

Nemko Test Report: 5L0047RUS1_1502

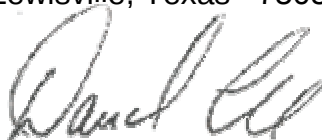
Applicant: Enfora
661 E. 18th Street
Plano, Texas, 75024xxx

**Equipment Under Test:
(E.U.T.)** WLN1502

In Accordance With: **FCC Part 15, Subpart C, 15.247**
Spread Spectrum Transmitters

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

Authorized By:

A handwritten signature in black ink, appearing to read 'David Light', is positioned above the printed name.

David Light, Senior Wireless Engineer

Date: 19 August 2005

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Section 1. Summary of Test Results

Manufacturer: Enfora
Name: Wi-Fi Adapter for Treo Smartphones
Model Number: WLN1502
Serial Number: None
Part Number: None
Production Status: Pre-production
E.U.T. Arrival Date: 7/19/2005

Description of E.U.T.:

Wi-Fi adapter sled for Palm Treo 600 and 650 smartphones

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 for Direct Sequence Spread Spectrum devices. 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.



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. NONE
See “ Summary of Test Data”.



NVLAP LAB CODE: 100426-0

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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Powerline Conducted Emissions	15.207(a)	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	Complies
Maximum Peak Power Output	15.247(b)(1)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	NA
Spurious Emissions (Radiated)	15.247(c)	Complies
Peak Power Spectral Density	15.247(d)	Complies

Footnotes:

EUT has an integral antenna.

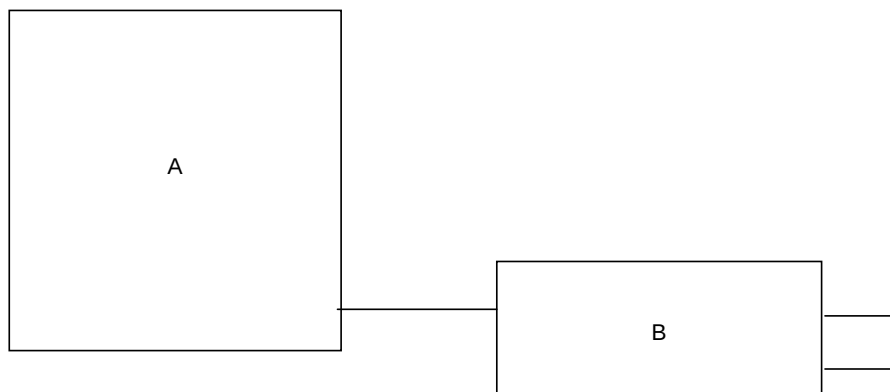
General Equipment Information

User Frequency Adjustment:	Software controlled
-----------------------------------	---------------------

Description of EUT

Wi-Fi adapter sled for Palm Treo 600 and 650 smartphones

System Diagram



A) EUT

B) Power Supply: PHIHONG PSA11R-050, Input: 100 – 240 VAC, 50-60 Hz, Output: 5VDC, 2A.

Section 3. Powerline Conducted Emissions

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for conducted disturbance as defined by CFR 47, Part 15, Subpart B, Class B, Paragraph Number 15.107.

Specification Limits:

Limits for conducted disturbance at the mains ports

Frequency Range (MHz)	Quasi-peak Limits (dBuV)	Average Limits (dBuV)
0.15 to 0.50	66-56	56-46
0.50 to 5.00	56	46
5.00-30.0	60	50
The limit decreases with the logarithm of the frequency in the range 0.15MHz to 0.5 MHz		

Method of Measurement (Procedure ANSI C63.4-2001):

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9 or 10 kHz bandwidth, CISPR Quasi-Peak detector.

See Sections 7 and 8

Test #: CEPV-01

Tested By: Brian Boyea

Date of Tests: 7/20/2005

Test Conditions:

Test Voltage: 120Vac

Temperature: 22°C

Humidity: 33%

Test Results:

The E.U.T. complies.

The worst-case emission is 44.4dBμV at 0.6591 MHz on the Hot side of the line.
This is 1.6 dB below the average specification limit of 46.0dBμV.

TEST EQUIPMENT

Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
545	LISN	Schwarz Beck	8120	8120350	09/17/04	09/17/05
968	Filter, High pass 5khz	Solartron	7930-5.0	933124	08/17/04	08/17/05
1019	CABLE, 9.5m	Nemko	RG223	N/A	07/27/04	07/27/05
1556	COUPLING DUAL DIRECTIONAL	AMPLIFIER RESEARCH	DC3010	18722	09/21/04	09/21/05
718	HP SPECTRUM ANALYZER	HEWLETT PACKARD	8591EM	3639A00980	04/06/05	04/06/06
674	LIMITER	HP	11947A	3107A02200	CBU	N/A

Test Data –Conducted Emissions, Power Lines Test#CEPV-01

Conducted Emissions													
Powerline Voltage Measurement													
Complete	<u>X</u>			Job # : <u>5L0047E</u>				Test # : <u>CEPV-01</u>					
Preliminary				Page <u>1</u>				of <u>2</u>					
Client Name : <u>Enfora</u>													
EUT Name : <u>Wi-Fi Adapter for Treo Smartphones</u>													
EUT Model # : <u>WLN1501</u>													
EUT Part # : <u>None</u>													
EUT Serial # : <u>None</u>													
EUT Config. : <u>Idle State, Transmit State (Pinging Router).</u>													
Specification : <u>CFR Pt 15 Subpart B, Class B</u>													
Reference :													
Transducer # :		<u>545</u>		Temp. (deg. C) :		<u>22</u>		Date :		<u>07/20/05</u>			
HP Filter # :		<u>968</u>		Humidity (%) :		<u>33</u>		Time :		<u>5:00 P.M.</u>			
Cable 1 # :		<u>1019</u>		EUT Voltage :		<u>120 Vac</u>		Staff :		<u>Brian Boyea</u>			
Cable 2 # :		<u>1556</u>		EUT Frequency :		<u>60 Hz</u>		Location :		<u>Lab 3</u>			
Detector 1 # :		<u>718</u>		Peak Bandwidth:		<u>10kHz</u>		Photo ID:		<u>5L0047E CEPV-01</u>			
Detector 2 # :				QP Bandwidth		<u>9kHz</u>							
Limiter # :		<u>674</u>		Avg. Bandwidth		<u>9kHz</u>							

Meas. Freq. (MHz)	EUT Test Point	Detector Type (P,QP, A)	Limit Type (QP, A)	Meter Reading (dBuV)	Path Loss (dB)	Transducer Factor (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV)		CR/SL Diff. (dB)	Pass Fail Unc.	Comment
								Q.P.	Avg.			
0.6591	H	P	A	44.4	0	0	44.4	56	46	-1.6	Pass	

Date: 07/20/2005 Time: 19:03:06 WO#:
CISPR-22-B COND [AVE] Test Lead: Black
Black Lead Sequence#: 1

The graph plots dBuV/m on the y-axis (ranging from 10.0 to 80.0) against Frequency in MHz on a logarithmic x-axis (ranging from 150KHz to 30MHz). The measured signal is shown as a black line with significant noise and several distinct peaks. The highest peak is located at approximately 0.7 MHz, reaching a value of about 45 dBuV/m. Two reference limit lines are overlaid: a red line labeled 'CISPR-22-B COND [QP]' and a blue line labeled 'CISPR-22-B COND [AVE]'. Both lines begin at approximately 65 dBuV/m at 0.15 MHz and decrease linearly to about 55 dBuV/m at 1 MHz. Above 1 MHz, the red line steps up to 60 dBuV/m and the blue line steps up to 50 dBuV/m. The measured signal remains well below both limit lines across the entire frequency range.

Test Data Conducted Emissions, Power Lines Test#CEPV-01 Cont.

Conducted Emissions												
Powerline Voltage Measurement												
Complete	<u>X</u>				Job # : <u>5L0047E</u>		Test # : <u>CEPV-01</u>					
Preliminary					Page <u>2</u>		of <u>2</u>					
Client Name : <u>Enfora</u>												
EUT Name : <u>Wi-Fi Adapter for Treo Smartphones</u>												
EUT Model # : <u>WLN1501</u>												
EUT Part # : <u>None</u>												
EUT Serial # : <u>None</u>												
EUT Config. : <u>Idle State, Transmit State (Pinging Router).</u>												
Specification : <u>CFR Pt 15 Subpart B, Class B</u> Reference : <u></u>												
Meas. Freq. (MHz)	EUT Test Point	Detector Type (P,QP, A)	Limit Type (QP, A)	Meter Reading (dBuV)	Path Loss (dB)	Transducer Factor (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV)		CR/SL Diff. (dB)	Pass Fail	Comment
0.656	N	P	A	41.9	0.0	0.0	41.9	59.0	46.0	-4.1	Pass	

Date: 07/20/2005 Time: 19:05:13 WO#:
CISPR-22-B COND [AVE] Test Lead: White Sequence#: 2

White Lead

dBuV/m

80.0

70.0

60.0

50.0

40.0

30.0

20.0

10.0

150kHz

1MHz

10MHz

30MHz

CISPR-22-B COND [QP]

CISPR-22-B COND [AVE]

Test Photographs - Test # CEPV-01



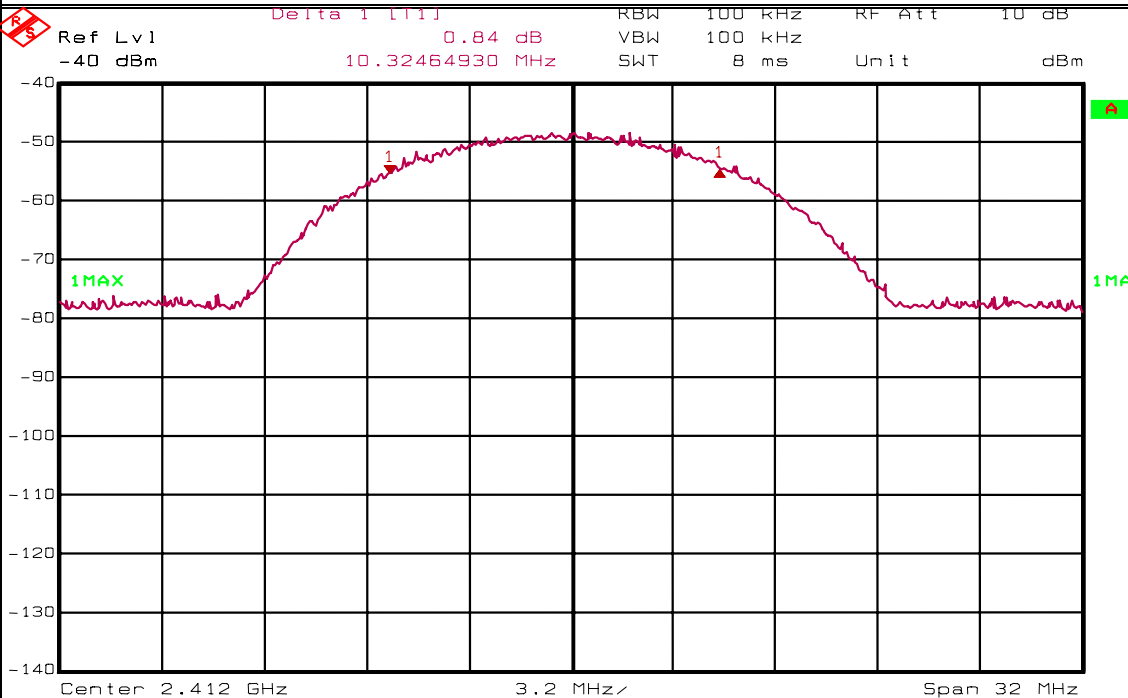
Section 4. Minimum 6 dB Bandwidth

NAME OF TEST: Minimum 6 dB Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: Kevin Rose	DATE: 08/15/05

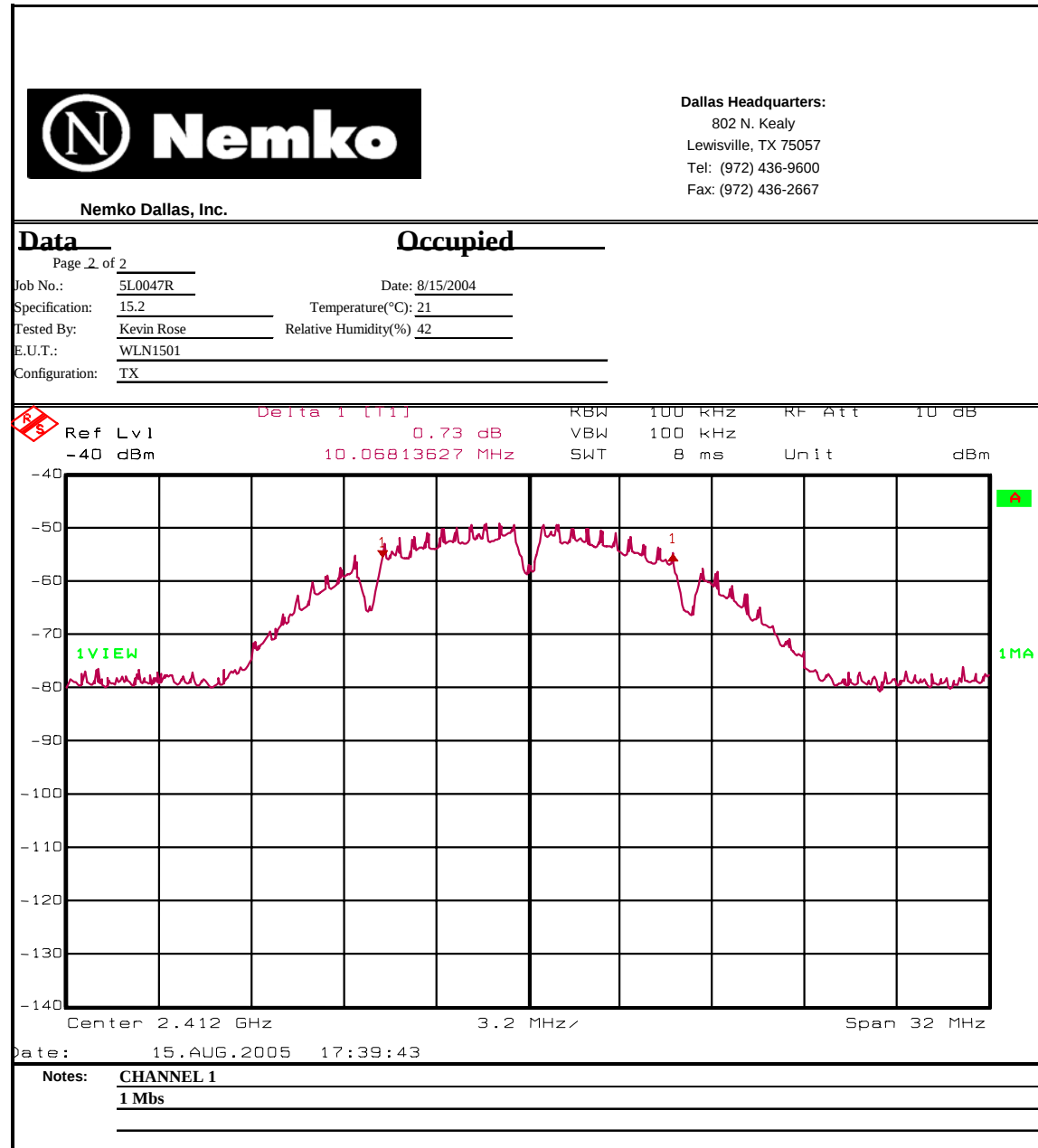
Test Results: Complies.

Measurement Data: See 6 dB BW plot
Measured 6 dB bandwidth: 10.2 MHz Max
Channel Separation: 5 MHz

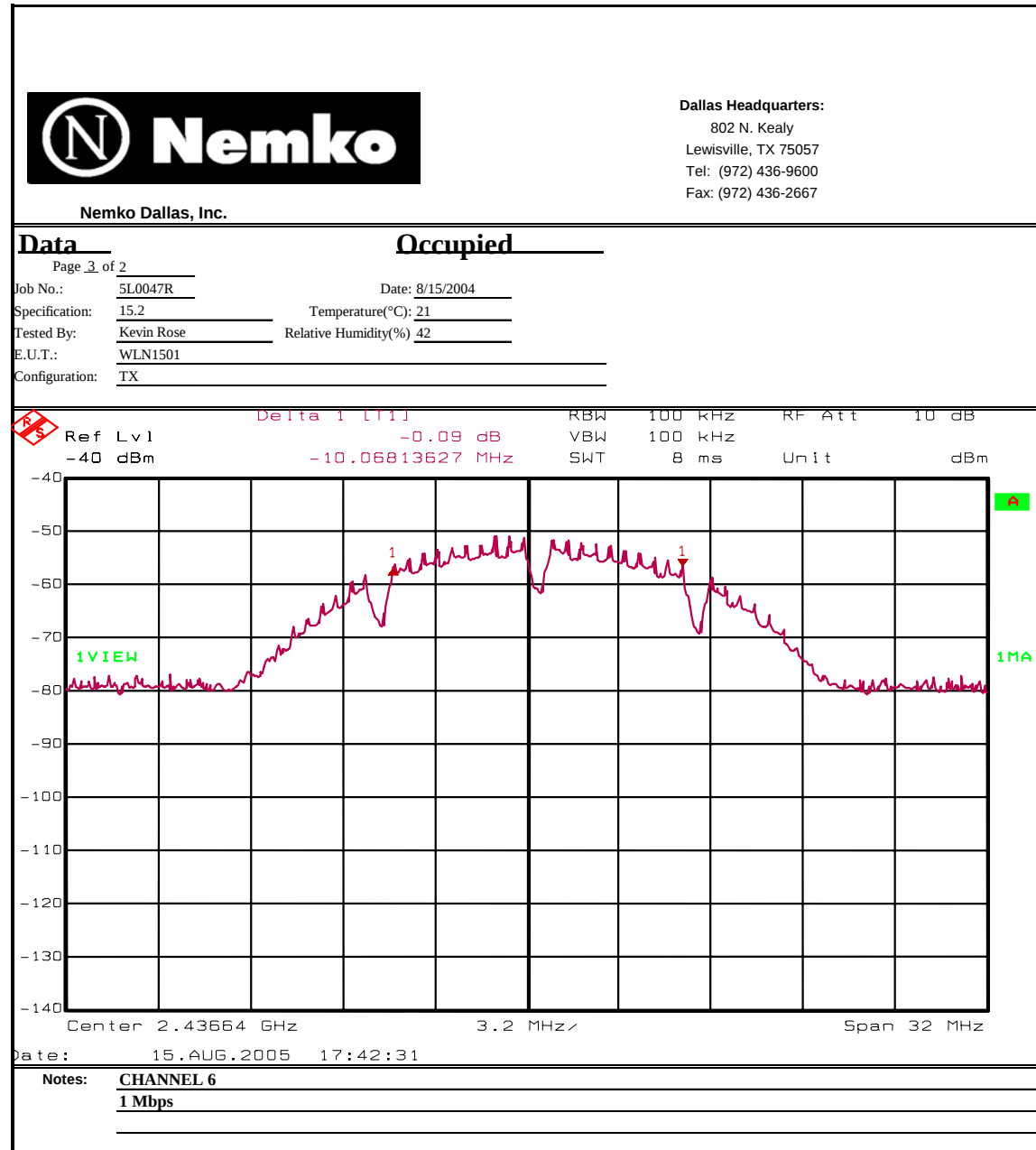
Test Data – Occupied Bandwidth

		Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667	
		Nemko Dallas, Inc.	
Data		Occupied	
Page 1 of 2		Complete <u>X</u>	
Job No.:	5L0047R	Date:	8/15/2004
Specification:	15.247	Temperature(°C):	21
Tested By:	Kevin Rose	Relative Humidity(%)	42
E.U.T.:	WLN1501		
Configuration:	TX		
Sample Number:	1		
Location:	Lab 2	RBW:	100 kHz
Detector Type:	Peak	VBW:	100 kHz
		Measurement Distance:	NA m
Test Equipment Used			
Antenna:	1480	Directional Coupler:	
Pre-Amp:		Cable #1:	
Filter:		Cable #2:	1484
Receiver:	1036	Cable #3:	1485
Attenuator #1:		Cable #4:	
Attenuator #2:		Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-1.7 dB		
			
Date: 15.AUG.2005 17:36:11			
Notes: CHANNEL 1 - 11 Mbps			

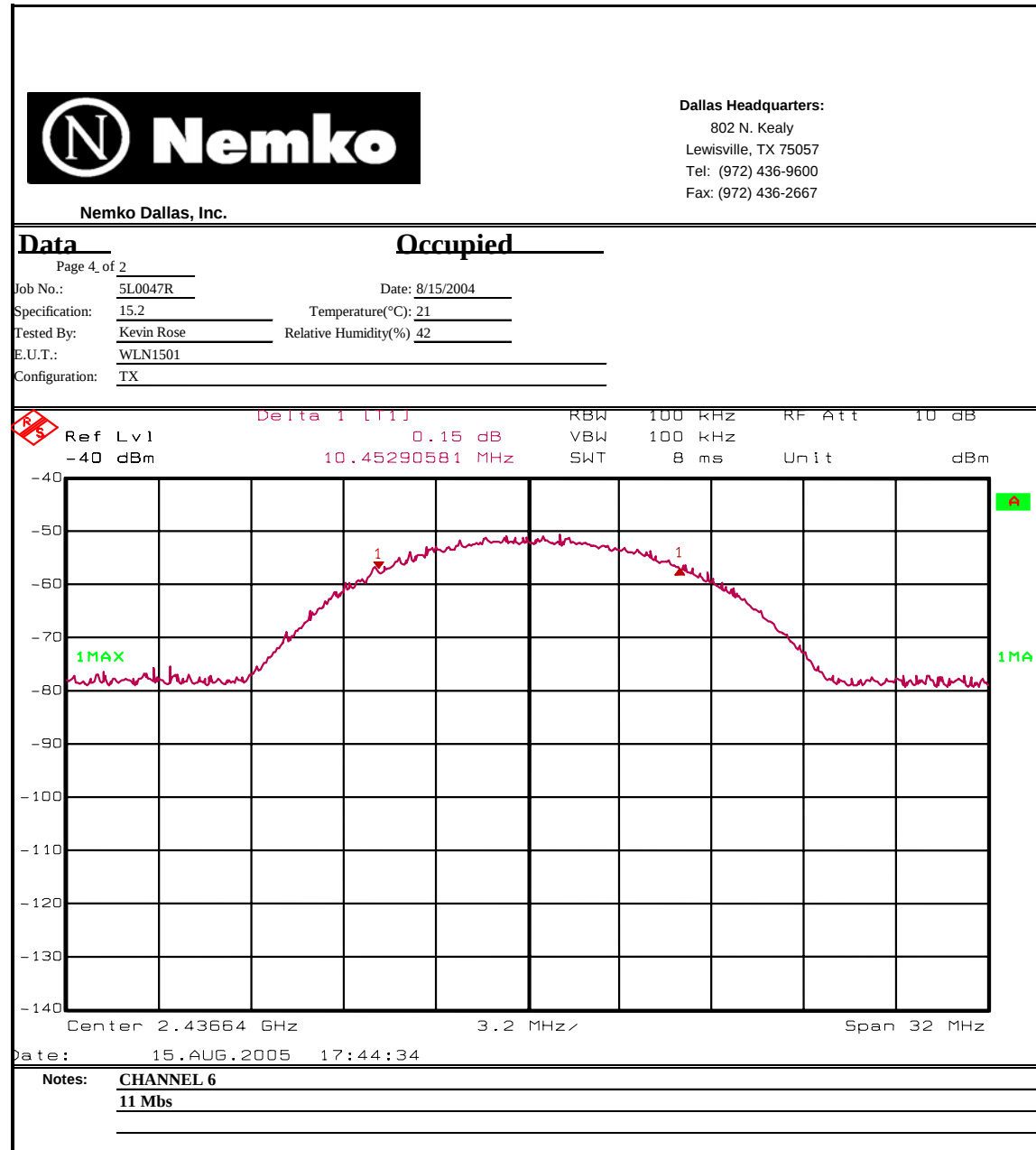
Test Data – Occupied Bandwidth



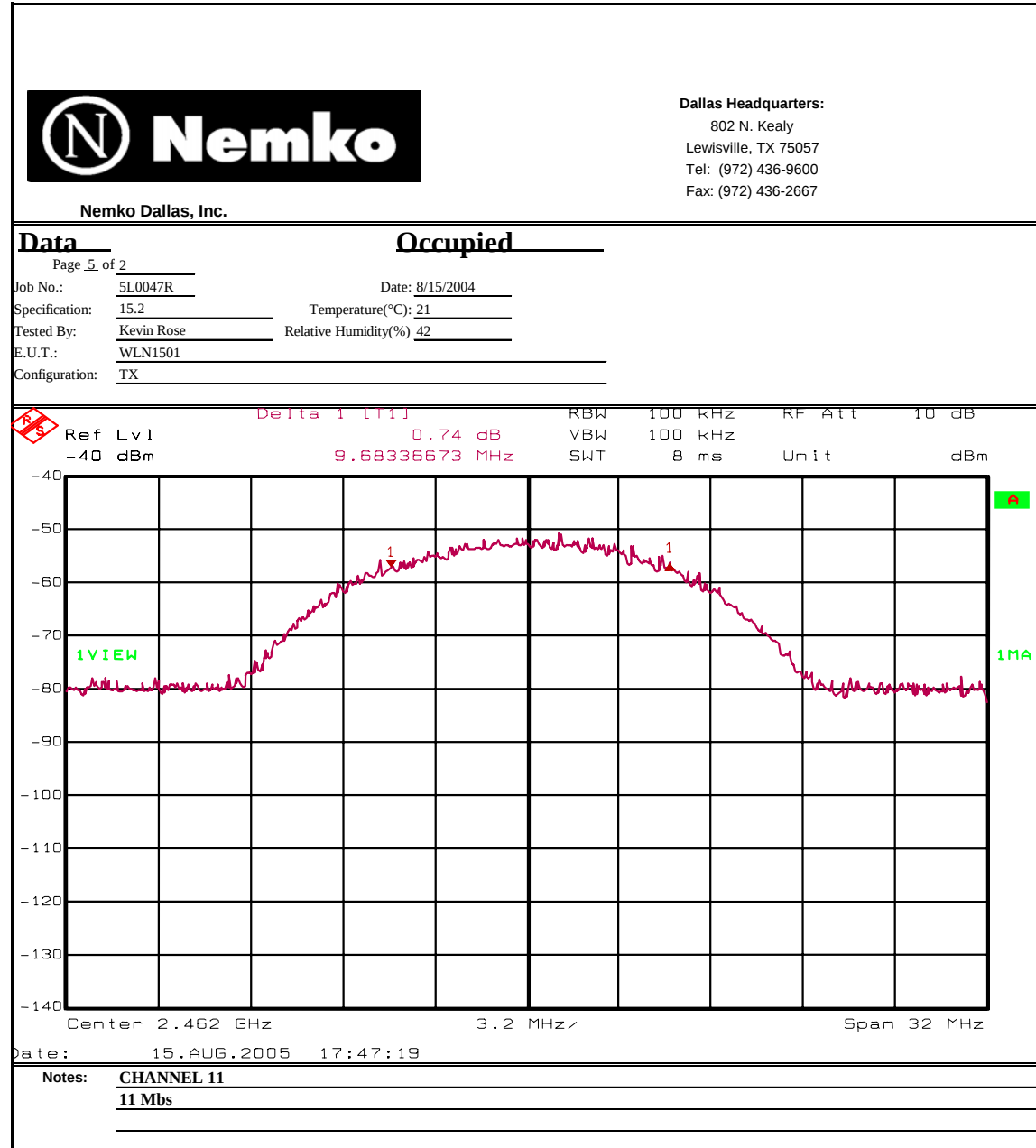
Test Data – Occupied Bandwidth



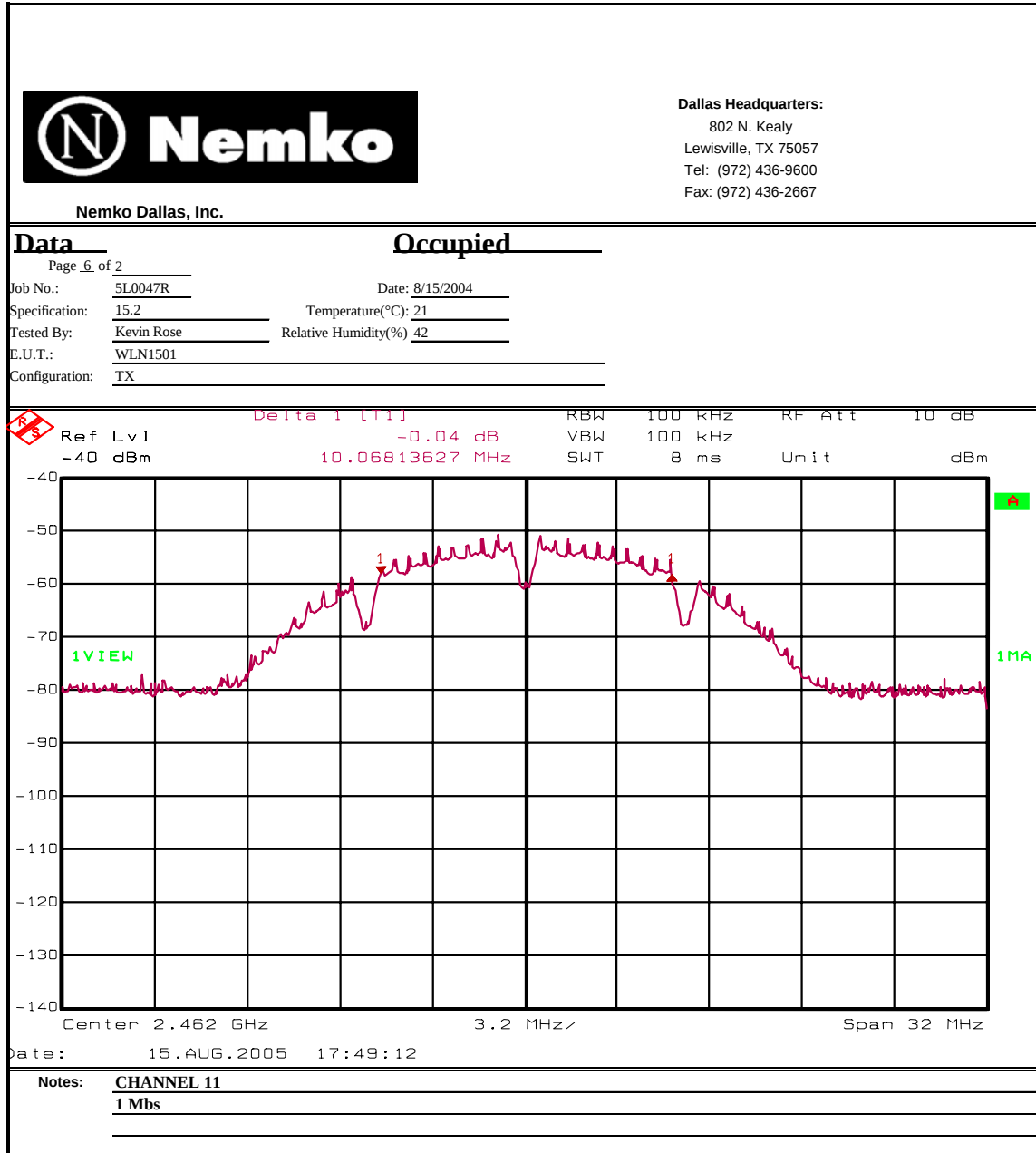
Test Data – Occupied Bandwidth



Test Data – Occupied Bandwidth



Test Data – Occupied Bandwidth



Section 5. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(1)
TESTED BY: Kevin Rose	DATE: 08/15/05

Test Results: Complies.

Measurement Data:

Note: The AC supply to the device was varied from 102 Vac to 138 Vac with RF output power monitored. There was no variation of rf output power noted.

NOTE: The device has an integral antenna. The Peak rf output power was measured as eirp using a substitution antenna method of measurement. The integral antenna is a $\frac{1}{4}$ wave antenna. The antenna conducted peak rf output power is interpolated by:

Peak conducted power = $EIRP/G$; where $G = 1.64$ (gain of a $\frac{1}{4}$ wave antenna relative to an ideal isotropic radiator).

Peak conducted power = $14.5 \text{ mW}/1.64 = 8.84 \text{ mW}$

Measurement Uncertainty: $\pm 0.7 \text{ dB}$

Temperature: 21 °C

Relative Humidity: 42 %

[illegible]

Section 6. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247 (c)
TESTED BY: Kevin Rose	DATE: 08/15/05

Test Results: Complies.

Measurement Data: See attached table.

Test Data – Radiated Emissions

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<u>Radiated Emissions</u>								
Page <u>1</u> of <u>1</u>								
Job No.:	5L047R	Date:	8/15/2005					
Specification:	15.247	Temperature(°C):	21					
Tested By:	Kevin Rose	Relative Humidity(%)	42					
E.U.T.:	WLN1501							
Configuration:	TX 11 MBPS							
Sample Number:	1							
Location:	AC 3	RBW:	1 MHz					
Detector Type:	Peak	VBW:	1 MHz					
<u>Test Equipment Used</u>								
Antenna:	1304	Directional Coupler:	#N/A					
Pre-Amp:	#N/A	Cable #1:	1484					
Filter:	#N/A	Cable #2:	1485					
Receiver:	1464	Cable #3:	#N/A					
Attenuator #1	#N/A	Cable #4:	#N/A					
Attenuator #2:	#N/A	Mixer:	#N/A					
Measurement Uncertainty: +/- 3.6 dB								
Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
2.4835	48.3	28.2	3.1	32.8	46.8	74	54	Peak - / Vertical
2.4835	33.2	28.2	3.1	32.8	31.7	74	54	Average - / Vertical
2.4835	46.3	28.2	3.1	32.8	44.8	74	54	Peak - / Horizontal
2.4835	34.8	28.2	3.1	32.8	33.3	74	54	Average - NF / Horizontal
Notes:								
The spectrum was searched to 25 GHz								
The device was tested at 2.412, 2.437 and 2.462 MHz and no emissions were found above the noise floor.								
Data presented is to demonstrate upper bandedge compliance on channel 11								

The noise floor of the measurement system is sufficient to measure emissions within 20 dB of the specification limit.

Test Data – Radiated Emissions continued

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Nemko Dallas, Inc.								
Radiated Emissions								
Page <u>1</u> of <u>1</u>								
Job No.:	5L047R	Date:	8/15/2005					
Specification:	15.247	Temperature(°C):	21					
Tested By:	Kevin Rose	Relative Humidity(%)	42					
E.U.T.:	WLN1501							
Configuration:	TX 1 MBPS							
Sample Number:	1							
Location:	AC 3	RBW:	1 MHz					
Detector Type:	Peak	VBW:	1 MHz					
Test Equipment Used								
Antenna:	1304	Directional Coupler:	#N/A					
Pre-Amp:	1016	Cable #1:	1484					
Filter:	#N/A	Cable #2:	1485					
Receiver:	1036	Cable #3:	1081					
Attenuator #1	#N/A	Cable #4:	#N/A					
Attenuator #2:	#N/A	Mixer:	#N/A					
Measurement Uncertainty: +/- 3.6 dB								
Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
2.4835	47.3	28.2	3.1	32.8	45.8	74	54	Peak - / Vertical
2.4835	35.0	28.2	3.1	32.8	33.5	74	54	Average - / Vertical
2.4835	46.2	28.2	3.1	32.8	44.7	74	54	Peak - / Horizontal
2.4835	34.2	28.2	3.1	32.8	32.7	74	54	Average - NF / Horizontal
Notes:								
The spectrum was searched to 25 GHz								
The device was tested at 2.412, 2.437 and 2.462 MHz and no emissions were found above the noise floor.								
Data presented is to demonstrate upper bandedge compliance on channel 11								

The noise floor of the measurement system is sufficient to measure emissions within 20 dB of the specification limit.

Setup Photos



Section 8. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: Kevin Rose	DATE: 08/16/05

Test Results: Complies.

Measurement Data: See attached plots.

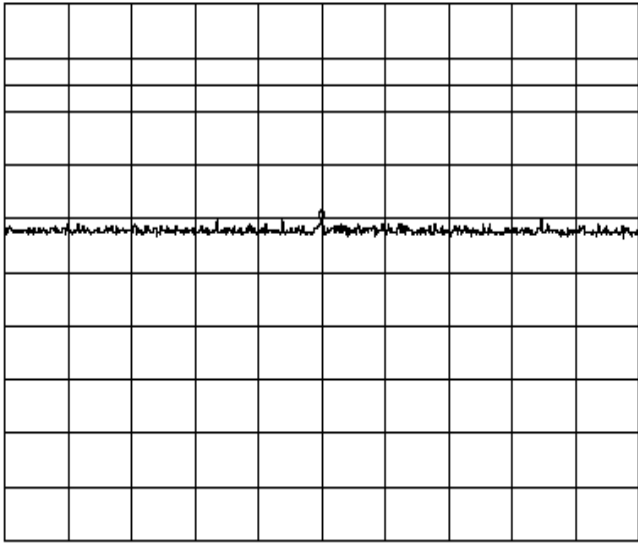
Note – This measurement was made radiated. The limit applied of -35.1 dBm is equal to +8 dBm EIRP as determined by using the signal substitution method of measurement per TIA/EIA-603-1992, Section 2.2.12

Test Data – Spectral Density



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Data		Peak Power Spectral	
Page <u>5</u> of 6			
Job No.:	<u>510047R</u>	Date:	<u>8/17/2004</u>
Specification:	<u>PART</u>	Temperature(°C):	<u>21</u>
Tested By:	<u>Kevin Rose</u>	Relative Humidity(%)	<u>42</u>
E.U.T.:	<u>WLN1501</u>		
Configuration:	<u>TRANSMITTING</u>		
ATTEN 10dB MKR -60.33dBm RL -20.0dBm 10dB/ 2.462017GHz  CENTER 2.462017GHz SPAN 2.000MHz *RBW 3.0kHz VBW 3.0kHz *SWP 600sec			
Notes: <u>channel 11 11Mbps</u>			
<u>MINUS 35.1 DBM IS 8 DBM EIRP</u>			

Test Data – Spectral Density



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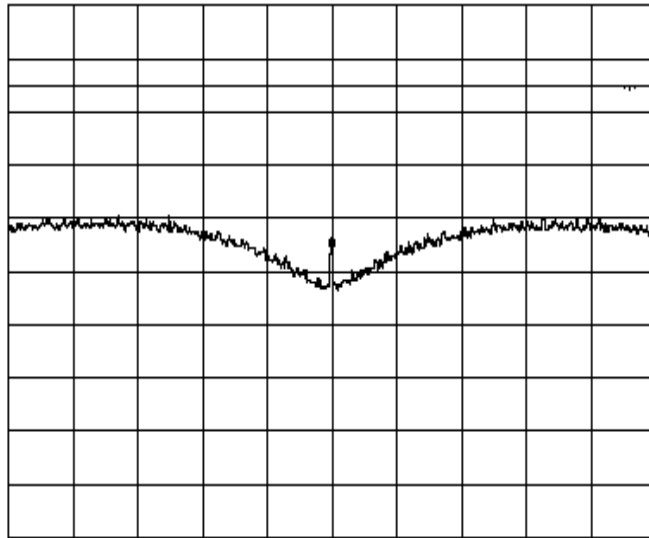
Data

Page 6 of 6

Job No.: 510047R Date: 8/17/2004
 PART
 Specification: 15.247(d) Temperature(°C): 21
 Tested By: Kevin Rose Relative Humidity(%) 42
 E.U.T.: WLN1501
 Configuration: TRANSMITTING

Peak Power Spectral

ATTEN 10dB MKR -65.67dBm
 RL -20.0dBm 10dB/ 2.462017GHz



CENTER 2.462017GHz SPAN 2.000MHz
 *RBW 3.0kHz VBW 3.0kHz *SWP 680sec

Notes: channel 11 1Mbps
MINUS 35.1 DBM IS 8 DBM ERIP

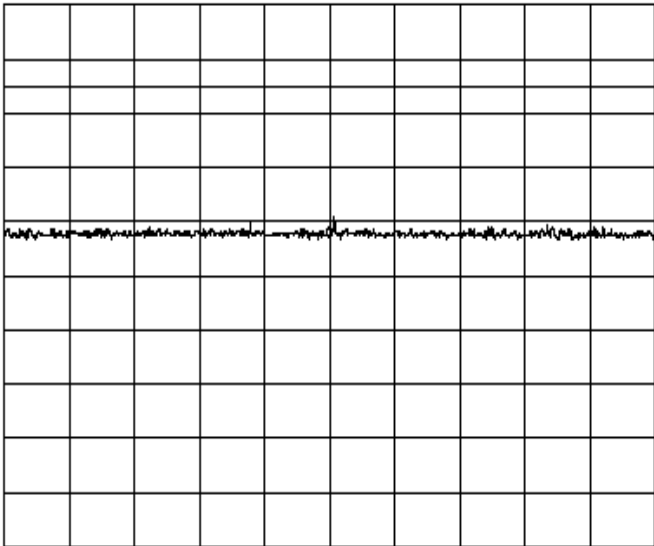
Test Data – Spectral Density



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Data		Peak Power Spectral	
Page 4 of 6			
Job No.:	510047R	Date:	8/17/2004
Specification:	PART	Temperature(°C):	21
Tested By:	Kevin Rose	Relative Humidity(%)	42
E.U.T.:	WLN1501		
Configuration:	TRANSMITTING		

ATTEN 10dB		MKR -63.00dBm	
RL -20.0dBm	10dB/	2.437000GHz	
			
CENTER 2.437000GHz		SPAN 2.000MHz	
*RBW 3.0kHz	VBW 3.0kHz	*SWP 680sec	

Notes:	channel 6 11Mbps
	MINUS 35.1 DBM IS 8 DBM ERIP



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Test Data – Spectral Density



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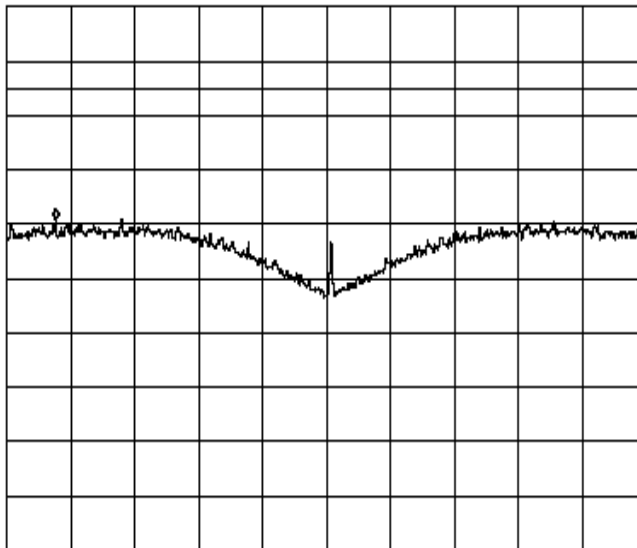
Data

Page 3 of 6

Job No.: 510047R Date: 8/17/2004
PART
Specification: 15.247(d) Temperature(°C): 21
Tested By: Kevin Rose Relative Humidity(%) 42
E.U.T.: WLN1501
Configuration: TRANSMITTING

Peak Power Spectral

ATTEN 10dB MKR -59.17dBm
RL -20.0dBm 10dB/ 2.436153GHz



CENTER 2.437000GHz SPAN 2.000MHz
*RBW 3.0kHz VBW 3.0kHz *SWP 680sec

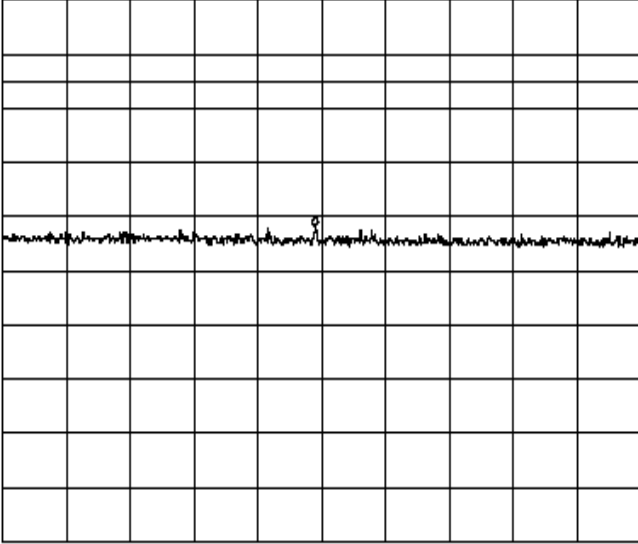
Notes: channel 6 1Mbps
MINUS 35.1 DBM IS 8 DBM ERIIP

Test Data – Spectral Density



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Fax: (972) 436-2667

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Data		Peak Power Spectral	
Page <u>2</u> of 6			
Job No.:	<u>510047R</u>	Date:	<u>8/17/2004</u>
Specification:	<u>PART</u>	Temperature(°C):	<u>21</u>
Tested By:	<u>Kevin Rose</u>	Relative Humidity(%):	<u>42</u>
E.U.T.:	<u>WLN1501</u>		
Configuration:	<u>TRANSMITTING</u>		
ATTEN 10dB MKR -62.00dBm RL -20.0dBm 10dB/ 2.412013GHz  START 2.411033GHz STOP 2.413033GHz *RBW 3.0kHz VBW 3.0kHz *SWP 680sec			
Notes: <u>channel 1 11Mbps</u>			
<u>MINUS 35.1 DBM IS 8 DBM ERIP</u>			

Test Data – Spectral Density



Dallas Headquarters:

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Data		Peak Power Spectral	
Page <u>1</u> of <u>6</u>		Complete <u>X</u>	
Job No.:	510047R	Date:	8/17/2004
Specification:	PART 15.247(d)	Temperature(°C):	21
Tested By:	Kevin Rose	Relative Humidity(%)	42
E.U.T.:	WLN1501		
Configuration:	TRANSMITTING		
Sample Number:	1		
Location:	Lab 2	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots
Test Equipment Used			
Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	
Filter:		Cable #2:	1485
Receiver:	1464	Cable #3:	
Attenuator #1:		Cable #4:	
Attenuator #2:		Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-1.7 dB		
ATTEN 10dB MKR -75.50dBm RL -20.00dBm 10dB/ 2.412033GHz CENTER 2.412033GHz SPAN 2.000MHz *RBW 3.0kHz VBW 3.0kHz *SWP 680sec			
Notes: <u>channel 1 1Mbps</u>			
<u>MINUS 35.1 DBM IS 8 DBM ERIP</u>			

Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	08/26/04	08/26/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	08/26/04	08/26/05
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	08/26/04	08/26/05
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
545	LISN	Schwarz Beck 8120	8120350	09/17/04	09/17/05
958	#N/A	#N/A #N/A	#N/A	#N/A	#N/A
1113	CABLE, 1m	KTL RG223	N/A	08/26/04	08/26/05
1019	CABLE, 9.5m	KTL RG223	N/A	07/27/04	07/27/05
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	07/30/04	07/31/06
716	Receiver cal extension	Polorad ESH2	879342/005	02/02/04	08/01/05
674	LIMITER	HP 11947A	3107A02200	CBU	CBU
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/04	11/12/05
1480	Bilog Antenna	Schaffner-Chase CBL6111C	2572	CalNotReq	N/A
1029	PEAK POWER METER	HP 8900D	3303U0012	12/23/04	12/22/05
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	08/26/04	08/26/05
1474	20db Attenuator DC 18 Ghz	MCL Inc. BW-S20W2	NONE	CBU	N/A

ANNEX A - TEST DETAILS

NAME OF TEST: Powerline Conducted Emissions

PARA. NO.: 15.207(a)

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for conducted disturbance as defined by CFR 47, Part 15, Subpart B, Class B, Paragraph Number 15.107.

Specification Limits:

Limits for conducted disturbance at the mains ports

Frequency Range (MHz)	Quasi-peak Limits (dBuV)	Average Limits (dBuV)
0.15 to 0.50	66-56	56-46
0.50 to 5.00	56	46
5.00-30.0	60	50
The limit decreases with the logarithm of the frequency in the range 0.15MHz to 0.5 MHz		

Method of Measurement (Procedure ANSI C63.4-2001):

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9 or 10 kHz bandwidth, CISPR Quasi-Peak detector.

Nemko Dallas

FCC PART 15, SUBPART C
SPREAD SPECTRUM TRANSMITTER

EQUIPMENT WLN1502

PROJECT NO. 5L0047RUS1

NAME OF TEST: Minimum 6 dB 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)(1)

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.

Measurement Method For Integral Antenna: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

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(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 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)

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: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

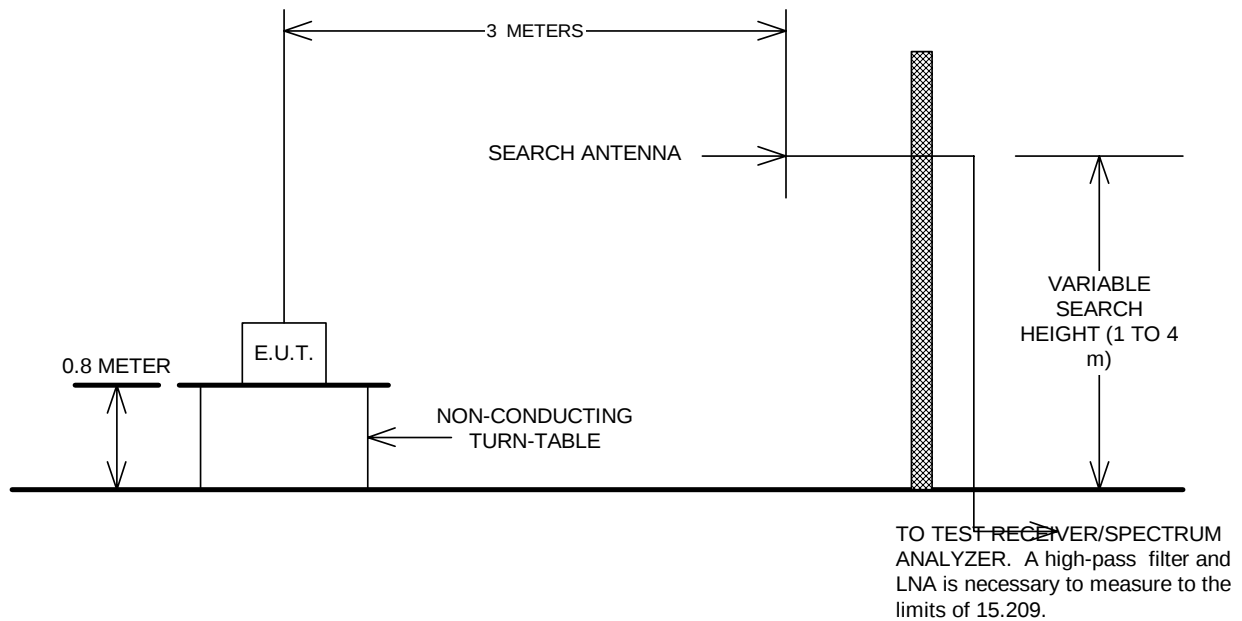
Number of channels tested:

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

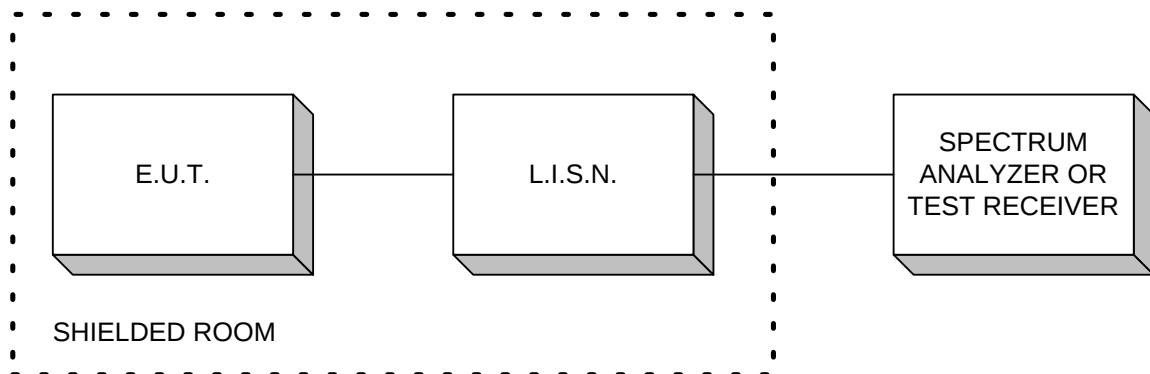
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ANNEX B - TEST DIAGRAMS

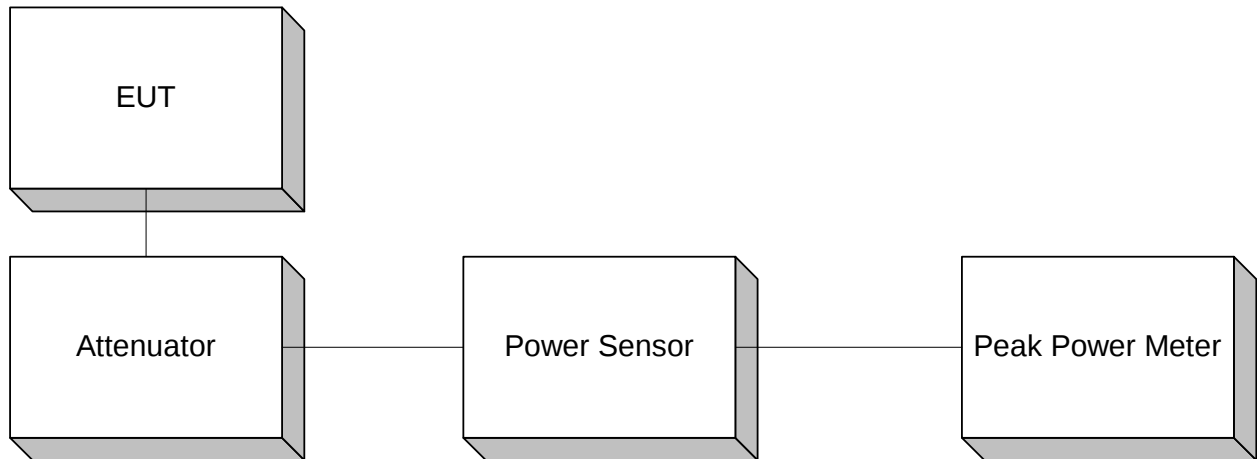
Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals



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

