




**Nemko Test Report:** 18366RUS1


**Applicant:** AeroComm, Inc.  
11160 Thompson Avenue  
Lenexa, Kansas 66219  
USA

**Equipment Under Test:  
(E.U.T.)** Z100S1

**In Accordance With:** **FCC Part 15, Subpart C, 15.247 and IC 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:** 16 October, 2008

**APPROVED BY:**   
\_\_\_\_\_  
Tom Tidwell, Telecom Direct **DATE:** 17 October, 2008

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**Section 1. Summary of Test Results**

Manufacturer: AeroComm, Inc.  
Model No.: Z100S1AFR and Z100S1UFC\*  
Serial No.: None

\* [Refer to description on page 5](#)

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 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.

- |                                     |                            |                                     |                     |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission             | <input checked="" type="checkbox"/> | Production Unit     |
| <input type="checkbox"/>            | Class II Permissive Change | <input type="checkbox"/>            | 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**

<b>NAME OF TEST</b>	<b>PARA. NO.</b>	<b>RESULT</b>
Powerline Conducted Emissions	15.207(a), RSS-Gen 7.2.2	Complies
Minimum 6 dB Bandwidth	15.247(a)(2), RSS 210 A8.2(1)	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 (Restricted Bands)	15.247(d)/15.209(a), RSS 210 A8.5/Para 2.7	Complies
Peak Power Spectral Density	15.247(e), RSS 210 A8.1(2)	Complies
Receiver Spurious Emissions	RSS-Gen. 6(b)	Complies

**Footnotes:**

## 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: 2405 to 2475 MHz

User Frequency Adjustment: Software controlled

### Description of EUT

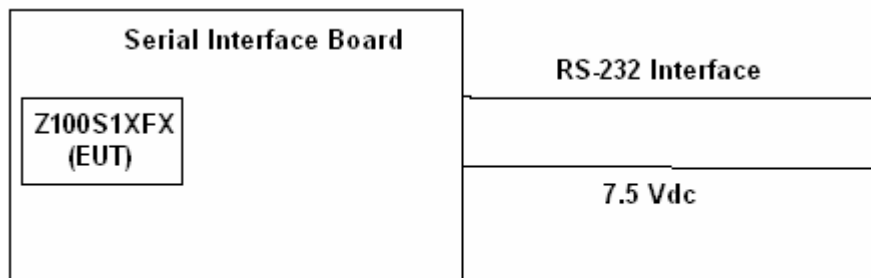
The Z100S1 is a 2.4 GHz Direct Sequence Spread Spectrum transceiver module that uses Texas Instruments ZB2430 chip for all RF and processing controls.

Model Z100S1AFR incorporates a 2 dBi integral chip antenna, AeroComm, Inc. model WIC2450-A

Model Z100S1UFC uses a detachable 5 dBi dipole antenna, Nearson model S151FC-L-(132)PX-2450S

### System Diagram

All communication with the **Z100S1** is through a serial interface board provided using the RS-232 serial port. Power is supplied using 7.5 volt DC supply.



**Section 3. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: David Light	DATE: 15 October 2008

**Test Results:** Complies.

**Measurement Data:** See 6 dB BW plot  
Measured 6 dB bandwidth: 1.7 MHz max

**Test Conditions:** 48 %RH  
22 °C

**Measurement Uncertainty:** +/-1x10<sup>-7</sup> ppm

**Test Equipment Used:** 1464-1472-1082







**Section 4. Maximum Peak Output Power**

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(3)
TESTED BY: David Light	DATE: 15 October 2008

**Test Results:** Complies.

**Measurement Data:** Refer to attached data

**Test Conditions:** 48 %RH  
22 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1464-1472-1082

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





**Section 5          Spurious Emissions at Antenna Terminals**

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 15.247 (d)
TESTED BY: David Light	DATE: 15 October 2008

**Test Results:**                      Complies.

**Measurement Data:**    See attached plots.

**Test Conditions:**                48 %RH  
    22 °C

**Measurement Uncertainty:**    +/-1.7    dB

**Test Equipment Used:**    1464-1472-1082







**Section 6. Radiated Emissions**

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.247 (d)
TESTED BY: David Light	DATE: 16 October 2008

**Test Results:** Complies.

**Measurement Data:** See attached table.

**Test Conditions:** 52 %RH  
24 °C

**Measurement Uncertainty:** +/-3.6 dB

**Test Equipment Used:** 1464-1484-1485-1016-993-1763-1767-791

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 is presented below.



**Radiated Emissions**

Measurement Data – Radiated Emissions

The spectrum was searched from 30 MHz to the tenth harmonic of the carrier. There were no emissions detected above the noise floor which was at least 20 dB below the specification limit. Upper band edge data is presented below.

Z100S1AFR

**Measurement Data:**

Test Distance: 3 Meters

Freq MHz	Rdng dBµV	Cable dB	Cable dB	Pre-A dB	Horn dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
2483.5	55.2	+0.8	+2.3	-32.8	+29.0	+0.0	54.5	74.0	-19.5	Vert
Peak										
2483.5	44.3	+0.8	+2.3	-32.8	+29.0	+0.0	43.6	54.0	-10.4	Vert
Ave										
2483.5	55.2	+0.8	+2.3	-32.8	+29.0	+0.0	54.5	74.0	-19.5	Vert
2483.5	44.3	+0.8	+2.3	-32.8	+29.0	+0.0	43.6	54.0	-10.4	Vert
Ave										

Z100S1UFC

**Measurement Data:**

Test Distance: 3 Meters

Freq MHz	Rdng dBµV	Cable dB	Cable dB	Pre-A dB	Horn dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
2483.5	55.4	+0.8	+2.3	-32.8	+29.0	+0.0	54.7	74.0	-19.3	Vert
Peak										
2483.5	44.0	+0.8	+2.3	-32.8	+29.0	+0.0	43.6	54.0	-10.7	Vert
Ave										
2483.5	55.4	+0.8	+2.3	-32.8	+29.0	+0.0	54.7	74.0	-19.3	Vert
2483.5	44.0	+0.8	+2.3	-32.8	+29.0	+0.0	43.6	54.0	-10.7	Vert
Ave										

RBW=VBW=100 kHz below 1000 MHz  
 RBW=VBW=1 MHz above 1000 MHz (Peak)  
 RBW= 1 MHz VBW=3 kHz (Average)

**Section 7. Peak Power Spectral Density**

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(e)
TESTED BY: David Light	DATE: 16 October 2008

**Test Results:** Complies.

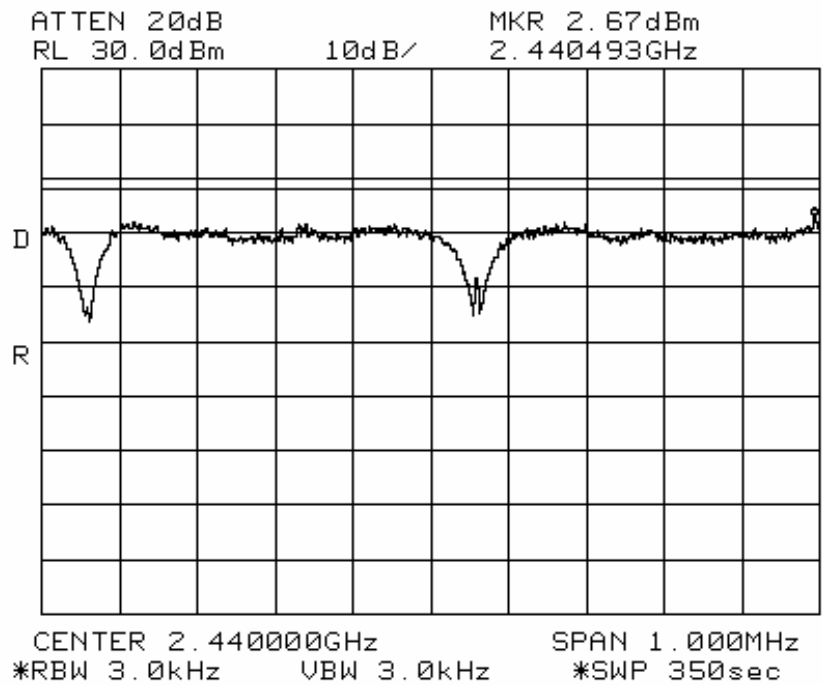
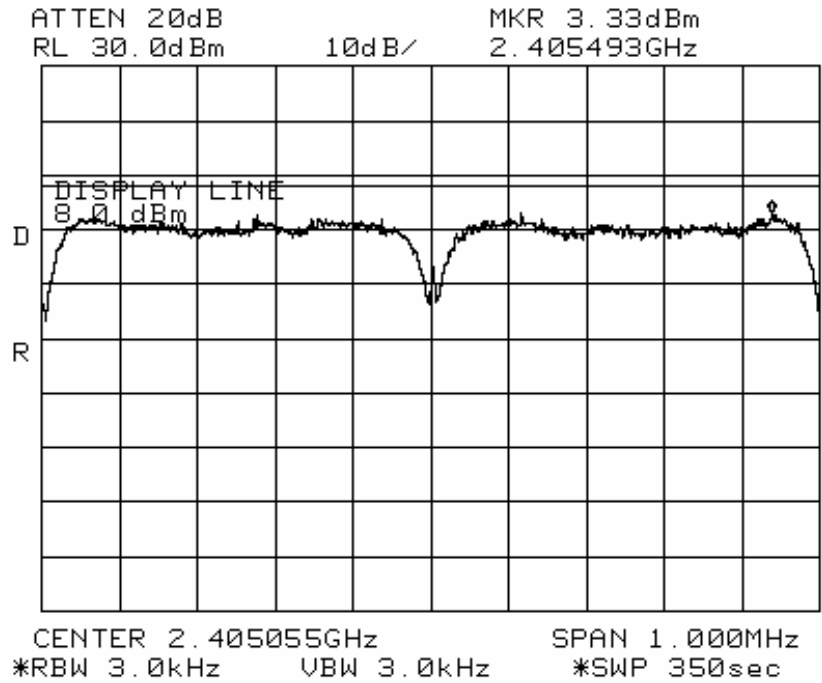
**Measurement Data:** See attached data..

**Test Conditions:** 48 %RH  
22 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1464-1472-1082

Peak Power Spectral Density





**Section 8. Powerline Conducted Emissions**

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: David Light	DATE: 16 October

**Test Results:** Complies.

**Measurement Data:** See attached graphs..

**Test Conditions:** 41 %RH  
24 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1663-1484-545

Power was supplied with an HP triple output power supply model 6235A

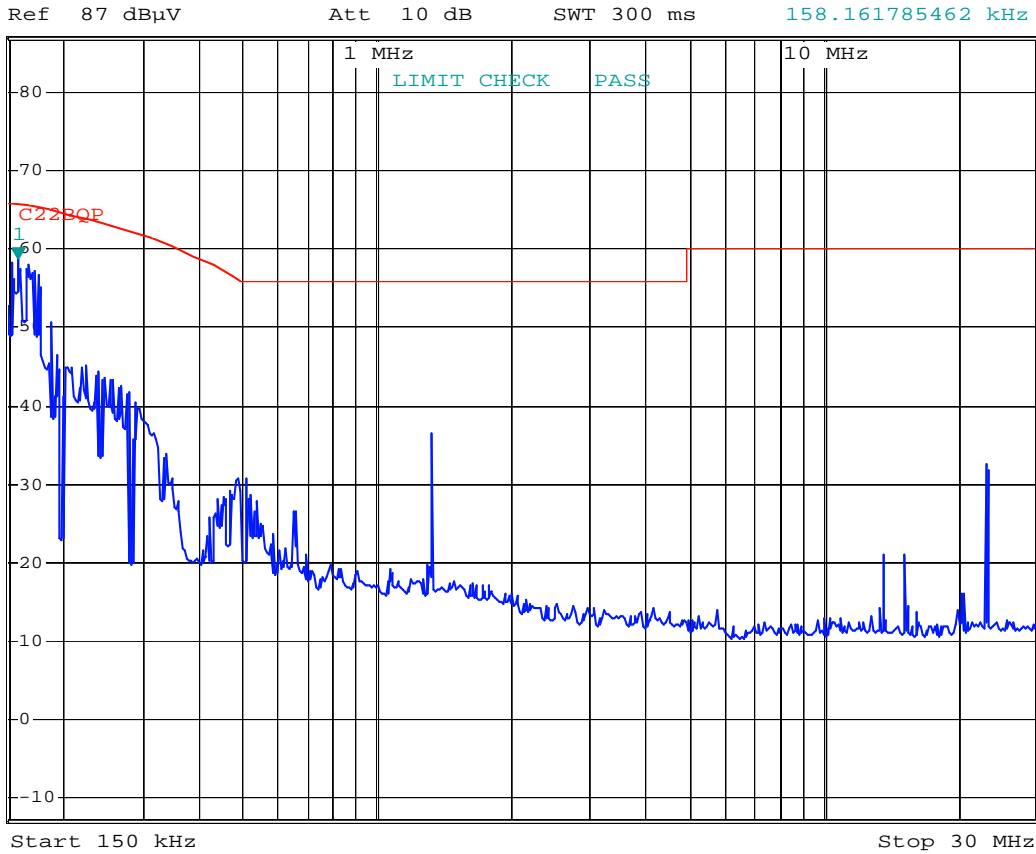
Test Data – Powerline Conducted Emissions

L1 Peak



\*RBW 10 kHz    Marker 1 [T1 ]  
VBW 30 kHz        58.77 dBµV  
SWT 300 ms        158.161785462 kHz

1 PK  
VIEW



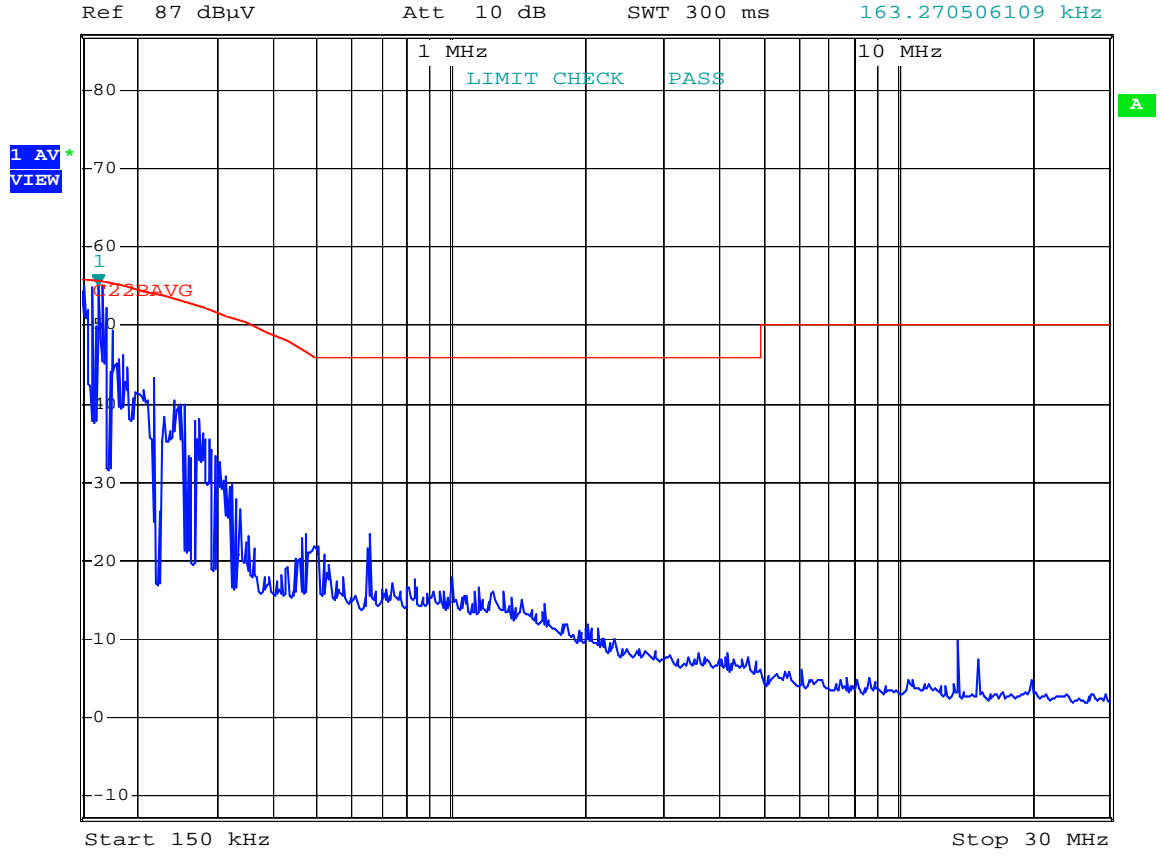
Date: 16.OCT.2008 14:56:51

### Test Data – Powerline Conducted Emissions

L1 Average



\*RBW 10 kHz    Marker 1 [T1 ]  
VBW 100 kHz    55.05 dBµV  
SWT 300 ms    163.270506109 kHz



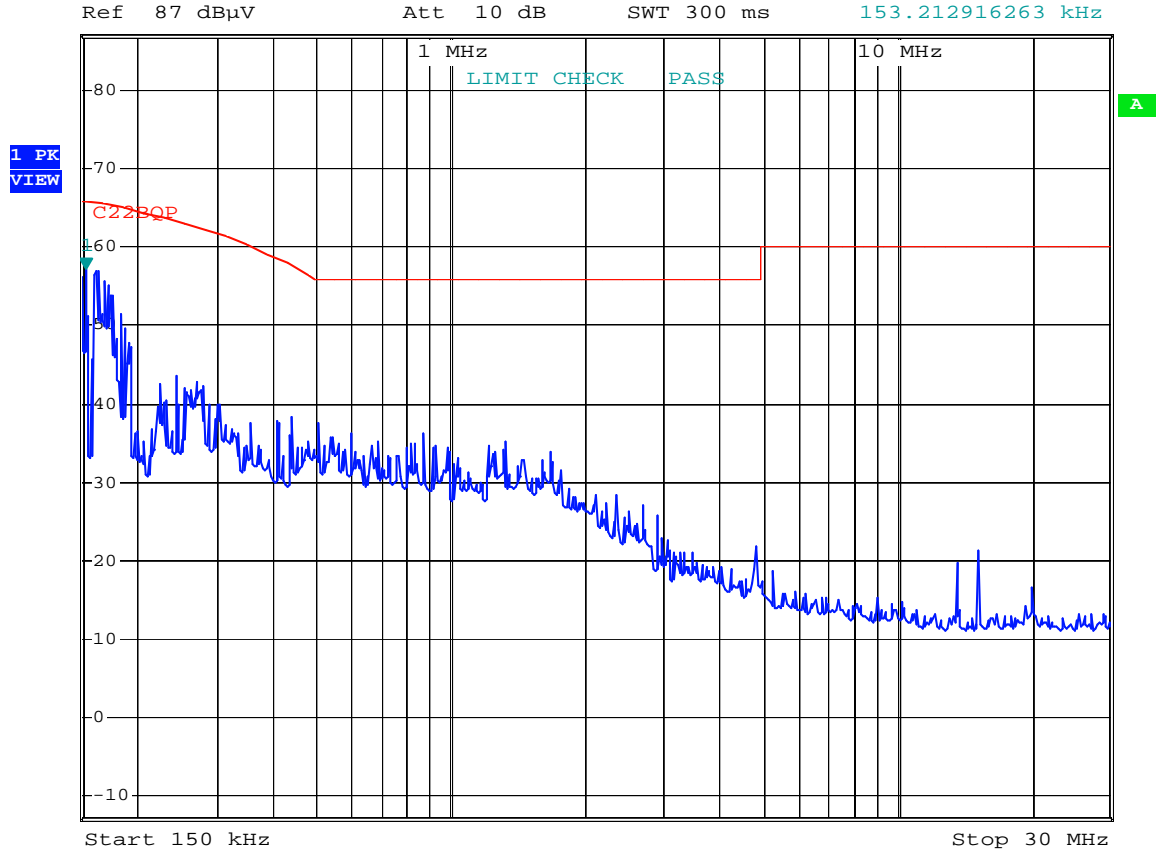
Date: 16.OCT.2008 15:00:19

Test Data – Powerline Conducted Emissions

L2 Peak



\*RBW 10 kHz    Marker 1 [T1 ]  
VBW 30 kHz        57.15 dBµV  
SWT 300 ms        153.212916263 kHz



Date: 16.OCT.2008 15:02:05

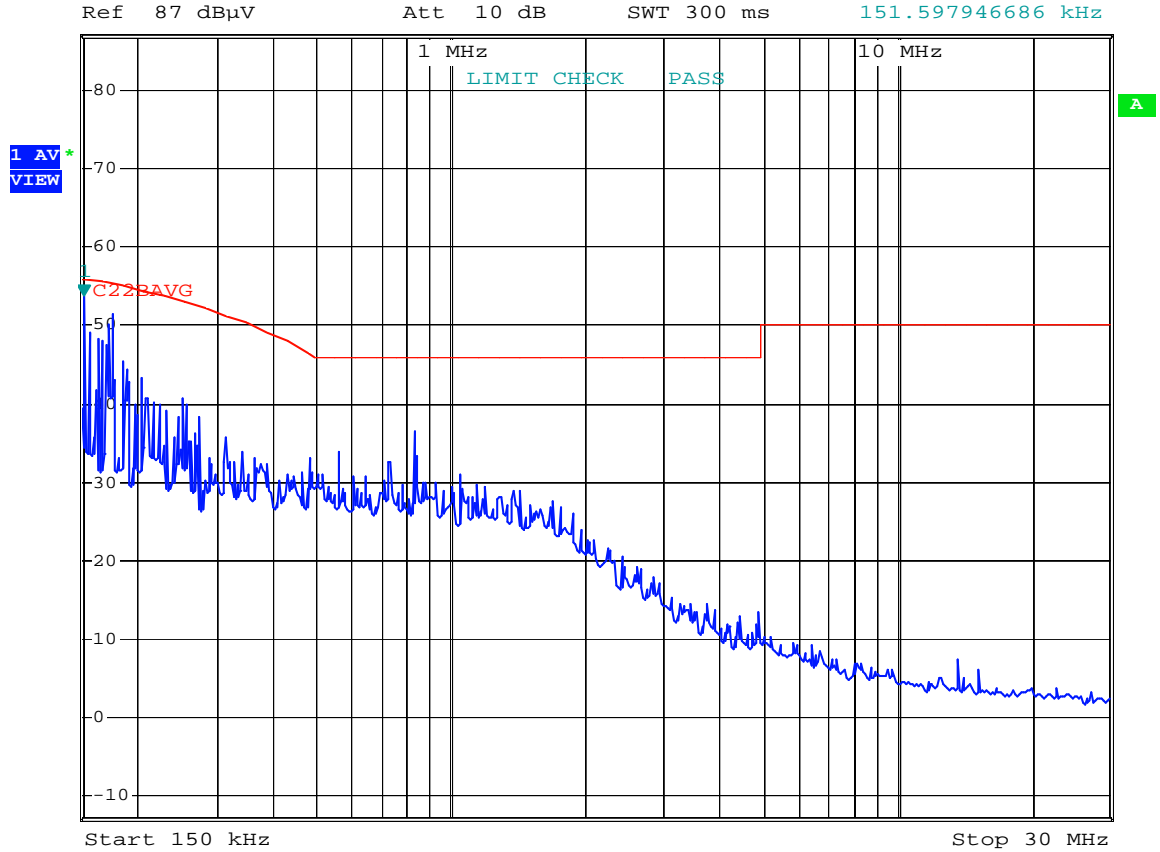


### Test Data – Powerline Conducted Emissions

L2 Average



\*RBW 10 kHz    Marker 1 [T1 ]  
VBW 100 kHz    53.92 dBμV  
SWT 300 ms    151.597946686 kHz



Date: 16.OCT.2008 15:03:15

**Section 8. Receiver Spurious Emissions**

NAME OF TEST: Receiver Spurious Emissions	PARA. NO.: RSS-Gen
TESTED BY: David Light	DATE: 15 October 2008

**Test Results:** Complies.

**Measurement Data:** See attached data..

**Test Conditions:** 48 %RH  
22 °C

**Measurement Uncertainty:** +/-1.7 dB

**Test Equipment Used:** 1464-1472-1082



## Section 10. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1484	Cable	Storm PR90-010-072	N/A	05/07/08	05/07/09
1485	Cable	Storm PR90-010-216	N/A	05/07/08	05/07/09
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/07/08	05/07/09
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/09
1763	Bilog Antenna	Schaffner CBL 6111D	22926	09/21/07	09/20/08
1767	EMI Test Receiver 20Hz - 26.5 GHz	ROHDE & SCHWARZ ESIB26	837491/0002	09/20/07	09/19/09
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/07/08	05/07/09
1663	Spectrum Analyzer	Rhode & Schwarz FSP3	100073	06/03/08	06/03/09
545	LISN	Schwarz Beck 8120	8120350	08/05/08	08/05/09

## **ANNEX A - TEST DETAILS**

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

**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: 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

**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)
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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 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  $\leq 3$  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:**

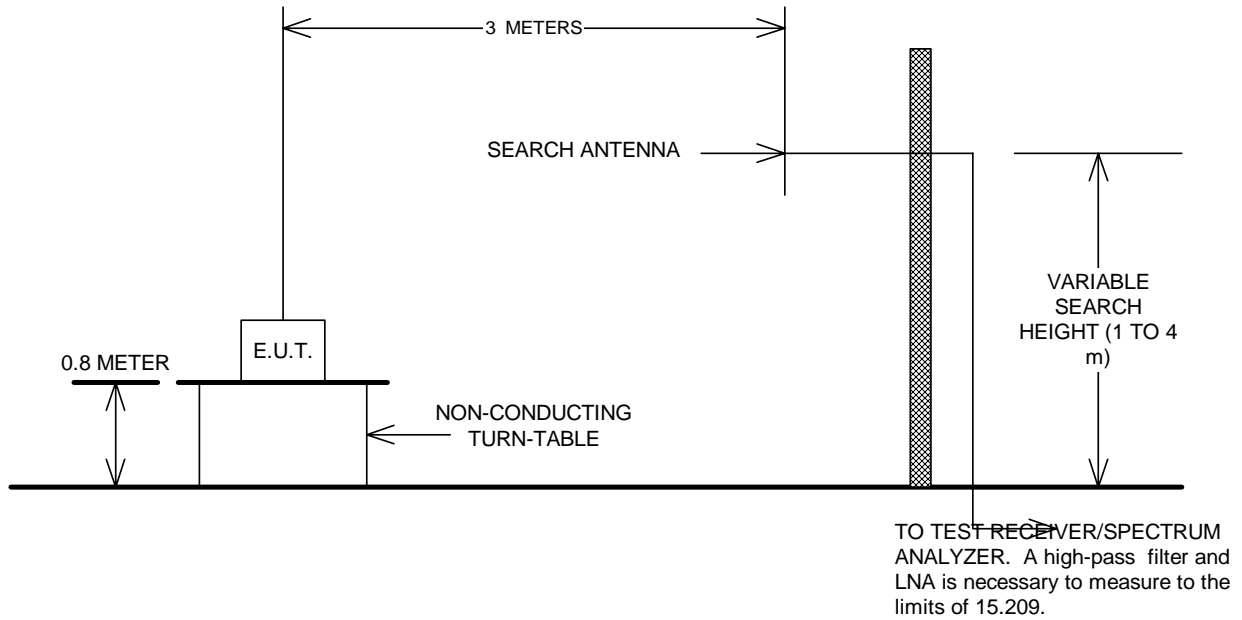
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent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

Number of channels tested:

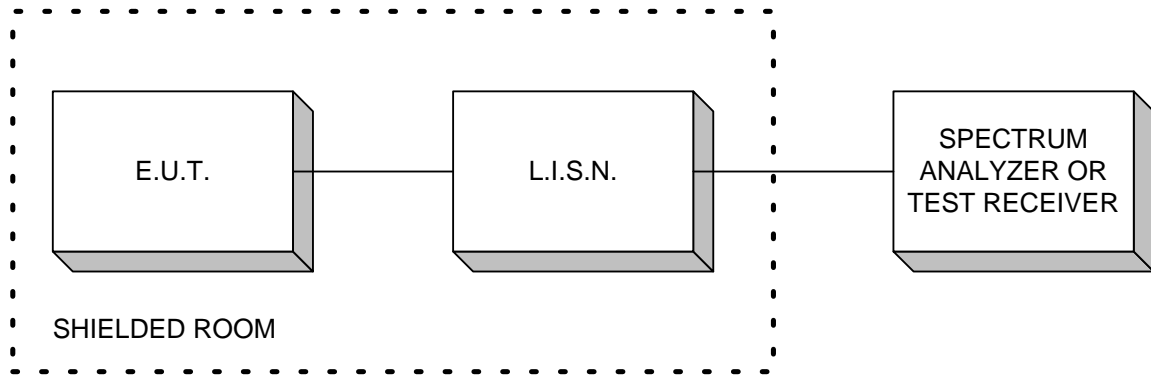
Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

**ANNEX B - TEST DIAGRAMS**

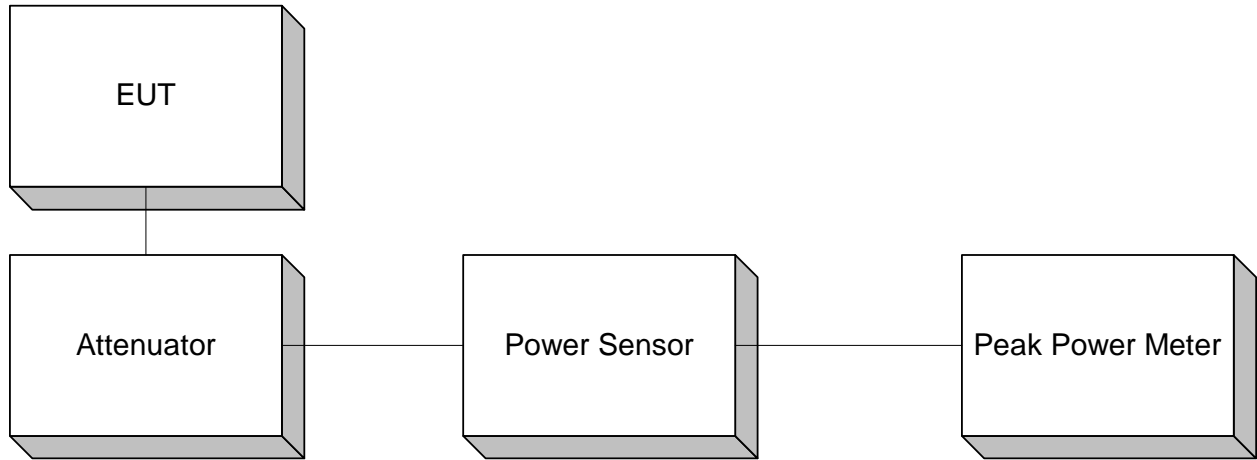
**Test Site For Radiated Emissions**



**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)**

