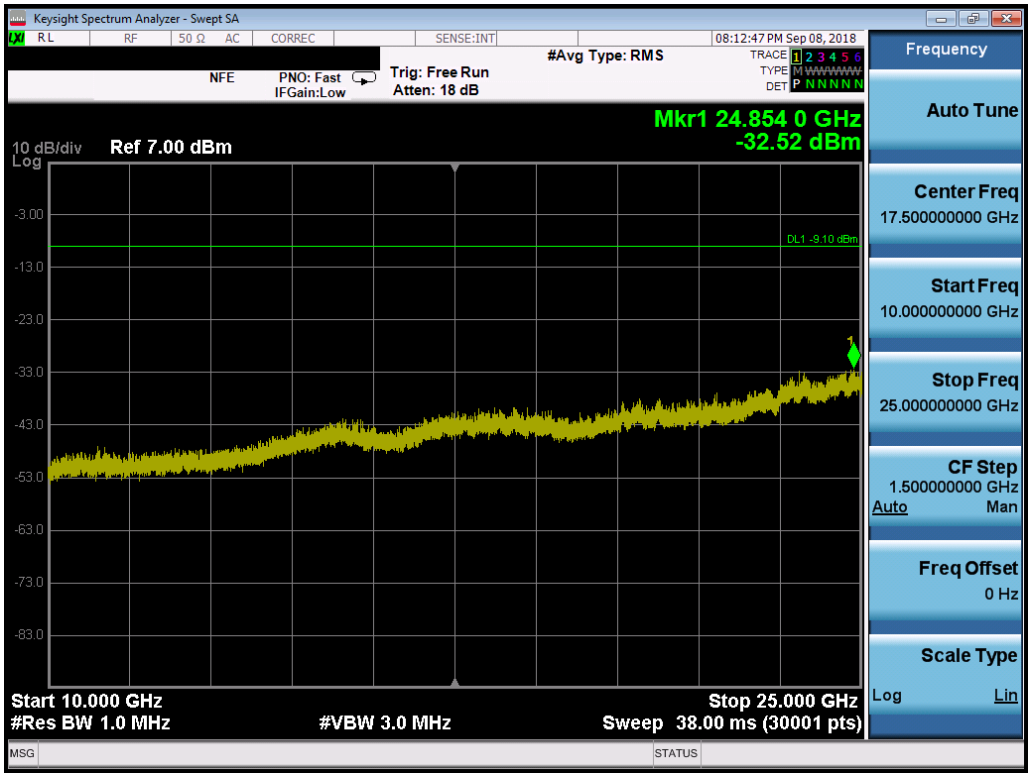

Plot 7-78. Conducted Spurious Plot ANT1 (Bluetooth (HDR4), 4Mbps, ePA – Ch. 75)

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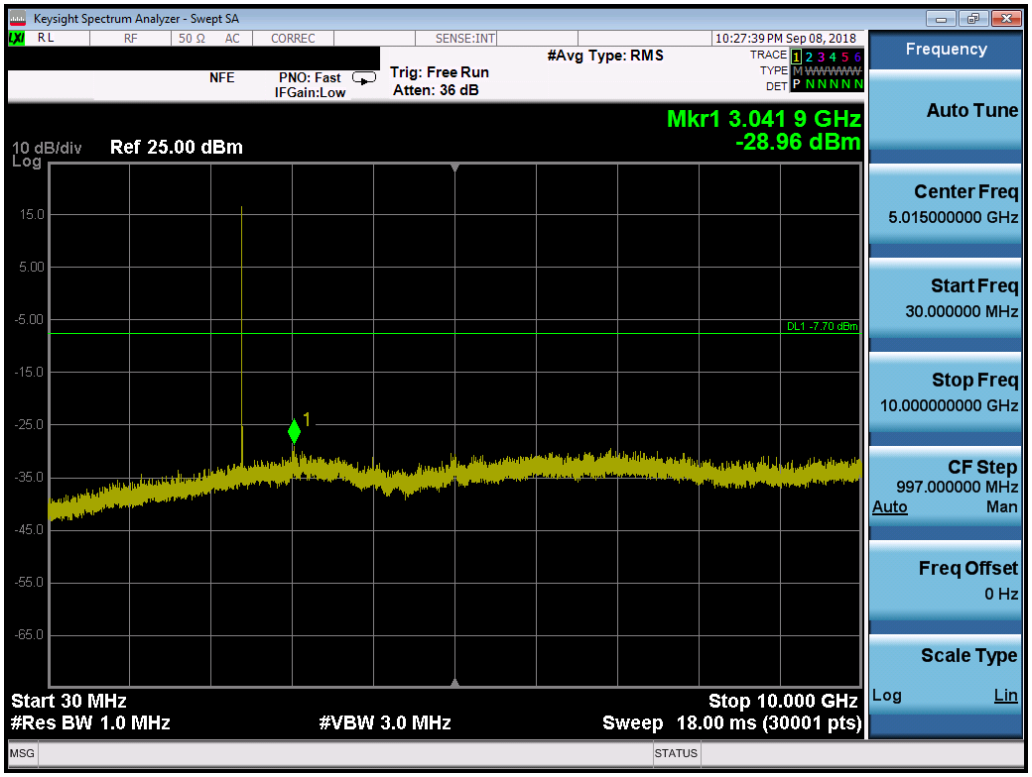
Antenna 2



Plot 7-79. Conducted Spurious Plot ANT2 (Bluetooth (HDR4), 4Mbps, ePA – Ch. 1)

Plot 7-80. Conducted Spurious Plot ANT2 (Bluetooth (HDR4), 4Mbps, ePA – Ch. 1)

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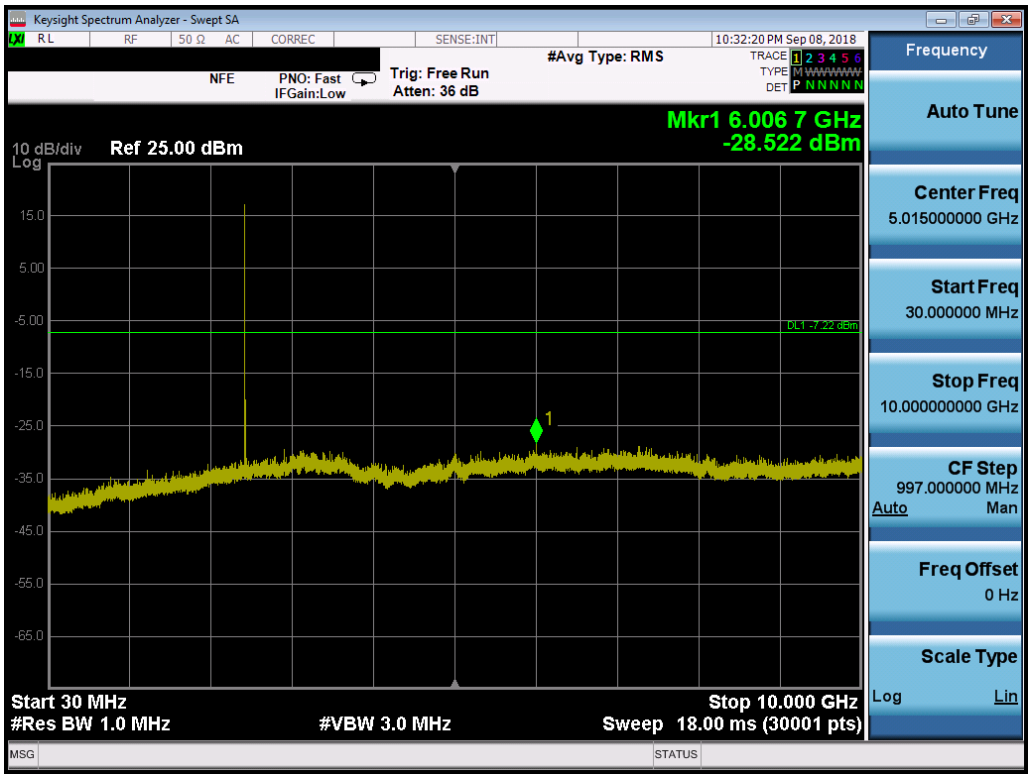
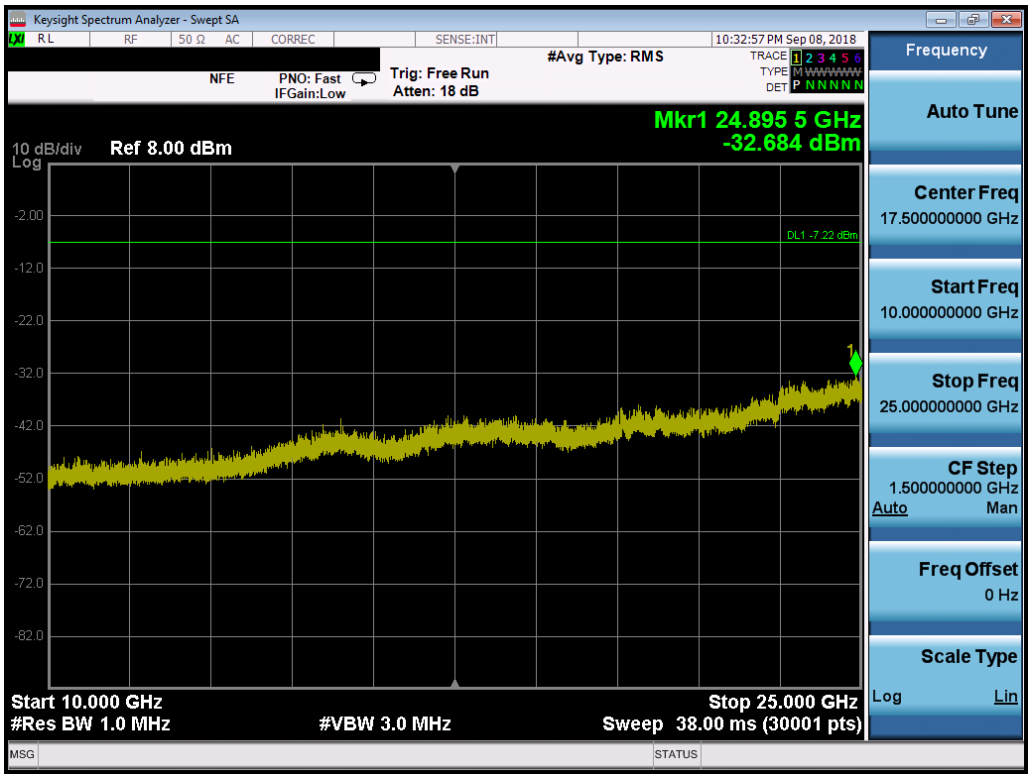


Plot 7-81. Conducted Spurious Plot ANT2 (Bluetooth (HDR4), 4Mbps, ePA – Ch. 38)



Plot 7-82. Conducted Spurious Plot ANT2 (Bluetooth (HDR4), 4Mbps, ePA – Ch. 38)

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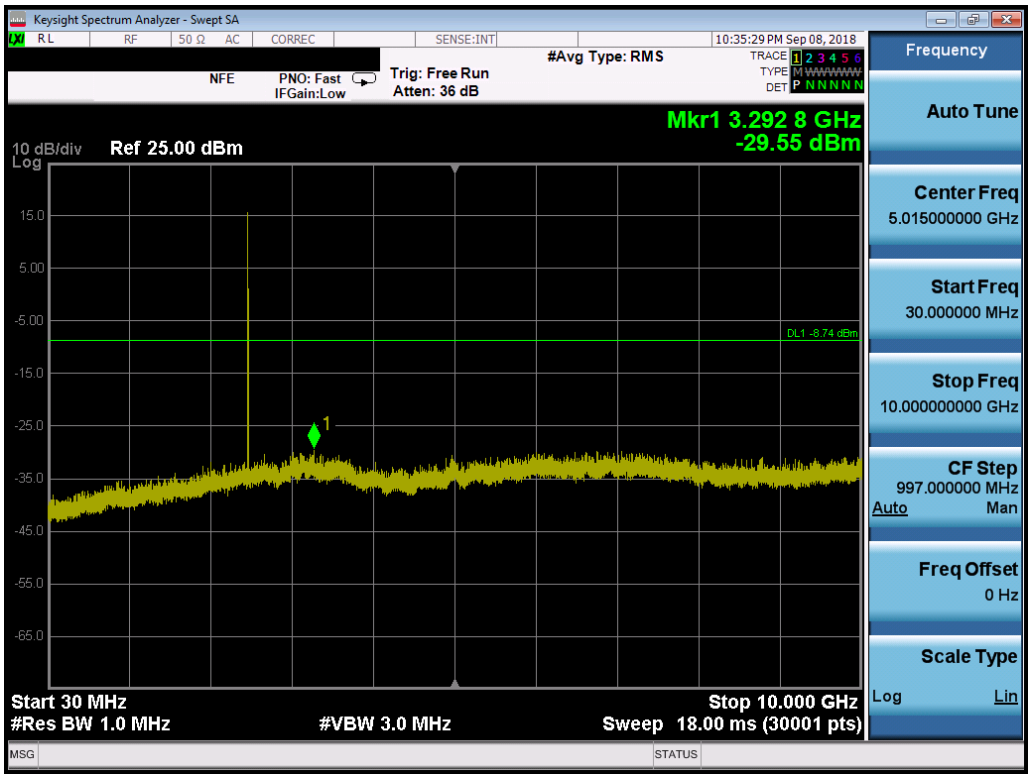

Plot 7-83. Conducted Spurious Plot ANT2 (Bluetooth (HDR4), 4Mbps, ePA – Ch. 75)

Plot 7-84. Conducted Spurious Plot ANT2 (Bluetooth (HDR4), 4Mbps, ePA – Ch. 75)

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7.7 Radiated Spurious Emission Measurements – Above 1GHz

§15.205 §15.209 §15.247(d); 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 maximum power and at the appropriate frequencies. 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 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-14 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 7-14. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Section 6.6.4.3

KDB 558074 D01 v05 – Section 8.6, 8.7

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. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

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Peak Field Strength Measurements

8. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
9. RBW is set depending on measurement frequency, as specified in Table 7-15 below
10. VBW = 3MHz
11. Detector = peak
12. Sweep time = auto couple
13. Trace mode = max hold
14. Trace was allowed to stabilize

Frequency	RBW
9 – 150kHz	200 – 300Hz
0.15 – 30MHz	9 – 10kHz
30 – 1000MHz	100 – 120kHz
> 1000MHz	1MHz

Table 7-15. RBW as a Function of Frequency

Test Setup

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

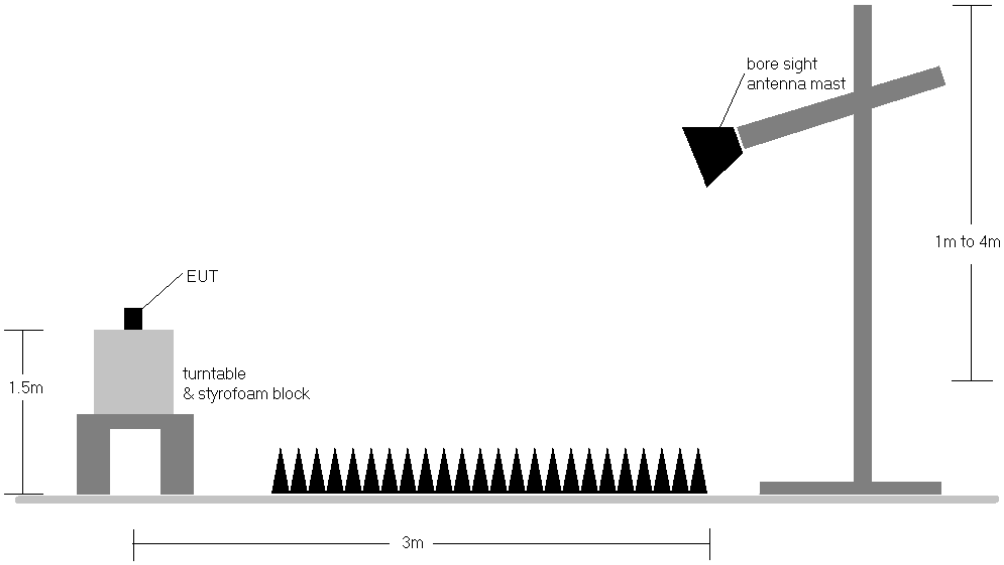

Figure 7-6. Radiated Test Setup >1GHz

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Test Notes

1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v05 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
2. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-14.
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 "-" shown in the following RSE tables are used to denote a noise floor measurement.
8. Both power schemes were investigated and only the worst case 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 $_{[dB]}$
- 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 in Section 7.8 was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

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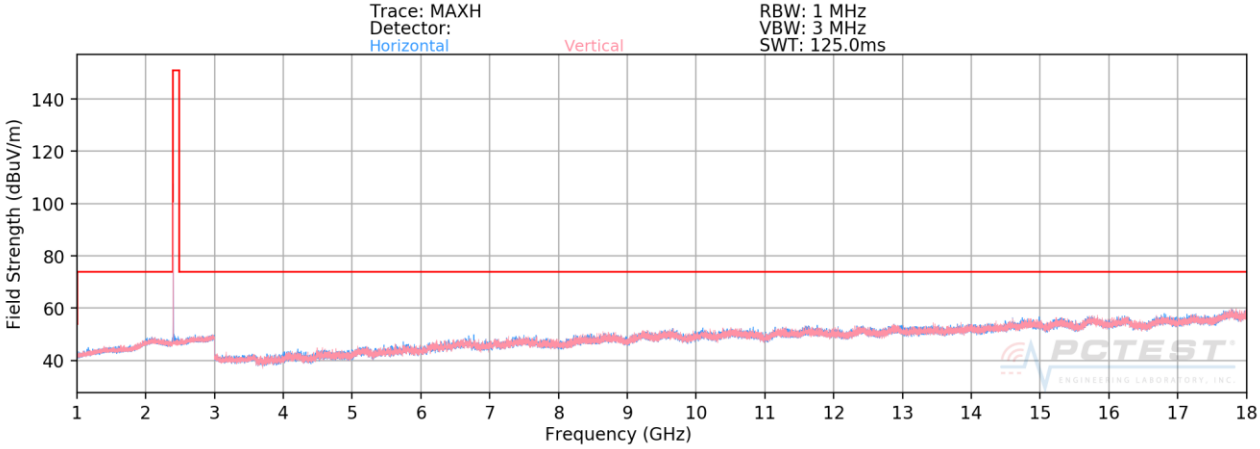
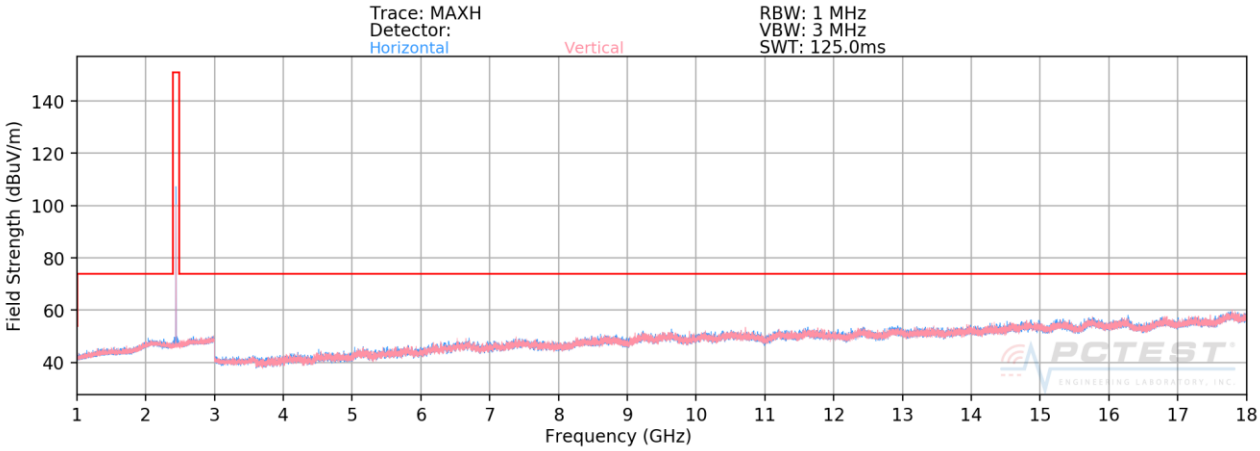
Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247(d); RSS-Gen [8.9]

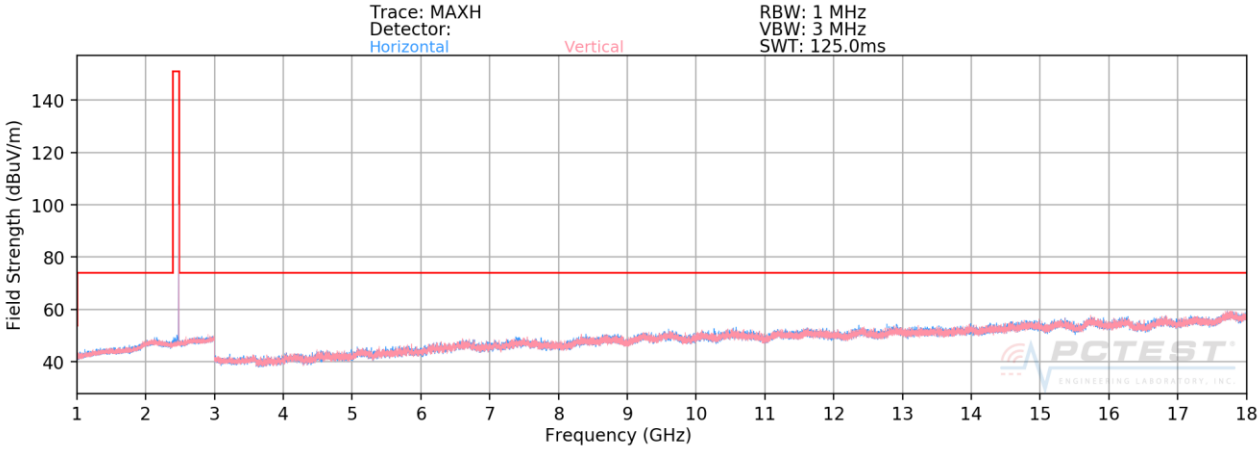
Antenna 0



Plot 7-85. Radiated Spurious Plot Above 1GHz ANT0 (4Mbps, HDR4 ePA – Ch. 1, Ant. Pol. H & V)



Plot 7-86. Radiated Spurious Plot Above 1GHz ANT0 (4Mbps, HDR4 ePA – Ch. 38, Ant. Pol. H & V)



Plot 7-87. Radiated Spurious Plot Above 1GHz ANT0 (4Mbps, HDR4 ePA – Ch. 75, Ant. Pol. H & V)

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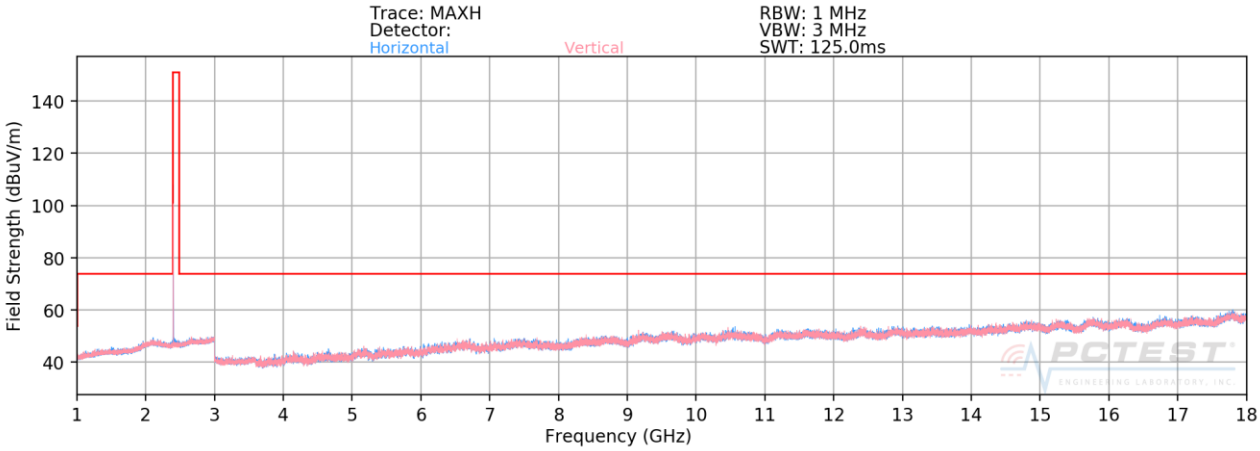
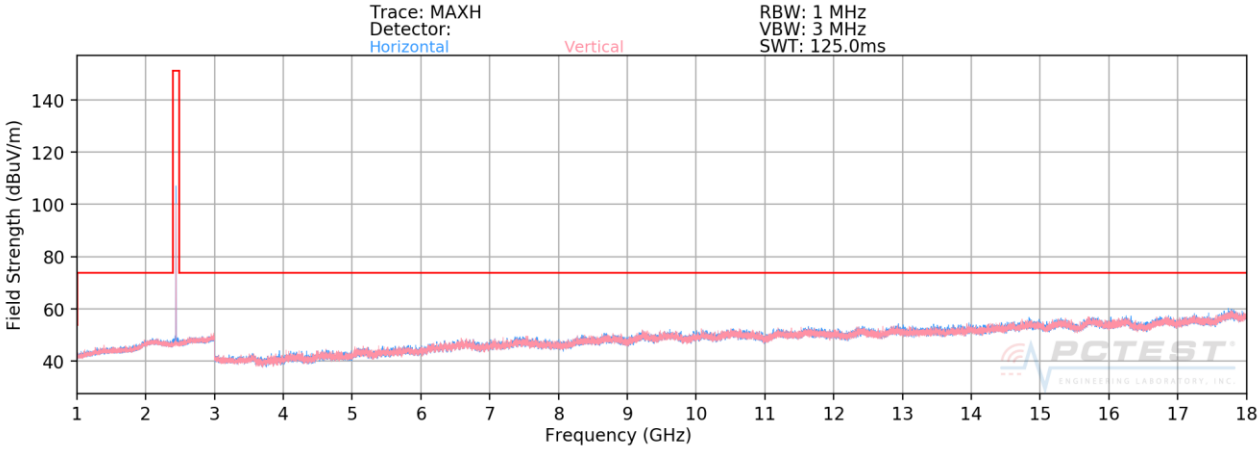
Radiated Spurious Emission Measurements

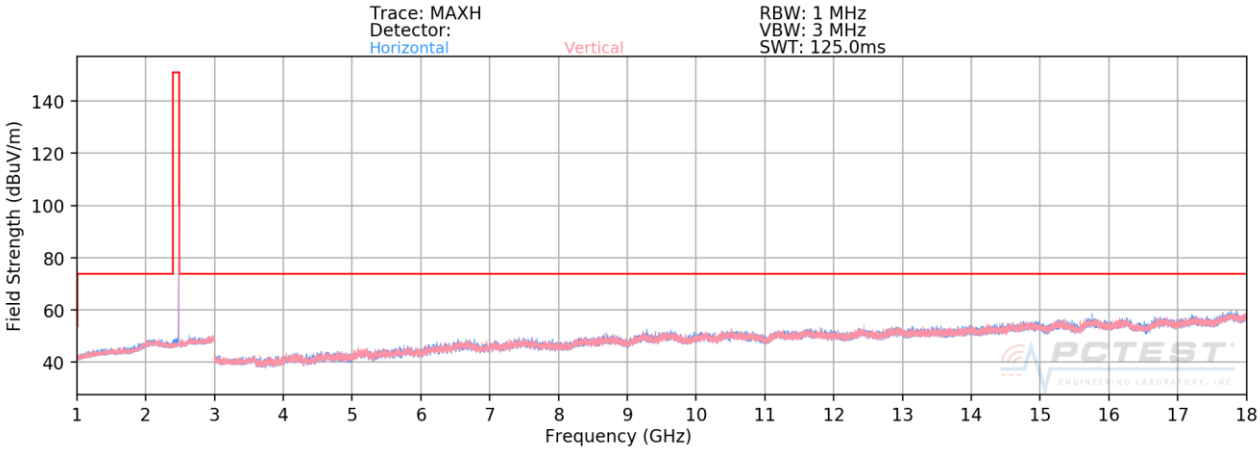
§15.205 §15.209 §15.247(d); RSS-Gen [8.9]



Plot 7-88. Radiated Spurious Plot Above 1GHz ANT0 (8Mbps, HDR8 ePA – Ch. 1, Ant. Pol. H & V)



Plot 7-89. Radiated Spurious Plot Above 1GHz ANT0 (8Mbps, HDR8 ePA – Ch. 38, Ant. Pol. H & V)



Plot 7-90. Radiated Spurious Plot Above 1GHz ANT0 (8Mbps, HDR8 ePA – Ch. 75, Ant. Pol. H & V)

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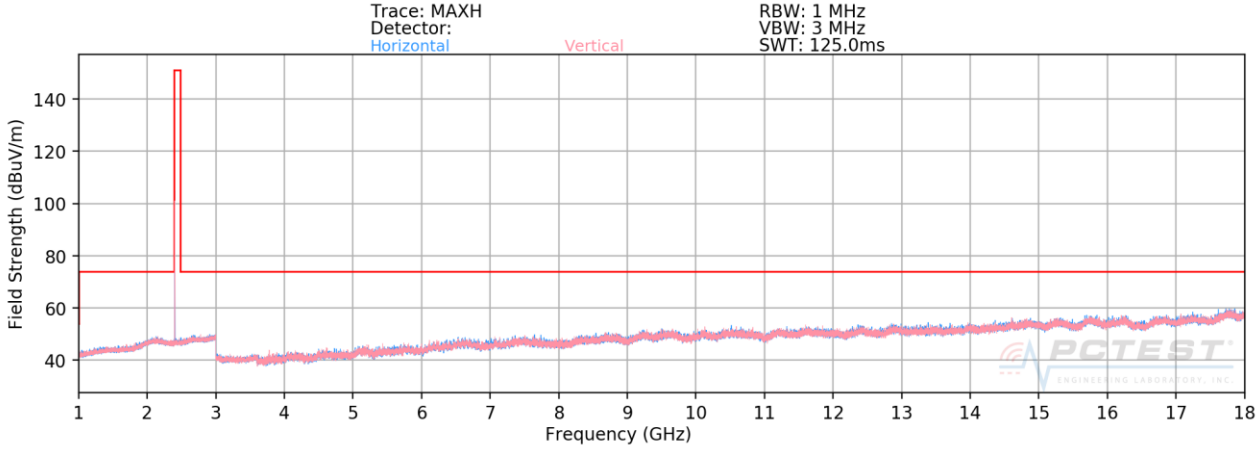
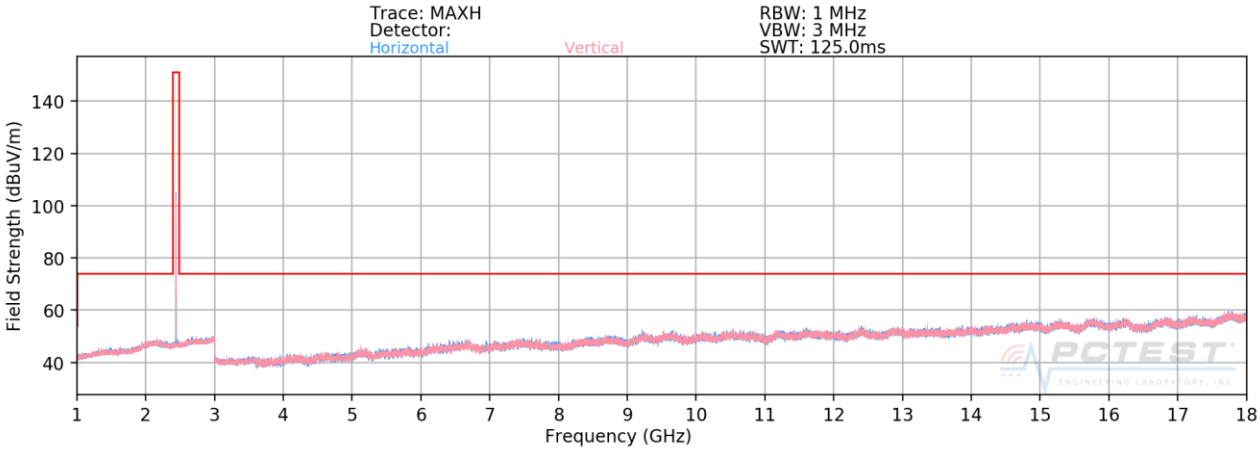
Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247(d); RSS-Gen [8.9]

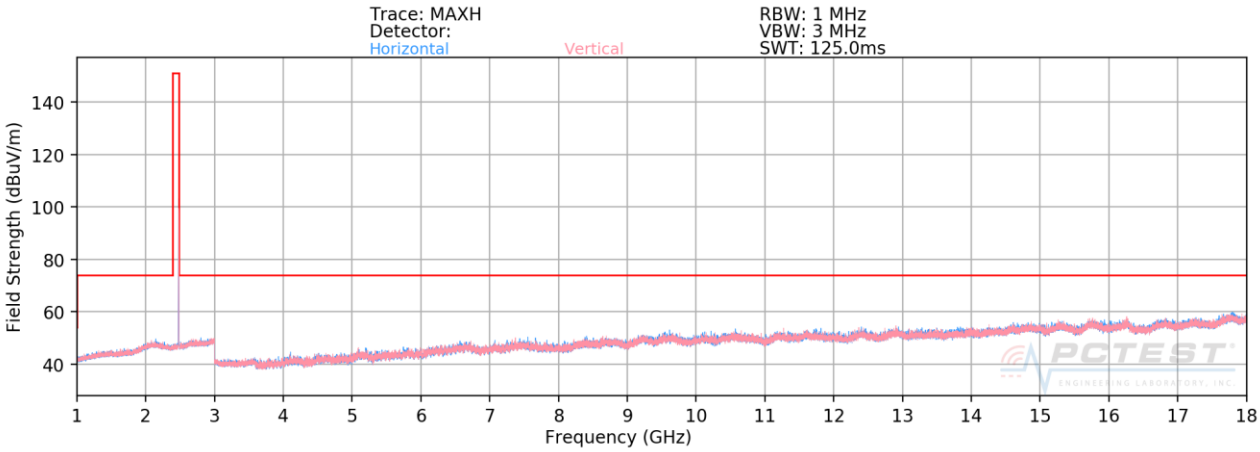
Antenna 1



Plot 7-91. Radiated Spurious Plot Above 1GHz ANT1 (4Mbps, HDR4 ePA – Ch. 1, Ant. Pol. H & V)



Plot 7-92. Radiated Spurious Plot Above 1GHz ANT1 (4Mbps, HDR4 ePA – Ch. 38, Ant. Pol. H & V)



Plot 7-93. Radiated Spurious Plot Above 1GHz ANT1 (4Mbps, HDR4 ePA – Ch. 75, Ant. Pol. H & V)

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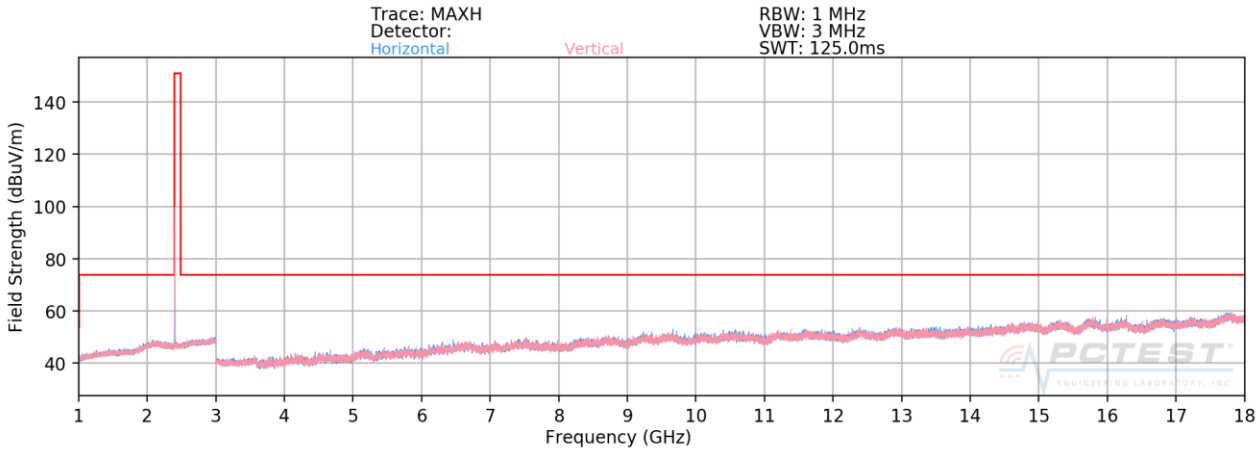
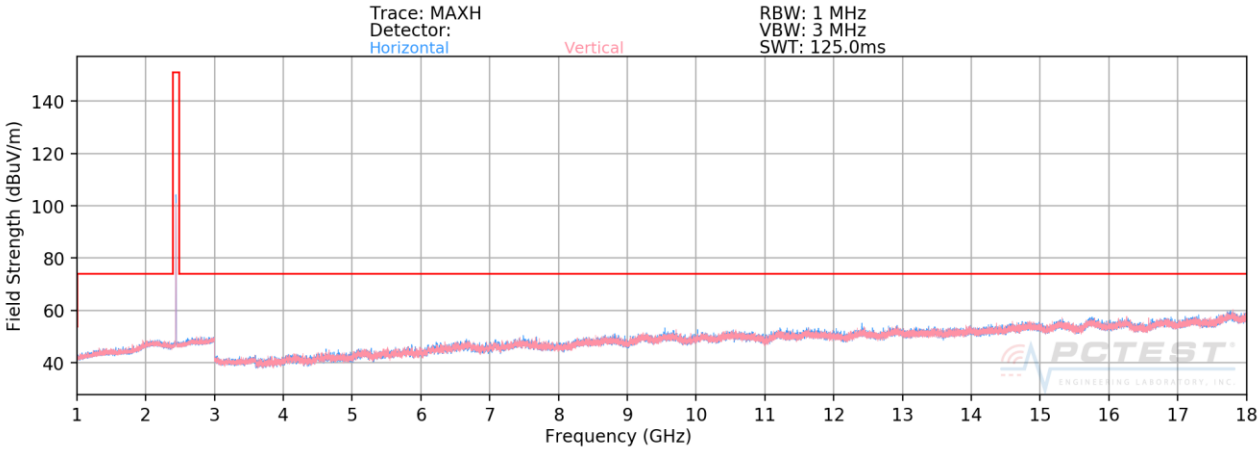
Radiated Spurious Emission Measurements

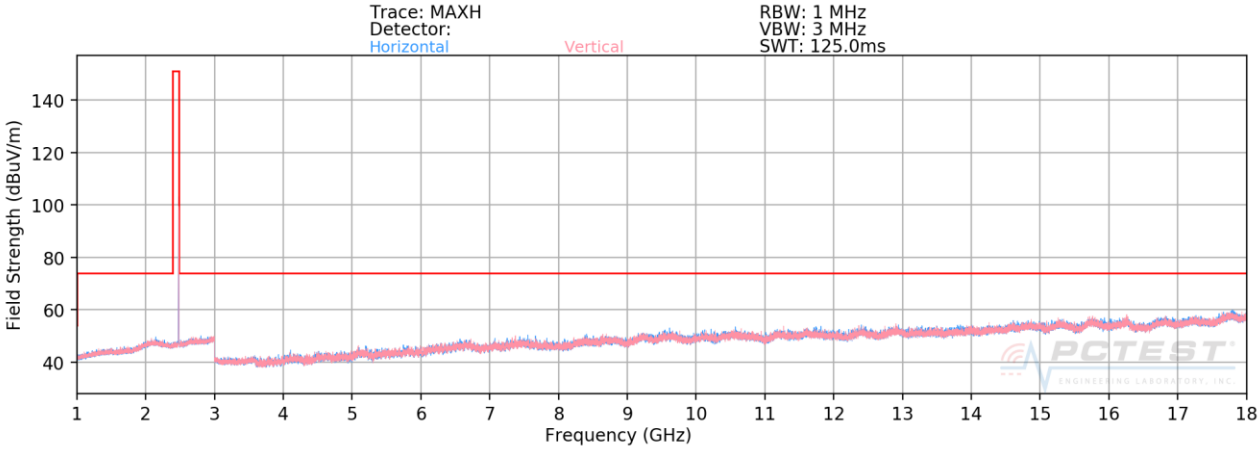
§15.205 §15.209 §15.247(d); RSS-Gen [8.9]



Plot 7-94. Radiated Spurious Plot Above 1GHz ANT1 (8Mbps, HDR8 ePA – Ch. 1, Ant. Pol. H & V)



Plot 7-95. Radiated Spurious Plot Above 1GHz ANT1 (8Mbps, HDR8 ePA – Ch. 38, Ant. Pol. H & V)



Plot 7-96. Radiated Spurious Plot Above 1GHz ANT1 (8Mbps, HDR8 ePA – Ch. 75, Ant. Pol. H & V)

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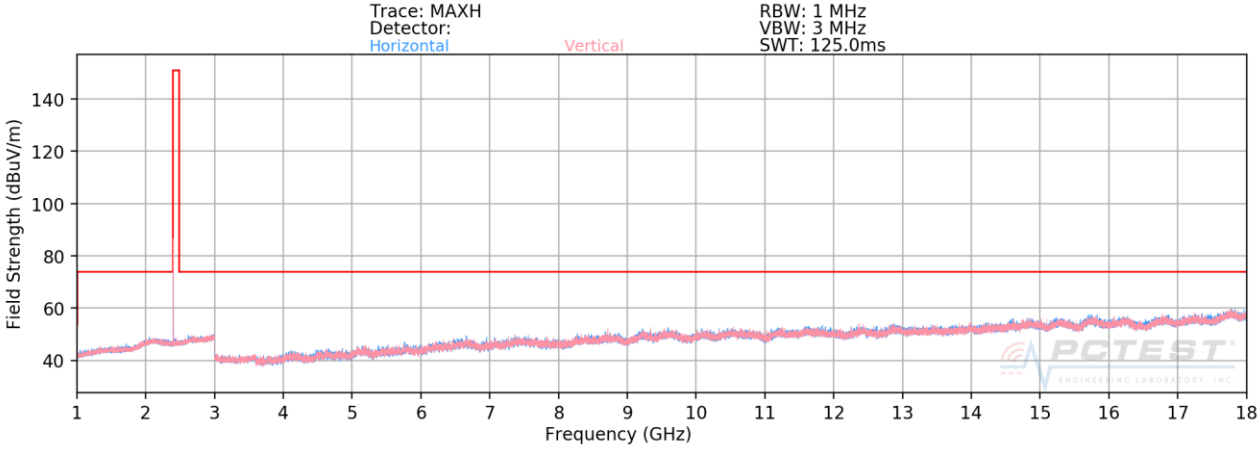
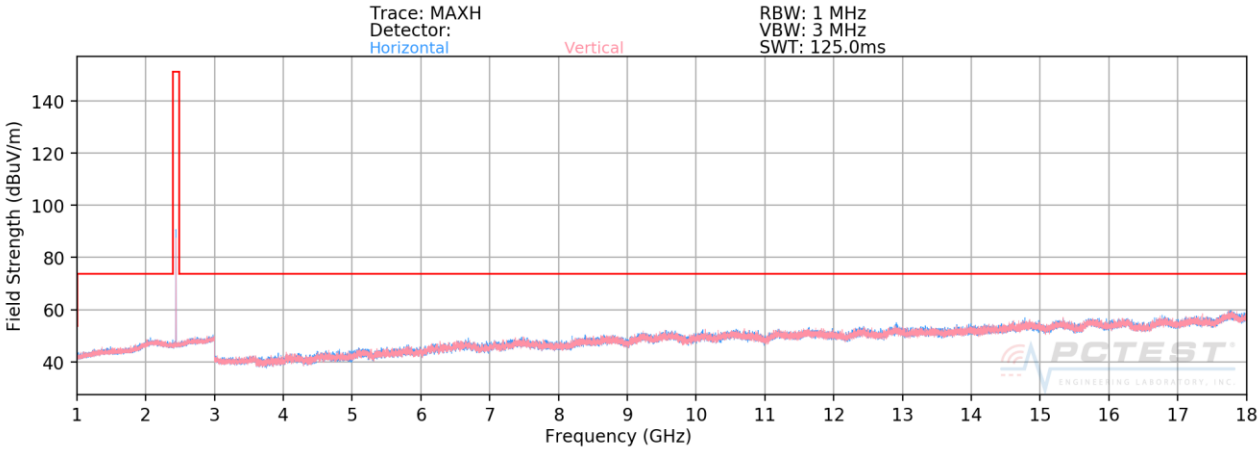
Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247(d); RSS-Gen [8.9]

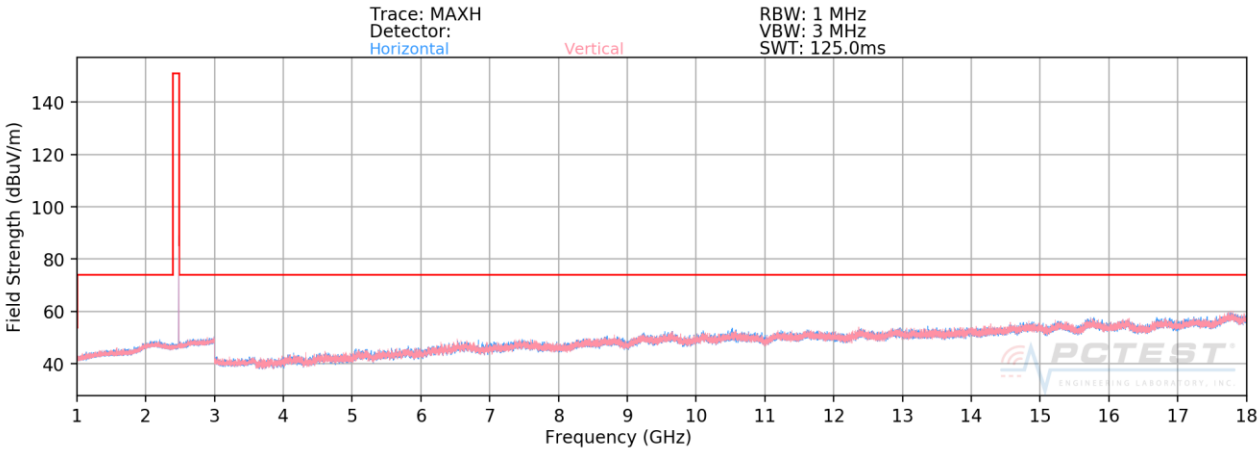
Antenna 2



Plot 7-97. Radiated Spurious Plot Above 1GHz ANT2 (4Mbps, HDR4 ePA – Ch. 1, Ant. Pol. H & V)



Plot 7-98. Radiated Spurious Plot Above 1GHz ANT2 (4Mbps, HDR4 ePA – Ch. 38, Ant. Pol. H & V)



Plot 7-99. Radiated Spurious Plot Above 1GHz ANT2 (4Mbps, HDR4 ePA – Ch. 75, Ant. Pol. H & V)

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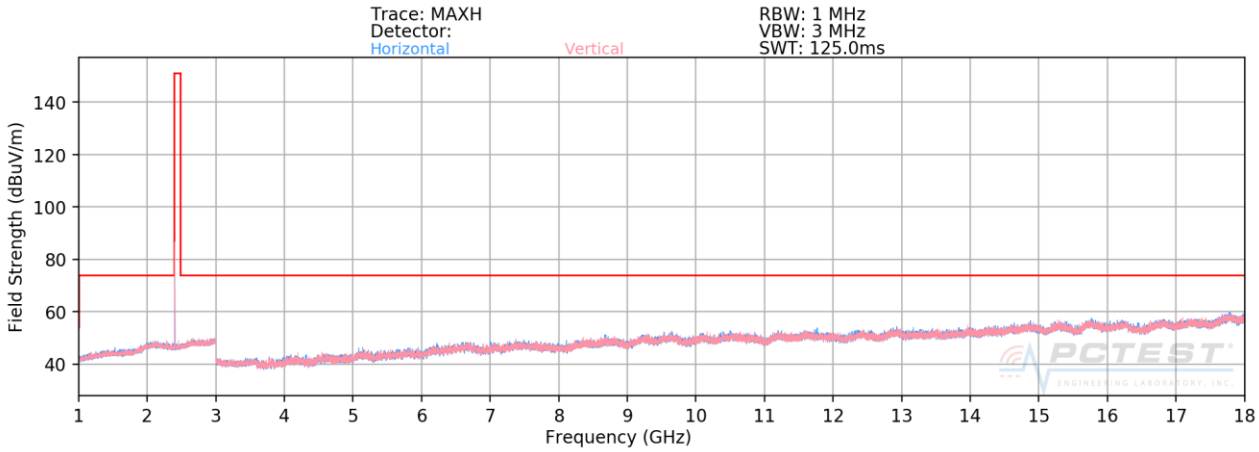
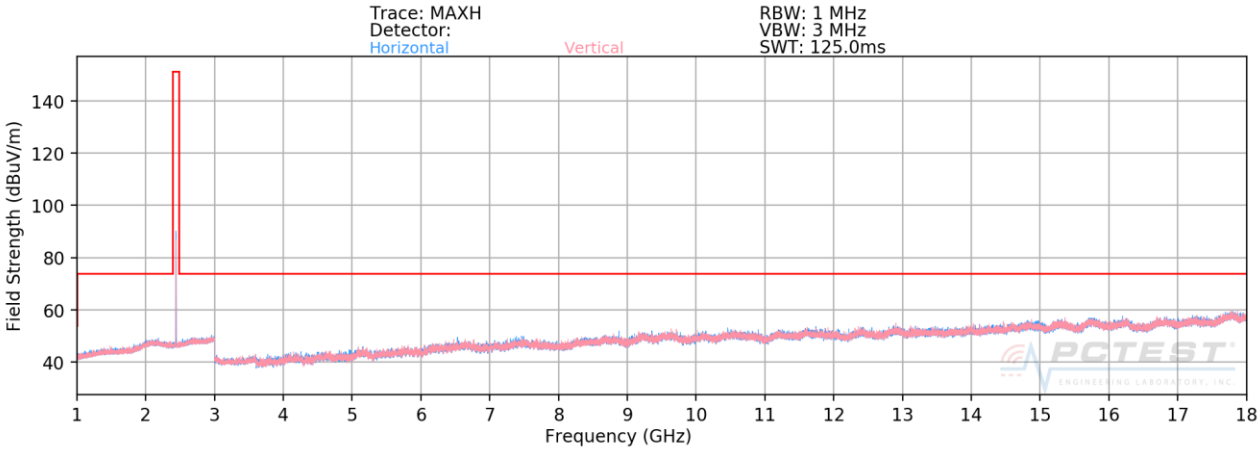
Radiated Spurious Emission Measurements

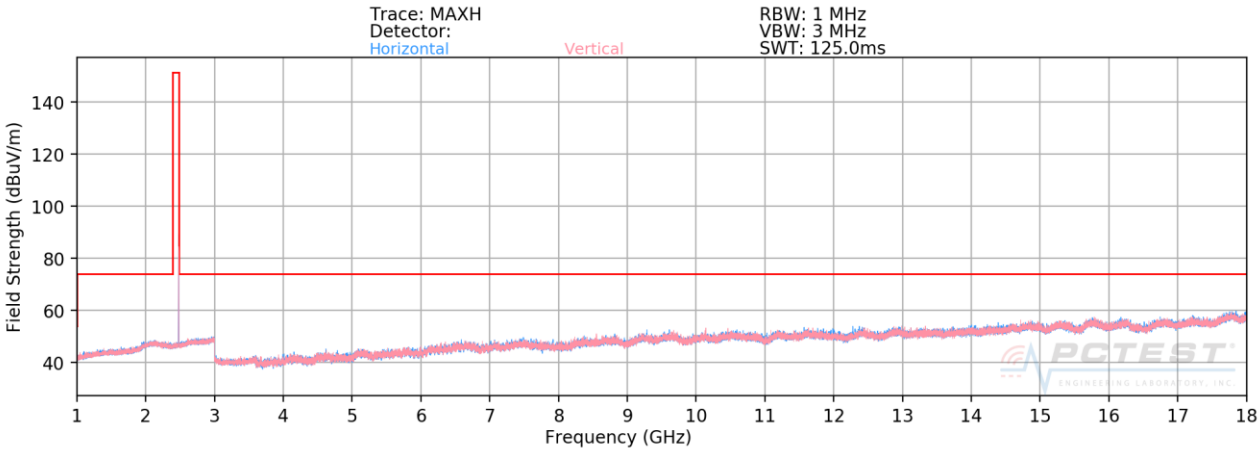
§15.205 §15.209 §15.247(d); RSS-Gen [8.9]



Plot 7-100. Radiated Spurious Plot Above 1GHz ANT2 (8Mbps, HDR8 ePA – Ch. 1, Ant. Pol. H & V)



Plot 7-101. Radiated Spurious Plot Above 1GHz ANT2 (8Mbps, HDR8 ePA – Ch. 38, Ant. Pol. H & V)



Plot 7-102. Radiated Spurious Plot Above 1GHz ANT2 (8Mbps, HDR8 ePA – Ch. 75, Ant. Pol. H & V)

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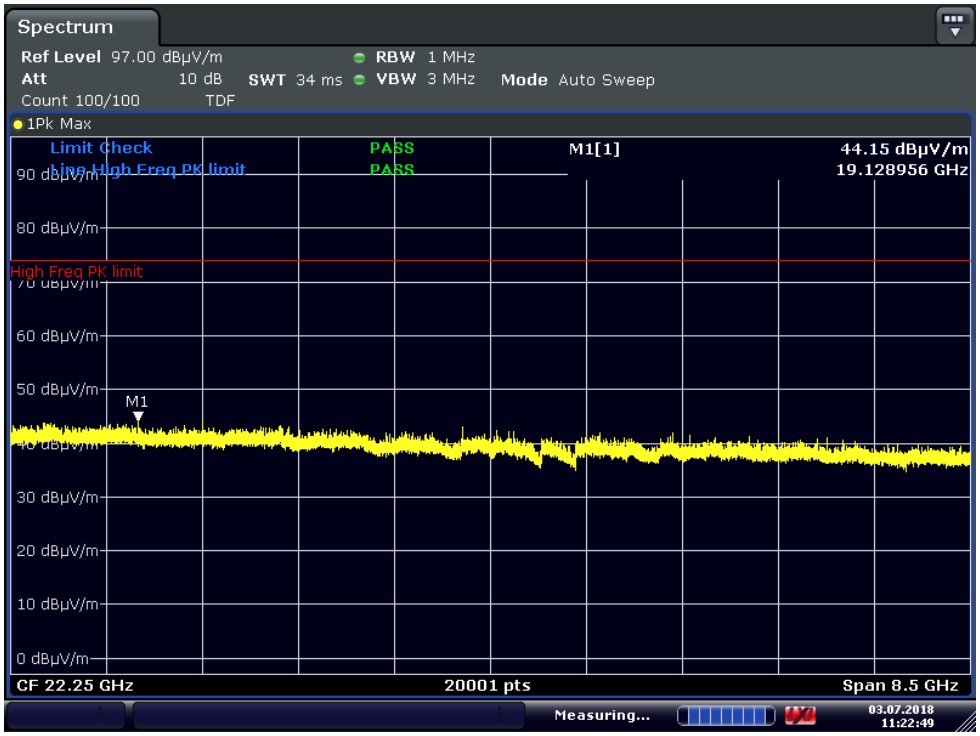
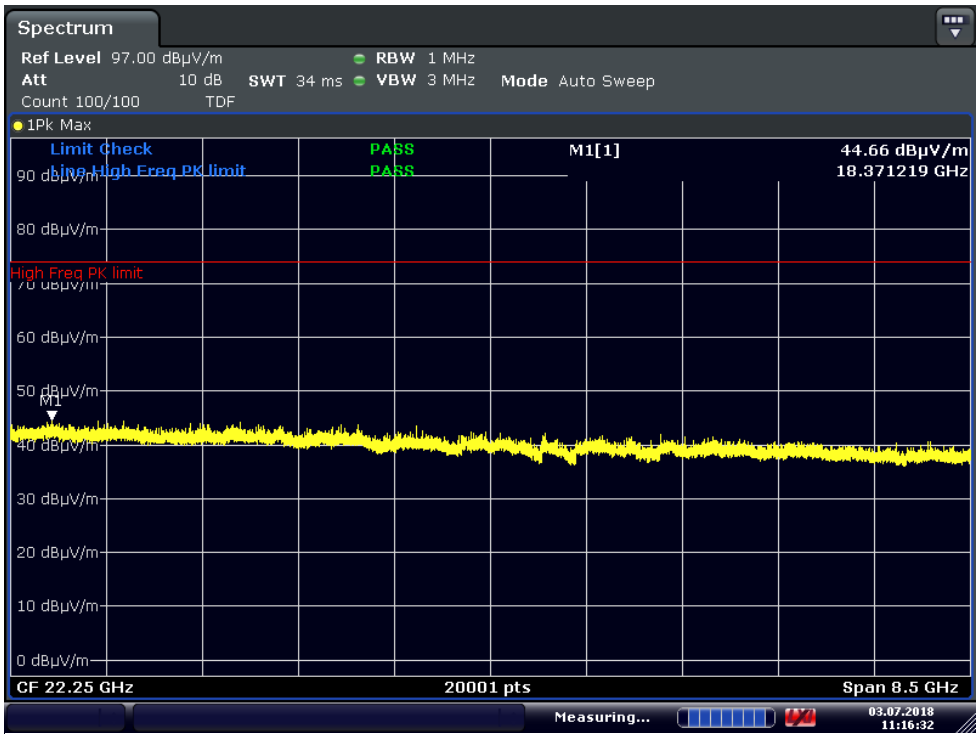
Radiated Spurious Emission Measurements (Above 18GHz)

§15.205 §15.209 §15.247(d); RSS-Gen [8.9]



Plot 7-103. Radiated Spurious Plot Above 18GHz ANT0 (8Mbps, HDR8 ePA, Ant. Pol. H)



Plot 7-104. Radiated Spurious Plot Above 18GHz ANT0 (8Mbps, HDR8 ePA, Ant. Pol. V)

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Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247(d); RSS-Gen [8.9]

Antenna 0

Bluetooth Mode: HDR4
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2404MHz
Channel: 1

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]
4808.00	Avg	H	-	-	-79.93	5.50	32.57	53.98	-21.41
4808.00	Peak	H	-	-	-67.18	5.50	45.32	73.98	-28.66
12020.00	Avg	H	-	-	-84.95	19.43	41.48	53.98	-12.49
12020.00	Peak	H	-	-	-73.58	19.43	52.85	73.98	-21.12

Table 7-16. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR4
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2441MHz
Channel: 38

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]
4882.00	Avg	H	-	-	-79.81	5.73	32.92	53.98	-21.06
4882.00	Peak	H	-	-	-67.29	5.73	45.44	73.98	-28.54
7323.00	Avg	H	-	-	-82.27	12.76	37.49	53.98	-16.49
7323.00	Peak	H	-	-	-70.35	12.76	49.41	73.98	-24.57
12205.00	Avg	H	-	-	-85.11	20.11	42.00	53.98	-11.98
12205.00	Peak	H	-	-	-73.50	20.11	53.61	73.98	-20.37

Table 7-17. Radiated Measurements @ 3 meters

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Bluetooth Mode: HDR4
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2478MHz
Channel: 75

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]
4956.00	Avg	H	-	-	-79.70	5.05	32.35	53.98	-21.63
4956.00	Peak	H	-	-	-66.83	5.05	45.22	73.98	-28.76
7434.00	Avg	H	-	-	-82.74	12.66	36.92	53.98	-17.06
7434.00	Peak	H	-	-	-70.67	12.66	48.99	73.98	-24.99
12390.00	Avg	H	-	-	-86.10	19.64	40.54	53.98	-13.44
12390.00	Peak	H	-	-	-74.49	19.64	52.15	73.98	-21.83

Table 7-18. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2404MHz
Channel: 1

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]
4808.00	Avg	H	-	-	-78.77	5.50	33.73	53.98	-20.25
4808.00	Peak	H	-	-	-67.07	5.50	45.43	73.98	-28.55
12020.00	Avg	H	-	-	-83.97	19.43	42.46	53.98	-11.51
12020.00	Peak	H	-	-	-71.95	19.43	54.48	73.98	-19.49

Table 7-19. Radiated Measurements @ 3 meters

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Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2441MHz
Channel: 38

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]
4882.00	Avg	H	-	-	-78.68	5.73	34.05	53.98	-19.93
4882.00	Peak	H	-	-	-67.35	5.73	45.38	73.98	-28.60
7323.00	Avg	H	-	-	-81.44	12.76	38.32	53.98	-15.66
7323.00	Peak	H	-	-	-69.75	12.76	50.01	73.98	-23.97
12205.00	Avg	H	-	-	-84.02	20.11	43.09	53.98	-10.89
12205.00	Peak	H	-	-	-72.55	20.11	54.56	73.98	-19.42

Table 7-20. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2478MHz
Channel: 75

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]
4956.00	Avg	V	-	-	-78.64	5.05	33.41	53.98	-20.57
4956.00	Peak	V	-	-	-67.00	5.05	45.05	73.98	-28.93
7434.00	Avg	V	-	-	-81.50	12.66	38.16	53.98	-15.82
7434.00	Peak	V	-	-	-69.76	12.66	49.90	73.98	-24.08
12390.00	Avg	V	-	-	-85.17	19.64	41.47	53.98	-12.51
12390.00	Peak	V	-	-	-73.57	19.64	53.07	73.98	-20.91

Table 7-21. Radiated Measurements @ 3 meters

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Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247(d); RSS-Gen [8.9]

Antenna 1

Bluetooth Mode: HDR4
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2404MHz
Channel: 1

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]
4808.00	Avg	H	-	-	-79.66	5.50	32.84	53.98	-21.14
4808.00	Peak	H	-	-	-67.81	5.50	44.69	73.98	-29.29
12020.00	Avg	H	-	-	-84.98	19.43	41.45	53.98	-12.52
12020.00	Peak	H	-	-	-73.60	19.43	52.83	73.98	-21.14

Table 7-22. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR4
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2441MHz
Channel: 38

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]
4882.00	Avg	H	-	-	-80.14	5.73	32.59	53.98	-21.39
4882.00	Peak	H	-	-	-67.97	5.73	44.76	73.98	-29.22
7323.00	Avg	H	-	-	-82.63	12.76	37.13	53.98	-16.85
7323.00	Peak	H	-	-	-70.42	12.76	49.34	73.98	-24.64
12205.00	Avg	H	-	-	-85.11	20.11	42.00	53.98	-11.98
12205.00	Peak	H	-	-	-73.48	20.11	53.63	73.98	-20.35

Table 7-23. Radiated Measurements @ 3 meters

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Bluetooth Mode: HDR4
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2478MHz
Channel: 75

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]
4956.00	Avg	H	-	-	-79.73	5.05	32.32	53.98	-21.66
4956.00	Peak	H	-	-	-67.25	5.05	44.80	73.98	-29.18
7434.00	Avg	H	-	-	-82.87	12.66	36.79	53.98	-17.19
7434.00	Peak	H	-	-	-70.38	12.66	49.28	73.98	-24.70
12390.00	Avg	H	-	-	-85.66	19.64	40.98	53.98	-13.00
12390.00	Peak	H	-	-	-74.00	19.64	52.64	73.98	-21.34

Table 7-24. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2404MHz
Channel: 1

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]
4808.00	Avg	H	-	-	-79.11	5.50	33.39	53.98	-20.59
4808.00	Peak	H	-	-	-66.85	5.50	45.65	73.98	-28.33
12020.00	Avg	V	-	-	-84.39	19.43	42.04	53.98	-11.93
12020.00	Peak	V	-	-	-71.89	19.43	54.54	73.98	-19.43

Table 7-25. Radiated Measurements @ 3 meters

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Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2441MHz
Channel: 38

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]
4882.00	Avg	V	-	-	-78.62	5.73	34.11	53.98	-19.87
4882.00	Peak	V	-	-	-67.19	5.73	45.54	73.98	-28.44
7323.00	Avg	H	-	-	-81.52	12.76	38.24	53.98	-15.74
7323.00	Peak	H	-	-	-70.14	12.76	49.62	73.98	-24.36
12205.00	Avg	H	-	-	-83.98	20.11	43.13	53.98	-10.85
12205.00	Peak	H	-	-	-72.57	20.11	54.54	73.98	-19.44

Table 7-26. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2478MHz
Channel: 75

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]
4956.00	Avg	H	-	-	-78.46	5.05	33.59	53.98	-20.39
4956.00	Peak	H	-	-	-67.07	5.05	44.98	73.98	-29.00
7434.00	Avg	H	-	-	-81.46	12.66	38.20	53.98	-15.78
7434.00	Peak	H	-	-	-70.30	12.66	49.36	73.98	-24.62
12390.00	Avg	H	-	-	-85.05	19.64	41.59	53.98	-12.39
12390.00	Peak	H	-	-	-73.82	19.64	52.82	73.98	-21.16

Table 7-27. Radiated Measurements @ 3 meters

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Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247(d); RSS-Gen [8.9]

Antenna 2

Bluetooth Mode:	HDR4
Power Scheme	ePA
Distance of Measurements:	3 Meters
Operating Frequency:	2404MHz
Channel:	1

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]
4808.00	Avg	H	-	-	-79.59	5.50	32.91	53.98	-21.07
4808.00	Peak	H	-	-	-67.25	5.50	45.25	73.98	-28.73
12020.00	Avg	H	-	-	-84.87	19.43	41.56	53.98	-12.41
12020.00	Peak	H	-	-	-73.42	19.43	53.01	73.98	-20.96

Table 7-28. Radiated Measurements @ 3 meters

Bluetooth Mode:	HDR4
Power Scheme	ePA
Distance of Measurements:	3 Meters
Operating Frequency:	2441MHz
Channel:	38

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]
4882.00	Avg	H	-	-	-80.52	5.73	32.21	53.98	-21.77
4882.00	Peak	H	-	-	-68.22	5.73	44.51	73.98	-29.47
7323.00	Avg	H	-	-	-82.23	12.76	37.53	53.98	-16.45
7323.00	Peak	H	-	-	-70.63	12.76	49.13	73.98	-24.85
12205.00	Avg	H	-	-	-85.02	20.11	42.09	53.98	-11.89
12205.00	Peak	H	-	-	-73.30	20.11	53.81	73.98	-20.17

Table 7-29. Radiated Measurements @ 3 meters

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Bluetooth Mode: HDR4
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2478MHz
Channel: 75

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]
4956.00	Avg	H	-	-	-79.76	5.05	32.29	53.98	-21.69
4956.00	Peak	H	-	-	-67.57	5.05	44.48	73.98	-29.50
7434.00	Avg	H	-	-	-82.90	12.66	36.76	53.98	-17.22
7434.00	Peak	H	-	-	-70.16	12.66	49.50	73.98	-24.48
12390.00	Avg	H	-	-	-86.62	19.64	40.02	53.98	-13.96
12390.00	Peak	H	-	-	-74.65	19.64	51.99	73.98	-21.99

Table 7-30. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2404MHz
Channel: 1

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]
4808.00	Avg	H	-	-	-78.74	5.50	33.76	53.98	-20.22
4808.00	Peak	H	-	-	-67.01	5.50	45.49	73.98	-28.49
12020.00	Avg	V	-	-	-84.02	19.43	42.41	53.98	-11.56
12020.00	Peak	V	-	-	-72.28	19.43	54.15	73.98	-19.82

Table 7-31. Radiated Measurements @ 3 meters

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Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2441MHz
Channel: 38

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]
4882.00	Avg	H	-	-	-78.64	5.73	34.09	53.98	-19.89
4882.00	Peak	H	-	-	-67.08	5.73	45.65	73.98	-28.33
7323.00	Avg	H	-	-	-81.53	12.76	38.23	53.98	-15.75
7323.00	Peak	H	-	-	-69.64	12.76	50.12	73.98	-23.86
12205.00	Avg	V	-	-	-84.20	20.11	42.91	53.98	-11.07
12205.00	Peak	V	-	-	-72.18	20.11	54.93	73.98	-19.05

Table 7-32. Radiated Measurements @ 3 meters

Bluetooth Mode: HDR8
Power Scheme ePA
Distance of Measurements: 3 Meters
Operating Frequency: 2478MHz
Channel: 75

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]
4956.00	Avg	V	-	-	-78.54	5.05	33.51	53.98	-20.47
4956.00	Peak	V	-	-	-66.39	5.05	45.66	73.98	-28.32
7434.00	Avg	H	-	-	-81.54	12.66	38.12	53.98	-15.86
7434.00	Peak	H	-	-	-69.53	12.66	50.13	73.98	-23.85
12390.00	Avg	H	-	-	-85.27	19.64	41.37	53.98	-12.61
12390.00	Peak	H	-	-	-73.28	19.64	53.36	73.98	-20.62

Table 7-33. Radiated Measurements @ 3 meters

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7.8 Radiated Restricted Band Edge Measurements

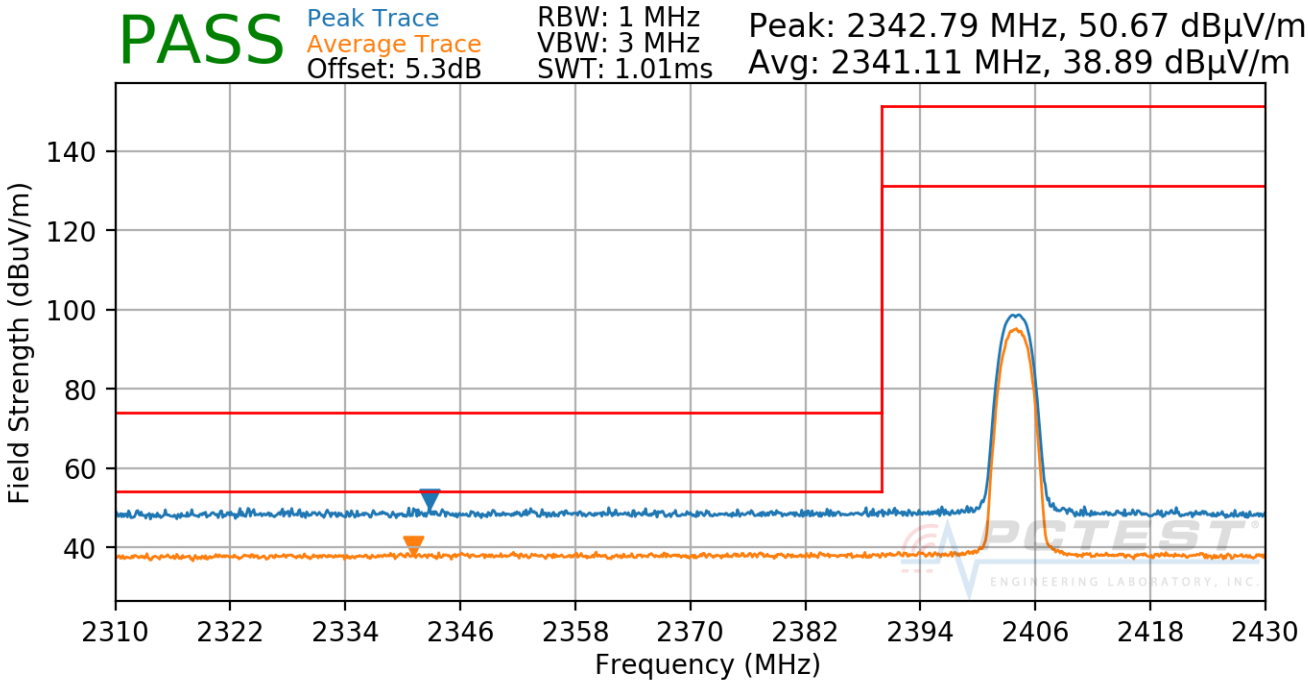
§15.205 §15.209; RSS-Gen [8.9]

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

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR4
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-105. Radiated Restricted Lower Band Edge Measurement ANT0 (Average & Peak)

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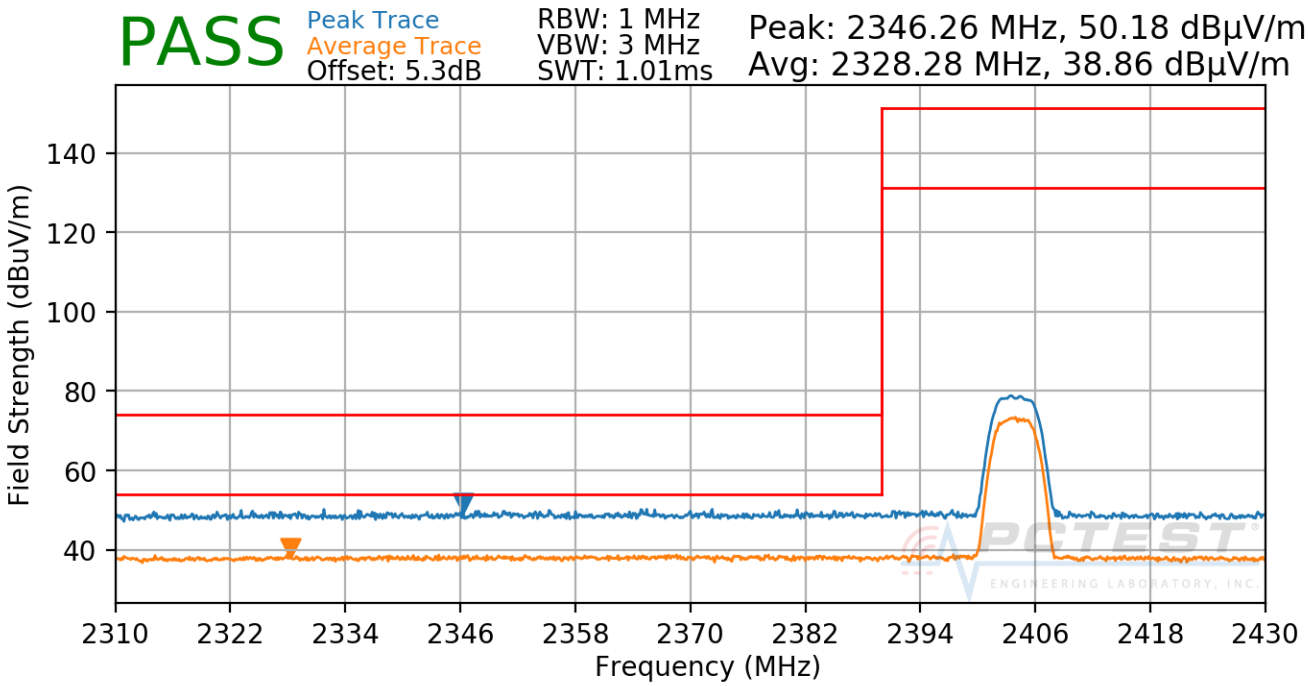
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR8
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-106. Radiated Restricted Lower Band Edge Measurement ANT0 (Average & Peak)

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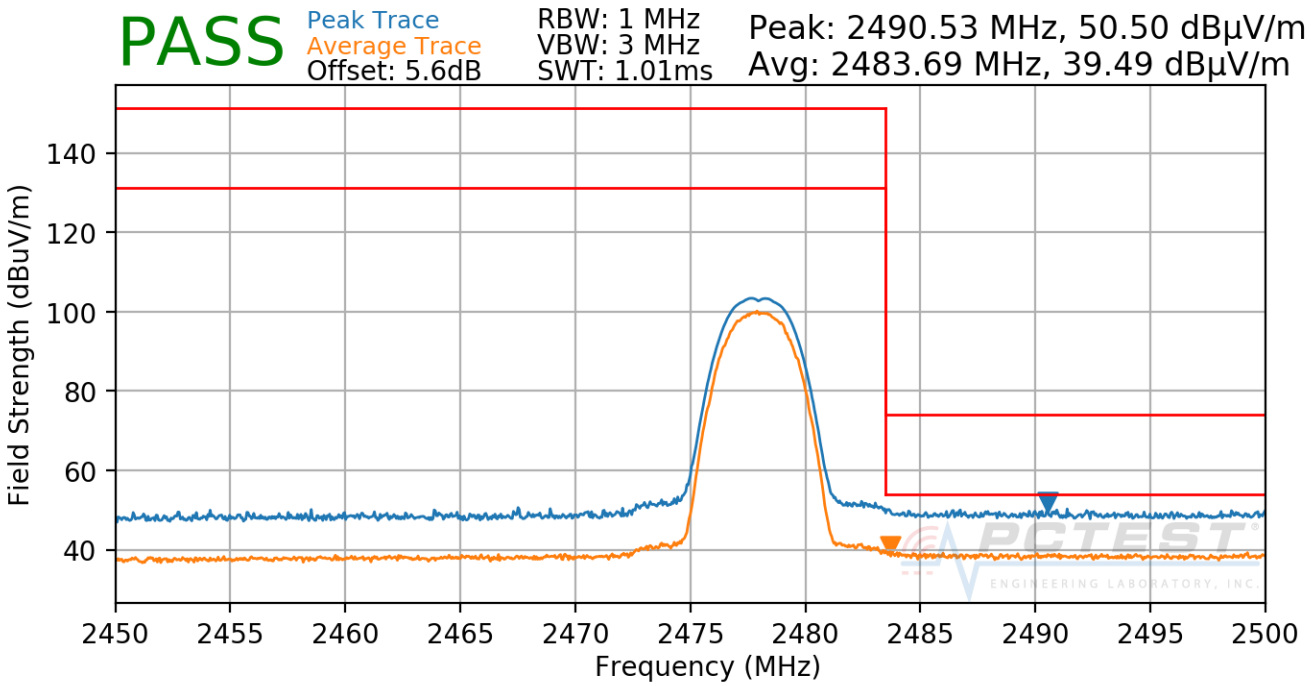
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR4
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	75



Plot 7-107. Radiated Restricted Upper Band Edge Measurement ANT0 (Average & Peak)

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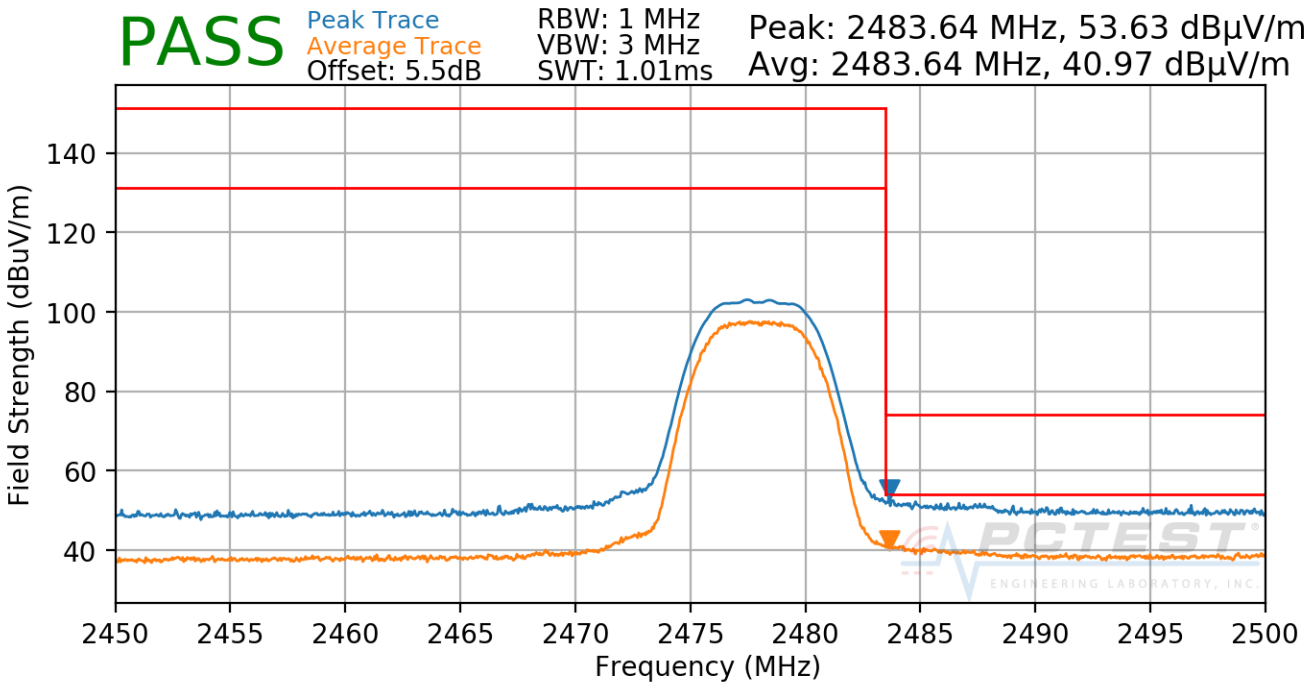
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR8
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	75



Plot 7-108. Radiated Restricted Upper Band Edge Measurement ANT0 (Average & Peak)

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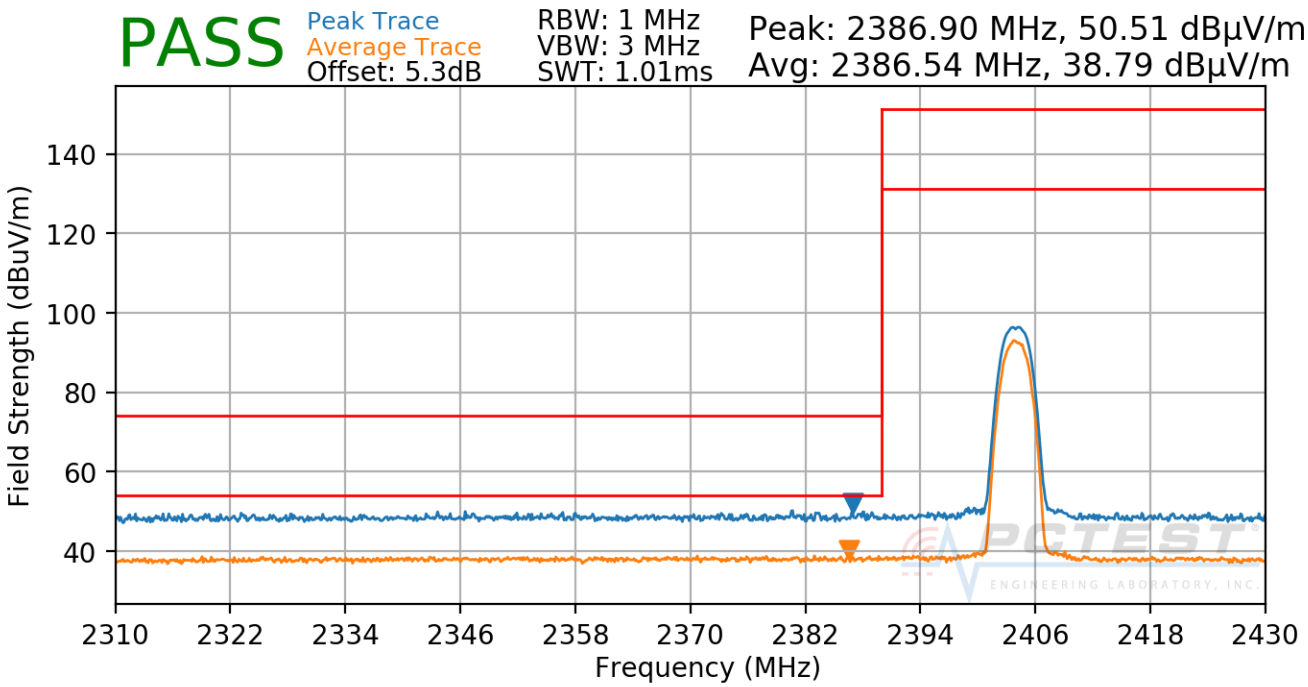
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR4
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-109. Radiated Restricted Lower Band Edge Measurement ANT1 (Average & Peak)

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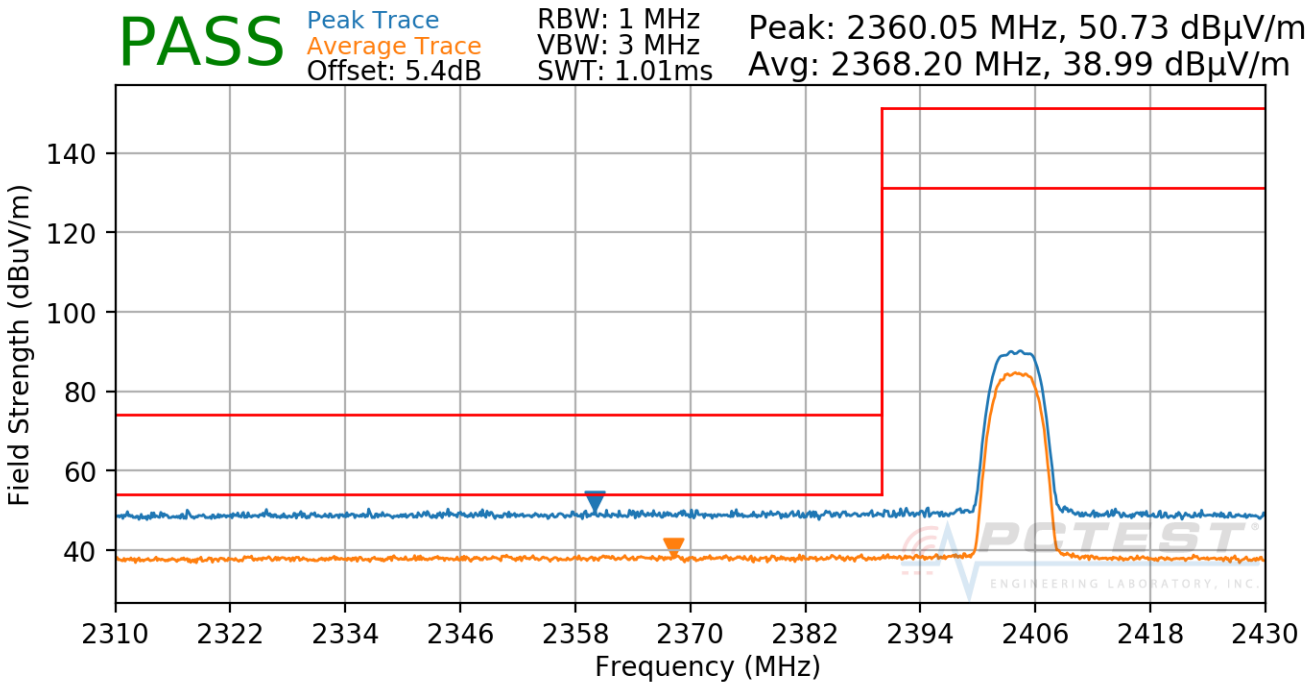
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR8
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-110. Radiated Restricted Lower Band Edge Measurement ANT1 (Average & Peak)

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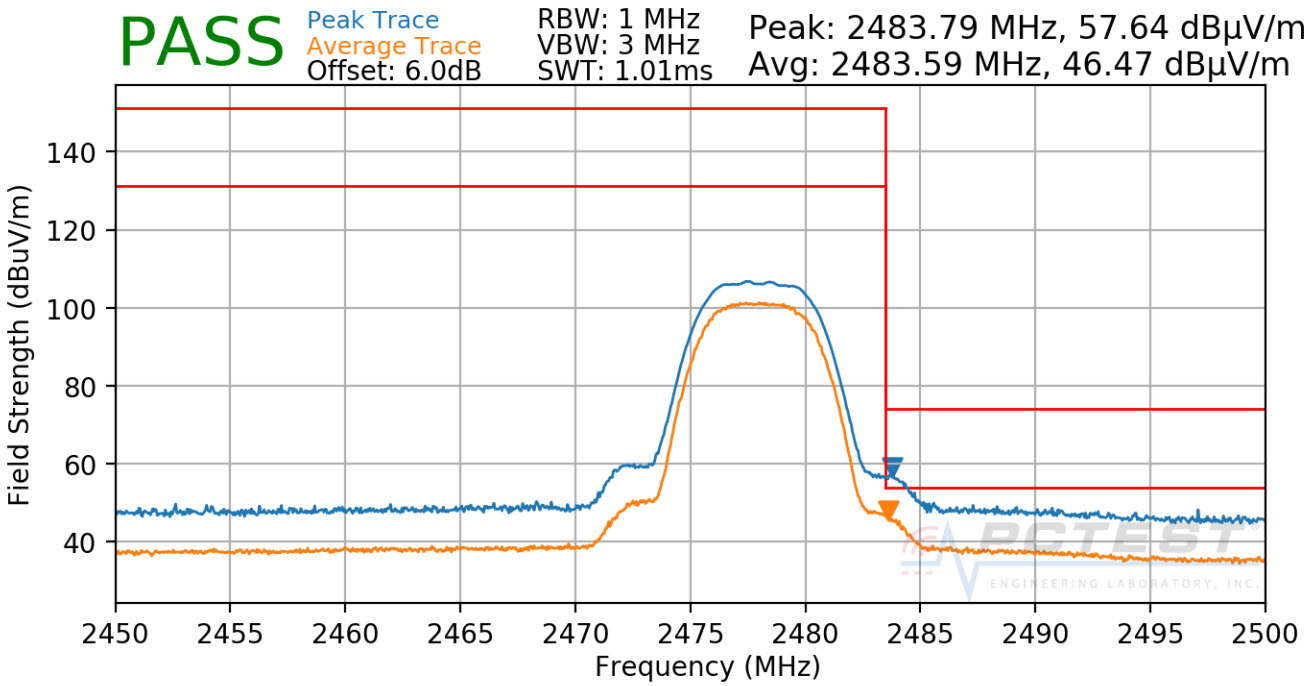
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR4
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	75



Plot 7-111. Radiated Restricted Upper Band Edge Measurement ANT1 (Average & Peak)

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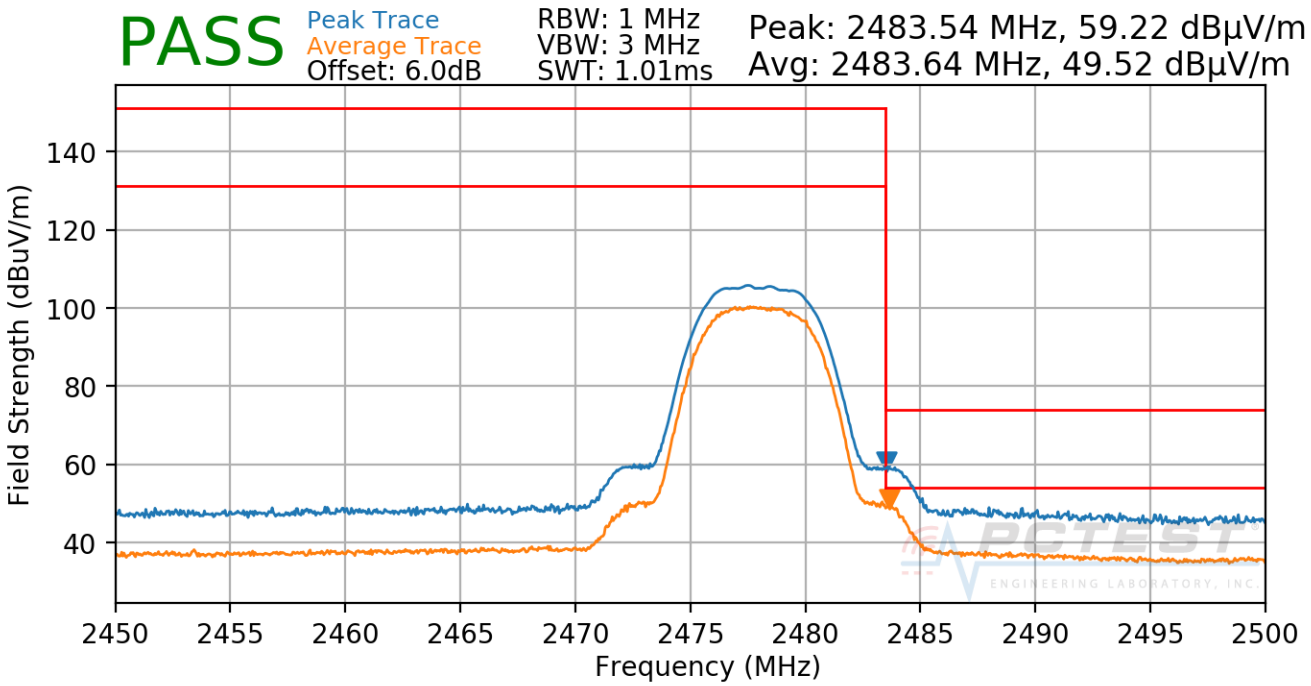
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR8
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	75



Plot 7-112. Radiated Restricted Upper Band Edge Measurement ANT1 (Average & Peak)

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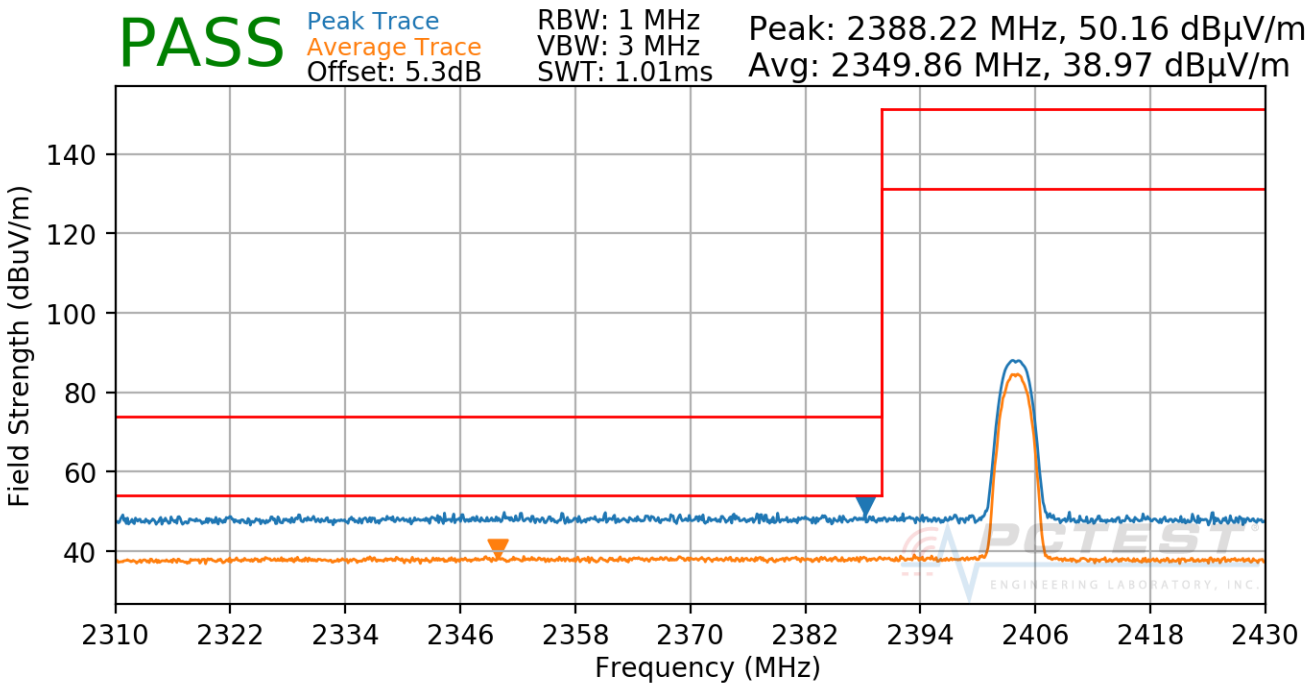
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR4
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-113. Radiated Restricted Lower Band Edge Measurement ANT2 (Average & Peak)

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Radiated Restricted Band Edge Measurements

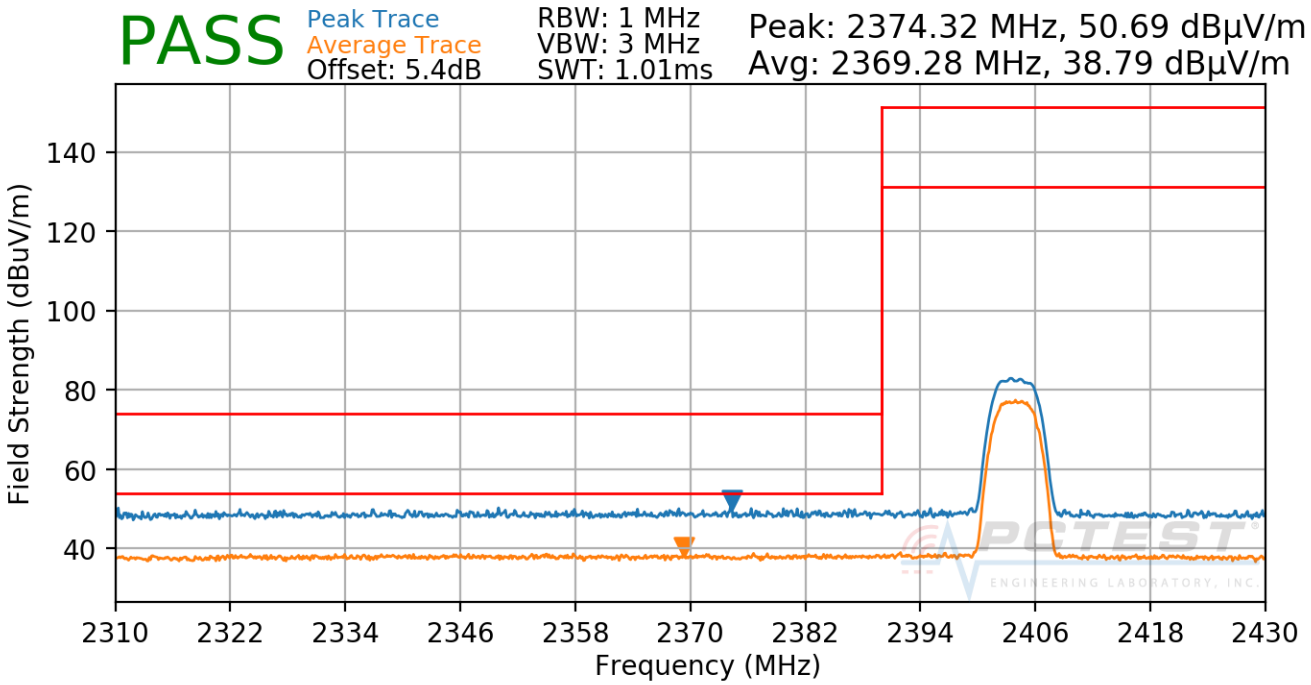
§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR8
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1

Plot 7-114. Radiated Restricted Lower Band E



dge Measurement ANT2 (Average & Peak)

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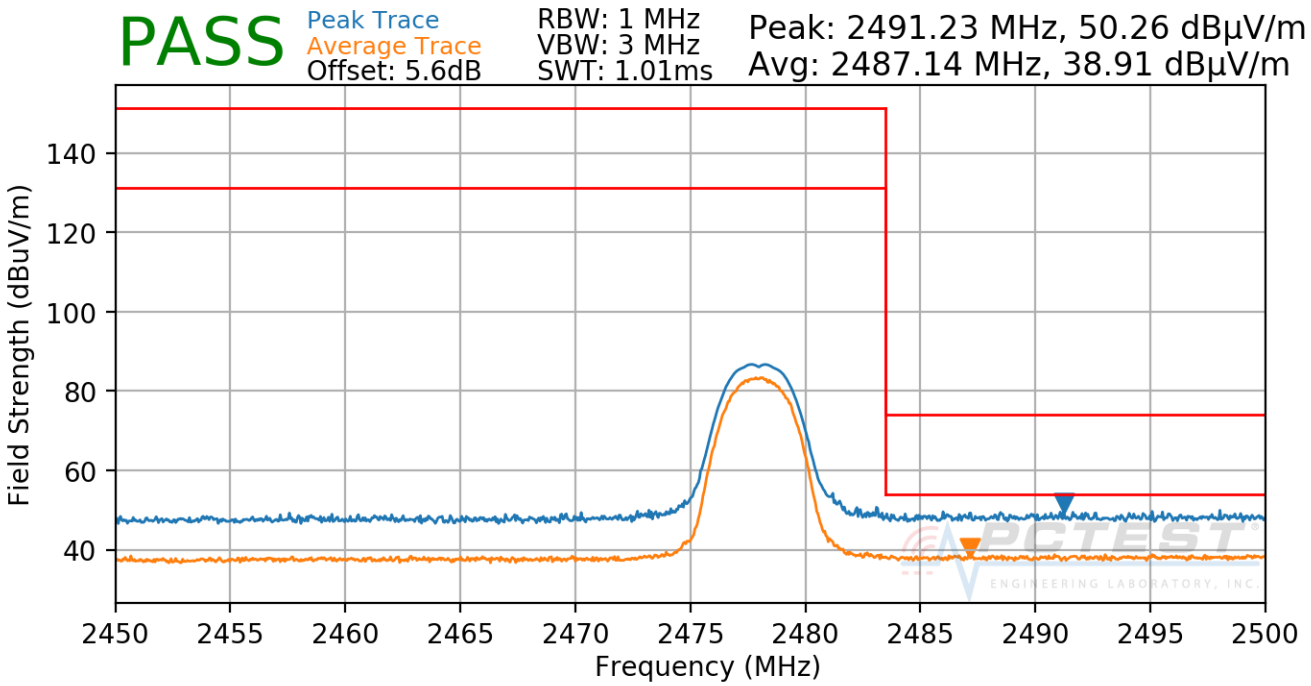
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR4
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	75



Plot 7-115. Radiated Restricted Upper Band Edge Measurement ANT2 (Average & Peak)

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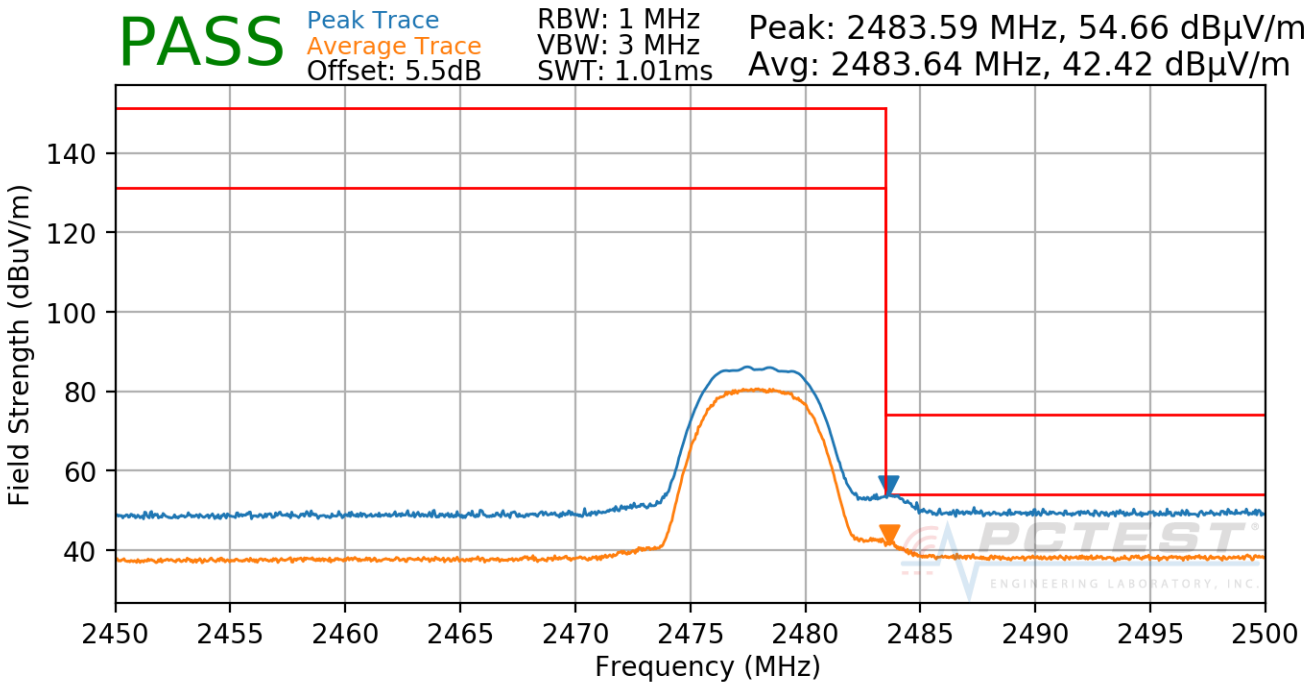
Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

Bluetooth Mode:	HDR8
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	75



Plot 7-116. Radiated Restricted Upper Band Edge Measurement ANT2 (Average & Peak)

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7.9 Radiated Spurious Emissions Measurements – 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.

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 C63.10-2013

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

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Test Setup

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

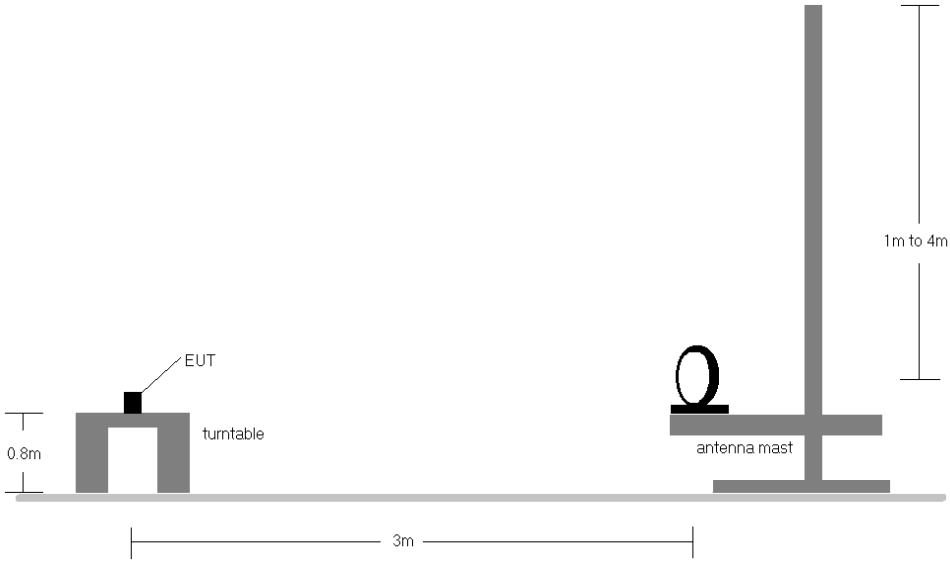

Figure 7-7. Radiated Test Setup < 30Mhz

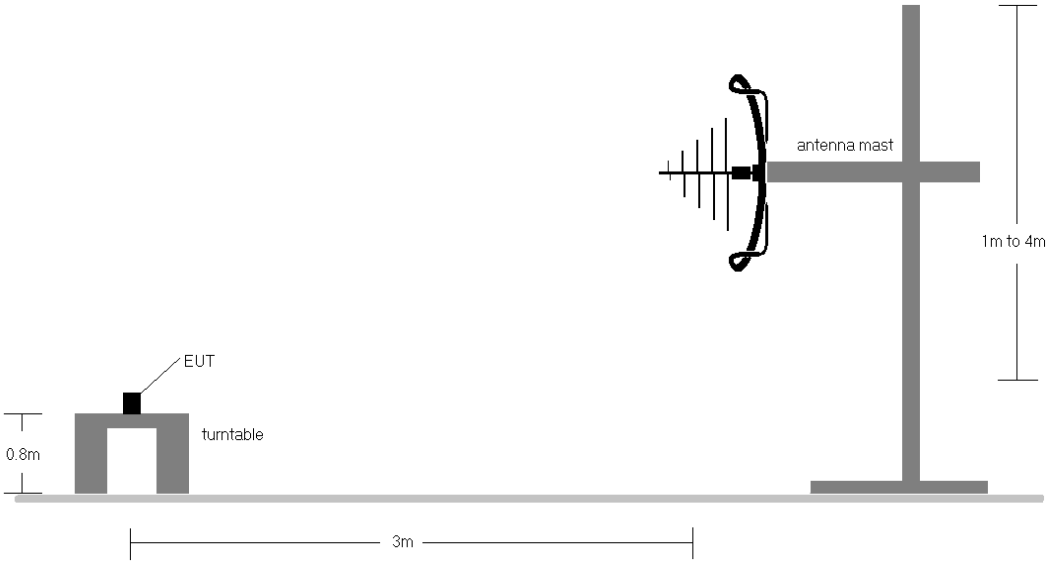

Figure 7-8. Radiated Test Setup < 1GHz

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Test Notes

1. All emissions lying in restricted bands specified in §15.205 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.
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.
10. The unit was tested with all possible mode and power schemes and only the highest emission is reported.

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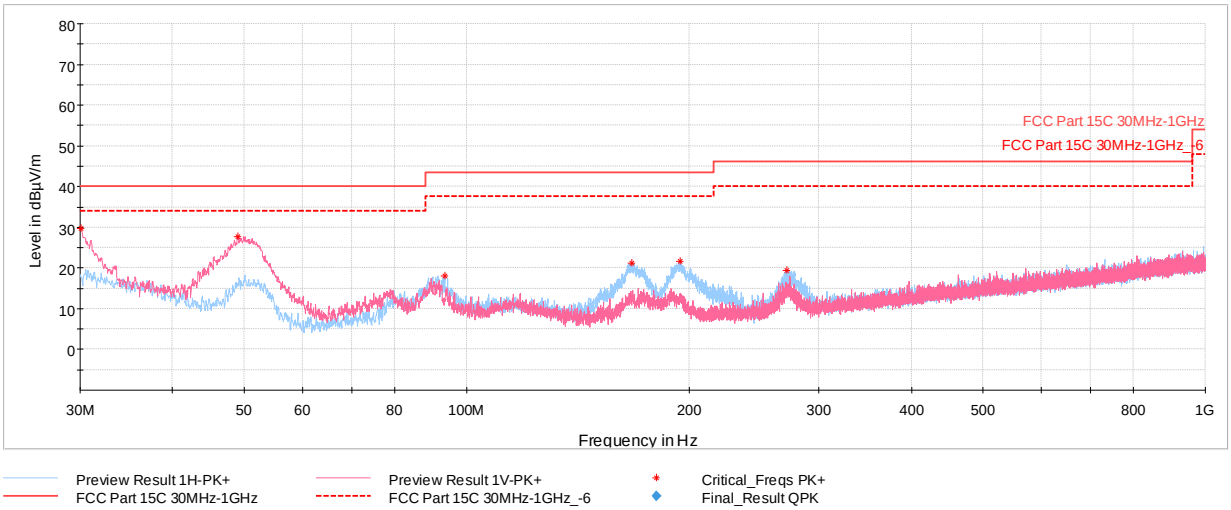

Plot 7-117. Radiated Spurious Plot below 1GHz (4Mbps, HDR4 ePA, Pol. H & V, with AC/DC Adapter)

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]
30.10	Quasi-Peak	V	100	50	-70.59	-8.93	27.48	40.00	-12.52
49.06	Quasi-Peak	V	100	7	-73.07	-20.81	13.12	40.00	-26.88
93.44	Max-Peak	H	250	345	-68.16	-18.00	20.84	43.52	-22.68
167.30	Max-Peak	H	250	47	-69.00	-17.83	20.17	43.52	-23.36
194.51	Max-Peak	H	100	353	-65.08	-19.16	22.76	43.52	-20.76
271.53	Max-Peak	H	100	72	-60.05	-16.59	30.36	46.02	-15.66

Table 7-35. Radiated Spurious Emissions Below 1GHz (4Mbps, HDR4 ePA, with AC/DC Adapter)

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7.10 Line-Conducted Test Data

§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 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 C63.10-2013, Section 6.2

Test Settings

Quasi-Peak Field Strength Measurements

7. Analyzer center frequency was set to the frequency of the spurious emission of interest
8. RBW = 9kHz (for emissions from 150kHz – 30MHz)
9. Detector = quasi-peak
10. Sweep time = auto couple
11. Trace mode = max hold
12. 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

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Test Setup

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

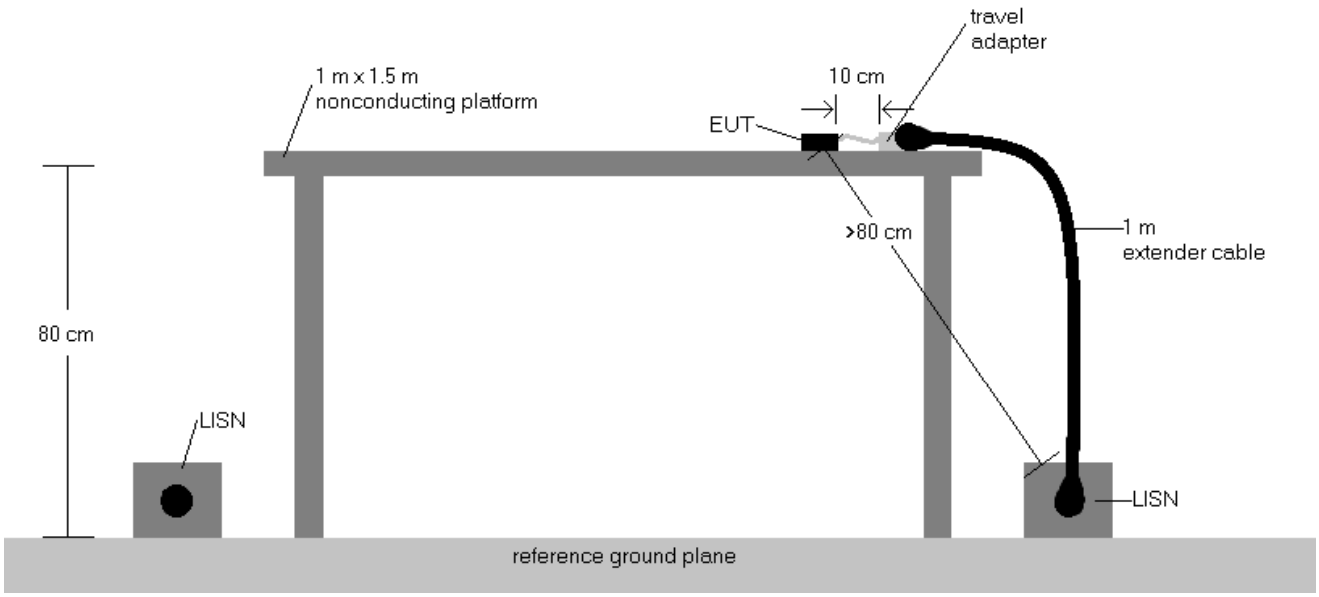

Figure 7-9. Test Instrument & Measurement Setup

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 Part 15.207 and RSS-Gen (8.8).
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.
8. Both power schemes were investigated, and only worst case is reported.

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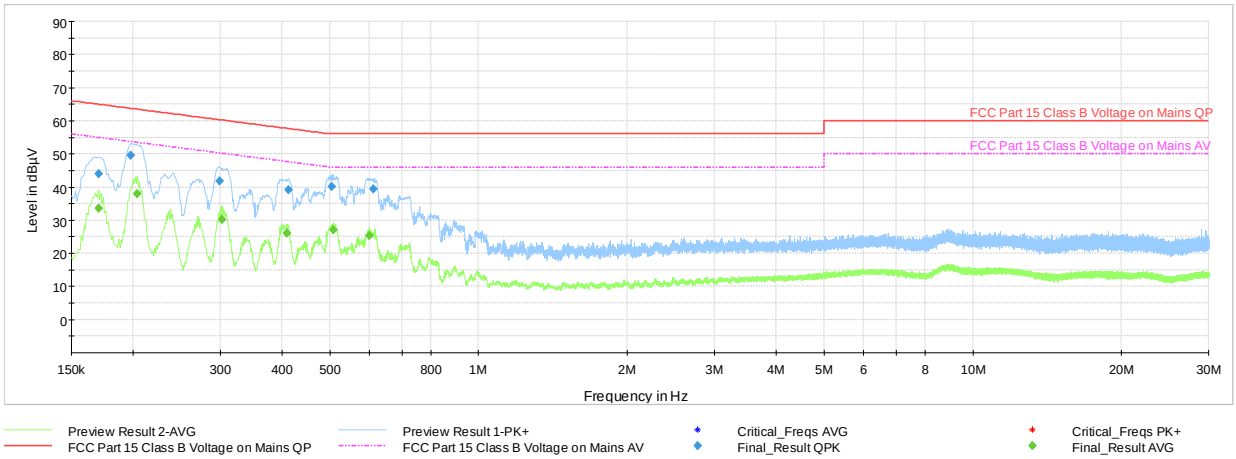

Plot 7-118. Line Conducted Plot with Bluetooth HDR (L1, with AC/DC Adapter)

Frequency MHz	Process State	QuasiPeak dBµV	Average dBµV	Limit dBµV	Margin dB	Bandwidth kHz	Line	PE
0.1700	FINAL	—	33.57	54.96	-21.39	9.000	L1	GND
0.1700	FINAL	44.09	—	64.96	-20.87	9.000	L1	GND
0.1980	FINAL	49.64	—	63.69	-14.05	9.000	L1	GND
0.2040	FINAL	—	38.02	53.45	-15.43	9.000	L1	GND
0.2990	FINAL	41.75	—	60.27	-18.52	9.000	L1	GND
0.3020	FINAL	—	30.17	50.19	-20.02	9.000	L1	GND
0.4090	FINAL	—	26.16	47.67	-21.51	9.000	L1	GND
0.4130	FINAL	39.06	—	57.59	-18.53	9.000	L1	GND
0.5050	FINAL	40.16	—	56.00	-15.84	9.000	L1	GND
0.5090	FINAL	—	26.97	46.00	-19.03	9.000	L1	GND
0.6010	FINAL	—	25.26	46.00	-20.74	9.000	L1	GND
0.6120	FINAL	39.41	—	56.00	-16.59	9.000	L1	GND

Table 7-37. Line Conducted Measurements with Bluetooth HDR (L1, with AC/DC Adapter)

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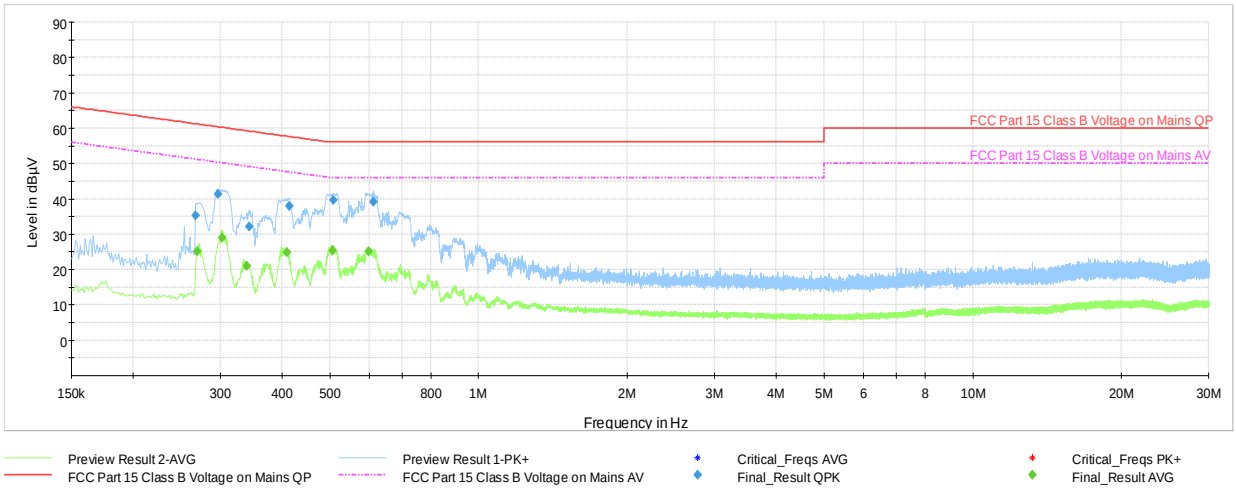

Plot 7-119. Line Conducted Plot with Bluetooth HDR (N, with AC/DC Adapter)

Frequency MHz	Process State	QuasiPeak dBµV	Average dBµV	Limit dBµV	Margin dB	Bandwidth kHz	Line	PE
0.267000	FINAL	35.39	—	61.21	-25.82	9.000	N	GND
0.269000	FINAL	—	25.02	51.15	-26.13	9.000	N	GND
0.297000	FINAL	41.31	—	60.33	-19.02	9.000	N	GND
0.303000	FINAL	—	29.02	50.16	-21.14	9.000	N	GND
0.339000	FINAL	—	20.92	49.23	-28.31	9.000	N	GND
0.343000	FINAL	32.17	—	59.13	-26.96	9.000	N	GND
0.410000	FINAL	—	24.83	47.65	-22.82	9.000	N	GND
0.414000	FINAL	37.85	—	57.57	-19.72	9.000	N	GND
0.506000	FINAL	—	25.41	46.00	-20.59	9.000	N	GND
0.509000	FINAL	39.73	—	56.00	-16.27	9.000	N	GND
0.598000	FINAL	—	25.21	46.00	-20.79	9.000	N	GND
0.613000	FINAL	39.23	—	56.00	-16.77	9.000	N	GND

Table 7-38. Line Conducted Measurements with Bluetooth HDR (N, with AC/DC Adapter)

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8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Apple Tablet Device FCC ID: BCGA1980** 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.

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