



**TEST REPORT OF A 2.4 GHZ WLAN PCMCIA CARD,
BRAND LINKSYS, MODEL WPC11, IN CONFORMITY
WITH 47 CFR PART 15 (2001-12-18).**

FCC listed : 90828
Industry Canada : IC3501

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Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

MEASUREMENT/TECHNICAL REPORT

The Linksys Group, Inc.

Model : WPC11

FCC ID: PKW-WPC11-V29

November 5, 2002

This report concerns:	Original grant/certification	Class 2 change	Verification
Equipment type:	Digital Transmission System		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	Yes	No	
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The data taken for this test and report herein was done in accordance with 47 CFR Part 15 and the measurement procedures of ANSI C63.4-1992. TNO Electronic Products & Services (EPS) B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: November 5, 2002

Signature:

P. de Beer
TNO Electronic Products & Services (EPS) B.V.



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Description of test item

Test item : 2.4 GHz WLAN PCMCIA card
Manufacturer : The Linksys Group, Inc.
Brand : Linksys
Model : WPC11
Serial numbers : 02290095 and 02290096
Revision : n.a.
Receipt number : 2
Receipt date : October 29, 2002

Applicant information

Applicant's representative : Mr. Robin Hung
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Test(s) performed

Location : Niekerk
Test(s) started : October 29, 2002
Test(s) completed : November 4, 2002
Purpose of test(s) : Type approval / certification
Test specification(s) : 47 CFR Part 15 (2001-12-18)

Test engineer : O.H. Hoekstra

Report written by : P.A.J.M. Robben, B.Sc.E.E.

Project leader : P.A.J.M. Robben, B.Sc.E.E.

This report is in conformity with NEN-EN-ISO/IEC 17025.

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The test results relate only to the item(s) tested.



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Table of contents

1	General information.....	5
1.1	Product description.....	5
1.2	Related submittal(s) and/or Grant(s).....	5
1.3	Tested system details.....	5
1.4	Test methodology.....	6
1.5	Test facility.....	6
1.6	Product labeling.....	6
1.7	System test configuration.....	7
1.7.1	Justification.....	7
1.7.2	EUT exercise software.....	7
1.8	Special accessories.....	7
1.9	Equipment modifications.....	8
1.10	Configuration of the tested system.....	8
1.11	Block diagram(s) of the EUT.....	8
2	Radiated emission data.....	9
2.1	Test results with EUT operating in receive mode on channel 1.....	9
2.2	Test results with EUT operating in receive mode on channel 6.....	10
2.3	Test results with EUT operating in receive mode on channel 11.....	11
2.4	Test results with EUT operating in transmit mode on channel 1.....	12
2.5	Test results with EUT operating in transmit mode on channel 6.....	13
2.6	Test results with EUT operating in transmit mode on channel 11.....	14
3	Conducted emission data.....	15
3.1	AC mains with EUT operating in transmit and receive mode.....	15
3.2	Emission in restricted bands nearest to the band 2400 - 2483.5 MHz.....	16
4	Test results of measurements in conformity with 47 CFR Part 15.247.....	17
4.1	Minimum 6 dB bandwidth.....	17
4.2	Maximum peak output power.....	18
4.3	Radiated emission data outside restricted bands.....	19
4.4	Conducted emission data outside restricted bands.....	20
4.5	Peak power spectral density.....	21
5	Plots of measurement data.....	22
5.1	Emission in restricted bands nearest to the band 2400 - 2483.5 MHz.....	23
5.2	Minimum 6 dB bandwidth.....	27
5.3	Conducted emission data outside restricted bands.....	31
5.4	Peak power spectral density.....	35
6	List of utilized test equipment.....	39



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1 General information

1.1 Product description

The 2.4 GHz WLAN PCMCIA card, brand Linksys, model WPC11, is designed to operate in the 2.4 GHz ISM frequency band, channels 1 to 11 (2412 MHz to 2462 MHz), as specified by the Federal Communications Commission in the USA.

The 2.4 GHz WLAN PCMCIA card, brand Linksys, model WPC11, utilizes Direct Sequence Spread Spectrum (DSSS) technology.

The 2.4 GHz WLAN PCMCIA card, brand Linksys, model WPC11, incorporates an integral antenna having a gain of 0.4 dBi.

1.2 Related submittal(s) and/or Grant(s)

Not applicable.

1.3 Tested system details

Details and an overview of the system and all its components, as it has been tested, can be found in table 1 below. FCC ID's are stated in this overview where applicable. The EUT is listed in the first row of this table 1.

Description	Model number	Serial number	FCC ID	Cable descriptions
2.4 GHz WLAN PCMCIA card	WPC11	02290095 and 02290096	PKW-WPC11-V29	None.
Toshiba notebook computer	S2180CDT	40534194G SS218-E	n.a. (DoC)	-Unshielded DC power cord to AC/DC adapter -Shielded parallel cable to printer
Toshiba AC/DC power adapter 100-240 VAC/0.6-0.3 Amps to +15 VDC/3.0 Amps	PA3049U-1ACA	0003 A 0147884G	n.a. (DoC)	-Unshielded DC power cord to notebook computer -Unshielded power cord to AC mains
HP DeskJet 895Cxi	C6410A	ES8B42307H	n.a. (DoC)	-Unshielded DC power cord to AC/DC adapter -Shielded parallel cable to notebook computer
HP AC/DC power adapter 100-240 VAC/1 Amps to +18 VDC/1.1 Amps	C6409-60014	n.a.	n.a. (DoC)	-Unshielded DC power cord to printer -Unshielded power cord to AC mains

Table 1 - Tested system details overview.



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FCC ID:	PKW-WPC11-V29

1.4 Test methodology

The test methodology used is based on the requirements of 47 CFR Part 15 (2001-12-18), sections 15.107, 15.207, 15.109, 15.209, 15.205 and 15.247.

The test methods, which have been used, are based on ANSI C63.4: 1992.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters. Below 30 MHz the radiated emission tests were carried out at measurement distances of 3 and 10 meters. The test results regarding the radiated emission tests on frequencies below 30 MHz have been extrapolated in order to determine the field strength of the measured values at measurement distances of 30 and 300 meters (as required by 47 CFR Part 15).

The bandwidth of the receiver is switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

Radiated emission tests on frequencies above 1 GHz were performed with appropriate pre-amplifiers, antennas and a spectrum analyzer. At frequencies on which radiated emissions were found the level at the input of the pre-amplifier was reproduced by means of a RF signal generator. The output level of the signal generator was then increased with the antenna factor in order to obtain the actual field strength value for each individual frequency on which radiated emissions were found.

1.5 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at TNO Electronic Products & Services (EPS) B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 23, 2000.

The description of the test facilities has been filed under registration number 90828 at the Office of the Federal Communications Commission. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at <http://www.fcc.gov>.

1.6 Product labeling

In accordance with 47 CFR Part 15.19 (a)(3) the following text shall be placed on a label, which is attached to the EUT:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

In accordance with 47 CFR Part 2.925 (a)(1), the FCC ID shall be placed on a label, which is attached to the EUT.

For further details about the labeling requirements (size, legibility, etc.) as set by the Federal Communications Commission see 47 CFR Part 15.19 (a)(3), 47 CFR Part 15.19 (b)(2), 47 CFR Part 15.19 (b)(4), 47 CFR Part 2.925 and 47 CFR Part 2.926.



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1.7 System test configuration

1.7.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 1992.

Tests were performed at the lowest operating frequency (channel 1: 2412 MHz), the operating frequency in the middle of the specified frequency band (channel 6: 2437 MHz) and the highest operating frequency (channel 11: 2462 MHz). Further details may be found in table 2 below.

Channel	Operating frequencies (MHz)	Rated output power (dBm)	Test performed
1	2412	+18.8	yes
2	2417	+18.8	no
3	2422	+18.8	no
4	2427	+18.8	no
5	2432	+18.8	no
6	2437	+18.8	yes
7	2442	+18.8	no
8	2447	+18.8	no
9	2452	+18.8	no
10	2457	+18.8	no
11	2462	+18.8	yes

Table 2 - Specification of channels and rated maximum output power (excluding an antenna gain of 0.4 dBi).

The EUT was tested while mounted in a notebook computer. The EUT was tested while using the integral antenna (having a gain of 0.4 dBi) of the EUT.

1.7.2 EUT exercise software

The EUT could be enabled to transmit or receive continuously on channels 1 (2412 MHz), 6 (2437 MHz) and 11 (2462 MHz) by means of test software, which was supplied by the manufacturer of the EUT. Furthermore, the utilized test software also enables various transmission bit-rate settings in the range of 1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s.

1.8 Special accessories

No special accessories are used and/or needed to achieve compliance with the appropriate sections of 47 CFR Part 15.



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1.9 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the appropriate sections of 47 CFR Part 15.

1.10 Configuration of the tested system

Not applicable. See table 1 in section 1.3 of this test report.

1.11 Block diagram(s) of the EUT

The block diagram is available as part of the documentation which is to be submitted to the FCC/TCB.



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2 Radiated emission data

2.1 Test results with EUT operating in receive mode on channel 1

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109 and 47 CFR Part 15.209 with the EUT operating in receive mode on channel 1 (2412 MHz), are depicted in table 3.


Frequency (MHz)	Test results quasi peak (dBμV/m)		Test results average (dBμV/m)		Test results peak (dBμV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBμV/m)	Average limits (dBμV/m)	Peak limits (dBμV/m)
	V	H	V	H	V	H				
52.00	27.9	16.5	-	-	-	-	120	40.0	-	-
189.60	27.4	33.0	-	-	-	-	120	43.5	-	-
221.20	32.5	31.7	-	-	-	-	120	46.0	-	-
240.00	26.1	26.3	-	-	-	-	120	46.0	-	-
320.15	36.5	33.7	-	-	-	-	120	46.0	-	-
360.15	37.7	31.9	-	-	-	-	120	46.0	-	-
400.15	36.6	32.5	-	-	-	-	120	46.0	-	-
442.40	37.3	35.4	-	-	-	-	120	46.0	-	-
473.80	40.9	33.8	-	-	-	-	120	46.0	-	-
1038.00	-	-	n.t.	n.t.	38.4	<34.0	1000	-	54.0	74.0
1232.00	-	-	n.t.	n.t.	38.4	<34.0	1000	-	54.0	74.0
1427.00	-	-	41.6	48.5	53.4	59.0	1000	-	54.0	74.0
1897.00	-	-	n.t.	n.t.	41.3	36.1	1000	-	54.0	74.0
2287.00	-	-	n.t.	n.t.	41.4	35.9	1000	-	54.0	74.0
2377.00	-	-	n.t.	n.t.	41.0	39.6	1000	-	54.0	74.0
2852.00	-	-	n.t.	n.t.	41.4	<34.0	1000	-	54.0	74.0
8163.00	-	-	n.t.	n.t.	44.9	43.7	1000	-	54.0	74.0
12247.00	--	-	n.t.	n.t.	42.3	38.3	1000	-	54.0	74.0

Table 3 - Test results with the EUT operating in receive mode on channel 1 (2412 MHz).

Note: Above 1 GHz, most measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 3 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



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2.2 Test results with EUT operating in receive mode on channel 6

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109 and 47 CFR Part 15.209 with the EUT operating in receive mode on channel 6 (2437 MHz), are depicted in table 4.

Frequency (MHz)	Test results quasi peak (dBµV/m)		Test results average (dBµV/m)		Test results peak (dBµV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBµV/m)	Average limits (dBµV/m)	Peak limits (dBµV/m)
	V	H	V	H	V	H				
52.00	27.9	16.5	-	-	-	-	120	40.0	-	-
189.60	27.4	33.0	-	-	-	-	120	43.5	-	-
221.20	32.5	31.7	-	-	-	-	120	46.0	-	-
240.00	26.1	26.3	-	-	-	-	120	46.0	-	-
320.15	36.5	33.7	-	-	-	-	120	46.0	-	-
360.15	37.7	31.9	-	-	-	-	120	46.0	-	-
400.15	36.6	32.5	-	-	-	-	120	46.0	-	-
442.40	37.3	35.4	-	-	-	-	120	46.0	-	-
473.80	40.9	33.8	-	-	-	-	120	46.0	-	-
1038.00	-	-	n.t.	n.t.	38.1	<34.0	1000	-	54.0	74.0
1232.00	-	-	n.t.	n.t.	38.3	<34.0	1000	-	54.0	74.0
1427.00	-	-	41.9	48.2	53.7	59.0	1000	-	54.0	74.0
1897.00	-	-	n.t.	n.t.	41.3	36.7	1000	-	54.0	74.0
2287.00	-	-	n.t.	n.t.	40.8	36.0	1000	-	54.0	74.0
2377.00	-	-	n.t.	n.t.	40.9	39.4	1000	-	54.0	74.0
2852.00	-	-	n.t.	n.t.	39.5	<34.0	1000	-	54.0	74.0
8284.00	-	-	n.t.	n.t.	43.1	41.6	1000	-	54.0	74.0
12398.00	--	-	n.t.	n.t.	40.7	38.8	1000	-	54.0	74.0

Table 4 - Test results with the EUT operating in receive mode on channel 6 (2437 MHz).

Note: Above 1 GHz, most measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 4 are more than 20 dB below the applicable limit.

Test engineer

Signature

Name

: Onno H. Hoekstra

Date

: November 4, 2002



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Manufacturer: The Linksys Group, Inc.
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2.3 Test results with EUT operating in receive mode on channel 11

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109 and 47 CFR Part 15.209 with the EUT operating in receive mode on channel 11 (2462 MHz), are depicted in table 5.

Frequency (MHz)	Test results quasi peak (dBµV/m)		Test results average (dBµV/m)		Test results peak (dBµV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBµV/m)	Average limits (dBµV/m)	Peak limits (dBµV/m)
	V	H	V	H	V	H				
52.00	27.9	16.5	-	-	-	-	120	40.0	-	-
189.60	27.4	33.0	-	-	-	-	120	43.5	-	-
221.20	32.5	31.7	-	-	-	-	120	46.0	-	-
240.00	26.1	26.3	-	-	-	-	120	46.0	-	-
320.15	36.5	33.7	-	-	-	-	120	46.0	-	-
360.15	37.7	31.9	-	-	-	-	120	46.0	-	-
400.15	36.6	32.5	-	-	-	-	120	46.0	-	-
442.40	37.3	35.4	-	-	-	-	120	46.0	-	-
473.80	40.9	33.8	-	-	-	-	120	46.0	-	-
1038.00	-	-	n.t.	n.t.	37.5	<34.0	1000	-	54.0	74.0
1232.00	-	-	n.t.	n.t.	38.0	<34.0	1000	-	54.0	74.0
1427.00	-	-	41.8	48.6	53.0	59.6	1000	-	54.0	74.0
1897.00	-	-	n.t.	n.t.	40.9	36.9	1000	-	54.0	74.0
2287.00	-	-	n.t.	n.t.	41.3	36.0	1000	-	54.0	74.0
2377.00	-	-	n.t.	n.t.	41.1	39.5	1000	-	54.0	74.0
2852.00	-	-	n.t.	n.t.	40.0	<34.0	1000	-	54.0	74.0
8375.00	-	-	n.t.	n.t.	41.0	40.7	1000	-	54.0	74.0
12549.00	--	-	n.t.	n.t.	44.0	38.7	1000	-	54.0	74.0

Table 5 - Test results with the EUT operating in receive mode on channel 11 (2462 MHz).

Note: Above 1 GHz, most measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 5 are more than 20 dB below the applicable limit.

Test engineer

Signature

Name : Onno H. Hoekstra

Date : November 4, 2002



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2.4 Test results with EUT operating in transmit mode on channel 1.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109, 47 CFR Part 15.209 and 47 CFR Part 15.205 (restricted bands of operation) with the EUT operating in transmit mode on channel 1 (2412 MHz), are depicted in table 6.

Frequency (MHz)	Test results quasi peak (dBµV/m)		Test results average (dBµV/m)		Test results peak (dBµV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBµV/m)	Average limits (dBµV/m)	Peak limits (dBµV/m)
	V	H	V	H	V	H				
52.00	29.0	17.0	-	-	-	-	120	40.0	-	-
189.60	29.4	34.5	-	-	-	-	120	43.5	-	-
221.20	31.0	30.7	-	-	-	-	120	46.0	-	-
240.00	27.8	26.7	-	-	-	-	120	46.0	-	-
320.15	36.5	34.0	-	-	-	-	120	46.0	-	-
360.15	38.6	33.3	-	-	-	-	120	46.0	-	-
400.15	37.3	33.2	-	-	-	-	120	46.0	-	-
442.40	37.4	35.6	-	-	-	-	120	46.0	-	-
473.80	40.5	34.3	-	-	-	-	120	46.0	-	-
1038.00	-	-	n.t.	n.t.	39.5	<34.0	1000	-	54.0	74.0
1228.00	-	-	n.t.	n.t.	39.1	34.9	1000	-	54.0	74.0
1422.00	-	-	43.3	48.4	54.7	59.5	1000	-	54.0	74.0
1522.00	-	-	n.t.	n.t.	38.6	39.4	1000	-	54.0	74.0
1902.00	-	-	n.t.	n.t.	40.5	36.3	1000	-	54.0	74.0
2282.00	-	-	n.t.	n.t.	42.2	36.0	1000	-	54.0	74.0
2852.00	-	-	n.t.	n.t.	43.0	39.7	1000	-	54.0	74.0
4731.25	-	-	n.t.	n.t.	39.3	38.5	1000	-	54.0	74.0
4824.00	-	-	n.t.	n.t.	44.4	43.0	1000	-	54.0	74.0
5693.75	-	-	n.t.	n.t.	39.5	<30.0	1000	-	54.0	74.0
6118.75	-	-	n.t.	n.t.	40.8	39.9	1000	-	54.0	74.0

Table 6 - Test results with the EUT operating in transmit mode on channel 1 (2412 MHz).

Note: Radiated emission tests have been performed with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) in transmit mode. The highest values measured of the spurious emission components are reported by means of table 6.

Note: Above 1 GHz, most measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 6 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
 Description of EUT: 2.4 GHz WLAN PCMCIA card
 Manufacturer: The Linksys Group, Inc.
 Brand mark: Linksys
 Model: WPC11
 FCC ID: PKW-WPC11-V29

2.5 Test results with EUT operating in transmit mode on channel 6.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109, 47 CFR Part 15.209 and 47 CFR Part 15.205 (restricted bands of operation) with the EUT operating in transmit mode on channel 6 (2437 MHz), are depicted in table 7.

Frequency (MHz)	Test results quasi peak (dBμV/m)		Test results average (dBμV/m)		Test results peak (dBμV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBμV/m)	Average limits (dBμV/m)	Peak limits (dBμV/m)
	V	H	V	H	V	H				
52.00	29.0	17.0	-	-	-	-	120	40.0	-	-
189.60	29.4	34.5	-	-	-	-	120	43.5	-	-
221.20	31.0	30.7	-	-	-	-	120	46.0	-	-
240.00	27.8	26.7	-	-	-	-	120	46.0	-	-
320.15	36.5	34.0	-	-	-	-	120	46.0	-	-
360.15	38.6	33.3	-	-	-	-	120	46.0	-	-
400.15	37.3	33.2	-	-	-	-	120	46.0	-	-
442.40	37.4	35.6	-	-	-	-	120	46.0	-	-
473.80	40.5	34.3	-	-	-	-	120	46.0	-	-
1038.00	-	-	n.t.	n.t.	39.2	<34.0	1000	-	54.0	74.0
1228.00	-	-	n.t.	n.t.	39.2	34.7	1000	-	54.0	74.0
1422.00	-	-	43.1	48.4	54.7	59.3	1000	-	54.0	74.0
1522.00	-	-	n.t.	n.t.	38.7	39.4	1000	-	54.0	74.0
1902.00	-	-	n.t.	n.t.	40.5	36.6	1000	-	54.0	74.0
2282.00	-	-	n.t.	n.t.	42.2	35.8	1000	-	54.0	74.0
2852.00	-	-	n.t.	n.t.	40.6	41.4	1000	-	54.0	74.0
4737.50	-	-	n.t.	n.t.	39.6	39.4	1000	-	54.0	74.0
4874.00	-	-	n.t.	n.t.	46.8	45.1	1000	-	54.0	74.0
5687.50	-	-	n.t.	n.t.	38.9	<30.0	1000	-	54.0	74.0
6193.75	-	-	n.t.	n.t.	42.5	41.2	1000	-	54.0	74.0


Table 7 - Test results with the EUT operating in transmit mode on channel 6 (2437 MHz).

Note: Radiated emission tests have been performed with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) in transmit mode. The highest values measured of the spurious emission components are reported by means of table 7.

Note: Above 1 GHz, most measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 7 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
 Description of EUT: 2.4 GHz WLAN PCMCIA card
 Manufacturer: The Linksys Group, Inc.
 Brand mark: Linksys
 Model: WPC11
 FCC ID: PKW-WPC11-V29

2.6 Test results with EUT operating in transmit mode on channel 11.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15.109, 47 CFR Part 15.209 and 47 CFR Part 15.205 (restricted bands of operation) with the EUT operating in transmit mode on channel 11 (2462 MHz), are depicted in table 8.

Frequency (MHz)	Test results quasi peak (dBµV/m)		Test results average (dBµV/m)		Test results peak (dBµV/m)		Resolution bandwidth (kHz)	Quasi peak limits (dBµV/m)	Average limits (dBµV/m)	Peak limits (dBµV/m)
	V	H	V	H	V	H				
52.00	29.0	17.0	-	-	-	-	120	40.0	-	-
189.60	29.4	34.5	-	-	-	-	120	43.5	-	-
221.20	31.0	30.7	-	-	-	-	120	46.0	-	-
240.00	27.8	26.7	-	-	-	-	120	46.0	-	-
320.15	36.5	34.0	-	-	-	-	120	46.0	-	-
360.15	38.6	33.3	-	-	-	-	120	46.0	-	-
400.15	37.3	33.2	-	-	-	-	120	46.0	-	-
442.40	37.4	35.6	-	-	-	-	120	46.0	-	-
473.80	40.5	34.3	-	-	-	-	120	46.0	-	-
1038.00	-	-	n.t.	n.t.	38.8	<34.0	1000	-	54.0	74.0
1228.00	-	-	n.t.	n.t.	39.4	34.9	1000	-	54.0	74.0
1422.00	-	-	43.0	48.1	54.3	59.0	1000	-	54.0	74.0
1522.00	-	-	n.t.	n.t.	38.4	39.6	1000	-	54.0	74.0
1902.00	-	-	n.t.	n.t.	39.9	36.6	1000	-	54.0	74.0
2282.00	-	-	n.t.	n.t.	41.9	35.4	1000	-	54.0	74.0
2852.00	-	-	n.t.	n.t.	44.0	40.2	1000	-	54.0	74.0
4743.50	-	-	n.t.	n.t.	38.9	38.4	1000	-	54.0	74.0
4924.00	-	-	n.t.	n.t.	46.5	47.8	1000	-	54.0	74.0
5681.25	-	-	n.t.	n.t.	40.0	<30.0	1000	-	54.0	74.0
6268.75	-	-	n.t.	n.t.	44.9	41.4	1000	-	54.0	74.0

Table 8 - Test results with the EUT operating in transmit mode on channel 11 (2462 MHz).

Note: Radiated emission tests have been performed with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) in transmit mode. The highest values measured of the spurious emission components are reported by means of table 8.

Note: Above 1 GHz, most measured values of the spurious emissions with the detector in peak mode, are below the applicable limits, which are valid when using an average detector. Therefore, most spurious emissions above 1 GHz have been measured with the peak detector only (n.t. = not tested), unless otherwise noted.

Note: Field strength values of radiated emissions at frequencies not listed in table 8 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

3 Conducted emission data

3.1 AC mains with EUT operating in transmit and receive mode


The (worst-case) results of the conducted emission tests at the 110 Volts AC mains connection terminals of the notebook computer to which the EUT is connected, carried out in accordance with 47 CFR Part 15.107 and 47 CFR Part 15.207 with the EUT operating in transmit and receive mode on channels 1 (2412 MHz), 6 (2437 MHz) and 11 (2462 MHz) while utilizing all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s), are depicted in table 9.

Frequency (MHz)	Measurement results dB(μV) Neutral		Measurement results dB(μV) Line 1		Limits dB(μV)		Margin (dB) Neutral		Margin (dB) Line 1		Result
	QP	AV	QP	AV	QP	AV	QP	AV	QP	AV	
0.21	41.8	38.0	43.0	36.8	63.1	53.1	-21.3	-15.1	-20.1	-16.3	PASS
0.32	37.0	29.5	35.1	29.5	59.7	49.7	-22.7	-20.2	-24.6	-20.2	PASS
0.39	36.0	36.0	36.1	36.0	58.1	48.1	-22.1	-12.1	-22.0	-12.1	PASS
0.58	31.2	31.1	31.1	31.1	56.0	46.0	-24.8	-14.9	-24.9	-14.9	PASS
0.65	30.7	30.6	30.7	30.5	56.0	46.0	-25.3	-15.4	-25.3	-15.5	PASS
1.49	31.0	30.3	31.3	29.8	56.0	46.0	-25.0	-15.7	-24.7	-16.2	PASS
2.46	28.7	28.3	28.6	28.2	56.0	46.0	-27.3	-17.7	-27.4	-17.8	PASS
7.46	30.9	24.5	23.7	19.0	60.0	50.0	-29.1	-25.5	-36.3	-31.0	PASS
8.31	25.5	19.0	24.6	17.3	60.0	50.0	-34.5	-31.0	-35.4	-32.7	PASS
25.52	23.5	22.9	24.4	23.7	60.0	50.0	-36.5	-27.1	-35.6	-26.3	PASS

Table 9 - Test results with the EUT operating in transmit and receive mode.

Note: Disturbance voltage values of conducted emissions at frequencies not listed in table 9 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

3.2 Emission in restricted bands nearest to the band 2400 - 2483.5 MHz

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15.205 (restricted bands of operation, with the emphasis on the emission in restricted bands nearest to the band 2400-2483.5 MHz) with the EUT operating in transmit mode, are depicted in table 10.

The plots of the measurement results may be found in section 5.1 of this test report.


Frequency (MHz)	Test results quasi peak (dBμV/m)	Test results average (dBμV/m)	Test results peak (dBμV/m)	Resolution bandwidth (kHz)	Quasi peak limits (dBμV/m)	Average limits (dBμV/m)	Peak limits (dBμV/m)
2390.00	-	46.7	54.1	1000	-	54.0	74.0
2483.50	-	53.9	61.9	1000	-	54.0	74.0

Table 10 - Test results with the EUT operating in transmit mode.

Note: Conducted emission tests have been performed with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) in transmit mode. The highest values measured of the spurious emission components are reported by means of table 10.

Note: Field strength values of conducted emissions at frequencies not listed in table 10 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

4 Test results of measurements in conformity with 47 CFR Part 15.247

4.1 Minimum 6 dB bandwidth


The results of tests on the EUT, carried out in accordance with 47 CFR Part 15.247 (a)(2), are depicted in table 11.

The plots of the measurement results may be found in section 5.2 of this test report.

Transmission bitrate (Mbit/s)	Minimum 6 dB bandwidth (kHz)			Limit (kHz)
	Channel 1 (2412 MHz)	Channel 6 (2437 MHz)	Channel 11 (2462 MHz)	
1	11175	11175	11175	>500
2	11175	11100	11175	>500
5.5	10275	10050	10350	>500
11	11250	11250	11250	>500

Table 11 - Minimum 6 dB bandwidth.

Test engineer

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Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

4.2 Maximum peak output power

The results of tests on the EUT, carried out in accordance with 47 CFR Part 15.247 (b)(1), are depicted in table 12.

Transmission bitrate (Mbit/s)	Maximum peak output power (dBm)			Limit (dBm) Antenna gain < 6 dBi
	Channel 1 (2412 MHz)	Channel 6 (2437 MHz)	Channel 11 (2462 MHz)	
1	18.2	18.4	18.8	30.0
2	18.0	18.4	18.8	30.0
5.5	17.8	18.3	18.6	30.0
11	17.9	18.4	18.7	30.0

Table 12 - Maximum peak output power.

Note: During the measurements, the AC mains supply voltage of the notebook PC to which the EUT is connected in was varied between 85% and 115% of the nominal value. The maximum measured values are depicted in table 12. No differences in measurement results, due to the AC mains voltage variations between 85% and 115% from the nominal value, have been observed. As the antenna gain does not exceed 6 dBi, no reduction of the maximum peak output power is required.

Test engineer

Signature

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

4.3 Radiated emission data outside restricted bands

The results of tests on the EUT, carried out in accordance with 47 CFR Part 15.247 (c), are depicted in table 13.

Radiated emission data outside restricted bands in a 100 kHz bandwidth shall be at least 20 dB below the highest level in a 100 kHz bandwidth within the band.

Frequency (MHz)	Level below working channel based on field strength (dB)	Limit of level below working channel based on field strength (dB)
486.0	-48.7	< -20.0
2397.0	-32.4	< -20.0
2399.8	-32.4	< -20.0
2849.0	-47.7	< -20.0
4924.0	-53.6	< -20.0
other frequencies	< -40.0	< -20.0

Table 13 - Radiated emission data outside restricted bands.

Note: Worst case measurement values for transmissions with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) and channel 1 (2412 MHz), channel 6 (2437 MHz) and channel 11 (2462 MHz) combinations.

Test engineer

Signature

: 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

4.4 Conducted emission data outside restricted bands

The results of tests on the EUT, carried out in accordance with 47 CFR Part 15.247 (c), are depicted in table 14.

Conducted emission data outside restricted bands in a 100 kHz bandwidth shall be at least 20 dB below the highest level in a 100 kHz bandwidth within the band.


The plots of the measurement results may be found in section 5.3 of this test report.

Frequency (MHz)	Level below working channel based on field strength (dB)	Limit of level below working channel based on field strength (dB)
486.0	-48.7	< -20.0
2397.0	-32.4	< -20.0
2399.8	-32.4	< -20.0
2849.0	-47.7	< -20.0
4924.0	-53.6	< -20.0
other frequencies	< -40.0	< -20.0

Table 14 - Conducted emission data outside restricted bands.

Note: Worst case measurement values for transmissions with all possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s) and channel 1 (2412 MHz), channel 6 (2437 MHz) and channel 11 (2462 MHz)) combinations.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

4.5 Peak power spectral density


The results of the tests on the EUT, carried out in accordance with 47 CFR Part 15.247 (d), are depicted in table 15.

The plots of the measurement results may be found in section 5.4 of this test report.

Transmission bitrate (Mbit/s)	Peak power spectral density (conducted) in any 3 kHz band (dBm)			Limit (dBm)
	Channel 1 (2412 MHz)	Channel 6 (2437 MHz)	Channel 11 (2462 MHz)	
1	-9.1	-8.4	-7.9	<8.0
2	-8.2	-7.5	-6.9	<8.0
5.5	-8.2	-7.5	-6.5	<8.0
11	-6.4	-5.8	-5.2	<8.0

Table 15 - Peak power spectral density.

Test engineer

Signature : 

Name : Onno H. Hoekstra

Date : November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

5 Plots of measurement data

For reference purposes and visualization of spectrum analyzer settings during the measurements, a selection of plots of measurement data is included in this test report.

Test engineer

Signature

: 

Name

: Onno H. Hoekstra

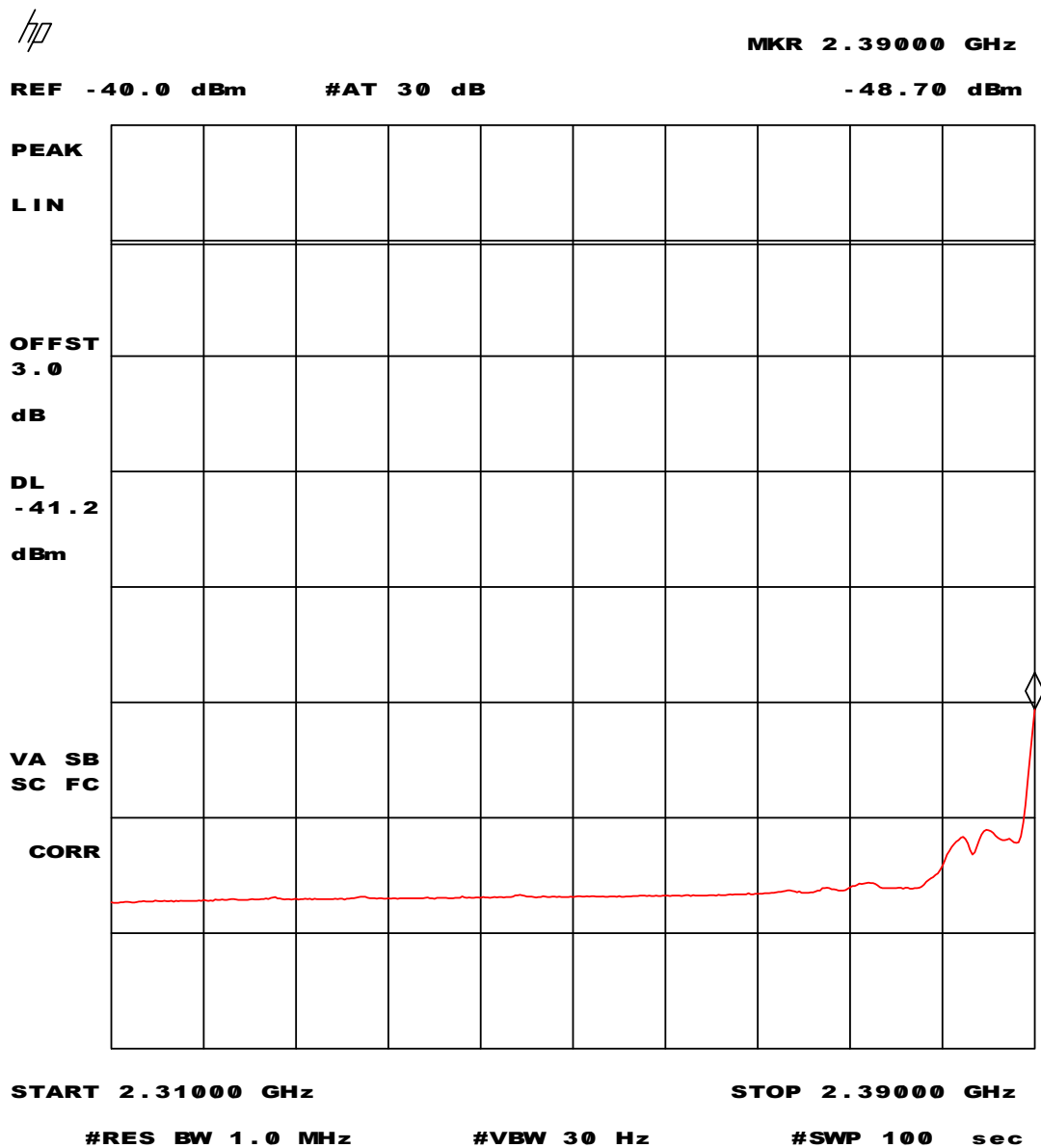
Date

: November 4, 2002



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

5.1 Emission in restricted bands nearest to the band 2400 - 2483.5 MHz



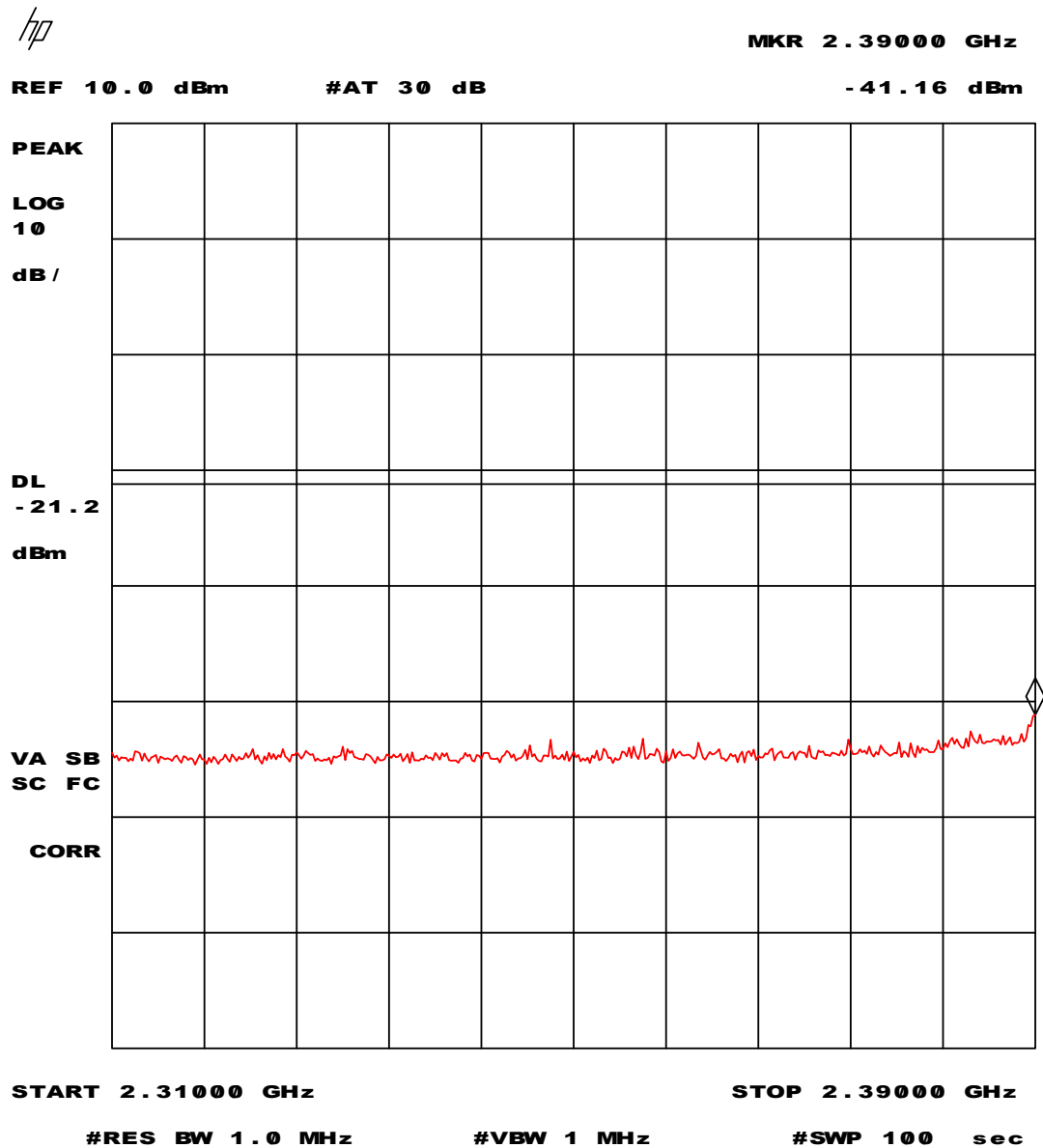
Plot 1 - Average measurement values in restricted band 2310 - 2390 MHz.

Average measurement values in restricted band. All possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s), conducted measurement, corrected for 0.4 dBi antenna gain (including antenna cable losses) and cable losses (measurement cable)

Note: 54 dBμV/m :: -41.2 dBm display line setting.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29



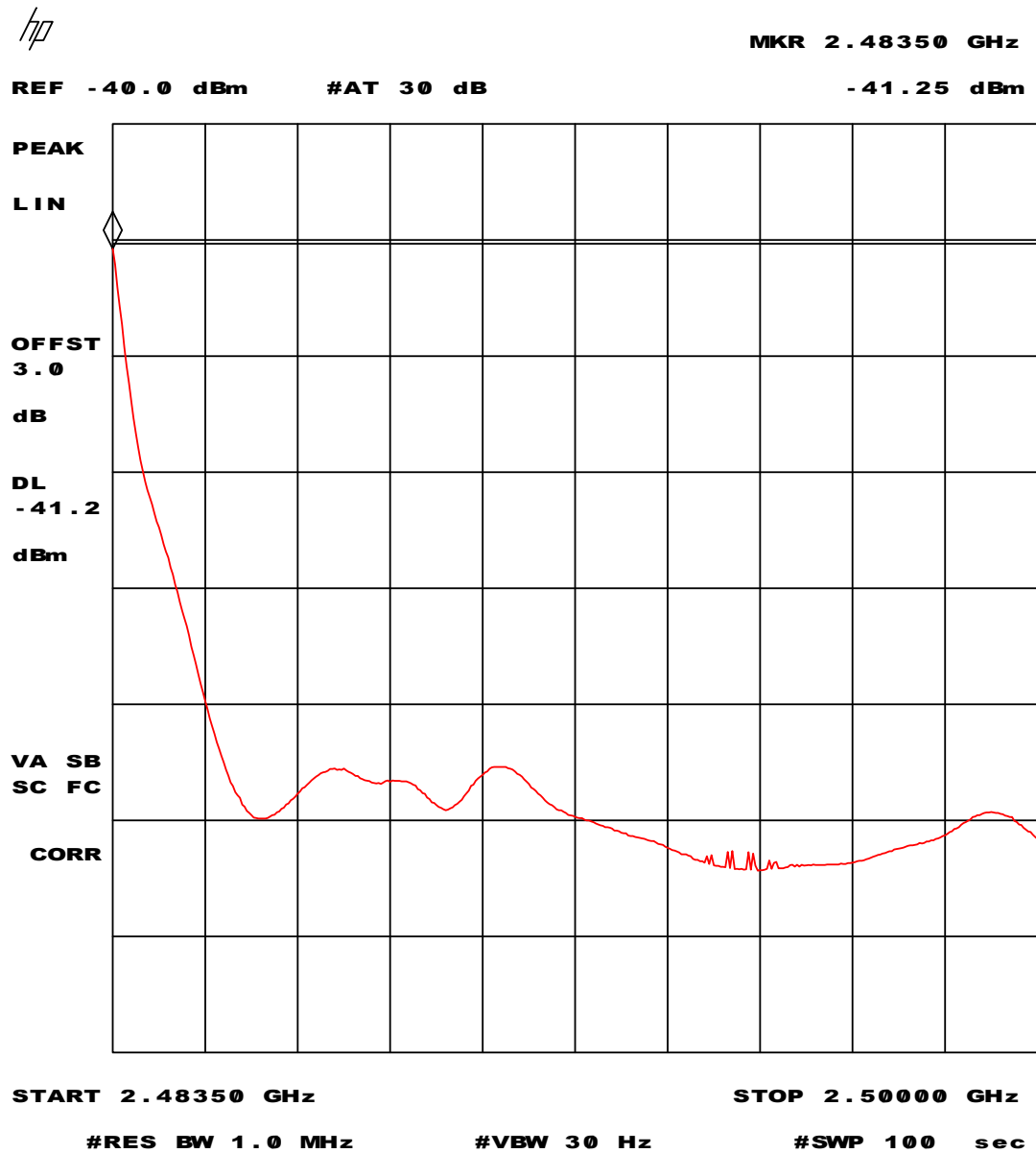
Plot 2 - Peak measurement values in restricted band 2310 - 2390 MHz.

Peak measurement values in restricted band. All possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s), conducted measurement, corrected for 0.4 dBi antenna gain (including antenna cable losses) and cable losses (measurement cable).

Note: 74 dB μ V/m :: -21.2 dBm display line setting.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29



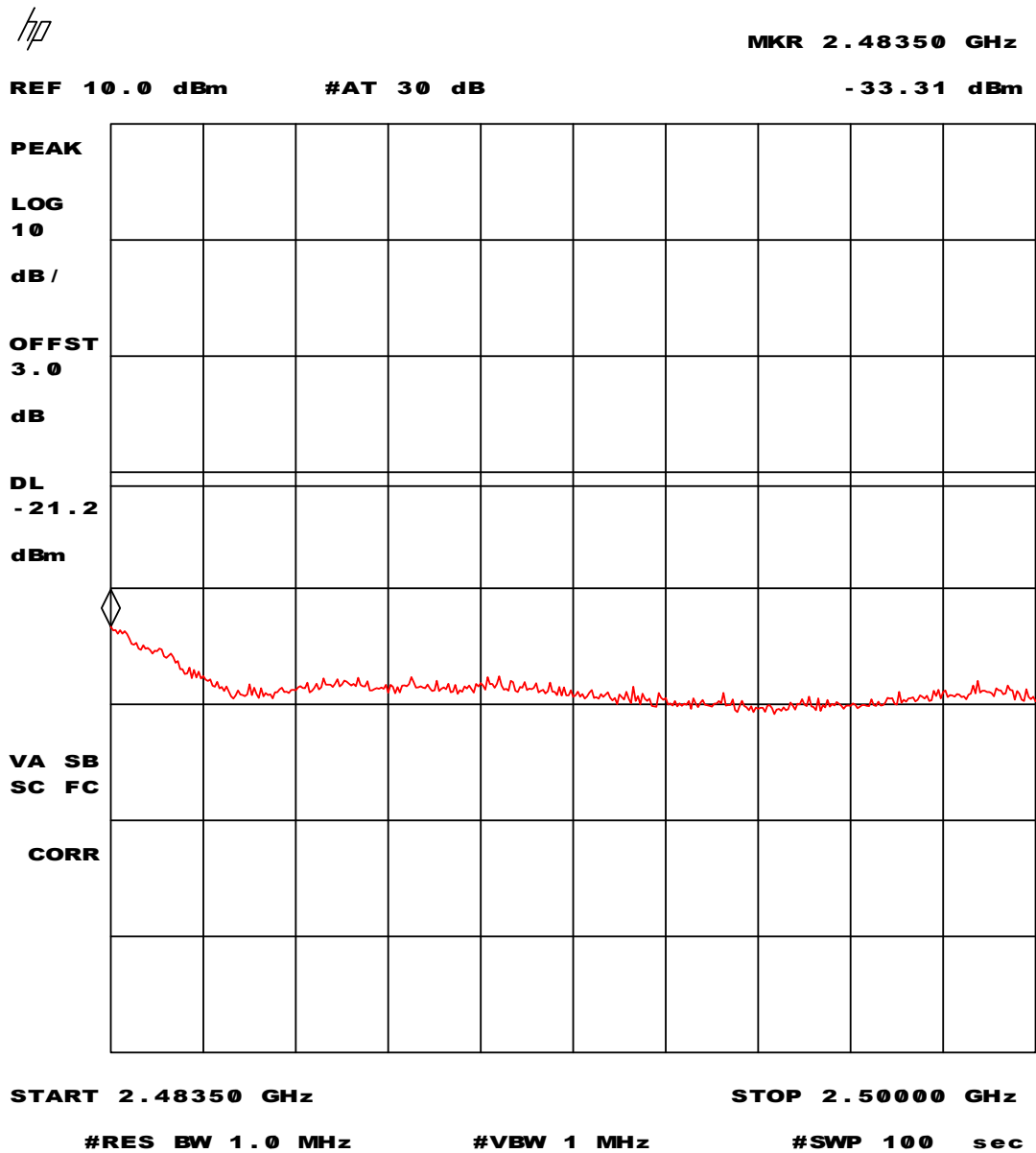
Plot 3 - Average measurement values in restricted band 2483.5 - 2500 MHz.

Average measurement values in restricted band. All possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s), conducted measurement, corrected for 0.4 dBi antenna gain (including antenna cable losses) and cable losses (measurement cable).

Note: 54 dBμV/m :: -41.2 dBm display line setting.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29



Plot 4 - Peak measurement values in restricted band 2483.5 - 2500 MHz.

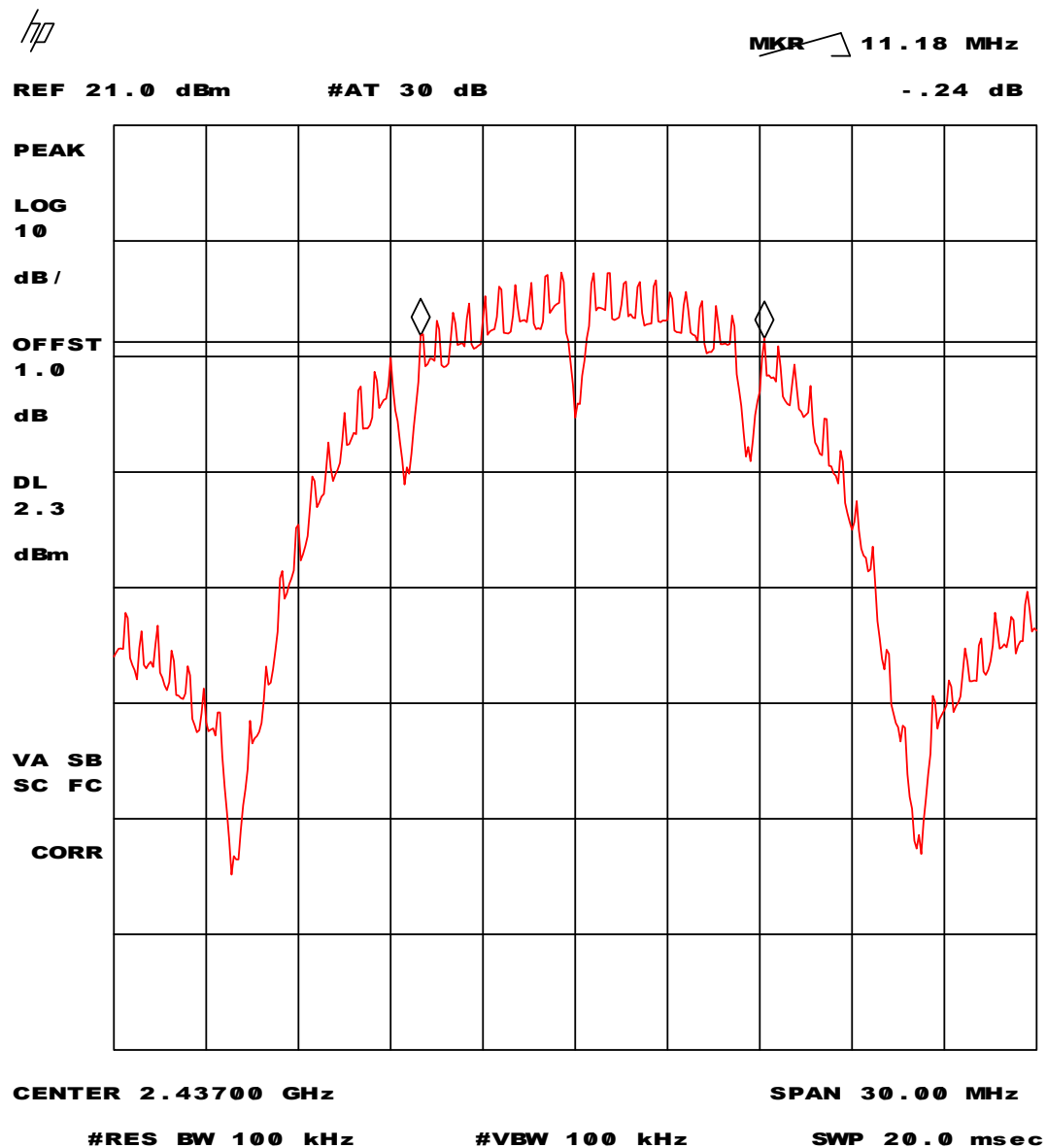
Peak measurement values in restricted band. All possible transmission bit-rates (1 Mbit/s, 2 Mbit/s, 5.5 Mbit/s and 11 Mbit/s), conducted measurement, corrected for 0.4 dBi antenna gain (including antenna cable losses) and cable losses (measurement cable).

Note: 74 dBμV/m :: -21.2 dBm display line setting.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

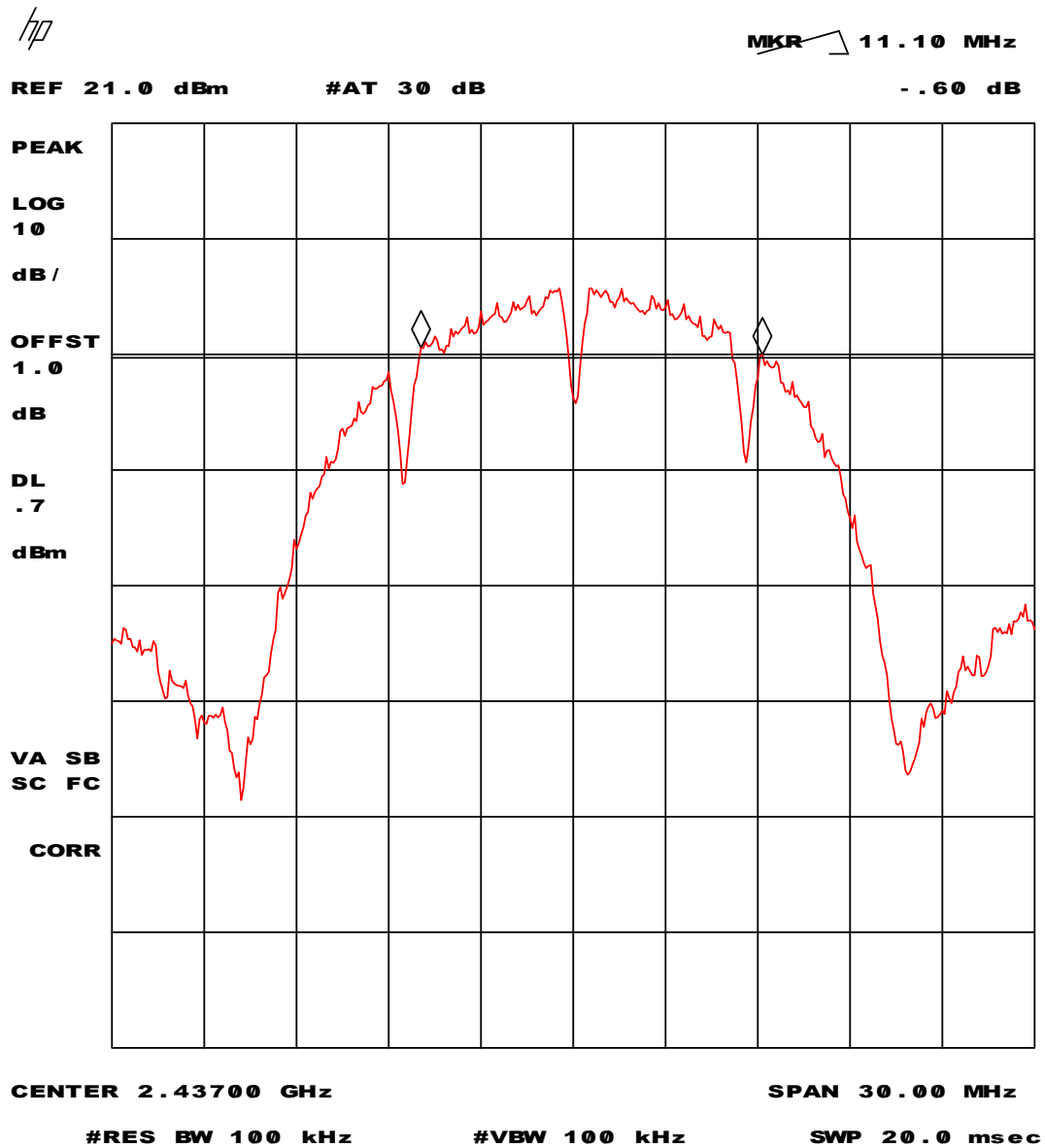
5.2 Minimum 6 dB bandwidth



Plot 5 - Minimum 6 dB bandwidth at a transmission bit-rate of 1 Mbit/s.



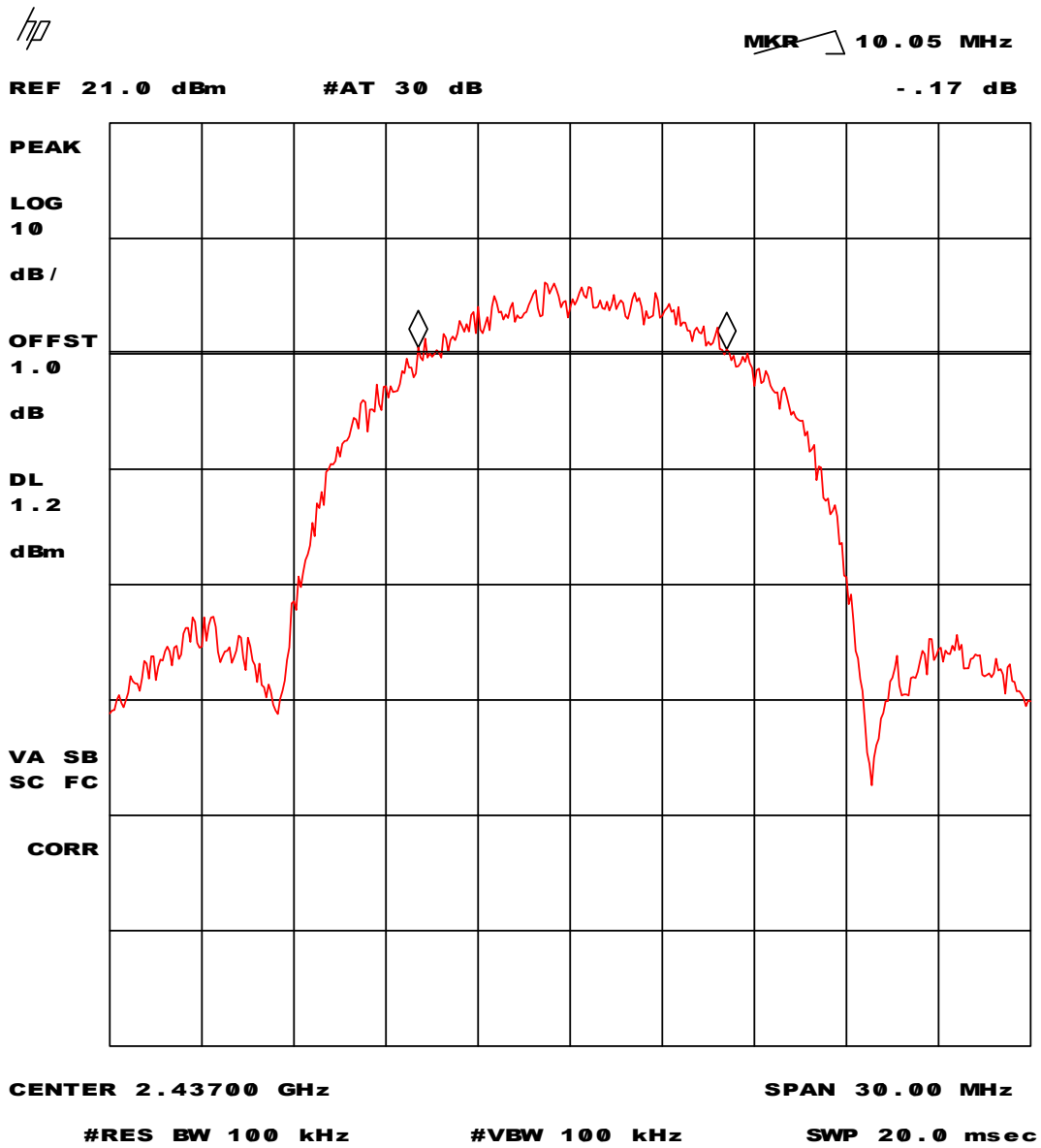
Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29



Plot 6 - Minimum 6 dB bandwidth at a transmission bit-rate of 2 Mbit/s.



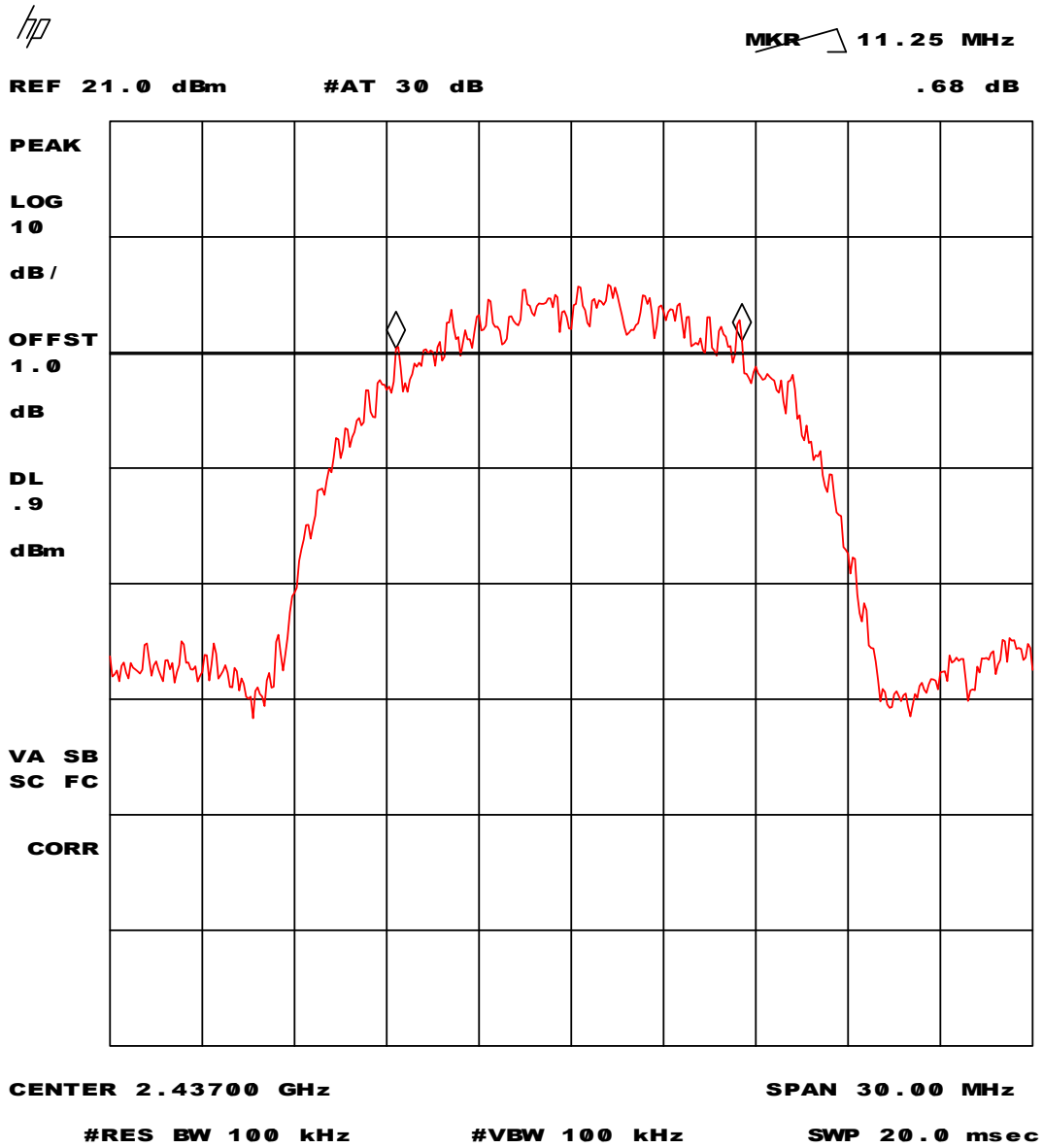
Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29



Plot 7 - Minimum 6 dB bandwidth at a transmission bit-rate of 5.5 Mbit/s.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

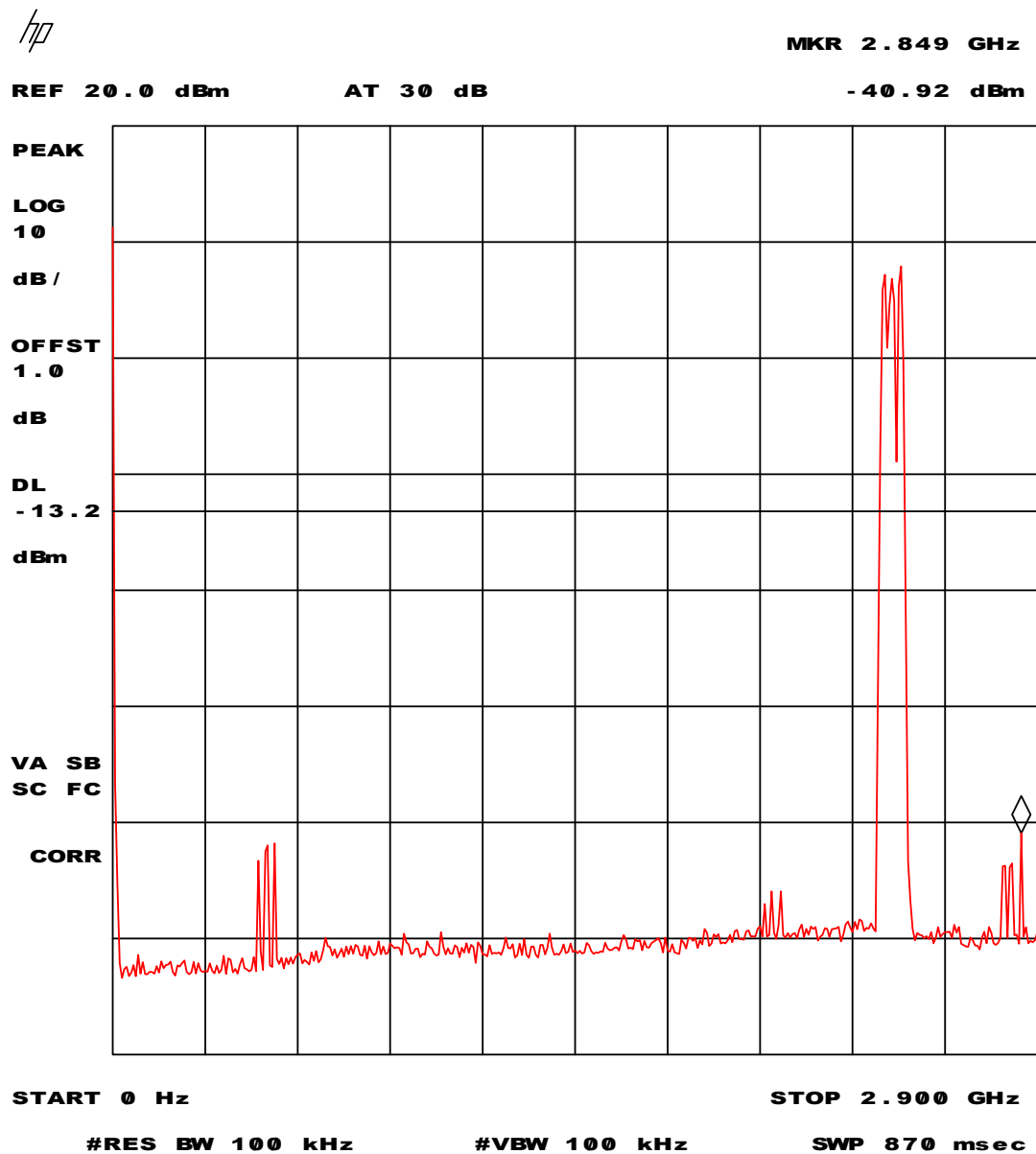


Plot 8 - Minimum 6 dB bandwidth at a transmission bit-rate of 11 Mbit/s.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

5.3 Conducted emission data outside restricted bands

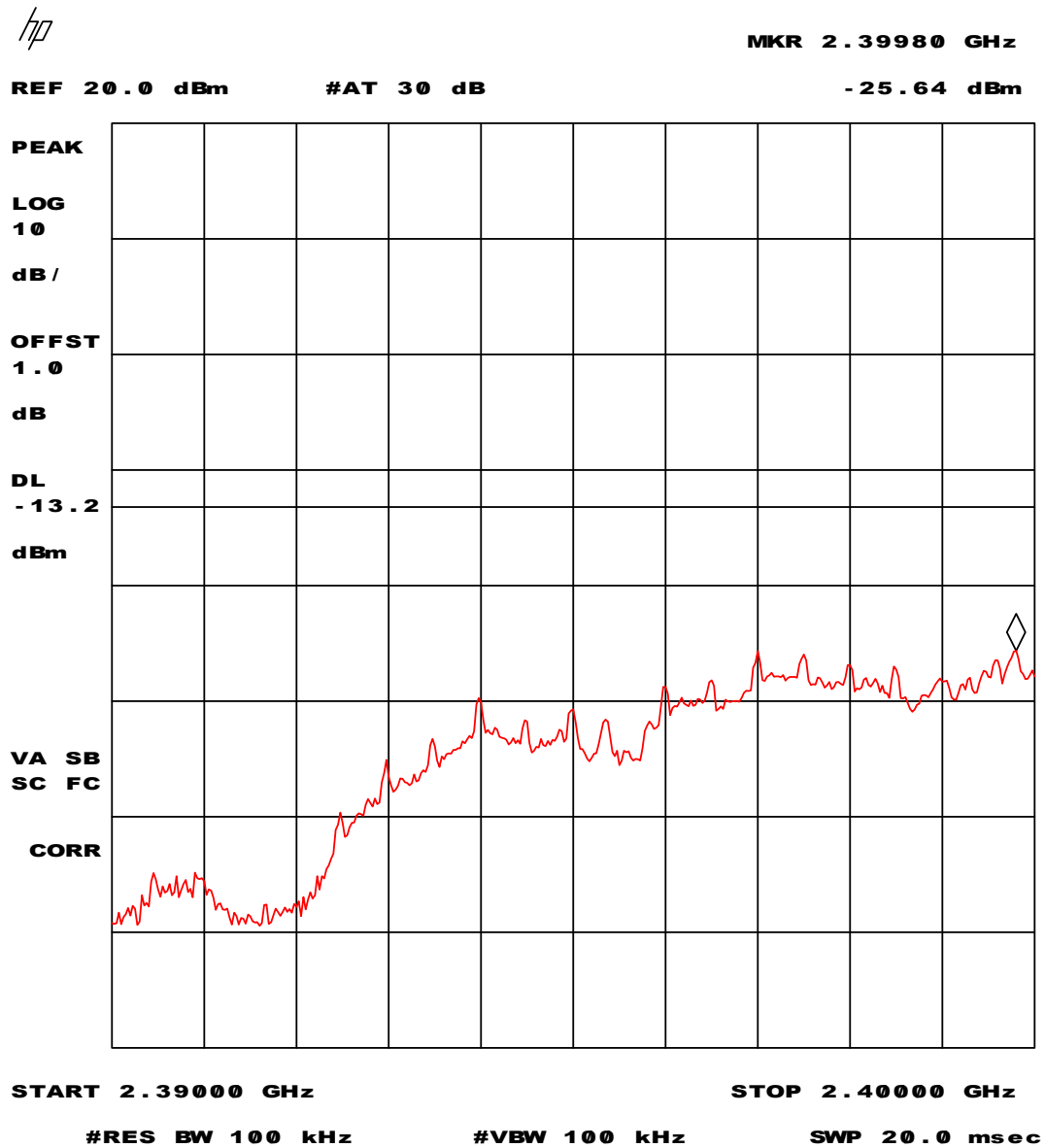


Plot 9 - Conducted emission outside restricted bands.

Conducted emission data outside restricted bands in a 100 kHz bandwidth shall be at least 20 dB below the highest level in a 100 kHz bandwidth within the band. Display line :: -20 dB limit line. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
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Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

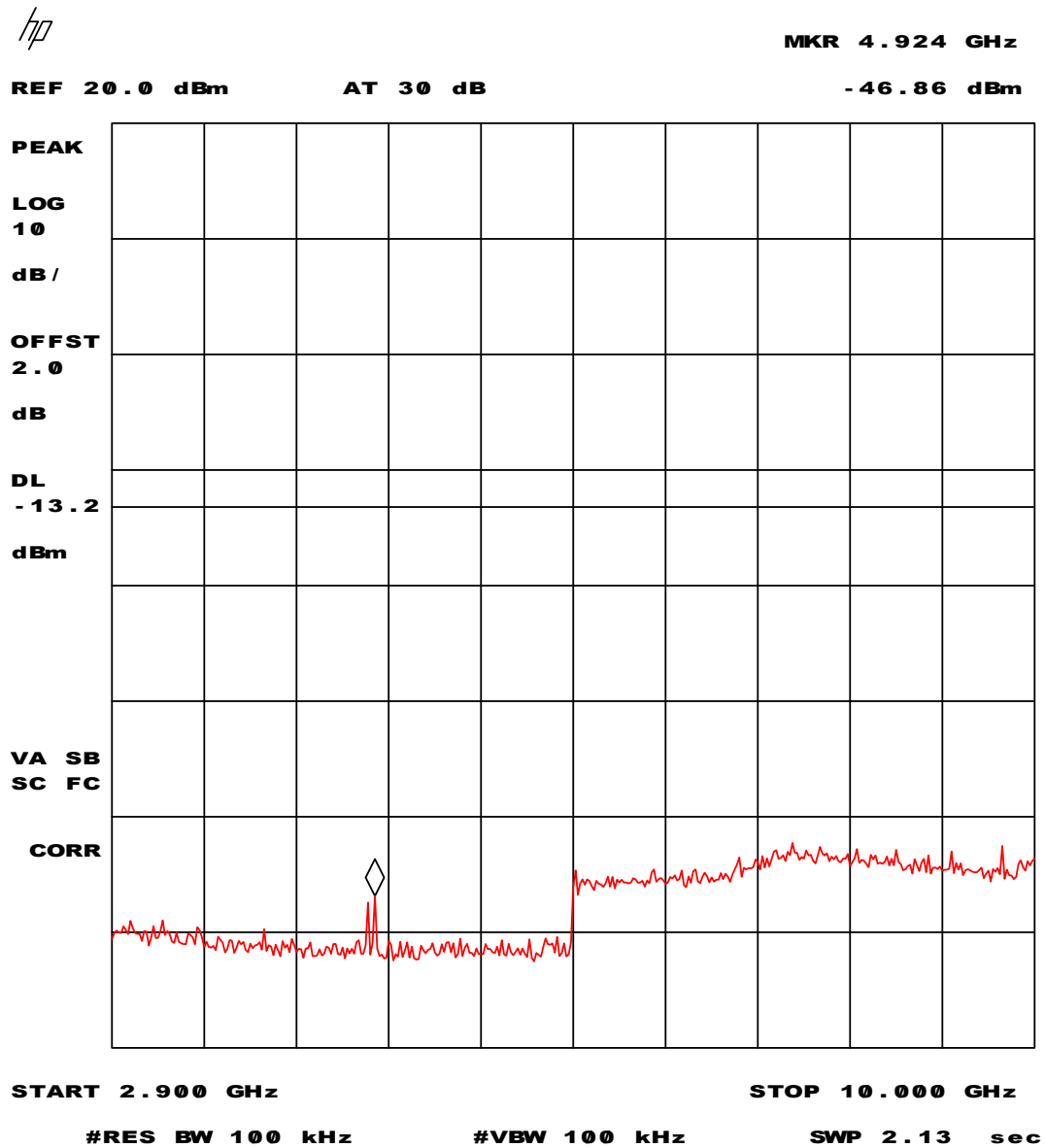


Plot 10 - Conducted emission outside restricted bands.

Conducted emission data outside restricted bands in a 100 kHz bandwidth shall be at least 20 dB below the highest level in a 100 kHz bandwidth within the band. Display line :: -20 dB limit line. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

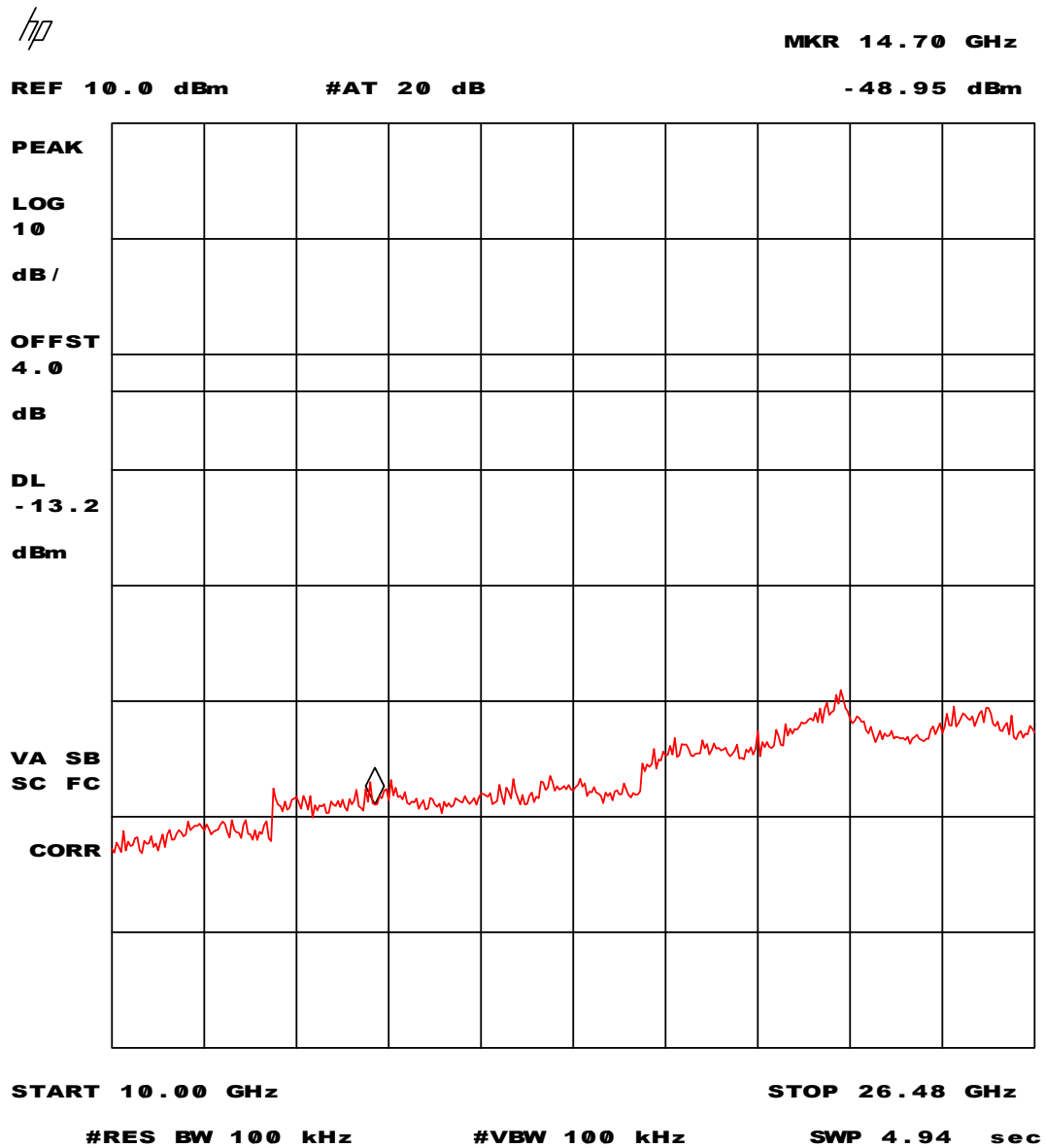


Plot 11 - Conducted emission outside restricted band.

Conducted emission data outside restricted bands in a 100 kHz bandwidth shall be at least 20 dB below the highest level in a 100 kHz bandwidth within the band. Display line :: -20 dB limit line. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29



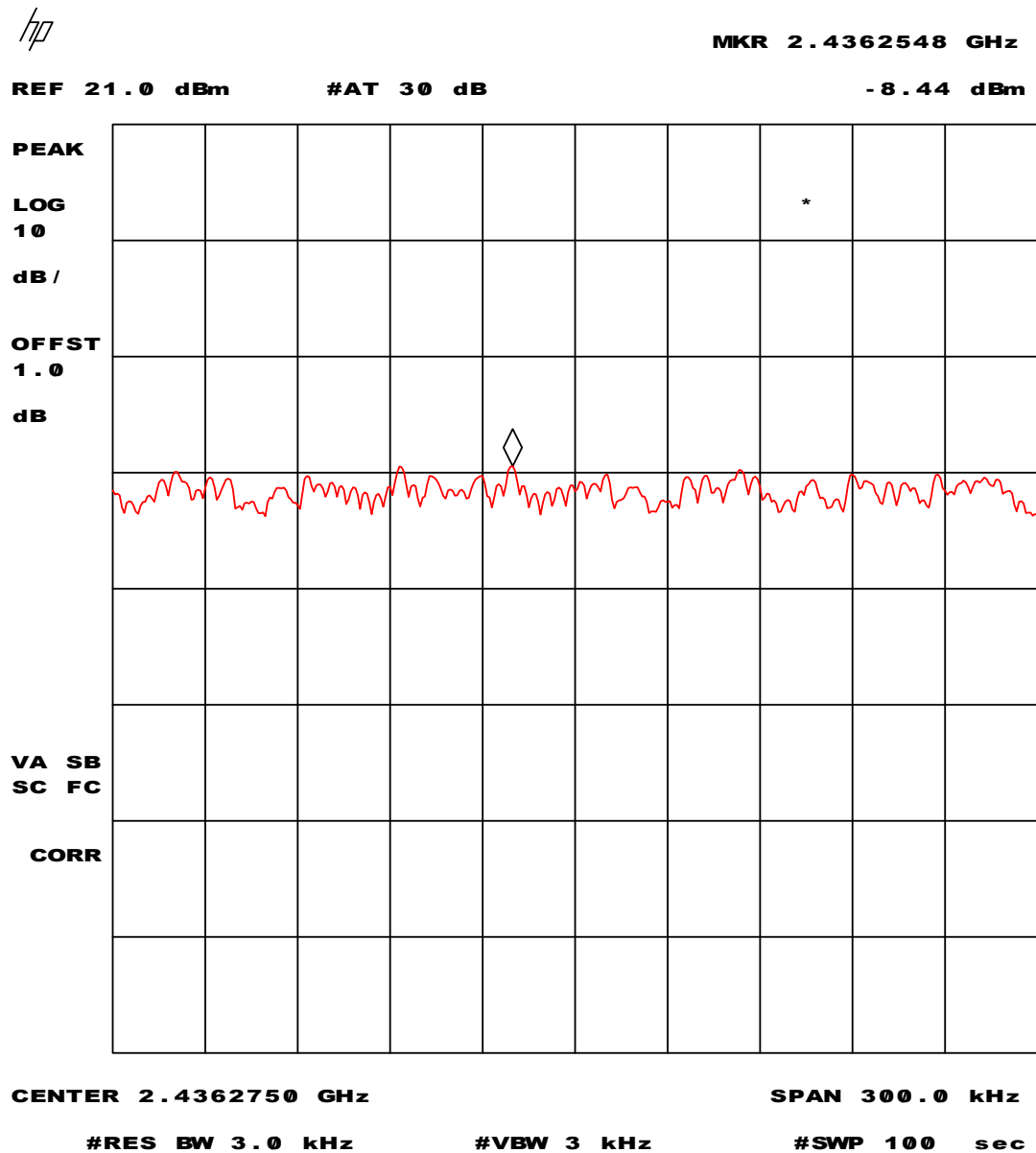
Plot 12 - Conducted emission outside restricted band.

Conducted emission data outside restricted bands in a 100 kHz bandwidth shall be at least 20 dB below the highest level in a 100 kHz bandwidth within the band. Display line :: -20 dB limit line. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

5.4 Peak power spectral density

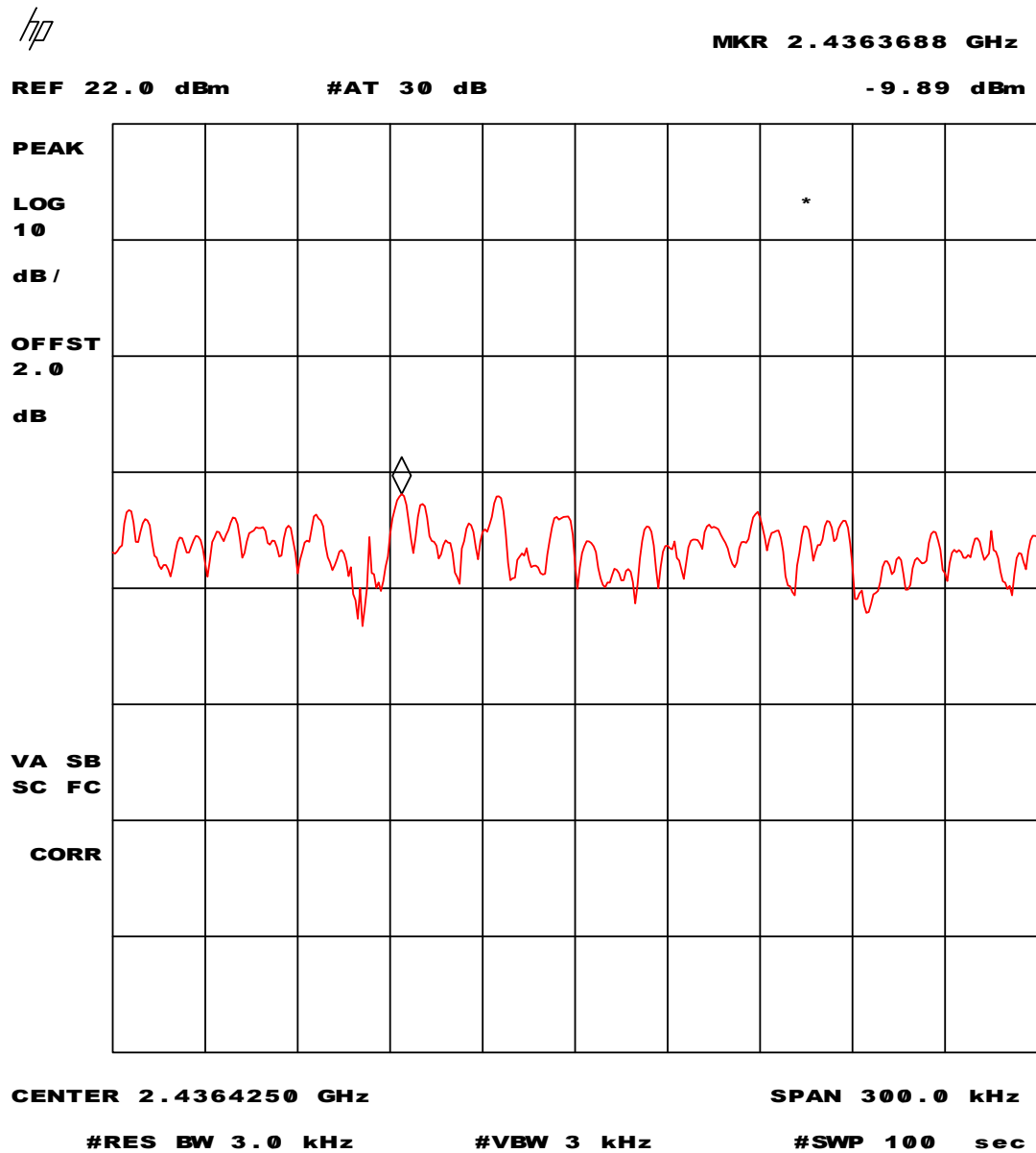


Plot 13 - Peak power spectral density (conducted) from the intentional radiator in any 3 kHz band.

Peak power spectral density (conducted) in a 3 kHz bandwidth at a transmission bit-rate of 1 Mbit/s. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

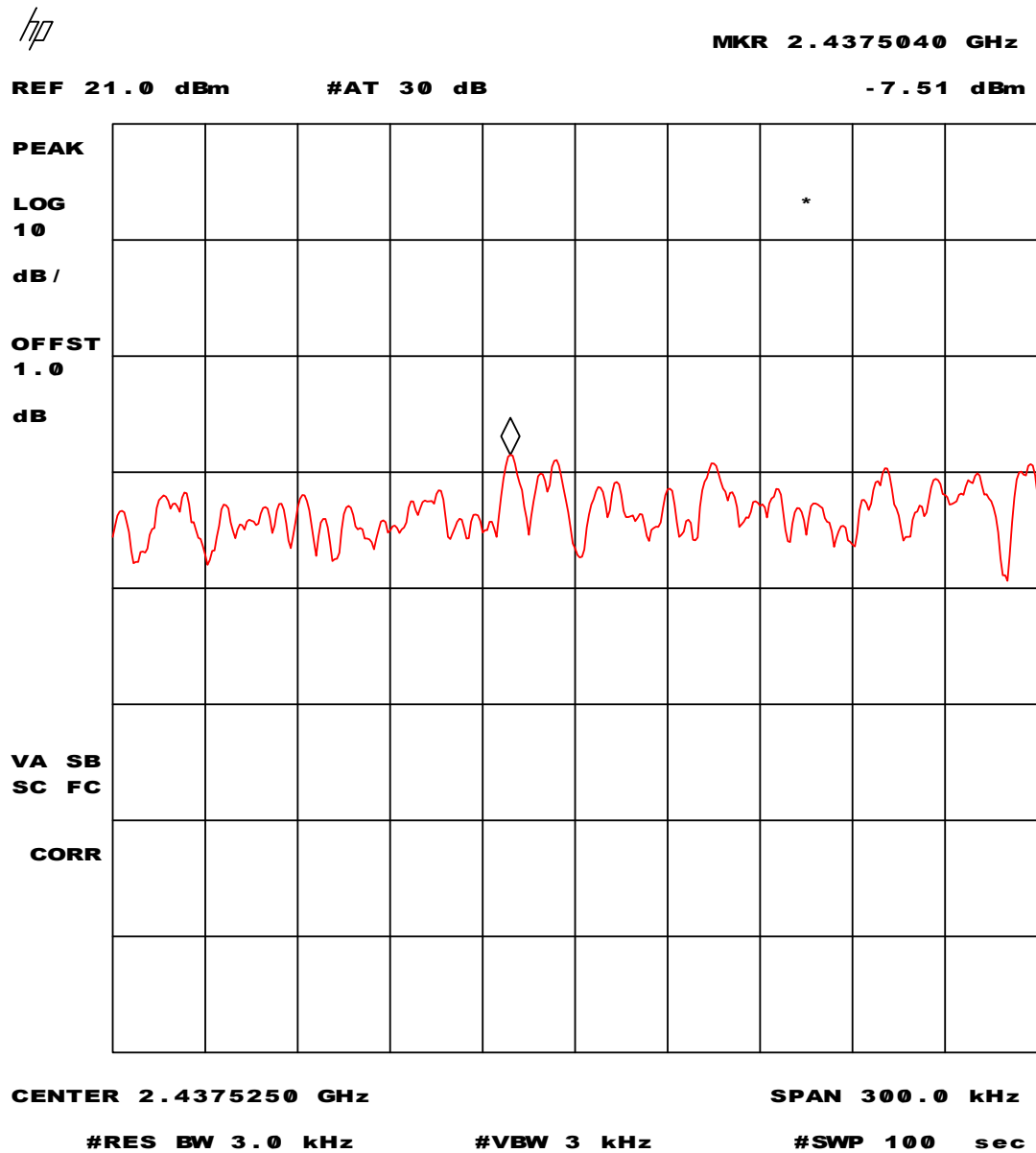


Plot 14 - Peak power spectral density (conducted) from the intentional radiator in any 3 kHz band.

Peak power spectral density (conducted) in a 3 kHz bandwidth at a transmission bit-rate of 2 Mbit/s. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29

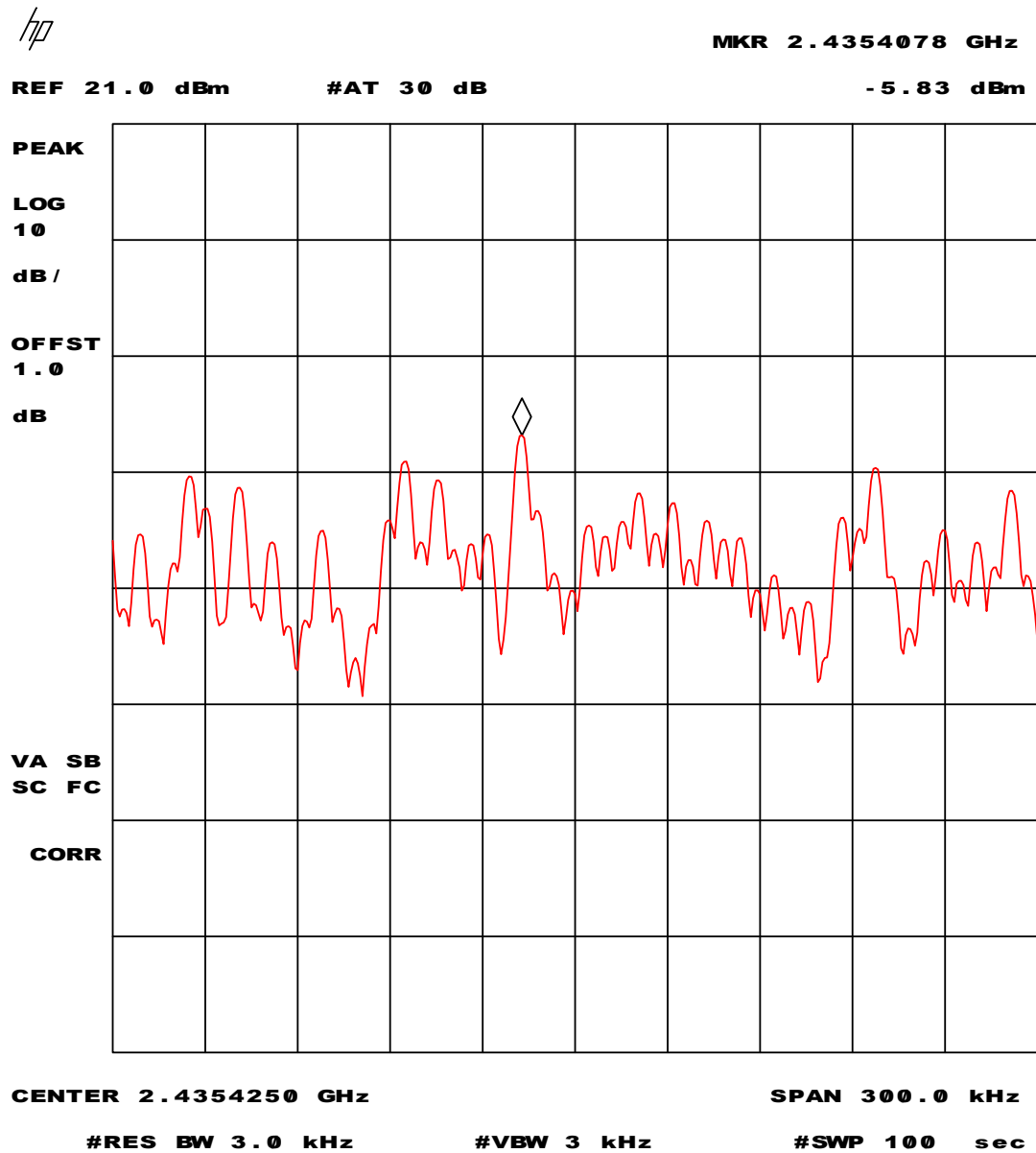


Plot 15 - Peak power spectral density (conducted) from the intentional radiator in any 3 kHz band.

Peak power spectral density (conducted) in a 3 kHz bandwidth at a transmission bit-rate of 5.5 Mbit/s. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
Description of EUT: 2.4 GHz WLAN PCMCIA card
Manufacturer: The Linksys Group, Inc.
Brand mark: Linksys
Model: WPC11
FCC ID: PKW-WPC11-V29



Plot 16 - Peak power spectral density (conducted) from the intentional radiator in any 3 kHz band.

Peak power spectral density (conducted) in a 3 kHz bandwidth at a transmission bit-rate of 11 Mbit/s. Corrected (offset) for cable losses.



Test specification(s): 47 CFR Part 15 (2001-12-18)
 Description of EUT: 2.4 GHz WLAN PCMCIA card
 Manufacturer: The Linksys Group, Inc.
 Brand mark: Linksys
 Model: WPC11
 FCC ID: PKW-WPC11-V29

6 List of utilized test equipment

Inventory number	Description	Brand	Model
12471	Biconical antenna 20MHz-200MHz	EATON	94455-1
12473	Log-per antenna 200-1000MHz	EATON	96005
12476	Antenna mast	EMCO	TR3
12477	Antenna mast 1-4 mtr	Poelstra	--
12482	Loop antenna	EMCO	6507
12483	Guidehorn	EMCO	3115
12484	Guidehorn	EMCO	3115
12488	Guidehorn 18 - 26.5 GHz	EMCO	RA42-K-F-4B-C
12533	Signalgenerator	MARCONI	2032
12559	Digital storage oscilloscope	Le Croy	9310M
12561	DC Power Supply 20A/70V	DELTA	SM7020D
12567	Plotter	HP	7440A
12605	calibrated dipole 28MHz-1GHz	Emco	3121c
12608	HF milliwattmeter	Hewlett Packard	HP435a
12609	Power sensor 10MHz-18GHz	Hewlett Packard	HP8481A
12636	Polyester chamber	Polyforce	--
12640	Temperature chamber	Heraeus	VEM03/500
13664	Spectrum analyzer	HP	HP8593E
13078	Preamplifier 0.1 GHz - 12 GHz	Miteq	AMF-3D-001120-35-14p
13452	Digital multi meter	HP	34401A
13526	Signalgenerator 20 GHz	Hewlett & Packard	83620A
13594	Preamplifier 10 GHz - 25 GHz	Miteq	AMF-6D-100250-10p
13886	Open Area testsite	Comtest	--
14051	Anechoic room	Comtest	--
14450	2.4 GHz bandrejectfilter	BSC	XN-1783
15633	Biconilog Testantenna	Chase	CBL 6111B
15667	Measuring receiver	R&S	ESCS 30
99045	DC Power Supply 3A/30V	DELTA	E030/3
99055	Non-conducting support	NMi	--
99061	Non-conducting support 150cm	NMi	--
99068	Detector N-F/BNC-F	Radiall	R451576000
99069	Cable 5m RG214	NMi	--
99071	Cable 10m RG214	NMi	--
99076	Bandpassfilter 4 - 10 GHz	Reactel	7AS-7G-6G-511
99077	Regulating trafo	RFT	LTS006
99112	Tripod	Chase	--
99136	Bandpassfilter 10 - 26.5 GHz	Reactel	9HS-10G/26.5G-S11