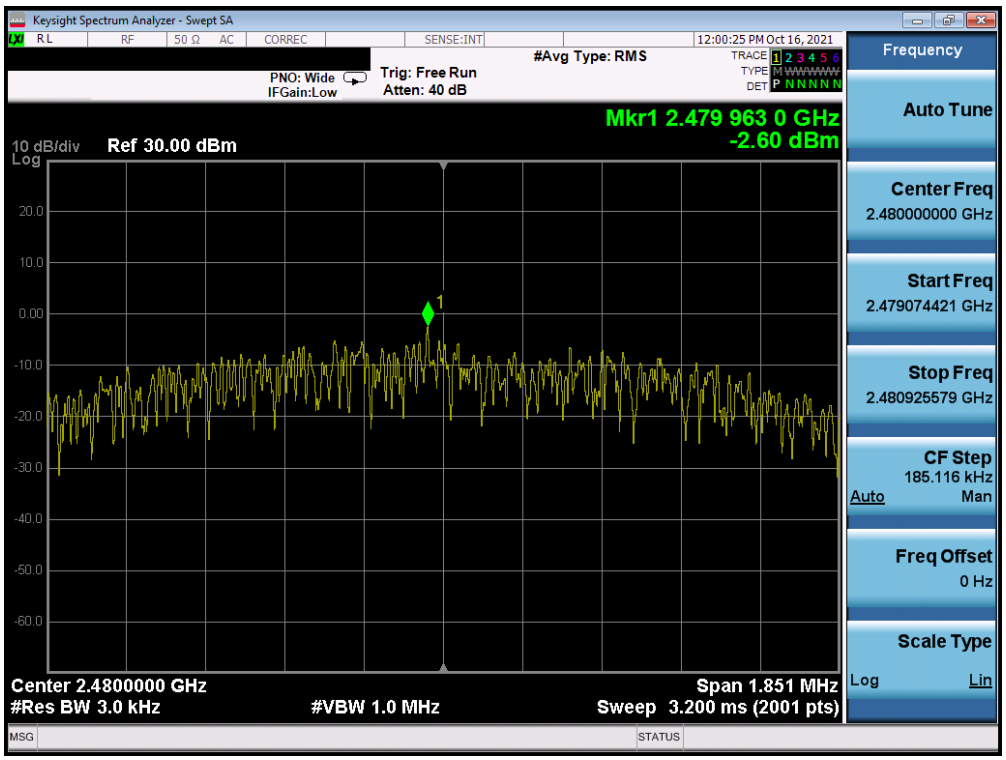
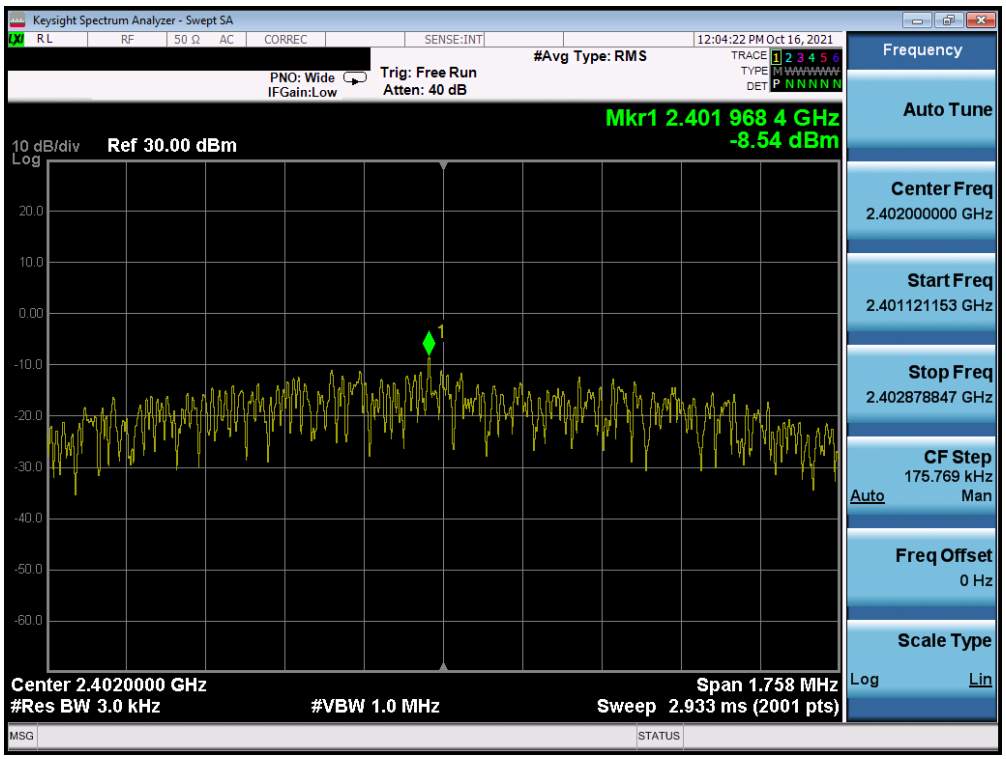


Plot 7-105. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 39) Antenna 2



Plot 7-106. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 2

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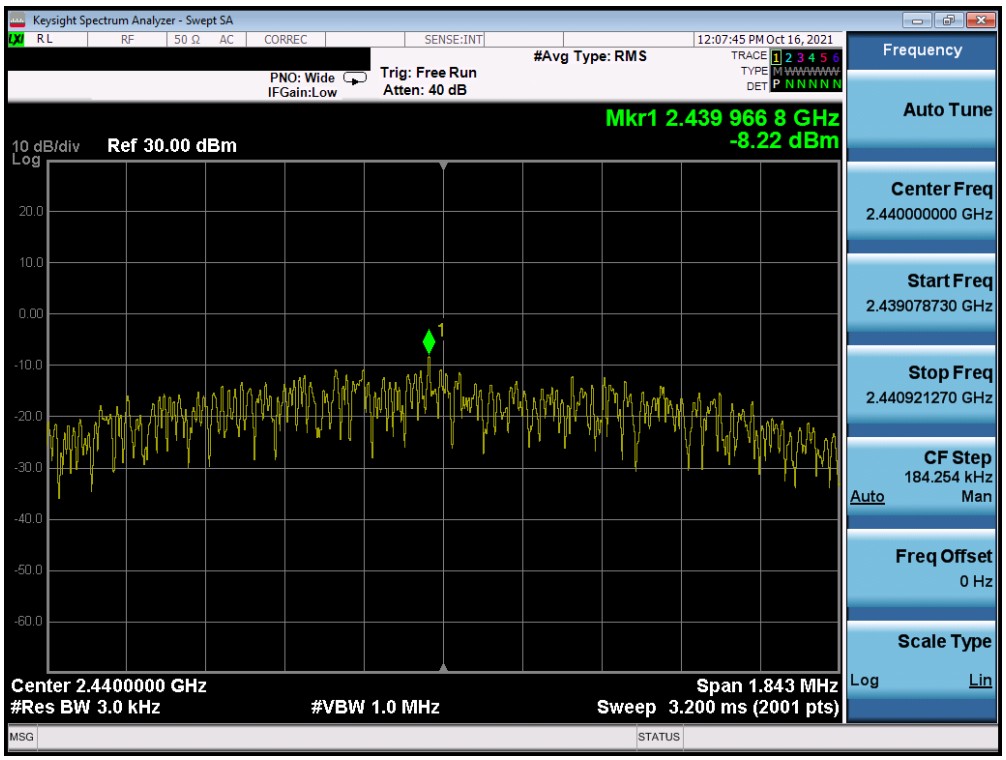
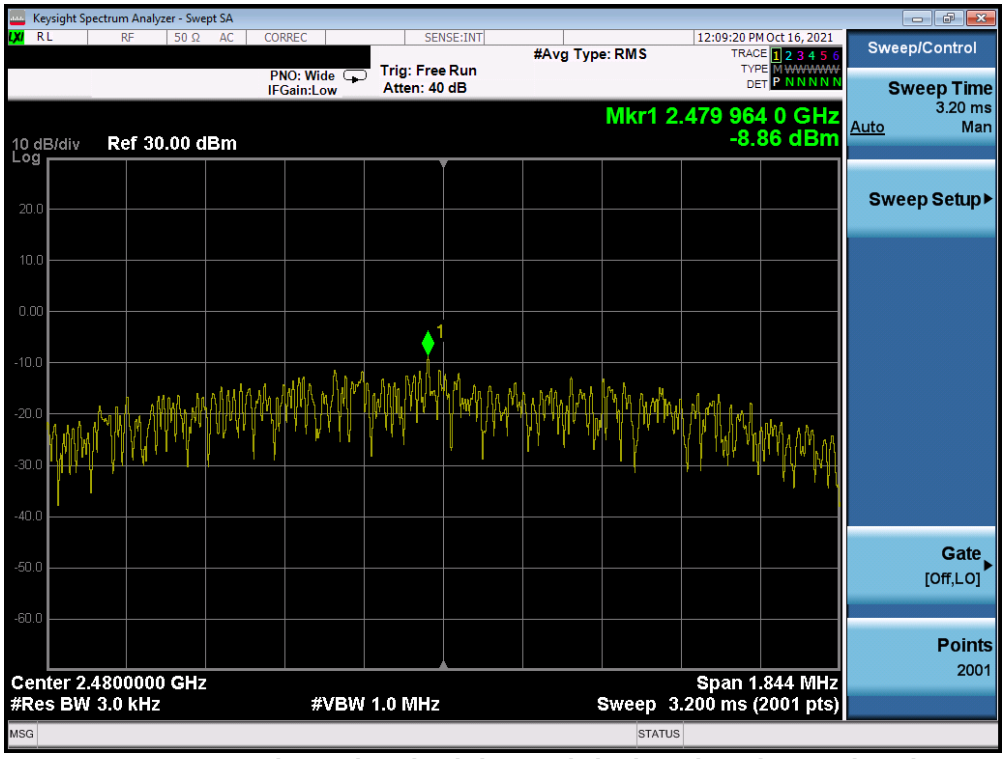


Plot 7-107. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 2



Plot 7-108. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 2

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Dual Antenna

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Bluetooth Mode	Antenna 1 Power Density [dBm]	Antenna 2 Power Density [dBm]	Summed Dual Power Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	1 Mbps	iPA	0	LE	-4.60	-6.38	-2.39	8.0	-10.39
2440	1 Mbps	iPA	19	LE	-4.21	-6.28	-2.11	8.0	-10.11
2480	1 Mbps	iPA	39	LE	-5.23	-7.13	-3.06	8.0	-11.06
2402	2 Mbps	iPA	0	LE	-6.46	-8.62	-4.40	8.0	-12.40
2440	2 Mbps	iPA	19	LE	-6.24	-8.19	-4.09	8.0	-12.09
2480	2 Mbps	iPA	39	LE	-7.16	-9.07	-5.00	8.0	-13.00

Table 7-9. Conducted Power Density Measurements Dual Antenna

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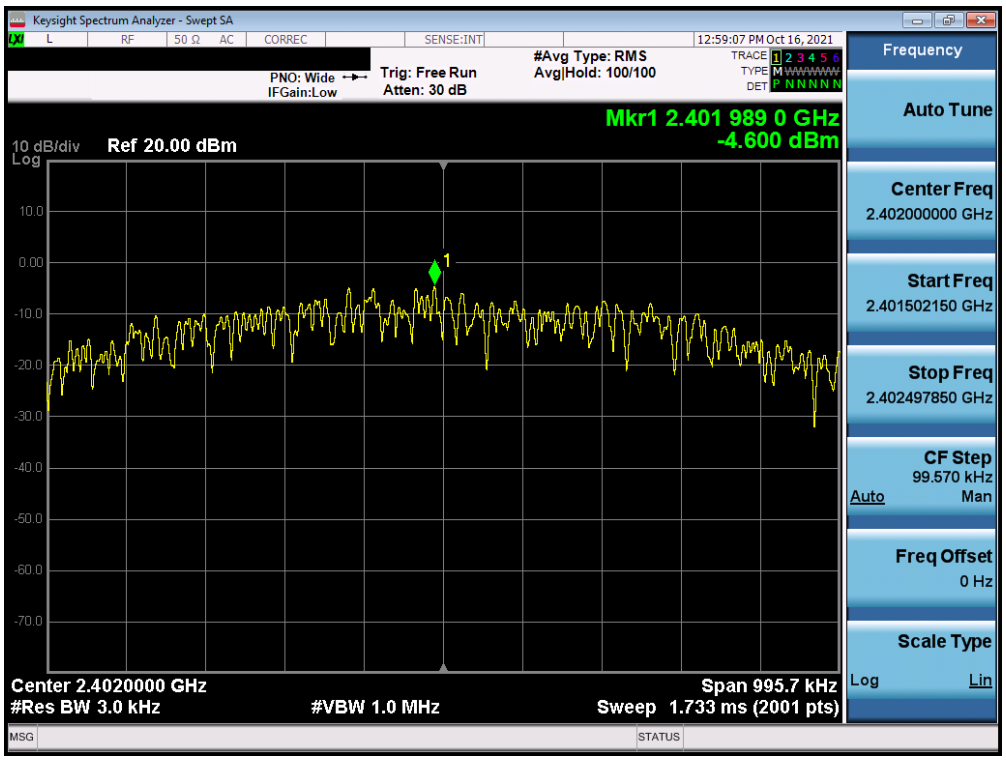
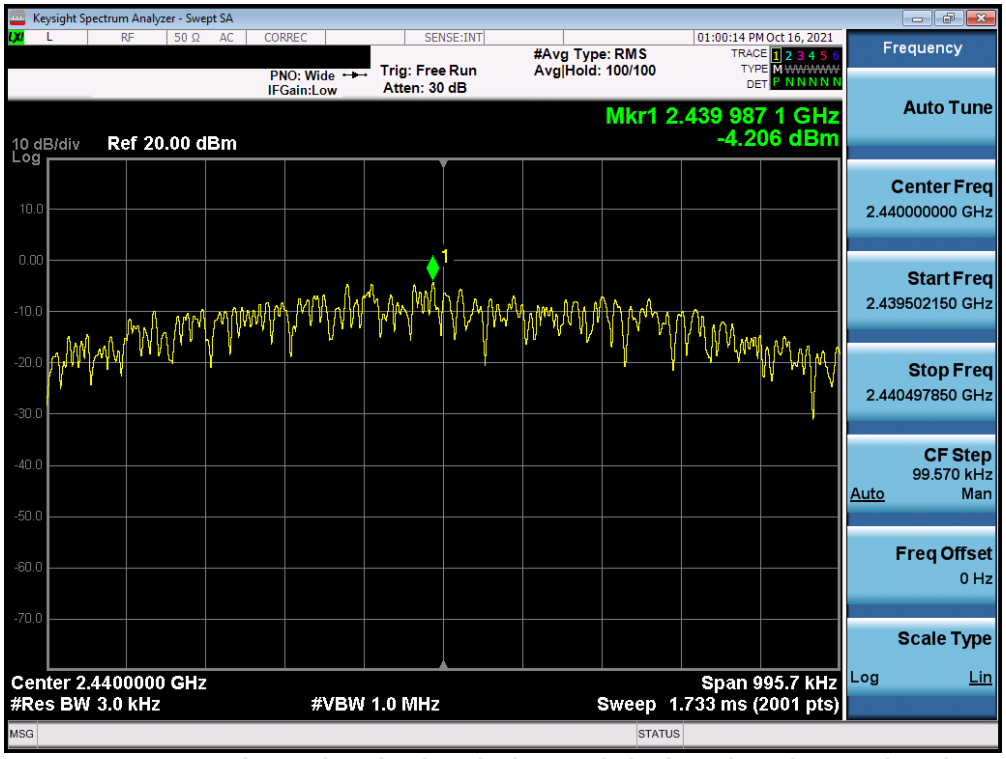


Plot 7-109. Power Spectral Density Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 1



Plot 7-110. Power Spectral Density Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 19) Antenna 1

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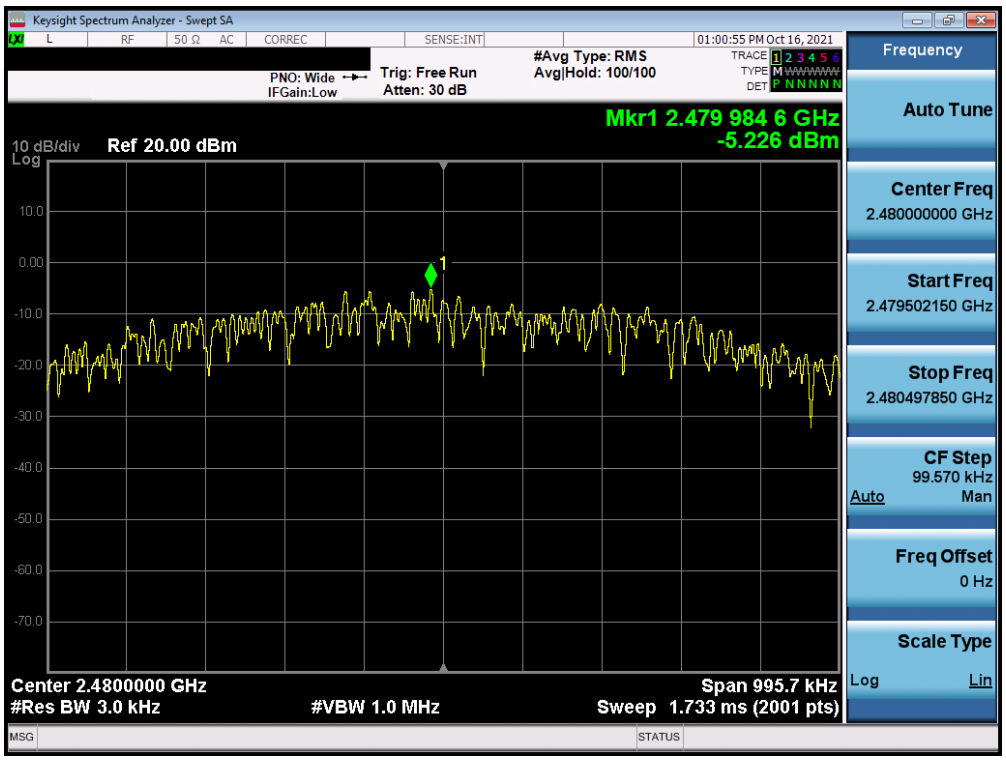
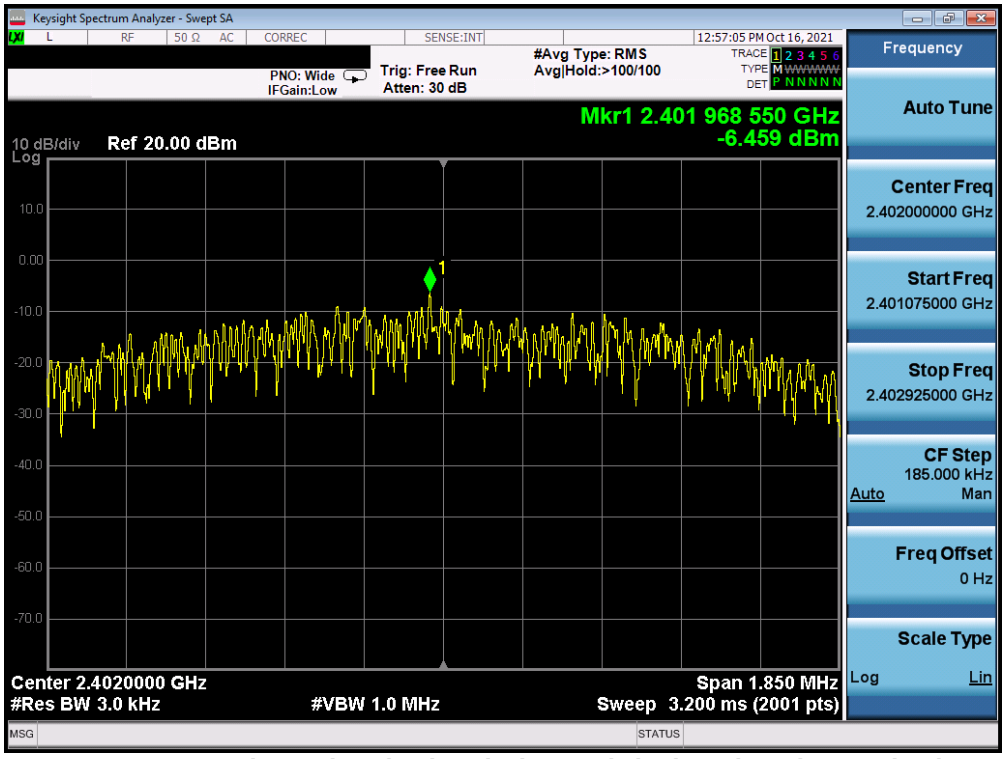


Plot 7-111. Power Spectral Density Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 39) Antenna 1



Plot 7-112. Power Spectral Density Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 1

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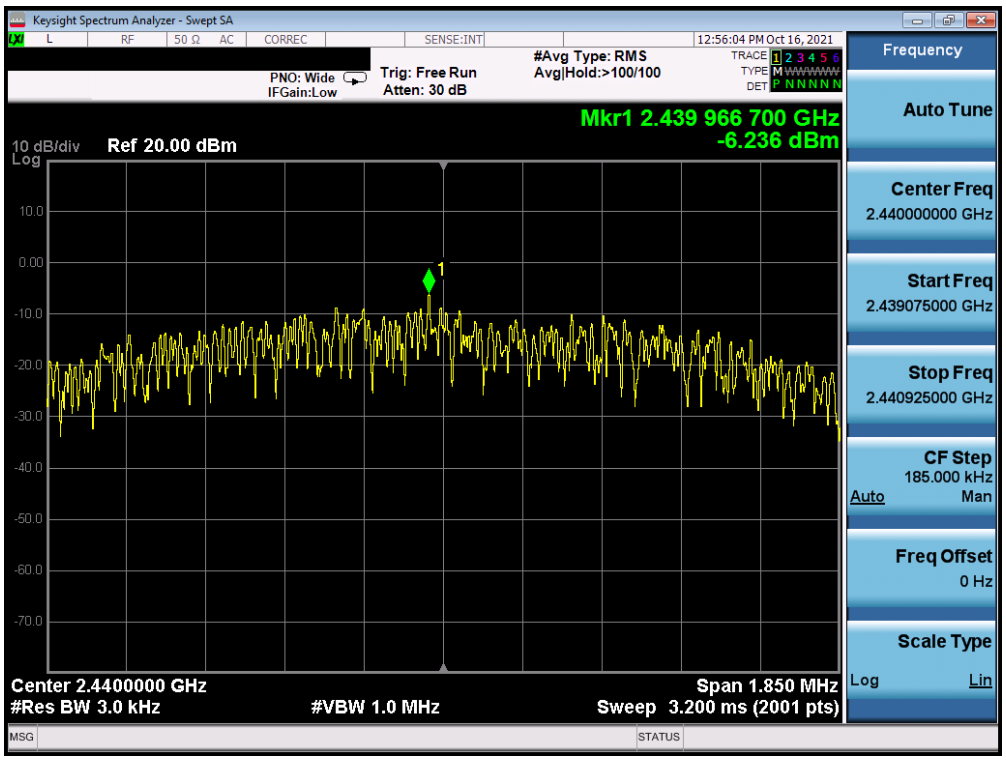
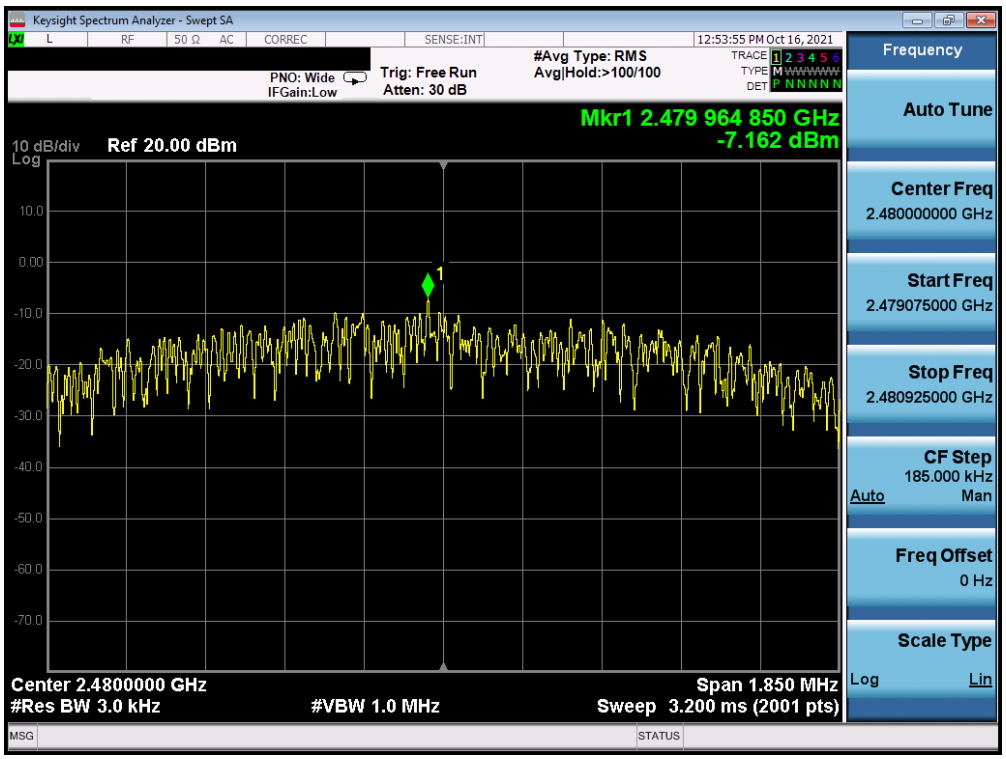


Plot 7-113. Power Spectral Density Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 1



Plot 7-114. Power Spectral Density Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 1

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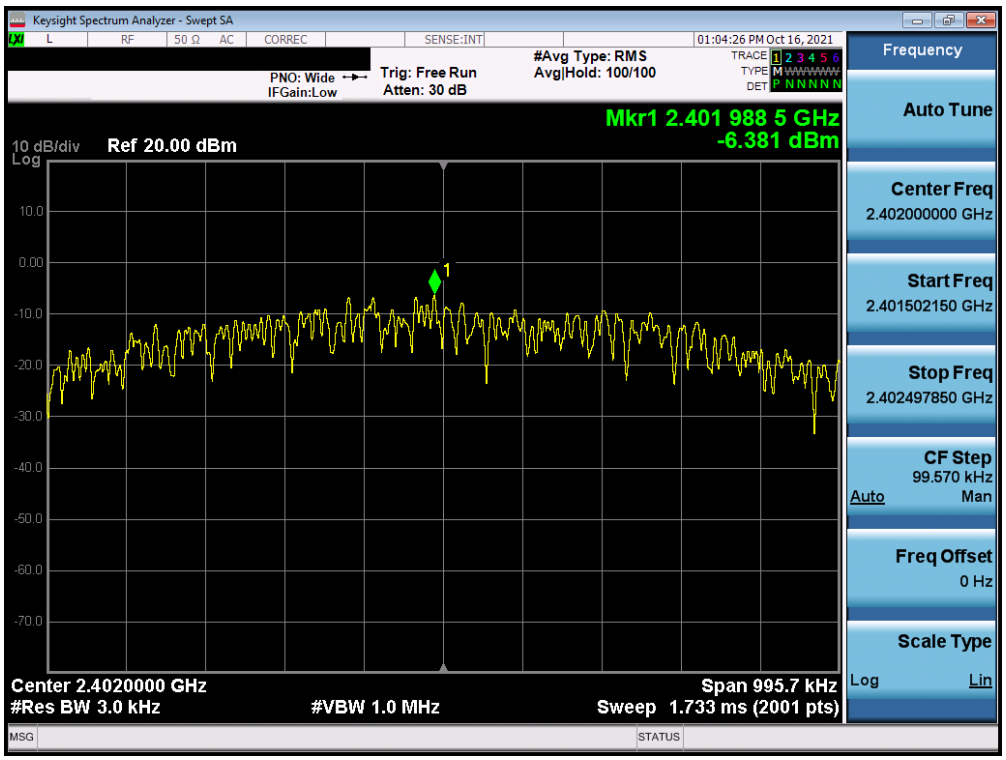
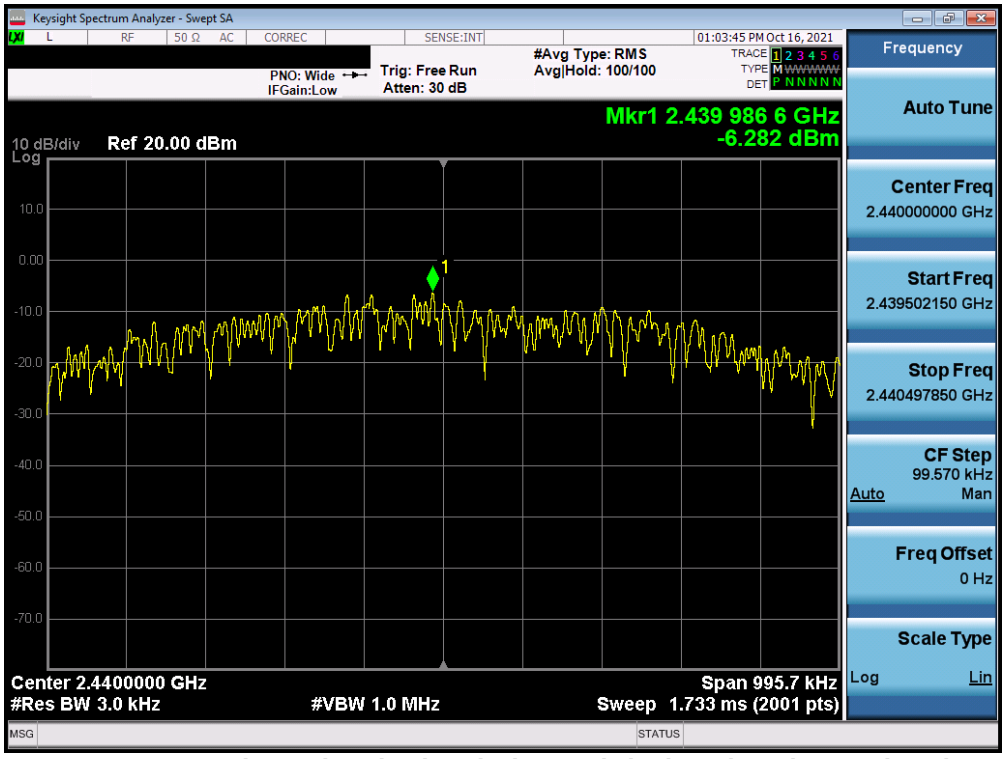


Plot 7-115. Power Spectral Density Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 2



Plot 7-116. Power Spectral Density Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 19) Antenna 2

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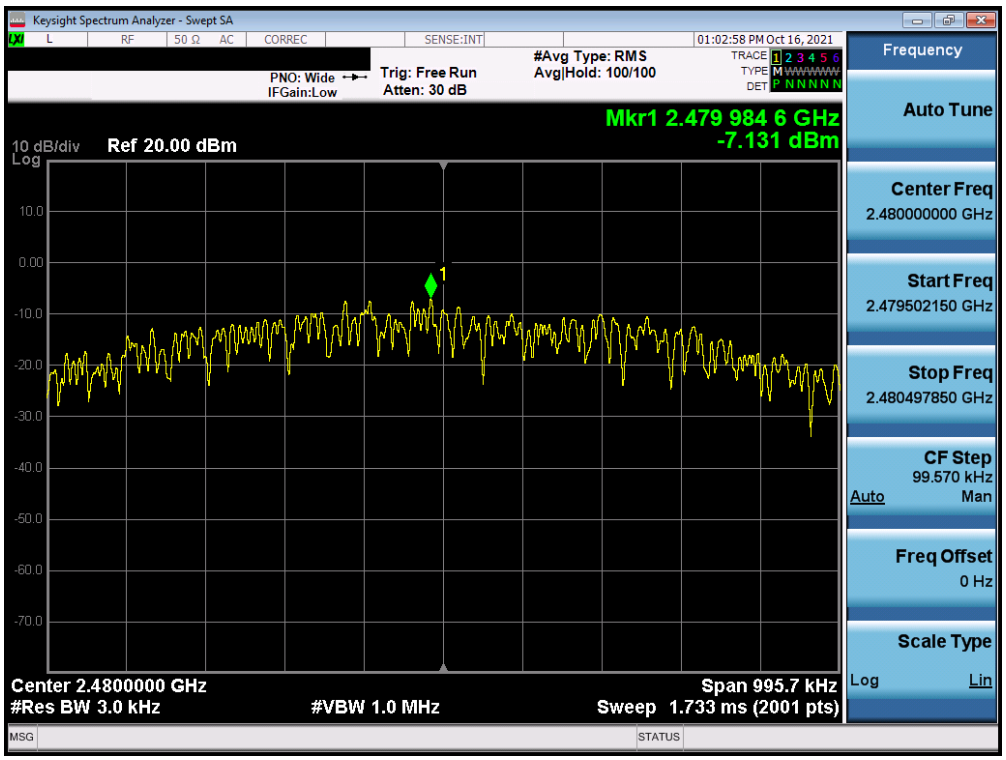
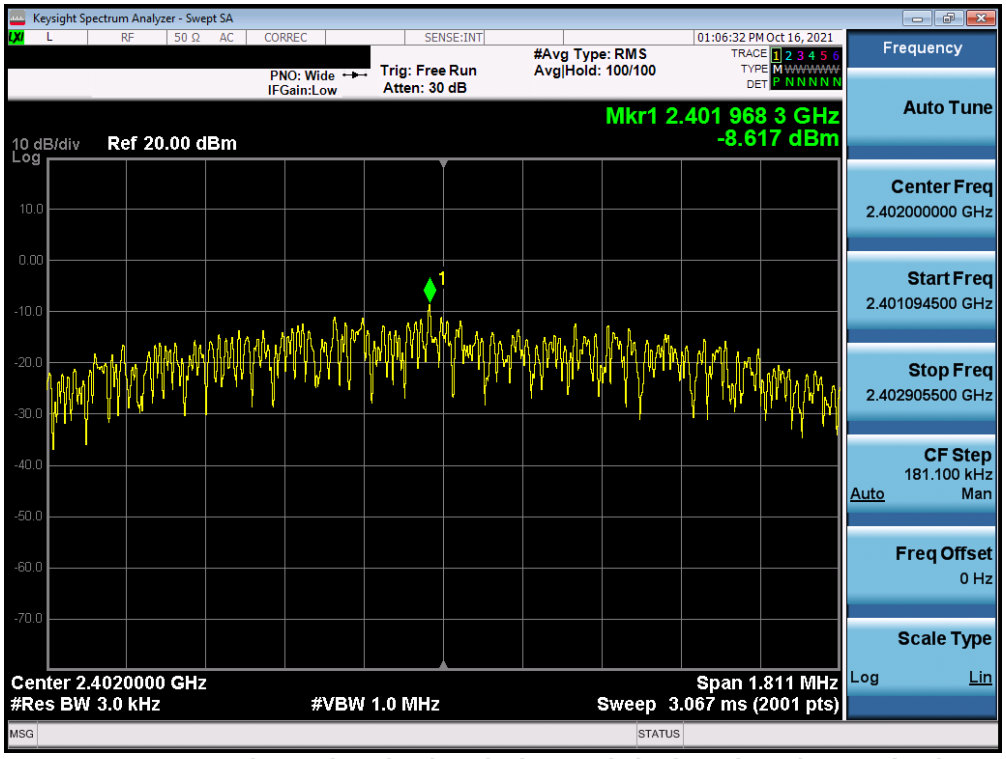


Plot 7-117. Power Spectral Density Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 39) Antenna 2



Plot 7-118. Power Spectral Density Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 2

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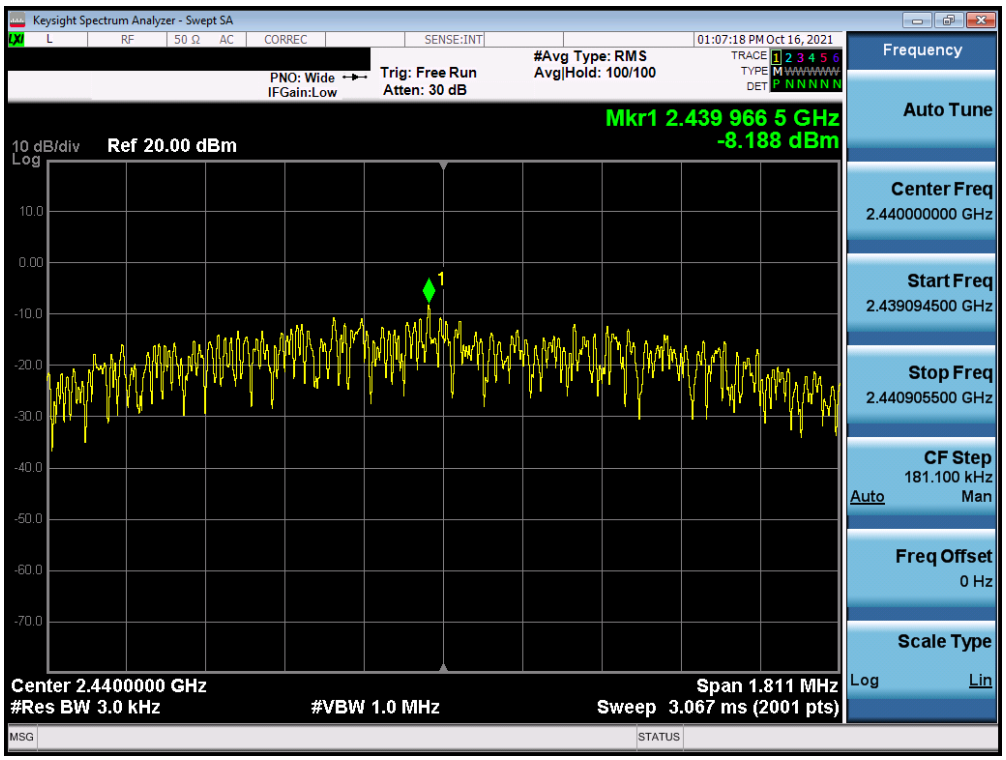
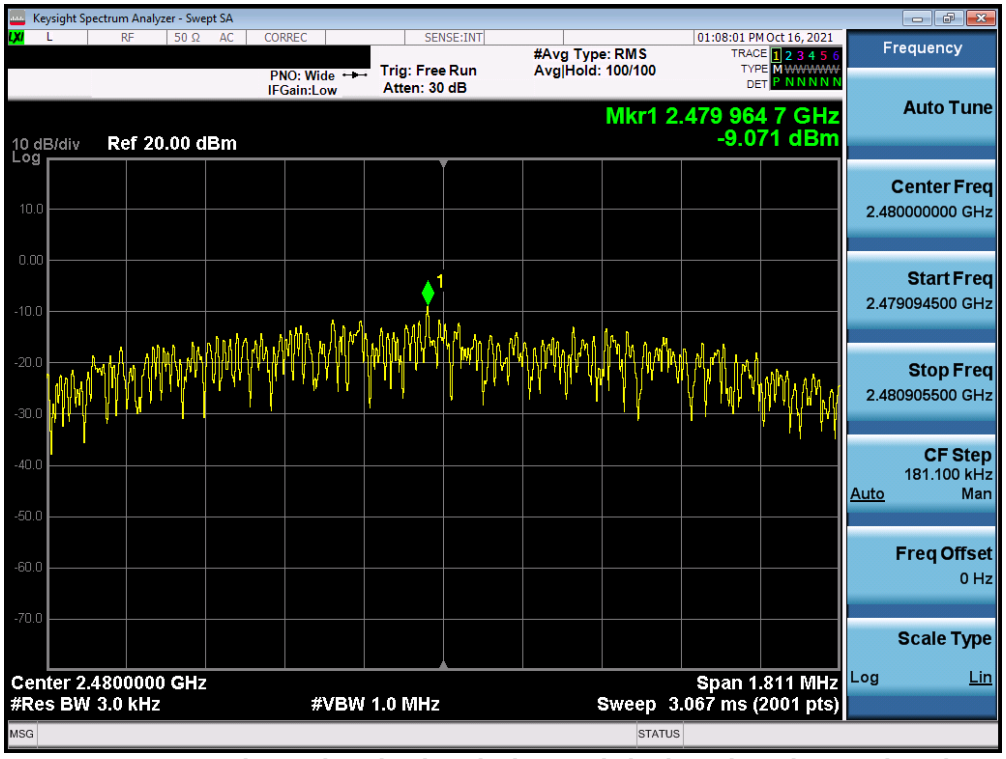


Plot 7-119. Power Spectral Density Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 2



Plot 7-120. Power Spectral Density Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 2

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7.5 Conducted Authorized Band Edge

§15.247(d); RSS-247 [5.5]

Test Overview and Limit

For the following out of band conducted spurious emissions plots at the band edge, the EUT was set to transmit at maximum power with the largest packet size available. These settings produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth.

Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3
KDB 558074 D01 v05r02 – Section 8.7.2

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 300kHz
5. Detector = Peak
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None

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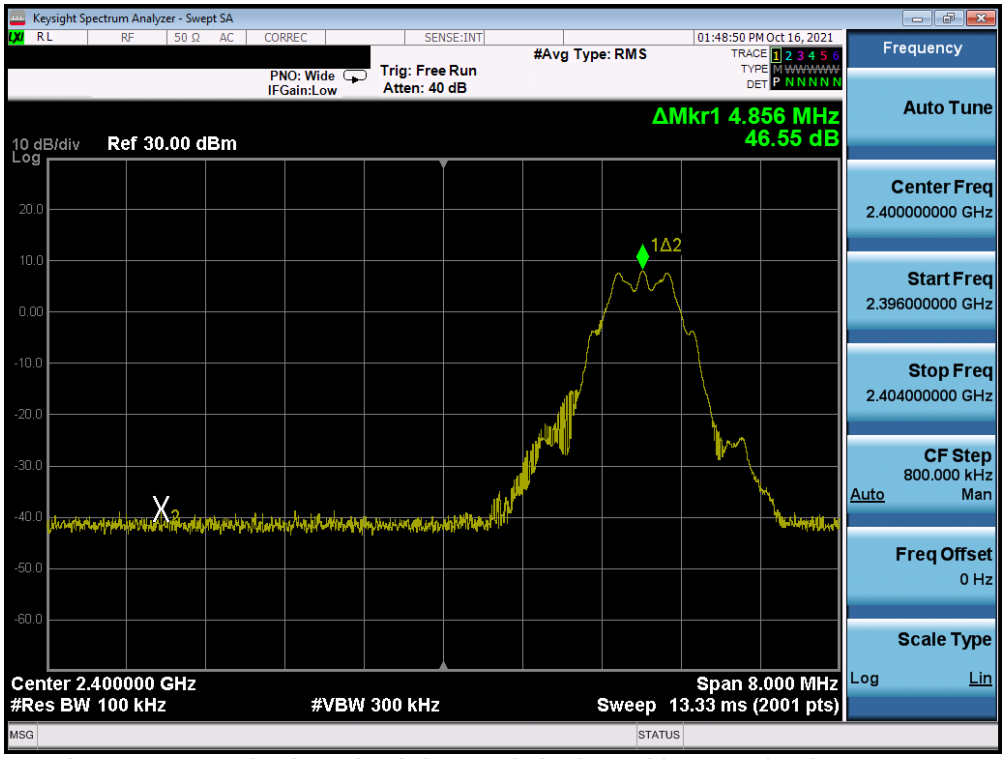
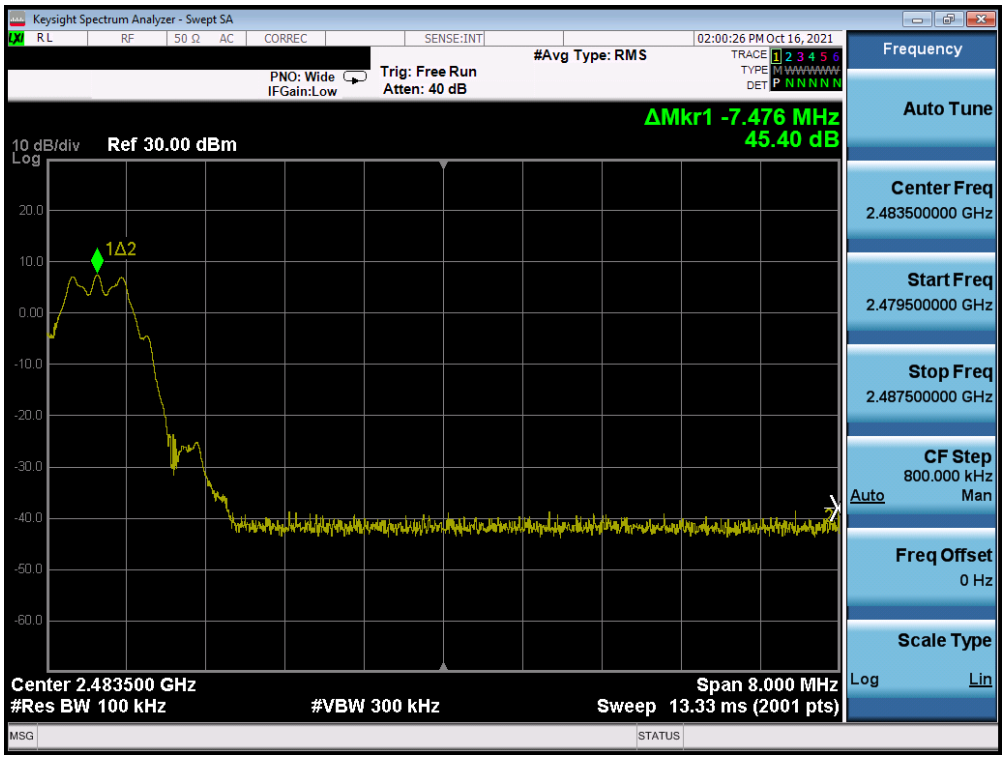
Antenna 1



Plot 7-121. Band Edge Plot (Bluetooth (LE), 125kbps, – Ch. 0) Antenna 1



Plot 7-122. Band Edge Plot (Bluetooth (LE), 125kbps, – Ch. 39) Antenna 1

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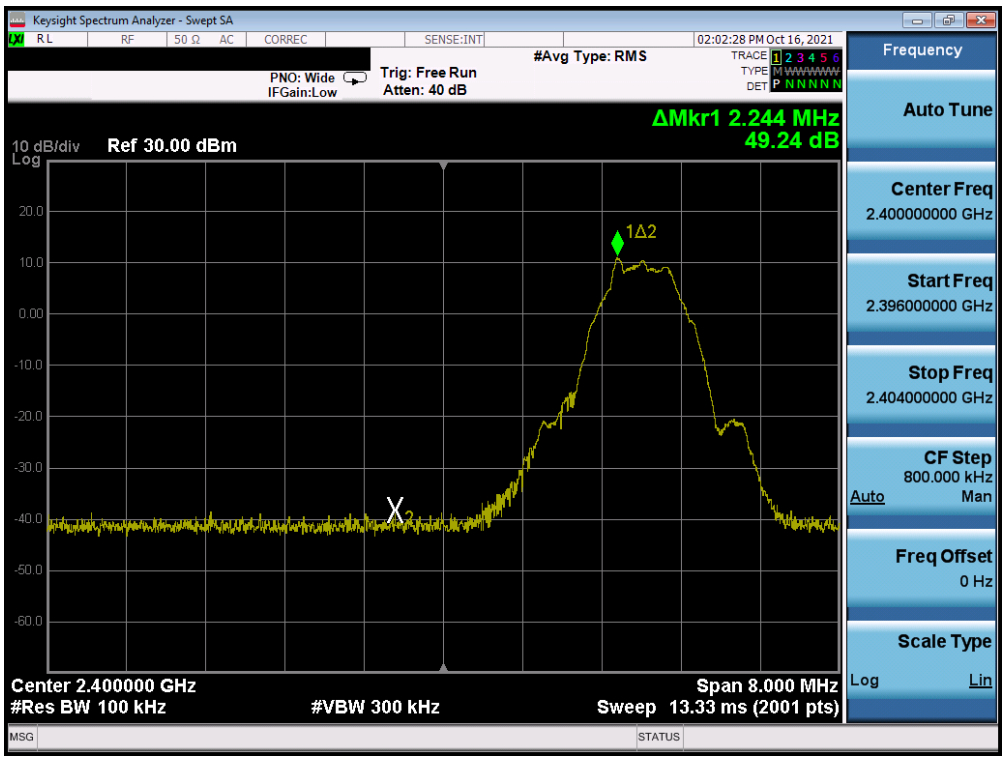
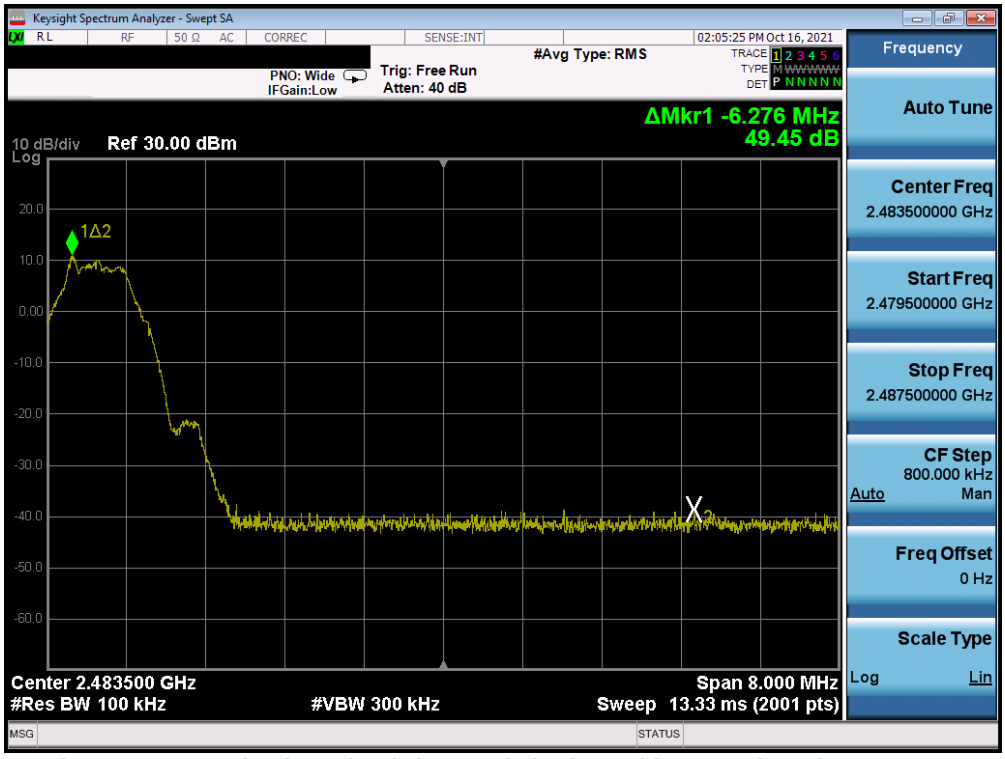


Plot 7-123. Band Edge Plot (Bluetooth (LE), 500kbps, – Ch. 0) Antenna 1



Plot 7-124. Band Edge Plot (Bluetooth (LE), 500kbps, – Ch. 39) Antenna 1

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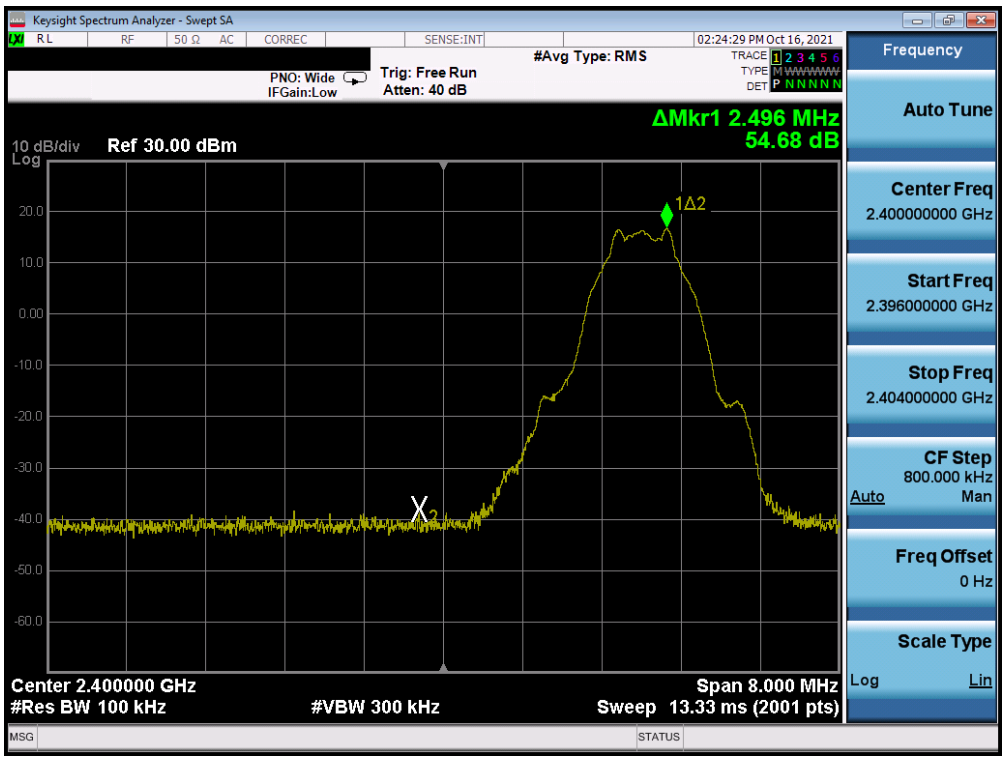
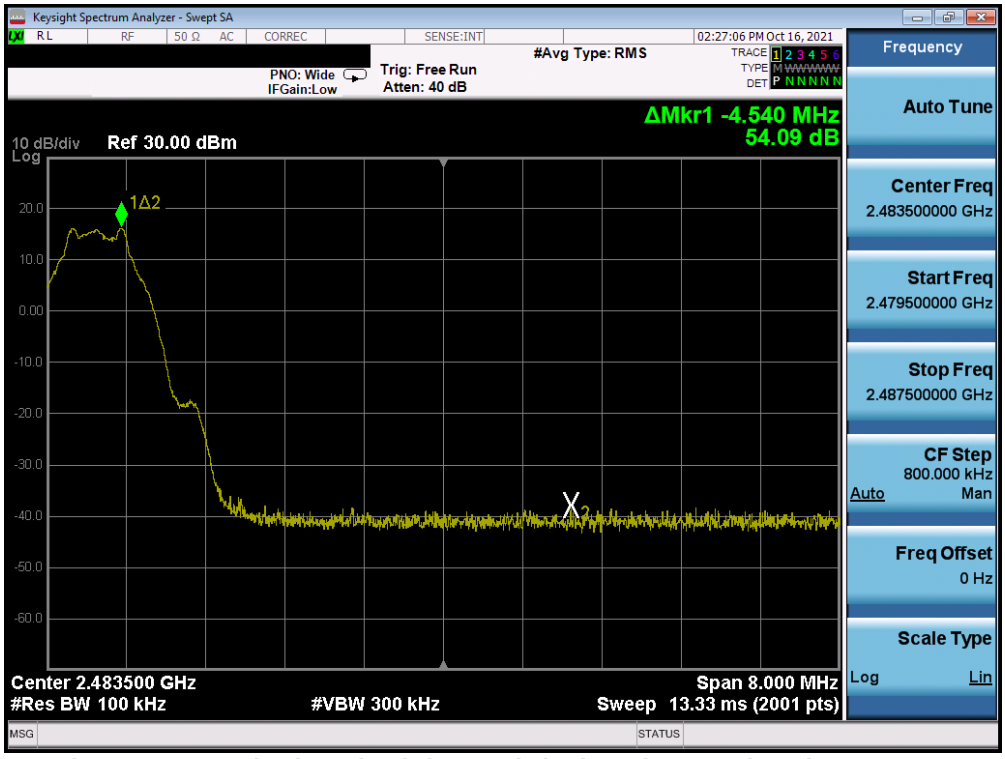


Plot 7-125. Band Edge Plot (Bluetooth (LE), 1Mbps, – Ch. 0) Antenna 1



Plot 7-126. Band Edge Plot (Bluetooth (LE), 1Mbps, – Ch. 39) Antenna 1

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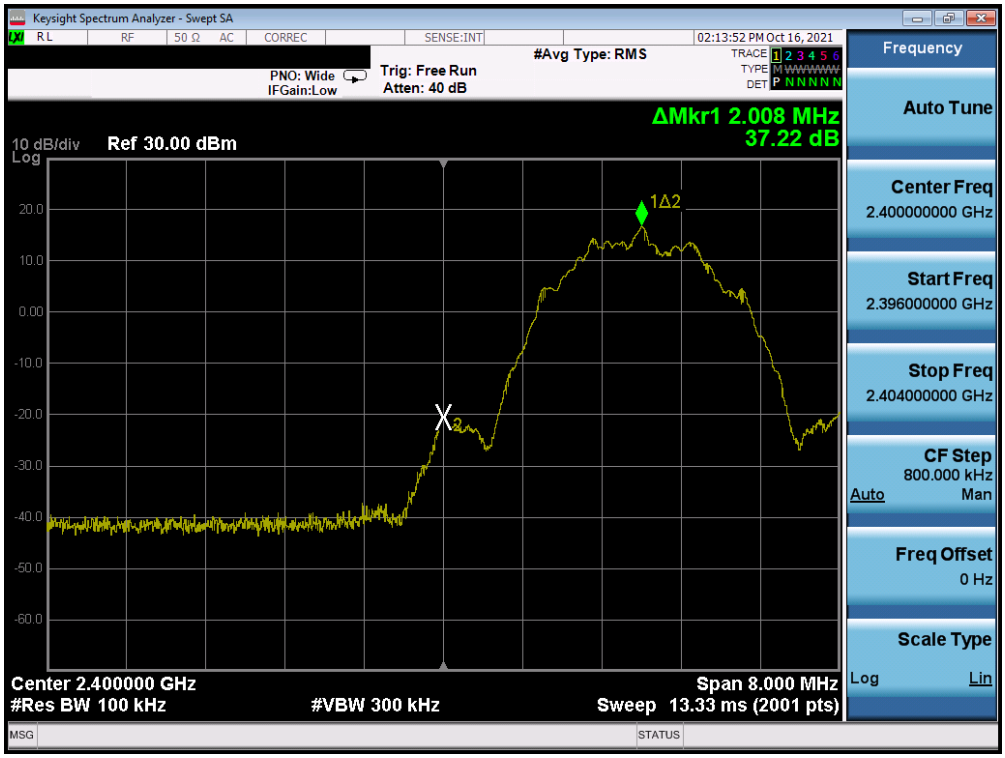
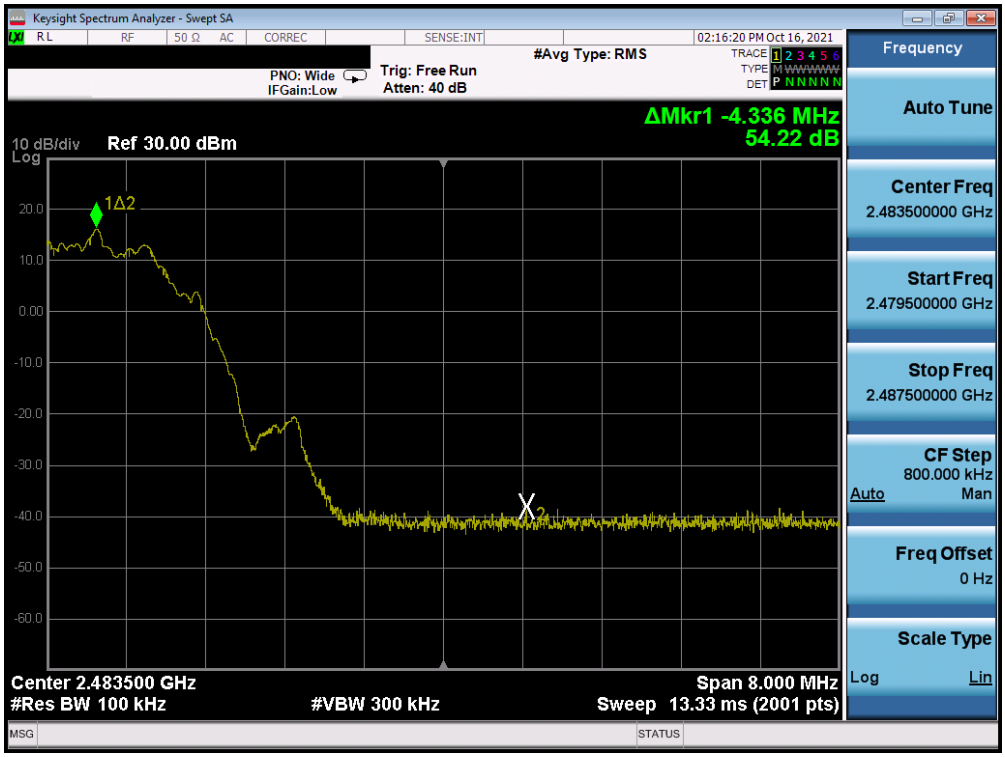


Plot 7-127. Band Edge Plot (Bluetooth (LE), 2Mbps, – Ch. 0) Antenna 1



Plot 7-128. Band Edge Plot (Bluetooth (LE), 2Mbps, – Ch. 39) Antenna 1

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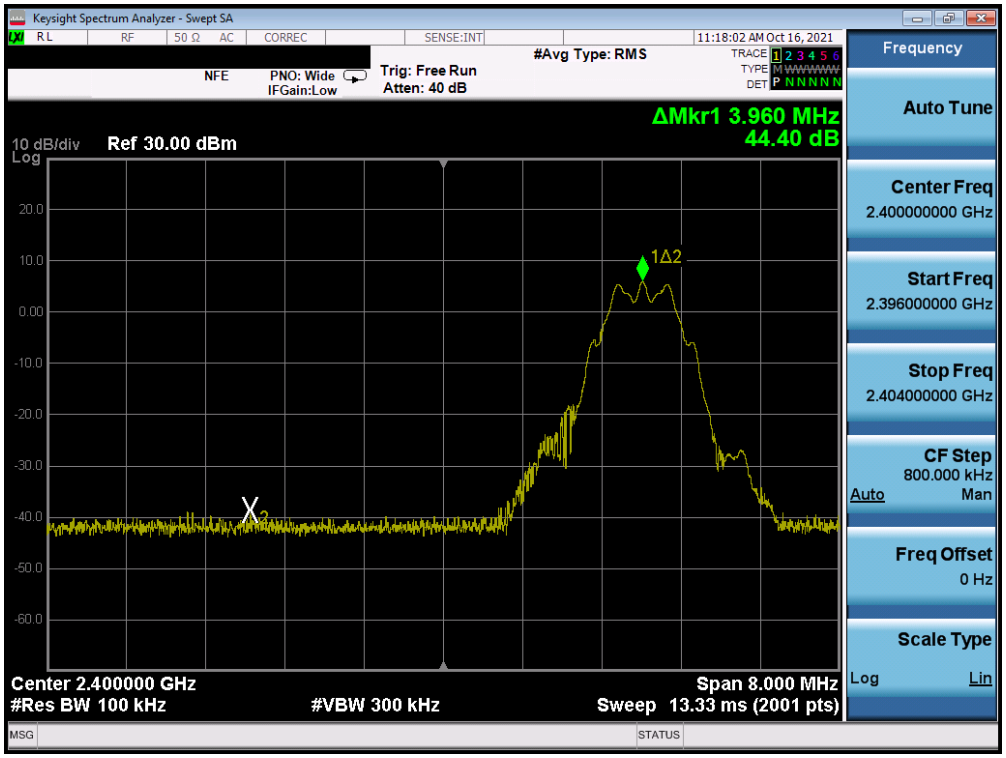
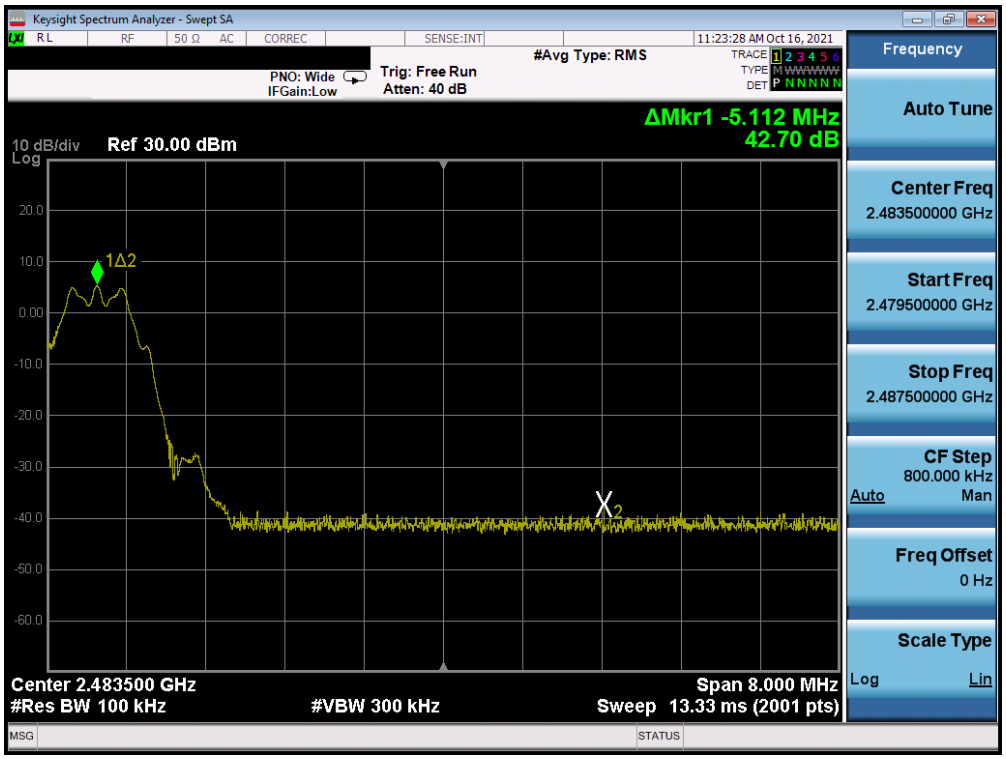
Antenna 2



Plot 7-129. Band Edge Plot (Bluetooth (LE), 125kbps, – Ch. 0) Antenna 2



Plot 7-130. Band Edge Plot (Bluetooth (LE), 125kbps, – Ch. 39) Antenna 2

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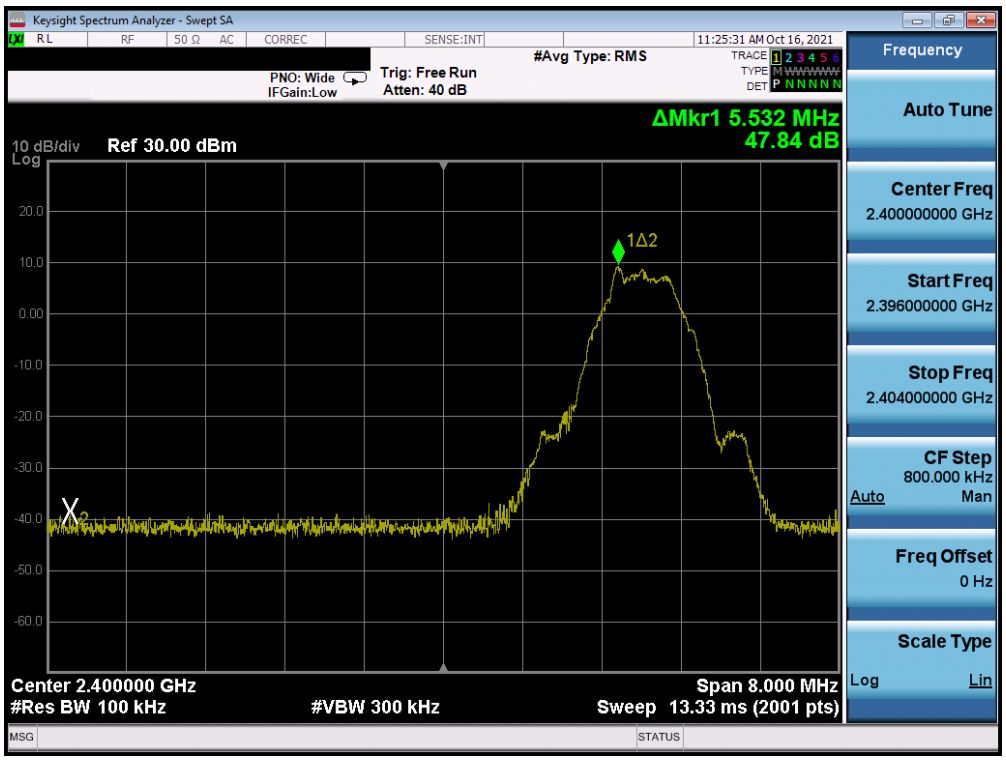
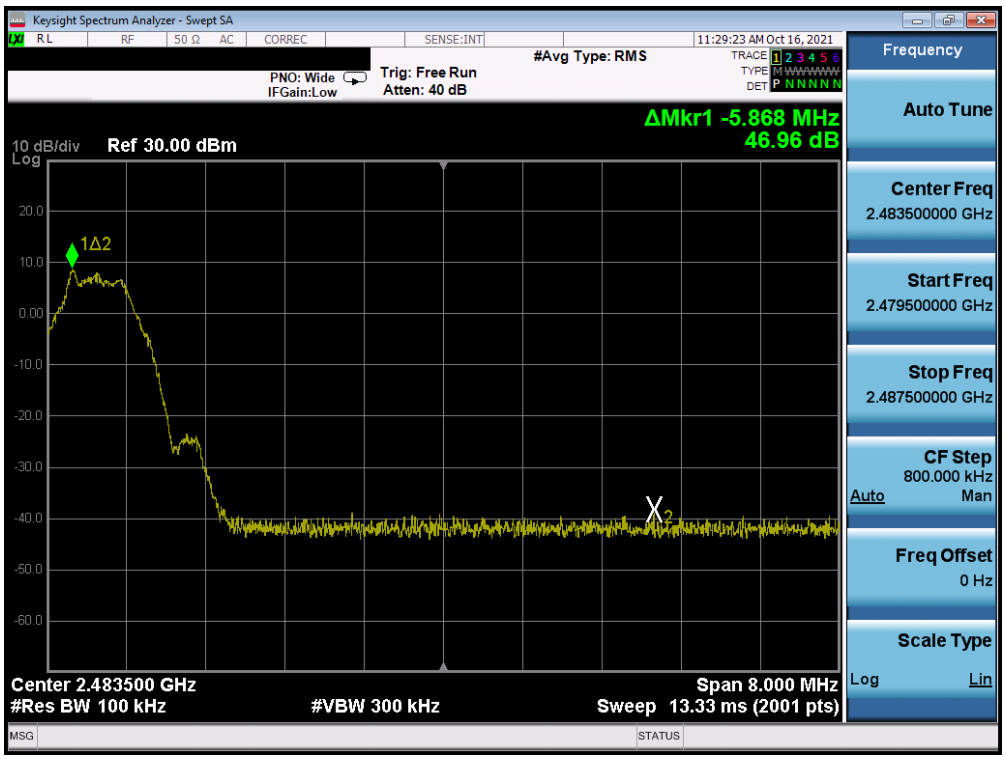


Plot 7-131. Band Edge Plot (Bluetooth (LE), 500kbps, – Ch. 0) Antenna 2



Plot 7-132. Band Edge Plot (Bluetooth (LE), 500kbps, – Ch. 39) Antenna 2

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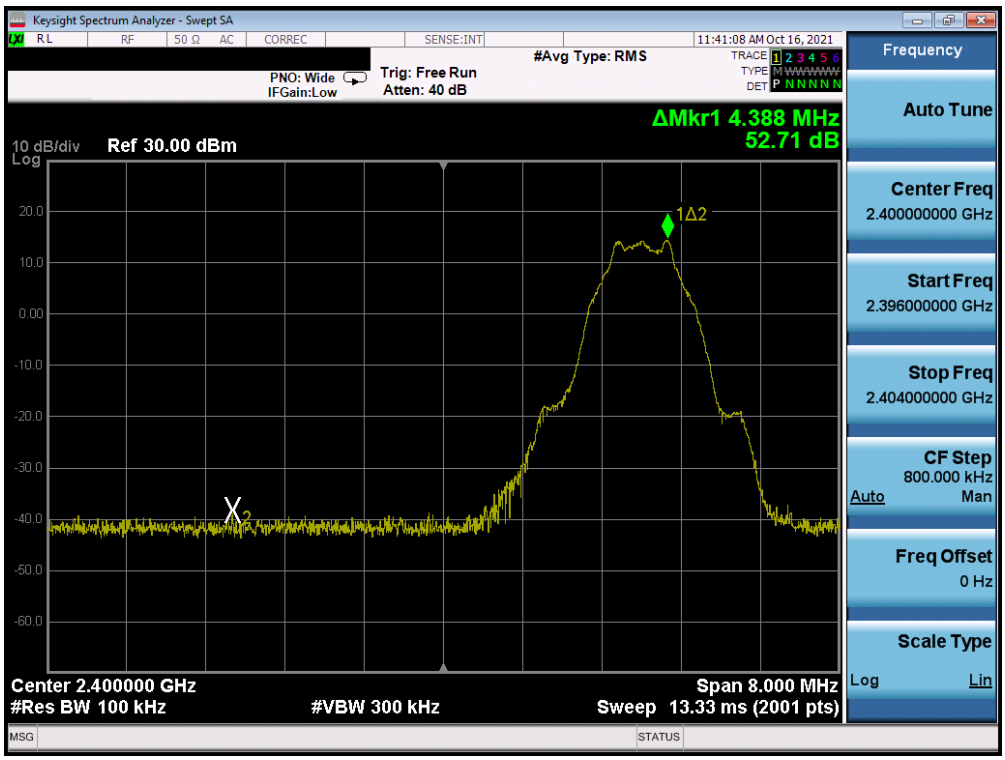
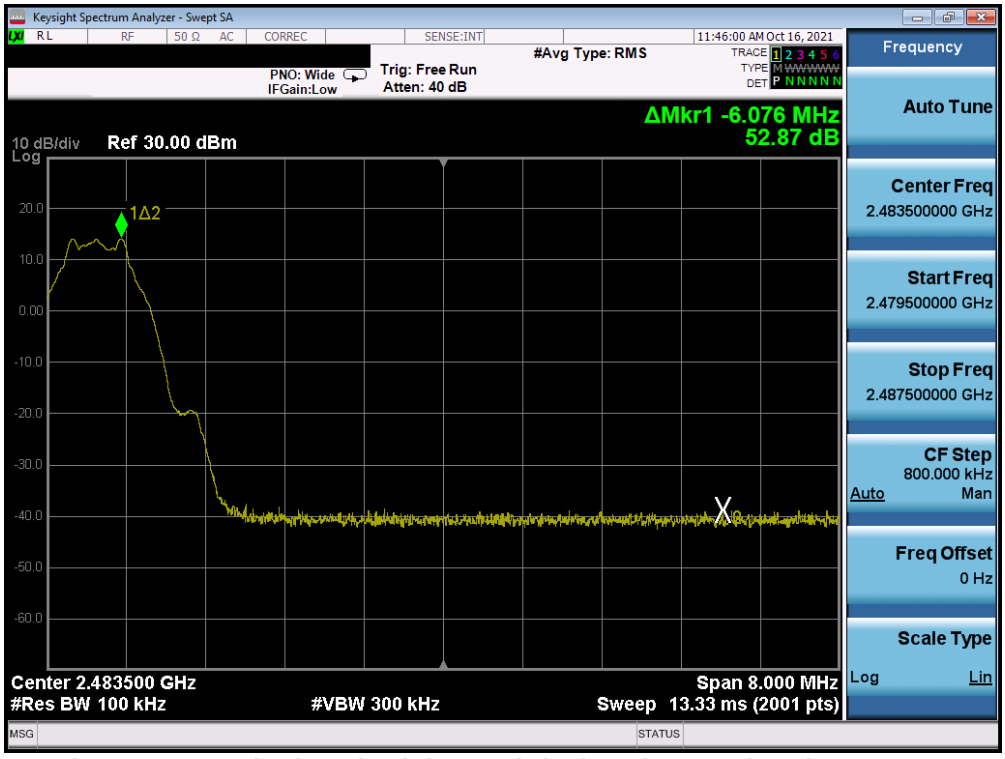


Plot 7-133. Band Edge Plot (Bluetooth (LE), 1Mbps, – Ch. 0) Antenna 2



Plot 7-134. Band Edge Plot (Bluetooth (LE), 1Mbps, – Ch. 39) Antenna 2

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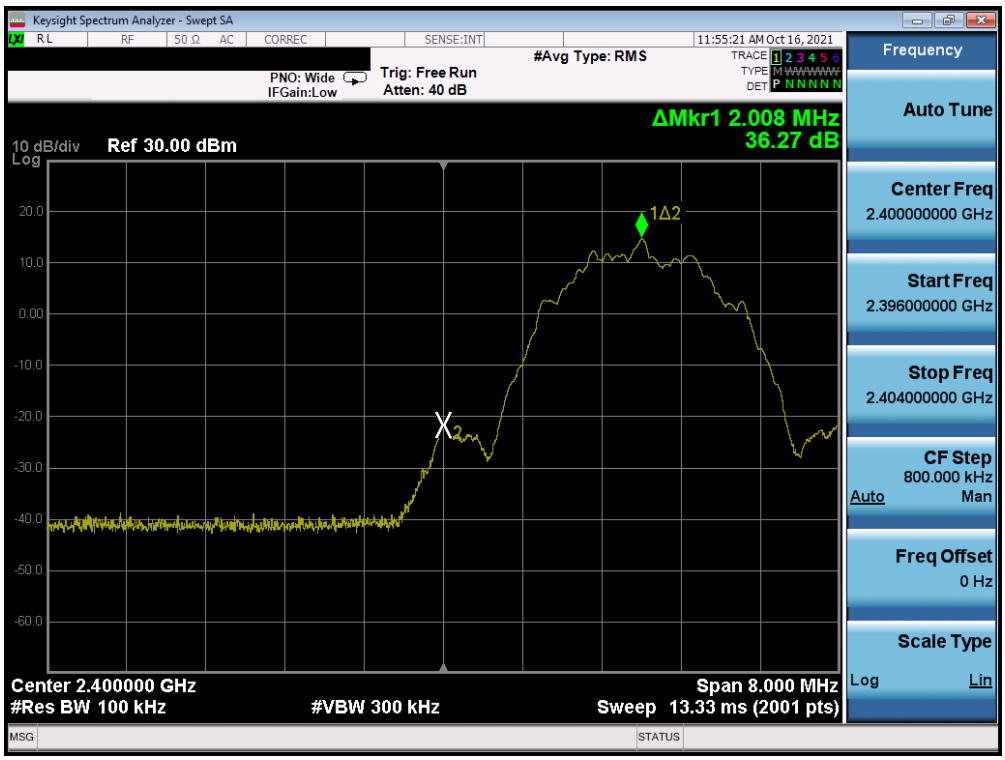
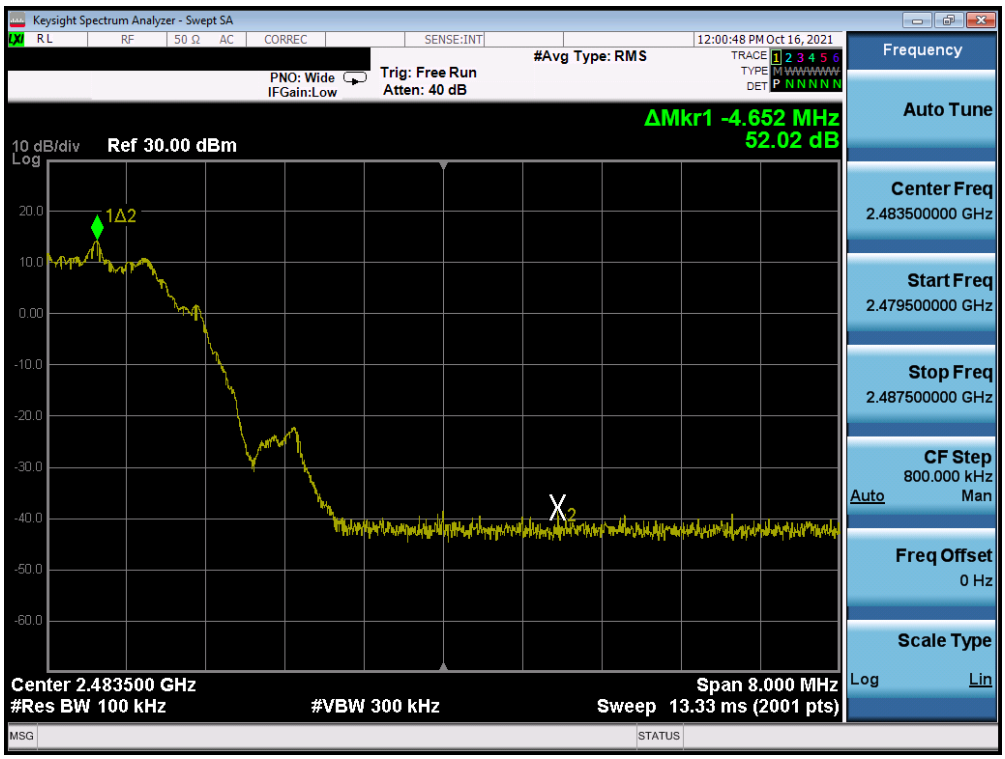


Plot 7-135. Band Edge Plot (Bluetooth (LE), 2Mbps, – Ch. 0) Antenna 2



Plot 7-136. Band Edge Plot (Bluetooth (LE), 2Mbps, – Ch. 39) Antenna 2

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7.6 Conducted Spurious Emissions

§15.247(d); RSS-247 [5.5]

Test Overview and Limit

For the following out of band conducted spurious emissions plots, the EUT was set to transmit at maximum power with the largest packet size available. The worst case spurious emissions were found in this configuration.

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the procedure in Section 8.5 of KDB 558074 D01 v05r02 and Section 11.11.3 of ANSI C63.10-2013.

Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3
KDB 558074 D01 v05r02 – Section 8.5

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

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

Figure 7-5. Test Instrument & Measurement Setup

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Test Notes

1. RBW was set to 1MHz rather than 100kHz in order to increase the measurement speed.

2. The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.

3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

4. All supported modulation and power schemes have been tested on the unit and only worst case configuration is reported.

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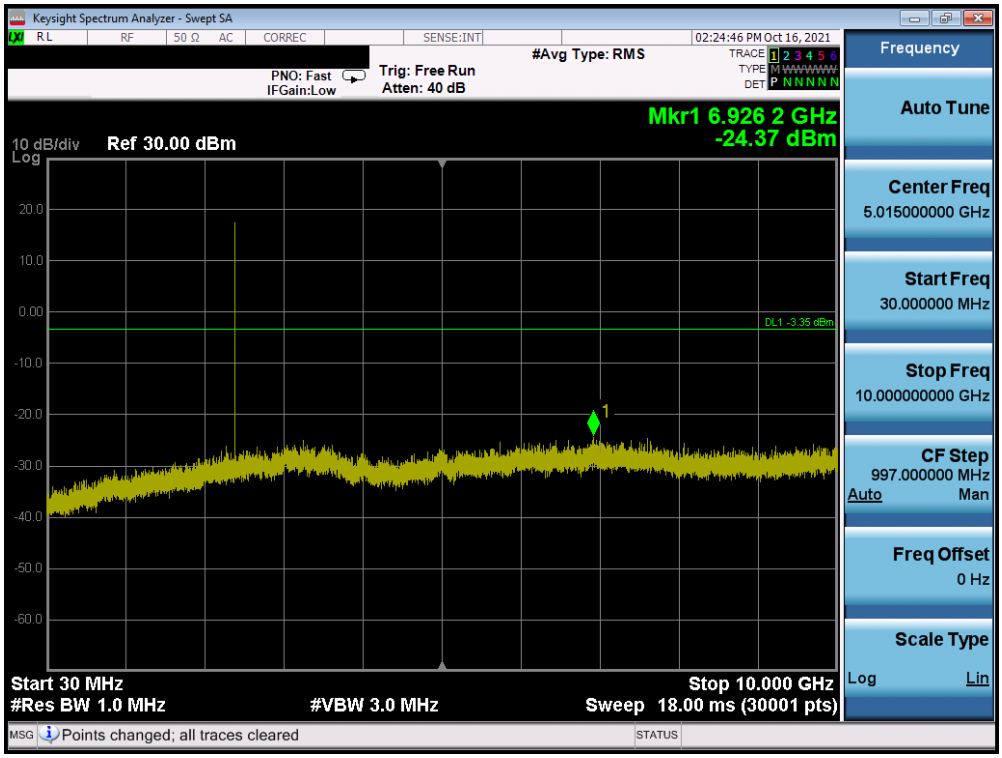
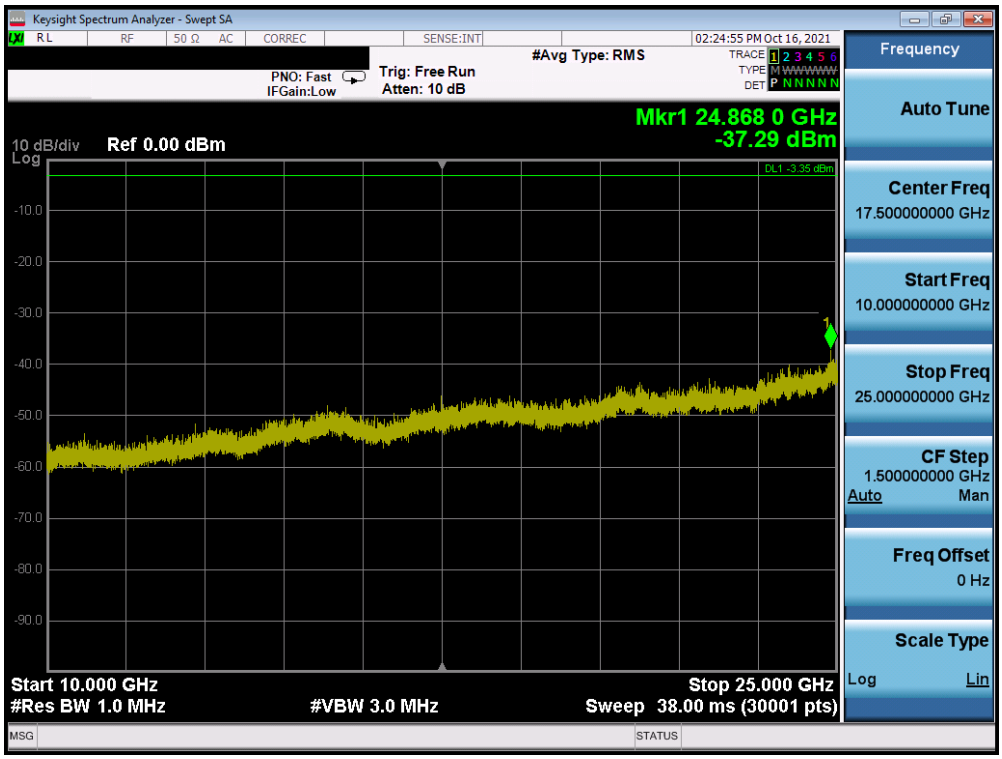
Antenna 1



Plot 7-137. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 1



Plot 7-138. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 1

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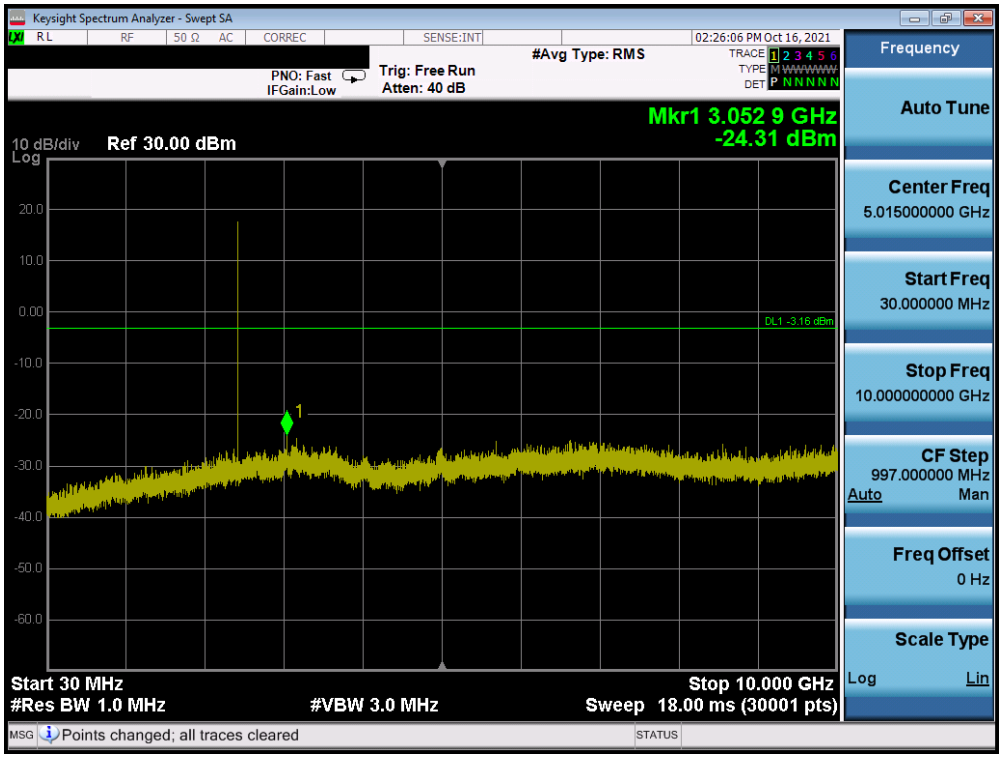
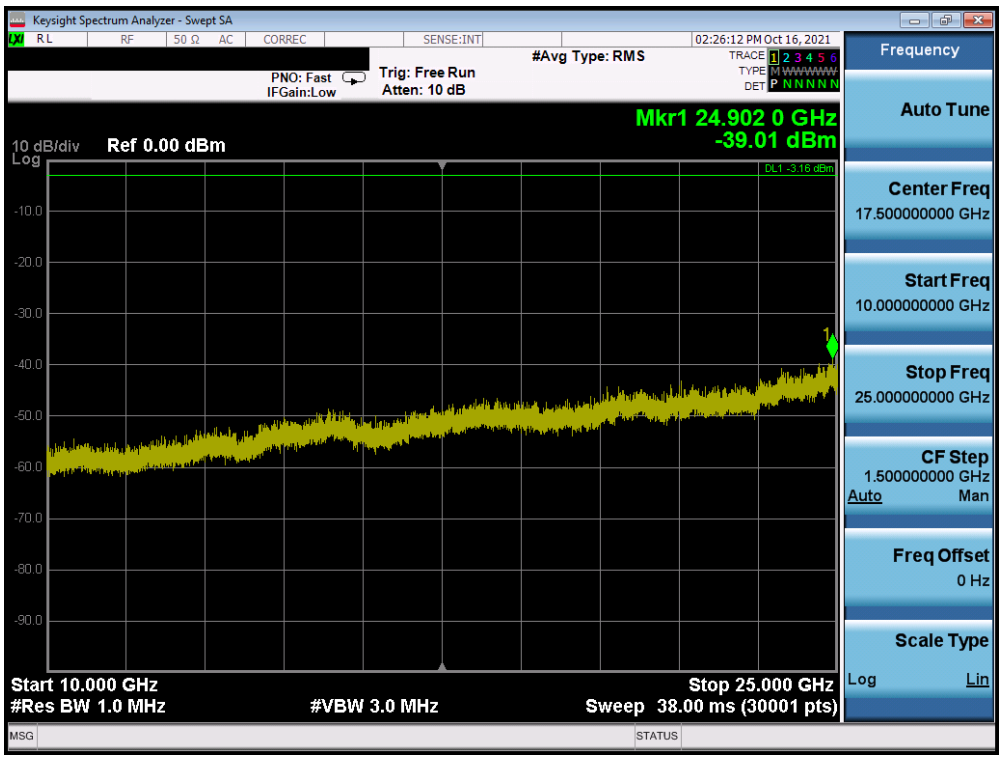


Plot 7-139. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 1



Plot 7-140. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 1

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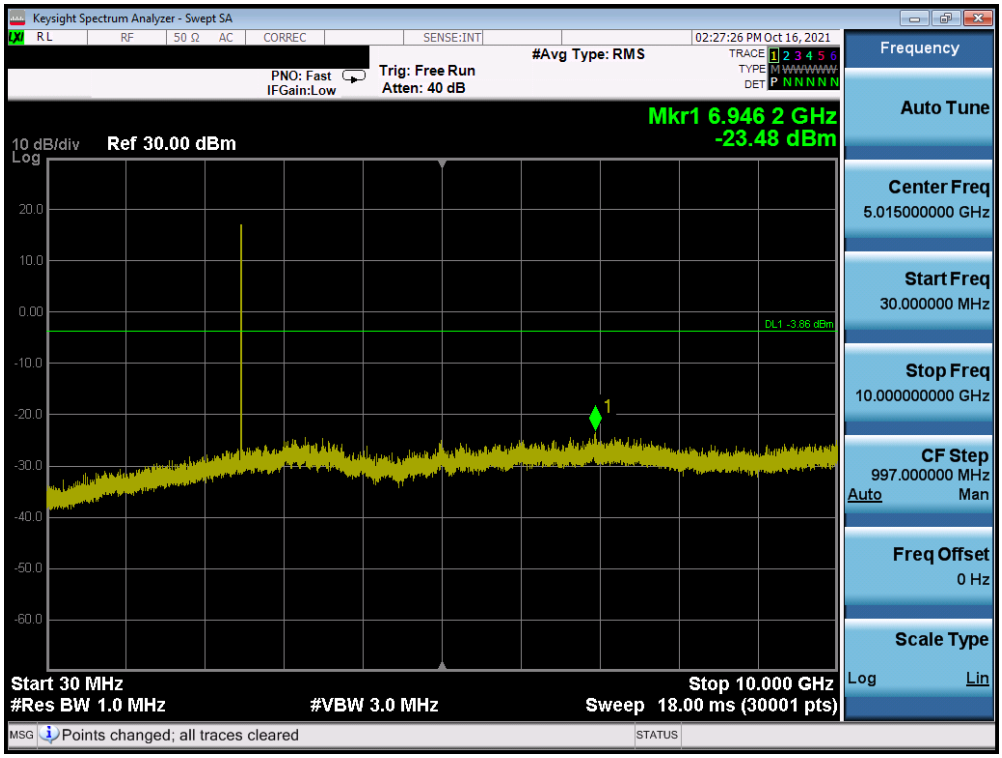
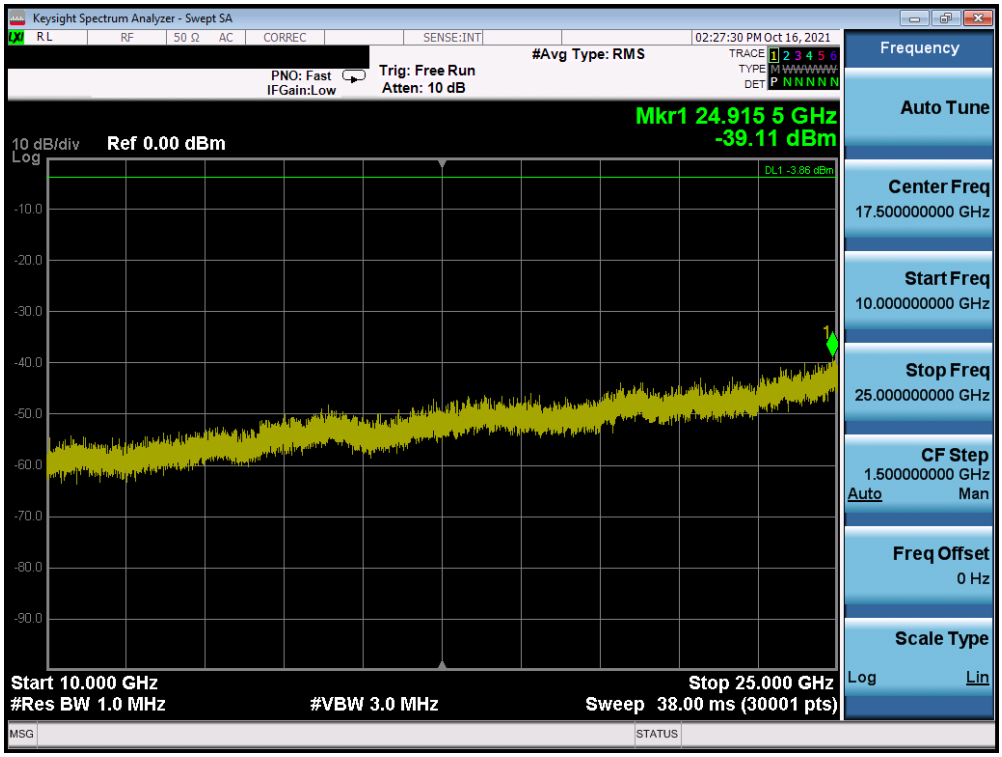


Plot 7-141. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 1



Plot 7-142. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 1

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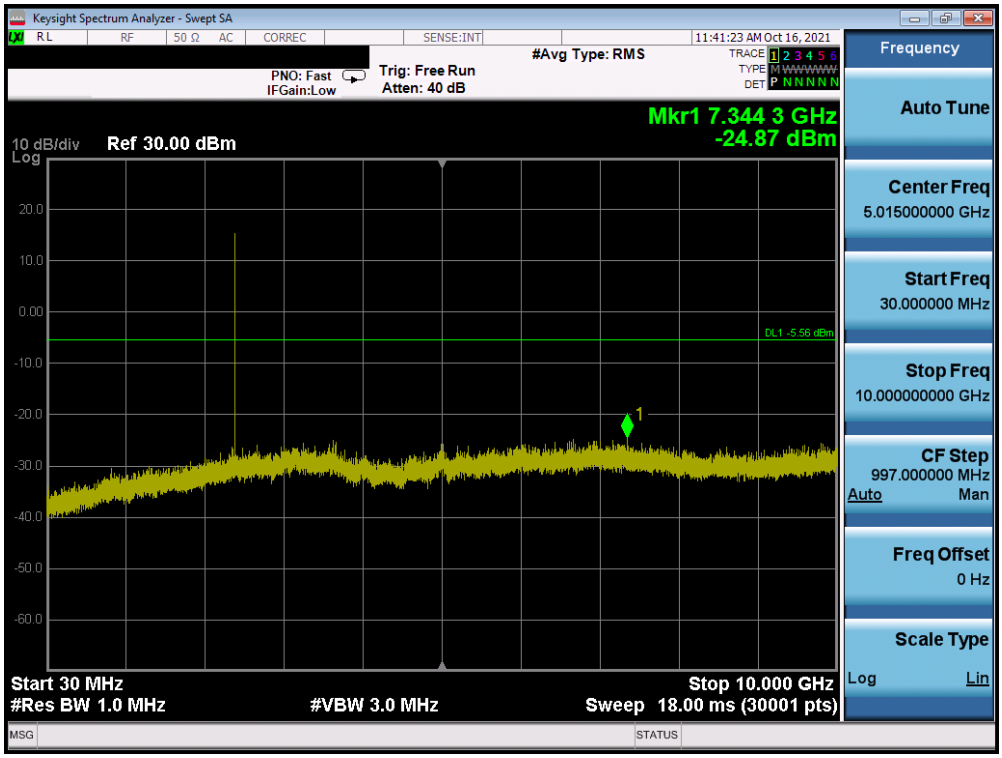
Antenna 2



Plot 7-143. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 2

Plot 7-144. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 2

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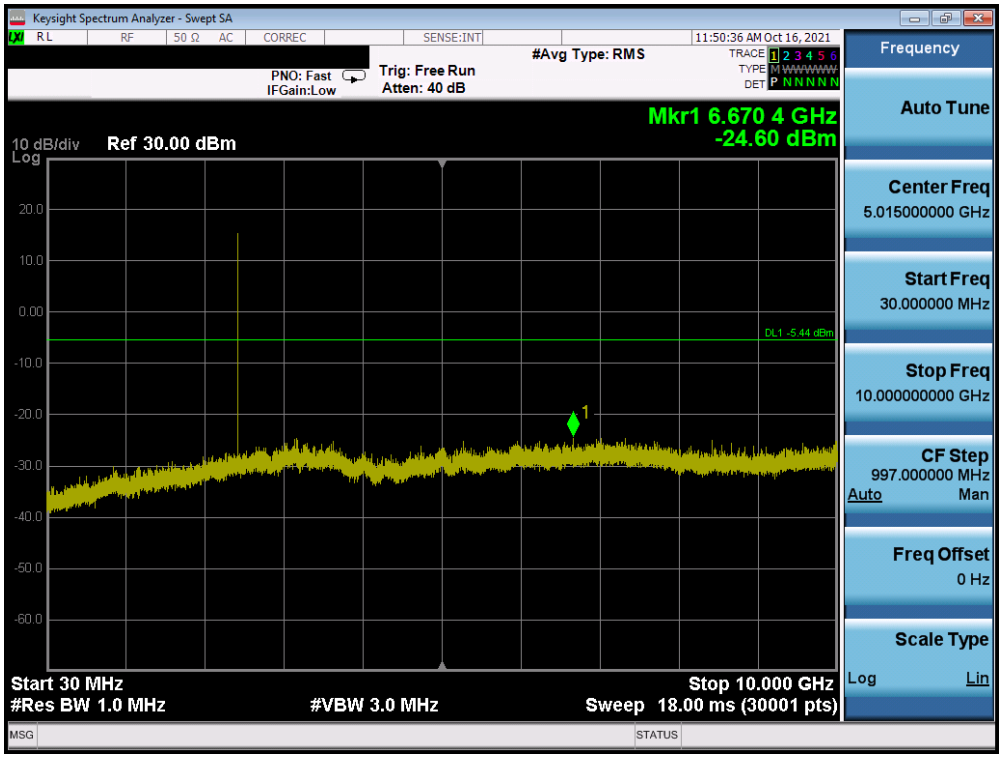
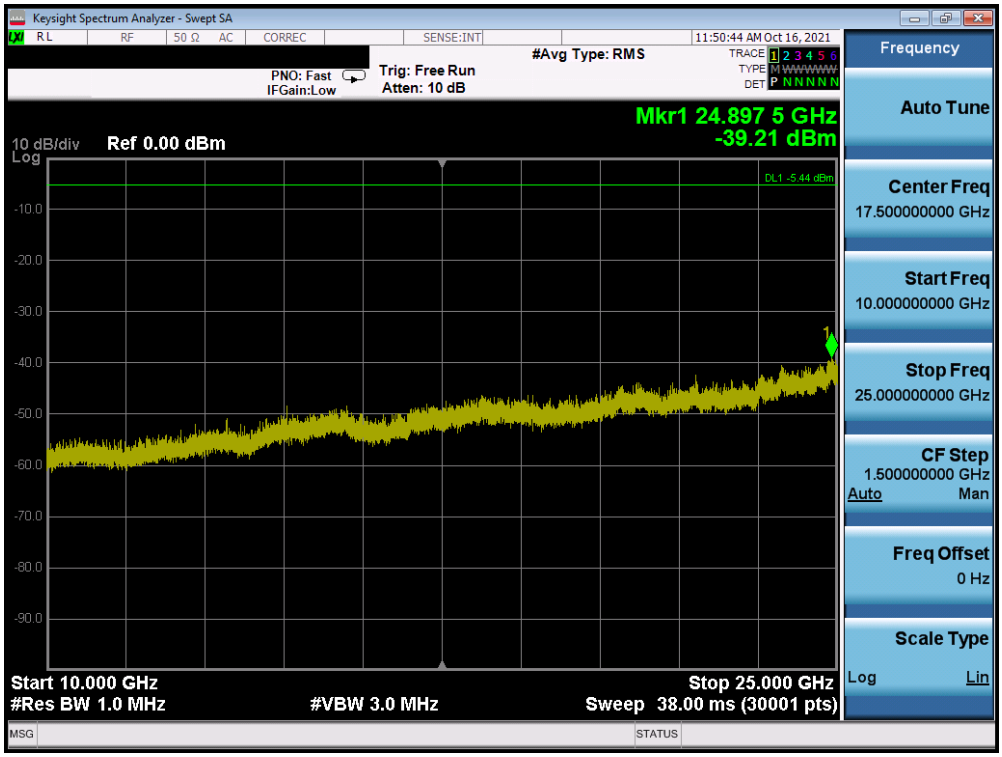


Plot 7-145. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 2



Plot 7-146. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 2

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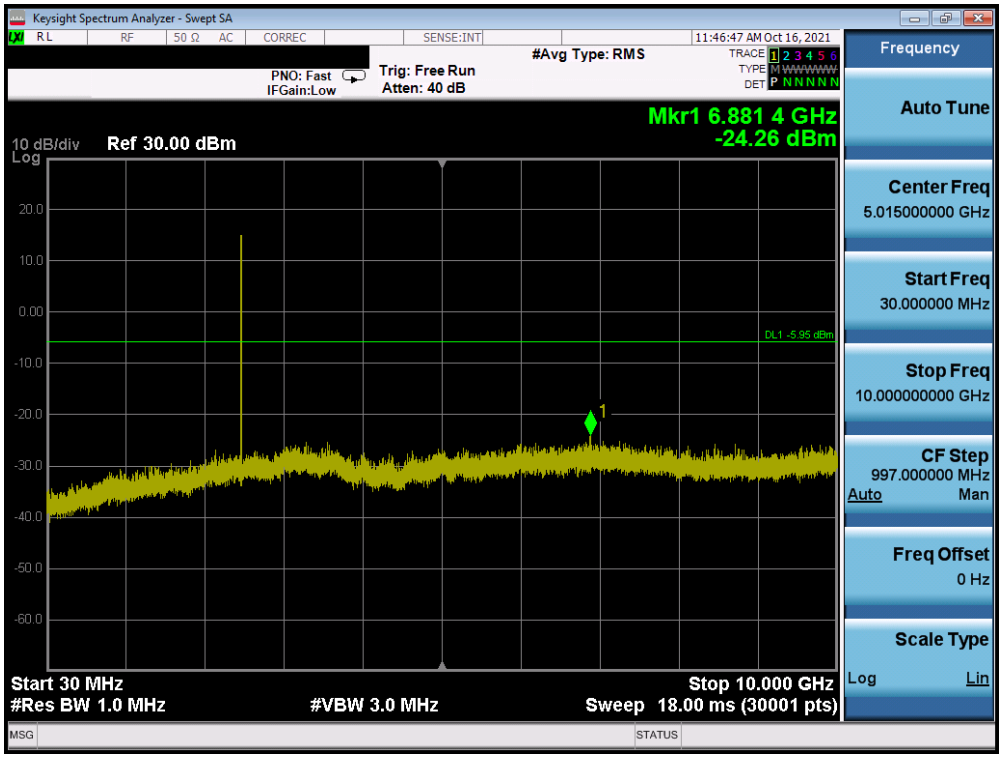
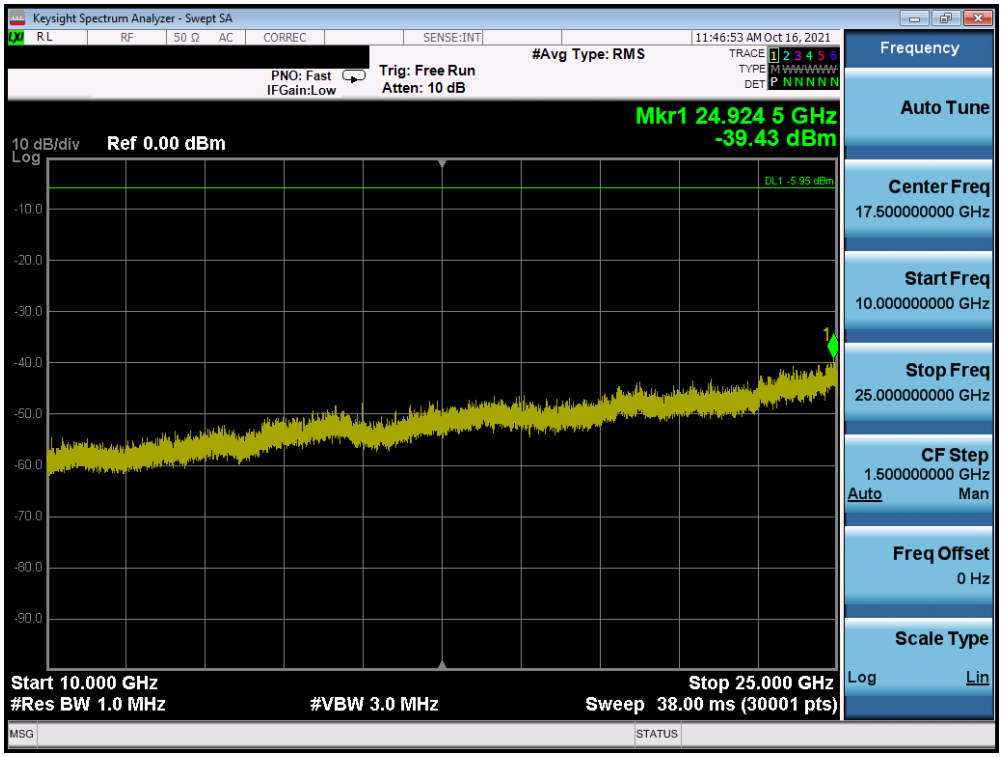


Plot 7-147. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 2



Plot 7-148. Conducted Spurious Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 2

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7.7 Radiated Spurious Emissions – 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 7 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-10 per Section 15.209 and RSS-Gen (8.9).

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

Table 7-10. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Section 6.6.4.3

KDB 558074 D01 v05r02 – Section 8.6, 8.7

Test Settings

Average Field Strength Measurements

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

Peak 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 = Peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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Test Setup

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

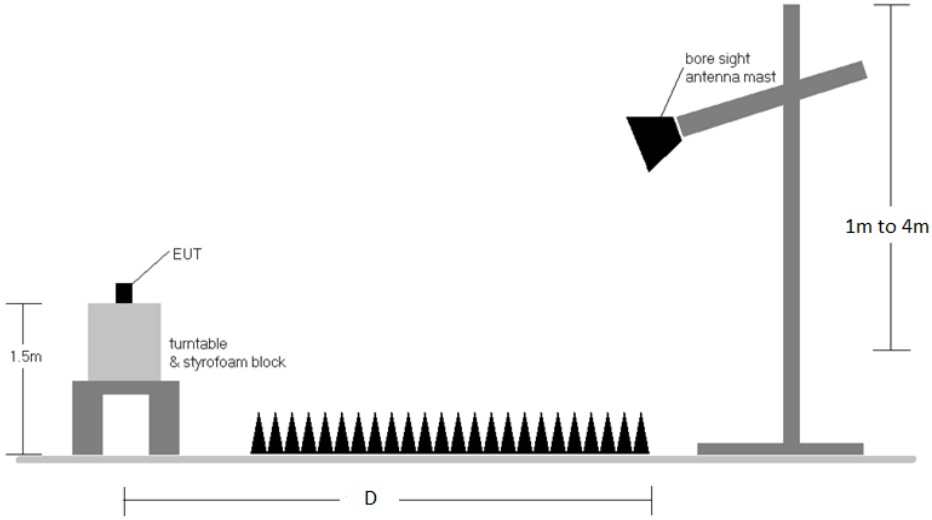

Figure 7-6. Radiated Test Setup >1GHz

Test Notes

1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v05r02 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
2. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-10.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. «Batteries»
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
6. D is the measurement test distance and emissions 1-18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
8. All supported modulation and power schemes have been tested on the unit and only worst case configuration is reported.

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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 Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 7.8 was calculated using the formula:

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

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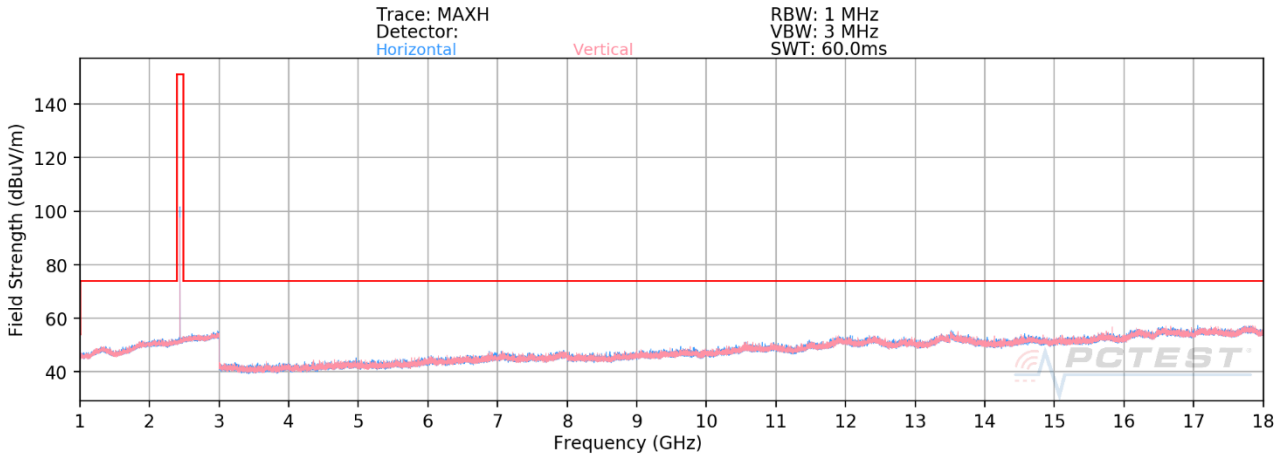
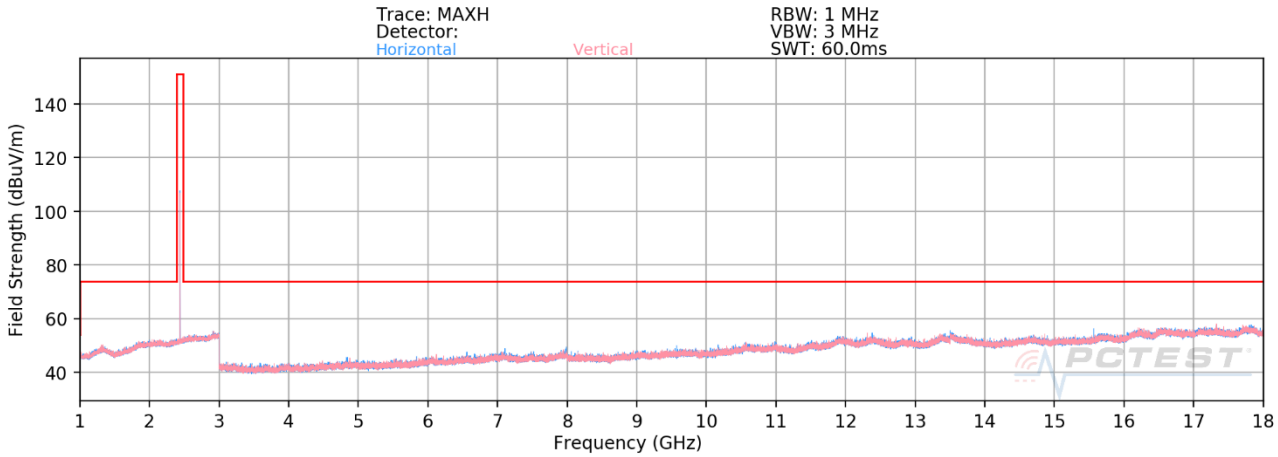
Radiated Spurious Emission Measurements (1 – 18GHz)

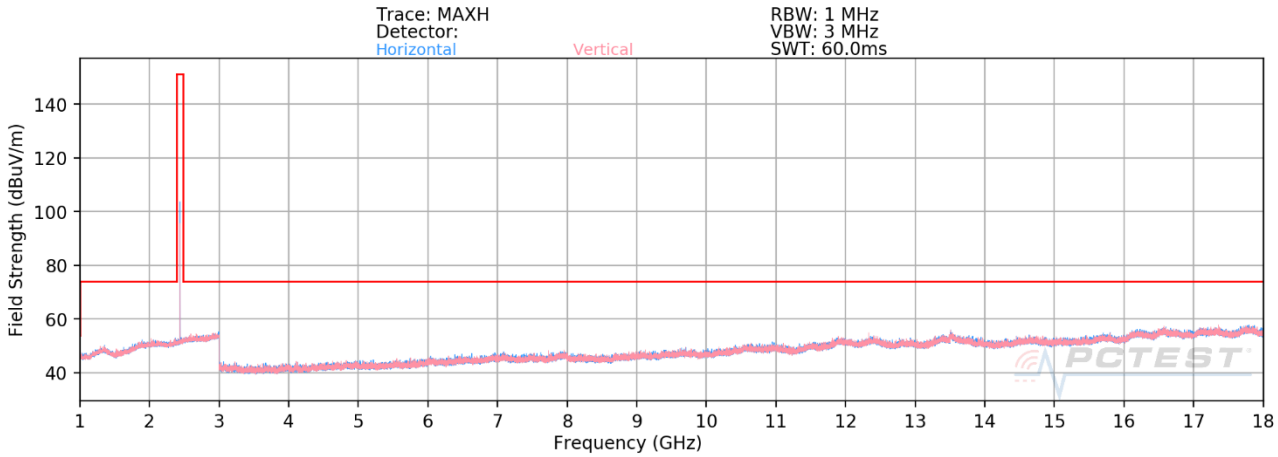
§15.205 §15.209 §15.247(d); RSS-Gen [8.9]



Plot 7-149. Radiated Spurious Emissions Above 1GHz (2Mbps, ePA – Ch. 19, Antenna 1)



Plot 7-150. Radiated Spurious Emissions Above 1GHz (2Mbps, ePA – Ch. 19, Antenna 2)



Plot 7-151. Radiated Spurious Emissions Above 1GHz (2Mbps, ePA – Ch. 19, Dual Antenna)

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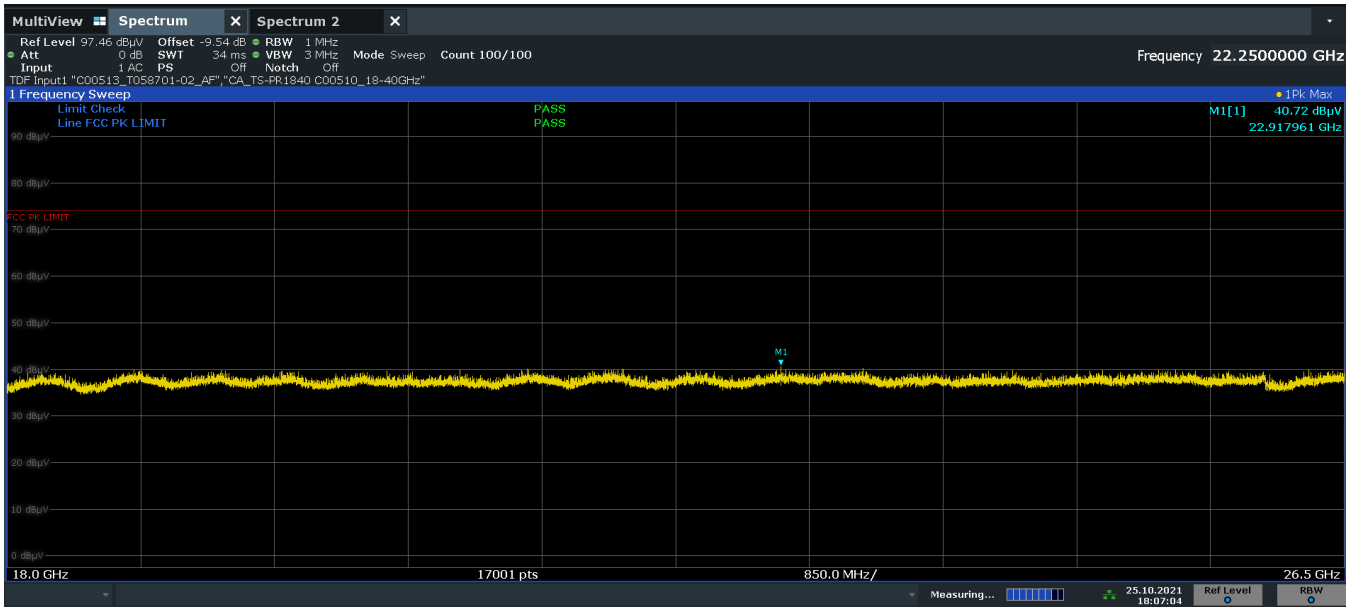
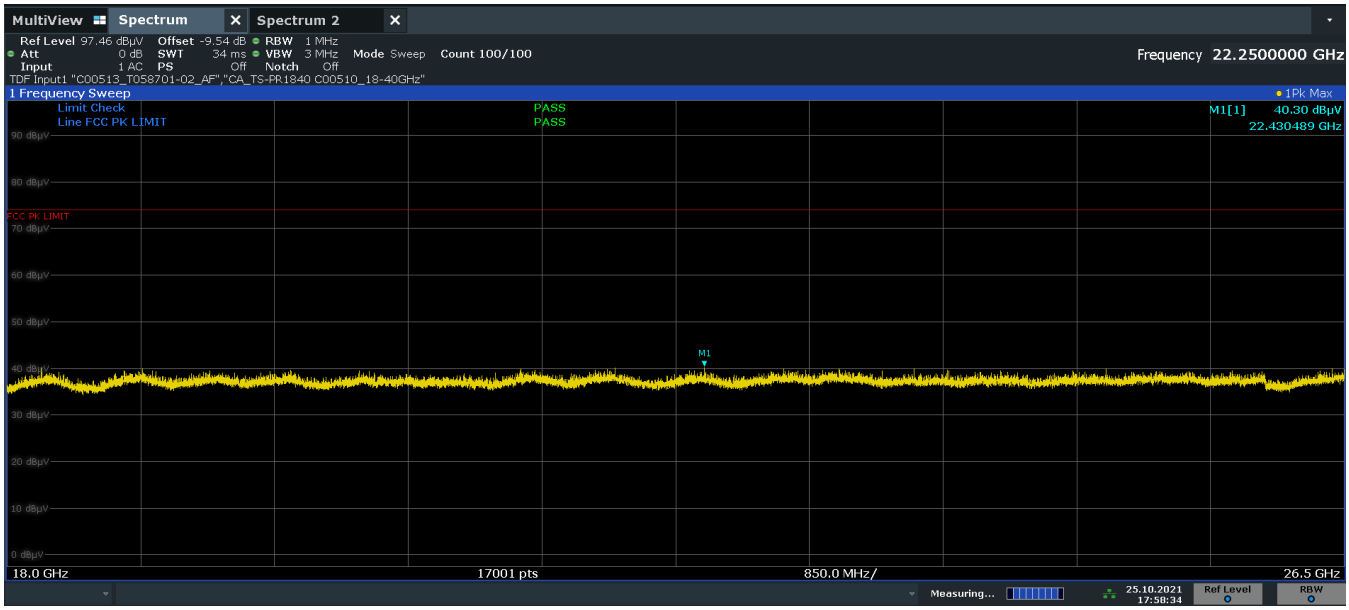


Plot 7-152. Radiated Spurious Emissions above 18GHz (2Mbps, ePA – Ch. 19 Antenna 1) – Pol. H



Plot 7-153. Radiated Spurious Emissions above 18GHz (2Mbps, ePA – Ch. 19 Antenna 1) – Pol. V

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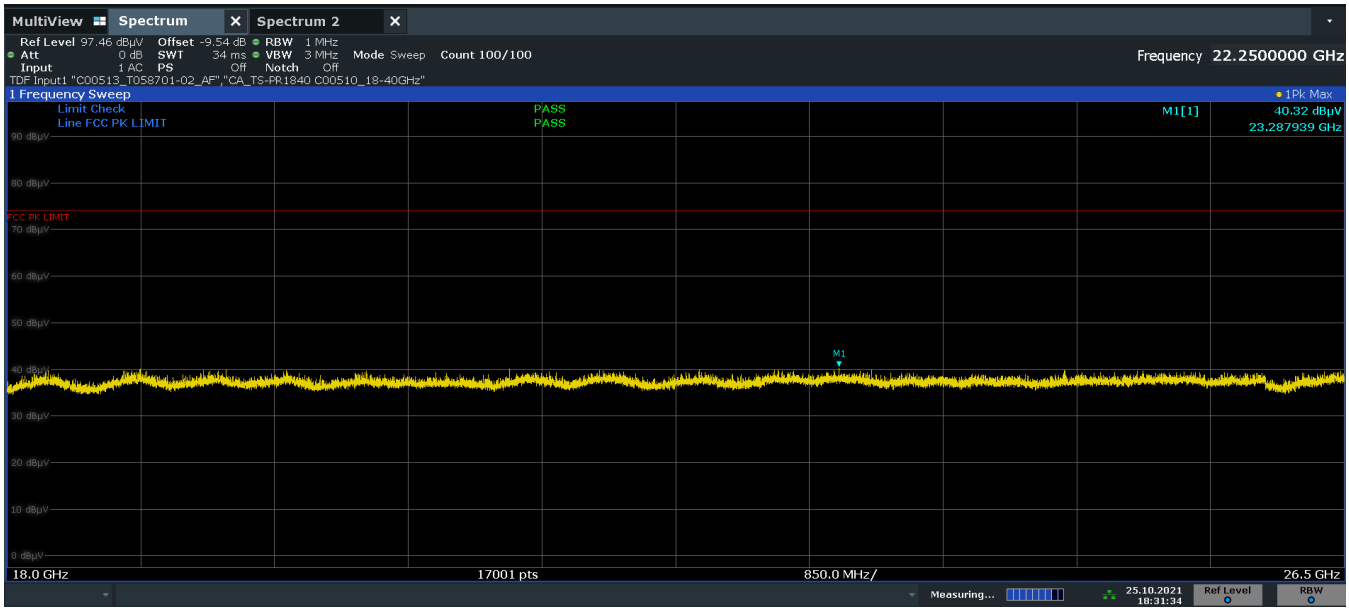
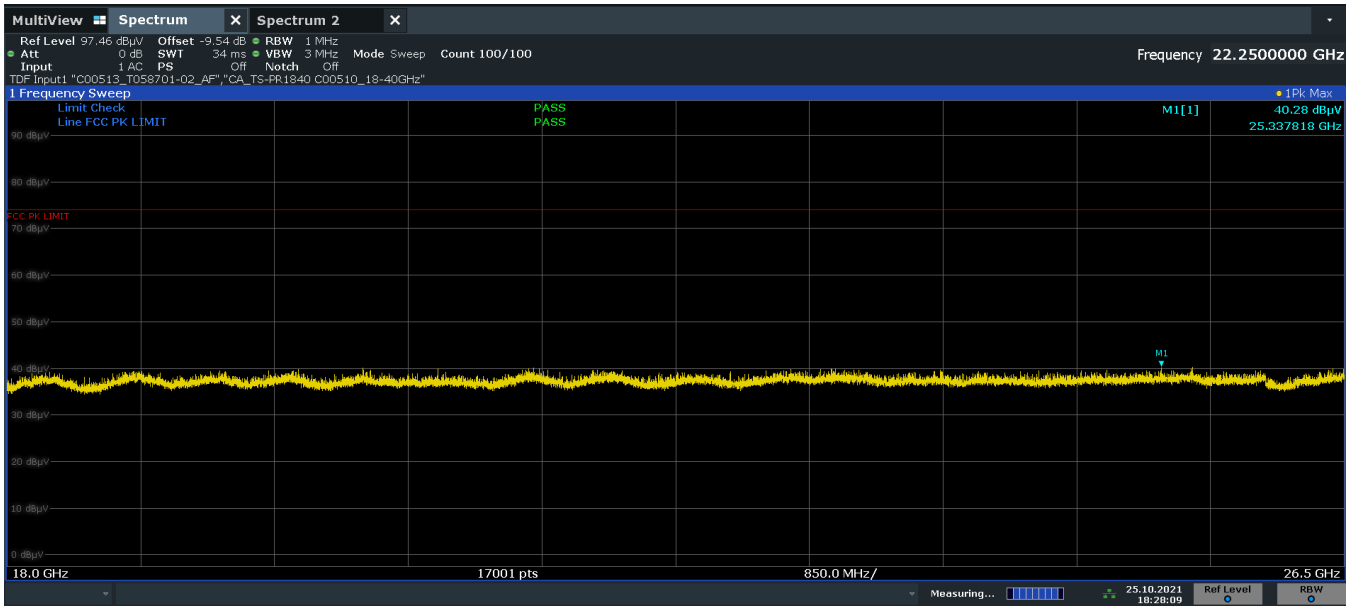


Plot 7-154. Radiated Spurious Emissions above 18GHz (2Mbps, ePA – Ch. 19 Antenna 2) – Pol. H



Plot 7-155. Radiated Spurious Emissions above 18GHz (2Mbps, ePA – Ch. 19 Antenna 2) – Pol. V

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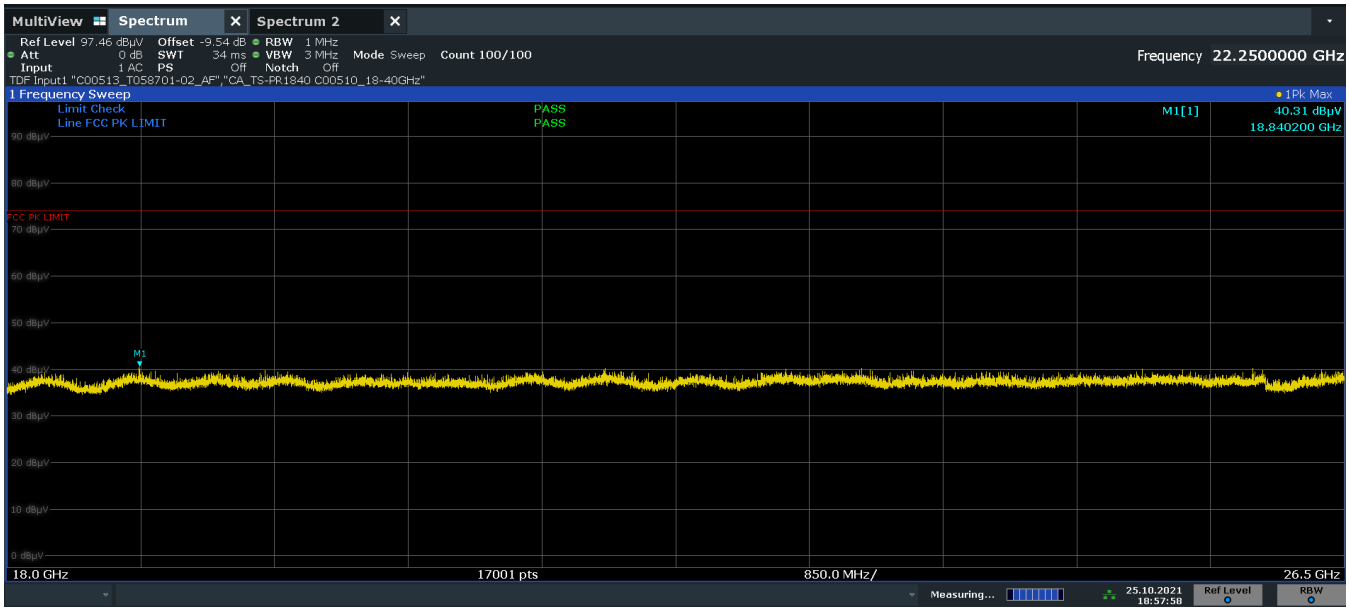
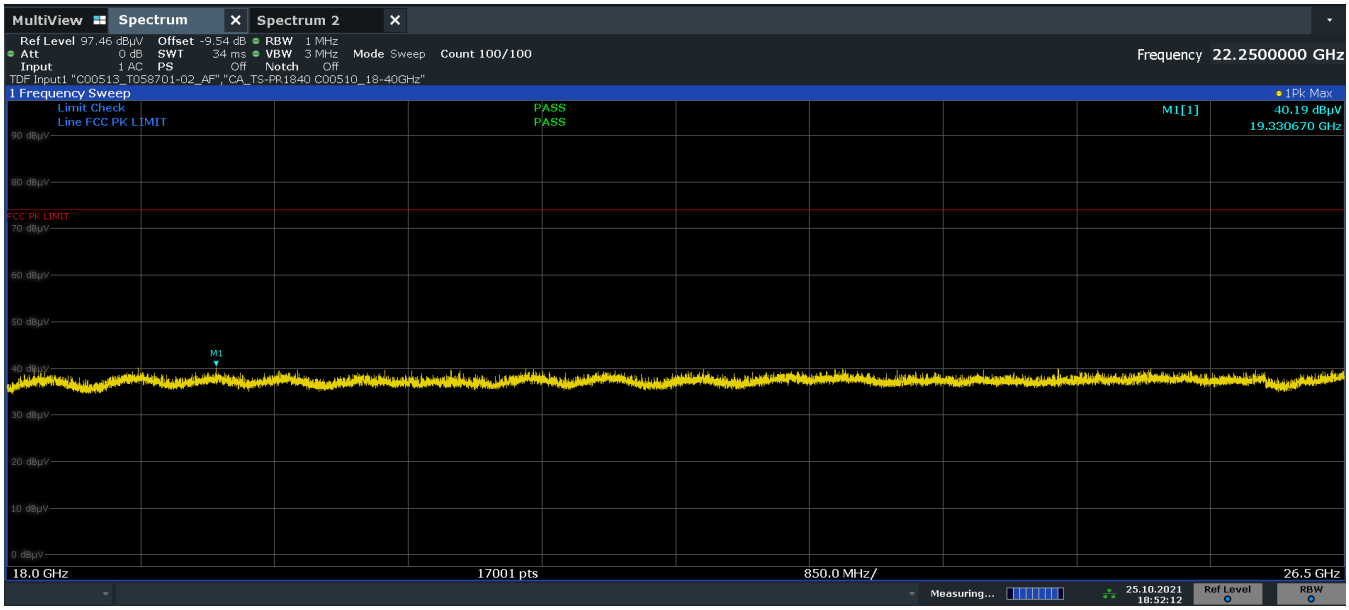


Plot 7-156. Radiated Spurious Emissions above 18GHz (2Mbps, ePA – Ch. 19 Dual Antenna) – Pol. H



Plot 7-157. Radiated Spurious Emissions above 18GHz (2Mbps, ePA – Ch. 19 Dual Antenna) – Pol. V

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Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	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	-	-	-81.62	7.71	33.09	53.98	-20.89
4804.00	Peak	H	-	-	-70.33	7.71	44.38	73.98	-29.60
12010.00	Avg	H	-	-	-84.01	17.55	40.54	53.98	-13.44
12010.00	Peak	H	-	-	-72.60	17.55	51.95	73.98	-22.03

Table 7-11. Radiated Emission Measurements (Antenna 1)

Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2440MHz
Channel:	19

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]
4880.00	Avg	H	-	-	-81.85	7.95	33.10	53.98	-20.88
4880.00	Peak	H	-	-	-70.72	7.95	44.23	73.98	-29.75
7320.00	Avg	H	-	-	-83.05	11.44	35.39	53.98	-18.59
7320.00	Peak	H	-	-	-72.07	11.44	46.37	73.98	-27.61
12200.00	Avg	H	-	-	-83.71	17.77	41.06	53.98	-12.92
12200.00	Peak	H	-	-	-71.73	17.77	53.04	73.98	-20.94

Table 7-12. Radiated Emission Measurements (Antenna 1)

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Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2480MHz
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]
4960.00	Avg	H	-	-	-81.23	7.89	33.66	53.98	-20.32
4960.00	Peak	H	-	-	-70.34	7.89	44.55	73.98	-29.43
7440.00	Avg	H	-	-	-83.73	12.38	35.65	53.98	-18.33
7440.00	Peak	H	-	-	-72.47	12.38	46.91	73.98	-27.07
12400.00	Avg	H	-	-	-84.28	18.27	40.99	53.98	-12.99
12400.00	Peak	H	-	-	-72.84	18.27	52.43	73.98	-21.55

Table 7-13. Radiated Emission Measurements (Antenna 1)

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Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	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	392	8	-80.09	7.71	34.62	53.98	-19.36
4804.00	Peak	V	392	8	-67.53	7.71	47.18	73.98	-26.80
12010.00	Avg	V	-	-	-83.93	17.55	40.62	53.98	-13.36
12010.00	Peak	V	-	-	-71.71	17.55	52.84	73.98	-21.14

Table 7-14. Radiated Emission Measurements (Antenna 2)

Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2440MHz
Channel:	19

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]
4880.00	Avg	V	400	356	-79.48	7.95	35.47	53.98	-18.51
4880.00	Peak	V	400	356	-67.83	7.95	47.12	73.98	-26.86
7320.00	Avg	V	-	-	-83.11	11.44	35.33	53.98	-18.65
7320.00	Peak	V	-	-	-71.50	11.44	46.94	73.98	-27.04
12200.00	Avg	V	-	-	-83.54	17.77	41.23	53.98	-12.75
12200.00	Peak	V	-	-	-72.41	17.77	52.36	73.98	-21.62

Table 7-15. Radiated Emission Measurements (Antenna 2)

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Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2480MHz
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]
4960.00	Avg	V	360	343	-79.19	7.89	35.70	53.98	-18.28
4960.00	Peak	V	360	343	-67.73	7.89	47.16	73.98	-26.82
7440.00	Avg	V	-	-	-83.57	12.38	35.81	53.98	-18.17
7440.00	Peak	V	-	-	-72.19	12.38	47.19	73.98	-26.79
12400.00	Avg	V	-	-	-84.52	18.27	40.75	53.98	-13.23
12400.00	Peak	V	-	-	-72.95	18.27	52.32	73.98	-21.66

Table 7-16. Radiated Emission Measurements (Antenna 2)

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Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	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	-	-	-81.35	7.71	33.36	53.98	-20.62
4804.00	Peak	H	-	-	-69.51	7.71	45.20	73.98	-28.78
12010.00	Avg	H	-	-	-82.78	17.55	41.77	53.98	-12.21
12010.00	Peak	H	-	-	-71.26	17.55	53.29	73.98	-20.69

Table 7-17. Radiated Emission Measurements (Dual Antenna)

Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2440MHz
Channel:	19

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]
4880.00	Avg	H	-	-	-81.78	7.95	33.17	53.98	-20.81
4880.00	Peak	H	-	-	-70.01	7.95	44.94	73.98	-29.04
7320.00	Avg	H	-	-	-82.99	11.44	35.45	53.98	-18.53
7320.00	Peak	H	-	-	-70.95	11.44	47.49	73.98	-26.49
12200.00	Avg	H	-	-	-83.53	17.77	41.24	53.98	-12.74
12200.00	Peak	H	-	-	-71.82	17.77	52.95	73.98	-21.03

Table 7-18. Radiated Emission Measurements (Dual Antenna)

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Bluetooth Mode:	LE
Data Rate:	2Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2480MHz
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]
4960.00	Avg	H	-	-	-81.35	7.89	33.54	53.98	-20.44
4960.00	Peak	H	-	-	-69.21	7.89	45.68	73.98	-28.30
7440.00	Avg	H	-	-	-83.70	12.38	35.68	53.98	-18.30
7440.00	Peak	H	-	-	-72.49	12.38	46.89	73.98	-27.09
12400.00	Avg	H	-	-	-84.37	18.27	40.90	53.98	-13.08
12400.00	Peak	H	-	-	-72.61	18.27	52.66	73.98	-21.32

Table 7-19. Radiated Emission Measurements (Dual Antenna)

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7.8 Radiated Restricted Band Edge Measurements

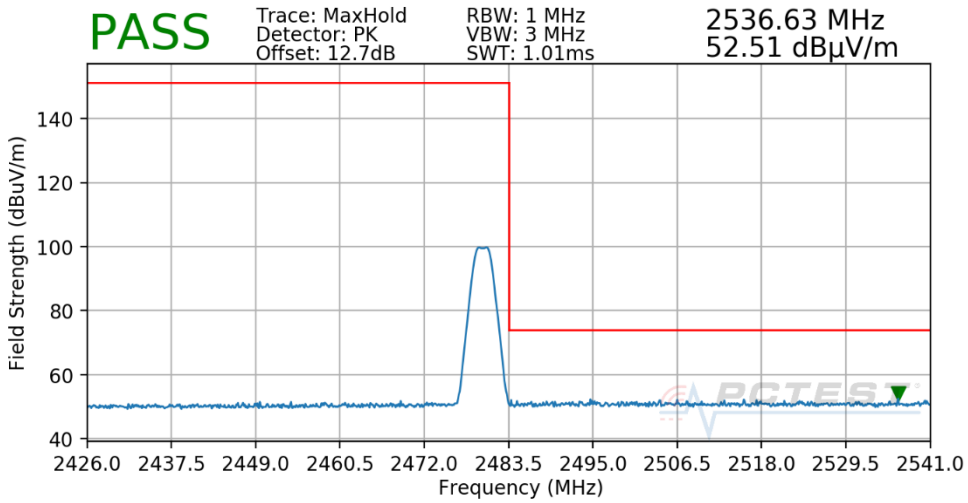
§15.205 §15.209; RSS-Gen [8.9]

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

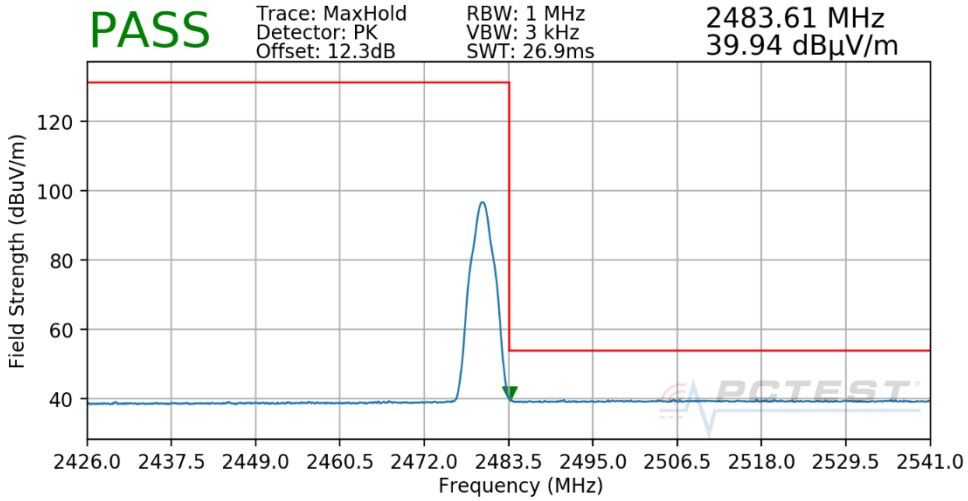
The amplitude offset shown in the following plots for average measurements was calculated using the formula:

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

Bluetooth Mode:	LE
Data Rate	2Mbps
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	39



Plot 7-158. Radiated Restricted Upper Band Edge Measurement Antenna 1 (Peak)



Plot 7-159. Radiated Restricted Upper Band Edge Measurement Antenna 1 (Average)

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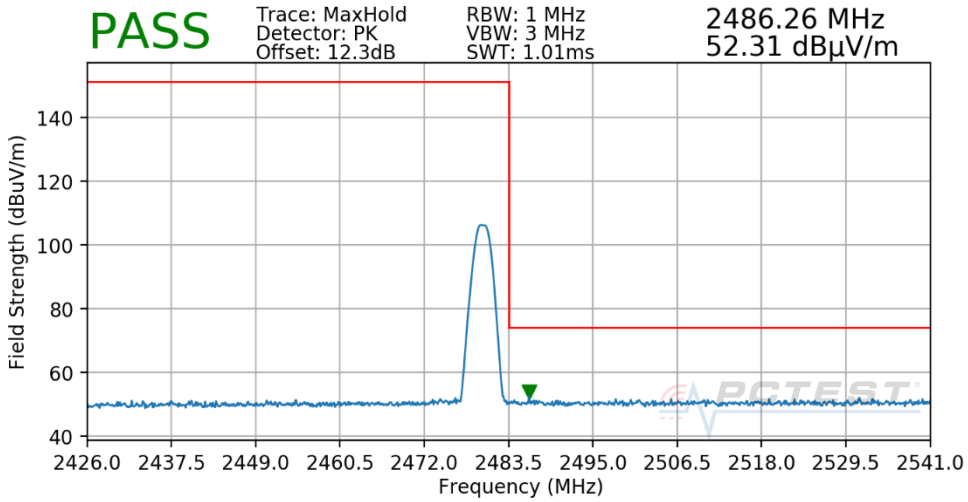
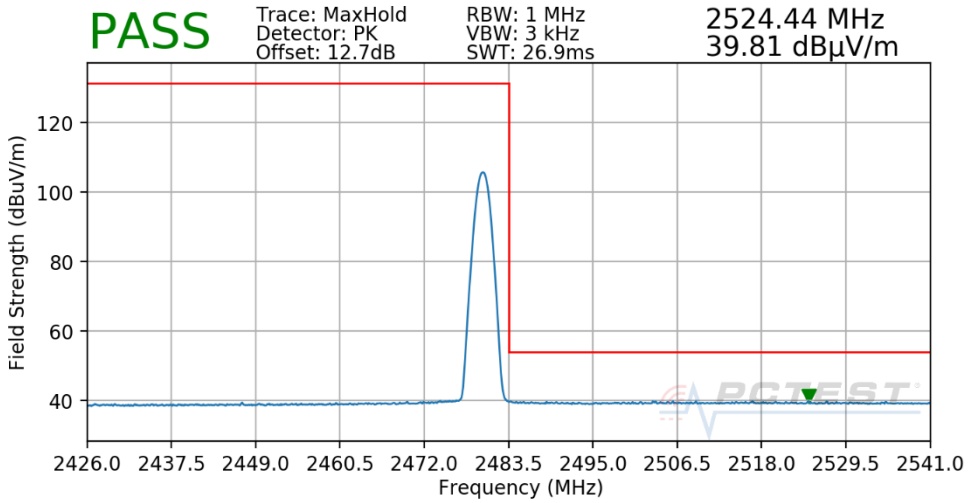
Bluetooth Mode:	LE
Data Rate	2Mbps
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	39



Plot 7-160. Radiated Restricted Upper Band Edge Measurement Antenna 2 (Peak)



Plot 7-161. Radiated Restricted Upper Band Edge Measurement Antenna 2 (Average)

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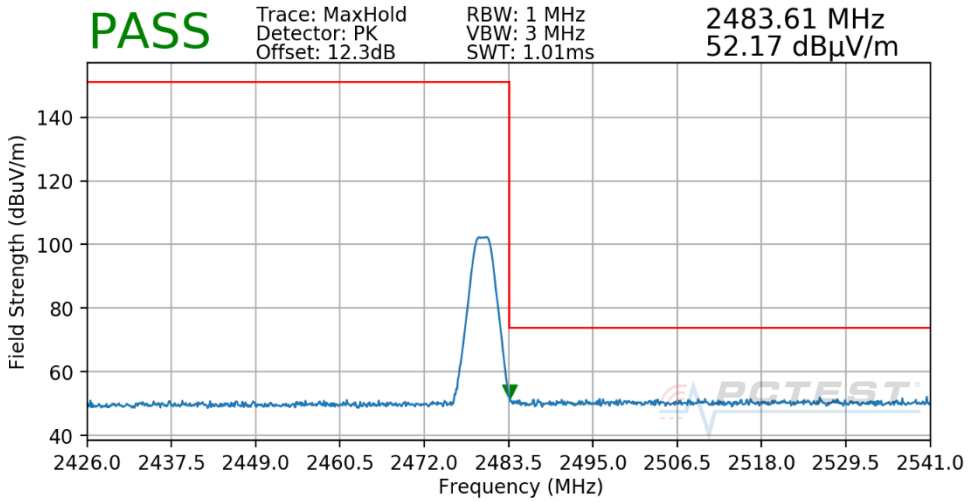
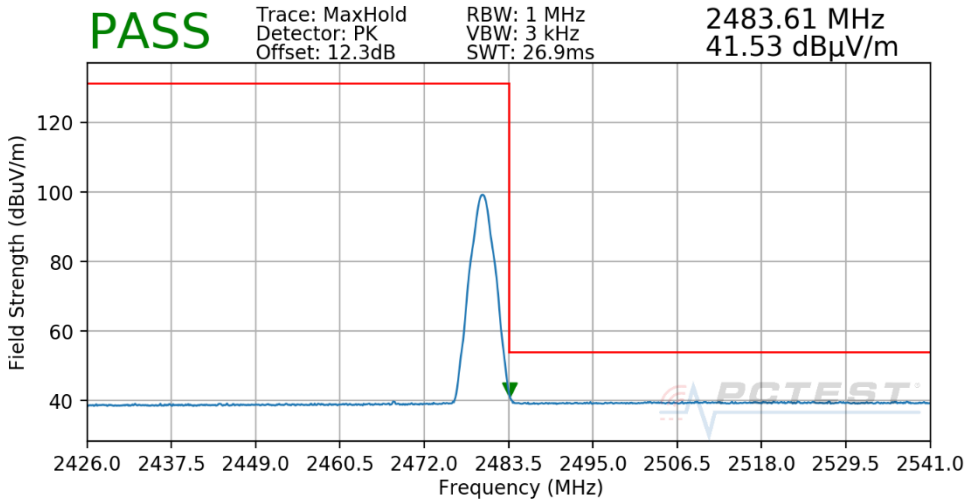
Bluetooth Mode:	LE
Data Rate	2Mbps
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	39



Plot 7-162. Radiated Restricted Upper Band Edge Measurement Dual Antenna (Peak)



Plot 7-163. Radiated Restricted Upper Band Edge Measurement Dual Antenna (Average)

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7.9 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209; RSS-Gen [8.9]

Test Overview and Limit

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

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 7 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-20 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 7-20. 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

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

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Test Setup

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

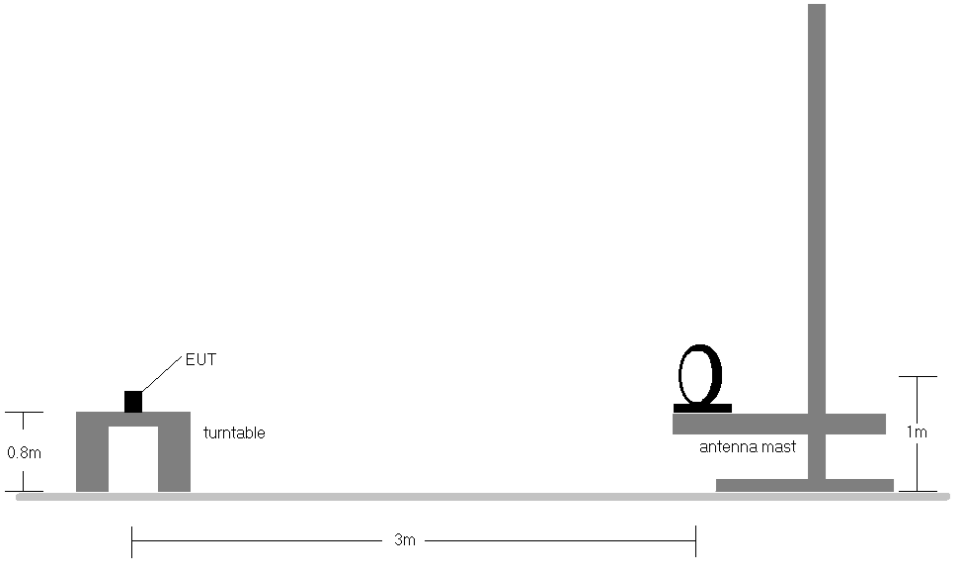

Figure 7-7. Radiated Test Setup < 30Mhz

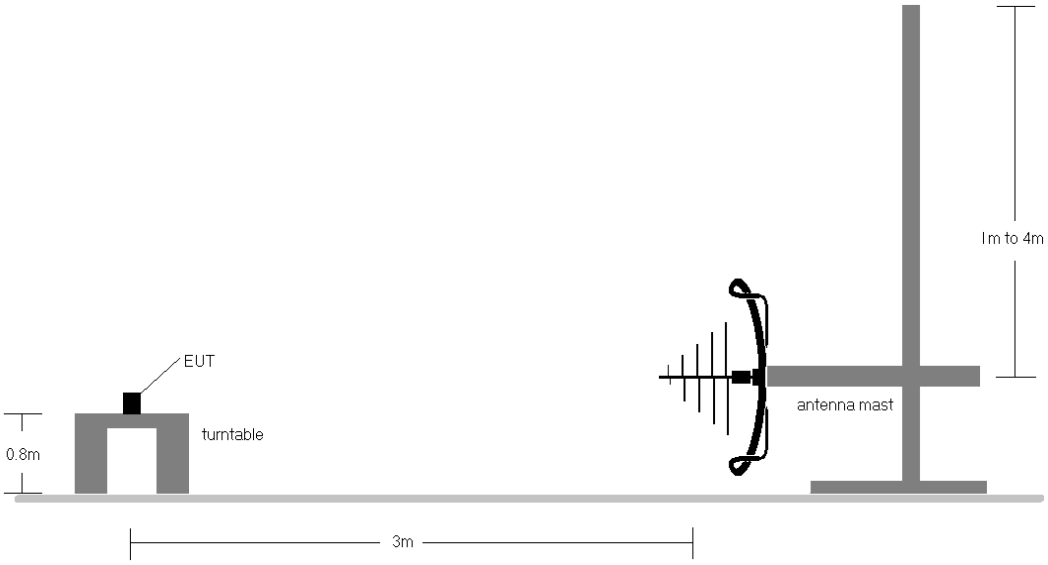

Figure 7-8. Radiated Test Setup < 1GHz

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Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen(8.10) are below the limit shown in Table 7-20.
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 devices was tested with a 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.
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 modulation and power schemes have been tested on the unit and only worst case configuration is reported.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$ – Preamplifier Gain $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

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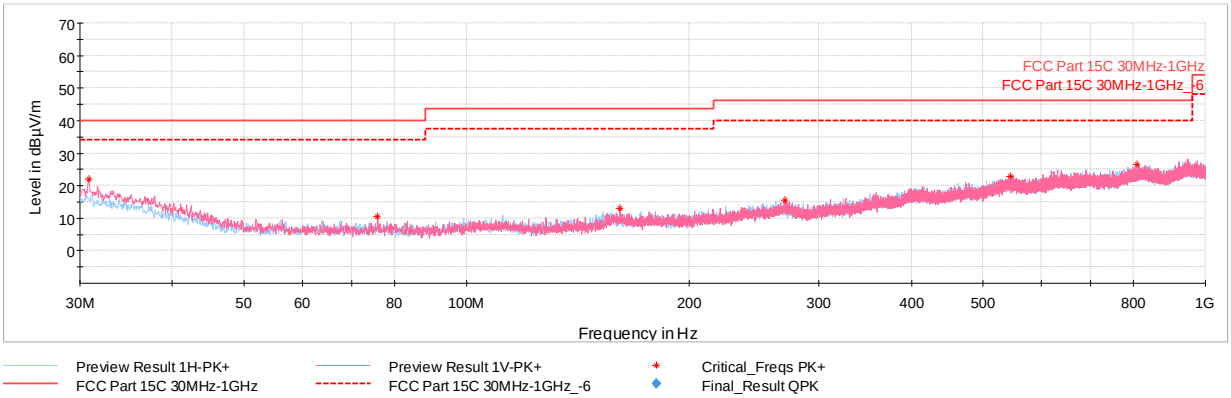
Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209; RSS-Gen [8.9]



Plot 7-164. Radiated Spurious Emissions Below 1GHz (Antenna 1)

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
30.82	Max-Peak	V	250	302	-75.53	-9.53	21.94	40.00	-18.06
75.83	Max-Peak	V	250	22	-75.95	-20.45	10.60	40.00	-29.40
161.44	Max-Peak	V	250	227	-77.28	-16.68	13.04	43.52	-30.48
269.93	Max-Peak	V	250	13	-78.64	-12.81	15.55	46.02	-30.47
544.39	Max-Peak	H	250	206	-78.45	-5.75	22.80	46.02	-23.22
808.28	Max-Peak	H	250	19	-78.68	-1.96	26.36	46.02	-19.66

Table 7-21. Radiated Spurious Emissions Below 1GHz (Antenna 1)

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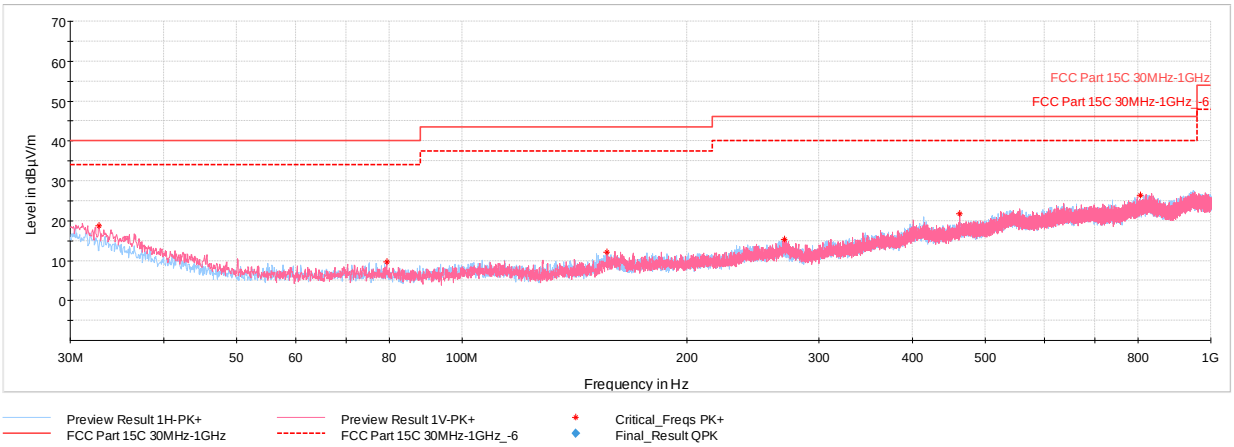

Plot 7-165. Radiated Spurious Emissions Below 1GHz (Antenna 2)

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]
32.76	Max-Peak	V	100	115	-77.19	-11.05	18.76	40.00	-21.24
79.42	Max-Peak	V	250	156	-76.82	-20.56	9.62	40.00	-30.38
156.15	Max-Peak	H	250	85	-78.20	-16.67	12.13	43.52	-31.39
269.83	Max-Peak	V	100	172	-78.73	-12.84	15.43	46.02	-30.59
461.89	Max-Peak	V	250	39	-76.66	-8.61	21.73	46.02	-24.29
804.74	Max-Peak	H	250	85	-78.67	-1.92	26.41	46.02	-19.61

Table 7-22. Radiated Spurious Emissions Below 1GHz (Antenna 2)

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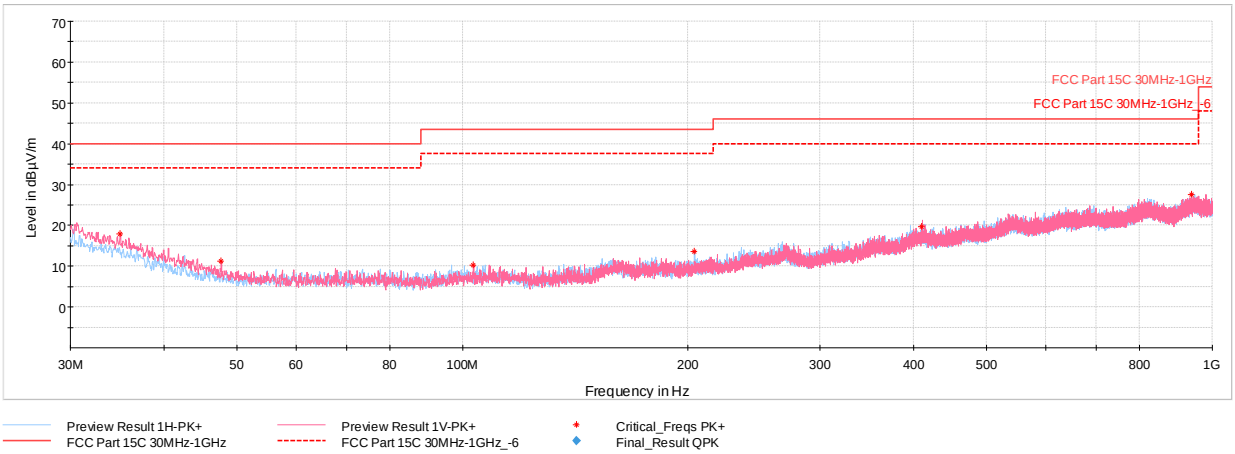

Plot 7-166. Radiated Spurious Emissions Below 1GHz (Dual Antenna)

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]
34.95	Max-Peak	V	100	82	-76.76	-12.28	17.96	40.00	-22.04
47.65	Max-Peak	V	250	300	-76.75	-19.09	11.16	40.00	-28.84
103.43	Max-Peak	V	100	325	-77.21	-19.47	10.32	43.52	-33.20
203.97	Max-Peak	H	250	225	-76.87	-16.62	13.51	43.52	-30.01
410.05	Max-Peak	V	100	198	-78.34	-9.01	19.65	46.02	-26.37
937.39	Max-Peak	H	100	149	-78.80	-0.61	27.59	46.02	-18.43

Table 7-23. Radiated Spurious Emissions Below 1GHz (Dual Antenna)

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7.10 AC Line-Conducted Emissions Measurement

§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 AC Line 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 7-24. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2013, Section 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

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Test Setup

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

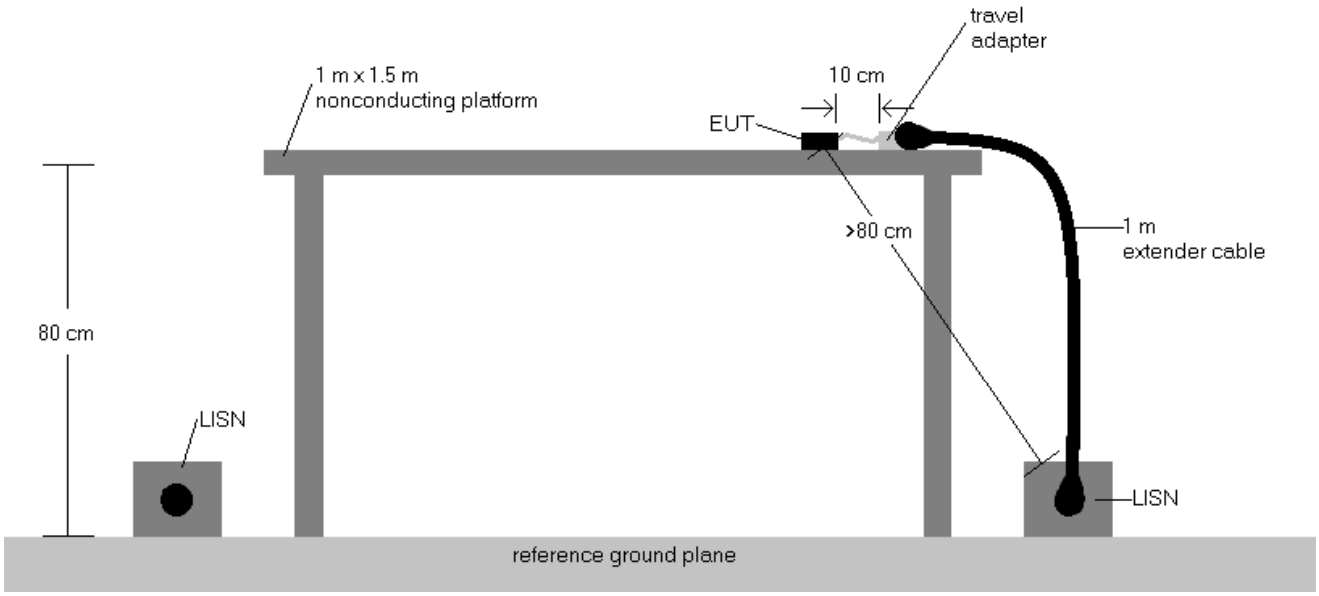

Figure 7-9. Test Instrument & Measurement Setup

Test Notes

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

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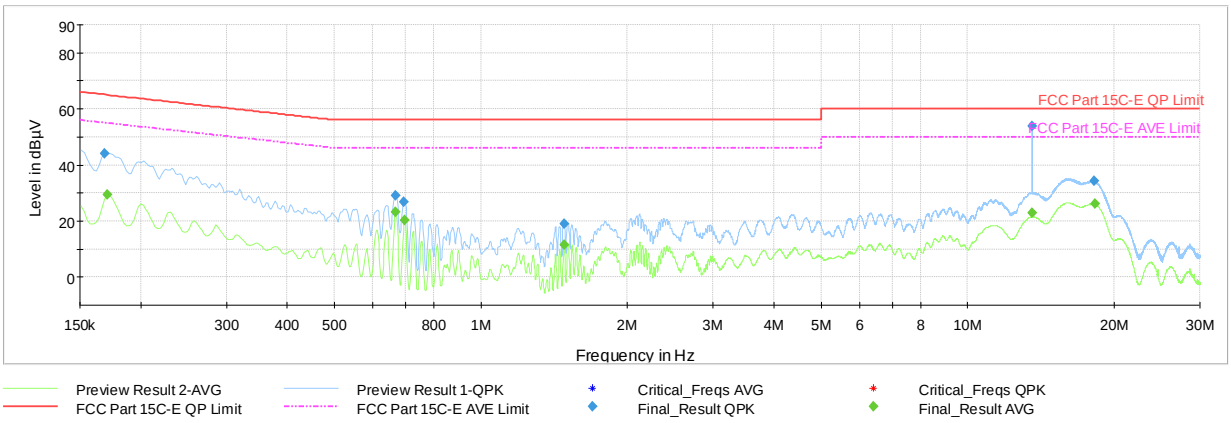

Plot 7-167. AC Line Conducted Emissions (L1) with charger

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.169	FINAL	44.0	---	65.02	-21.06	L1	GND
0.171	FINAL	---	29.26	54.91	-25.65	L1	GND
0.668	FINAL	---	23.18	46.00	-22.82	L1	GND
0.668	FINAL	29.2	---	56.00	-26.81	L1	GND
0.695	FINAL	26.9	---	56.00	-29.06	L1	GND
0.698	FINAL	---	20.25	46.00	-25.75	L1	GND
1.481	FINAL	---	11.40	46.00	-34.60	L1	GND
1.483	FINAL	18.9	---	56.00	-37.06	L1	GND
13.561	FINAL	53.8	---	60.00	-6.19	L1	GND
13.561	FINAL	---	22.75	50.00	-27.25	L1	GND
18.151	FINAL	34.2	---	60.00	-25.83	L1	GND
18.227	FINAL	---	26.10	50.00	-23.90	L1	GND

Table 7-25. AC Line Conducted Emissions (L1) with charger

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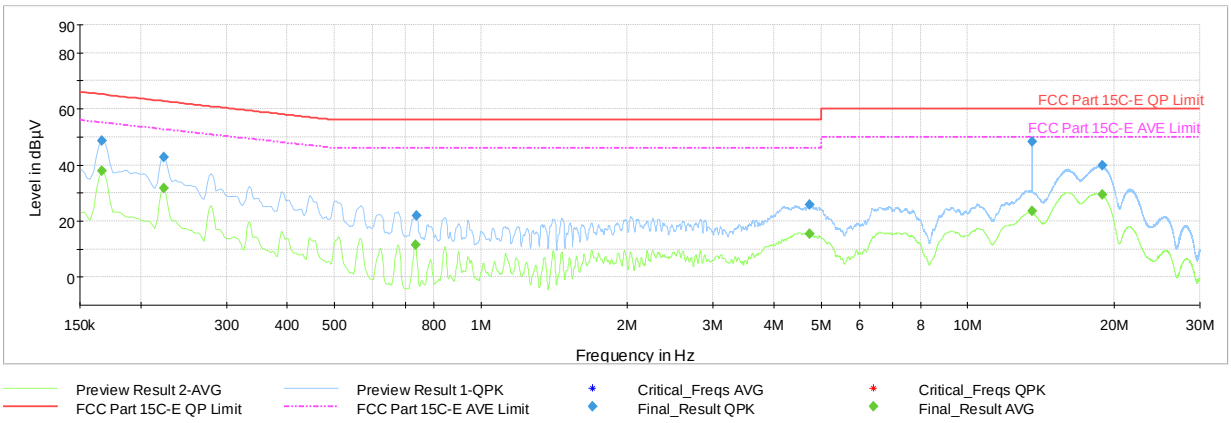

Plot 7-168. AC Line Conducted Emissions (N) with charger

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.167	FINAL	---	37.82	55.13	-17.31	N	GND
0.167	FINAL	48.7	---	65.13	-16.40	N	GND
0.223	FINAL	---	31.78	52.72	-20.93	N	GND
0.223	FINAL	42.9	---	62.72	-19.87	N	GND
0.734	FINAL	---	11.39	46.00	-34.61	N	GND
0.736	FINAL	22.0	---	56.00	-34.01	N	GND
4.727	FINAL	---	15.57	46.00	-30.43	N	GND
4.736	FINAL	25.9	---	56.00	-30.14	N	GND
13.559	FINAL	---	23.39	50.00	-26.61	N	GND
13.561	FINAL	48.3	---	60.00	-11.72	N	GND
18.898	FINAL	---	29.40	50.00	-20.60	N	GND
18.909	FINAL	39.7	---	60.00	-20.31	N	GND

Table 7-26. AC Line Conducted Emissions (N) with charger

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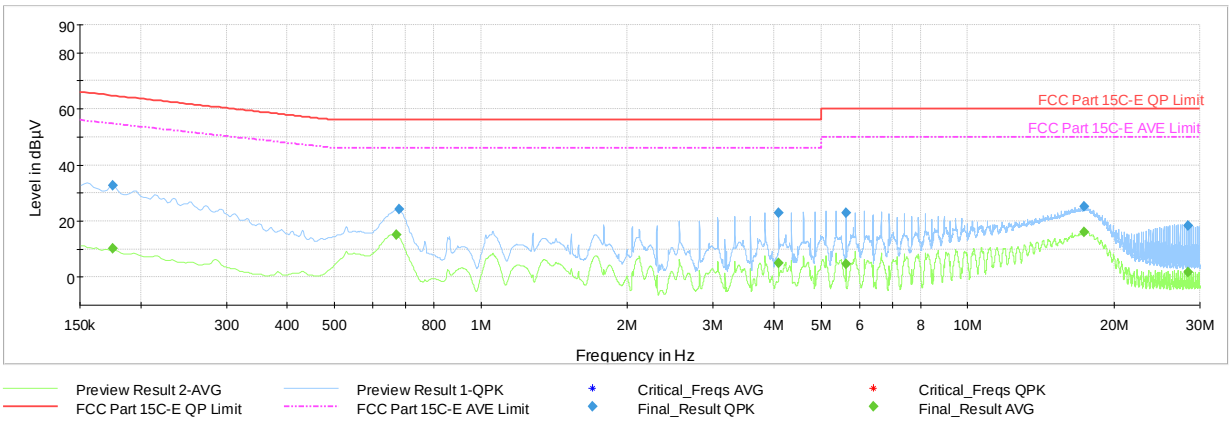

Plot 7-169. AC Line Conducted Emissions (L1) with WCP

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.176	FINAL	---	10.04	54.70	-44.66	L1	GND
0.176	FINAL	32.7	---	64.70	-32.03	L1	GND
0.671	FINAL	---	15.16	46.00	-30.84	L1	GND
0.680	FINAL	24.1	---	56.00	-31.91	L1	GND
4.088	FINAL	22.8	---	56.00	-33.18	L1	GND
4.088	FINAL	---	4.98	46.00	-41.02	L1	GND
5.623	FINAL	23.0	---	60.00	-36.98	L1	GND
5.623	FINAL	---	4.67	50.00	-45.33	L1	GND
17.377	FINAL	---	16.01	50.00	-33.99	L1	GND
17.379	FINAL	25.1	---	60.00	-34.90	L1	GND
28.368	FINAL	---	1.73	50.00	-48.27	L1	GND
28.368	FINAL	18.4	---	60.00	-41.63	L1	GND

Table 7-27. AC Line Conducted Emissions (L1) with WCP

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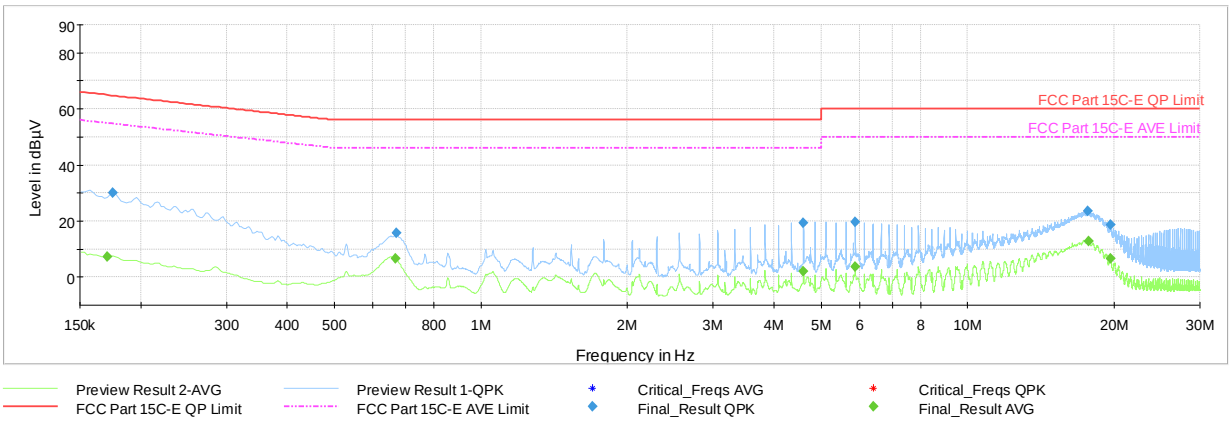

Plot 7-170. AC Line Conducted Emissions (N) with WCP

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.171	FINAL	---	7.28	54.91	-47.63	N	GND
0.176	FINAL	29.9	---	64.70	-34.76	N	GND
0.668	FINAL	---	6.69	46.00	-39.31	N	GND
0.671	FINAL	15.6	---	56.00	-40.37	N	GND
4.599	FINAL	---	1.92	46.00	-44.08	N	GND
4.601	FINAL	19.2	---	56.00	-36.77	N	GND
5.877	FINAL	19.8	---	60.00	-40.25	N	GND
5.877	FINAL	---	3.61	50.00	-46.39	N	GND
17.636	FINAL	23.4	---	60.00	-36.58	N	GND
17.696	FINAL	---	12.95	50.00	-37.05	N	GND
19.679	FINAL	---	6.49	50.00	-43.51	N	GND
19.679	FINAL	18.6	---	60.00	-41.43	N	GND

Table 7-28. AC Line Conducted Emissions (N) with WCP

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset** **FCC ID: A3LSMS908JPN** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-247 of the Innovation, Science and Economic Development Canada Rules.

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