



**FCC CFR47 PART 15 SUBPART C
CLASS II PERMISSIVE CHANGE
TEST REPORT**

FOR

XBOX 360 WIRELESS RACING WHEEL WITH FORCE FEEDBACK

MODEL NUMBER:WRW02

FCC ID: C3KWRW02

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NVLAP LAB CODE 200065-0

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MICROSOFT CORPORATION
 1065 LA AVENIDA
 MOUNTAIN VIEW, CA 94043, USA

EUT DESCRIPTION: XBOX 360 WIRELESS RACING WHEEL WITH FORCE FEEDBACK

MODEL: WRW02

SERIAL NUMBER: A273307010600501 (Power adapter)

DATE TESTED: AUGUST 20-22, 2007

| 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 most of the requirements set forth in the above standards. Testing the average time of occupancy is not feasible, therefore the demonstration of compliance with this requirement is based on the theory of operation as documented in this report. The test results show that the equipment tested is capable of demonstrating compliance with the remaining requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and 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:

| PARAMETER | UNCERTAINTY |
|-------------------------------------|----------------|
| Radiated Emission, 30 to 200 MHz | +/- 3.3 dB |
| Radiated Emission, 200 to 1000 MHz | +4.5 / -2.9 dB |
| Radiated Emission, 1000 to 2000 MHz | +4.5 / -2.9 dB |
| Radiated Emission, Above 2000 MHz | +/- 4.3 dB |
| Power Line Conducted Emission | +/- 2.9 dB |

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Monaco 2 with alternate Phihong AC adapter.

During the final tests, a special design test accessory (RTX Unity) was used to control the frequency channel and enable continuous transmission.

Proprietary communication protocol is detailed in the theory of operation.

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

Monaco II with alternate Phihong AC adapter, model number: PSC15R-240.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a directional patch antenna, with a maximum peak gain of -2.1 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was BAT-menu-V0107.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2402 MHz.

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|-----------------------------------|--------------|----------------|------------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Laptop | Dell | Inspiron 1200 | 0043-658-488-585 | DoC |
| RTX Unity | MS | Xbox MS | 76 | N/A |
| Converter | MS | Xbox MS | 209358 | N/A |
| Converter | KEYSPAN | USA-19113 | N/A | DoC |
| Steering Wheel | Microsoft | DVX809211-001 | 608000011 | NA |
| AC Adapter | Phihong | PSC24W-240(MS) | N/A | DoC |

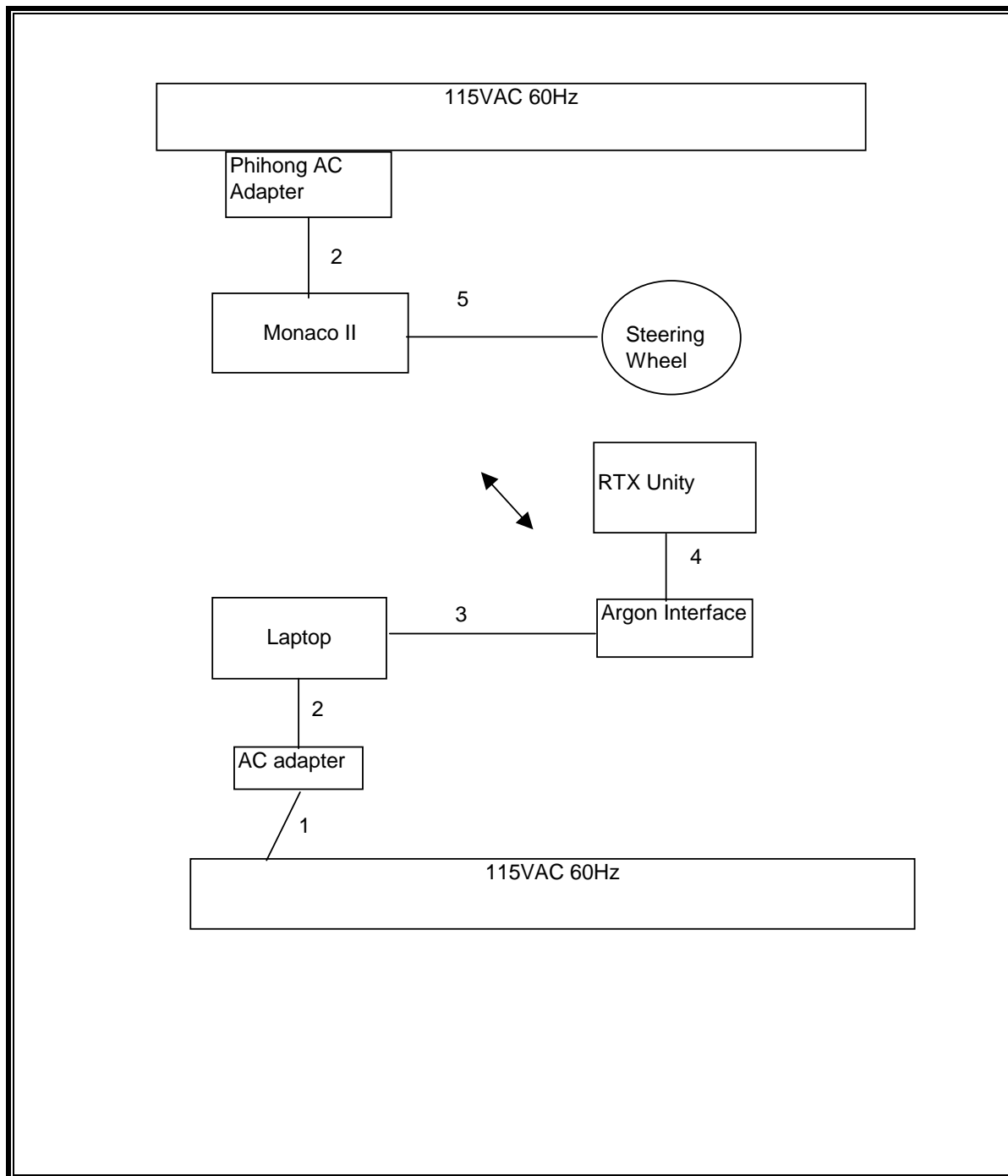
I/O CABLES

| I/O CABLE LIST | | | | | | |
|----------------|----------------------|----------------------|-----------------|-------------|--------------|------------------------------|
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
| 1 | AC | 2 | US 115V | Un-shielded | 2m | N/A |
| 2 | DC | 2 | DC | Un-shielded | 2m | Ferrite on one end |
| 3 | USB | 1 | Argon Interface | Un-shielded | 2m | Two Ferrites on laptop's end |
| 4 | Serial | 1 | Argon Interface | Un-shielded | 0.2m | To Argon Interface Card |
| 5 | J6, 6 Pins Connector | 1 | Steering Wheel | Un-shielded | 0.2m | N/A |

TEST SETUP

The EUT was tested in a standalone configuration once it was setup for testing with the laptop.

SETUP DIAGRAM FOR EMISSIONS TESTS



7. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST | | | | |
|--------------------------------------|----------------|------------------|---------------|----------|
| Description | Manufacturer | Model | Serial Number | Cal Due |
| Antenna, Bilog 30 MHz ~ 2 Ghz | Sunol Sciences | JB1 | A121003 | 08/13/08 |
| Antenna, Log Periodic 200 ~ 1000 MHz | EMCO | 3146 | 9107-3163 | 03/11/08 |
| SA RF Section, 1.5 GHz | Agilent / HP | 85680B | 2814A04227 | 01/07/08 |
| SA Display Section 2 | Agilent / HP | 85662A | 2816A16696 | 04/07/08 |
| LISN, 10 kHz ~ 30 MHz | FCC | LISN-50/250-25-2 | 2023 | 09/15/07 |
| EMI Test Receiver | R & S | ESHS 20 | 827129/006 | 01/27/08 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | 1937A02062 | 01/23/08 |
| Preamp 30-1000MHz | Sonoma | 310N | 185623 | 01/20/08 |

8. LIMITS AND RESULTS

8.1. RADIATED EMISSIONS

8.1.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

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

| MHz | MHz | MHz | GHz |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 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 | (²) |
| 13.36 - 13.41 | | | |

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§15.205 (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 based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (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.

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

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 in the 2.4 GHz band.

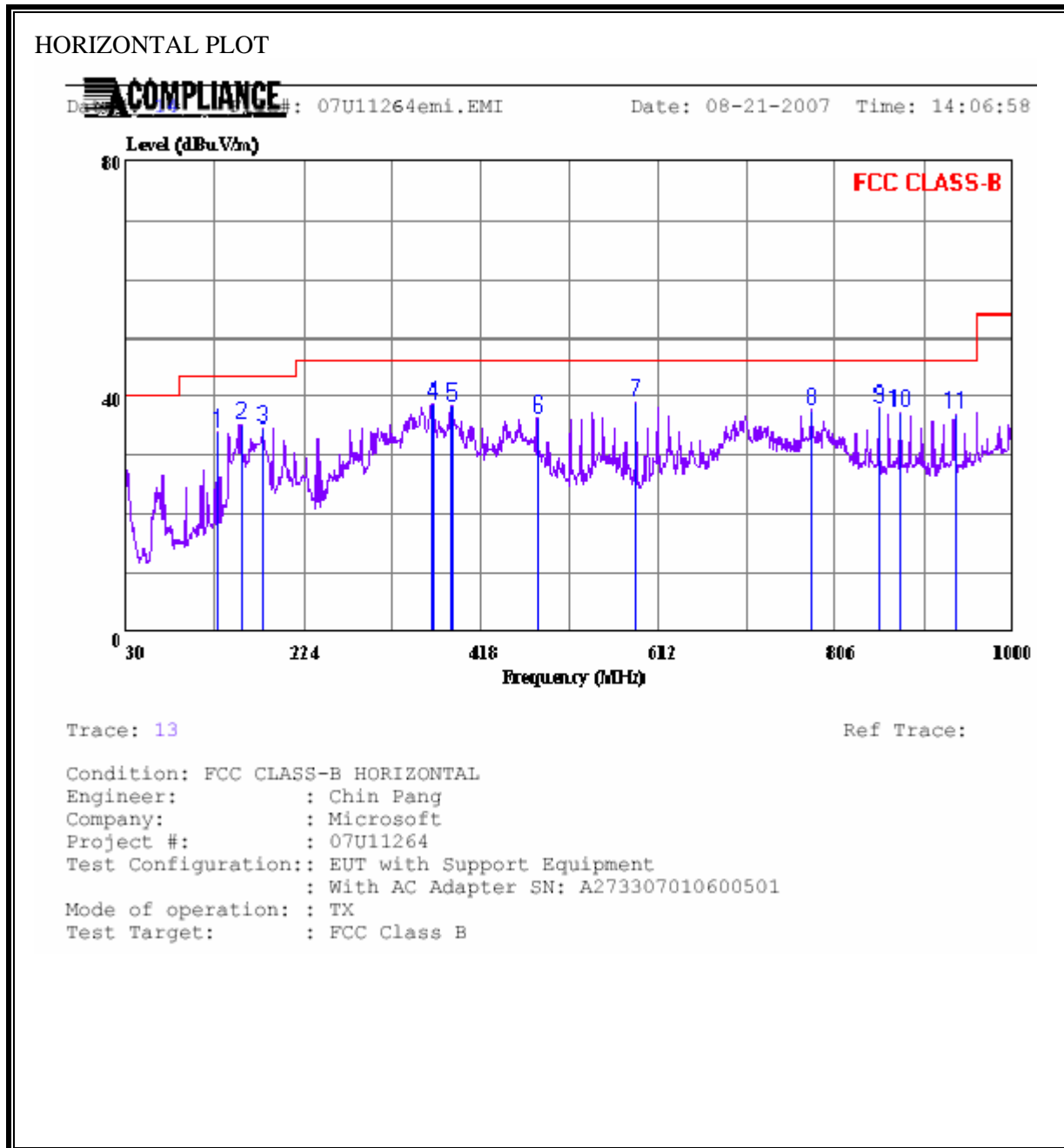
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. 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 emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

The EUT was tested inside the host system and in stand-alone configuration.

The data reported represents the worse case.

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

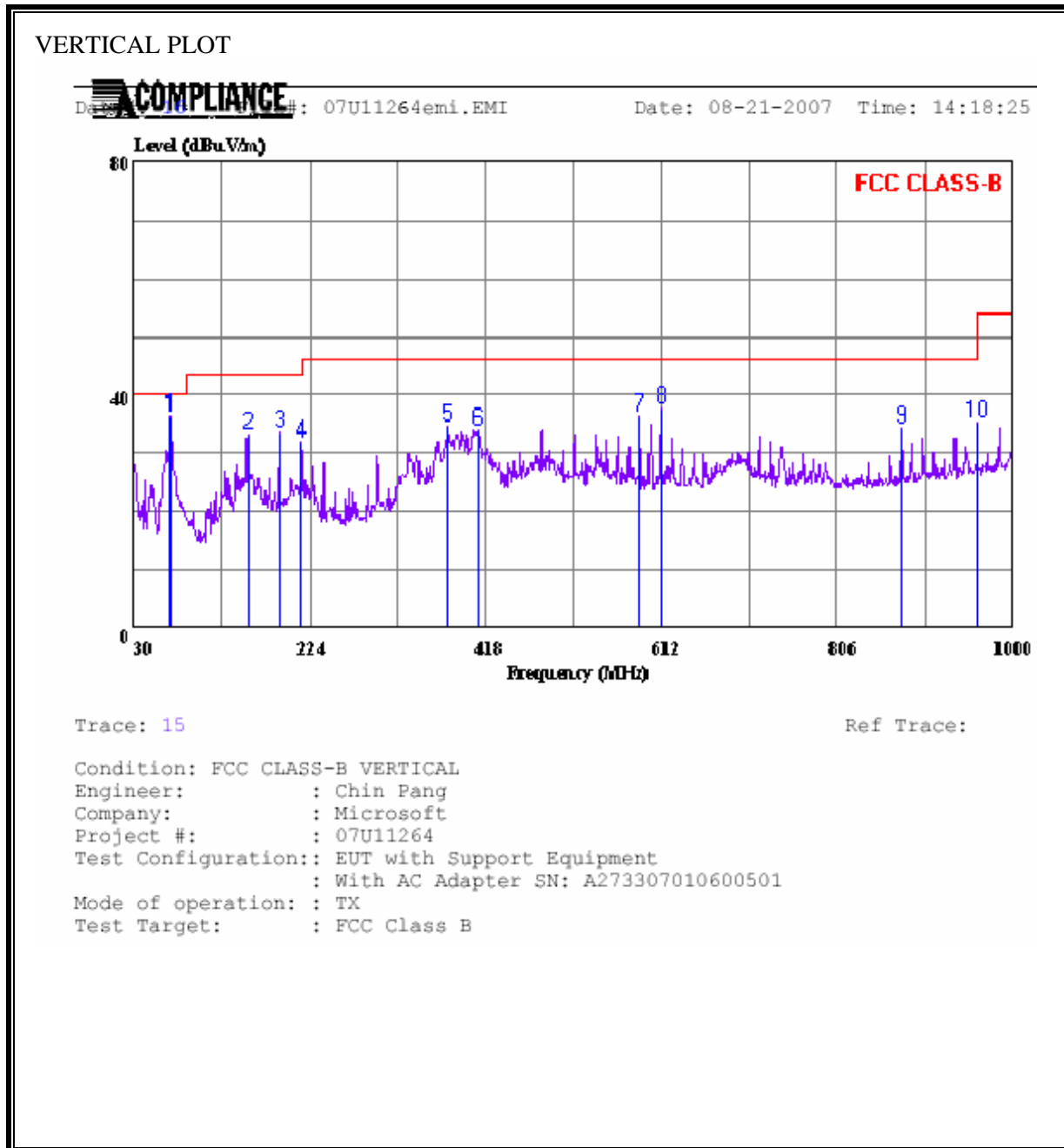


HORIZONTAL DATA

Page: 1

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|----|---------|------------|--------|--------|------------|------------|--------|
| | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | 130.880 | 50.40 | -16.60 | 33.80 | 43.50 | -9.70 | Peak |
| 2 | 155.130 | 53.00 | -17.63 | 35.38 | 43.50 | -8.13 | Peak |
| 3 | 178.410 | 53.20 | -18.51 | 34.69 | 43.50 | -8.81 | Peak |
| 4 | 364.650 | 52.80 | -14.11 | 38.69 | 46.00 | -7.31 | Peak |
| 5 | 385.990 | 52.10 | -13.76 | 38.34 | 46.00 | -7.66 | Peak |
| 6 | 480.080 | 48.10 | -11.67 | 36.43 | 46.00 | -9.57 | Peak |
| 7 | 587.750 | 49.30 | -10.08 | 39.22 | 46.00 | -6.78 | Peak |
| 8 | 779.810 | 44.80 | -7.13 | 37.67 | 46.00 | -8.33 | Peak |
| 9 | 852.560 | 43.90 | -5.87 | 38.03 | 46.00 | -7.97 | Peak |
| 10 | 876.810 | 42.90 | -5.45 | 37.45 | 46.00 | -8.55 | Peak |
| 11 | 936.950 | 41.50 | -4.32 | 37.18 | 46.00 | -8.82 | Peak |

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)



VERTICAL DATA

Page: 1

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|----|---------|------------|--------|--------|------------|------------|--------|
| | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | 70.740 | 58.90 | -22.67 | 36.23 | 40.00 | -3.77 | Peak |
| 2 | 155.130 | 50.80 | -17.63 | 33.18 | 43.50 | -10.33 | Peak |
| 3 | 191.020 | 51.70 | -18.14 | 33.56 | 43.50 | -9.94 | Peak |
| 4 | 215.270 | 50.70 | -18.77 | 31.93 | 43.50 | -11.57 | Peak |
| 5 | 376.290 | 48.60 | -13.99 | 34.61 | 46.00 | -11.39 | Peak |
| 6 | 409.270 | 47.00 | -13.21 | 33.79 | 46.00 | -12.21 | Peak |
| 7 | 587.750 | 46.50 | -10.08 | 36.42 | 46.00 | -9.58 | Peak |
| 8 | 612.000 | 47.30 | -9.72 | 37.58 | 46.00 | -8.42 | Peak |
| 9 | 876.810 | 39.80 | -5.45 | 34.35 | 46.00 | -11.65 | Peak |
| 10 | 960.230 | 39.10 | -3.73 | 35.37 | 54.00 | -18.63 | Peak |

8.2. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that 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 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|-----------------------------|------------------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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.

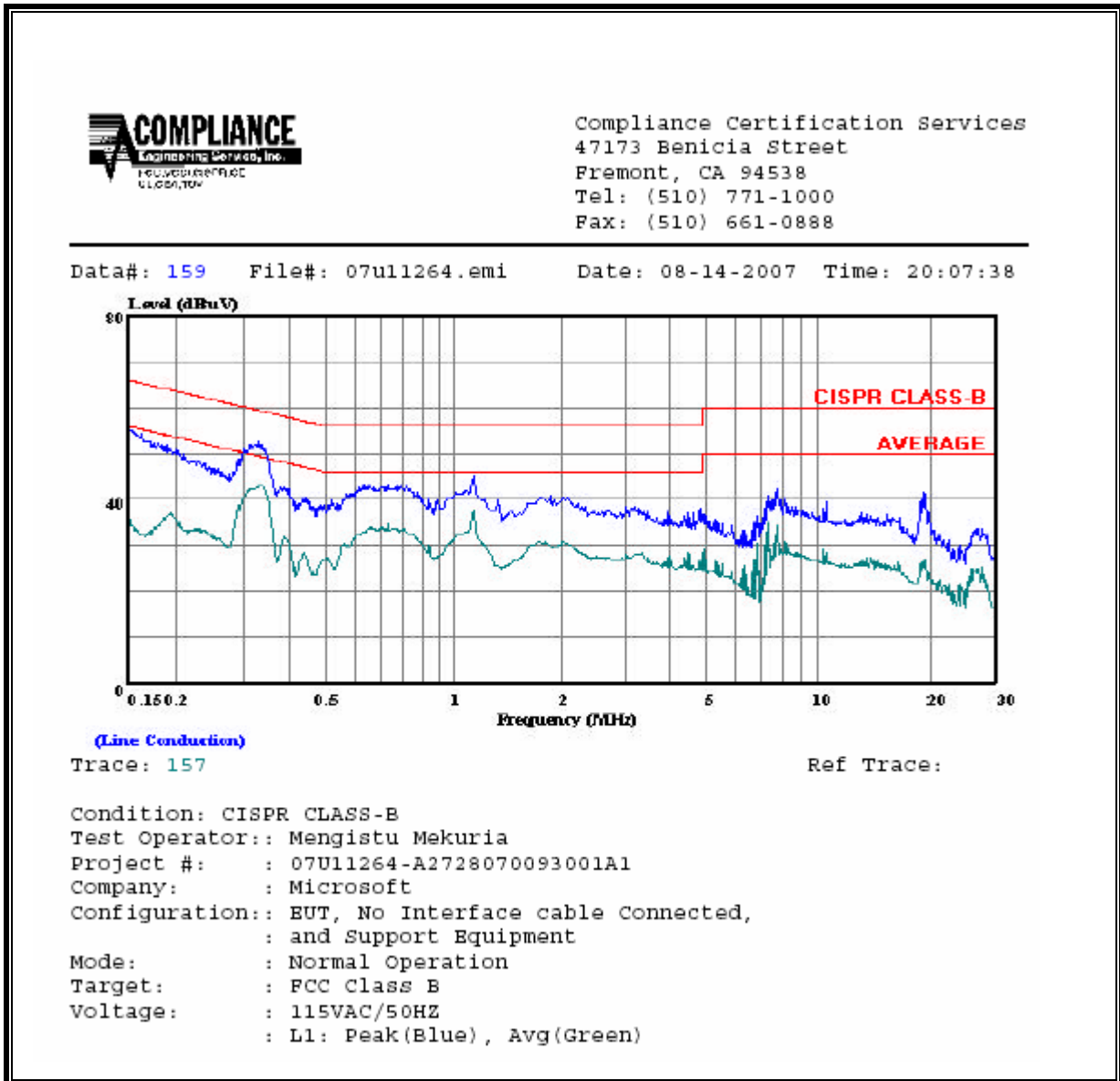
RESULTS

No non-compliance noted:

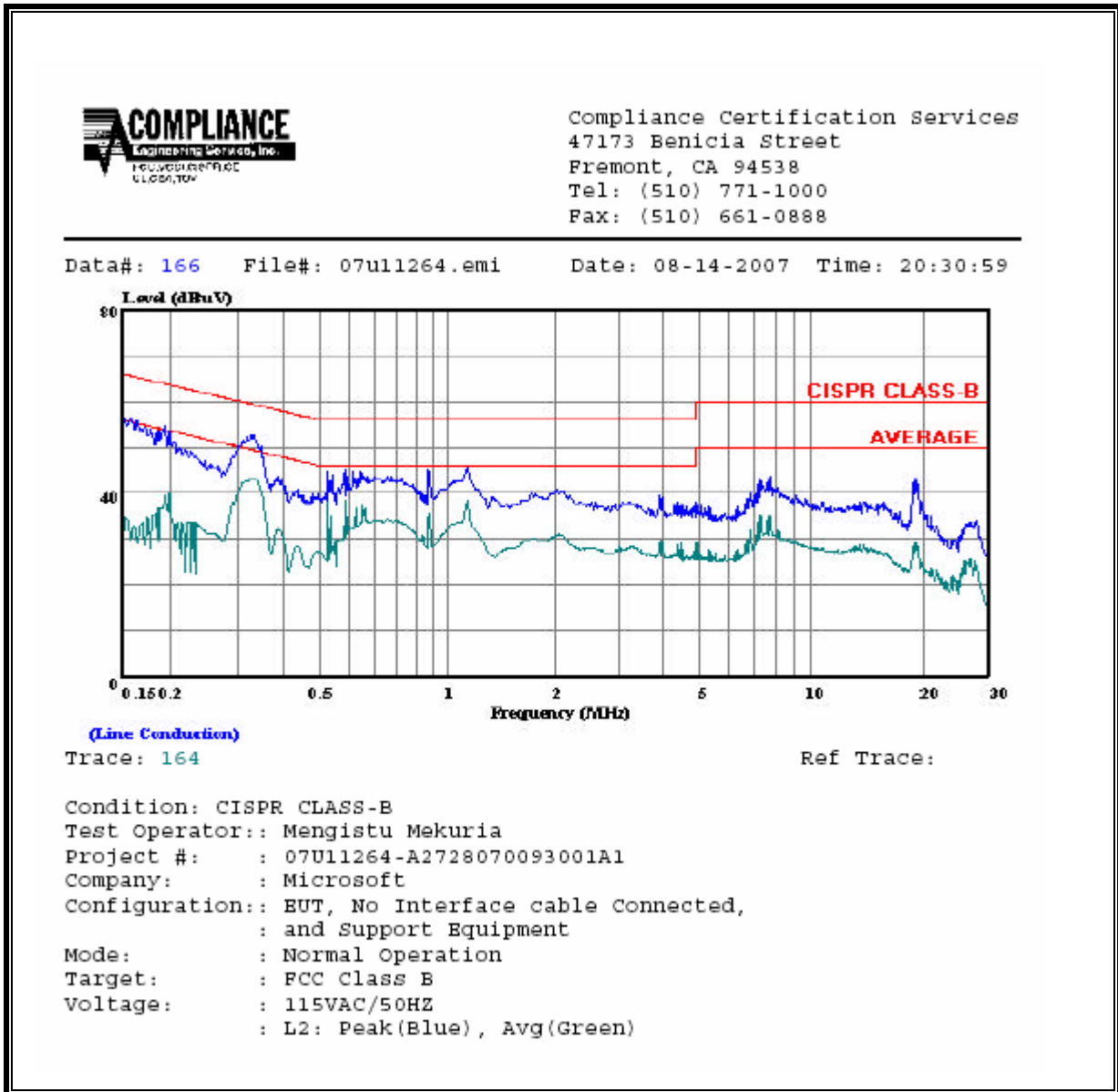
6 WORST EMISSIONS

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq. | Reading | | | Closs | Limit | EN_B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.33 | 52.69 | -- | 43.40 | 0.00 | 59.40 | 49.40 | -6.71 | -6.00 | L1 |
| 0.63 | 43.39 | -- | 34.79 | 0.00 | 56.00 | 46.00 | -12.61 | -11.21 | L1 |
| 1.23 | 44.95 | -- | 37.87 | 0.00 | 56.00 | 46.00 | -11.05 | -8.13 | L1 |
| 0.19 | 54.87 | -- | 39.52 | 0.00 | 63.91 | 53.91 | -9.04 | -14.39 | L2 |
| 0.33 | 52.73 | -- | 43.44 | 0.00 | 59.35 | 49.35 | -6.62 | -5.91 | L2 |
| 1.23 | 45.71 | -- | 38.55 | 0.00 | 56.00 | 46.00 | -10.29 | -7.45 | L2 |
| 6 Worst Data | | | | | | | | | |

LINE 1 RESULTS



LINE 2 RESULTS

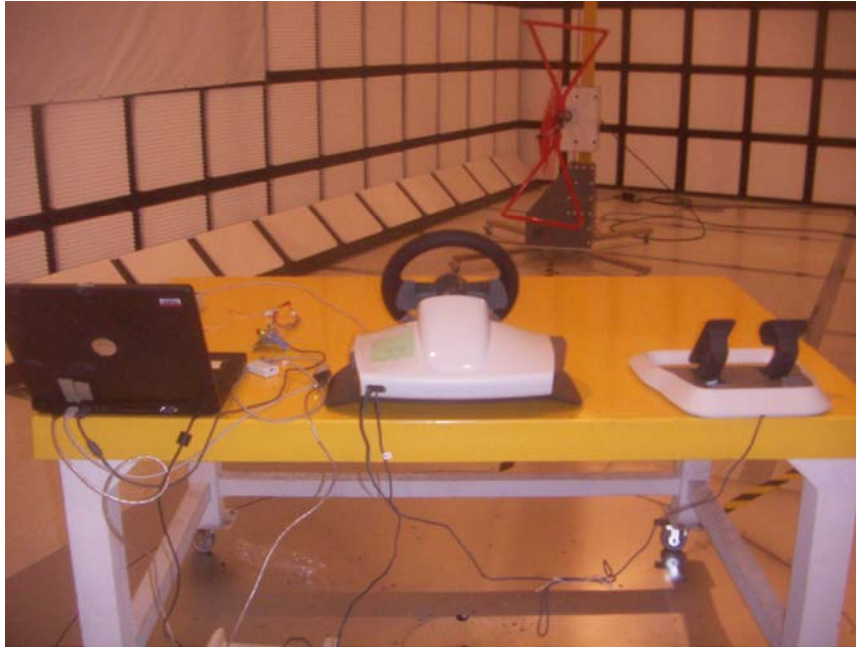


9. SETUP PHOTOS

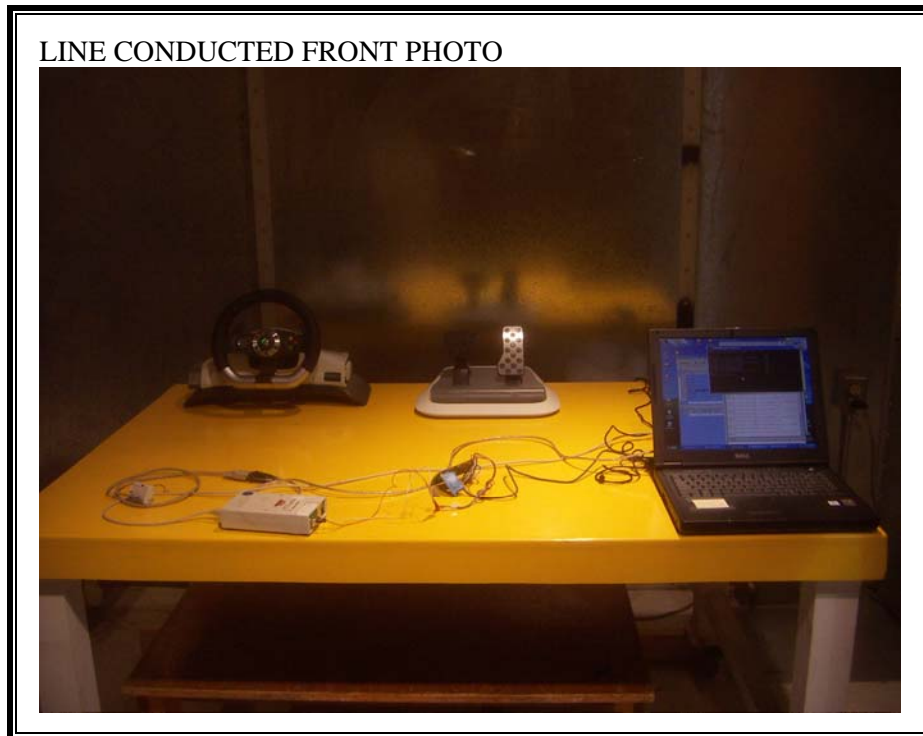
RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



LINE CONDUCTED BACK PHOTO



END OF REPORT