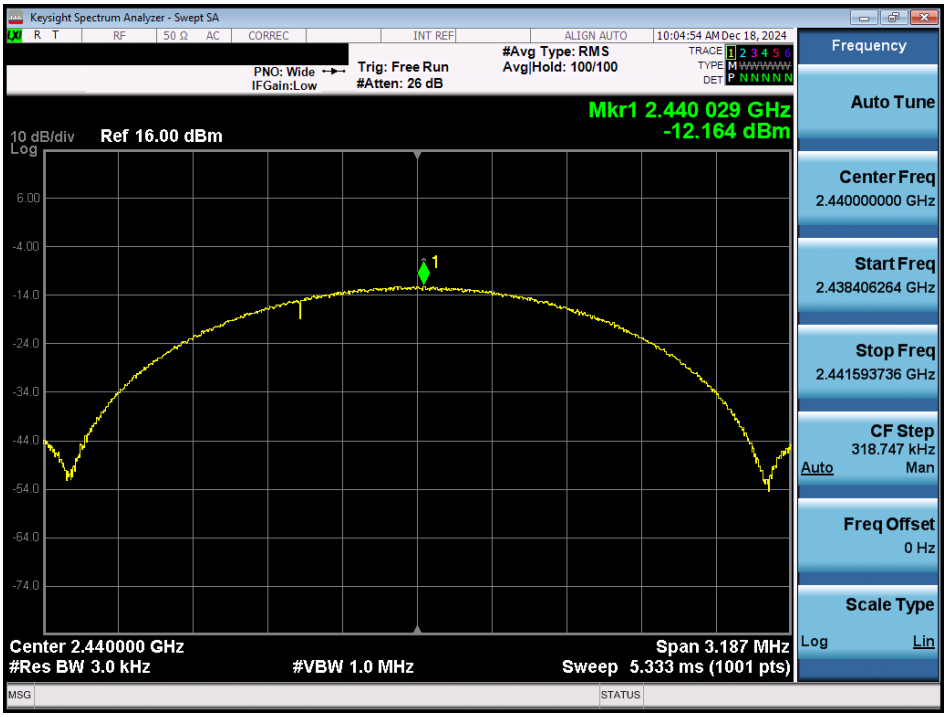
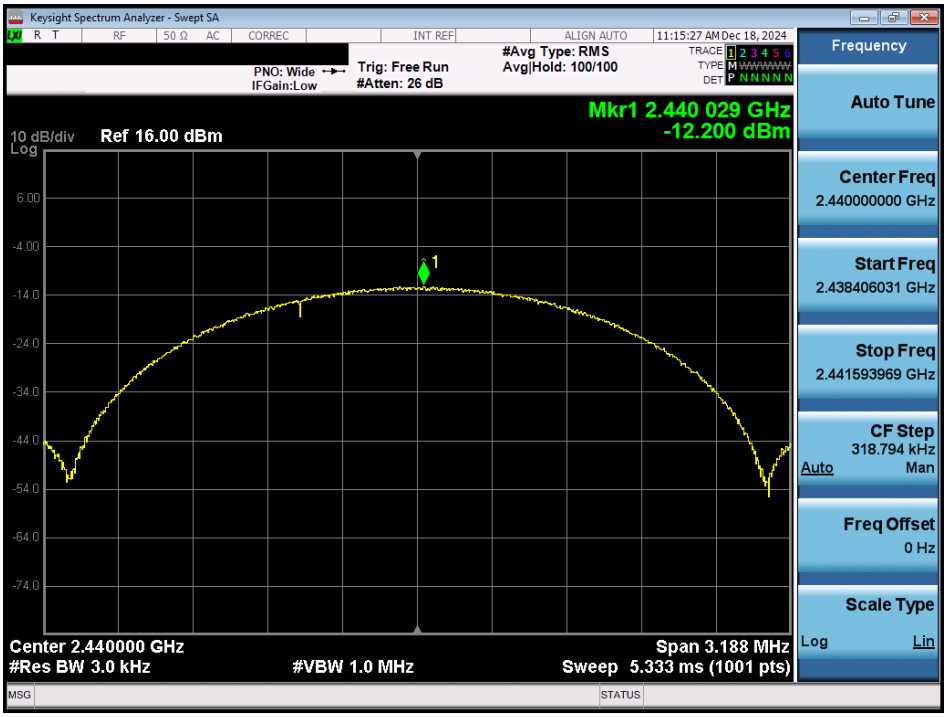
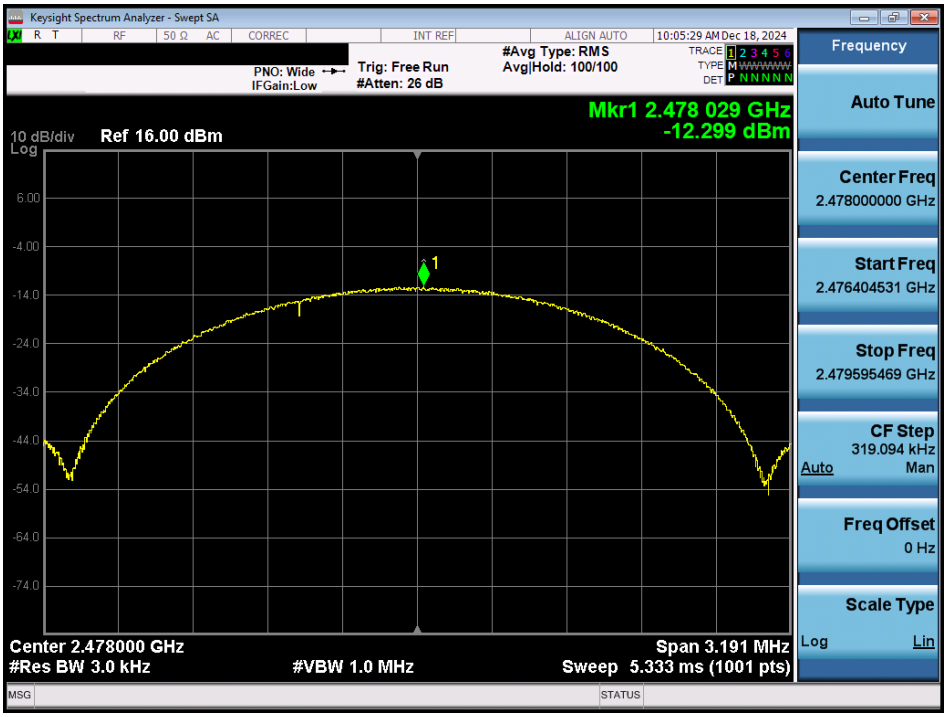


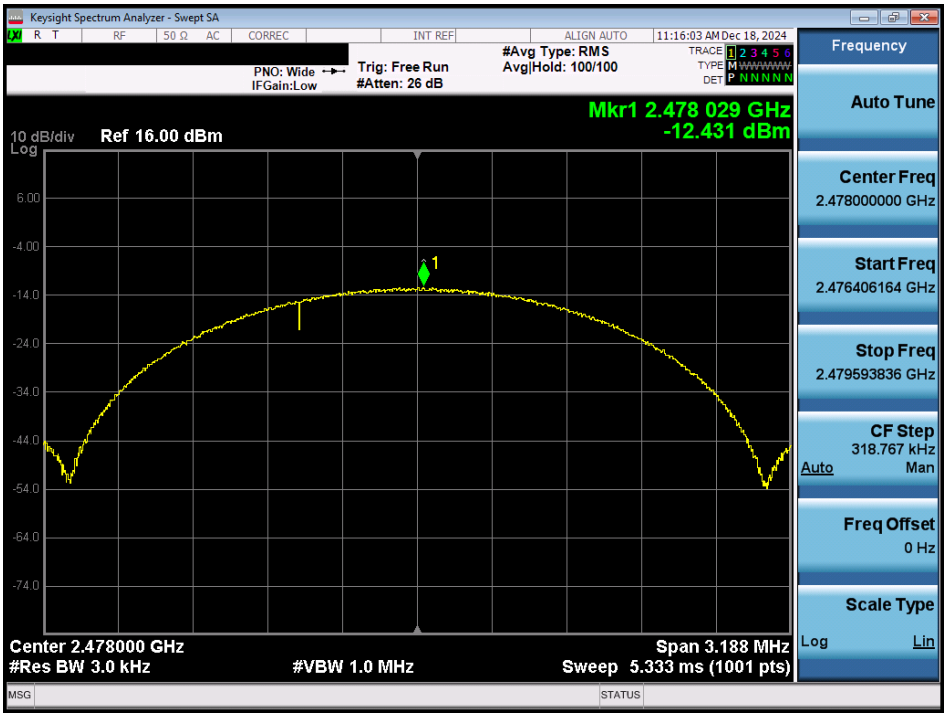
Plot 7-57. Power Spectral Density Plot Antenna 3a (Bluetooth (LE), 2Mbps, iPA – Ch. 19)



Plot 7-58. Power Spectral Density Plot Antenna 1a (Bluetooth (LE), 2Mbps, iPA – Ch. 19)



Plot 7-59. Power Spectral Density Plot Antenna 3a (Bluetooth (LE), 2Mbps, iPA – Ch. 38)



Plot 7-60. Power Spectral Density Plot Antenna 1a (Bluetooth (LE), 2Mbps, iPA – Ch. 38)

Note:

Per ANSI C63.10-2020 Subclause 14.6.3, the directional gain is calculated using the following formula, where G_N is the gain of the nth antenna and N_{ANT}, the total number of antennas used.

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}] \text{ dBi}$$

Per ANSI C63.10-2020 Section 14.5.2.2 and KDB 662911 D01 v02r01 Section E)2), the power spectral density at Antenna 3a and Antenna 1a were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample TxBF Calculation:

At 2402MHz the average conducted power spectral density was measured to be -4.78 dBm for Antenna 3a and -4.62 dBm for Antenna 1a.

Antenna 3a + Antenna 1a = TxBF

(-4.78 dBm + -4.62 dBm) = (0.333 mW + 0.345 mW) = 0.678 mW = -1.68 dBm

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 C63.10-2020 – Subclause 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 ≥ 3 × RBW
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.

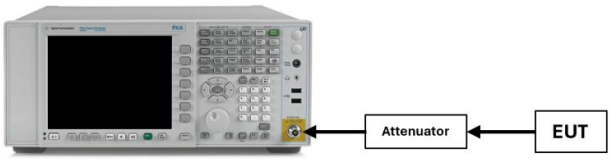
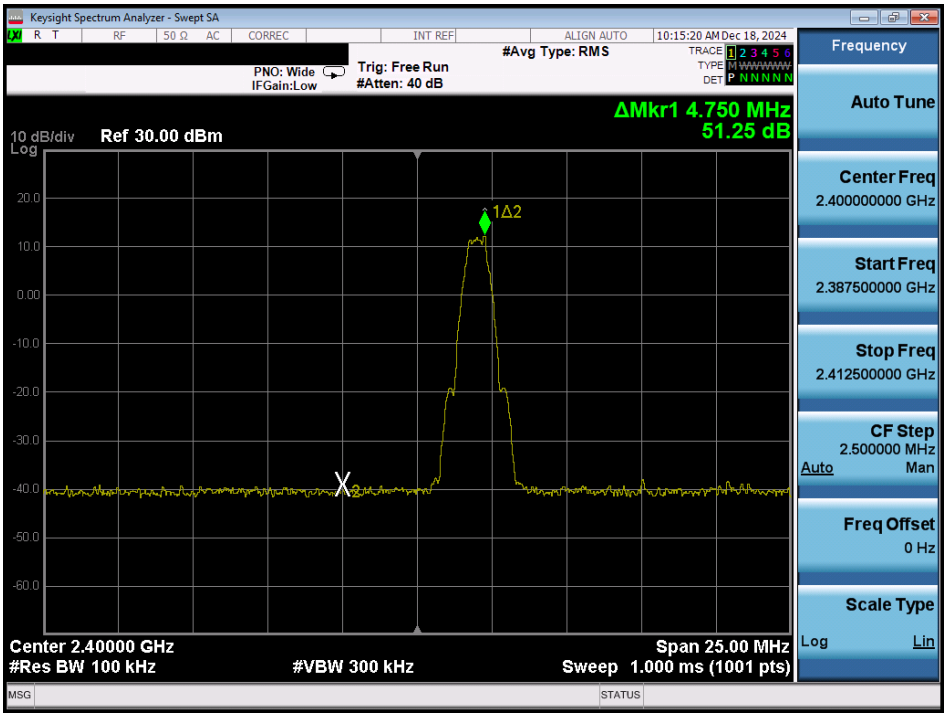


Figure 7-4. Test Instrument & Measurement Setup

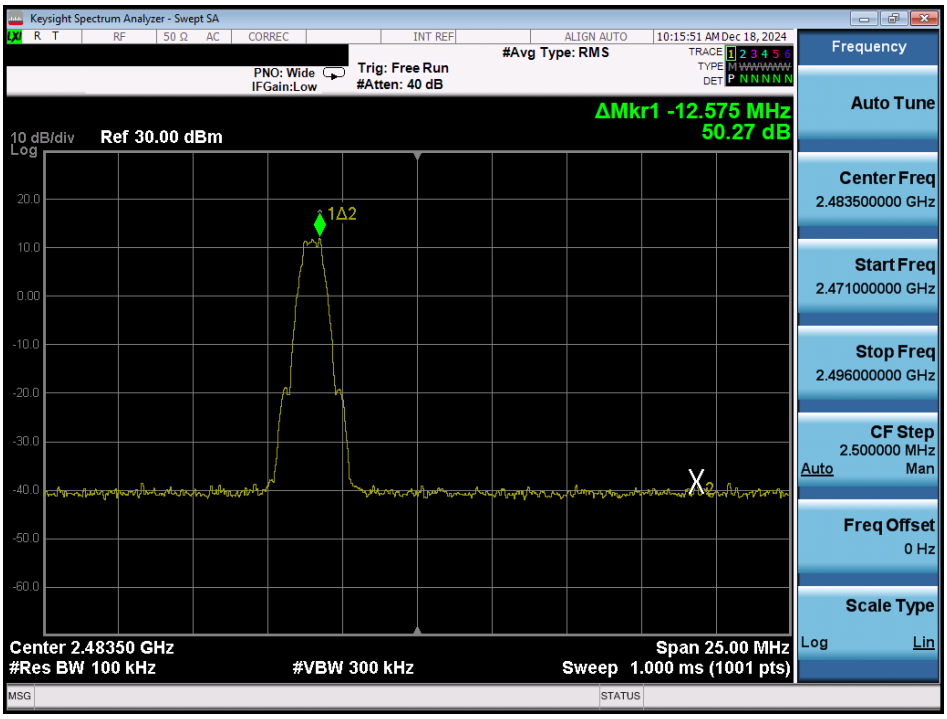
Test Notes

All supported modulation, antenna (including TxBF mode) and power schemes have been tested on the unit and only worst case configuration is reported.

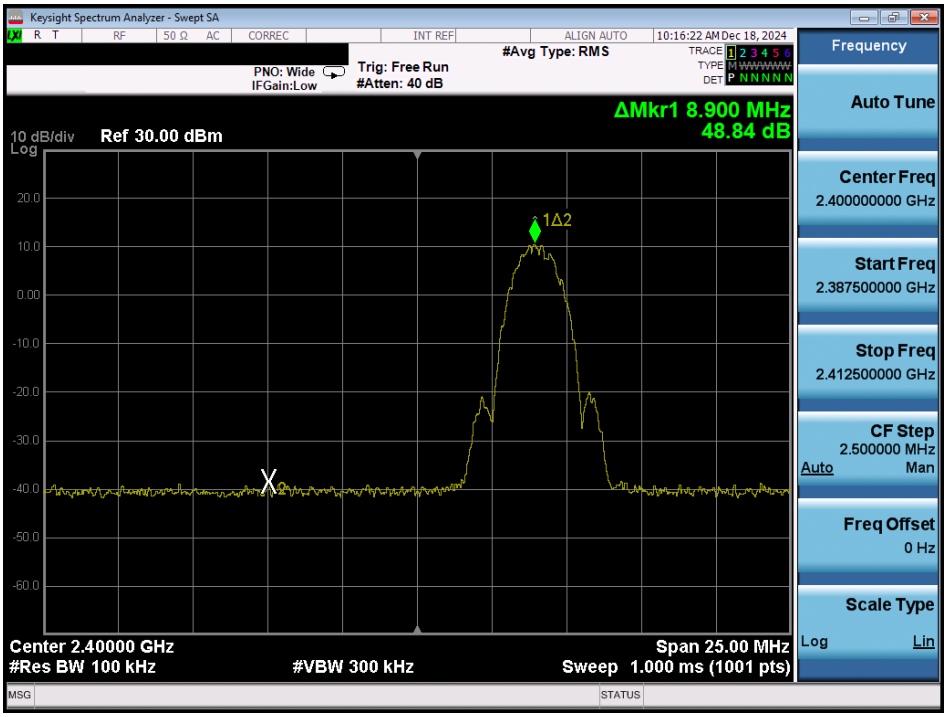
Antenna 3a



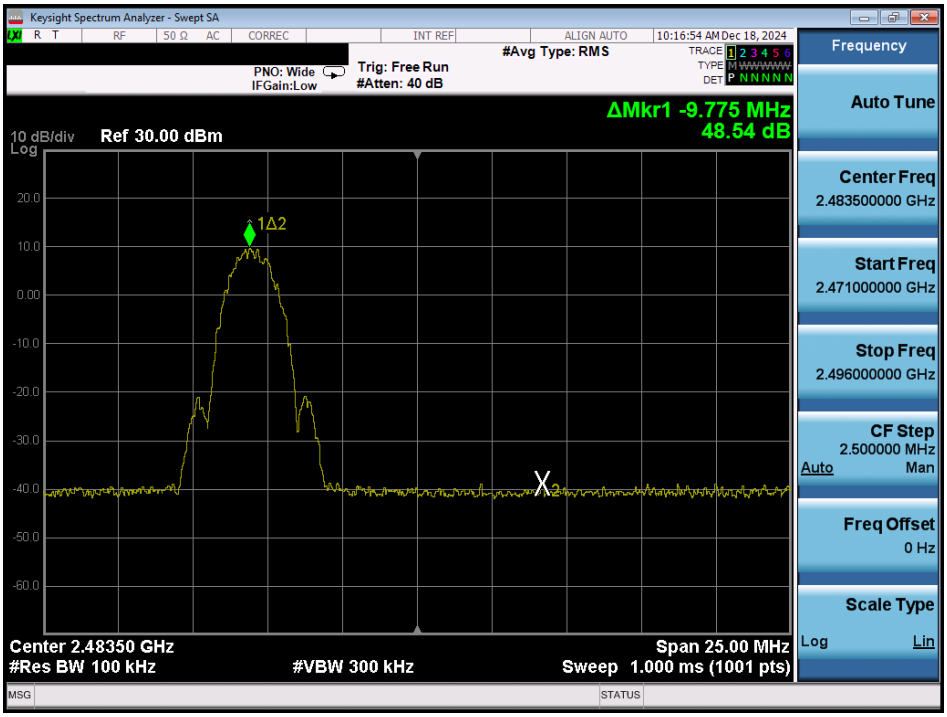
Plot 7-61. Band Edge Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch.0)



Plot 7-62. Band Edge Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch. 39)

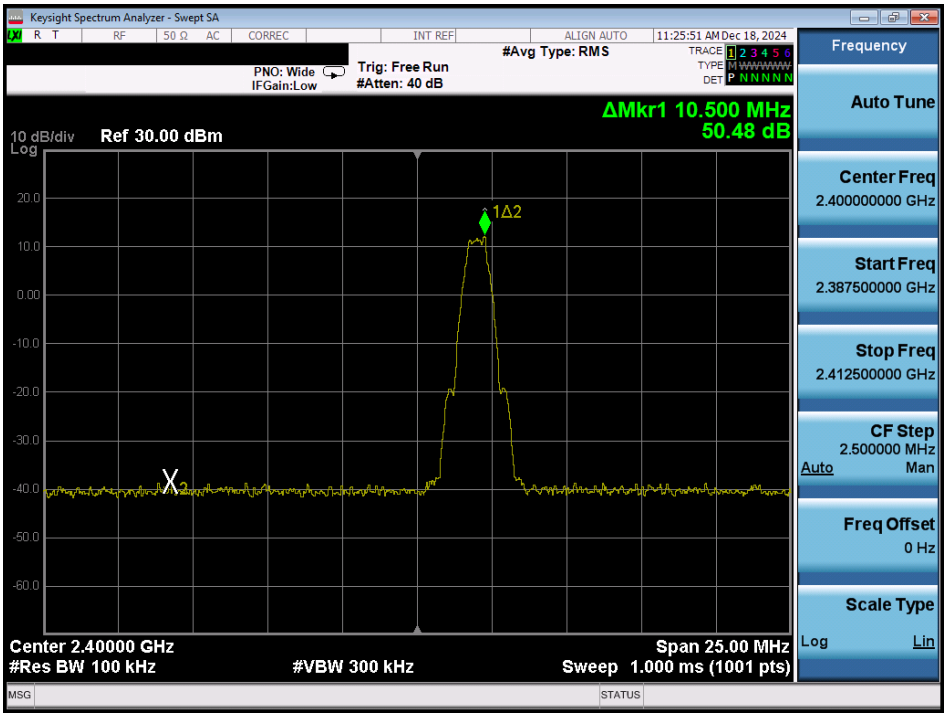


Plot 7-63. Band Edge Plot Antenna 3a (Bluetooth (LE), 2Mbps, ePA – Ch. 1)

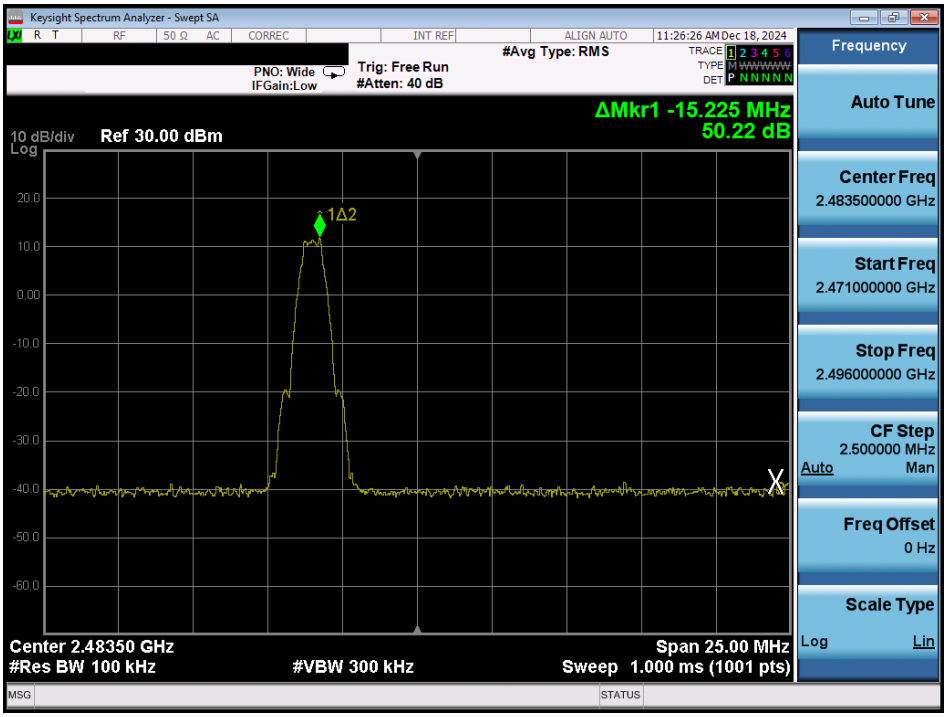


Plot 7-64. Band Edge Plot Antenna 3a (Bluetooth (LE), 2Mbps, ePA – Ch. 38)

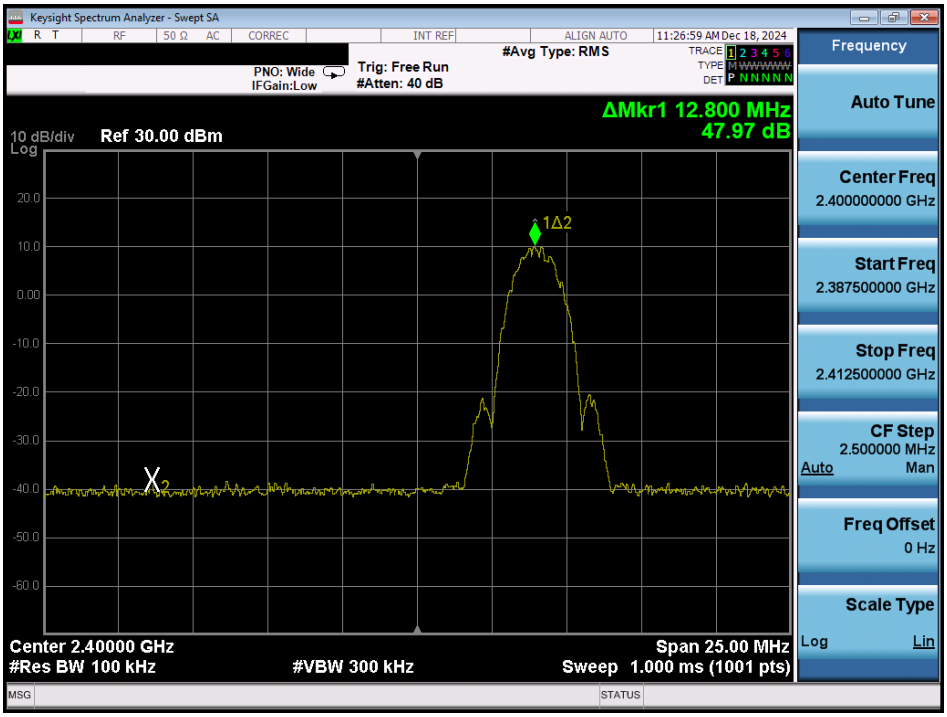
Antenna 1a



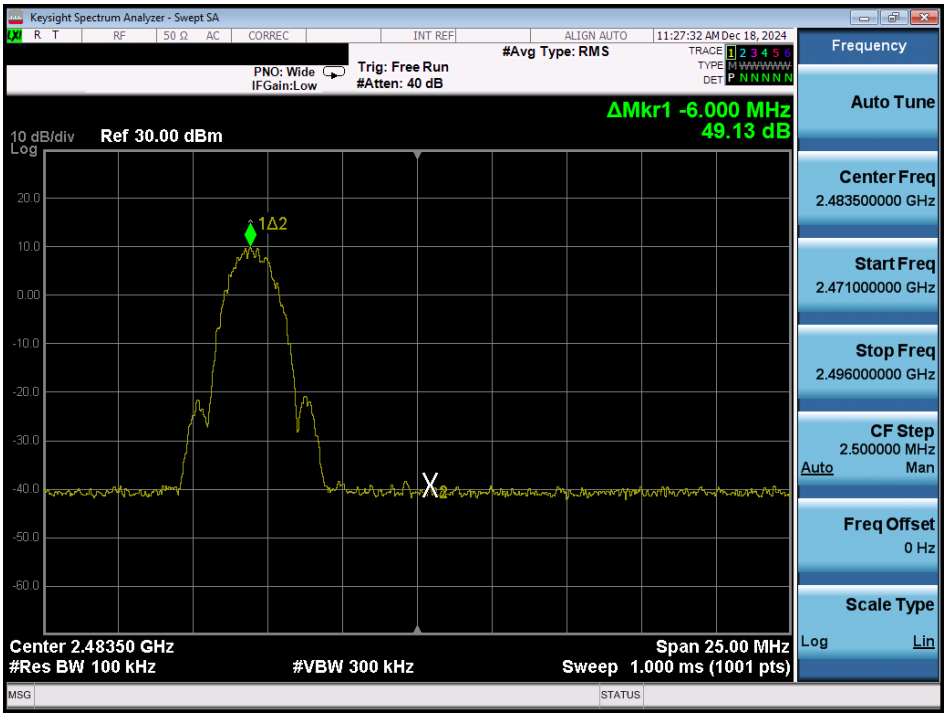
Plot 7-65. Band Edge Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch.0)



Plot 7-66. Band Edge Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch. 39)



Plot 7-67. Band Edge Plot Antenna 1a (Bluetooth (LE), 2Mbps, ePA – Ch. 1)



Plot 7-68. Band Edge Plot Antenna 1a (Bluetooth (LE), 2Mbps, ePA – Ch. 38)

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 of ANSI C63.10-2020.

Test Procedure Used

ANSI C63.10-2020 – Subclause 11.11.3
KDB 558074 D01 v05r02 – Section 8.5
ANSI C63.10-2020 – Subclause 14.5.3
KDB 662911 D01 v02r01 – Section E)3)b)

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.

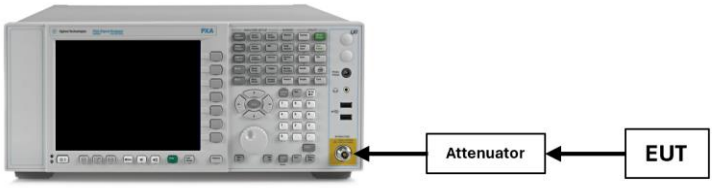


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

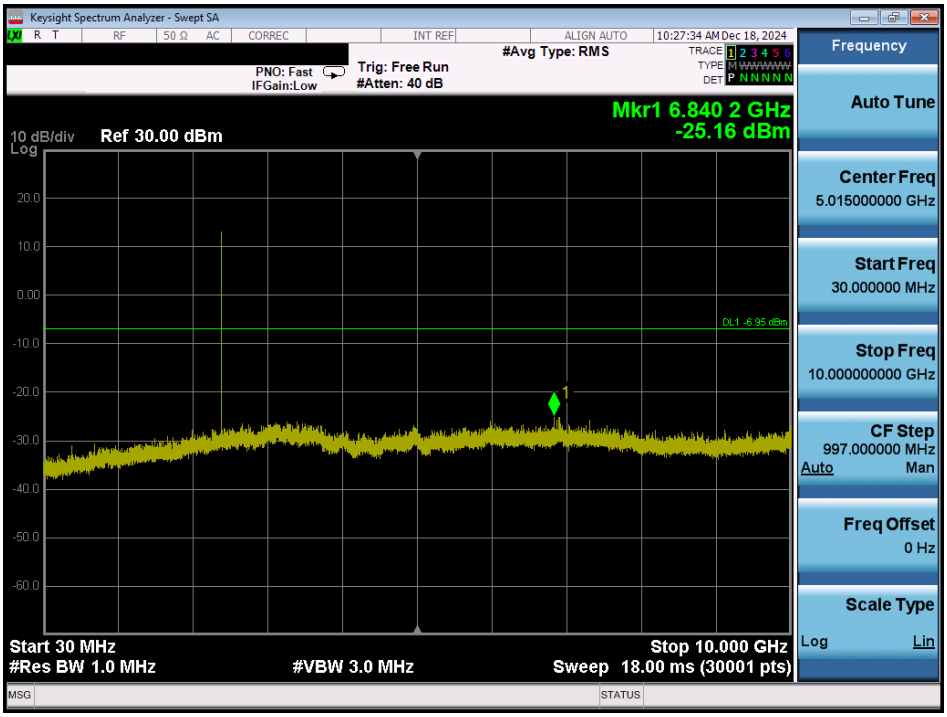
1. RBW was set to 1MHz rather than 100kHz in order to increase the measurement speed.

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.

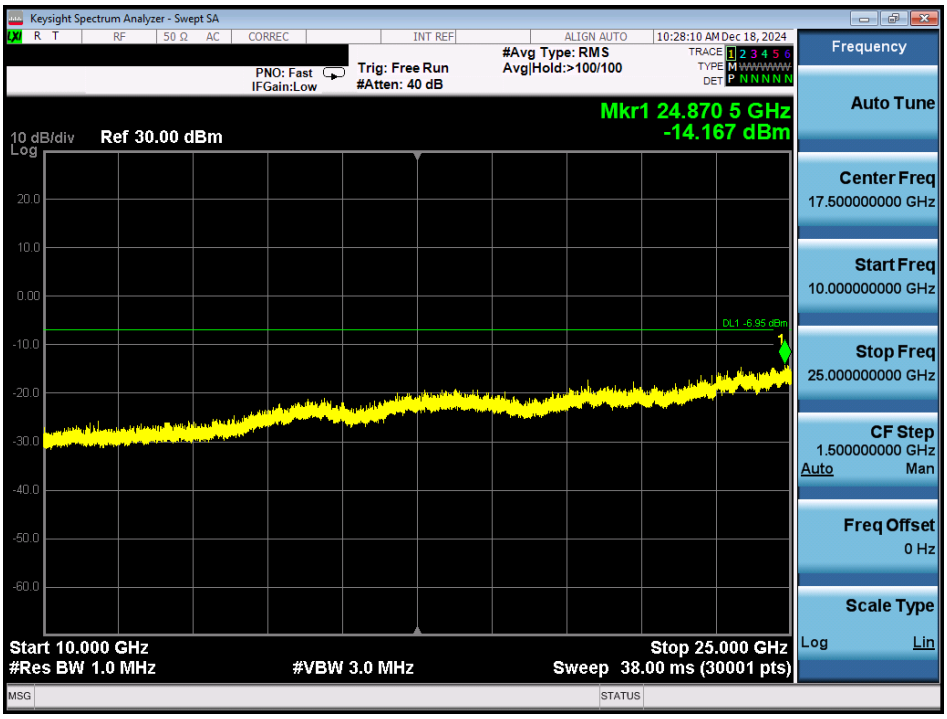
3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.

4. All supported modulation, antenna (including TxBF mode) and power schemes have been tested on the unit and only worst case configuration is reported.

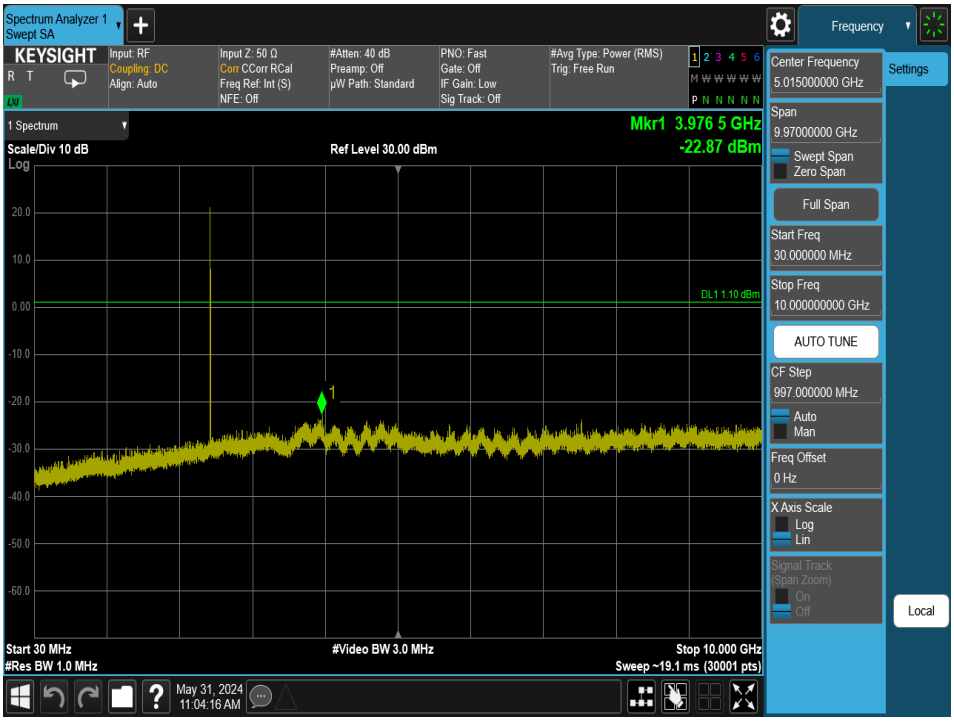
Antenna 3a



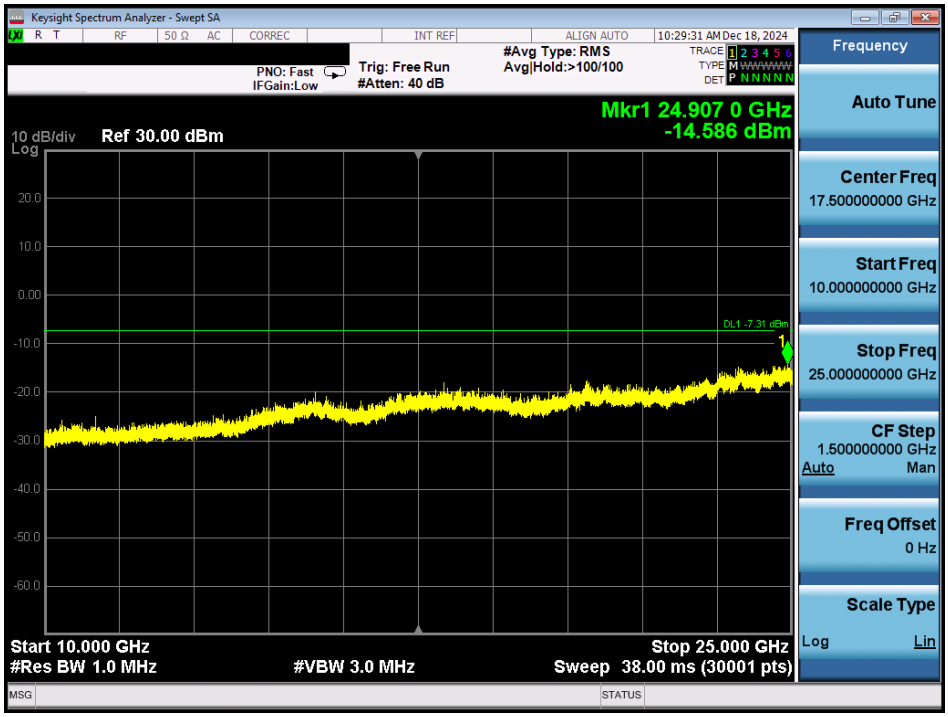
Plot 7-69. Conducted Spurious Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch. 0)



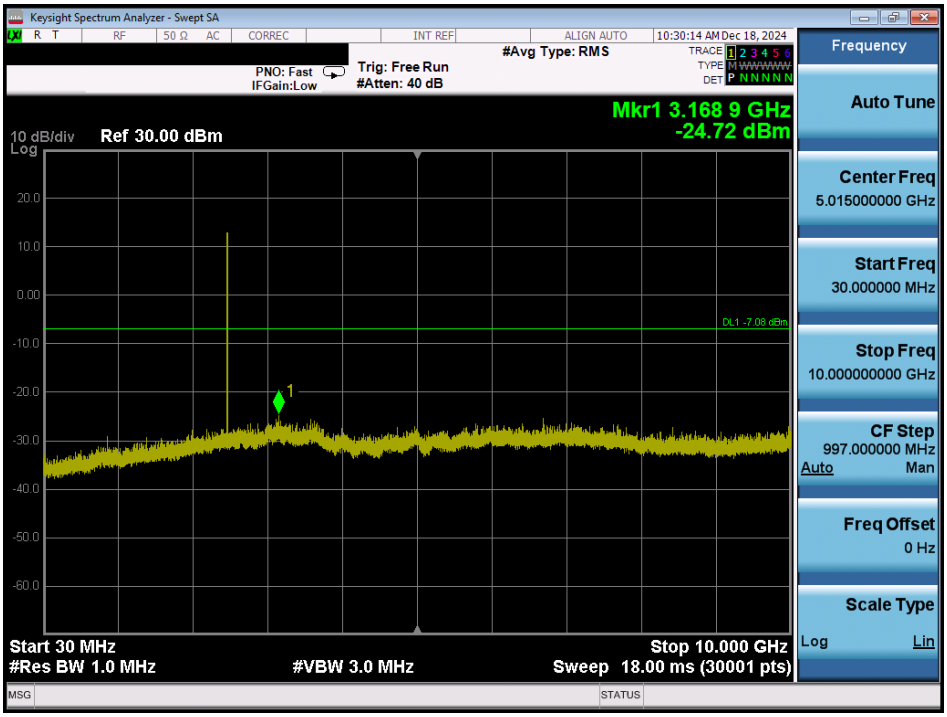
Plot 7-70. Conducted Spurious Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch. 0)



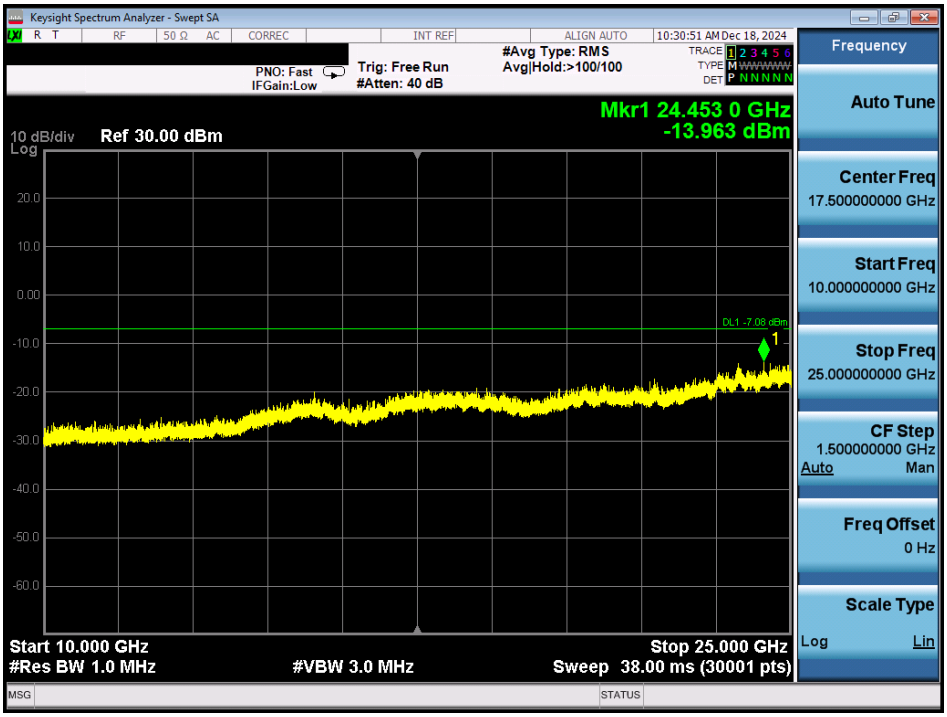
Plot 7-71. Conducted Spurious Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch. 19)



Plot 7-72. Conducted Spurious Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch. 19)

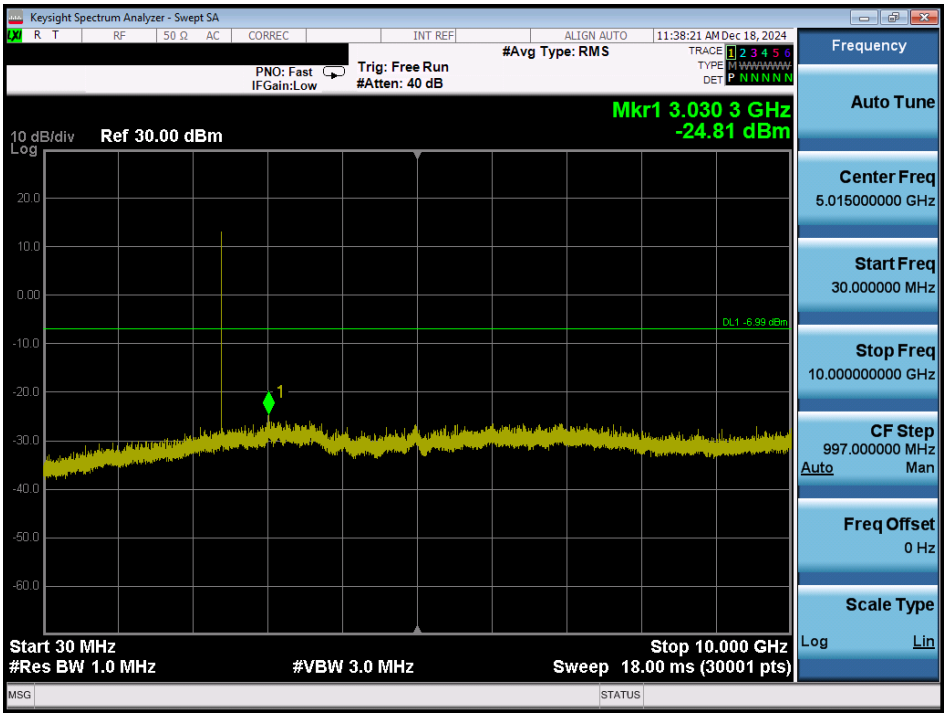


Plot 7-73. Conducted Spurious Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch. 39)

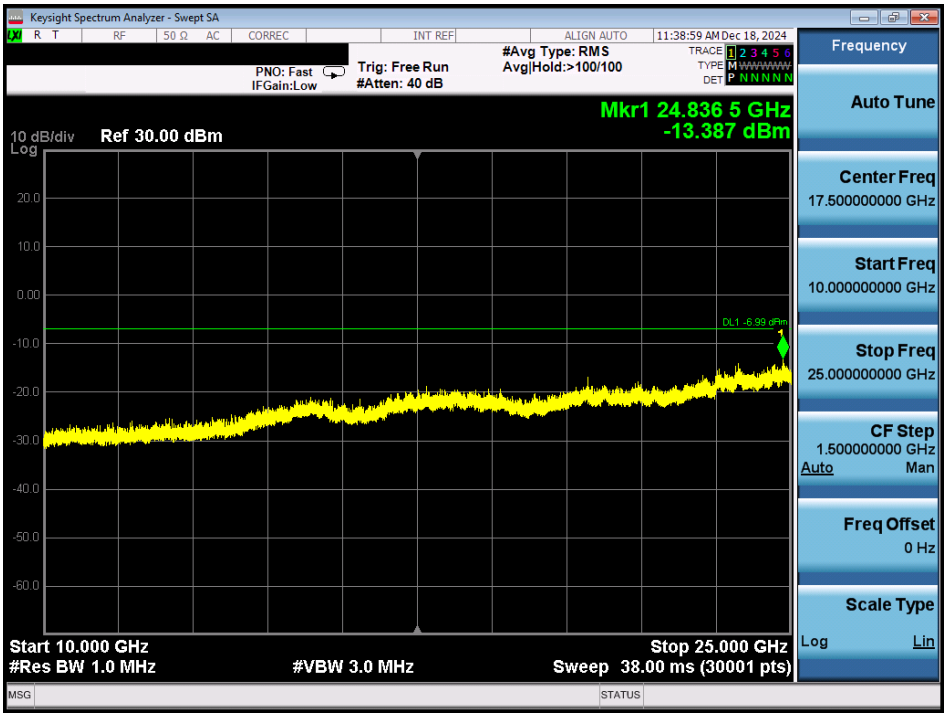


Plot 7-74. Conducted Spurious Plot Antenna 3a (Bluetooth (LE), 1Mbps, ePA – Ch. 39)

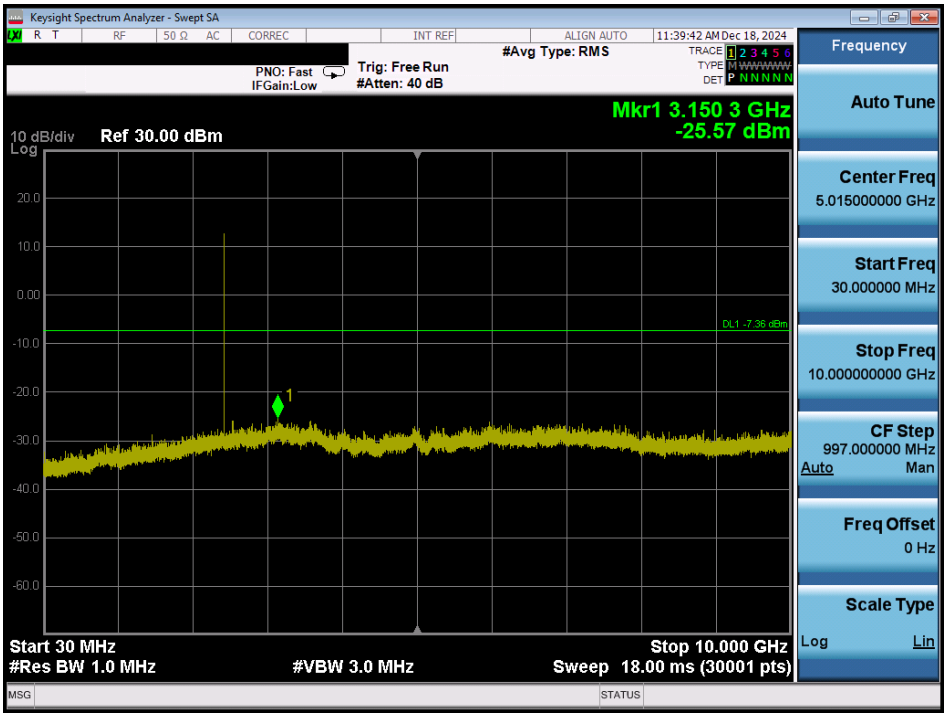
Antenna 1a



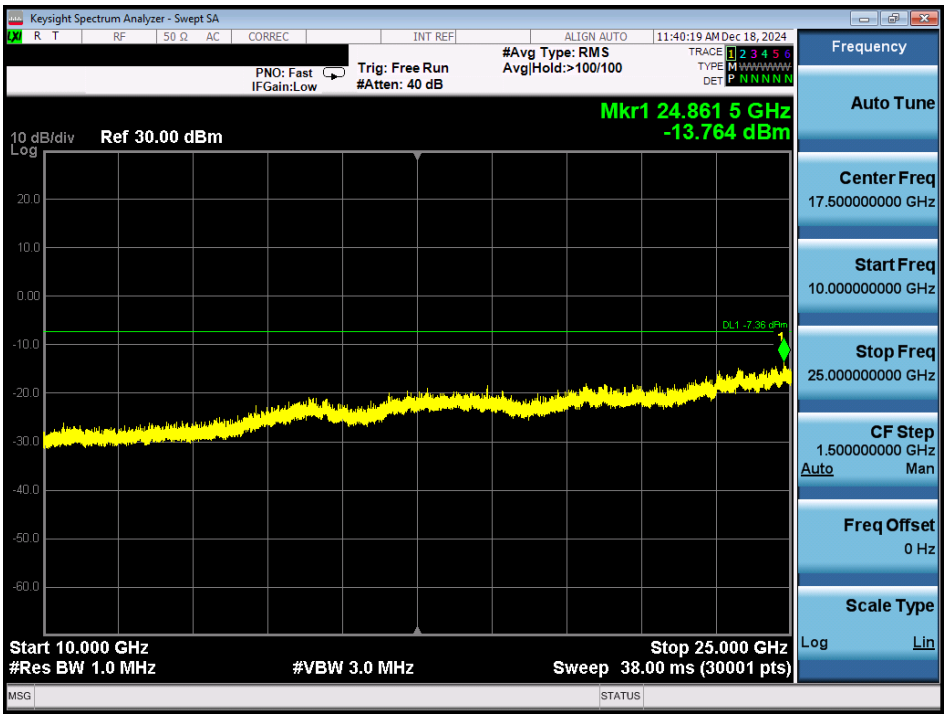
Plot 7-75. Conducted Spurious Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch. 0)



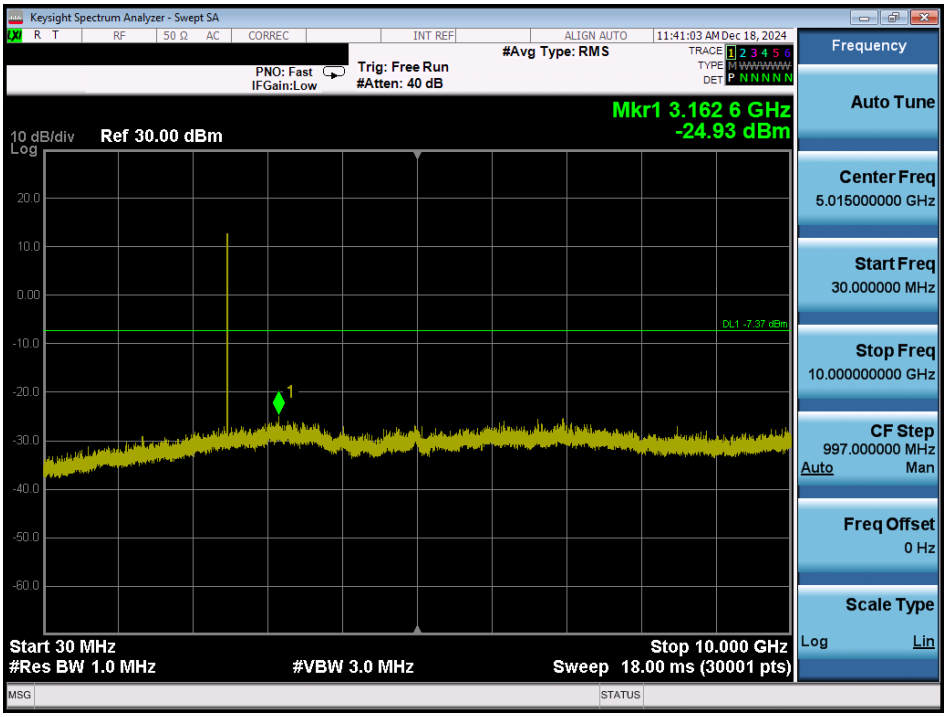
Plot 7-76. Conducted Spurious Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch. 0)



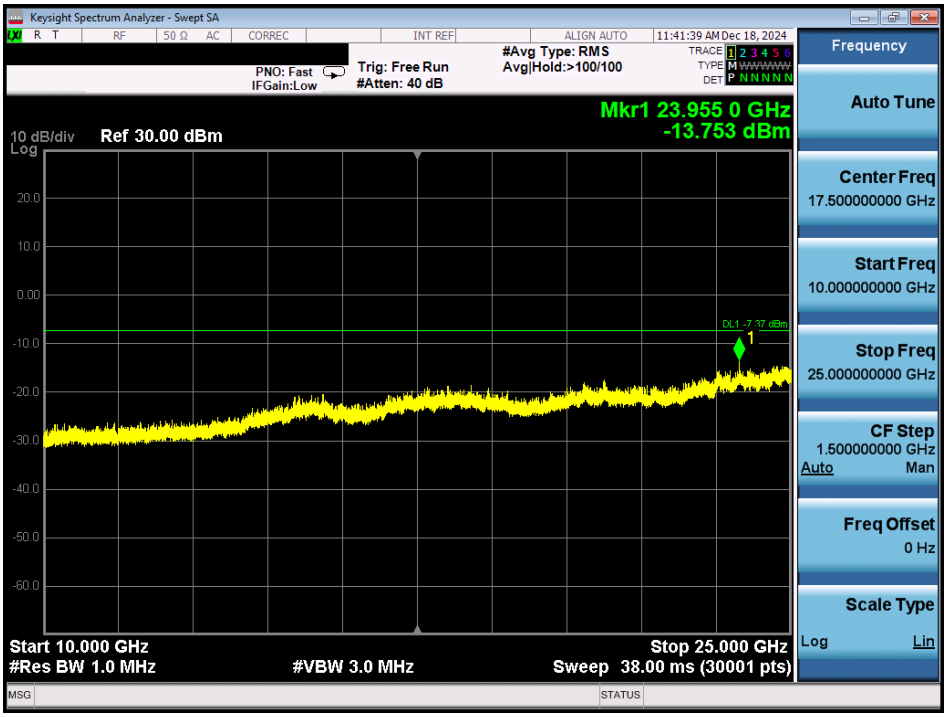
Plot 7-77. Conducted Spurious Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch. 19)



Plot 7-78. Conducted Spurious Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch. 19)



Plot 7-79. Conducted Spurious Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch. 39)



Plot 7-80. Conducted Spurious Plot Antenna 1a (Bluetooth (LE), 1Mbps, ePA – Ch. 39)

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 7-13 per Section 15.209 and RSS-Gen (8.9).

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

Table 7-13. Radiated Limits

Test Procedures Used

ANSI C63.10-2020 – Subclause 6.6.4.3
KDB 558074 D01 v05r02 – Sections 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

Test Setup

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

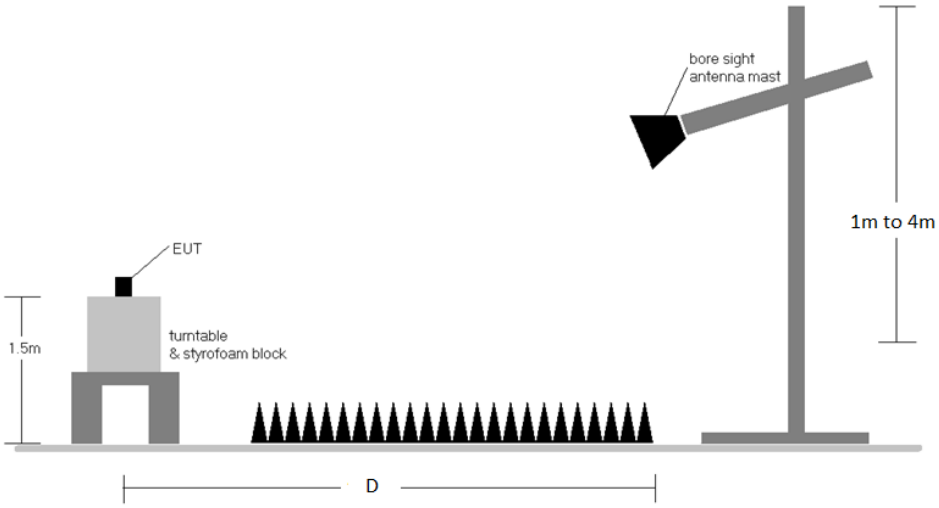


Figure 7-6. Radiated Test Setup >1GHz

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 7-13.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
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.
6. D is the measurement test distance and emissions 1-18GHz were measured at a 3 meters 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, antenna (including TxBF mode) 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 $_{[dB\mu V/m]}$

Radiated Band Edge Measurement Offset

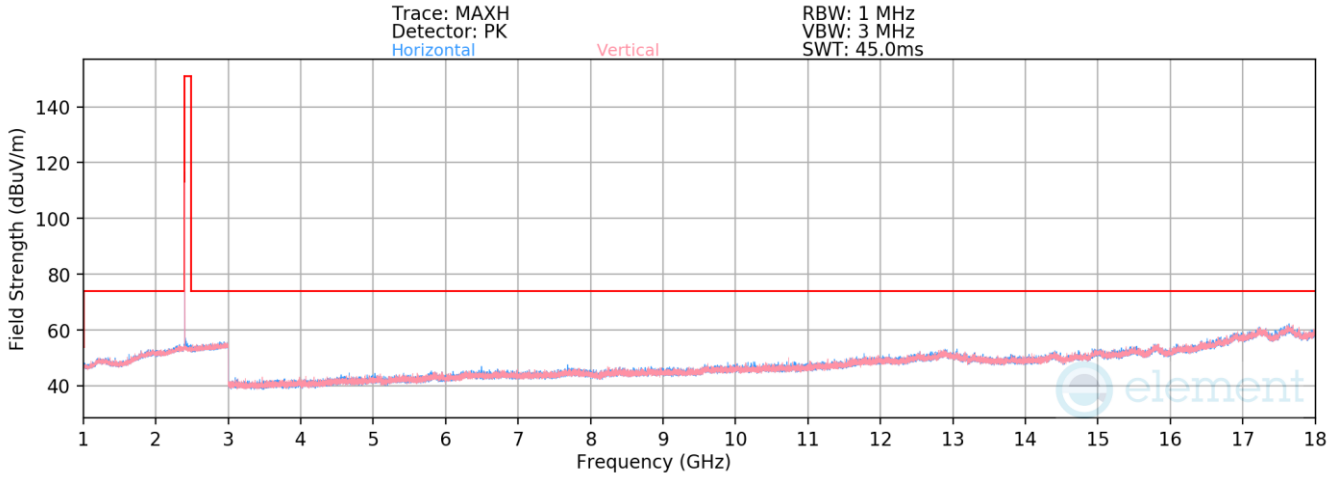
- The amplitude offset shown in the radiated restricted band edge plots in Section 7.7.2 was calculated using the formula:

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

7.7.1 Radiated Spurious Emission Measurements

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

TxBF

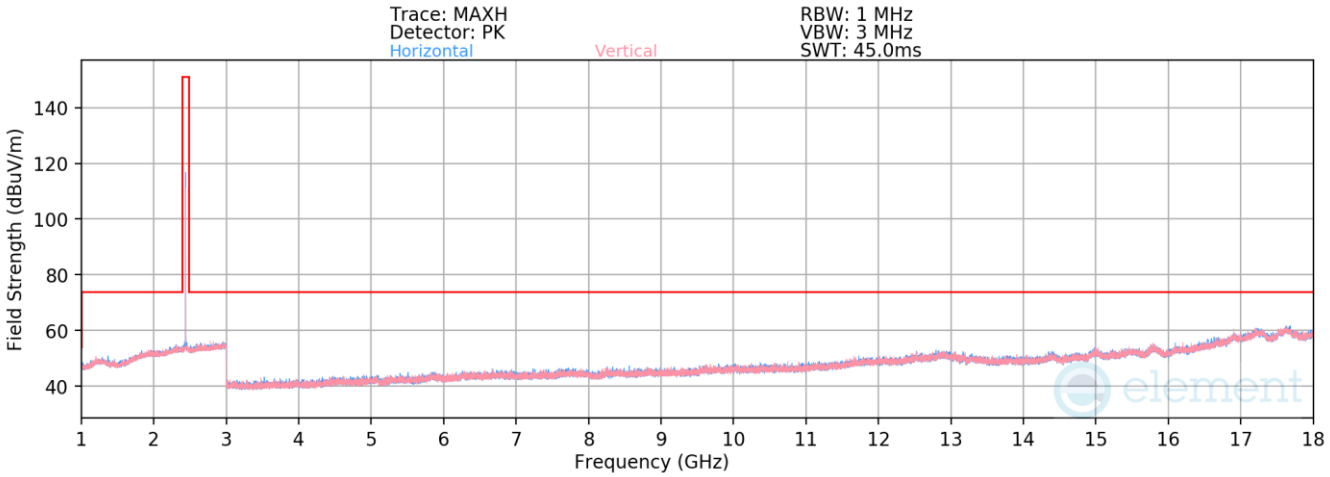


Plot 7-81. Radiated Spurious Emissions 1-18GHz TxBF (1Mbps, ePA – Ch. 0)

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme	ePA
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	Average	V	-	-	-80.84	6.16	32.32	53.98	-21.66
4804.00	Peak	V	-	-	-69.69	6.16	43.47	73.98	-30.51
12010.00	Average	V	-	-	-83.69	15.28	38.59	53.98	-15.39
12010.00	Peak	V	-	-	-72.34	15.28	49.94	73.98	-24.04

Table 7-14. Radiated Measurements TxBF

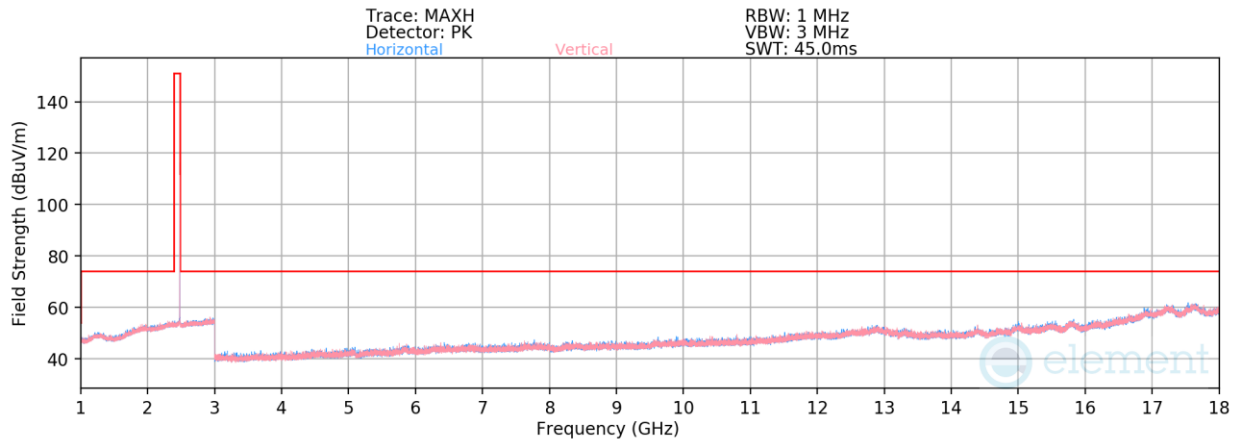


Plot 7-82. Radiated Spurious Emissions 1-18GHz TxBF (1Mbps, ePA – Ch. 19)

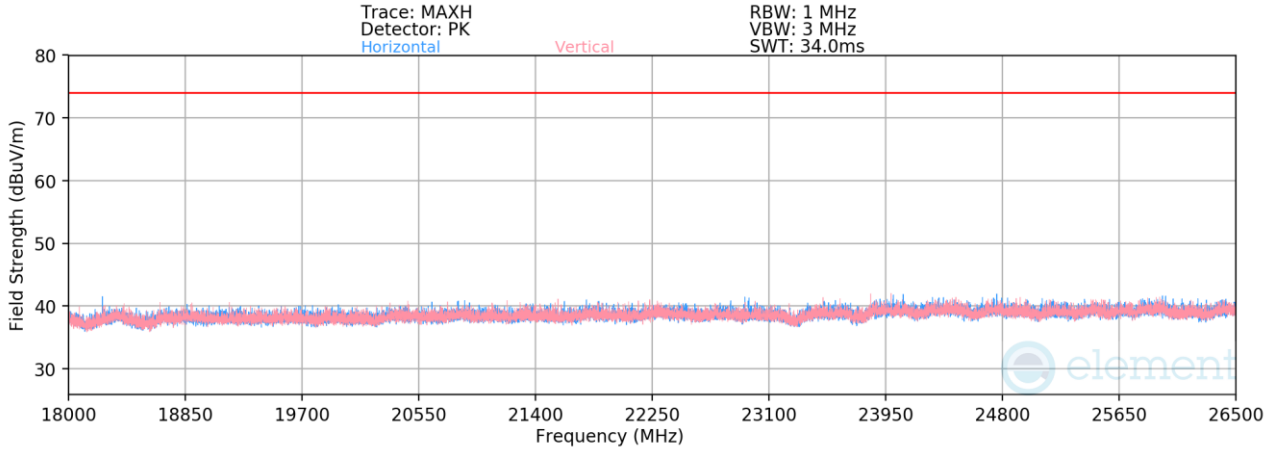
Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme	ePA
Distance of Measurements:	3 Meters
Operating Frequency:	2440MHz
Channel:	19

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	Average	H	-	-	-80.95	6.25	32.30	53.98	-21.68
4880.00	Peak	H	-	-	-69.66	6.28	43.63	73.98	-30.35
7320.00	Average	V	-	-	-82.92	10.59	34.67	53.98	-19.31
7320.00	Peak	V	-	-	-70.50	10.31	46.81	73.98	-27.17
12200.00	Average	H	-	-	-83.53	15.07	38.54	53.98	-15.44
12200.00	Peak	H	-	-	-71.94	15.07	50.13	73.98	-23.85

Table 7-15. Radiated Measurements TxBF



Plot 7-83. Radiated Spurious Emissions 1-18GHz TxBF (1Mbps ePA – Ch. 39)



Plot 7-84. Radiated Spurious Emissions Above 18GHz TxBF (1Mbps ePA – Ch. 39)

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme	ePA
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	Average	V	-	-	-81.00	6.53	32.53	53.98	-21.45
4960.00	Peak	V	-	-	-69.34	6.52	44.18	73.98	-29.80
7440.00	Average	V	-	-	-83.11	10.70	34.58	53.98	-19.40
7440.00	Peak	V	-	-	-71.11	10.26	46.15	73.98	-27.83
12400.00	Average	H	-	-	-83.24	15.78	39.53	53.98	-14.45
12400.00	Peak	H	-	-	-72.05	15.78	50.72	73.98	-23.26

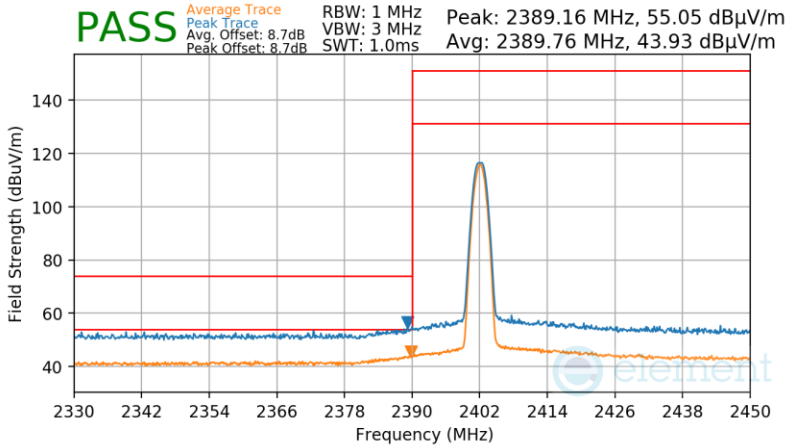
Table 7-16. Radiated Measurements TxBF

7.7.2 Radiated Restricted Band Edge Measurements

§15.205 §15.209; RSS-Gen [8.9]

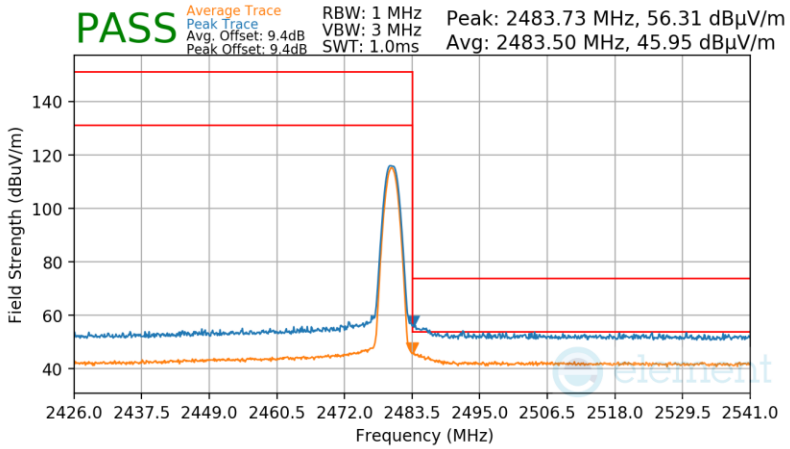
Antenna 3a

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



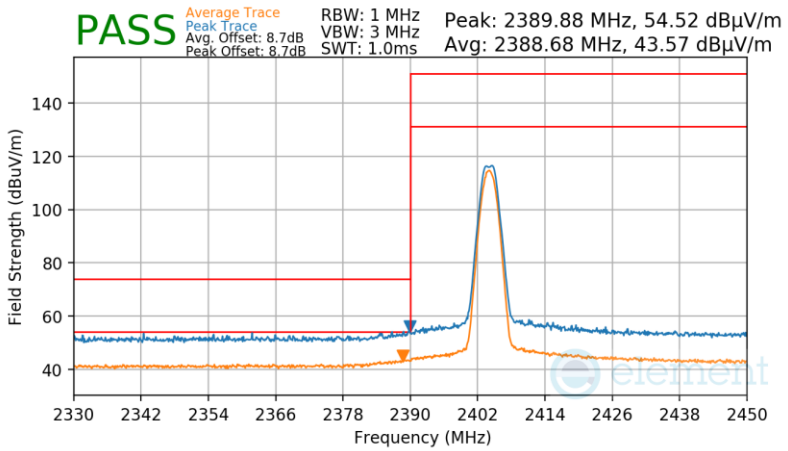
Plot 7-85. Radiated Restricted Lower Band Edge Measurement Antenna 3a (Average & Peak)

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	39



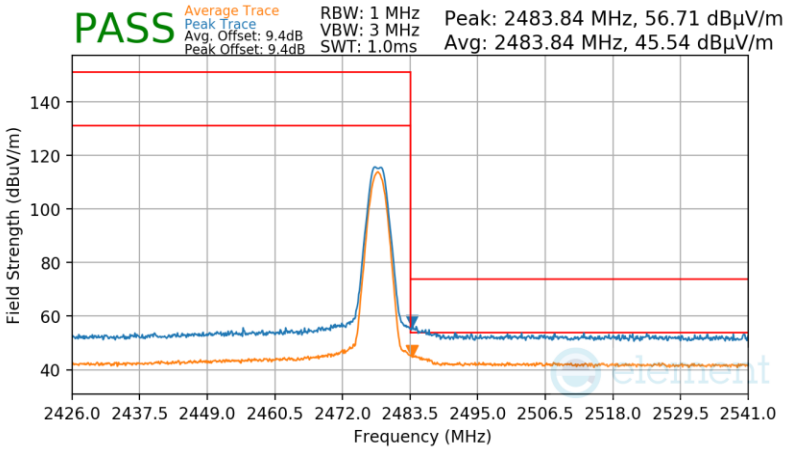
Plot 7-86. Radiated Restricted Upper Band Edge Measurement Antenna 3a (Average & Peak)

Bluetooth Mode:	LE
Data Rate:	2Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-87. Radiated Restricted Lower Band Edge Measurement Antenna 3a (Average & Peak)

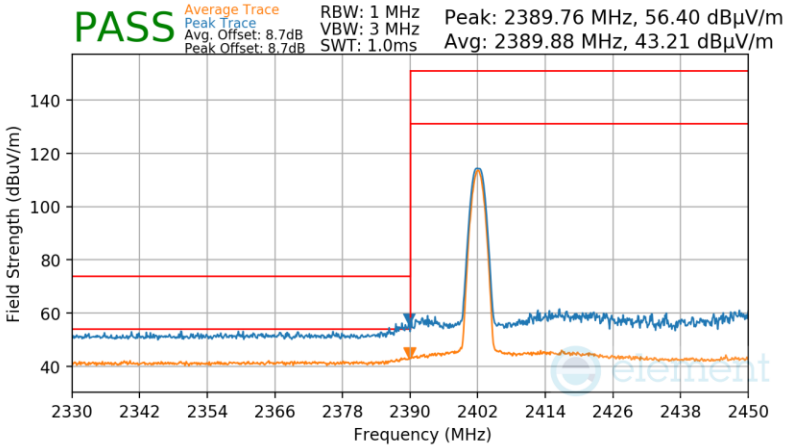
Bluetooth Mode:	LE
Data Rate:	2Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	38



Plot 7-88. Radiated Restricted Upper Band Edge Measurement Antenna 3a (Average & Peak)

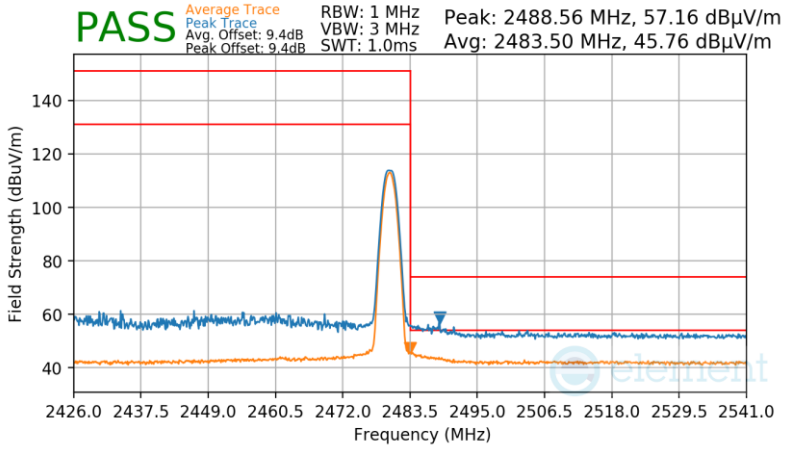
Antenna 1a

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



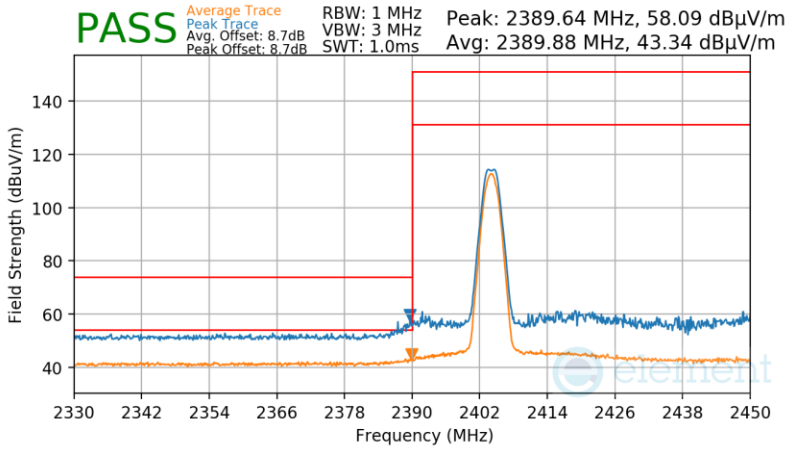
Plot 7-89. Radiated Restricted Lower Band Edge Measurement Antenna 1a (Average & Peak)

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	39



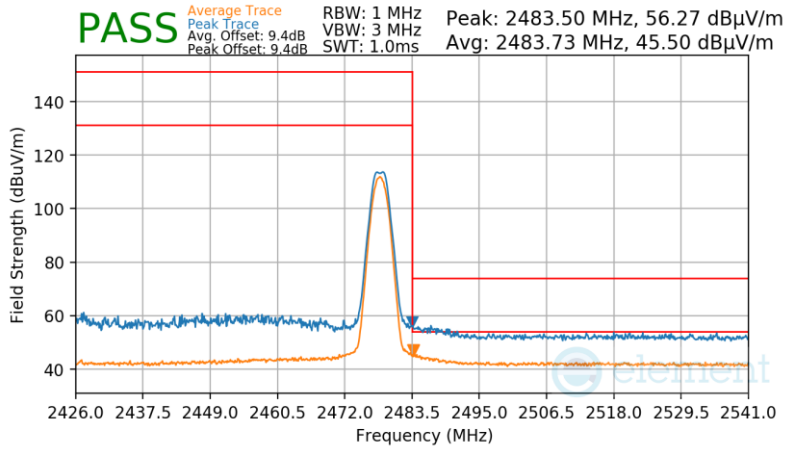
Plot 7-90. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Average & Peak)

Bluetooth Mode:	LE
Data Rate:	2Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-91. Radiated Restricted Lower Band Edge Measurement Antenna 1a (Average & Peak)

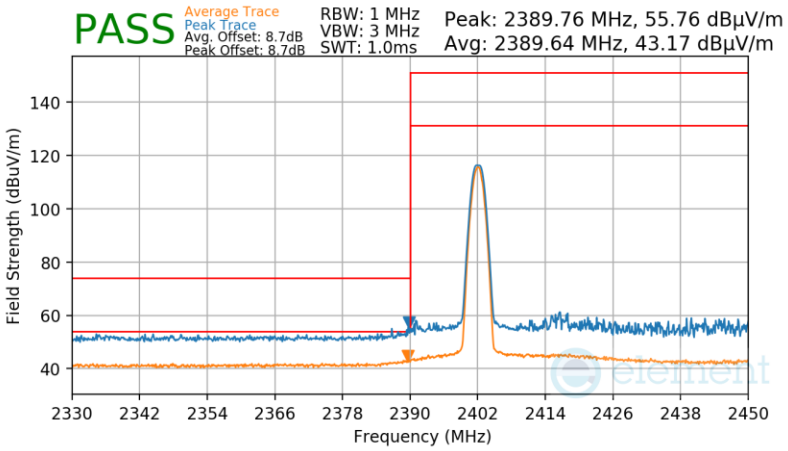
Bluetooth Mode:	LE
Data Rate:	2Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	38



Plot 7-92. Radiated Restricted Upper Band Edge Measurement Antenna 1a (Average & Peak)

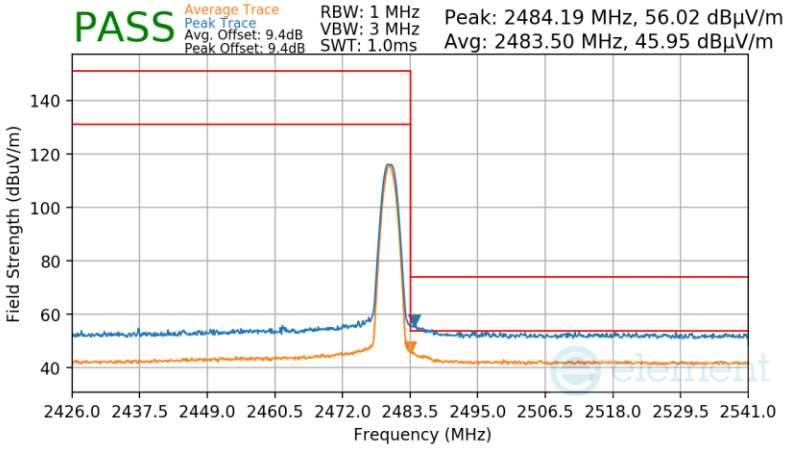
TxBF

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2402MHz
Channel:	0



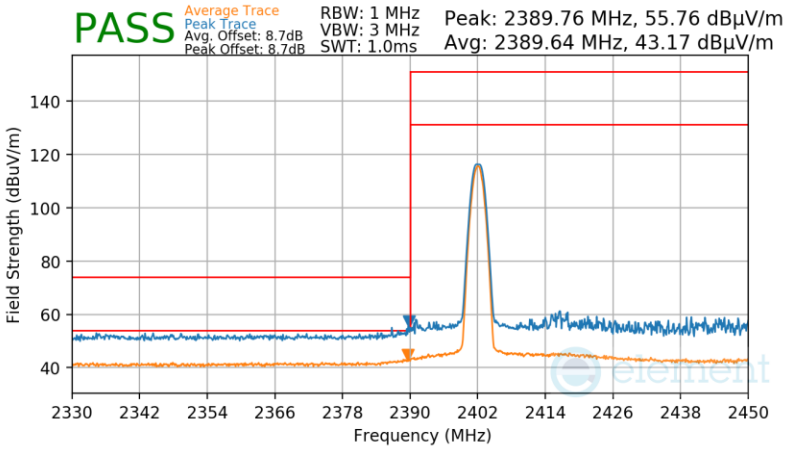
Plot 7-93. Radiated Restricted Lower Band Edge Measurement TxBF (Average & Peak)

Bluetooth Mode:	LE
Data Rate:	1Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Channel:	39



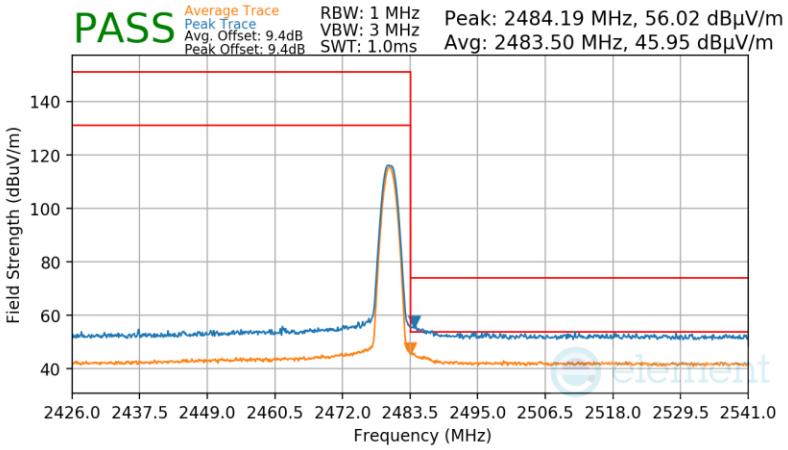
Plot 7-94. Radiated Restricted Upper Band Edge Measurement TxBF (Average & Peak)

Bluetooth Mode:	LE
Data Rate:	2Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2404MHz
Channel:	1



Plot 7-95. Radiated Restricted Lower Band Edge Measurement TxBF (Average & Peak)

Bluetooth Mode:	LE
Data Rate:	2Mbps
Power Scheme:	ePA
Measurement Distance:	3 Meters
Operating Frequency:	2478MHz
Channel:	38



Plot 7-96. Radiated Restricted Upper Band Edge Measurement TxBF (Average & Peak)

7.8 Radiated Spurious Emissions – 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 7-17 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 7-17. 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.

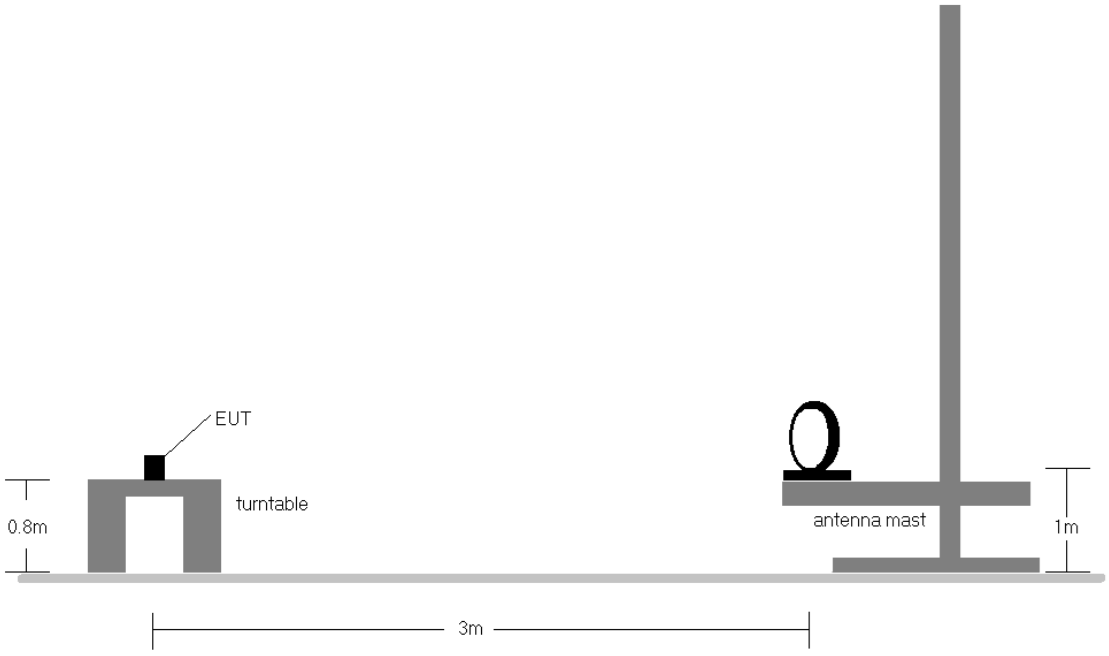


Figure 7-7. Radiated Test Setup < 30MHz

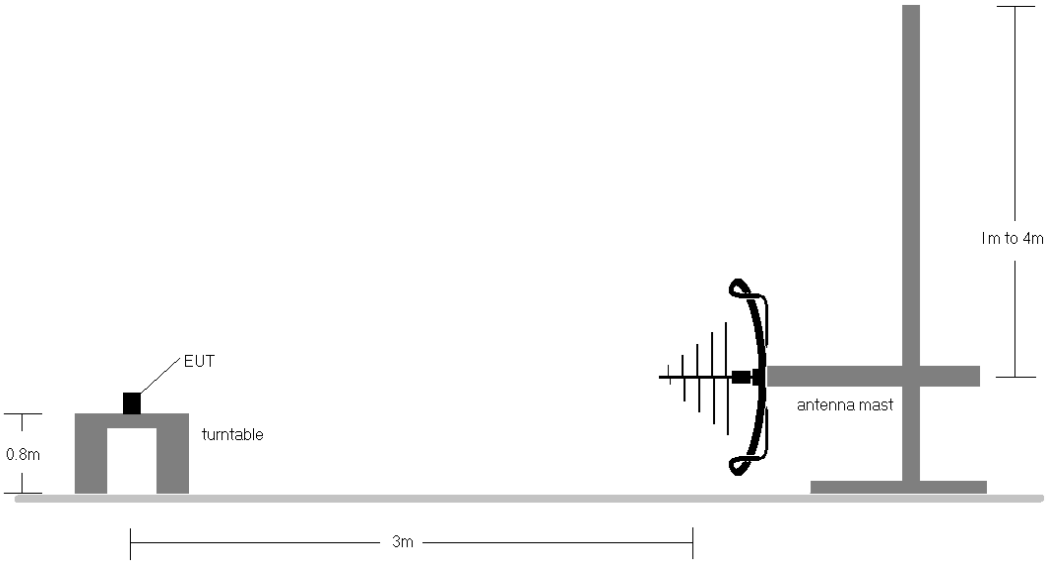


Figure 7-8. Radiated Test Setup < 1GHz

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 7-17.
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 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, antenna (including TxBF mode) and power schemes 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 powered by AC/DC adaptor via USB-C cable with wire charger
    b. EUT powered by host PC via USB-C cable with wire charger

Sample Calculations

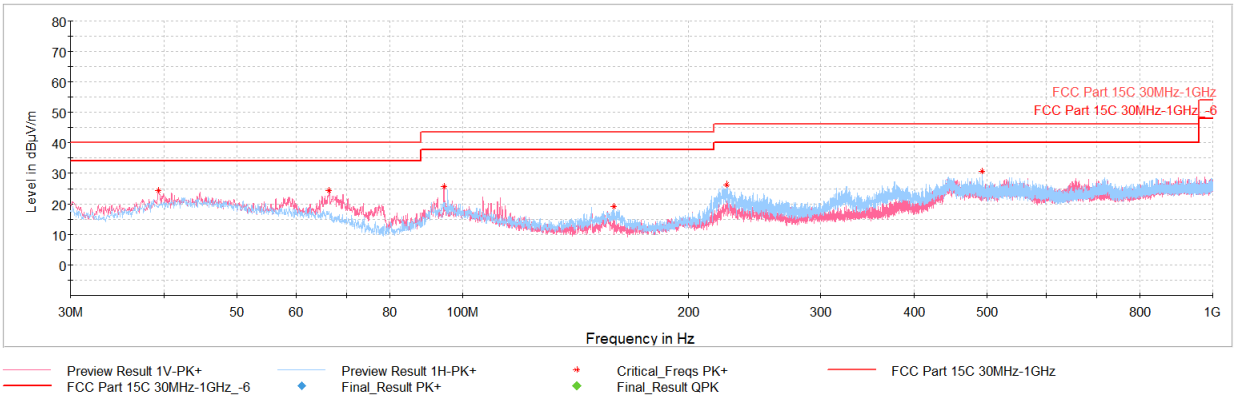
Determining Spurious Emissions Levels

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

7.8.1 Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209; RSS-Gen [8.9]

TxBF



Plot 7-97. Radiated Spurious Emissions Below 1GHz TxBF (1Mbps, ePA – Ch.19, Pol. H & V, 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]
39.361	Max-Peak	V	100	146	-66.51	-16.03	24.46	40.00	-15.54
66.424	Max-Peak	V	100	134	-64.63	-17.80	24.57	40.00	-15.43
94.505	Max-Peak	V	100	157	-63.70	-17.47	25.83	43.52	-17.69
159.010	Max-Peak	H	300	47	-68.94	-18.95	19.11	43.52	-24.41
224.873	Max-Peak	H	100	228	-65.19	-15.45	26.36	46.02	-19.66
492.011	Max-Peak	H	200	217	-67.92	-8.60	30.48	46.02	-15.54

Table 7-18. Radiated Spurious Emissions Below 1GHz TxBF (1Mbps, ePA – Ch.19, Pol. H & V, with AC/DC Adapter)

7.9 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 7-19. 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.

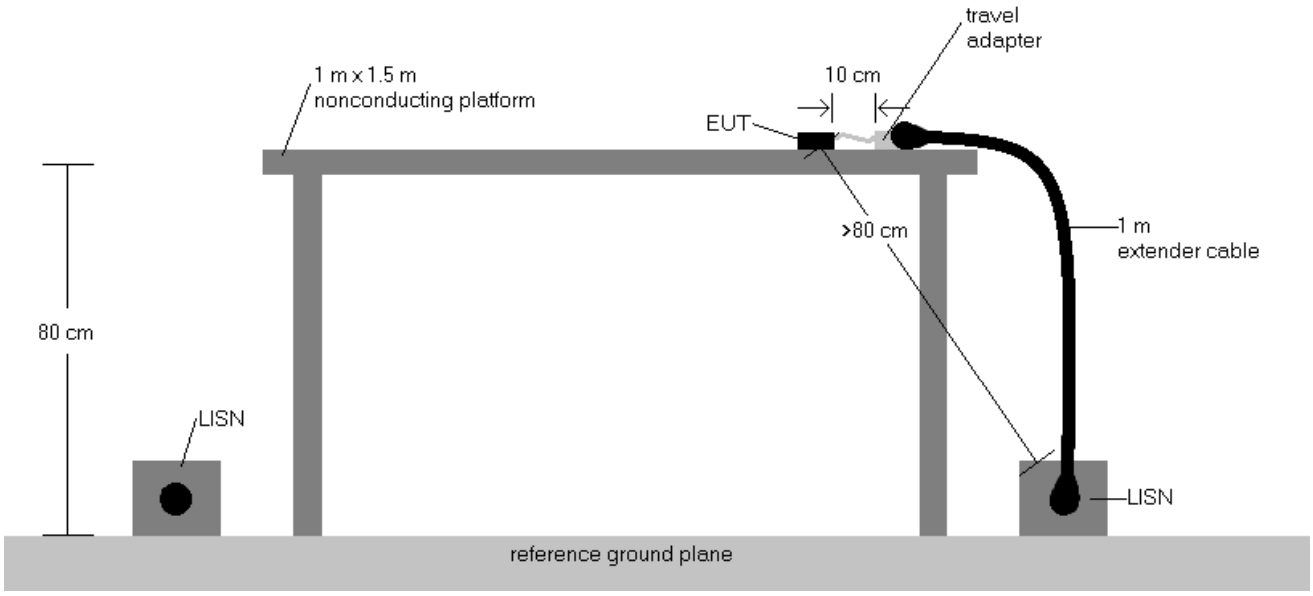
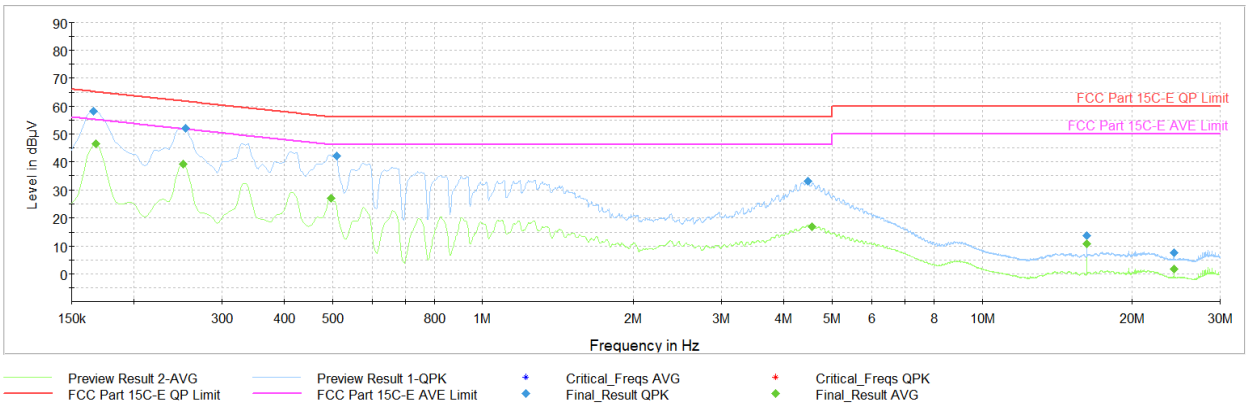


Figure 7-9. Test Instrument & Measurement Setup

Test Notes

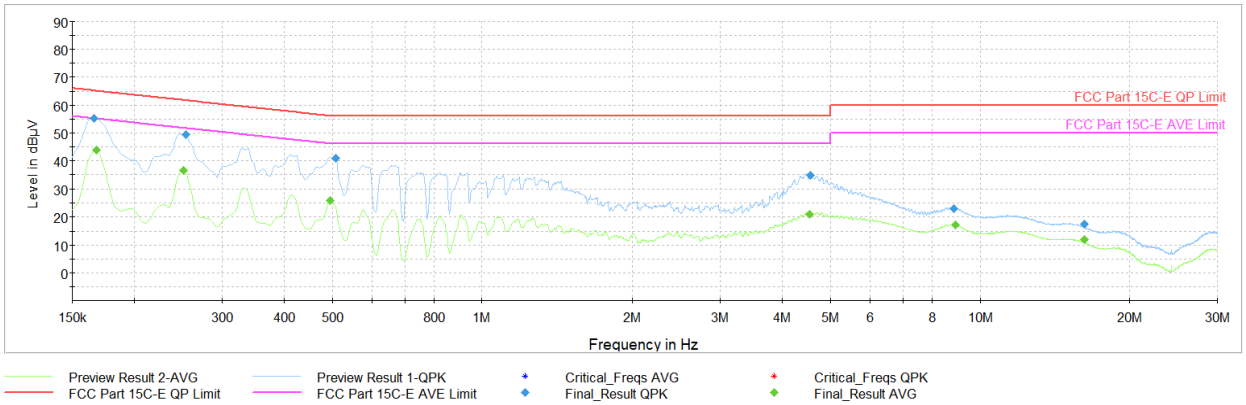
1. All modes of operation were investigated and the worst-case emissions are reported. The emissions found were not affected by the choice of channel used during testing.
2. Both configurations below were investigated, and the worst case has been reported.
    a. EUT powered by AC/DC adaptor via USB-C cable with wire charger
    b. EUT powered by host PC via USB-C cable with wire charger
3. The limit for an intentional radiator from 150kHz to 30MHz are specified in Part 15.207 and RSS-Gen (8.8).
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 plot are made using a quasi peak and average detectors.
8. Deviations to the Specifications: None.



Plot 7-98. AC Line Conducted Plot with Bluetooth LE TxBF (L1, 1Mbps ePA – Ch.19 with AC/DC Adapter)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.17	FINAL	58.01	---	65.17	-7.16	L1	GND
0.17	FINAL	---	46.40	55.06	-8.66	L1	GND
0.25	FINAL	---	39.04	51.72	-12.68	L1	GND
0.25	FINAL	52.01	---	61.64	-9.63	L1	GND
0.50	FINAL	---	27.22	46.06	-18.84	L1	GND
0.51	FINAL	42.01	---	56.00	-13.99	L1	GND
4.47	FINAL	33.06	---	56.00	-22.94	L1	GND
4.56	FINAL	---	16.93	46.00	-29.07	L1	GND
16.19	FINAL	13.78	---	60.00	-46.22	L1	GND
16.19	FINAL	---	10.76	50.00	-39.24	L1	GND
24.29	FINAL	---	1.66	50.00	-48.34	L1	GND
24.29	FINAL	7.48	---	60.00	-52.52	L1	GND

Table 7-20. AC Line Conducted Data with Bluetooth LE TxBF (L1, 1Mbps ePA – Ch.19 with AC/DC Adapter)



Plot 7-99. AC Line Conducted Plot with Bluetooth LE TxBF (N, 1Mbps ePA – Ch.19, with AC/DC Adapter)

Frequency [MHz]	Process State	QuasiPeak [dBµV]	Average [dBµV]	Limit [dBµV]	Margin [dB]	Line	PE
0.17	FINAL	55.13	---	65.17	-10.04	N	GND
0.17	FINAL	---	43.67	55.06	-11.39	N	GND
0.25	FINAL	---	36.57	51.72	-15.15	N	GND
0.25	FINAL	49.47	---	61.64	-12.17	N	GND
0.49	FINAL	---	26.08	46.10	-20.02	N	GND
0.51	FINAL	40.87	---	56.00	-15.13	N	GND
4.54	FINAL	---	20.98	46.00	-25.02	N	GND
4.57	FINAL	34.80	---	56.00	-21.20	N	GND
8.87	FINAL	23.07	---	60.00	-36.93	N	GND
8.91	FINAL	---	17.28	50.00	-32.72	N	GND
16.19	FINAL	---	11.95	50.00	-38.05	N	GND
16.19	FINAL	17.59	---	60.00	-42.41	N	GND

Table 7-21. AC Line Conducted Data with Bluetooth LE TxBF (N, 1Mbps ePA – Ch.19 with AC/DC Adapter)

8 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Tablet Device FCC ID: BCGA3267 and IC: 579C-A3267** 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.