## FCC CFR47 PART 15 SUBPART C CERTIFICATION



## **TEST REPORT ADDENDUM**

## FOR

# 802.11a/b CARDBUS INSTALLED IN IBM LAPTOP

# MODEL NUMBER: WLC221-D4 / BCP3483U

# **BRAND NAME: ASKEY**

# FCC ID: H8NWLC221-D4

# **REPORT NUMBER: 02T1639-3**

# **ISSUE DATE: MARCH 7, 2003**

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 INSTALLED IN IBM LAPTOP
MODEL NAME:	WLC221-D4 / BCP3483U
DATE TESTED:	FEBRUARY 27 – MARCH 4, 2003

APPLICABLE STANDARDS					
STANDARD TEST RESULTS					
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED				

Compliance Certification Services, Inc. tested the above equipment in accordance with the radiated and conducted emissions requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**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.

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

Approved & Released For CCS By:

Tested By:

MH

Mautompuym

MIKE HECKROTTE CHIEF ENGINEER COMPLIANCE CERTIFICATION SERVICES THANH NGUYEN EMC ENGINEER COMPLIANCE CERTIFICATION SERVICES

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# 2. 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.

# 3. FACILITIES AND ACCREDITATION

# 3.1. 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.

# 3.2. 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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# 3.3. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	<b>FCC</b> 1300
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	<b>Canada</b> IC2324 A,B,C, and F

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# 4. CALIBRATION AND UNCERTAINTY

# 4.1. 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.

## 4.2. 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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# 4.3. TEST AND MEASUREMENT EQUIPMENT

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

TES	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				
Preamplifier (1 - 26.5GHz)	Miteq	NSP10023988	646456	4/26/03				
Horn Antenna (1 - 18GHz)	EMCO	3115	6717	2/4/04				
Horn Antenna (18 – 26.5GHz)	ARA	MWH 1826/B	1013	11/7/03				
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				

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# 5. 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 IBM Think Pad A20M 97-051T607/00 DoC							
AC Adapter	IBM	02K6654	1Z0Z4997732	N/A			

## **I/O CABLES**

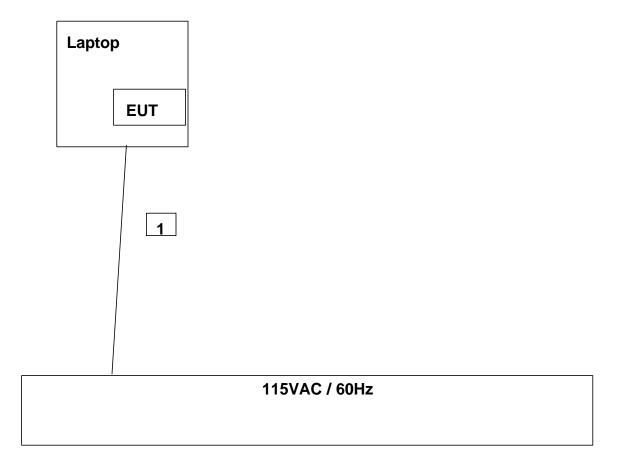
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115	Unshielded	2 m	Laptop cable is integrated with AC Adapter

## TEST SETUP

The EUT is installed in the laptop computer.

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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								
Laptop	IBM	Think Pad A20M	97-051T607/00	DoC				
AC Adapter	IBM	02K6654	1Z0Z4997732	N/A				

## **I/O CABLES**

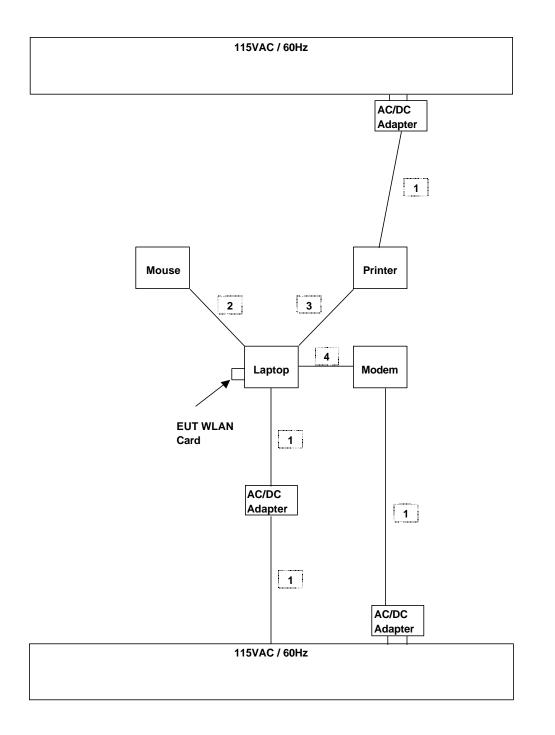
Cable	Port	# of	Connector	Cable	Cable	Remarks
No.		Identical	Туре	Туре	Length	
		Ports				
						Laptop cable is integrated with
1	AC	3	US 115V	<b>Un-shielded</b>	2m	AC Adapter
		•				
2	USB	1	USB	<b>Un-shielded</b>	2m	•
2 3	USB Parallel	1 1 1		Un-shielded Shielded	2m 2m	

#### **TEST SETUP**

The EUT is installed in the laptop computer.

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### SETUP DIAGRAM FOR DIGITAL DEVICES





# 6. RESULTS

# 6.1. RADIATED SPURIOUS EMISSIONS

## TEST SETUP

The EUT is placed on the wooden table. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4/1992.

The EUT is set to transmit in a continuous mode.

## TEST PROCEDURE

For measurements below 1 GHz 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 measurements above 1 GHz, 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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels within the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels within the 5.8 GHz band.

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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#### ADJACENT RESTRICTED BAND (Fund = 2.412GHz, NORMAL MODE, HORIZONTAL, PEAK)

Company	Company Name:				Project N	lo.:	Time & Date			
ASKEY (	Computer (	Corporati	on		02T1639-1		10:57:48 AM March 04, 2003			
REF 108.	REF 108.90 dBµV ATTEN 0 dB		0 dB				MKR 2.39	9000 GHz	63.06 dBµV	
POS PK LOG 10 dB/										
DL 74.0 dBµV										
RL OFFST	white	Munuh	window	man and	Warna	ghthere		all and a second	North March	physical
21.9 dB		1					P		2	
START 2.	31000 GH	z		<u>×</u>			k z	STOP 2	.39000 @	5Hz
CCS R	ES BW 1 N	/Hz	1		VID BW 1	MHz		SWP 20	.0000 m:	sec
Test Iter	n: All ion:802.11	a/b WI A	N Card J	Model : Y	WI C221-F	)4. BCP	348311			

Horizontal Low Channel Peak

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### ADJACENT RESTRICTED BAND (Fund = 2.412GHz, NORMAL MODE, HORIZONTAL, AVERAGE

Company Name:		Time &	Time & Date			
Corporation	02T1639-1	11:00:27 AM March 04, 2003				
ATTEN 0 dB		MKR 2	MKR 2.39000 GHz 50.40 dBµV			
		_				
Hz			STOP 2	.39000 GHz		
CCS RES BW 1 MHz			SWP 24	.00 sec		
	ATTEN 0 dB		Corporation 02T1639-1 11:00 ATTEN 0 dB MKR 2	Corporation       02T1639-1       11:00:27 AM March         ATTEN 0 dB       MKR 2.39000 GHz         Image: state stat		

Description:802.11 a/b WLAN Card , Model : WLC221-D4, BCP3483U Horizontal Low Channel Average

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## ADJACENT RESTRICTED BAND (Fund = 2.412GHz, NORMAL MODE, VERTICAL, PEAK

Company	VName:							& Date			
ASKEY (	Computer	Corporati	on		02T1639	9-1	10:47:22	AM Marc	h 04, 20	03	
REF 108.	90 dBµV	ATTEN	0 dB				MKR 2.39	9000 GHz	65.16	dBµV	
POS PK LOG 10 dB/							-				
DL 74.0 dBµV											
RL OFFST	runder	altructure	napilona	Mana	water when the	WWW WWW	ana	niiwanik	MANAM	W WANT	
21.9 dB					1						
START 2.	31000 GH	z						STOP 2.39000 GHz			
CCS F	ES BW 1 M	ИНz	23		VID BW 1 MHz SWP 20.0000 mse						
Test Iter		a (h Wild	N Card . M	lodel : 1	el : WLC221-D4. BCP3483U						

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## ADJACENT RESTRICTED BAND (Fund = 2.412GHz, NORMAL MODE, VERTICAL, AVERAGE

		o.:	Time & Date				
Corporation	02T1639	-1	10:50:26	AM Marcl	h 04, 20	03	
ATTEN 0 dB			MKR 2.3	9000 GHz	53.11	dBµV	
					~	and the	
łz				STOP 2.	39000 G	iHz	
MHz	VID BW 1	VID BW 10 Hz					
	ATTEN 0 dB	ATTEN 0 dB	ATTEN 0 dB	ATTEN 0 dB     MKR 2.3       MKR 2.3	ATTEN 0 dB       MKR 2.39000 GHz         Image: Comparison of the second sec	ATTEN 0 dB MKR 2.39000 GHz 53.11 (	

Low Channel Average

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## ADJACENT RESTRICTED BAND (Fund = 2.462GHz, NORMAL MODE, HORIZONTAL, PEAK

Company	/ Name:				Project N	lo.:	Time & Date					
ASKEY (	Computer (	Corporati	on		02T1639	9-1	11:07:18	AM Marc	:h 04, 200	03		
REF 108.	90 dBµV	ATTEN	0 dB				MKR 2.49	9885 GHz	51.28 d	lBµV		
POS PK LOG 10 dB/												
DL 74.0 dBµV												
RL OFFST	the second	anus mener	-yundarath	an the first of the second	humun	awara	andresse	anter an	Manua	. Marco		
21.9 dB					1		1					
START 2.	-1 48300 GH	z					1	STOP 2,50000 GHz				
CCS F	ES BW 1 M	/IHz			VID BW 1	MHz		SWP 20.0000 msec				
Test Iter	99.970		N Card	Model (	: WLC221-D4, BCP3483U							

Horizontal High Channel PeakRestric Band.

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## ADJACENT RESTRICTED BAND (Fund = 2.462GHz, NORMAL MODE, HORIZONTAL, AVERAGE

Time & Date					
:09:20 AM March 04, 2003					
(R 2.49596 GHz 39.47 dBµV					
STOP 2.50000 GHz					
SWP 5.10 sec					

Horizontal High Channel Average Restricted band.

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## ADJACENT RESTRICTED BAND (Fund = 2.462GHz, NORMAL MODE, VERTICAL, PEAK

Company	Name:				Project N	lo.:	Time & Date				
ASKEY C	iomputer (	Corporati	on		02T1639	-1	11:14:51	AM Marc	h 04, 200	03	
REF 108.	90 dBµV	ATTEN	0 dB				MKR 2,49	9639 GHz	51.87 d	JBµV	
POS PK LOG 10 dB/											
DL											
74.0 dBµV											
RL OFFST		ry war for here was	nundern	m	munut	un Man MP	Vuinne	inmark	a hole w	mound	
21.9 dB					1						
START 2.	48300 GH	z			<u>l</u> i		1	STOP 2.50000 GHz			
CCS R	ES BW 1 M	4Hz			VID BW 1	MHz		SWP 20,0000 msec			
Test Item: All											

Description:802.11 a/b WLAN Card , Model : WLC221-D4, BCP3483U Vertical High Channel Peak restricted Band.

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## ADJACENT RESTRICTED BAND (Fund = 2.462GHz, NORMAL MODE, VERTICAL, AVERAGE

Company Name:		Project No.:	Time & Date				
ASKEY Compute	r Corporation	02T1639-1	11:16:16	AM Marc	h 04, 2003		
REF 108.90 dBµV	ATTEN 0 dB		MKR 2.49	9618 GHz	39.75 dBµV		
POS PK LOG 10 dB/							
DL							
RL							
21.9 dB							
START 2.48300 G	Hz		-	5TOP 2,50000 GHz			
CCS RES BW 1	MHz	VID BW 10 Hz		5WP 5.10 sec			

Vertical High Channel Average Restricted Band.

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#### HARMONIC AND SPURIOUS RADIATED EMISSIONS (2.412GHz, NORMAL)

03/02/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Company EUT Des EUT M/I Test Tar	Project #:     02T1639-1       Company:     Askey Computer Corporation       EUT Doscrip.:     802.11 ab Dual Band Card Busin IBM Laptop       EUT M/N:     WLC221.04, BC93483U       Test Target:     FCC 15.247       Mode Oper:     EUT transmitting at Low Channel (2412MHz), ART =15														
EMCO T73: S/I	Test Target: FCC 15.247 Mode Oper: EUT transmitting at Low Channel (2412MHz), ART =15 Test Equipment:														
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m		Pk Mar dB	Avg Mar dB	Notes
4.824	9.8	46.3	45.1	33.9	3.4	-36.1	0.0	1.0	48.5	47.3	74.0	54.0	-25.5	-6.7	V, 2nd Harmonic
4 8 2 4	33	48.0	36.2	33.9	34	-36.1	-9.5	1.0	40.7	28.9	74.0	54.0	-33.3	-25.1	H. 2nd Harmonic
	f       Measurement Frequency       Amp       Preamp Gain       Avg Lim       Average Field Strength Limit         Dist       Distance to Antenna       D Corr       Distance Correct to 3 meters       Pk Lim       Peak Field Strength Limit         Read       Analyzer Reading       Avg       Average Field Strength @ 3 m       Avg Mar       Margin vs. Average Limit         AF       Antenna Factor       Peak       Calculated Peak Field Strength       Pk Mar       Margin vs. Peak Limit         CL       Cable Loss       HPF       High Pass Filter       Presenter       Presenter														

Note: No other spurious or harmonic signals were found above the system noise floor.

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#### HARMONIC AND SPURIOUS RADIATED EMISSIONS (2.437GHz, NORMAL)

03/02/03	8 1 2														
Complia	nce Ce	rtification S	Services, Mo	rgan H	ill Op	en Field (	Site								
Project # Company EUT Des EUT M/Y Test Tar	Test Eminment:														
EMCO T73: S/	Mode Oper: EUT transmitting at Mid Channel (2437MHz), ART =15														
f GHz	Dist	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
4.874	9.8	45.9	44.1	33.9	3.4	-36.1	0.0	1.0	48.2	46.4	74.0	54.0	-25.8	-7.6	V, 2nd Harmonic
7.311	9.8	50.2	44.4	36.8	4.4	-36.3	0.0	1.0	56.1	50.3	74.0	54.0	-17.9	-3.7	V, 3rd Harmonic
4.874	9.8	43.7	41.1	33.9	3.4	-36.1	0.0	1.0	46.0	43.4	74.0	54.0	-28.0	-10.6	H, 2nd Harmonic
fMeasurement FrequencyAmpPreamp GainAvg LimAverage Field Strength LimitDistDistance to AntennaD CorrDistance Correct to 3 metersPk LimPeak Field Strength LimitReadAnalyzer ReadingAvgAverage Field Strength @ 3 mAvg MarMargin vs. Average LimitAFAntenna FactorPeakCalculated Peak Field StrengthPk MarMargin vs. Peak LimitCLCable LossHPFHigh Pass FilterFilter												.imit .imit			

Note: No other spurious or harmonic signals were found above the system noise floor.

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### HARMONIC AND SPURIOUS RADIATED EMISSIONS (2.462GHz, NORMAL)

03/02/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Project # Company EUT Des EUT M/I Test Tar	Test Faninment:														
Mode Oper:       EUT transmitting at High Channel (2462MHz), ART =15         Test Fourinment:         EMCO Horn 1-18GHz       Pre-amolifer 1-26GHz       Soectrum Analyzer       Horn > 18GHz         T72: S/N: 6739       Pre-amolifer 1-26GHz       Soectrum Analyzer       Horn > 18GHz         Hi Frequency Cables       Pre-amolifer 1 - 26GHz       Soectrum Analyzer       Horn > 18GHz         Y (2 ft)       Y (2 ~ 3 ft)       Y (4 ~ 6 ft)       Y (12 ft)       Peak Measurements:       Average Measurements:         1 MHz Resolution Bandwidth       1 MHz Resolution Bandwidth       1 MHz Video Bandwidth       10Hz Video Bandwidth															
f GHz	Dist	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB		Video Bandw Peak dBuV/m	Avg	10Hz Video Pk Lim dBuV/m	Avg Lim	Pk Mar dB	Avg Mar dB	Notes
4.924	9.8	43.2	30.9	34.1	3.4	-36.1	0.0	1.0	45.7	33.4	74.0	54.0	-28.3	-20.6	V. 2nd Harmonic
7.386	9.8	55.2	43.2	37.1	4.4	-36.2	0.0	1.0	61.5	49.5	74.0	54.0	-12.5	-4.5	V, 3rd Harmonic
4.924	9.8	45.1	31.9	34.1	3.4	-36.1	0.0	1.0	47.6	34.4	74.0	54.0	-26.4	-19.6	H, 2nd Harmonic
7.386	0.8	49.3	36.7	37.1	4.4	36.2	0.0	1.0	55.6	43.0	74.0	54.0	18.4	11.0	H, 3rd Harmonic
	fMeasurement FrequencyAmpPreamp GainAvg LimAverage Field Strength LimitDistDistance to AntennaD CorrDistance Correct to 3 metersPk LimPeak Field Strength LimitReadAnalyzer ReadingAvgAverage Field Strength @ 3 mAvg Mar Margin vs. Average LimitAFAntenna FactorPeakCalculated Peak Field StrengthPk MarMargin vs. Peak LimitCLCable LossHPFHigh Pass FilterHigh Pass Filter														

Note: No other spurious or harmonic signals were found above the system noise floor.

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#### HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.745GHz, NORMAL)

03/03/03	High	Frequency	Measureme	ent											
Complia	nce Ce	rtification S	Services, Mo	rgan H	ill Ope	en Field (	Site								
Test Eng Project # Company EUT Des EUT M/Y Test Tary Mode Op	: crip.: d: get: oer:		Thanh Nguyen 02T1639-1 Askey Comput 802.11 a/b Dua WLC221-D4, 1 FCC 15.247 EUT transmitti	er Corpor al Band C BCP3483	ard Bus U			°=15, N	ormal MOD	E					
ЕМСО	Test Faminment:         EMCO Horn 1-18GHz       Pre-amplifer 1-26GHz       Spectrum Analyzer         T72: S/N: 6739       Mitea NSP2600-44       Sectrum Analyzer       Horn > 18CHz         T72: S/N: 6739       Mitea NSP2600-44       Sectrum Analyzer       T87; ARA 18-26GHz; S/N:1049         Hi Frequency Cables       Peak Measurements:       Average Measurements:														
Hi From	T72: S/N: 6739														
	ft)		<b>?</b> (4 ~ 6 ft)	? (12 ft)				1 MHz	Resolution E	andwidth	1 MHz Reso	lution Bandw			
	ft) Dist feet		? (4~6 ft) Read Avg. dRuV	? (12 ft) AF dB/m	CL dB	Amp		1 MHz 1MHz	Resolution E Video Bandy Peak	andwidth vidth	1 MHz Reso	lution Bandw Bandwidth Avg Lim	idth	Avg Mar dB	Notes
? (2 f	Dist	? (2~3 ft) Read Pk	Read Avg.	AF	CL	· ·	D Corr	1 MHz 1MHz	Resolution E Video Bandy Peak	andwidth vidth	1 MHz Reso 10Hz Video Pk Lim	lution Bandw Bandwidth Avg Lim	idth Pk Mar		Notes
? (2 f GHz	Dist	? (2~3 ft) Read Pk	Read Avg.	AF	CL	· ·	D Corr	1 MHz 1MHz	Resolution E Video Bandy Peak	andwidth vidth	1 MHz Reso 10Hz Video Pk Lim	lution Bandw Bandwidth Avg Lim	idth Pk Mar		V, 2nd Harmonic
? (2 f <u>GHz</u> 5.745	Dist feet	? (2~3 ft) Read Pk dRuV	Read Avg. dRuV	AF dB/m	CL dB	dB	D Corr dB	1 MHz 1MHz HPF	Resolution E Video Bandy Peak dBuV/m	Avg dBuV/m	1 MHz Reso 10Hz Video Pk Lim dBuV/m	lution Bandw Bandwidth Avg Lim dBuV/m	idth Pk Mar dB	dB	
? (2 f <u>GHz</u> 5.745 11.490	Dist feet	? (2~3 ft) Read Pk dRuV 51.4	Read Avg. dBuV 38.6	AF dB/m 39.2	CL dB 5.9	dB -36.0	D Corr dB	1 MHz 1MHz HPF	Resolution E Video Bandy Peak dRuV/m 61.5	Avg dRuV/m 48.7	1 MHz Reso 10Hz Video Pk Lim dBuV/m 74.0	lution Bandw Bandwidth Avg Lim dBuV/m 54.0	idth Pk Mar dB -12.5	dB -5.3	V, 2nd Harmonic
? (2 f <u>GHz</u> 5.745 11.490	Dist feet	? (2~3 ft) Read Pk dRuV 51.4	Read Avg. dBuV 38.6	AF dB/m 39.2	CL dB 5.9	dB -36.0	D Corr dB	1 MHz 1MHz HPF	Resolution E Video Bandy Peak dRuV/m 61.5	Avg dRuV/m 48.7	1 MHz Reso 10Hz Video Pk Lim dBuV/m 74.0	lution Bandw Bandwidth Avg Lim dBuV/m 54.0	idth Pk Mar dB -12.5	dB -5.3	V, 2nd Harmonic

Note: No other spurious or harmonic signals were found above the system noise floor.

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Avg Ma

-61

-8.3

-15.7

-18.1

Notes

V 2nd Har

H. 2nd Har

#### HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.785GHz, NORMAL)

#### 03/03/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site Test Engr: Thanh Nguyen Project #: 02T1639-1 Company: EUT Descrip.: Askey Computer Corporation 802.11 a/b Dual Band Card Bus, in IBM laptop EUT M/N: WLC221-D4, BCP3483U Test Target: FCC 15.247 Mode Oper: EUT transmitting at Channel MID (5785MHz), ART =15, Normal Mode Test Equipment: EMCO Horn 1-18GHz Pre-amplifer 1-26GHz Spectrum Analyzer Horn > 18GHz Miteq NSP2600-44 T87; ARA 18-26GHz; S/N:1049 8593EM Analyzer 🔻 Ŧ T72; S/N: 6739 • Hi Frequency Cables Peak Measurements: Average Measurements: ? (2 ~ 3 ft) ? (4 ~ 6 ft) ? (12 ft) ? (2 ft) 1 MHz Resolution Bandwidth 1 MHz Resolution Bandwidth 10Hz Video Bandwidth 1MHz Video Bandwidth f Dist Read Pk Read Avg. AF CL Amp D Corr HPF Peak Avg Pk Lim Avg Lim Pk Mar GHz dBuV dB dВ |BuV/ dRuV/i dBuV łR/i dB BuV dBuV/ 5.785 11 570 98 48.2 37.8 30 3 5.9 -36.0 0.0 10 58 3 47.9 74.0 54.0 1.570 45.8 74.0 54.0 9.8 35.6 39.3 -36.0 0.0 55.9 45.7 5.9 1.0

f	Measureme	ent Frequenc	у	Amp	Preamp C	Jain			Avg Lim	Average F	ield Streng	gth Limit	
Dist	Distance to	Antenna		D Corr	Distance	Correc	et to 3 mete	ers	Pk Lim	Peak Field	Strength I	Limit	
Read	Analyzer R	Reading		Avg	Average	Field S	Strength @	3 m	Avg Mar	Margin vs	. Average I	Limit	
AF	Antenna Fa	actor		Peak	Calculate	d Peak	Field Stre	ngth	Pk Mar	Margin vs	. Peak Lim	it	
CL	Cable Loss			HPF	High Pas	s Filter	r						

No other spurious or harmonic signals were found above the system noise floor. Note:

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Avg Ma

13.5

-7.2

Notes

V 2nd Har

H. 2nd Har

#### HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.825GHz, NORMAL)

#### 03/03/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site Test Engr: Thanh Nguyen Project #: 02T1639-1 Company: EUT Descrip.: Askey Computer Corporation 802.11 a/b Dual Band Card Bus, in IBM laptop EUT M/N: WLC221-D4, BCP3483U Test Target: FCC 15.247 Mode Oper: EUT transmitting at Channel HIGH (5825MHz), ART =15, Normal Mode Test Equipment: EMCO Horn 1-18GHz Pre-amplifer 1-26GHz Spectrum Analyzer Horn > 18GHz Miteq NSP2600-44 T87; ARA 18-26GHz; S/N:1049 8593EM Analyzer 🔻 Ŧ T72; S/N: 6739 • Hi Frequency Cables Peak Measurements: Average Measurements: ? (2 ~ 3 ft) ? (4 ~ 6 ft) ? (12 ft) ? (2 ft) 1 MHz Resolution Bandwidth 1 MHz Resolution Bandwidth 10Hz Video Bandwidth 1MHz Video Bandwidth Read Pk f Dist Read Avg. AF CL Amp D Corr HPF Peak Avg Pk Lim Avg Lim Pk Mar GHz dBuV dB dB |BnV/ dBuV/ı dBuV łR/i dB |BuV/ dBuV/ 5.825 1 650 98 43.9 30.4 30.3 5.9 -36.1 0.0 10 54.0 40.5 74.0 54.0 -20.0 74.0 1.650 9.8 50.8 36.7 39.3 -36.1 0.0 46.8 54.0 -13.1 5.9 1.0 60.9

f	Measureme	ent Frequenc	y	Amp	Preamp C	lain			Avg Lim	Average F	ield Streng	gth Limit	
Dist	Distance to	Antenna		D Corr	Distance	Correc	et to 3 mete	ers	Pk Lim	Peak Field	Strength I	Limit	
Read	Analyzer R	leading		Avg	Average	Field S	Strength @	3 m	Avg Mar	Margin vs	. Average I	Limit	
AF	Antenna Fa	actor		Peak	Calculate	d Peak	Field Stre	ngth	Pk Mar	Margin vs	. Peak Lim	it	
CL	Cable Loss			HPF	High Pas	s Filter	r						

Note: No other spurious or harmonic signals were found above the system noise floor.

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#### HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.76GHz, TURBO)

#### 03/03/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site Test Engr: Thanh Nguyen Project #: 02T1639-1 Company: EUT Descrip.: Askey Computer Corporation 802.11 a/b Dual Band Card Bus, in IBM laptop EUT M/N: WLC221-D4, BCP3483U Test Target: FCC 15.247 Mode Oper: EUT transmitting at Channel LOW (5760MHz), ART =15, TURBO MODE Test Equipment: EMCO Horn 1-18GHz Pre-amplifer 1-26GHz Spectrum Analyzer Horn > 18GHz Miteg NSP2600-44 8593EM Analyzer -T87; ARA 18-26GHz; S/N:1049 T72; S/N: 6739 • Hi Frequency Cables Peak Measurements: Average Measurements: ? (2 ~ 3 ft) ? (4 ~ 6 ft) ? (12 ft) ? (2 ft) 1 MHz Resolution Bandwidth 1 MHz Resolution Bandwidth 10Hz Video Bandwidth 1MHz Video Bandwidth D Corr f Dist Read Pk Read Avg. AF CL Amp HPF Peak Avg Pk Lim Avg Lim Pk Mar Avg Ma Notes dBuV |BuV/ dRuV/i GH dBuV łR/i dB dR dB BuV dBuV/ 760 1 520 98 47.9 34.3 39.2 5.9 -36.0 0.0 10 58.0 44.4 74.0 54.0 -16.0 -9.6 V 2nd Har 74.0 1.520 9.8 44.5 33.0 39.2 5.9 -36.0 0.0 54.6 43.1 54.0 -19.4 10.9 1.0 H. 2nd Har f Measurement Frequency Amp Preamp Gain Avg Lim Average Field Strength Limit Dist Distance to Antenna D Corr Distance Correct to 3 meters Pk Lim Peak Field Strength Limit Read Analyzer Reading Average Field Strength @ 3 m Avg Mar Margin vs. Average Limit Avg Antenna Factor Calculated Peak Field Strength Pk Mar Margin vs. Peak Limit AF Peak CL Cable Loss HPF High Pass Filter

Note: No other spurious or harmonic signals were found above the system noise floor.

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### HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.80GHz, TURBO)

03/03/03 Complia			v Measureme Services, Mo		ill Ope	en Field :	Site								
Test Eng Project # Company EUT Des EUT M/I Test Tar; Mode Op	ipet #:         02T1639-1           opamy:         Askey Computer Corporation           f Descrip.:         802.11 a/b Dual Band Card Bus, in IBM laptop           f M/N:         WLC221-D4, BCP3483U           t Target:         FCC 15.247														
EMCO T72: S/I	Net Funiment:         EMCO Horn 1-18GHz       Pre-amulifer 1-26GHz       Soectrum Analyzer       Horn > 18GHz         T72: S/N: 6739       Mitea NSP2600-44       Soectrum Analyzer       Horn > 18GHz         Hi Frequency Cables         ? (2 ft)       ? (2 - 3 ft)       ? (4 - 6 ft)       ? (12 ft)       Peak Measurements: 1 MHz Resolution Bandwidth 1 MHz Video Bandwidth 1 MHz Video Bandwidth       1 MHz Resolution Bandwidth 10Hz Video Bandwidth														
f GHz 5.800	Dist feet	Read Pk dBuV	dRuV	AF dB/m	CL dB	Amp dB	D Corr dB		Peak dBuV/m		dBuV/m		dB	Avg Mar dB	Notes
11.600 11.600	9.8 9.8	44.7 43.3	32.8 31.0	39.3 39.3	5.9 5.9	-36.1 -36.1	0.0	1.0 1.0	54.8 53.4	42.9	74.0 74.0	54.0 51.0	-19.2 -20.6	-11.1 -12.0	V, 2nd Harmonic H, 2nd Harmonic
	f Dist Read AF CL	Measureme Distance to Analyzer R Antenna Fa Cable Loss		D Corr Avg Peak	Corr Distance Correct to 3 meters g Average Field Strength @ 3 m k Calculated Peak Field Strength					Avg LimAverage Field Strength LimitPk LimPeak Field Strength LimitAvg MarMargin vs. Average LimitPk MarMargin vs. Peak Limit					

Note: No other spurious or harmonic signals were found above the system noise floor.

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## DIGITAL DEVICE RADIATED EMISSIONS

	FC	C, VCCI, ( , CSA, TU TEREY R	CISPR, CE V, BSMI, I DAD, SAN	AUSTEL, DHHS, NVL JOSE, CA FAX: (408) 4	NZ AP 95037-9001	1	Proje Repo Date& I Test E	ort #: Sime:	02T1639- 030228B <sup>2</sup> 02/28/03 Thanh Ng	1 8:05 PM		
Company:         Askey Computer Corporation           EUT Description:         801.11a/b WLAN Card, Model : WLC221-D4, BCP3843U           Test Configuration :         EUT in IBM LapTop , Modem, Printer, Mouse.           Type of Test:         FCC Part 15 Class B												
Mode of Operation: <u>TX</u>												
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)	
480.07	45.40	17.03	5.50	28.77	39.15	46.00	-6.85	3mV	180.00	1.50	Р	
130.52	44.00	11.47	2.78	28.35	29.91	43.50	-13.59	3mV	180.00	1.00	Р	
239.25	44.80	11.42	3.77	27.99	32.00	46.00	-14.00	3mV	180.00	1.00	Р	
132.72	43.30	11.36	2.80	28.34	29.12	43.50	-14.38	3mV	180.00	1.00	Р	
240.03	44.30	11.47	3.77	27.98	31.56	46.00	-14.44	3mV	0.00	1.50	Р	
153.32 6 Worst	44.00 Data	10.30	2.97	28.27	28.99	43.50	-14.51	3mV	180.00	1.00	Ρ	

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# 6.2. AC 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 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

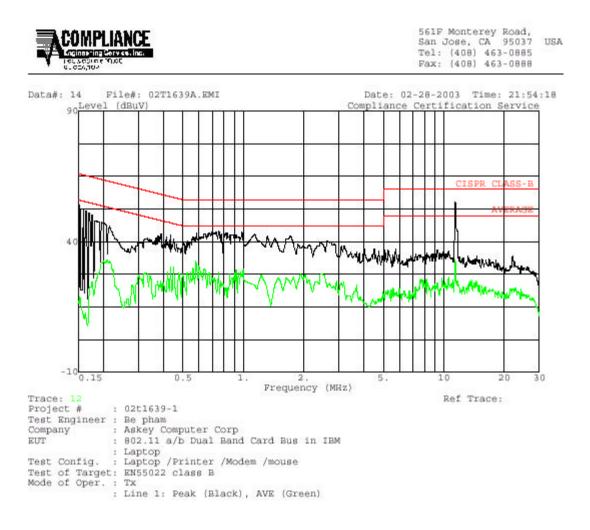
Line conducted data is recorded for both NEUTRAL and HOT lines.

## **RESULTS**

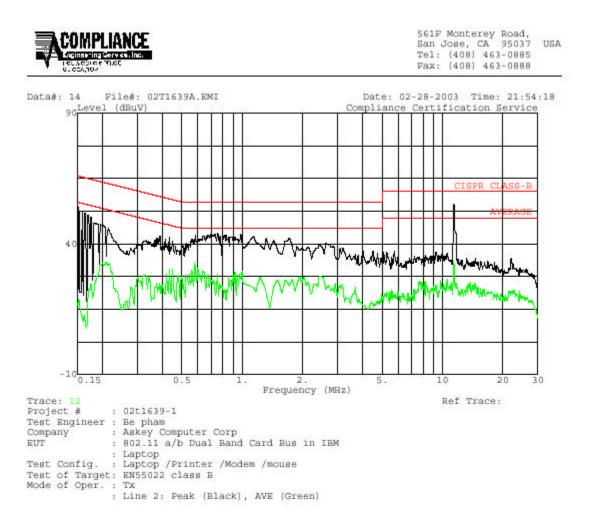
No non-compliance noted:

Frea.		Reading		Closs	Limit	EN B	Mars	Remark	
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1/L2
0.15	56.30		33.08	0.00	65.94	55.94	-9.64	-22.86	L1
0.40	47.44		34.65	0.00	58.80	48.80	-11.36	-14.15	L1
11.08	56.60		34.30	0.00	60.00	50.00	-3.40	-15.70	L1
0.15	53.92		28.67	0.00	65.91	55.91	-11.99	-27.24	L2
0.41	41.80		28.56	0.00	58.49	48.49	-16.69	-19.93	L2
11.38	55.22		32.90	0.00	60.00	50.00	-4.78	-17.10	L2
									l
6 Worst Data									1
									I

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# 6.3. SETUP PHOTOS

## **Radiated Emissions, freq > 1GHz**



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## **Radiated Emissions, freq < 1GHz**



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## **Power Line Conducted Emissions**



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# **END OF REPORT**

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