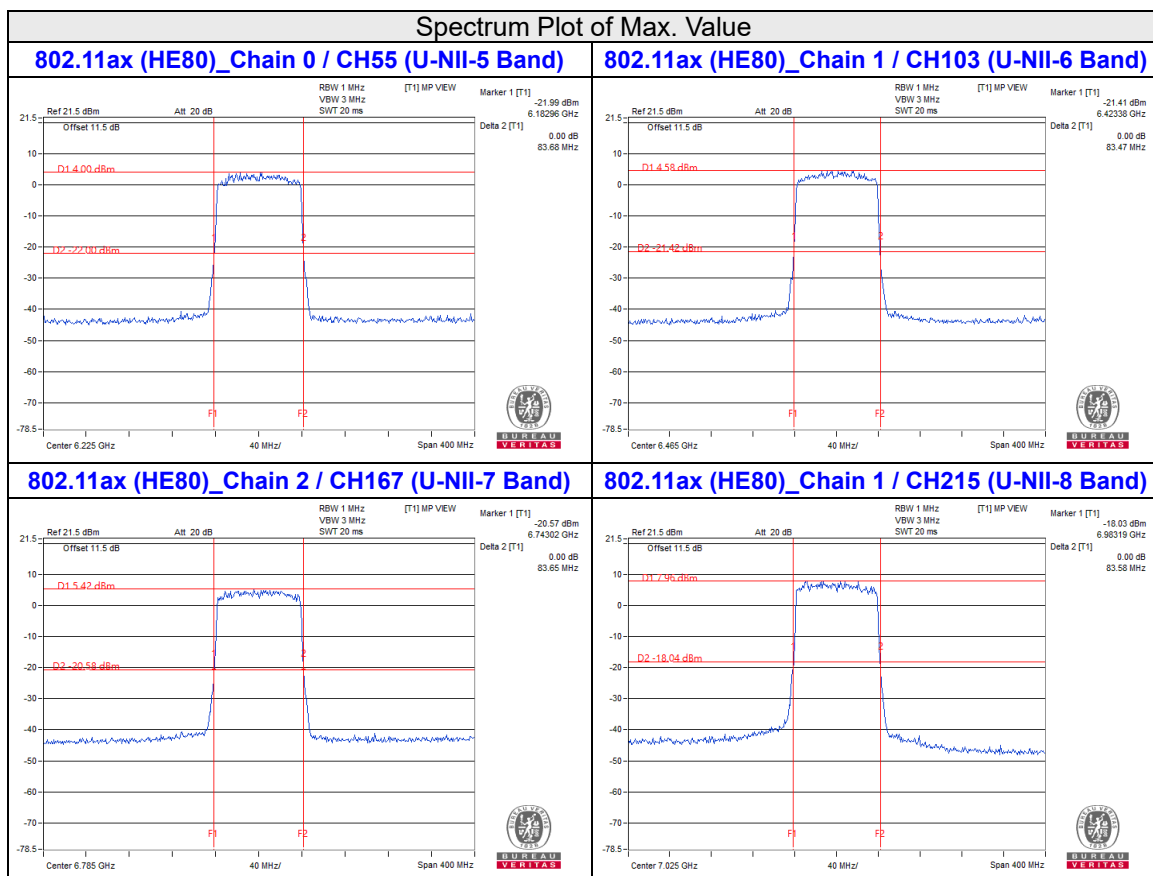
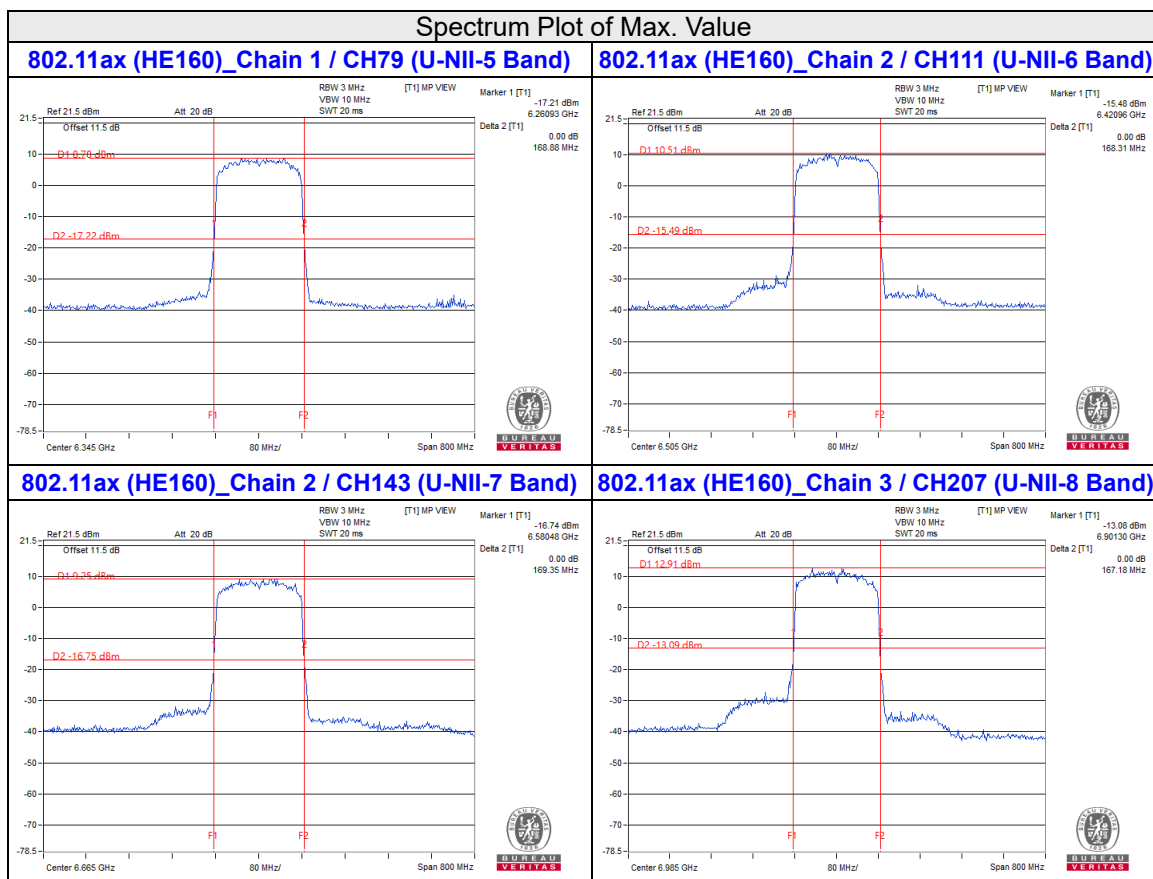




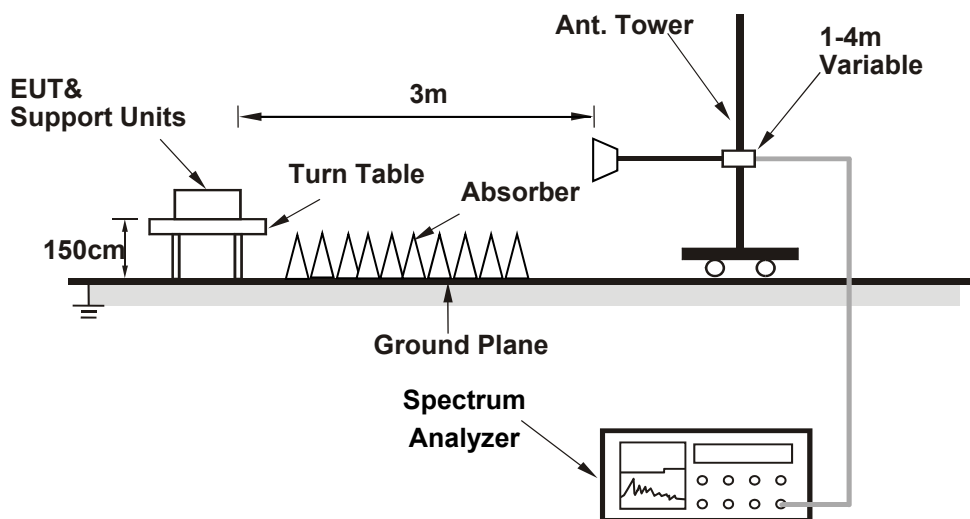


4.6 Peak Power Spectral Density Measurement

4.6.1 Limits of Peak Power Spectral Density Measurement

Operation Band	EUT Category	Limit
		Peak Power Density (EIRP)
U-NII-5 U-NII-6 U-NII-7 U-NII-8	Indoor AP / Subordinate Device	5 dBm/MHz

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. Perform a field strength measurement and record the worse read value, is the field strength value via a spectrum reading obtained corrected for antenna factor, cable loss and pre-amplifier factor and then mathematically convert the measured field strength level to EIRP level.
- e. Follow ANSI 63.10 and KDB 412172 D01 v01r01, $EIRP \text{ Value (dBm)} = \text{Field Strength Value (dB}\mu\text{V/m)} + \text{Correction Factor @ 3m}$.
- f. $\text{Correction Factor (dB) @ 3m} = 20\log(D) - 104.7$; where D is the measurement distance @3m=-95.15dB

Note: Spectrum analyzer setting as below:

Method SA-1

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz, Set VBW $\geq$ 3 MHz, Detector = RMS
3. Sweep time = auto, trigger set to "free run" (duty cycle $\geq$ 98 percent) ; Set video trigger (duty cycle < 98 percent).
4. Trace average at least 100 traces in power averaging mode.
5. Record the max value

4.6.5 EUT Operating Condition

Same as Item 4.3.6.

4.6.6 Test Results

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Field Strength (dBuV/m)	Correction Factor (dB)	EIRP PSD (dBm/MHz)	EIRP PSD Limit (dBm/MHz)	Pass / Fail
33	6115	100.10	-95.15	4.95	5.00	Pass
61	6255	100.09	-95.15	4.94	5.00	Pass
93	6415	100.09	-95.15	4.94	5.00	Pass
97	6435	100.07	-95.15	4.92	5.00	Pass
105	6475	100.09	-95.15	4.94	5.00	Pass
113	6515	100.08	-95.15	4.93	5.00	Pass
117	6535	100.07	-95.15	4.92	5.00	Pass
153	6715	100.11	-95.15	4.96	5.00	Pass
181	6855	100.06	-95.15	4.91	5.00	Pass
185	6875	100.12	-95.15	4.97	5.00	Pass
213	7015	100.14	-95.15	4.99	5.00	Pass
229	7095	100.14	-95.15	4.99	5.00	Pass

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Field Strength (dBuV/m)	Correction Factor (dB)	EIRP PSD (dBm/MHz)	EIRP PSD Limit (dBm/MHz)	Pass / Fail
35	6125	100.00	-95.15	4.85	5.00	Pass
59	6165	100.01	-95.15	4.86	5.00	Pass
91	6405	100.05	-95.15	4.90	5.00	Pass
99	6445	100.05	-95.15	4.90	5.00	Pass
107	6485	100.05	-95.15	4.90	5.00	Pass
115	6525	100.06	-95.15	4.91	5.00	Pass
123	6565	100.03	-95.15	4.88	5.00	Pass
155	6725	100.05	-95.15	4.90	5.00	Pass
179	6845	100.03	-95.15	4.88	5.00	Pass
187	6885	100.11	-95.15	4.96	5.00	Pass
211	7005	100.06	-95.15	4.91	5.00	Pass
227	7085	100.03	-95.15	4.88	5.00	Pass

802.11ax (HE80)

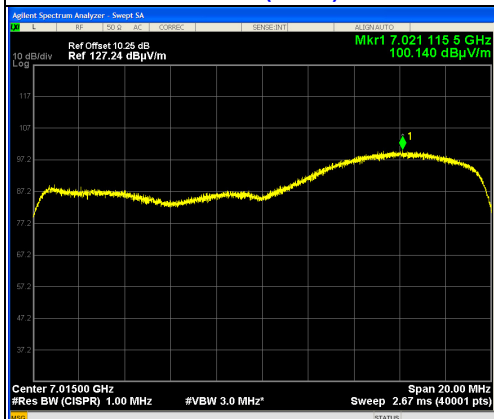
Chan.	Chan. Freq. (MHz)	Field Strength (dBuV/m)	Correction Factor (dB)	EIRP PSD (dBm/MHz)	EIRP PSD Limit (dBm/MHz)	Pass / Fail
39	6145	100.13	-95.15	4.98	5.00	Pass
55	6225	100.08	-95.15	4.93	5.00	Pass
87	6385	100.08	-95.15	4.93	5.00	Pass
103	6465	100.08	-95.15	4.93	5.00	Pass
119	6545	100.11	-95.15	4.96	5.00	Pass
135	6625	100.10	-95.15	4.95	5.00	Pass
151	6705	100.04	-95.15	4.89	5.00	Pass
167	6785	100.13	-95.15	4.98	5.00	Pass
183	6865	100.13	-95.15	4.98	5.00	Pass
199	6945	100.08	-95.15	4.93	5.00	Pass
215	7025	100.12	-95.15	4.97	5.00	Pass

802.11ax (HE160)

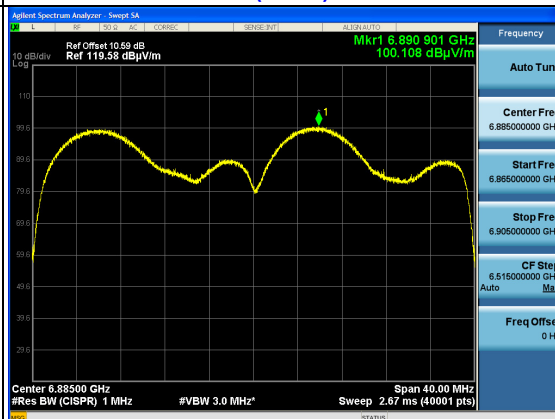
Chan.	Chan. Freq. (MHz)	Field Strength (dBuV/m)	Correction Factor (dB)	EIRP PSD (dBm/MHz)	EIRP PSD Limit (dBm/MHz)	Pass / Fail
47	6185	100.12	-95.15	4.97	5.00	Pass
79	6345	100.10	-95.15	4.95	5.00	Pass
111	6505	100.05	-95.15	4.90	5.00	Pass
143	6665	100.11	-95.15	4.96	5.00	Pass
175	6825	100.14	-95.15	4.99	5.00	Pass
207	6985	100.10	-95.15	4.95	5.00	Pass

Spectrum Plot of Worst Value

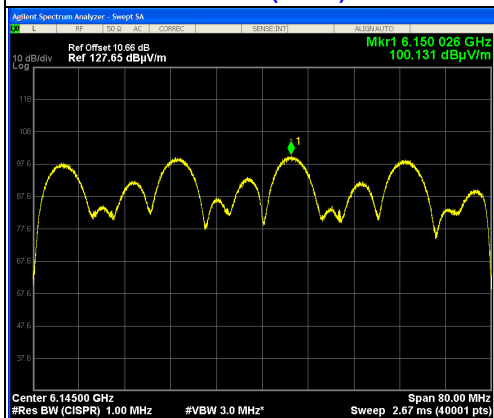
802.11ax (HE20) / CH213



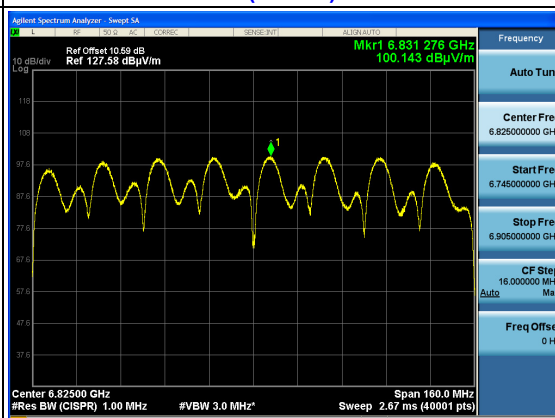
802.11ax (HE40) / CH187



802.11ax (HE80) / CH39



802.11ax (HE160) / CH175

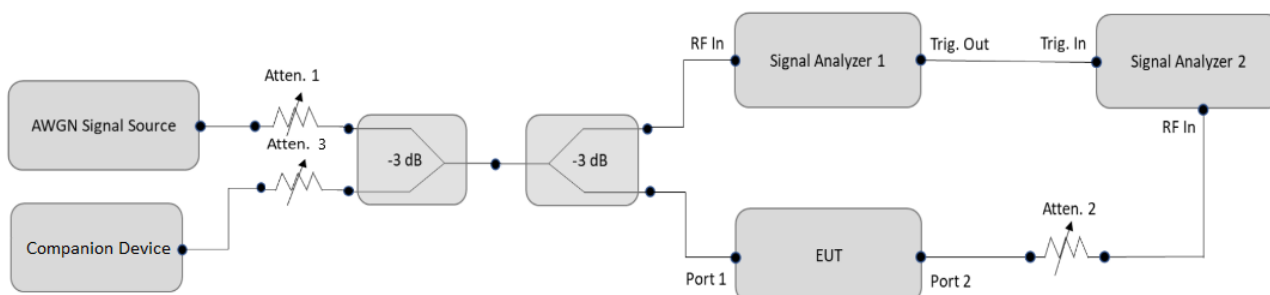


4.7 Contention Based Protocol Measurement

4.7.1 Limits of Contention Based Protocol Measurement

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.

4.7.2 Test Setup



4.7.3 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
N9030B - PXA Signal Analyzer	N9030B	MY60070562	2021/1/6	2022/1/5
N9030B - PXA Signal Analyzer	N9030B	MY57140938	2021/5/9	2022/5/8
MXG -X Vector Signal Generator	N5182B	MY57301272	2021/1/22	2022/1/21
N5182BU	N5182BU	MY59360189	NA	NA
Splitters/Combiners	WDIV-4R40291	NA	2021/1/13	2022/1/12

NOTE:

1. The test was performed in Femtocell room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: 2021/10/18

4.7.4 Test Procedure

- 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. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
- Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters (set as following section 4.7.5 EUT operating condition).
- Determine number of times detection threshold test as following table,

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

- 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.
- 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.
- Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
- 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.
- (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.
- 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.

4.7.5 EUT Operating Condition

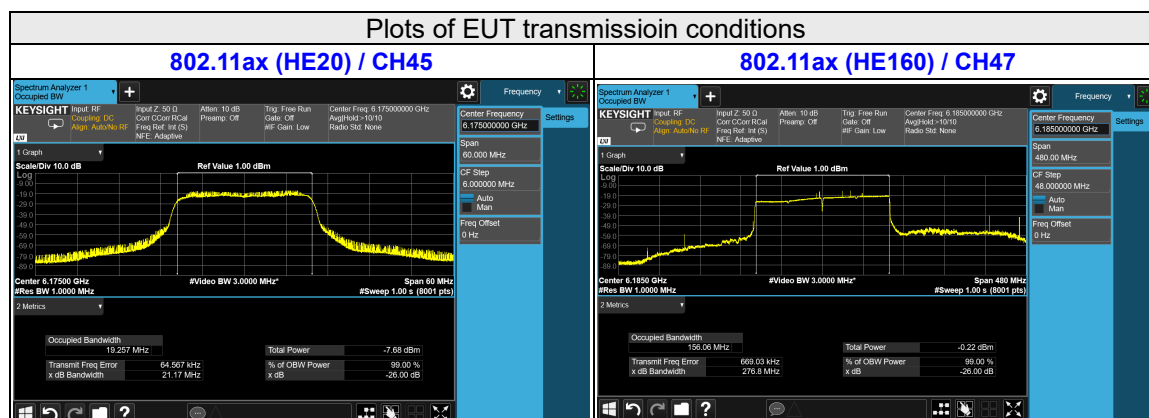
Set the EUT to transmit with a constant duty cycle and relative operating parameters which including power level, operating frequency, modulation and bandwidth.

4.7.6 Test Results

For U-NII-5 band

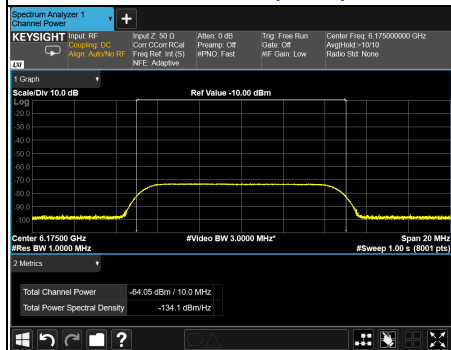
CPB Test Result											
Operation Band	Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	Test Result						
					Incumbent Signals (AWGN)	Detection Level (dBm)	Number of Trail	Number of Detected	Ratio	Detection Criterion (dBm)	Pass/Fail
U-NII 5	802.11ax	20	45	6175	6175	-64.05	10	10	100%	-62	Pass
		160	47	6185	6110	-64.05	10	10	100%	-62	Pass
					6185	-62.04	10	10	100%	-62	Pass
					6260	-65.02	10	10	100%	-62	Pass

Note: Detection criterion = -62 dBm + G (0 dBi) = -62 dBm



Plots of Incumbent signal (AWGN) level

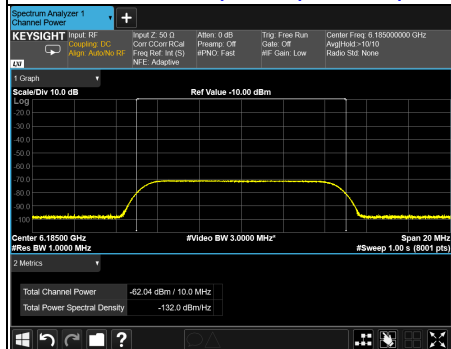
802.11ax (HE20) / CH45



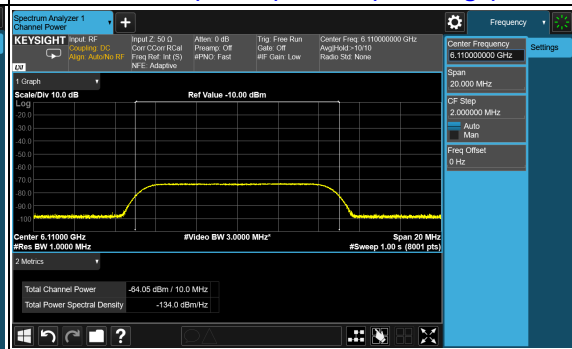
802.11ax (HE160) / CH47 (High Edge)



802.11ax (HE160) / CH47 (Middle)

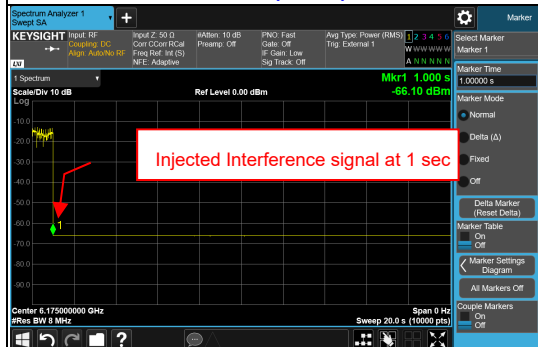


802.11ax (HE160) / CH47 (Low Edge)

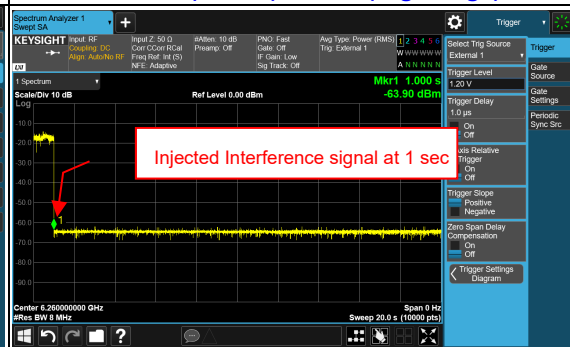


Plots of EUT ceased transmission in the time domain

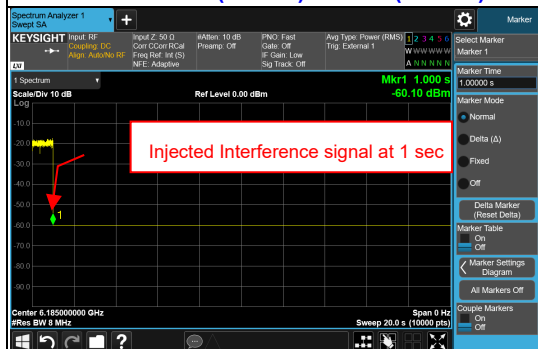
802.11ax (HE20) / CH45



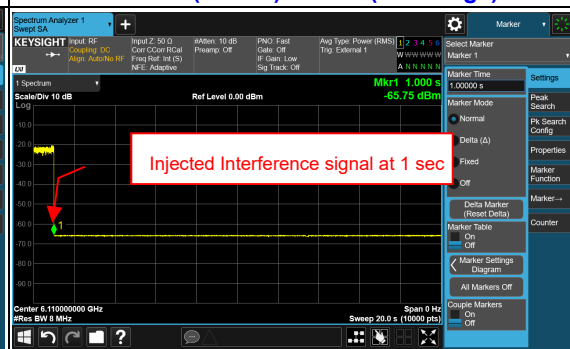
802.11ax (HE160) / CH47 (High Edge)



802.11ax (HE160) / CH47 (Middle)



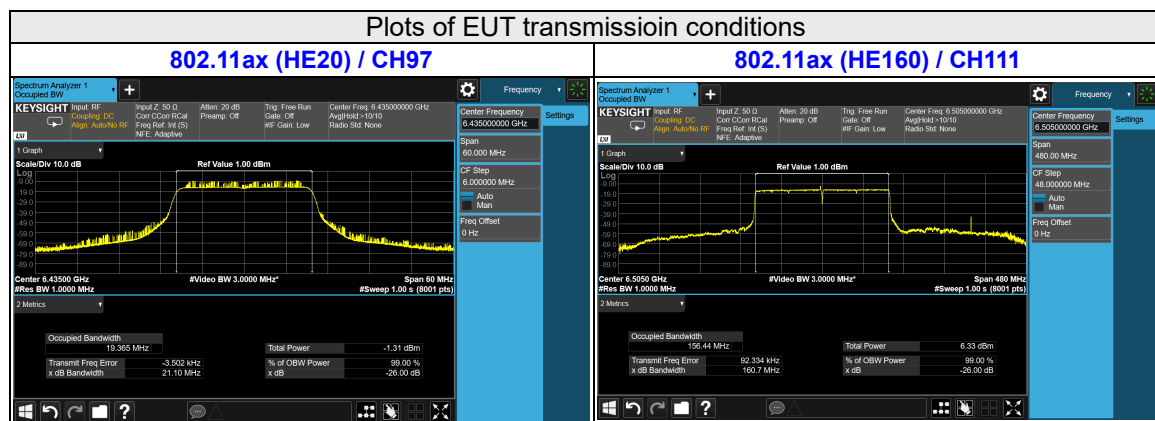
802.11ax (HE160) / CH47 (Low Edge)



For U-NII-6 band

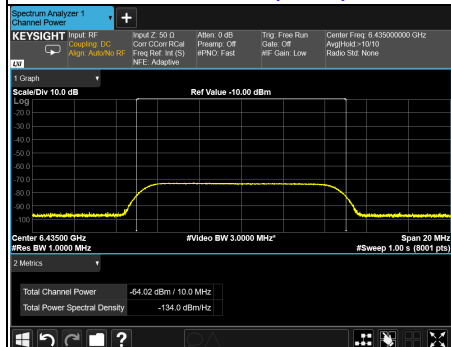
CPB Test Result											
Operation Band	Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	Test Result						
					Incumbent Signals (AWGN) Freq. (MHz)	Detection Level (dBm)	Number of Trail	Number of Detected	Ratio	Detection Criterion (dBm)	Pass/Fail
U-NII 6	802.11ax	20	97	6435	6435	-64.02	10	10	100%	-62	Pass
		160	111	6505	6430	-65.04	10	10	100%	-62	Pass
					6505	-64.04	10	10	100%	-62	Pass
					6580	-62.03	10	10	100%	-62	Pass

Note: Detection criterion = -62 dBm + G (0 dBi) = -62 dBm

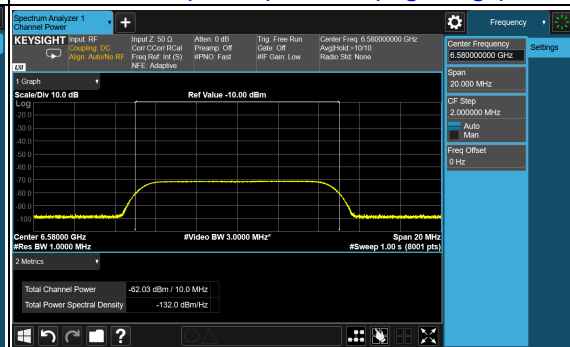


Plots of Incumbent signal (AWGN) level

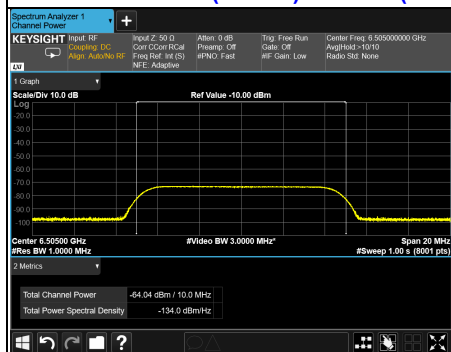
802.11ax (HE20) / CH97



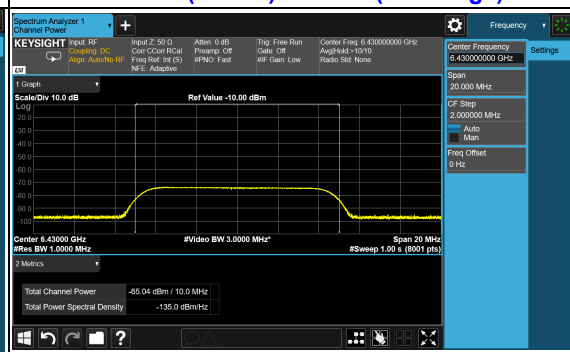
802.11ax (HE160) / CH111 (High Edge)



802.11ax (HE160) / CH111 (Middle)

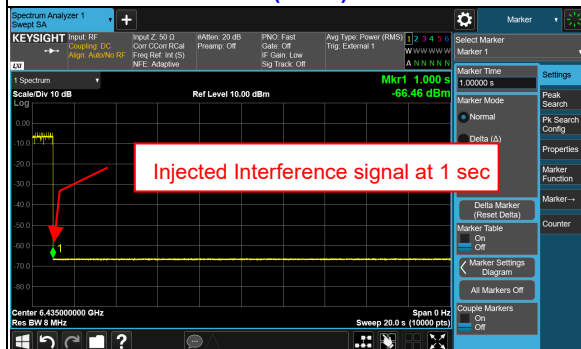


802.11ax (HE160) / CH111 (Low Edge)

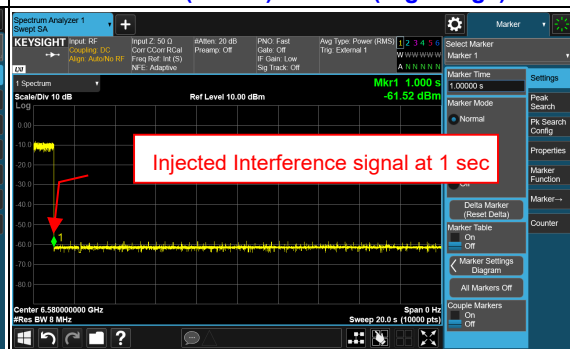


Plots of EUT ceased transmission in the time domain

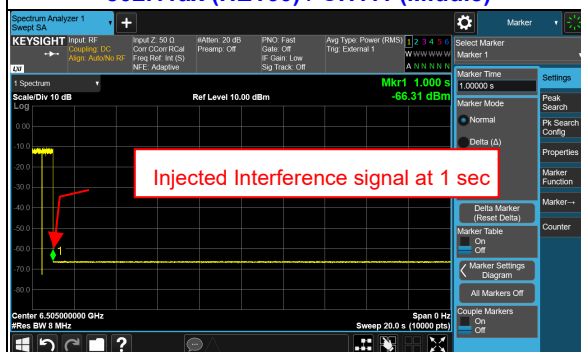
802.11ax (HE20) / CH97



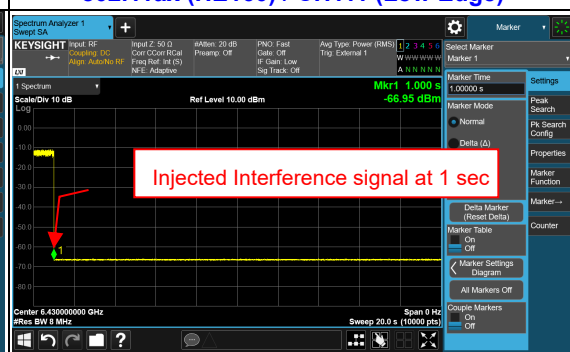
802.11ax (HE160) / CH111 (High Edge)



802.11ax (HE160) / CH111 (Middle)



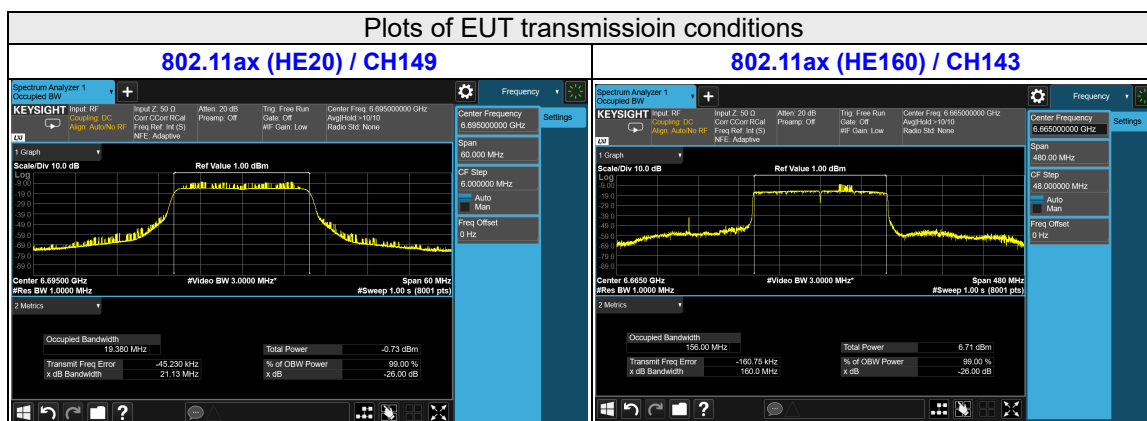
802.11ax (HE160) / CH111 (Low Edge)



For U-NII-7 band

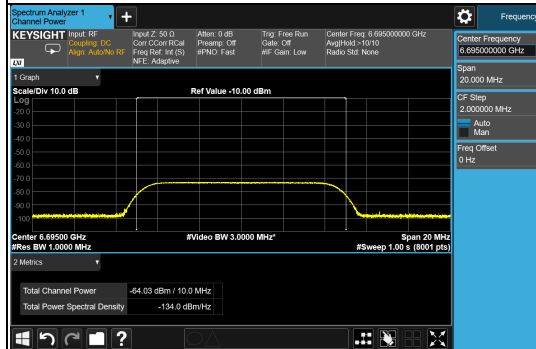
CPB Test Result											
Operation Band	Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	Test Result						
					Incumbent Signals (AWGN)	Detection Level (dBm)	Number of Trail	Number of Detected	Ratio	Detection Criterion (dBm)	Pass/Fail
U-NII 7	802.11ax	20	149	6695	6695	-64.03	10	10	100%	-62	Pass
		160	143	6665	6590	-66.02	10	10	100%	-62	Pass
					6665	-62.03	10	10	100%	-62	Pass
					6740	-66.03	10	10	100%	-62	Pass

Note: Detection criterion = -62 dBm + G (0 dBi) = -62 dBm

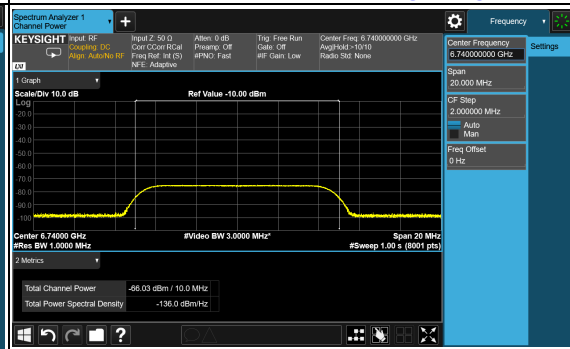


Plots of Incumbent signal (AWGN) level

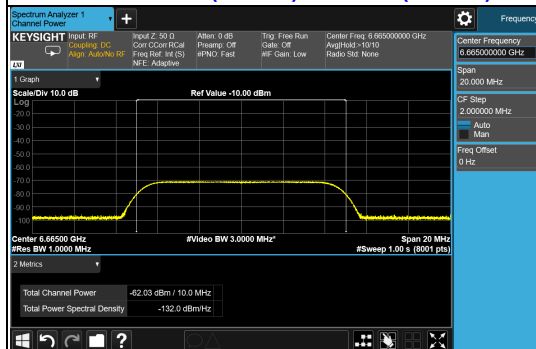
802.11ax (HE20) / CH149



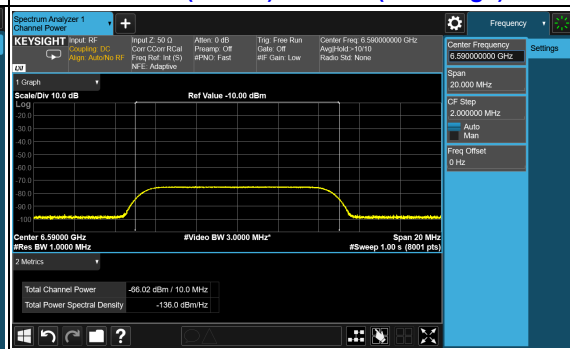
802.11ax (HE160) / CH143 (High Edge)



802.11ax (HE160) / CH143 (Middle)

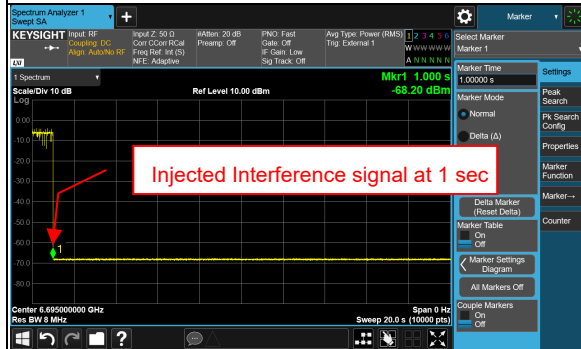


802.11ax (HE160) / CH143 (Low Edge)

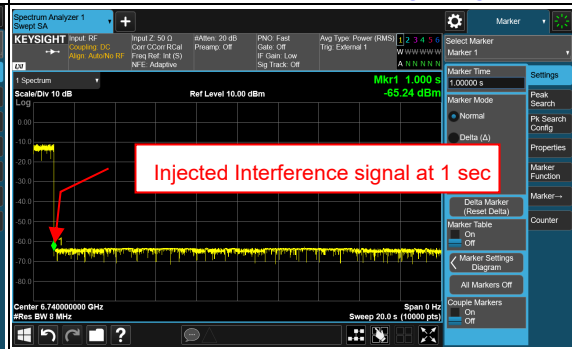


Plots of EUT ceased transmission in the time domain

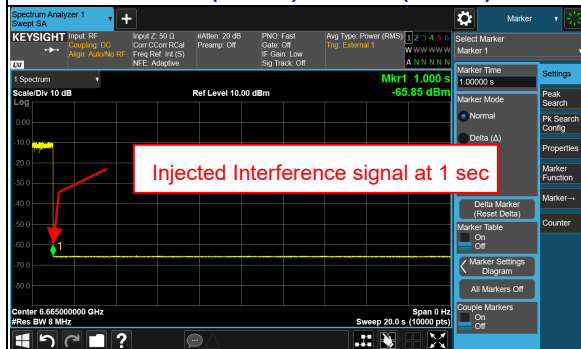
802.11ax (HE20) / CH149



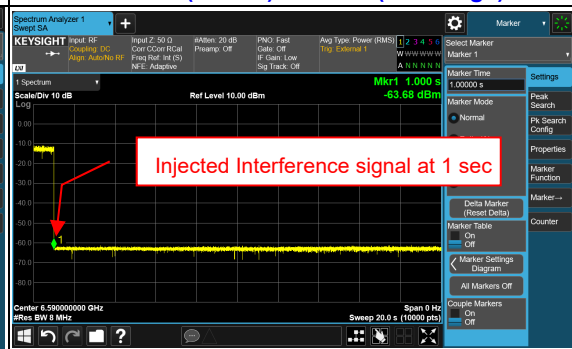
802.11ax (HE160) / CH143 (High Edge)



802.11ax (HE160) / CH143 (Middle)



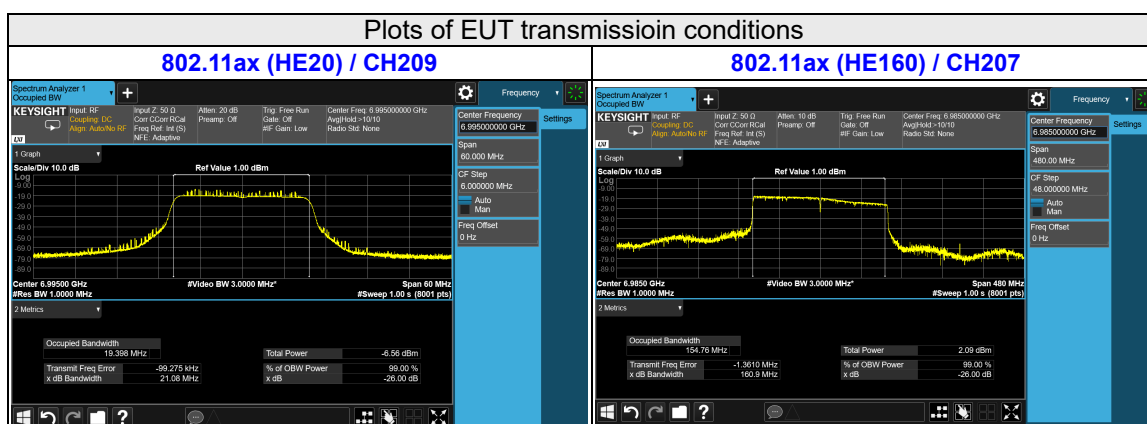
802.11ax (HE160) / CH143 (Low Edge)



For U-NII-8 band

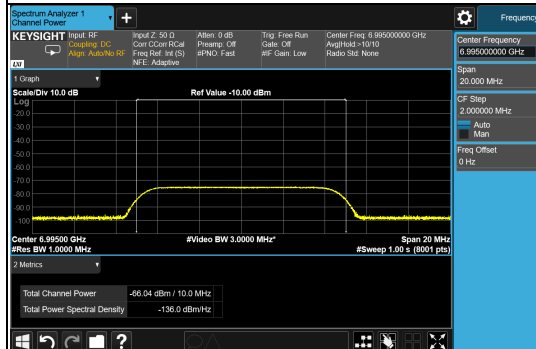
CPB Test Result											
Operation Band	Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	Test Result						
					Incumbent Signals (AWGN)	Detection Level (dBm)	Number of Trail	Number of Detected	Ratio	Detection Criterion (dBm)	Pass/Fail
					Freq. (MHz)						
U-NII 8	802.11ax	20	209	6995	6995	-66.04	10	10	100%	-62	Pass
		160	207	6985	6910	-66.02	10	10	100%	-62	Pass
					6985	-62.02	10	10	100%	-62	Pass
					7060	-66.03	10	10	100%	-62	Pass

Note: Detection criterion= -62 dBm +G (0 dBi) = -62 dBm

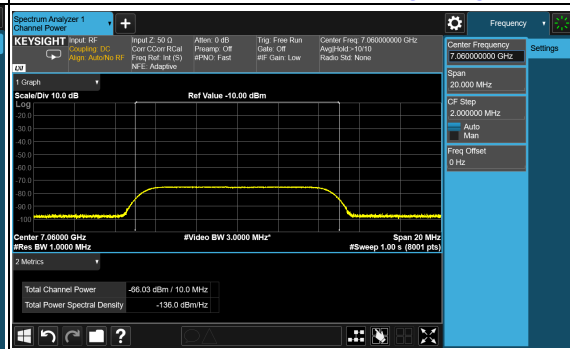


Plots of Incumbent signal (AWGN) level

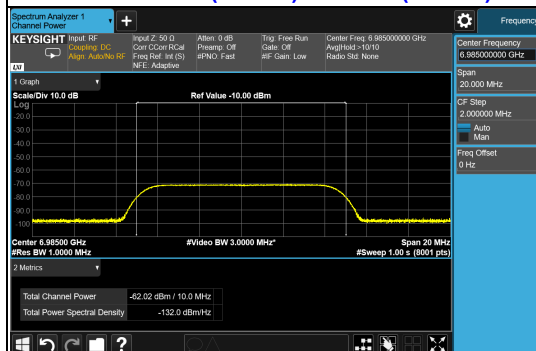
802.11ax (HE20) / CH209



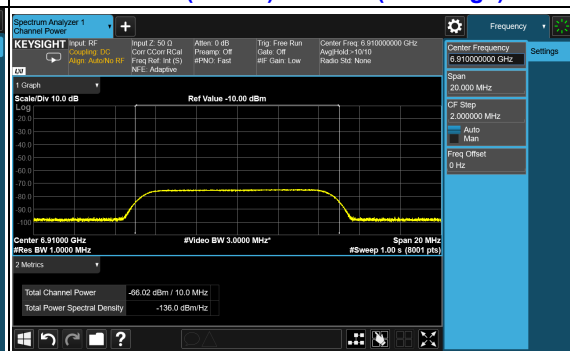
802.11ax (HE160) / CH207 (High Edge)



802.11ax (HE160) / CH207 (Middle)

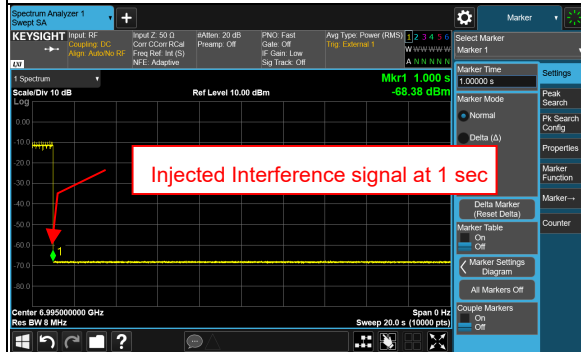


802.11ax (HE160) / CH207 (Low Edge)

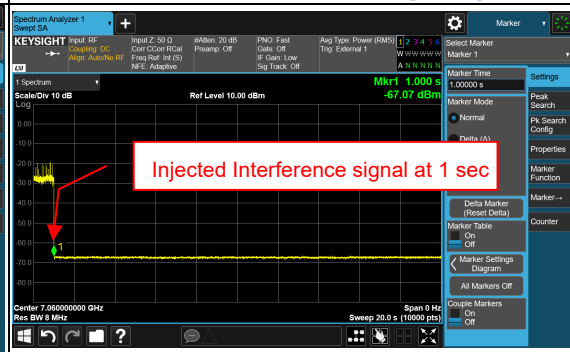


Plots of EUT ceased transmission in the time domain

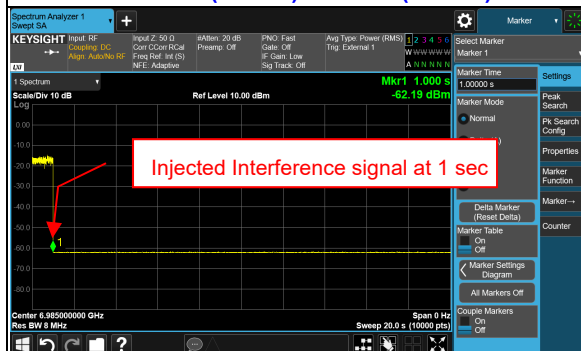
802.11ax (HE20) / CH209



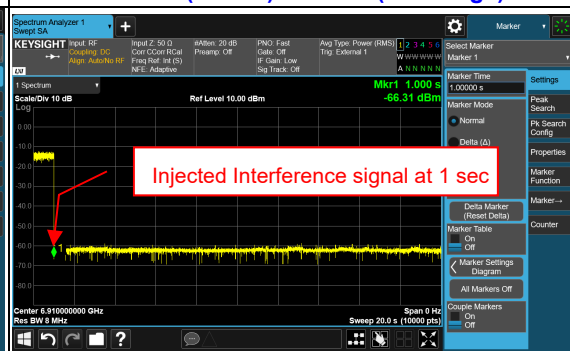
802.11ax (HE160) / CH207 (High Edge)



802.11ax (HE160) / CH207 (Middle)



802.11ax (HE160) / CH207 (Low Edge)

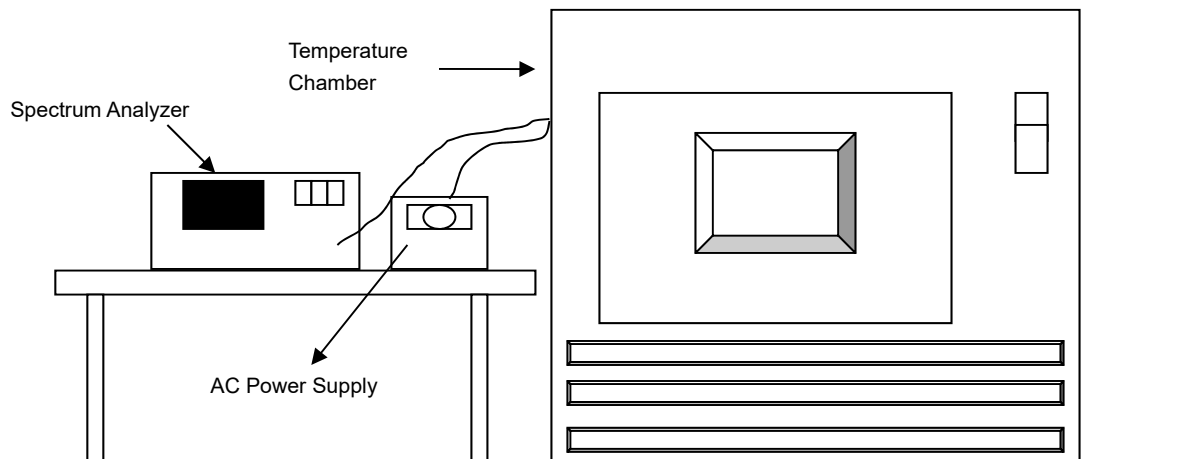


4.8 Frequency Stability Measurement

4.8.1 Limits of Frequency Stability Measurement

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

4.8.2 Test Setup



4.8.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.8.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turn the EUT on and couple its output to a spectrum analyzer.
- Turn the EUT off and set the chamber to the highest temperature specified.
- Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 Minutes.
- Repeat step (d) with the temperature chamber set to the next desired temperature until measurements down to the lowest specified temperature have been completed..
- The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 Minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.8.5 EUT Operating Condition

Set the EUT transmit at un-modulation mode to test frequency stability.

4.8.6 Test Results

802.11ax (HE20)

Frequency Stability Versus Temp.									
Operating Frequency: 6115MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
40	120	6114.9767	Pass	6114.9723	Pass	6114.9762	Pass	6114.9721	Pass
30	120	6114.9864	Pass	6114.9861	Pass	6114.9833	Pass	6114.9836	Pass
20	120	6114.9805	Pass	6114.9806	Pass	6114.9857	Pass	6114.9857	Pass
10	120	6115.0272	Pass	6115.0249	Pass	6115.0231	Pass	6115.027	Pass
0	120	6114.9998	Pass	6114.9975	Pass	6114.9985	Pass	6114.9993	Pass

Frequency Stability Versus Voltage									
Operating Frequency: 6115MHz									
TEMP. (°C)	Power Supply (Vac)	0 Minute		2 Minutes		5 Minutes		10 Minutes	
		Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail	Measured Frequency (MHz)	Pass/Fail
20	138	6114.9807	Pass	6114.9806	Pass	6114.9865	Pass	6114.9851	Pass
	120	6114.9805	Pass	6114.9806	Pass	6114.9857	Pass	6114.9857	Pass
	102	6114.9803	Pass	6114.9795	Pass	6114.9851	Pass	6114.9847	Pass

4.9 Operational Restrictions for 6GHz U-NII Devices

4.9.1 Limits of Operational Restrictions for 6 GHz U-NII Devices

- (1) Operation of indoor access points in the 5.925-7.125 GHz band is prohibited on oil platforms, cars, trains, boats, and aircraft, except that indoor access points are permitted to operate in the 5.925-6.425 GHz bands in large aircraft while flying above 10,000 feet.
- (2) Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.
- (3) Transmitters operating under the provisions of paragraphs (a)(5), (a)(6), and (a)(8) of this section are limited to indoor locations.
- (4) In the 5.925-7.125 GHz band, indoor access points must bear the following statement in a conspicuous location on the device and in the user's manual: FCC regulations restrict operation of this device to indoor use only. The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.
- (5) In the 5.925-7.125 GHz band, Access points and subordinate devices may connect to other access points or subordinate devices.
- (6) Indoor access points, operating in the 5.925-7.125 GHz band must employ a contention-based protocol.

4.9.2 Test Setup

N/A

4.9.3 Test Instruments

N/A

4.9.4 Test Procedure

N/A.

4.9.5 Test Results

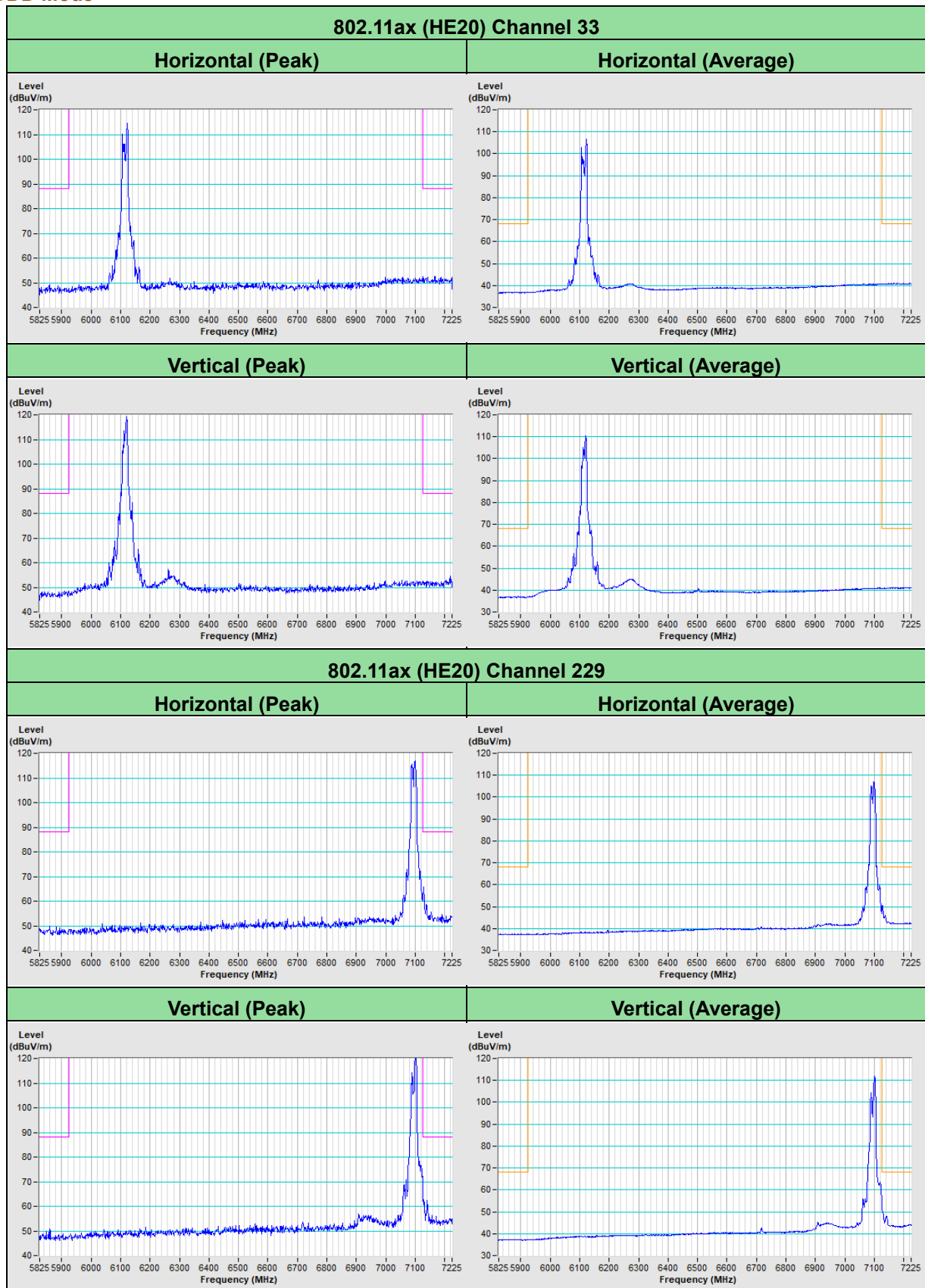
Device is an indoor access point, / subordinate modes all restrictions are meet the §15.407 (d) requirements. Please refer to the Attestation letter exhibit supplied within this application.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

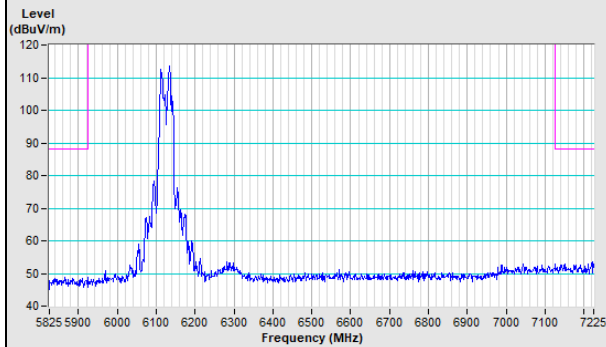
Annex A - Band-Edge Measurement

CDD Mode

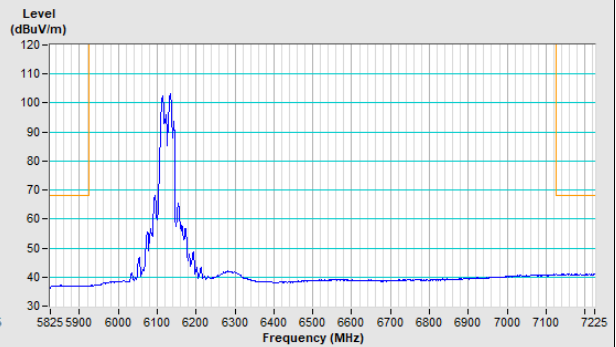


802.11ax (HE40) Channel 35

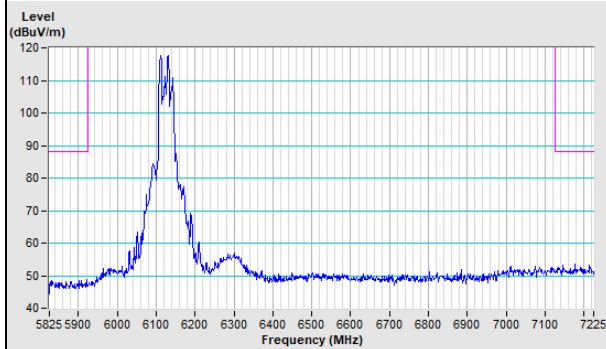
Horizontal (Peak)



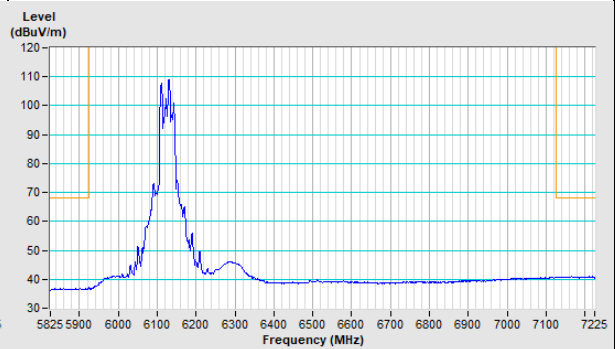
Horizontal (Average)



Vertical (Peak)

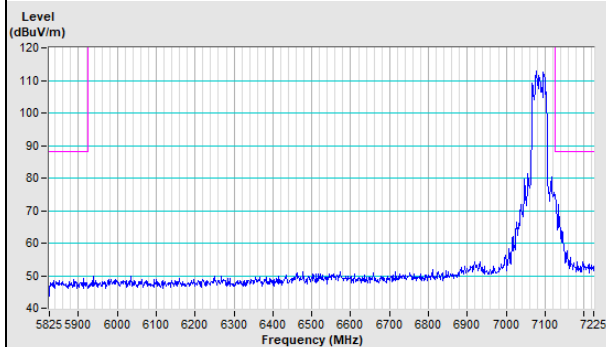


Vertical (Average)

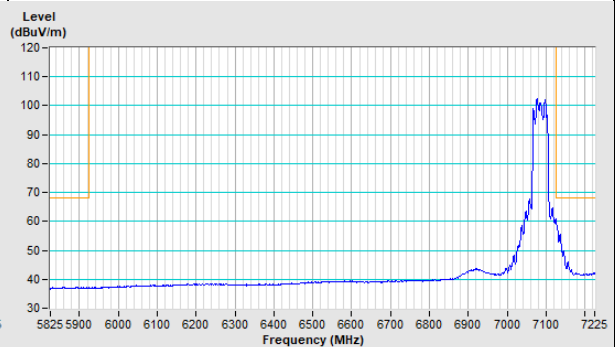


802.11ax (HE40) Channel 227

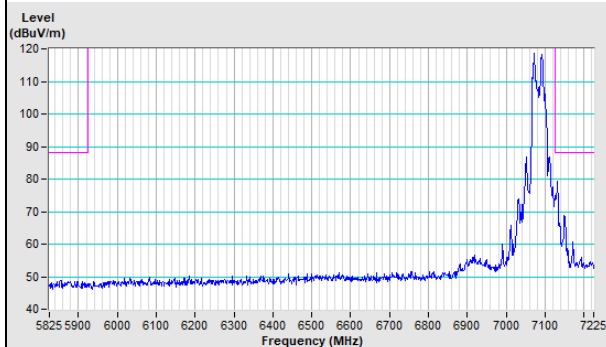
Horizontal (Peak)



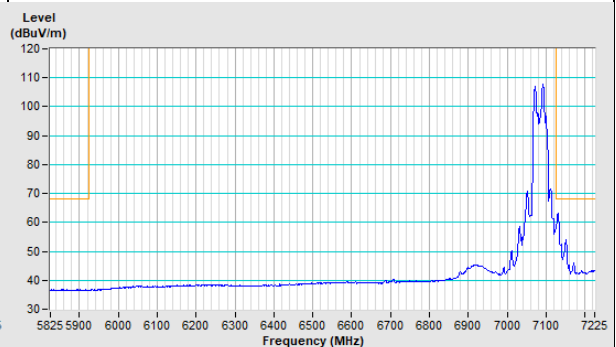
Horizontal (Average)

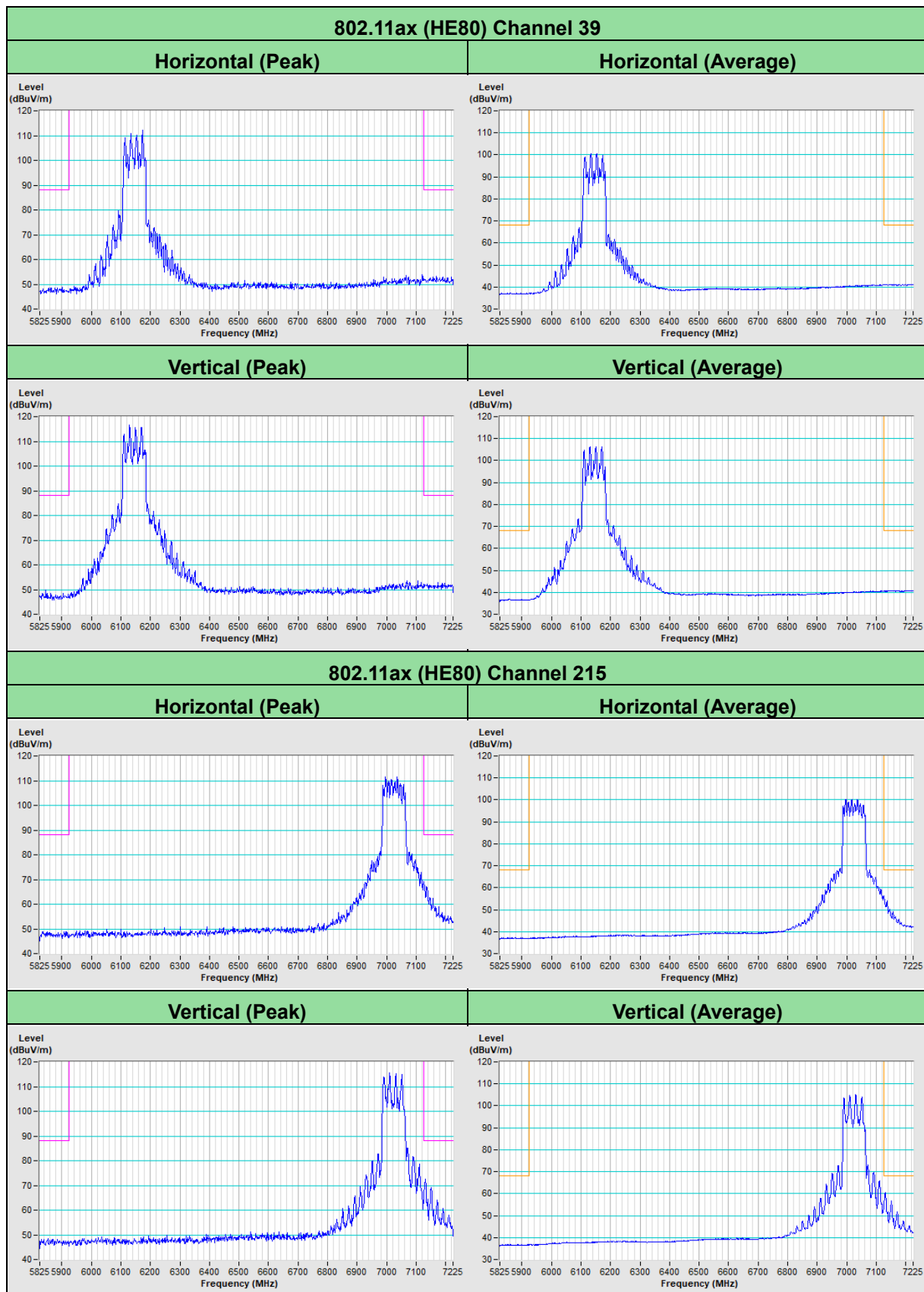


Vertical (Peak)



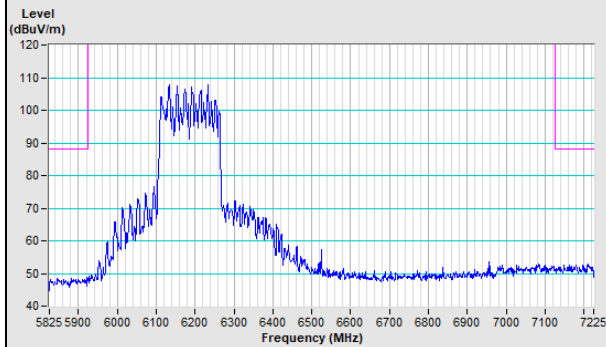
Vertical (Average)



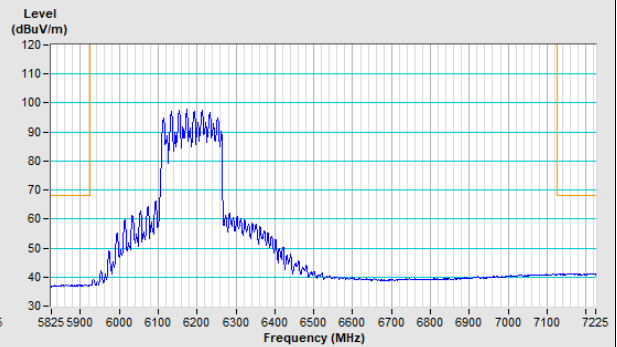


802.11ax (HE160) Channel 47

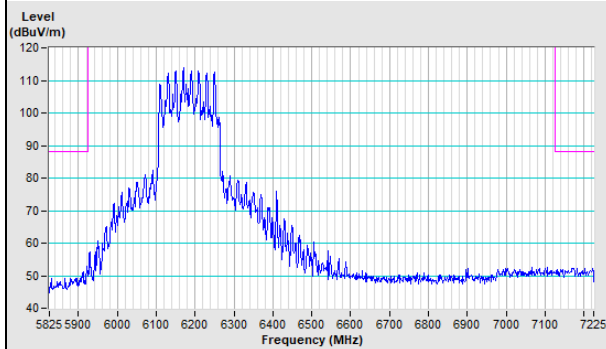
Horizontal (Peak)



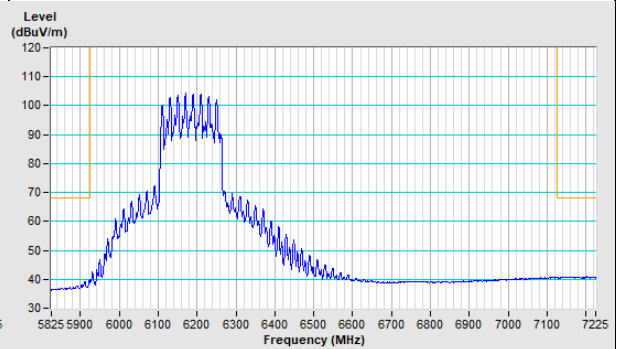
Horizontal (Average)



Vertical (Peak)

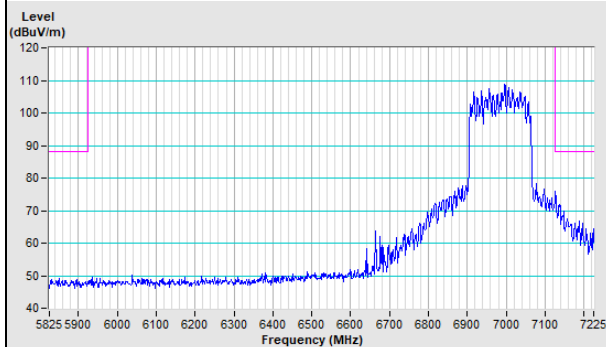


Vertical (Average)

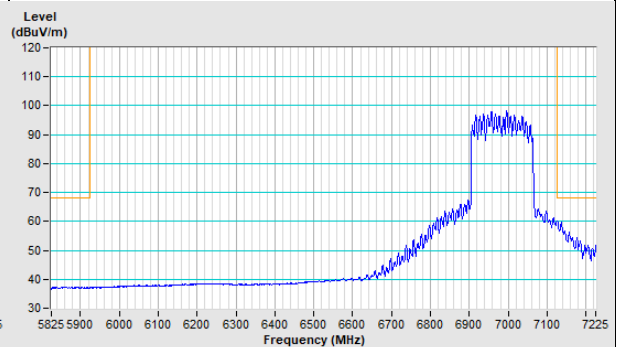


802.11ax (HE160) Channel 207

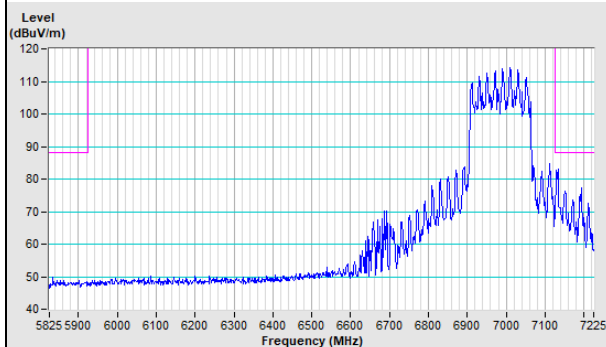
Horizontal (Peak)



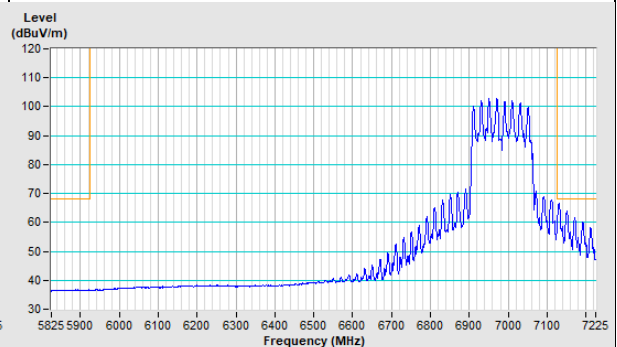
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



Appendix A– Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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