



FCC PART 15.245



TEST AND MEASUREMENT REPORT

For

Teltron, Inc.

#202 Iplex, 16 Sinseong-Ro, Yusong-Gu,
Daejeon, 305-343 South Korea

FCC ID: XXNTMSM200-1000
Model: TMSM200-1000

| | |
|--|--|
| Report Type: Original Report | Product Type: Motion Sensor |
| Test Engineer: Dennis Huang |  |
| Report Number: R0911233-245 | |
| Report Date: 2009-12-11 | |
| Reviewed By: EMC/RF Supervisor |  |
| Prepared By: (84) | Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164 |

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP*, NIST, or any agency of the Federal Government.

* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*”

TABLE OF CONTENTS

| | | |
|----------|---|-----------|
| 1 | GENERAL INFORMATION..... | 5 |
| 1.1 | PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)..... | 5 |
| 1.2 | EUT MECHANICAL DESCRIPTION..... | 5 |
| 1.3 | EUT PHOTO..... | 5 |
| 1.4 | OBJECTIVE..... | 5 |
| 1.5 | RELATED SUBMITTAL(S)/GRANT(S)..... | 6 |
| 1.6 | TEST METHODOLOGY..... | 6 |
| 1.7 | MEASUREMENT UNCERTAINTY..... | 6 |
| 1.8 | TEST FACILITY..... | 6 |
| 2 | SYSTEM TEST CONFIGURATION..... | 7 |
| 2.1 | JUSTIFICATION..... | 7 |
| 2.2 | EUT EXERCISE SOFTWARE..... | 7 |
| 2.3 | SPECIAL ACCESSORIES..... | 7 |
| 2.4 | EQUIPMENT MODIFICATIONS..... | 7 |
| 2.5 | LOCAL SUPPORT EQUIPMENT..... | 7 |
| 2.6 | EUT INTERNAL CONFIGURATION AND DETAILS..... | 7 |
| 2.7 | INTERFACE PORTS AND CABLING..... | 7 |
| 3 | SUMMARY OF TEST RESULTS..... | 8 |
| 4 | FCC §15.207– CONDUCTED EMISSIONS..... | 9 |
| 4.1 | APPLICABLE STANDARD..... | 9 |
| 4.2 | EUT SETUP..... | 9 |
| 4.3 | TEST SETUP BLOCK DIAGRAM..... | 10 |
| 4.4 | TEST EQUIPMENT LIST AND DETAILS..... | 10 |
| 4.5 | TEST PROCEDURE..... | 10 |
| 4.6 | TEST ENVIRONMENTAL CONDITIONS..... | 10 |
| 4.7 | SUMMARY OF TEST RESULTS..... | 11 |
| 4.8 | CONDUCTED EMISSIONS TEST PLOTS AND DATA..... | 11 |
| 5 | FCC §15.245 (B) – FIELD STRENGTH OF FUNDAMENTAL..... | 14 |
| 5.1 | APPLICABLE STANDARDS..... | 14 |
| 5.2 | TEST SETUP..... | 14 |
| 5.3 | TEST ENVIRONMENTAL CONDITIONS..... | 14 |
| 5.4 | TEST EQUIPMENT LIST AND DETAILS..... | 14 |
| 5.5 | TEST PROCEDURE..... | 15 |
| 5.6 | CORRECTED AMPLITUDE & MARGIN CALCULATION..... | 15 |
| 5.7 | SUMMARY OF TEST RESULTS..... | 15 |
| 5.8 | TEST RESULTS..... | 15 |
| 6 | FCC §15.245 (B) – FIELD STRENGTH OF HARMONICS & OUT OF BAND EMISSIONS..... | 16 |
| 6.1 | APPLICABLE STANDARDS..... | 16 |
| 6.2 | TEST SETUP..... | 17 |
| 6.3 | TEST ENVIRONMENTAL CONDITIONS..... | 17 |
| 6.4 | TEST EQUIPMENT LIST AND DETAILS..... | 18 |
| 6.5 | TEST PROCEDURE..... | 18 |
| 6.6 | CORRECTED AMPLITUDE & MARGIN CALCULATION..... | 18 |
| 6.7 | TEST DIAGRAM..... | 19 |
| 6.8 | SUMMARY OF TEST RESULTS..... | 19 |
| 6.9 | TEST RESULTS..... | 20 |

| | | |
|----------|--|-----------|
| 7 | EXHIBIT A – FCC EQUIPMENT LABELING REQUIREMENTS | 22 |
| 7.1 | FCC ID LABEL REQUIREMENT | 22 |
| 7.2 | FCC ID LABEL CONTENT | 22 |
| 7.3 | SUGGESTED FCC LABEL LOCATION | 22 |
| 8 | EXHIBIT B – EUT SETUP PHOTOGRAPHS | 23 |
| 8.1 | CONDUCTED EMISSIONS – FRONT VIEW | 23 |
| 8.2 | CONDUCTED EMISSIONS – SIDE VIEW | 23 |
| 8.3 | 30 MHz – 1 GHz RADIATED EMISSIONS – FRONT VIEW | 24 |
| 8.4 | 30 MHz – 1 GHz RADIATED EMISSIONS – REAR VIEW | 24 |
| 8.5 | 1 GHz TO 18 GHz RADIATED EMISSIONS - FRONT VIEW | 25 |
| 8.6 | 1 GHz TO 18 GHz RADIATED EMISSIONS - REAR VIEW | 25 |
| 8.7 | 18 GHz TO 26.5 GHz RADIATED EMISSIONS - FRONT VIEW | 26 |
| 8.8 | 18 GHz TO 26.5 GHz RADIATED EMISSIONS – REAR VIEW | 26 |
| 8.9 | 26.5 GHz TO 40 GHz RADIATED EMISSIONS – FRONT VIEW | 27 |
| 8.10 | 26.5 GHz TO 40 GHz RADIATED EMISSIONS - REAR VIEW | 27 |
| 8.11 | 40 GHz TO 60 GHz RADIATED EMISSIONS - FRONT VIEW | 28 |
| 8.12 | 40 GHz TO 60 GHz RADIATED EMISSIONS - REAR VIEW | 28 |
| 8.13 | 60 GHz TO 90 GHz RADIATED EMISSIONS - FRONT VIEW | 29 |
| 8.14 | 60 GHz TO 90 GHz RADIATED EMISSIONS - REAR VIEW | 29 |
| 8.15 | 90 GHz TO 120 GHz RADIATED EMISSIONS - FRONT VIEW | 30 |
| 8.16 | 90 GHz TO 120 GHz RADIATED EMISSIONS - REAR VIEW | 30 |
| 9 | EXHIBIT C - EUT PHOTOGRAPHS | 31 |
| 9.1 | EUT – TOP VIEW | 31 |
| 9.2 | EUT – BOTTOM VIEW | 31 |
| 9.3 | EUT – SIDE VIEW 1 | 32 |
| 9.4 | EUT – SIDE VIEW 2 | 32 |
| 9.5 | EUT – COVER OFF VIEW | 33 |
| 9.6 | EUT – ALL PCB ASSEMBLY TOP VIEW | 33 |
| 9.7 | EUT – ALL PCB ASSEMBLY BOTTOM VIEW | 34 |
| 9.8 | EUT – PCB ASSEMBLY-1 TOP VIEW | 34 |
| 9.9 | EUT – PCB ASSEMBLY-1 BOTTOM VIEW | 35 |
| 9.10 | EUT – PCB ASSEMBLY-1 BOTTOM VIEW (WITHOUT SHIELDING) | 35 |
| 9.11 | EUT – PCB ASSEMBLY-2 TOP VIEW (WITHOUT PCB ASSEMBLY-1) | 36 |

DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|------------------------|----------------------|--------------------------------|-------------------------|
| 0 | R0911233-245 | Original Report | 2009-12-11 |

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

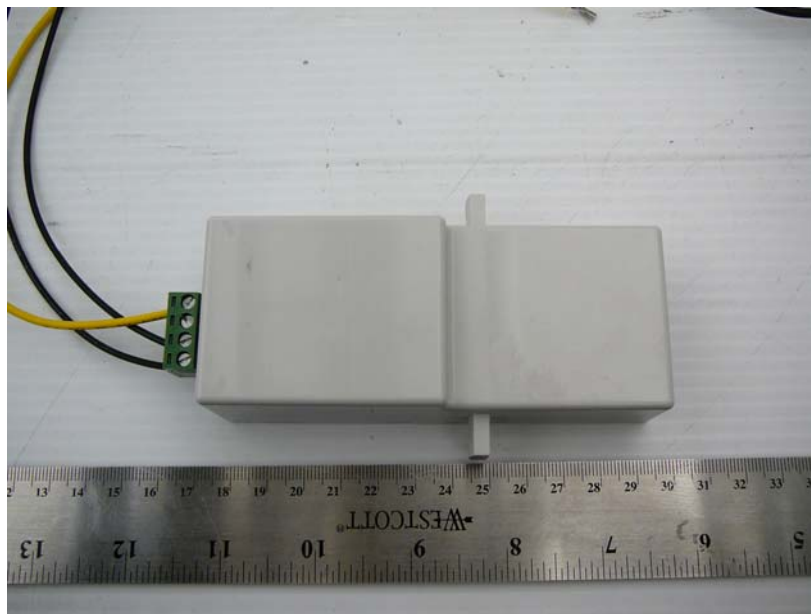
This test and measurement report was prepared on behalf of *Teltron Inc.* and their product, *Model: TMSM200-1000, FCC ID: XXNTMSM200-1000* or the “EUT” as referred to in this report. The EUT is a microwave sensor that detects minute motion of human bodies and reflective objects. It is operated by an AC source and automatically turns on and off of electric instruments; including lamps. It operates in a single frequency; the output frequency of the motion sensor has a tolerance of 10525 ± 25 MHz.

1.2 EUT Mechanical Description

The *EUT* measures approximately 116mm (L) x 45mm (W) x 35mm (H), weighing approximately 156g.

* *The test data gathered are from production samples provided by the manufacturer, serial numbers: R0911233-1 assigned by BACL.*

1.3 EUT Photo



Additional photos in exhibit C

1.4 Objective

This type approval report is prepared on behalf of *Teltron Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, and C.

1.5 Related Submittal(s)/Grant(s)

N/A

1.6 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003.

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from ± 2.0 for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

1.8 Test Facility

The semi-anechoic chambers used by BACL to collect radiated and conducted emissions measurement data is located in the building at it's facility in Sunnyvale, California, USA.

BACL's test sites have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the testing mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

N/A

2.3 Special Accessories

There were no special accessories were required, included, or intended for use with EUT during these tests.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

No Local Support Equipment used.

2.6 EUT Internal Configuration and Details

| Manufacturers | Descriptions | Models | Serial Numbers |
|---------------|--------------|------------|----------------|
| Teltron Inc. | PCB Board-1 | - | M1-4 |
| Teltron Inc. | PCB Board-2 | Auto on II | 091021 |

2.7 Interface Ports and Cabling

| Cable Descriptions | Length (m) | From | To |
|--------------------|------------|------|---------|
| Power Cable | < 1m | EUT | AC Main |

3 SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Results |
|------------------|--|----------------|
| §15.207 | Conducted Emissions | Compliant |
| §15.245 (b) | Field Strength of Fundamental | Compliant |
| §15.245 (b) | Field Strength of Harmonics | Compliant |
| §15.245 (b)(3) | Radiated Emissions: Out of Band Emission | Compliant |

4 FCC §15.207– CONDUCTED EMISSIONS

4.1 Applicable Standard

As per FCC §15.207: Conducted Limits

- (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 Range (MHz) | Limits (dB μ V) | |
|-----------------------|---------------------|-----------|
| | Quasi-Peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.5 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

- (b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- (1) For carrier current system containing their fundamental emission within the frequency band 535–1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
- (2) For all other carrier current systems: 1000 μ V within the frequency band 535–1705 kHz, as measured using a 50 μ H/50 ohms LISN.
- (3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

- (c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

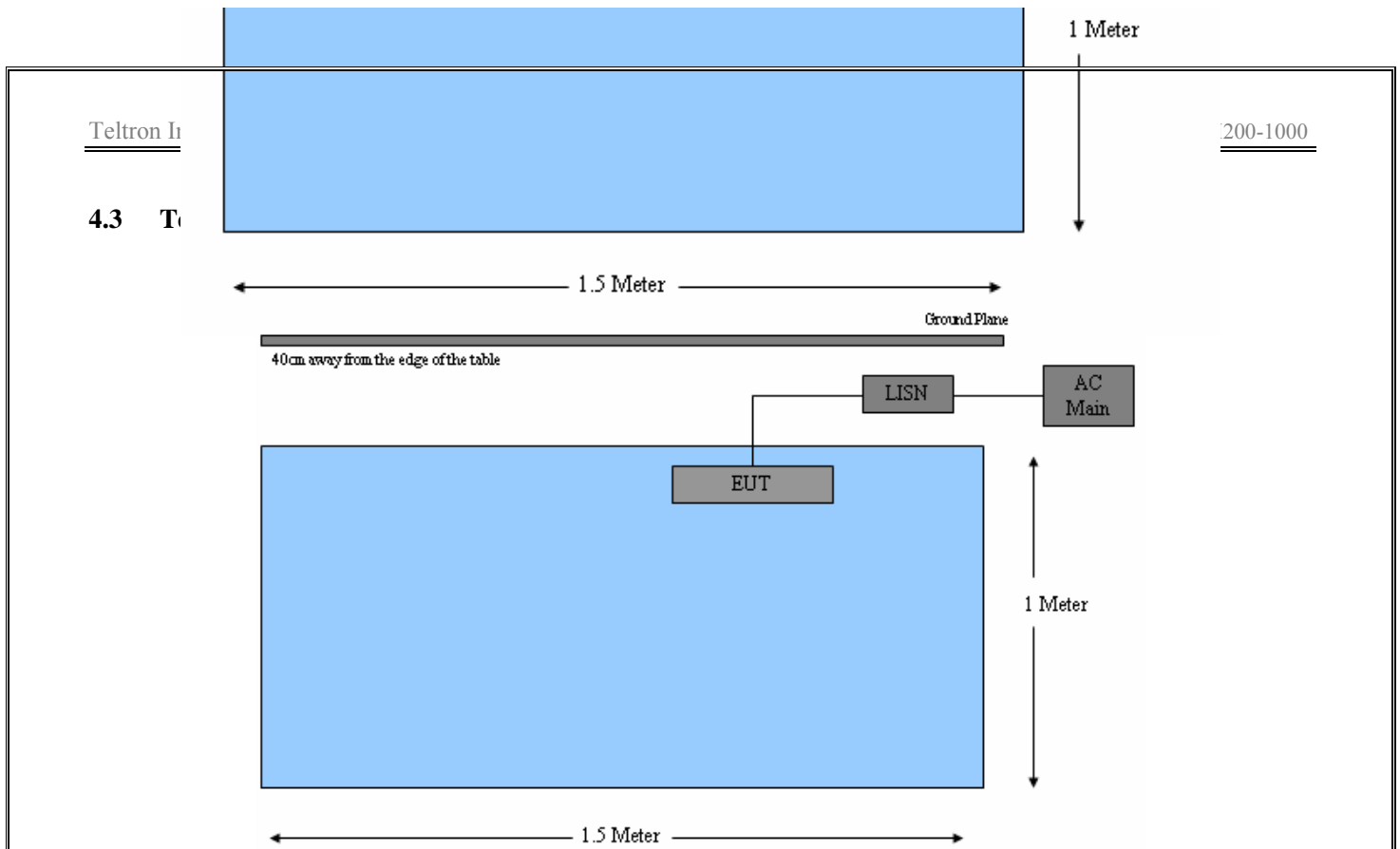
4.2 EUT Setup

The conducted emissions tests were performed in the 5-meter test chamber, using the setup in accordance with ANSI C63.4-2003 measurement procedures. The specifications used were in accordance with FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled as required.

The EUT was connected to a 120 V, 60 Hz AC line power source.



4.4 Test Equipment List and Details

| Manufacturers | Descriptions | Model Number | Serial Number | Calibration Dates |
|-------------------|-------------------|-------------------|---------------|-------------------|
| Solar Electronics | LISN | 9252-R-24-BNC | 511205 | 2009-06-09 |
| Rohde & Schwarz | EMI Test Receiver | ESCI 1166.5950K03 | 100338 | 2009-02-28 |

4.5 Test Procedure

During the conducted emissions test, the power cord of the Host was connected to the main outlet of the LISN. Maximization procedure was performed on the six (6) highest emission readings from the EUT.

4.6 Test Environmental Conditions

| | |
|---------------------------|----------|
| Temperature: | 22.5° C |
| Relative Humidity: | 43% |
| ATM Pressure: | 107.9kPa |

*Testing was performed by Dennis Huang on 2009-12-01 in 5 meter chamber 3.

4.7 Summary of Test Results

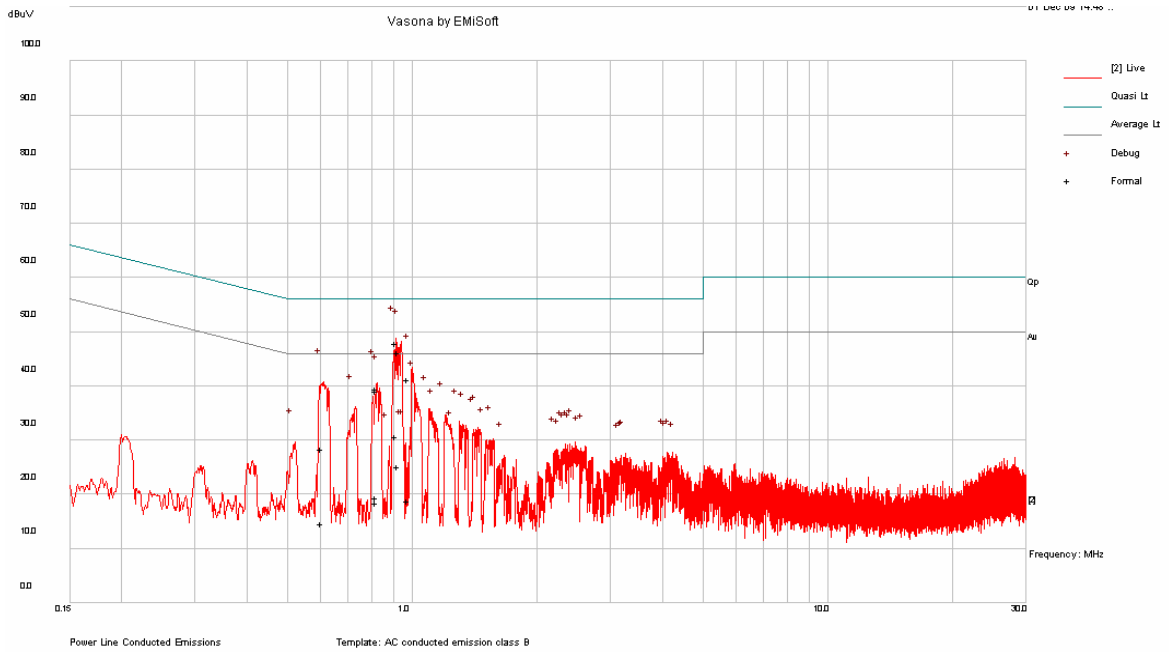
According to the recorded data, the EUT complied with FCC Part 15.207 limits, and had the worst margin reading of:

| Mode: 120 V/ 60 Hz | | | |
|---------------------------|------------------------|--------------------------------------|--------------------|
| Margin (dB) | Frequency (MHz) | Conductor Mode (Line/Neutral) | Range (MHz) |
| -8.09 | 0.929193 | Line | 0.15-30 |
| -7.76 | 0.936237 | Neutral | 0.15-30 |

4.8 Conducted Emissions Test Plots and Data

Please refer to the following plots and tables.

120 V, 60 Hz – Line



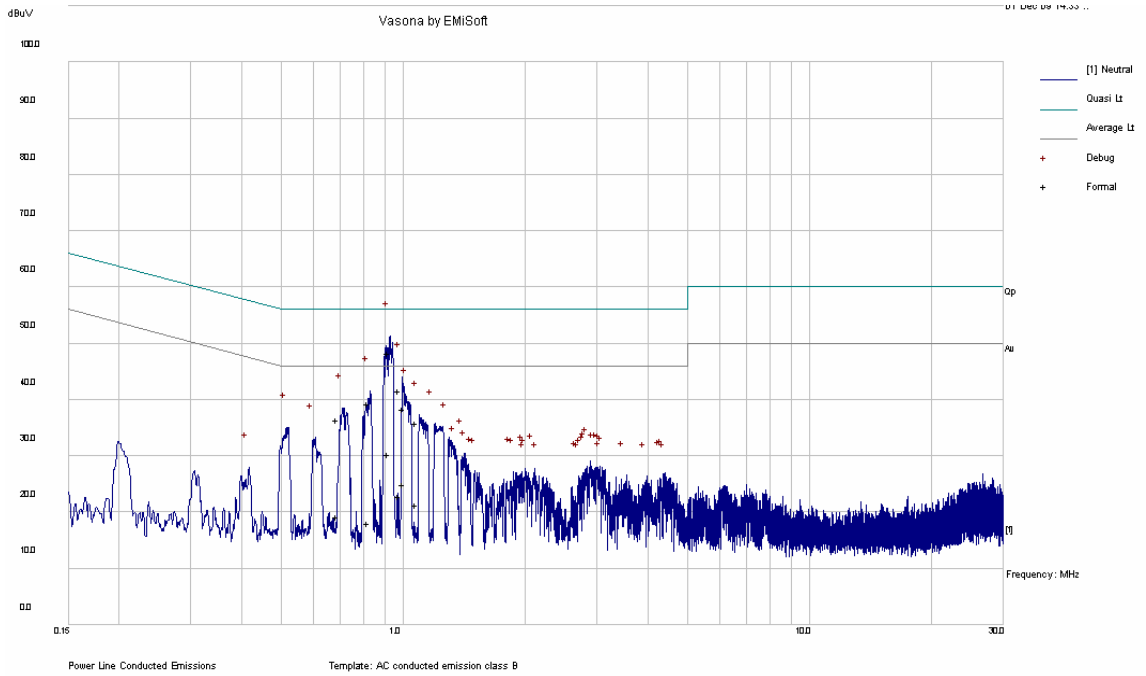
Quasi-Peak Measurements

| Frequency (MHz) | Cord. Quasi-Peak Amplitude (dBuV) | Conductor (L/N) | Limit (dBuV) | Margin (dB) |
|-----------------|-----------------------------------|-----------------|--------------|-------------|
| 0.929193 | 47.91 | L | 56 | -8.09 |
| 0.941082 | 46.26 | L | 56 | -9.74 |
| 0.994029 | 41.17 | L | 56 | -14.83 |
| 0.616107 | 28.43 | L | 56 | -27.57 |
| 0.835569 | 39.12 | L | 56 | -16.88 |
| 0.83475 | 39.46 | L | 56 | -16.54 |

Average Measurements

| Frequency (MHz) | Cord. Average Amplitude (dBuV) | Conductor (L/N) | Limit (dBuV) | Margin (dB) |
|-----------------|--------------------------------|-----------------|--------------|-------------|
| 0.929193 | 30.75 | L | 46 | -15.25 |
| 0.941082 | 25.17 | L | 46 | -20.83 |
| 0.994029 | 18.73 | L | 46 | -27.27 |
| 0.616107 | 14.61 | L | 46 | -31.39 |
| 0.835569 | 18.52 | L | 46 | -27.48 |
| 0.83475 | 19.42 | L | 46 | -26.58 |

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

| Frequency (MHz) | Cord. Quasi-Peak Amplitude (dBuV) | Conductor (L/N) | Limit (dBuV) | Margin (dB) |
|-----------------|-----------------------------------|-----------------|--------------|-------------|
| 0.936237 | 48.24 | N | 56 | -7.76 |
| 0.993699 | 41.61 | N | 56 | -14.39 |
| 0.836226 | 39.24 | N | 56 | -16.76 |
| 1.019541 | 38.35 | N | 56 | -17.65 |
| 0.702477 | 36.51 | N | 56 | -19.49 |
| 1.096698 | 35.85 | N | 56 | -20.15 |

Average Measurements

| Frequency (MHz) | Cord. Average Amplitude (dBuV) | Conductor (L/N) | Limit (dBuV) | Margin (dB) |
|-----------------|--------------------------------|-----------------|--------------|-------------|
| 0.936237 | 30.24 | N | 46 | -15.76 |
| 0.993699 | 22.89 | N | 46 | -23.11 |
| 0.836226 | 17.97 | N | 46 | -28.03 |
| 1.019541 | 24.91 | N | 46 | -21.09 |
| 0.702477 | 19.27 | N | 46 | -26.73 |
| 1.096698 | 21.28 | N | 46 | -24.72 |

5 FCC §15.245 (b) – FIELD STRENGTH OF FUNDAMENTAL

5.1 Applicable standards

Per FCC §15.245 Operation within the bands 902–928 MHz, 2435–2465 MHz, 5785–5815 MHz, 10500–10550 MHz, and 24075–24175 MHz.

(a) Operation under the provisions of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency (MHz) | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (millivolts/meter) |
|-----------------------------|--|--|
| 902–928 | 500 | 1.6 |
| 2435–2465 | 500 | 1.6 |
| 5785–5815 | 500 | 1.6 |
| 10500–10550 | 2500 | 25.0 |
| 24075–24175 | 2500 | 25.0 |

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209.

5.2 Test Setup

The radiated emissions tests were performed in the 3-meter semi-anechoic chamber test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

5.3 Test Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 24 °C |
| Relative Humidity: | 45 % |
| ATM Pressure: | 102.1kPa |

*Testing was performed by Dennis Huang on 2009-11-23.

5.4 Test Equipment List and Details

| Manufacturers | Description | Model Numbers | Serial Numbers | Calibration Dates |
|---------------|-------------------------------|---------------|----------------|-------------------|
| HP | Pre, Amplifier (1~18 GHz) | 8449B | 3147A00400 | 2009-10-22 |
| A. R.A | Antenna, Horn, DRG (1~18 GHz) | DRG-118/A | 1132 | 2009-09-23 |
| Agilent | Analyzer, Spectrum | E4440A | MY44303352 | 2009-04-27 |

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

5.5 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "QP" in the data table.

5.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Cable Loss} + \text{Attenuator Factor}$$

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10dB)

The "Margin" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit, the equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

5.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15.245 limits, and had the worst margin of:

-33.36 dB @ 10525 MHz in the **Vertical** polarization

The provisions in §15.35 for limiting peak emissions apply, Please refer to the following tables for full test results

5.8 Test Results

Fundamental Frequency = 10525 MHz (Measured at 3 meter)

| Freq. (MHz) | S.A. Reading (dBuV) | Azimuth (Degrees) | Test Antenna | | | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Comments |
|-------------|---------------------|-------------------|--------------|-------------|---------------|-----------------|--------------------|---------------------|----------------|-------------|----------|
| | | | Height (m) | Polar (H/V) | Factor (dB/m) | | | | | | |
| 10525 | 79.08 | 276 | 1.23 | V | 40.1 | 11.9 | 36.21 | 94.87 | 148 | -53.13 | Peak |
| 10525 | 72.83 | 4 | 1.31 | H | 40.1 | 11.9 | 36.21 | 88.62 | 148 | -59.38 | Peak |
| 10525 | 78.85 | 276 | 1.23 | V | 40.1 | 11.9 | 36.21 | 94.64 | 128 | -33.36 | Ave. |
| 10525 | 72.46 | 4 | 1.31 | H | 40.1 | 11.9 | 36.21 | 88.25 | 128 | -39.75 | Ave. |

6 FCC §15.245 (b) – FIELD STRENGTH OF HARMONICS & OUT OF BAND EMISSIONS

6.1 Applicable Standards

Per § 15.245, operation within the bands 902–928 MHz, 2435–2465 MHz, 5785–5815 MHz, 10500–10550 MHz, and 24075–24175 MHz

(a) Operation under the provisions of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency (MHz) | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (millivolts/meter) |
|-----------------------------|--|--|
| 902–928 | 500 | 1.6 |
| 2435–2465 | 500 | 1.6 |
| 5785–5815 | 500 | 1.6 |
| 10500–10550 | 2500 | 25.0 |
| 24075–24175 | 2500 | 25.0 |

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209.

Per §15.205 Restricted bands of operation

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

| (MHz) | (MHz) | (MHz) | (MHz) | (MHz) | (GHz) | (GHz) |
|-------------------|---------------------|-----------------------|-------------------|-----------------|----------------|---------------|
| 0.090 – 0.110 | 8.291 – 8.294 | 16.69475 – 16.69525 | 156.7 – 156.9 | 1435 – 1626.5 | 3.332 – 3.339 | 10.6 – 12.7 |
| 0.495 – 0.505 | 8.362 – 8.366 | 25.5 – 25.67 | 162.0125 – 167.17 | 1645.5 – 1646.5 | 3.3458 – 3.358 | 13.25 – 13.4 |
| 2.1735 – 2.1905 | 8.37625 – 8.38675 | 37.5 – 38.25 | 167.72 – 173.2 | 1660 – 1710 | 3.600 – 4.400 | 14.47 – 14.5 |
| 4.125 – 4.128 | 8.41425 – 8.41475 | 73 – 74.6 | 240 – 285 | 1718.8 – 1722.2 | 4.5 – 5.15 | 15.35 – 16.2 |
| 4.17725 – 4.17775 | 12.29 – 12.293 | 74.8 – 75.2 | 322 – 335.4 | 2200 – 2300 | 5.35 – 5.46 | 17.7 – 21.4 |
| 4.20725 – 4.20775 | 12.51975 – 12.52025 | 108 – 121.94 | 399.9 – 410 | 2310 – 2390 | 7.25 – 7.75 | 22.01 – 23.12 |
| 6.215 – 6.218 | 12.57675 – 12.57725 | 123 – 138 | 608 – 614 | 2483.5 – 2500 | 8.025 – 8.5 | 23.6 – 24.0 |
| 6.26775 – 6.26825 | 13.36 – 13.41 | 149.9 – 150.05 | 960 – 1240 | 2690 – 2900 | 9.0 – 9.2 | 31.2 – 31.8 |
| 6.31175 – 6.31225 | 16.42 – 16.423 | 156.52475 – 156.52525 | 1300 – 1427 | 3260 – 3267 | 9.3 – 9.5 | 36.43 – 36.5 |
| | | | | | | Above 38.6 |

(b) Except as provided in 15.205 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.

(c) Except as provided in paragraphs (d) and (e), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

Per FCC §15.209 Radiated emission limits, general requirements.

(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) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009 - 0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30 - 88 | 100 ** | 3 |
| 88 - 216 | 150 ** | 3 |
| 216 - 960 | 200 ** | 3 |
| Above 960 | 500 | 3 |

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

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

6.2 Test Setup

The radiated emissions tests were performed in the 3-meter semi-anechoic chamber test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

6.3 Test Environmental Conditions

| | |
|--------------------|----------|
| Temperature: | 24 °C |
| Relative Humidity: | 45 % |
| ATM Pressure: | 102.1kPa |

*Testing was performed by Dennis Huang on 2009-12-01 at 3 meter 3 chamber.

6.4 Test Equipment List and Details

| Manufacturers | Description | Model Number | Serial Number | Calibration Dates |
|----------------|---|-----------------|---------------|-------------------|
| HP | Pre-Amplifier | 8447D | 2944A06639 | 2009-06-05 |
| Sunol Sciences | EMI Test Receiver | 1166.5950.03 | 100044 | 2009-04-15 |
| Sunol Sciences | Antenna | JB1 | A020106-1 | 2009-04-17 |
| HP | Pre, Amplifier (1~18 GHz) | 8449B | 3147A00400 | 2009-10-22 |
| A. R.A | Antenna, Horn, DRG (1~18 GHz) | DRG-118/A | 1132 | 2009-09-23 |
| Wise Wave | Antenna, Horn, (18~26.5 GHz) | ARH-4223-02 | 10555-02 | 2009-05-16 |
| Wise Wave | Pre, Amplifier (18~26.5 GHz) | ALN-22093530-01 | 12263-01 | 2009-03-11 |
| Wise Wave | Antenna, Horn, (26.5~40 GHz) | 2823-02 | 10555-01 | 2009-05-16 |
| Wise Wave | Pre, Amplifier (26.5~40 GHz) | ALN-33144130-01 | 11424-01 | 2009-03-11 |
| OML | WR-12 Harmonic Mixer with Horn Antenna (60~90 GHz) | M12HWD | E60120-1 | 2009-03-11 |
| OML | WR-12 Harmonic Mixer with Horn Antenna (90~140 GHz) | M08HWD | F60313-1 | 2009-03-11 |
| OML | Diplexer for Agilent Spectrum Analyzer | DPL26 | N/A | N/A |
| Agilent | Analyzer, Spectrum | E4440A | MY44303352 | 2009-04-27 |

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

6.5 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak and Quasi-Peak detection mode for frequencies below 1 GHz, peak and Average detection mode for frequencies above 1 GHz.

6.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Loss, and Attenuator Factor adding to the Indicated Reading. The basic equation is as follows:

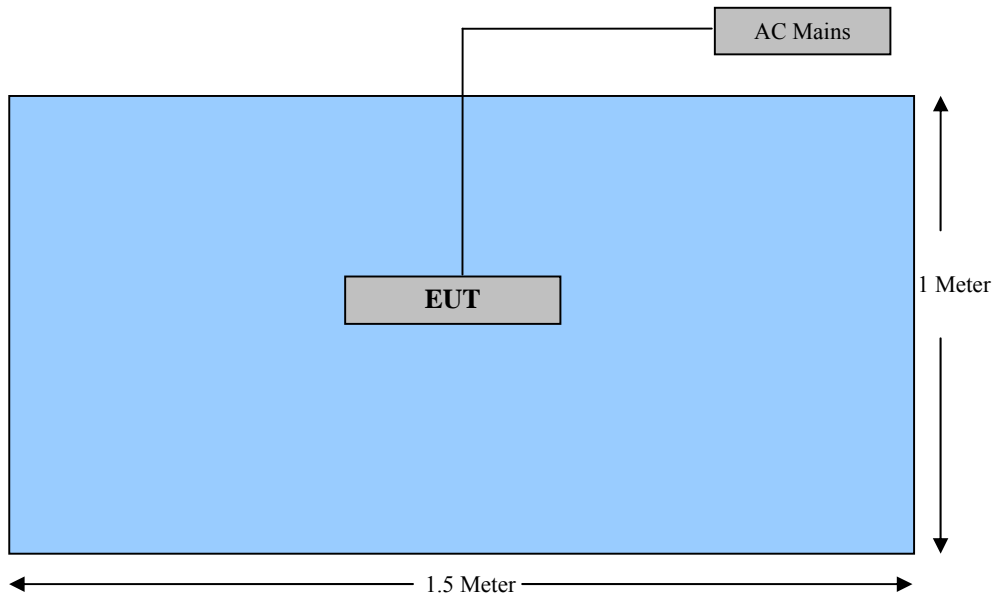
$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Cable Loss} + \text{Attenuator Factor}$$

For example, a Corrected Amplitude of 34.08 dBuV/m = Indicated Reading (23.85 dBuV) + Cable Factor (0.22 dB) + Attenuator Factor (10dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit, the equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

6.7 Test Diagram



6.8 Summary of Test Results

Fundamental Frequency = 10525 MHz

Worst case reading as follows measured at 3 meters:

30 MHz to 1 GHz: **-22.06 dB at 33.03672 MHz in the Vertical Polarization**

1GHz – 18 GHz: Emissions are at noise floor level.

Above 18 GHz

(Measured at 1Meter): **-35.84 dB at 21066 MHz in the Vertical Polarization**

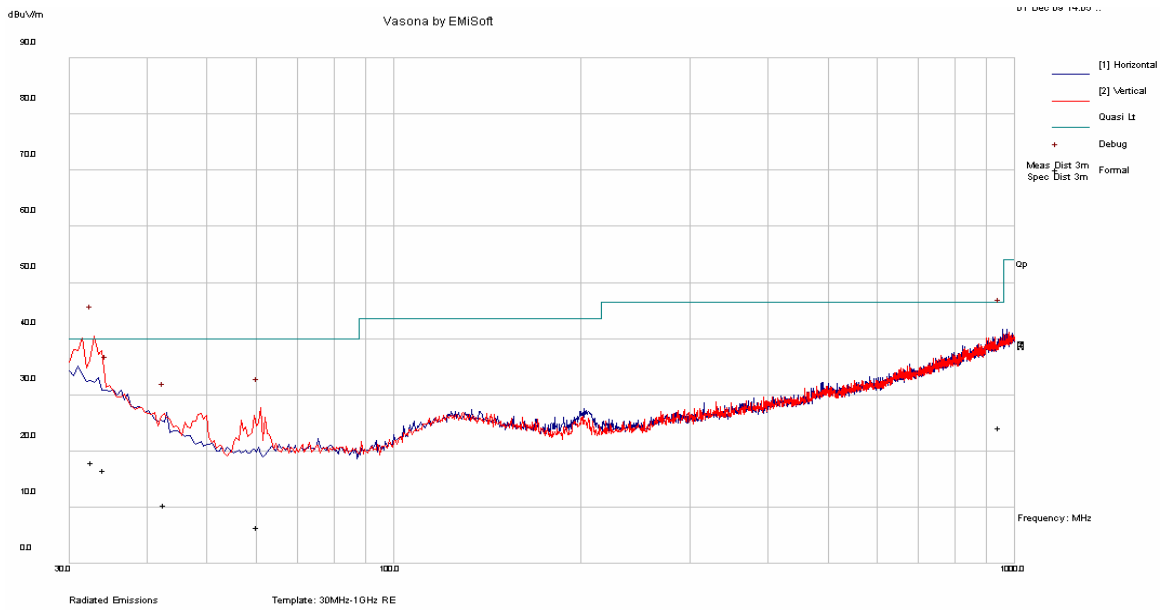
Band Edge: **-11.24 dB at 10500 MHz in the Horizontal Polarization**

Please refer to the following tables for full test results

6.9 Test Results

30 to 1000 MHz:

(Measured at 3 meters)



Quasi-Peak Measurements

| Frequency (MHz) | Corrected Quasi-Peak (dBµV/m) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dBµV/m) | Margin (dB) |
|-----------------|-------------------------------|---------------------|------------------------|-----------------------------|----------------|-------------|
| 33.03672 | 17.94 | 121 | V | 68 | 40.0 | -22.06 |
| 956.02940 | 24.15 | 396 | H | 360 | 46.5 | -22.35 |
| 34.64144 | 16.63 | 131 | V | 281 | 40.0 | -23.37 |
| 61.15136 | 6.48 | 166 | V | 320 | 40.0 | -33.52 |
| 43.24260 | 10.47 | 139 | H | 318 | 40.0 | -29.53 |

1 to 18 GHz:

(Measured at 3 meter)

| Frequency (MHz) | S.A. Reading (dBuV) | Detector (PK/AV) | Azimuth (Degree) | Test Antenna | | | Cable Loss (dB) | Pre-Amp. Gain (dB) | Duty Cycle Factor (dB) | Cord. Amp. (dBuV/m) | Part 15.245 | |
|-----------------|---------------------|------------------|------------------|--------------|-------------|---------------|-----------------|--------------------|------------------------|---------------------|----------------|-------------|
| | | | | Height (m) | Polar (H/V) | Factor (dB/m) | | | | | Limit (dBuV/m) | Margin (dB) |
| - | - | - | - | - | - | - | - | - | - | - | - | _* |

* Emissions are at noise floor level

Above 18 GHz:

(Measured at 1 meter)

| Frequency (MHz) | S.A. Reading (dBuV) | Azimuth (Degree) | Test Antenna | | | Cable Loss (dB) | Pre-Amp. Gain (dB) | Distance Factor (dB) | Cord. Amp. (dBuV/m) | Part 15.245 | | Comment |
|-----------------|---------------------|------------------|--------------|-------------|---------------|-----------------|--------------------|----------------------|---------------------|----------------|-------------|---------|
| | | | Height (m) | Polar (H/V) | Factor (dB/m) | | | | | Limit (dBuV/m) | Margin (dB) | |
| 21066 | 62.99 | 274 | 1.0 | V | 33.6 | 8.75 | 42.87 | -9.54 | 52.93 | 108 | -55.07 | Peak |
| 21066 | 58.16 | 115 | 1.0 | H | 33.6 | 8.75 | 42.87 | -9.54 | 48.10 | 108 | -59.90 | Peak |
| 21066 | 62.22 | 274 | 1.0 | V | 33.6 | 8.75 | 42.87 | -9.54 | 52.16 | 88 | -35.84 | Ave |
| 21066 | 56.71 | 115 | 1.0 | H | 33.6 | 8.75 | 42.87 | -9.54 | 46.65 | 88 | -41.35 | Ave |

*Other emissions are at noise floor level.

Band Edge (10500 - 10550 MHz):

(Measured at 3 meter)

| Frequency (MHz) | S.A. Reading (dBuV) | Azimuth (Degree) | Test Antenna | | | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dBuV/m) | Part 15.245/209 | | Comments |
|-----------------|---------------------|------------------|--------------|-------------|-------------|-----------------|--------------------|---------------------|-----------------|-------------|----------|
| | | | Height (m) | Polar (H/V) | Factor (dB) | | | | Limit (dBuV/m) | Margin (dB) | |
| 10500 | 26.97 | 360 | 1.0 | H | 40.1 | 11.9 | 36.21 | 42.76 | 54 | -11.24 | Ave |
| 10500 | 26.95 | 360 | 1.0 | V | 40.1 | 11.9 | 36.21 | 42.74 | 54 | -11.26 | Ave |
| 10550 | 26.94 | 360 | 1.0 | V | 40.1 | 11.9 | 36.21 | 42.73 | 54 | -11.27 | Ave |
| 10550 | 26.9 | 360 | 1.0 | H | 40.1 | 11.9 | 36.21 | 42.69 | 54 | -11.31 | Ave |
| 10550 | 41.57 | 360 | 1.0 | V | 40.1 | 11.9 | 36.21 | 57.36 | 74 | -16.64 | Peak |
| 10500 | 40.42 | 360 | 1.0 | V | 40.1 | 11.9 | 36.21 | 56.21 | 74 | -17.79 | Peak |
| 10550 | 40.2 | 360 | 1.0 | H | 40.1 | 11.9 | 36.21 | 55.99 | 74 | -18.01 | Peak |
| 10500 | 38.64 | 360 | 1.0 | H | 40.1 | 11.9 | 36.21 | 54.43 | 74 | -19.57 | Peak |