



Nemko Test Report: 60426RUS1


Applicant: Traxxas
1100 Klein Road
Plano, Texas 75074
USA

**Equipment Under Test:
(E.U.T.)** 2218

FCC Identifier: XVE-SA09218

In Accordance With: **FCC Part 15, Subpart C, 15.247 and
Industry Canada, RSS-210, Issue 7**
Digital Transmission System Transmitter

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

TESTED BY: 

David Light, Senior Wireless Engineer

DATE: 06 October 2010

APPROVED BY: 

Tom Tidwell, Telecom Direct

DATE: 14 October 2010

Table of Contents

SECTION 1.	SUMMARY OF TEST RESULTS	3
SECTION 2.	EQUIPMENT UNDER TEST (E.U.T.)	5
SECTION 3.	OCCUPIED BANDWIDTH	7
SECTION 4.	MAXIMUM PEAK OUTPUT POWER	10
SECTION 5	SPURIOUS EMISSIONS (CONDUCTED)	13
SECTION 6.	RADIATED EMISSIONS	18
SECTION 7.	PEAK POWER SPECTRAL DENSITY	19
SECTION 8.	RECEIVER SPURIOUS EMISSIONS	22
SECTION 9.	TEST EQUIPMENT LIST	25
ANNEX A -	TEST DETAILS	26
ANNEX B -	TEST DIAGRAMS	32

Section 1. Summary of Test Results

Manufacturer: Traxxas

Model No.: 2218

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 7 for Digital Transmission Systems. Radiated tests were conducted in 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".



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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a) / RSS-Gen 7.2.2	NA
Minimum 6 dB Bandwidth	15.247(a)(2) / RSS-210 A8.2(a)	Complies
Maximum Peak Power Output	15.247(b)(3) / Rss-210 A8.4(4)	Complies
Spurious Emissions (Antenna Conducted)	15.247(d) / RSS-210 A8.5	Complies
Spurious Emissions (Radiated)	15.247(d)/15.209(a) / RSS-210 A8.5	Complies
Peak Power Spectral Density	15.247(e) / RSS-210 A8.2(b)	Complies
Receiver Spurious Emissions	RSS-Gen 7.2.3	Complies

Footnotes:

The device is battery powered.

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

General Equipment Information

Frequency Band (MHz):	902-928	2400-2483.5	5725-5850
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

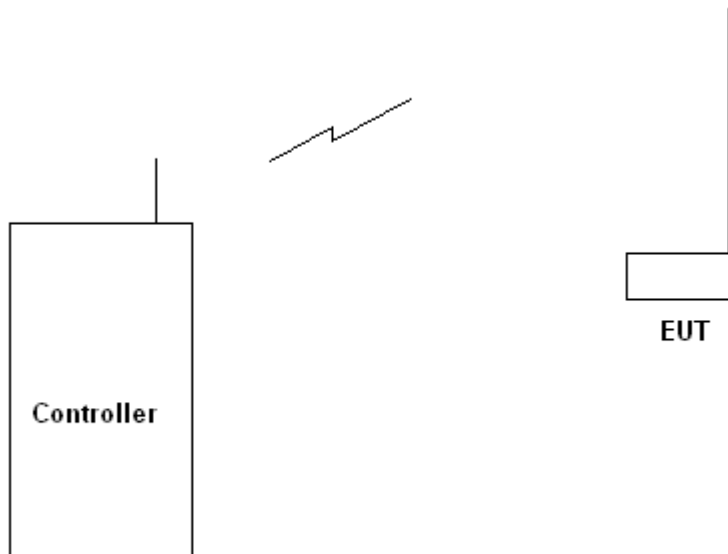
Operating Frequency of Test Sample: 2435 and 2444 MHz

User Frequency Adjustment: Software controlled

Description of EUT

This is a 2.4 GHz transceiver used in remote control hobbyist vehicles. The primary function of the EUT is as a receiver but it does periodically transmit a signal to link with the controller.

System Diagram



Section 3. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2) / A8.2(a)
TESTED BY: David Light	DATE: 06 October 2010

Test Results: Complies.


Measurement Data: See 6 dB BW plot
Measured 6 dB bandwidth: 932 kHz

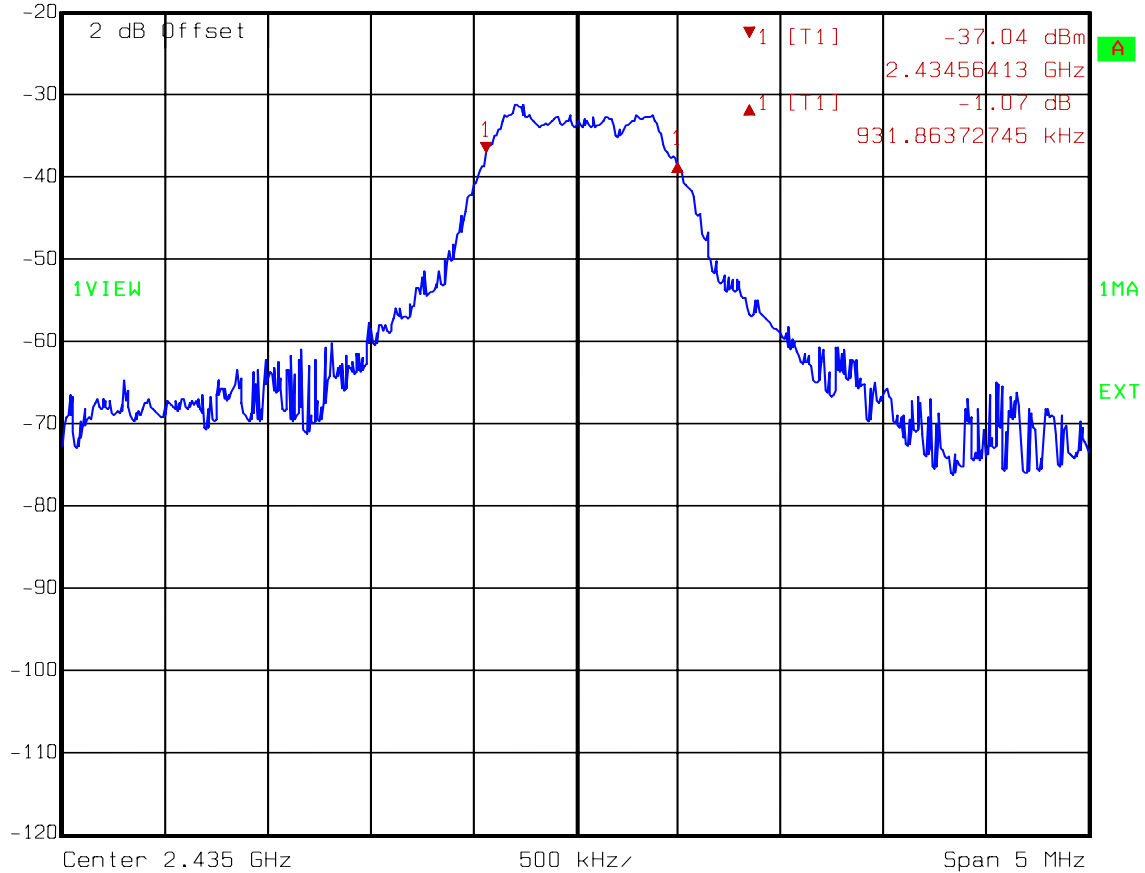
Test Conditions: 50 %RH
22 °C

Measurement Uncertainty: +/-1x10⁻⁷ ppm

Test Equipment Used: 1036-1082

Test Data – Occupied Bandwidth

	Delta 1 [T1]	RBW	100 kHz	RF Att	10 dB
	Ref Lvl	-1.07 dB	VBW	100 kHz	
	-20 dBm	931.86372745 kHz	SWT	5 ms	Unit

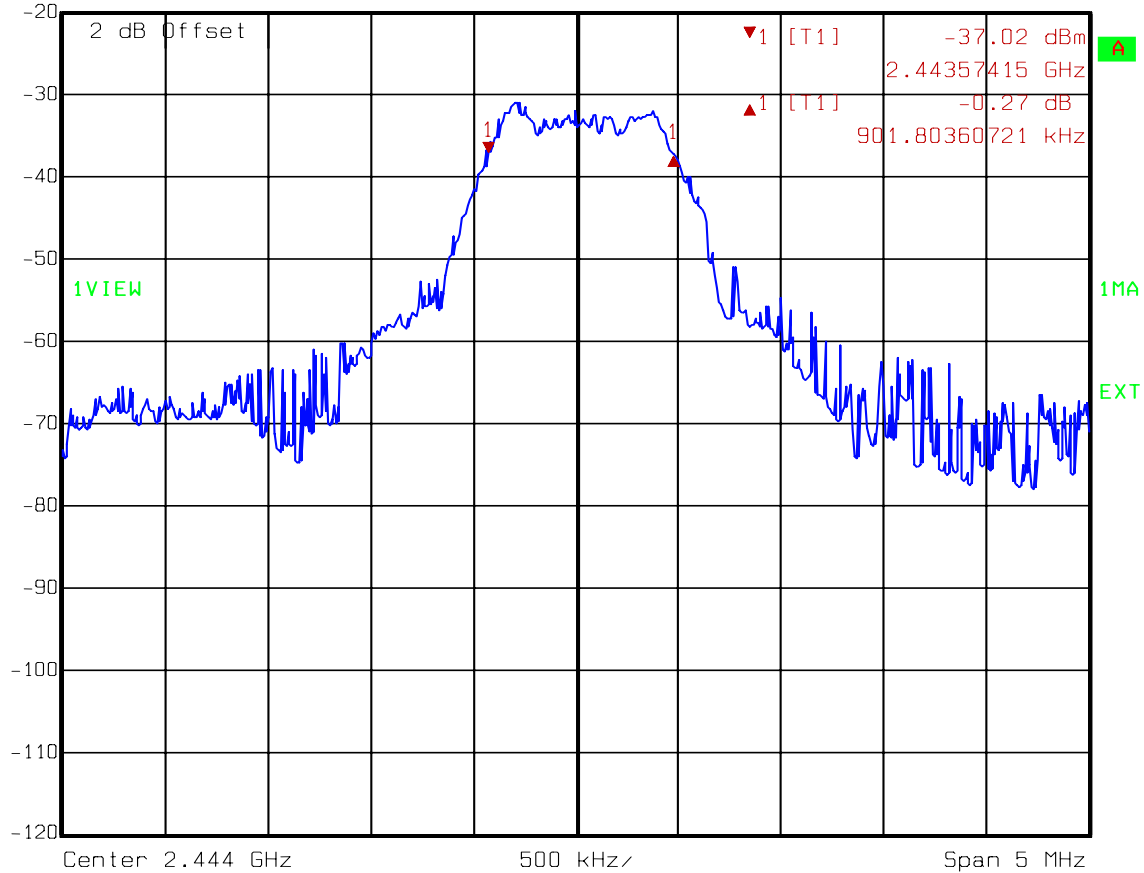


Date: 06.OCT.2010 12:20:25

Test Data – Occupied Bandwidth



	Delta 1 [T1]	RBW	100 kHz	RF Att	10 dB
Ref Lvl	-0.27 dB	VBW	100 kHz		
-20 dBm	901.80360721 kHz	SWT	5 ms	Unit	dBm



Date: 06.OCT.2010 12:31:38

Section 4. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(3) / A8.4(4)
TESTED BY: David Light	DATE: 06 October 2010

Test Results: Complies.

Measurement Data: Refer to attached data

Test Conditions: 50 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

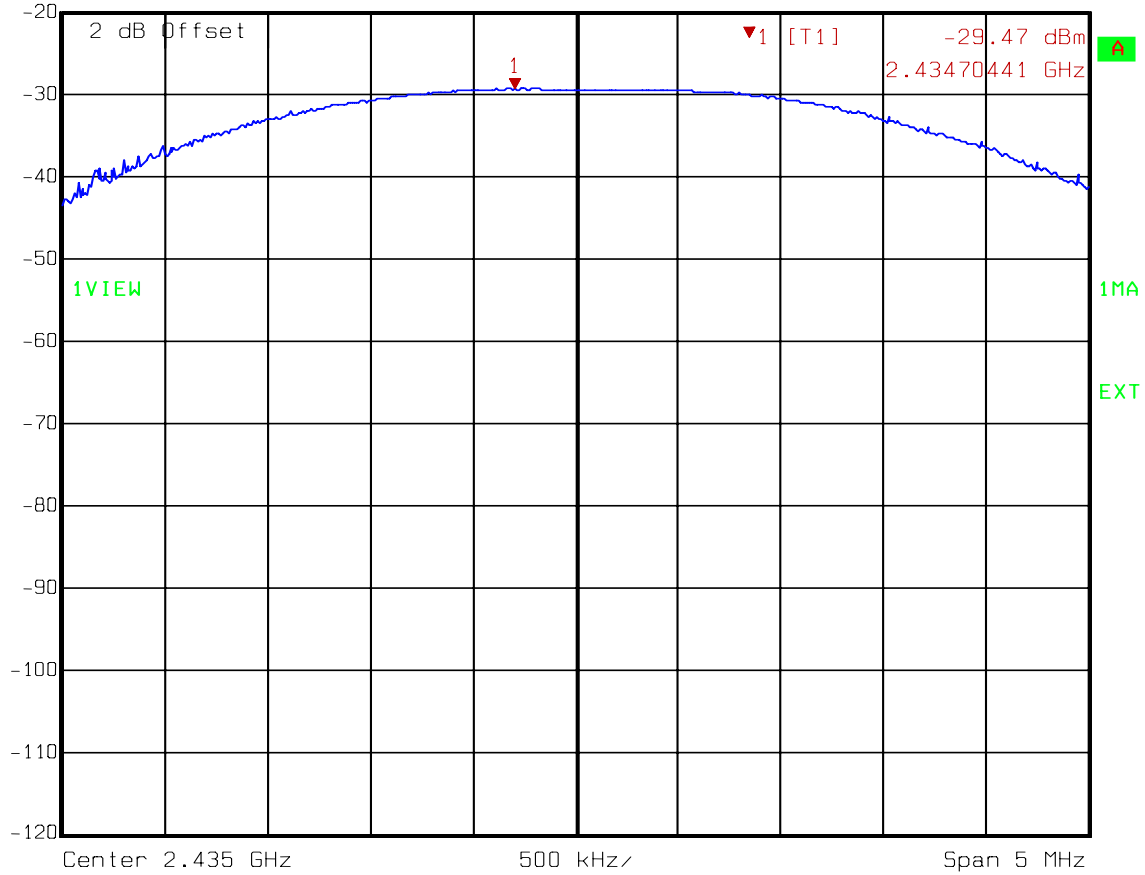
Test Equipment Used: 1036-1082

- 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 fresh batteries per 15.31(e).
- The device was tested on three channels per 15.31(l).
- This test was performed radiated.

Test Data – Peak Power



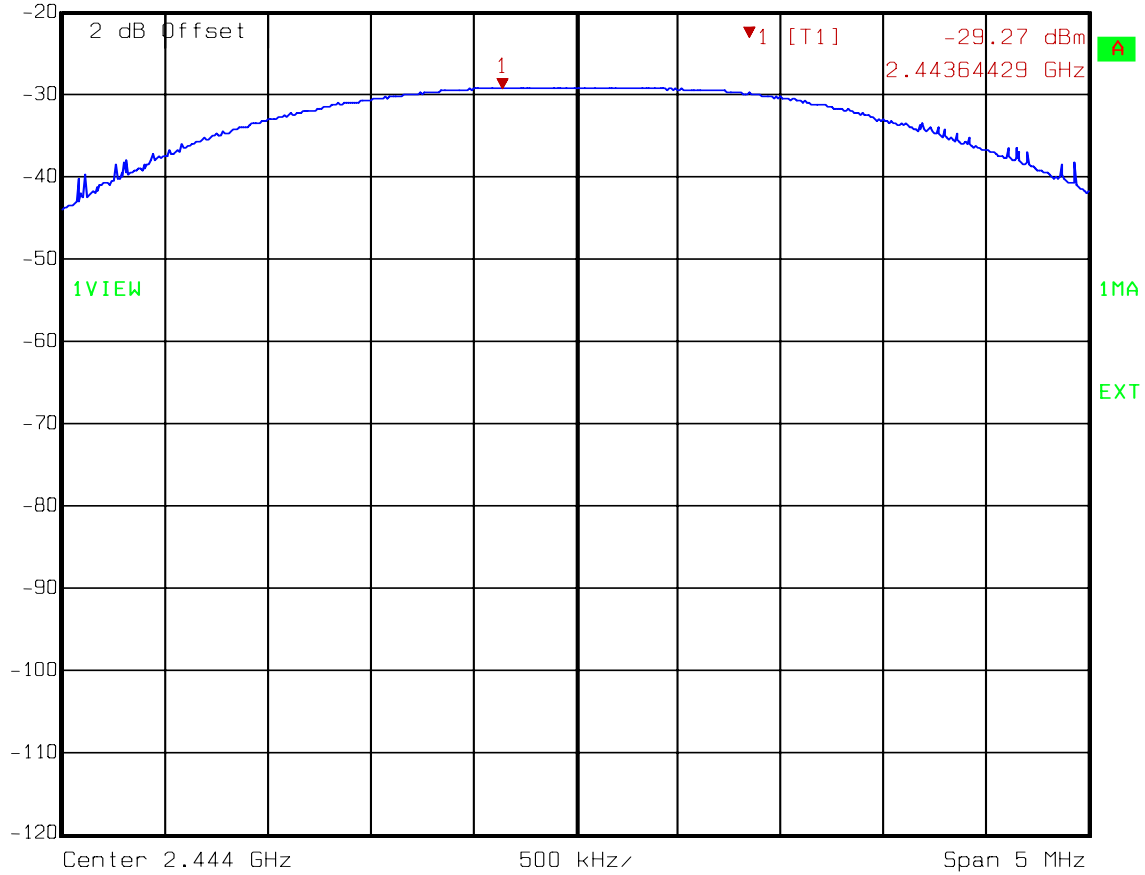
Ref Lvl -20 dBm
Marker 1 [T1] -29.47 dBm
2.43470441 GHz
RBW 2 MHz
RF Att 10 dB
VBW 2 MHz
SWT 5 ms
Unit dBm



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Test Data – Peak Power

 Ref Lvl -20 dBm Marker 1 [T1] -29.27 dBm RBW 2 MHz RF Att 10 dB
2.44364429 GHz VBW 2 MHz Unit dBm
SWT 5 ms



Date: 06.OCT.2010 12:32:13

Section 5 Spurious Emissions (Conducted)

NAME OF TEST: Spurious Emissions (Conducted)	PARA. NO.: 15.247 (d) / A8.5
TESTED BY: David Light	DATE: 06 August 2009

Test Results: Complies.

Measurement Data: See attached plots.

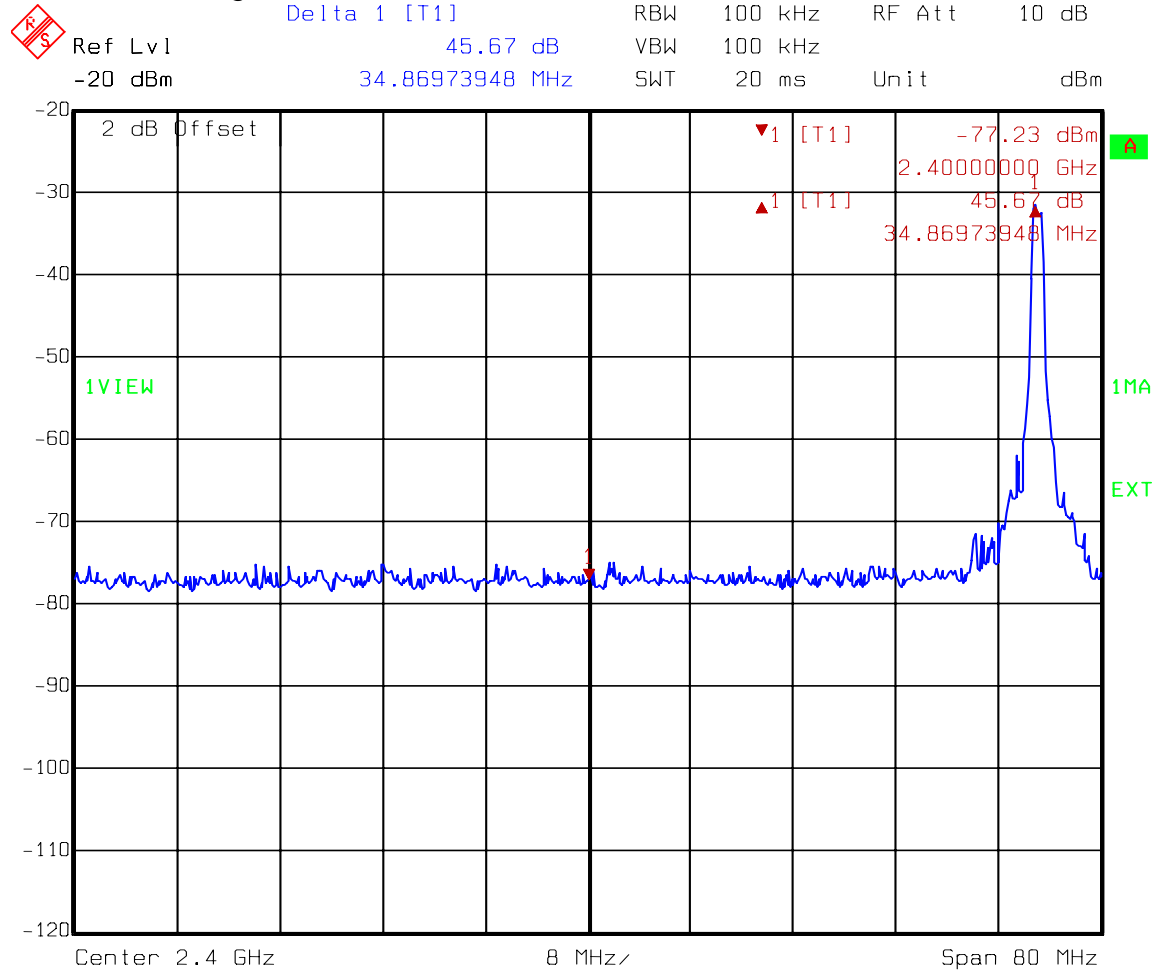
Test Conditions: 50 %RH
 22 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082

Test Data – Spurious Emissions at Antenna Terminals

Lower Band Edge

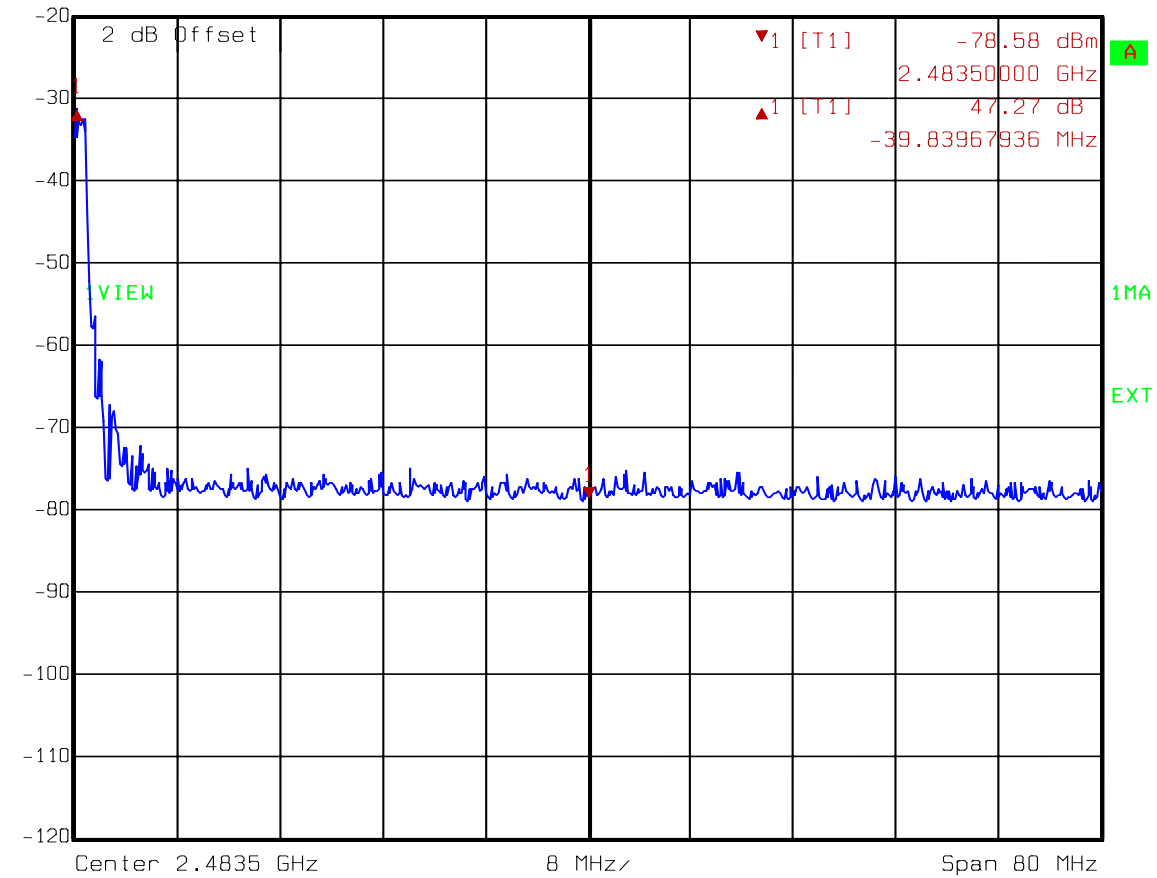


Date: 06.OCT.2010 12:22:00

Test Data – Spurious Emissions at Antenna Terminals

Upper Band Edge


 Delta 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl 47.27 dB VBW 100 kHz
-20 dBm -39.83967936 MHz SWT 20 ms Unit dBm

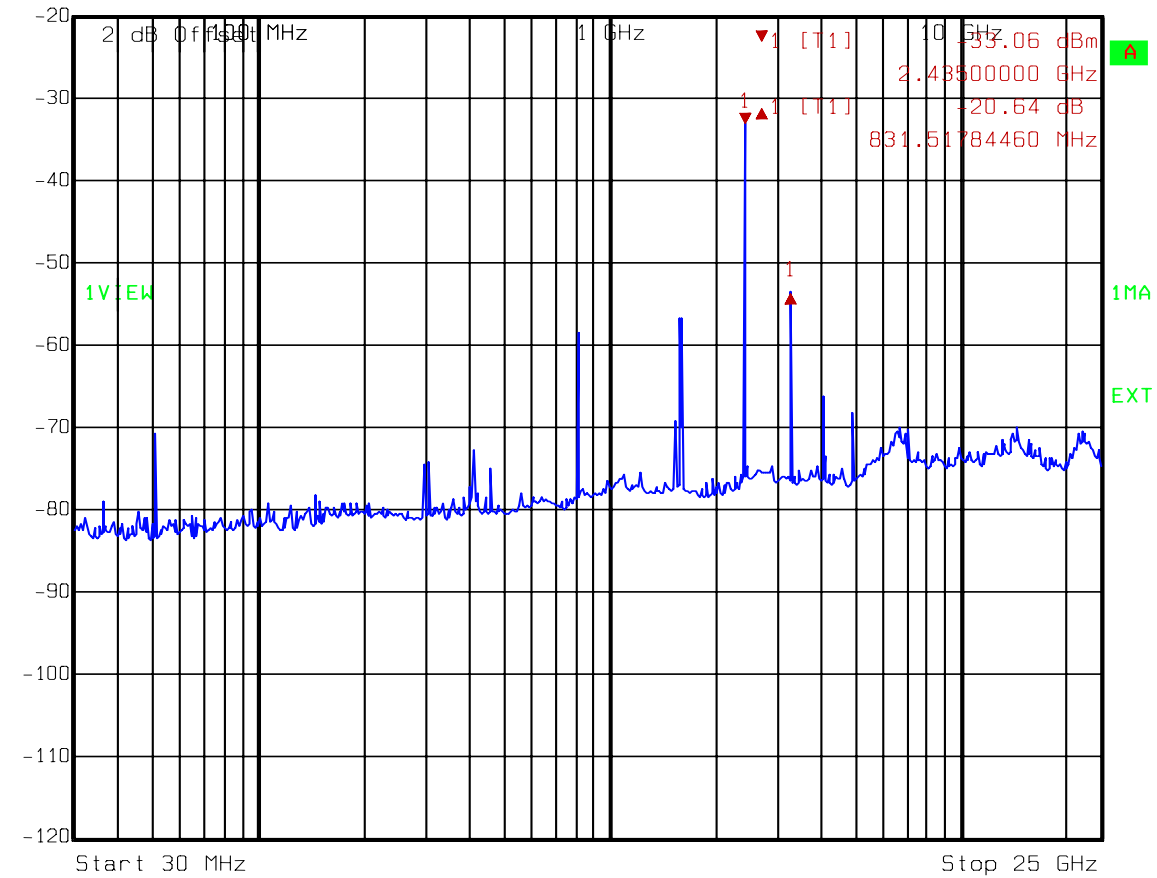


Date: 06.OCT.2010 12:32:52

Test Data – Spurious Emissions at Antenna Terminals

Low Channel

 Delta 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl -20.64 dB VBW 100 kHz
-20 dBm 831.51784460 MHz SWT 6.4 s Unit dBm

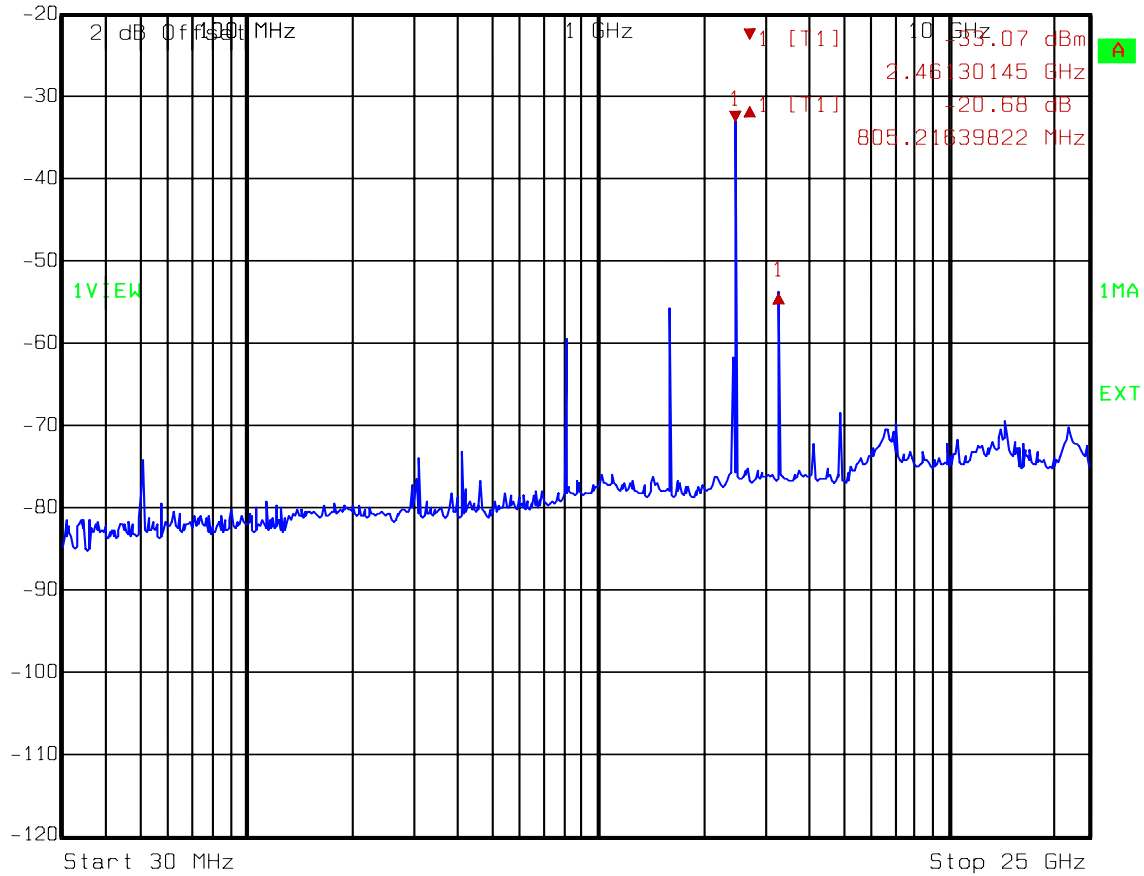


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Test Data – Spurious Emissions at Antenna Terminals

High Channel

 Delta 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl -20.68 dB VBW 100 kHz
-20 dBm 805.21639822 MHz SWT 6.4 s Unit dBm



Date: 06.OCT.2010 12:34:11

Section 6. Radiated Emissions

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.247 (d)
TESTED BY: David Light	DATE: 06 October 2010

Test Results: Complies.

Measurement Data: See attached table.

Test Conditions: 50 %RH
22 °C

Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1480-791-993-1016-1464-1484-1485

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).

RBW=VBW=100 kHz below 1000 MHz

RBW=VBW=1 MHz above 1000 MHz

Peak detector

Section 7. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(e)/A8.2(b)
TESTED BY: David Light	DATE: 30 August 2010

Test Results: Complies.

Measurement Data: See attached data.

Test Conditions: 50 %RH
22 °C

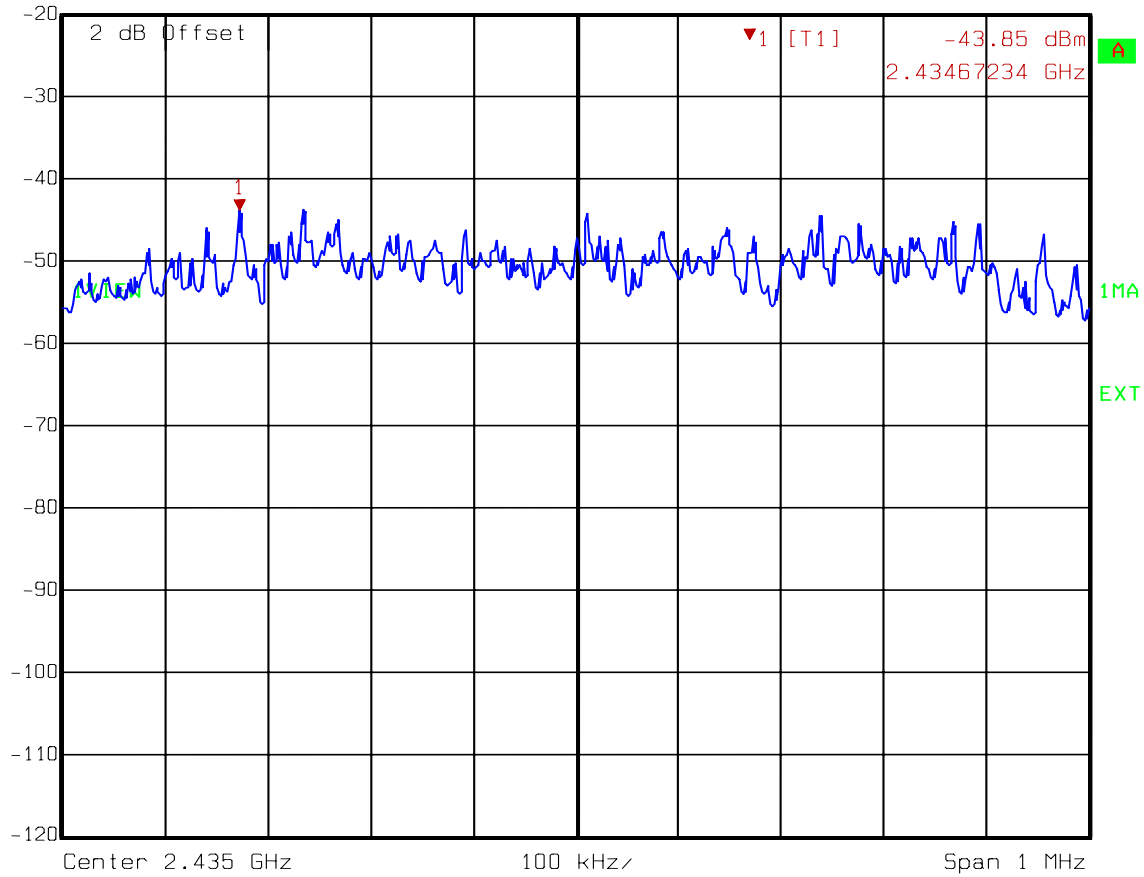
Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082

Peak Power Spectral Density



Ref Lvl -20 dBm
Marker 1 [T1] -43.85 dBm
2.43467234 GHz
RBW 3 kHz RF Att 10 dB
VBW 3 kHz
SWT 360 s Unit dBm



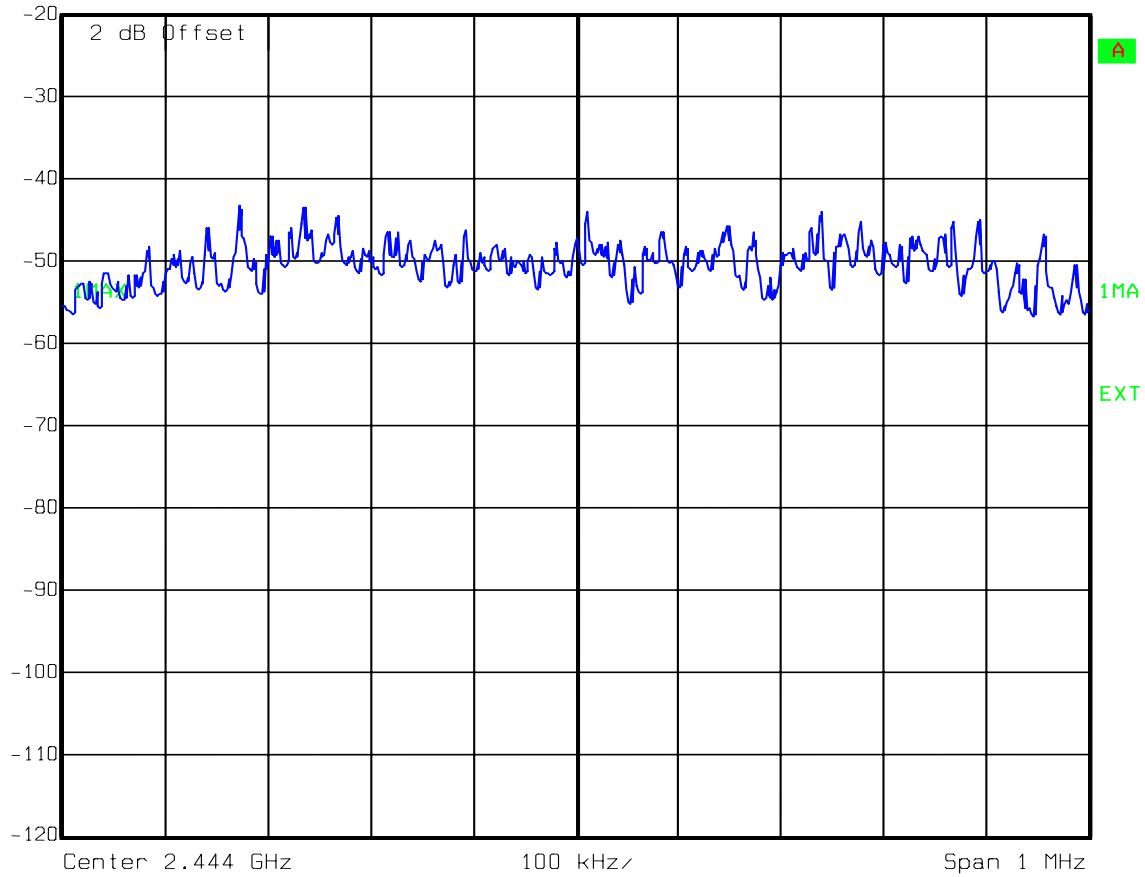
Date: 06.OCT.2010 12:30:08

Peak Power Spectral Density



Ref Lvl
-20 dBm

RBW 3 kHz RF Att 10 dB
VBW 3 kHz
SWT 360 s Unit dBm



Date: 06.OCT.2010 12:42:31

Section 8. Receiver Spurious Emissions

NAME OF TEST: Receiver Spurious Emissions	PARA. NO.: RSS-GEN
TESTED BY: David Light	DATE: 06 October 2010

Test Results: Complies.

Measurement Data: See attached plots.

Test Conditions: 50 %RH
22 °C

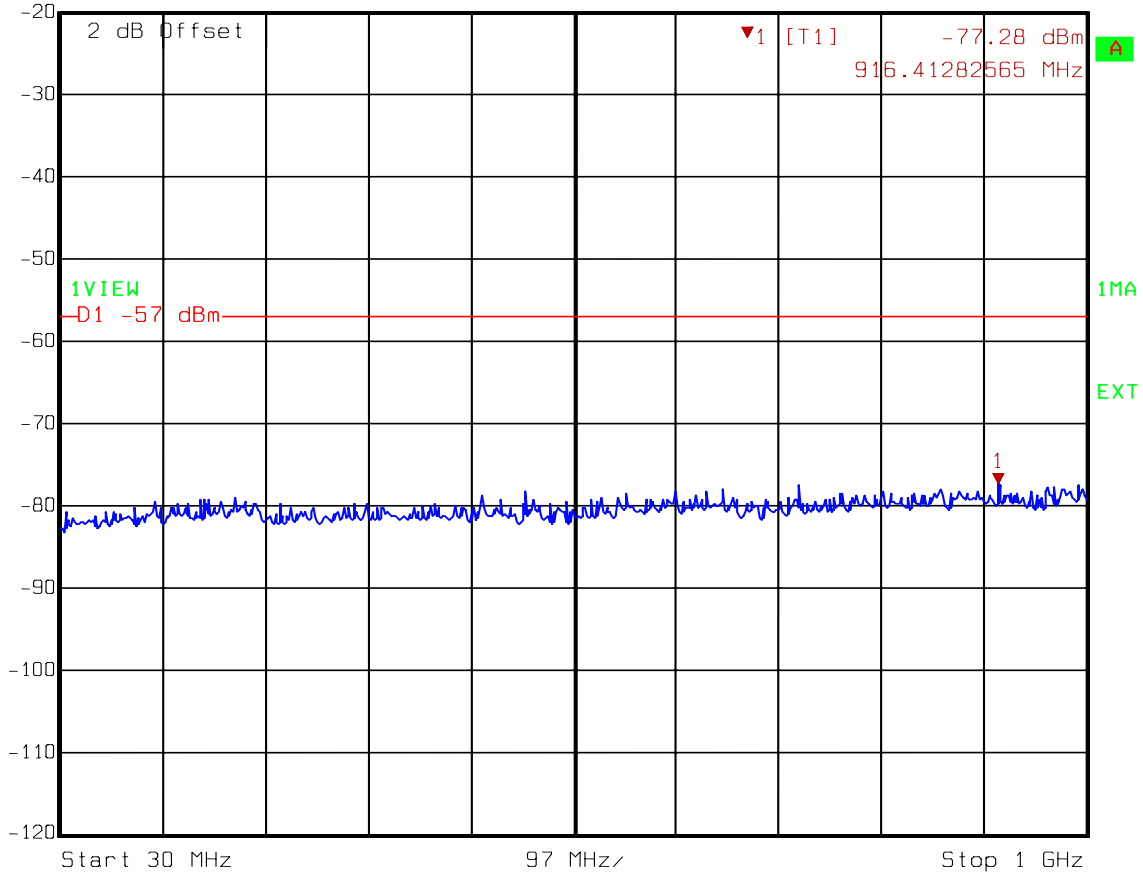
Measurement Uncertainty: +/-1.7 dB

Test Equipment Used: 1036-1082

Test Data – Receiver Spurious Emissions



Ref Lvl -20 dBm
Marker 1 [T1] 916.41282565 MHz
RBW 100 kHz RF Att 10 dB
VBW 100 kHz
SWT 245 ms Unit dBm

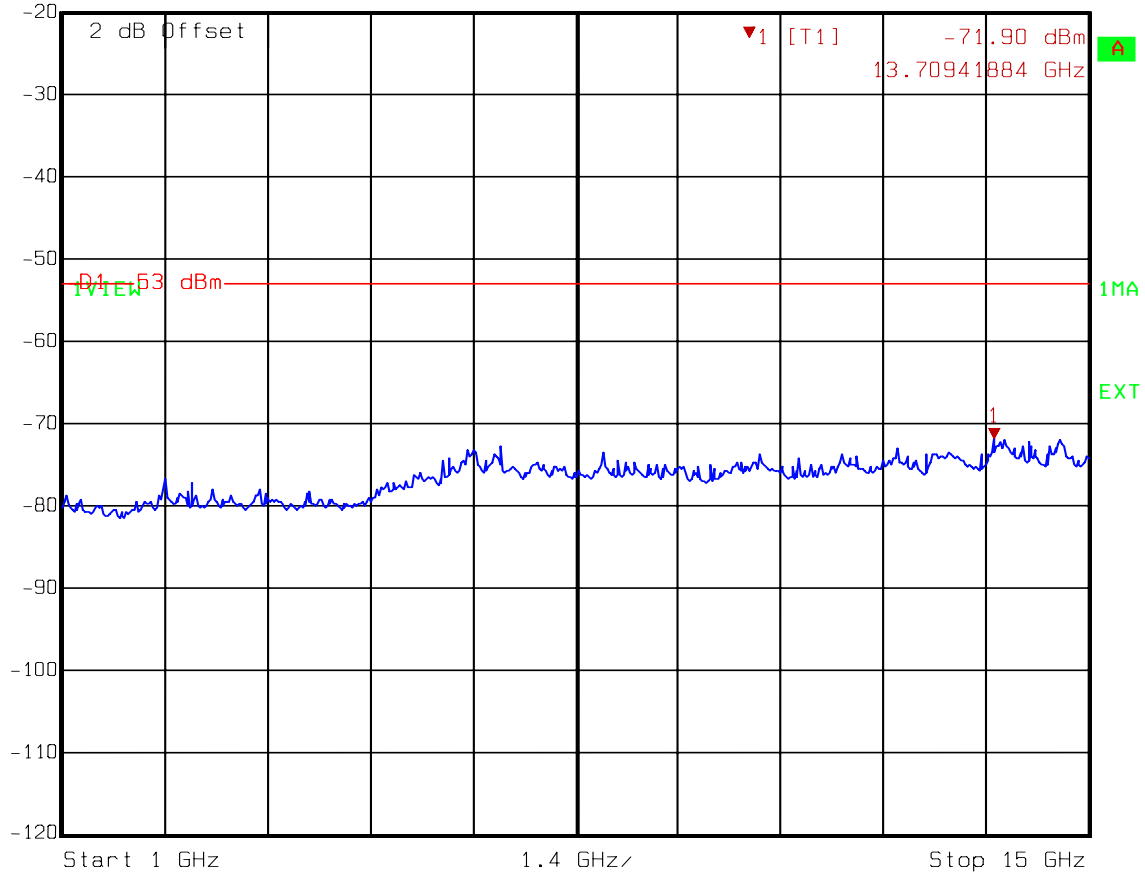


Date: 06.OCT.2010 12:45:04

Test Data – Receiver Spurious Emissions



Ref Lvl -20 dBm
Marker 1 [T1] -71.90 dBm
13.70941884 GHz
RBW 1 MHz RF Att 0 dB
VBW 1 MHz
SWT 140 ms Unit dBm



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Section 9. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
993	Antenna, Horn	A.H. Systems	SAS-200/571	162	09-Sep-2009	09-Sep-2011
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	19-Jun-2010	19-Jun-2011
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	830844/006	19-Jan-2009	19-Jan-2011
1082	Cable, 2m	Astrolab	32027-2- 29094-72TC		N/R	
1464	Spectrum Analyzer	Hewlett Packard	8563E	3551A04428	27-Feb-2009	27-Feb-2011
1480	Antenna, Bilog	Schaffner- Chase	CBL6111C	2572	18-Jan-2010	18-Jan-2011
1484	Cable	Storm	PR90-010-072		19-Jun-2010	19-Jun-2011
1485	Cable	Storm	PR90-010-216		19-Jun-2010	19-Jun-2011
791	PreAmp	Nemko, USA			08-Mar-2010	08-Mar-2011

ANNEX A - TEST DETAILS

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
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Minimum Standard: The minimum 6 dB bandwidth shall be at least 500 kHz

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

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW = VBW = 100 kHz.

Span: Sufficient to display 6 dB bandwidth

LOG dB/div.: 10 dB

Sweep: Auto

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

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Substitution Antenna Method for Integral Antennas:

The peak field strength of the carrier is measured in a worst-case configuration with a RBW > 5 times the occupied bandwidth of the transmitted waveform. For cases where the RBW of the test instrument is not sufficient, the power is measured using a peak power meter instead of the spectrum analyzer.

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

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: Spurious Emissions(conducted)	PARA. NO.: 15.247(d)
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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 ($\mu\text{V/m}$ @ 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 IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.

Method Of Measurement:

30 MHz - 10th harmonic plot

RBW: 100 kHz

VBW: 300 kHz

Sweep: Auto

Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level above center frequency.

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: 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 ($\mu\text{V/m @ 3m}$)	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)
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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:

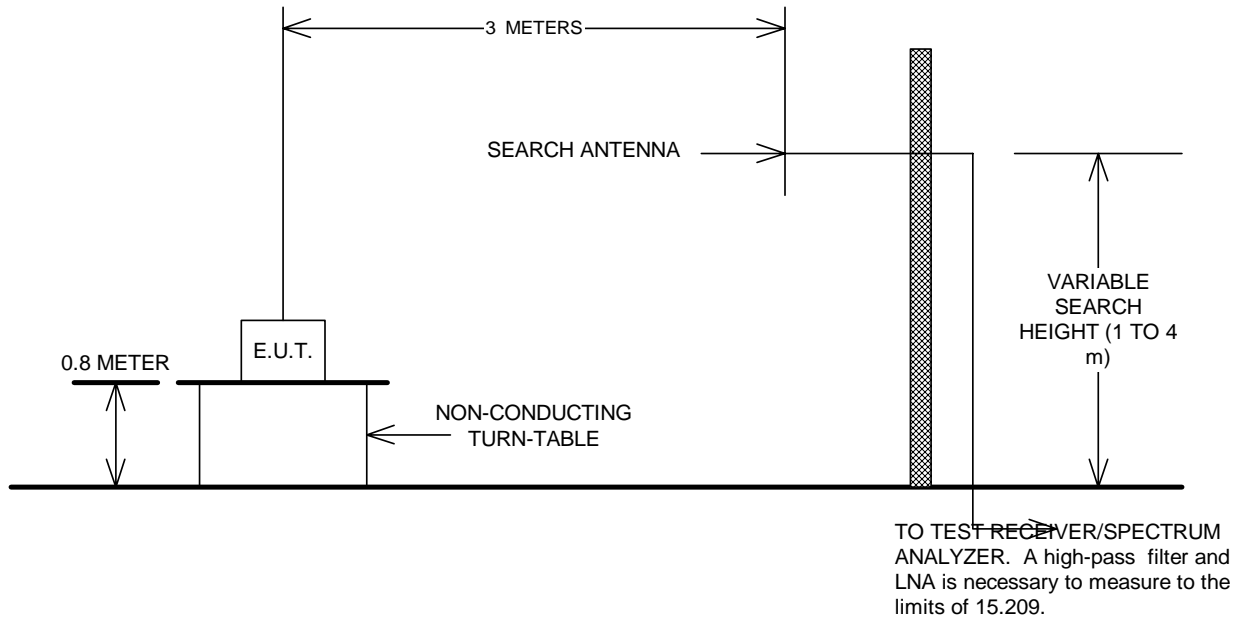
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent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

Number of channels tested:

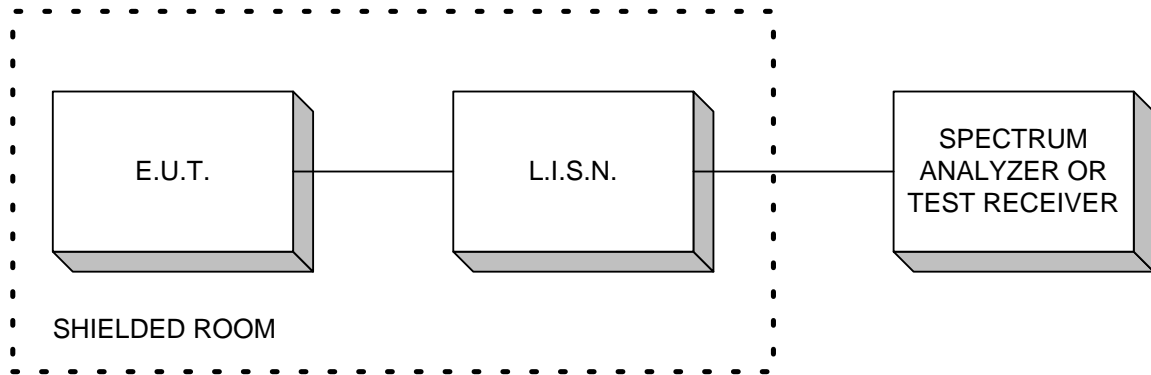
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

ANNEX B - TEST DIAGRAMS

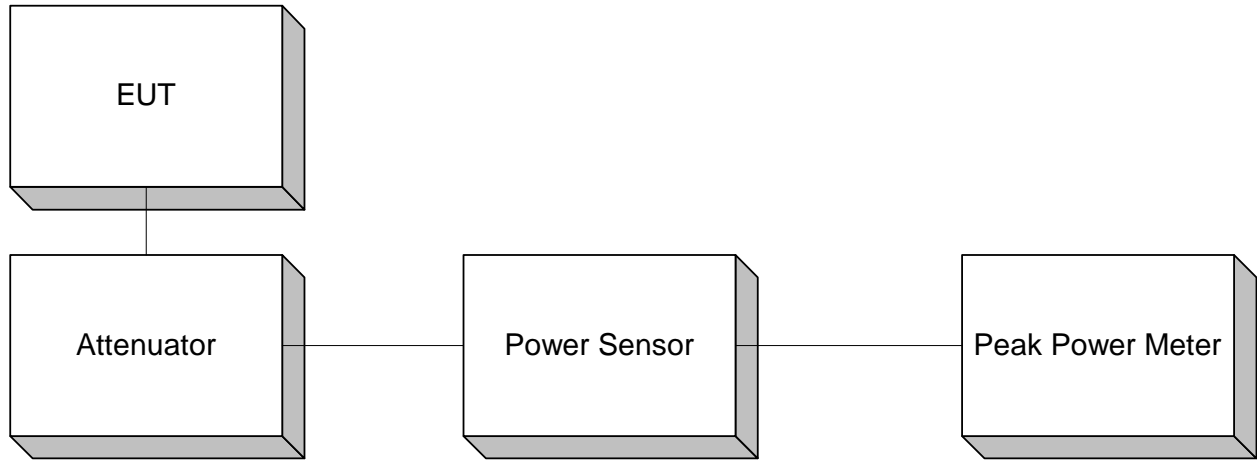
Test Site for Radiated Emissions



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 6 dB bandwidth of the transmitter.

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

