# FCC CFR47 PART 15 SUBPART E CERTIFICATION



## **TEST REPORT**

## FOR

# 802.11a/b CARDBUS

# MODEL NUMBER: WLC221-D4 / BCP3483U

# **BRAND NAME: ASKEY**

# FCC ID: H8NWLC221-D4

# **REPORT NUMBER: 02T1639-2**

# **ISSUE DATE: NOVEMBER 18, 2002**

Prepared for ASKEY COMPUTER CORP. 10F, NO. 119, CHIENKANG RD. CHUNG-HO, TAIPEI TAIWAN, R.O.C.

Prepared by COMPLIANCE CERTIFICATION SERVICES 561F MONTEREY ROAD, MORGAN HILL, CA 95037, USA TEL: (408) 463-0885 FAX: (408) 463-0888

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## **1. TEST RESULT CERTIFICATION**

COMPANY NAME:	ASKEY COMPUTER CORP. 10F, NO. 119, CHIENKANG RD. CHUNG-HO, TAIPEI, TAIWAN, R.O.C.
EUT DESCRIPTION:	802.11A/B CARDBUS
MODEL NAME:	WLC221-D4 / BCP3483U

### **DATE TESTED:** NOVEMBER 9 – NOVEMBER 15, 2002

TYPE OF EQUIPMENT	INTENTIONAL RADIATOR
EQUIPMENT TYPE	5.15 – 5.35 GHz TRANSCEIVER *
MEASUREMENT PROCEDURE	ANSI 63.4 / 1992, TIA/EIA 603
PROCEDURE	CERTIFICATION
FCC RULE	CFR 47 PART 15.E

\* The 5.2 GHz band is applicable to this report; other bands of operation (2.4 GHz and 5.8 GHz) are documented in a separate report

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirements set forth in CFR 47, PART 15, Subpart E. The equipment in the configuration described in this report, shows the measured emission levels emanating from the equipment do not exceed the specified limit.

**Note**: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

Tested By:

MIKE HECKROTTE CHIEF ENGINEER COMPLIANCE CERTIFICATION SERVICES FRANK IBRAHIM EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

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# 2. EUT DESCRIPTION

The Askey WLAN module is an 802.11 a/b wireless Spread Spectrum transceiver. It is constructed on a printed circuit card with a PCMCIA interface and is designed to be installed in a host system.

This unit provides a peak power output of +14.6 dBm (29 mW) in the 5150 -5350 MHz band. It is designed to use two identical dielectric antennas. A single antenna is used for transmit. Both antennas are used for receive diversity. The antenna gain is 5.2 dBi in the 5.2 GHz band. Both antennas are integral to the WLAN module.

This transceiver is based on an Atheros AR5001X three-chip solution. The three chips include:

AR5211: Multiprotocol MAC/baseband processor, and CardBus/PCI bus interface.

AR5111 Radio-on-a-Chip (RoC): An all-CMOS single-chip radio transceiver that includes a power amplifier, and integrated dual conversion filters to convert signals from 5 GHz to the baseband range for use by the AR5211. The AR5111 offers fully integrated transmitter, receiver, and frequency synthesizer functions; eliminating the need for external voltage controlled oscillators (VCOs) and surface acoustic wave (SAW) filters.

AR2111 Radio-on-a-Chip (RoC): An all-CMOS single-chip radio transceiver that, when combined with the AR5111, implements a 2.4 GHz 802.11 b/g radio solution. The AR2111 offers fully integrated transmitter, receiver, and frequency synthesizer functions. Like the AR5111, the AR2111 does not require external VCOs or SAW filters.

# 3. MODIFICATIONS TO THE EUT

The following modifications were made to the EUT during testing:

- 1. A jumper was added to the 32 MHz clock distribution trace. This trace, which is primarily on the bottom layer, originally included a short section of printed trace on the top layer. The vias to the top layer section were drilled out, the top layer section was removed, and a jumper wire was soldered to the bottom side of the printed circuit board.
- 2. The hole in the internal shield plate was covered.
- 3. The internal shield plate was soldered to the internal shield side wall peice, instead of the original snap fastening. There is no change to the fastening method between the side wall peice and the printed circuit board; this was originally a solder joint and remains as such.

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# 4. TEST METHODOLOGY

Conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and 15.407.

# 5. FACILITIES AND ACCREDITATION

## 5.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

Receiving equipment (i.e., receiver, analyzer, quasi-peak adapter, pre-selector) and LISNs conform to CISPR specifications for "Radio Interference Measuring Apparatus and Measurement Methods," Publication 16.

## 5.2. LABORATORY ACCREDITATIONS AND LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2)).

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## 5.3. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	FCC Part 15, CISPR 22, AS/NZS 3548,IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC	NVLAP
		61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, CNS 13438	200065-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	<b>FC</b>
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	<b>VCCI</b> R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	N <sub>ELA 117</sub>
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	N <sub>ELA-171</sub>
Taiwan	BSMI	CNS 13438	SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	Canada IC2324 A,B,C, and F

\* No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

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# 6. CALIBRATION AND UNCERTAINTY

## 6.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

## 6.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission					
30MHz - 200 MHz	+/- 3.3dB				
200MHz - 1000MHz	+4.5/-2.9dB				
1000MHz - 2000MHz	+4.6/-2.2dB				
Power Line Conducted Emission					
150kHz – 30MHz	+/-2.9				

Any results falling within the above values are deemed to be marginal.

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## 6.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST AND MEASUREMENT EQUIPMENT LIST						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date		
Spectrum Analyzer	HP	8566B	3014A06685	6/1/03		
Spectrum Display	HP	85662A	2152A03066	6/1/03		
Quasi-Peak Detector	HP	85650A	3145A01654	6/1/03		
Preamplifier	HP	8447D	2944A06833	8/22/03		
Log Periodic Antenna	EMCO	3146	9107-3163	3/30/03		
Biconical Antenna	Eaton	94455-1	1197	3/30/03		
Spectrum Analyzer	HP	8564E	3943A01643	7/22/03		
Spectrum Analyzer	HP	8593EM	3710A00205	6/11/03		
Preamplifier (1 - 26.5GHz)	HP	8449B	3008A00369	6/30/03		
Preamplifier (1 - 26.5GHz)	Miteq	NSP10023988	646456	4/26/03		
Horn Antenna (1 - 18GHz)	EMCO	3115	6717	1/31/03		
Horn Antenna (1 - 18GHz)	EMCO	3115	6739	1/31/03		
Horn Antenna (18 – 26.5GHz)	ARA	MWH 1826/B	1013	1/31/03		
High Pass Filter (4.57GHz)	FSY Microwave	FM-4570-9SS	003	N.C.R.		
Harmonic Mixer	HP	11970A	3008A04190	10/14/05		
Spectrum Analyzer	HP	E4404B	ID 963805	3/25/03		
Microwave Detector	Agilent	8474C	2905A04047	6/4/03		
Oscilloscope	HP	54601A	3106A00123	11/6/03		

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# 7. SETUP OF EQUIPMENT UNDER TEST

### SETUP INFORMATION FOR TRANSMITTER TESTS

#### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST							
Device Type	Device Type Manufacturer Model Serial Number FCC ID						
Laptop Personal Computer N340S8 PB344S811902382 DoC							
AC Adapter	Lishin International	LSE9802A2060	010810241A1	N/A			

#### I/O CABLES

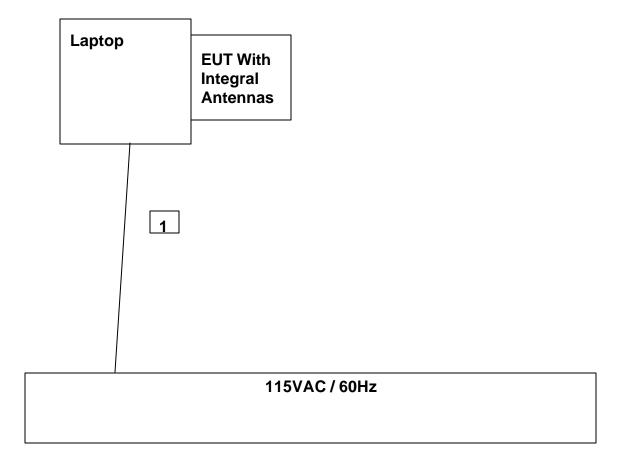
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115	Unshielded	2 m	Laptop cable is integrated with AC Adapter

#### TEST SETUP

The EUT is installed in the laptop computer via a PCMCIA extender card.

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#### SETUP DIAGRAM FOR TRANSMITTER TESTS



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#### SETUP INFORMATION FOR DIGITAL DEVICE TESTS

#### SUPPORT EQUIPMENT

	PERIPHERAL SUPPORT EQUIPMENT LIST							
Device Type	Manufacturer	Model	Serial Number	FCC ID				
MODEM	ACEEX	1414	9013538	IFAXDM1414				
PRINTER	HP	2225C	2541S41679	BS46XU2225C				
PS/2 MOUSE	PACKARD BELL	FDM-611	FWMC55039667	F4Z4K3FDM-612				
	PERSONAL COMPUTER	N340S8	PB344S811902382	DoC				
AC/DC ADAPTER	LISHIN INTERNATIONAL	LSE9802A2060	010810241A1	N/A				
DC POWER SUPPLY	HP	E3610A	KR24104150	N/A				

#### **I/O CABLES**

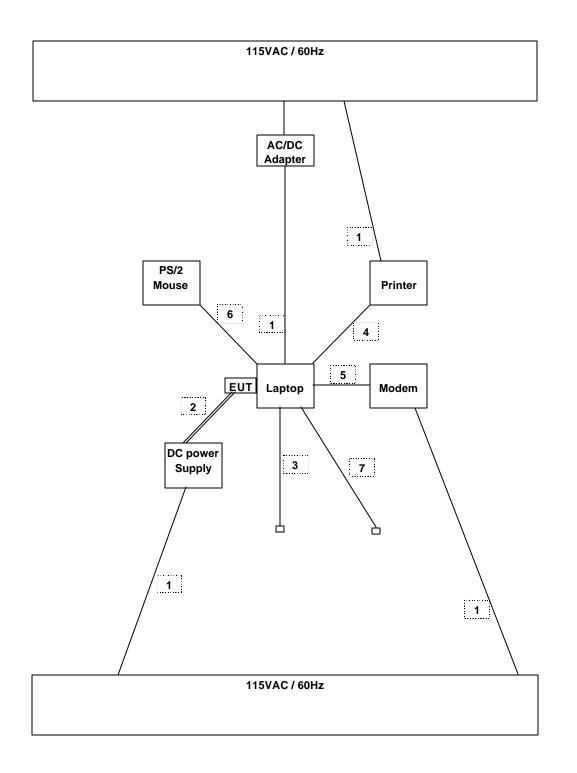
Cable	Port	# of	Connector	Cable	Cable	Remarks
No.		Identical	Туре	Туре	Length	
		Ports				
						Laptop cable is integrated with
1	AC	4	US 115V	<b>Un-shielded</b>	2m	AC Adapter
2	DC	1	CLIPS	<b>Un-shielded</b>	2m	
3	USB	1	USB	<b>Un-shielded</b>	2m	
4	Parallel	1	DB25	Shielded	2m	
5	Serial	1	DB9	Shielded	2m	
6	Mouse	1	PS/2	<b>Un-shielded</b>	2m	
7	LAN	1	RJ45	Shielded	2m	

#### TEST SETUP

The EUT is installed in the laptop computer via a PCMCIA extender card.

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#### SETUP DIAGRAM FOR DIGITAL DEVICE TESTS



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# 8. APPLICABLE RULES

## **§15.403- EMISSION BANDWIDTH**

(c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

## §15.407(a)- POWER LIMIT

(1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Specification Limit:

Channel	Frequency (MHz)	10 Log B (dB)	4 + 10 Log B or 11 + 10 Log B (dBm)	Power Limit (dBm)
Low	5180	14.8	18.8	17
Middle	5260	15.51	26.51	24
High	5320	14.73	25.73	24

Base Mode

Turbo Mode

Channel	Frequency	10 Log B	4 + 10 Log B or	Power Limit
	(MHz)	(dB)	11 + 10  Log B (dBm)	(dBm)
Low	5210	19.22	21.22	17
Middle	5250	18.94	22.94	17
High	5290	18.22	29.22	24

Maximum antenna gain = 5.2 dBi, therefore there is no reduction due to antenna gain.

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### COMPLIANCE CERTIFICATION SERVICES

## §15.407(a)- PEAK POWER SPECTRAL DENSITY

(1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Specification Limit:

4 dBm and 11 dBm. Maximum antenna gain = 5.2 dBi, therefore there is no reduction due to antenna gain.

## §15.407(a)- PEAK EXCURSION

(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### §15.407(b)- UNDESIRABLE EMISSION LIMITS

(1 & 2) For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(6) The provisions of §15.205 apply to intentional radiators operating under this section.

## §15.407(c)- TRANSMISSION IN CASE OF ABSENCE OF INFORMATION

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

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## §15.407(d)- ANTENNA TYPE

Any U-NII device that operates in the 5.15-5.25 GHz band shall use a transmitting antenna that is an integral part of the device.

## §15.407(f)- RADIO FREQUENCY EXPOSURE

U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

## §15.407(g)- FREQUENCY STABILITY

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

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## §15.205- RESTRICTED BANDS OF OPERATIONS

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 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
6.215 - 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	( <sup>2</sup> )
13.36 - 13.41			

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

 $^1$  Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.  $^2$  Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated using measurement instrumentation in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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## §15.207- CONDUCTED LIMITS

(a) For an intentional radiator which 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 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

## §15.209- RADIATED EMISSION LIMITS

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)	
30 - 88	100 **	3	
88 - 216	150 **	3	
216 - 960	200 **	3	
Above 960	500	3	

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

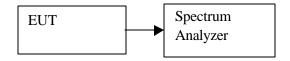
Frequency Range	Field Strength	Field Strength
(MHz)	(uV/m at 3 m)	(dBuV/m at 3 m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

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# 9. TEST SETUP, PROCEDURE AND RESULT

## 9.1. EMISSION BANDWIDTH

### TEST SETUP



### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to approximately 1% of the emission bandwidth and peak detection is used. The emission bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 26 dB.

#### **RESULTS**

No non-compliance noted:

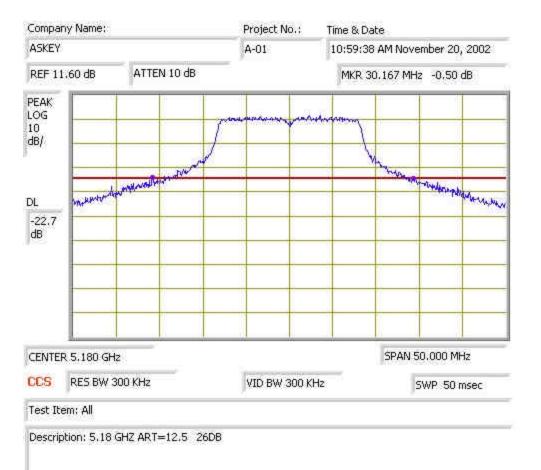
Base Mode

Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5180	30.167	14.8
Middle	5260	35.583	15.51
High	5320	29.75	14.73

Turbo Mode

Channel	Frequency	В	10 Log B
	(MHz)	(MHz)	(dB)
Low	5210	83.5	19.22
Middle	5250	78.333	18.94
High	5290	66.333	18.22

#### EMISSION BANDWIDTH (NORMAL MODE)



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## REPORT NO: 02T1639-2 EUT: 802.11 a/b CARDBUS

	Project No.:	Time & Date
	A-01	11:06:57 AM November 20, 2002
ATTEN 10 dB		MKR 35,583 MHz 0.17 dB
	manna	many have
5		SPAN 50.000 MHz
00 KHz	VID BW 300 K	Hz SWP 50 msec
	ATTEN 10 dB	ATTEN 10 dB

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## REPORT NO: 02T1639-2 EUT: 802.11 a/b CARDBUS

Company Name:		1,10,000	Project No.: Time & Da		ate		
ASKEY		A-01		11:18:40 AM November 20, 2002			
REF 11.60 dB			MKR 29.75	0 MHz 0.0	0 dB		
PEAK OG 0 IB/ -22.2 dB	and the second of the				Manufantan	etter mannafilma	
CENTER 5.320 GHz	Decreation	VID B	V 300 KH2		PAN 50.000	I MHz 50 msec	
fest Item: All							

Page 21 of 90

Compa	Company Name:			oject No.:	Time & Da	Time & Date			
ASKEY			A-	01	11:28:47 AM November 20, 2002				
REF 11.60 dB ATTEN 10 dB					MKR 83	MKR 83.500 MHz -0.33 dB			
PEAK LOG 10 dB/			<u></u>	*****	mandan	he.			
	anner	fuchanauthinanoutha	-		_	- AN HOUSE	and the second s	and the second	
DL -18.2 dB									
CENTE	R 5.210 GHz					SPAN 1	100.000 M	/IHz	
CCS	RES BW 1 MHz			VID BW 1 MHz		B	5WP 501	msec	
Test It	em: All								
Descrip	otion: 5.21 G	HZ TURBO ART=1	15 26DB						

## EMISSION BANDWIDTH (TURBO MODE)

Page 22 of 90

## REPORT NO: 02T1639-2 EUT: 802.11 a/b CARDBUS

el	Project No.:	Time & Date		
ASKEY		11:31:51 AM November 20, 2002		
ATTEN 10 dB		MKR 78.333 MHz -0.16 dB		
		many		
GHz		SPAN 100,000 MHz		
W 1 MHz	VID BW 1 MHz	SWP 50 msec		
	ATTEN 10 dB	A-01 ATTEN 10 dB		

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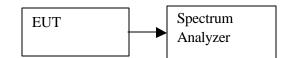
### REPORT NO: 02T1639-2 EUT: 802.11 a/b CARDBUS

Company Name:			Project No.:	Project No.: Time & Dat			te		
ASKEY	ASKEY		A-01	11:36:05 4	11:36:05 AM November 20, 2002				
REF 11.60 dB ATTEN 10 dB				MKR 66.	333 MI	Hz 0.00 (	18		
PEAK LOG 10 dB/			ſ		may	4			
	annahuamah	H-AND WAY	MAN		-	"Weillard	We Willingen	How many	
DL -18.7 dB	Secury								
CENTER	R 5.290 GHz					SPAN	100.000	٩Hz	
CCS	RES BW 1 MHz			VID BW 1 MHz		SWP 50 msec		msec	
Test Ite	em: All								

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## 9.2. PEAK POWER

## TEST SETUP



### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output is initially connected to a microwave detector and oscilloscope to measure the pulse duration, T.

Normal mode pulse duration = 3.14 msec. Normal mode pulse duration = 1.57 msec.

The automatic analyzer settings yield a sweep time of 50 msec. Sweep time > T and EBW > largest available RBW, therefore Method # 3 is used.

### **RESULTS**

No non-compliance noted:

Base Mode

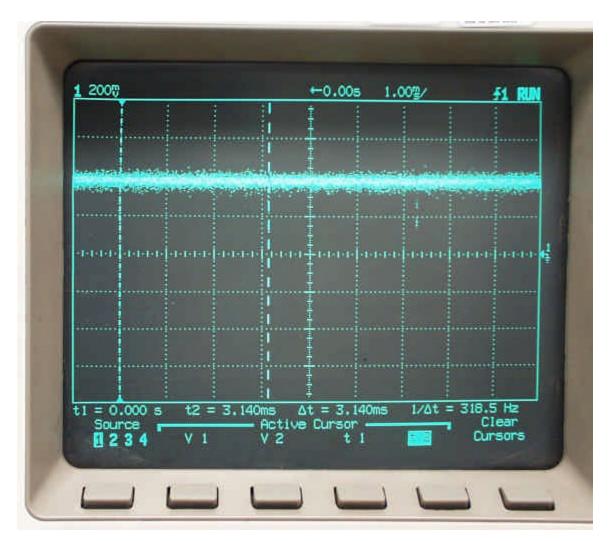
Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	11.9	17	-5.1
Middle	5260	14.3	24	-9.7
High	5320	12.5	24	-11.5

Turbo Mode

Channel	Frequency	Peak Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5210	14.6	17	-2.4
Middle	5250	14.6	17	-2.4
High	5290	14.0	24	-10.0

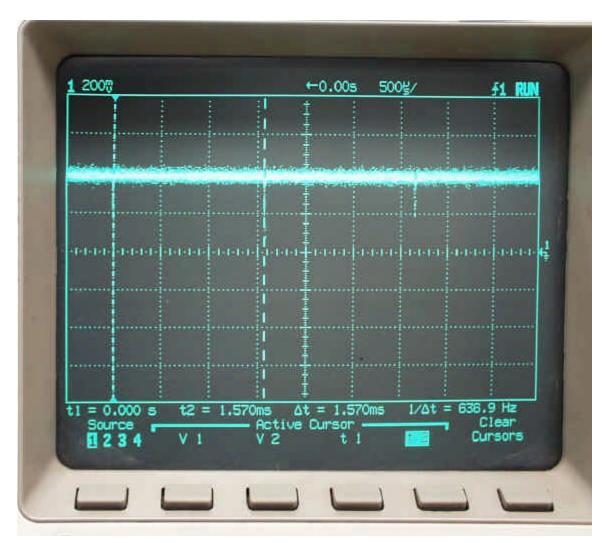
### Page 25 of 90

#### PULSE DURATION (NORMAL MODE)



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#### PULSE DURATION (TURBO MODE)



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#### PEAK POWER (NORMAL MODE)



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	And	www.www	monte	ming		
CHANNEL POW ACROSS 35.6		BW	v		-	
TOTAL 14.30 DENSITY -61	Bim		z			
	-					

CENTER 5.26000GHz SPAN 50.00MHz \*RBW 1.0MHz \*VBW 10KHz SWP 50.0ms

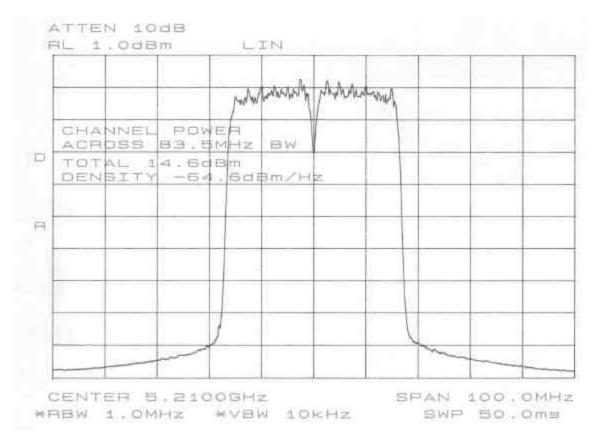
Page 29 of 90

	~	many per	whating	+
CHANNEL P		BW		
TOTAL 12 DENSITY		∃m∕Hz		
				_

CENTER 5.32000GHZ SPAN 50.00MHz \*RBW 1.0MHz \*VBW 10KHz SWP 50.0ms

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#### PEAK POWER (TURBO MODE)



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CENTER 5.2500GHz SPAN 100.0MHz \*RBW 1.0MHz \*VBW 10KHz SWP 50.0ms

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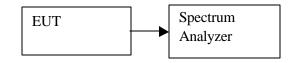
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CHA	NNEL	POV	MHZ	BW	/			
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CENTER 5.2900GHZ SPAN 100.0MHZ \*RBW 1.0MHZ \*VBW 10KHZ SWP 50.0ms

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## 9.3. PEAK POWER SPECTRAL DENSITY

#### TEST SETUP



#### TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002, Method 2.

### **RESULTS**

No non-compliance noted:

Base Mode

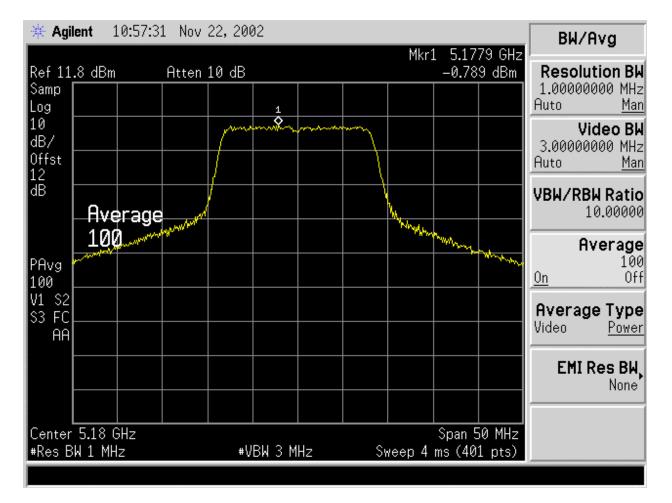
Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5180	-0.789	4	-4.789
Middle	5260	1.782	11	-9.218
High	5320	-0.635	11	-11.635

Turbo Mode

Channel	Frequency	PPSD	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	5210	-1.445	4	-5.445
Middle	5250	-1.297	4	-5.297
High	5290	-1.416	11	-12.416

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#### PPSD (NORMAL MODE)



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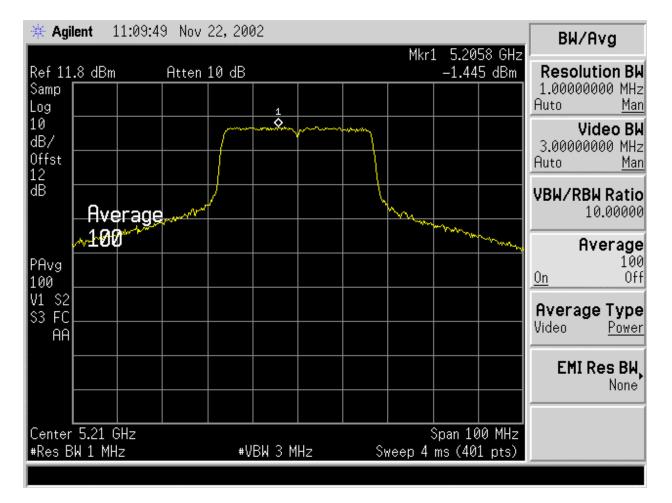
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	.8 dBm		Atten	10 dB				Mkr1		54 GHz 2 dBm	Resolution	
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V1 S2 S3 FC AA									<b>Average Type</b> Video <u>Power</u>
									EMI Res BW, None
	5.32 GHz W 1 MHz		#VBW	3 MHz	SI	иеер 4 I	Span 5 ms (40:		

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#### PPSD (TURBO MODE)



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	BW/Avg
	- Resolution BW
	1.00000000 MHz Auto <u>Man</u>
Offst	<b>Video BW</b> 3.00000000 MHz Auto <u>Man</u>
Average	/BW/RBW Ratio 10.00000
PAvg 100	Average 100 Dn Off
V1 S2 S3 FC	Average Type Video <u>Power</u>
	EMI Res BW, None
Center 5.25 GHz Span 100 MHz #Res BW 1 MHz #VBW 3 MHz Sweep 4 ms (401 pts)	

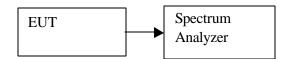
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🔆 Agil	<b>ent</b> 11:16:0	0 Nov 22, 2	002			BW/Avg
Ref 11. Samp Log	.8 dBm	Atten 10 dE	3	MKr.	1 5.2955 GHz -1.416 dBm	Resolution BW 1.00000000 MHz Auto <u>Man</u>
10 dB/ 0ffst 12			an a			Video BW 3.00000000 MHz Auto <u>Man</u>
12 dB	Average	and the second second		han and a second	trong and the second	VBW/RBW Ratio 10.00000 Average
PAvg 100 V1 S2						<u>0n</u> 0ff
S3 FC AA						Average Type Video <u>Power</u>
						EMI Res BW, None
	5.29 GHz W 1 MHz	ŧ	VBW 3 MHz		Span 100 MHz ms (401 pts)	

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# 9.4. PEAK EXCURSION

## TEST SETUP



## TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 3 was used for peak power measurements, Method # 3 is used for the second PPSD trace.

#### **RESULTS**

No non-compliance noted:

Base Mode

Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5180	10.17	13	-2.83
Middle	5260	9.50	13	-3.5
High	5320	10.34	13	-2.66

Turbo Mode

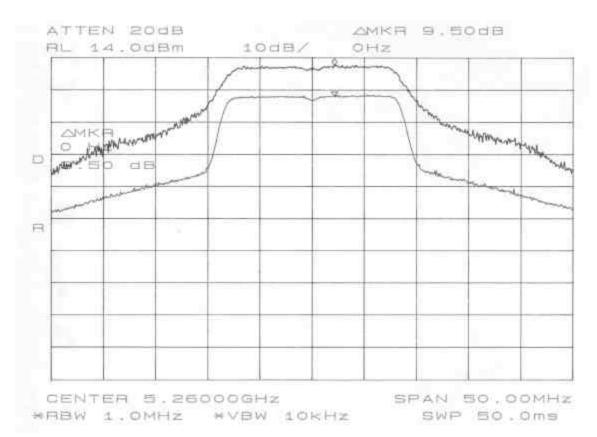
Channel	Frequency	Peak Excursion	Limit	Margin
	(MHz)	(dB)	(dB)	(dB)
Low	5210	9.66	13	-3.34
Middle	5250	9.33	13	-3.67
High	5290	9.50	13	-3.5

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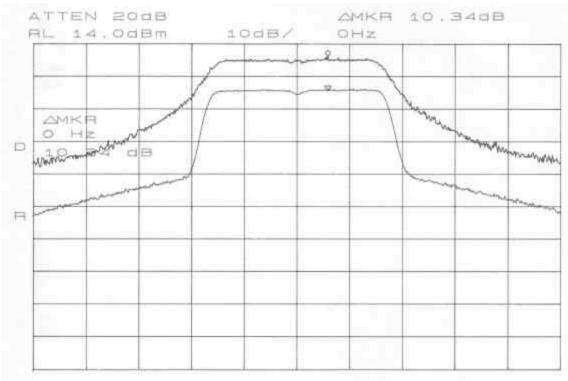
#### PEAK EXCURSION (NORMAL MODE)



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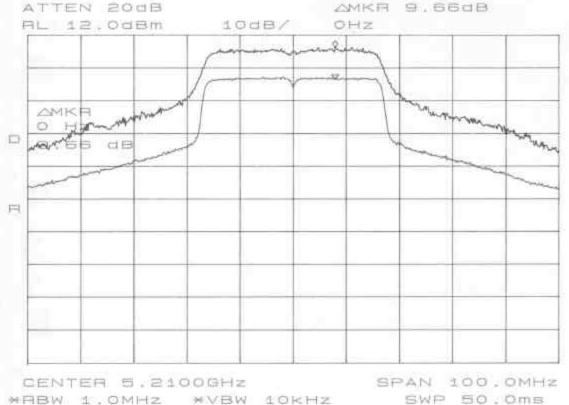
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CENTER 5.32000GHz SPAN 50.00MHz \*RBW 1.0MHz \*VBW 10KHz SWP 50.0ms

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#### PEAK EXCURSION (TURBO MODE)



MABW 1.0MHz MVBW 10KHz

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SWP 50.0ms

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\*RBW 1.0MHz \*VBW 10KHz

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SWP 50.0ms

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\*RBW 1.0MHz \*VBW 10KHz

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## 9.5. TRANSMISSION IN THE ABSENCE OF DATA

## **RESULTS**

No non-compliance noted:

Refer to the theory of operation.

# 9.6. TYPE OF ANTENNA

## **RESULTS**

No non-compliance noted:

Refer to the installation manual.

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## 9.7. MAXIMUM PERMISSIBLE EXPOSURE

## CALCULATIONS

Given

and

 $E = \sqrt{(30 * P * G)} / d$ 

 $S = E^{2}/3770$ 

where

E = Field Strength in Volts / meter P = Power in Watts G = Numeric antenna gain d = distance in metersS = Power Density in milliwatts / square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

 $d = \sqrt{((30 * P * G) / (3770 * S))}$ 

Changing to units of mW and cm, using:

P(mW) = P(W) / 1000 and

$$d(cm) = 100 * d(m)$$

yields

 $d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$ 

 $d = 0.282 * \sqrt{(P * G / S)}$ 

where

d = distance in cm P = Power in mW G = Numeric antenna gain

 $S = Power Density in mW / cm^2$ 

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Equation (1)

Substituting the logarithmic form of power and gain using:

 $P(mW) = 10 ^ (P(dBm) / 10)$  and

 $G (numeric) = 10 \land (G (dBi) / 10)$ 

yields

 $d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ 

where

d = MPE safe distance in cm

P = Power in dBm

G = Antenna Gain in dBi

 $S = Power Density Limit in mW / cm^2$ 

## **RESULTS**

No non-compliance noted:

EUT output power = 14.6 dBm Antenna Gain = 5.2 dBi  $S = 1.0 \text{ mW} / \text{cm}^2$  from 1.1310 Table 1

Substituting these parameters into Equation (1) above:

MPE Safe Distance = 2.76 cm

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

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# 9.8. FREQUENCY STABILITY

## **RESULTS**

No non-compliance noted:

Referring to the theory of operation, the crystal used to set the frequency has a temperature coefficient of +/-20 ppm over the specified rated temperature range. For a transmitter fundamental frequency of 5.35 GHz, this corresponds to +/-107 kHz.

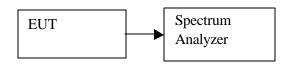
An examination of the band edge plots shows that the emission will stay within the authorized band over the entire temperature range.

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## 9.9. UNDESIRABLE EMISSIONS – CONDUCTED MEASUREMENTS

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

## TEST SETUP



#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## **RESULTS**

No non-compliance noted:

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#### CONDUCTED SPURIOUS (NORMAL MODE)

START BOMHZ STOP 40.00GHZ RBW 1.0MHZ VBW 1.0MHZ SWP BOOMS

Page 53 of 90

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Page 54 of 90

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START BOMHZ STOP 40.00GHZ RBW 1.0MHZ VBW 1.0MHZ SWP BOOMS

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#### CONDUCTED SPURIOUS (TURBO MODE)

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RBW 1.0MHz VBW 1.0MHz SWP BOOMS

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START BOMHZ STOP 40.00GHZ RBW 1.0MHZ VBW 1.0MHZ SWP 800ms

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## 9.10. UNDESIRABLE EMISSIONS – RADIATED MEASUREMENTS

### TEST SETUP

The EUT is placed on the wooden table. The antenna to EUT distance is 3 meters for measurements below 1 GHz and 1 meter for measurements above 1 GHz. The EUT is configured in accordance with Section 8 of ANSI C63.4/1992.

The EUT is set to transmit in a continuous mode.

#### TEST PROCEDURE

For measurements below 1 GHz within restricted bands the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For all other measurements, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The frequency span is set small enough to easily differentiate between broadcast stations, intermittent ambient signals and EUT emissions. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the suspected signal. Measurements were made with the antenna polarized in both the vertical and the horizontal positions.

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#### SYSTEM NOISE FLOOR FOR HARMONIC AND SPURIOUS MEASUREMENTS

## **Compliance Certification Services**

Worst Case Radiated Emissions System Noise Floor

Each band below corresponds to each horn antenna band Uses the lowest gain preamplifier; actual preamp used may have higher gain Uses the longest typical cable configuration; actual cables used may have less loss Noise floor field strength results are compared to the FCC 15.205 Restricted Band limit

Specif	ication D	istance:	3	meters					
Freq GHz	SA dBuV	AF dB/m	Distance m	Distance dB	Preamp dB	Cable dB	Field dBuV/m	Limit dBuV/m	Margin dB
1 to 18 (	GHz ban	d							
RBW =	<u>1 MHz. r</u>	beak dete	ection						
18	41.9	47.8	1	-9.5	32.6	13.5	61.06	74	-12.94
RBW = 1 MHz, average detection									
18	28.7	47.8	1	-9.5	32.6	13.5	47.86	54	-6.14
18 to 26	5.5 GHz I	band							
RBW = 1 MHz_peak detection									
26.5	44.6	33.4	1	-9.5	35.0	19.5	52.96	74	-21.04
RBW =	<u>1 MHz, a</u>	verage	detection						
26.5	32.4	33.4	1	-9.5	35.0	19.5	40.76	54	-13.24

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#### SAMPLE CALCULATIONS

Given

 $E = \sqrt{(30 * P * G)} / d$ 

where

E = Field Strength in Volts / meter

P = Power in watts

G = Numeric antenna gain

d = distance in meters

Rearranging terms yields:

 $P * G = (d * E) ^ 2 / 30$ 

Converting to the logarithmic form and changing to units of mW and uV/m, using:

P (mW) = P (W) / 1000 andE (uV/m) = E (V/m) / 1000000

yields

$$10 \log (P * G) = 10 \log (d^2) + 10 \log (E^2) - 10 \log (30) - 10 \log (10^9) = 20 \log (d) + 20 \log (E) - 104.77$$

In this logarithmic form

10 log (P \* G) is PG in dBm and 20 log (E) is E in dBuV/m

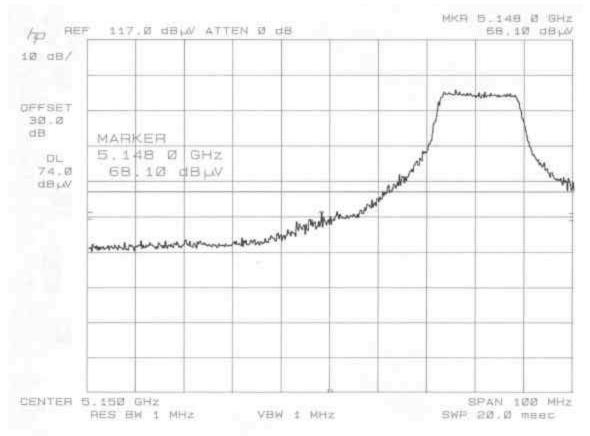
Since EIRP = P \* G, then at a specification distance of 3 meters, the EIRP in terms of field strength is:

EIRP (dBm) = P \* G (dBm) = E (dBuV/m) - 95.2

## TEST RESULTS

No non-compliance noted:

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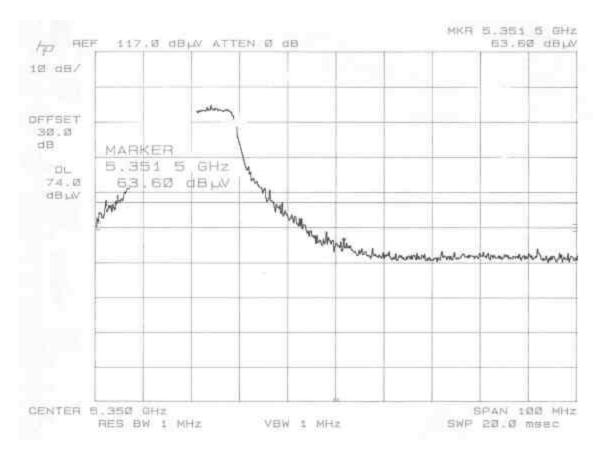


#### BAND EDGE RADIATED EMISSIONS (NORMAL MODE, VERTICAL POLARIZATION)

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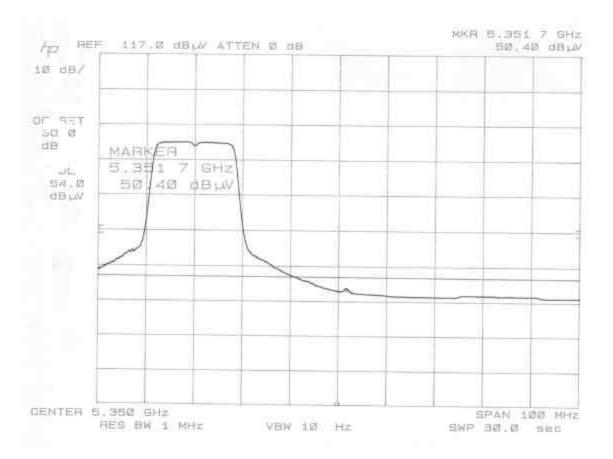
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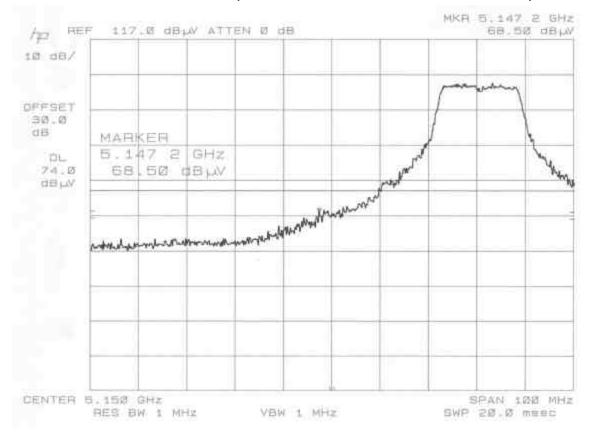


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## DATE: NOVEMBER 18, 2002 FCC ID: H8NWLC221-D4



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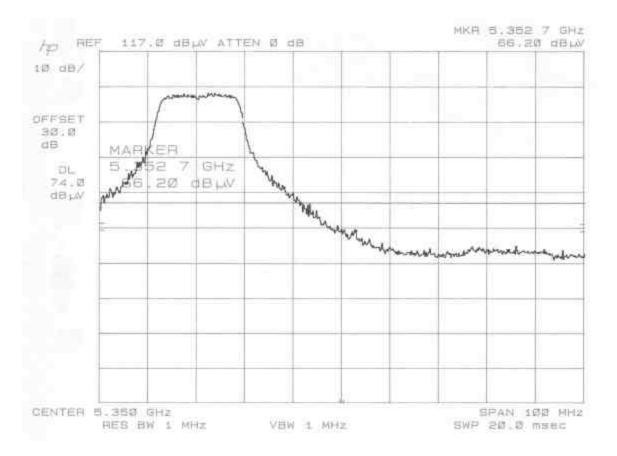


#### BAND EDGE RADIATED EMISSIONS (NORMAL MODE, HORIZONTAL POLARIZATION)

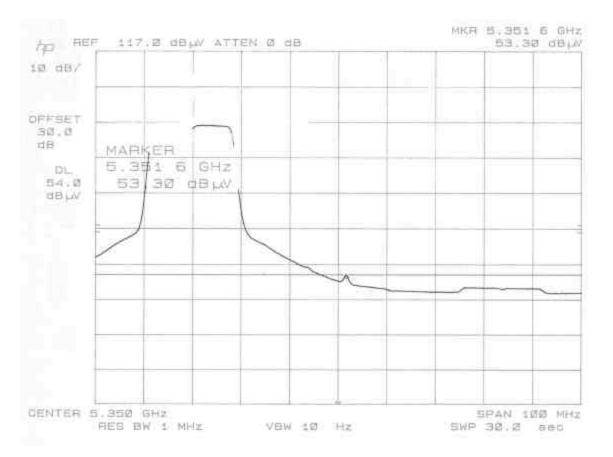
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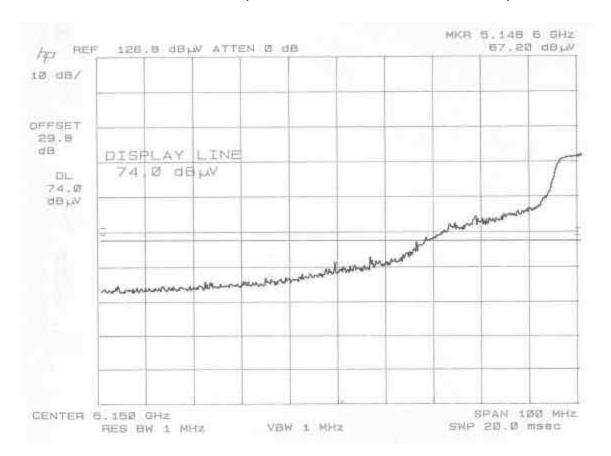
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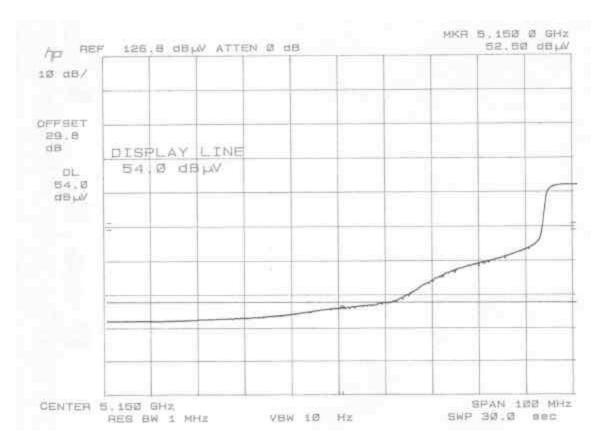


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#### BAND EDGE RADIATED EMISSIONS (TURBO MODE, VERTICAL POLARIZATION)

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### BAND EDGE RADIATED EMISSIONS (TURBO MODE, HORIZONTAL POLARIZATION)

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dB/					
				 _	
6ET 1.8	DISPL	AY LIN	E		
DL.		deµV			ſ
18 LAV					
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FSET				_		-	-		_	-
10.3 18		PLAY	LINE							-
DE		Ødi				-				-
74.0			1.1=							
de µV										
			_							
		_						_	_	
	marana	Alun	Mul Si	an an Ta	Constant of	5.423.577	Hanaha			10.910
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- each			ATTE V				_	53.1	1
dB/									
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DL		Øde							-
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- I.									

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### HARMONIC AND SPURIOUS RADIATED EMISSIONS (NORMAL MODE)

	Pro Te	ject Nu est Eng Corr	imber: Date: ineer: npany:	02T16 11/15/ Neelis Askey	39-2 02 h Raj Compu	of Band H ter Corp _AN Card						
Т	est C	onfigu	ration:	EUT,	Laptop,	DC powe = 5.18 G	r Supp	ly				
Spec			stance: stance:			Ell Cable Lo			n Factor:	95.2	dB	
Freq GHz	Pol V/H	Det	SA dBuV	Dist		Preamp dB			Field dBuV/m	EIRP dBm	Limit dBm	Margin dB
10.360	V	Peak	55.5	-9.5	38.9	34.6	1.0	8.8	60.0	-35.2	-7.0	-28.2
10.360	V	Avg	45.8	-9.5	38.9	34.6	1.0	8.8	50.3	-44.9	-27.0	-17.9
10.360	н	Peak	55.2	-9.5	38.9	34.6	1.0	8.8	59.7	-35.5	-7.0	-28.5
	Pr EU <sup>-</sup> Test Mode	Cor Cor Cor Configu Configu configu	umber: Date: gineer: npany: ription: iration: eration:	02T10 11/15 Neelis Askey 802.1 EUT, TX OI	639-2 /02 sh Raj / Compu 1 a/b WL Laptop, I	ter Corp AN Card, DC power = 5.18 GH	, Model Supply	: WLC2	21-D4, B(			
Spe			istance:	3.0	meters							
			istance:	1.0	meters		e Lengt					Manain
Freq GHz	Pol V/H	Det	SA dBuV	Dist dB	AF dB/m	Preamp dB	dB			a Li //m dBu		Margin dB
15.540	V	Peak	54.2	-9.5						1.8	74.0	-12.2
15.540	V	Ava	43.6	-9.5						1.2	54.0	-2.8
15.540	Н	Peak	51.1	-9.5	38.3	33.6	6 1	.0 1	1.4 5	8.7	74.0	-15.3
15.540	Н	Avg	41.8	-9.5	38.3	33.6	6 1	.0 1	1.4 4	9.4	54.0	-4.6

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8.0

Description of Test: Radiated Out of Band Harmonic and Spurious Emissions Project Number: 02T1639-2 Date: 11/14/02 Test Engineer: Frank Ibrahim Company: Askey Computer Corp EUT Description: 802.11 a/b WLAN Card, Model: WLC221-D4, BCP3483U Test Configuration: EUT, Laptop, DC power Supply Mode of Operation: TX ON, Freq = 5.26 GHz, Normal Mode, ART setting = 15 Specification Distance: 3.0 meters EIRP Conversion Factor: 95.2 dB Actual Distance: 15.0 feet 1.0 meters Cable Length: Freq Pol Det SA Dist AF Preamp Filter Cable Field EIRP Limit Margin GHz V/H dBuV dB dB/m dB dB dB dBuV/m dBm dBm dB 10.520 V Peak 57.7 -9.5 39.2 35.7 1.0 8.9 61.5 -33.7 -7.0 -26.7 <u>48.2</u> 10.520 V -9.5 39.2 35.7 1.0 52.0 -43.2 -27.0 -16.2 Ανα 8.9 <u>-35</u>.7 н -9.5 59.5 10.520 Peak 55.7 39.2 35.7 1.0 8.9 -7.0 -28.7 -9.5 10.520 Н 46.2 39.2 35.7 1.0 8.9 50.0 -45.2 -27.0 -18.2 Ava Description of Test: Radiated Emissions - Restricted Bands Project Number: 02T1639-2 Date: 11/14/02 Test Engineer: Frank Ibrahim

			Co	mpany:	Askey	Compute	er Corp					
		EU	T Desc	cription:	802.11	a/b WL	AN Card,	Model: V	VLC221-	D4, BCP3	8483U	
		Test	Config	uration:	EUT, L	aptop, D	C power	Supply				
			-				-		al Mode	ART setti	na = 15	
			Op	0.0.011		,	0.20 011	_,				
F	Sne	ecific	ation D	istance:	3.0	meters						
	Opt						0-1-1-	1	45.0	4 4		
L		A	ctual L	istance:	1.0	meters	Cable	Length:	15.0	feet		
	Freq	Pol	Det	SA	Dist	AF	Preamp	Filter	Cable	Field	Limit	Margin
	GHz	V/H		dBuV	dB	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB
L	15.780	V	Peak	58.8	-9.5	38.8	38.8	1.0	11.6	61.8	74.0	-12.
	15.780	V	Ava	47.5	-9.5	38.8	38.8	1.0	11.6	50.5	54.0	-3.
	15.780	Н	Peak	53.0	-9.5	38.8	38.8	1.0	11.6	56.0	74.0	-18.
ſ	15.780	Н	Avg	43.3	-9.5	38.8	38.8	1.0	11.6	46.3	54.0	-7.

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D		-	of Test: umber:			of Band H	larmonio	c and S	ourious El	mission	IS	
	T IC		Date:									
	Т	est Eng	gineer:	Neelis	h Raj							
		Cor	npany:	Askev	Comput	er Corp						
	EUT			-		•	, Model:	WLC22	21-D4, BC	P3483	U	
		•			• • •	DC powe						
M	lode	of Ope	eration:	TX ON	I , Freq :	= 5.32 Gł	Hz, Norr	nal Moc	le, ART s	etting =	12.5	
Spec			stance:		neters	EIF	RP Conv	ersion l	actor:	95.2 c	зB	
	I		stance:			Cable Le						
Freq GHz	Po V/H		SA dBuV	Dist dB	AF I dB/m	Preamp dB	Filter C dB	able dB d		EIRP dBm	Limit dBm	Margin dB
10.520		Peak		-9.5	38.9	34.5	1.0	8.9	62.5	-32.7	-7.0	
10.520		Ava		-9.5	38.9	34.5	1.0	8.9	53.0	-42.2	-27.0	
10.520		Peak		-9.5	38.9	34.5	1.0	8.9	60.5	-34.7	-7.0	
10.520		Avg	46.2	-9.5	38.9	34.5	1.0	8.9	51.0	-44.2	-27.0	
1		-				sions - Re	estricted	Bands				
	Pr	oject N	umber:	02116								
		Test Er	igineer:									
			.gee									
			mpany:									
			•					WLC22	-D4, BCP	3483U		
		-				DC power					о <i>г</i>	
	wooe	e or Op	eration:	TX OF	∎, Freq =	= 5.32 GH	z, norm	ai wode	, ART set	ling = 1	2.5	
Spe	ecific	ation D	istance:	3.0	meters							
		ctual D	istance:	1.0	meters		<u>Length</u>		feet	-		
Freq	Pol	Det	SA	Dist	AF	Preamp		Cable	Field	Lim		Margin
GHz	<b>V/H</b>		dBuV	<b>dB</b> -9.5	dB/m	dB	dB	dB	dBuV/n			<b>dB</b> -15.9
10.640 10.640	V	Peak Avg	<u>53.2</u> 42.6	-9.5 -9.5							74.0 74.0	-15.9
10.640	-	Peak	52.6	-9.5							4.0 74.0	-16.5
10.640		Avg	41.0								74.0	-28.1
15.960	V	Peak	54.3	-9.5	38.0	34.0			7 61.5	5 7	<b>'</b> 4.0	-12.5
15.960		Avg	44.3	-9.5							54.0	-2.5
15.960		Peak	50.5	-9.5							4.0	-16.3
15,960	н	Δνα	41 2	-95	38.0	34.0	10	11	7 48 /	1 5	54 0	-56

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### HARMONIC AND SPURIOUS RADIATED EMISSIONS (TURBO MODE)

De	Pro	ject Nu est Eng	imber: Date: ineer:	02T16 11/15 Neelis	639-2 /02 sh Raj	of Band H	Harmor	ic and	Spurious	Emissic	ons	
Т	est C	Descr onfigui	iption: ration:	802.1 EUT,	1 a/b W Laptop,	LAN Card DC powe = 5.21 Gl	r Supp	ly				
Spec			stance:		meters meters	Ell Cable L			n Factor:	95.2	dB	
Freq GHz	Pol V/H	Det	SA dBuV	Dist	AF dB/m	Preamp dB			Field dBuV/m	EIRP dBm	Limit dBm	Margin dB
10.420	V	Peak	59.1	-9.5	38.9	34.6	1.0	8.9	63.7	-31.5	-7.0	-24.5
10.420		Avg	48.4		38.9	34.6		8.9				-15.2
10.420 10.420		Peak Avg	59.5 48.9		<u>38.9</u> 38.9	<u>34.6</u> 34.6		<u>8.9</u> 8.9				
	Pr ٦ EU Test Mode	Cor Cor Cor Configu of Ope	umber: Date: gineer: npany: ription: iration: eration:	02T1 11/15 Neelis Askey 802.1 EUT, TX O	639-2 5/02 sh Raj y Compu 1 a/b W Laptop, N , Freq	tter Corp LAN Card DC power = 5.21 GF	, Model Supply	: WLC2	21-D4, BC			
Spe			istance: istance:		meters meters		e Lenat	h: 15.	0 feet			
Freq	Pol	Det	SA SA	Dist		Preamp				d Li	mit	Margin
GHz	V/H		dBuV	dB	dB/m	-	dB			/m dBu	ıV/m	dB
15.630	V	Peak	56.0	-9.5	5 38.2	2 33.7	7 1	.0 1	1.5 6	3.5	74.0	-10.5
15.630		Ava	45.6							3.1	54.0	-0.9
15.630		Peak	52.1	-9.5						9.6	74.0	-14.4
15.630	Н	Avg	41.3	-9.5	5 38.2	2 33.7	7 1	.0 1	1.5 4	8.8	54.0	-5.2

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De			Test: mber:			of Band I	Harmor	nic and	Spurious	Emissio	ns	
	110	001110	Date:									
	Те	st Eng			Ibrahin	n						
				-	•	uter Corp						
			•						221-D4, B	CP348	30	
		•			• •	DC powe		•				
M	ode d	of Oper	ation:	TX O	N , Freq	= 5.25 G	Hz, Tu	rbo Moo	de, ART se	etting =	15	
Spec	ificat	ion Dis	tance:	3.0	meters	EI	RP Co	nversior	n Factor:	95.2	dB	
	Act	ual Dis	tance:	1.0	meters	Cable L	enath:	15.0	feet			
Freq	Pol	Det	SA	Dist	AF	Preamp	Filter	Cable	Field	EIRP	Limit	Margin
MHz	V/H		dBuV	dB	dB/m	dB	dB	dB	dBuV/m	dBm	dBm	dB
10.500	V	Peak	56.1	-9.5	39.2	35.7	1.0	8.9	59.9	-35.3	-7.0	-28.3
10.500	V	Ava	46.1	-9.5	39.2	35.7	1.0	8.9	49.9	-45.3	-27.0	-18.3
10.500	н	Peak	56.4	-9.5		35.7	1.0	8.9	60.2	-35.0	-7.0	-28.0
10.500		Avg	45.4			35.7	1.0			-46.0		-19.0

	Desc	rintion	of Test	Radiat	ed Emis	sions - Re	stricted	Rands			
			lumber:				Sinclou	Danas			
		ojectiv		11/14/0							
	-				-						
		lest Er	ngineer:	Frank	Ibrahim						
		-									
			mpany:		•						
	EU	T Desc	cription:	802.11	a/b WL	AN Card,	Model: V	VLC221-	D4, BCP3	483U	
	Test	Config	uration:	EUT, L	aptop, D	C power	Supply				
		-				-		Mode, A	RT setting	a = 15	
				-	, - 1		,	,			
Sp	ecific	ation D	istance:	3.0	meters						
	A	ctual D	istance:	1.0	meters	Cable	Length:	15.0	feet		
Freq	Pol	Det	SA	Dist	AF	Preamp	Filter	Cable	Field	Limit	Margin
GHz	V/H		dBuV	dB	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB
15.750	V	Peak	55.0	-9.5	38.8	38.8	1.0	11.6	58.0	74.0	-16.0
15.750	V	Ava	45.9	-9.5	38.8	38.8	1.0	11.6	48.9	54.0	-5.1
15.750	Н	Peak	51.5	-9.5	38.8	38.8	1.0	11.6	54.5	74.0	-19.5
15.750	Н	Ava	40.8	-9.5	38.8	38.8	1.0	11.6	43.8	54.0	-10.2

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De	escrip	otion of	Test:	Radia	ted Out	of Band I	Harmor	nic and	Spurious I	Emissio	ns	
	Proj	ject Nu	mber:	02T16	639-2							
			Date:	11/15	/02							
	Τe	est Eng	ineer:	Neelis	sh Raj							
		Com	pany:	Askey	/ Compi	uter Corp						
	EUT	Descri	ption:	802.1	1 a/b W	LAN Carc	l. Mode	el: WLC	221-D4, B	CP348	3U	
			•			DC powe			,			
		•			• • •	•		•	de, ART se	ettina =	14	
	040	0, 000	allonn		,,,,,,,,,,	0.20 0				stang	••	
Spoo												
Spec	ificat	ion Dis	tance:	3.0	meters	EI	RP Co	nversior	n Factor:	95.2	dB	
Spec					meters meters					95.2	dB	
Freq		ual Dis			meters		enath:	15.0	feet	95.2 EIRP	dB Limit	Margin
	Act Pol	ual Dis Det	tance:	1.0 Dist	meters AF	Cable L	enath:	15.0	feet	EIRP	Limit	Margin dB
Freq	Act Pol V/H	ual Dis Det	tance: SA	1.0 Dist dB	meters AF dB/m	Cable L Preamp dB	enath: Filter dB	15.0 Cable dB	feet Field dBuV/m	EIRP	Limit dBm	U
Freq GHz	Act Pol V/H	ual Dis Det	tance: SA dBuV	1.0 Dist dB -9.5	Meters AF dB/m 38.9	Cable L Preamp dB 34.4	enath: Filter dB 1.0	15.0 Cable dB 8.9	feet Field dBuV/m 61.1	EIRP dBm -34.1	Limit dBm -7.0	dB
<b>Freq</b> <b>GHz</b> 10.580	Act Pol V/H V	Det Det Peak	tance: SA dBuV 56.3 45.4	1.0 Dist dB -9.5 -9.5	meters AF dB/m 38.9 38.9	Cable L Preamp dB 34.4 34.4	enath: Filter dB 1.0 1.0	15.0 Cable dB 8.9 8.9	feet Field dBuV/m 61.1 50.2	EIRP dBm -34.1 -45.0	Limit dBm -7.0 -27.0	dB -27.1
Freq GHz 10.580 10.580	Act Pol V/H V V	Det Det Peak	tance: SA dBuV 56.3 45.4	1.0 Dist dB -9.5 -9.5 -9.5	meters AF dB/m 38.9 38.9 38.9	Cable L Preamp dB 34.4 34.4 34.4	enath: Filter dB 1.0 1.0	15.0 Cable dB 8.9 8.9 8.9	feet Field dBuV/m 61.1 50.2 58.6	EIRP dBm -34.1 -45.0 -36.6	Limit dBm -7.0 -27.0 -7.0	dB -27.1 -18.0
Freq GHz 10.580 10.580 10.580	Act Pol V/H V V	Det Det Peak Avg Peak	tance: SA dBuV 56.3 45.4 53.8	1.0 Dist dB -9.5 -9.5 -9.5	meters AF dB/m 38.9 38.9 38.9	Cable L Preamp dB 34.4 34.4 34.4	enath: Filter dB 1.0 1.0	15.0 Cable dB 8.9 8.9 8.9	feet Field dBuV/m 61.1 50.2 58.6	EIRP dBm -34.1 -45.0 -36.6	Limit dBm -7.0 -27.0 -7.0	dB -27.1 -18.0 -29.6

	Desc	ription	of Test:	Radiat	ed Emis	sions - Re	stricted	Bands			
	Pr	oject N	umber:	02T16	39-2						
			Date:	11/15/0	)2						
	٦	Fest En	gineer:	Neelisł	n Raj						
		Co	mpany:	Askey	Comput	er Corp					
	EU	T Desc	cription:	802.11	a/b WL	AN Card,	Model: V	VLC221-	D4, BCP3	3483U	
	Test	Configu	uration:	EUT, L	.aptop, D	C power	Supply				
	Mode	of Op	eration:	TX ON	, Freq =	5.29 GH	z, Turbo	Mode, A	RT setting	g = 14	
								•		-	
Spe	ecific	ation D	istance:	3.0	meters						
-	Α	ctual D	istance:	1.0	meters	Cable	Length:	15.0	feet		
Freq	Pol	Det	SA	Dist	AF	Preamp	Filter	Cable	Field	Limit	Margin
GHz	V/H		dBuV	dB	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB
15.870	V	Peak	54.2	-9.5	38.1	33.9	1.0	11.6	61.5	74.0	-12.5
15.870	V	Ava	43.6	-9.5	38.1	33.9	1.0	11.6	50.9	54.0	-3.1
15.870	Н	Peak	51.9	-9.5	38.1	33.9	1.0	11.6	59.2	74.0	-14.8
15.870		Avg	39.9	-9.5		33.9					-6.8

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### DIGITAL DEVICE RADIATED EMISSIONS

	FC	C, VCCI, ( ., CSA, TU TEREY R(	CISPR, CE IV, BSMI, I DAD, SAN	AUSTEL, DHHS, NVL JOSE, CA FAX: (408) 4	NZ AP 95037-9001				02T1639 021114C 11/14/02 Frank lbr	01 9:36 AM	-
	Test Con	Descrij nfigura Type of	otion: tion : Test:	802.11 a EUT, La FCC 15.	ptop, Mou	and Card se, Printer	Bus, Moo r, Modem	n, DC Po	ower Supp	BCP3483U ly Main Sheet	-
Freq.	Reading	AF	Closs	Pre-amp	Level	Limit	Margin	Pol	Az	Height	Mark
(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	FCC_B	(dB)	(H/V)	(Deg)	(Meter)	(P/Q/A)
480.00	50.90	17.53	3.94	27.47	44.90	46.00	-1.10	3mH	0.00	1.00	QP
416.00	50.70	15.89	3.64	27.19	43.04	46.00	-2.96	3mH	0.00	1.00	QP
533.00	47.50	18.29	4.21	27.64	42.37	46.00	-3.63	3mH	0.00	1.00	Р
633.00	45.60	19.69	4.69	27.84	42.14	46.00	-3.86	3mH	0.00	1.00	Р
133.00	49.90	13.28	1.93	26.95	38.17	43.50	-5.33	3mV	0.00	1.00	Р
544.00	45.10	18.38	4.27	27.66	40.09	46.00	-5.91	3mV	0.00	1.00	Р
6 Worst	Data		I			l					l

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## 9.11. POWERLINE CONDUCTED EMISSIONS

### TEST SETUP

The EUT is placed on a wooden table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane on the floor.

The EUT is set to transmit in a continuous mode.

### TEST PROCEDURE

The resolution bandwidth is set to 10 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

### **RESULTS**

No non-compliance noted:

Frea.		Reading		Closs	Limit	FCC B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	( <b>dB</b> )	QP	AV	QP (dB)	AV (dB)	L1/L2
0.48	47.90	46.10		0.00	48.00		-1.90		L1
0.64	46.48	45.50		0.00	48.00		-2.50		L1
0.80	44.02	43.40		0.00	48.00		-4.60		L1
0.48	47.44	46.60		0.00	48.00		-1.40		L2
0.64	46.72	45.70		0.00	48.00		-2.30		L2
0.81	45.54	44.20		0.00	48.00		-3.80		L2
6 Worst I	Data								

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Model Name

Mode of Op.

Test of Target: FCC 15.407

: with extension card

: WLC221-D4, BCP3483U Test Config. : EUT, Laptop, Printer, Mouse, Modem, P.S.

: 115VAC@60Hz

: TX ON, Mid Channel 5.26 GHz, ART(15)

: Peak: L1( Black ), L2(Green)

: 7 File#: 1 80Level (dBuV)	LC1114.EMI						14-2002 T Certificati	
		3	3		J—J.		*	
		0 0					FC	C CLASS-B
35	A Anterinitation	intelle						2012 F
	t of an addition.	Matha Ut	1 1 1	171	<b>W</b>	YNNY	The second second	M
		-						
-100.45	1. 2			5.			10	20 3

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# **10. SETUP PHOTOS**

## ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



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### RADIATED RF MEASUREMENT SETUP

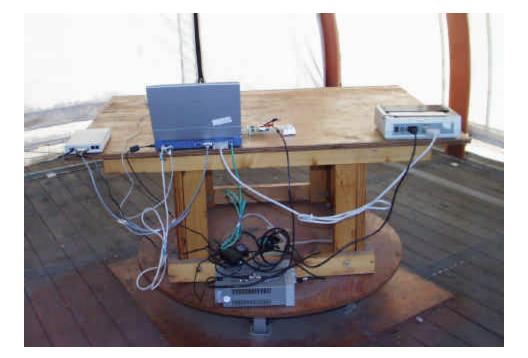




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### DIGITAL DEVICE RADIATED EMISSIONS MEASUREMENT SETUP





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### POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP





# **END OF REPORT**

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