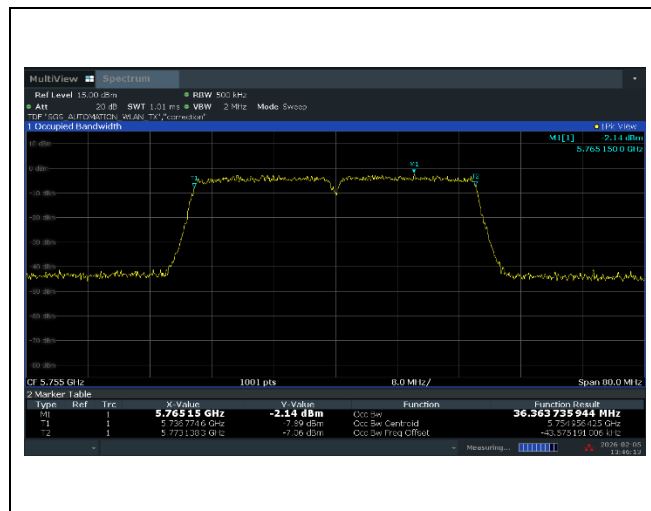
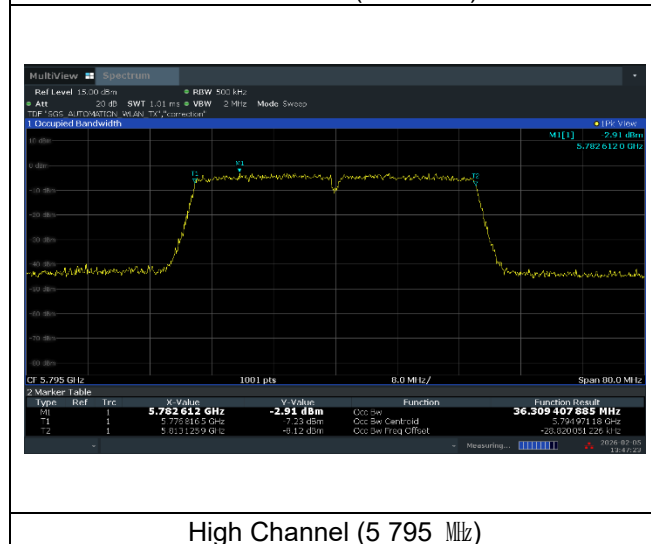


11n_HT40 (U-NII 3)

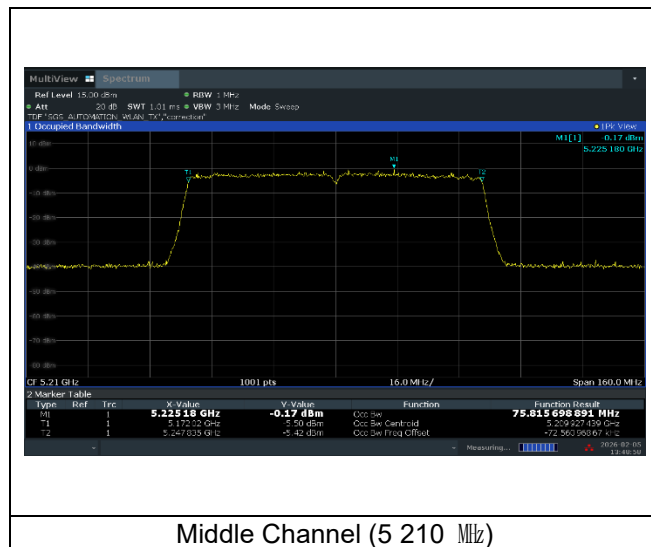


Low Channel (5.755 MHz)

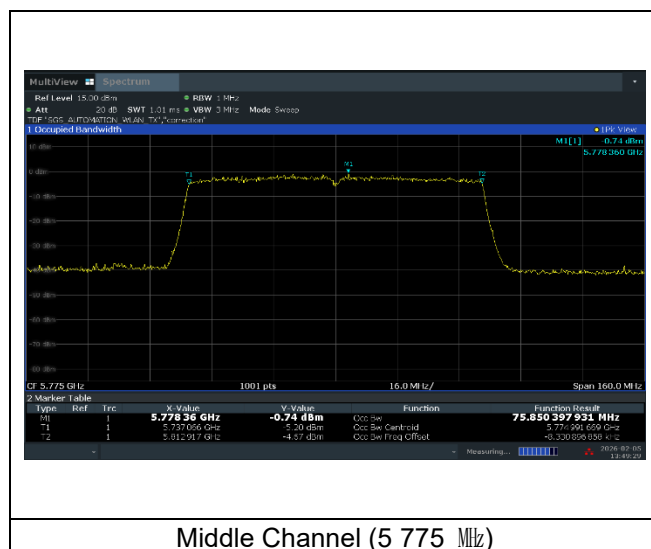


High Channel (5.795 MHz)

11ac_VHT80 (U-NII 1)



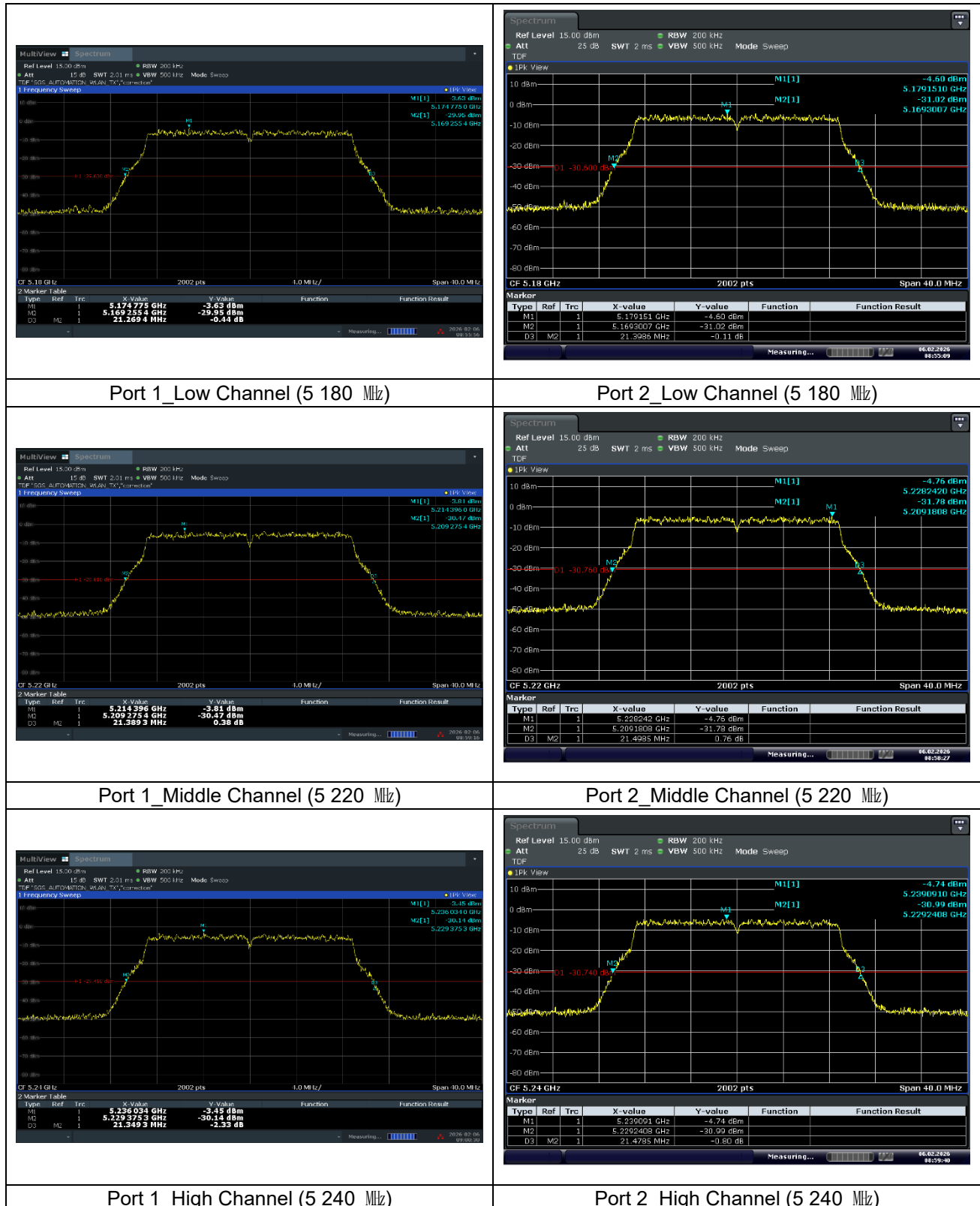
11ac_VHT80 (U-NII 3)



- Ant. 1 + Ant. 2

26 dB Bandwidth

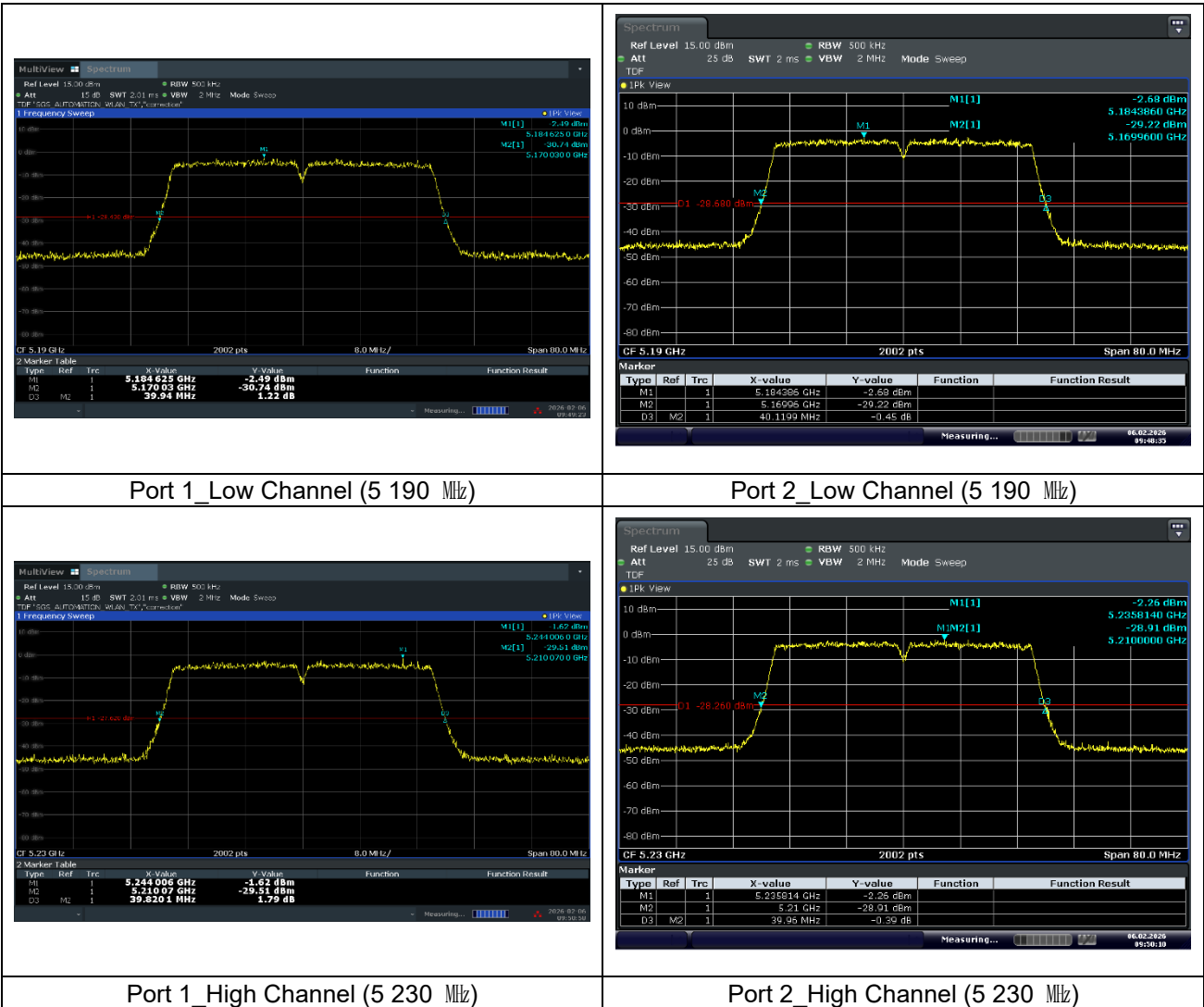
11ac_VHT20 (Band 1)



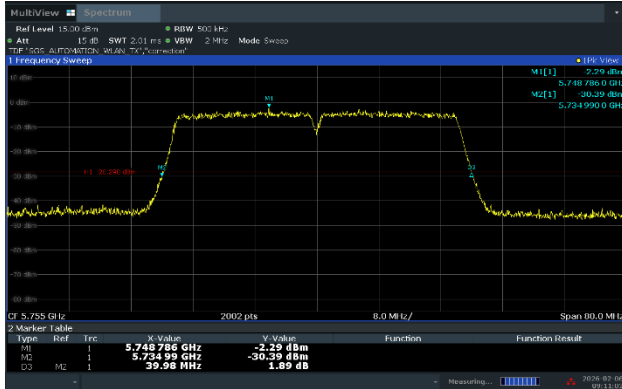
11ac_VHT20 (U-NII 3)



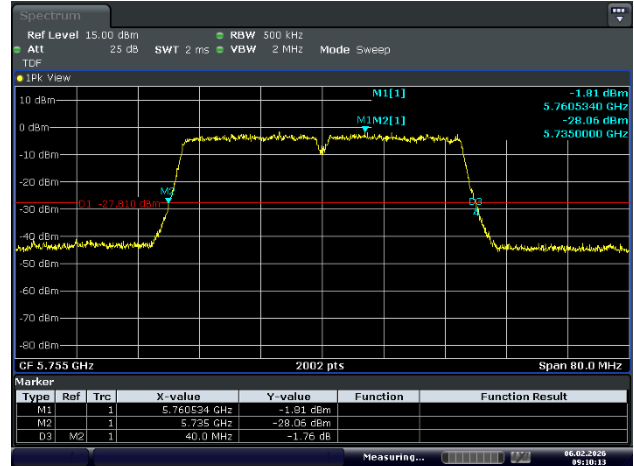
11n_HT40 (U-NII 1)



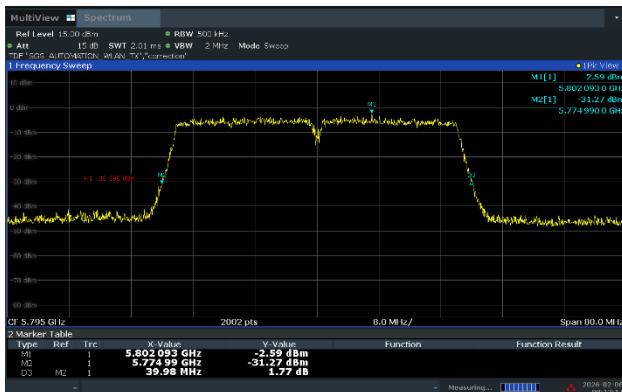
11n_HT40 (U-NII 3)



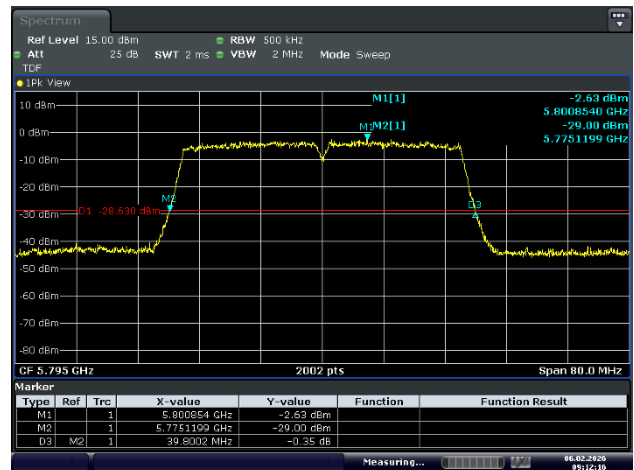
Port 1_Low Channel (5 755 MHz)



Port 2_Low Channel (5 755 MHz)

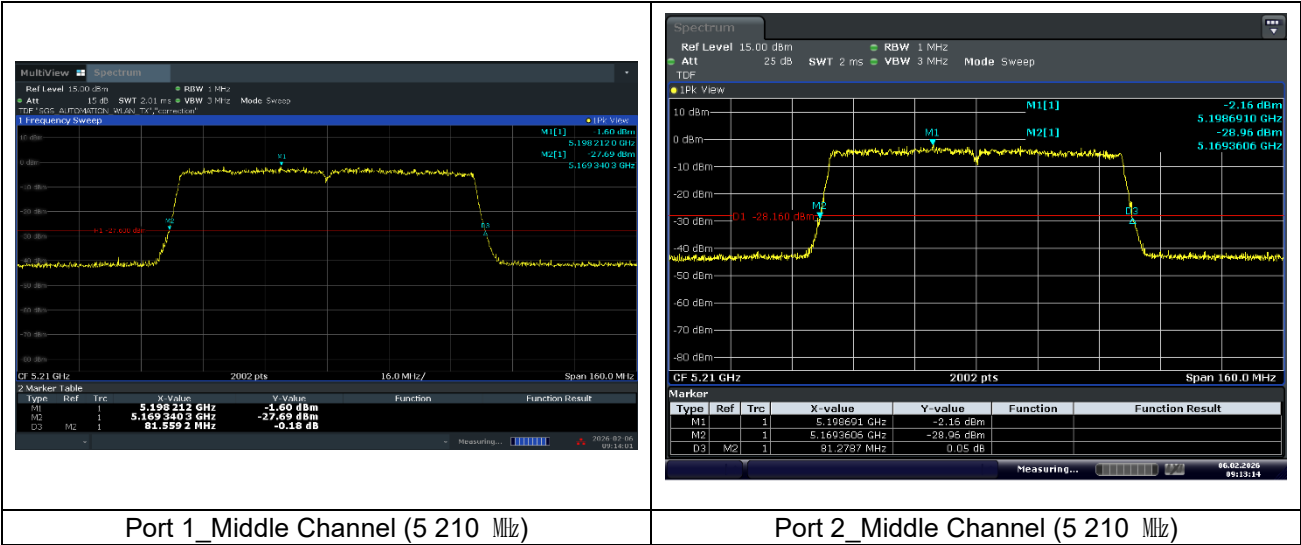


Port 1_High Channel (5 795 MHz)

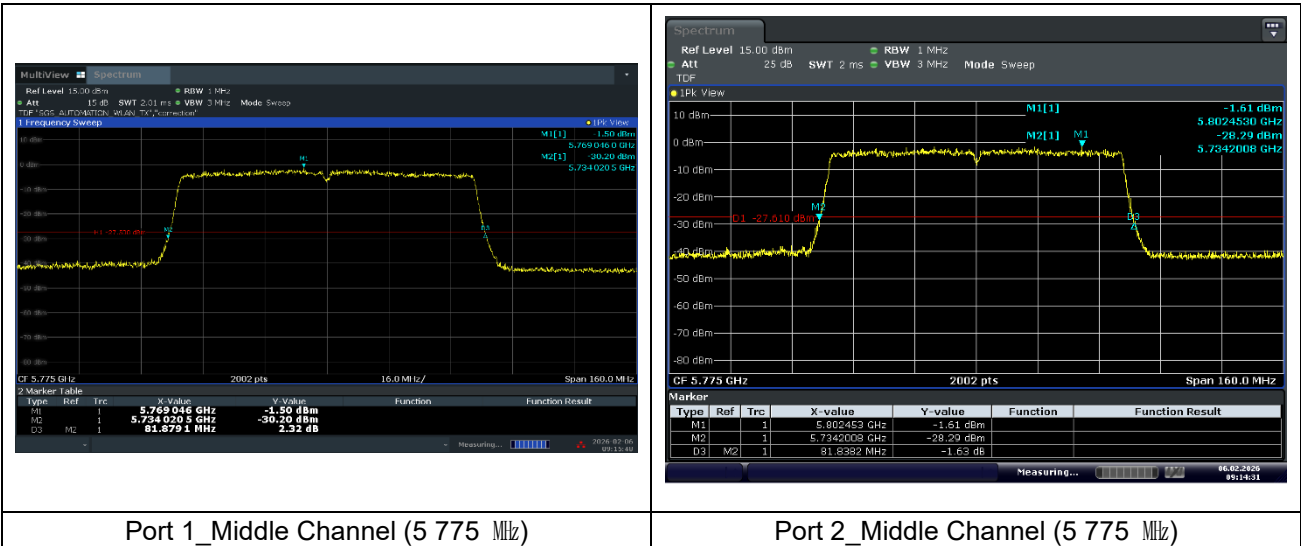


Port 2_High Channel (5 795 MHz)

11ac_VHT80 (U-NII 1)



11ac_VHT80 (U-NII 3)

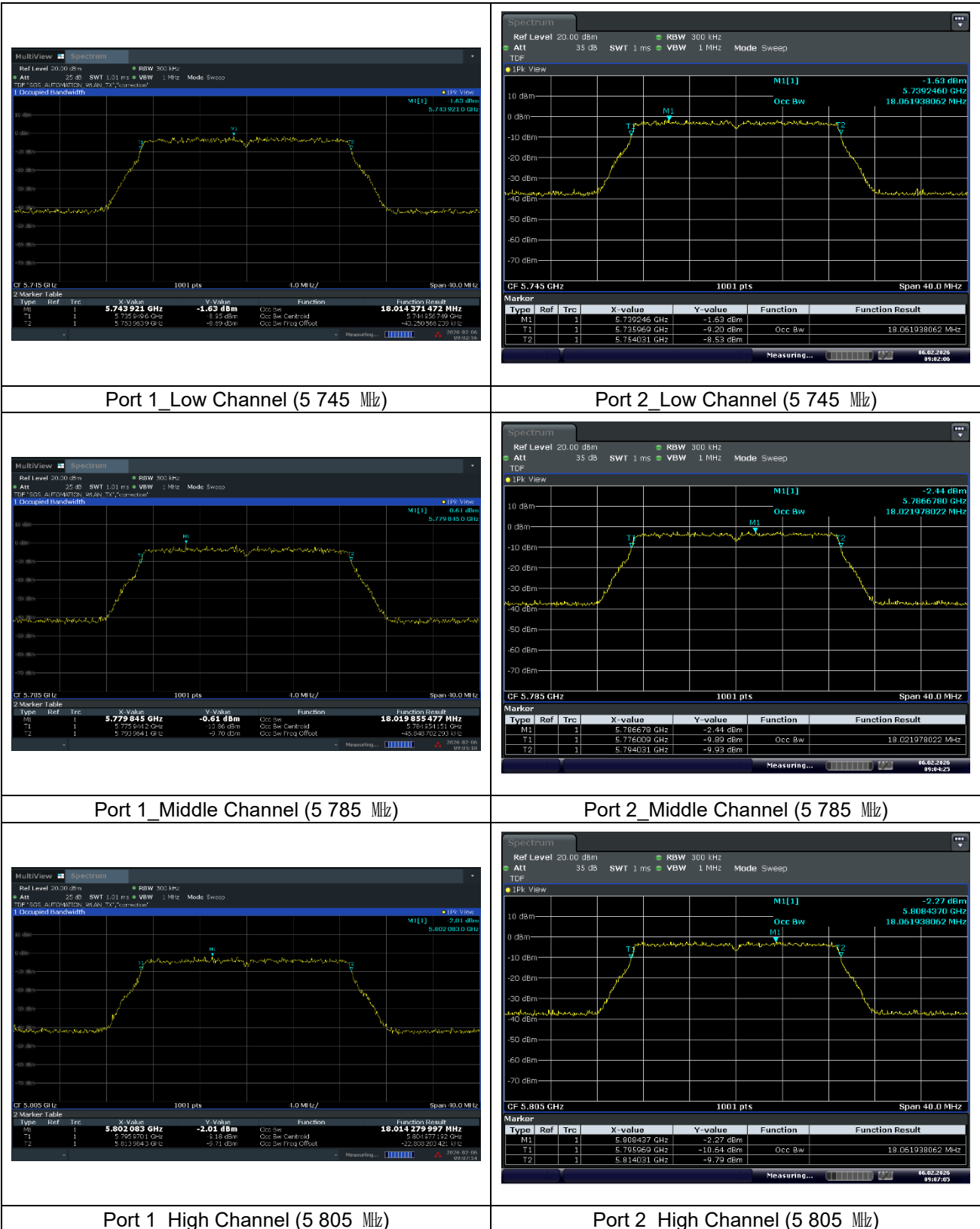


99 % Bandwidth

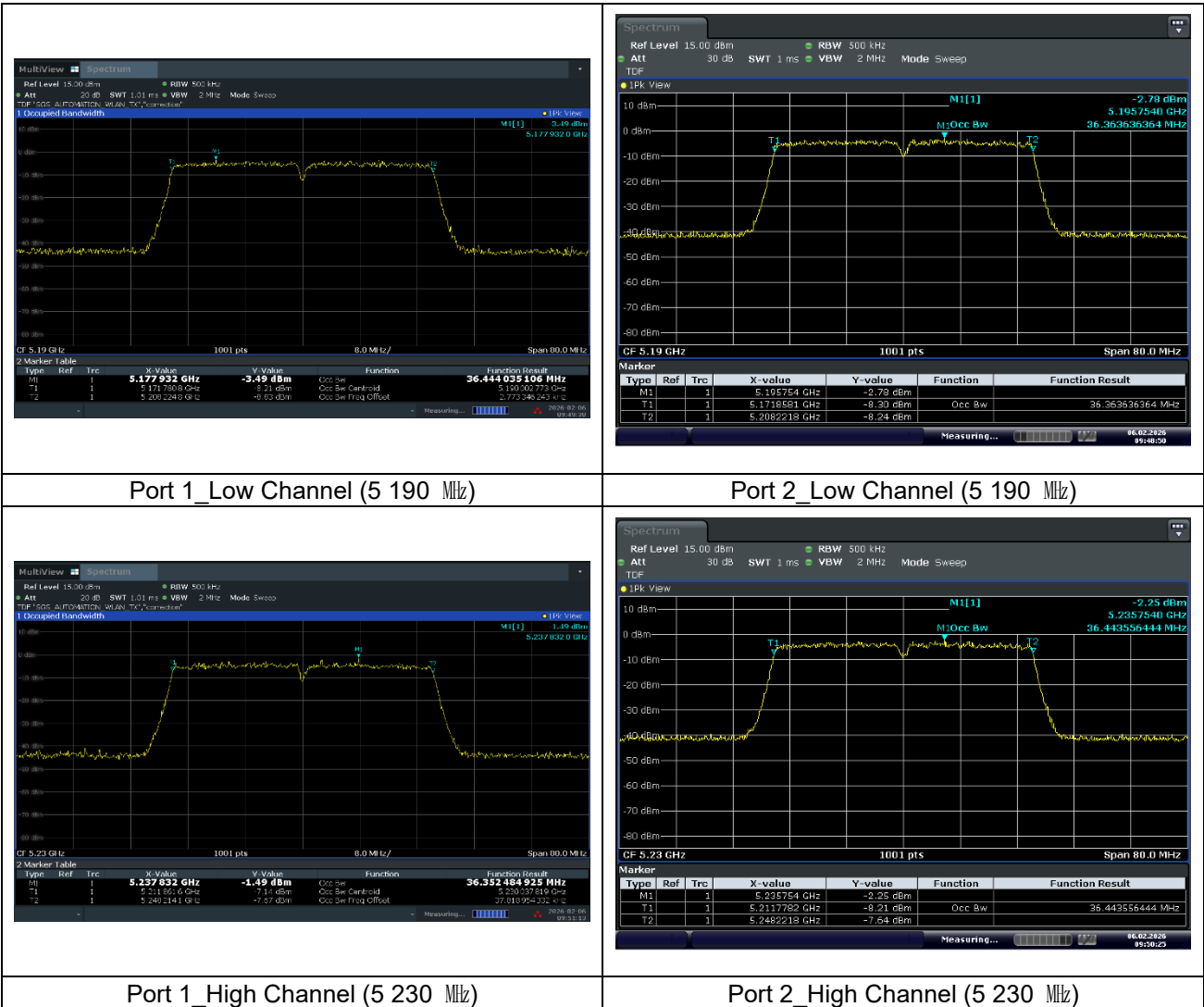
11ac_VHT20 (U-NII 1)



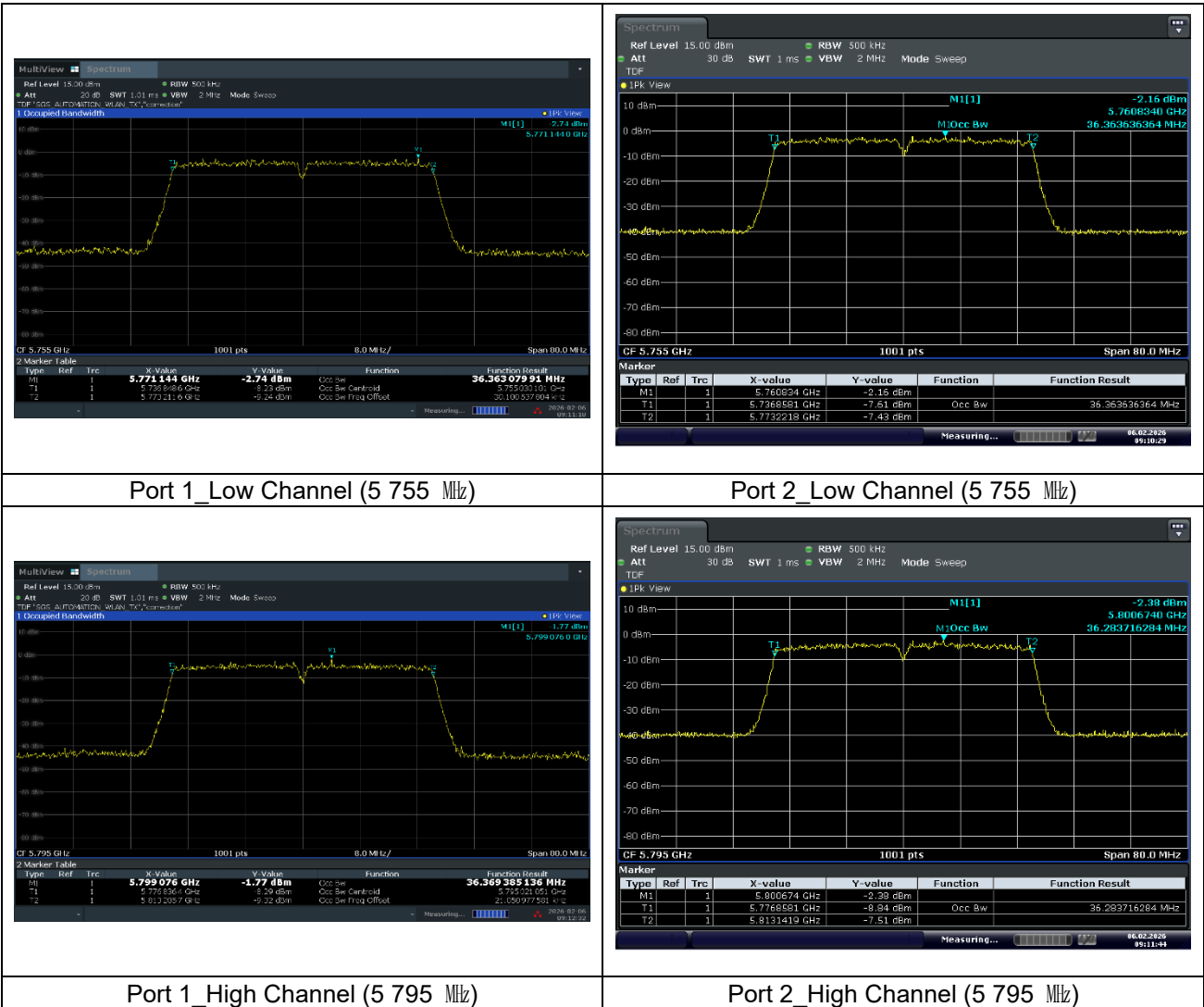
11ac_VHT20(U-NII 3)



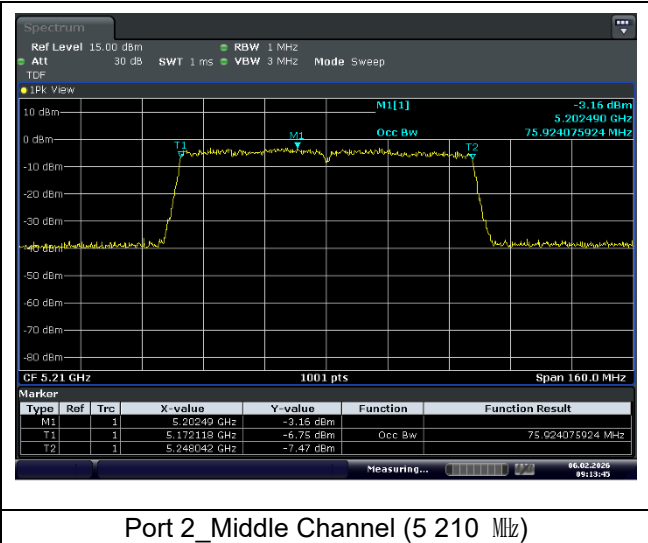
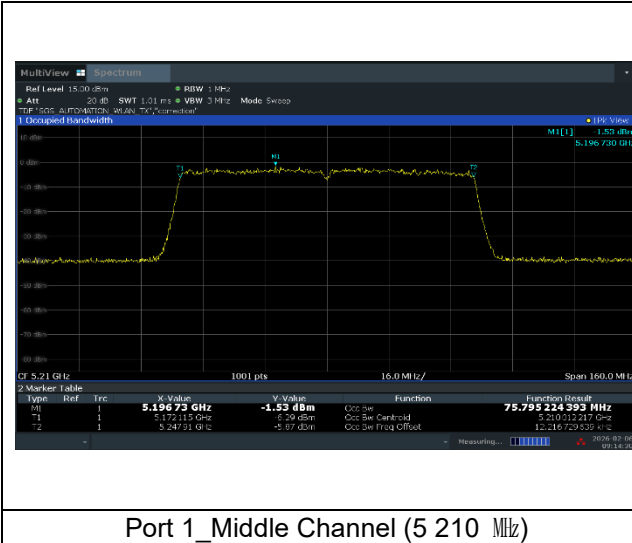
11n_HT40 (U-NII 1)



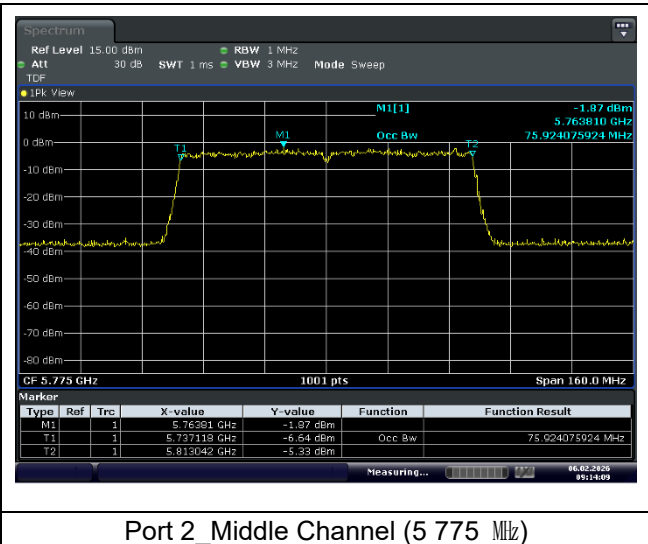
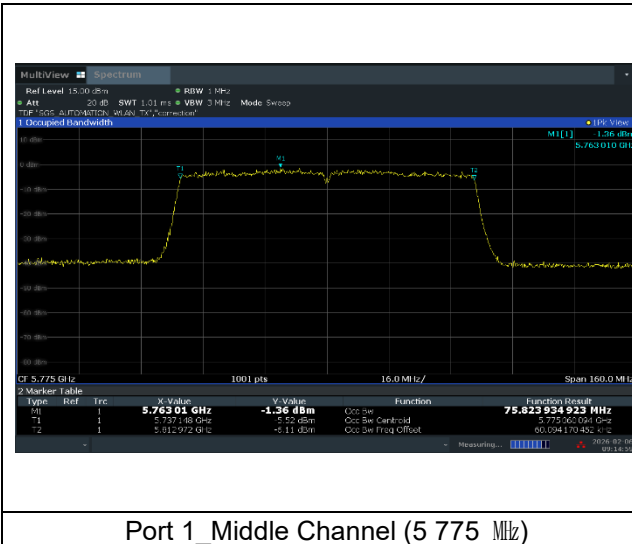
11n_HT40 (U-NII 3)



11ac_VHT80 (U-NII 1)

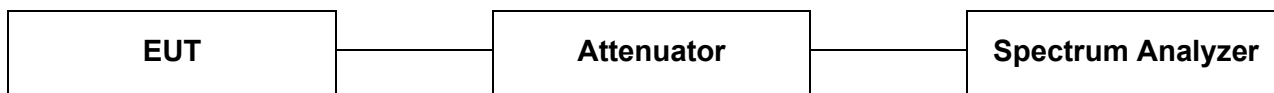


11ac_VHT80 (U-NII 3)



4. 6 dB Bandwidth

4.1. Test Setup



4.2. Limit

According to §15.407(e), within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

4.3. Test Procedure

1. This measurement settings are specified in section II.C.2 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = 100 kHz.
3. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 %

- Ant. 1

Band	Mode	Frequency (MHz)	Ch.	Data Rate	6 dB Bandwidth (MHz)	Minimum Bandwidth (kHz)
U-NII 3	11a	5 745	149	48 Mbps	16.512	500
		5 785	157		16.492	
		5 805	161		16.512	

- Ant. 2

Band	Mode	Frequency (MHz)	Ch.	Data Rate	6 dB Bandwidth (MHz)	Minimum Bandwidth (kHz)
U-NII 3	11a	5 745	149	48 Mbps	16.512	500
		5 785	157		16.492	
		5 805	161		16.512	

- Ant. 3

Band	Mode	Frequency (MHz)	Ch.	Data Rate	6 dB Bandwidth (MHz)	Minimum Bandwidth (kHz)
U-NII 3	11a	5 745	149	48 Mbps	16.532	500
		5 785	157		16.532	
		5 805	161		16.512	
	11n_HT20	5 745	149	MCS5	17.771	
		5 785	157		17.731	
		5 805	161		17.731	
	11n_HT40	5 755	151	MCS5	36.462	
		5 795	159		36.422	
	11ac_VHT80	5 775	155	MCS5	76.442	

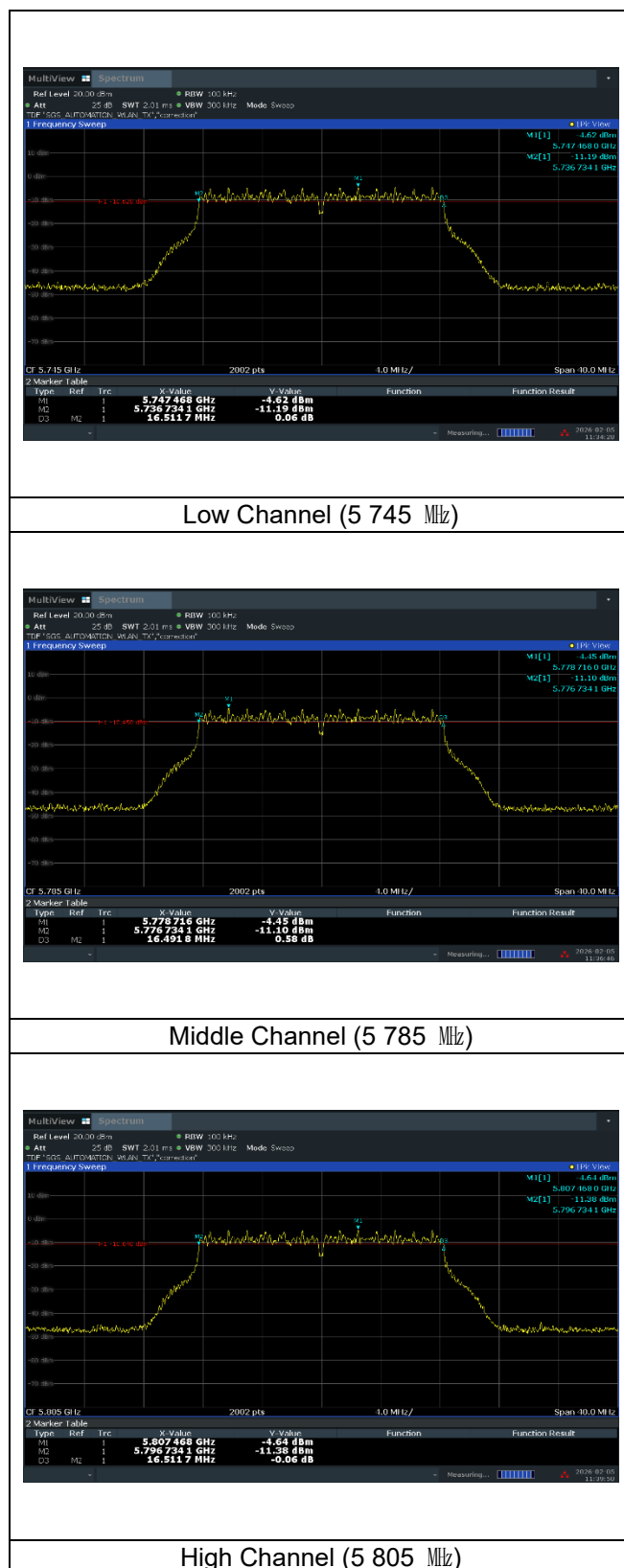
- Ant. 1 + Ant. 2

Band	Mode	Frequency (MHz)	Ch.	Data Rate	6 dB Bandwidth (MHz)		Minimum Bandwidth (kHz)
					Port 1	Port 2	
U-NII 3	11ac_VHT20	5 745	149	MCS5	17.731	17.742	500
		5 785	157		17.751	17.682	
		5 805	161		17.711	17.742	
	11n_HT40	5 755	151	MCS6	36.502	36.484	
		5 795	159		36.462	36.444	
	11ac_VHT80	5 775	155	MCS5	75.882	76.484	

Test plots

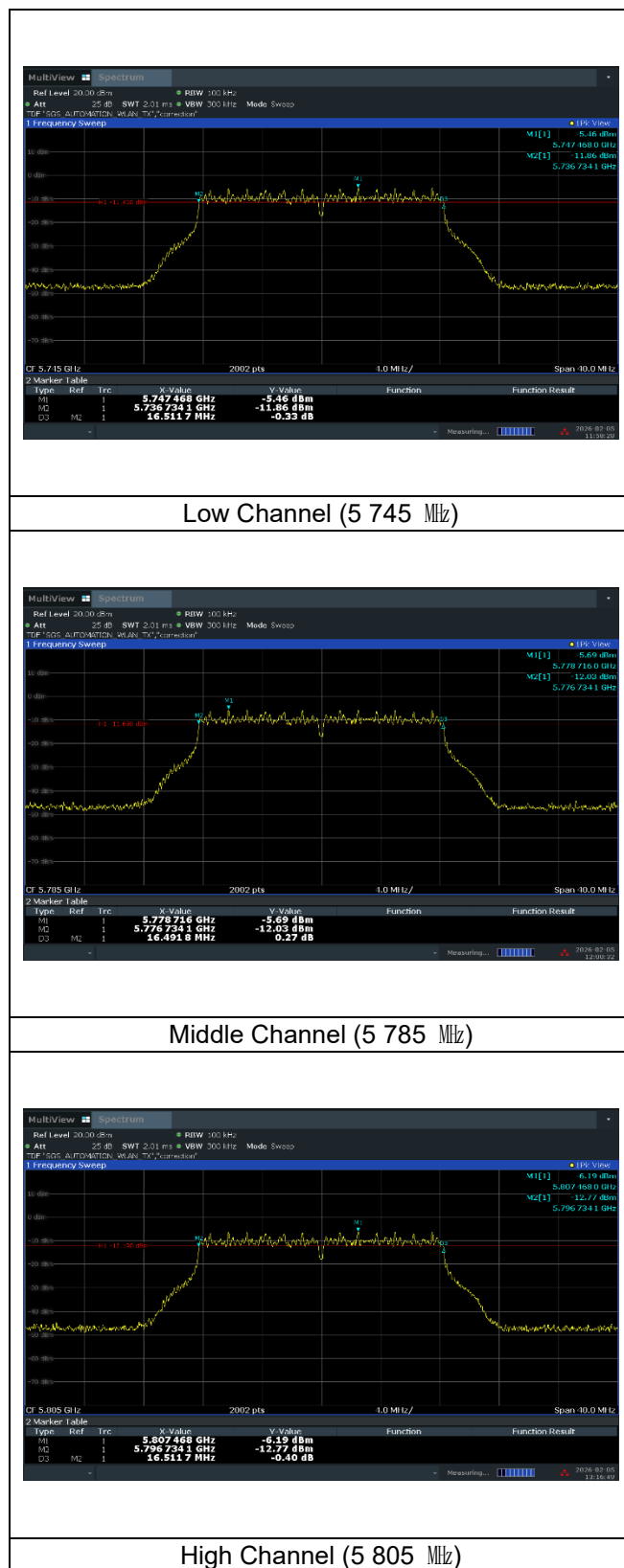
- Ant. 1

11a (U-NII 3)



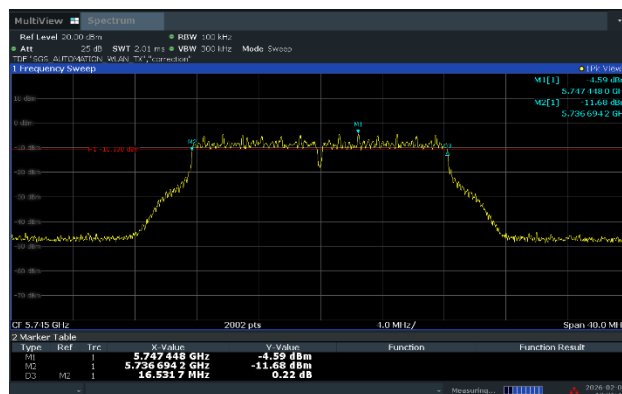
- Ant. 2

11a (U-NII 3)

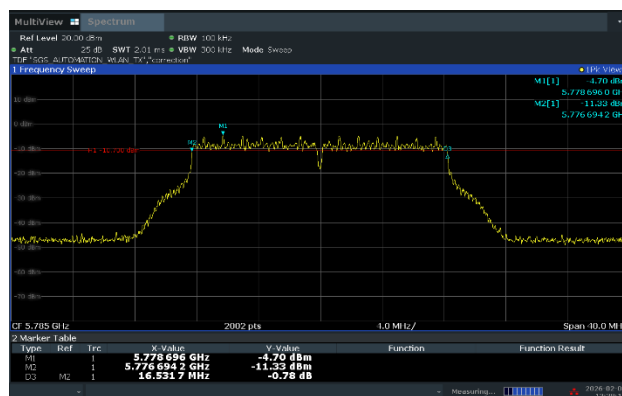


- Ant. 3

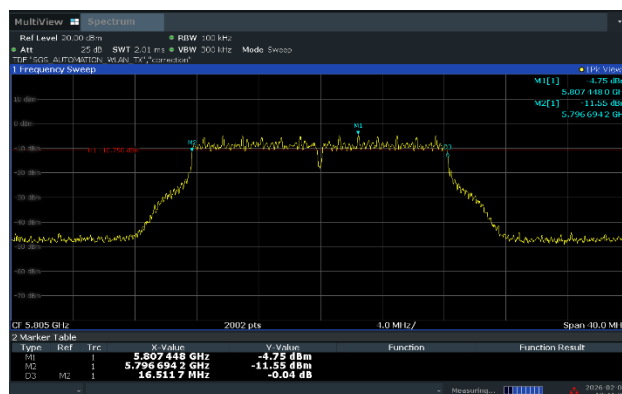
11a (U-NII 3)



Low Channel (5 745 MHz)

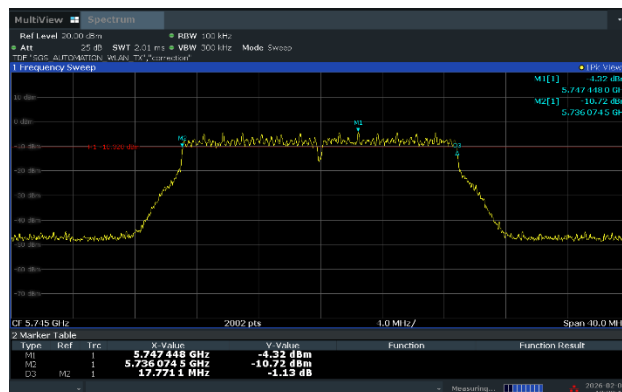


Middle Channel (5 785 MHz)

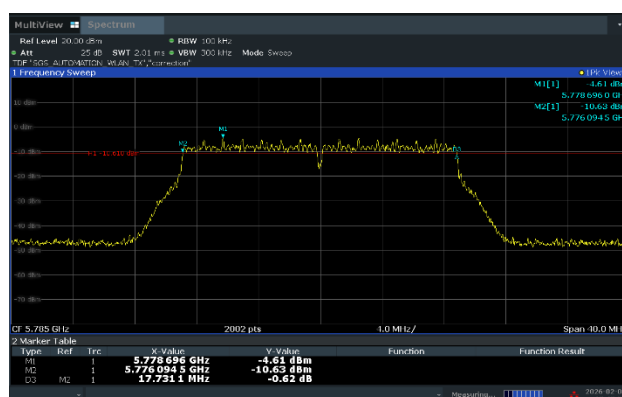


High Channel (5 805 MHz)

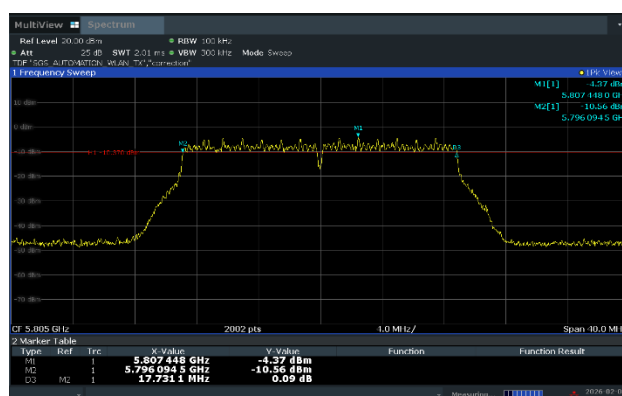
11n_HT20 (U-NII 3)



Low Channel (5.745 MHz)

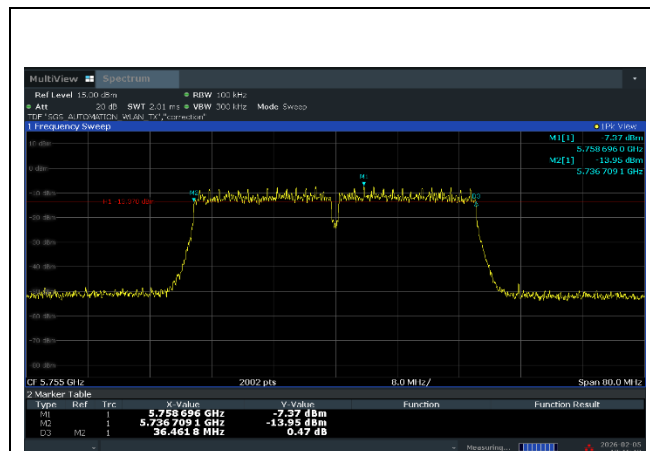


Middle Channel (5.785 MHz)

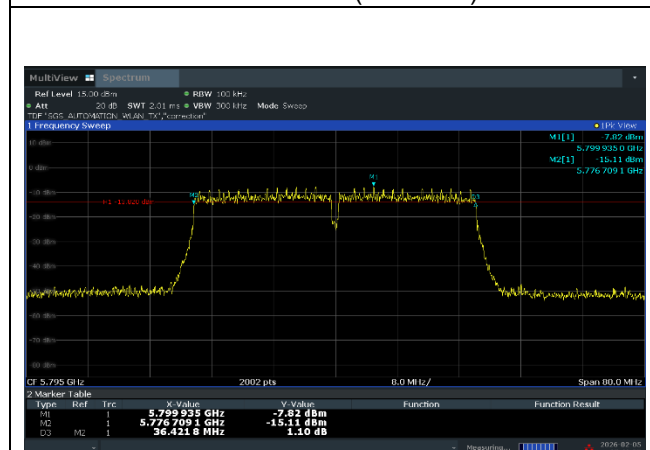


High Channel (5.805 MHz)

11n_HT40 (U-NII 3)

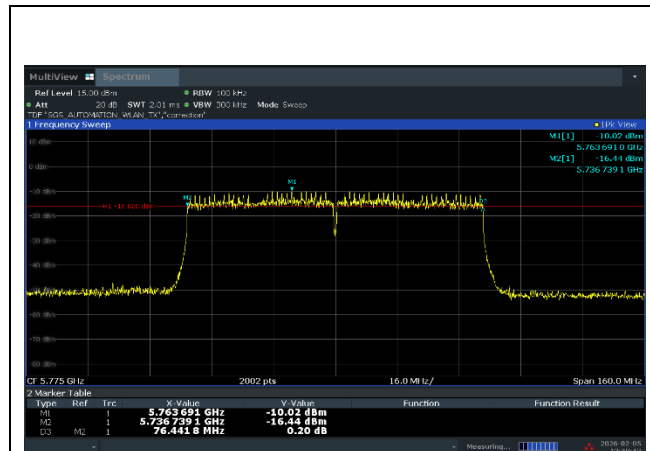


Low Channel (5.755 MHz)



High Channel (5.795 MHz)

11ac_VHT80 (U-NII 3)



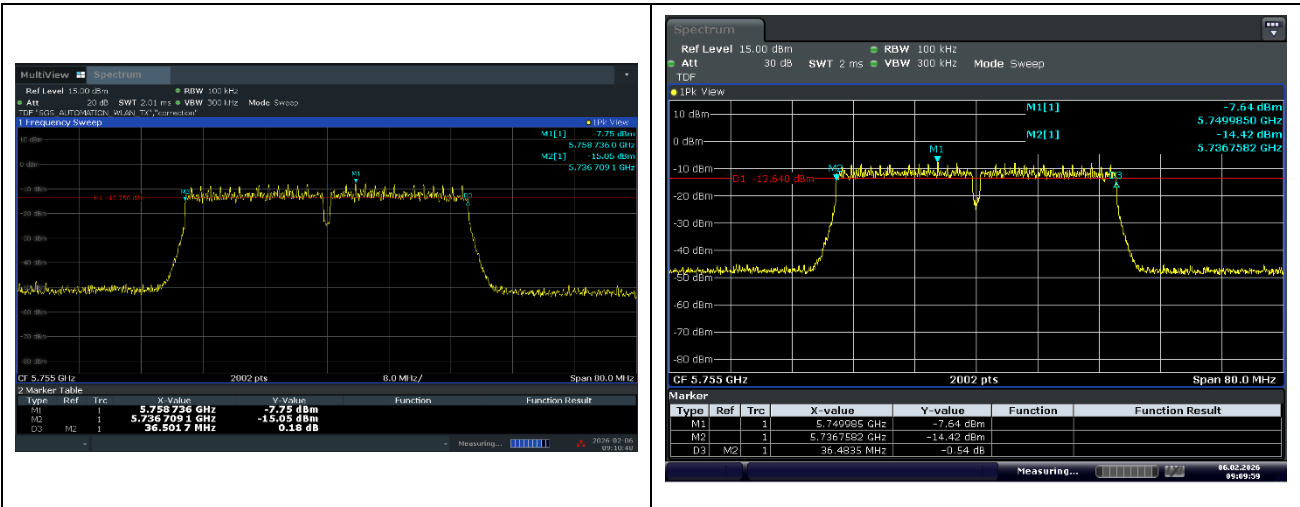
Middle Channel (5.775 MHz)

- Ant. 1 + Ant. 2

11ac_VHT20 (U-NII 3)

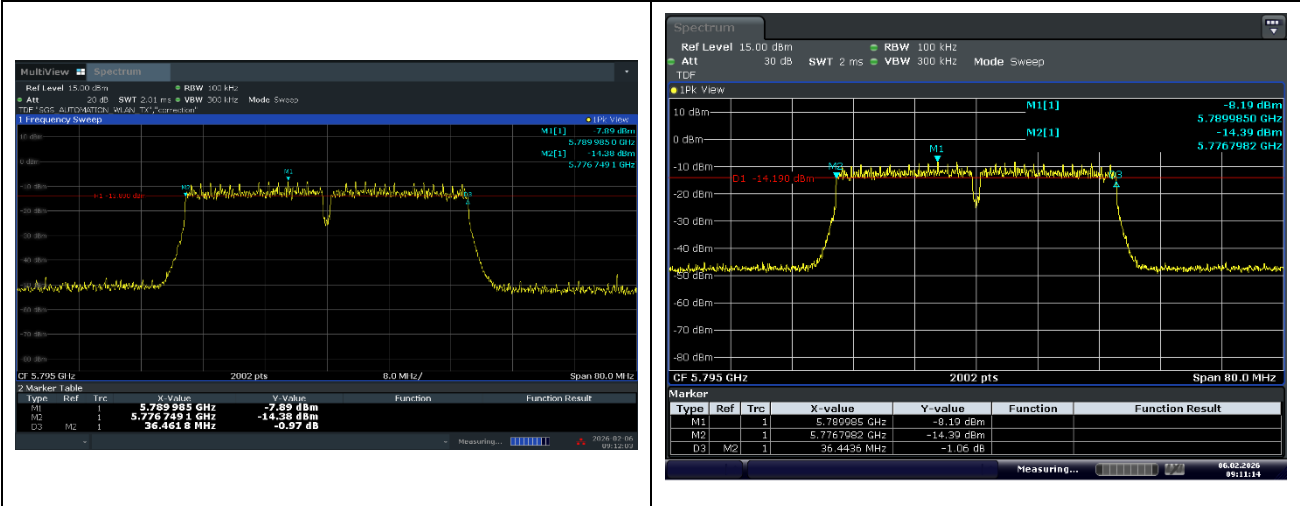


11n_HT40 (U-NII 3)



Port 1_Low Channel (5.755 MHz)

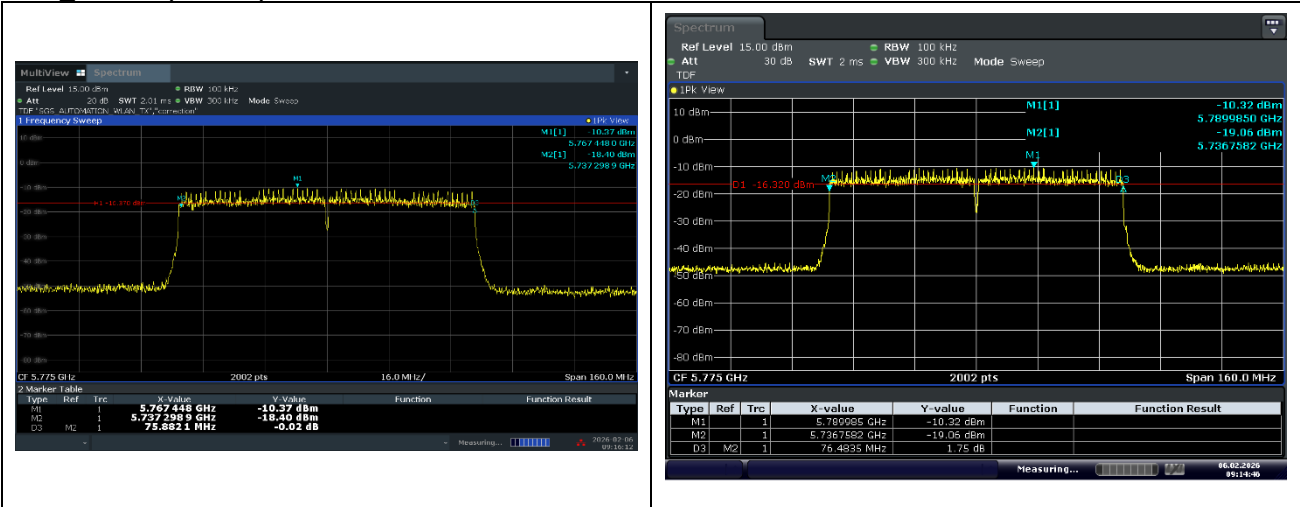
Port 2_Low Channel (5.755 MHz)



Port 1_High Channel (5.795 MHz)

Port 2_High Channel (5.795 MHz)

11ac_VHT80 (U-NII 3)

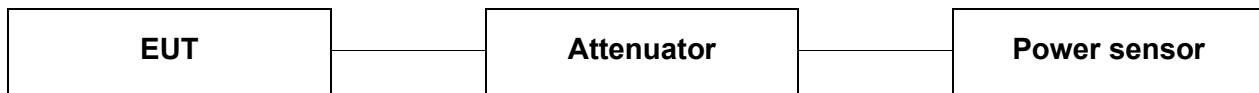


Port 1_Middle Channel (5.775 MHz)

Port 2_Middle Channel (5.775 MHz)

5. Maximum Conducted Output Power

5.1. Test Setup



5.2. Limit

According to 15.407(a)(1)(i)

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, 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. In addition, 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.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

5.3. Test Procedure

1. This measurement settings are specified in section II.E.3.b of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

5.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 %

- Ant. 1

Test mode: 11a

Band	Frequency (MHz)	Data Rate	Average Power (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 180	48 Mbps	6.25	2.80	9.05
	5 220		6.58		9.38
	5 240		6.22		9.02
U-NII 3	5 745		7.30	0.40	7.70
	5 785		7.71		8.11
	5 805		7.95		8.35

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)		
		Client	Access point				Client	Access point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 180	23.98				2.80	23.98	30	21
	5 220								
	5 240								
U-NII 3	5 745	30				0.40	30		-
	5 785								
	5 805								

Remark;

1. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

- Ant. 2

Test mode: 11a

Band	Frequency (MHz)	Data Rate	Average Power (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 180	48 Mbps	5.16	2.00	7.16
	5 220		5.82		7.82
	5 240		5.20		7.20
U-NII 3	5 745		7.28	3.70	10.98
	5 785		6.92		10.62
	5 805		7.43		11.13

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)		
		Client	Access point				Client	Access point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 180	23.98			2.00	23.98	30	21	
	5 220								
	5 240								
U-NII 3	5 745	30			3.70	30		-	
	5 785								
	5 805								

Remark;

1. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

- Ant. 3

Test mode: 11a

Band	Frequency (MHz)	Data Rate	Average Power (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 180	48 Mbps	6.84	3.90	10.74
	5 220		7.79		11.69
	5 240		6.46		10.36
U-NII 3	5 745		7.92	2.00	9.92
	5 785		7.99		9.99
	5 805		7.02		9.02

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)		
		Client	Access point				Client	Access point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 180	23.98			3.90	23.98	30	21	
	5 220								
	5 240								
U-NII 3	5 745	30			2.00	30		-	
	5 785								
	5 805								

Test mode: 11n_HT20

Band	Frequency (MHz)	Data Rate	Average Power (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 180	MCS5	7.51	3.90	11.41
	5 220		7.24		11.14
	5 240		7.29		11.19
U-NII 3	5 745		7.88	2.00	9.88
	5 785		7.75		9.75
	5 805		7.27		9.27

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)		
		Client	Access point				Client	Access point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 180	23.98			3.90	23.98	30	21	
	5 220								
	5 240								
U-NII 3	5 745	30			2.00	30		-	
	5 785								
	5 805								

Remark;

1. E.I.R.P. (dB m) = Average Power (dB m) + Antenna Gain (dB i)

Test mode: 11n_HT40

Band	Frequency (MHz)	Data Rate	Average Power (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 190	MCS5	7.28	3.90	11.18
	5 230		6.85		10.75
U-NII 3	5 755		7.96	2.00	9.96
	5 795		7.33		9.33

Band	Frequency (MHz)	Limit						
		Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)	
		Client	Access Point				Client	Access Point
U-NII 1	5 190	23.98	30			3.90	23.98	30
	5 230							
U-NII 3	5 755	30				2.00	30	-
	5 795							

Test mode: 11ac_VHT80

Band	Frequency (MHz)	Data Rate	Average Power (dB m)	Antenna Gain (dB i)	E.I.R.P. (dB m)
U-NII 1	5 210	MCS5	6.69	3.90	10.59
U-NII 3	5 775		6.78	2.00	8.78

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)		
		Client	Access Point				Client	Access Point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 210	23.98				3.90	23.98	30	21
U-NII 3	5 775	30				2.00	30		-

Remark;

1. E.I.R.P. (dB m) = Average Power Result (dB m) + Antenna Gain (dB i)

- Ant. 1 + Ant. 2

Test mode: 11ac_VHT20

Band	Frequency (MHz)	Data Rate	Port 1 Average Power (dB m)	Port 2 Average Power (dB m)	MIMO Average Power (dB m)
U-NII 1	5 180	MCS5	6.73	5.89	9.34
	5 220		6.83	5.92	9.41
	5 240		6.52	5.70	9.14
U-NII 3	5 745		6.87	5.93	9.44
	5 785		7.00	5.55	9.35
	5 805		6.82	5.36	9.16
Band	Frequency (MHz)	Data Rate	MIMO Average Power (dB m)	Directional Antenna Gain (dB i)	MIMO E.I.R.P. (dB m)
U-NII 1	5 180	MCS5	9.34	5.42	14.76
	5 220		9.41		14.83
	5 240		9.14		14.56
U-NII 3	5 745		9.44	5.22	14.66
	5 785		9.35		14.57
	5 805		9.16		14.38

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Directional Antenna Gain (dB i)	Limit (dB m)		
		Client	Access point				Client	Access point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 180	23.98				5.42	23.98	30	21
	5 220								
	5 240								
U-NII 3	5 745	30				5.22	30		-
	5 785								
	5 805								

Remark;

- According to KDB 662911, Average power of each port and antenna gain was combined by using below calculation.

- Average power: $10 \log \{10^{(\text{Port 1 power} / 10)} + 10^{(\text{Port 2 power} / 10)}\}$

- Unequal antenna gains, with equal transmit powers. For antenna gains given by $G_1, G_2, \dots, G_N$ dB i

(i) If transmit signals are correlated, then

Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$ dB i [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

- E.I.R.P. (dB m) = Average Power (dB m) + Directional Antenna Gain (dB i)

Test mode: 11n_HT40

Band	Frequency (MHz)	Data Rate	Port 1 Average Power (dB m)	Port 2 Average Power (dB m)	MIMO Average Power (dB m)
U-NII 1	5 190	MCS6	6.56	5.86	9.23
	5 230		6.42	5.73	9.10
U-NII 3	5 755		6.36	5.24	8.85
	5 795		6.16	5.31	8.77
Band	Frequency (MHz)	Data Rate	MIMO Average Power (dB m)	Directional Antenna Gain (dB i)	MIMO E.I.R.P. (dB m)
U-NII 1	5 190	MCS6	9.23	5.42	14.65
	5 230		9.10		14.52
U-NII 3	5 755		8.85	5.22	14.07
	5 795		8.77		13.99

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Directional Antenna Gain (dB i)	Limit (dB m)		
		Client	Access Point				Client	Access Point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 190	23.98	30		5.42	23.98	30	21	
	5 230								
U-NII 3	5 755	30			5.22	30		-	
	5 795								

Remark;

1. According to KDB 662911, Average power of each port and antenna gain was combined by using below calculation.

- Average power: $10 \log \{10^{(\text{Port 1 power} / 10)} + 10^{(\text{Port 2 power} / 10)}\}$

- Unequal antenna gains, with equal transmit powers. For antenna gains given by $G_1, G_2, \dots, G_N$ dB i

(i) If transmit signals are correlated, then

Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$ dB i [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

2. E.I.R.P. (dB m) = Average Power (dB m) + Directional Antenna Gain (dB i)

Test mode: 11ac_VHT80

Band	Frequency (MHz)	Data Rate	Port 1 Average Power (dB m)	Port 2 Average Power (dB m)	MIMO Average Power (dB m)
U-NII 1	5 210	MCS5	6.25	5.62	8.96
U-NII 3	5 775		6.64	5.50	9.12
Band	Frequency (MHz)	Data Rate	MIMO Average Power (dB m)	Directional Antenna Gain (dB i)	MIMO E.I.R.P. (dB m)
U-NII 1	5 210	MCS5	8.96	5.42	14.38
U-NII 3	5 775		9.12	5.22	14.34

Band	Limit								
	Frequency (MHz)	Fixed Limit (dB m)		Min. 26 dB BW (MHz)	11+10LogB (dB m)	Directional Antenna Gain (dB i)	Limit (dB m)		
		Client	Access Point				Client	Access Point	
							Cond.	Cond.	E.I.R.P.
U-NII 1	5 210	23.98				5.42	23.98	30	21
U-NII 3	5 775	30				5.22	30		-

Remark;

- According to KDB 662911, Average power of each port and antenna gain was combined by using below calculation.

- Average power: $10 \log \{10^{(\text{Port 1 power} / 10)} + 10^{(\text{Port 2 power} / 10)}\}$

- Unequal antenna gains, with equal transmit powers. For antenna gains given by $G_1, G_2, \dots, G_N$ dB i

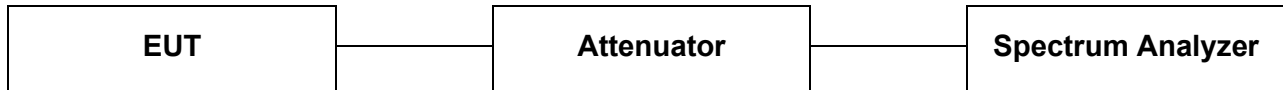
(i) If transmit signals are correlated, then

Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$ dB i [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

- E.I.R.P. (dB m) = Average Power (dB m) + Directional Antenna Gain (dB i)

6. Maximum Power Spectral Density

6.1. Test Setup



6.2. Limit

According to 15.407(a)(1)(i)

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 17 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i 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 dB i. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dB m).

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, 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 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i 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 dB i.

According to 15.407(a)(3)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i 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 dB i. However, fixed point-to point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations

6.3. Test Procedure

1. This measurement settings are specified in section II.F of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. Make the following adjustments to the peak value of the spectrum, if applicable:
 - a) **If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.**
 - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ($< 1 \text{ MHz}$, or $< 500 \text{ kHz}$) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
 - a) Set $\text{RBW} \geq 1/T$, where T is defined in section II.B.1.a).
 - b) Set $\text{VBW} \geq 3 \text{ RBW}$.
 - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log(500 \text{ kHz}/\text{RBW})$ to the measured result, whereas $\text{RBW} (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log(1 \text{ MHz}/\text{RBW})$ to the measured result, whereas $\text{RBW} (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

6.4. Test Result

Ambient temperature : (23 ± 1) °C

Relative humidity : 47 %

- Ant. 1

Mode	Band	Frequency (MHz)	Ch.	Data Rate	Measured PSD (dB m)	Duty Cycle Correction Factor (dB)	Final PSD (dB m)	Limit
11a	U-NII 1	5 180	36	48 Mbps	-6.45	2.05	-4.40	11 (dB m/1 MHz)
		5 220	44		-6.00		-3.95	
		5 240	48		-6.26		-4.21	
	U-NII 3	5 745	149		-9.17		-7.12	30 (dB m/500 kHz)
		5 785	157		-8.96		-6.91	
		5 805	165		-9.15		-7.10	

- Ant. 2

Mode	Band	Frequency (MHz)	Ch.	Data Rate	Measured PSD (dB m)	Duty Cycle Correction Factor (dB)	Final PSD (dB m)	Limit
11a	U-NII 1	5 180	36	48 Mbps	-7.48	2.05	-5.43	11 (dB m/1 MHz)
		5 220	44		-7.02		-4.97	
		5 240	48		-7.28		-5.23	
	U-NII 3	5 745	149		-10.00		-7.95	30 (dB m/500 kHz)
		5 785	157		-10.10		-8.05	
		5 805	165		-10.60		-8.55	

Remark;

- Final PSD (dB m/500 kHz) = PSD (dB m/500 kHz) + Duty Cycle Correction Factor (dB)

- Ant. 3

Mode	Band	Frequency (MHz)	Ch.	Data Rate	Measured PSD (dB m/500 kHz)	Duty Cycle Correction Factor (dB)	Final PSD (dB m/500 kHz)	Limit
11a	U-NII 1	5 180	36	48 Mbps	-6.24	2.05	-4.19	11 (dB m/1 MHz)
		5 220	44		-5.91		-3.86	
		5 240	48		-6.05		-4.00	
11n_HT20		5 180	36	MCS5	-6.68	1.87	-4.81	
		5 220	44		-5.96		-4.09	
		5 240	48		-6.26		-4.39	
11n_HT40		5 190	38	MCS5	-10.48	2.85	-7.63	
		5 230	46		-9.84		-6.99	
11ac_VHT80		5 210	42	MCS5	-13.35	3.63	-9.72	
11a	U-NII 3	5 745	149	48 Mbps	-8.88	2.05	-6.83	30 (dB m/500 kHz)
		5 785	157		-9.23		-7.18	
		5 805	161		-9.33		-7.28	
11n_HT20		5 745	149	MCS5	-8.94	1.87	-7.07	
		5 785	157		-9.29		-7.42	
		5 805	161		-9.15		-7.28	
11n_HT40		5 755	151	MCS5	-12.81	2.85	-9.96	
		5 795	159		-12.94		-10.09	
11ac_VHT80		5 775	155	MCS5	-15.88	3.63	-12.25	

Remark;

- Final PSD (dB m/500 kHz) = PSD (dB m/500 kHz) + Duty Cycle Correction Factor (dB)

- Ant. 1 + Ant. 2

Test mode: 11n_HT20

Test Model: FH-TH10										
Mode	Band	Freq. (MHz)	Ch.	Data Rate	Measured PSD (dB m)			Duty Cycle Correction Factor (dB)	Final PSD (dB m)	Limit
					Port 1	Port 2	Port 1+2			
11ac_VHT20	U-NII 1	5 180	36	MCS5	-8.22	-8.92	-5.55	2.68	-2.87	11 (dB m/1 MHz)
		5 220	44		-7.59	-8.86	-5.17		-2.49	
		5 240	48		-7.79	-8.62	-5.17		-2.49	
11n_HT40		5 190	38	MCS6	-11.60	-12.47	-9.00	3.70	-5.30	
		5 230	46		-11.12	-12.05	-8.55		-4.85	
11ac_VHT80			5 210	42	MCS5	-14.42	-15.40	-11.87	3.64	
11ac_VHT20	U-NII 3	5 745	149	MCS5	-10.01	-10.09	-7.04	2.68	-4.36	30 (dB m/500 kHz)
		5 785	157		-10.31	-10.57	-7.43		-4.75	
		5 805	161		-10.65	-10.72	-7.67		-4.99	
11n_HT40		5 755	151	MCS6	-13.75	-14.03	-10.88	3.70	-7.18	
		5 795	159		-13.98	-14.43	-11.19		-7.49	
11ac_VHT80			5 775	155	MCS5	-16.64	-16.66	-13.64	3.64	

Remark;

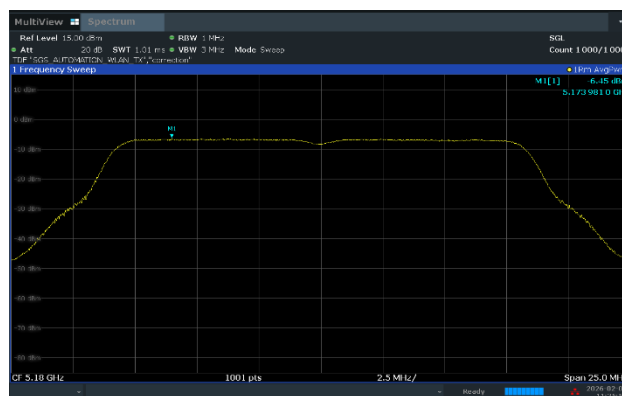
- According to KDB 662911, power spectral density of each port and antenna gain was combined by using below calculation.
 - PSD: $10 \log \{10^{(\text{Port 1 PSD} / 10)} + 10^{(\text{Port 2 PSD} / 10)}\}$
 - Unequal antenna gains, with equal transmit powers. For antenna gains given by $G_1, G_2, \dots, G_N$ dB i
 - (i) If transmit signals are correlated, then
 Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$ dB i [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]
- Final PSD (dB m) = PSD (dB m) + Duty Cycle Correction Factor (dB)

Test plots

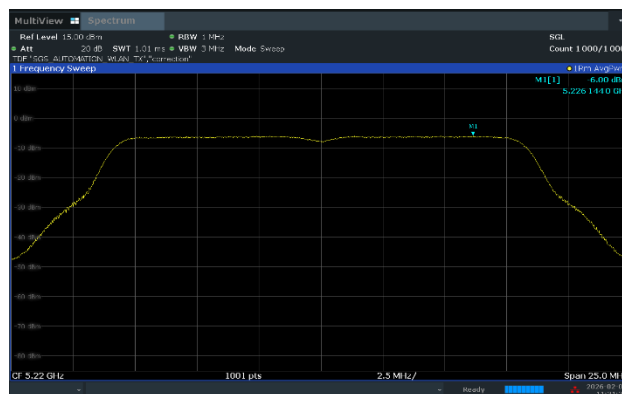
- Ant. 1

11a (U-NII 1)

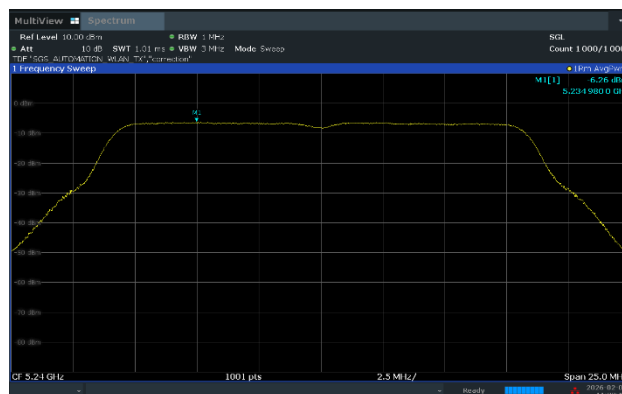
Low Channel (5 180 MHz)



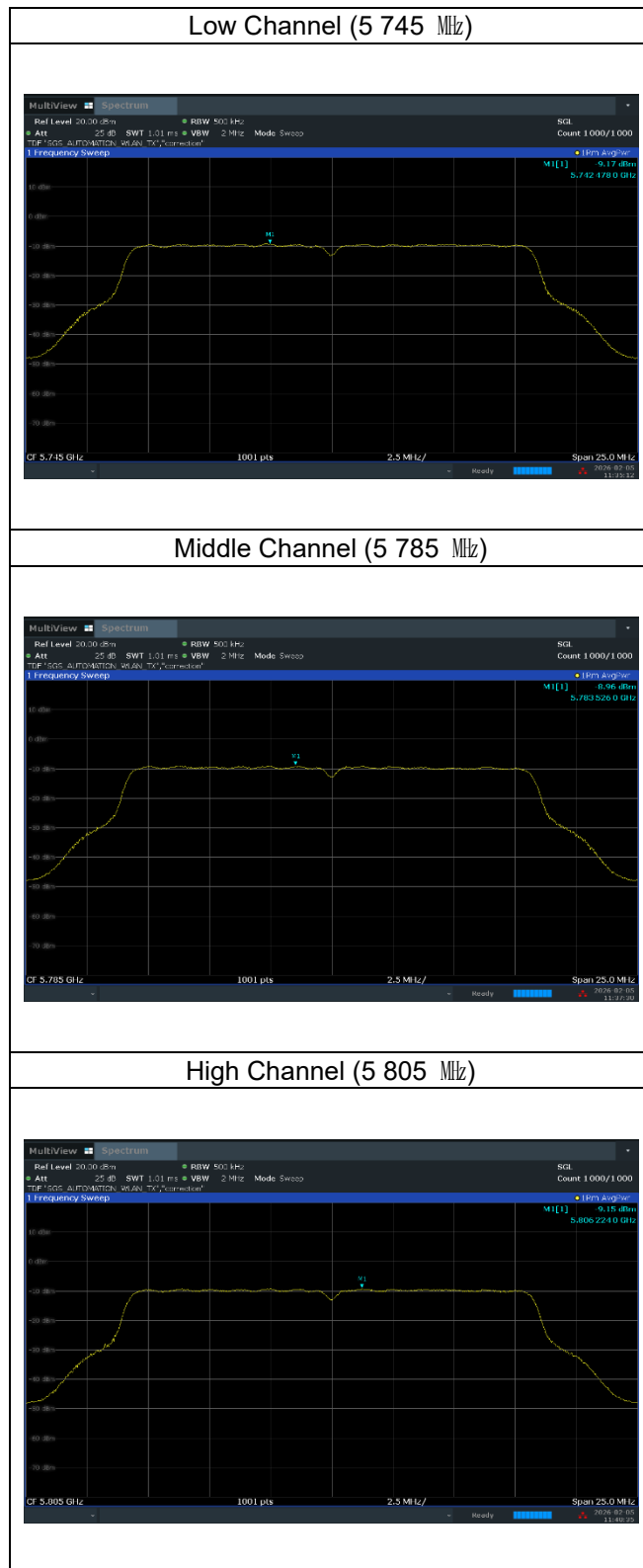
Middle Channel (5 220 MHz)



High Channel (5 240 MHz)



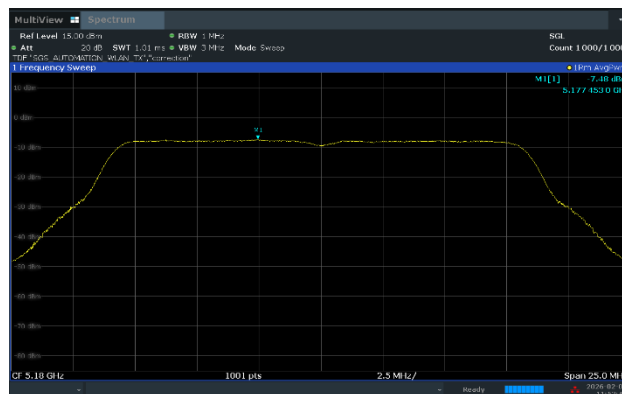
11a (U-NII 3)



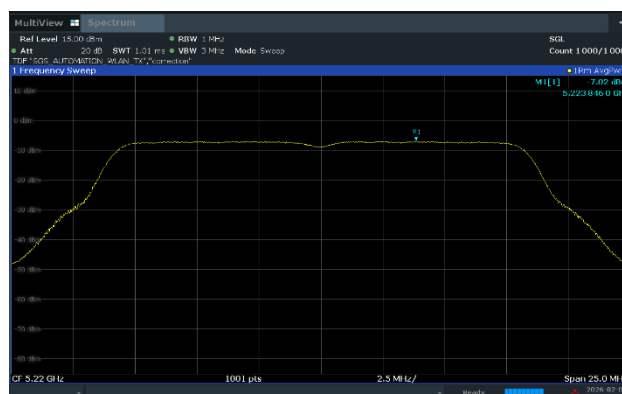
- Ant. 2

11a (U-NII 1)

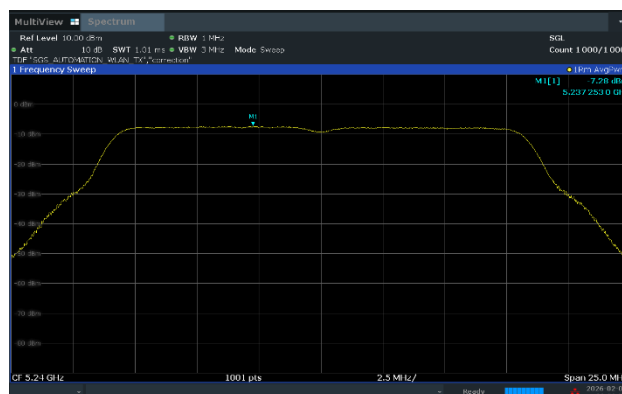
Low Channel (5 180 MHz)



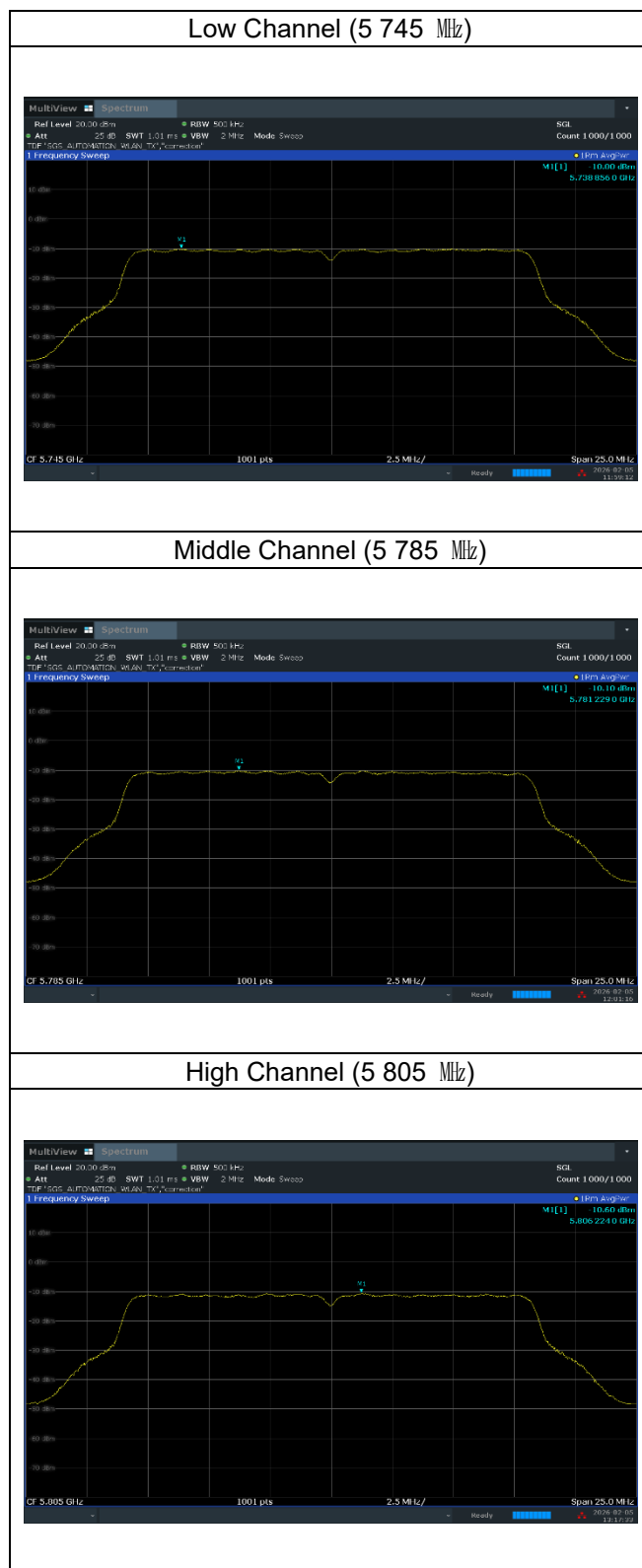
Middle Channel (5 220 MHz)



High Channel (5 240 MHz)



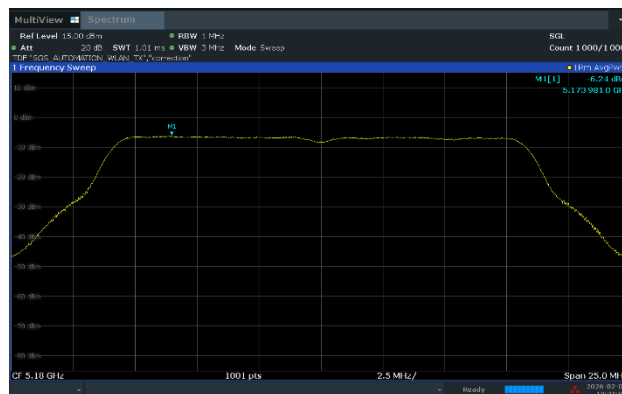
11a (U-NII 3)



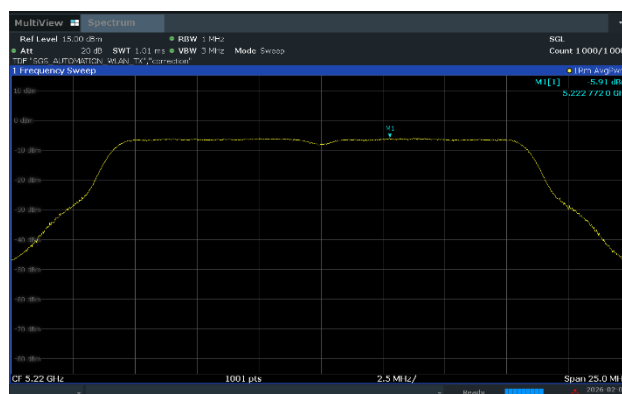
- Ant. 3

11a (U-NII 1)

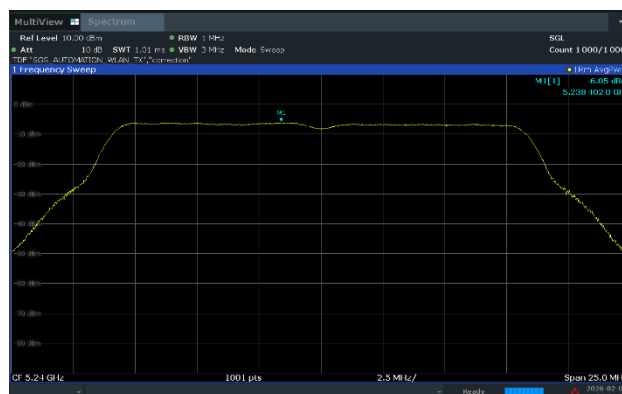
Low Channel (5 180 MHz)



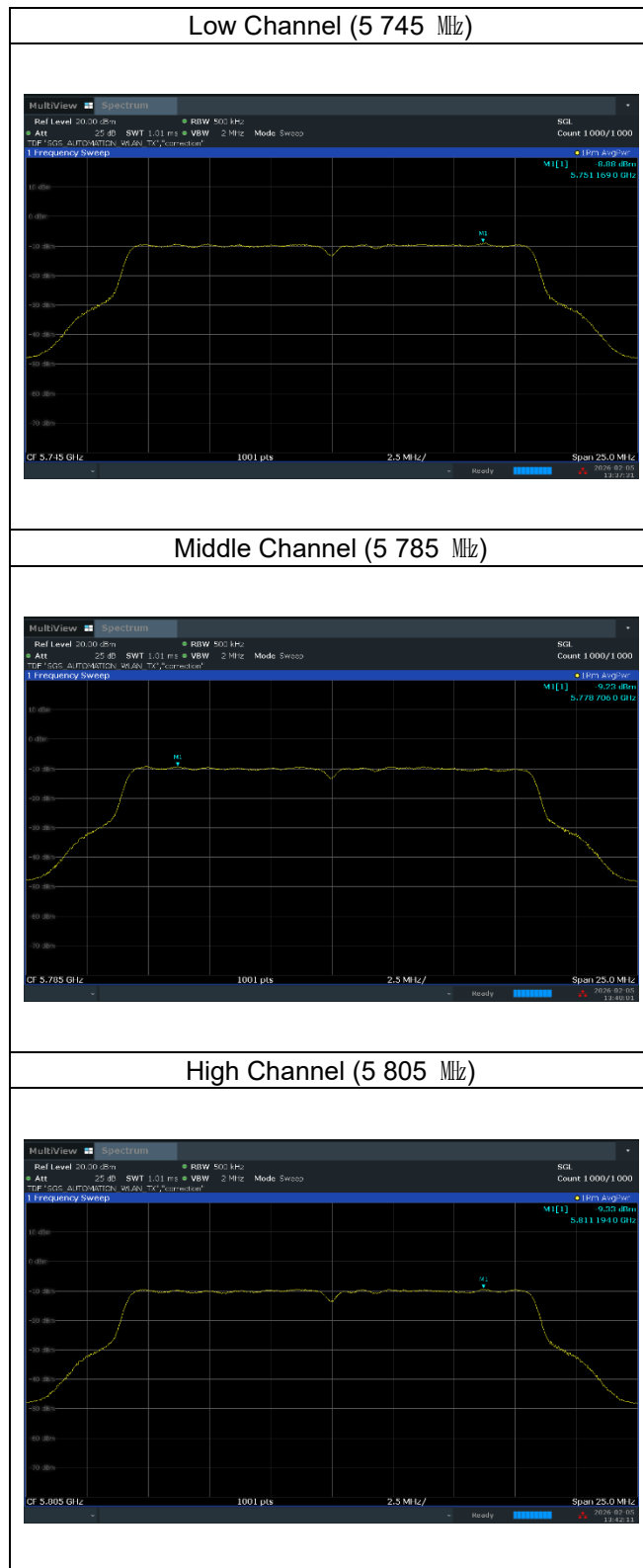
Middle Channel (5 220 MHz)



High Channel (5 240 MHz)

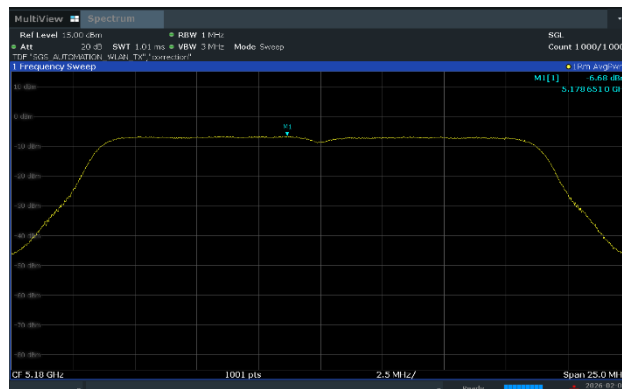


11a (U-NII 3)

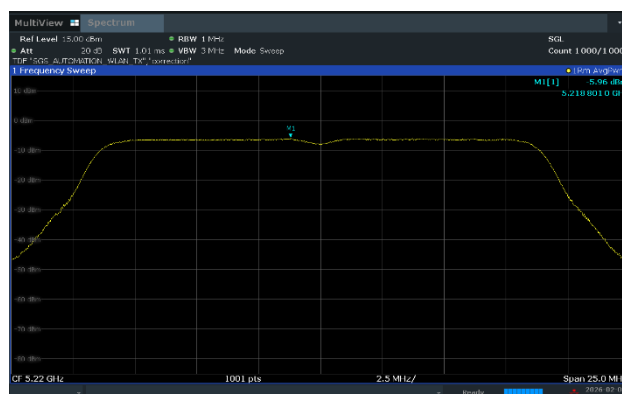


11n_HT20 (U-NII 1)

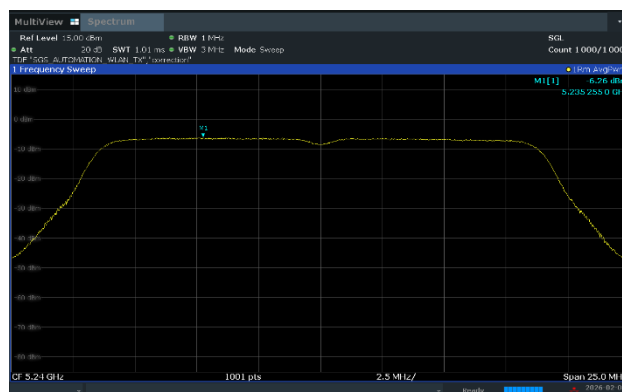
Low Channel (5 180 MHz)



Middle Channel (5 220 MHz)

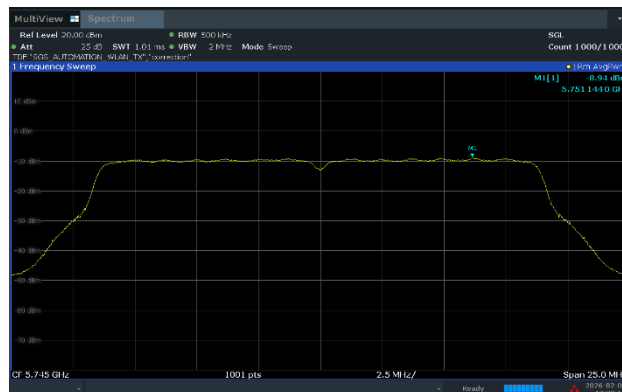


High Channel (5 240 MHz)

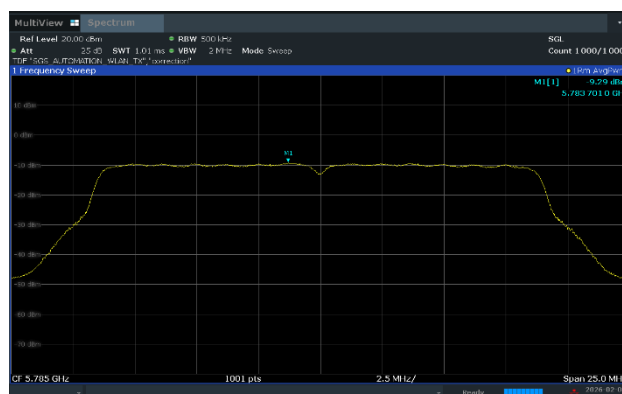


11n_HT20 (U-NII 3)

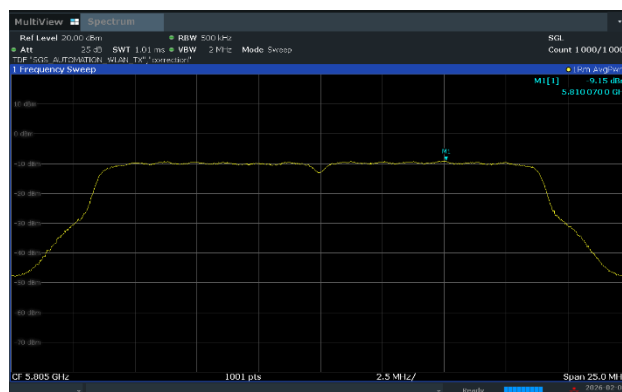
Low Channel (5 745 MHz)



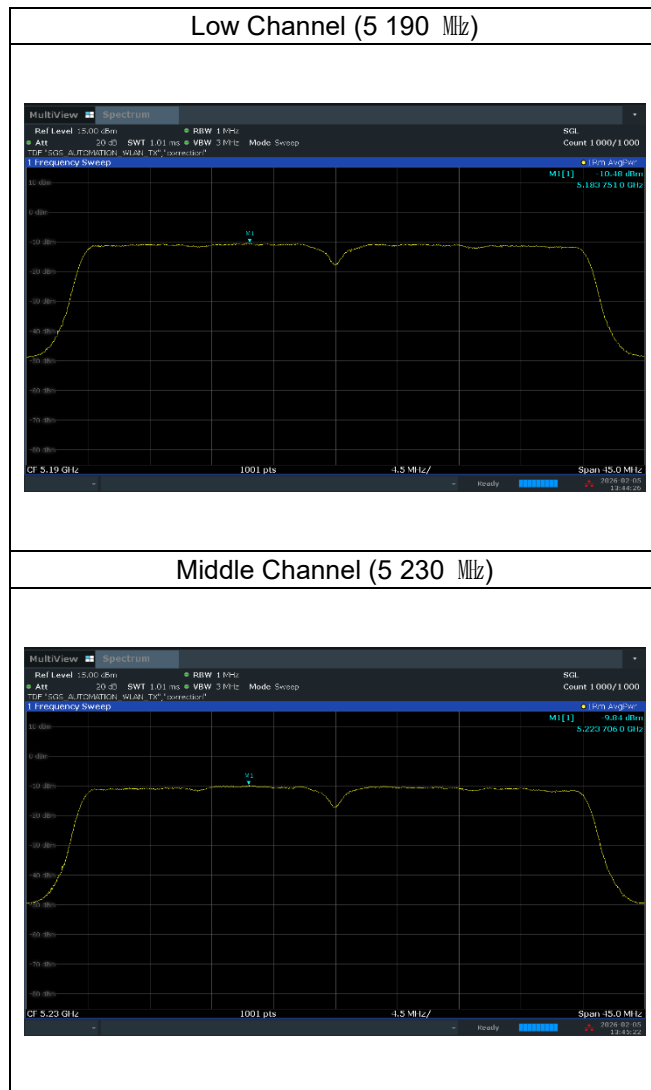
Middle Channel (5 785 MHz)



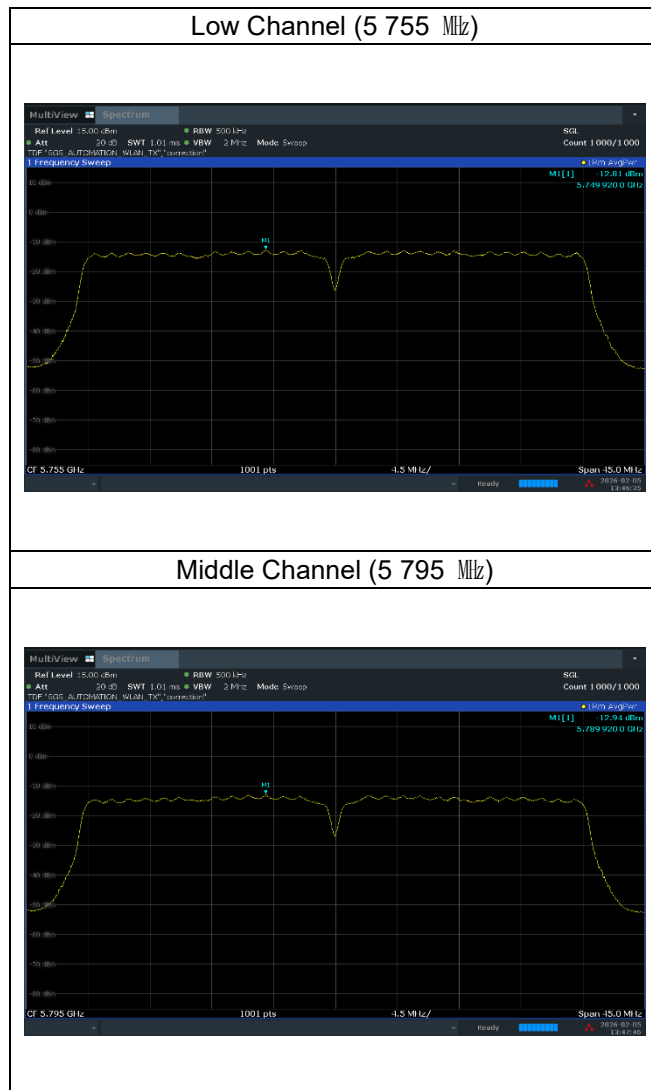
High Channel (5 805 MHz)



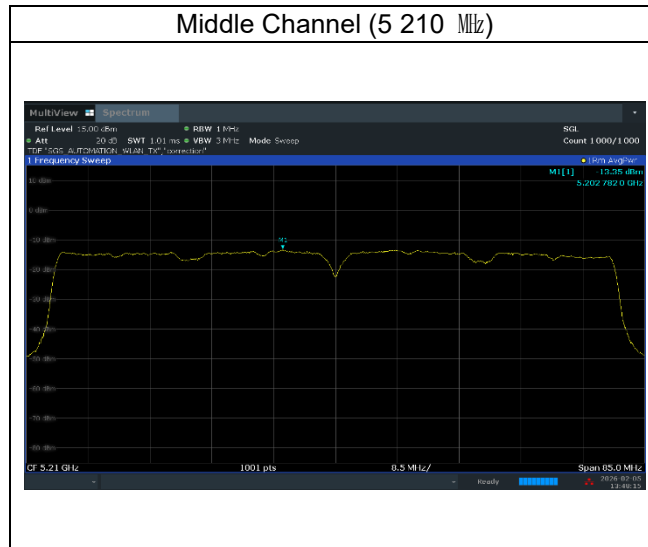
11n_HT40 (U-NII 1)



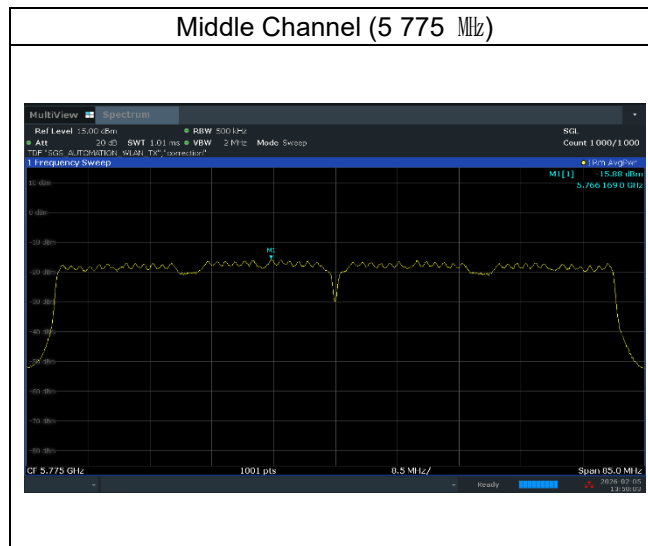
11n_HT40 (U-NII 3)



11ac_VHT80 (U-NII 1)



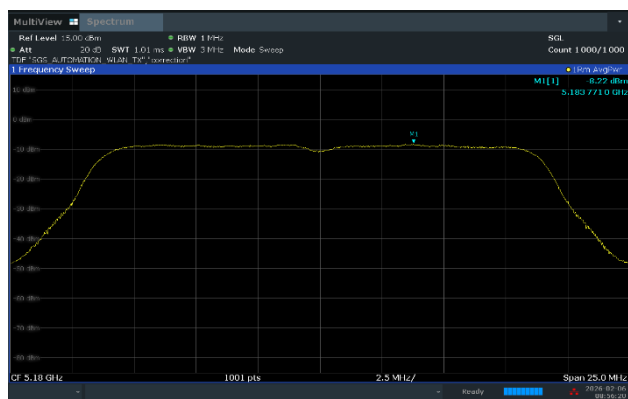
11ac_VHT80 (U-NII 3)



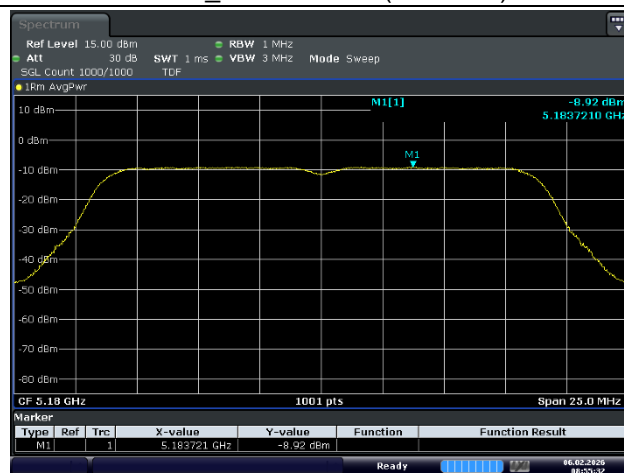
- Ant. 1 + Ant. 2

11ac_VHT20 (U-NII 1)

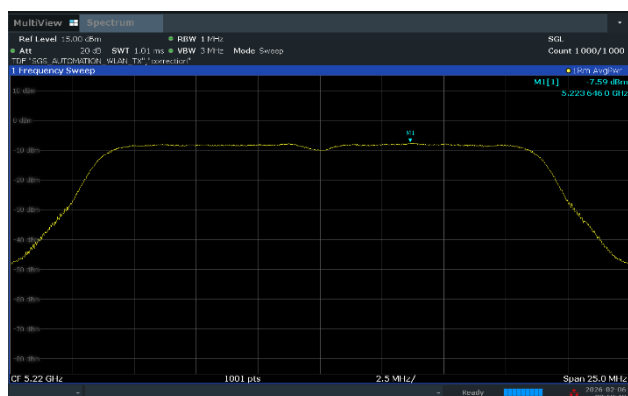
Port 1_Low Channel (5 180 MHz)



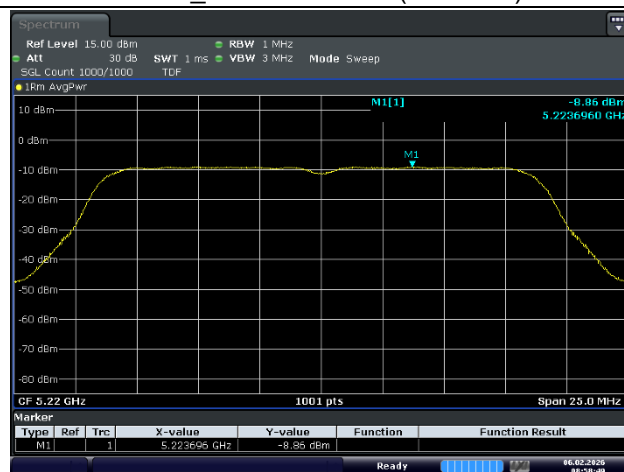
Port 2_Low Channel (5 180 MHz)



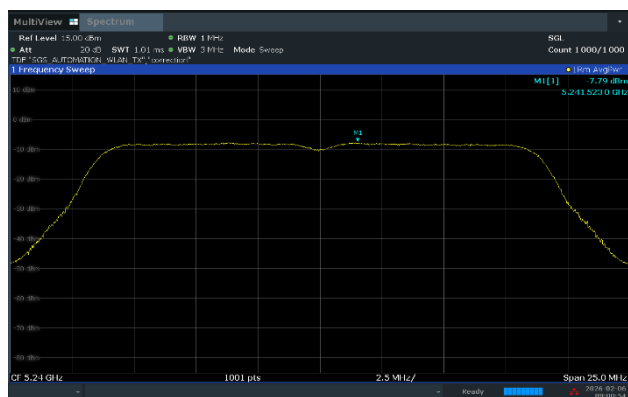
Port 1_Middle Channel (5 220 MHz)



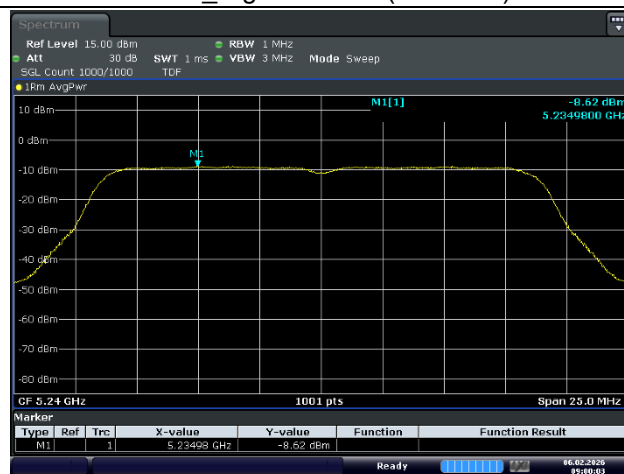
Port 2_Middle Channel (5 220 MHz)



Port 1_High Channel (5 240 MHz)



Port 2_High Channel (5 240 MHz)

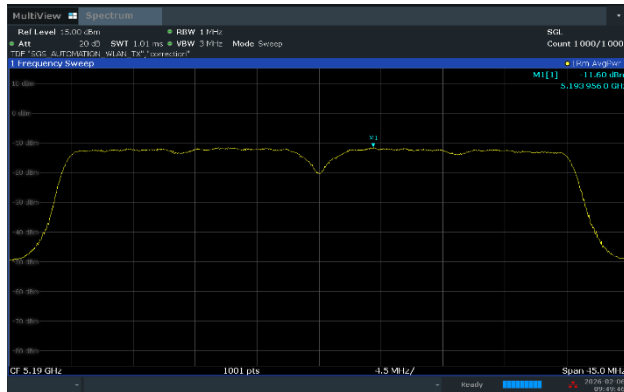


11ac_VHT20 (U-NII 3)

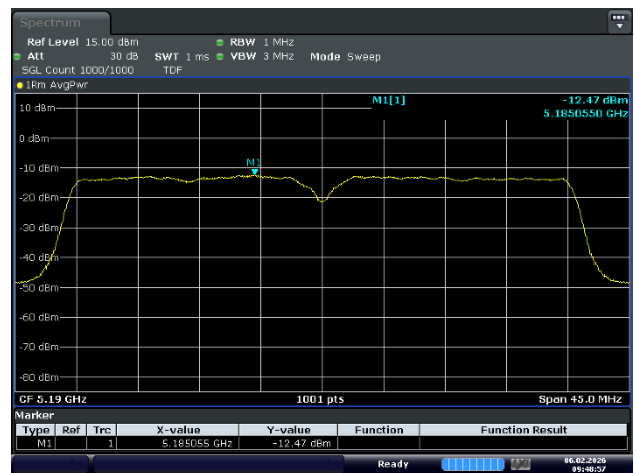


11n_HT40 (U-NII 1)

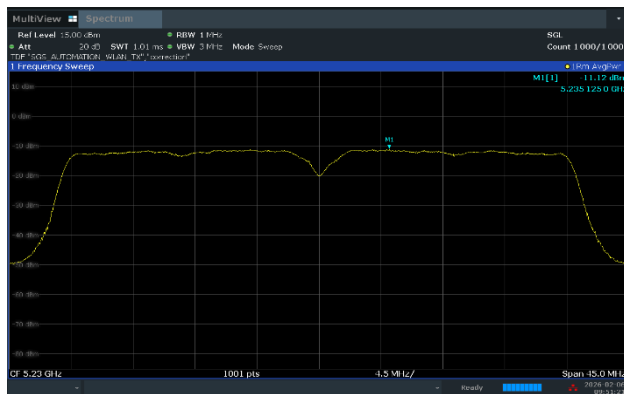
Port 1_Low Channel (5 190 MHz)



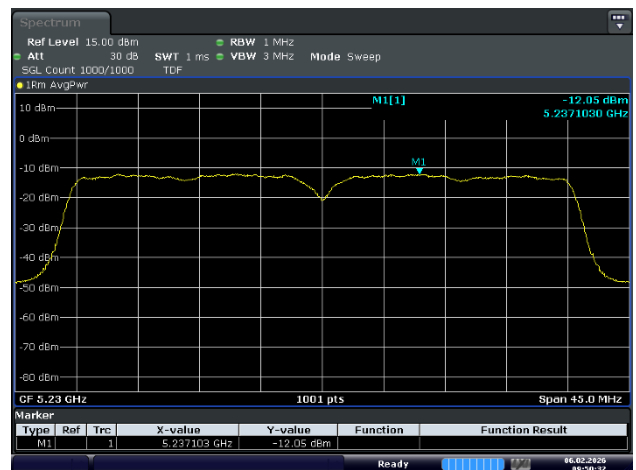
Port 2_Low Channel (5 190 MHz)



Port 1_Middle Channel (5 230 MHz)

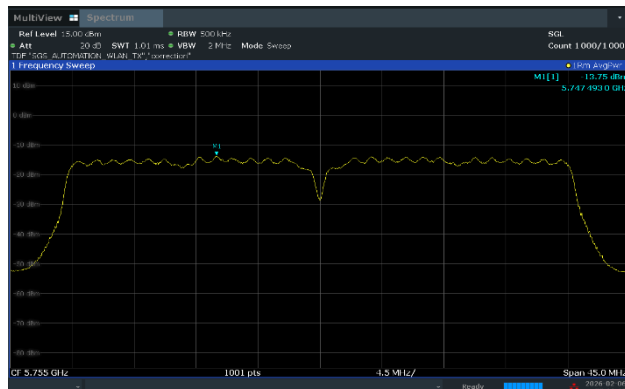


Port 2_Middle Channel (5 230 MHz)

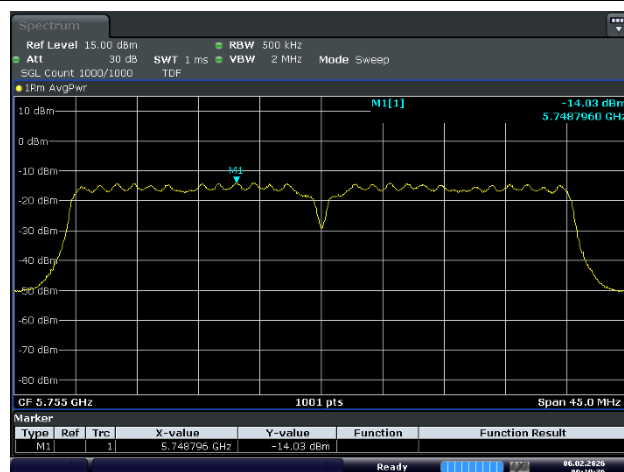


11n_HT40 (U-NII 3)

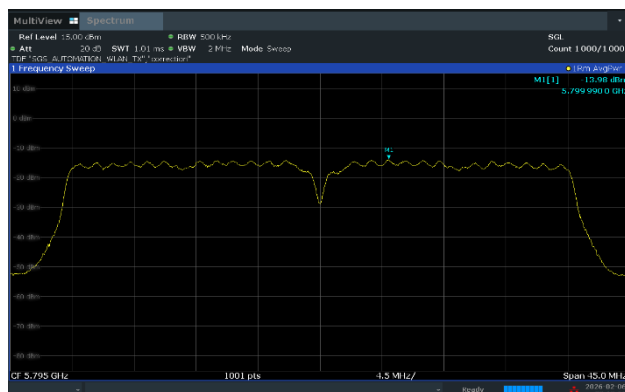
Port 1_Low Channel (5 755 MHz)



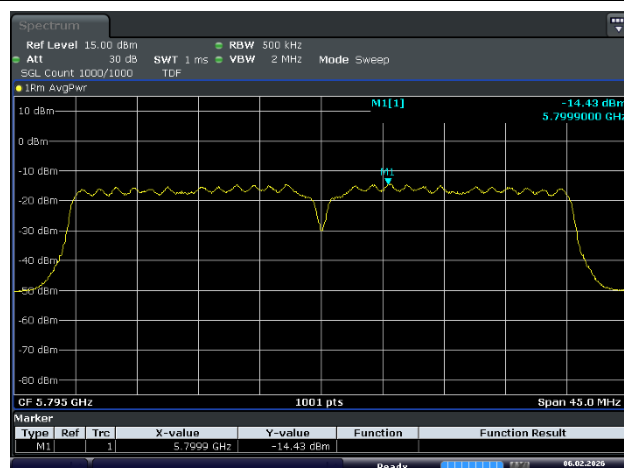
Port 2_Low Channel (5 755 MHz)



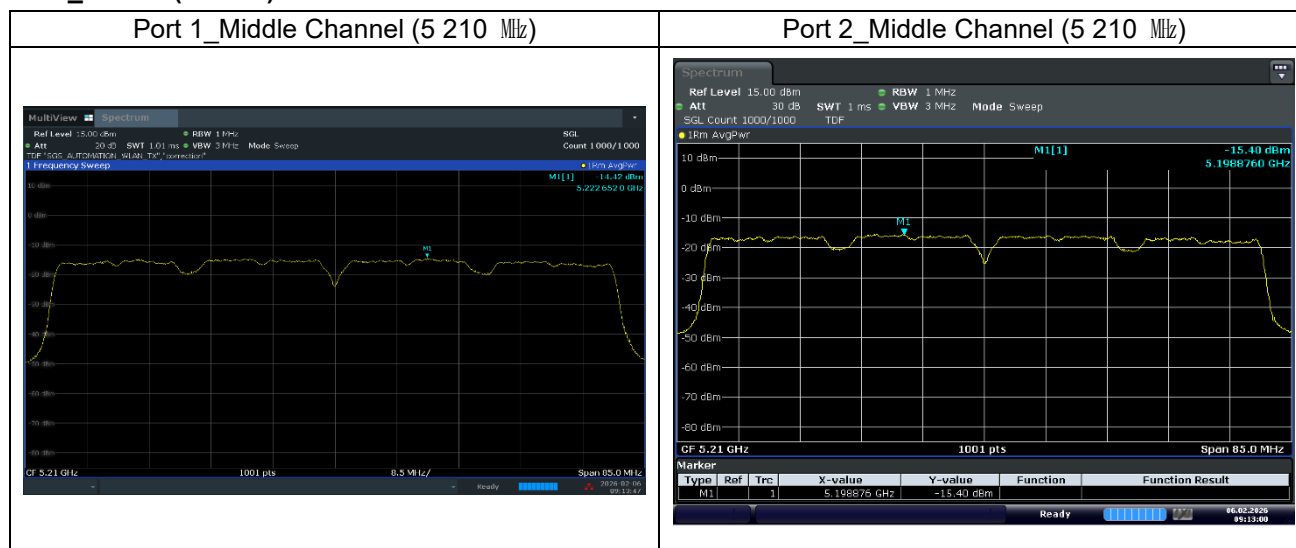
Port 1_Middle Channel (5 795 MHz)



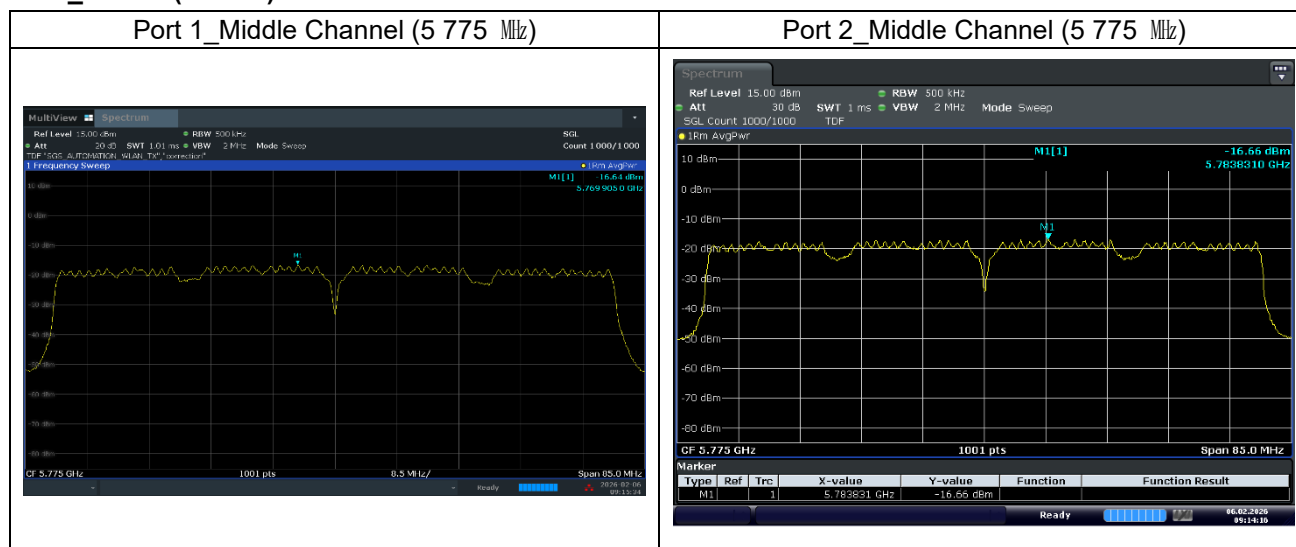
Port 2_Middle Channel (5 795 MHz)



11ac_VHT80 (U-NII 1)



11ac_VHT80 (U-NII 3)



7. Antenna Requirement

7.1. Standard Applicable

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

7.2. Antenna Connected Construction

Antenna used in this product is Pattern antenna and peak max gain of antenna as below.

Band		5 150 MHz ~ 5 250 MHz	5 725 MHz ~ 5 850 MHz
Mode		11a/n_HT20, HT40, 11ac_VHT20, VHT40, VHT80	
Ant. 1 Gain (dBi)		2.80	0.40
Ant. 2 Gain (dBi)		2.00	3.70
Ant. 3 Gain (dBi)		3.90	2.00
Directional Gain (dBi)	Ant. 1 + Ant. 2	5.42	5.22

According to ANSI C63.10-2020+Cor.1-2023+C63.10a-2024+Errata to C63.10a-2024, unequal antenna gains with equal transmit powers.

a) If transmit signals are correlated, then

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{\text{ANT}}] \text{ dBi}$$

Note that the purpose of the factor 20 in the denominator of each exponent and the square of the sum of terms is to combine the signal levels coherently.

- End of the Test Report -