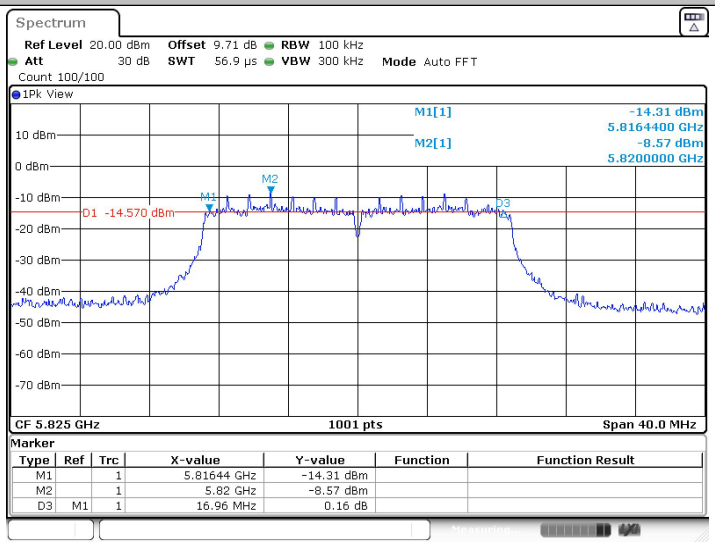
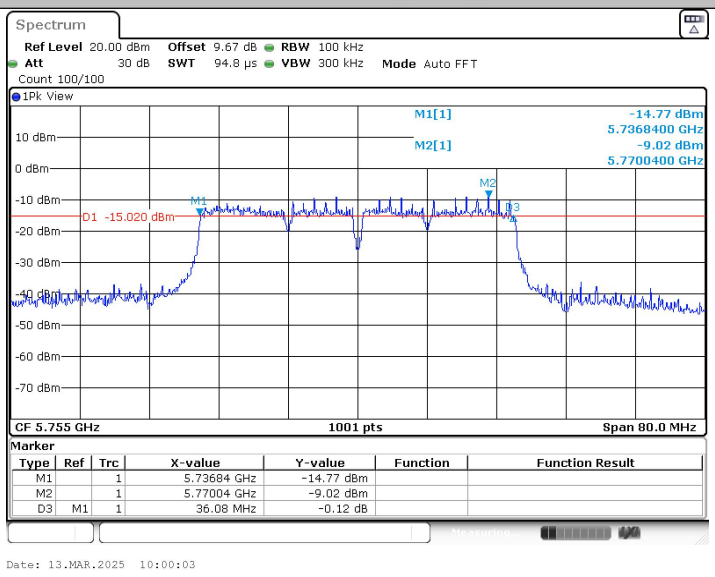
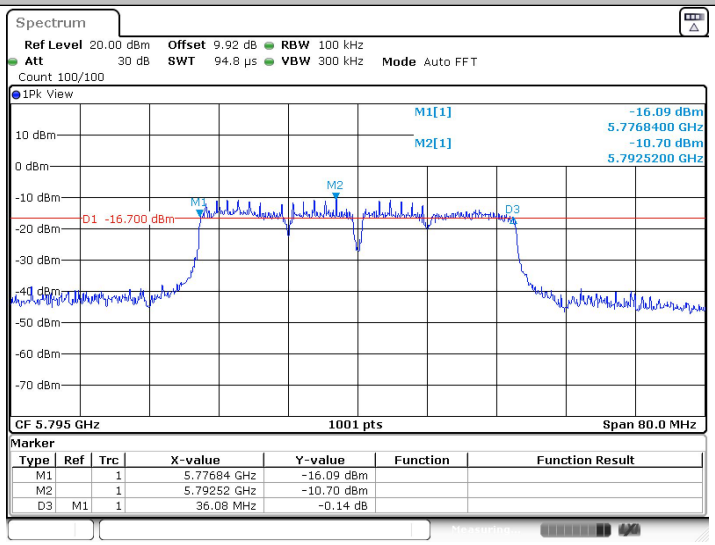
IEEE 802.11ac VHT20_Ant1_5825MHz



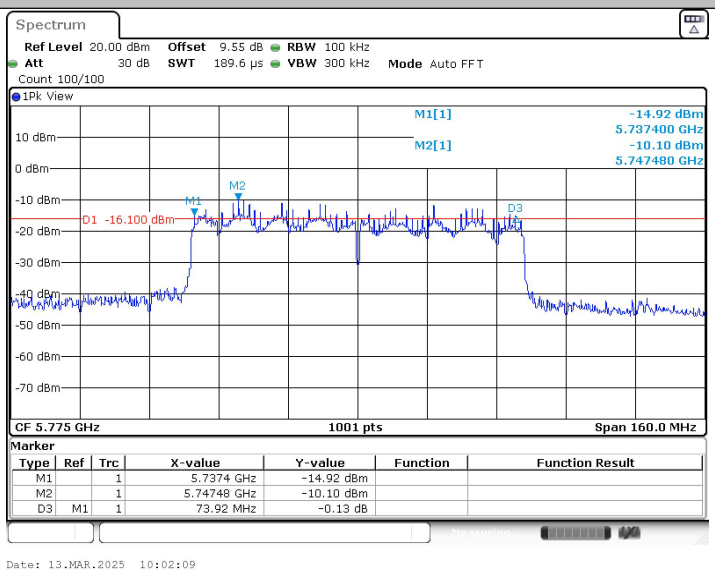
IEEE 802.11ac VHT40_Ant1_5755MHz



IEEE 802.11ac VHT40_Ant1_5795MHz

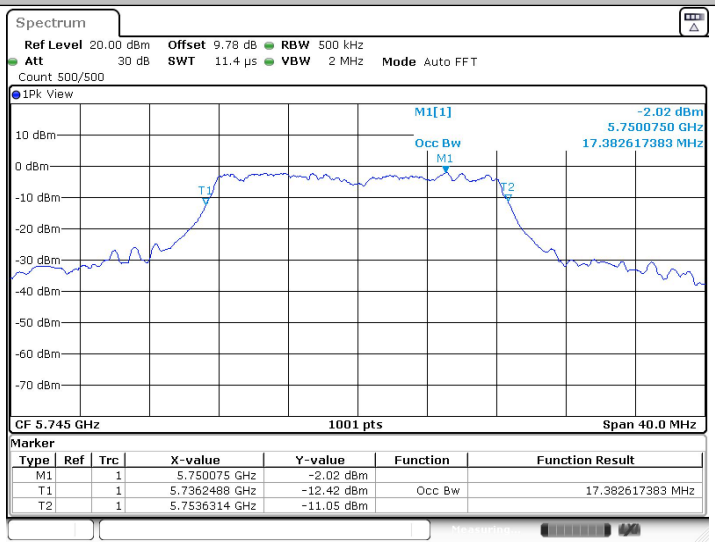


IEEE 802.11ac VHT80_Ant1_5775MHz

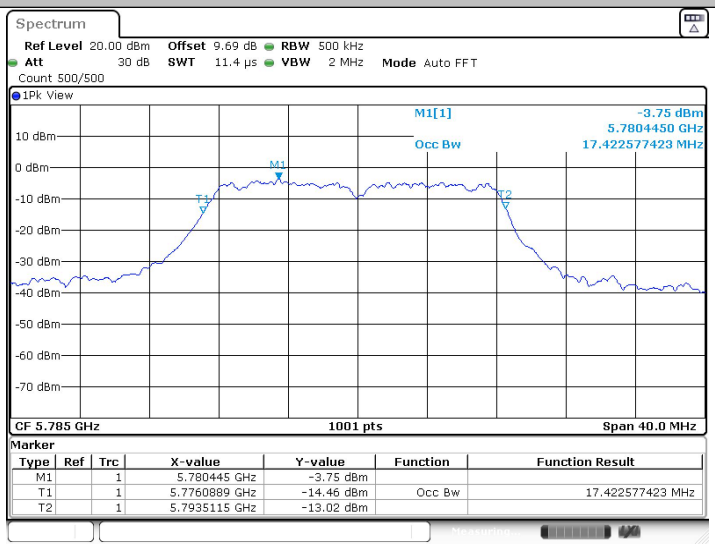


99% OCCUPIED BANDWIDTH

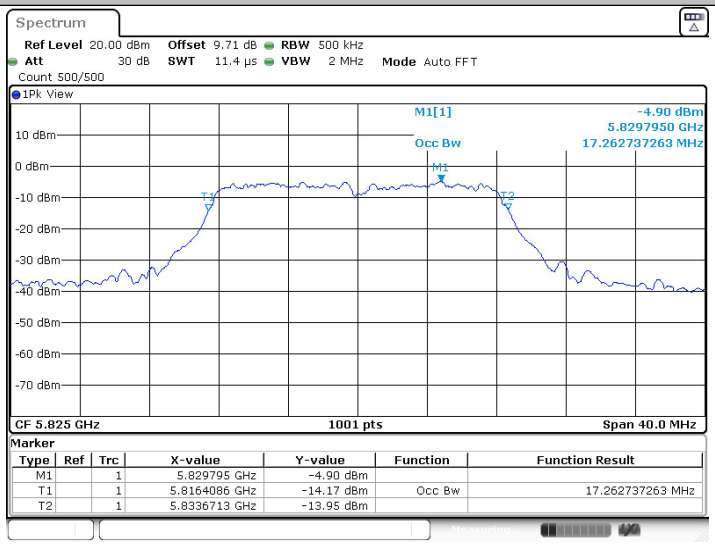
IEEE 802.11a_Ant1_5745MHz



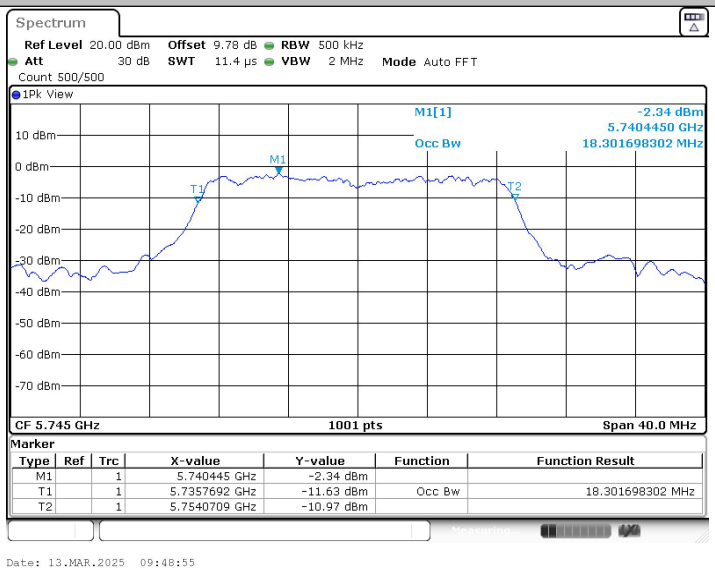
IEEE 802.11a_Ant1_5785MHz



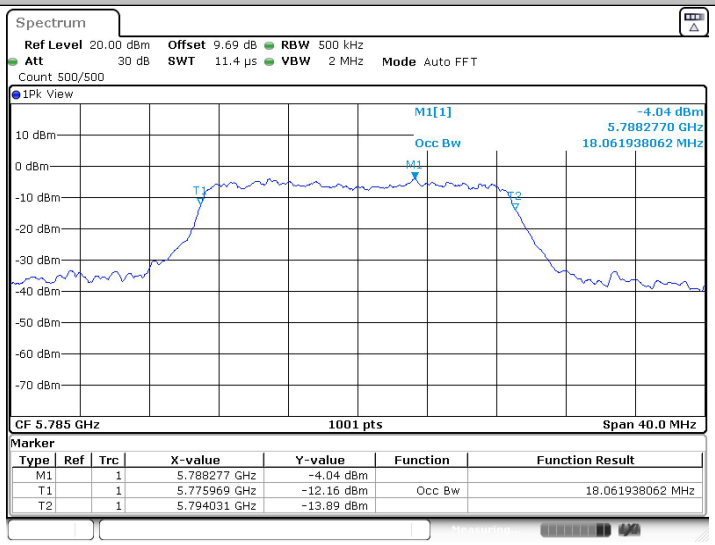
IEEE 802.11a_Ant1_5825MHz



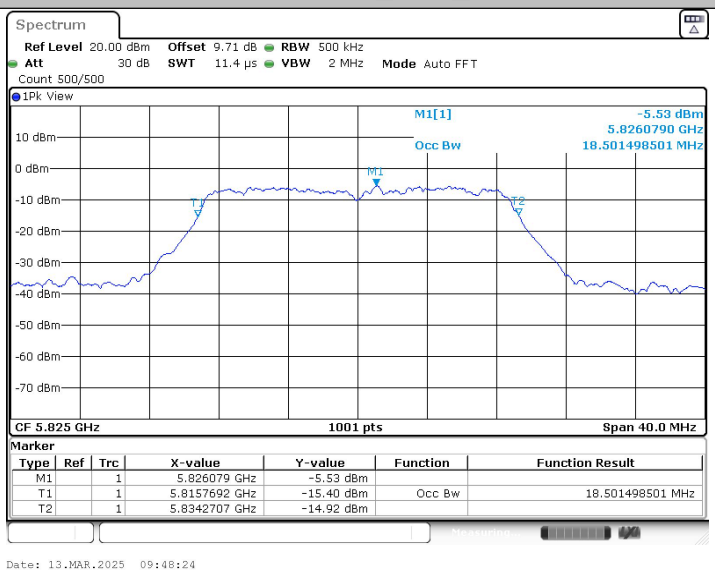
IEEE 802.11n HT20_Ant1_5745MHz



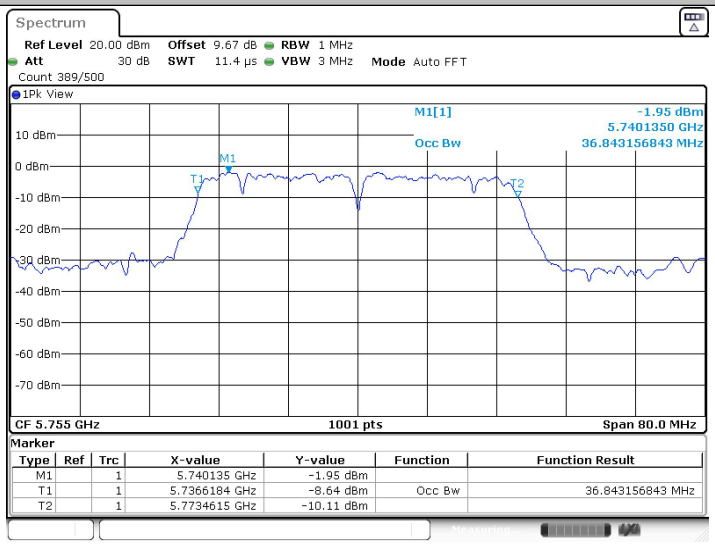
IEEE 802.11n HT20_Ant1_5785MHz



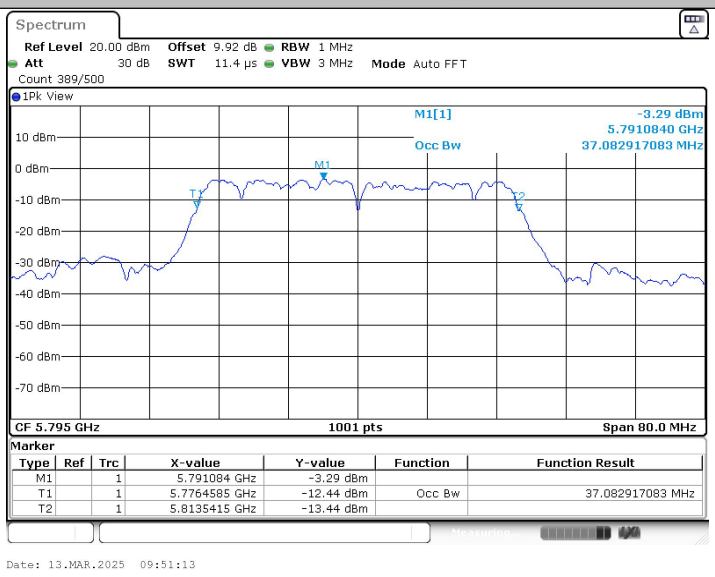
IEEE 802.11n HT20_Ant1_5825MHz



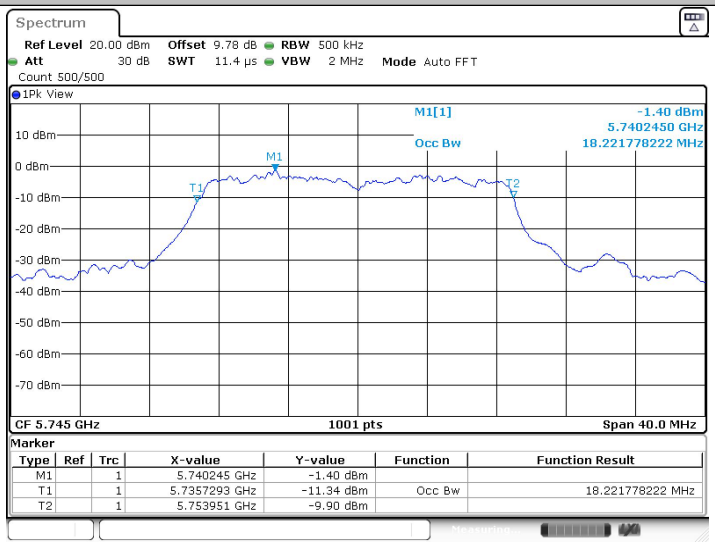
IEEE 802.11n HT40_Ant1_5755MHz



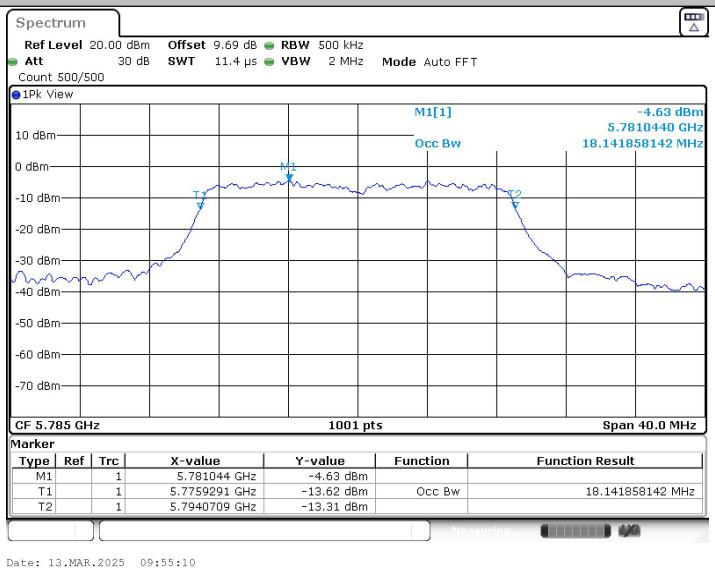
IEEE 802.11n HT40_Ant1_5795MHz



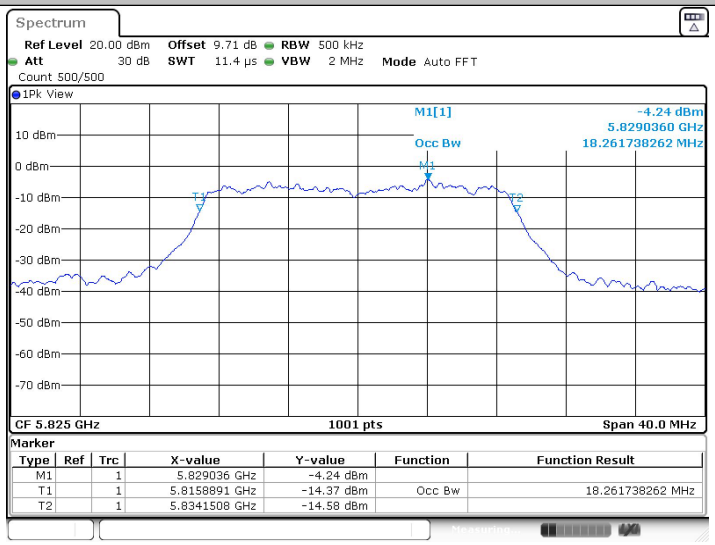
IEEE 802.11ac VHT20_Ant1_5745MHz



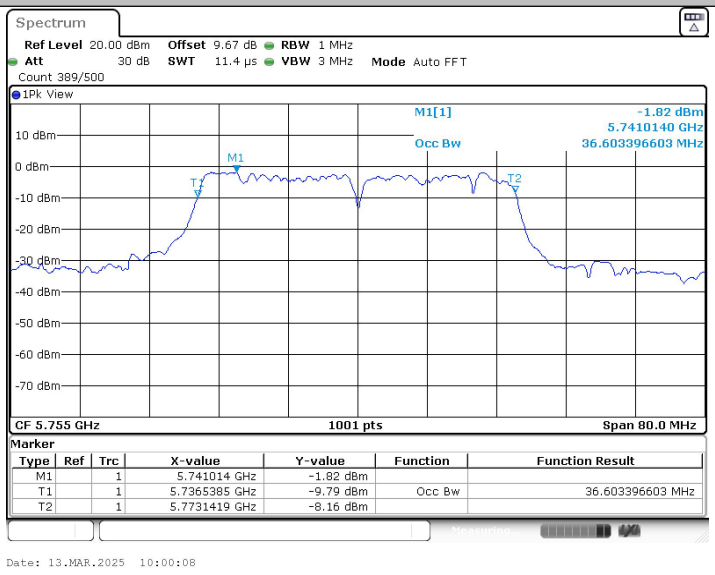
IEEE 802.11ac VHT20_Ant1_5785MHz



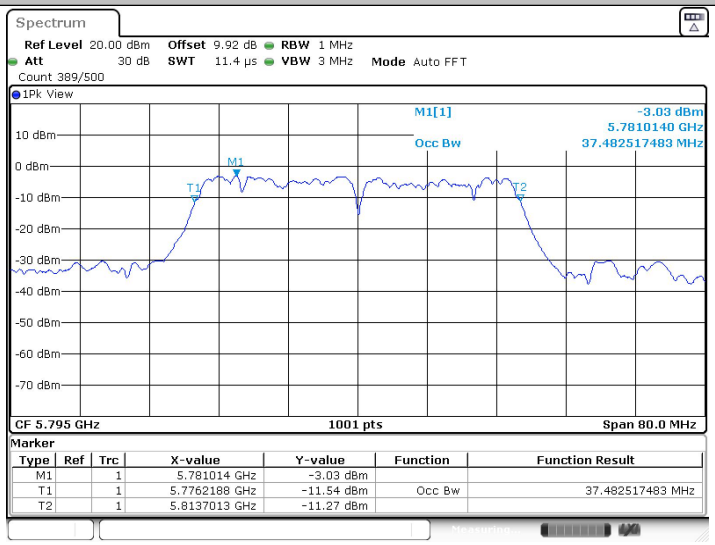
IEEE 802.11ac VHT20_Ant1_5825MHz



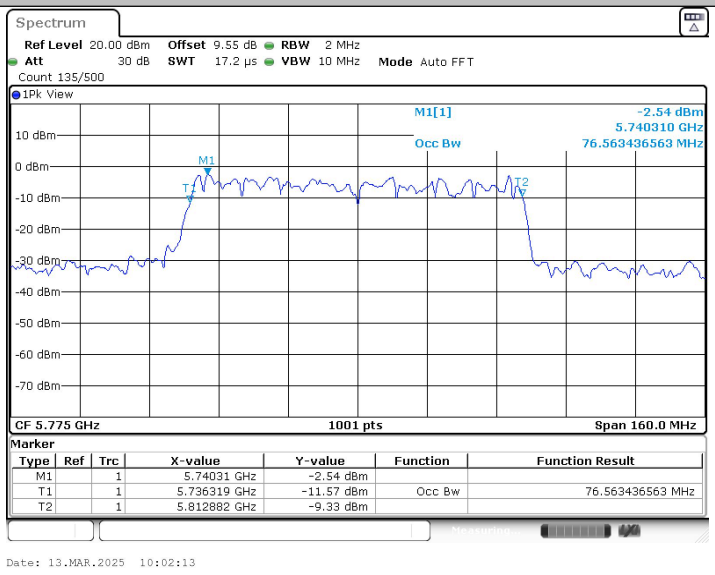
IEEE 802.11ac VHT40_Ant1_5755MHz



IEEE 802.11ac VHT40_Ant1_5795MHz



IEEE 802.11ac VHT80_Ant1_5775MHz



7.3. Output Power Measurement

7.3.1. Test Limit

The FCC 15.407(a),The maximum conducted output power should not exceed:

Band	EUT Type	Limit
U-NII-3	All Device	1W(30dBm)

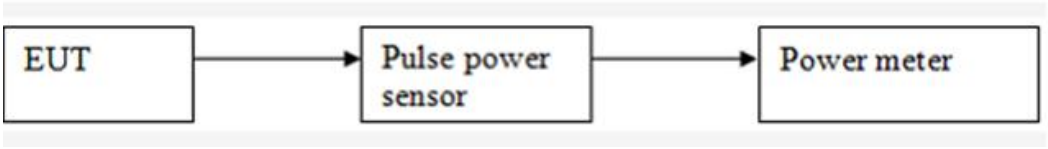
7.3.2. Test Setting

a) The RF output of EUT was connected to the broadband average RF power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.

b) Set to the maximum power setting and enable the EUT transmit continuously.

c) Measure the conducted output power and record the results in the test report.

7.3.3. Test Setup



7.3.4. Test Result

U-NII-3:

Test Mode	Antenna	Frequency [MHz]	AVG Conducted Output Power with Duty Factor (dBm)	Limit [dBm]	Verdict
IEEE 802.11a	Ant1	5745	7.06	≤ 30	PASS
	Ant1	5785	5.70	≤ 30	PASS
	Ant1	5825	4.49	≤ 30	PASS
IEEE 802.11n HT20	Ant1	5745	7.15	≤ 30	PASS
	Ant1	5785	5.80	≤ 30	PASS
	Ant1	5825	4.55	≤ 30	PASS
IEEE 802.11n HT40	Ant1	5755	7.41	≤ 30	PASS
	Ant1	5795	6.08	≤ 30	PASS
IEEE 802.11ac VHT20	Ant1	5745	7.11	≤ 30	PASS
	Ant1	5785	5.68	≤ 30	PASS
	Ant1	5825	4.39	≤ 30	PASS
IEEE 802.11ac VHT40	Ant1	5755	6.84	≤ 30	PASS
	Ant1	5795	5.51	≤ 30	PASS
IEEE 802.11ac VHT80	Ant1	5775	6.86	≤ 30	PASS

Note：1. Result already includes duty factor, 5745MHz~5825MHz antenna gain is 3.5dBi.

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

Section 15.407(a)

The maximum power spectral density should not exceed:

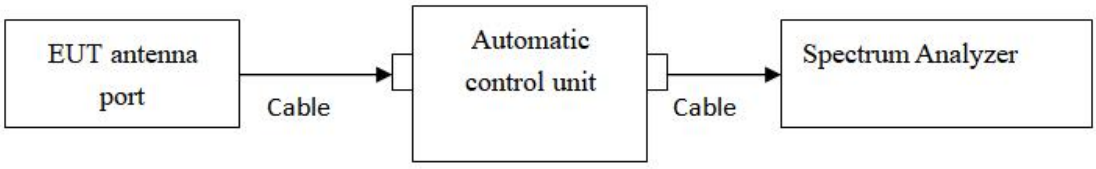
Band	EUT Type	Limit
U-NII-3	All Device	30dBm/500kHz

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.

7.4.2. Test Setting

Spectrum Parameters	Setting
RBW	500kHz(For U-NII-3)
VBW	2MHz(For U-NII-3)
Span	encompass the entire 26 dB EBW or 99% OBW of the signal
Sweep Time	Auto
Number of Sweep Point	≥2×SPAN/RBW
Detector	RMS(power averaging)
Trace Average	≥100 traces

7.4.3. Test Setup



7.4.4. Test Result

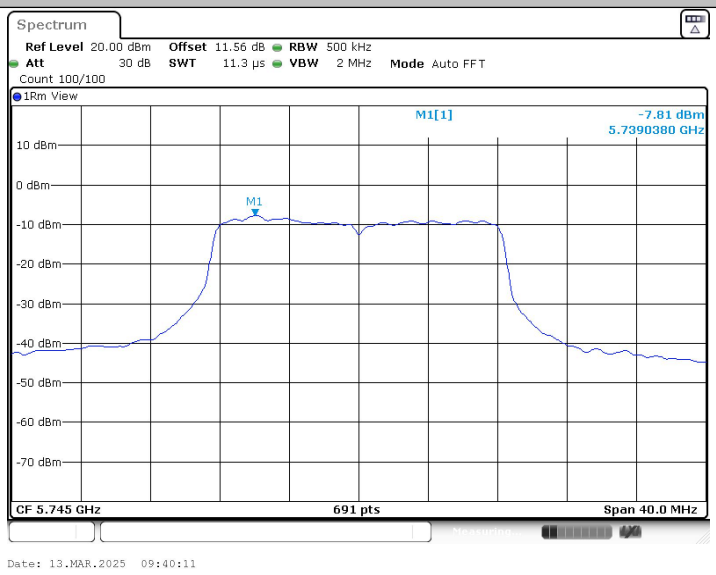
U-NII-3:

Test Mode	Antenna	Frequency [MHz]	Result [dBm/500kHz]	Limit [dBm/500kHz]	Verdict
IEEE 802.11a	Ant1	5745	-7.81	≤ 30	PASS
	Ant1	5785	-10.89	≤ 30	PASS
	Ant1	5825	-11.81	≤ 30	PASS
IEEE 802.11n HT20	Ant1	5745	-9.01	≤ 30	PASS
	Ant1	5785	-10.77	≤ 30	PASS
	Ant1	5825	-11.60	≤ 30	PASS
IEEE 802.11n HT40	Ant1	5755	-11.79	≤ 30	PASS
	Ant1	5795	-12.72	≤ 30	PASS
IEEE 802.11ac VHT20	Ant1	5745	-9.13	≤ 30	PASS
	Ant1	5785	-11.27	≤ 30	PASS
	Ant1	5825	-12.32	≤ 30	PASS
IEEE 802.11ac VHT40	Ant1	5755	-11.74	≤ 30	PASS
	Ant1	5795	-12.59	≤ 30	PASS
IEEE 802.11ac VHT80	Ant1	5775	-12.98	≤ 30	PASS

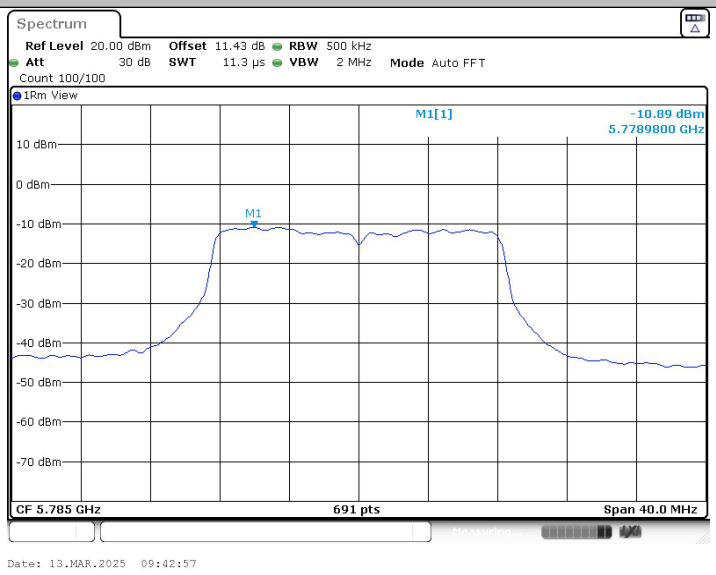
Note：1. Result already includes duty factor, 5745MHz~5825MHz antenna gain is 3.5dBi.

Test Graphs

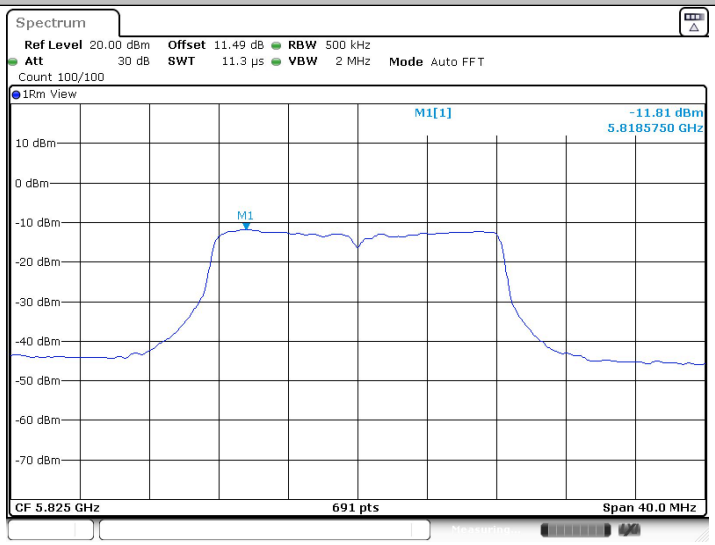
IEEE 802.11a_Ant1_5745MHz



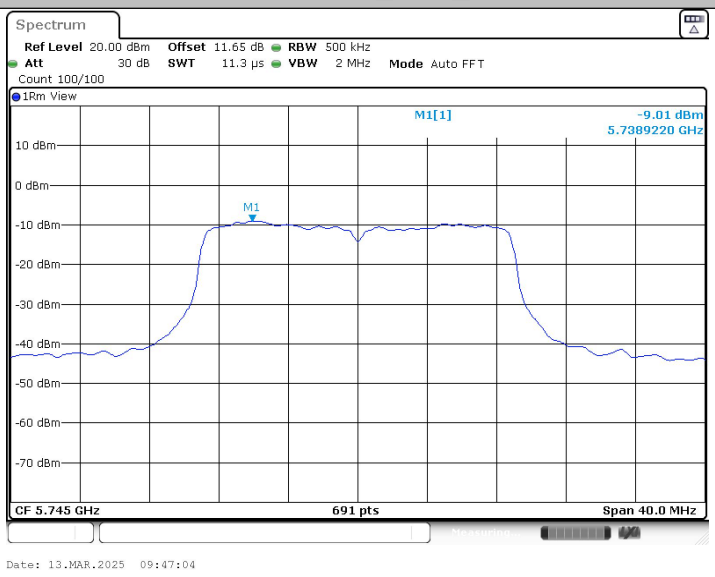
IEEE 802.11a_Ant1_5785MHz



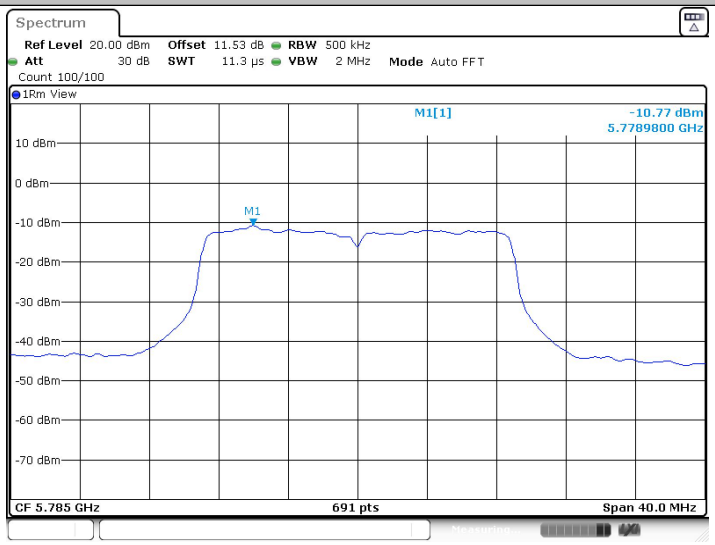
IEEE 802.11a_Ant1_5825MHz



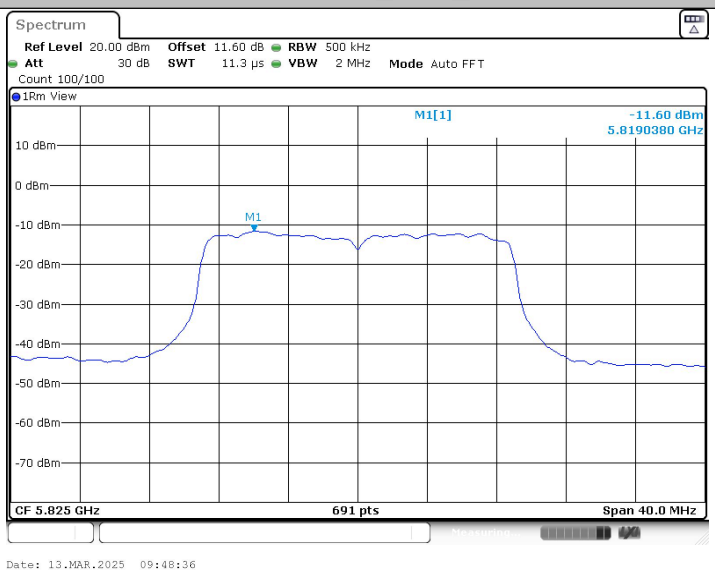
IEEE 802.11n HT20_Ant1_5745MHz



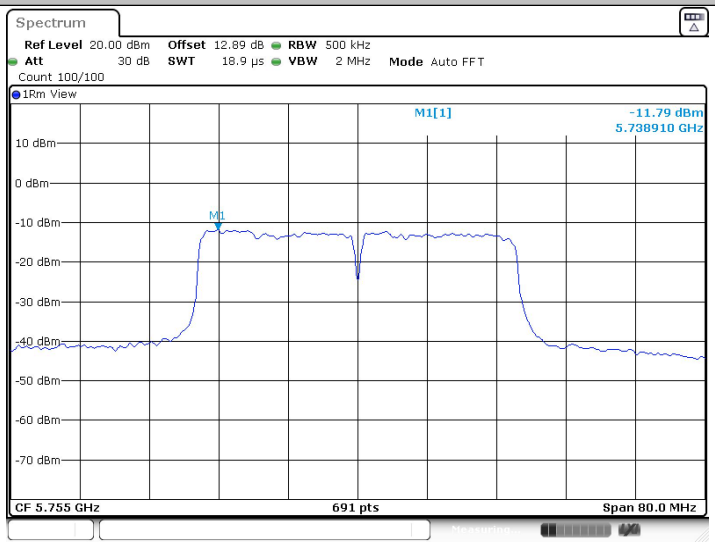
IEEE 802.11n HT20_Ant1_5785MHz



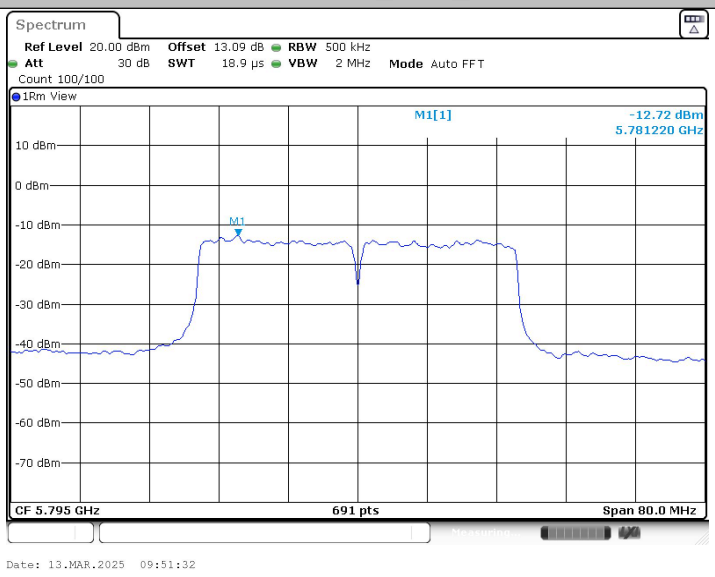
IEEE 802.11n HT20_Ant1_5825MHz



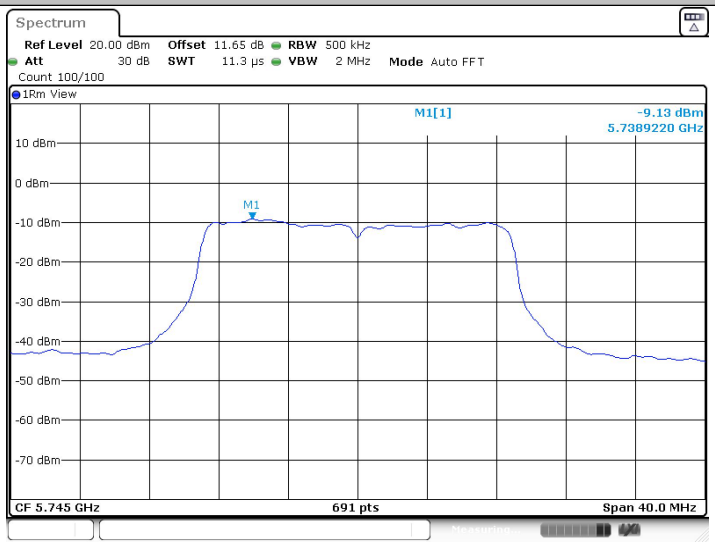
IEEE 802.11n HT40_Ant1_5755MHz



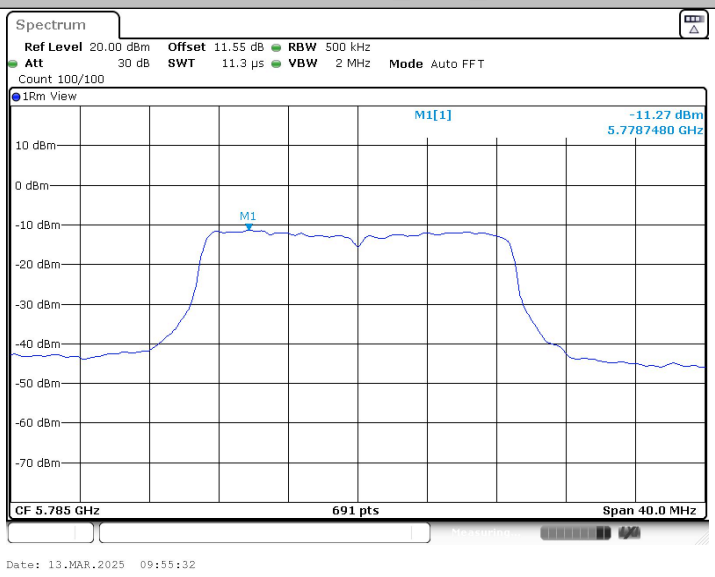
IEEE 802.11n HT40_Ant1_5795MHz



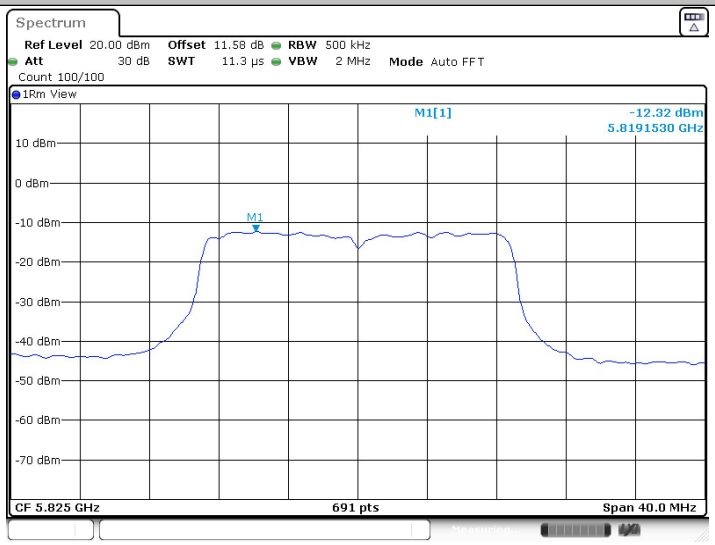
IEEE 802.11ac VHT20_Ant1_5745MHz



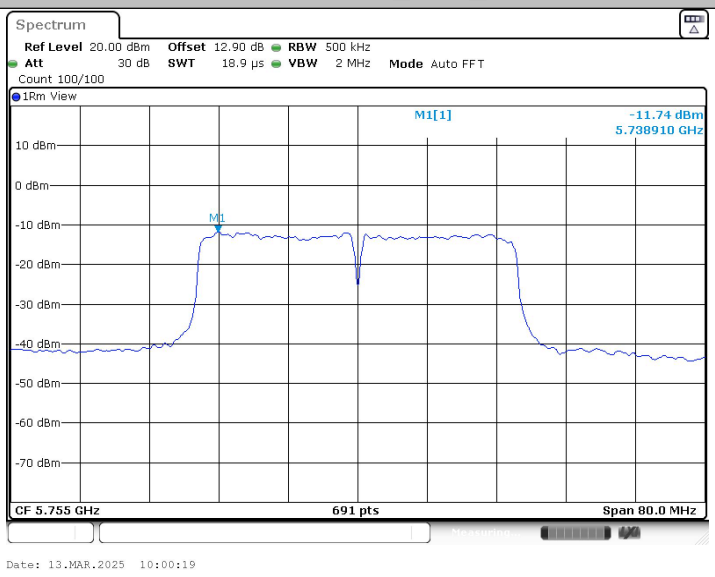
IEEE 802.11ac VHT20_Ant1_5785MHz



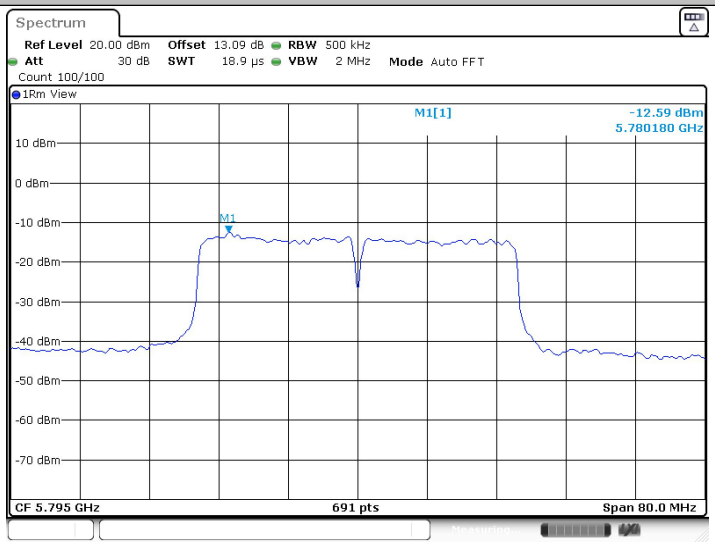
IEEE 802.11ac VHT20_Ant1_5825MHz



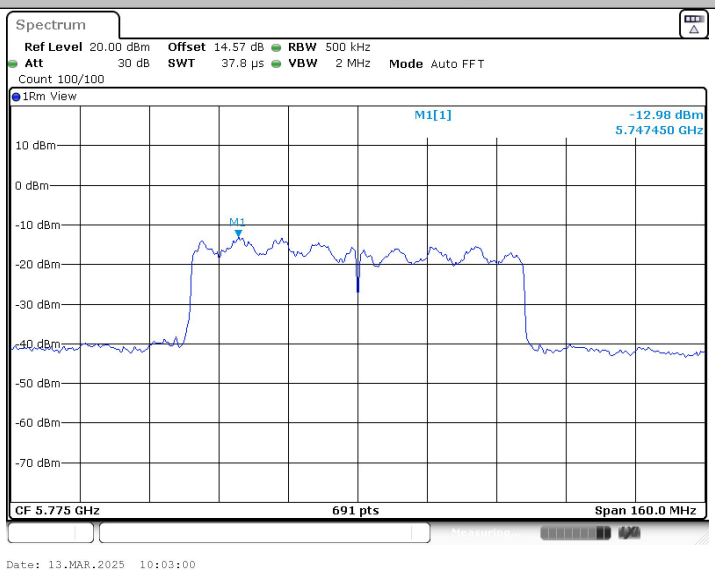
IEEE 802.11ac VHT40_Ant1_5755MHz



IEEE 802.11ac VHT40_Ant1_5795MHz



IEEE 802.11ac VHT80_Ant1_5775MHz



7.5. Frequency Stability Measurement

7.5.1. Test Limit

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

7.5.2. Test Setting

Frequency Stability Under Temperature Variations:

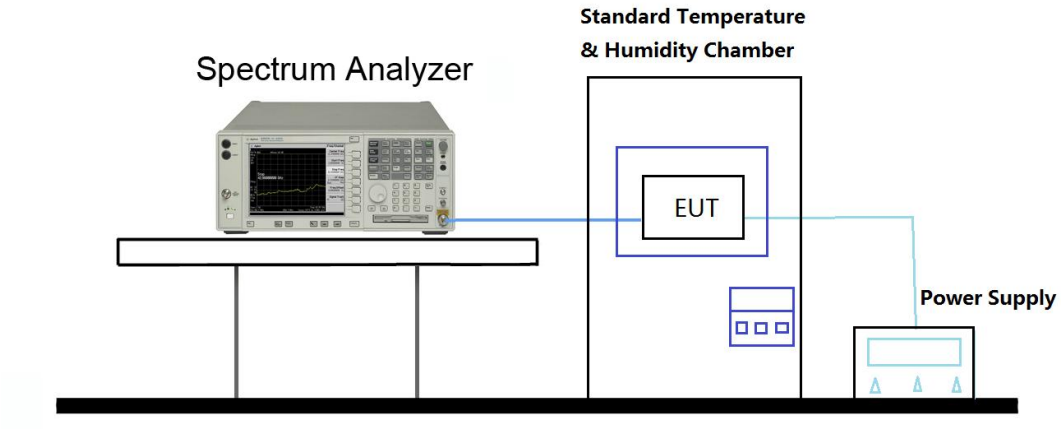
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

7.5.3. Test Setup



7.5.4. Test Result

Voltage								
Test Mode	Antenna	Freq (MHz)	Voltage (Vdc)	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
IEEE 802.11a	Ant1	5745	NV	NT	-10000.00	-1.740644	20	PASS
			LV	NT	-10000.00	-1.740644	20	PASS
			HV	NT	-14000.00	-2.436902	20	PASS
		5785	NV	NT	-10000.00	-1.728608	20	PASS
			LV	NT	-10000.00	-1.728608	20	PASS
			HV	NT	-10000.00	-1.728608	20	PASS
		5825	NV	NT	-11000.00	-1.888412	20	PASS
			LV	NT	-16000.00	-2.746781	20	PASS
			HV	NT	-12000.00	-2.060086	20	PASS
IEEE 802.11n HT20	Ant1	5745	NV	NT	-10000.00	-1.740644	20	PASS
			LV	NT	-10000.00	-1.740644	20	PASS
			HV	NT	-14000.00	-2.436902	20	PASS
		5785	NV	NT	-10000.00	-1.728608	20	PASS
			LV	NT	-10000.00	-1.728608	20	PASS
			HV	NT	-10000.00	-1.728608	20	PASS
		5825	NV	NT	-12000.00	-2.060086	20	PASS
			LV	NT	-12000.00	-2.060086	20	PASS
			HV	NT	-12000.00	-2.060086	20	PASS
IEEE 802.11n HT40	Ant1	5755	NV	NT	-10000.00	-1.737619	20	PASS
			LV	NT	-10000.00	-1.737619	20	PASS
			HV	NT	-9000.00	-1.563858	20	PASS
		5795	NV	NT	-11000.00	-1.898188	20	PASS
			LV	NT	-12000.00	-2.070751	20	PASS
			HV	NT	-12000.00	-2.070751	20	PASS
IEEE 802.11ac VHT20	Ant1	5745	NV	NT	-11000.00	-1.914708	20	PASS
			LV	NT	-11000.00	-1.914708	20	PASS
			HV	NT	-11000.00	-1.914708	20	PASS
		5785	NV	NT	-10000.00	-1.728608	20	PASS
			LV	NT	-10000.00	-1.728608	20	PASS
			HV	NT	-10000.00	-1.728608	20	PASS
		5825	NV	NT	-11000.00	-1.888412	20	PASS
			LV	NT	-11000.00	-1.888412	20	PASS

			HV	NT	-12000.00	-2.060086	20	PASS
IEEE 802.11ac VHT40	Ant1	5755	NV	NT	-1000.00	-0.173762	20	PASS
			LV	NT	-1000.00	-0.173762	20	PASS
			HV	NT	-1000.00	-0.173762	20	PASS
		5795	NV	NT	-11000.00	-1.898188	20	PASS
			LV	NT	-11000.00	-1.898188	20	PASS
			HV	NT	-11000.00	-1.898188	20	PASS
IEEE 802.11ac VHT80	Ant1	5775	NV	NT	-8000.00	-1.385281	20	PASS
			LV	NT	-7000.00	-1.212121	20	PASS
			HV	NT	-6000.00	-1.038961	20	PASS

Temperature								
Test Mode	Antenna	Freq (MHz)	Voltage (Vdc)	Temperature (℃)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
IEEE 802.11a	Ant1	5745	NV	-20	-10000.00	-1.740644	20	PASS
			NV	-10	-10000.00	-1.740644	20	PASS
			NV	0	-10000.00	-1.740644	20	PASS
			NV	10	-10000.00	-1.740644	20	PASS
			NV	20	-10000.00	-1.740644	20	PASS
			NV	30	-10000.00	-1.740644	20	PASS
			NV	40	-10000.00	-1.740644	20	PASS
			NV	50	-10000.00	-1.740644	20	PASS
		5785	NV	-20	-10000.00	-1.728608	20	PASS
			NV	-10	-10000.00	-1.728608	20	PASS
			NV	0	-10000.00	-1.728608	20	PASS
			NV	10	-10000.00	-1.728608	20	PASS
			NV	20	-11000.00	-1.901469	20	PASS
			NV	30	-11000.00	-1.901469	20	PASS
			NV	40	-10000.00	-1.728608	20	PASS
			NV	50	-10000.00	-1.728608	20	PASS
		5825	NV	-20	-12000.00	-2.060086	20	PASS
			NV	-10	-12000.00	-2.060086	20	PASS
			NV	0	-12000.00	-2.060086	20	PASS
			NV	10	-12000.00	-2.060086	20	PASS
			NV	20	-12000.00	-2.060086	20	PASS
			NV	30	-12000.00	-2.060086	20	PASS

			NV	40	-12000.00	-2.060086	20	PASS
			NV	50	-12000.00	-2.060086	20	PASS
IEEE 802.11n HT20	Ant1	5745	NV	-20	-10000.00	-1.740644	20	PASS
			NV	-10	-10000.00	-1.740644	20	PASS
			NV	0	-10000.00	-1.740644	20	PASS
			NV	10	-10000.00	-1.740644	20	PASS
			NV	20	-10000.00	-1.740644	20	PASS
			NV	30	-10000.00	-1.740644	20	PASS
			NV	40	-10000.00	-1.740644	20	PASS
			NV	50	-10000.00	-1.740644	20	PASS
		5785	NV	-20	-10000.00	-1.728608	20	PASS
			NV	-10	-10000.00	-1.728608	20	PASS
			NV	0	-10000.00	-1.728608	20	PASS
			NV	10	-10000.00	-1.728608	20	PASS
			NV	20	-11000.00	-1.901469	20	PASS
			NV	30	-10000.00	-1.728608	20	PASS
			NV	40	-11000.00	-1.901469	20	PASS
			NV	50	-11000.00	-1.901469	20	PASS
		5825	NV	-20	-12000.00	-2.060086	20	PASS
			NV	-10	-12000.00	-2.060086	20	PASS
			NV	0	-12000.00	-2.060086	20	PASS
			NV	10	-12000.00	-2.060086	20	PASS
			NV	20	-16000.00	-2.746781	20	PASS
			NV	30	-12000.00	-2.060086	20	PASS
			NV	40	-12000.00	-2.060086	20	PASS
			NV	50	-12000.00	-2.060086	20	PASS
IEEE 802.11n HT40	Ant1	5755	NV	-20	-6000.00	-1.042572	20	PASS
			NV	-10	-9000.00	-1.563858	20	PASS
			NV	0	-4000.00	-0.695048	20	PASS
			NV	10	-4000.00	-0.695048	20	PASS
			NV	20	-3000.00	-0.521286	20	PASS
			NV	30	-3000.00	-0.521286	20	PASS
			NV	40	-6000.00	-1.042572	20	PASS
			NV	50	-2000.00	-0.347524	20	PASS
		5795	NV	-20	-12000.00	-2.070751	20	PASS
			NV	-10	-12000.00	-2.070751	20	PASS
			NV	0	-12000.00	-2.070751	20	PASS

			NV	10	-12000.00	-2.070751	20	PASS
			NV	20	-11000.00	-1.898188	20	PASS
			NV	30	-11000.00	-1.898188	20	PASS
			NV	40	-11000.00	-1.898188	20	PASS
			NV	50	-11000.00	-1.898188	20	PASS
IEEE 802.11ac VHT20	Ant1	5745	NV	-20	-11000.00	-1.914708	20	PASS
			NV	-10	-11000.00	-1.914708	20	PASS
			NV	0	-11000.00	-1.914708	20	PASS
			NV	10	-15000.00	-2.610966	20	PASS
			NV	20	-11000.00	-1.914708	20	PASS
			NV	30	-11000.00	-1.914708	20	PASS
			NV	40	-11000.00	-1.914708	20	PASS
			NV	50	-11000.00	-1.914708	20	PASS
		5785	NV	-20	-11000.00	-1.901469	20	PASS
			NV	-10	-11000.00	-1.901469	20	PASS
			NV	0	-11000.00	-1.901469	20	PASS
			NV	10	-11000.00	-1.901469	20	PASS
			NV	20	-11000.00	-1.901469	20	PASS
			NV	30	-11000.00	-1.901469	20	PASS
			NV	40	-11000.00	-1.901469	20	PASS
			NV	50	-11000.00	-1.901469	20	PASS
		5825	NV	-20	-11000.00	-1.888412	20	PASS
			NV	-10	-11000.00	-1.888412	20	PASS
			NV	0	-12000.00	-2.060086	20	PASS
			NV	10	-12000.00	-2.060086	20	PASS
			NV	20	-11000.00	-1.888412	20	PASS
			NV	30	-11000.00	-1.888412	20	PASS
			NV	40	-11000.00	-1.888412	20	PASS
			NV	50	-11000.00	-1.888412	20	PASS
IEEE 802.11ac VHT40	Ant1	5755	NV	-20	-1000.00	-0.173762	20	PASS
			NV	-10	0.00	0.000000	20	PASS
			NV	0	0.00	0.000000	20	PASS
			NV	10	0.00	0.000000	20	PASS
			NV	20	0.00	0.000000	20	PASS
			NV	30	0.00	0.000000	20	PASS
			NV	40	0.00	0.000000	20	PASS
			NV	50	1000.00	0.173762	20	PASS

		5795	NV	-20	-11000.00	-1.898188	20	PASS
			NV	-10	-11000.00	-1.898188	20	PASS
			NV	0	-11000.00	-1.898188	20	PASS
			NV	10	-11000.00	-1.898188	20	PASS
			NV	20	-11000.00	-1.898188	20	PASS
			NV	30	-11000.00	-1.898188	20	PASS
			NV	40	-11000.00	-1.898188	20	PASS
			NV	50	-11000.00	-1.898188	20	PASS
IEEE 802.11ac VHT80	Ant1	5775	NV	-20	-5000.00	-0.865801	20	PASS
			NV	-10	-5000.00	-0.865801	20	PASS
			NV	0	-5000.00	-0.865801	20	PASS
			NV	10	-4000.00	-0.692641	20	PASS
			NV	20	-4000.00	-0.692641	20	PASS
			NV	30	-7000.00	-1.212121	20	PASS
			NV	40	-3000.00	-0.519481	20	PASS
			NV	50	-3000.00	-0.519481	20	PASS

Note: 1.This report records the worst case of temperature change test observation time 0/2/5/10min .

2.Test Voltage-NV:DC 12V, Test Voltage-LV:DC 10.2V, Test Voltage-HV:DC 13.8V.

3.Test Temperature Range:-20℃~50℃, Temperature-NT: 23.1℃.

4.Frequency Tolerance (ppm) = {[Measured Frequency (Hz) - Declared Frequency (Hz)] / Declared Frequency (Hz)} *10^6.

7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) 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 e.i.r.p. of −27 dBm/MHz.

(2) 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 e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

The unwanted emissions which fall in Restricted bands shall not exceed the field strength levels specified in the following table:

15.209 Radiated emission limits

Frequency (MHz)	Field Strength(μV/m)	Distance(m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

7.6.2. Test Setting

a) EUT was placed on a turn table, which is 0.8 meter high above ground for below 1GHz test, and which is 1.5 meter high above ground for above 1GHz test.
b) EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower.
c) Set the EUT transmit continuously with maximum output power.
d) The turn table can rotate 360 degrees to determine the position of the maximum emission level.
e) The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.
f) Spectrum analyzer setting parameters please see the below table.
g) Repeat above procedures until all channels were measured.
h) Record the results in the test report.

For 9kHz-150kHz

Spectrum Parameters	Setting
RBW	300Hz(for Peak&AVG)/CISPR 200Hz(for QP)
VBW	300Hz(for Peak&AVG)/CISPR 200Hz(for QP)
Start frequency	9kHz
Stop frequency	150kHz
Sweep Time	Auto
Detector	PEAK/QP/AVG
Trace Mode	Max Hold

Note: For 9kHz-90kHz&110kHz-150kHz,the detector is average,other frequency is CISPR QP detector.