MEASUREMENT AND TECHNICAL REPORT

LGC Wireless, Inc.
2540 Junction Avenue
San Jose, CA 95134

Date: 11 September, 2001

This Report Concerns: LGC Wireless, Inc. Original Grant: X Class II Change:

Equipment Type: InterReach Unison IDEN

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes: ____ Defer until: _____ No: X

LCG Wireless Inc., agrees to notify the Commission by: _____

Of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes: *No:

(*) FCC Part 2, Paragraphs, 2.1046, 2.1051, 2.1053, 2.1055 and Part 90.

Report Prepared By:

TÜV Product Service
4855 Patrick Henry Drive Bldg. 6
Santa Clara, CA 95054

D I R E C T O R Y

1 . GENERAL INFORMATION

1.1 Product Description

EUT Description:

The system is a distributed in-building antenna system that enables wireless uninterrupted communication. The Main Hub of the system receives an RF signal from either a roof top antenna or a base station. The Main Hub down converts this signal to an IF signal and passes the signal to the Expansion Hub via fiber. The Expansion Hub does some additional filtering and passes the signal via Cat5 cable on to the Remote Antenna Unit, the RAU. The RAU up converts the signal back to an RF signal and rebroadcasts it. The system extends the wireless coverage area by bringing wireless signals into hard to penetrate structures.

EUT Name: InterReach Unison Model No. IDEN

Product Options: N/A Serial No. Not Serialized

Configurations To Be Tested:

InterReach Unison IDEN compromising of Main Hub, Expansion, and Remote Antenna Unit.

Power Requirements

Voltage: 120 VAC (If battery powered, make sure battery life is sufficient to complete testing.)

No. Of Phases: N/A

Current: Amps / Phase (Max): 5 A
Current: Amps / Phase (Nominal): N/A

Typical Installation and / or Operating Environment

TELECOM

EUT Power Cable

■ - Permanent or ☐ - Removable ☐ - Shielded or ■ - Unshielded
Length (In Meters): 1.5 ■ - Not Applicable

EUT Power Cable	
CONNECTION:	Signal Generator To Main Hub and RAU to Spectrum Analyzer: RF
SHIELD:	Yes
CONNECTORS:	Yes
TERMINATION TYPE:	SMA or N
LENGTH:	
REMOVABLE:	Yes
CONNECTION:	Expansion Hub to RAU: Cat5 Cable
SHIELD:	No
CONNECTORS:	Yes
TERMINATION TYPE:	RJ 45
LENGTH:	50 m max
REMOVABLE:	Yes
CONNECTION:	Main Hub to expansion Hub: Fiber
SHIELD:	No

1.

GENERAL INFORMATION (continued)

1.2 RELATED SUBMITTAL / GRANT

None

1.3 TESTED SYSTEM DETAILS

The FCC IDs for all equipment, plus descriptions of all cables used in test system are:

None.

1.4 STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests.

1.5 TEST FACILITY

All measurements and tests were performed by:

TÜV Product Service
4855 Patrick Henry Drive
Building 6
Santa Clara, CA 95054

The Test Site Data and performance comply with ANSI 63.4 and are registered with the FCC, 7435 Oakland Mills Rd., Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

1.6 **PART 2 REQUIREMENTS**

Equipment Specifications

Frequency Range In MHz	Rated RF Power In Watts	Frequency Tolerance %, Hz, ppm	Emission Designator (see CFR §2.201 and § 2.202)	Microprocessor Model Number
806-824 851-869	**0.01**	**+/- 5ppm**	**F9W, D9W**	

2. **SYSTEM TEST CONFIGURATION**

2.1 **JUSTIFICATION**

The InterReach Unison IDEN was tested in the configuration shown in the block diagram.

2.2 EUT EXERCISE SOFTWARE

None

2.3 SPECIAL ACCESSORIES

None.

2.4 MODIFICATIONS

None.

2.5 CONFIGURATION OF TESTED SYSTEM

See Block Diagram.

RF Power Output – 2.1046

Uplink

Channel	Frequency (MHz)	Peak Power Level (dBm)
Low	806.000	-15.9
Mid	815.000	-14.7
High	824.000	-14.2

Downlink

Channel	Frequency (MHz)	Peak Power Level (dBm)
Low	851.000	7.5
Mid	860.000	8.4
High	869.000	7.4

Test Equipment used:

	Model No.	Description	Manufacturer	Serial No.	Due Calib. Date
■ -	8566B	Spectrum Analyzer	Hewlett Packard	2816A18342	9/25/02
■ -	8656B	Signal Generator	Hewlett Packard	2523A03399	4/9/02
■ -	HP8491B	Attenuator	Hewlett Packard	35958	N/A

Remarks: All Cable losses taken into account in above results.

Modulation Characterisitics (2.1047)

This test is not applicable. The EUT is an Amplifier Type Repeater.

Occupied Bandwidth (2.1049)

Minimum Requirement:

Section 2.1049(i); transmitters designed for other types of modulation –when modulated by an appropriate signal of sufficient amplitude to be represented of the type of service in which used. A description of the input signal should be supplied.

Test Procedure

The EUT's Occupied Bandwidth is compared to the input source plot (signal generator) and the output plot (EUT) and checked that the input signal bandwidth is not greater at the output of the EUT.

Test Results

Plots were produced for the output of the EUT and for the signal generator. See following pages.

Test Equipment Used:

	Model No.	Description	Manufacturer	Serial No.	Due Calib. Date
■ -	8566B	Spectrum Analyzer	Hewlett Packard	2816A18342	9/25/01
■ -	8656B	Signal Generator	Hewlett Packard	2523A03399	4/9/02
■ -	HP8491B	Attenuator	Hewlett Packard	35958	N/A

OCCUPIED BANDWIDTH (2.1049)

TEST PLOTS

Spurious Emissions At The Antenna Terminals (2.1051)

Method: Spurious Emissions at the antenna terminals.

Measurements shown are corrected to take into account cable losses and correction factors.

Uplink

Frequency (MHz)	Channel Frequency (MHz)		
	806.000	815.000	824.000

Downlink

Frequency (MHz)	Channel Frequency (MHz)		
	851.000	860.000	869.000

Remarks:

No emissions were detected at a level greater then 20 dB below the limit.

Test Equipment Used:

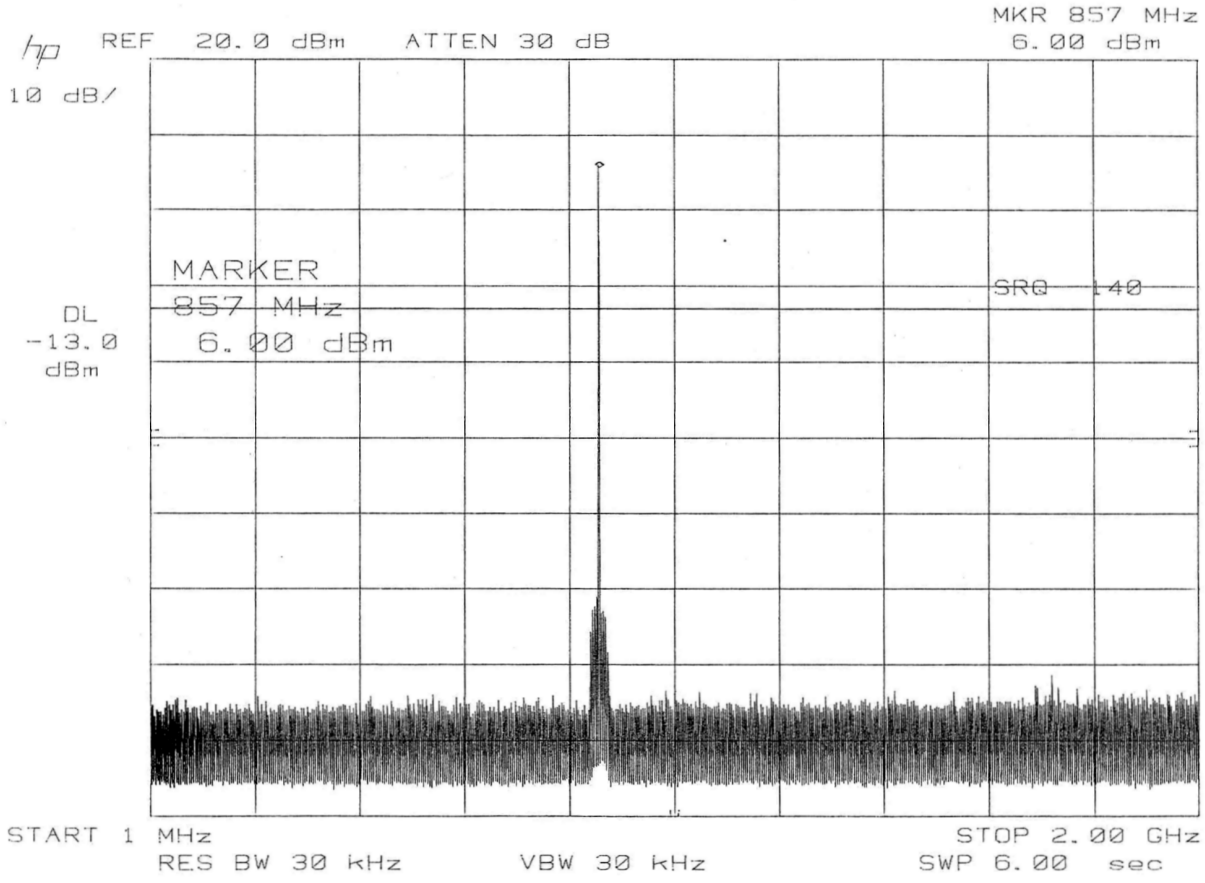
	Model No.	Description	Manufacturer	Serial No.	Due Calib. Date
■ -	85462A	Receiver RF Section	Hewlett Packard	3325A00161	5/15/02
■ -	85460A	RF Filter Section	Hewlett Packard	3330A00160	5/15/02
■ -	8566B	Spectrum Analyzer	Hewlett Packard	2421A00443	6/7/02
■ -	85680B	Spectrum Analyzer, RF section	Hewlett Packard	2732A04047	5/15/02
■ -	85662B	Spectrum Analyzer, Display section	Hewlett Packard	2816A16342	5/15/02
■ -	3115	Horn Antenna	EMCO	9902-5686	11/22/01
■ -	CBL6111	Bilog Antenna	Chase	1122	8/15/01
■ -	A-AMF10009046	RF Pre-amplifier	Miteq Inc.	AMF-5D-010180-35-10P	4/10/02

SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS (2.1051)

TEST PLOTS

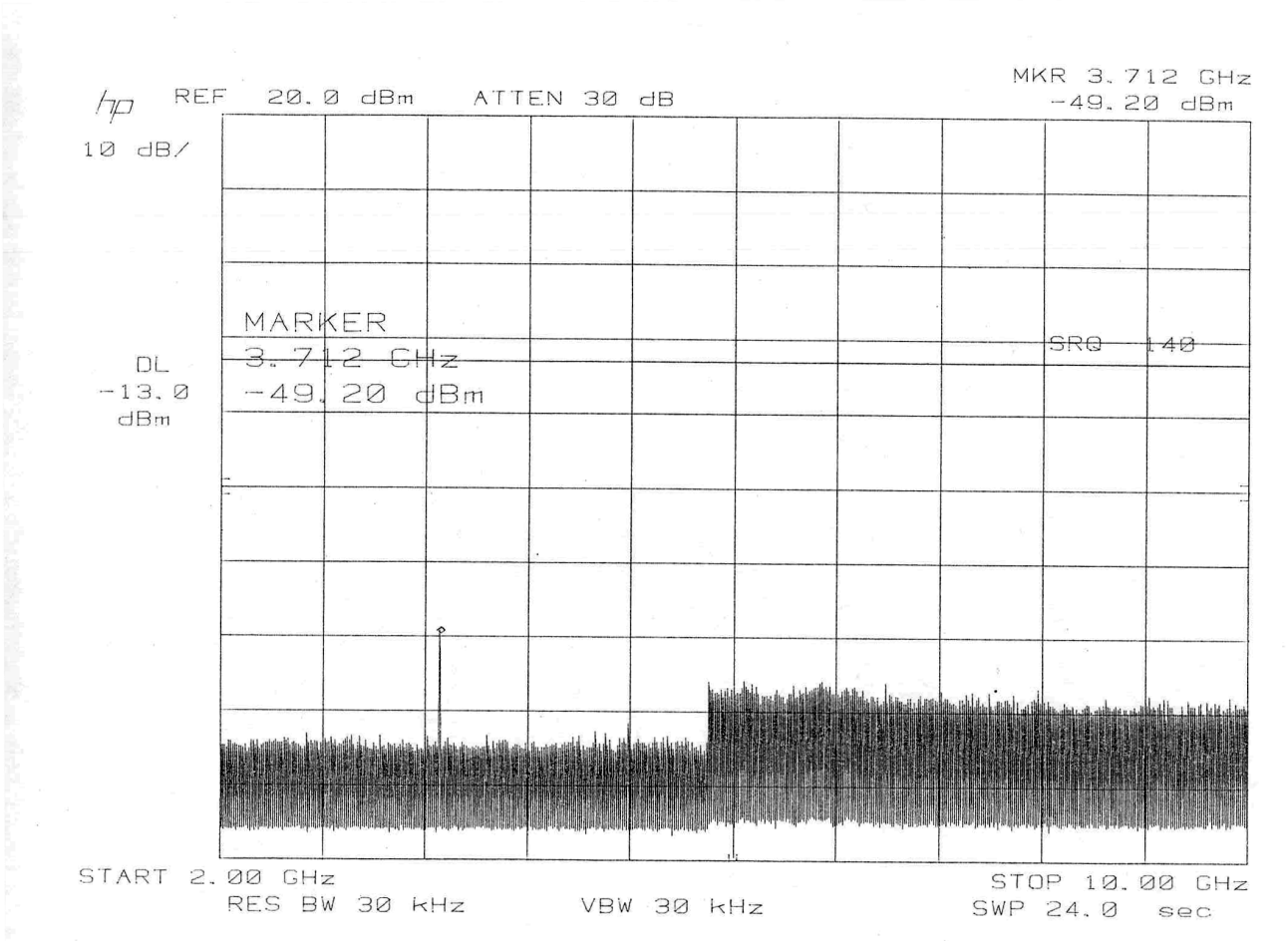
860 MHz Downlink

1.0 MHz – 2.0 GHz



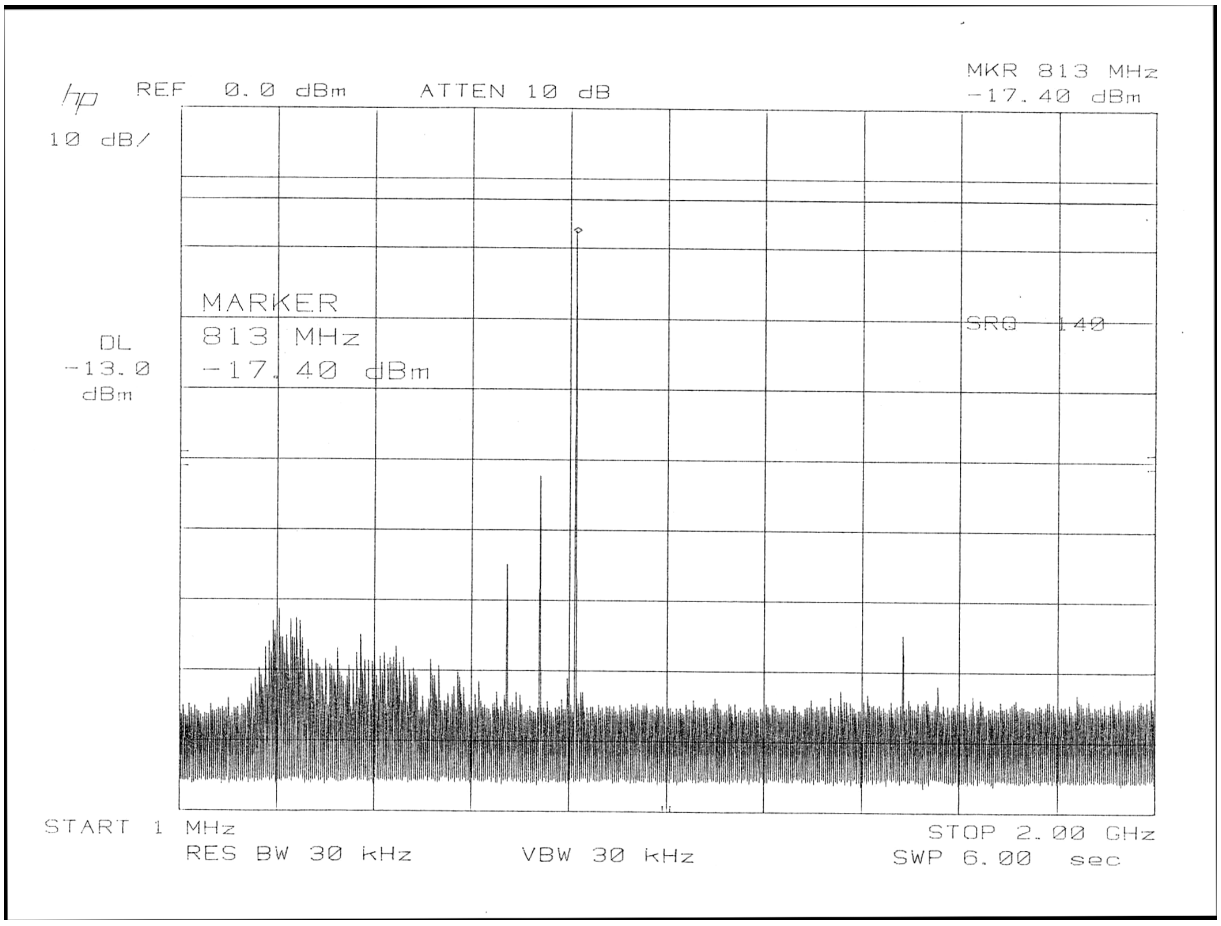
860 MHz Downlink

2.0 GHz – 10.0 GHz



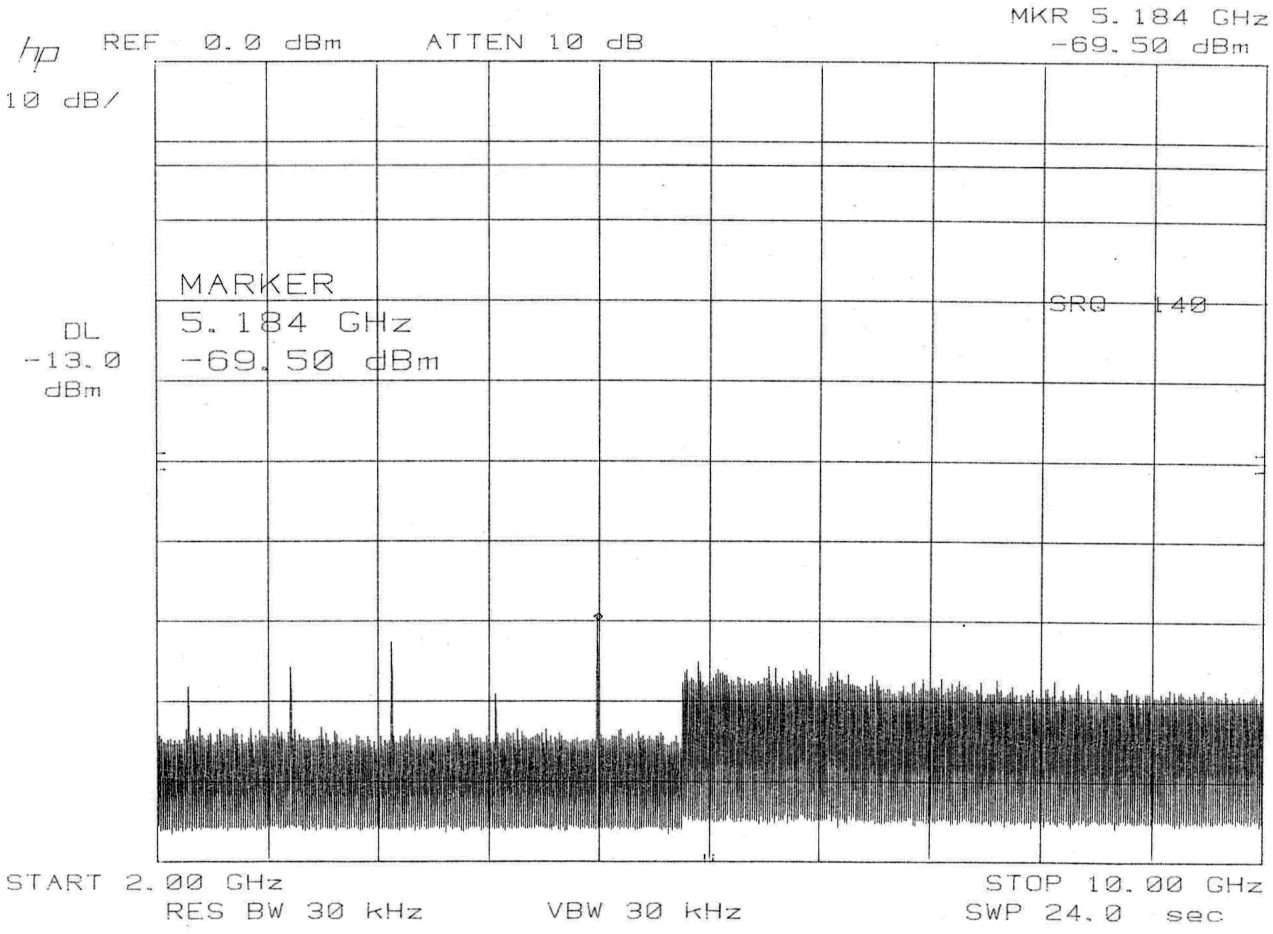
815 MHz Uplink

1.0 MHz – 2.0 GHz



815 MHz Uplink

2.0 GHz – 10.0 GHz



Field Strength Of Spurious Radiation (2.1053)

Method: The field strength of spurious radiation was measured at a distance of 3 meters in a semi anechoic absorber lined chamber. Frequency range investigated was 900 MHz to the 10th Harmonic.

Uplink

Frequency (MHz)	Channel Frequency (MHz)		
	806 MHz	815 MHz	824 MHz

Downlink

Frequency (MHz)	Channel Frequency (MHz)		
	851 MHz	860 MHz	869 MHz

Remarks:

No emissions were detected at a level greater than 20 dB below the limit.

(See Radiated Emissions Plots on pages 30 and 31.)

Test Equipment Used:

	Model No.	Description	Manufacturer	Serial No.	Due Calib. Date
■ -	85462A	Receiver RF Section	Hewlett Packard	3325A00161	5/15/02
■ -	85460A	RF Filter Section	Hewlett Packard	3330A00160	5/15/02
■ -	8566B	Spectrum Analyzer	Hewlett Packard	2421A00443	6/7/02
■ -	85680B	Spectrum Analyzer, RF section	Hewlett Packard	2732A04047	5/15/02
■ -	85662B	Spectrum Analyzer, Display section	Hewlett Packard	2816A16342	5/15/02
■ -	3115	Horn Antenna	EMCO	9902-5686	11/22/01
■ -	CBL6111	Bilog Antenna	Chase	1122	8/15/01
■ -	A-AMF10009046	RF Pre-amplifier	Miteq Inc.	AMF-5D-010180-35-10P	4/10/02

Section 2.1055: Frequency Stability

Not Applicable. EUT is an Amplifier Type repeater. No RF oscillators or frequency determining circuits in EUT.

3.0 RADIATED EMISSION EQUIPMENT / DATA

The following data lists the significant emission frequencies, measured levels, correction factor (which includes cable and antenna corrections), the corrected reading, and the limit.

See following page (s).

See test setup photos for radiated emissions test setup.

Sample Calculations

These calculations are performed automatically by the control software prior to display. For radiated emissions the corrected level is derived by taking into account the antenna gain, antenna mast amplifier and coax cable loss.

For example, assuming a receiver measurement of 50.0dbμV. Allowing for an antenna factor of 10.0dB/m, a mast amplifier gain of 25dB and a cable loss of 0.64dB, the resultant corrected field strength would be calculated as follows:-

Receiver level = field strength - antenna factor + amplifier gain - cable factor

Corrected field strength = (Receiver level) + (Cable factor) - (Amp gain) + (Antenna factor)

= 50.0 + 10.0 + 0.64 - 25

= 35.64dBμV/m

FCC limits are specified in μV for conducted emissions and μV/m for radiated emissions. These are converted to dbμV and dBμV/m respectively by the control software before results are displayed, limits being converted accordingly. The conversion factor is 20 $\log_{10}(\mu V)$ = dBμV.

Emissions Test Conditions: RADIATED EMISSIONS, FCC Part 2, and Paragraph 2.1053

The *RADIATED EMISSIONS* measurements were performed at the following test location: Santa Clara, CA

☐- Test not applicable

■ - Test area no. 1 – Semi - anechoic absorber – lined chamber (80' x 44' x 28')

☐ - Test area no. 2 – Shielded room (19' x 19' x 8')

☐ - Test area no. 3 – Fully – anechoic ferrite – lined chamber (24' x 16' x 11')

Testing was performed at a test distance of :

■ - 3 meters

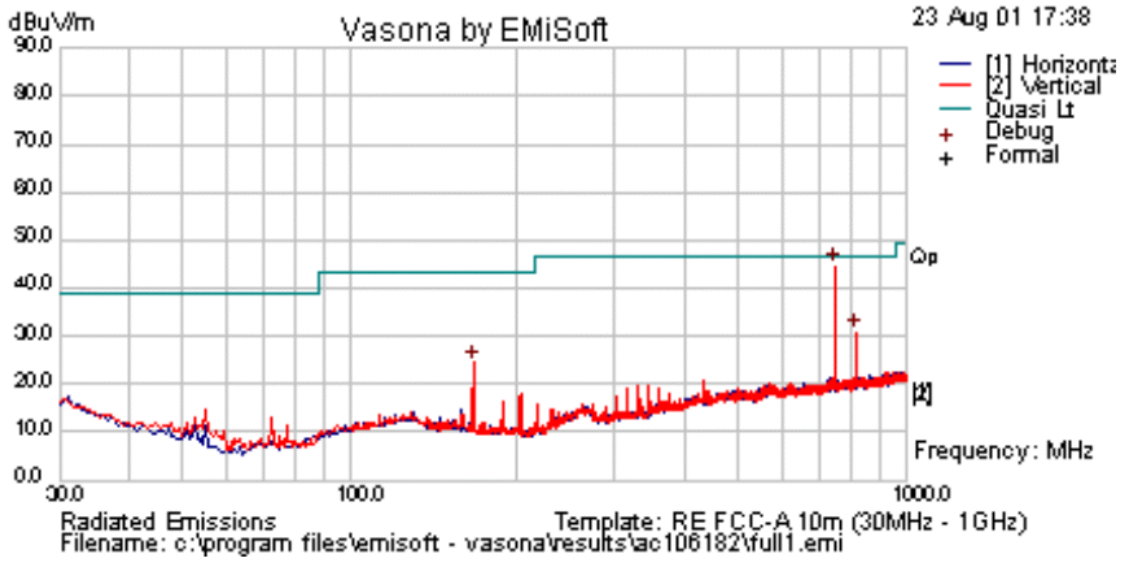
☐ - 10 meters

Test Equipment Used :

Model No.	Description Manufacturer	Serial No.		Due Calib. Date
■ - 85462A	Receiver RF Section	Hewlett Packard	3325A00161	5/15/02
■ - 85460A	RF Filter Section	Hewlett Packard	3330A00160	5/15/02
■ - 8566B	Spectrum Analyzer	Hewlett Packard	2421A00443	6/7/02
■ - 85680B	Spectrum Analyzer, RF section	Hewlett Packard	2732A04047	5/15/02
■ - 85662B	Spectrum Analyzer, Display section	Hewlett Packard	2816A16342	5/15/02
■ - 3115	Horn Antenna	EMCO	9902-5686	11/22/01
■ - CBL6111	Bilog Antenna	Chase	1122	8/15/01
■ - A-AMF10009046	RF Pre-amplifier	Miteq Inc.	AMF-5D-010180-35-10P	4/10/02

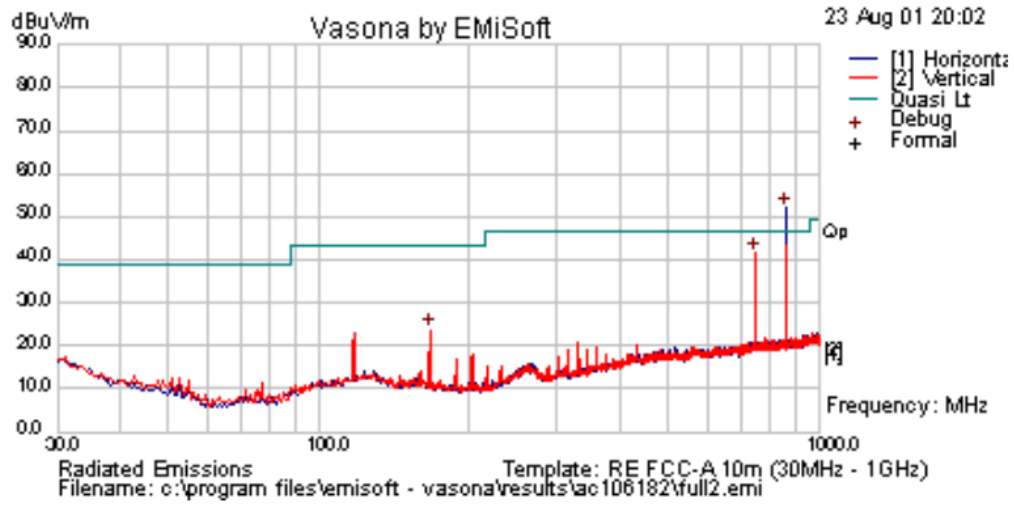
Remarks: _____

Company: LGC Wireless, 8-23-01
EUT: Unison, IDEN 800MHz, 50ohm termination on MH
Config: FCC-A (10m) (30MHz-1000MHz), 120vac/60Hz, uplink,full scan
operator: Ron Wumkes



No	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB	Level dBuV/m	Emission Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	744.769	46.19	3.5	-5.12	44.57	Preview	V	200	130	46.4	-1.83	Pass	
2	815.7	32.13	3.64	-5.02	30.75	Preview	V	200	130	46.4	-15.65	Pass	
3	167.013	37.84	1.47	-14.88	24.44	Preview	V	100	190	43.5	-19.06	Pass	

Company: LGC Wireless, 8-23-01
EUT: Unison, IDEN 800MHz,
Config: FCC-A (10m) (30MHz-1000MHz), 120vac/60Hz, downlink,Full scan
operator: Ron Wumkes



No	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB	Level dBuV/m	Emission Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	860.563	52.87	3.77	-4.52	52.13	Preview	H	100	70	46.4	5.73	Fail	
2	745.375	43.12	3.5	-5.12	41.5	Preview	V	200	190	46.4	-4.9	Pass	
3	167.013	37.02	1.47	-14.88	23.62	Preview	V	100	190	43.5	-19.88	Pass	

4. CONDUCTED EMISSION EQUIPMENT / DATA

See following page(s).

Emissions Test Conditions: CONDUCTED EMISSIONS, FCC PART 2, 2.1046 AND 2.1051 and Part 90.

The *RADIATED EMISSIONS* measurements were performed at the following test location: Santa Clara, CA

☐ - Test not applicable

■ - Test area no. 1 – Semi - anechoic absorber – lined chamber (80' x 44' x 28')

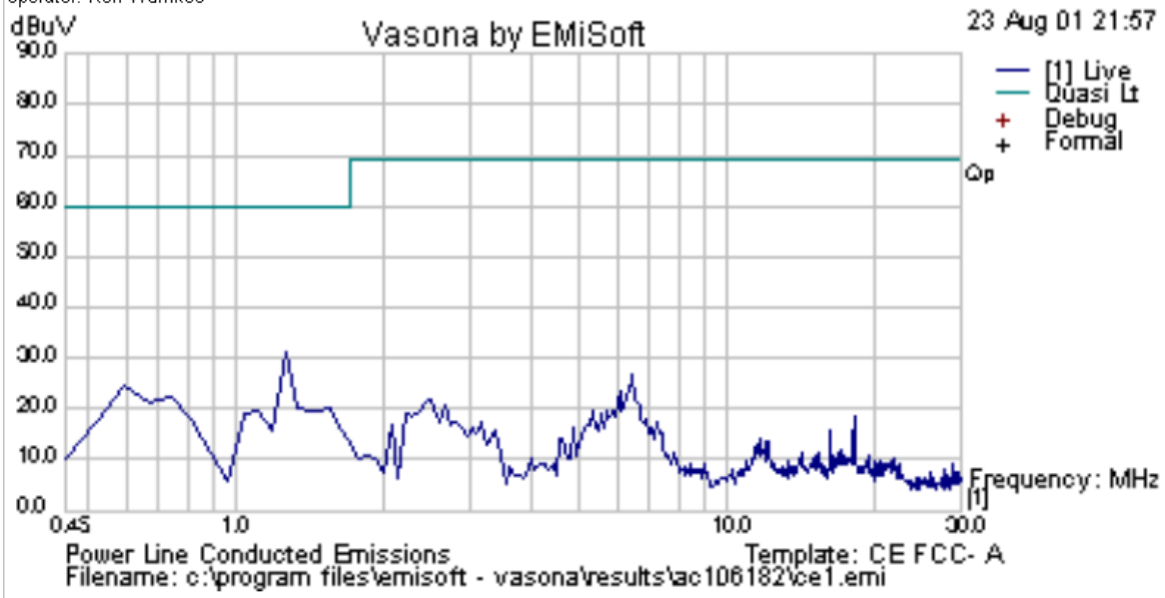
☐ - Test area no. 2 – Shielded room (19' x 19' x 8')

☐ - Test area no. 3 – Fully – anechoic ferrite – lined chamber (24' x 16' x 11')

	Model No.	Description	Manufacturer	Serial No.	Due Calib. Date
■ -	85462A	Receiver RF Section	Hewlett Packard	3325A00161	5/15/02
■ -	85460A	RF Filter Section	Hewlett Packard	3330A00160	5/15/02
☐ -	AC LISN	Line Impedance Stabilization Network	Fischer Custom Communications	6A,6B	5/26/02
☐ -	AC LISN	Line Impedance Stabilization Network	Fischer Custom Communications	3A,3B	5/26/02
■ -	AC LISN	Line Impedance Stabilization Network	Fischer Custom Communications	2A,2B,2C,2D	5/26/02

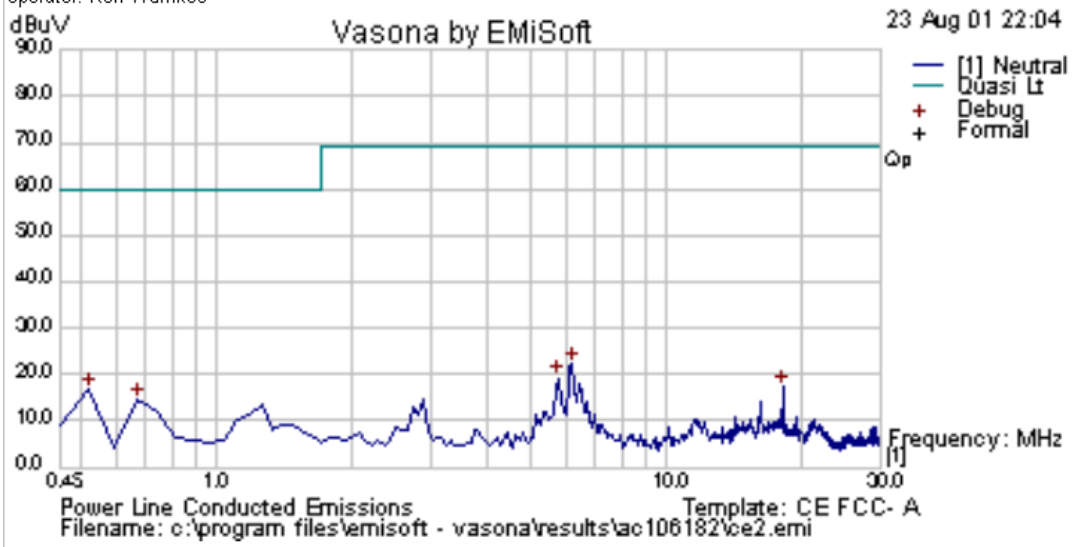
Remarks: _____

Company: LGC Wireless, 8-23-01
EUT: Unison, IDEN 800MHz,
Config:CE FCC-A (.45-30MHz, 120vac/60Hz, ,Full scan, Live on Main Hub
operator: Ron Wumkes



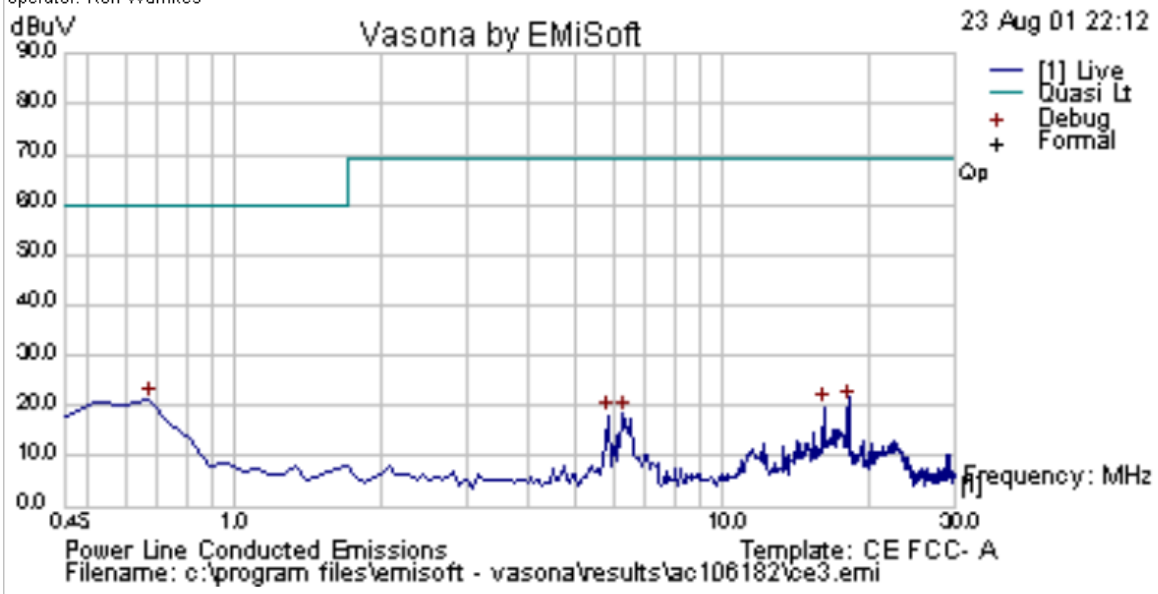
No	Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Emission Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	1.265	30.14	0.43	0.01	30.58	Debug	Live	60	-29.42	Pass	
2	6.439	25.75	0.62	0.01	26.38	Debug	Live	69.5	-43.12	Pass	
3	0.603	23.65	0.48	0.01	24.14	Debug	Live	60	-35.86	Pass	

Company: LGC Wireless, 8-23-01
EUT: Unison, IDEN 800MHz,
Config:CE FCC-A (.45-30MHz, 120vac/60Hz, ,Full scan, Neutral on Main Hub
operator: Ron Wumkes



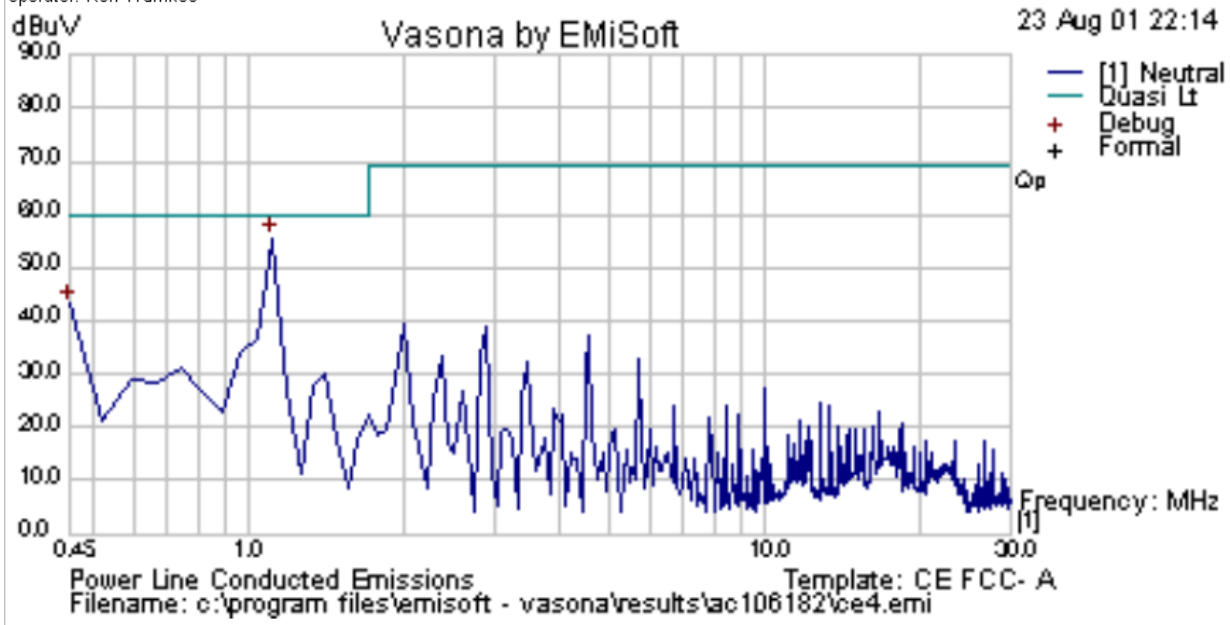
No	Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Emission Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	6.218	21.38	0.62	0.01	22.01	Debug	Neutral	69.5	-47.49	Pass	
2	5.77	18.53	0.61	0.01	19.15	Debug	Neutral	69.5	-50.35	Pass	
3	0.524	16.36	0.51	0.01	16.88	Debug	Neutral	60	-43.12	Pass	
4	0.674	14.1	0.46	0.01	14.57	Debug	Neutral	60	-45.43	Pass	
5	18.28	16.47	0.89	0.01	17.37	Debug	Neutral	69.5	-52.13	Pass	

Company: LGC Wireless, 8-23-01
EUT: Unison, IDEN 800MHz,
Config:CE FCC-A (.45-30MHz, 120vac/60Hz, ,Full scan, Live, expansion Hub
operator: Ron Wumkes



No	Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Emission Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	0.673	20.85	0.46	0.01	21.32	Debug	Live	60	-38.68	Pass	
2	6.311	17.43	0.62	0.01	18.06	Debug	Live	69.5	-51.44	Pass	
3	5.841	17.48	0.61	0.01	18.1	Debug	Live	69.5	-51.4	Pass	
4	18.298	19.69	0.89	0.01	20.59	Debug	Live	69.5	-48.91	Pass	
5	16.212	18.86	0.84	0.01	19.71	Debug	Live	69.5	-49.79	Pass	

Company: LGC Wireless, 8-23-01
EUT: Unison, IDEN 800MHz,
Config:CE FCC-A (.45-30MHz, 120vac/60Hz, ,Full scan,Neutral, expansion Hub
operator: Ron Wumkes



No	Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Emission Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	1.115	55.21	0.4	0.01	55.62	Preview	Neutral	60	-4.38	Pass	
2	0.45	42.63	0.52	0.01	43.16	Preview	Neutral	60	-16.84	Pass	

5.0 ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests according to FCC Part 2, Paragraphs, 2.1046, 2.1051, 2.1053, 2.1055 and Part 90

■ - Performed

☐- Not Performed

The Equipment Under Test

■ - Fulfills the requirements of FCC Part 2, Paragraphs, 2.1046, 2.1051, 2.1053, 2.1055 and Part 90

☐ - Does not fulfill the general approval requirements cited on page 1.

BABT / TÜV Product Service

Responsible Engineer:

_____ Date: 11 September 2001

Srini Chandrasekaran

Lead EMC Engineer