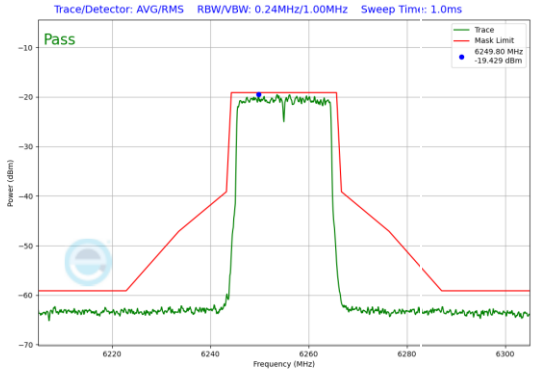
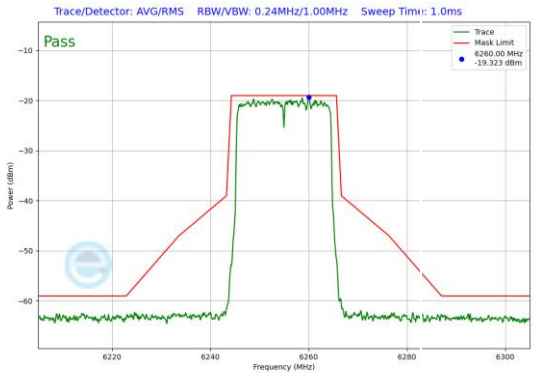
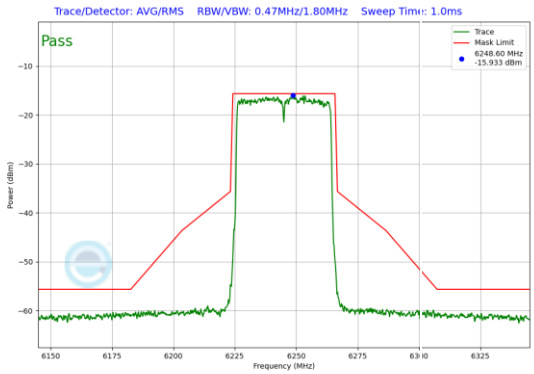


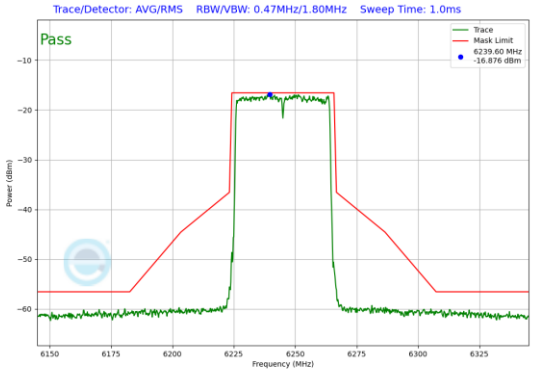
Plot 7-69. In-Band Emission Plot SDM Antenna WF8 (20MHz 802.11ax (UNII Band 5) – Ch. 61)



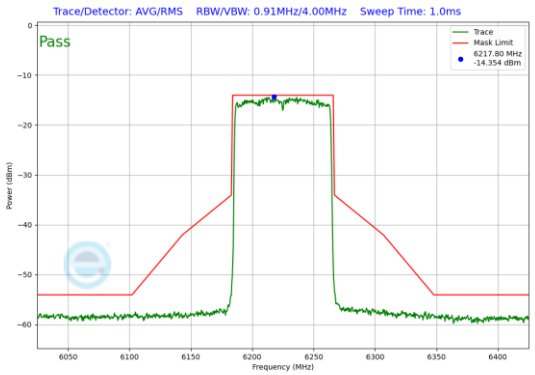
Plot 7-70. In-Band Emission Plot SDM Antenna WF7a (20MHz 802.11ax (UNII Band 5) – Ch. 61)



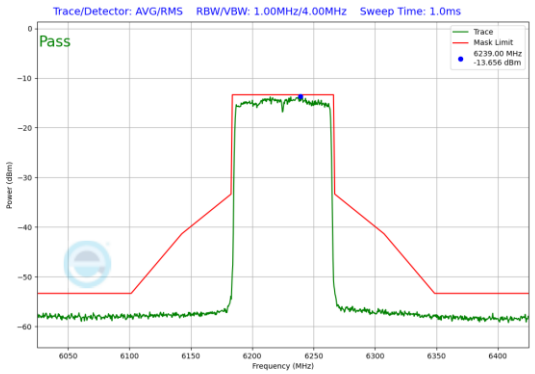
Plot 7-71. In-Band Emission Plot SDM Antenna WF8 (40MHz 802.11ax (UNII Band 5) – Ch. 59)



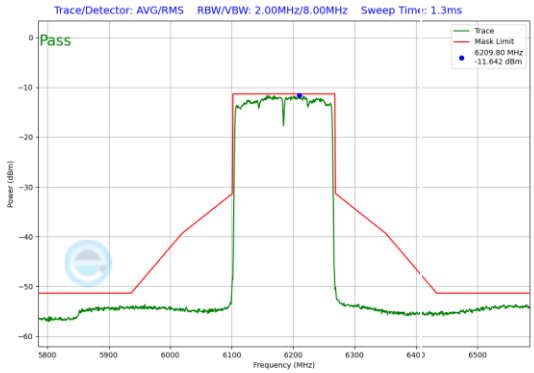
Plot 7-72. In-Band Emission Plot SDM Antenna WF7a (40MHz 802.11ax (UNII Band 5) – Ch. 59)



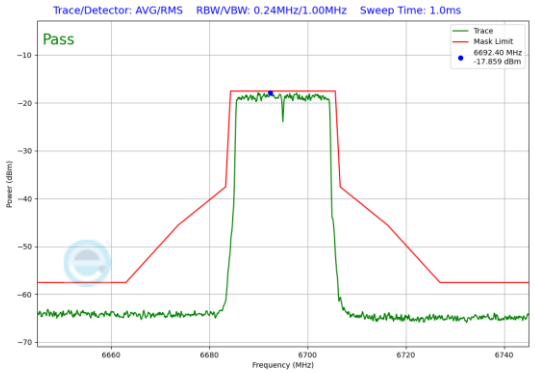
Plot 7-73. In-Band Emission Plot SDM Antenna WF8 (80MHz 802.11ax (UNII Band 5) – Ch. 55)



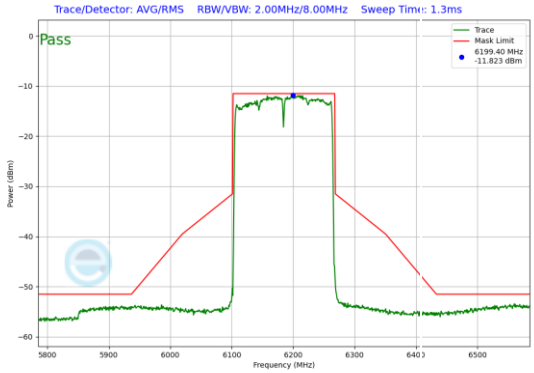
Plot 7-74. In-Band Emission Plot SDM Antenna WF7a (80MHz 802.11ax (UNII Band 5) – Ch. 55)



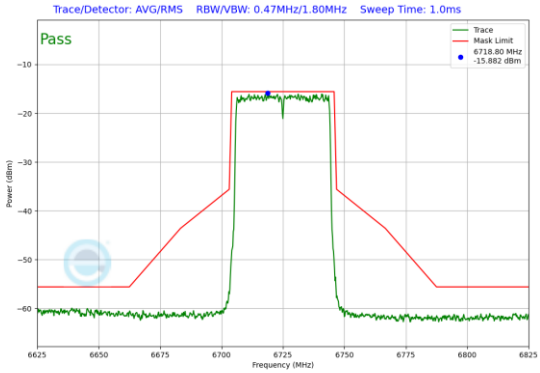
Plot 7-75. In-Band Emission Plot SDM Antenna WF8 (160MHz 802.11ax (UNII Band 5) – Ch. 47)



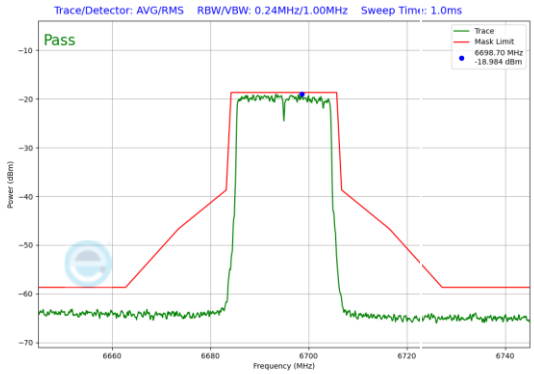
Plot 7-78. In-Band Emission Plot SDM Antenna WF7a (20MHz 802.11ax (UNII Band 7) – Ch. 149)



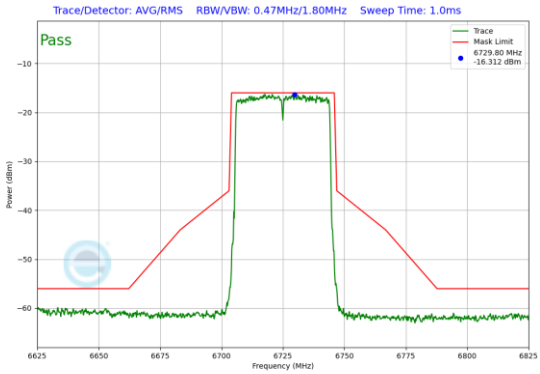
Plot 7-76. In-Band Emission Plot SDM Antenna WF7a (160MHz 802.11ax (UNII Band 5) – Ch. 47)



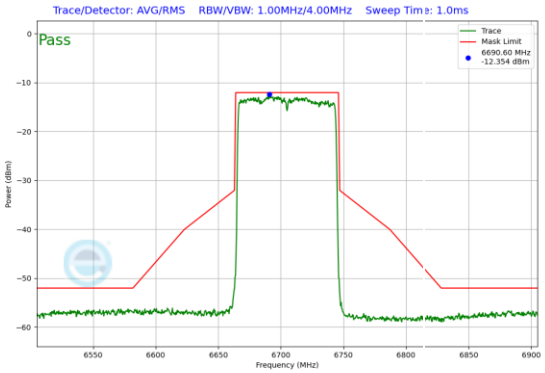
Plot 7-79. In-Band Emission Plot SDM Antenna WF8 (40MHz 802.11ax (UNII Band 7) – Ch. 155)



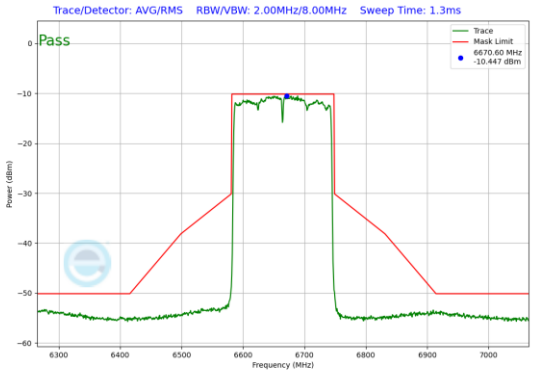
Plot 7-77. In-Band Emission Plot SDM Antenna WF8 (20MHz 802.11ax (UNII Band 7) – Ch. 149)



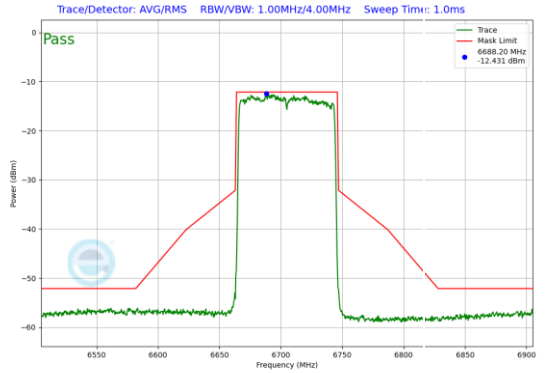
Plot 7-80. In-Band Emission Plot SDM Antenna WF7a (40MHz 802.11ax (UNII Band 7) – Ch. 155)



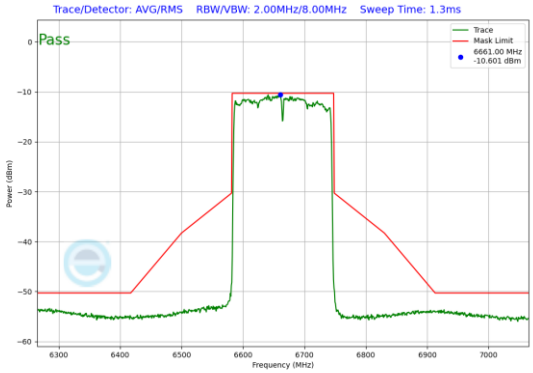
Plot 7-81. In-Band Emission Plot SDM Antenna WF8 (80MHz 802.11ax (UNII Band 7) – Ch. 151)



Plot 7-83. In-Band Emission Plot SDM Antenna WF8 (160MHz 802.11ax (UNII Band 7) – Ch. 143)



Plot 7-82. In-Band Emission Plot SDM Antenna WF7a (80MHz 802.11ax (UNII Band 7) – Ch. 151)



Plot 7-84. In-Band Emission Plot SDM Antenna WF7a (160MHz 802.11ax (UNII Band 7) – Ch. 143)

7.6 Contention Based Protocol

§15.407(d)(6); RSS-248[4.7]

Test Overview and Limit

Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices), while very low power devices operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands are required to use technologies that include a contention-based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are detected in a technology-agnostic manner, unlicensed devices are required to detect co-channel radio frequency energy (energy detect) and avoid simultaneous transmission.

Unlicensed indoor low-power and very low power devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor and very low power devices must vacate the channel and stay off the channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain.

To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel.

Test Procedure Used

KDB 987594 D02 v03 – Section I

Test Settings

1. Configure the EUT to transmit with a constant duty cycle.
2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth
3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT.
4. Connect the output port of the EUT to the signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
5. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
6. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
7. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in Figure 2.
8. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
9. 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.
10. 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.
11. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

Test Setup

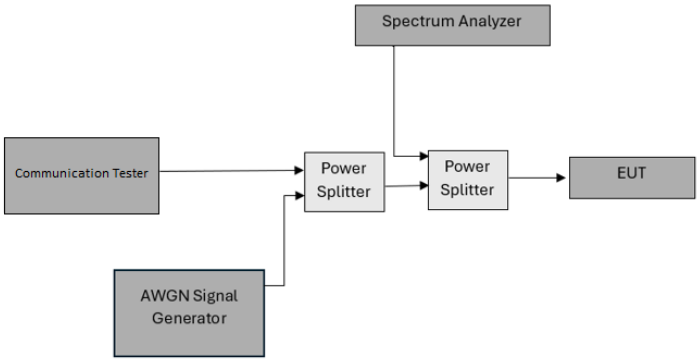


Figure 7-5. Contention-based protocol test setup, conducted method

Test Notes

1. The EUT does not support channel puncturing.
2. Per guidance from KDB 987594 D02 v03, contention-based protocol was tested using an AWGN signal with a bandwidth of 10MHz. The amplitude of the signal was increased until detected by the EUT, signaled by the ceasing of transmission, marker indicates the point at which the AWGN signal is introduced.
3. Per KDB 987594 D04 v03, contention-based protocol was tested with receiver with the lowest antenna gain.
4. 15 trials were ran in order to assure that at least 90% of certainty was met.

Detection Level = Injected AWGN Power (dBm) – Antenna Gain (dBi) + Path Loss (dB)

Equation 7-1. Incumbent Detection Level Calculation

Band	Channel	Channel Frquency [MHz]	Channel BW [MHz]	Incumbent Frequency [MHz]	Injected (AWGN) [dBm]	Antenna Gain [dBi]	Adjusted Power Level [dBm]	Detection Limit [dBm]	Margin [dB]
UNII Band 5	53	6215	20	6215	-75.61	0.20	-75.81	-62.0	-13.81
	47	6185	160	6115	-71.05	0.20	-71.25	-62.0	-9.25
				6185	-70.27	0.20	-70.47	-62.0	-8.47
				6260	-66.11	0.20	-66.31	-62.0	-4.31
UNII Band 7	149	6695	20	6695	-75.68	0.20	-75.88	-62.0	-13.88
	143	6665	160	6590	-68.99	0.20	-69.19	-62.0	-7.19
				6665	-72.01	0.20	-72.21	-62.0	-10.21
				6740	-68.10	0.20	-68.30	-62.0	-6.30

Table 7-22. Contention Based Protocol – Incumbent Detection Results

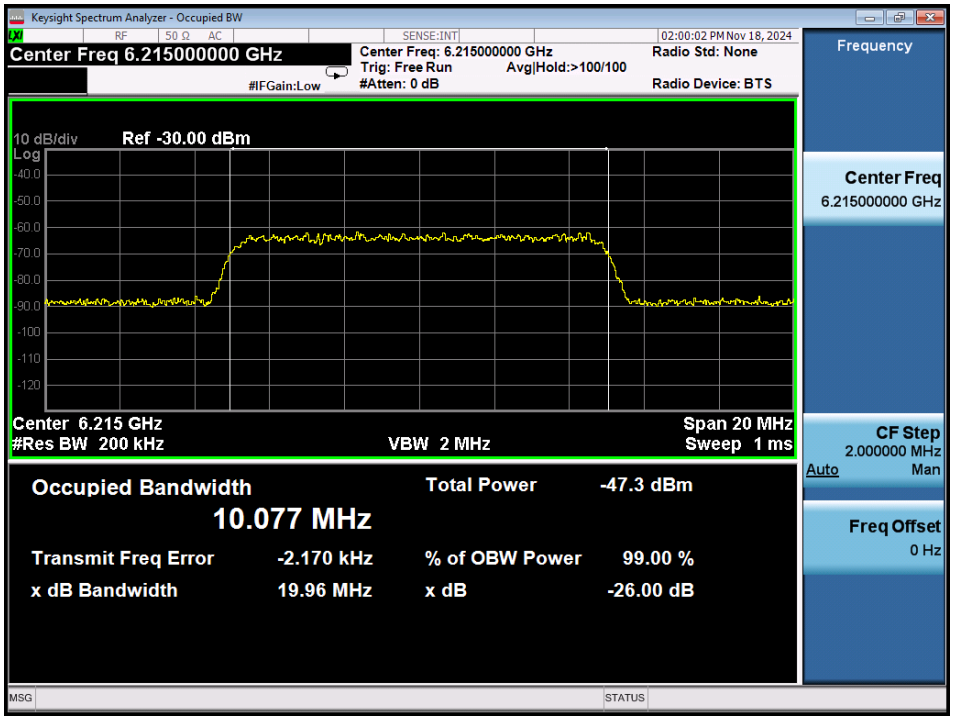
Band	Channel	Channel Frquency [MHz]	Channel BW [MHz]	Incumbent Frequency [MHz]	EUT Transmission Status Adjusted AWGN Power (dBm)		
					Normal	Minimal	Ceased
UNII Band 5	53	6215	20	6215	-86.99	-77.06	-75.81
	47	6185	160	6110	-82.43	-72.50	-71.25
				6185	-81.64	-71.72	-70.47
				6260	-77.49	-67.56	-66.31
UNII Band 7	149	6695	20	6695	-86.86	-77.10	-75.88
	143	6665	160	6750	-80.17	-70.41	-69.19
				6825	-83.19	-73.43	-72.21
				6900	-79.28	-69.52	-68.30

Table 7-23. Contention Based Protocol VLP – Detection Results – All Tx Cases

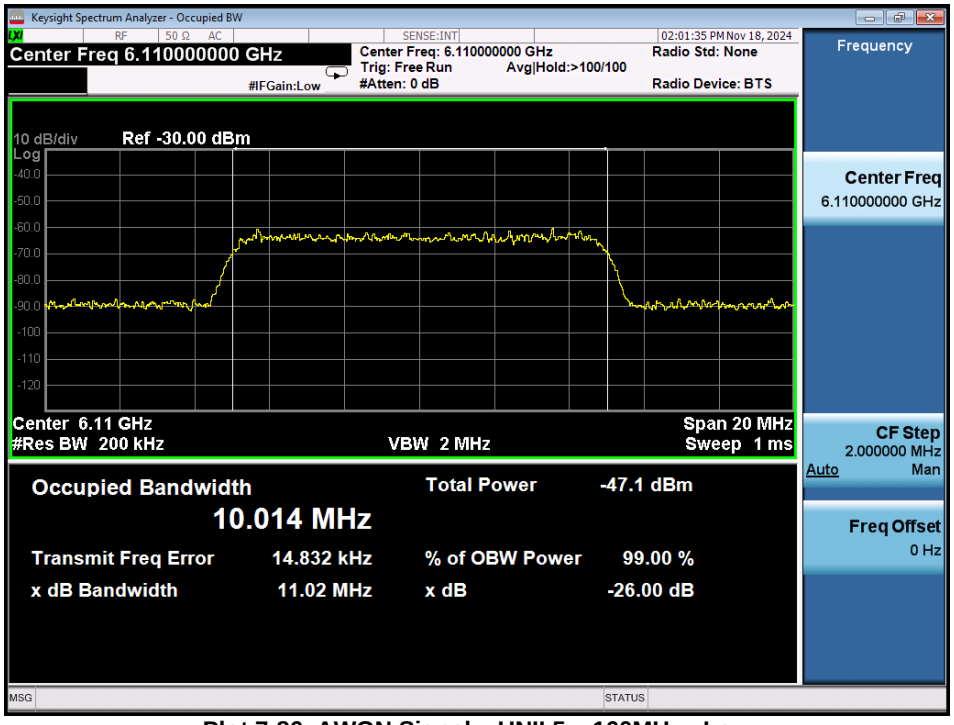
CBP Detection (1 = Detection, Blank = No Detection)																					
Band	Channel	Channel Frquency [MHz]	Channel BW [MHz]	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Detection Rate [%]	Limit [%]	Pass/Fail
UNII Band 5	53	6215	20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass
	47	6185	160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass
				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass
				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass
UNII Band 7	149	6695	20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass
	175	6665	160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass
				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass
				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100.0	90	Pass

Table 7-24. Contention Based Protocol – Incumbent Detection Trial Results

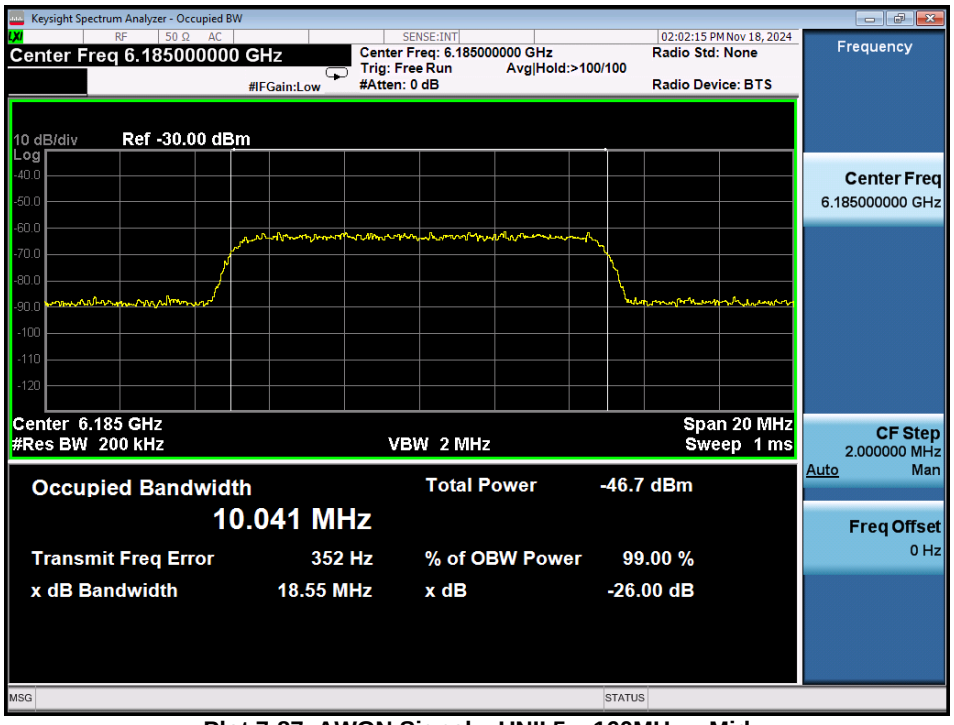
AWGN Plots



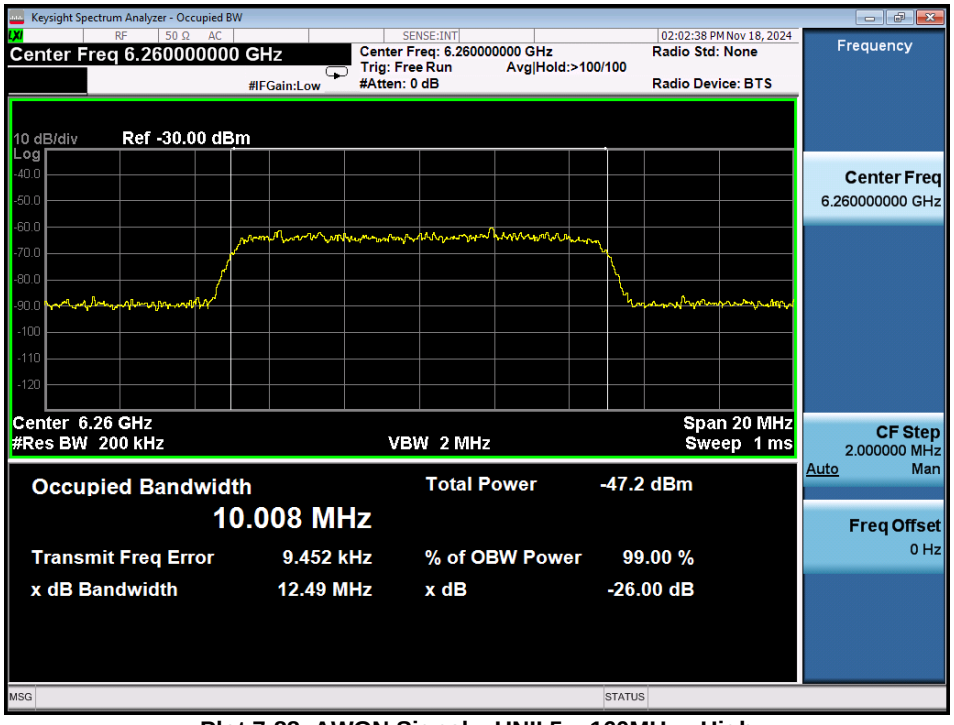
Plot 7-85. AWGN Signal – UNII 5 – 20MHz



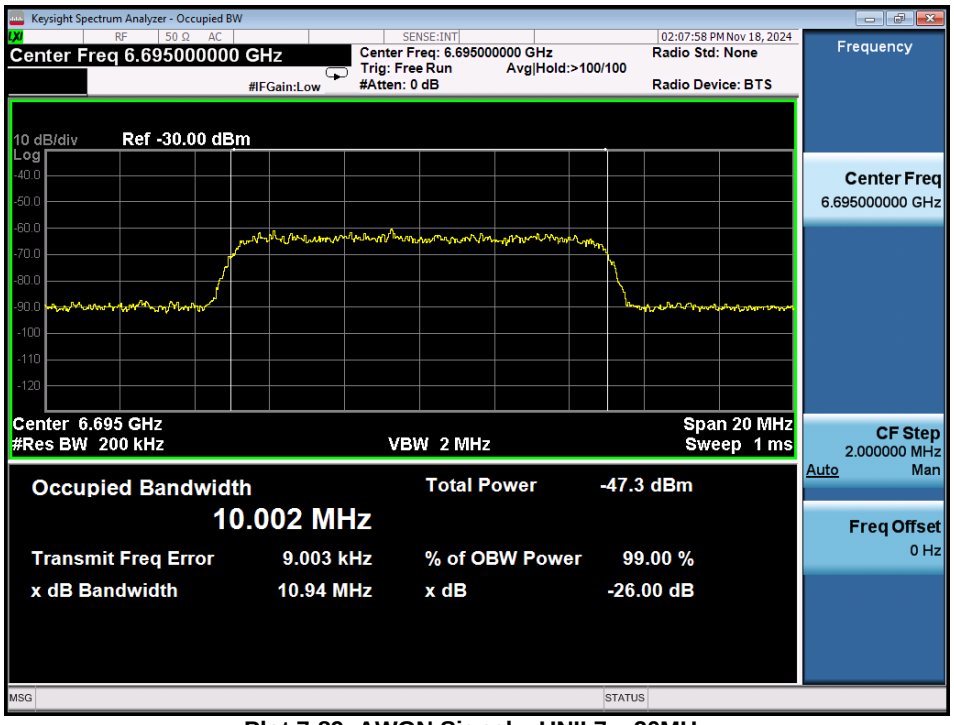
Plot 7-86. AWGN Signal – UNII 5 – 160MHz - Low



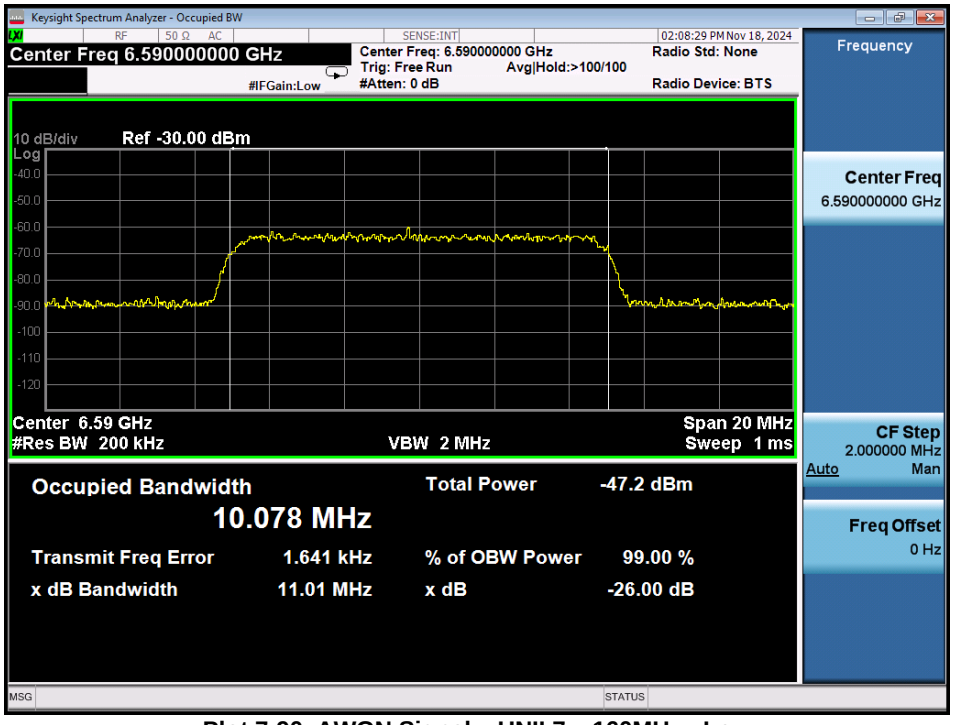
Plot 7-87. AWGN Signal – UNII 5 – 160MHz – Mid



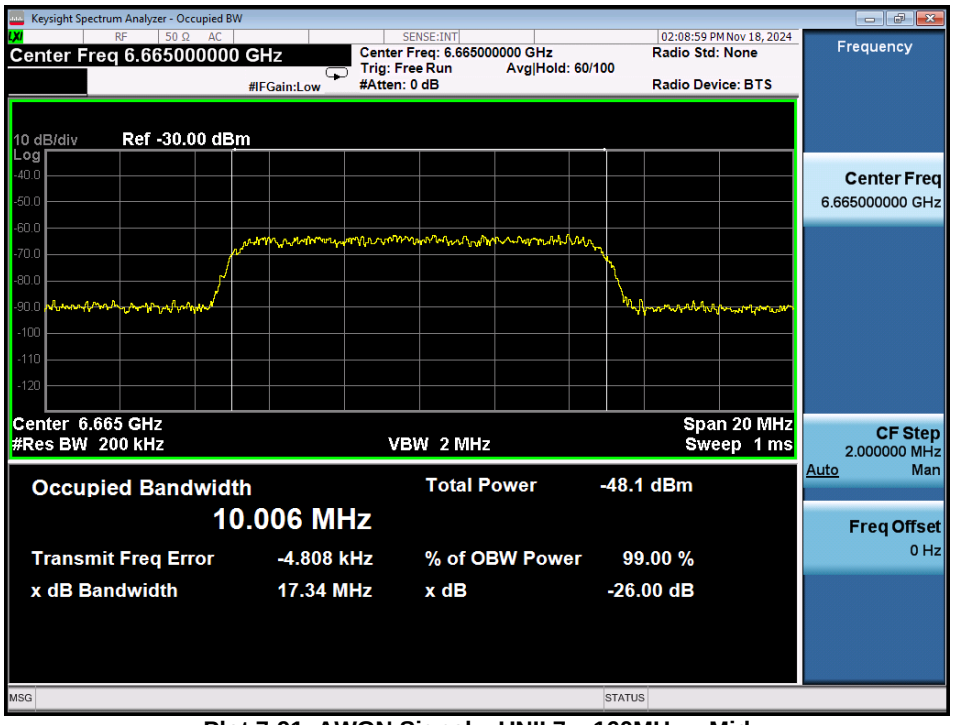
Plot 7-88. AWGN Signal – UNII 5 – 160MHz - High



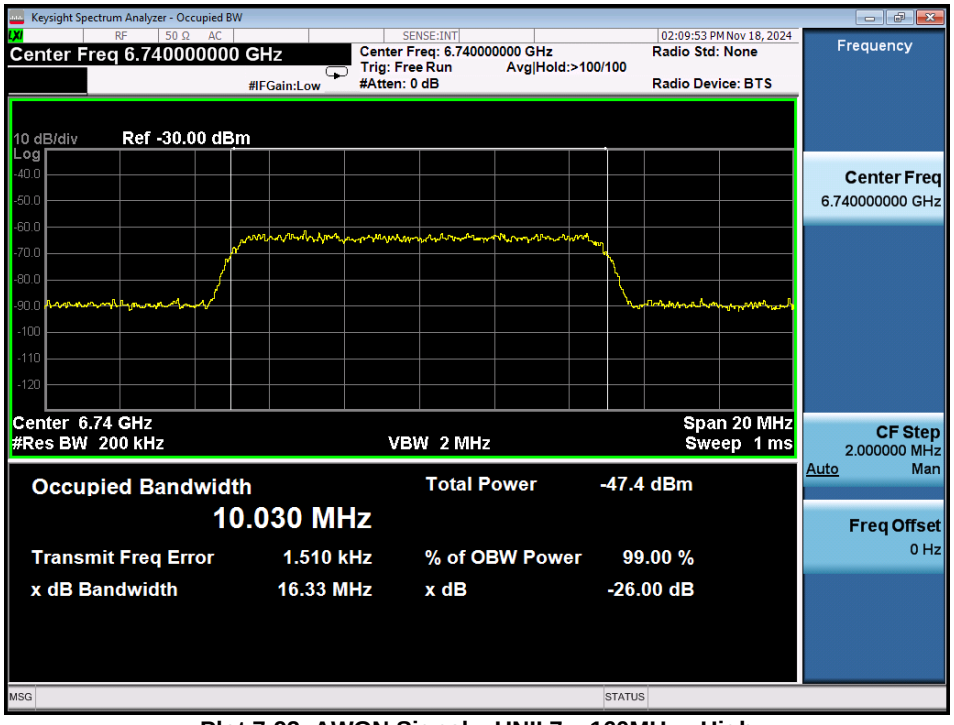
Plot 7-89. AWGN Signal – UNII 7 – 20MHz



Plot 7-90. AWGN Signal – UNII 7 – 160MHz - Low

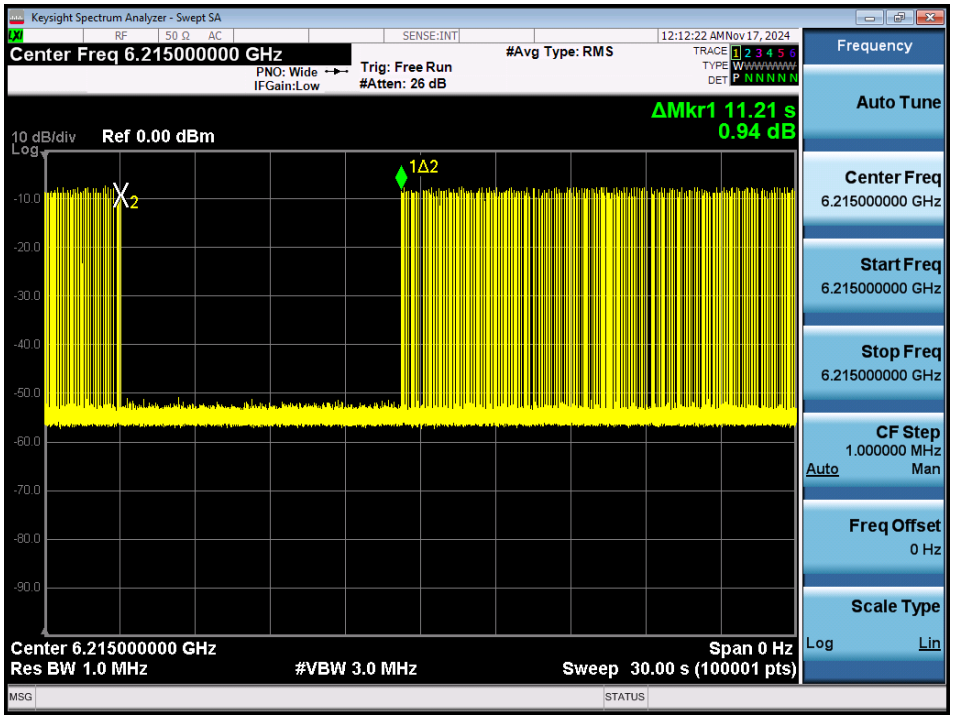


Plot 7-91. AWGN Signal – UNII 7 – 160MHz – Mid

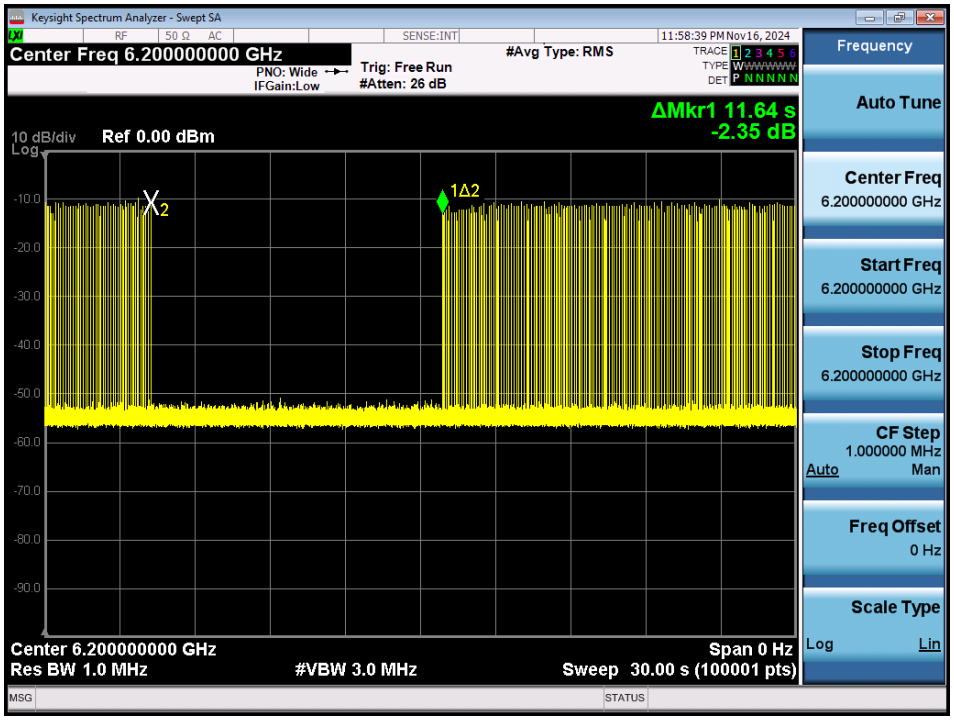


Plot 7-92. AWGN Signal – UNII 7 – 160MHz - High

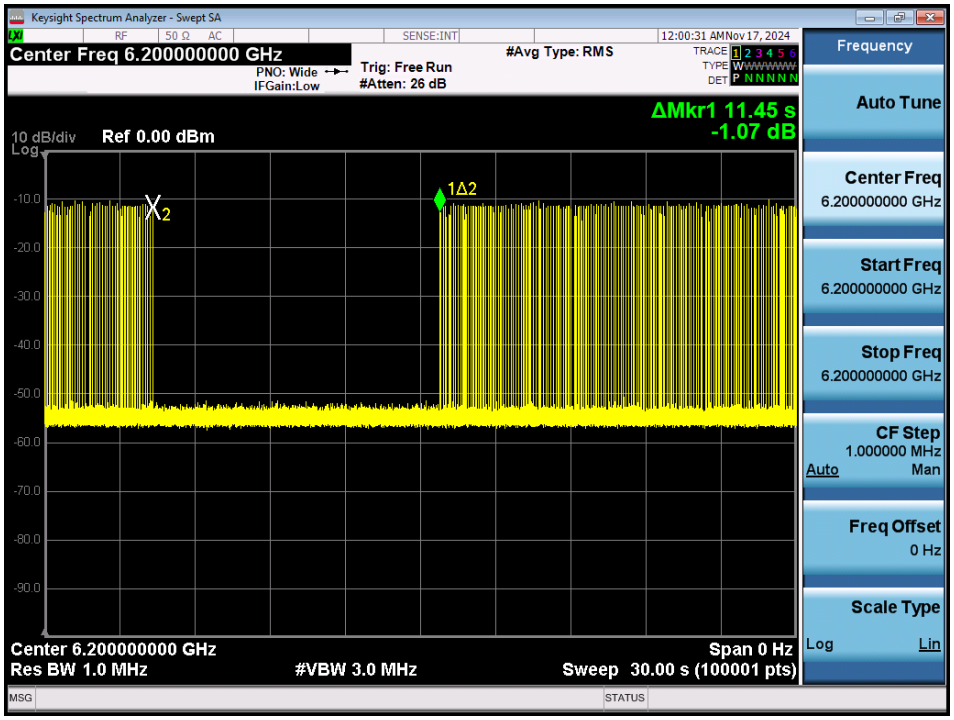
Contention-Based Protocol Timing Plots



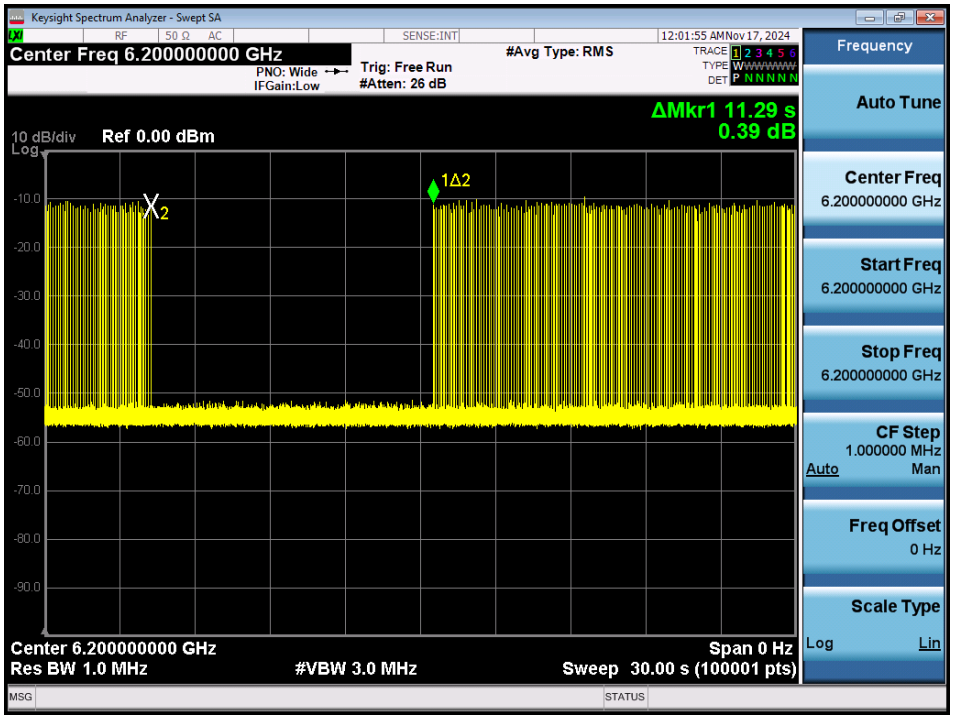
Plot 7-93. Contention Based Protocol Timing Plot – UNII 5 – 20MHz Channel 53



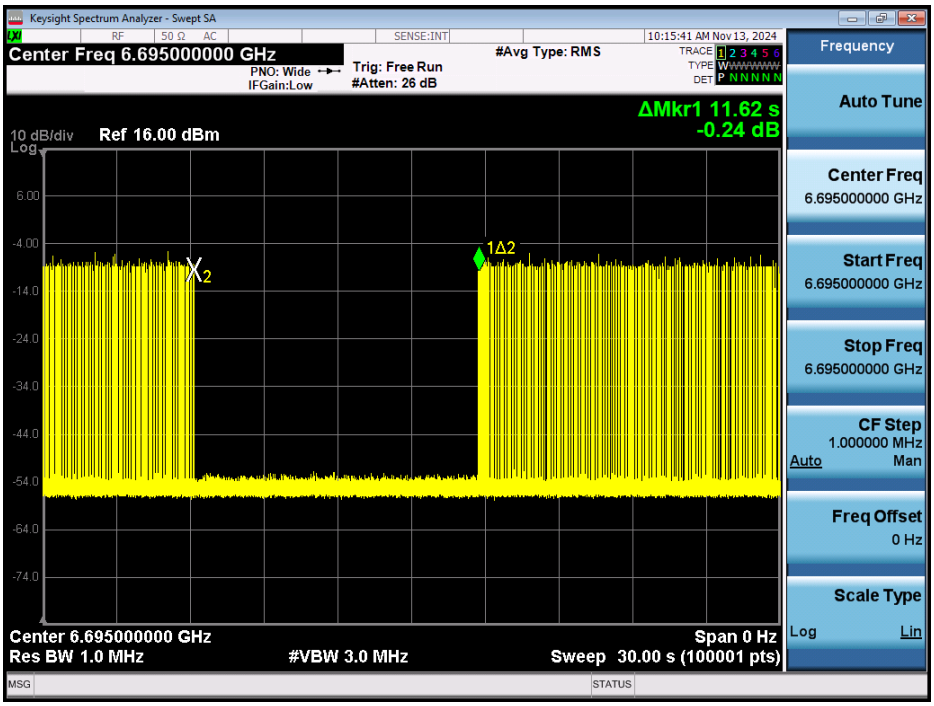
Plot 7-94. Contention Based Protocol Timing Plot – UNII 5 – 160MHz Channel 47 – Low



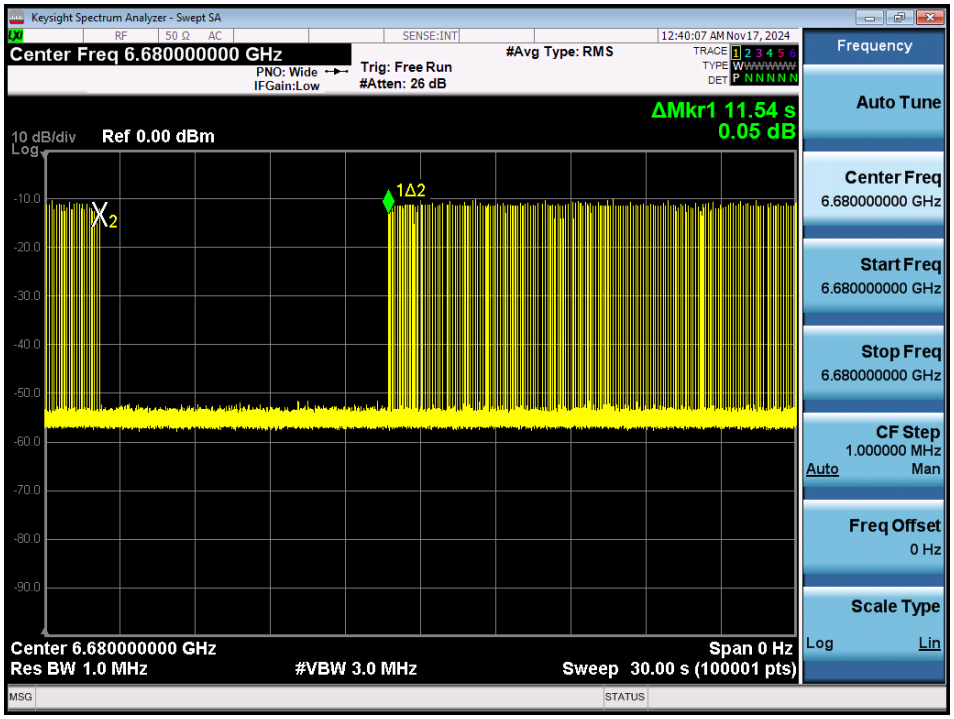
Plot 7-95. Contention Based Protocol Timing Plot –UNII 5 – 160MHz Channel 47 – Mid



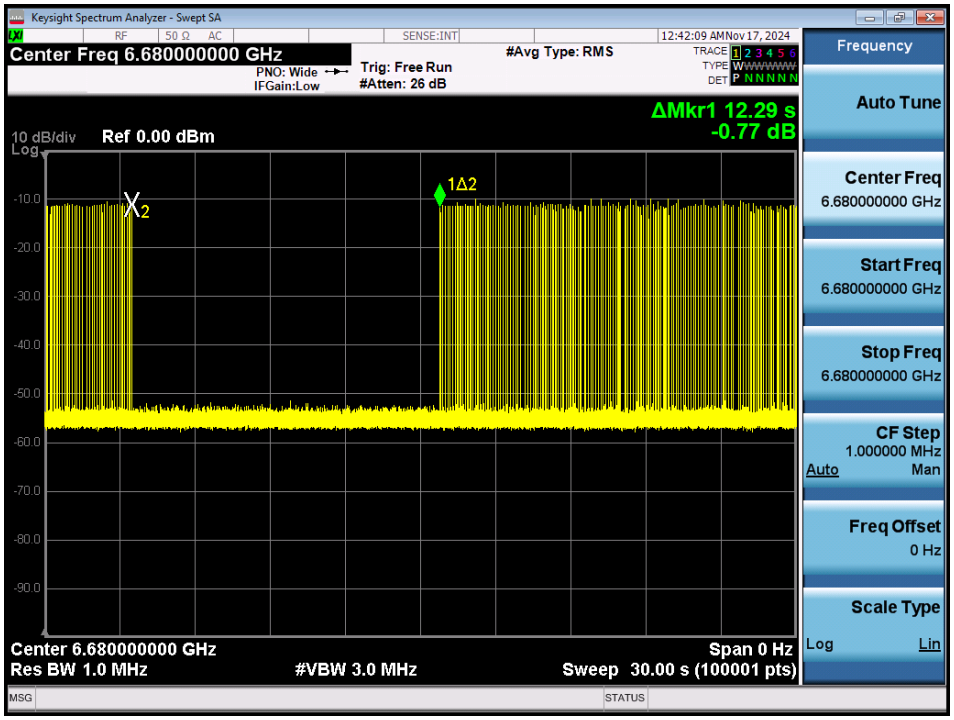
Plot 7-96. Contention Based Protocol Timing Plot – UNII 5 – 160MHz Channel 47 – High



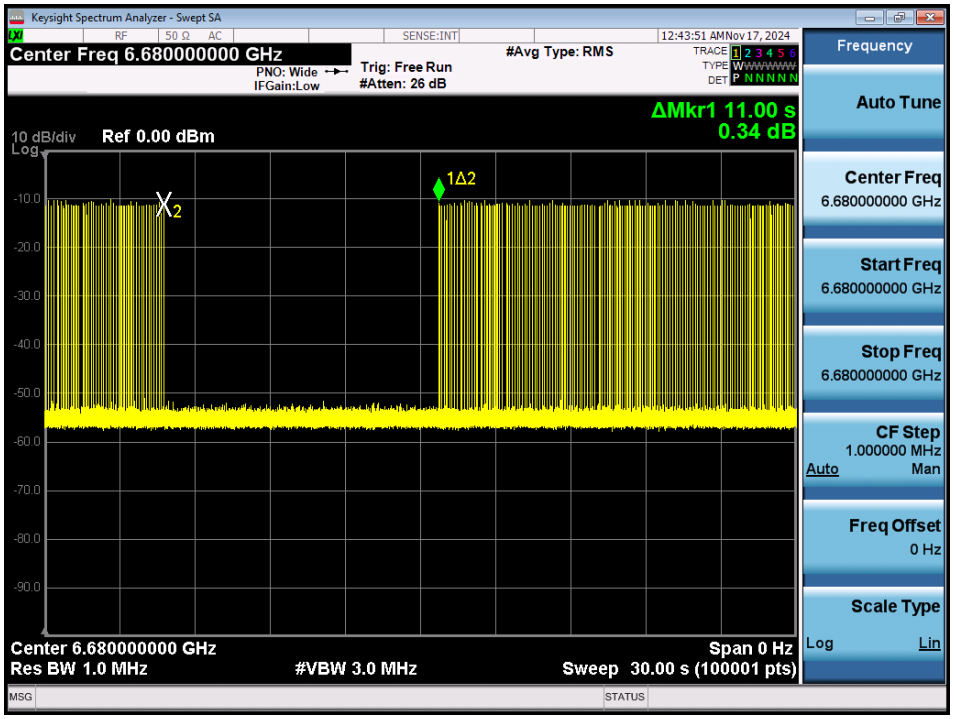
Plot 7-97. Contention Based Protocol Timing Plot – UNII 7 – 20MHz Channel 149



Plot 7-98. Contention Based Protocol Timing Plot – UNII 7 – 160MHz Channel 143 – Low

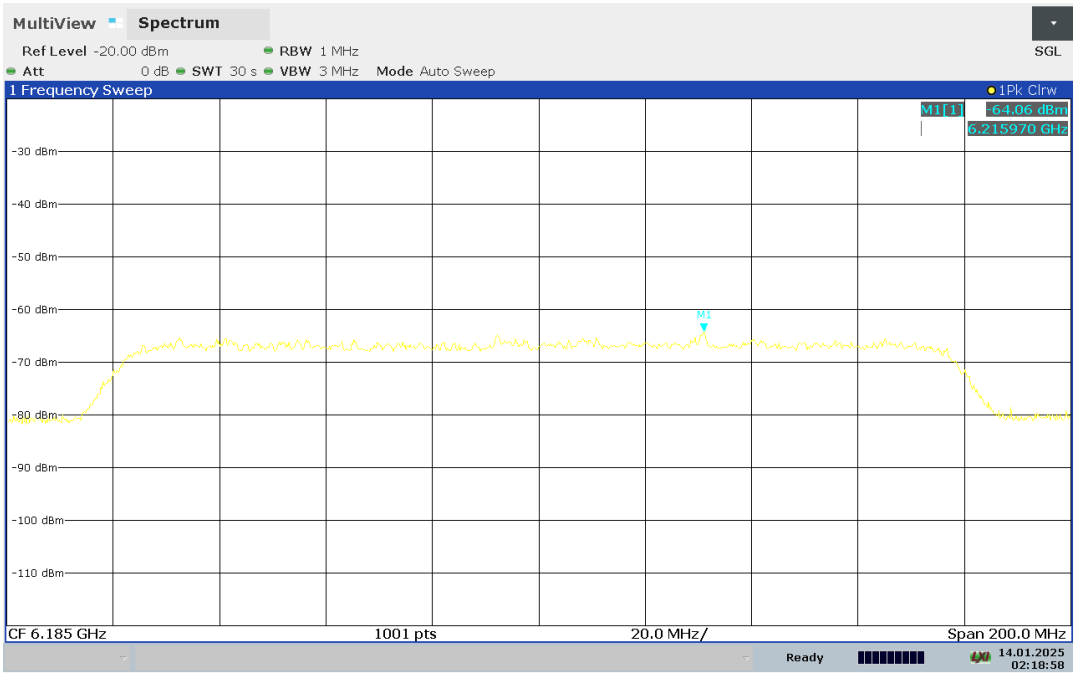


Plot 7-99. Contention Based Protocol Timing Plot – UNII 7 – 160MHz Channel 143 – Mid



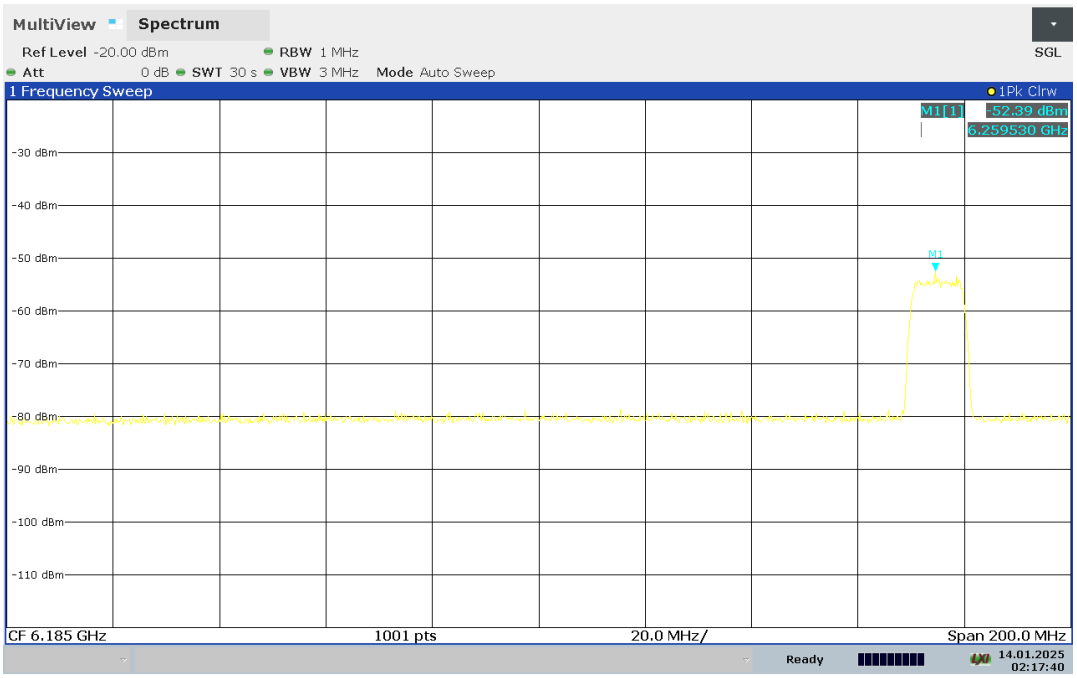
Plot 7-100. Contention Based Protocol Timing Plot – UNII 7 – 160MHz Channel 143 – High

CBP Bandwidth Reduction Plots



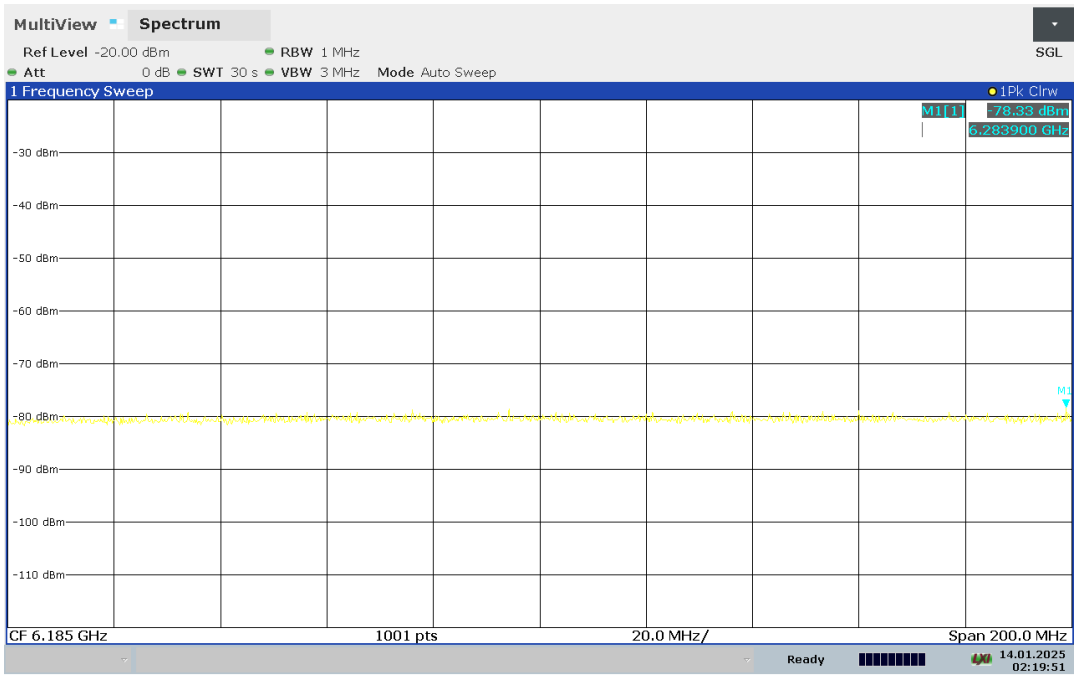
02:18:58 14.01.2025

Plot 7-101. 160MHz Bandwidth, Before AWGN Signal Injected – Channel 47



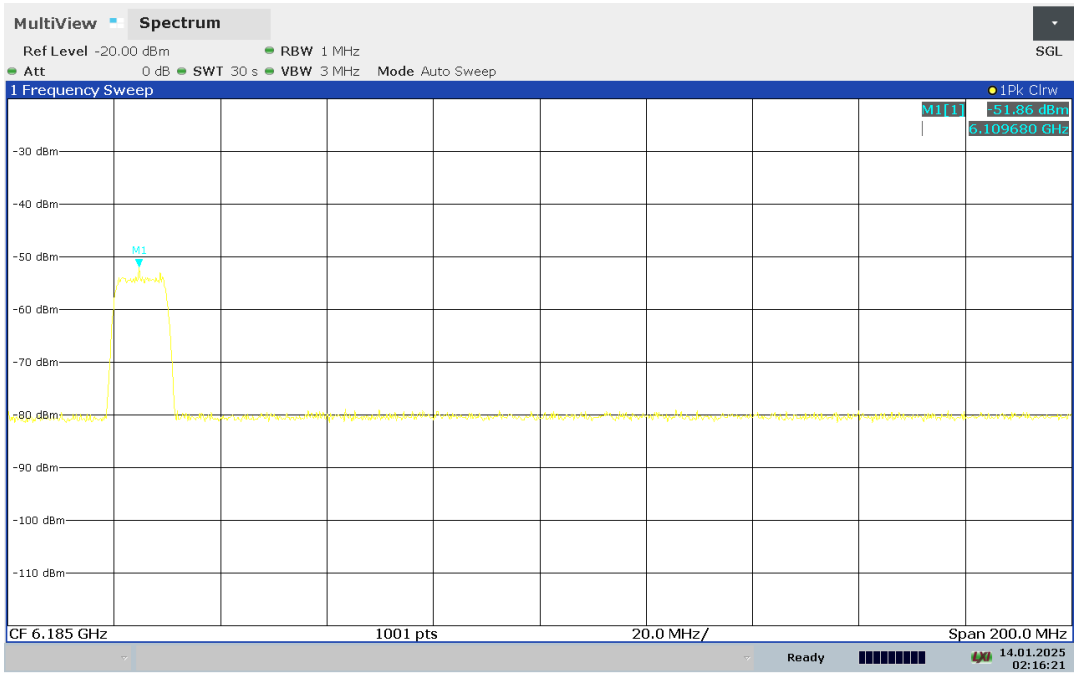
02:17:41 14.01.2025

Plot 7-102. 160MHz Bandwidth, AWGN Signal Injected at Low End – Channel 47



02:19:51 14.01.2025

Plot 7-103. 160MHz Bandwidth, AWGN Signal Injected at Center – Channel 47



02:16:21 14.01.2025

Plot 7-104. 160MHz Bandwidth, AWGN Signal Injected at High End – Channel 47

7.7 Transmit Power Control (TPC)

§15.407(d.10); RSS-248[4.6]

Test Overview and Limit

Very low power devices operating in the 5.925-6.425 and 6.525-6.875 GHz bands shall employ a transmit power control (TPC) mechanism. A very low power device is required to have the capability to operate at least 6 dB below the maximum EIRP power spectral density (PSD) value of −5 dBm/MHz.

Test Procedure Used

ANSI C63.10-2020 – Section 12.4.2.6
KDB 789033 D02 v02r01 – Section F

Test Settings

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Set span to encompass the entire 99% OBW of the signal.
3. Set sweep trigger to “free run.”
4. Set RBW = 1 MHz
5. Set VBW ≥ 3 MHz
6. Number of points in sweep ≥ 2 × span / RBW.
7. Sweep time ≤ (number of points in sweep) × T, where T is defined
8. Detector = power averaging (rms).
9. Trace mode = max hold.
10. Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

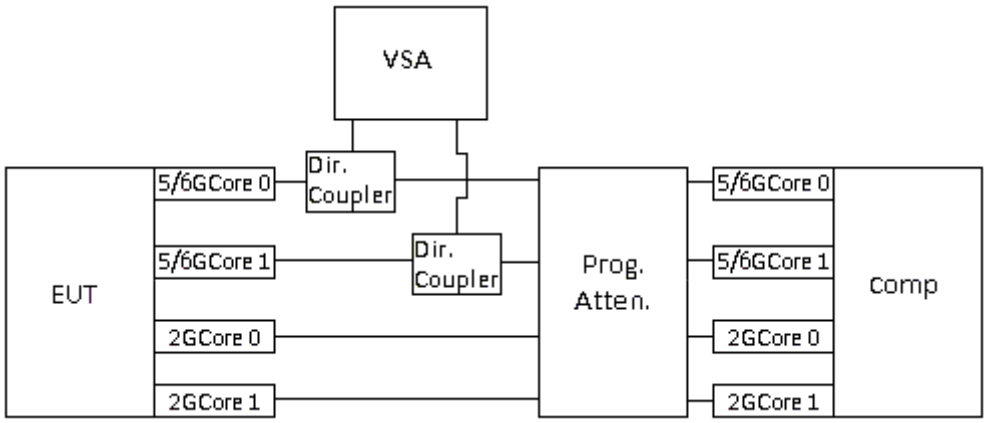


Figure 7-6. Test Instrument & Measurement Setup

This test demonstrates the ability of the device to increase and decrease power by the required 6dB as the RSSI is decreased and increased.

1. Configure EUT and companion device for peer-to-peer communication as shown in Figure 7-6.
2. Set variable attenuator to 0dB (noise free spectral environment, high RSSI simulation)
3. Establish a link and start communication between EUT and companion device
4. Capture PSD on spectrum analyzer
5. Set attenuator to 20dB (noisy spectral environment, low RSSI simulation)
6. Capture PSD on spectrum analyzer
7. Compare the highest PSD captured in step 4 to the highest PSD on step 6 and determine the delta.

Test Notes

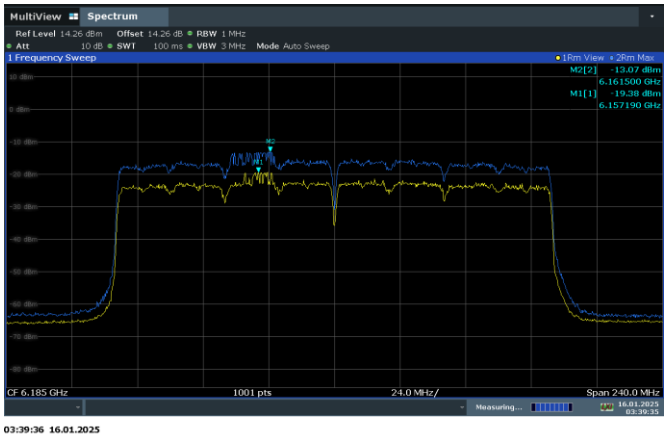
1. The companion device used was model: A3269 (refer to Table 2-10)
2. Per manufacturer's declaration, after establishing communication between the EUT and the companion device, 6GHz UNII signal was used to maintain communication and traffic.
3. TPC is triggered when a high RSSI is detected. As RSSI detected signal decreases, the transmitters output power will increase back to maximum allowed power.

BW [MHz]	Frequency [MHz]	MIMO		Summed Power Density [dBm/MHz]	Antenna Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	e.i.r.p. Power Density Limit [dBm/MHz]
		Measured Power Density [dBm/MHz]					
		Antenna WF8	Antenna WF7a				
160	6185	-13.07	-15.17	-10.98	3.92	-7.07	-5.00

Table 7-25. PSD Measurements (No TPC)

BW [MHz]	Frequency [MHz]	MIMO		Summed Power Density [dBm/MHz]	Antenna Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	e.i.r.p. Power Density Limit [dBm/MHz]
		Measured Power Density [dBm/MHz]					
		Antenna WF8	Antenna WF7a				
160	6185	-19.38	-22.16	-17.54	3.92	-13.62	-11.00

Table 7-26. PSD Measurements (with TPC)



03:39:36 16.01.2025

Plot 7-105. 160MHz Bandwidth – 6185MHz Antenna WF8

03:46:20 16.01.2025

Plot 7-106. 160MHz Bandwidth – 6185MHz Antenna WF7a

7.8 Radiated Spurious Emissions – Above 1GHz

§15.407(b) §15.205 §15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2020 and KDB 789033 D02 v02r01, and at the appropriate frequencies. All channels, modes (e.g. 802.11a, 802.11ax(SU) (20MHz BW), 802.11ax(SU) (40MHz BW), 802.11ax(SU) (80MHz), 802.11ax(SU) (160MHz) and modulations/data rates were investigated among the UNII bands. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

For transmitters operating in the 5.925-7.125 GHz band: All emissions outside of the 5.925-7.125 GHz band shall not exceed an EIRP of −27 dBm/MHz. Emissions found in a restricted band are subject to the limits of 15.209 and RSS-Gen (8.9) as shown in the table below.

Frequency	Field Strength [µV/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-27. Radiated Limits

Test Procedures Used

ANSI C63.10-2020 – Sections 12.7.7, 12.7.6.
KDB 789033 D02 v02r01 – Section G

Test Settings

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be ≥ 2 x span/RBW)
6. Averaging type = power (RMS)
7. Sweep time = auto couple
8. Trace was averaged over 100 sweeps

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

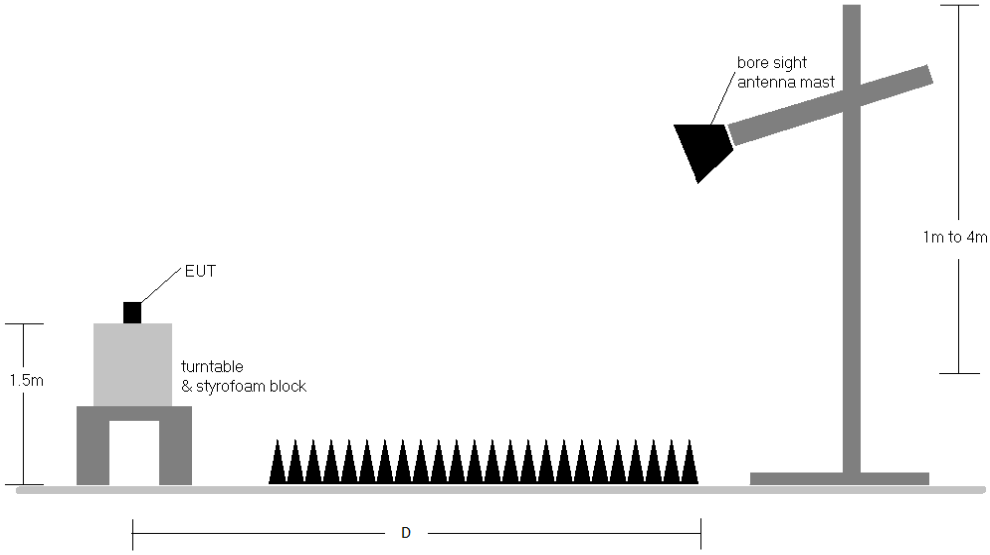


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

1. All emissions that lie in the restricted bands (denoted by a * next to the frequency) specified in §15.205 and section 8.10 of RSS-Gen are below the limit shown in Table 7-27.
2. All spurious emissions lying in restricted bands specified in §15.205 and section 8.10 of RSS-Gen are below the limit shown in Table 7-27. All spurious emissions that do not lie in a restricted band are subject to a limit of -27dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a "conversion" factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions of 68.2dBμV/m.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas.
6. D is the measurement test distance and emissions 1-18GHz were measured at a 3 meters test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
8. All data rates and antenna configurations were investigated and only the worse case is reported
9. The unit was tested with all possible modes and only the highest emission is reported.
10. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
11. All radiated measurements were tested at the highest supported power setting per band.

Sample Calculations

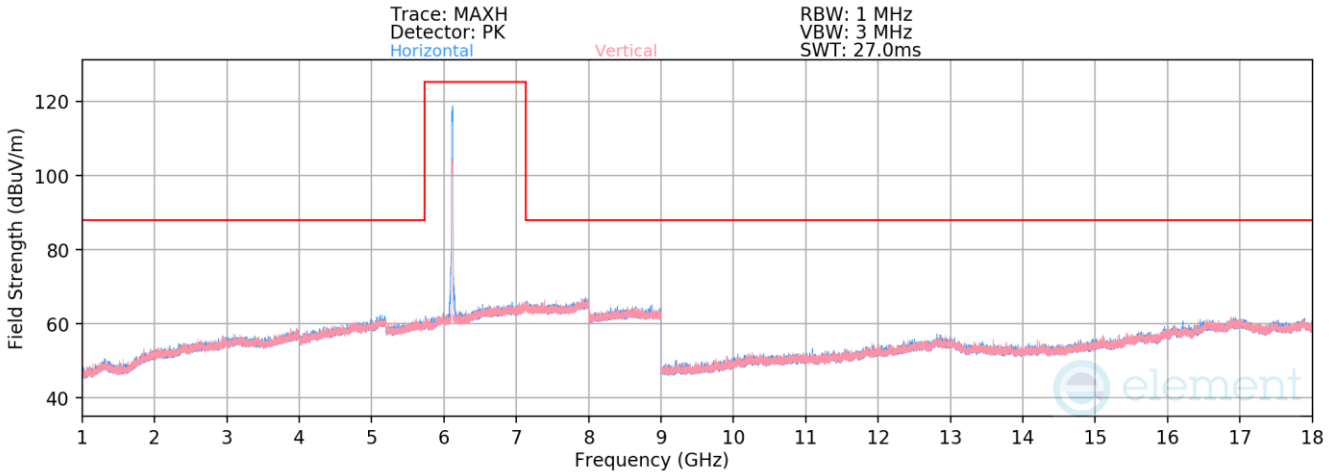
Determining Spurious Emissions Levels

- Field Strength Level [dBμV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] – Preamplifier Gain [dB]
- Margin [dB] = Field Strength Level [dBμV/m] – Limit [dBμV/m]

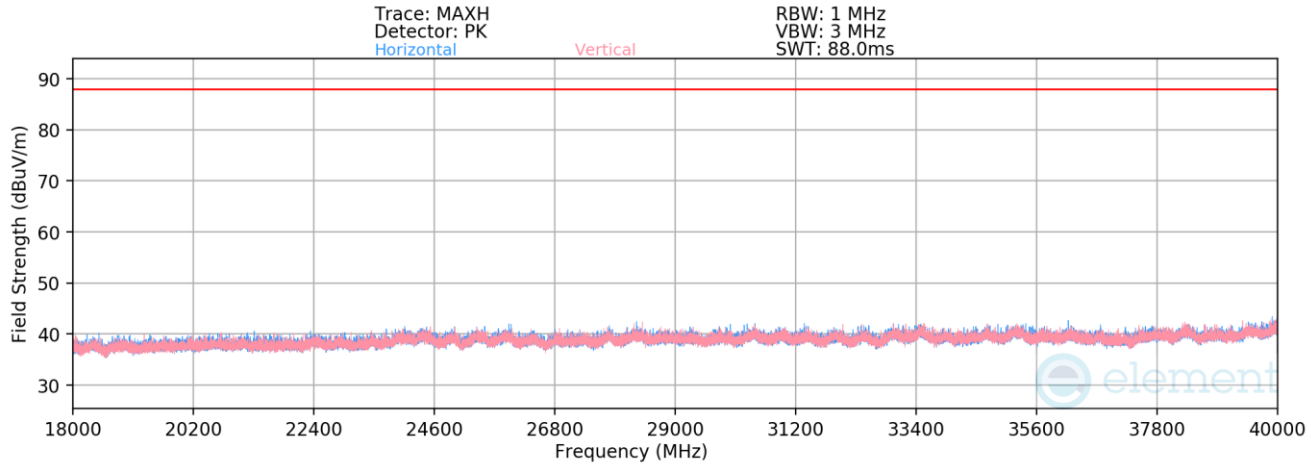
Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 7.7.6 to 7.7.25 was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

7.8.1 SDM Radiated Spurious Emission



Plot 7-107. Radiated Spurious Emissions 1-18GHz SDM (802.11ax – Ch. 33)

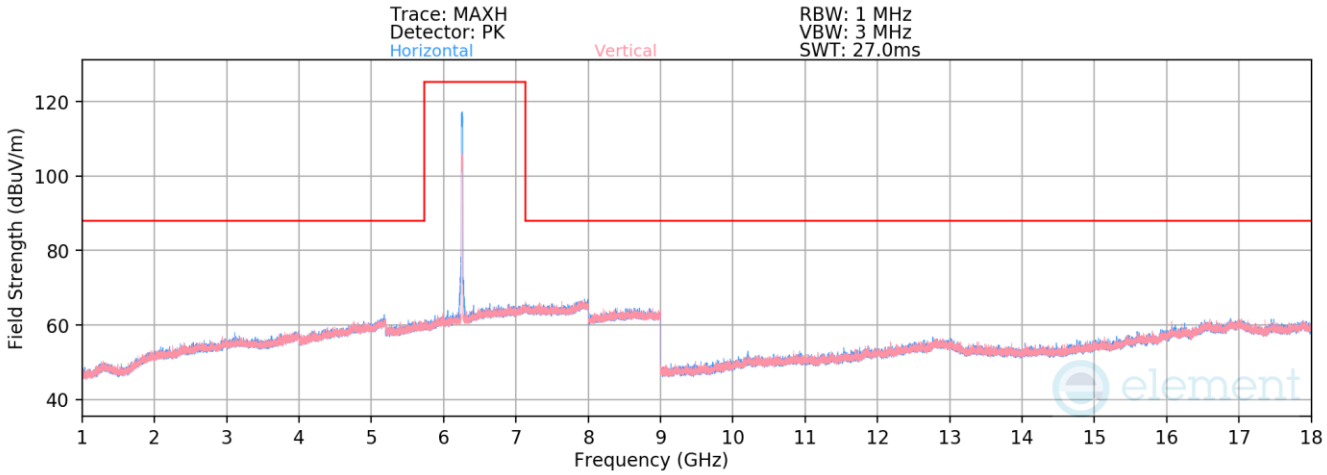


Plot 7-108. Radiated Spurious Emissions 18-40GHz SDM (802.11ax – Ch. 33)

Mode:	802.11ax
Data Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6115MHz
Channel:	33

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	12230.00	Average	H	-	-	-85.76	20.87	42.11	53.98	-11.87
*	12230.00	Peak	H	-	-	-74.14	20.87	53.73	73.98	-20.25

Table 7-28. Radiated Spurious Emission Measurements SDM

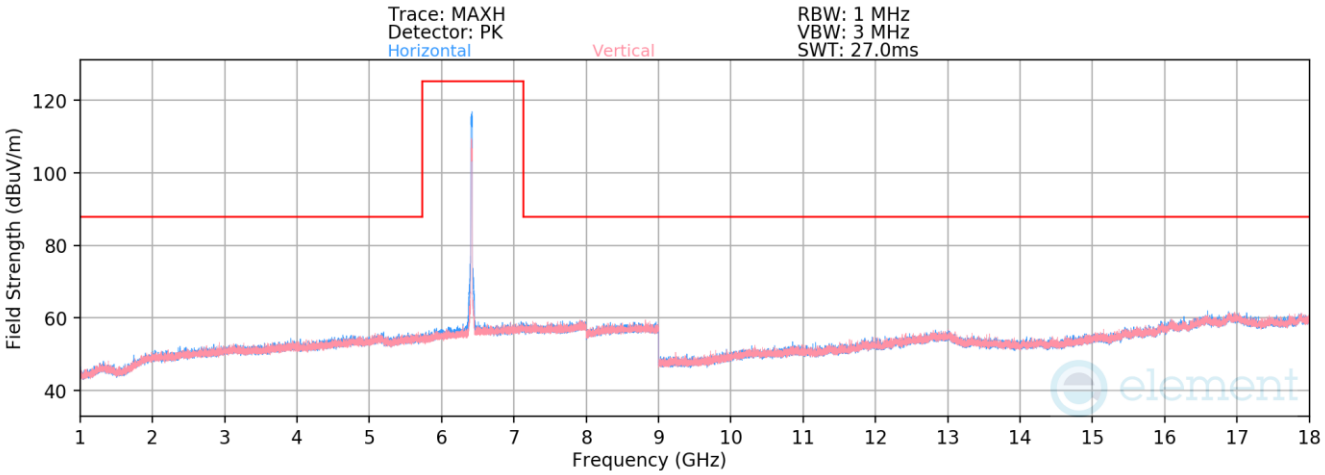


Plot 7-109. Radiated Spurious Emissions 1-18GHz SDM (802.11ax – Ch. 61)

Mode:	802.11ax
Data Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6255MHz
Channel:	61

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	12510.00	Average	H	-	-	-85.07	21.30	43.23	53.98	-10.75
*	12510.00	Peak	H	-	-	-74.04	21.30	54.26	73.98	-19.72

Table 7-29. Radiated Spurious Emission Measurements SDM

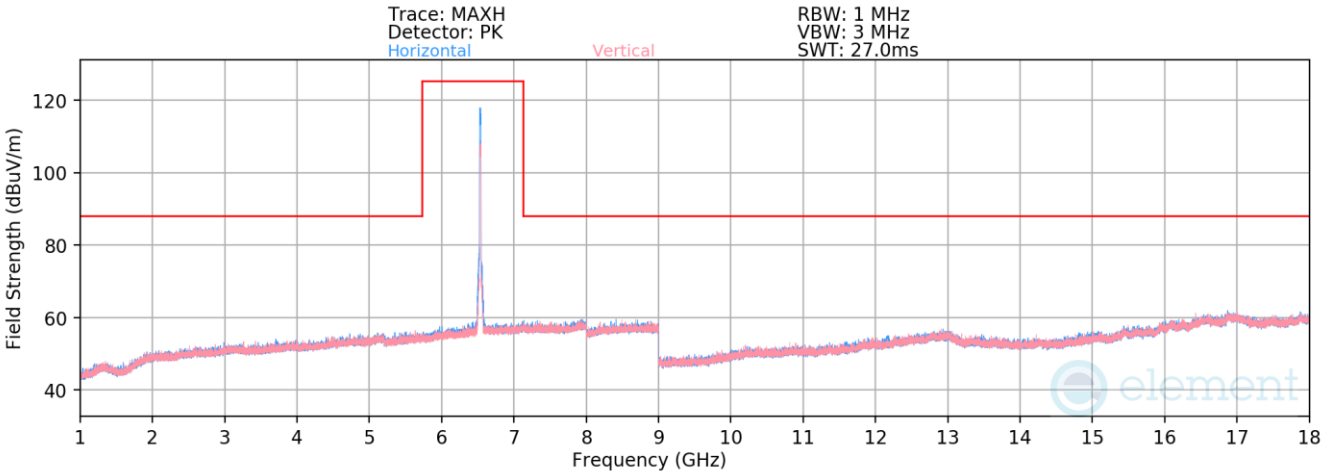


Plot 7-110. Radiated Spurious Emissions 1-18GHz SDM (802.11ax – Ch. 93)

Mode:	802.11ax
Data Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6415MHz
Channel:	93

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
12830.00	Average	H	-	-	-85.02	21.66	43.64	68.23	-24.59
12830.00	Peak	H	-	-	-73.62	21.66	55.04	88.23	-33.19

Table 7-30. Radiated Spurious Emission Measurements SDM

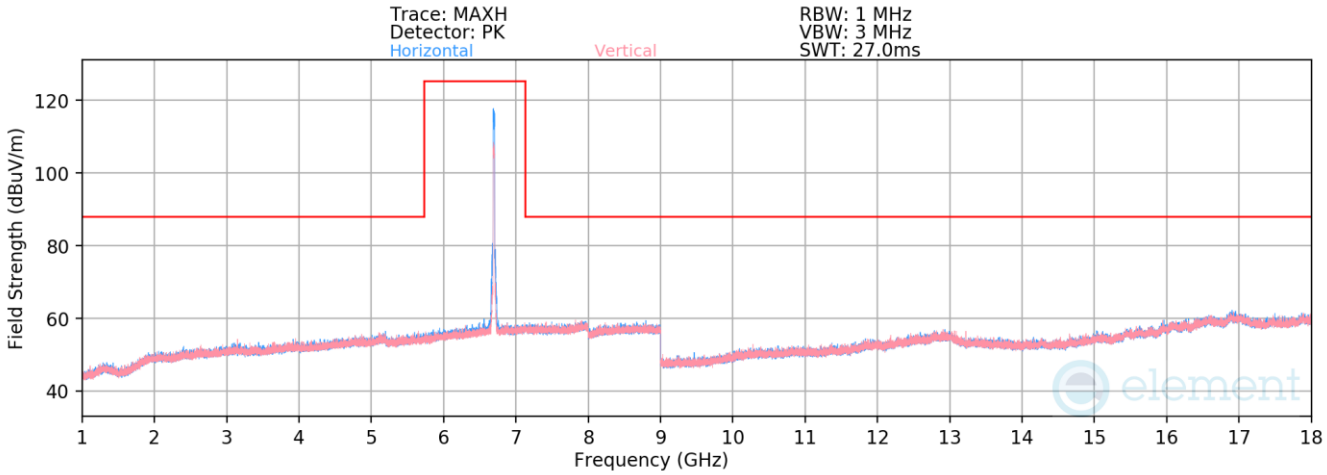


Plot 7-111. Radiated Spurious Emissions 1-18GHz SDM (802.11ax – Ch. 117)

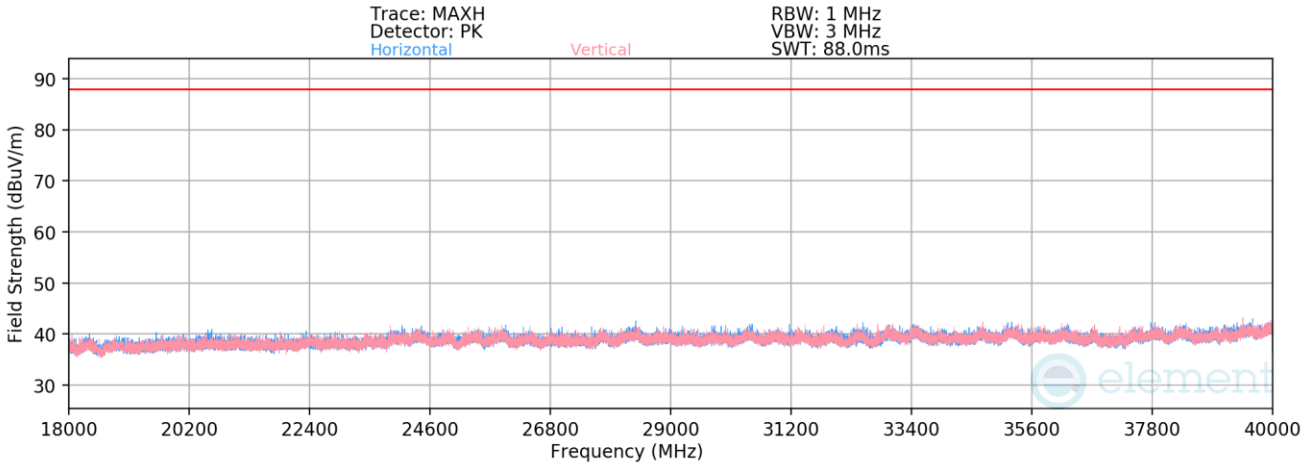
Mode:	802.11ax
Data Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6535MHz
Channel:	117

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
13070.00	Average	H	-	-	-85.12	21.89	43.77	68.23	-24.46
13070.00	Peak	H	-	-	-73.70	21.89	55.19	88.23	-33.04

Table 7-31. Radiated Spurious Emission Measurements SDM



Plot 7-112. Radiated Spurious Emissions 1-18GHz SDM (802.11ax – Ch. 149)

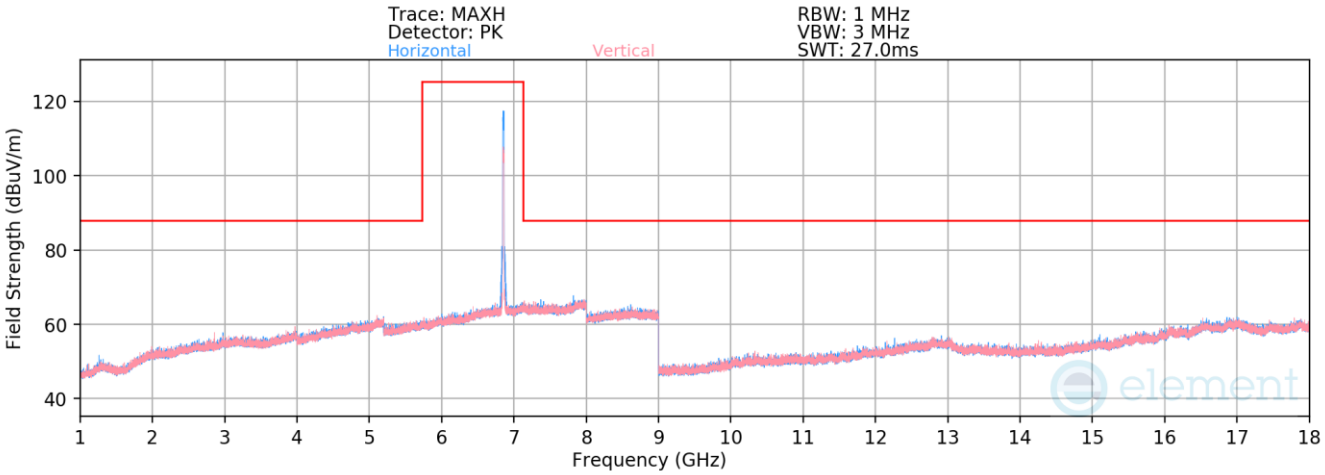


Plot 7-113. Radiated Spurious Emissions 18-40GHz SDM (802.11ax – Ch. 149)

Mode:	802.11ax
Data Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6695MHz
Channel:	149

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	13390.00	Average	H	-	-	-85.50	22.21	43.71	53.98	-10.27
*	13390.00	Peak	H	-	-	-73.80	21.88	55.08	73.98	-18.90

Table 7-32. Radiated Spurious Emission Measurements SDM



Plot 7-114. Radiated Spurious Emissions 1-18GHz SDM (802.11ax – Ch. 181)

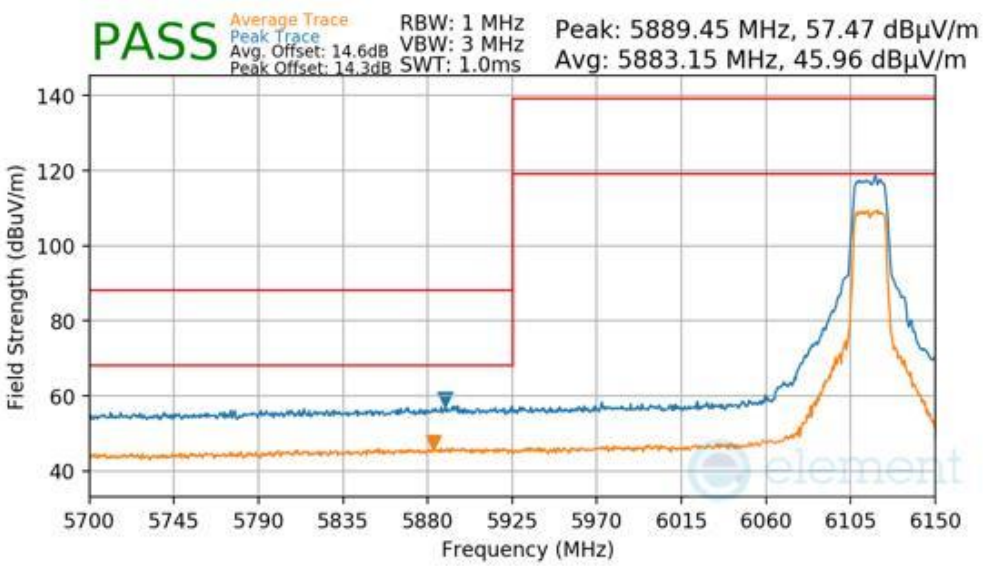
Mode:	802.11ax
Data Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6855MHz
Channel:	181

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
13710.00	Average	H	-	-	-85.73	21.73	43.00	68.23	-25.23
13710.00	Peak	H	-	-	-74.40	21.73	54.33	88.23	-33.90

Table 7-33. Radiated Spurious Emission Measurements SDM

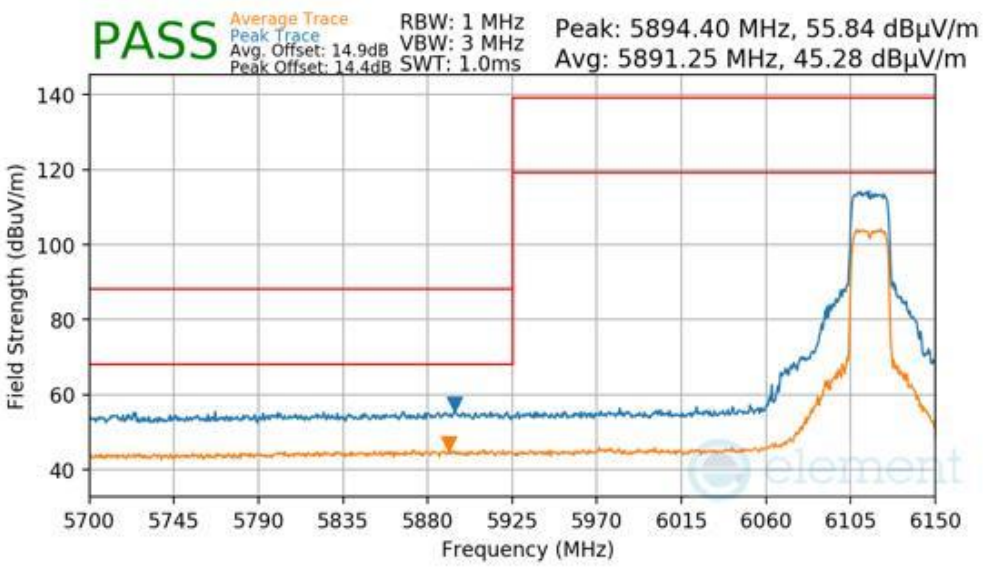
7.8.2 Antenna WF8 Radiated Band Edge Measurements (20MHz BW)

Mode	802.11a
Data Rate	MCS54
Distance of Measurement	3 Meters
Operating Frequency	6115MHz
Channel	33



Plot 7-115 Antenna WF8 Radiated Lower Band Edge (Peak & Average – UNII Band 5)

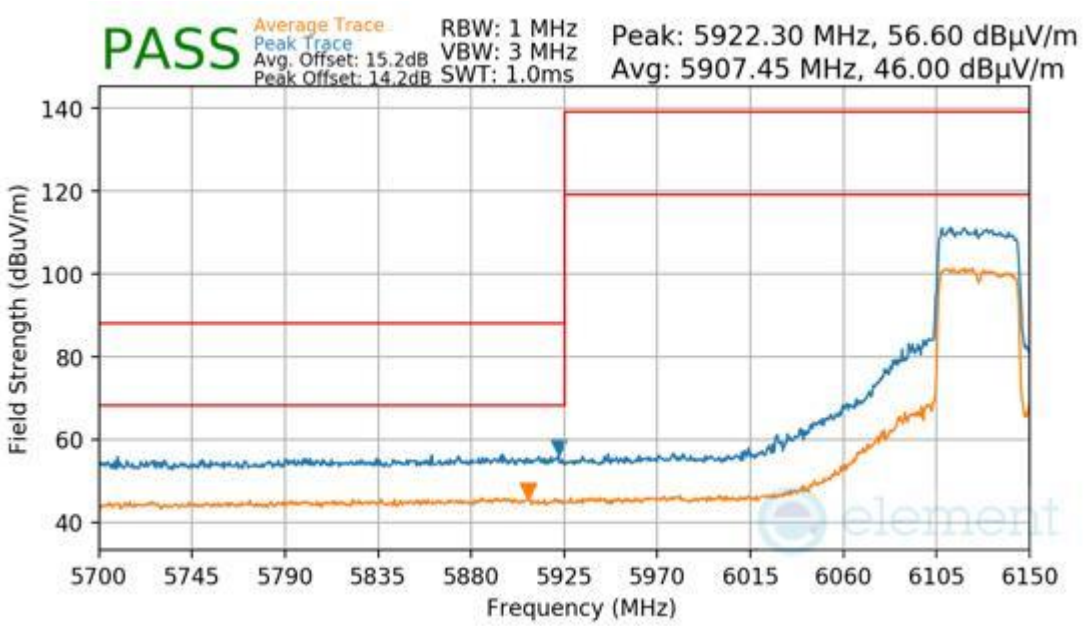
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6115MHz
Channel	33



Plot 7-116 Antenna WF8 Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.3 Antenna WF8 Radiated Band Edge Measurements (40MHz BW)

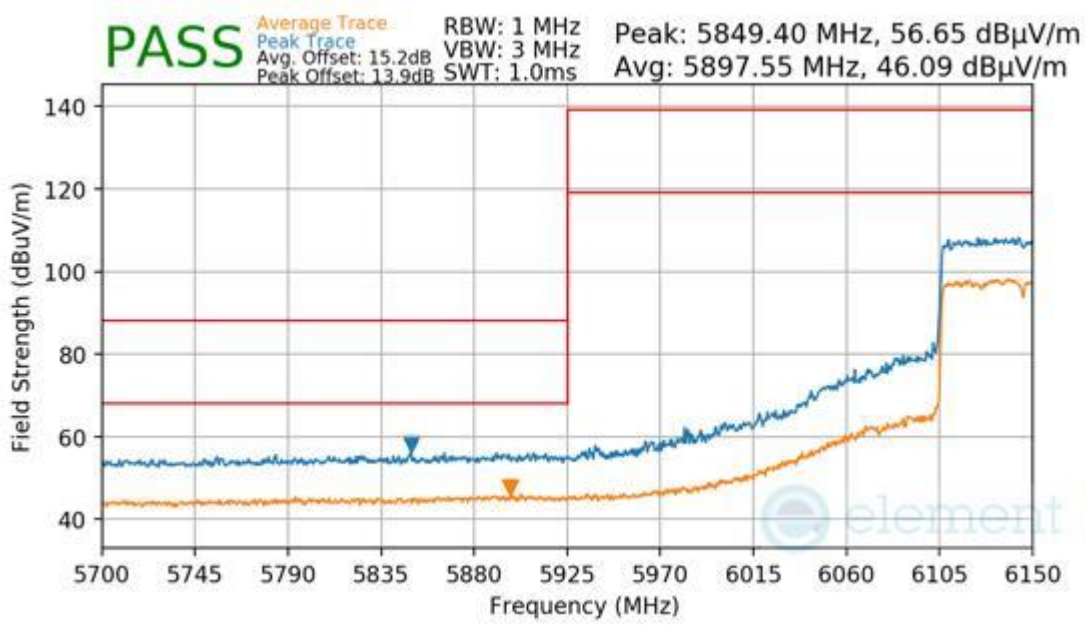
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6125MHz
Channel	35



Plot 7-117 Antenna WF8 Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.4 Antenna WF8 Radiated Band Edge Measurements (80MHz BW)

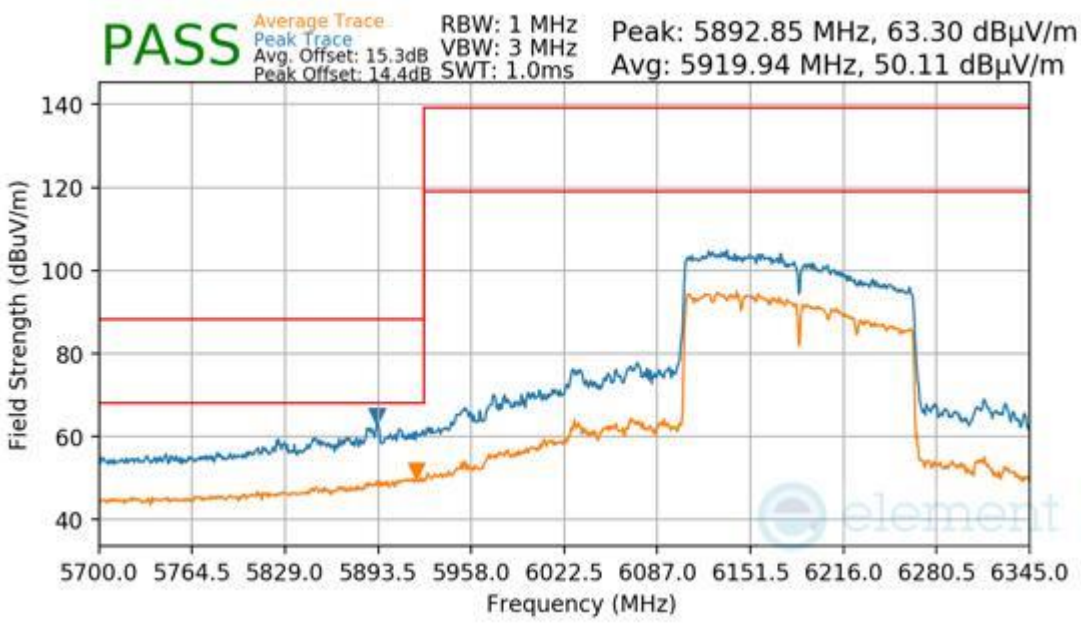
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6145MHz
Channel	39



Plot 7-118 Antenna WF8 Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.5 Antenna WF8 Radiated Band Edge Measurements (160MHz BW)

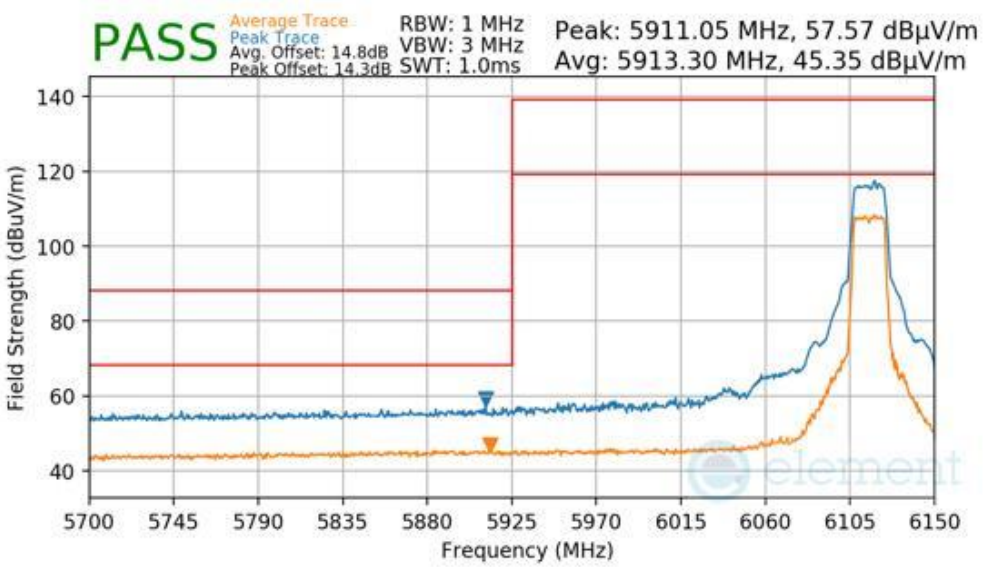
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6185MHz
Channel	47



Plot 7-119 Antenna WF8 Radiated Lower Band Edge (Peak & Average – UNII Band 5)

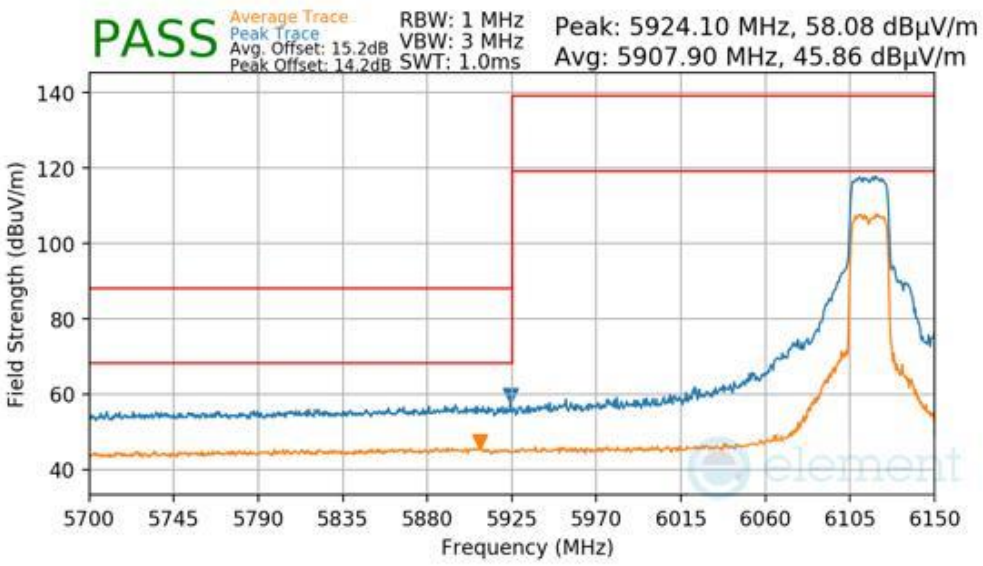
7.8.6 Antenna WF7a Radiated Band Edge Measurements (20MHz BW)

Mode	802.11a
Data Rate	MCS54
Distance of Measurement	3 Meters
Operating Frequency	6115MHz
Channel	33



Plot 7-120 Antenna WF7a Radiated Lower Band Edge (Peak & Average – UNII Band 5)

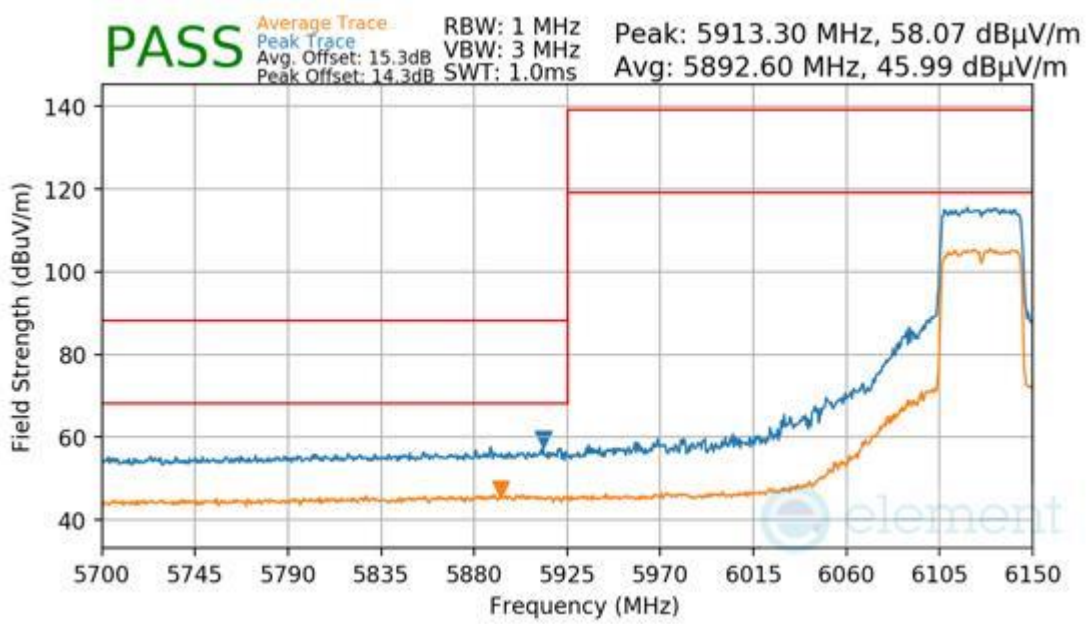
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6115MHz
Channel	33



Plot 7-121 Antenna WF7a Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.7 Antenna WF7a Radiated Band Edge Measurements (40MHz BW)

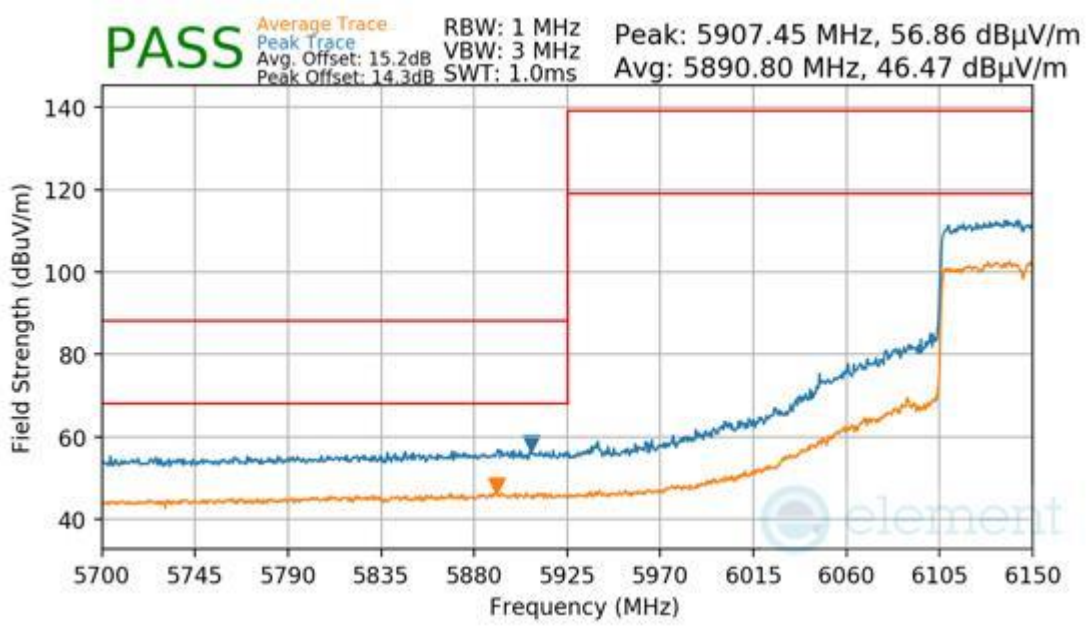
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6125MHz
Channel	35



Plot 7-122 Antenna WF7a Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.8 Antenna WF7a Radiated Band Edge Measurements (80MHz BW)

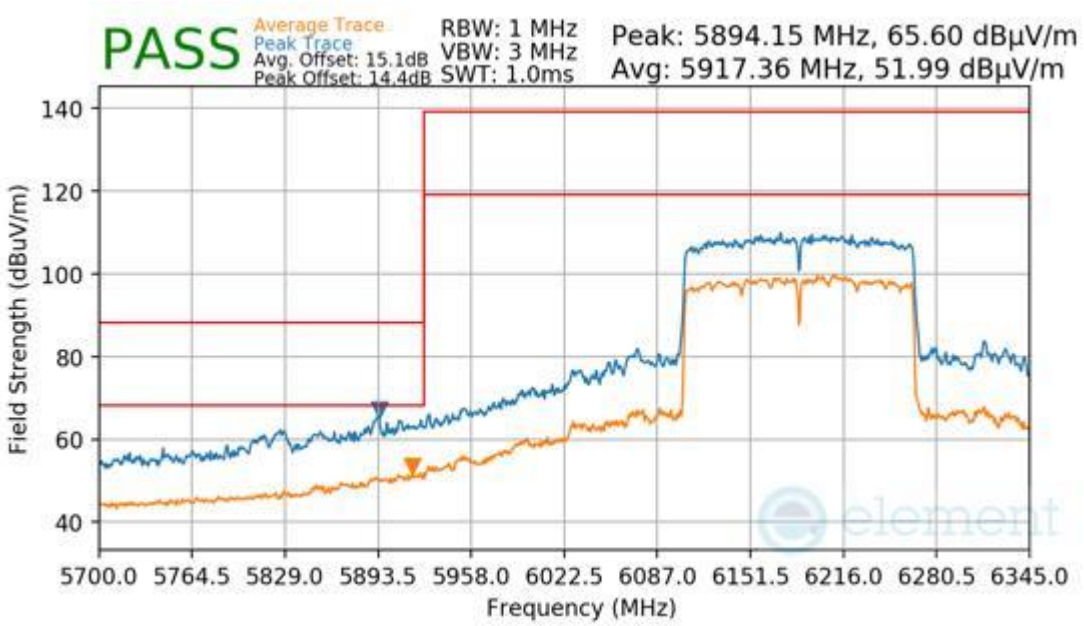
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6145MHz
Channel	39



Plot 7-123 Antenna WF7a Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.9 Antenna WF7a Radiated Band Edge Measurements (160MHz BW)

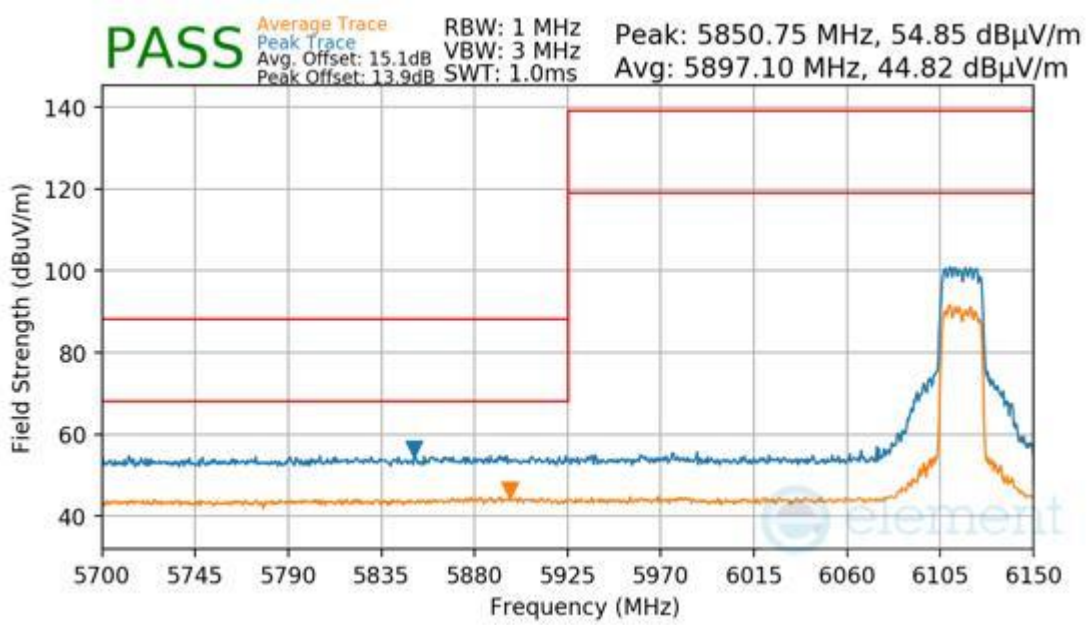
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6185MHz
Channel	47



Plot 7-124 Antenna WF7a Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.10 SDM Radiated Band Edge Measurements (20MHz BW)

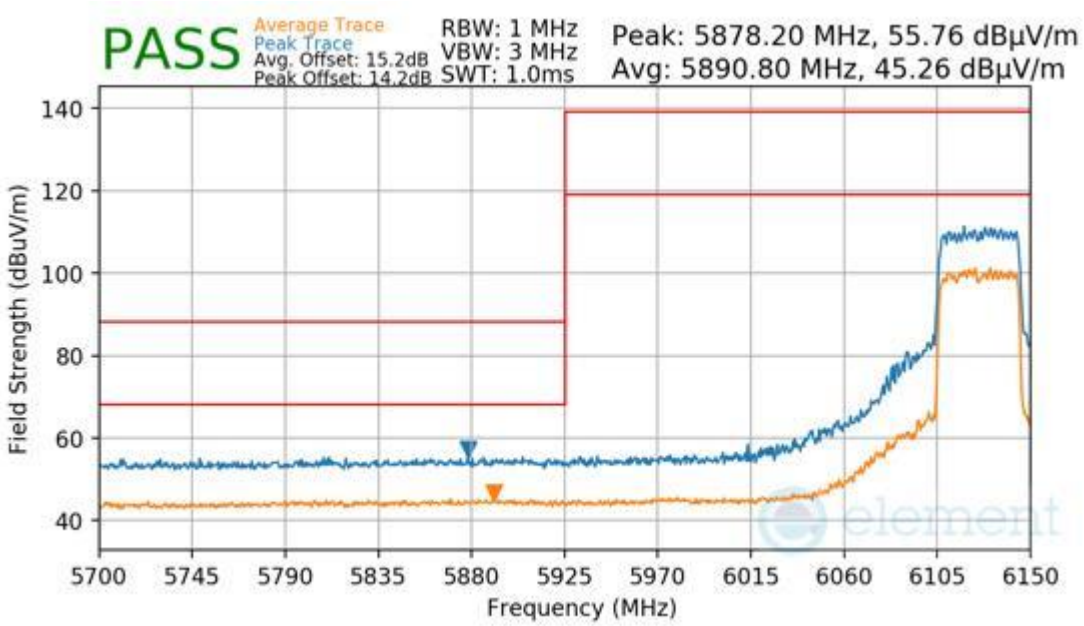
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6115MHz
Channel	33



Plot 7-125 SDM Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.11 SDM Radiated Band Edge Measurements (40MHz BW)

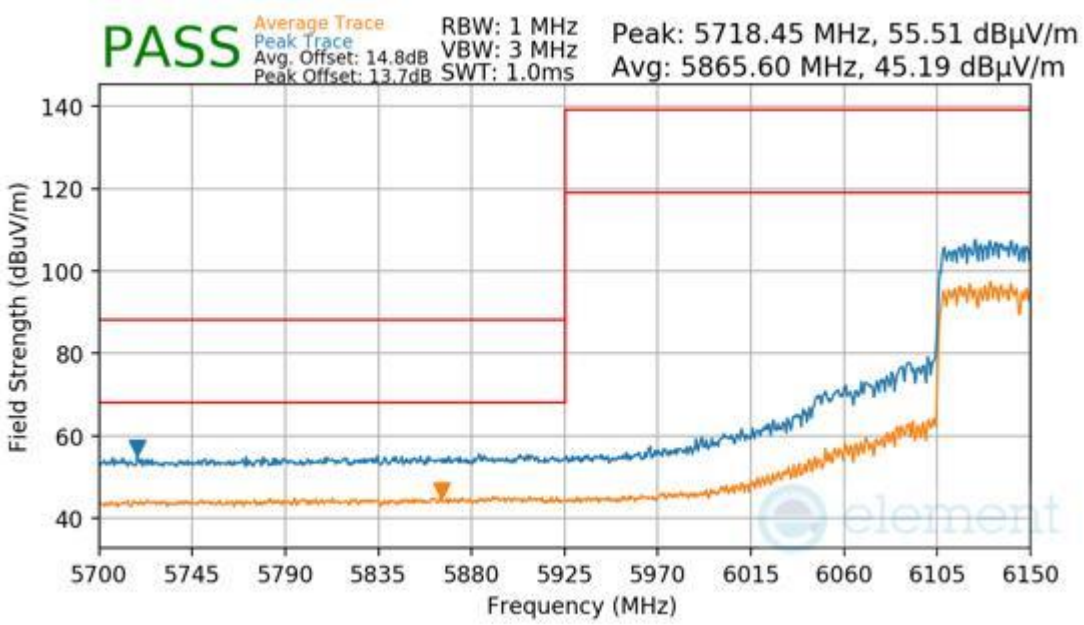
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6125MHz
Channel	35



Plot 7-126 SDM Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.12 SDM Radiated Band Edge Measurements (80MHz BW)

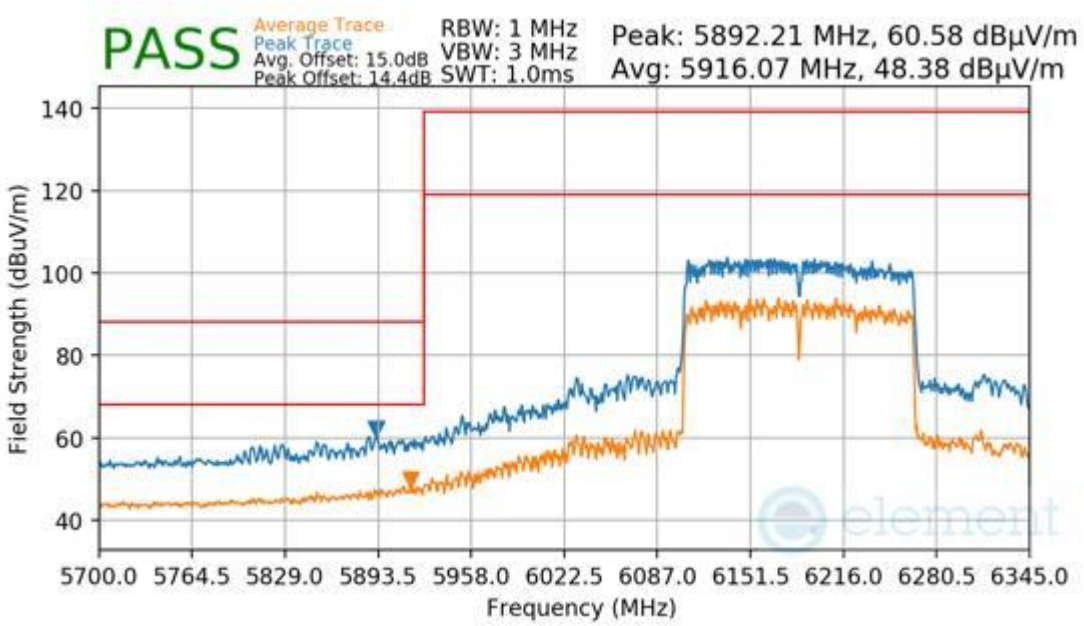
Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6145MHz
Channel	39



Plot 7-127 SDM Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.8.13 SDM Radiated Band Edge Measurements (160MHz BW)

Mode	802.11ax-SU
Data Rate	MCS11
Distance of Measurement	3 Meters
Operating Frequency	6185MHz
Channel	47



Plot 7-128 SDM Radiated Lower Band Edge (Peak & Average – UNII Band 5)

7.9 Radiated Spurious Emissions – Below 1GHz

§15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 7-34 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [µV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-34. Radiated Limits

Test Procedures Used

ANSI C63.10-2020

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. VBW = 300kHz
4. Detector = quasi-peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

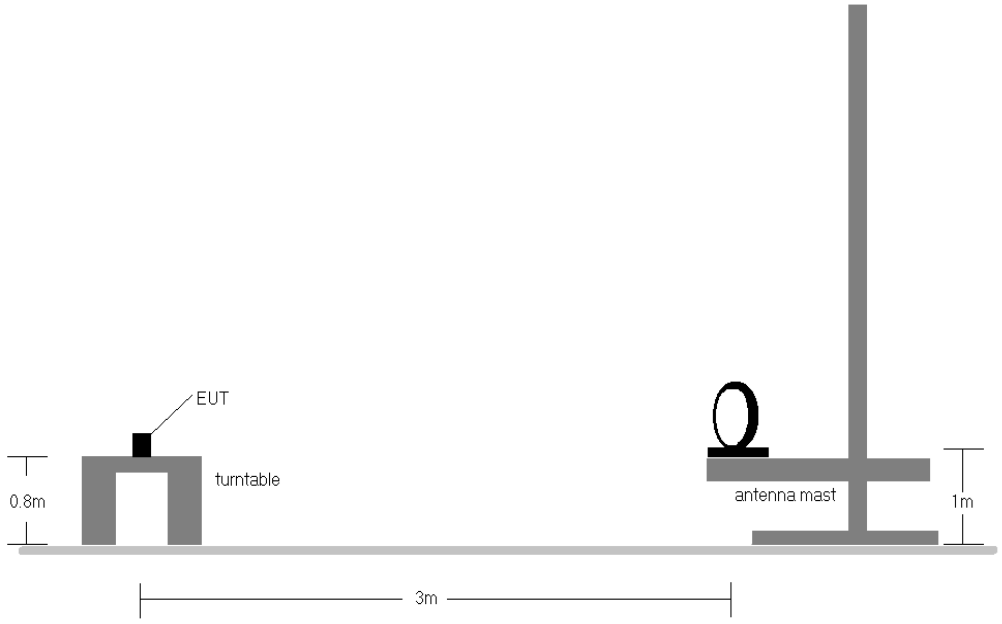


Figure 7-8. Radiated Test Setup < 30MHz

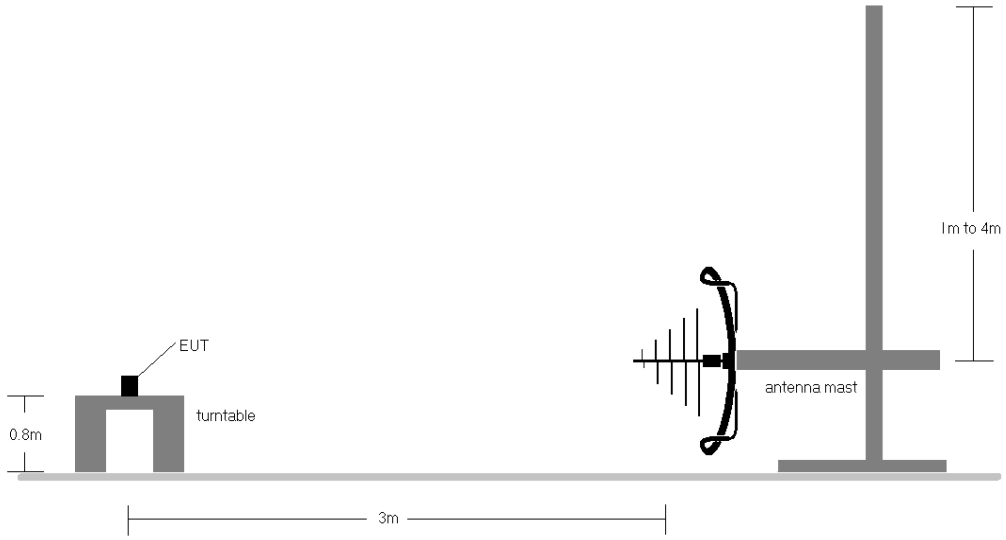


Figure 7-9. Radiated Test Setup < 1GHz

Test Notes

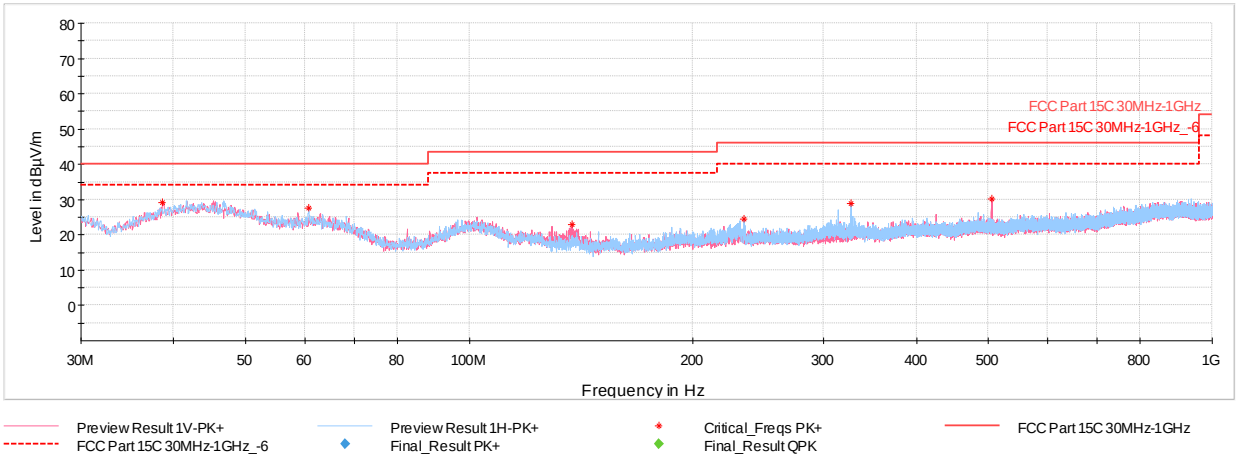
1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limit shown in Table 7-34.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes. For below 30MHz the loop antenna was positioned in 3 orthogonal planes (X front, Y side, Z top) to determine the orientation resulting in the worst case emissions.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector on emissions that were within 6dB of the limit.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. Both configurations below were investigated, and the worst case has been reported.
    a. EUT powered by AC/DC adaptor via USB-C cable with wire charger
    b. EUT powered by host PC via USB-C cable with wire charger
10. All antenna configurations were investigated and only the worst case is reported.
11. The unit was tested with all possible modes and only the highest emission is reported.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$ - Preamp Gain $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

7.9.1 SDM Radiated Spurious Emissions Measurements (Below 1GHz)



Plot 7-129. Radiated Spurious Emissions below 1GHz SDM, 802.11ax, Ch.33 with host PC via USB-C cable with wire charger

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
38.63	Max Peak	V	100	189	-61.50	-16.28	29.22	40.00	-10.78
60.80	Max Peak	H	300	307	-63.42	-16.02	27.56	40.00	-12.44
137.38	Max Peak	V	100	309	-64.03	-20.04	22.93	43.52	-20.59
234.09	Max Peak	H	100	199	-67.74	-14.89	24.37	46.02	-21.65
326.68	Max Peak	H	100	170	-65.70	-12.41	28.89	46.02	-17.13
504.43	Max Peak	V	100	170	-68.11	-8.57	30.32	46.02	-15.70

Table 7-35. Radiated Spurious Emissions Measurement below 1GHz SDM, 802.11ax, Ch.33 with host PC via USB-C cable with wire charger

7.10 AC Line-Conducted Emissions Measurement

§15.407; RSS-Gen[8.8]

Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for AC Line conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

All conducted emissions must not exceed the limits shown in the table below, per Section 15.207 and RSS-Gen (8.8).

Frequency of emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Table 7-36. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2020, Section 6.2

Test Settings

Quasi-Peak Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

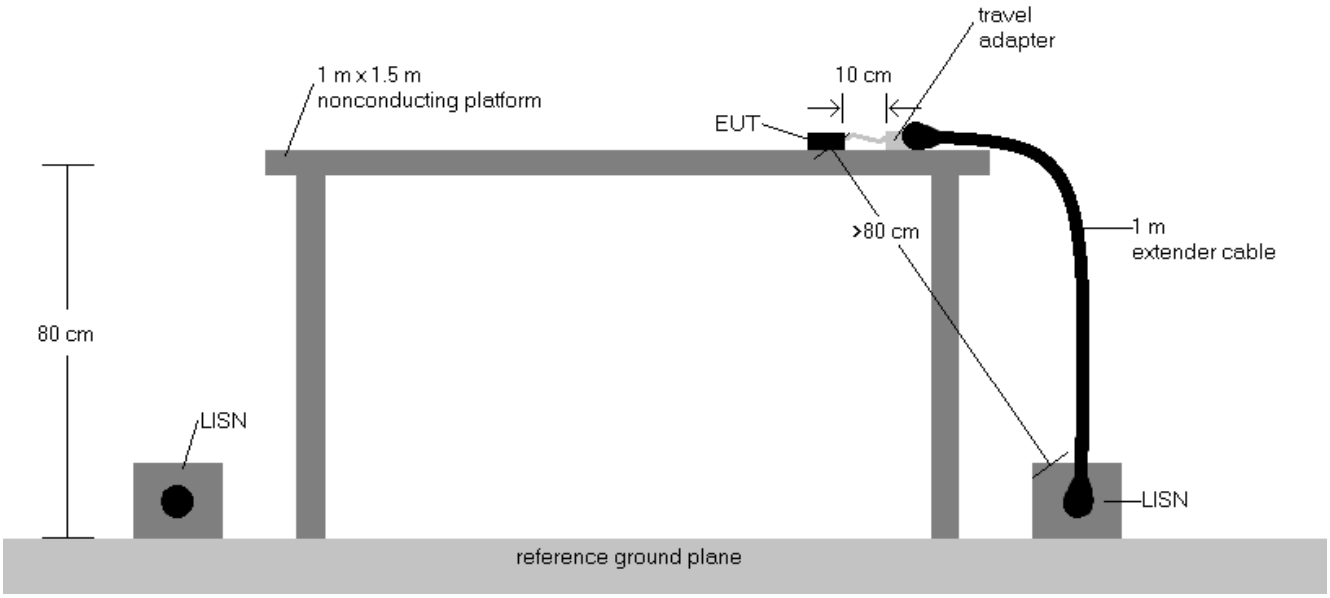
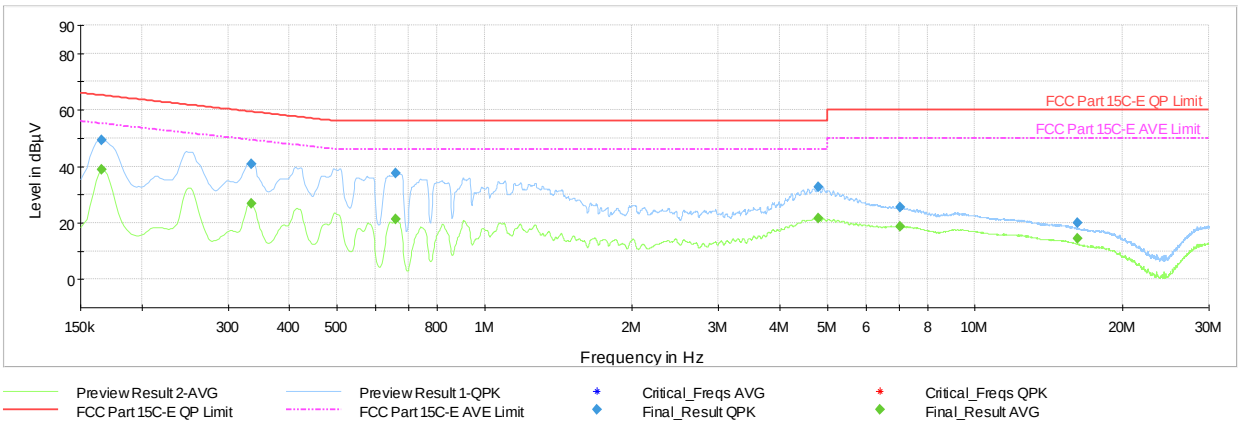


Figure 7-10. Test Instrument & Measurement Setup

Test Notes

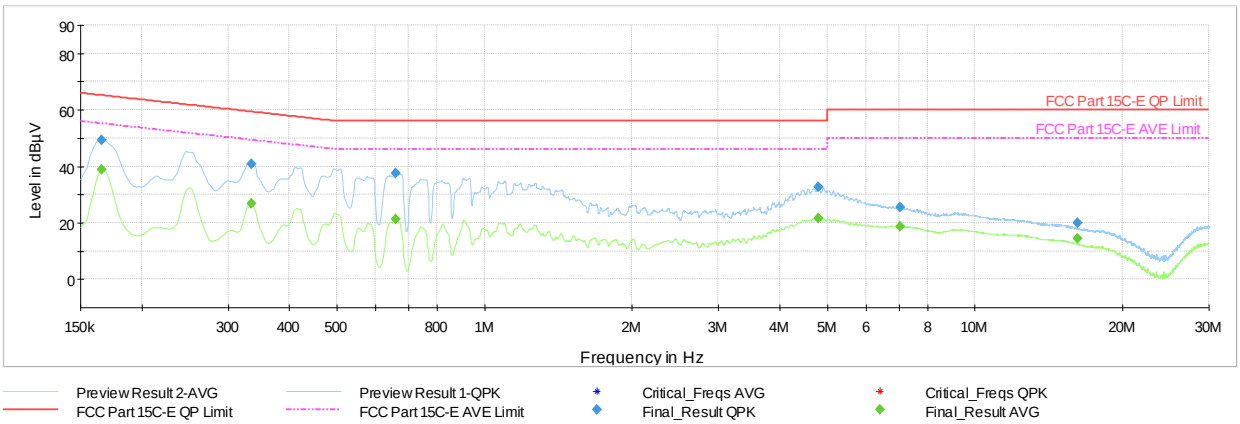
1. All modes of operation were investigated, and the worst-case emissions are reported. The emissions found were not affected by the choice of channel used during testing.
2. Both configurations below were investigated, and the worst case has been reported.
    a. EUT powered by AC/DC adaptor via USB-C cable with wire charger
    b. EUT powered by host PC via USB-C cable with wire charger
3. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207 and RSS-Gen (8.8).
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Correction Factor (dB)
6. Margin (dB) = QP/AV Level (dBµV) - QP/AV Limit (dBµV)
7. Traces shown in plots are made using quasi-peak and average detectors.
8. Deviations to the Specifications: None.
9. The unit was tested with all possible modes and only the highest emission is reported.



Plot 7-130. AC Line Conducted Plot with 802.11ax SDM – Ch.33 (L1), with host PC via USB-C cable with wire charger

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.17	FINAL	---	38.80	55.17	-16.37	L1	GND
0.17	FINAL	49.30	---	65.17	-15.87	L1	GND
0.34	FINAL	---	26.80	49.34	-22.54	L1	GND
0.34	FINAL	40.87	---	59.34	-18.47	L1	GND
0.66	FINAL	---	21.21	46.00	-24.79	L1	GND
0.66	FINAL	37.54	---	56.00	-18.46	L1	GND
4.80	FINAL	---	21.76	46.00	-24.24	L1	GND
4.80	FINAL	32.83	---	56.00	-23.17	L1	GND
7.03	FINAL	25.37	---	60.00	-34.63	L1	GND
7.03	FINAL	---	18.55	50.00	-31.45	L1	GND
16.17	FINAL	19.81	---	60.00	-40.19	L1	GND
16.18	FINAL	---	14.28	50.00	-35.72	L1	GND

Table 7-37. AC Line Conducted Data with 802.11ax SDM – Ch. 33 (L1) with host PC via USB-C cable with wire charger



Plot 7-131. AC Line Conducted Plot with 802.11ax SDM – Ch. 33 (N), with host PC via USB-C cable with wire charger

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.20	FINAL	---	36.42	53.73	-17.31	N	GND
0.20	FINAL	48.18	---	63.73	-15.55	N	GND
0.26	FINAL	---	27.03	51.35	-24.32	N	GND
0.26	FINAL	39.16	---	61.35	-22.19	N	GND
0.72	FINAL	---	16.60	46.00	-29.40	N	GND
0.73	FINAL	27.47	---	56.00	-28.53	N	GND
1.87	FINAL	---	12.85	46.00	-33.15	N	GND
1.88	FINAL	24.04	---	56.00	-31.96	N	GND
7.08	FINAL	---	24.34	50.00	-25.66	N	GND
7.08	FINAL	32.62	---	60.00	-27.38	N	GND
24.54	FINAL	---	18.78	50.00	-31.22	N	GND
24.54	FINAL	24.92	---	60.00	-35.08	N	GND

Table 7-38. AC Line Conducted Data with 802.11ax SDM – Ch. 33 (N), with host PC via USB-C cable with wire charger

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Apple Tablet Device FCC ID: BCGA3266** and **IC: 579C-A3266** is in compliance with Part 15 Subpart E (15.407) of the FCC Rules and RSS-248 of the Innovation, Science and Economic Development Canada Rules.