

MEASUREMENT AND TECHNICAL REPORT

LGC Wireless, Inc.

2540 Junction Avenue
San Jose, CA 95134

DATE: 26 June 2001

This Report Concerns:

Original Grant: X

Class II Change:

Equipment Type: InterReach Unison PCS

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, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and Part 24.

Report Prepared By:

TUV / BABT Product Service

4855 Patrick Henry Drive Bldg. 6

Santa Clara, CA 95054

DIRECTORY

		Page No.
1	GENERAL INFORMATION	<u>2</u>
1.1	Product Description	<u>3</u>
1.2	Related Submittal Grant	<u>3</u>
1.3	Tested System Details	<u>3</u>
1.4	Tested Methodology	<u>3</u>
1.5	Test Facility	<u>3</u>
1.6	Part 2 Requirements	<u>4</u>
2	SYSTEM TEST CONFIGURATION	<u>4</u>
2.1	Justification	<u>4</u>
2.2	EUT Software Exercise	<u>4</u>
2.3	Special Accessories	<u>4</u>
2.4	Equipment Modifications	<u>4</u>
2.5	Configuration of Tested System	<u>4</u>
2.1046	RF Power Output	<u>5</u>
2.1047	Modulation Characteristics	<u>6</u>
2.1049	Occupied Bandwidth	<u>6</u>
2.1051	Spurious Emissions At The Antenna Terminals	<u>11</u>
2.1053	Field Strength of Spurious Radiations	<u>12</u>
2.1055	Frequency Stability	<u>13</u>
3	RADIATED EMISSION EQUIPMENT DATA Field Strength Calculation	<u>14</u>
4	Signature Page	<u>20</u>

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 PCS Model No. UNS-PCS-1

Product Options: _____ Serial No. N/A

Configurations To Be Tested:

InterReach Unison Cell Compromising: Main Hub, (UNS-MH1) Expansion Hub (UNS-EH-1), and Remote Antenna Unit (UNS-PCS-1)

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): **Not Applicable**

EUT I/O PORTS AND CABLES: * FROM PIF FORM

CONNECTION:	Signal Generator To Main Hub and RAU to Spectrum Analyzer: RF Cable.
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

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:

BABT

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
1850 - 1990	0.01	10 ppm	GXW, NXW, F9W, F1D, DXW	

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The Intereach Unison PCS 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

Minimum Requirement:

Section 24.232 ; Maximum ERP.

In no case may the Peak Output Power exceed 100 Watts.

Test Result:

Maximum measured 11.7dBm or 14.8mW.

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

Section 2.1047: Modulation Characteristics:

Not Applicable. The equipment is a 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 representative of the type of service in which used. A description of the input signal should be supplied.

Test Results:

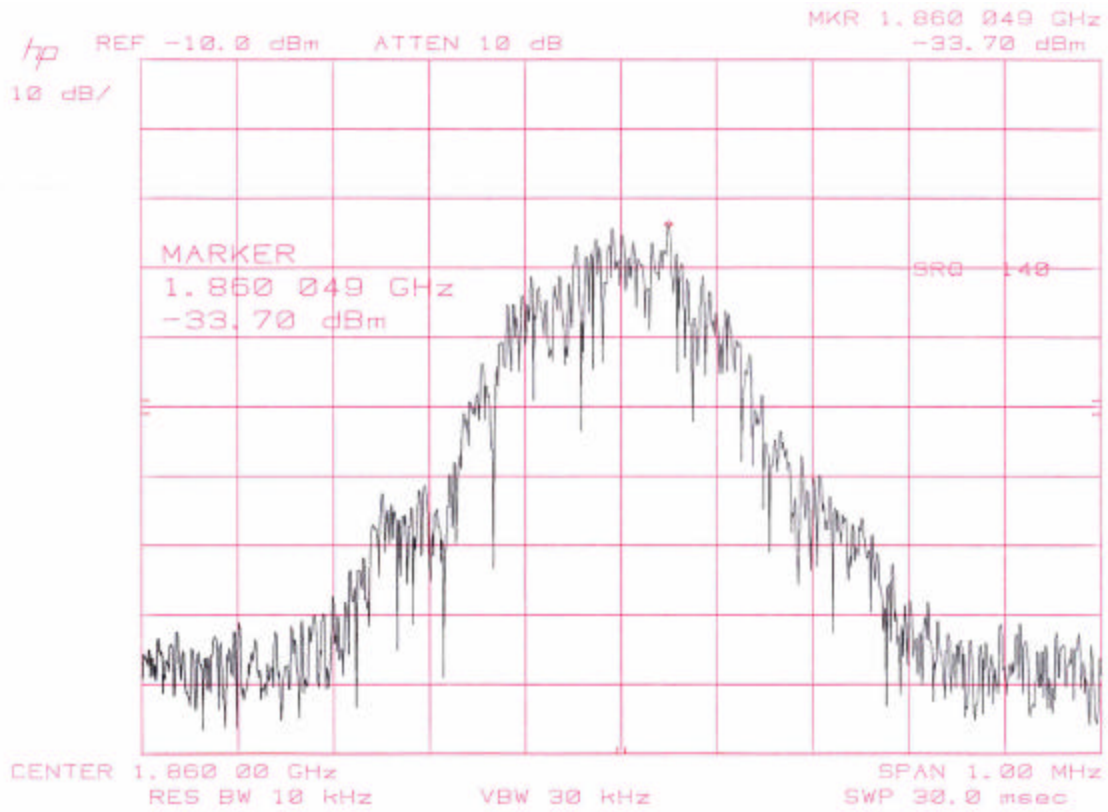
Plots were taken for the equipment output and for the signal generator input to the equipment. These are shown on the following pages. The test signal used is TDMA.

Test Equipment Used:

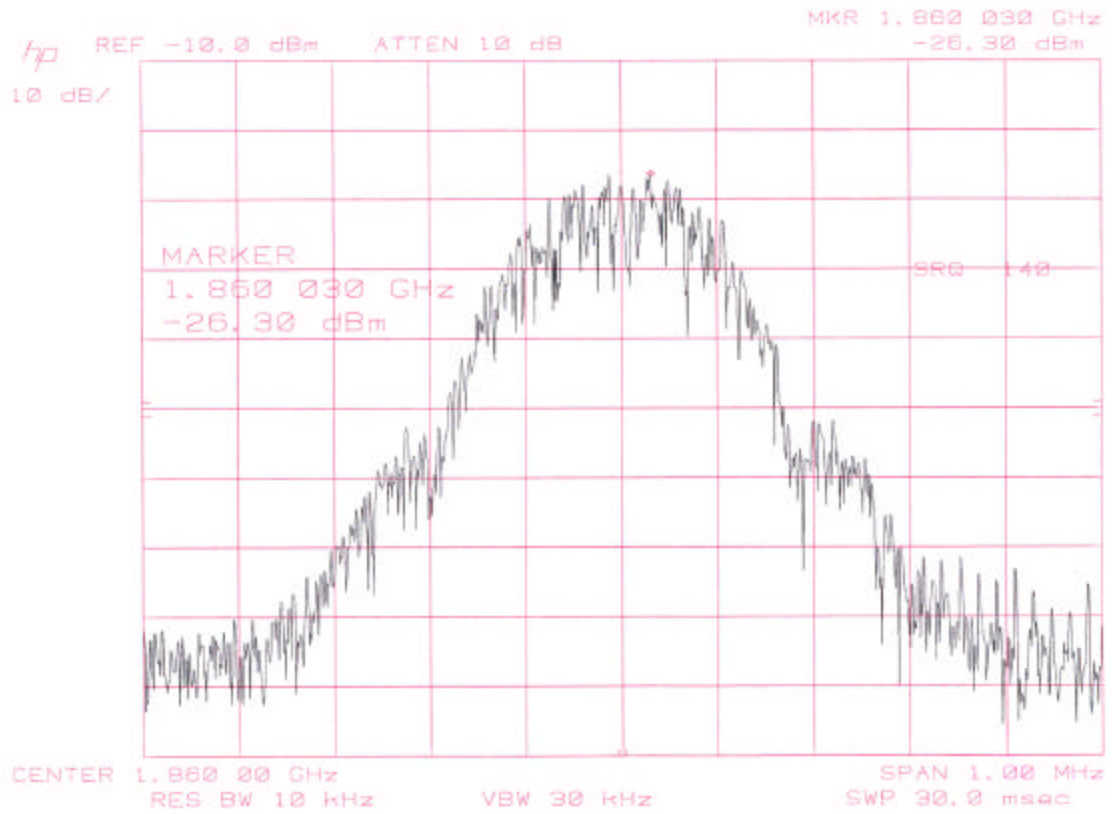
	Model No.	Description	Manufacturer	Serial No.	Due Calib. Date
■ -	8566B	Spectrum Analyzer	Hewlett Packard	2816A18342	9/25/01
■ -	8656B	Signal Generator	Hewlett Packard	2523A03399	4/9/02
■ -	HP8491B	Attenuator	Hewlett Packard	35958	N/A

TEST PLOTS

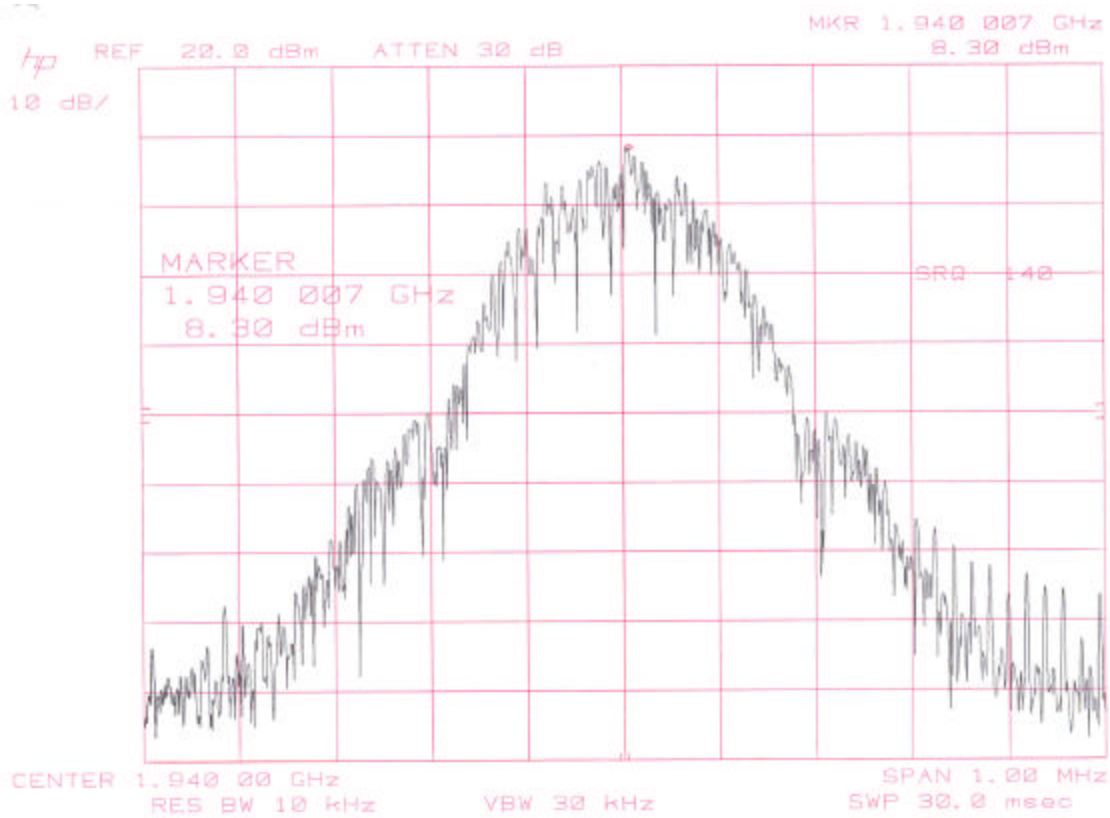
1860MHz
Uplink
SG



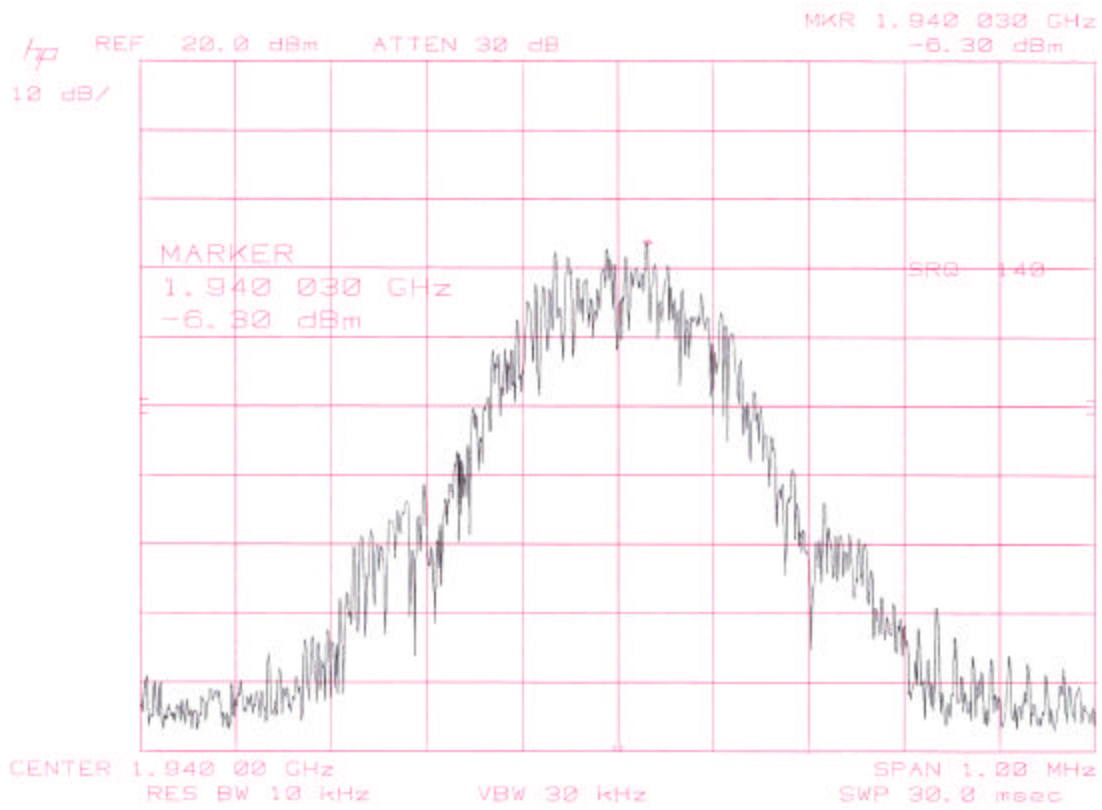
1860MHz
Uplink
EUT



1940MHz
Downlink
SG



1940MHz
Downlink
EUT



Section 2.1051: Spurious Emissions At The Antenna Terminals

Minimum Requirement: Section 24.238

On Any frequency outside a Licensees frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10\text{Log}(P)$ dBc.

Test Results:

The EUT Output was scanned from 10kHz to 20GHz. No emissions were detected at a level greater than 20dB below the limit.

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 30 MHz to the 10th Harmonic.

Remarks:

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

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

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.

Company: LGC wireless 6-20-01

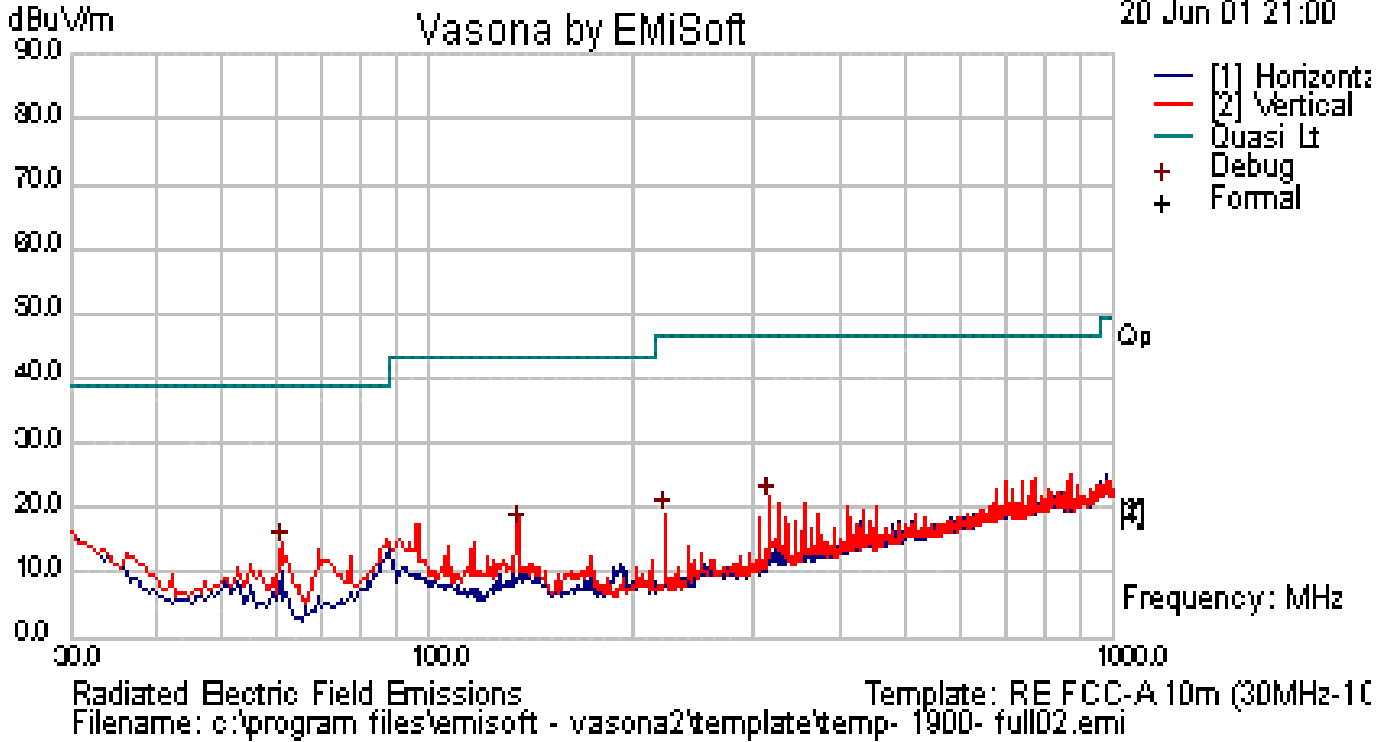
config:FCC-A 10m (30MHz-1000MHz), 120vac/60hz, full scan

details:1900 MHz, Class A, PCS1 band uplink, center frequency 1860 MHz, TDMA modulation, 10 m stacked CAT5 cable, 1km optical fiber,

input power -30dBm, output power -15dBm, MH output terminated with 50 Ohm.

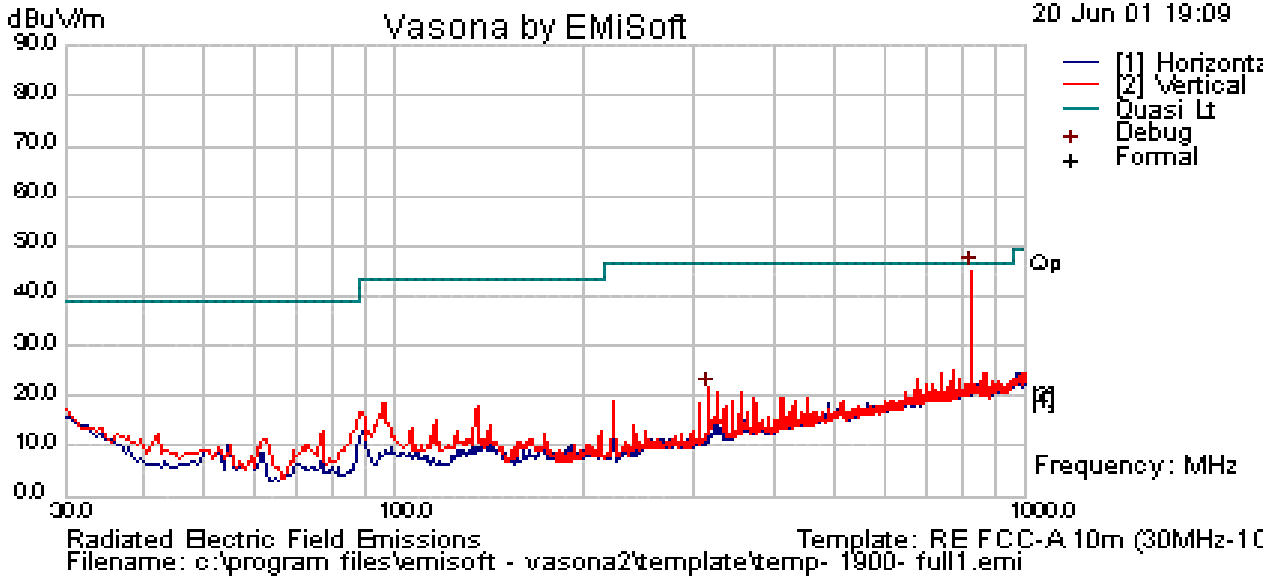
operator: Ron Wumkes

20 Jun 01 21:00



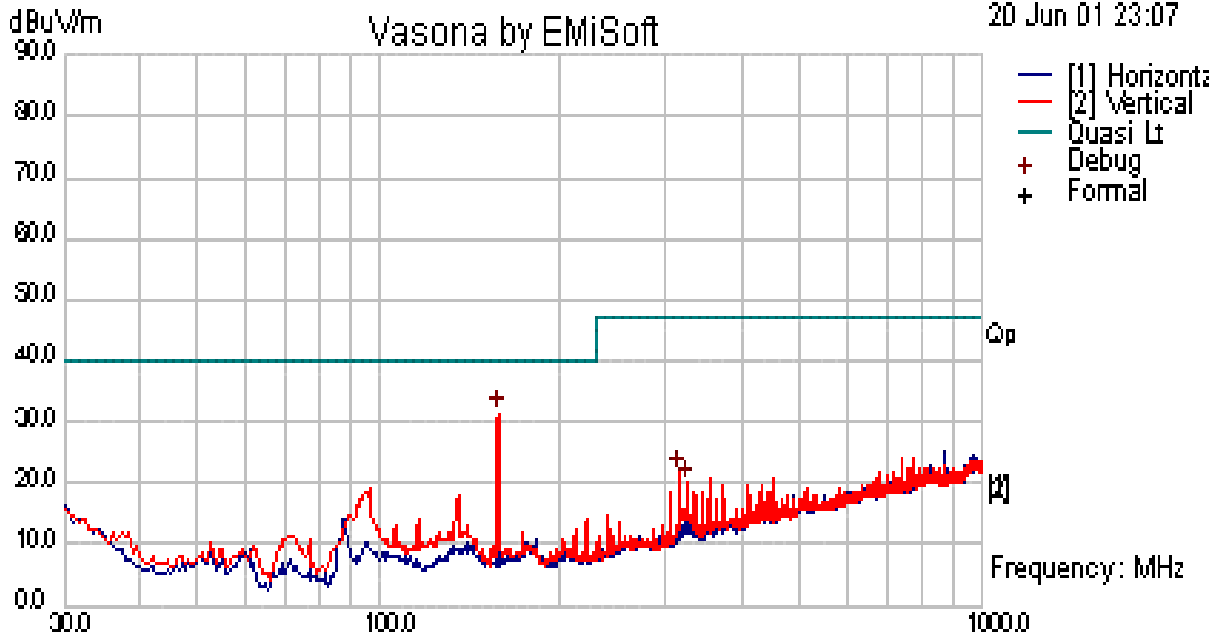
No	Frequency MHz	Raw dBuV	Cable Loss dB	AF dB	Level dBuV/m	Emission Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1	135.605	28.95	1.3	-13.43	16.81	Debug	H	98	354	43.5	-26.69	Pass	
2	222.108	31.41	1.77	-14.12	19.06	Debug	H	98	354	46.4	-27.34	Pass	
3	61.05	31.32	0.88	-18.14	14.06	Debug	H	98	354	39.1	-25.04	Pass	
4	315.396	29.95	2.18	-11.1	21.02	Debug	H	98	354	46.4	-25.38	Pass	

Company: LGC wireless 6-20-01
 config:FCC-A 10m (30MHz-1000MHz), 120vac/60hz, full scan
 details:1900 MHz, Class A, PCS1 band downlink, center frequency 1940 MHz, TDMA modulation, 10 m stacked CAT5 cable, 1km optical fiber, input power -8dBm, output power +7dBm.
 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	825.596	13.46	3.67	-1.98	15.15	Quasi Peak	V	215	96	46.4	-31.25	Pass	
2	315.478	29.94	2.18	-11.1	21.02	Debug	H	97	351	46.4	-25.38	Pass	
3	96.945	30.7	1.09	-14.97	16.82	Debug	H	97	351	43.5	-26.68	Pass	
4	222.17	31.47	1.77	-14.12	19.12	Debug	H	97	351	46.4	-27.28	Pass	

Company: LGC wireless 6-20-01
 config RE EN55022-A (30MHz-1000MHz), 120vac/60hz, full scan
 details:1800 MHz. Class A. DCS1 band Downlink. center frequency 1823.75 MHz. GSM modulation. 10 m stacked CAT5 cable. 1km optical
 fiber, input power -5dBm, output power 10dBm, MH Uplink input terminated with 50 Ohm.
 operator: Ron Wumkes



Radiated Electric Field Emissions
 Template: RE EN55022-A
 Filename: c:\program files\emisoft - vasona2\template\LGC-1800-full1.emi

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	157.919	43.66	1.41	-13.81	31.27	Preview	V	100	10	40	-8.73	Pass	
2	315.561	30.57	2.18	-11.1	21.65	Debug	H	97	353	47	-25.35	Pass	
3	324.736	28.56	2.22	-10.76	20.02	Debug	H	97	353	47	-26.98	Pass	
4	95.762	32.46	1.08	-15.09	18.45	Debug	H	97	353	40	-21.55	Pass	

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: _____

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 50.0dB μ V. 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:-

$$\text{Receiver level} = \text{field strength} - \text{antenna factor} + \text{amplifier gain} - \text{cable factor}$$

$$\text{Corrected field strength} = (\text{Receiver level}) + (\text{Cable factor}) - (\text{Amp gain}) + (\text{Antenna factor})$$

$$= 50.0 + 10.0 + 0.64 - 25$$

$$= 35.64\text{dB}\mu\text{V}/\text{m}$$

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

4. ATTESTATION STATEMENT

GENERAL REMARKS:

SUMMARY:

All tests according to FCC Part 2, Paragraphs 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and Part 24.,

- Performed

- Not Performed

The Equipment Under Test

- Fulfills the requirements of FCC Part 2, Paragraphs 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and Part 24.,

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

TUV / BABT Product Service

Responsible Engineer:



Srini Chandrasekaran

Lead EMC Engineer