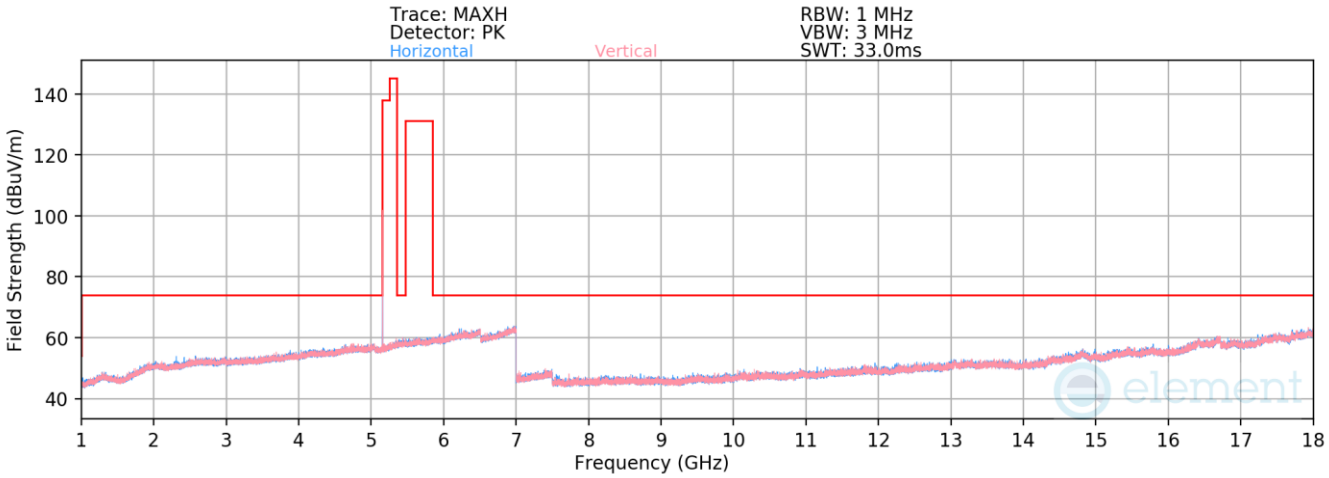
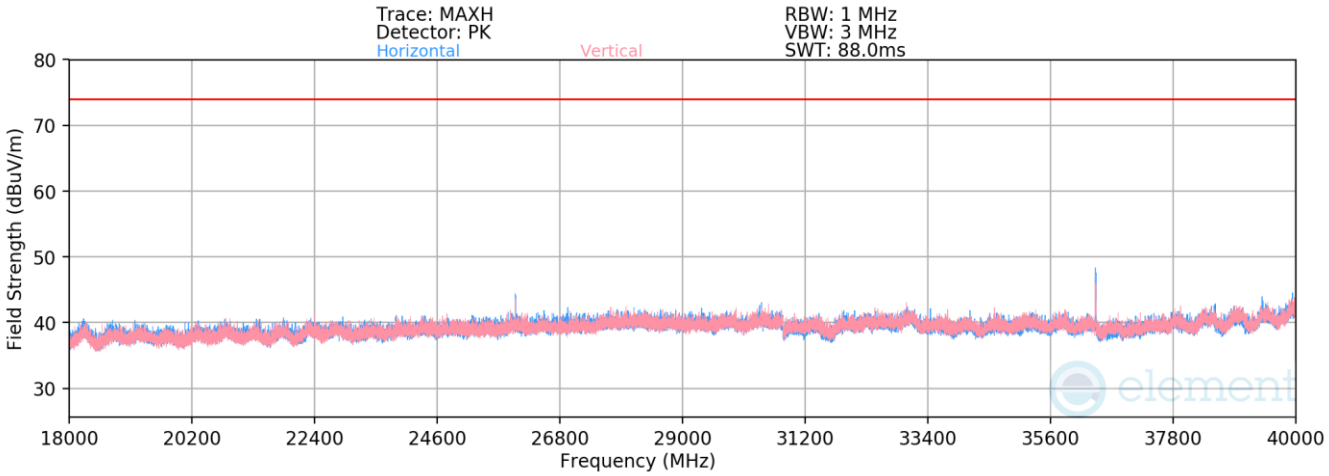


Plot 7-85. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5157MHz)

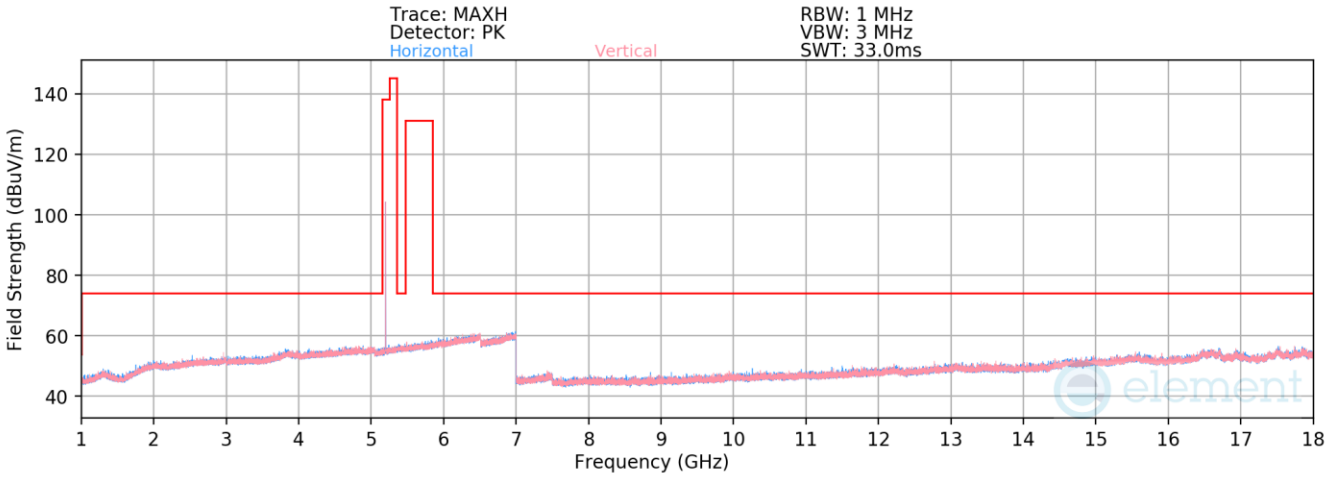


Plot 7-86. Radiated Spurious Emissions 18-40GHz (NB UNII HDRp4 – 5157MHz)

Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5157MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10314.00	Peak	H	-	-	-70.12	12.42	0.00	49.30	68.23	-18.93
*	15471.00	Avg	H	259	153	-82.75	20.01	0.58	44.83	53.98	-9.15
*	15471.00	Peak	H	259	153	-70.33	19.43	0.00	56.10	73.98	-17.88
*	20628.00	Avg	V	39	176	-69.67	-6.81	0.58	31.10	53.98	-22.88
*	20628.00	Peak	V	39	176	-59.18	-6.81	0.00	41.01	73.98	-32.97
	25785.00	Avg	H	269	112	-64.73	-4.47	0.58	38.38	53.98	-15.60
	25785.00	Peak	H	269	112	-55.34	-4.47	0.00	47.19	68.23	-21.04
	30942.00	Avg	H	150	115	-72.40	-2.49	0.58	32.69	53.98	-21.29
	30942.00	Peak	H	150	115	-61.12	-2.49	0.00	43.39	73.98	-30.59
	36099.00	Peak	H	150	114	-50.78	-6.38	0.00	49.84	68.23	-18.39

Table 7-17. Radiated Spurious Emissions Measurements

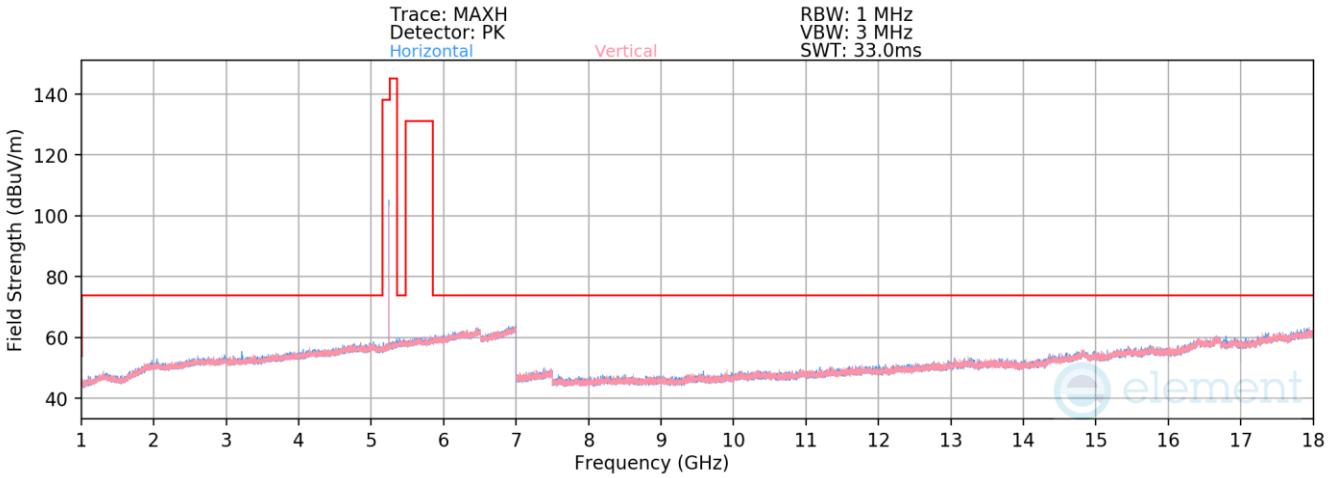


Plot 7-87. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5201MHz)

Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5201MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10402.00	Peak	H	-	-	-66.92	8.51	0.00	48.59	68.23	-19.64
*	15603.00	Avg	H	303	48	-77.36	15.46	0.58	45.68	53.98	-8.30
*	15603.00	Peak	H	303	48	-67.13	14.30	0.00	54.17	73.98	-19.81

Table 7-18. Radiated Spurious Emissions Measurements

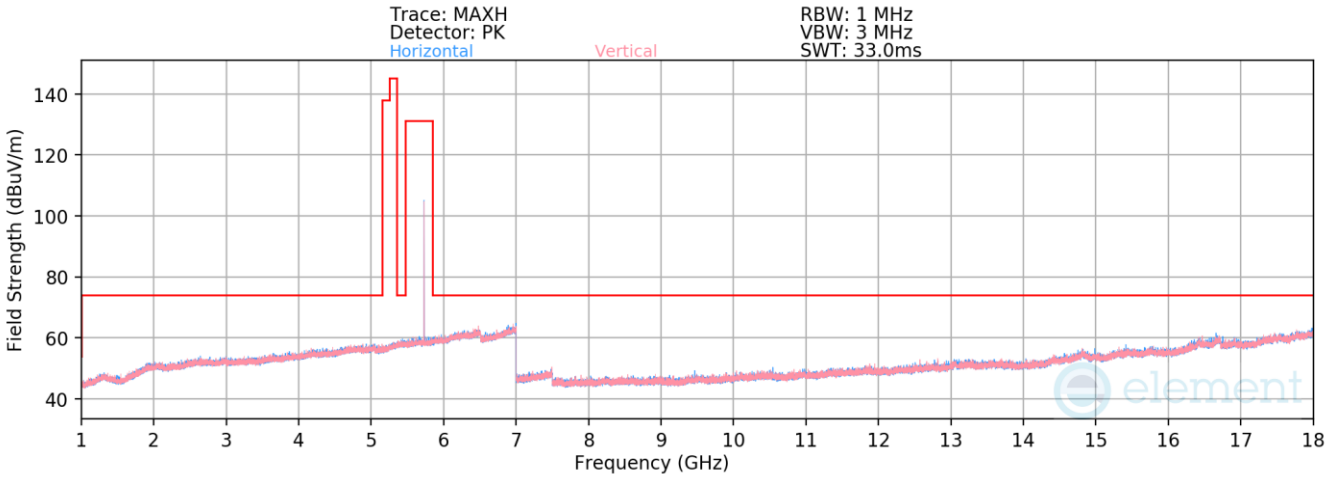


Plot 7-88. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5245MHz)

Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5245MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10490.00	Peak	H	-	-	-70.77	12.78	0.00	49.00	68.23	-19.23
*	15735.00	Avg	H	254	81	-82.86	20.33	0.58	45.05	53.98	-8.93
*	15735.00	Peak	H	254	81	-71.05	19.75	0.00	55.70	73.98	-18.28

Table 7-19. Radiated Spurious Emissions Measurements

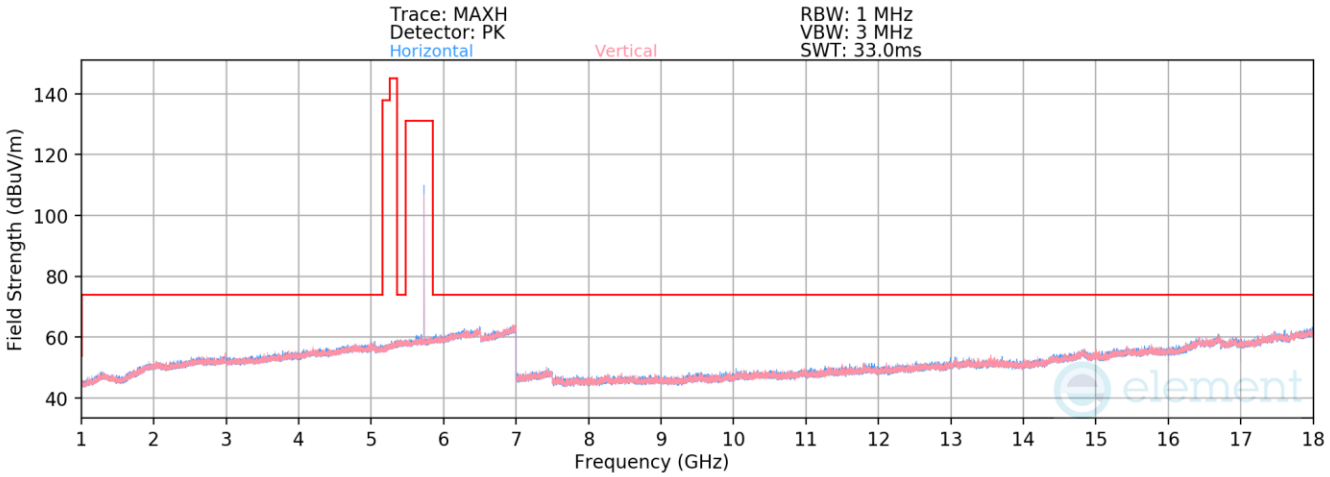


Plot 7-89. Radiated Spurious Emissions 1-18GHz (NB UNII BDR – 5731MHz)

Mode:	BDR
Data Rate:	1Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5731MHz

	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]
*	11462.00	Avg	H	-	-	-81.83	13.59	38.76	53.98	-15.22
*	11462.00	Peak	H	-	-	-70.78	13.59	49.81	73.98	-24.17
	17193.00	Peak	H	242	88	-68.79	23.30	61.52	68.23	-6.71

Table 7-20. Radiated Spurious Emissions Measurements

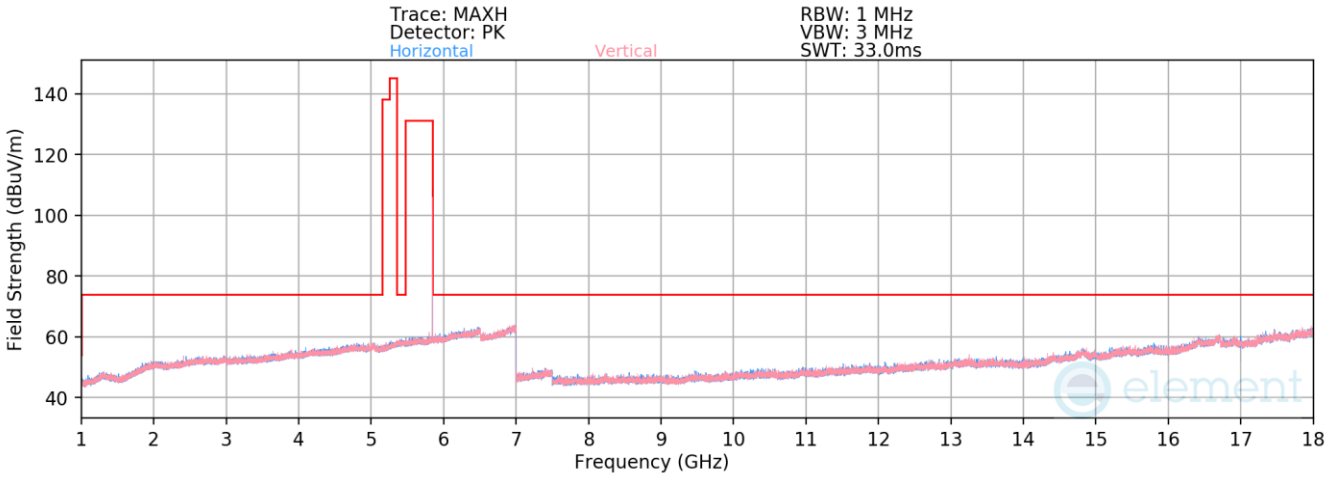


Plot 7-90. Radiated Spurious Emissions 1-18GHz (NB UNII BDR – 5788MHz)

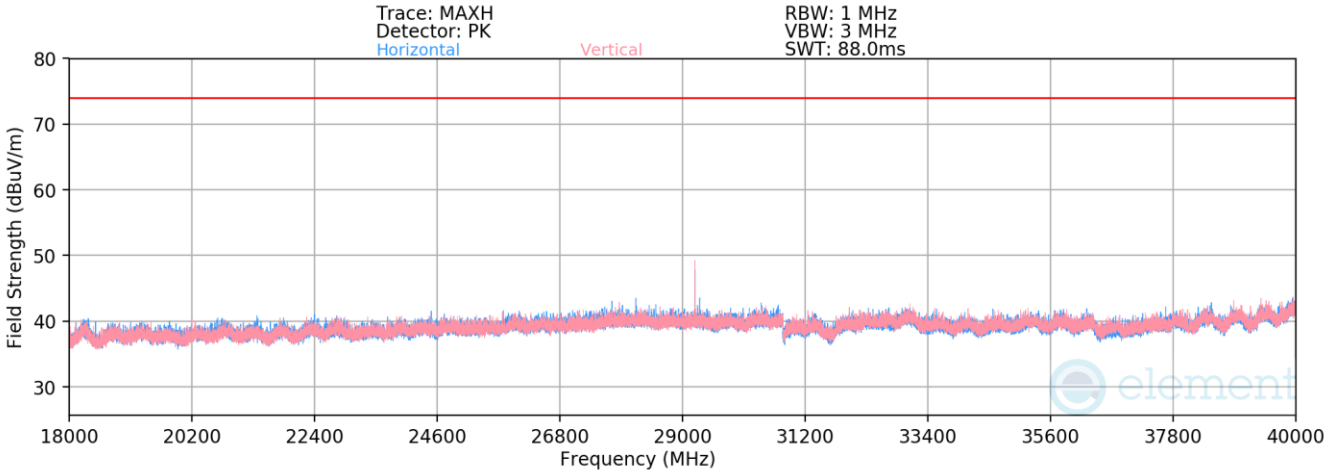
Mode:	BDR
Data Rate:	1Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5788MHz

	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]
*	11576.00	Avg	H	-	-	-78.77	9.47	37.70	53.98	-16.28
*	11576.00	Peak	H	-	-	-67.61	9.47	48.86	73.98	-25.12
	17364.00	Peak	H	216	91	-64.12	17.25	60.13	68.23	-8.10

Table 7-21. Radiated Spurious Emissions Measurements



Plot 7-91. Radiated Spurious Emissions 1-18GHz (NB UNII BDR – 5844MHz)

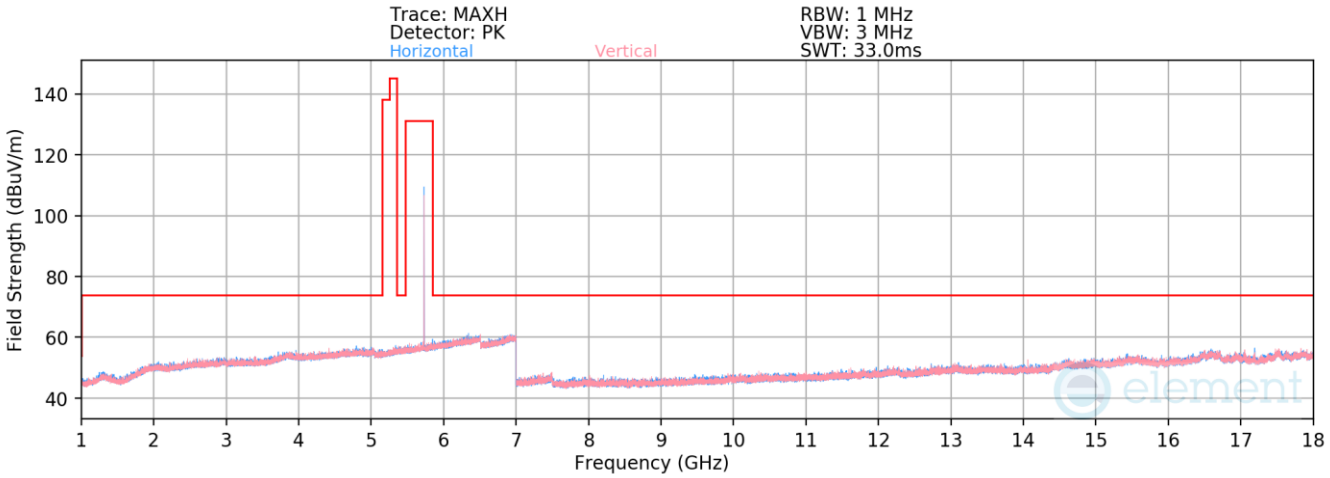


Plot 7-92. Radiated Spurious Emissions 18-40GHz (NB UNII BDR – 5844MHz)

Mode:	BDR
Data Rate:	1Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5844MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11688.00	Avg	H	-	-	-81.64	13.78	0.00	39.14	53.98	-14.84
*	11688.00	Peak	H	-	-	-69.93	13.78	0.00	50.85	73.98	-23.13
	17532.00	Peak	H	237	90	-69.68	25.33	0.00	62.65	68.23	-5.58
	23376.00	Peak	H	-	-	-60.04	-6.04	0.00	40.92	68.23	-27.31
	29220.00	Peak	V	150	131	-54.68	-2.76	0.00	49.56	68.23	-18.67
	35064.00	Peak	H	329	181	-59.19	-3.77	0.00	44.04	68.23	-24.19

Table 7-22. Radiated Spurious Emissions Measurements

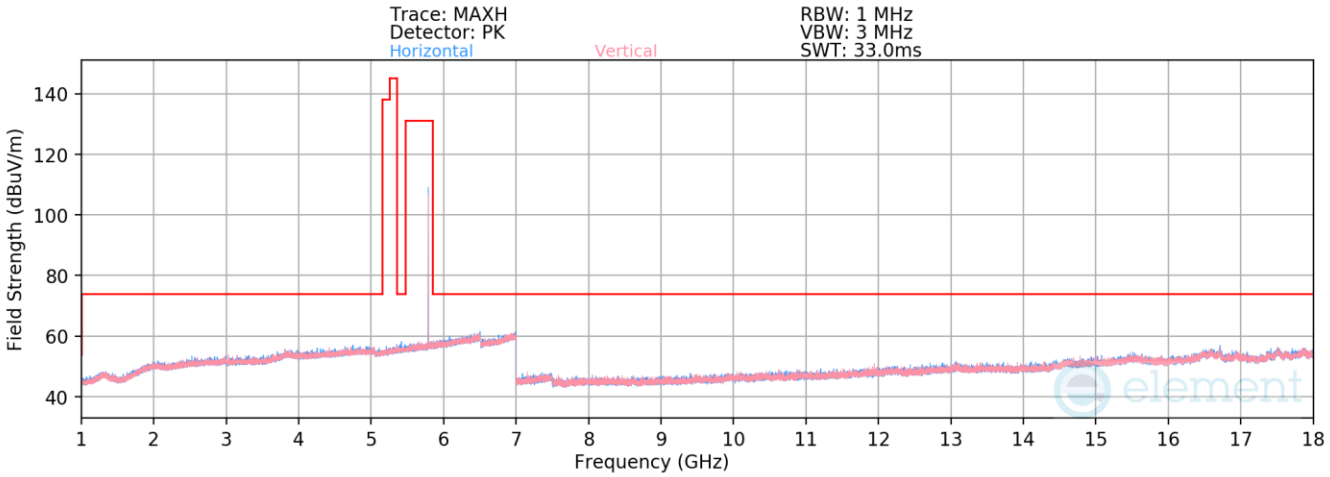


Plot 7-93. Radiated Spurious Emissions 1-18GHz (NB UNII LE2M – 5731MHz)

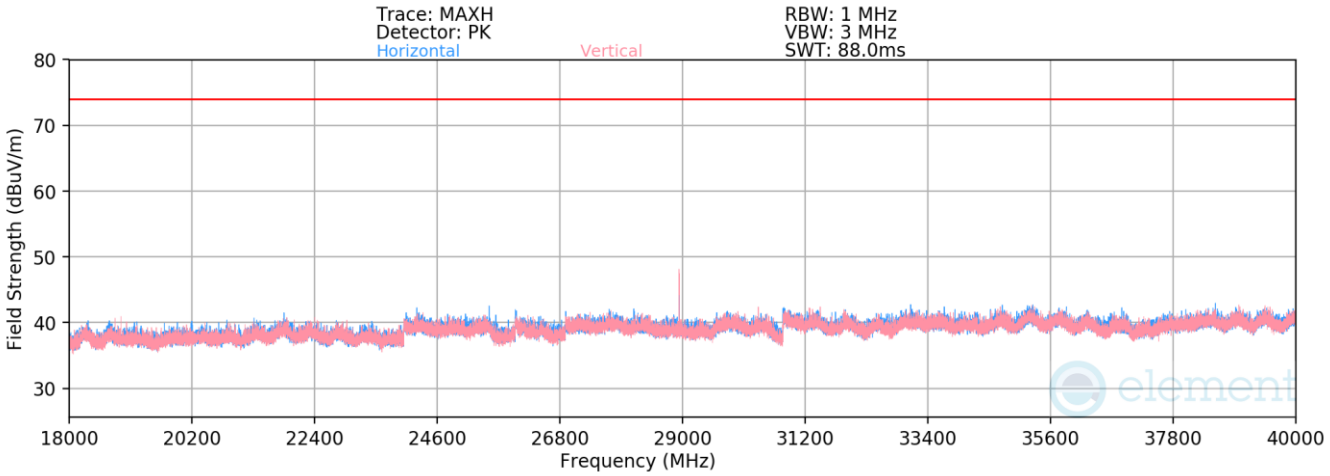
Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5731MHz

	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]
*	11462.00	Avg	H	-	-	-78.52	9.57	38.05	53.98	-15.93
*	11462.00	Peak	H	-	-	-67.78	9.57	48.79	73.98	-25.19
	17193.00	Peak	H	221	91	-66.12	16.22	57.10	68.23	-11.13

Table 7-23. Radiated Spurious Emissions Measurements



Plot 7-94. Radiated Spurious Emissions 1-18GHz (NB UNII LE2M – 5788MHz)

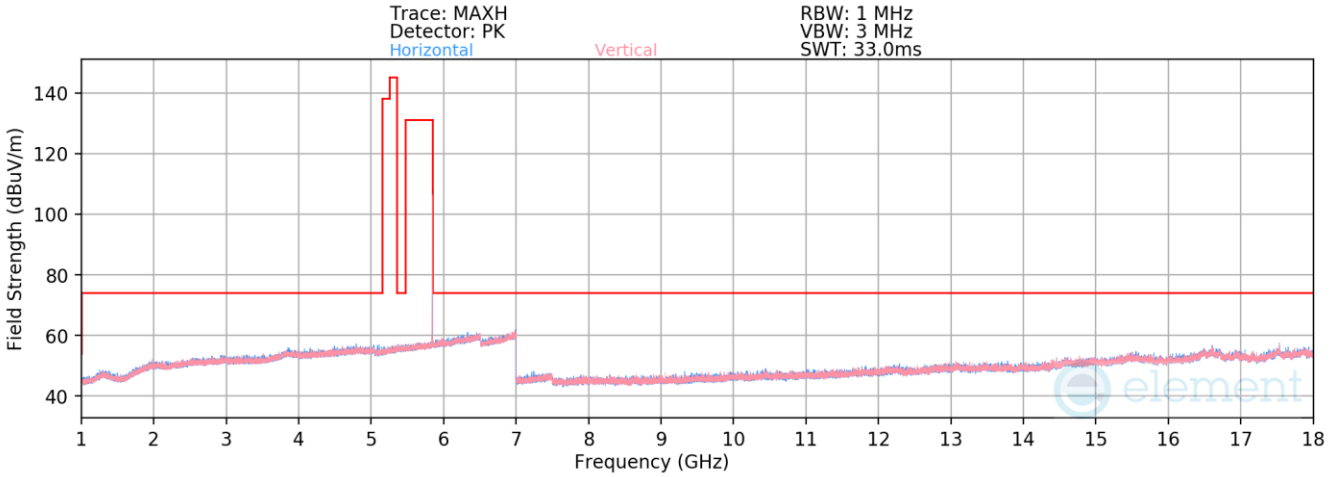


Plot 7 94. Radiated Spurious Emissions 18-40GHz (NB UNII LE2M – 5788MHz)

Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5788MHz

	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]
*	11576.00	Avg	H	-	-	-78.71	9.47	37.76	53.98	-16.22
*	11576.00	Peak	H	-	-	-67.84	9.47	48.63	73.98	-25.35
	17364.00	Peak	H	220	91	-66.52	17.35	57.83	68.23	-10.40
	23152.00	Peak	V	150	130	-61.96	-6.23	38.81	68.23	-29.42
	28940.00	Peak	V	150	258	-54.96	-2.96	49.08	68.23	-19.15
	34728.00	Peak	V	184	72	-61.15	-3.68	42.17	68.23	-26.06

Table 7-24. Radiated Spurious Emissions Measurements

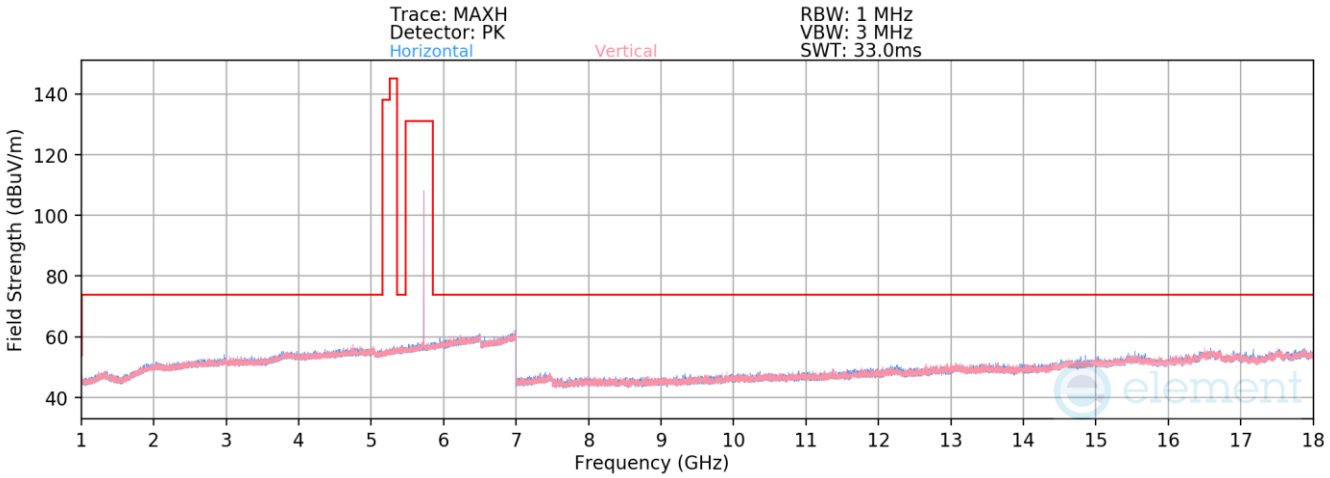


Plot 7-95. Radiated Spurious Emissions 1-18GHz (NB UNII LE2M – 5844MHz)

Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5844MHz

	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]
*	11688.00	Avg	H	-	-	-78.78	9.84	38.06	53.98	-15.92
*	11688.00	Peak	H	-	-	-68.36	9.84	48.48	73.98	-25.50
	17532.00	Peak	H	231	95	-66.63	18.79	59.16	68.23	-9.07

Table 7-25. Radiated Spurious Emissions Measurements

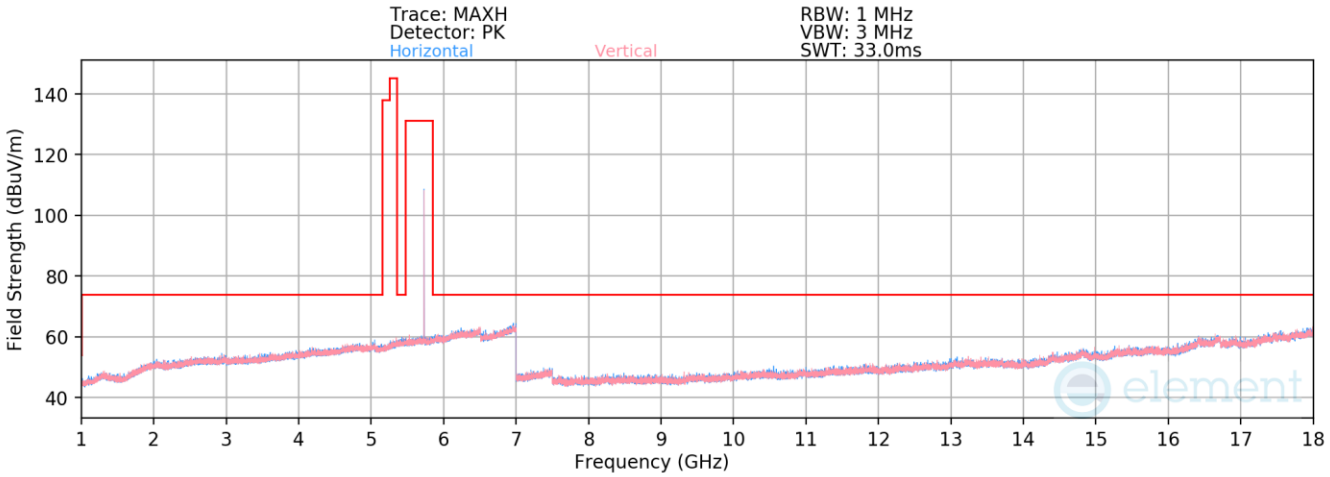


Plot 7-96. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5731MHz)

Mode:	HDR4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5731MHz

	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]
*	11462.00	Avg	H	-	-	-81.95	13.59	38.64	53.98	-15.34
*	11462.00	Peak	H	-	-	-70.31	13.59	50.28	73.98	-23.70
	17193.00	Peak	H	233	92	-70.61	23.30	59.70	68.23	-8.54

Table 7-26. Radiated Spurious Emissions Measurements

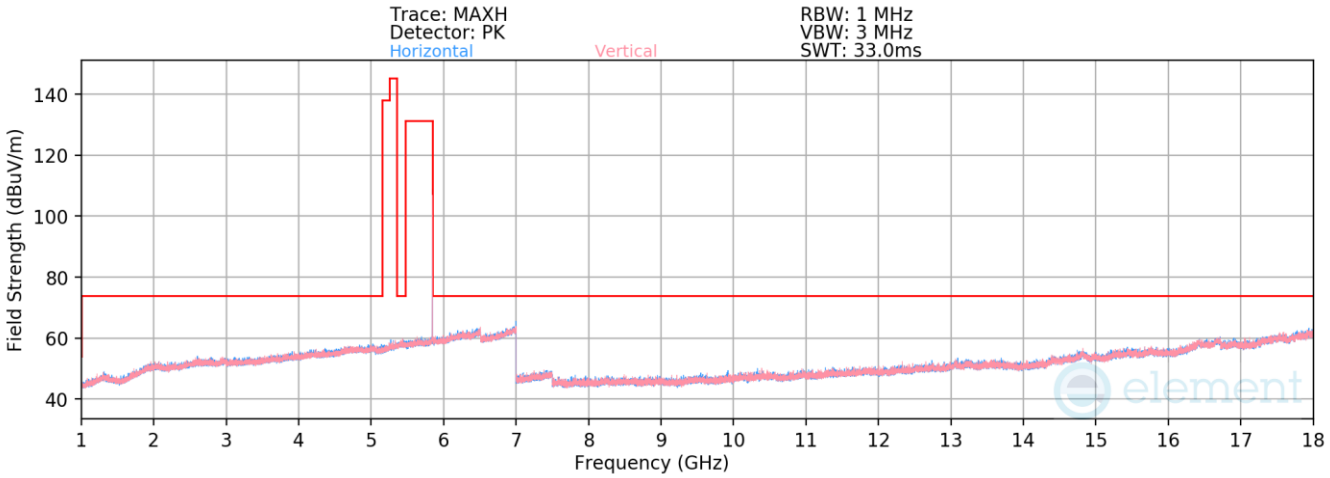


Plot 7-97. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5788MHz)

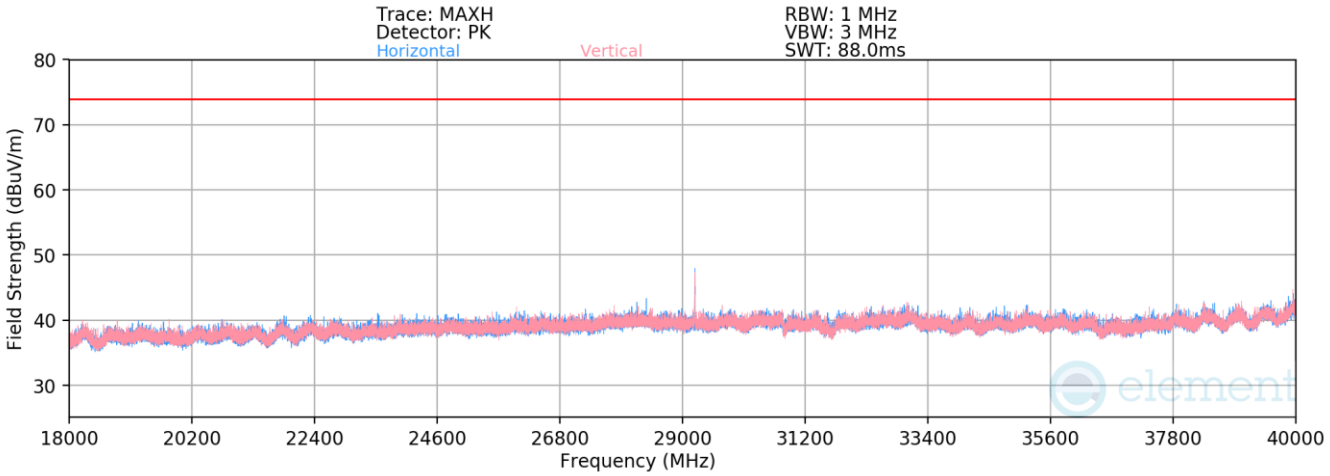
Mode:	HDR4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5788MHz

	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]
*	11576.00	Avg	H	-	-	-78.67	9.47	37.80	53.98	-16.18
*	11576.00	Peak	H	-	-	-67.27	9.47	49.20	73.98	-24.78
	17364.00	Peak	H	231	127	-66.24	17.25	58.01	68.23	-10.22

Table 7-27. Radiated Spurious Emissions Measurements



Plot 7-98. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5844MHz)

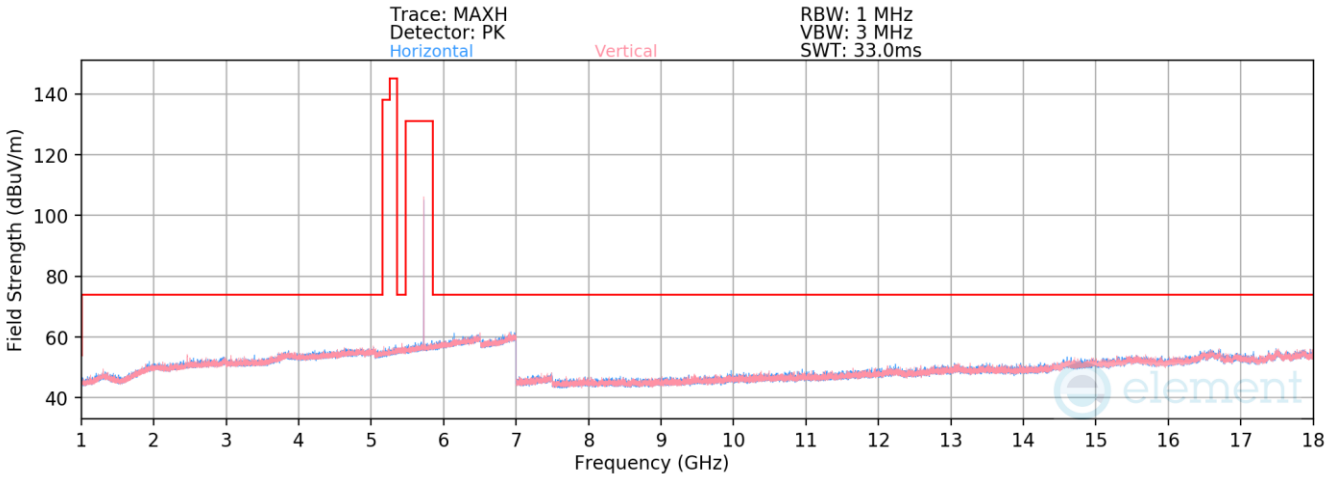


Plot 7-99. Radiated Spurious Emissions 18-40GHz (NB UNII HDR4 – 5844MHz)

Mode:	HDR4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5844MHz

	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]
*	11688.00	Avg	H	-	-	-81.48	13.78	39.30	53.98	-14.69
*	11688.00	Peak	H	-	-	-70.50	13.78	50.28	73.98	-23.70
	17532.00	Peak	H	242	120	-70.96	25.33	61.37	68.23	-6.86
	23376.00	Peak	-	-	-	-60.34	-6.04	40.62	68.23	-27.61
	29220.00	Peak	V	150	101	-52.65	-2.76	51.59	68.23	-16.64
	35064.00	Peak	V	150	183	-59.58	-3.77	43.65	68.23	-24.58

Table 7-28. Radiated Spurious Emissions Measurements

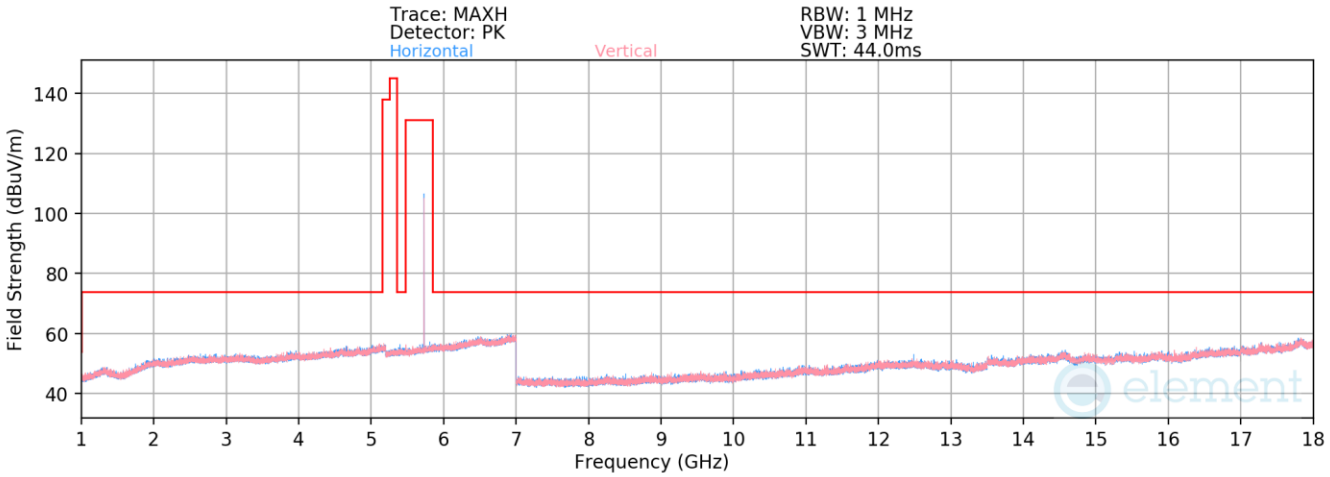


Plot 7-100. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5731MHz)

Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5731MHz

	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]
*	11462.00	Avg	H	-	-	-82.80	13.25	37.45	53.98	-16.53
*	11462.00	Peak	H	-	-	-71.00	13.25	49.25	73.98	-24.73
	17193.00	Peak	V	229	73	-73.12	22.87	56.74	68.23	-11.49

Table 7-29. Radiated Spurious Emissions Measurements

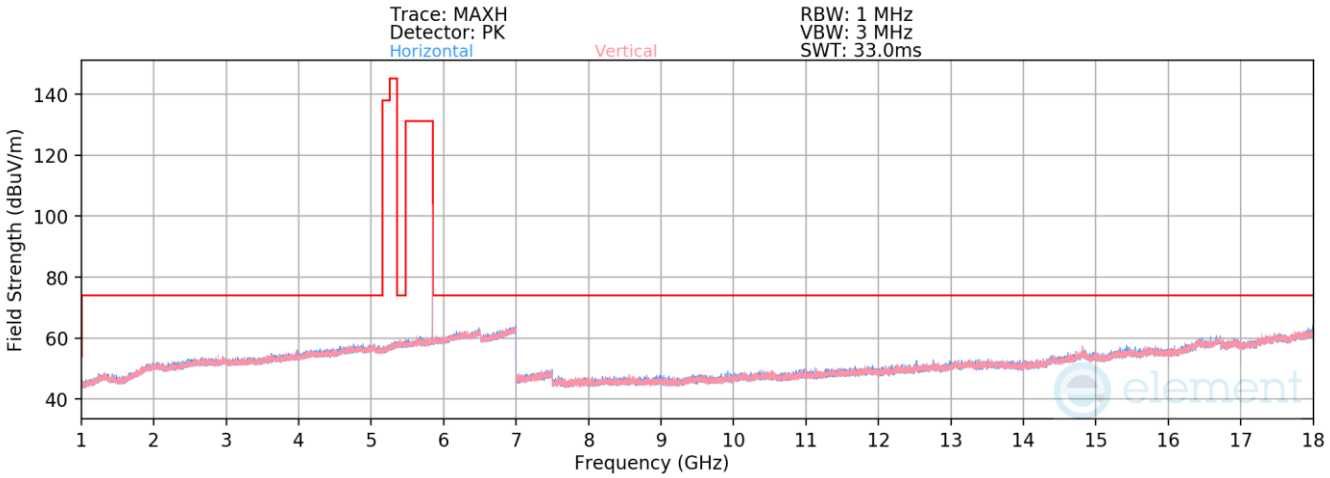


Plot 7-101. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5788MHz)

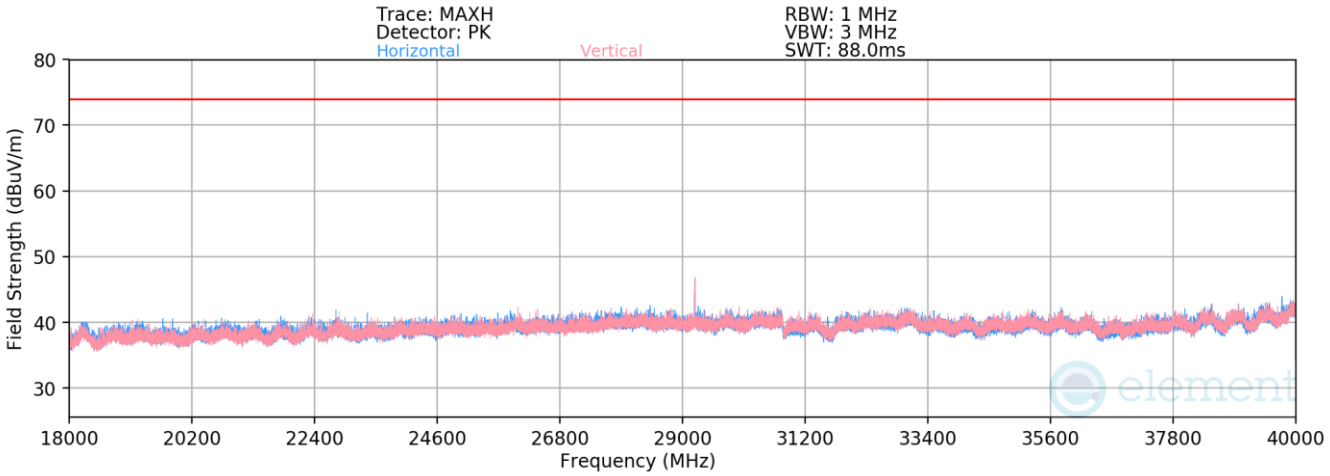
Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5788MHz

	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]
*	11576.00	Avg	H	-	-	-78.86	9.45	37.59	53.98	-16.39
*	11576.00	Peak	H	-	-	-68.11	9.45	48.34	73.98	-25.64
	17364.00	Peak	V	220	66	-67.50	17.03	56.53	68.23	-11.70

Table 7-30. Radiated Spurious Emissions Measurements



Plot 7-102. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5844MHz)



Plot 7-103. Radiated Spurious Emissions 18-40GHz (NB UNII HDRp4 – 5844MHz)

Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5844MHz

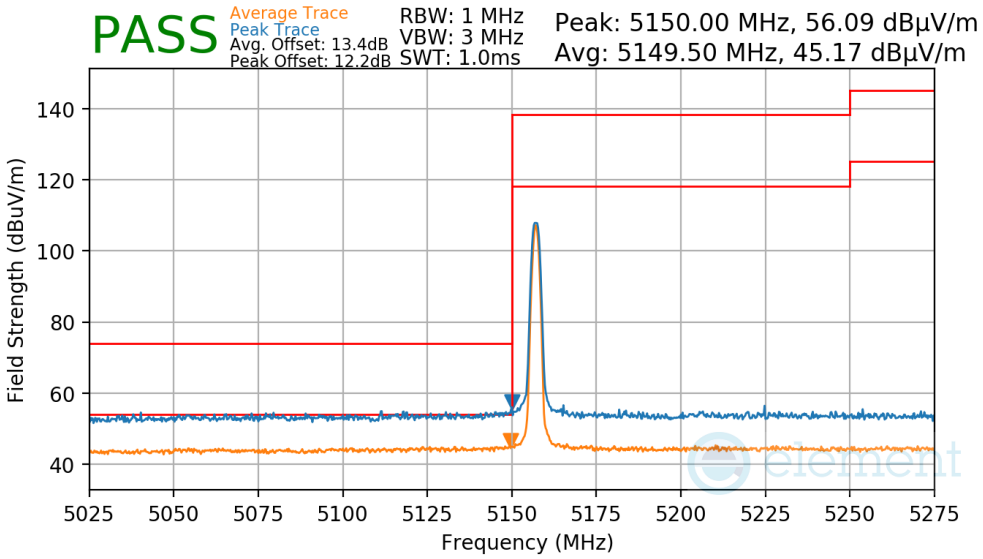
	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11688.00	Avg	H	-	-	-81.81	13.78	0.00	38.97	53.98	-15.01
*	11688.00	Peak	H	-	-	-70.60	13.78	0.00	50.18	73.98	-23.80
	17532.00	Peak	H	235	105	-71.01	25.33	0.00	61.32	73.98	-12.66
	23376.00	Peak	H	-	-	-60.07	-6.04	0.00	40.89	73.98	-33.09
	29220.00	Peak	V	150	165	-55.43	-2.76	0.00	48.81	73.98	-25.17
	35064.00	Peak	H	-	-	-60.44	-3.77	0.00	42.79	73.98	-31.19

Table 7-31. Radiated Spurious Emissions Measurements

Radiated Band Edge Measurements

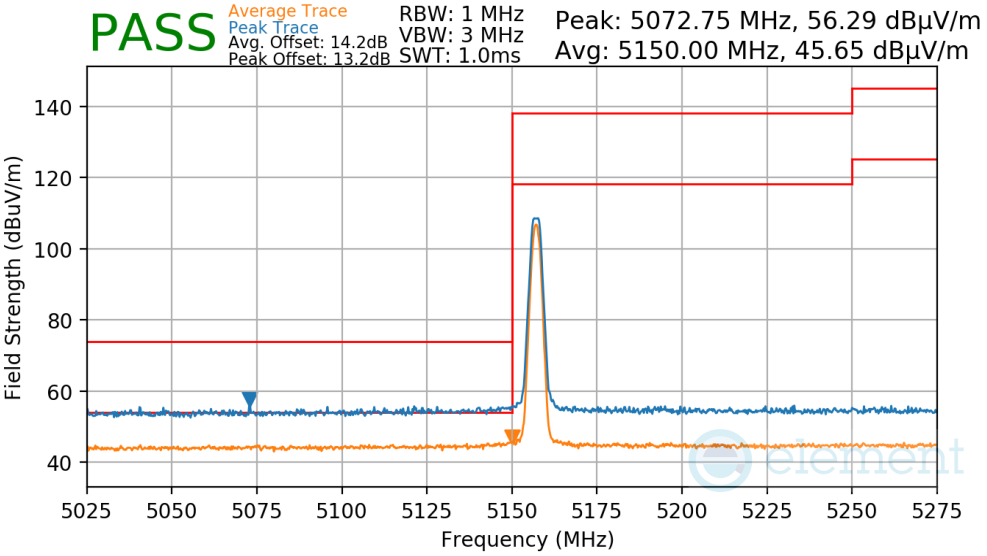
§15.407(b.1) §15.205 §15.209

Mode:	BDR
Measurement Distance:	3 Meters
Operating Frequency:	5157MHz



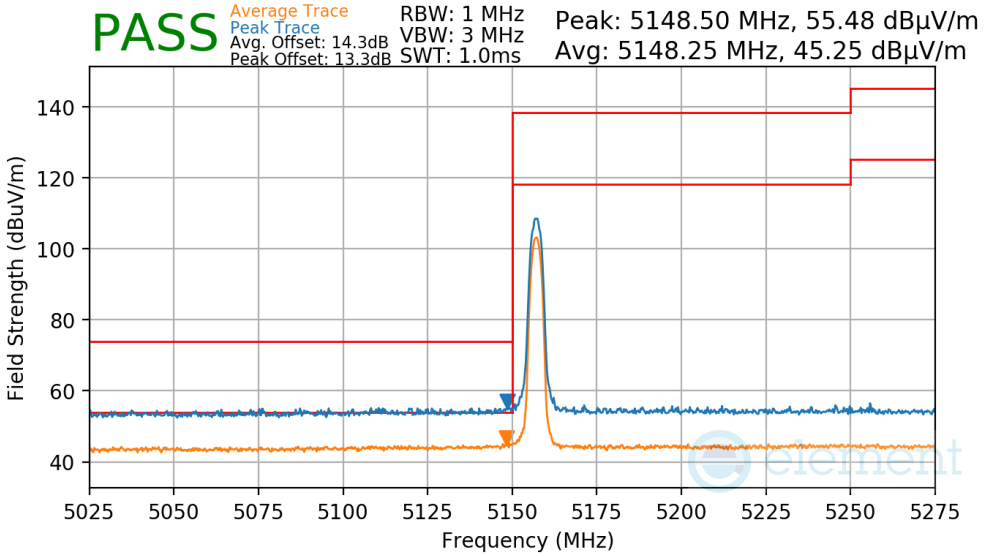
Plot 7-104. Radiated Lower Band Edge Measurement

Mode:	LE2M
Measurement Distance:	3 Meters
Operating Frequency:	5157MHz



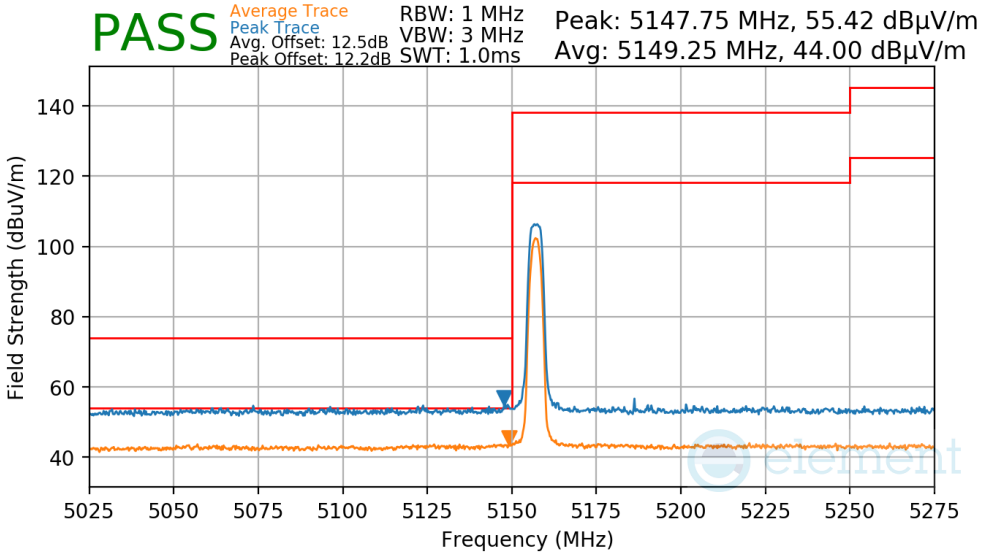
Plot 7-105. Radiated Lower Band Edge Measurement

Mode:	HDR4
Measurement Distance:	3 Meters
Operating Frequency:	5157MHz



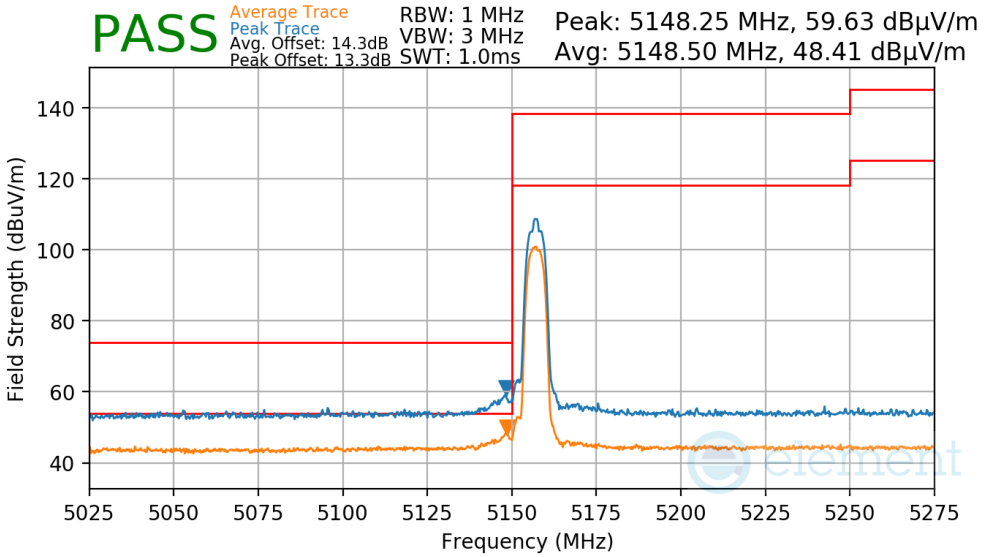
Plot 7-106. Radiated Lower Band Edge Measurement

Mode:	HDRp4
Measurement Distance:	3 Meters
Operating Frequency:	5157MHz



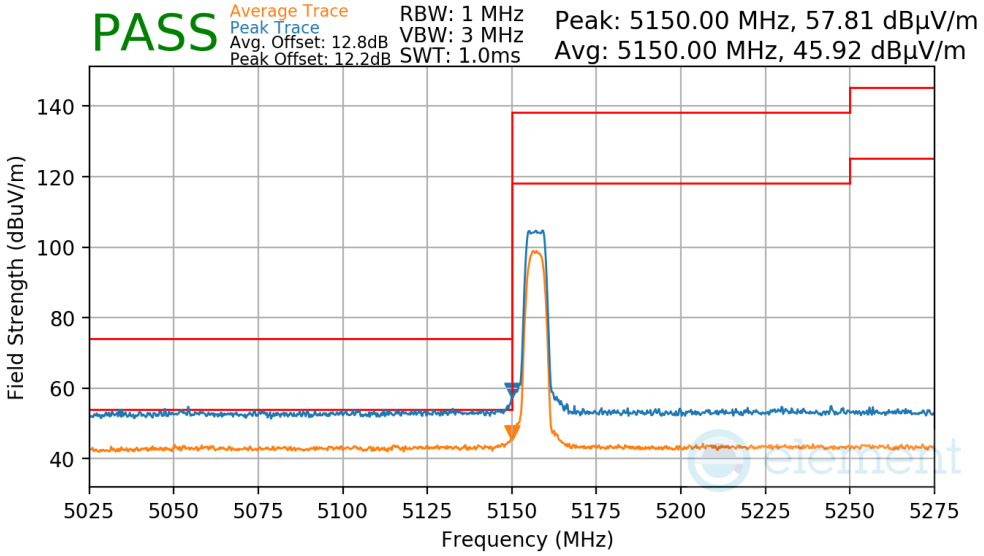
Plot 7-107. Radiated Lower Band Edge Measurement

Mode:	HDR8
Measurement Distance:	3 Meters
Operating Frequency:	5157MHz



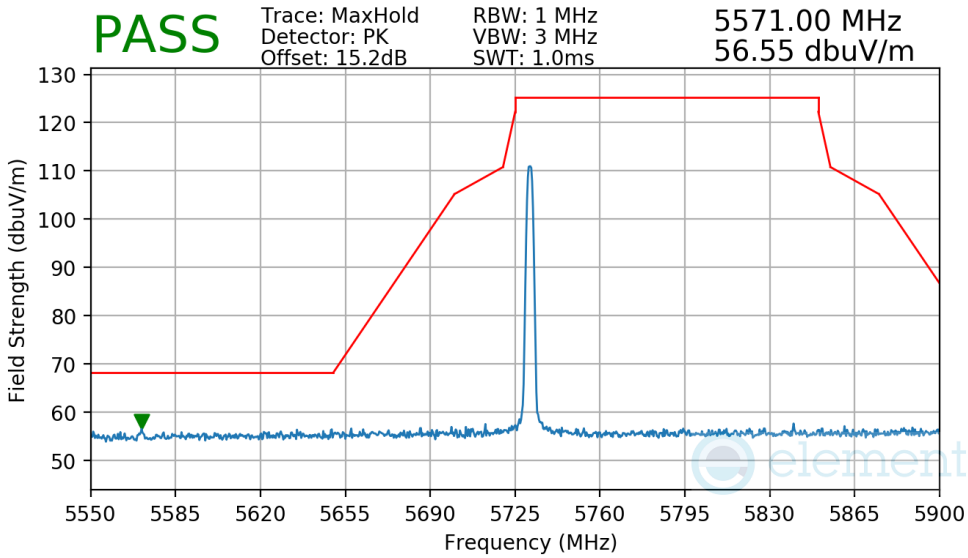
Plot 7-108. Radiated Lower Band Edge Measurement

Mode:	HDRp8
Measurement Distance:	3 Meters
Operating Frequency:	5157MHz



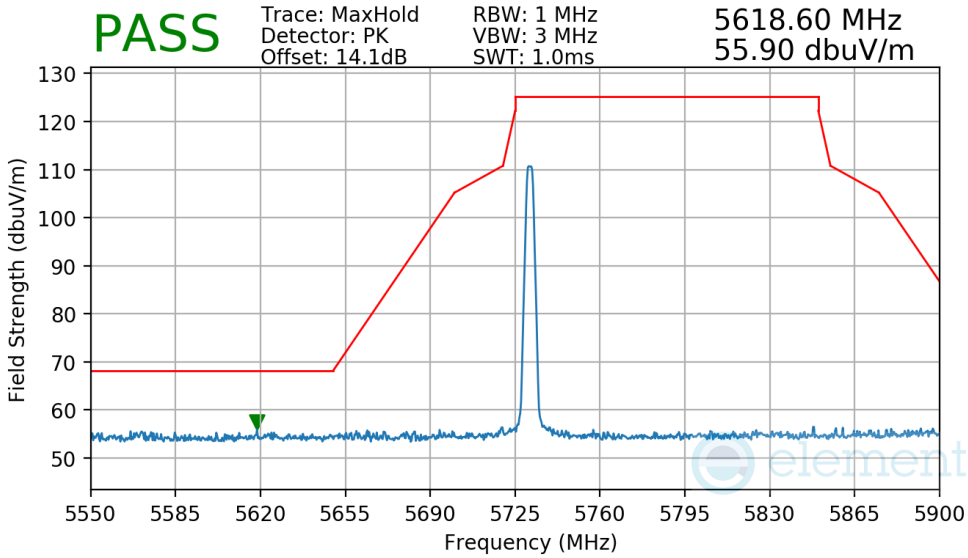
Plot 7-109. Radiated Lower Band Edge Measurement

Mode:	BDR
Measurement Distance:	3 Meters
Operating Frequency:	5731MHz



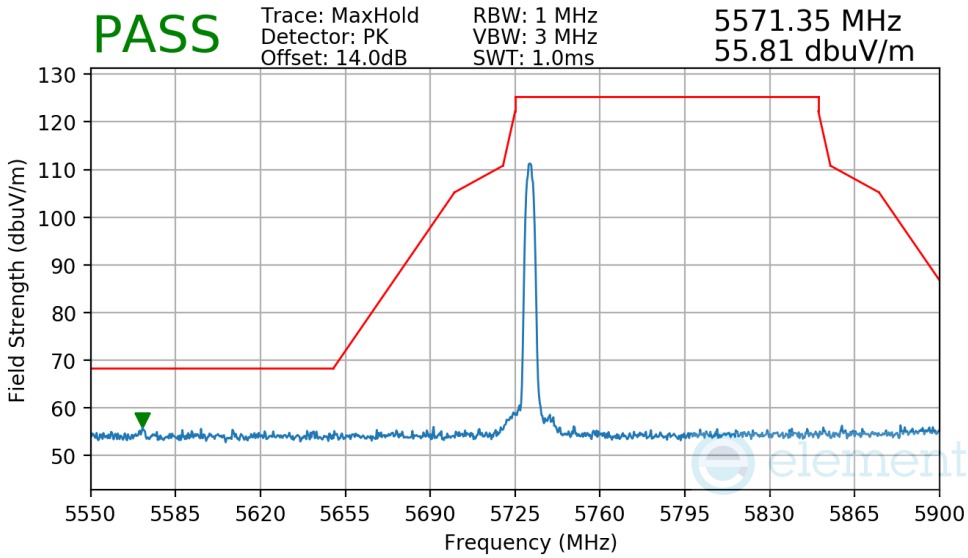
Plot 7-110. Radiated Lower Band Edge Measurement

Mode:	LE2M
Measurement Distance:	3 Meters
Operating Frequency:	5731MHz



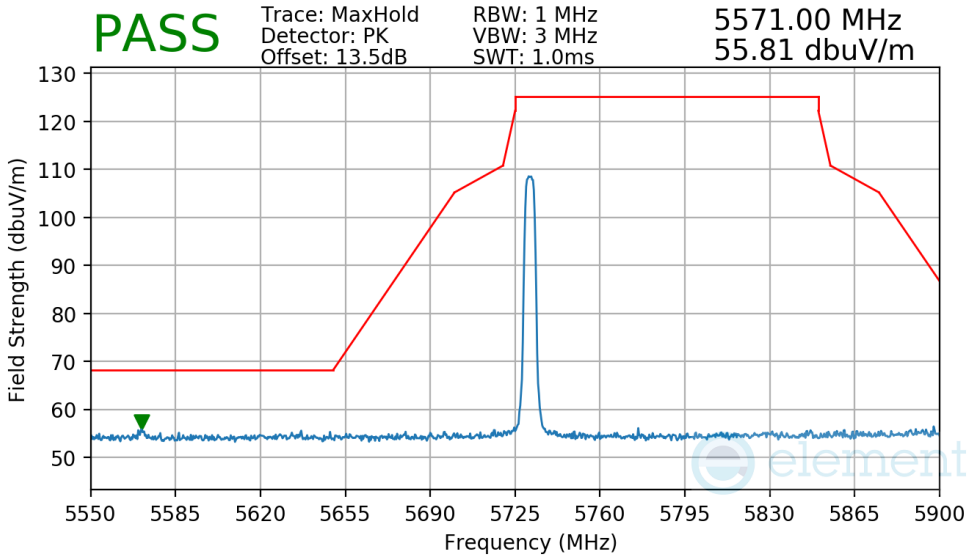
Plot 7-111. Radiated Lower Band Edge Measurement

Mode:	HDR4
Measurement Distance:	3 Meters
Operating Frequency:	5731MHz



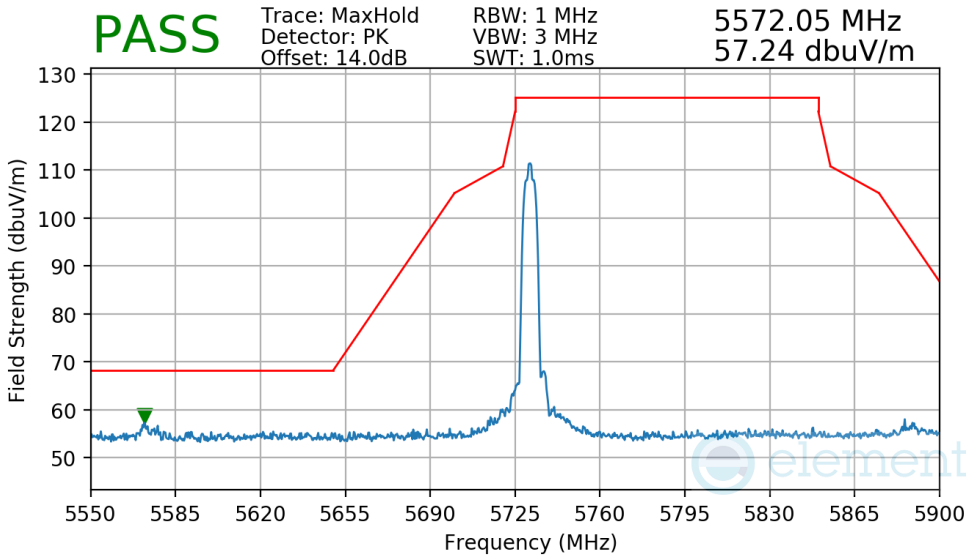
Plot 7-112. Radiated Lower Band Edge Measurement

Mode:	HDRp4
Measurement Distance:	3 Meters
Operating Frequency:	5731MHz



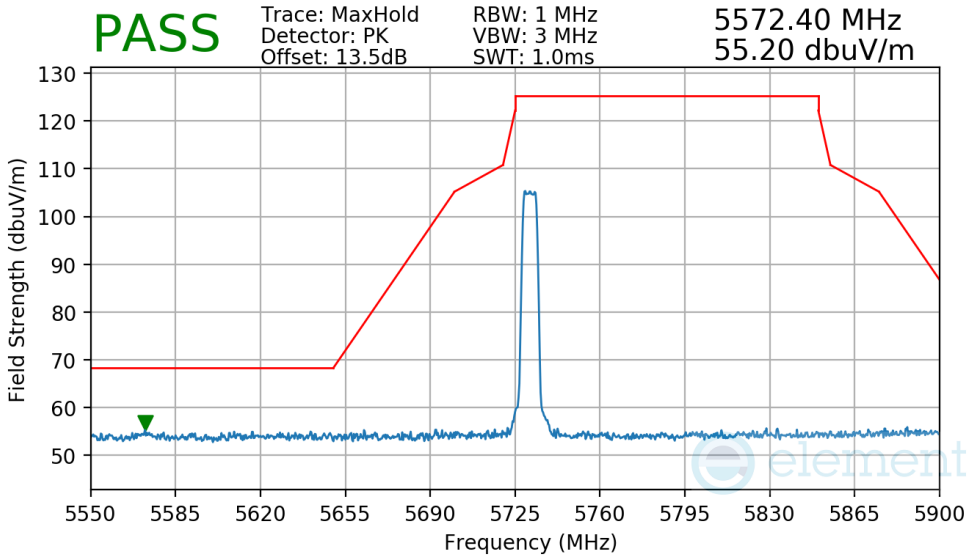
Plot 7-113. Radiated Lower Band Edge Measurement

Mode:	HDR8
Measurement Distance:	3 Meters
Operating Frequency:	5731MHz



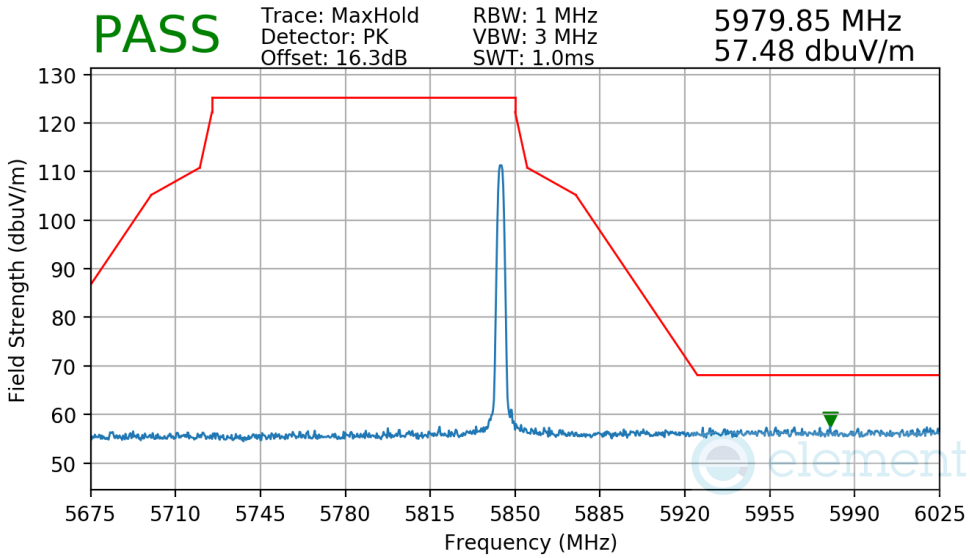
Plot 7-114. Radiated Lower Band Edge Measurement

Mode:	HDRp8
Measurement Distance:	3 Meters
Operating Frequency:	5731MHz



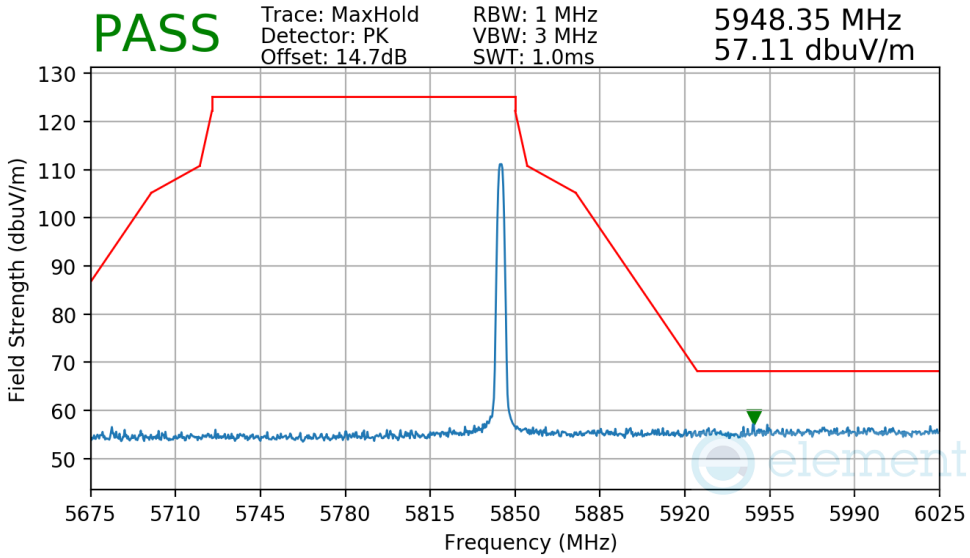
Plot 7-115. Radiated Lower Band Edge Measurement

Mode:	BDR
Measurement Distance:	3 Meters
Operating Frequency:	5844MHz



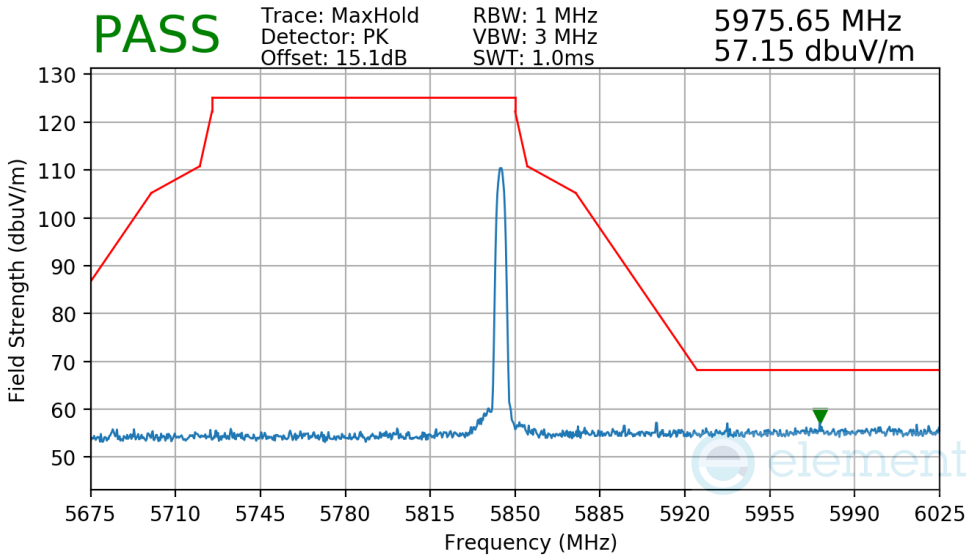
Plot 7-116. Radiated Upper Band Edge Measurement

Mode:	LE2M
Measurement Distance:	3 Meters
Operating Frequency:	5844MHz



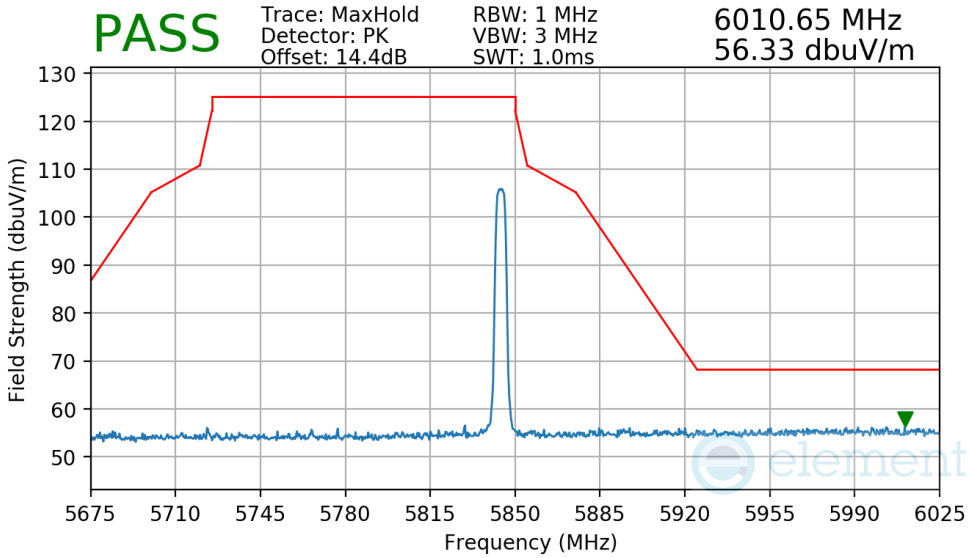
Plot 7-117. Radiated Upper Band Edge Measurement

Mode:	HDR4
Measurement Distance:	3 Meters
Operating Frequency:	5844MHz



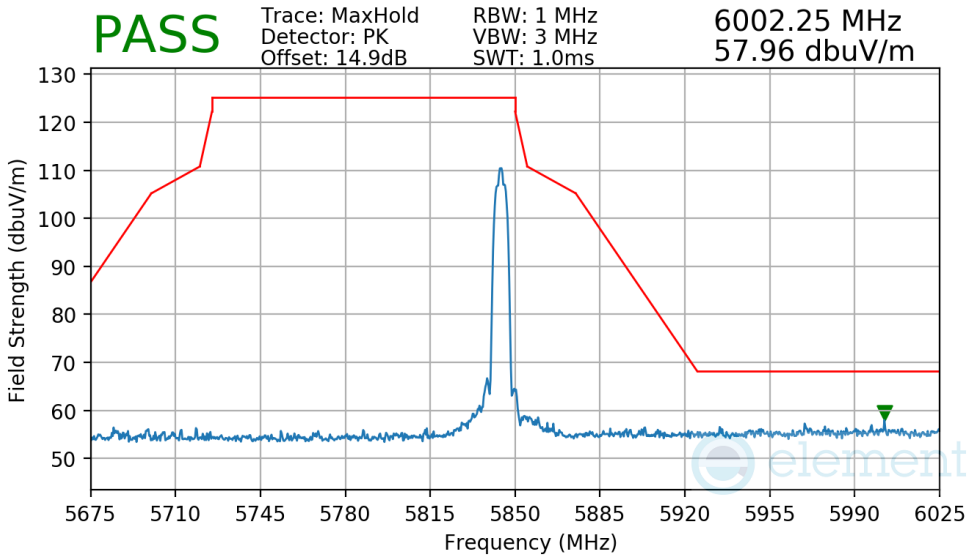
Plot 7-118. Radiated Upper Band Edge Measurement

Mode:	HDRp4
Measurement Distance:	3 Meters
Operating Frequency:	5844MHz



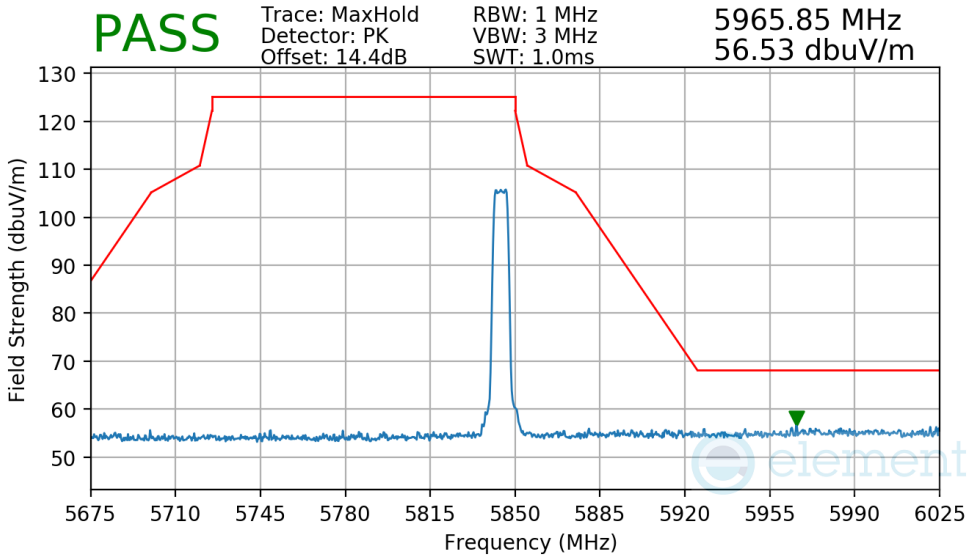
Plot 7-119. Radiated Upper Band Edge Measurement

Mode:	HDR8
Measurement Distance:	3 Meters
Operating Frequency:	5844MHz



Plot 7-120. Radiated Upper Band Edge Measurement

Mode:	HDRp8
Measurement Distance:	3 Meters
Operating Frequency:	5844MHz



Plot 7-121. Radiated Upper Band Edge Measurement

7.7 Radiated Spurious Emissions – 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 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 7-32 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 7-32. Radiated Limits

Test Procedures Used

ANSI C63.10-2020

Test Settings

Quasi-Peak Field Strength Measurements

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

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. VBW = 300kHz
4. Detector = 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.

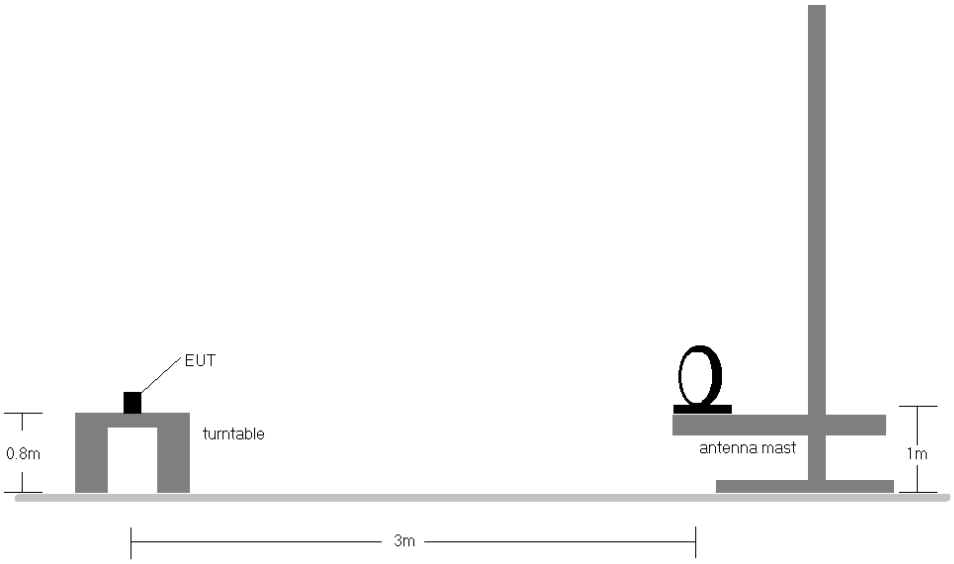


Figure 7-6. Radiated Test Setup < 30MHz

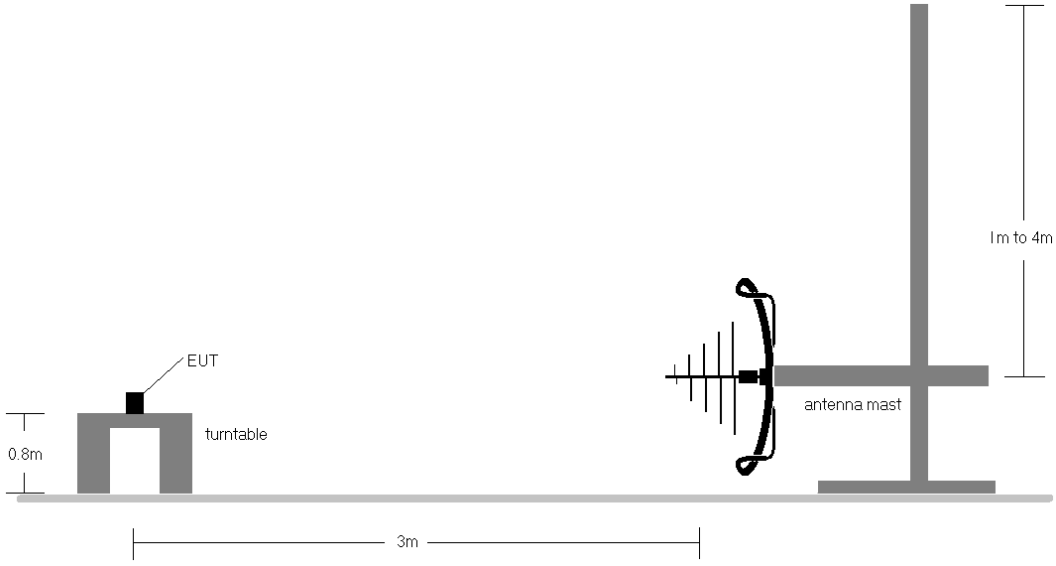


Figure 7-7. Radiated Test Setup < 1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-32.
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 supported modulations have been tested on the unit and only worst case configuration is reported.
10. Both configurations below were investigated, and the worst case has been reported.
    a. EUT charged by charging case and powered by AC/DC adaptor with USB-C cable
    b. EUT charged by charging case and powered by host PC with USB-C cable

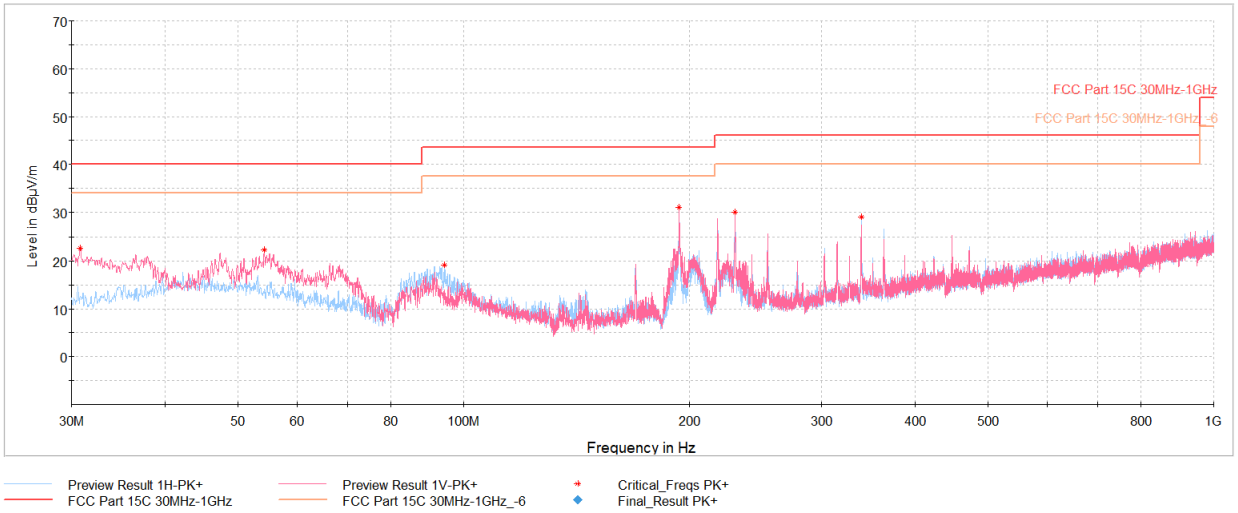
Sample Calculations

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 $_{[dB\mu V/m]}$

Radiated Spurious Emissions (Below 1GHz)

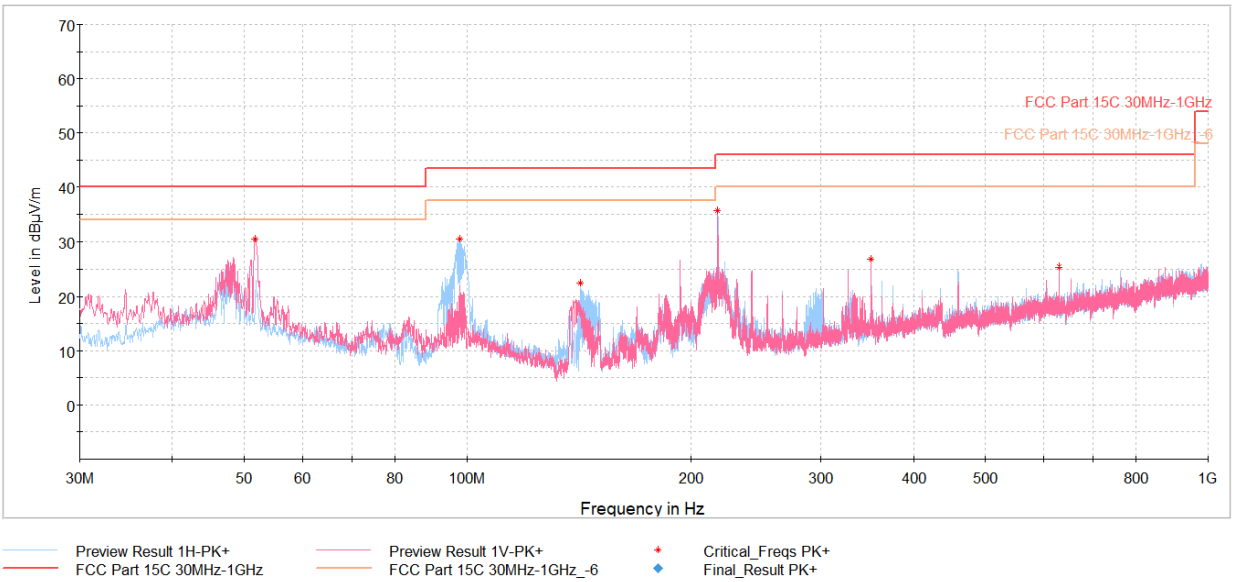
§15.209



Plot 7-122. Radiated Spurious Emissions Below 1GHz (NB UNII BDR – 5157MHz), with AC/DC Adapter and USB-C Cable

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]
30.83	Max Peak	V	200	334	-67.62	-16.68	22.70	40.00	-17.30
54.25	Max Peak	V	200	287	-70.31	-14.34	22.35	40.00	-17.65
94.41	Max Peak	H	300	0	-70.36	-17.57	19.07	43.52	-24.45
193.54	Max Peak	H	100	298	-58.33	-17.64	31.03	43.52	-12.49
229.77	Max Peak	V	100	315	-60.40	-16.58	30.02	46.02	-16.00
338.85	Max Peak	H	100	133	-64.34	-13.66	29.00	46.02	-17.02

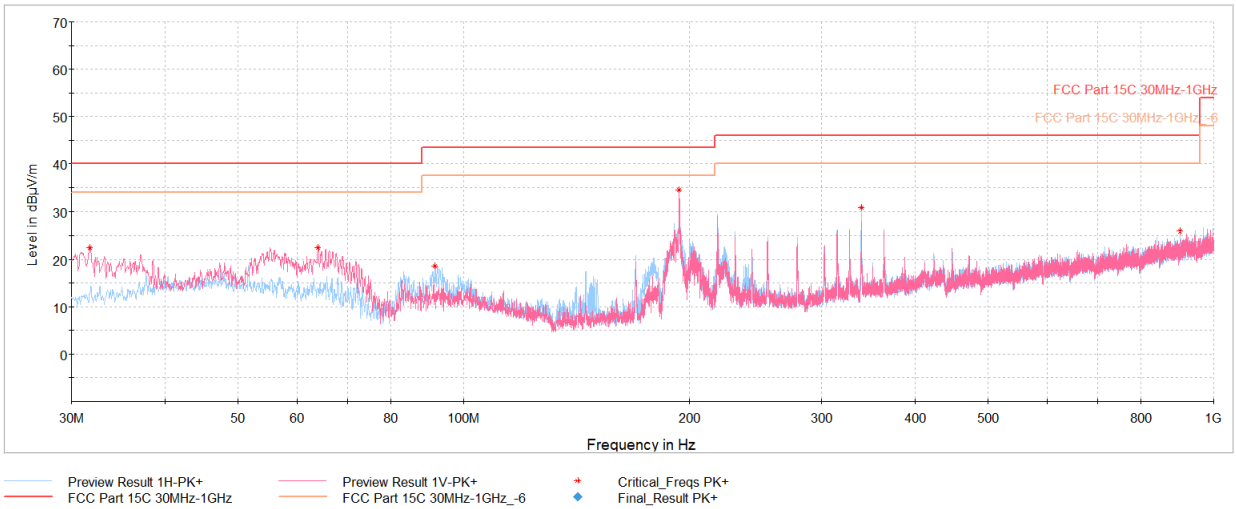
Table 7-33. Radiated Spurious Emissions Below 1GHz (NB UNII BDR – 5157MHz), with AC/DC Adapter and USB-C Cable



Plot 7-123. Radiated Spurious Emissions Below 1GHz (NB UNII LE2M – 5201MHz), with AC/DC Adapter and USB-C Cable

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]
51.78	Max Peak	V	200	244	-62.71	-13.88	30.41	40.00	-9.59
97.95	Max Peak	H	300	181	-59.17	-17.35	30.48	43.52	-13.04
141.89	Max Peak	H	300	220	-63.61	-20.89	22.50	43.52	-21.02
217.60	Max Peak	H	100	314	-53.95	-17.38	35.67	46.02	-10.35
350.78	Max Peak	H	100	0	-66.88	-13.40	26.72	46.02	-19.30
628.93	Max Peak	V	100	330	-73.31	-8.42	25.27	46.02	-20.75

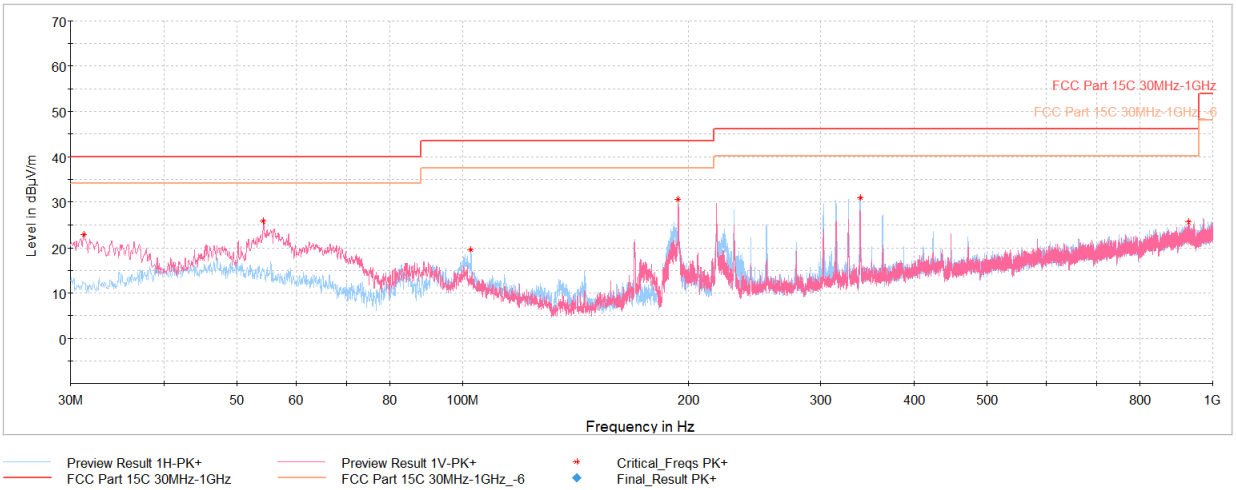
Table 7-34. Radiated Spurious Emissions Below 1GHz (NB UNII LE2M – 5201MHz), with AC/DC Adapter and USB-C Cable



Plot 7-124. Radiated Spurious Emissions Below 1GHz (NB UNII HDR4 – 5245MHz), with AC/DC Adapter and USB-C Cable

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]
31.75	Max Peak	V	100	351	-67.68	-16.80	22.52	40.00	-17.48
64.00	Max Peak	V	200	141	-67.45	-17.08	22.47	40.00	-17.53
91.64	Max Peak	H	200	0	-70.64	-17.80	18.56	43.52	-24.96
193.59	Max Peak	H	100	321	-54.84	-17.64	34.52	43.52	-9.00
338.80	Max Peak	H	100	357	-62.64	-13.66	30.70	46.02	-15.32
902.71	Max Peak	H	200	268	-77.60	-3.57	25.83	46.02	-20.19

Table 7-35. Radiated Spurious Emissions Below 1GHz (NB UNII HDR4 – 5245MHz), with AC/DC Adapter and USB-C Cable



Plot 7-125. Radiated Spurious Emissions Below 1GHz (NB UNII HDRp4 – 5157MHz), with AC/DC Adapter and USB-C Cable

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]
31.26	Max Peak	V	100	1	-67.25	-16.79	22.96	40.00	-17.04
54.30	Max Peak	V	100	55	-66.93	-14.35	25.72	40.00	-14.28
102.65	Max Peak	H	300	7	-70.27	-17.08	19.65	43.52	-23.87
193.49	Max Peak	H	100	318	-58.79	-17.65	30.56	43.52	-12.96
338.70	Max Peak	H	100	314	-62.38	-13.67	30.95	46.02	-15.07
928.80	Max Peak	H	300	0	-77.95	-3.41	25.64	46.02	-20.38

Table 7-36. Radiated Spurious Emissions Below 1GHz (NB UNII HDRp4 – 5157MHz), with AC/DC Adapter and USB-C Cable

7.8 AC Line Conducted Emissions Measurement

§15.207

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. All data rates and modes were investigated for AC Line conducted spurious emissions.

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 7-37. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2020, 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.

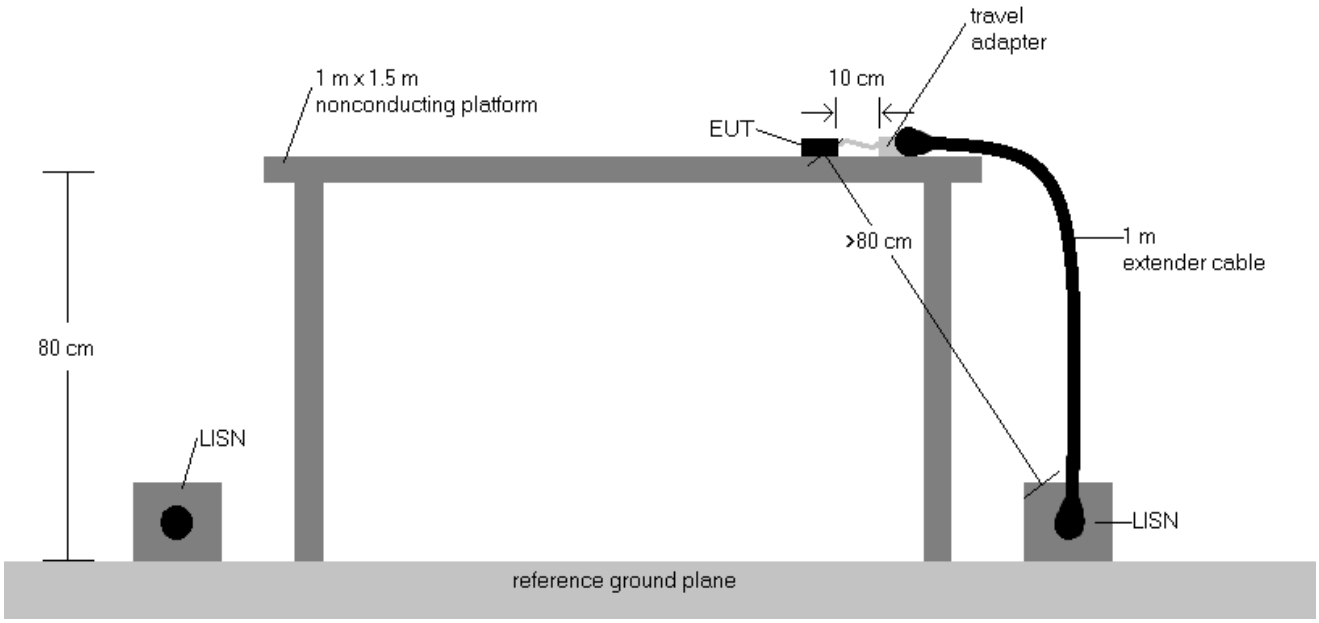
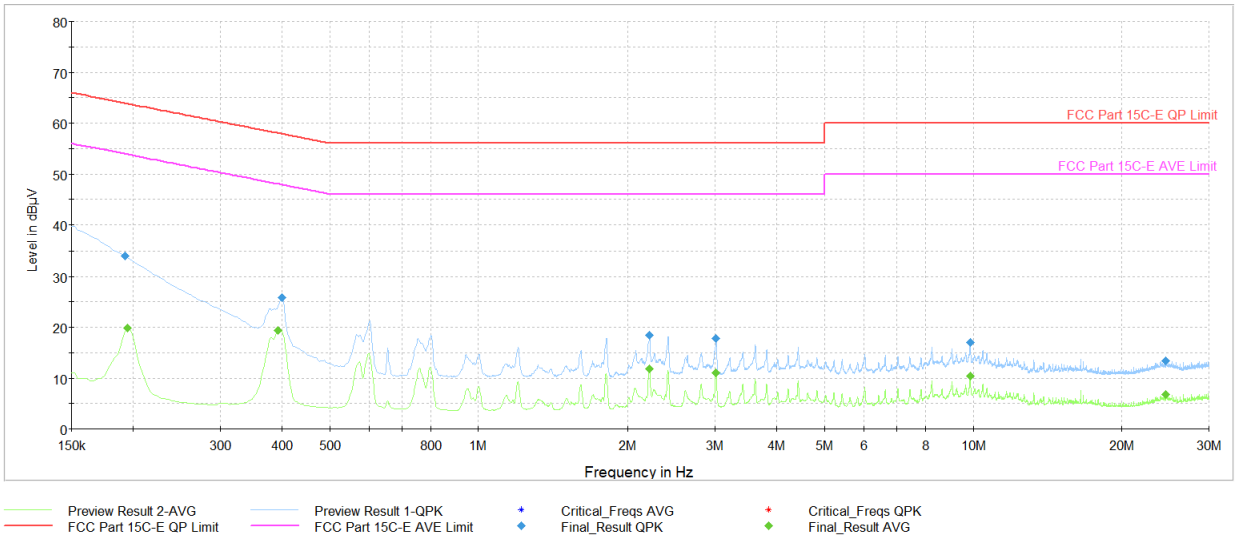


Figure 7-8. Test Instrument & Measurement Setup

Test Notes

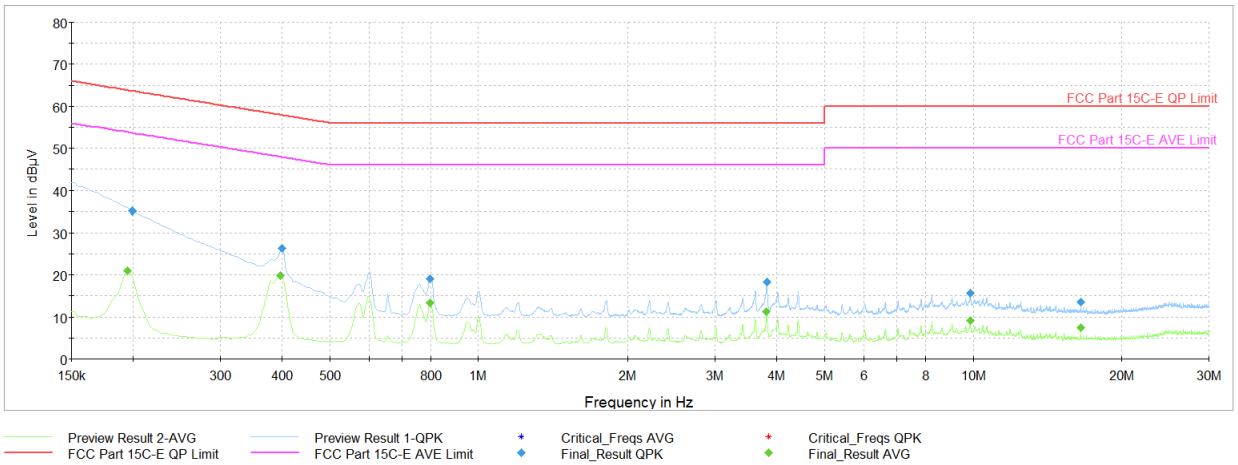
1. All modes of operation were investigated and the worst-case emissions are reported. The emissions found were not affected by the choice of channel used during testing.
2. Both configurations below were investigated, and the worst case has been reported.
    a. EUT charged by charging case and powered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



Plot 7-126. AC Line Conducted Plot (NB UNII BDR – 5157MHz) (L1) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.193	FINAL	34.1	—	63.92	-29.86	L1	GND
0.195	FINAL	—	19.86	53.82	-33.96	L1	GND
0.393	FINAL	—	19.34	48.00	-28.66	L1	GND
0.400	FINAL	25.9	—	57.86	-31.99	L1	GND
2.209	FINAL	—	11.77	46.00	-34.23	L1	GND
2.211	FINAL	18.4	—	56.00	-37.56	L1	GND
3.010	FINAL	—	10.95	46.00	-35.05	L1	GND
3.014	FINAL	17.8	—	56.00	-38.22	L1	GND
9.850	FINAL	17.0	—	60.00	-43.01	L1	GND
9.857	FINAL	—	10.33	50.00	-39.67	L1	GND
24.538	FINAL	—	6.71	50.00	-43.29	L1	GND
24.538	FINAL	13.4	—	60.00	-46.64	L1	GND

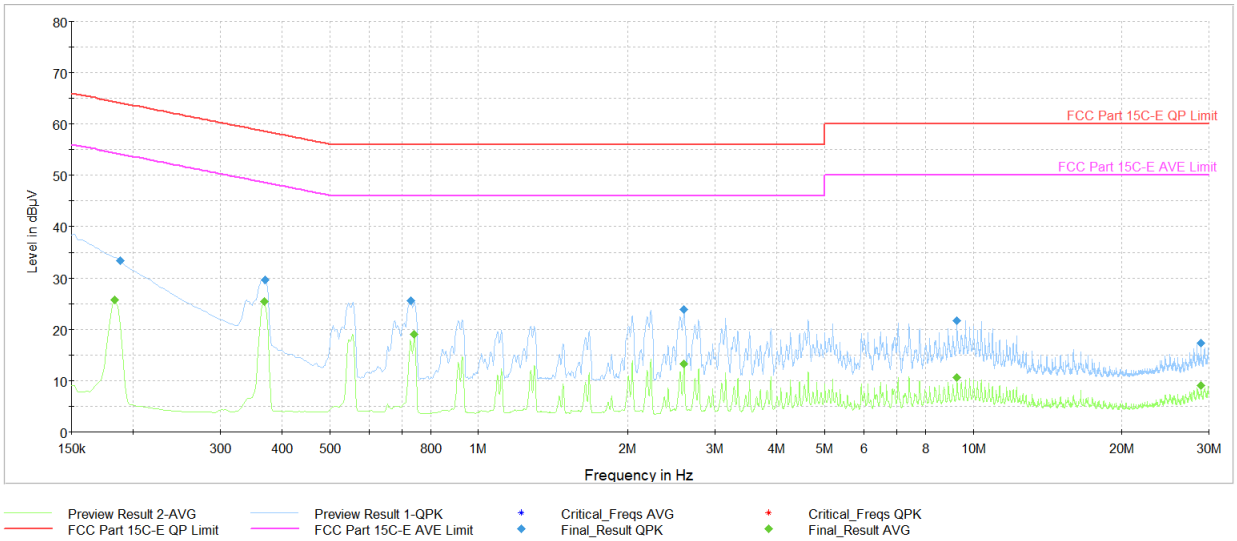
Table 7-38. AC Line Conducted Data (NB UNII BDR – 5157MHz) (L1) with Laptop and USB-C Cable



Plot 7-127. AC Line Conducted Plot (NB UNII BDR – 5157MHz) (N) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.195	FINAL	—	20.91	53.82	-32.91	N	GND
0.200	FINAL	35.2	—	63.63	-28.43	N	GND
0.398	FINAL	—	19.91	47.91	-28.00	N	GND
0.400	FINAL	26.3	—	57.86	-31.56	N	GND
0.798	FINAL	—	13.28	46.00	-32.72	N	GND
0.798	FINAL	19.2	—	56.00	-36.81	N	GND
3.818	FINAL	—	11.28	46.00	-34.72	N	GND
3.820	FINAL	18.2	—	56.00	-37.76	N	GND
9.854	FINAL	15.6	—	60.00	-44.40	N	GND
9.857	FINAL	—	9.13	50.00	-40.87	N	GND
16.508	FINAL	—	7.50	50.00	-42.50	N	GND
16.508	FINAL	13.5	—	60.00	-46.49	N	GND

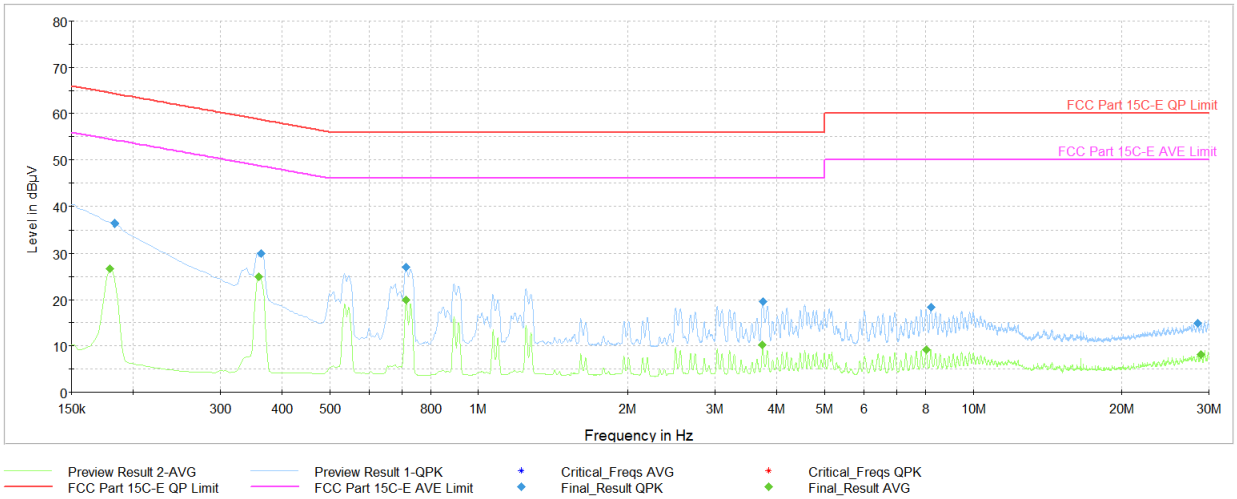
Table 7-39. AC Line Conducted (NB UNII BDR – 5157MHz) (N) with Laptop and USB-C Cable



Plot 7-128. AC Line Conducted Plot (NB UNII LE2M – 5201MHz) (L1) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.184	FINAL	—	25.79	54.31	-28.52	L1	GND
0.188	FINAL	33.5	—	64.11	-30.65	L1	GND
0.368	FINAL	—	25.39	48.54	-23.15	L1	GND
0.371	FINAL	29.7	—	58.49	-28.81	L1	GND
0.731	FINAL	25.6	—	56.00	-30.42	L1	GND
0.742	FINAL	—	19.02	46.00	-26.98	L1	GND
2.594	FINAL	—	13.21	46.00	-32.79	L1	GND
2.596	FINAL	23.9	—	56.00	-32.09	L1	GND
9.269	FINAL	21.8	—	60.00	-38.20	L1	GND
9.269	FINAL	—	10.66	50.00	-39.34	L1	GND
28.919	FINAL	17.4	—	60.00	-42.62	L1	GND
28.921	FINAL	—	9.03	50.00	-40.97	L1	GND

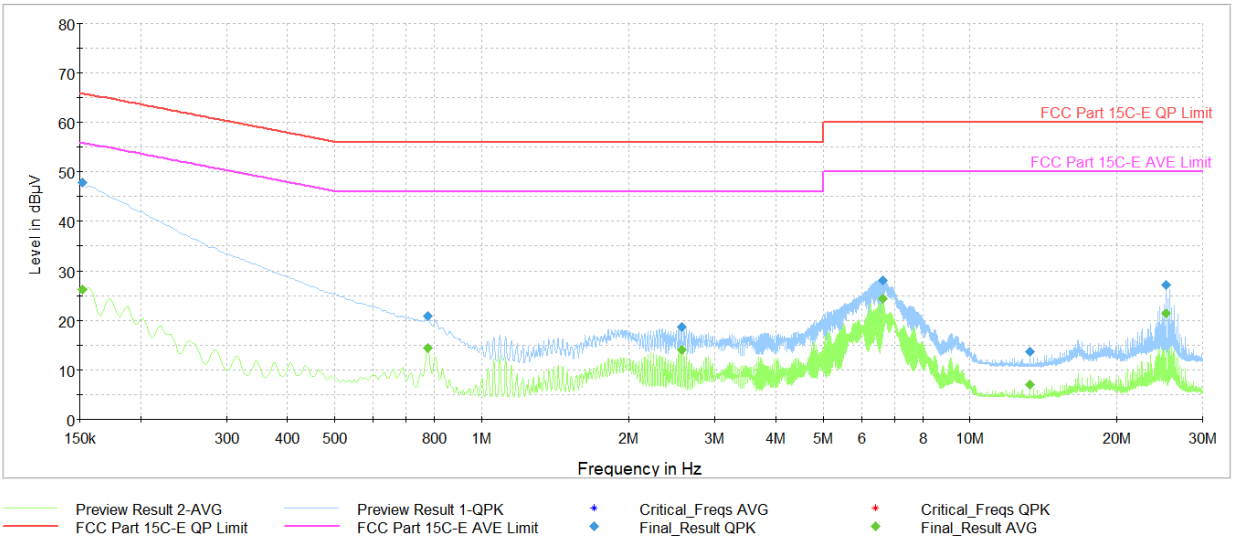
Table 7-40. AC Line Conducted Data (NB UNII LE2M – 5201MHz) (L1) with Laptop and USB-C Cable



Plot 7-129. AC Line Conducted Plot (NB UNII LE2M – 5201MHz) (N) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.179	FINAL	—	26.75	54.52	-27.77	N	GND
0.184	FINAL	36.3	—	64.31	-28.01	N	GND
0.359	FINAL	—	24.95	48.75	-23.80	N	GND
0.364	FINAL	29.9	—	58.64	-28.72	N	GND
0.713	FINAL	—	20.00	46.00	-26.00	N	GND
0.715	FINAL	27.0	—	56.00	-28.99	N	GND
3.746	FINAL	—	10.14	46.00	-35.86	N	GND
3.750	FINAL	19.5	—	56.00	-36.52	N	GND
8.025	FINAL	—	9.12	50.00	-40.88	N	GND
8.205	FINAL	18.4	—	60.00	-41.63	N	GND
28.448	FINAL	14.9	—	60.00	-45.15	N	GND
28.914	FINAL	—	8.14	50.00	-41.86	N	GND

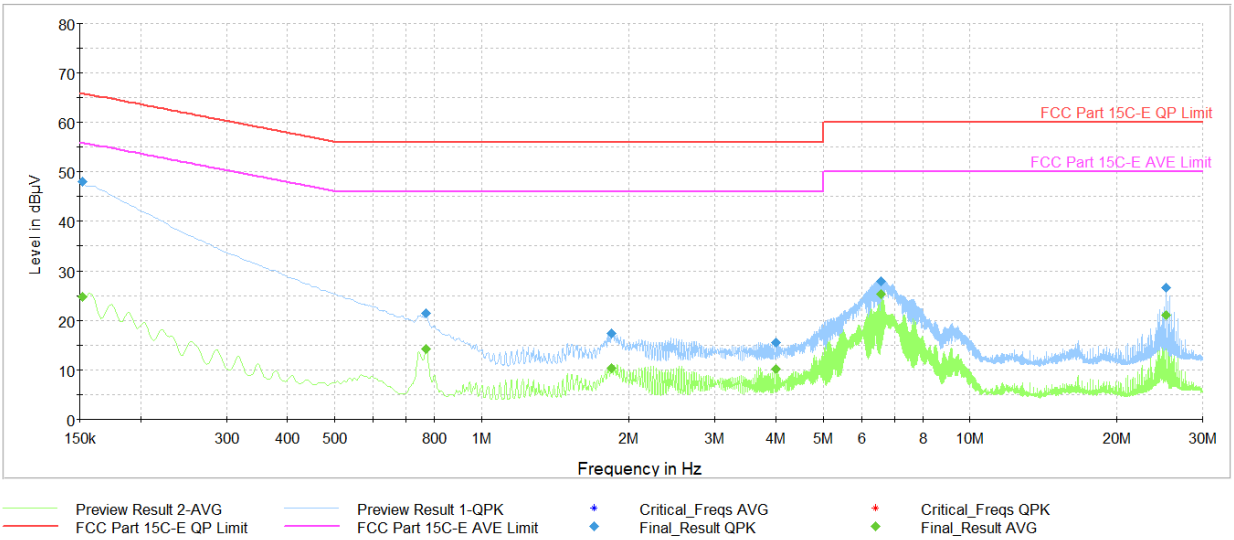
Table 7-41. AC Line Conducted (NB UNII LE2M – 5201MHz) (N) with Laptop and USB-C Cable



Plot 7-130. AC Line Conducted Plot (NB UNII HDR4 – 5245MHz) (L1) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.152	FINAL	—	26.25	55.88	-29.63	L1	GND
0.152	FINAL	47.7	—	65.88	-18.15	L1	GND
0.776	FINAL	—	14.49	46.00	-31.51	L1	GND
0.776	FINAL	20.9	—	56.00	-35.06	L1	GND
2.560	FINAL	—	14.09	46.00	-31.91	L1	GND
2.560	FINAL	18.7	—	56.00	-37.28	L1	GND
6.617	FINAL	28.1	—	60.00	-31.89	L1	GND
6.617	FINAL	—	24.43	50.00	-25.57	L1	GND
13.272	FINAL	13.7	—	60.00	-46.32	L1	GND
13.272	FINAL	—	7.11	50.00	-42.89	L1	GND
25.249	FINAL	—	21.45	50.00	-28.55	L1	GND
25.249	FINAL	27.2	—	60.00	-32.77	L1	GND

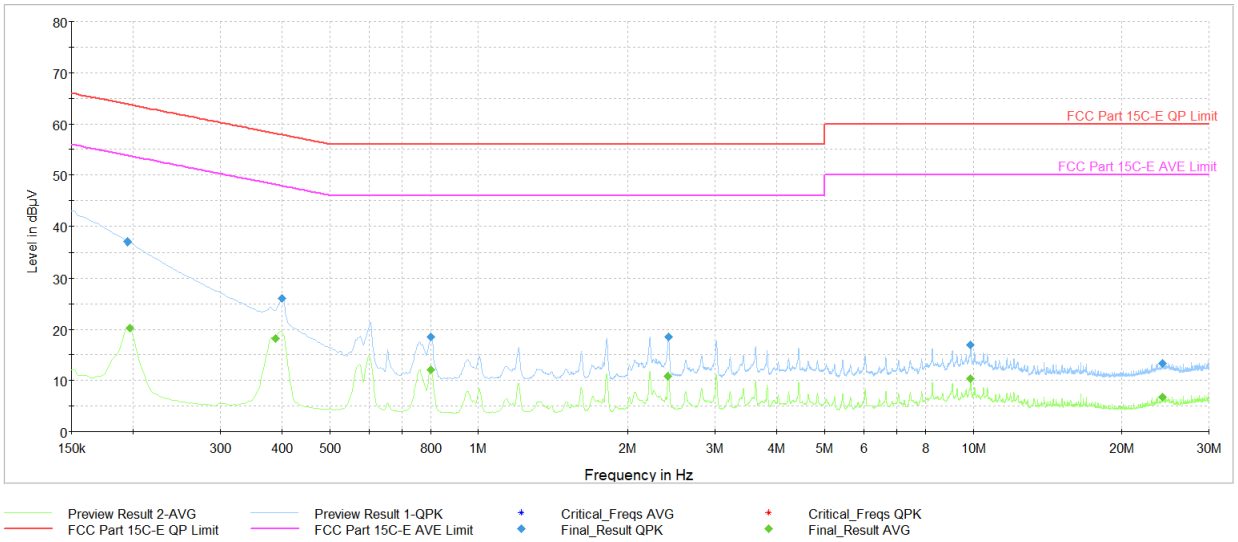
Table 7-42. AC Line Conducted Data (NB UNII HDR4 – 5245MHz) (L1) with Laptop and USB-C Cable



Plot 7-131. AC Line Conducted Plot (NB UNII HDR4 – 5245MHz) (N) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.152	FINAL	—	24.77	55.88	-31.11	N	GND
0.152	FINAL	48.0	—	65.88	-17.92	N	GND
0.769	FINAL	—	14.23	46.00	-31.77	N	GND
0.769	FINAL	21.4	—	56.00	-34.56	N	GND
1.842	FINAL	17.3	—	56.00	-38.67	N	GND
1.842	FINAL	—	10.32	46.00	-35.68	N	GND
3.998	FINAL	15.5	—	56.00	-40.46	N	GND
3.998	FINAL	—	10.27	46.00	-35.73	N	GND
6.558	FINAL	—	25.46	50.00	-24.54	N	GND
6.560	FINAL	27.9	—	60.00	-32.10	N	GND
25.249	FINAL	—	21.02	50.00	-28.98	N	GND
25.249	FINAL	26.7	—	60.00	-33.28	N	GND

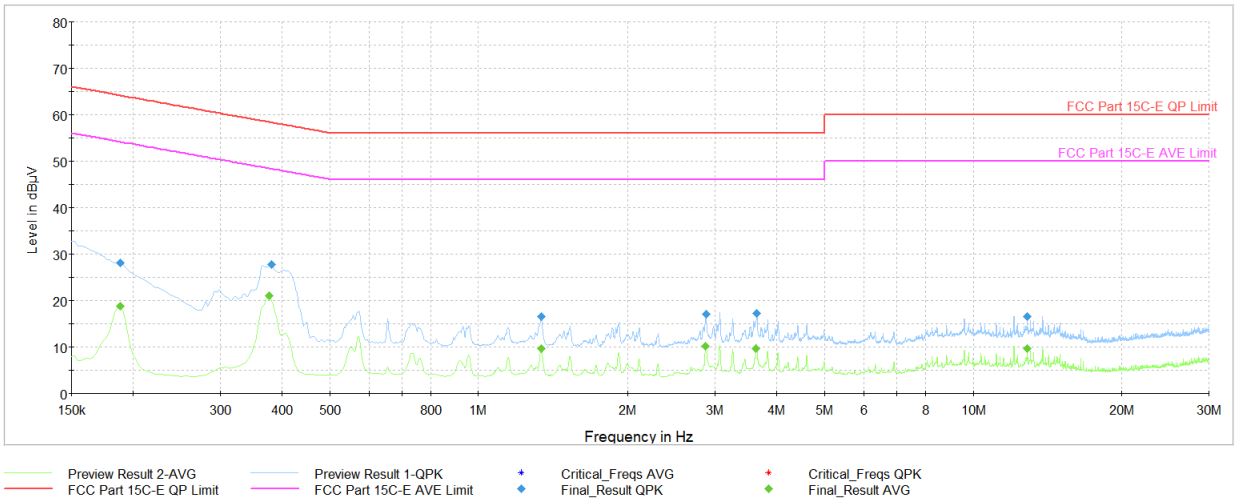
Table 7-43. AC Line Conducted (NB UNII HDR4 – 5245MHz) (N) with Laptop and USB-C Cable



Plot 7-132. AC Line Conducted Plot (NB UNII HDRp4 – 5157MHz) (L1) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.195	FINAL	37.0	—	63.82	-26.78	L1	GND
0.197	FINAL	—	20.20	53.73	-33.53	L1	GND
0.389	FINAL	—	18.16	48.10	-29.93	L1	GND
0.400	FINAL	26.1	—	57.86	-31.75	L1	GND
0.800	FINAL	—	12.05	46.00	-33.95	L1	GND
0.803	FINAL	18.5	—	56.00	-37.53	L1	GND
2.409	FINAL	—	10.85	46.00	-35.15	L1	GND
2.416	FINAL	18.5	—	56.00	-37.46	L1	GND
9.879	FINAL	17.0	—	60.00	-42.98	L1	GND
9.881	FINAL	—	10.34	50.00	-39.66	L1	GND
24.178	FINAL	13.4	—	60.00	-46.64	L1	GND
24.182	FINAL	—	6.80	50.00	-43.20	L1	GND

Table 7-44. AC Line Conducted Data (NB UNII HDRp4 – 5157MHz) (L1) with Laptop and USB-C Cable



Plot 7-133. AC Line Conducted Plot (NB UNII HDRp4 – 5157MHz) (N) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.188	FINAL	—	18.91	54.11	-35.20	N	GND
0.188	FINAL	28.1	—	64.11	-36.03	N	GND
0.377	FINAL	—	21.11	48.34	-27.23	N	GND
0.382	FINAL	27.8	—	58.24	-30.49	N	GND
1.340	FINAL	—	9.71	46.00	-36.29	N	GND
1.343	FINAL	16.5	—	56.00	-39.46	N	GND
2.870	FINAL	—	10.12	46.00	-35.88	N	GND
2.877	FINAL	17.1	—	56.00	-38.89	N	GND
3.635	FINAL	—	9.69	46.00	-36.31	N	GND
3.647	FINAL	17.3	—	56.00	-38.71	N	GND
12.858	FINAL	16.6	—	60.00	-43.36	N	GND
12.863	FINAL	—	9.73	50.00	-40.27	N	GND

Table 7-45. AC Line Conducted (NB UNII HDRp4 – 5157MHz) (N) with Laptop and USB-C Cable

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Apple Wireless Left Earbud FCC ID: BCGA3158** is in compliance with Part 15 Subpart E (15.407) of the FCC Rules.