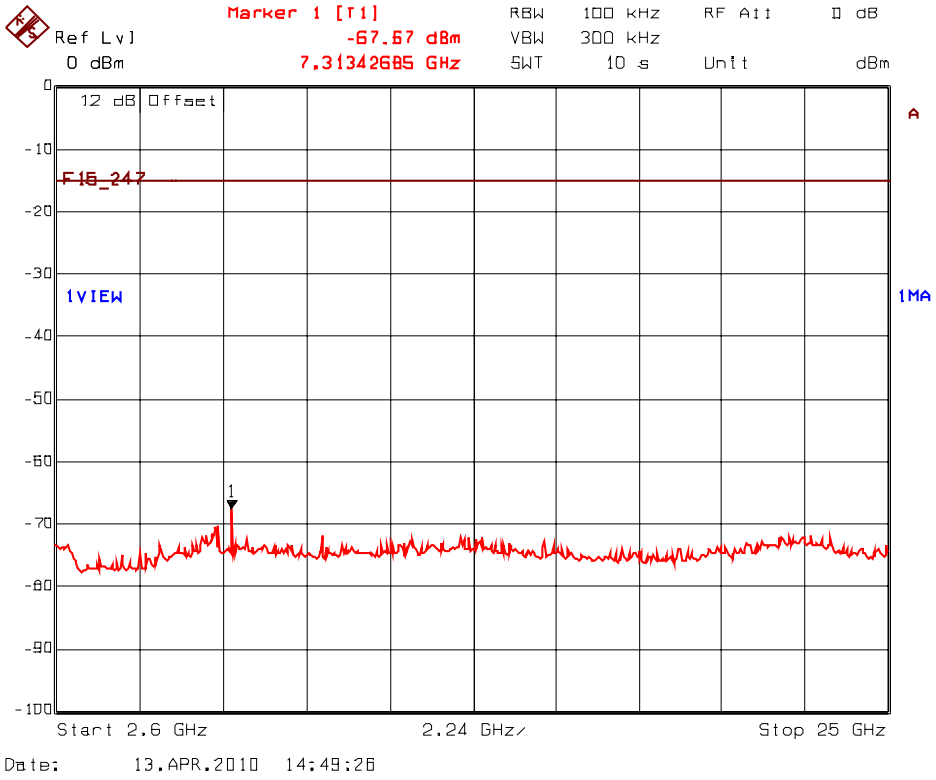
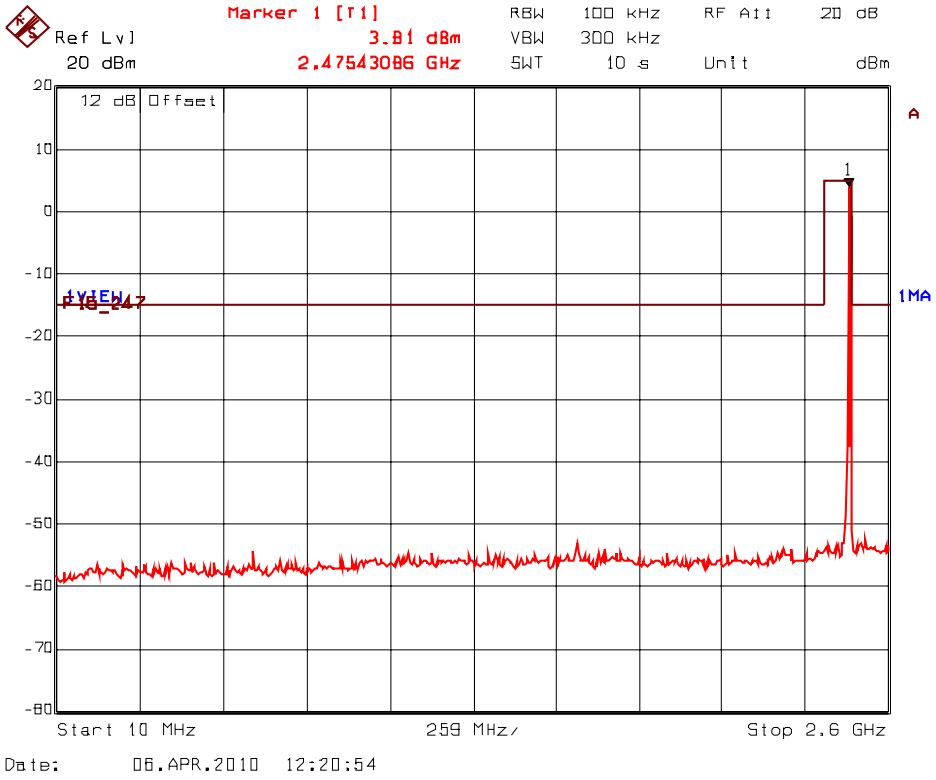
Plot 5.8.4.2.4. Spurious RF Conducted Emissions
Transmitter Frequency: 2440 MHz, High Power

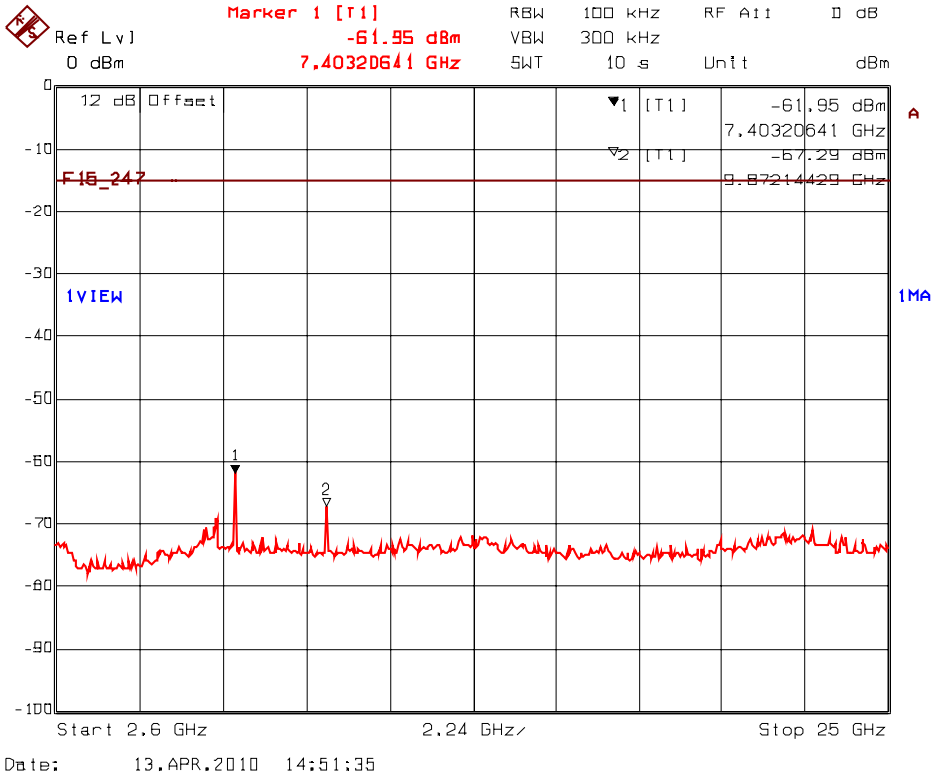


Plot 5.8.4.2.5. Spurious RF Conducted Emissions
Transmitter Frequency: 2475 MHz, High Power

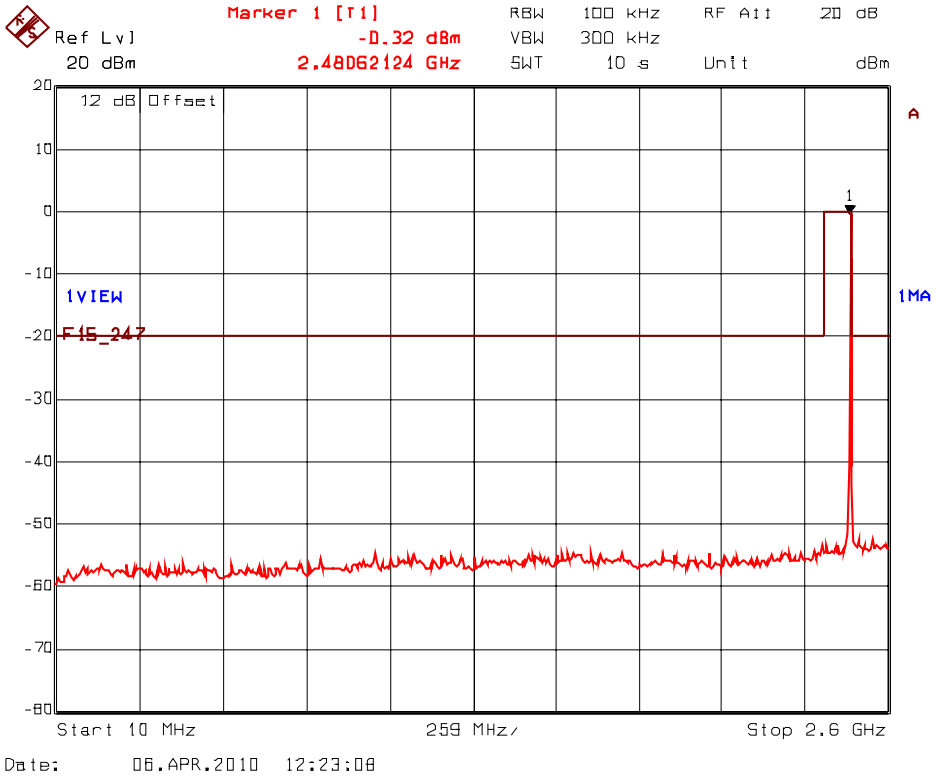


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

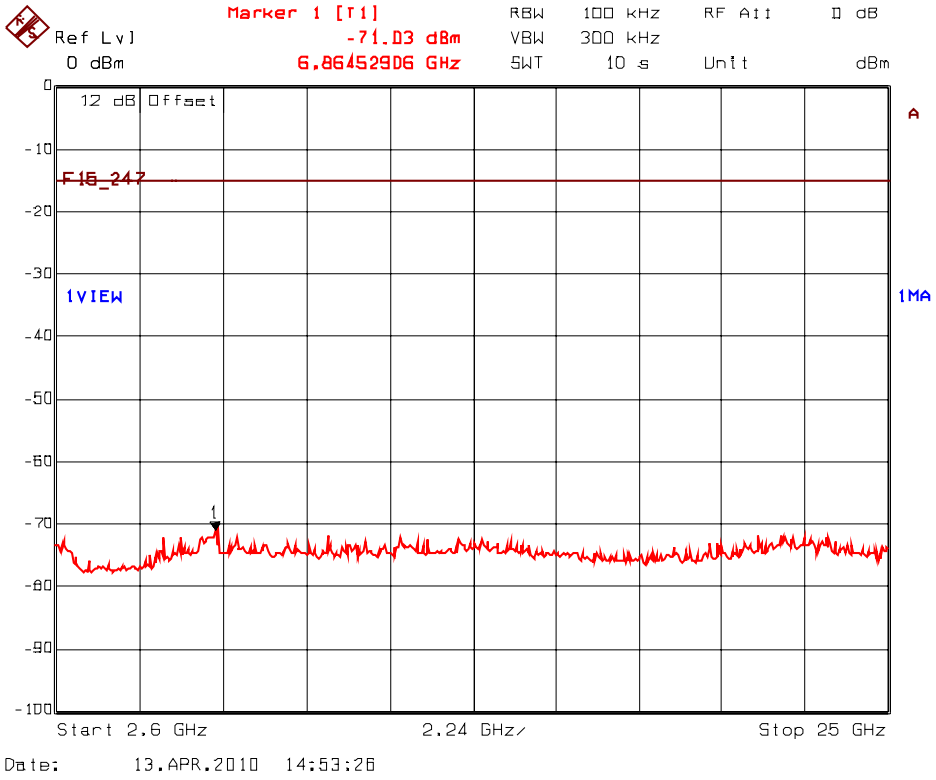
Plot 5.8.4.2.6. Spurious RF Conducted Emissions
Transmitter Frequency: 2475 MHz, High Power



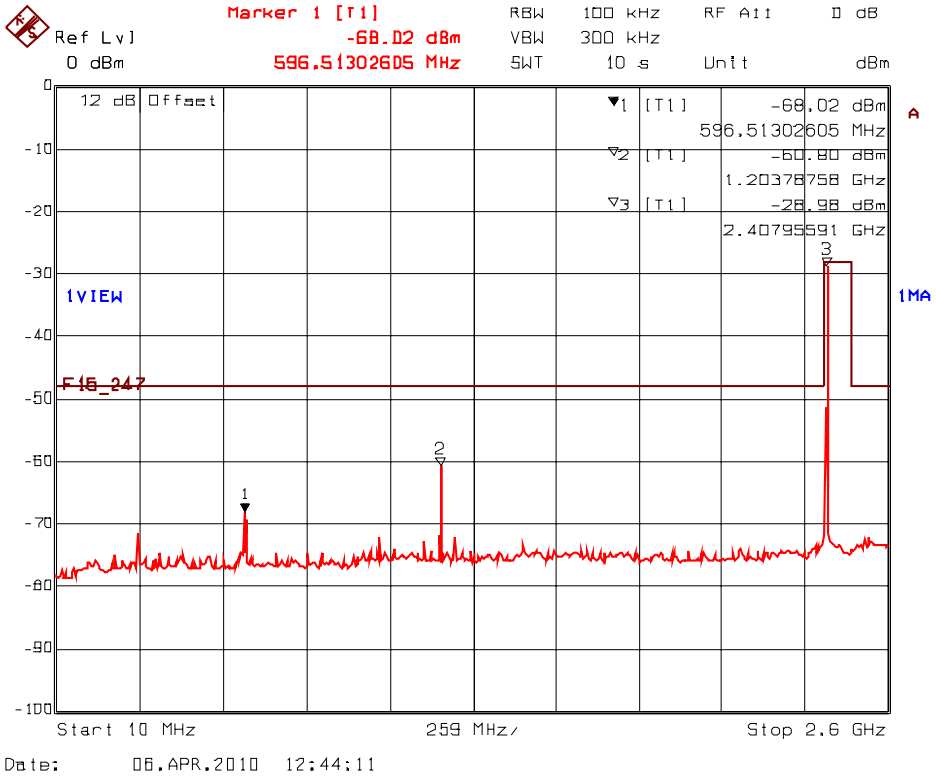
Plot 5.8.4.2.7. Spurious RF Conducted Emissions
Transmitter Frequency: 2480 MHz, High Power



Plot 5.8.4.2.8. Spurious RF Conducted Emissions
Transmitter Frequency: 2480 MHz, High Power

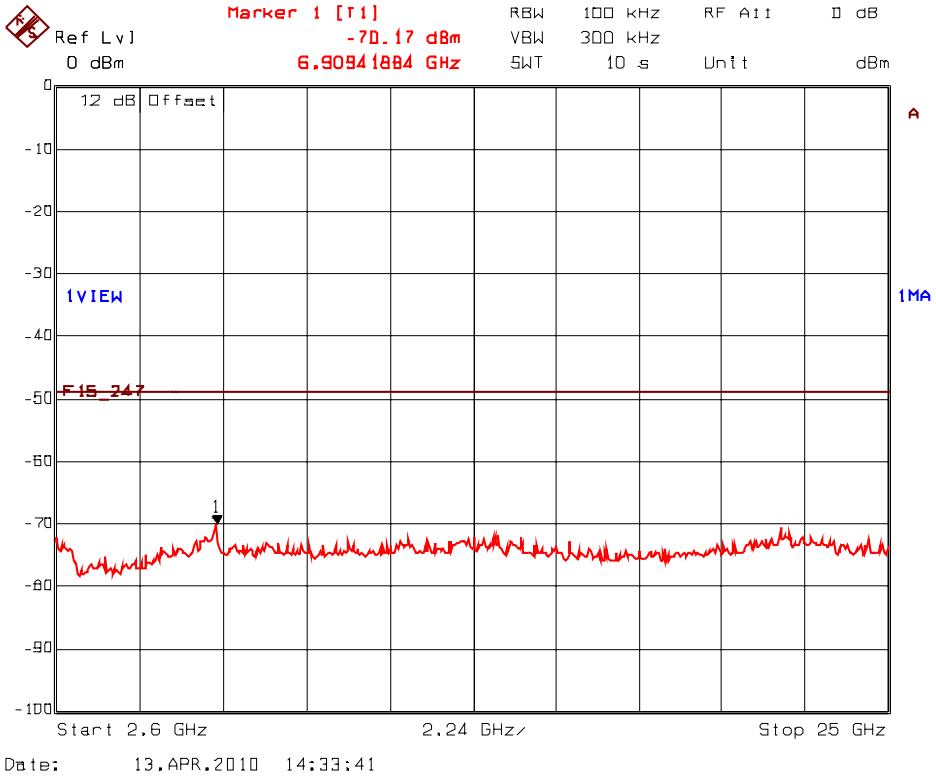


Plot 5.8.4.2.9. Spurious RF Conducted Emissions
Transmitter Frequency: 2405 MHz, Low Power

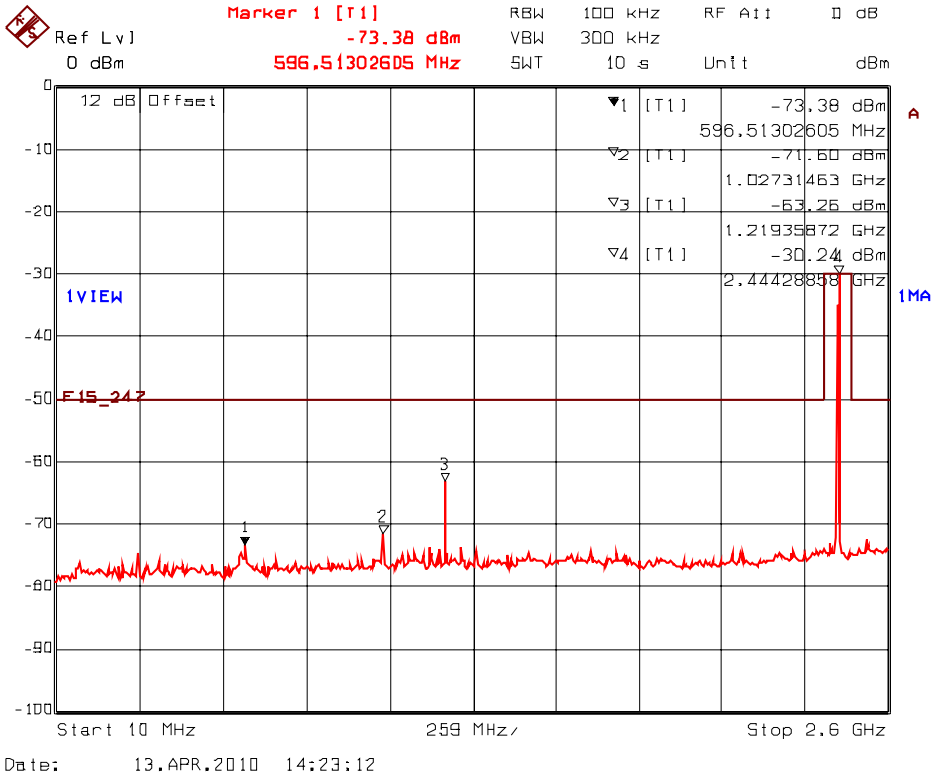


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

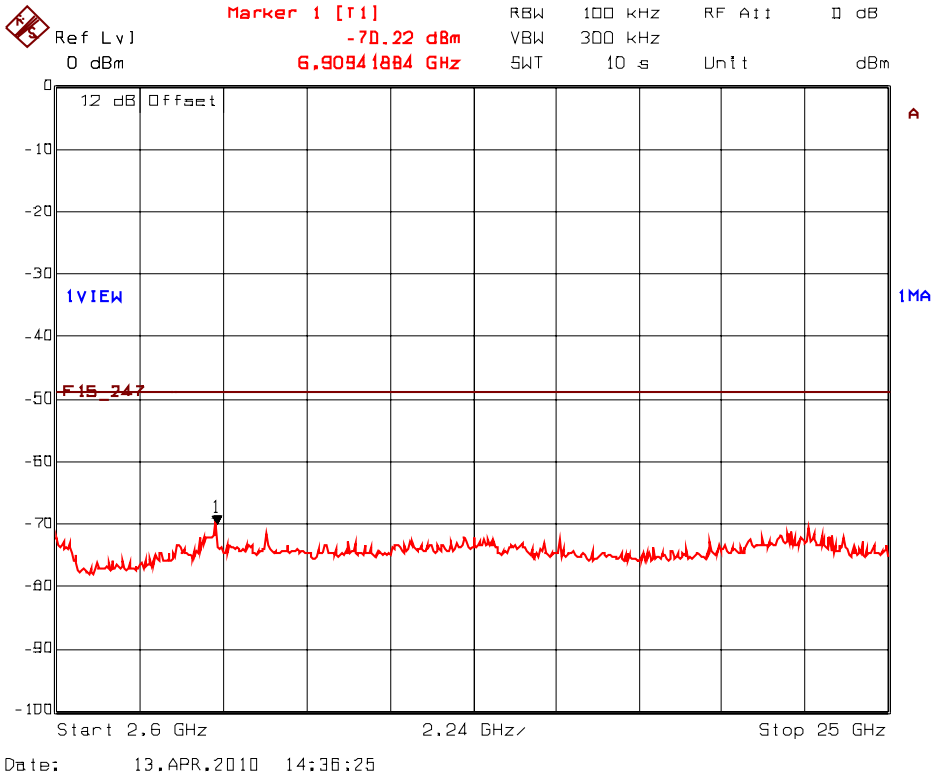
Plot 5.8.4.2.10. Spurious RF Conducted Emissions
Transmitter Frequency: 2405 MHz, Low Power



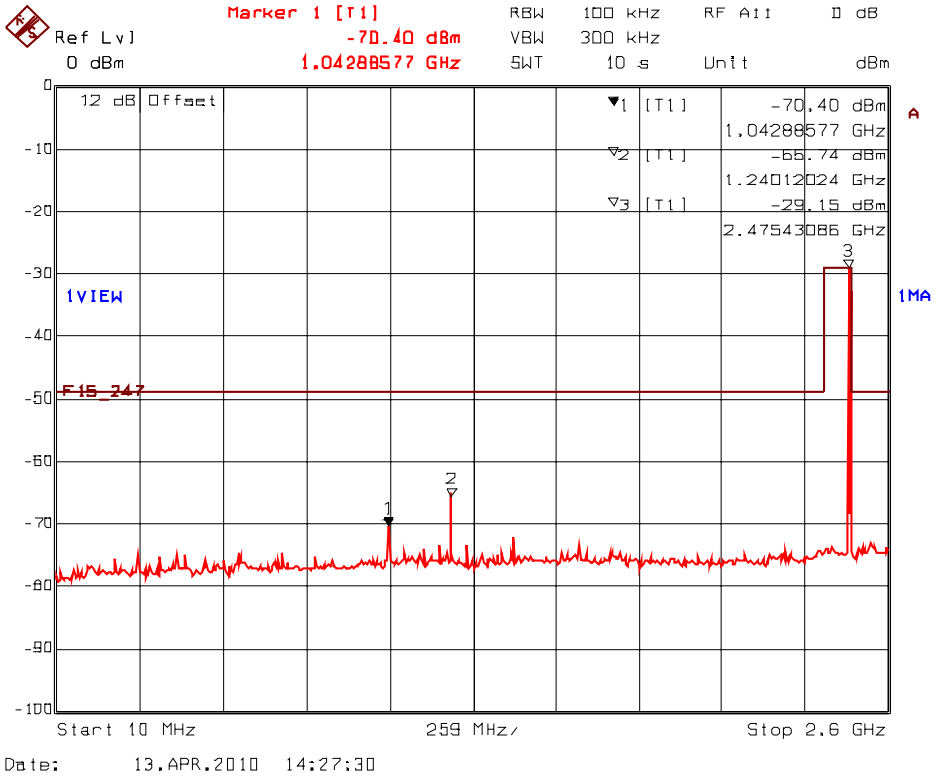
Plot 5.8.4.2.11. Spurious RF Conducted Emissions
Transmitter Frequency: 2440 MHz, Low Power



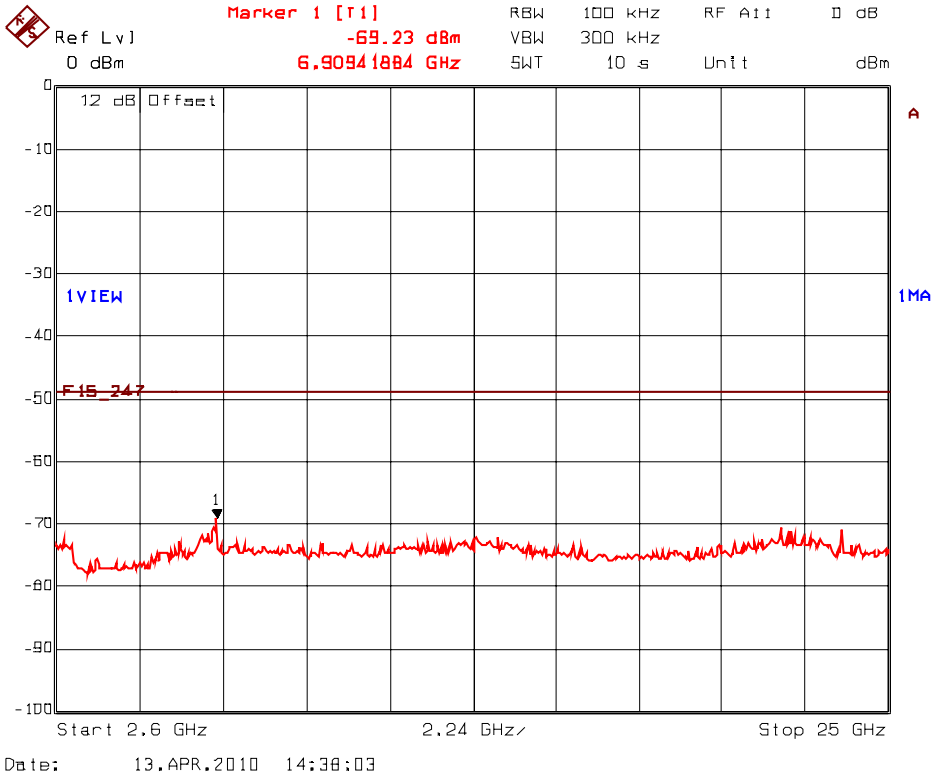
Plot 5.8.4.2.12. Spurious RF Conducted Emissions
Transmitter Frequency: 2440 MHz, Low Power



Plot 5.8.4.2.13. Spurious RF Conducted Emissions
Transmitter Frequency: 2475 MHz, Low Power

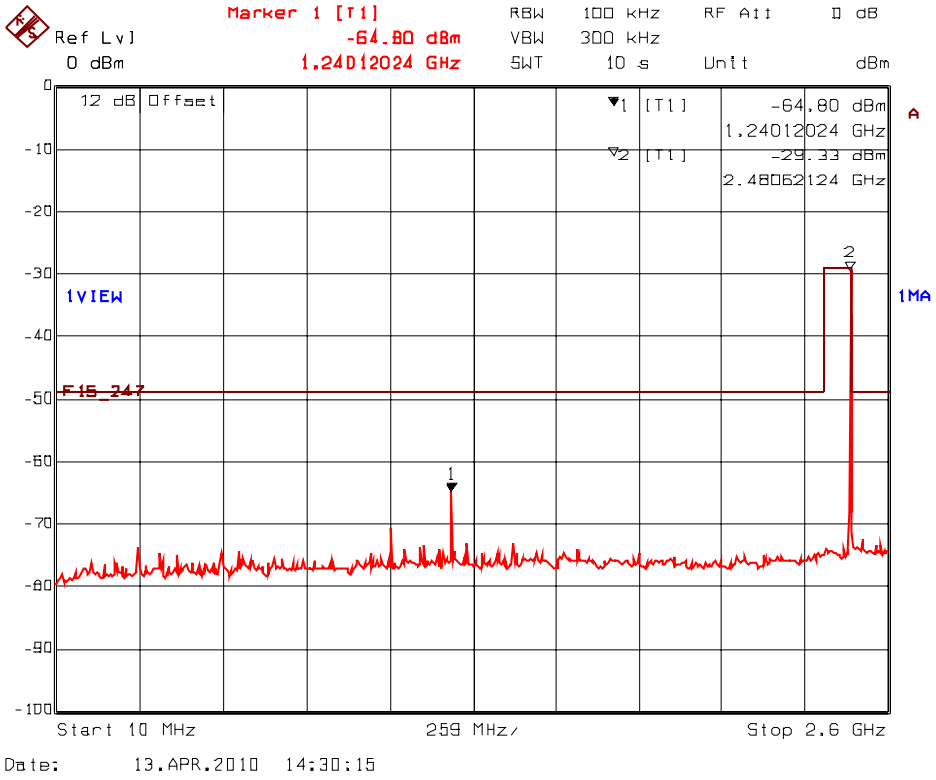


Plot 5.8.4.2.14. Spurious RF Conducted Emissions
Transmitter Frequency: 2475 MHz, Low Power

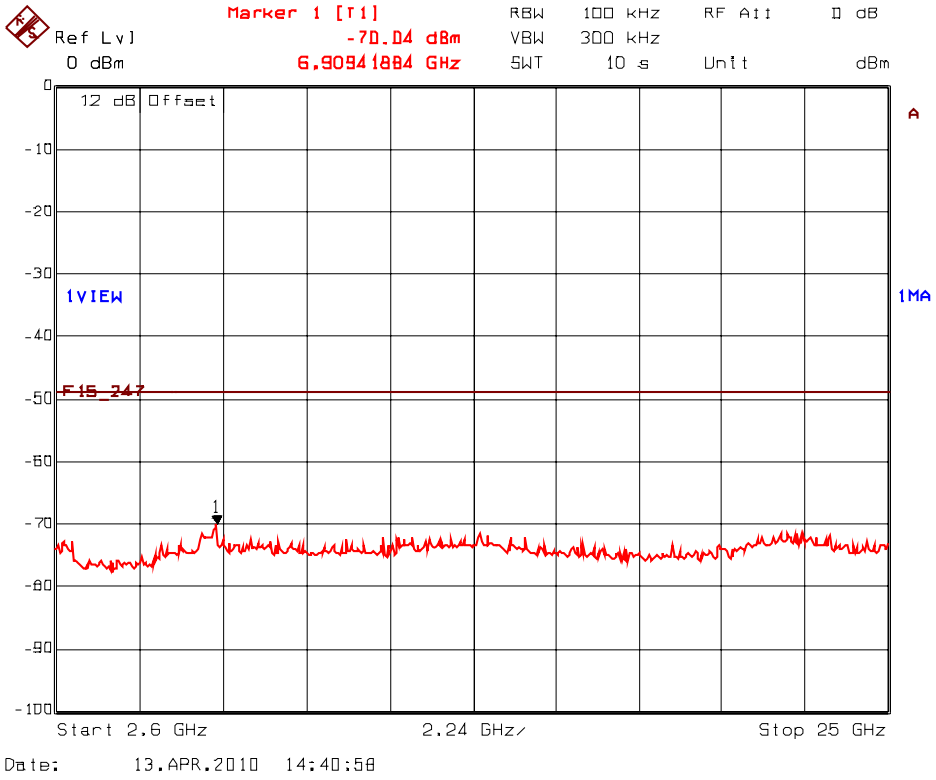


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.8.4.2.15. Spurious RF Conducted Emissions
Transmitter Frequency: 2480 MHz, Low Power



Plot 5.8.4.2.16. Spurious RF Conducted Emissions
Transmitter Frequency: 2480 MHz, Low Power



5.9. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.9.1. Limit(s)

§ 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

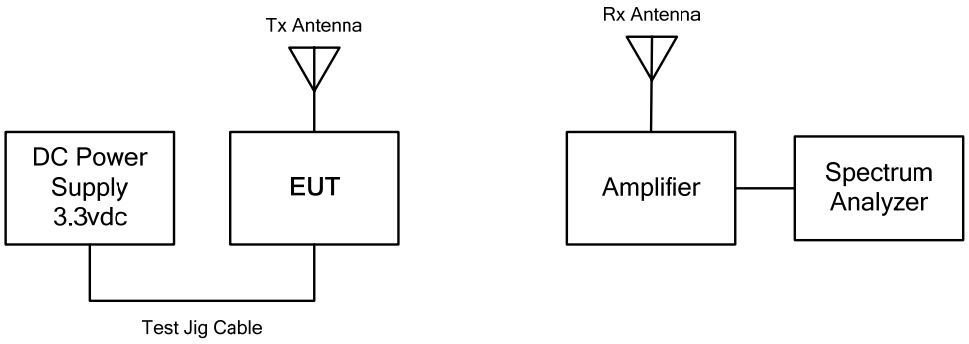
Section 15.209(a)
– Field Strength Limits within Restricted Frequency Bands --

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.9.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247) and ANSI C63.10.

5.9.3. Test Arrangement



5.9.4. Test Data

Remarks:

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- The following test results are the worst-case measurements.
- A duty cycle correction factor of 27% (-11.37dB) shall be applied to a measurement made with an average detector.
- Band-edges compliance condition: EUT connected to antennas via antenna feedline must have a minimum cable loss as specified in the test configurations and the following table.

Antenna Type	Maximum Antenna Gain (dBi)	Minimum Cable Loss (dB)	
		2405 - 2475 MHz	2480 MHz
Dipole Antenna	2.1	0.62	0.62
Omni Directional Antenna	15	0.62	5.12
Yagi Antenna	15	0.62	9.12
Panel Antenna	19	0.62	13.62
Integrated PCB/Monopole Antenna	1.5	N/A	N/A

5.9.4.1. EUT with Dipole Antenna (2.1 dBi Gain with 0.62 dB Cable Loss)

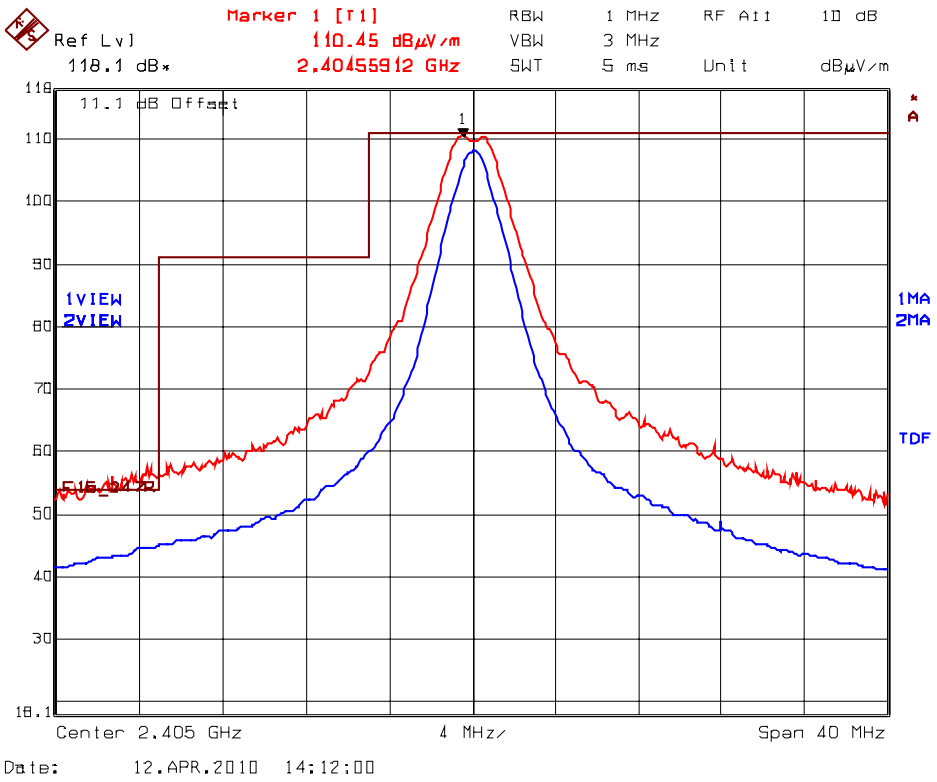
Fundamental Frequency:	2405 MHz
Test Frequency Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	103.55	--	V	--	--	--	--
2405	110.45	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	90.5	*	Pass

*The spurious emissions from intentional radiators are more than 20 dB below the specified imit.

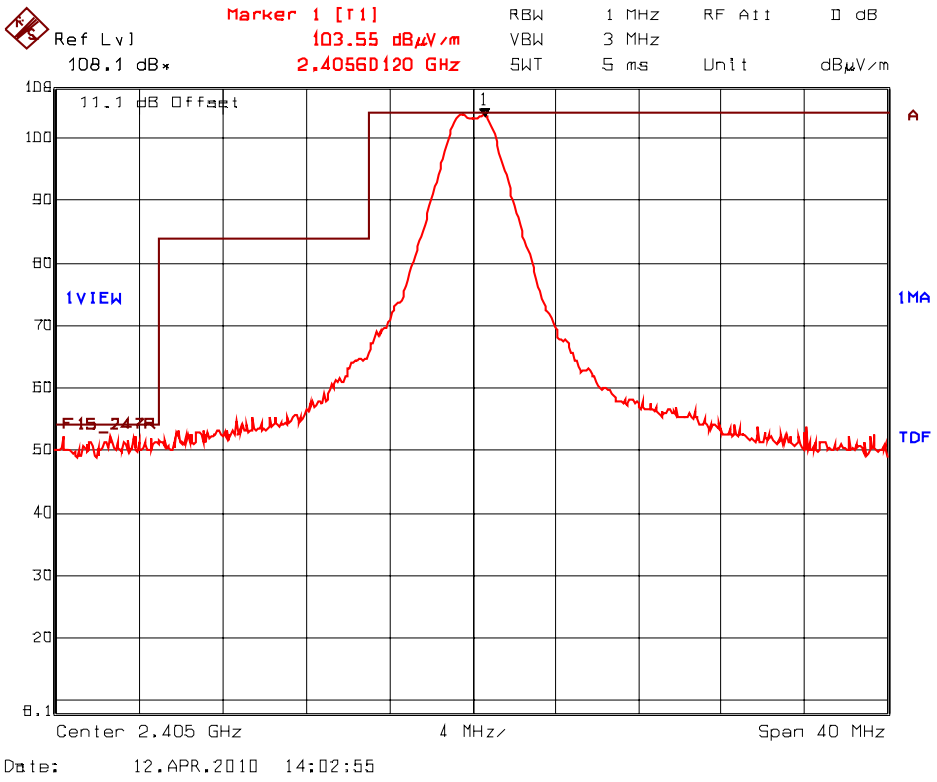
See the following test data plots for band-edge emissions.

Plot 5.9.4.1.1. Band-Edge RF Radiated Emissions @ 3 m
Low End of Frequency Band, 2405 MHz
Rx Antenna Orientation: Horizontal



Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz

Plot 5.9.4.1.2. Band-Edge RF Radiated Emissions @ 3 m
Low End of Frequency Band, 2405 MHz
Rx Antenna Orientation: Vertical



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Fundamental Frequency:	2440 MHz
Test Frequency Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2440	104.05	--	V	--	--	--	--
2440	110.24	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	90.2	*	Pass

*The spurious emissions from intentional radiators are more than 20 dB below the specified imit.

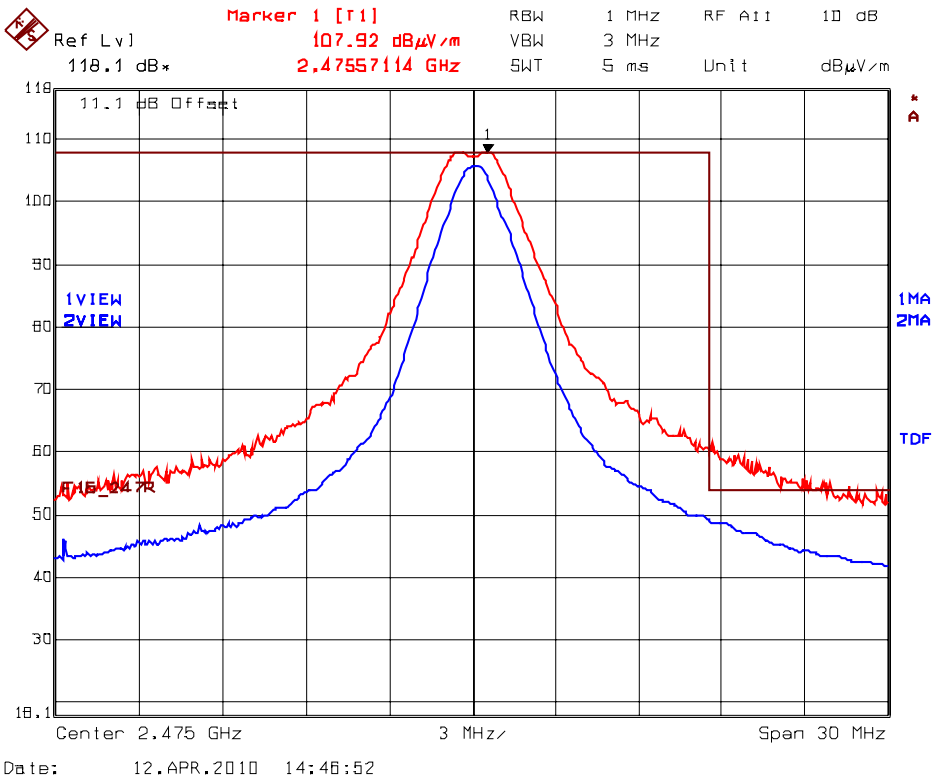
Fundamental Frequency:	2475 MHz
Test Frequency Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2475	105.15	--	V	--	--	--	--
2475	107.92	--	H	--	--	--	--
30 - 25000	*	*	V/H	*	87.9	*	Pass

*The spurious emissions from intentional radiators are more than 20 dB below the specified imit.

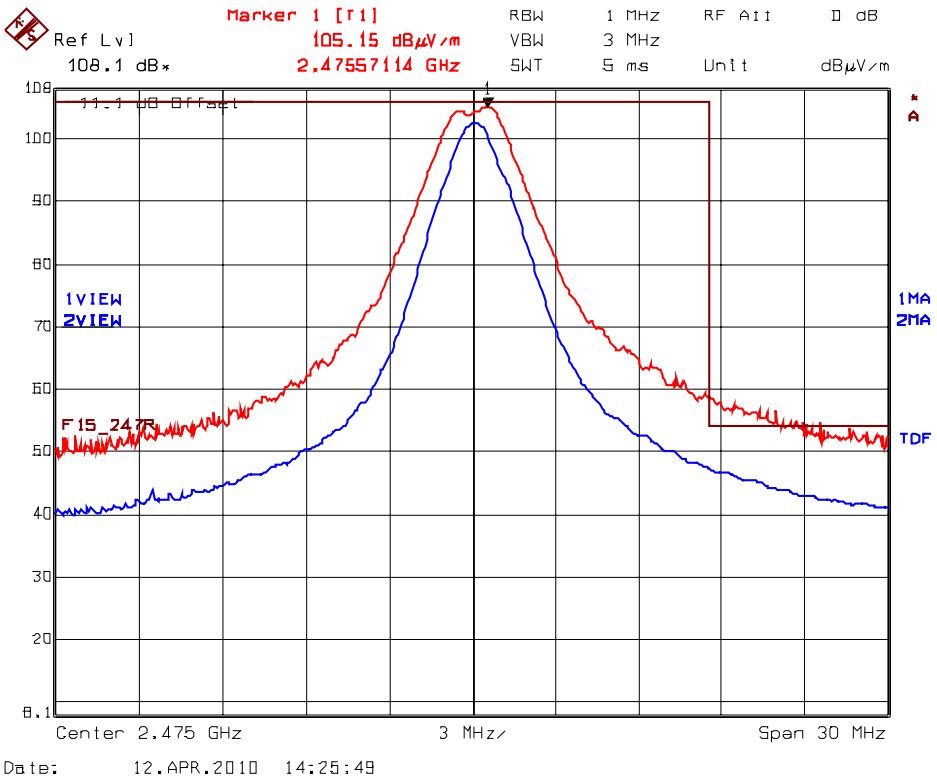
See the following test data plots for band-edge emissions.

Plot 5.9.4.1.3. Band-Edge RF Radiated Emissions @ 3 m
Low End of Frequency Band, 2475 MHz
Rx Antenna Orientation: Horizontal



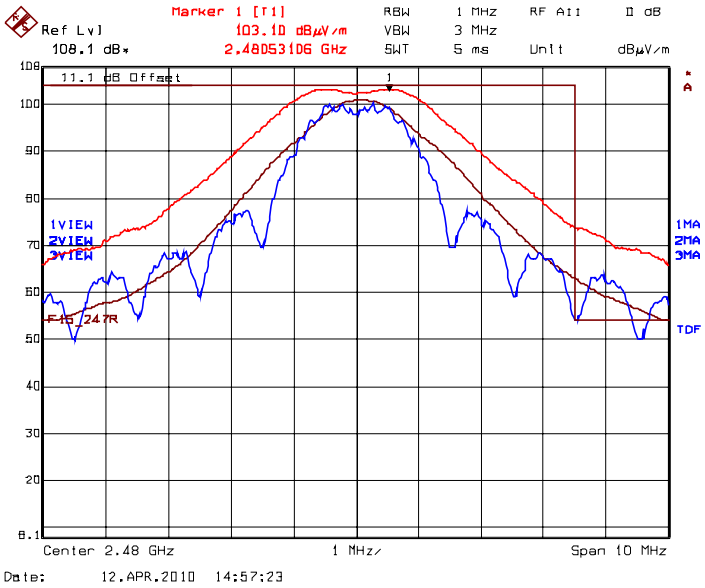
Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz

Plot 5.9.4.1.4. Band-Edge RF Radiated Emissions @ 3 m
Low End of Frequency Band, 2475 MHz
Rx Antenna Orientation: Vertical

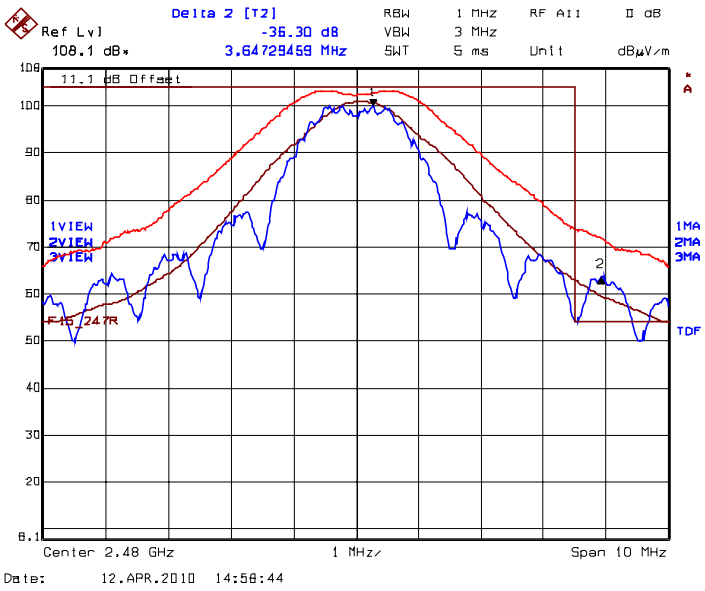


Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz

Plot 5.9.4.1.5. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Horizontal

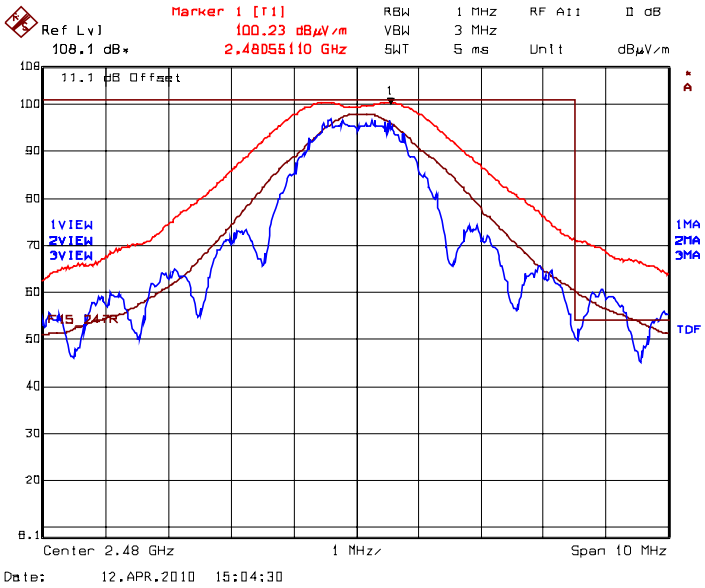


Plot 5.9.4.1.6. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Horizontal

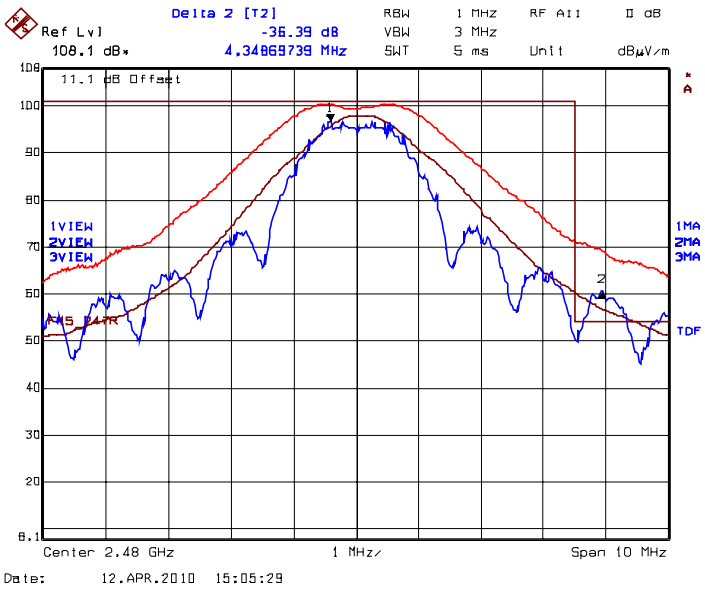


Trace 1: RBW= 1 MHz, VBW= 3 MHz
Trace 2: RBW= 100 kHz, VBW= 300 kHz, Delta (Peak to Band-Edge): 36.30dB
Trace 3: RBW= 1 MHz, VBW= 10 Hz
Peak Band-Edge at 2483.5 MHz: Peak = 103.10 dBµV/m – 36.30 dB = 66.80 dBµV/m (limit 74 dBµV/m)
Average: 62.78 dBµV/m – 11.37dB= 51.41 dBµV/m (limit 54 dBµV/m)

Plot 5.9.4.1.7. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Vertical



Plot 5.9.4.1.8. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Vertical



Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 100 kHz, VBW = 300 kHz, Delta (Peak to Band-Edge): 36.39 dB
Trace 3: RBW = 1 MHz, VBW = 10 Hz
Peak Band-Edge at 2483.5 MHz: Peak = 100.23 dBµV/m – 36.39 dB= 63.84 dBµV/m (limit 74 dBµV/m)
Average: 60.23 dBµV/m – 11.37 dB = 48.86 dBµV/m (limit 54 dBµV/m)

5.9.4.2. EUT with Omni Directional Antenna (15 dBi Gain with 0.62 dB Cable Loss (for 2405-2475 MHz) or 5.12 dB Cable Loss (for 2480MHz))

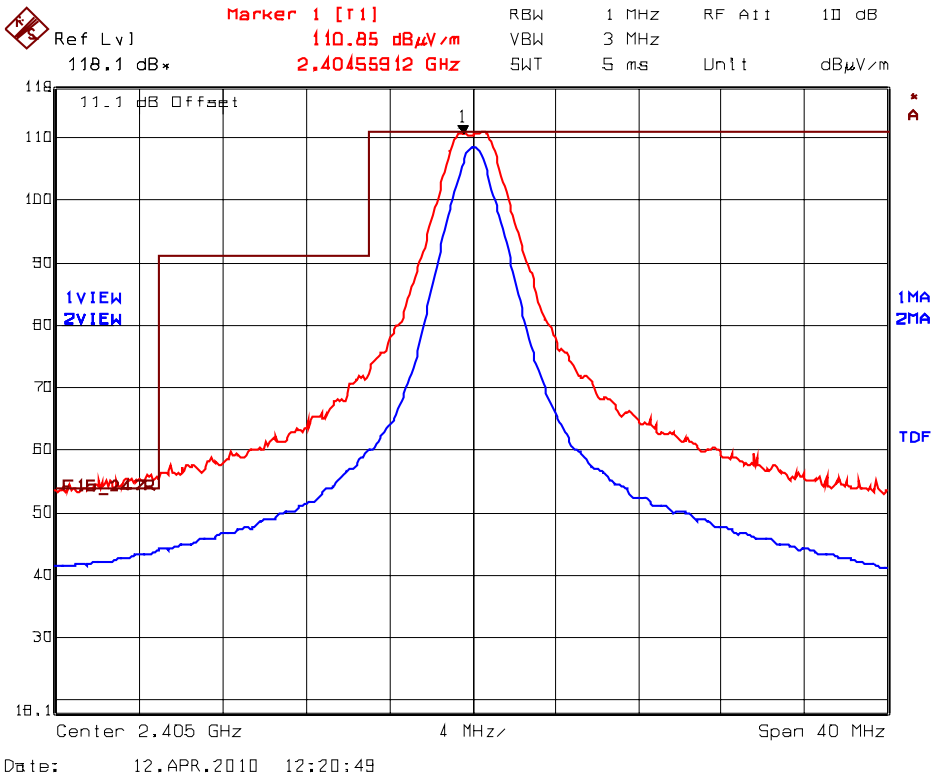
Fundamental Frequency:	2405 MHz
Test Frequency Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	116.47	–	V	--	--	–	--
2405	110.85	--	H	--	--	–	--
30 -25000	*	*	V/H	*	96.5	*	Pass

*The spurious emissions from intentional radiators are more than 20 dB below the specified imit.

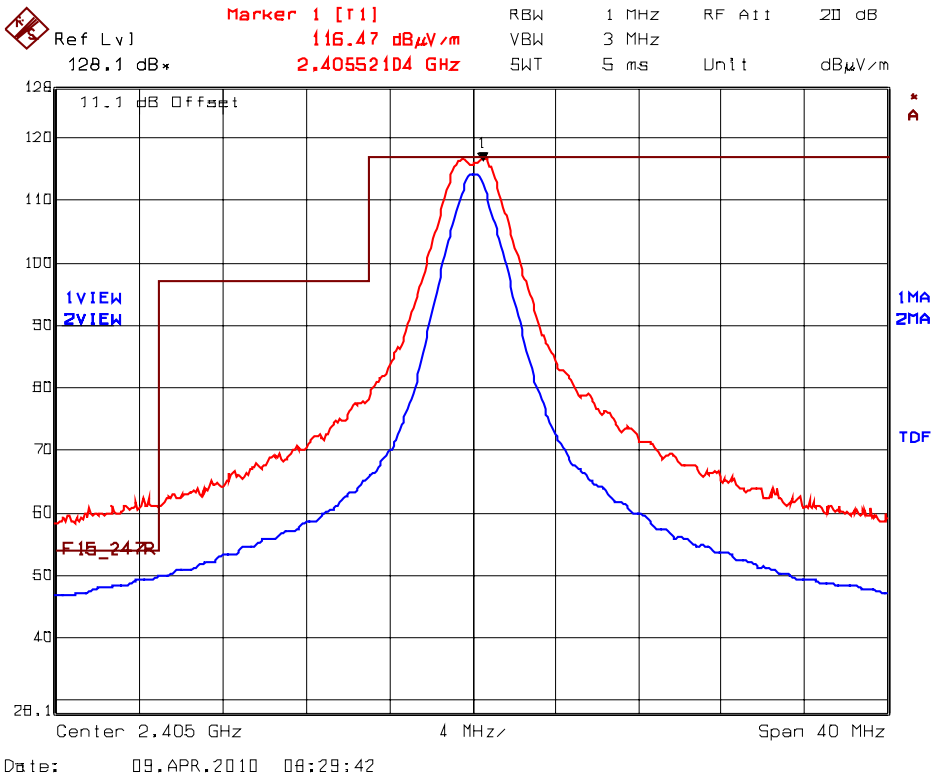
See the following test data plots for band-edge emissions.

Plot 5.9.4.2.1. Band-Edge RF Radiated Emissions @ 3 m
Low End of Frequency Band, 2405 MHz
Rx Antenna Orientation: Horizontal



Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz

Plot 5.9.4.2.2. Band-Edge RF Radiated Emissions @ 3 m
Low End of Frequency Band, 2405 MHz
Rx Antenna Orientation: Vertical



Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz

Fundamental Frequency:	2440 MHz						
Test Frequency Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2440	115.89	--	V	--	--	--	--
2440	110.55	--	H	--	--	--	--
7320	57.50	35.46	V	54.0	95.9	-18.5	Pass*
7320	57.76	36.12	H	54.0	95.9	-17.9	Pass*

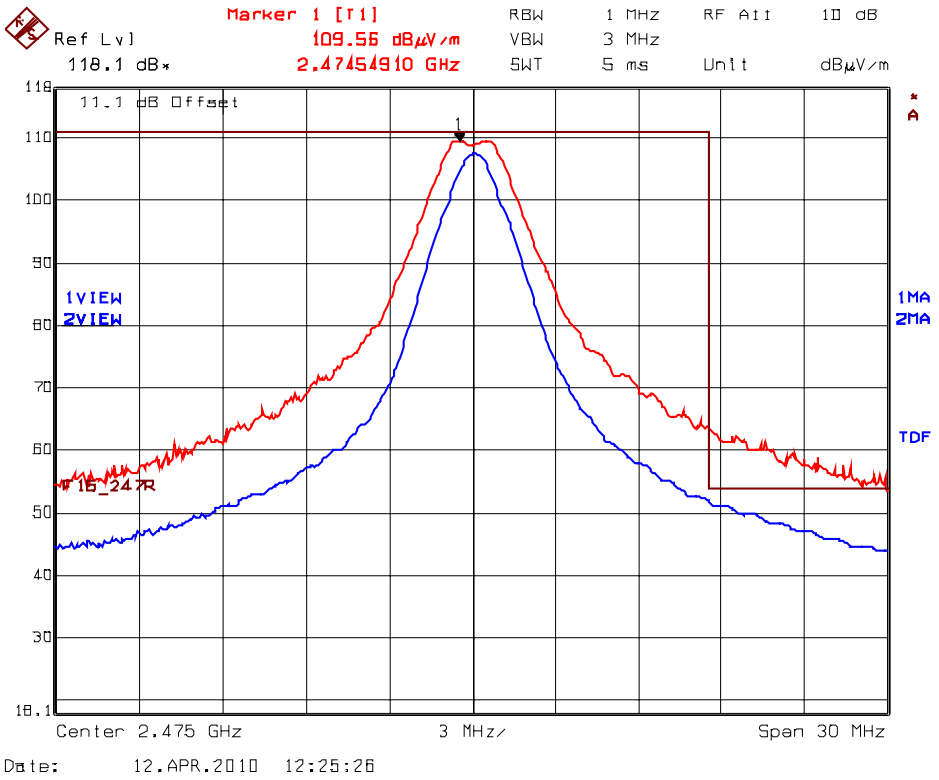
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	2475 MHz						
Test Frequency Range:	30 MHz – 25 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit 15.209 (dBµV/m)**	**Limit 15.247 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
2475	113.08	--	V	--	--	--	--
2475	109.56	--	H	--	--	--	--
7425	59.08	36.78	V	54.0	93.1	-17.2	Pass*
7425	57.42	35.01	H	54.0	93.1	-19.0	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

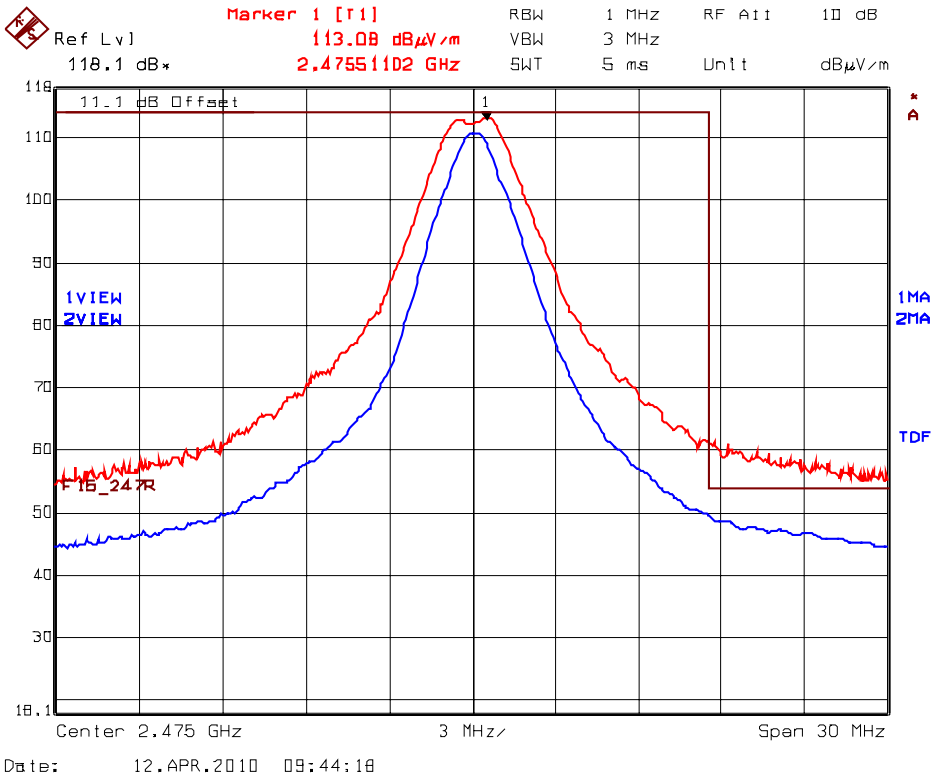
See the following test data plots for band-edge emissions.

Plot 5.9.4.2.3. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2475 MHz
Rx Antenna Orientation: Horizontal



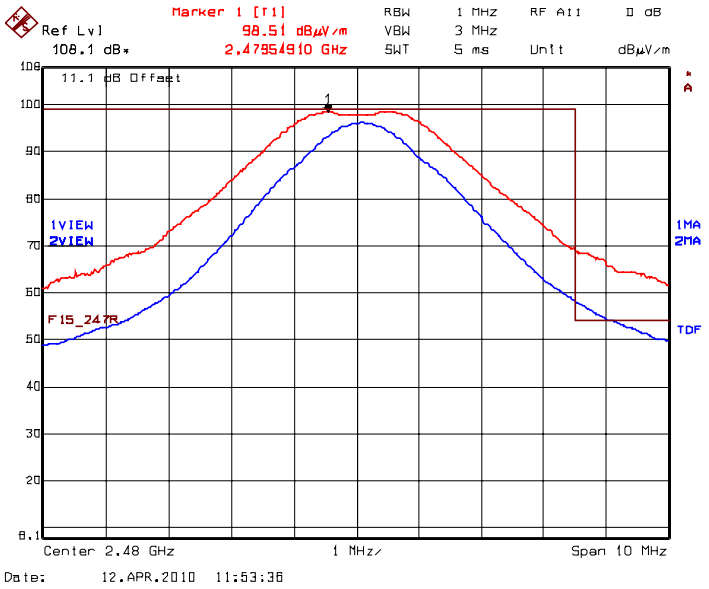
Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz

Plot 5.9.4.2.4. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2475 MHz
Rx Antenna Orientation: Vertical

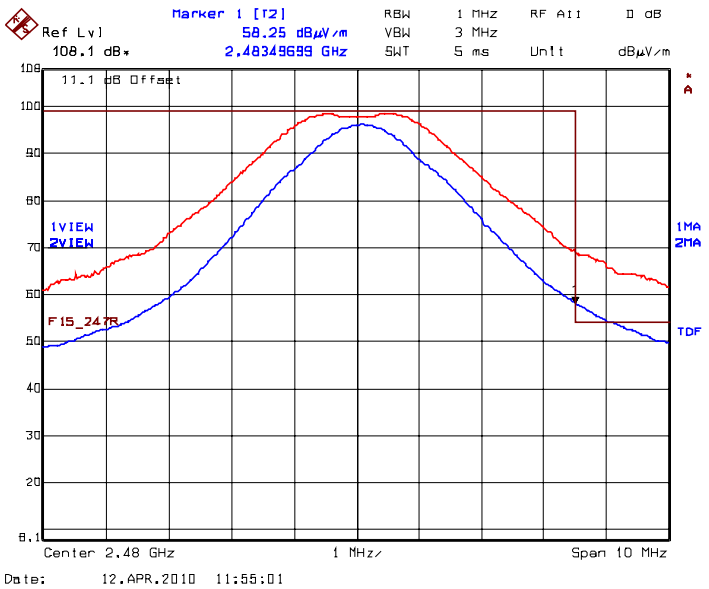


Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz

Plot 5.9.4.2.5. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Horizontal

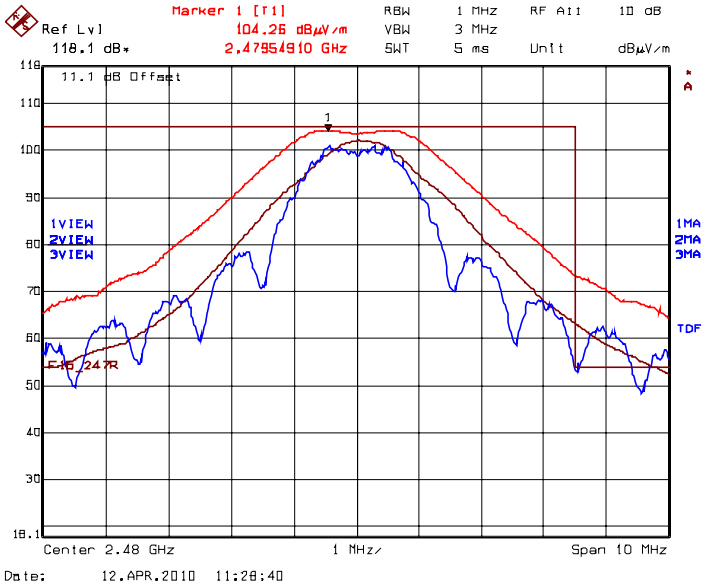


Plot 5.9.4.2.6. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Horizontal

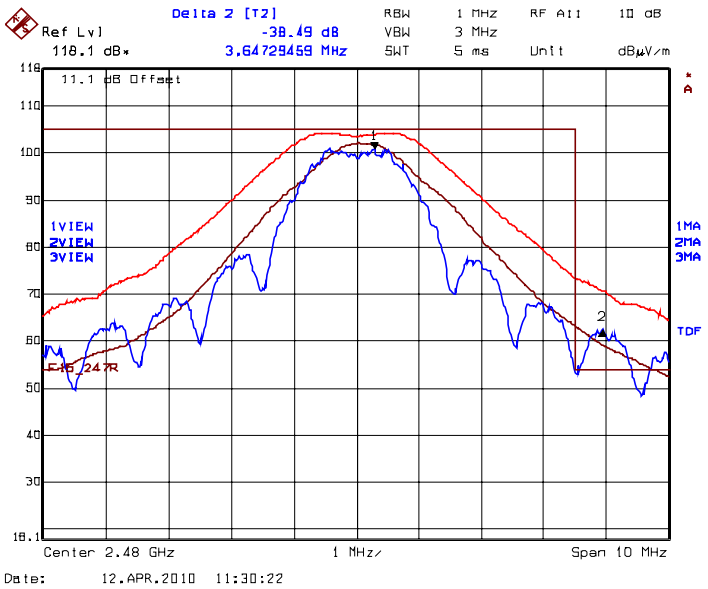


Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 1 MHz, VBW = 10 Hz
Average: 58.25 dBµV/m – 11.37 dB = 46.88 dBµV/m (limit 54 dBµV/m)

Plot 5.9.4.2.7. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Vertical



Plot 5.9.4.2.8. Band-Edge RF Radiated Emissions @ 3 m
High End of Frequency Band, 2480 MHz, Rx Antenna Orientation: Vertical



Trace 1: RBW = 1 MHz, VBW = 3 MHz
Trace 2: RBW = 100 kHz, VBW = 300 kHz, Delta (Peak to Band-Edge): 38.49dB
Trace 3: RBW = 1 MHz, VBW = 10 Hz
Peak Band-Edge at 2483.5 MHz: Peak = 104.26 dBµV/m - 38.49 dB = 65.77 dBµV/m (limit 74 dBµV/m)
Average: 63.19 dBµV/m - 11.37 dB = 51.82 dBµV/m (limit 54 dBµV/m)

5.9.4.3. EUT with Yagi Antenna (15 dBi Gain with 0.62 dB Cable Loss (for 2405-2475 MHz) or 9.12 dB Cable Loss (for 2480 MHz))

Fundamental Frequency:	2405 MHz
Test Frequency Range:	30 MHz – 25 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
2405	116.47	–	V	--	--	–	--
2405	116.13	--	H	--	--	–	--
30-25000	*	*	V/H	*	96.5	*	Pass

*The spurious emissions from intentional radiators are more than 20 dB below the specified imit.

See the following test data plots for band-edge emissions.