

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	100.05	-95.15	4.90	5	Pass
55	6225	100.07	-95.15	4.92	5	Pass
87	6385	99.99	-95.15	4.84	5	Pass
103	6465	100.12	-95.15	4.97	5	Pass
119	6545	100.10	-95.15	4.95	5	Pass
135	6625	100.10	-95.15	4.95	5	Pass
151	6705	100.04	-95.15	4.89	5	Pass
167	6785	100.08	-95.15	4.93	5	Pass
183	6865	100.12	-95.15	4.97	5	Pass
199	6945	100.05	-95.15	4.90	5	Pass
215	7025	100.08	-95.15	4.93	5	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	100.13	-95.15	4.98	5	Pass
79	6345	100.06	-95.15	4.91	5	Pass
111	6505	100.04	-95.15	4.89	5	Pass
143	6665	100.09	-95.15	4.94	5	Pass
175	6825	100.01	-95.15	4.86	5	Pass
207	6985	100.06	-95.15	4.91	5	Pass

Beamforming Mode

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	99.88	-95.15	4.73	5	Pass
61	6255	100.00	-95.15	4.85	5	Pass
93	6415	99.87	-95.15	4.72	5	Pass
97	6435	99.98	-95.15	4.83	5	Pass
105	6475	99.93	-95.15	4.78	5	Pass
113	6515	99.95	-95.15	4.80	5	Pass
117	6535	99.90	-95.15	4.75	5	Pass
153	6715	100.04	-95.15	4.89	5	Pass
181	6855	99.96	-95.15	4.81	5	Pass
185	6875	99.69	-95.15	4.54	5	Pass
213	7015	99.87	-95.15	4.72	5	Pass
229	7095	99.84	-95.15	4.69	5	Pass
233	7115	85.69	-95.15	-9.46	5	Pass

802.11ax (HE40)

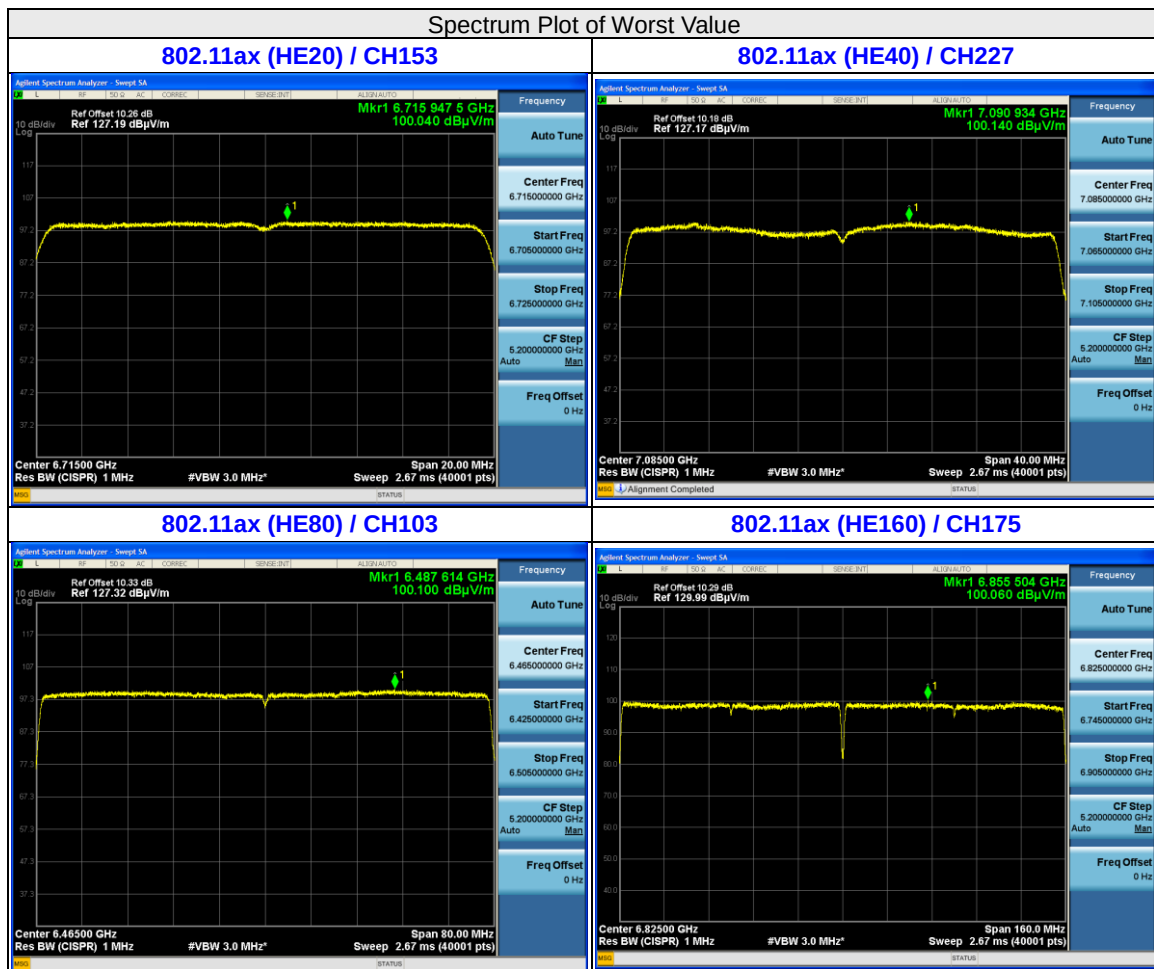
Chan.	Chan. Freq. (MHz)	Field Strength (dBuV/m)	Correction Factor (dB)	EIRP PSD (dBm/MHz)	EIRP PSD Limit (dBm/MHz)	Pass / Fail
35	6125	100.03	-95.15	4.88	5	Pass
59	6245	100.02	-95.15	4.87	5	Pass
91	6405	99.93	-95.15	4.78	5	Pass
99	6445	100.07	-95.15	4.92	5	Pass
107	6485	99.92	-95.15	4.77	5	Pass
115	6525	100.03	-95.15	4.88	5	Pass
123	6565	100.07	-95.15	4.92	5	Pass
155	6725	99.96	-95.15	4.81	5	Pass
179	6845	99.97	-95.15	4.82	5	Pass
187	6885	99.88	-95.15	4.73	5	Pass
211	7005	100.12	-95.15	4.97	5	Pass
227	7085	100.08	-95.15	4.93	5	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	99.98	-95.15	4.83	5	Pass
55	6225	99.98	-95.15	4.83	5	Pass
87	6385	99.96	-95.15	4.81	5	Pass
103	6465	100.10	-95.15	4.95	5	Pass
119	6545	100.08	-95.15	4.93	5	Pass
135	6625	100.06	-95.15	4.91	5	Pass
151	6705	99.99	-95.15	4.84	5	Pass
167	6785	100.06	-95.15	4.91	5	Pass
183	6865	100.06	-95.15	4.91	5	Pass
199	6945	100.00	-95.15	4.85	5	Pass
215	7025	99.91	-95.15	4.76	5	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	100.03	-95.15	4.88	5	Pass
79	6345	100.04	-95.15	4.89	5	Pass
111	6505	99.99	-95.15	4.84	5	Pass
143	6665	100.04	-95.15	4.89	5	Pass
175	6825	99.94	-95.15	4.79	5	Pass
207	6985	99.96	-95.15	4.81	5	Pass

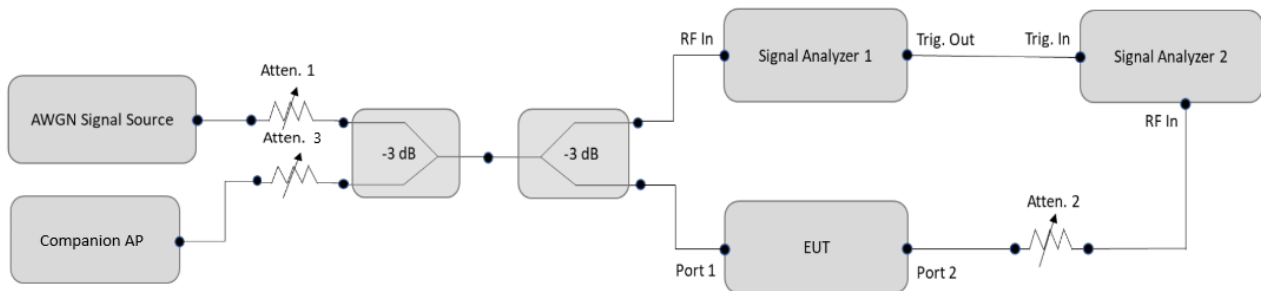


4.7 Contention Based Protocol Measurement

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

Refer to section 4.1.2 to get information of above instrument.

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSW8	101497	Nov 10, 2020	Nov 09, 2021
Spectrum Analyzer R&S	FSV40	101516	Mar. 08, 2021	Mar. 07, 2022
MXG X-Series RF Vector Signal Generator Agilent	N5182B	MY53052700	July 14, 2020	July 13, 2021
N5182BU KEYSIGHT	N5182BX07	MY59360203	Dec. 10, 2020	Dec. 09, 2021
Power Splitter/combiner Mini-Circuits	ZFRSC-123-S+	F698501347_01	Jan. 27, 2021	Jan. 26, 2022
Power Splitter/combiner Mini-Circuits	ZFRSC-123-S+	F698501347_02	Dec. 23, 2020	Dec. 22, 2021

- 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: Mar. 31, 2021

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
$BW_{Inc} < BW_{EUT} \leq 2x BW_{Inc}$	Once	Contained within BW_{EUT}
$2x BW_{Inc} < BW_{EUT} \leq 4x BW_{Inc}$	Twice. (Incumbent transmission is contained within BW_{EUT})	Closely to the lower edge and upper edge of the EUT Channel
$BW_{EUT} > 4x BW_{Inc}$	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

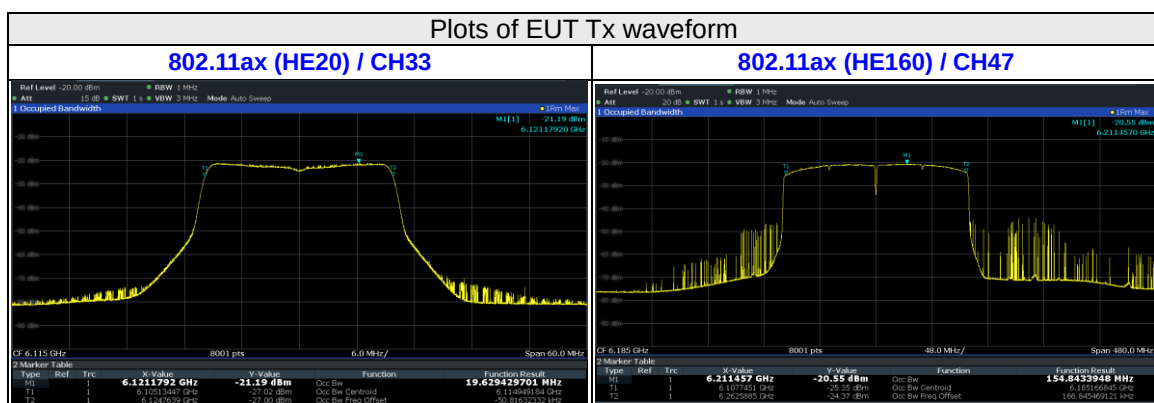
Set the EUT to transmit with a constant duty cycle and relative operating parameters which including power level, operating frequency, modulation and bandwidth.

4.7.6 Test Results

For U-NII-5 band

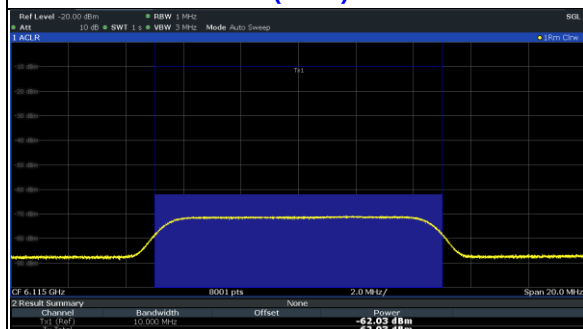
Contention Based Protocol Measurement									
Measurement Mode :		Conducted measurement		The Incumbent Signal(AWGN) Level(dBm) :			-62	at the antenna connector	
Device Type :		Indoor AP / Subordinate Device		Antenna Gain(dBi) :			0		
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Number of Times	Number of Detected	Detection Rate	Minimum Limit	Pass/Fail
802.11ax	20	33	6115	6115	10	10	100%	90%	Pass
	160	47	6185	6110	10	10	100%	90%	Pass
				6185	10	10	100%	90%	Pass
				6260	10	10	100%	90%	Pass
Result	Complied								

Lowest Interference(AWGN) Level Check						
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Threshold Level (dBm)	EUT Status
802.11ax	20	33	6115	6115	-64	Start transmitting
	160	47	6185	6110	-64	Start transmitting
				6185	-63	Start transmitting
				6260	-63	Start transmitting

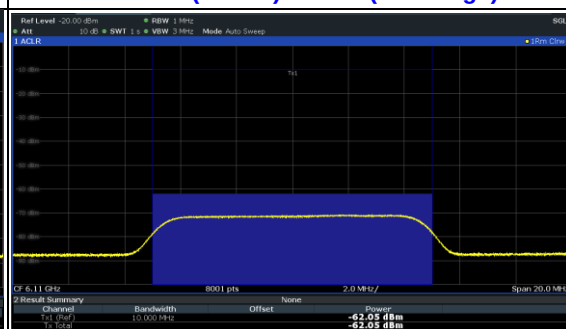


Plots of Incumbent signal level

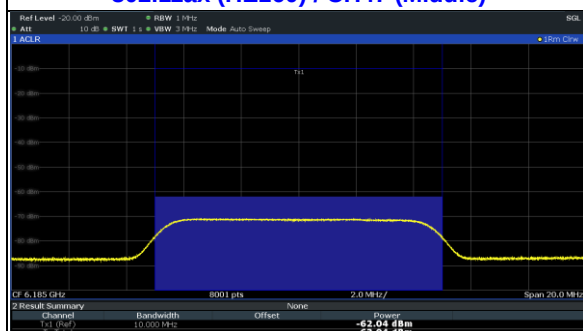
802.11ax (HE20) / CH33



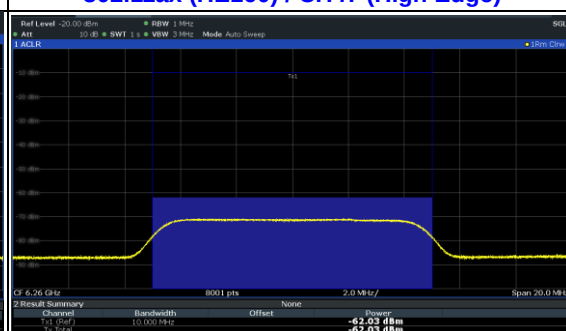
802.11ax (HE160) / CH47 (Low Edge)

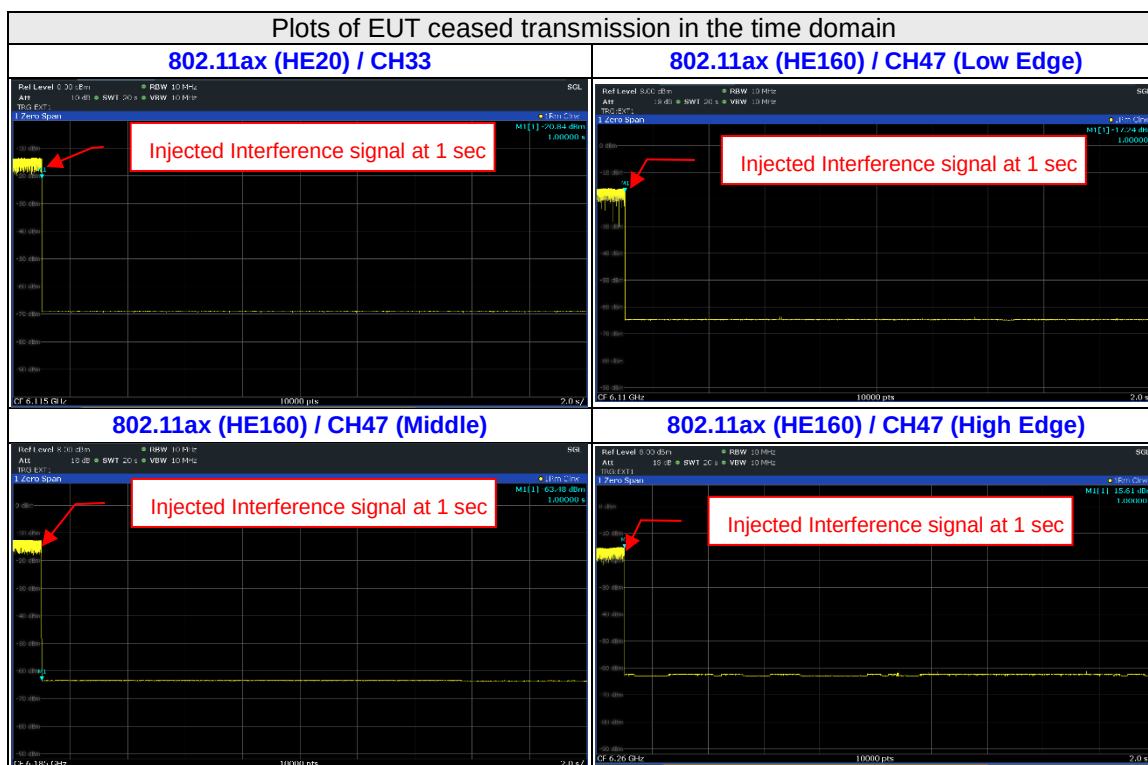


802.11ax (HE160) / CH47 (Middle)



802.11ax (HE160) / CH47 (High Edge)

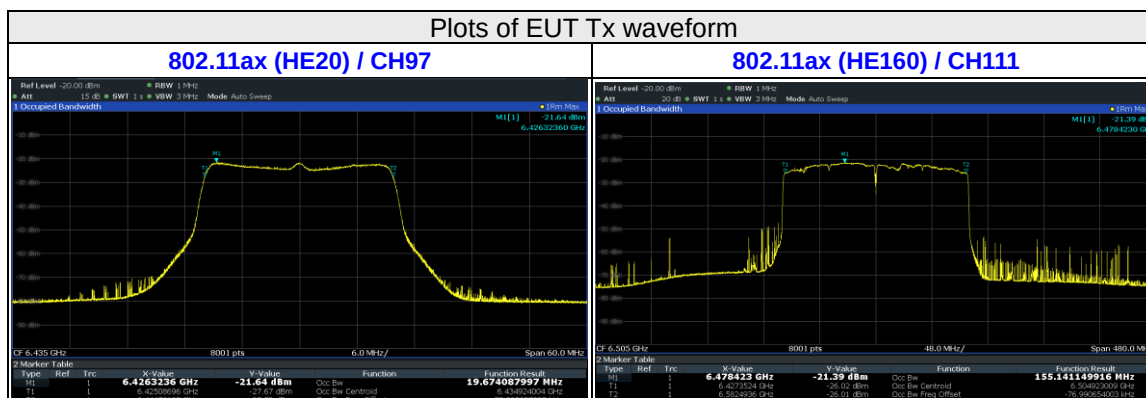




For U-NII-6 band

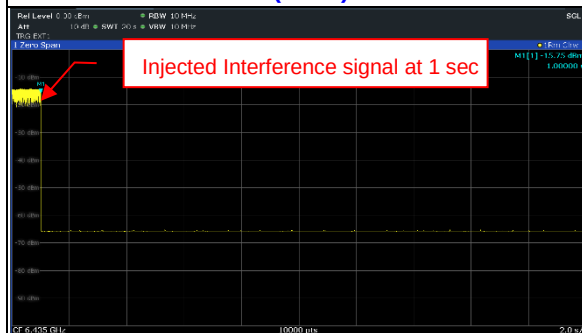
Contention Based Protocol Measurement									
Measurement Mode :		Conducted measurement		The Incumbent Signal(AWGN) Level(dBm) :			-62	at the antenna connector	
Device Type :		Indoor AP / Subordinate Device		Antenna Gain(dBi) :			0		
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Number of Times	Number of Detected	Detection Rate	Minimum Limit	Pass/Fail
802.11ax	20	97	6435	6435	10	10	100%	90%	Pass
	160	111	6505	6430	10	10	100%	90%	Pass
				6505	10	10	100%	90%	Pass
				6580	10	10	100%	90%	Pass
Result	Complied								

Lowest Interference(AWGN) Level Check						
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Threshold Level (dBm)	EUT Status
802.11ax	20	97	6435	6435	-64	Start transmitting
	160	111	6505	6430	-64	Start transmitting
				6505	-63	Start transmitting
				6580	-63	Start transmitting

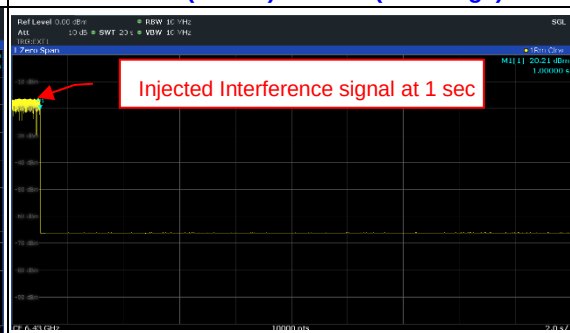


Plots of EUT ceased transmission in the time domain

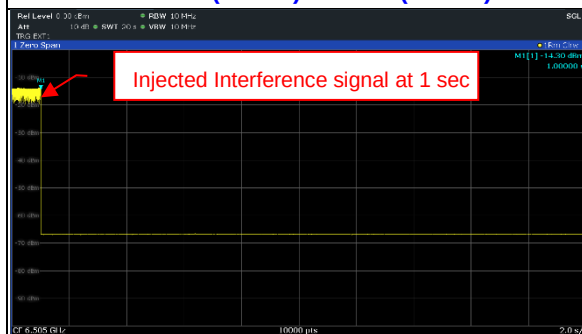
802.11ax (HE20) / CH97



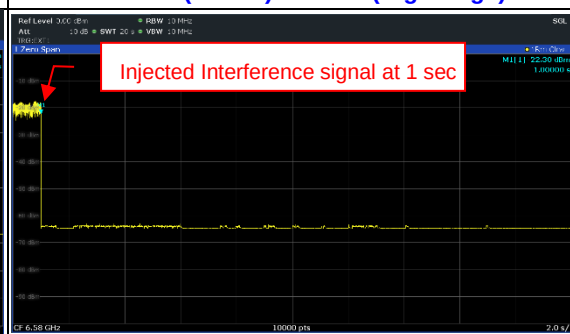
802.11ax (HE160) / CH111 (Low Edge)



802.11ax (HE160) / CH111 (Middle)



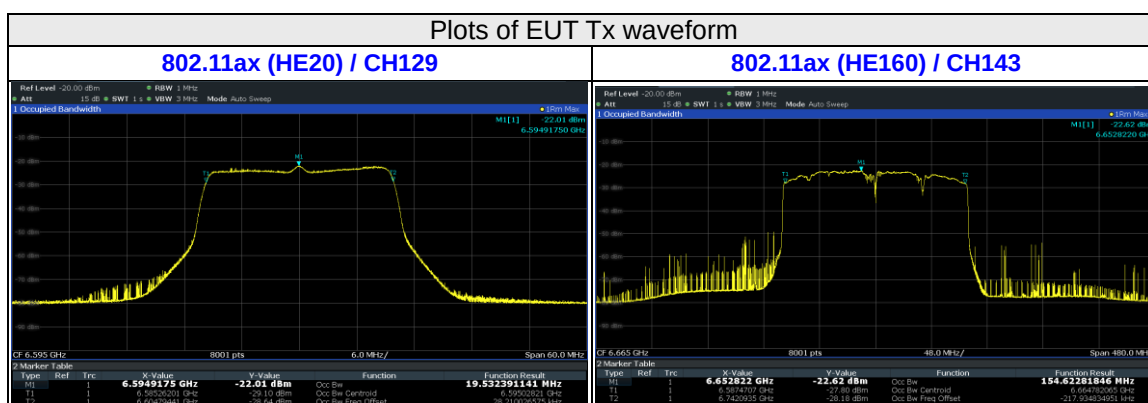
802.11ax (HE160) / CH111 (High Edge)

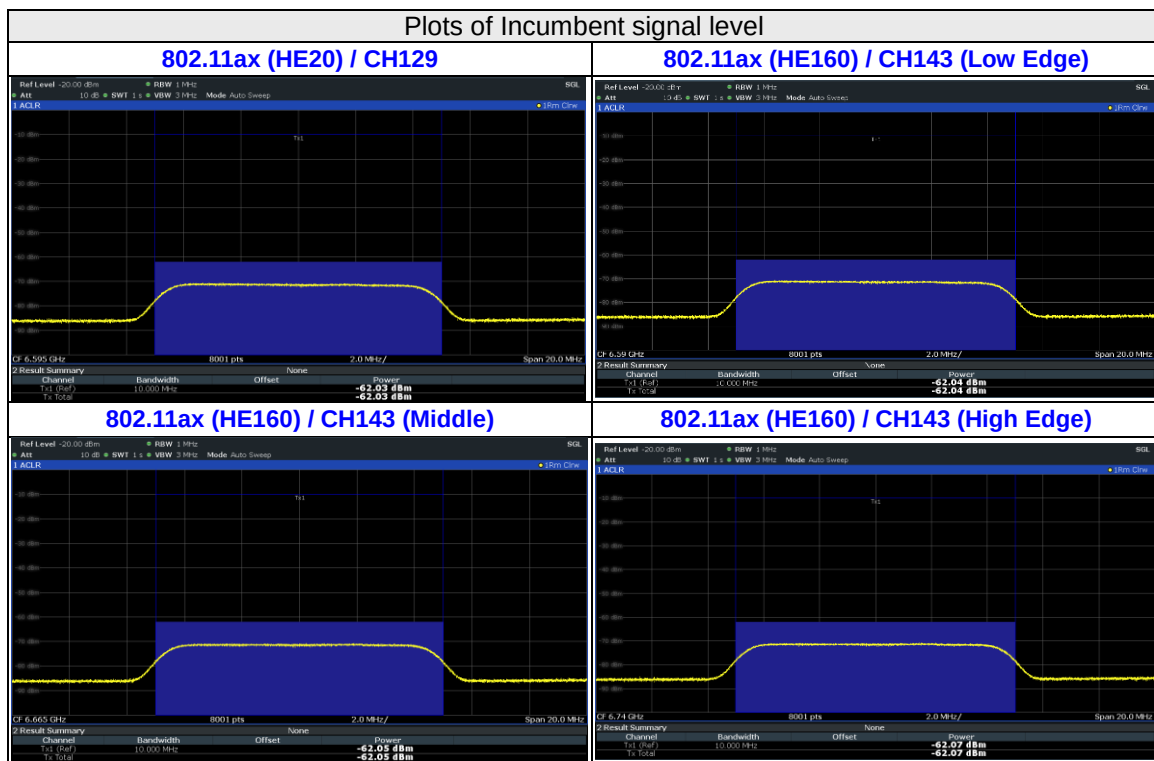


For U-NII-7 band

Contention Based Protocol Measurement									
Measurement Mode :		Conducted measurement		The Incumbent Signal(AWGN) Level(dBm) :			-62	at the antenna connector	
Device Type :		Indoor AP / Subordinate Device		Antenna Gain(dBi) :			0		
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Number of Times	Number of Detected	Detection Rate	Minimum Limit	Pass/Fail
802.11ax	20	129	6595	6595	10	10	100%	90%	Pass
	160	143	6665	6590	10	10	100%	90%	Pass
				6665	10	10	100%	90%	Pass
				6740	10	10	100%	90%	Pass
Result	Complied								

Lowest Interference(AWGN) Level Check						
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Threshold Level (dBm)	EUT Status
802.11ax	20	129	6595	6595	-63	Start transmitting
	160	143	6665	6590	-64	Start transmitting
				6665	-63	Start transmitting
				6740	-63	Start transmitting



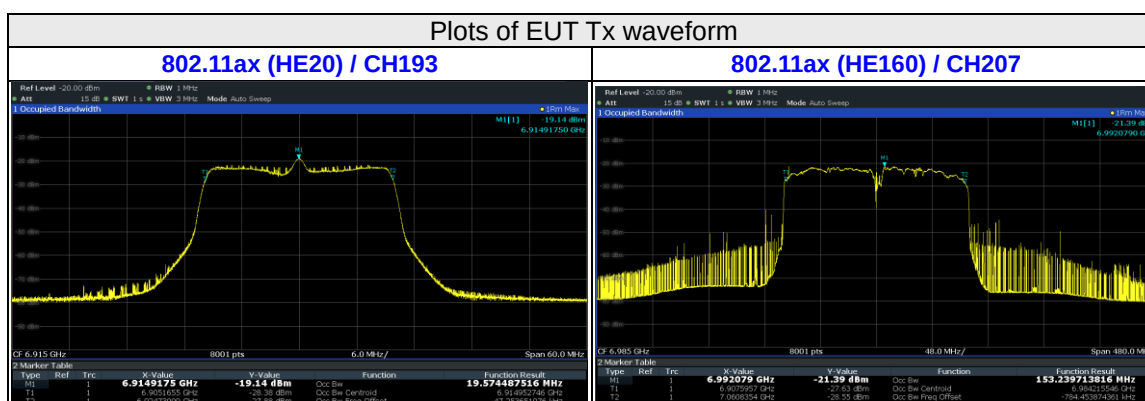




For U-NII-8 band

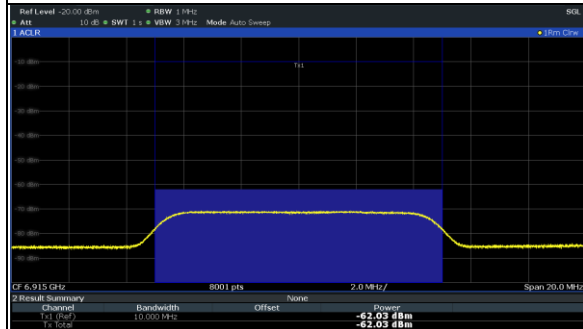
Contention Based Protocol Measurement									
Measurement Mode :		Conducted measurement		The Incumbent Signal(AWGN) Level(dBm) :			-62	at the antenna connector	
Device Type :		Indoor AP / Subordinate Device		Antenna Gain(dBi) :			0		
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Number of Times	Number of Detected	Detection Rate	Minimum Limit	Pass/Fail
802.11ax	20	193	6915	6915	10	10	100%	90%	Pass
	160	207	6985	6910	10	10	100%	90%	Pass
				6985	10	10	100%	90%	Pass
				7060	10	10	100%	90%	Pass
Result	Complied								

Lowest Interference(AWGN) Level Check						
Operation Mode	Channel Bandwidth (MHz)	Channel Number	Channel Frequency (MHz)	AWGN Signal Frequency (MHz)	Threshold Level (dBm)	EUT Status
802.11ax	20	193	6915	6915	-64	Start transmitting
	160	207	6985	6910	-64	Start transmitting
				6985	-63	Start transmitting
				7060	-63	Start transmitting

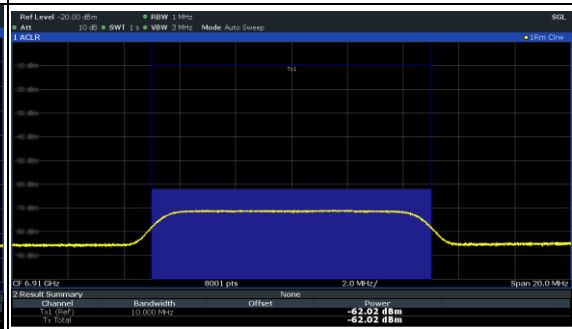


Plots of Incumbent signal level

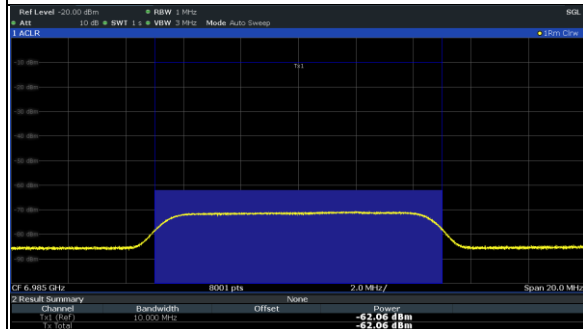
802.11ax (HE20) / CH193



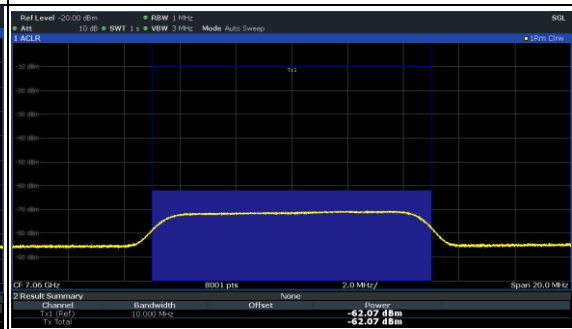
802.11ax (HE160) / CH207 (Low Edge)

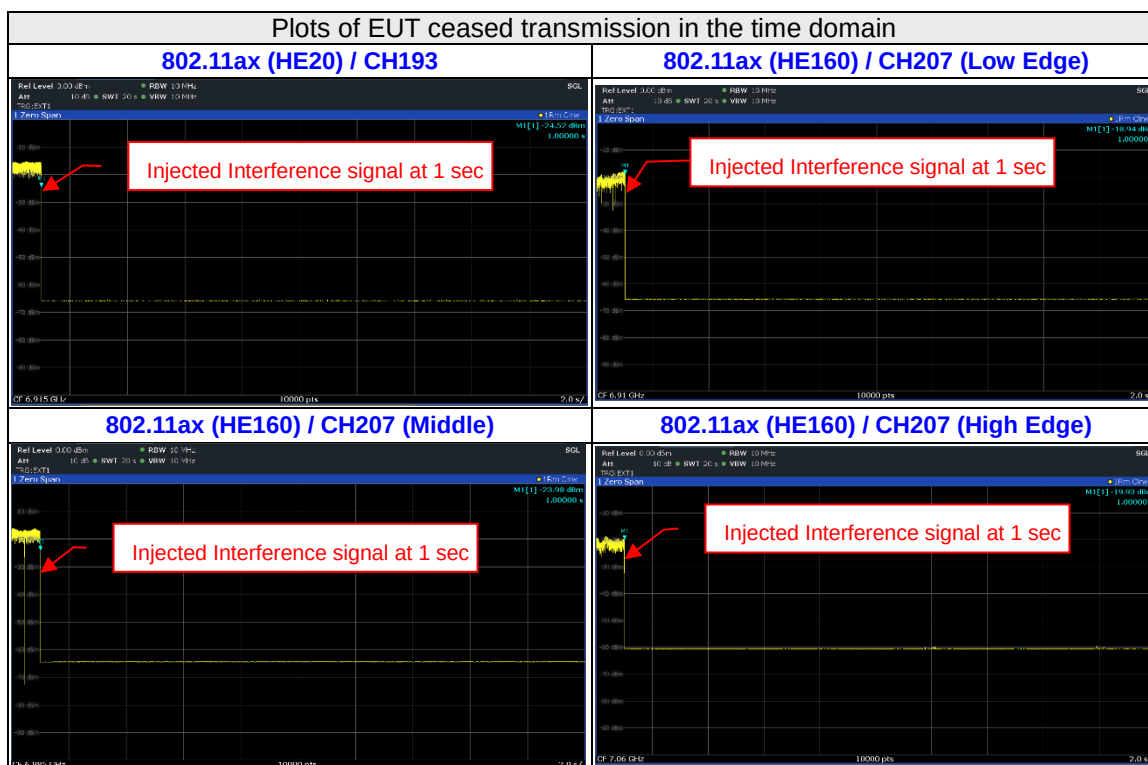


802.11ax (HE160) / CH207 (Middle)



802.11ax (HE160) / CH207 (High Edge)



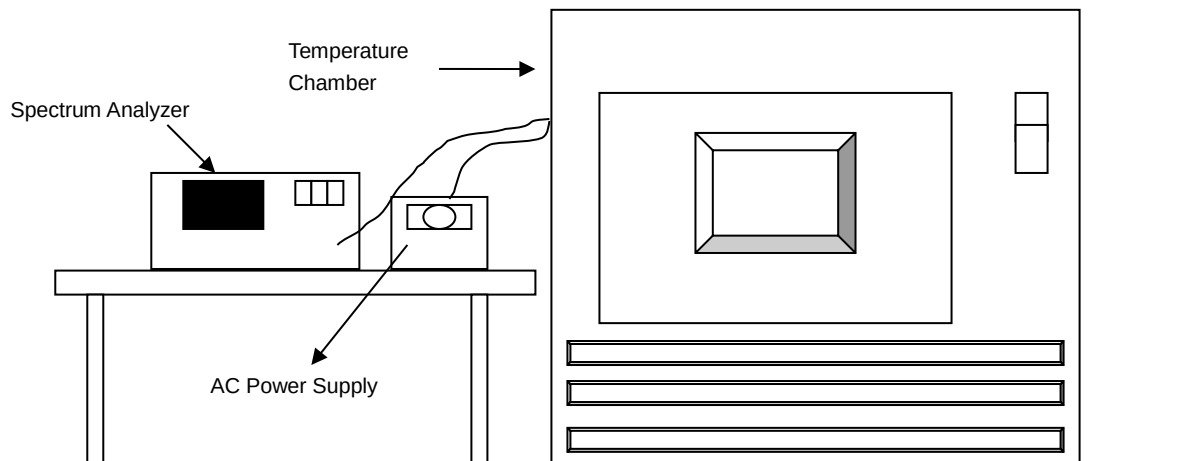


4.8 Frequency Stability Measurement

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

802.11a

Frequency Stability Versus Temp.									
Operating Frequency: 6115 MHz									
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	6114.9976	PASS	6114.9934	PASS	6114.9956	PASS	6114.995	PASS
30	120	6115.0304	PASS	6115.027	PASS	6115.0296	PASS	6115.028	PASS
20	120	6114.9951	PASS	6114.9946	PASS	6114.9985	PASS	6114.9946	PASS
10	120	6115.0221	PASS	6115.0186	PASS	6115.0208	PASS	6115.0191	PASS
0	120	6115.0151	PASS	6115.0156	PASS	6115.0128	PASS	6115.0123	PASS

Frequency Stability Versus Voltage									
Operating Frequency: 6115 MHz									
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	6114.9941	PASS	6114.994	PASS	6114.9979	PASS	6114.9941	PASS
	120	6114.9951	PASS	6114.9946	PASS	6114.9985	PASS	6114.9946	PASS
	102	6114.9959	PASS	6114.9956	PASS	6114.9992	PASS	6114.994	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 AP / Subordinate Device in the 5.925-7.125 GHz band is prohibited on oil platforms, cars, trains, boats, and aircraft, except that Indoor AP / Subordinate Device 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 indoor access point is limited to indoor locations.
- (4) In the 5.925-7.125 GHz band, Indoor AP / Subordinate Device 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 may connect to other access points or subordinate devices.
- (6) Indoor AP / Subordinate Device 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

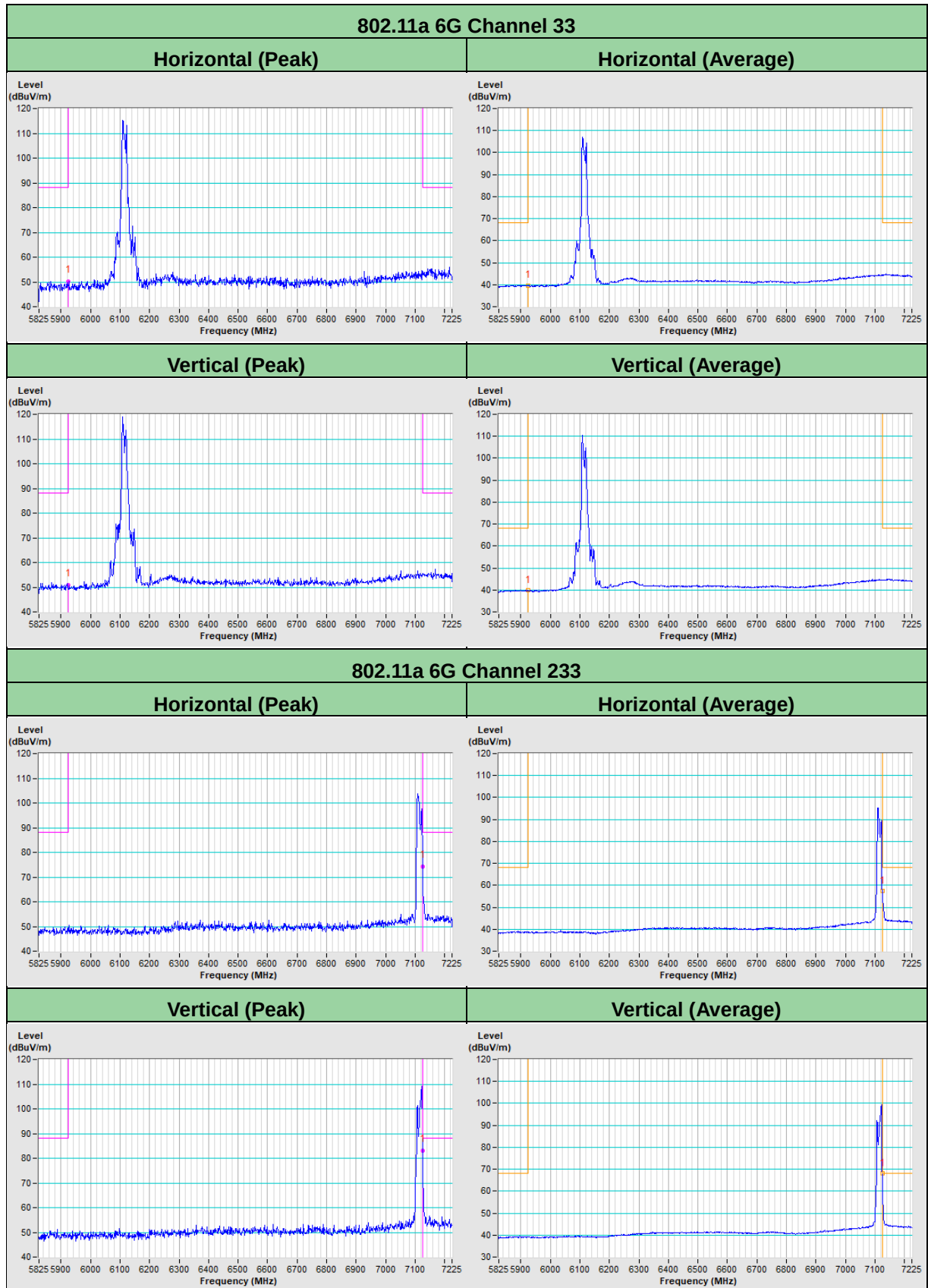
Device is an Indoor AP / Subordinate Device, all restrictions are meet the §15.407 (d) requirements. Please refer to the Attestation letter exhibit supplied within this application.

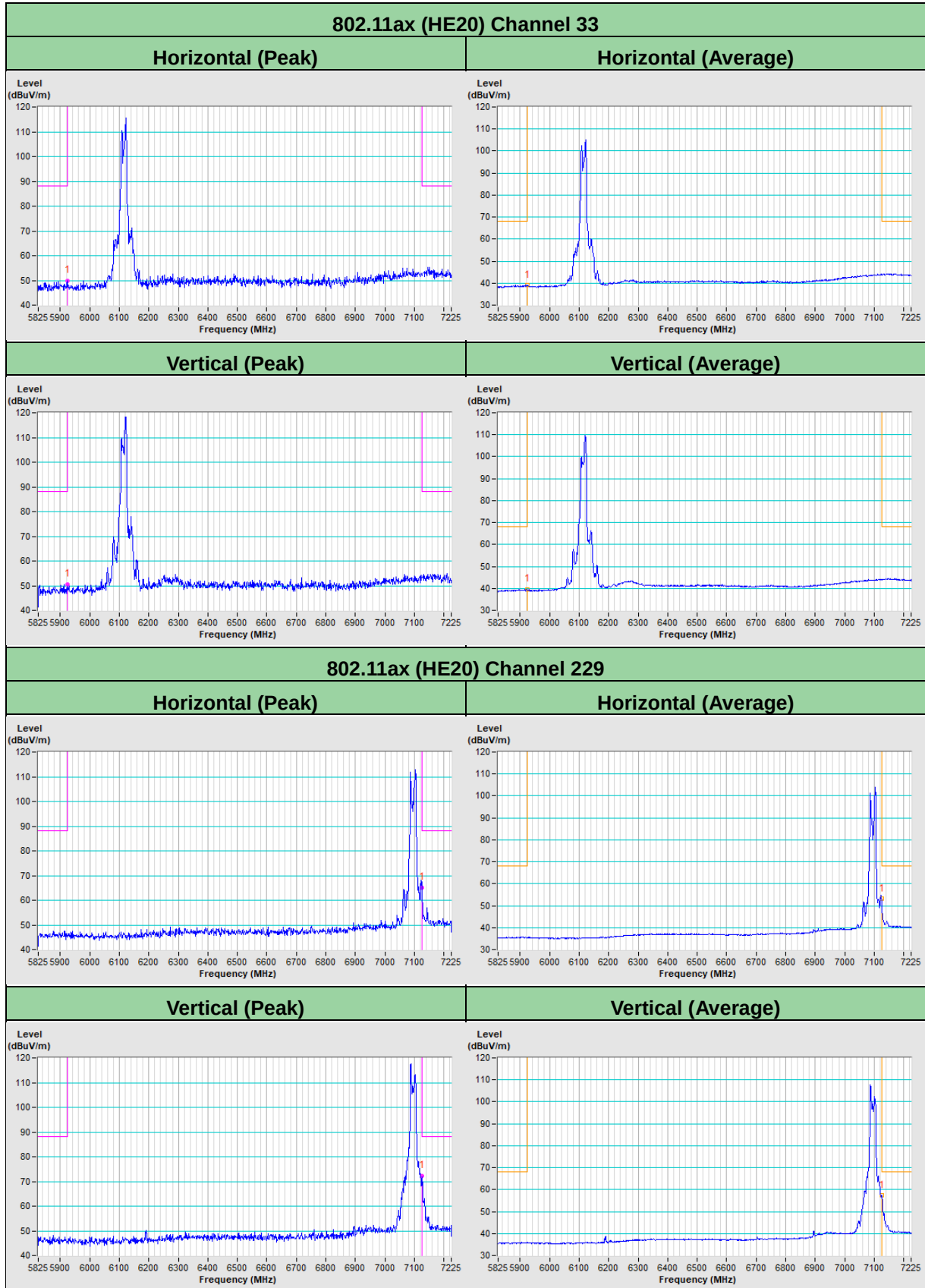
5 Pictures of Test Arrangements

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

Annex A - Band-Edge Measurement

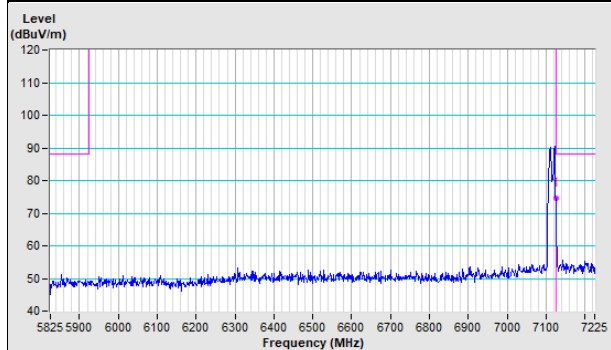
Mode 1



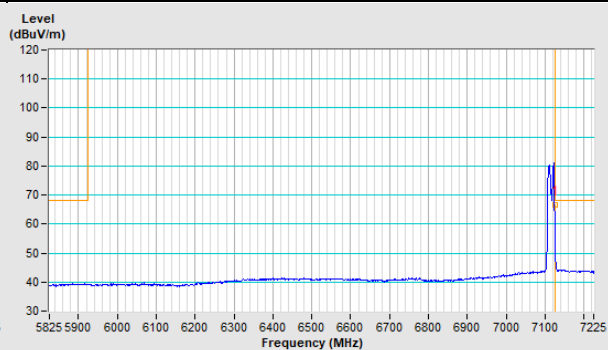


802.11ax (HE20) Channel 233

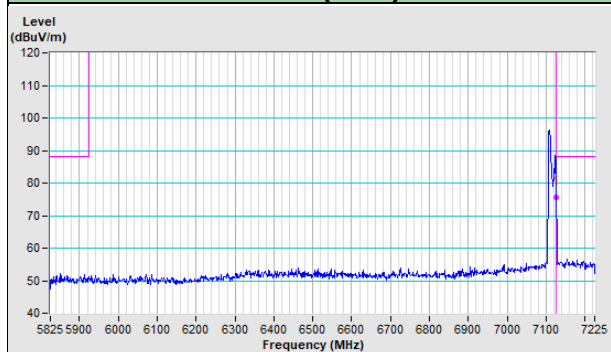
Horizontal (Peak)



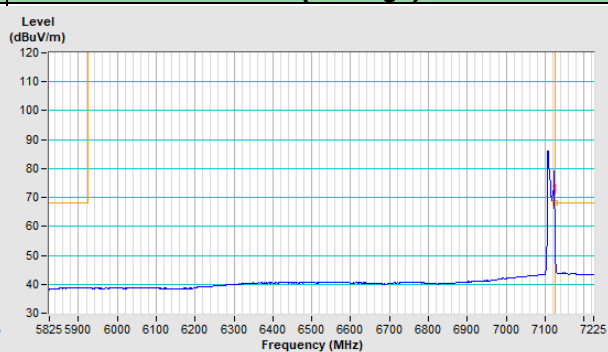
Horizontal (Average)

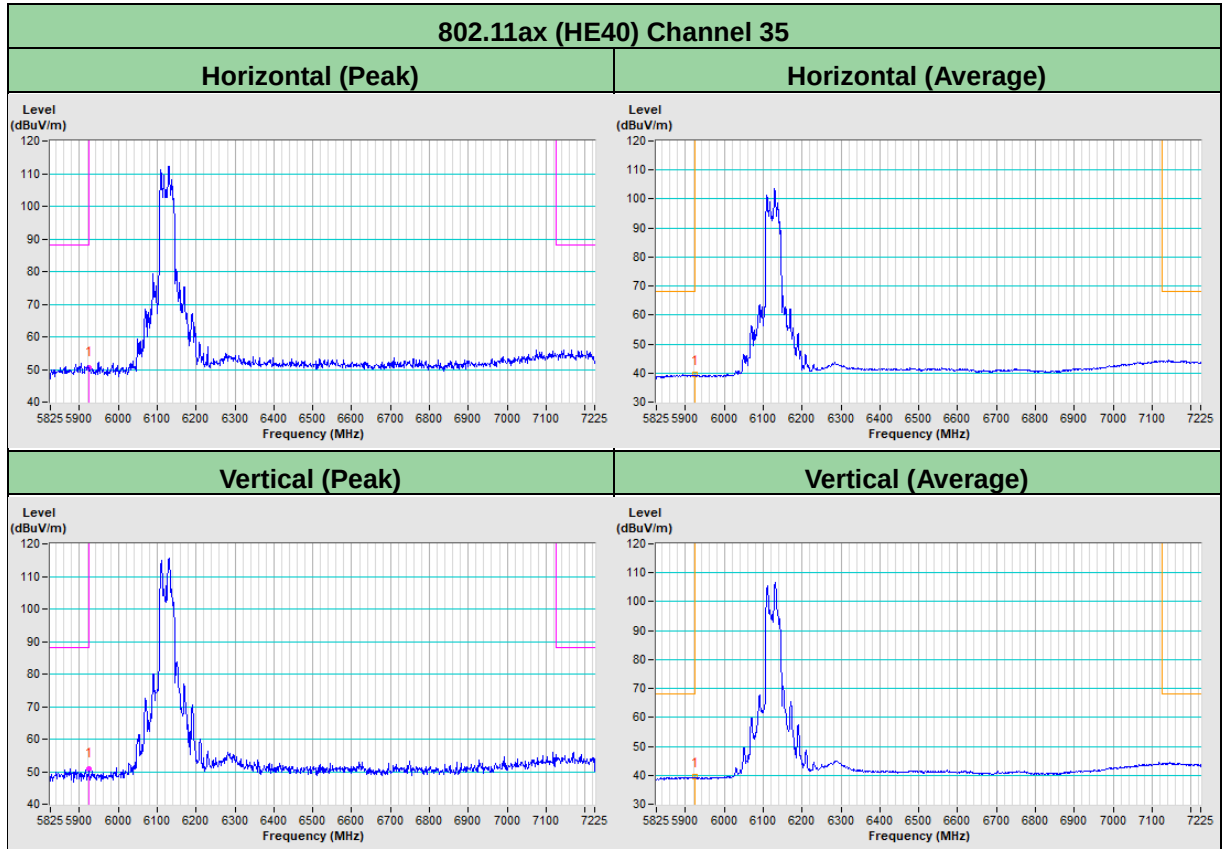


Vertical (Peak)



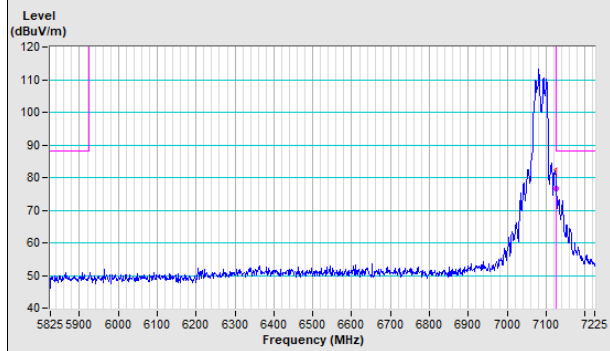
Vertical (Average)



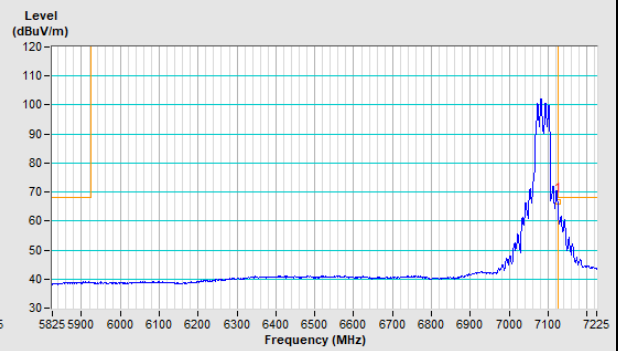


802.11ax (HE40) Channel 227

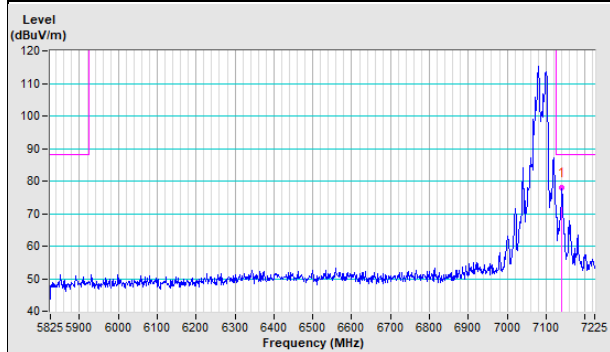
Horizontal (Peak)



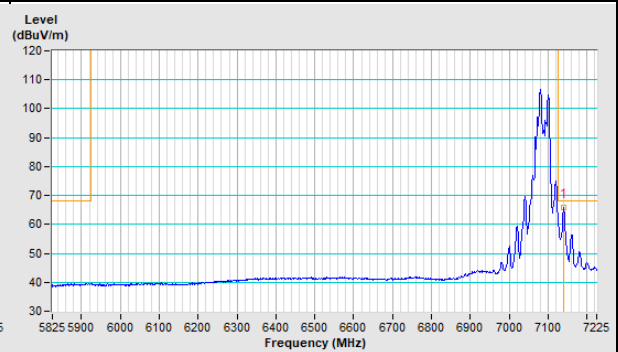
Horizontal (Average)

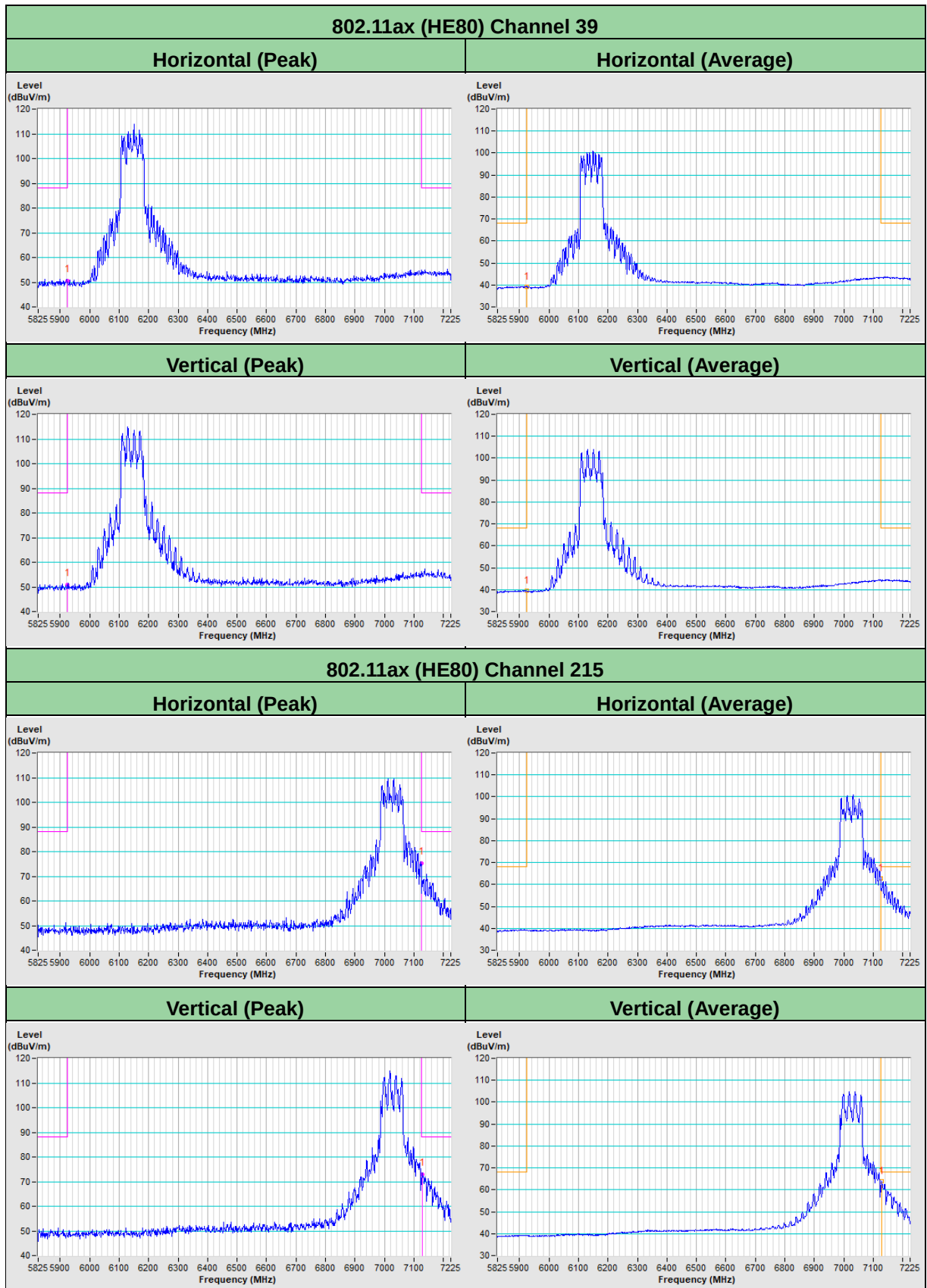


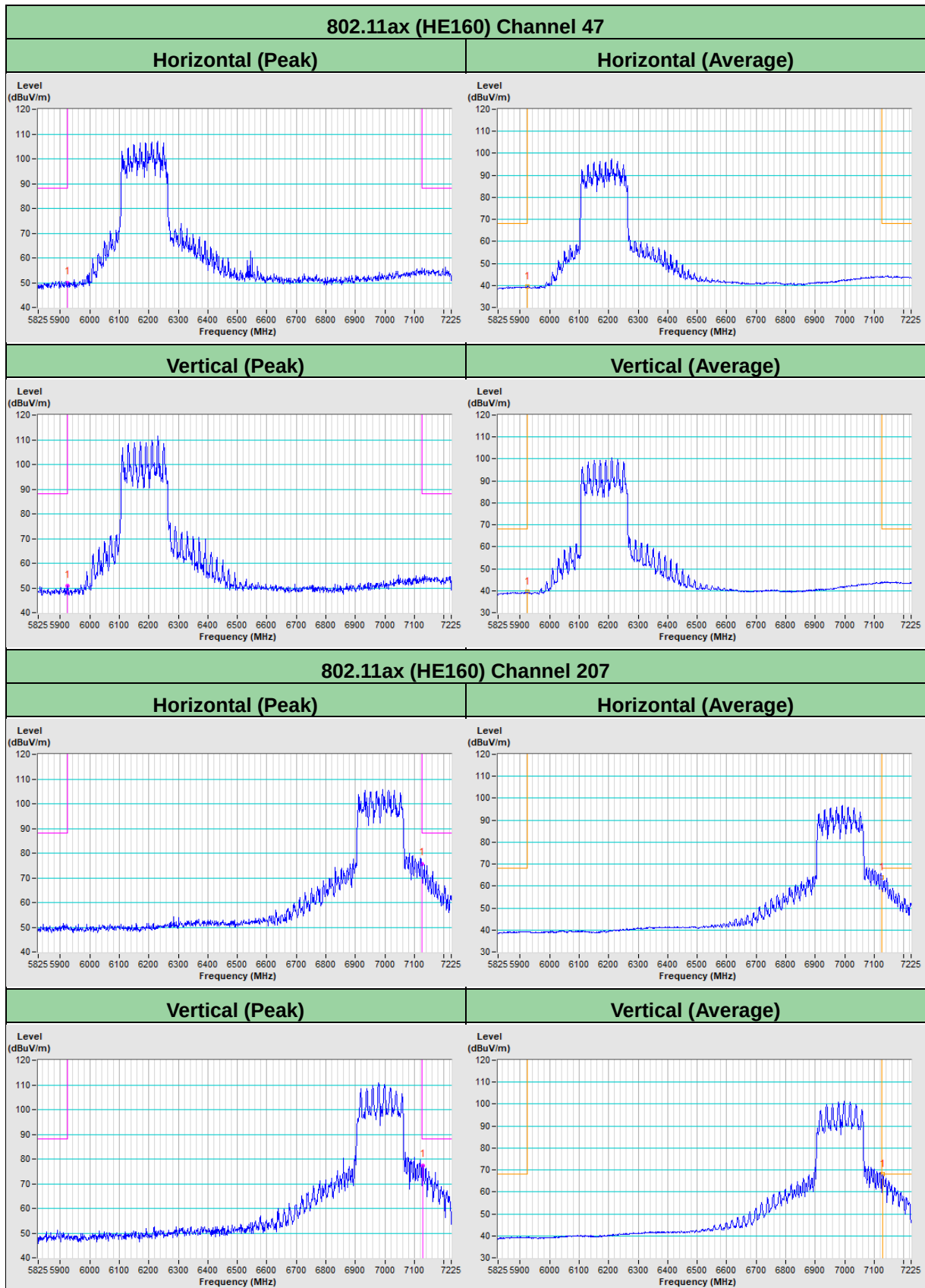
Vertical (Peak)



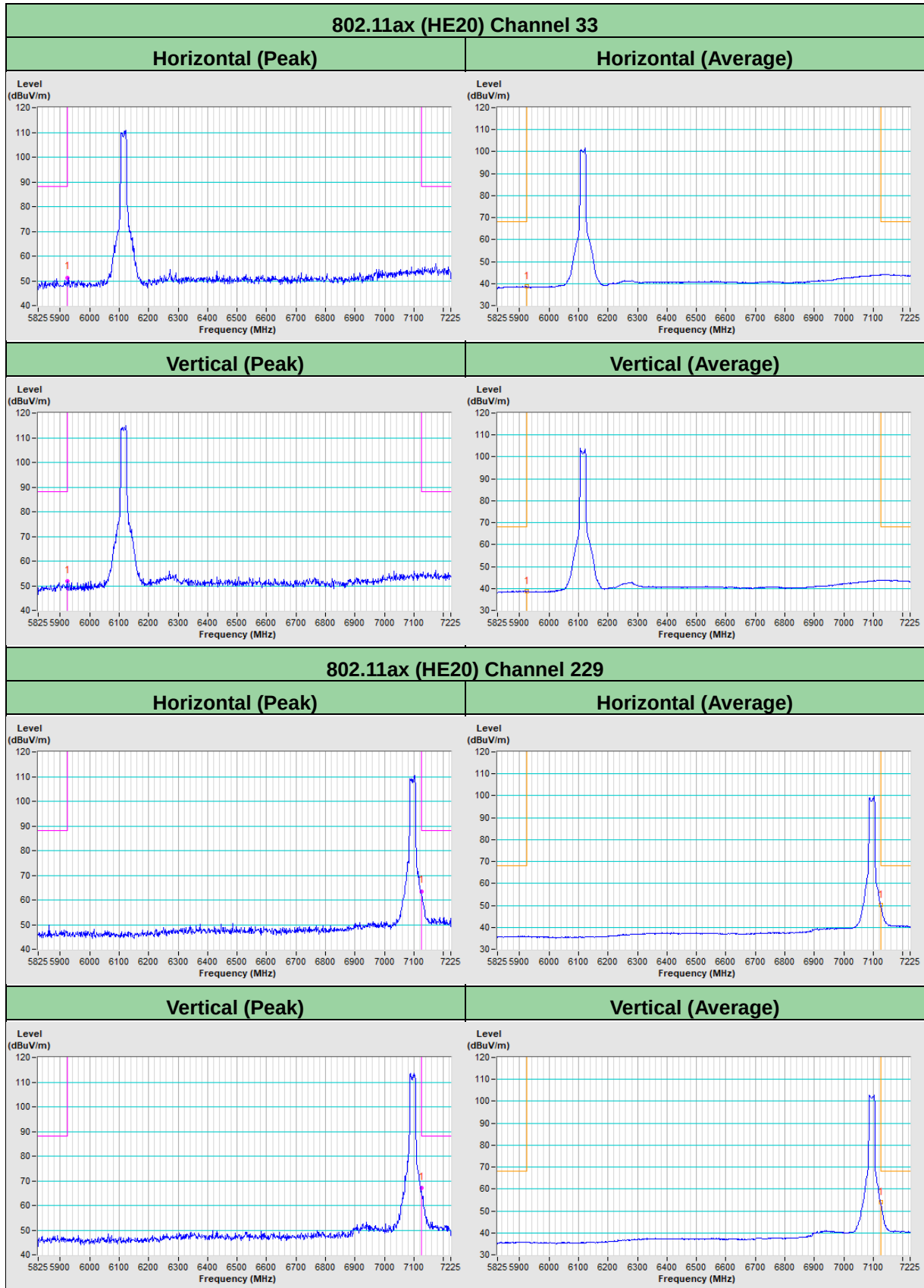
Vertical (Average)





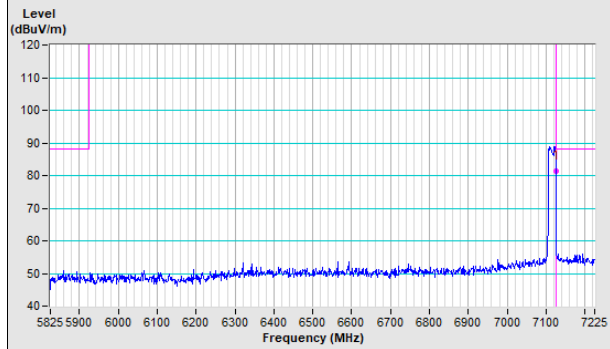


Mode 2

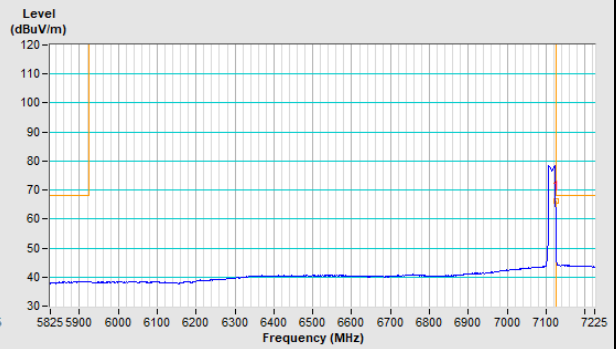


802.11ax (HE20) Channel 233

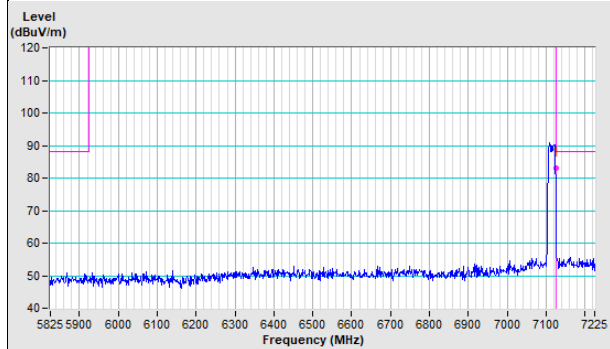
Horizontal (Peak)



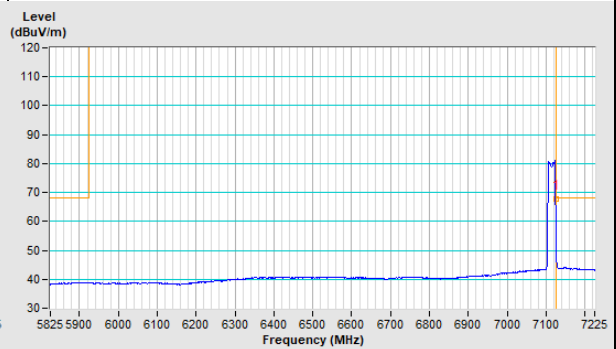
Horizontal (Average)

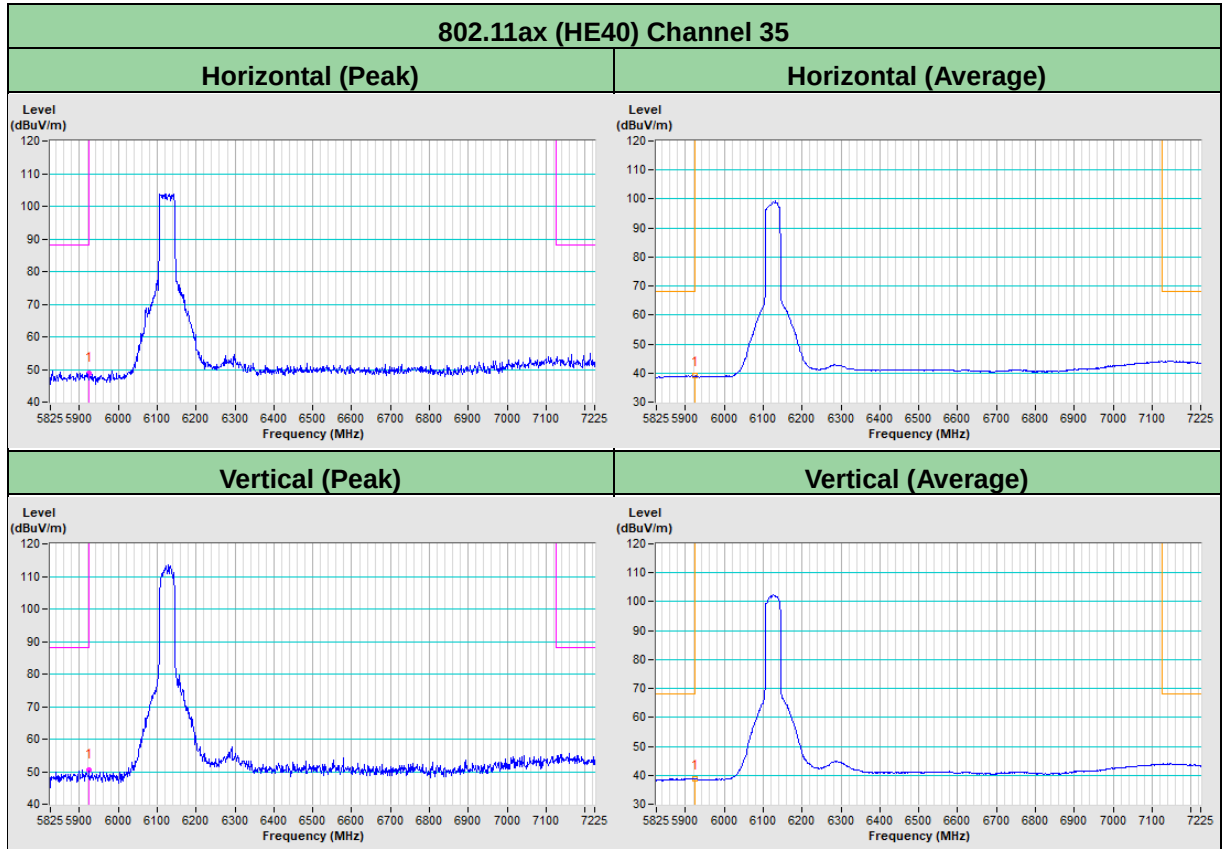


Vertical (Peak)



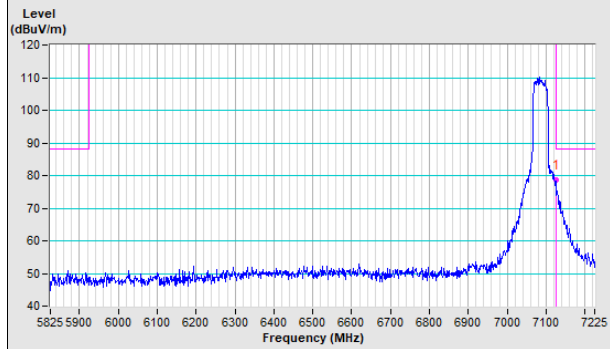
Vertical (Average)



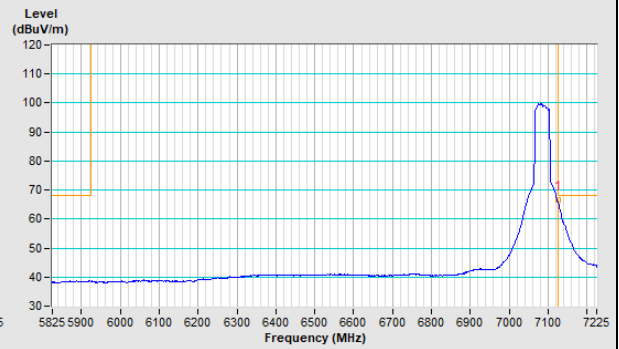


802.11ax (HE40) Channel 227

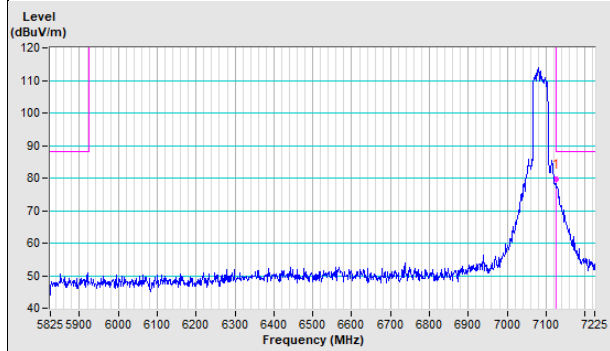
Horizontal (Peak)



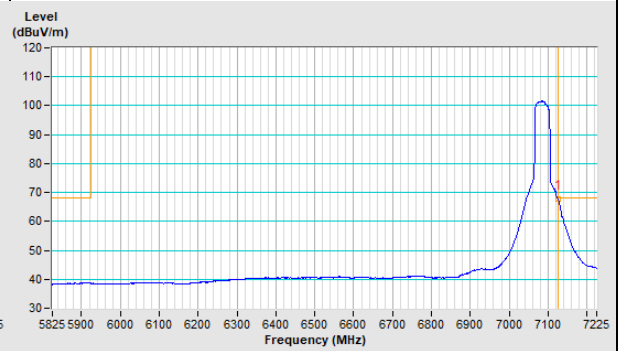
Horizontal (Average)

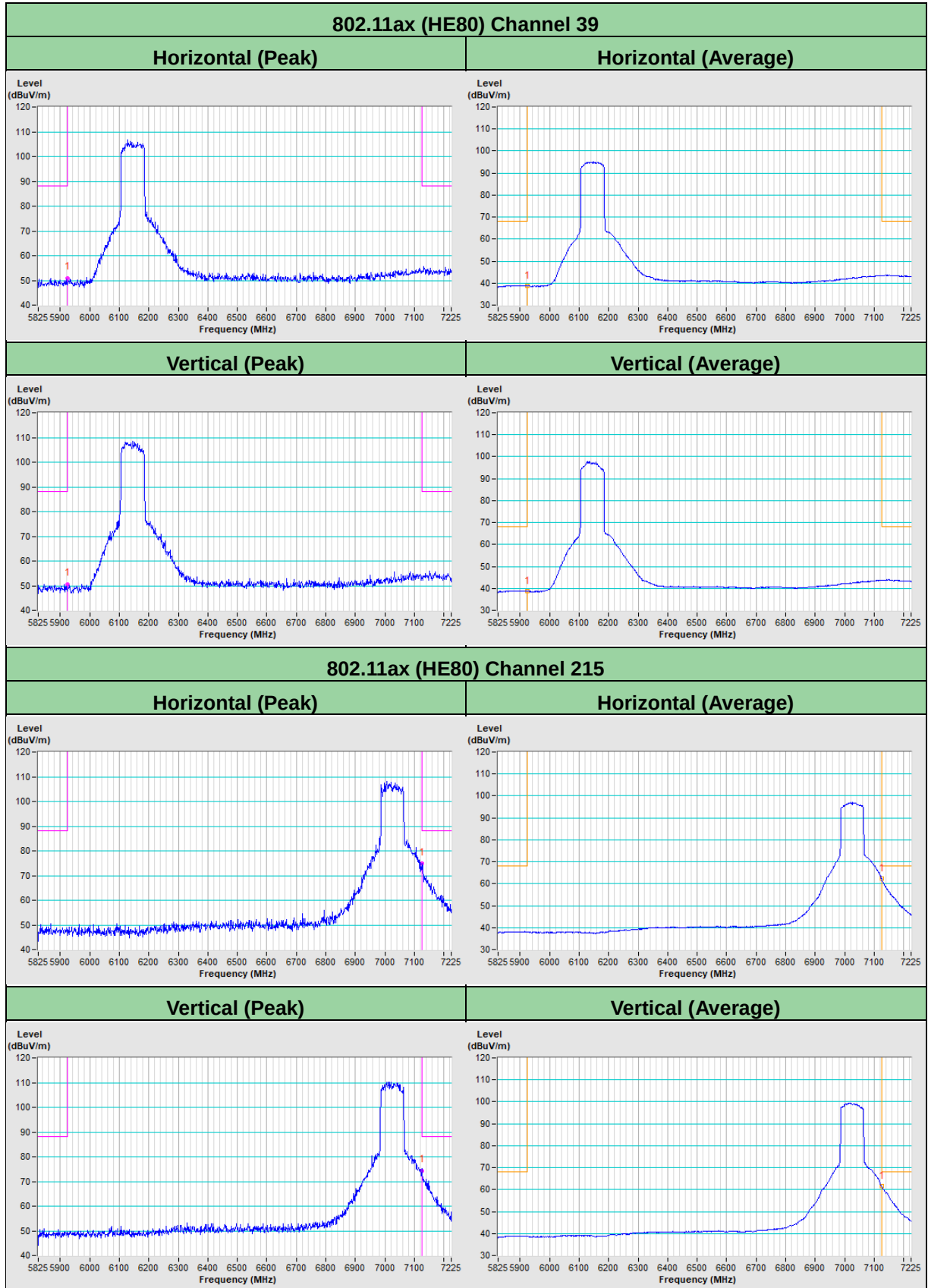


Vertical (Peak)



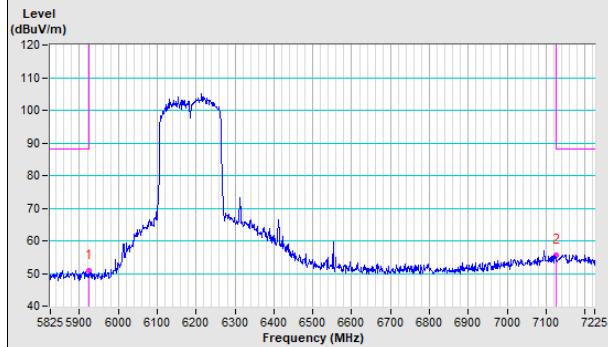
Vertical (Average)



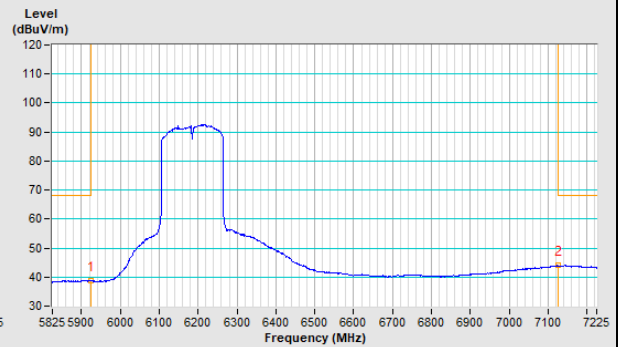


802.11ax (HE160) Channel 47

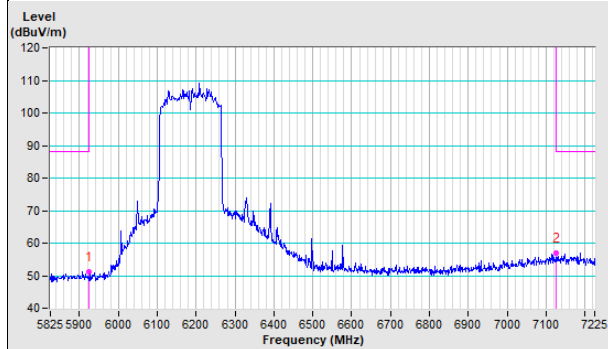
Horizontal (Peak)



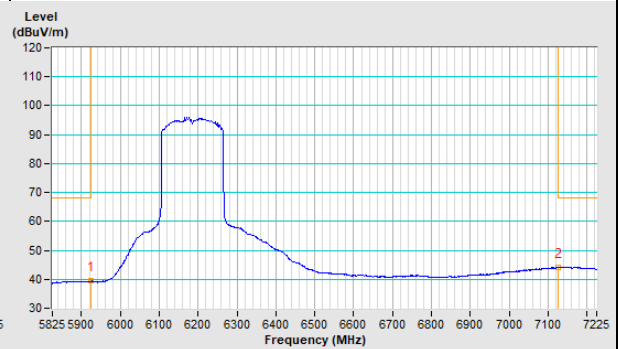
Horizontal (Average)



Vertical (Peak)

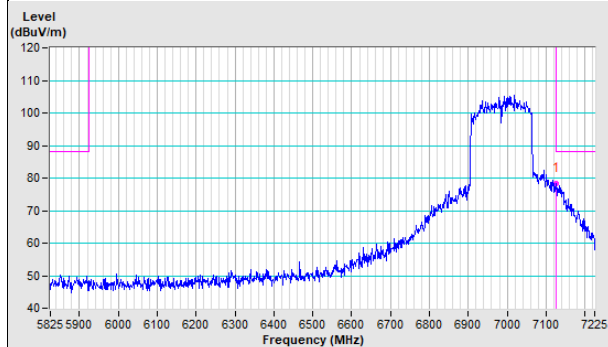


Vertical (Average)

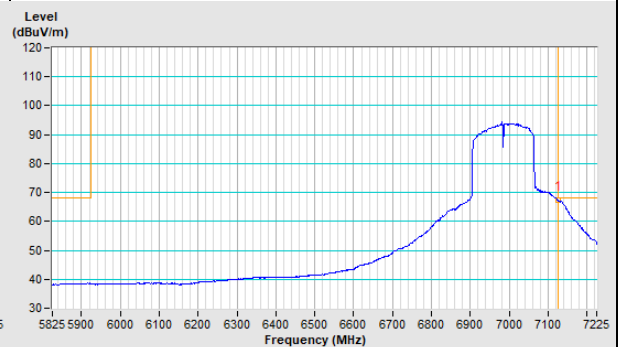


802.11ax (HE160) Channel 207

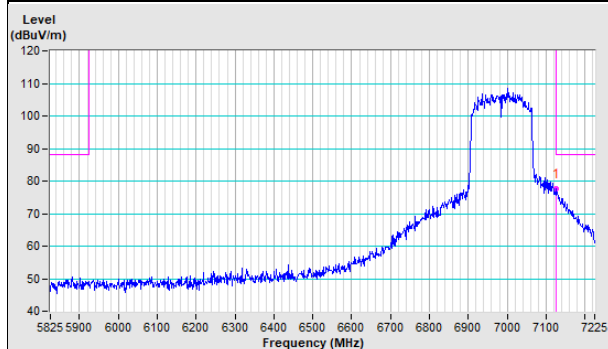
Horizontal (Peak)



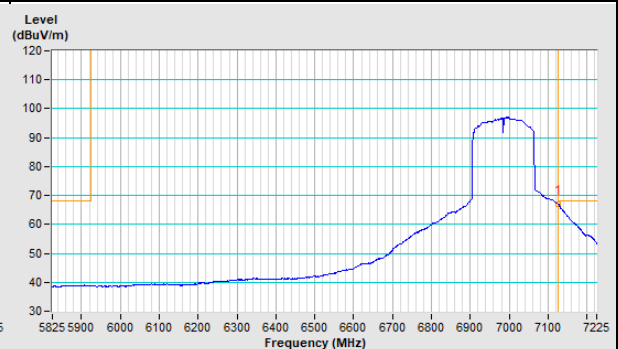
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



Appendix – 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.

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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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