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 | FCC 1300 |
| Japan | VCCI | CISPR 22 Two OATS and one conducted Site | VCCI 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 _{ELA 117} |
| 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 _{ELA-171} |
| Taiwan | BSMI | CNS 13438 | SL2-IN-E-1012 |
| Canada | Industry Canada | RSS210 Low Power Transmitter and Receiver | Canada 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

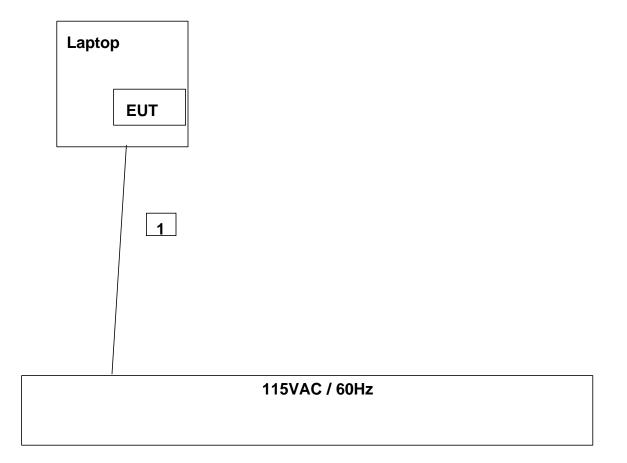
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
|--------------|------|----------------------------|-------------------|---------------|-----------------|--|
| 1 | AC | 1 | US115 | Unshielded | 2 m | Laptop cable is integrated with AC Adapter |

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

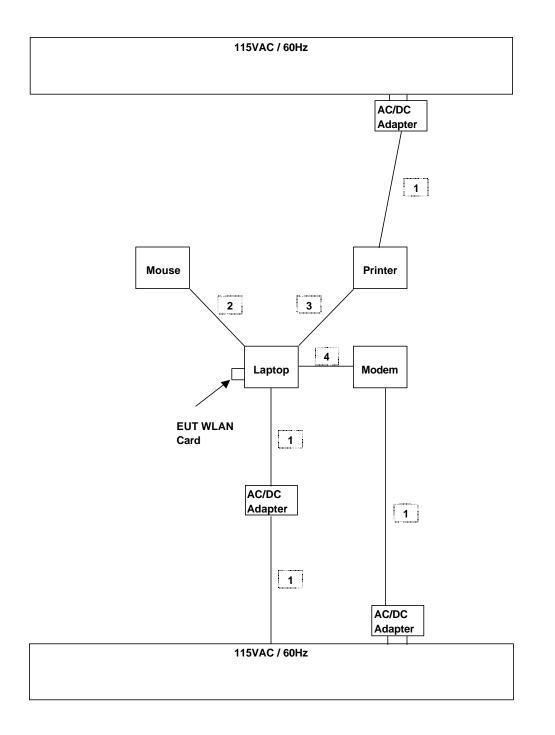
| Cable | Port | # of | Connector | Cable | Cable | Remarks |
|--------|-----------------|-------------|-----------|-------------------------|----------|---------------------------------|
| No. | | Identical | Туре | Туре | Length | |
| | | Ports | | | | |
| | | | | | | Laptop cable is integrated with |
| 1 | AC | 3 | US 115V | Un-shielded | 2m | AC Adapter |
| | | • | | | | |
| 2 | USB | 1 | USB | Un-shielded | 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) | | ? (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 ² 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.

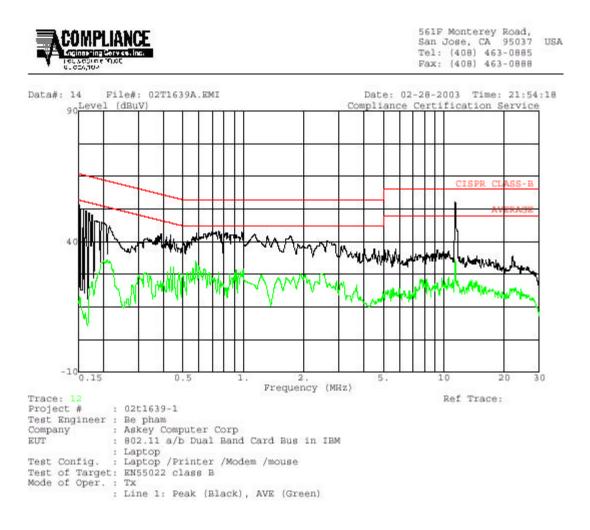
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

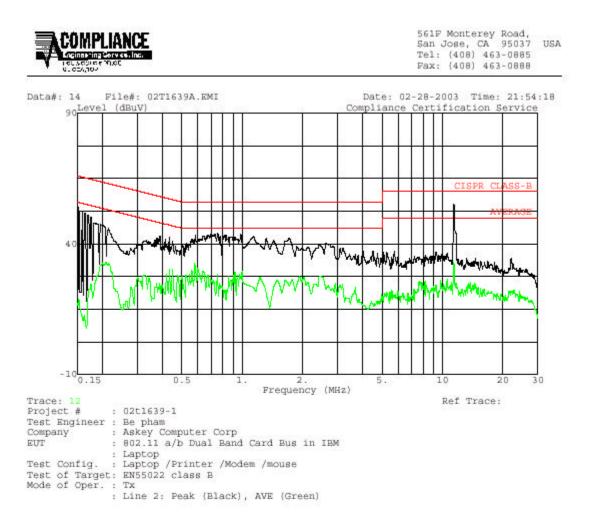
No non-compliance noted:

| 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

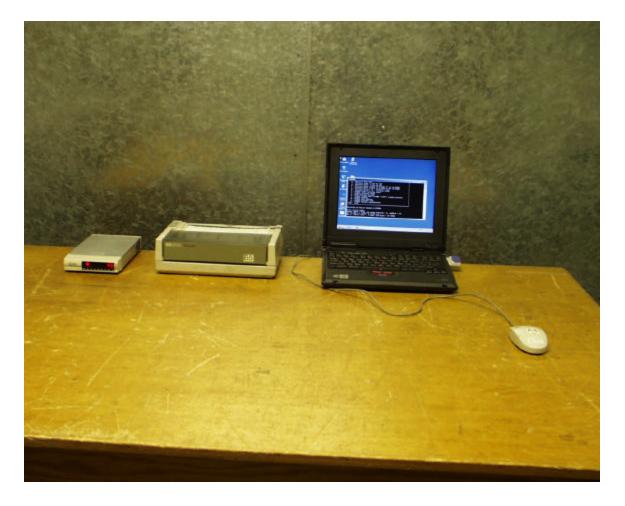


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Power Line Conducted Emissions



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END OF REPORT

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