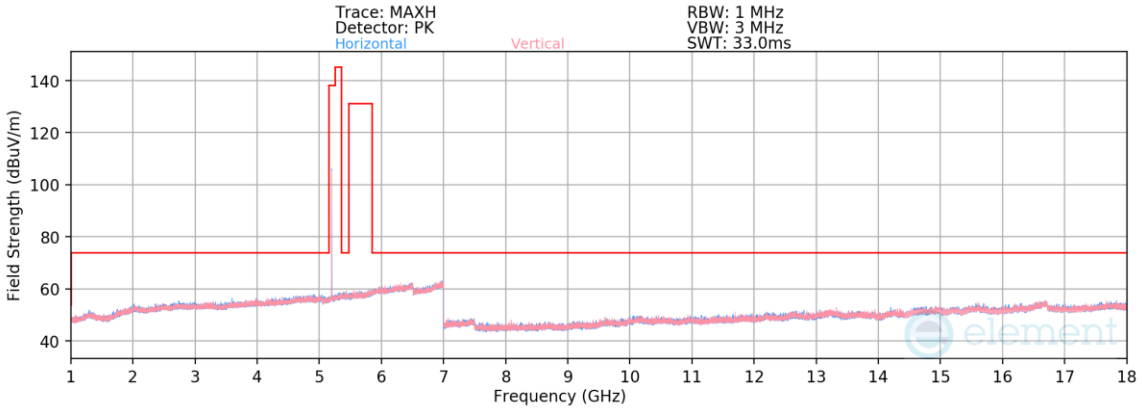
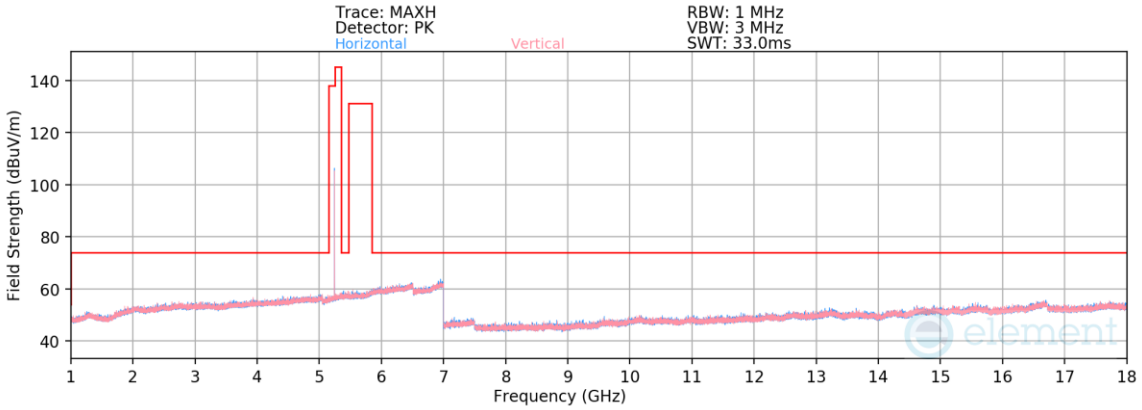


Plot 7-82. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5201MHz)

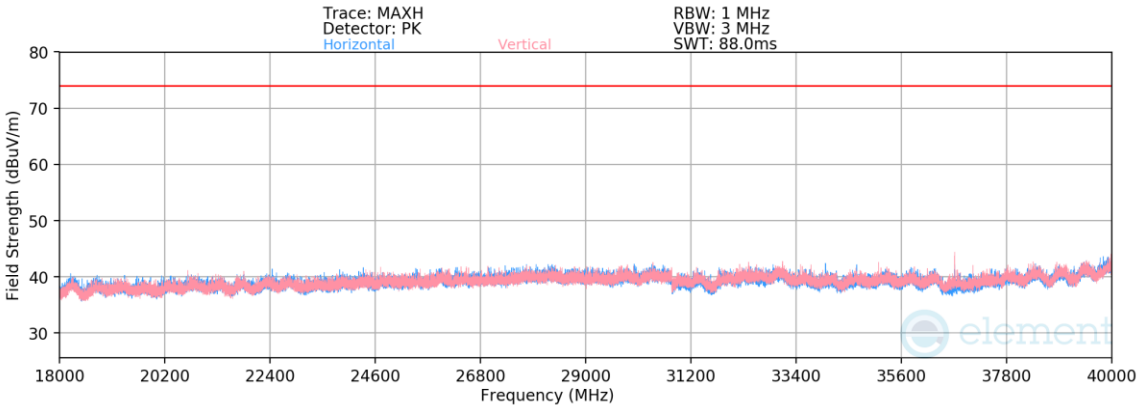
Mode:	HDR4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5201MHz

	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	V	-	-	-68.99	11.12	49.13	68.23	-19.10
*	15603.00	Avg	V	-	-	-81.25	15.57	41.32	53.98	-12.66
*	15603.00	Peak	V	-	-	-69.91	15.57	52.66	73.98	-21.32

Table 7-15. Radiated Spurious Emissions Measurements



Plot 7-83. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5245MHz)

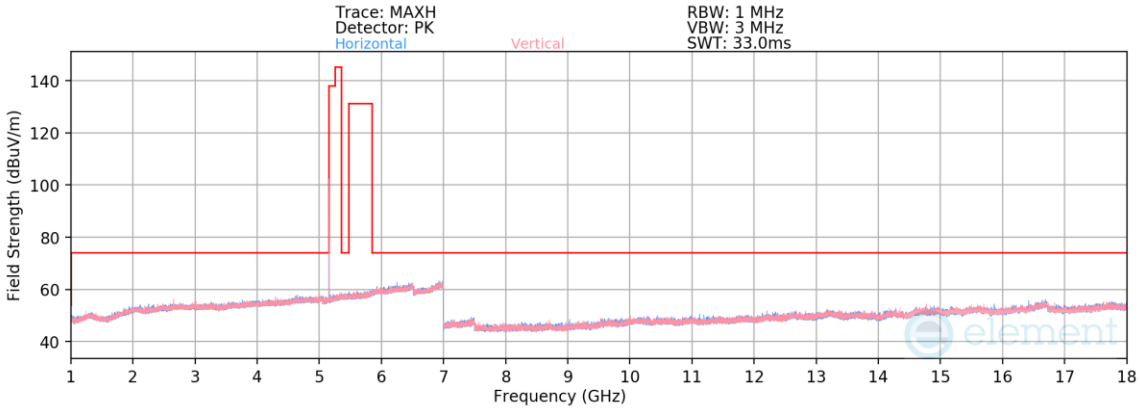


Plot 7-84. Radiated Spurious Emissions 18-40GHz (NB UNII HDR4 – 5245MHz)

Mode:	HDR4
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	V	-	-	-69.54	11.77	0.00	49.23	68.23	-19.00
*	15735.00	Avg	V	-	-	-80.95	15.38	0.00	41.43	53.98	-12.55
*	15735.00	Peak	V	-	-	-69.41	15.38	0.00	52.97	73.98	-21.01
*	20980.00	Avg	V	-	-	-71.01	-6.74	0.00	29.25	53.98	-24.73
*	20980.00	Peak	V	-	-	-59.37	-6.74	0.00	40.89	73.98	-33.09
	26225.00	Peak	V	34	58	-59.08	-4.48	0.00	43.44	68.23	-24.79
*	31470.00	Avg	V	252	136	-72.67	-2.30	1.08	33.11	53.98	-20.87
*	31470.00	Peak	V	252	136	-61.83	-2.30	0.00	42.87	73.98	-31.11
	36715.00	Peak	V	356	120	-52.64	-6.23	0.00	48.13	68.23	-20.10

Table 7-16. Radiated Spurious Emissions Measurements

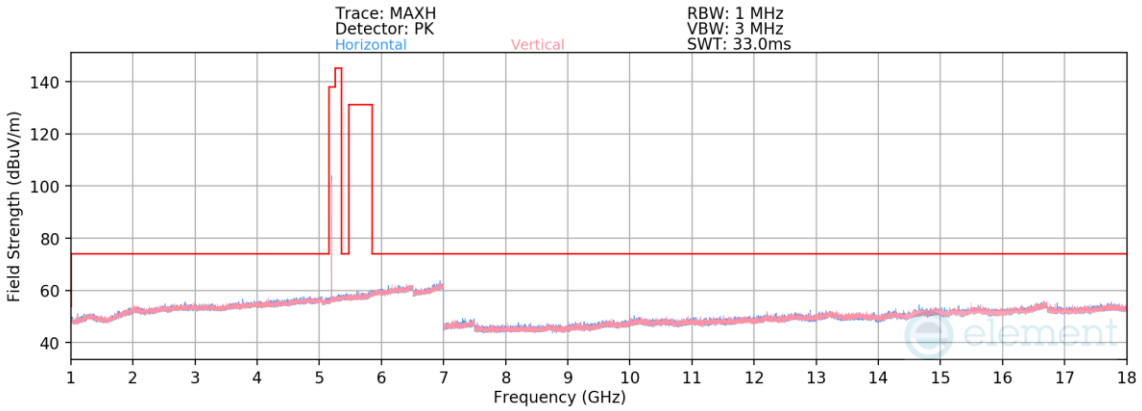


Plot 7-85. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5157MHz)

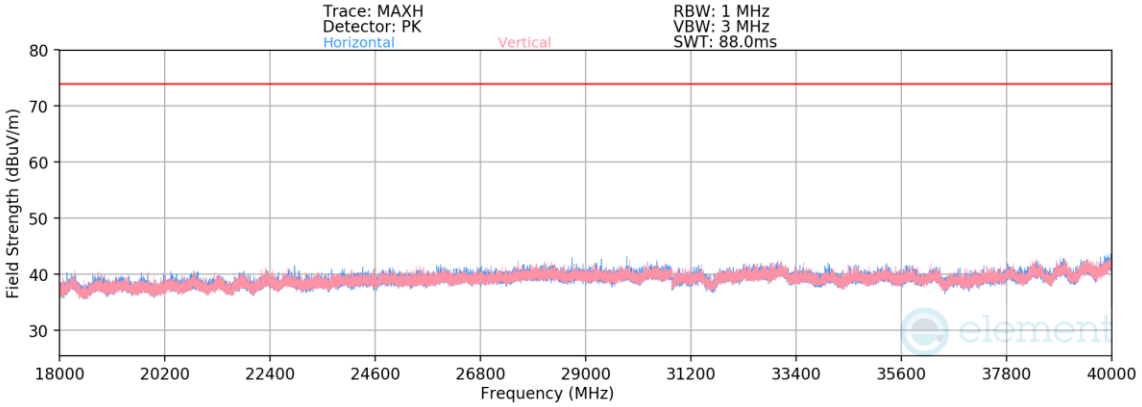
Mode:	HDRp4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5157MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10314.00	Peak	H	-	-	-68.81	10.68	48.87	68.23	-19.36
*	15471.00	Avg	H	-	-	-80.45	14.50	41.05	53.98	-12.93
*	15471.00	Peak	H	-	-	-69.99	14.50	51.51	73.98	-22.47

Table 7-17. Radiated Spurious Emissions Measurements



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

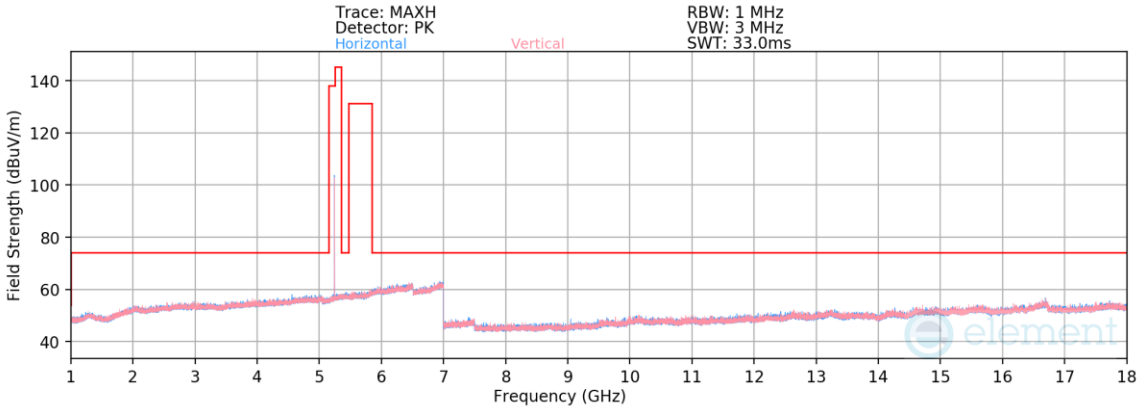


Plot 7-87. Radiated Spurious Emissions 18-40GHz (NB UNII HDRp4 – 5201MHz)

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	-	-	-68.80	11.04	49.24	68.23	-18.99
*	15603.00	Avg	H	-	-	-81.45	15.92	42.07	53.98	-11.91
*	15603.00	Peak	H	-	-	-70.67	15.92	52.25	73.98	-21.73
*	20804.00	Avg	H	-	-	-70.73	-6.81	29.46	53.98	-24.52
*	20804.00	Peak	H	-	-	-59.05	-6.81	41.14	73.98	-32.84
	26005.00	Peak	H	-	-	-60.97	-4.47	41.56	68.23	-32.42
*	31206.00	Avg	H	-	-	-73.71	-2.49	30.80	53.98	-23.18
*	31206.00	Peak	H	-	-	-61.84	-2.49	42.67	73.98	-31.31
	36407.00	Peak	V	2	206	-56.91	-6.38	43.71	68.23	-30.27

Table 7-18. Radiated Spurious Emissions Measurements

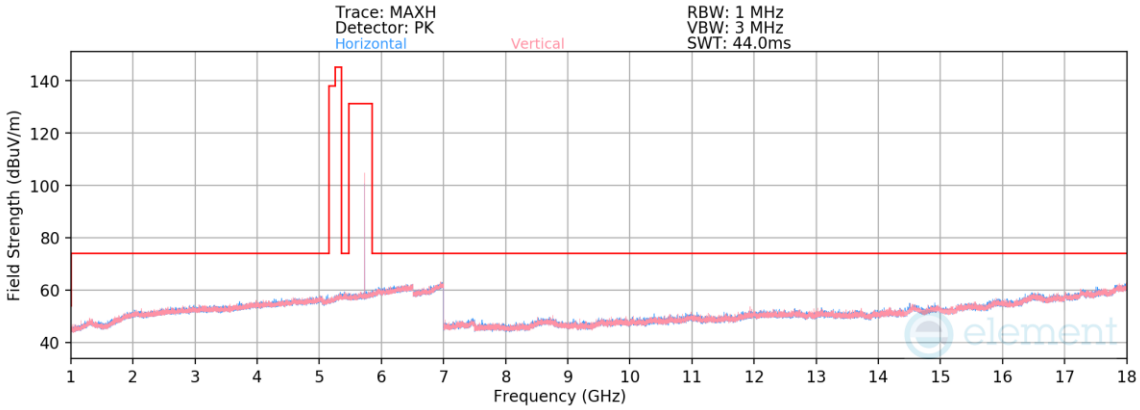


Plot 7-88. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5245MHz)

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]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10490.00	Peak	H	-	-	-69.51	11.60	49.09	68.23	-19.14
*	15735.00	Avg	H	-	-	-80.79	15.25	42.06	53.98	-11.92
*	15735.00	Peak	H	-	-	-70.67	15.25	51.58	73.98	-22.40

Table 7-19. Radiated Spurious Emissions Measurements

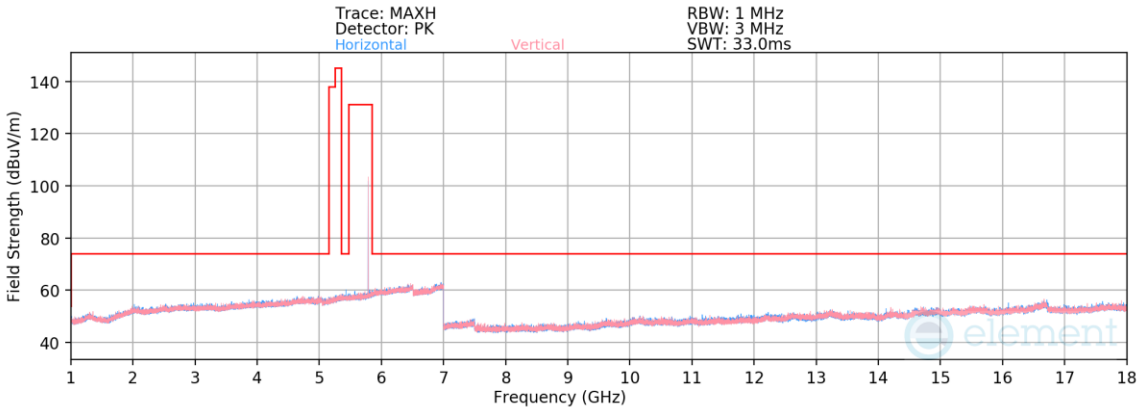


Plot 7-89. Radiated Spurious Emissions 1-18GHz (NB UNII BDR – 5731MHz)

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]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11462.00	Avg	H	258	140	-79.23	13.25	1.16	42.18	53.98	-11.80
*	11462.00	Peak	H	258	140	-69.53	13.25	0.00	50.72	73.98	-23.26
	17193.00	Peak	H	-	-	-75.67	22.87	0.00	54.20	68.23	-14.03

Table 7-20. Radiated Spurious Emissions Measurements

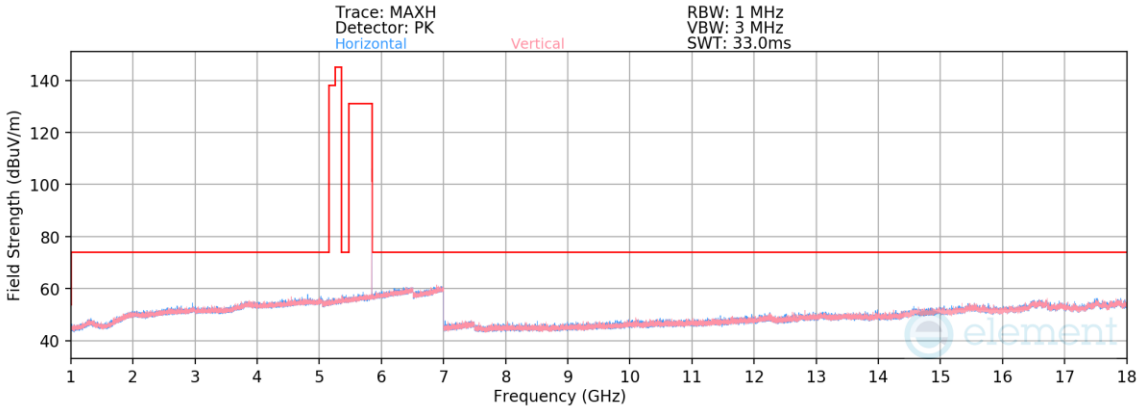


Plot 7-90. Radiated Spurious Emissions 1-18GHz (NB UNII BDR – 5788MHz)

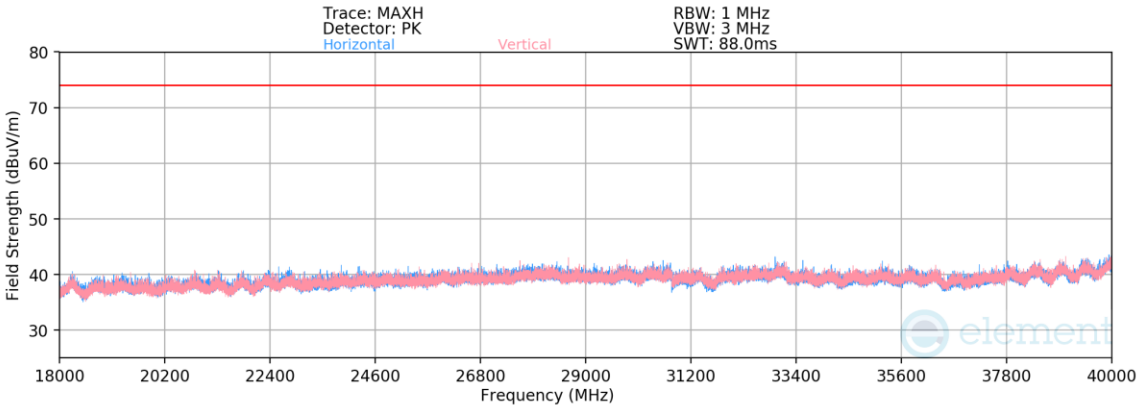
Mode:	BDR
Data Rate:	1Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5788MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11576.00	Avg	H	268	62	-79.95	12.04	1.16	40.25	53.98	-13.73
*	11576.00	Peak	H	268	62	-69.66	12.04	0.00	49.38	73.98	-24.60
	17364.00	Peak	H	-	-	-69.75	17.00	0.00	54.25	68.23	-13.98

Table 7-21. Radiated Spurious Emissions Measurements



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

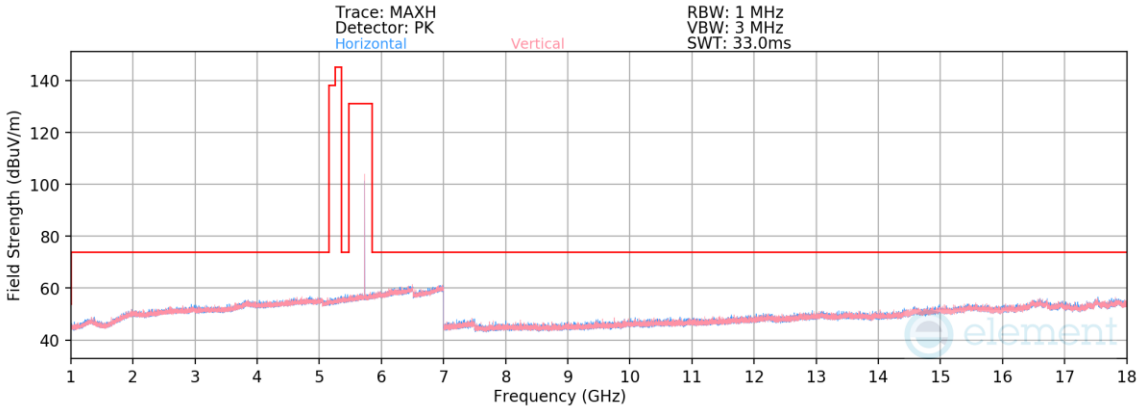


Plot 7-92. Radiated Spurious Emissions 18-40GHz (NB UNII BDR – 5844MHz)

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]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11688.00	Avg	H	-	-	-80.88	13.79	39.91	53.98	-14.07
*	11688.00	Peak	H	-	-	-69.70	13.79	51.09	73.98	-22.89
	17532.00	Peak	H	-	-	-76.19	24.33	55.14	68.23	-13.09
	23376.00	Peak	H	-	-	-60.10	-6.04	40.86	68.23	-27.37
	29220.00	Peak	H	2	225	-61.97	-2.76	42.27	68.23	-25.96
	35064.00	Peak	V	7	169	-60.33	-3.77	42.90	68.23	-25.33

Table 7-22. Radiated Spurious Emissions Measurements

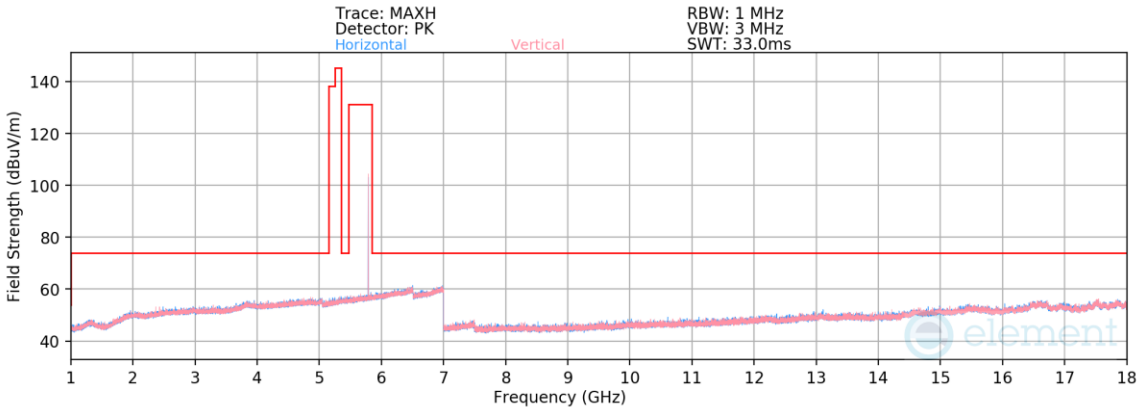


Plot 7-93. Radiated Spurious Emissions 1-18GHz (NB UNII LE2M – 5731MHz)

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]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11462.00	Avg	H	258	224	-79.70	12.06	0.63	39.99	53.98	-13.99
*	11462.00	Peak	H	258	224	-69.09	12.06	0.00	49.97	73.98	-24.01
	17193.00	Peak	H	-	-	-70.45	16.84	0.00	53.39	68.23	-14.84

Table 7-23. Radiated Spurious Emissions Measurements

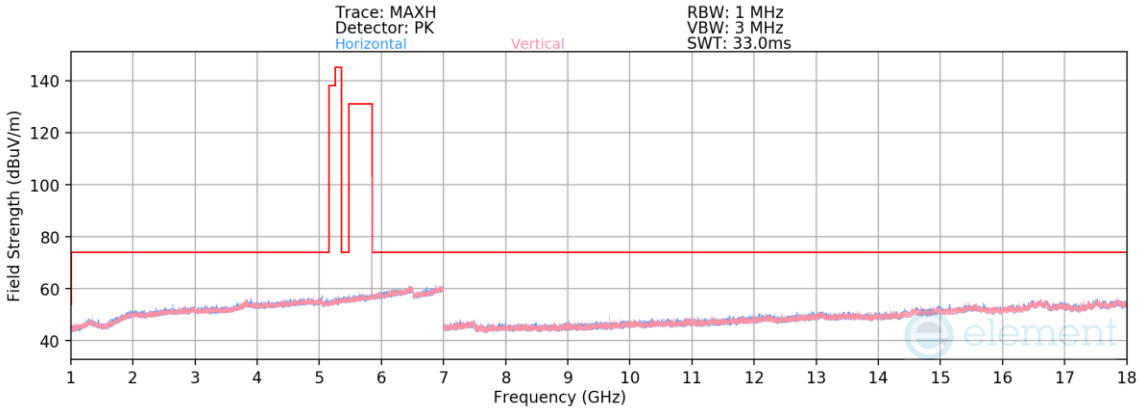


Plot 7-94. Radiated Spurious Emissions 1-18GHz (NB UNII LE2M – 5788MHz)

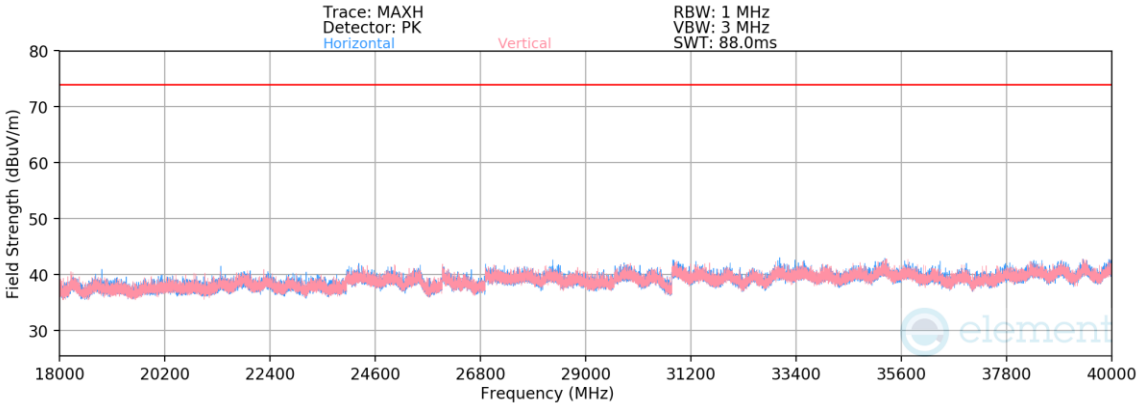
Mode:	LE2M
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5788MHz

	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	265	206	-78.44	9.43	0.63	38.62	53.98	-15.36
*	11576.00	Peak	H	265	206	-68.06	9.43	0.00	48.36	73.98	-25.62
	17364.00	Peak	H	-	-	-69.54	17.03	0.00	54.49	68.23	-13.74

Table 7-24. Radiated Spurious Emissions Measurements



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

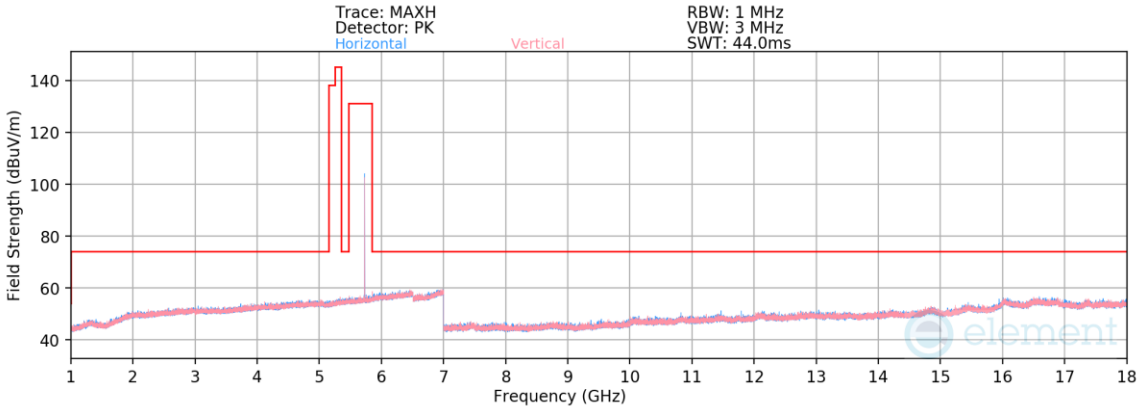


Plot 7 94. Radiated Spurious Emissions 18-40GHz (NB UNII LE2M – 5844MHz)

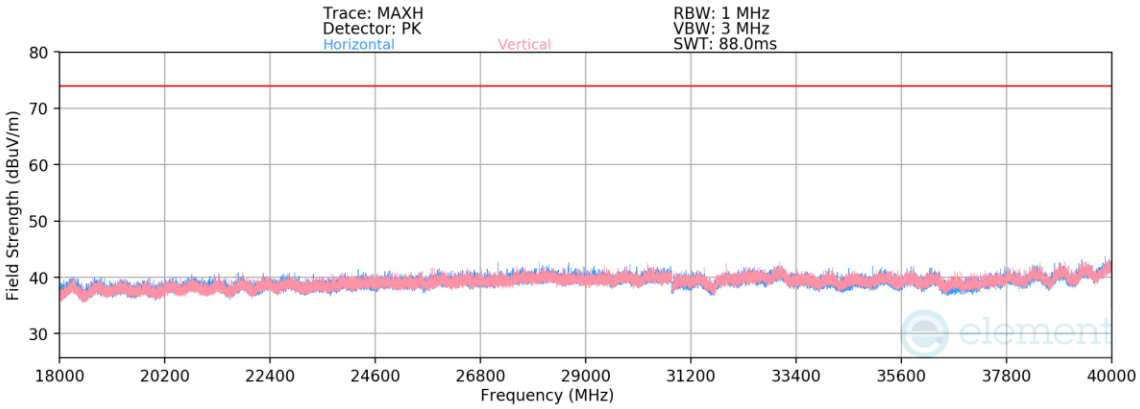
Mode:	LE2M
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5844MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11688.00	Avg	H	-	-	-78.67	9.84	38.17	53.98	-15.81
*	11688.00	Peak	H	-	-	-67.99	9.84	48.85	73.98	-25.13
	17532.00	Peak	H	-	-	-70.18	18.79	55.61	68.23	-12.62

Table 7-25. Radiated Spurious Emissions Measurements



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

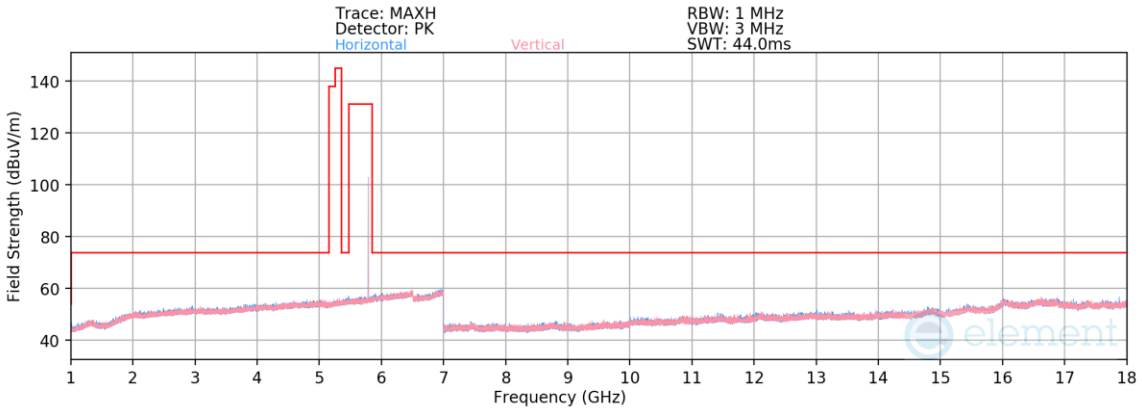


Plot 7-97. Radiated Spurious Emissions 18-40GHz (NB UNII HDR4 – 5731MHz)

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]	Duty Cycle Correction [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11462.00	Avg	V	118	79	-77.70	9.57	1.09	39.96	53.98	-14.02
*	11462.00	Peak	V	118	79	-67.43	9.57	0.00	49.14	73.98	-24.84
	17193.00	Peak	V	-	-	-70.39	18.10	0.00	54.71	68.23	-13.52
*	22924.00	Avg	V	-	-	-71.90	-6.23	0.00	28.87	53.98	-25.11
*	22924.00	Peak	V	-	-	-60.74	-6.23	0.00	40.03	73.98	-33.95
	28655.00	Peak	V	92	112	-60.57	-2.96	0.00	43.47	68.23	-24.76
	34386.00	Peak	V	-	-	-60.92	-3.68	0.00	42.40	68.23	-25.83

Table 7-26. Radiated Spurious Emissions Measurements

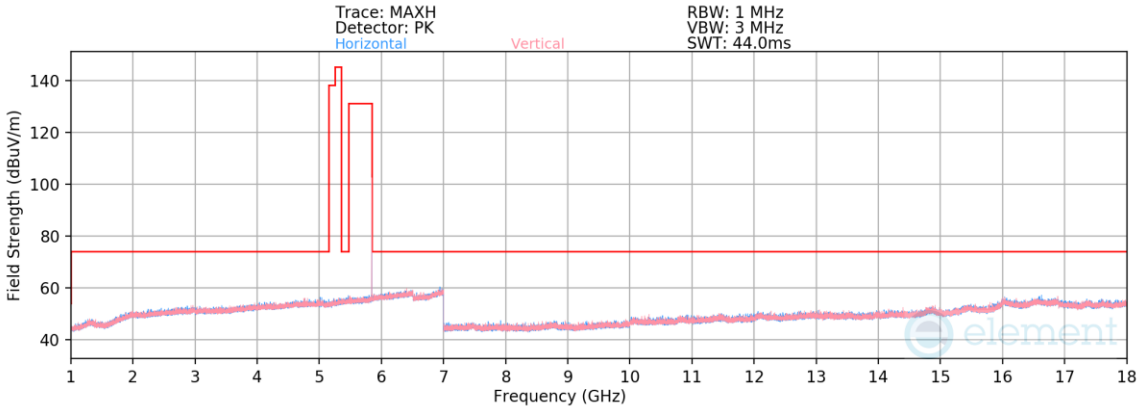


Plot 7-98. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5788MHz)

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	V	-	-	38.26	12.03	38.08	53.98	-15.90
*	11576.00	Peak	V	-	-	38.26	12.03	48.81	73.98	-25.17
	17364.00	Peak	V	-	-	40.89	17.00	55.12	68.23	-13.11

Table 7-27. Radiated Spurious Emissions Measurements

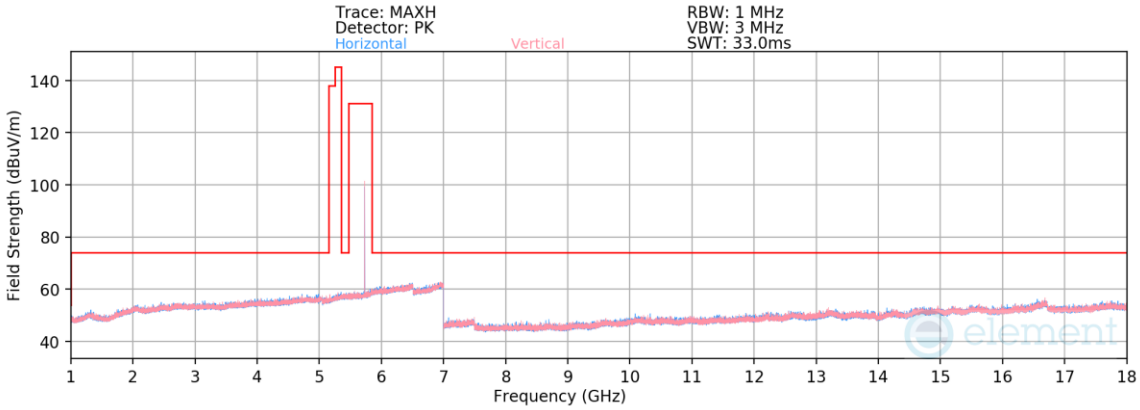


Plot 7-99. Radiated Spurious Emissions 1-18GHz (NB UNII HDR4 – 5844MHz)

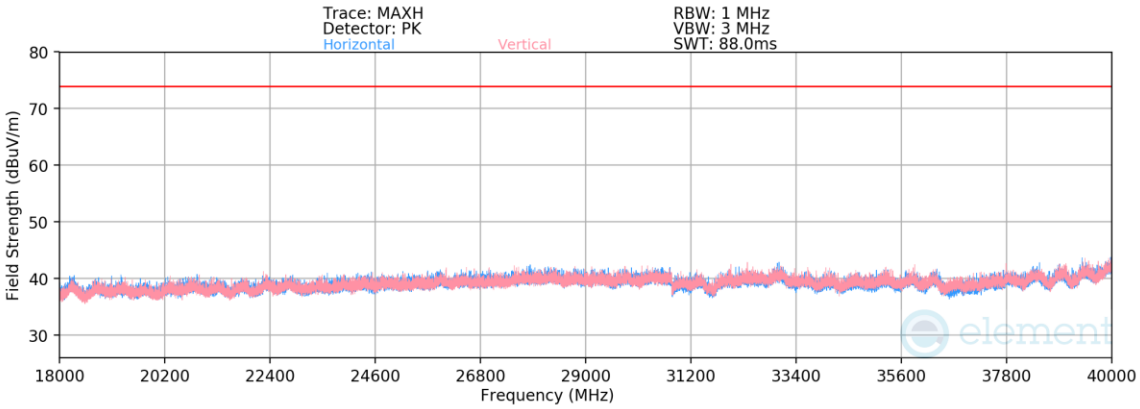
Mode:	HDR4
Data Rate:	4Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5844MHz

	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	V	-	-	-79.23	10.43	38.20	53.98	-15.78
*	11688.00	Peak	V	-	-	-67.97	10.43	49.46	73.98	-24.52
	17532.00	Peak	V	-	-	-70.32	17.54	54.22	68.23	-14.01

Table 7-28. Radiated Spurious Emissions Measurements



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

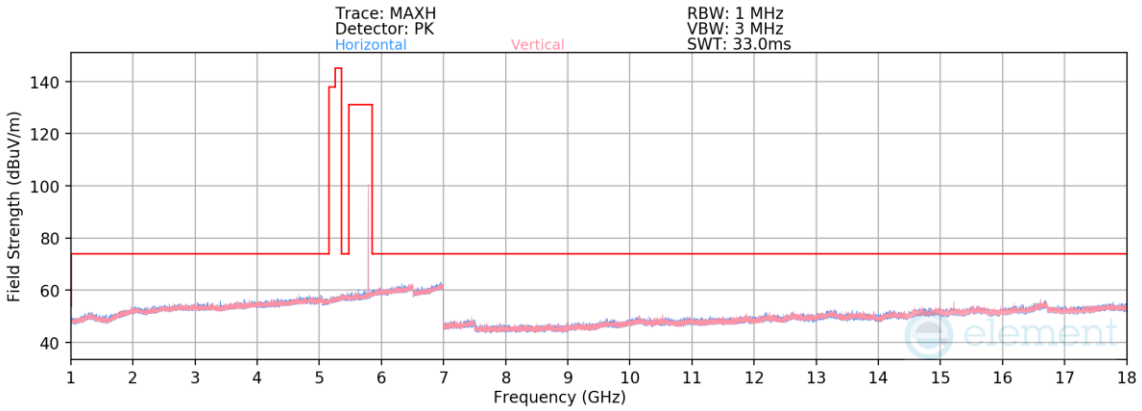


Plot 7-101. Radiated Spurious Emissions 18-40GHz (NB UNII HDRp4 – 5731MHz)

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	-	-	-80.58	12.06	38.48	53.98	-15.50
*	11462.00	Peak	H	-	-	-69.25	12.06	49.81	73.98	-24.17
	17193.00	Peak	H	-	-	-69.77	16.84	54.07	68.23	-14.16
*	22924.00	Avg	H	-	-	-71.35	-6.04	29.61	53.98	-24.37
*	22924.00	Peak	H	-	-	-59.67	-6.04	41.29	73.98	-32.69
	28655.00	Peak	H	340	22	-62.00	-2.76	42.24	68.23	-25.99
	34386.00	Peak	H	-	-	-60.64	-3.77	42.59	68.23	-25.64

Table 7-29. Radiated Spurious Emissions Measurements

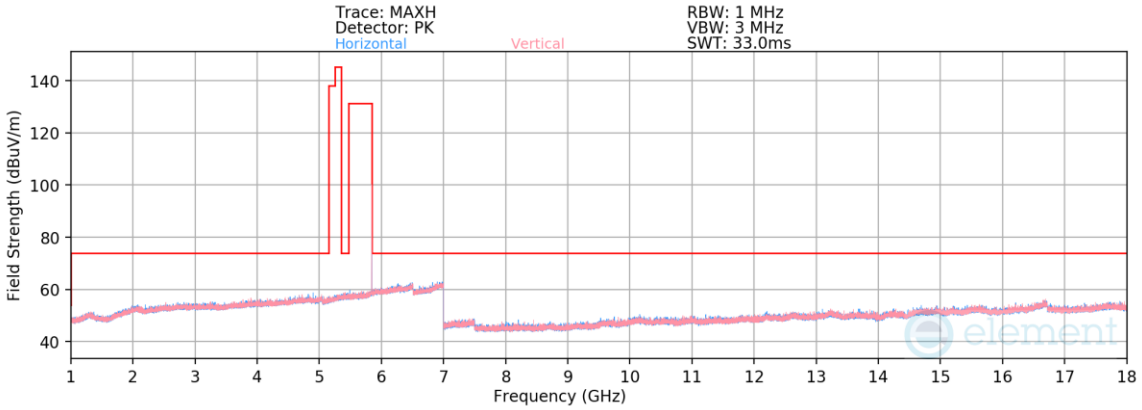


Plot 7-102. Radiated Spurious Emissions 1-18GHz (NB UNII HDRp4 – 5788MHz)

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	-	-	-80.64	12.03	38.39	53.98	-15.59
*	11576.00	Peak	H	-	-	-69.53	12.03	49.50	73.98	-24.48
	17364.00	Peak	H	-	-	-69.93	17.00	54.07	73.98	-19.91

Table 7-30. Radiated Spurious Emissions 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

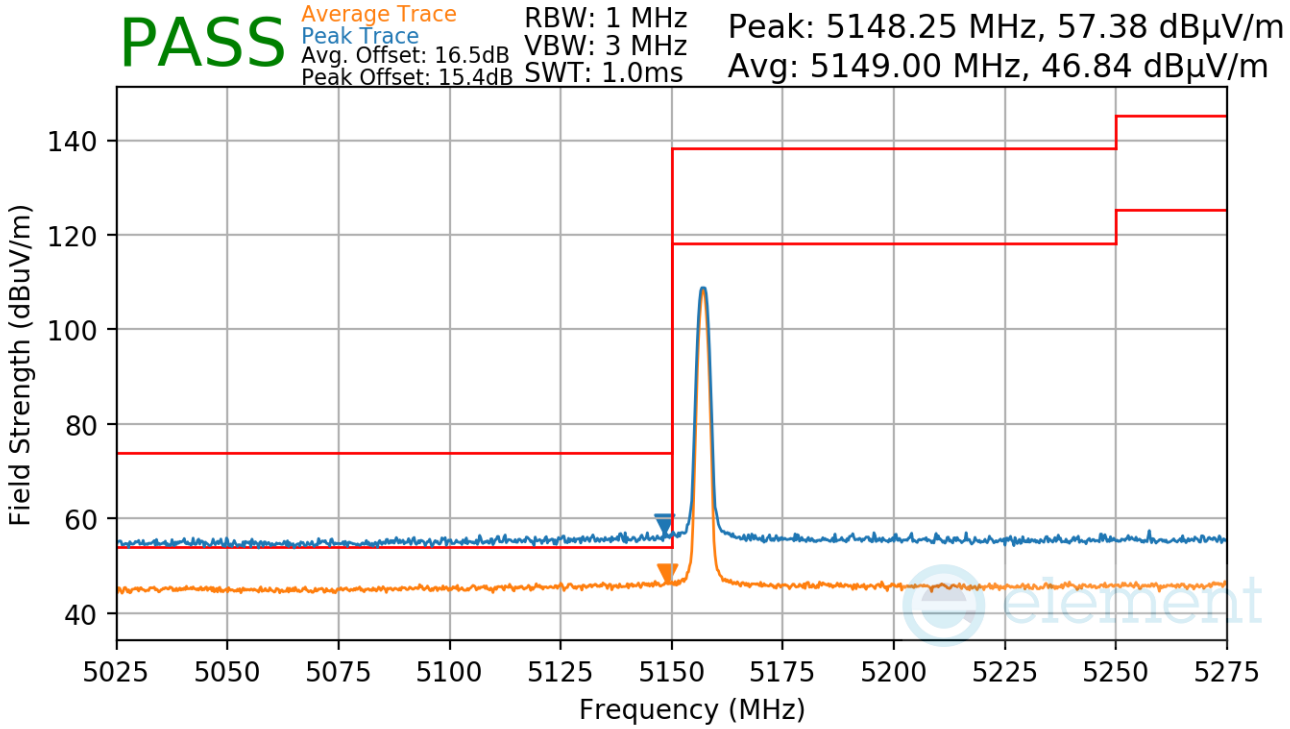
	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11688.00	Avg	H	-	-	-80.50	12.02	38.52	53.98	-15.46
*	11688.00	Peak	H	-	-	-69.78	12.02	49.24	73.98	-24.74
	17532.00	Peak	H	-	-	-70.51	17.68	54.17	73.98	-19.81

Table 7-31. Radiated Spurious Emissions Measurements

Radiated Band Edge Measurements

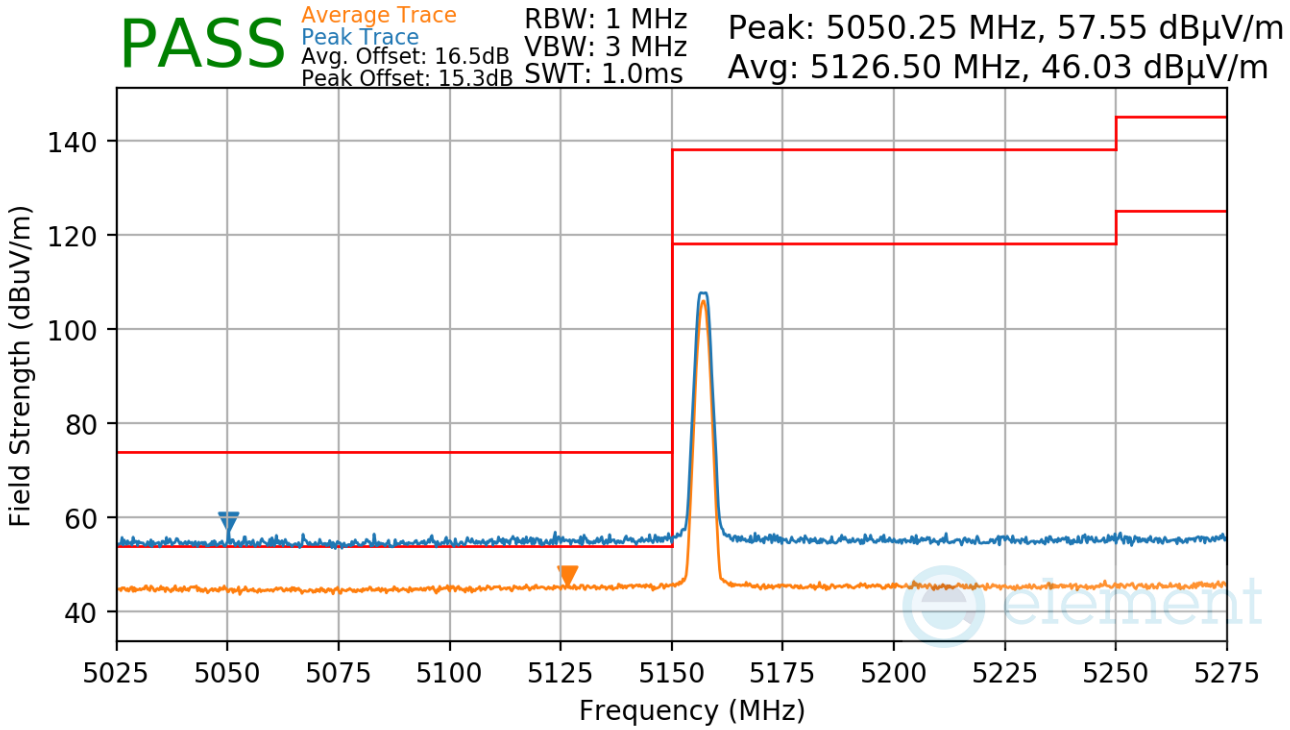
§15.407(b.1) §15.205 §15.209

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



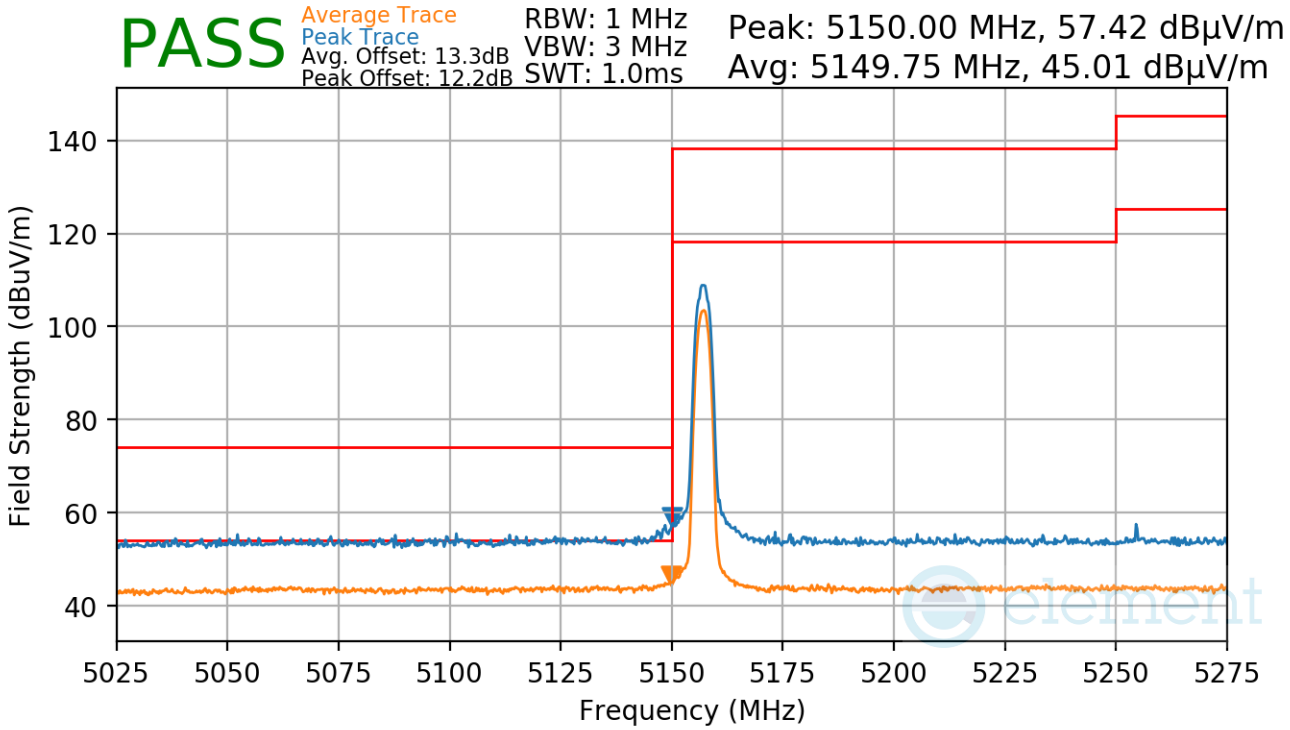
Plot 7-104. Radiated Lower Band Edge Measurement

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



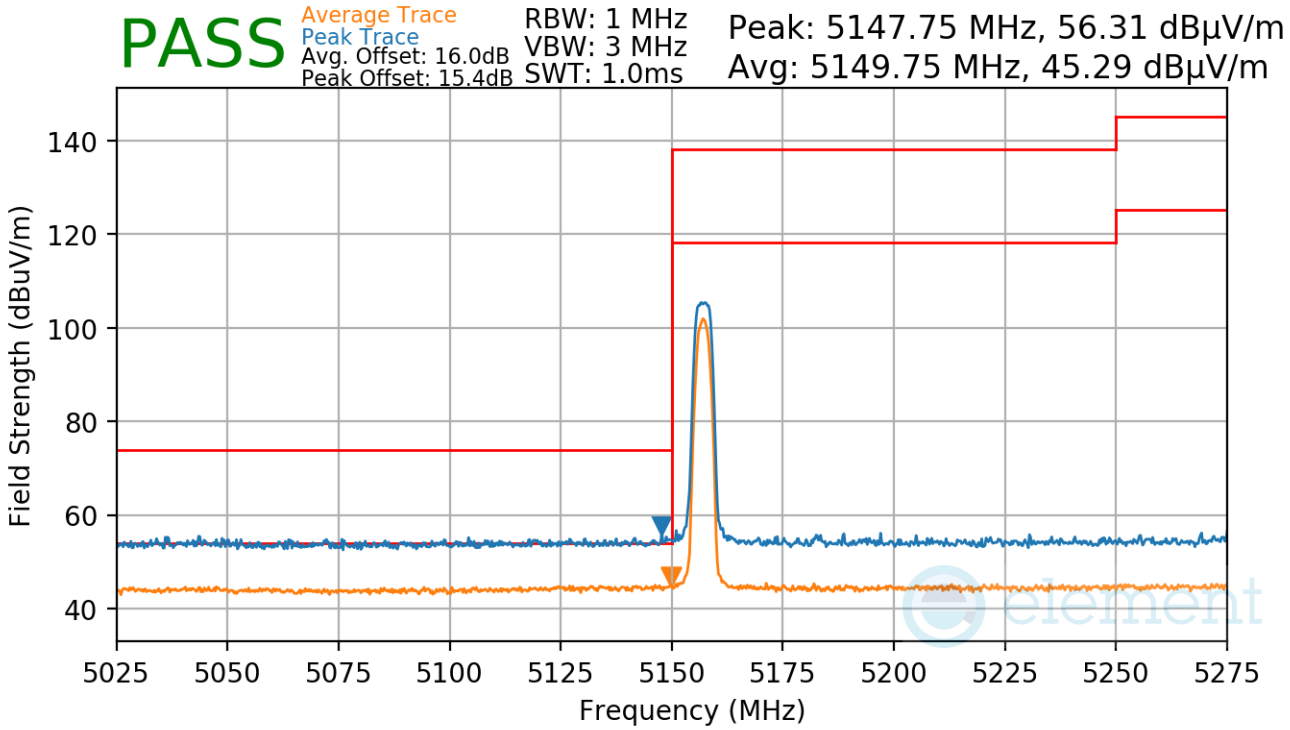
Plot 7-105. Radiated Lower Band Edge Measurement

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



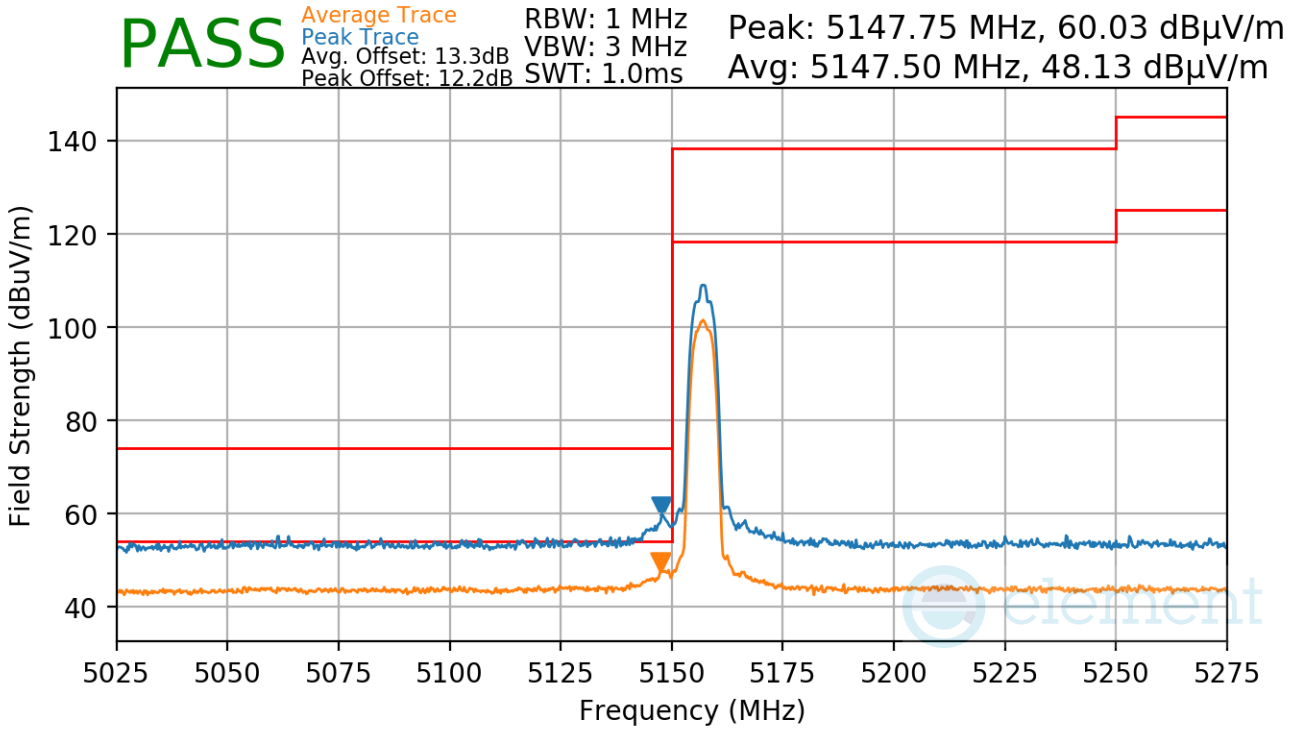
Plot 7-106. Radiated Lower Band Edge Measurement

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



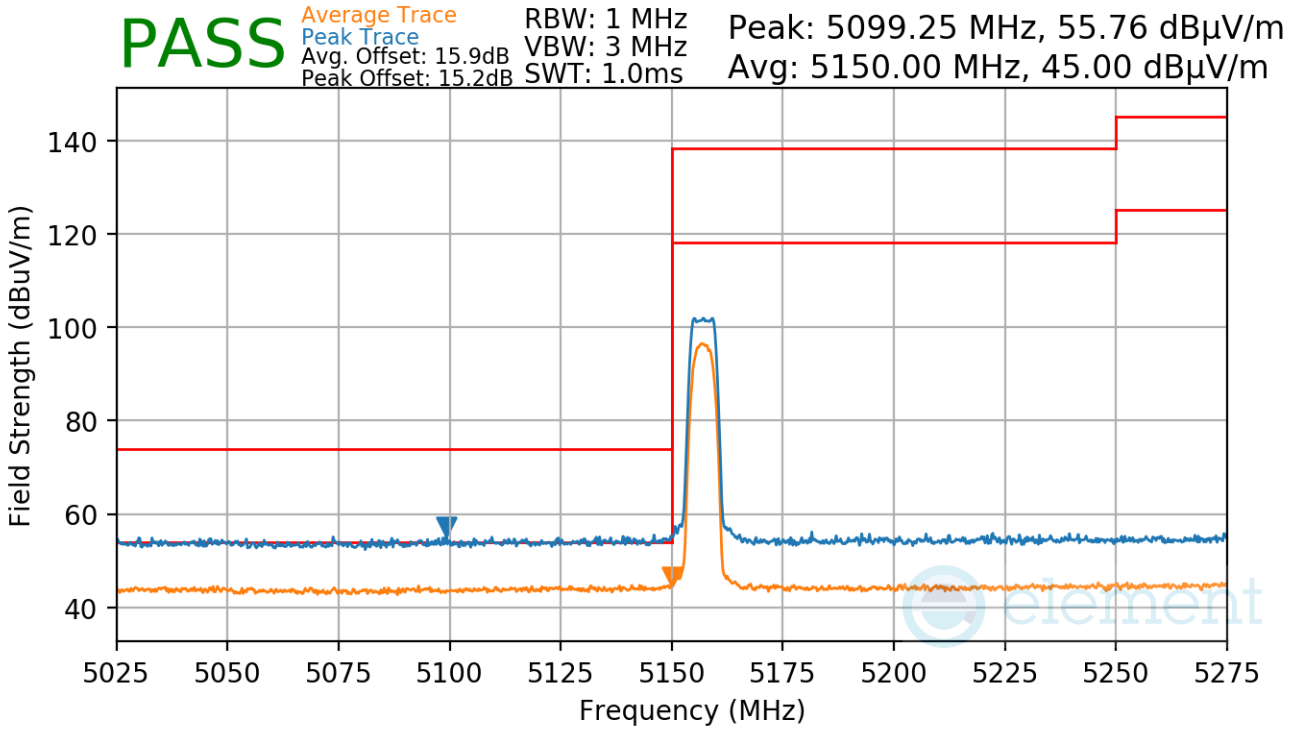
Plot 7-107. Radiated Lower Band Edge Measurement

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



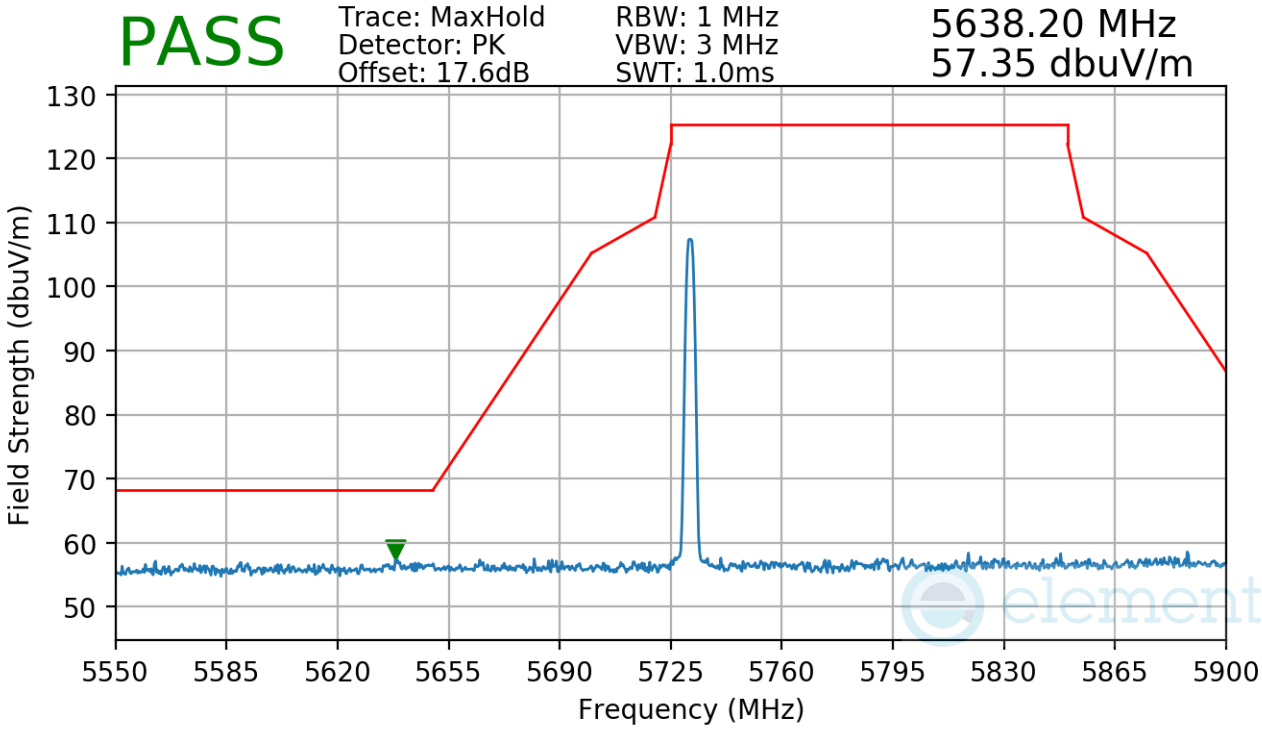
Plot 7-108. Radiated Lower Band Edge Measurement

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



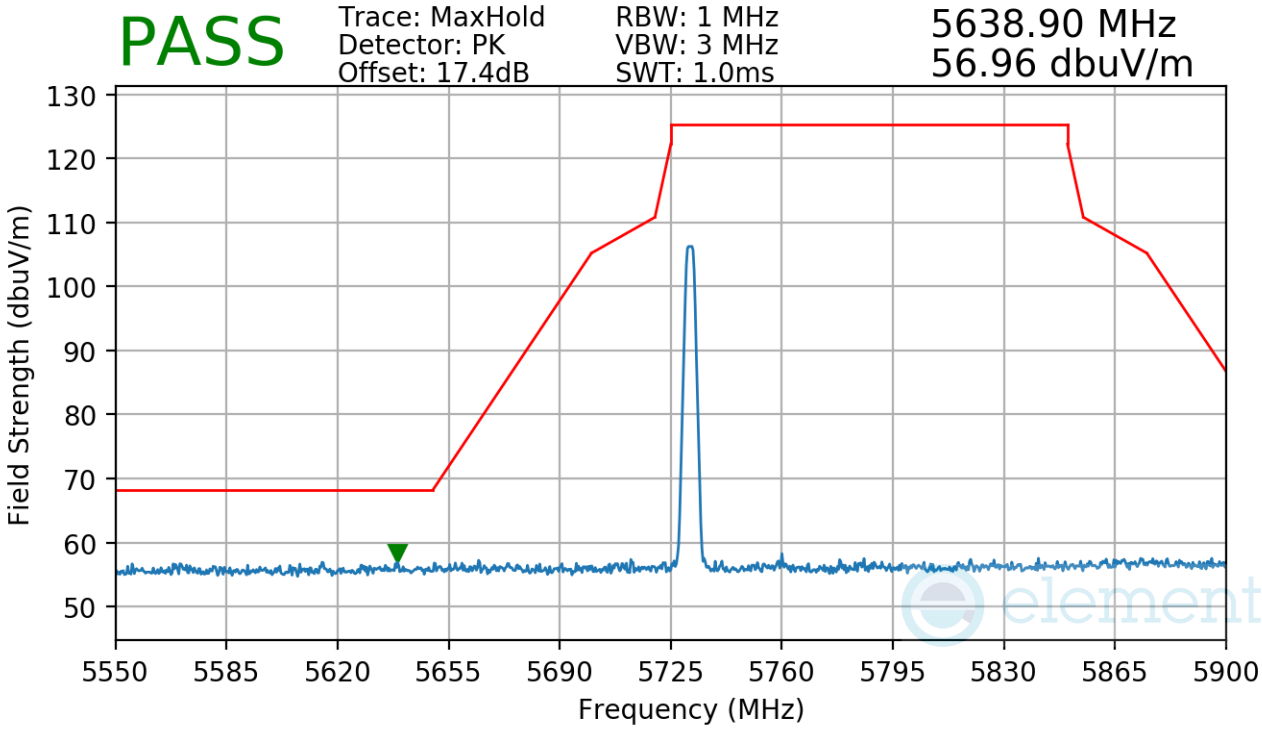
Plot 7-109. Radiated Lower Band Edge Measurement

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



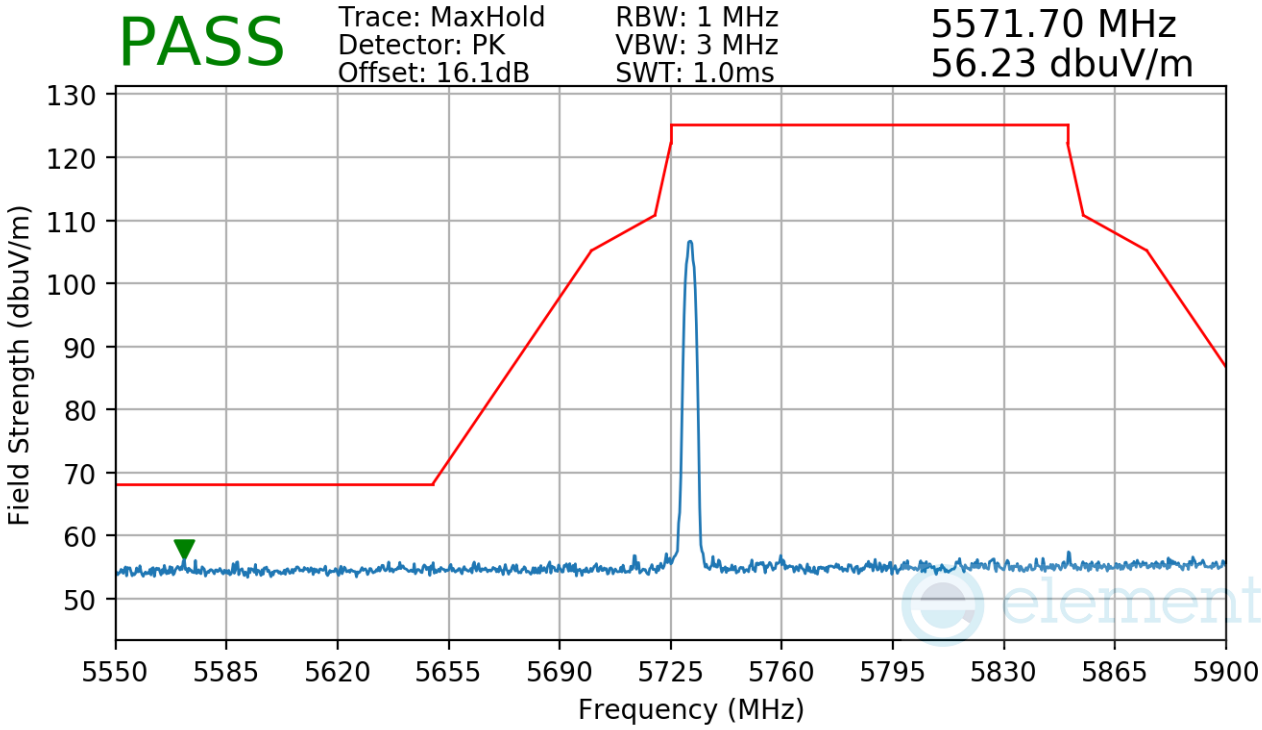
Plot 7-110. Radiated Lower Band Edge Measurement

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



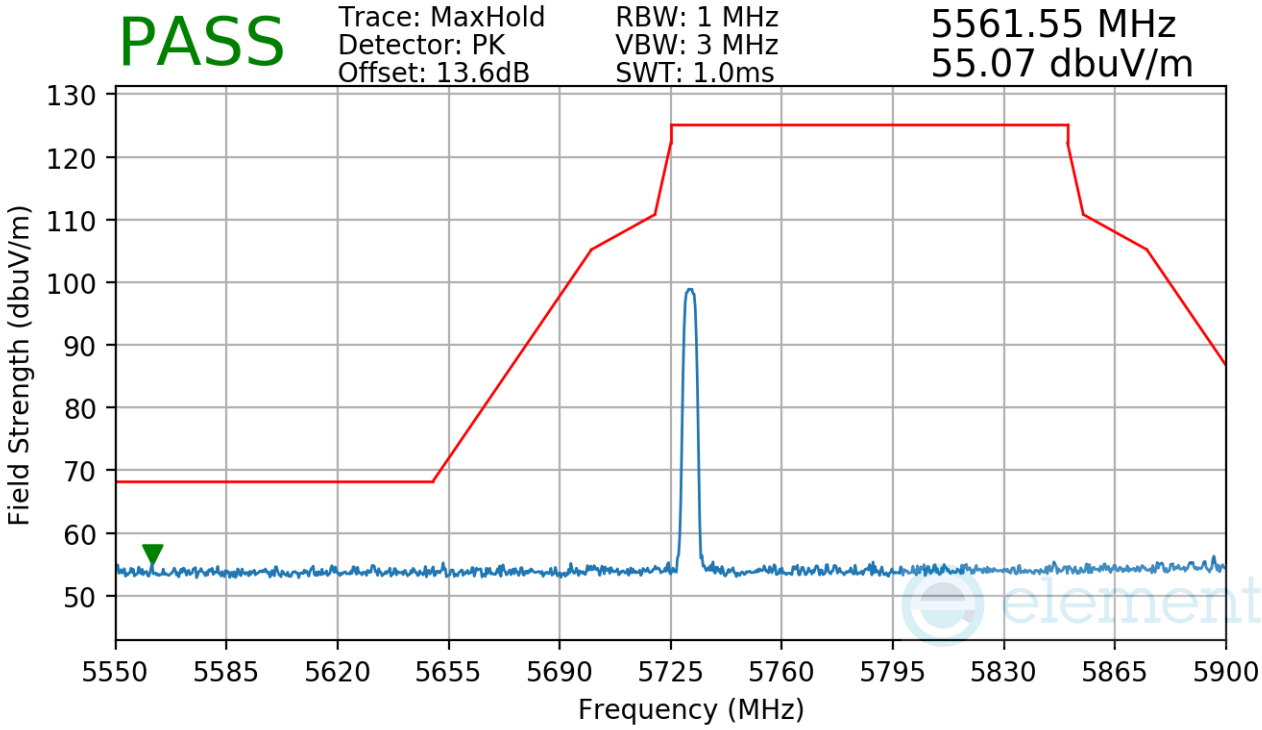
Plot 7-111. Radiated Lower Band Edge Measurement

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



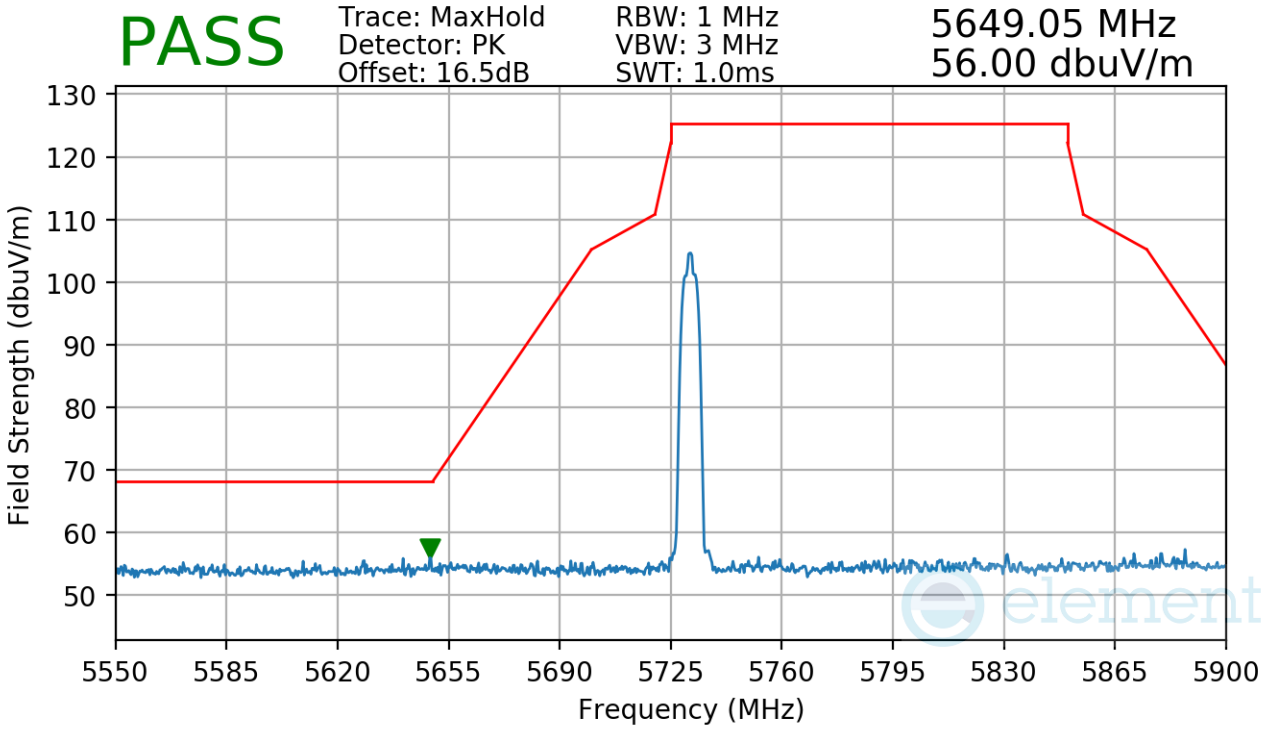
Plot 7-112. Radiated Lower Band Edge Measurement

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



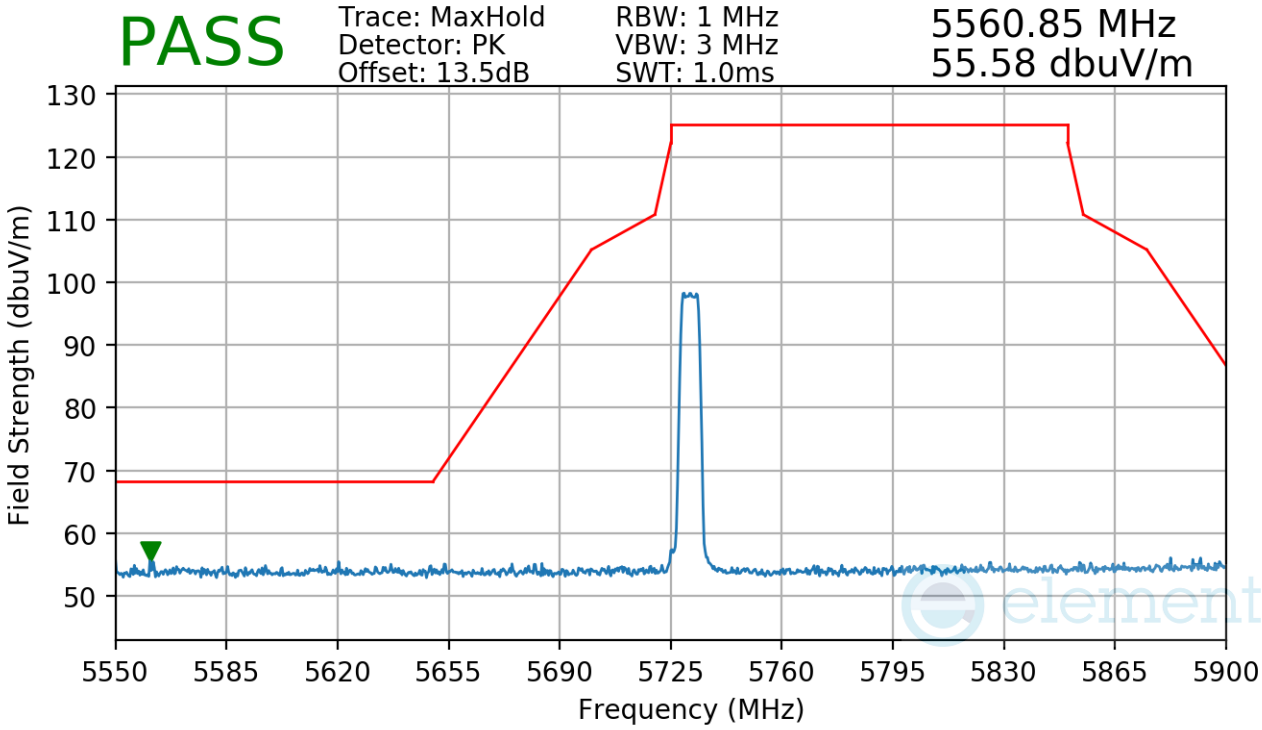
Plot 7-113. Radiated Lower Band Edge Measurement

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



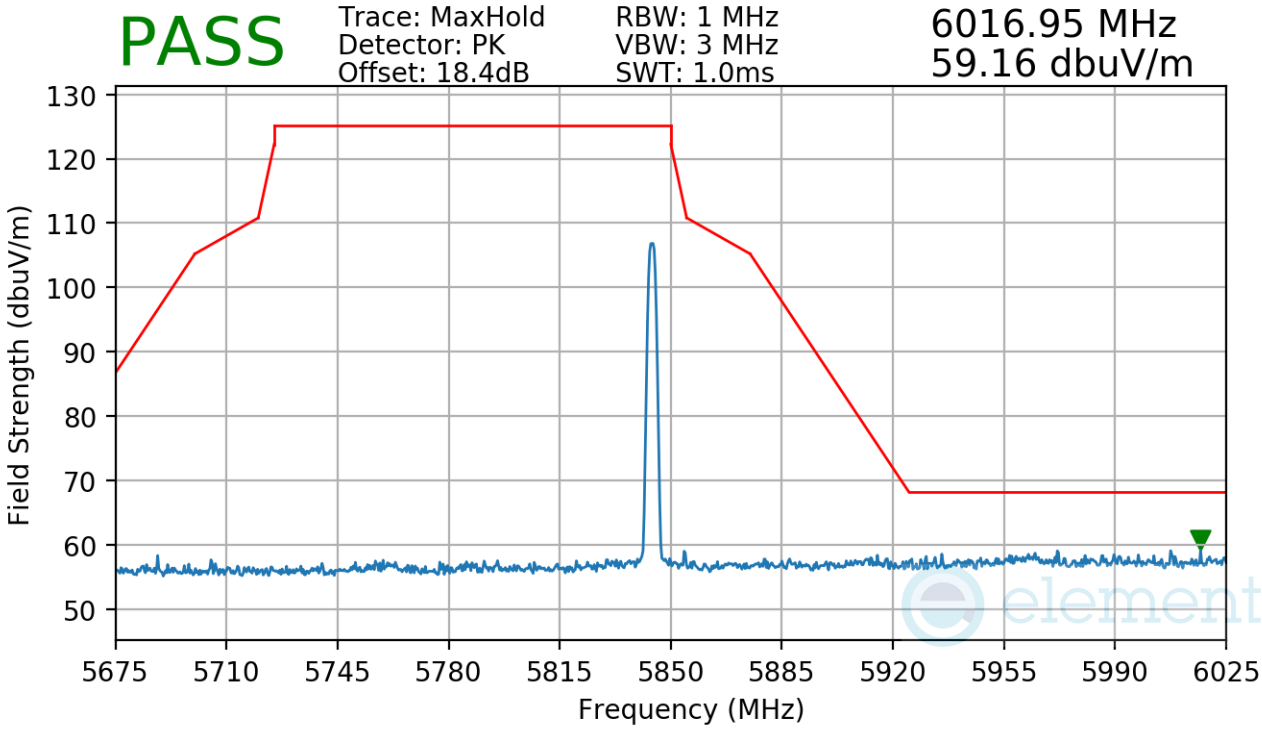
Plot 7-114. Radiated Lower Band Edge Measurement

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



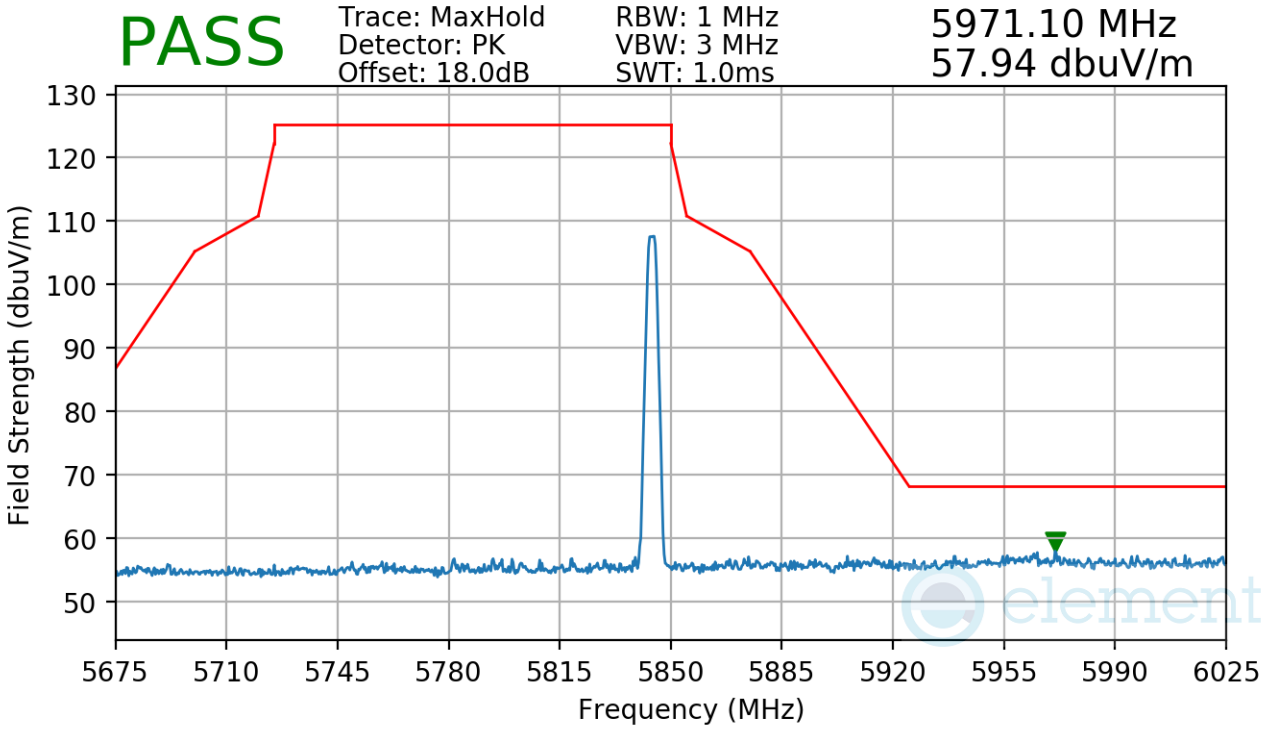
Plot 7-115. Radiated Lower Band Edge Measurement

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



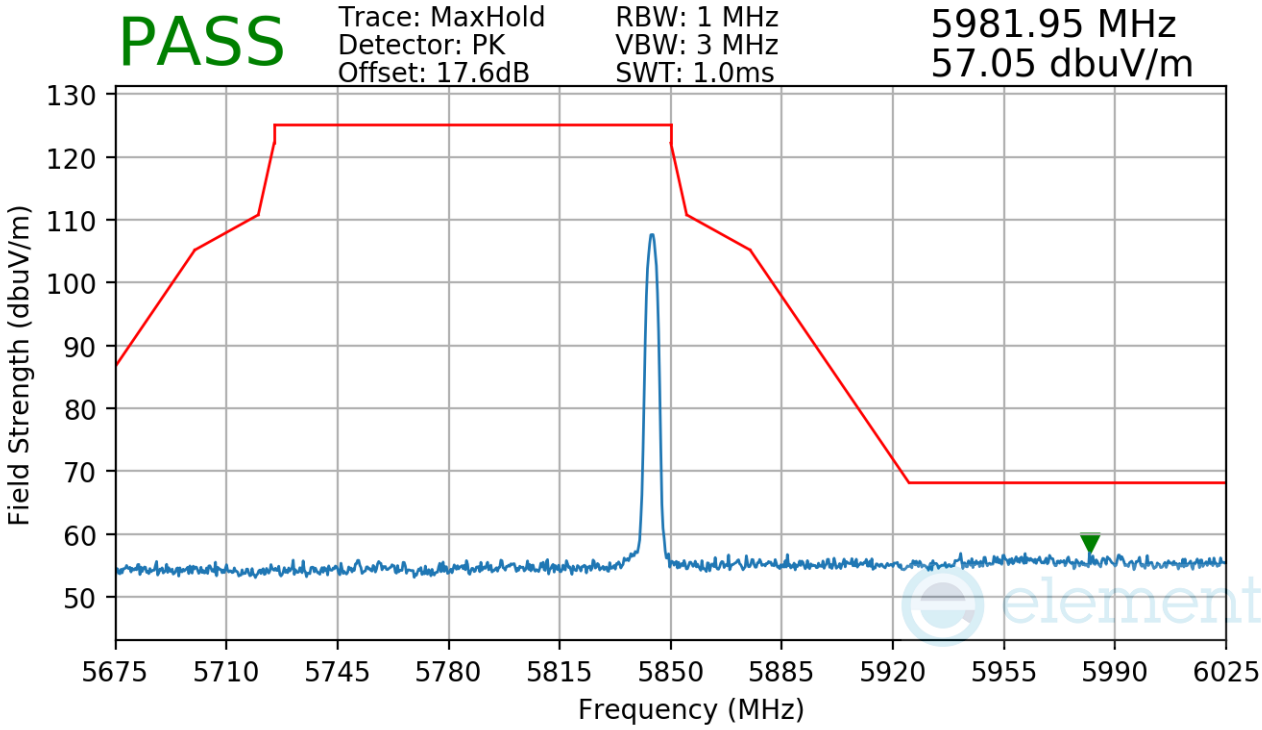
Plot 7-116. Radiated Upper Band Edge Measurement

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



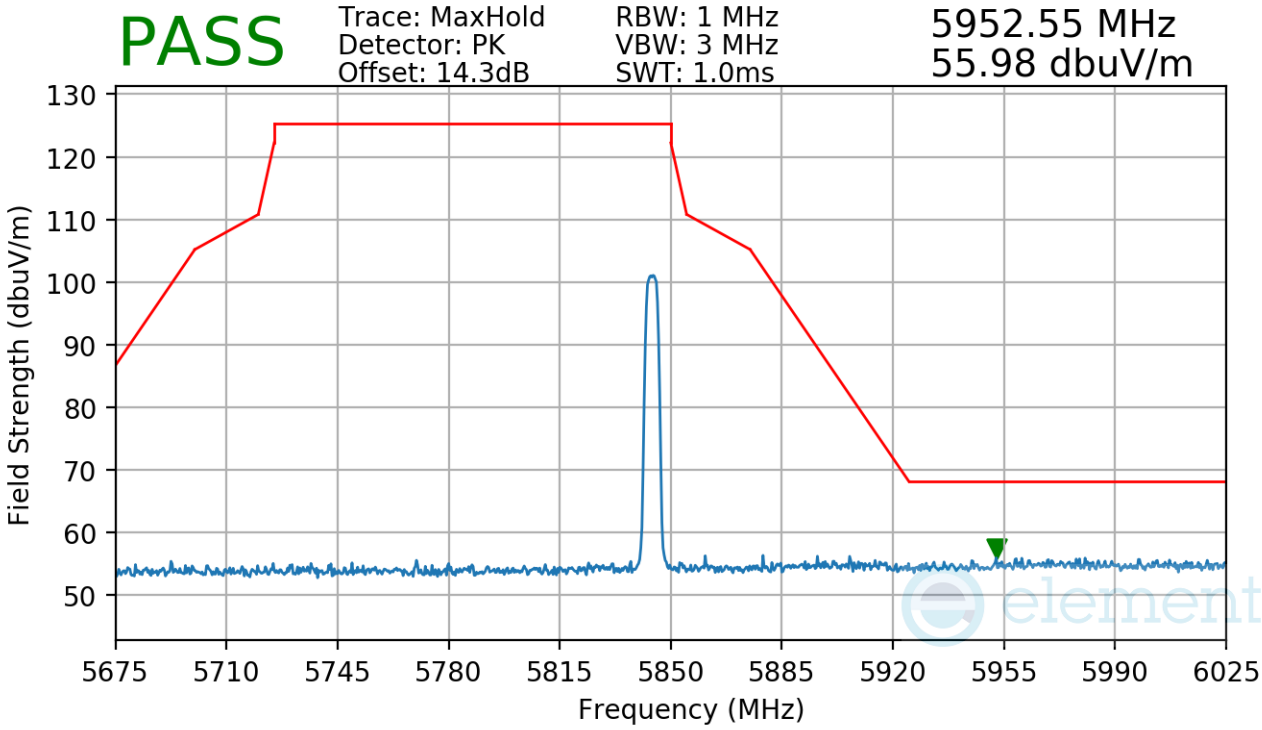
Plot 7-117. Radiated Upper Band Edge Measurement

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



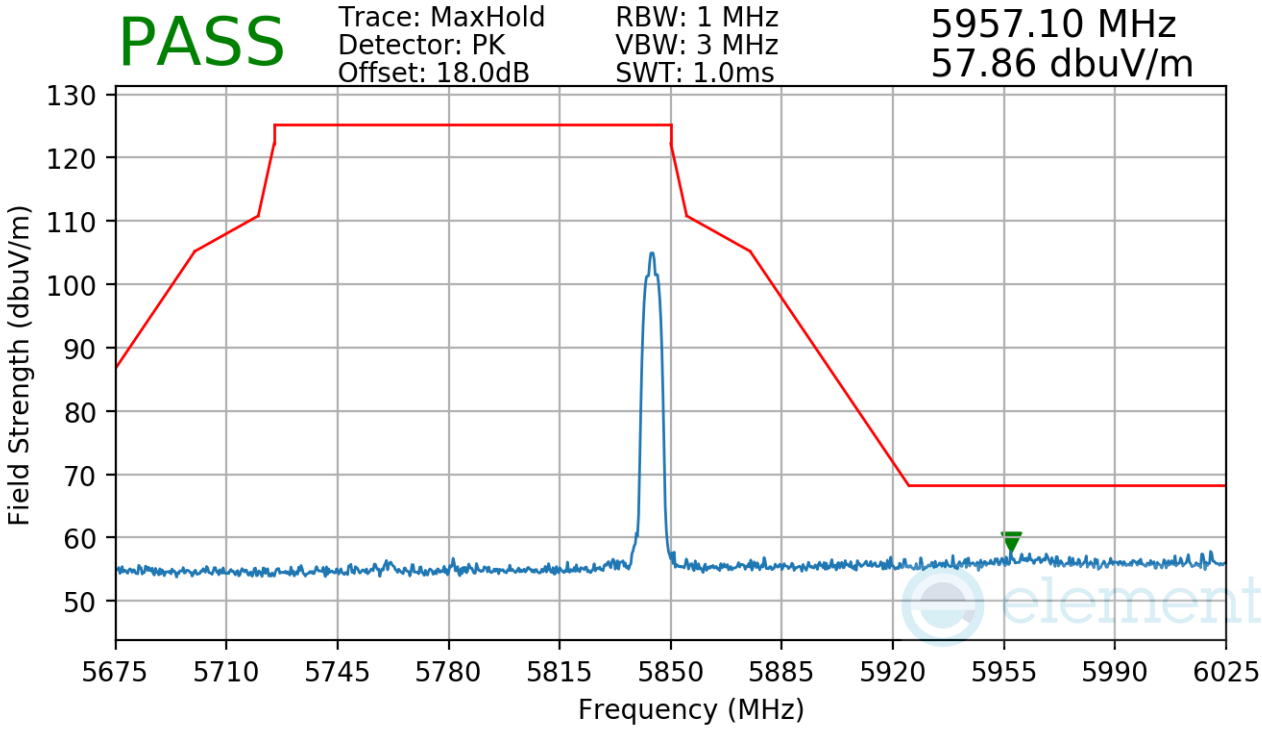
Plot 7-118. Radiated Upper Band Edge Measurement

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



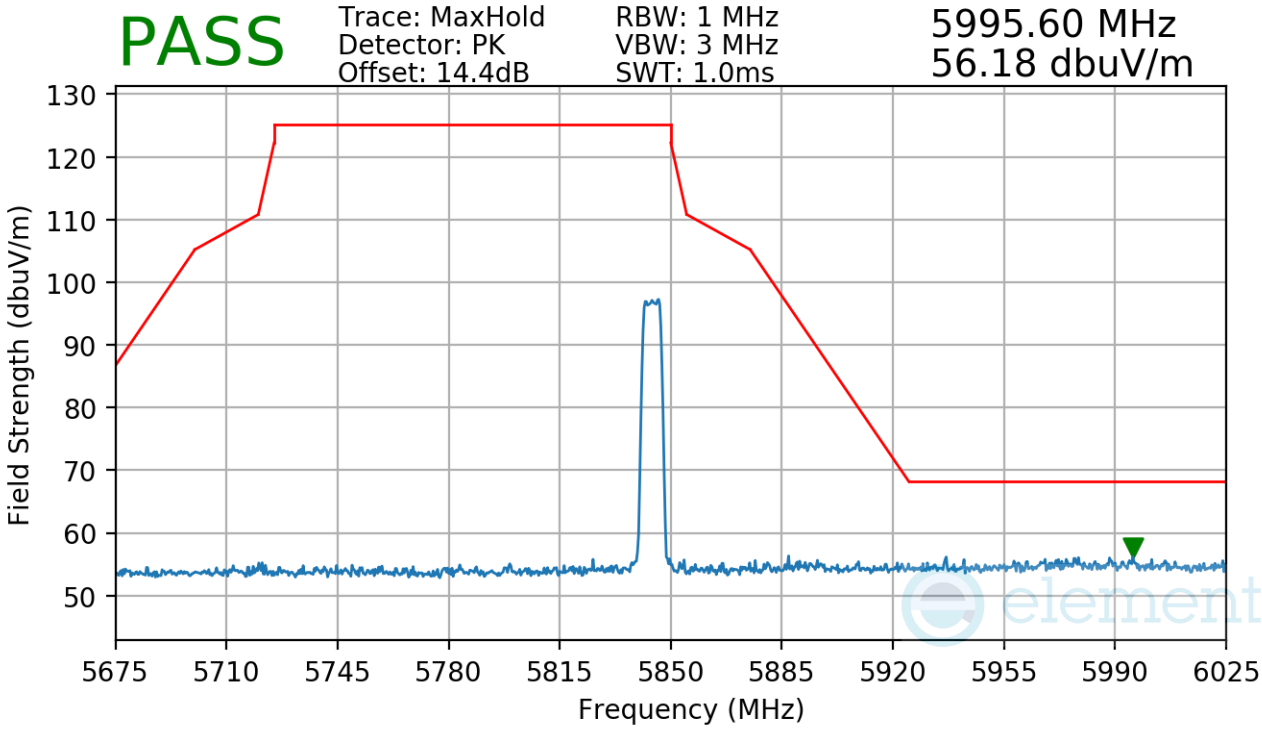
Plot 7-119. Radiated Upper Band Edge Measurement

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.

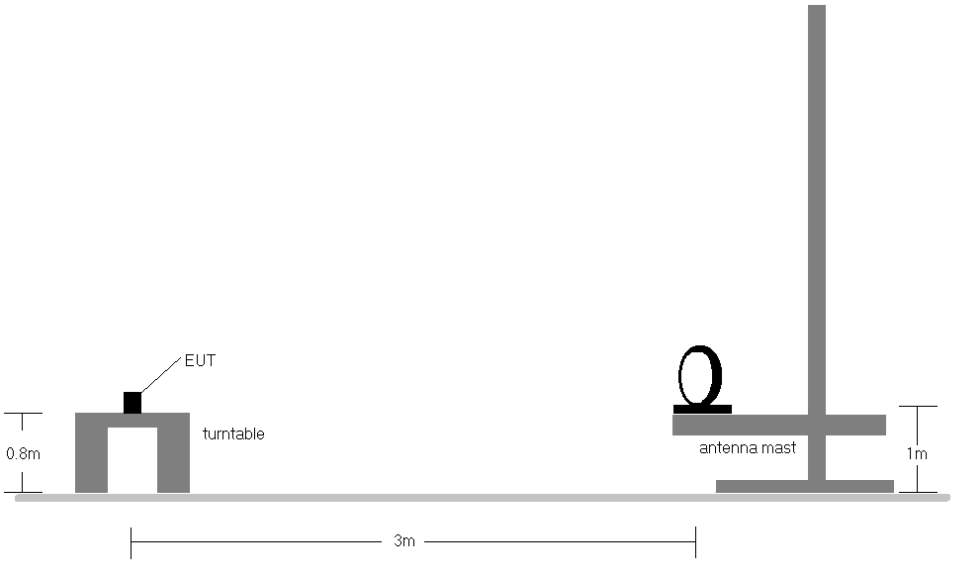


Figure 7-6. Radiated Test Setup < 30MHz

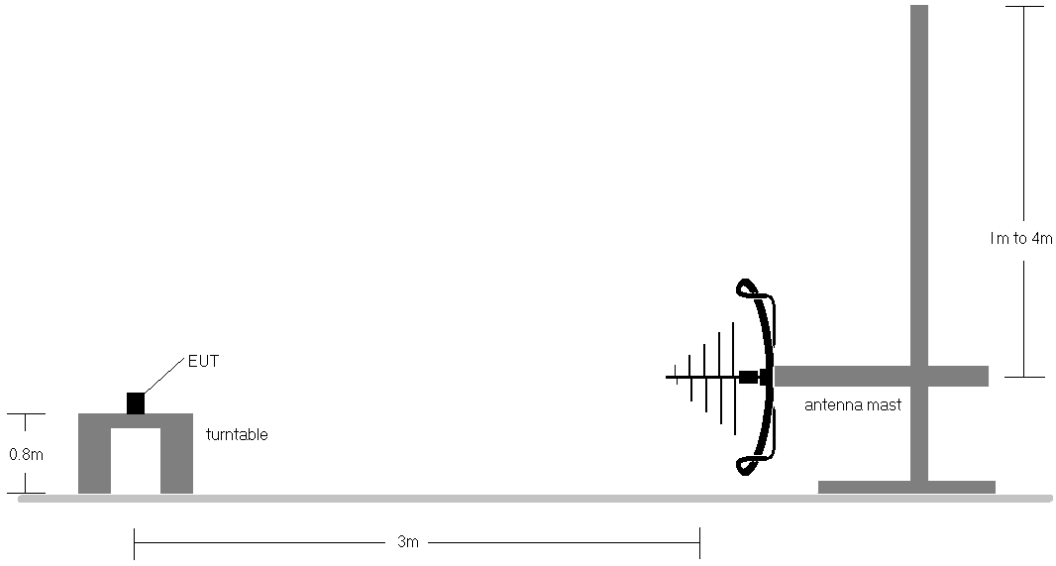


Figure 7-7. Radiated Test Setup < 1GHz

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

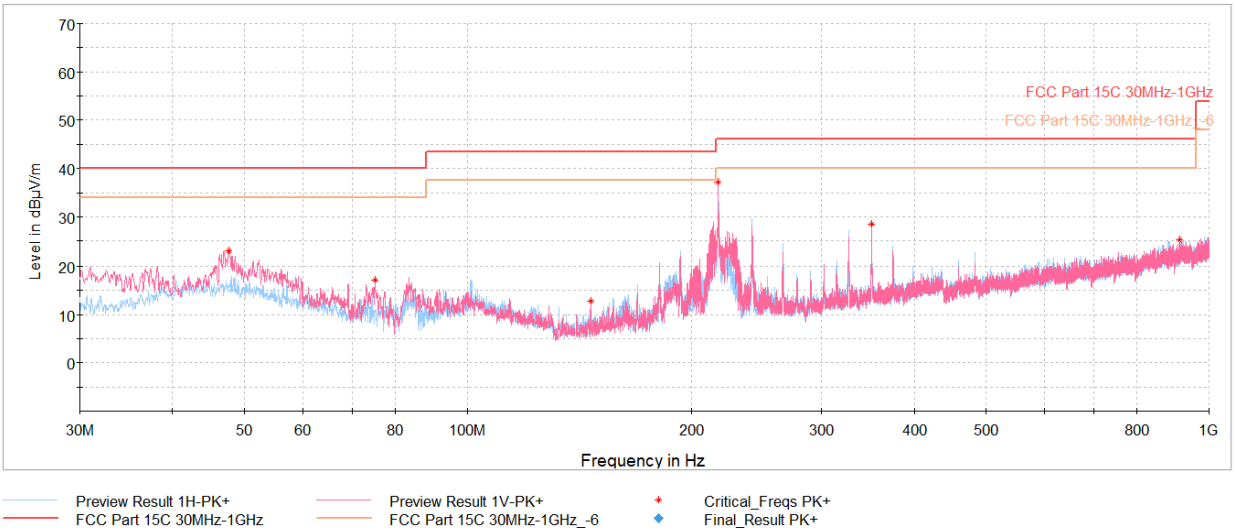
Sample Calculations

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)

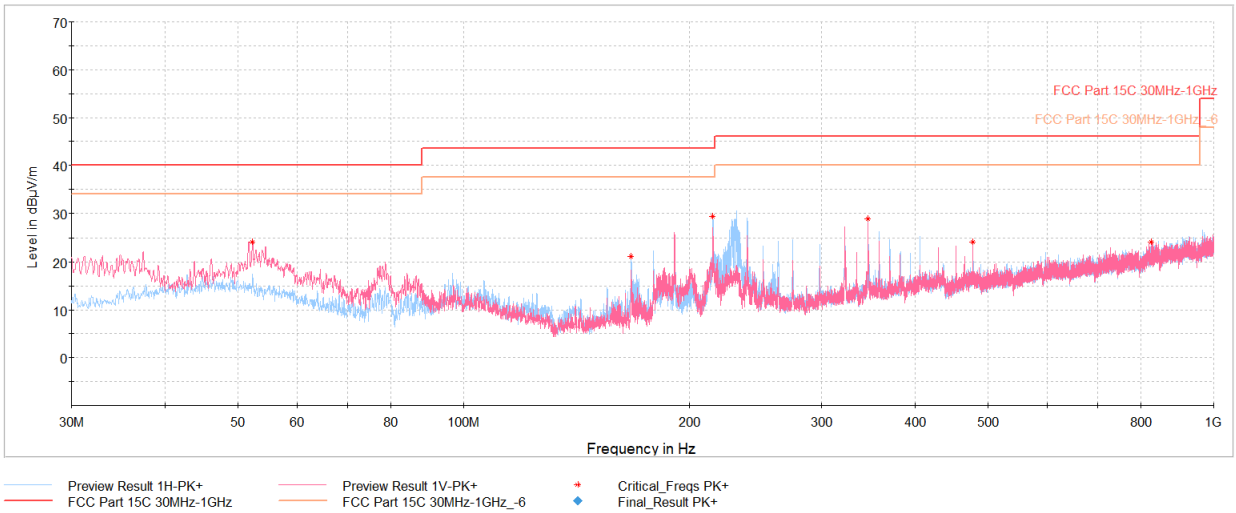
§15.209



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]
47.70	Max Peak	V	200	267	-70.32	-13.53	23.15	40.00	-16.85
75.11	Max Peak	V	300	130	-68.73	-21.14	17.13	40.00	-22.87
146.35	Max Peak	V	100	190	-73.37	-20.86	12.77	43.52	-30.75
217.60	Max Peak	V	100	316	-52.34	-17.38	37.28	46.02	-8.74
350.54	Max Peak	V	100	0	-65.18	-13.40	28.42	46.02	-17.60
913.96	Max Peak	V	200	353	-78.23	-3.45	25.32	46.02	-20.70

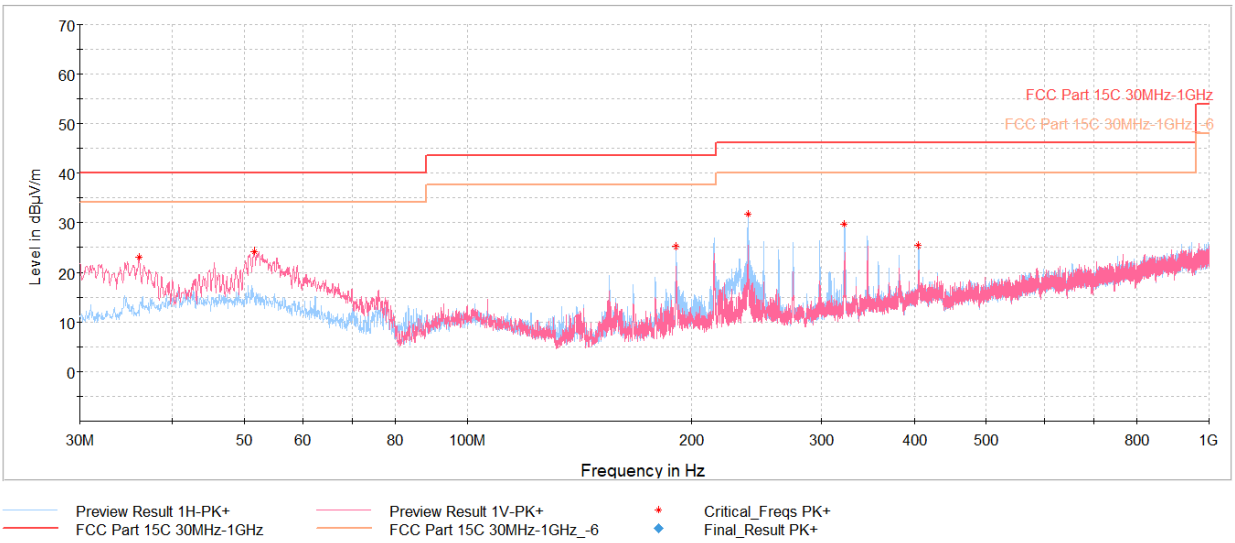
Table 7-33. Radiated Spurious Emissions Below 1GHz (NB UNII BDR – 5157MHz), with AC/DC Adapter and USB-C Cable



Plot 7-123. Radiated Spurious Emissions Below 1GHz (NB UNII LE2M – 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]
52.31	Max Peak	V	100	345	-68.84	-13.99	24.17	40.00	-15.83
167.01	Max Peak	H	200	197	-66.10	-19.83	21.07	43.52	-22.45
214.69	Max Peak	H	100	316	-60.06	-17.58	29.36	43.52	-14.16
345.98	Max Peak	H	100	55	-64.77	-13.42	28.81	46.02	-17.21
477.17	Max Peak	V	100	285	-71.99	-10.95	24.06	46.02	-21.96
825.55	Max Peak	H	300	134	-77.75	-5.07	24.18	46.02	-21.84

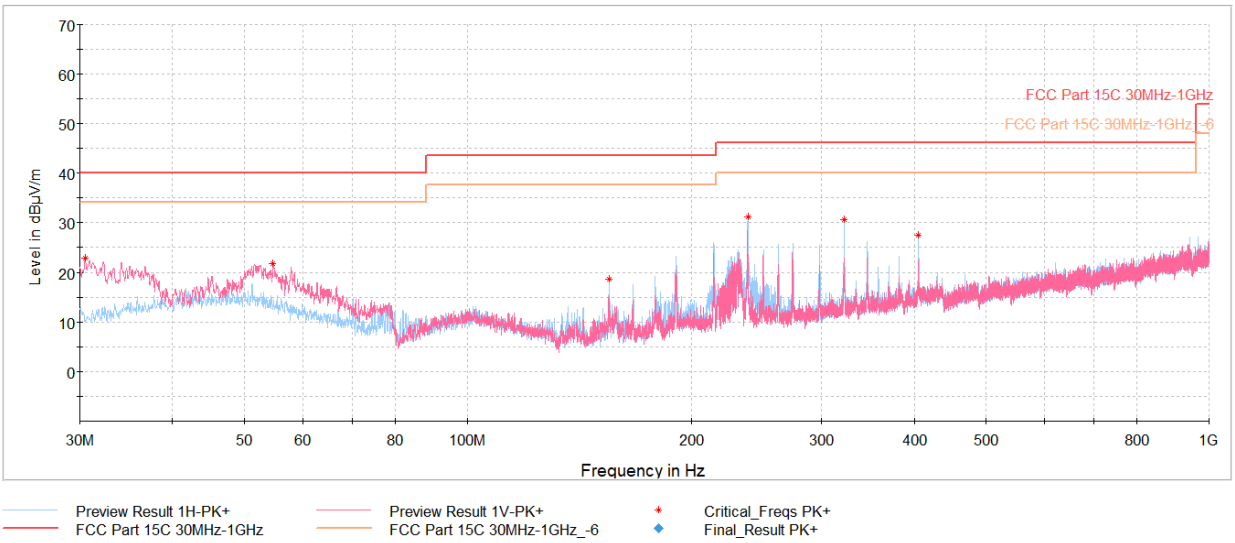
Table 7-34. Radiated Spurious Emissions Below 1GHz (NB UNII LE2M – 5157MHz), with AC/DC Adapter and USB-C Cable



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]
36.06	Max Peak	V	100	354	-68.16	-15.69	23.15	40.00	-16.85
51.63	Max Peak	V	100	0	-68.86	-13.86	24.28	40.00	-15.72
190.97	Max Peak	H	200	94	-63.87	-17.99	25.14	43.52	-18.38
238.50	Max Peak	H	100	93	-58.90	-16.37	31.73	46.02	-14.29
322.21	Max Peak	H	100	284	-63.06	-14.38	29.56	46.02	-16.46
405.63	Max Peak	V	200	307	-69.40	-12.24	25.36	46.02	-20.66

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 – 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]
30.49	Max Peak	V	100	273	-67.52	-16.50	22.98	40.00	-17.02
54.69	Max Peak	V	100	164	-70.75	-14.44	21.81	40.00	-18.19
154.98	Max Peak	H	200	279	-68.06	-20.30	18.64	43.52	-24.88
238.60	Max Peak	H	100	0	-59.59	-16.37	31.04	46.02	-14.98
321.87	Max Peak	H	100	222	-62.13	-14.39	30.48	46.02	-15.54
405.15	Max Peak	H	200	313	-67.41	-12.25	27.34	46.02	-18.68

Table 7-36. Radiated Spurious Emissions Below 1GHz (NB UNII HDRp4 – 5201MHz), 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.

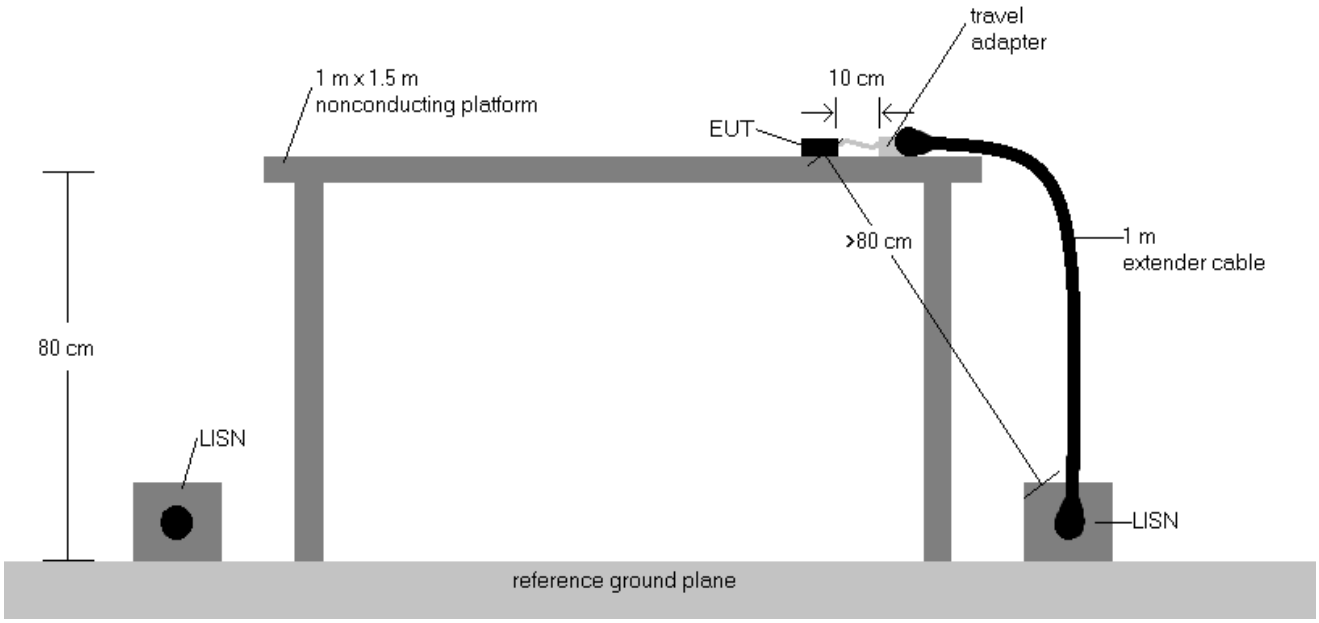
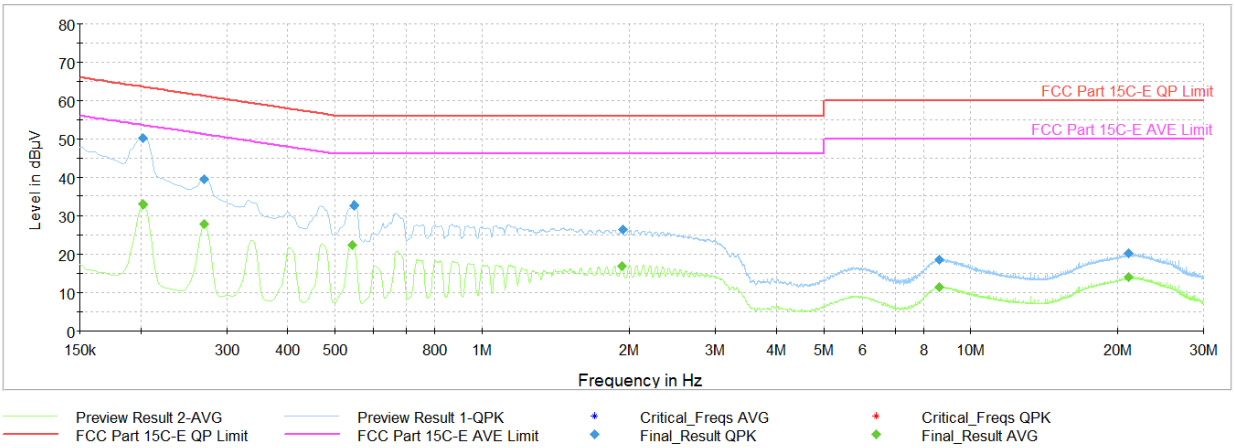


Figure 7-8. Test Instrument & Measurement Setup

Test Notes

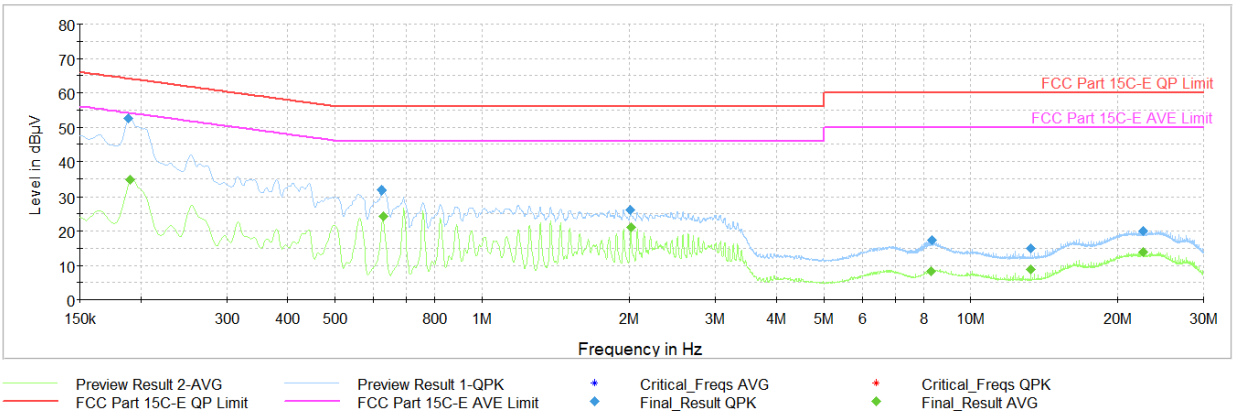
1. All modes of operation were investigated and the worst-case emissions are reported. The emissions found were not affected by the choice of channel used during testing.
2. Both configurations below were investigated, and the worst case has been reported.
    a. EUT charged by charging case and powered 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
0.202	FINAL	—	32.97	53.54	-20.57	L1	GND
0.202	FINAL	50.3	—	63.54	-13.29	L1	GND
0.269	FINAL	—	28.02	51.14	-23.12	L1	GND
0.269	FINAL	39.4	—	61.14	-21.77	L1	GND
0.542	FINAL	—	22.38	46.00	-23.62	L1	GND
0.548	FINAL	32.6	—	56.00	-23.36	L1	GND
1.932	FINAL	—	16.94	46.00	-29.06	L1	GND
1.941	FINAL	26.4	—	56.00	-29.56	L1	GND
8.610	FINAL	18.7	—	60.00	-41.33	L1	GND
8.610	FINAL	—	11.41	50.00	-38.59	L1	GND
21.093	FINAL	—	14.15	50.00	-35.85	L1	GND
21.093	FINAL	20.2	—	60.00	-39.76	L1	GND

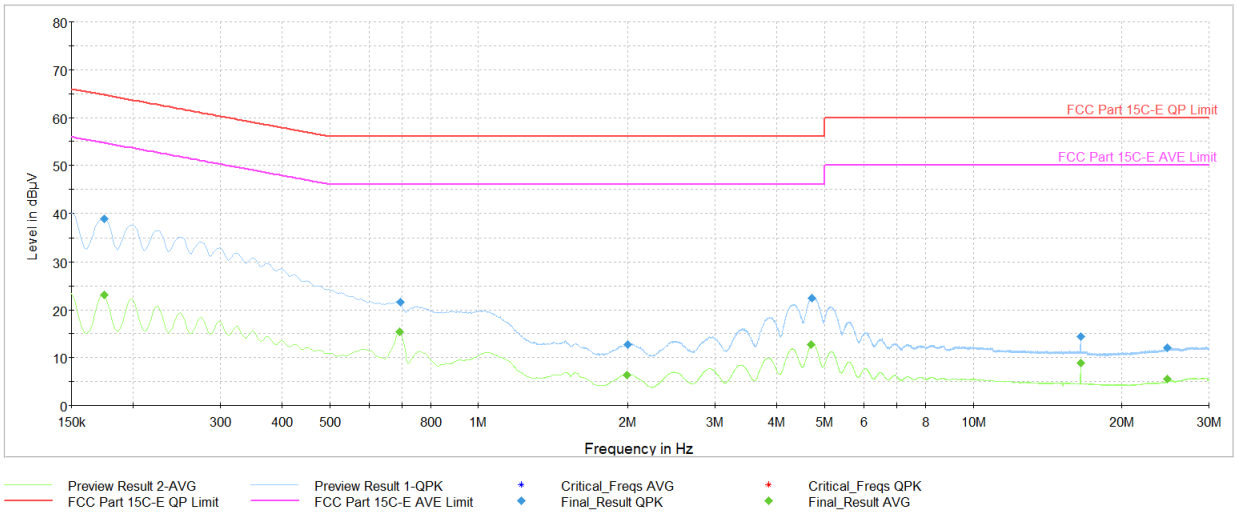
Table 7-38. AC Line Conducted Data (NB UNII BDR – 5157MHz) (L1) with Laptop and USB-C Cable



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
0.188	FINAL	52.5	—	64.11	-11.64	N	GND
0.191	FINAL	—	34.54	54.02	-19.47	N	GND
0.623	FINAL	31.8	—	56.00	-24.21	N	GND
0.627	FINAL	—	24.16	46.00	-21.84	N	GND
2.009	FINAL	26.1	—	56.00	-29.92	N	GND
2.011	FINAL	—	21.06	46.00	-24.94	N	GND
8.304	FINAL	—	8.29	50.00	-41.71	N	GND
8.313	FINAL	17.3	—	60.00	-42.73	N	GND
13.272	FINAL	14.8	—	60.00	-45.16	N	GND
13.272	FINAL	—	8.69	50.00	-41.31	N	GND
22.522	FINAL	—	13.74	50.00	-36.26	N	GND
22.522	FINAL	19.9	—	60.00	-40.07	N	GND

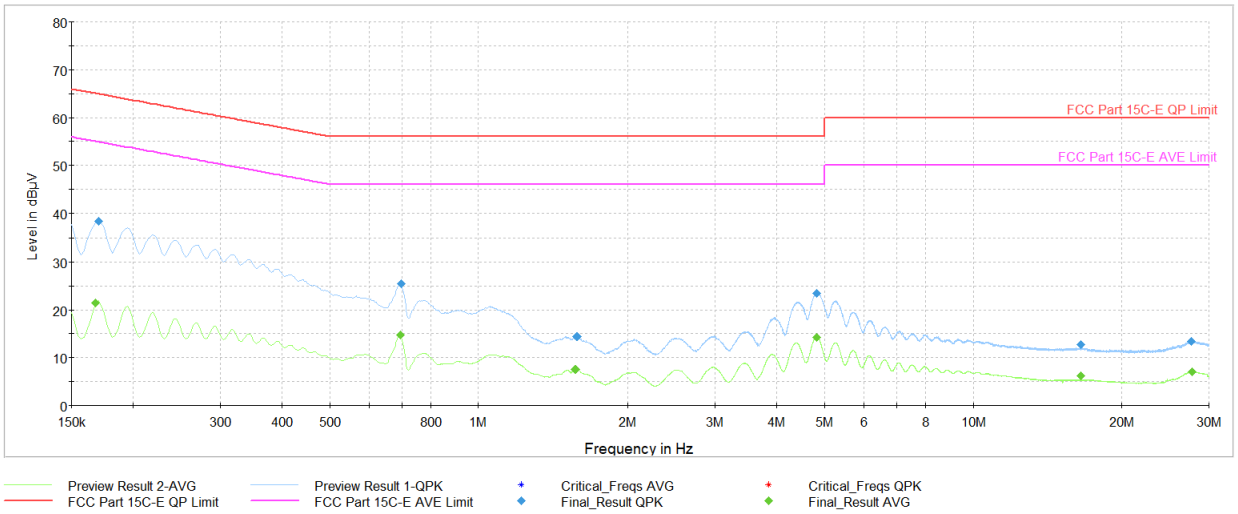
Table 7-39. AC Line Conducted (NB UNII BDR – 5157MHz) (N) with Laptop and USB-C Cable



Plot 7-128. AC Line Conducted Plot (NB UNII LE2M – 5157MHz) (L1) 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	—	23.10	54.73	-31.63	L1	GND
0.175	FINAL	38.8	—	64.73	-25.89	L1	GND
0.692	FINAL	—	15.39	46.00	-30.61	L1	GND
0.695	FINAL	21.6	—	56.00	-34.41	L1	GND
1.993	FINAL	—	6.41	46.00	-39.59	L1	GND
2.000	FINAL	12.7	—	56.00	-43.31	L1	GND
4.702	FINAL	—	12.70	46.00	-33.30	L1	GND
4.711	FINAL	22.5	—	56.00	-33.50	L1	GND
16.487	FINAL	14.4	—	60.00	-45.63	L1	GND
16.487	FINAL	—	8.90	50.00	-41.10	L1	GND
24.731	FINAL	—	5.51	50.00	-44.49	L1	GND
24.734	FINAL	12.1	—	60.00	-47.90	L1	GND

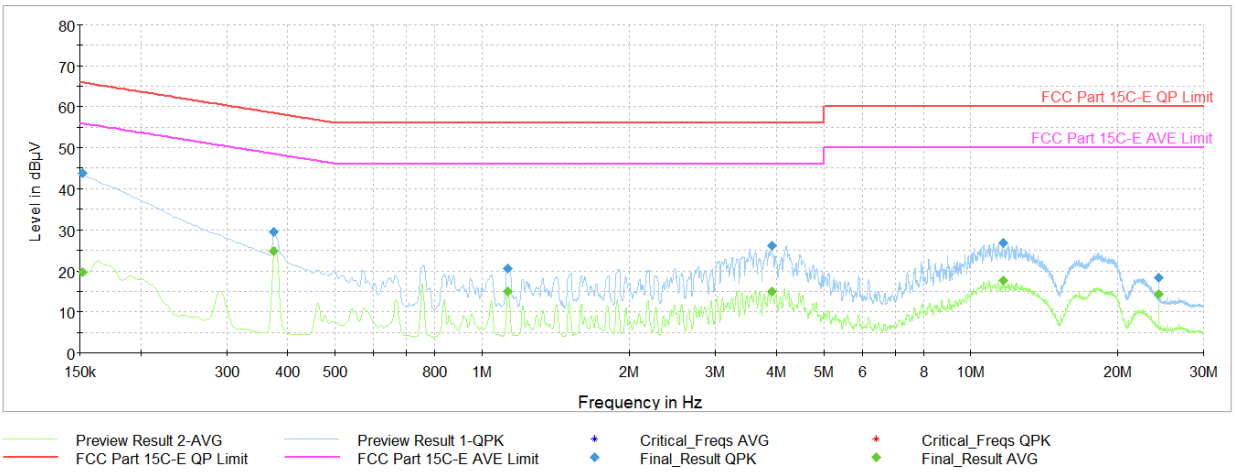
Table 7-40. AC Line Conducted Data (NB UNII LE2M – 5157MHz) (L1) with AC/DC Adapter and USB-C Cable



Plot 7-129. AC Line Conducted Plot (NB UNII LE2M – 5157MHz) (N) with AC/DC Adapter and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.168	FINAL	—	21.34	55.06	-33.72	N	GND
0.170	FINAL	38.3	—	64.95	-26.62	N	GND
0.695	FINAL	—	14.68	46.00	-31.32	N	GND
0.697	FINAL	25.5	—	56.00	-30.50	N	GND
1.570	FINAL	—	7.55	46.00	-38.45	N	GND
1.581	FINAL	14.4	—	56.00	-41.57	N	GND
4.819	FINAL	23.4	—	56.00	-32.57	N	GND
4.828	FINAL	—	14.28	46.00	-31.72	N	GND
16.487	FINAL	—	6.23	50.00	-43.77	N	GND
16.490	FINAL	12.7	—	60.00	-47.33	N	GND
27.672	FINAL	13.3	—	60.00	-46.69	N	GND
27.690	FINAL	—	6.97	50.00	-43.03	N	GND

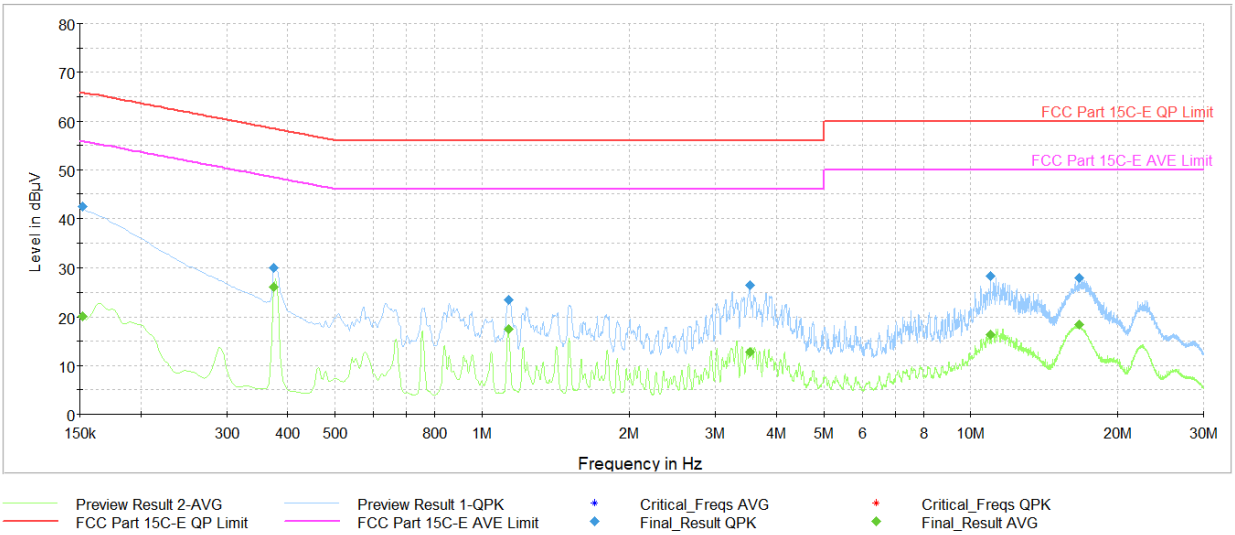
Table 7-41. AC Line Conducted (NB UNII LE2M – 5157MHz) (N) with AC/DC Adapter and USB-C Cable



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	—	19.79	55.88	-36.08	L1	GND
0.152	FINAL	43.7	—	65.88	-22.17	L1	GND
0.375	FINAL	—	24.77	48.39	-23.62	L1	GND
0.375	FINAL	29.5	—	58.39	-28.92	L1	GND
1.131	FINAL	20.7	—	56.00	-35.29	L1	GND
1.131	FINAL	—	15.01	46.00	-30.99	L1	GND
3.910	FINAL	26.3	—	56.00	-29.75	L1	GND
3.910	FINAL	—	15.09	46.00	-30.91	L1	GND
11.650	FINAL	—	17.66	50.00	-32.34	L1	GND
11.672	FINAL	26.9	—	60.00	-33.12	L1	GND
24.268	FINAL	—	14.28	50.00	-35.72	L1	GND
24.268	FINAL	18.4	—	60.00	-41.59	L1	GND

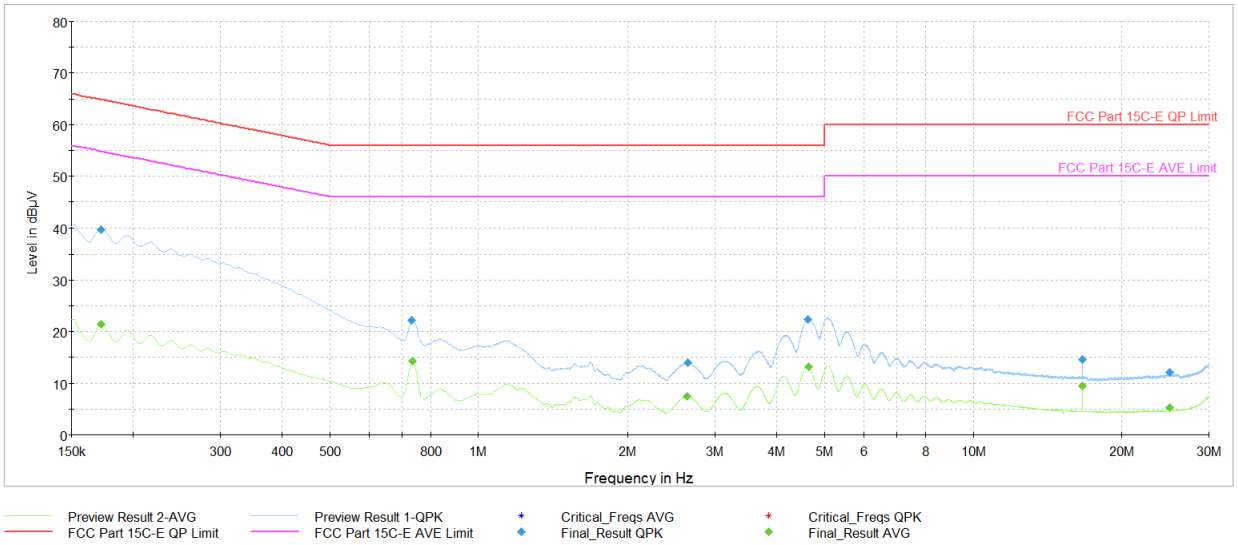
Table 7-42. AC Line Conducted Data (NB UNII HDR4 – 5245MHz) (L1) with Laptop and USB-C Cable



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	—	20.14	55.88	-35.74	N	GND
0.152	FINAL	42.5	—	65.88	-23.40	N	GND
0.375	FINAL	—	26.16	48.39	-22.23	N	GND
0.375	FINAL	30.0	—	58.39	-28.37	N	GND
1.133	FINAL	—	17.54	46.00	-28.46	N	GND
1.133	FINAL	23.5	—	56.00	-32.54	N	GND
3.525	FINAL	26.4	—	56.00	-29.59	N	GND
3.525	FINAL	—	12.75	46.00	-33.25	N	GND
10.977	FINAL	28.4	—	60.00	-31.61	N	GND
10.982	FINAL	—	16.39	50.00	-33.61	N	GND
16.703	FINAL	28.0	—	60.00	-32.04	N	GND
16.710	FINAL	—	18.43	50.00	-31.57	N	GND

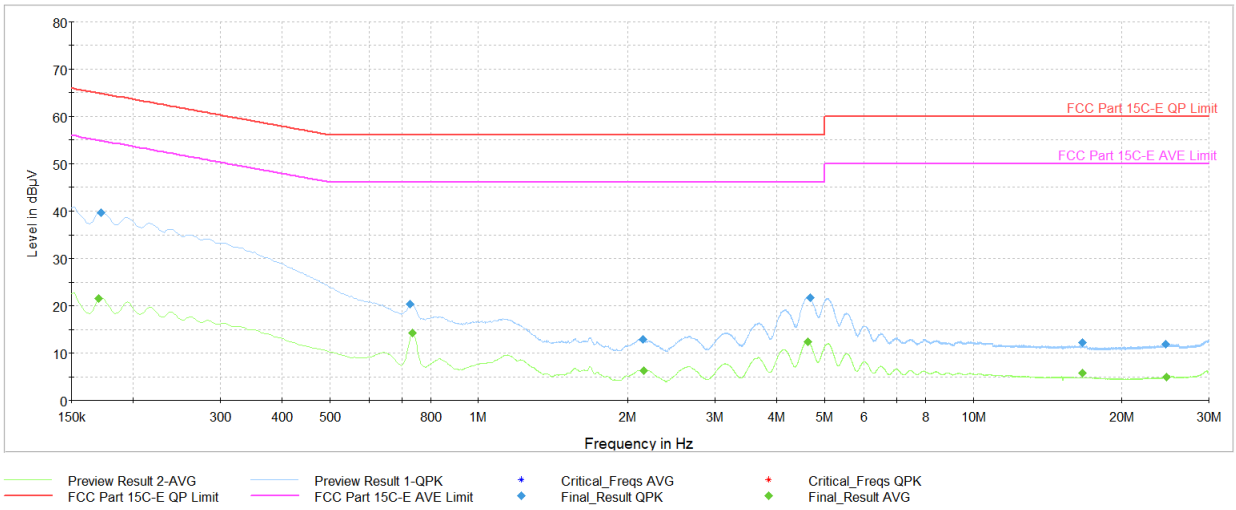
Table 7-43. AC Line Conducted (NB UNII HDR4 – 5245MHz) (N) with Laptop and USB-C Cable



Plot 7-132. AC Line Conducted Plot (NB UNII HDRp4 – 5201MHz) (L1) with AC/DC Adapter and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.173	FINAL	—	21.41	54.84	-33.43	L1	GND
0.173	FINAL	39.6	—	64.84	-25.29	L1	GND
0.733	FINAL	22.2	—	56.00	-33.81	L1	GND
0.735	FINAL	—	14.31	46.00	-31.69	L1	GND
2.639	FINAL	—	7.50	46.00	-38.50	L1	GND
2.648	FINAL	14.0	—	56.00	-42.00	L1	GND
4.634	FINAL	22.4	—	56.00	-33.59	L1	GND
4.643	FINAL	—	13.18	46.00	-32.82	L1	GND
16.647	FINAL	14.5	—	60.00	-45.47	L1	GND
16.647	FINAL	—	9.41	50.00	-40.59	L1	GND
24.970	FINAL	—	5.36	50.00	-44.64	L1	GND
24.972	FINAL	12.1	—	60.00	-47.95	L1	GND

Table 7-44. AC Line Conducted Data (NB UNII HDRp4 – 5201MHz) (L1) with AC/DC Adapter and USB-C Cable



Plot 7-133. AC Line Conducted Plot (NB UNII HDRp4 – 5201MHz) (N) with AC/DC Adapter and USB-C Cable

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.170	FINAL	—	21.51	54.95	-33.44	N	GND
0.173	FINAL	39.6	—	64.84	-25.22	N	GND
0.728	FINAL	20.4	—	56.00	-35.61	N	GND
0.735	FINAL	—	14.22	46.00	-31.78	N	GND
2.148	FINAL	12.9	—	56.00	-43.07	N	GND
2.155	FINAL	—	6.34	46.00	-39.66	N	GND
4.623	FINAL	—	12.39	46.00	-33.61	N	GND
4.670	FINAL	21.7	—	56.00	-34.31	N	GND
16.649	FINAL	12.2	—	60.00	-47.85	N	GND
16.649	FINAL	—	5.78	50.00	-44.22	N	GND
24.560	FINAL	11.8	—	60.00	-48.19	N	GND
24.578	FINAL	—	4.95	50.00	-45.05	N	GND

Table 7-45. AC Line Conducted (NB UNII HDRp4 – 5201MHz) (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 Right Earbud FCC ID: BCG-A3050** is in compliance with Part 15 Subpart E (15.407) of the FCC Rules.