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# *EMC Test Report*

## *Application for Grant of Equipment Authorization*
## *Class II Permissive Change/Reassessment*

## *FCC Part 15 Subpart C*
## *FCC Part 15, Subpart E*

## *Model: HR44*

| | |
|---|---|
| FCC ID: | PGRHR44 |
| APPLICANT: | Pace Americas, Inc.<br>310 Providence Mine Road, Suite 200<br>Nevada City, CA 95959 |
| TEST SITE(S): | National Technical Systems - Silicon Valley<br>41039 Boyce Road.<br>Fremont, CA. 94538-2435 |
| IC SITE REGISTRATION #: | 2845B-7 |
| REPORT DATE: | November 19, 2013 |
| FINAL TEST DATES: | September 19 and November 7, 2013 |
| TOTAL NUMBER OF PAGES: | 35 |

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## *REVISION HISTORY*

| Rev# | Date | Comments | Modified By |
|---|---|---|---|
| - | | First release | |

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## *SCOPE*

An electromagnetic emissions test has been performed on the Pace Americas, Inc. model HR44, pursuant to the following rules:

FCC Part 15 Subpart C
FCC Part 15, Subpart E requirements for UNII Devices

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2009
FCC DTS Measurement Guidance KDB558074
FCC General UNII Test Procedures KDB789033

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

Note, testing was limited to AC conducted emissions. The only change to the product was the external AC/DC adapter. Original testing showed no radio related emissions below 1GHz.

## *OBJECTIVE*

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

## *STATEMENT OF COMPLIANCE*

The tested sample of Pace Americas, Inc. model HR44 complied with the requirements of the following regulations:

FCC Part 15 Subpart C
FCC Part 15, Subpart E requirements for UNII Devices

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Pace Americas, Inc. model HR44 and therefore apply only to the tested sample. The sample was selected and prepared by Mark Rieger of Pace Americas, Inc.

## *DEVIATIONS FROM THE STANDARDS*

No deviations were made from the published requirements listed in the scope of this report.

## *TEST RESULTS SUMMARY*

*DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)*

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.247(a) | RSS 210 A8.2 | Digital Modulation | Testing not performed. | Results unchanged from original filing. | |
| 15.247 (a) (2) | RSS 210 A8.2 (1) | 6dB Bandwidth | | | |
| 15.247 (b) (3) | RSS 210 A8.2 (4) | Output Power (multipoint systems) | | | |
| 15.247(d) | RSS 210 A8.2 (2) | Power Spectral Density | | | |
| 15.247(c) | RSS 210 A8.5 | Antenna Port Spurious Emissions 30MHz – 25 GHz | | | |
| 15.247(c) / 15.209 | RSS 210 A8.5 | Radiated Spurious Emissions 30MHz – 25 GHz | | | |

*DIGITAL TRANSMISSION SYSTEMS (5725 –5850 MHz)*

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.247(a) | RSS 210 A8.2 | Digital Modulation | Testing not performed. | Results unchanged from original filing. | |
| 15.247 (a) (2) | RSS 210 A8.2 (1) | 6dB Bandwidth | | | |
| 15.247 (b) | RSS 210 A8.2 (4) | Output Power (multipoint systems) | | | |
| 15.247(d) | RSS 210 A8.2 (2) | Power Spectral Density | | | |
| 15.247(c) | RSS 210 A8.5 | Antenna Port Spurious Emissions – 30MHz – 40 GHz | | | |
| 15.247(c) / 15.209 | RSS 210 A8.5 Table 2, 3 | Radiated Spurious Emissions 30MHz – 40 GHz | | | |

*UNII / LELAN DEVICES*

**Operation in the 5.15 – 5.25 GHz Band**

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.407(e) | | Indoor operation only | Testing not performed. | Results unchanged from original filing. | |
| 15.407(a) (2) | | 26dB Bandwidth | | | |
| 15.407 (a) (1) | A9.2(1) | Output Power | | | |
| 15.407 (a) (1) | - | Power Spectral Density | | | |
| - | A9.5 (2) | | | | |

**Operation in the 5.25 – 5.35 GHz Band**

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result (margin) |
|---|---|---|---|---|---|
| 15.407(a) (2) | | 26dB Bandwidth | Testing not performed. | Results unchanged from original filing. | |
| 15.407(a) (2) | A9.2(2) | Output Power | | | |
| 15.407(a) (2) | - | Power Spectral Density | | | |
| - | A9.2(2) / A9.5 (2) | Power Spectral Density | | | |

**Operation in the 5.47 – 5.725 GHz Band**

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result (margin) |
|---|---|---|---|---|---|
| 15.407(a) (2) | | 26dB Bandwidth | Testing not performed. | Results unchanged from original filing. | |
| 15.407(a) (2) | A9.2(2) | Output Power | | | |
| 15.407(a) (2)) | | Power Spectral Density | | | |
| | A9.2(2) / A9.5 (2) | Power Spectral Density | | | |
| KDB 443999 | A9 | Non-operation in 5600 – 5650 MHz sub band | | | |

**Requirements for all U-NII/LELAN bands**

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.407 | A9.5a | Modulation | Testing not performed. Results unchanged from original filing. | | |
| 15.407(b) (5) / 15.209 | A9.3 | Spurious Emissions | | | |
| 15.407(a)(6) | - | Peak Excursion Ratio | | | |
| | A9.5 (3) | Channel Selection | | | |
| 15 | | | | | |
| 15.407 (c) | A9.5(4) | Operation in the absence of information to transmit | | | |
| 15.407 (g) | A9.5 (5) | Frequency Stability | | | |
| 15.407 (h1) | A9.4 | Transmit Power Control | | | |
| 15.407 (h2) | A9.4 | Dynamic frequency Selection (device without radar detection) | | | |
| | A9.9g | User Manual information | | | |

*GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS*

| FCC Rule Part | RSS Rule part | Description | Measured Value / Comments | Limit / Requirement | Result (margin) |
|---|---|---|---|---|---|
| 15.203 | - | RF Connector | Testing not performed. Results unchanged from original filing. | | |
| 15.207 | RSS GEN Table 2 | AC Conducted Emissions Delta Power Supply | 38.0 dBµV @ 12.900 MHz (-12.0 dB) | Refer to page 19 | Complies |
| 15.207 | RSS GEN Table 2 | AC Conducted Emissions LiteOn Power Supply | 47.2 dBµV @ 0.151 MHz (-18.7 dB) | Refer to page 19 | Complies |
| 15.109 | RSS GEN 7.2.3 Table 1 | Receiver spurious emissions | Testing not performed. Results unchanged from original filing. | | |
| 15.247 (b) (5) 15.407 (f) | RSS 102 | RF Exposure Requirements | | | |
| - | RSP 100 RSS GEN 7.1.5 | User Manual | | | |
| - | RSP 100 RSS GEN 7.1.5 | User Manual | | | |
| - | RSP 100 RSS GEN 4.4.1 | 99% Bandwidth | | | |

*MEASUREMENT UNCERTAINTIES*

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

| Measurement Type | Measurement Unit | Frequency Range | Expanded Uncertainty |
|---|---|---|---|
| RF power, conducted (power meter) | dBm | 25 to 7000 MHz | ± 0.52 dB |
| RF power, conducted (Spectrum analyzer) | dBm | 25 to 7000 MHz | ± 0.7 dB |
| Conducted emission of transmitter | dBm | 25 to 26500 MHz | ± 0.7 dB |
| Conducted emission of receiver | dBm | 25 to 26500 MHz | ± 0.7 dB |
| Radiated emission (substitution method) | dBm | 25 to 26500 MHz | ± 2.5 dB |
| Radiated emission (field strength) | dBµV/m | 25 to 1000 MHz | ± 3.6 dB |
| | | 1000 to 40000 MHz | ± 6.0 dB |
| Conducted Emissions (AC Power) | dBµV | 0.15 to 30 MHz | ± 2.4 dB |

## *EQUIPMENT UNDER TEST (EUT) DETAILS*

### *GENERAL*

The Pace Americas, Inc. model HR44 is a set-top-box that incorporates 802.11abgn 2x2 and 2.4GHz 802.15.4 radios. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120 Volts, 60Hz, 1.3 Amps.

The sample was received on September 19, 2013 and tested on September 19 and November 7, 2013. The EUT consisted of the following component(s):

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Direct TV | HR44 | Set-top-box | G33DA2LT000092 | PGRHR44 |
| Delta | EPS44R0-16 | External power supply | DD44A1332D7233 | N/A |
| LiteOn | EPS44R0-08 | External power supply | LA44A1337B1434 | N/A |

### *ANTENNA SYSTEM*

The wifi and 802.15.4 radios use separate antennas.
The peak gain for the WiFi antennas: 3.3 dBi (2.4GHz), 4.1 dBi (5GHz)
The peak gain for the 802.15.4 antennas: 4.9 dBi (2.4GHz)

### *ENCLOSURE*

The EUT enclosure is primarily constructed of plastic. It measures approximately 34 cm wide by 25 cm deep by 4.5 cm high.

### *MODIFICATIONS*

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

### *SUPPORT EQUIPMENT*

The following equipment was used as support equipment for testing:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| G RAID | - | Sata Drive | - | - |
| G Drive | - | USB Drive | - | - |
| Thomson, Inc. | 29267GE1-B | Telephone | 70961920 | - |

The following equipment was used as remote support equipment for emissions testing:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Dell | Latitude D630 | Laptop | - | - |
| Dell | Latitude D630 | Laptop | - | - |
| Toshiba | 24SL415U | TV | B46193T06429C1 | - |
| Radyne | DM240 Digital Modular | Satellite Headed | | |
| Direct TV | DCA28R0-18oCA | MoCA to Ethernet Bridge | GDD4A1213B7667 | |
| Direct TV | SWM | 8 channel | N816900 823 652 | |
| Pace | 405 | Access Point | 34131M000002 | |

*EUT INTERFACE PORTS*

The I/O cabling configuration during testing was as follows:

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| Serial | Laptop | Multiwire | Shielded | 5 |
| DC power | External power supply | 2 wire | Unshielded | 2 |
| AC power (ext supply) | AC Mains | 3 wire | Unshielded | 2 |
| Component | TV | RCA | Shielded | 10 |
| Ethernet | Laptop | CAT5 | Unshielded | 10 |
| RJ-11 | Telephone | RJ-11 | Unshielded | 3 |
| HDMI | TV | HDMI | Shielded | 10 |
| Composite | TV | RCA | Shielded | 10 |
| MoCA | Satellite | MoCA to Ethernet | Shielded | 10 |
| USB | USB Drive | USB | Shielded | 2 |
| Sata | Sata Drive | Sata | Shielded | 2 |

*EUT OPERATION*

The EUT (Satellite Set Top Box) was setup supporting a Direct TV video test stream from a Satellite Head-end simulator and in turn displaying it on a TV over the HDMI at 1080i, Component, and Composite outputs. A 75 ohm splitter was used between the head-end and the STB to split out the MoCA communications from the EUT to a DECA (MoCA to Ethernet bridge) and pinging the EUT (MOCA communications operating in the band 475MHz to 625MHz). The Ethernet port was connected to a separate PC and was also pinging the EUT. The USB port was terminated (and enumerated) into a USB Memory Stick. The eSATA port was terminated to a remote Hard drive (Note: The internal hard drive was active during this test since both cannot be active at one time). SPDIF was terminated into a 75 ohm load. The RJ11 telecom port was terminated into a 600 ohm load.

The RF4CE and WiFi radios were both enabled. The WiFi radio was associated with an access point.

## *TEST SITE*

### *GENERAL INFORMATION*

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

| Site | Registration Numbers | | Location |
|---|---|---|---|
| | FCC | Canada | |
| Chamber 7 | A2LA accreditation | 2845B-7 | 41039 Boyce Road<br>Fremont,<br>CA 94538-2435 |

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

### *CONDUCTED EMISSIONS CONSIDERATIONS*

Conducted emissions testing is performed in conformance with ANSI C63.10. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

### *RADIATED EMISSIONS CONSIDERATIONS*

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

## *MEASUREMENT INSTRUMENTATION*

### *RECEIVER SYSTEM*

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

### *INSTRUMENT CONTROL COMPUTER*

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

### *LINE IMPEDANCE STABILIZATION NETWORK (LISN)*

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

*FILTERS/ATTENUATORS*

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

*ANTENNAS*

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

*ANTENNA MAST AND EQUIPMENT TURNTABLE*

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor as specified in ANSI C63.4. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

*INSTRUMENT CALIBRATION*

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

## TEST PROCEDURES

### EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10, and the worst-case orientation is used for final measurements.

### CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

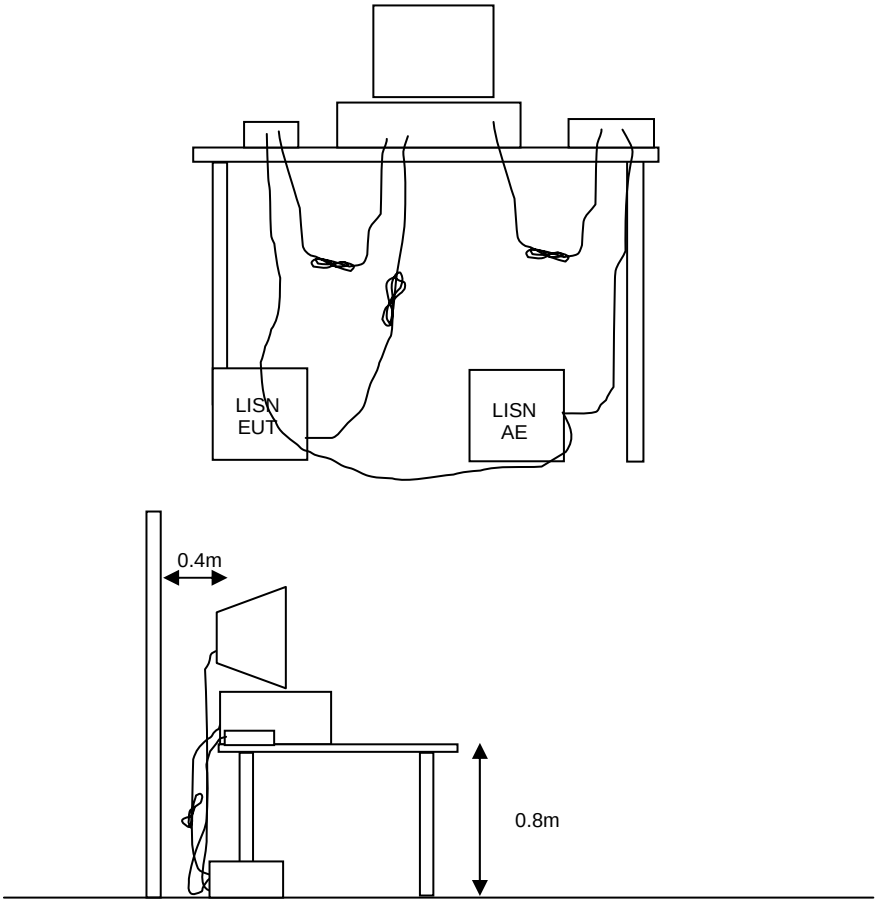



**Figure 1 Typical Conducted Emissions Test Configuration**

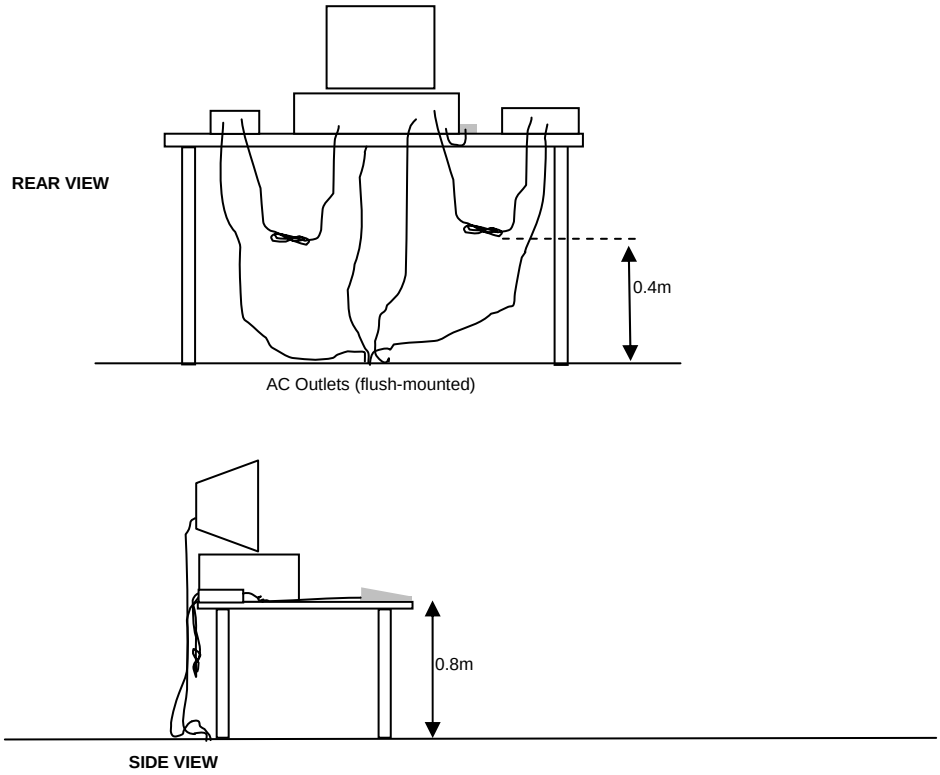
*RADIATED EMISSIONS*

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

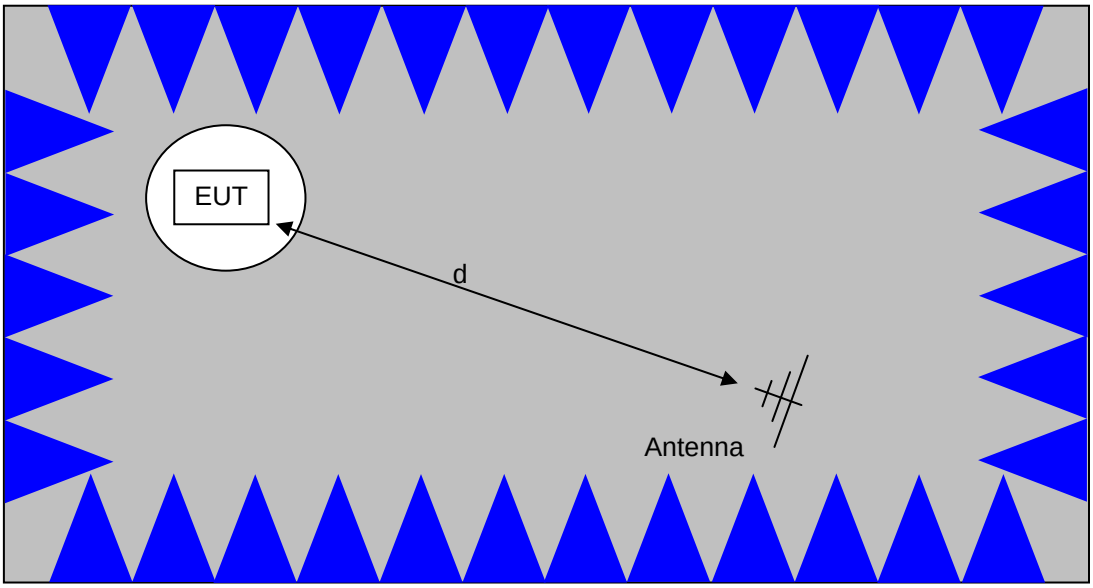
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

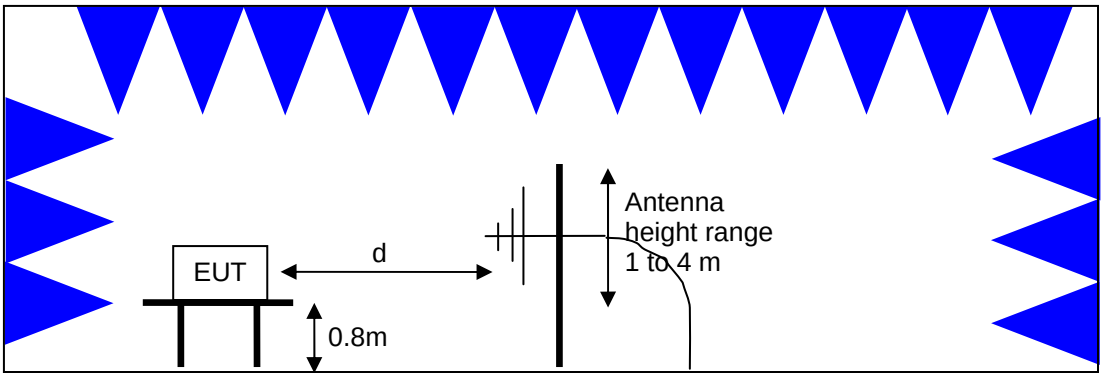



Typical Test Configuration for Radiated Field Strength Measurements




The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.




Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

*SPECIFICATION LIMITS AND SAMPLE CALCULATIONS*

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

*CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN*

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

| Frequency (MHz) | Average Limit (dBuV) | Quasi Peak Limit (dBuV) |
|---|---|---|
| 0.150 to 0.500 | Linear decrease on logarithmic frequency axis between 56.0 and 46.0 | Linear decrease on logarithmic frequency axis between 66.0 and 56.0 |
| 0.500 to 5.000 | 46.0 | 56.0 |
| 5.000 to 30.000 | 50.0 | 60.0 |

# *Appendix A Test Equipment Calibration Data*

**Conducted Emissions - AC Power Ports, 19-Sep-13**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| EMCO | LISN, 10 kHz-100 MHz, 25A | 3825/2 | 1292 | 2/14/2014 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB7 | 1538 | 12/12/2013 |
| Rohde & Schwarz | Pulse Limiter | ESH3 Z2 | 1594 | 5/15/2014 |

**Conducted Emissions - AC Power Ports, 07-Nov-13**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| EMCO | LISN, 10 kHz-100 MHz, 25A | 3825/2 | 1292 | 2/14/2014 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB7 | 1538 | 12/12/2013 |
| Rohde & Schwarz | Pulse Limiter | ESH3 Z2 | 1594 | 5/15/2014 |

# *Appendix B Test Data*

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| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Product | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Emissions Standard(s): | FCC 15.B / FCC 15.C | Class: | B |
| Immunity Standard(s): | - | Environment: | - |

# EMC Test Data

For The

# Pace Americas

Product

HR44

Date of Last Test: 11/7/2013

| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

# Conducted Emissions

*(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)*

## Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 11/7/2013
Test Engineer: Chris Groat
Test Location: Fremont Chamber #7

Config. Used: 1
Config Change: none
EUT Voltage: 120V/60Hz

## General Test Configuration

For tabletop equipment, the EUT was located on a wooden table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located outside of the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

## Ambient Conditions:

Temperature: 21 °C
Rel. Humidity: 34 %

## Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|---|---|---|---|---|
| 1 | CE, AC Power,120V/60Hz | Class B | Pass | 47.2 dBµV @ 0.151 MHz (-18.7 dB) |

## Modifications Made During Testing

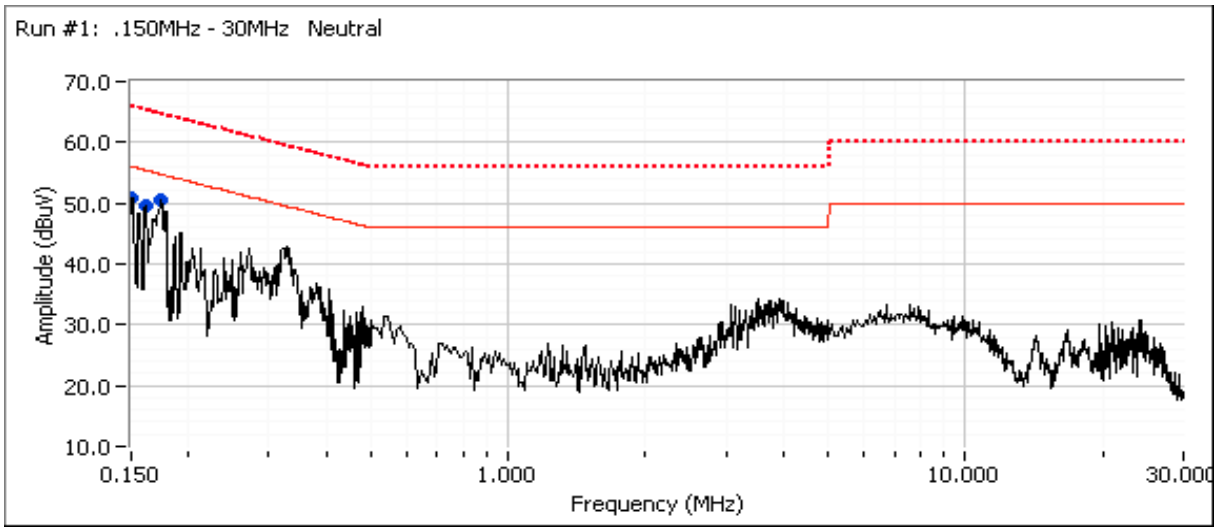
No modifications were made to the EUT during testing

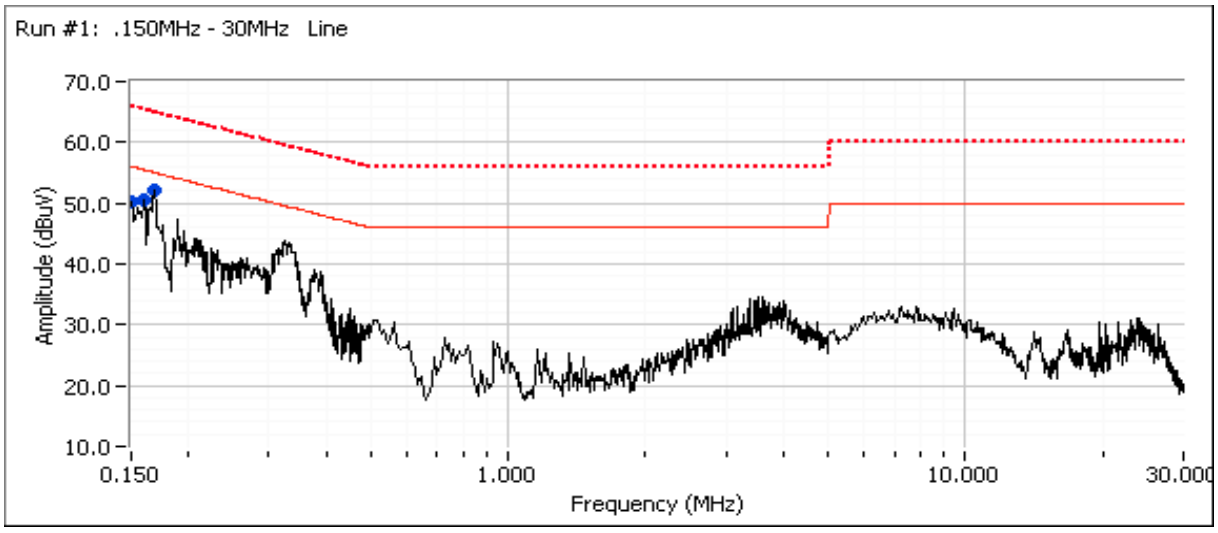
## Deviations From The Standard

No deviations were made from the requirements of the standard.

| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
Testing with External LiteOn (EPS44R0-08) Power Supply.
WiFi Enabled. Ethernet Inactive



| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
Testing with External LiteOn (EPS44R0-08) Power Supply.
WiFi Enabled. Ethernet Inactive

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

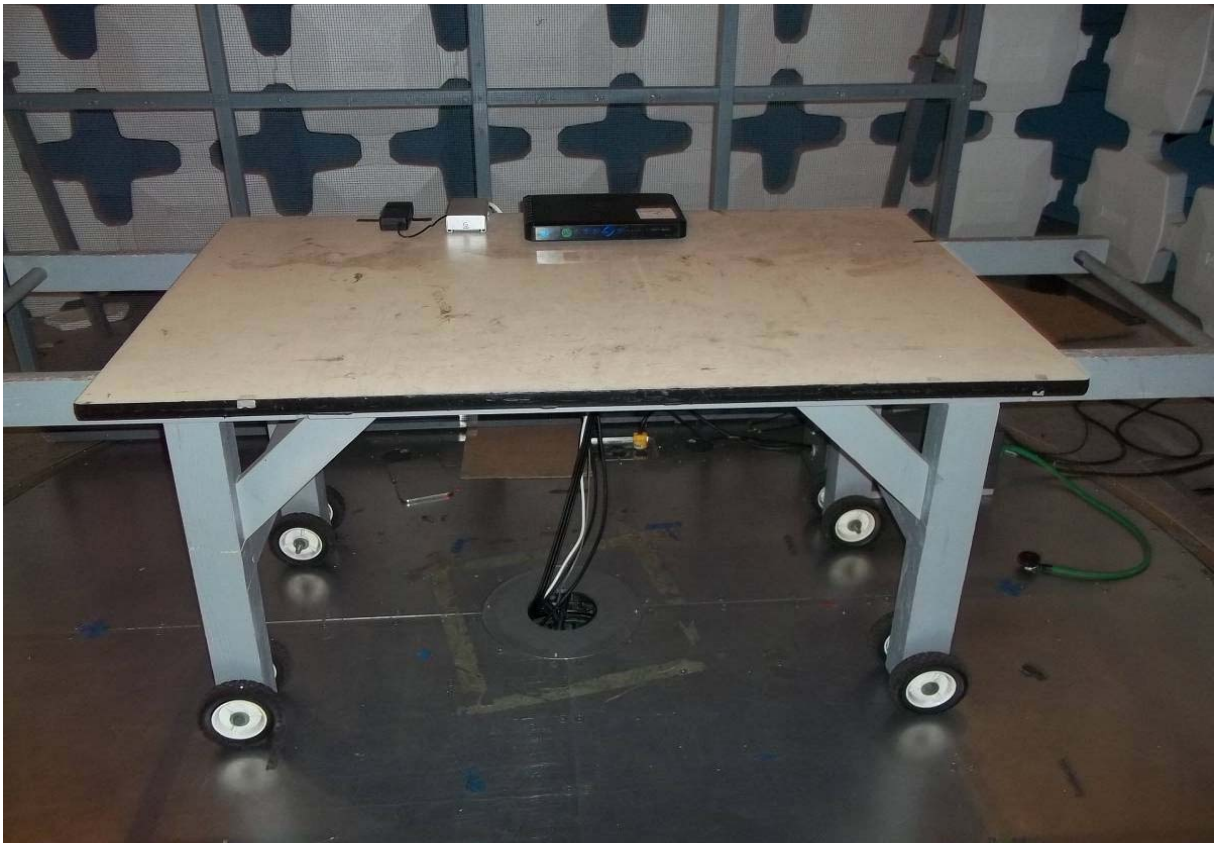
| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 0.168 | 52.0 | Line 1 | 55.0 | -3.0 | Peak | |
| 0.174 | 50.4 | Neutral | 54.8 | -4.4 | Peak | |
| 0.160 | 50.5 | Line 1 | 55.4 | -4.9 | Peak | |
| 0.151 | 51.0 | Neutral | 56.0 | -5.0 | Peak | |
| 0.162 | 49.6 | Neutral | 55.4 | -5.8 | Peak | |
| 0.151 | 50.2 | Line 1 | 56.0 | -5.8 | Peak | |

Final quasi-peak and average readings

| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 0.151 | 47.2 | Neutral | 65.9 | -18.7 | QP | QP (1.00s) |
| 0.162 | 46.2 | Neutral | 65.4 | -19.2 | QP | QP (1.00s) |
| 0.150 | 46.8 | Line 1 | 66.0 | -19.2 | QP | QP (1.00s) |
| 0.160 | 46.3 | Line 1 | 65.5 | -19.2 | QP | QP (1.00s) |
| 0.168 | 45.9 | Line 1 | 65.1 | -19.2 | QP | QP (1.00s) |
| 0.162 | 35.3 | Neutral | 55.4 | -20.1 | AVG | AVG (0.10s) |
| 0.160 | 34.8 | Line 1 | 55.5 | -20.7 | AVG | AVG (0.10s) |
| 0.168 | 34.1 | Line 1 | 55.1 | -21.0 | AVG | AVG (0.10s) |
| 0.174 | 43.6 | Neutral | 64.8 | -21.2 | QP | QP (1.00s) |
| 0.151 | 34.3 | Neutral | 55.9 | -21.6 | AVG | AVG (0.10s) |
| 0.150 | 33.7 | Line 1 | 56.0 | -22.3 | AVG | AVG (0.10s) |
| 0.174 | 29.7 | Neutral | 54.8 | -25.1 | AVG | AVG (0.10s) |

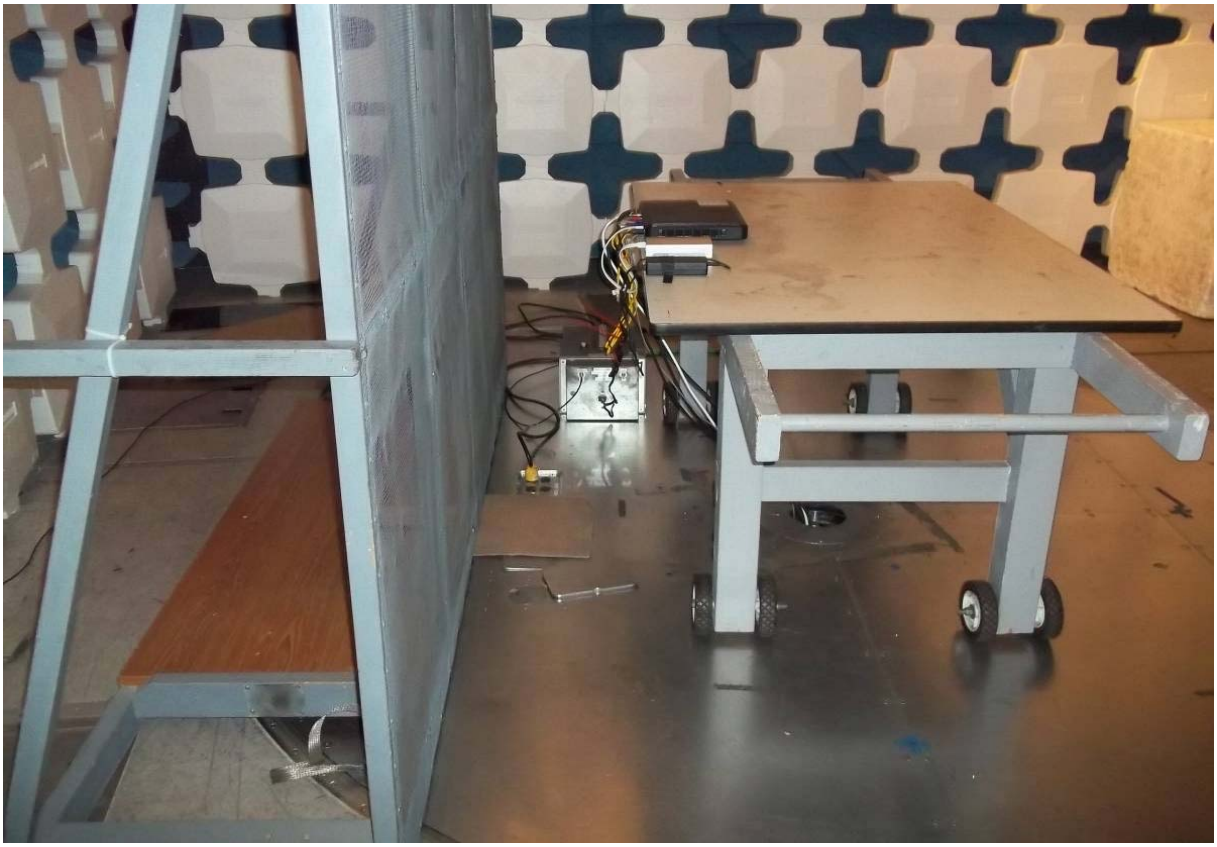
| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Test Configuration Photograph #1
(Conducted Emissions - Power Port)



| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Test Configuration Photograph #2
(Conducted Emissions - Power Port)



| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

# Conducted Emissions

*(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)*

## Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 9/19/2013
Test Engineer: Alika Hirano
Test Location: Fremont Chamber #7

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

## General Test Configuration

For tabletop equipment, the EUT was located on a wooden table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN. Remote support equipment was located outside of the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

## Ambient Conditions:

Temperature: 22 °C
Rel. Humidity: 38 %

## Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|---|---|---|---|---|
| 1 | CE, AC Power,120V/60Hz<br>Ethernet Enabled, Wi-Fi Inactive | Class B | Pass | 38.8 dBµV @ 13.019 MHz<br>(-11.2 dB) |
| 2 | CE, AC Power,120V/60Hz<br>Wi-Fi Enabled, Ethernet Inactive | Class B | Pass | 38.0 dBµV @ 12.900 MHz<br>(-12.0 dB) |

## Modifications Made During Testing

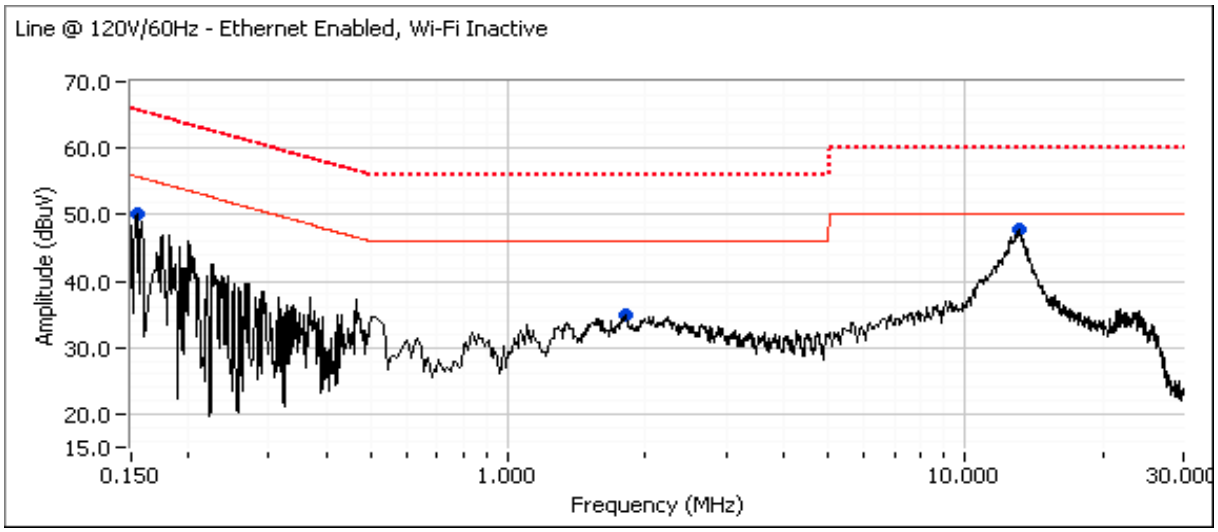
No modifications were made to the EUT during testing

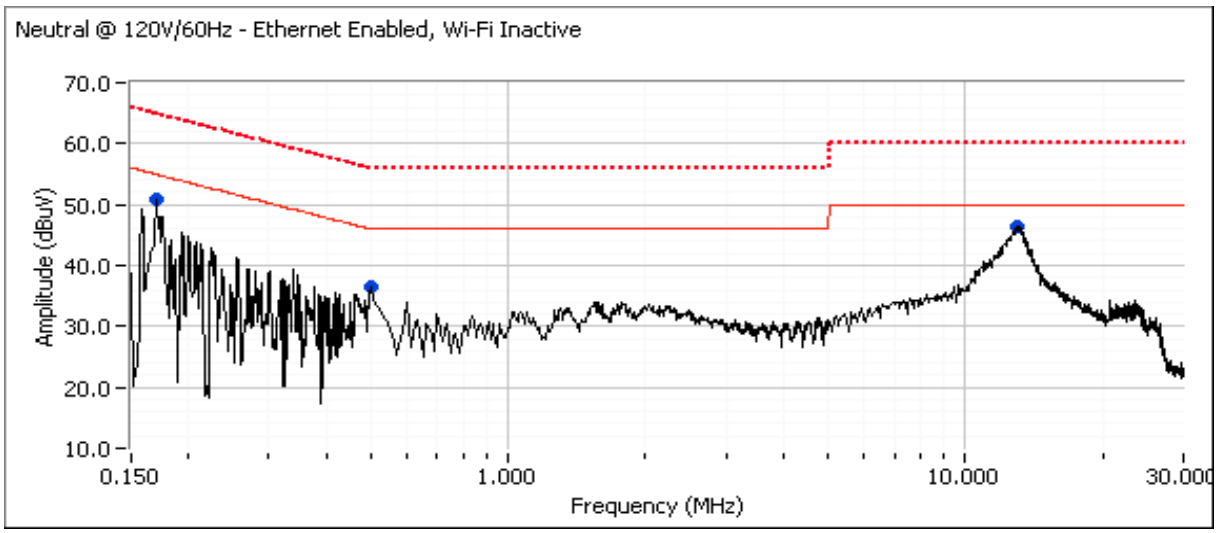
## Deviations From The Standard

No deviations were made from the requirements of the standard.

| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
Ethernet Enabled, Wi-Fi Inactive



| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

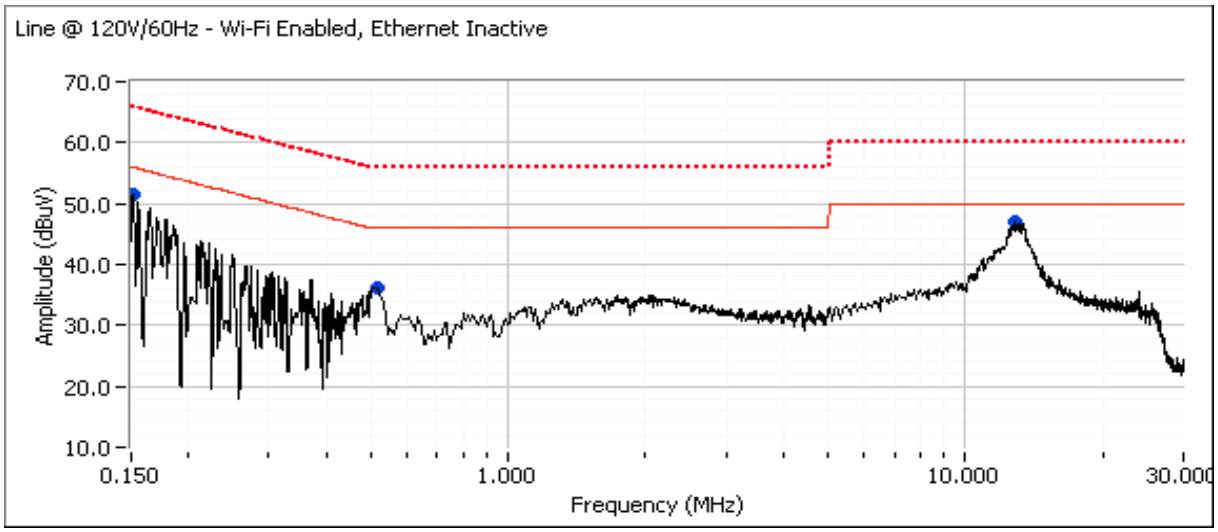
| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 0.152 | 50.1 | Line 1 | 55.8 | -5.7 | Peak | |
| 1.803 | 34.9 | Line 1 | 46.0 | -11.1 | Peak | |
| 13.019 | 47.7 | Line 1 | 50.0 | -2.3 | Peak | |
| 0.170 | 50.9 | Neutral | 54.9 | -4.0 | Peak | |
| 0.500 | 36.4 | Neutral | 46.0 | -9.6 | Peak | |
| 12.868 | 46.3 | Neutral | 50.0 | -3.7 | Peak | |

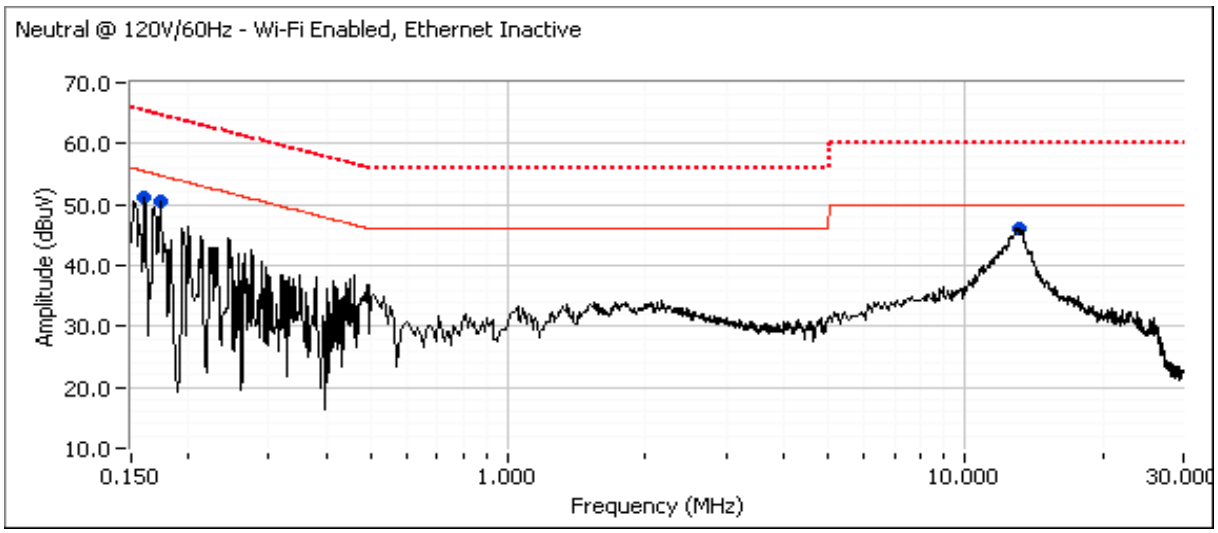
Final quasi-peak and average readings

| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 13.019 | 38.8 | Line 1 | 50.0 | -11.2 | AVG | AVG (0.10s) |
| 12.868 | 38.2 | Neutral | 50.0 | -11.8 | AVG | AVG (0.10s) |
| 0.500 | 32.6 | Neutral | 46.0 | -13.4 | AVG | AVG (0.10s) |
| 13.019 | 44.5 | Line 1 | 60.0 | -15.5 | QP | QP (1.00s) |
| 12.868 | 43.5 | Neutral | 60.0 | -16.5 | QP | QP (1.00s) |
| 1.803 | 27.1 | Line 1 | 46.0 | -18.9 | AVG | AVG (0.10s) |
| 0.500 | 35.9 | Neutral | 56.0 | -20.1 | QP | QP (1.00s) |
| 0.170 | 34.0 | Neutral | 55.0 | -21.0 | AVG | AVG (0.10s) |
| 1.803 | 33.2 | Line 1 | 56.0 | -22.8 | QP | QP (1.00s) |
| 0.170 | 42.2 | Neutral | 65.0 | -22.8 | QP | QP (1.00s) |
| 0.152 | 42.5 | Line 1 | 65.9 | -23.4 | QP | QP (1.00s) |
| 0.152 | 16.9 | Line 1 | 55.9 | -39.0 | AVG | AVG (0.10s) |

| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
Wi-Fi Enabled, Ethernet Inactive



| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

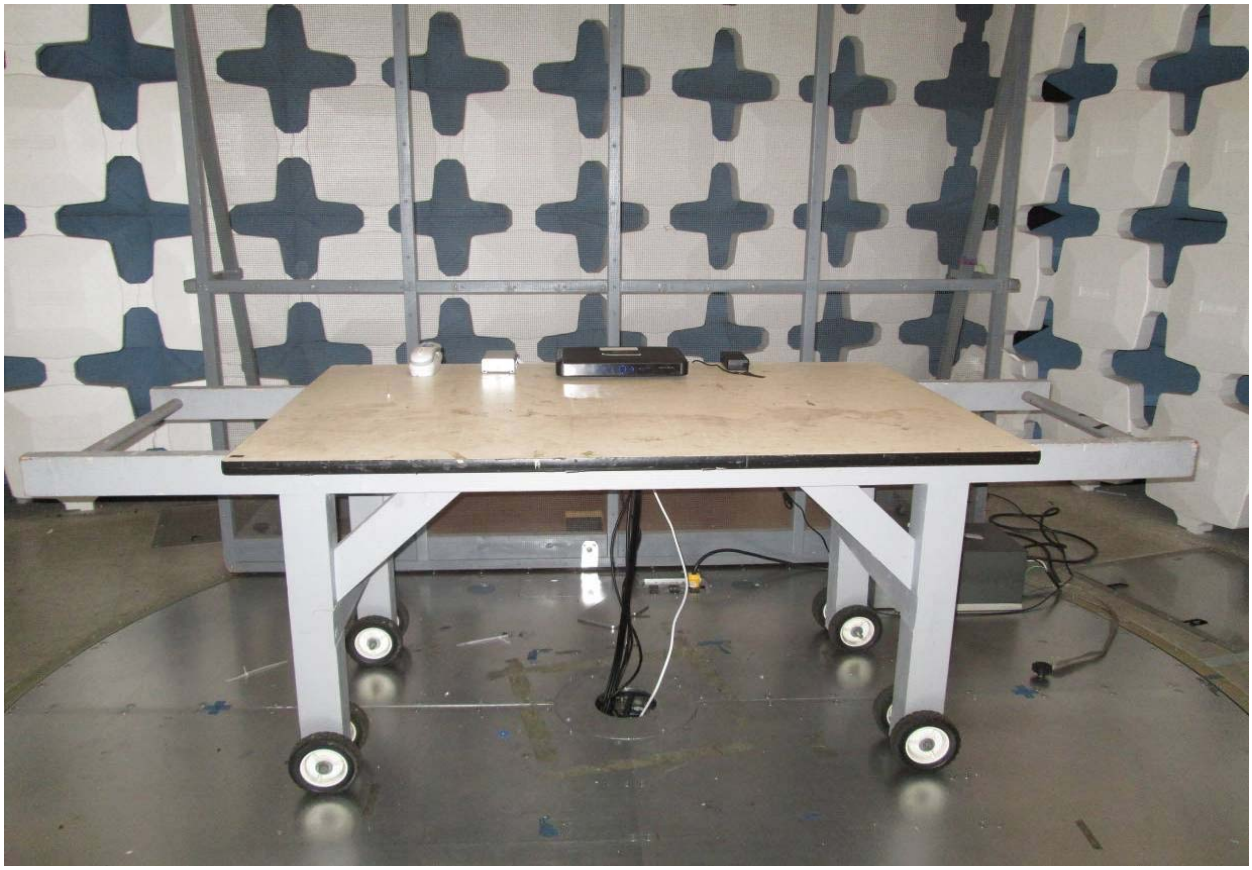
| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 0.153 | 51.5 | Line 1 | 55.9 | -4.4 | Peak | |
| 0.512 | 36.3 | Line 1 | 46.0 | -9.7 | Peak | |
| 12.900 | 47.0 | Line 1 | 50.0 | -3.0 | Peak | |
| 0.160 | 51.1 | Neutral | 55.4 | -4.3 | Peak | |
| 0.172 | 50.4 | Neutral | 54.8 | -4.4 | Peak | |
| 13.130 | 46.0 | Neutral | 50.0 | -4.0 | Peak | |

Final quasi-peak and average readings

| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 12.900 | 38.0 | Line 1 | 50.0 | -12.0 | AVG | AVG (0.10s) |
| 13.130 | 36.9 | Neutral | 50.0 | -13.1 | AVG | AVG (0.10s) |
| 12.900 | 43.4 | Line 1 | 60.0 | -16.6 | QP | QP (1.00s) |
| 0.512 | 29.3 | Line 1 | 46.0 | -16.7 | AVG | AVG (0.10s) |
| 13.130 | 42.6 | Neutral | 60.0 | -17.4 | QP | QP (1.00s) |
| 0.512 | 35.2 | Line 1 | 56.0 | -20.8 | QP | QP (1.00s) |
| 0.172 | 33.6 | Neutral | 54.9 | -21.3 | AVG | AVG (0.10s) |
| 0.153 | 43.0 | Line 1 | 65.8 | -22.8 | QP | QP (1.00s) |
| 0.172 | 41.9 | Neutral | 64.9 | -23.0 | QP | QP (1.00s) |
| 0.160 | 42.4 | Neutral | 65.5 | -23.1 | QP | QP (1.00s) |
| 0.160 | 19.7 | Neutral | 55.5 | -35.8 | AVG | AVG (0.10s) |
| 0.153 | 17.4 | Line 1 | 55.8 | -38.4 | AVG | AVG (0.10s) |

| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Test Configuration Photograph #1
(Conducted Emissions - Power Port)



| | | | |
|---|---|---|---|
| Client: | Pace Americas | Job Number: | J93323 |
| Model: | HR44 | T-Log Number: | T93342 |
| | | Project Manager: | Sheareen Jacobs |
| Contact: | Mark Rieger | Project Coordinator: | Irene Rademacher |
| Standard: | FCC 15.B / FCC 15.C | Class: | B |

Test Configuration Photograph #2
(Conducted Emissions - Power Port)

*End of Report*

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