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 Cell

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 22.

Report Prepared By:

TUV / BABT Product Service

4855 Patrick Henry Drive Bldg. 6

Santa Clara, CA 95054

DIRECTORY

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 Cell Model No. UNS-CELL-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-CELL-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
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:

TUV / 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
824-849 **869-894**	**.01** **.01**	**10ppm** **10ppm**	**F8W, F9W, DXW, F1D**	

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The InterReach Unison Cell 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 22.913(a); Maximum ERP.

The effective radiated power (ERP) of Base Transmitters and Cellular Repeaters must not exceed 500 Watts. The ERP of Mobile Transmitters and Auxiliary Test Transmitters must not exceed 7 Watts.

Test Result:

Maximum measured 9.7dBm or 9.4mW.

Test Equipment Used:

	Model No.	Description	Manufacturer	Serial No.	Due Calib. Date
■ -	8566B	Spectrum Analyzer	Hewlett Packard	2816A18342	9/25/01
■ -	8656B	Signal Generator	Rohde & Schwartz	23533	5/25/02
■ -	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:

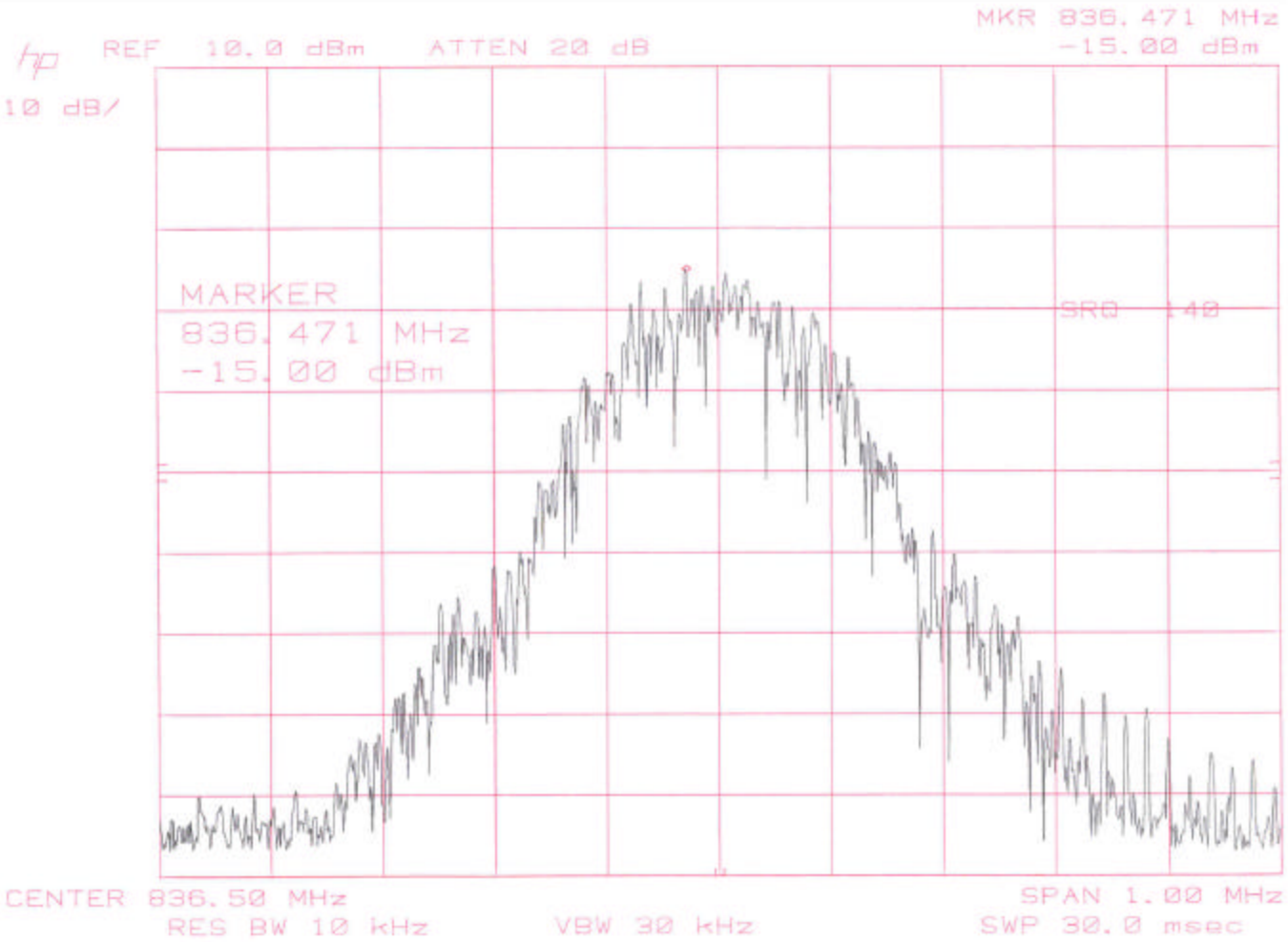
Plots were taken for the equipment output and for the signal generator input to the equipment. These are shown on the following pages. The test signal used is TDMA.

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

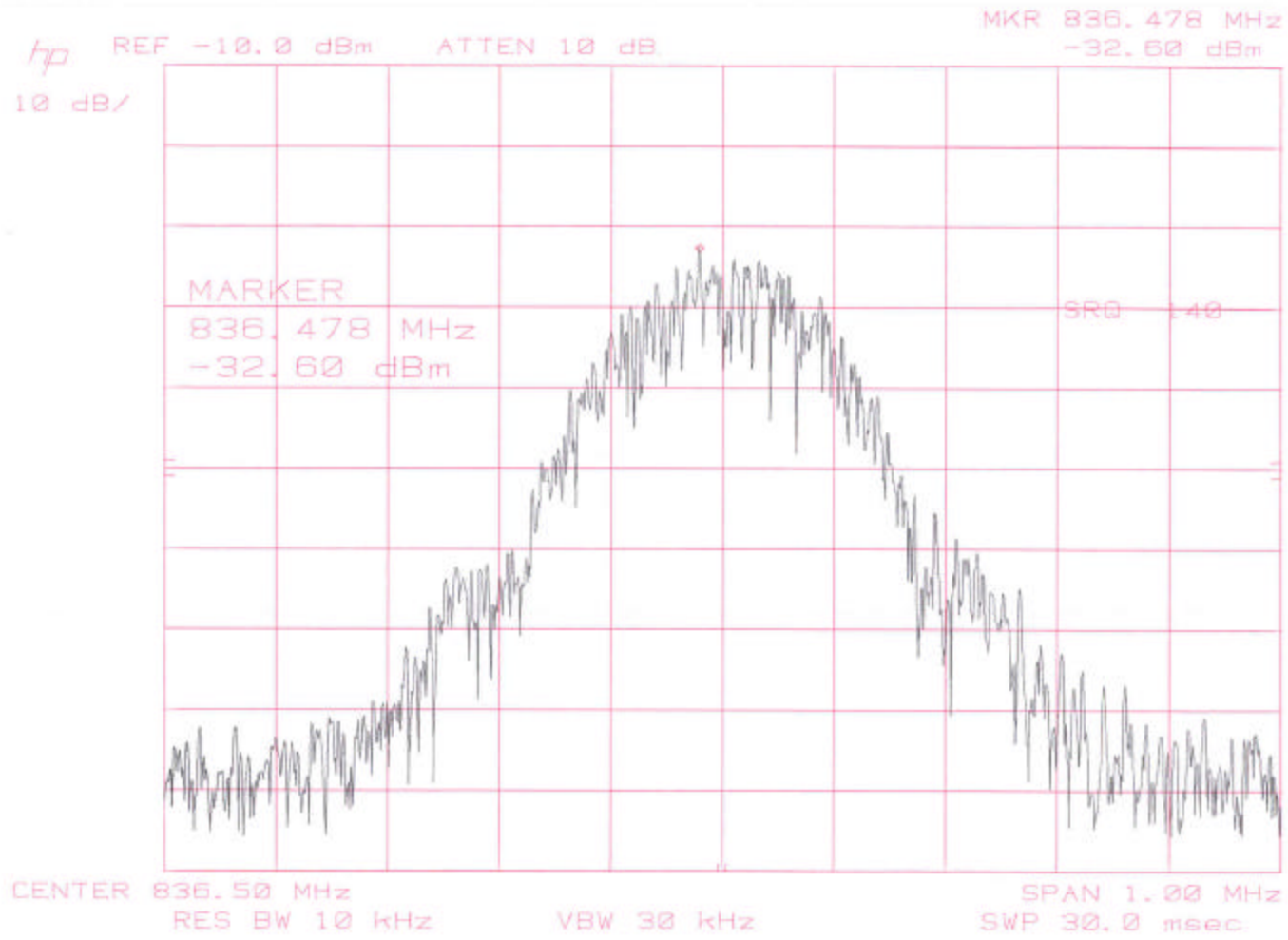
TEST PLOTS

836.5MHz
Uplink
EUT



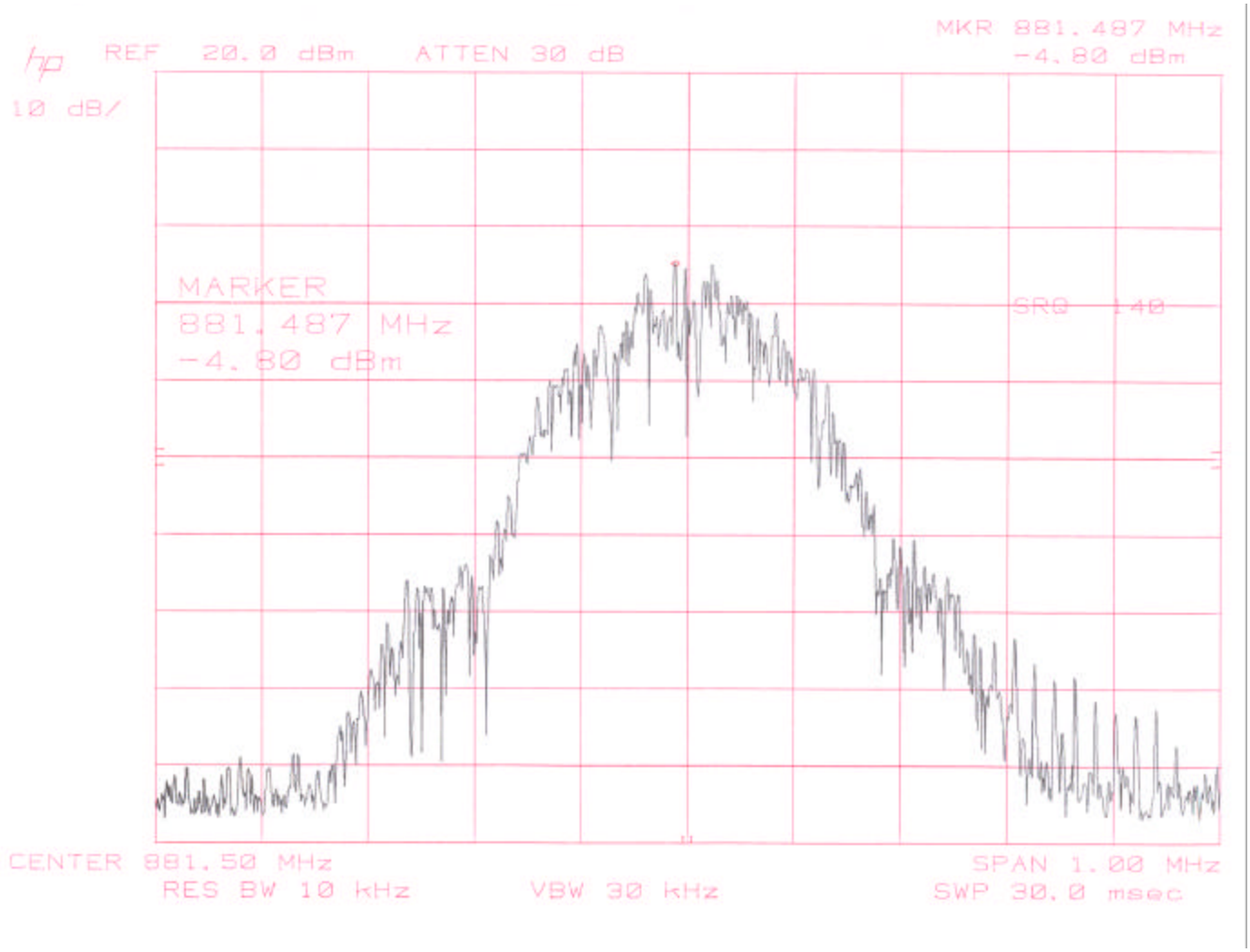
LGC Unison Cell

836.5MHz
Uplink
SG



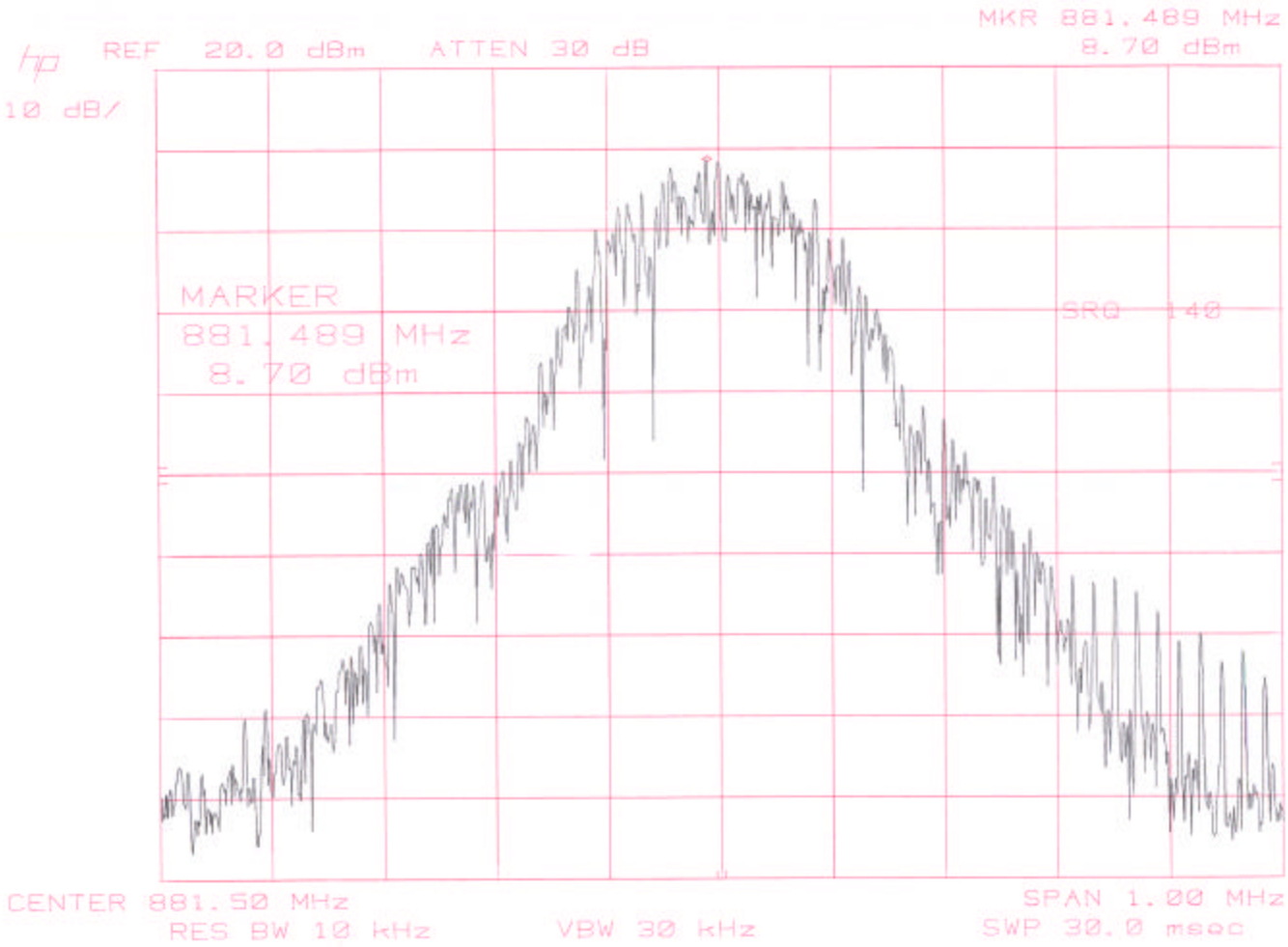
LGC Unison Cell

881.5
Downlink
EUT



LGC Unison Cell

881.5
Downlink
SG



LGC Unison Cell

Section 2.1051: Spurious Emissions At The Antenna Terminals

Minimum Requirement: Section 22.917(e):

For transmitters the magnitude of each spurious, Harmonic, and Intermodulation Emissions that can be detected when the equipment is operated under conditions specified in the instruction manual and / or alignment procedure, shall not be more than 43 + 10 Log (P) dBc.

Test Results:

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

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

Emissions Test Conditions: RADIATED EMISSIONS, FCC Part 2, Paragraphs 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and Part 22.

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

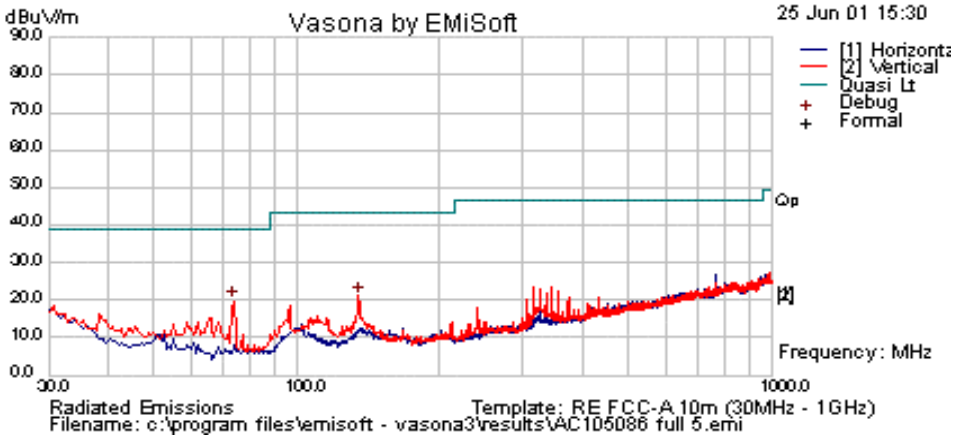
☐ - 10 meters

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: AC105107, LGC Wireless, Date : June-25-2001
EUT:800 MHz TDMA, 10 m Cat5 stacked, 2 spools 1 km fiber, Up Link, -30 dBm in, -15 dBm out, Fc= 881..5 MHz, 50 Ohm term at MH.
Config: 120V/60Hz, FCC-A, Radiate Emission, Full Scan, (Up Link)
Operator: Dao Le



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	73.65	36.88	0.96	-18.09	19.76	Preview	V	100	0	39.1	-19.34	Pass	
2	134.95	33.02	1.29	-13.42	20.89	Debug	H	97	6	43.5	-22.61	Pass	

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 $\log_{10}$(μV) = dBμV.

4. CONDUCTED EMISSION EQUIPMENT / DATA

See following page(s).

Emissions Test Conditions: CONDUCTED EMISSIONS,

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')

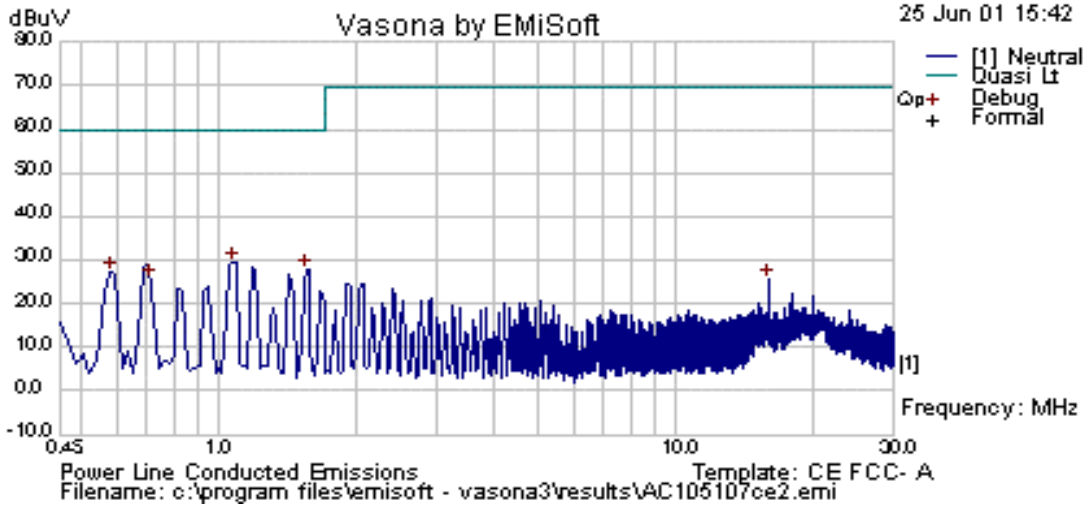
☐ - Test area no. 2 – Shielded room (19' x 19' x 8')

☐ - 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

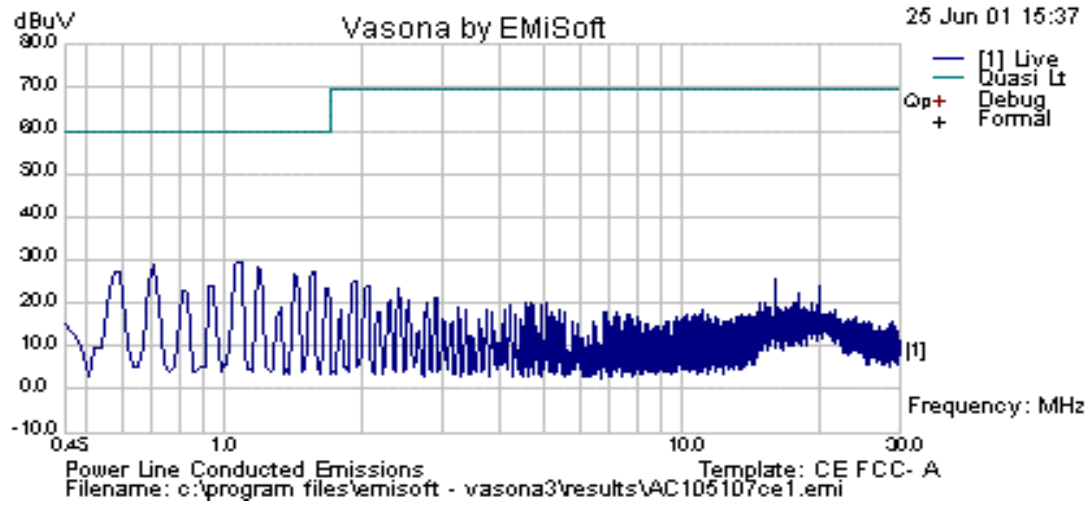
Remarks: _____

Company: AC105107, LGC Wireless, Date : June-25-2001
EUT:800 MHz TDMA, 10 m Cat5 stacked, 2 spools 1 km fiber, Up Link, -30 dBm in, -15 dBm out, Fc= 881..5 MHz, 50 Ohm term at MH.
Config: 120V/60Hz, FCC-A, Conducted Emission, Main Hub, NEUTRAL
Operator: Dao Le



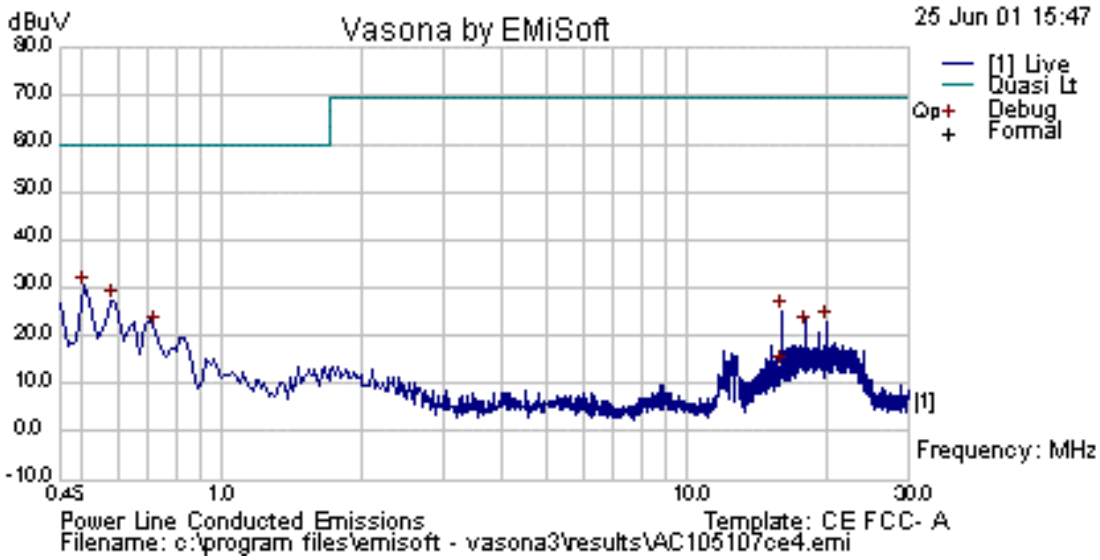
No	Frequency MHz	Raw dBuV	Cable Loss d	Factors dB	Level dBuV	Emission Ty	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	0.588	26.38	0.49	0.01	26.88	Debug	Neutral	60	-33.12	Pass	
2	0.714	24.96	0.45	0.01	25.42	Debug	Neutral	60	-34.58	Pass	
3	1.085	29.07	0.4	0.01	29.48	Debug	Neutral	60	-30.52	Pass	
4	1.566	27.22	0.47	0.01	27.7	Debug	Neutral	60	-32.3	Pass	
5	15.998	24.62	0.83	0.01	25.46	Debug	Neutral	69.5	-44.04	Pass	

Company: AC105107, LGC Wireless, Date : June-25-2001
EUT:800 MHz TDMA, 10 m Cat5 stacked, 2 spools 1 km fiber, Up Link, -30 dBm in, -15 dBm out, Fc= 881..5 MHz, 50 Ohm term at MH.
Config: 120V/60Hz, FCC-A, Conducted Emission, Main Hub, LIVE
Operator: Dao Le



No	Frequency M	Raw dBuV	Cable Loss d	Factors dB	Level dBuV	Emission Typ	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	0.595	26.75	0.48	0.01	27.24	Debug	Live	60	-32.76	Pass	
2	0.705	27.76	0.45	0.01	28.22	Debug	Live	60	-31.78	Pass	
3	1.085	28.87	0.4	0.01	29.28	Debug	Live	60	-30.72	Pass	
4	1.566	26.92	0.47	0.01	27.4	Debug	Live	60	-32.6	Pass	
5	16	24.48	0.83	0.01	25.32	Debug	Live	69.5	-44.18	Pass	

Company: AC105107, LGC Wireless, Date : June-25-2001
EUT:800 MHz TDMA, 10 m Cat5 stacked, 2 spools 1 km fiber, Up Link, -30 dBm in, -15 dBm out, Fc= 881..5 MHz, 50 Ohm term at MH.
Config: 120V/60Hz, FCC-A, Conducted Emission, Expansion Hub, LIVE
Operator: Dao Le



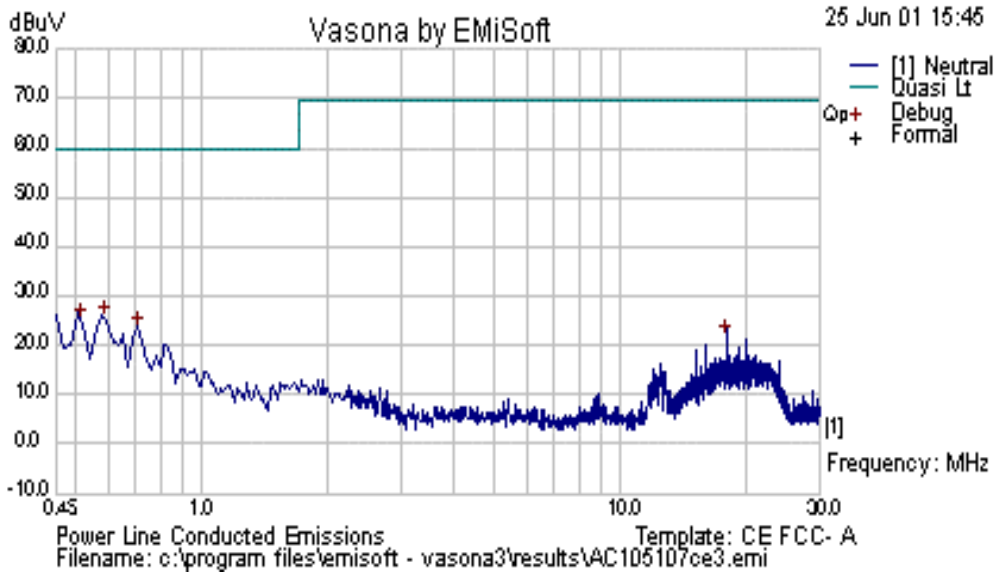
No	Frequency MHz	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Emission Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	0.508	29.46	0.52	0.01	29.99	Debug	Live	60	-30.01	Pass	
2	0.588	26.46	0.49	0.01	26.96	Debug	Live	60	-33.04	Pass	
3	0.723	20.91	0.45	0.01	21.37	Debug	Live	60	-38.63	Pass	
4	18.042	20.43	0.88	0.01	21.32	Debug	Live	69.5	-48.18	Pass	
5	20.052	21.94	0.94	0.01	22.89	Debug	Live	69.5	-46.61	Pass	
6	16	23.94	0.83	0.01	24.78	Debug	Live	69.5	-44.72	Pass	

Company: AC105107, LGC Wireless, Date : June-25-2001

EUT:800 MHz TDMA, 10 m Cat5 stacked, 2 spools 1 km fiber, Up Link, -30 dBm in, -15 dBm out, Fc= 881.5 MHz, 50 Ohm term at MH.

Config: 120V/60Hz, FCC-A, Conducted Emission, Expansions Hub, NEUTRAL

Operator: Dao Le



No	Frequency MH	Raw dBuV	Cable Loss dB	Factors dB	Level dBuV	Emission Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1	0.522	24.45	0.51	0.01	24.97	Debug	Neutral	60	-35.03	Pass	
2	0.714	22.48	0.45	0.01	22.94	Debug	Neutral	60	-37.06	Pass	
3	18.026	20.49	0.88	0.01	21.38	Debug	Neutral	69.5	-48.12	Pass	
4	0.595	24.81	0.48	0.01	25.3	Debug	Neutral	60	-34.7	Pass	

5. 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 22.

■ - 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 22.

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

BABT / TUV Product Service

Responsible Engineer:

Srini Chandrasekaran

Lead EMC Engineer