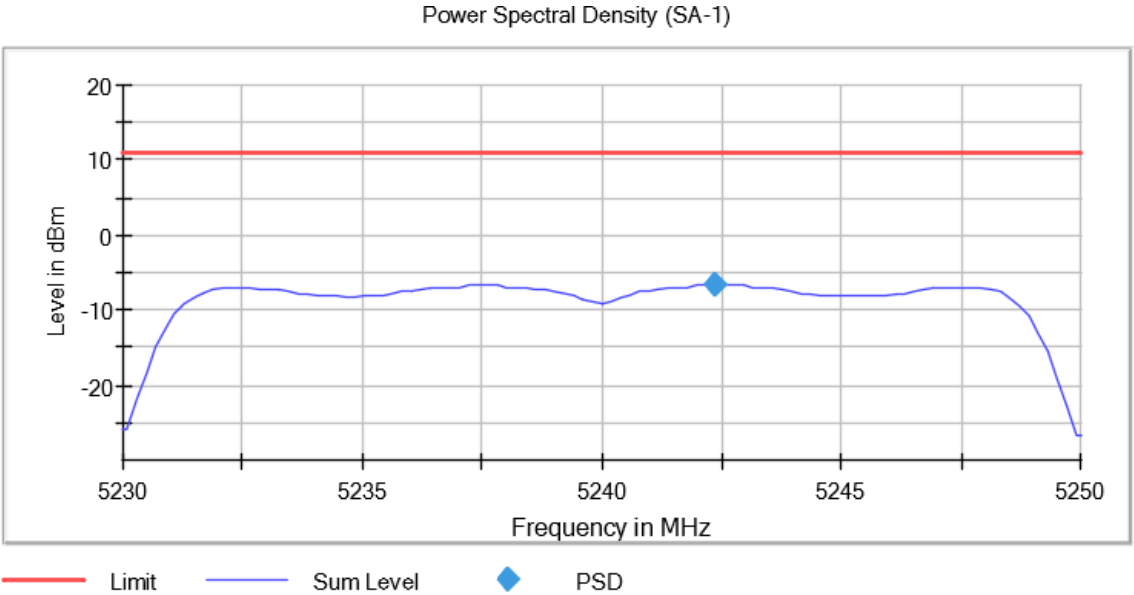
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5220.00000 Modulation = 802.11n HT20 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5240.00000 Modulation = 802.11n HT20 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5190.00000	No	5194.752475	-10.63
		5230.00000		5234.752475	-10.25

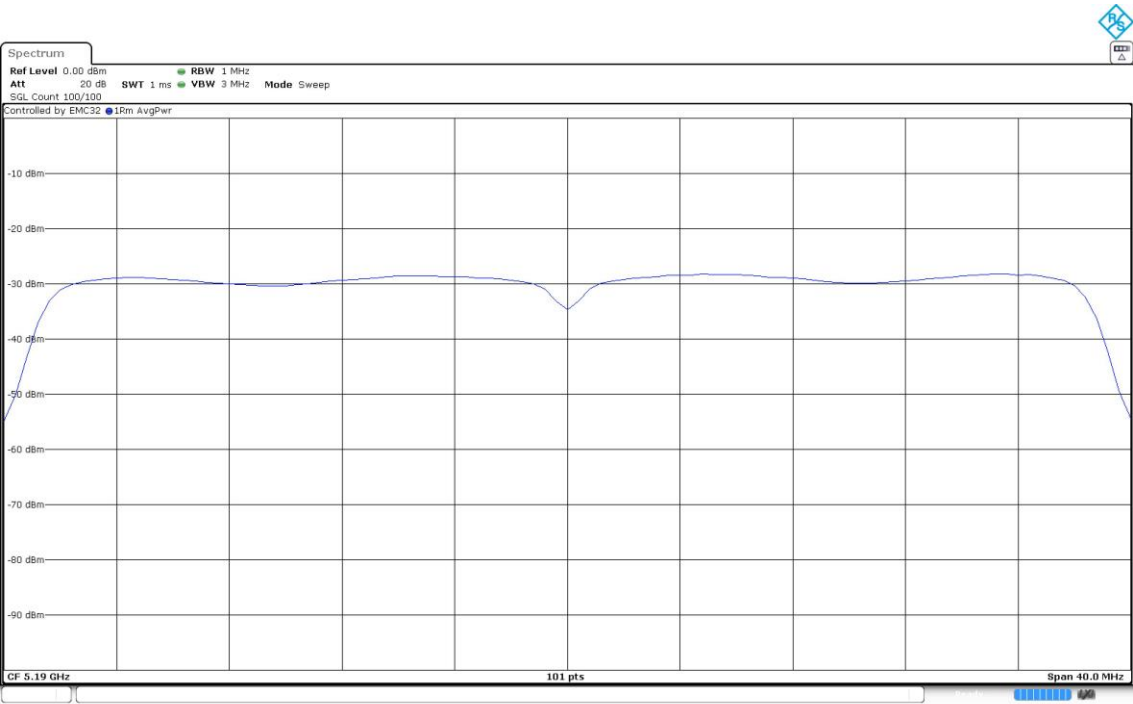
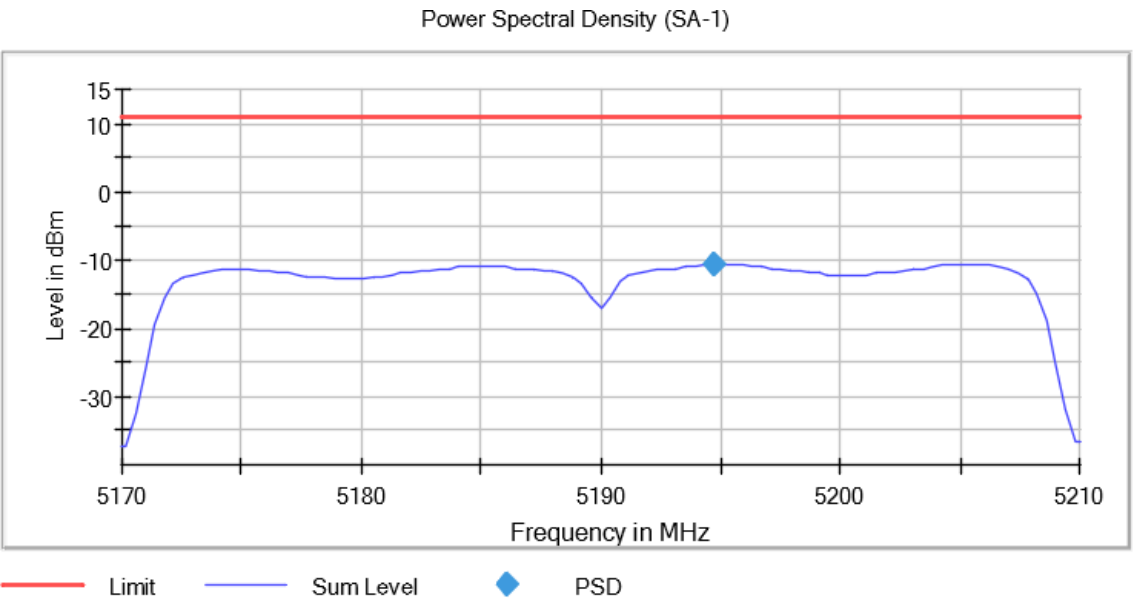
Verdict

Pass

Attachments

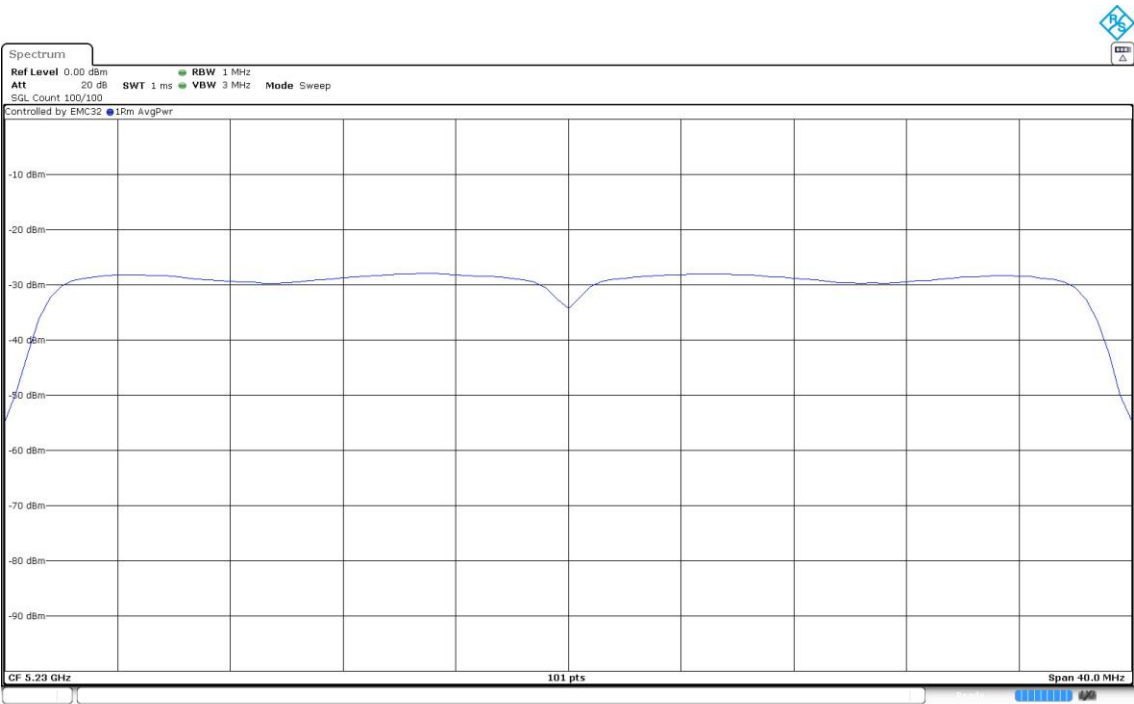
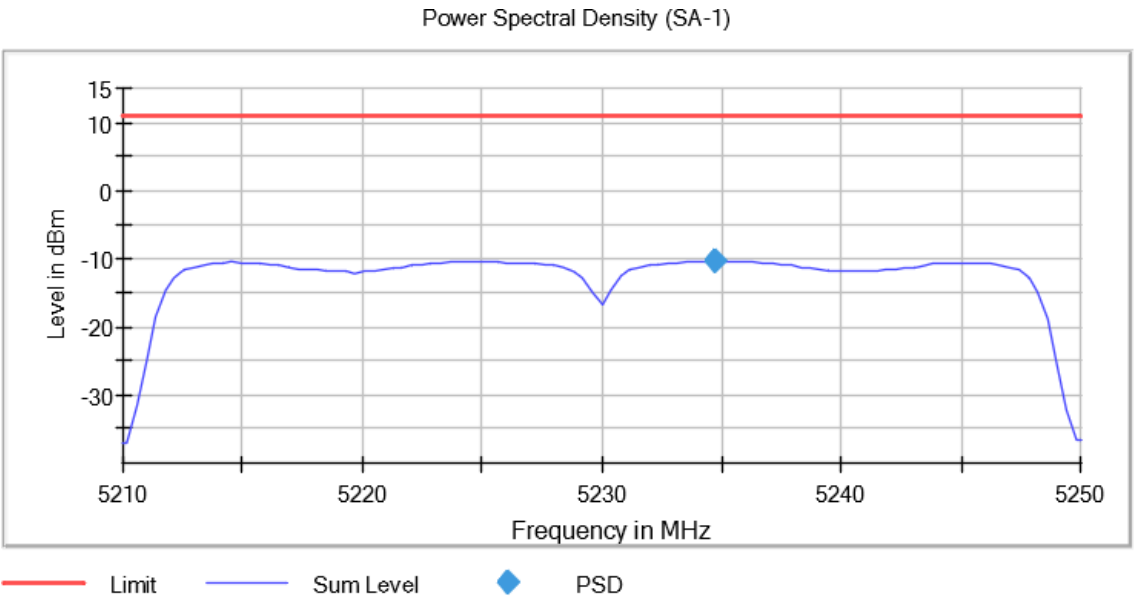
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5190.00000 Modulation = 802.11n HT40 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5230.00000 Modulation = 802.11n HT40 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ac VHT20 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5180.00000	No	5182.376238	-6.91
		5220.00000		5222.772277	-6.61
		5240.00000		5242.376238	-6.58

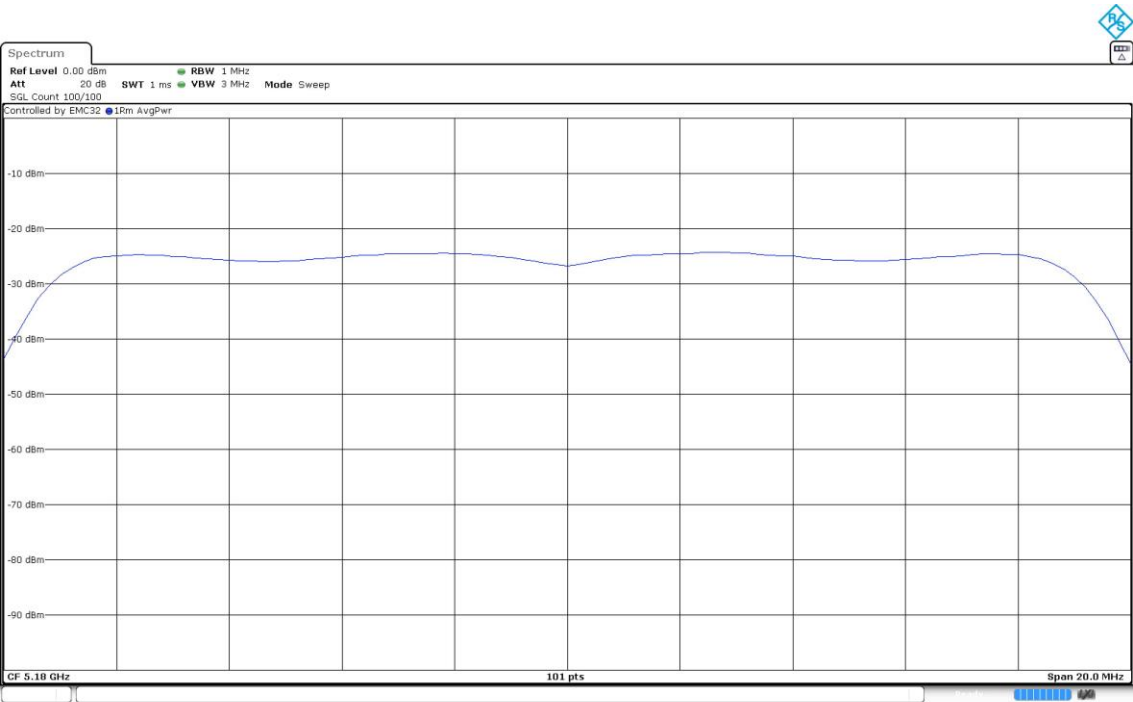
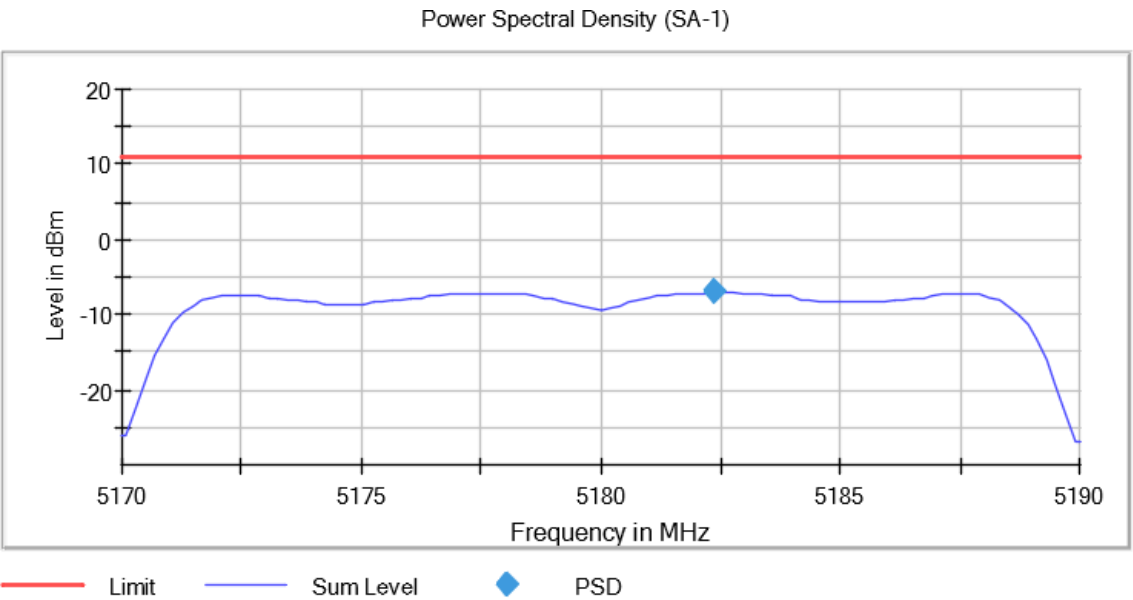
Verdict

Pass

Attachments

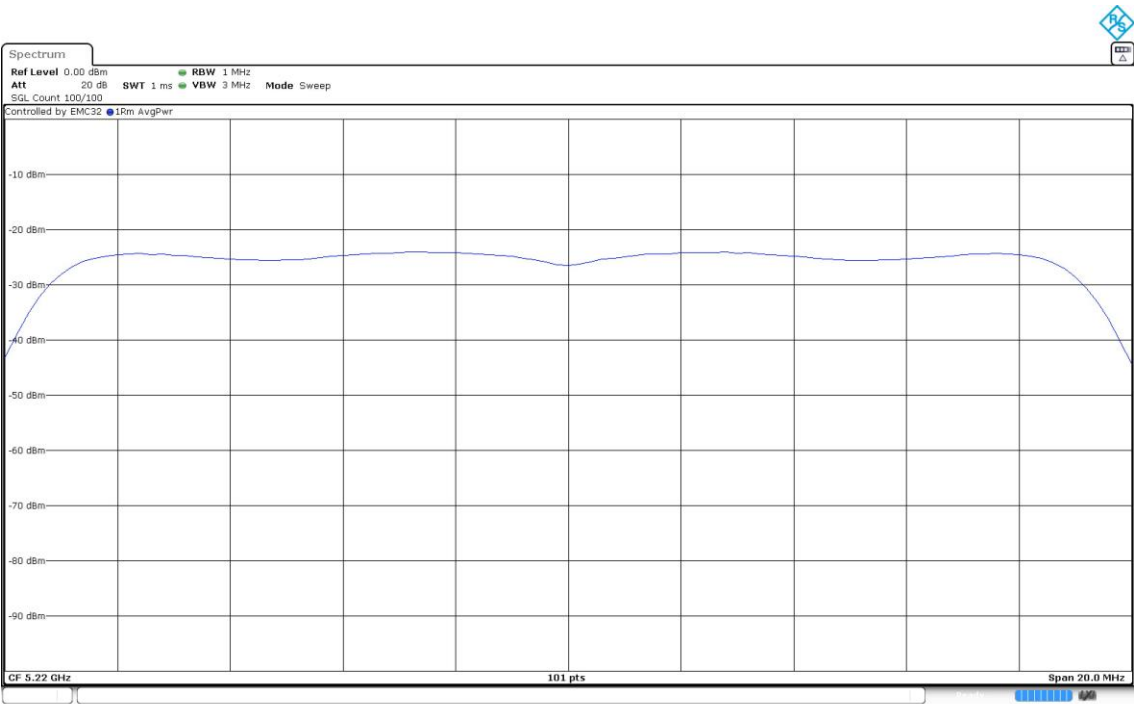
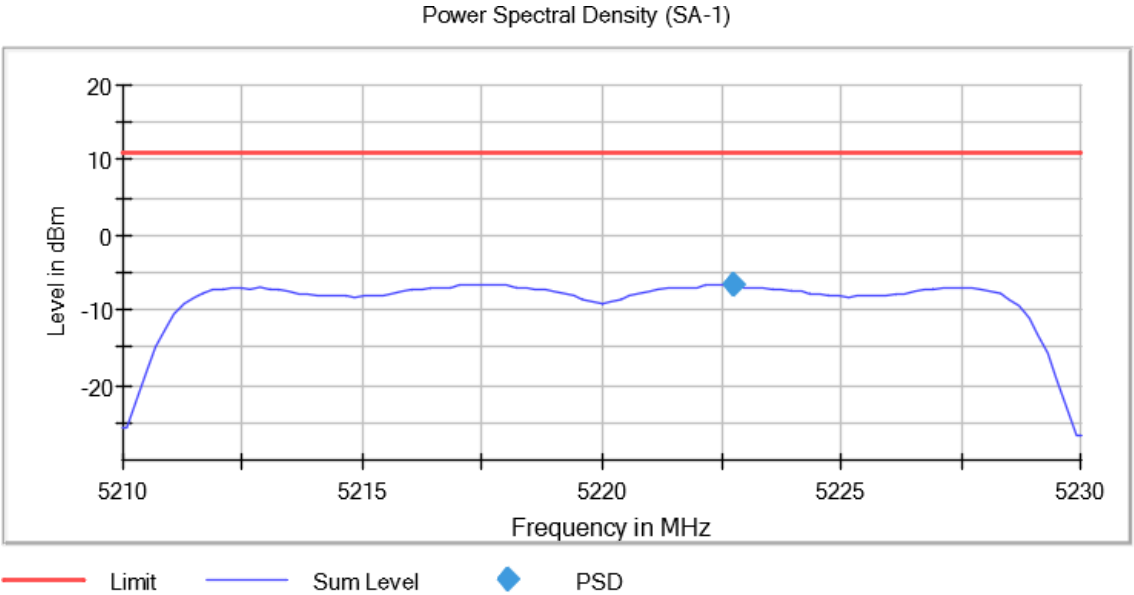
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5180.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



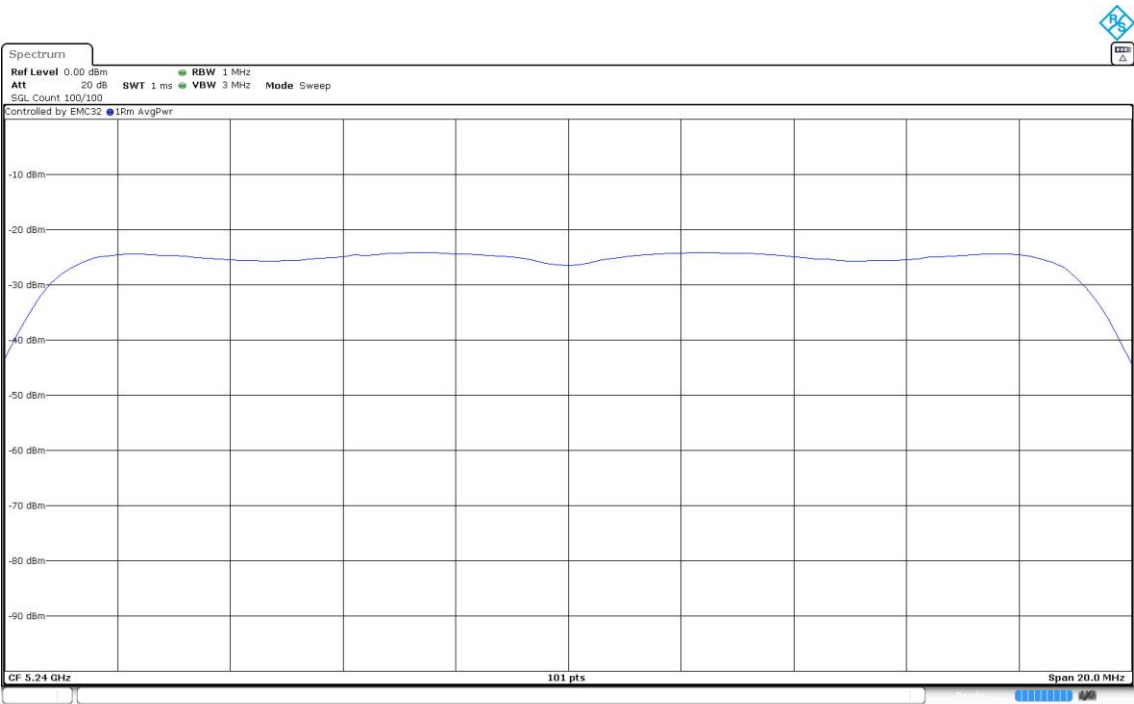
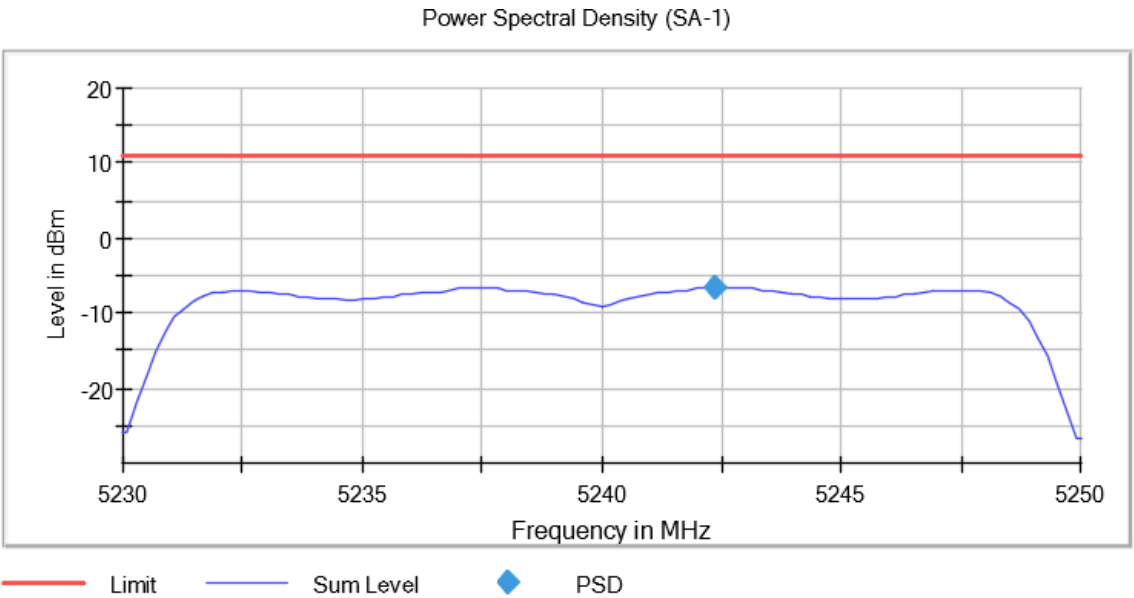
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5220.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5240.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ac VHT40 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5190.00000	No	5205.049505	-10.61
		5230.00000		5234.752475	-10.35

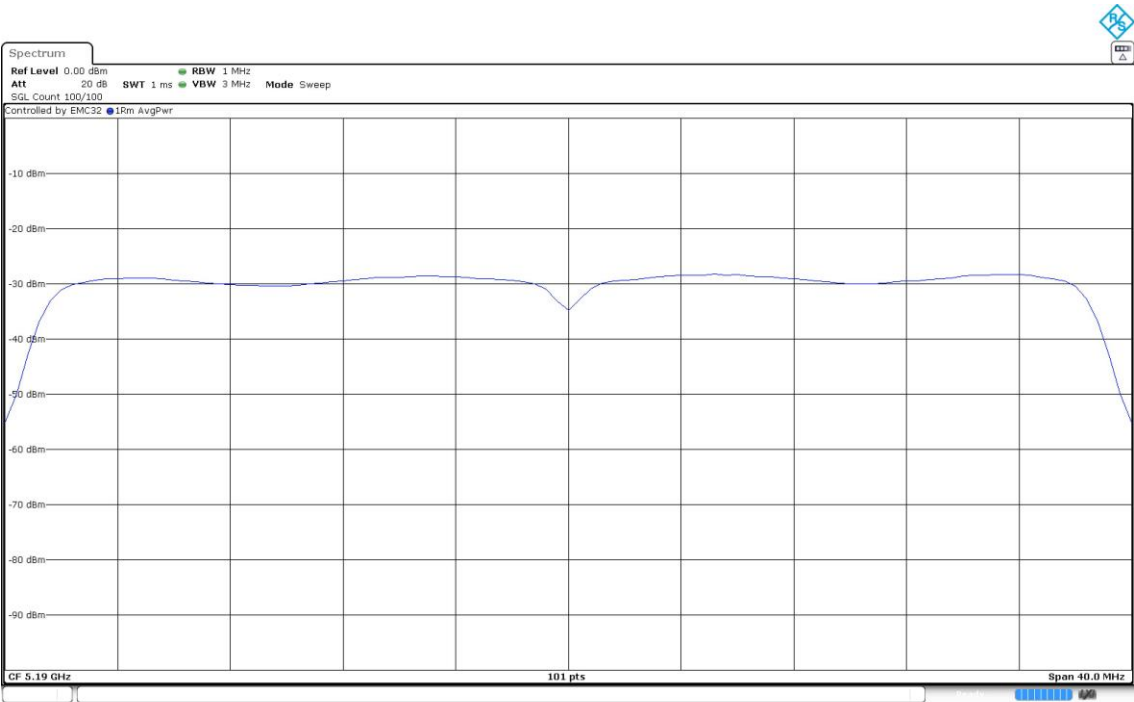
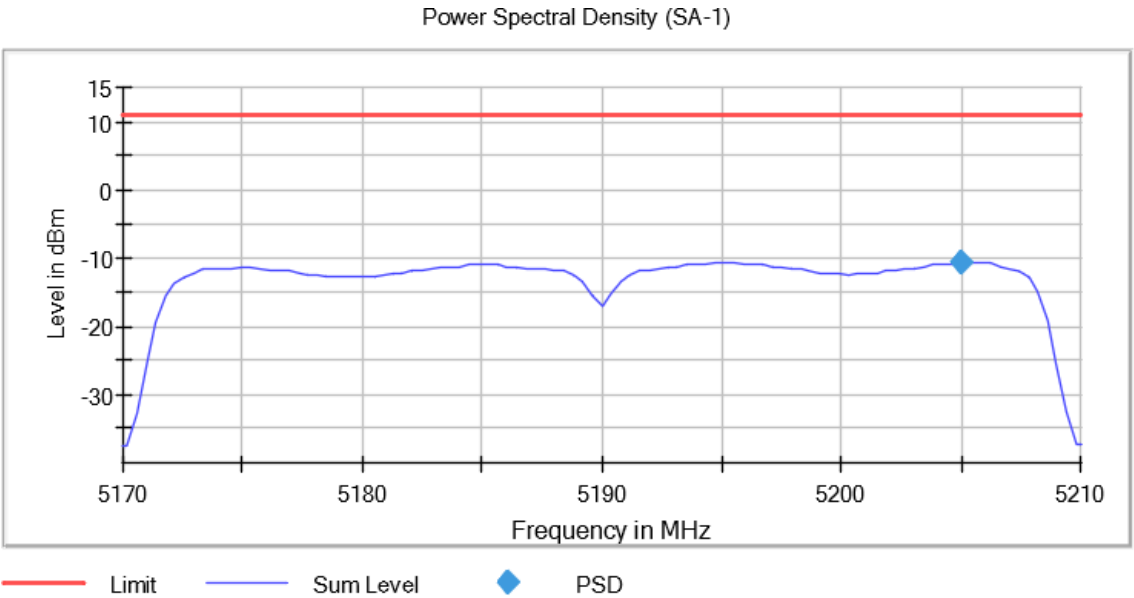
Verdict

Pass

Attachments

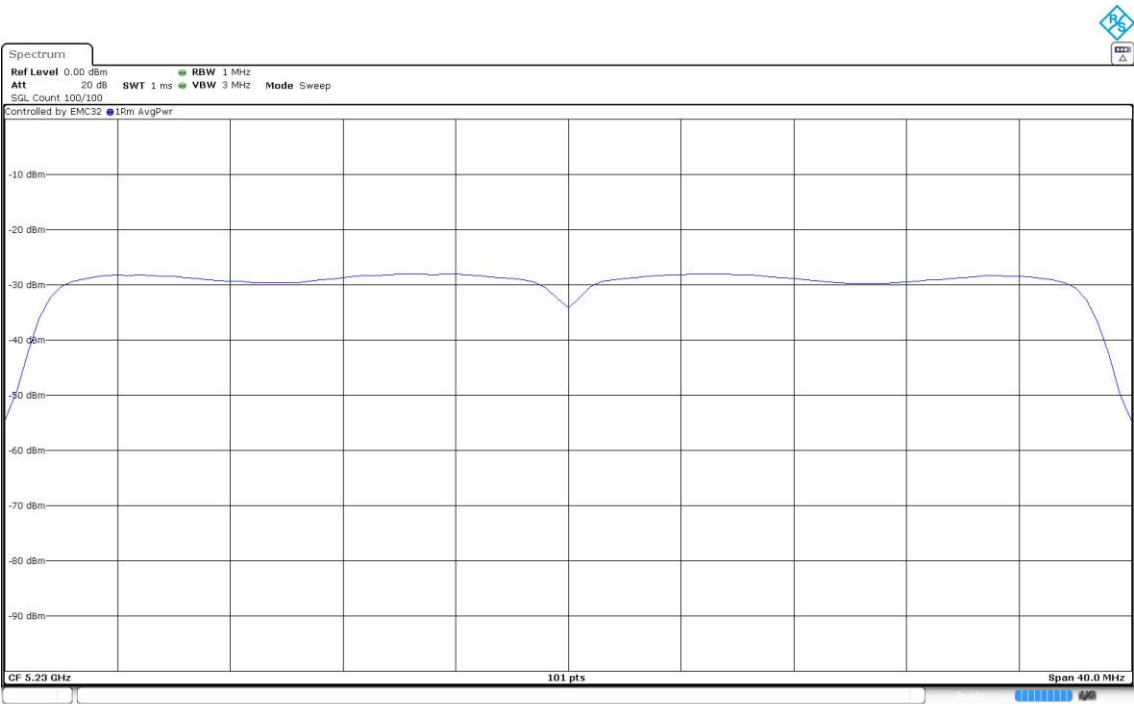
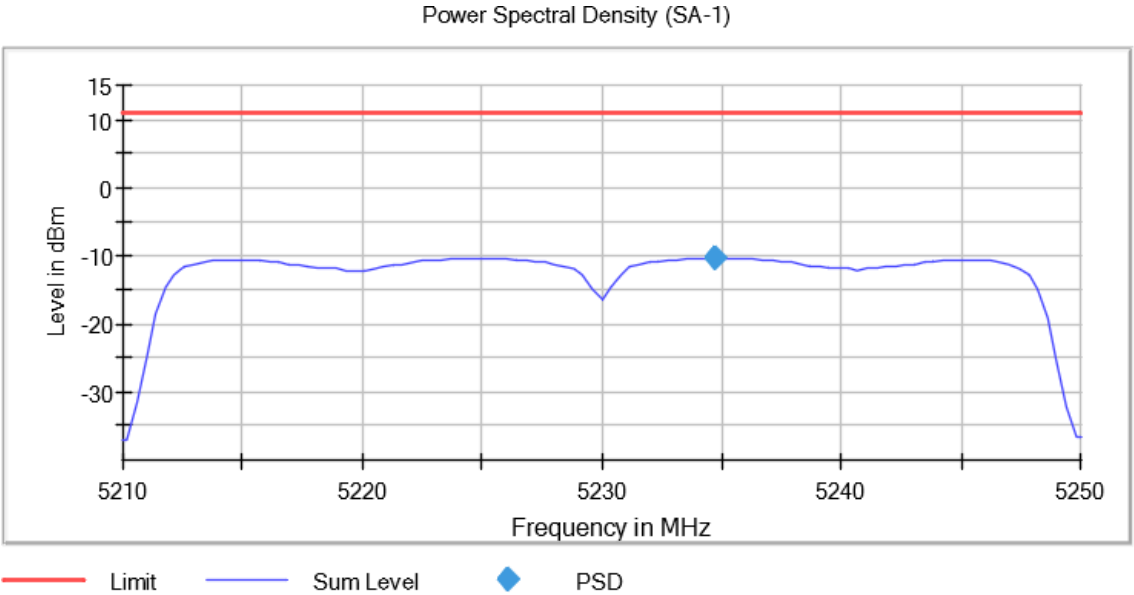
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5190.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5230.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ac VHT80 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5210.00000	No	5236.250000	-13.96

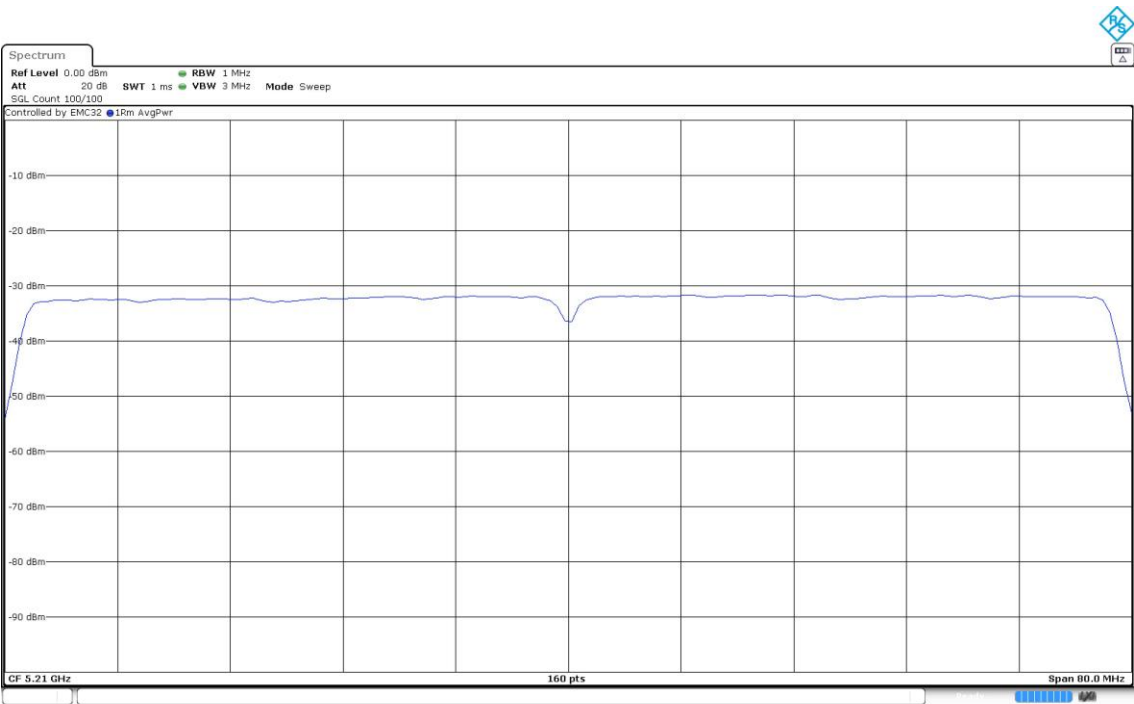
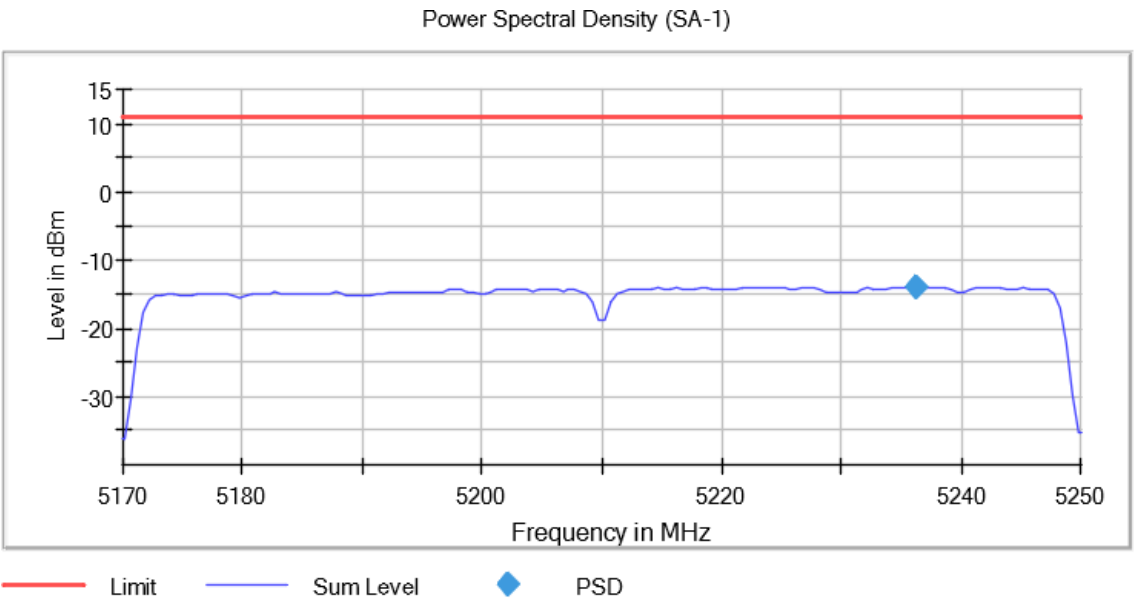
Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5210.00000 Modulation = 802.11ac VHT80 (OFDM MCS0)
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ax HE20 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5180.00000	No	5182.970297	-11.884
		5220.00000		5222.772277	-10.930
		5240.00000		5242.376238	-10.620

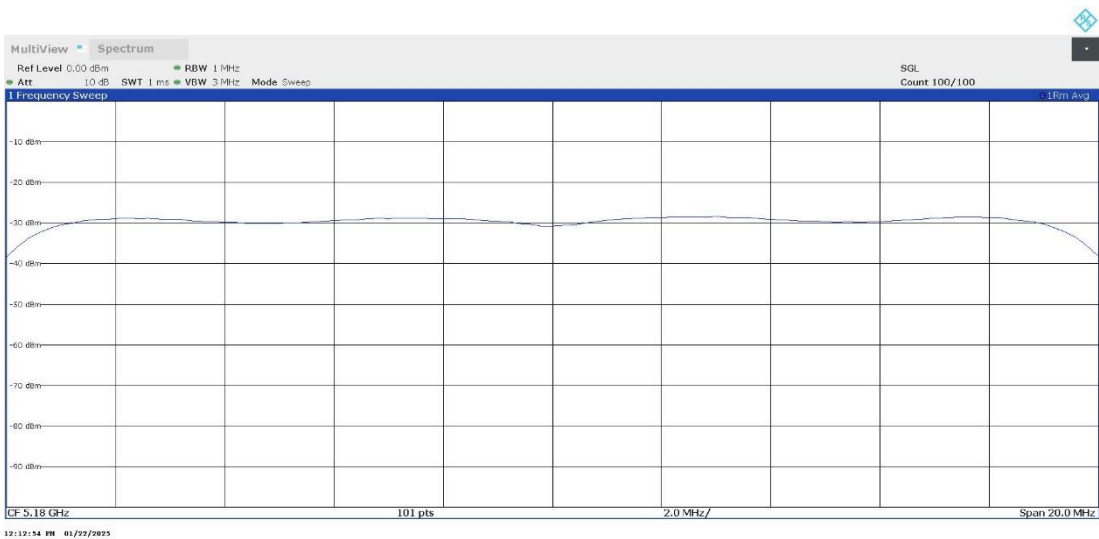
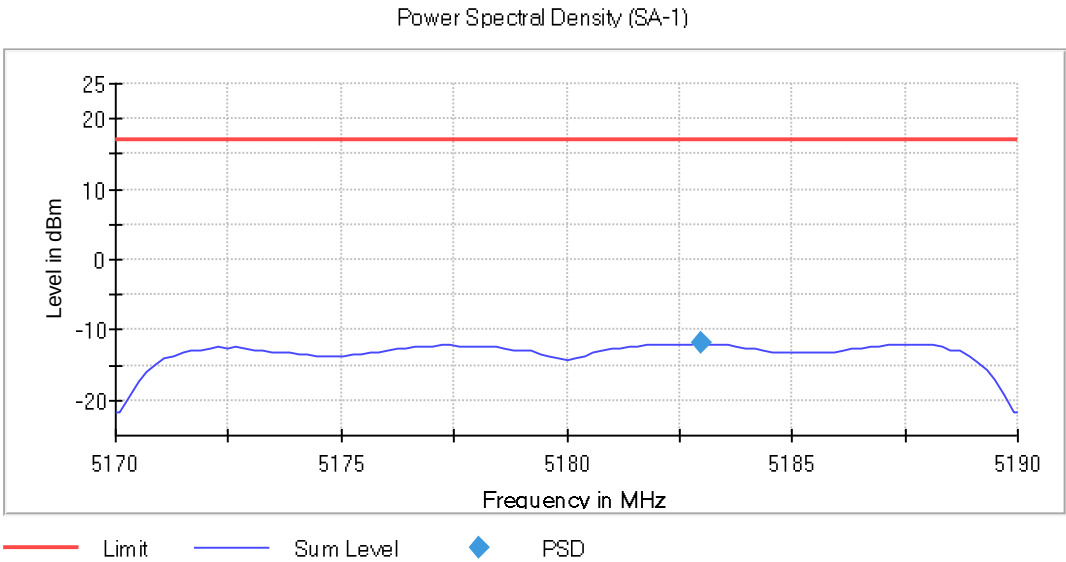
Verdict

Pass

Attachments

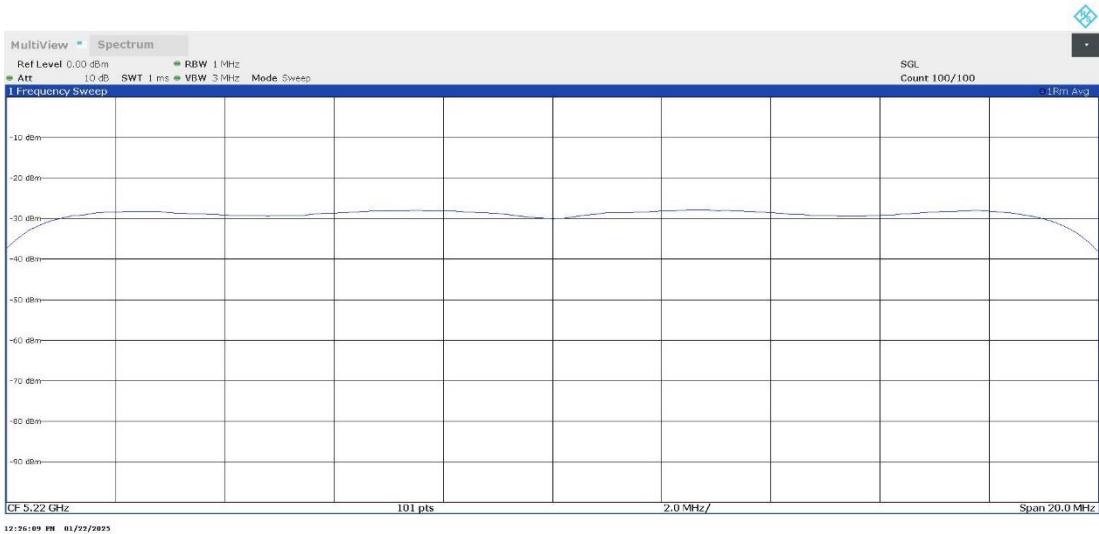
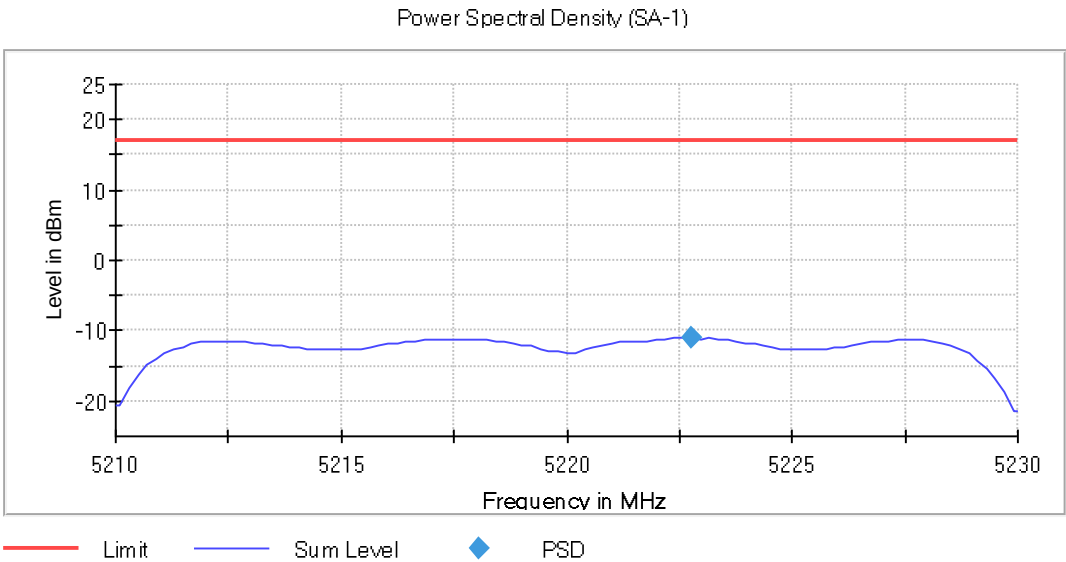
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5180.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) SU
TPC = No Antenna Configuration = SISO

Images:



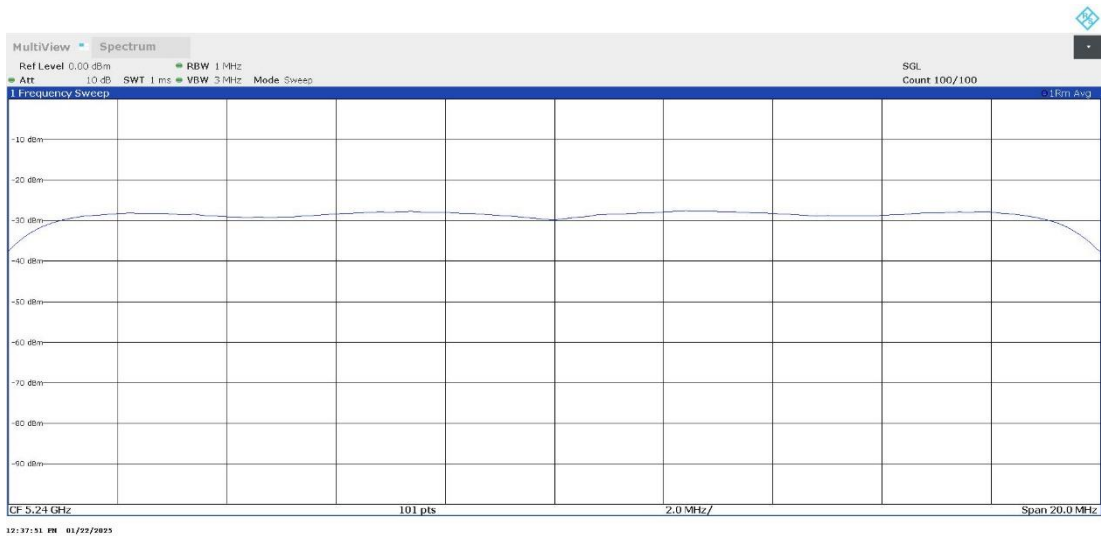
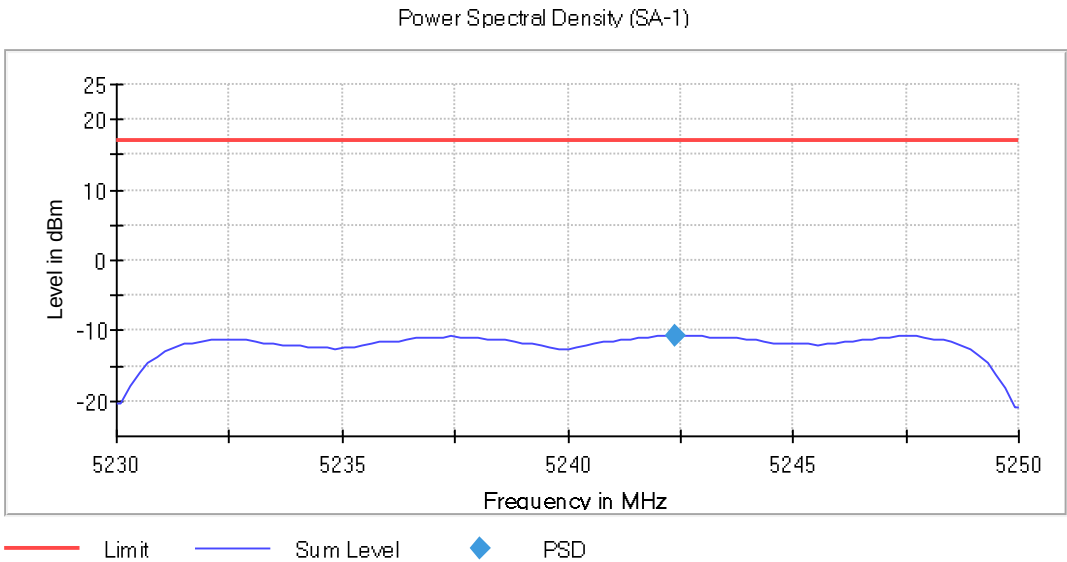
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5220.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) SU
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5240.00000 Modulation = 802.11ac VHT20 (OFDM MCS0) SU
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ax HE20 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5180.00000	No	5171.683168	-2.914
		5220.00000		5217.425743	-1.684
		5240.00000		5248.118812	-1.836

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5180MHz):	0
	Middle (5220MHz):	3
	Highest (5240MHz):	8
[5725, 5850]	Lowest (5745MHz):	0
	Middle (5785MHz):	3
	Highest (5825MHz):	8

Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 3

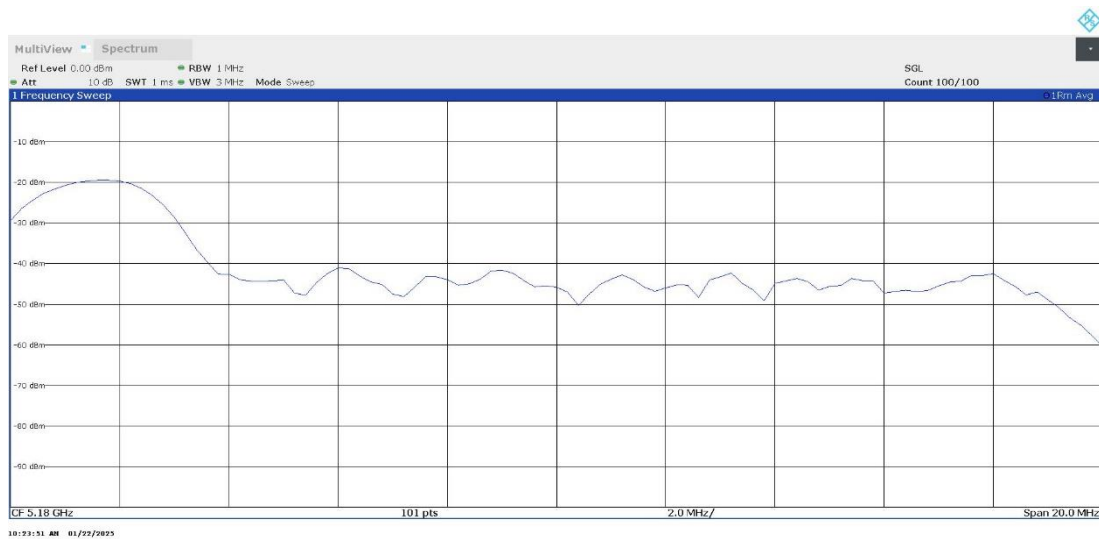
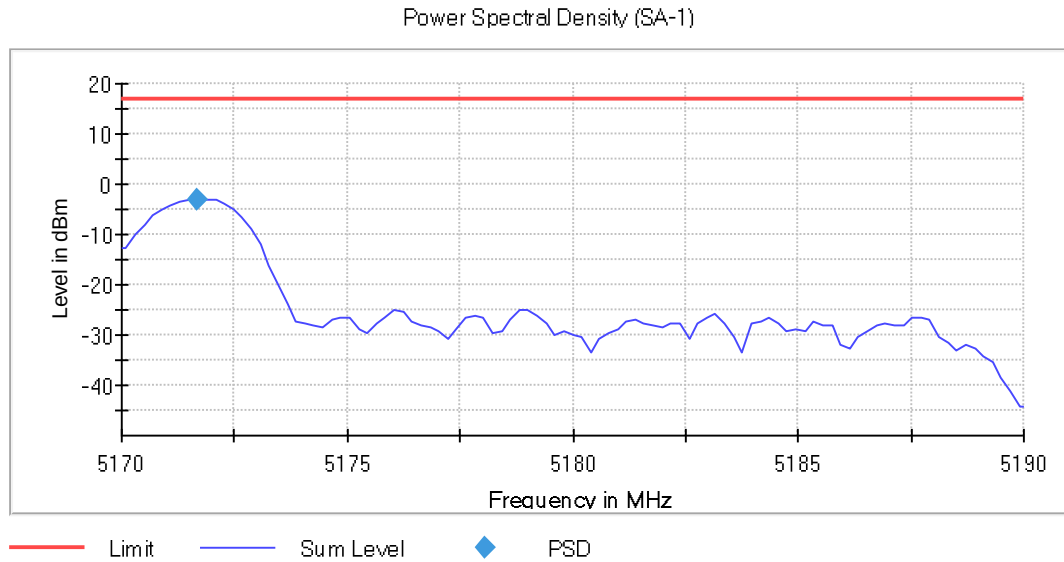
Frequency MHz = 5180.00000

Modulation = 802.11ax HE20 (OFDMA MCS0) RU26

TPC = No

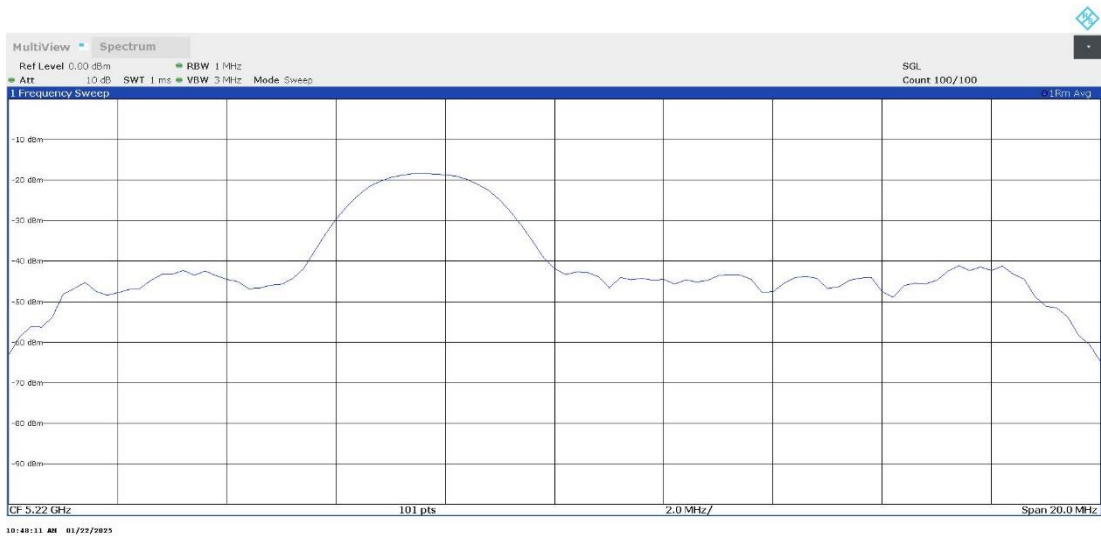
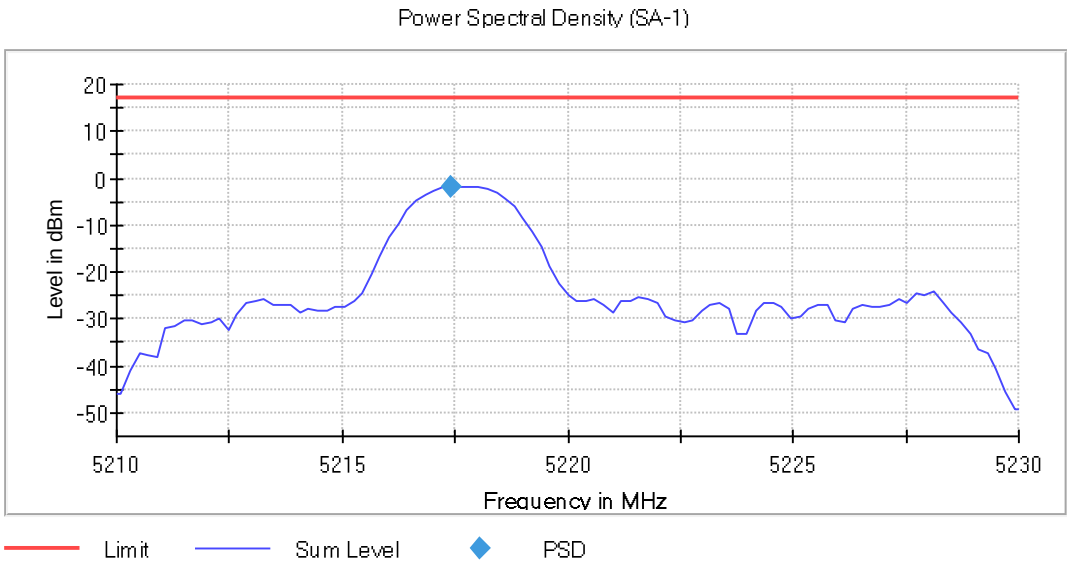
Antenna Configuration = SISO

Images:



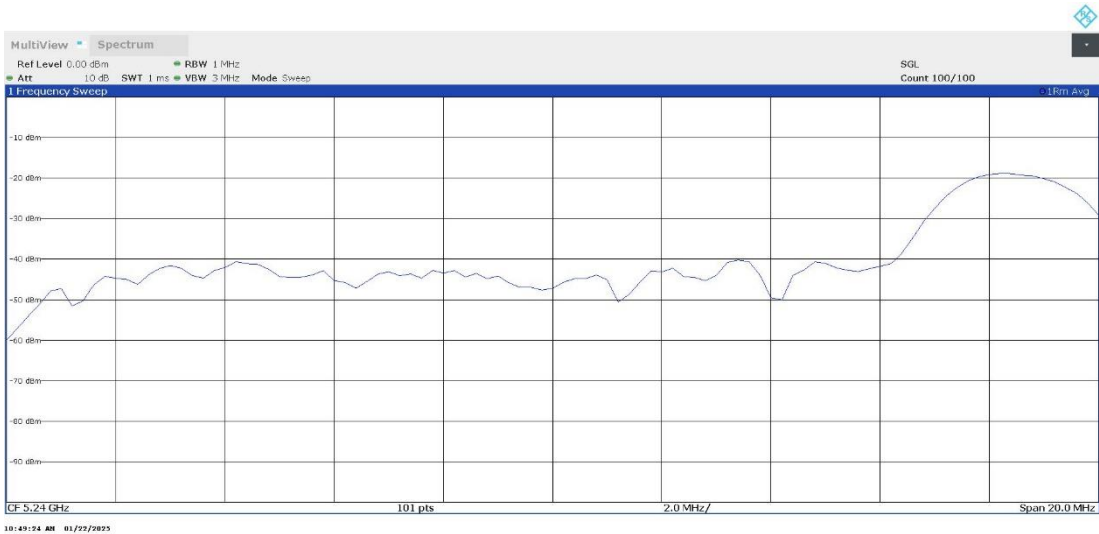
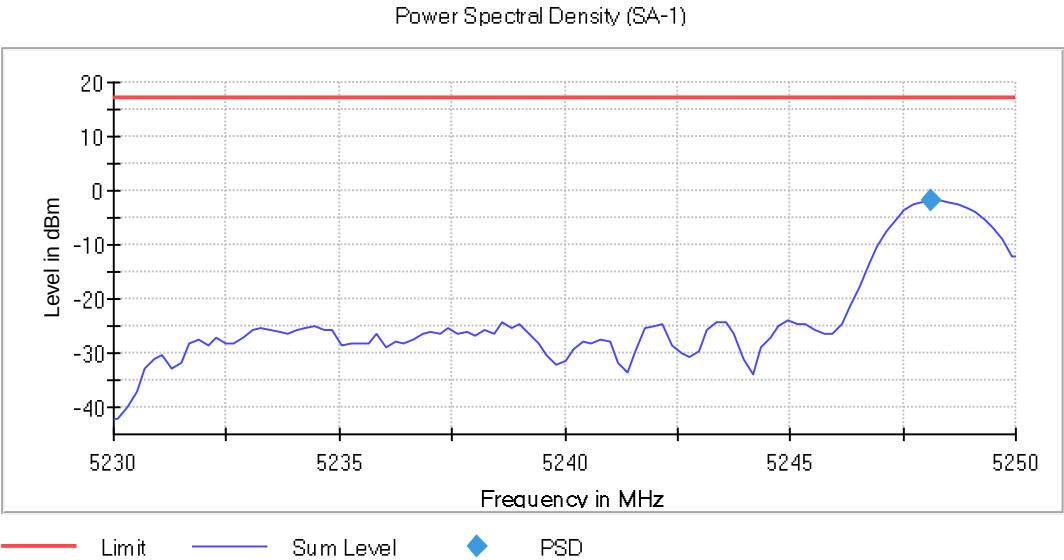
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5220.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5240.00000 Modulation = 802.11ac VHT20 (OFDM MCS0) RU26
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ax HE40 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5190.00000	No	5194.752475	-13.635
		5230.00000		5245.049505	-13.205

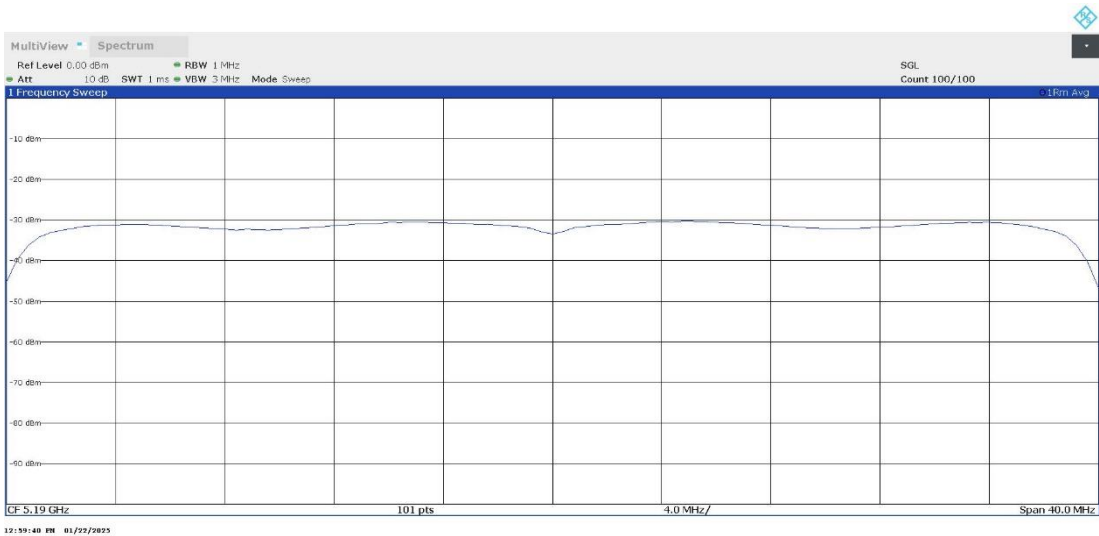
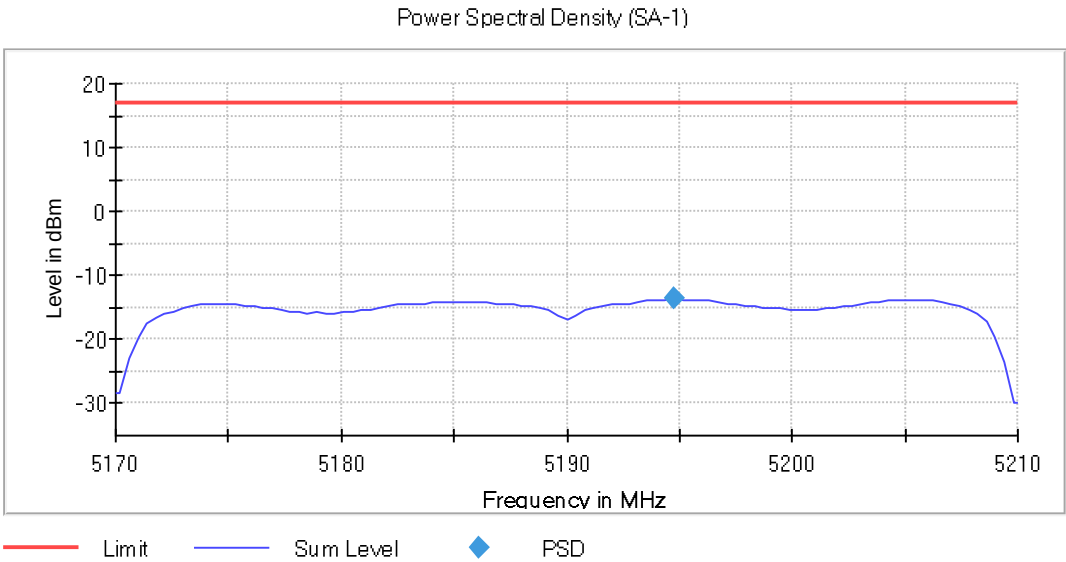
Verdict

Pass

Attachments

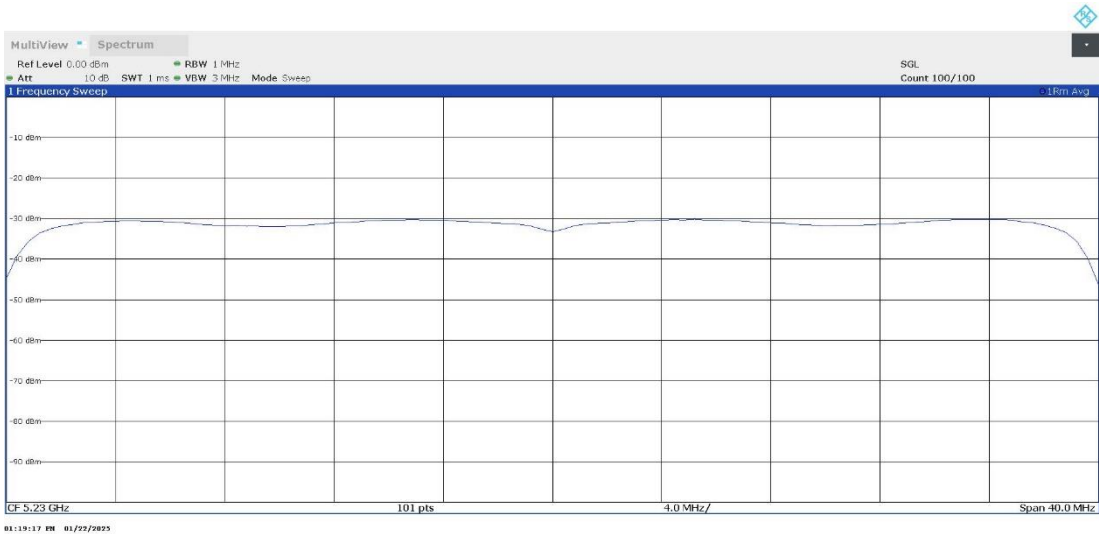
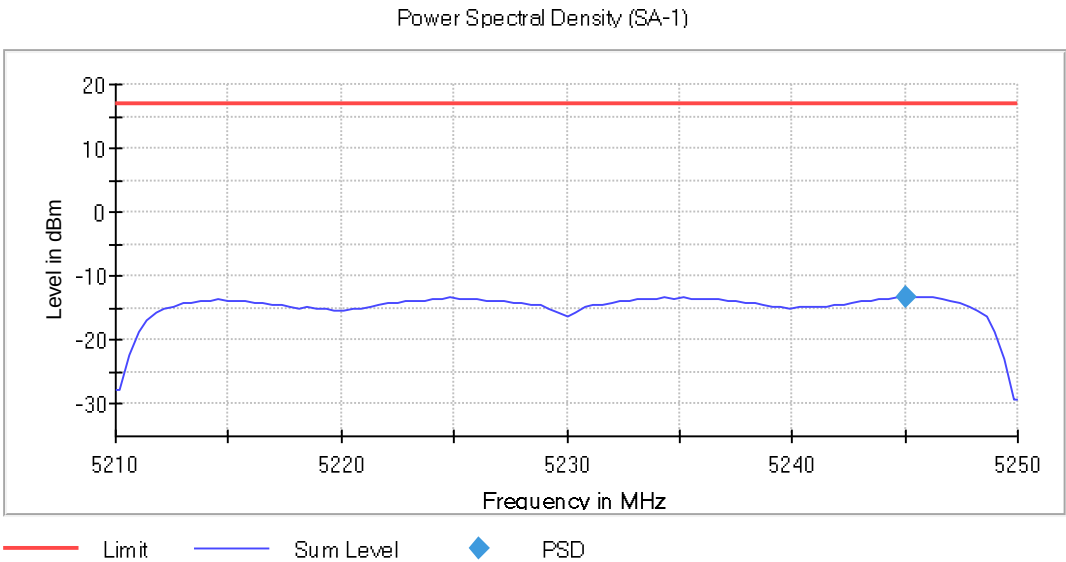
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5190.00000 Modulation = 802.11ax HE40 (OFDMA MCS0) SU
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5230.00000 Modulation = 802.11ax HE40 (OFDMA MCS0) SU
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ax HE40 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5190.00000	No	5172.178218	-3.671
		5230.00000		5247.821782	-2.168

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5190MHz):	0
	Highest (5230MHz):	17
[5725, 5850]	Lowest (5755MHz):	0
	Highest (5795MHz):	17

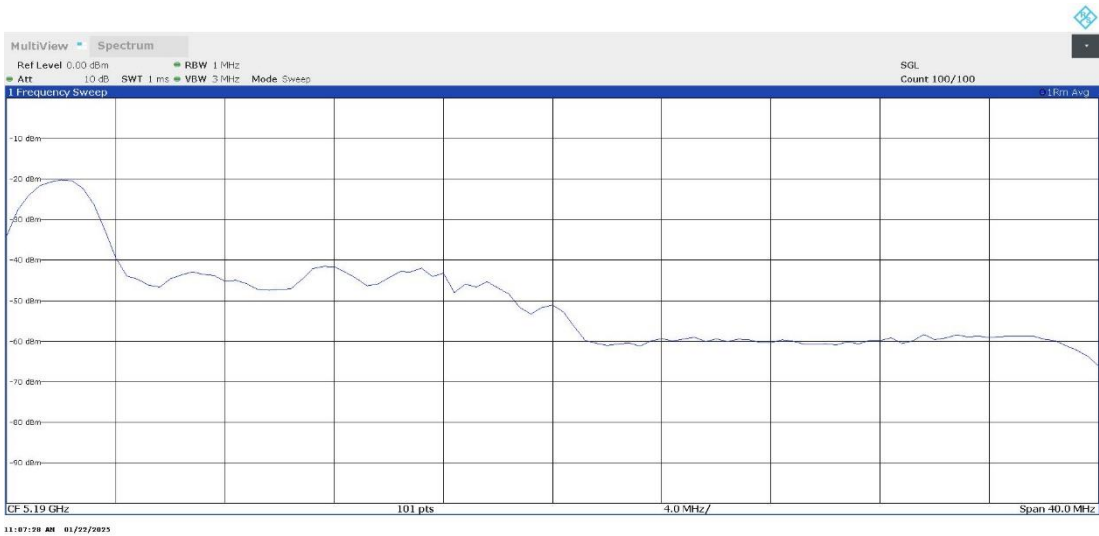
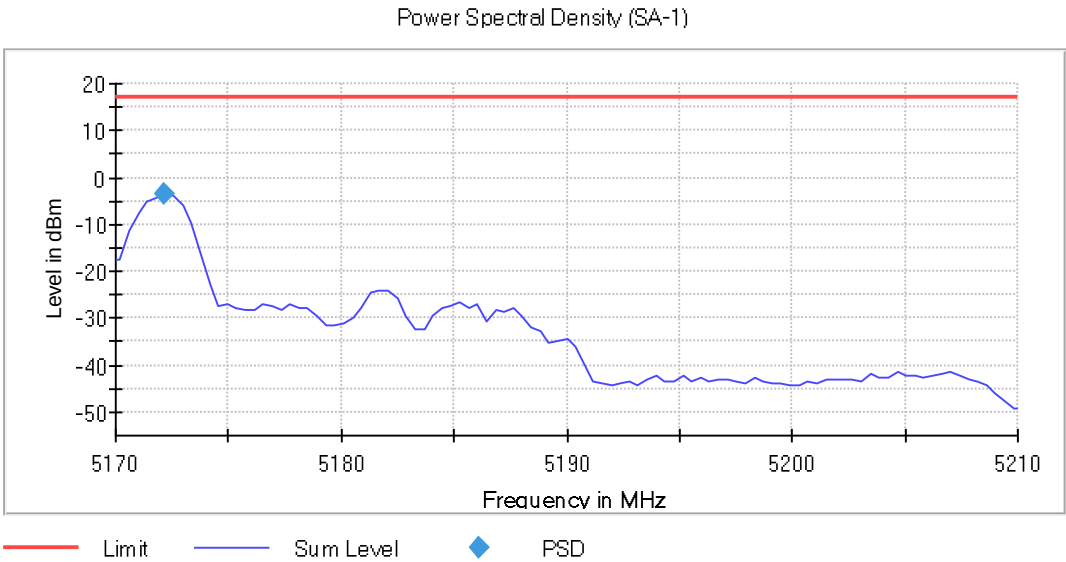
Verdict

Pass

Attachments

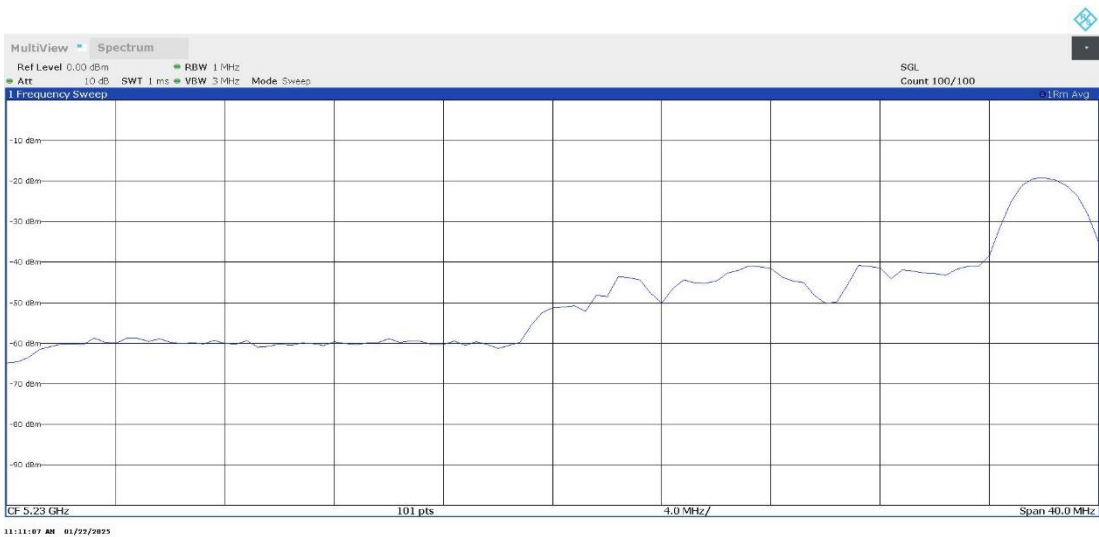
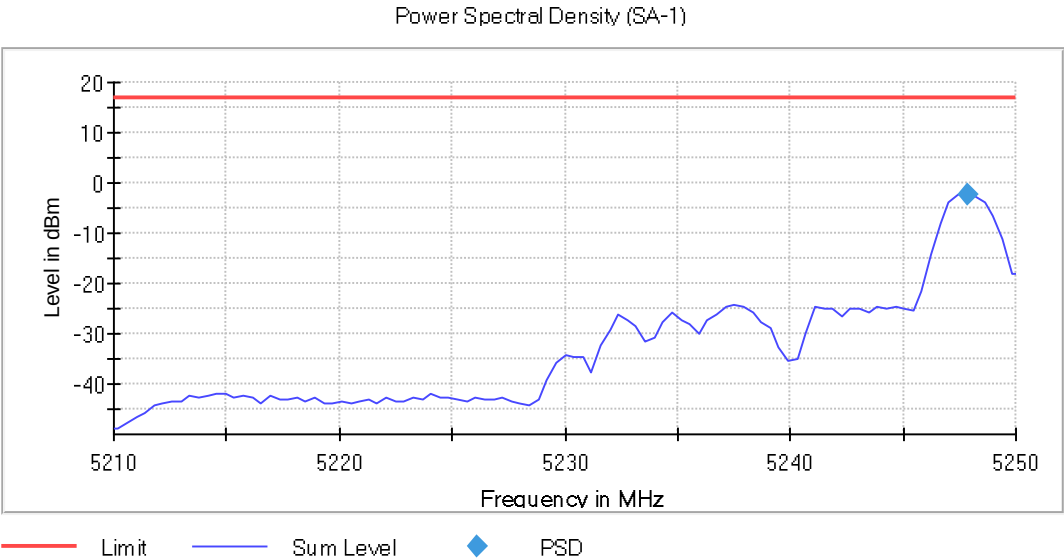
Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5190.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = SISO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5230.00000 Modulation = 802.11ac VHT20 (OFDM MCS0) RU26
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ax HE80 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5210.00000	No	5225.250000	-17.684

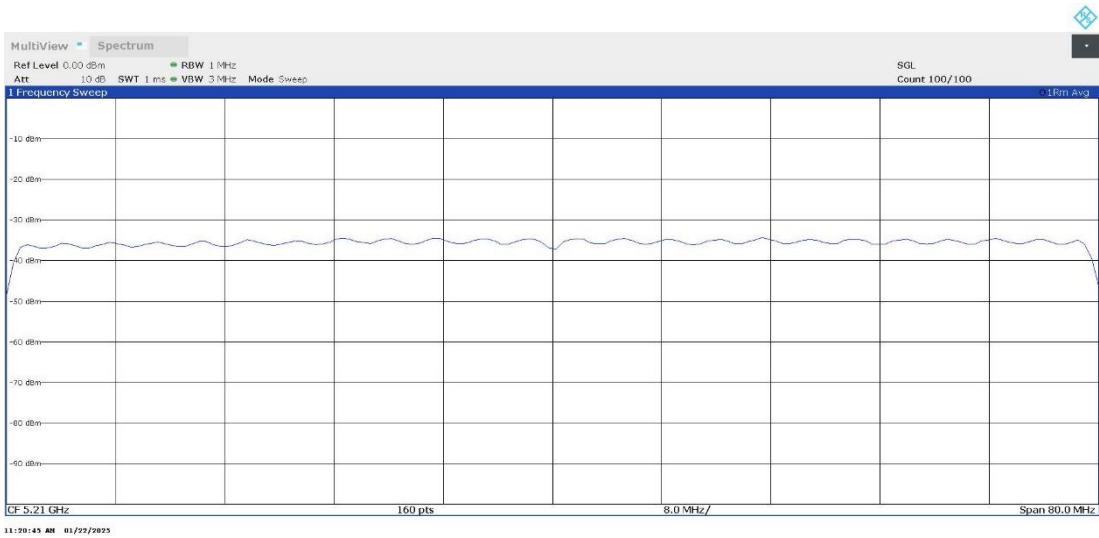
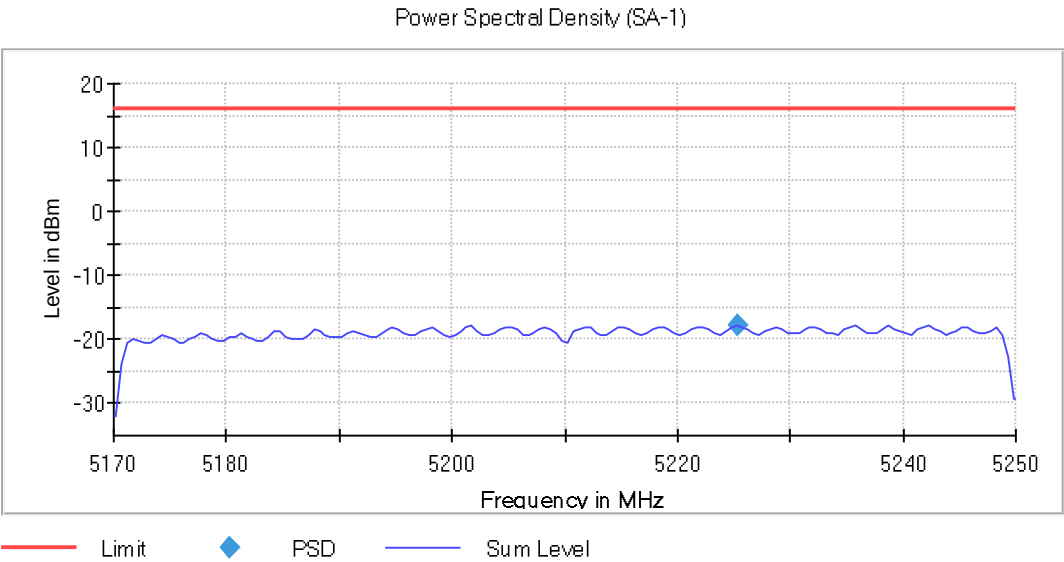
Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5190.00000 Modulation = 802.11ax HE80 (OFDMA MCS0) SU
TPC = No Antenna Configuration = SISO

Images:



Modulation: 802.11ax HE80 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3	5210.00000	No	5207.750000	-5.325

Offset RU used in each channel:

Operation Band (MHz)	Channel	Offset
[5150, 5250]	Single (5190MHz):	18
[5725, 5850]	Single (5755MHz):	18

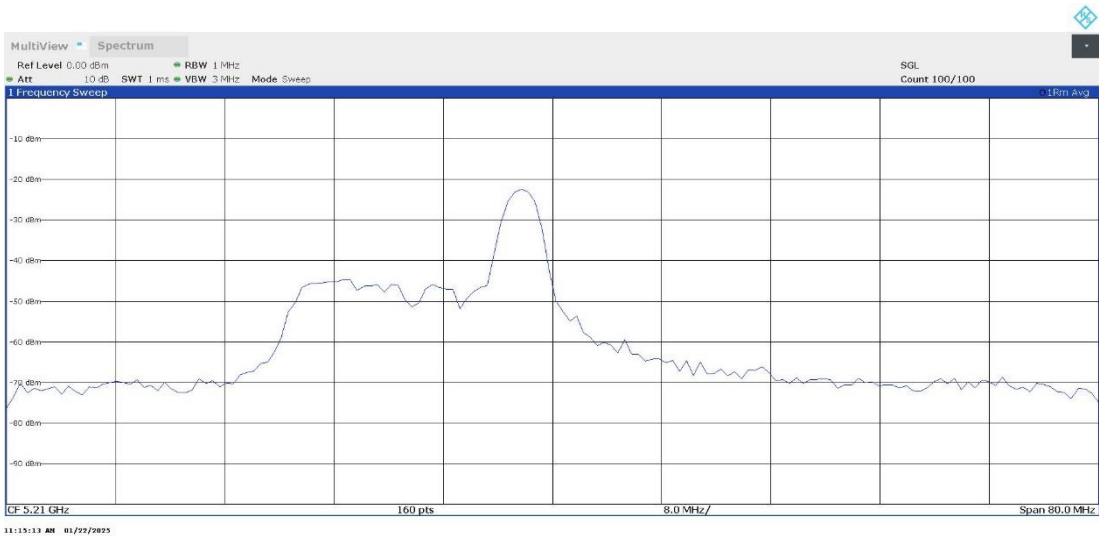
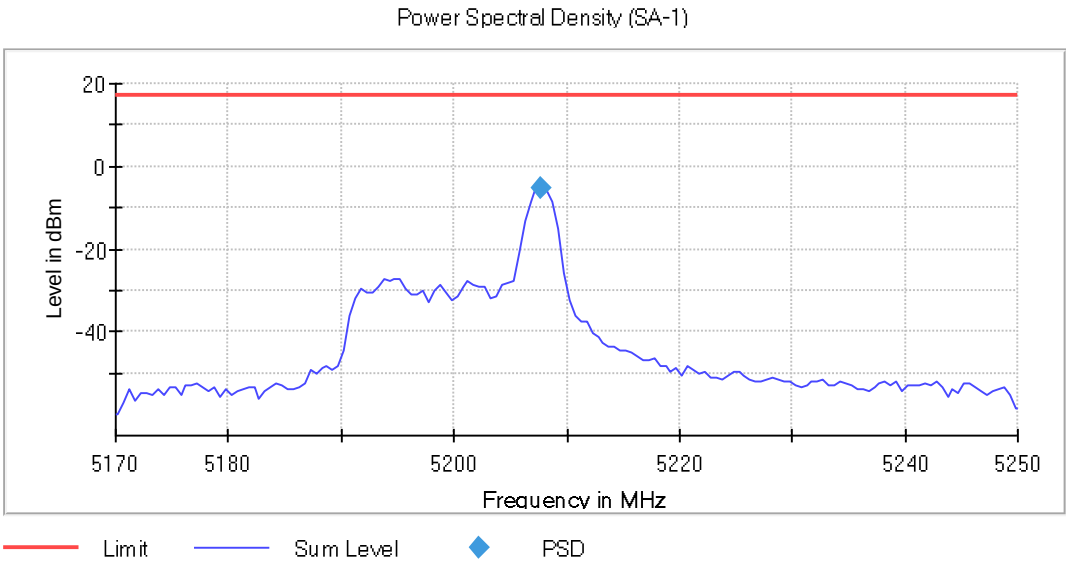
Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 3
Frequency MHz = 5190.00000 Modulation = 802.11ax HE80 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = SISO

Images:



MIMO (Port 3 + Port 2)

Modulation: 802.11a (OFDM 6 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5180.00000	No	5182.376238	-3.111
		5220.00000		5222.574257	-2.916
		5240.00000		5242.376238	-2.457

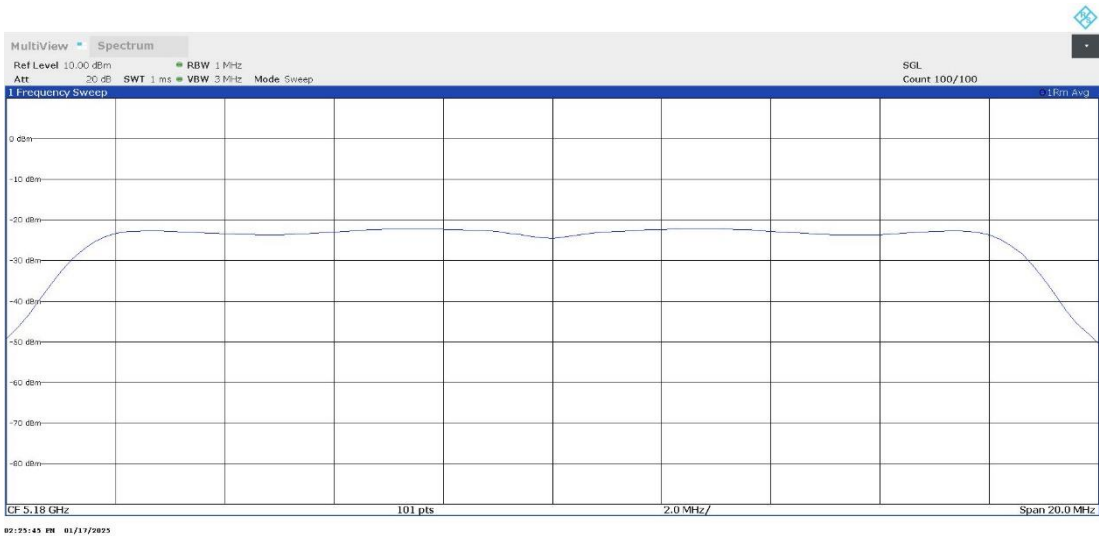
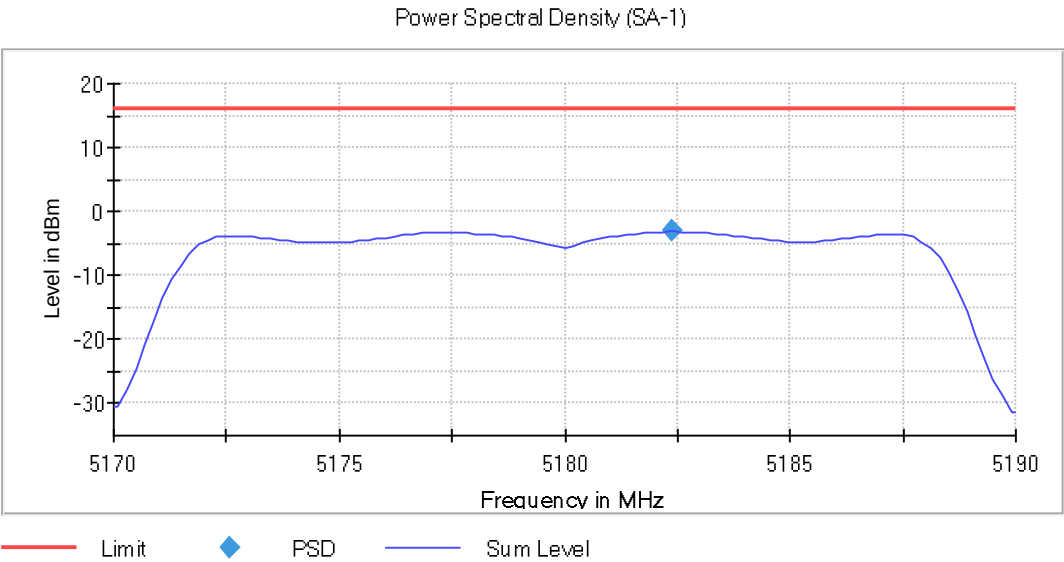
Verdict

Pass

Attachments

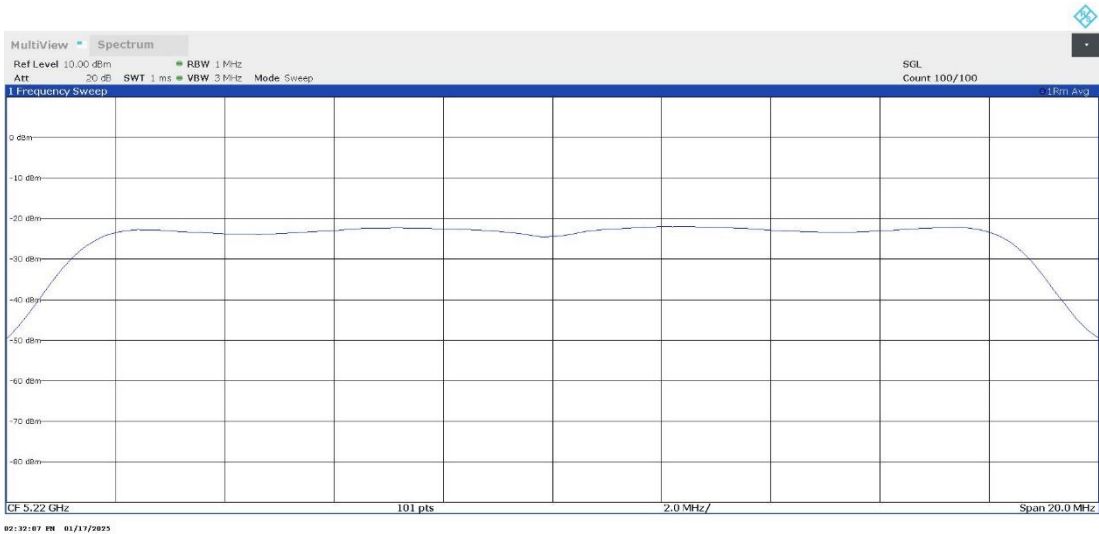
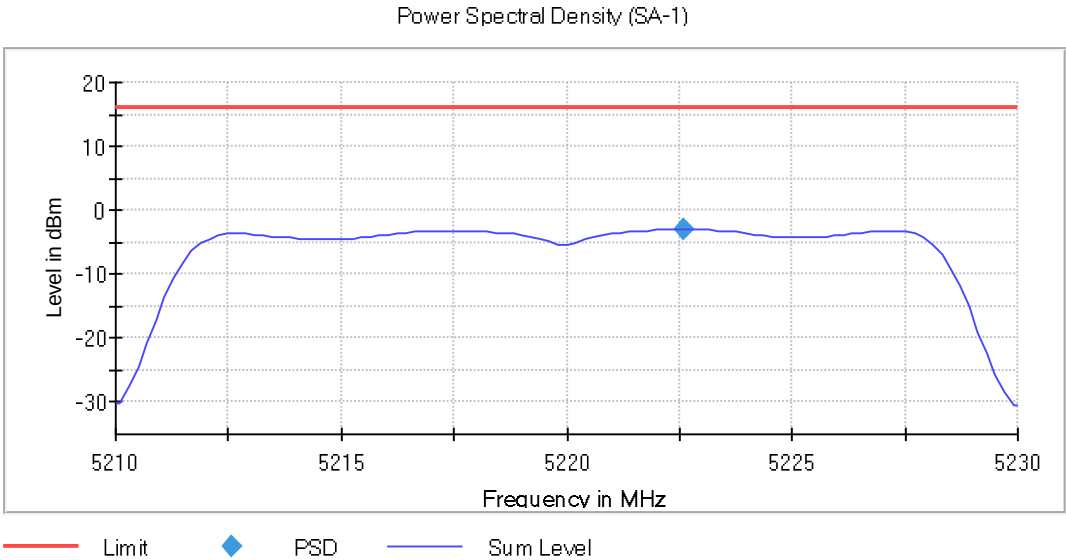
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5180.00000 Modulation = 802.11a (OFDM 6 Mbit/s)
TPC = No Antenna Configuration = MIMO

Images:



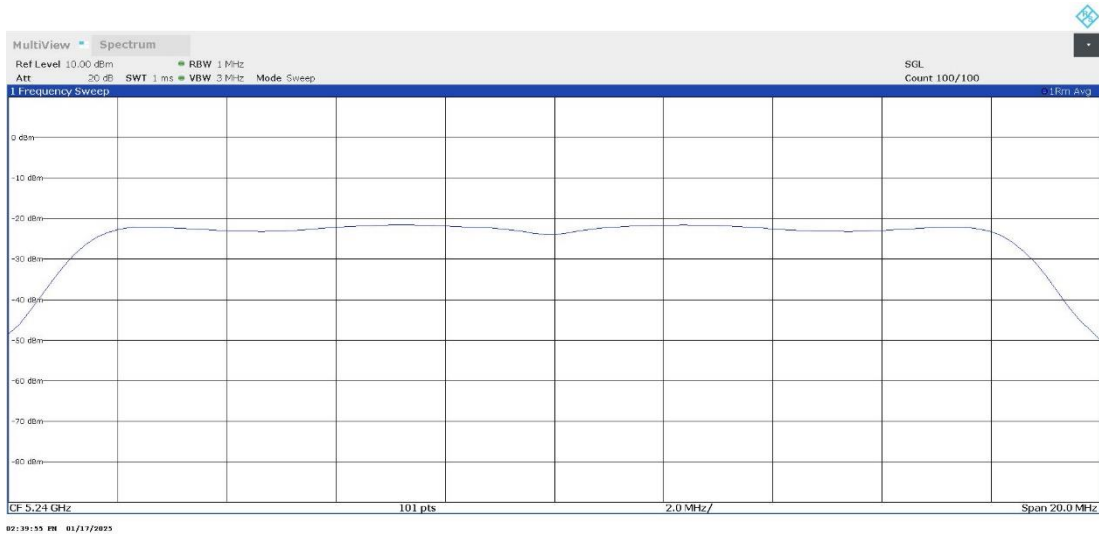
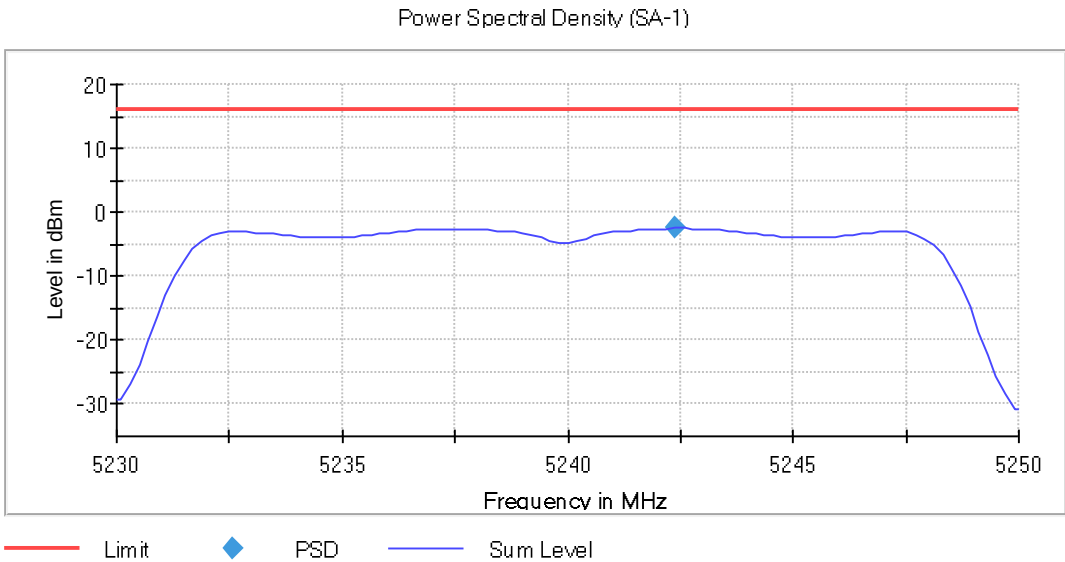
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5220.00000 Modulation = 802.11a (OFDM 6 Mbit/s)
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5240.00000 Modulation = 802.11a (OFDM 6 Mbit/s)
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5180.00000	No	5182.376238	-3.618
		5220.00000		5222.178218	-3.273
		5240.00000		5241.980198	-2.801

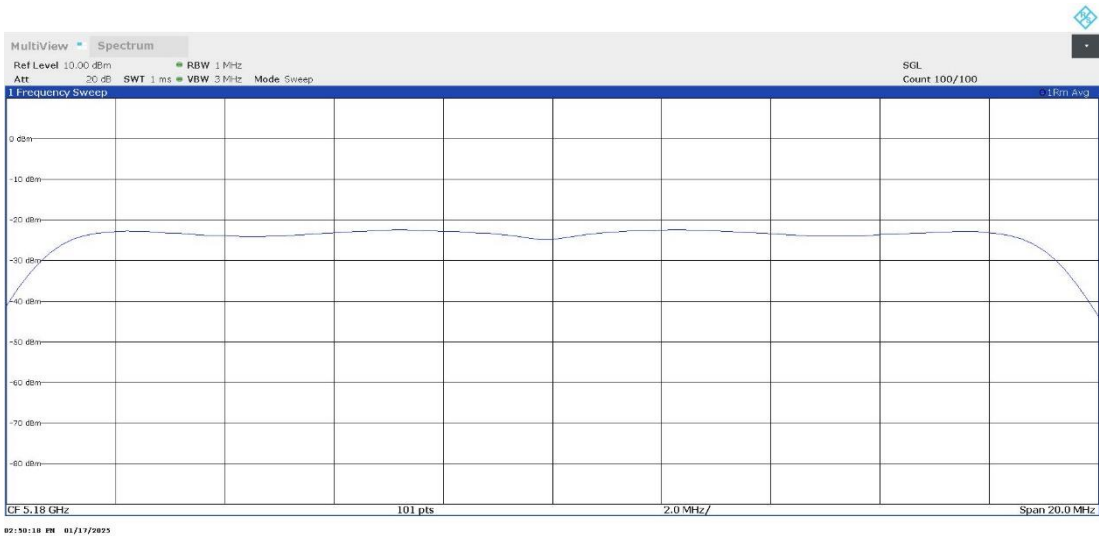
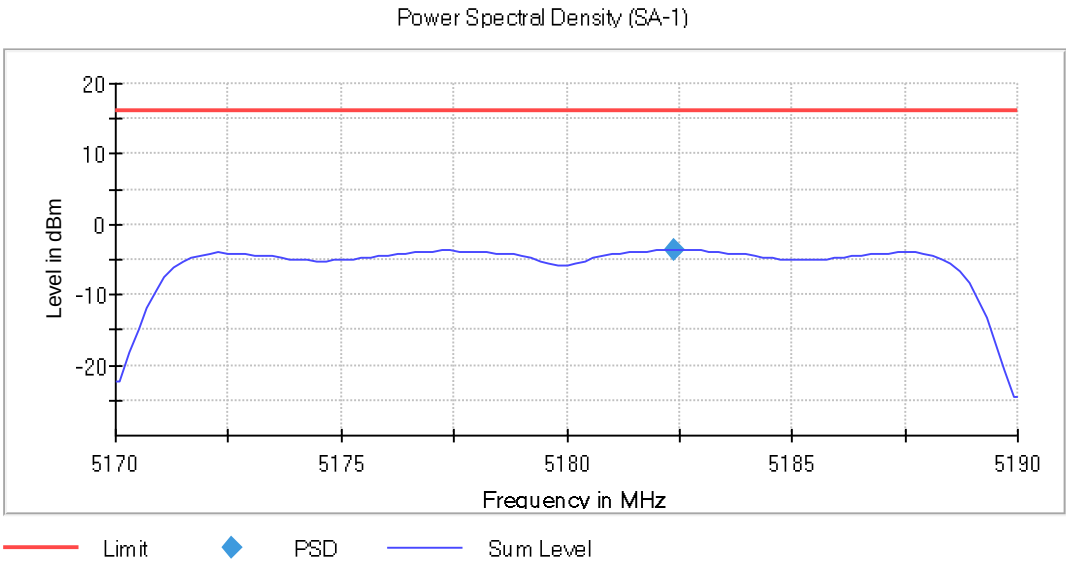
Verdict

Pass

Attachments

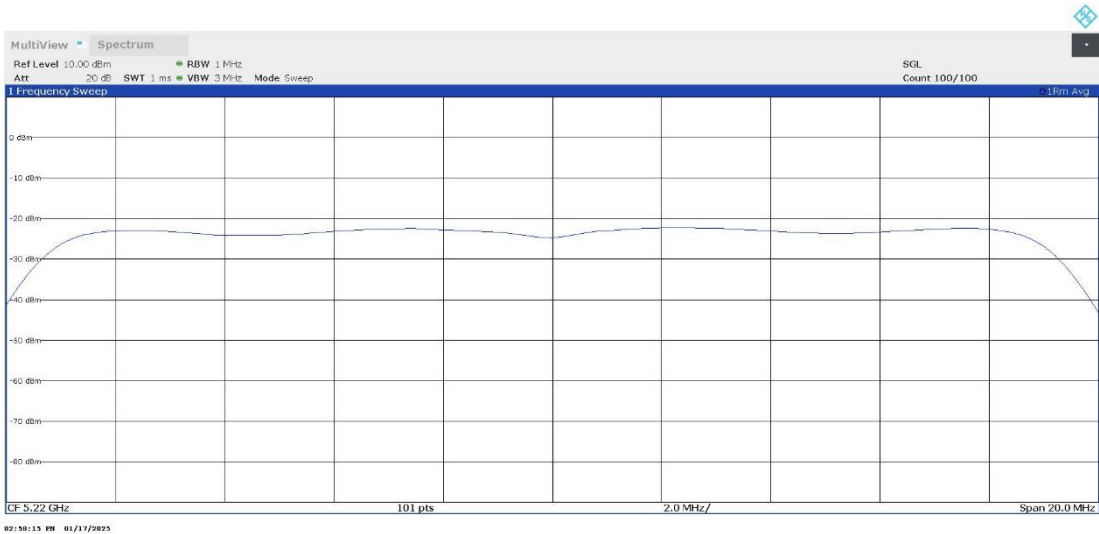
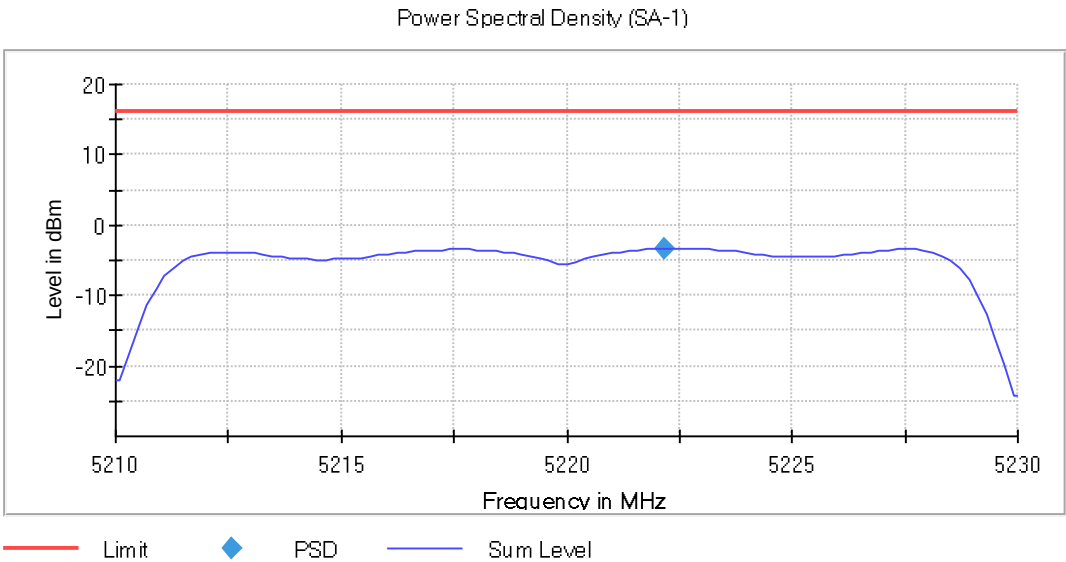
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5180.00000 Modulation = 802.11n HT20 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



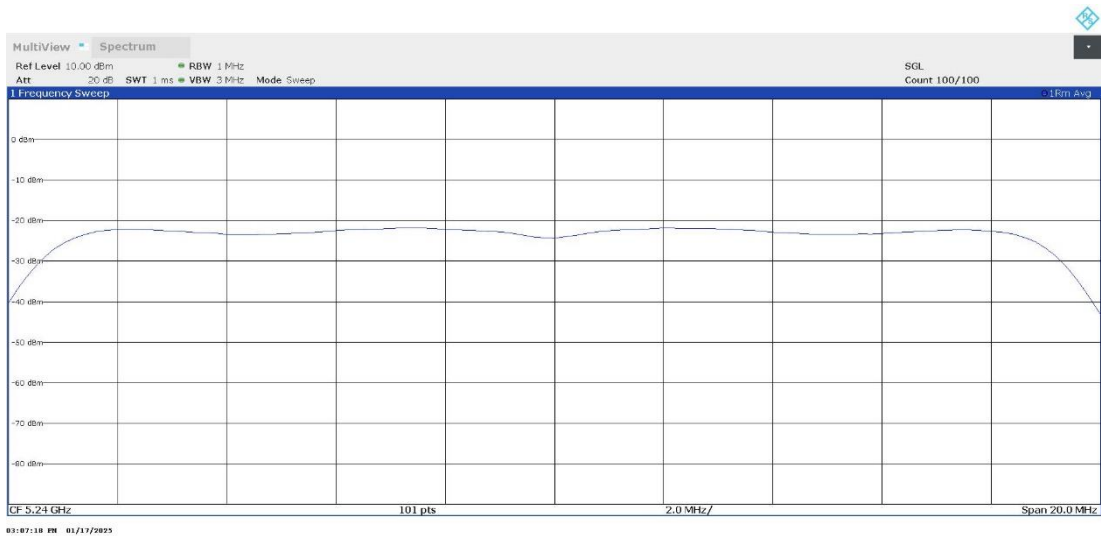
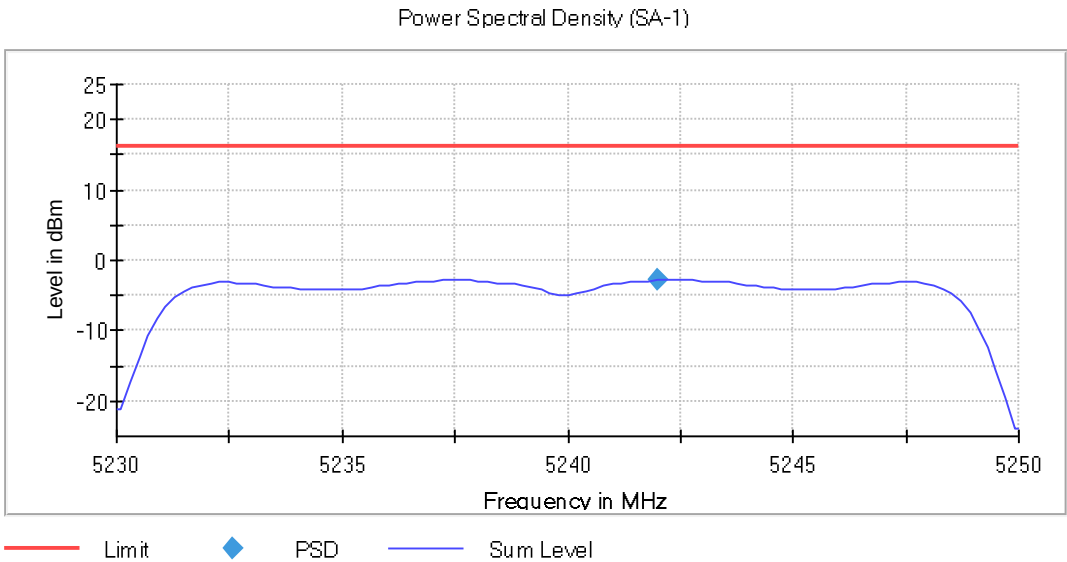
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5220.00000 Modulation = 802.11n HT20 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5240.00000 Modulation = 802.11n HT20 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11n HT40 (OFDM MCS0 13.5 Mbit/s)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5190.00000	No	5184.851485	-6.455
		5230.00000		5234.752475	-5.756

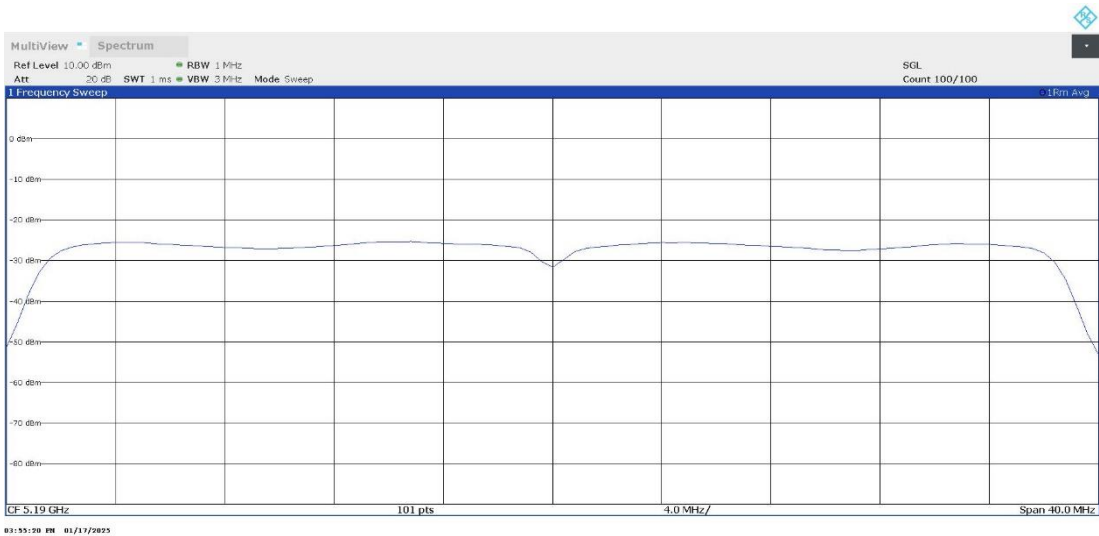
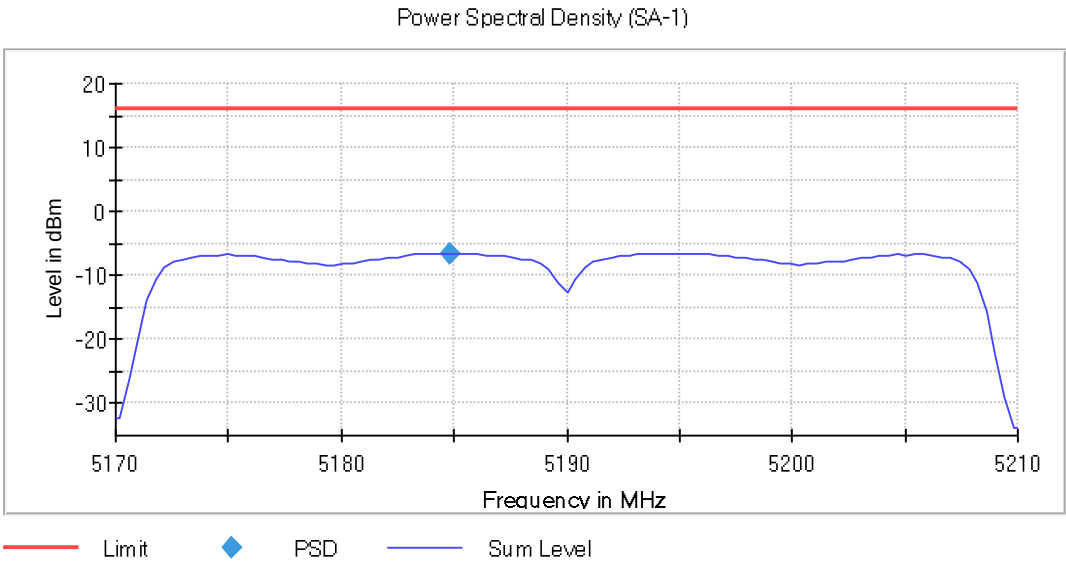
Verdict

Pass

Attachments

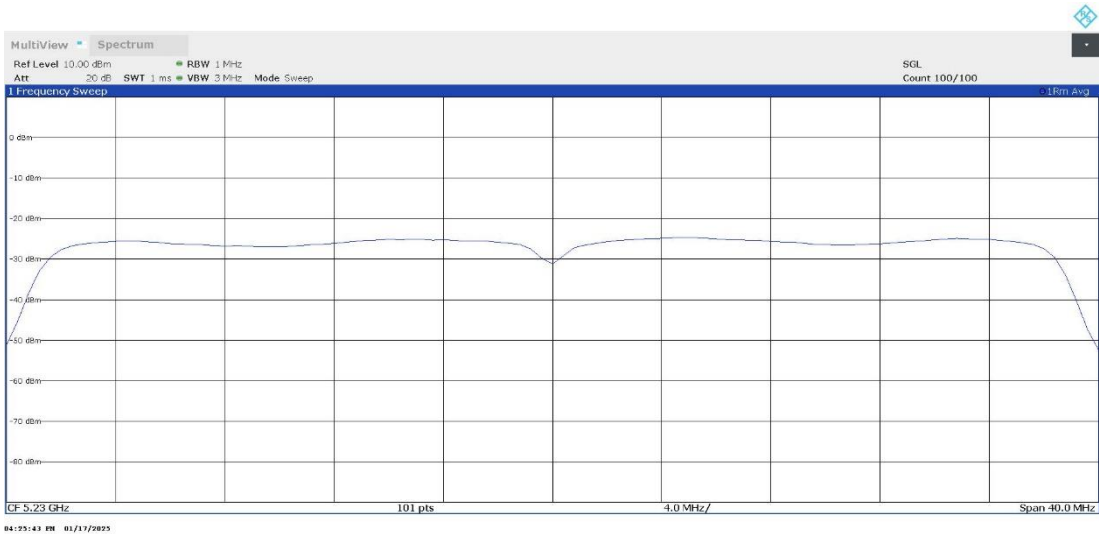
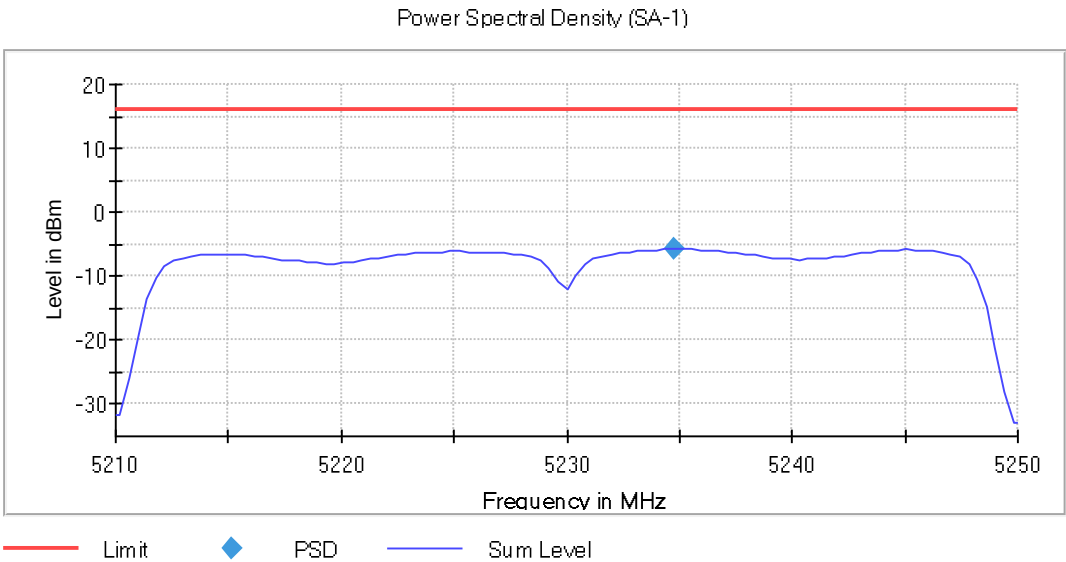
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5190.00000 Modulation = 802.11n HT40 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5230.00000 Modulation = 802.11n HT40 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ac VHT20 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5180.00000	No	5182.574257	-3.407
		5220.00000		5222.574257	-3.005
		5240.00000		5242.376238	-2.632

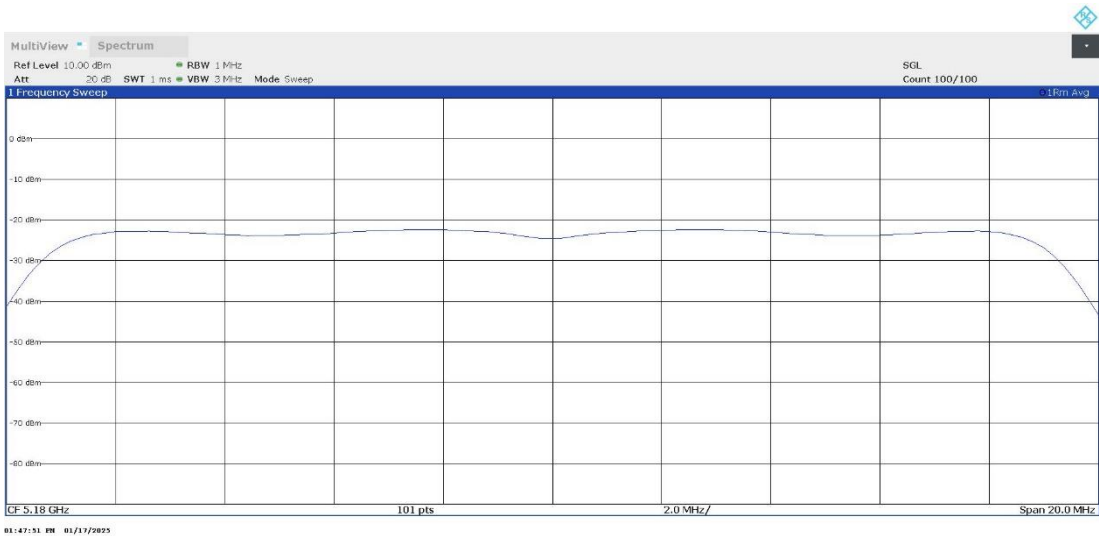
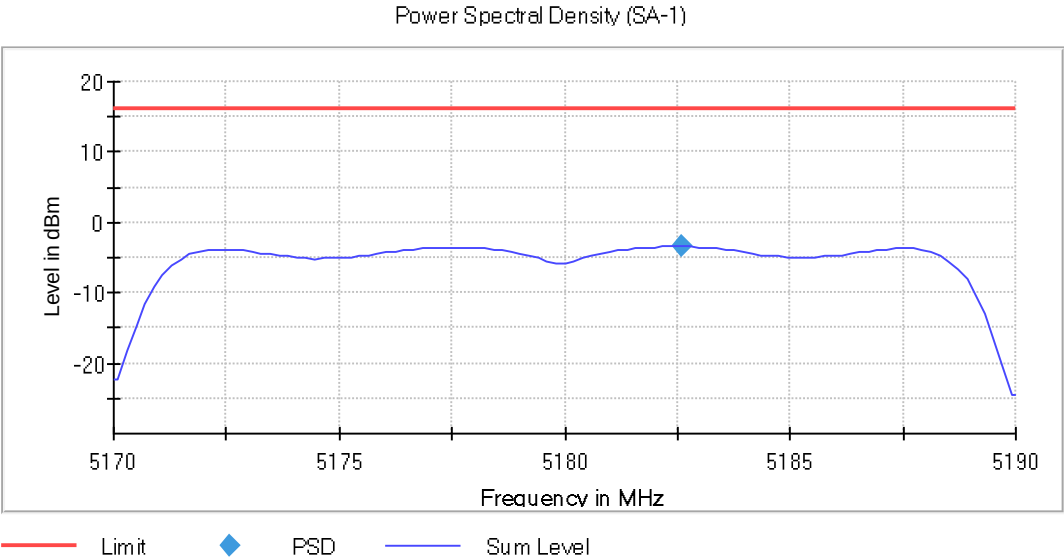
Verdict

Pass

Attachments

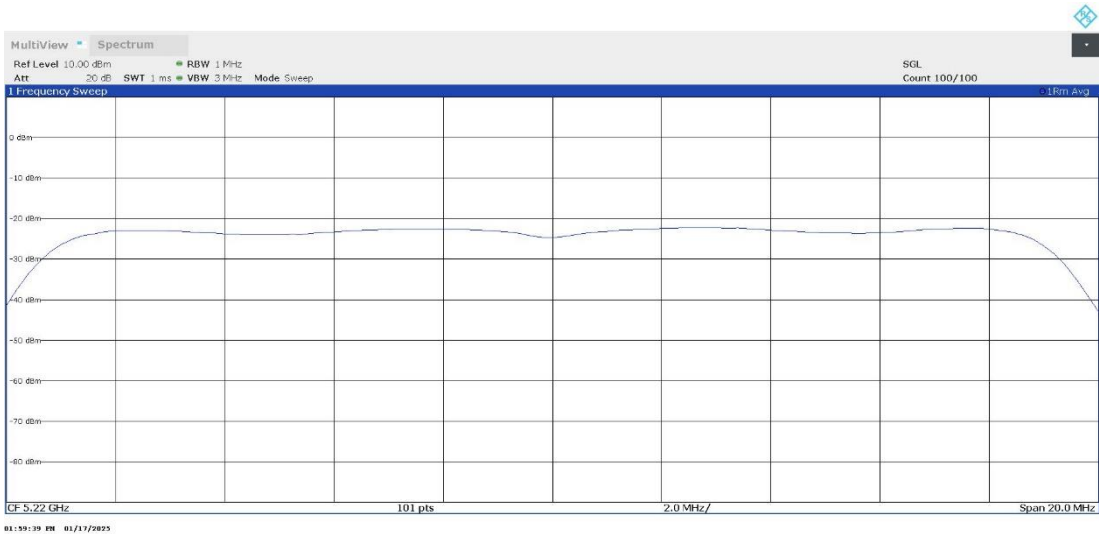
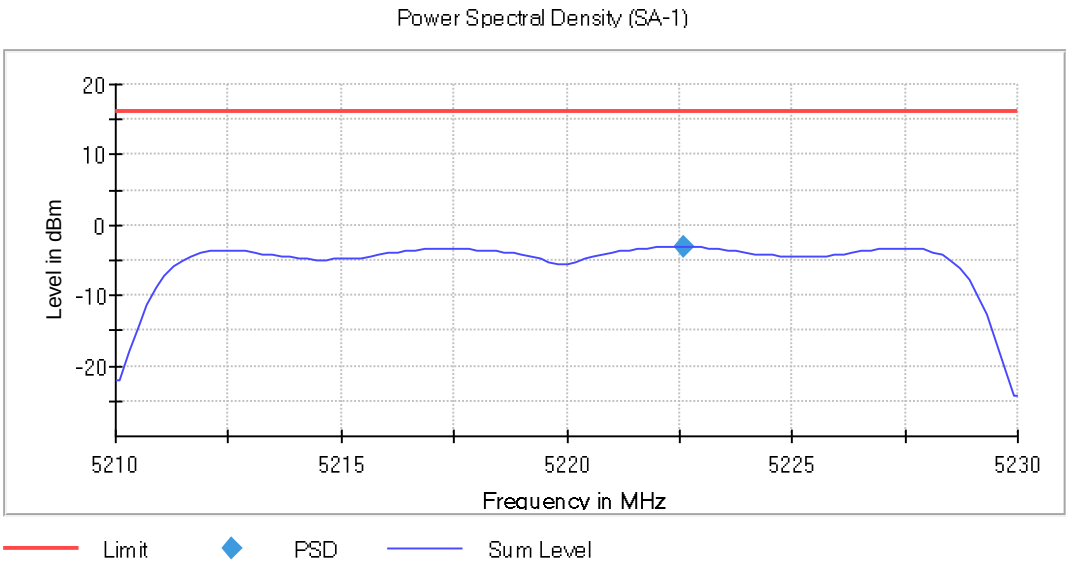
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5180.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



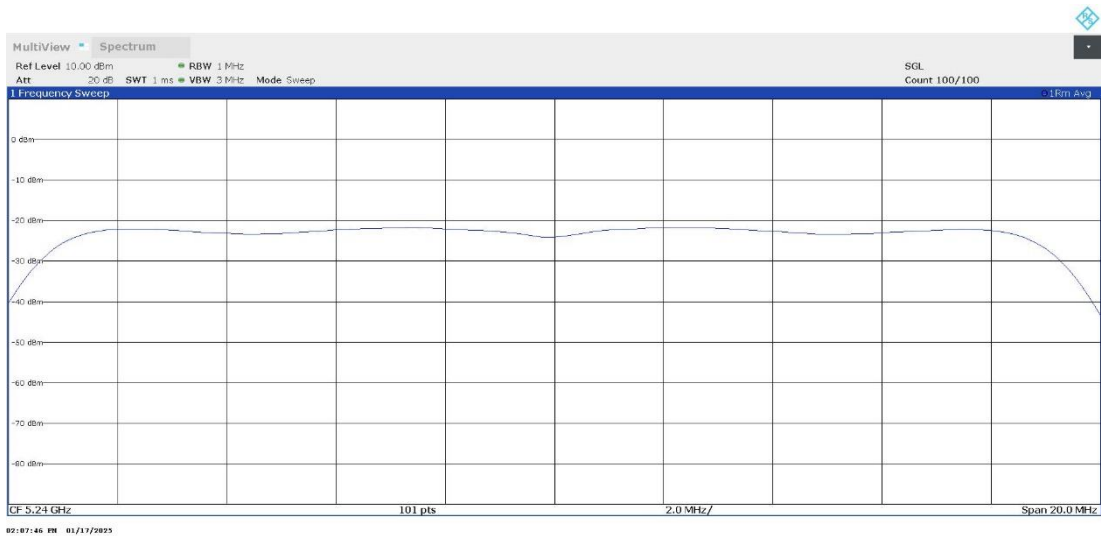
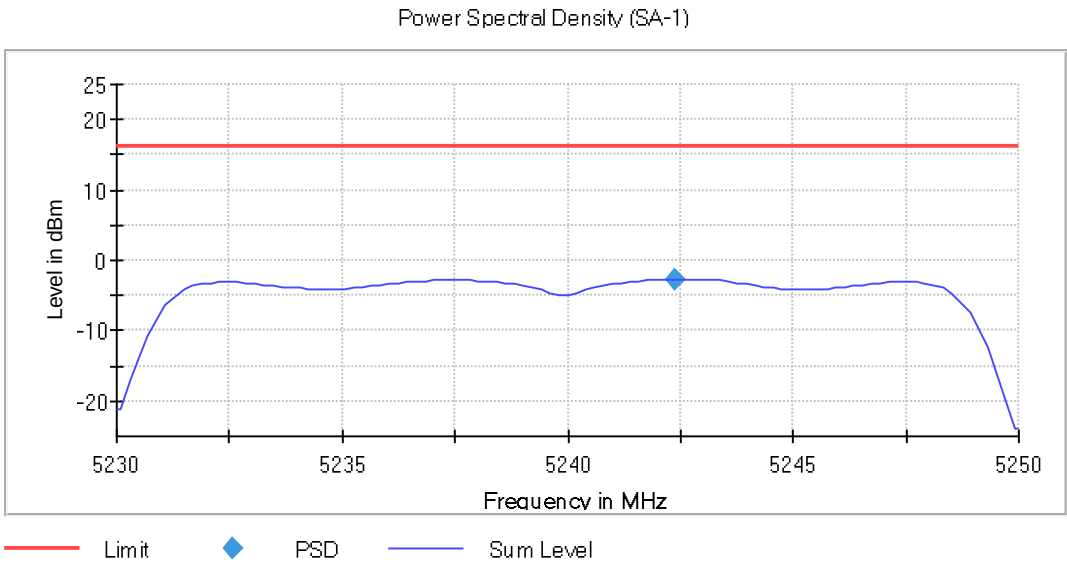
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5220.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5240.00000 Modulation = 802.11ac VHT20 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ac VHT40 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5190.00000	No	5194.752475	-6.288
		5230.00000		5235.148515	-5.654

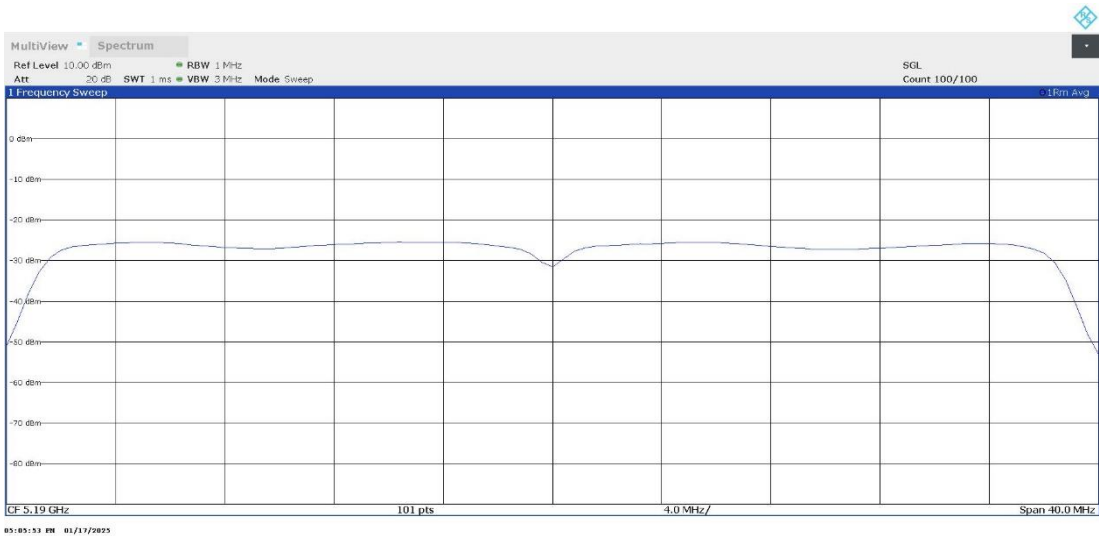
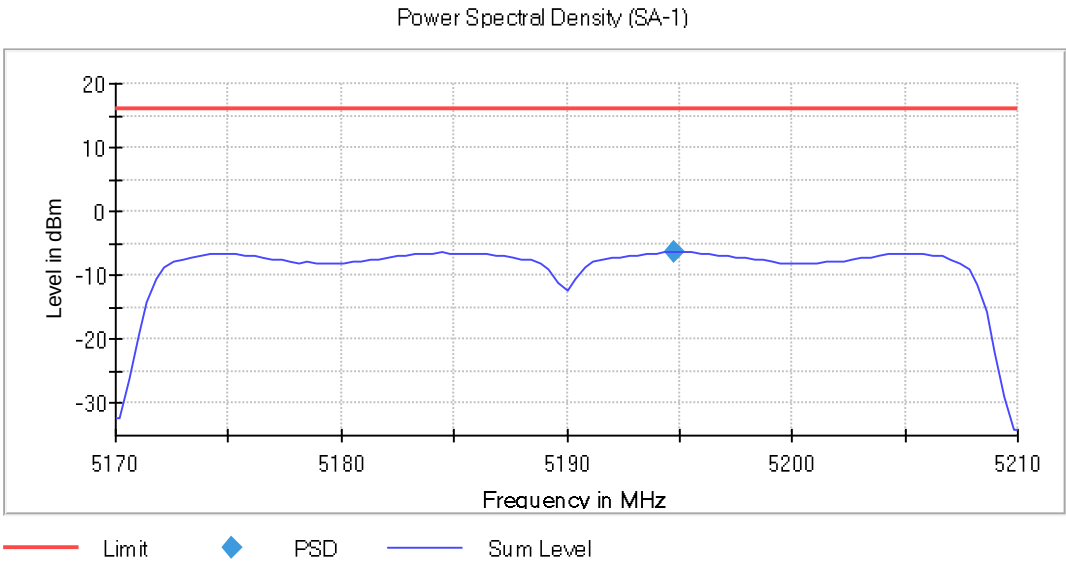
Verdict

Pass

Attachments

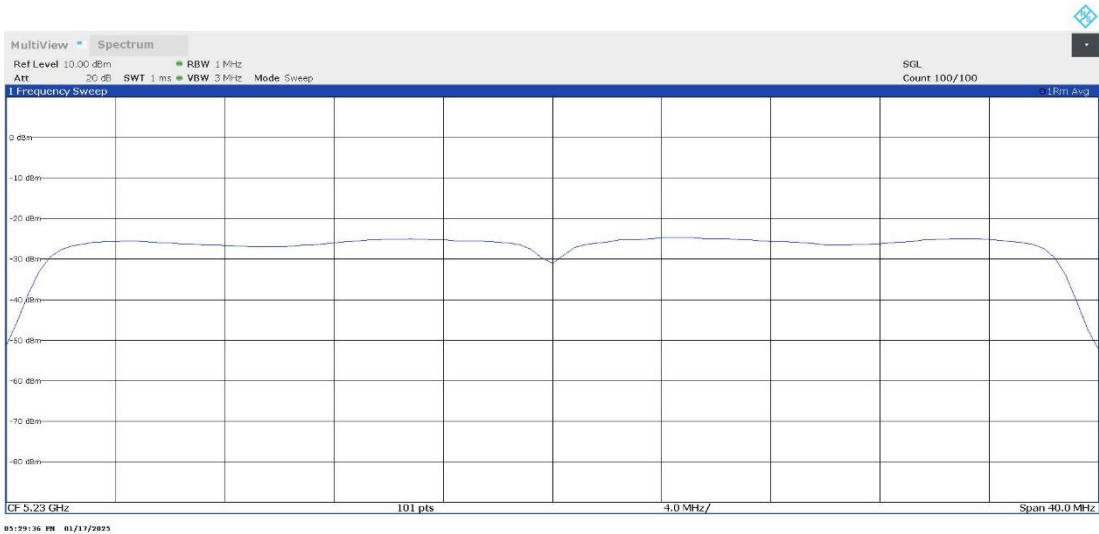
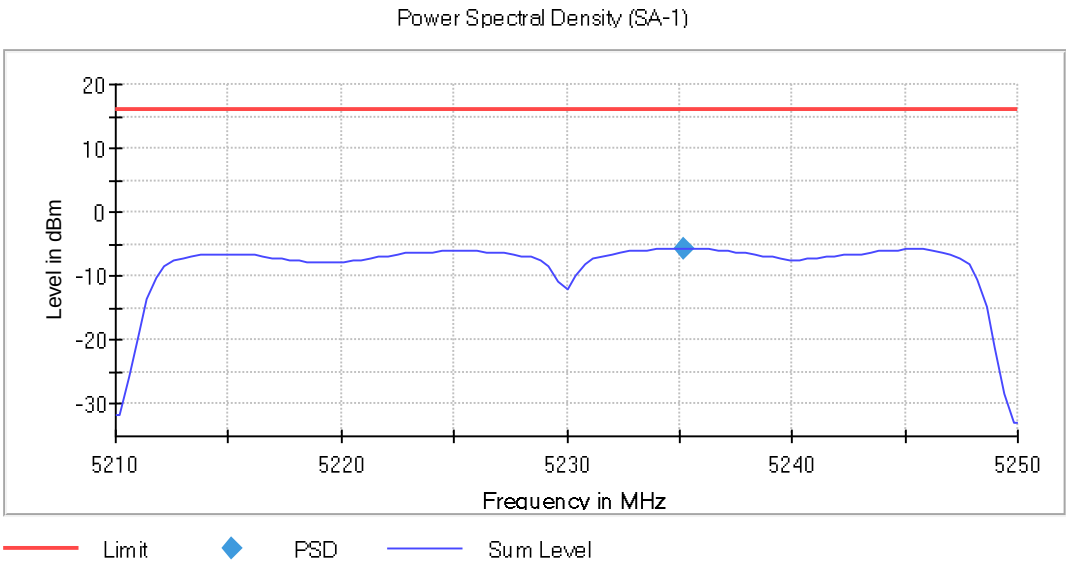
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5190.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5230.00000 Modulation = 802.11ac VHT40 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ac VHT80 (OFDM MCS0)

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5210.00000	No	5243.750000	-9.254

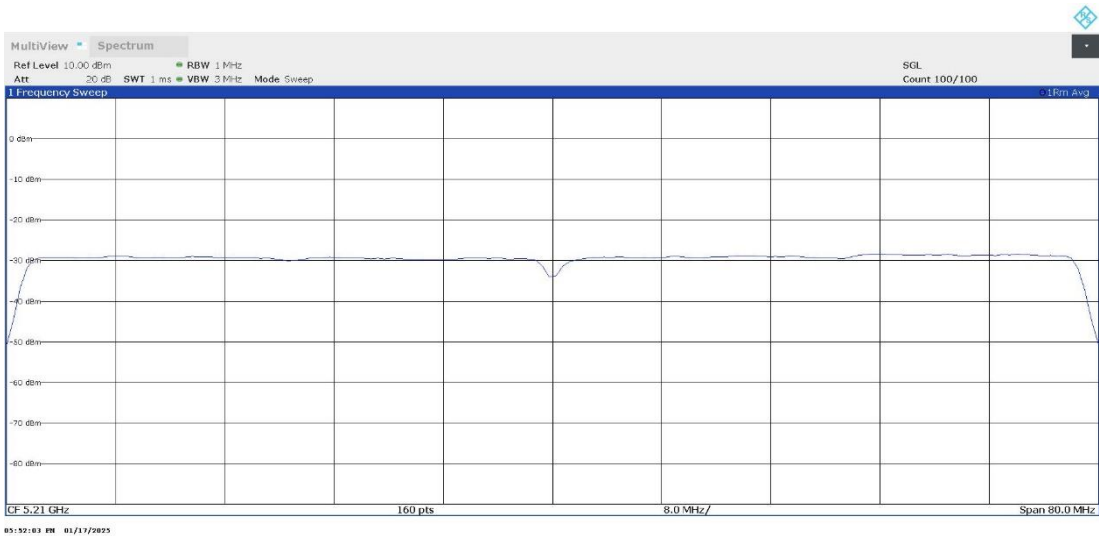
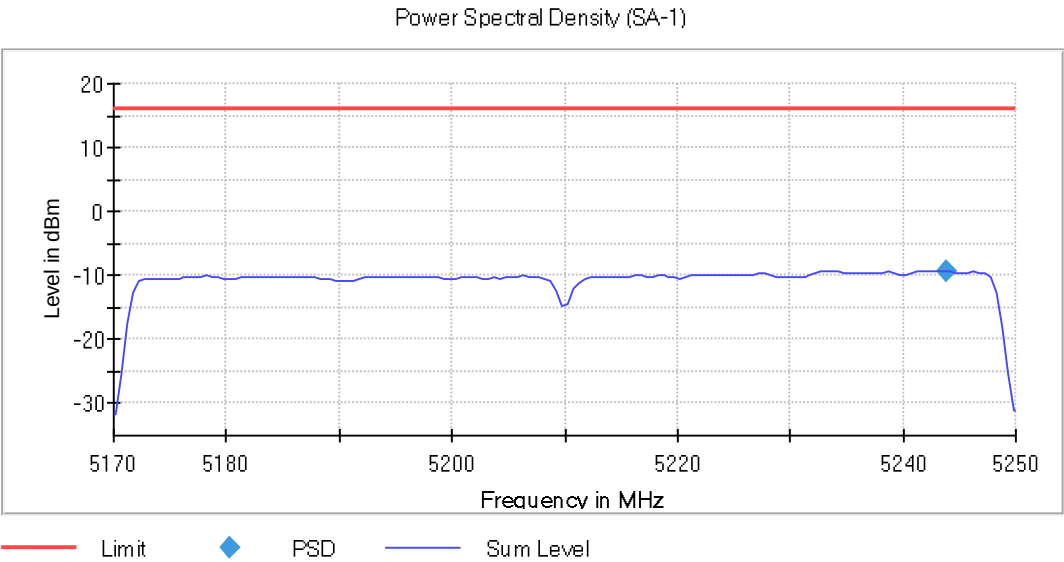
Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5210.00000 Modulation = 802.11ac VHT80 (OFDM MCS0)
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ax HE20 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5180.00000	No	5182.376238	-6.525
		5220.00000		5222.772277	-6.206
		5240.00000		5242.772277	-5.701

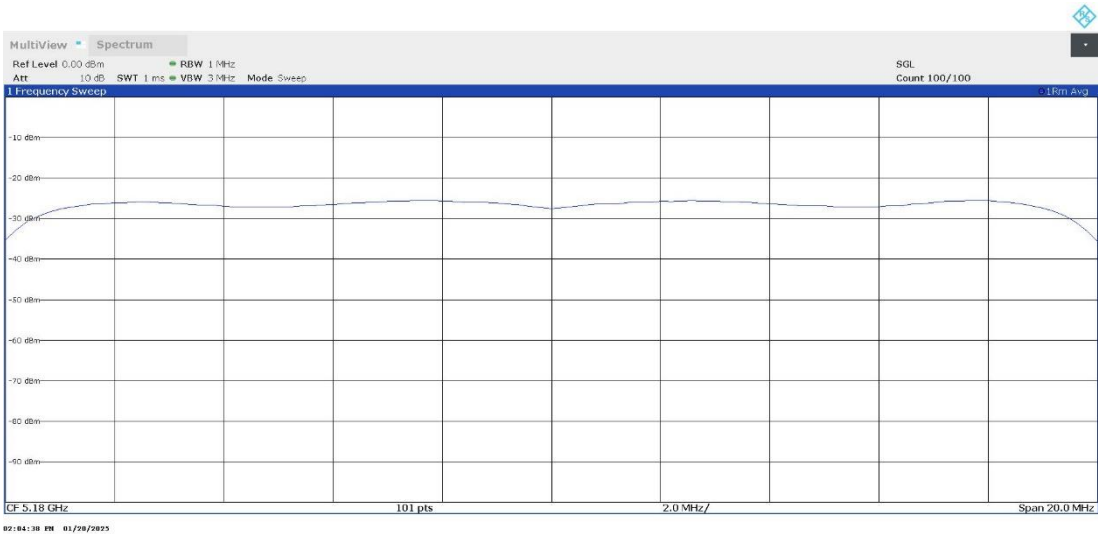
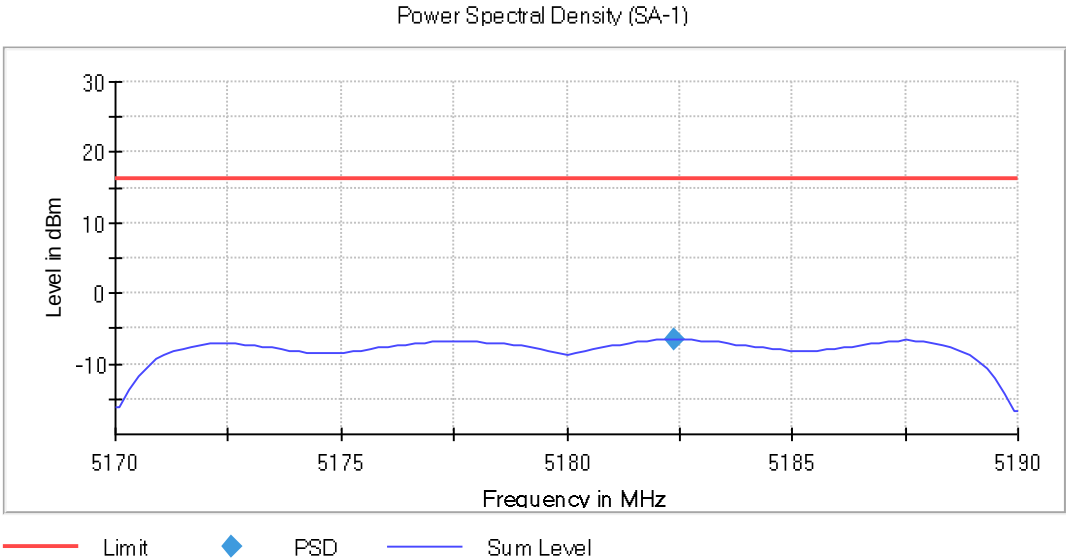
Verdict

Pass

Attachments

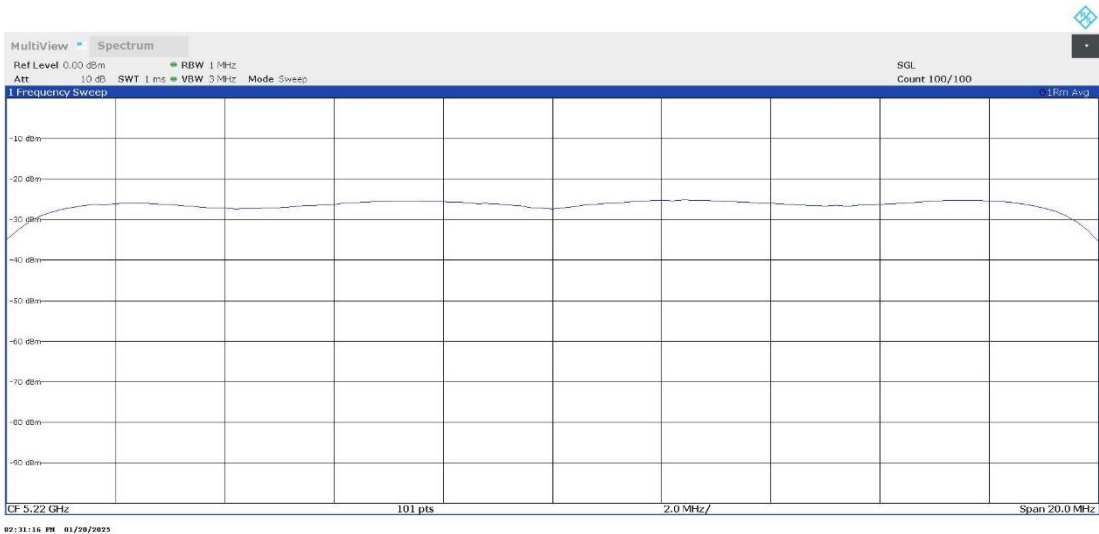
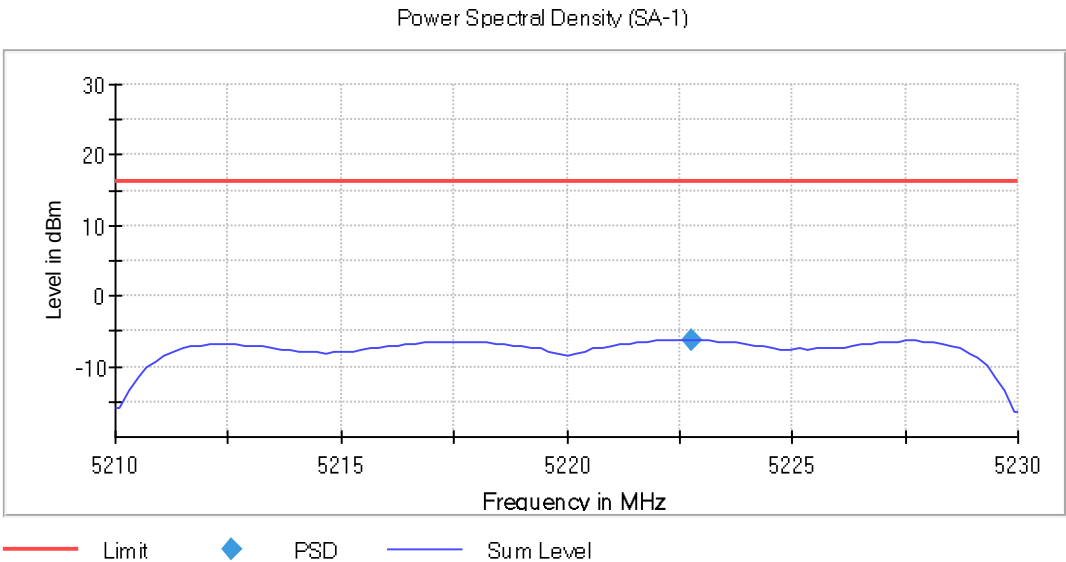
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5180.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) SU
TPC = No Antenna Configuration = MIMO

Images:



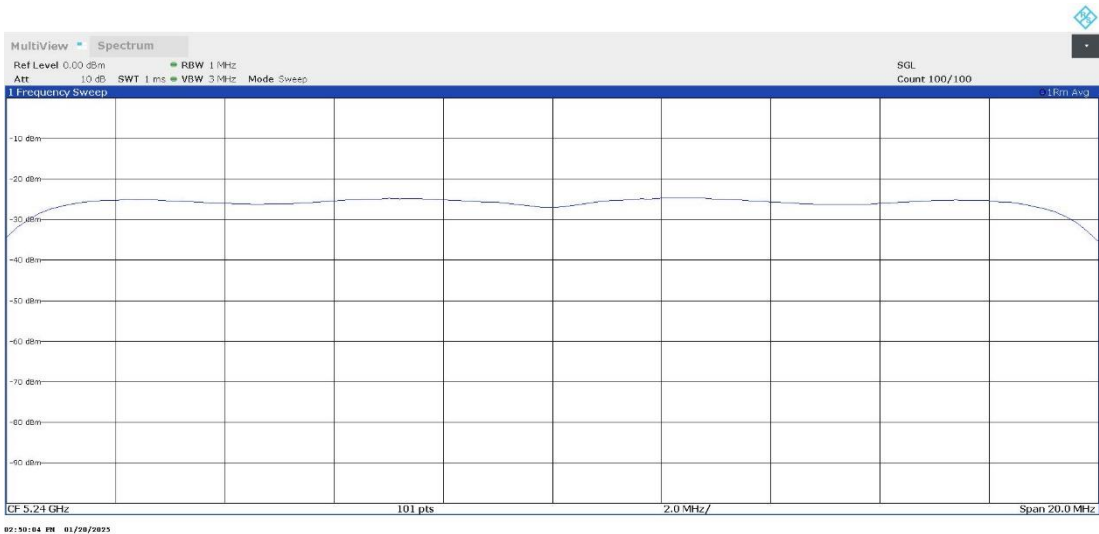
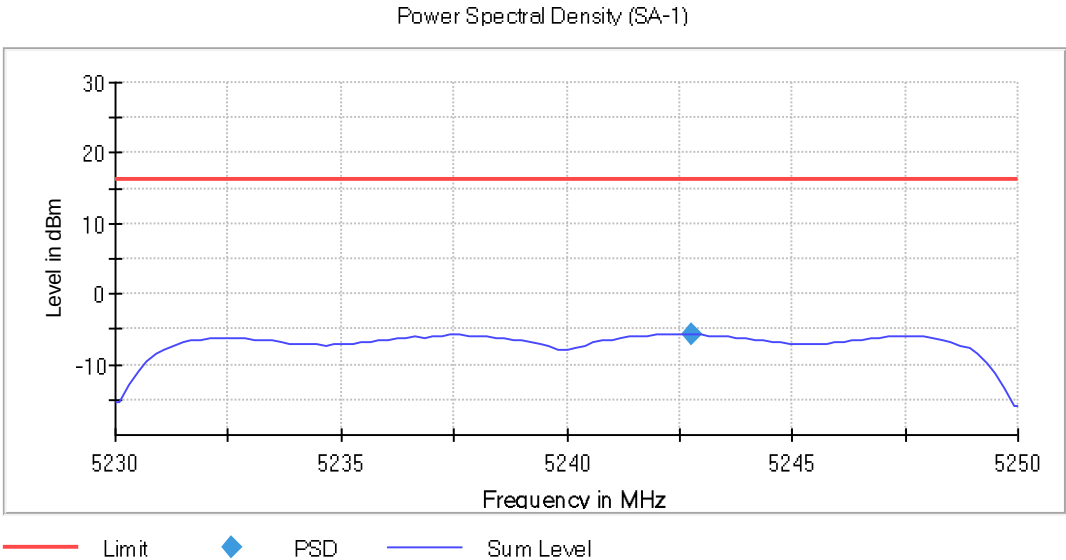
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5220.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) SU
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5240.00000 Modulation = 802.11ac VHT20 (OFDM MCS0) SU
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ax HE20 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5180.00000	No	5171.881188	1.764
		5220.00000		5222.376238	3.052
		5240.00000		5248.118812	3.045

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5180MHz):	0
	Middle (5220MHz):	5
	Highest (5240MHz):	8
[5725, 5850]	Lowest (5745MHz):	0
	Middle (5785MHz):	5
	Highest (5825MHz):	8

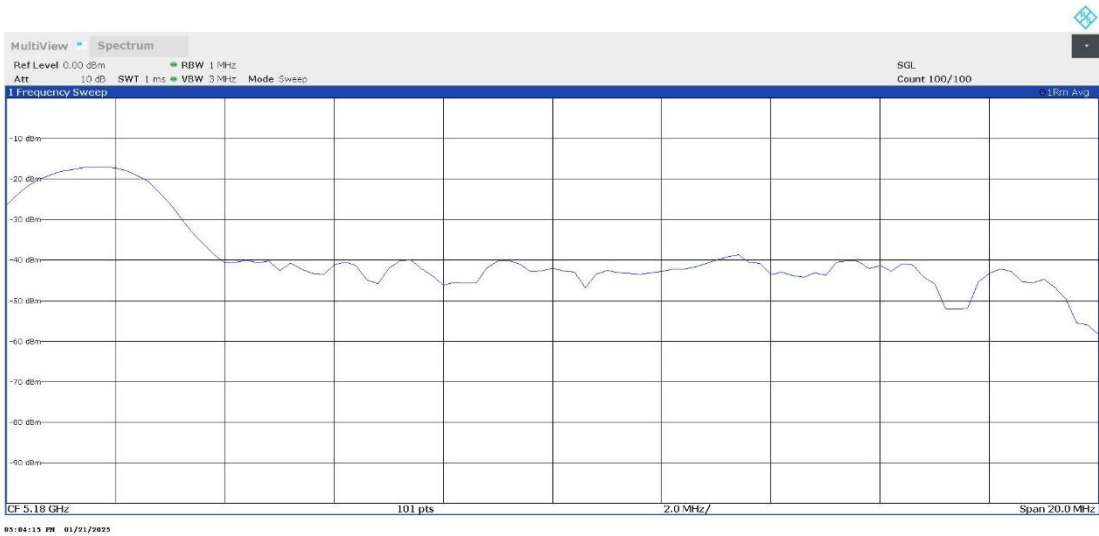
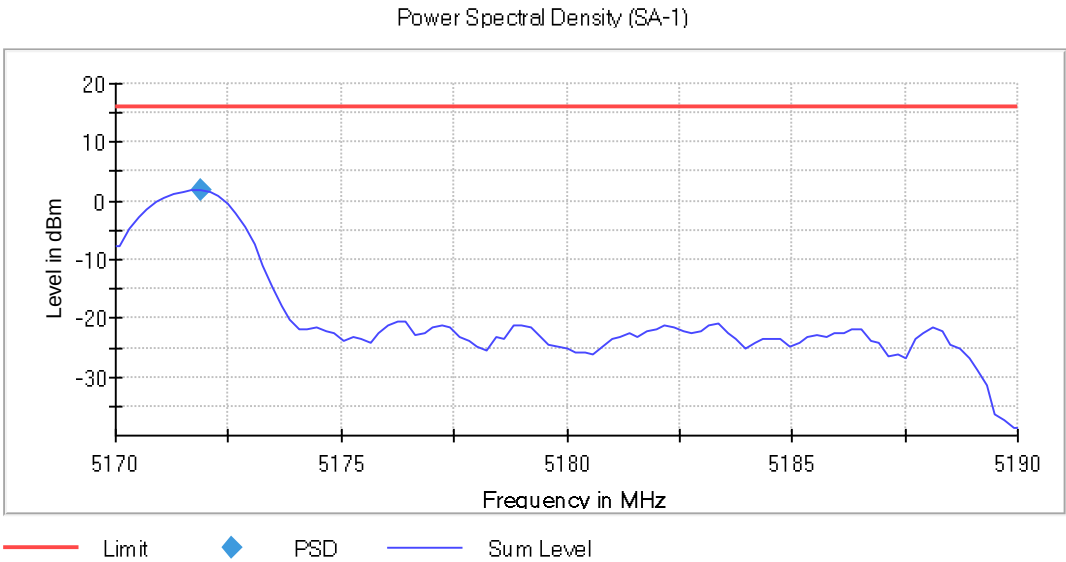
Verdict

Pass

Attachments

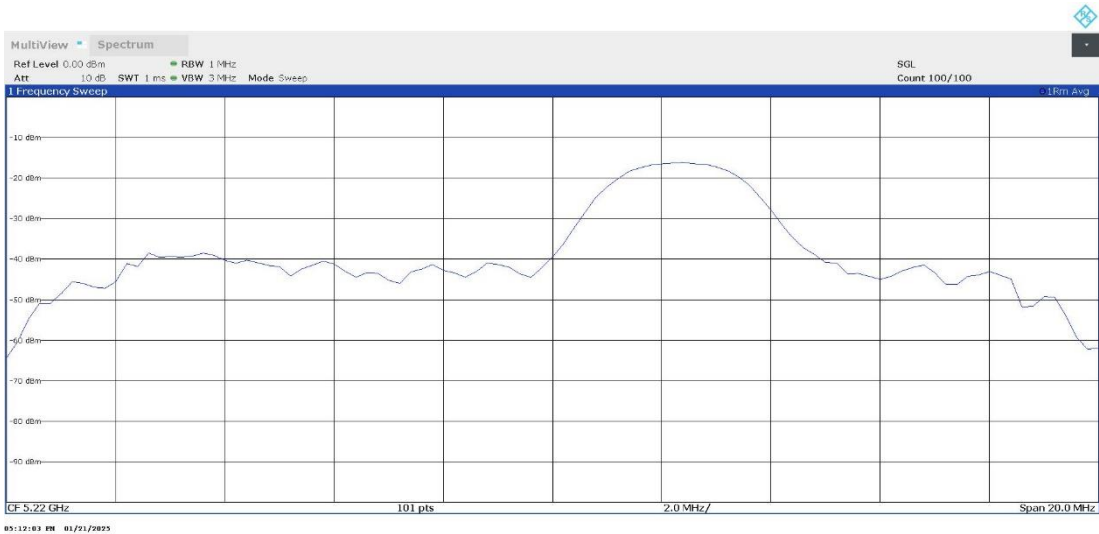
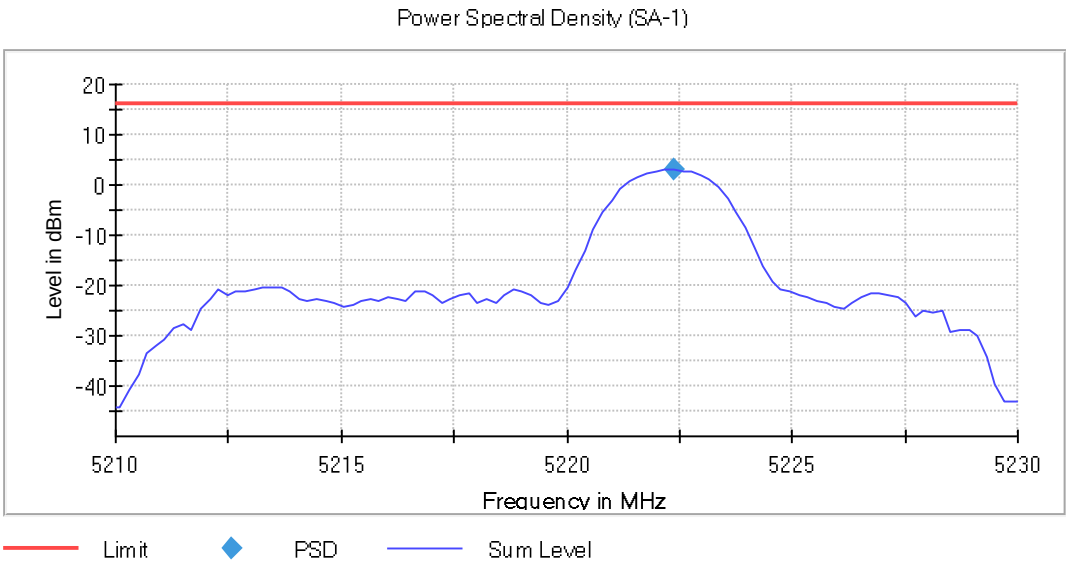
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Frequency MHz = 5180.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = MIMO

Images:



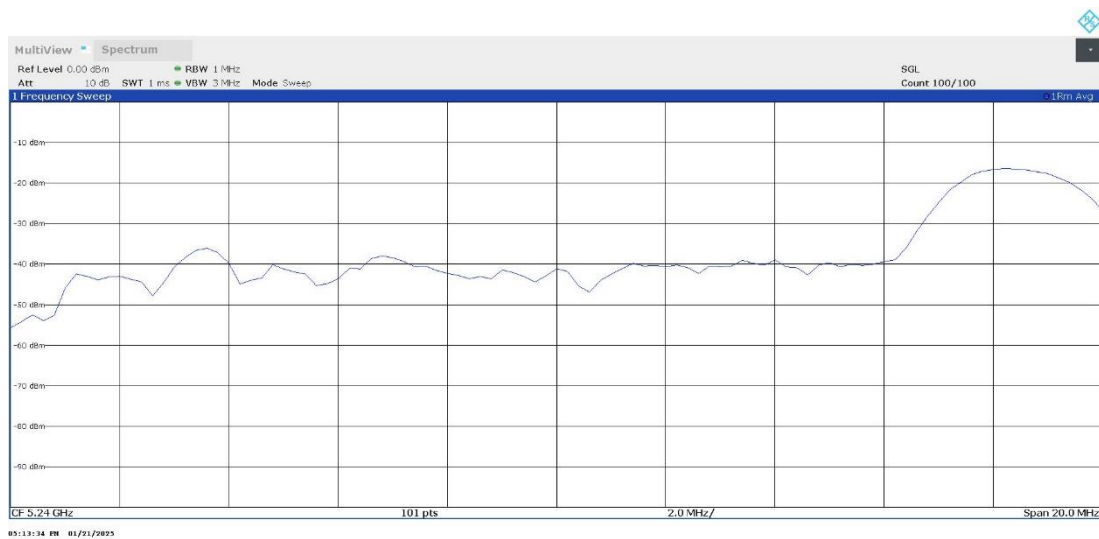
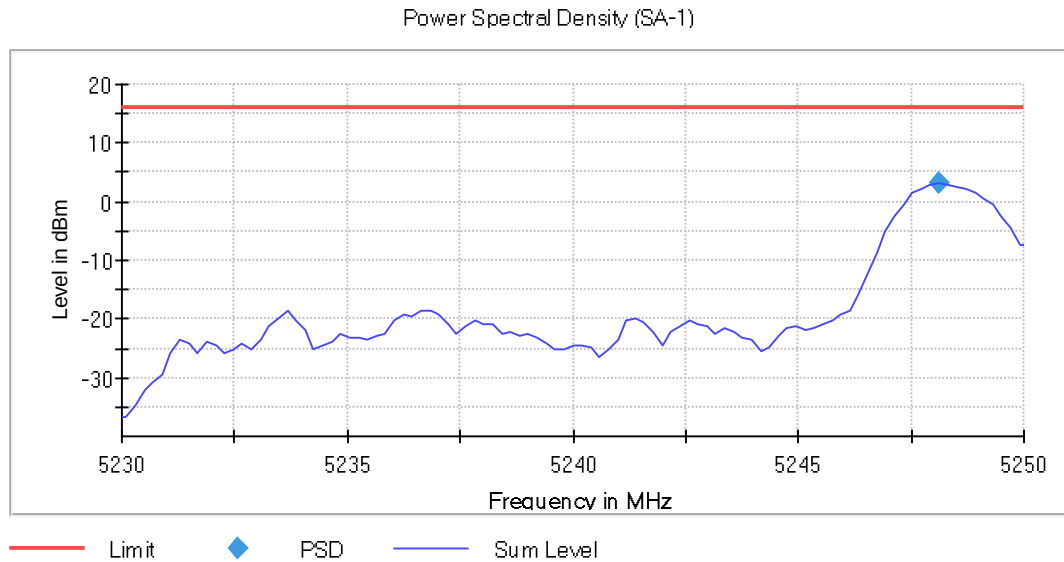
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5220.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5240.00000 Modulation = 802.11ac VHT20 (OFDM MCS0) RU26
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ax HE40 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5190.00000	No	5205.049505	-11.748
		5230.00000		5235.544554	-8.147

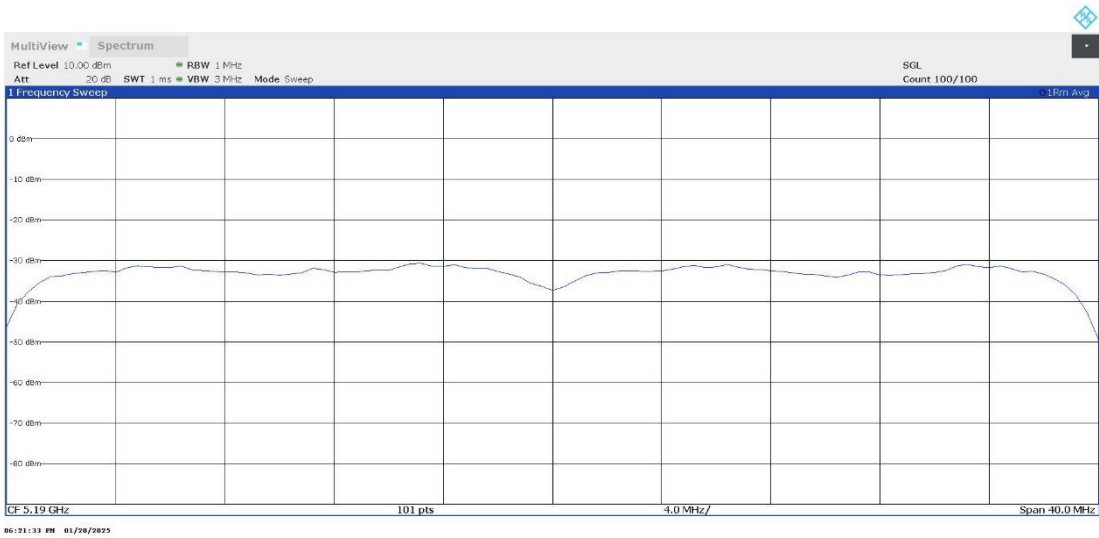
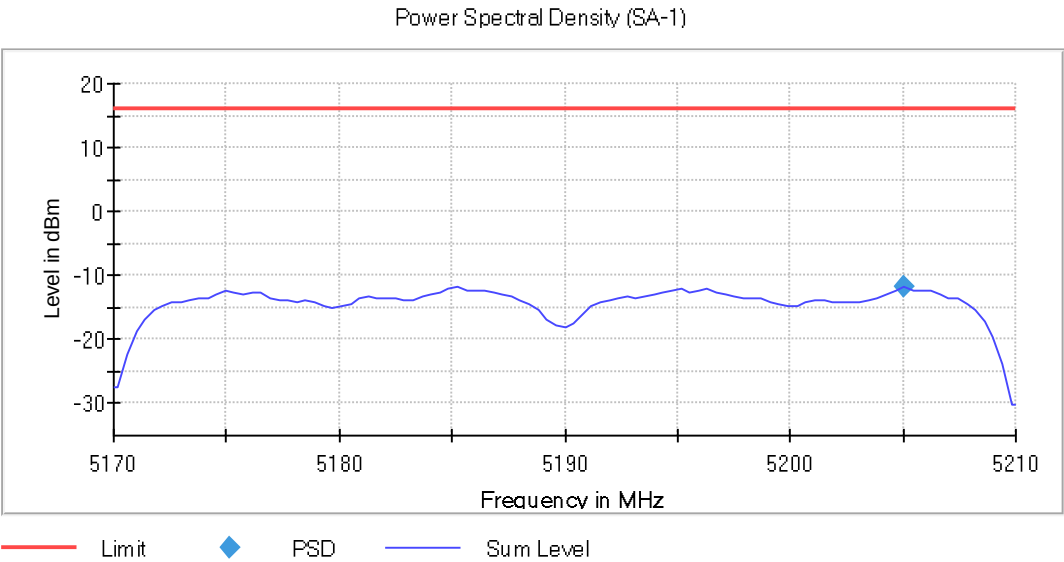
Verdict

Pass

Attachments

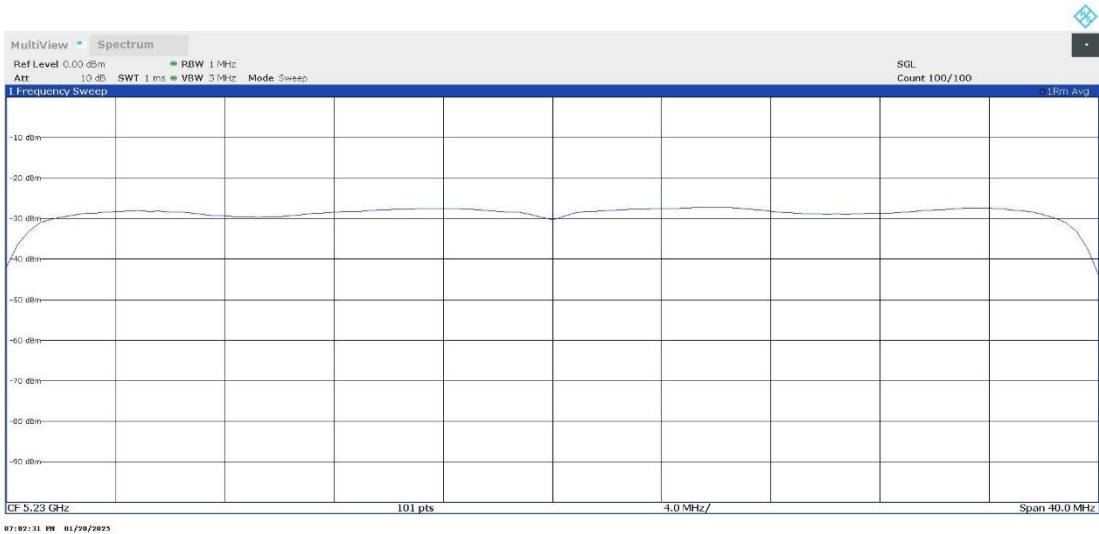
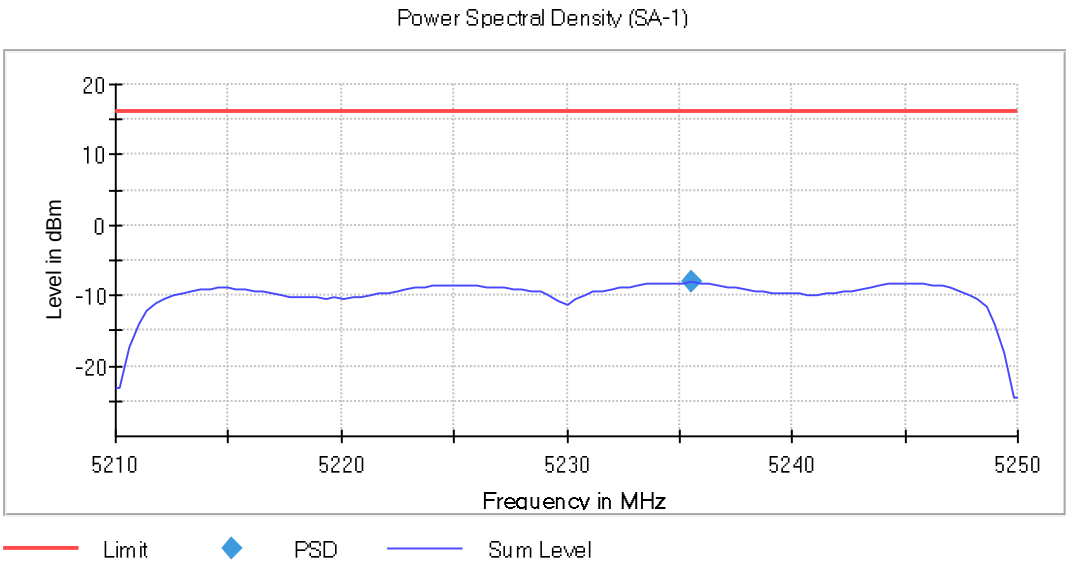
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5190.00000 Modulation = 802.11ax HE40 (OFDMA MCS0) SU
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5230.00000 Modulation = 802.11ax HE40 (OFDMA MCS0) SU
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ax HE40 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5190.00000	No	5172.178218	1.452
		5230.00000		5247.821782	2.371

Offset RU used in each channel:

Operation Band (MHz)	Channels	Offset
[5150, 5250]	Lowest (5190MHz):	0
	Highest (5230MHz):	17
[5725, 5850]	Lowest (5755MHz):	0
	Highest (5795MHz):	17

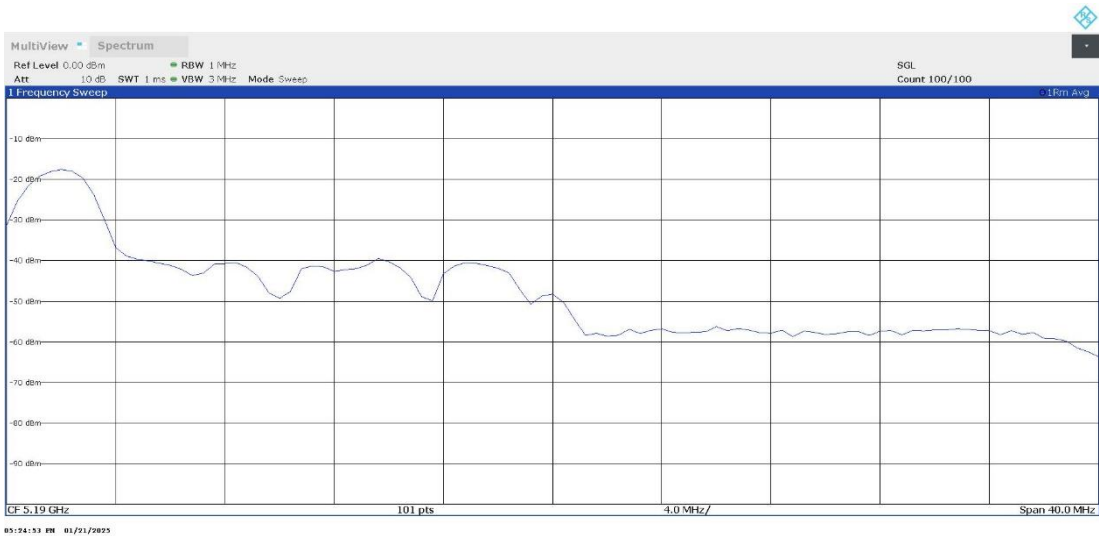
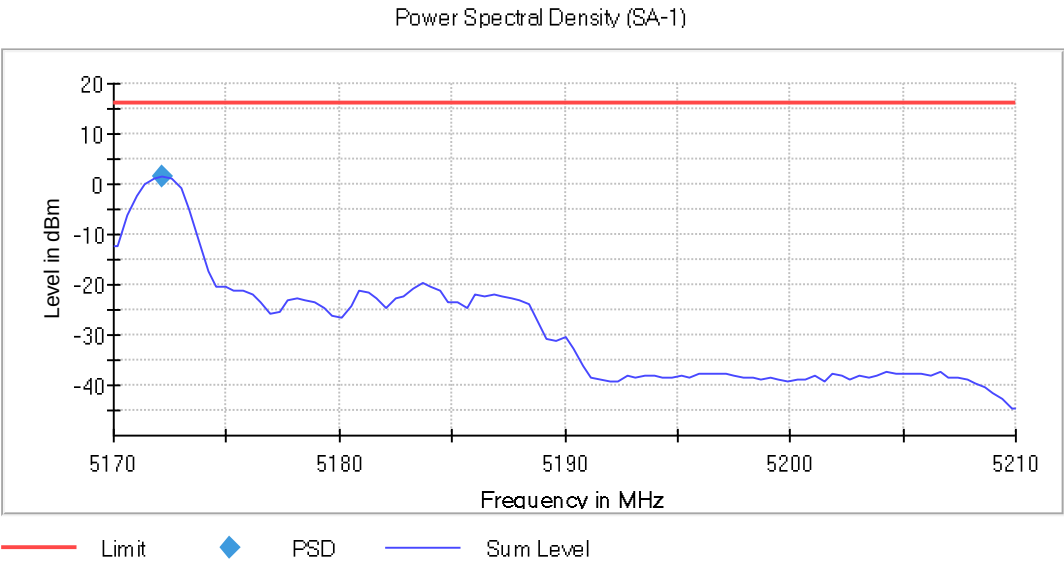
Verdict

Pass

Attachments

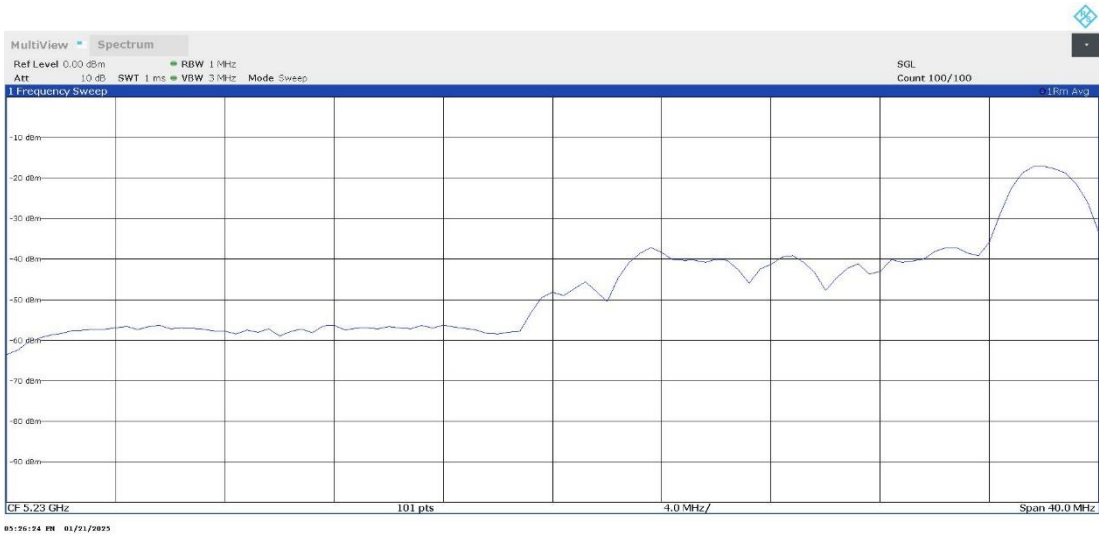
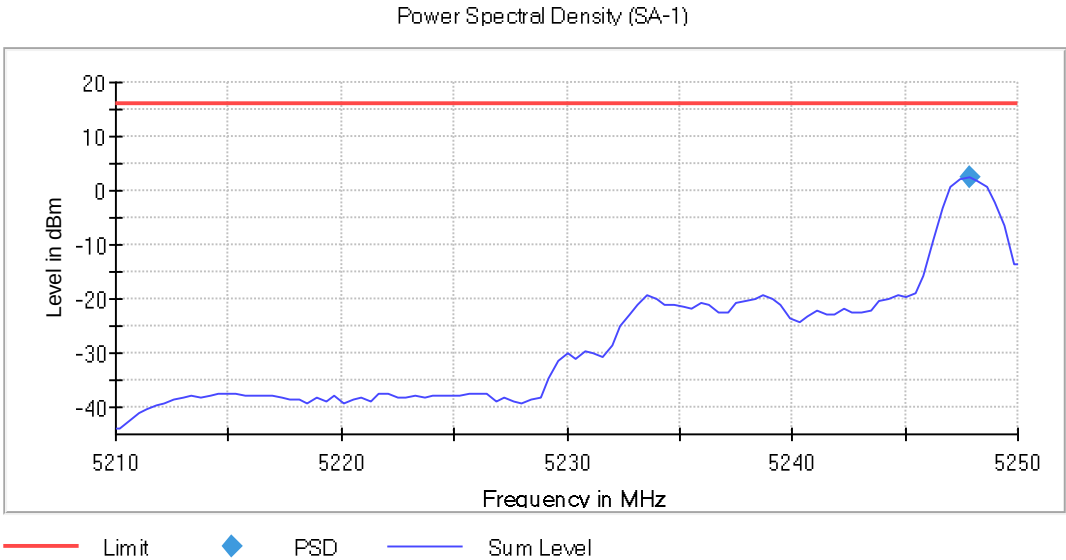
Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5190.00000 Modulation = 802.11ax HE20 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = MIMO

Images:



Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5230.00000 Modulation = 802.11ax HE80 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ax HE80 (OFDMA MCS0) SU

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5210.00000	No	5235.250000	-12.093

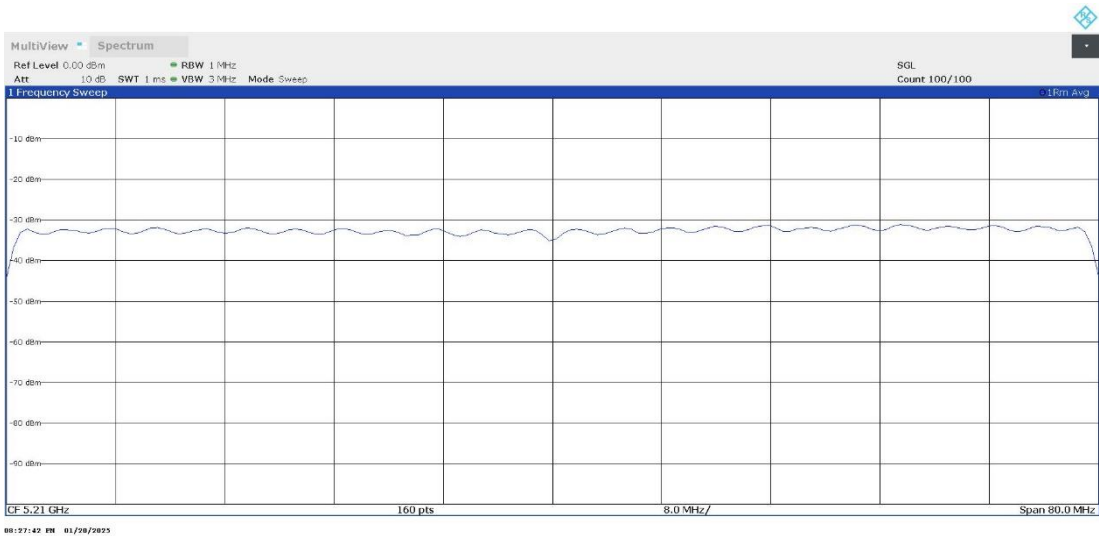
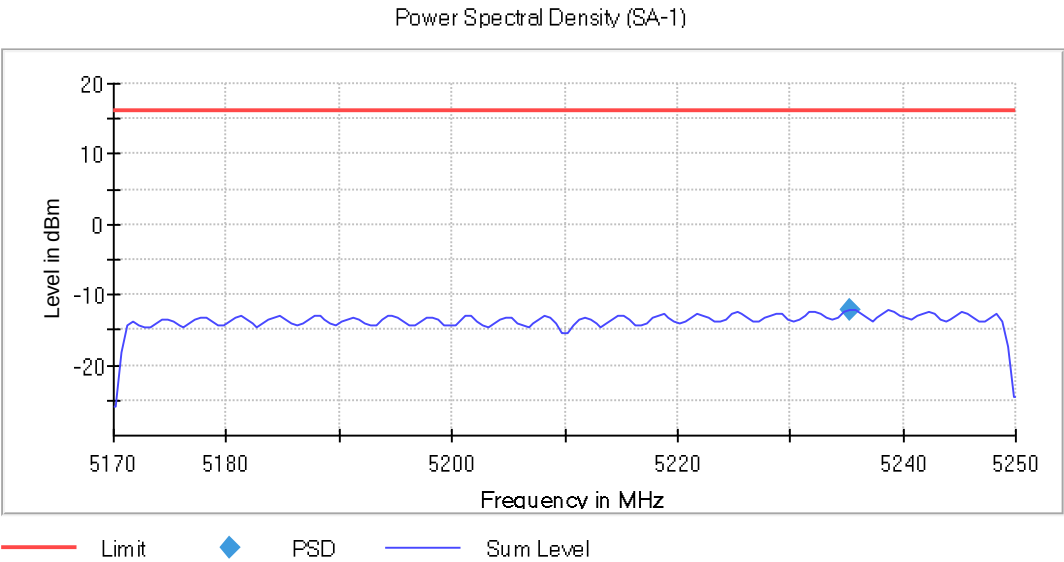
Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5190.00000 Modulation = 802.11ax HE80 (OFDMA MCS0) SU
TPC = No Antenna Configuration = MIMO

Images:



Modulation: 802.11ax HE80 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq (MHz)	TPC	Freq (MHz)	PSD (dBm)
[5150, 5250]	3+2	5210.00000	No	5207.750000	2.069

Offset RU used in each channel:

Operation Band (MHz)	Channel	Offset
[5150, 5250]	Single (5190MHz):	18
[5725, 5850]	Single (5755MHz):	18

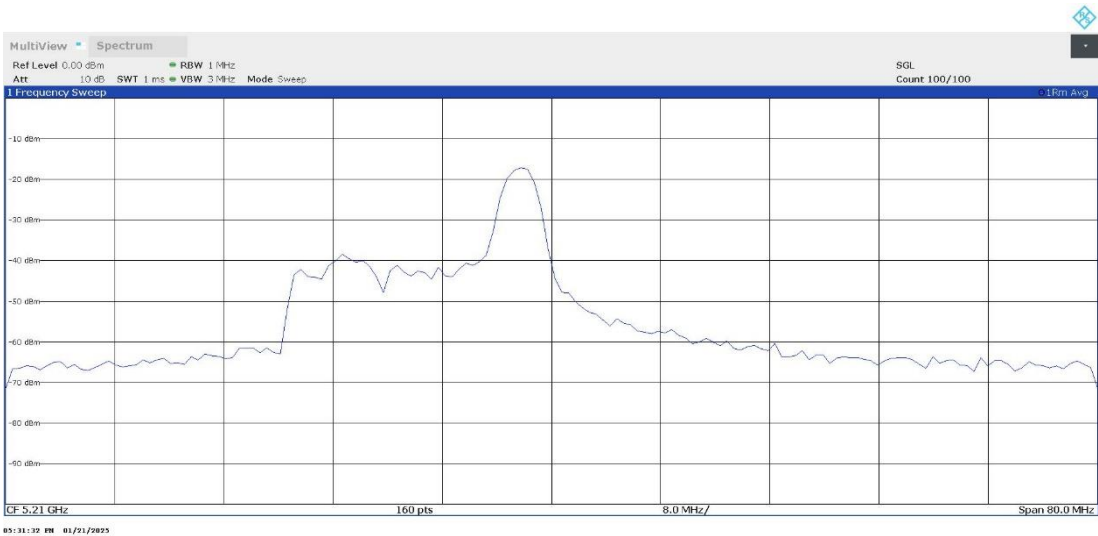
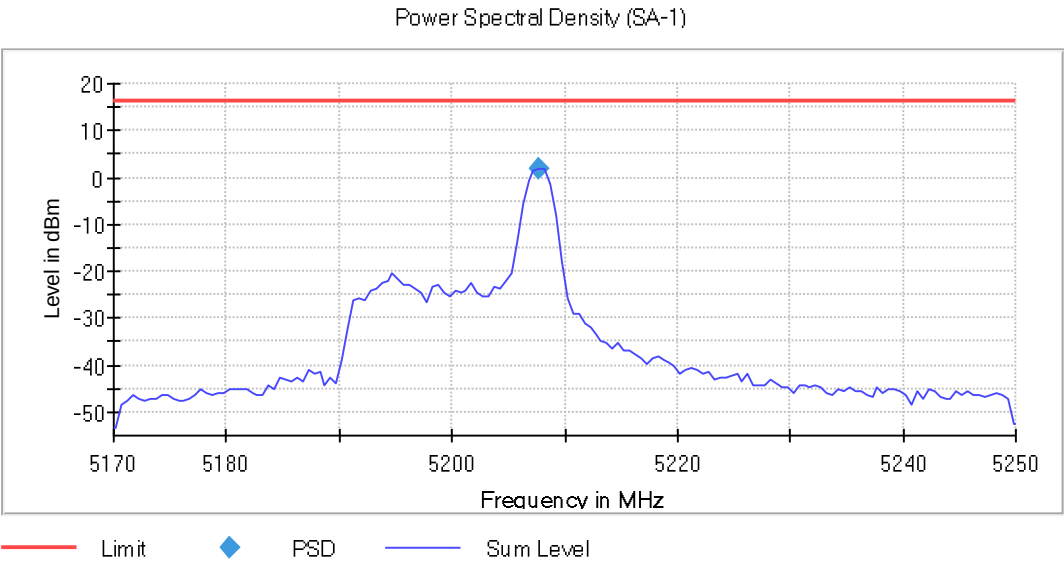
Verdict

Pass

Attachments

Operation Band MHz = [5150, 5250] Active Port = 3+2
Frequency MHz = 5190.00000 Modulation = 802.11ax HE80 (OFDMA MCS0) RU26
TPC = No Antenna Configuration = MIMO MIMO

Images:



FCC 15.407 (b)(1) Transmitter Out of Band Radiated Emissions

Limit:

For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 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)	-	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, specified when measuring with peak detector function.

Results

The worst case was determined by measuring the e.i.r.p density (radiated). Test performed on the worst-case:

Test performed on all the supported modes of the EUT, in the worst data rates after preliminary testing.

Worst case mode in terms of spurious emissions is reported below.

This test was performed on all the supported modes of the EUT, in the worst data rates after preliminary testing.

This test was performed on determined SISO Chain 0 (Port 3) as worst-case after preliminary testing.

Frequency range tested for Radiated emissions:

Start frequency: no radiofrequency signal generated in the device found below 10th sub-harmonic, no further investigation required.

Stop frequency: it has been performed the radiated spurious emissions until 10th harmonic.

Frequency range 1 - 17 GHz

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.

SISO (Port 3) (worst-case)

Results

Modulation: 802.11ax HE20 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[5150, 5250]	3	[1, 6.5]	5180.00000	1501.600	54.62	V	PK
					43.49	V	AVG
				2492.150	58.67	V	PK
					46.23	V	AVG
			4994.100	58.43	V	PK	
				44.46	V	AVG	
			5220.00000	4988.600	59.57	V	AVG
					43.23	V	PK

Modulation: 802.11ax HE40 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[5150, 5250]	3	[1, 6.5]	5190.00000	4980.900	58.17	V	PK
					42.86	V	AVG

Modulation: 802.11ax HE80 (OFDMA MCS0) RU26

Operation Band (MHz)	Port	Freq Rng (GHz)	Freq (MHz)	Unwanted Freq (MHz)	Unwanted Lvl (dBµV/m)	Pol	Detector
[5150, 5250]	3	[1, 6.5]	5180.00000	4987.225	56.13	V	PK
					42.52	V	AVG

Verdict

Pass

Attachments

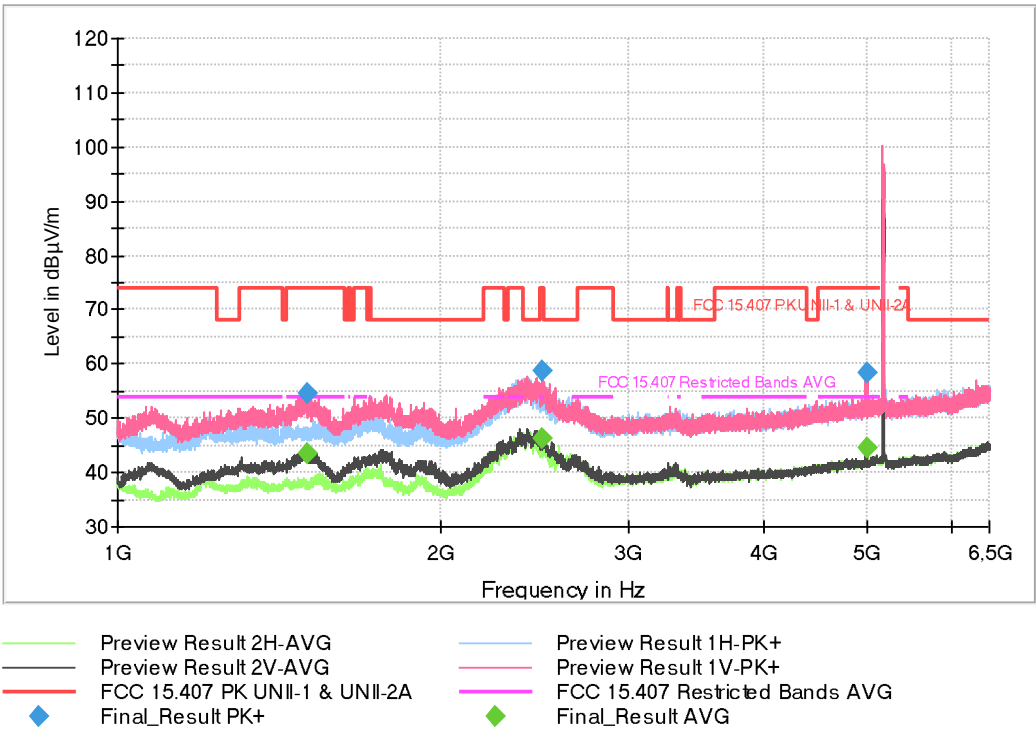
The measurement settings for each range of frequency is as follows:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESW 44] 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: [ESW 44] 17 GHz - 40 GHz	766,667 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Operation Band MHz = [5150, 5250] Active Port = 3
Frequency Range GHz = [1, 6.5] Frequency MHz = 5180.00000
Modulation = 802.11ax HE20 (OFDMA MCS0) RU26 Antenna Configuration = SISO

Images:

Full Spectrum



Operation Band MHz = [5150, 5250] Active Port = 3
Frequency Range GHz = [1, 6.5] Frequency MHz = 5220.00000
Modulation = 802.11ax HE20 (OFDMA MCS0) RU26 Antenna Configuration = SISO

Images:

Full Spectrum

