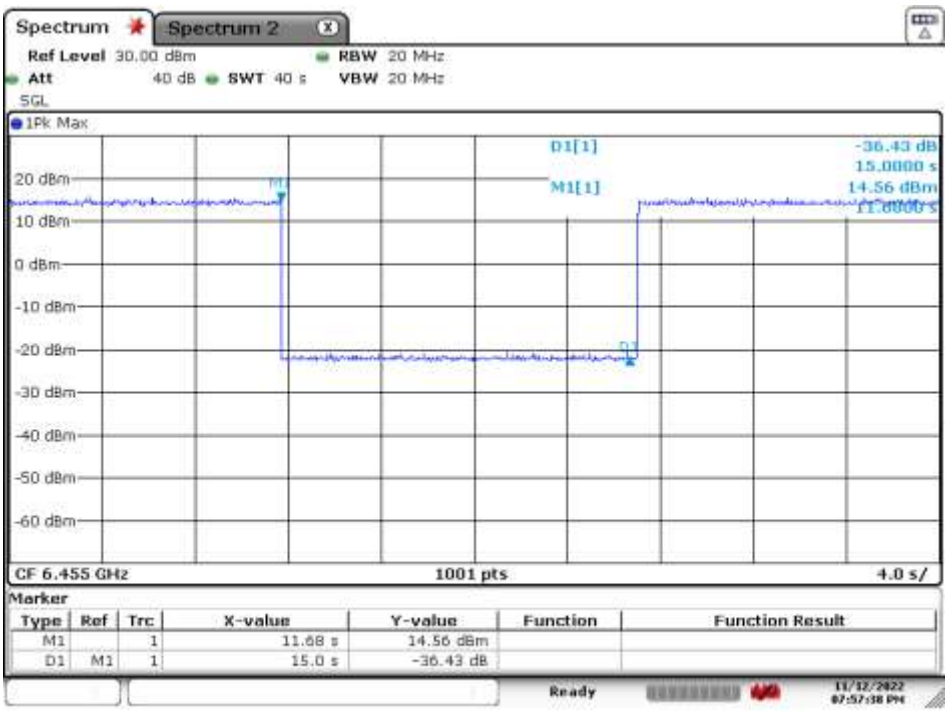
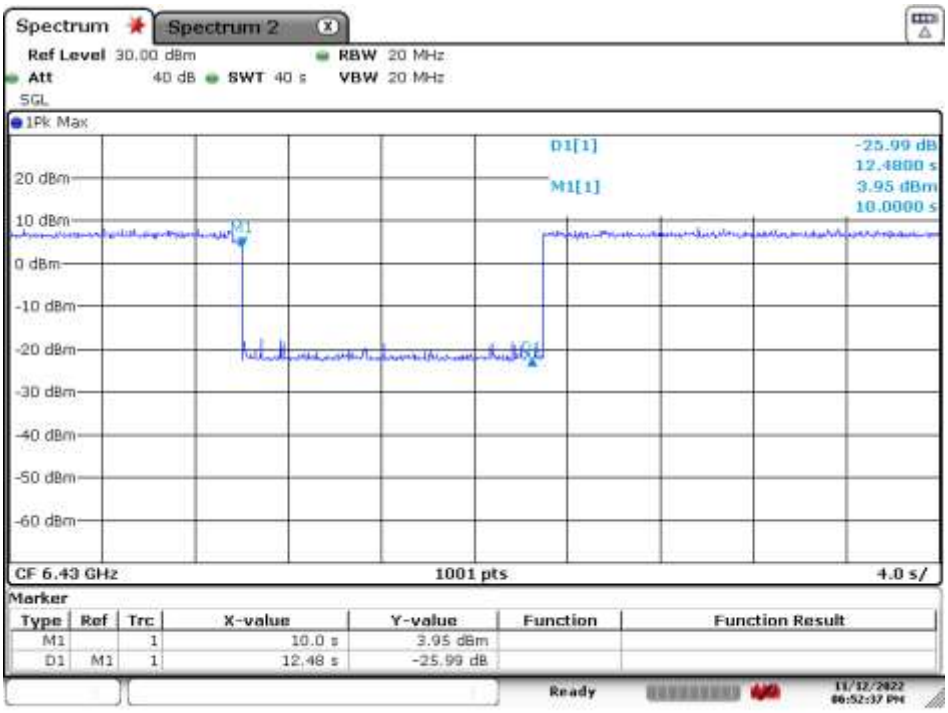
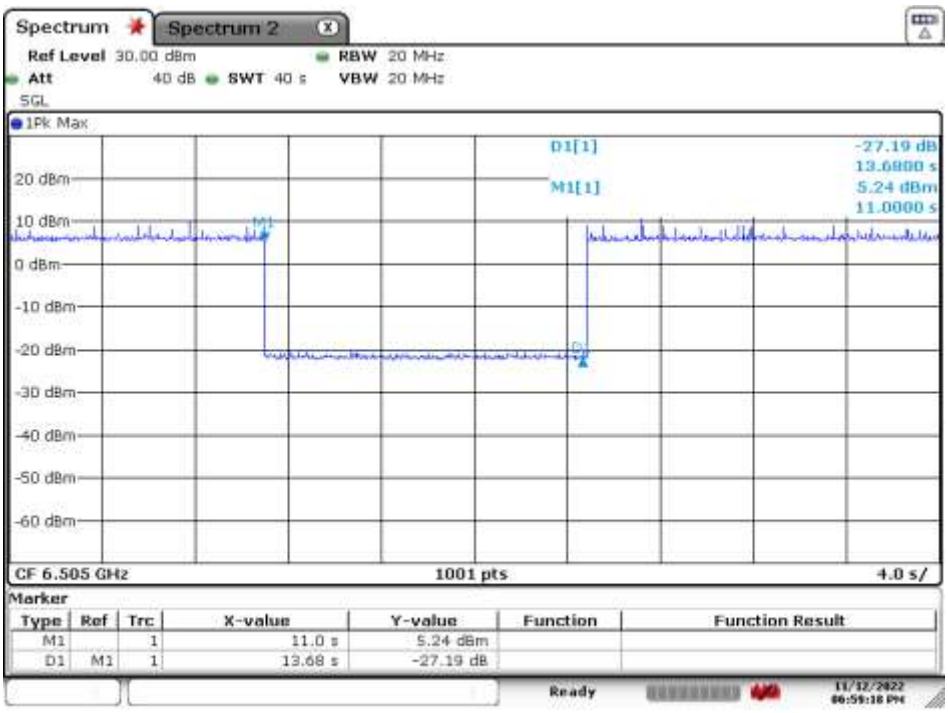


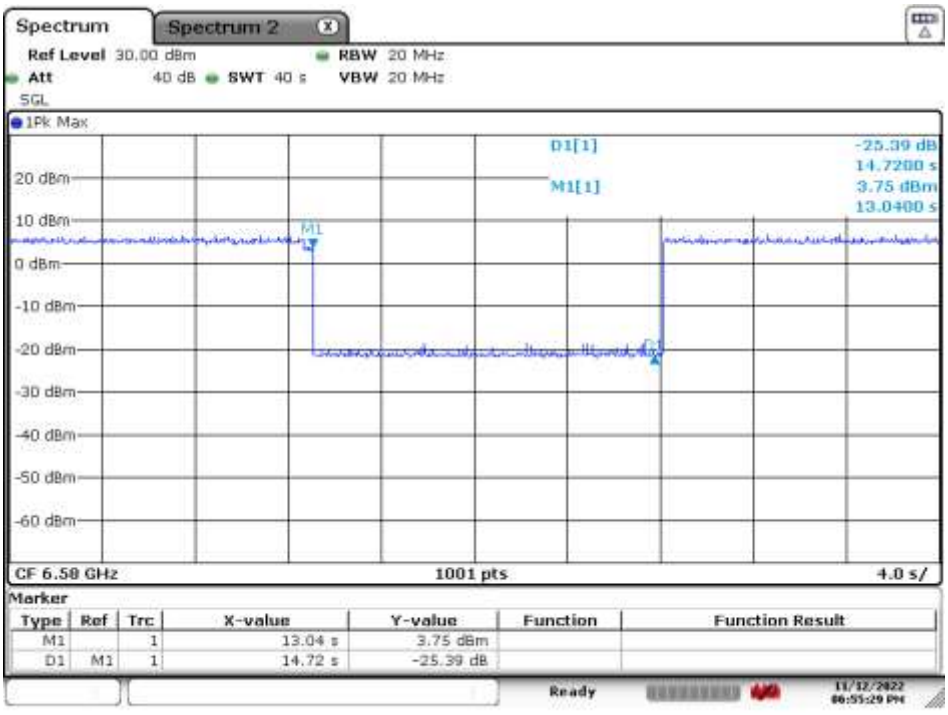
Plot 7-333. Contention Based Protocol Timing Plot – UNII 6 – 20MHz Ch101



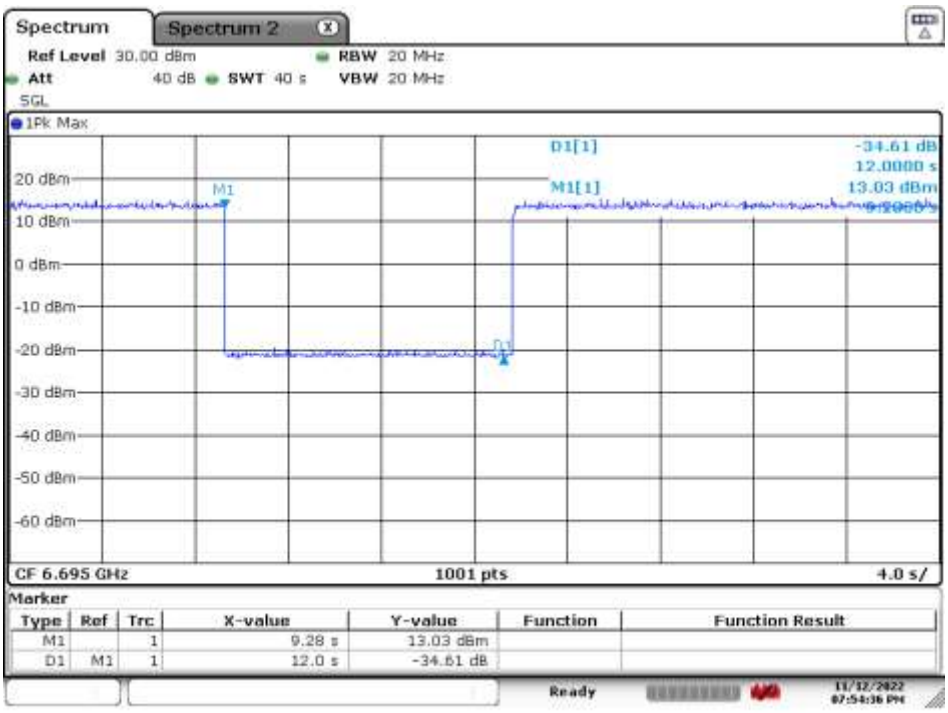
Plot 7-334. Contention Based Protocol Timing Plot – UNII 6 – 160MHz Ch111 – Low



Plot 7-335. Contention Based Protocol Timing Plot – UNII 6 – 160MHz Ch111 – Mid

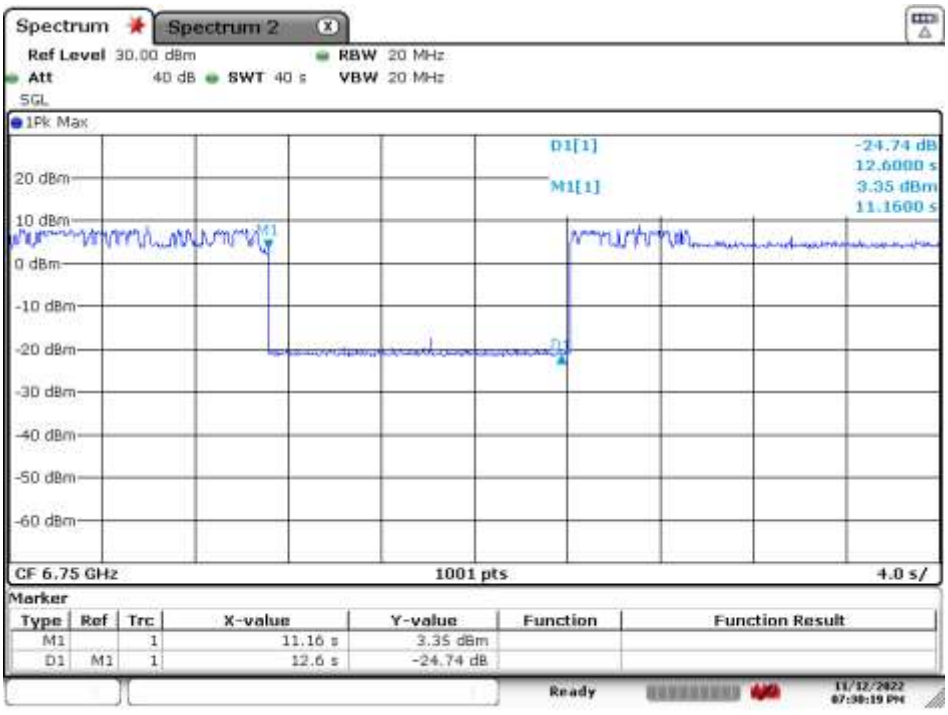


Plot 7-336. Contention Based Protocol Timing Plot – UNII 6 – 160MHz Ch111 - High



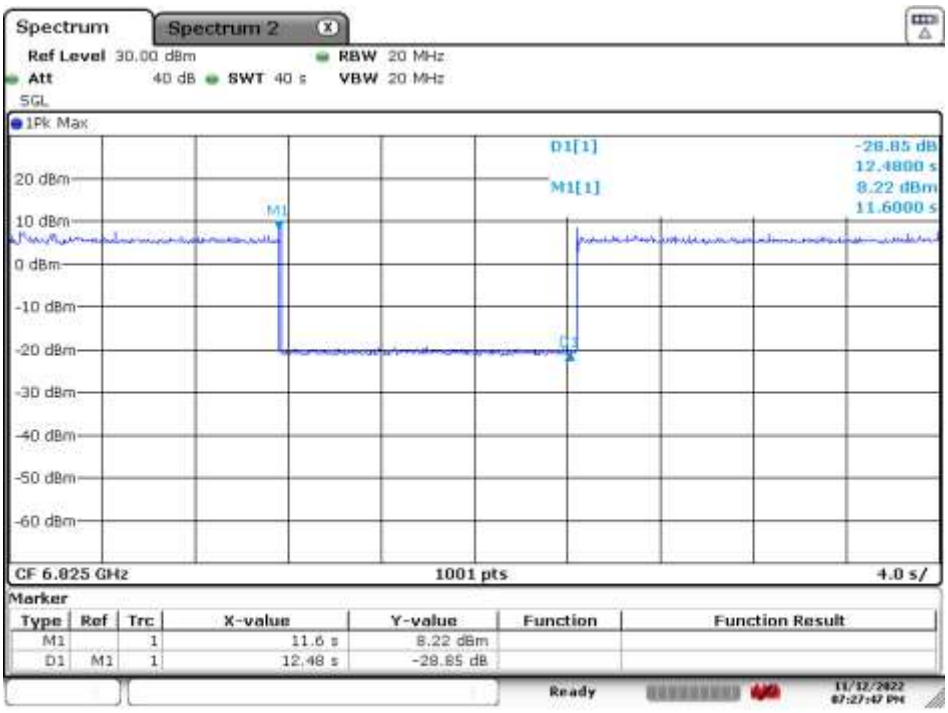
Date: 12.NOV.2022 19:54:35

Plot 7-337. Contention Based Protocol Timing Plot – UNII 7 – 20MHz Ch149

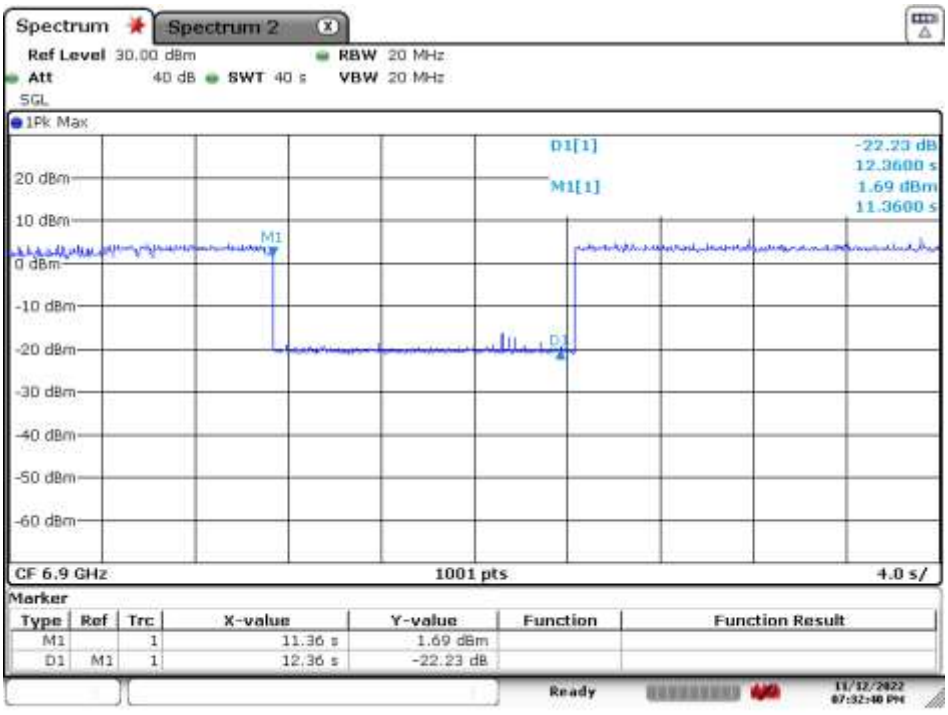


Date: 12.NOV.2022 19:30:18

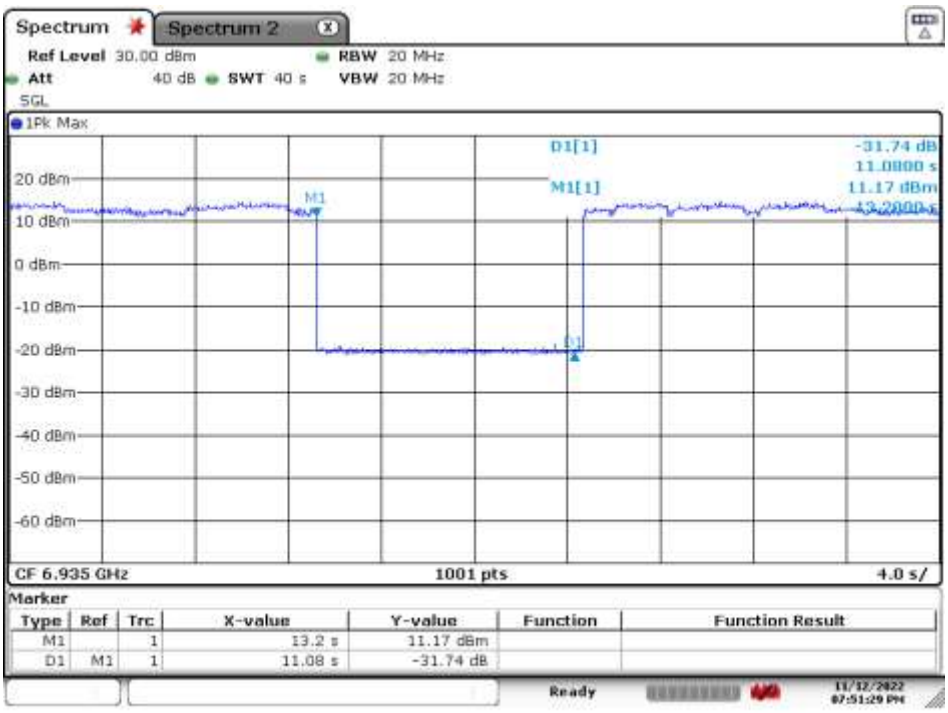
Plot 7-338. Contention Based Protocol Timing Plot – UNII 7 – 160MHz Ch175 – Low



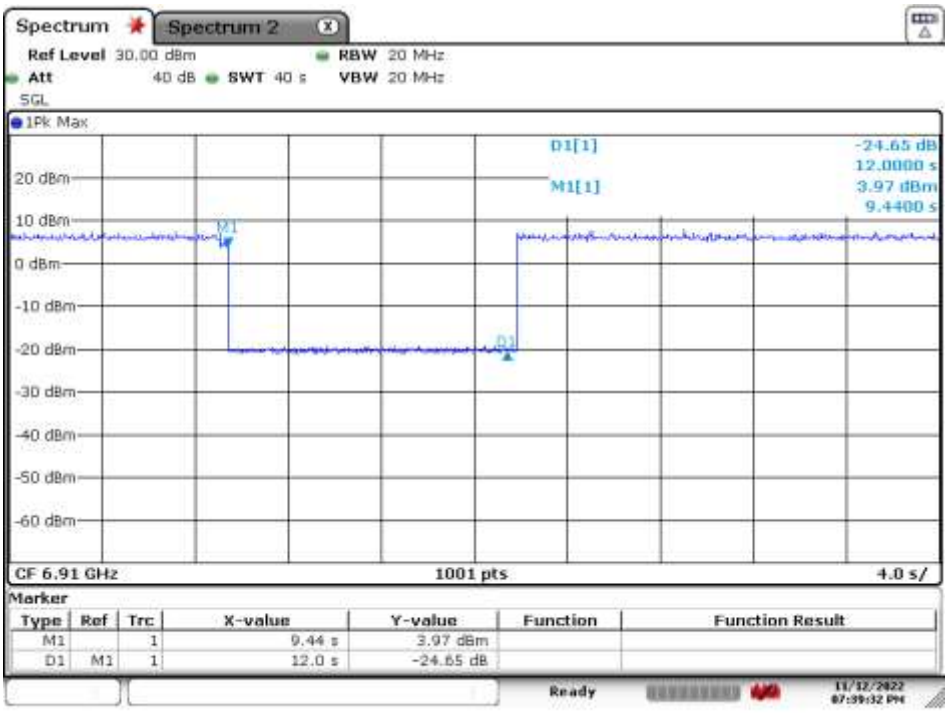
Plot 7-339. Contention Based Protocol Timing Plot – UNII 7 – 160MHz Ch175 – Mid



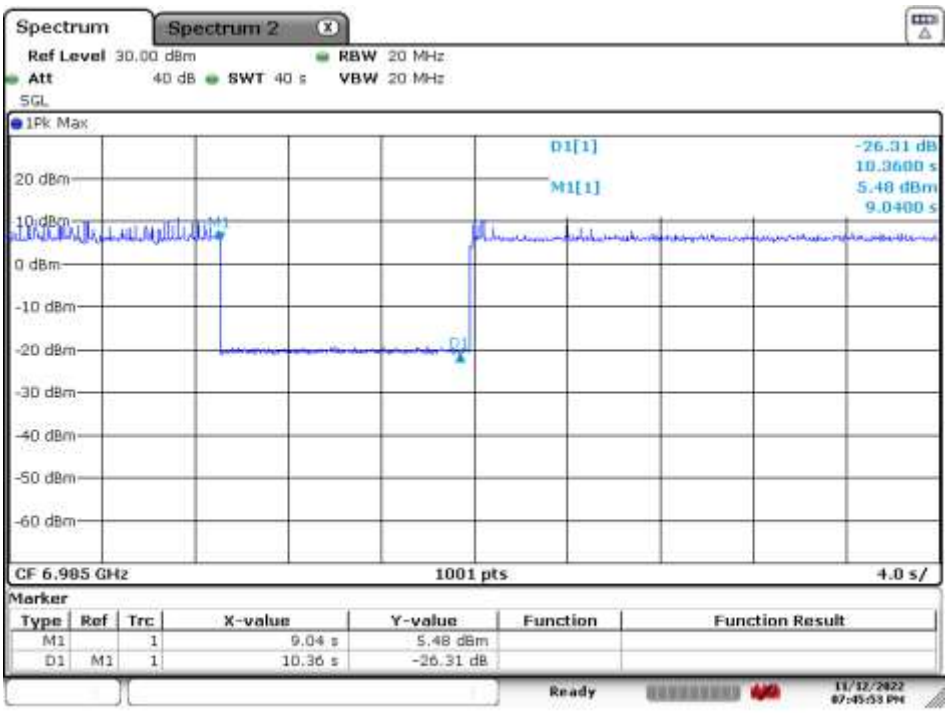
Plot 7-340. Contention Based Protocol Timing Plot – UNII 7 – 160MHz Ch175 - High



Plot 7-341. Contention Based Protocol Timing Plot – UNII 8 – 20MHz Ch197

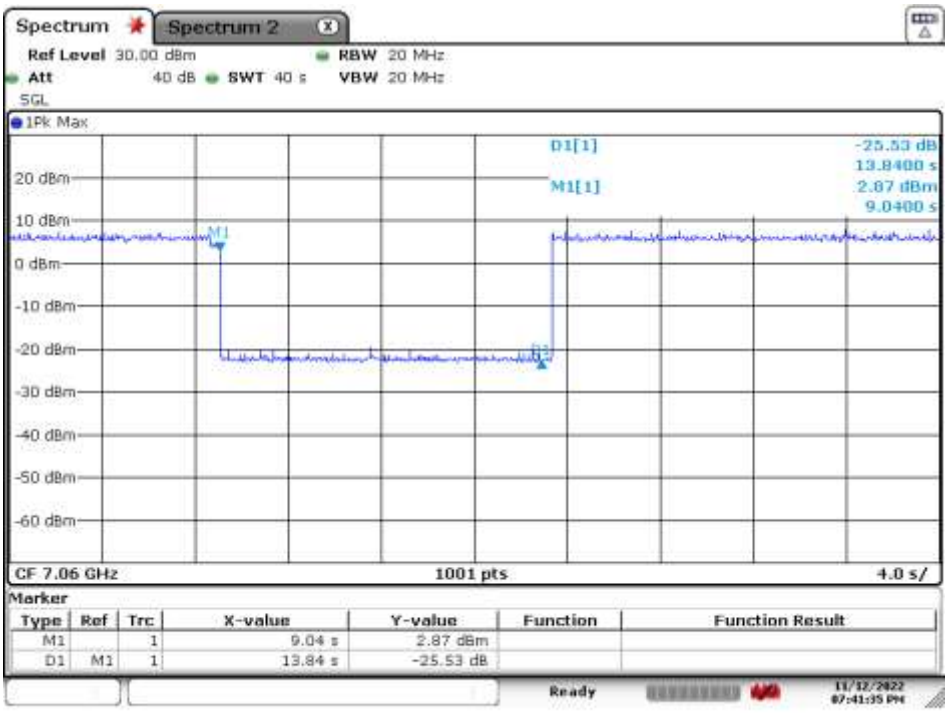


Plot 7-342. Contention Based Protocol Timing Plot – UNII 8 – 160MHz Ch207 – Low



Date: 12.NOV.2022 19:45:52

Plot 7-343. Contention Based Protocol Timing Plot – UNII 8 – 160MHz Ch207 – Mid



Date: 12.NOV.2022 19:41:34

Plot 7-344. Contention Based Protocol Timing Plot – UNII 8 – 160MHz Ch207 - High

7.7 Radiated Spurious Emission Measurements – Above 1GHz

§15.205, §15.209, §15.407(b)(6)

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 C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. All channels, modes (e.g. 802.11a, 802.11ax (20/40/80/160MHz), and modulations/data rates were investigated among all 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 -27dBm/MHz (68.2dBuV/m at a 3m distance). Emissions found in a restricted band are subject to the limits of 15.209 as shown in the table below.

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

Table 7-11. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Sections 12.7.7.2, 12.7.6, 12.7.5
KDB 789033 D02 v02r01 – Section G

Test Settings

Average Measurements above 1GHz (Method AD)

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 Measurements above 1GHz

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

Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = 120kHz
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Test Setup

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

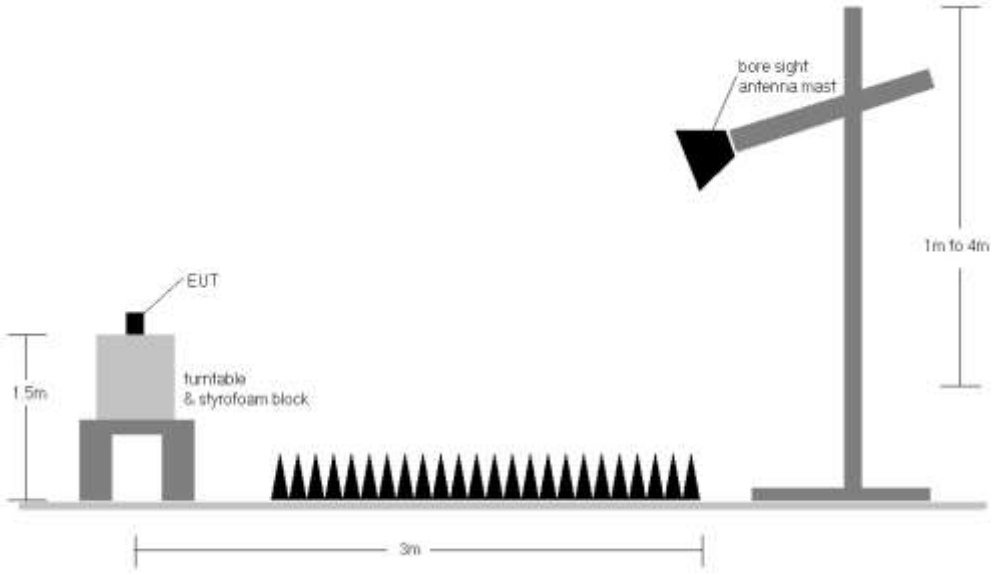


Figure 7-6. Test Instrument & Measurement Setup

Test Notes

1. All spurious emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-11. All spurious emissions that do not lie in a restricted band are subject to an average 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.
2. All spurious emissions that do not lie in a restricted band are subject to a peak limit not to exceed 20dB of the average limit [68.2dBμV/m]. If a peak measurement passes the average limit it was determined no further investigation is necessary.
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. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3 meter 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. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
9. In the case where a peak-detector measurement passed the given RMS limit it was determined sufficient to demonstrate compliance.

Sample Calculations

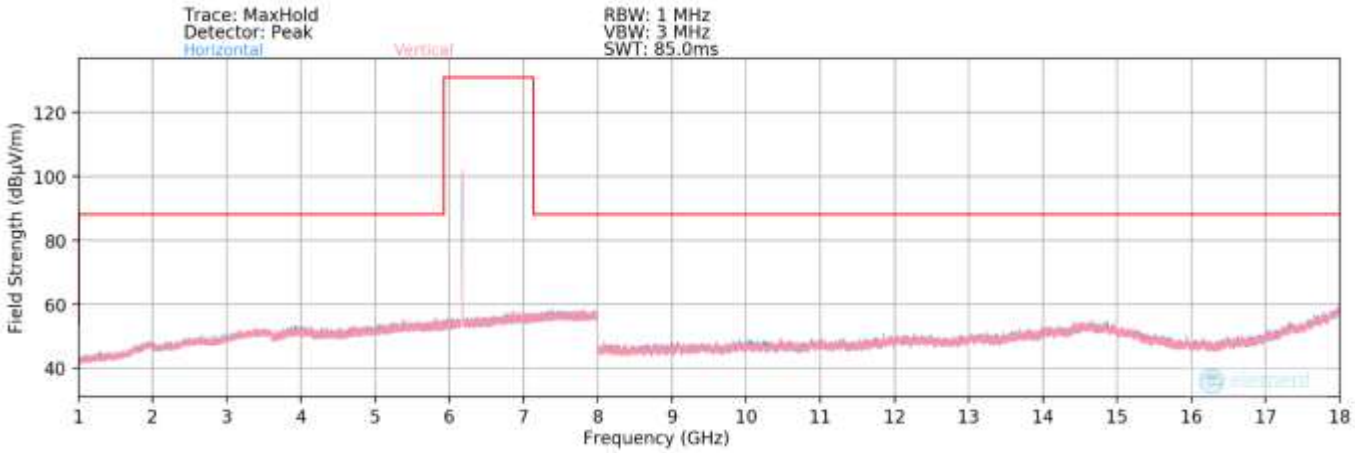
Determining Spurious Emissions Levels

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

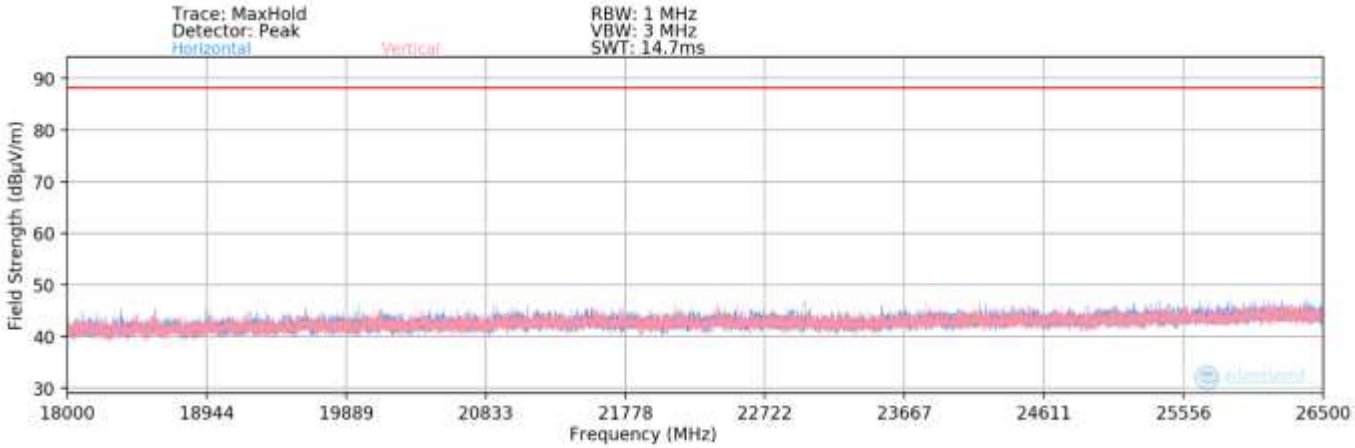
Radiated Band Edge Measurement Offset

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

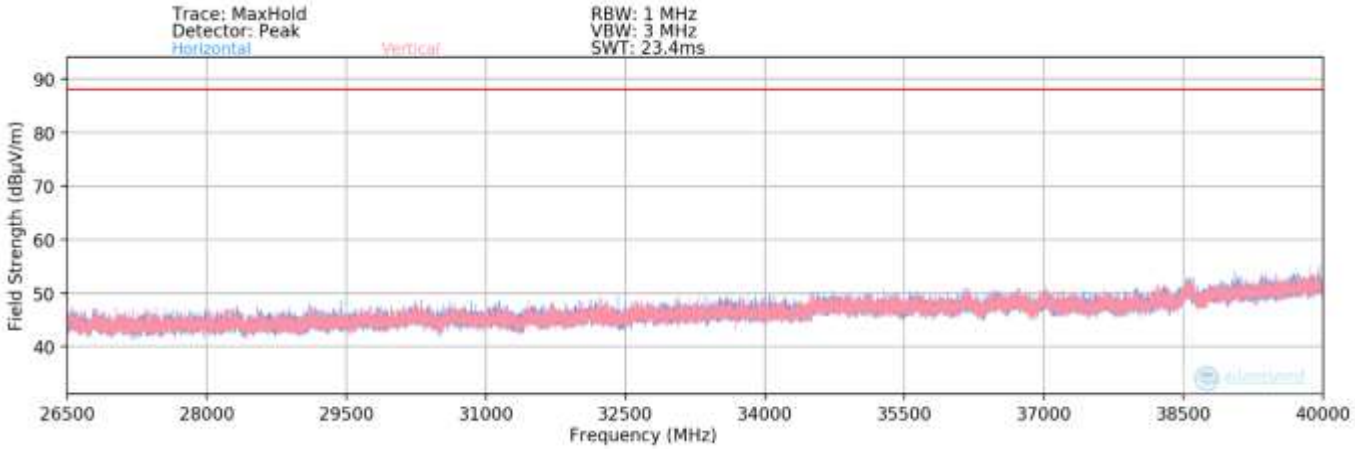
11.7.1 MIMO Radiated Spurious Emission Measurements



Plot 7-345. Radiated Spurious Plot above 1GHz MIMO (802.11ax – UNII Band 5 – 20MHz – Ch.45)



Plot 7-346. Radiated Spurious Plot above 18GHz - 26.5GHz – CH 45 - MIMO (802.11ax)



Plot 7-347. Radiated Spurious Plot 26.5GHz - 40GHz – CH 45 - MIMO (802.11ax)

MIMO Radiated Spurious Emission Measurements

§15.407(b) §15.205 & §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5935MHz
Channel:	2

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11870.00	Average	H	-	-	-75.17	11.97	0.00	43.80	53.98	-10.18
*	11870.00	Peak	H	-	-	-63.83	11.97	0.00	55.14	73.98	-18.84
*	17805.00	Average	H	-	-	-77.41	19.16	0.00	48.75	53.98	-5.23
*	17805.00	Peak	H	-	-	-63.11	19.16	0.00	63.05	73.98	-10.93
*	23740.00	Average	H	-	-	-71.85	3.89	-9.54	29.50	53.98	-24.48
*	23740.00	Peak	H	-	-	-60.42	3.89	-9.54	40.93	73.98	-33.05
	29675.00	Peak	H	-	-	-60.72	6.04	-9.54	42.78	68.20	-25.42

Table 7-12. Radiated Measurements MIMO (UNII Band 5 – Low Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6175MHz
Channel:	45

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	12350.00	Average	H	-	-	-74.67	12.08	0.00	44.41	53.98	-9.57
*	12350.00	Peak	H	-	-	-62.15	12.08	0.00	56.93	73.98	-17.05
*	18525.00	Average	H	-	-	-66.28	1.68	-9.54	32.86	53.98	-21.12
*	18525.00	Peak	H	-	-	-55.72	1.68	-9.54	43.42	73.98	-30.56
	24700.00	Peak	H	-	-	-55.29	4.25	-9.54	46.42	68.20	-21.78
	30875.00	Peak	H	-	-	-55.81	6.73	-9.54	48.38	68.20	-19.82

Table 7-13. Radiated Measurements MIMO (UNII Band 5 – Mid Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6415MHz
Channel:	93

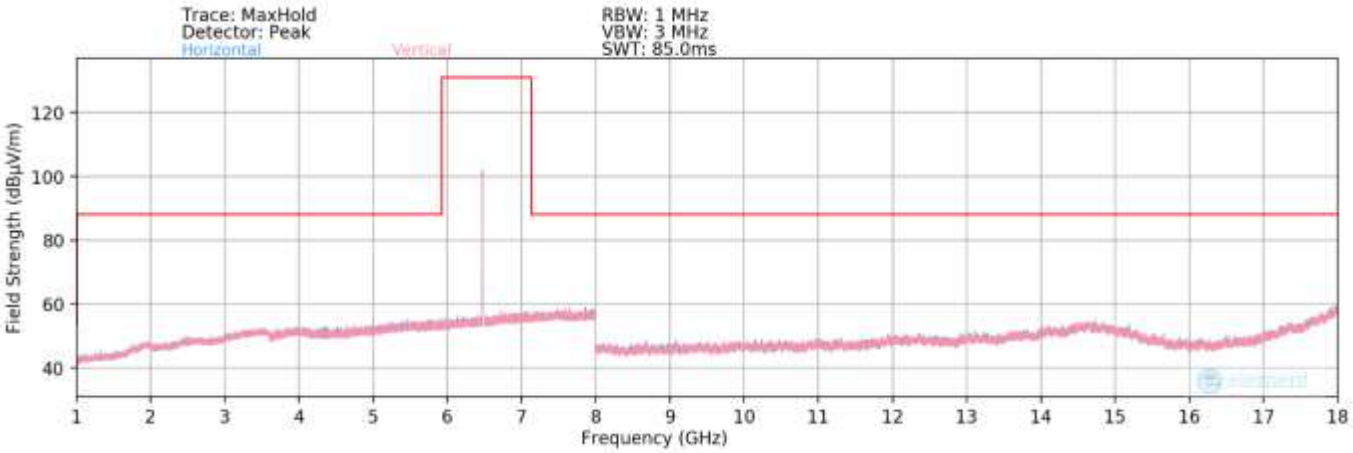
	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	12830.00	Peak	H	-	-	-62.29	12.39	0.00	57.10	68.20	-11.10
*	19245.00	Average	H	-	-	-66.17	2.45	-9.54	33.74	53.98	-20.24
*	19245.00	Peak	H	-	-	-55.40	2.45	-9.54	44.51	73.98	-29.47
	25660.00	Peak	H	-	-	-55.76	4.57	-9.54	46.27	68.20	-21.93
	32075.00	Peak	H	-	-	-55.47	6.88	-9.54	48.86	68.20	-19.34

Table 7-14. Radiated Measurements MIMO (UNII Band 5 – High Channel – 20MHz)

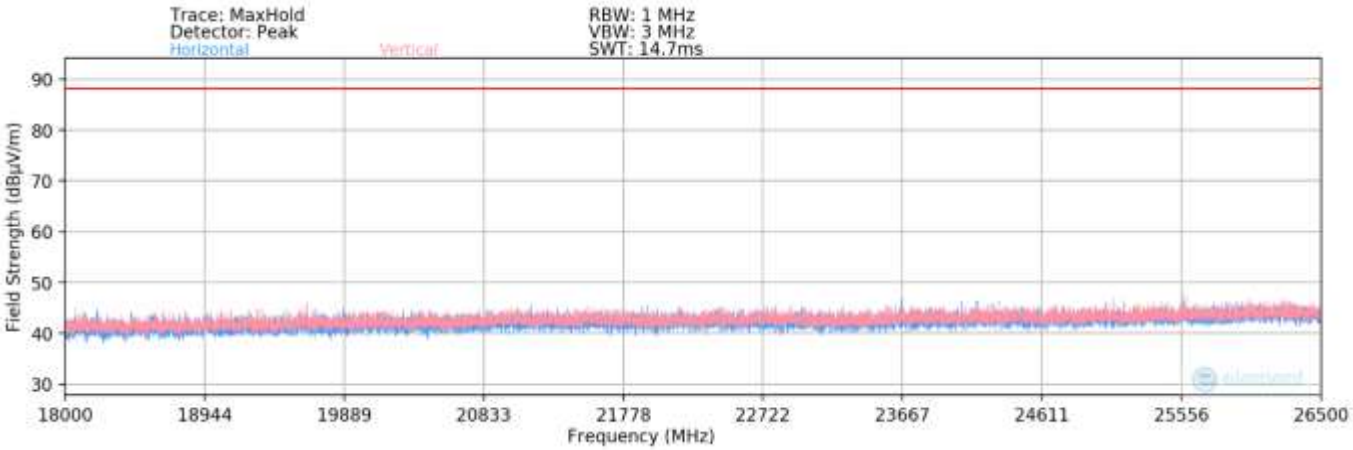
Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6175MHz
Channel:	45

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	12350.00	Average	H	-	-	-76.60	12.08	0.00	42.48	53.98	-11.50
*	12350.00	Peak	H	-	-	-65.83	12.08	0.00	53.25	73.98	-20.73
*	18525.00	Average	H	-	-	-66.16	1.68	-9.54	32.98	53.98	-21.00
*	18525.00	Peak	H	-	-	-55.06	1.68	-9.54	44.08	73.98	-29.90
	24700.00	Peak	H	-	-	-55.21	4.25	-9.54	46.50	68.20	-21.70
	30875.00	Peak	H	-	-	-55.86	6.73	-9.54	48.33	68.20	-19.87

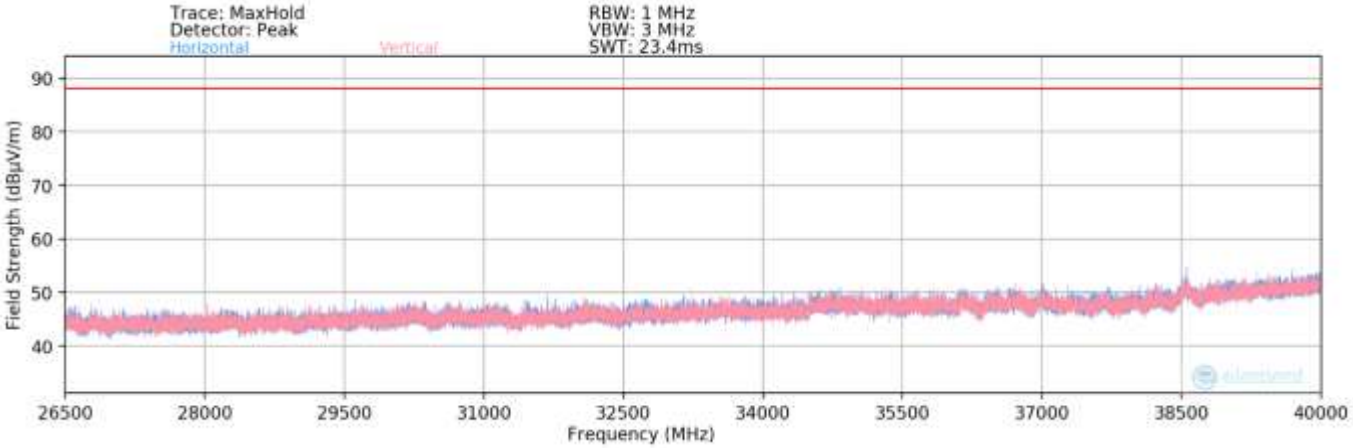
Table 7-15. Radiated Measurements MIMO (UNII Band 5 – Mid Channel – 20MHz) with WCP



Plot 7-348. Radiated Spurious Plot above 1GHz MIMO (802.11ax– UNII Band 6 – 20MHz – Ch.105)



Plot 7-349. Radiated Spurious Plot above 18GHz - 26.5GHz – CH 105 - MIMO (802.11ax)



Plot 7-350. Radiated Spurious Plot 26.5GHz - 40GHz – CH 105 - MIMO (802.11ax)

MIMO Radiated Spurious Emission Measurements

§15.407(b) §15.205 & §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6435MHz
Channel:	97

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	12870.00	Peak	H	-	-	-65.03	12.51	0.00	54.48	68.20	-13.72
*	19305.00	Average	H	-	-	-66.18	2.29	-9.54	33.57	53.98	-20.41
*	19305.00	Peak	H	-	-	-55.66	2.29	-9.54	44.09	73.98	-29.89
	25740.00	Peak	H	-	-	-55.90	4.49	-9.54	46.04	68.20	-22.16
	32175.00	Peak	H	-	-	-55.15	7.04	-9.54	49.35	68.20	-18.85

Table 7-16. Radiated Measurements MIMO (UNII Band 6 – Low Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6475MHz
Channel:	105

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	12950.00	Peak	H	-	-	-66.02	12.67	0.00	53.65	68.20	-14.55
*	19425.00	Average	H	-	-	-66.50	2.36	-9.54	33.32	53.98	-20.66
*	19425.00	Peak	H	-	-	-55.86	2.36	-9.54	43.96	73.98	-30.02
	25900.00	Peak	H	-	-	-55.32	4.84	-9.54	46.97	68.20	-21.23
	32375.00	Peak	H	-	-	-56.00	6.78	-9.54	48.24	68.20	-19.96

Table 7-17. Radiated Measurements MIMO (UNII Band 6 – Mid Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6515MHz
Channel:	113

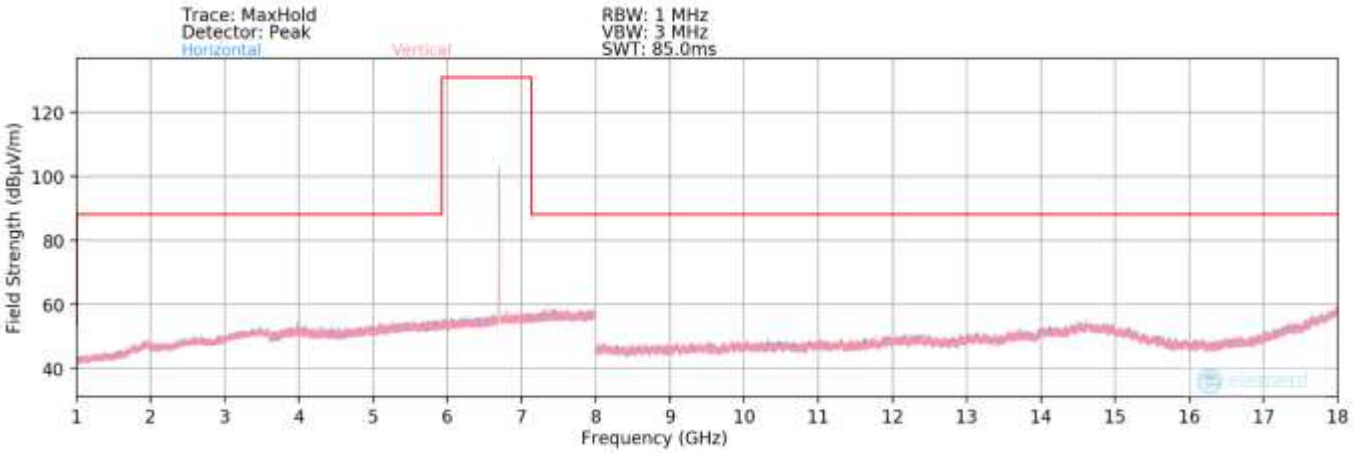
	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	13030.00	Peak	H	-	-	-66.44	12.83	0.00	53.39	68.20	-14.81
*	19545.00	Average	H	-	-	-72.31	2.31	-9.54	27.46	53.98	-26.52
*	19545.00	Peak	H	-	-	-61.97	2.31	-9.54	37.80	73.98	-36.18
	26060.00	Peak	H	-	-	-61.05	4.92	-9.54	41.33	68.20	-26.87
	32575.00	Peak	H	-	-	-59.26	6.55	-9.54	44.75	68.20	-23.45

Table 7-18. Radiated Measurements MIMO (UNII Band 6 – High Channel – 20MHz)

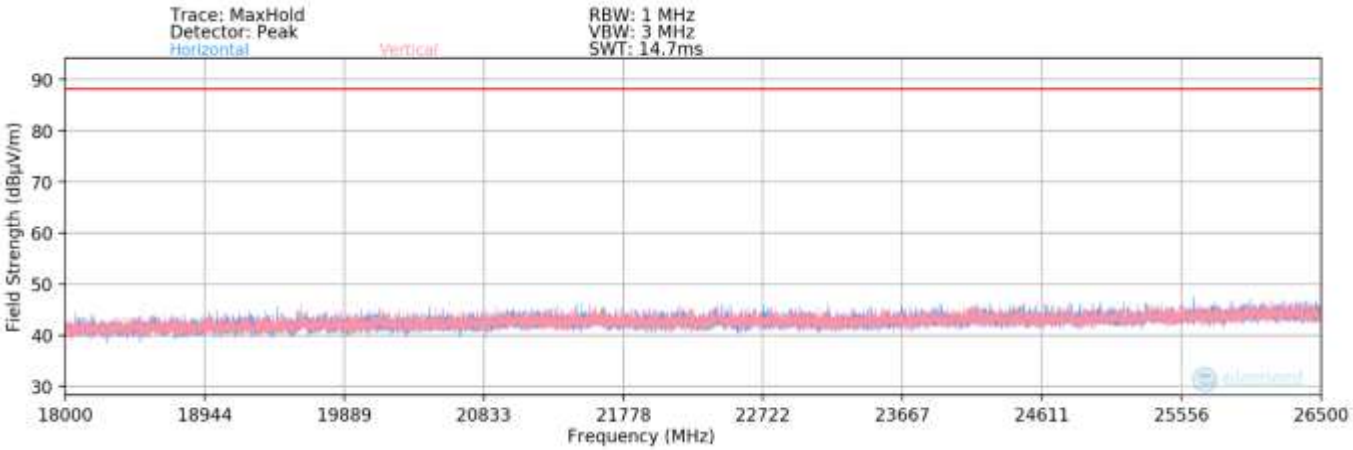
Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6475MHz
Channel:	105

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	12950.00	Peak	H	-	-	-66.06	12.67	0.00	53.61	68.20	-14.59
*	19425.00	Average	H	-	-	-66.50	2.36	-9.54	33.32	53.98	-20.66
*	19425.00	Peak	H	-	-	-56.27	2.36	-9.54	43.55	73.98	-30.43
	25900.00	Peak	H	-	-	-55.67	4.84	-9.54	46.62	68.20	-21.58
	32375.00	Peak	H	-	-	-56.80	6.78	-9.54	47.44	68.20	-20.76

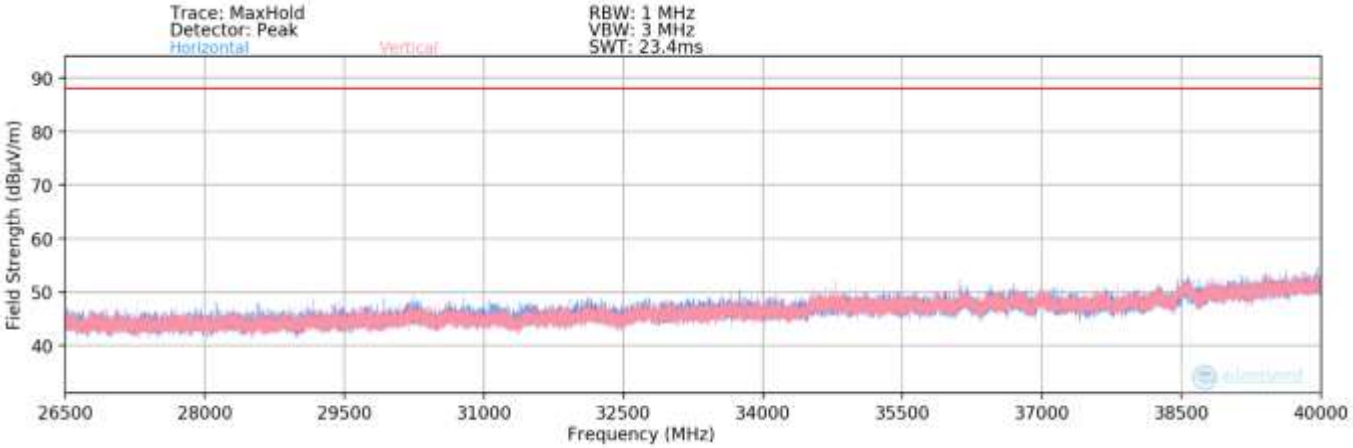
Table 7-19. Radiated Measurements MIMO (UNII Band 6 – Mid Channel – 20MHz) with WCP



Plot 7-351. Radiated Spurious Plot above 1GHz MIMO (802.11ax– UNII Band 7 – 20MHz – Ch.149)



Plot 7-352. Radiated Spurious Plot above 18GHz - 26.5GHz – CH 149 - MIMO (802.11ax)



Plot 7-353. Radiated Spurious Plot 26.5GHz - 40GHz – CH 149 - MIMO (802.11ax)

MIMO Radiated Spurious Emission Measurements

§15.407(b) §15.205 & §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 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]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	13070.00	Peak	H	-	-	-66.13	12.94	0.00	53.81	68.20	-14.39
*	19605.00	Average	H	-	-	-66.31	2.79	-9.54	33.94	53.98	-20.04
*	19605.00	Peak	H	-	-	-55.31	2.79	-9.54	44.94	73.98	-29.04
	26140.00	Peak	H	-	-	-55.54	4.83	-9.54	46.75	68.20	-21.45
	32675.00	Peak	H	-	-	-55.26	6.85	-9.54	49.05	68.20	-19.15

Table 7-20. Radiated Measurements MIMO (UNII Band 7 – Low Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 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]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	13390.00	Average	H	-	-	-79.08	12.97	0.00	40.89	53.98	-13.09
*	13390.00	Peak	H	-	-	-65.75	12.97	0.00	54.22	73.98	-19.76
*	20085.00	Average	H	-	-	-66.44	3.04	-9.54	34.06	53.98	-19.92
*	20085.00	Peak	H	-	-	-55.72	3.04	-9.54	44.78	73.98	-29.20
	26780.00	Peak	H	-	-	-55.36	5.16	-9.54	47.26	68.20	-20.94
	33475.00	Peak	H	-	-	-54.98	7.26	-9.54	49.74	68.20	-18.46

Table 7-21. Radiated Measurements MIMO (UNII Band 7 – Mid Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6875MHz
Channel:	185

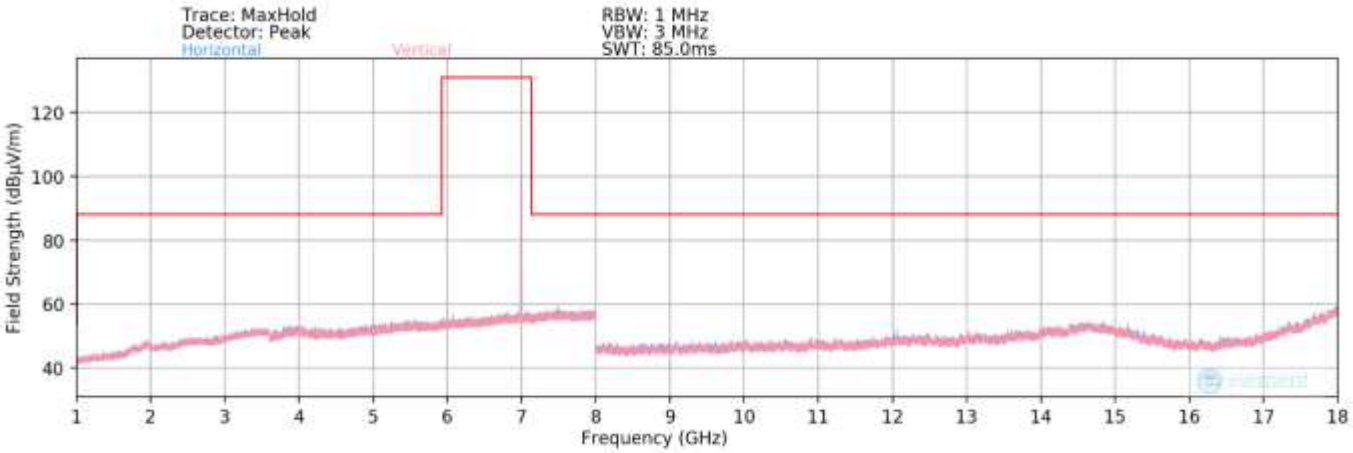
	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	13750.00	Peak	H	-	-	-66.09	13.83	0.00	54.74	68.20	-13.46
*	20625.00	Average	H	-	-	-67.44	3.28	-9.54	33.30	53.98	-20.68
*	20625.00	Peak	H	-	-	-56.68	3.28	-9.54	44.06	73.98	-29.92
	27500.00	Peak	H	-	-	-55.81	4.79	-9.54	46.43	68.20	-21.77
	34375.00	Peak	H	-	-	-55.01	7.69	-9.54	50.14	68.20	-18.06

Table 7-22. Radiated Measurements MIMO (UNII Band 7 – High Channel – 20MHz)

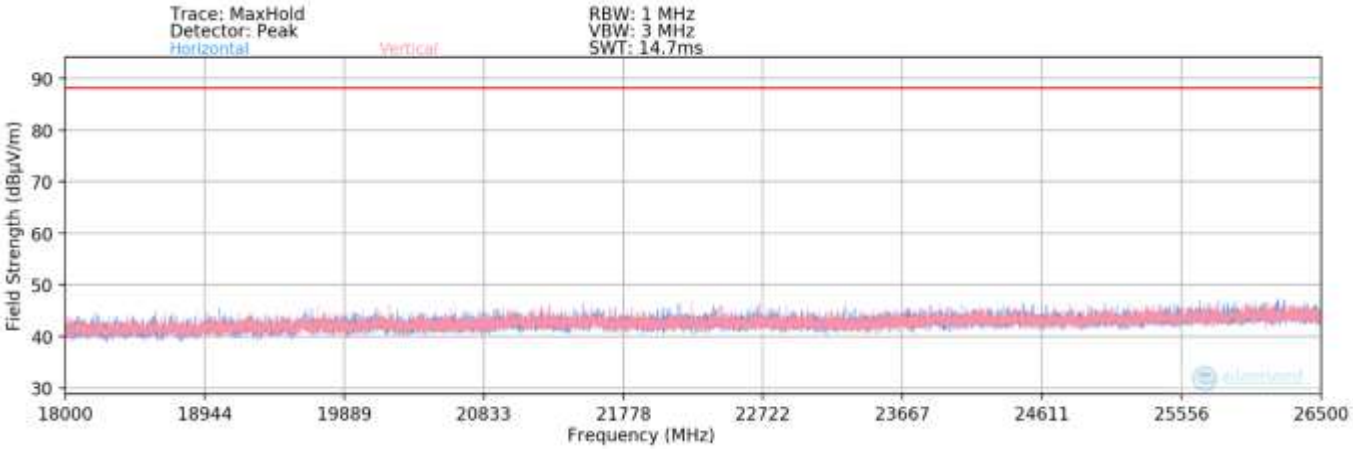
Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6535MHz
Channel:	117

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	13390.00	Average	H	-	-	-77.08	12.97	0.00	42.89	53.98	-11.09
*	13390.00	Peak	H	-	-	-65.91	12.97	0.00	54.06	73.98	-19.92
*	20085.00	Average	H	-	-	-66.09	3.04	-9.54	34.41	53.98	-19.57
*	20085.00	Peak	H	-	-	-55.57	3.04	-9.54	44.93	73.98	-29.05
	26780.00	Peak	H	-	-	-55.10	5.16	-9.54	47.52	68.20	-20.68
	33475.00	Peak	H	-	-	-55.04	7.26	-9.54	49.68	68.20	-18.52

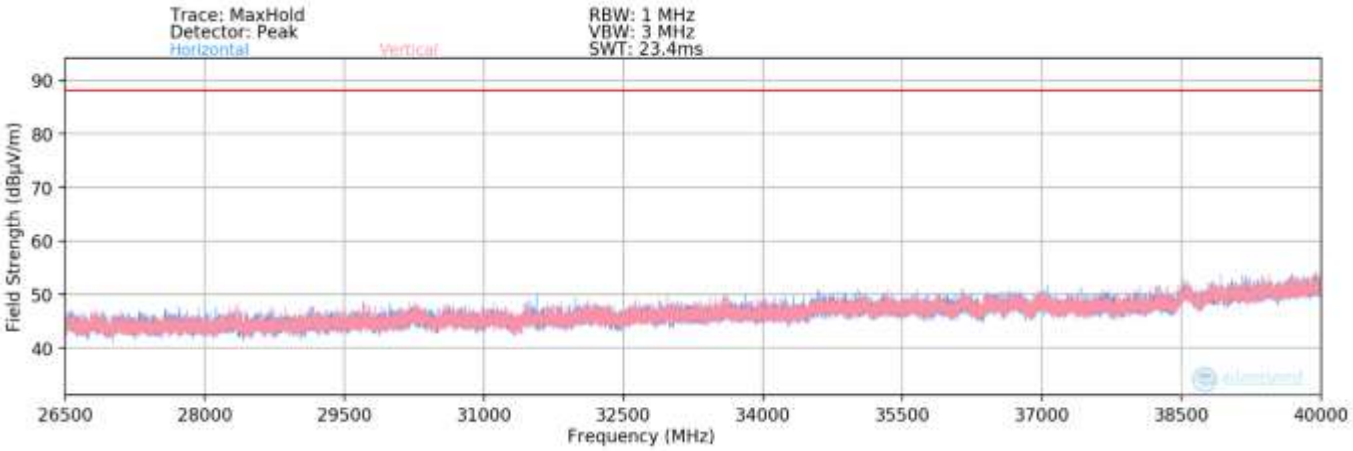
Table 7-23. Radiated Measurements MIMO (UNII Band 7 – Mid Channel – 20MHz) with WCP



Plot 7-354. Radiated Spurious Plot above 1GHz MIMO (802.11ax– UNII Band 8 – 20MHz – Ch.209)



Plot 7-355. Radiated Spurious Plot above 18GHz - 26.5GHz – CH 209 - MIMO (802.11ax)



Plot 7-356. Radiated Spurious Plot 26.5GHz - 40GHz – CH 209 - MIMO (802.11ax)

MIMO Radiated Spurious Emission Measurements

§15.407(b) §15.205 & §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6895MHz
Channel:	189

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	13790.00	Peak	H	-	-	-63.79	13.66	0.00	56.87	68.20	-11.33
*	20685.00	Average	H	-	-	-68.91	3.27	-9.54	31.82	53.98	-22.16
*	20685.00	Peak	H	-	-	-55.92	3.27	-9.54	44.81	73.98	-29.17
	27580.00	Peak	H	-	-	-55.50	5.23	-9.54	47.19	68.20	-21.01
	34475.00	Peak	H	-	-	-55.42	7.64	-9.54	49.67	68.20	-18.53

Table 7-24. Radiated Measurements MIMO (UNII Band 8 – Low Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6995MHz
Channel:	209

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	13990.00	Peak	H	-	-	-64.67	13.89	0.00	56.22	68.20	-11.98
*	20985.00	Average	H	-	-	-73.19	3.46	-9.54	27.73	53.98	-26.25
*	20985.00	Peak	H	-	-	-62.26	3.46	-9.54	38.66	73.98	-35.32
	27980.00	Peak	H	-	-	-61.54	5.02	-9.54	40.93	68.20	-27.27
	34975.00	Peak	H	-	-	-57.80	7.91	-9.54	47.56	68.20	-20.64

Table 7-25. Radiated Measurements MIMO (UNII Band 8 – Mid Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	7115MHz
Channel:	233

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	14230.00	Peak	H	-	-	-64.34	14.92	0.00	57.58	68.20	-10.62
*	21345.00	Average	H	-	-	-66.71	3.78	-9.54	34.53	53.98	-19.45
*	21345.00	Peak	H	-	-	-56.70	3.78	-9.54	44.54	73.98	-29.44
	28460.00	Peak	H	-	-	-56.07	5.45	-9.54	46.84	68.20	-21.36
	35575.00	Peak	H	-	-	-54.32	7.65	-9.54	50.79	68.20	-17.41

Table 7-26. Radiated Measurements MIMO (UNII Band 8 – High Channel – 20MHz)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	6995MHz
Channel:	209

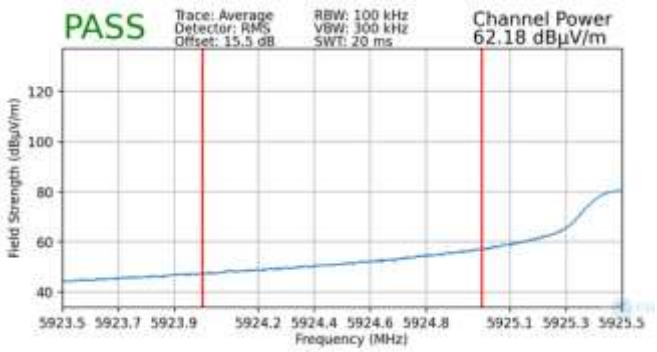
	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	13990.00	Peak	H	-	-	-65.71	13.89	0.00	55.18	68.20	-13.02
*	20985.00	Average	H	-	-	-67.13	3.46	-9.54	33.79	53.98	-20.19
*	20985.00	Peak	H	-	-	-57.17	3.46	-9.54	43.75	73.98	-30.23
	27980.00	Peak	H	-	-	-56.21	5.02	-9.54	46.27	68.20	-21.93
	34975.00	Peak	H	-	-	-54.81	7.91	-9.54	50.56	68.20	-17.64

Table 7-27. Radiated Measurements MIMO (UNII Band 8 – Mid Channel – 20MHz) with WCP

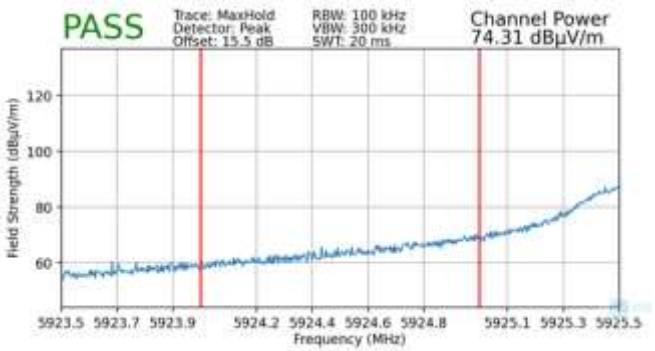
11.7.2 MIMO Radiated Band Edge Measurements (20MHz BW)

§15.407(b)(6) §15.205 §15.209

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5935MHz
Channel:	2

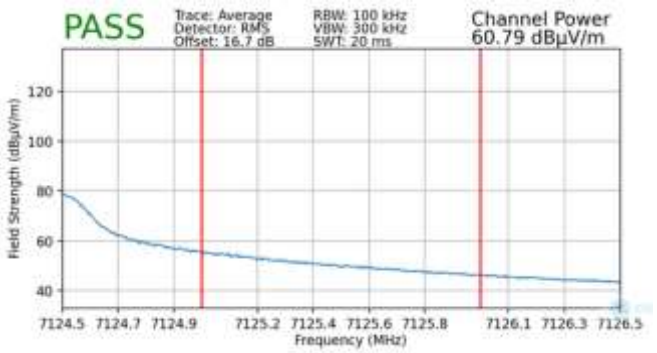


Plot 7-357. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 5)

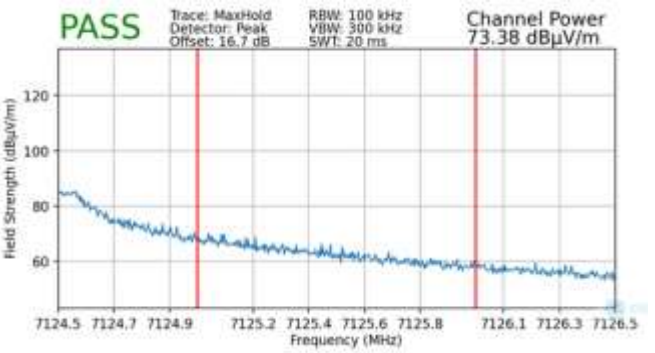


Plot 7-358. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 5)

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	7115MHz
Channel:	233

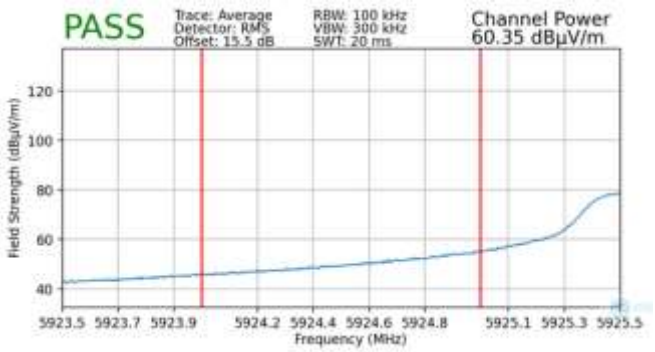


Plot 7-359. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 8)

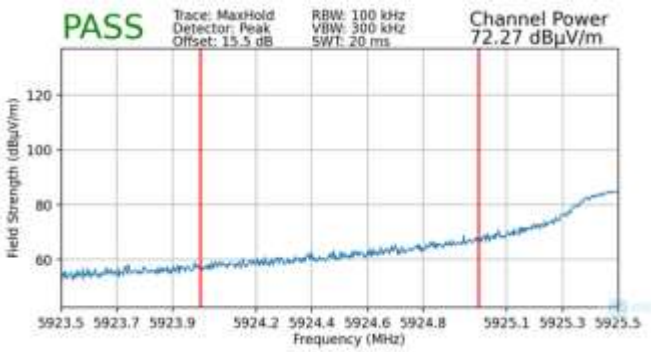


Plot 7-360. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 8)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5935MHz
Channel:	2



Plot 7-361. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 5) with WCP

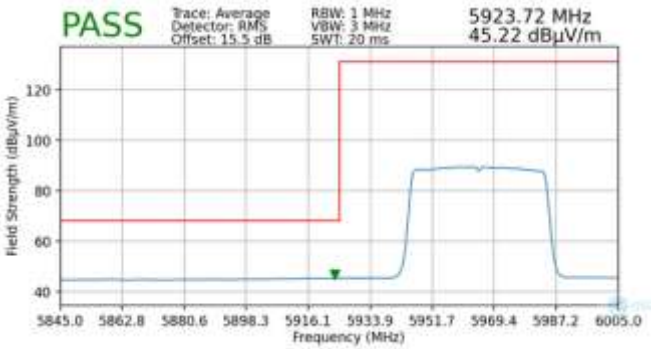


Plot 7-362. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 5) with WCP

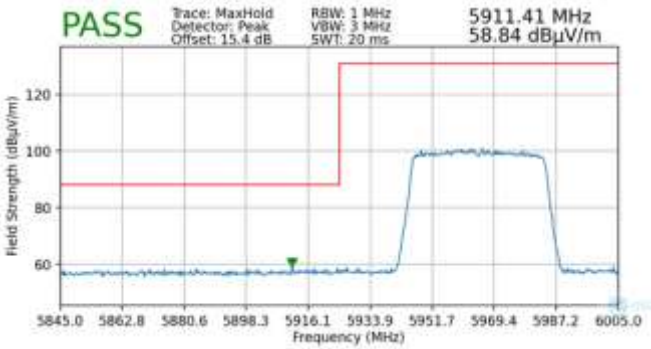
11.7.3 MIMO Radiated Band Edge Measurements (40MHz BW)

§15.407(b.5) §15.205 §15.209

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5965MHz
Channel:	3

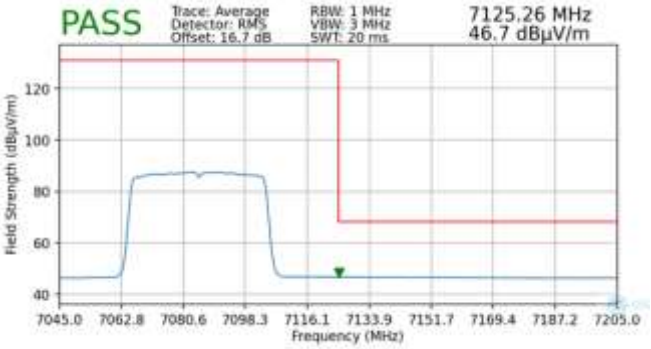


Plot 7-363. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 5)

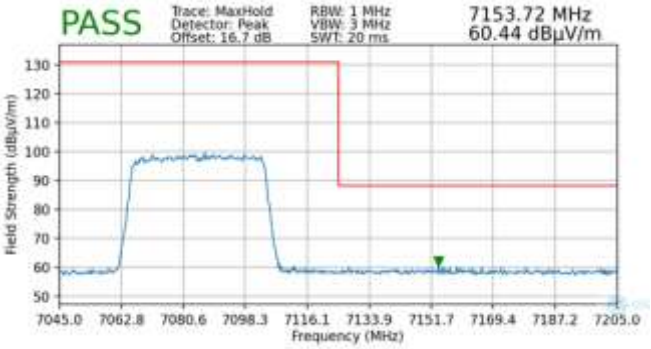


Plot 7-364. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 5)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	7085MHz
Channel:	227



Plot 7-365. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 8)

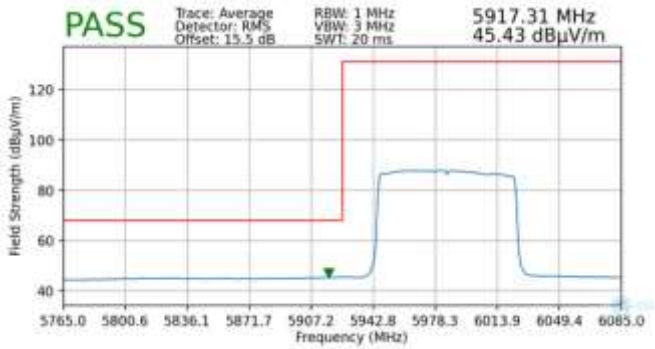


Plot 7-366. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 8)

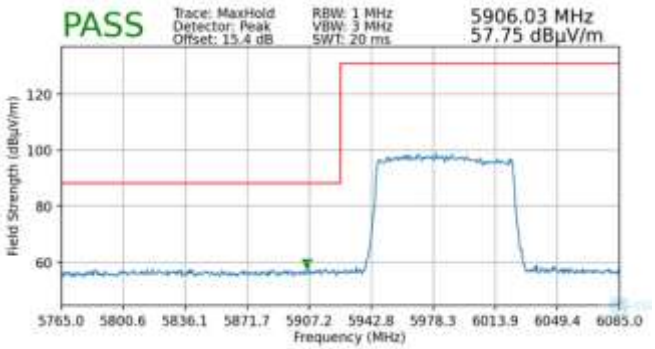
11.7.4 MIMO Radiated Band Edge Measurements (80MHz BW)

§15.407(b.5) §15.205 §15.209

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5985MHz
Channel:	7

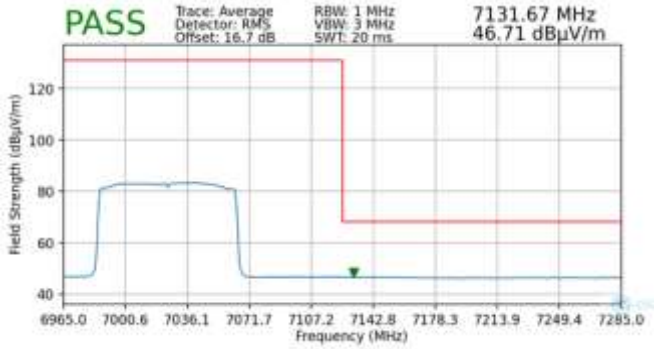


Plot 7-367. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 5)

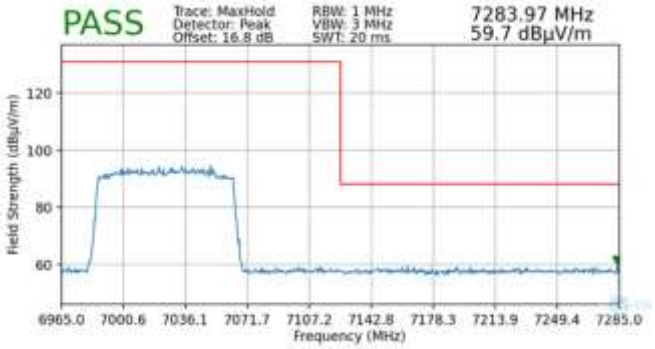


Plot 7-368. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 5)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	7025MHz
Channel:	215



Plot 7-369. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 8)

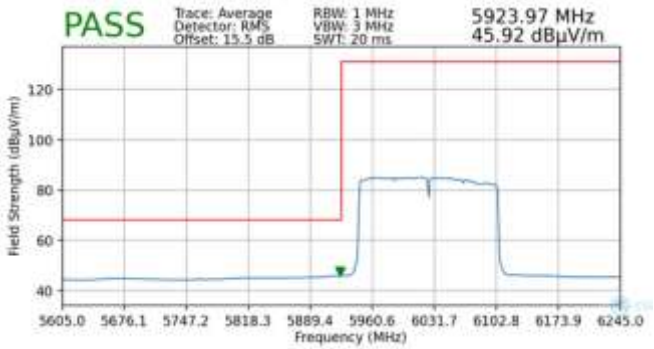


Plot 7-370. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 8)

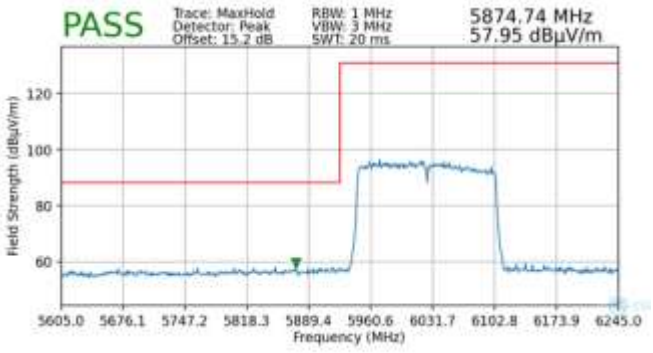
11.7.5 MIMO Radiated Band Edge Measurements (160MHz BW)

§15.407(b.5) §15.205 §15.209

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6025MHz
Channel:	15

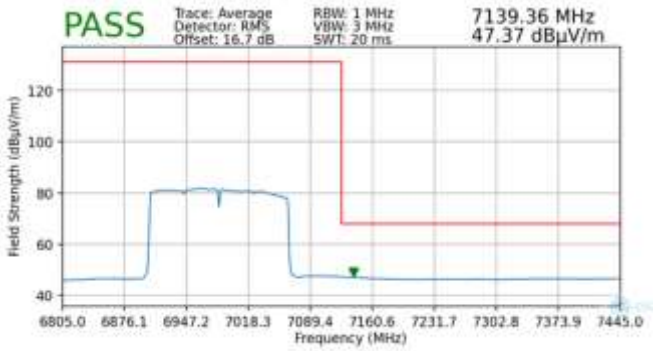


Plot 7-371. Radiated Lower Band Edge Plot MIMO (Average – UNII Band 5)

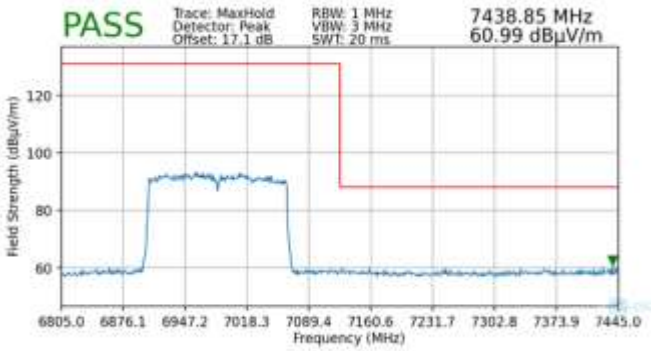


Plot 7-372. Radiated Lower Band Edge Plot MIMO (Peak – UNII Band 5)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	6985MHz
Channel:	207



Plot 7-373. Radiated Upper Band Edge Plot MIMO (Average – UNII Band 8)



Plot 7-374. Radiated Upper Band Edge Plot MIMO (Peak – UNII Band 8)

7.8 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209

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 emissions < 960MHz must not exceed the limit shown in* Table 7-28 *per Section 15.209

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 7-28. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

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

Test Setup

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

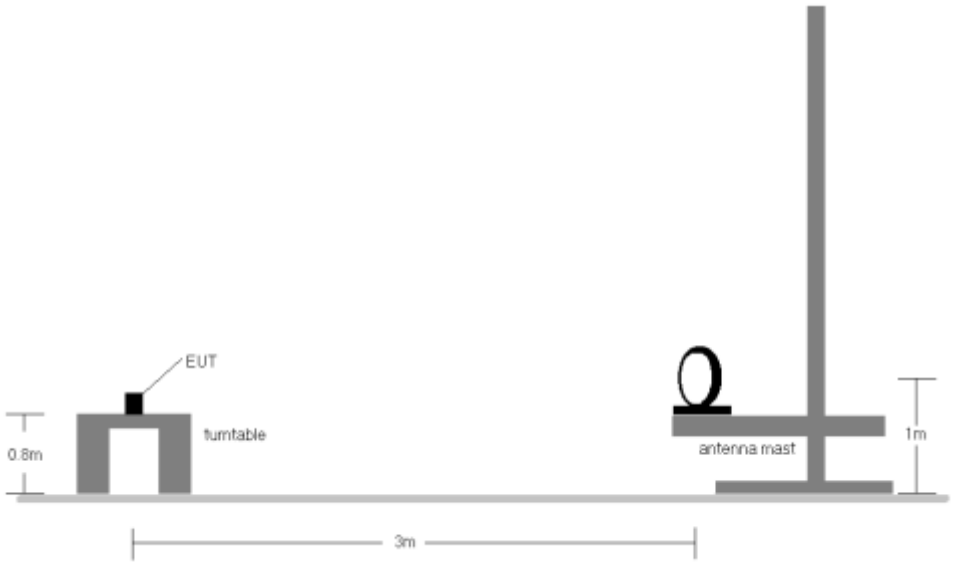


Figure 7-7. Radiated Test Setup < 30MHz

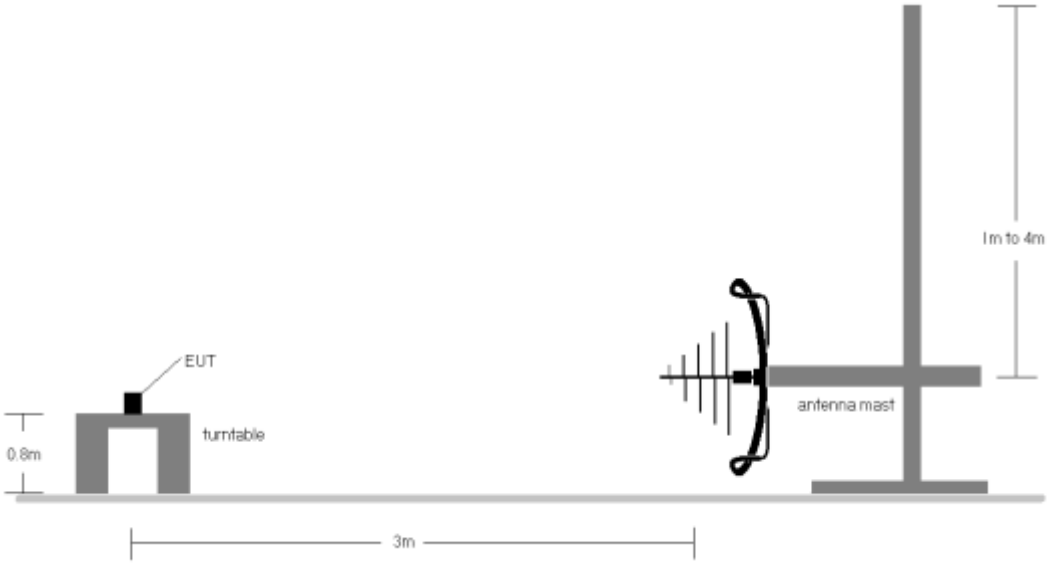


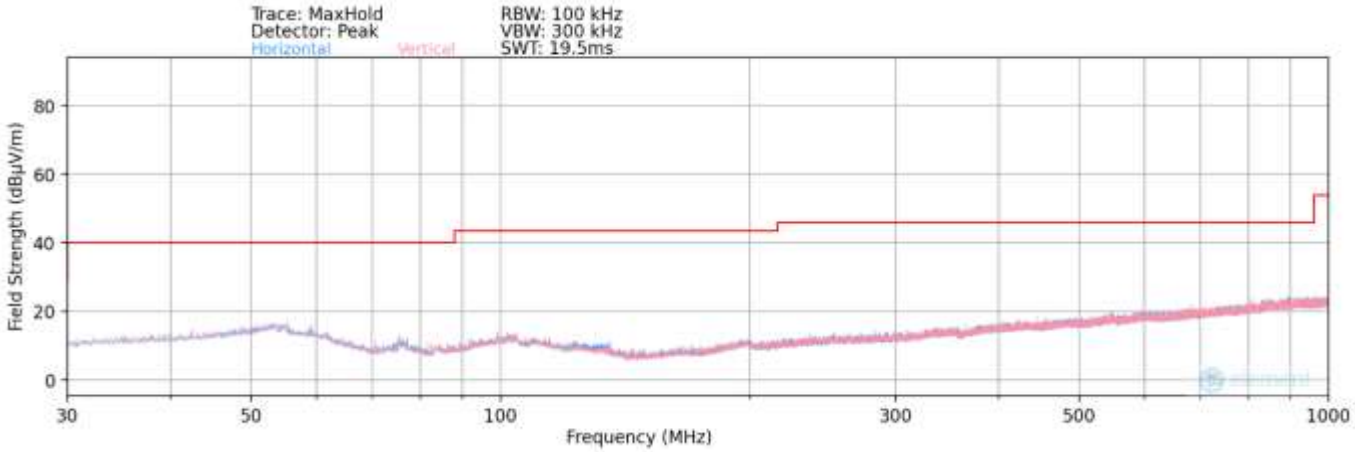
Figure 7-8. Radiated Test Setup < 1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-28.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
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. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
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. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209



Plot 7-375. Radiated Spurious Plot below 1GHz

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]
834.00	Quasi-Peak	V	-	-	-91.11	-4.48	11.41	46.02	-34.61

Plot 7-376. Radiated Spurious Data below 1GHz

7.9 Line-Conducted Test Data

§15.407(b)(9)

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 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.

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 7-29. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2013, Section 6.2

Test Settings

Quasi-Peak Field Strength 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 Field Strength 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.

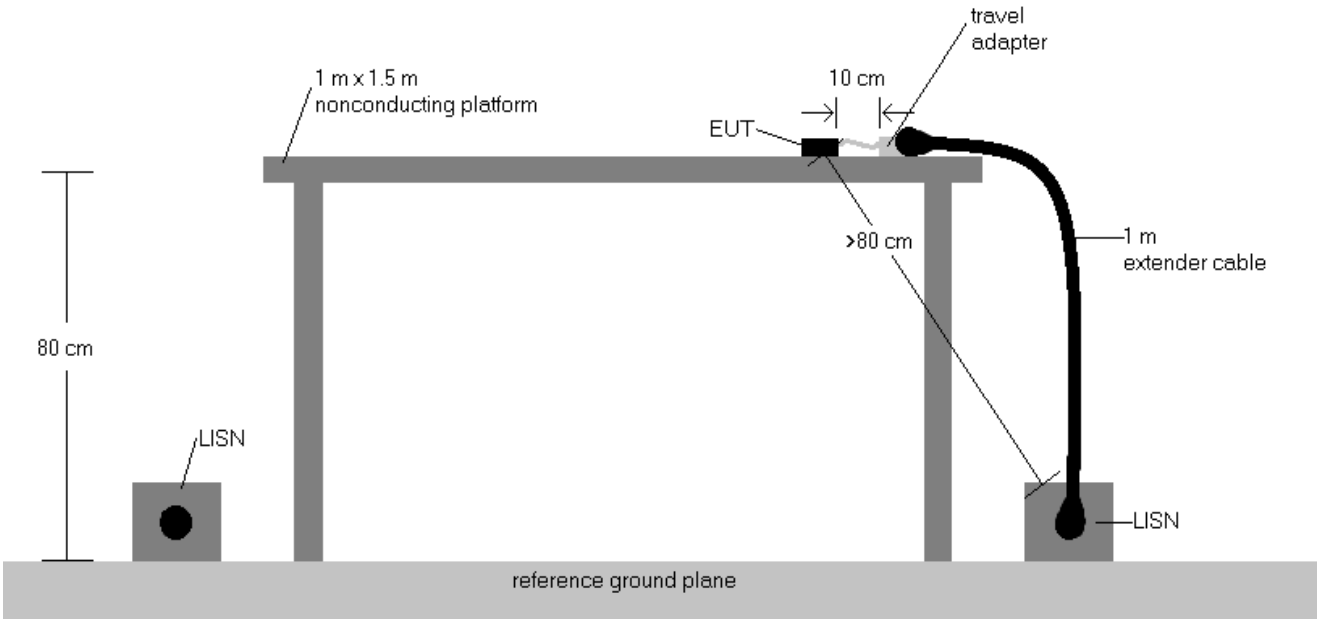
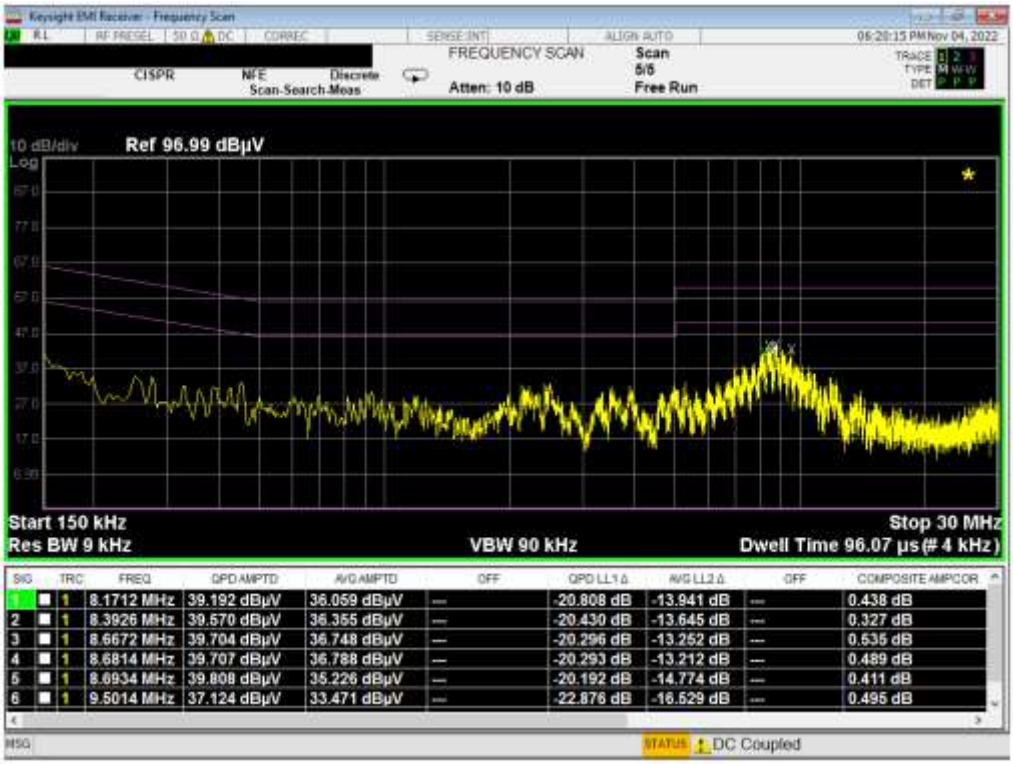


Figure 7-9. Test Instrument & Measurement Setup

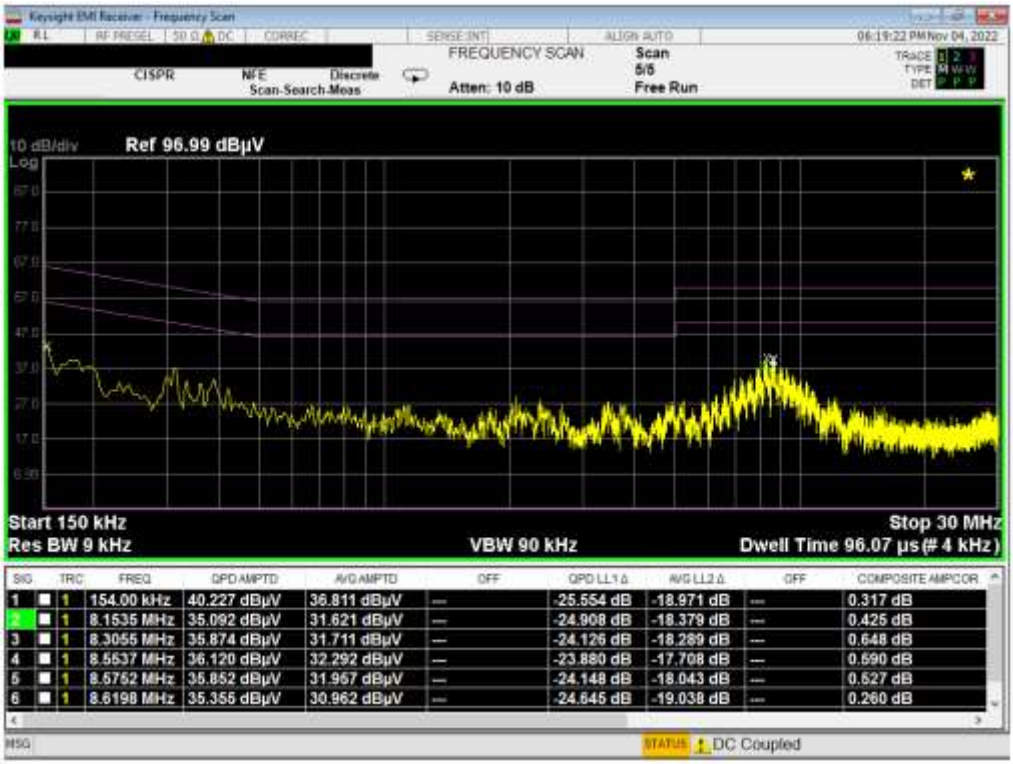
Test Notes

1. All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBμV) = QP/AV Analyzer/Receiver Level (dBμV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBμV) - QP/AV Level (dBμV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.



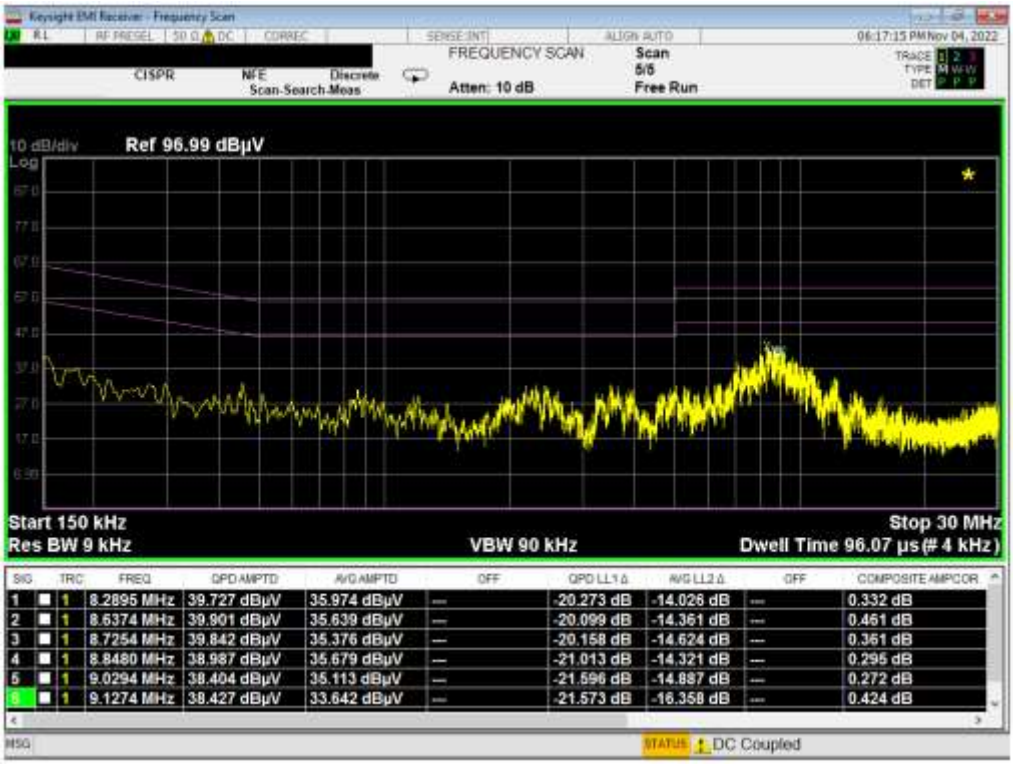
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	8.1712 MHz	39.192 dBµV	36.059 dBµV	---	-20.808 dB	-13.941 dB	---	0.438 dB
2	1	8.3926 MHz	39.670 dBµV	36.355 dBµV	---	-20.430 dB	-13.645 dB	---	0.327 dB
3	1	8.6672 MHz	39.704 dBµV	36.748 dBµV	---	-20.296 dB	-13.252 dB	---	0.535 dB
4	1	8.6814 MHz	39.707 dBµV	36.788 dBµV	---	-20.293 dB	-13.212 dB	---	0.489 dB
5	1	8.6934 MHz	39.808 dBµV	35.226 dBµV	---	-20.192 dB	-14.774 dB	---	0.411 dB
6	1	9.5014 MHz	37.124 dBµV	33.471 dBµV	---	-22.876 dB	-16.529 dB	---	0.495 dB

Plot 7-377. Line Conducted Plot with 802.11a UNII Band 5 (L1)



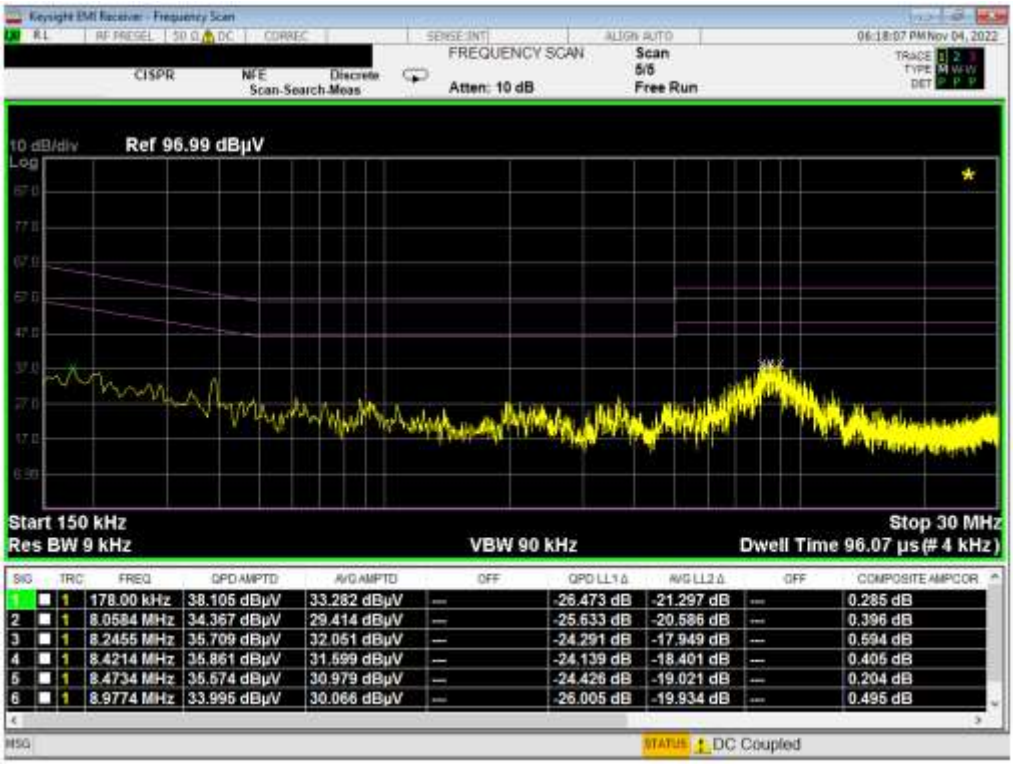
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	154.00 kHz	40.227 dBµV	36.811 dBµV	---	-25.554 dB	-18.971 dB	---	0.317 dB
2	1	8.1535 MHz	35.092 dBµV	31.621 dBµV	---	-24.908 dB	-18.379 dB	---	0.425 dB
3	1	8.3055 MHz	35.874 dBµV	31.711 dBµV	---	-24.126 dB	-18.289 dB	---	0.648 dB
4	1	8.5537 MHz	36.120 dBµV	32.292 dBµV	---	-23.880 dB	-17.708 dB	---	0.590 dB
5	1	8.5752 MHz	35.852 dBµV	31.957 dBµV	---	-24.148 dB	-18.043 dB	---	0.527 dB
6	1	8.6198 MHz	35.355 dBµV	30.962 dBµV	---	-24.645 dB	-19.038 dB	---	0.260 dB

Plot 7-378. Line Conducted Plot with 802.11a UNII Band 5 (N)



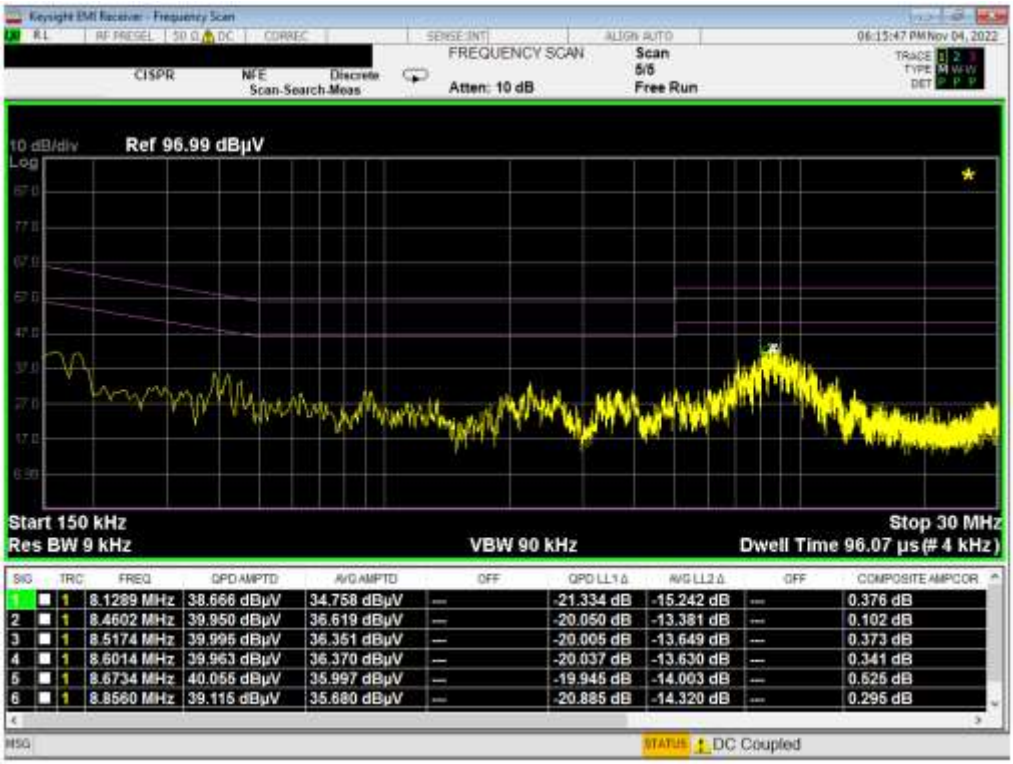
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	8.2895 MHz	39.727 dBµV	35.974 dBµV	---	-20.273 dB	-14.026 dB	---	0.332 dB
2	1	8.6374 MHz	39.901 dBµV	35.639 dBµV	---	-20.099 dB	-14.361 dB	---	0.461 dB
3	1	8.7254 MHz	39.842 dBµV	35.376 dBµV	---	-20.158 dB	-14.624 dB	---	0.361 dB
4	1	8.8480 MHz	38.987 dBµV	35.679 dBµV	---	-21.013 dB	-14.321 dB	---	0.295 dB
5	1	9.0294 MHz	38.404 dBµV	35.113 dBµV	---	-21.596 dB	-14.887 dB	---	0.272 dB
6	1	9.1274 MHz	38.427 dBµV	33.642 dBµV	---	-21.573 dB	-16.358 dB	---	0.424 dB

Plot 7-379. Line Conducted Plot with 802.11a UNII Band 6 (L1)



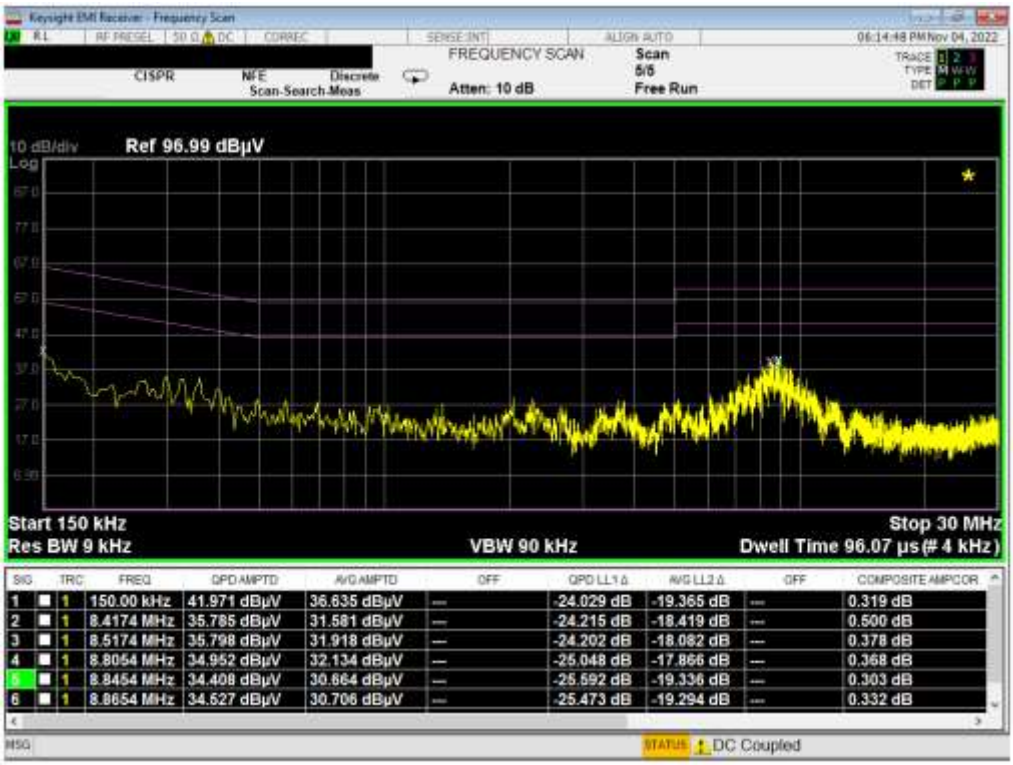
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	178.00 kHz	38.105 dBµV	33.282 dBµV	---	-26.473 dB	-21.297 dB	---	0.285 dB
2	1	8.0584 MHz	34.367 dBµV	29.414 dBµV	---	-25.633 dB	-20.586 dB	---	0.396 dB
3	1	8.2455 MHz	35.709 dBµV	32.051 dBµV	---	-24.291 dB	-17.949 dB	---	0.594 dB
4	1	8.4214 MHz	35.861 dBµV	31.599 dBµV	---	-24.139 dB	-18.401 dB	---	0.405 dB
5	1	8.4734 MHz	35.574 dBµV	30.979 dBµV	---	-24.426 dB	-19.021 dB	---	0.204 dB
6	1	8.9774 MHz	33.995 dBµV	30.066 dBµV	---	-26.005 dB	-19.934 dB	---	0.495 dB

Plot 7-380. Line Conducted Plot with 802.11a UNII Band 6 (N)



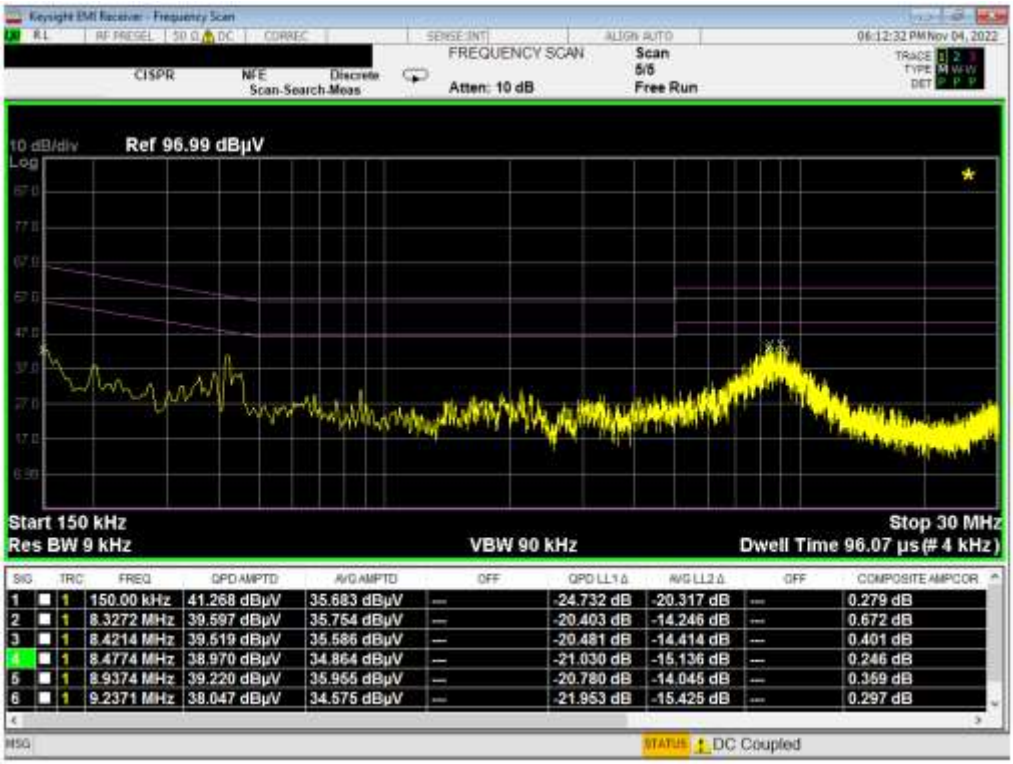
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	8.1289 MHz	38.666 dBµV	34.758 dBµV	---	-21.334 dB	-15.242 dB	---	0.376 dB
2	1	8.4602 MHz	39.950 dBµV	36.619 dBµV	---	-20.050 dB	-13.381 dB	---	0.102 dB
3	1	8.5174 MHz	39.995 dBµV	36.351 dBµV	---	-20.005 dB	-13.649 dB	---	0.373 dB
4	1	8.6014 MHz	39.963 dBµV	36.370 dBµV	---	-20.037 dB	-13.630 dB	---	0.341 dB
5	1	8.6734 MHz	40.055 dBµV	35.997 dBµV	---	-19.945 dB	-14.003 dB	---	0.525 dB
6	1	8.8560 MHz	39.115 dBµV	35.680 dBµV	---	-20.885 dB	-14.320 dB	---	0.295 dB

Plot 7-381. Line Conducted Plot with 802.11a UNII Band 7 (L1)



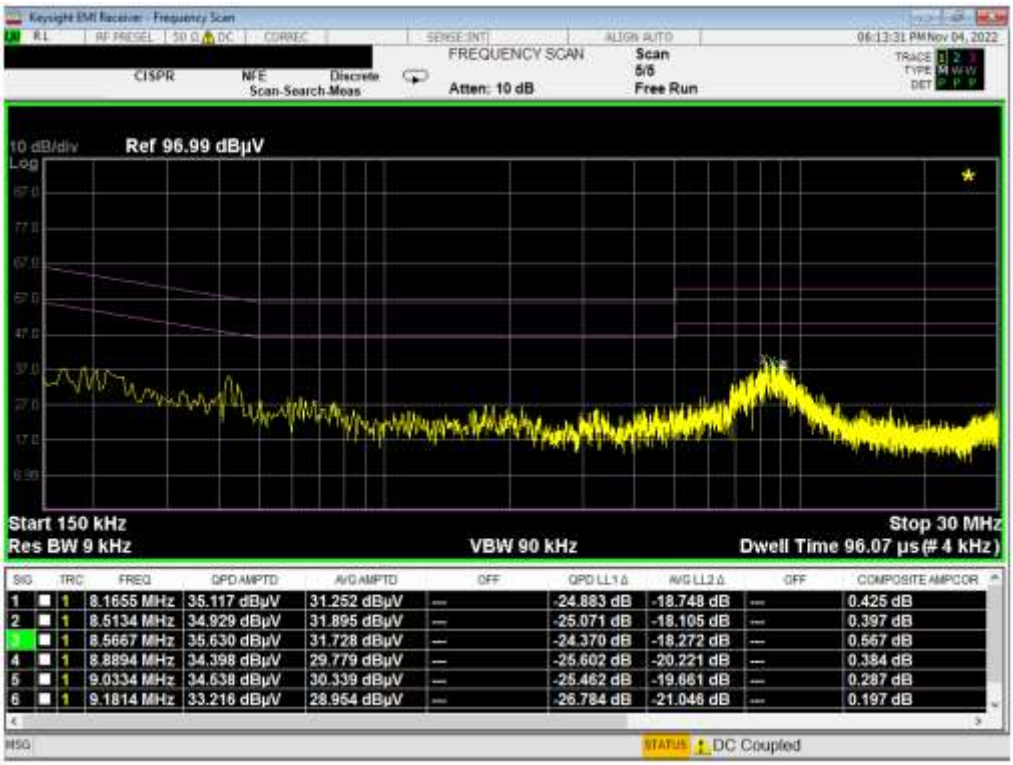
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	150.00 kHz	41.971 dBµV	36.635 dBµV	---	-24.029 dB	-19.365 dB	---	0.319 dB
2	1	8.4174 MHz	35.785 dBµV	31.581 dBµV	---	-24.215 dB	-18.419 dB	---	0.500 dB
3	1	8.5174 MHz	35.798 dBµV	31.918 dBµV	---	-24.202 dB	-18.082 dB	---	0.378 dB
4	1	8.8054 MHz	34.952 dBµV	32.134 dBµV	---	-25.048 dB	-17.866 dB	---	0.368 dB
5	1	8.8454 MHz	34.408 dBµV	30.664 dBµV	---	-25.592 dB	-19.336 dB	---	0.303 dB
6	1	8.8654 MHz	34.527 dBµV	30.706 dBµV	---	-25.473 dB	-19.294 dB	---	0.332 dB

Plot 7-382. Line Conducted Plot with 802.11a UNII Band 7 (N)



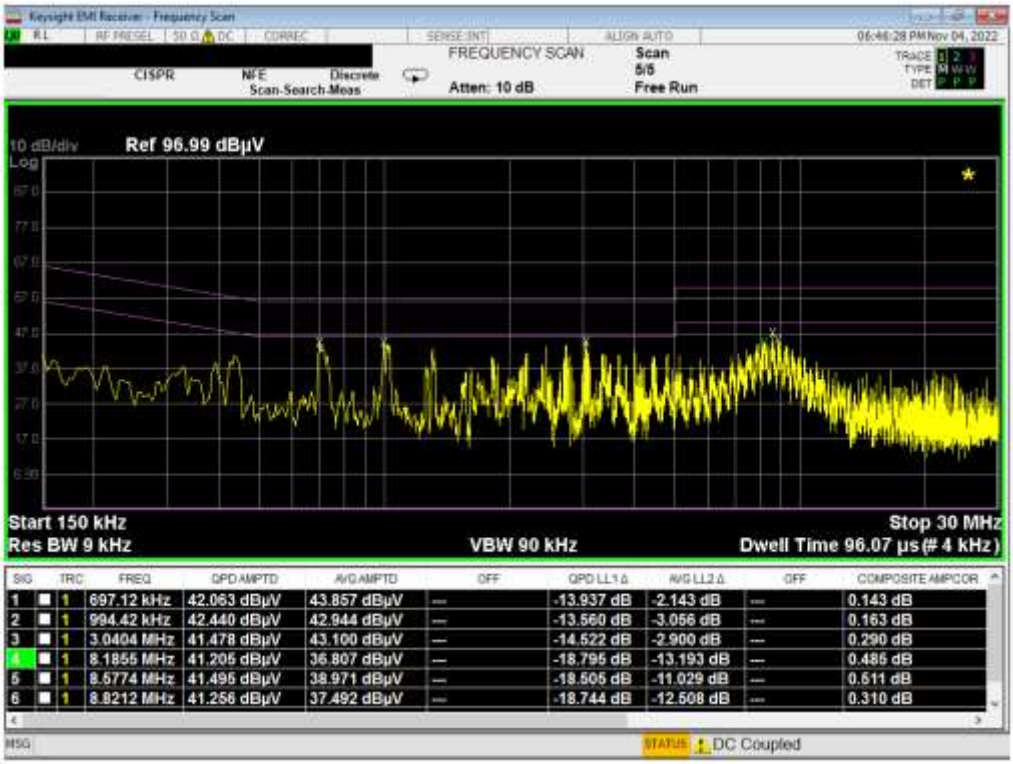
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	150.00 kHz	41.268 dBµV	35.683 dBµV	---	-24.732 dB	-20.317 dB	---	0.279 dB
2	1	8.3272 MHz	39.597 dBµV	35.754 dBµV	---	-20.403 dB	-14.246 dB	---	0.672 dB
3	1	8.4214 MHz	39.519 dBµV	35.586 dBµV	---	-20.481 dB	-14.414 dB	---	0.401 dB
4	1	8.4774 MHz	38.970 dBµV	34.864 dBµV	---	-21.030 dB	-15.136 dB	---	0.246 dB
5	1	8.9374 MHz	39.220 dBµV	35.955 dBµV	---	-20.780 dB	-14.045 dB	---	0.359 dB
6	1	9.2371 MHz	38.047 dBµV	34.575 dBµV	---	-21.953 dB	-15.425 dB	---	0.297 dB

Plot 7-383. Line Conducted Plot with 802.11a UNII Band 8 (L1)



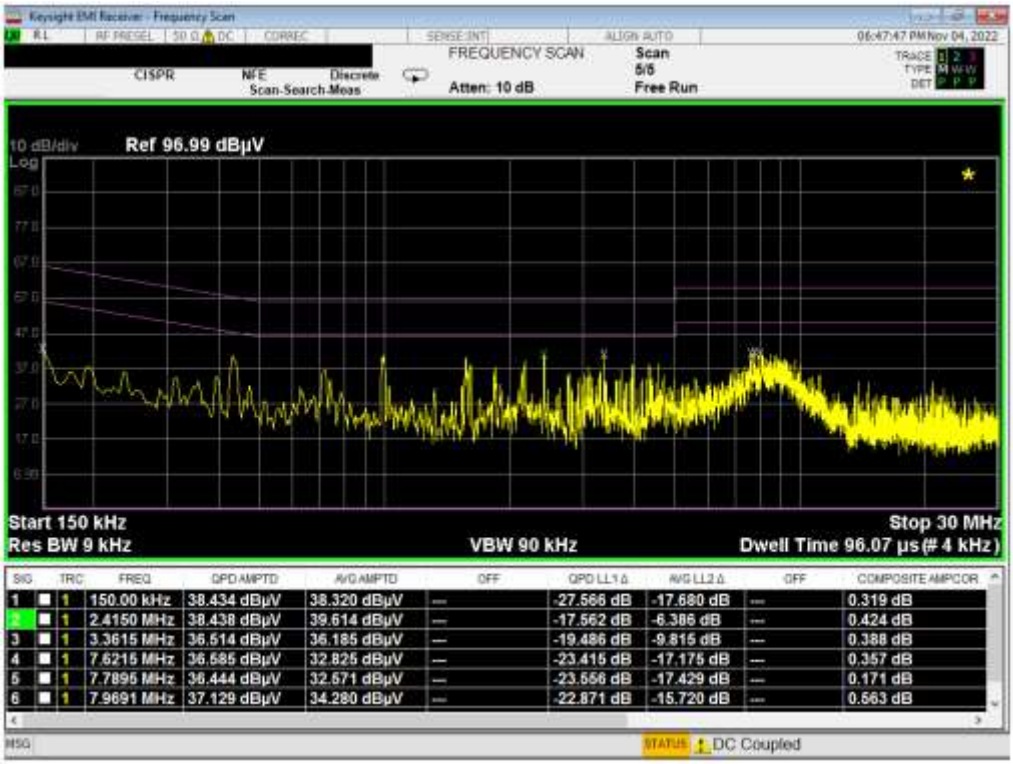
SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	8.1655 MHz	35.117 dBµV	31.252 dBµV	---	-24.883 dB	-18.748 dB	---	0.425 dB
2	1	8.5134 MHz	34.929 dBµV	31.895 dBµV	---	-25.071 dB	-18.105 dB	---	0.397 dB
3	1	8.5667 MHz	35.630 dBµV	31.728 dBµV	---	-24.370 dB	-18.272 dB	---	0.567 dB
4	1	8.8894 MHz	34.398 dBµV	29.779 dBµV	---	-25.602 dB	-20.221 dB	---	0.384 dB
5	1	9.0334 MHz	34.638 dBµV	30.339 dBµV	---	-25.462 dB	-19.661 dB	---	0.287 dB
6	1	9.1814 MHz	33.216 dBµV	28.954 dBµV	---	-26.784 dB	-21.046 dB	---	0.197 dB

Plot 7-384. Line Conducted Plot with 802.11a UNII Band 8 (N)



SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	697.12 kHz	42.063 dBµV	43.857 dBµV	---	-13.937 dB	-2.143 dB	---	0.143 dB
2	1	994.42 kHz	42.440 dBµV	42.944 dBµV	---	-13.560 dB	-3.056 dB	---	0.163 dB
3	1	3.0404 MHz	41.478 dBµV	43.100 dBµV	---	-14.522 dB	-2.900 dB	---	0.290 dB
4	1	8.1855 MHz	41.205 dBµV	36.807 dBµV	---	-18.795 dB	-13.193 dB	---	0.486 dB
5	1	8.5774 MHz	41.495 dBµV	38.971 dBµV	---	-18.505 dB	-11.029 dB	---	0.511 dB
6	1	8.8212 MHz	41.256 dBµV	37.492 dBµV	---	-18.744 dB	-12.508 dB	---	0.310 dB

Plot 7-385. Line Conducted Plot with 802.11a UNII Band 5 (L1) with WCP



SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	COMPOSITE AMPCOR
1	1	150.00 kHz	38.434 dBµV	38.320 dBµV	---	-27.566 dB	-17.680 dB	---	0.319 dB
2	1	2.4150 MHz	38.438 dBµV	39.614 dBµV	---	-17.562 dB	-6.386 dB	---	0.424 dB
3	1	3.3615 MHz	36.514 dBµV	36.185 dBµV	---	-19.486 dB	-9.815 dB	---	0.388 dB
4	1	7.6215 MHz	36.585 dBµV	32.825 dBµV	---	-23.415 dB	-17.175 dB	---	0.357 dB
5	1	7.7895 MHz	36.444 dBµV	32.571 dBµV	---	-23.556 dB	-17.429 dB	---	0.171 dB
6	1	7.9691 MHz	37.129 dBµV	34.280 dBµV	---	-22.871 dB	-15.720 dB	---	0.663 dB

Plot 7-386. Line Conducted Plot with 802.11a UNII Band 5 (N) with WCP

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Handset FCC: A3LSMS911JPN** is in compliance with FCC Part Subpart E (15.407) of the FCC rules for operation as a client device.