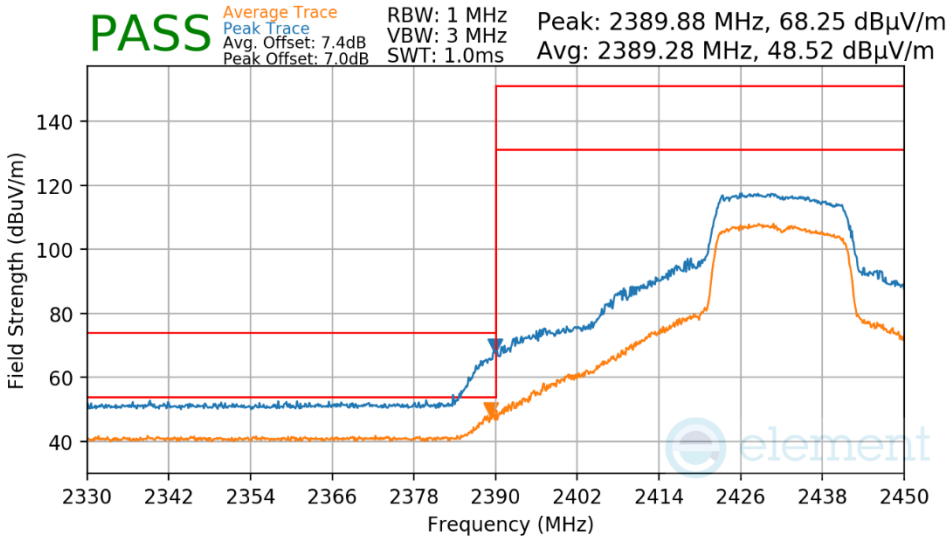
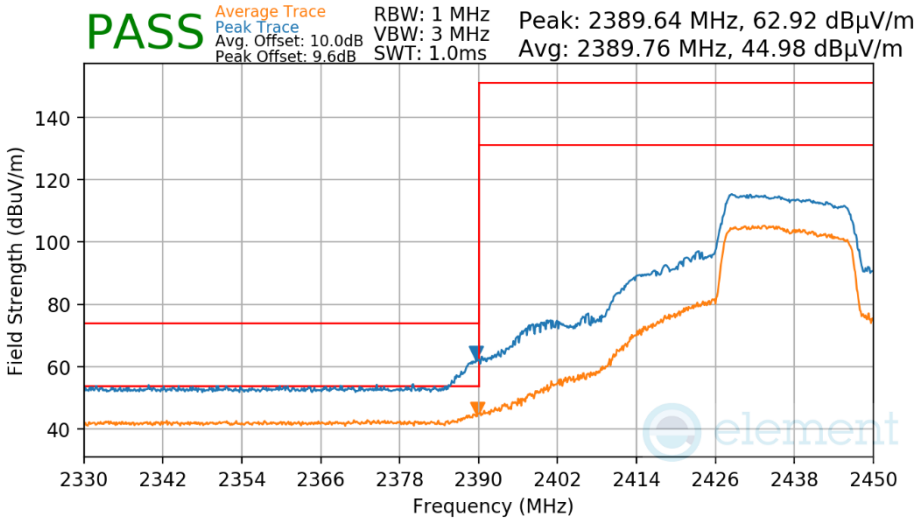
Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2432MHz
Channel:	5



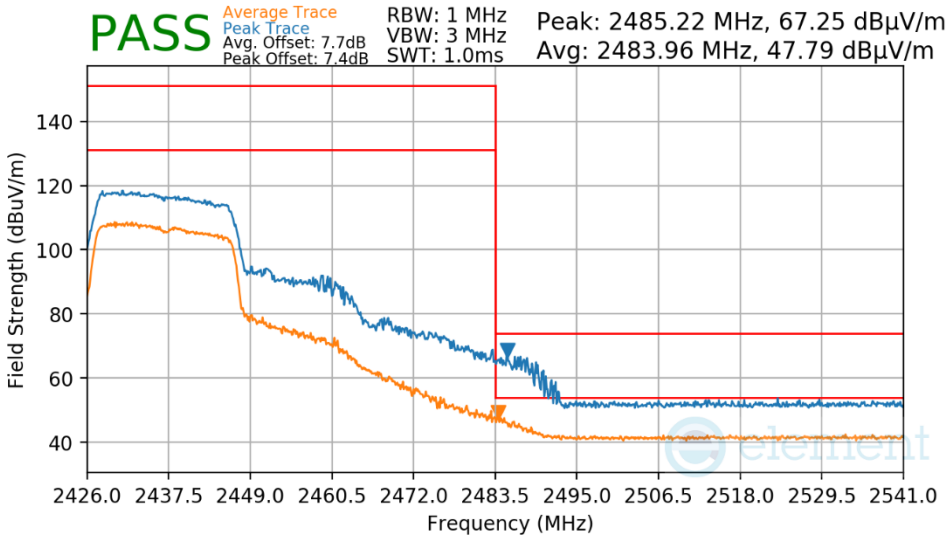
Plot 7-176. Radiated Restricted Lower Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	6



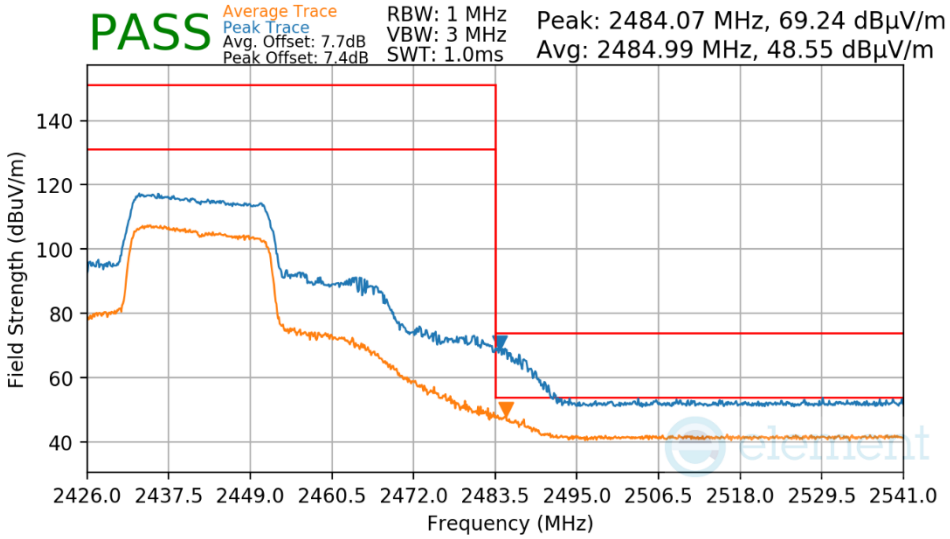
Plot 7-177. Radiated Restricted Lower Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	6



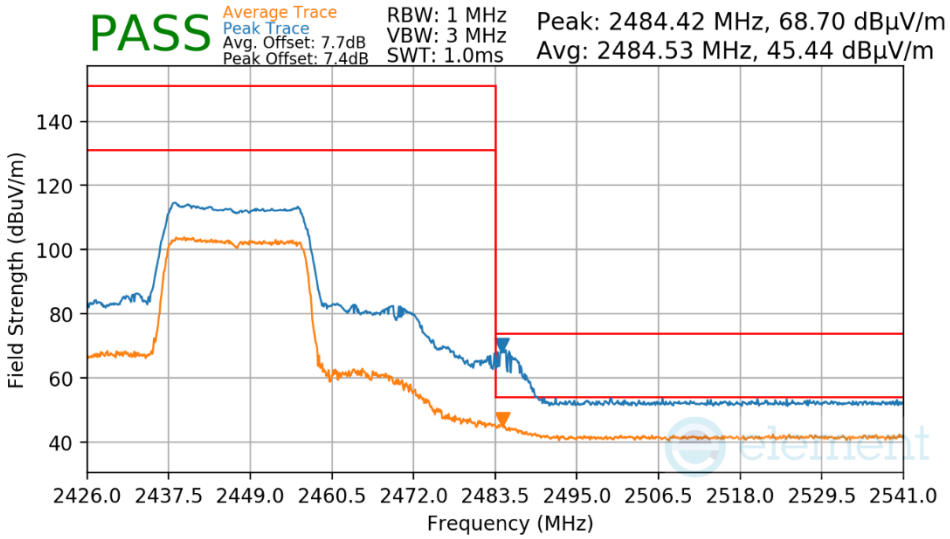
Plot 7-178. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2442MHz
Channel:	7



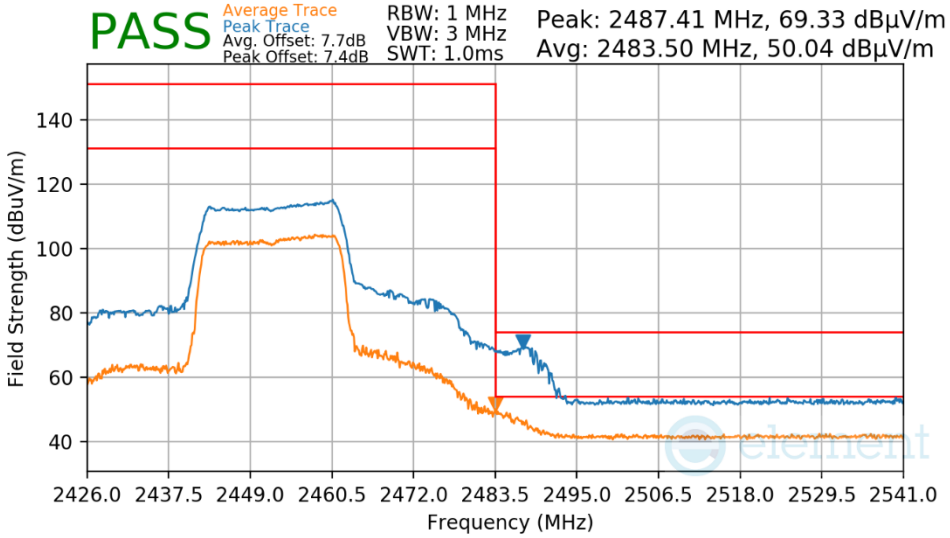
Plot 7-179. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2447MHz
Channel:	8



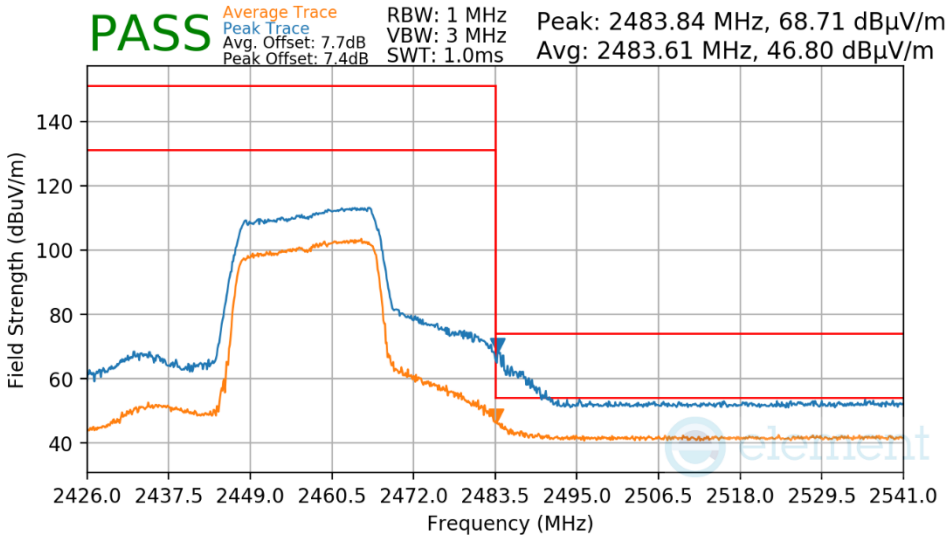
Plot 7-180. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2452MHz
Channel:	9



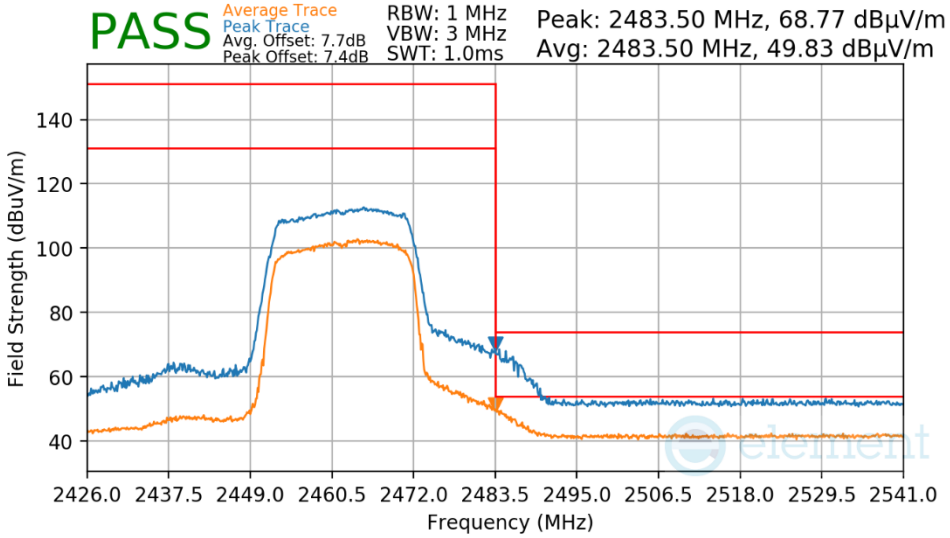
Plot 7-181. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2457MHz
Channel:	10



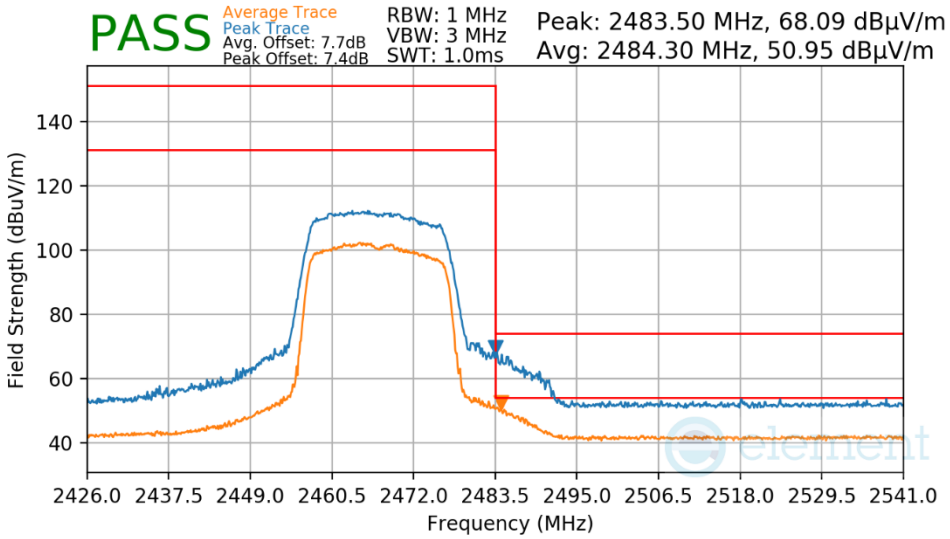
Plot 7-182. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Plot 7-183. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2467MHz
Channel:	12



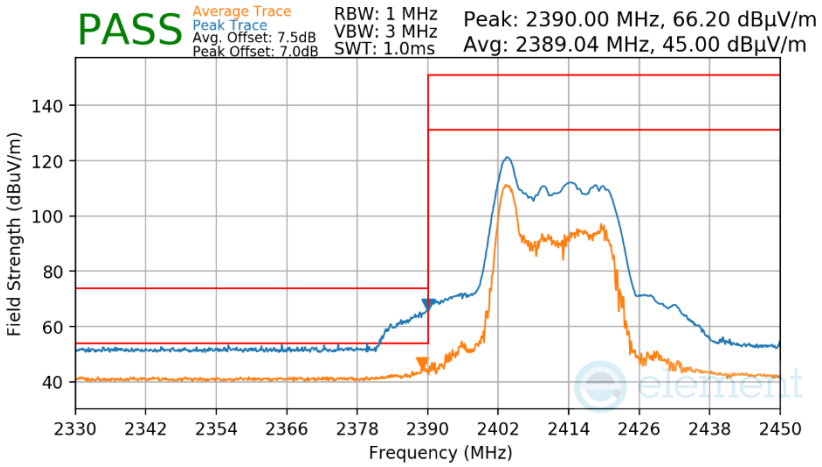
Plot 7-184. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Peak & Average – RU242)

7.7.6 CDD Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

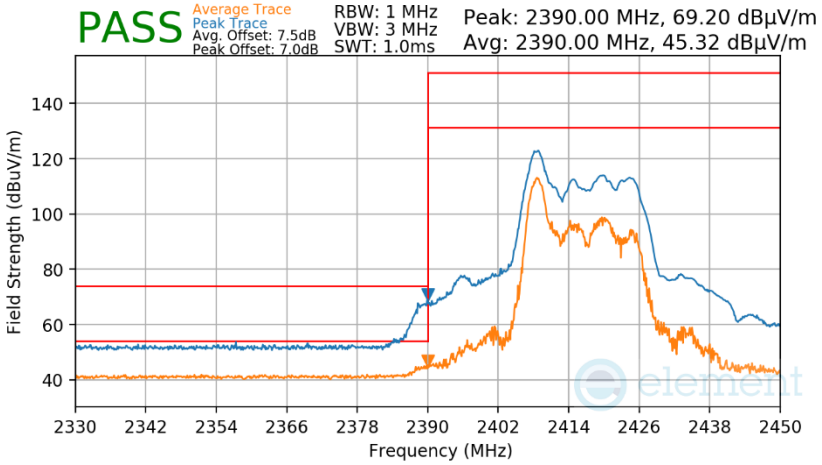
The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	0
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



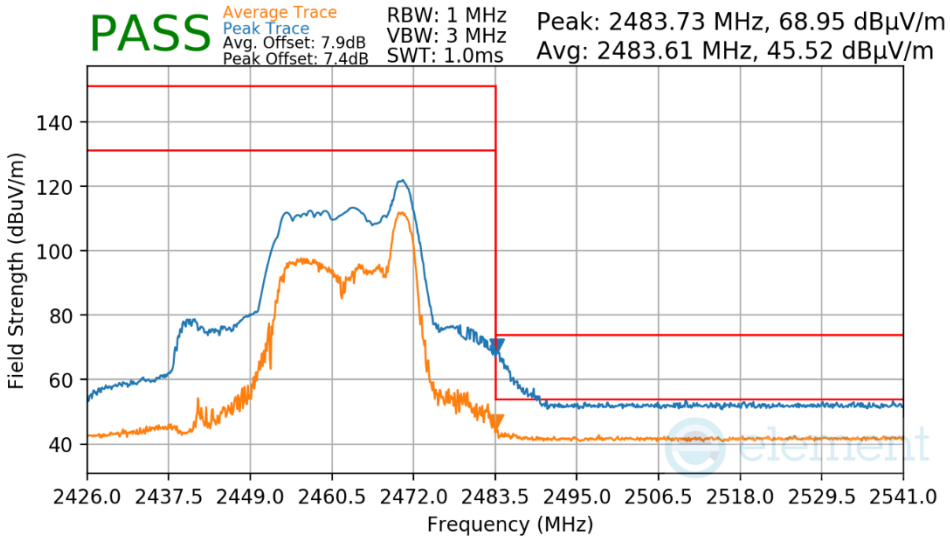
Plot 7-185. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU26)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	0
Distance of Measurements:	3 Meters
Operating Frequency:	2417MHz
Channel:	2



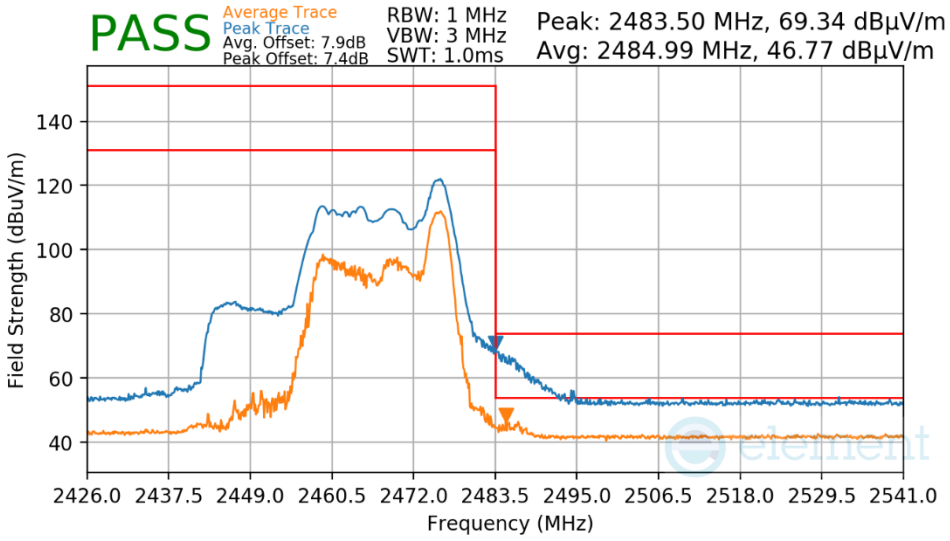
Plot 7-186. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU26)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	8
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



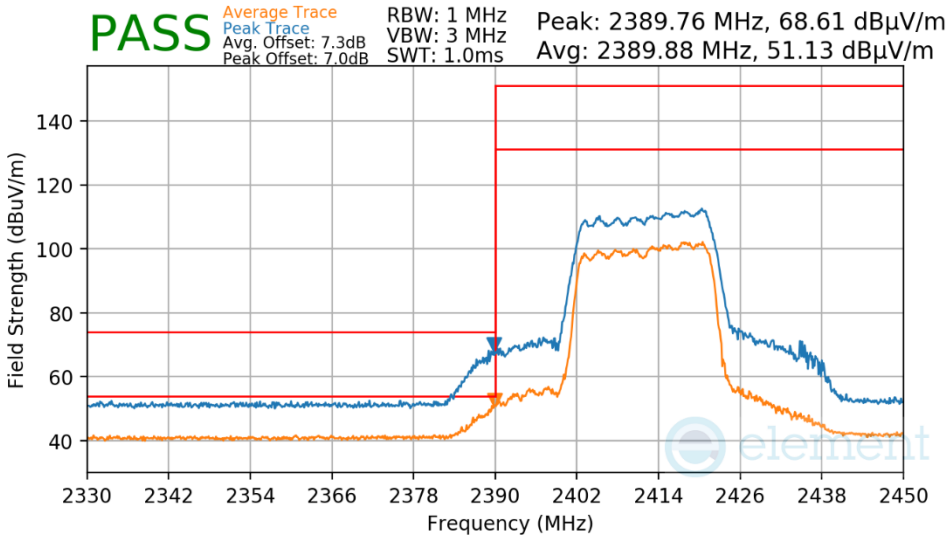
Plot 7-187. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU26)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	8
Distance of Measurements:	3 Meters
Operating Frequency:	2467MHz
Channel:	12



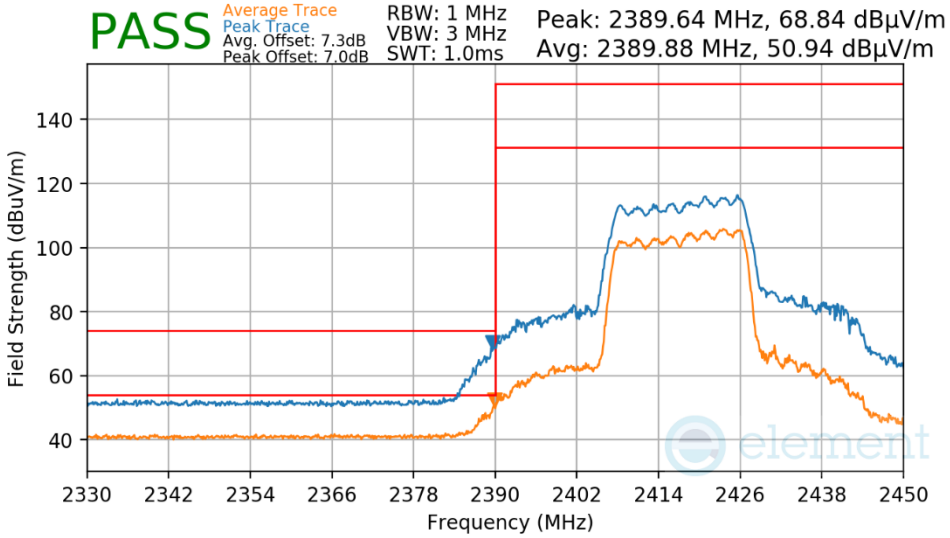
Plot 7-188. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU26)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



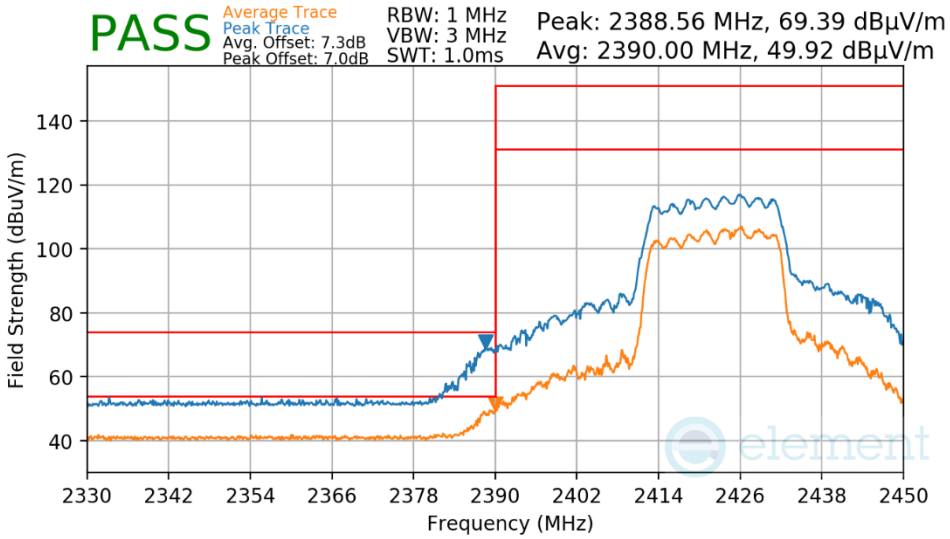
Plot 7-189. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2417MHz
Channel:	2



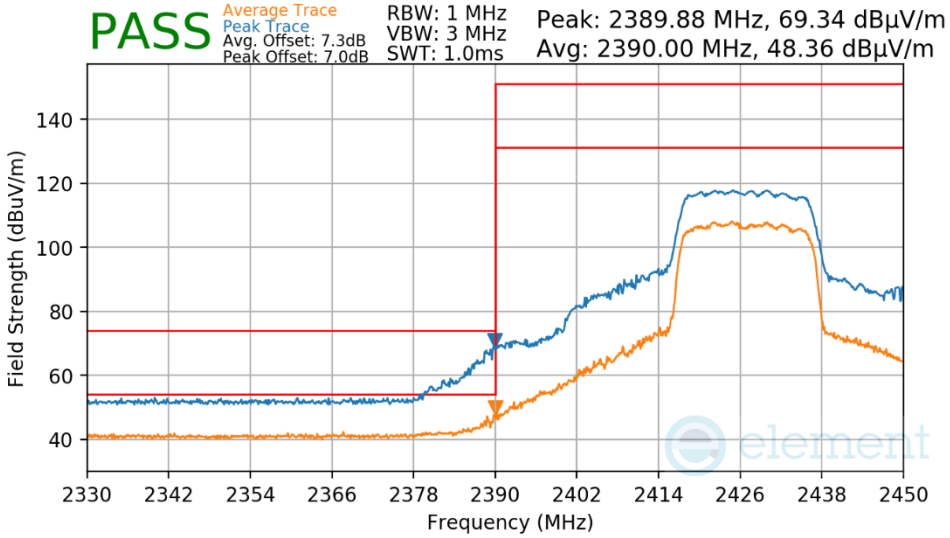
Plot 7-190. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2422MHz
Channel:	3



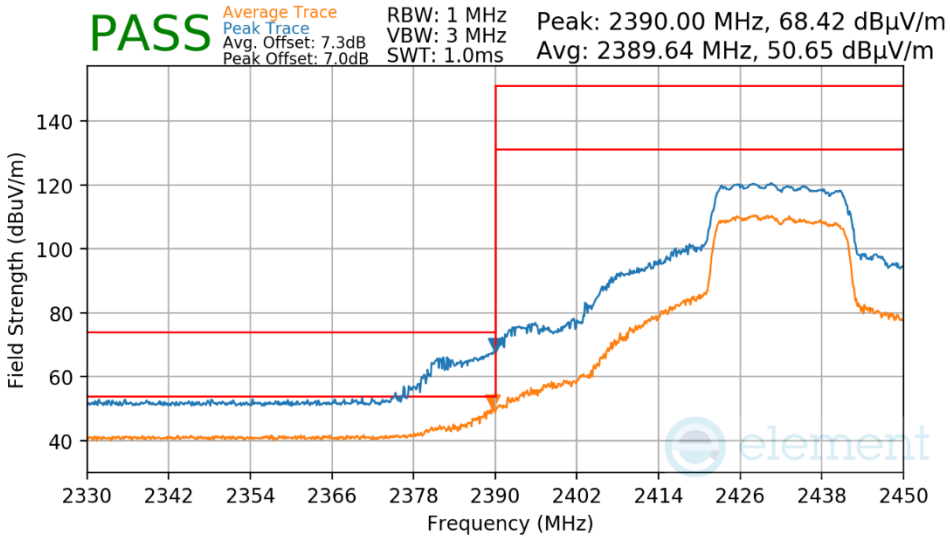
Plot 7-191. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2427MHz
Channel:	4



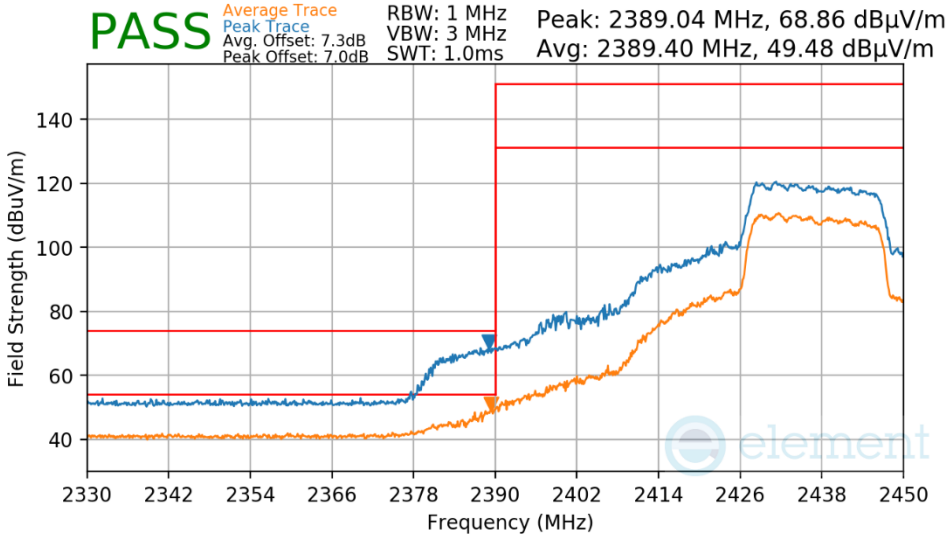
Plot 7-192. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2432MHz
Channel:	5



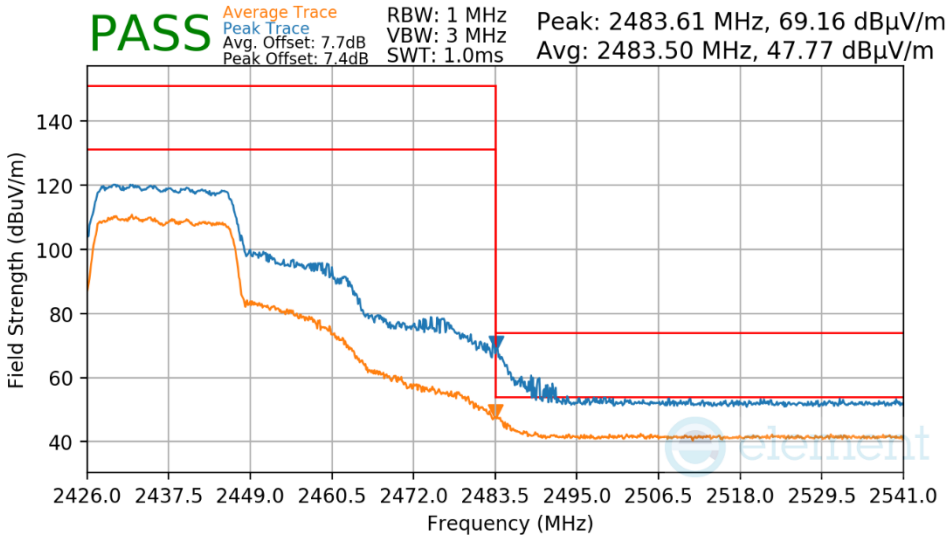
Plot 7-193. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	6



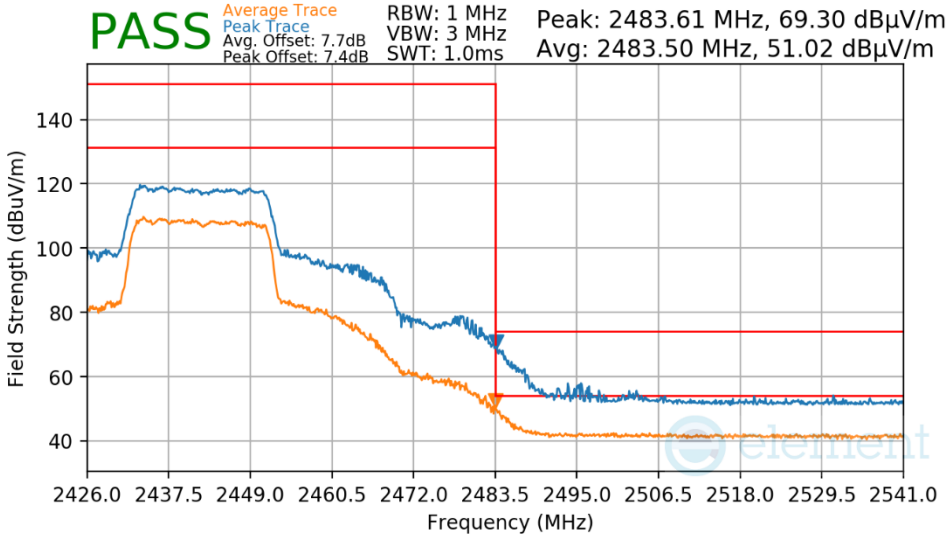
Plot 7-194. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	6



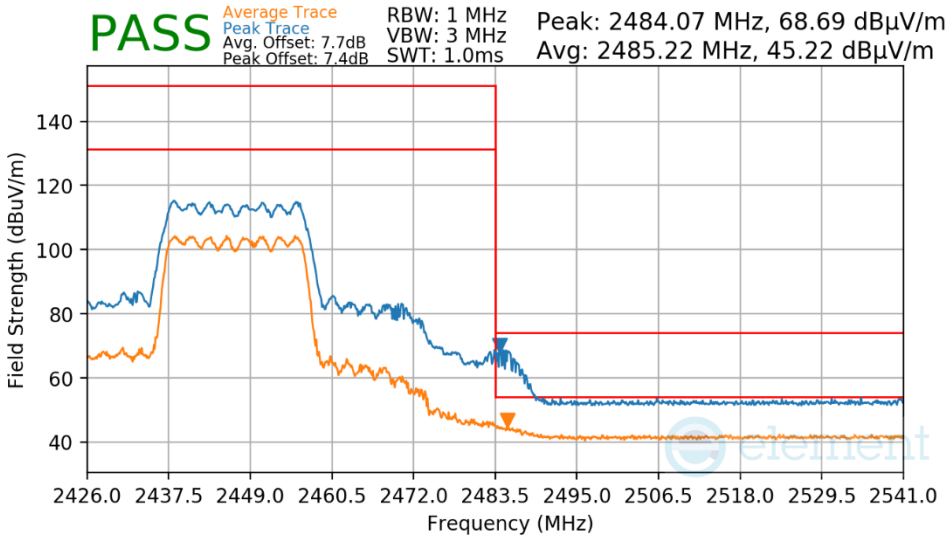
Plot 7-195. Radiated Restricted Lower Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2442MHz
Channel:	7



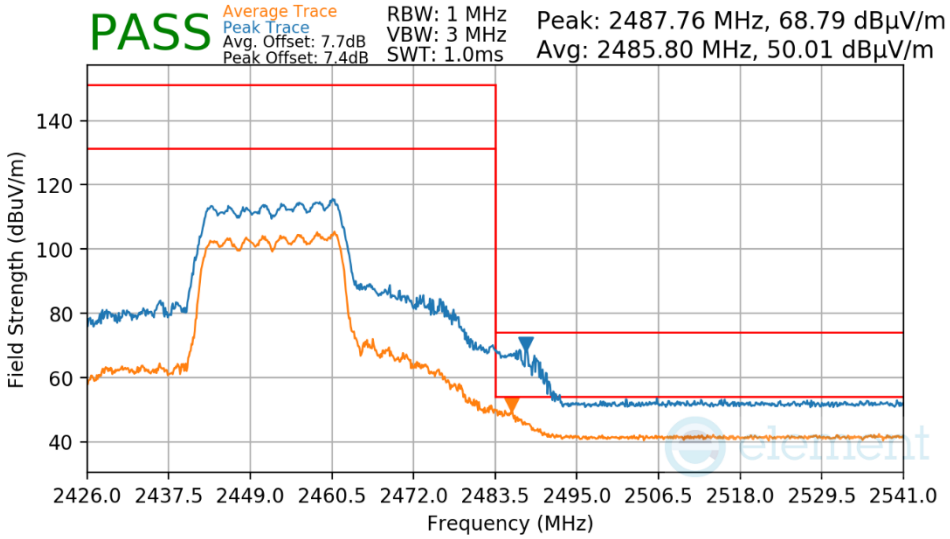
Plot 7-196. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2447MHz
Channel:	8



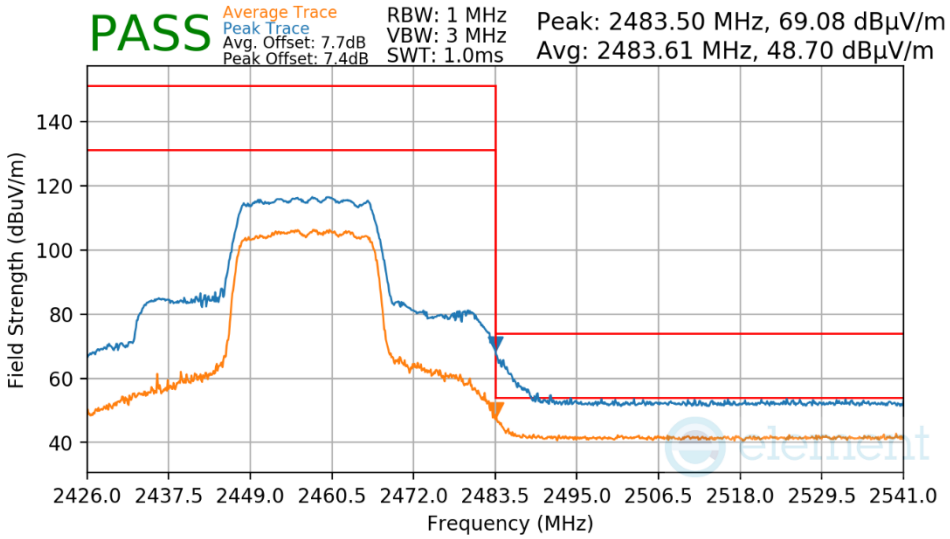
Plot 7-197. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2452MHz
Channel:	9



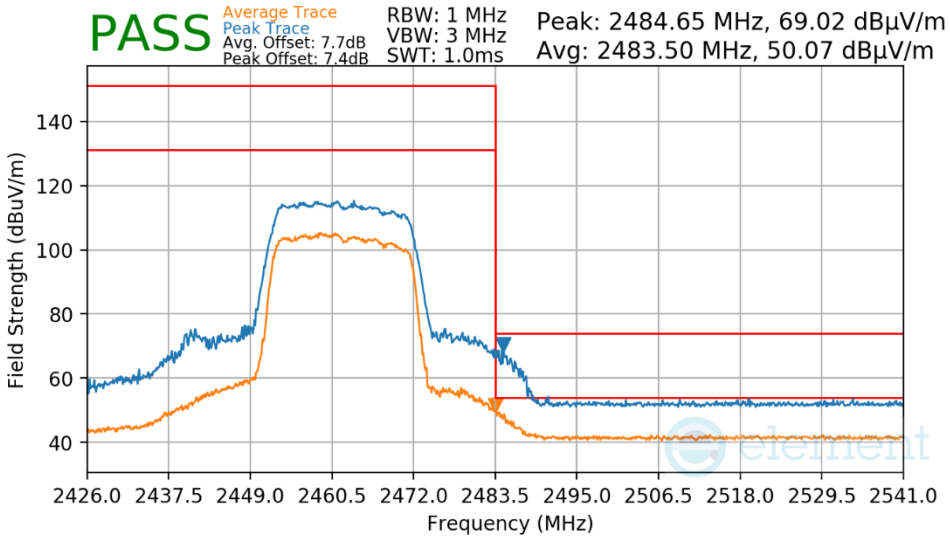
Plot 7-198. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2457MHz
Channel:	10



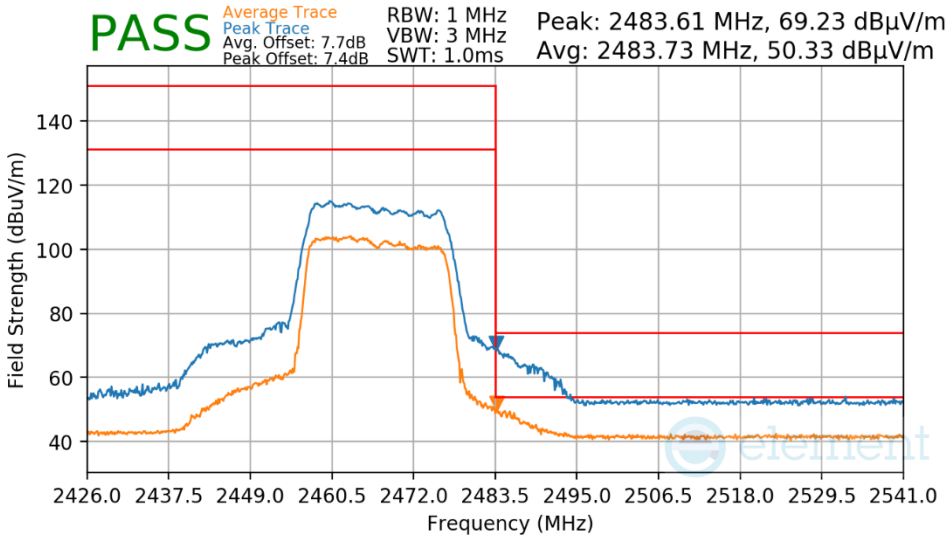
Plot 7-199. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Plot 7-200. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU242)

Worst Case Mode:	802.11ax OFDMA
Worst Case Transfer Rate:	MCS9
RU Index:	61
Distance of Measurements:	3 Meters
Operating Frequency:	2467MHz
Channel:	12



Plot 7-201. Radiated Restricted Upper Band Edge Measurement CDD (Peak & Average – RU242)

7.8 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 and Table 7 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-38 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 7-38. 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

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 = 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.

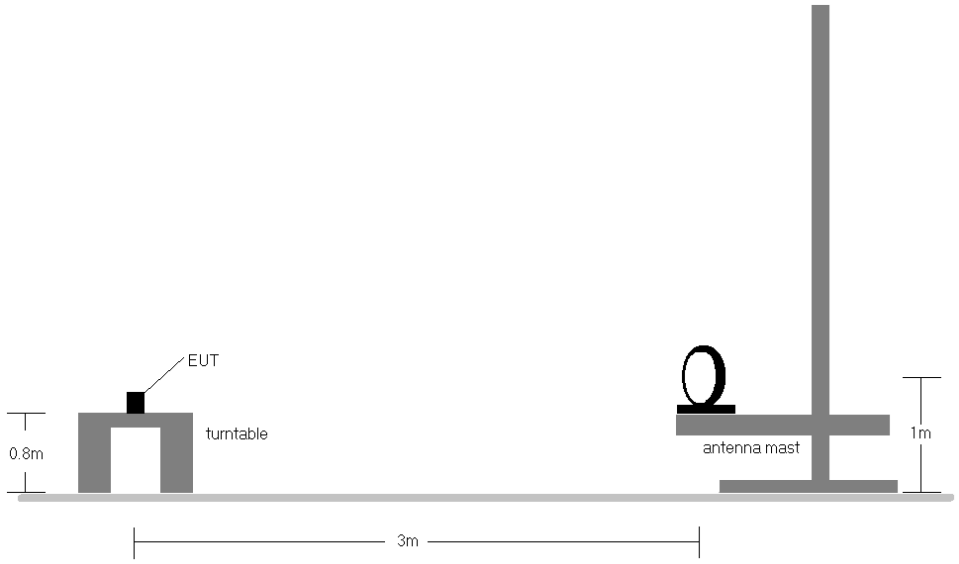


Figure 7-7. Radiated Test Setup < 30MHz

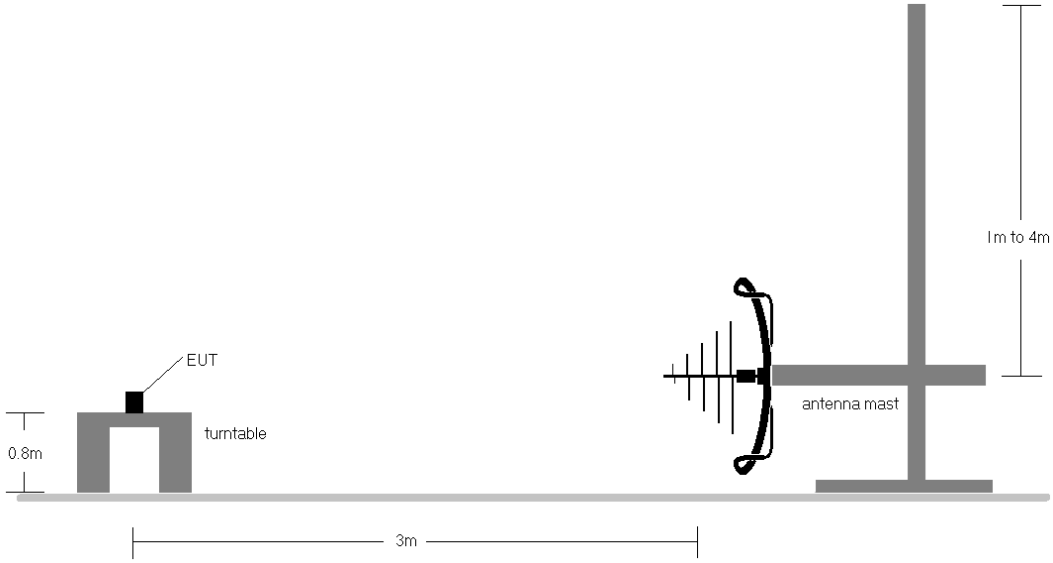


Figure 7-8. Radiated Test Setup < 1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen(8.10) are below the limit shown in Table 7-38.
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 for emissions 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. All antenna configurations and data rates were investigated and only the worst case are reported.
10. For radiated measurements, emissions were investigated for the fully-loaded RU configuration and for all the partially-loaded RU configurations. Among all of the available partially-loaded RU configurations, only the configuration with the worst case emissions is reported.
11. 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

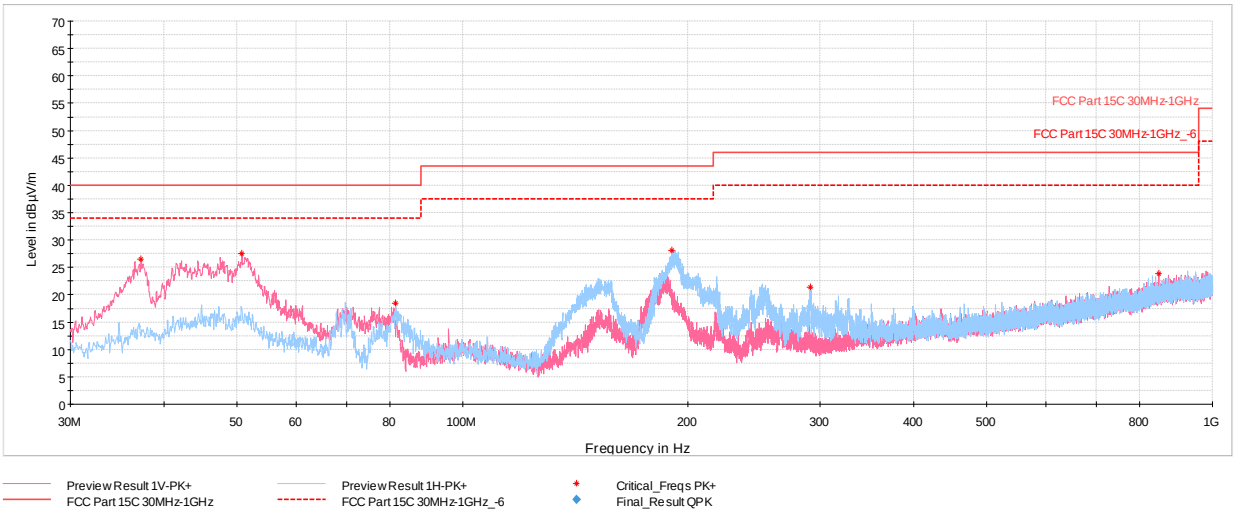
Sample Calculations

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 $_{[dB]}$ – Preamplifier Gain $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

CDD Radiated Spurious Emissions Measurements (Below 1GHz)

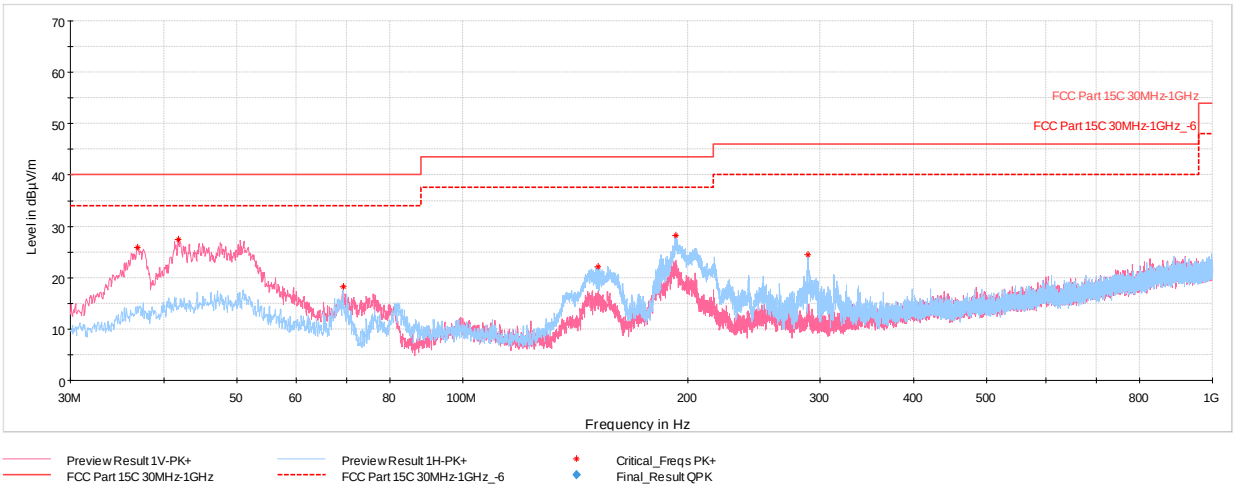
§15.209; RSS-Gen [8.9]



Plot 7-202. Radiated Spurious Emissions below 1GHz CDD Ch.6 (RU26), with AC/DC Adapter

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]
37.28	MaxPeak	V	100	0	-65.35	-15.17	26.48	40.00	-13.52
50.81	MaxPeak	V	100	3	-66.36	-13.12	27.52	40.00	-12.48
81.46	MaxPeak	H	200	282	-67.60	-20.91	18.49	43.52	-25.03
190.29	MaxPeak	H	100	152	-61.39	-17.44	28.17	43.52	-15.35
291.03	MaxPeak	H	100	101	-70.78	-14.79	21.43	46.02	-24.59
848.83	MaxPeak	V	100	78	-79.86	-3.21	23.93	46.02	-22.09

Table 7-39. Radiated Spurious Emissions below 1GHz CDD Ch.6 (RU26), with AC/DC Adapter



Plot 7-203. Radiated Spurious Emissions below 1GHz CDD Ch.6 (RU242), with AC/DC Adapter

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]
36.89	MaxPeak	V	100	306	-65.79	-15.26	25.95	40.00	-14.05
41.79	MaxPeak	V	100	317	-65.94	-13.59	27.47	40.00	-12.53
69.33	MaxPeak	H	300	129	-70.30	-18.51	18.19	40.00	-21.81
151.69	MaxPeak	H	200	215	-64.74	-20.13	22.13	43.52	-21.39
192.67	MaxPeak	H	100	178	-61.59	-17.19	28.22	43.52	-15.30
288.60	MaxPeak	H	100	265	-67.70	-14.83	24.47	46.02	-21.55

Table 7-40. Radiated Spurious Emissions below 1GHz CDD Ch.6 (RU242), with AC/DC Adapter

7.9 AC Line-Conducted Emissions Measurement

§15.207; 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 7-41. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2013, Subclause 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.

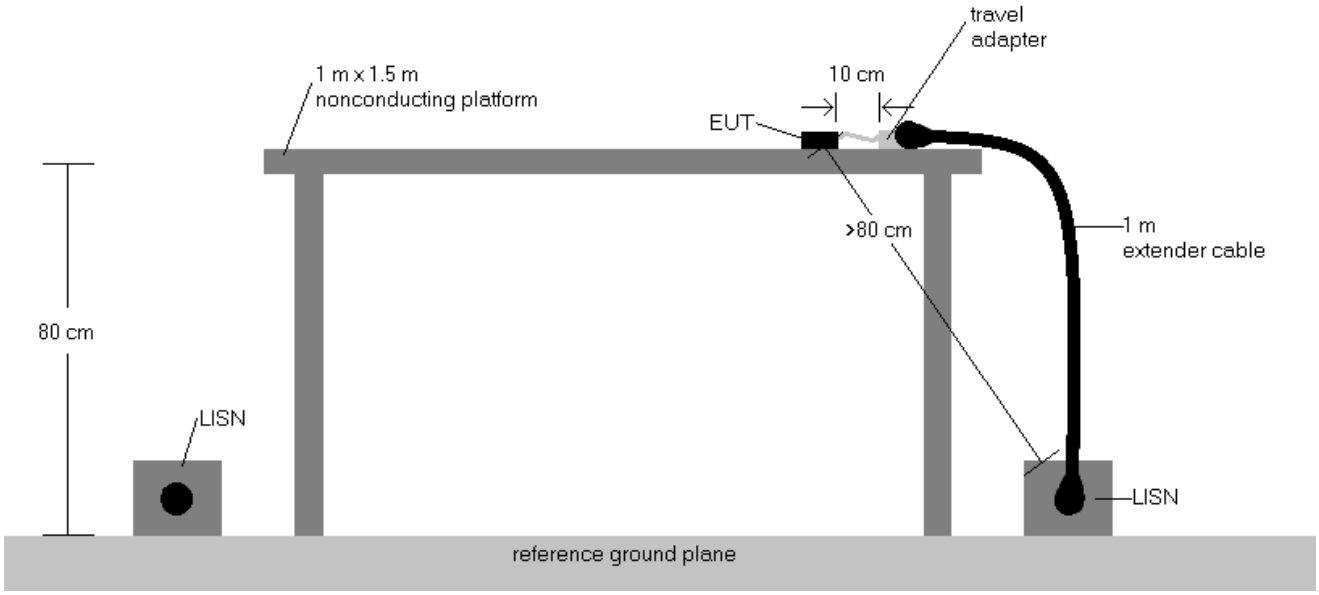
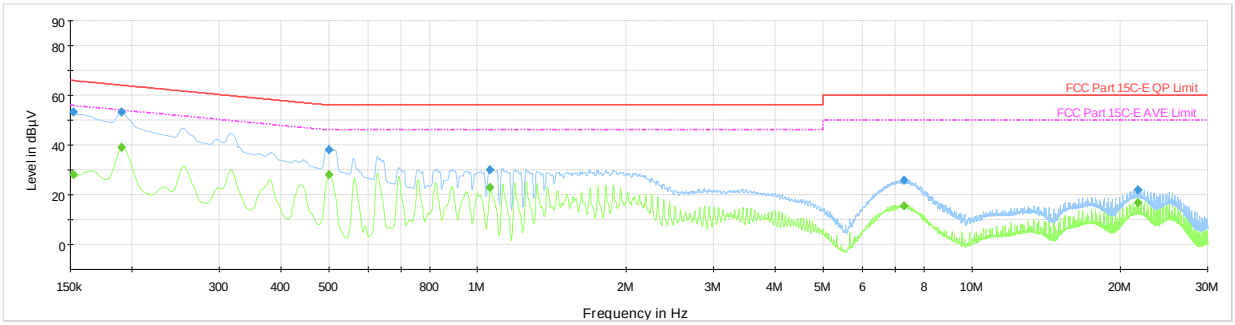


Figure 7-9. Test Instrument & Measurement Setup

Test Notes

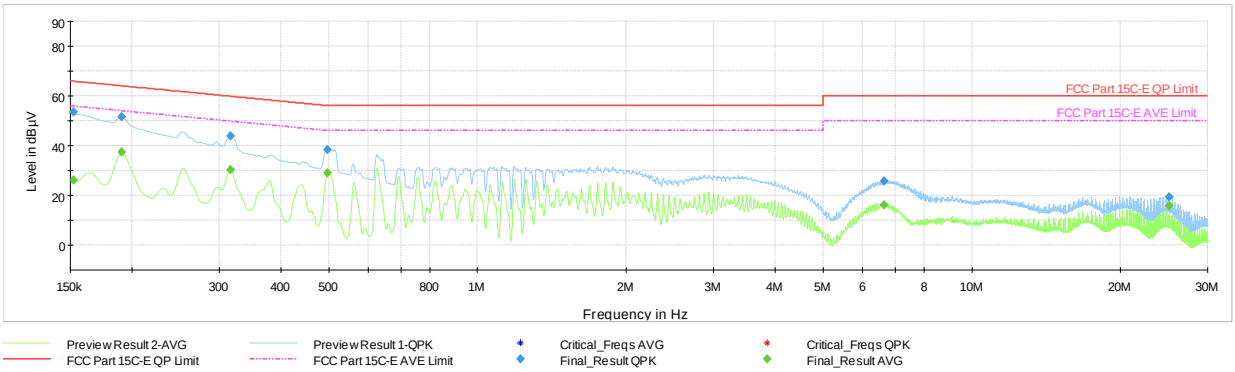
1. All modes of operation were investigated and the worst-case emissions are reported. The emissions found were not affected by the choice of channel used during testing.
2. Both configurations below were investigated, and the worst case has been reported.
   a. EUT powered by AC/DC adaptor via USB-C 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 Part 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 Factore (dB)
6. Margin (dB) = QP/AV Level (dBμV) - QP/AV Limit (dBμV)
7. Traces shown in plot are made using quasi peak and average detectors.
8. Deviations to the Specifications: None.
9. All RU's were investigated and only worst case partially-loaded and fully-loaded RU's are reported.



Plot 7-204. AC Line Conducted Emissions with 802.11ax (RU26) Ch.6 (L1, with Laptop)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.152	FINAL	---	27.98	55.88	-27.89	L1	GND
0.152	FINAL	53.2	---	65.88	-12.65	L1	GND
0.191	FINAL	---	39.17	54.02	-14.84	L1	GND
0.191	FINAL	53.3	---	64.02	-10.77	L1	GND
0.501	FINAL	---	28.15	46.00	-17.85	L1	GND
0.501	FINAL	38.1	---	56.00	-17.87	L1	GND
1.061	FINAL	30.1	---	56.00	-25.95	L1	GND
1.061	FINAL	---	22.82	46.00	-23.18	L1	GND
7.292	FINAL	25.7	---	60.00	-34.30	L1	GND
7.292	FINAL	---	15.48	50.00	-34.52	L1	GND
21.669	FINAL	---	16.79	50.00	-33.21	L1	GND
21.669	FINAL	22.0	---	60.00	-37.96	L1	GND

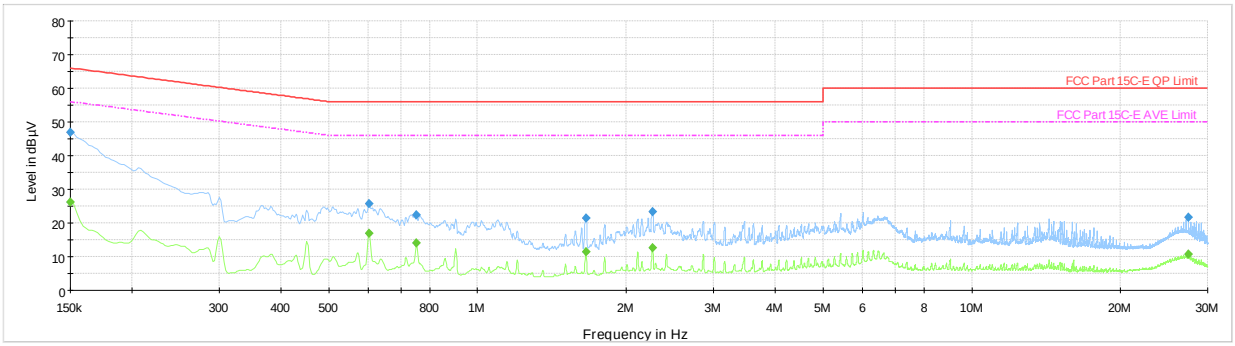
Table 7-42. AC Line Conducted Data with 802.11ax (RU26) Ch.6 (L1, with Laptop)



Plot 7-205. AC Line Conducted Emissions with 802.11ax (RU26) Ch.6 (N, with Laptop)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.152	FINAL	---	26.27	55.88	-29.60	N	GND
0.152	FINAL	53.5	---	65.88	-12.37	N	GND
0.191	FINAL	---	37.52	54.02	-16.49	N	GND
0.191	FINAL	51.5	---	64.02	-12.55	N	GND
0.317	FINAL	43.7	---	59.80	-16.08	N	GND
0.317	FINAL	---	30.37	49.80	-19.43	N	GND
0.497	FINAL	38.4	---	56.06	-17.70	N	GND
0.497	FINAL	---	28.99	46.06	-17.06	N	GND
6.637	FINAL	---	16.24	50.00	-33.76	N	GND
6.639	FINAL	25.7	---	60.00	-34.28	N	GND
25.114	FINAL	---	15.90	50.00	-34.10	N	GND
25.114	FINAL	19.4	---	60.00	-40.58	N	GND

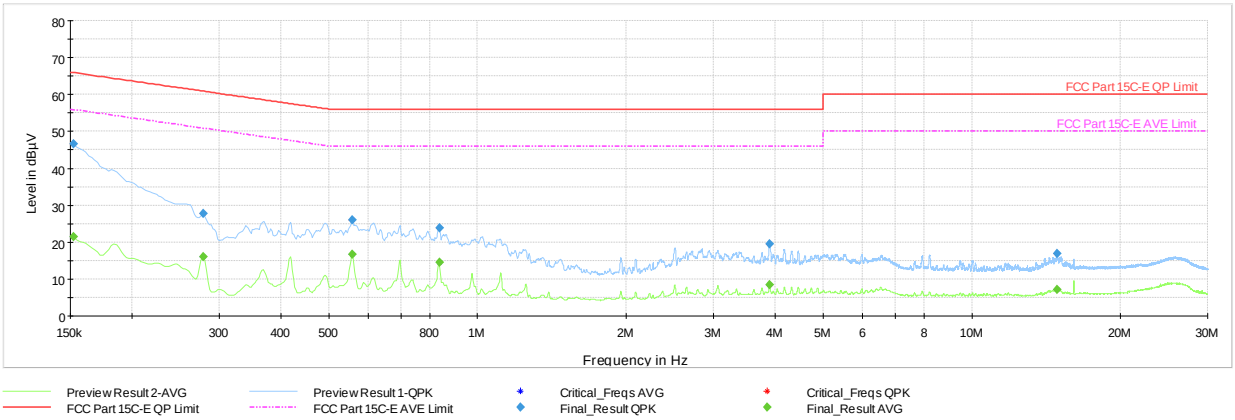
Table 7-43. AC Line Conducted Data with 802.11ax (RU26) Ch.6 (N, with Laptop)



Plot 7-206. AC Line Conducted Emissions with 802.11ax (RU242) Ch.6 (L1, with Laptop)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.150	FINAL	—	26.28	56.00	-29.72	L1	GND
0.150	FINAL	46.9	—	66.00	-19.08	L1	GND
0.602	FINAL	—	16.84	46.00	-29.16	L1	GND
0.602	FINAL	25.7	—	56.00	-30.33	L1	GND
0.753	FINAL	—	14.02	46.00	-31.98	L1	GND
0.753	FINAL	22.5	—	56.00	-33.54	L1	GND
1.658	FINAL	21.5	—	56.00	-34.49	L1	GND
1.658	FINAL	—	11.41	46.00	-34.59	L1	GND
2.261	FINAL	23.4	—	56.00	-32.61	L1	GND
2.261	FINAL	—	12.71	46.00	-33.29	L1	GND
27.454	FINAL	—	10.67	50.00	-39.33	L1	GND
27.454	FINAL	21.7	—	60.00	-38.29	L1	GND

Table 7-44. AC Line Conducted Data with 802.11ax (RU242) Ch.6 (L1, with Laptop)



Plot 7-207. AC Line Conducted Emissions with 802.11ax (RU242) Ch.6 (N, with Laptop)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.152	FINAL	—	21.56	55.88	-34.32	N	GND
0.152	FINAL	46.6	—	65.88	-19.26	N	GND
0.278	FINAL	—	16.02	50.87	-34.85	N	GND
0.278	FINAL	27.8	—	60.87	-33.06	N	GND
0.557	FINAL	—	16.78	46.00	-29.22	N	GND
0.557	FINAL	26.0	—	56.00	-30.00	N	GND
0.836	FINAL	23.9	—	56.00	-32.13	N	GND
0.836	FINAL	—	14.58	46.00	-31.42	N	GND
3.899	FINAL	19.6	—	56.00	-36.39	N	GND
3.899	FINAL	—	8.55	46.00	-37.45	N	GND
14.874	FINAL	—	7.24	50.00	-42.76	N	GND
14.874	FINAL	16.9	—	60.00	-43.12	N	GND

Table 7-45. AC Line Conducted Data with 802.11ax (RU242) Ch.6 (N, with Laptop)

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Apple Tablet Device FCC ID: BCGA2903, IC: 579C-A2903** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-247 of the Innovation, Science and Economic Development Canada Rules.