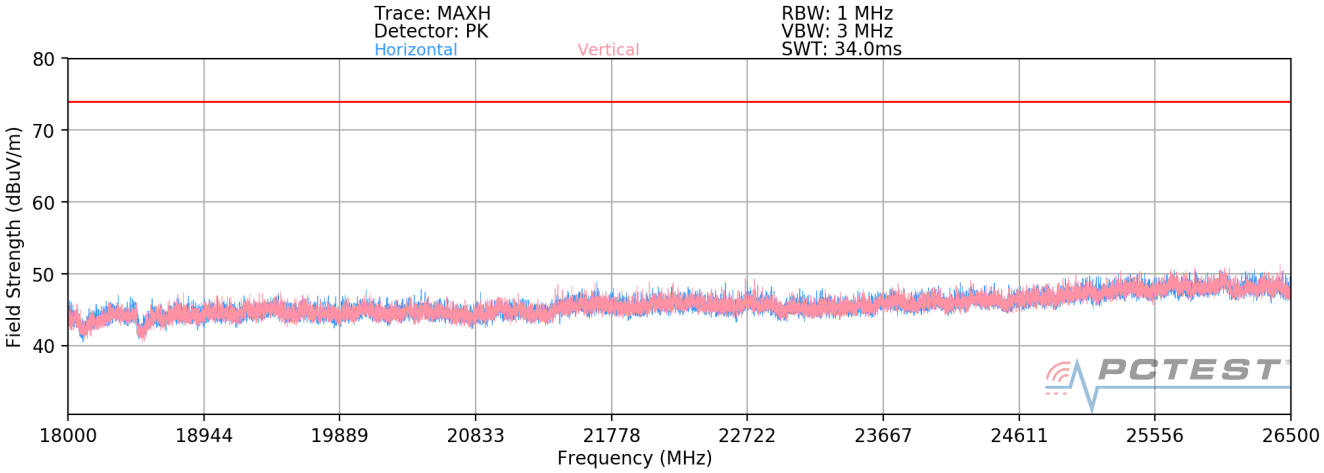
SISO Antenna-1 Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209; RSS-Gen [8.9]



Plot 7-74. Radiated Spurious Plot above 18GHz SISO ANT1

SISO Antenna-1 Radiated Spurious Emission Measurements

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

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

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]
4824.00	Avg	H	205	41	-68.59	3.23	41.64	53.98	-12.34
4824.00	Peak	H	205	41	-61.81	3.23	48.42	73.98	-25.56
12060.00	Avg	H	-	-	-81.53	14.06	39.53	53.98	-14.45
12060.00	Peak	H	-	-	-69.42	14.06	51.64	73.98	-22.34

Table 7-14. Radiated Measurements SISO ANT1

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

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]
4874.00	Avg	H	165	41	-70.30	3.57	40.27	53.98	-13.71
4874.00	Peak	H	165	41	-63.64	3.57	46.93	73.98	-27.05
7311.00	Avg	H	-	-	-79.70	9.09	36.39	53.98	-17.59
7311.00	Peak	H	-	-	-67.61	9.09	48.48	73.98	-25.50
12185.00	Avg	H	-	-	-81.10	13.21	39.11	53.98	-14.86
12185.00	Peak	H	-	-	-69.17	13.21	51.04	73.98	-22.93

Table 7-15. Radiated Measurements SISO ANT1

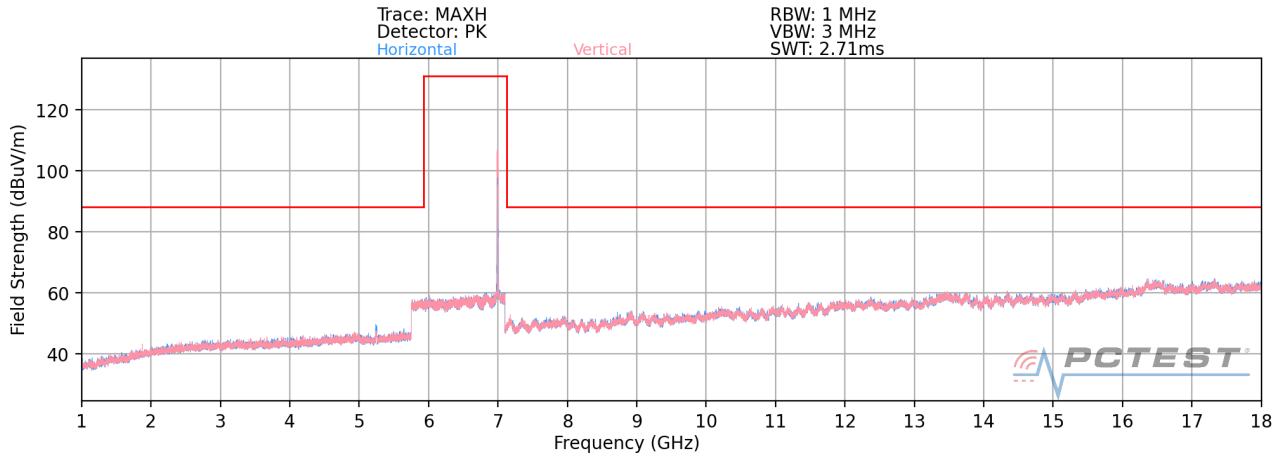
Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

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]
4924.00	Avg	H	357	39	-68.68	3.79	42.11	53.98	-11.87
4924.00	Peak	H	357	39	-62.69	3.79	48.10	73.98	-25.88
7386.00	Avg	H	-	-	-79.60	8.90	36.30	53.98	-17.68
7386.00	Peak	H	-	-	-66.58	8.90	49.32	73.98	-24.66
12310.00	Avg	H	-	-	-81.01	13.11	39.10	53.98	-14.88
12310.00	Peak	H	-	-	-69.24	13.11	50.87	73.98	-23.11

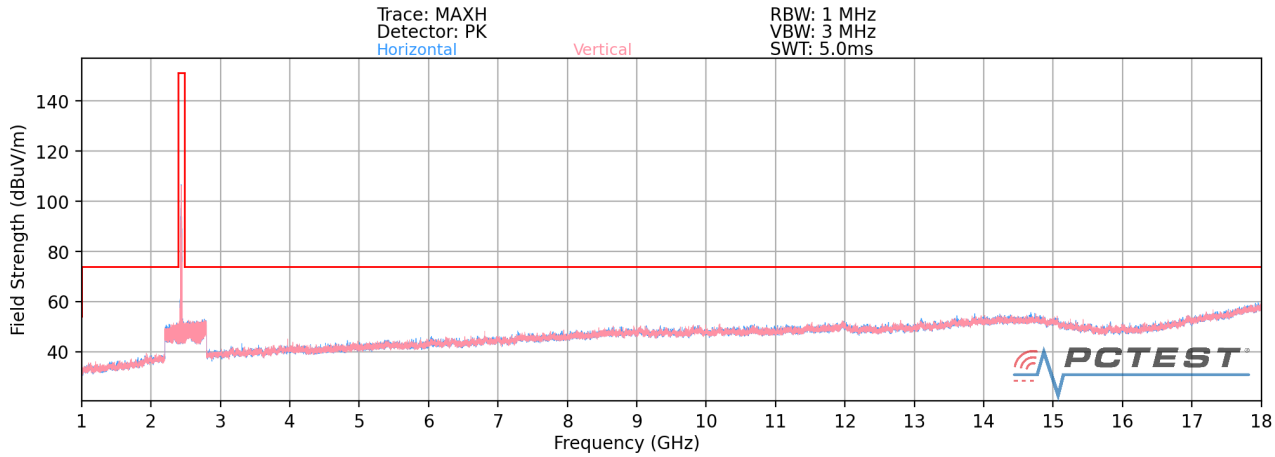
Table 7-16. Radiated Measurements SISO ANT1

7.7.2 SISO Antenna-2 Radiated Spurious Emission Measurements

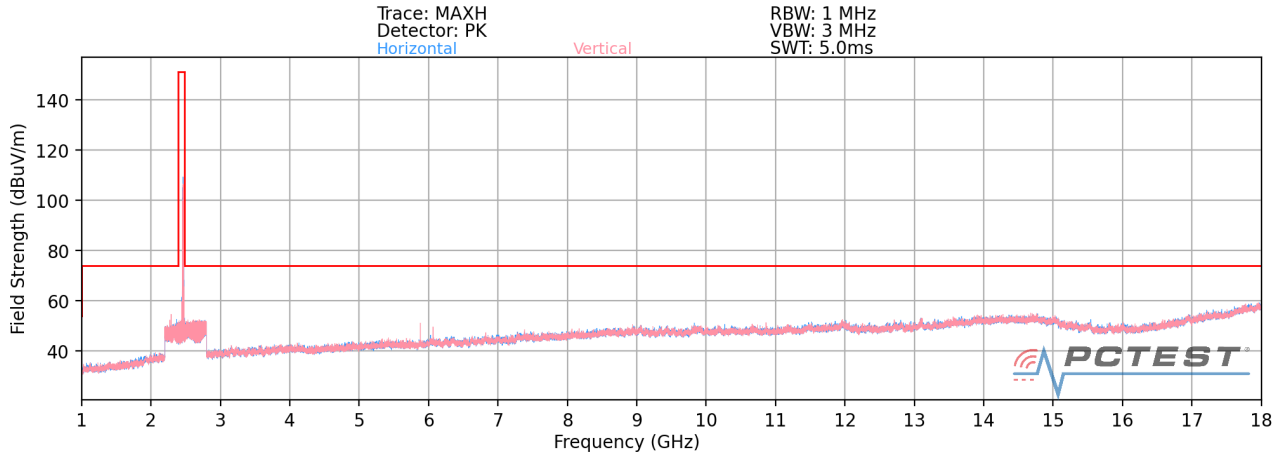
§15.247(d) §15.205 & §15.209; RSS-Gen [8.9]



Plot 7-75. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11b – Ch. 1)



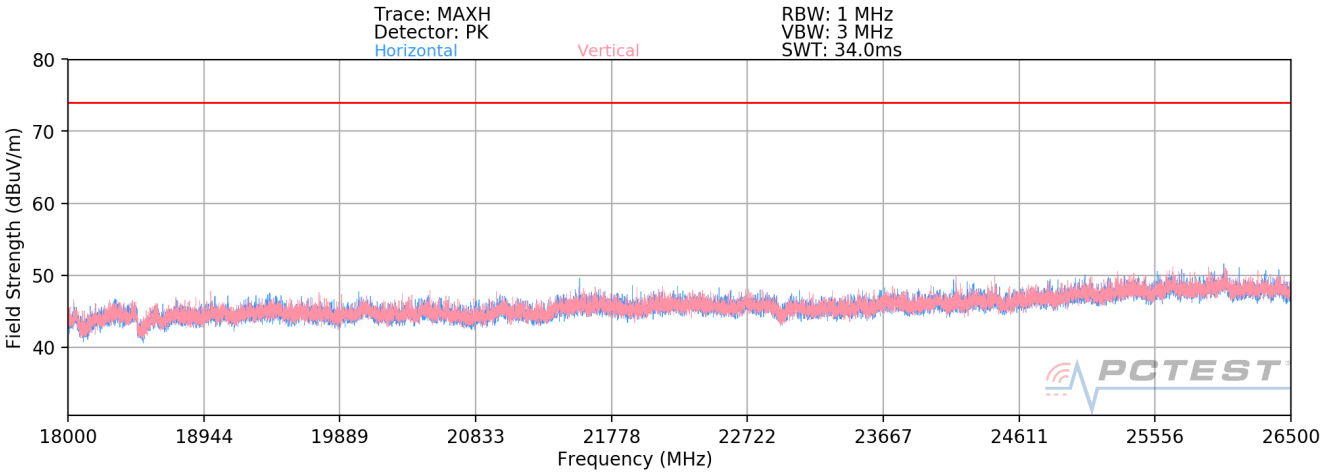
Plot 7-76. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11b – Ch. 6)



Plot 7-77. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11b – Ch. 11)

SISO Antenna-2 Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209; RSS-Gen [8.9]



Plot 7-78. Radiated Spurious Plot above 18GHz SISO ANT2

SISO Antenna-2 Radiated Spurious Emission Measurements

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

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

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]
4824.00	Avg	H	121	146	-68.31	3.23	41.92	53.98	-12.06
4824.00	Peak	H	121	146	-62.16	3.23	48.07	73.98	-25.91
12060.00	Avg	H	-	-	-81.59	14.06	39.47	53.98	-14.51
12060.00	Peak	H	-	-	-69.37	14.06	51.69	73.98	-22.29

Table 7-17. Radiated Measurements SISO ANT2

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

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]
4874.00	Avg	H	346	163	-78.23	3.57	32.34	53.98	-21.64
4874.00	Peak	H	346	163	-66.42	3.57	44.15	73.98	-29.83
7311.00	Avg	H	-	-	-79.80	9.09	36.29	53.98	-17.69
7311.00	Peak	H	-	-	-66.91	9.09	49.18	73.98	-24.80
12185.00	Avg	H	-	-	-81.09	13.21	39.12	53.98	-14.85
12185.00	Peak	H	-	-	-69.03	13.21	51.18	73.98	-22.79

Table 7-18. Radiated Measurements SISO ANT2

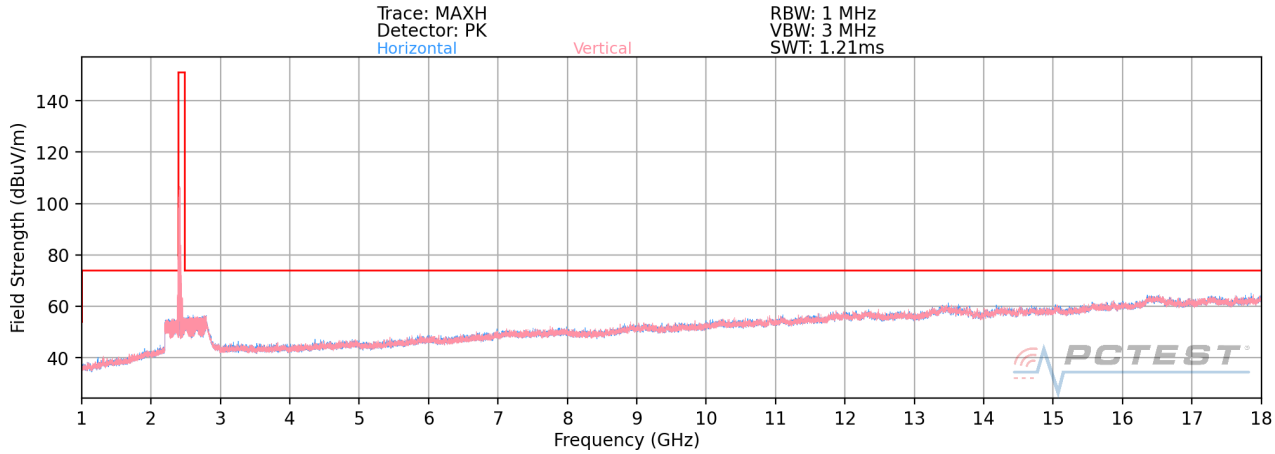
Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

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]
4924.00	Avg	H	-	-	-78.66	3.79	32.13	53.98	-21.85
4924.00	Peak	H	-	-	-66.76	3.79	44.03	73.98	-29.95
7386.00	Avg	H	-	-	-79.63	8.90	36.27	53.98	-17.71
7386.00	Peak	H	-	-	-67.40	8.90	48.50	73.98	-25.48
12310.00	Avg	H	-	-	-81.05	13.11	39.06	53.98	-14.92
12310.00	Peak	H	-	-	-69.26	13.11	50.85	73.98	-23.13

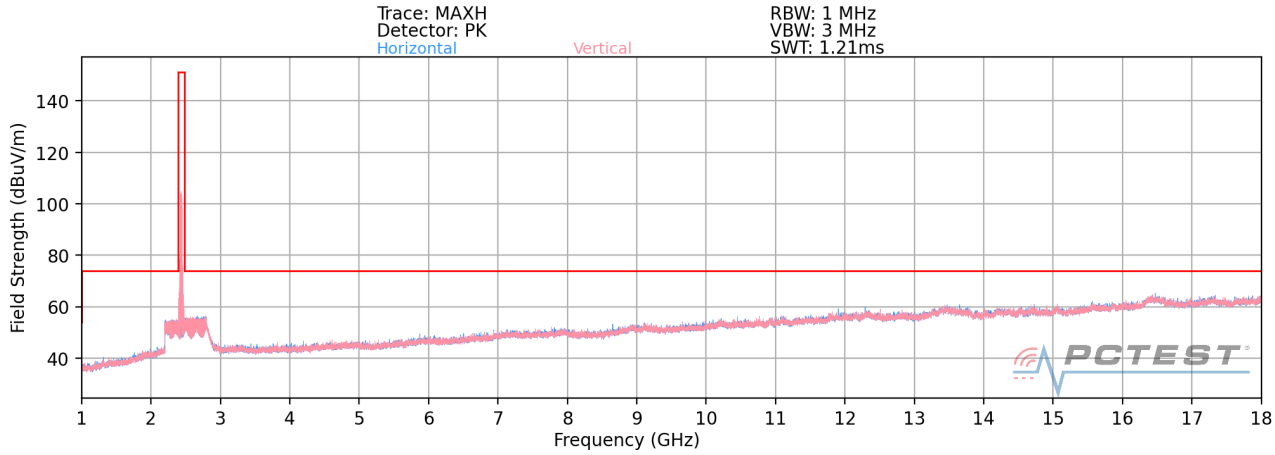
Table 7-19. Radiated Measurements SISO ANT2

7.7.3 MIMO/CDD Radiated Spurious Emission Measurements

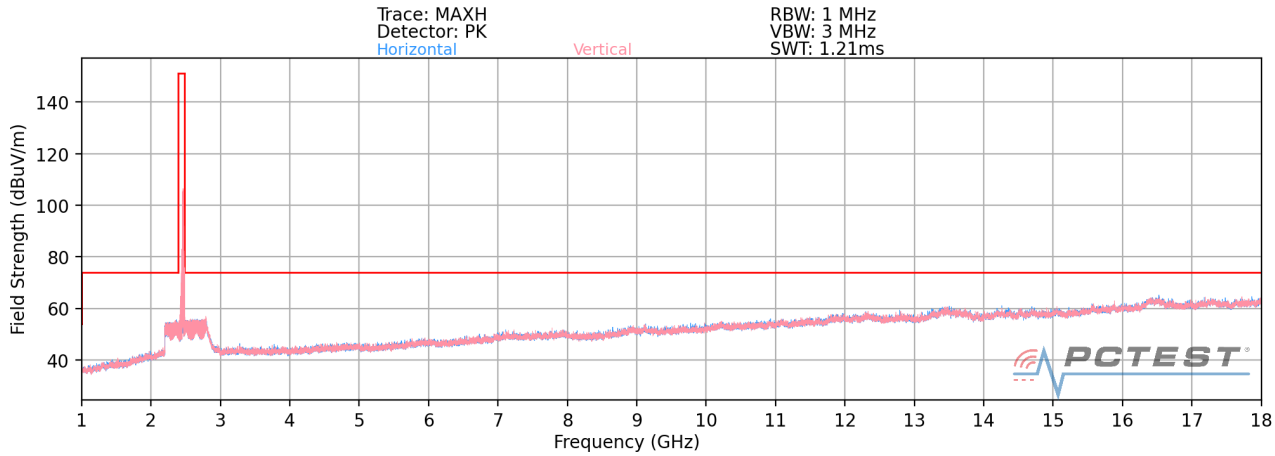
§15.247(d) §15.205 & §15.209; RSS-Gen [8.9]



Plot 7-79. Radiated Spurious Plot above 1GHz MIMO/CDD (802.11g – Ch. 1)



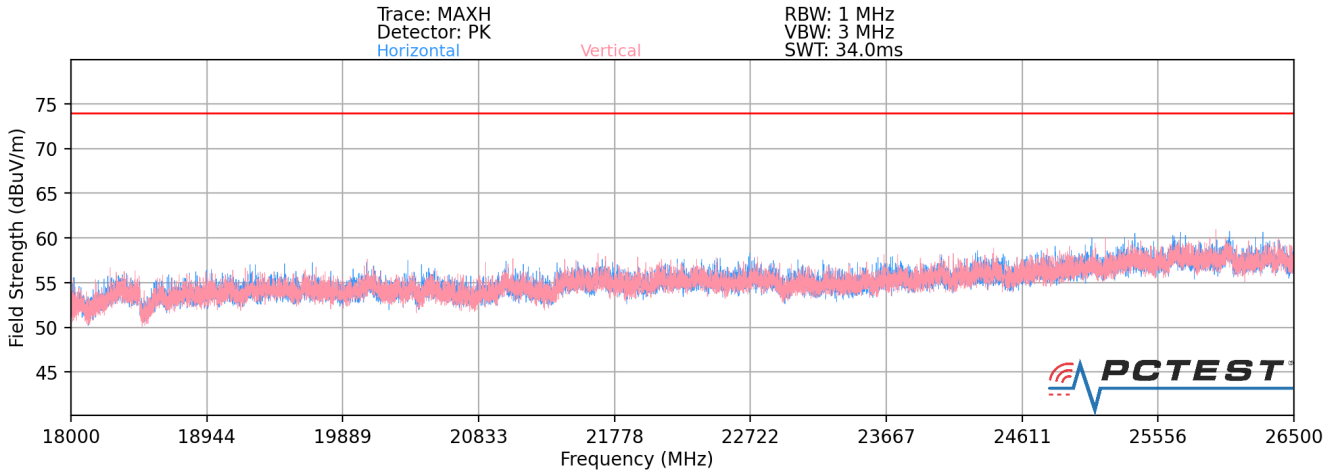
Plot 7-80. Radiated Spurious Plot above 1GHz MIMO/CDD (802.11g – Ch. 6)



Plot 7-81. Radiated Spurious Plot above 1GHz MIMO/CDD (802.11g – Ch. 11)

MIMO/CDD Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209; RSS-Gen [8.9]



Plot 7-82. Radiated Spurious Plot above 18GHz MIMO/CDD

MIMO/CDD Radiated Spurious Emission Measurements

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

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

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]
4824.00	Avg	H	144	344	-75.75	9.25	40.50	53.98	-13.48
4824.00	Peak	H	144	344	-62.10	9.25	54.15	73.98	-19.83
12060.00	Avg	H	-	-	-79.16	22.21	50.05	53.98	-3.93
12060.00	Peak	H	-	-	-66.81	22.21	62.40	73.98	-11.58

Table 7-20. Radiated Measurements MIMO/CDD

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

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]
4874.00	Avg	H	-	-	-78.20	9.22	38.02	53.98	-15.96
4874.00	Peak	H	-	-	-66.50	9.22	49.72	73.98	-24.26
7311.00	Avg	H	-	-	-80.21	15.13	41.92	53.98	-12.06
7311.00	Peak	H	-	-	-69.02	15.13	53.11	73.98	-20.87
12185.00	Avg	H	-	-	-79.81	22.62	49.81	53.98	-4.17
12185.00	Peak	H	-	-	-68.30	22.62	61.32	73.98	-12.66

Table 7-21. Radiated Measurements MIMO/CDD

Worst Case Mode: 802.11g
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 3 Meters
Operating Frequency: 2462MHz
Channel: 11

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]
4924.00	Avg	H	312	229	-77.09	9.47	39.38	53.98	-14.60
4924.00	Peak	H	312	229	-66.65	9.47	49.82	73.98	-24.16
7386.00	Avg	H	-	-	-80.43	15.45	42.02	53.98	-11.95
7386.00	Peak	H	-	-	-69.06	15.45	53.39	73.98	-20.58
12310.00	Avg	H	-	-	-79.36	23.13	50.77	53.98	-3.21
12310.00	Peak	H	-	-	-68.67	23.13	61.46	73.98	-12.52

Table 7-22. Radiated Measurements MIMO/CDD

Worst Case Mode: 802.11g
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 3 Meters
Operating Frequency: 2412MHz
Channel: 01

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]
4824.00	Avg	H	-	-	-77.96	9.25	38.29	53.98	-15.69
4824.00	Peak	H	-	-	-66.89	9.25	49.36	73.98	-24.62
12060.00	Avg	H	-	-	-79.24	22.21	49.97	53.98	-4.01
12060.00	Peak	H	-	-	-66.78	22.21	62.43	73.98	-11.55

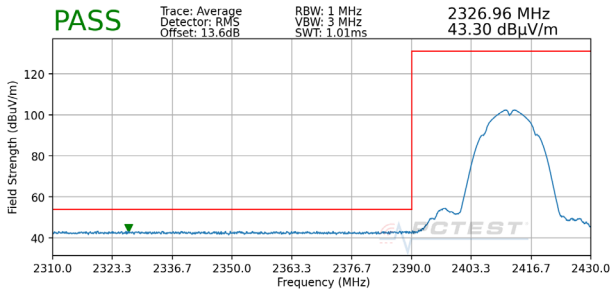
Table 7-23. Radiated Measurements MIMO/CDD with WCP

7.7.4 SISO Antenna-1 Radiated Restricted Band Edge Measurements

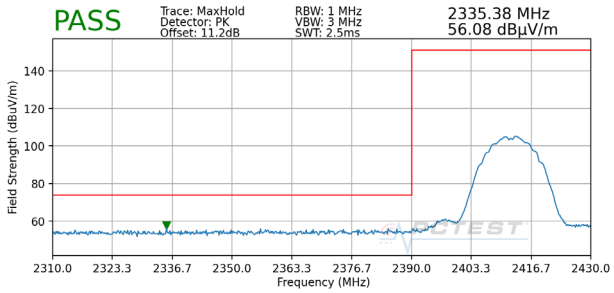
§15.205 §15.209; RSS-Gen [8.9]

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

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1

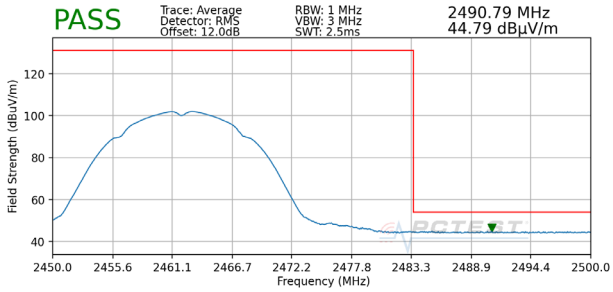


Plot 7-83. Radiated Restricted Lower Band Edge Measurement SISO ANT1 (Average)

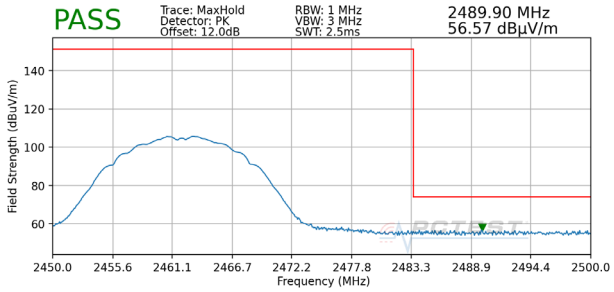


Plot 7-84. Radiated Restricted Lower Band Edge Measurement SISO ANT1 (Peak)

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

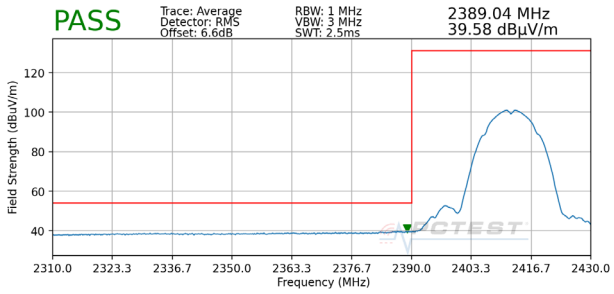


Plot 7-85. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Average)

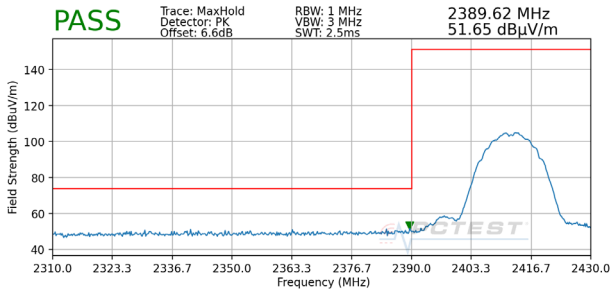


Plot 7-86. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Plot 7-87. Radiated Restricted Band Edge Measurement SISO ANT1 with WCP (Average)



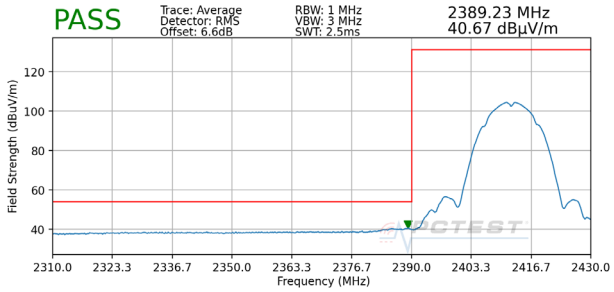
Plot 7-88. Radiated Restricted Band Edge Measurement SISO ANT1 with WCP (Peak)

7.7.5 SISO Antenna-2 Radiated Restricted Band Edge Measurements

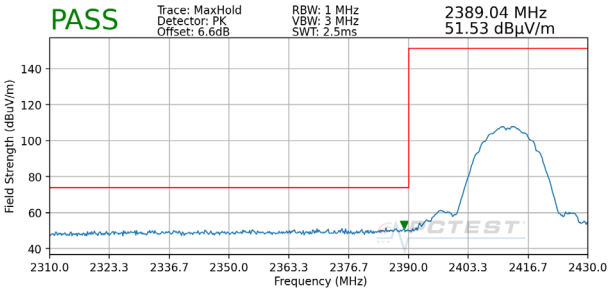
§15.205 §15.209; RSS-Gen [8.9]

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

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1

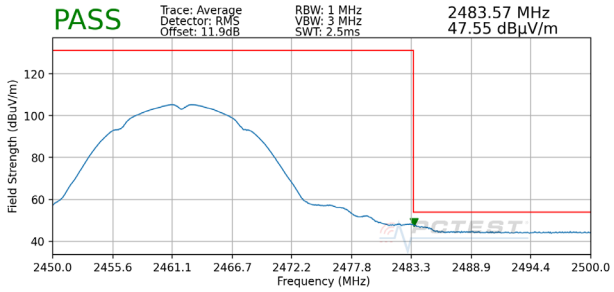


Plot 7-89. Radiated Restricted Lower Band Edge Measurement SISO ANT2 (Average)

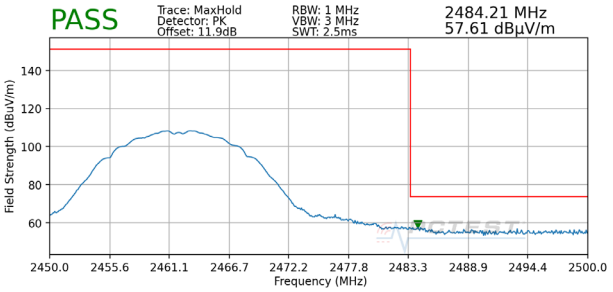


Plot 7-90. Radiated Restricted Lower Band Edge Measurement SISO ANT2 (Peak)

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

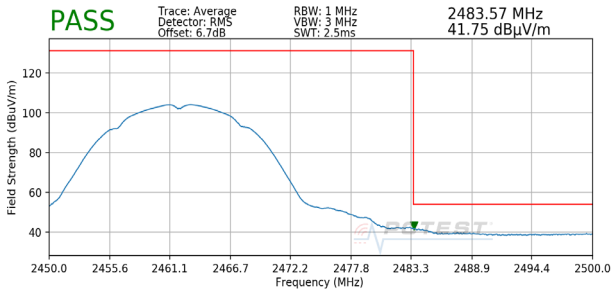


Plot 7-91. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Average)

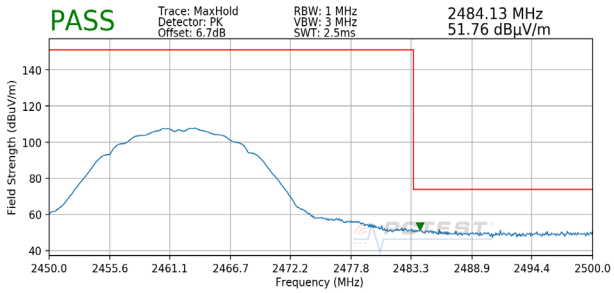


Plot 7-92. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Plot 7-93. Radiated Restricted Band Edge Measurement SISO ANT2 with WCP (Average)



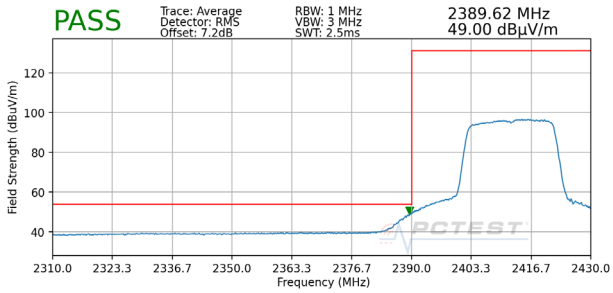
Plot 7-94. Radiated Restricted Band Edge Measurement SISO ANT2 with WCP (Peak)

7.7.6 MIMO Radiated Restricted Band Edge Measurements

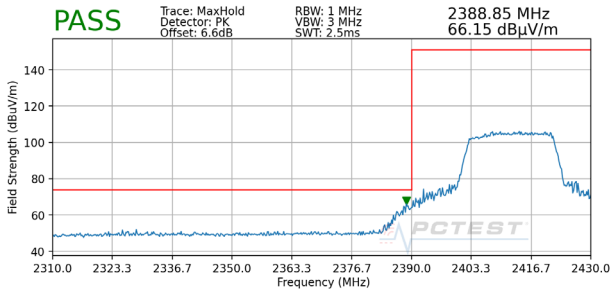
§15.205 §15.209; RSS-Gen [8.9]

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

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1

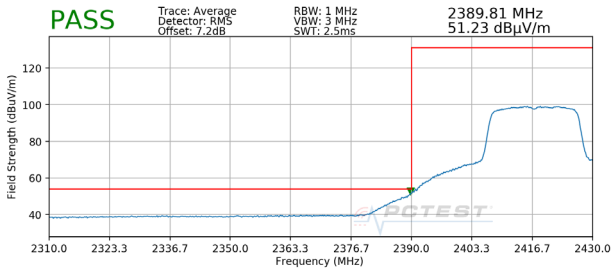


Plot 7-95. Radiated Restricted Lower Band Edge Measurement MIMO (Average)

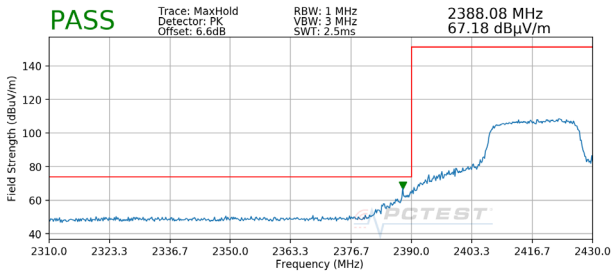


Plot 7-96. Radiated Restricted Lower Band Edge Measurement MIMO (Peak)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2417MHz
Channel:	2

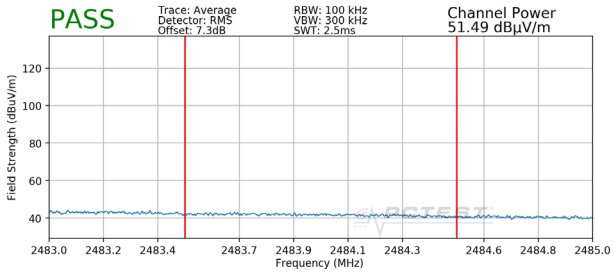


Plot 7-97. Radiated Restricted Lower Band Edge Measurement MIMO (Average)

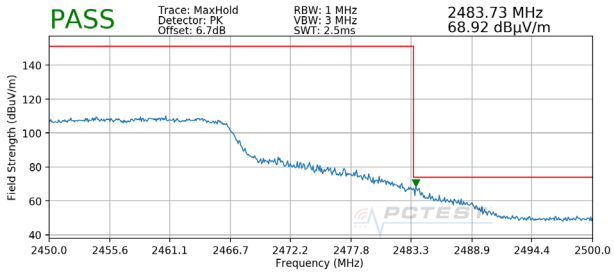


Plot 7-98. Radiated Restricted Lower Band Edge Measurement MIMO (Peak)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2457MHz
Channel:	10

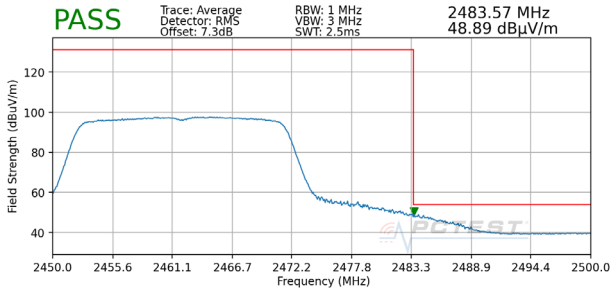


Plot 7-99. Radiated Restricted Upper Band Edge Measurement MIMO (Average)

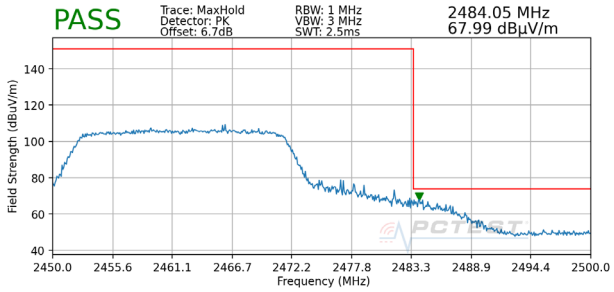


Plot 7-100. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

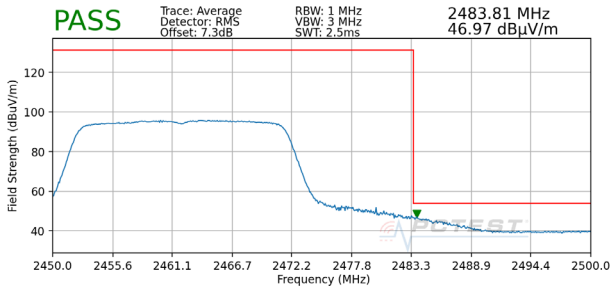


Plot 7-101. Radiated Restricted Upper Band Edge Measurement MIMO (Average)

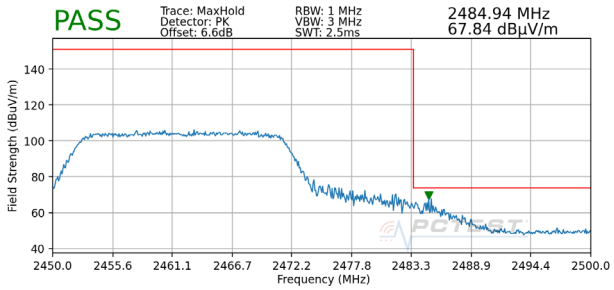


Plot 7-102. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)

Worst Case Mode:	802.11ax
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Plot 7-103. Radiated Restricted Band Edge Measurement MIMO with WCP (Average)



Plot 7-104. Radiated Restricted Band Edge Measurement MIMO with WCP (Peak)

7.8 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 7-24 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 7-24. 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.

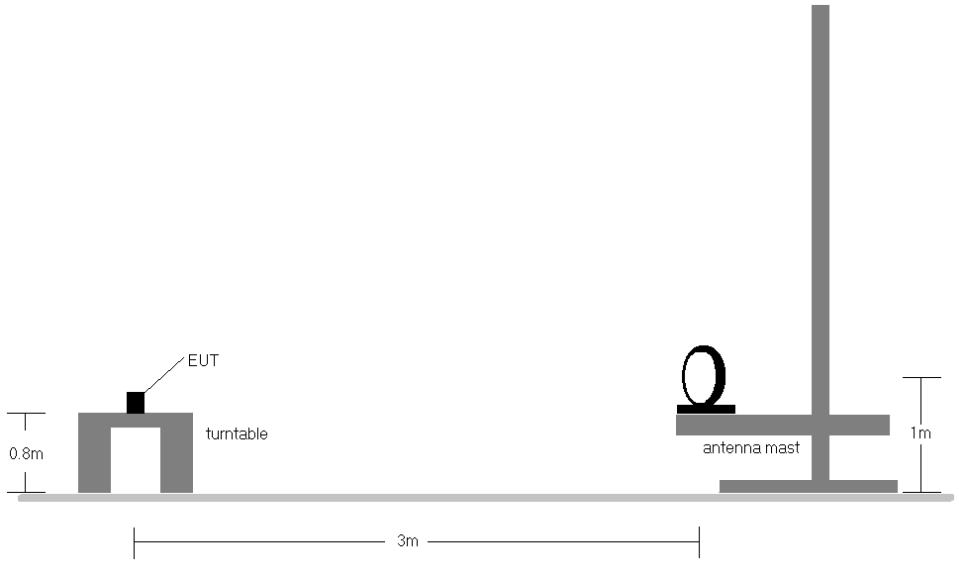


Figure 7-7. Radiated Test Setup < 30Mhz

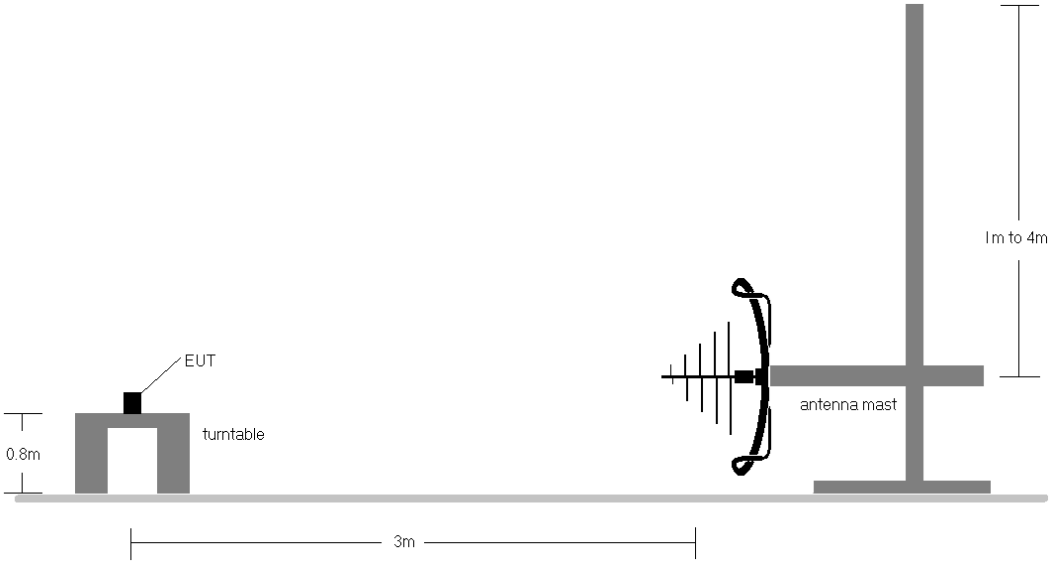


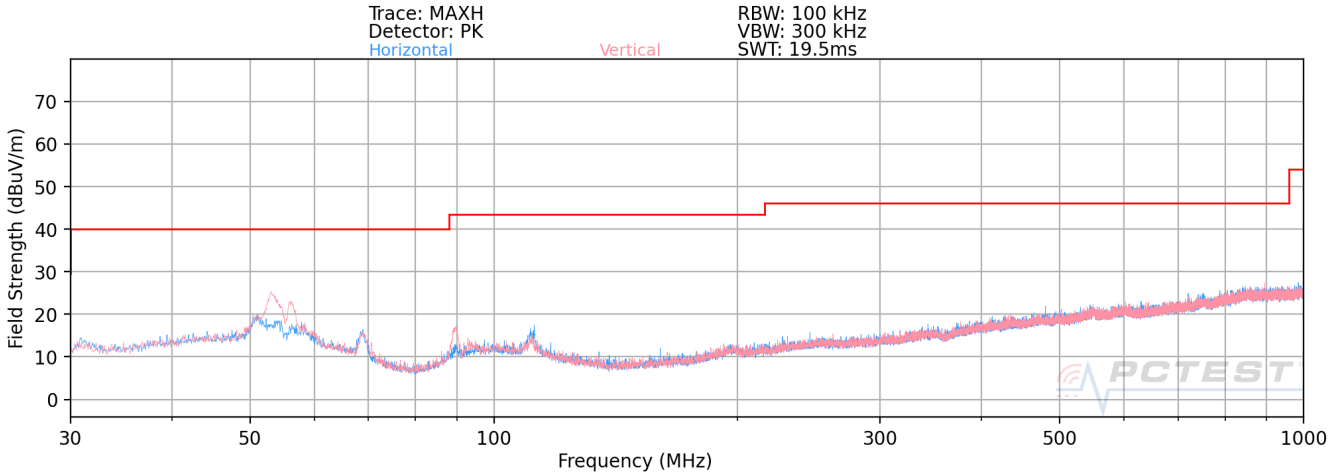
Figure 7-8. Radiated Test Setup < 1GHz

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 7-24.
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. 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 7-105. Radiated Spurious Plot below 1GHz

7.9 Line-Conducted Test 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 7-25. 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.

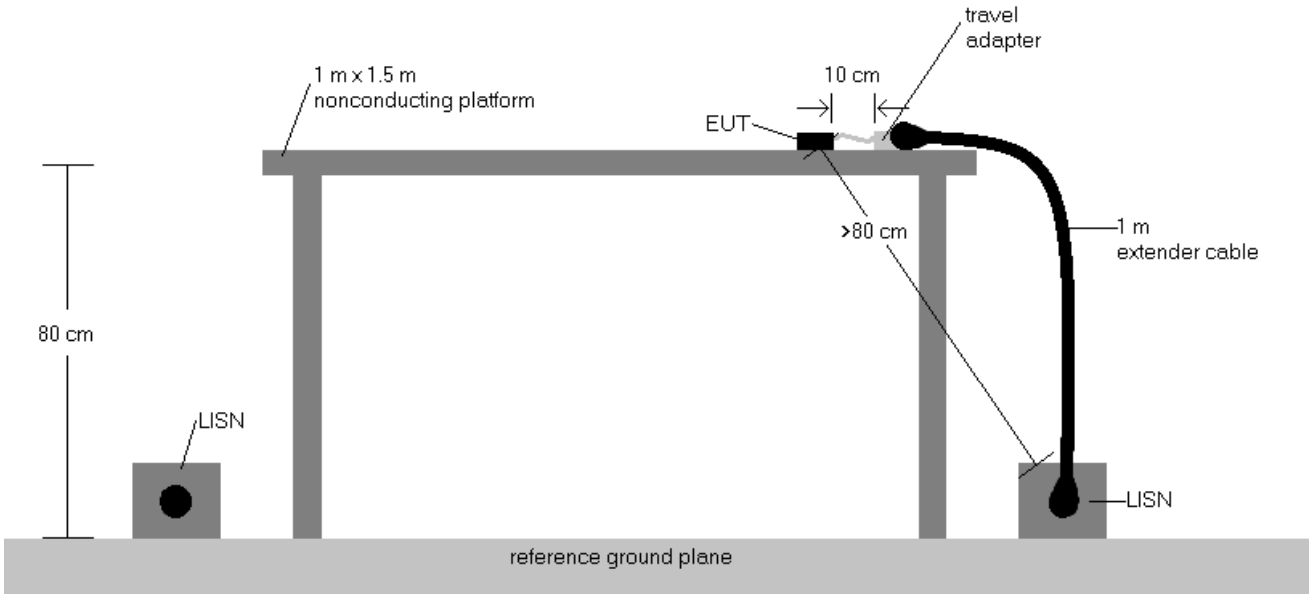
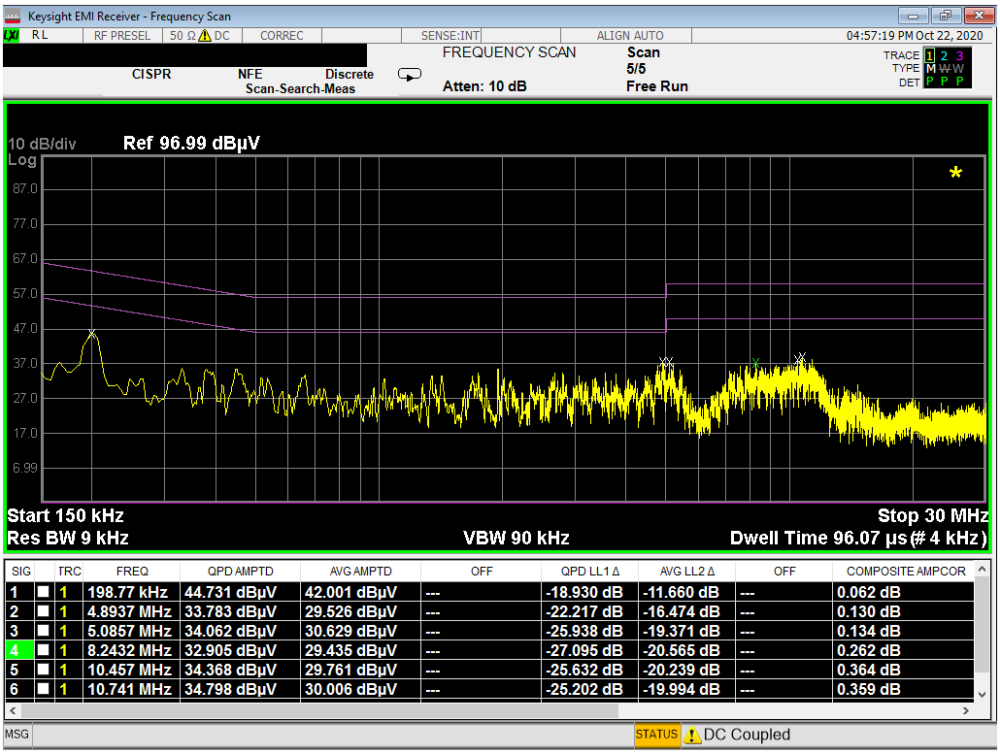


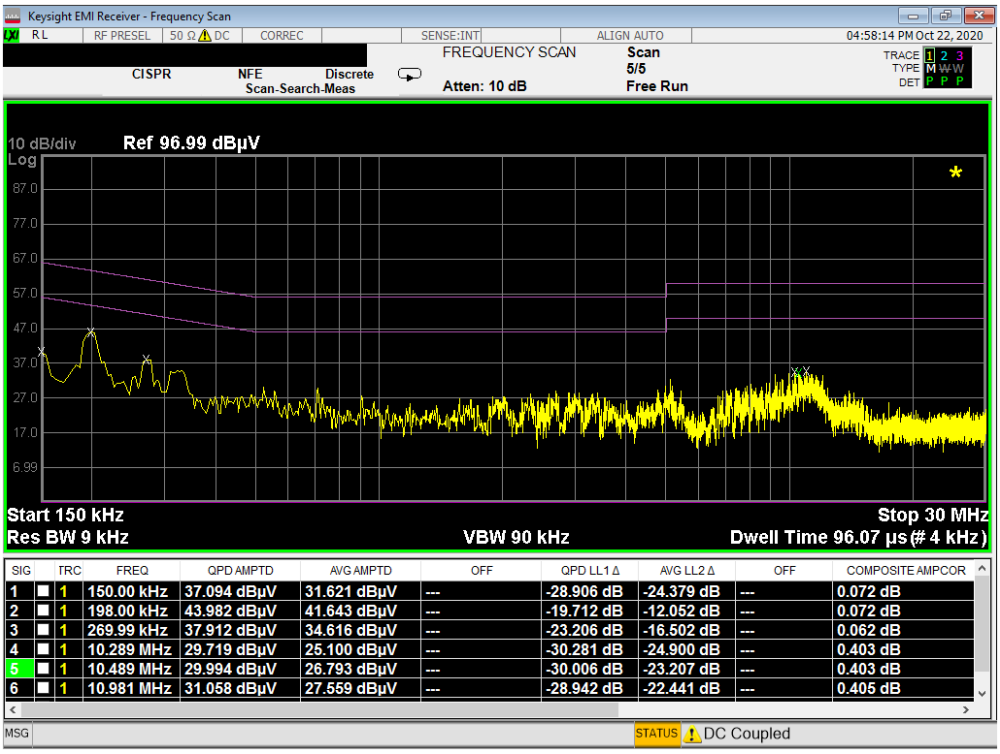
Figure 7-9. Test Instrument & Measurement Setup

Test Notes

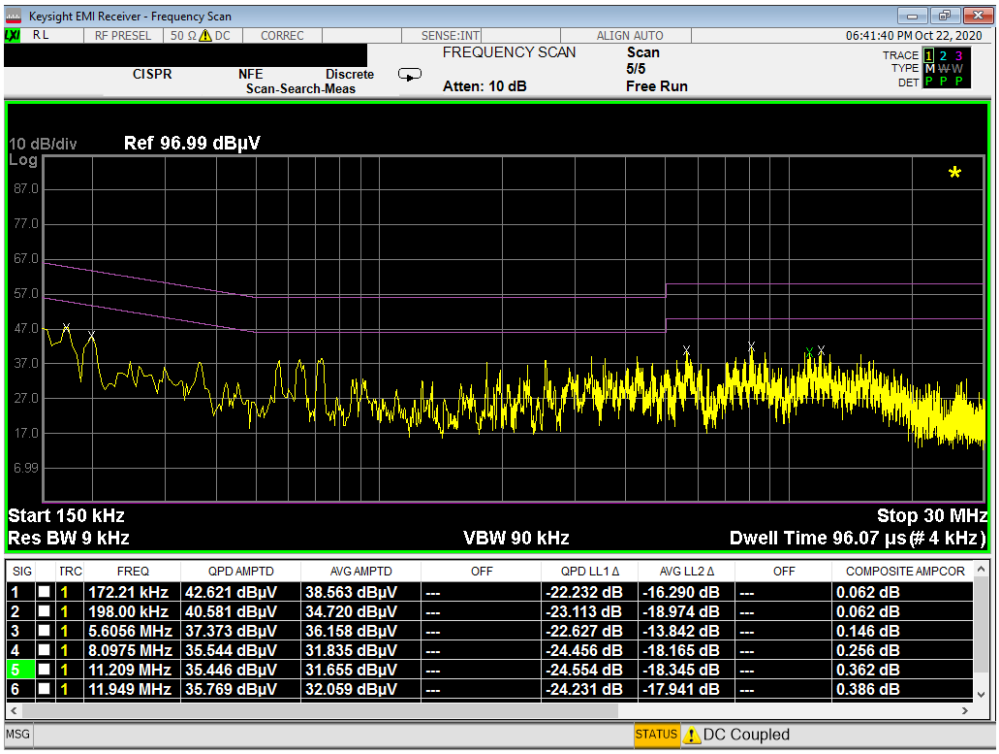
1. All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in Part 15.207 and RSS-Gen(8.8).
3. 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) = 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.
8. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.



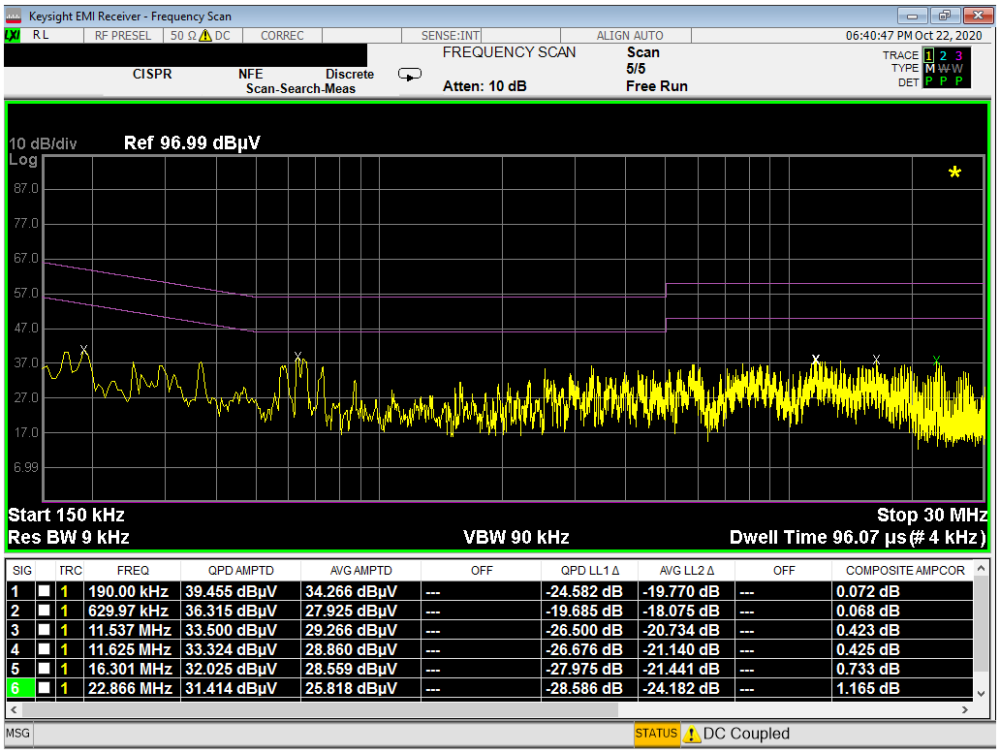
Plot 7-106. Line Conducted Plot with 802.11b (L1)



Plot 7-107. Line Conducted Plot with 802.11b (N)



Plot 7-108. Line Conducted Plot with 802.11b with WCP (L1)



Plot 7-109. Line Conducted Plot with 802.11b with WCP (N)

8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG998U** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules.