TEST REPORT OF A LUCENT TECHNOLOGIES 2.4 GHz 11 Mbps RLAN PCMCIA CARD, TYPE WAVELAND SILVER TURBO, WITH A 2 dBi ANTENNA CONNECTED, BRAND VOCOLLECT, TYPE PT-656022 IN CONFORMITY WITH FCC PART 15 AND ANSI C63.4-1992

FCC report layout endorsed by the FCC
by Public Notice of March 11, 1992.

Global Certification Laboratories, Ltd.

4 Matthews Drive
East Haddam, CT. 06423

Telephone: 1-860-873-1452
Telefax: 1-860-873-1947
E-mail: emc@connix.com

MEASUREMENT/TECHNICAL REPORT

Vocollect, Inc.

Model number:
2.4 GHz 11 Mbps RLAN PC card - Waveland Silver Turbo with Vocollect 2 dBi antenna connected

FCC ID: MQOTT500-33300

May 25, 2000

This report concerns (check one):	~~Original grant~~ change Class II
Equipment type: Direct Sequence Spread Spectrum Transceiver	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	~~Yes~~ no
If yes defer until:	_____
Transition Rules Request per 15.37	~~yes~~ no
If no, assumed Part 15, Subpart B for unintentional radiators – the new 47 CFR (10-1-90 Edition) provision.	
Report prepared by: Name	: Steve Petix BSc. EE
Company name	: Global Certification Laboratories, Ltd.
Telephone	: 1-860-873-1452
Telefax number	: -860-873-1947
Mailing address	: 4 Matthews Drive,
City, State, zip	: East Haddam, CT. 06423
Country	: U.S.A.

The data taken for this test and report herein was done in accordance with FCC Part 15 and measurement Procedures of ANSI C63.4-1992 and were relevant the procedures as specified in the sheets from the FCC attached to this test report. Global Certification Labs certifies that the data is accurate and contains a true representation of the emission-profile of the Equipment Under Test (EUT) on the date of the test noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: Signature:

May 25, 2000 J. Rogers
Global Certification Laboratories, Ltd.

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1 General information.

1.1 Product description.

The Lucent Technologies 2.4 GHz 11 Mbps RLAN PCMCIA card, type Waveland Silver Turbo (referred to as EUT in this report) with a 2 dBi antenna connected, brand Vocollect, type PT-656022, is intended for installation in a wireless scanning device, brand Vocollect, model TT-500-28300, type Apollo Talkman Open or a personal computer with a suitable PCMCIA slot. The wireless scanning device has a standard PCMCIA slot in which an approved RLAN PCMCIA card can be fitted.

The 2.4 GHz 11 Mbps RLAN PCMCIA card has been previously approved by the FCC by means of FCC ID: IMRWLPCE24H. The addition of the 2 dBi antenna, brand Vocollect, type PT-656022 has been classified as a permissive class II change. Therefore measurements have been performed on the combination of the previously approved Lucent Technologies 2.4 GHz RLAN PCMCIA card with the 2 dBi antenna, brand Vocollect, type PT-656022 connected in order to justify the class II permissive change.

The 11 Mbps WLAN PC card features high-speed wireless connection, up to 11 Mbps and supports full mobility and seamless roaming from cell to cell (handover). The air interface is interoperable with IEEE 802.11.

The EUT is to be powered from the wireless scanning device or a personal computer and has no external power supply.

1.2 Related Submittal(s)/Grant(s).

Lucent Technologies 2.4 GHz RLAN PCMCIA card; FCC ID: IMRWLPCE24H.

1.3 Tested System Details.

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system (included inserted cards, which have Grants) are:

Model	Serial #	FCC ID	Description	Cable Descriptions
EUT: PCMCIA 2.4 GHz 11 Mbps RLAN card	99UT12445599	IMRWLPCE24H	11 Mbps RLAN card	direct connection with laptop PC via PCMCIA slot
PT-656022	N/A.	N/A.	Vocollect 2 dBi antenna	N/A.
MS InPort Mouse	N/A.	N/A.	Serial PC mouse	serial cable to serial PC port
IBM Thinkpad type 9545-006	78-L3515	N/A.	Laptop PC	power cord to adapter serial cable to PC mouse

1.4 Test Methodology.

The test methodology used has been based on the requirements of FCC Part 15, (10-1-97 edition), relevant clauses 15.205, 15.207, 15.209 and 15.247,. The used measuring methods are based on the ANSI C63.4-1992 document.

Radiated tests above 30 MHz were performed at a distance of 3 meter. Field strength measurements on frequencies above 1 GHz were measured with appropriate pre-amplifiers, antennas and a spectrum analyser. On found frequencies the actual level at the input of the pre-amplifier was generated with aid of a signal generator. The output level of the signal generator was increased with the antenna-factor to obtain the field strength.

1.5 Test Facility

All testing was performed at the facilities of

Global Certification Laboratories, Ltd.
4 Matthews Drive
East Haddam CT. 06423
USA

unless noted otherwise.

1.6 List of measurement equipment.

The following instrumentation has been used for all emissions measurements.

Manufacturer/Description	Model	Serial
ADVANTEST Spectrum Analyzer	R3361A	91730394
ADVANTEST Preamplifier	R14601	93120019
ADVANTEST Preselector	R3551	92970013
AILTECH Log Periodic Antenna	90005/3146	1095
CALIFORNIA INSTRUMENTS Power Supply	3800	N/A
ELECTROMETRICS Horn Antenna	RGA-60	6139
EMCO Horn Antenna	3115	2498
FLUKE Digital Multimeter	76	6540398
FLUKE Thermocouple Module	80TK	6698122
GLOBAL Laboratories 3, 10 & 30 meter O.A.T.S.	N/A	N/A
HEWLETT PACKARD Spectrum Analyzer	8569B	2607A03112
HEWLETT PACKARD RF Power Meter	435A	1530A03143
MARCONI Signal Generator	2022C	52022-930X
OAKTON Thermal-hygrometer	35612-00	none
RAYPROOF Shielded Room		4536
SCHWARZBECK 50 Ω Artificial Mains Network	NNLK 8121	8121245
SCHWARZBECK Biconical Antenna	VHA-9103	" A"
SCHWARZBECK RF Receiver 9KH to 30 MHz.	VUME 1518	1518167
SCHWARZBECK RF Receiver 30 to 1000 MHz	VUME 1520	1520346
STACO ENERGY PRODUCTS Variable Autotransformer	None	H-214

1.7 Bandwidth and antenna factors.

The utilized measuring equipment is stated in § 1.6. The bandwidth of the receiver switches automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. Also the antenna factors are included in the test receiver. The computer used to collect the data automatically calculates the appropriate correction factors for the measurement antenna and also the appropriate correction factor for the cable loss.
The total correction is automatically added to the measured value.

2 Product labelling.

2.1 FCC ID Label

The following label shall be attached to the device under test.

FCC ID: MQOTT500-33300

This Device complies with Part 15 of the FCC rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation

Figure 1. FCC ID label

The dimensions of the label, the location of the label and the type of font can be found in the FCC regulation book CFR 47, parts 0 to 19, revised as per October 1, 1993.

2.2 Location of the FCC ID Label on the EUT

The FCC ID Label will be placed on the rear side of the WLAN PC card

See attached documentation-sheet for more detailed information.

3 System test configuration.

3.1 Justification.

The system was configured for testing in a typical fashion (as a customer would normally use it).

The justification of cables and equipment has been carried out as prescribed in the ANSI
C63.4-1992 document.

The measurements were performed on the operating frequency in the middle of the specified frequency band (channel 7: 2442 MHz).

To complete the configuration required by the FCC, the transmitter was tested in a laptop PC.
Some tests required direct connections from the PCMCIA card to the measurement sets such as the spectrum analyser

For radiated “ enclosure” measurements a 2 dBi antenna was used in the Global Certification OATS facility.

3.2 EUT exercise software.

The “ CERT” program called was used to cause the transmitter to transmit continuously for the tests and measurements, which was verified by a receiving unit during testing. The carrier was also checked to verify that the information was being transmitted.

3.3 Special accessories.

No special accessories are used to achieve FCC compliance.

3.4 Equipment modifications.

No modifications have been made to the equipment to achieve compliance.

Applicant Signature	: N/A.	Date	: N/A.
Printed name	: N/A.	Position	: N/A.

3.5 Configuration of the tested system.

Block diagrams of the tested system are included in annexes attached to this report.

4 Block diagram(s) of the tested model.

Not applicable.

5 Conducted emission data.

The initial step in collecting conducted data is a scan of the measurement range. All significant signals found were measured with a quasi-peak detector.

Conducted emissions on channel 7. 2442 MHz

TERMINAL DISTURBANCE VOLTAGES DETECTED FROM 0.45MHz - 30MHz FOR FCC PART 15, SECTION 15.207.

FILE: VOCO00F2
EUT: LUCENT 11 Mb PCMIA LOCAL AREA NETWORK CARD

THE EUT IS A LAN CARD THAT IS INSTALLED IN A PCMCIA CARD SLOT IN A NOTEBOOK COMPUTER.

THE EUT IS POWERED BY 120 VAC.
THE EUT SERIAL NUMBER IS 99UT12445599.
CUSTOMER REPRESENTATIVE: DAVE DIGREGORIO.

MEASURED BY STEVE PETIX ON 4/4/00 TO FCC PART 15, SUBPART B, CLASS B IN AN 8'x10'x15' SHIELDED ROOM UTILIZING A SCHWARZBECK ARTIFICIAL MAINS NETWORK MODEL NNLK8121 AND A SCHWARZBECK INTERFERENCE RECEIVER MODEL FMLK 1518.

The EUT is mounted in a IBM "Thinkpad" laptop computer, s/n 78-L3515.
The laptop is powered from a remote power supply "brick", which is powered through the Artificial mains network.

The EUT is in a continuous transmission mode while in Channel 7.

Preliminary scans indicated that this would generate the highest representative level of conducted emissions.

Continued on following page.

TESTING NEUTRAL LINE :

FREQ. (MHz)	AMPL QUASI-P dB(µV)	AMPL + LISN LOSSES dB(µV)	LIMIT QUASI-P dB(µV)	PASS?	MARGIN dB
0.45	0	0.11	48	YES	47.9
0.50	11	11.11	48	YES	36.9
0.54	33	33.11	48	YES	14.9
0.68	27	27.11	48	YES	20.9
0.81	33	33.11	48	YES	14.9
ALL SIGNALS ARE BELOW 30 dBuV.					
2.04	28	28.11	48	YES	19.9
2.17	31	31.11	48	YES	16.9
2.58	30	30.11	48	YES	17.9
2.71	31	31.11	48	YES	16.9
2.98	31	31.11	48	YES	16.9
3.12	30	30.20	48	YES	17.8
ALL SIGNALS ARE BELOW 35 dBuV.					
4.75	18	18.20	48	YES	29.8
5.16	23	23.20	48	YES	24.8
5.43	24	24.20	48	YES	23.8
7.20	39	39.06	48	YES	8.9
8.15	38	38.06	48	YES	9.9
8.42	38	38.06	48	YES	9.9
9.23	39	39.61	48	YES	8.4
10.18	40	40.61	48	YES	7.4
ALL SIGNALS ARE BELOW 40 dBuV.					
11.27	40	40.61	48	YES	7.4
12.22	40	40.61	48	YES	7.4
13.44	41	41.61	48	YES	6.4
19.69	37	38.67	48	YES	9.3
22.67	37	38.60	48	YES	9.4
25.11	33	35.50	48	YES	12.5
27.15	30	31.44	48	YES	16.6
27.56	40	41.44	48	YES	6.6
29.06	30	32.40	48	YES	15.6
30.00	30	33.05	48	YES	15.0
ALL OTHER FREQUENCIES BELOW LIMITS					

continued on following page

TESTING LINE1:

FREQ. (MHz)	AMPL QUASI-P dB(µV)	AMPL + LISN LOSSES dB(µV)	LIMIT QUASI-P dB(µV)	PASS?	MARGIN dB
0.45	0	0.11	48	YES	47.9
0.50	12	12.11	48	YES	35.9
0.54	32	32.11	48	YES	15.9
0.68	28	28.11	48	YES	19.9
0.81	34	34.11	48	YES	13.9
ALL SIGNALS ARE BELOW 30 dBuV.					
2.04	28	28.11	48	YES	19.9
2.17	27	27.11	48	YES	20.9
2.58	30	30.11	48	YES	17.9
2.72	31	31.11	48	YES	16.9
3.00	31	31.20	48	YES	16.8
3.12	30	30.20	48	YES	17.8
ALL SIGNALS ARE BELOW 35 dBuV.					
4.75	20	20.20	48	YES	27.8
5.16	23	23.20	48	YES	24.8
5.43	25	25.20	48	YES	22.8
7.20	38	38.06	48	YES	9.9
8.15	38	38.06	48	YES	9.9
8.42	38	38.06	48	YES	9.9
9.00	38	38.61	48	YES	9.4
10.18	40	40.61	48	YES	7.4
ALL SIGNALS ARE BELOW 40 dBuV.					
11.27	40	40.61	48	YES	7.4
12.22	40	40.61	48	YES	7.4
13.44	41	41.61	48	YES	6.4
13.58	41	41.61	48	YES	6.4
19.69	38	39.67	48	YES	8.3
22.67	37	38.60	48	YES	9.4
25.11	30	32.50	48	YES	15.5
27.15	30	31.44	48	YES	16.6
27.56	40	41.44	48	YES	6.6
29.00	30	32.40	48	YES	15.6
30.00	30	33.05	48	YES	15.0
ALL OTHER FREQUENCIES BELOW LIMITS					

THE LUCENT 11 Mb LAN CARD MEETS THE CONDUCTED EMISSIONS REQUIREMENT OF FCC PART 15 FOR CLASS B WITHOUT MODIFICATIONS.

6 Radiated spurious emission data

RADIATED EMISSIONS DATA USING FCC SECTION 15.209 LIMITS AT A 3 METER EUT TO ANTENNA DISTANCE.

FILE: VOCO00F2
EUT: LUCENT 11 Mb PCMCIA LOCAL AREA NETWORK CARD.

THE EUT IS A LAN CARD THAT IS INSTALLED IN A PCMCIA CARD SLOT IN A NOTEBOOK COMPUTER.

THE EUT IS POWERED BY 120 VAC.
THE EUT SERIAL NUMBER IS: 99UT12445599.
CUSTOMER REPRESENTATIVE: DAVE DIGREGORIO.

MEASURED BY STEVE PETIX ON 4/6/00 TO FCC SECTION 15.209. USING THE 3 METER OPEN AREA TEST SITE, (i.e. OATS).

A SCHWARZBECK MODEL VHA9103 BICONICAL ANTENNA, (s/n: A) IS USED FOR 30 TO 300 MHz.
AN AILTECH MODEL 96005, (s/n 1095), LOG PERIODIC ANTENNA IS USED FOR 200 TO 1000 MHz.
AN ELECTROMETRICS MODEL RGA-60 s/n 6139 GUIDED RIDGE HORN ANTENNA IS USED FOR 1 TO 18 GHz.

THE ANTENNAS ARE FACING THE CARD SIDE (EUT SLOT) OF THE NOTEBOOK COMPUTER IN ORDER TO OBTAIN FREQUENCIES OF INTEREST. THIS CORRESPONDS TO ZERO DEGREES ON THE TURNTABLE.

ALL MEASUREMENTS BELOW 1 GHz USE QUASI-PEAK DETECTION UNLESS NOTED OTHERWISE. MEASUREMENTS ABOVE 1 GHz USE PEAK DETECTION.

The spectrum analyzer used 1 GHz uses a resolution bandwidth of 100 kHz.
The receiver used for measurements below 1 GHz uses a resolution bandwidth of 120 kHz.

The LUCENT 11 Mbytes PCMCIA card is installed in an IBM "Thinkpad" laptop computer, s/n 78-L3515.

The LUCENT 11 Mbytes PCMCIA card is transmitting continuously with the "CERT" test software.

Only channel 7, i.e. 2,442MHz is measured for unwanted emission compliance to 15.209.
Maximum levels are achieved with antenna height scans.

continued on next page

The following data lists the significant spurious emission frequencies (worst case), measured levels in accordance with FCC 15.209. Photographs of the test set-ups are included in annexes attached to this report.

The following measurements of spurious emissions are taken with the transmitter operational.

THE 30 TO 300 MHz ANTENNA IS HORIZONTAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(µV)	AZIMUTH DEGREES	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(µV/m)	FCC LIMIT QUASI-P dB(µV/m)	PASS?	MARGIN dB
204	10	0	3.60	18.62	32.22	43.5	YES	11.28
233	14	0	3.92	18.60	36.52	46	YES	9.48
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 30 TO 300 MHz ANTENNA IS VERTICAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(µV)	AZIMUTH DEGREES	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(µV/m)	FCC LIMIT QUASI-P dB(µV/m)	PASS?	MARGIN dB
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 300 TO 1000 MHz ANTENNA IS HORIZONTAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(µV)	AZIMUTH DEGREES	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(µV/m)	FCC LIMIT QUASI-P dB(µV/m)	PASS?	MARGIN dB
335.8	11	0	5.14	17.36	33.50	46	YES	12.50
598	8	0	7.78	19.14	34.92	46	YES	11.08
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 300 TO 1000 MHz ANTENNA IS VERTICAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(µV)	AZIMUTH	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(µV/m)	FCC LIMIT QUASI-P dB(µV/m)	PASS?	MARGIN dB
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.								
FREQ. (MHz)	AMPL QUASI-P dBm	AMPL QUASI-P dB(µV)	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(µV/m)	FCC LIMIT QUASI-P dB(µV/m)	PASS?	MARGIN dB
2442.00	-67	40	20.80	28.50	64.30	N/A	N/A	N/A
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.								
FREQ. (MHz)	AMPL QUASI-P dBm	AMPL QUASI-P dB(µV)	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(µV/m)	FCC LIMIT QUASI-P dB(µV/m)	PASS?	MARGIN dB
2442.00	-74	33	20.80	28.50	57.30	N/A	N/A	N/A
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

continued on next page

The transmitter has been put into a STANDBY mode by using the "CERT" test program.

THE 30 TO 300 MHz ANTENNA IS HORIZONTAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(μV)	AZIMUTH	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT QUASI-P dB(μV/m)	PASS?	MARGIN dB
204	11	180	3.60	18.62	33.22	43.5	YES	10.28
233	0	180	3.92	18.60	22.52	46	YES	23.48
NO OTHER SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 30 TO 300 MHz ANTENNA IS VERTICAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(μV)	AZIMUTH DEGREES	CABLE LOSS dB(μV)	ANTENNA FACTORS dB	TOTAL FIELD dB(μV/m)	LIMIT QUASI-P dB(μV)	PASS?	MARGIN dB
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 300 TO 1000 MHz ANTENNA IS HORIZONTAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(μV)	AZIMUTH	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT QUASI-P dB(μV/m)	PASS?	MARGIN dB
335.8	11	180	5.14	17.36	33.50	46	YES	12.50
598	5	180	7.78	19.14	31.92	46	YES	14.08
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 300 TO 1000 MHz ANTENNA IS VERTICAL AND AT 3 METERS.								
FREQ. (MHz)	AMPL QUASI-P dB(μV)	AZIMUTH	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT QUASI-P dB(μV/m)	PASS?	MARGIN dB
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 1 TO 18 GHz ANTENNA IS HORIZONTAL AND AT 1 METER.								
FREQ. (MHz)	AMPL QUASI-P dBm	AMPL QUASI-P dB(μV)	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT QUASI-P dB(μV/m)	PASS?	MARGIN dB
2442.00	-68	39	20.80	28.50	63.30	N/A	N/A	N/A
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE 1 TO 18 GHz ANTENNA IS VERTICAL AND AT 1 METER.								
FREQ. (MHz)	AMPL QUASI-P dBm	AMPL QUASI-P dB(μV)	CABLE LOSS, dB	ANTENNA FACTORS dB/m	TOTAL FIELD dB(μV/m)	FCC LIMIT QUASI-P dB(μV/m)	PASS?	MARGIN dB
2442.00	-74	33	20.80	28.50	57.30	N/A	N/A	N/A
NO SIGNIFICANT EUT GENERATED SIGNALS FOUND FOR THIS RANGE.								

THE LUCENT 11 Mbytes LAN PCMCIA CARD MEETS THE RADIATED EMISSIONS REQUIREMENT OF FCC PART 15.209 WITHOUT MODIFICATIONS.