# Emissions Test Report

**EUT Name:** LAN Option Board

**EUT Model:** ILC2

**FCC ID** QZC-ILC2

FCC Title 47, Part 15, SubpartC, RSS-210 Issue 7

*Prepared for:*

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*Report/Issue Date:* 9 October 2007
*Report Number:* 30862813PC.001

# Statement of Compliance

| | |
|---|---|
| *Manufacturer:* | Elster Electricity, LLC<br>208 South Rogers Lane<br>Raleigh, NC 27610<br>919 212-4700 |
| *Requester / Applicant:* | John Holt |
| *Name of Equipment:* | LAN Option Board |
| *Operation Frequency Range* | 902.4 MHz to 927.6 MHz |
| *Type of Equipment:* | Intentional Radiator |
| *Application of Regulations:* | FCC Title 47, Part 15, SubpartC, RSS-210 Issue 7 |
| *Test Dates:* | 09 October 2008 to 09 October 2008 |

*Guidance Documents:*

Emissions: FCC 47 CFR Part 15, RSS-210 Issue 7

*Test Methods:*

Emissions: ANSI C63.4:2003

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland of North America, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

Pamela Sequeira
2008.10.23
15:27:43 -04'00'

NVLAP Signatory

23 October 2008

Date

200094-0

90552 and 100881

Industry Canada

IC3755

# 1 Executive Summary

## 1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Title 47, Part 15, SubpartC, RSS-210 Issue 7 based on the results of testing performed on *09 October* 2008 through *09 October 2008* on the *LAN Option Board* Model No. *ILC2* manufactured by Elster Electricity, LLC. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

## 1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

This report is to cover two component changes in the transmitter circuit for a Class II Permissive Change.

## 1.3 Summary of Test Results

Table 1 - Summary of Test Results

| Test | Test Method(s) | Test Parameters | Measurement | Result |
|---|---|---|---|---|
| Peak Output Power | FCC Part 15.247(b)(2) RSS-210, Annex 8, Section A8.4 (1) | 0.25 Watts | 0.232 Watts | **compliant** |
| Spurious Emissions | FCC Part 15.247(C) RSS-210, Annex 8, Section A8.5 | Table FCC Part 15.209 | 51.15 dBuV/m @ 3meters Average @ 7318.40 MHz | **compliant** |

## 1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

## 1.5 Equipment Modifications

No modifications were found to be necessary in order to achieve compliance.

# 2 Laboratory Information

## *2.1 Accreditations & Endorsements*

### 2.1.1 US Federal Communications Commission

TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

### 2.1.2 NIST / NVLAP

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 25 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

### 2.1.3 Canada – Industry Canada

Registration No. IC3755

### 2.1.4 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174 and C-1236).

### 2.1.5 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

## *2.2 Test Facilities*

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

### 2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2005, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2005, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

### 2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of $10^9$ Ohms/square on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

## 2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

*The Combined Standard Uncertainty* is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

*The Expanded Uncertainty* defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The conducted test system has a combined standard uncertainty of ± 1.2 dB. The radiated test system has a combined standard uncertainty of ± 1.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

## 2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 25.

## *2.5 Product Information*


Figure 1: Photo of EUT, Front

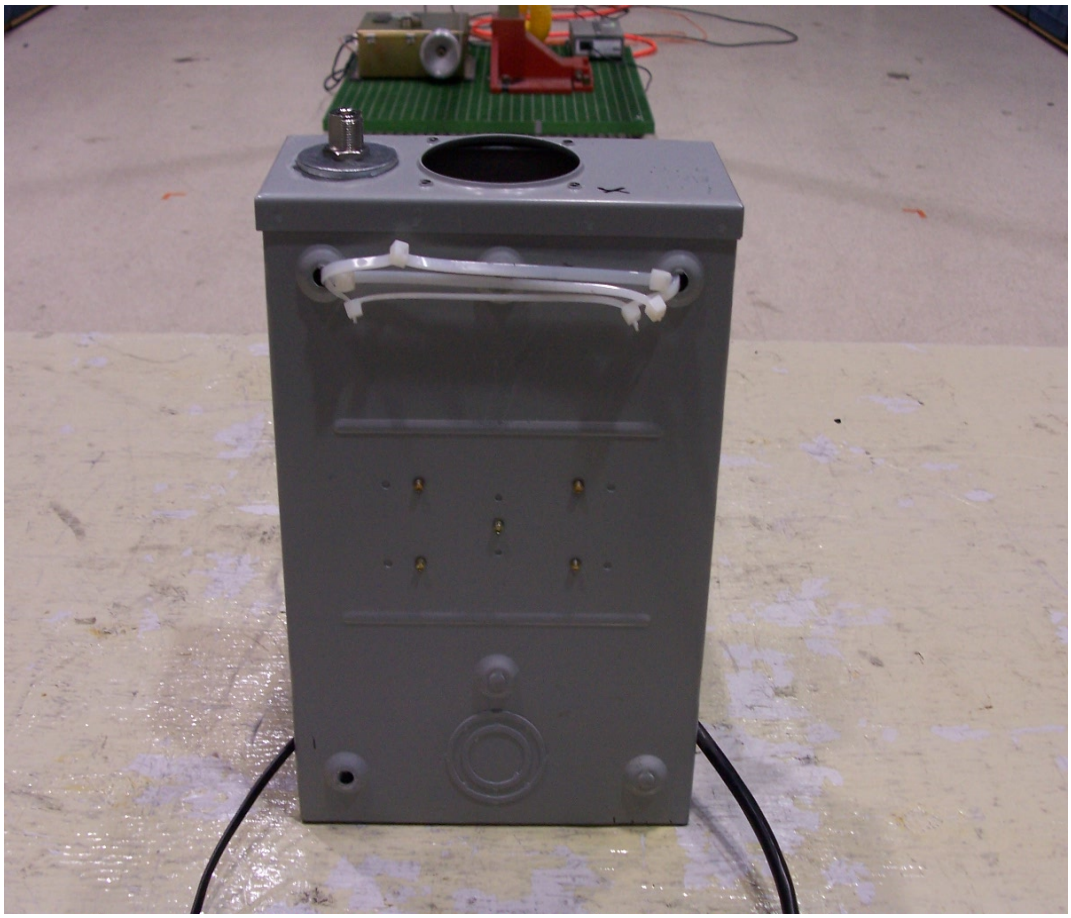


Figure 2: Photo of EUT, Rear


Figure 3: Photo of EUT, Side

## 2.6 Product Description

The EUT is a single-phase watt-hour meter with an integrated 900 MHz band, frequency hoping radio. A bock diagram and schematic showing the major sections of the electronic assembly have been included in a separate test plan document for submission.

## 2.7 Configuration

Each meter type was installed in turn in a meter socket appropriate for measuring electricity consumption. Preliminary testing was performed on each of the three meter types to determine the configuration that produced maximum radiation. The following meter types were tested:

| Meter Form | Model | Elster Style Number |
|---|---|---|
| #51 - A3 Node, form 2S, w/relay board, internal antenna | ILC2<br>(ILC2I) | ZDC304P8000 |

All units have an internal microwave slot antenna printed on the main PCB. There are no other antenna options to be tested. The printed circuit board assembly is connected to line voltage (120 or 240V ac) and to the output of a current transformer. There are no other cables or wires connected to the Single-phase meter. For the service disconnect meter, there is a disconnect option board that connects to the main board via the 10-pin header J5.

The final configuration was selected to produce worse case radiation and place the EUT in the most susceptible state. The Rex2 meter with the internal service disconnect switch was determined to have the worst case emissions and was therefore used for all final testing displayed in this report.

# 3 Antenna Port Conducted Emissions

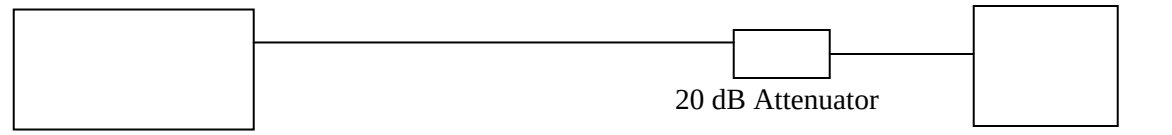
Testing was performed in accordance with 47 CFR Part 15, ANSI C63.4:2003, RSS-210 Issue 7. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

## *3.1 Peak Output Power FCC Part 15.247(b)(2)*

The maximum peak output power of the intentional radiator shall not exceed 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels. (Conducted Measurement)

The peak output power was measured at CH1, CH15, and at CH31. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. After the measurement was made the cable loss and the attenuator was added to the measurement. The spectrum analyzer's resolution bandwidth was greater than the 20dB bandwidth of the modulated carrier and the video bandwidth was equal to the resolution bandwidth.

Test Setup




**Peak Power Output** Low Band

| Channel | Frequency (MHz) | Unmodulated Peak Power (dBm) |
|---|---|---|
| 01 | 902.8 | 21.99 |
| 34 | 916 | 22.57 |
| 48 | 921.6 | 22.66 |
| 63 | 927.6 | 21.78 |

Figure 4 – Un-modulated Peak Power

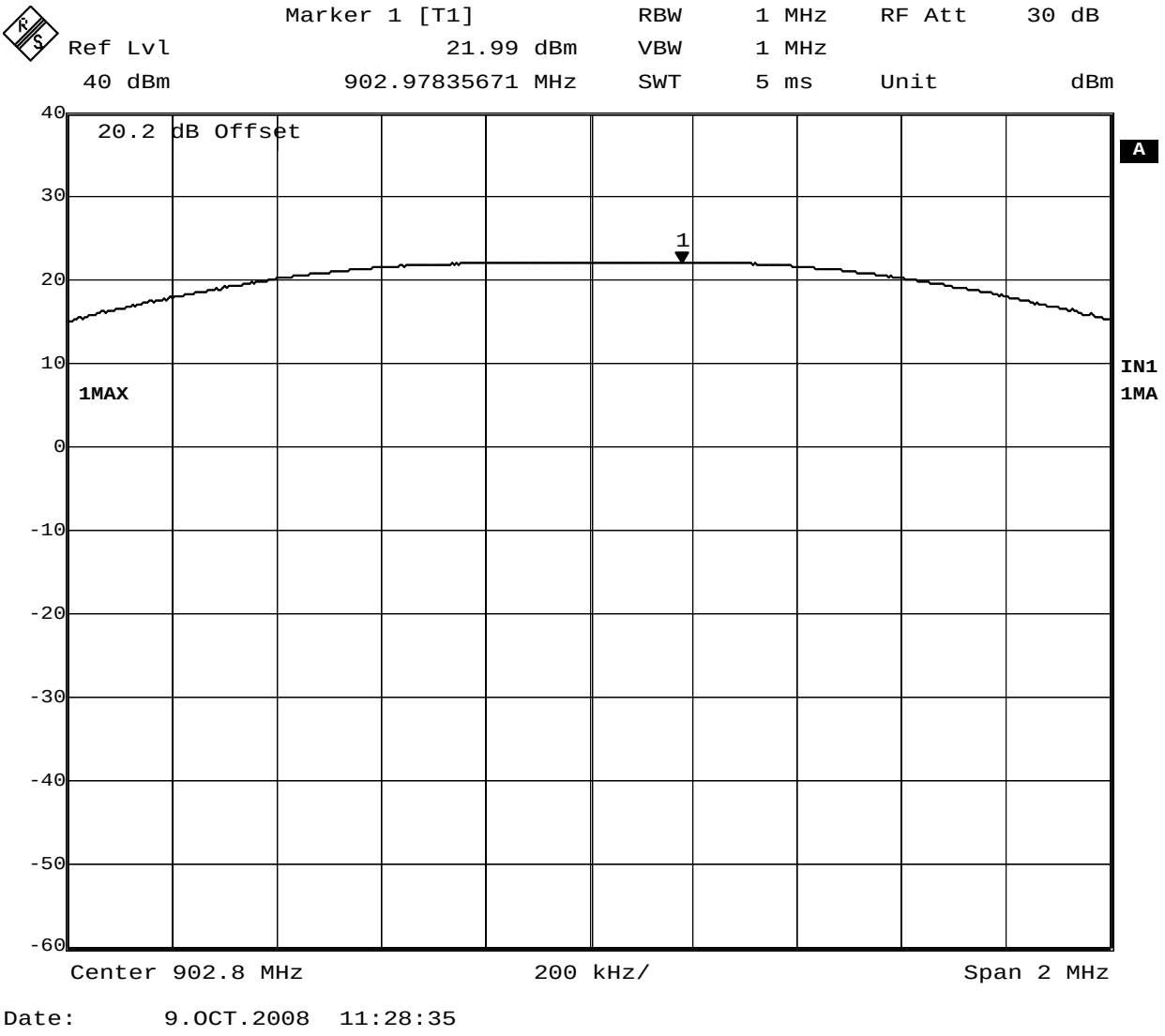



Figure 5: CH 01 (902.8 MHz) Peak Output Power

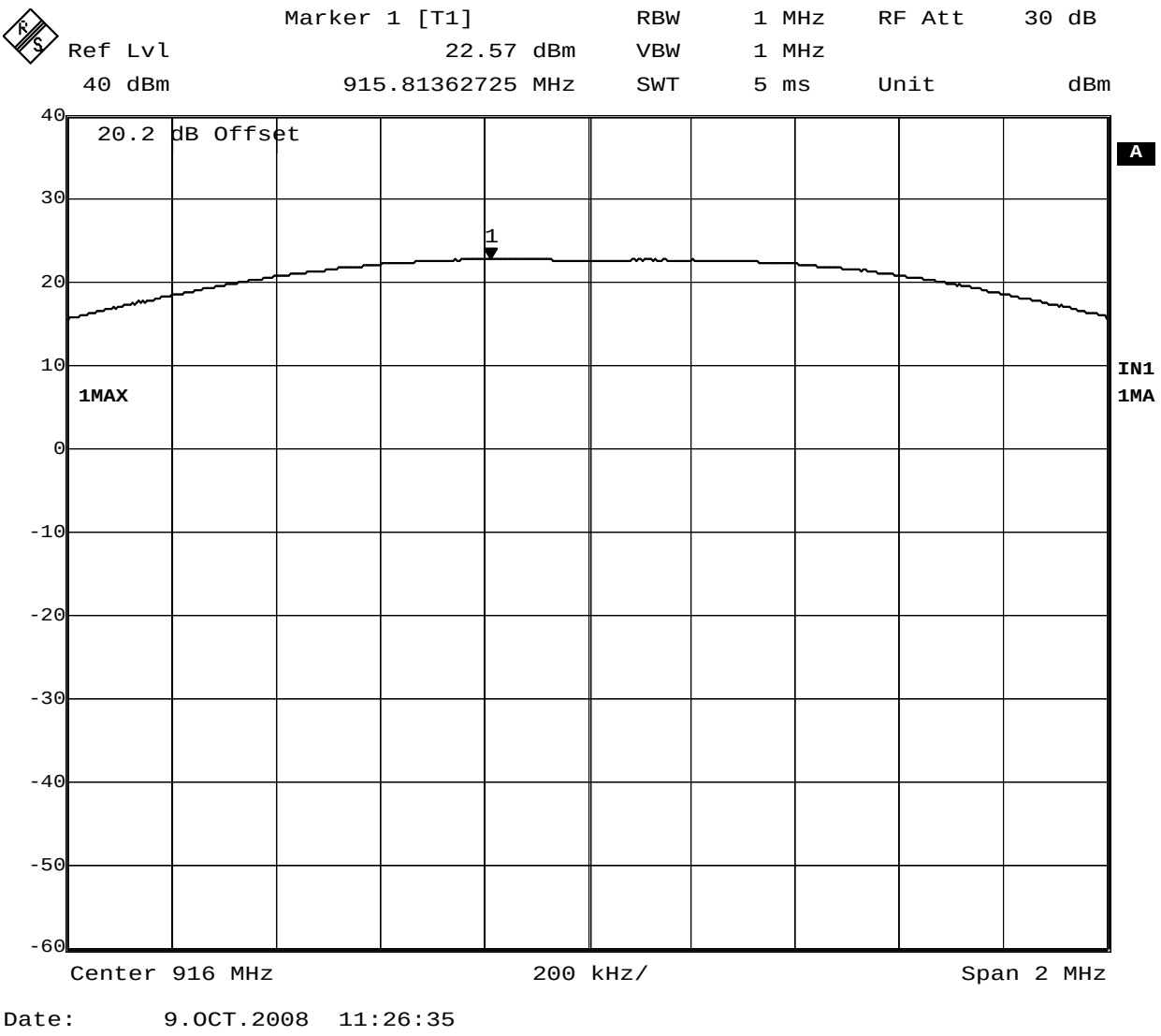



Figure 6: CH 34 (916 MHz) Peak Output Power

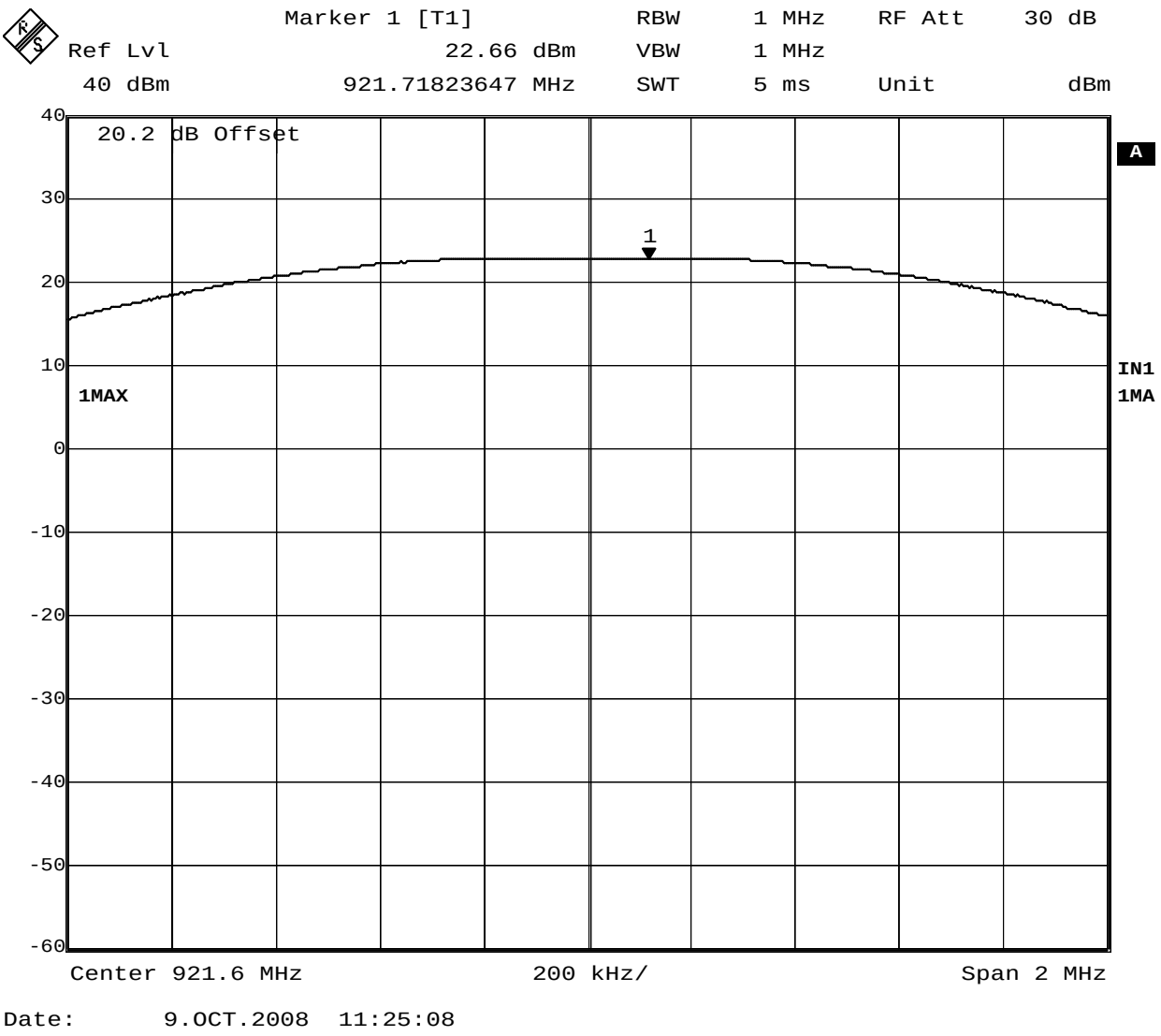



Figure 7: CH 48 (921.6 MHz) Peak Output Power

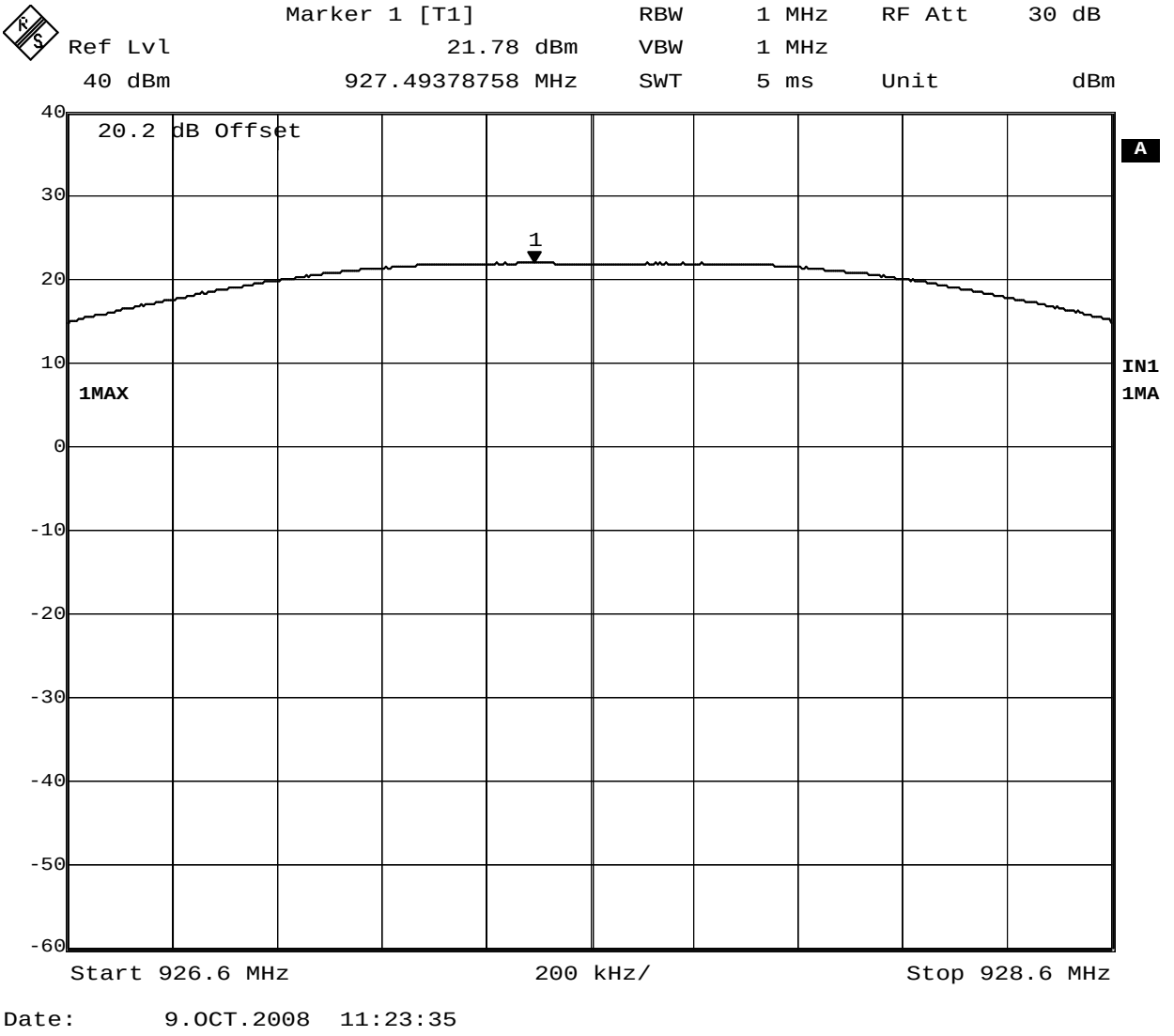



Figure 8: CH 63 (927.6 MHz) Peak Output Power

## *3.2 Spurious Emissions FCC Part 15.247(c)*

### 3.2.1 Test Methodology

#### *3.2.1.1 Preliminary Test*

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for each 6° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

#### *3.2.1.2 Final Test*

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

#### *3.2.1.3 Deviations*

There were no deviations from this test methodology.

### 3.2.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

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**SOP 1** Radiated Emissions



| | | | |
|---|---|---|---|
| **EUT Name** | LAN Option Board | **Date** | 9 October 2008 |
| **EUT Model** | ILC2 | **Temp / Hum in** | 74 degrees F / 33%rH |
| **EUT Serial** | 0107 | **Temp / Hum out** | |
| **Standard** | FCC 47 CFR Part 15, RSS-210 Issue 7 | **Line AC / Freq.** | 120VAC / 60hz |
| **Deg/sweep** | 12 degrees | **RBW / VBW** | 1Mhz / 3Mhz |
| **Dist/Ant Used** | 3 meters / 3115 | **Performed by** | Pamela Sequeira |
| **Configuration** | L3 = 2.2nH; C28 = 3.3pF and 2dB attenuator | | |

| Emission Freq (MHz) | ANT Polar (H/V) | ANT Pos (m) | Table Pos (deg) | **FIM Avg Value** (dBuV) | Amp Gain (dB) | Cable Loss (dB) | ANT Factor (dB/m) | E-Field Value (dBuV/m) | Spec Limit (dBuV/m) | Spec Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 902.8 MHz | | | | | | | | | | |
| 2708.80 | H | 1.00 | 50 | 40.10 | 36.00 | 7.81 | 29.68 | 41.59 | 54 | -12.41 |
| 2708.80 | V | 1.07 | 314 | 42.03 | 36.00 | 7.81 | 29.21 | 43.05 | 54 | -10.95 |
| 3610.60 | H | 1.23 | 39 | 27.33 | 35.74 | 9.42 | 31.82 | 32.83 | 54 | -21.17 |
| 3610.60 | V | 1.30 | 9 | 27.23 | 35.74 | 9.42 | 31.61 | 32.52 | 54 | -21.48 |
| 4514.80 | H | 1.00 | 312 | 26.72 | 35.83 | 10.52 | 32.43 | 33.84 | 54 | -20.16 |
| 4514.80 | V | 1.00 | 89 | 26.81 | 35.83 | 10.52 | 32.63 | 34.13 | 54 | -19.87 |
| 5417.60 | H | 1.00 | 19 | 30.43 | 35.15 | 11.29 | 34.17 | 40.73 | 54 | -13.27 |
| 5417.60 | V | 1.00 | 362 | 30.63 | 35.15 | 11.29 | 34.34 | 41.10 | 54 | -12.9 |
| 8123.60 | H | 1.00 | 108 | 27.20 | 35.46 | 15.81 | 37.27 | 44.82 | 54 | -9.18 |
| 8123.60 | V | 1.00 | 344 | 26.30 | 35.46 | 15.81 | 37.22 | 43.87 | 54 | -10.13 |
| 9022.80 | H | 1.00 | 0 | 25.51 | 35.94 | 15.50 | 37.60 | 42.68 | 54 | -11.32 |
| 9022.80 | V | 1.00 | 0 | 25.59 | 35.94 | 15.50 | 37.80 | 42.96 | 54 | -11.04 |
| | | | | | | | | | | |
| 916 MHz | | | | | | | | | | |
| 2747.60 | H | 1.00 | 277 | 35.70 | 35.93 | 7.94 | 29.79 | 37.50 | 54 | -16.5 |
| 2747.60 | V | 1.00 | 316 | 39.58 | 35.93 | 7.94 | 29.34 | 40.93 | 54 | -13.07 |
| 3664.40 | H | 1.40 | 37 | 27.40 | 35.60 | 9.24 | 31.93 | 32.97 | 54 | -21.03 |
| 3664.40 | V | 1.17 | 22 | 27.43 | 35.60 | 9.24 | 31.76 | 32.83 | 54 | -21.17 |
| 4578.60 | H | 1.00 | 0 | 25.38 | 35.94 | 10.92 | 32.57 | 32.93 | 54 | -21.07 |
| 4578.60 | V | 1.00 | 0 | 25.38 | 35.94 | 10.92 | 32.74 | 33.10 | 54 | -20.9 |
| 7327.20 | H | 1.00 | 29 | 27.77 | 36.11 | 14.35 | 36.42 | 42.43 | 54 | -11.57 |
| 7327.20 | V | 1.00 | 16 | 28.60 | 36.11 | 14.35 | 36.42 | 43.26 | 54 | -10.74 |
| 8244.80 | H | 1.00 | 0 | 26.29 | 35.57 | 15.76 | 37.35 | 43.83 | 54 | -10.17 |
| 8244.80 | V | 1.00 | 0 | 26.28 | 35.57 | 15.76 | 37.34 | 43.82 | 54 | -10.18 |
| 9158.20 | H | 1.00 | 0 | 25.42 | 36.04 | 15.43 | 37.63 | 42.44 | 54 | -11.56 |
| 9158.20 | V | 1.00 | 0 | 25.44 | 36.04 | 15.43 | 37.83 | 42.66 | 54 | -11.34 |
| | | | | | | | | | | |
| 921.6 MHz | | | | | | | | | | |
| 2765.20 | H | 1.04 | 290 | 36.23 | 35.96 | 7.99 | 29.84 | 38.11 | 54 | -15.89 |
| 2765.20 | V | 1.00 | 316 | 37.38 | 35.96 | 7.99 | 29.40 | 38.82 | 54 | -15.18 |
| 3687.20 | H | 1.00 | 335 | 25.35 | 35.53 | 9.18 | 31.97 | 30.97 | 54 | -23.03 |
| 3687.20 | V | 1.00 | 22 | 25.87 | 35.53 | 9.18 | 31.82 | 31.34 | 54 | -22.66 |
| 4601.60 | H | 1.00 | 0 | 25.23 | 35.98 | 10.98 | 32.62 | 32.85 | 54 | -21.15 |
| 4601.60 | V | 1.00 | 0 | 25.27 | 35.98 | 10.98 | 32.78 | 33.05 | 54 | -20.95 |
| 7370.20 | H | 1.00 | 0 | 26.13 | 36.06 | 14.42 | 36.51 | 41.01 | 54 | -12.99 |
| 7370.20 | V | 1.00 | 0 | 26.12 | 36.06 | 14.42 | 36.54 | 41.02 | 54 | -12.98 |
| 8292.80 | H | 1.00 | 0 | 26.12 | 35.59 | 15.73 | 37.38 | 43.64 | 54 | -10.36 |

| Emission Freq (MHz) | ANT Polar (H/V) | ANT Pos (m) | Table Pos (deg) | **FIM Avg Value** (dBuV) | Amp Gain (dB) | Cable Loss (dB) | ANT Factor (dB/m) | E-Field Value (dBuV/m) | Spec Limit (dBuV/m) | Spec Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 8292.80 | V | 1.00 | 0 | 26.13 | 35.59 | 15.73 | 37.39 | 43.66 | 54 | -10.34 |
| 9214.40 | H | 1.00 | 0 | 25.43 | 36.12 | 15.41 | 37.64 | 42.37 | 54 | -11.63 |
| 9214.40 | V | 1.00 | 0 | 25.47 | 36.12 | 15.41 | 37.84 | 42.61 | 54 | -11.39 |
| | | | | | | | | | | |
| 927.6 MHz | | | | | | | | | | |
| 2782.40 | H | 1.00 | 285 | 33.97 | 35.98 | 8.05 | 29.89 | 35.93 | 54 | -18.07 |
| 2782.40 | V | 1.00 | 46 | 32.54 | 35.98 | 8.05 | 29.46 | 34.07 | 54 | -19.93 |
| 3707.00 | H | 1.00 | 0 | 25.29 | 35.51 | 9.06 | 32.01 | 30.86 | 54 | -23.14 |
| 3707.00 | V | 1.00 | 0 | 25.38 | 35.51 | 9.06 | 31.88 | 30.82 | 54 | -23.18 |
| 4638.00 | H | 1.00 | 0 | 25.36 | 36.01 | 10.76 | 32.70 | 32.82 | 54 | -21.18 |
| 4638.00 | V | 1.00 | 0 | 25.35 | 36.01 | 10.76 | 32.85 | 32.95 | 54 | -21.05 |
| 7420.60 | H | 1.00 | 0 | 26.05 | 35.94 | 14.56 | 36.63 | 41.29 | 54 | -12.71 |
| 7420.60 | V | 1.00 | 0 | 26.04 | 35.94 | 14.56 | 36.68 | 41.34 | 54 | -12.66 |
| 8346.40 | H | 1.00 | 0 | 25.98 | 35.61 | 15.72 | 37.41 | 43.50 | 54 | -10.5 |
| 8346.40 | V | 1.00 | 0 | 25.96 | 35.61 | 15.72 | 37.45 | 43.52 | 54 | -10.48 |
| | | | | | | | | | | |

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor $\pm$ Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.6$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

# 4 Test Equipment Use List

## *4.1 Test Equipment use list*

| Equipment | Manufacturer | Model # | Serial/Inst # | Last Cal dd/mm/yy | Next Cal dd/mm/yy |
|---|---|---|---|---|---|
| SOP 1 - Radiated Emissions (5 Meter Chamber) | | | | | |
| Amplifier, preamp | Agilent Technologies | 8449B | 3008A01480 | 30-Jan-08 | 30-Jan-09 |
| Amplifier, preamp | Hewlett Packard | 8447D | 1937A01766 | 30-Jan-08 | 30-Jan-09 |
| Antenna Horn 1-18GHz | EMCO | 3115 | 2236 | 25-Jan-07 | 25-Jan-09 |
| Ant. BiconiLog | Chase | CBL6140A | 1108 | 13-Jun-08 | 13-Jun-10 |
| Receiver, EMI | Rohde & Schwarz | ESIB40 | 100043 | 9-Jun-08 | 9-Jun-09 |
| Cable, Coax | Andrew | FSJ1-50A | 003 | 25-Jan-08 | 25-Jan-09 |
| Cable, Coax | Andrew | FSJ1-50A | 030 | 30-Jan-08 | 30-Jan-09 |
| Cable, Coax | Andrew | FSJ1-50A | 045 | 30-Jan-08 | 30-Jan-09 |

- Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.