



EMC EMISSIONS - TEST REPORT (Full)

Test Report No. **BC300408-1** Issue Date: **Mon 22/Dec/2003**

Model / Serial No. **L100-W-T-B / proto #1**

Product Type **Link-IT Wireless Connectivity Device**

Client **HIGHTec Consulting, Inc**

Manufacturer **HEI Inc.**

License holder **HEI Inc.**

Address **4801 N. 63rd Street**

Boulder, CO 80301

Test Criteria Applied **FCC CFR47 Part 15.247**

Test Result **PASS**

Test Project Number
References
Total Pages
Including
Appendices:

BC300408-1

Title 47 CFR 15: RADIO FREQUENCY
DEVICES

13

Todd Jackson

Robert Crosswell

Reviewed By :

Approved By :

INTERNATIONAL APPROVALS LABORATORIES (IAL) reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. IAL have no liability for any deductions, inferences or generalizations drawn by the client or others from IAL issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval of IAL. This report shall not be used by the client to claim product endorsement by NVLAP (No. 200624-0) or any agency of the US government.

International Approval Laboratories and its professional staff hold government and professional organization certifications and are members of IEEE, NVLAP, and VCCI.



Lab Code: 200624-0



Accredited

D I R E C T O R Y

Documentation	Page(s)
Test report	<u>1 - 54</u>
Directory	<u>2</u>
Test Regulations	<u>3</u>
General Remarks	<u>3</u>
Test-setup Photographs	<u>4 - 12</u>
 Appendix A	
Test Data Sheets and Test Equipment Used	<u>13 - 48</u>
 Appendix B	
Test Plan/Constructional Data Form	<u>49 - 49</u>
 Appendix C	
Measurement Protocol/Test Procedures	<u>50 - 54</u>

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty for Conducted Emissions in the frequency range of 150kHz – 30MHz is calculated to be $\pm 2.30\text{dB}$ and for Radiated Emissions is calculated to be $\pm 3.60\text{dB}$ in the frequency range of 30MHz – 200MHz and $\pm 3.38\text{dB}$ in the frequency range of 200MHz – 1000MHz.

EUT Received Date: 6-Dec-2003

Testing Start Date: 6-Dec-2003

Testing End Date: 8-Dec-2003

The tests were performed according to following regulations :

1. FCC CFR47 Part 15.205
2. FCC CFR47 Part 15.207
3. FCC CFR47 Part 15.209
4. FCC CFR47 Part 15.247
5. ICES-003

Emission Test Results:

Conducted Emissions, Powerline -

Test Result

Minimum limit margin -18.6 dB at 0.188 MHz
 Maximum limit exceeding _____ dB at _____ MHz

Remarks: 18.6dB margin @ 120VAC/60Hz

Radiated Emissions (15.209) -

Test Result

Minimum limit margin -2.10 dB at 414.77 MHz
 Maximum limit exceeding _____ dB at _____ MHz

Remarks: 2.1dB margin outside restricted band compliance to 15.209, not a product of the transmitter

Radiated Emissions (15.205) -

Test Result

Minimum limit margin -3.80 dB at 2483.51 MHz
 Maximum limit exceeding _____ dB at _____ MHz

Remarks: 3.8dB margin at 2483.51MHz a product of the transmitter

Bandwidth 15.247 (a)(2) -

Test Result

Minimum limit margin N/A dB at 6.88 MHz
 Maximum limit exceeding _____ dB at _____ MHz

Remarks: 6.88MHz on Mid Channel

Peak Output Power 15.247 (b)(1) -

Test Result

Minimum limit margin N/A dB at N/A MHz
 Maximum limit exceeding _____ dB at _____ MHz

Remarks: 25.5mW on High Channel - Limit = 1 watt

Out of band emissions 15.247 (c) -

Test Result

Minimum limit margin -3.80 dB at 2483.51 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: Maximum Spurious Emissions outside operating frequency meets the restricted band requirement (-49.8dBc)

Power Density 15.247 (d) -

Test Result

Minimum limit margin -15.0 dB at 2412.55 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: -15dB margin on the low channel - limit = 8dBm

GENERAL REMARKS:

Modifications required to pass: Added 2 ferrites on the Ethernet Cable needed for 15.209

Test Specification Deviations: Additions to or Exclusions from

Test-setup photo(s):
Conducted Emissions



Test-setup photo(s):
Conducted Emissions



Test-setup photo(s):
Radiated Emissions



Test-setup photo(s):
Radiated Emissions



Test-setup photo(s):
FCC CFR47 Part 15.247 (a)(2)



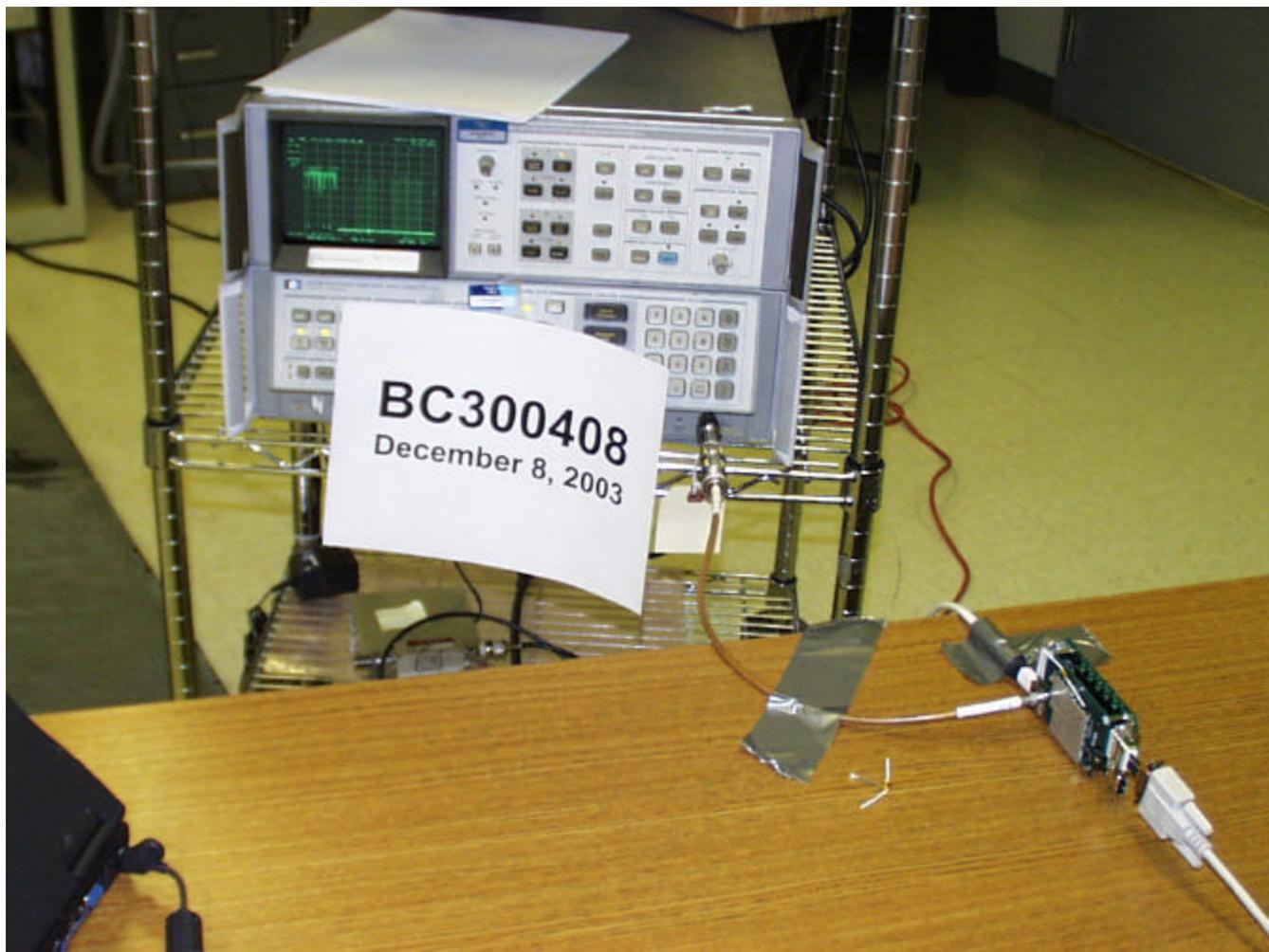
Test-setup photo(s):
FCC CFR47 Part 15.247 (b)(1)



Test-setup photo(s):
FCC CFR47 Part 15.247 (c)

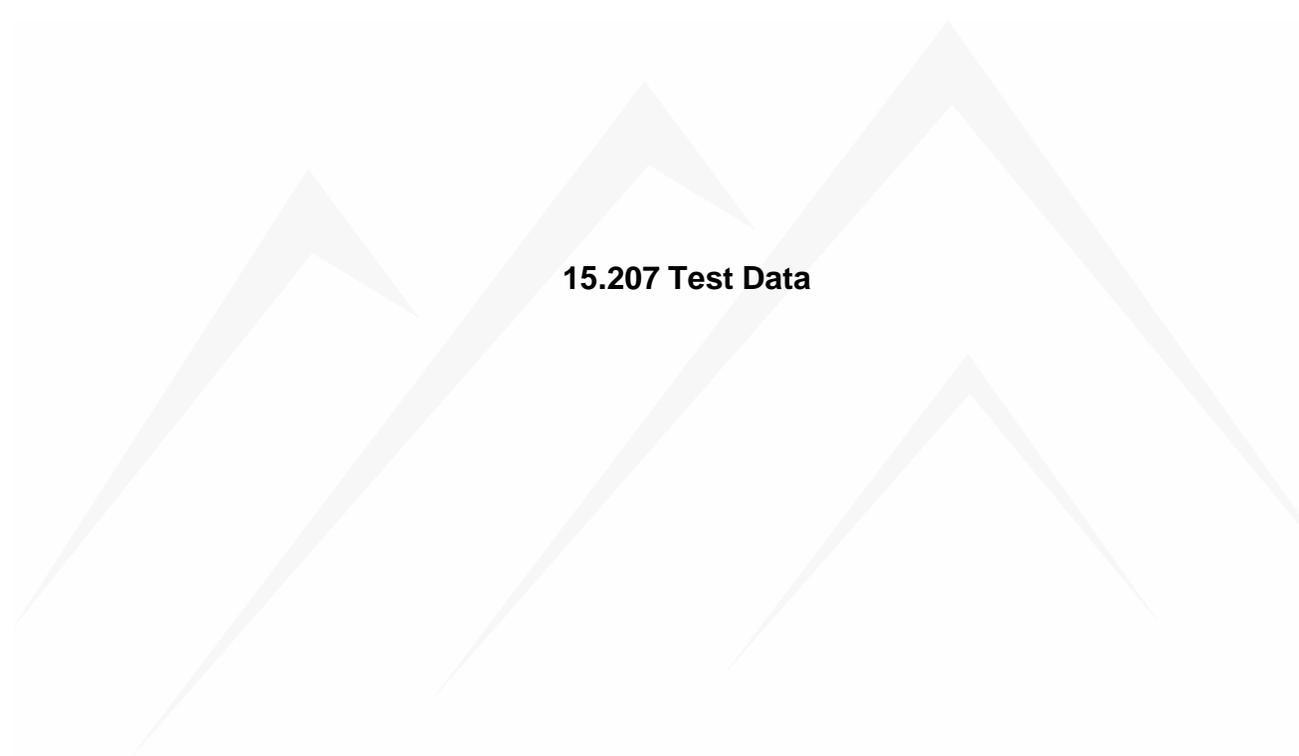


Test-setup photo(s):
FCC CFR47 Part 15.247 (d)



Appendix A

Test Data Sheets
and
Test Equipment Used



15.207 Test Data

Conducted Electromagnetic Emissions

Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: EN55022 Class B / FCC 15.207 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 1 of 2

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / LISN / ATTEN	FINAL	TEST POINT	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB)	(dBuV)		EN55022 B Avg	EN55022 B / 15.207 QP
0.150	27.9 Qp	0.1 / 0.0 / -10.0	38.0	Neutral	N/A	-28.0
0.150	1.0 Av	0.1 / 0.0 / -10.0	11.1	Neutral	-44.9	N/A
0.188	35.4 Qp	0.1 / 0.0 / -10.0	45.5	Neutral	N/A	-18.6
0.188	22.0 Av	0.1 / 0.0 / -10.0	32.1	Neutral	-22.0	N/A
0.309	26.3 Qp	0.1 / 0.0 / -10.0	36.4	Neutral	N/A	-23.6
0.309	20.0 Av	0.1 / 0.0 / -10.0	30.1	Neutral	-19.9	N/A
0.493	24.9 Qp	0.1 / 0.0 / -10.0	35.0	Neutral	N/A	-21.1
0.493	16.1 Av	0.1 / 0.0 / -10.0	26.2	Neutral	-19.9	N/A
0.557	25.0 Qp	0.1 / 0.0 / -10.0	35.1	Neutral	N/A	-20.9
0.557	16.4 Av	0.1 / 0.0 / -10.0	26.5	Neutral	-19.5	N/A
2.86	24.7 Qp	0.3 / 0.1 / -10.0	35.1	Neutral	N/A	-20.9
2.86	7.0 Av	0.3 / 0.1 / -10.0	17.4	Neutral	-28.6	N/A
4.64	22.3 Qp	0.4 / 0.2 / -10.0	32.9	Neutral	N/A	-23.1
4.64	9.4 Av	0.4 / 0.2 / -10.0	20.0	Neutral	-26.0	N/A
30.00	6.6 Qp	1.2 / 2.2 / -10.0	20.0	Neutral	N/A	-40.0
0.150	23.4 Qp	0.1 / 0.0 / -10.0	33.5	Line 1	N/A	-32.5
0.150	0.8 Av	0.1 / 0.0 / -10.0	10.9	Line 1	-45.1	N/A
0.187	35.3 Qp	0.1 / 0.0 / -10.0	45.4	Line 1	N/A	-18.8
0.187	24.6 Av	0.1 / 0.0 / -10.0	34.7	Line 1	-19.5	N/A
0.309	24.4 Qp	0.1 / 0.0 / -10.0	34.5	Line 1	N/A	-25.5
0.309	18.3 Av	0.1 / 0.0 / -10.0	28.4	Line 1	-21.6	N/A
0.493	22.1 Qp	0.1 / 0.0 / -10.0	32.2	Line 1	N/A	-23.9
0.493	12.0 Av	0.1 / 0.0 / -10.0	22.1	Line 1	-24.0	N/A
0.557	23.9 Qp	0.1 / 0.0 / -10.0	34.0	Line 1	N/A	-22.0
0.557	12.6 Av	0.1 / 0.0 / -10.0	22.7	Line 1	-23.3	N/A
2.86	25.6 Qp	0.3 / 0.1 / -10.0	36.0	Line 1	N/A	-20.0
2.86	11.1 Av	0.3 / 0.1 / -10.0	21.5	Line 1	-24.5	N/A
4.64	23.7 Qp	0.4 / 0.2 / -10.0	34.3	Line 1	N/A	-21.7
4.64	9.2 Av	0.4 / 0.2 / -10.0	19.8	Line 1	-26.2	N/A
30.00	6.5 Qp	1.2 / 2.2 / -10.0	19.9	Line 1	N/A	-40.1

Conducted Electromagnetic Emissions

Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: EN55022 Class B / FCC 15.207 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 2 of 2

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / LISN / ATTEN	FINAL	TEST POINT	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB)	(dBuV)		EN55022 B Avg	EN55022 B QP
***** Measurement Summary *****						
0.188	35.4 Qp	0.1 / 0.0 / -10.0	45.5	Neutral	N/A	-18.6
0.557	16.4 Av	0.1 / 0.0 / -10.0	26.5	Neutral	-19.5	N/A
0.309	20.0 Av	0.1 / 0.0 / -10.0	30.1	Neutral	-19.9	N/A
0.493	16.1 Av	0.1 / 0.0 / -10.0	26.2	Neutral	-19.9	N/A
2.86	25.6 Qp	0.3 / 0.1 / -10.0	36.0	Line 1	N/A	-20.0
4.64	23.7 Qp	0.4 / 0.2 / -10.0	34.3	Line 1	N/A	-21.7
0.150	27.9 Qp	0.1 / 0.0 / -10.0	38.0	Neutral	N/A	-28.0
30.00	6.6 Qp	1.2 / 2.2 / -10.0	20.0	Neutral	N/A	-40.0



15.209/15.205 Test Data

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 08** Test Area: Pinewood Site 1 (10m)
 Test Method: EN55022/15.209-15.205 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 1 of 5

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	FCC Part 15.209/205
RFping is working but the EUT will not send data.						
CLK is now 46.08 MHz.						
213.48	31.2 Qp	2.5 / 11.4 / 27.4	17.6	V / 1.0 / 0.0	-12.4	-15.4
221.56	35.8 Qp	2.5 / 11.0 / 27.4	21.9	V / 1.0 / 0.0	-8.1	-13.6
264.06	32.4 Qp	2.8 / 12.7 / 27.2	20.6	V / 1.0 / 0.0	-16.4	-14.9
276.55	33.8 Qp	2.9 / 13.7 / 27.2	23.2	V / 1.0 / 0.0	-13.8	-12.3
352.04	33.1 Qp	3.3 / 15.4 / 27.4	24.4	V / 1.0 / 0.0	-12.6	-11.1
359.82	33.1 Qp	3.3 / 15.3 / 27.5	24.3	V / 1.0 / 0.0	-12.7	-11.2
366.29	31.6 Qp	3.4 / 15.8 / 27.6	23.1	V / 1.0 / 0.0	-13.9	-12.4
368.69	32.5 Qp	3.4 / 15.7 / 27.6	24.0	V / 1.0 / 0.0	-13.0	-11.5
397.79	29.4 Qp	3.5 / 15.2 / 27.9	20.3	V / 1.0 / 0.0	-16.7	-15.2
410.17	28.8 Qp	3.5 / 15.4 / 27.9	19.8	V / 1.0 / 0.0	-17.2	-15.7
960.03	26.2 Qp	5.8 / 23.1 / 27.6	27.4	V / 1.0 / 0.0	-9.6	-16.1
230.45	35.5 Qp	2.6 / 11.0 / 27.3	21.7	V / 1.0 / 0.0	-15.3	-13.8
322.61	35.3 Qp	3.2 / 14.6 / 27.2	25.9	V / 1.0 / 0.0	-11.1	-9.6
414.77	33.3 Qp	3.6 / 15.5 / 28.0	24.4	V / 1.0 / 0.0	-12.6	-11.1
506.93	30.9 Qp	3.9 / 18.1 / 28.4	24.5	V / 1.0 / 0.0	-12.5	-11.0
218.32	31.7 Qp	2.5 / 11.1 / 27.4	17.8	V / 1.0 / 0.0	-12.2	-17.7
223.35	36.2 Qp	2.5 / 10.9 / 27.4	22.3	V / 1.0 / 0.0	-7.7	-13.2
228.04	34.6 Qp	2.6 / 11.0 / 27.4	20.8	V / 1.0 / 0.0	-9.2	-14.7
333.93	30.5 Qp	3.2 / 14.9 / 27.3	21.4	V / 1.0 / 0.0	-15.6	-14.1
385.67	33.2 Qp	3.4 / 15.6 / 27.8	24.5	V / 1.0 / 0.0	-12.5	-11.0
368.69	34.4 Qp	3.4 / 15.7 / 27.6	25.9	V / 1.0 / 90.0	-11.1	-9.6
410.17	30.6 Qp	3.5 / 15.4 / 27.9	21.6	V / 1.0 / 90.0	-15.4	-13.9
960.03	25.9 Qp	5.8 / 23.1 / 27.6	27.1	V / 1.0 / 90.0	-9.9	-16.4
240.07	29.4 Qp	2.7 / 11.3 / 27.3	16.0	V / 1.0 / 90.0	-21.0	-19.5
223.35	36.1 Qp	2.5 / 10.9 / 27.4	22.2	V / 1.0 / 180.0	-7.8	-13.3
322.61	35.9 Qp	3.2 / 14.6 / 27.2	26.4	V / 1.0 / 180.0	-10.6	-9.1
397.79	29.4 Qp	3.5 / 15.2 / 27.9	20.3	V / 1.0 / 180.0	-16.7	-15.2
414.77	35.3 Qp	3.6 / 15.5 / 28.0	26.4	V / 1.0 / 180.0	-10.6	-9.1
506.93	31.6 Qp	3.9 / 18.1 / 28.4	25.2	V / 1.0 / 180.0	-11.8	-10.3
960.03	26.0 Qp	5.8 / 23.1 / 27.6	27.3	V / 1.0 / 180.0	-9.7	-16.2

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 08** Test Area: Pinewood Site 1 (10m)
 Test Method: EN55022/15.209-15.205 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 2 of 5

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dBm) (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) EN55022 B	DELTA2 (dB) FCC Part 15.209/205
223.35	35.9 Qp	2.5 / 10.9 / 27.4	21.9	V / 1.0 / 270.0	-8.1	-13.6
264.06	31.1 Qp	2.8 / 12.7 / 27.2	19.4	V / 1.0 / 270.0	-17.6	-16.1
276.55	37.0 Qp	2.9 / 13.7 / 27.2	26.4	V / 1.0 / 270.0	-10.6	-9.1
322.61	39.4 Qp	3.2 / 14.6 / 27.2	29.9	V / 1.0 / 270.0	-7.1	-5.6
359.82	32.9 Qp	3.3 / 15.3 / 27.5	24.1	V / 1.0 / 270.0	-12.9	-11.4
368.69	36.3 Qp	3.4 / 15.7 / 27.6	27.8	V / 1.0 / 270.0	-9.2	-7.7
397.79	31.2 Qp	3.5 / 15.2 / 27.9	22.0	V / 1.0 / 270.0	-15.0	-13.5
414.77	36.9 Qp	3.6 / 15.5 / 28.0	28.0	V / 1.0 / 270.0	-9.0	-7.5

The following were maximized between 200 and 1000 MHz.

414.77	38.6 Qp	3.6 / 15.5 / 28.0	29.7	V / 1.0 / 241.0	-7.3	-5.8
368.69	36.7 Qp	3.4 / 15.7 / 27.6	28.2	V / 1.0 / 277.0	-8.8	-7.3
322.61	40.0 Qp	3.2 / 14.6 / 27.2	30.6	V / 1.0 / 297.0	-6.4	-4.9
276.55	37.3 Qp	2.9 / 13.7 / 27.2	26.7	V / 1.0 / 302.0	-10.3	-8.8

Maximized cables.

322.61	40.4 Qp	3.2 / 14.6 / 27.2	30.9	V / 1.0 / 285.0	-6.1	-4.6
--------	---------	-------------------	------	-----------------	------	------

EUT is now sending data.

322.61	36.4 Qp	3.2 / 14.6 / 27.2	27.0	H / 2.5 / 0.0	-10.0	-8.5
359.82	29.6 Qp	3.3 / 15.3 / 27.5	20.7	H / 2.5 / 0.0	-16.3	-14.8
414.77	33.9 Qp	3.6 / 15.5 / 28.0	25.0	H / 2.5 / 0.0	-12.0	-10.5
506.93	31.2 Qp	3.9 / 18.1 / 28.4	24.9	H / 1.6 / 0.0	-12.1	-10.6
322.61	32.8 Qp	3.2 / 14.6 / 27.2	23.4	H / 1.6 / 0.0	-13.6	-12.1
322.61	33.9 Qp	3.2 / 14.6 / 27.2	24.4	H / 1.6 / 90.0	-12.6	-11.1
414.77	34.6 Qp	3.6 / 15.5 / 28.0	25.7	H / 1.6 / 90.0	-11.3	-9.8
506.93	33.4 Qp	3.9 / 18.1 / 28.4	27.0	H / 1.6 / 90.0	-10.0	-8.5
322.61	34.2 Qp	3.2 / 14.6 / 27.2	24.8	H / 2.5 / 90.0	-12.2	-10.7
384.05	31.2 Qp	3.4 / 15.6 / 27.7	22.5	H / 2.5 / 90.0	-14.5	-13.0
414.77	37.6 Qp	3.6 / 15.5 / 28.0	28.8	H / 2.5 / 90.0	-8.2	-6.7

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 08** Test Area: Pinewood Site 1 (10m)
 Test Method: EN55022/15.209-15.205 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 3 of 5

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	FCC Part 15.209/205
506.93	33.9 Qp	3.9 / 18.1 / 28.4	27.5	H / 1.6 / 90.0	-9.5	-8.0
384.05	32.0 Qp	3.4 / 15.6 / 27.7	23.3	H / 2.5 / 180.0	-13.7	-12.2
322.62	33.1 Qp	3.2 / 14.6 / 27.2	23.7	H / 2.5 / 180.0	-13.3	-11.8
220.05	26.4 Qp	2.5 / 11.0 / 27.4	12.5	H / 2.5 / 270.0	-17.5	-23.0
276.55	31.1 Qp	2.9 / 13.7 / 27.2	20.5	H / 2.5 / 270.0	-16.5	-15.0
The following were maximized between 200 and 1000 MHz.						
414.77	37.9 Qp	3.6 / 15.5 / 28.0	29.0	H / 1.6 / 95.0	-8.0	-6.5
506.93	35.2 Qp	3.9 / 18.1 / 28.4	28.9	H / 1.6 / 315.0	-8.1	-6.6
The following were maximized after the data transfer was started.						
414.77	42.2 Qp	3.6 / 15.5 / 28.0	33.4	V / 4.0 / 22.0	-3.6	-2.1
276.55	37.9 Qp	2.9 / 13.7 / 27.2	27.3	V / 1.0 / 301.0	-9.7	-8.2
No other vertical emissions maximized any higher after the data transfer was started.						
33.45	31.6 Qp	0.9 / 12.8 / 28.3	17.0	V / 1.0 / 0.0	-13.0	-12.5
69.00	32.9 Qp	1.3 / 9.0 / 28.2	15.0	V / 1.0 / 0.0	-15.0	-14.5
32.09	34.1 Qp	0.9 / 12.9 / 28.3	19.6	V / 1.0 / 0.0	-10.4	-9.9
33.87	35.1 Qp	0.9 / 12.8 / 28.3	20.5	V / 1.0 / 0.0	-9.5	-9.0
100.43	33.5 Qp	1.6 / 9.5 / 28.1	16.5	V / 1.0 / 0.0	-13.5	-16.5
184.36	29.7 Qp	2.2 / 13.3 / 27.6	17.7	V / 1.0 / 0.0	-12.3	-15.3
64.81	34.6 Qp	1.2 / 9.1 / 28.2	16.8	V / 1.0 / 90.0	-13.2	-12.7
69.00	33.2 Qp	1.3 / 9.0 / 28.2	15.3	V / 1.0 / 90.0	-14.7	-14.2
33.45	34.2 Qp	0.9 / 12.8 / 28.3	19.7	V / 1.0 / 180.0	-10.3	-9.8
69.00	33.5 Qp	1.3 / 9.0 / 28.2	15.7	V / 1.0 / 180.0	-14.3	-13.8
76.57	32.1 Qp	1.4 / 7.8 / 28.2	13.1	V / 1.0 / 180.0	-16.9	-16.4
100.43	35.6 Qp	1.6 / 9.5 / 28.1	18.6	V / 1.0 / 180.0	-11.4	-14.4

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 08** Test Area: Pinewood Site 1 (10m)
 Test Method: EN55022/15.209-15.205 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 4 of 5

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	FCC Part 15.209/205
184.36	33.5 Qp	2.2 / 13.3 / 27.6	21.5	V / 1.0 / 180.0	-8.5	-11.5
35.82	35.6 Qp	1.0 / 12.6 / 28.3	20.8	V / 1.0 / 180.0	-9.2	-8.7
The following were maximized between 30 and 200 MHz.						
184.36	36.9 Qp	2.2 / 13.3 / 27.6	24.8	V / 1.0 / 270.0	-5.2	-8.2
The following were maximized between 30 and 200 MHz.						
33.52	37.6 Qp	0.9 / 12.8 / 28.3	23.0	V / 1.0 / 255.0	-7.0	-6.5
35.82	36.0 Qp	1.0 / 12.6 / 28.3	21.3	V / 1.0 / 15.0	-8.7	-8.2
184.36	37.4 Qp	2.2 / 13.3 / 27.6	25.4	V / 1.5 / 280.0	-4.6	-7.6
No higher emissions found: 90Deg, Horizontal.						
32.09	32.6 Qp	0.9 / 12.9 / 28.3	18.1	H / 2.5 / 0.0	-11.9	-11.4
184.36	35.1 Qp	2.2 / 13.3 / 27.6	23.1	H / 2.5 / 0.0	-6.9	-9.9
The following was maximized between 30 and 200 MHz.						
184.36	32.8 Qp	2.2 / 13.3 / 27.6	20.7	H / 2.5 / 180.0	-9.3	-12.3
184.36	36.0 Qp	2.2 / 13.3 / 27.6	23.9	H / 2.5 / 270.0	-6.1	-9.1
The following was maximized between 30 and 200 MHz.						
184.36	36.8 Qp	2.2 / 13.3 / 27.6	24.8	H / 2.6 / 300.0	-5.2	-8.2

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 08** Test Area: Pinewood Site 1 (10m)
 Test Method: EN55022/15.209-15.205 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 5 of 5

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV/m)	(m) (DEG)	EN55022 B	FCC Part 15.209/205
***** Measurement Summary *****						
414.77	42.2 Qp	3.6 / 15.5 / 28.0	33.4	V / 4.0 / 22.0	-3.6	-2.1
184.36	37.4 Qp	2.2 / 13.3 / 27.6	25.4	V / 1.5 / 280.0	-4.6	-7.6
322.61	40.4 Qp	3.2 / 14.6 / 27.2	30.9	V / 1.0 / 285.0	-6.1	-4.6
33.52	37.6 Qp	0.9 / 12.8 / 28.3	23.0	V / 1.0 / 255.0	-7.0	-6.5
506.93	35.2 Qp	3.9 / 18.1 / 28.4	28.9	H / 1.6 / 315.0	-8.1	-6.6
368.69	36.7 Qp	3.4 / 15.7 / 27.6	28.2	V / 1.0 / 277.0	-8.8	-7.3
223.35	36.2 Qp	2.5 / 10.9 / 27.4	22.3	V / 1.0 / 0.0	-7.7	-13.2
221.56	35.8 Qp	2.5 / 11.0 / 27.4	21.9	V / 1.0 / 0.0	-8.1	-13.6
35.82	36.0 Qp	1.0 / 12.6 / 28.3	21.3	V / 1.0 / 15.0	-8.7	-8.2
276.55	37.9 Qp	2.9 / 13.7 / 27.2	27.3	V / 1.0 / 301.0	-9.7	-8.2
228.04	34.6 Qp	2.6 / 11.0 / 27.4	20.8	V / 1.0 / 0.0	-9.2	-14.7
960.03	26.2 Qp	5.8 / 23.1 / 27.6	27.4	V / 1.0 / 0.0	-9.6	-16.1
33.45	34.2 Qp	0.9 / 12.8 / 28.3	19.7	V / 1.0 / 180.0	-10.3	-9.8
32.09	34.1 Qp	0.9 / 12.9 / 28.3	19.6	V / 1.0 / 0.0	-10.4	-9.9
385.67	33.2 Qp	3.4 / 15.6 / 27.8	24.5	V / 1.0 / 0.0	-12.5	-11.0
352.04	33.1 Qp	3.3 / 15.4 / 27.4	24.4	V / 1.0 / 0.0	-12.6	-11.1
359.82	33.1 Qp	3.3 / 15.3 / 27.5	24.3	V / 1.0 / 0.0	-12.7	-11.2
100.43	35.6 Qp	1.6 / 9.5 / 28.1	18.6	V / 1.0 / 180.0	-11.4	-14.4
218.32	31.7 Qp	2.5 / 11.1 / 27.4	17.8	V / 1.0 / 0.0	-12.2	-17.7
384.05	32.0 Qp	3.4 / 15.6 / 27.7	23.3	H / 2.5 / 180.0	-13.7	-12.2
213.48	31.2 Qp	2.5 / 11.4 / 27.4	17.6	V / 1.0 / 0.0	-12.4	-15.4
366.29	31.6 Qp	3.4 / 15.8 / 27.6	23.1	V / 1.0 / 0.0	-13.9	-12.4
64.81	34.6 Qp	1.2 / 9.1 / 28.2	16.8	V / 1.0 / 90.0	-13.2	-12.7
397.79	31.2 Qp	3.5 / 15.2 / 27.9	22.0	V / 1.0 / 270.0	-15.0	-13.5
69.00	33.5 Qp	1.3 / 9.0 / 28.2	15.7	V / 1.0 / 180.0	-14.3	-13.8
230.45	35.5 Qp	2.6 / 11.0 / 27.3	21.7	V / 1.0 / 0.0	-15.3	-13.8
410.17	30.6 Qp	3.5 / 15.4 / 27.9	21.6	V / 1.0 / 90.0	-15.4	-13.9
333.93	30.5 Qp	3.2 / 14.9 / 27.3	21.4	V / 1.0 / 0.0	-15.6	-14.1
264.06	32.4 Qp	2.8 / 12.7 / 27.2	20.6	V / 1.0 / 0.0	-16.4	-14.9
76.57	32.1 Qp	1.4 / 7.8 / 28.2	13.1	V / 1.0 / 180.0	-16.9	-16.4
220.05	26.4 Qp	2.5 / 11.0 / 27.4	12.5	H / 2.5 / 270.0	-17.5	-23.0
240.07	29.4 Qp	2.7 / 11.3 / 27.3	16.0	V / 1.0 / 90.0	-21.0	-19.5

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 09** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC Part 15.209 & 15.205 Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 1 of 3

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC Part 15.209/205	N/A
2037.79	40.7 Av	3.3 / 28.5 / 37.7	34.7	V / 1.0 / 0.0	-19.3	N/A
1059.93	39.6 Av	2.3 / 25.1 / 37.5	29.4	V / 1.0 / 0.0	-24.6	N/A
1152.09	38.9 Av	2.4 / 25.4 / 37.6	29.1	V / 1.0 / 0.0	-24.9	N/A
1613.11	38.2 Av	3.0 / 27.0 / 37.2	31.0	V / 1.0 / 0.0	-23.0	N/A
2333.59	39.2 Av	3.7 / 28.9 / 37.3	34.5	V / 1.0 / 0.0	-19.5	N/A
2037.79	43.4 Av	3.3 / 28.5 / 37.7	37.4	V / 1.0 / 0.0	-16.6	N/A
1613.11	39.9 Av	3.0 / 27.0 / 37.2	32.6	V / 1.0 / 90.0	-21.4	N/A
2037.79	44.5 Av	3.3 / 28.5 / 37.7	38.5	V / 1.0 / 90.0	-15.5	N/A
1152.09	43.1 Av	2.4 / 25.4 / 37.6	33.4	V / 1.0 / 180.0	-20.6	N/A
1613.11	40.5 Av	3.0 / 27.0 / 37.2	33.3	V / 1.0 / 180.0	-20.7	N/A
2037.79	46.1 Av	3.3 / 28.5 / 37.7	40.2	V / 1.0 / 180.0	-13.8	N/A
1197.98	40.8 Av	2.5 / 25.6 / 37.2	31.6	V / 1.0 / 180.0	-22.4	N/A
1612.72	40.6 Av	3.0 / 27.0 / 37.2	33.5	V / 1.0 / 180.0	-20.5	N/A
2343.54	39.6 Av	3.7 / 28.9 / 37.0	35.2	V / 1.0 / 270.0	-18.8	N/A
The following were maximized between 1 and 4 GHz.						
2343.54	41.2 Av	3.7 / 28.9 / 37.0	36.8	V / 1.0 / 284.0	-17.2	N/A
2333.59	42.4 Av	3.7 / 28.9 / 37.3	37.7	V / 1.0 / 250.0	-16.3	N/A
2037.79	51.4 Av	3.3 / 28.5 / 37.7	45.4	V / 1.3 / 282.0	-8.6	N/A
2037.79	37.4 Av	3.3 / 28.5 / 37.7	31.4	H / 1.0 / 0.0	-22.6	N/A
No higher emissions found: 90Deg, Horizontal.						
No higher emissions found: 180Deg, Horizontal.						
2037.79	38.1 Av	3.3 / 28.5 / 37.7	32.1	H / 1.0 / 270.0	-21.9	N/A
The following were maximized between 1 and 4 GHz.						

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 09**
 Test Method: FCC Part 15.209 & 15.205
 EUT Model #: L100-W-T-B
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Test Area: Pinewood Site 1 (3m)
 Test Date: 23-Nov-2003
 EUT Power: 120V 60Hz

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 2 of 3

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB/m) (dB)	(dBuV/m)	(m) (DEG)	FCC Part 15.209/205	N/A
2037.79	47.8 Av	3.3 / 28.5 / 37.7	41.8	H / 1.0 / 142.0	-12.2	N/A
No other emissions found up to 25 GHz.						

Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 09**
 Test Method: FCC Part 15.209 & 15.205
 EUT Model #: L100-W-T-B
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Test Area: Pinewood Site 1 (3m)
 Test Date: 23-Nov-2003
 EUT Power: 120V 60Hz

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 3 of 3

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV/m)	(m) (DEG)	FCC Part 15.109 B	N/A
***** Measurement Summary *****						
2037.79	51.4 Av	3.3 / 28.5 / 37.7	45.4	V / 1.3 / 282.0	-8.6	N/A
2333.59	42.4 Av	3.7 / 28.9 / 37.3	37.7	V / 1.0 / 250.0	-16.3	N/A
2343.54	41.2 Av	3.7 / 28.9 / 37.0	36.8	V / 1.0 / 284.0	-16.3	N/A
1612.72	40.6 Av	3.0 / 27.0 / 37.2	33.5	V / 1.0 / 180.0	-17.2	N/A
2333.59	42.4 Av	3.7 / 28.9 / 37.3	37.7	V / 1.0 / 250.0	-20.5	N/A
1152.09	43.1 Av	2.4 / 25.4 / 37.6	33.4	V / 1.0 / 180.0	-20.6	N/A
1197.98	40.8 Av	2.5 / 25.6 / 37.2	31.6	V / 1.0 / 180.0	-22.4	N/A
1059.93	39.6 Av	2.3 / 25.1 / 37.5	29.4	V / 1.0 / 0.0	-24.6	N/A



15.247 (a)(2) Test Data

Conducted Electromagnetic Emissions

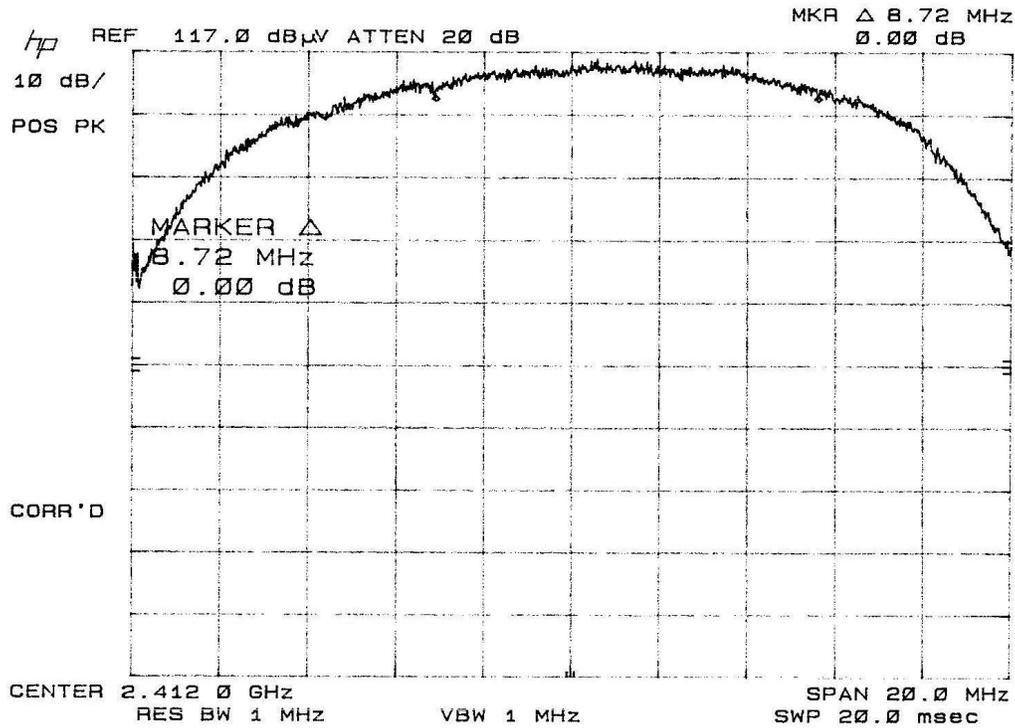
Test Report #: BC300408 Run 02 Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 1 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

6 dB Bandwidth Measurements in accordance to FCC CFR47 Part 15.247 (2)
 Low Channel



Conducted Electromagnetic Emissions

Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 2 of 3

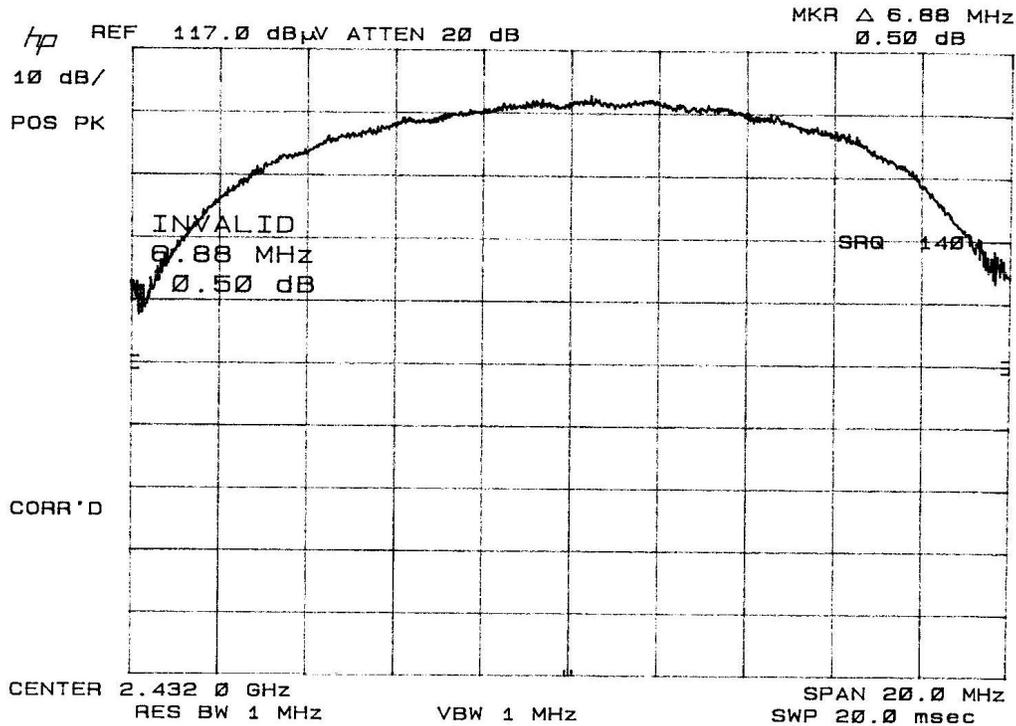
EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk - Peak	Nb - Narrow Band
Qp - QuasiPeak	Bb - Broad Band
Av - Average	

6 dB Bandwidth Measurements in accordance to FCC CFR47 Part 15.247 (2)
 Mid Channel



Conducted Electromagnetic Emissions

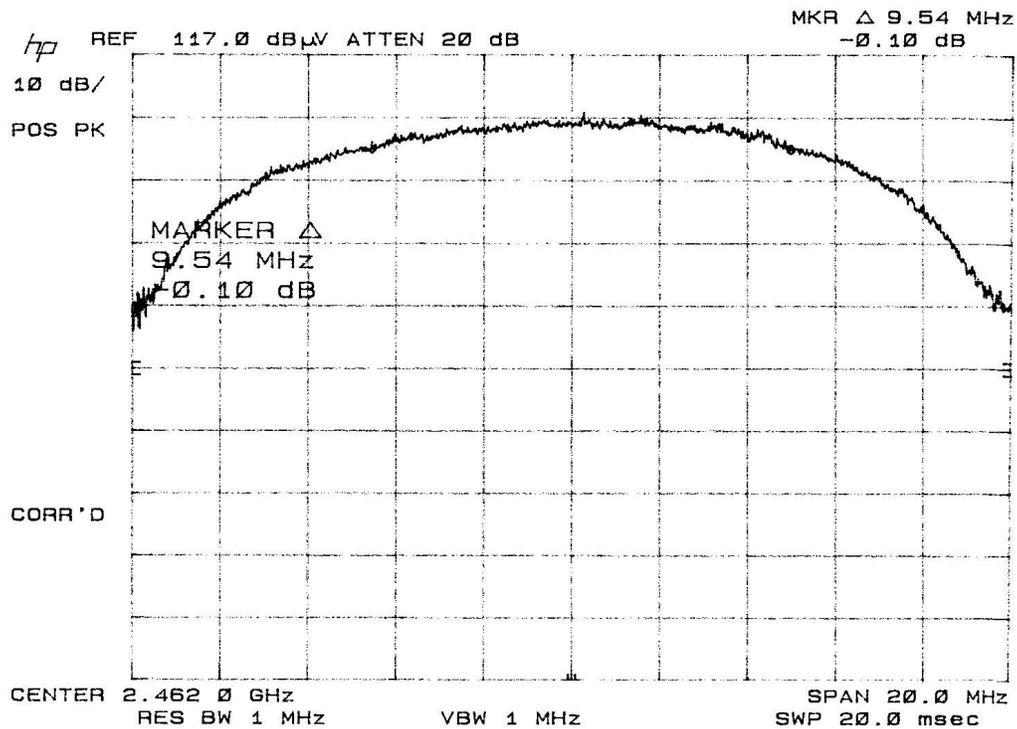
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

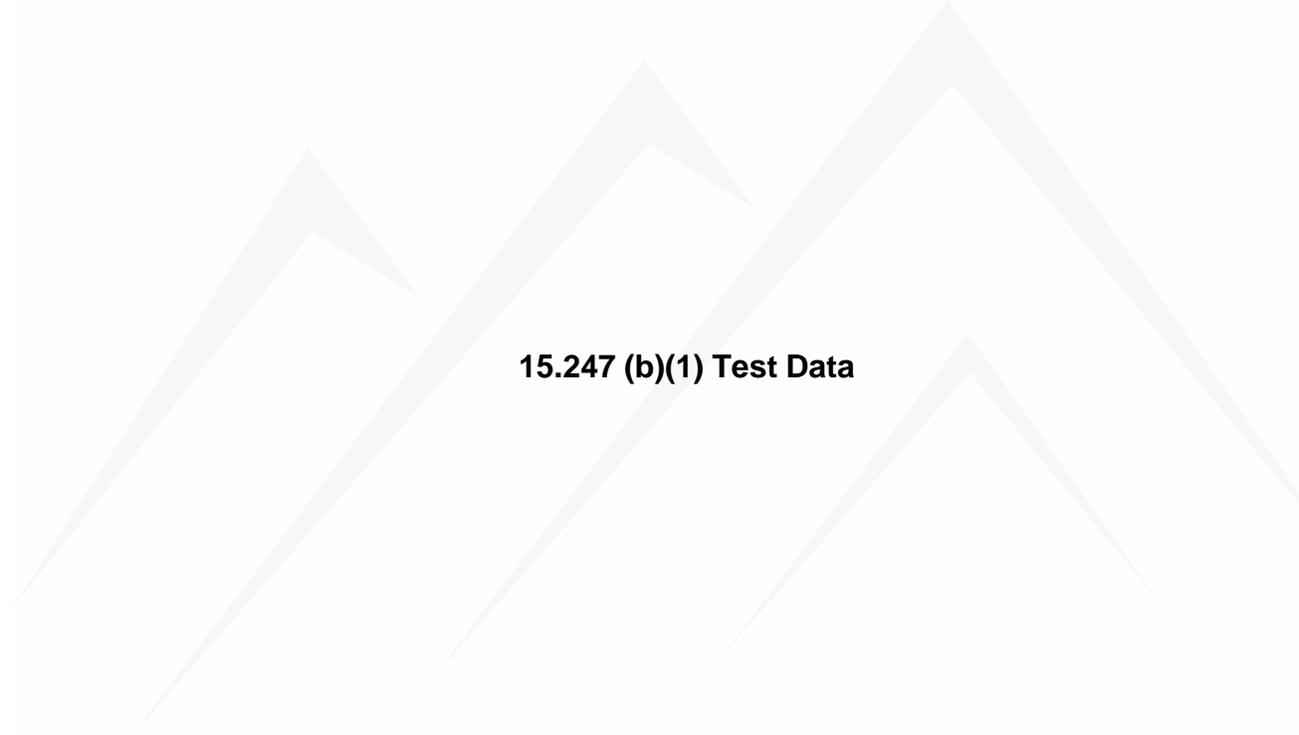
Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 3 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

6 dB Bandwidth Measurements in accordance to FCC CFR47 Part 15.247 (2)
 High Channel





15.247 (b)(1) Test Data

Radiated Electromagnetic Emissions

Test Report #: **BC300408**
 Test Method: 15.247 (2)(b)(1)
 EUT Model #: L100-W-T-B
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.
 EUT Description: Link-iT Wireless Connectivity Device
 Notes: The transmitter was in CW mode for this test. In CW mode the transmitter would only run for 30 seconds.

Test Area: CC2-1
 Test Date: 8-Dec-03
 EUT Power: 120V 60Hz

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 1 of 1

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Measurements were taken off of a power meter. The power sensor was connected to the antenna port with a 10dB pad. The follow readings are corrected for the 10dB pad.

Frequency in GHz	Amplitude in mW
2.412 (CH 1)	21.6
2.432 (CH 5)	22.8
2.462 (CH 11)	25.5

Conducted Electromagnetic Emissions

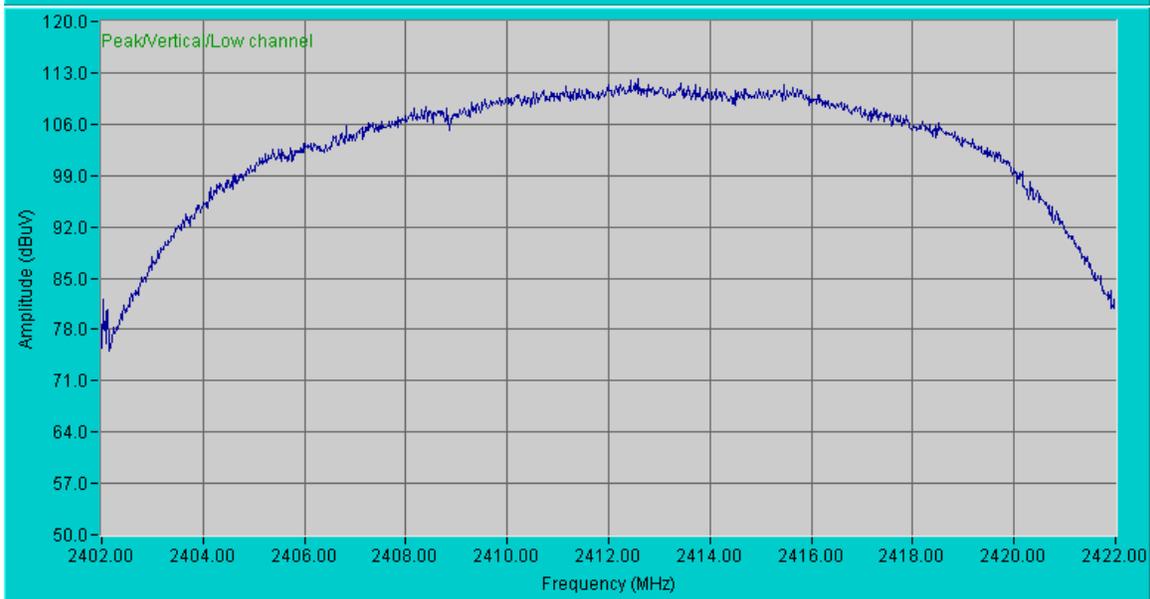
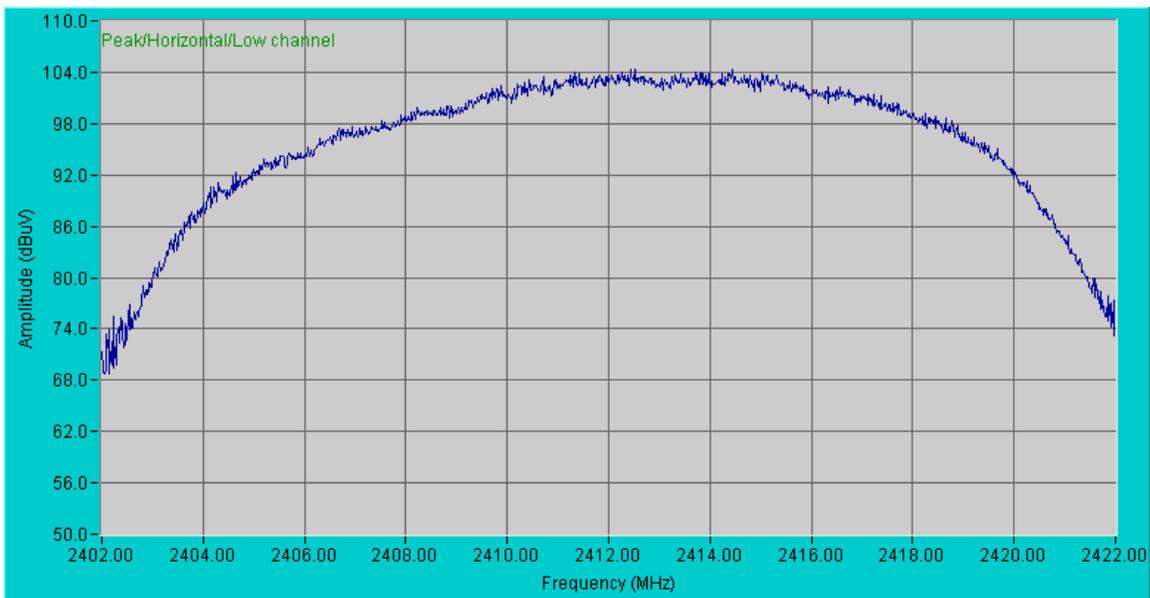
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(b)(1) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 1 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Peak Output Power in accordance to FCC CFR47 Part 15.247 (2)(b)(1) Low Channel



Conducted Electromagnetic Emissions

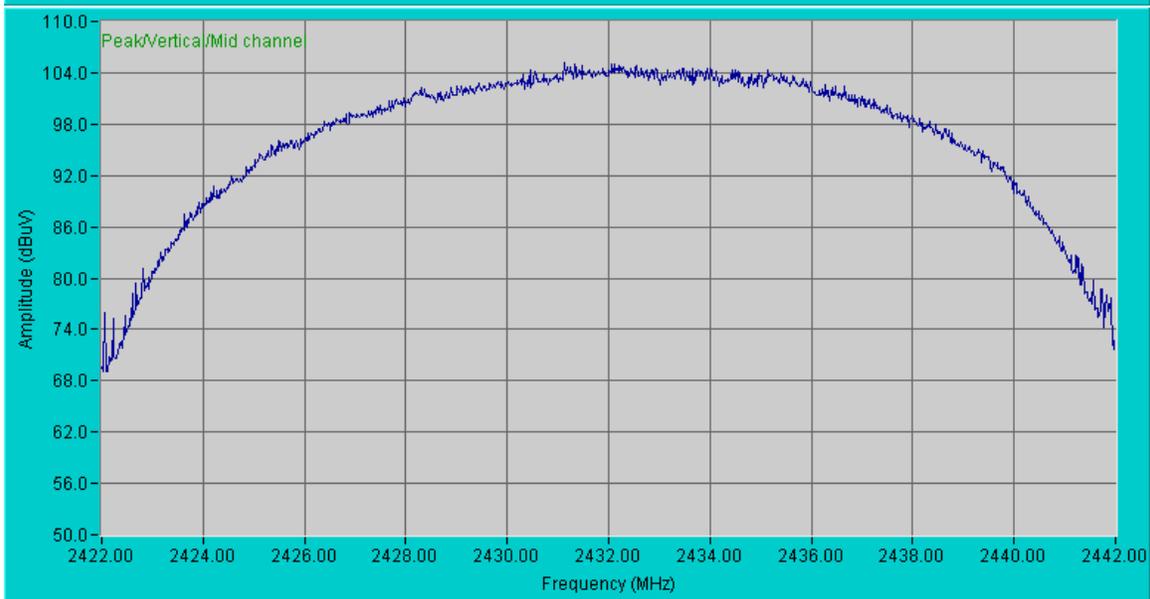
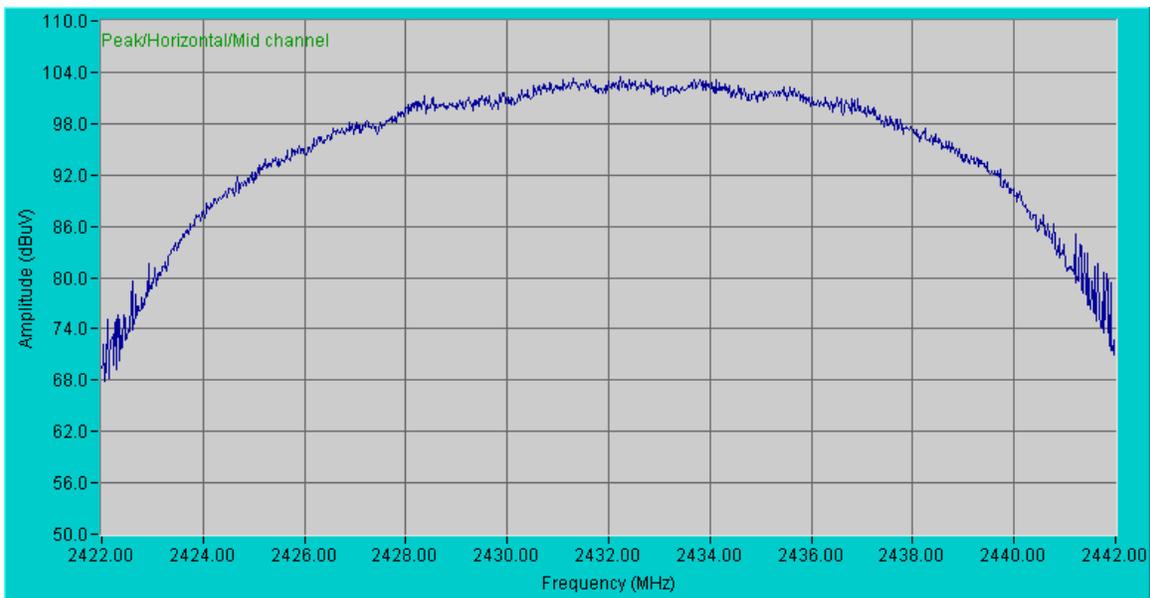
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(b)(1) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 2 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Peak Output Power in accordance to FCC CFR47 Part 15.247 (2)(b)(1) Mid Channel



Conducted Electromagnetic Emissions

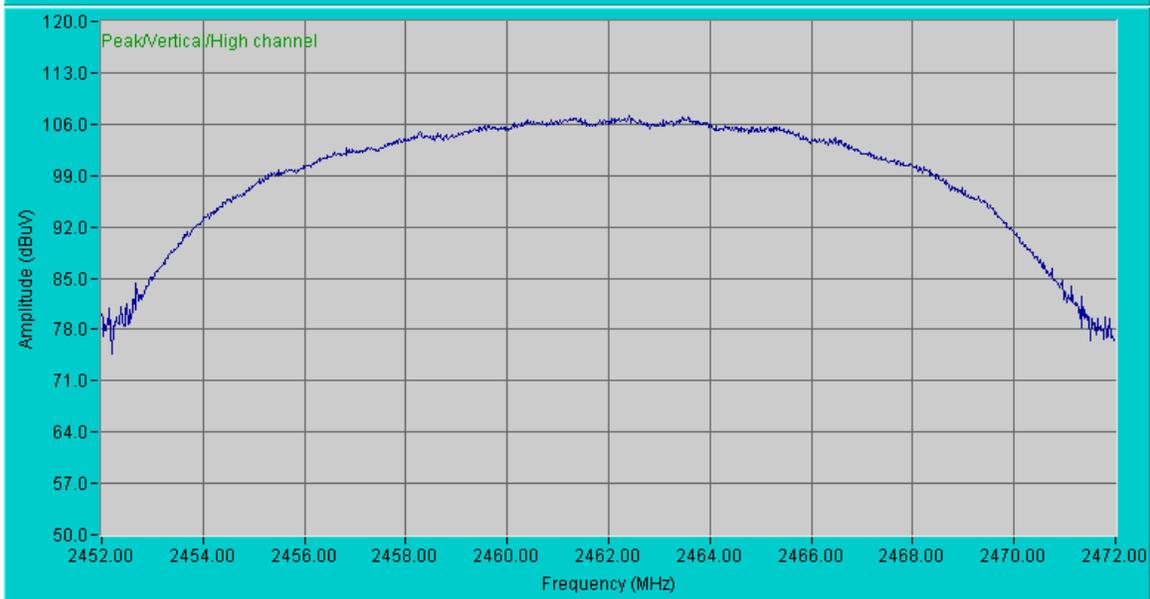
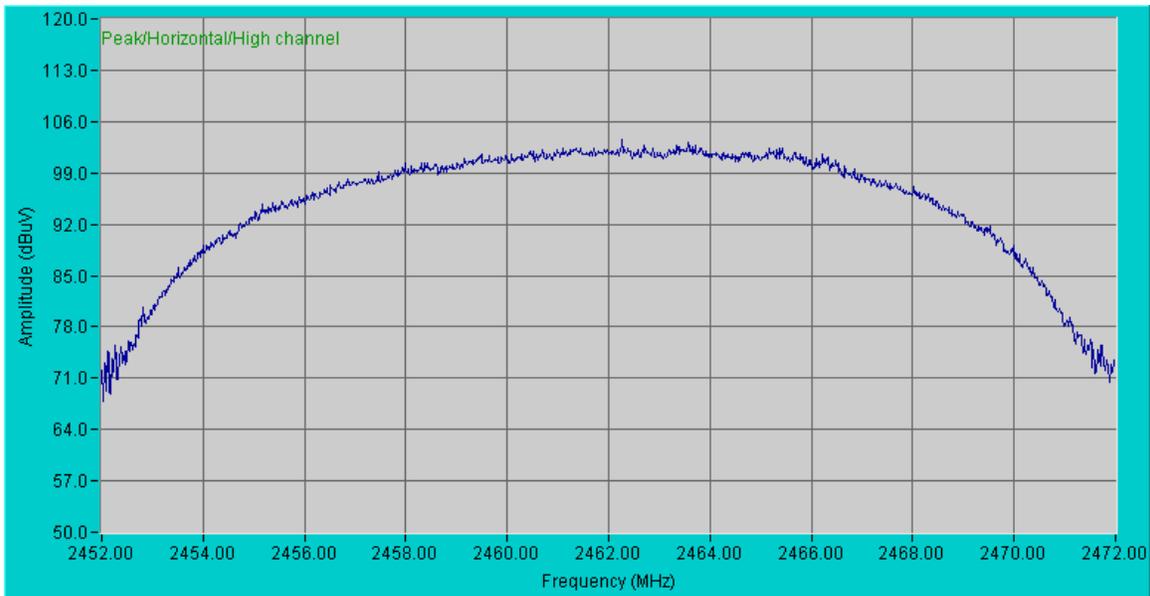
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(b)(1) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

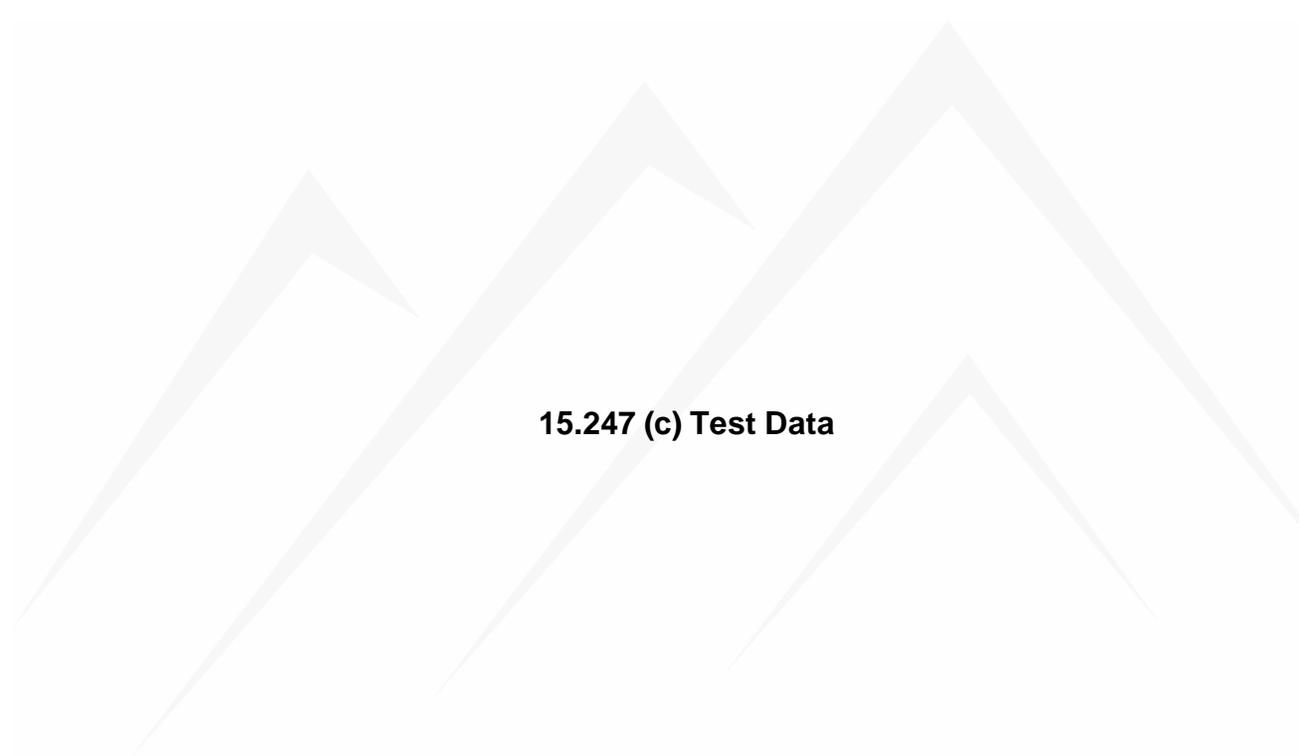
Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 3 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Peak Output Power in accordance to FCC CFR47 Part 15.247 (2)(b)(1) High Channel





15.247 (c) Test Data

Conducted Electromagnetic Emissions

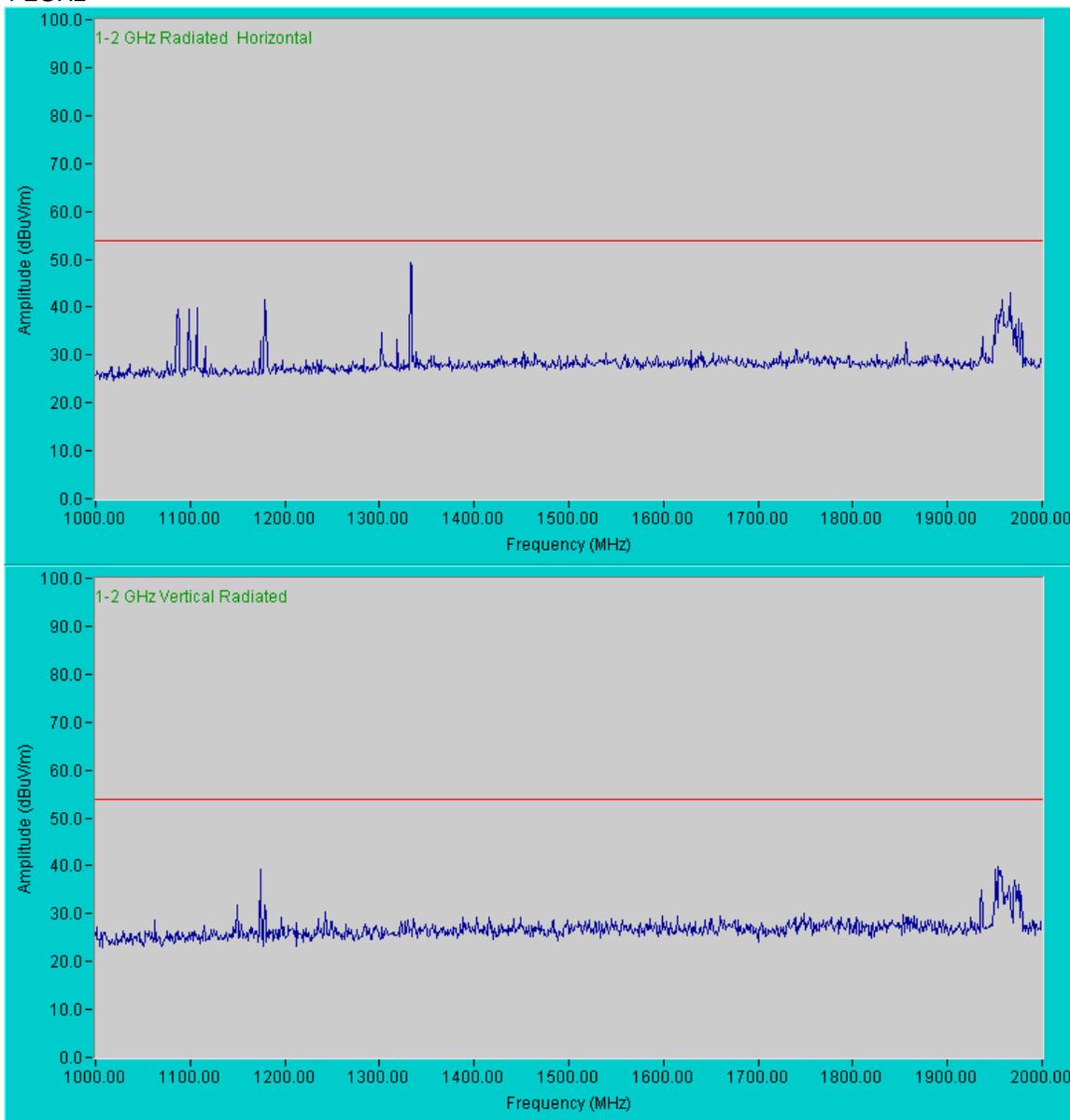
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(c) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 1 of 6

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Out of Band Emissions in accordance to FCC CFR47 Part 15.247 (2)(c) 1-2GHz



Conducted Electromagnetic Emissions

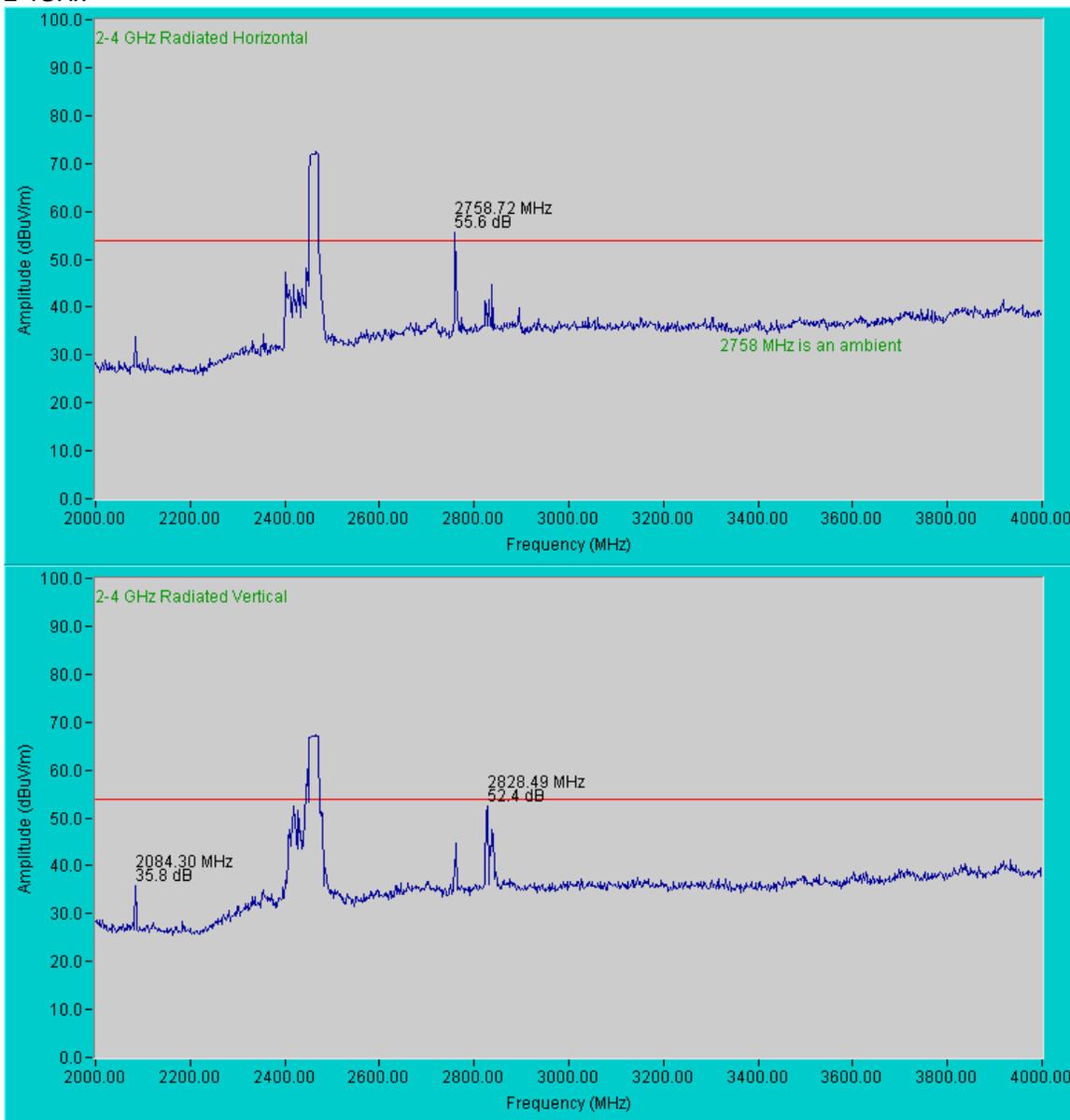
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(c) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 2 of 6

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits pinging per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Out of Band Emissions in accordance to FCC CFR47 Part 15.247 (2)(c) 2-4GHz



Conducted Electromagnetic Emissions

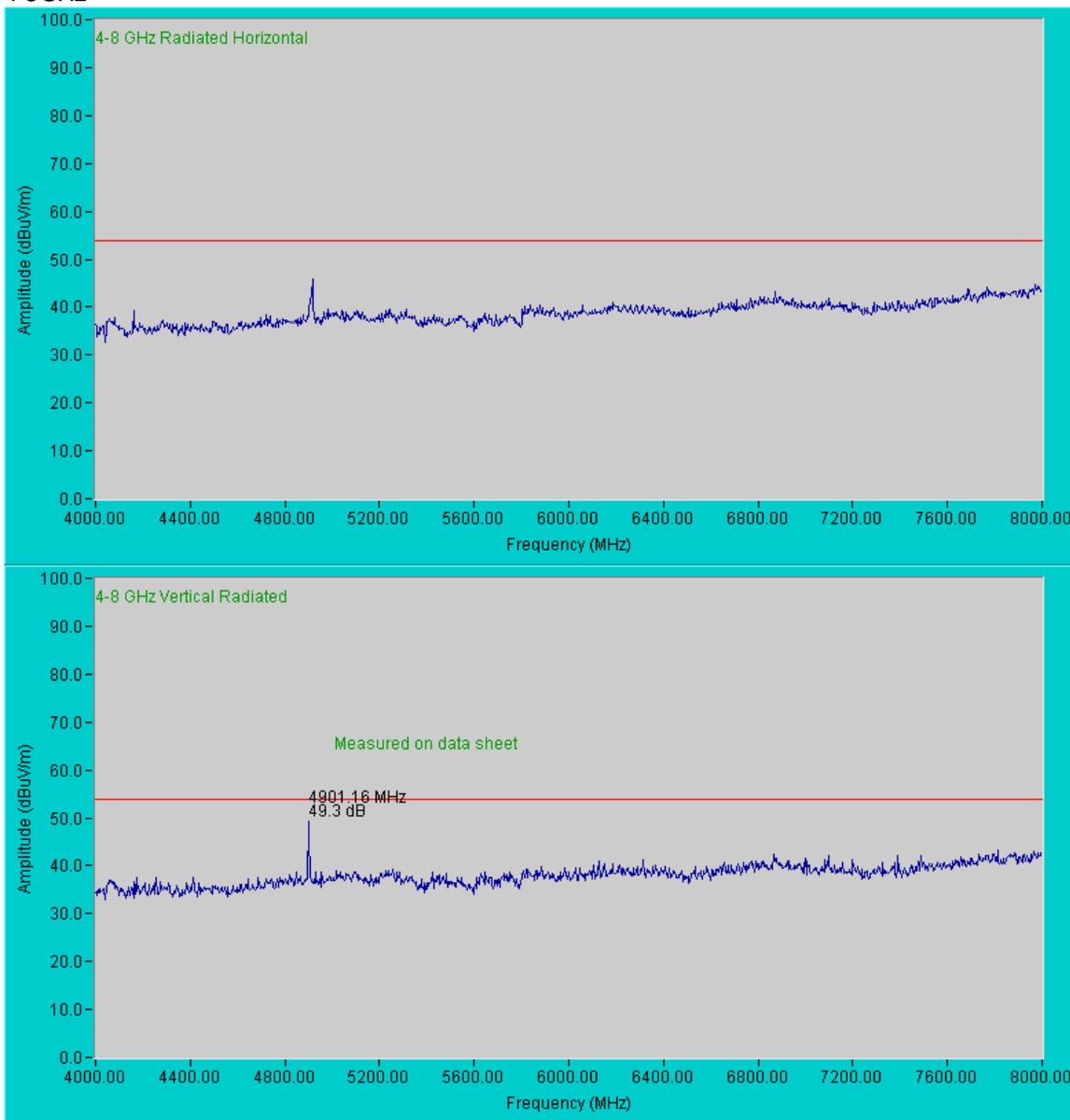
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(c) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 3 of 6

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits pinging per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Out of Band Emissions in accordance to FCC CFR47 Part 15.247 (2)(c) 4-8GHz



Conducted Electromagnetic Emissions

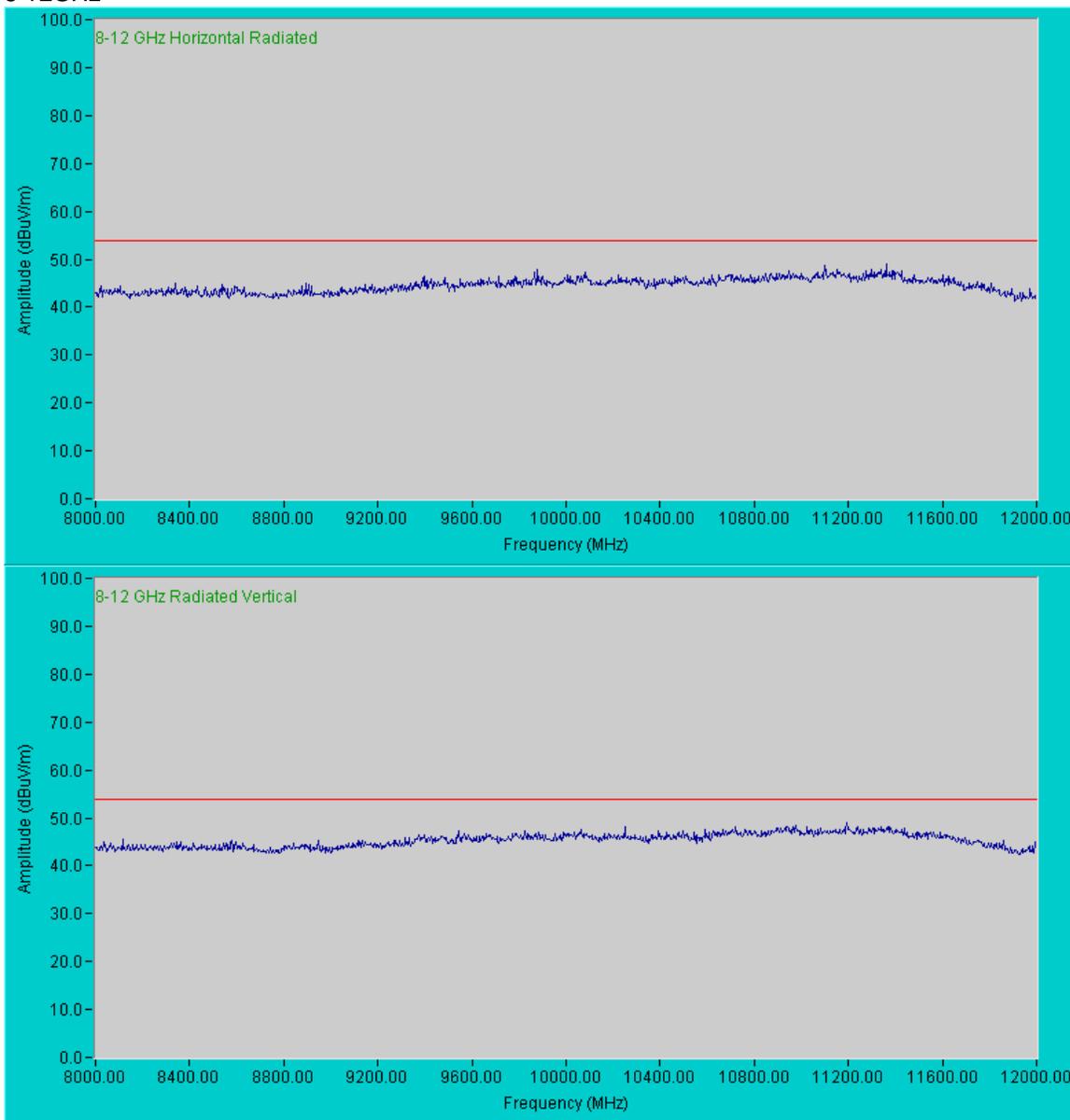
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(c) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 4 of 6

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Out of Band Emissions in accordance to FCC CFR47 Part 15.247 (2)(c) 8-12GHz



Conducted Electromagnetic Emissions

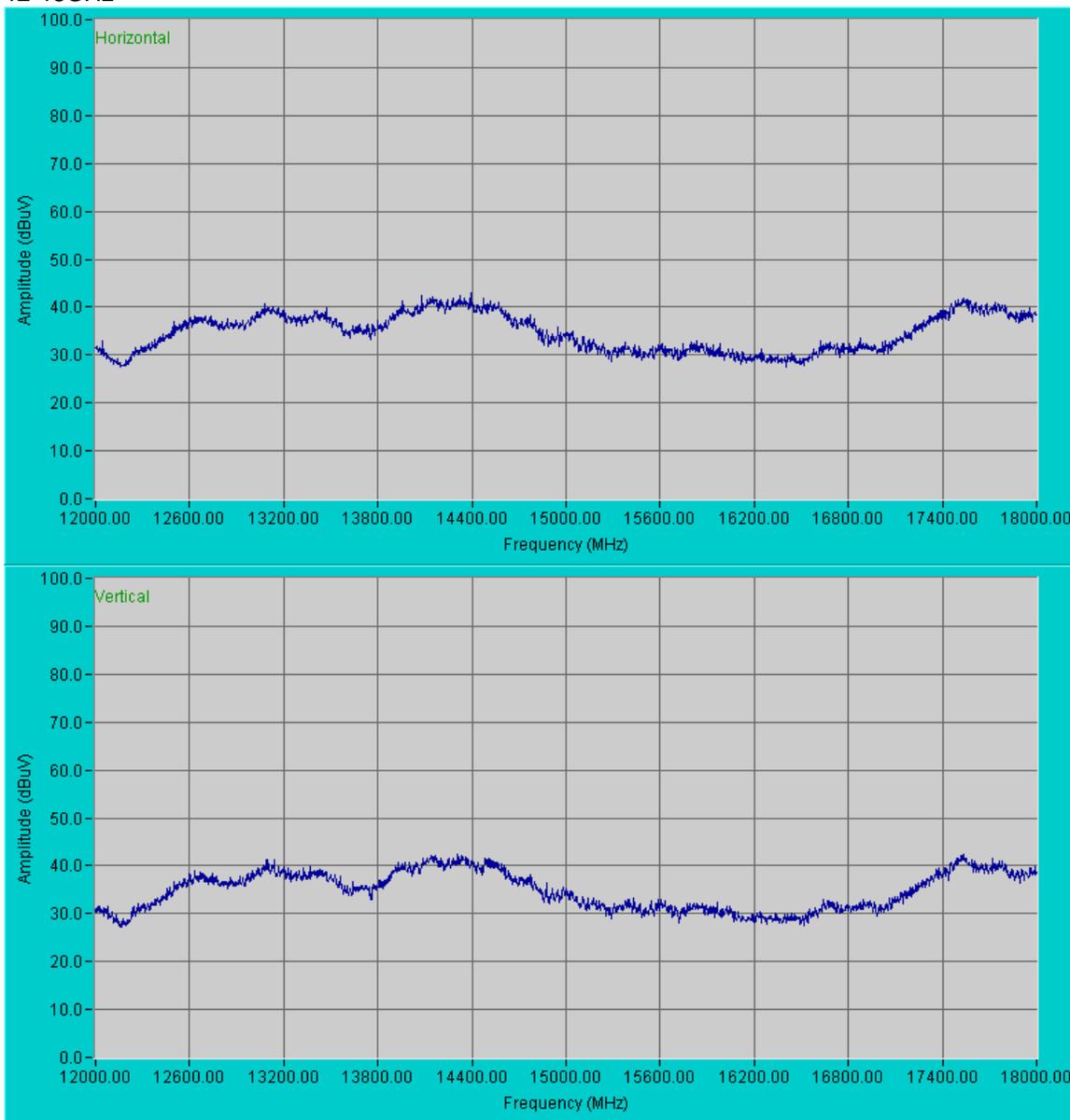
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(c) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 5 of 6

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Out of Band Emissions in accordance to FCC CFR47 Part 15.247 (2)(c) 12-18GHz



Conducted Electromagnetic Emissions

Test Report #: BC300408 Run 02 Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(c) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

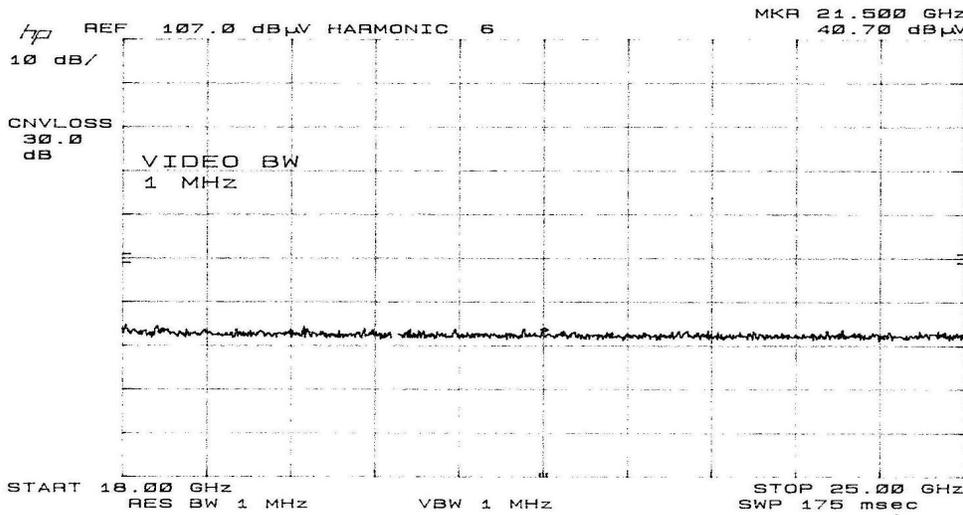
Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 6 of 6

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

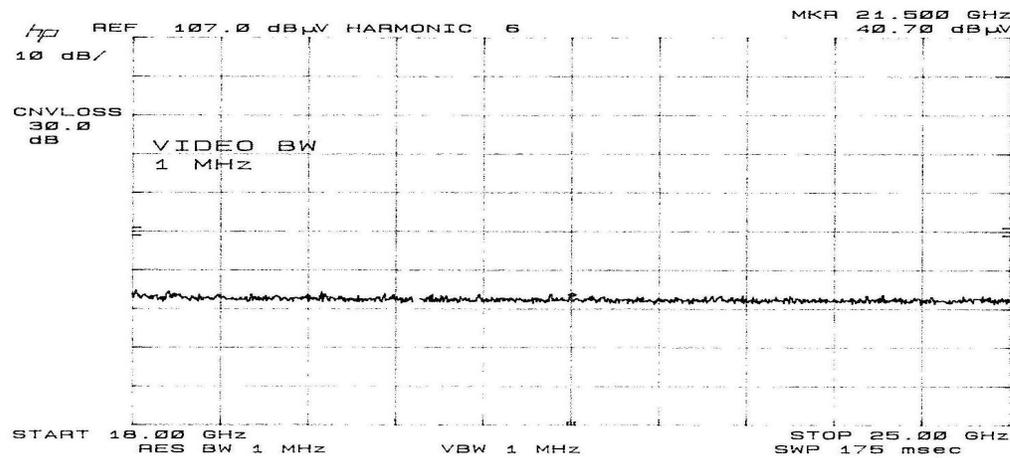
Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Out of Band Emissions in accordance to FCC CFR47 Part 15.247 (2)(c) 18-25GHz

Horizontal



Vertical



Radiated Electromagnetic Emissions

Test Report #: **BC300408 Run 12** Test Area: Pinewood Site 1 (3m)
 Test Method: FCC 15.249 (c) Test Date: 06-Dec-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 1 of 2

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.

Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dBm) (dB)	(dBuV)	(m) (DEG)	FCC 15.249 >1GHz P	kFCC 15.249 >1GHz
High Channel, 11						
2389.54	47.4 Pk	3.8 / 28.9 / 37.0	43.1	V / 1.0 / 280.0	-30.9	-10.9
2390.00	34.9 Av	3.8 / 28.9 / 36.9	30.8	V / 1.0 / 280.0	N/A	-23.2
2483.51	54.2 Pk	4.0 / 29.1 / 37.1	50.2	V / 1.0 / 285.0	-23.8	-3.8
2483.50	37.2 Av	4.0 / 29.1 / 37.1	33.2	V / 1.0 / 285.0	N/A	-20.8
2483.51	46.8 Pk	4.0 / 29.1 / 37.1	42.8	H / 1.5 / 309.0	-31.2	-11.2
2483.50	35.2 Av	4.0 / 29.1 / 37.1	31.2	H / 1.5 / 309.0	N/A	-22.8
2389.54	35.9 Pk	3.8 / 28.9 / 37.0	31.6	H / 1.5 / 309.0	-42.4	-22.4
Low channel , 1						
2390.04	47.5 Pk	3.8 / 28.9 / 36.9	43.4	V / 1.2 / 309.0	-30.6	-10.6
2389.54	35.2 Av	3.8 / 28.9 / 37.0	30.9	V / 1.2 / 309.0	N/A	-23.1
2483.51	35.1 Av	4.0 / 29.1 / 37.1	31.0	V / 1.2 / 309.0	N/A	-23.0
2483.51	39.8 Pk	4.0 / 29.1 / 37.1	35.8	V / 1.2 / 309.0	-38.2	-18.2
2390.00	42.9 Pk	3.8 / 28.9 / 36.9	38.8	H / 1.2 / 261.0	-35.2	-15.2
2390.00	32.8 Av	3.8 / 28.9 / 36.9	28.7	H / 1.2 / 261.0	N/A	-25.3
2483.51	33.0 Av	4.0 / 29.1 / 37.1	29.0	H / 1.2 / 261.0	N/A	-25.0
2483.51	33.7 Pk	4.0 / 29.1 / 37.1	29.7	H / 1.2 / 261.0	-44.3	-24.3
No other emissions found in restricted bands up to 25 GHz.						

Radiated Electromagnetic Emissions

Test Report #: BC300408 Run 12 Test Area: Pinewood Site 1 (3m)
 Test Method: FCC 15.249 (c) Test Date: 06-Dec-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 20.2 °C
 Relative Humidity: 26 %
 Air Pressure: kPa
 Page: 2 of 2

EUT Description: Link-iT Wireless Connectivity Device

Notes: Wireless mode, serial connected to the laptop. 16.384 bits
ping per second. Buffer amp in the clock line is removed.
Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	FCC 15.249 >1GHz P	kFCC 15.249 >1GHz
***** Measurement Summary *****						
2483.51	54.2 Pk	4.0 / 29.1 / 37.1	50.2	V / 1.0 / 285.0	-23.8	-3.8
2390.04	47.5 Pk	3.8 / 28.9 / 36.9	43.4	V / 1.2 / 309.0	-30.6	-10.6



15.247 (d)

Conducted Electromagnetic Emissions

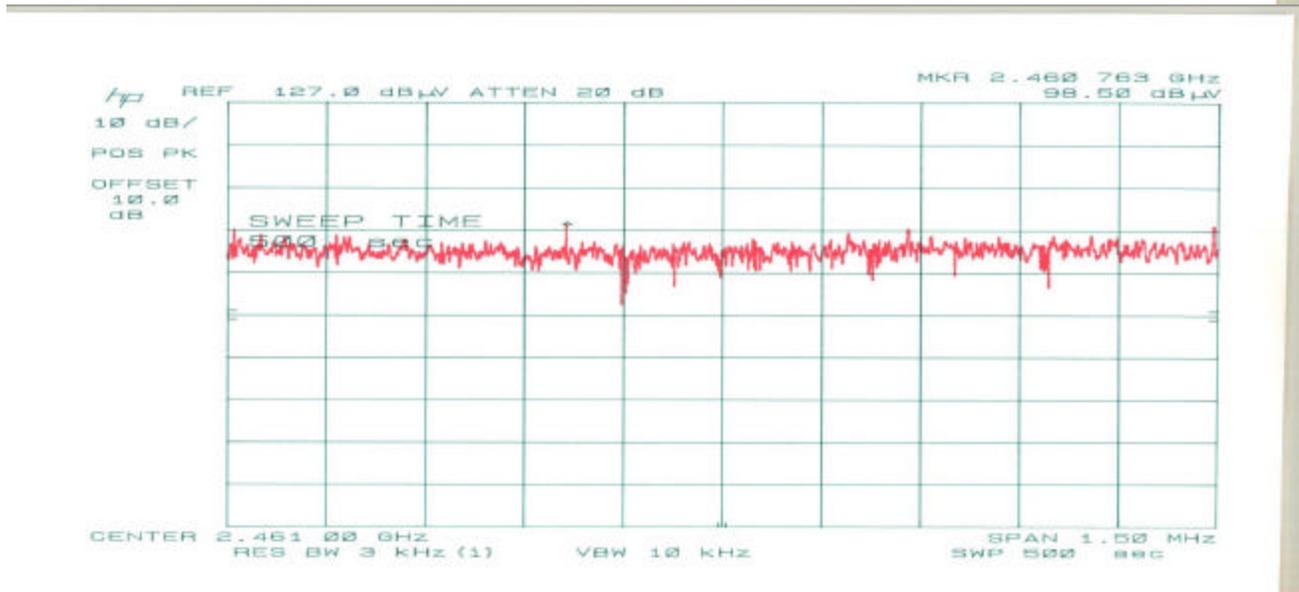
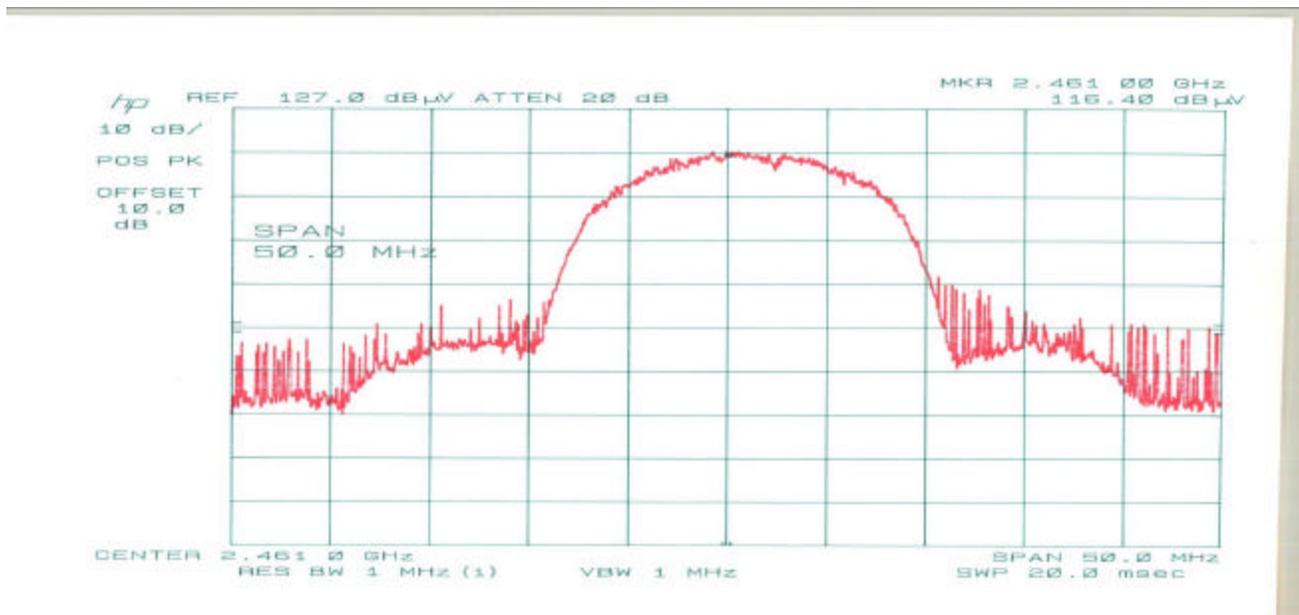
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(d) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 1 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Power Density in accordance to FCC CFR47 Part 15.247 (2)(c)
 High Channel



Conducted Electromagnetic Emissions

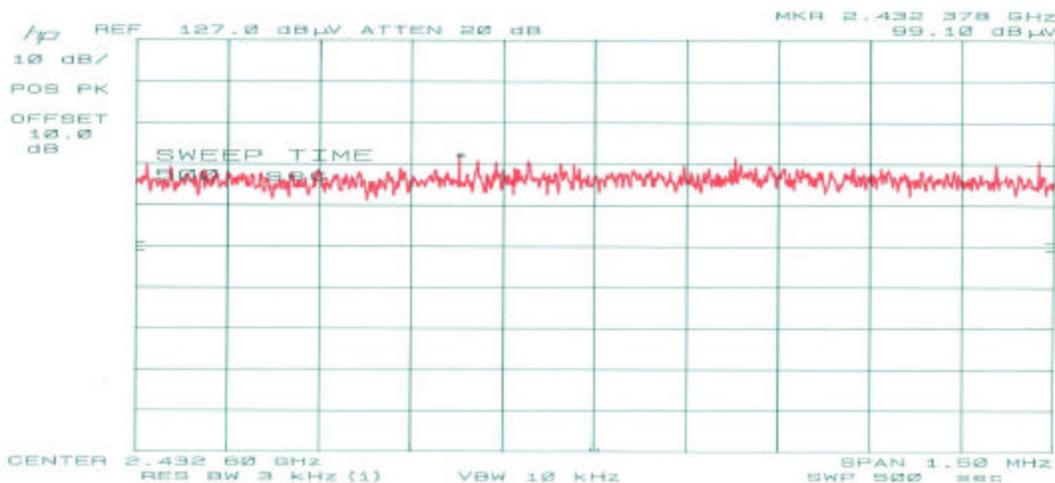
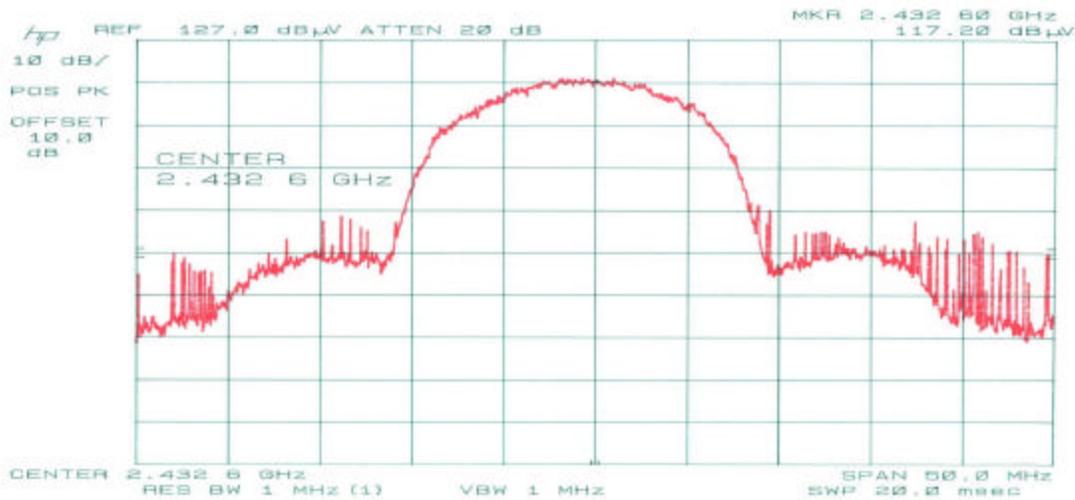
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(d) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 2 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Power Density in accordance to FCC CFR47 Part 15.247 (2)(c)
 Mid Channel



Conducted Electromagnetic Emissions

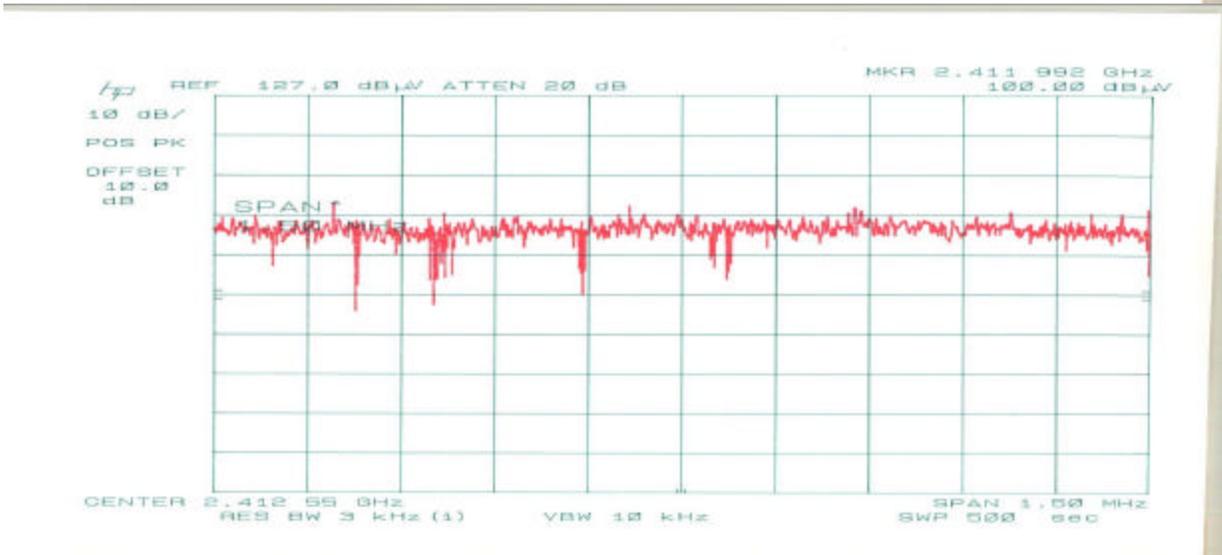
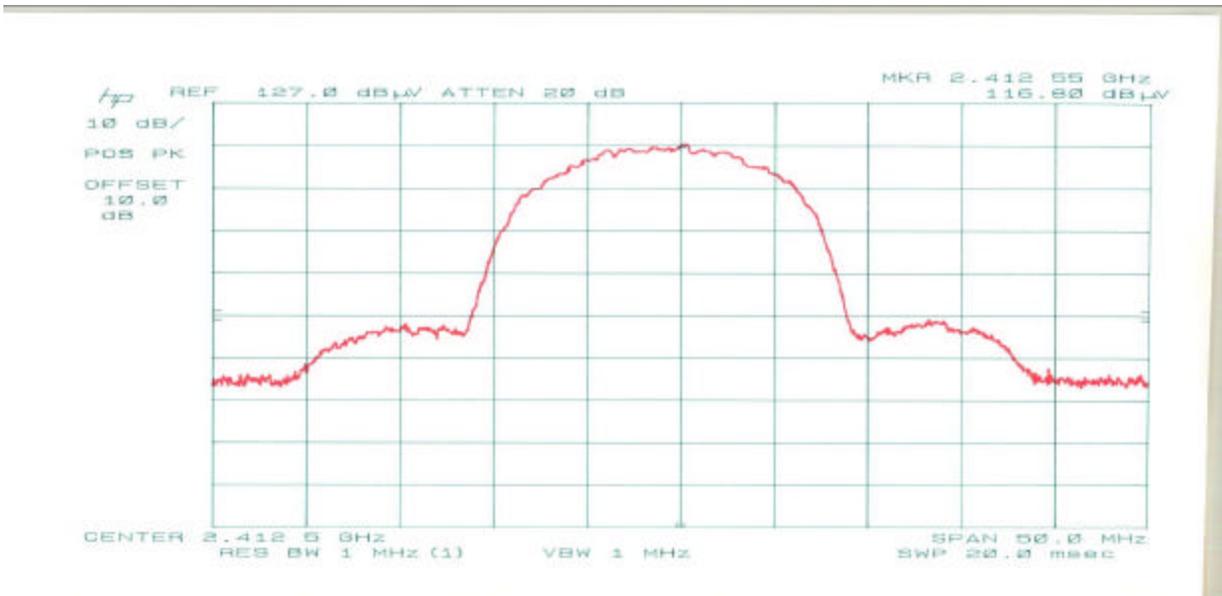
Test Report #: **BC300408 Run 02** Test Area: Pinewood Site 1 Cond
 Test Method: FCC 15.247 (2)(d) Test Date: 23-Nov-2003
 EUT Model #: L100-W-T-B EUT Power: 120V 60Hz
 EUT Serial #: proto #1
 Manufacturer: HEI Inc.

Temperature: 25 °C
 Relative Humidity: 26 %
 Air Pressure: 80 kPa
 Page: 3 of 3

EUT Description: Link-iT Wireless Connectivity Device
 Notes: Wireless mode, serial connected to the laptop. 16.384 bits
 ping per second. Buffer amp in the clock line is removed.
 Two ferrites on the ethernet cable.

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

Power Density in accordance to FCC CFR47 Part 15.247 (2)(c)
 Low Channel



Project Report

Begin Date: 12/6/2003 End Date: 12/8/2003

Technician Mike Spataro

Project: BC300408

Capital Asset ID	Manufacturer	Model #	Serial #	Description	Test Performed	Service Type	Service Date	Service Due
95	Hewlett-Packard	11947A	3107A01975	Transient Limiter	C Conducted Emissions	For Ver	2/1/2003	2/1/2004
113	Hewlett-Packard	8482A	2349A14570	Power Sensor Set 3	C Conducted Emissions	For Cal	3/28/2003	3/28/2004
150	WIENSCHEL	2	AC1989	10 DB Attenuator	C Conducted Emissions	For Ver	1/30/2003	1/30/2004
192	RHODE & SCHWARZ	ESH2-Z5	830364/002	LISN 50 ohm/50uH 3 line (1kHz - 30 MHz)	C Conducted Emissions	For Ver	3/4/2003	3/4/2004
199	RHODE & SCHWARZ	ESH3	872318/036	Low Frequency Receiver (9 kHz - 30 MHz)	C Conducted Emissions	For Cal	11/10/2003	11/10/2004
238	RHODE & SCHWARZ	ESHS 30	842806/001	EMI Test Receiver	C Conducted Emissions	For Cal	6/24/2003	6/24/2004
3	Hewlett-Packard	85650A	2811A01300	Q.P Adapter	R Radiated Emissions	For Cal	9/3/2003	9/3/2004
106	TENSOR	4105	2020	Ridged Guide Antenna 1-18GHz	R Radiated Emissions	For Cal	7/11/2003	7/11/2004
135	EMCO	3146	9402-3775	Log Periodic Antenna (200-1000MHz)	R Radiated Emissions	For Cal	9/10/2003	9/10/2004
189	EMCO	3109	9801-3142	Bicon Antenna 30 - 300 MHz	R Radiated Emissions	For Cal	9/9/2003	9/9/2004
201	Hewlett-Packard	11975A	2738A01557	Amplifier	R Radiated Emissions	For Cal	10/3/2002	10/3/2004
202	Avantek	AWT-18037	1002	RF Pre-Amplifier (8-18 GHz)	R Radiated Emissions	For Ver	4/23/2003	4/23/2004
203	Avantek	AFT97-8434-10F	1007	RF Pre-Amplifier (4-8 GHz)	R Radiated Emissions	For Ver	4/23/2003	4/23/2004
204	Hewlett-Packard	11970K	2332A01280	Harmonic Mixer (18-26MHz)	R Radiated Emissions	For Cal	10/5/2002	10/5/2005
209	Hewlett-Packard	85662A	2403A08749	Display Section	R Radiated Emissions	For Cal	11/4/2003	11/4/2004
210	Hewlett-Packard	8566B	2410A00154	Spectrum Analyzer (dc-26 GHz)	R Radiated Emissions	For Cal	11/4/2003	11/4/2004
213	Mini-Circuits Lab	ZHL-42	N052792-2	Amplifier	R Radiated Emissions	For Ver	6/20/2003	6/20/2004

Thursday, January 08, 2004

Page 1 of 1

Appendix B

Test Plan
and
Constructional Data Form

Appendix C

Measurement Protocol

And

Test Procedures



MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Conducted and radiated emission testing is performed according to the procedures in ANSI C63.4 & CNS13438.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the applicable limit.

To convert between dB μ V and μ V, the following conversions apply:

- $\text{dB}\mu\text{V} = 20(\log \mu\text{V})$
- $\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$

RADIATED EMISSIONS

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the applicable limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example: At a Test Frequency of 30 MHz, with a peak reading on the spectrum analyzer or measuring receiver of 14 dB μ V:

Measured Level		Transducer & Cable Loss factor		Corrected Reading	Specification Limit		Corrected Reading		Delta Specification
(dB μ V)	+	(dB)	=	(dB μ V/m)	(dB μ V/m)	-	(dB μ V/m)	=	
14.0		14.9		28.9	40.0		28.9		-11.1

DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 22GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

Conducted Emissions Diagram:

