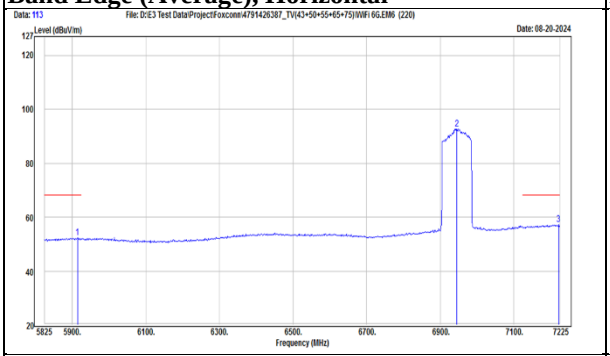
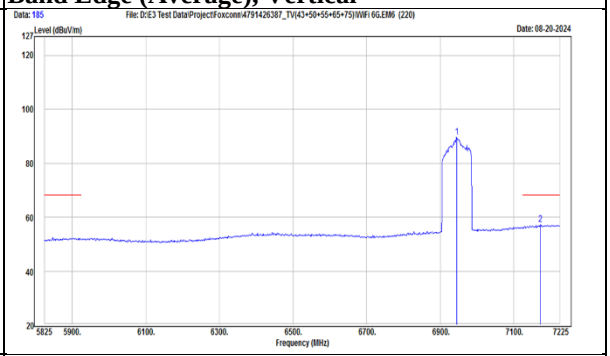
Mode	802.11ax(HE80)	Channel	199

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		5914.6	30.97	21.53	52.5	68.2	-15.7	AVG
	@	6945	76.85	25.25	102.1	N/A	N/A	PK
	@	6945	67.54	25.25	92.79	N/A	N/A	AVG
		7206.8	40.89	26.99	67.88	88.2	-20.32	PK
		7222.2	30.26	27.01	57.27	68.2	-10.93	AVG
Vertical	@	6945	74.23	25.25	99.48	N/A	N/A	PK
	@	6945	64.42	25.25	89.67	N/A	N/A	AVG
		7171.8	30.57	26.65	57.22	68.2	-10.98	AVG
		7187.2	40.73	26.83	67.56	88.2	-20.64	PK

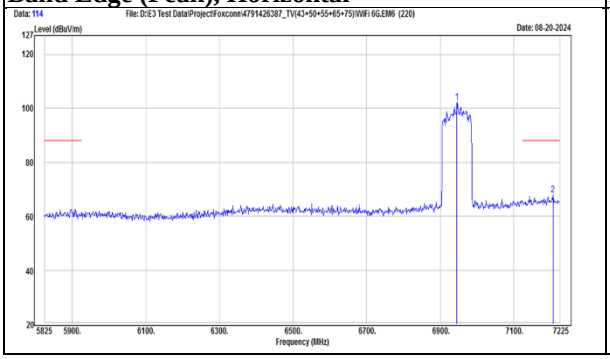
TX, 802.11ax(HE80) (Ch 199)
Band Edge (Average), Horizontal



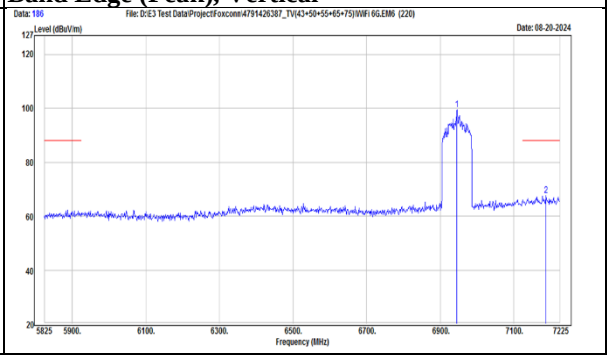
TX, 802.11ax(HE80) (Ch 199)
Band Edge (Average), Vertical



TX, 802.11ax(HE80) (Ch 199)
Band Edge (Peak), Horizontal



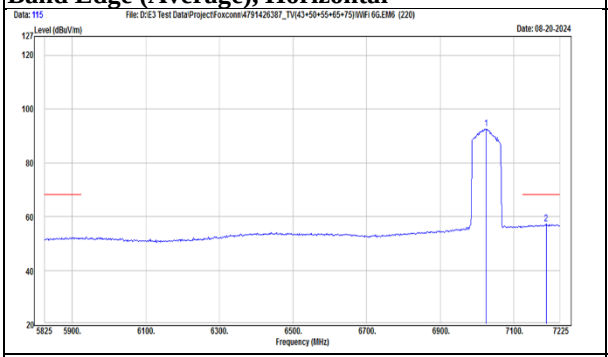
TX, 802.11ax(HE80) (Ch 199)
Band Edge (Peak), Vertical



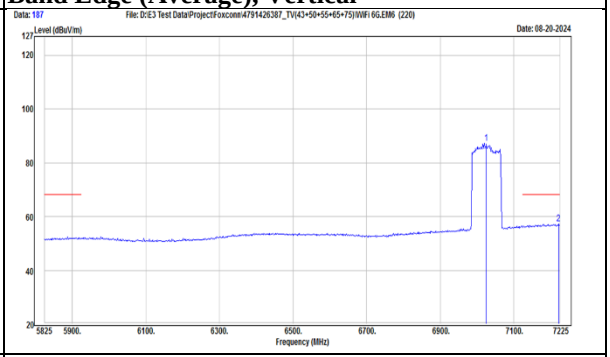
Mode	802.11ax(HE80)	Channel	215

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal	@	7025	75.13	25.64	100.77	N/A	N/A	PK
	@	7025	66.95	25.64	92.59	N/A	N/A	AVG
		7183	40.92	26.78	67.7	88.2	-20.5	PK
		7188.6	30.34	26.85	57.19	68.2	-11.01	AVG
Vertical	@	7025	69.23	25.64	94.87	N/A	N/A	PK
	@	7025	61.5	25.64	87.14	N/A	N/A	AVG
		7192.8	41.47	26.9	68.37	88.2	-19.83	PK
		7222.2	30.26	27.01	57.27	68.2	-10.93	AVG

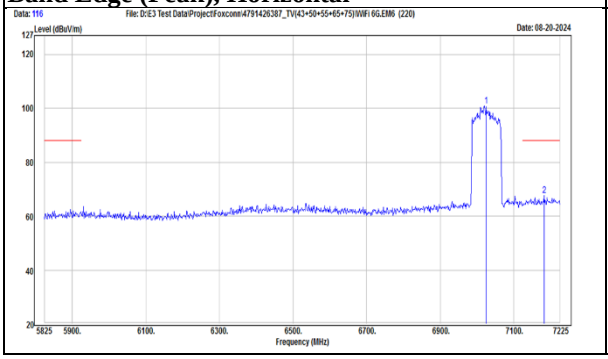
TX, 802.11ax(HE80) (Ch 215)
Band Edge (Average), Horizontal



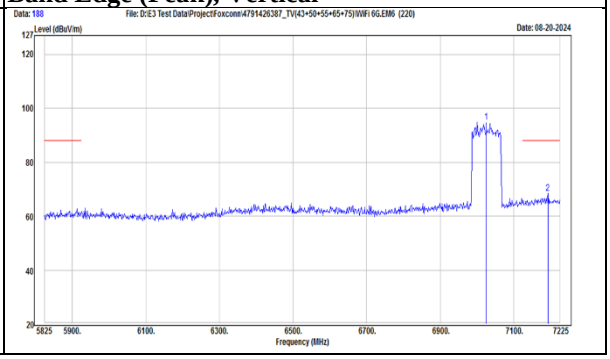
TX, 802.11ax(HE80) (Ch 215)
Band Edge (Average), Vertical



TX, 802.11ax(HE80) (Ch 215)
Band Edge (Peak), Horizontal



TX, 802.11ax(HE80) (Ch 215)
Band Edge (Peak), Vertical

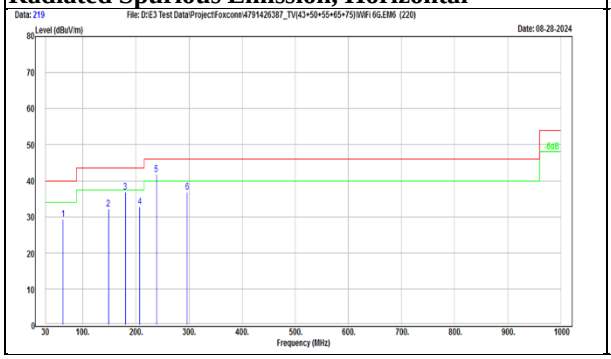


Below 1 GHz

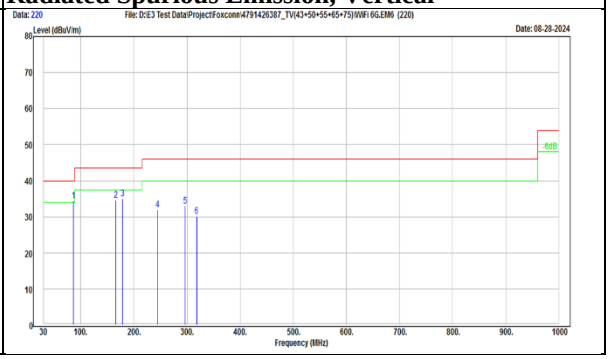
Mode	802.11ax(HE20)	Channel	149

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		62.98	41.55	-12.28	29.27	40	-10.73	PK
		148.34	44.08	-11.84	32.24	43.5	-11.26	PK
		180.35	49.47	-12.72	36.75	43.5	-6.75	PK
		207.51	47.31	-14.62	32.69	43.5	-10.81	PK
		238.55	54.39	-12.71	41.68	46	-4.32	PK
		296.75	47.25	-10.38	36.87	46	-9.13	PK
Vertical		86.26	52.03	-17.6	34.43	40	-5.57	PK
		165.8	46.13	-11.51	34.62	43.5	-8.88	PK
		178.41	47.56	-12.56	35	43.5	-8.5	PK
		244.37	44.23	-12.34	31.89	46	-14.11	PK
		296.75	43.44	-10.38	33.06	46	-12.94	PK
		318.09	39.88	-9.72	30.16	46	-15.84	PK

TX, 802.11ax(HE20) (Ch 149)
Radiated Spurious Emission, Horizontal



TX, 802.11ax(HE20) (Ch 149)
Radiated Spurious Emission, Vertical



9.7. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

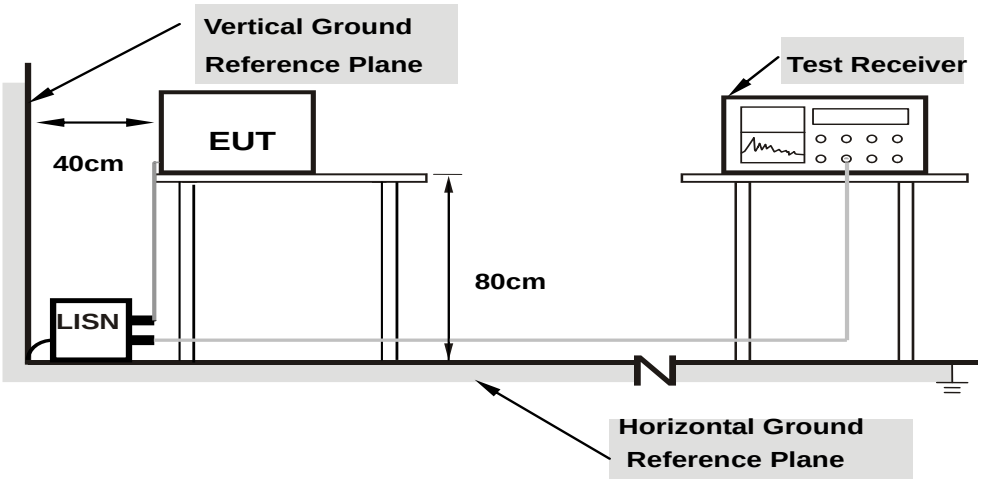
Note:
1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
3. Test data of Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB).
4. Test data of Margin(dB) = Result value (dBuV) - Limit value (dBuV).
5. Test data of Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).

Test Setup



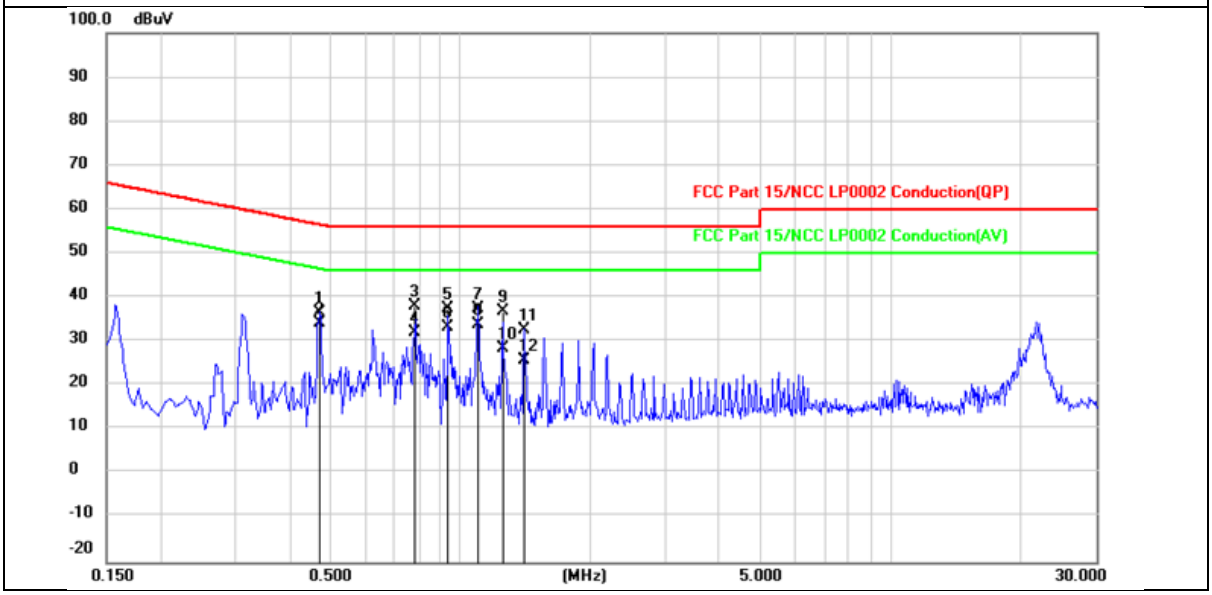
Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

Test Data

Mode	11ax80_TX6625	Channel	135

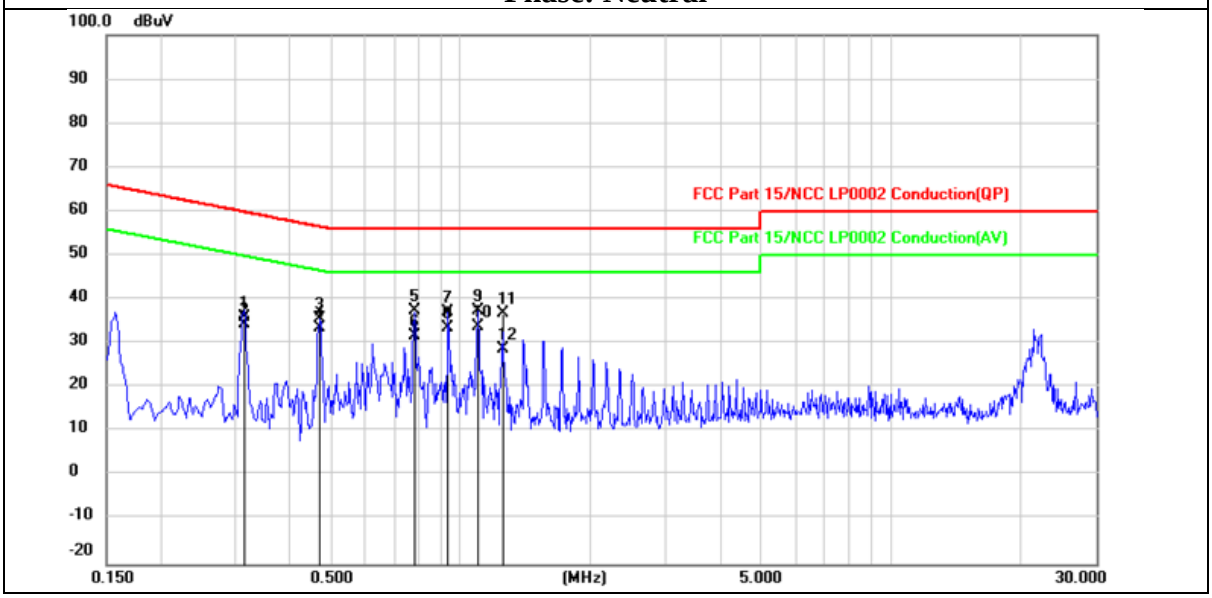
Phase: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4695	26.61	9.95	36.56	56.52	-19.96	QP
2	0.4695	24.08	9.95	34.03	46.52	-12.49	AVG
3	0.7815	28.01	9.96	37.97	56.00	-18.03	QP
4	0.7815	22.21	9.96	32.17	46.00	-13.83	AVG
5	0.9359	27.60	9.97	37.57	56.00	-18.43	QP
6	0.9359	23.43	9.97	33.40	46.00	-12.60	AVG
7	1.0945	27.40	9.98	37.38	56.00	-18.62	QP
8	1.0945	23.89	9.98	33.87	46.00	-12.13	AVG
9	1.2516	26.87	9.99	36.86	56.00	-19.14	QP
10	1.2516	18.45	9.99	28.44	46.00	-17.56	AVG
11	1.4066	22.67	9.99	32.66	56.00	-23.34	QP
12	1.4066	15.87	9.99	25.86	46.00	-20.14	AVG

Mode	11ax80_TX6625	Channel	135

Phase: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3125	26.13	9.94	36.07	59.90	-23.83	QP
2	0.3125	24.37	9.94	34.31	49.90	-15.59	AVG
3	0.4687	25.60	9.95	35.55	56.54	-20.99	QP
4	0.4687	23.62	9.95	33.57	46.54	-12.97	AVG
5	0.7809	27.41	9.96	37.37	56.00	-18.63	QP
6	0.7809	21.71	9.96	31.67	46.00	-14.33	AVG
7	0.9363	27.24	9.96	37.20	56.00	-18.80	QP
8	0.9363	23.46	9.96	33.42	46.00	-12.58	AVG
9	1.0947	27.40	9.97	37.37	56.00	-18.63	QP
10	1.0947	23.82	9.97	33.79	46.00	-12.21	AVG
11	1.2514	26.91	9.98	36.89	56.00	-19.11	QP
12	1.2514	18.83	9.98	28.81	46.00	-17.19	AVG

9.8. In-Band Emission (Mask) Measurement

Requirements

Test Item	Frequencies (MHz)	(X) dBc*1
Emission Mask	At 1 MHz outside of channel edge	20
	At one channel bandwidth from the channel center*2	28
	At one- and one-half times the channel bandwidth away from channel center*3	40
	More than one- and one-half times the channel bandwidth	40

*1 :The power spectral density must be suppressed by "x" dB

*2 : At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression,

*3 : At frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression.

Test procedure

Using method:

a. Connect output of the antenna port to a spectrum analyzer and adjust appropriate attenuation.

b. Measure the 26 dB EBW using the test procedure 12.4.1 of ANSI C63.10-2013. (Determine the channel edge.)

c. Measure the power spectral density (for emissions mask reference) using the following procedure:

a) Set the span to encompass the entire 26 dB EBW of the signal.

b) Set RBW = same RBW used for 26 dB EBW measurement.

c) Set VBW ≥ 3 X RBW

d) Number of points in sweep ≥ [2 X span / RBW].

e) Sweep time = auto.

f) Detector = RMS (i.e., power averaging)

g) Trace average at least 100 traces in power averaging (rms) mode.

h) Use the peak search function on the instrument to find the peak of the spectrum.

d. Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:

a) Suppressed by 20 dB at 1 MHz outside of the channel edge. (The channel edge is defined as the 26-dB point on either side of the carrier center frequency.)

b) Suppressed by 28 dB at one channel bandwidth from the channel center.

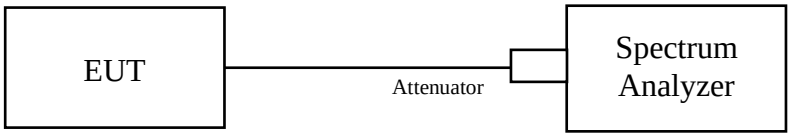
c) Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.

e. Adjust the span to encompass the entire mask as necessary and clear trace.

f. Trace average at least 100 traces in power averaging (rms) mode.

g. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask

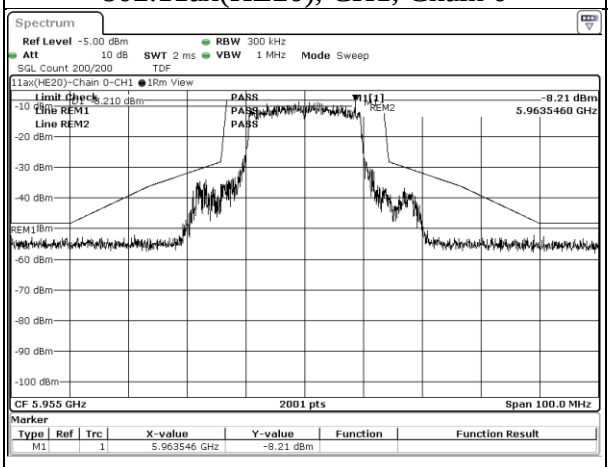
Test Setup



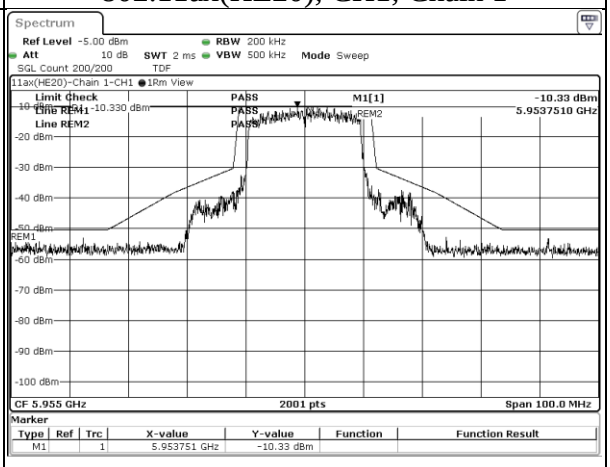
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

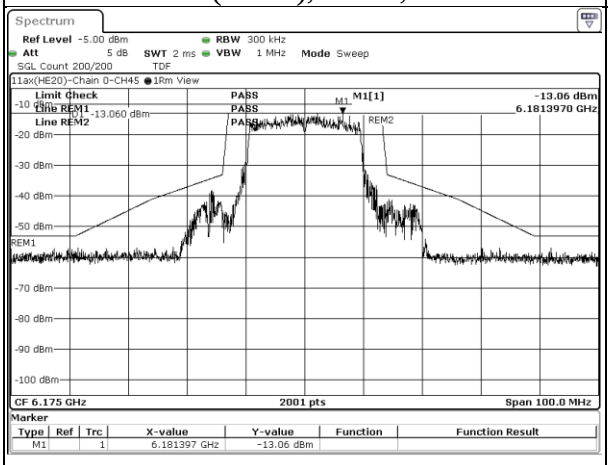
802.11ax(HE20), CH1, Chain 0



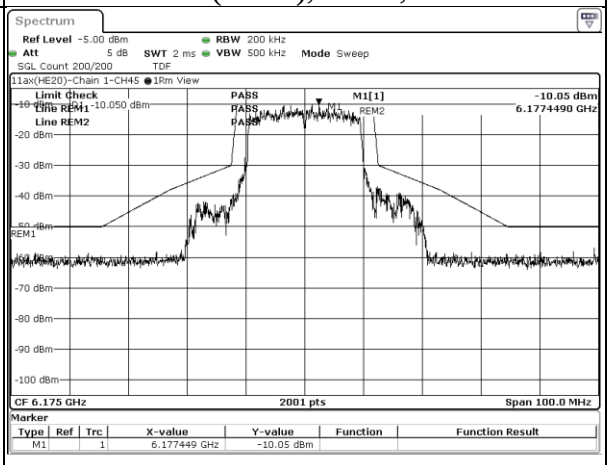
802.11ax(HE20), CH1, Chain 1



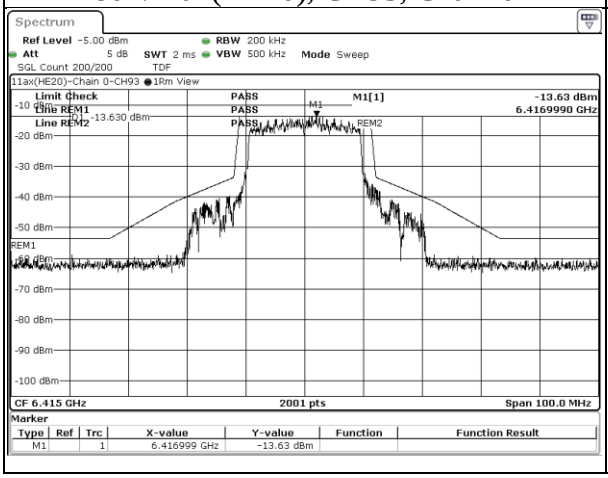
802.11ax(HE20), CH45, Chain 0



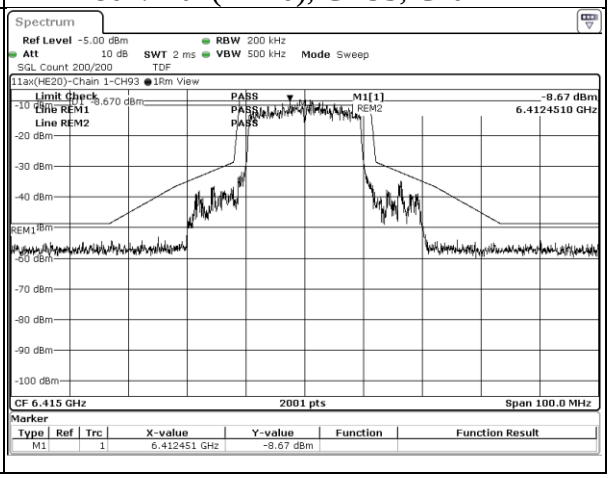
802.11ax(HE20), CH45, Chain 1



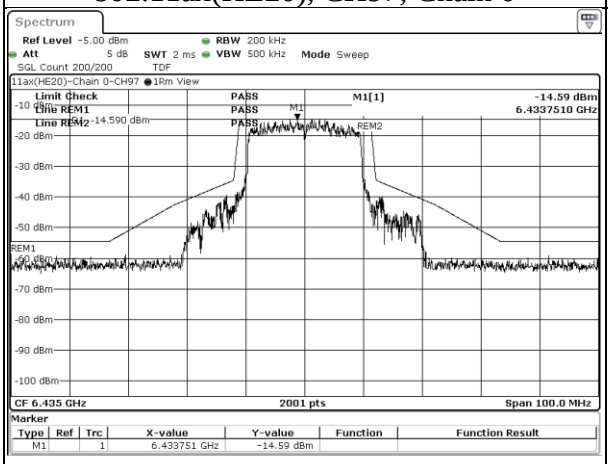
802.11ax(HE20), CH93, Chain 0



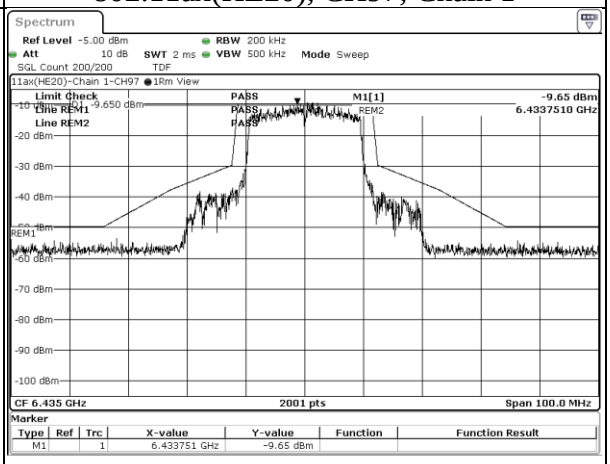
802.11ax(HE20), CH93, Chain 1



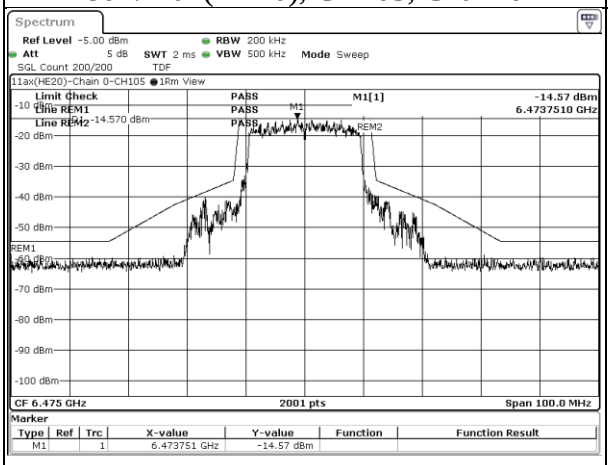
802.11ax(HE20), CH97, Chain 0



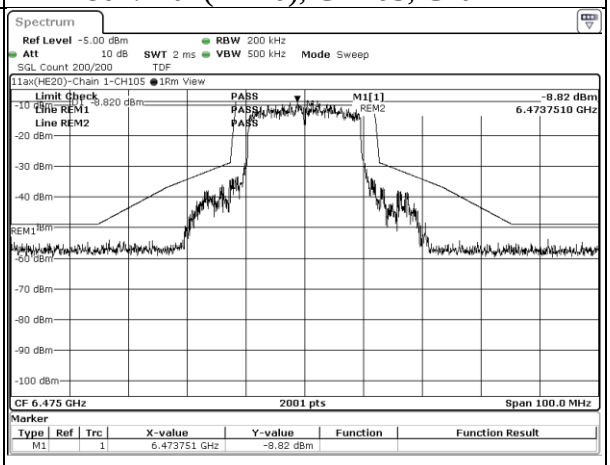
802.11ax(HE20), CH97, Chain 1



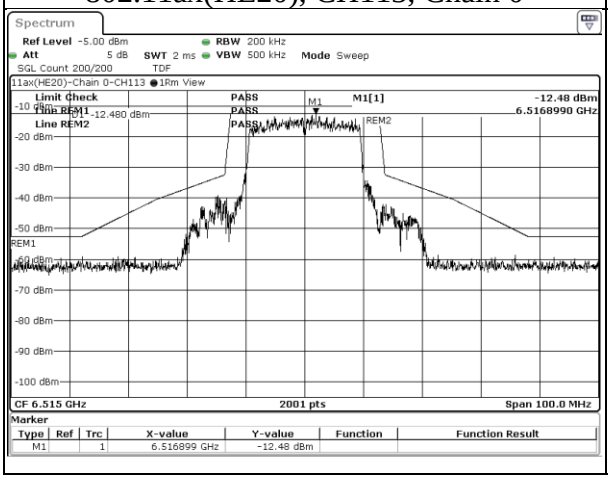
802.11ax(HE20), CH105, Chain 0



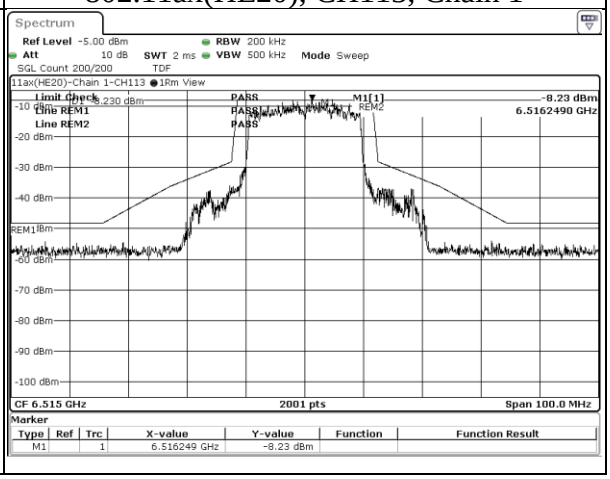
802.11ax(HE20), CH105, Chain 1



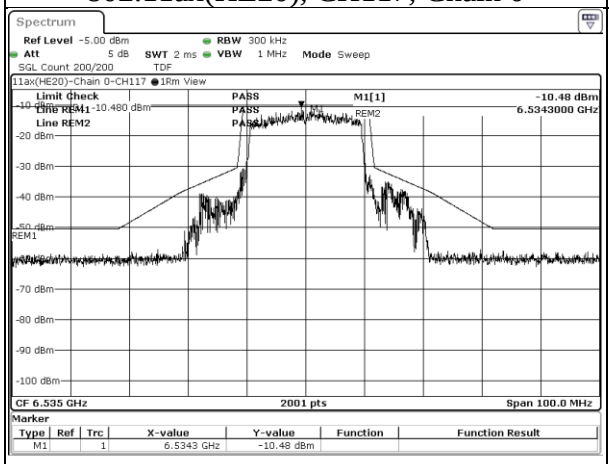
802.11ax(HE20), CH113, Chain 0



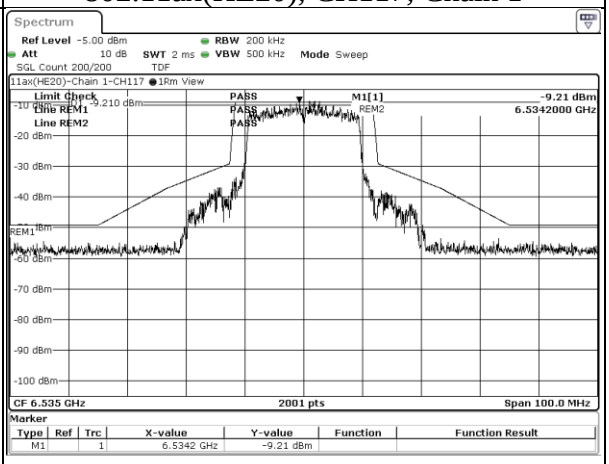
802.11ax(HE20), CH113, Chain 1



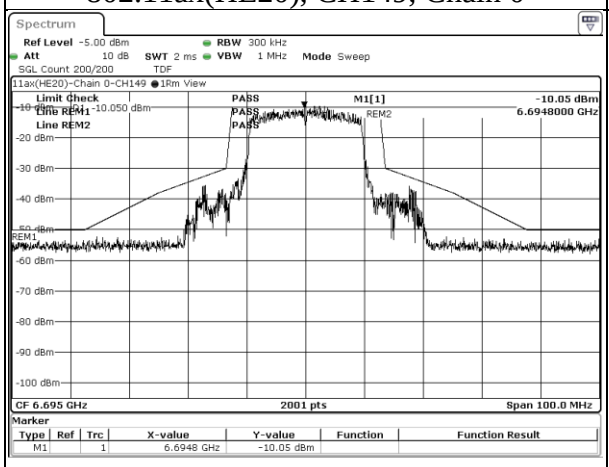
802.11ax(HE20), CH117, Chain 0



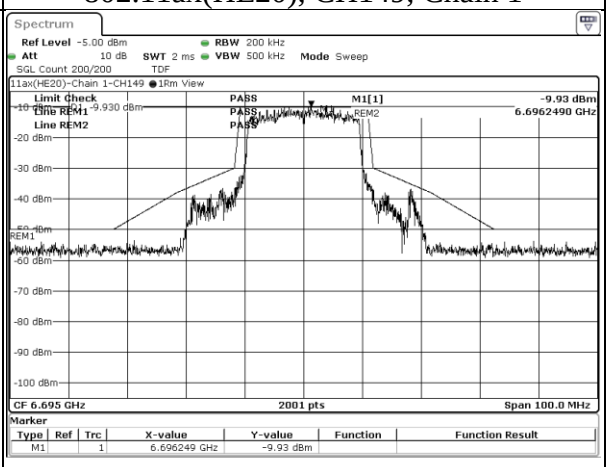
802.11ax(HE20), CH117, Chain 1



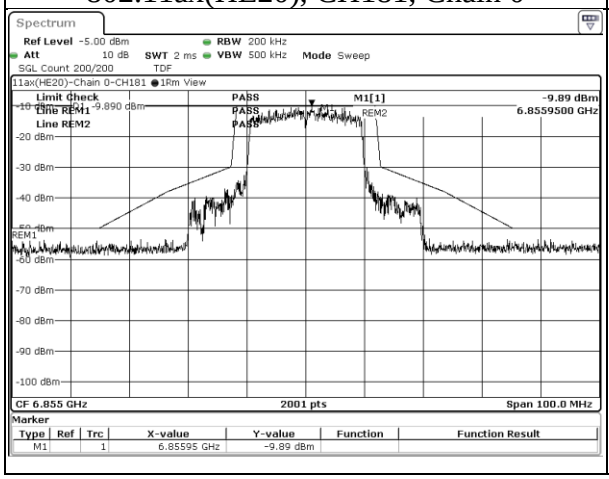
802.11ax(HE20), CH149, Chain 0



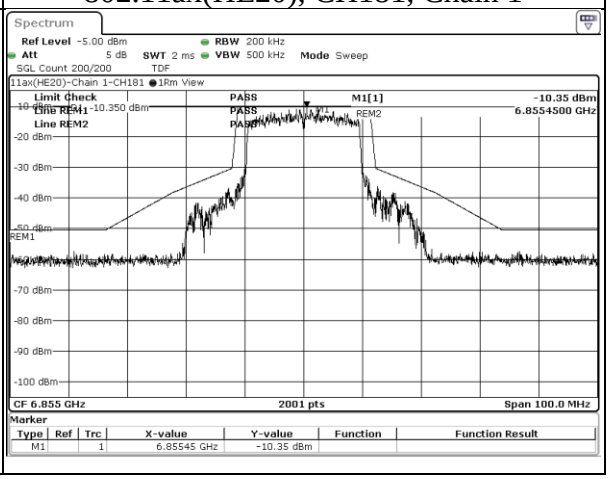
802.11ax(HE20), CH149, Chain 1



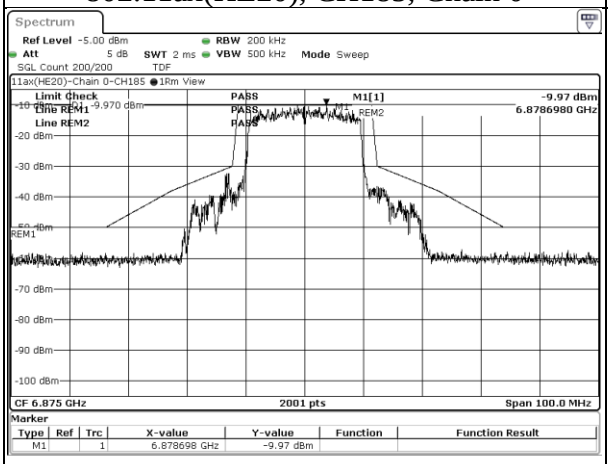
802.11ax(HE20), CH181, Chain 0



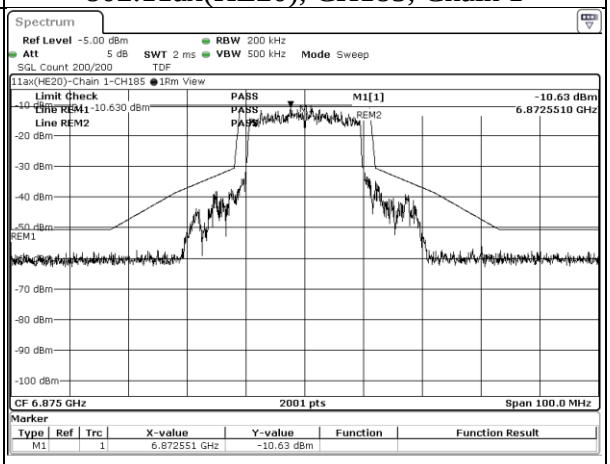
802.11ax(HE20), CH181, Chain 1



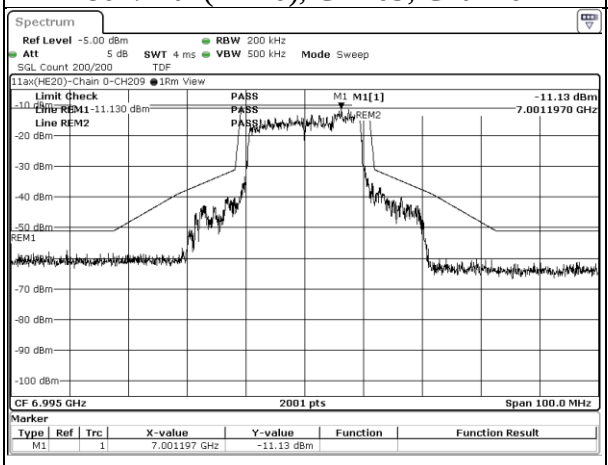
802.11ax(HE20), CH185, Chain 0



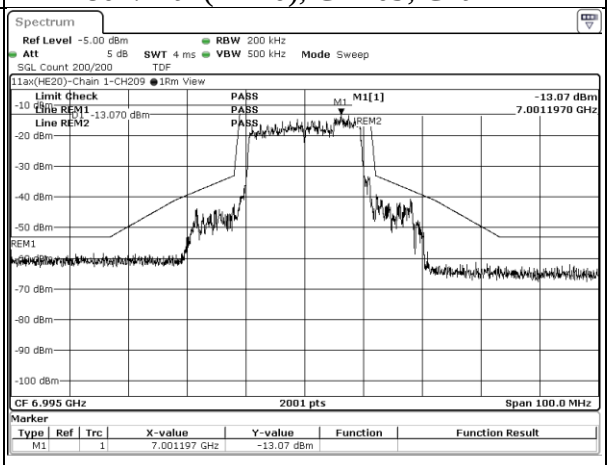
802.11ax(HE20), CH185, Chain 1



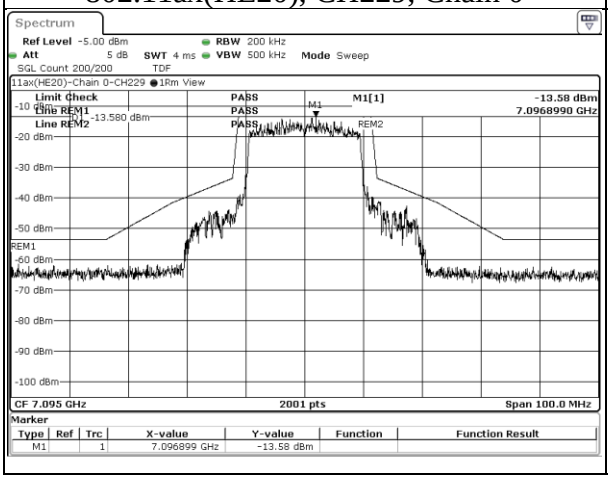
802.11ax(HE20), CH209, Chain 0



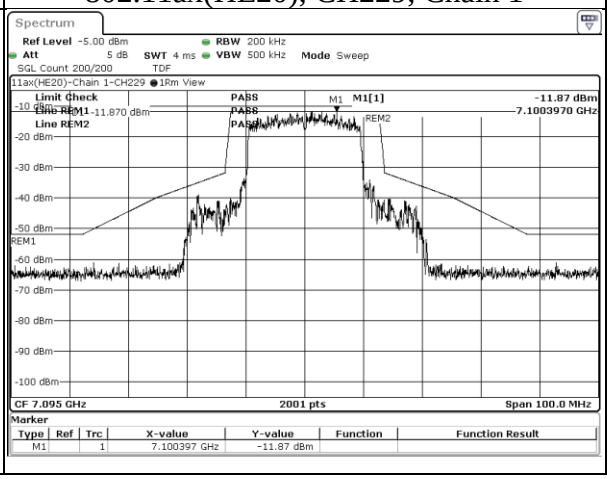
802.11ax(HE20), CH209, Chain 1



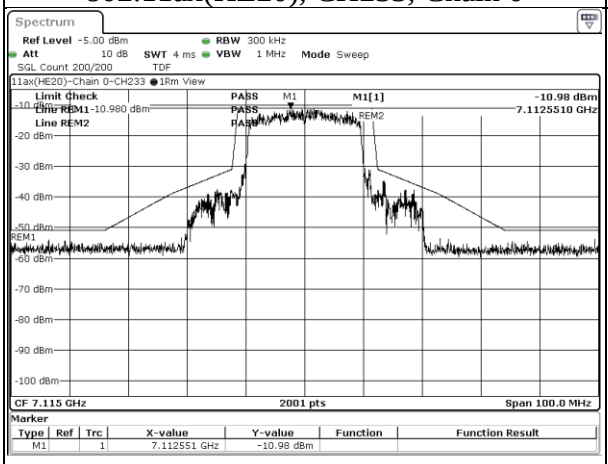
802.11ax(HE20), CH229, Chain 0



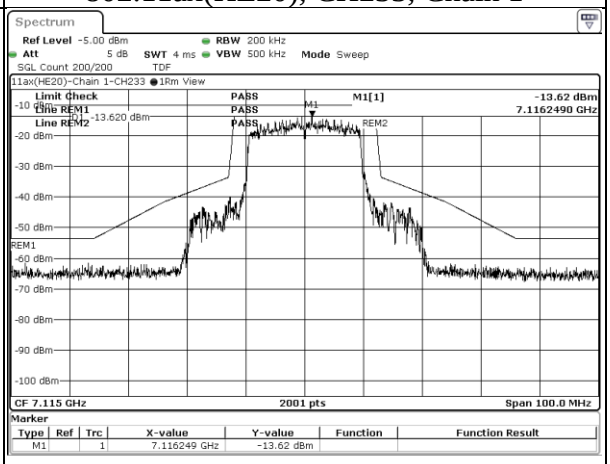
802.11ax(HE20), CH229, Chain 1



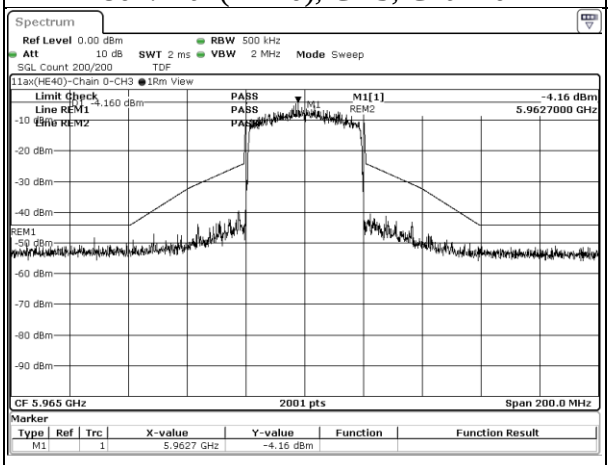
802.11ax(HE20), CH233, Chain 0



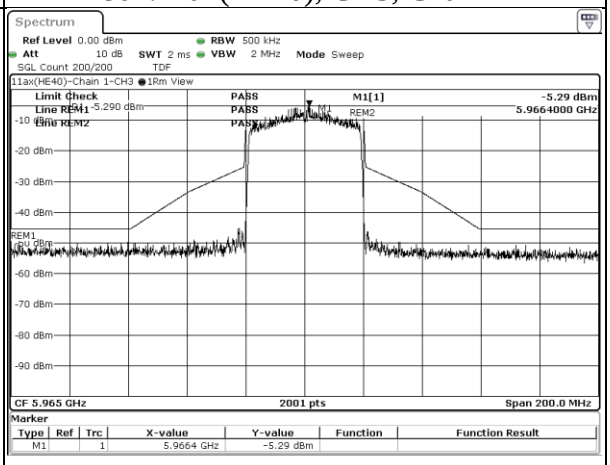
802.11ax(HE20), CH233, Chain 1



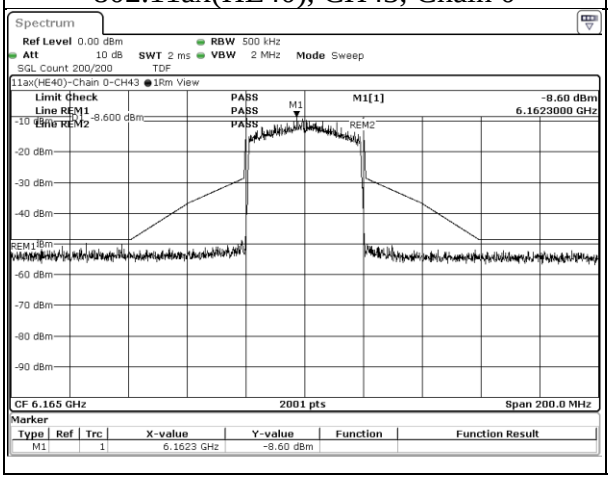
802.11ax(HE40), CH3, Chain 0



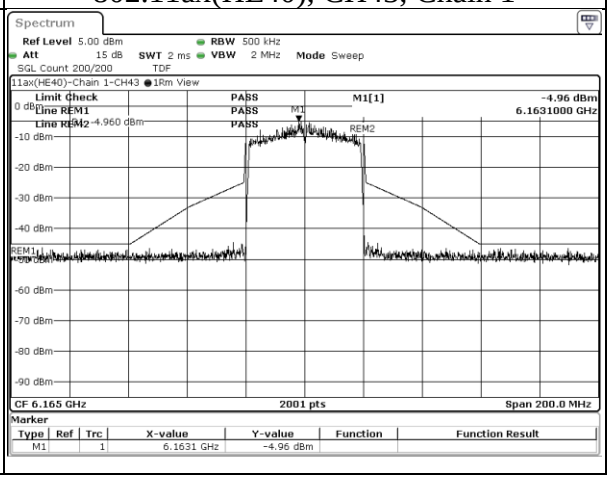
802.11ax(HE40), CH3, Chain 1



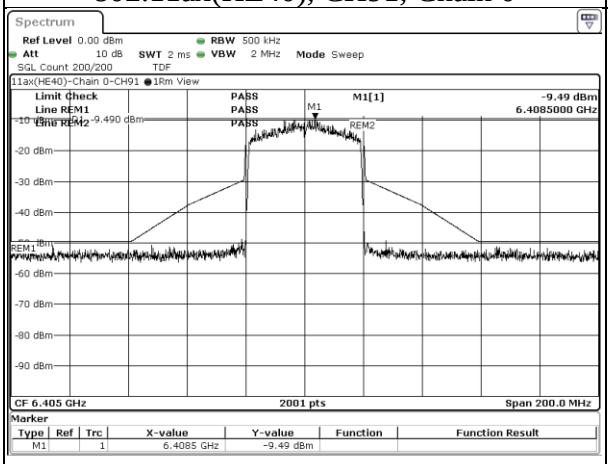
802.11ax(HE40), CH43, Chain 0



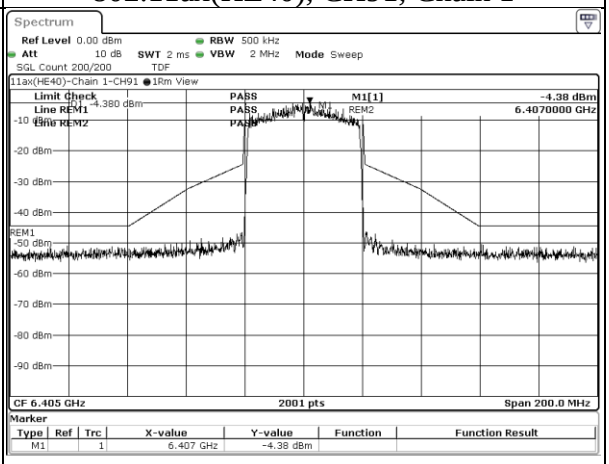
802.11ax(HE40), CH43, Chain 1



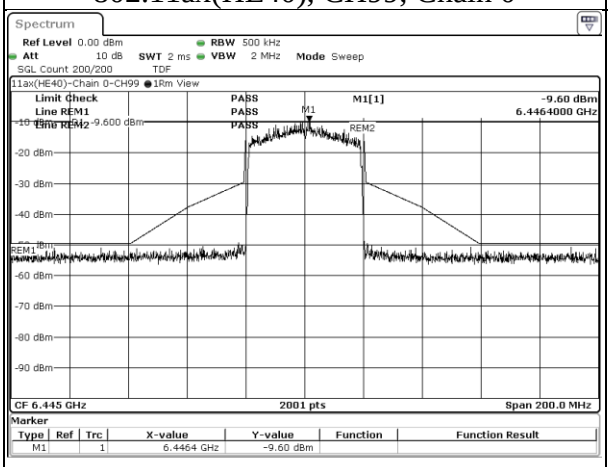
802.11ax(HE40), CH91, Chain 0



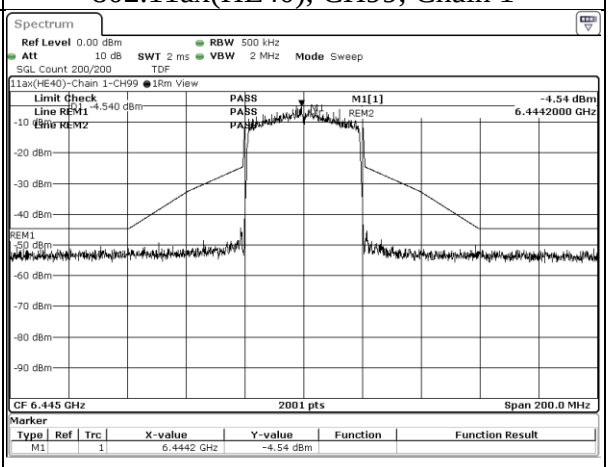
802.11ax(HE40), CH91, Chain 1



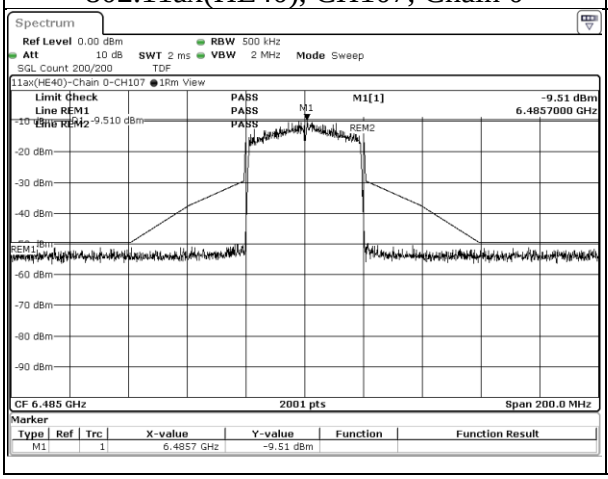
802.11ax(HE40), CH99, Chain 0



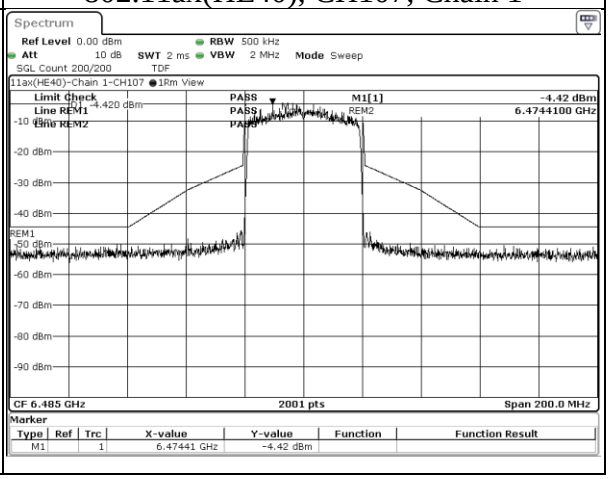
802.11ax(HE40), CH99, Chain 1



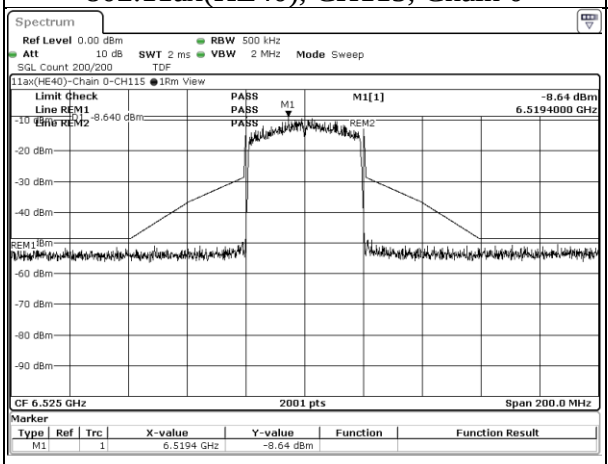
802.11ax(HE40), CH107, Chain 0



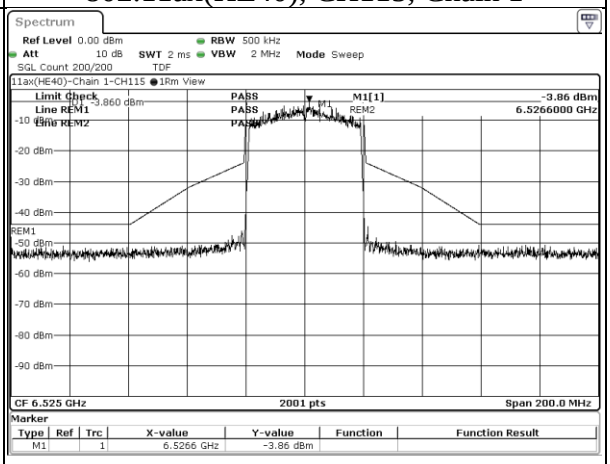
802.11ax(HE40), CH107, Chain 1



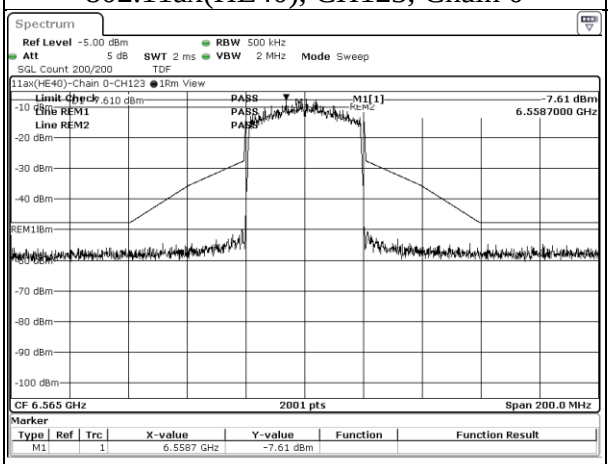
802.11ax(HE40), CH115, Chain 0



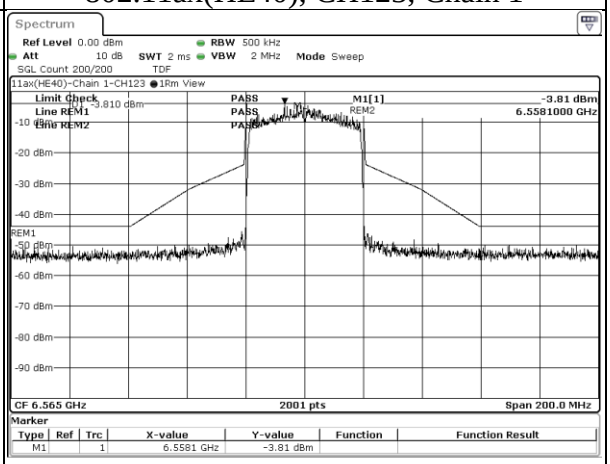
802.11ax(HE40), CH115, Chain 1



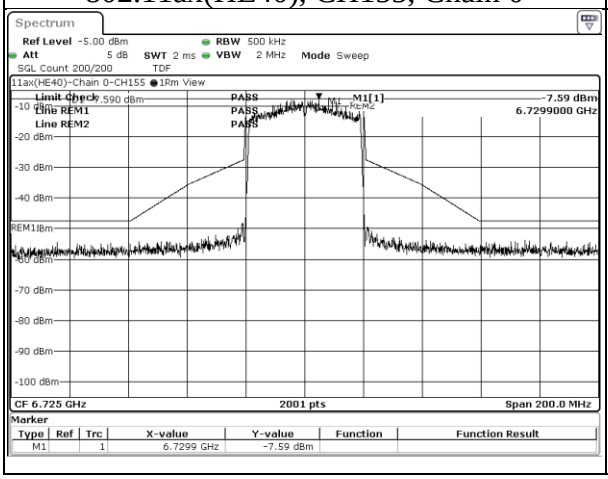
802.11ax(HE40), CH123, Chain 0



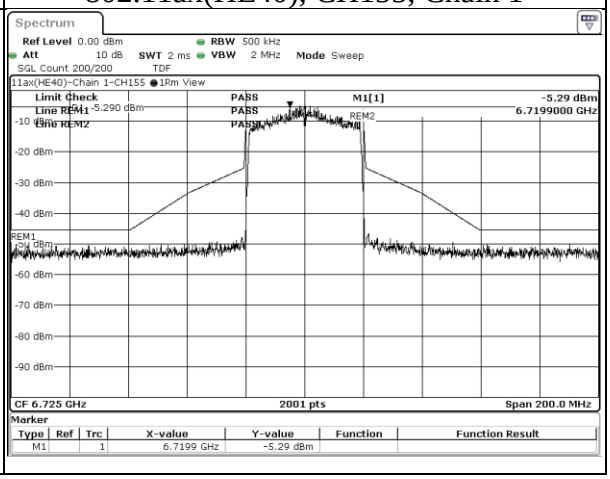
802.11ax(HE40), CH123, Chain 1



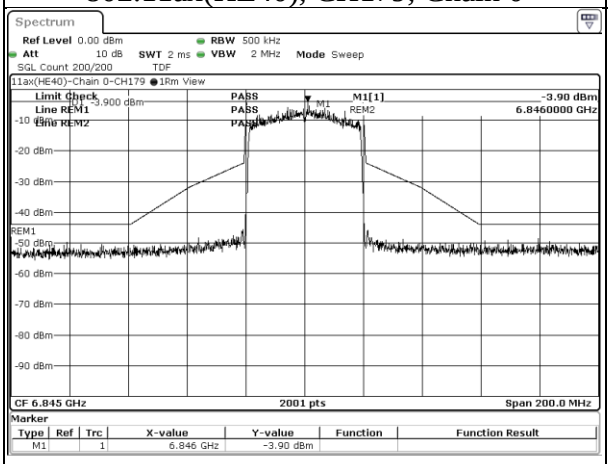
802.11ax(HE40), CH155, Chain 0



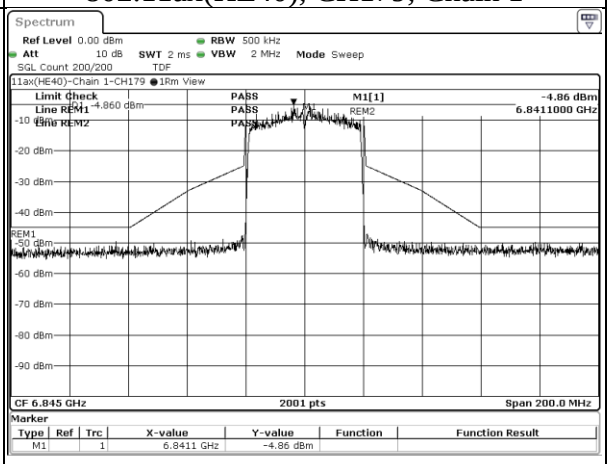
802.11ax(HE40), CH155, Chain 1



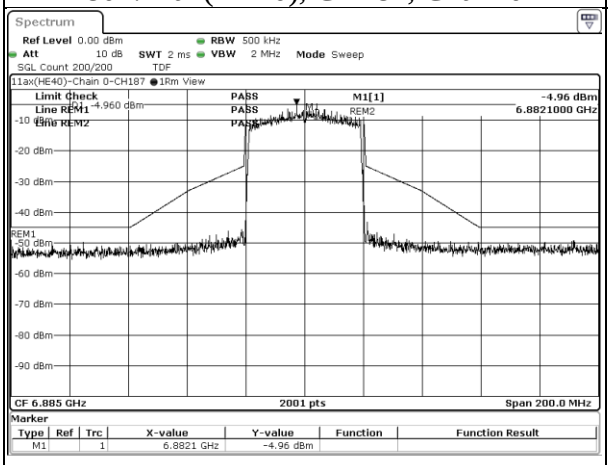
802.11ax(HE40), CH179, Chain 0



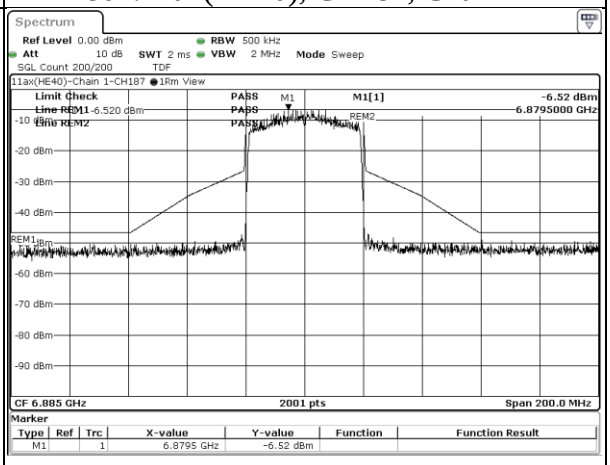
802.11ax(HE40), CH179, Chain 1



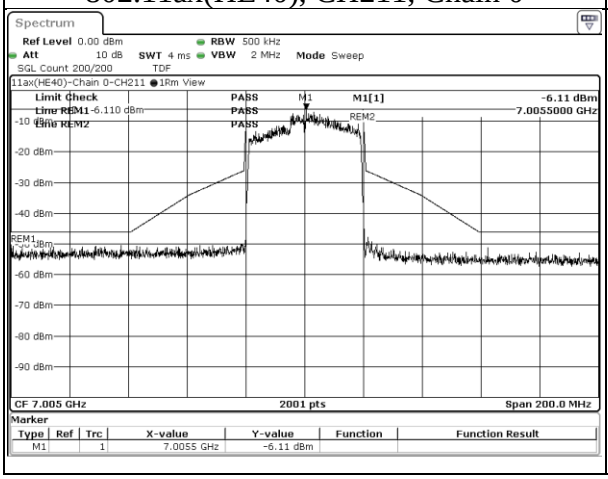
802.11ax(HE40), CH187, Chain 0



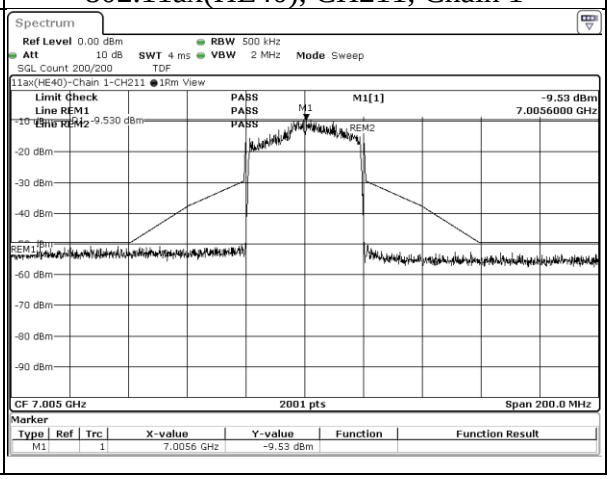
802.11ax(HE40), CH187, Chain 1



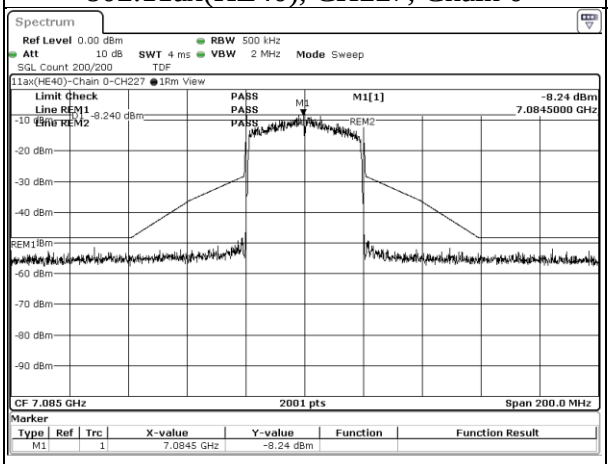
802.11ax(HE40), CH211, Chain 0



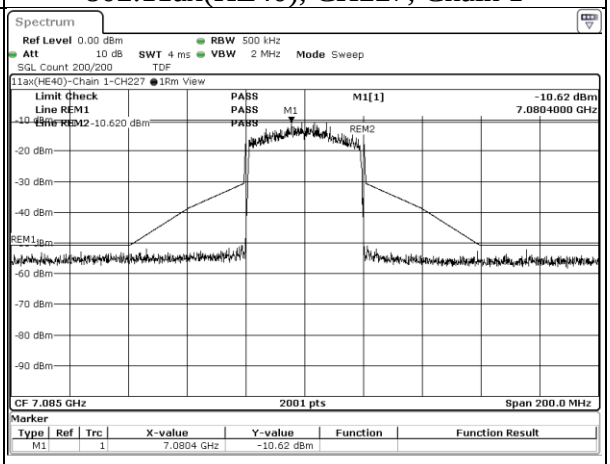
802.11ax(HE40), CH211, Chain 1



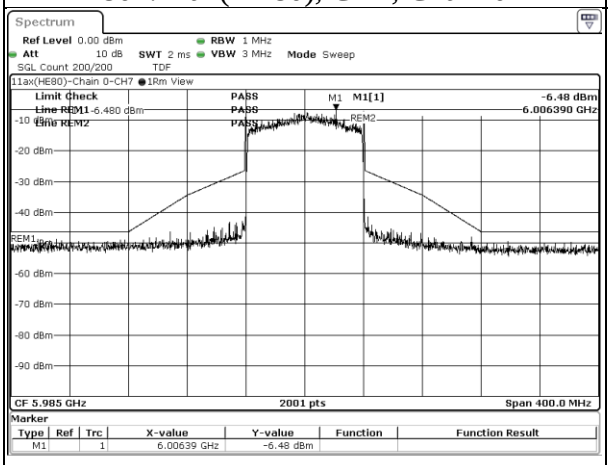
802.11ax(HE40), CH227, Chain 0



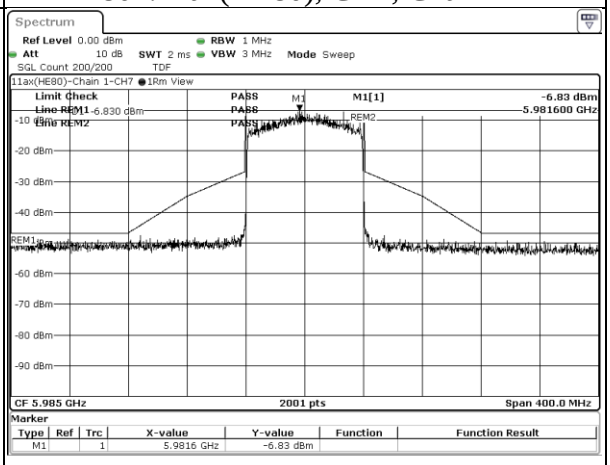
802.11ax(HE40), CH227, Chain 1



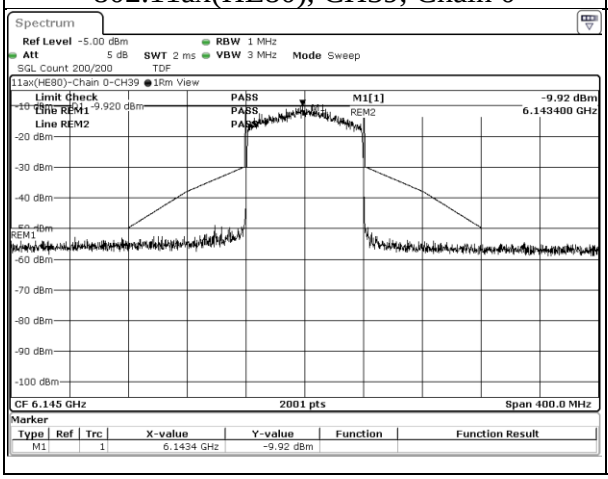
802.11ax(HE80), CH7, Chain 0



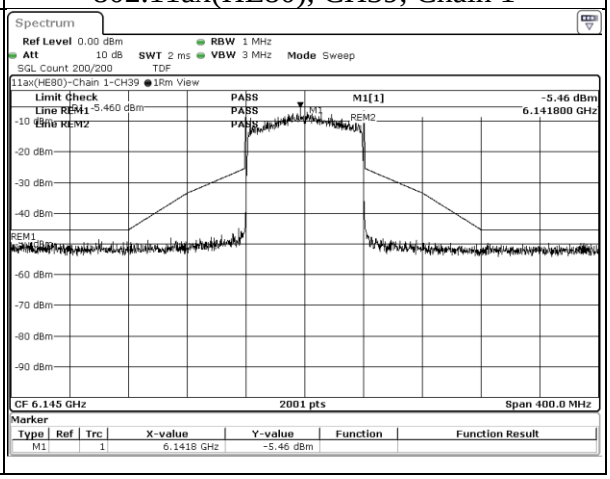
802.11ax(HE80), CH7, Chain 1



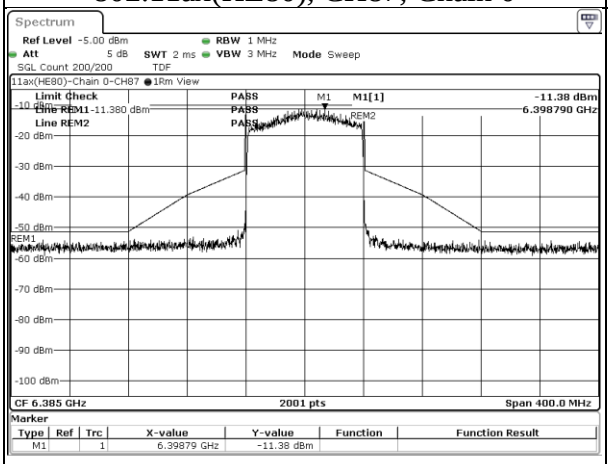
802.11ax(HE80), CH39, Chain 0



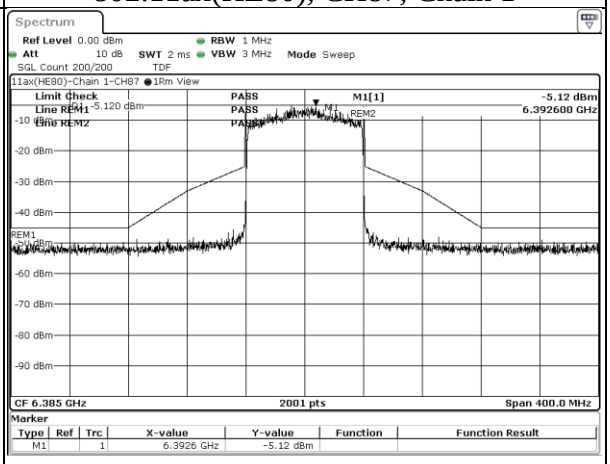
802.11ax(HE80), CH39, Chain 1



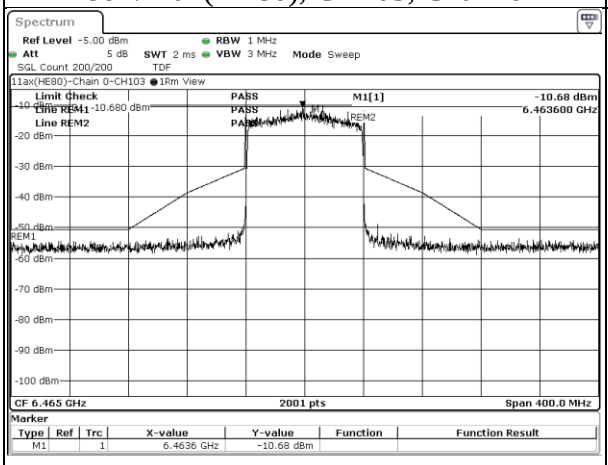
802.11ax(HE80), CH87, Chain 0



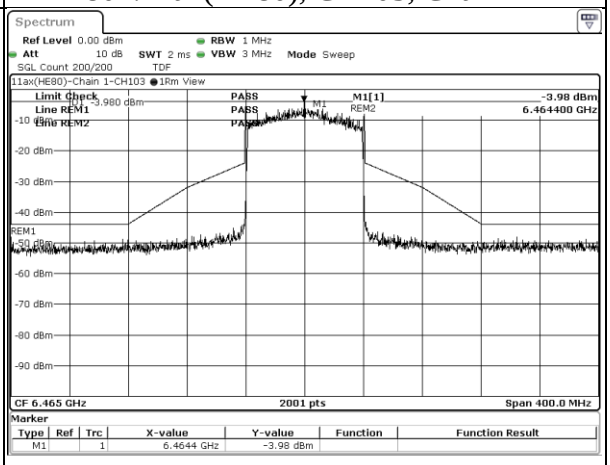
802.11ax(HE80), CH87, Chain 1



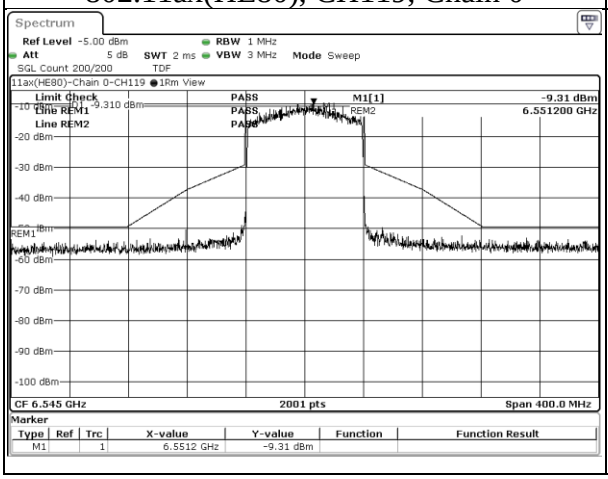
802.11ax(HE80), CH103, Chain 0



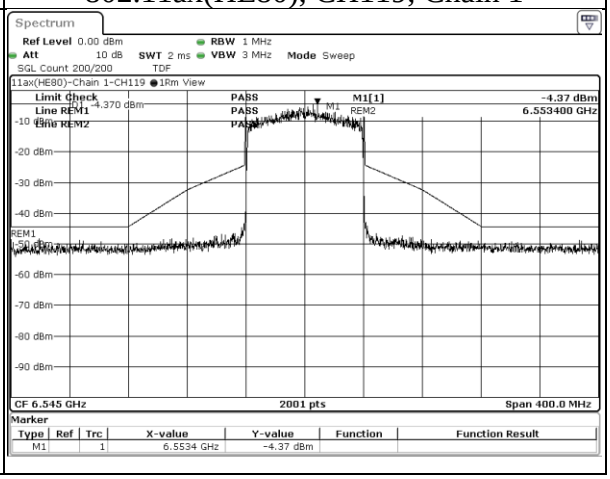
802.11ax(HE80), CH103, Chain 1



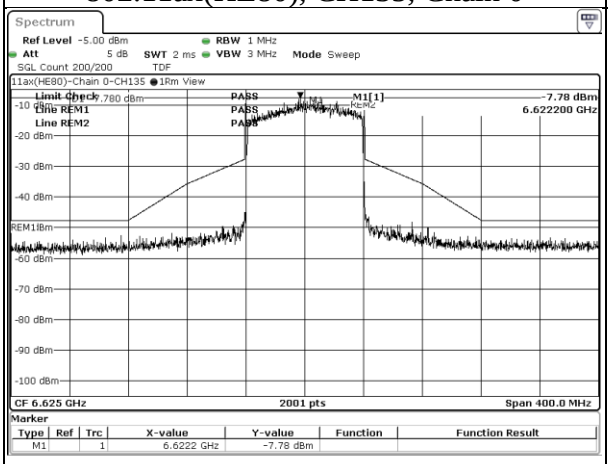
802.11ax(HE80), CH119, Chain 0



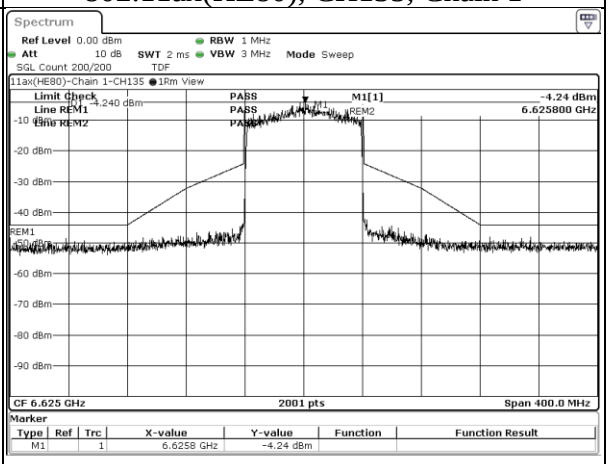
802.11ax(HE80), CH119, Chain 1



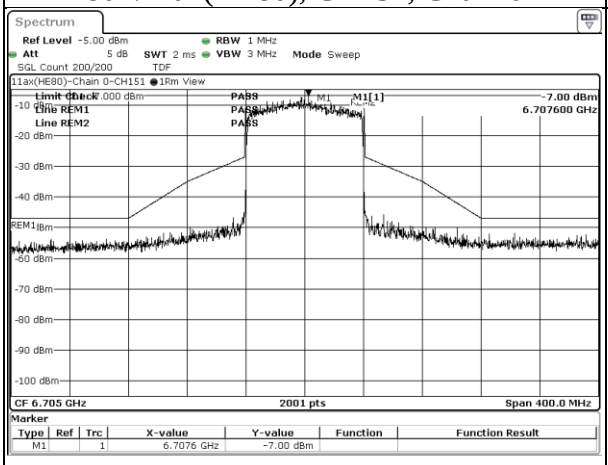
802.11ax(HE80), CH135, Chain 0



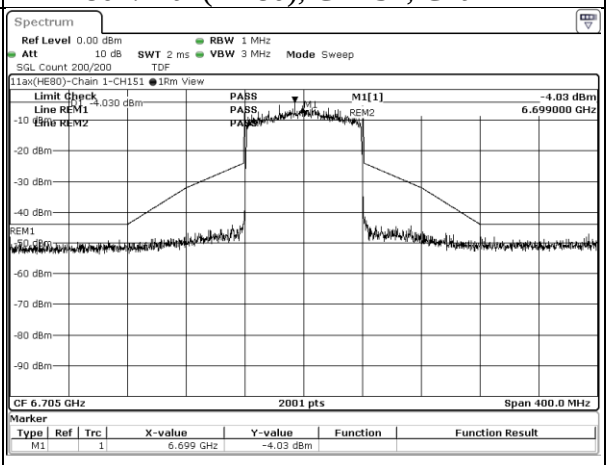
802.11ax(HE80), CH135, Chain 1



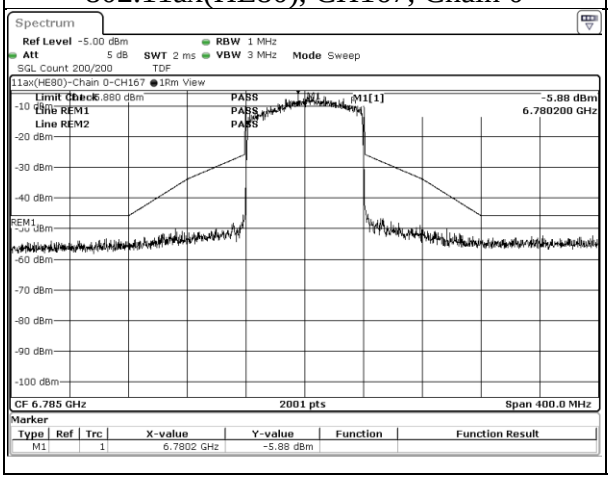
802.11ax(HE80), CH151, Chain 0



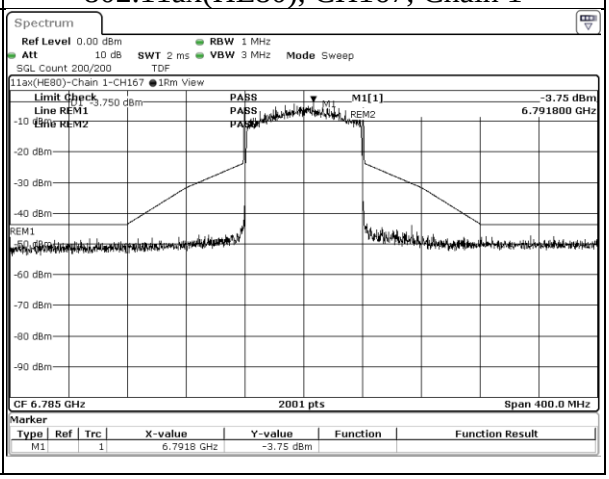
802.11ax(HE80), CH151, Chain 1



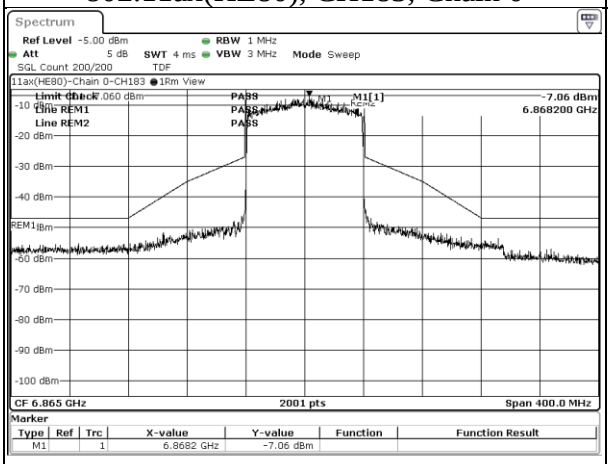
802.11ax(HE80), CH167, Chain 0



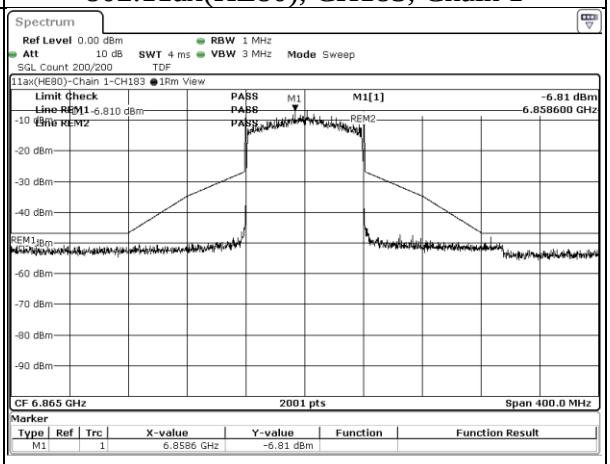
802.11ax(HE80), CH167, Chain 1



802.11ax(HE80), CH183, Chain 0



802.11ax(HE80), CH183, Chain 1



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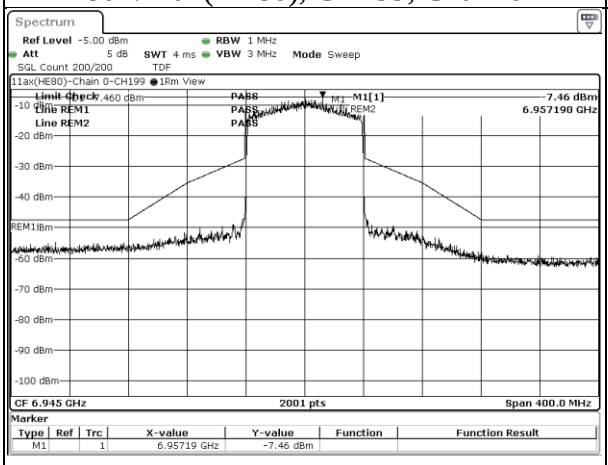
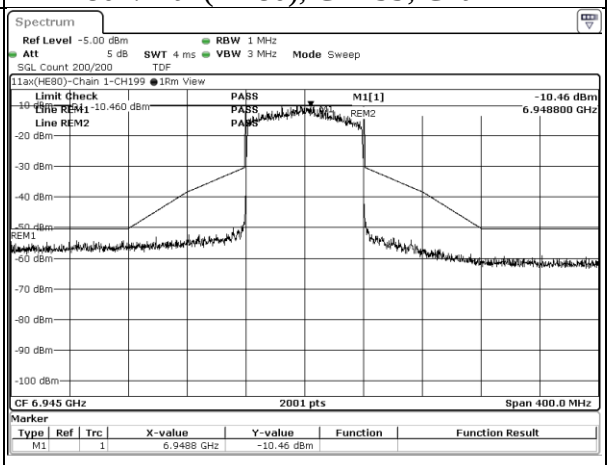
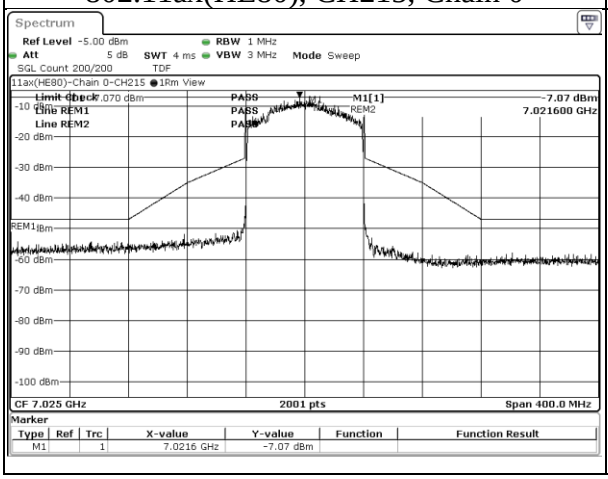


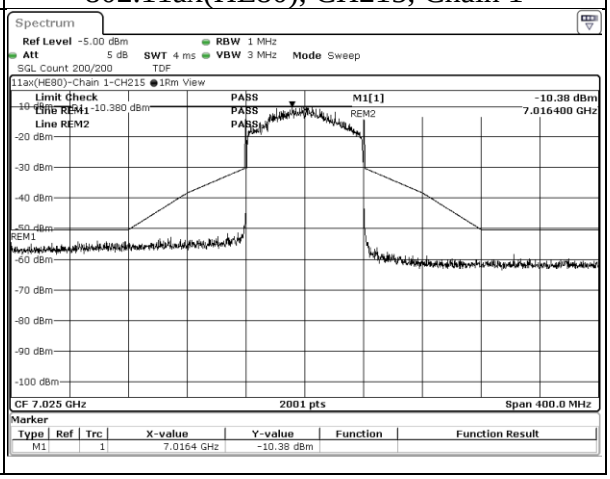
802.11ax(HE80), CH199, Chain 1



802.11ax(HE80), CH215, Chain 0



802.11ax(HE80), CH215, Chain 1



9.9. Contention Based Protocol Measurement

Requirements

Unlicensed indoor low-power devices must detect co-channel radio frequency power that is at least -62 dBm (The threshold is referenced to a 0 dBi antenna gain.) or lower. Additionally, indoor low-power devices must detect co-channel energy with 90% or greater certainty.

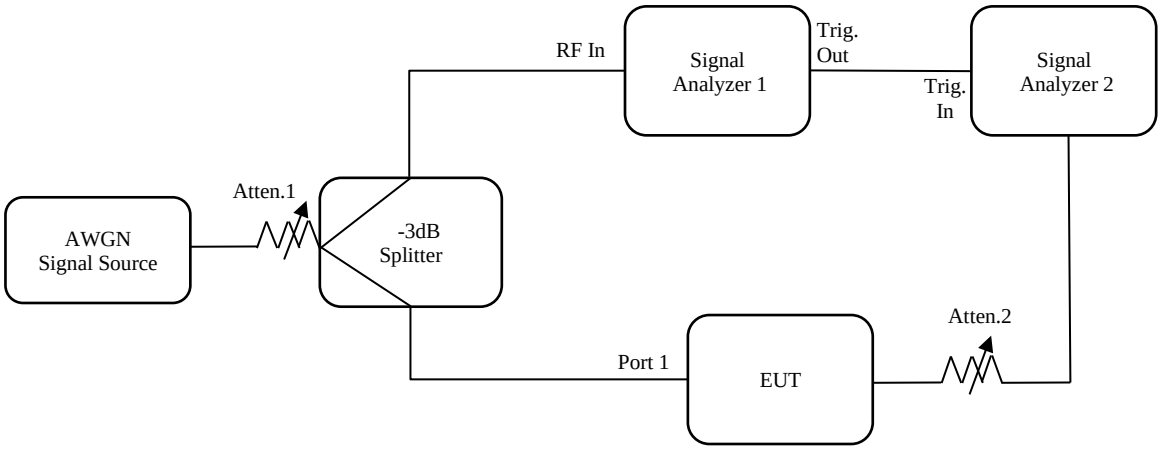
Test procedure

a. Set the EUT to transmit with a constant duty cycle and relative operating parameters which including power level, operating frequency, modulation and bandwidth.
b. 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. Triger out connect the output port of the EUT to signal analyzer 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
c. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters.
d. Determine number of times detection threshold test as following table:

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leqq BW_{Inc}$	Once	Same as EUT transmission
$BW_{Inc} < BW_{EUT} \leqq 2*BW_{Inc}$	Once	Contained within BW_{EUT}
$2xBW_{Inc} < BW_{EUT} \leqq 4*BW_{Inc}$	Twice (Incumbent transmission is contained within BW_{EUT})	Closely to the lower edge and upper edge of the EUT Channel
$BW_{EUT} > 4*BW_{Inc}$	Three times	Closely to the lower edge, in the middle and upper edge of the EUT Channel

e. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use step c table to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
f. 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.
g. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
h. 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.
i. (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.
j. Refer to step c table 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 d, choose a different center frequency for the AWGN signal and repeat the process.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

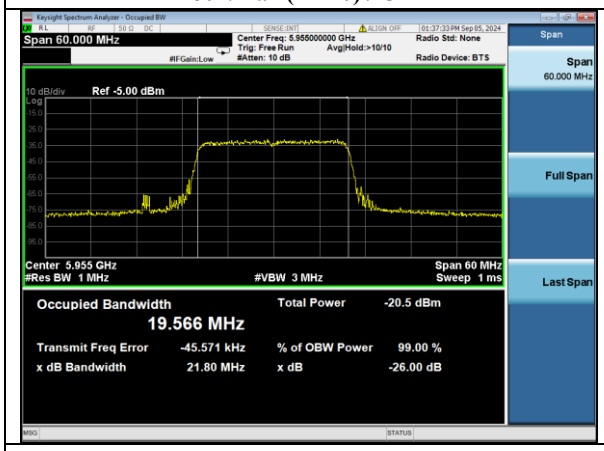
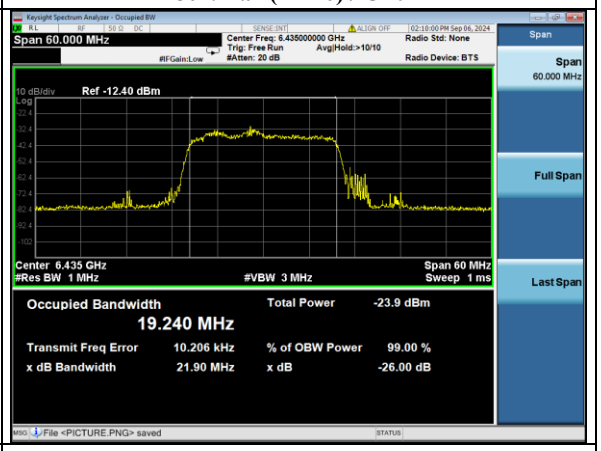
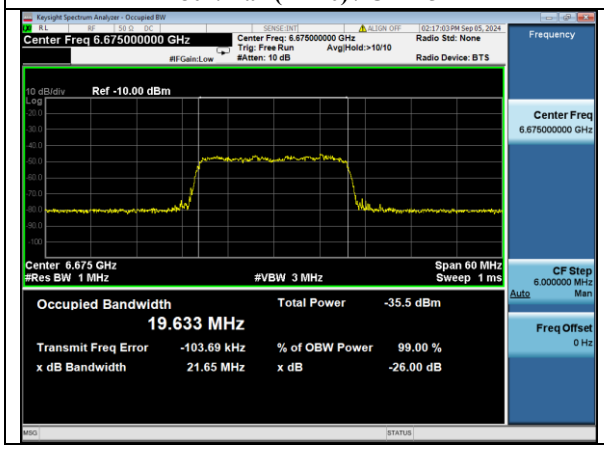
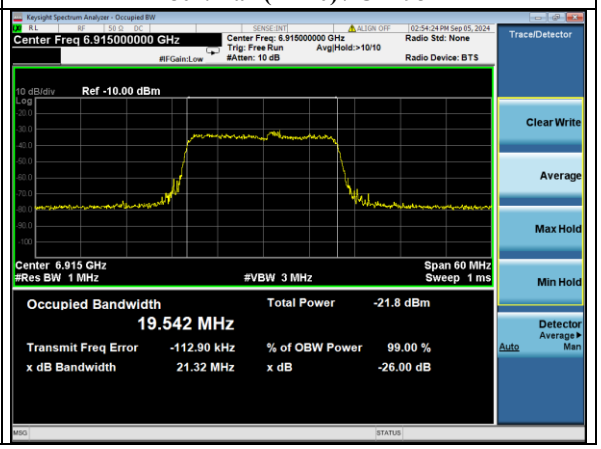
Test Data

Measurement Mode	Conducted measurement	Device Type	Indoor Client

802.11ax (HE20)

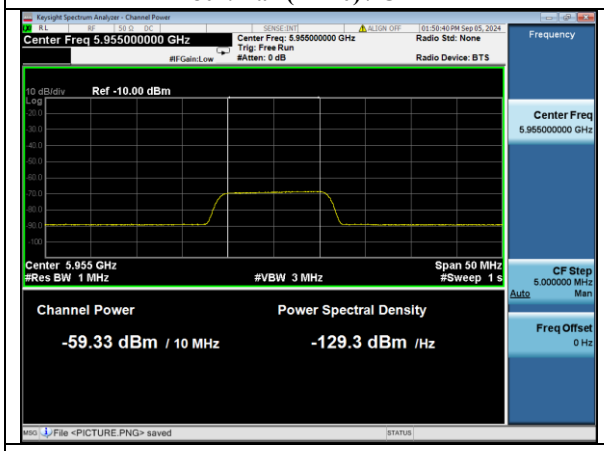
Operation Band	Ch.	EUT Freq. (MHz)	Minimum Antenna Gain (dBi)	Test Result							
				Test Signals Freq. (MHz)	The Incumbent (AWGN) Signal Level (dBm)	Number of Times	Number of Detected	Detection Rate (%)	Limit	PASS /FAIL	Status of EUT transmission
UNII-5	1	5955	3.07	5955	-58.93	10	10	100%	90%	PASS	Ceased
					-66	10	10	100%	90%	PASS	Minimal
					-67	10	0	0%	90%	FAIL	Transmitting
UNII-6	97	6435	3.35	6435	-58.65	10	10	100%	90%	PASS	Ceased
					-68	10	10	100%	90%	PASS	Minimal
					-69	10	0	0%	90%	FAIL	Transmitting
UNII-7	145	6675	4.01	6675	-57.99	10	10	100%	90%	PASS	Ceased
					-66	10	10	100%	90%	PASS	Minimal
					-67	10	0	0%	90%	FAIL	Transmitting
UNII-8	193	6915	2.97	6915	-59.03	10	10	100%	90%	PASS	Ceased
					-69	10	10	100%	90%	PASS	Minimal
					-70	10	0	0%	90%	FAIL	Transmitting

Note :
1. For status "Ceased" is mean this threshold where the device detects interference will stops transmitting level.
2. For status "Minimal" is mean this threshold where the device detects interference will stops transmitting minimum level.
3. For status "Transmitting" is mean this threshold where the detects interference will device re-starts transmitting level.
4. For UNII-5, The Incumbent (AWGN) Signal Level is considered 3.07 dBi gain for path loss, Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (3.07dBi) + Path Loss (0dB)= -58.93dBm.
5. For UNII-6, The Incumbent (AWGN) Signal Level is considered 3.35 dBi gain for path loss, Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (3.35dBi) + Path Loss (0dB)= -58.65dBm.
6. For UNII-7, The Incumbent (AWGN) Signal Level is considered 4.01 dBi gain for path loss, Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (4.01dBi) + Path Loss (0dB)= -57.99dBm.
7. For UNII-8, The Incumbent (AWGN) Signal Level is considered 2.97 dBi gain for path loss,
8. Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (2.97dBi) + Path Loss (0dB)= -59.03dBm.

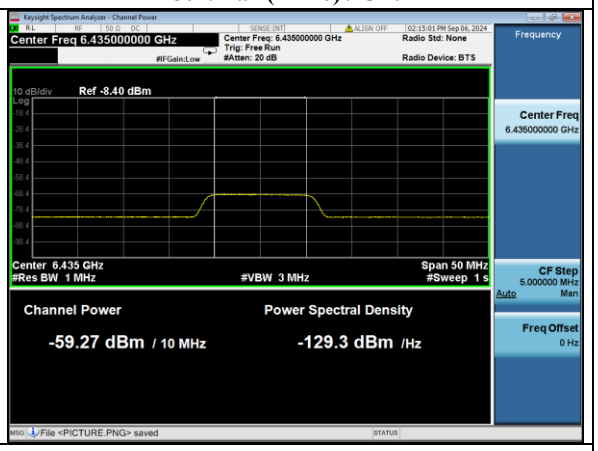
Plots of EUT Tx waveform	
802.11ax (HE20) / CH1	**802.11ax (HE20) / CH97**
	
802.11ax (HE20) / CH145	**802.11ax (HE20) / CH193**
	

Plots of shows Incumbent signal level

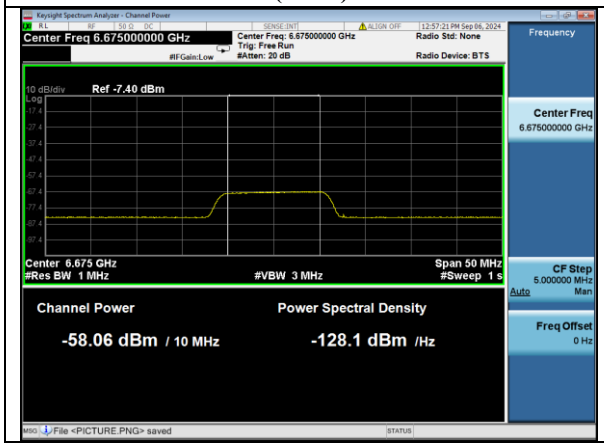
802.11ax (HE20) / CH1



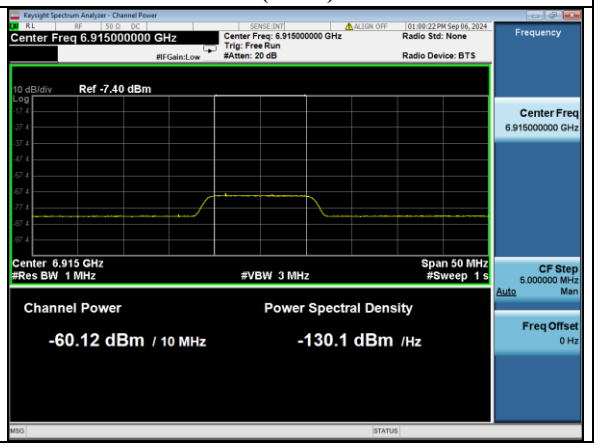
802.11ax (HE20) / CH97



802.11ax (HE20) / CH145

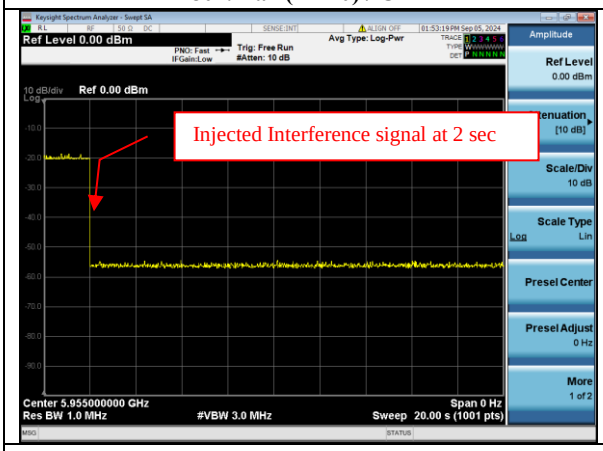


802.11ax (HE20) / CH193

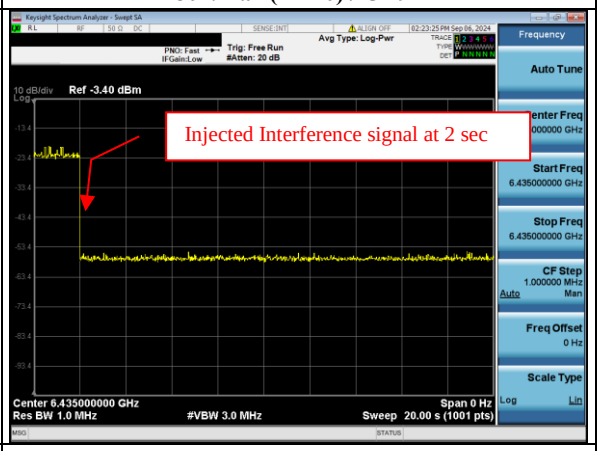


Plots of EUT ceased transmission in the time domain

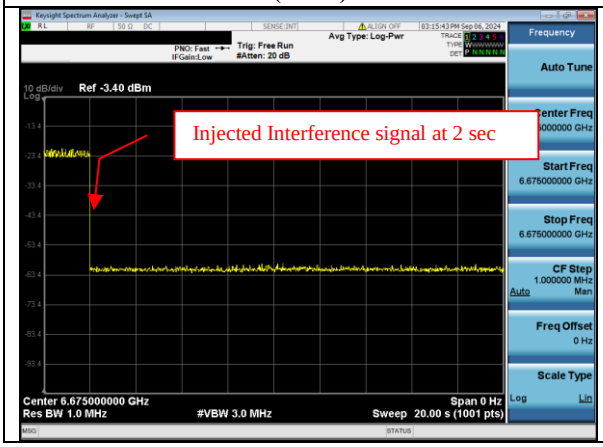
802.11ax (HE20) / CH1



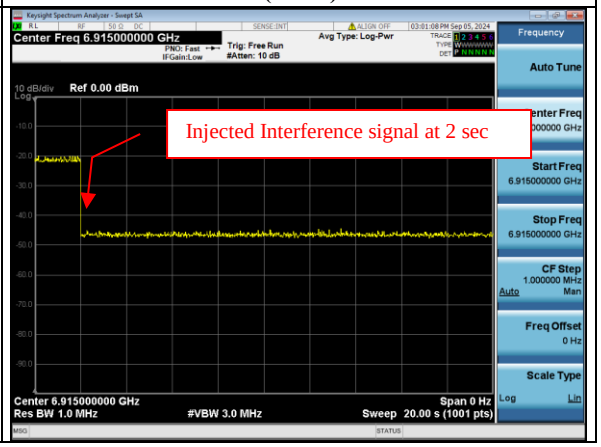
802.11ax (HE20) / CH97



802.11ax (HE20) / CH145



802.11ax (HE20) / CH193



802.11ax (HE80)

Operation Band	Ch.	EUT Freq. (MHz)	Minimum Antenna Gain (dBi)	Test Result							
				Test Signals Freq. (MHz)	The Incumbent (AWGN) Signal Level (dBm)	Number of Times	Number of Detected	Detection Rate (%)	Limit	PASS /FAIL	Status of EUT transmission
UNII-5	7	5985	3.07	5950	-58.93	10	10	100%	90%	PASS	Ceased
					-62	10	9	90%	90%	PASS	Minimal
					-63	10	0	0%	90%	FAIL	Transmitting
				5985	-58.93	10	10	100%	90%	PASS	Ceased
					-61	10	10	100%	90%	PASS	Minimal
					-62	10	0	0%	90%	FAIL	Transmitting
				6020	-58.93	10	10	100%	90%	PASS	Ceased
					-62	10	10	100%	90%	PASS	Minimal
					-63	10	0	0%	90%	FAIL	Transmitting
UNII-6	103	6465	3.35	6430	-58.65	10	10	100%	90%	PASS	Ceased
					-66	10	10	100%	90%	PASS	Minimal
					-67	10	0	0%	90%	FAIL	Transmitting
				6465	-58.65	10	10	100%	90%	PASS	Ceased
					-64	10	10	100%	90%	PASS	Minimal
					-65	10	0	0%	90%	FAIL	Transmitting
				6500	-58.65	10	10	100%	90%	PASS	Ceased
					-66	10	10	100%	90%	PASS	Minimal
					-67	10	0	0%	90%	FAIL	Transmitting
UNII-7	135	6625	4.01	6590	-57.99	10	10	100%	90%	PASS	Ceased
					-66	10	10	100%	90%	PASS	Minimal
					-67	10	0	0%	90%	FAIL	Transmitting
				6625	-57.99	10	10	100%	90%	PASS	Ceased
					-62	10	9	90%	90%	PASS	Minimal
					-63	10	0	0%	90%	FAIL	Transmitting
				6660	-57.99	10	10	100%	90%	PASS	Ceased
					-68	10	10	100%	90%	PASS	Minimal
					-69	10	0	0%	90%	FAIL	Transmitting
UNII-8	199	6945	2.97	6910	-59.03	10	10	100%	90%	PASS	Ceased
					-65	10	10	100%	90%	PASS	Minimal
					-66	10	0	0%	90%	FAIL	Transmitting
				6945	-59.03	10	10	100%	90%	PASS	Ceased
					-61	10	9	90%	90%	PASS	Minimal
					-62	10	0	0%	90%	FAIL	Transmitting
				6980	-59.03	10	10	100%	90%	PASS	Ceased
					-65	10	10	100%	90%	PASS	Minimal
					-66	10	0	0%	90%	FAIL	Transmitting

Note :

1. For status "Ceased" is mean this threshold where the device detects interference will stops transmitting level.
2. For status "Minimal" is mean this threshold where the device detects interference will stops transmitting minimum level.
3. For status "Transmitting" is mean this threshold where the detects interference will device re-starts transmitting level.
4. For UNII-5, The Incumbent (AWGN) Signal Level is considered 3.07 dBi gain for path loss, Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (3.07dBi) + Path Loss (0dB)= -58.93dBm.
5. For UNII-6, The Incumbent (AWGN) Signal Level is considered 3.35 dBi gain for path loss, Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (3.35dBi) + Path Loss (0dB)= -58.65dBm.
6. For UNII-7, The Incumbent (AWGN) Signal Level is considered 4.01 dBi gain for path loss, Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (4.01dBi) + Path Loss (0dB)= -57.99dBm.
7. For UNII-8, The Incumbent (AWGN) Signal Level is considered 2.97 dBi gain for path loss, Required Detection Level = Injected AWGN Power (-62dBm) – Antenna Gain (2.97dBi) + Path Loss (0dB)= -59.03dBm.