Nemko Test Report: 10217451RUS1rev1

Applicant: AgileMesh, Inc.
1761 International ParkwaySuite 113
Richardson TX 75081
USA

Equipment Under Test: (E.U.T.) DNMA92AM

FCC ID.: TTHDNMA92AM
IC: 10127A-DNMA92AM

In Accordance With: **FCC Part 15, Subpart C, 15.247 and Industry Canada, RSS-210 Issue 8**
Digital Transmission Systems

Tested By: Nemko USA, Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

TESTED BY: _____ **DATE:** **13 January 2012**
David Light, Senior Wireless Engineer

APPROVED BY: _____ **DATE:** **17-Jan-2012**
Michael Cantwell, GM

Number of Pages: 51

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Section 1. Summary of Test Results

Manufacturer: AgileMesh, Inc.

Model No.: DNMA92AM

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 and Industry Canada RSS-210, Issue 8 for Digital Transmission Systems. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC and Industry Canada.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP®
LAB CODE: 100426-0

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a) / RSS-Gen 7.2.4	Complies
Minimum 6 dB Bandwidth	15.247(a)(2) / A8.2(a)	Complies
Maximum Peak Power Output	15.247(b)(3) / A8.4(4)	Complies
Spurious Emissions (Antenna Conducted)	15.247(d) / A8.5	Complies
Spurious Emissions (Restricted Bands)	15.247(d)/15.209(a) / RSS-Gen 7.2.2	Complies
Peak Power Spectral Density	15.247(e) / A8.2(b)	Complies

Revisions:

Rev1: Added data for Industry Canada to test report.

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Band (MHz):	902-928	2400-2483.5	5725-5850
	☐	☒	☒

Operating Frequency of Test Sample: 2412 to 2462 MHz
5745 to 5825 MHz

Channel Spacing: 5 MHz (2.4 Band)
20 MHz (5.8 Band)

User Frequency Adjustment: Software controlled

Description of EUT

Wireless data radio module

Section 3. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: FCC 15.247(a)(2) RSS-210 A8.2(a)
TESTED BY: David Light	DATE: 11 January 2012

Test Results: Complies.

Measurement Data: See 6 dB BW plot

Measured 6 dB bandwidth:	16.8 MHz Max
Channel Separation:	5 MHz (2.4GHz) 20 MHz (5.8GHz)

Test Conditions:

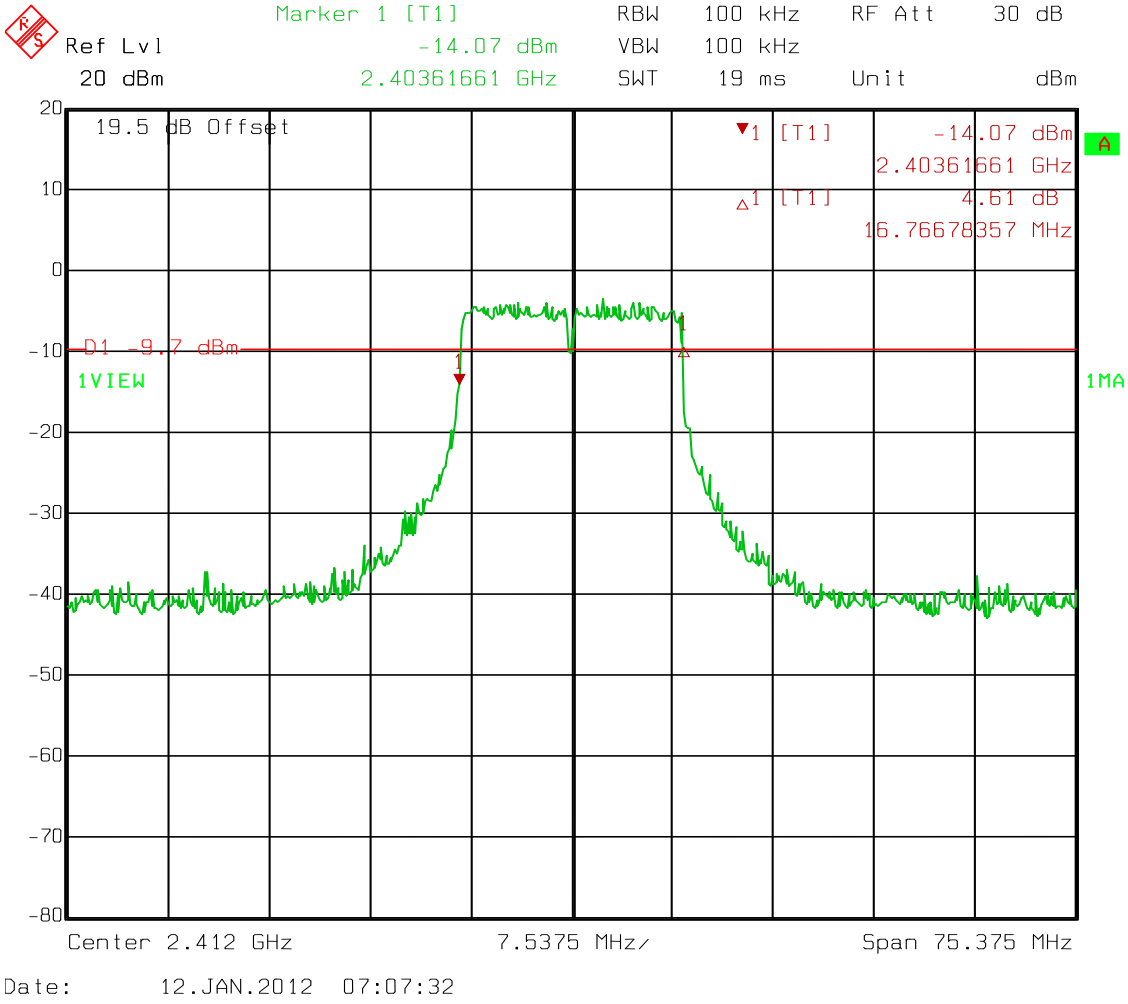
48	%RH
22	°C

Measurement Uncertainty: $+/-1x10^{-7}$ ppm

Test Equipment Used: 1472-1082-1036

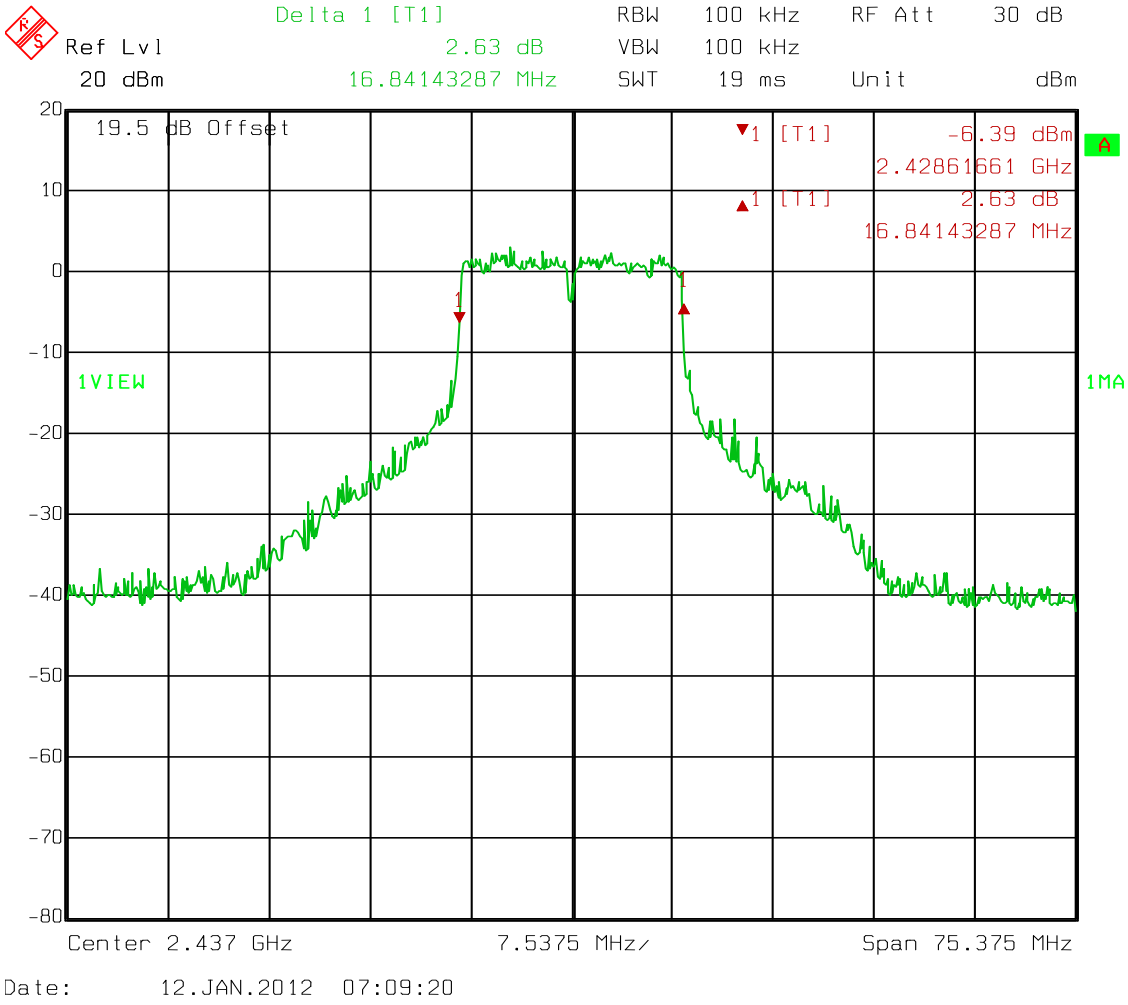
Test Data – Occupied Bandwidth

2400 MHz Band
Lowest channel
6 dB BW



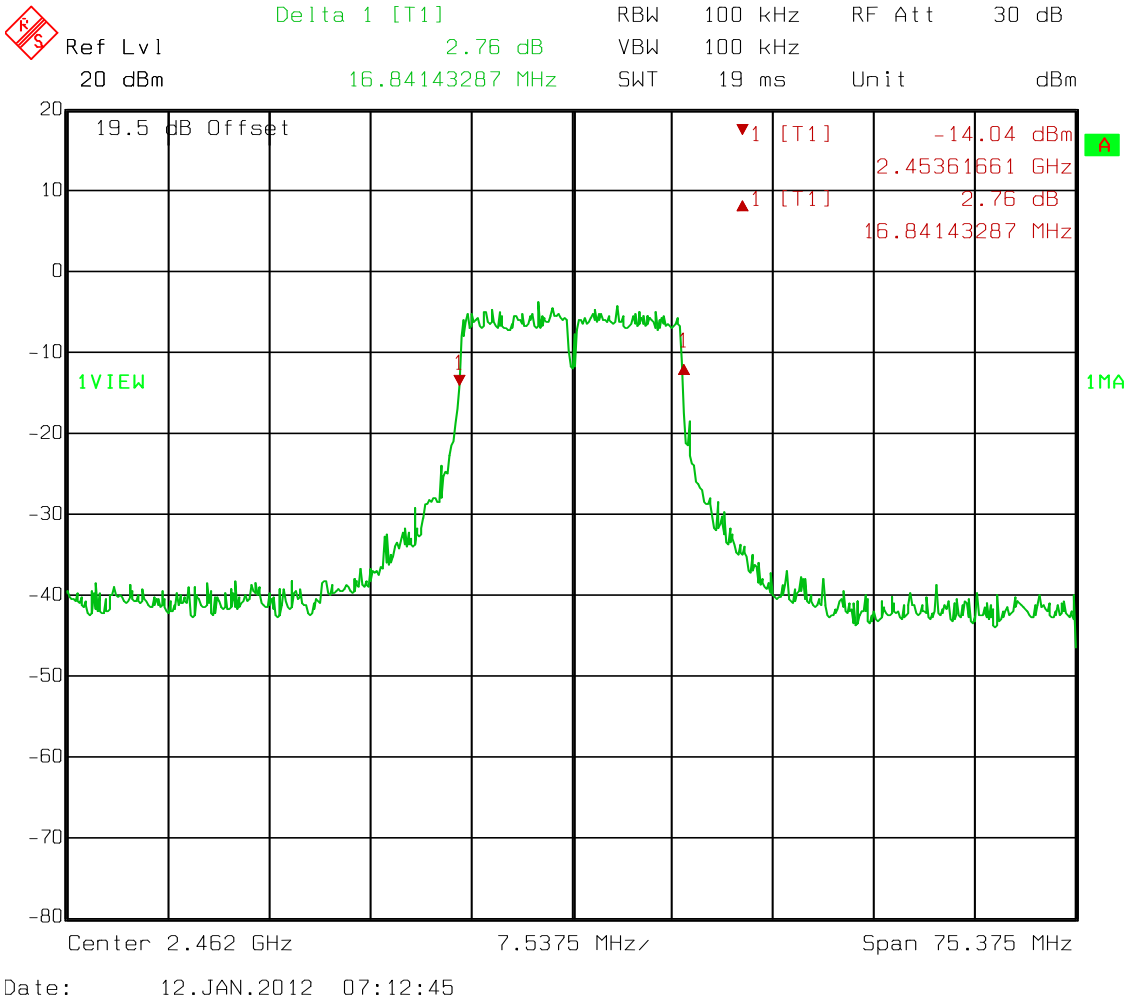
Test Data – Occupied Bandwidth

2400 MHz Band
Mid Channel
6 dB BW



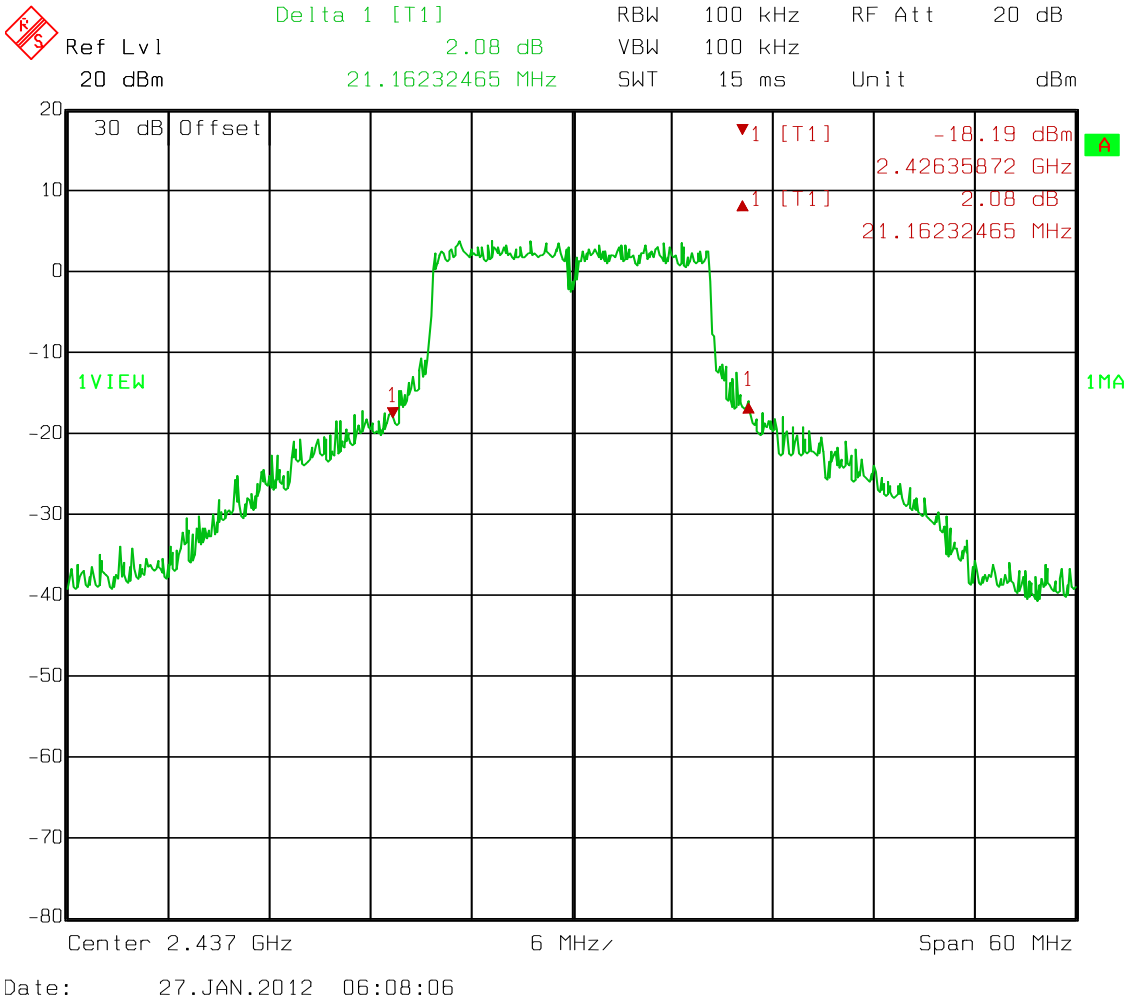
Test Data – Occupied Bandwidth

2400 MHz Band
High Channel
6 dB BW



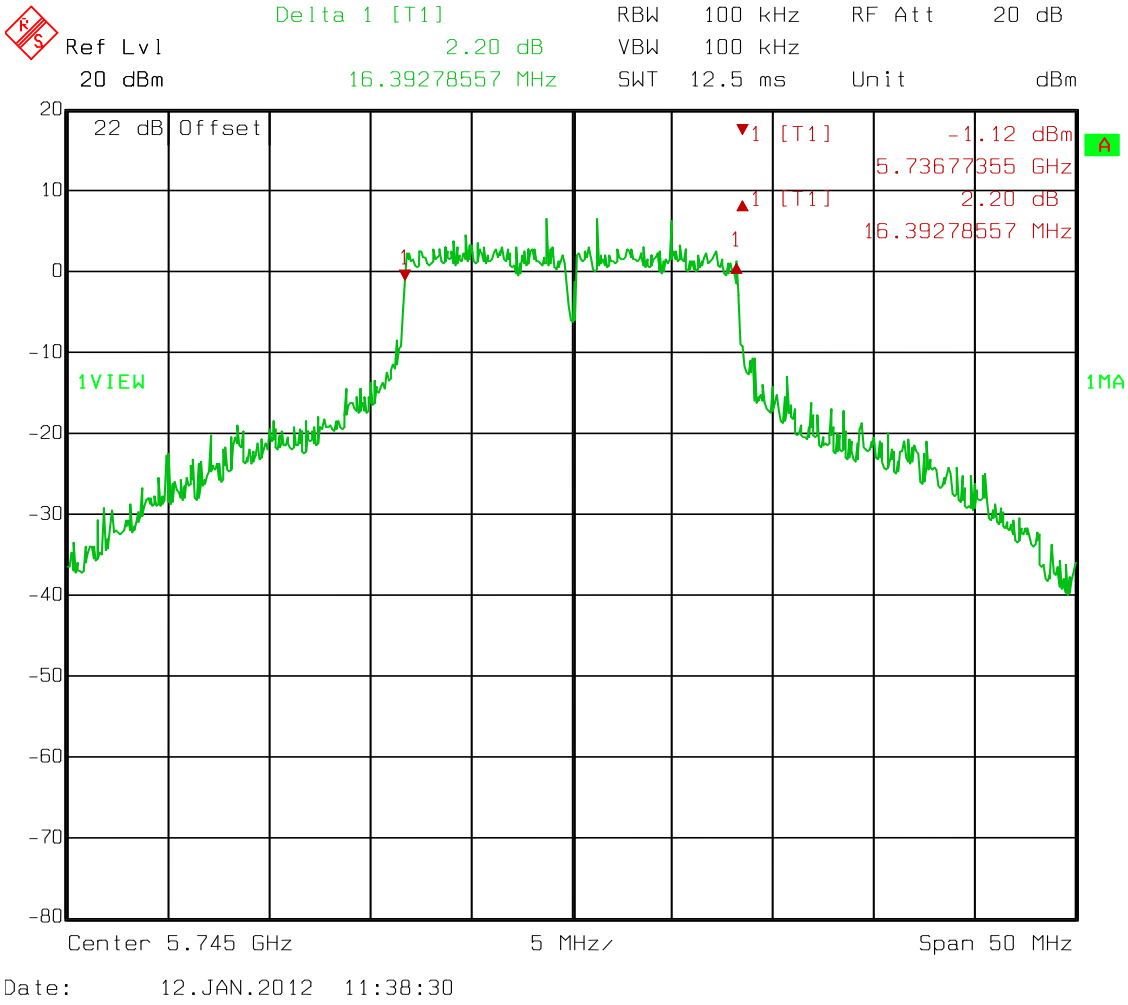
Test Data – Occupied Bandwidth

20 dB Bandwidth for Industry Canada
2400 MHz Band



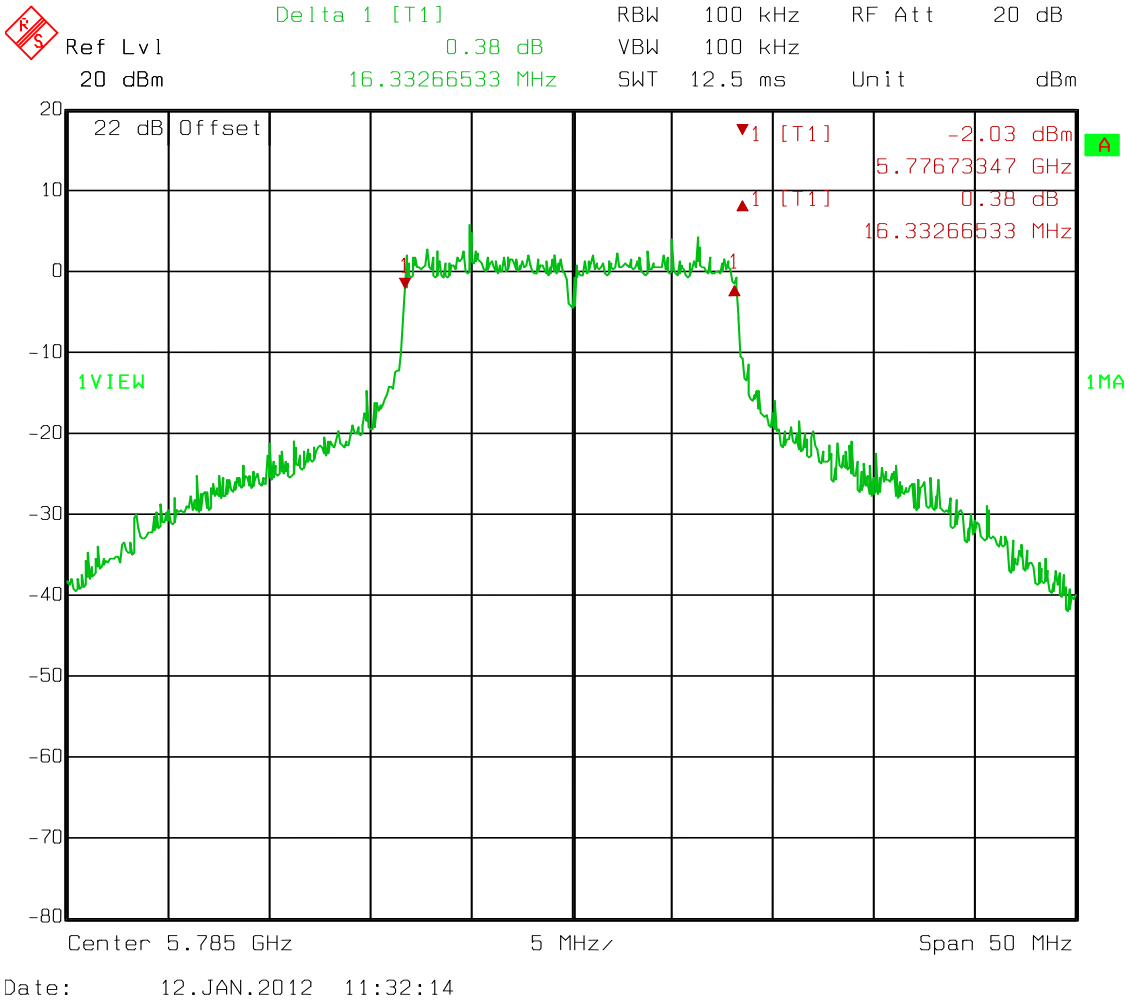
Test Data – Occupied Bandwidth

5800 MHz Band
Lowest channel
6 dB BW



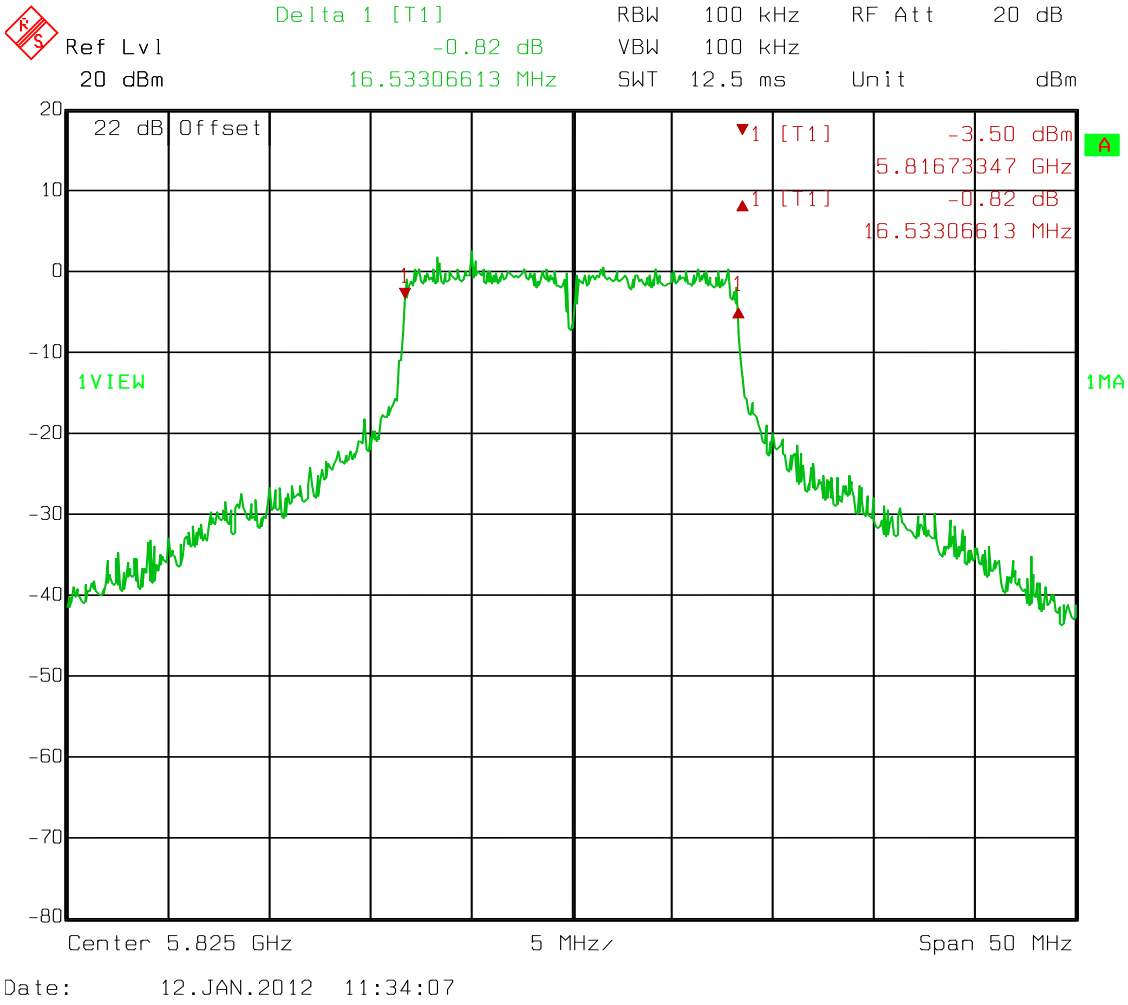
Test Data – Occupied Bandwidth

5800 MHz Band
Mid Channel
6 dB BW



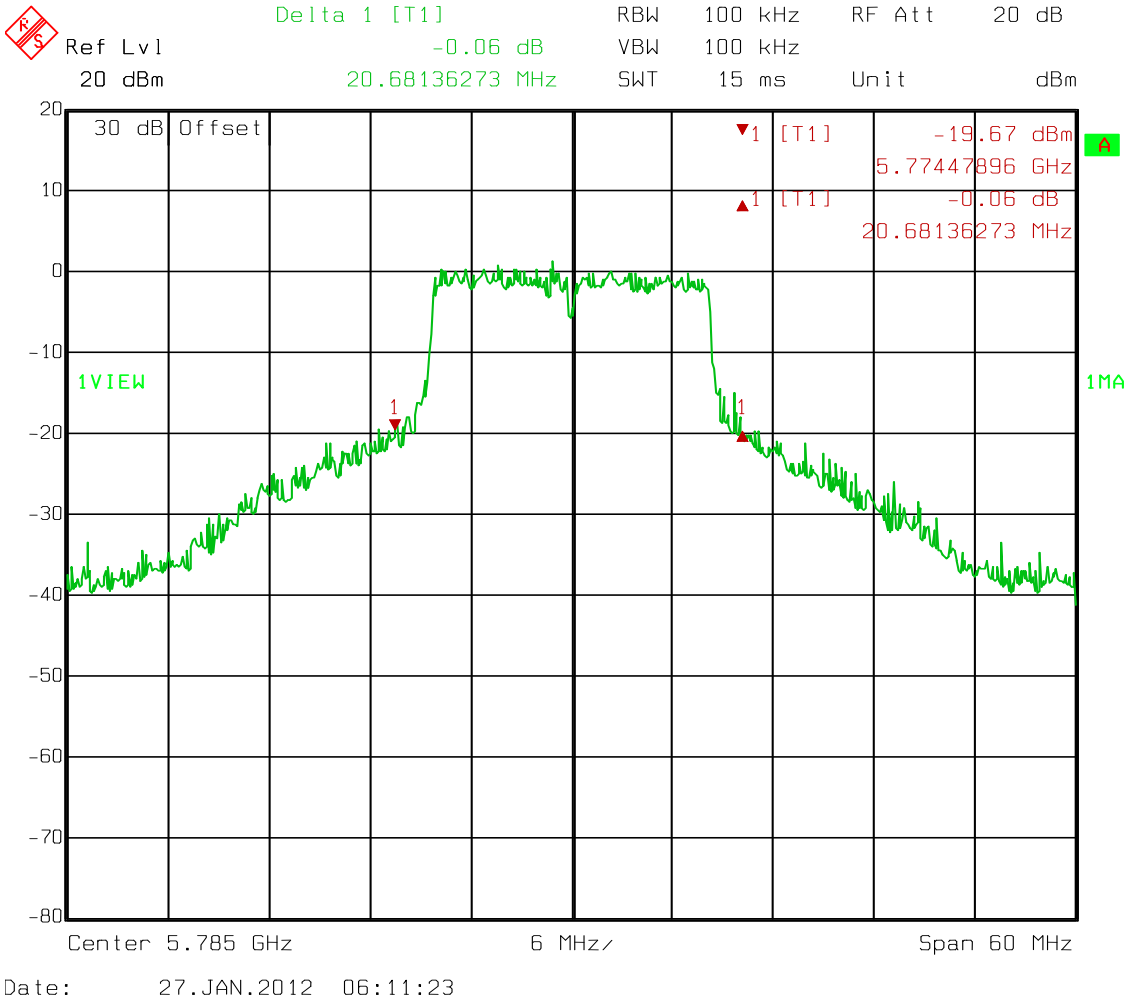
Test Data – Occupied Bandwidth

5800 MHz Band
High Channel
6 dB BW



Test Data – Occupied Bandwidth

20 dB Bandwidth for Industry Canada
5800 MHz Band



Section 4. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: FCC 15.247(b)(3) RSS-210 A8.4(4)
TESTED BY: David Light	DATE: 11 January 2012

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Power Out (dBm)	Power Out (mW)	Antenna Gain (dBi)	E.I.R.P. (dBm)
2412	16.3	43.0	7.4	23.7
2437	21.3	135.0	7.4	28.7
2462	15.6	36.0	7.4	23.0
5745	21.9	155.0	5.5	27.4
5785	21.5	141.0	5.5	27.0
5825	20.8	120.0	5.5	26.3

Test Conditions: 48 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082-1472

Spectrum analyzer settings:
RBW: 100kHz
VBW: 100 kHz
Detector: Max. Pk
Power over BW mode

☒ This device was tested at +/- 15% input power per 15.31(e), with no variation in output power.

☐ For battery powered equipment, the device was tested with a fresh battery per 15.31(e).

☒ The device was tested on three channels per 15.31(l).

Section 5 Spurious Emissions (Conducted)

NAME OF TEST: Spurious Emissions (Conducted)	PARA. NO.: FCC 15.247 (d) RSS-210 A8.5
TESTED BY: David Light	DATE: 11 January 2012

Test Results: Complies.

Measurement Data: See attached plots.

Test Conditions: 48 %RH
22 °C

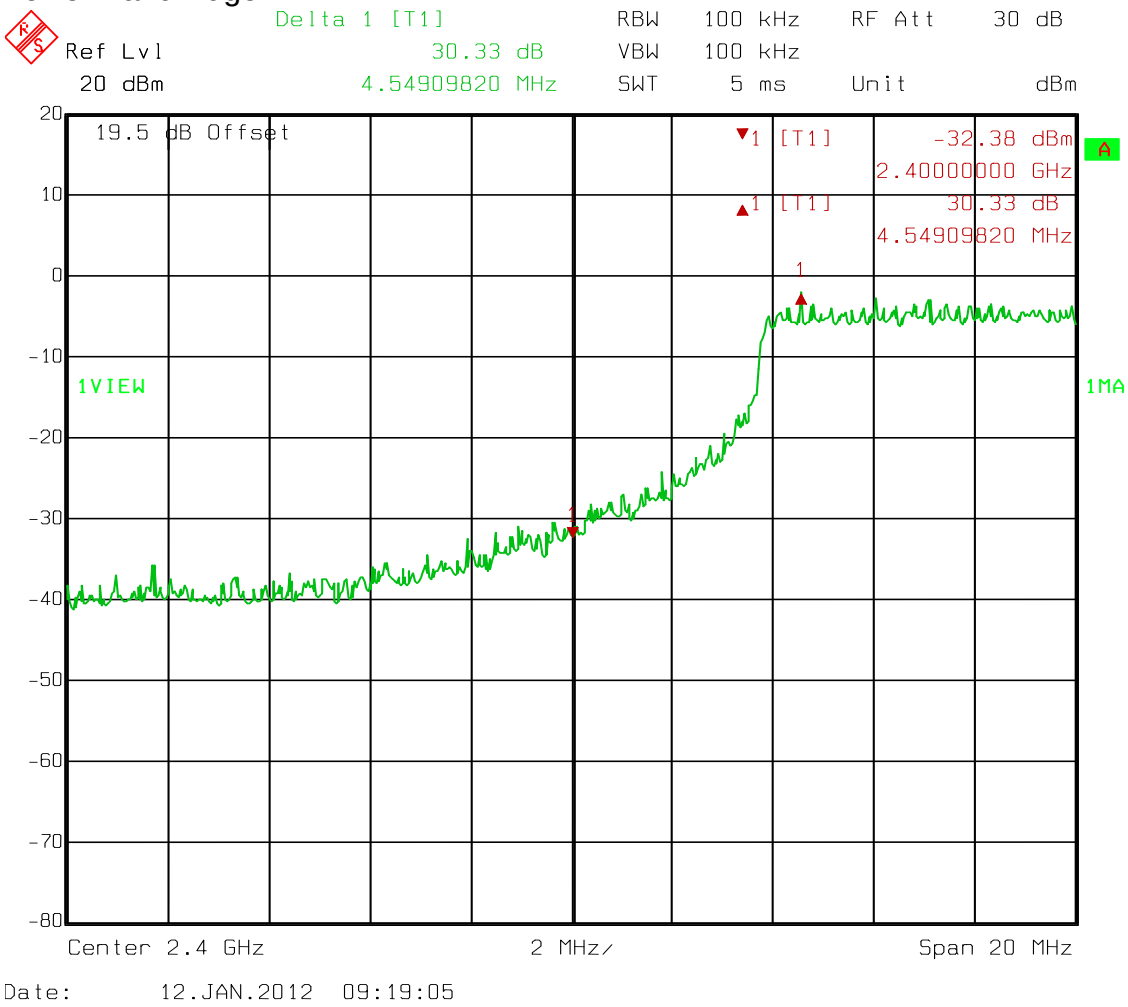
Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1472-1036-1082

Detector: Max pk

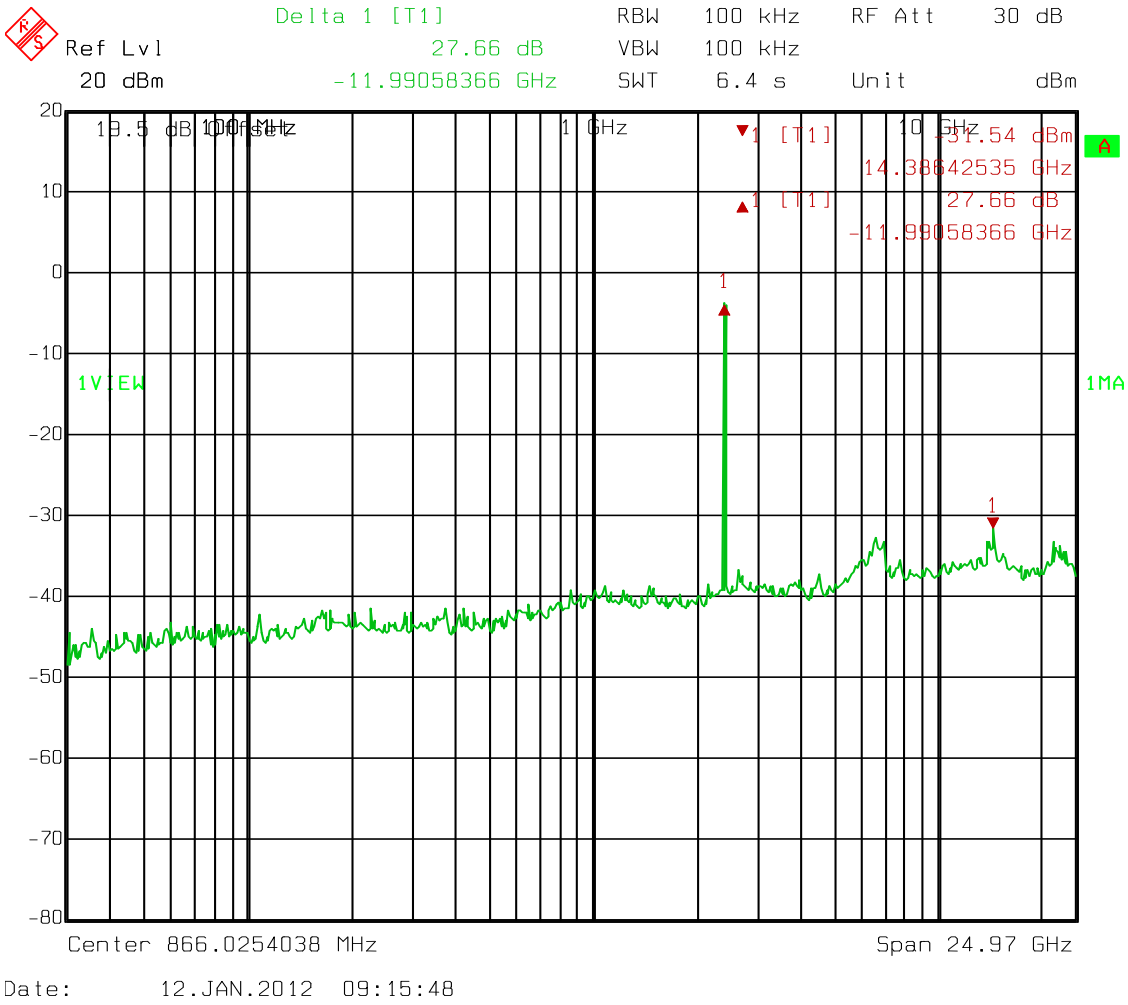
Test Data – Spurious Emissions at Antenna Terminals

Lower Band Edge



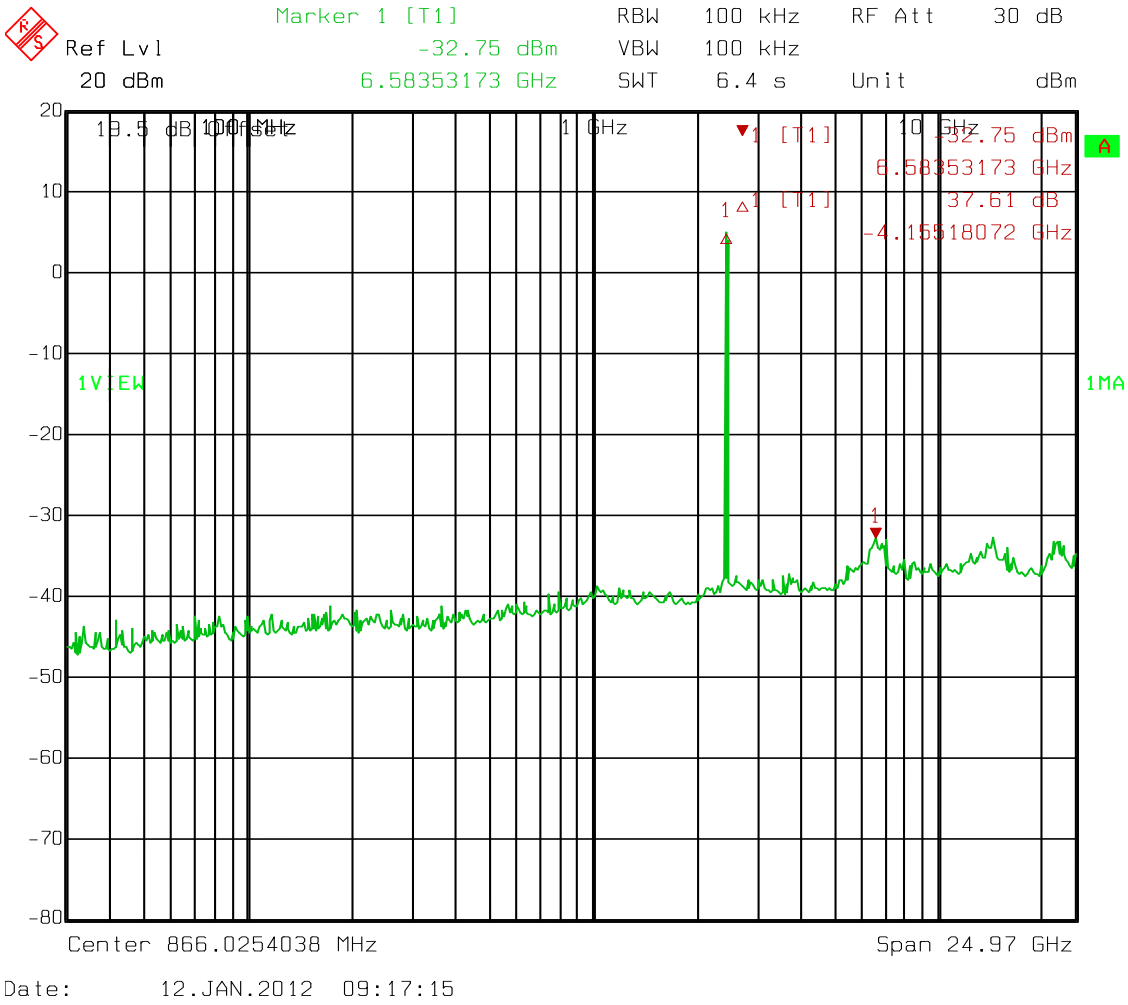
Test Data – Spurious Emissions at Antenna Terminals

2400 Band
Low Channel



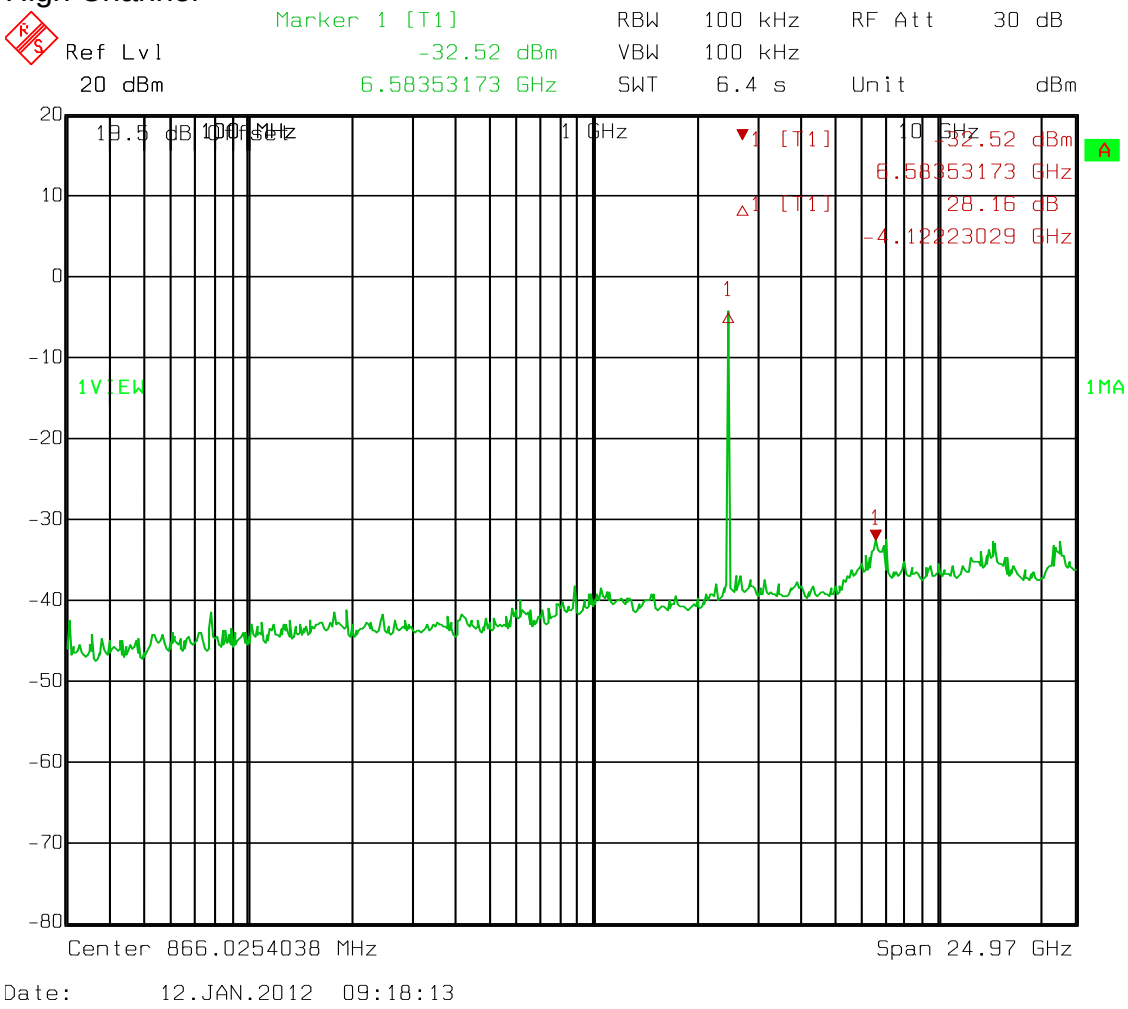
Test Data – Spurious Emissions at Antenna Terminals

2400 Band
Mid Channel



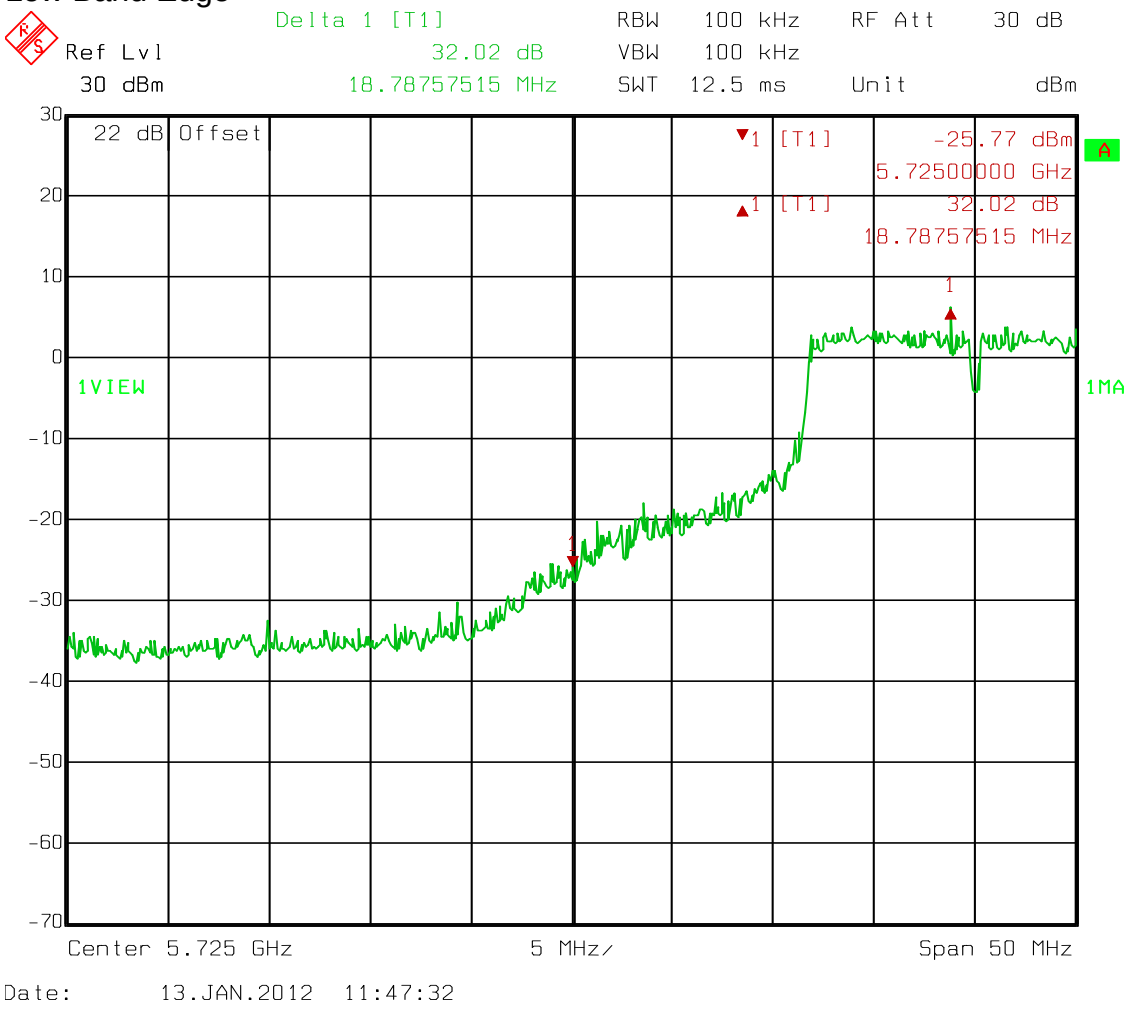
Test Data – Spurious Emissions at Antenna Terminals

2400 Band
High Channel



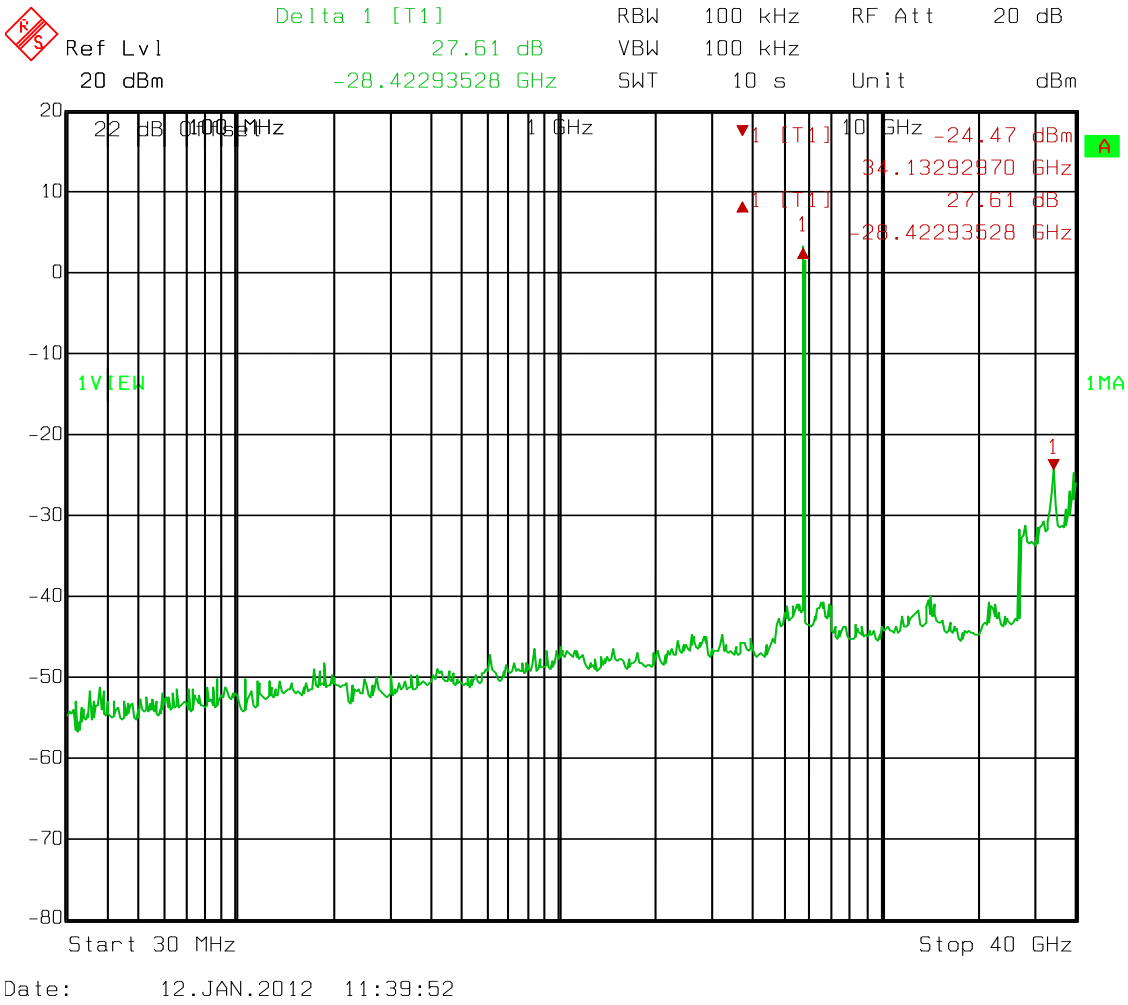
Test Data – Spurious Emissions at Antenna Terminals

2800 Band
Low Band Edge



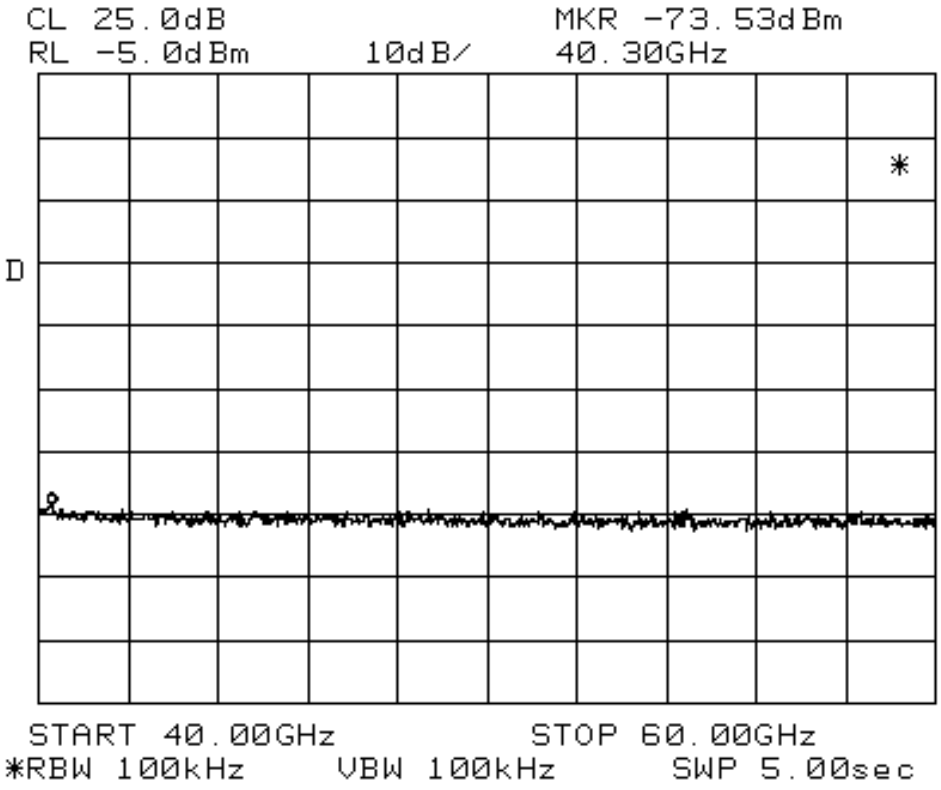
Test Data – Spurious Emissions at Antenna Terminals

Low Channel
5800 Band



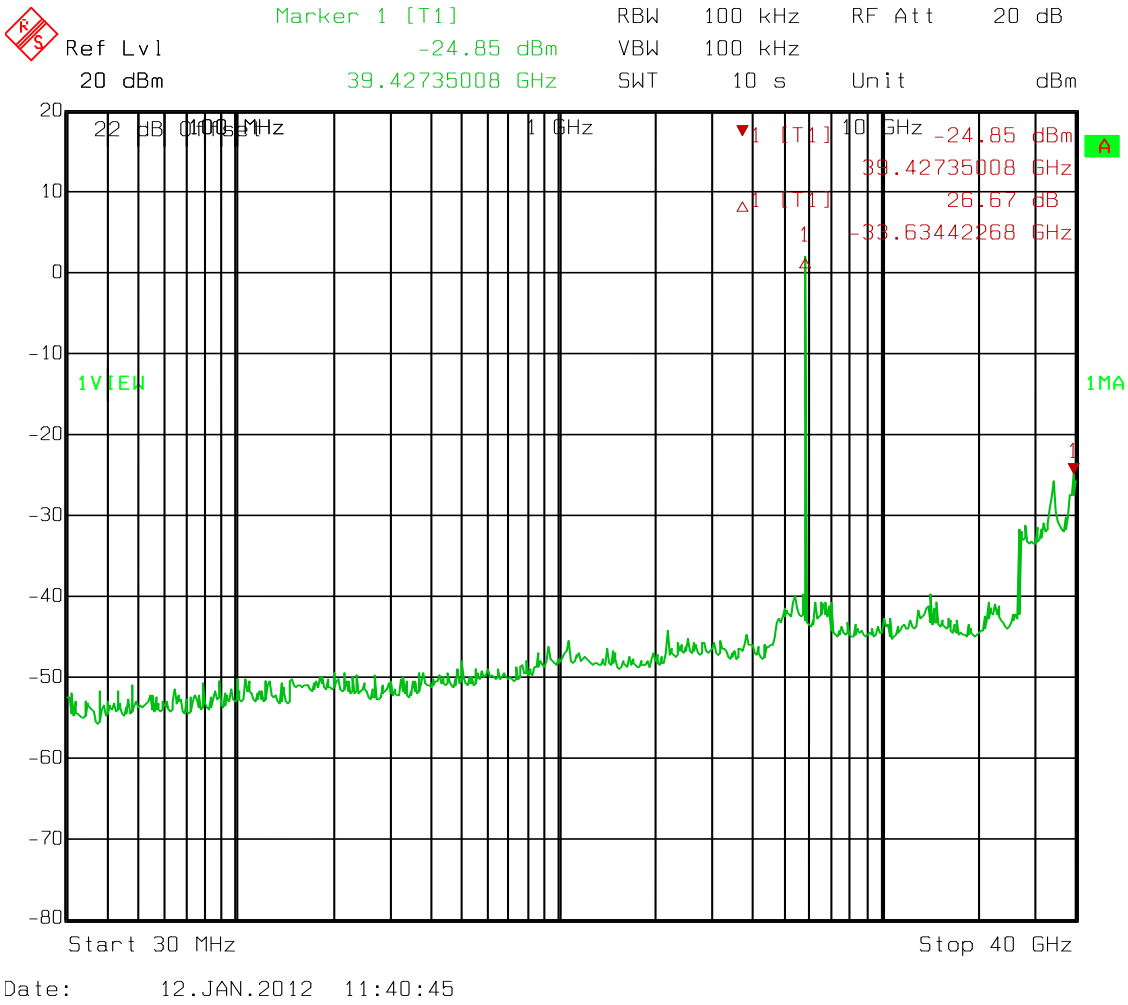
Test Data – Spurious Emissions at Antenna Terminals

5800 Band
Low Channel



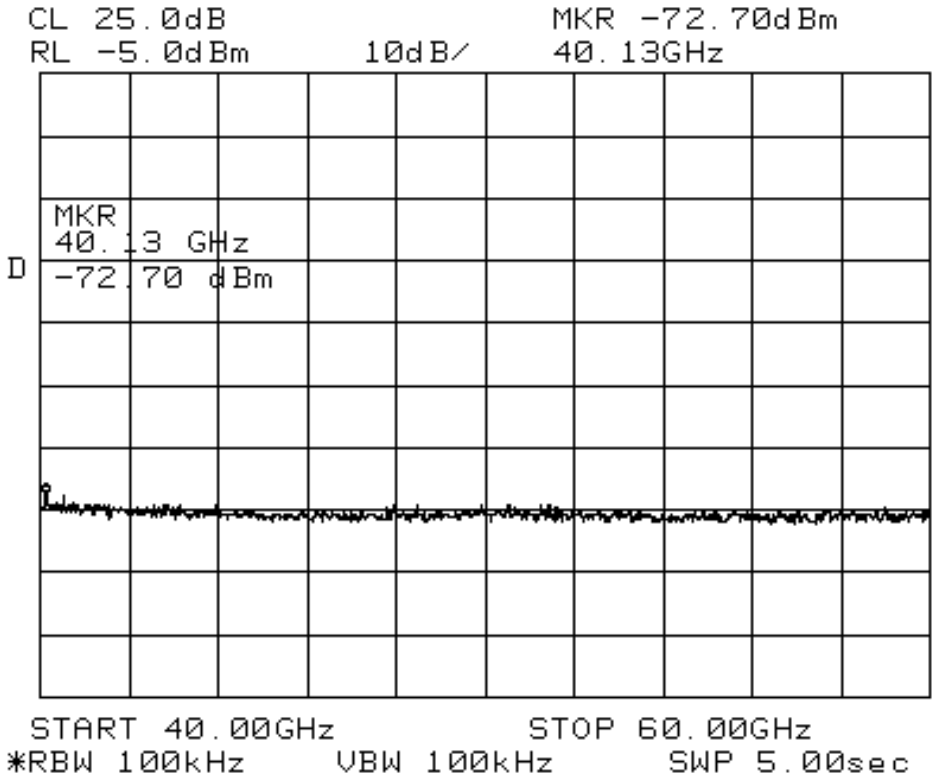
Test Data – Spurious Emissions at Antenna Terminals

5800 Band
Mid Channel



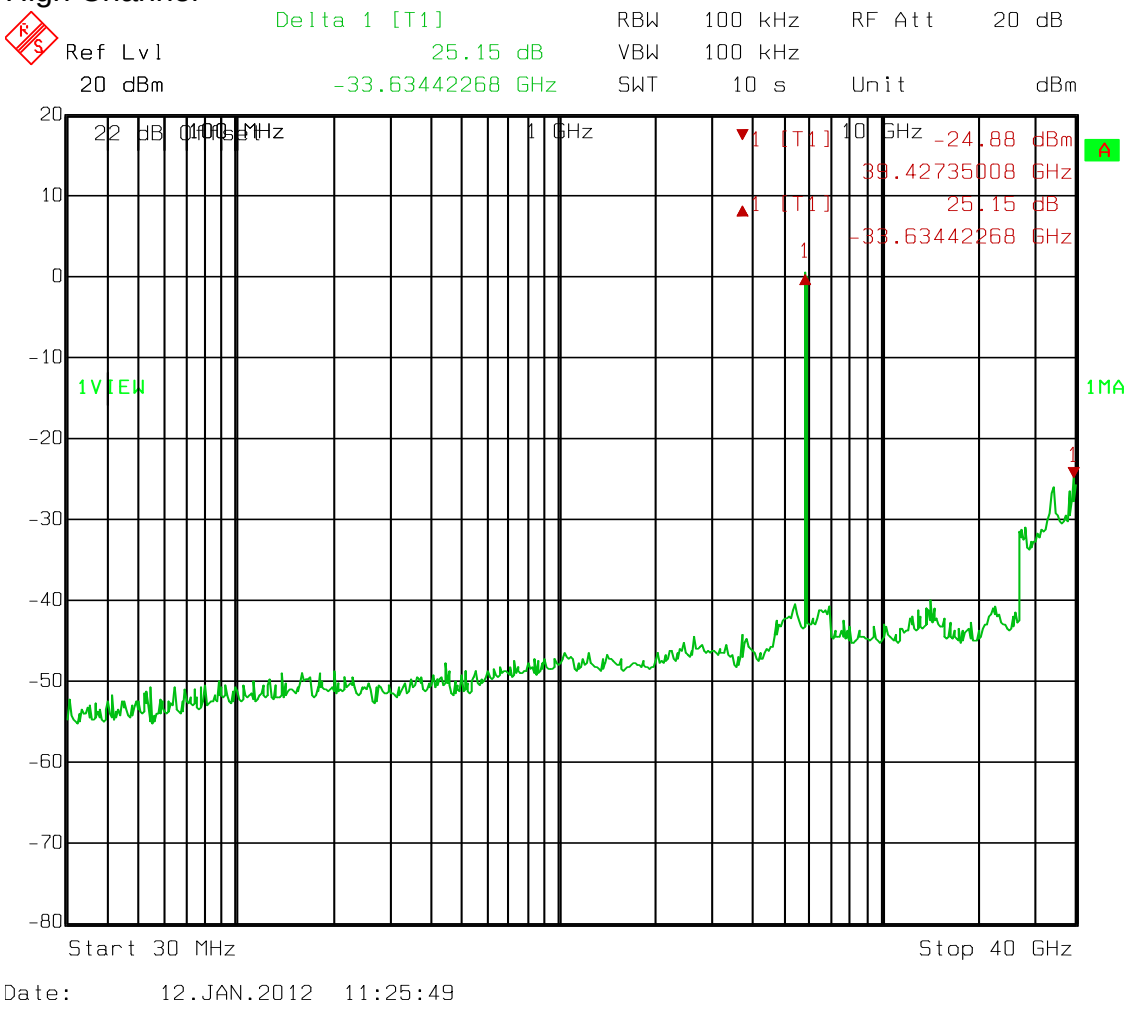
Test Data – Spurious Emissions at Antenna Terminals

5800 Band
Mid Channel



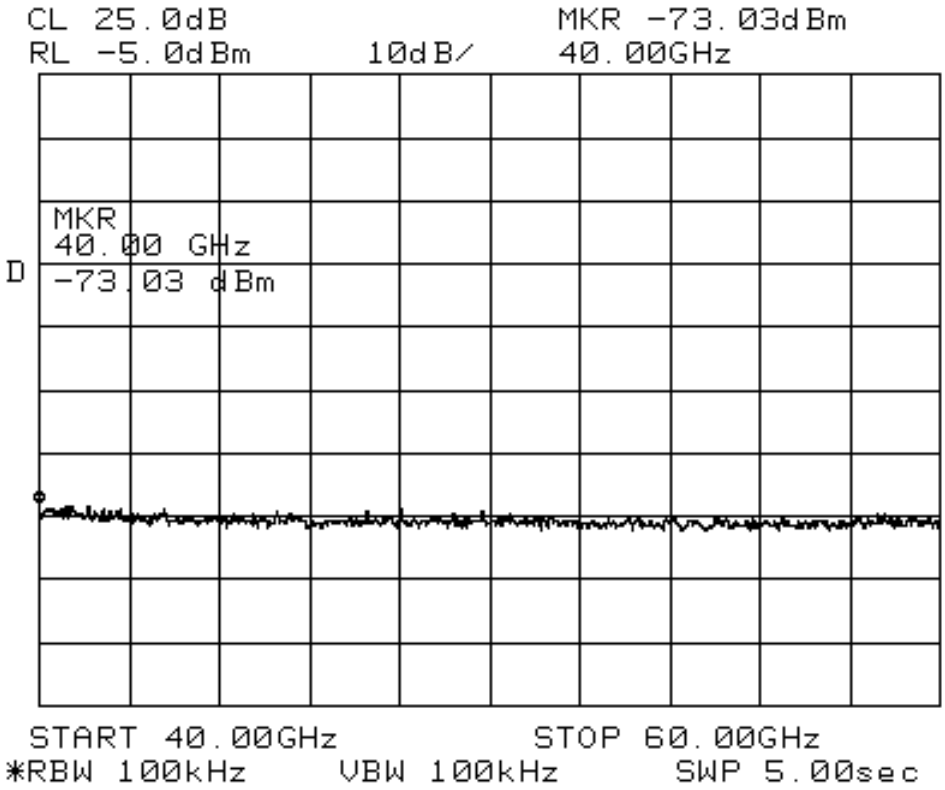
Test Data – Spurious Emissions at Antenna Terminals

5800 Band
High Channel



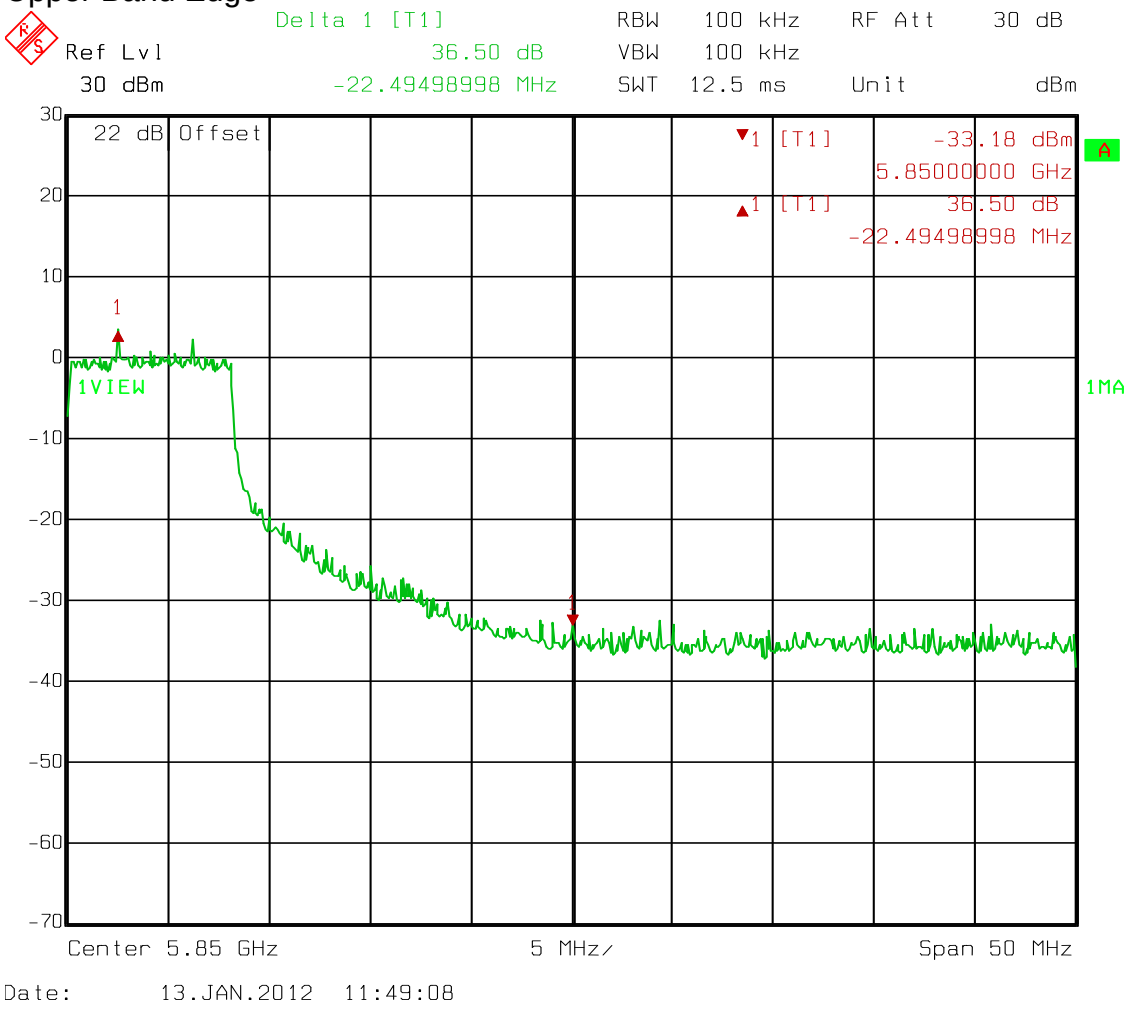
Test Data – Spurious Emissions at Antenna Terminals

5800 Band
High Channel



Test Data – Spurious Emissions at Antenna Terminals

5800 Band
Upper Band Edge



Section 6. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: FCC 15.247 (d) RSS-Gen 7.2.2
TESTED BY: David Light	DATE: 10 January 2012

Test Results: Complies.

Measurement Data: See attached table.

Test Conditions: 51 %RH
24 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1464-1783-1016-1480-1025-993

Notes:

☐ For handheld devices, the EUT was tested on three orthogonal axis'

☒ The device was tested from 30 MHz to the tenth harmonic of the highest fundamental frequency per 15.33

☒ The device was tested on three channels per 15.31(l).

☒ No emissions were detected within 20 dB of the specification limit therefore none are reported per 15.31(o). Band edge data for the 2.4 GHz band is presented below.

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz (Peak)
RBW= 1 MHz VBW=10Hz (Average)
Detector: Peak

Radiated Emissions

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.
2483.5	V	0.0	55.0	29.0	3.1	31.8	55.3	74.0	-18.7	Pass
2483.5	V	0.0	48.0	29.0	3.1	31.8	48.3	54.0	-5.7	Pass
2483.5	H	0.0	47.0	29.0	3.1	31.8	47.3	74.0	-26.7	Pass
2483.5	H	0.0	38.0	29.0	3.1	31.8	38.3	54.0	-15.7	Pass

Section 7. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: FCC 15.247(e) RSS-210 A8.2(b)
TESTED BY: David Light	DATE: 11 January 2012

Test Results: Complies.

Measurement Data: See attached data..

Test Conditions: 48 %RH
22 °C

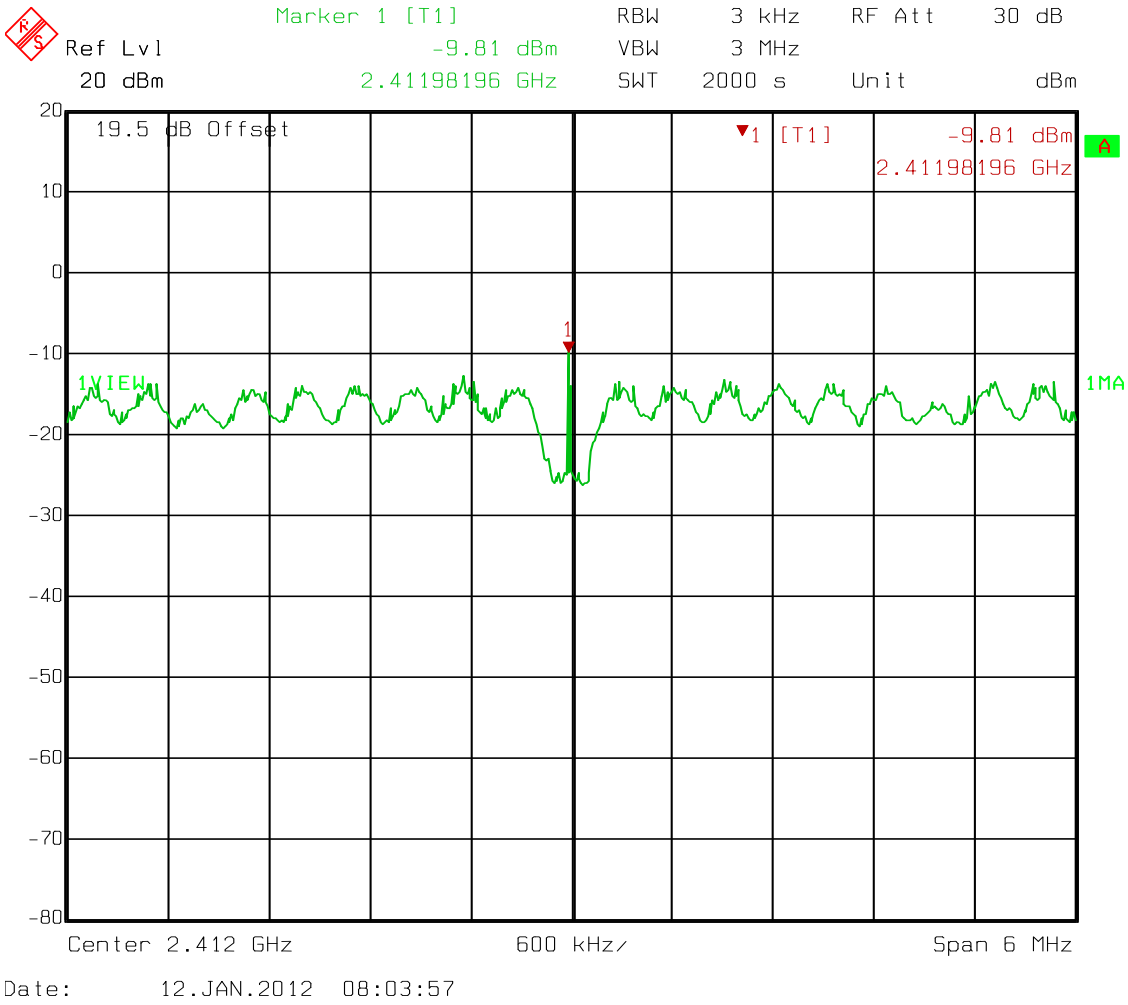
Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1472-1082

Detector: Max Pk

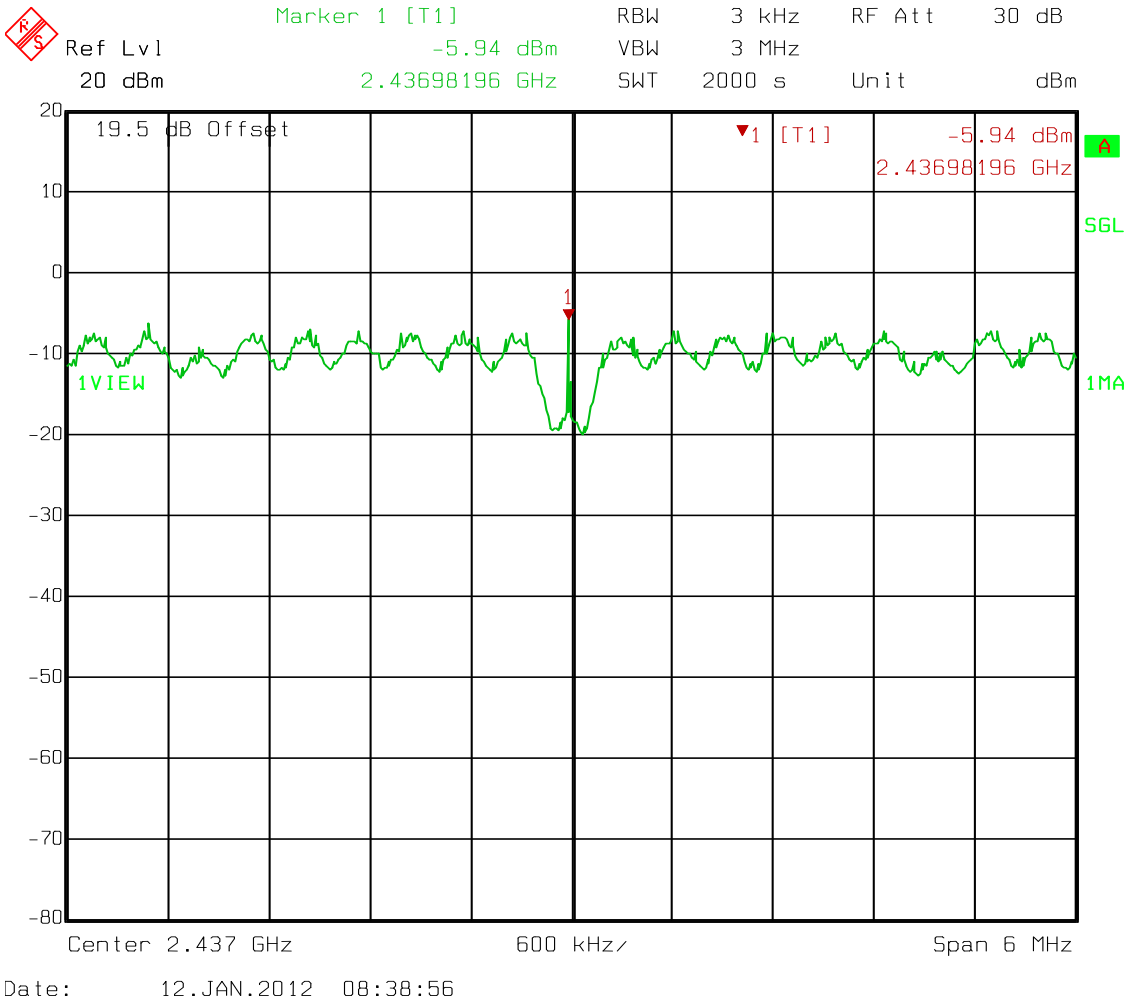
Peak Power Spectral Density

2400 Band
Low Channel



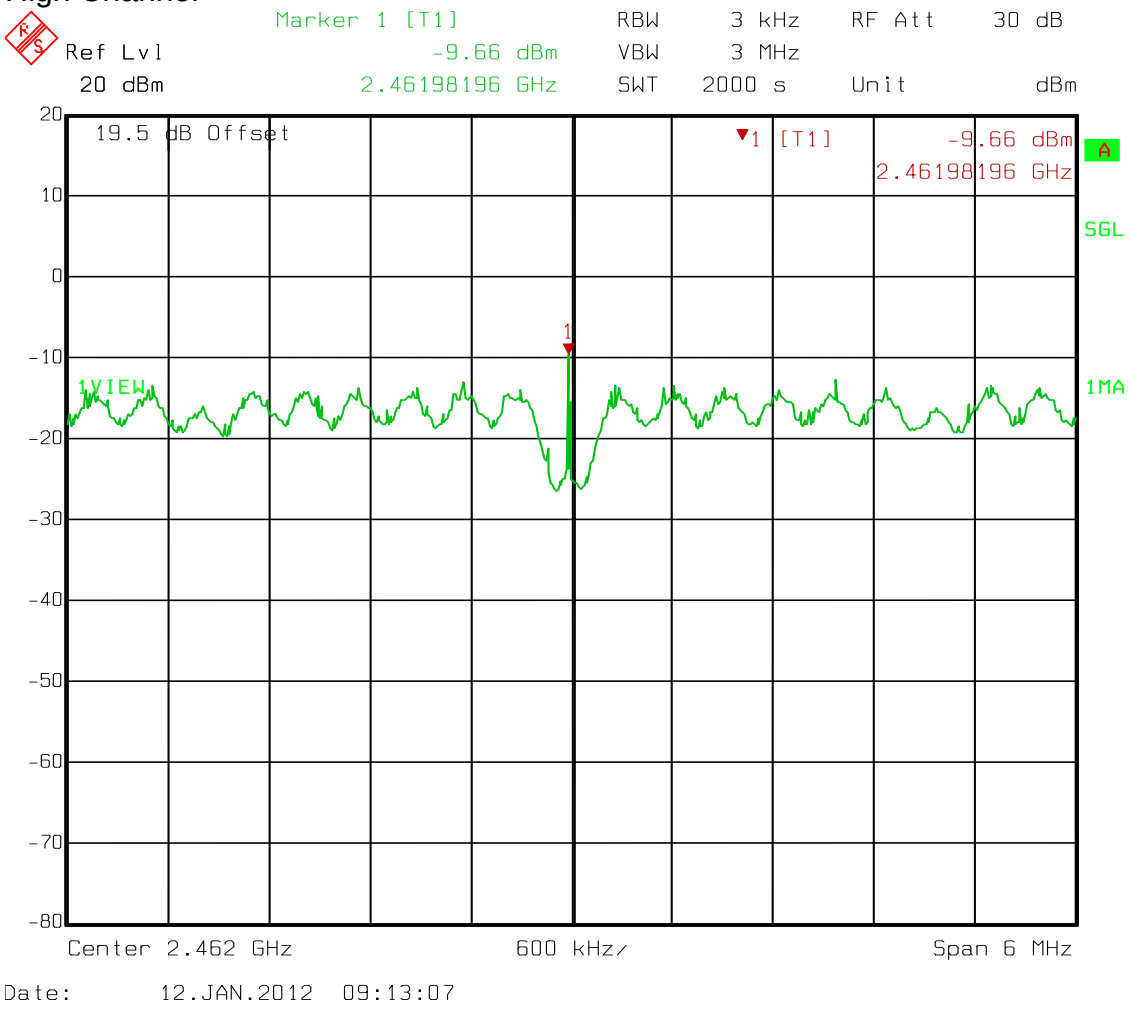
Peak Power Spectral Density

2400 Band
Mid Channel



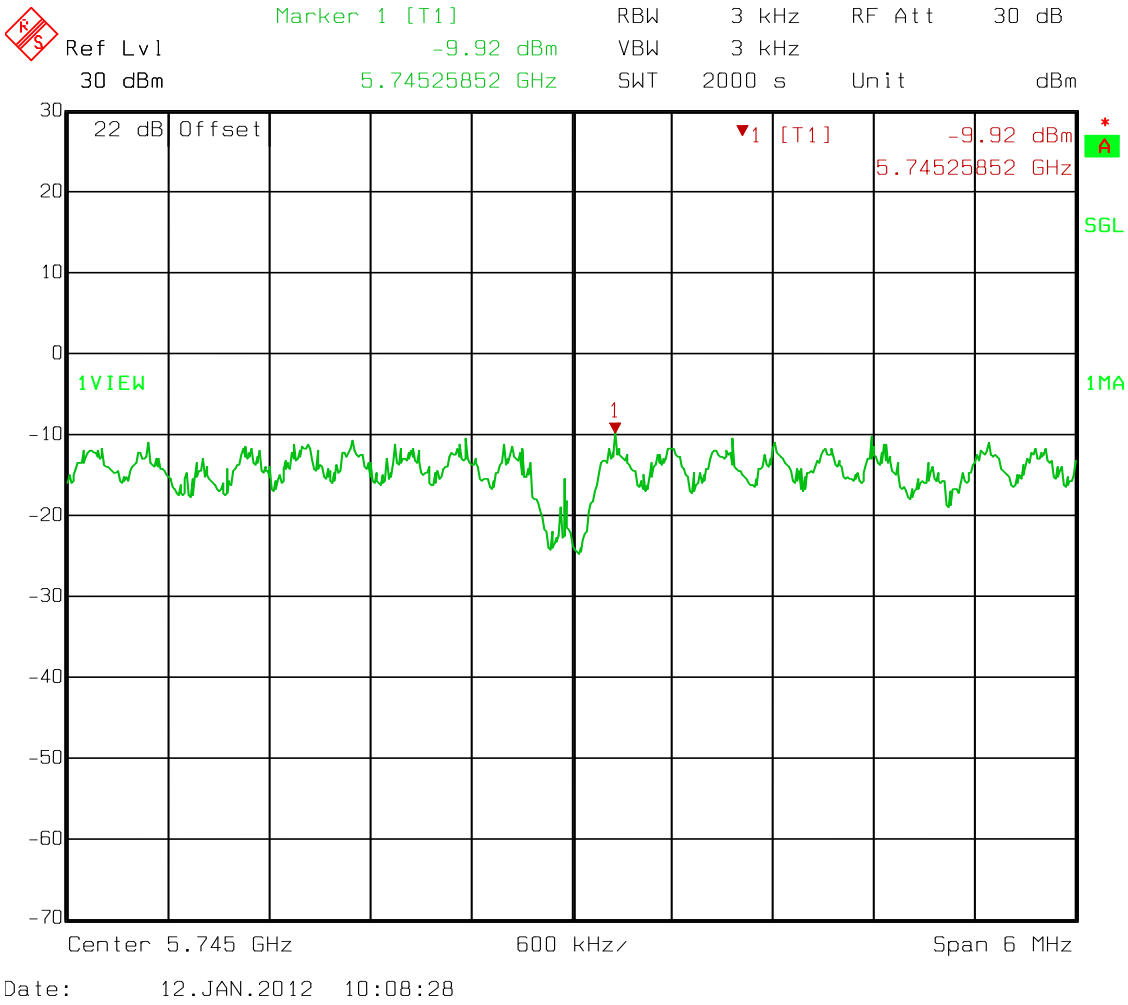
Peak Power Spectral Density

2400 Band
High Channel



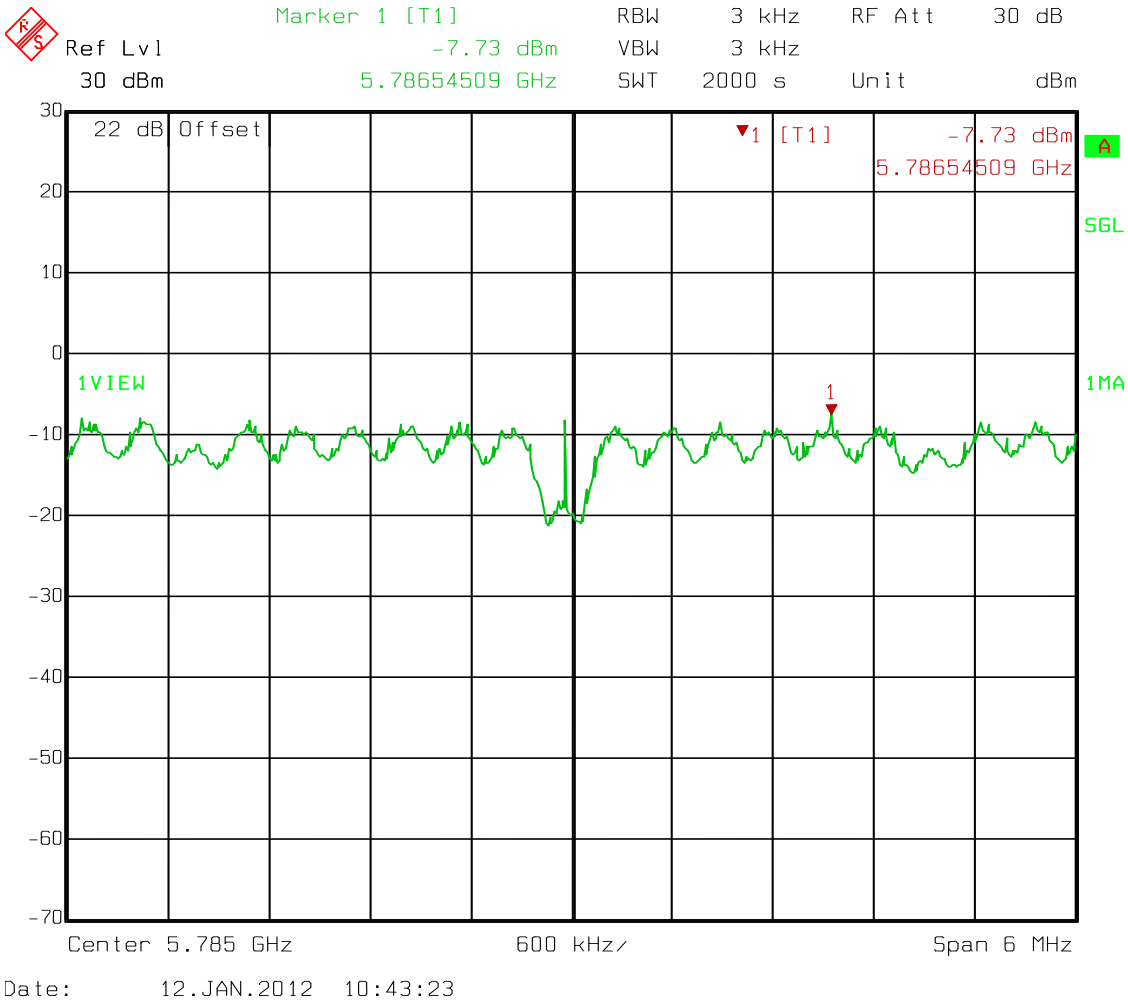
Peak Power Spectral Density

5800 Band
Low Channel



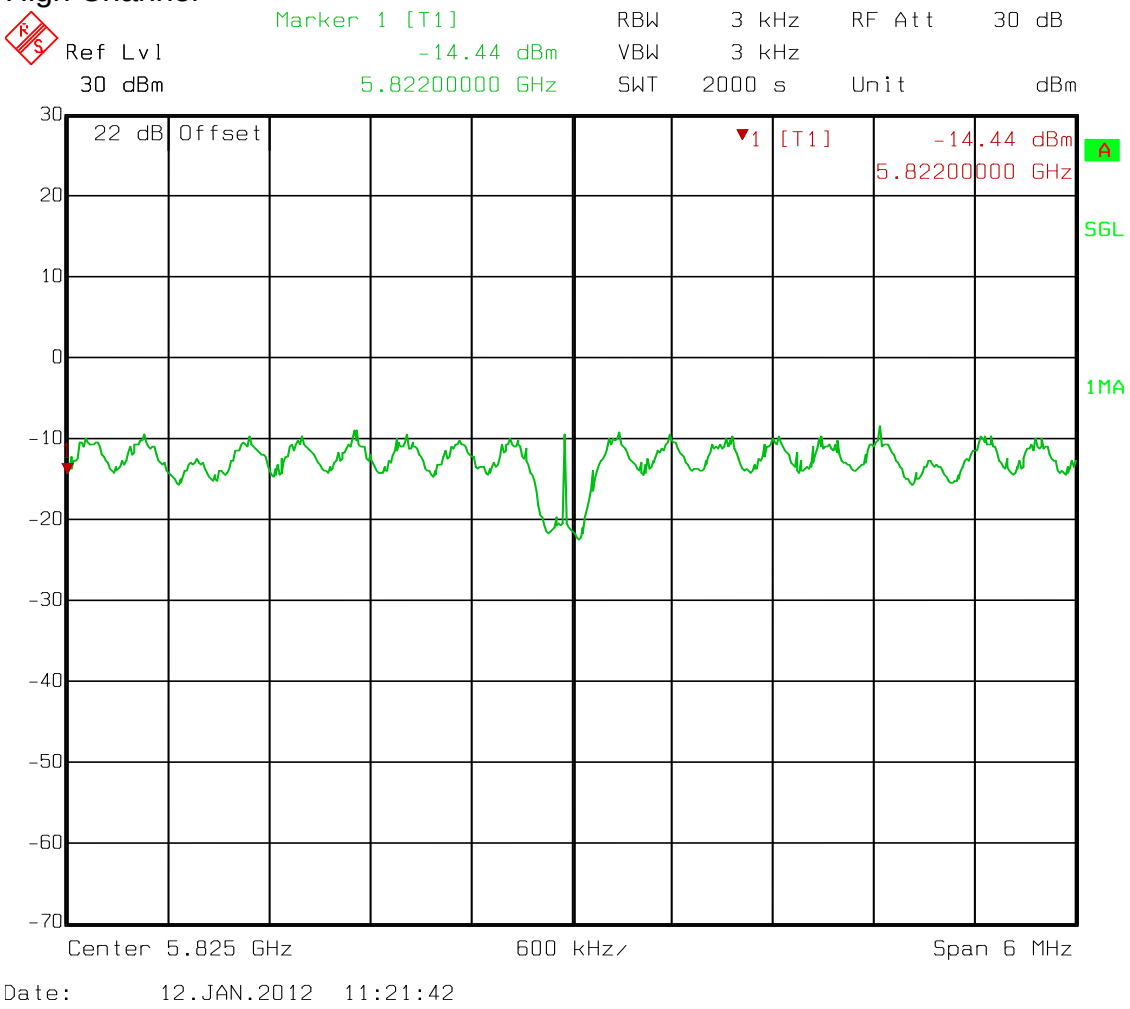
Peak Power Spectral Density

5800 Band
Mid Channel



Peak Power Spectral Density

5800 Band
High Channel



Section 8. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: FCC 15.207(a) RSS-Gen 7.2.4
TESTED BY: Arturo Ruvalcaba	DATE: 03 January 2012

Test Results: Complies.

Measurement Data: See attached plots.

Test Conditions: 35 %RH
24 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 703-811-749-704-1663-674

Test Data – Powerline Conducted Emissions

Line 1 Final QP/AVG

Frequency	FCC B QP	FCC B AVG	AVG	AVG	QP	QP
MHz	LIMIT	LIMIT	Meas	Margin	Meas	Margin
0.152	65.9	55.9	41.8	-14.1	55.8	-10.1
0.167	65.5	55.5	23.4	-32.1	44.8	-20.8
12.939	60.0	50.0	47.8	-2.2	49.5	-10.5
13.024	60.0	50.0	47.8	-2.2	49.3	-10.7
13.026	60.0	50.0	47.8	-2.2	49.4	-10.6
13.092	60.0	50.0	47.7	-2.3	49.6	-10.4
13.097	60.0	50.0	47.5	-2.5	49.6	-10.4
13.105	60.0	50.0	47.6	-2.4	49.7	-10.3
13.185	60.0	50.0	47.4	-2.6	49.5	-10.5
13.186	60.0	50.0	47.6	-2.4	49.6	-10.4

Line 2 Final QP/Avg

Frequency	FCC B QP	FCC B AVG	AVG	AVG	QP	QP
MHz	Limit	Limit	Meas	Margin	Meas	Margin
0.151	66.0	56.0	41.3	-14.6	55.3	-10.6
0.157	65.8	55.8	38.4	-17.4	52.3	-13.5
13.042	60.0	50.0	46.9	-3.1	49.0	-11.0
13.046	60.0	50.0	46.9	-3.1	48.9	-11.1
13.048	60.0	50.0	47.0	-3.0	48.9	-11.1
13.131	60.0	50.0	46.8	-3.2	49.0	-11.0
13.202	60.0	50.0	46.8	-3.2	49.2	-10.8
13.207	60.0	50.0	46.8	-3.2	49.2	-10.8
13.209	60.0	50.0	46.9	-3.1	49.1	-10.9
13.287	60.0	50.0	46.8	-3.2	49.1	-10.9

Section 9. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
674	Limiter	Hewlett Packard	11947A	3107A02200	01-Nov-2011	01-Nov-2012
703	LISN	Rohde & Schwarz	ESH2-Z5	871884/048	13-Jul-2011	13-Jul-2012
704	Filter, High Pass, 5KHz	Solar Electronics	7930-5.0	933126	01-Nov-2011	01-Nov-2012
749	Cable	Nemko USA, Inc.	RG223		25-Feb-2011	25-Feb-2012
993	Antenna, Horn	A.H. Systems	SAS-200/571	162	22-Sep-2011	22-Sep-2013
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	20-Jul-2011	20-Jul-2012
1025	Preamplifier, 25dB	Nemko USA, Inc.	LNA25	399	23-Feb-2011	23-Feb-2012
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	830844/006	06-Jan-2012	06-Jan-2014
1082	Cable	Astrolab	32027-2-29094-72TC		N/R	
1464	Spectrum Analyzer	Hewlett Packard	8563E	3551A04428	16-May-2011	16-May-2013
1472	Attenuator,	Omni Spectra	20600-20db		N/R	
1480	Antenna, Bilog	Schaffner-Chase	CBL6111C	2572	19-Jan-2011	19-Jan-2012
1663	Spectrum Analyzer	Rohde & Schwartz	FSP3	100073	02-Sep-2011	02-Sep-2013
1783	Cable Assy, r	Nemko	Chamber		26-Sep-2011	26-Sep-2012
811	Cable Assy	Nemko USA	RG223		25-Feb-2011	25-Feb-2012

ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions PARA. NO.: 15.207(a)

Minimum Standard: §15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

* Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)

Minimum Standard: The minimum 6 dB bandwidth shall be at least 500 kHz

NAME OF TEST: Maximum Peak Output Power	PARA. NO.: 15.247(b)(3)

Minimum Standard: The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)

Minimum Standard: Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

NAME OF TEST: Spurious Emissions(conducted) PARA. NO.: 15.247(d)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

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NAME OF TEST: Radiated Spurious Emissions PARA. NO.: 15.247(c)

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (μV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
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
6.125-6.218	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	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Transmitter Power Density	PARA. NO.: 15.247(d)

Minimum Standard: The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

Method Of Measurement: The spectrum analyzer is set as follows:

RBW: 3 kHz
VBW: >3 kHz
Span: => measured 6 dB bandwidth
Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is 1500/3 = 500 sec.
LOG dB/div.: 2 dB

Note: For devices with spectrum line spacing =< 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

For Devices With Integral Antenna:

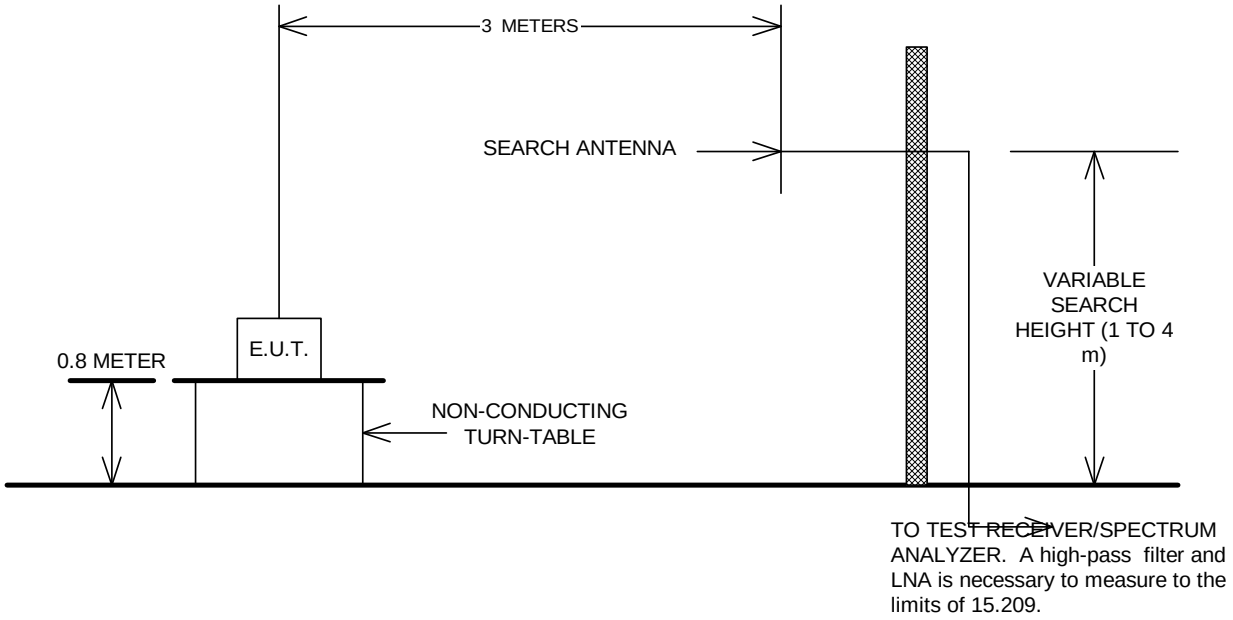
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Number of channels tested:

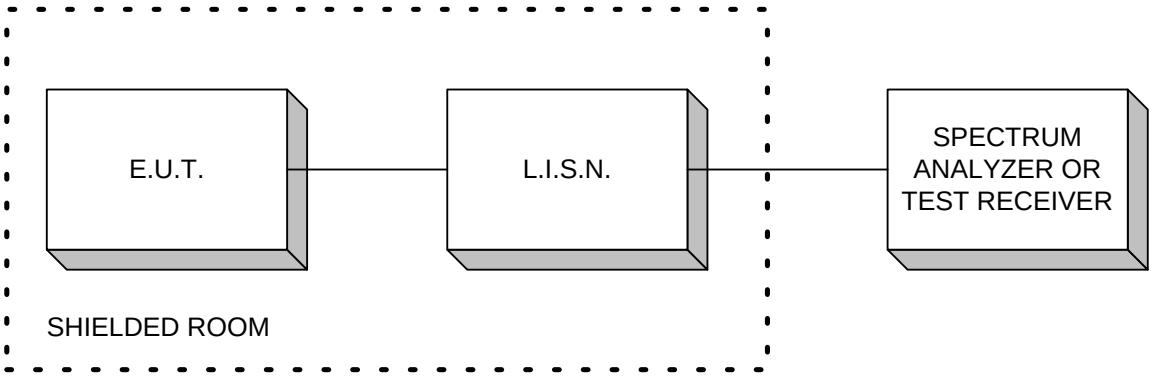
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

ANNEX B - TEST DIAGRAMS

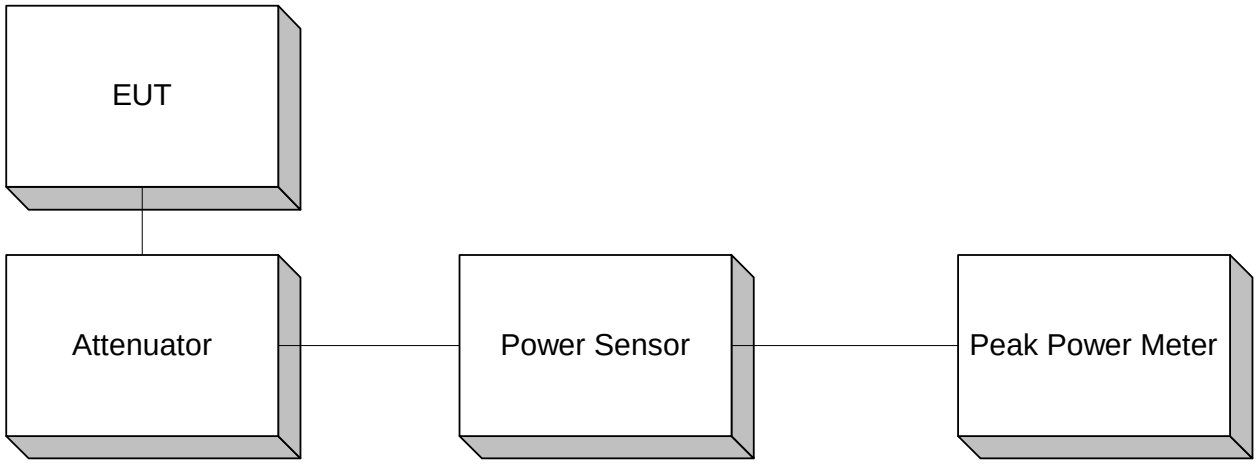
Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals



Note: A spectrum analyzer may be substituted for Peak Power Meter given that the measurement bandwidth is sufficient to capture the 60 dB bandwidth of the transmitter.

Minimum 6 dB Bandwidth
Peak Power Spectral Density
Spurious Emissions (conducted)