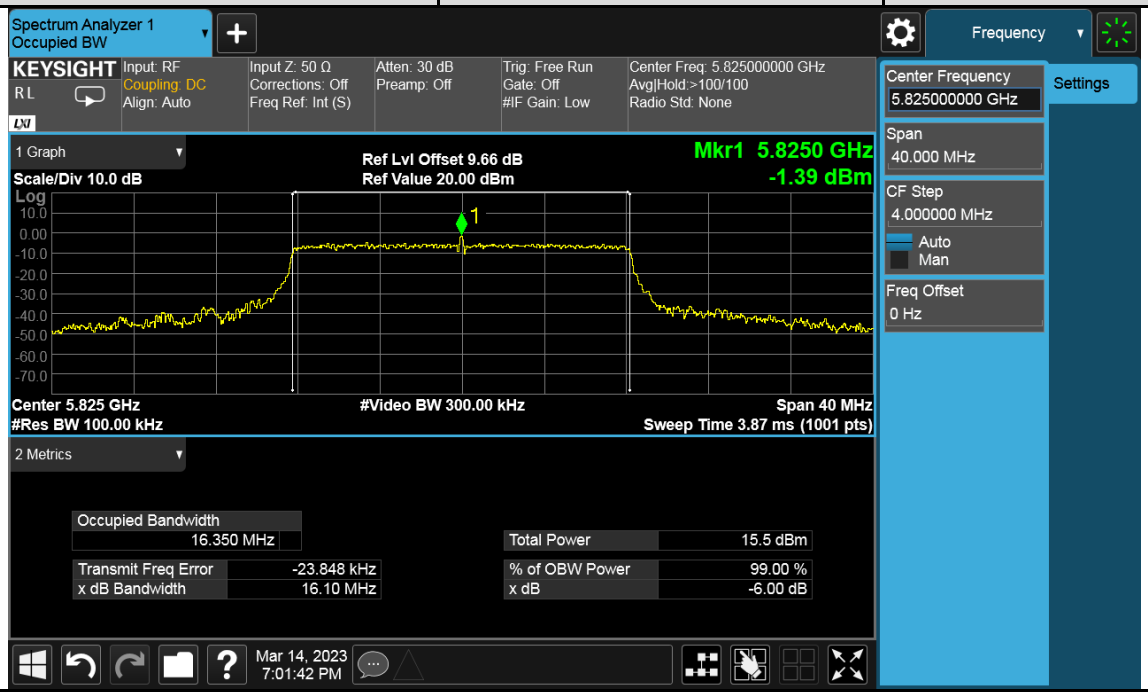
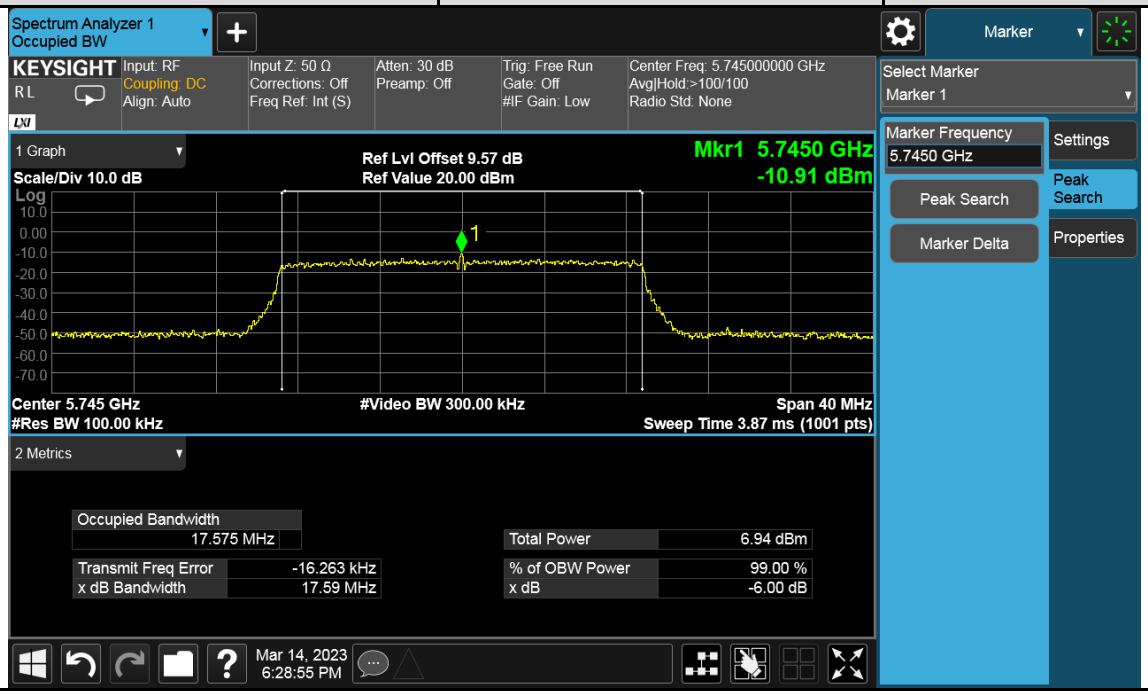
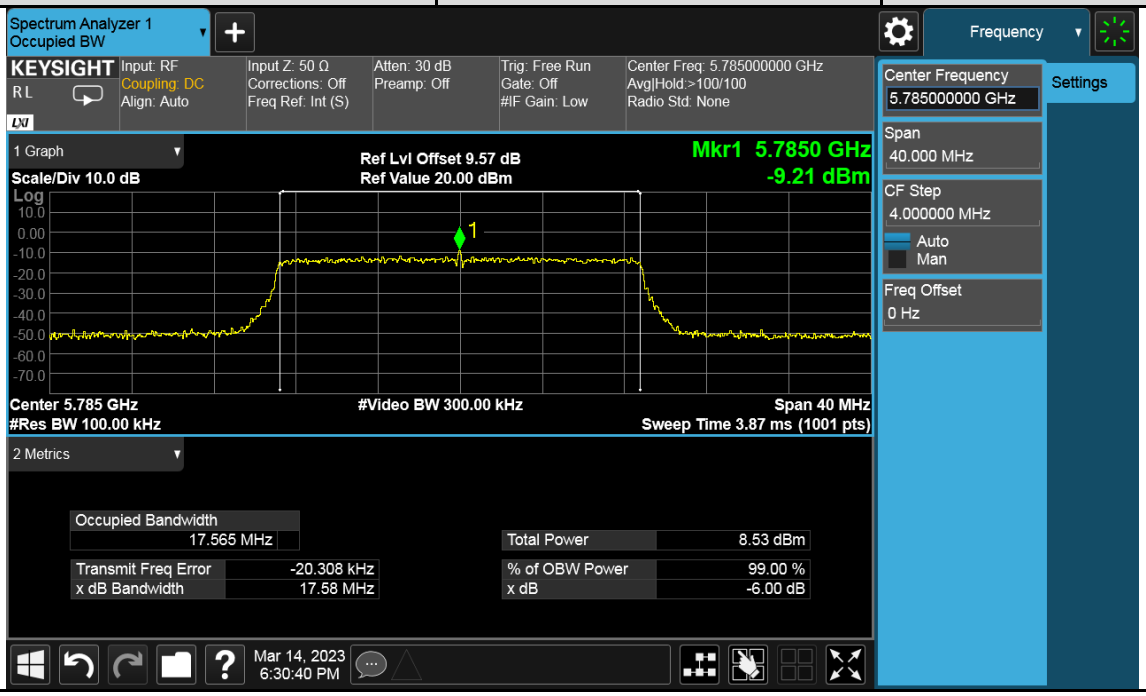
Test Mode	Test Channel	Verdict
11A	5825	PASS



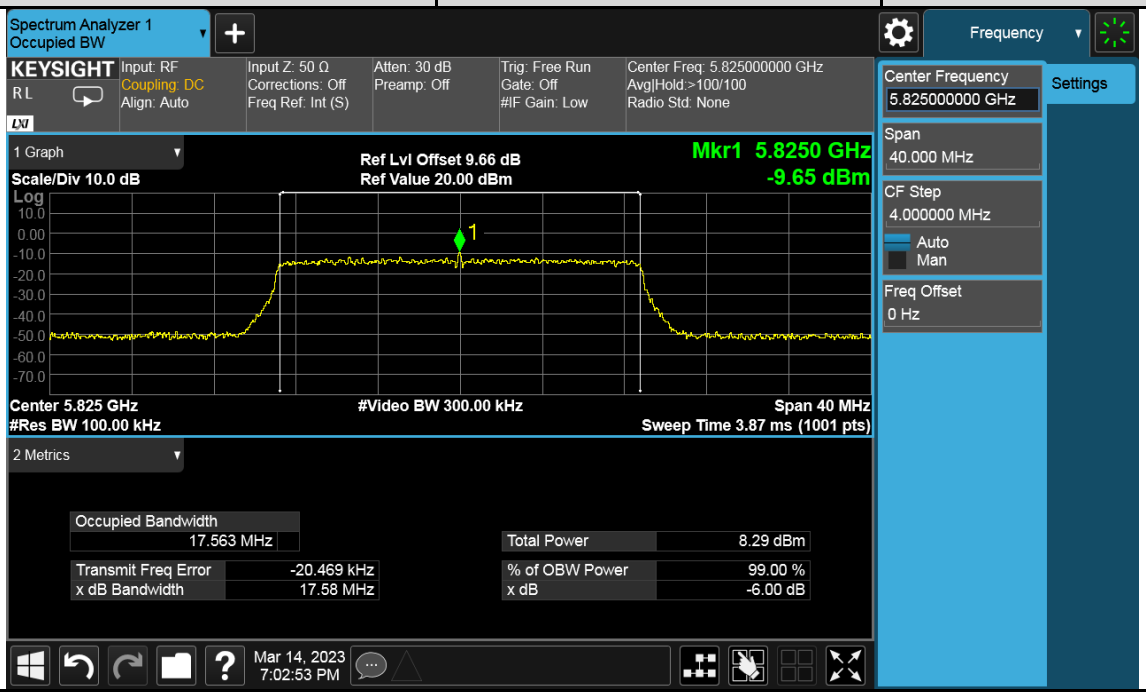
Test Mode	Test Channel	Verdict
11AC20	5745	PASS



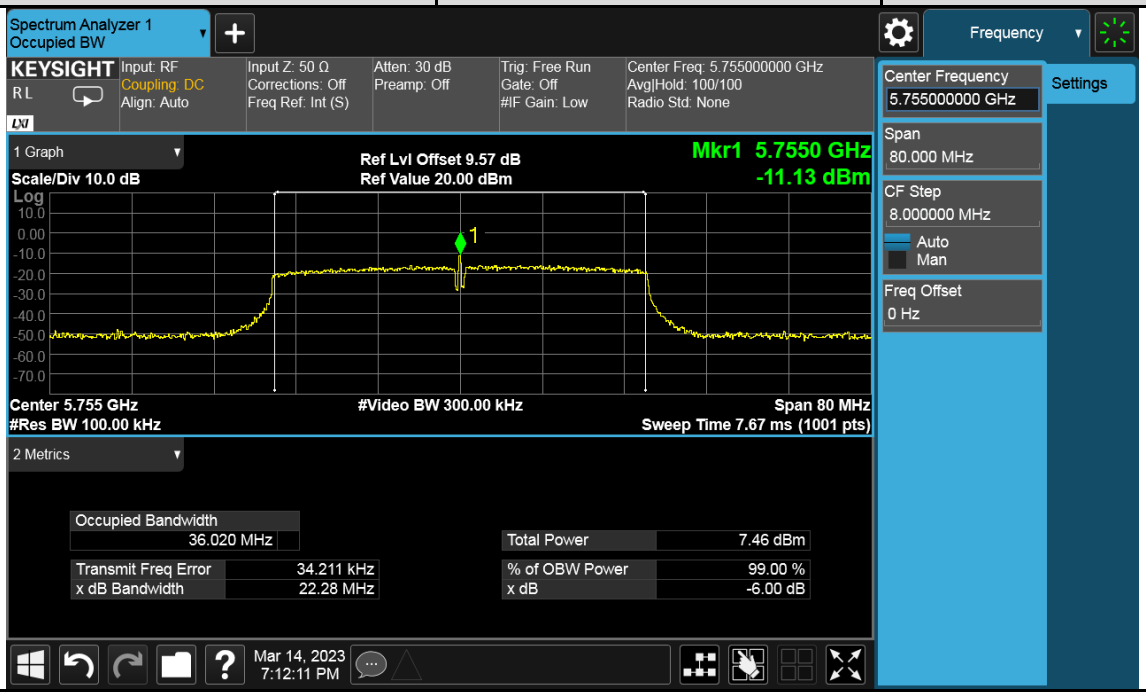
Test Mode	Test Channel	Verdict
11AC20	5785	PASS



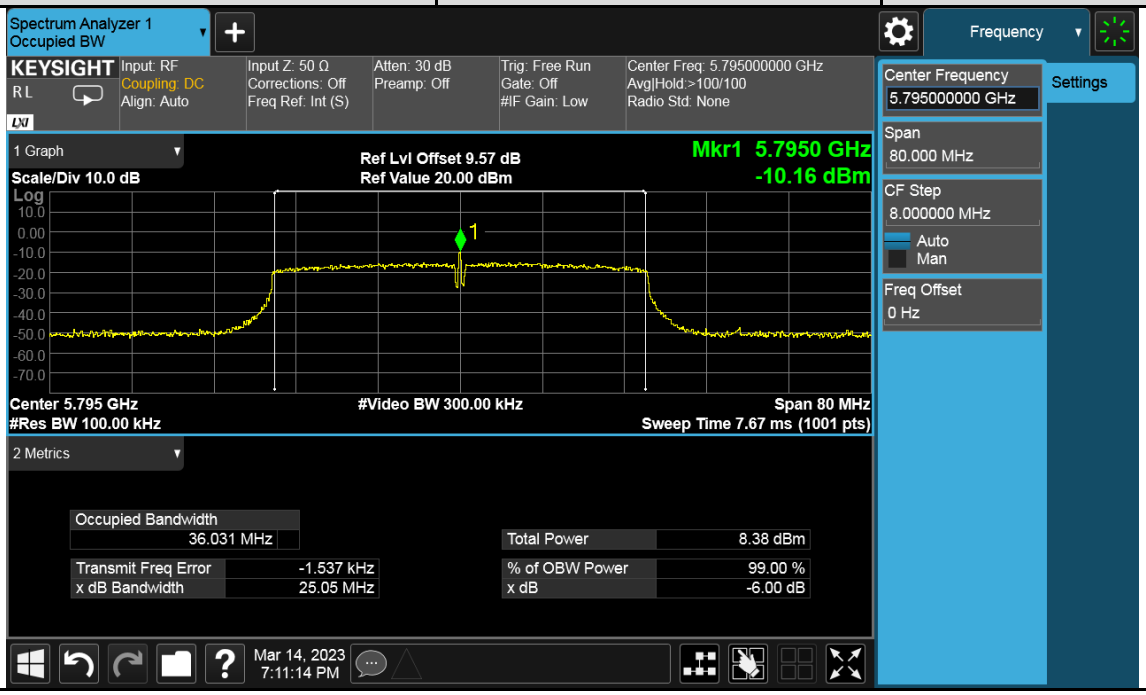
Test Mode	Test Channel	Verdict
11AC20	5825	PASS



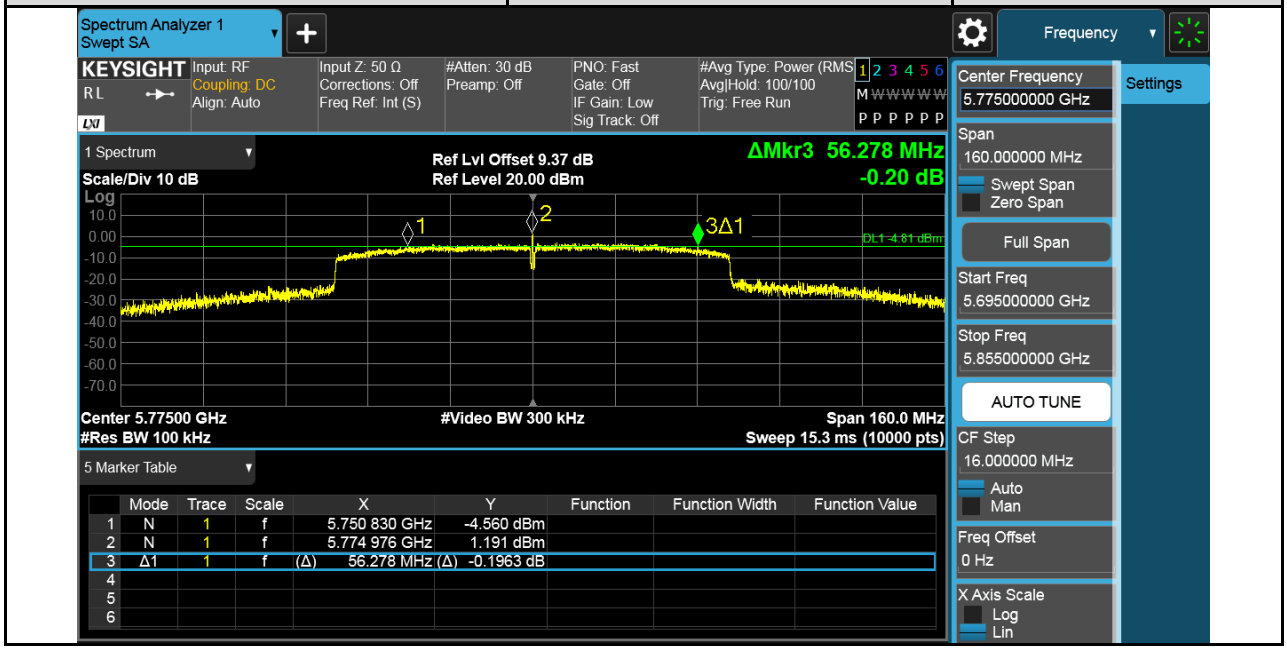
Test Mode	Test Channel	Verdict
11AC40	5755	PASS



Test Mode	Test Channel	Verdict
11AC40	5795	PASS

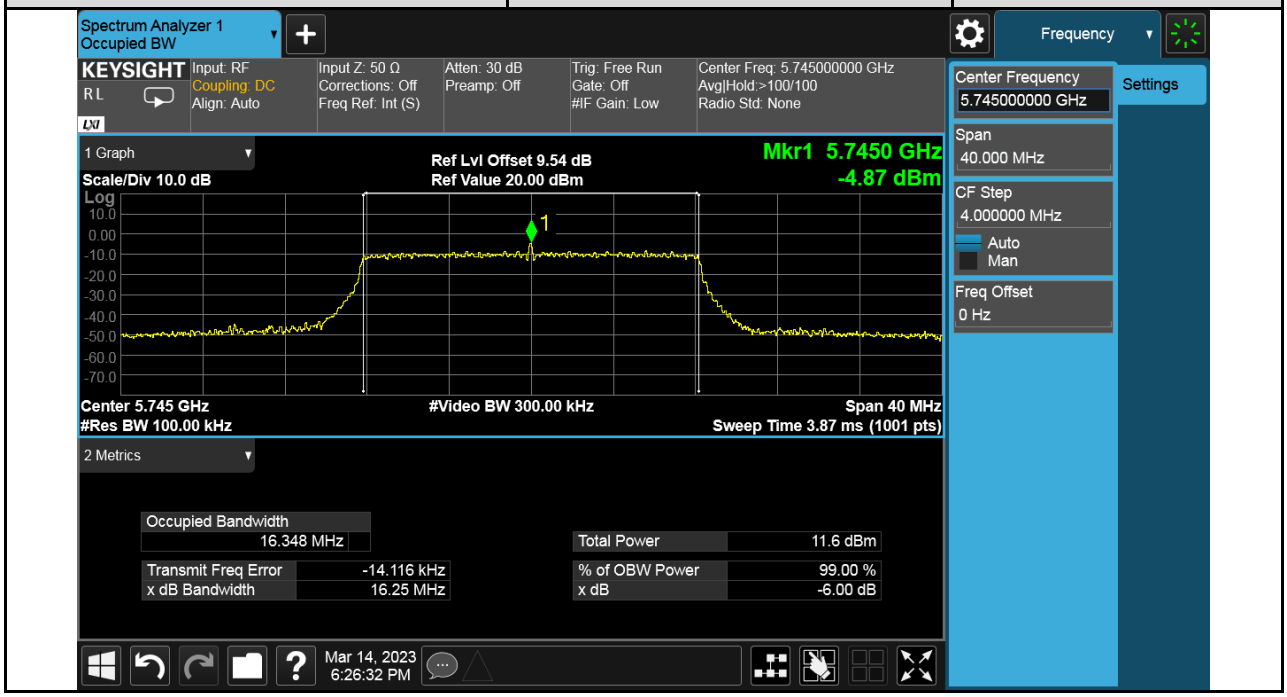


Test Mode	Test Channel	Verdict
11AC80	5775	PASS

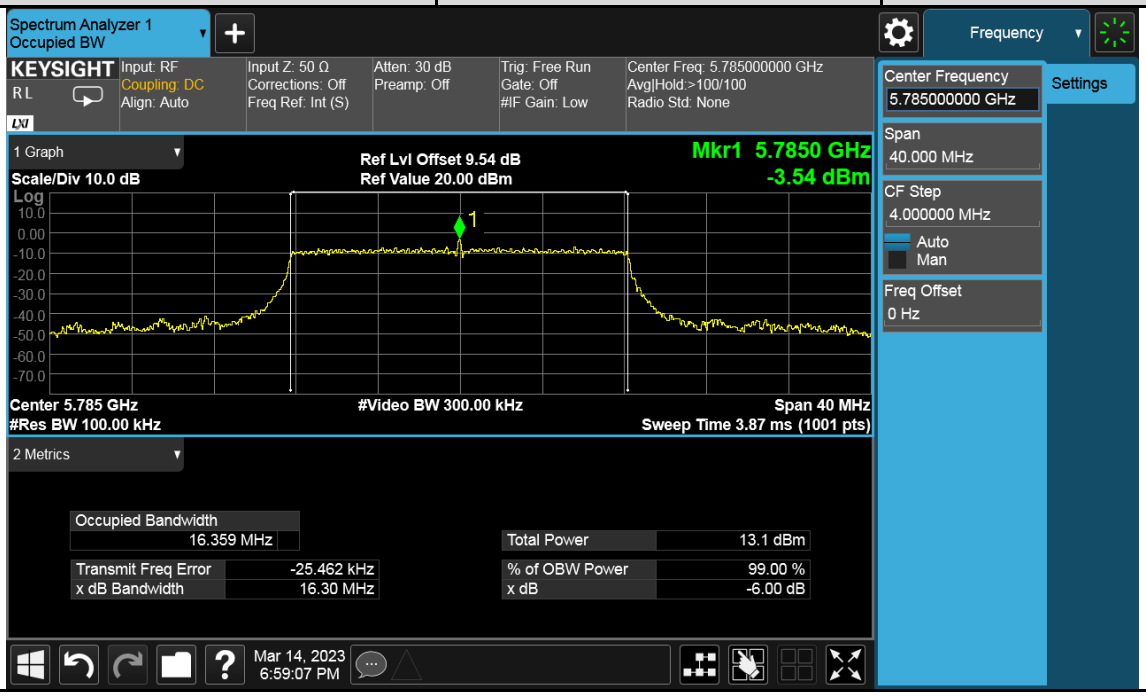


IV) For 6 dB Emission Bandwidth Antenna 2 Part:

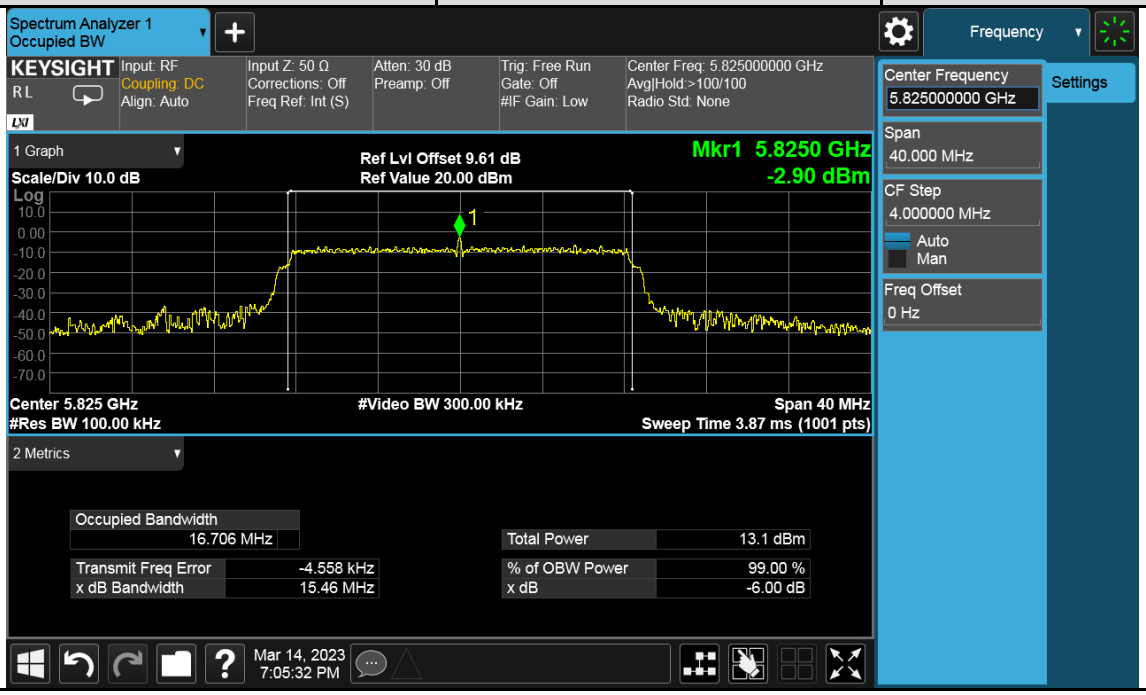
Test Mode	Test Channel	Verdict
11A	5745	PASS



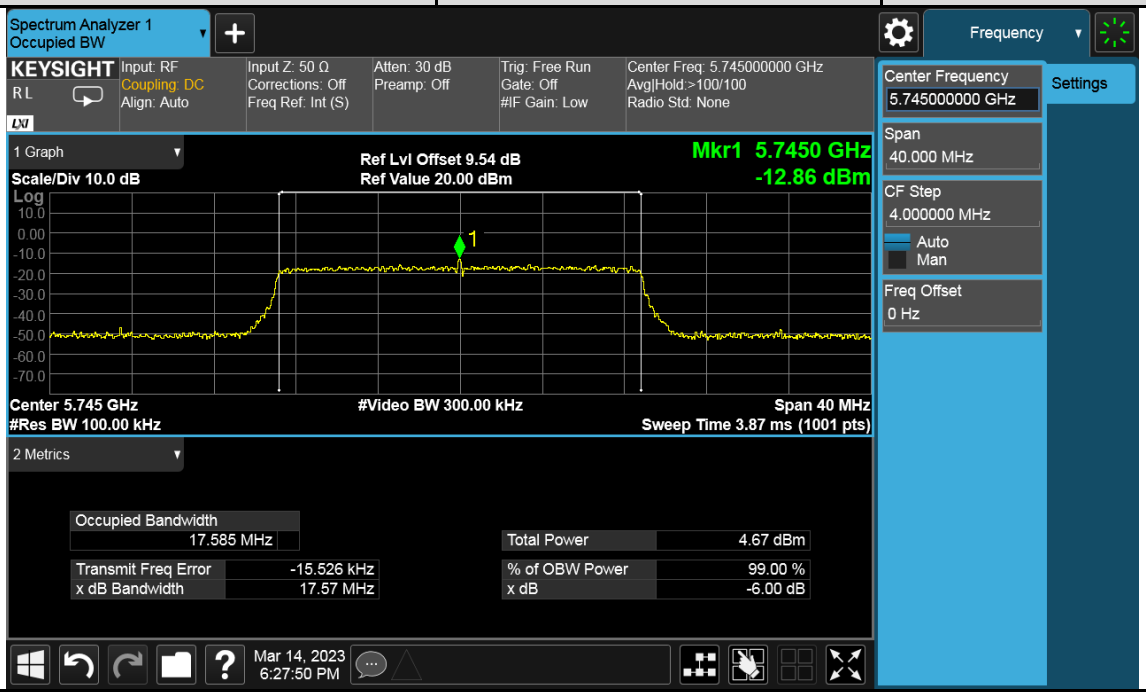
Test Mode	Test Channel	Verdict
11A	5785	PASS



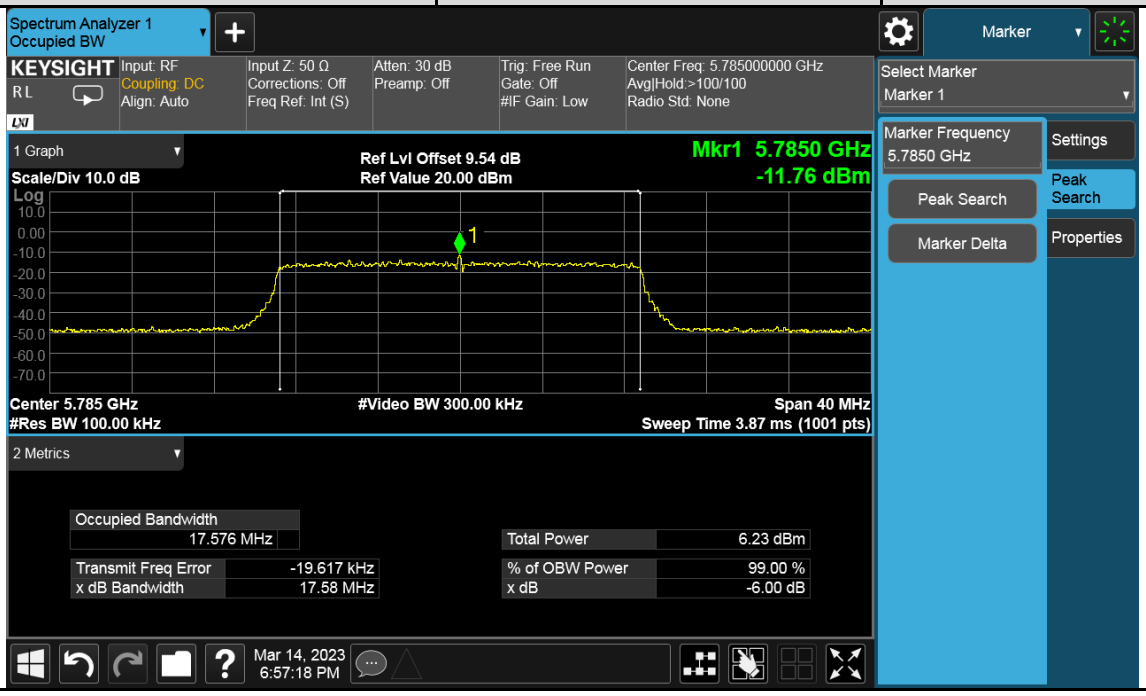
Test Mode	Test Channel	Verdict
11A	5825	PASS



Test Mode	Test Channel	Verdict
11AC20	5745	PASS

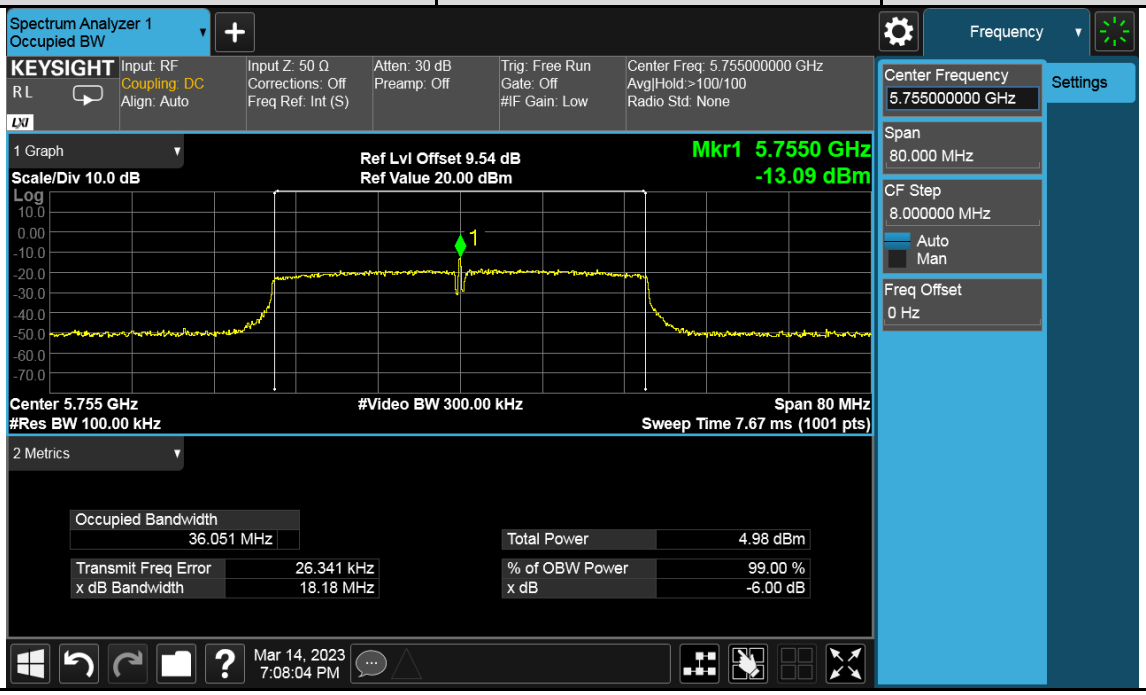


Test Mode	Test Channel	Verdict
11AC20	5785	PASS

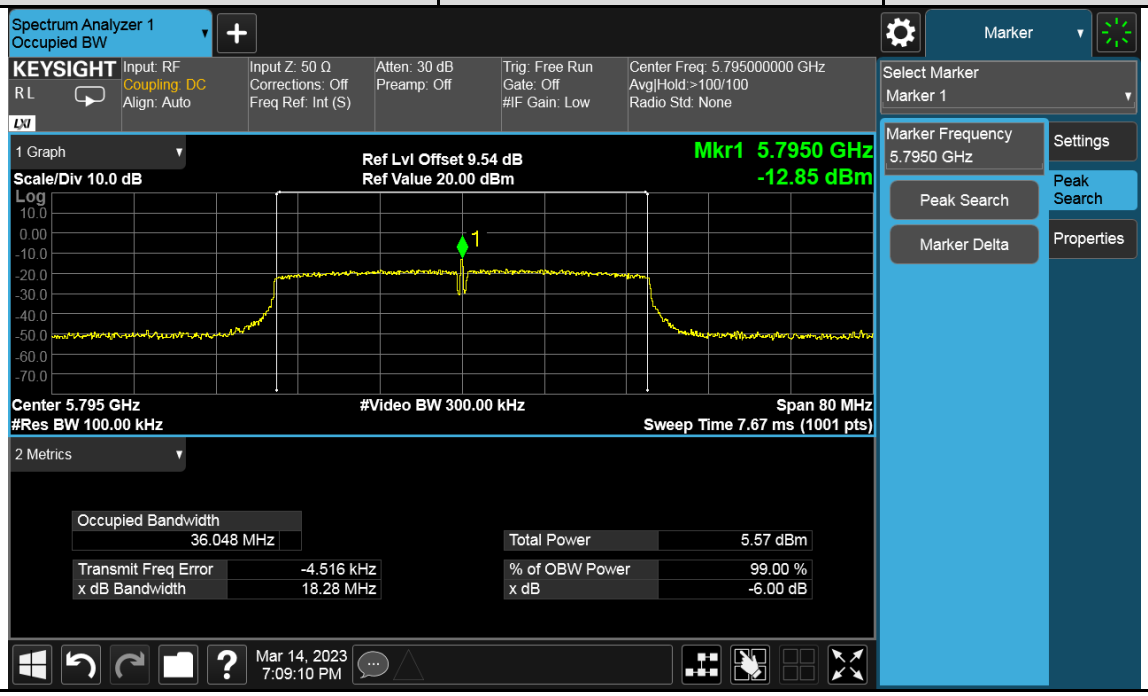


Test Mode	Test Channel	Verdict
11AC20	5825	PASS

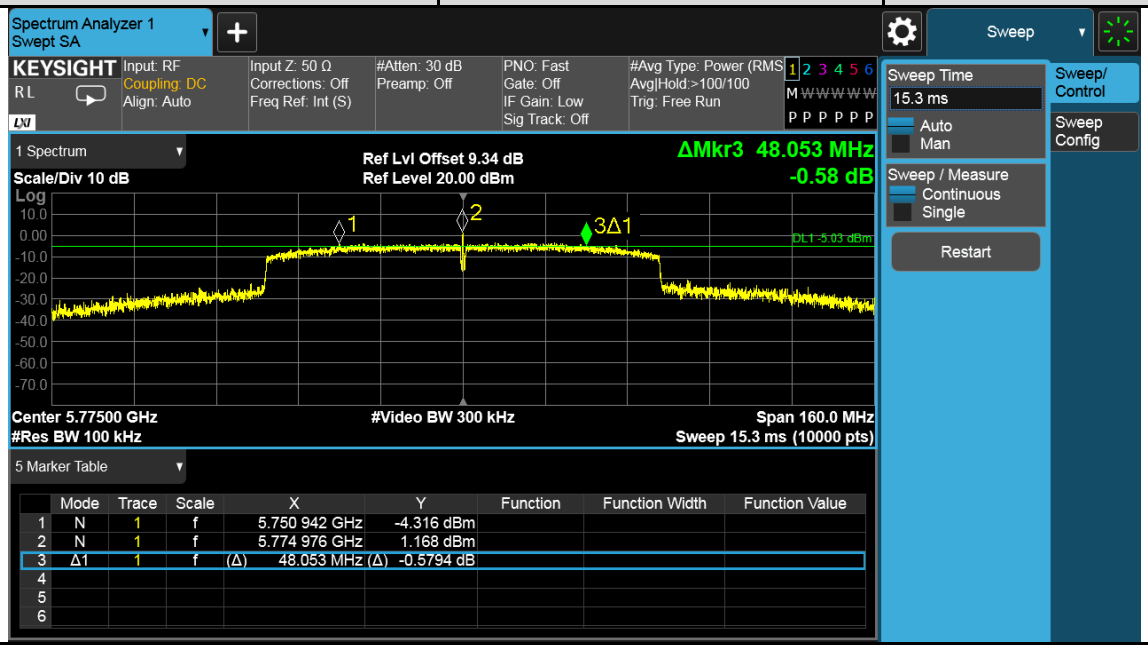
Test Mode	Test Channel	Verdict
11AC40	5755	PASS



Test Mode	Test Channel	Verdict
11AC40	5795	PASS



Test Mode	Test Channel	Verdict
11AC80	5775	PASS



6.3. MAXIMUM CONDUCTED AVERAGE OUTPUT POWER

LIMITS

CFR 47 FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
Conducted Output Power	☐ Outdoor Access Point: 1 W (30 dBm) ☐ Indoor Access Point: 1 W (30 dBm) ☐ Fixed Point-To-Point Access Points: 1 W (30 dBm) ☒ Client Devices: 250 mW (24 dBm)	5150 ~ 5250
	Shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.	5250 ~ 5350 5470 ~ 5725
	Shall not exceed 1 Watt (30 dBm).	5725 ~ 5850
Remark: 1)The above limits are based upon the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.		

TEST PROCEDURE

Refer to KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 section II.E.

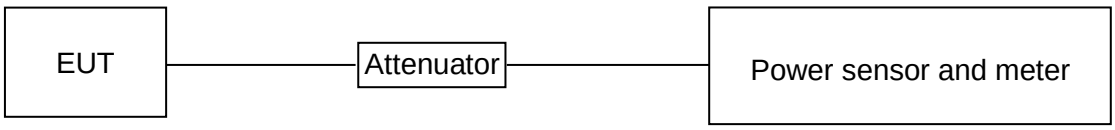
Method PM (Measurement using an RF average power meter):
(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:
a. The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
b. At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
c. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in II.B.
(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
(iv) Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (1/0.25) if the duty cycle is 25 %).

Method PM-G (Measurement using a gated RF average power meter):
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.

TEST ENVIRONMENT

Temperature	23.0℃	Relative Humidity	44%
Atmosphere Pressure	102kpa	Test Voltage	DC5V

TEST SETUP



TEST RESULT TABLE

Mode	Frequency (MHz)	Average Conducted Output Power (dBm)			FCC Conducted Power Limit (dBm)
		ANT 1	ANT 2	Total	
802.11a	5180	11.06	10.18	/	24
	5200	10.29	9.66	/	24
	5240	9.70	9.42	/	24
	5745	7.11	4.59	/	30
	5785	8.06	5.09	/	30
	5825	8.08	5.44	/	30
802.11 ac 20MIMO	5180	12.40	11.77	14.97	21.73
	5200	11.67	11.36	14.53	21.73
	5240	11.07	10.97	14.03	21.73
	5745	1.74	-0.53	3.76	28.97
	5785	2.22	-0.72	4.00	28.97
	5825	2.55	-0.28	4.37	28.97
802.11 ac 40MIMO	5190	11.13	10.66	13.91	21.73
	5230	10.16	10.07	13.13	21.73
	5755	1.22	-1.36	3.13	28.97
	5795	2.03	-0.63	3.91	28.97
802.11 ac 80MIMO	5210	9.74	9.18	12.48	21.73
	5775	1.62	-1.12	3.47	28.97

Remark: 1. The test results have already included the duty cycle correction factor. About correction Factor please refer to section 6.2.

6.4. POWER SPECTRAL DENSITY

LIMITS

CFR 47 FCC Part15, Subpart E		
Test Item	Limit	Frequency Range (MHz)
Power Spectral Density	☐ Outdoor Access Point: 17 dBm/MHz ☐ Indoor Access Point: 17 dBm/MHz ☐ Fixed Point-To-Point Access Points: 17 dBm/MHz ☒ Client Devices: 11 dBm/MHz	5150 ~ 5250
	11 dBm/MHz	5250 ~ 5350 5470 ~ 5725
	30 dBm/500kHz	5725 ~ 5850
Remark: 1)The above limits are based upon the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.		

TEST PROCEDURE

Refer to KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 section II.F.

Connect the EUT to the spectrum analyser and use the following settings:

For U-NII-1, U-NII-2A and U-NII-2C band:

Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	1 MHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

For U-NII-3:

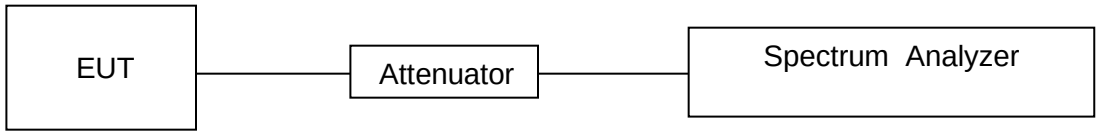
Center Frequency	The center frequency of the channel under test
Detector	RMS
RBW	500 kHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Allow trace to fully stabilize and Use the peak search function on the instrument to find the peak of the spectrum and record its value.
Add 10 log (1/x), where x is the duty cycle, to the peak of the spectrum, the result is the Maximum PSD over 1 MHz / 500 kHz reference bandwidth.

TEST ENVIRONMENT

Temperature	23.0℃	Relative Humidity	44%
Atmosphere Pressure	102kpa	Test Voltage	DC5V

TEST SETUP



RESULTS

Test Mode	Antenna	Channel	Power [dBm/MHz]	Limit [dBm/MHz]	Verdict
11A	Ant1	5180	-0.42	<=11	PASS
	Ant2	5180	-1.05	<=11	PASS
	Ant1	5200	-1.06	<=11	PASS
	Ant2	5200	-1.49	<=11	PASS
	Ant1	5240	-1.64	<=11	PASS
	Ant2	5240	-1.87	<=11	PASS
11AC20MIMO	Ant1	5180	0.99	<=11	PASS
	Ant2		0.27	<=11	PASS
	total		3.66	<=8.73	PASS
	Ant1	5200	0.11	<=11	PASS
	Ant2		-0.18	<=11	PASS
	total		2.98	<=8.73	PASS
	Ant1	5240	-0.57	<=11	PASS
	Ant2		-0.64	<=11	PASS
	total		2.41	<=8.73	PASS
11AC40MIMO	Ant1	5190	-3.18	<=11	PASS
	Ant2		-3.8	<=11	PASS
	total		-0.47	<=8.73	PASS
	Ant1	5230	-3.97	<=11	PASS
	Ant2		-4.22	<=11	PASS
	total		-1.08	<=8.73	PASS
11AC80MIMO	Ant1	5210	-7.38	<=11	PASS
	Ant2		-6.82	<=11	PASS
	total		-4.08	<=8.73	PASS

Test Mode	Antenna	Channel	Power [dBm/500kHz]	Limit [dBm/500kHz]	Verdict
11A	Ant1	5745	-1.68	<=30	PASS
	Ant2	5745	-4.09	<=30	PASS
	Ant1	5785	-0.65	<=30	PASS
	Ant2	5785	-3.41	<=30	PASS
	Ant1	5825	-0.63	<=30	PASS
	Ant2	5825	-2.98	<=30	PASS
11AC20MIMO	Ant1	5745	-9.35	<=28.97	PASS
	Ant2		-11.52	<=28.97	PASS
	total		-7.29	<=28.97	PASS
	Ant1	5785	-8.36	<=28.97	PASS
	Ant2		-11.13	<=28.97	PASS
	total		-6.52	<=28.97	PASS
	Ant1	5825	-8.1	<=28.97	PASS
	Ant2		-10.86	<=28.97	PASS
	total		-6.25	<=28.97	PASS
11AC40MIMO	Ant1	5755	-9.66	<=28.97	PASS
	Ant2		-12.16	<=28.97	PASS
	total		-7.72	<=28.97	PASS
	Ant1	5795	-8.67	<=28.97	PASS
	Ant2		-11.41	<=28.97	PASS
	total		-6.82	<=28.97	PASS
11AC80MIMO	Ant1	5775	-8.84	<=28.97	PASS
	Ant2		-11.62	<=28.97	PASS
	total		-7.00	<=28.97	PASS

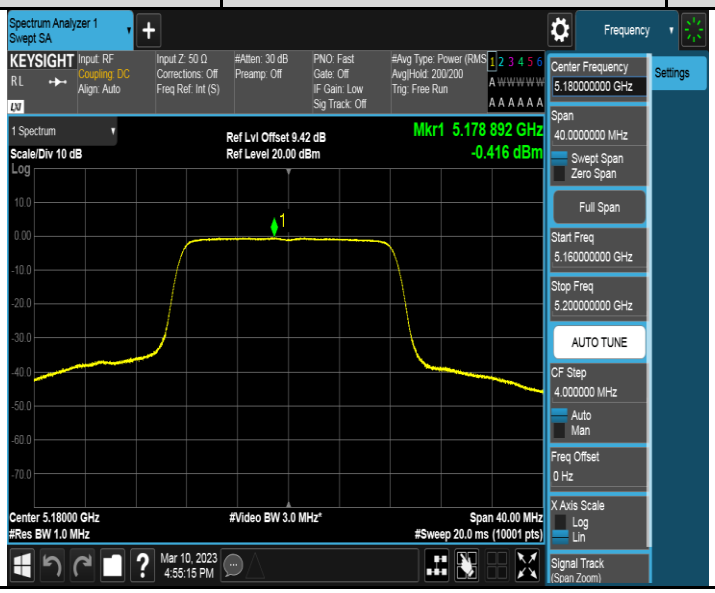
Remark：

1) The Result and Limit Unit is dBm/500 kHz in the band 5.725 ~ 5.85 GHz.
2) The test result has considered the difference RBW setting as the factor in test data through “Ref Lvl Offset” parameter in test graphs. The final “Ref Lvl Offset” =Actual Cable loss+ correction factor(10log(500/300)).

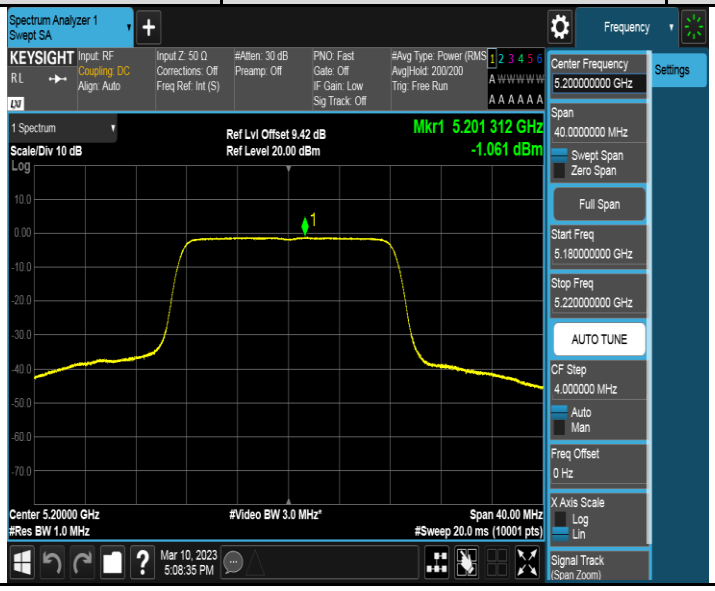
TEST GRAPHS

Antenna 1 Part:

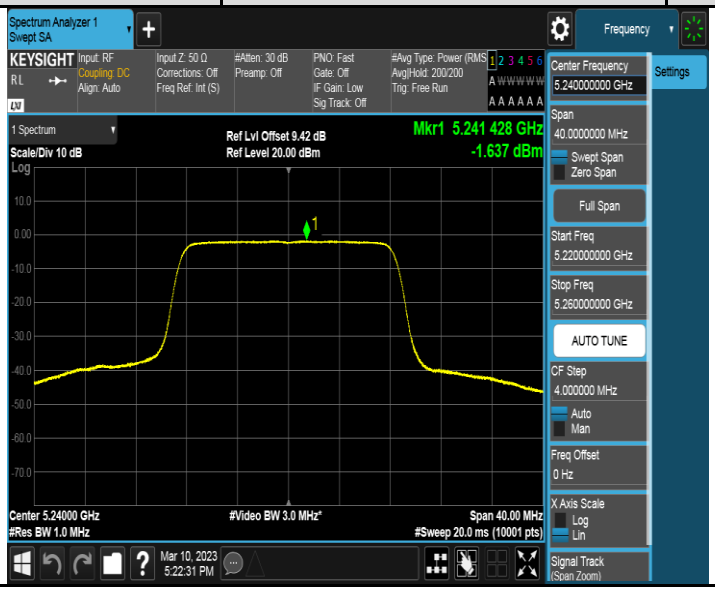
Test Mode	Test Channel	Verdict
11A	5180	PASS



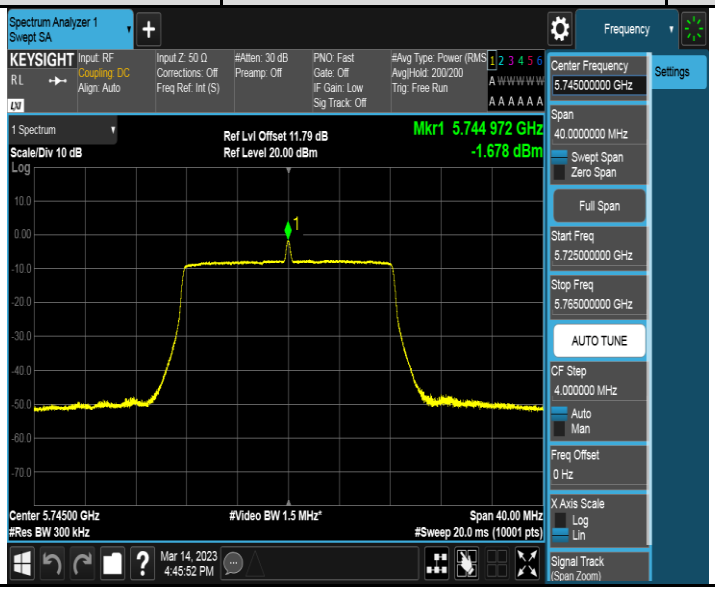
Test Mode	Test Channel	Verdict
11A	5200	PASS



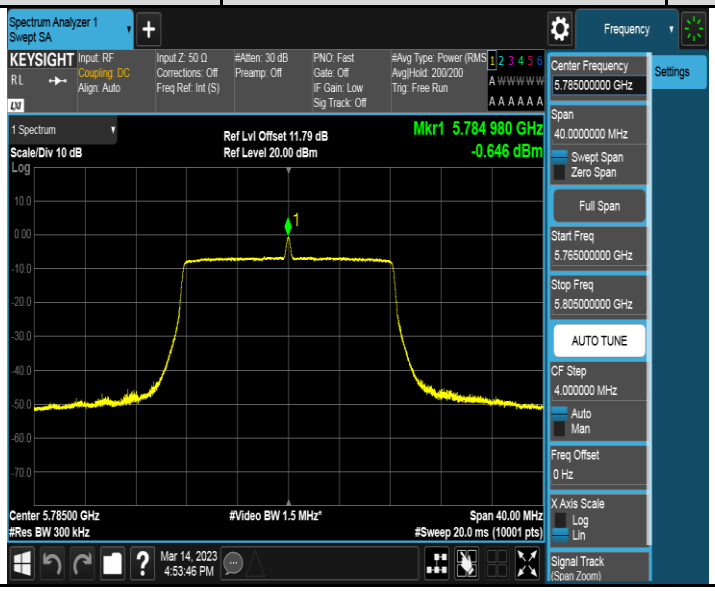
Test Mode	Test Channel	Verdict
11A	5240	PASS



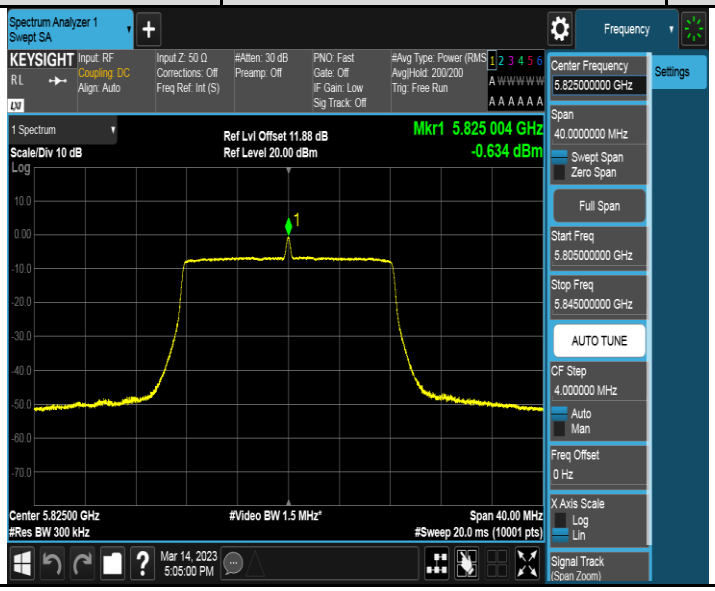
Test Mode	Test Channel	Verdict
11A	5745	PASS



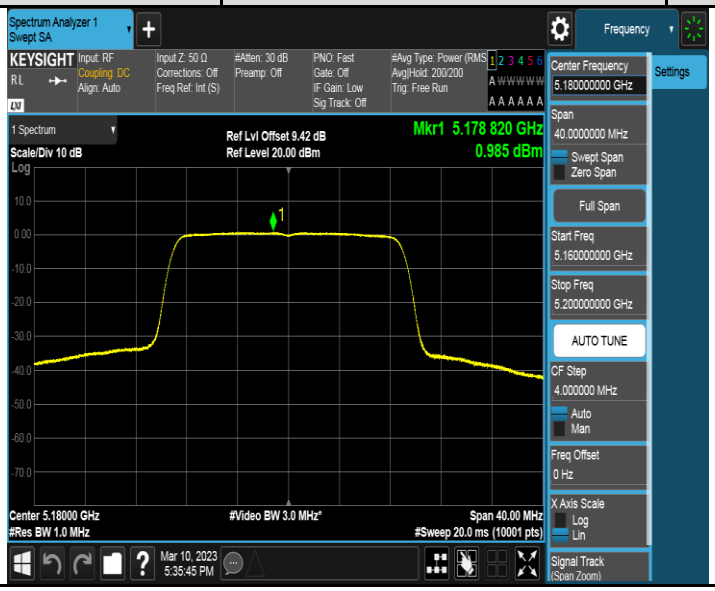
Test Mode	Test Channel	Verdict
11A	5785	PASS



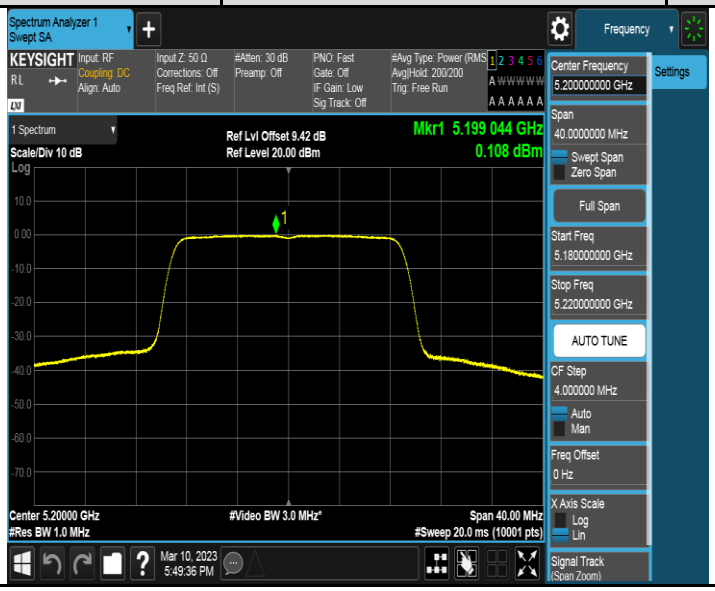
Test Mode	Test Channel	Verdict
11A	5825	PASS



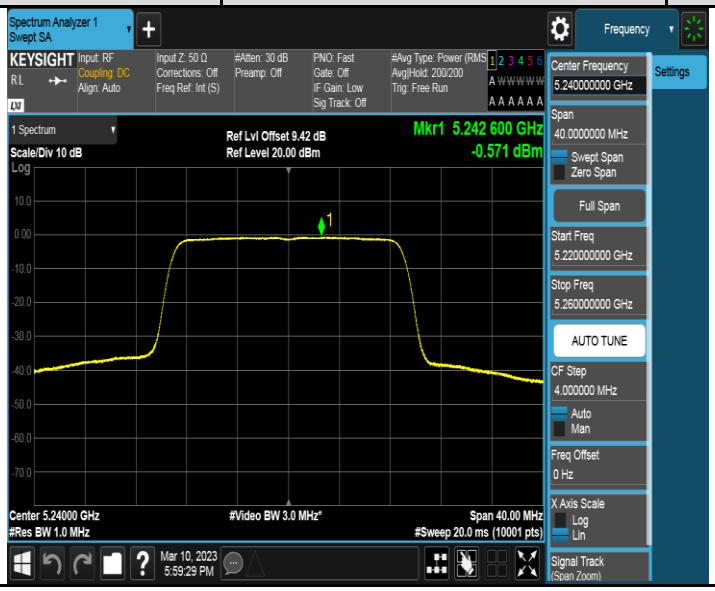
Test Mode	Test Channel	Verdict
11AC20	5180	PASS



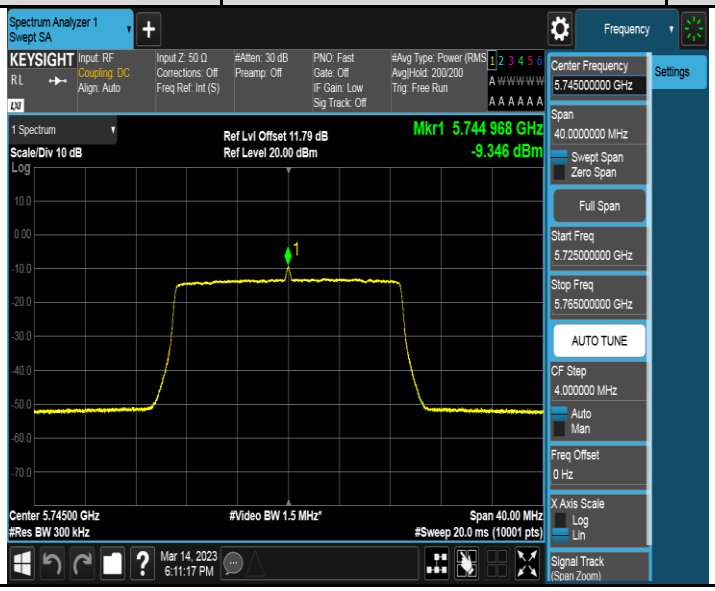
Test Mode	Test Channel	Verdict
11AC20	5200	PASS



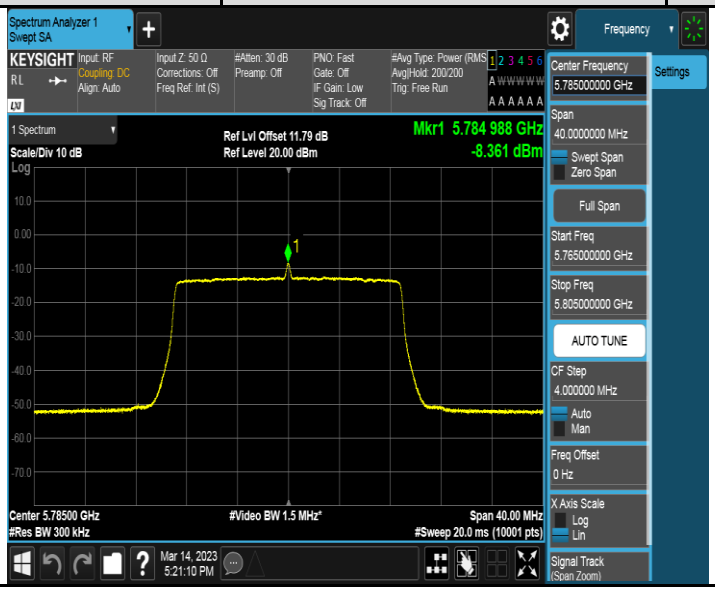
Test Mode	Test Channel	Verdict
11AC20	5240	PASS



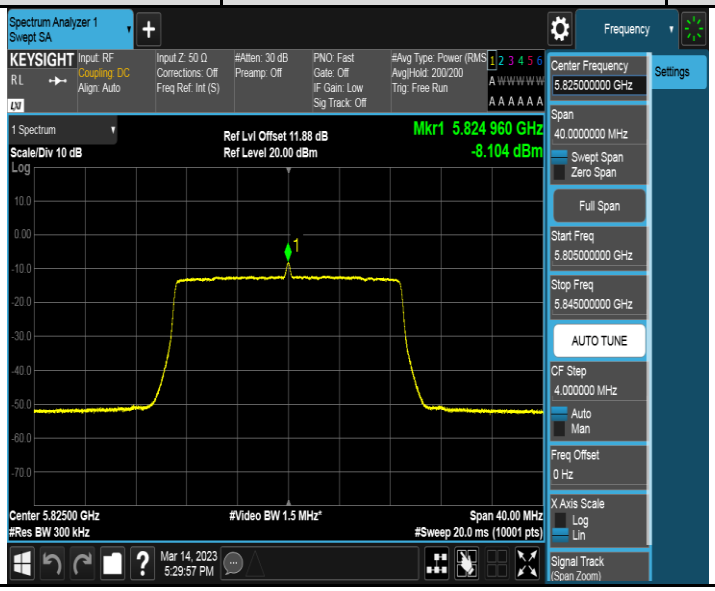
Test Mode	Test Channel	Verdict
11AC20	5745	PASS



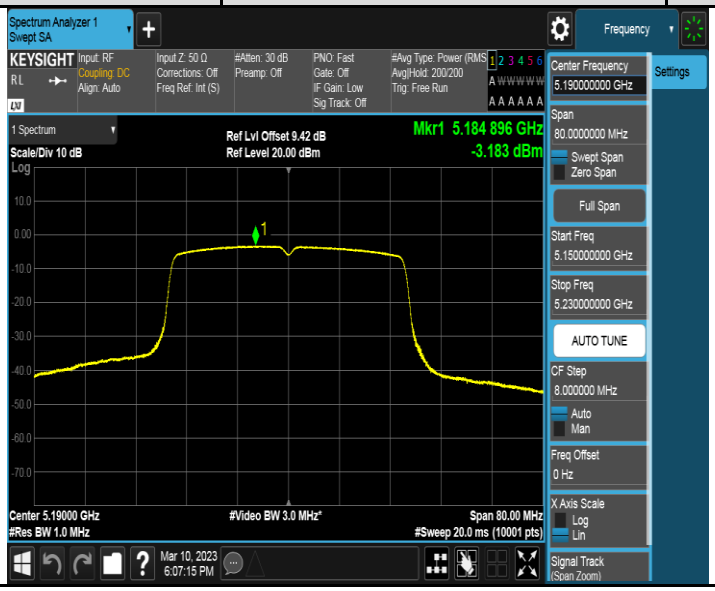
Test Mode	Test Channel	Verdict
11AC20	5785	PASS



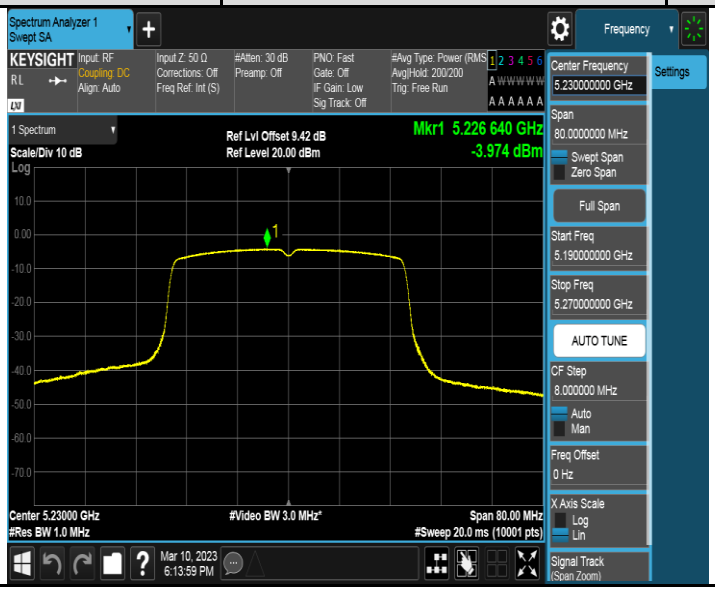
Test Mode	Test Channel	Verdict
11AC20	5825	PASS



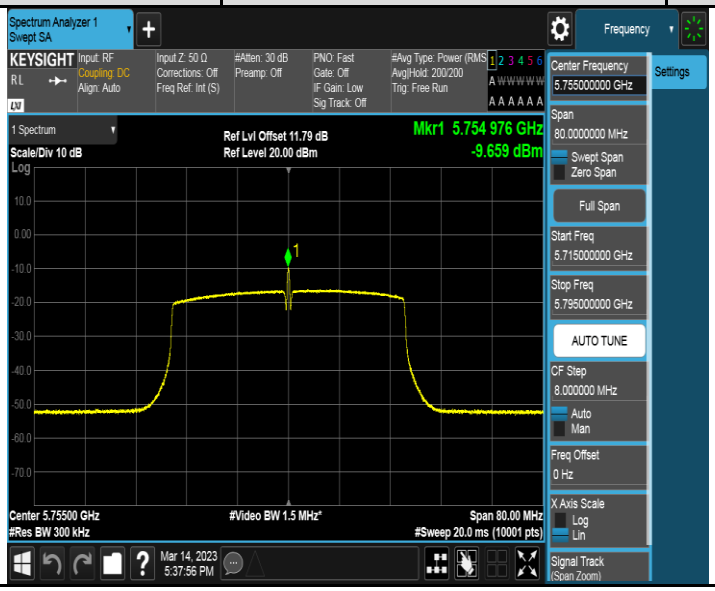
Test Mode	Test Channel	Verdict
11AC40	5190	PASS



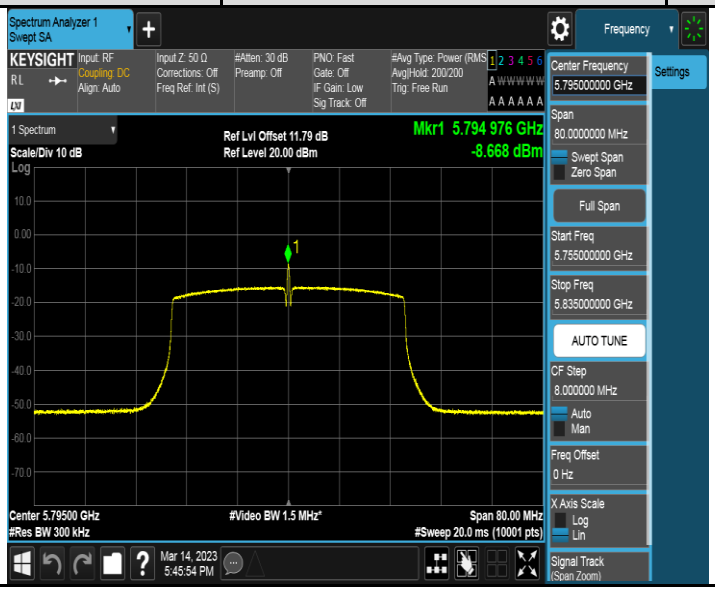
Test Mode	Test Channel	Verdict
11AC40	5230	PASS



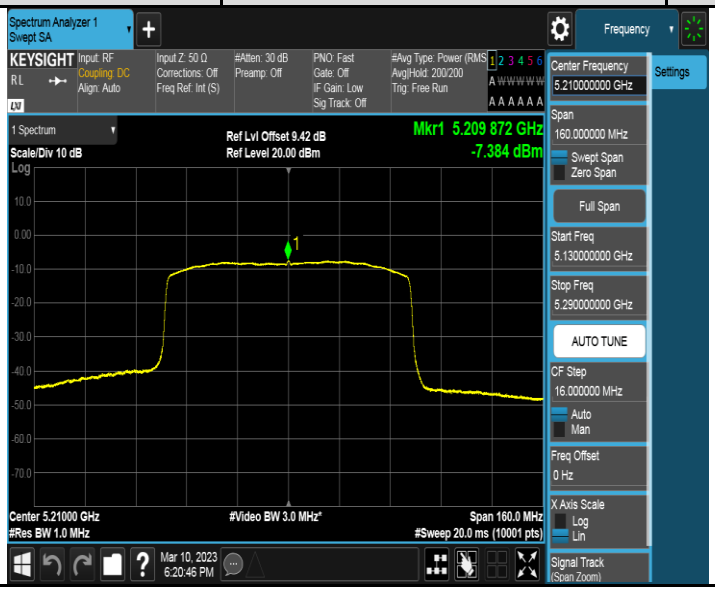
Test Mode	Test Channel	Verdict
11AC40	5755	PASS



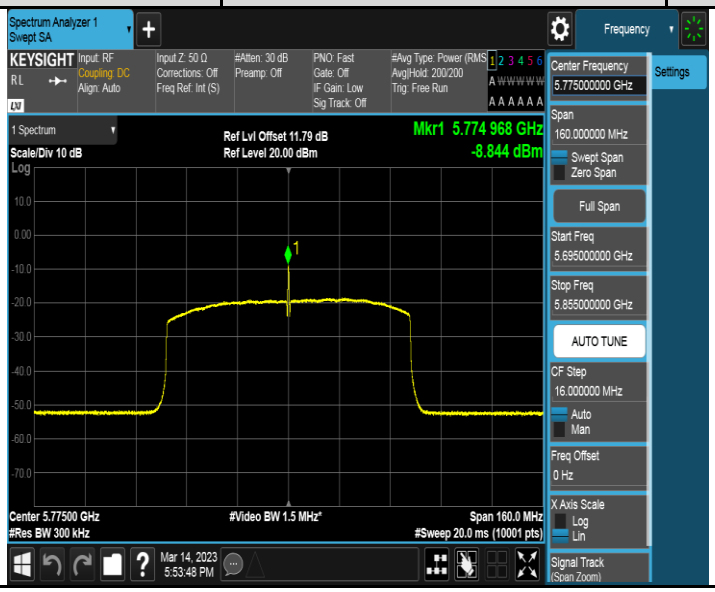
Test Mode	Test Channel	Verdict
11AC40	5795	PASS



Test Mode	Test Channel	Verdict
11AC80	5210	PASS

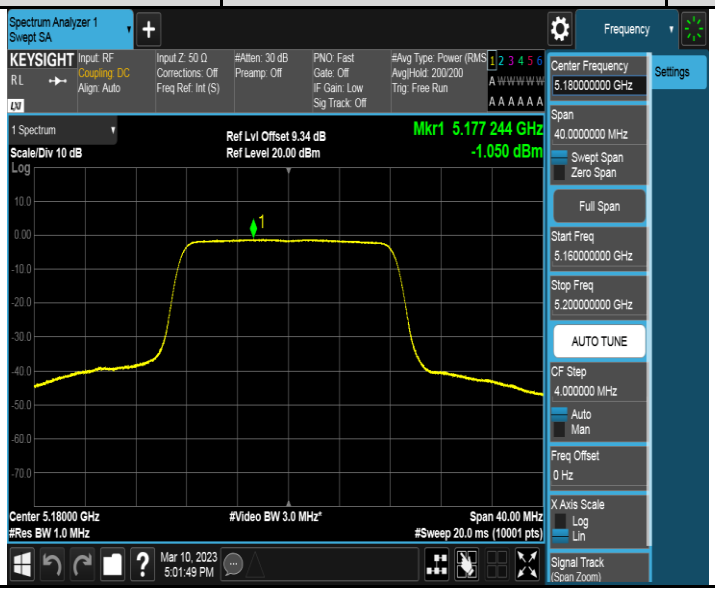


Test Mode	Test Channel	Verdict
11AC80	5775	PASS

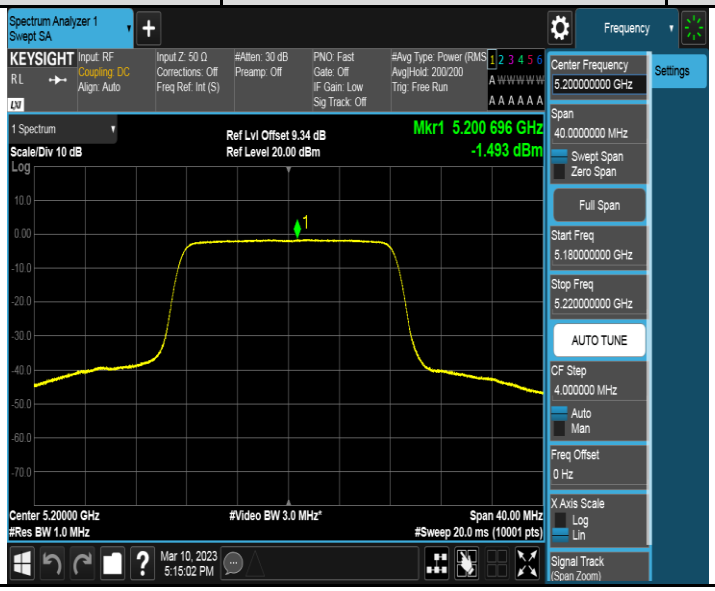


Antenna 2 Part:

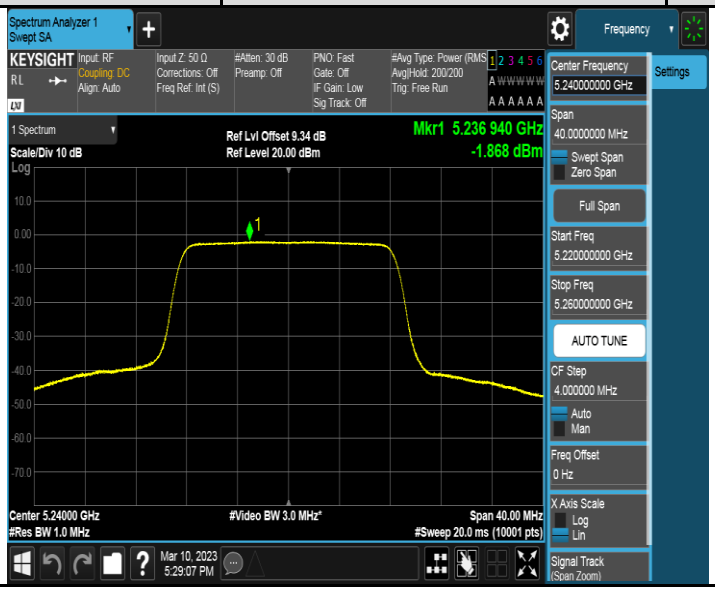
Test Mode	Test Channel	Verdict
11A	5180	PASS



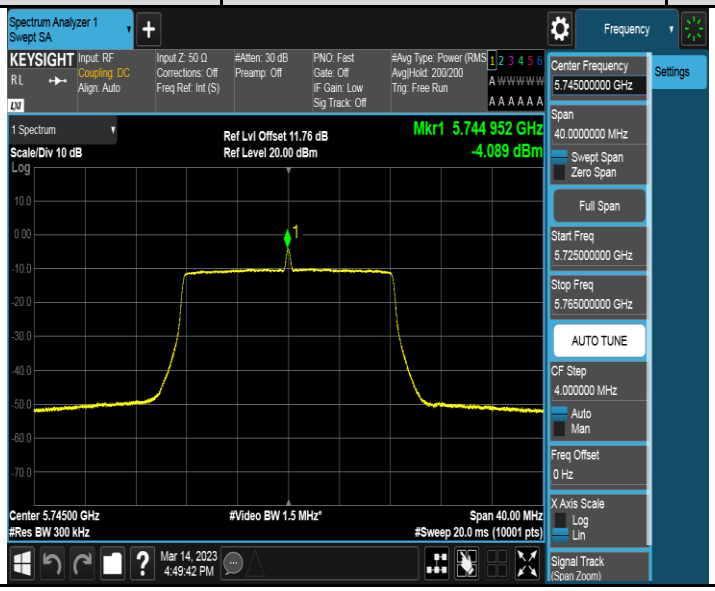
Test Mode	Test Channel	Verdict
11A	5200	PASS



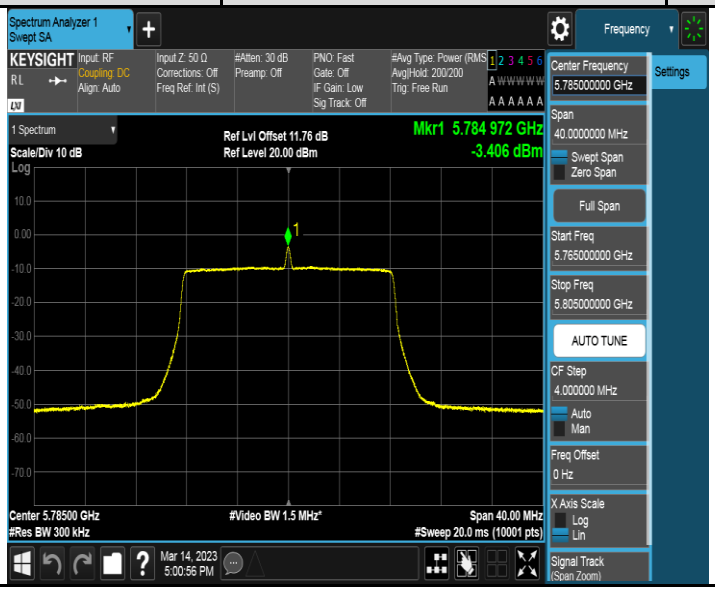
Test Mode	Test Channel	Verdict
11A	5240	PASS



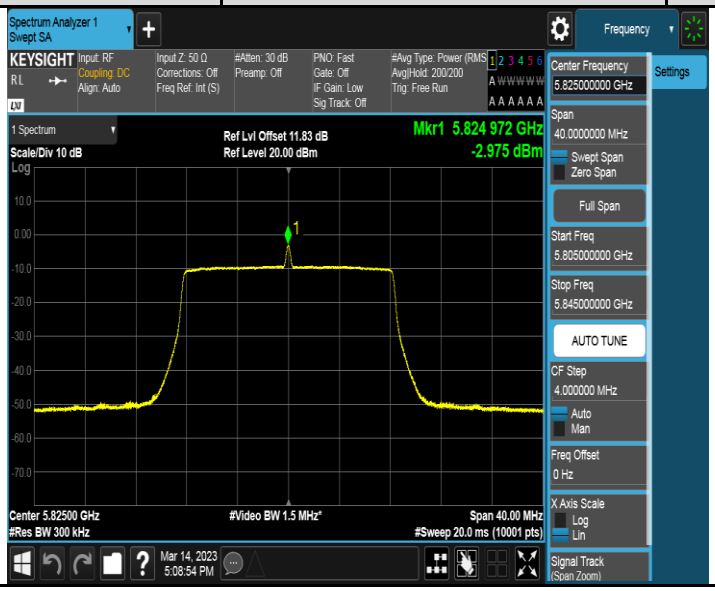
Test Mode	Test Channel	Verdict
11A	5745	PASS



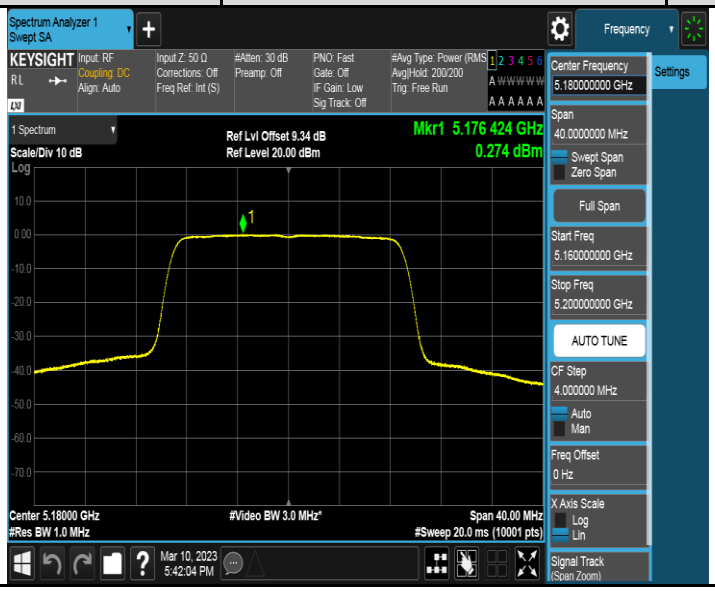
Test Mode	Test Channel	Verdict
11A	5785	PASS



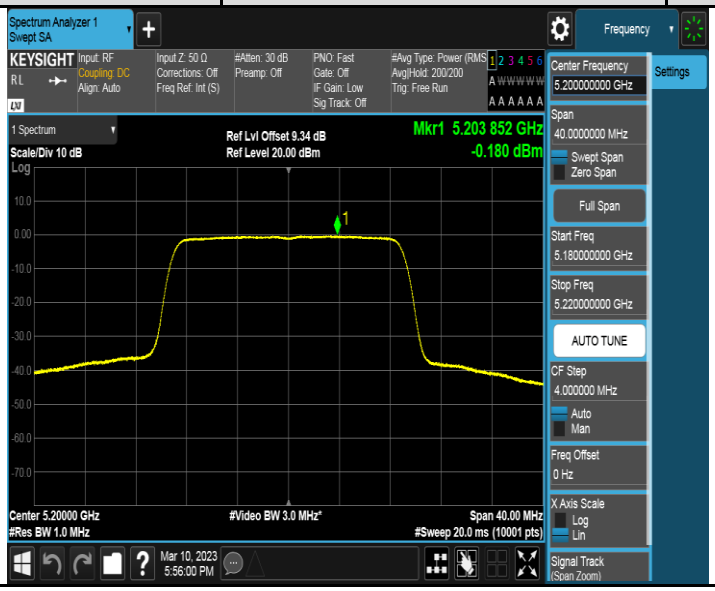
Test Mode	Test Channel	Verdict
11A	5825	PASS



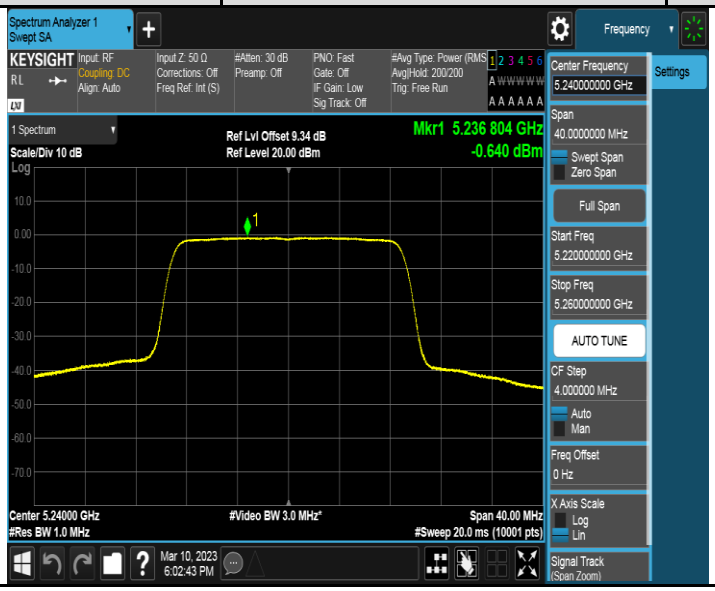
Test Mode	Test Channel	Verdict
11AC20	5180	PASS



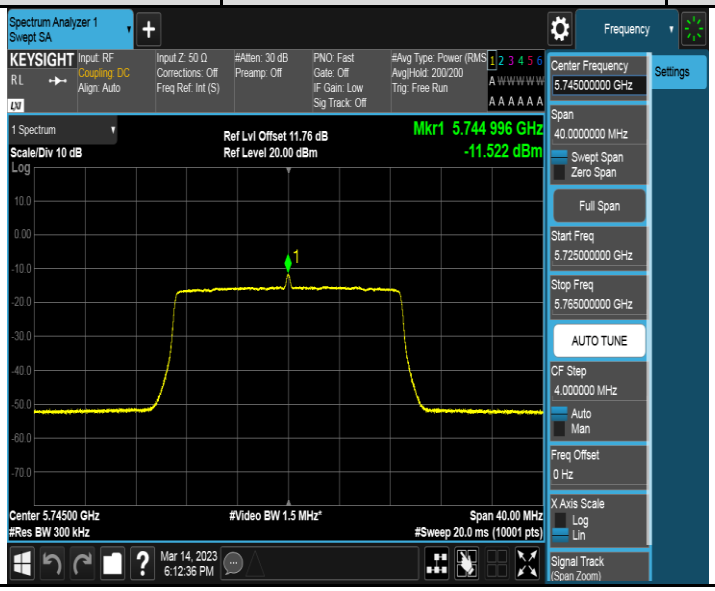
Test Mode	Test Channel	Verdict
11AC20	5200	PASS



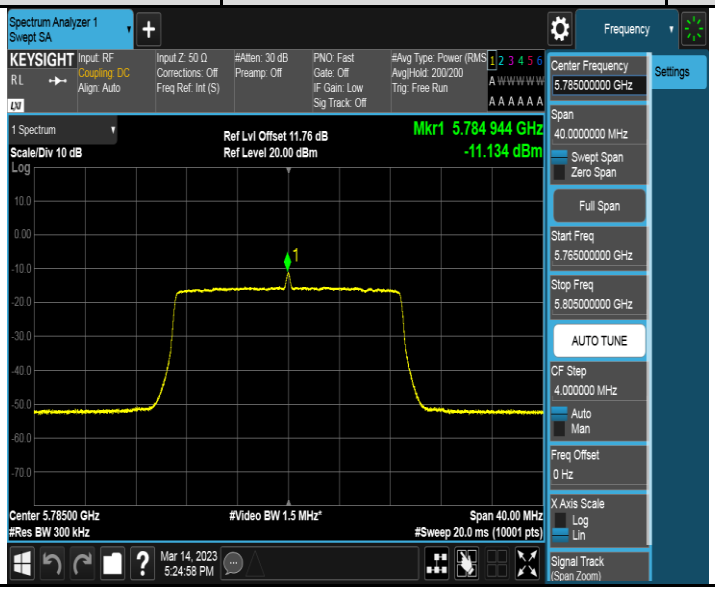
Test Mode	Test Channel	Verdict
11AC20	5240	PASS



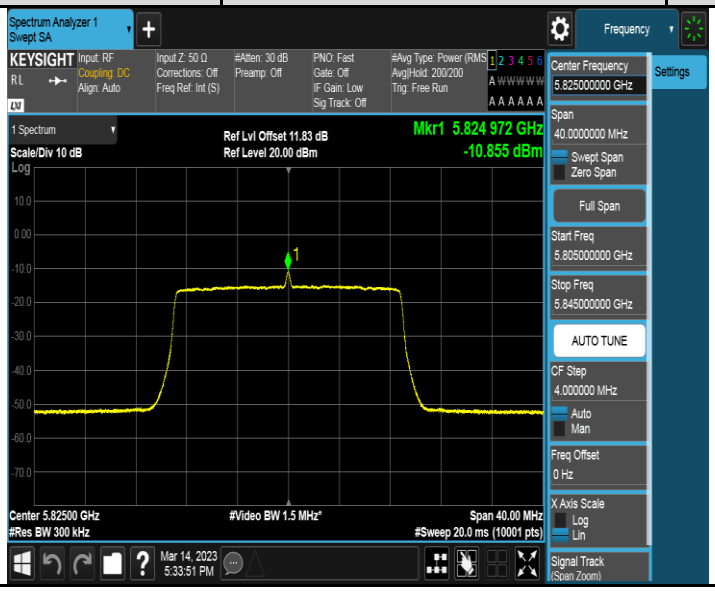
Test Mode	Test Channel	Verdict
11AC20	5745	PASS



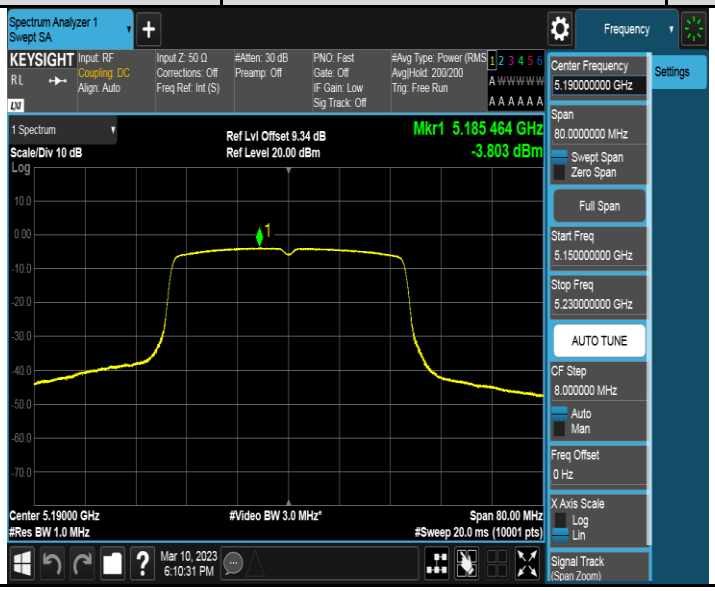
Test Mode	Test Channel	Verdict
11AC20	5785	PASS



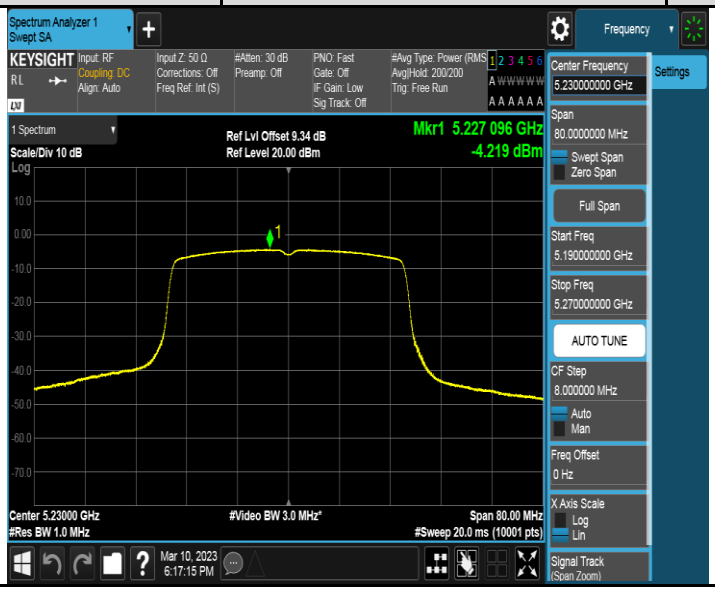
Test Mode	Test Channel	Verdict
11AC20	5825	PASS



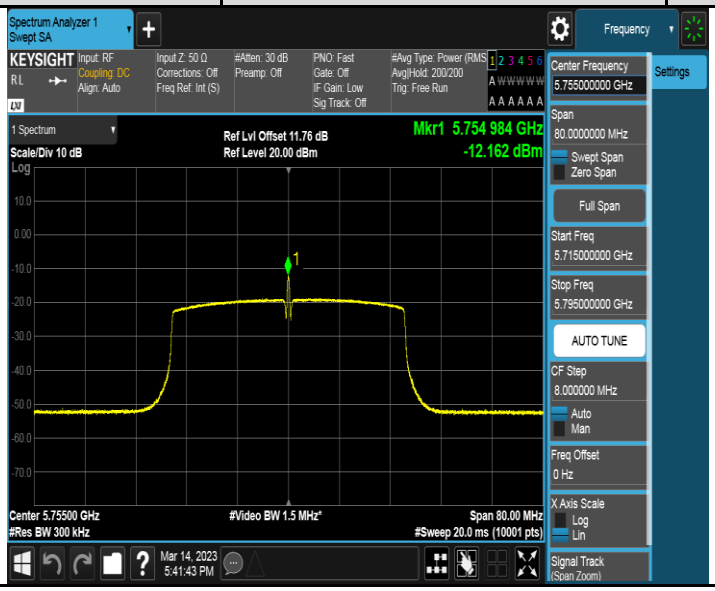
Test Mode	Test Channel	Verdict
11AC40	5190	PASS



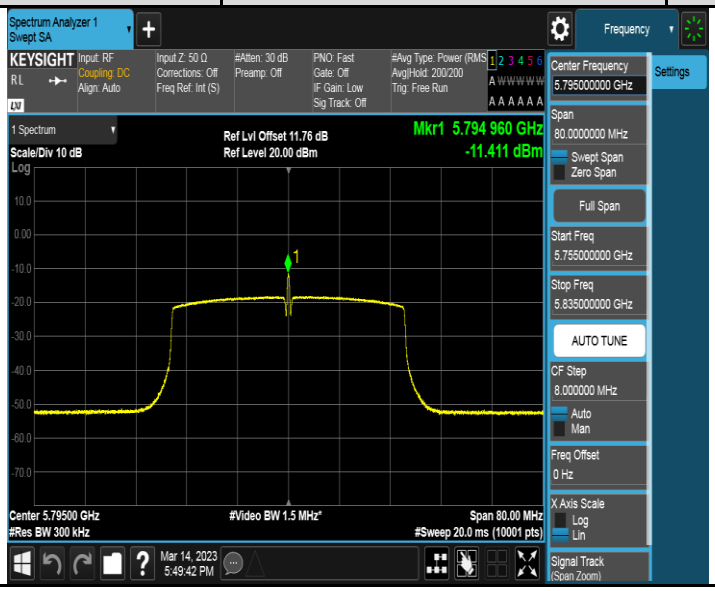
Test Mode	Test Channel	Verdict
11AC40	5230	PASS



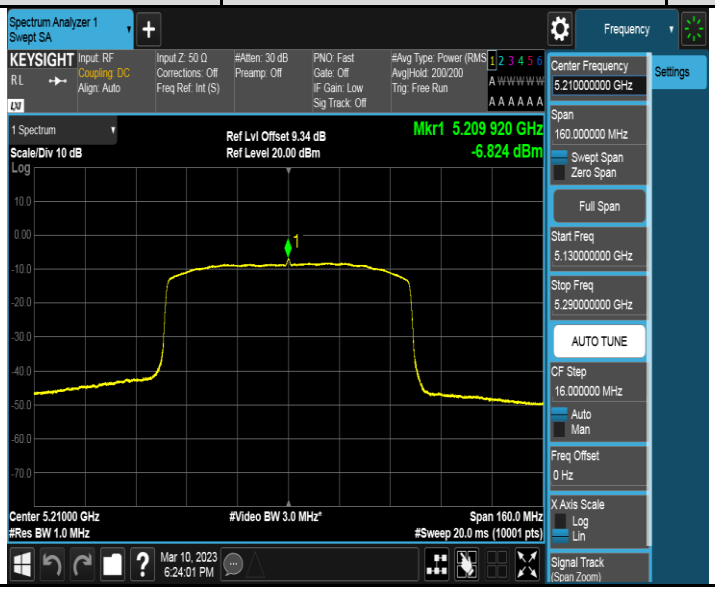
Test Mode	Test Channel	Verdict
11AC40	5755	PASS



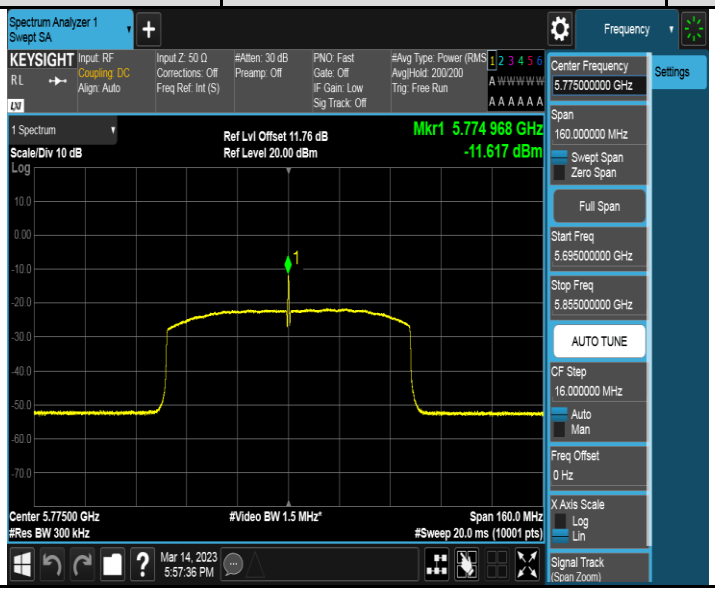
Test Mode	Test Channel	Verdict
11AC40	5795	PASS



Test Mode	Test Channel	Verdict
11AC80	5210	PASS



Test Mode	Test Channel	Verdict
11AC80	5775	PASS



7. RADIATED TEST RESULTS

LIMITS

Refer to CFR 47 FCC §15.205, §15.209 and §15.407 (b).

Refer to ISED RSS-GEN Clause 8.9, Clause 8.10 and ISED RSS-247 6.2.

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz ~ 1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30

FCC Restricted bands of operation refer to FCC §15.205 (a):

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

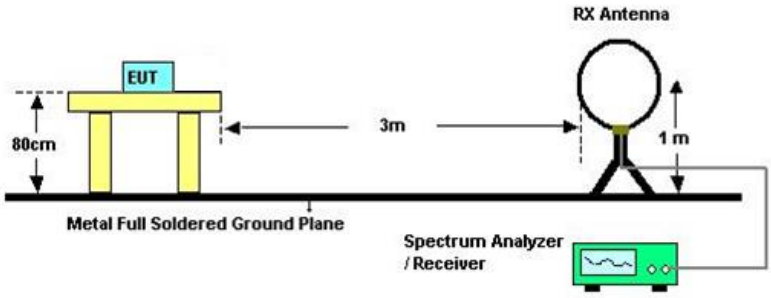
Remark: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

Limits of unwanted/undesirable emission out of the restricted bands refer to CFR 47 FCC §15.407 (b).

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1GHz)		
Frequency Range (MHz)	EIRP Limit	Field Strength Limit (dBuV/m) at 3 m
5150~5250 MHz	PK: -27 (dBm/MHz)	PK:68.2(dBμV/m)
5250~5350 MHz		
5470~5725 MHz		
5725~5850 MHz	PK: -27 (dBm/MHz) *1 PK: 10 (dBm/MHz) *2 PK: 15.6 (dBm/MHz) *3 PK: 27 (dBm/MHz) *4	PK: 68.2(dBμV/m) *1 PK: 105.2 (dBμV/m) *2 PK: 110.8(dBμV/m) *3 PK: 122.2 (dBμV/m) *4
Remark: *1 beyond 75 MHz or more above of the band edge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

TEST SETUP AND PROCEDURE

Below 30 MHz



The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz) / 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz) / 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 and KDB 414788.

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.

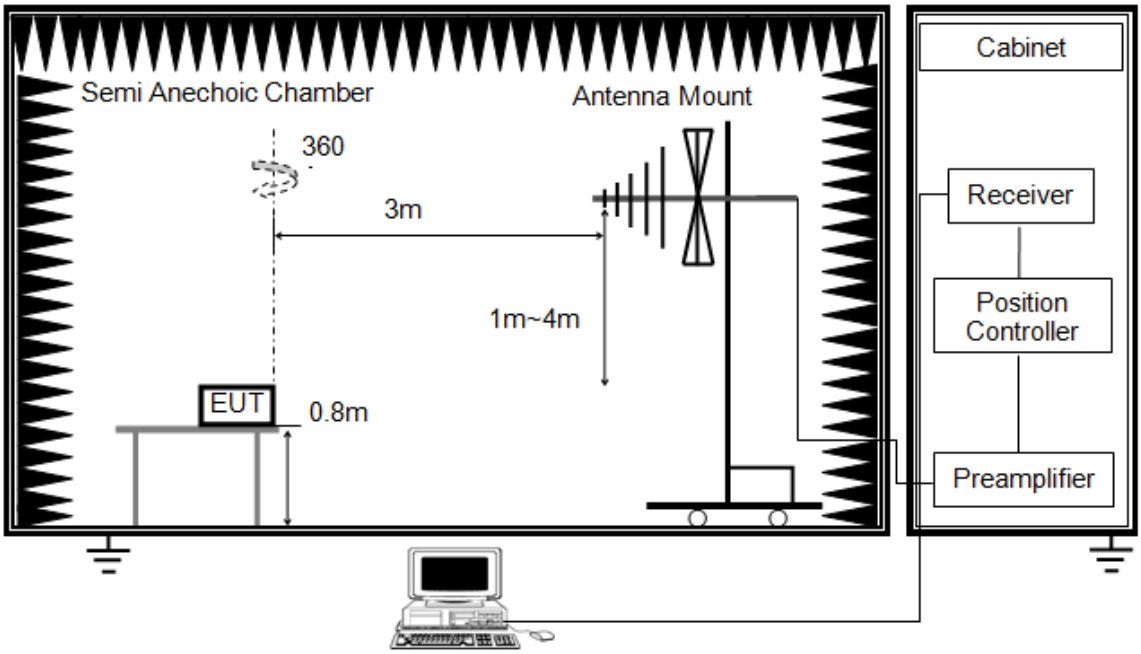
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.

7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.

8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ω. For example, the measurement frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz



The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 11.11.

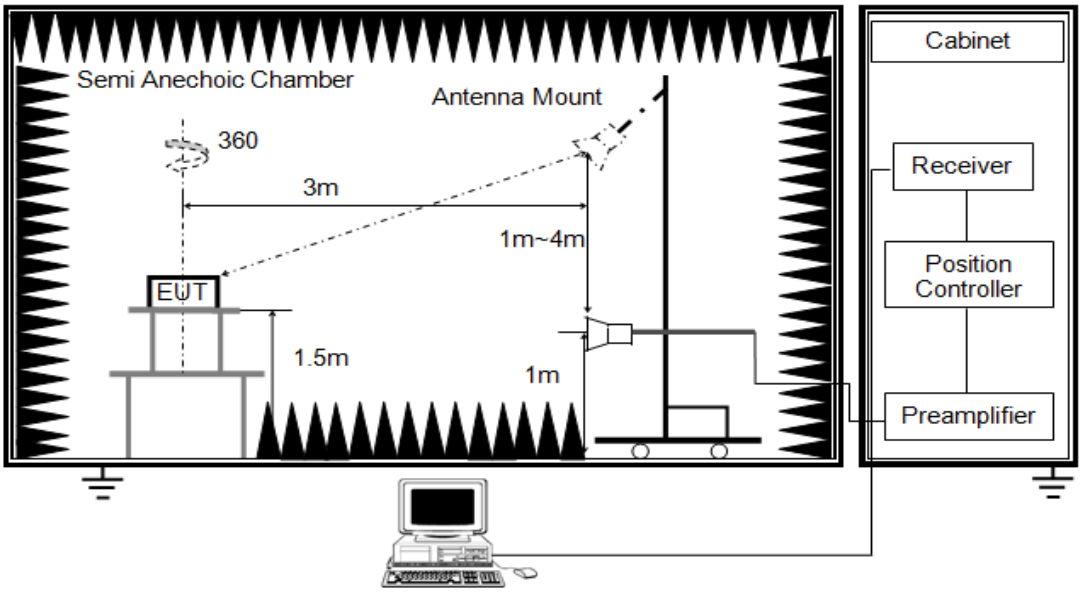
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1G



The setting of the spectrum analyzer

RBW	1MHz
VBW	PEAK: 3MHz AVG: see Remark 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the Antenna 1re set to make the measurement.

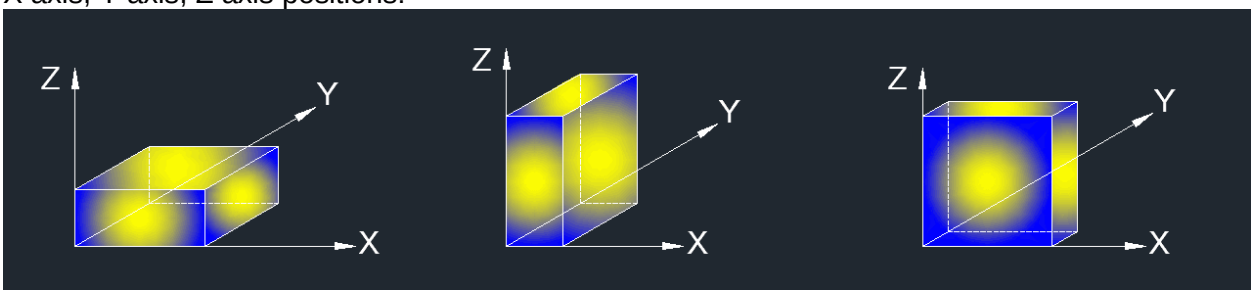
3. The EUT was placed on a turntable with 1.5m above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector. For the Duty Cycle please refer to clause 6.2. ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Remark 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

7.1. RESTRICTED BANDEDGE

TEST ENVIRONMENT

Temperature	22.0℃	Relative Humidity	53.5%
Atmosphere Pressure	102kpa	Test Voltage	DC5V

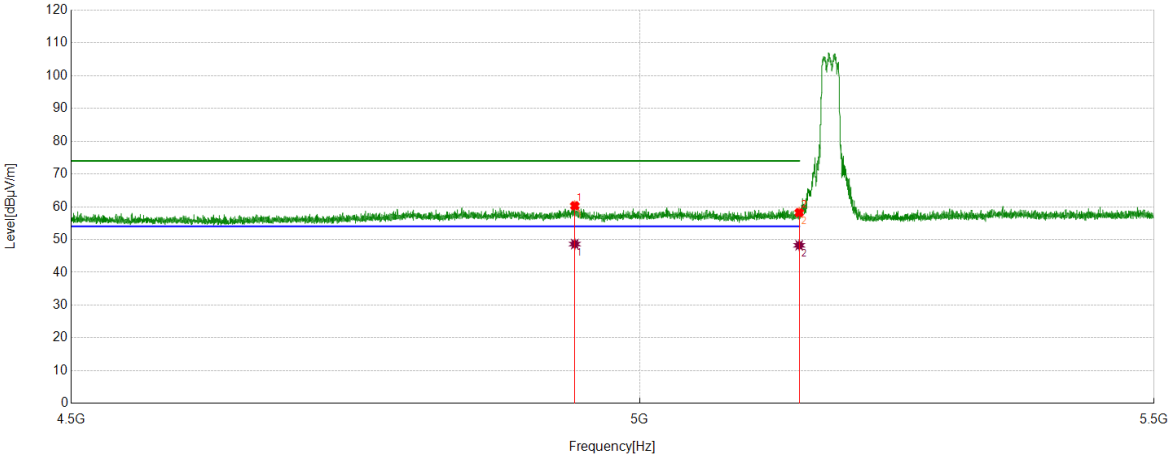
TEST RESULT TABLE

Test Mode	Antenna	Channel	Puw(dBm)	Verdict
11A	Ant1	5180	<Limit	PASS
		5240	<Limit	PASS
		5745	<Limit	PASS
		5825	<Limit	PASS
11AC20MIMO	Ant1+2	5180	<Limit	PASS
		5240	<Limit	PASS
		5745	<Limit	PASS
		5825	<Limit	PASS
11AC40MIMO	Ant1+2	5190	<Limit	PASS
		5230	<Limit	PASS
		5755	<Limit	PASS
		5795	<Limit	PASS
11AC80MIMO	Ant1+2	5210	<Limit	PASS
		5775	<Limit	PASS

Remark:
1) Since 802.11ac VHT20/VHT40 modes are different from 802.11n HT20/HT40 only in control messages, so all the tests are performed on the worst case (802.11ac VHT20/802.11ac VHT40) mode between these 4 modes and only the worst data was recorded in this report.
2) Through pre-testing both antennas of 11A test mode, but only the data of worse case is included in this test report.

TEST GRAPHS:

Test Mode	Channel	Polarization	Verdict
11A	5180	Horizontal	PASS



PK Result:

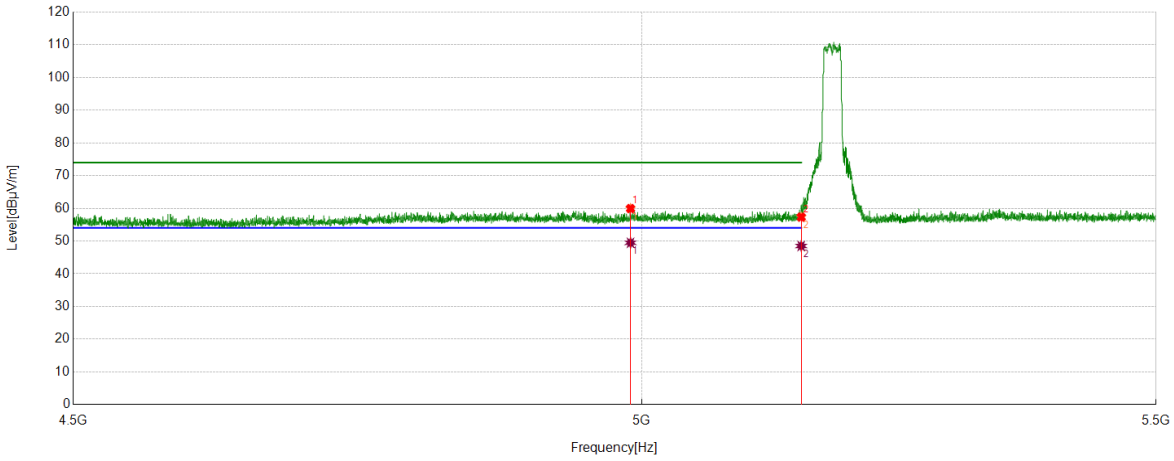
No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	4940.244	39.86	20.45	60.31	74.00	13.69	peak
2	5150.0000	38.77	19.46	58.23	74.00	15.77	peak

AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	4940.244	28.17	20.45	48.62	54.00	5.38	AV
2	5150.0000	28.79	19.46	48.25	54.00	5.75	AV

Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.
4. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

Test Mode	Channel	Polarization	Verdict
11A	5180	Vertical	PASS



PK Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	4989.649	39.35	20.58	59.93	74.00	14.07	peak
2	5150.0000	37.87	19.46	57.33	74.00	16.67	peak

AV Result:

No.	Frequency	Reading Level	Correct Factor	Result	Limit	Margin	Remark
	[MHz]	[dBuV]	[dB/m]	[dBuV/m]	[dBuV/m]	[dB]	
1	4989.649	28.89	20.58	49.47	54.00	4.53	AV
2	5150.0000	29.03	19.46	48.49	54.00	5.51	AV

Remark: 1. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
2. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
3. Measurement = Reading Level + Correct Factor.
4. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.