

EMISSIONS TEST REPORT

Report Number: 3144422BOX-015

Project Number: 3144422

Testing performed on the

Merlin™@home

Model: EX1150

To

CFR47 "Telecommunications" Part 15 Subpart C "Intentional Radiators" 15.249
Industry Canada's RSS-210 Issue 7 June 2007 Annex 2.9

For


St. Jude Medical

Test Performed by:
Intertek – ETL SEMKO
70 Codman Hill Road
Boxborough, MA 01719

Test Authorized by:
St. Jude Medical
15900 Valley View Court
Sylmar, CA 91342

Prepared by: 
Nicholas Abbondante

Date: 05/05/2008

Reviewed by: 
Michael F. Murphy

Date: 5/12/08

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1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company: Plexus Services Corp.
55 Jewelers Park Drive
Neenah, WI 54957
Contact: Mr. Jeffrey Newhouse
Telephone: (920) 751-5658
Fax: (920) 751-5395
Email: Jeffrey.Newhouse@Plexus.com

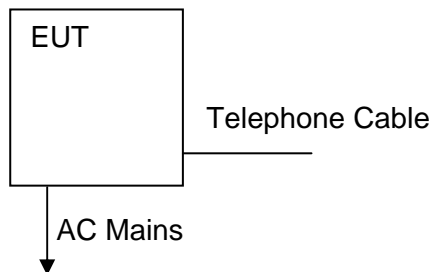
1.2 Equipment Under Test

Equipment Type: Merlin™@home
Model Number(s): EX1150
Serial number(s): 6070823, 6070822
Manufacturer: Plexus Services Corp.
EUT receive date: 02/11/2008
EUT received condition: Prototypes in Good Condition
Test start date: 02/25/2008
Test end date: 05/05/2008

1.3 Test Plan Reference: Tested according to the standards listed, ANSI C63.4:2003, and RSS-Gen Issue 2 June 2007.

1.4 Test Configuration

1.4.1 Block Diagram



1.4.2. Cables:

Cable	Shielding	Connector	Length (m)	Qty.
AC Mains	None	Plastic	2.5	1
Telephone	None	Plastic RJ11	2.7	1

1.4.3. Support Equipment:

Name: None
Model No.:
Serial No.:

1.5 Mode(s) of Operation:

The EUT was activated from 120V/60Hz AC power and was transmitting a modulated carrier during testing. Channels 6, 13, and 20 were utilized for testing unless otherwise indicated.

Ch6 2406.00 MHz
Ch13 2413.00 MHz
Ch20 2420.00 MHz

A laptop PC was used to program the device for testing, but was not present during testing. For the emission bandwidth, duty cycle, band edge compliance, and AC line-conducted emissions testing, an Alpha3 prototype was used instead of the final Beta revision of the EX1150. The results of these tests would not be affected by the differences between the two prototypes. It has been indicated that the color of the plastic housing may change in the future. This type of change is cosmetic and would be considered a class I permissive change, with no effect on test results.

2.0 Test Summary

TEST STANDARD	RESULTS	
CFR47 Telecommunications FCC Part 15 Subpart C 15.249 Industry Canada's RSS-210 Issue 2 June 2007 Annex 2.9		
SUB-TEST	TEST PARAMETER	COMMENT
RF Output Power FCC §15.249, RSS-210 Section A2.9	The fundamental field strength must not exceed 50 mV/meter at 3m test distance (94 dB μ V/m at 3m).	Pass
Emission Bandwidth FCC §15.215, RSS-Gen Section 4.4	The fundamental frequency must stay within the assigned band.	Pass
Radiated Spurious Emissions FCC §15.205, 15.209, 15.249, RSS-210 Sections 2.7, A2.9	Harmonic emissions must not exceed 500 μ V/m (54 dB μ V/m). Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209 and RSS-210 Section 2.7 Table 2, whichever is the lesser attenuation. Field strength limits are specified at a distance of 3 meters. Emissions falling into the restricted bands of 15.205 and RSS-210 Section 2.7 Table 1 must meet the general limits of 15.209 and RSS-210 Section 2.7 Table 2, respectively.	Pass
AC Line-Conducted Emissions FCC §15.207, RSS-Gen Section 7.2.2	The AC line-conducted emissions must not exceed the FCC 15.207 and RSS-Gen Section 7.2.2 Table 2 limits.	Pass

REVISION SUMMARY – The following changes have been made to this Report:

<u>Date</u>	<u>Project</u>	<u>Project</u>	<u>Page(s)</u>	<u>Item</u>	<u>Description of Change</u>
	<u>No.</u>	<u>Handler</u>			

3.0 Sample Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB μ V
 AF = 7.4 dB/m
 CF = 1.6 dB
 AG = 29.0 dB
 FS = 32 dB μ V/m

$$\text{Level in } \mu\text{V/m} = [10(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

The following is how net line-conducted readings were determined:

$$NF = RF + LF + CF + AF$$

Where NF = Net Reading in dB μ V

- RF = Reading from receiver in dB μ V
- LF = LISN Correction Factor in dB
- CF = Cable Correction Factor in dB
- AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where UF = Net Reading in } \mu\text{V}$$

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 254 \mu\text{V/m}$$

3.1 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be:

± 3.5 dB at 10m, ± 3.8 dB at 3m

The expanded uncertainty ($k = 2$) for mains conducted emissions from 150 kHz to 30 MHz has been determined to be:

± 2.6 dB

The expanded uncertainty ($k = 2$) for telecom port conducted emissions from 150 kHz to 30 MHz has been determined to be:

± 3.2 for ISN and voltage probe measurements

± 3.1 for current probe measurements

3.2 Site Description

Test Site(s): 2

Our OATS are 3m and 10m sheltered emissions measurement ranges located in a light commercial environment in Boxborough, Massachusetts. They meet the technical requirements of ANSI C63.4-2003 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity (12,000 lb. in Site 3) is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

The EMC Lab has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference groundplanes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.249, IC RSS-210 A2.9

Test: RF Output Power

Performance Criterion: The fundamental field strength must not exceed 50 mV/meter at 3m test distance (94 dB μ V/m at 3m).

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	23	Humidity (%):	34	Pressure (hPa):	1050
Pretest Verification Performed	Yes		Equipment under Test:	Merlin™@home		
Test Engineer(s):	Nicholas Abbondante		EUT Serial Number:	6070822		

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR2	05/20/2008
2	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	11/26/2008
3	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/06/2008
4	Oscilloscope, Digital Storage	Tektronix	TDS3052	B014809	03/21/2009
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/06/2008
6	Diode Detector	Hewlett Packard	8437C	N/L	Verified
7	HORN ANTENNA	EMCO	3115	9602-4675	09/24/2008

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Details:

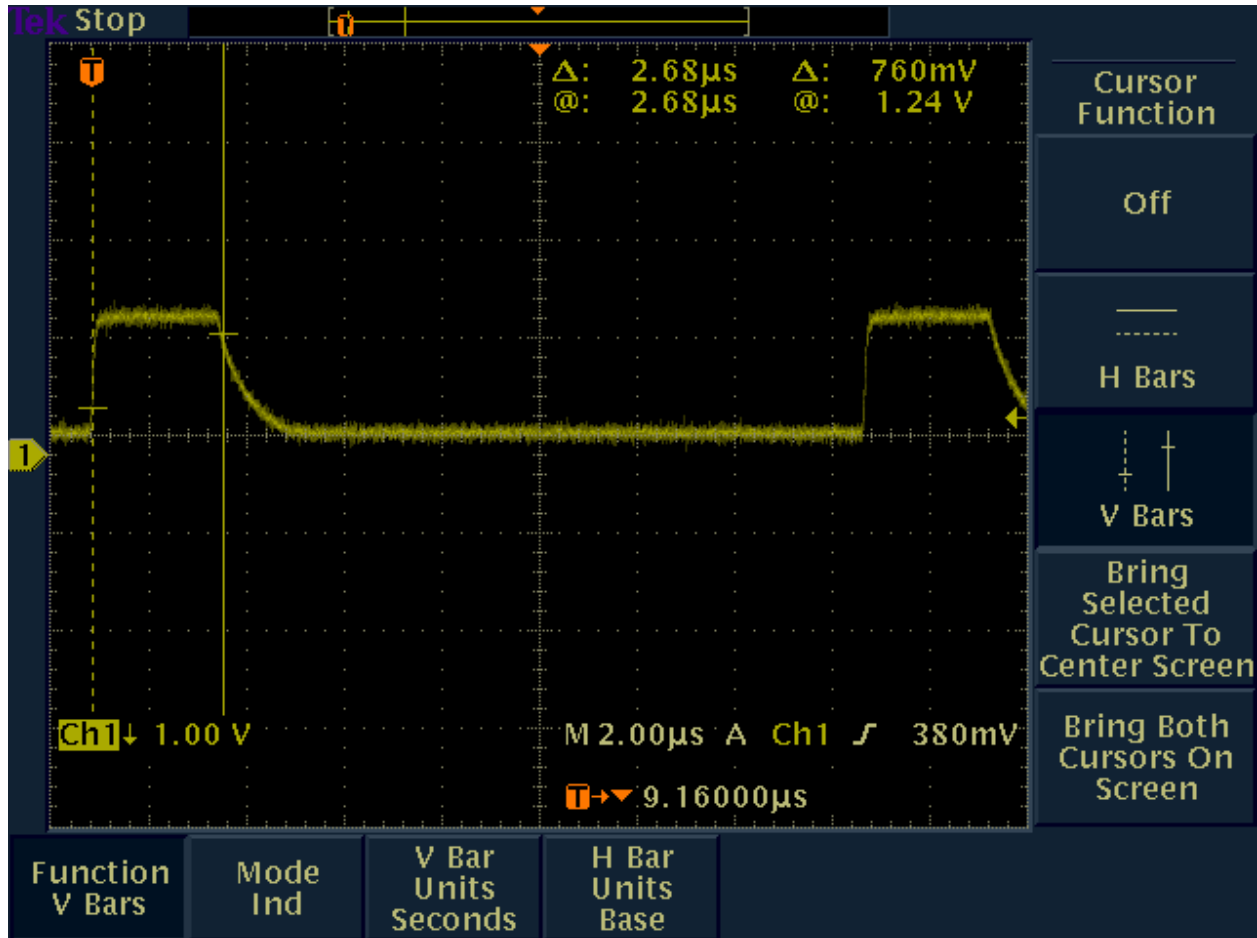
Notes: Pulse trains from the EUT consist of 96 words in a 2.8 ms burst. Each word is 2.7 us long. This yields a duty cycle of 9.26%, and a duty cycle correction factor of -20.7 dB.

Radiated Emissions

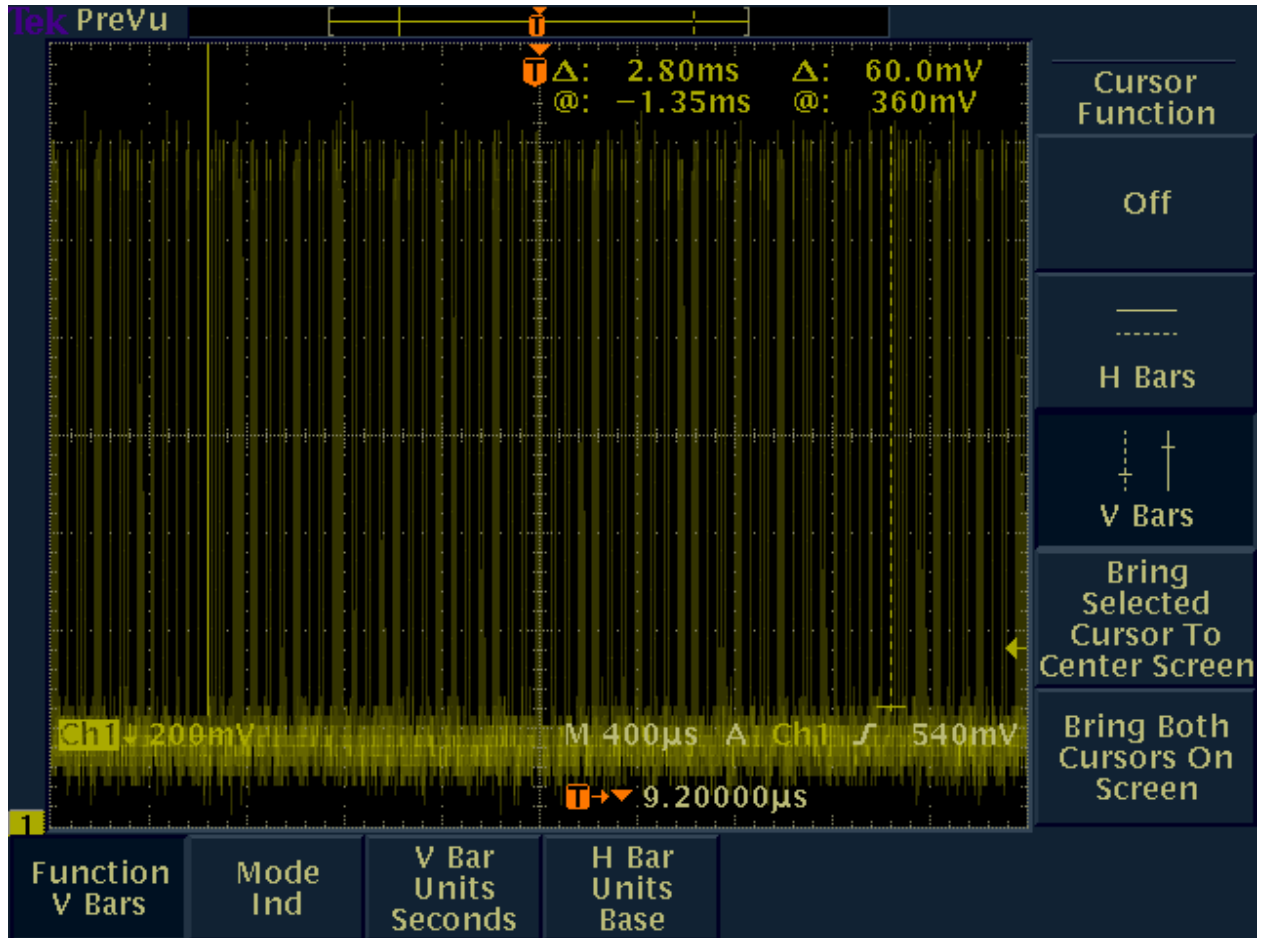
Company: Plexus Services Corp. Antenna & Cables: LF Bands: N, LF, HF, SHF
 Model #: EX1150 Antenna: Horn2 V1m 9-24-2008.txt Horn2 H1m 9-24-2008.txt
 Serial #: 6070822 Cable(s): CBL028 12-06-08.txt NONE.
 Engineers: Nicholas Abbondante Location: Site 2 Barometer: BAR2 Filter: None
 Project #: 3144422 Date(s): 05/05/08
 Standard: FCC Part 15 Subpart C 15.249/IC RSS-210 A2.9 Temp/Humidity/Pressure: 23c 34% 1050mB
 Receiver: R&S FSEK-30 (ROS001) Limit Distance (m): 3
 PreAmp: PRE8 11-09-08.txt Test Distance (m): 3
 PreAmp Used? (Y or N): N Voltage/Frequency: 120V/60Hz Frequency Range: 1-4 GHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

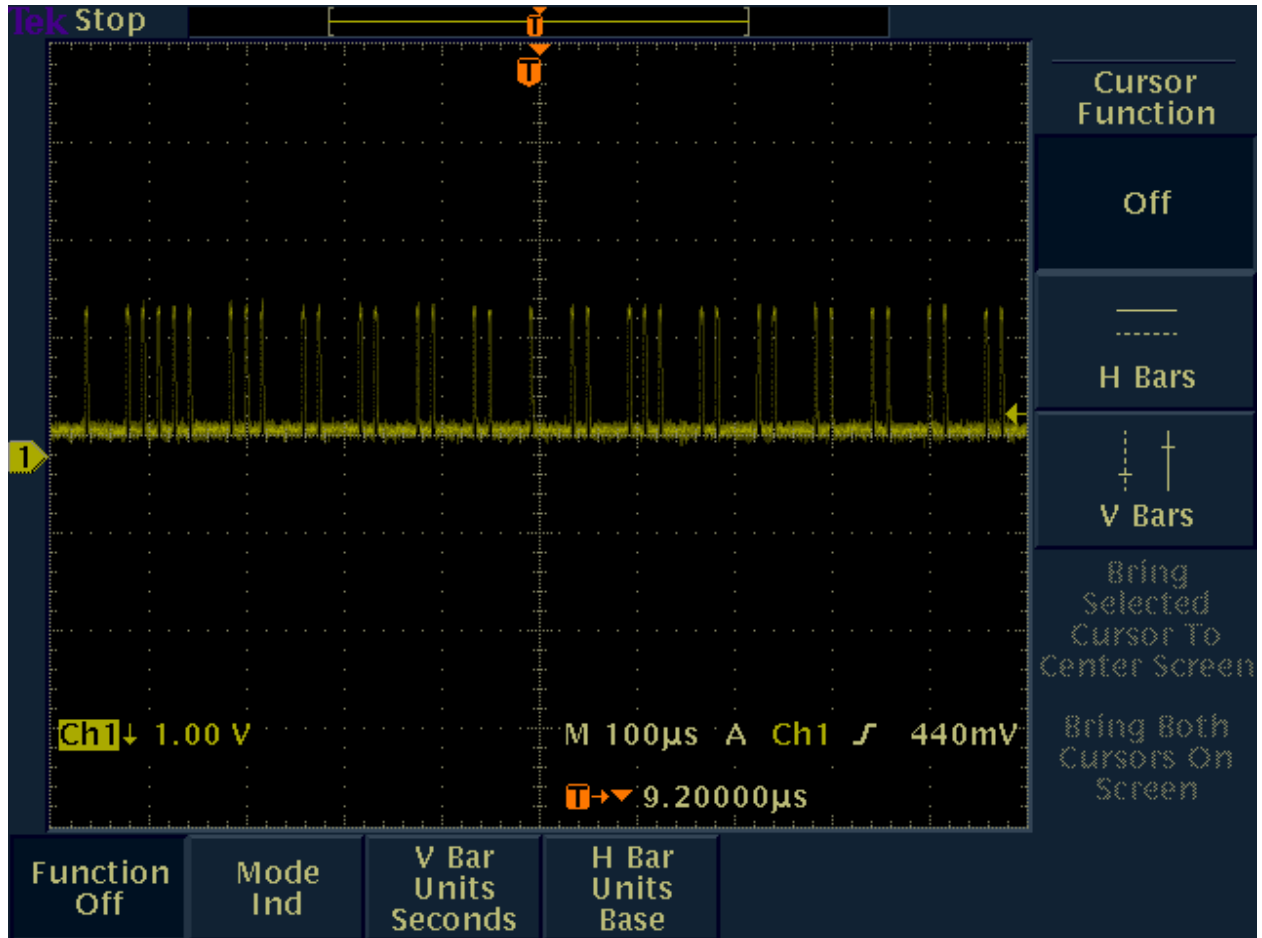
Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Power Setting: 147 Average values obtained using a -20.7 dB duty cycle averaging factor													
PK	V	2406.000	81.3	28.6	3.1	0.0	0.0	113.1	114.0	-0.9	1/3 MHz		
AVG	V	2406.000	60.6	28.6	3.1	0.0	0.0	92.4	94.0	-1.6	1/3 MHz		
PK	V	2413.000	81.7	28.7	3.2	0.0	0.0	113.5	114.0	-0.5	1/3 MHz		
AVG	V	2413.000	61.0	28.7	3.2	0.0	0.0	92.8	94.0	-1.2	1/3 MHz		
PK	V	2420.000	81.8	28.7	3.2	0.0	0.0	113.6	114.0	-0.4	1/3 MHz		
AVG	V	2420.000	61.1	28.7	3.2	0.0	0.0	92.9	94.0	-1.1	1/3 MHz		
Note: Power Setting: 147; 100 kHz marker-delta method referenced to measured channel field strength in 1 MHz RBW (-39.24 dB)													
PK	V	2399.990	42.1	28.6	3.1	0.0	0.0	73.8	74.0	-0.2	1/3 MHz		
AVG	V	2399.990	21.4	28.6	3.1	0.0	0.0	53.1	54.0	-0.9	1/3 MHz		
Note: Noise Floor													
PK	V	1200.000	24.5	25.3	2.1	0.0	0.0	51.9	74.0	-22.1	1/3 MHz	RB	RB
AVG	V	1200.000	14.7	25.3	2.1	0.0	0.0	42.1	54.0	-11.9	1/3 MHz	RB	RB



Word Length, 2.68 us



Pulse Train, 96 words



Example of Burst Start

Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.249, IC RSS-210 A2.9

Test: Emission Bandwidth

Performance Criterion: The fundamental frequency must stay within the assigned band.

Test Environment:

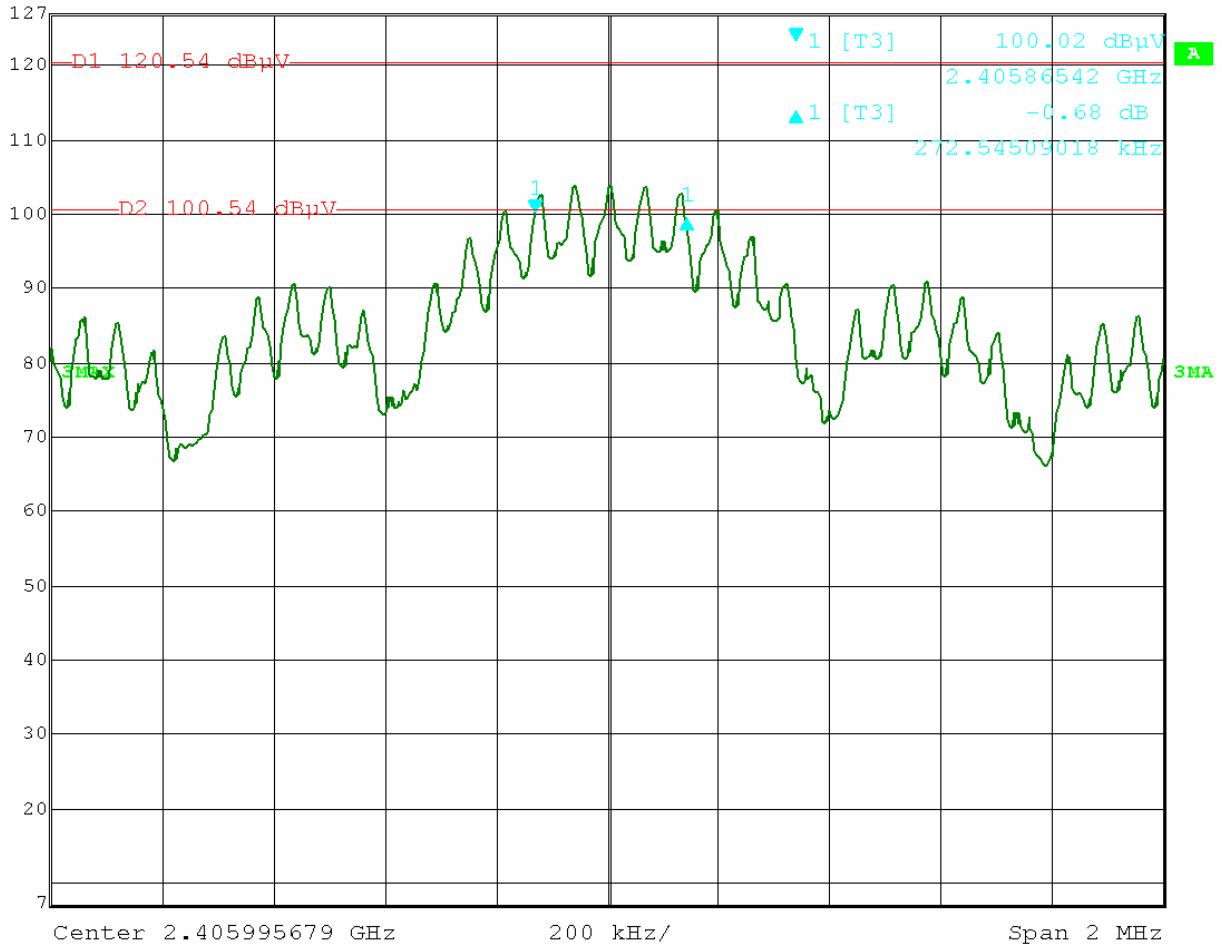
Environmental Conditions During Testing:	Ambient (°C):	N/A	Humidity (%):	N/A	Pressure (hPa):	N/A
Pretest Verification Performed	Yes		Equipment under Test:	Merlin™@home		
Test Engineer(s):	Nicholas Abbondante		EUT Serial Number:	6070823		

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	11/26/2008
2	HORN ANTENNA	EMCO	3115	9602-4675	09/24/2008
3	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/06/2008

Test Details:

	Delta 1 [T3]	RBW	10 kHz	RF Att	30 dB
Ref Lvl	-0.68 dB	VBW	30 kHz		
127 dBμV	272.54509018 kHz	SWT	50 ms	Unit	dBμV



Date: 7.MAR.2008 15:08:03
 Channel 6 20 dB Bandwidth, 272.5 kHz

Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.249, IC RSS-210 A2.9

Test: Radiated Spurious Emissions

Performance Criterion: Harmonic emissions must not exceed 500µV/m (54 dBµV/m). Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209 and RSS-210 Section 2.7 Table 2, whichever is the lesser attenuation. Field strength limits are specified at a distance of 3 meters. Emissions falling into the restricted bands of 15.205 and RSS-210 Section 2.7 Table 1 must meet the general limits of 15.209 and RSS-210 Section 2.7 Table 2, respectively.

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	See Tables	Humidity (%):	See Tables	Pressure (hPa):	See Tables
Pretest Verification Performed	Yes		Equipment under Test:	Merlin™@home		
Test Engineer(s):	Nicholas Abbondante		EUT Serial Number:	6070822, 6070823		

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR2	05/20/2008
2	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	11/26/2008
3	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	01/25/2009
4	PREAMPLIFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	11/09/2008
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/06/2008
6	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL029	12/06/2008
7	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/06/2008
8	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	09/17/2008
9	ANTENNA	EMCO	3142	9711-1225	06/05/2008
10	HORN ANTENNA	EMCO	3115	9602-4675	09/24/2008
11	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	12/26/2008
12	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	09/18/2008
13	18GHz High Pass Filter	Reactel, Inc	7HS-18G/40G K11	(06)1	04/11/2009

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Results:

Notes: See RF Output Power for duty cycle calculations.

Special Radiated Emissions

Company: Plexus Services Corp. Antenna & Cables: N Bands: N, LF, HF, SHF
 Model #: EX1150 Antenna: LOG4 06-05-08 V3.txt LOG4 06-05-08 H3.txt
 Serial #: 6070822 Cable(s): S2 3M FLR 9-17-08.txt NONE
 Engineers: Nicholas Abbondante Location: Site 2 Barometer: BAR2 Filter: None
 Project #: 3144422 Date(s): 04/29/08 Temp/Humidity/Pressure: 17c 50% 1050mB
 Standard: FCC Part 15 Subpart C 15.249/IC RSS-210 A2.9
 Receiver: R&S ESCI (ROS002) Limit Distance (m): 3
 PreAmp: PRE8 11-09-08.txt Test Distance (m): 3
 PreAmp Used? (Y or N): N Voltage/Frequency: 120V/60Hz Frequency Range: 30-1000 MHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

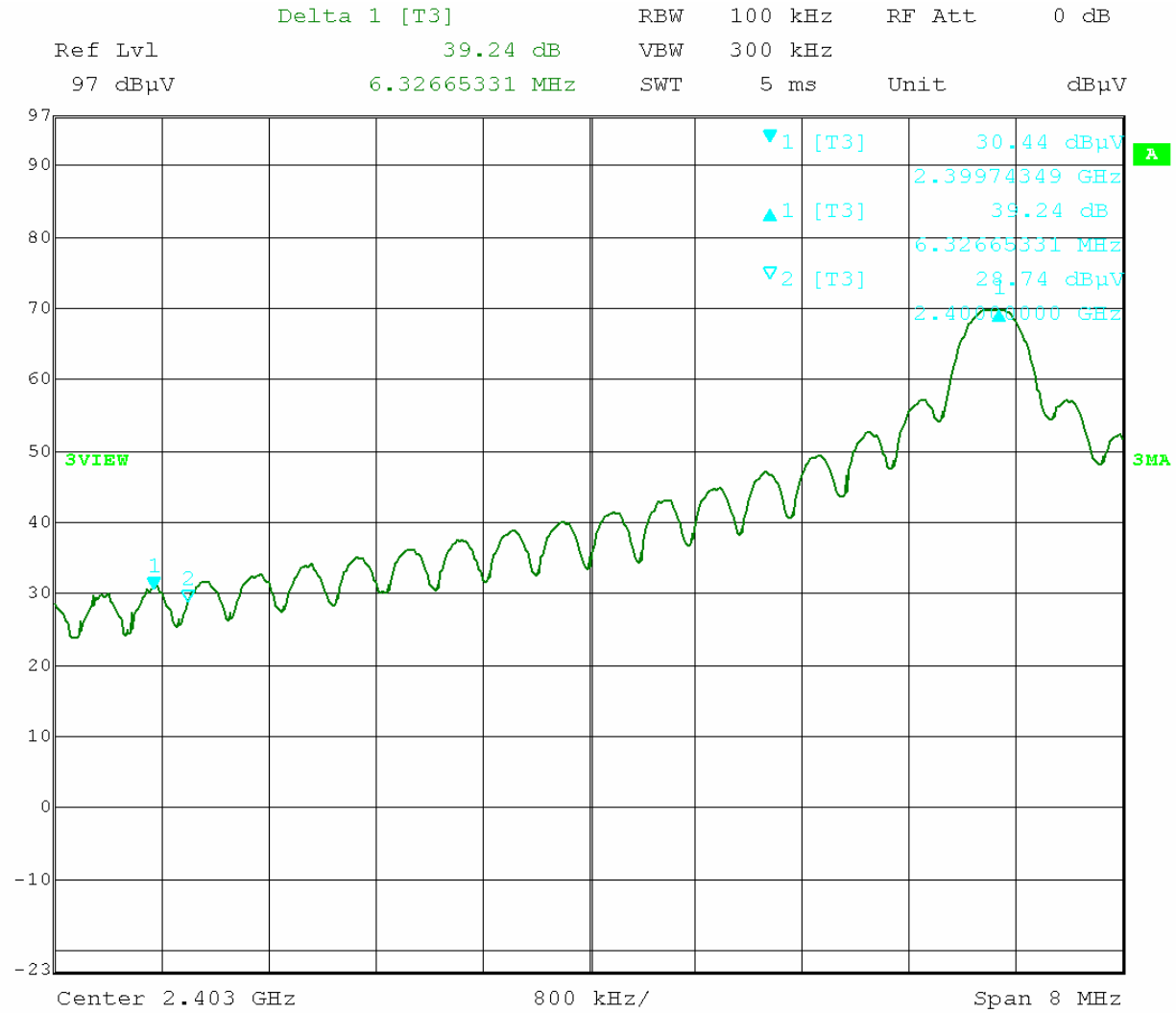
Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
QP	V	60.840	14.9	9.1	0.9	0.0	0.0	24.9	40.0	-15.1	120/300 kHz		
QP	V	85.380	18.3	7.7	1.1	0.0	0.0	27.2	40.0	-12.8	120/300 kHz		
QP	V	112.200	11.6	7.8	1.3	0.0	0.0	20.7	43.5	-22.8	120/300 kHz	RB	RB
QP	V	132.470	9.8	6.7	1.4	0.0	0.0	17.9	43.5	-25.6	120/300 kHz	RB	RB
QP	V	140.534	9.7	7.2	1.5	0.0	0.0	18.4	43.5	-25.1	120/300 kHz		
QP	V	149.130	8.7	8.2	1.5	0.0	0.0	18.4	43.5	-25.1	120/300 kHz		
QP	V	156.100	9.2	8.4	1.6	0.0	0.0	19.2	43.5	-24.3	120/300 kHz		
QP	V	192.500	3.8	10.2	1.8	0.0	0.0	15.7	43.5	-27.8	120/300 kHz		
QP	V	232.800	1.6	12.3	1.9	0.0	0.0	15.9	46.0	-30.1	120/300 kHz		
QP	V	60.840	16.1	9.1	0.9	0.0	0.0	26.1	40.0	-13.9	120/300 kHz		
QP	V	85.380	18.1	7.7	1.1	0.0	0.0	27.0	40.0	-13.0	120/300 kHz		
QP	V	112.200	10.9	7.8	1.3	0.0	0.0	20.0	43.5	-23.5	120/300 kHz	RB	RB
QP	V	121.520	6.5	6.9	1.4	0.0	0.0	14.7	43.5	-28.8	120/300 kHz	RB	RB
QP	V	140.424	8.4	7.2	1.5	0.0	0.0	17.1	43.5	-26.4	120/300 kHz		
QP	V	149.160	6.7	8.2	1.5	0.0	0.0	16.4	43.5	-27.1	120/300 kHz		
QP	V	156.100	8.3	8.4	1.6	0.0	0.0	18.3	43.5	-25.2	120/300 kHz		
QP	V	192.500	3.2	10.2	1.8	0.0	0.0	15.1	43.5	-28.4	120/300 kHz		
QP	V	232.800	0.3	12.3	1.9	0.0	0.0	14.6	46.0	-31.4	120/300 kHz		
QP	V	60.810	16.5	9.1	0.9	0.0	0.0	26.5	40.0	-13.5	120/300 kHz		
QP	V	85.380	18.8	7.7	1.1	0.0	0.0	27.7	40.0	-12.3	120/300 kHz		
QP	V	114.550	12.1	7.6	1.3	0.0	0.0	21.0	43.5	-22.5	120/300 kHz	RB	RB
QP	V	121.520	9.5	6.9	1.4	0.0	0.0	17.7	43.5	-25.8	120/300 kHz	RB	RB
QP	V	132.780	7.2	6.8	1.4	0.0	0.0	15.3	43.5	-28.2	120/300 kHz	RB	RB
QP	V	140.424	7.6	7.2	1.5	0.0	0.0	16.3	43.5	-27.2	120/300 kHz		
QP	V	149.160	7.5	8.2	1.5	0.0	0.0	17.2	43.5	-26.3	120/300 kHz		
QP	V	156.100	9.8	8.4	1.6	0.0	0.0	19.8	43.5	-23.7	120/300 kHz		
QP	V	164.700	8.0	8.5	1.6	0.0	0.0	18.1	43.5	-25.4	120/300 kHz	RB	
QP	V	192.500	2.5	10.2	1.8	0.0	0.0	14.4	43.5	-29.1	120/300 kHz		
QP	V	232.800	2.3	12.3	1.9	0.0	0.0	16.6	46.0	-29.4	120/300 kHz		

Radiated Emissions

Company: Plexus Services Corp. Antenna & Cables: LF Bands: N, LF, HF, SHF
 Model #: EX1150 Antenna: Horn2 V1m 9-24-2008.txt Horn2 H1m 9-24-2008.txt
 Serial #: 6070822 Cable(s): CBL028 12-06-08.txt NONE.
 Engineers: Nicholas Abbondante Location: Site 2 Barometer: BAR2 Filter: None
 Project #: 3144422 Date(s): 05/05/08
 Standard: FCC Part 15 Subpart C 15.249/IC RSS-210 A2.9 Temp/Humidity/Pressure: 23c 34% 1050mB
 Receiver: R&S FSEK-30 (ROS001) Limit Distance (m): 3
 PreAmp: PRE8 11-09-08.txt Test Distance (m): 3
 PreAmp Used? (Y or N): N Voltage/Frequency: 120V/60Hz Frequency Range: 1-4 GHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS: NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Power Setting: 147; 100 kHz marker-delta method referenced to measured channel field strength in 1 MHz RBW (-39.24 dB)													
PK	V	2399.990	42.1	28.6	3.1	0.0	0.0	73.8	74.0	-0.2	1/3 MHz		
AVG	V	2399.990	21.4	28.6	3.1	0.0	0.0	53.1	54.0	-0.9	1/3 MHz		
Note: Noise Floor													
PK	V	1200.000	24.5	25.3	2.1	0.0	0.0	51.9	74.0	-22.1	1/3 MHz	RB	RB
AVG	V	1200.000	14.7	25.3	2.1	0.0	0.0	42.1	54.0	-11.9	1/3 MHz	RB	RB



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Channel 6 Band Edge Compliance, Marker Delta Measurement

Special Radiated Emissions

Company: Plexus Services Corp. Antenna & Cables: HF Bands: N, LF, HF, SHF
 Model #: EX1150 Antenna: Horn2 V1m 9-24-2008.txt Horn2 H1m 9-24-2008.txt
 Serial #: 6070822 Cable(s): CBL029 12-06-08.txt CBL030 12-06-08.txt
 Engineers: Nicholas Abbondante Location: Site 2 Barometer: BAR2 Filter: REA004
 Project #: 3144422 Date(s): 04/29/08 04/30/08
 Standard: FCC Part 15 Subpart C 15.249/IC RSS-210 A2.9 Temp/Humidity/Pressure: 20c 32% 1050mB
 Receiver: R&S FSEK-30 (ROS001) Limit Distance (m): 3 22c 28% 1050mB
 PreAmp: PRE8 11-09-08.txt Test Distance (m): 3
 PreAmp Used? (Y or N): Y Voltage/Frequency: 120V/60Hz Frequency Range: 4-18 GHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Power Setting: 153, 3 GHz High Pass Filter REA004, Average values obtained using a -20.7 dB duty cycle averaging factor													
PK	V	4812.000	47.8	33.5	3.7	22.4	0.0	62.6	74.0	-11.4	1/3 MHz	RB	RB
AVG	V	4812.000	27.1	33.5	3.7	22.4	0.0	41.9	54.0	-12.1	1/3 MHz	RB	RB
PK	V	7218.000	40.2	36.6	4.7	21.4	0.0	60.1	74.0	-13.9	1/3 MHz		
AVG	V	7218.000	19.5	36.6	4.7	21.4	0.0	39.4	54.0	-14.6	1/3 MHz		
PK	H	9624.000	38.3	38.2	5.6	19.0	0.0	63.1	74.0	-10.9	1/3 MHz		
AVG	H	9624.000	17.6	38.2	5.6	19.0	0.0	42.4	54.0	-11.6	1/3 MHz		
PK	H	12030.000	34.3	39.3	6.5	19.0	0.0	61.2	74.0	-12.8	1/3 MHz	RB	RB
AVG	H	12030.000	13.6	39.3	6.5	19.0	0.0	40.5	54.0	-13.5	1/3 MHz	RB	RB
PK	V	14436.000	29.5	40.8	7.6	20.6	0.0	57.3	74.0	-16.7	1/3 MHz		
AVG	V	14436.000	21.5	40.8	7.6	20.6	0.0	49.3	54.0	-4.7	1/3 MHz		
PK	V	16842.000	29.5	40.5	9.6	23.7	0.0	55.8	74.0	-18.2	1/3 MHz		
AVG	V	16842.000	19.4	40.5	9.6	23.7	0.0	45.8	54.0	-8.2	1/3 MHz		
PK	V	4826.000	47.6	33.6	3.7	22.4	0.0	62.4	74.0	-11.6	1/3 MHz	RB	RB
AVG	V	4826.000	26.9	33.6	3.7	22.4	0.0	41.7	54.0	-12.3	1/3 MHz	RB	RB
PK	H	7239.000	38.0	36.9	4.7	21.4	0.0	58.2	74.0	-15.8	1/3 MHz		
AVG	H	7239.000	17.3	36.9	4.7	21.4	0.0	37.5	54.0	-16.5	1/3 MHz		
PK	H	9652.000	37.0	38.3	5.6	19.0	0.0	61.9	74.0	-12.1	1/3 MHz		
AVG	H	9652.000	16.3	38.3	5.6	19.0	0.0	41.2	54.0	-12.8	1/3 MHz		
PK	H	12065.000	34.4	39.3	6.5	19.0	0.0	61.2	74.0	-12.8	1/3 MHz	RB	RB
AVG	H	12065.000	22.2	39.3	6.5	19.0	0.0	49.0	54.0	-5.0	1/3 MHz	RB	RB
PK	V	14478.000	32.2	40.7	7.6	20.6	0.0	59.9	74.0	-14.1	1/3 MHz	RB	RB
AVG	V	14478.000	20.2	40.7	7.6	20.6	0.0	47.8	54.0	-6.2	1/3 MHz	RB	RB
PK	H	16891.000	32.1	41.1	9.7	23.8	0.0	59.0	74.0	-15.0	1/3 MHz		
AVG	H	16891.000	19.6	41.1	9.7	23.8	0.0	46.5	54.0	-7.5	1/3 MHz		
PK	V	4840.000	39.3	33.6	3.7	22.5	0.0	54.1	74.0	-19.9	1/3 MHz	RB	RB
AVG	V	4840.000	18.6	33.6	3.7	22.5	0.0	33.4	54.0	-20.6	1/3 MHz	RB	RB
PK	H	7260.000	37.6	36.9	4.7	21.3	0.0	57.8	74.0	-16.2	1/3 MHz	RB	RB
AVG	H	7260.000	16.9	36.9	4.7	21.3	0.0	37.1	54.0	-16.9	1/3 MHz	RB	RB
PK	H	9680.000	35.5	38.3	5.6	19.0	0.0	60.4	74.0	-13.6	1/3 MHz		
AVG	H	9680.000	14.8	38.3	5.6	19.0	0.0	39.7	54.0	-14.3	1/3 MHz		
PK	H	12100.000	31.6	39.3	6.5	19.0	0.0	58.4	74.0	-15.6	1/3 MHz	RB	RB
AVG	H	12100.000	21.7	39.3	6.5	19.0	0.0	48.5	54.0	-5.5	1/3 MHz	RB	RB
PK	V	14520.000	31.4	40.5	7.6	20.6	0.0	58.9	74.0	-15.1	1/3 MHz		
AVG	V	14520.000	20.7	40.5	7.6	20.6	0.0	48.2	54.0	-5.8	1/3 MHz		
PK	V	16940.000	31.4	40.9	9.7	23.9	0.0	58.1	74.0	-15.9	1/3 MHz		
AVG	V	16940.000	20.2	40.9	9.7	23.9	0.0	46.9	54.0	-7.1	1/3 MHz		

Special Radiated Emissions

Company: Plexus Services Corp. Antenna & Cables: SHF Bands: N, LF, HF, SHF
 Model #: EX1150 Antenna: EMC04 V 1m 12-26-2008.txt EMC04 H 1m 12-26-2008.txt
 Serial #: 6070822 Cable(s): CBL029 12-06-08.txt CBL030 12-06-08.txt
 Engineers: Nicholas Abbondante Location: Site 2 Barometer: BAR2 Filter: REA006
 Project #: 3144422 Date(s): 04/30/08
 Standard: FCC Part 15 Subpart C 15.249/ IC RSS-210 A2.9 Temp/Humidity/Pressure: 22c 28% 1050mB
 Receiver: R&S FSEK-30 (ROS001) Limit Distance (m): 3
 PreAmp: PRE8 11-09-08.txt Test Distance (m): 1
 PreAmp Used? (Y or N): Y Voltage/Frequency: 120V/60Hz Frequency Range: 18-25 GHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
PK	V	19248.000	32.9	45.2	9.8	24.9	9.5	53.5	74.0	-20.5	1/3 MHz	RB	RB
AVG	V	19248.000	20.2	45.2	9.8	24.9	9.5	40.8	54.0	-13.2	1/3 MHz	RB	RB
PK	V	21654.000	33.9	45.4	9.7	22.9	9.5	56.6	74.0	-17.4	1/3 MHz		
AVG	V	21654.000	21.2	45.4	9.7	22.9	9.5	44.0	54.0	-10.0	1/3 MHz		
PK	V	24060.000	33.0	45.6	10.3	20.0	9.5	59.4	74.0	-14.6	1/3 MHz		
AVG	V	24060.000	19.6	45.6	10.3	20.0	9.5	45.9	54.0	-8.1	1/3 MHz		
PK	V	19304.000	32.3	45.3	9.8	24.9	9.5	53.0	74.0	-21.0	1/3 MHz	RB	RB
AVG	V	19304.000	19.6	45.3	9.8	24.9	9.5	40.2	54.0	-13.8	1/3 MHz	RB	RB
PK	V	21717.000	34.7	45.4	9.7	22.7	9.5	57.5	74.0	-16.5	1/3 MHz		
AVG	V	21717.000	21.7	45.4	9.7	22.7	9.5	44.6	54.0	-9.4	1/3 MHz		
PK	V	24130.000	32.8	45.7	10.3	20.1	9.5	59.1	74.0	-14.9	1/3 MHz		
AVG	V	24130.000	20.2	45.7	10.3	20.1	9.5	46.5	54.0	-7.5	1/3 MHz		
PK	V	19360.000	32.8	45.3	9.8	24.8	9.5	53.5	74.0	-20.5	1/3 MHz	RB	RB
AVG	V	19360.000	19.6	45.3	9.8	24.8	9.5	40.3	54.0	-13.7	1/3 MHz	RB	RB
PK	V	21780.000	35.2	45.4	9.7	22.6	9.5	58.2	74.0	-15.8	1/3 MHz		
AVG	V	21780.000	22.2	45.4	9.7	22.6	9.5	45.1	54.0	-8.9	1/3 MHz		
PK	V	24200.000	34.1	45.7	10.3	20.3	9.5	60.4	74.0	-13.6	1/3 MHz		
AVG	V	24200.000	20.2	45.7	10.3	20.3	9.5	46.4	54.0	-7.6	1/3 MHz		

Radiated Emissions Setup Photos



Radiated Emissions Setup Photos



Radiated Emissions Setup Photos



Radiated Emissions Setup Photos



Radiated Emissions Setup Photos



Radiated Emissions Setup Photos



Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.249, IC RSS-210 A2.9

Test: AC Line-Conducted Emissions

Performance Criterion: The AC line-conducted emissions must not exceed the FCC 15.207 and RSS-Gen Section 7.2.2 Table 2 limits.

Test Environment:

Environmental Conditions During Testing:	Ambient (°C):	22	Humidity (%):	23	Pressure (hPa):	1050
Pretest Verification Performed	Yes		Equipment under Test:	Merlin™@home		
Test Engineer(s):	Vathana Ven		EUT Serial Number:	6070823		

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR2	05/20/2008
2	LISN, 50uH, .01 - 50MHz, 24A	Solar Electronics	9252-50-R-24-BNC	941714	10/11/2008
3	RG223 50ohm Coaxial Cable	Intertek	BNC-30	CBLBNC6	12/28/2008
4	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS24	09/18/2008
5	EMI Receiver (9 KHz to 2.9 GHz)	Hewlett Packard	HP85422E	3906A00273	03/06/2009
6	RFI Filter Section	Hewlett Packard	85420E	3705A00230	03/06/2009

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	3/07/07 Revision

Test Results:

Conducted Emissions

Company: Plexus Services Corp. Receiver: HP 8542E (145-092)
 Model #: EX1150 Cable: CBLBNC6 12-28-08.txt
 Serial #: 6070823 LISN 1: LISN12 [1] 10-11-08.txt
 Engineer(s): Vathana Ven Location: Site 2 LISN 2: LISN12 [2] 10-11-08.txt
 Project #: 3144422 Date: 02/25/08 LISN 3: NONE.
 Standard: FCC Part 15.207/IC RSS-Gen Table 2 LISN 4: NONE.
 Notes: WUT, Channel 7, Power=144
 Barometer: BAR2 Temp/Humidity/Pressure: 22 deg. C 23% 1050 mB Attenuator: DS24 9-18-08.txt
 Voltage/Frequency: 120V/60 Hz Frequency Range: 0.150-30 MHz
 Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.166	8.0	9.0			30.7	65.2	-34.4	9/30 kHz
QP	0.250	5.4	9.0			30.7	61.8	-31.1	9/30 kHz
QP	0.335	4.0	8.0			29.7	59.3	-29.7	9/30 kHz
QP	0.753	10.0	12.0			33.6	56.0	-22.4	9/30 kHz
QP	20.170	17.6	22.0			44.3	60.0	-15.7	9/30 kHz
QP	21.220	15.5	20.0			42.3	60.0	-17.7	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.166	-4.0	-2.0			19.7	55.2	-35.4	9/30 kHz
AVG	0.250	-8.0	-4.3			17.4	51.8	-34.4	9/30 kHz
AVG	0.335	-11.0	4.1			25.8	49.3	-23.6	9/30 kHz
AVG	0.753	0.4	6.0			27.6	46.0	-18.4	9/30 kHz
AVG	20.170	12.0	15.0			37.3	50.0	-12.7	9/30 kHz
AVG	21.220	10.0	13.0			35.3	50.0	-14.7	9/30 kHz

AC Line-Conducted Emissions Setup Photos



AC Line-Conducted Emissions Setup Photos

