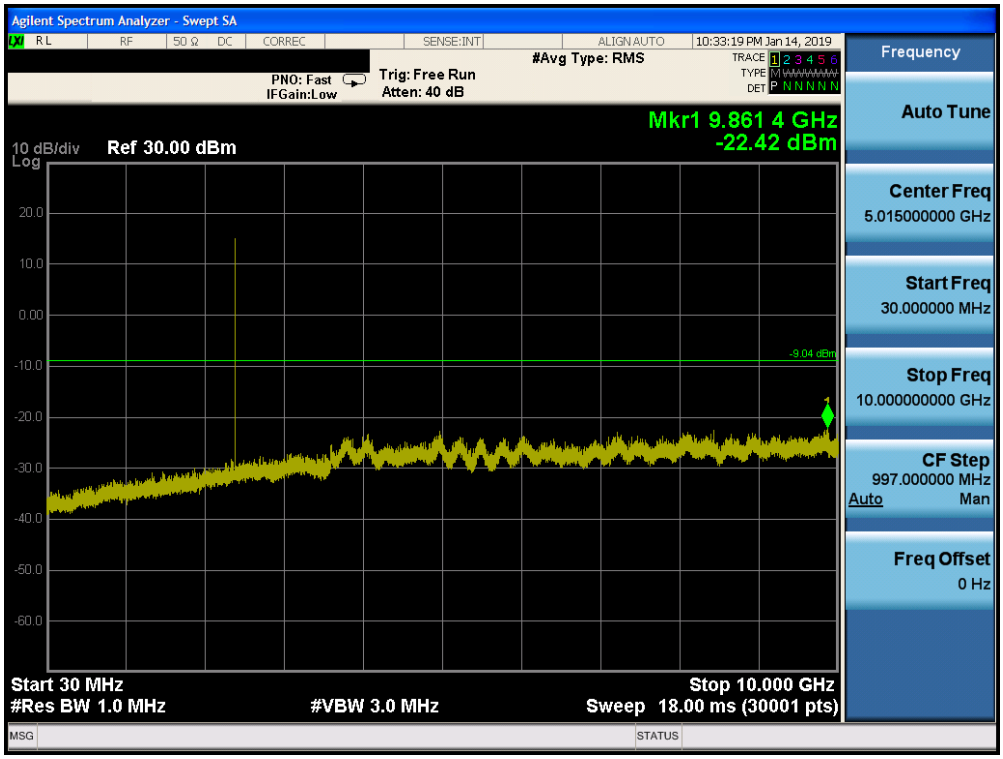
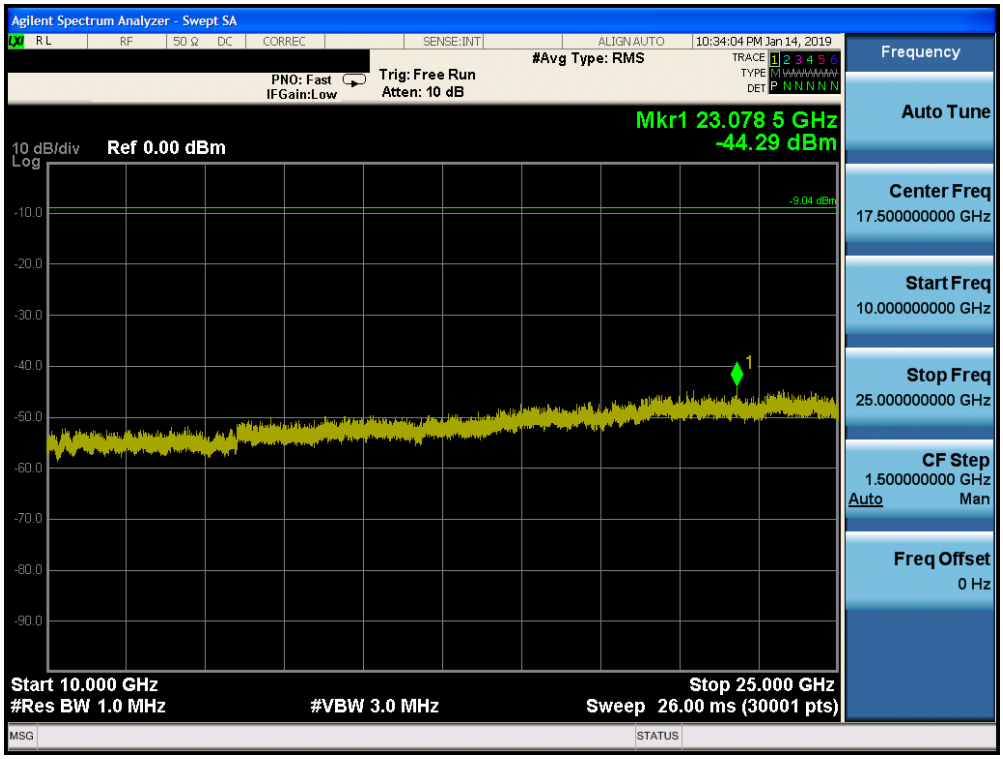
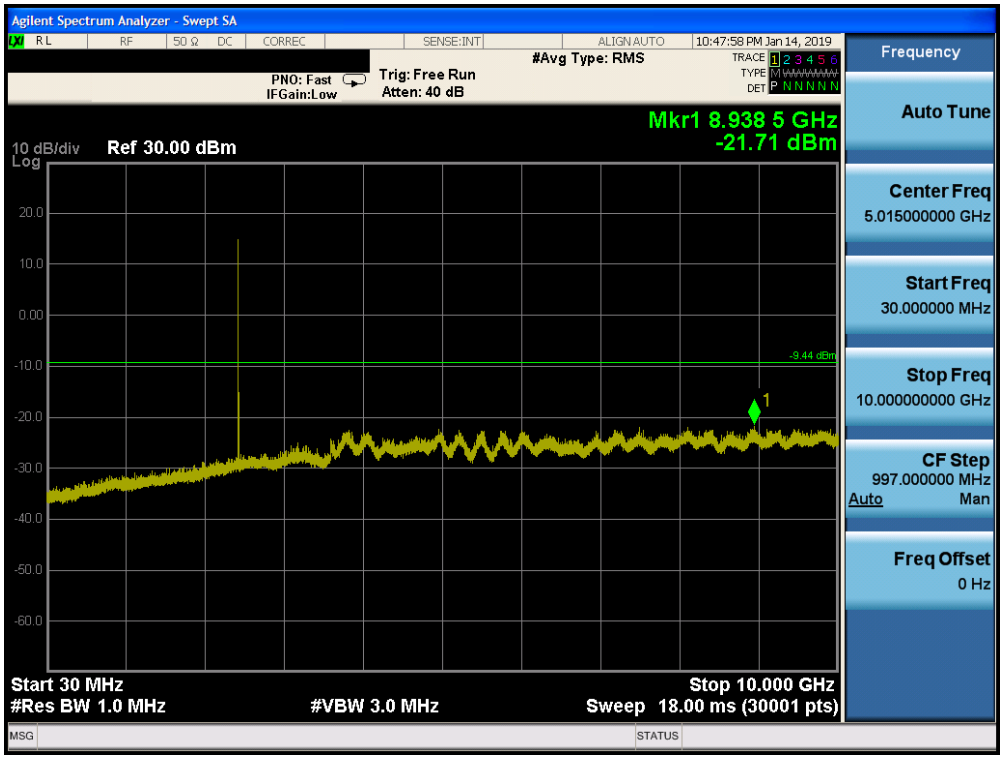


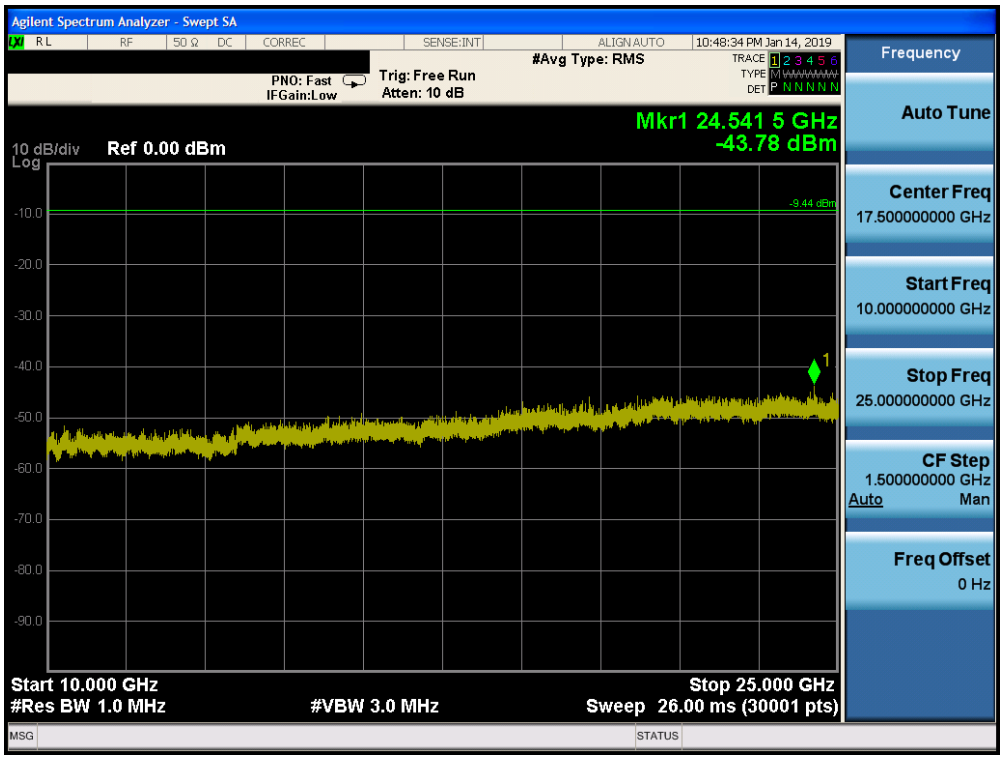
Plot 7-85. Conducted Spurious Plot ANT 1 (Bluetooth, 8DPSK, ePA – Ch. 0)



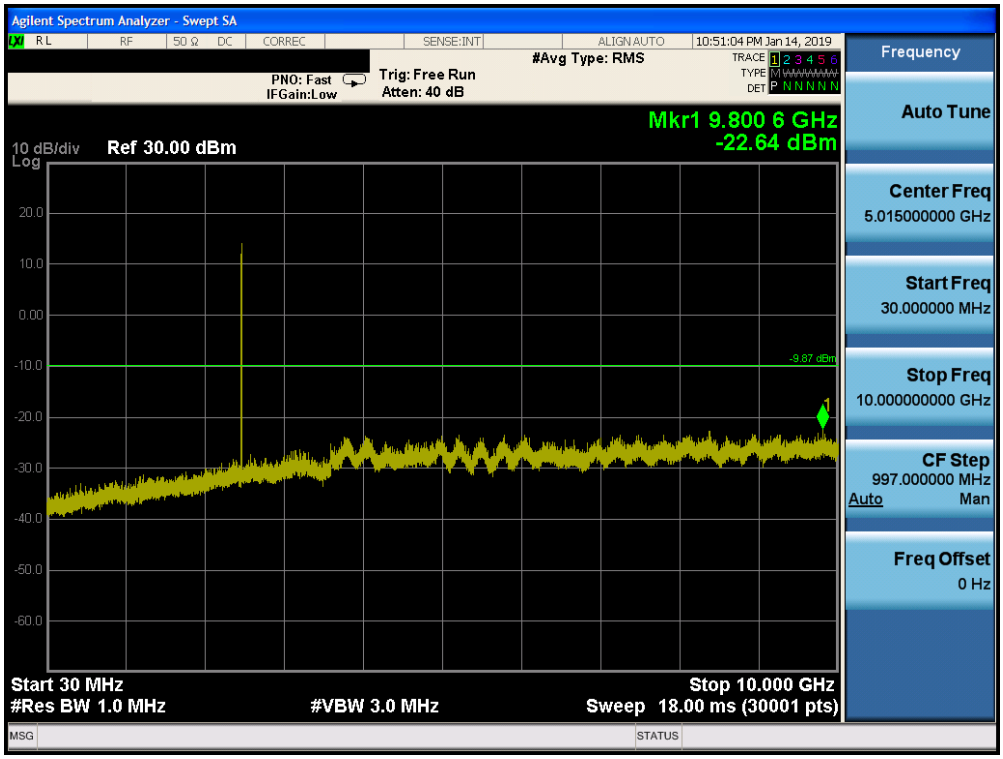
Plot 7-86. Conducted Spurious Plot ANT 1 (Bluetooth, 8DPSK, ePA – Ch. 0)



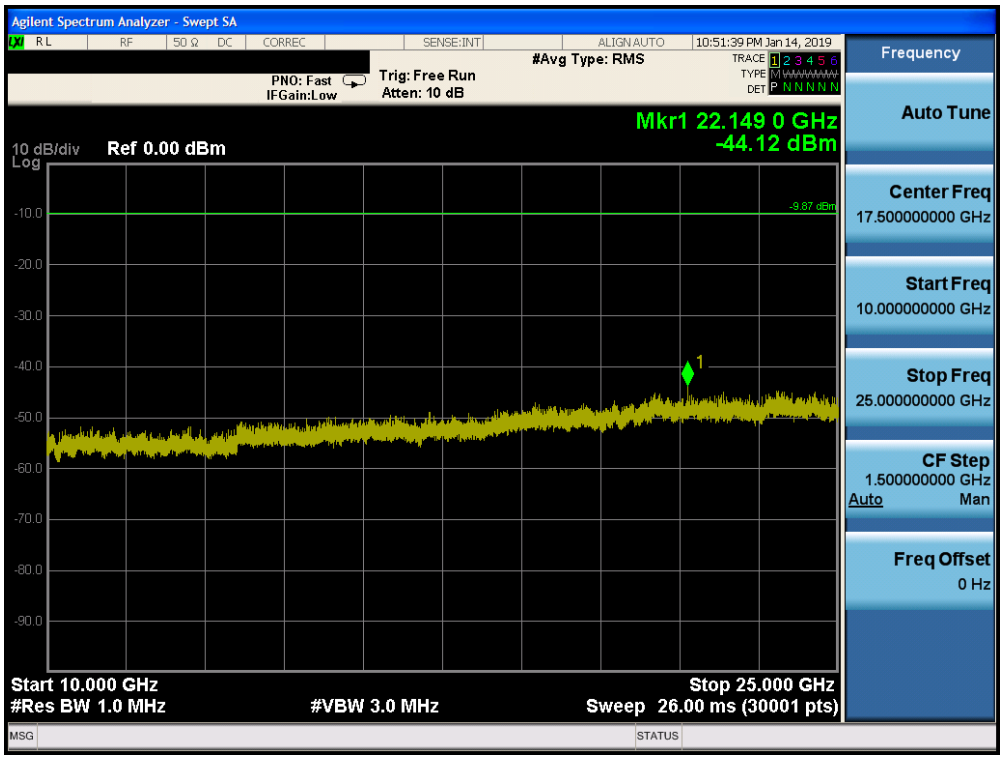
Plot 7-87. Conducted Spurious Plot ANT 1 (Bluetooth, 8DPSK, ePA – Ch. 39)



Plot 7-88. Conducted Spurious Plot ANT 1 (Bluetooth, 8DPSK, ePA Ch. 39)

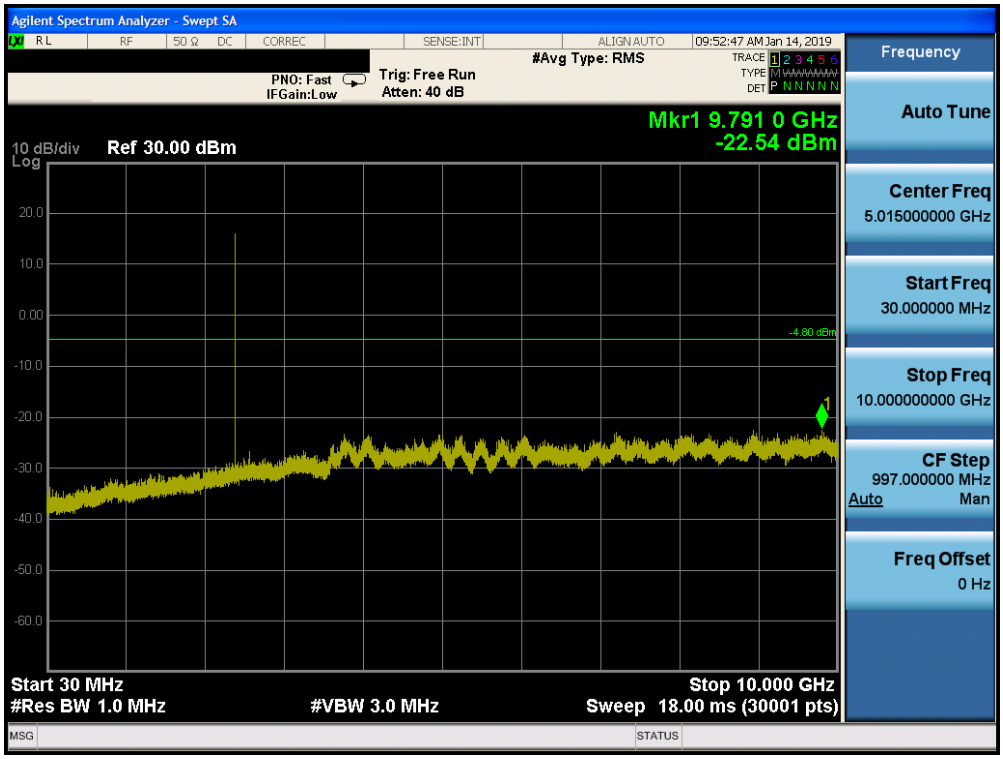


Plot 7-89. Conducted Spurious Plot ANT 1 (Bluetooth, 8DPSK, ePA – Ch. 78)

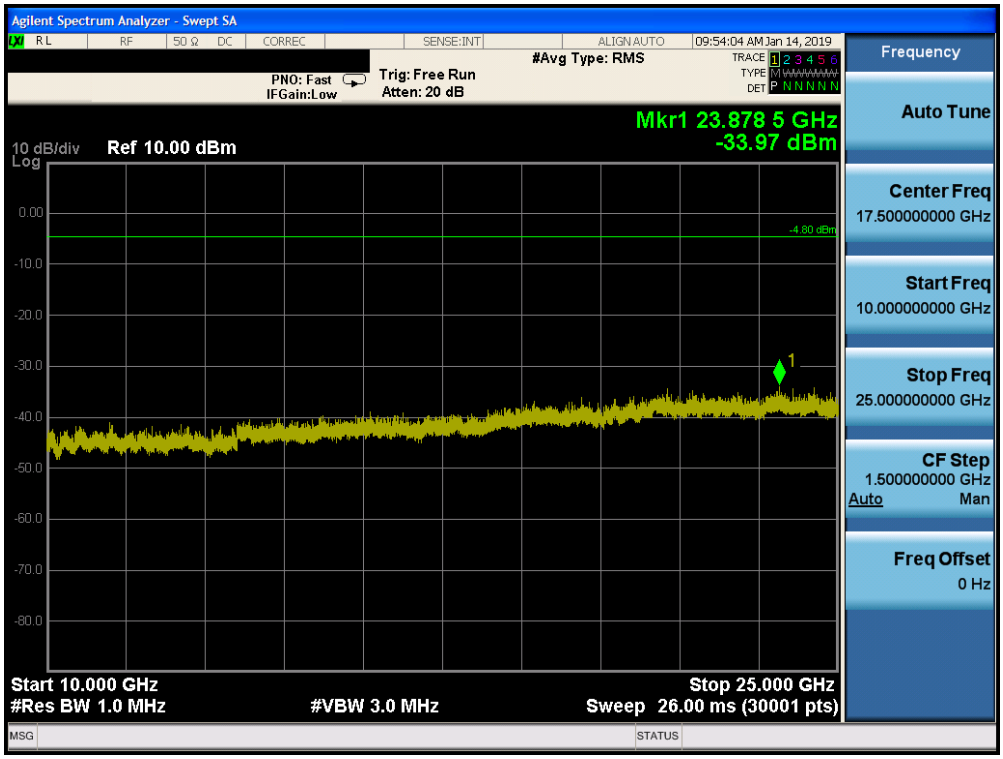


Plot 7-90. Conducted Spurious Plot ANT 1 (Bluetooth, 8DPSK, ePA – Ch. 78)

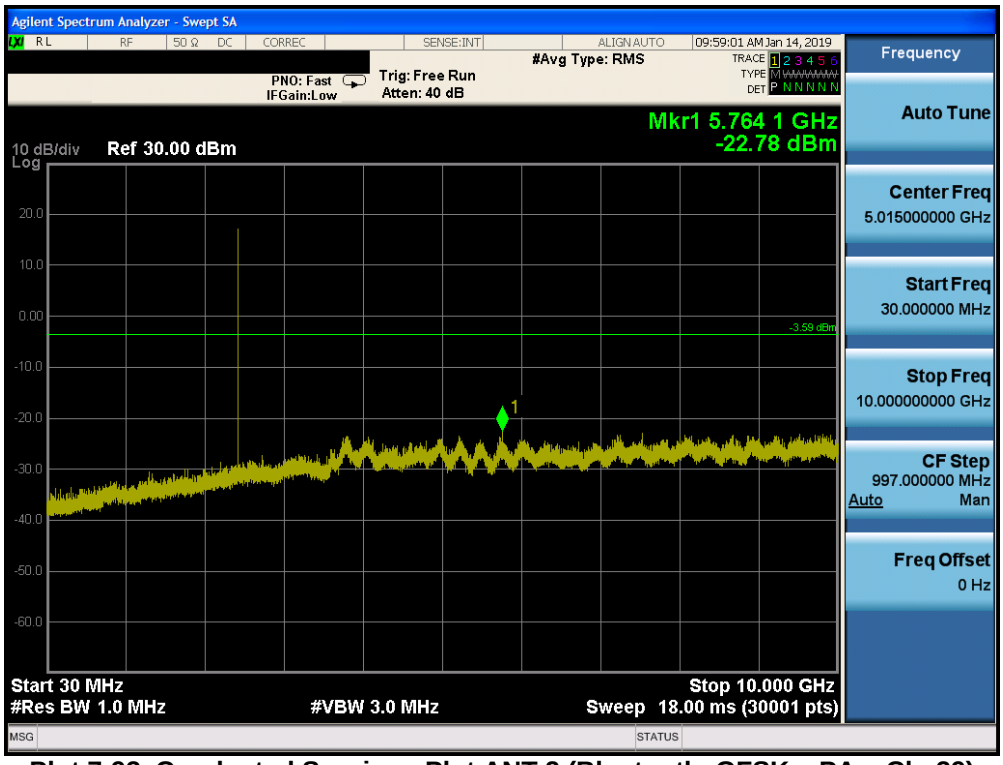
Antenna 2



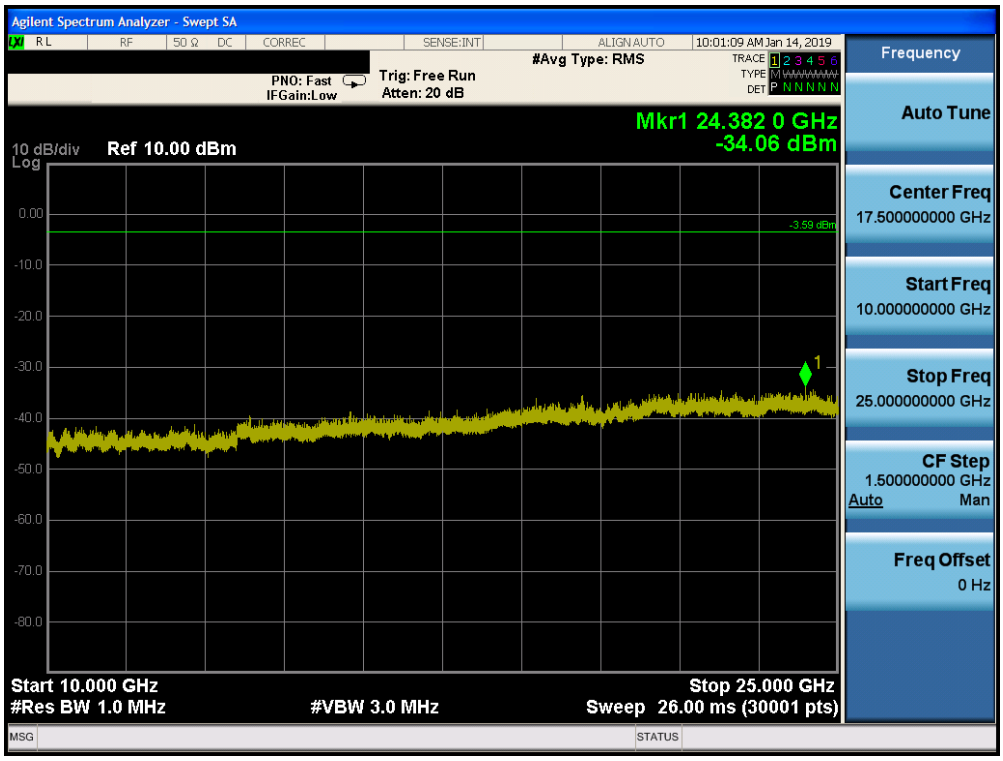
Plot 7-91. Conducted Spurious Plot ANT 2 (Bluetooth, GFSK, ePA – Ch. 0)



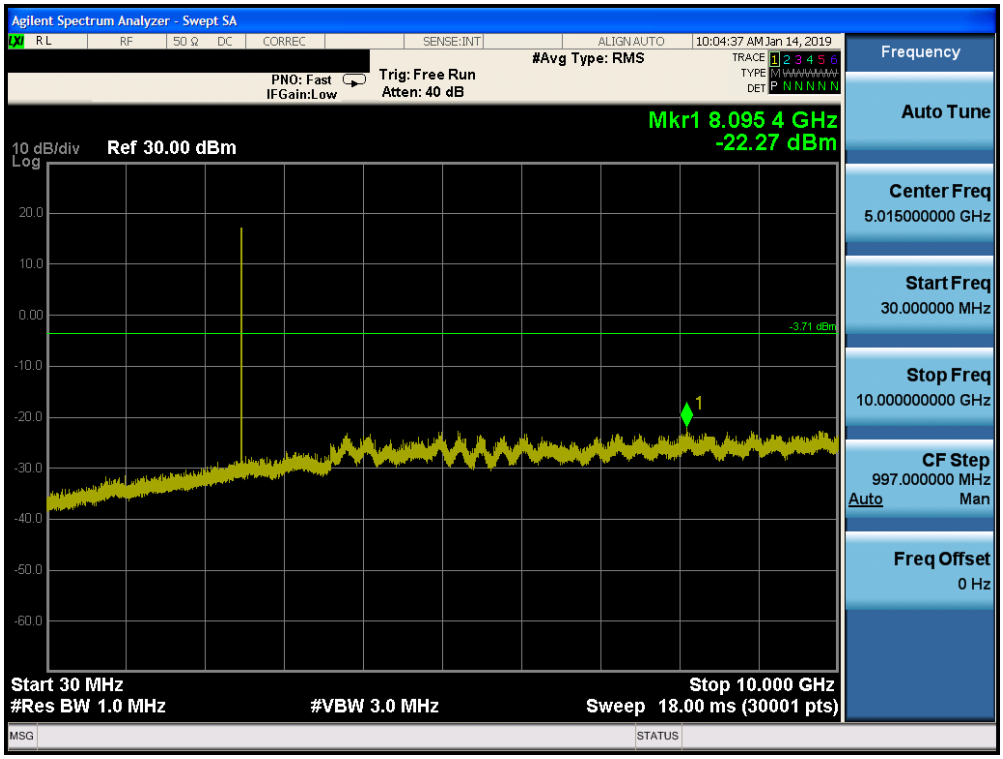
Plot 7-92. Conducted Spurious Plot ANT 2 (Bluetooth, GFSK, ePA – Ch. 0)



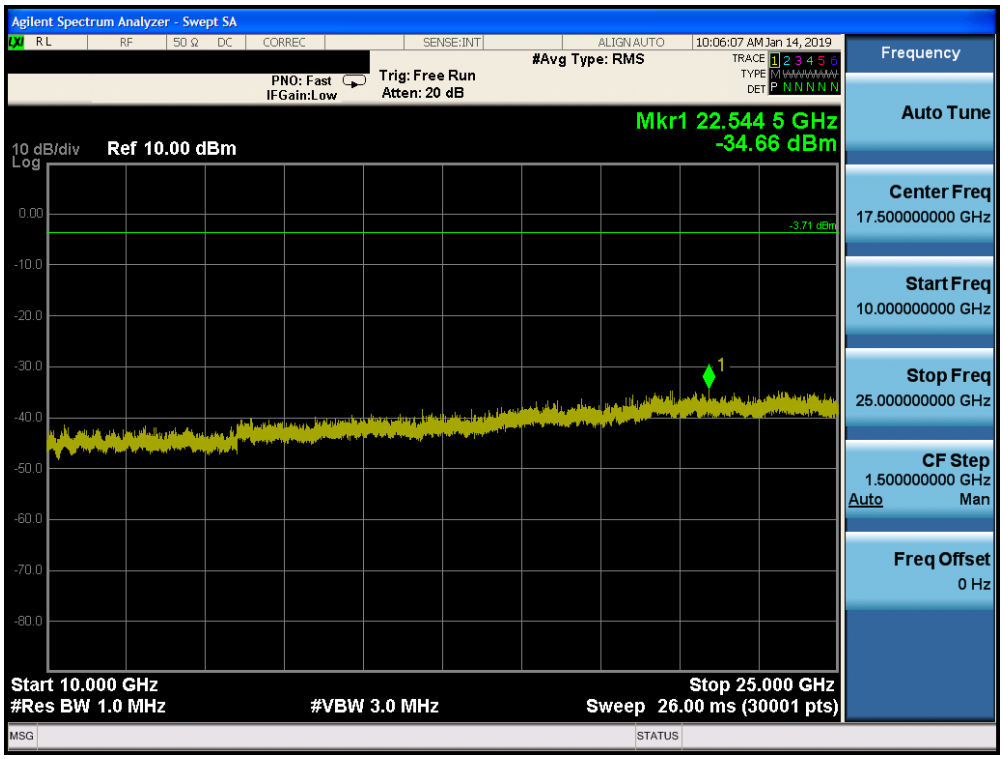
Plot 7-93. Conducted Spurious Plot ANT 2 (Bluetooth, GFSK, ePA – Ch. 39)



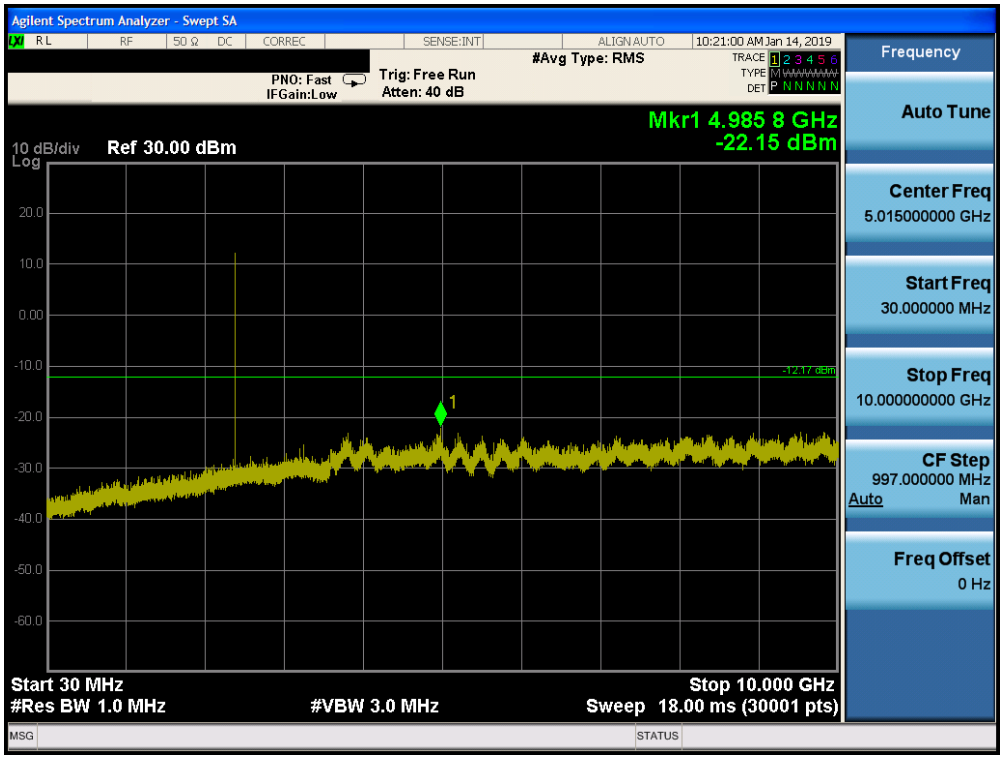
Plot 7-94. Conducted Spurious Plot ANT 2 (Bluetooth, GFSK, ePA Ch. 39)



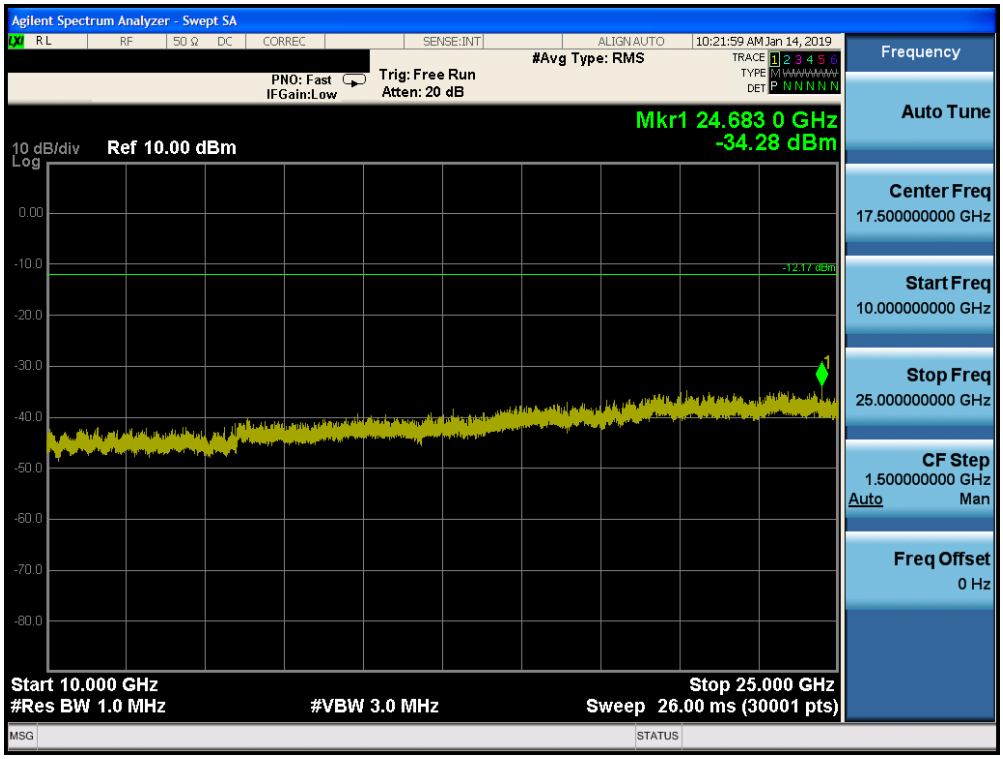
Plot 7-95. Conducted Spurious Plot ANT 2 (Bluetooth, GFSK, ePA – Ch. 78)



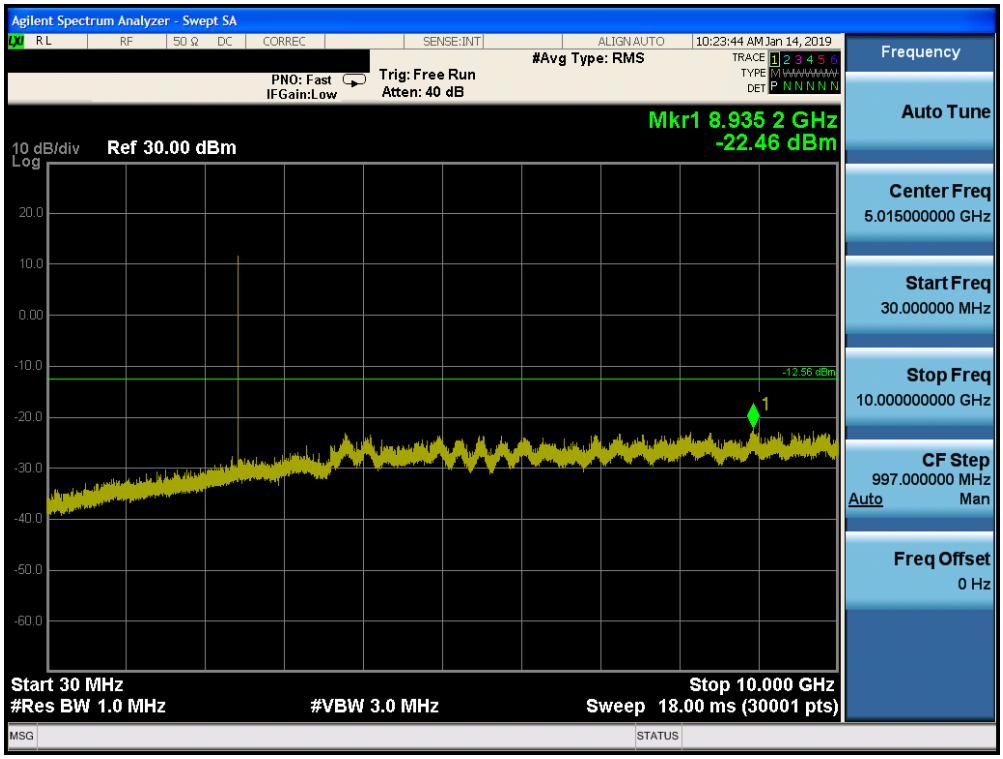
Plot 7-96. Conducted Spurious Plot ANT 2 (Bluetooth, GFSK, ePA – Ch. 78)



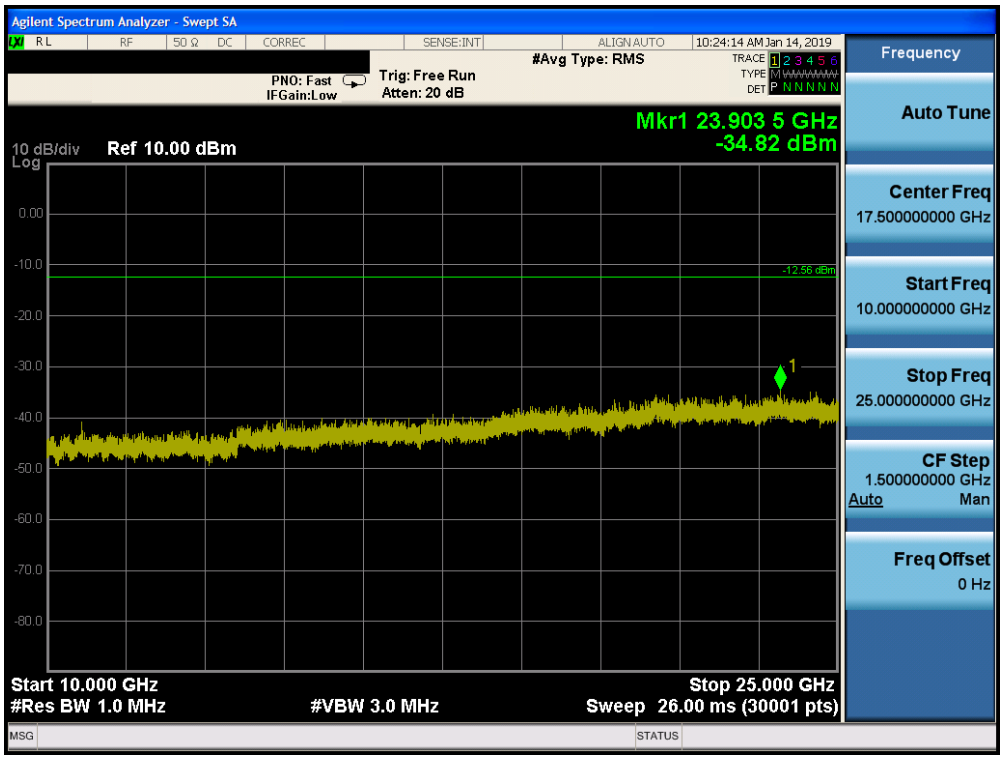
Plot 7-97. Conducted Spurious Plot ANT 2 (Bluetooth, 8DPSK, ePA – Ch. 0)



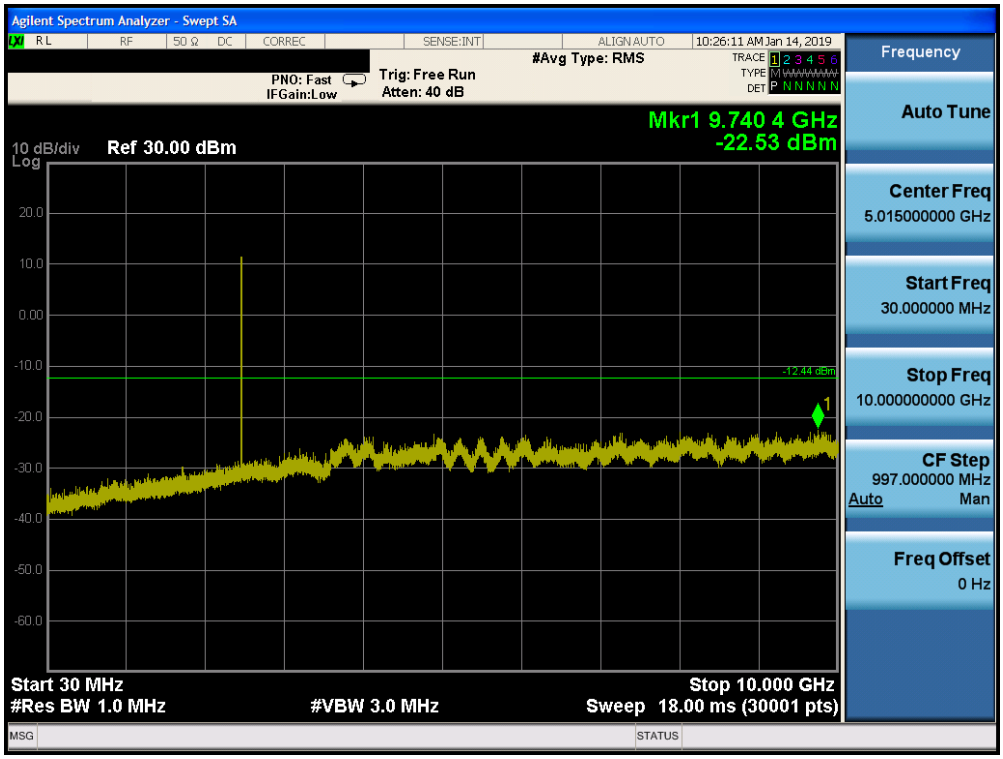
Plot 7-98. Conducted Spurious Plot ANT 2 (Bluetooth, 8DPSK, ePA – Ch. 0)



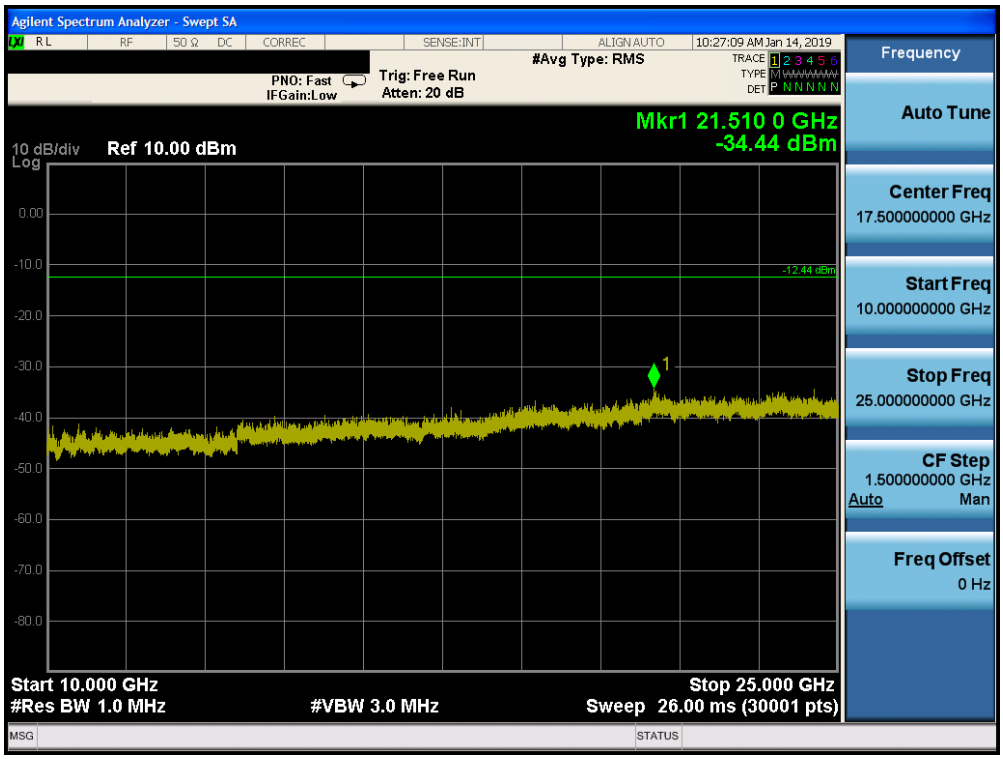
Plot 7-99. Conducted Spurious Plot ANT 2 (Bluetooth, 8DPSK, ePA – Ch. 39)



Plot 7-100. Conducted Spurious Plot ANT 2 (Bluetooth, 8DPSK, ePA Ch. 39)



Plot 7-101. Conducted Spurious Plot ANT 2 (Bluetooth, 8DPSK, ePA – Ch. 78)



Plot 7-102. Conducted Spurious Plot ANT 2 (Bluetooth, 8DPSK, ePA – Ch. 78)

7.9 Radiated Spurious Emission Measurements – Above 1GHz

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

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-14 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-14. Radiated Limits

Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

Test Settings

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be ≥ 2 x span/RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW is set depending on measurement frequency, as specified in Table 7-15 below
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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

Table 7-15. RBW as a Function of Frequency

Test Setup

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

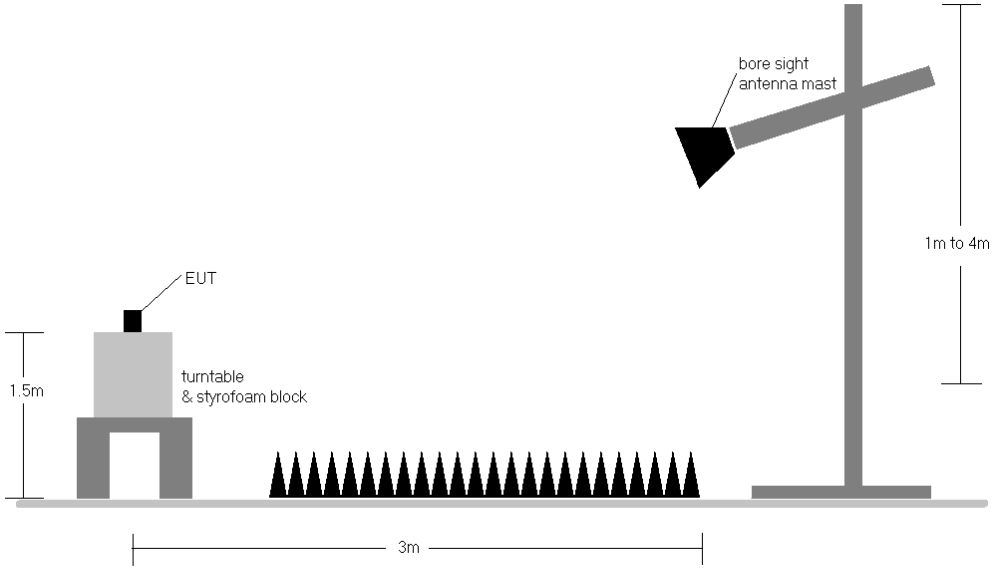


Figure 7-8. Radiated Test Setup >1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-14.
2. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
5. The duty cycle correction factor was not applied to noise floor measurements.
6. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
7. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
8. Both power schemes were investigated and only the worst case is reported

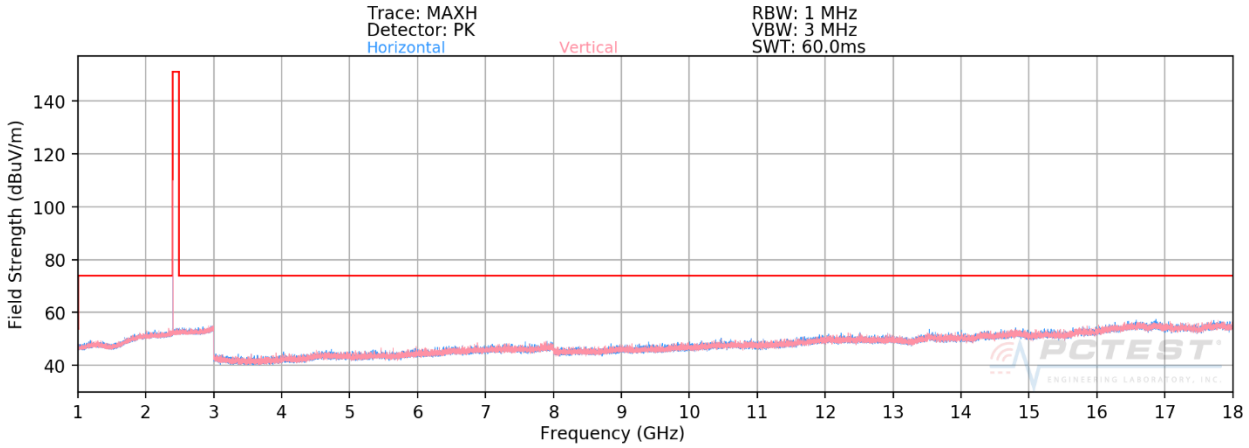
Sample Calculation

- Field Strength Level [dBµV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m] + Duty Cycle Correction [dB]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB]
- Margin [dB] = Field Strength Level [dBµV/m] – Limit [dBµV/m]

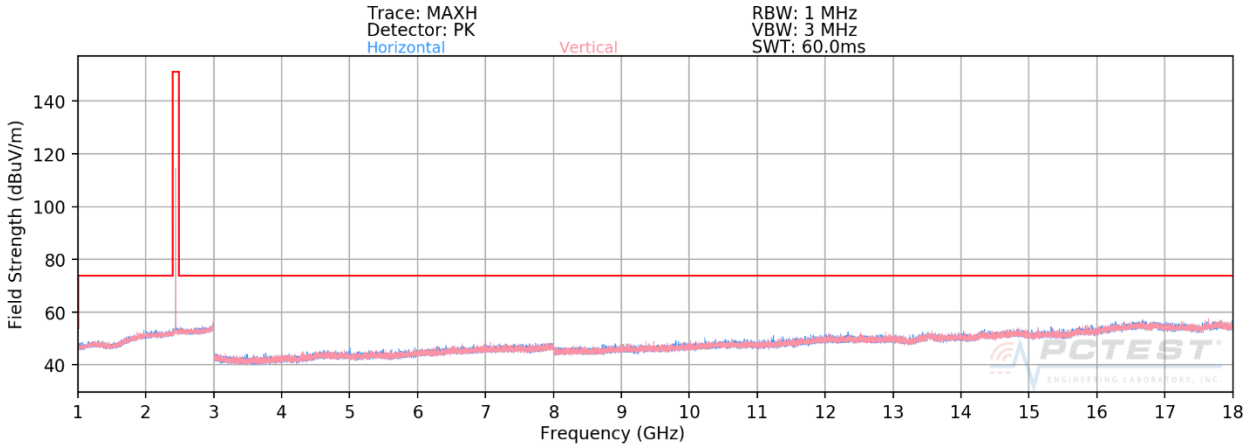
Radiated Spurious Emission Measurements

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

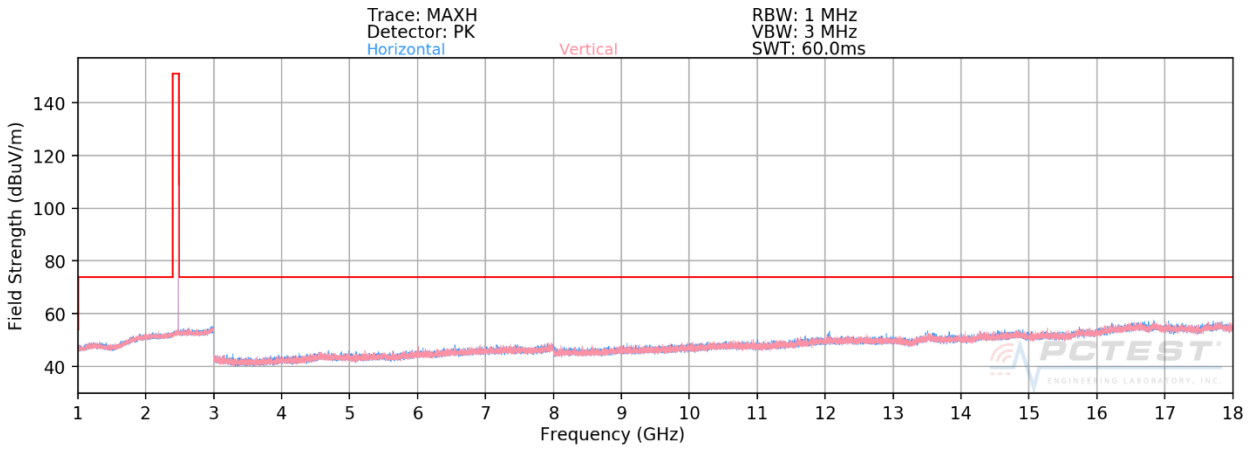
Antenna 0



Plot 7-103. Radiated Spurious Plot above 1GHz ANT 0 (BT GFSK ePA – Ch. 0)

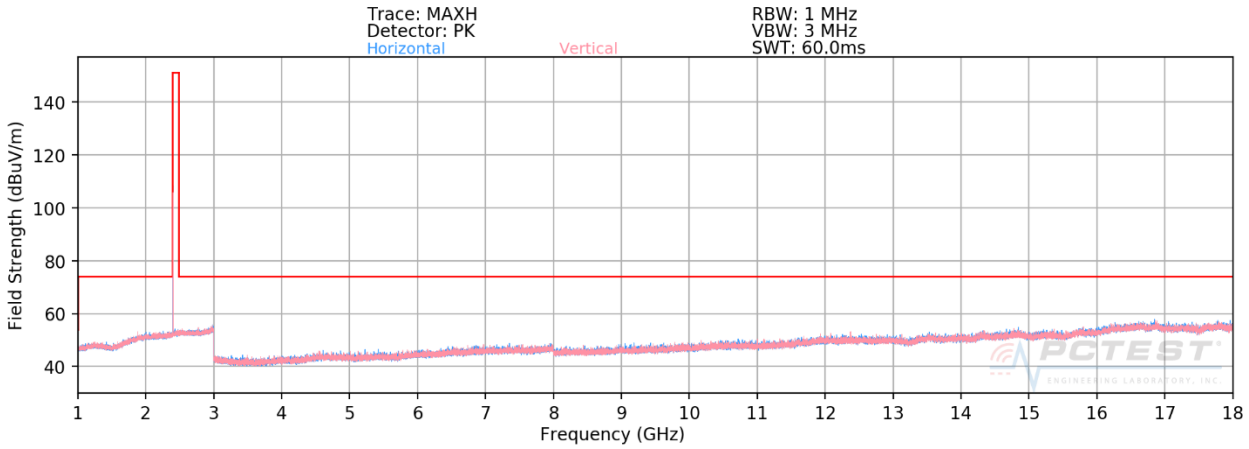


Plot 7-104. Radiated Spurious Plot above 1GHz ANT 0 (BT GFSK ePA – Ch. 39)

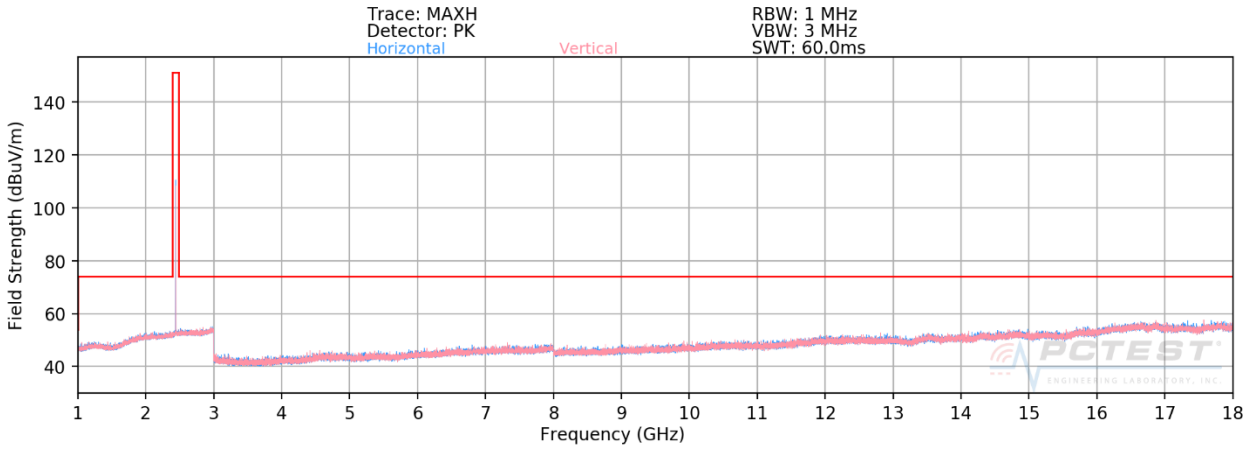


Plot 7-105. Radiated Spurious Plot above 1GHz ANT 0 (BT GFSK ePA – Ch. 78)

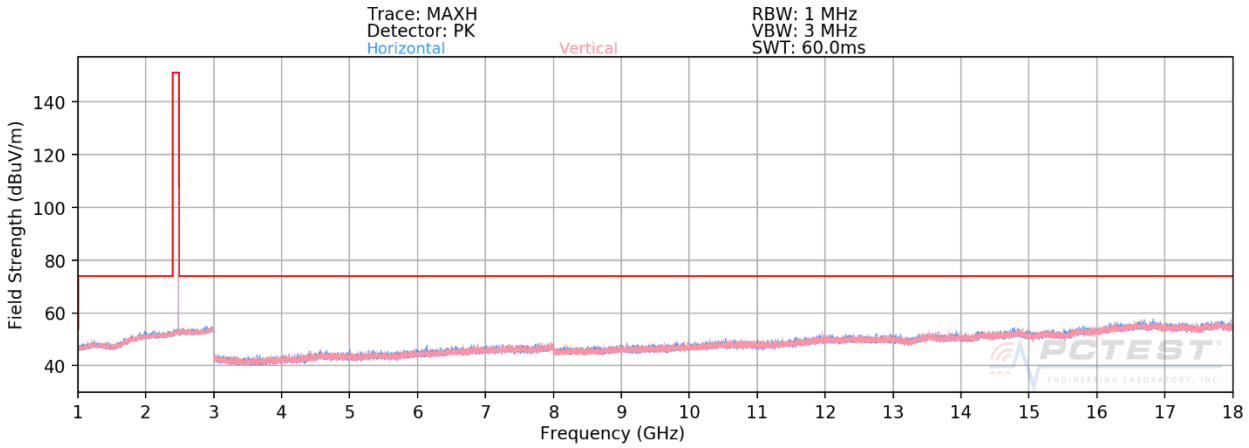
Antenna 1



Plot 7-106. Radiated Spurious Plot above 1GHz ANT 1 (BT GFSK ePA – Ch. 0)

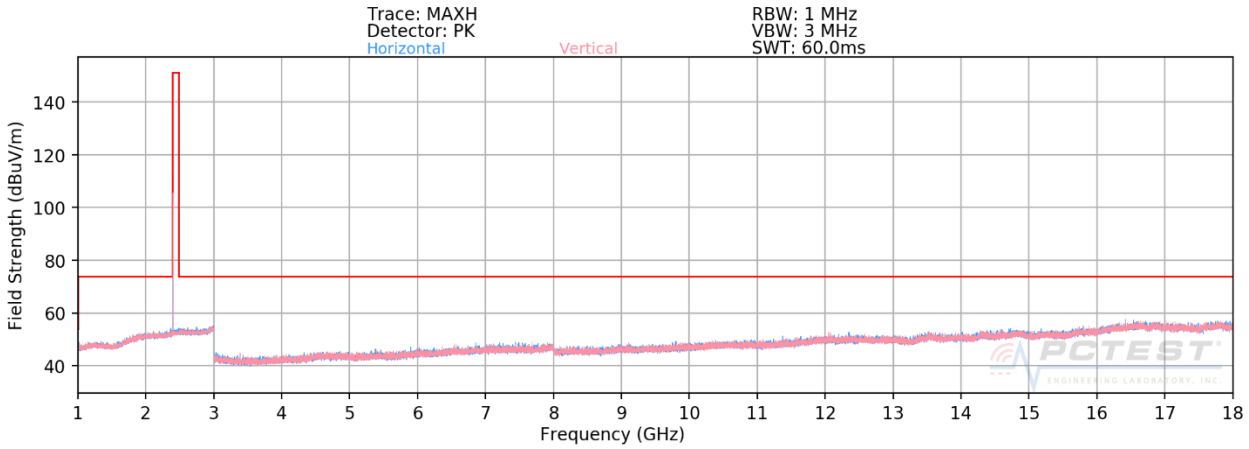


Plot 7-107. Radiated Spurious Plot above 1GHz ANT 1 (BT GFSK ePA – Ch. 39)

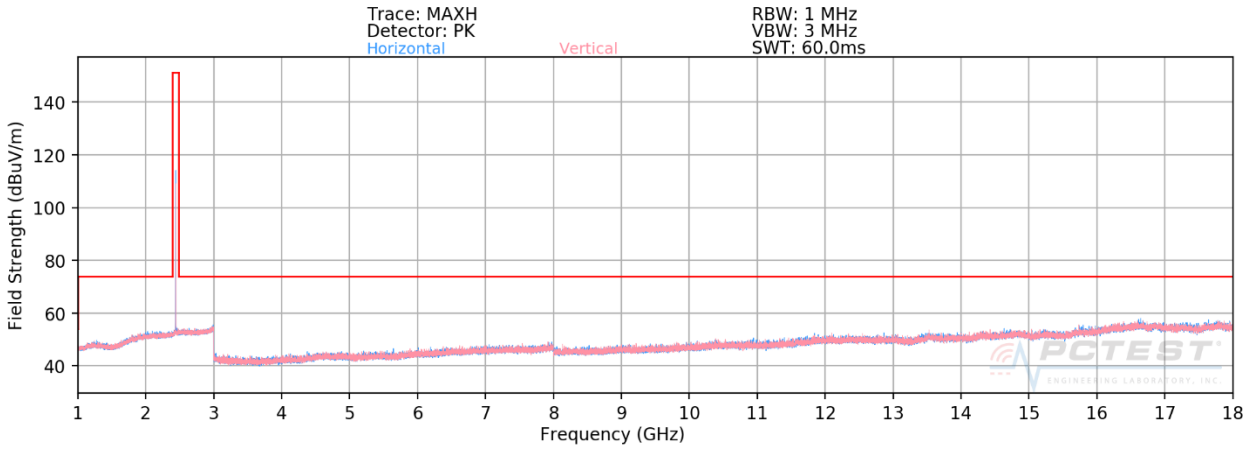


Plot 7-108. Radiated Spurious Plot above 1GHz ANT 1 (BT GFSK ePA – Ch. 78)

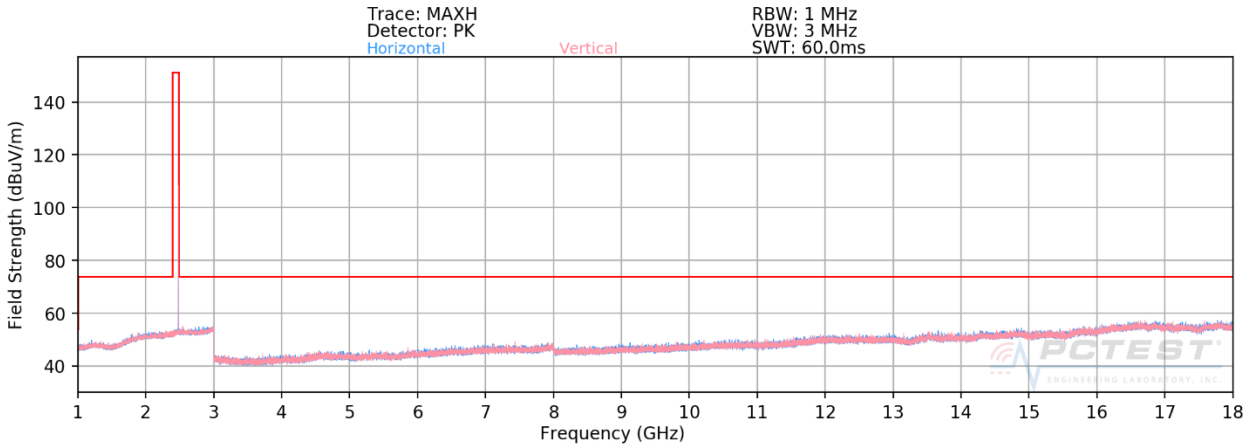
Antenna 2



Plot 7-109. Radiated Spurious Plot above 1GHz ANT 2 (BT GFSK ePA – Ch. 0)



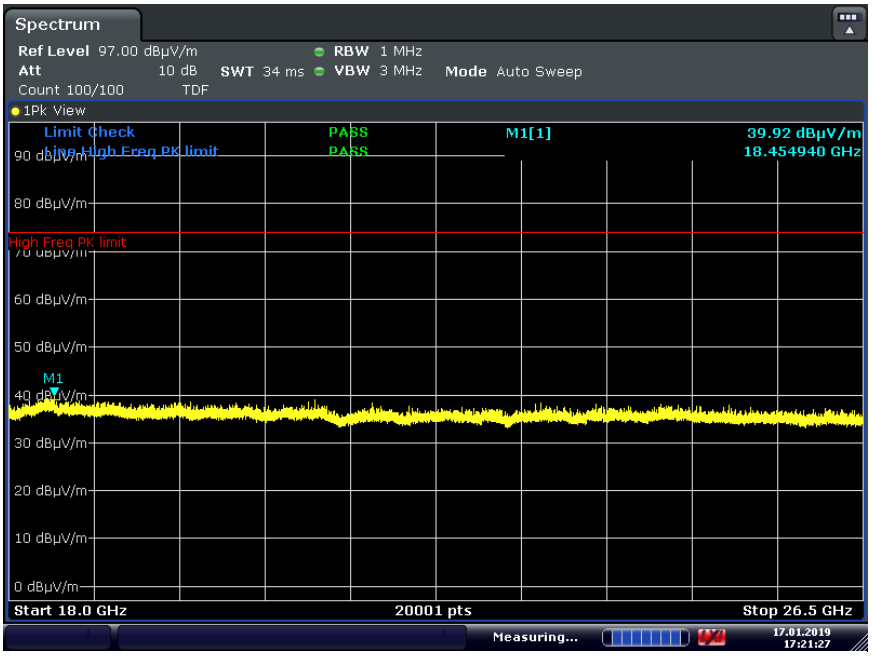
Plot 7-110. Radiated Spurious Plot above 1GHz ANT 2 (BT GFSK ePA – Ch. 39)



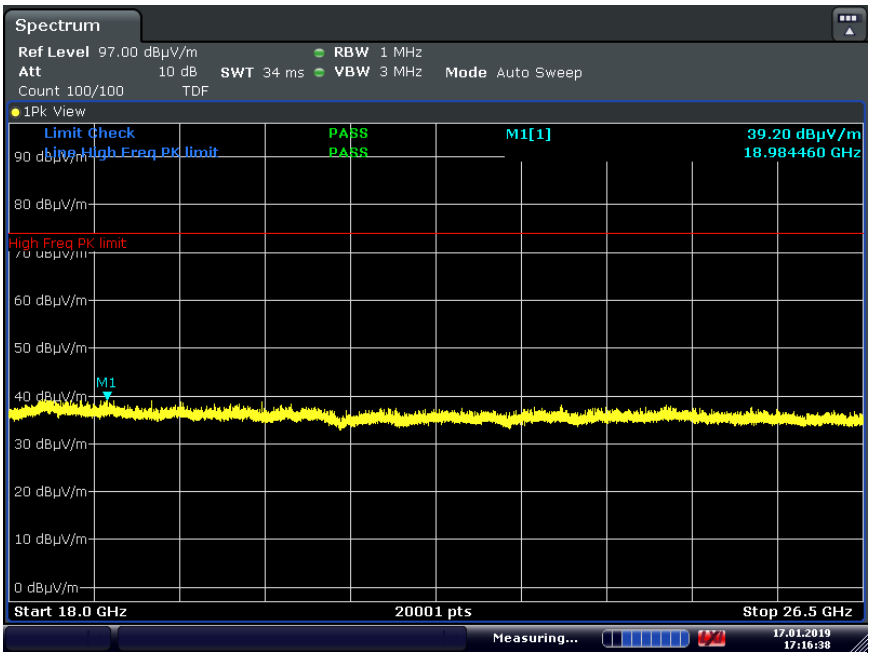
Plot 7-111. Radiated Spurious Plot above 1GHz ANT 2 (BT GFSK ePA – Ch. 78)

Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209; RSS-Gen [8.9]



Plot 7-112. Radiated Spurious Plot above 18GHz (GFSK ePA – Ch. 78, Pol. H)



Plot 7-113. Radiated Spurious Plot above 18GHz (GFSK ePA – Ch. 78, Pol. V)

Radiated Spurious Emission Measurements

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

Antenna 0

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0

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]
4804.00	Avg	H	-	-	-78.87	6.00	34.13	53.98	-19.85
4804.00	Peak	H	-	-	-66.35	6.00	46.65	73.98	-27.33
12010.00	Avg	H	-	-	-82.92	15.14	39.22	53.98	-14.76
12010.00	Peak	H	-	-	-71.78	15.14	50.36	73.98	-23.62

Table 7-16. Radiated Measurements

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2441MHz
Channel:	39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4882.00	Avg	H	-	-	-79.17	6.12	33.95	53.98	-20.03
4882.00	Peak	H	-	-	-67.23	6.12	45.89	73.98	-28.09
7323.00	Avg	H	-	-	-79.72	8.50	35.78	53.98	-18.20
7323.00	Peak	H	-	-	-68.19	8.50	47.31	73.98	-26.67
12205.00	Avg	H	-	-	-82.34	14.89	39.55	53.98	-14.43
12205.00	Peak	H	-	-	-70.24	14.89	51.65	73.98	-22.33

Table 7-17. Radiated Measurements

Radiated Spurious Emission Measurements

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78

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]
4960.00	Avg	H	-	-	-79.11	6.12	34.01	53.98	-19.97
4960.00	Peak	H	-	-	-67.81	6.12	45.31	73.98	-28.67
7440.00	Avg	H	-	-	-80.06	8.97	35.91	53.98	-18.07
7440.00	Peak	H	-	-	-68.94	8.97	47.03	73.98	-26.95
12400.00	Avg	H	-	-	-83.10	15.91	39.81	53.98	-14.17
12400.00	Peak	H	-	-	-72.04	15.91	50.87	73.98	-23.11

Table 7-18. Radiated Measurements

Antenna 1

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0

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]
4804.00	Avg	V	-	-	-78.73	6.00	34.27	53.98	-19.71
4804.00	Peak	V	-	-	-67.75	6.00	45.25	73.98	-28.73
12010.00	Avg	V	-	-	-82.44	15.14	39.70	53.98	-14.28
12010.00	Peak	V	-	-	-70.79	15.14	51.35	73.98	-22.63

Table 7-19. Radiated Measurements

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2441MHz
Channel:	39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4882.00	Avg	V	-	-	-79.18	6.12	33.94	53.98	-20.04
4882.00	Peak	V	-	-	-67.69	6.12	45.43	73.98	-28.55
7323.00	Avg	V	115	130	-74.91	8.50	40.59	53.98	-13.39
7323.00	Peak	V	115	130	-65.97	8.50	49.53	73.98	-24.45
12205.00	Avg	V	-	-	-81.84	14.89	40.05	53.98	-13.93
12205.00	Peak	V	-	-	-70.83	14.89	51.06	73.98	-22.92

Table 7-20. Radiated Measurements

Radiated Spurious Emission Measurements

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78

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]
4960.00	Avg	H	340	81	-76.06	6.12	37.06	53.98	-16.92
4960.00	Peak	H	340	81	-66.83	6.12	46.29	73.98	-27.69
7440.00	Avg	Y	-	-	-79.77	8.97	36.20	53.98	-17.78
7440.00	Peak	Y	-	-	-68.85	8.97	47.12	73.98	-26.86
12400.00	Avg	Y	-	-	-82.89	15.91	40.02	53.98	-13.96
12400.00	Peak	Y	-	-	-71.48	15.91	51.43	73.98	-22.55

Table 7-21. Radiated Measurements

Antenna 2

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0

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]
4804.00	Avg	H	-	-	-78.91	6.00	34.09	53.98	-19.89
4804.00	Peak	H	-	-	-66.85	6.00	46.15	73.98	-27.83
12010.00	Avg	H	-	-	-82.38	15.14	39.76	53.98	-14.22
12010.00	Peak	H	-	-	-70.46	15.14	51.68	73.98	-22.30

Table 7-22. Radiated Measurements

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2441MHz
Channel:	39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4882.00	Avg	H	-	-	-79.08	6.12	34.04	53.98	-19.94
4882.00	Peak	H	-	-	-67.40	6.12	45.72	73.98	-28.26
7323.00	Avg	H	-	-	-79.50	8.50	36.00	53.98	-17.98
7323.00	Peak	H	-	-	-68.54	8.50	46.96	73.98	-27.02
12205.00	Avg	H	-	-	-81.77	14.89	40.12	53.98	-13.86
12205.00	Peak	H	-	-	-70.27	14.89	51.62	73.98	-22.36

Table 7-23. Radiated Measurements

Radiated Spurious Emission Measurements

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78

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]
4960.00	Avg	V	347	44	-78.36	6.12	34.76	53.98	-19.22
4960.00	Peak	V	347	44	-67.62	6.12	45.50	73.98	-28.48
7440.00	Avg	H	-	-	-79.66	8.97	36.31	53.98	-17.67
7440.00	Peak	H	-	-	-67.90	8.97	48.07	73.98	-25.91
12400.00	Avg	H	-	-	-83.00	15.91	39.91	53.98	-14.07
12400.00	Peak	H	-	-	-71.33	15.91	51.58	73.98	-22.40

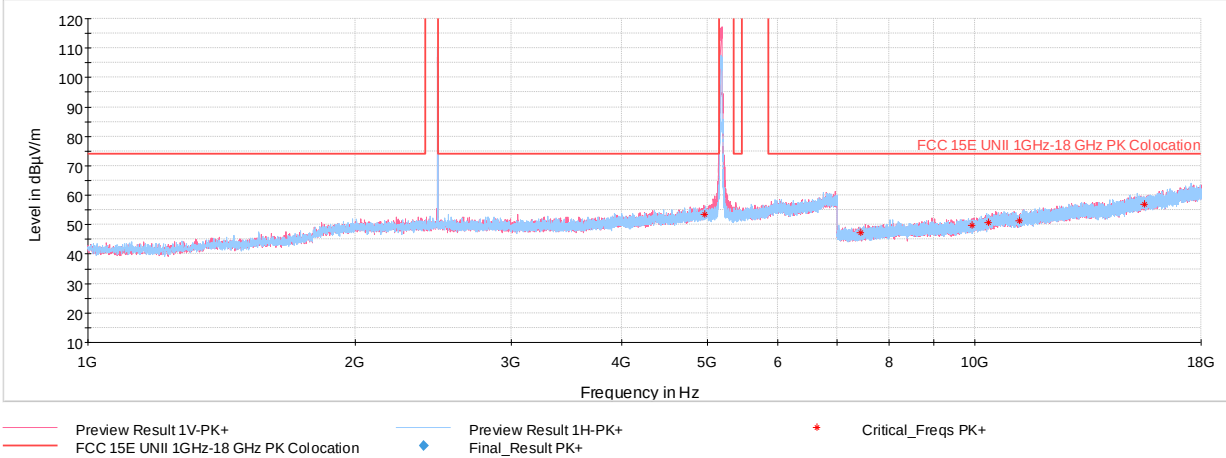
Table 7-24. Radiated Measurements

Simultaneous Tx Radiated Spurious Measurements

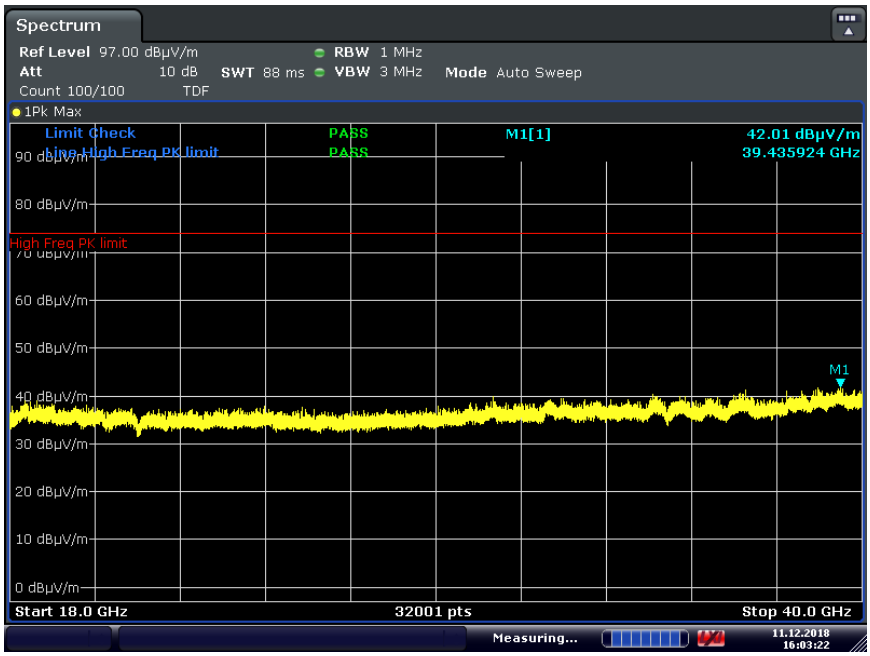
§15.247 §15.205 & §15.209; RSS-Gen [8.9]

Description	2.4 GHz Emission	5 GHz Emission
Antenna	0	0
Channel	78	36
Operating Frequency (MHz)	2480	5180
Data Rate (Mbps)	GFSK/1Mbps	MCS0
Mode	Bluetooth	UNII

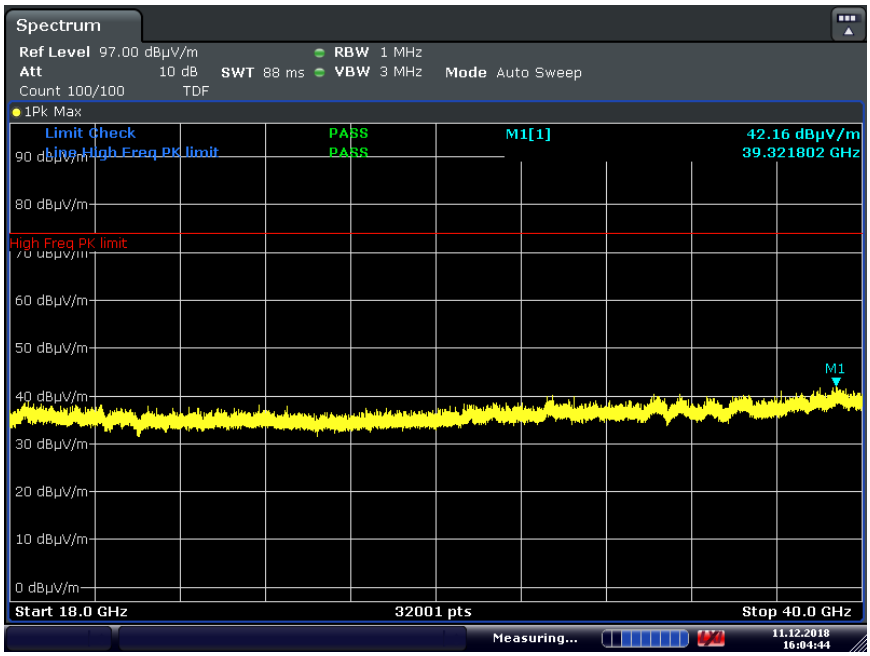
Table 7-25. Worst Case Simultaneous Transmission Config



Plot 7-114. Radiated Spurious Plot above 1GHz (2.4GHz – 5GHz)



Plot 7-115. Radiated Spurious Plot 18GHz – 40GHz (2.4GHz – 5GHz) Pol. H



Plot 7-116. Radiated Spurious Plot 18GHz – 40GHz (2.4GHz – 5GHz) Pol. V

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]
4960.00	Avg	V	-	-	-81.73	16.90	42.17	53.98	-11.81
4960.00	Peak	V	-	-	-68.82	16.90	55.08	73.98	-18.90
7440.00	Avg	V	-	-	-85.14	15.99	37.85	53.98	-16.13
7440.00	Peak	V	-	-	-72.42	15.99	50.57	73.98	-23.41
9920.00	Avg	V	-	-	-86.93	19.66	39.73	53.98	-14.25
9920.00	Peak	V	-	-	-73.75	19.66	52.91	73.98	-21.07
12400.00	Avg	V	-	-	-86.88	23.65	43.77	53.98	-10.21
12400.00	Peak	V	-	-	-73.83	23.65	56.82	73.98	-17.16
10360.00	Avg	V	-	-	-84.91	20.61	42.70	53.98	-11.28
10360.00	Peak	V	-	-	-73.44	20.61	54.17	73.98	-19.81
15540.00	Avg	V	-	-	-85.49	27.67	49.18	53.98	-4.80
15540.00	Peak	V	-	-	-74.27	27.67	60.40	73.98	-13.58

Table 7-26. Radiated Measurements (2.4GHz – 5GHz)

7.10 Radiated Restricted Band Edge Measurements

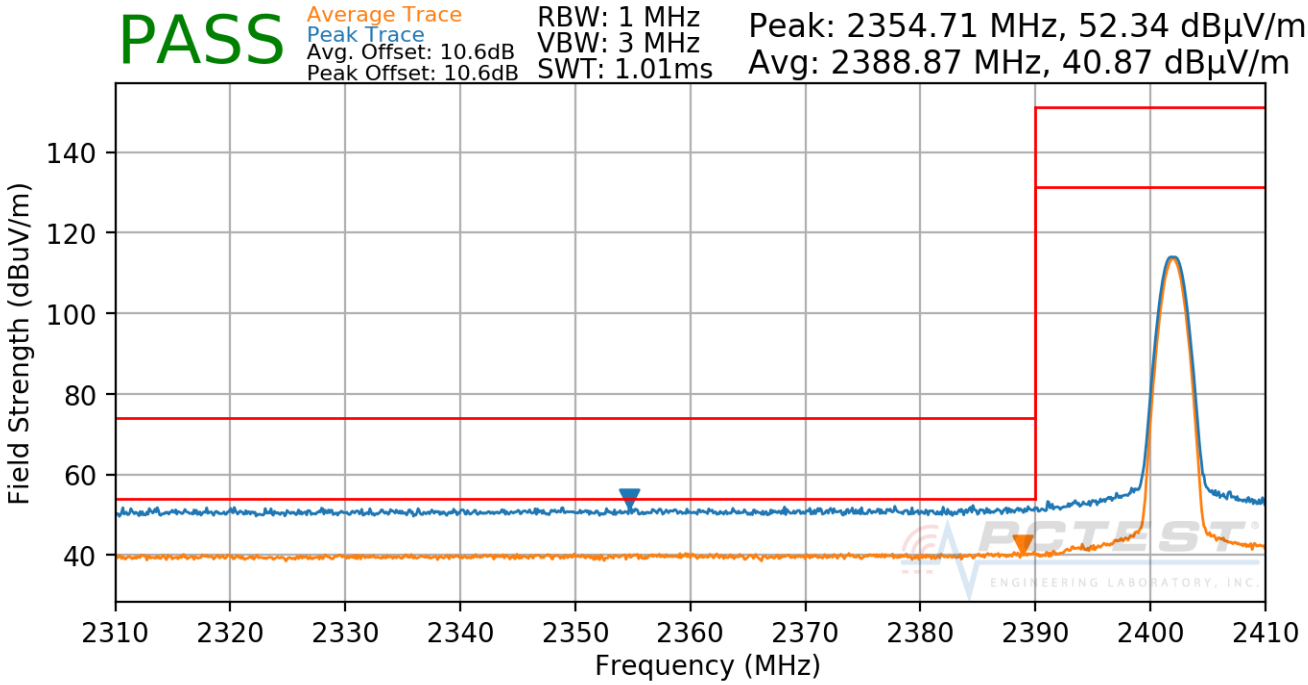
§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting. Two different amplitude offsets were used depending on whether peak or average measurements were measured. The average measurements use a duty cycle correction factor (DCCF).

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



Plot 7-117. Radiated Restricted Lower Band Edge Measurement ANT 0

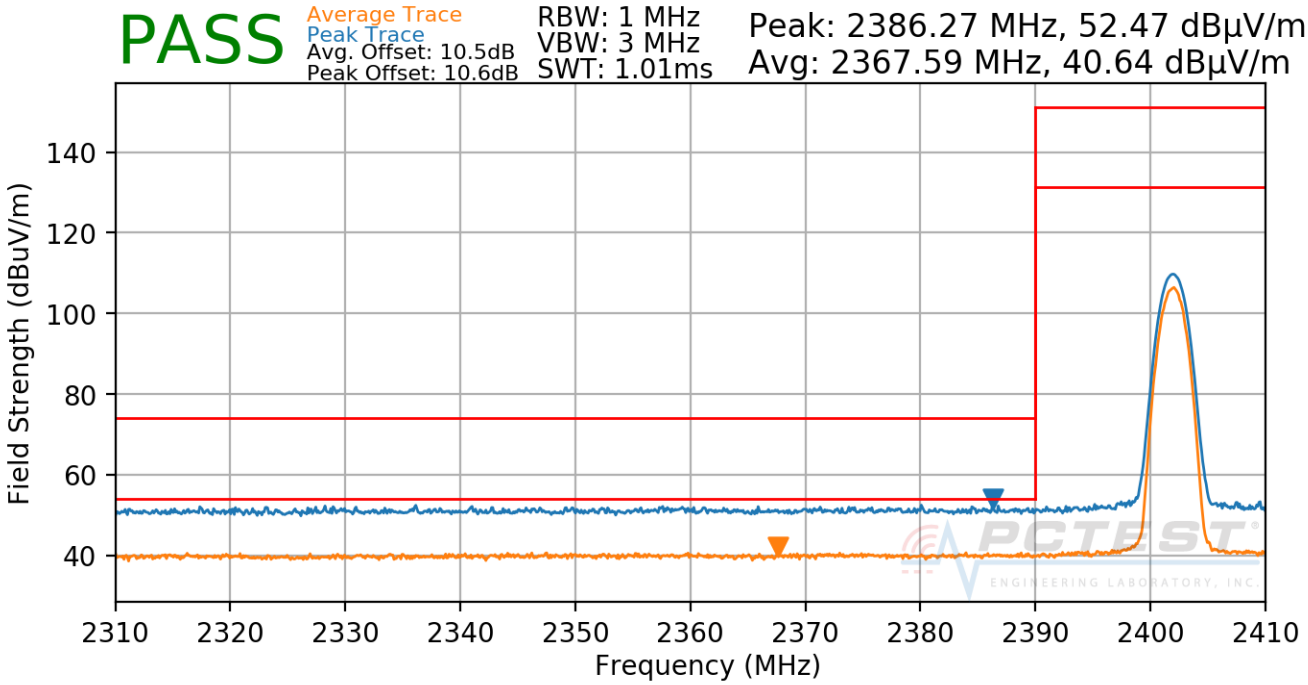
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	8DPSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



Plot 7-118. Radiated Restricted Lower Band Edge Measurement ANT 0

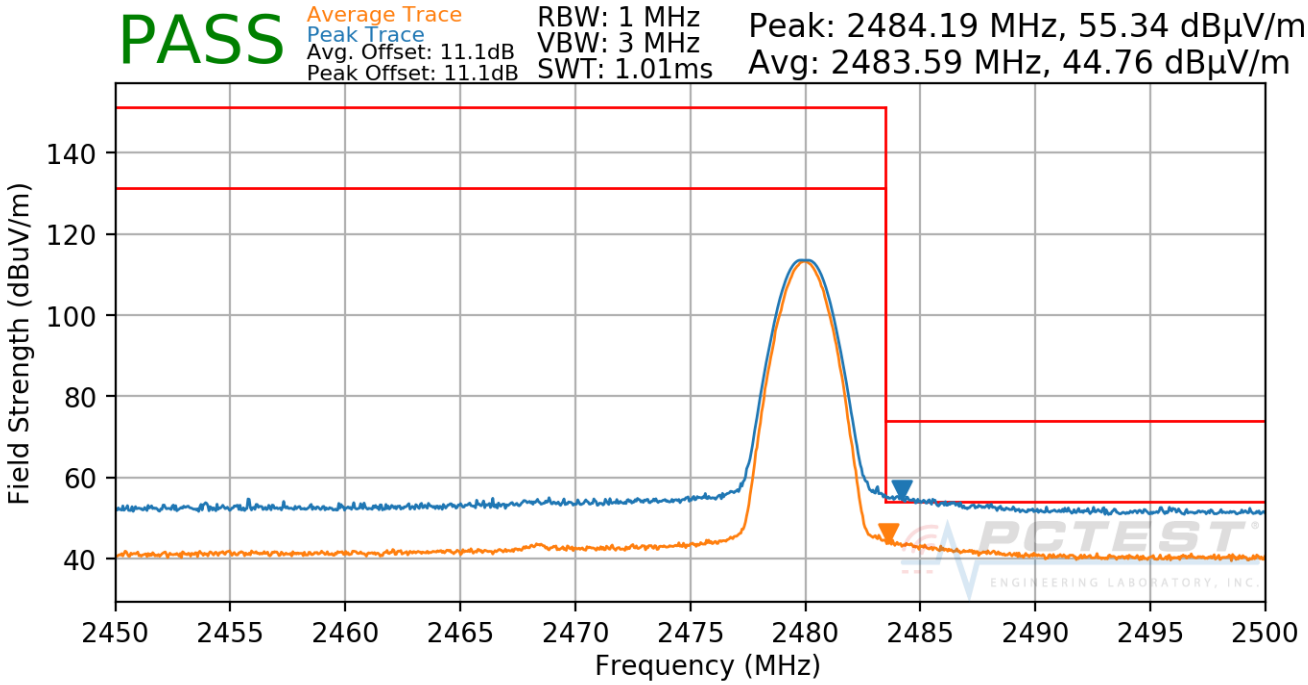
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78



Plot 7-119. Radiated Restricted Upper Band Edge Measurement ANT 0

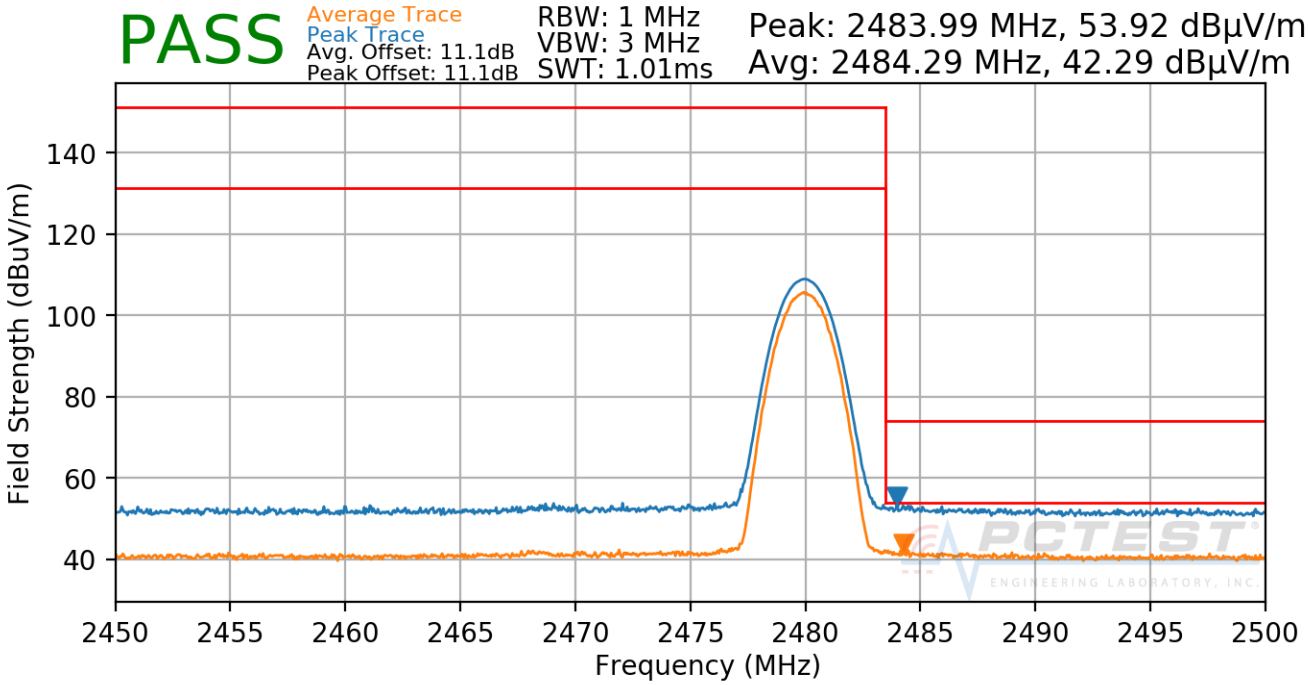
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	8DPSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78



Plot 7-120. Radiated Restricted Upper Band Edge Measurement ANT 0

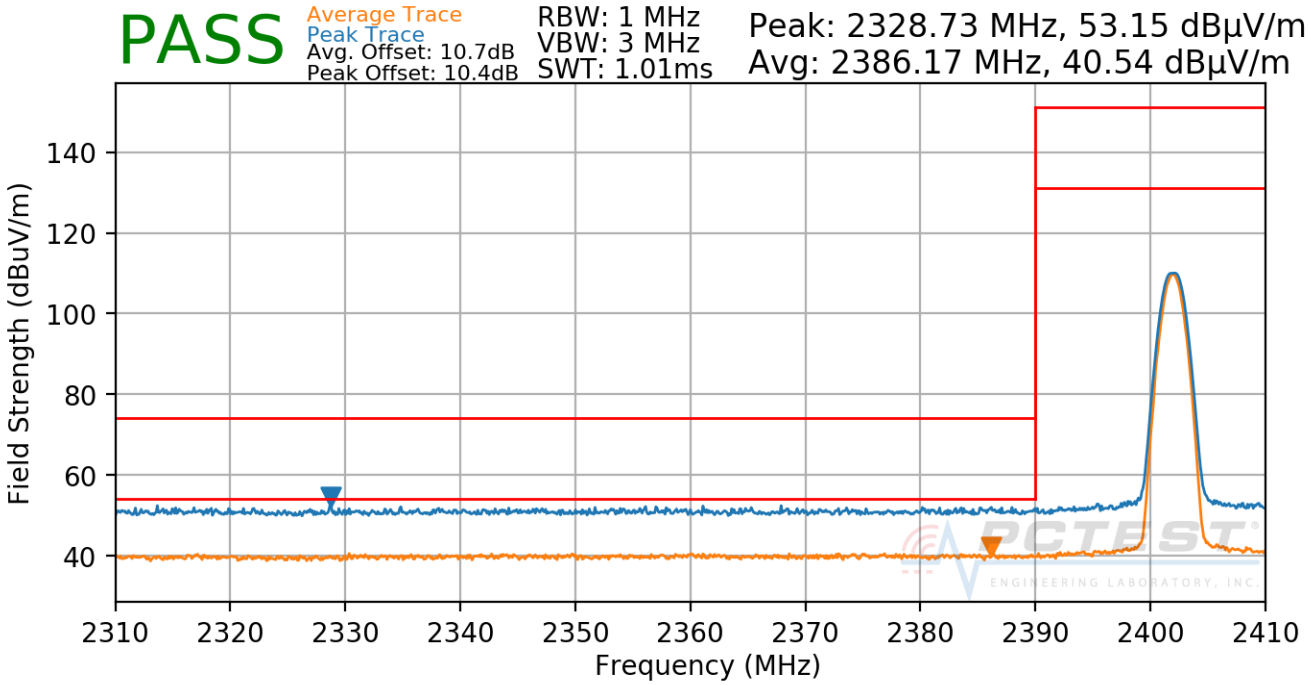
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



Plot 7-121. Radiated Restricted Lower Band Edge Measurement ANT 1

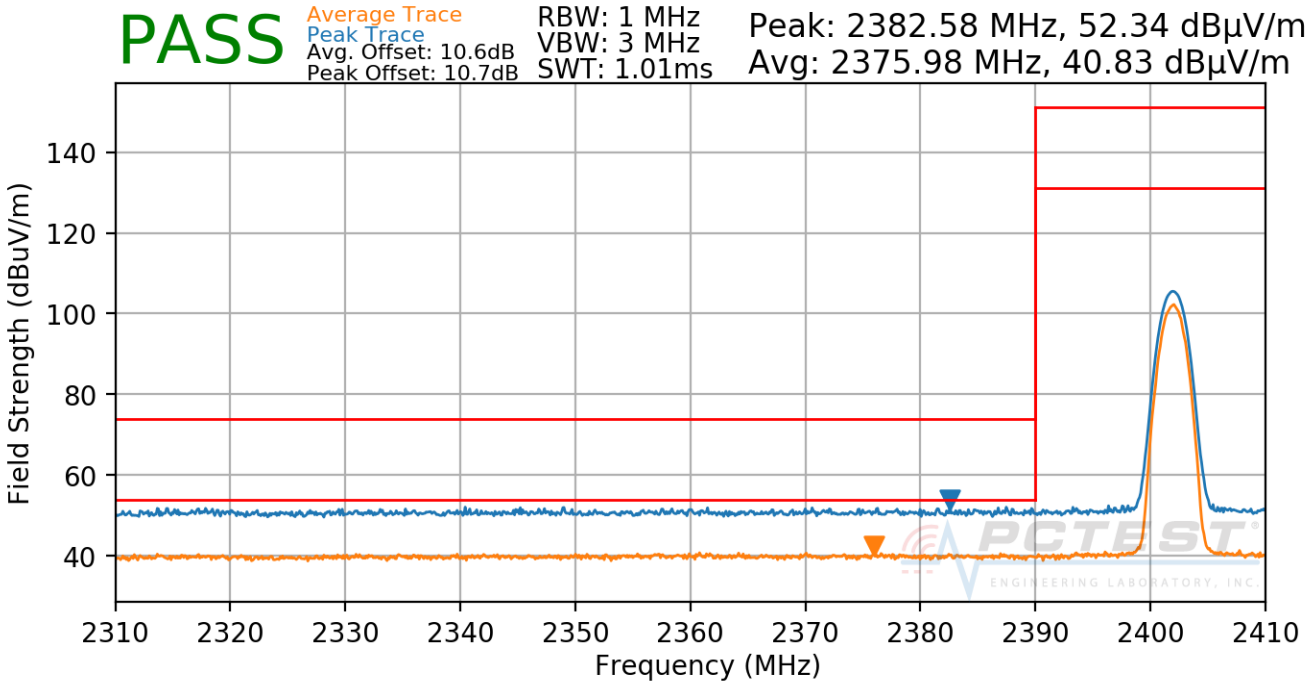
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	8DPSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



Plot 7-122. Radiated Restricted Lower Band Edge Measurement ANT 1

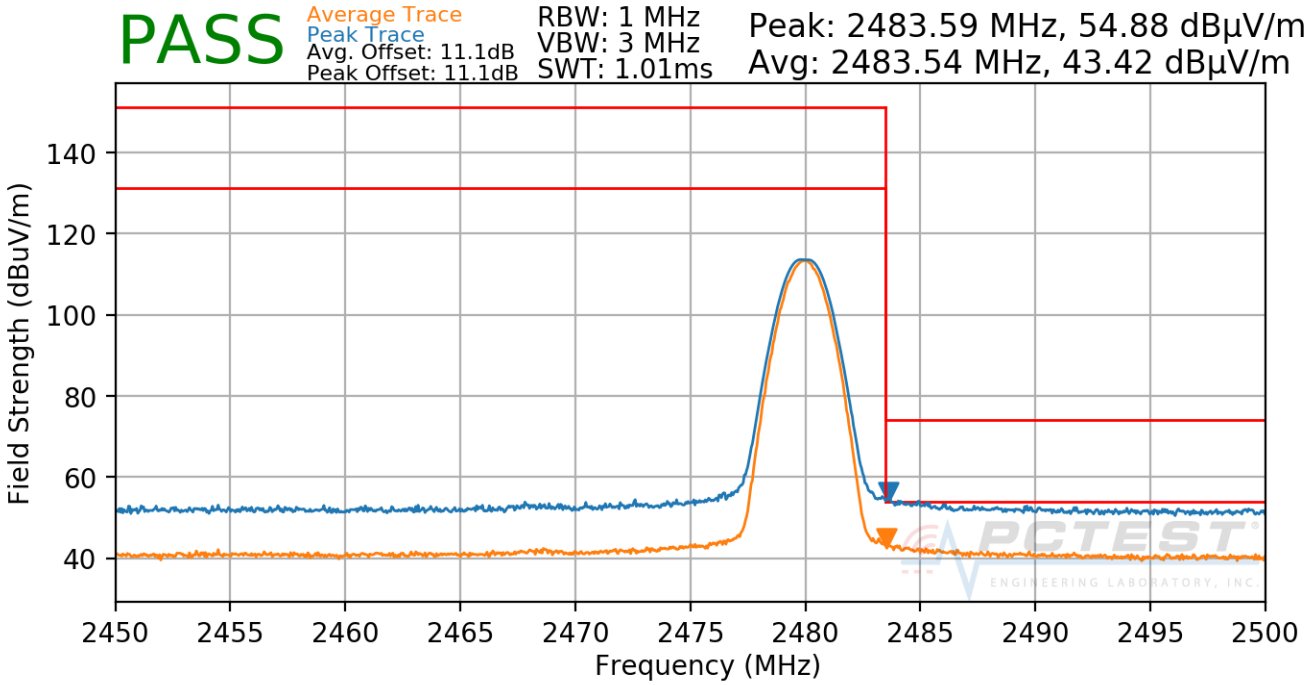
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78



Plot 7-123. Radiated Restricted Upper Band Edge Measurement ANT 1

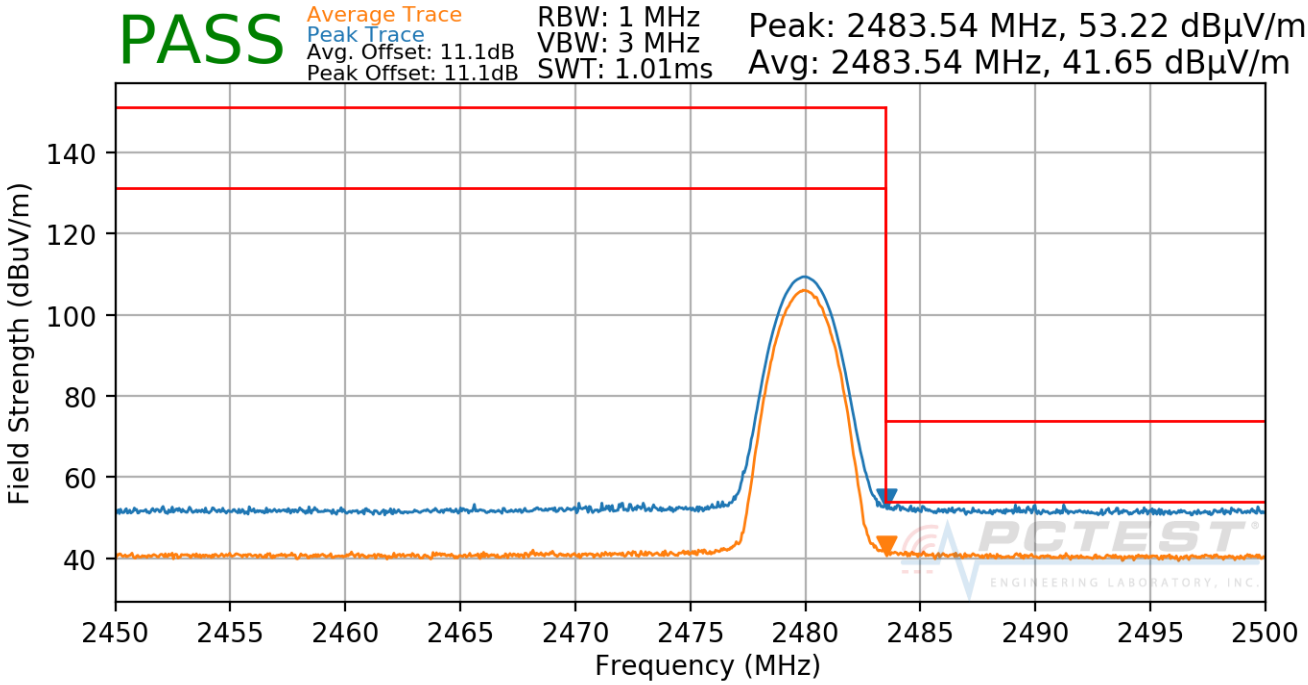
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	8DPSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78



Plot 7-124. Radiated Restricted Upper Band Edge Measurement ANT 1

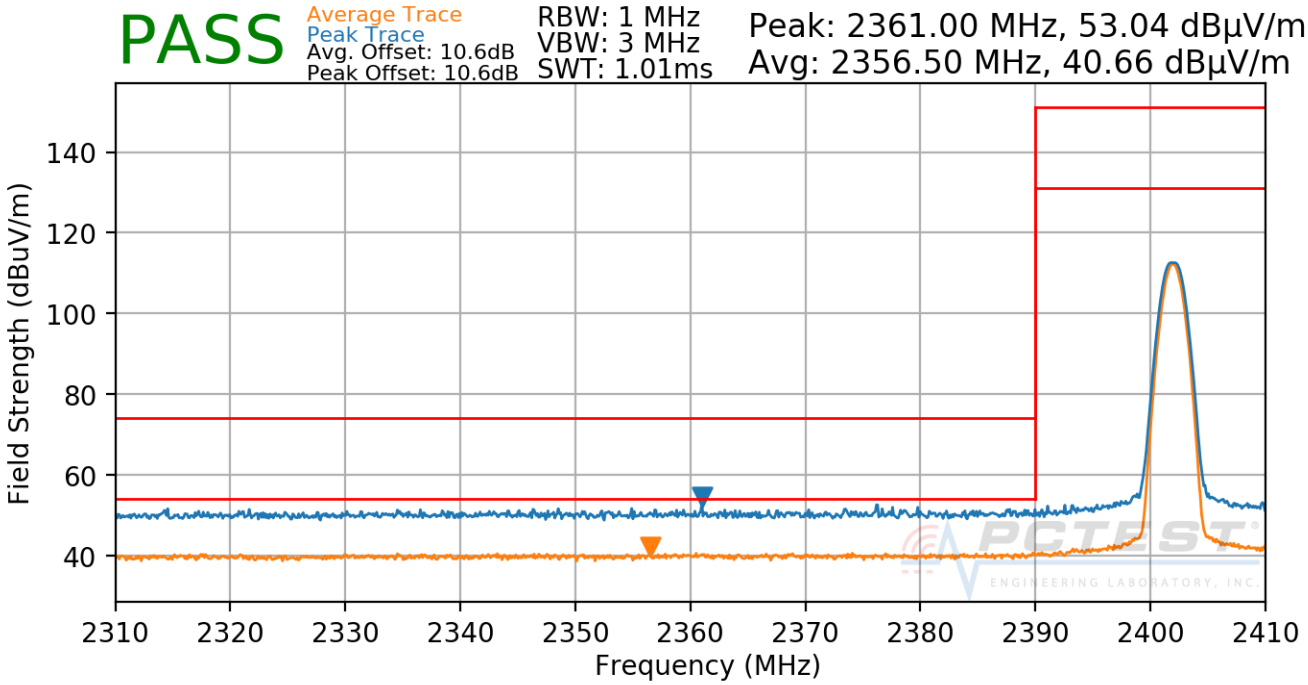
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



Plot 7-125. Radiated Restricted Lower Band Edge Measurement ANT 2

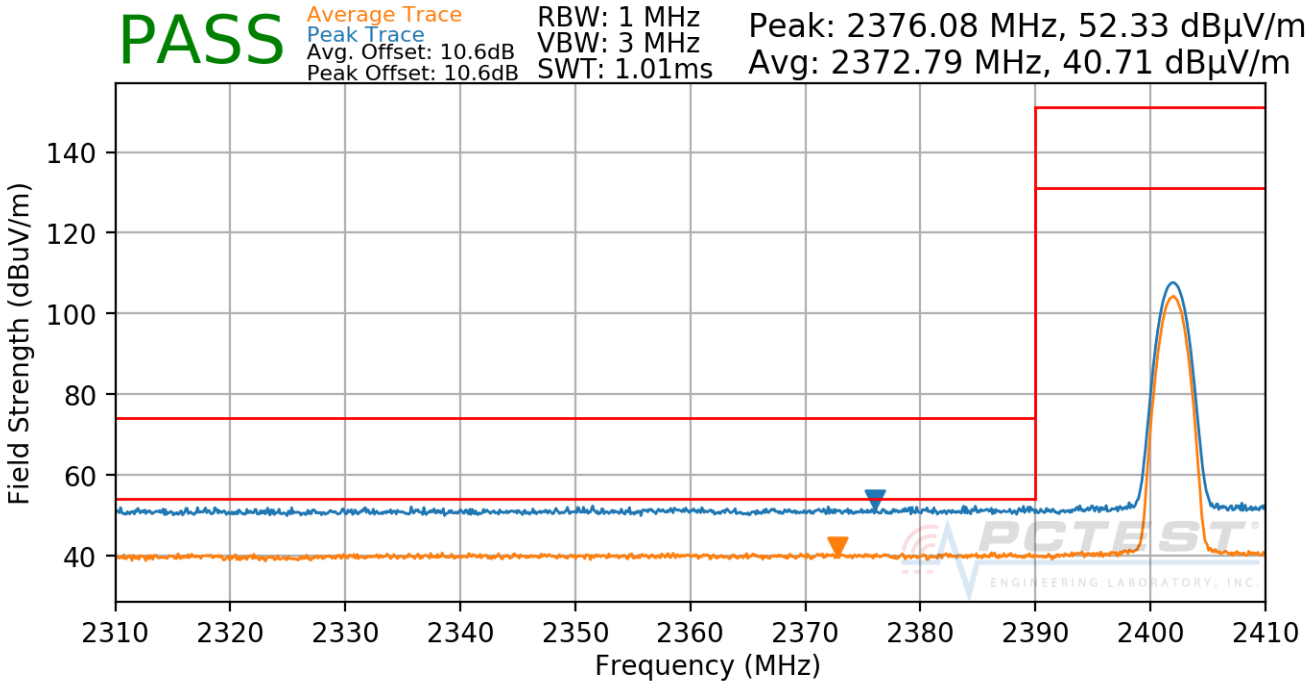
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	8DPSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



Plot 7-126. Radiated Restricted Lower Band Edge Measurement ANT 2

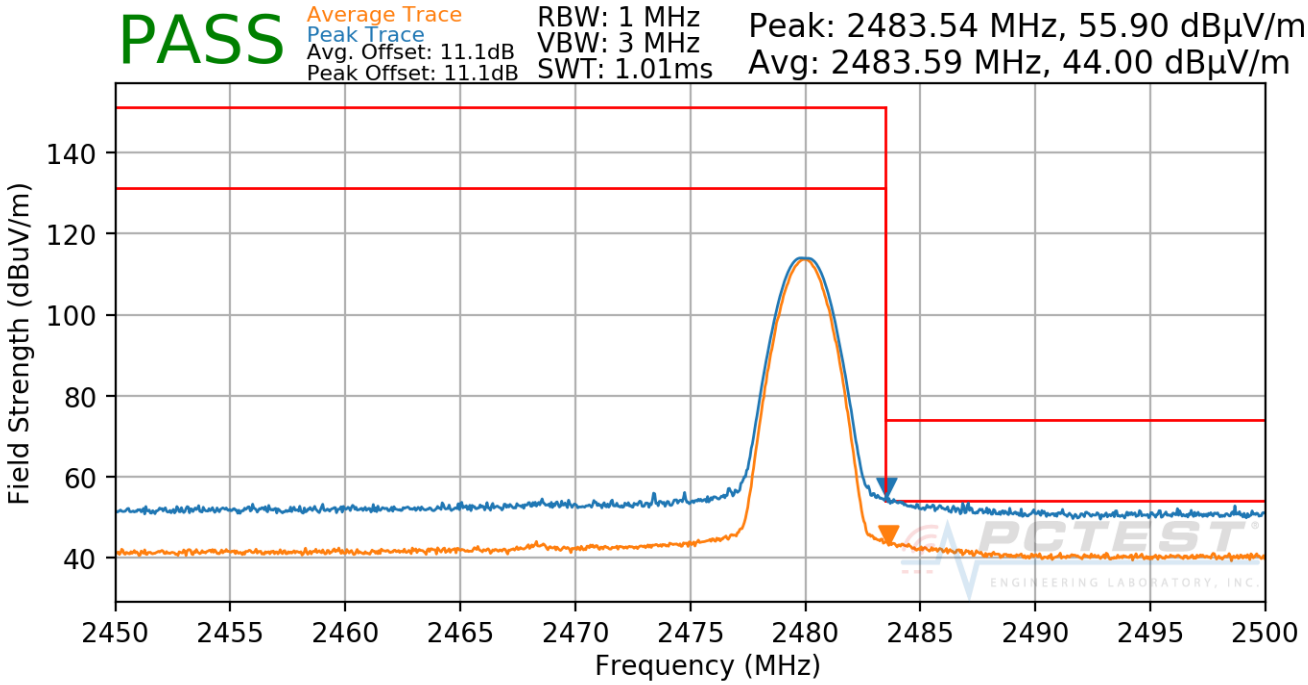
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	GFSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78



Plot 7-127. Radiated Restricted Upper Band Edge Measurement ANT 2

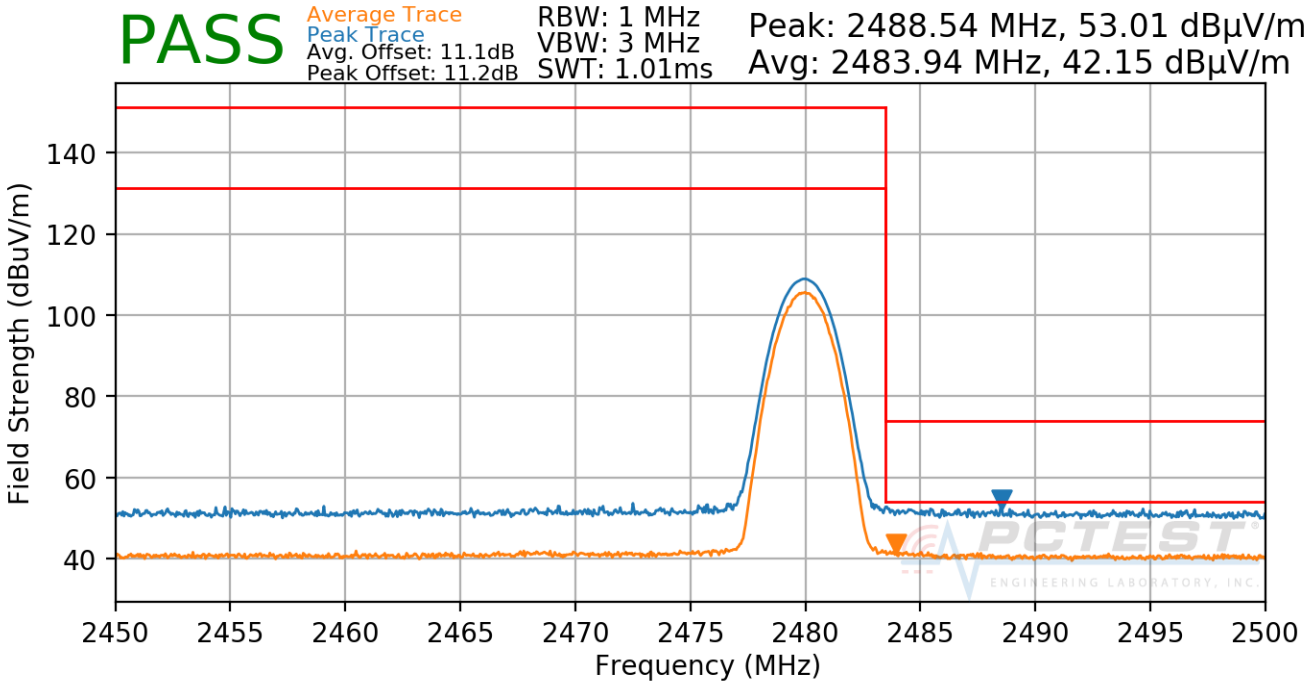
Radiated Restricted Band Edge Measurements

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

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

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

Worst Case Mode:	Bluetooth
Worst Case Modulation:	8DPSK
Worst Case Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	78



Plot 7-128. Radiated Restricted Upper Band Edge Measurement ANT 2

7.11 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209; RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-27 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [µV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-27. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Quasi-Peak Field Strength Measurements

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

Test Setup

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

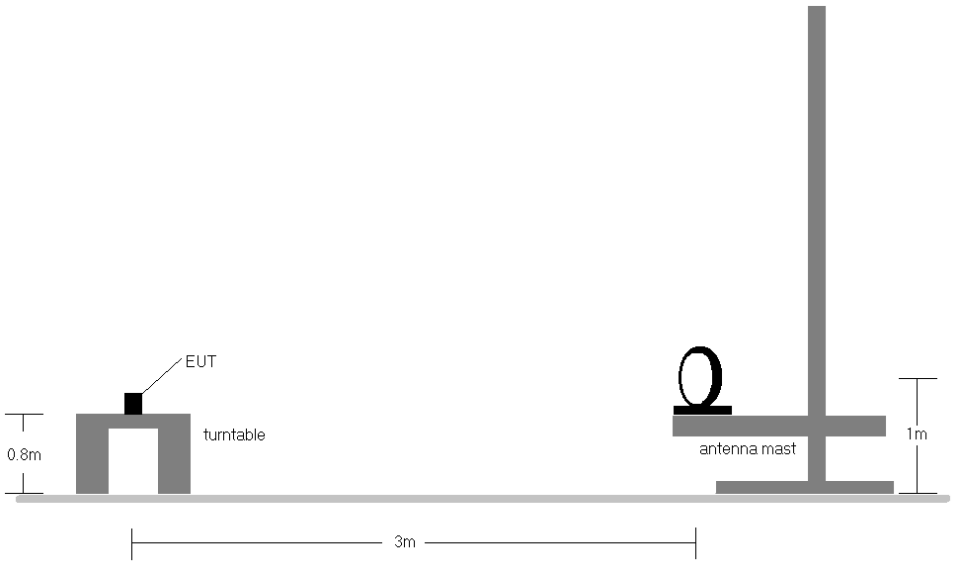


Figure 7-9. Radiated Test Setup < 30Mhz

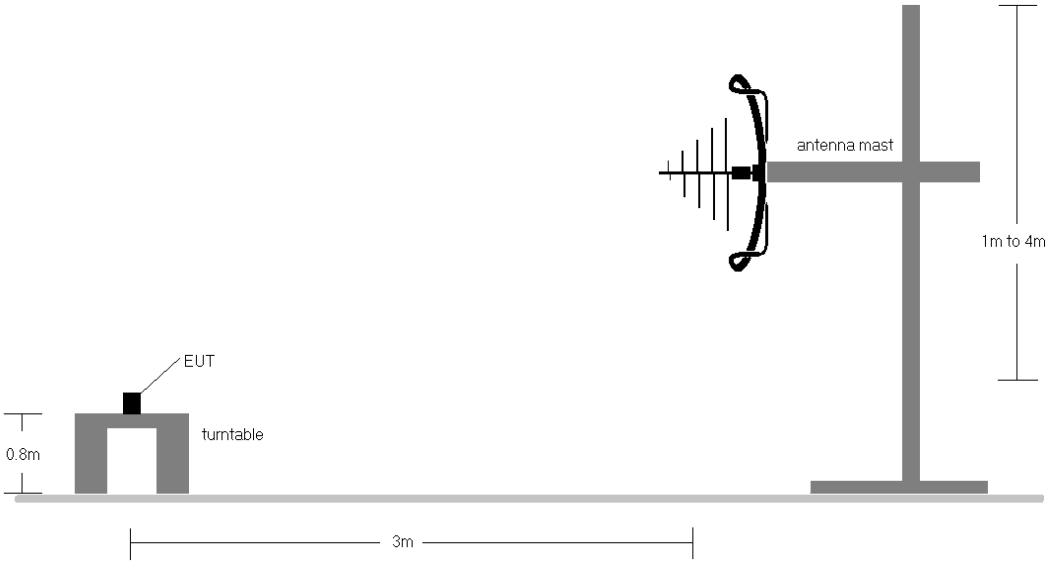


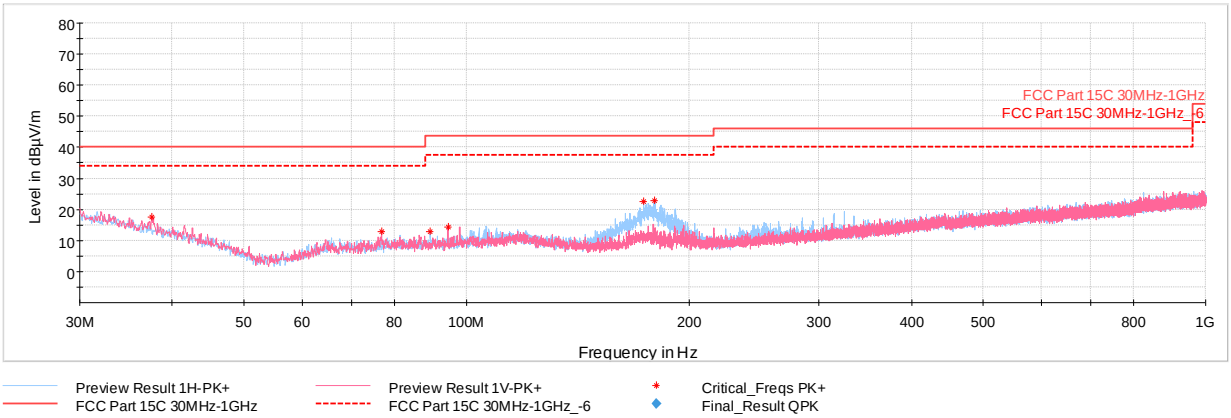
Figure 7-10. Radiated Test Setup < 1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limit shown in Table 7-27.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector on emissions that were within 6dB of the limit. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209; RSS-Gen [8.9]



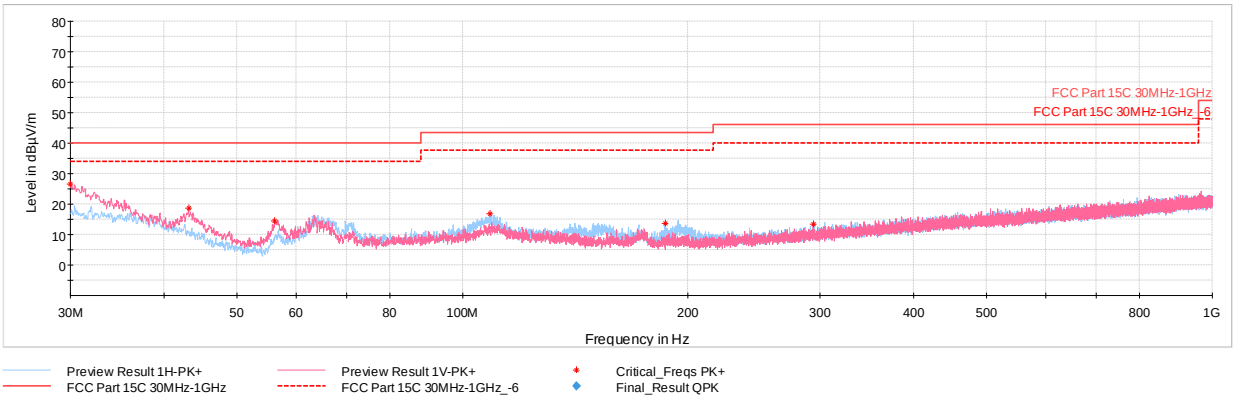
Plot 7-129. Radiated Spurious Plot below 1GHz GFSK ePA - Ch.0, with Laptop

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
37.57	Max Peak	V	100	293	-76.53	-12.77	17.70	40.00	-22.30
76.80	Max Peak	V	100	183	-75.10	-19.03	12.87	40.00	-27.13
89.32	Max Peak	H	100	239	-75.95	-18.26	12.79	43.52	-30.73
94.46	Max Peak	V	100	303	-74.60	-17.94	14.46	43.52	-29.06
173.75	Max Peak	H	100	215	-68.42	-16.13	22.45	43.52	-21.07
179.96	Max Peak	H	100	203	-65.25	-18.95	22.80	43.52	-20.72

Table 7-28. Radiated Spurious Emissions Below 1GHz GFSK ePA - Ch.0, with Laptop

Simultaneous TX Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209; RSS-Gen [8.9]



Plot 7-130. Radiated Spurious Plot below 1GHz (2.4GHz – 5GHz), with AC/DC Adapter

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
30.00	Max Peak	V	100	218	-71.63	-8.89	26.48	40.00	-13.52
43.14	Max Peak	V	100	200	-72.02	-16.33	18.65	40.00	-21.35
56.19	Max Peak	V	250	65	-69.14	-23.37	14.49	40.00	-25.51
108.81	Max Peak	H	250	222	-72.83	-17.30	16.87	43.52	-26.65
186.27	Max Peak	H	100	245	-73.81	-19.43	13.76	43.52	-29.76
293.55	Max Peak	V	100	229	-77.73	-15.87	13.40	46.02	-32.62

Table 7-29. Radiated Spurious Emissions Below 1GHz (2.4GHz – 5GHz), with AC/DC Adapter

7.12 AC Line Conducted Measurement Data

§15.207; RSS-Gen [8.8]

Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

All conducted emissions must not exceed the limits shown in the table below, per Section 15.207 and RSS-Gen (8.8).

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Table 7-30. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2013, Section 6.2

Test Settings

Quasi-Peak Field Strength Measurements

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 Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Test Setup

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

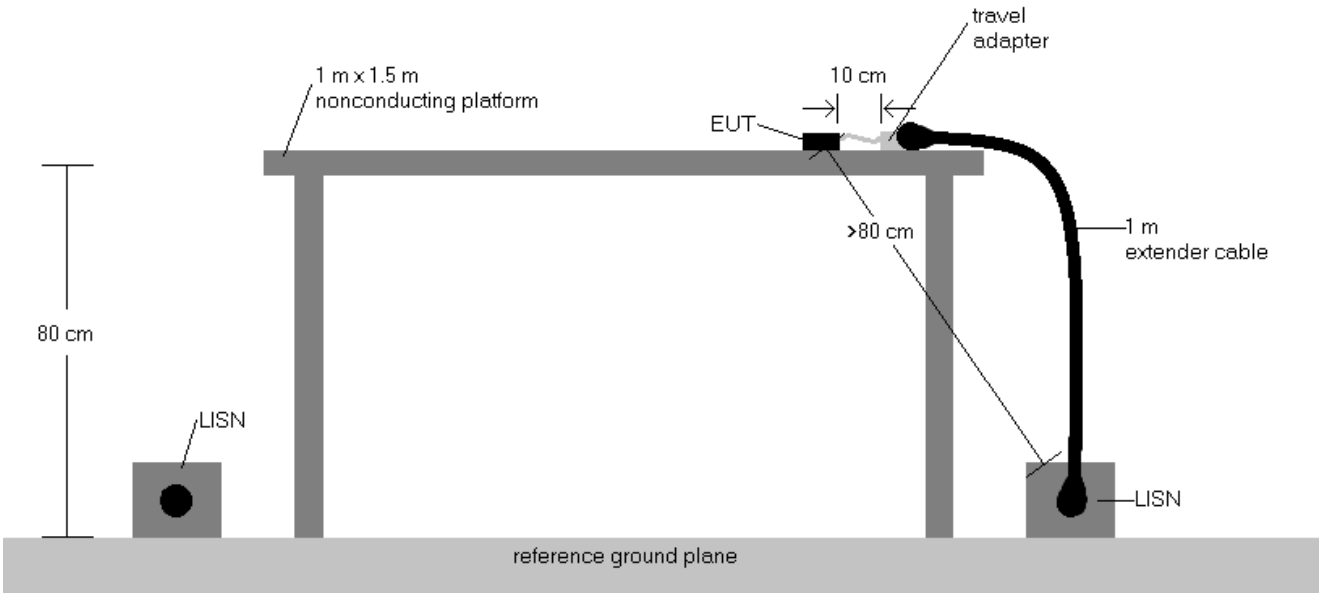
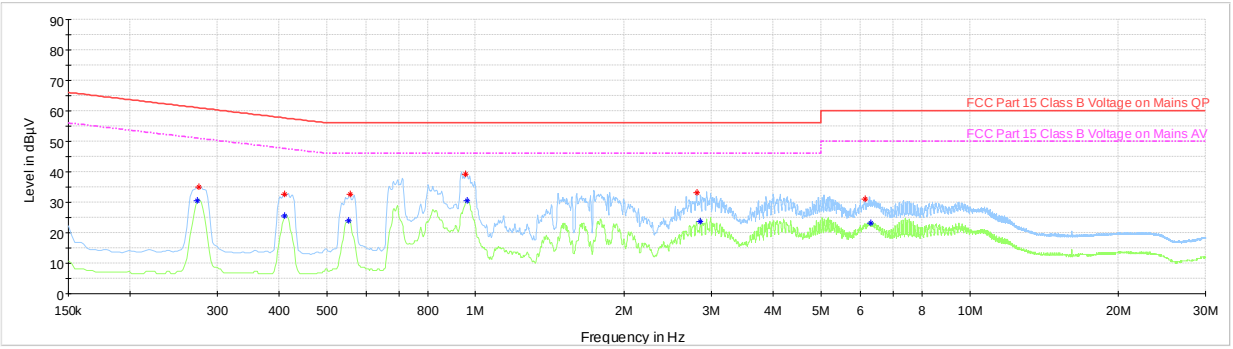


Figure 7-11. Test Instrument & Measurement Setup

Test Notes

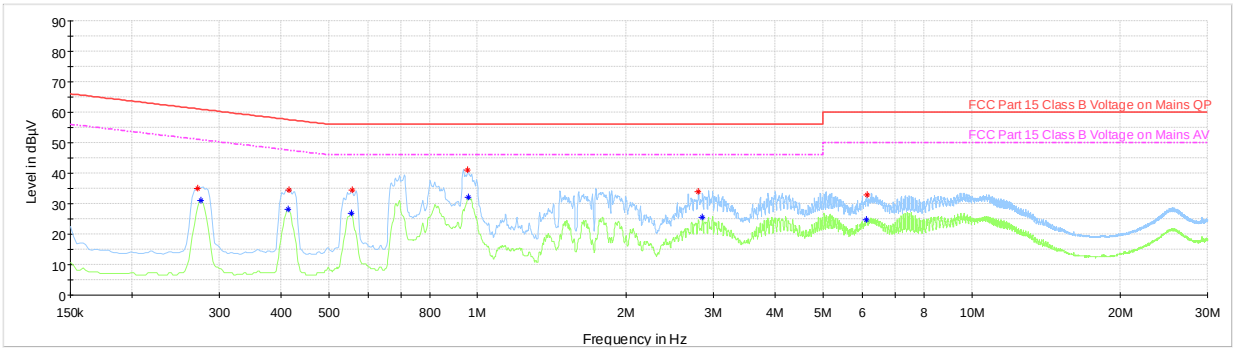
1. All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207 and RSS-Gen (8.8).
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBμV) = QP/AV Analyzer/Receiver Level (dBμV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBμV) - QP/AV Level (dBμV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.



Plot 7-131. Line-Conducted Test Plot - Ch.0 (L1, with AC/DC Adapter)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.274	FINAL	—	30.62	51.00	-20.38	L1	GND
0.276	FINAL	34.9	—	60.94	-25.99	L1	GND
0.411	FINAL	—	25.47	47.63	-22.16	L1	GND
0.411	FINAL	32.7	—	57.63	-24.95	L1	GND
0.553	FINAL	—	23.85	46.00	-22.15	L1	GND
0.557	FINAL	32.6	—	56.00	-23.44	L1	GND
0.953	FINAL	39.2	—	56.00	-16.81	L1	GND
0.960	FINAL	—	30.50	46.00	-15.50	L1	GND
2.803	FINAL	33.2	—	56.00	-22.76	L1	GND
2.846	FINAL	—	23.66	46.00	-22.34	L1	GND
6.144	FINAL	31.1	—	60.00	-28.95	L1	GND
6.315	FINAL	—	23.23	50.00	-26.77	L1	GND

Table 7-31. Line-Conducted Test Data - Ch.0 (L1, with AC/DC Adapter)



Plot 7-132. Line-Conducted Test Plot - Ch.0 (N, with AC/DC Adapter)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.272	FINAL	34.9	—	61.07	-26.15	N	GND
0.276	FINAL	—	31.10	50.94	-19.84	N	GND
0.413	FINAL	—	28.08	47.58	-19.50	N	GND
0.416	FINAL	34.4	—	57.54	-23.12	N	GND
0.555	FINAL	—	26.73	46.00	-19.27	N	GND
0.557	FINAL	34.5	—	56.00	-21.48	N	GND
0.956	FINAL	41.1	—	56.00	-14.92	N	GND
0.958	FINAL	—	32.17	46.00	-13.83	N	GND
2.801	FINAL	34.1	—	56.00	-21.93	N	GND
2.848	FINAL	—	25.57	46.00	-20.43	N	GND
6.110	FINAL	—	24.66	50.00	-25.34	N	GND
6.135	FINAL	32.9	—	60.00	-27.12	N	GND

Table 7-32. Line-Conducted Test Data - Ch.0 (N, with AC/DC Adapter)

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Tablet Device FCC ID: BCGA2126** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-247 of the Innovation, Science and Economic Development Canada Rules.