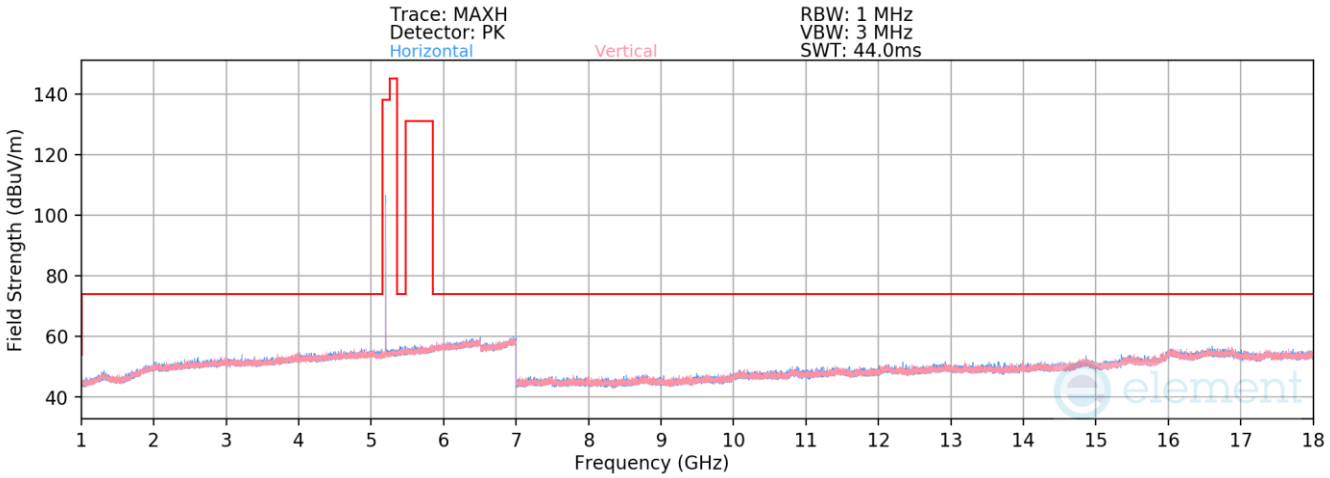
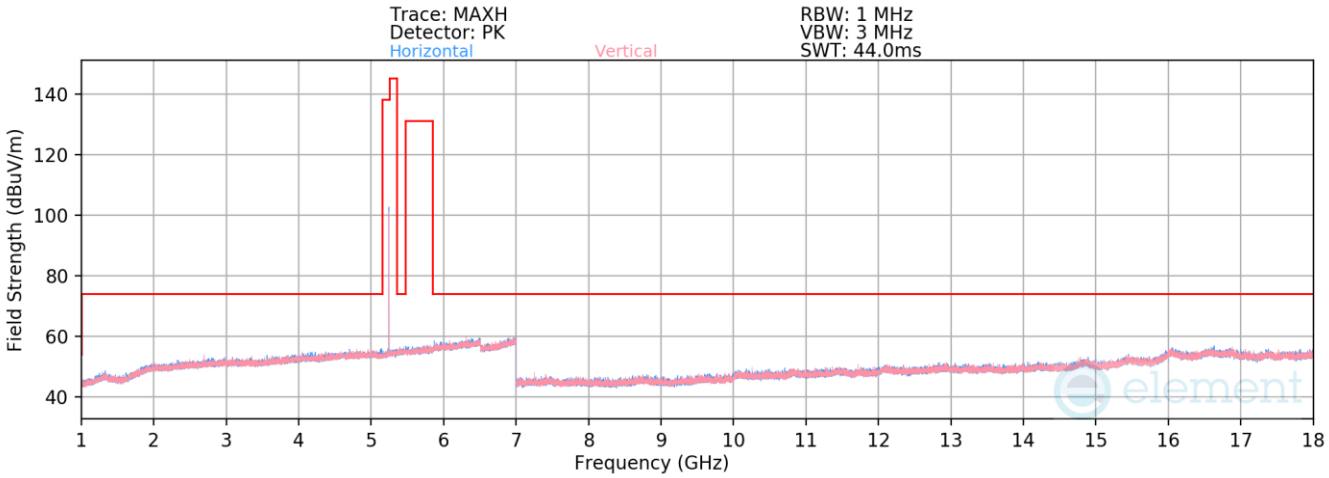


Plot 7-86. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5201MHz)

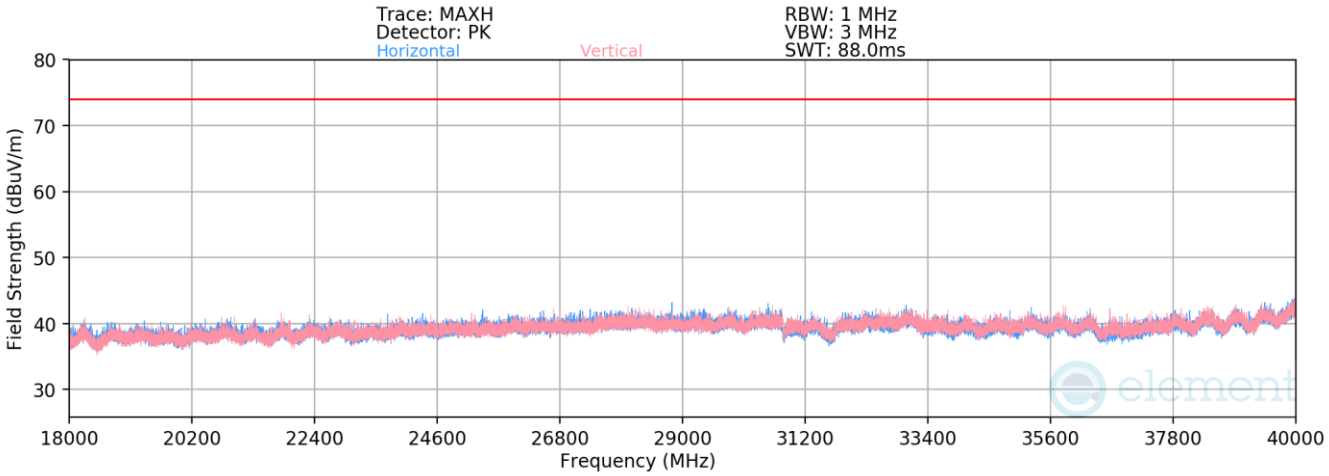
Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5201MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10402.00	Peak	H	108	265	-65.90	7.77	48.86	68.23	-19.37
*	15603.00	Avg	H	-	-	-81.09	15.89	41.80	53.98	-12.18
*	15603.00	Peak	H	-	-	-70.91	15.89	51.98	73.98	-22.00

Table 7-18. Radiated Spurious Emission Measurements



Plot 7-87. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5245MHz)



Plot 7-88. Radiated Spurious Emissions 18-40GHz (NB UNII HDRp4 – 5245MHz)

Mode: HDRp4

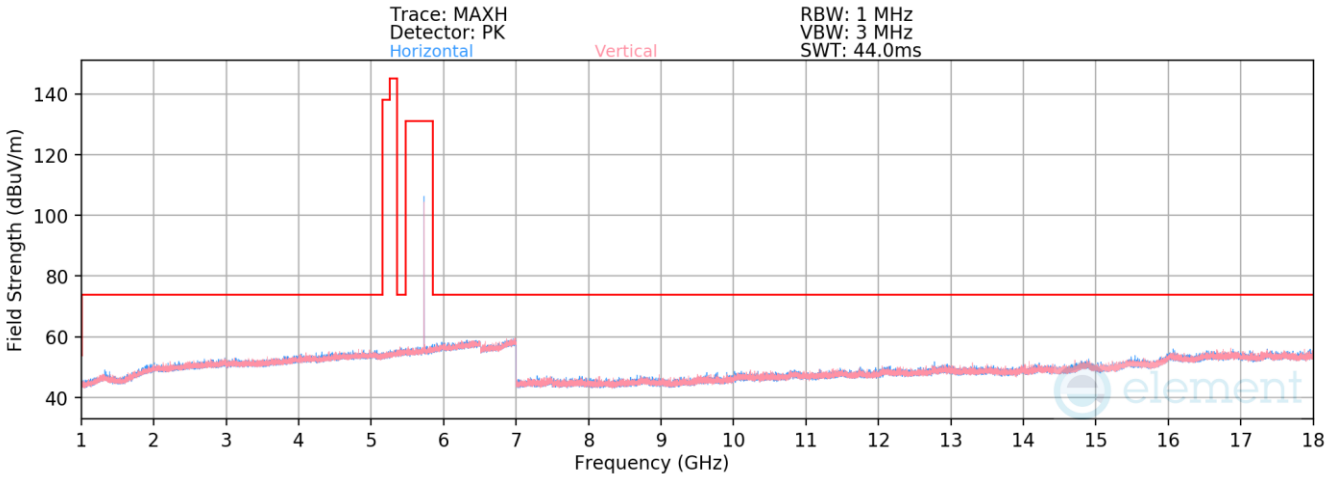
Data Rate: 4Mbps

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]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10490.00	Peak	H	100	272	-66.67	8.08	48.41	68.23	-19.82
*	15735.00	Avg	H	-	-	-81.47	15.79	41.32	53.98	-12.66
*	15735.00	Peak	H	-	-	-70.80	15.79	51.99	73.98	-21.99
*	20980.00	Avg	H	-	-	-70.78	-6.74	29.48	53.98	-24.50
*	20980.00	Peak	H	-	-	-59.61	-6.74	40.65	73.98	-33.33
	26225.00	Peak	H	-	-	-61.27	-4.48	41.25	68.23	-32.73
*	31470.00	Avg	H	-	-	-73.33	-2.30	31.37	53.98	-22.61
*	31470.00	Peak	H	-	-	-62.32	-2.30	42.37	73.98	-31.61
	36715.00	Peak	H	44	110	-52.34	-6.23	48.44	68.23	-25.54

Table 7-19. Radiated Spurious Emission Measurements

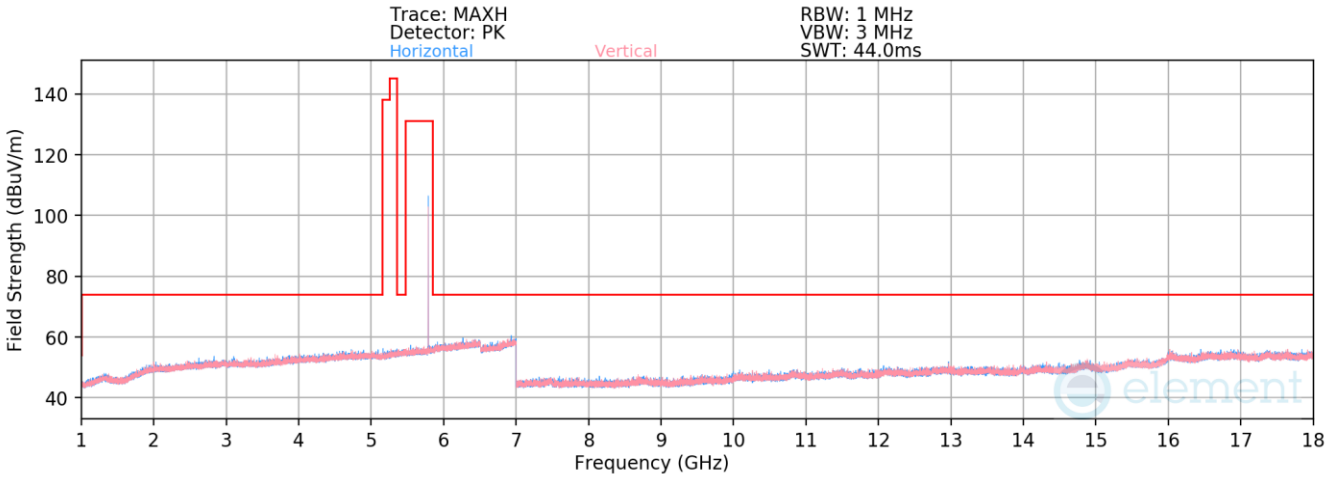


Plot 7-89. Radiated Spurious Emissions 1-18GHz (NB UNII BDR – 5731MHz)

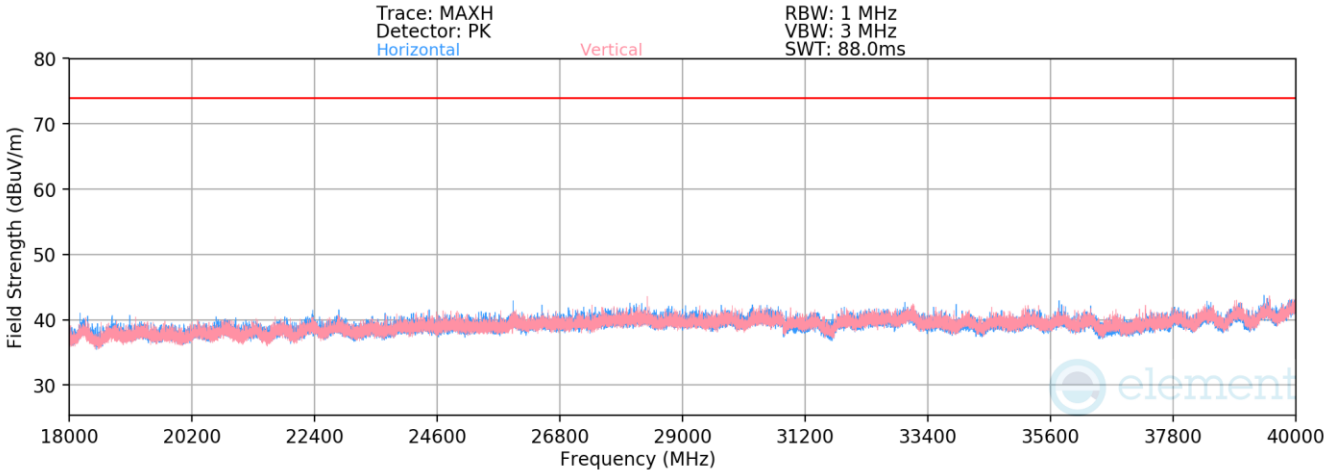
Mode:	BDR
Data Rate:	1Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5731MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11462.00	Avg	H	115	76	-77.04	9.60	1.16	40.72	53.98	-13.26
*	11462.00	Peak	H	115	76	-66.64	9.60	0.00	49.96	73.98	-24.02
	17193.00	Peak	V	-	-	-70.50	17.73	0.00	54.23	68.23	-14.00

Table 7-20. Radiated Spurious Emission Measurements



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

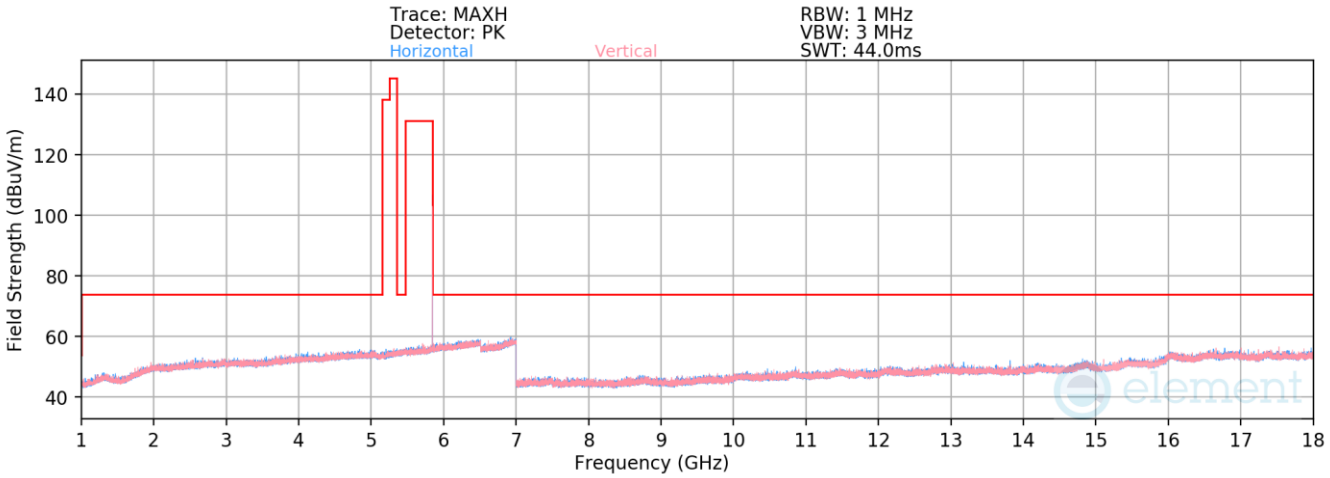


Plot 7-91. Radiated Spurious Emissions 18-40GHz (NB UNII BDR – 5788MHz)

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]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11576.00	Avg	H	339	55	-77.23	9.62	1.16	40.55	53.98	-13.43
*	11576.00	Peak	H	339	55	-67.08	9.62	0.00	49.54	73.98	-24.44
	17364.00	Peak	V	104	147	-69.91	18.06	0.00	55.15	68.23	-13.08
	23152.00	Peak	H	-	-	-60.64	-6.23	0.00	40.13	68.23	-28.10
	28940.00	Peak	H	70	58	-62.27	-2.96	0.00	41.77	68.23	-26.46
	34728.00	Peak	H	-	-	-60.67	-3.68	0.00	42.65	68.23	-25.58

Table 7-21. Radiated Spurious Emission Measurements

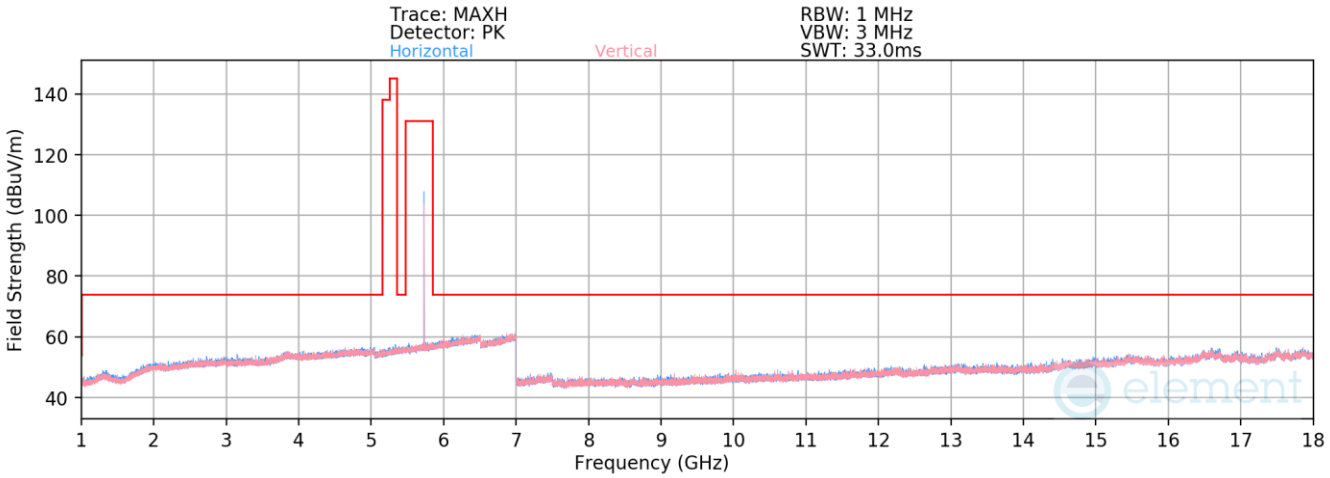


Plot 7-92. Radiated Spurious Emissions 1-18GHz (NB UNII BDR – 5844MHz)

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	345	49	-77.24	10.28	1.16	41.20	53.98	-12.78
*	11688.00	Peak	H	345	49	-67.52	10.28	0.00	49.76	73.98	-24.22
	17532.00	Peak	V	323	110	-69.88	17.53	0.00	54.65	68.23	-13.58

Table 7-22. Radiated Spurious Emission Measurements

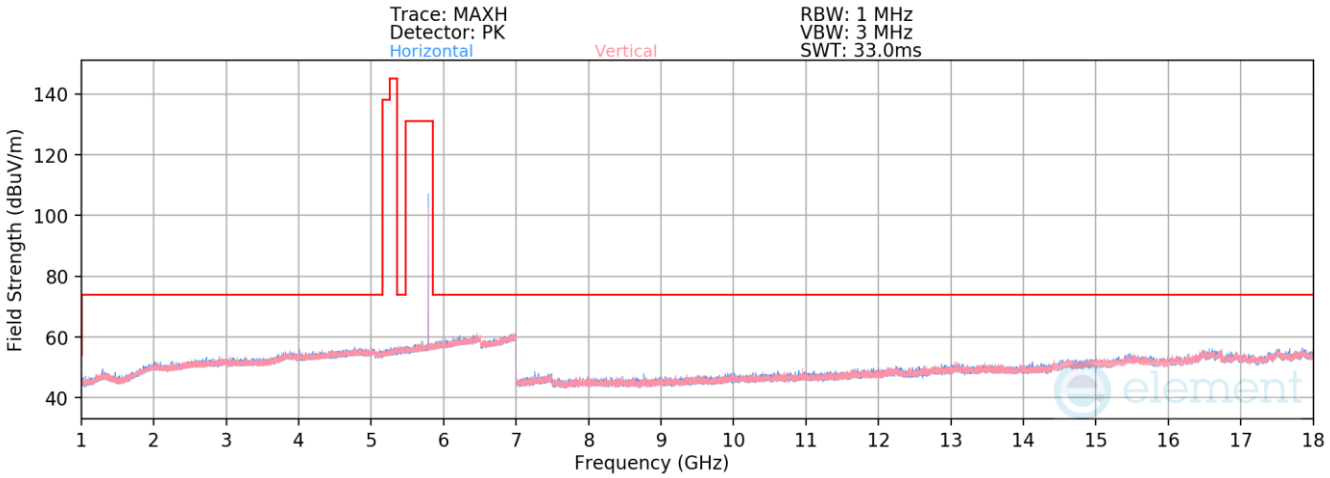


Plot 7-93. Radiated Spurious Emissions 1-18GHz (NB UNII LE2M – 5731MHz)

Mode:	LE2M
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	-	-	-78.75	9.57	37.82	53.98	-16.16
*	11462.00	Peak	H	-	-	-67.87	9.57	48.70	73.98	-25.28
	17193.00	Peak	H	-	-	-69.75	16.22	53.47	68.23	-14.76

Table 7-23. Radiated Spurious Emission Measurements

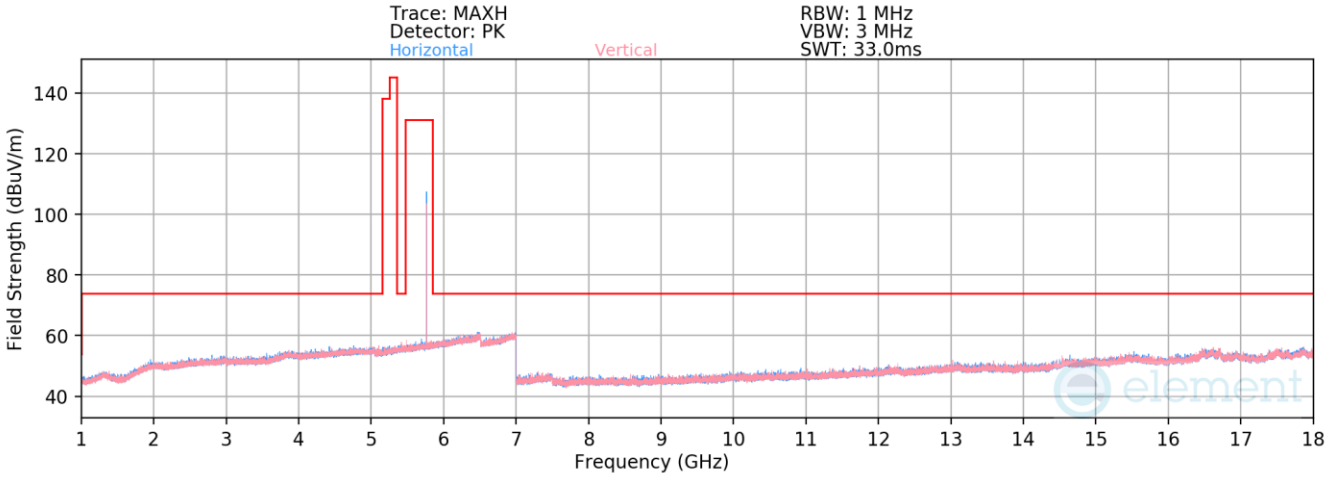


Plot 7-94. Radiated Spurious Emissions 1-18GHz (NB UNII LE2M – 5788MHz)

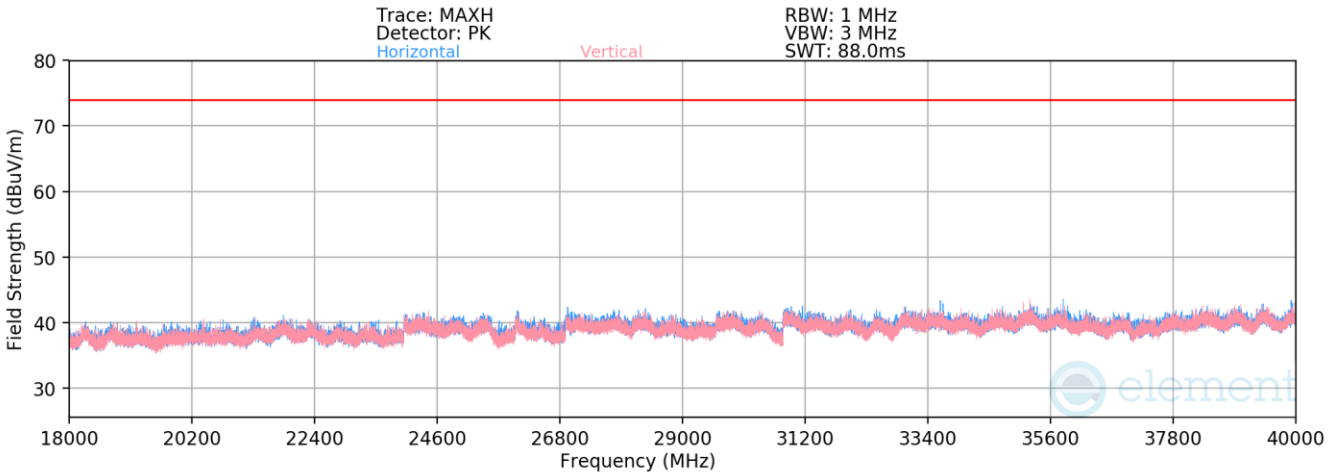
Mode:	LE2M
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5788MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11576.00	Avg	H	261	49	-78.03	9.47	0.64	39.08	53.98	-14.90
*	11576.00	Peak	H	261	49	-67.75	9.47	0.00	48.72	73.98	-25.26
	17364.00	Peak	H	-	-	-69.44	17.35	0.00	54.91	68.23	-13.32

Table 7-24. Radiated Spurious Emission Measurements



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



Plot 7 94. Radiated Spurious Emissions 18-40GHz (NB UNII LE2M – 5844MHz)

Mode: LE2M

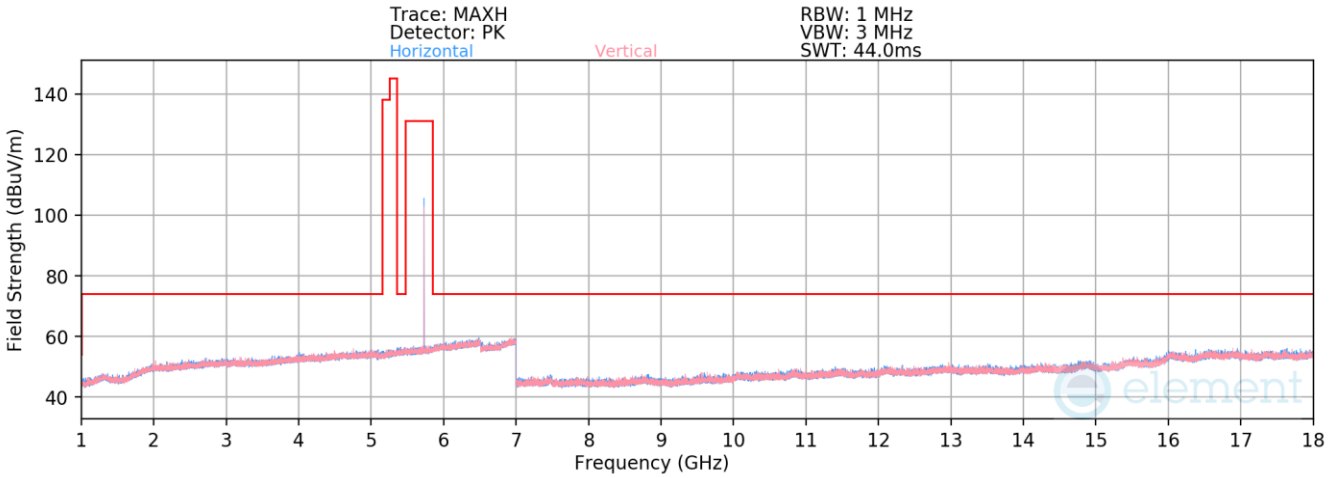
Data Rate: 2Mbps

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]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11688.00	Avg	H	282	246	-78.06	9.84	0.64	39.42	53.98	-14.56
*	11688.00	Peak	H	282	246	-68.27	9.84	0.00	48.57	73.98	-25.41
	17532.00	Peak	V	100	288	-70.21	18.79	0.00	55.58	68.23	-12.65
	23376.00	Peak	H	-	-	-60.95	-6.23	0.00	39.82	68.23	-34.16
	29220.00	Peak	H	-	-	-63.68	-2.96	0.00	40.36	68.23	-33.62
	35064.00	Peak	H	-	-	-60.82	-3.68	0.00	42.50	68.23	-31.48

Table 7-25. Radiated Spurious Emission Measurements

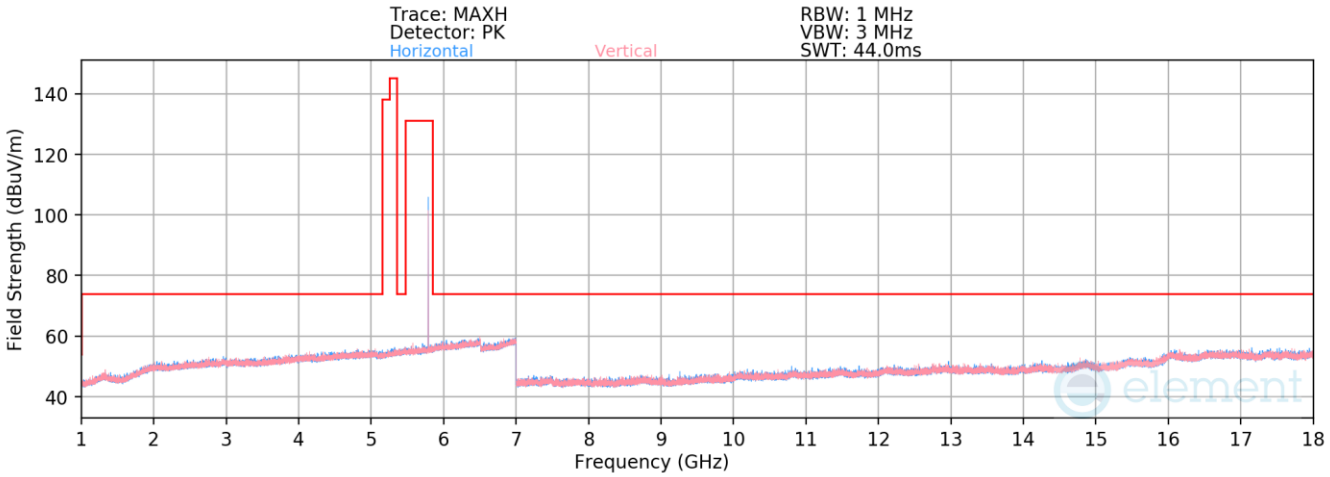


Plot 7-96. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5731MHz)

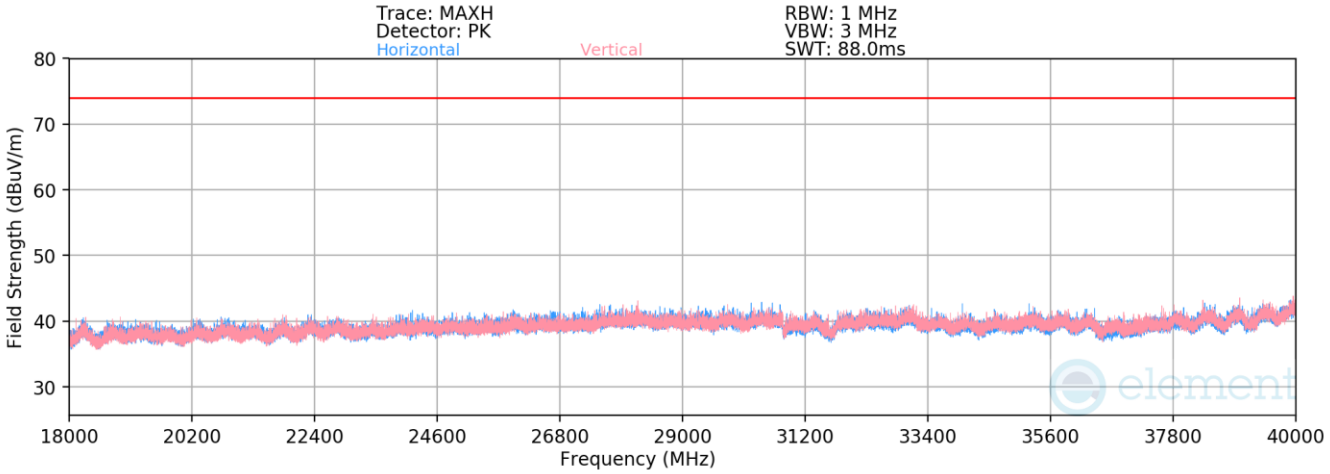
Mode:	HDR4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5731MHz

	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	-	-	-78.20	9.57	38.37	53.98	-15.61
*	11462.00	Peak	H	-	-	-66.95	9.57	49.62	73.98	-24.36
	17193.00	Peak	H	-	-	-71.00	17.67	53.67	68.23	-14.56

Table 7-26. Radiated Spurious Emission Measurements



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

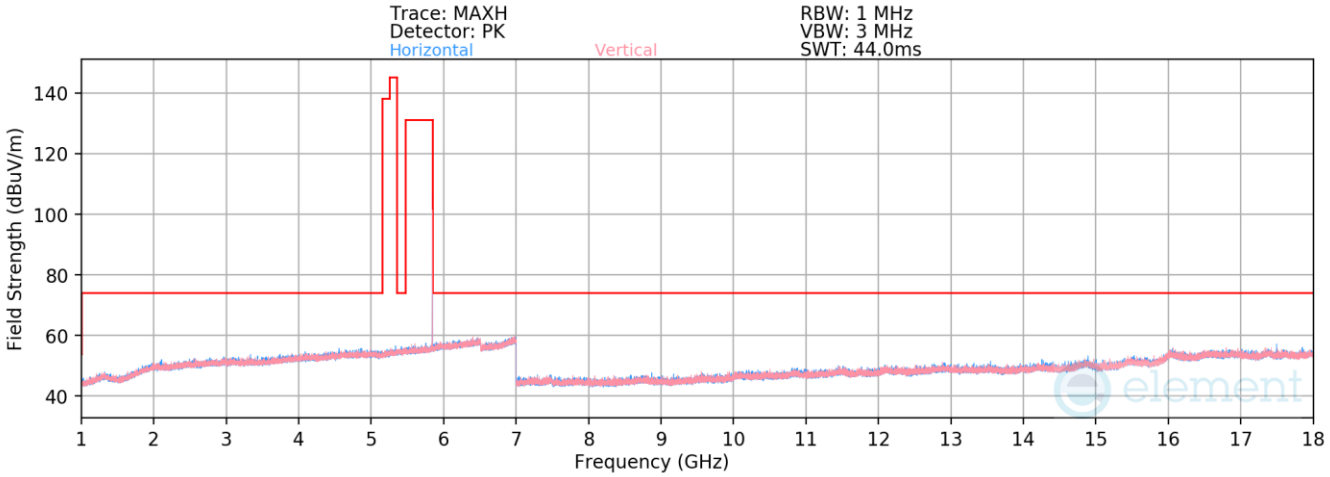


Plot 7-98. Radiated Spurious Emissions 18-40GHz (NB UNII HDR4 – 5788MHz)

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	-	-	-78.20	9.58	38.38	53.98	-15.60
*	11576.00	Peak	H	-	-	-67.20	9.67	49.47	73.98	-24.51
	17364.00	Peak	H	-	-	-70.76	18.05	54.29	68.23	-13.94
	23152.00	Peak	H	-	-	-59.97	-6.23	40.80	68.23	-33.18
	28940.00	Peak	V	28	214	-61.95	-2.96	42.09	68.23	-31.89
	34728.00	Peak	H	-	-	-61.14	-3.68	42.18	68.23	-31.80

Table 7-27. Radiated Spurious Emission Measurements

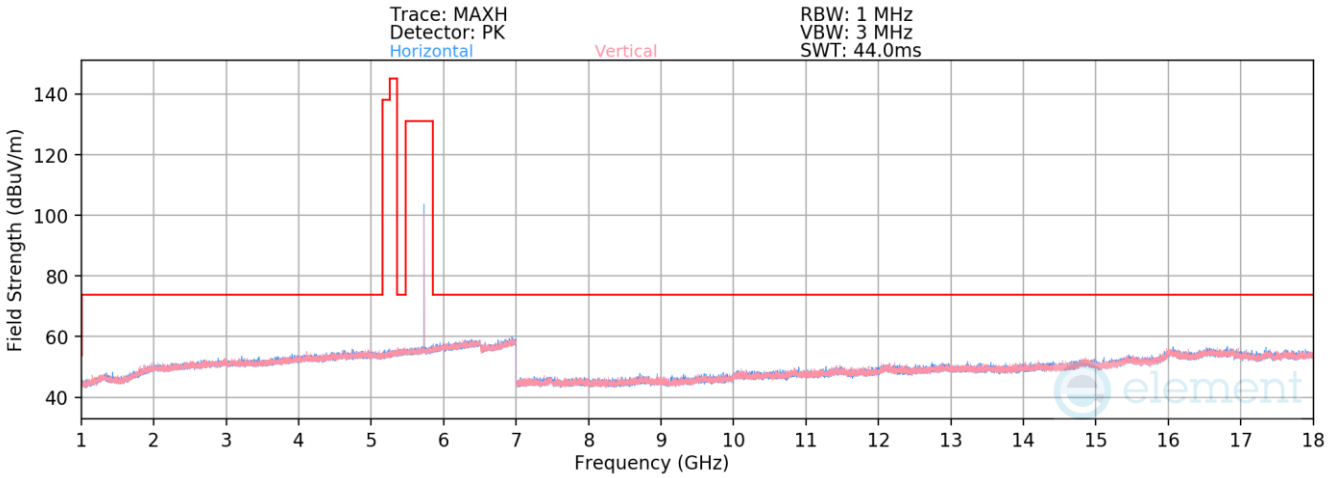


Plot 7-99. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5844MHz)

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	-	-	-79.33	10.33	38.00	53.98	-15.98
*	11688.00	Peak	H	-	-	-68.46	10.14	48.68	73.98	-25.30
	17532.00	Peak	H	-	-	-71.03	17.49	53.46	68.23	-14.77

Table 7-28. Radiated Spurious Emission Measurements

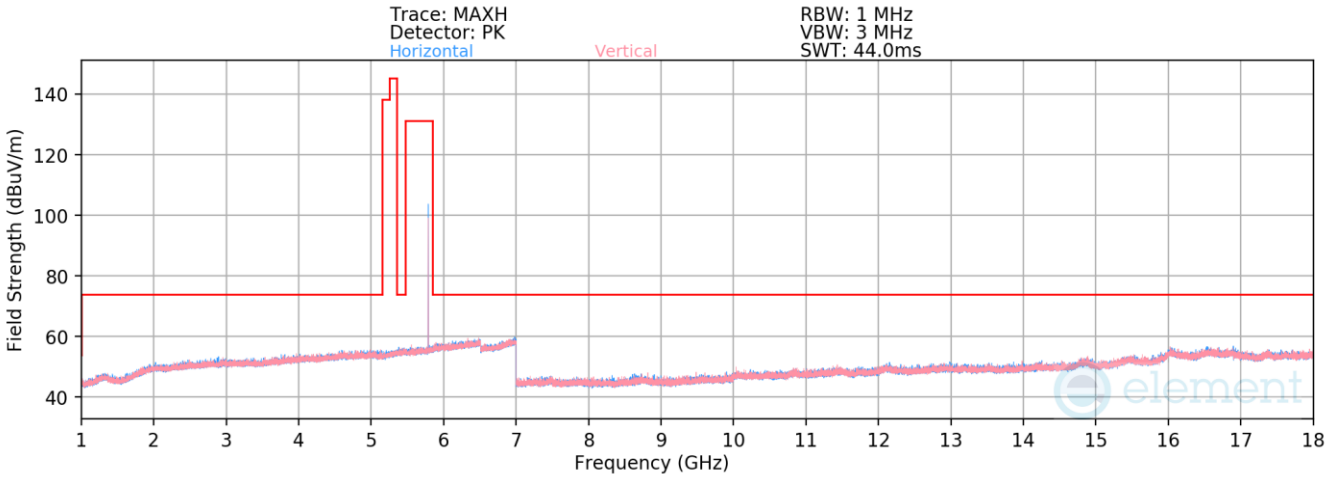


Plot 7-100. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5731MHz)

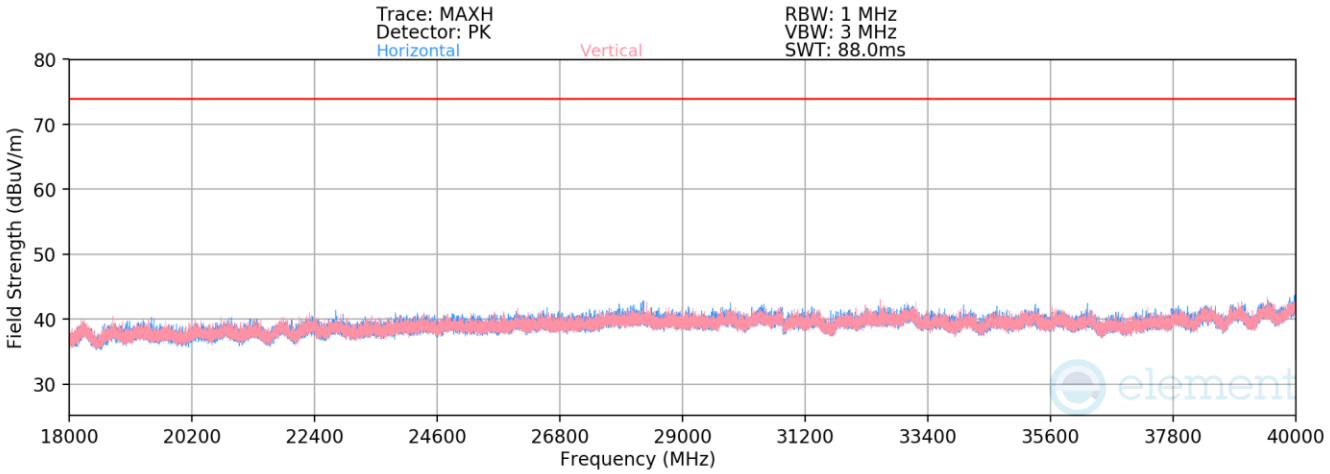
Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5731MHz

	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	-	-	-78.20	9.57	38.37	53.98	-15.61
*	11462.00	Peak	H	-	-	-66.95	9.57	49.62	73.98	-24.36
	17193.00	Peak	H	-	-	-71.00	17.67	53.67	68.23	-14.56

Table 7-29. Radiated Spurious Emission Measurements



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

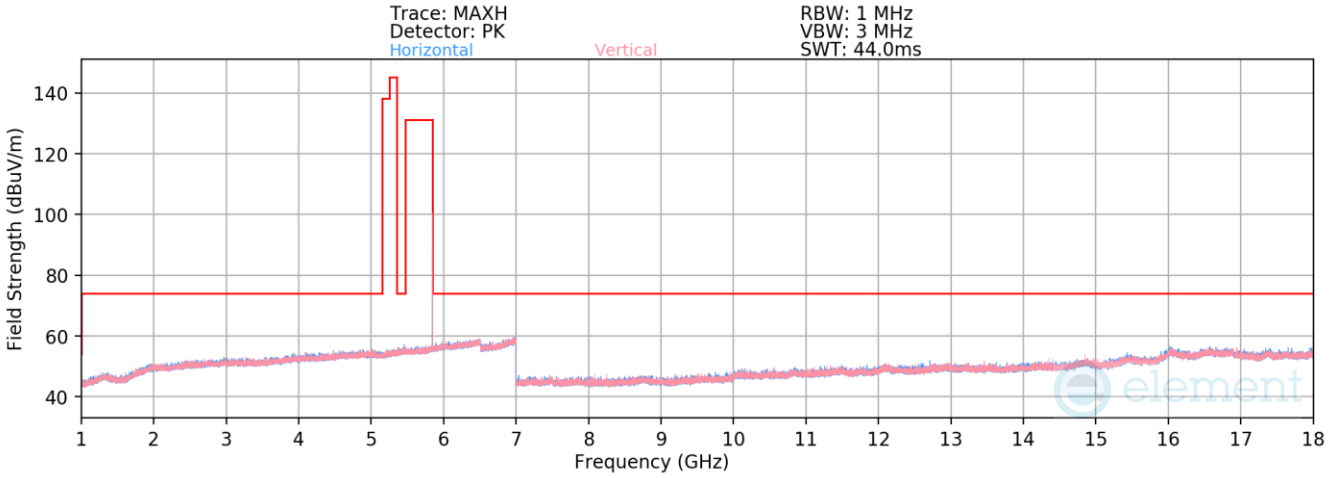


Plot 7-102. Radiated Spurious Emissions 18-40GHz (NB UNII HDRp4 – 5788MHz)

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	-	-	-78.20	9.58	38.38	53.98	-15.60
*	11576.00	Peak	H	-	-	-67.20	9.67	49.47	73.98	-24.51
	17364.00	Peak	H	-	-	-70.76	18.05	54.29	68.23	-13.94
	23152.00	Peak	H	-	-	-59.97	-6.23	40.80	68.23	-33.18
	28940.00	Peak	V	28	214	-61.95	-2.96	42.09	68.23	-31.89
	34728.00	Peak	H	-	-	-61.14	-3.68	42.18	68.23	-31.80

Table 7-30. Radiated Spurious Emission Measurements



Plot 7-103. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5844MHz)

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

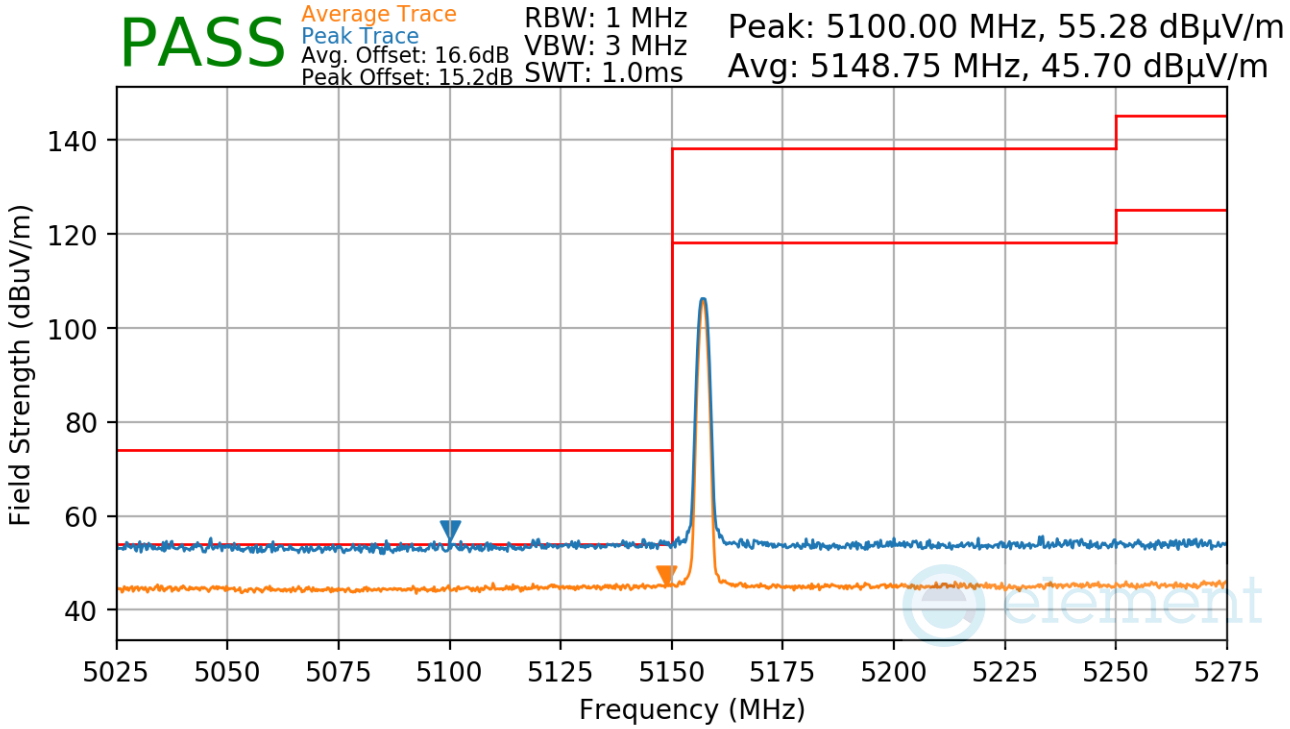
	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11688.00	Avg	H	-	-	-79.33	10.33	38.00	53.98	-15.98
*	11688.00	Peak	H	-	-	-68.46	10.14	48.68	73.98	-25.30
	17532.00	Peak	H	-	-	-71.03	17.49	53.46	68.23	-14.77

Table 7-31. Radiated Spurious Emission Measurements

Radiated Band Edge Measurements

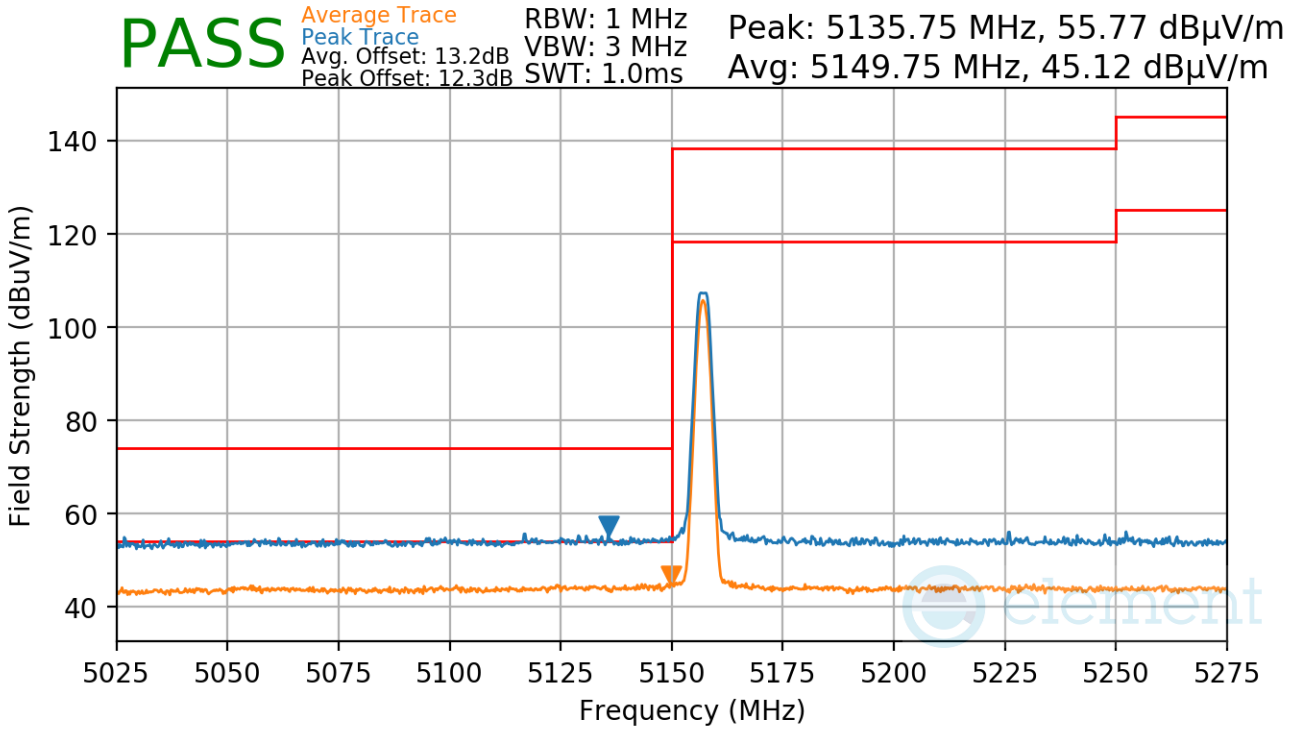
§15.407(b.1) §15.205 §15.209

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



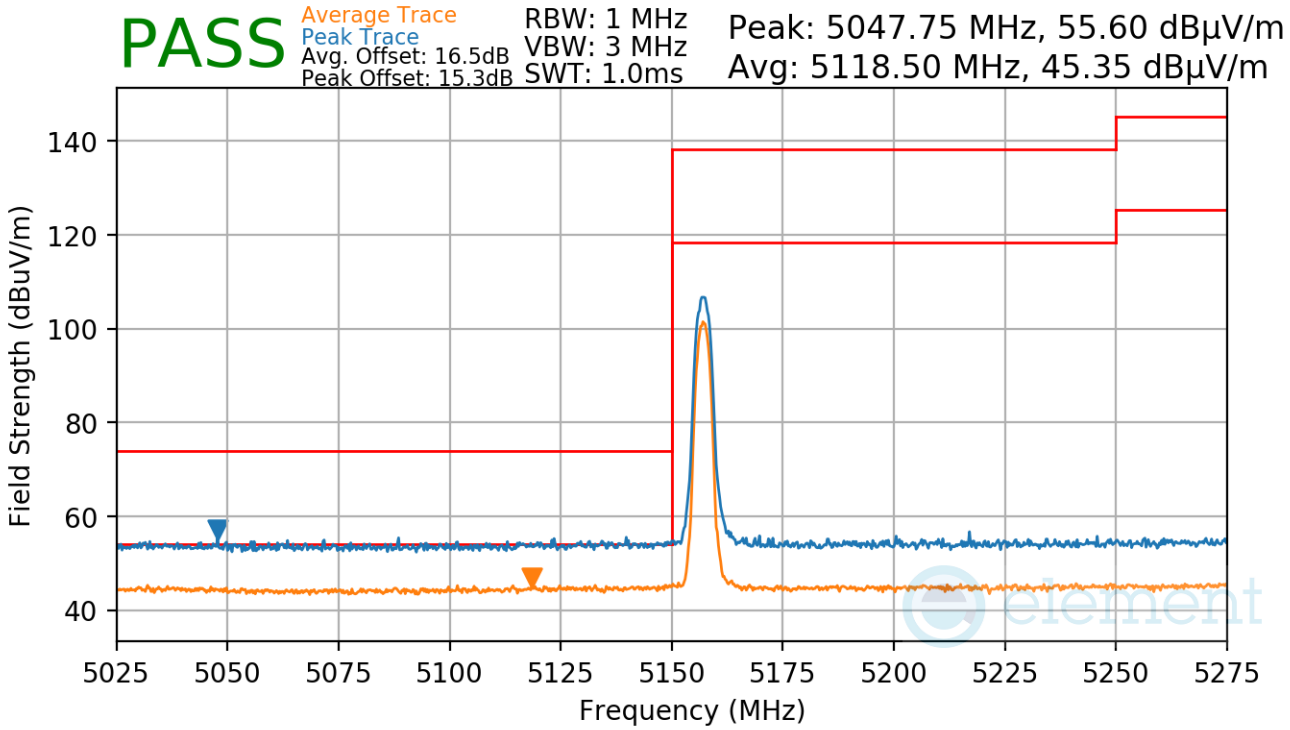
Plot 7-104. Radiated Lower Band Edge Measurement

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



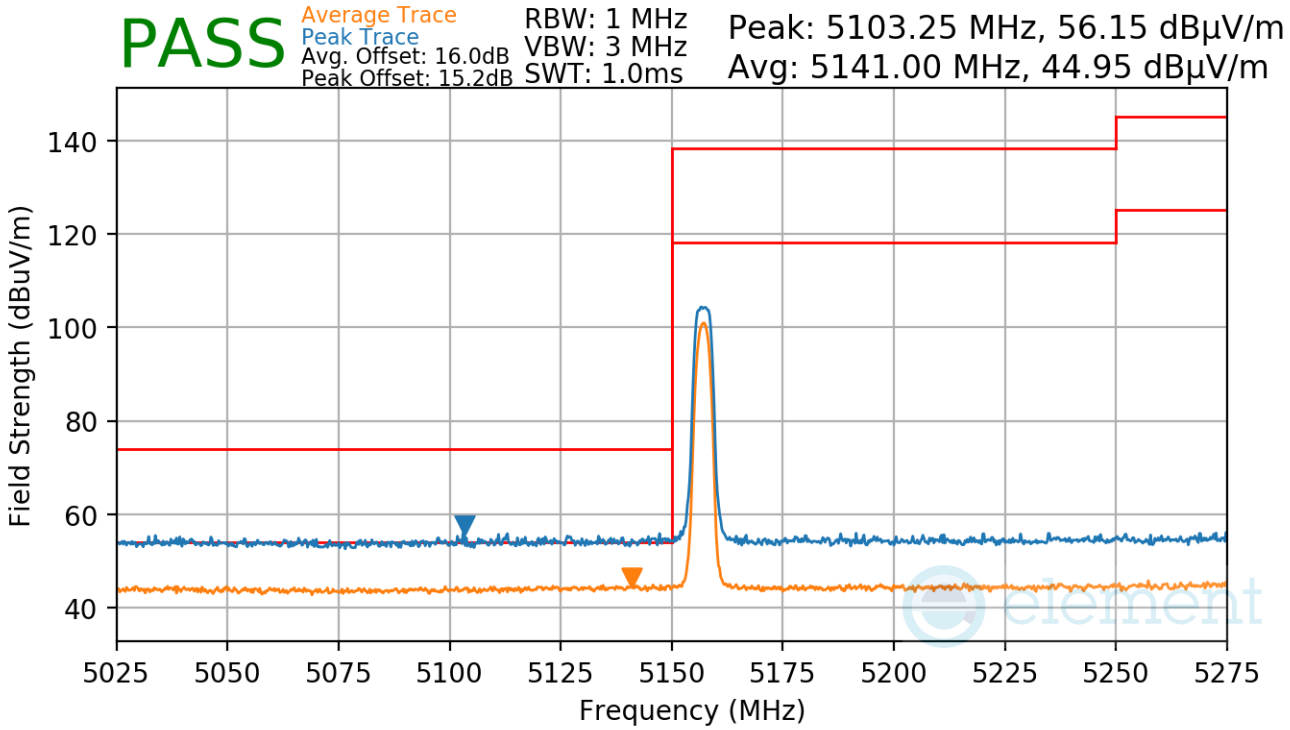
Plot 7-105. Radiated Lower Band Edge Measurement

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



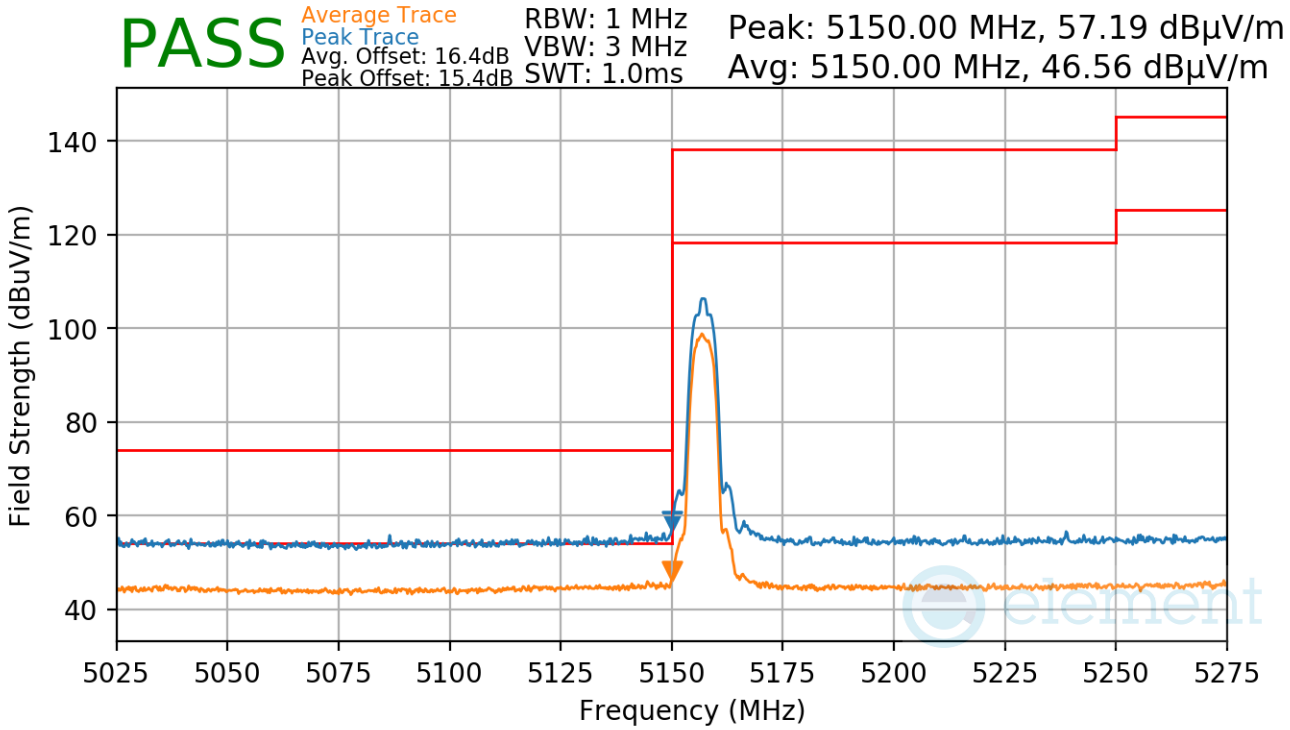
Plot 7-106. Radiated Lower Band Edge Measurement

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



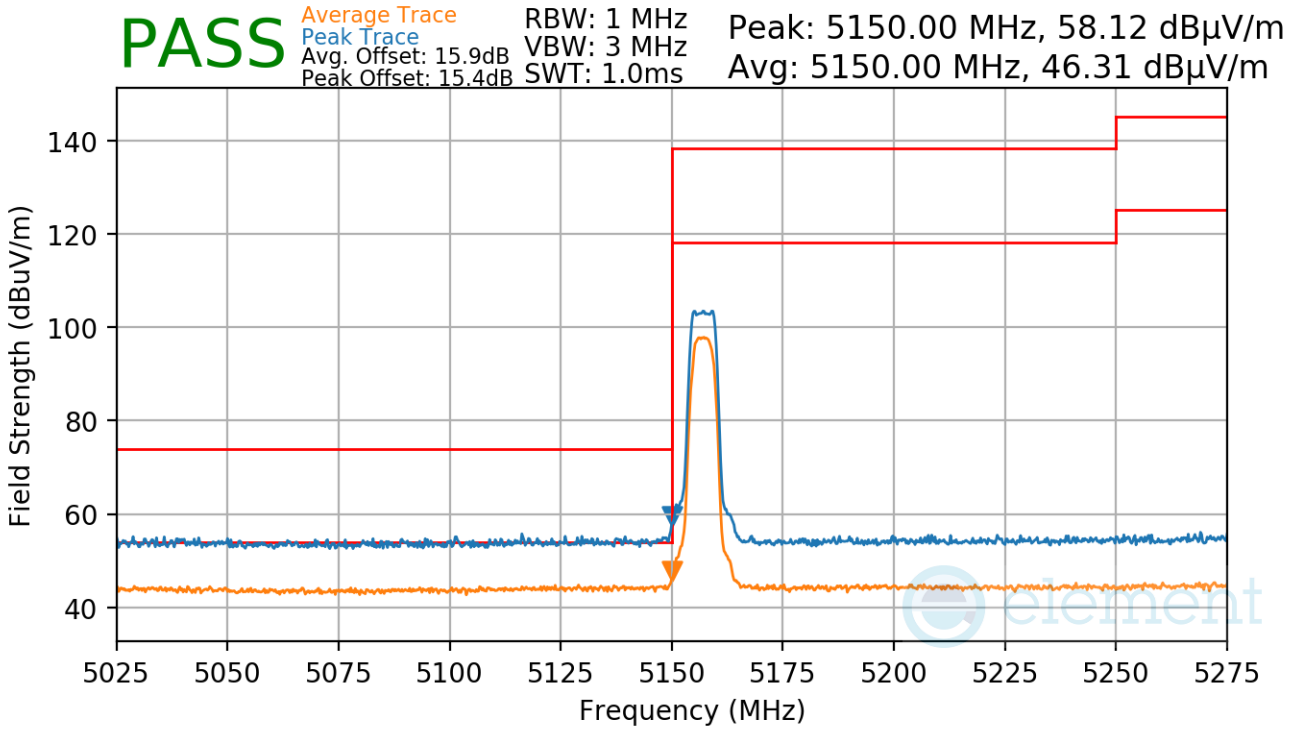
Plot 7-107. Radiated Lower Band Edge Measurement

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



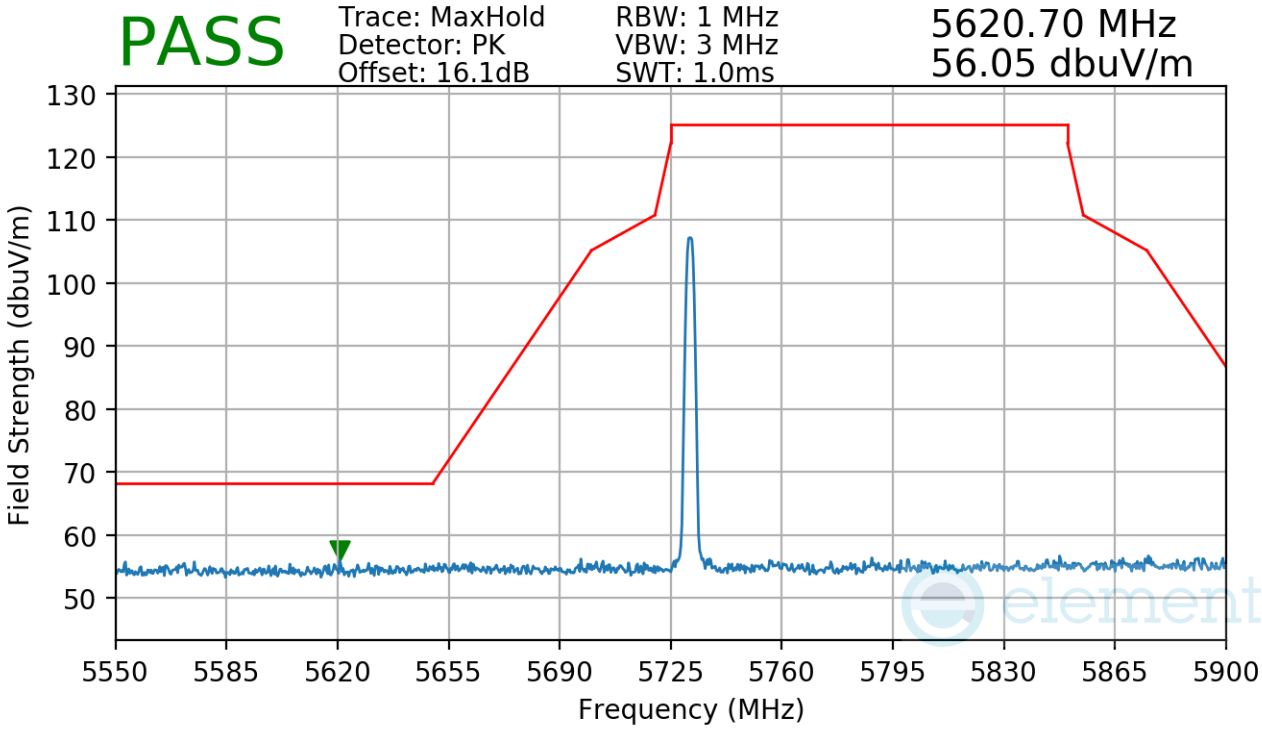
Plot 7-108. Radiated Lower Band Edge Measurement

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



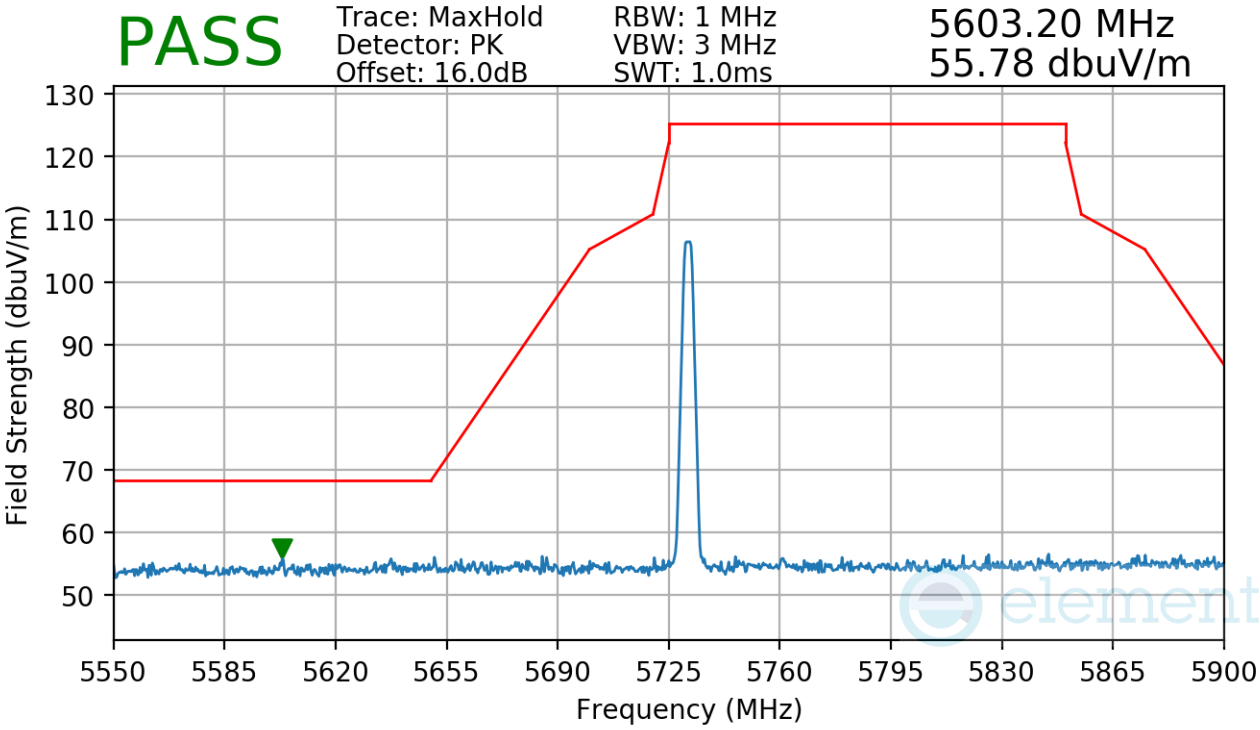
Plot 7-109. Radiated Lower Band Edge Measurement

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



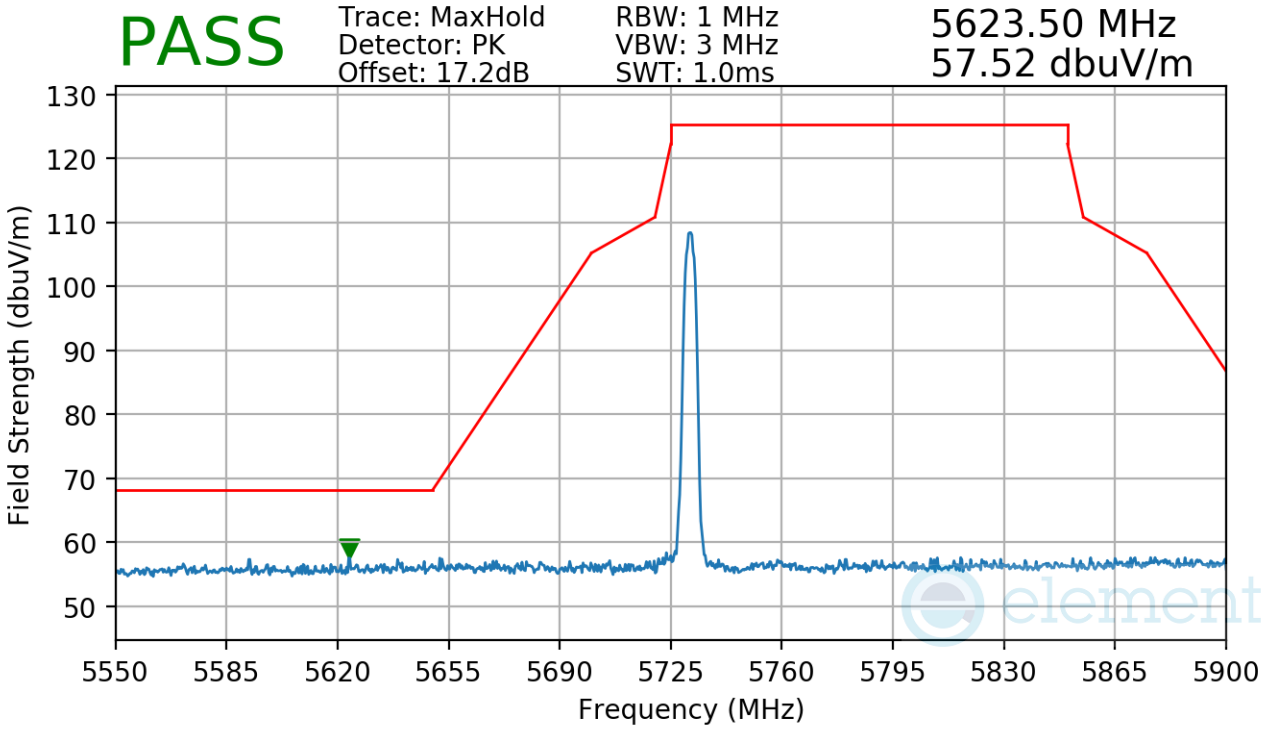
Plot 7-110. Radiated Lower Band Edge Measurement

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



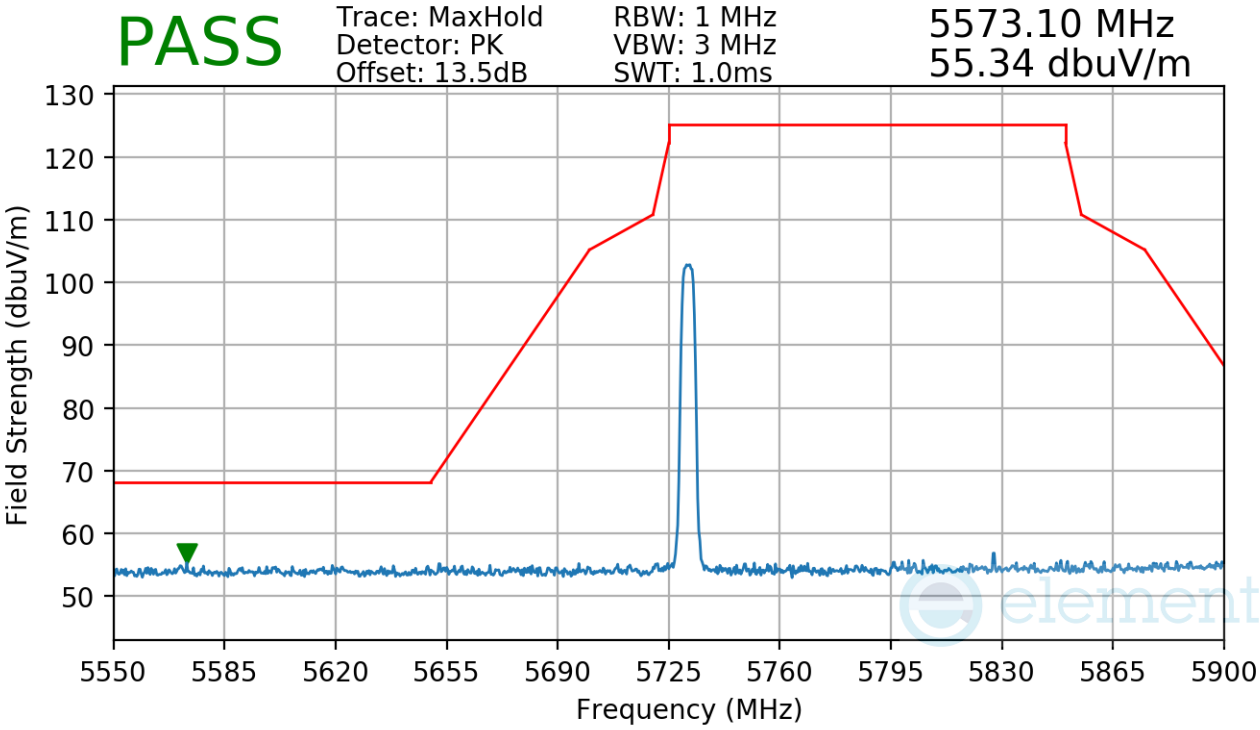
Plot 7-111. Radiated Lower Band Edge Measurement

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



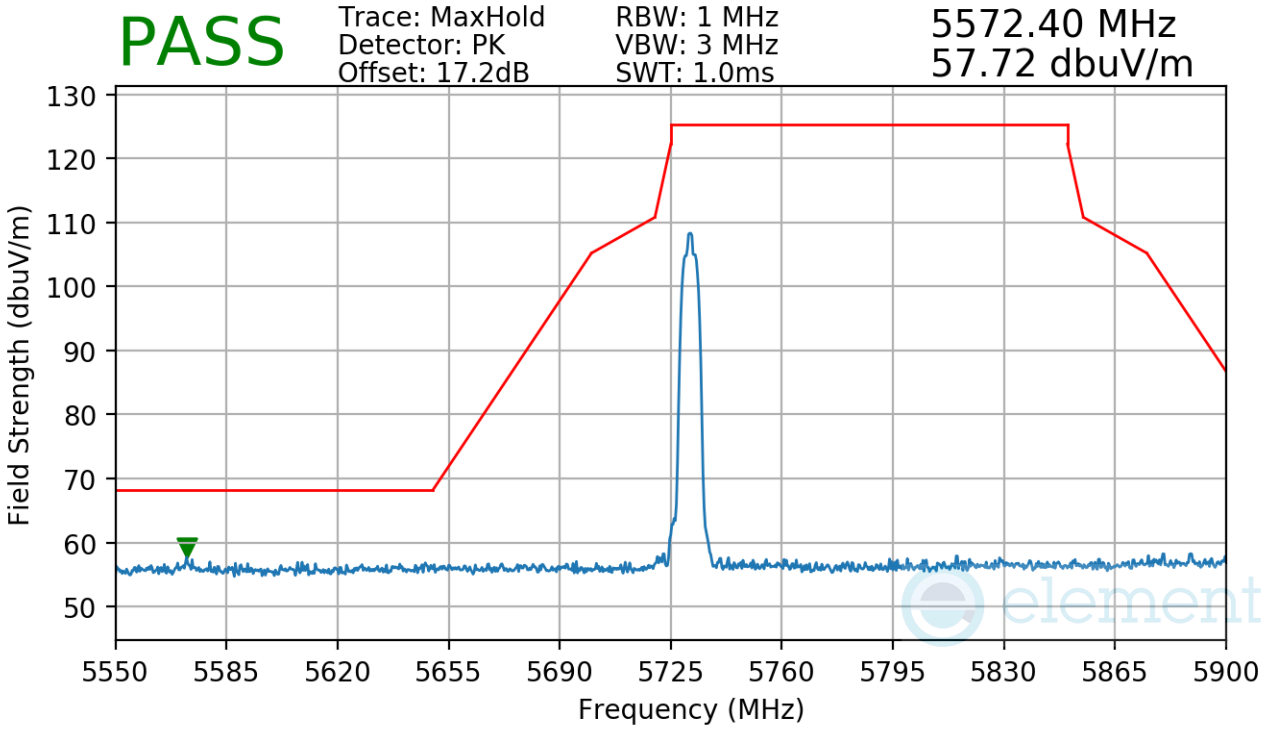
Plot 7-112. Radiated Lower Band Edge Measurement

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



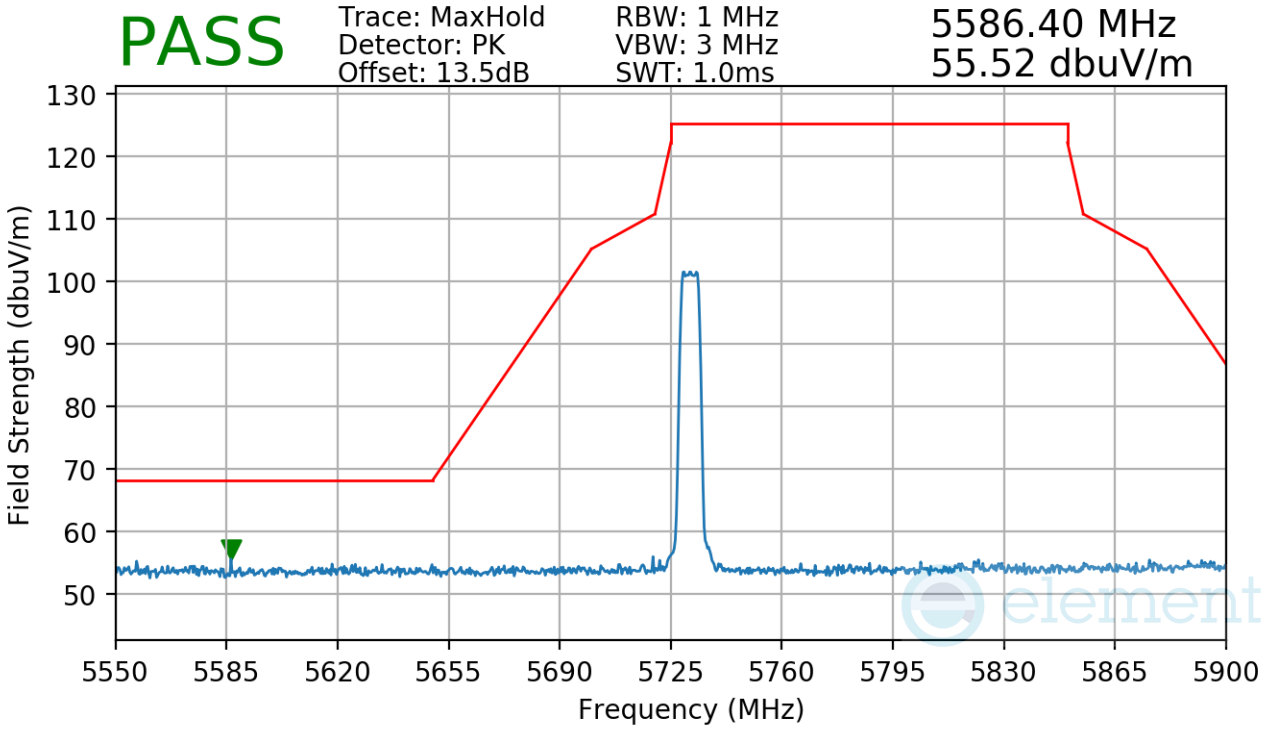
Plot 7-113. Radiated Lower Band Edge Measurement

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



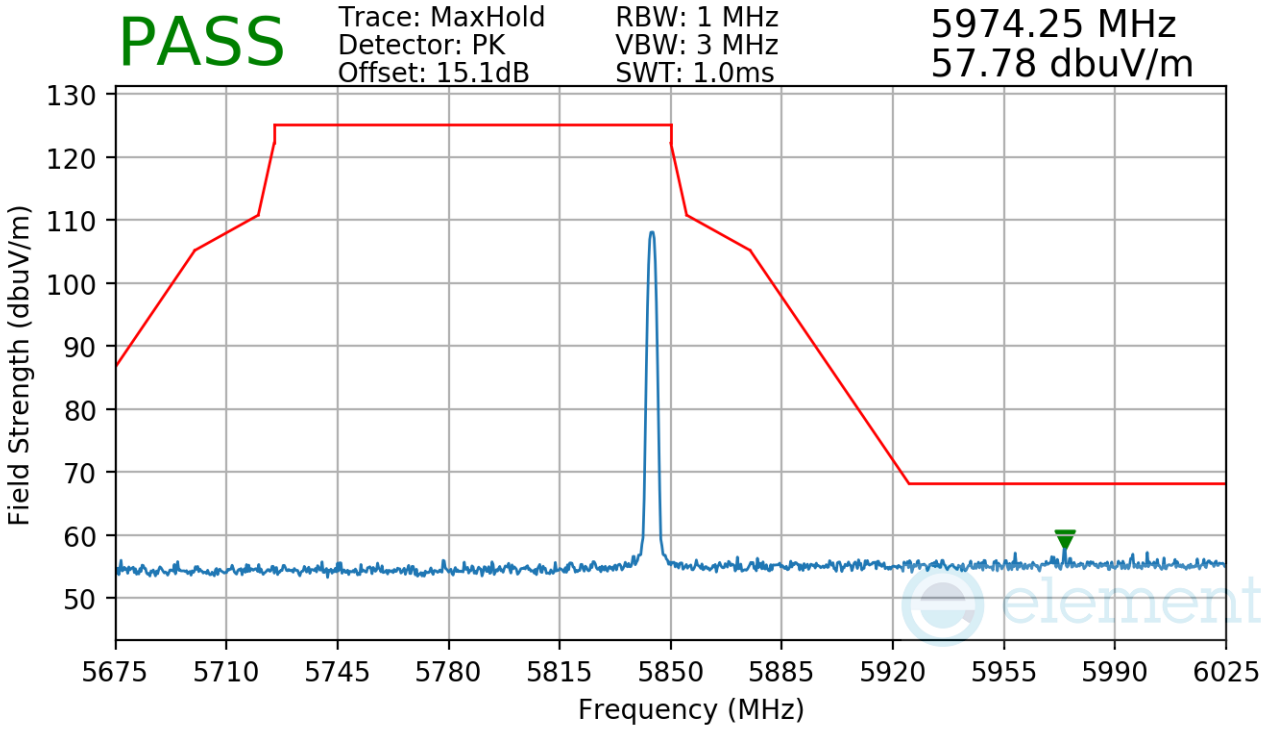
Plot 7-114. Radiated Lower Band Edge Measurement

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



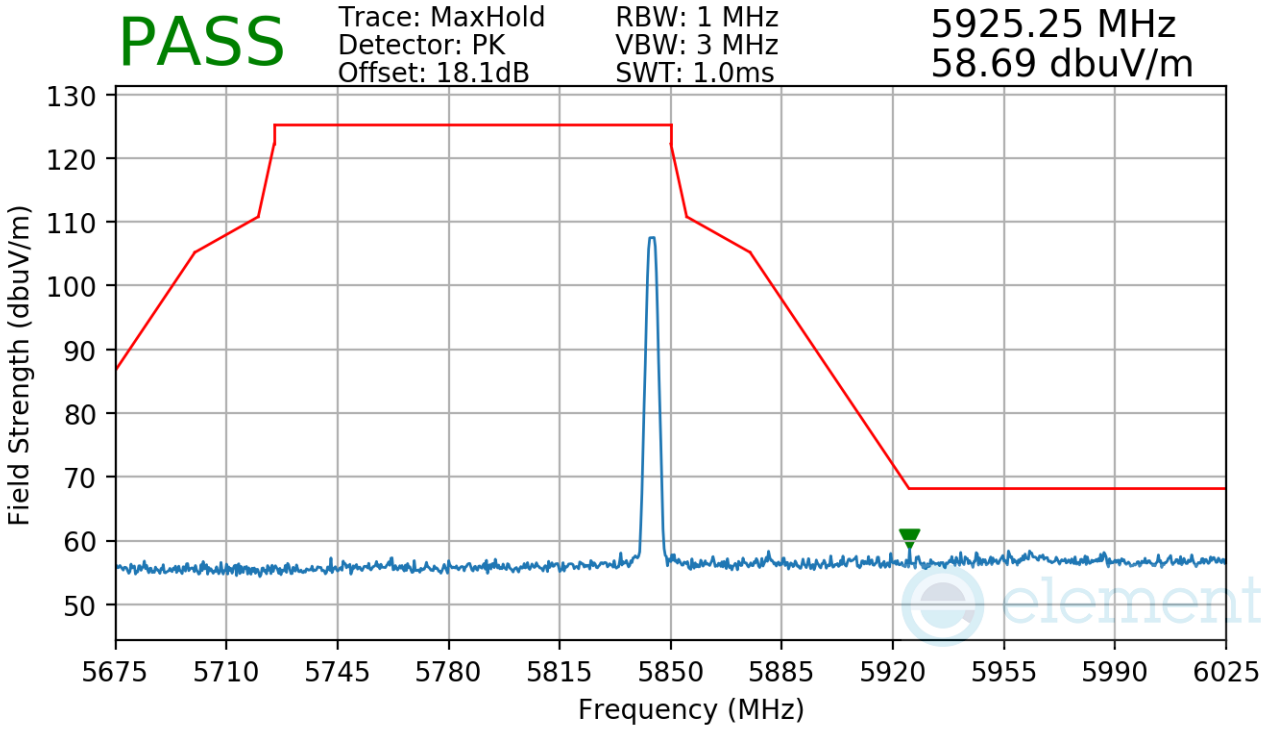
Plot 7-115. Radiated Lower Band Edge Measurement

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



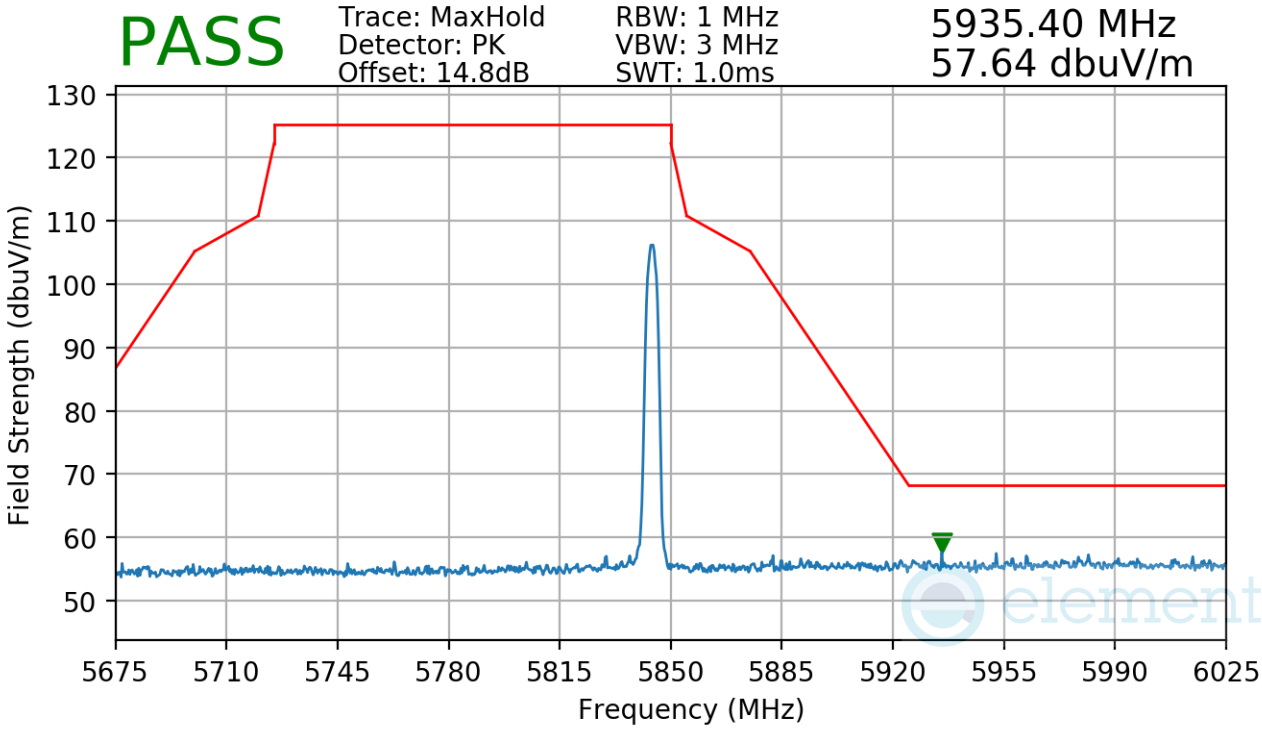
Plot 7-116. Radiated Upper Band Edge Measurement

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



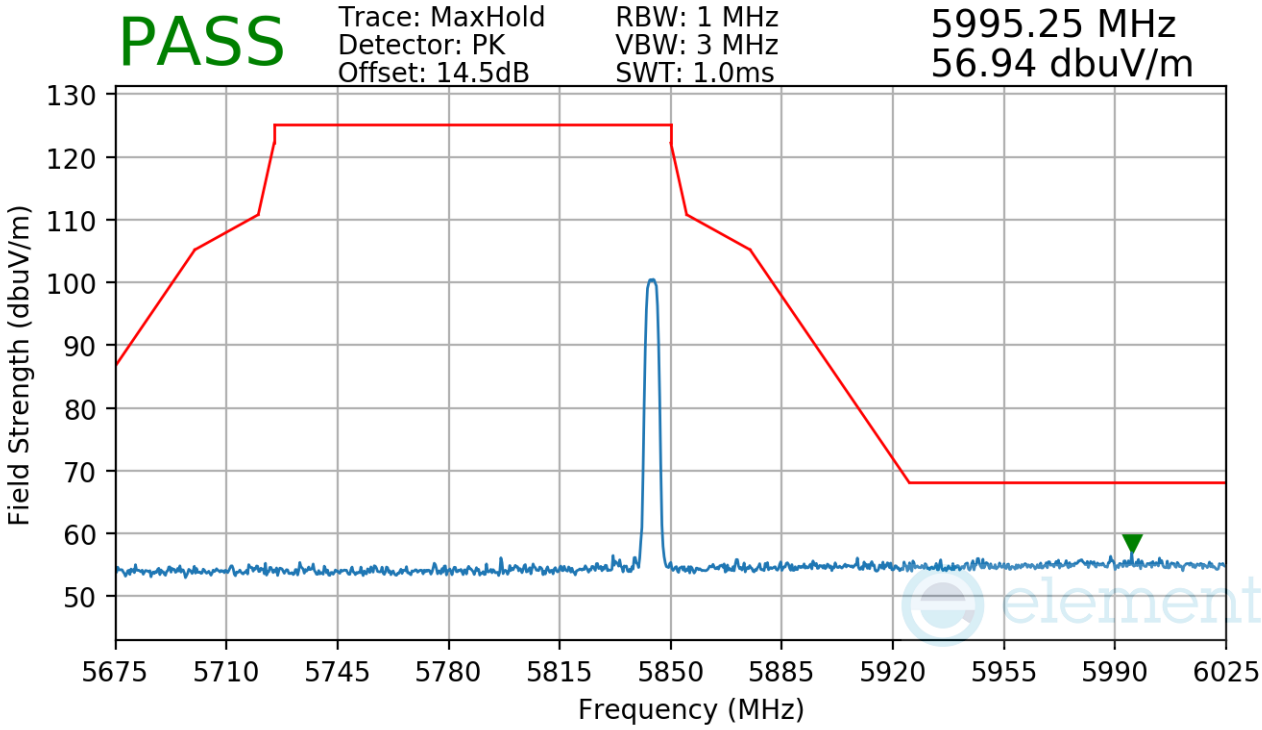
Plot 7-117. Radiated Upper Band Edge Measurement

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



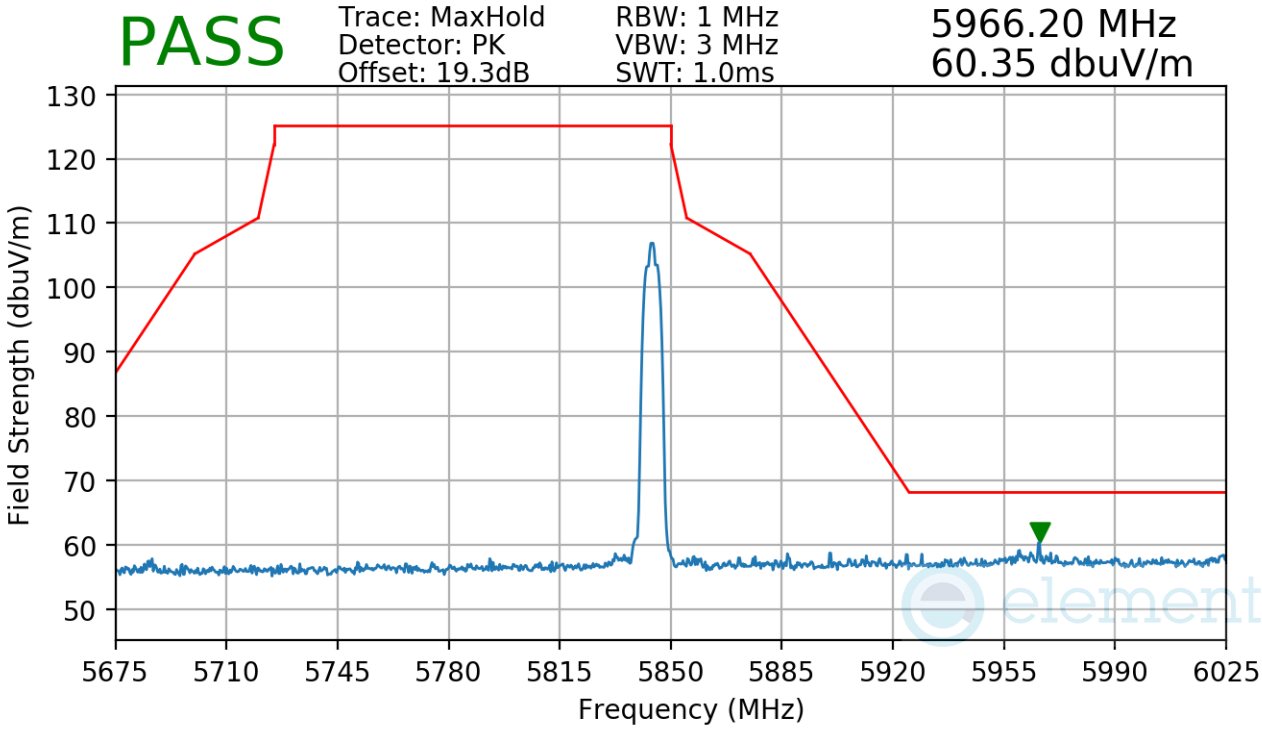
Plot 7-118. Radiated Upper Band Edge Measurement

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



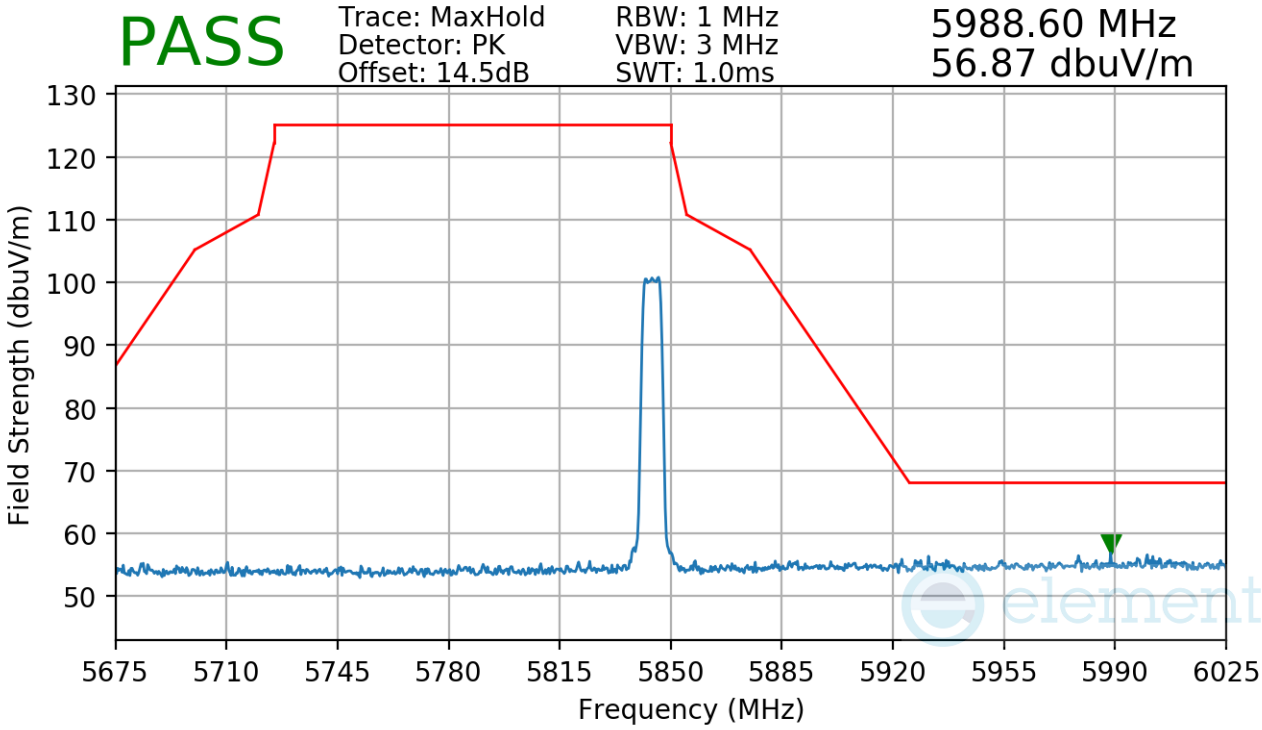
Plot 7-119. Radiated Upper Band Edge Measurement

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.

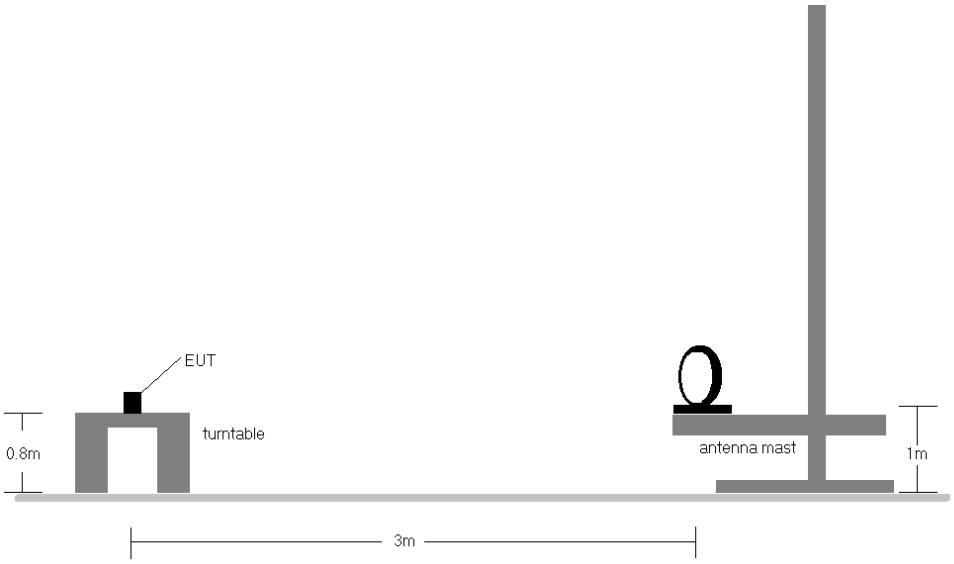


Figure 7-6. Radiated Test Setup < 30MHz

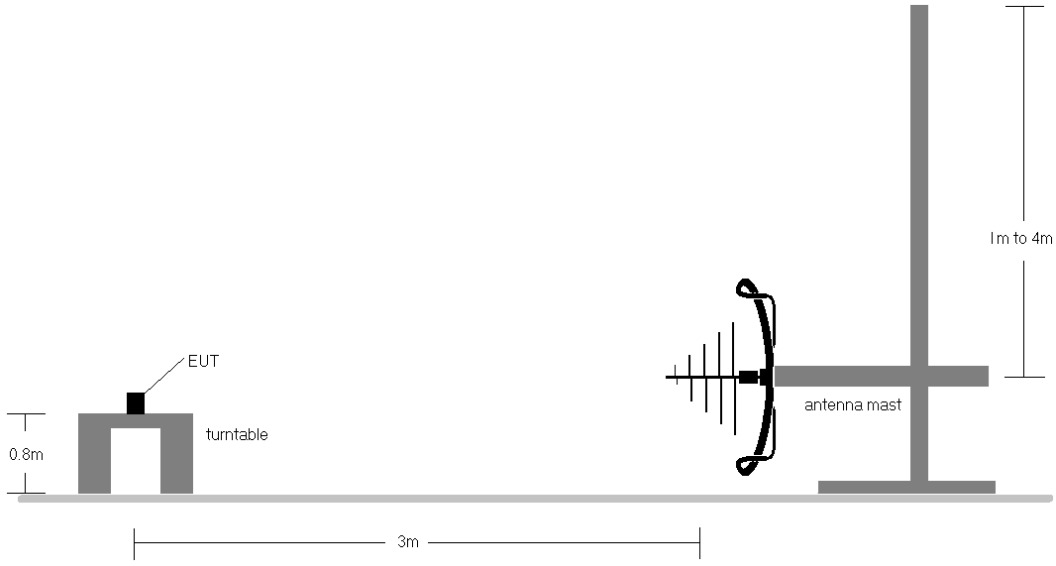


Figure 7-7. Radiated Test Setup < 1GHz

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

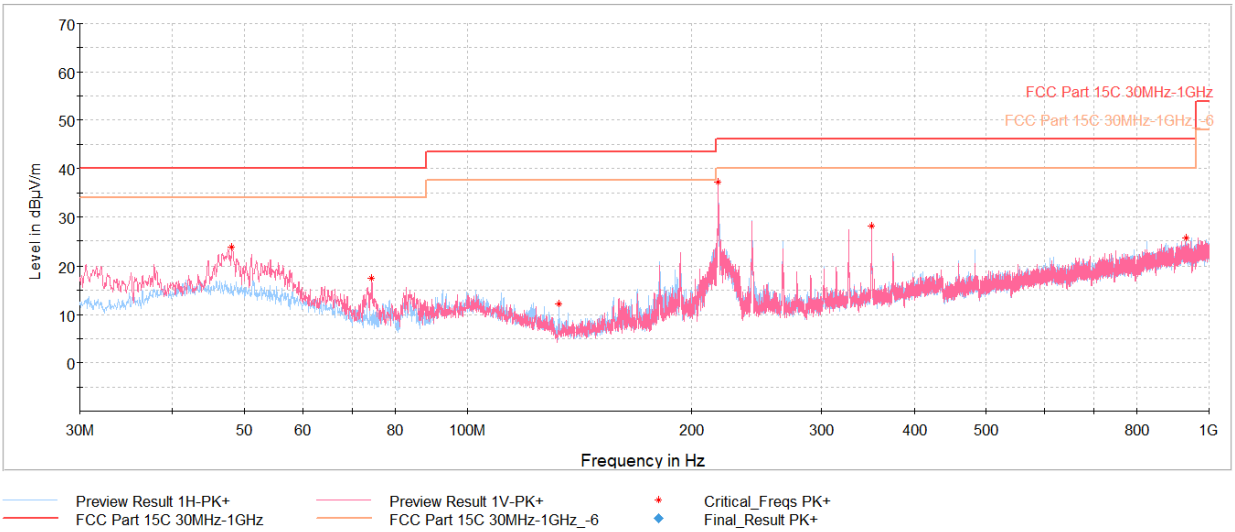
Sample Calculations

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)

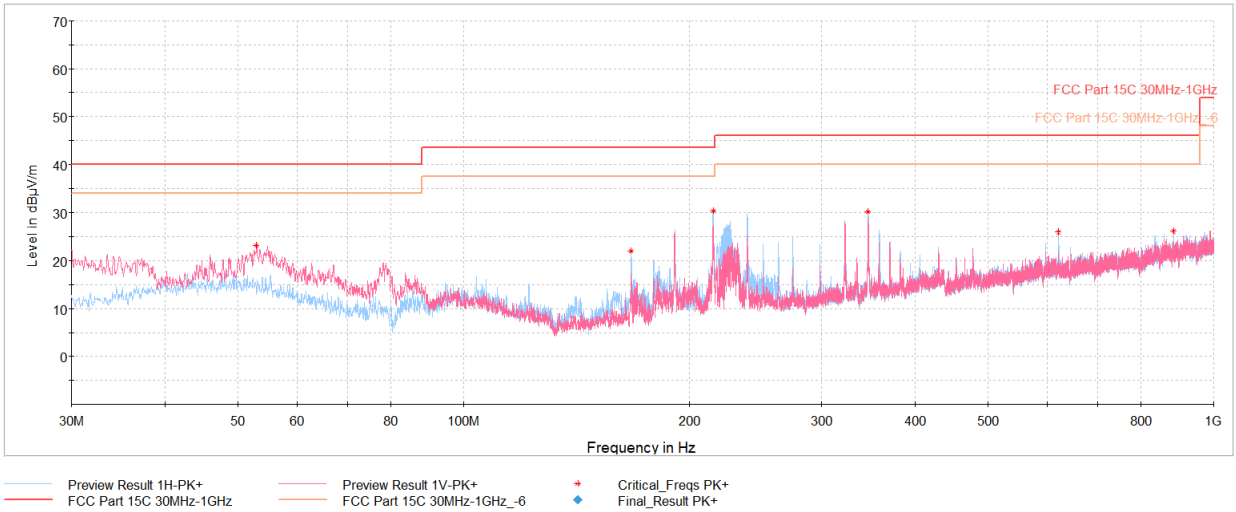
§15.209



Plot 7-122. Radiated Spurious Emissions Below 1GHz (NB UNII BDR – 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]
48.14	Max Peak	V	200	310	-69.54	-13.54	23.92	40.00	-16.08
74.28	Max Peak	V	300	14	-68.58	-20.88	17.54	40.00	-22.46
132.92	Max Peak	H	300	198	-74.26	-20.47	12.27	43.52	-31.25
217.50	Max Peak	V	100	327	-52.42	-17.39	37.19	46.02	-8.83
350.44	Max Peak	V	100	139	-65.48	-13.40	28.12	46.02	-17.90
932.59	Max Peak	H	300	342	-78.01	-3.40	25.59	46.02	-20.43

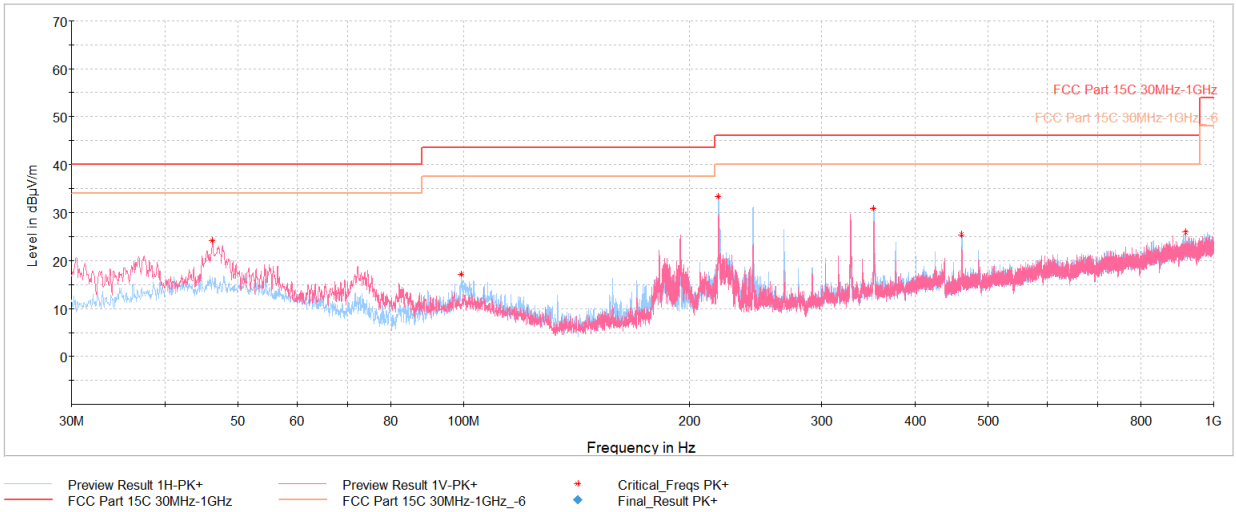
Table 7-33. Radiated Spurious Emissions Below 1GHz (NB UNII BDR – 5201MHz), with AC/DC Adapter and USB-C Cable



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]
52.99	Max Peak	V	100	6	-69.61	-14.14	23.25	40.00	-16.75
167.06	Max Peak	H	200	199	-65.18	-19.83	21.99	43.52	-21.53
214.83	Max Peak	H	100	321	-59.19	-17.56	30.25	43.52	-13.27
345.98	Max Peak	H	100	3	-63.52	-13.42	30.06	46.02	-15.96
620.34	Max Peak	H	200	295	-72.52	-8.54	25.94	46.02	-20.08
883.65	Max Peak	H	100	150	-76.72	-4.18	26.10	46.02	-19.92

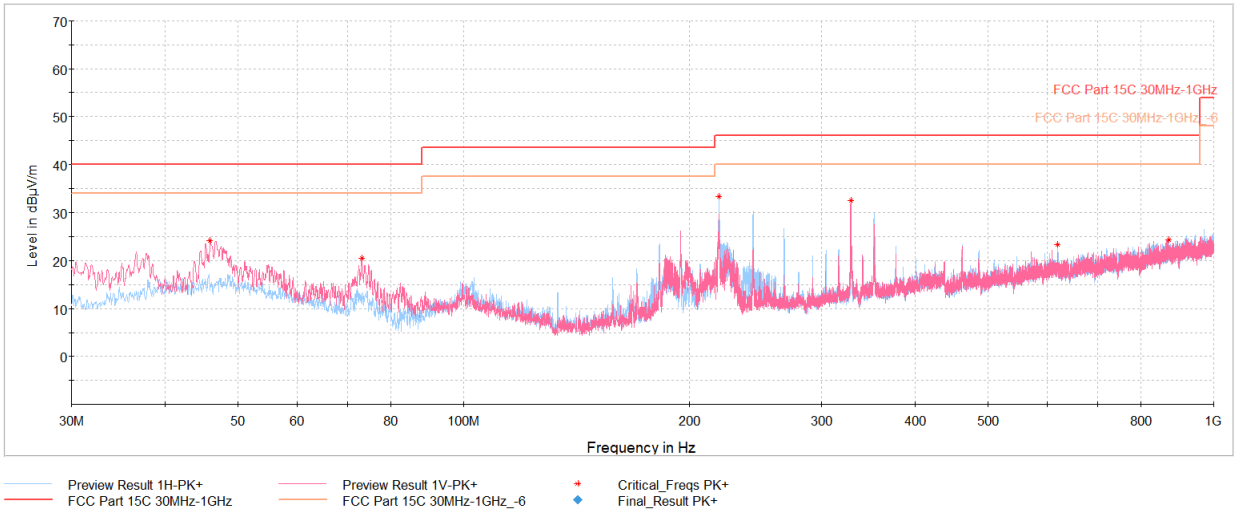
Table 7-34. Radiated Spurious Emissions Below 1GHz (NB UNII LE2M – 5201MHz), with AC/DC Adapter and USB-C Cable



Plot 7-124. Radiated Spurious Emissions Below 1GHz (NB UNII HDR4 – 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]
46.30	Max Peak	V	100	333	-69.20	-13.50	24.30	40.00	-15.70
99.31	Max Peak	H	200	353	-72.57	-17.20	17.23	43.52	-26.29
218.47	Max Peak	H	100	328	-56.42	-17.30	33.28	46.02	-12.74
352.09	Max Peak	H	100	50	-62.76	-13.50	30.74	46.02	-15.28
461.41	Max Peak	H	100	149	-69.98	-11.60	25.42	46.02	-20.60
918.23	Max Peak	V	300	260	-77.54	-3.50	25.96	46.02	-20.06

Table 7-35. Radiated Spurious Emissions Below 1GHz (NB UNII HDR4 – 5201MHz), with AC/DC Adapter and USB-C Cable



Plot 7-125. Radiated Spurious Emissions Below 1GHz (NB UNII HDRp4 – 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]
45.96	Max Peak	V	100	326	-69.35	-13.51	24.14	40.00	-15.86
73.21	Max Peak	V	100	326	-66.08	-20.47	20.45	40.00	-19.55
218.71	Max Peak	H	100	312	-56.36	-17.34	33.30	46.02	-12.72
327.89	Max Peak	V	100	285	-60.33	-14.20	32.47	46.02	-13.55
619.71	Max Peak	H	100	289	-75.01	-8.54	23.45	46.02	-22.57
870.65	Max Peak	H	300	312	-78.34	-4.20	24.46	46.02	-21.56

Table 7-36. Radiated Spurious Emissions Below 1GHz (NB UNII HDRp4 – 5245MHz), 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.

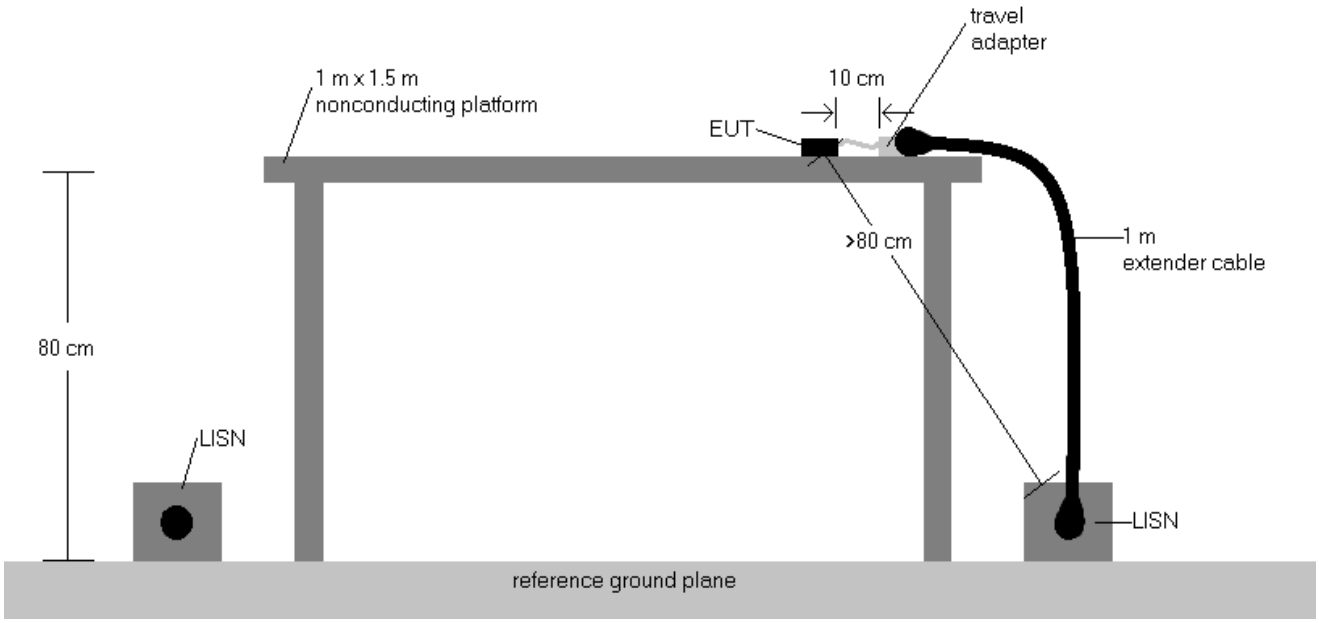
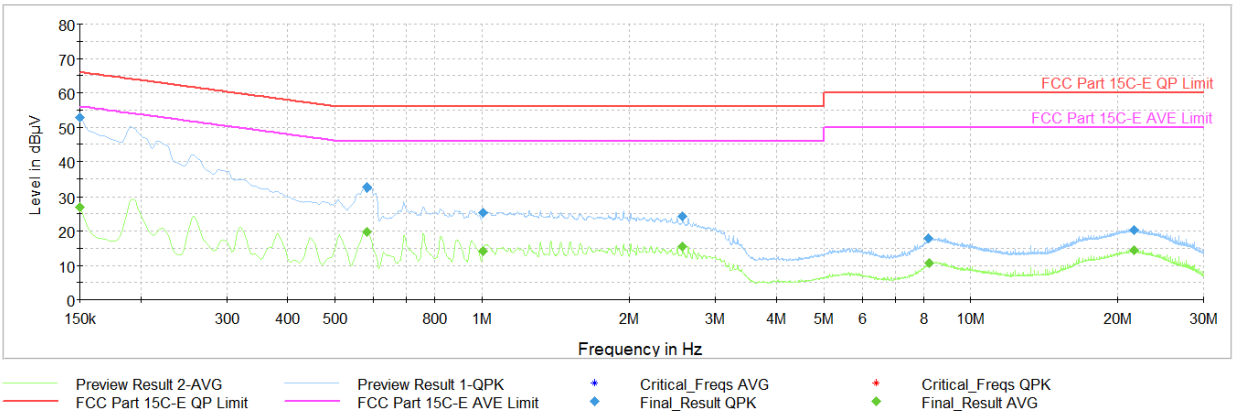


Figure 7-8. Test Instrument & Measurement Setup

Test Notes

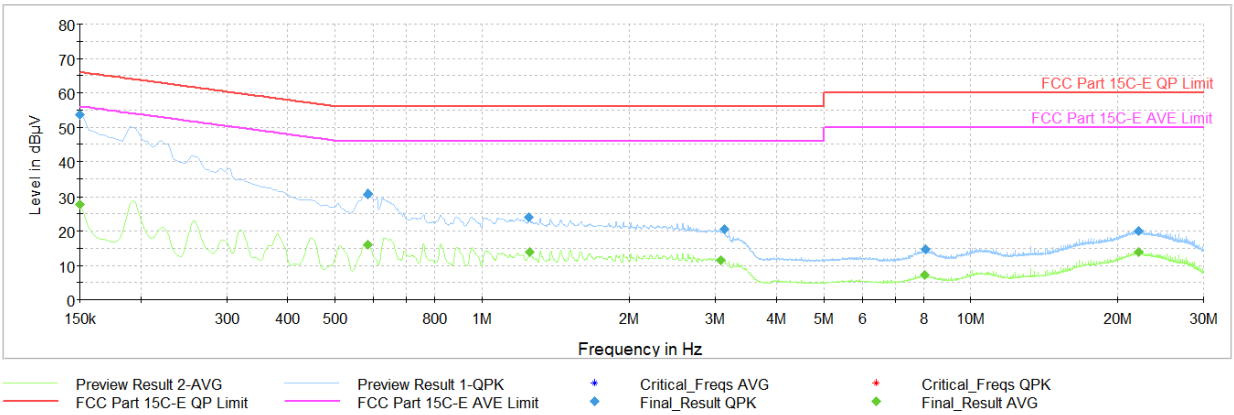
1. All modes of operation were investigated and the worst-case emissions are reported. The emissions found were not affected by the choice of channel used during testing.
2. Both configurations below were investigated, and the worst case has been reported.
    a. EUT charged by charging case and powered 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 – 5201MHz) (L1) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.150	FINAL	—	26.89	56.00	-29.11	L1	GND
0.150	FINAL	52.8	—	66.00	-13.17	L1	GND
0.582	FINAL	—	19.64	46.00	-26.36	L1	GND
0.582	FINAL	32.5	—	56.00	-23.51	L1	GND
1.007	FINAL	—	14.10	46.00	-31.90	L1	GND
1.007	FINAL	25.4	—	56.00	-30.58	L1	GND
2.569	FINAL	24.2	—	56.00	-31.78	L1	GND
2.569	FINAL	—	15.33	46.00	-30.67	L1	GND
8.201	FINAL	17.7	—	60.00	-42.26	L1	GND
8.205	FINAL	—	10.62	50.00	-39.38	L1	GND
21.568	FINAL	—	14.33	50.00	-35.67	L1	GND
21.568	FINAL	20.4	—	60.00	-39.62	L1	GND

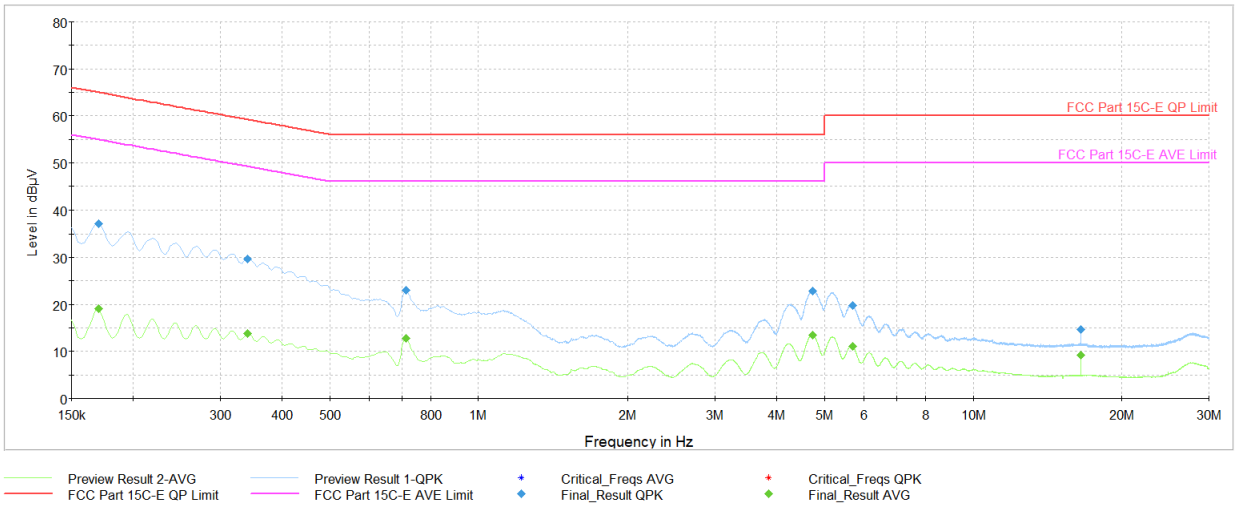
Table 7-38. AC Line Conducted Data (NB UNII BDR – 5201MHz) (L1) with Laptop and USB-C Cable



Plot 7-127. AC Line Conducted Plot (NB UNII BDR – 5201MHz) (N) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.150	FINAL	—	27.77	56.00	-28.23	N	GND
0.150	FINAL	53.7	—	66.00	-12.27	N	GND
0.584	FINAL	—	16.12	46.00	-29.88	N	GND
0.584	FINAL	30.7	—	56.00	-25.33	N	GND
1.250	FINAL	24.0	—	56.00	-32.02	N	GND
1.253	FINAL	—	13.99	46.00	-32.01	N	GND
3.073	FINAL	—	11.42	46.00	-34.58	N	GND
3.127	FINAL	20.6	—	56.00	-35.38	N	GND
8.057	FINAL	—	7.22	50.00	-42.78	N	GND
8.066	FINAL	14.6	—	60.00	-45.42	N	GND
22.040	FINAL	—	13.94	50.00	-36.06	N	GND
22.040	FINAL	20.0	—	60.00	-39.96	N	GND

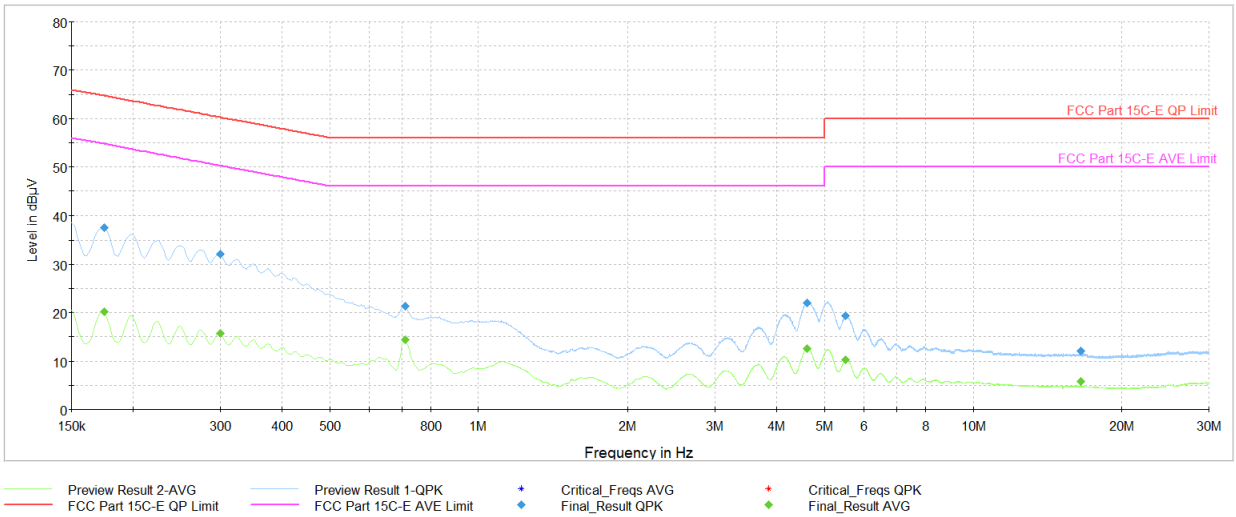
Table 7-39. AC Line Conducted (NB UNII BDR – 5201MHz) (N) with Laptop and USB-C Cable



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

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.170	FINAL	—	19.04	54.95	-35.90	L1	GND
0.170	FINAL	37.1	—	64.95	-27.85	L1	GND
0.341	FINAL	—	13.76	49.17	-35.41	L1	GND
0.341	FINAL	29.7	—	59.17	-29.49	L1	GND
0.713	FINAL	—	12.87	46.00	-33.13	L1	GND
0.713	FINAL	23.0	—	56.00	-33.00	L1	GND
4.729	FINAL	22.9	—	56.00	-33.10	L1	GND
4.729	FINAL	—	13.52	46.00	-32.48	L1	GND
5.708	FINAL	19.7	—	60.00	-40.27	L1	GND
5.708	FINAL	—	11.05	50.00	-38.95	L1	GND
16.528	FINAL	—	9.27	50.00	-40.73	L1	GND
16.528	FINAL	14.6	—	60.00	-45.38	L1	GND

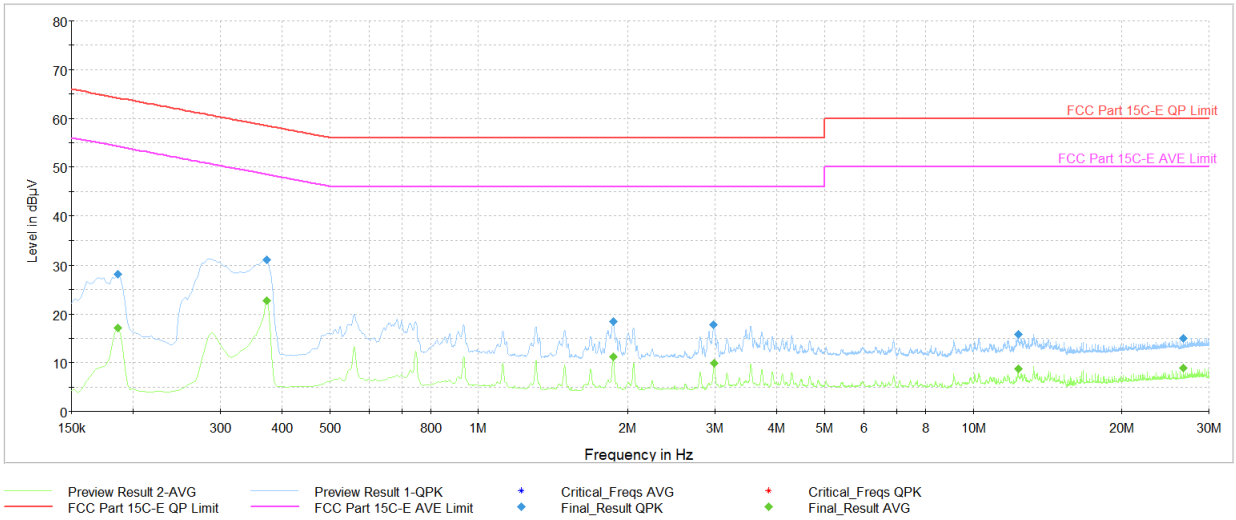
Table 7-40. AC Line Conducted Data (NB UNII LE2M – 5201MHz) (L1) with AC/DC Adapter and USB-C Cable



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

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.175	FINAL	—	20.20	54.73	-34.53	N	GND
0.175	FINAL	37.4	—	64.73	-27.34	N	GND
0.301	FINAL	—	15.76	50.22	-34.46	N	GND
0.301	FINAL	32.1	—	60.22	-28.13	N	GND
0.710	FINAL	—	14.41	46.00	-31.59	N	GND
0.710	FINAL	21.4	—	56.00	-34.58	N	GND
4.610	FINAL	22.1	—	56.00	-33.92	N	GND
4.610	FINAL	—	12.53	46.00	-33.47	N	GND
5.519	FINAL	19.3	—	60.00	-40.68	N	GND
5.519	FINAL	—	10.19	50.00	-39.81	N	GND
16.517	FINAL	—	5.74	50.00	-44.26	N	GND
16.519	FINAL	12.1	—	60.00	-47.89	N	GND

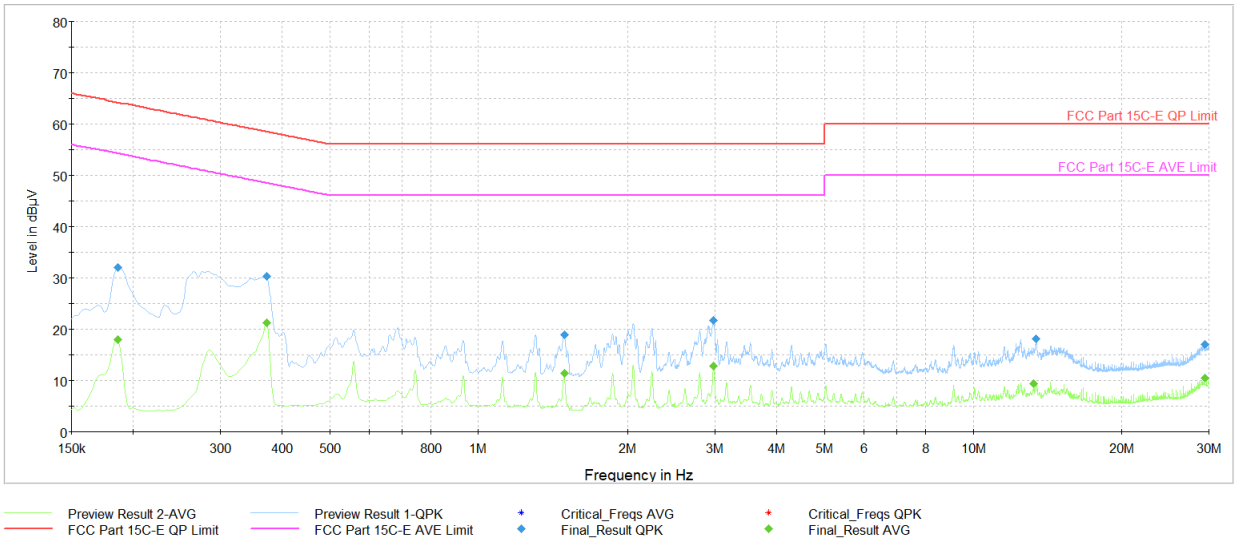
Table 7-41. AC Line Conducted (NB UNII LE2M – 5201MHz) (N) with AC/DC Adapter and USB-C Cable



Plot 7-130. AC Line Conducted Plot (NB UNII HDR4 – 5201MHz) (L1) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.186	FINAL	—	17.13	54.21	-37.08	L1	GND
0.186	FINAL	28.1	—	64.21	-36.10	L1	GND
0.373	FINAL	—	22.79	48.44	-25.65	L1	GND
0.373	FINAL	31.2	—	58.44	-27.25	L1	GND
1.867	FINAL	—	11.16	46.00	-34.84	L1	GND
1.867	FINAL	18.5	—	56.00	-37.55	L1	GND
2.983	FINAL	17.8	—	56.00	-38.22	L1	GND
2.985	FINAL	—	9.94	46.00	-36.06	L1	GND
12.323	FINAL	15.7	—	60.00	-44.28	L1	GND
12.323	FINAL	—	8.78	50.00	-41.22	L1	GND
26.671	FINAL	—	8.92	50.00	-41.08	L1	GND
26.671	FINAL	15.0	—	60.00	-45.02	L1	GND

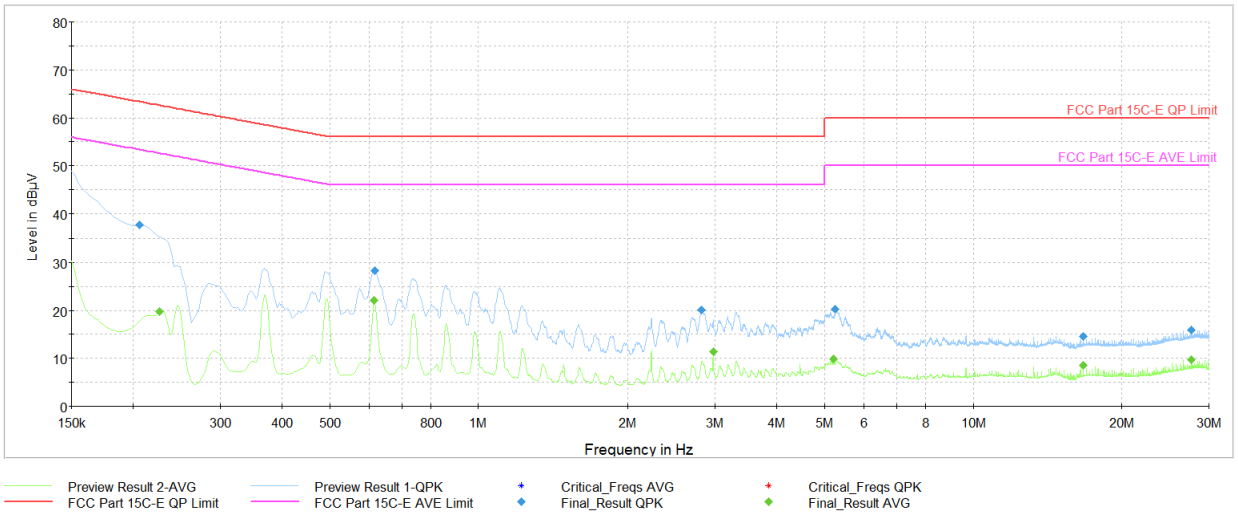
Table 7-42. AC Line Conducted Data (NB UNII HDR4 – 5201MHz) (L1) with Laptop and USB-C Cable



Plot 7-131. AC Line Conducted Plot (NB UNII HDR4 – 5201MHz) (N) with Laptop and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.186	FINAL	—	18.02	54.21	-36.19	N	GND
0.186	FINAL	32.2	—	64.21	-32.07	N	GND
0.373	FINAL	—	21.30	48.44	-27.14	N	GND
0.373	FINAL	30.3	—	58.44	-28.12	N	GND
1.491	FINAL	—	11.35	46.00	-34.65	N	GND
1.493	FINAL	18.9	—	56.00	-37.07	N	GND
2.981	FINAL	21.8	—	56.00	-34.21	N	GND
2.981	FINAL	—	12.77	46.00	-33.23	N	GND
13.272	FINAL	—	9.46	50.00	-40.54	N	GND
13.425	FINAL	18.2	—	60.00	-41.84	N	GND
29.396	FINAL	—	10.49	50.00	-39.51	N	GND
29.396	FINAL	17.0	—	60.00	-43.00	N	GND

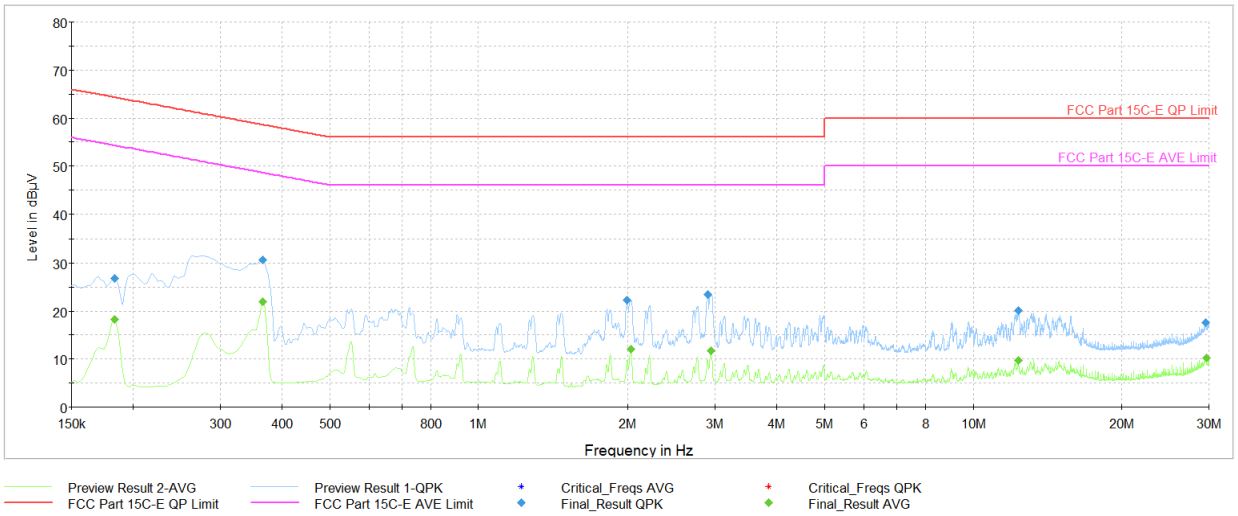
Table 7-43. AC Line Conducted (NB UNII HDR4 – 5201MHz) (N) with Laptop and USB-C Cable



Plot 7-132. AC Line Conducted Plot (NB UNII HDRp4 – 5245MHz) (L1) with AC/DC Adapter and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.206	FINAL	37.7	—	63.36	-25.63	L1	GND
0.227	FINAL	—	19.78	52.58	-32.79	L1	GND
0.616	FINAL	—	22.17	46.00	-23.83	L1	GND
0.618	FINAL	28.3	—	56.00	-27.75	L1	GND
2.821	FINAL	20.1	—	56.00	-35.94	L1	GND
2.976	FINAL	—	11.36	46.00	-34.64	L1	GND
5.206	FINAL	—	9.82	50.00	-40.18	L1	GND
5.262	FINAL	20.2	—	60.00	-39.83	L1	GND
16.708	FINAL	14.6	—	60.00	-45.43	L1	GND
16.708	FINAL	—	8.55	50.00	-41.45	L1	GND
27.618	FINAL	—	9.63	50.00	-40.37	L1	GND
27.618	FINAL	15.8	—	60.00	-44.16	L1	GND

Table 7-44. AC Line Conducted Data (NB UNII HDRp4 – 5245MHz) (L1) with AC/DC Adapter and USB-C Cable



Plot 7-133. AC Line Conducted Plot (NB UNII HDRp4 – 5245MHz) (N) with AC/DC Adapter and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.184	FINAL	—	18.18	54.31	-36.14	N	GND
0.184	FINAL	26.9	—	64.31	-37.47	N	GND
0.366	FINAL	—	21.94	48.59	-26.65	N	GND
0.366	FINAL	30.6	—	58.59	-28.00	N	GND
1.993	FINAL	22.3	—	56.00	-33.67	N	GND
2.027	FINAL	—	12.00	46.00	-34.00	N	GND
2.902	FINAL	23.4	—	56.00	-32.57	N	GND
2.945	FINAL	—	11.78	46.00	-34.22	N	GND
12.323	FINAL	—	9.67	50.00	-40.33	N	GND
12.347	FINAL	20.1	—	60.00	-39.90	N	GND
29.571	FINAL	17.5	—	60.00	-42.48	N	GND
29.634	FINAL	—	10.21	50.00	-39.79	N	GND

Table 7-45. AC Line Conducted (NB UNII HDRp4 – 5245MHz) (N) with AC/DC Adapter 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: BCG-A3053** is in compliance with Part 15 Subpart E (15.407) of the FCC Rules.