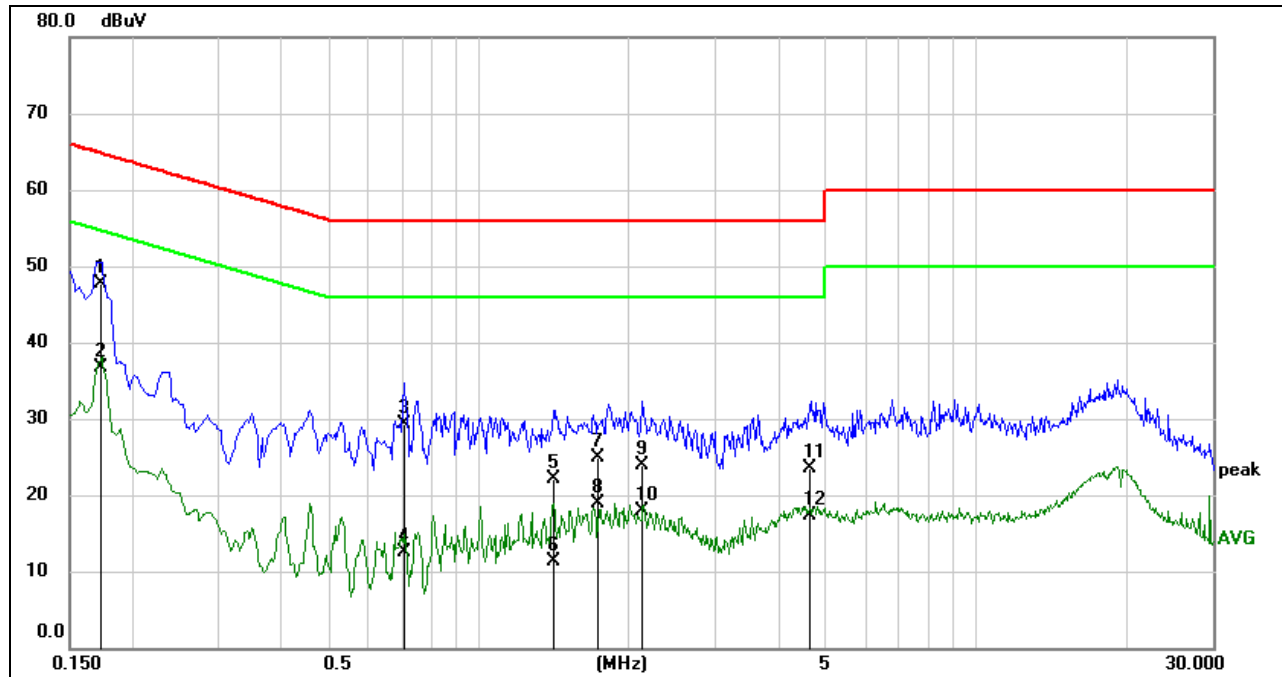


RESULTS

9.1.1. 802.11ax HE80 CDD MODE

LINE N RESULTS (UNII-8 BAND HIGH CHANNEL, WORST-CASE CONFIGURATION)



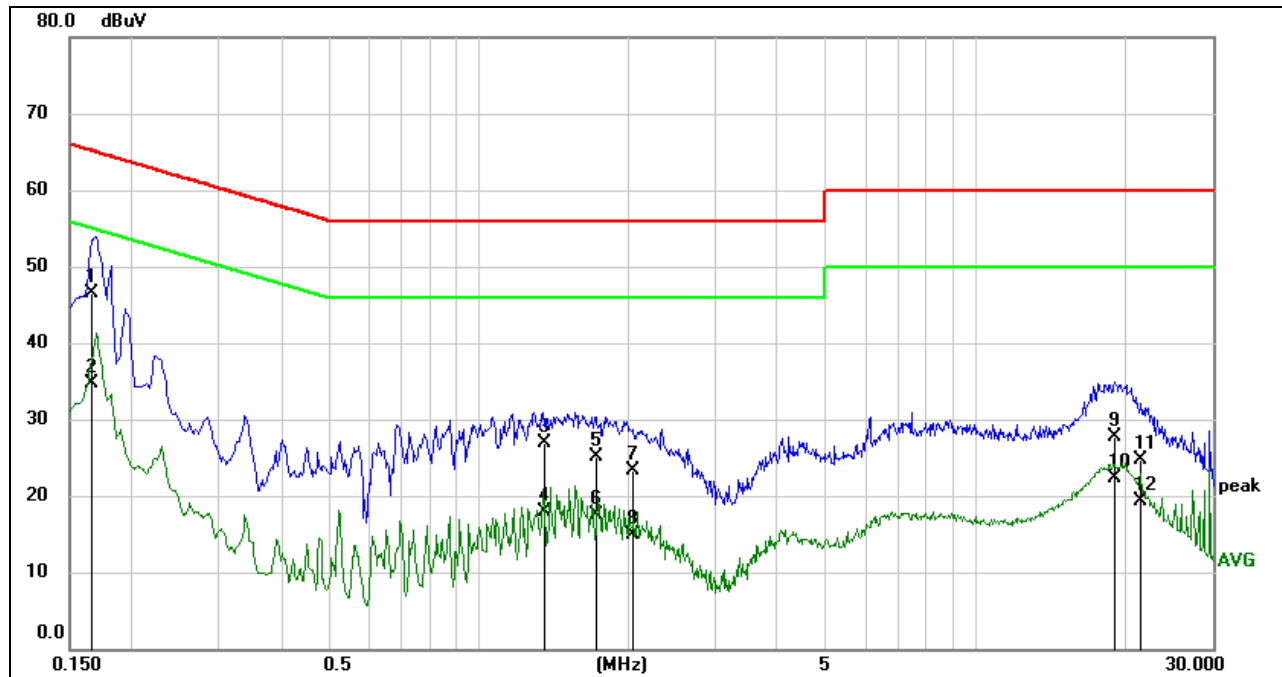
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1724	38.19	9.59	47.78	64.84	-17.06	QP
2	0.1724	27.05	9.59	36.64	54.84	-18.20	AVG
3	0.7069	19.62	9.60	29.22	56.00	-26.78	QP
4	0.7069	2.94	9.60	12.54	46.00	-33.46	AVG
5	1.4150	12.58	9.62	22.20	56.00	-33.80	QP
6	1.4150	1.72	9.62	11.34	46.00	-34.66	AVG
7	1.7410	15.29	9.62	24.91	56.00	-31.09	QP
8	1.7410	9.22	9.62	18.84	46.00	-27.16	AVG
9	2.1350	14.25	9.63	23.88	56.00	-32.12	QP
10	2.1350	8.36	9.63	17.99	46.00	-28.01	AVG
11	4.6131	13.80	9.61	23.41	56.00	-32.59	QP
12	4.6131	7.72	9.61	17.33	46.00	-28.67	AVG

Note: 1. Result = Reading + Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).

4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

**LINE L RESULTS (UNII-8 BAND HIGH CHANNEL, WORST-CASE CONFIGURATION)**

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1652	37.08	9.52	46.60	65.20	-18.60	QP
2	0.1652	25.28	9.52	34.80	55.20	-20.40	AVG
3	1.3565	17.33	9.55	26.88	56.00	-29.12	QP
4	1.3565	8.26	9.55	17.81	46.00	-28.19	AVG
5	1.7252	15.50	9.59	25.09	56.00	-30.91	QP
6	1.7252	7.93	9.59	17.52	46.00	-28.48	AVG
7	2.0474	13.59	9.63	23.22	56.00	-32.78	QP
8	2.0474	5.29	9.63	14.92	46.00	-31.08	AVG
9	19.0869	17.94	9.72	27.66	60.00	-32.34	QP
10	19.0869	12.50	9.72	22.22	50.00	-27.78	AVG
11	21.3969	14.97	9.75	24.72	60.00	-35.28	QP
12	21.3969	9.47	9.75	19.22	50.00	-30.78	AVG

Note: 1. Result = Reading + Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).

4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes had been tested, but only the worst data was recorded in the report.

10. FREQUENCY STABILITY

LIMITS

The frequency of the carrier signal shall be maintained within band of operation.

TEST PROCEDURE

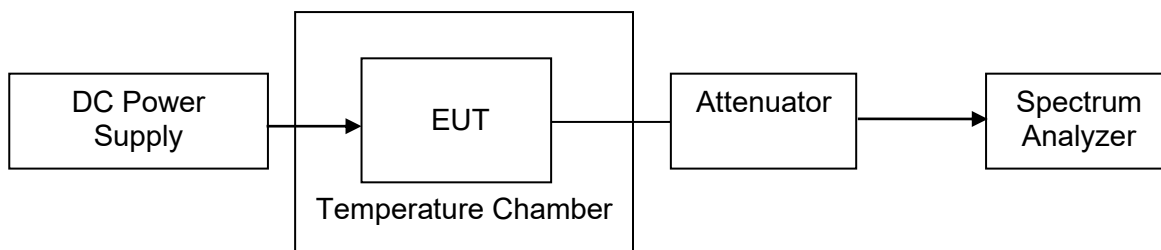
1. The EUT was placed inside an environmental chamber as the temperature in the chamber was varied between 0 °C ~ 70 °C (declared by customer).
2. The temperature was incremented by 10 °C intervals and the unit allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.
3. The primary supply voltage is varied from 85 % to 115 % of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

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

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	10 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

4. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized.
5. Allow the trace to stabilize, find the peak value of the power envelope and record the frequency, then calculated the frequency drift.

TEST SETUP





TEST ENVIRONMENT

	Normal Test Conditions	Extreme Test Conditions
Relative Humidity	20 % - 75 %	/
Atmospheric Pressure	100 kPa ~102 kPa	/
Temperature	T_N (Normal Temperature): 25.1 °C	T_L (Low Temperature): 0 °C
		T_H (High Temperature): 70 °C
Supply Voltage	V_N (Normal Voltage): AC 120 V	V_L (Low Voltage): AC 102 V
		V_H (High Voltage): DC 138 V

RESULTS

Please refer to Appendix G.

11. CONTENTION BASED PROTOCOL

APPLICABILITY OF DFS REQUIREMENTS

Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices) are required to use technologies that include a contention-based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are detected in a technology-agnostic manner, unlicensed devices are required to detect co-channel radio frequency energy (energy detect) and avoid simultaneous transmission.

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel (in which incumbent signal is transmitted) and stay off the incumbent channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm)¹. The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain. To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

a) Simulating Incumbent Signal

The incumbent signal is assumed to be noise-like. One example of such transmission could be Digital Video Broadcasting (DVB) systems that use Orthogonal Frequency Division Multiplexing (OFDM). Incumbent systems may also use different bandwidths for their transmissions. A 10 MHz-wide additive white Gaussian noise (AWGN) signal is selected to simulate and represent incumbent transmission.

b) Required number of tests

Incumbent and EUT (access point, subordinate or client) signals may occupy different portions of the channel. Depending on the EUT transmission bandwidth and incumbent signal center frequency (simulated by a 10 MHz-wide AWGN signal), the center frequency of the EUT signal f_{fcc1} may fall within the incumbent's occupied bandwidth (Figure 1.a), or outside of it (Figure 1.b).

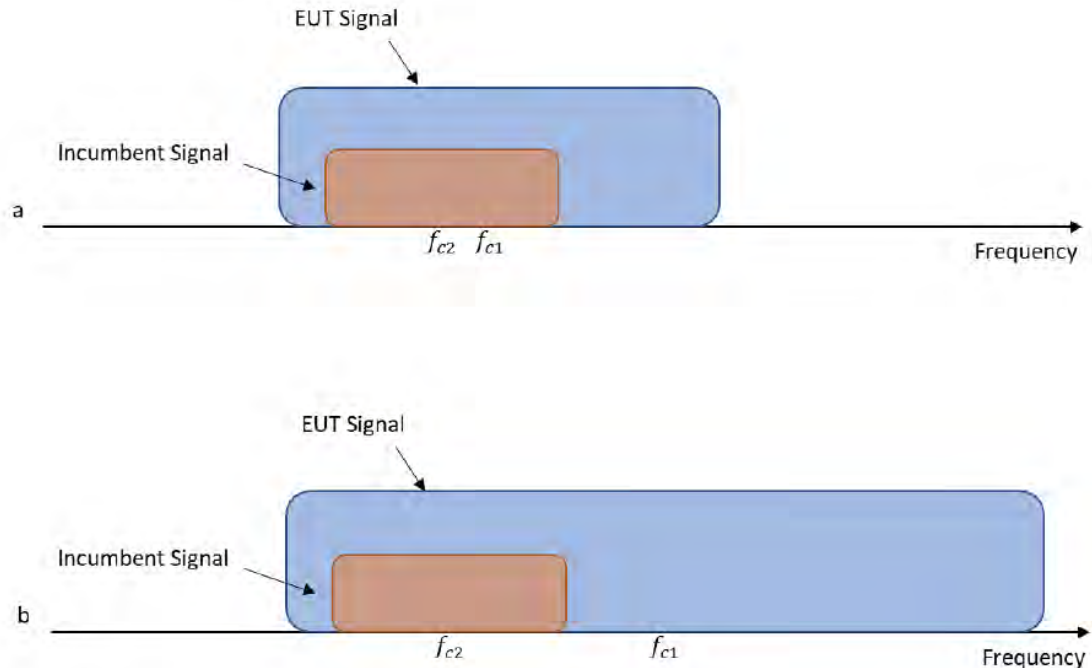


Figure 1. Two possible scenarios where a) center frequency of EUT transmission falls within incumbent's bandwidth, or b) outside of it

To ensure EUT reliably detects an incumbent signal in both scenarios shown in Figure 1, the detection threshold test may be repeated more than once with the incumbent signal (having center frequency f_{c2}) tuned to different center frequencies within the EUT transmission bandwidth. The criteria specified in Table 1 determines how many times the detection threshold test must be performed;

Table 1. Criteria to determine number of times detection threshold test may be performed

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leq BW_{Inc}$	Once	Tune incumbent and EUT transmissions ($f_{c1} = f_{c2}$)
$BW_{Inc} < BW_{EUT} \leq 2BW_{Inc}$	Once	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} < BW_{EUT} \leq 4BW_{Inc}$	Twice. Incumbent transmission is contained within BW_{EUT}	Incumbent transmission is located as closely as possible to the lower edge and upper edge, respectively, of the EUT channel
$BW_{EUT} > 4BW_{Inc}$	Three times	Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of EUT channel, and as closely as possible to the upper edge of the EUT channel

where:

BW_{EUT} : Transmission bandwidth of EUT signal

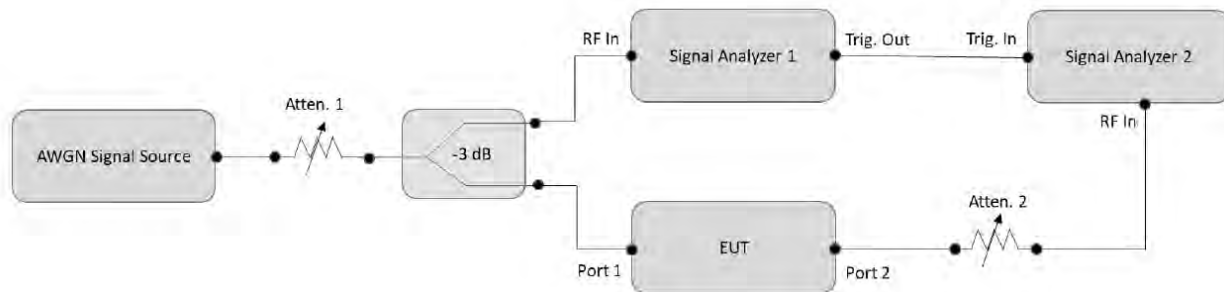
BW_{Inc} : Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)

f_{c1} : Center frequency of EUT transmission

f_{c2} : Center frequency of simulated incumbent signal

TEST SETUP AND PROCEDURE

To ensure the EUT is capable of detecting co-channel energy, the first step is to configure the EUT to transmit with a constant duty cycle.² To simulate an incumbent signal, a signal generator (or similar source) that is capable of generating band-limited additive white Gaussian noise (AWGN) is required. Depending on the EUT antenna configuration, the AWGN signal can be provided to the EUT receiver via a conducted method (Figure 2) or a radiated method (Figure 3). Figure 2 shows the conducted test setup where a band-limited AWGN signal is generated at a very low power level and injected into the EUT's antenna port. The AWGN signal power level is then incrementally increased while the EUT transmission is monitored on a signal analyzer 2 to verify if the EUT can sense the AWGN signal and can subsequently cease its transmission. A triggered measurement, as shown in Figure 2, is optional, and assists with determining the time it takes the EUT to cease transmission (or vacate the channel) upon detecting RF energy. If the EUT has only one antenna port, then an AWGN signal source can be connected to the same antenna port.



1. Configure the EUT to transmit with a constant duty cycle.
2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT.

Connect the output port of the EUT to the signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.

4. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
5. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
6. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in Figure 2.
7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.



8. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
9. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
10. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

TEST ENVIRONMENT

Temperature	24.1 °C	Relative Humidity	60.5 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

RESULTS

Please refer to Appendix F.

12. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS

Complies



12.1. Appendix A1: Emission Bandwidth

12.1.1. Test Result

Test Mode	Antenna	Channel	26db EBW [MHz]	FL[MHz]	FH[MHz]	Verdict
11AX20MIMO	Ant1	5955	21.040	5944.680	5965.720	PASS
	Ant2	5955	20.520	5944.840	5965.360	PASS
	Ant1	6175	21.120	6164.640	6185.760	PASS
	Ant2	6175	21.320	6164.240	6185.560	PASS
	Ant1	6415	21.400	6404.320	6425.720	PASS
	Ant2	6415	21.080	6404.480	6425.560	PASS
	Ant1	6435	21.040	6424.560	6445.600	PASS
	Ant2	6435	21.760	6424.360	6446.120	PASS
	Ant1	6475	21.840	6463.760	6485.600	PASS
	Ant2	6475	21.440	6464.040	6485.480	PASS
	Ant1	6515	21.200	6504.520	6525.720	PASS
	Ant2	6515	21.400	6504.200	6525.600	PASS
	Ant1	6535	20.920	6524.640	6545.560	PASS
	Ant2	6535	21.560	6524.240	6545.800	PASS
	Ant1	6715	21.240	6704.280	6725.520	PASS
	Ant2	6715	21.720	6703.920	6725.640	PASS
	Ant1	6855	21.040	6844.320	6865.360	PASS
	Ant2	6855	21.400	6844.480	6865.880	PASS
	Ant1	6875	21.880	6864.280	6886.160	PASS
	Ant2	6875	20.440	6864.800	6885.240	PASS
11AX40MIMO	Ant1	7015	21.400	7004.720	7026.120	PASS
	Ant2	7015	21.480	7004.280	7025.760	PASS
	Ant1	7115	21.040	7104.600	7125.640	PASS
	Ant2	7115	21.080	7104.320	7125.400	PASS
	Ant1	5965	39.360	5945.320	5984.680	PASS
	Ant2	5965	39.120	5945.400	5984.520	PASS
	Ant1	6165	39.360	6145.400	6184.760	PASS
	Ant2	6165	39.280	6145.240	6184.520	PASS
	Ant1	6405	39.040	6385.480	6424.520	PASS
	Ant2	6405	39.200	6385.480	6424.680	PASS
	Ant1	6445	39.360	6425.480	6464.840	PASS
	Ant2	6445	39.280	6425.400	6464.680	PASS
	Ant1	6485	39.280	6465.480	6504.760	PASS
	Ant2	6485	39.200	6465.480	6504.680	PASS
	Ant1	6525	39.360	6505.560	6544.920	PASS
	Ant2	6525	39.280	6505.400	6544.680	PASS
	Ant1	6565	39.040	6545.560	6584.600	PASS
	Ant2	6565	39.200	6545.560	6584.760	PASS
	Ant1	6725	39.120	6705.560	6744.680	PASS
	Ant2	6725	39.200	6705.480	6744.680	PASS
11AX80MIMO	Ant1	6845	39.360	6825.560	6864.920	PASS
	Ant2	6845	39.120	6825.560	6864.680	PASS
	Ant1	6885	39.440	6865.320	6904.760	PASS
	Ant2	6885	39.440	6865.400	6904.840	PASS
	Ant1	7005	39.520	6985.320	7024.840	PASS
	Ant2	7005	39.120	6985.560	7024.680	PASS
11AX80MIMO	Ant1	7085	39.440	7065.320	7104.760	PASS
	Ant2	7085	39.360	7065.320	7104.680	PASS
	Ant1	5985	80.000	5945.160	6025.160	PASS
	Ant2	5985	80.160	5945.160	6025.320	PASS
	Ant1	6145	79.680	6105.320	6185.000	PASS
	Ant2	6145	80.160	6105.000	6185.160	PASS
11AX80MIMO	Ant1	6385	79.840	6345.320	6425.160	PASS
	Ant2	6385	80.160	6345.000	6425.160	PASS



	Ant1	6465	79.840	6425.160	6505.000	PASS
	Ant2	6465	79.840	6425.000	6504.840	PASS
	Ant1	6545	79.360	6505.480	6584.840	PASS
	Ant2	6545	80.000	6505.160	6585.160	PASS
	Ant1	6625	79.840	6585.000	6664.840	PASS
	Ant2	6625	80.000	6584.840	6664.840	PASS
	Ant1	6705	79.840	6665.000	6744.840	PASS
	Ant2	6705	80.160	6664.840	6745.000	PASS
	Ant1	6785	79.840	6745.000	6824.840	PASS
	Ant2	6785	80.160	6744.840	6825.000	PASS
	Ant1	6865	80.000	6825.000	6905.000	PASS
	Ant2	6865	79.840	6825.000	6904.840	PASS
	Ant1	6945	80.000	6905.000	6985.000	PASS
	Ant2	6945	80.000	6904.840	6984.840	PASS
	Ant1	7025	79.840	6985.000	7064.840	PASS
	Ant2	7025	80.320	6984.840	7065.160	PASS

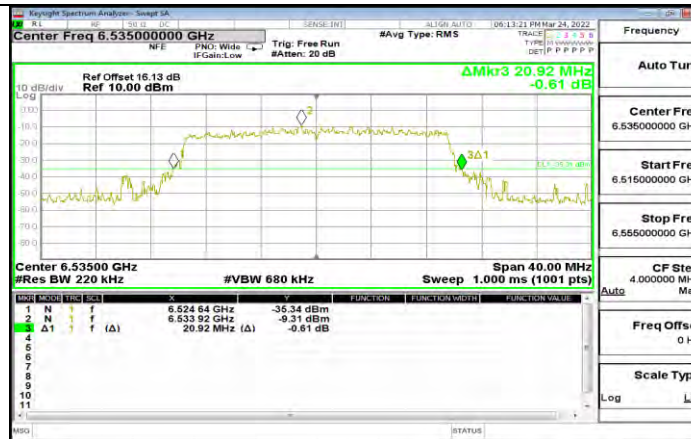
12.1.2. Test Graphs



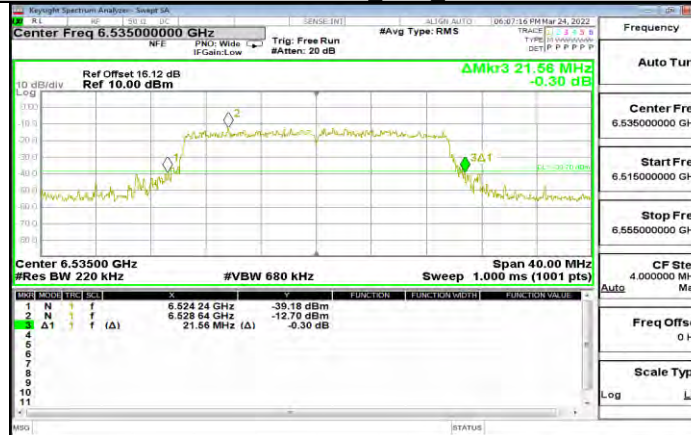








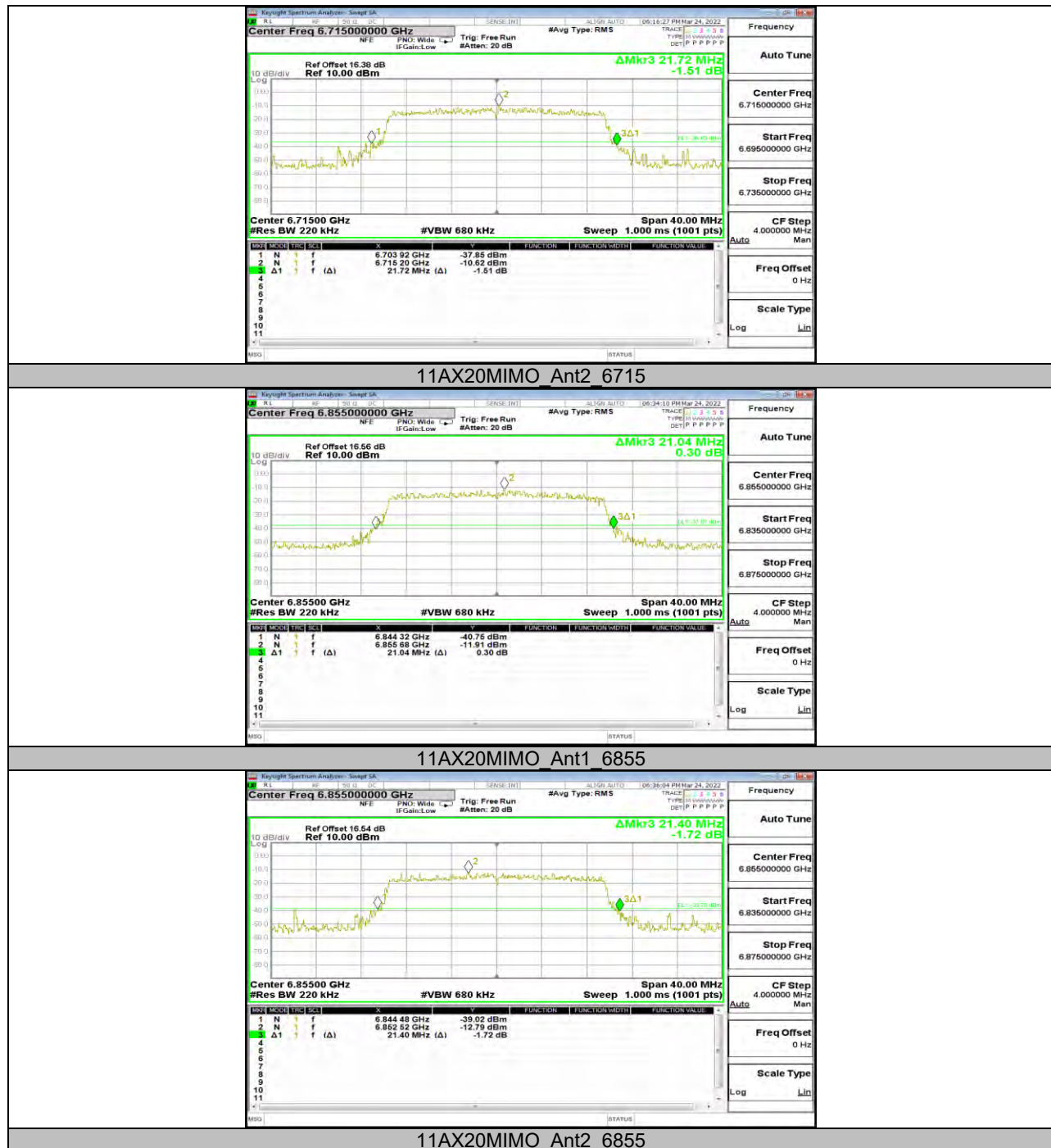
11AX20MIMO Ant1_6535



11AX20MIMO_Ant2_6535



11AX20MIMO_Ant1_6715























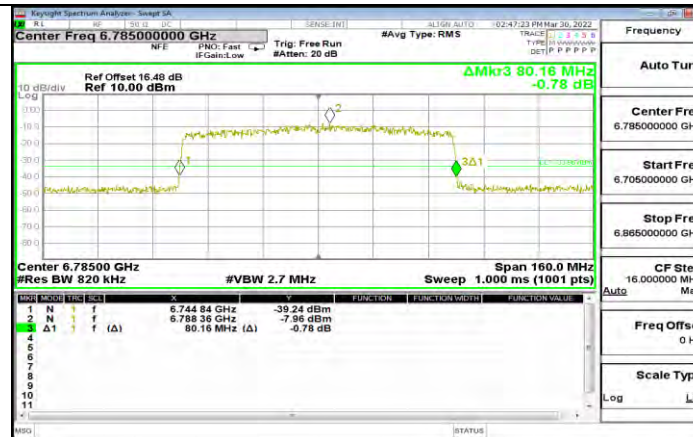








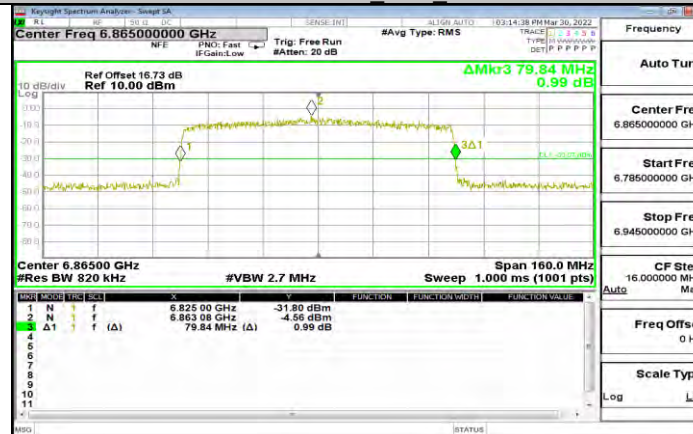




11AX80MIMO Ant2 6785



11AX80MIMO Ant1 6865



11AX80MIMO Ant2 6865







12.2. Appendix A2: Occupied Channel Bandwidth

12.2.1. Test Result

Test Mode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
11AX20MIMO	Ant1	5955	19.090	5945.516	5964.606	PASS
	Ant2	5955	19.082	5945.490	5964.572	PASS
	Ant1	6175	19.078	6165.497	6184.575	PASS
	Ant2	6175	19.091	6165.462	6184.553	PASS
	Ant1	6415	19.103	6405.413	6424.516	PASS
	Ant2	6415	19.025	6405.499	6424.524	PASS
	Ant1	6435	19.084	6425.570	6444.654	PASS
	Ant2	6435	19.089	6425.517	6444.606	PASS
	Ant1	6475	19.100	6465.434	6484.534	PASS
	Ant2	6475	19.060	6465.498	6484.558	PASS
	Ant1	6515	19.173	6505.458	6524.631	PASS
	Ant2	6515	19.091	6505.491	6524.582	PASS
	Ant1	6535	19.086	6525.516	6544.602	PASS
	Ant2	6535	19.086	6525.506	6544.592	PASS
	Ant1	6715	19.049	6705.493	6724.542	PASS
	Ant2	6715	19.088	6705.477	6724.565	PASS
	Ant1	6855	19.060	6845.558	6864.618	PASS
	Ant2	6855	19.027	6845.503	6864.530	PASS
	Ant1	6875	19.066	6865.500	6884.566	PASS
	Ant2	6875	19.066	6865.492	6884.558	PASS
	Ant1	7015	19.131	7005.530	7024.661	PASS
	Ant2	7015	19.117	7005.448	7024.565	PASS
11AX40MIMO	Ant1	7115	19.052	7105.483	7124.535	PASS
	Ant2	7115	19.063	7105.478	7124.541	PASS
	Ant1	5965	37.534	5946.192	5983.726	PASS
	Ant2	5965	37.501	5946.372	5983.873	PASS
	Ant1	6165	37.464	6146.212	6183.676	PASS
	Ant2	6165	37.529	6146.090	6183.619	PASS
	Ant1	6405	37.351	6386.264	6423.615	PASS
	Ant2	6405	37.534	6386.267	6423.801	PASS
	Ant1	6445	37.342	6426.666	6464.008	PASS
	Ant2	6445	37.551	6426.467	6464.018	PASS
	Ant1	6485	37.518	6466.191	6503.709	PASS
	Ant2	6485	37.539	6466.323	6503.862	PASS
	Ant1	6525	37.437	6506.501	6543.938	PASS
	Ant2	6525	37.585	6506.314	6543.899	PASS
	Ant1	6565	37.524	6546.275	6583.799	PASS
	Ant2	6565	37.502	6546.333	6583.835	PASS
	Ant1	6725	37.421	6706.253	6743.674	PASS
	Ant2	6725	37.472	6706.337	6743.809	PASS
	Ant1	6845	37.573	6826.443	6864.016	PASS
	Ant2	6845	37.534	6826.304	6863.838	PASS
	Ant1	6885	37.408	6866.348	6903.756	PASS
	Ant2	6885	37.556	6866.273	6903.829	PASS
11AX80MIMO	Ant1	7005	37.526	6986.416	7023.942	PASS
	Ant2	7005	37.433	6986.323	7023.756	PASS
	Ant1	7085	37.542	7066.411	7103.953	PASS
	Ant2	7085	37.670	7066.281	7103.951	PASS
	Ant1	6385	75.778	6347.449	6423.227	PASS



	Ant2	6385	76.321	6347.119	6423.440	PASS
	Ant1	6465	76.481	6426.900	6503.381	PASS
	Ant2	6465	76.571	6426.718	6503.289	PASS
	Ant1	6545	76.415	6506.873	6583.288	PASS
	Ant2	6545	76.837	6506.821	6583.658	PASS
	Ant1	6625	76.287	6586.647	6662.934	PASS
	Ant2	6625	76.341	6586.499	6662.840	PASS
	Ant1	6705	76.375	6666.680	6743.055	PASS
	Ant2	6705	76.392	6666.819	6743.211	PASS
	Ant1	6785	76.520	6746.639	6823.159	PASS
	Ant2	6785	76.822	6746.605	6823.427	PASS
	Ant1	6865	76.232	6826.844	6903.076	PASS
	Ant2	6865	76.716	6826.528	6903.244	PASS
	Ant1	6945	76.238	6906.908	6983.146	PASS
	Ant2	6945	76.571	6906.613	6983.184	PASS
	Ant1	7025	76.302	6986.742	7063.044	PASS
	Ant2	7025	76.713	6986.483	7063.196	PASS

12.2.2. Test Graphs





































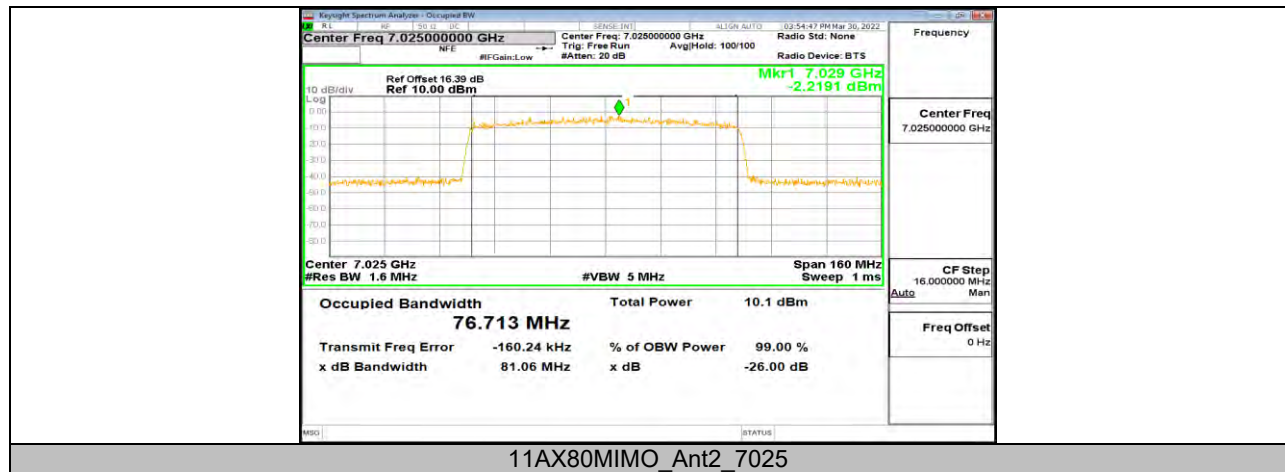














12.3. Appendix B: Duty Cycle

12.3.1. Test Result

Test Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
11AX20MIMO	0.55	0.94	0.5851	58.51	2.33	1.82	2
11AX40MIMO	0.32	0.71	0.4507	45.07	3.46	3.13	4
11AX80MIMO	0.19	0.58	0.3276	32.76	4.85	5.26	6

Note:

Duty Cycle Correction Factor= $10\log(1/x)$.

Where: x is Duty Cycle (Linear)

Where: T is On Time

If that calculated VBW is not available on the analyzer then the next higher value should be used.