Emissions Test Report

EUT Name: LAN Option Board

EUT Model: ILC/ILN

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

Prepared for:

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Report/Issue Date: 02 January 2007
Report Number: 30662119.001

Statement of Compliance

Manufacturer:	Elster Electricity, LLC 208 South Rogers Lane Raleigh, NC 27610 919 212-4700
Requester / Applicant:	Bob Mason
Name of Equipment:	LAN Option Board
Operation Frequency Range	902.8 MHz to 927.6
Type of Equipment:	Intentional Radiator
Application of Regulations:	FCC Title 47, Part 15, SubpartC, RSS-210 Issue 7
Test Dates:	02 November 2006 to 15 August 2007

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.

Randy Sherian	12 September 2007
NVLAP Signatory	Date

NVLAP	FC	Industry Canada
200094-0	90552 and 100881	IC3755

200094-0

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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 *02 November* 2006 through *15* August 2007 on the *LAN Option Board* Model No. *ILC/ILN* 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.

1.3 Summary of Test Results

Table 1 - Summary of Test Results

Test	Test Method(s)	Test Parameters	Measurement	Result
Channel Separation	FCC Part 15.247(a)(1)	Greater of 25 kHz or 20 dB bandwidth	405 kHz	**compliant**
Pseudorandom Hopping Algorithm				**compliant**
Time of Occupancy	FCC Part 15.247(a)(1)(i)	=<0.4 sec in 10 sec.	0.390 sec in 10sec	**compliant**
Occupied Bandwidth	FCC Part 15.247(a)(1)(i)	=<500kHz	404 kHz	**compliant**
Peak Output Power	FCC Part 15.247(b)(2)	0.25 Watts	0.236 Watts	**compliant**
Spurious Emissions	FCC Part 15.247(C)	Table FCC Part 15.209	48.19dBuV/m @ 3meters Average	**compliant**
Frequency Hopping Spread Spectrum Systems	FCC Part 15.247(g)			**compliant**
Incorporation of Intelligence	FCC Part 15.247(h)			**compliant**
Frequency Stability	FCC Part 15.215(c)	Containment of 20 dB bandwidth between 902 and 928	902.476 MHz 927.885 MHz	**compliant**
Conducted Emissions	47 CFR Part 15.207, ANSI C63.4:2003, RSS-210 Issue 7	Table FCC Part 15.207	34.81 dBuV Average	**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.

3 Product Information

Figure 1 – Photo of Meter Model No. ZD3200K20xx with External Antenna adapter

Figure 2 – Photo of Meter Model No. ZDC300K00xx with Internal Antenna

3.1 Product Description

The information for all equipment used in the tested system, including: descriptions of cables, clock and microprocessor frequencies, EMI critical components, and accessory equipment has been supplied by the manufacturer and is listed in the EMC Test Plan found in Section 7.

3.2 Equipment Configuration

A description and justification of the equipment configuration is given in the EMC Test Plan. The EUT was tested as described in the EMC Test Plan and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to warm up to normal operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce worse case radiation and place the EUT in the most susceptible state.

Two meters with the same LAN Option Board were presented for testing as follows:

ZDC300K00xx - Form 2S A3 ALPHA Meter/Node, 120 to 480VAC 3W, 60Hz

ZD3200K20xx - Form 9S A3 ALPHA Meter/Collector, external antenna ready, 120 to 480VAC, 4Wy or 4Wd, 60Hz.

Preliminary radiated scans were taken on both meters to determine “worst case”. No noticeable difference was found between the two and therefore, Radiated and Conducted Emissions data was taken on ZDC300K00xx because it contained the internal antenna as the end product would.

All remaining testing was performed with the ZD3200K20xx meter as it already had an external antenna connector.

4 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.

4.1 Channel Separation Part 15.247(a)(1)

Frequency hopping Systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Bandwidth=404 kHz

Channel Separation=405 kHz

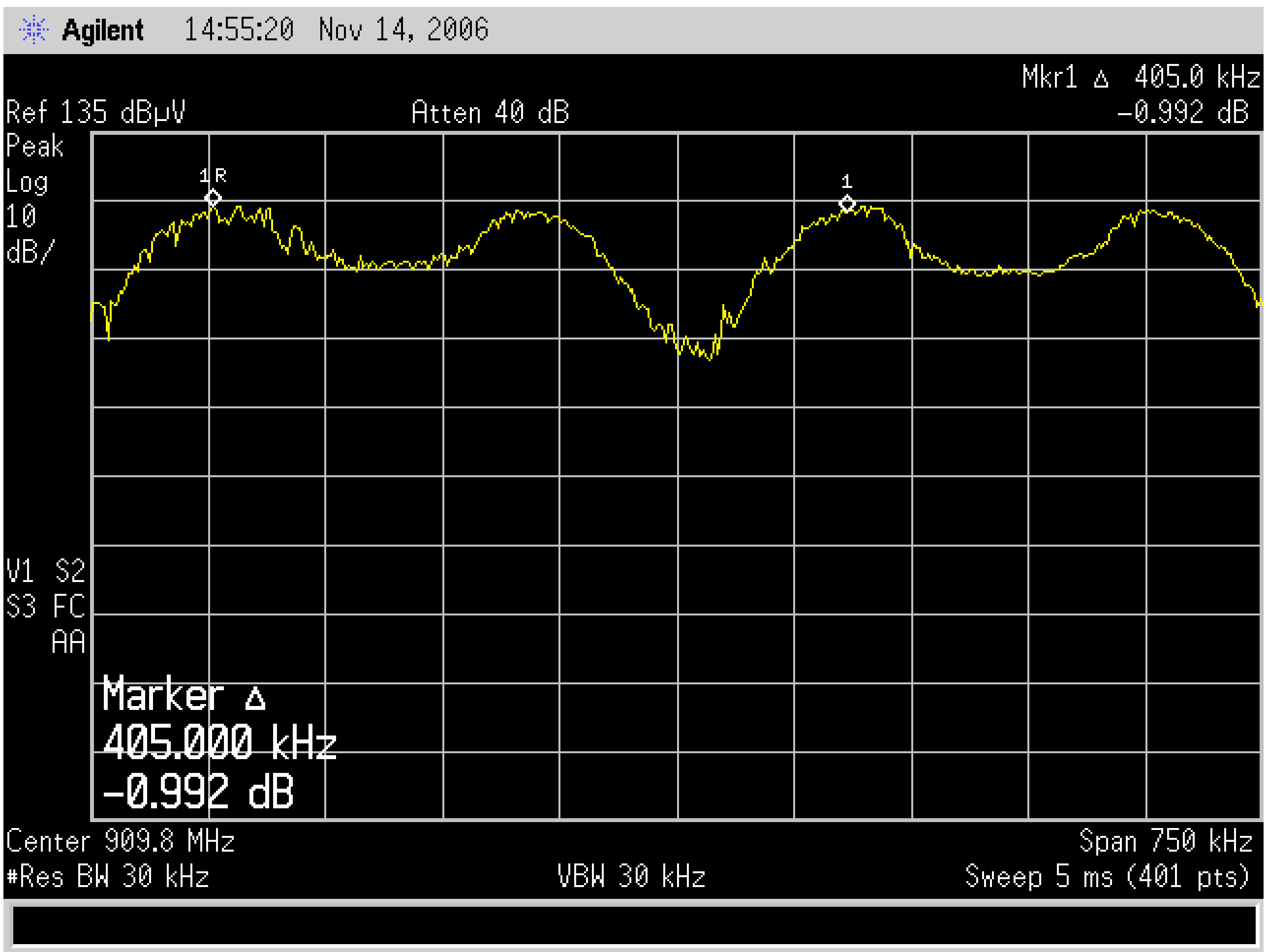

Figure 3 – Channel Separation Low Band

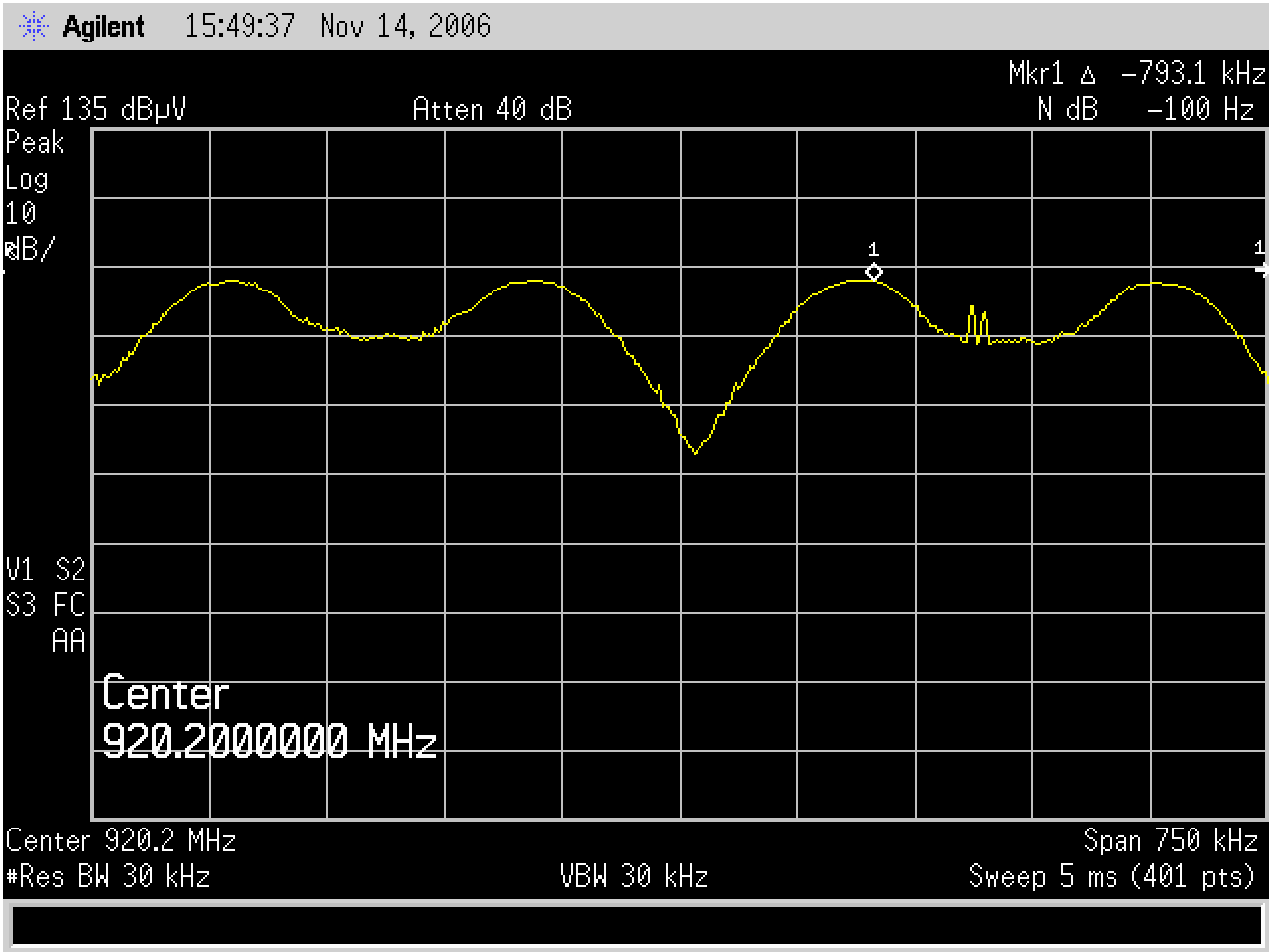

Figure 4 – Channel Separation High band

4.2 Pseudorandom Hopping Algorithm FCC Part 15.247(a)(1)

The system shall hop to channel frequencies that are selected from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their transmitters and shall shift frequencies in synchronization with the transmitted signals.

The pseudo-random hop table is used to determine the transmitter's frequency hop sequence. The transmitter is slow hopping frequency system where the entire data packet is sent on a single channel. After sending a data packet, the transmitter uses the next channel in the pseudo-random hop table. Each frequency in the hop table is used before the transmitter will hop to a frequency already used. The receiver is a single IF system whose bandwidth is 330 kHz. When not synchronized to a transmitting device, the receiver is constantly hopping across the 25 channels scanning for a valid preamble from a transmitter. Once a valid preamble is detected, the receiver is synchronized to the transmitter and receives the data packet. After the transmission, the receiver returns to the scanning mode where it can look for another packet from either the same device or a different device.

Index	Channel	Network #1 "Low Band" Center Frequency (MHz)	Network #2 "High Band" Center Frequency (MHz)
1	12	907.2	920.0
2	29	914.0	926.8
3	5	904.4	917.2
4	19	910.0	922.8
5	11	906.8	919.6
6	23	911.6	924.4
7	26	912.8	925.6
8	13	907.6	920.4
9	22	911.2	924.0
10	15	908.4	921.2
11	1	902.8	915.6
12	25	912.4	925.2
13	4	904.0	916.8
14	21	910.8	923.6
15	14	908.0	920.8
16	27	913.2	926.0
17	8	905.6	918.4
18	31	914.8	927.6
19	18	909.6	922.4
20	16	908.8	921.6
21	7	905.2	918.0

Index	Channel	Network #1 "Low Band" Center Frequency (MHz)	Network #2 "High Band" Center Frequency (MHz)
22	20	910.4	923.2
23	3	903.6	916.4
24	28	913.6	926.4
25	6	904.8	917.6

Sample hop table

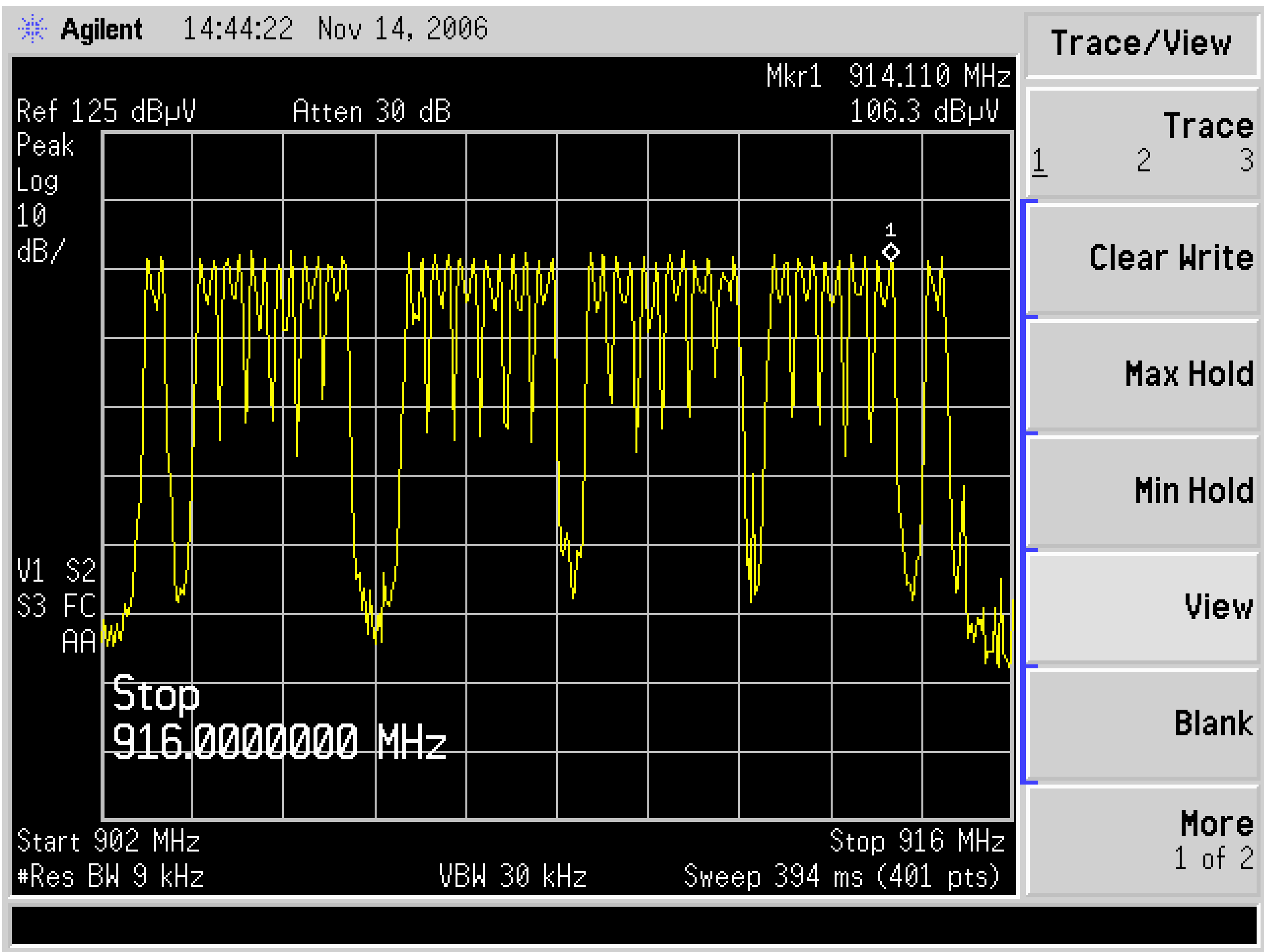

Figure 5 - Plot of hopping Channels 902-916 MHz

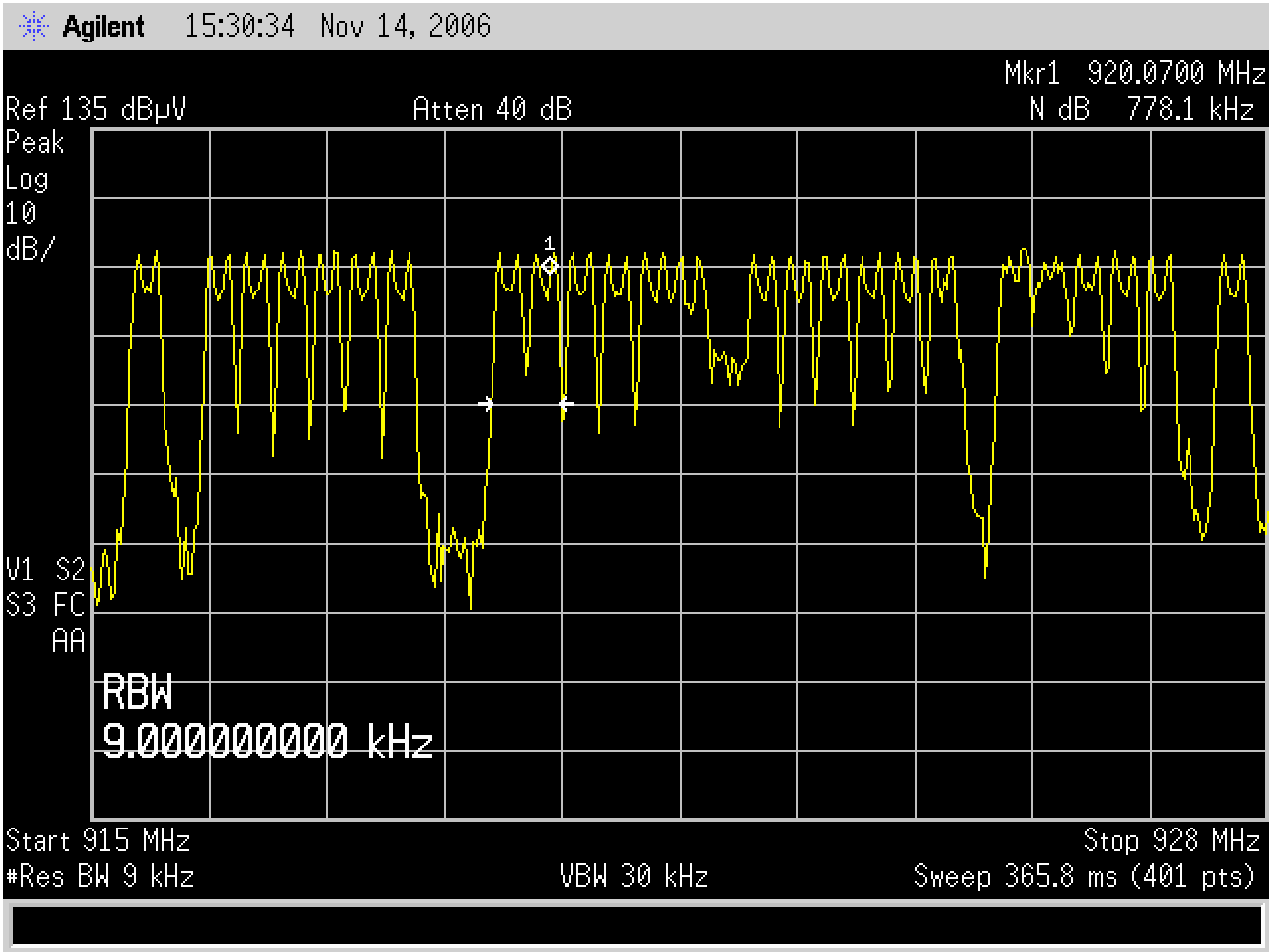

Figure 6 - Plot of hopping Channels 915-928 MHz

Time of Occupancy FCC Part 15.247(a)(1)(i)

Frequency Band (MHz)	20 dB Bandwidth	Number of Hopping Channels	Average Time of Occupancy
902.8-927.6	=>250 kHz	25	=<0.4 sec. In 10 sec.

The spectrum analyzer was set as follows:

RBW=9 kHz

VBW=RBW

Span=0Hz

LOG dB/div.= 10dB

Sweep = 10 Sec.

Trigger Video

The occupancy time was measured as above. There were 4 hops at .0975 seconds per hop for any 10 sec. Period. Time of occupancy equals number of hops multiplied by the duration of one hop.

Time of Occupancy = 0.390 seconds in any 10 second period.

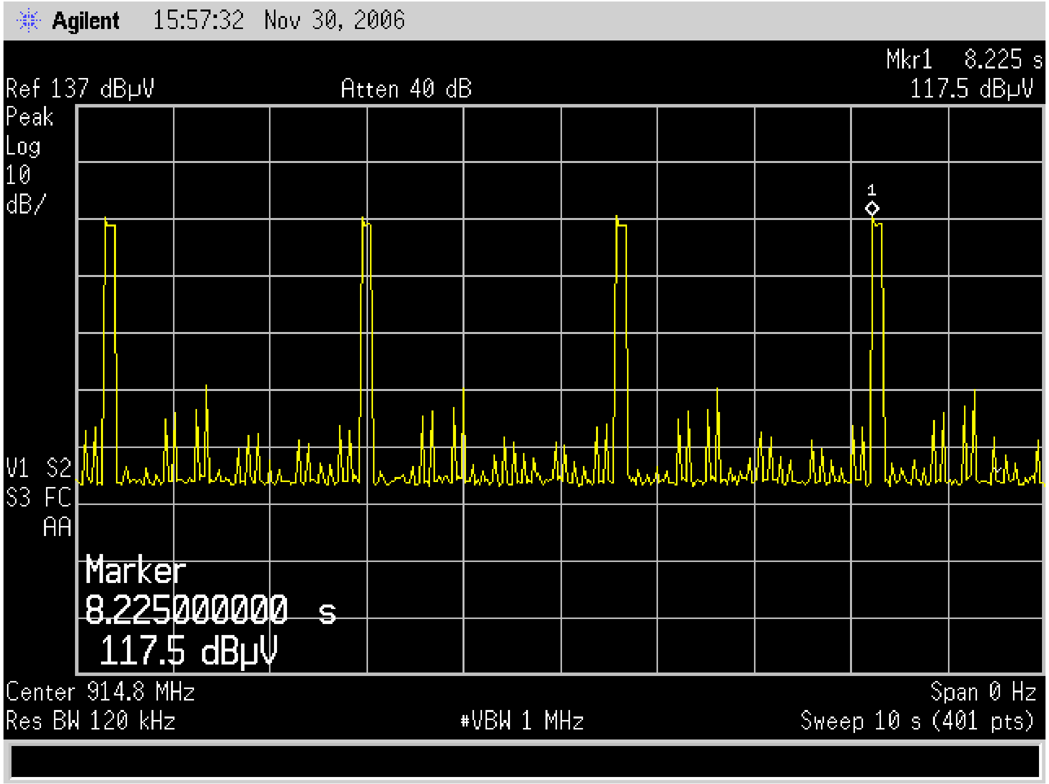

Figure 3 – 10 second sweep “Low Band” of 914.8 MHz

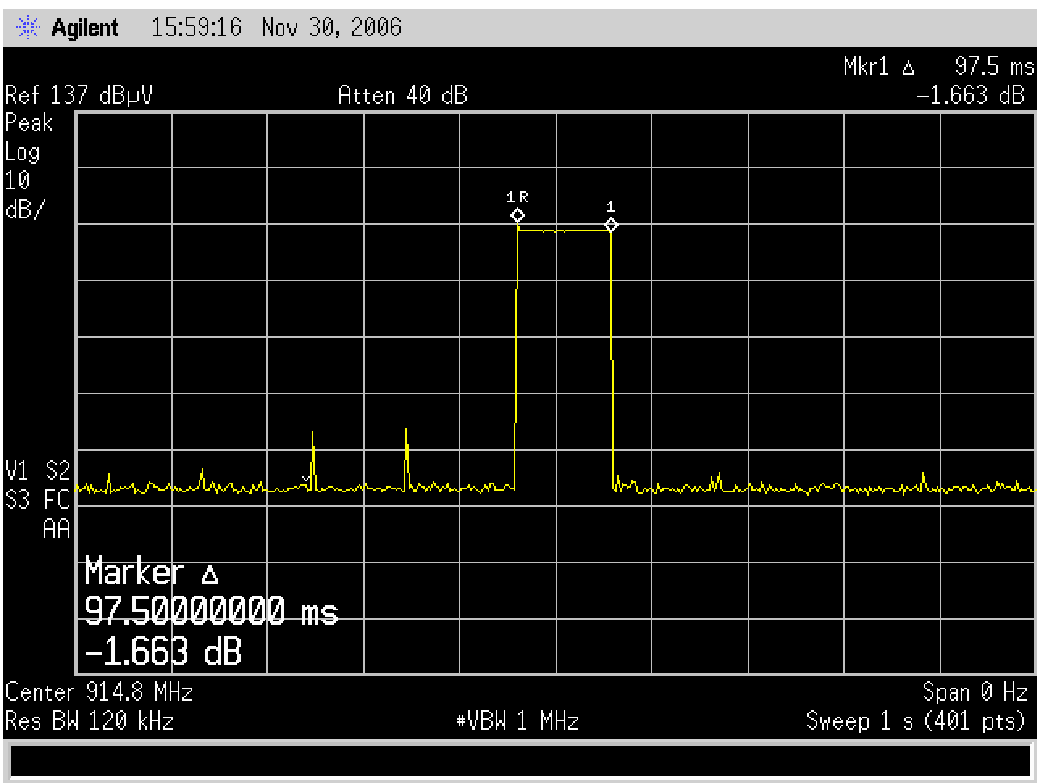

Figure 4 – Measurement of 1 hop in “Low Band” 914.8 MHz

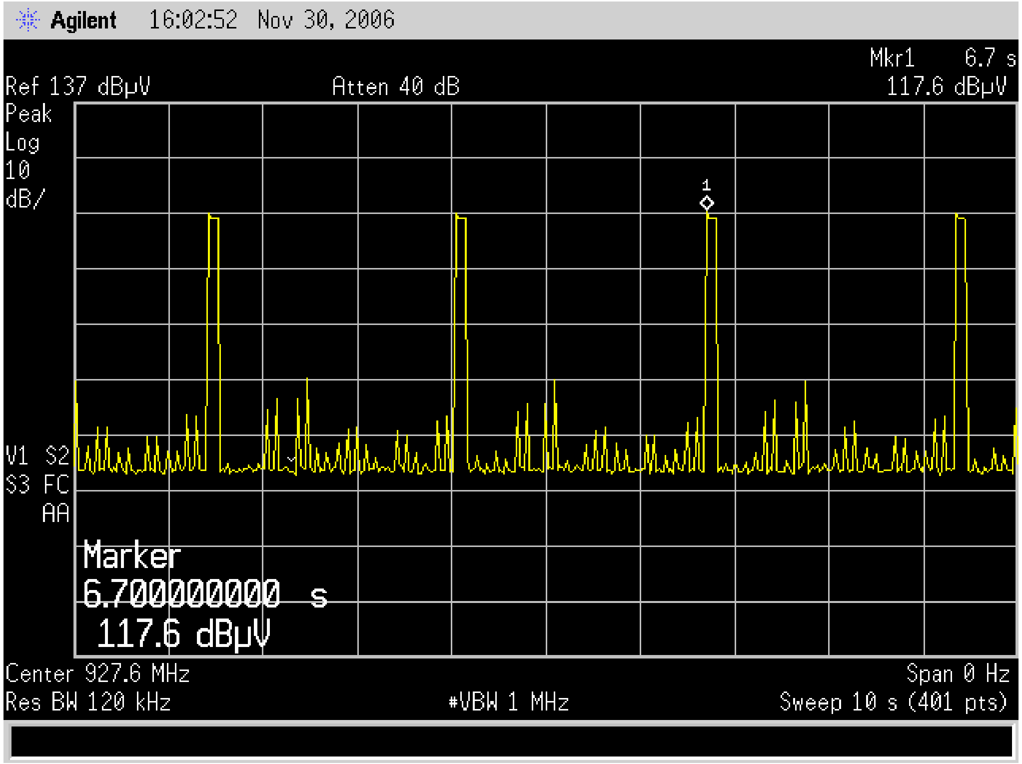

Figure 5 – 10 Second sweep of "High Band" 926 MHz

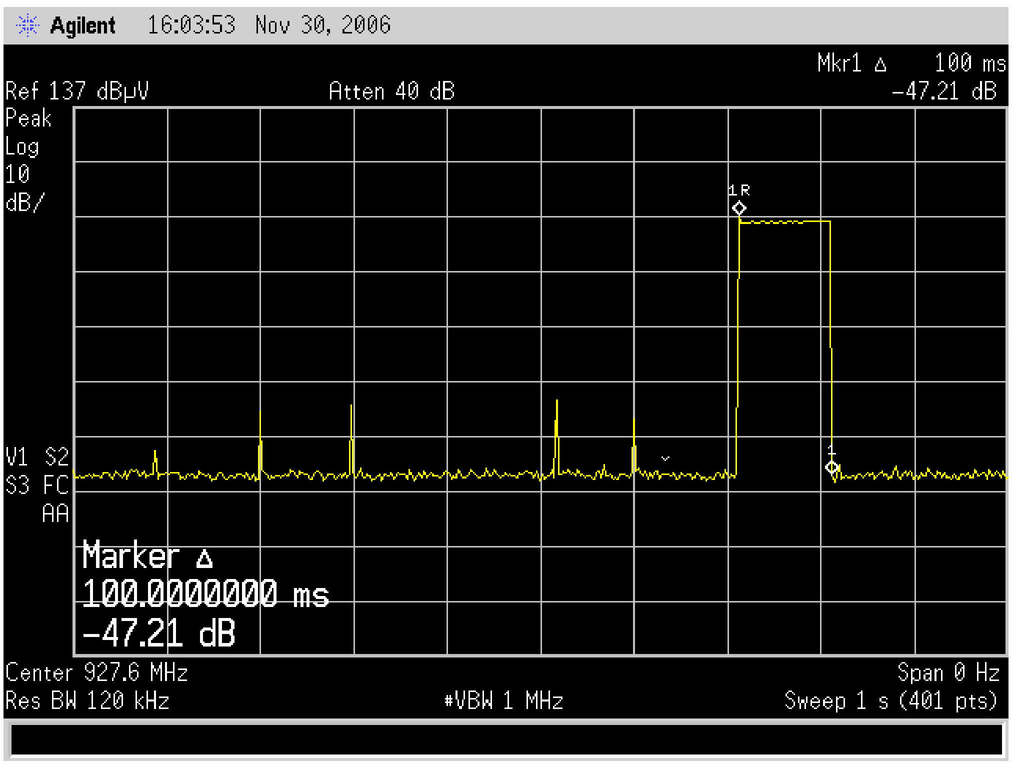

Figure 6 – Measurement of 1 hop in "High Band" 927.6 MHz

4.3 Occupied Bandwidth FCC Part 15.247(a)(1)(i)

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

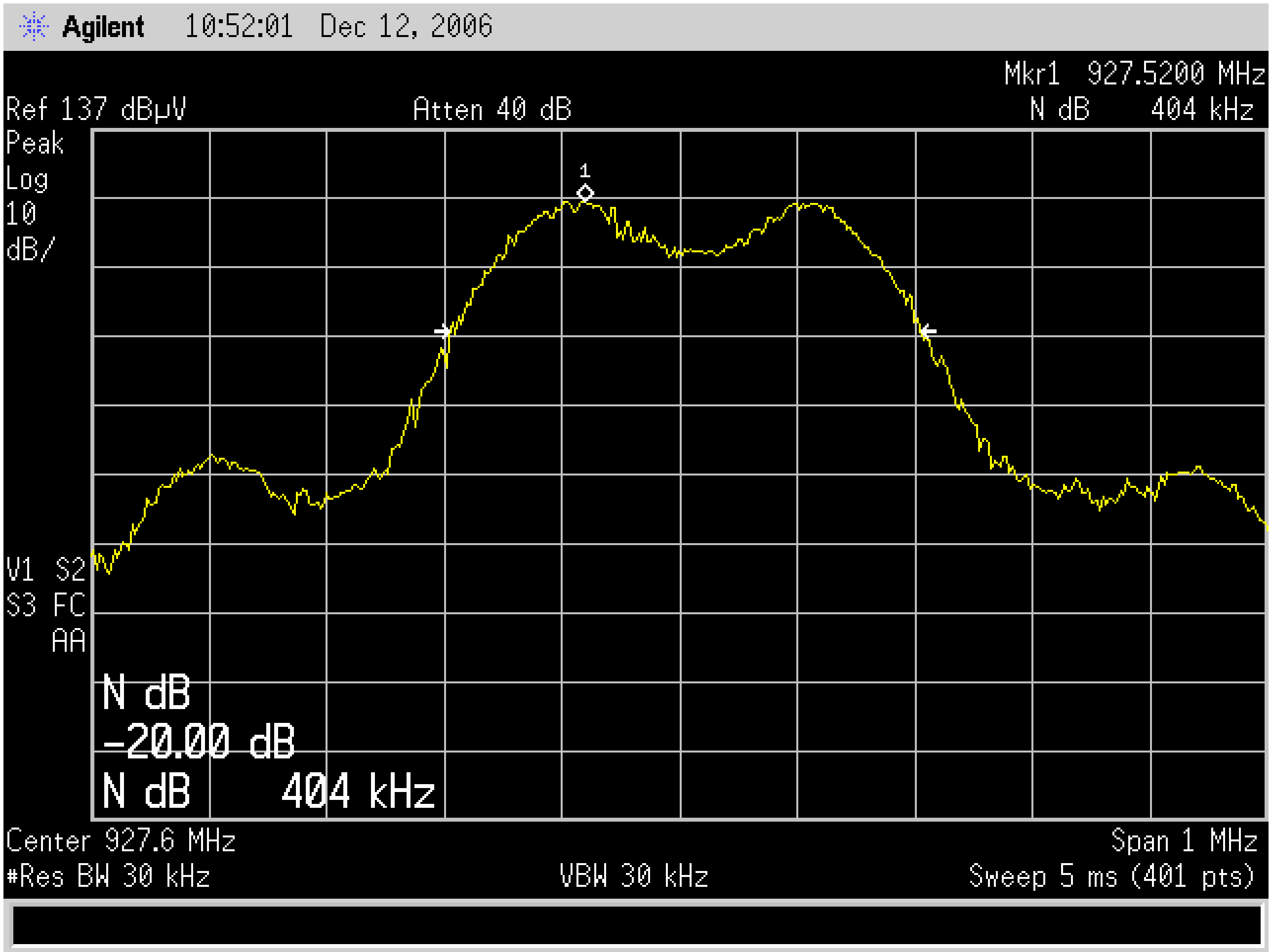

Figure 9 – CH31 “High Band” 927.6 MHz Occupied Bandwidth

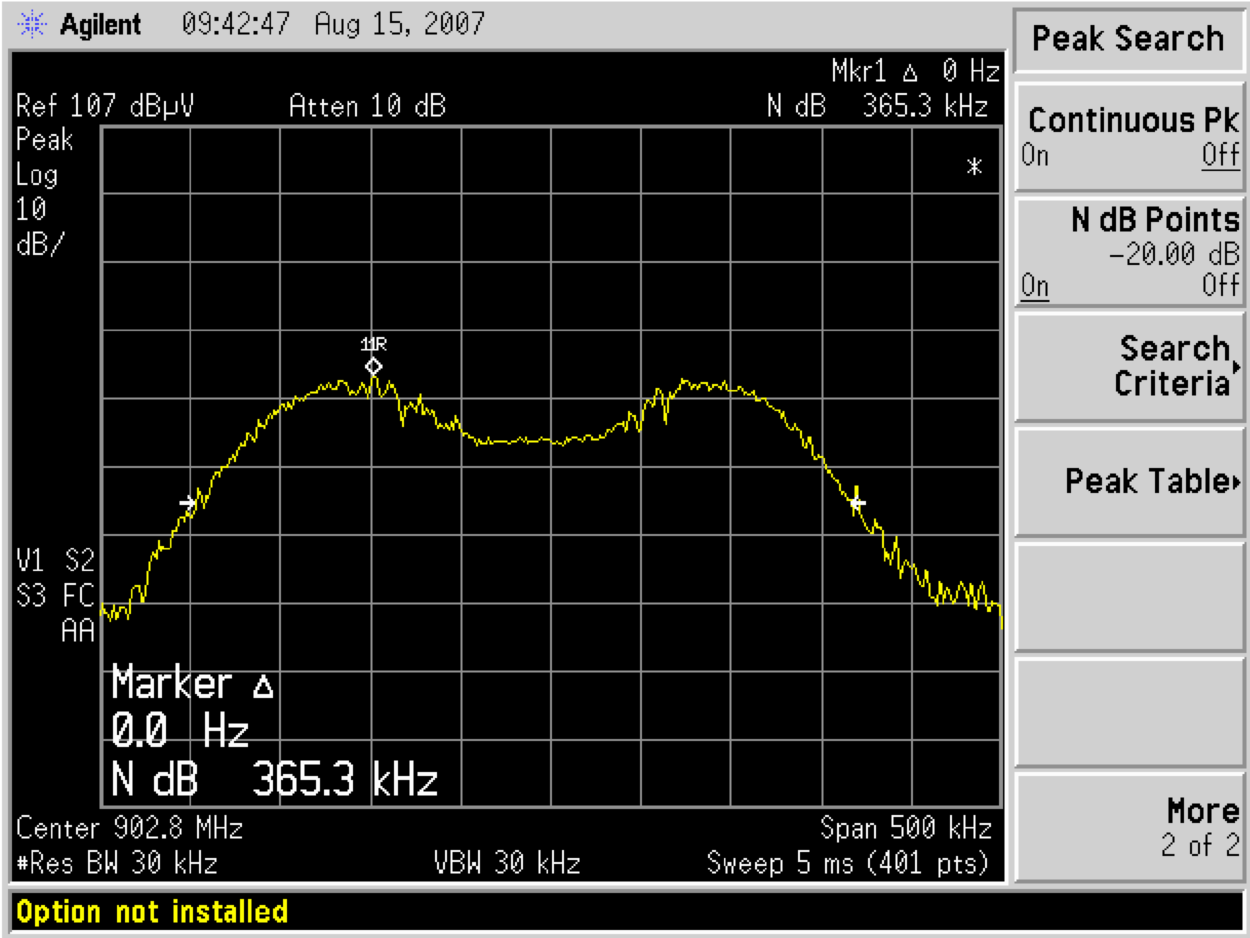

Figure 10 – CH 1 "Low Band" 902.8 MHz

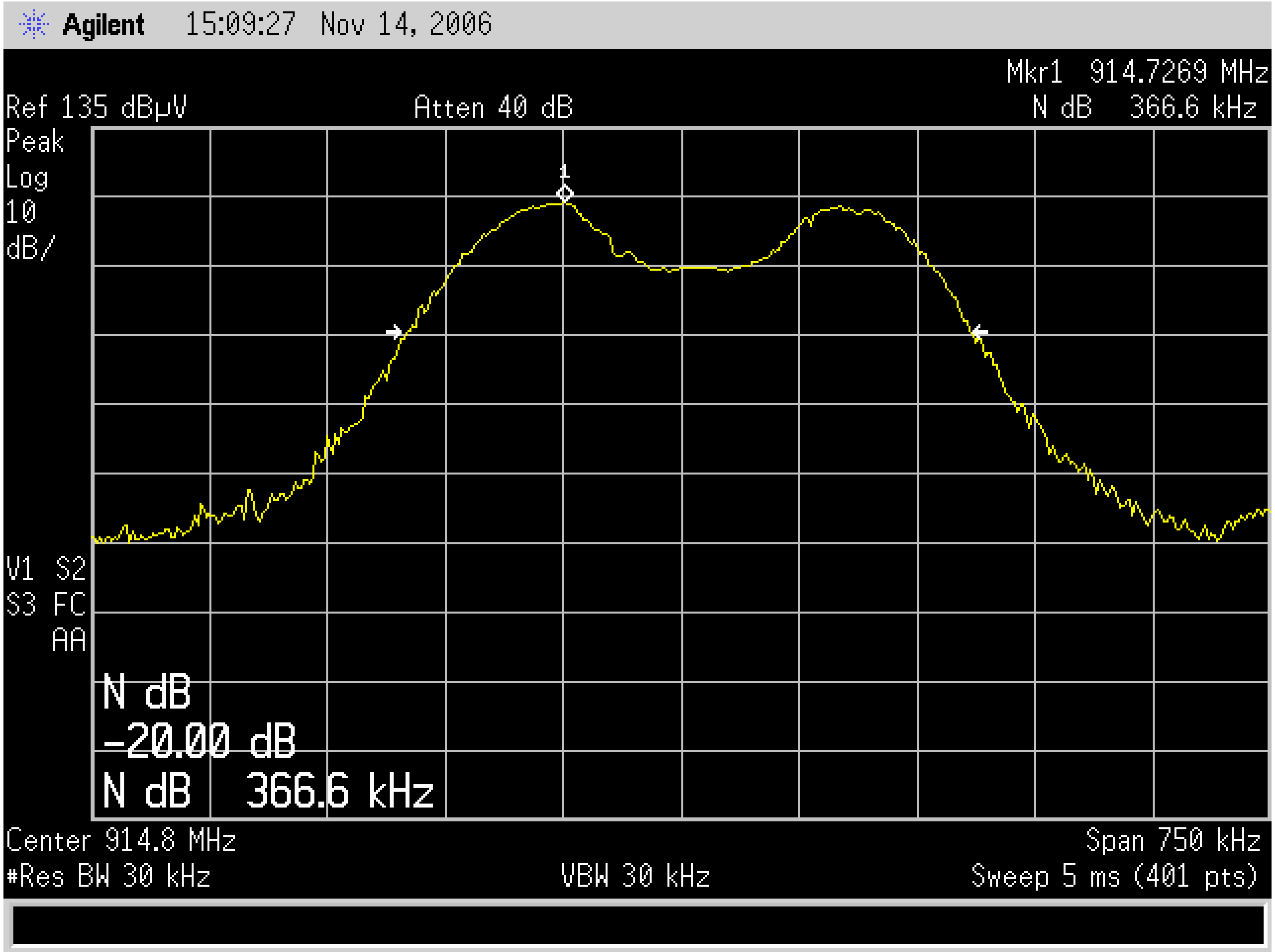

Figure 12 – CH 31 “Low Band” 914.8 MHz

4.4 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

CH1 - 902.8 MHz = 0.230 Watts

CH31 - 914.8 MHz = 0.236 Watts

High Band

CH31 – 927.6 MHz = 0.236 Watts

Antenna Gain

If peak power output was performed using the conducted method then the antenna gain will be stated.

The measurement was performed with out modulation. The transmitter under test was placed on a non-conductive table 80cm above the ground plane. The spectrum analyzer was tuned to the transmitter carrier frequency and the turntable was rotated 360 degrees about the vertical axis until the highest maximum signal was received. Then the receive antenna was raised and lowered 1 to 4 meters until the maximum signal was detected. Then the substitution dipole antenna and signal generator replaced the transmitter under test and both the receive and substitution dipole antenna were placed in the vertical polarization. The input signal to the substitution antenna was adjusted to the maximum signal received from the transmitter. The receive antenna was then raised and lowered to ensure the maximum signal was still received. The cable to the dipole was then removed and attached to a calibrated power meter to record the power level and added to the substitution dipole gain to obtain the EIRP level. Then the steps above were repeated for the horizontal polarization. The gain of the EUT antenna is the difference between the measured RF power at the RF port and the measured EIRP.

4.4.1.1 Results

Internal Antenna

Freq.	Peak (dBi)
(GHz)	
0.902 – 0.928	4.728

External Antennas

Freq.	Peak (dBi)
(GHz)	
0.902 – 0.928	3.1

TRA9023P 902-928 MHz

Freq.	Peak (dBi)
(GHz)	
0.902 – 0.928	3.1

MFB9380

Freq.	Peak (dBi)
(GHz)	
0.902 – 0.928	5.15

MFB9153

5 Emissions

5.1 Radiated Emissions

Testing was performed in accordance with 47 CFR 15, ANSI C63.4:2003. 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.

5.1.1 Test Methodology

5.1.1.1 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.

5.1.1.2 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. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

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.

5.1.1.3 Deviations

There were no deviations from this test methodology.

5.1.2 Test Results

Section 5.1.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

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

5.1.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

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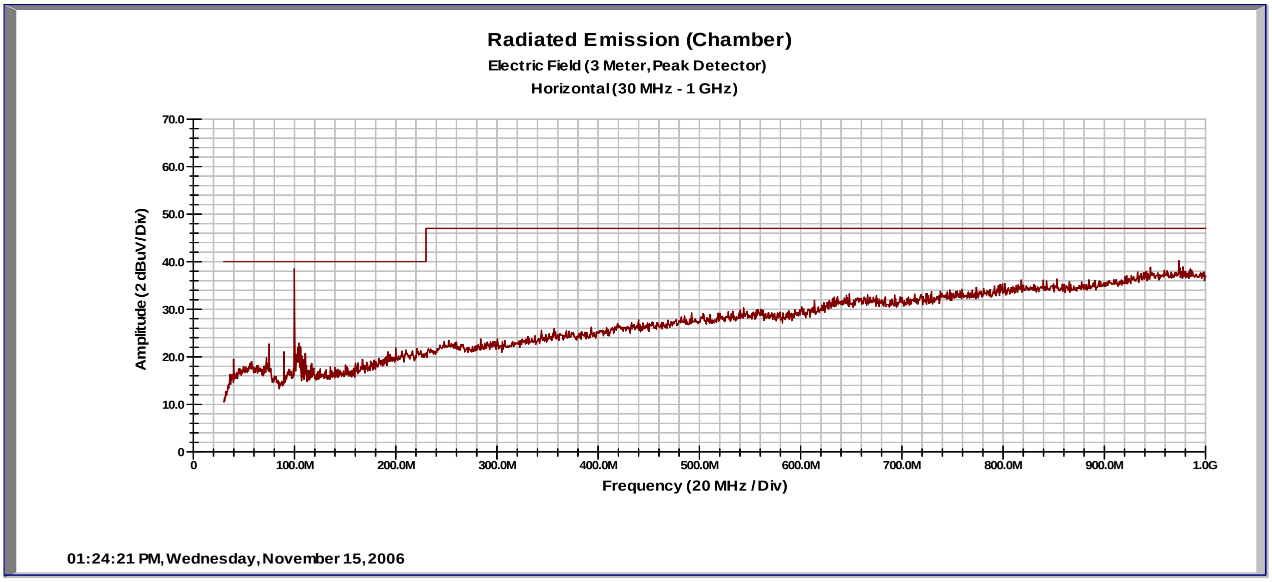
EUT Name	LAN Option Board	**Date**	November 15, 2006
EUT Model	ILC/ILN	**Temp / Hum in**	71 deg F 41% rh
EUT Serial	255-0000373648	**Temp / Hum out**	
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	480VAC/60Hz
Deg/sweep	12 degrees	**RBW / VBW**	120 kHz/300 kHz
Dist/Ant Used	3 Meters CBL-6140A	**Performed by**	Randy Masline
Configuration	Not Transmitting		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
75.20	V	1	0	19.85	0.00	0.92	7.48	28.25	40.00	-11.75
89.72	V	1	0	18.92	0.00	1.02	6.52	26.46	40.00	-13.54
99.92	V	1	0	25.80	0.00	1.08	7.59	34.47	40.00	-5.53

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

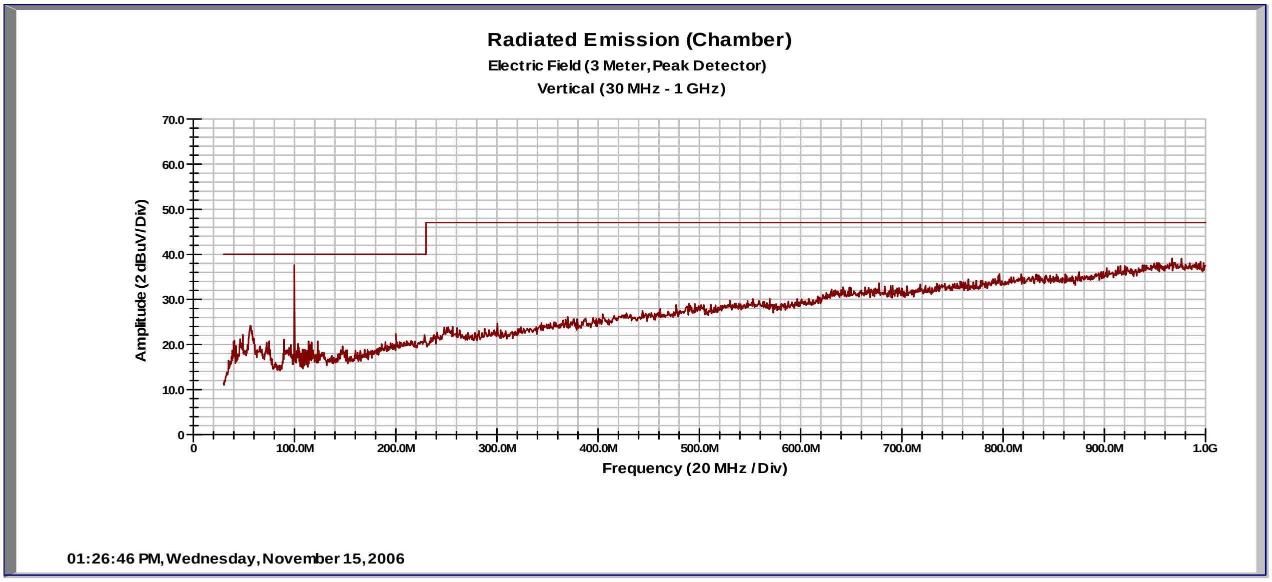
Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 1 Radiated Emissions

Tracking # 30662119.001 Page 2 of 2

EUT Name	LAN Option Board	**Date**	November 15, 2006
EUT Model	ILC/ILN	**Temp / Hum in**	71 deg F 41% rh
EUT Serial	255-0000373648	**Temp / Hum out**	
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	480VAC/60Hz
Deg/sweep	12 degrees	**RBW / VBW**	120 kHz/300 kHz
Dist/Ant Used	3 Meters CBL-6140A	**Performed by**	Randy Masline
Configuration	Not Transmitting		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
48.32	V	1	0	17.10	0.00	0.74	9.03	26.87	40.00	-13.13
57.12	V	1	0	19.24	0.00	0.80	9.13	29.17	40.00	-10.83
99.96	V	1	0	25.10	0.00	1.08	7.59	33.77	40.00	-6.23

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

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

Notes:

5.2 Spurious Emissions FCC Part 15.247(c)

5.2.1 Test Methodology

5.2.1.1 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.

5.2.1.2 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.

5.2.1.3 Deviations

There were no deviations from this test methodology.

5.2.2 Test Results

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

5.2.2.1 Radiated Emissions Outside the Frequency Band

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on radiated measurements.

5.2.2.2 Restricted band measurements

Radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see 15.205(c)).

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EUT Name	LAN Option Board	**Date**	November 15, 2006
EUT Model	ILC/ILN	**Temp / Hum in**	71 deg F / 42% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	100KHz/100KHz
Dist/Ant Used	3 meters 200MHz – 2GHz (CBL-6140A)	**Performed by**	Randy Masline
Configuration	with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	20dB below Fundamental (dBuV/m)
Channel 1									
902.80	H	1	0	87.53	0.00	3.38	22.76	113.67	N/A
1805.00	H	1	0	28.50	0.00	4.88	31.60	64.98	48.69
902.80	V	1	0	92.90	0.00	3.38	22.26	118.54	N/A
1805.00	V	1	0	27.30	0.00	4.88	30.60	62.78	55.76
Channel 31									
914.80	H	2	0	80.40	0.00	3.41	22.80	106.61	N/A
1829.00	H	1	0	38.00	0.00	4.92	31.50	74.42	32.19
914.80	V	1	36	93.50	0.00	3.41	22.50	119.41	N/A
1829.00	V	1	0	38.40	0.00	4.92	30.50	73.82	45.59
Channel 31									
927.60	H	1	0	88.71	0.00	4.46	23.05	116.22	N/A
1855.20	H	1	0	32.46	0.00	6.35	31.71	70.52	45.7
927.60	V	1	0	87.38	0.00	4.46	22.80	114.64	N/A
1855.20	V	1	0	33.29	0.00	6.35	31.50	71.14	43.5

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

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

Notes:
RBW/VBW = 100KHz/100KHz

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EUT Name	LAN Option Board	**Date**	November 15, 2006
EUT Model	ILC/ILN	**Temp / Hum in**	71 deg F / 42% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	480VAC 60Hz
Deg/sweep		**RBW / VBW**	100KHz/100KHz
Dist/Ant Used	3 meters 200MHz – 2GHz (CBL-6140A)	**Performed by**	Randy Masline
Configuration	with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	20dB below Fundamental (dBuV/m)	
Channel 1										
902.80	H	1	0	87.20	0.00	3.38	22.76	113.34	N/A	
1805.00	H	1	0	37.50	0.00	4.88	31.60	73.98	39.36	
902.80	V	1	0	91.70	0.00	3.38	22.26	117.34	N/A	
1805.00	V	1	0	37.30	0.00	4.88	30.60	72.78	44.56	
Channel 31										
914.80	H	2	0	87.20	0.00	3.41	22.80	113.41	N/A	
1829.00	H	1	0	39.00	0.00	4.92	31.50	75.42	37.99	
914.80	V	1	0	93.10	0.00	3.41	22.50	119.01	N/A	
1829.00	V	1	0	38.40	0.00	4.92	30.50	73.82	45.19	
Channel 31										
927.60	H	1	0	86.56	0.00	4.46	23.05	114.08	N/A	
1855.20	H	1	0	34.62	0.00	6.35	31.71	72.68	41.4	
927.60	V	1	0	93.94	0.00	4.46	22.80	121.21	N/A	
1855.20	V	1	0	37.79	0.00	6.35	31.50	75.63	45.58	

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

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

Notes:
RBW/VBW = 100KHz/100KHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	100KHz/100KHz
Dist/Ant Used	3 meters 200MHz – 2GHz (CBL-6140A)	**Performed by**	Randy Masline
Configuration	with TRAB9023NP Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	20dB below Fundamental (dBuV/m)	
Channel 1										
902.80	H	1.65	0	73.30	0.00	3.33	22.76	99.39	N/A	
1805.00	H	1.65	0	29.30	0.00	4.90	21.60	65.80	33.59	
902.80	V	1.85	0	71.90	0.00	3.33	22.26	97.49	N/A	
1805.00	V	1.85	0	29.56	0.00	4.90	30.60	65.06	32.4	
Channel 31										
914.80	H	1.65	0	74.00	0.00	3.37	22.80	100.17	N/A	
1829.00	H	1.65	0	31.00	0.00	4.99	31.50	67.49	32.68	
914.80	V	1.85	0	71.50	0.00	3.37	22.50	97.37	N/A	
1829.00	V	1.85	0	30.10	0.00	4.99	30.50	65.59	31.78	
Channel 31										
927.60	H	1.65	0	74.30	0.00	3.38	23.05	100.73	N/A	
1855.20	H	1.65	0	20.30	0.00	5.02	31.71	57.03	43.7	
927.60	V	1.85	0	72.80	0.00	3.38	22.80	98.99	N/A	
1855.20	V	1.85	0	20.20	0.00	5.02	31.50	56.72	42.27	

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

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

Notes:
RBW/VBW = 100KHz/100KHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	100KHz/100KHz
Dist/Ant Used	3 meters 200MHz – 2GHz (CBL-6140A)	**Performed by**	Randy Masline
Configuration	with MFB9380 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	20dB below Fundamental (dBuV/m)
Channel 1									
902.80	H	1.0	0	60.90	0.00	3.33	22.76	86.99	N/A
1805.60	H	1.0	0	21.10	0.00	4.90	31.60	57.60	29.39
902.80	V	1.0	0	63.80	0.00	3.33	22.26	89.39	N/A
1805.60	V	1.0	0	21.00	0.00	4.90	30.60	56.50	32.89
Channel 31									
914.80	H	1.0	0	67.80	0.00	3.37	22.80	93.97	N/A
1829.00	H	1.0	0	21.10	0.00	4.99	31.50	57.59	36.38
914.80	V	1.0	0	64.80	0.00	3.37	22.50	90.67	N/A
1829.00	V	1.0	0	21.00	0.00	4.99	30.50	56.49	34.18
Channel 31									
927.60	H	1	0	66.50	0.00	3.38	23.05	92.93	N/A
1855.20	H	1	0	21.00	0.00	5.02	31.71	57.73	35.17
927.60	V	1	0	63.20	0.00	3.38	22.80	89.39	N/A
1855.20	V	1	0	21.10	0.00	5.02	31.50	57.62	31.77

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

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

Notes:
RBW/VBW = 100KHz/100KHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	100KHz/100KHz
Dist/Ant Used	3 meters 200MHz – 2GHz (CBL-6140A)	**Performed by**	Randy Masline
Configuration	with MFB9153 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	20dB below Fundamental (dBuV/m)
Channel 1									
902.80	H	1.0	0	70.10	0.00	3.33	22.76	96.19	N/A
1805.00	H	1.0	0	21.10	0.00	4.90	31.60	57.60	38.59
902.80	V	1.0	0	67.53	0.00	3.33	22.26	93.12	N/A
1805.00	V	1.0	0	21.00	0.00	4.90	30.60	56.50	36.62
Channel 31									
914.80	H	1.0	0	66.40	0.00	3.37	22.80	92.57	N/A
1829.00	H	1.0	0	21.00	0.00	4.99	31.50	57.49	35.08
914.80	V	1.0	0	66.80	0.00	3.37	22.50	92.67	N/A
1829.00	V	1.0	0	21.00	0.00	4.99	30.50	56.49	36.18
Channel 31									
927.60	H	1	0	63.79	0.00	4.46	23.05	91.3	N/A
1855.20	H	1	0	21.00	0.00	6.35	31.71	59.06	32.24
927.60	V	1	0	59.47	0.00	4.46	22.80	86.73	N/A
1855.20	V	1	0	21.00	0.00	6.35	31.50	58.85	27.88

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

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

Notes:
RBW/VBW = 100KHz/100KHz

5.2.2.3 Restricted band measurements

Radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see 15.205(c)).

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EUT Name	LAN Option Board	**Date**	November 15, 2006
EUT Model	ILC/ILN	**Temp / Hum in**	71 deg F / 42% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “914.8 MHz” Spurious Emissions with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2744.00	H	1	0	39.45	35.34	6.06	29.53	39.69	74.00	-34.31
3659.00	H	1	0	40.46	34.90	7.15	31.88	44.59	74.00	-29.41
7318.00	H	1	0	34.79	35.01	11.91	36.45	48.14	74.00	-25.86
Average										
2744.00	H	1	0	27.35	35.34	6.06	29.53	27.6	54.00	-26.4
3659.00	H	1	0	36.04	34.90	7.15	31.88	40.17	54.00	-13.83
7318.00	H	1	0	24.26	35.01	11.91	36.45	37.61	54.00	-16.39

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

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EUT Name	LAN Option Board	**Date**	November 15, 2006
EUT Model	ILC/ILN	**Temp / Hum in**	71 deg F / 42% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	480VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/3MHz
Dist/Ant Used	3 meters 1Ghz -10GHz (3115-9903)	**Performed by**	Randy Masline
Configuration	Channel 31 “914.8 MHz” Spurious Emissions with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2744.00	V	1	0	42.04	35.34	6.06	29.33	42.08	74.00	-31.92
3659.00	V	1	0	35.07	34.90	7.15	31.75	39.07	74.00	-34.93
7318.00	V	1	0	33.65	35.01	11.91	36.39	46.94	74.00	-27.06
Average										
2744.00	V	1	0	34.04	35.34	6.06	29.33	34.08	54.00	-19.92
3659.00	V	1	0	25.28	34.90	7.15	31.75	29.28	54.00	-24.72
7318.00	V	1	0	22.15	35.01	11.91	36.39	35.44	54.00	-18.56

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz, Peak and Average measurements.

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EUT Name	LAN Option Board	**Date**	November 15, 2006
EUT Model	ILC/ILN	**Temp / Hum in**	71 deg F / 42% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	480VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/3MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 1 “902.8 MHz” Spurious Emissions with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2708.00	H	1	0	38.99	35.34	6.03	29.42	39.10	74.00	-34.90
3611.00	H	1	0	36.63	34.99	7.11	31.77	40.51	74.00	-33.49
4514.00	H	1	0	32.53	35.11	8.03	32.53	37.98	74.00	-36.02
Average										
2708.00	H	1	0	28.67	35.34	6.03	29.42	28.78	54.00	-25.22
3611.00	H	1	0	26.90	34.99	7.11	31.77	30.78	54.00	-23.22
4514.00	H	1	0	20.17	35.11	8.03	32.53	25.62	54.00	-28.38

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz, Peak and Average measurements.

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EUT Name	LAN Option Board	**Date**	15 November 2006
EUT Model	ILC/ILN	**Temp / Hum in**	70 Deg F / 67%rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 1 “902.8 MHz” Spurious Emissions with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2708.00	V	1	0	38.86	35.34	6.03	29.21	38.75	74.00	-35.25
3611.00	V	1	0	26.26	34.99	7.11	31.61	29.99	74.00	-44.01
4514.00	V	1	0	31.93	35.11	8.03	32.63	37.48	74.00	-36.52
Average										
2708.00	V	1	0	28.76	35.34	6.03	29.21	28.65	54.00	-25.35
3611.00	V	1	0	14.12	34.99	7.11	31.61	17.85	54.00	-36.15
4514.00	V	1	0	22.41	35.11	8.03	32.63	27.96	54.00	-26.04

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz, Peak and Average measurements.

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EUT Name	LAN Option Board	**Date**	16 November 2006
EUT Model	ILC/ILN	**Temp / Hum in**	70 deg F/ 70% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	480VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “927.6 MHz” Spurious Emissions with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2782.80	H	1	0	40.13	35.30	6.11	29.65	40.59	74.00	-33.41
3710.40	H	1	0	32.12	34.86	7.22	32.00	36.49	74.00	-37.51
4638.00	H	1	0	40.13	35.24	8.20	32.78	45.87	74.00	-28.13
5565.60	H	1	0	34.88	34.86	11.91	34.43	46.35	74.00	-27.65
Average										
2782.80	H	1	0	31.12	35.30	6.11	29.65	31.58	54.00	-22.42
3710.40	H	1	0	21.47	34.86	7.22	32.00	25.84	54.00	-28.16
4638.00	H	1	0	35.70	35.24	8.20	32.78	41.44	54.00	-16.39
5565.60	H	1	0	26.89	34.86	11.91	34.43	38.36	54.00	-15.64

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

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EUT Name	LAN Option Board	**Date**	16 November 2006
EUT Model	ILC/ILN	**Temp / Hum in**	70 deg F/ 70% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	480VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/3MHz
Dist/Ant Used	3 meters 1Ghz -10GHz (3115-9903)	**Performed by**	Randy Masline
Configuration	Channel 31 “927.6 MHz” Spurious Emissions with internal antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2782.80	V	1	0	42.05	35.30	6.11	29.46	42.32	74.00	-31.68
3710.40	V	1	0	40.31	34.86	7.22	31.89	44.56	74.00	-29.44
4638.00	V	1	0	44.58	35.24	8.20	32.85	50.39	74.00	-23.61
5565.60	V	1	0	37.53	34.86	11.91	34.51	49.09	74.00	-24.91
Average										
2782.80	V	1	0	35.21	35.30	6.11	29.46	35.48	54.00	-18.52
3710.40	V	1	0	35.37	34.86	7.22	31.89	39.62	54.00	-14.38
4638.00	V	1	0	42.38	35.24	8.20	32.85	48.19	54.00	-5.81
5565.60	V	1	0	32.44	34.86	11.91	34.51	44.00	54.00	-10.00

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz, Peak and Average measurements.

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “914.8 MHz” Spurious Emissions with TRAB9023NP Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2744.00	V	1	0	29.00	35.29	7.46	29.78	30.95	74.0	-43.05
3659.00	V	1	0	42.60	35.26	8.60	31.92	47.86	74.0	-26.14
7318.00	V	1	0	26.00	35.61	12.74	36.40	39.53	74.0	-34.47
Average										
2744.00	V	1	0	17.60	35.29	7.46	29.78	19.55	54.0	-34.45
3659.00	V	1	0	32.20	35.26	8.60	31.92	37.46	54.0	-16.54
7318.00	V	1	0	13.30	35.61	12.74	36.40	26.83	54.0	-27.17

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 1 “902.8 MHz” Spurious Emissions with TRAB9023NP Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2708.00	V	1	0	28.50	35.55	7.45	29.11	29.51	74.0	-44.49
3611.00	V	1	0	43.60	35.31	8.47	31.39	48.15	74.0	-25.85
4514.00	V	1	0	26.00	35.63	9.25	32.17	31.79	74.0	-42.21
Average										
2708.00	V	1	0	16.60	35.55	7.45	29.11	17.61	54.0	-36.39
3611.00	V	1	0	33.45	35.31	8.47	31.39	38	54.0	-16.00
4514.00	V	1	0	14.20	35.63	9.25	32.17	19.99	54.0	-34.01

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz, Peak and Average measurements.

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “927.6 MHz” Spurious Emissions with TRAB9023NP Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2782.80	V	1	0	28.20	35.35	7.48	29.37	29.7	74.0	-44.3
3710.40	V	1	0	29.70	35.17	8.70	31.66	34.89	74.0	-39.11
4638.00	V	1	0	26.00	35.33	10.37	32.44	33.48	74.0	-40.52
5565.60	V	1	0	28.00	34.99	10.78	34.05	37.84	74.0	-36.16
Average										
2782.80	V	1	0	16.90	35.35	7.48	29.37	18.4	54.0	-35.6
3710.40	V	1	0	18.20	35.17	8.70	31.66	23.39	54.0	-30.61
4638.00	V	1	0	14.20	35.33	10.37	32.44	21.68	54.0	-32.32
5565.60	V	1	0	15.60	34.99	10.78	34.05	25.44	54.0	-28.56

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “914.8 MHz” Spurious Emissions with MFB9380 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2744.00	V	1	0	34.71	35.29	7.46	29.78	36.66	74.00	-37.34
3659.00	V	1	0	27.45	35.26	8.60	31.92	32.71	74.00	-41.29
7318.00	V	1	0	26.82	35.61	12.74	36.40	40.35	74.00	-13.65
Average										
2744.00	V	1	0	28.01	35.29	7.46	29.78	29.96	54.00	-24.04
3659.00	V	1	0	15.34	35.26	8.60	31.92	20.60	54.00	-33.40
7318.00	V	1	0	14.09	35.61	12.74	36.40	27.62	54.00	-26.38

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 1 “902.8 MHz” Spurious Emissions with MFB9380 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2708.00	V	1	0	29.00	35.55	7.45	29.11	30.01	74.0	-43.99
3611.00	V	1	0	30.00	35.31	8.47	31.39	34.55	74.0	-39.45
4514.00	V	1	0	26.00	35.63	9.25	32.17	31.79	74.0	-42.21
Average										
2708.00	V	1	0	16.80	35.55	7.45	29.11	17.81	54.0	-36.19
3611.00	V	1	0	18.00	35.31	8.47	31.39	22.55	54.0	-31.45
4514.00	V	1	0	14.30	35.63	9.25	32.17	20.09	54.0	-33.91

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz, Peak and Average measurements.

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “927.6 MHz” Spurious Emissions with MFB9380 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2782.80	V	1	0	28.00	35.35	7.48	29.37	29.5	74.0	-44.5
3710.40	V	1	0	28.00	35.17	8.70	31.66	33.19	74.0	-40.81
4638.00	V	1	0	26.00	35.33	10.37	32.44	33.48	74.0	-40.52
5565.60	V	1	0	26.00	34.99	10.78	34.05	35.84	74.0	-38.16
Average										
2782.80	V	1	0	16.50	35.35	7.48	29.37	18	54.0	-36.00
3710.40	V	1	0	15.50	35.17	8.70	31.66	20.69	54.0	-33.31
4638.00	V	1	0	14.20	35.33	10.37	32.44	21.68	54.0	-32.32
5565.60	V	1	0	14.20	34.99	10.78	34.05	24.04	54.0	-29.96

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “914.8 MHz” Spurious Emissions with MFB9153 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2744.00	H	1	0	40.12	35.29	7.46	29.24	41.53	74.0	-32.47
3659.00	H	1	0	29.30	35.26	8.60	31.59	34.23	74.0	-39.77
7318.00	H	1	0	25.40	35.61	12.74	36.16	38.69	74.0	-35.31
Average										
2744.00	H	1	0	29.44	35.29	7.46	29.24	30.85	54.0	-23.15
3659.00	H	1	0	17.67	35.26	8.60	31.59	22.6	54.0	-31.4
7318.00	H	1	0	13.56	35.61	12.74	36.16	26.85	54.0	-27.15

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 1 “902.8 MHz” Spurious Emissions with MFB9153 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2708.00	V	1	0	29.50	35.55	7.45	29.11	30.51	74.0	-43.49
3611.00	V	1	0	31.20	35.31	8.47	31.39	35.75	74.0	-38.25
4514.00	V	1	0	26.00	35.63	9.25	32.17	31.79	74.0	-42.21
Average										
2708.00	V	1	0	16.90	35.55	7.45	29.11	17.91	54.0	-36.09
3611.00	V	1	0	19.50	35.31	8.47	31.39	24.05	54.0	-29.95
4514.00	V	1	0	14.50	35.63	9.25	32.17	20.29	54.0	-33.71

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz, Peak and Average measurements.

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EUT Name	LAN Option Board	**Date**	June 18, 2007
EUT Model	ILC/ILN	**Temp / Hum in**	74 deg F / 46% rh
EUT Serial	255-0000373648	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC / Freq.**	120VAC 60Hz
Deg/sweep		**RBW / VBW**	1MHz/1MHz
Dist/Ant Used	3 meters 1Ghz -10GHz	**Performed by**	Randy Masline
Configuration	Channel 31 “927.6 MHz” Spurious Emissions with MFB9153 Antenna		

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak										
2782.80	H	1	0	28.20	35.35	7.48	29.89	30.22	74.0	-43.78
3710.40	H	1	0	27.60	35.17	8.70	32.02	33.16	74.0	-40.84
4638.00	H	1	0	26.80	35.33	10.37	32.70	34.54	74.0	-39.46
5565.60	H	1	0	26.20	34.99	10.78	34.35	36.35	74.0	-37.65
Average										
2782.80	H	1	0	16.80	35.35	7.48	29.89	18.82	54.0	-35.18
3710.40	H	1	0	15.70	35.17	8.70	32.02	21.26	54.0	-32.74
4638.00	H	1	0	14.40	35.33	10.37	32.70	22.14	54.0	-31.86
5565.60	H	1	0	14.40	34.99	10.78	34.35	24.55	54.0	-29.45

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

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

Notes: RBW/VBW = 1MHz/1MHz For frequencies between 1GHz and 10 GHz

5.3 Frequency Hopping Spread Spectrum Systems FCC Part 15.247(g)

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

When the ALPHA Meter is presented with a continuous data stream, each 97.3 msec packet transmitted by the meter will be sent on the next channel in the 25-channel pseudo random list. When presented with a continuous data stream, the ALPHA meter adheres to the 0.4 second dwell time for each 10 second window requirement. The ALPHA Meter always distributes its transmissions across all 25 channels, and does not re-use a channel again until a transmission has occurred on each of the other 24 channels.

5.4 Incorporation of Intelligence within a Frequency Hopping Spread Spectrum System FCC Part 15.247(h)

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The ALPHA meter does not attempt to recognize other users or interferers within the spectrum band and then attempt to select which channels to use. The ALPHA Meter always distributes its transmissions across the same 25 channels. A channel is not re-used until a transmission has occurred on each of the other 24 channels.

5.5 Frequency Stability FCC Part 15.215(c)

The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

Spectrum Analyzer Parameters:

RBW=30KHz

VBW=RBW

Span=1MHz

LOG dB/div.= 10dB

Sweep = 9.167 mS

Trigger Video

5.5.1 Containment of the Emission during Variations in Temperature

The EUT was placed in an environmental temperature test chamber, supplied with the normal AC voltage, and with an antenna attached to the output port. If the antenna is an adjustable length antenna, it will be fully extended. The monitoring device (ie. Spectrum analyzer) was then attached to a receive antenna placed 15 cm away from the EUT via coaxial cable.

The temperature inside the chamber is then raised to the highest temperature specified and allowed sufficient time for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the environmental chamber, the carrier signal was then measured 40 min after temperature stabilization. Then the above process is repeated for the lowest temperature specified and 10 degree Centigrade increments between the extremes thereafter.

Results

Channel 0 “Low Band” (Modulated) 902.8 MHz

Temperature	Frequency in MHz measured 20dB below peak		Permitted Band Edge in MHz	Results
-30˚ C	902.476	903.124	902 - 928	Pass
-20˚ C	902.489	903.111	902 - 928	Pass
-10˚ C	902.495	903.105	902 - 928	Pass
0˚ C	902.489	903.111	902 - 928	Pass
10˚ C	902.476	903.124	902 - 928	Pass
20˚ C	902.594	903.086	902 - 928	Pass
30˚ C	902.525	903.075	902 - 928	Pass
40˚ C	902.536	903.064	902 - 928	Pass
50˚ C	902.536	903.064	902 - 928	Pass

Channel 31 “High Band” (Modulated) 927.6 MHz

Temperature	Frequency in MHz measured 20dB below peak		Permitted Band Edge in MHz	Results
-30˚ C	927.325	927.870	902 - 928	Pass
-20˚ C	927.325	927.870	902 - 928	Pass
-10˚ C	927.325	927.870	902 - 928	Pass
0˚ C	927.325	927.870	902 - 928	Pass
10˚ C	927.325	927.870	902 - 928	Pass
20˚ C	927.325	927.870	902 - 928	Pass
30˚ C	927.330	927.885	902 - 928	Pass
40˚ C	927.330	927.885	902 - 928	Pass
50˚ C	927.330	927.885	902 - 928	Pass

5.5.2 Containment of the Emission during Variations in Voltage

The setup was identical section 4.7.1 except the temperature inside of the chamber was set to 17 deg. C.

Channel 0 “Low Band” 902.8 MHz (Modulated)

Voltage	Frequency in MHz measured 20dB below peak		Permitted Band Edge in MHz	Results
120 VAC	902.468	903.132	902 - 928	Pass
102 VAC	902.465	903.136	902 - 928	Pass
138 VAC	902.483	903.116	902 - 928	Pass

Channel 31 “High Band” 927.6 MHz (Modulated)

Temperature	Frequency in MHz measured 20dB below peak		Permitted Band Edge in MHz	Results
120 VAC	927.331	927.885	902 - 928	Pass
102 VAC	927.332	927.886	902 - 928	Pass
138 VAC	927.335	927.896	902 - 928	Pass

Spectrum Analyzer Parameters:

RBW=30KHz

VBW=RBW

Span=1MHz

LOG dB/div.= 10dB

Sweep = 5 mS

Trigger Video

5.5.3 Photos

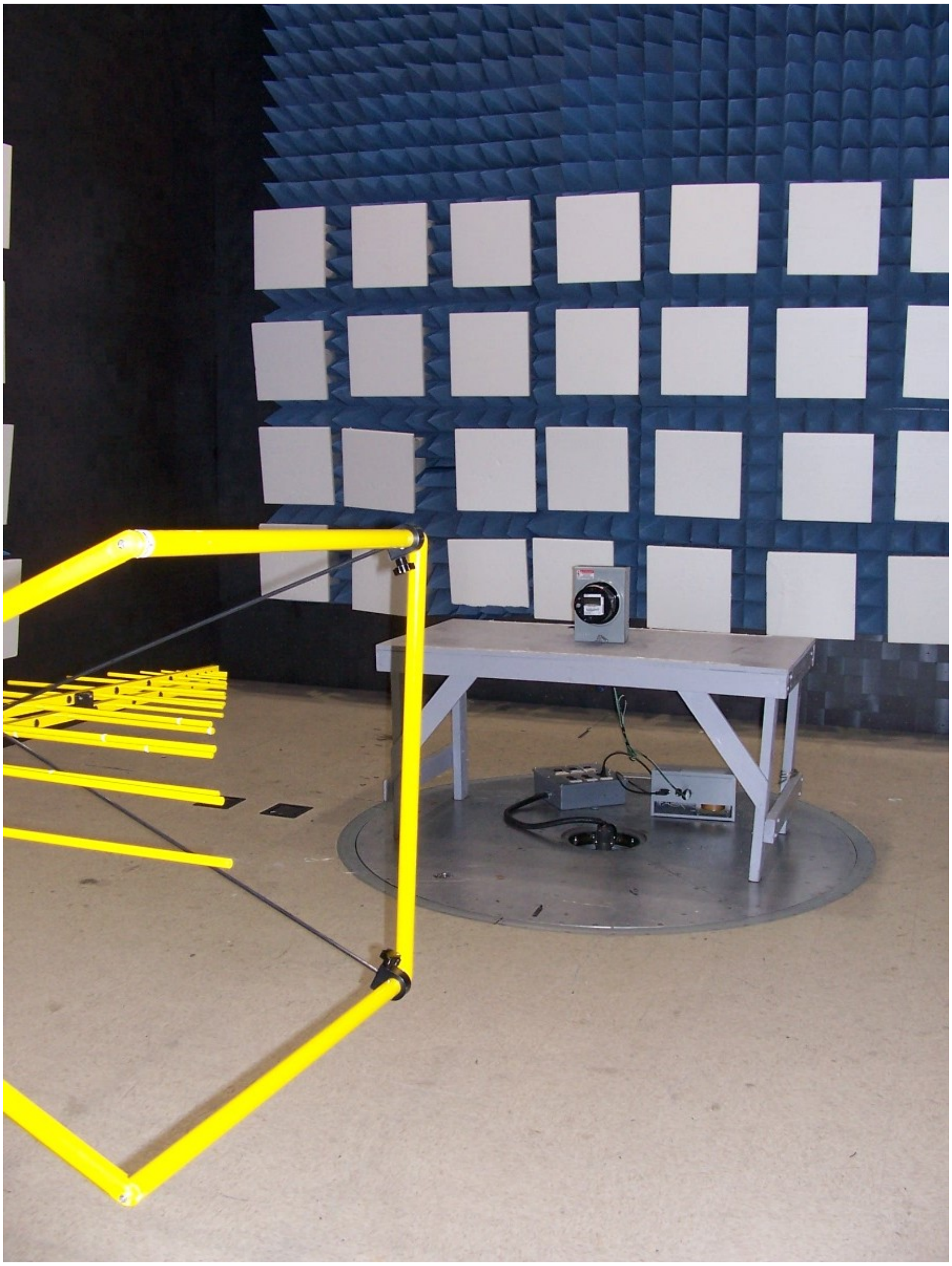

Figure 7 - Radiated Emissions Test Setup (Chamber – Front, X orientation)

Figure 8 - Radiated Emissions Test Setup (Chamber – Back, X orientation)

Figure 9 – Temperature Chamber Setup

Figure 10 – Setup for Substitution Method

Figure 11 – Setup for Conducted Power Measurements

5.5.4 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM - AMP + CBL + ACF

Where: FIM = Field Intensity Meter (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

5.6 Conducted Emissions

Testing was performed in accordance with 47 CFR Part 15.207, 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.

5.6.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. For each frequency sub-range, each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50µH / 50Ω LISNs.

Testing is either performed in the anechoic chamber or on PLC Site 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the anechoic chamber is a 2m x 2m wooden frame that is covered with ¼ inch hardware cloth and is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

5.6.1.1 Deviations

There were no deviations from this test methodology.

5.6.2 Test Results

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

Plots of the EUT's AC Line Conducted emissions are contained in the following sections. The plots show peak and/or average emissions and the corresponding peak and/or average limits. If the peak emissions are below the average limit, then the EUT is considered to pass and no average measurements are made. If the peak emissions are below the quasi-peak limit and the average emissions are below the average limit, then the EUT is considered to pass and no further measurements are made. Otherwise, individual frequencies are measured and compared to the corresponding limit for the detector used (quasi-peak or average).

5.6.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

SOP 2 Conducted Emissions

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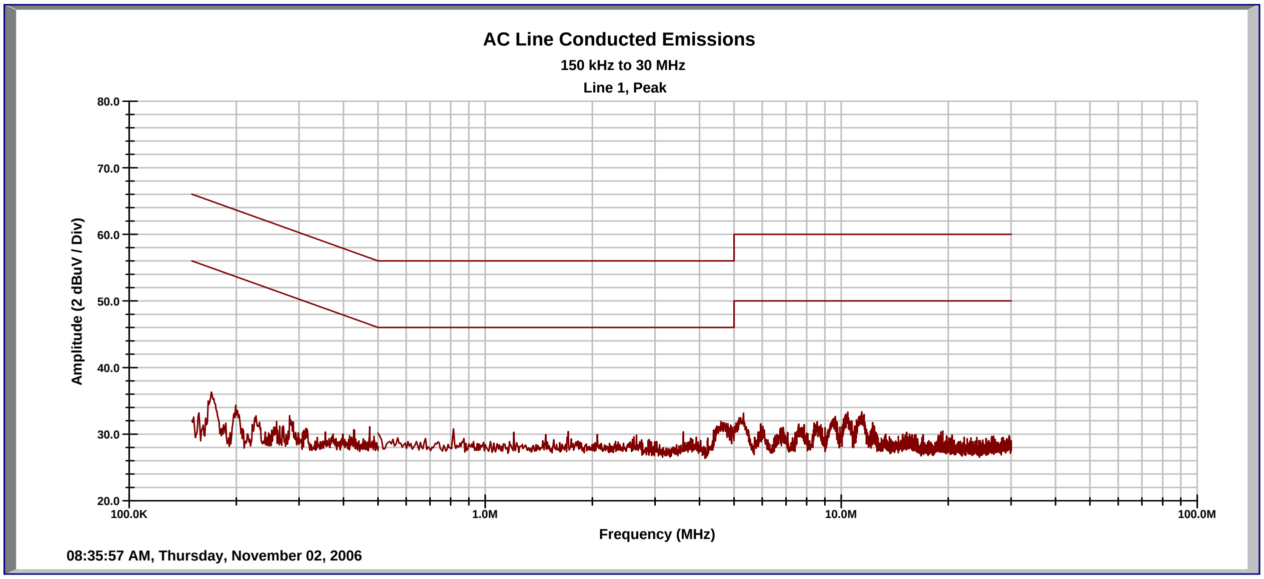
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	480VAC/60Hz
LISNs Used	ABB #2	**Performed by**	Randy Masline
Configuration	Form 2S Meter		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.17	1	14.61	6.29	0.01	10.04	64.96	54.96	-40.30	-38.62
5.30	1	15.63	9.00	0.07	10.17	60.00	50.00	-34.13	-30.76

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

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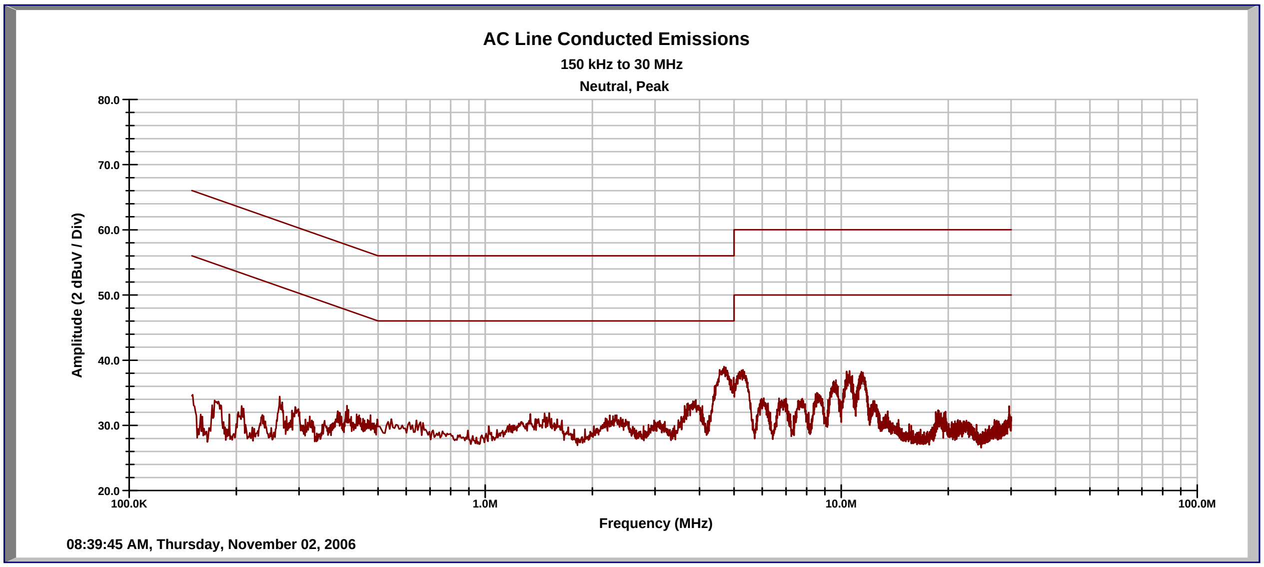
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	480VAC/60Hz
LISNs Used	ABB #2	**Performed by**	Randy Masline
Configuration	Form 2S Meter		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
4.68	N	25.07	18.83	0.07	10.06	56.00	46.00	-20.80	-17.04
5.24	N	23.87	17.25	0.07	10.09	60.00	50.00	-25.97	-22.59
10.55	N	23.24	16.87	0.11	10.31	60.00	50.00	-26.34	-22.71
11.50	N	22.54	16.07	0.12	10.33	60.00	50.00	-27.01	-23.48

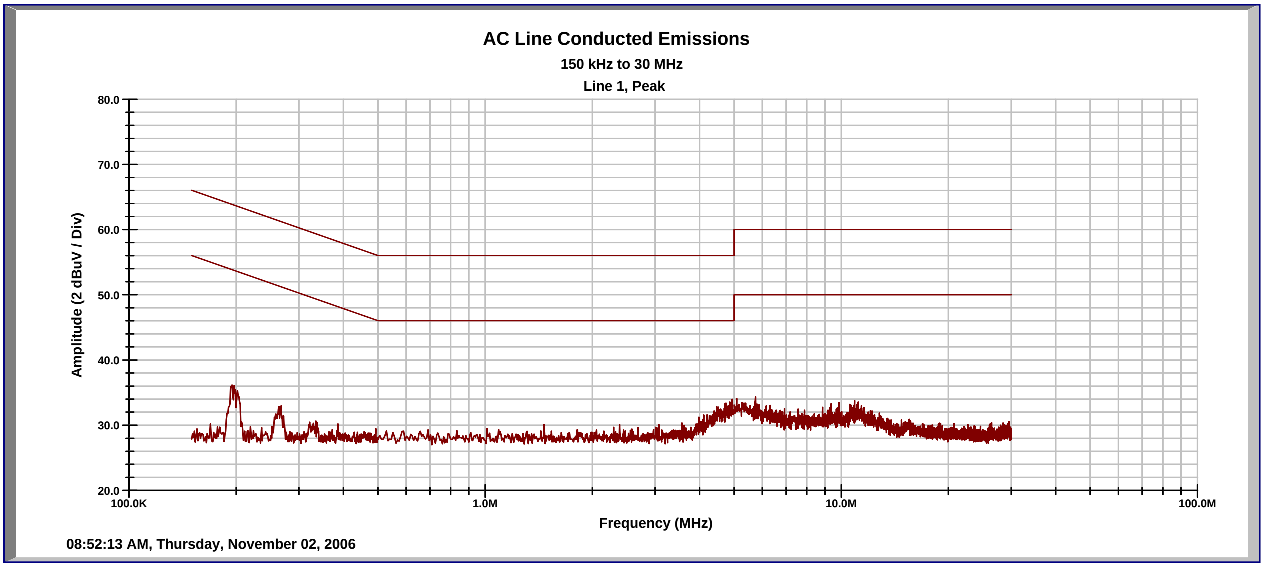
Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm$ 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions   Tracking # 30662119.001 Page 3 of 12

EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	120VAC/60Hz
LISNs Used	ABB #2	**Performed by**	Randy Masline
Configuration	Form 2S Meter		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.20	1	22.77	11.31	0.00	10.05	63.65	53.65	-30.83	-32.29
0.27	1	16.82	7.00	0.01	10.04	61.21	51.21	-34.34	-34.16

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB   Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

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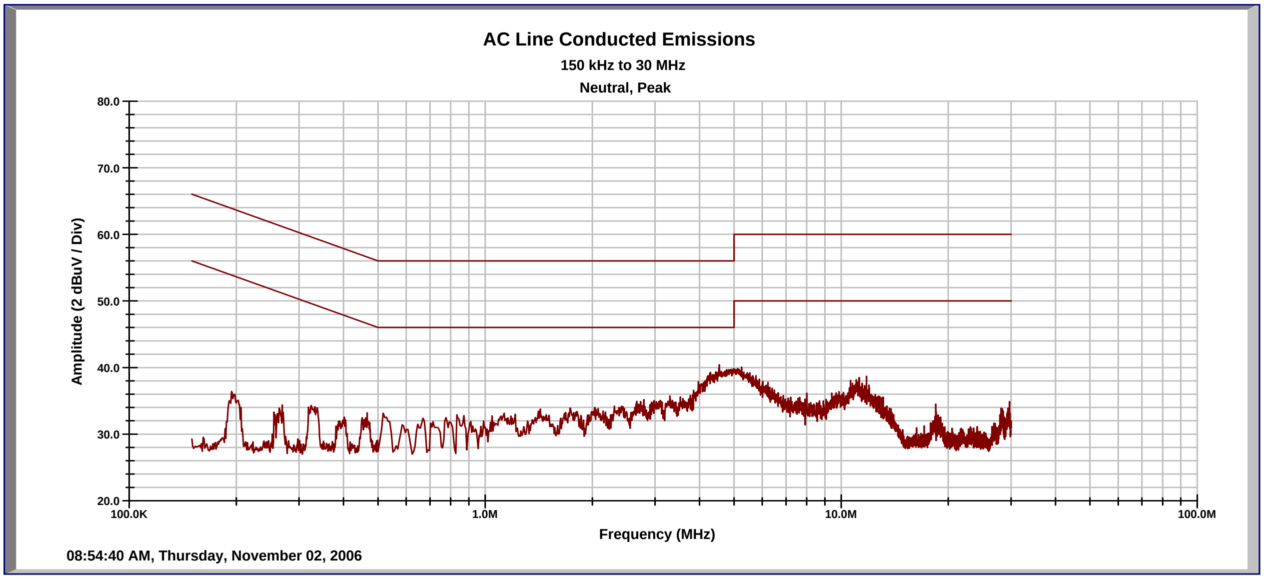
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	120VAC/60Hz
LISNs Used	ABB #2	**Performed by**	Randy Masline
Configuration	Form 2S Meter		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.20	N	22.72	16.16	0.00	9.93	63.65	53.65	-31.00	-27.56
0.33	N	19.71	13.73	0.01	9.92	59.40	49.40	-29.76	-25.74
4.54	N	24.99	12.92	0.06	10.07	56.00	46.00	-20.88	-22.95
5.11	N	24.63	12.91	0.07	10.09	60.00	50.00	-25.21	-26.93

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

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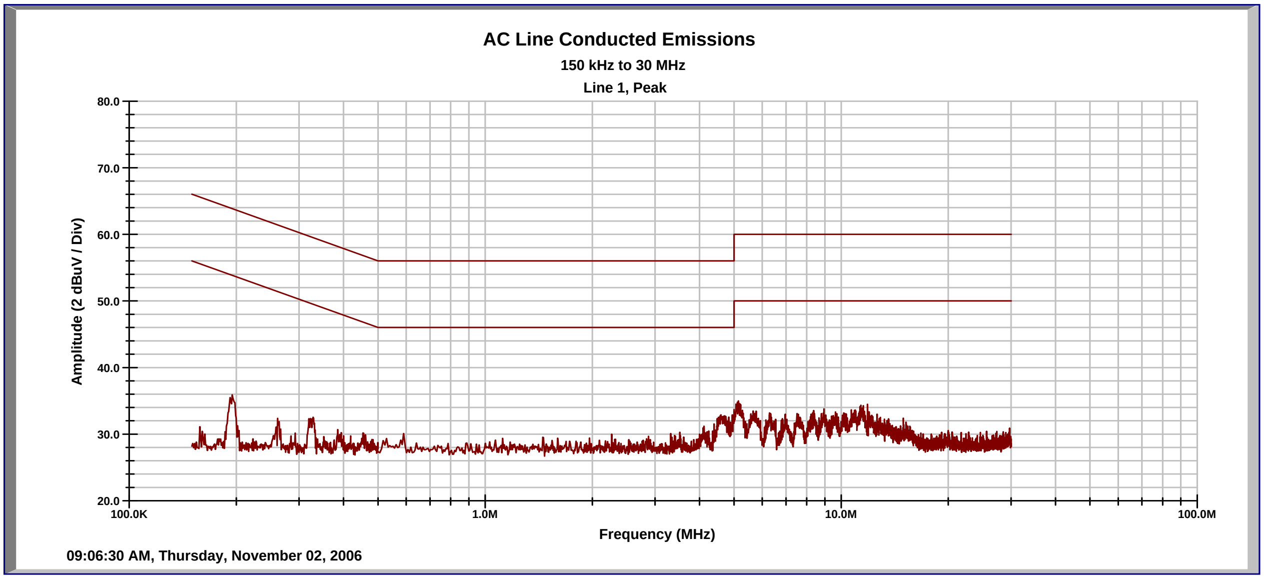
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	240VAC/60Hz
LISNs Used	ABB #2	**Performed by**	Randy Masline
Configuration	Form 2S Meter		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.19	1	20.43	10.48	0.00	10.04	64.04	54.04	-33.56	-33.51
5.14	1	18.13	8.18	0.07	10.16	60.00	50.00	-31.64	-31.59

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

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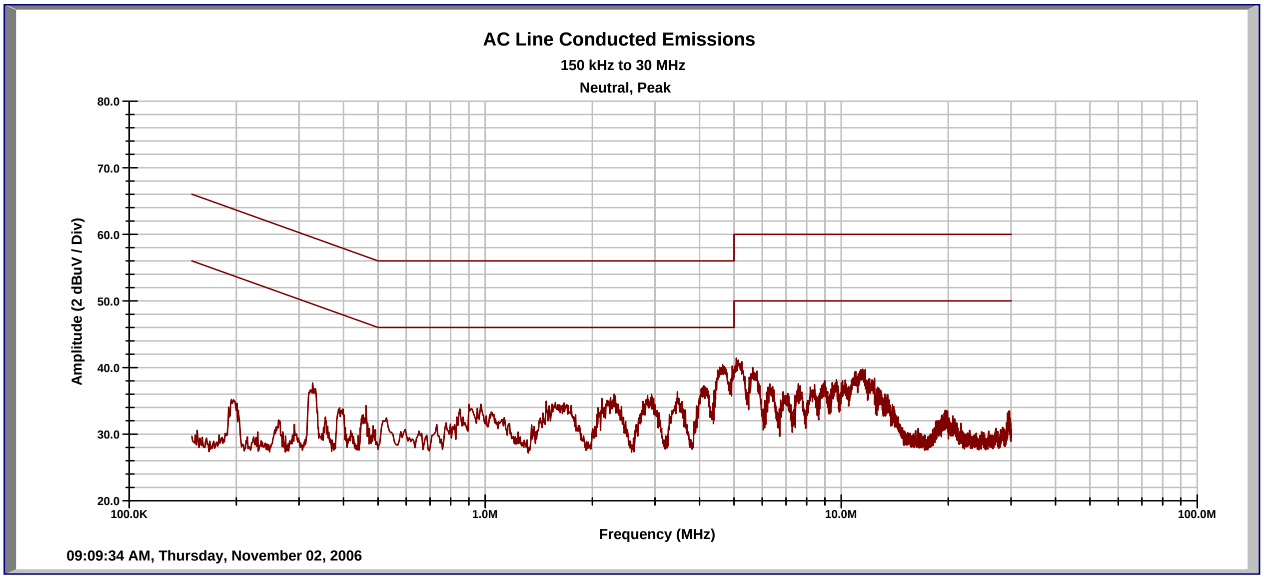
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	240VAC/60Hz
LISNs Used	ABB #2	**Performed by**	Randy Masline
Configuration	Form 2S Meter		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.33	N	23.33	17.82	0.01	9.92	59.53	49.53	-26.26	-21.77
4.70	N	26.25	16.81	0.07	10.06	56.00	46.00	-19.62	-19.06
5.07	N	25.21	14.95	0.07	10.09	60.00	50.00	-24.63	-24.89
2.30	N	19.72	9.52	0.04	9.98	56.00	46.00	-26.26	-26.46

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

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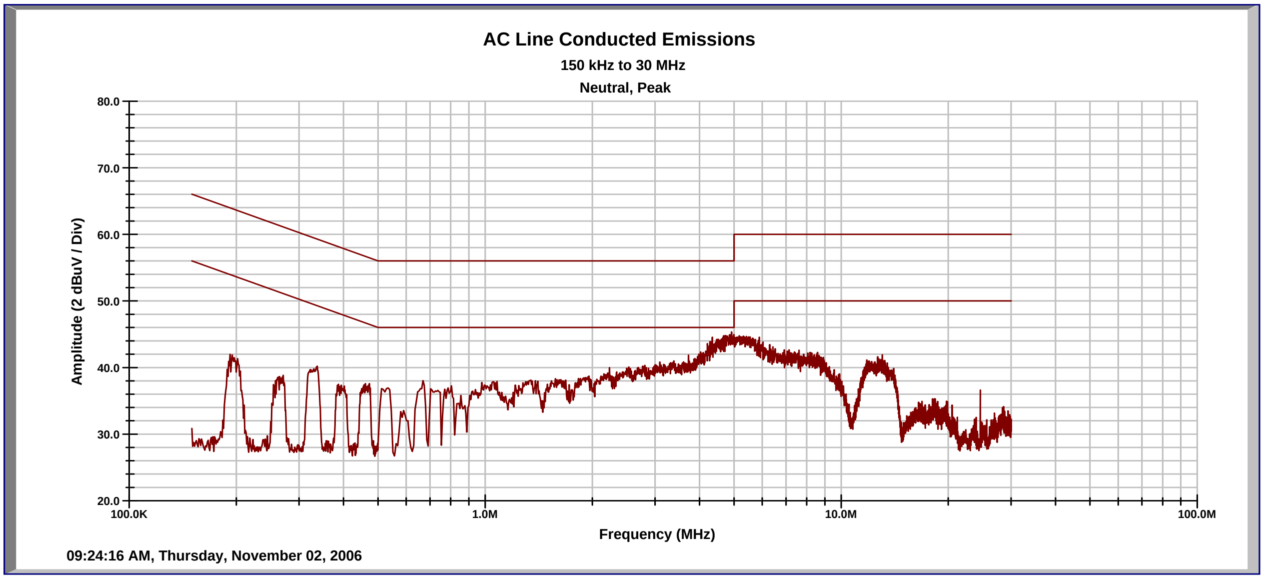
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	120VAC/60Hz
LISNs Used	ABB #1	**Performed by**	Randy Masline
Configuration	Form 9S Meter/Collector		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
4.34	N	28.58	17.20	0.07	10.05	56.00	46.00	-17.30	-18.68
4.98	N	30.38	20.24	0.06	10.08	56.00	46.00	-15.48	-15.62
5.47	N	29.88	19.75	0.07	10.11	60.00	50.00	-19.94	-20.07
0.33	N	27.70	20.04	0.01	9.92	59.33	49.33	-21.69	-19.35

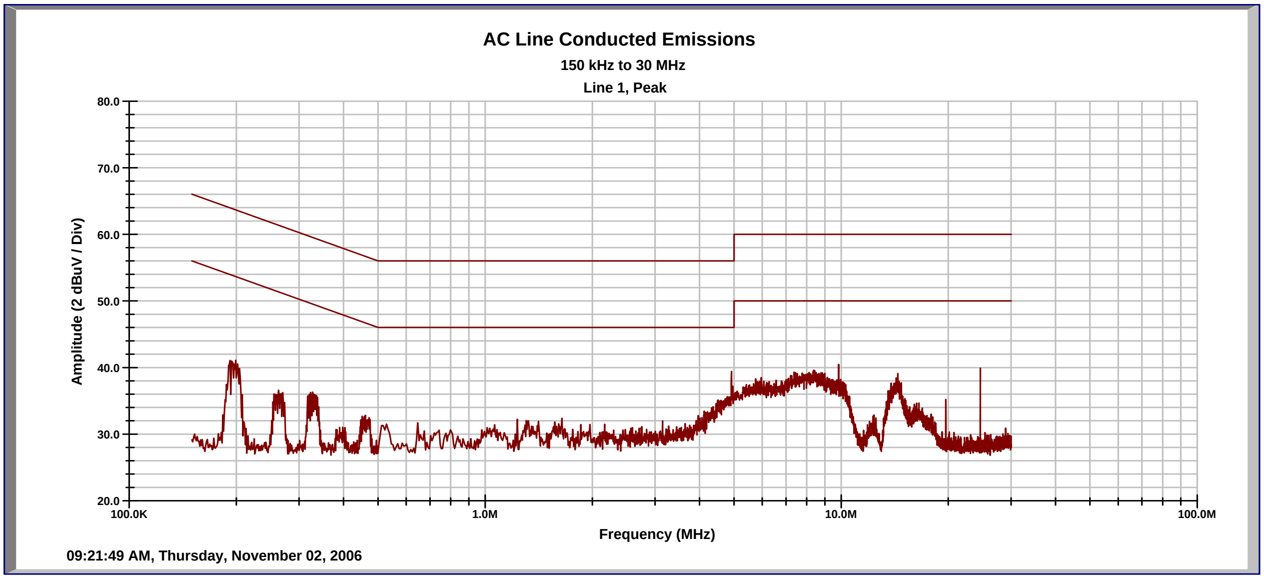
Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB   Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions Tracking # 30662119.001 Page 8 of 12

EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	120VAC/60Hz
LISNs Used	ABB #2	**Performed by**	Randy Masline
Configuration	Form 9S Meter/Collector		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
4.92	1	25.70	22.81	0.06	10.15	56.00	46.00	-20.09	-12.98
9.83	1	27.19	24.32	0.11	10.36	60.00	50.00	-22.34	-15.21

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

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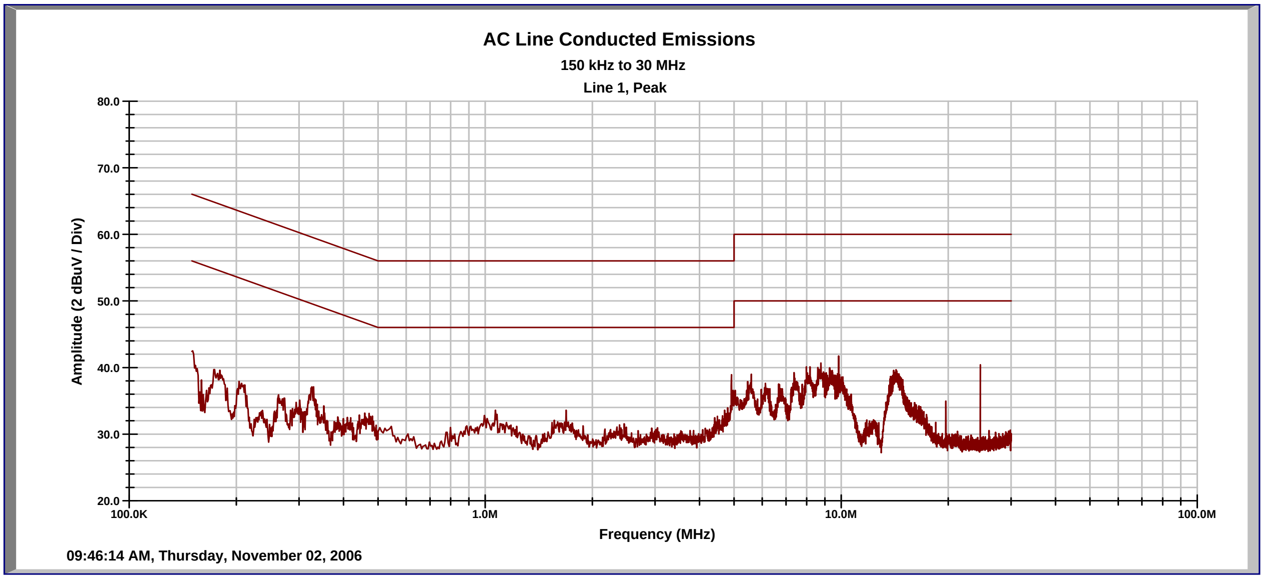
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	277VAC/60Hz
LISNs Used	ABB #1	**Performed by**	Randy Masline
Configuration	Form 9S Meter/Collector		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
4.91	1	25.89	23.60	0.06	10.15	56.00	46.00	-19.90	-12.19
9.83	1	27.44	24.65	0.11	10.36	60.00	50.00	-22.09	-14.88

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

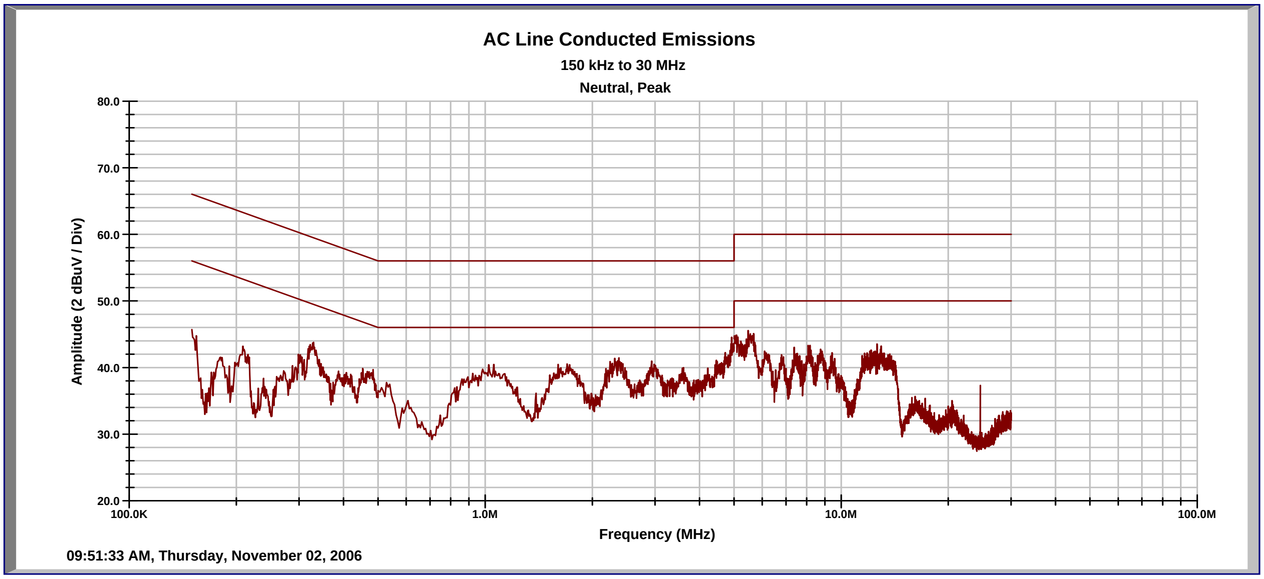
Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB   Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

Tracking # 30662119.001 Page 10 of 12

EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	277VAC/60Hz
LISNs Used	ABB #1	**Performed by**	Randy Masline
Configuration	Form 9S Meter/Collector		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.33	N	30.36	26.48	0.01	9.92	59.48	49.48	-19.18	-13.06
2.31	N	26.36	19.01	0.04	9.98	56.00	46.00	-19.62	-16.97
5.06	N	29.87	21.73	0.07	10.09	60.00	50.00	-19.97	-18.11
5.48	N	29.10	22.08	0.08	10.11	60.00	50.00	-20.72	-17.74

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm$ 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

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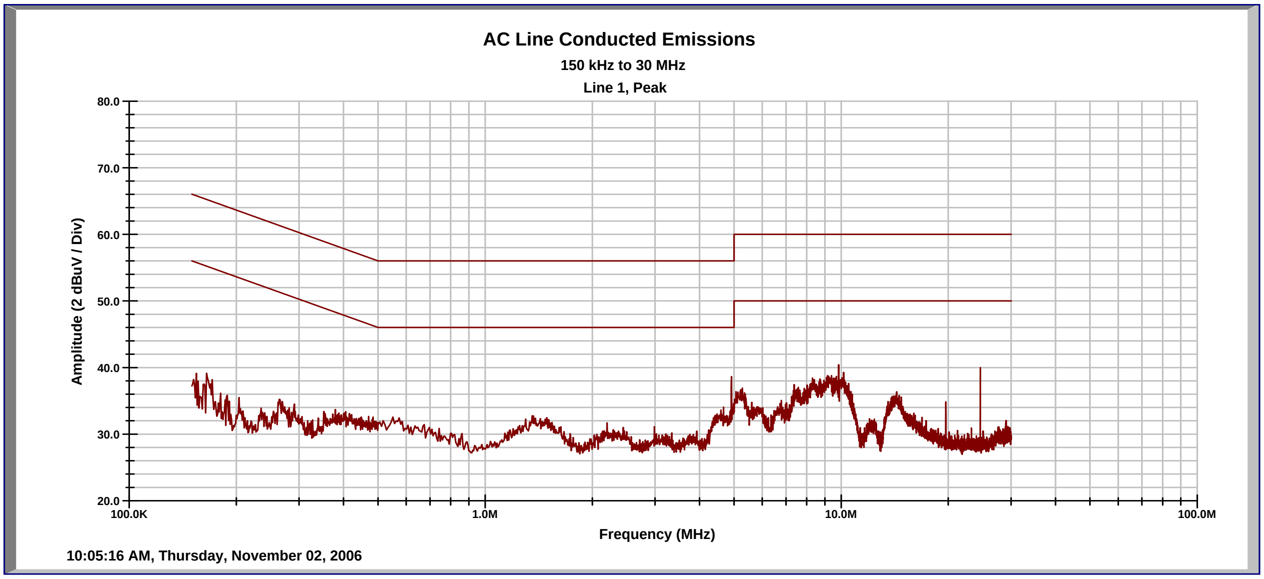
EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	480VAC/60Hz
LISNs Used	ABB #1	**Performed by**	Randy Masline
Configuration	Form 9S Meter/Collector		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
4.91	1	26.40	24.60	0.06	10.15	56.00	46.00	-19.39	-11.19
9.83	1	27.00	23.47	0.11	10.36	60.00	50.00	-22.53	-16.06

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

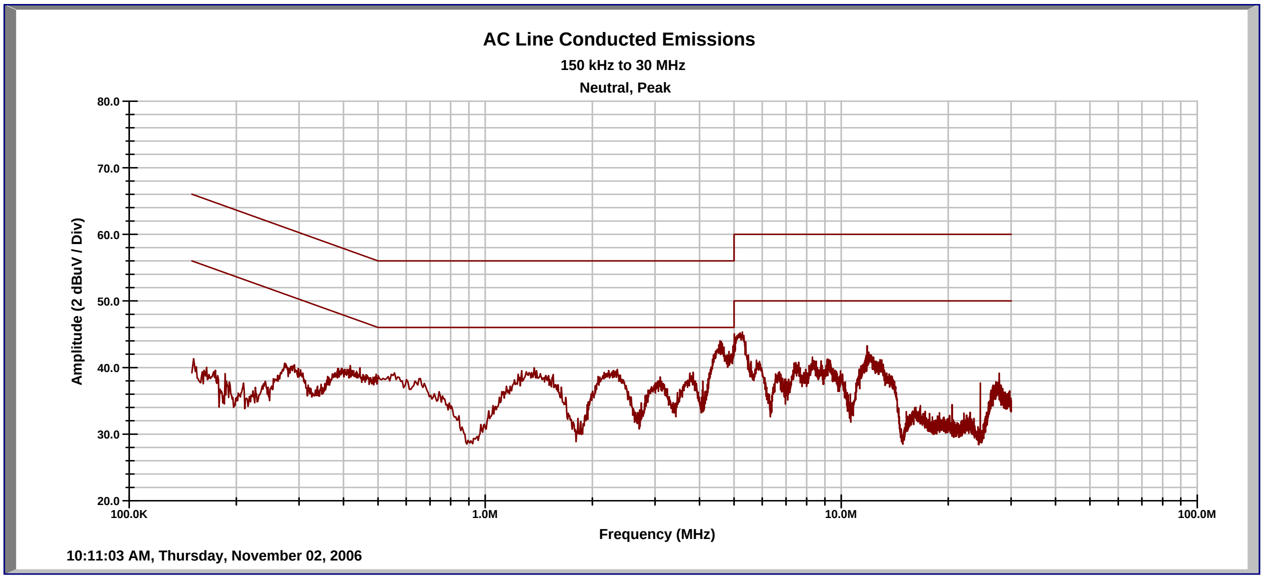
Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 2 Conducted Emissions

Tracking # 30662119.001 Page 12 of 12

EUT Name	LAN Option Board	**Date**	02 November 2006
EUT Model	ILC/ILN	**Temperature**	74 Deg F
EUT Serial	06 210 289	**Humidity**	39% rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 7	**Line AC /Freq**	480VAC/60Hz
LISNs Used	ABB #1	**Performed by**	Randy Masline
Configuration	Form 9S Meter/Collector		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.42	N	28.91	21.00	0.01	9.93	57.51	47.51	-18.66	-16.57
1.36	N	25.31	19.94	0.03	9.96	56.00	46.00	-20.70	-16.07
4.56	N	29.35	23.24	0.06	10.06	56.00	46.00	-16.52	-12.63
5.27	N	31.25	24.91	0.07	10.10	60.00	50.00	-18.58	-14.92

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm$ 1.2dB   Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

5.6.3 Photos

Figure 12 - Conducted Emissions Test Setup (Front)

5.6.4 Sample Calculation

The signal strength is calculated by adding the LISN Correction Factor and Cable Loss to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM + CBL + LCF

Where: FIM = Field Intensity Meter (dBμV)
CBL = Cable Loss (dB)
LCF = LISN Loss (dB)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

6 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	Hewlett Packard	8449B	3008A00268	05-Aug-06	05-Aug-07
Ant. Log Periodic	AH Systems	SAS-516	133	13-Mar-06	13-Mar-07
Antenna Horn	EMCO	3115	9903.5770	28 -Apr -06	28 -Apr-07
Ant. Dipole Set BL 1-4	EMCO	3121C	9302-914	9-Sep-05	9-Sep-06
Cable, Coax	Andrew	FSJ1-50A	031	18-Jan-06	18-Jan-07
Cable, Coax	Andrew	FSJ1-50A	041	18-Jan-06	18-Jan-07
Cable, Coax	Andrew	FSJ1-50A	042	18-Jan-06	18-Jan-07
Cable, Coax	Andrew	FSJ1-50A	045	18-Jan-06	18-Jan-07
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	27-Jan-06	27-Jan-07
Data Table, EMCWin	TUV EMC	EMCWin.dll	002	N/A	N/A
Spectrum Analyzer	Rohde & Schwarz	ESI		22-Dec-06	22-Dec-07

SOP 2 - Conducted Emissions (AC/DC and Signal I/O)					
Cable, Coax	Belden	RG-213	004	18-Jan-06	18-Jan-07
LISN (5) 50mH/50Ω	Solar Electronics	8028-50-TS-24	990441	5-Aug-06	5-Aug-07
LISN (6) 50mH/50Ω	Solar Electronics	8028-50-TS-24	990442	5-Aug-06	5-Aug-07
LISN Selection Box	TUV Rheinland	CFL-9206	1650	26-Sep-05	26-Sep-06
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	27-Feb-06	27-Feb-07
Cable, Coax	Belden	RG-213	004	18-Jan-06	18-Jan-07
General Laboratory Equipment					
Filter, High Pass	Bonn	BHF1500	025155	22-Jul-03	22-Jul-04
Meter, Multi	Fluke	79-3	69200606	5-Aug-06	5-Aug-07
Meter, Temp/Humid/Barom	Fisher	02-400	01	24-Oct-05	24-Oct-06
Power Supply, AC	California Instruments	1251P	L06429	CNR II	CNR II

* 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.

7 Secondary Test Equipment Use List

The following test equipment was used during additional testing

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emissions (5 Meter Chamber)					
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	19-Apr-07	19-Apr-08
Cable, Coax	Andrew	FSJ1-50A	036	14-Mar-07	14-Mar-08
Cable, Coax	Andrew	FSJ1-50A	030	24-Jan-2007	24-Jan-2008
Cable, Coax	Andrew	FSJ1-50A	045	24-Jan-07	24-Jan-08
Ant. BiconiLog	Chase	CBL6140A	1108	16-May-2006	16-May-2008
DBL Ridge Horn ANT	EMCO	3115	2236	25-Jan-07	25-Jan-09