

# LS Research, LLC

W66 N220 Commerce Court • Cedarburg, WI 53012 • USA

Phone: 262.375.4400 • Fax: 262.375.4248

[www.lsr.com](http://www.lsr.com)

---

## ENGINEERING TEST REPORT # 306308-TX-v2

Compliance Testing of:

### Wireless Nurse-Call System

Prepared For:

**Rauland-Borg Corporation**

Test Date(s):

**September 11<sup>TH</sup> through October 6<sup>TH</sup>, 2006**

In accordance with:

**Federal Communications Commission (FCC)**

**Part 15, Subpart C, Section 15.247**

**Digital Modulation Transmitters (DTS) Operating in the  
Frequency Band 902-928 MHz**

**This Test Report is issued under the Authority of:**

Brian E. Petted, VP of Engineering

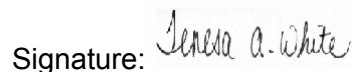


Signature:

Date: November 3, 2006

**Test Report Prepared by:**

Teresa A. White, Document Coordinator

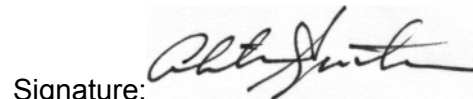


Signature:

Date: November 3, 2006

**Tested by:**

Abtin Spantman, RF / EMC Engineer



Signature:

Date: November 3, 2006

*This Test Report may not be reproduced, except in full, without written approval of LS Research, LLC.*

LS Research, LLC	Prepared For: Rauland-Borg Corporation	
Report #:306308-Tx-v2	Customer FCC ID #:UG2-301	Page 1 of 53

## **TABLE OF CONTENTS** *(page 1 of 2)*

<b>EXHIBIT 1.</b>	<b>INTRODUCTION</b>	<b>4</b>
1.1	Scope	4
1.2	Normative References	4
1.3	LS Research, LLC Test Facility	5
1.4	Location of Testing	5
1.5	Test Equipment Utilized	5
<b>EXHIBIT 2.</b>	<b>PERFORMANCE ASSESSMENT</b>	<b>6</b>
2.1	Client Information	6
2.2	Equipment Under Test (EUT) Information	6
2.3	Associated Antenna Description	6
2.4	EUT's Technical Specifications	7
2.5	Product Description	8
<b>EXHIBIT 3.</b>	<b>EUT OPERATING CONDITIONS &amp; CONFIGURATIONS DURING TESTS</b>	<b>9</b>
3.1	Climate Test Conditions	9
3.2	Applicability & Summary of EMC Emission Test Results	9
3.3	Modifications Incorporated in the EUT for Compliance Purposes	9
3.4	Deviations & Exclusions from Test Specifications	9
<b>EXHIBIT 4.</b>	<b>DECLARATION OF CONFORMITY</b>	<b>10</b>
<b>EXHIBIT 5.</b>	<b>RADIATED EMISSIONS TEST</b>	<b>11</b>
5.1	Test Setup	11
5.2	Test Procedure	11
5.3	Test Equipment Utilized	11
5.4	Test Equipment List	12
5.5	Calculation of Radiated Emission Measurements	13
5.6	Radiated Emissions Test Data Chart	14-17
5.7	Test Setup Photo(s)-Radiated Emissions Test	18-20
5.8	Screen Captures-Radiated Emissions Testing	21-28
<b>EXHIBIT 6.</b>	<b>CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207</b>	<b>29</b>
6.1	Test Setup	29
6.2	Test Procedure	29
6.3	Test Equipment List	29
6.4	FCC Limits of Conducted Emissions at the AC Mains Ports	30
6.5	Conducted Emissions Test Data Chart	31
6.6	Test Setup Photo(s)-Conducted Emissions Test	32
6.7	Screen Captures-Conducted Emissions Test	33
<b>EXHIBIT 7.</b>	<b>OCCUPIED BANDWIDTH; 15.247(a)(2)</b>	<b>34</b>
7.1	Limits	34
7.2	Method of Measurements	34
7.3	Test Equipment List	34
7.4	Screen Captures – Occupied Bandwidth	35-37

## **TABLE OF CONTENTS** (Page 2 of 2)

<b>EXHIBIT 8.</b>	<b>BAND-EDGE MEASUREMENTS</b>	<b>38</b>
8.1	Method of Measurements	38-39
<b>EXHIBIT 9.</b>	<b>PEAK OUTPUT POWER (CONDUCTED); 15.247(b)</b>	<b>40</b>
9.1	Method of Measurements	40
9.2	Test Data	40
9.3	Test Equipment List	40
9.4	Screen Captures – Power Output (Conducted)	41-42
<b>EXHIBIT 10.</b>	<b>POWER SPECTRAL DENSITY: 15.247(e)</b>	<b>43</b>
10.1	Limits	43
10.2	Test Equipment List	43
10.3	Test Data	43
10.4	Screen Captures-Power Spectral Density	44-45
<b>EXHIBIT 11.</b>	<b>SPURIOUS EMISSIONS: 15.247(d)</b>	<b>46</b>
11.1	Limits	46
11.2	Test Equipment List	46
11.3	Test Data	46
11.4	Screen Captures-Spurious Radiated Emissions	47-48
<b>EXHIBIT 12.</b>	<b>FREQUENCY &amp; POWER STABILITY OVER VOLTAGE VARIATIONS</b>	<b>49</b>
<b>EXHIBIT 13.</b>	<b>MPE CALCULATIONS</b>	<b>50</b>
<b>APPENDIX A</b>	<b>TEST EQUIPMENT LIST</b>	<b>51</b>
<b>APPENDIX B</b>	<b>ANTENNA SPECIFICATION(S)</b>	<b>52</b>
<b>APPENDIX C</b>	<b>FIRMWARE AND SETUP INSTRUCTIONS</b>	<b>53</b>

### LSC Revision Control

Date	Revision #	Revised By
9-06-06	2.0	AS/TAW

## EXHIBIT 1. INTRODUCTION

### 1.1 SCOPE

<b>References:</b>	FCC Part 15, Subpart C, Section 15.247
<b>Title:</b>	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
<b>Purpose of Test:</b>	To gain FCC Certification Authorization for Digital Transmission Systems operating in the Frequency Band of 902 MHz – 928 MHz
<b>Test Procedures:</b>	Both conducted and radiated emissions measurements were performed in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
<b>Environmental Classification:</b>	<ul style="list-style-type: none"> <li>• Commercial, Industrial or Business</li> <li>• Residential</li> </ul>

### 1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2005	Code of Federal Regulations - Telecommunications
ANSI C63.4	2004	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices.
FCC Procedures	2005, 03-23	Measurement of Digital Transmission Systems operating under Section 15.247.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 4 of 53</b>

### 1.3 **LS Research, LLC TEST FACILITY**

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: [www.lsr.com](http://www.lsr.com). Accreditation status can be verified at A2LA’s web site: [www.a2la2.net](http://www.a2la2.net).

### 1.4 **LOCATION OF TESTING**

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

### 1.5 **TEST EQUIPMENT UTILIZED**

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated in accordance with A2LA standards.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 5 of 53</b>

## EXHIBIT 2. PERFORMANCE ASSESSMENT

### 2.1 CLIENT INFORMATION



*quality's other name in Sound and Communications*

#### **RAULAND-BORG CORPORATION**

3450 WEST OAKTON STREET • SKOKIE, ILLINOIS 60076-2958 www.rauland.com  
TEL: (847) 679-0900, FAX: (847) 679-4106 internet: info@rauland.com

<b>Manufacturer Name:</b>	<b>Rauland-Borg Corporation</b>
<b>Address:</b>	<b>3450 West Oakton Street Skokie, IL 60076</b>
<b>Contact Person:</b>	<b>Mr. Larry Gallagher</b>

### 2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

*The following information has been supplied by the applicant.*

<b>Product Name:</b>	Wireless Bed Interface
<b>Model Number:</b>	WWU and WBU
<b>Serial Number:</b>	Pre-production engineering samples

### 2.3 ASSOCIATED ANTENNA DESCRIPTION

The antenna is a proprietary custom wire antenna, permanently installed inside the units.  
The units do not have any contingencies for any other antennas.  
The specifications for the custom antenna can be found in the appendix section of this report.

Prepared For: Rauland-Borg Corporation	Model #: WWU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 6 of 53</b>

## 2.4 EUT'S TECHNICAL SPECIFICATIONS

### Additional Information:

#### ***“WWU”***

Frequency Range (in MHz)	902-928 MHz
RF Power in Watts	0.0071 W
Field Strength (and at what distance)	97.4 dB $\mu$ V/m @3m
Occupied Bandwidth (99% BW)	690 kHz
Type of Modulation	DTS
Emission Designator	690K-F1D
Transmitter Spurious (worst case)	53.2 dB $\mu$ V/m @3m
Frequency Tolerance %, Hz, ppm	<100ppm
Microprocessor Model # (if applicable)	Cypress CY8C27443
EUT will be operated under FCC Rule Part(s)	15.247
Modular Filing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

#### ***“WBU”***

Frequency Range (in MHz)	902-928 MHz
RF Power in Watts	0.0087 W
Field Strength (and at what distance)	104.6 dB $\mu$ V/m @3m
Occupied Bandwidth (99% BW)	690 kHz
Type of Modulation	DTS
Emission Designator	690K-F1D
Transmitter Spurious (worst case)	62.0 dB $\mu$ V/m @3m
Frequency Tolerance %, Hz, ppm	<100ppm
Microprocessor Model # (if applicable)	Cypress CY8C27443
EUT will be operated under FCC Rule Part(s)	15.247
Modular Filing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

### RF Technical Information:

Type of Evaluation (check one)	<input type="checkbox"/>	SAR Evaluation: Device Used in the Vicinity of the Human Head
	<input type="checkbox"/>	SAR Evaluation: Body-worn Device
	<input checked="" type="checkbox"/>	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use
- Duty Cycle used in evaluation: 100 %
- Standard used for evaluation: 47CFRPart 2,

#### ***“WWU”***

- Measurement Distance: 3 m
- RF Value: 0.07 ☒ V/m ☐ A/m ☐ W/m<sup>2</sup>  
☒ Measured ☐ Computed ☐ Calculated

#### ***“WBU”***

- Measurement Distance: 3 m
- RF Value: 0.17 ☒ V/m ☐ A/m ☐ W/m<sup>2</sup>  
☒ Measured ☐ Computed ☐ Calculated

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 7 of 53</b>

## 2.5 **PRODUCT DESCRIPTION**

The Rauland-Borg *"Wireless Bed Interface"* is a wireless link system for the traditionally wired Nurse-call systems, as would be used in hospital or other care facilities. The *"Wireless Bed Interface"* system is composed of two units, identified as the *"Wireless Wall Unit"* or (WWU), and the *"Wireless Bed Unit"* or (WBU), with both transceivers utilizing the same RF section design.

The RF Section of the Wireless Bed Interface is based on the Semtech XE1203F 902–928 MHz ISM Transceiver. This device includes a Fractional-N PLL Frequency Synthesizer, Transmitter Power Amplifier and a 2–level FSK Receiver. All RF Operating Parameters are set by the associated microcontroller. The bit rate is fixed at 38 kbps, with a peak deviation of  $\pm 235$  kHz and individual transmissions are 7 msec in length. Transmit data is formatted to avoid more than 7 adjacent one's or zero's.

The receiver is a Zero-IF receiver design so the LO frequency is equal to the channel frequency. The received signal passes from the Internal Wire Antenna thru the BP Filter and Antenna Switch to a Balun . Receiver bandwidth is set to 600 kHz.

The Transceiver has 4 distinct states:

Sleep – The Synthesizer and Reference Oscillator are both turned off.

Standby – The Reference Oscillator is turned on.

Receive – The Synthesizer and Receiver are both turned on.

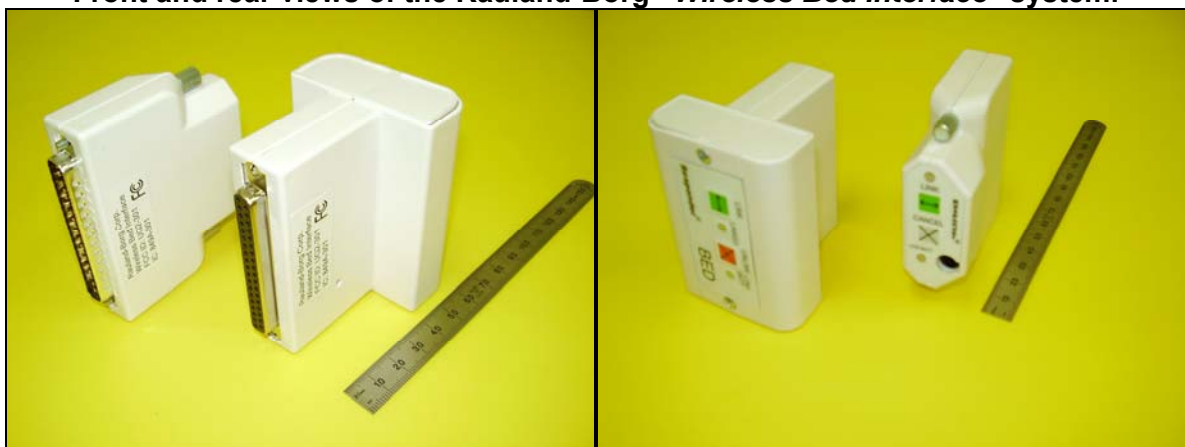
Transmit – The Synthesizer and Transmitter are both turned on.

The WBU and the WWU utilize a custom internal antenna, with no contingencies for using any other antennas. The specifications for the custom antenna may be found in the appendix section of this report.

The WBU uses 4.50 VDC power from 3 standard type "AA" batteries.

The WWU uses 12.0 VDC power from wall transformer, Model MW117RA1203B01, as provided by the manufacturer.

**Front and rear views of the Rauland-Borg *"Wireless Bed Interface"* system.**



This report covers the measurement of the RF characteristics of the transmitter sections of the WWU and the WBU, as supporting evidence of compliance under the FCC mandates. The devices were tested along with a host adapter boards, as provided by the manufacturer, to simulate existing nurse-call systems where the wireless units would plug into.

Prepared For: Rauland-Borg Corporation	Model #: WWU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 8 of 53</b>



### EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

#### 3.1 CLIMATE TEST CONDITIONS

Temperature:	22 °C
Humidity:	44 % RH
Pressure:	98.1 kPa

#### 3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (yes/no)
15.207	Power Line Conducted Emissions Measurements	Yes
15.247(a)(2)	6 dB Bandwidth of a Digital Modulation System	Yes
15.247(b) & 1.1310	Maximum Output Power	Yes
15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
15.247(c)	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d)	Transmitted Power Spectral Density of a Digital Modulation System	Yes
15.247(c), 15.209 & 15.205	Transmitter Radiated Emissions	Yes
<i>The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers. The Receiver Test Report is available upon request.</i>		

#### 3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

☒ None ☐ Yes (explain below)

#### 3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☒ None ☐ Yes (explain below)

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 9 of 53

## EXHIBIT 4.DECLARATION OF CONFORMITY

The EUTs (WWU and WBU) were found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-210 (2005), Section Annex 8 (section 8.2) for a Digital Spread Spectrum (DTS) Transmitters.

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 10 of 53</b>

## EXHIBIT 5. RADIATED EMISSIONS TEST

### 5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15 and ANSI C63.4-2003. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUTs were operated in continuous transmit mode. The WWU and the WBU were tested individually for transmitter characteristics. The results for both units are covered in this report, as a system. The WWU was powered from the wall type transformer provided by the manufacturer, and the WBU was powered by 3 standard type “AA” batteries.

The applicable limits apply at a 3 meter distance. Measurements above 5 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (3) standard channels: low (904.0 MHz), middle (915.0 MHz) and high (926.0 MHz) to comply with FCC Part 15.35. The channels and operating modes were changed using push button selections, in conjunction with special test software and host boards as prepared for these tests.

### 5.2 Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 30 MHz to 10000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 10 GHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities.

The battery voltage on the WBU was checked frequently, and the batteries were replaced as necessary.

Both EUTs were rotated along three orthogonal axis during the investigations to find the highest emission levels.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 11 of 53</b>

### 5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz).

### Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 for a DTS transmitter [Canada RSS-210 (2005), Annex 8 (section 8.2)]. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

### 5.4 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
EMI Receiver Pre-Select.	HP	85460A	3448A00296
Log Periodic Antenna	EMCO	93146	9701-4855
Horn Antenna	EMCO	3115	6907
Bicon Antenna	EMCO	93110B	9702-2918
Pre-Amp	Adv. Microwave	WLA612	1145A04094

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 12 of 53</b>

## 5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

The maximum peak output power of an intentional radiator in the 902-928 MHz band, as specified in Title 47 CFR 15.247 (b)(3), is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d), shall be at least 20 dB below the measured power of the desired signal, and must also meet the requirements described in 15.205(c).

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands.

Frequency (MHz)	3 m Limit $\mu\text{V/m}$	3 m Limit (dB $\mu\text{V/m}$ )	1 m Limit (dB $\mu\text{V/m}$ )
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-24,000	500	54.0	63.5

Sample conversion from field strength  $\mu\text{V/m}$  to dB $\mu\text{V/m}$ :

$$\begin{aligned}\text{dB}\mu\text{V/m} &= 20 \log_{10} (100) \\ &= 40 \text{ dB}\mu\text{V/m} \text{ (from 30-88 MHz)}\end{aligned}$$

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

$$\begin{aligned}&960 \text{ MHz to } 10,000 \text{ MHz} \\ &500\mu\text{V/m or } 54.0 \text{ dB}\mu\text{V/m at 3 meters} \\ &54.0 + 9.5 = 63.5 \text{ dB}\mu\text{V/m at 1 meter}\end{aligned}$$

For measurements made at 0.3 meter, a 20 dB correction has been invoked.

$$\begin{aligned}&960 \text{ MHz to } 10,000 \text{ MHz} \\ &500\mu\text{V/m or } 54.0 \text{ dB}\mu\text{V/m at 3 meters} \\ &54.0 + 20 = 74 \text{ dB}\mu\text{V/m at 0.3 meters}\end{aligned}$$

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 13 of 53</b>

## 5.6

**RADIATED EMISSIONS DATA CHART**

3 Meter Measurements of Electromagnetic Radiated Emissions

Test Standard: 47CFR, Part 15.205 and 15.247(DTS)

Frequency Range Inspected: 30 MHz to 10000 MHz

**“WWU”**

Manufacturer:	Rauland-Borg Corporation				
Date(s) of Test:	September 11 <sup>th</sup> through October 6 <sup>th</sup> , 2006				
Test Engineer(s):	Abtin Spantman				
Voltage:	WWU=12.0 VDC				
Operation Mode:	Continuous transmit, modulated				
Environmental Conditions in the Lab:	Temperature: 22° C Relative Humidity: 44%				
EUT Power:		Single Phase	VAC		3 Phase VAC
	√	Battery			Other:
EUT Placement:	√	80cm non-conductive table			10cm Spacers
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber			3/10m OATS
Measurements:		Pre-Compliance		Preliminary	√ Final
Detectors Used:		Peak		√ Quasi-Peak	√ Average

The following table depicts the level of significant spurious radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 (dBμV/m)	Margin (dB)
902.0	H / S	1.00	350	53.2	76.0	22.8
928.2	H / S	1.00	0	46.2	77.4	31.2

## Notes

- 1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
- 2) Measurements above 1 GHz were made at 1 meters of separation from the EUT, and at 0.3 m separation for frequencies between 18 – 25 GHz.
- 3) Measurement at receiver system noise floor.
- 4) For measurements of the fundamental power, because of spectral bandwidth, the receiver was set to RBW=VBW=1 MHz.

Prepared For: Rauland-Borg Corporation	Model #: WWU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 14 of 53</b>

## **RADIATED EMISSIONS DATA CHART “WWU”**

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on the Low Channel:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
904	H / S	1.00	0	96.0	125.0	29.0
1808	H / H	1.00	250	54.7	76.0	21.3
2712	V / H	1.05	180	54.1	63.5	9.4
3616				Note 3		
4520				Note 3		
5424				Note 3		
6328				Note 3		
7232				Note 3		
8136				Note 3		
9040				Note 3		

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Mid Channel:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
915	H / S	1.00	350	94.9	125.0	30.1
1830	H / H	1.00	260	54.1	74.9	20.8
2745	V / H	1.10	180	51.3	63.5	12.2
3660				Note 3		
4575				Note 3		
5490				Note 3		
6405				Note 3		
7320				Note 3		
8235				Note 3		
9150				Note 3		

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on High Channel:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
926	H / S	1.00	0	97.4	125.0	27.6
1852	H / H	1.00	260	53.2	77.4	24.2
2778	V / H	1.00	180	50.6	63.5	12.9
3704				Note 3		
4630				Note 3		
5556				Note 3		
6482				Note 3		
7408				Note 3		
8334				Note 3		
9260				Note 3		

## 5.6

**RADIATED EMISSIONS DATA CHART**

3 Meter Measurements of Electromagnetic Radiated Emissions

Test Standard: 47CFR, Part 15.205 and 15.247(DTS)

Frequency Range Inspected: 30 MHz to 10000 MHz

**“WBU”**

Manufacturer:	Rauland-Borg Corporation				
Date(s) of Test:	September 11 <sup>th</sup> through October 6 <sup>th</sup> , 2006				
Test Engineer(s):	Abtin Spantman				
Voltage:	WBU=4.5 VDC				
Operation Mode:	Continuous transmit, modulated				
Environmental Conditions in the Lab:	Temperature: 22° C Relative Humidity: 44%				
EUT Power:		Single Phase	VAC		3 Phase VAC
	√	Battery			Other:
EUT Placement:	√	80cm non-conductive table			10cm Spacers
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber			3/10m OATS
Measurements:		Pre-Compliance		Preliminary	√ Final
Detectors Used:		Peak	√	Quasi-Peak	√ Average

The following table depicts the level of significant spurious radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
481.1	H / H	1.00	100	27.8	84.5	56.7
901.8	H / H	1.00	100	62.0	84.5	22.5
928.2	H / H	1.00	105	56.0	84.6	28.6

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 16 of 53</b>



## **RADIATED EMISSIONS DATA CHART “WBU”**

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on the Low Channel:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
904	H / H	1.00	90	104.5	125.0	20.5
1808	V / S	1.00	250	57.1	84.5	27.4
2712	V / V	1.00	120	51.4	63.5	12.1
3616				Note 3		
4520				Note 3		
5424				Note 3		
6328				Note 3		
7232				Note 3		
8136				Note 3		
9040				Note 3		

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Mid Channel:

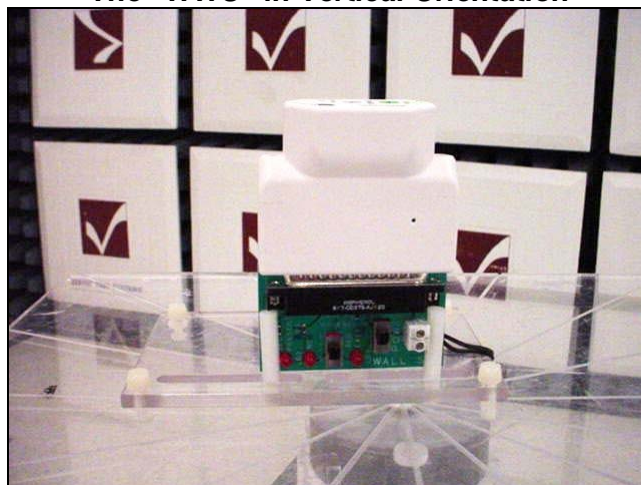
Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
915	H / H	1.00	95	103.2	125.0	21.8
1830	V / S	1.00	260	48.6	83.2	34.6
2745	V / V	1.00	120	51.8	63.5	11.7
3660				Note 3		
4575				Note 3		
5490				Note 3		
6405				Note 3		
7320				Note 3		
8235				Note 3		
9150				Note 3		

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on High Channel:

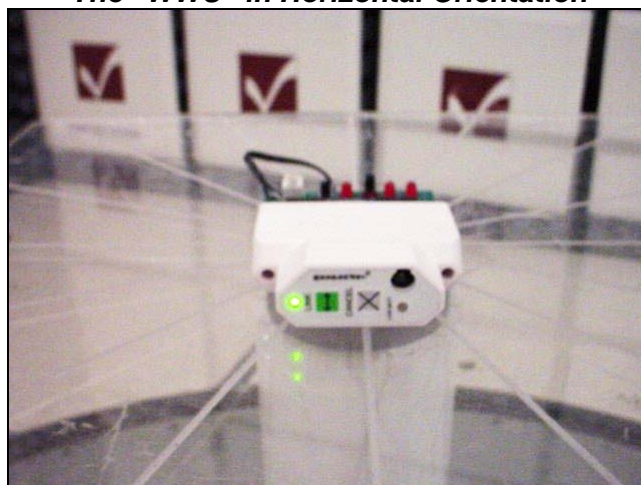
Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	15.247 Limit (dBμV/m)	Margin (dB)
926	H / H	1.00	105	104.6	125.0	20.4
1852	V / S	1.00	255	53.1	84.6	31.5
2778	V / V	1.00	120	53.1	63.5	10.4
3704				Note 3		
4630				Note 3		
5556				Note 3		
6482				Note 3		
7408				Note 3		
8334				Note 3		
9260				Note 3		

## 5.7 Test Setup Photo(s) – Radiated Emissions Test

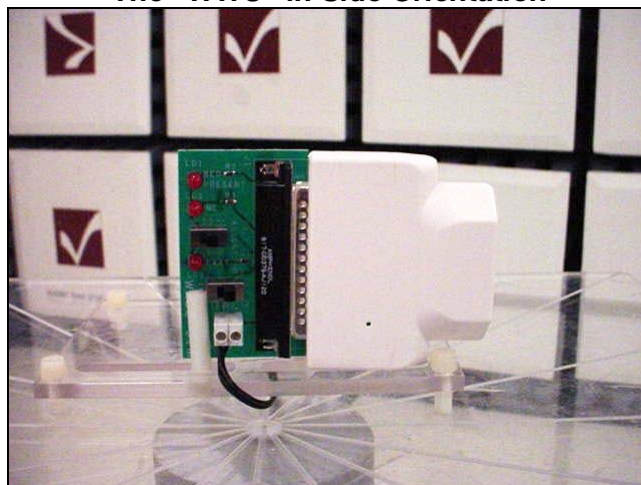
*The “WWU” in Vertical Orientation*



*The “WWU” in Horizontal Orientation*

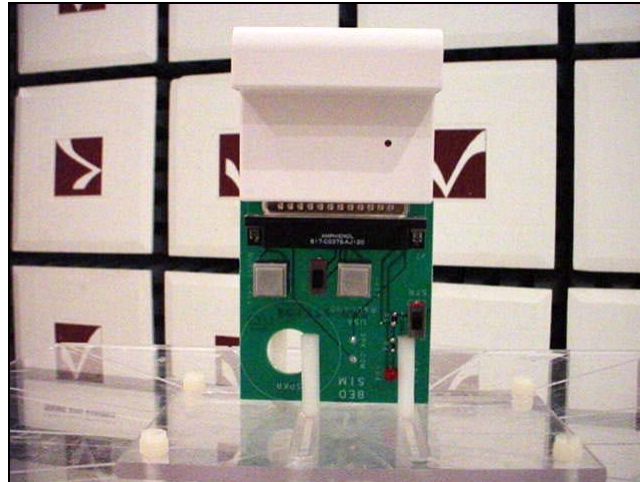


*The “WWU” in Side Orientation*



Prepared For: Rauland-Borg Corporation	Model #: WWU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 18 of 53

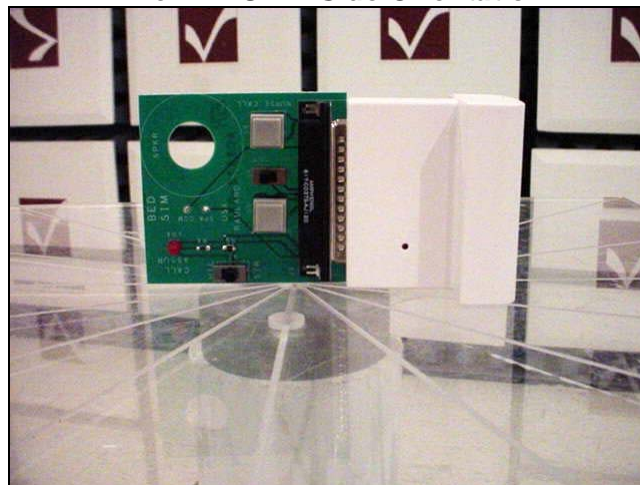
***The “WBU” in Vertical Orientation***



***The “WBU” in Horizontal Orientation***

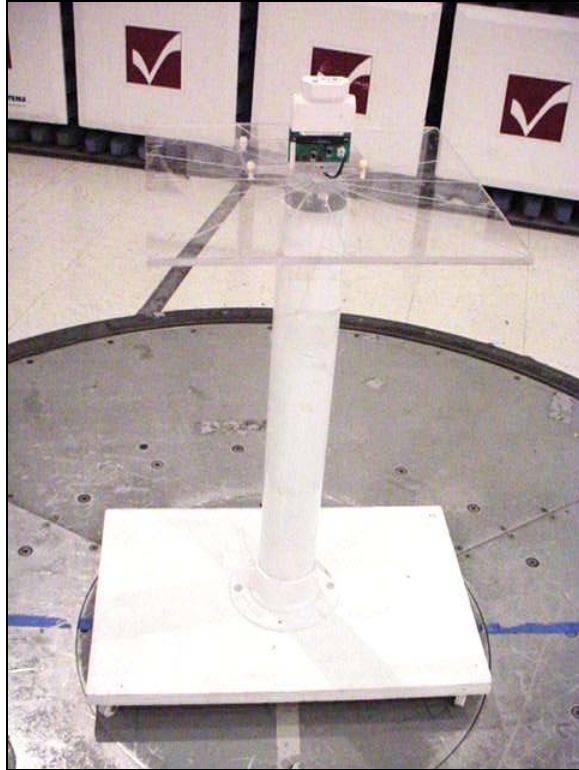


***The “WBU” in Side Orientation***



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 19 of 53</b>

***Typical EUT placement on the Test Pedestal***



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 20 of 53</b>

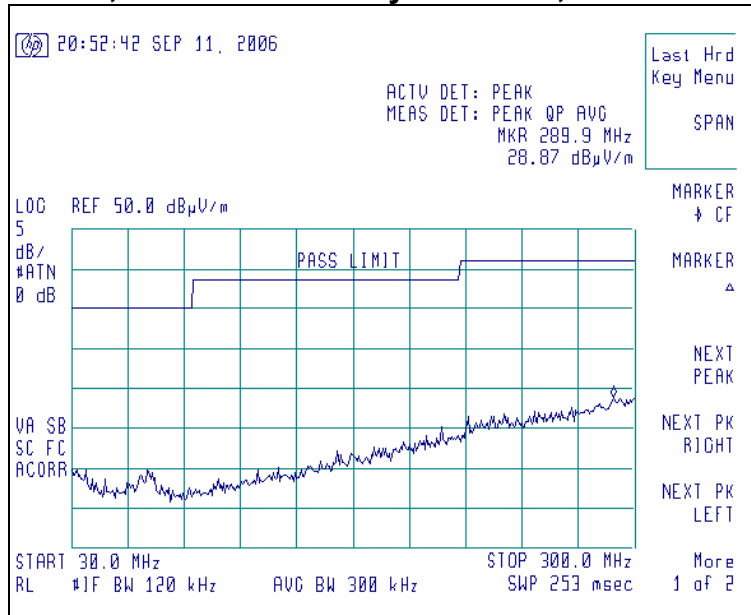
## 5.8 Screen Captures - Radiated Emissions Testing

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

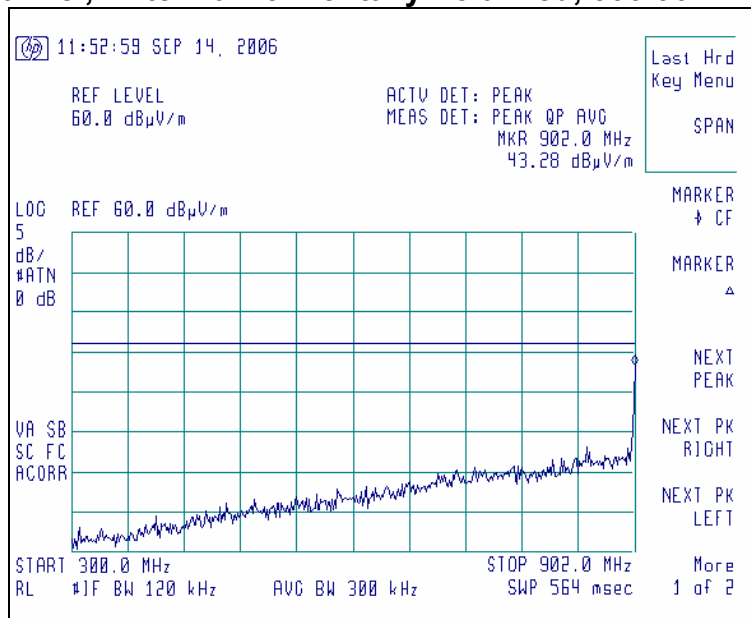
The signature scans shown here are from worst-case emissions, as measured on Low, Mid and High channels, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

### “WWU”

#### Mid Channel, Antenna Vertically Polarized, 30-300 MHz, at 3m



#### Low Channel, Antenna Horizontally Polarized, 300-902 MHz, at 3m

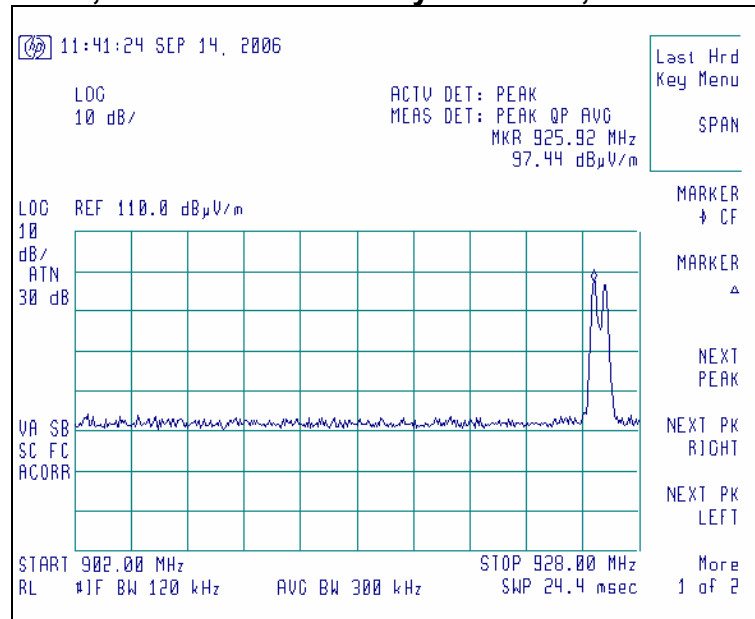


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 21 of 53

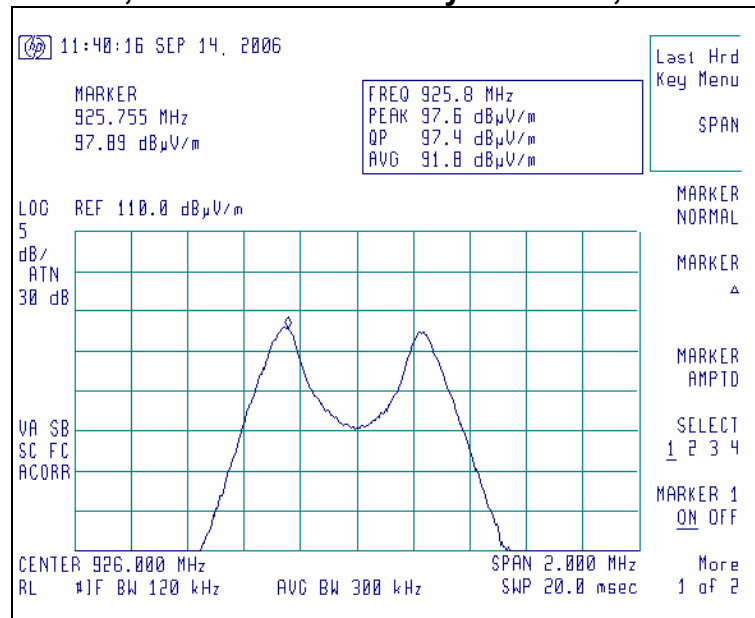
## Screen Captures - Radiated Emissions Testing (continued)

“WWU”

High Channel, Antenna Horizontally Polarized, 902-928 MHz, at 3m



High Channel, Antenna Horizontally Polarized, 926 MHz, at 3m



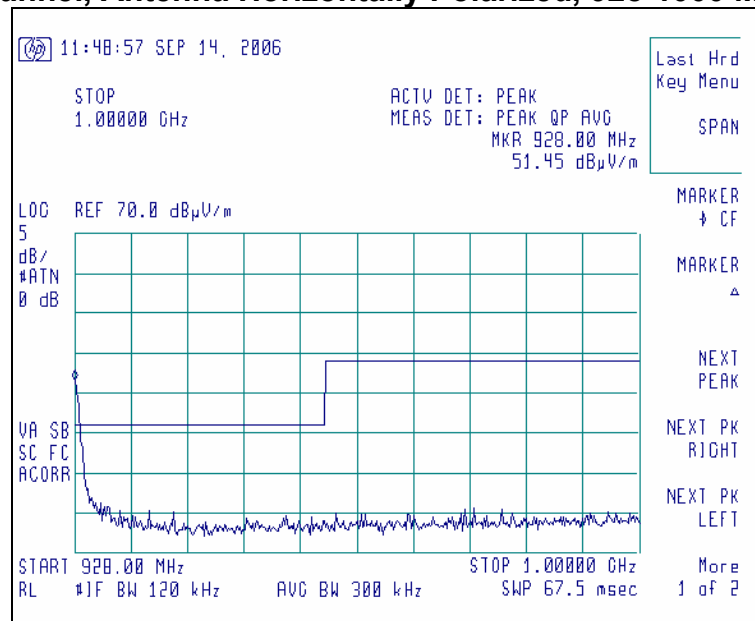
Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 22 of 53



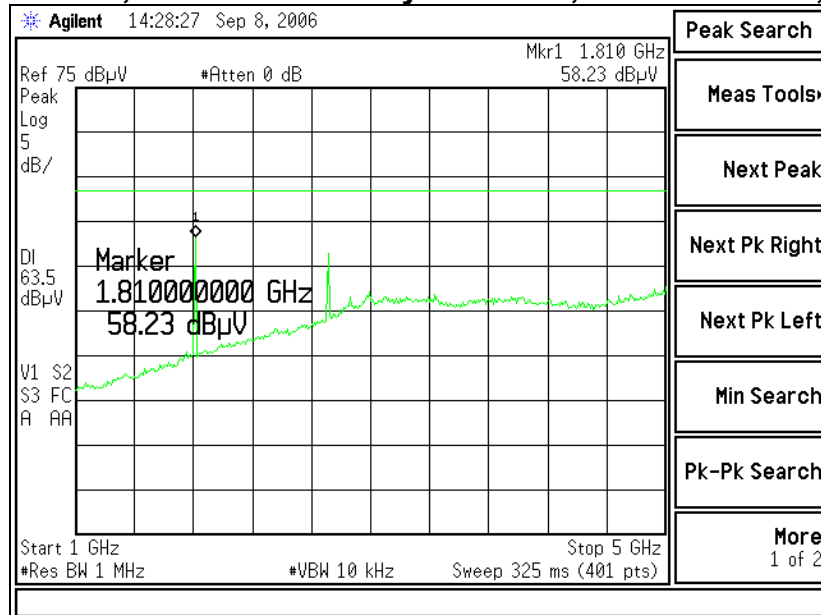
## Screen Captures - Radiated Emissions Testing (continued)

“WWU”

High Channel, Antenna Horizontally Polarized, 928-1000 MHz, at 3m



Low Channel, Antenna Vertically Polarized, 1000-5000 MHz, at 1m

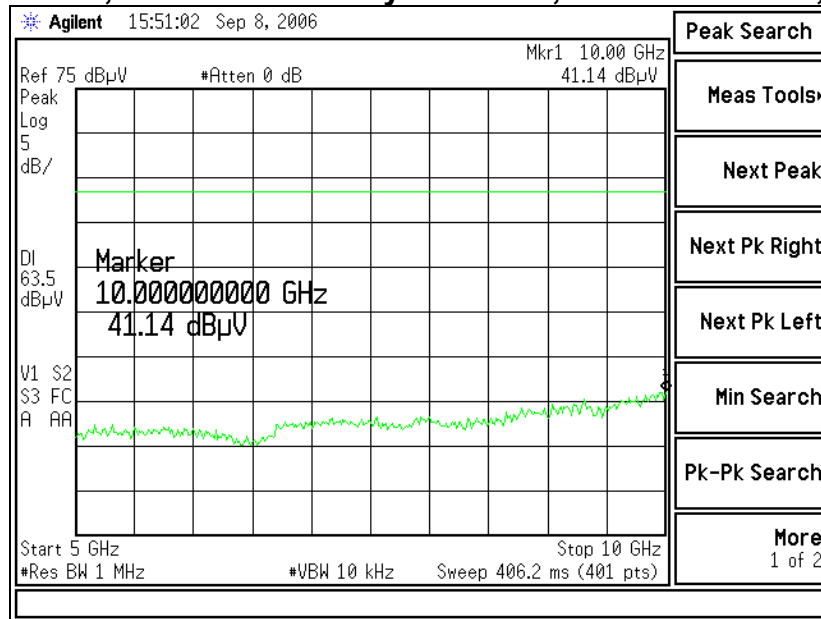


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 23 of 53

## Screen Captures - Radiated Emissions Testing (continued)

“WWU”

Mid Channel, Antenna Vertically Polarized, 5000-10000 MHz, at 1m.

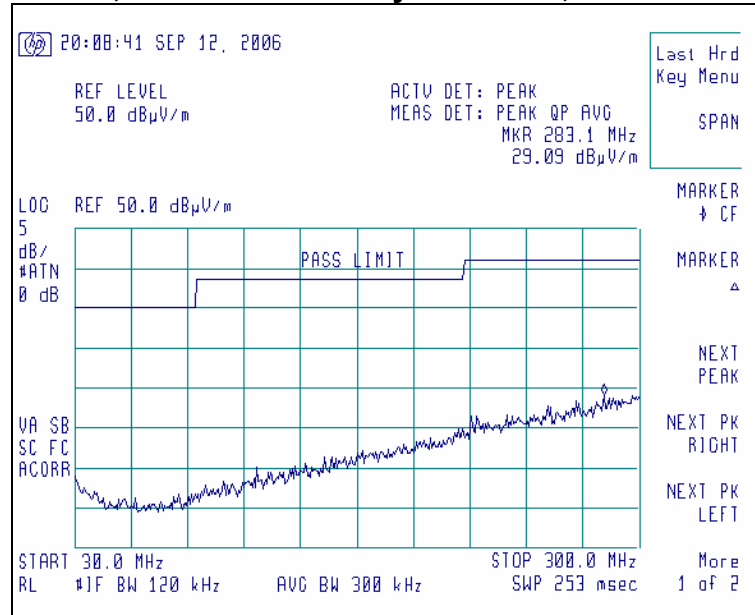


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 24 of 53

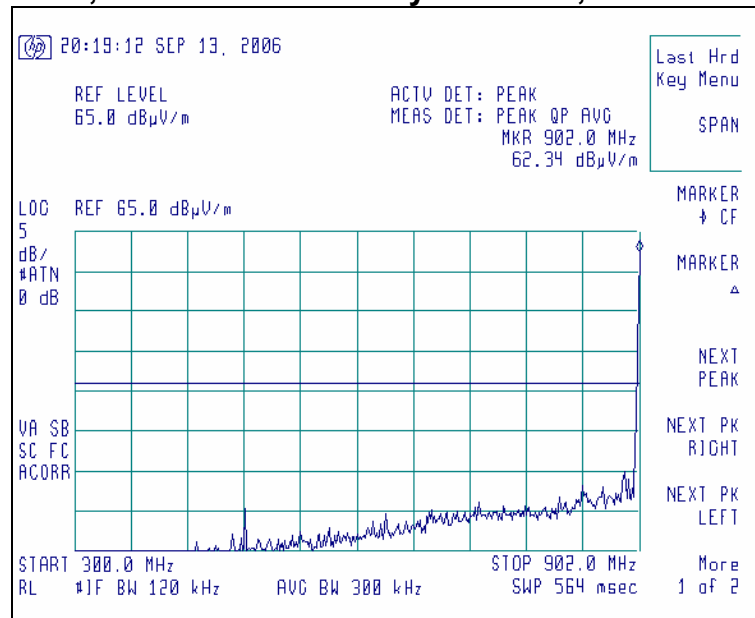


## “WBU”

### Mid Channel, Antenna Vertically Polarized, 30-300 MHz, at 3m



### Low Channel, Antenna Horizontally Polarized, 300-902 MHz, at 3m

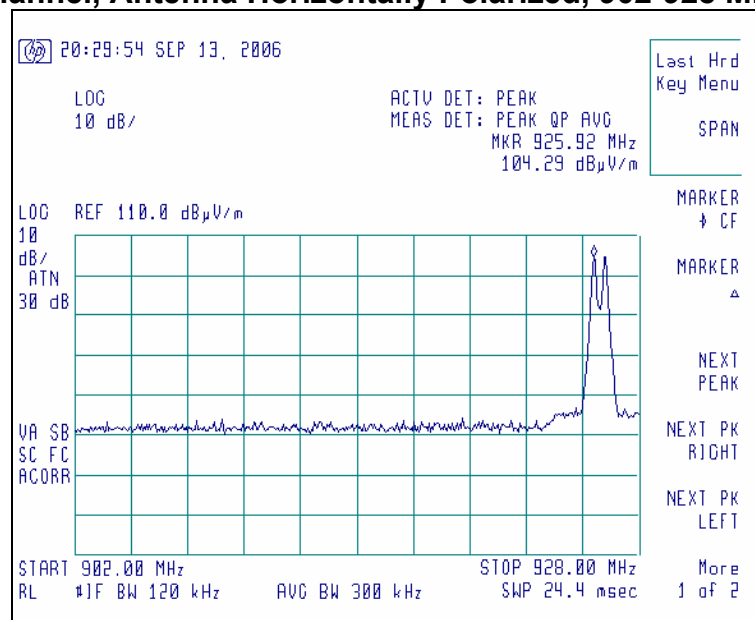


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 25 of 53

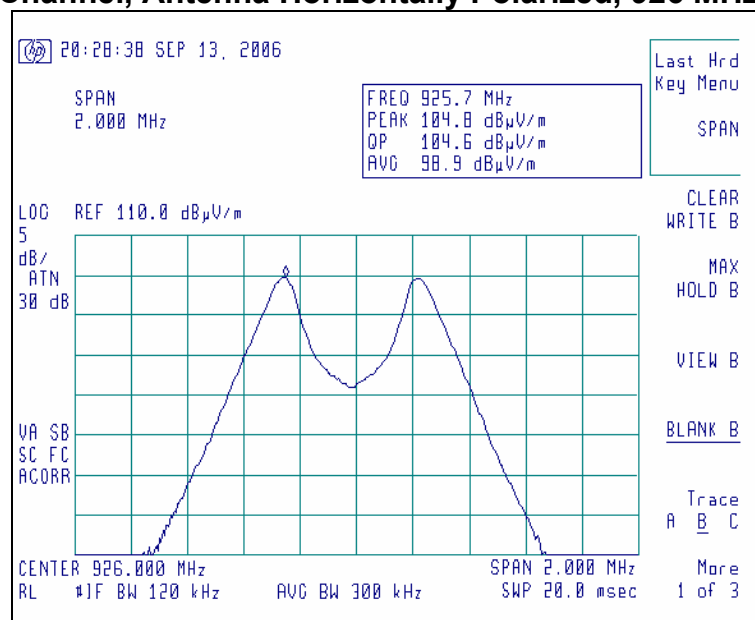
## Screen Captures - Radiated Emissions Testing (continued)

**“WBU”**

**High Channel, Antenna Horizontally Polarized, 902-928 MHz, at 3m**



**High Channel, Antenna Horizontally Polarized, 926 MHz, at 3m**

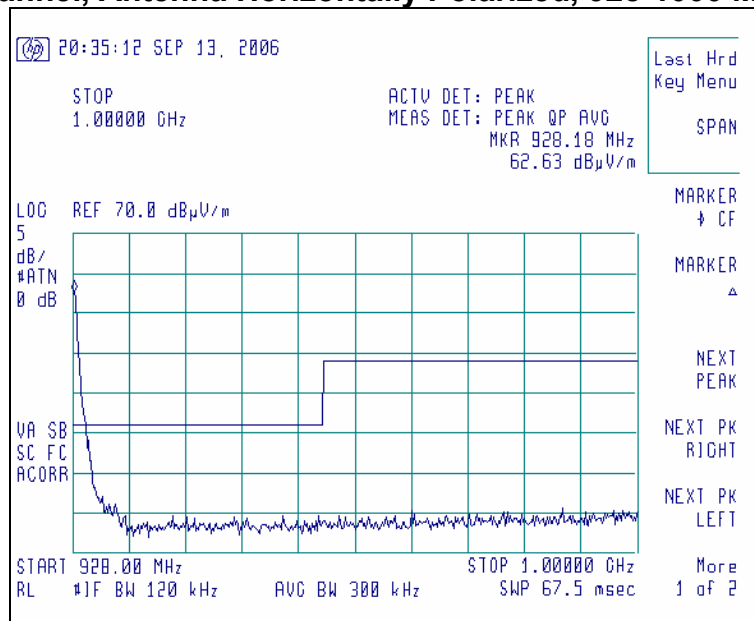


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 26 of 53

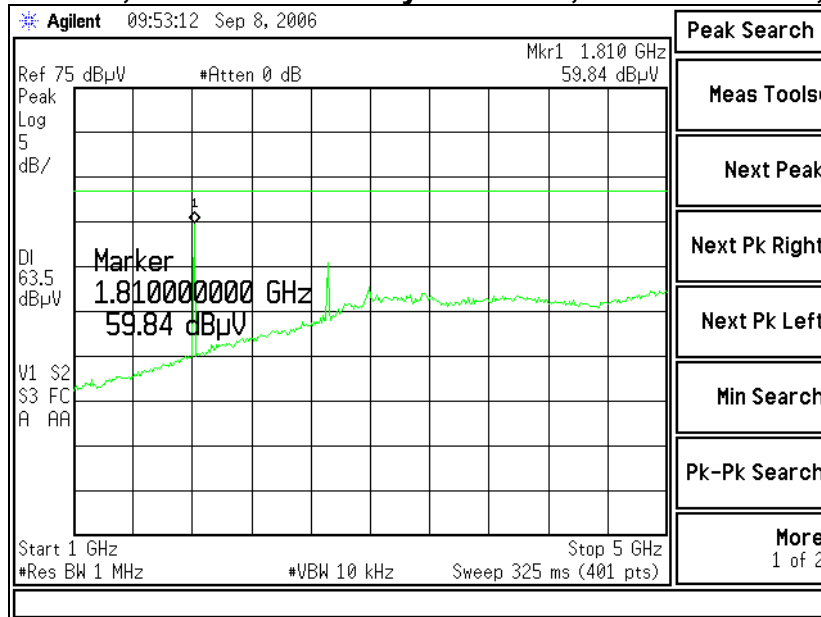
## Screen Captures - Radiated Emissions Testing (continued)

“WBU”

High Channel, Antenna Horizontally Polarized, 928-1000 MHz, at 3m



Low Channel, Antenna Vertically Polarized, 1000-5000 MHz, at 1m

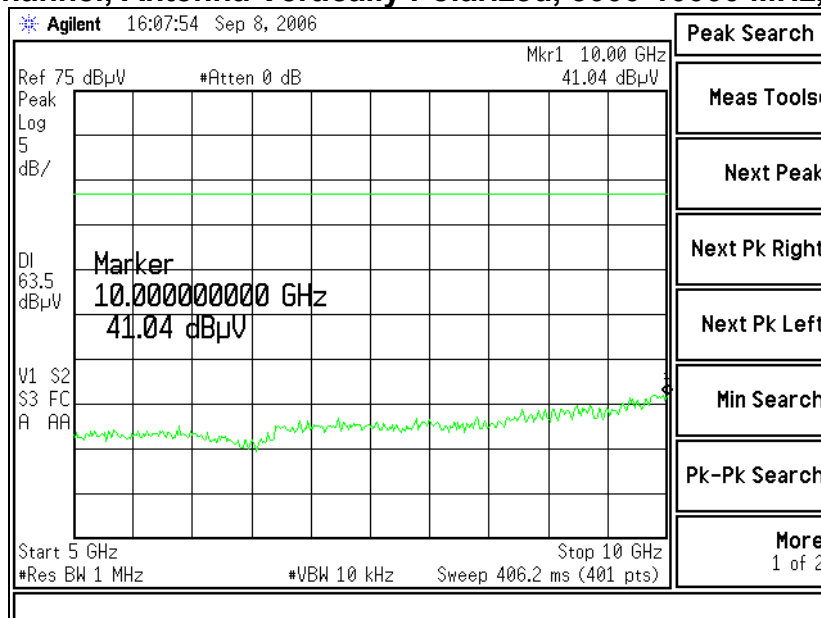


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 27 of 53

## Screen Captures - Radiated Emissions Testing (continued)

**“WBU”**

**Mid Channel, Antenna Vertically Polarized, 5000-10000 MHz, at 1m.**



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 28 of 53

## EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE: 15.207

### 6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4-2003 and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210, Issue 6). The EUT ("WWU") was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50 $\Omega$  (ohm), 50/250  $\mu$ H Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided via an appropriate broadband EMI Filter, and then to the LISN line input. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMCO LISN used has the ability to terminate the unused port with a 50 $\Omega$  (ohm) load when switched to either L1 (line) or L2 (neutral).

### 6.2 Test Procedure

The EUT was investigated in continuous modulated transmit mode for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (2003), Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

### Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

### 6.3 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	HP	8546A	3617A00320
LISN	EMCO	3816/2NM	9701-1057
Transient Limiter	HP	119474A	3107A01708

### Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 29 of 53

#### 6.4 FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBμV)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

## 6.5

### TEST DATA CHART CONDUCTED EMISSION

Frequency Range Inspected: 150 KHz to 30 MHz

Test Standard: FCC 15.207 Class B

#### “WWU”

Manufacturer:	Rauland-Borg Corporation				
Date(s) of Test:	September 11 <sup>th</sup> through October 6 <sup>th</sup> , 2006				
Test Engineer:	Abtin Spantman				
Model #:	Wireless Wall Unit (WWU)				
Serial #:	Pre-Production Engineering Samples				
Voltage:	12.0 VDC as derived from a wall step-down transformer				
Operation Mode:	Normal, and continuous transmit, modulated modes				
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %				
Test Location:					Chamber
EUT Placed On:	√	40cm from Vertical Ground Plane			10cm Spacers
	√	80cm above Ground Plane			Other:
Measurements:		Pre-Compliance		Preliminary	√ Final
Detectors Used:		Peak	√	Quasi-Peak	√ Average

#### “WWU”

Frequency (MHz)	Line	QUASI-PEAK			AVERAGE		
		Q-Peak Reading (dBμV)	Q-Peak Limit (dBμV)	Quasi-Peak Margin (dB)	Average Reading (dBμV)	Average Limit (dBμV)	Average Margin (dB)
0.200	L1	37.0	63.6	26.6	23.7	53.6	29.9
0.268	L1	30.8	61.2	30.4	19.8	51.2	31.4
0.536	L1	33.6	56.0	22.4	28.4	46.0	17.6
0.603	L1	35.5	56.0	20.5	32.9	46.0	13.1
1.475	L1	28.0	56.0	28.0	25.9	46.0	20.1
0.200	L2	38.7	63.6	24.9	27.9	53.6	25.7
0.334	L2	30.7	59.4	28.7	28.0	49.4	21.4
0.535	L2	36.2	56.0	19.8	32.5	46.0	13.5
0.602	L2	32.8	56.0	23.2	28.6	46.0	17.4
1.407	L2	27.0	56.0	29.0	24.5	46.0	21.5

#### Notes:

- 1) All other emissions were better than 20 dB below the limits.
- 2) The EUT exhibited similar emissions in transmit and receive modes, and across the Low, Middle and High channels tested.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 31 of 53

## 6.6 Test Setup Photo(s) – Conducted Emissions Test



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 32 of 53</b>

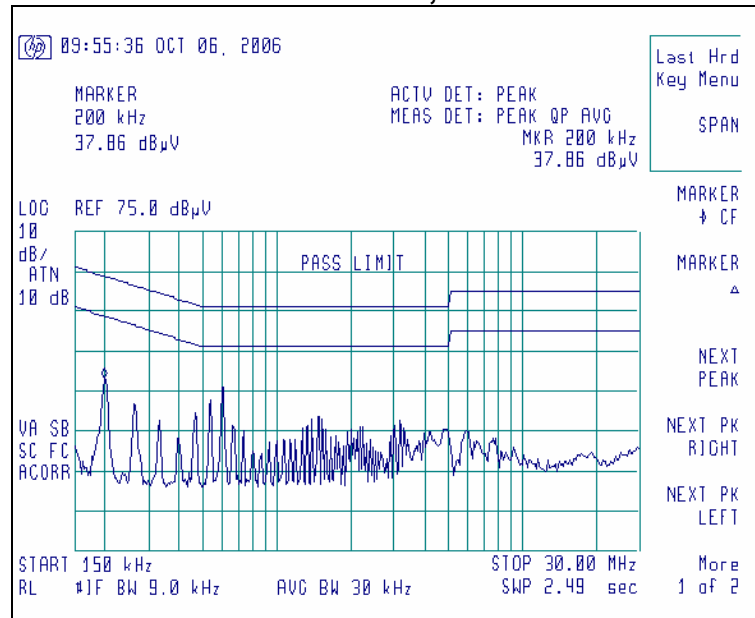


## 6.7 Screen Captures – Conducted Emissions Test

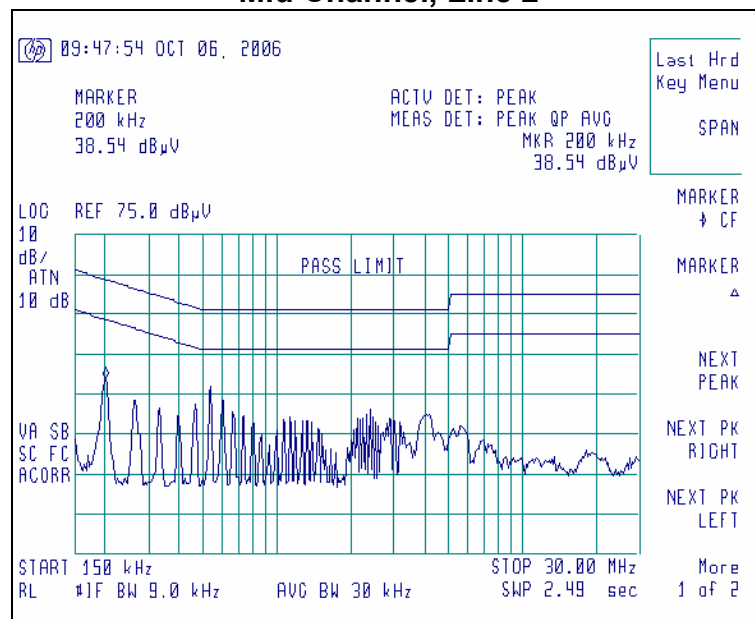
These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207.

The signature scans shown here are from the Mid channel, chosen as being a good representative of the channels.

**Mid Channel, Line 1**



**Mid Channel, Line 2**



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 33 of 53

## EXHIBIT 7. OCCUPIED BANDWIDTH: 15.247(a)(2)

### 7.1 Limits

For a Digital Modulation System, the -6 dBc bandwidth shall be at least 500 kHz.

### 7.2 Method of Measurements

Refer to ANSI C63.4 and FCC Procedures (March 23, 2005) for Digital Transmission Systems operating under 15.247.

The bandwidth requirement found in FCC Part 15.247(a)(2) requires a minimum -6 dBc occupied bandwidth of 500 kHz. For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to the HP E4407B spectrum analyzer. The loss from the cable was added on the analyzer as correction factor, thereby allowing direct measurements, without the need for any further corrections. A Hewlett Packard model E4407B spectrum analyzer was used with the resolution bandwidth set to 30 kHz for this portion of the tests. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used in peak-hold mode while measurements were made, as presented in the chart below.

From this data, the closest measurement when compared to the specified limit, is 560 kHz, which is above the minimum of 500 kHz.

### Test Data

#### “WWU”

Channel	Center Frequency (MHz)	Measured -6 dBc Occ. BW (kHz)	Minimum -6 dBc Limit (kHz)	Measured -20 dBc Occ.Bw (kHz)
Low	904	560	500	690
Mid	915	560	500	690
High	926	560	500	690

#### “WBU”

Channel	Center Frequency (MHz)	Measured -6 dBc Occ. BW (kHz)	Minimum -6 dBc Limit (kHz)	Measured -20 dBc Occ.Bw (kHz)
Low	904	560	500	690
Mid	915	560	500	690
High	926	560	500	690

### 7.3 Test Equipment List

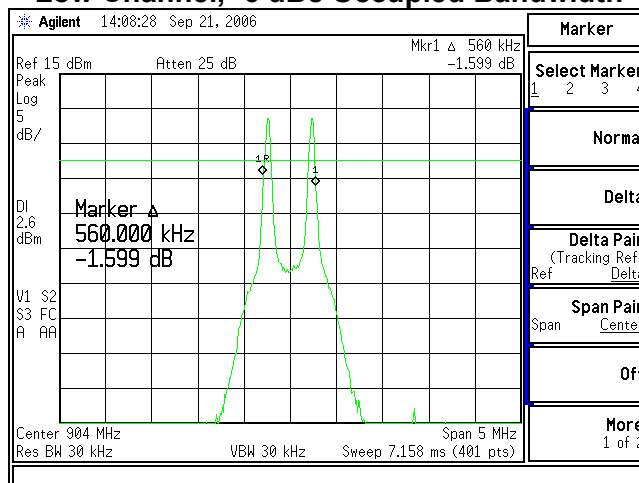
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256

Prepared For: Rauland-Borg Corporation	Model #: WWU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 34 of 53

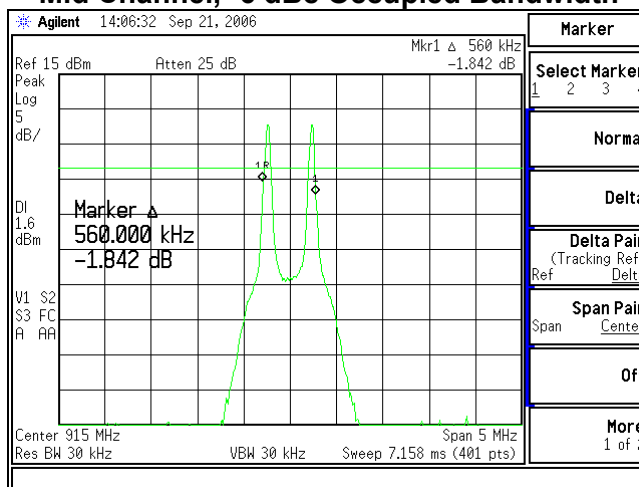
## 7.4 Screen Captures - OCCUPIED BANDWIDTH

**"WVU"**

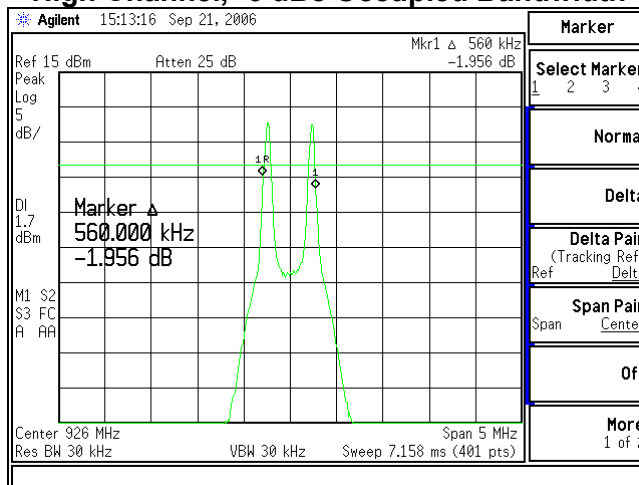
### Low Channel, -6 dBc Occupied Bandwidth



### Mid Channel, -6 dBc Occupied Bandwidth



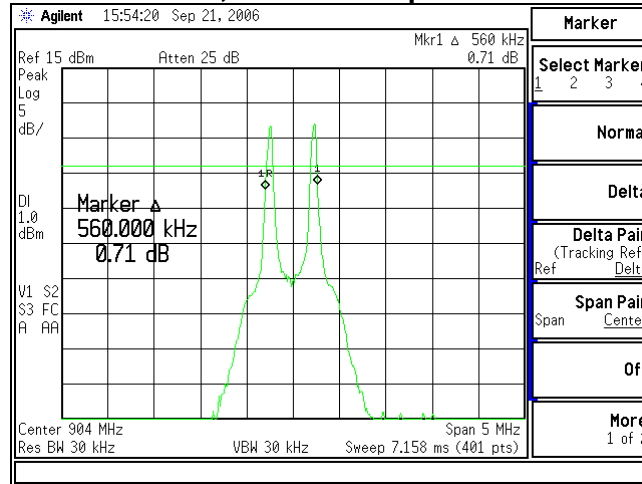
### High Channel, -6 dBc Occupied Bandwidth



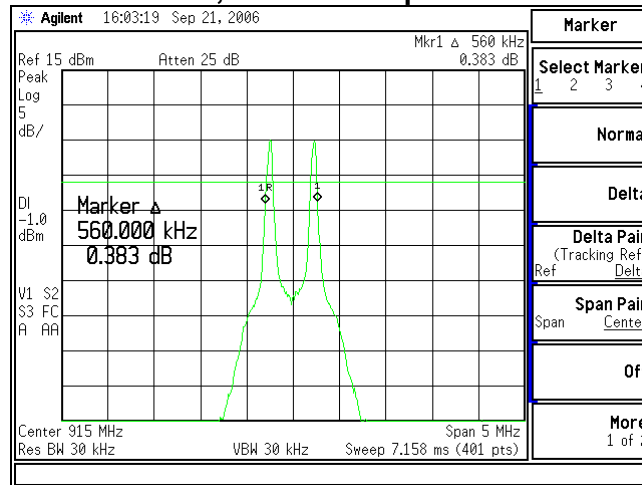
Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 35 of 53

## “WBU”

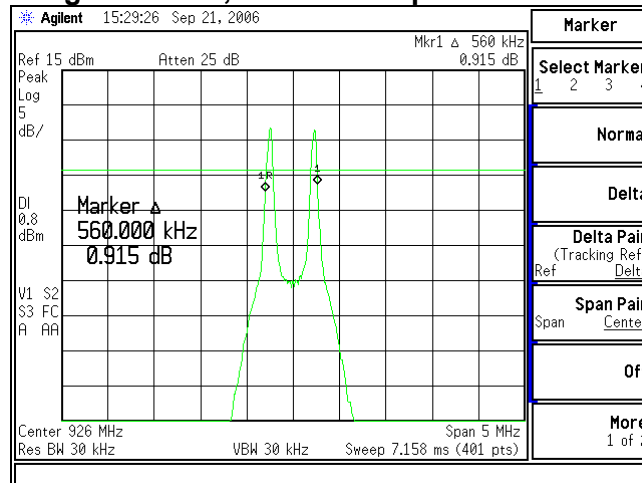
### Low Channel, -6 dBc Occupied Bandwidth



### Mid Channel, -6 dBc Occupied Bandwidth



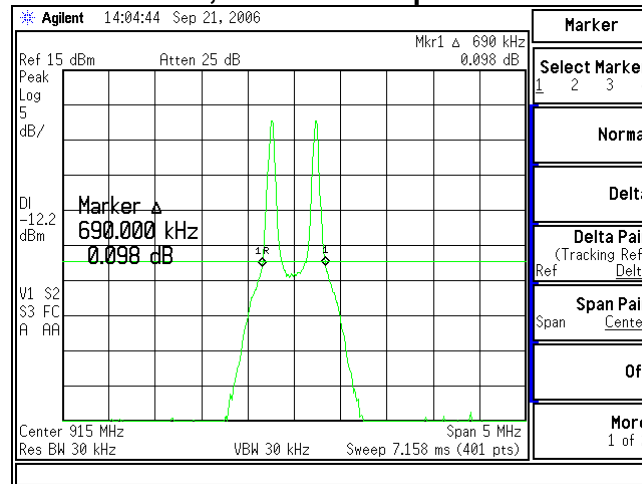
### High Channel, -6 dBc Occupied Bandwidth



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 36 of 53

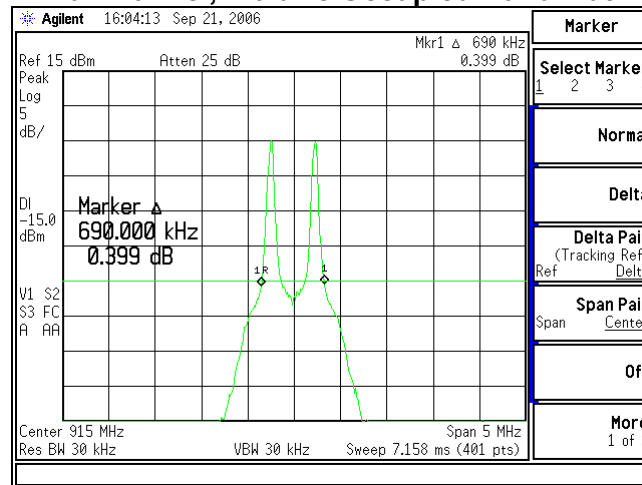
## “WWU”

### Mid Channel, -20 dBc Occupied Bandwidth



## “WBU”

### Mid Channel, -20 dBc Occupied Bandwidth



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 37 of 53

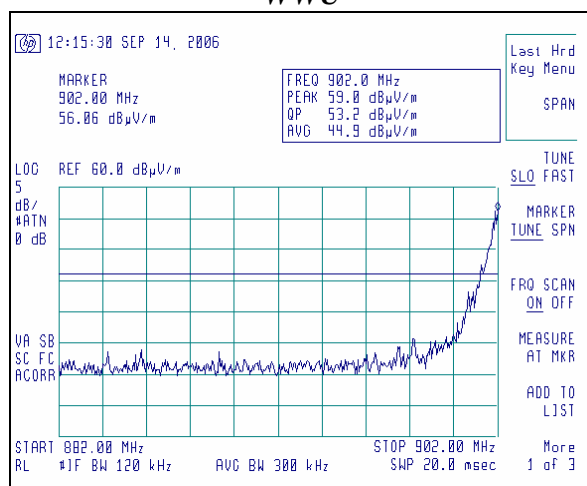
## EXHIBIT 8.BAND-EDGE MEASUREMENTS

### 8.1 Method of Measurements

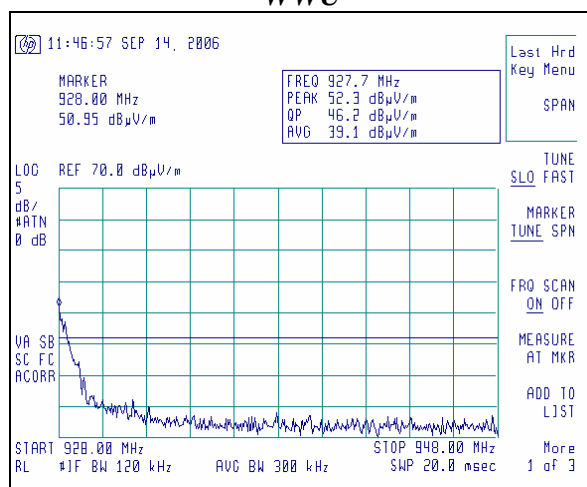
FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. The following screen captures demonstrate compliance of the intentional radiator at the 902-928 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source. The EUT was operated at the lowest channel for the investigation of the lower Band-Edge, and at the highest channel for the investigation of the higher Band-Edge.

*The Lower and Upper Band-Edge limit, in this case, would be -20 dBc.*

*Screen Capture Demonstrating Compliance at the Lower Band-Edge  
“WWU”*

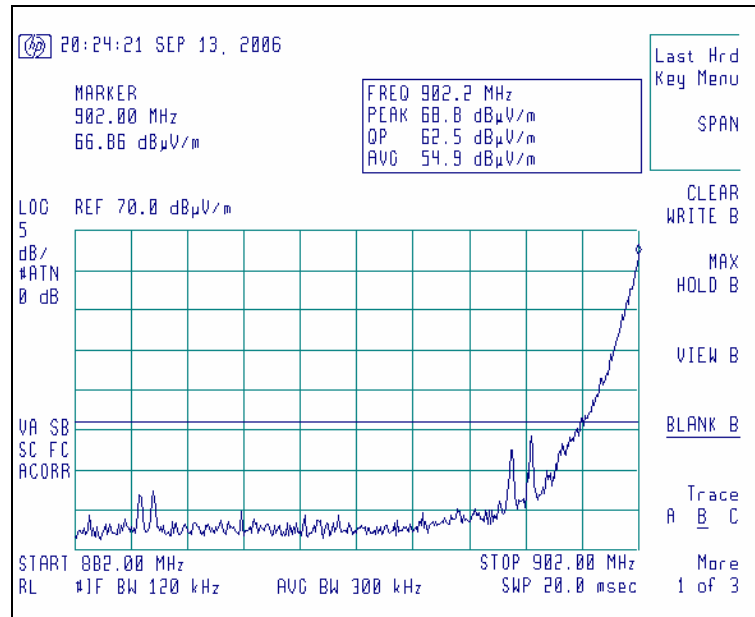


*Screen Capture Demonstrating Compliance at the Higher Band-Edge  
“WWU”*

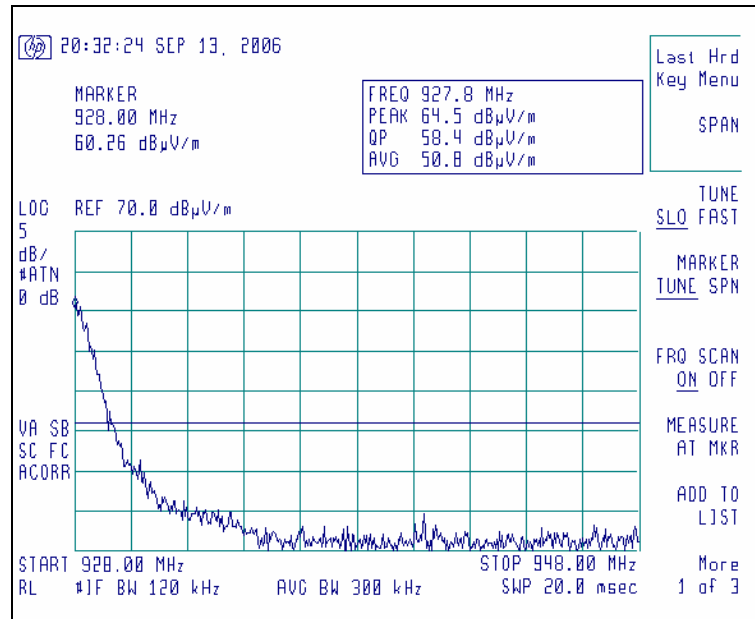


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 38 of 53

**Screen Capture Demonstrating Compliance at the Lower Band-Edge  
“WBU”**



**Screen Capture Demonstrating Compliance at the Higher Band-Edge  
“WBU”**



## EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

### 9.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable connected to the spectrum analyzer. The loss from the cable was added on the analyzer as a correction factor, there by allowing direct measurements without the need for any further corrections. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with resolution and video bandwidths set to 1 MHz, and a span of 10 MHz, with measurements from a peak detector presented in the chart below.

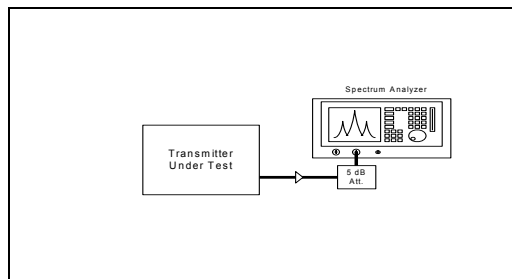
### 9.2 Test Data

#### “WWU”

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
Low	904	+ 30.0	+ 8.5	21.5
Mid	915	+ 30.0	+ 7.6	22.4
High	926	+ 30.0	+ 7.5	22.5

#### “WBU”

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
Low	904	+ 30.0	+ 6.8	23.2
Mid	915	+ 30.0	+ 4.6	25.4
High	926	+ 30.0	+ 6.4	23.6



**Measured Conducted RF power output (in watts):** “WWU”=0.0071 Watts ; “WBU”=0.0048 Watts

**Measured Radiated RF Power Output (in Watts):** “WWU”=0.0017 Watts ; “WBU”=0.0086 Watts

**Declared RF Power Output (in Watts):** “WWU”=0.0100 Watts ; “WBU”=0.0100 Watts

### 9.3 Test Equipment List

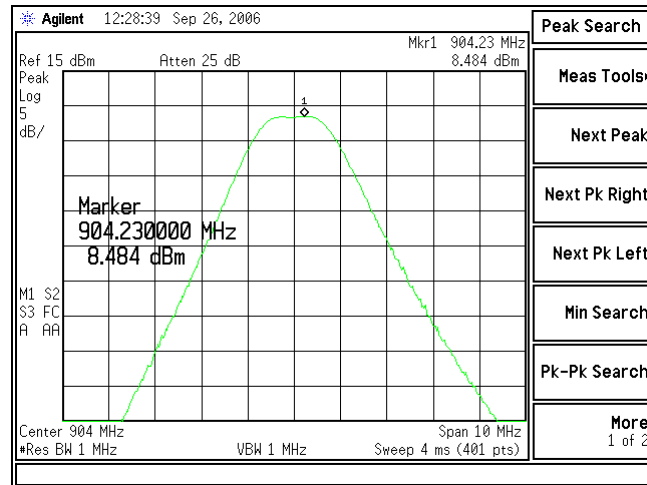
Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 40 of 53

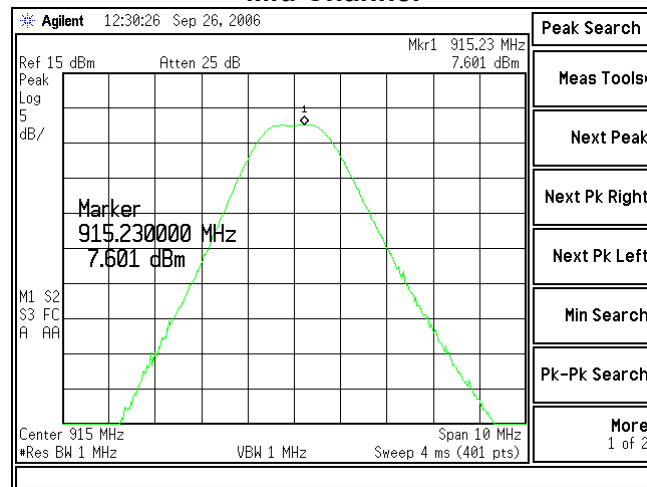


## 9.4 Screen Captures – Power Output (Conducted)

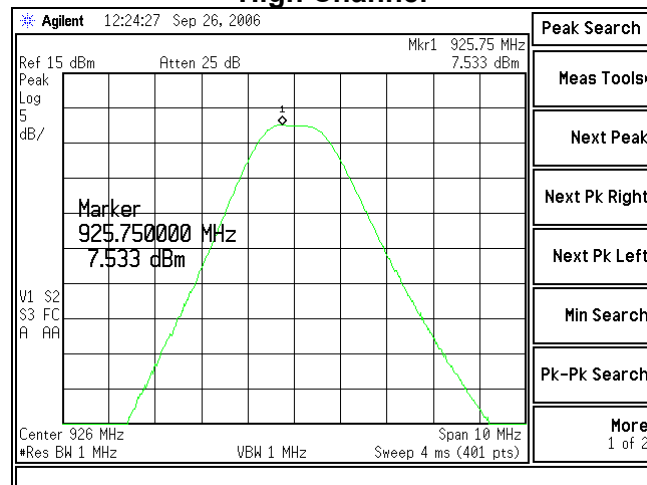
### “WWU” Low Channel



### Mid Channel

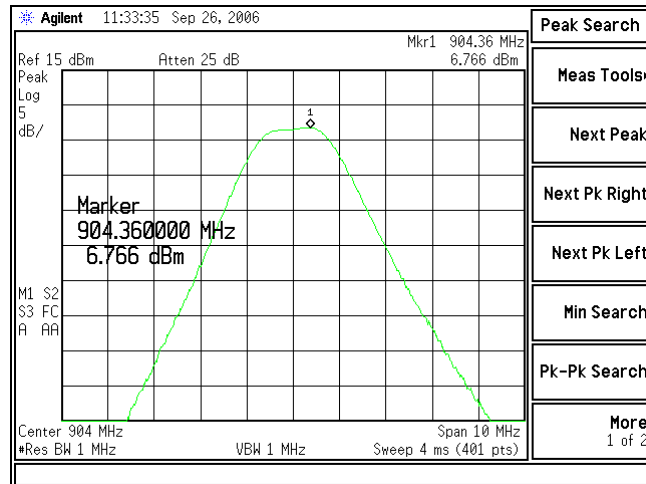


### High Channel

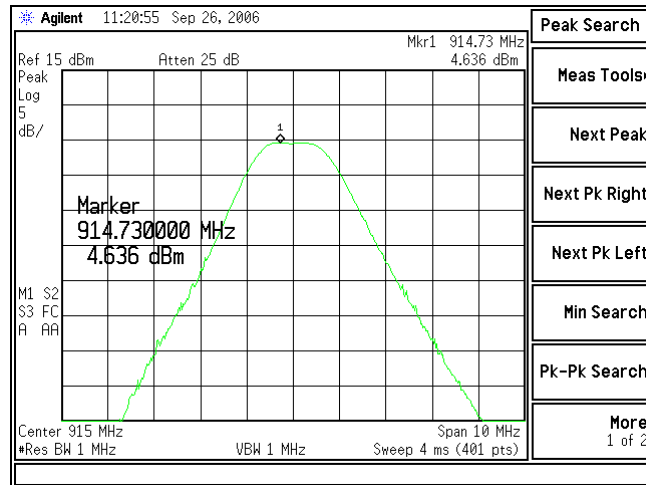


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 41 of 53

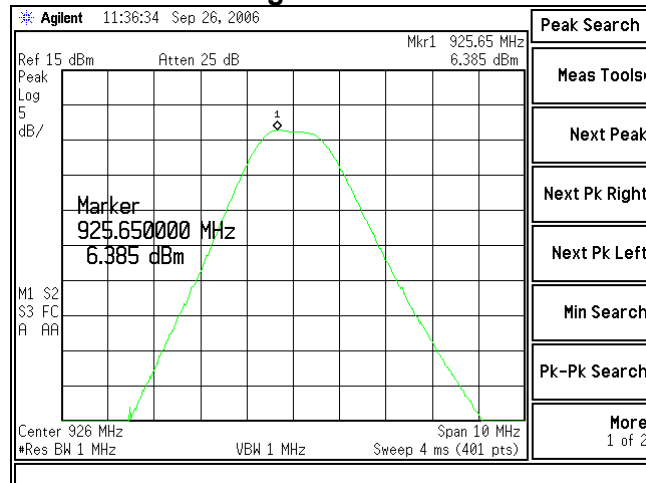
## “WBU” Low Channel



## Mid Channel



## High Channel



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 42 of 53

## EXHIBIT 10. SPECTRAL POWER DENSITY: 15.247(e)

### 10.1 Limits

In accordance with FCC Part 15.247(e), for digitally modulate systems, the peak spectral power density should not exceed +8 dBm in any 3 kHz band. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed. The highest spectral power density was found to be no greater than 4.7 dBm, which is under the allowable limit by 3.3 dB.

### 10.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256

### 10.3 Test Data

#### “WWU”

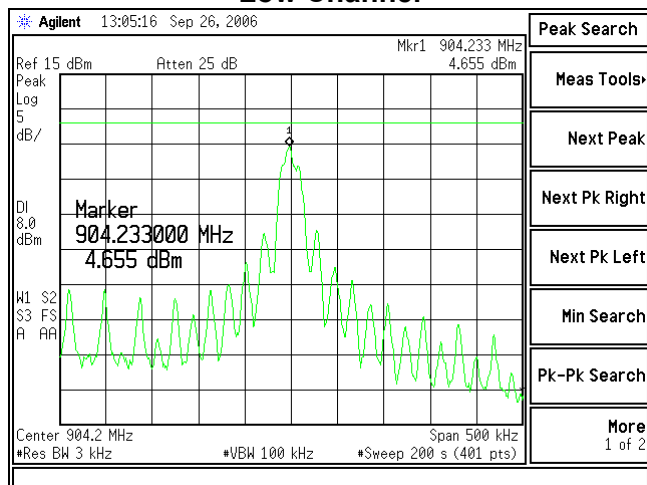
Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)
Low	904	+ 4.7	+ 8.0	3.3
Mid	915	+ 4.7	+ 8.0	3.3
High	926	+ 4.6	+ 8.0	3.4

#### “WBU”

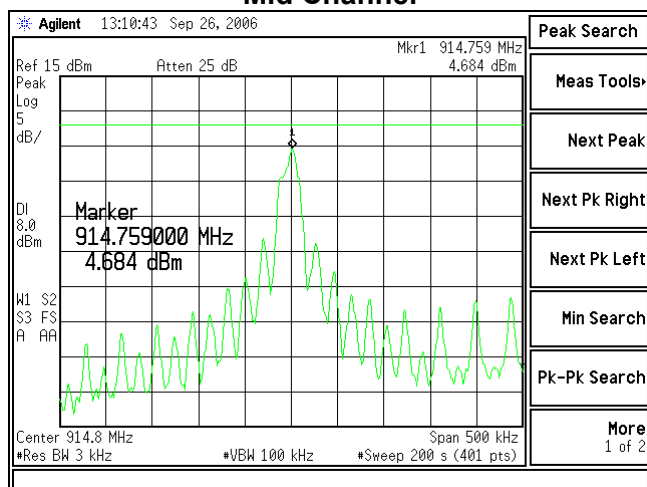
Transmitter Channel	Frequency (MHz)	RF Power Level In 3 kHz BW (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)
Low	904	+ 4.0	+ 8.0	4.0
Mid	915	+ 2.1	+ 8.0	5.9
High	926	+ 3.9	+ 8.0	4.1

## 10.4 Screen Captures – Power Spectral Density

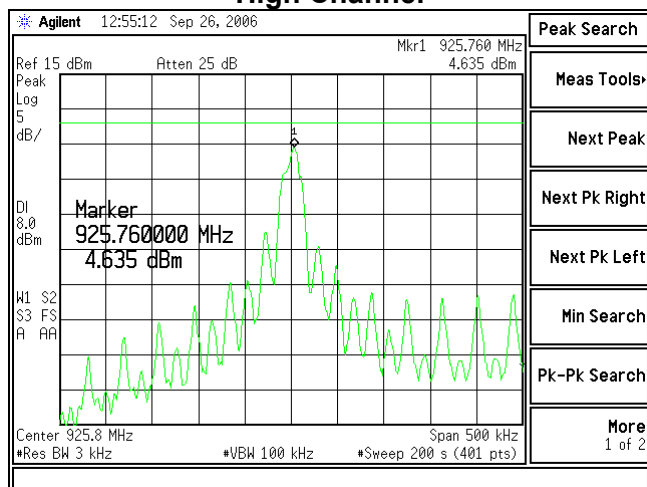
### “WVU” Low Channel



### Mid Channel

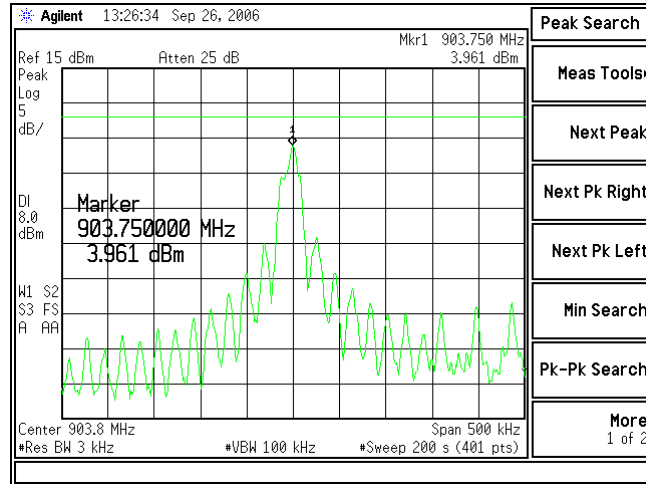


### High Channel

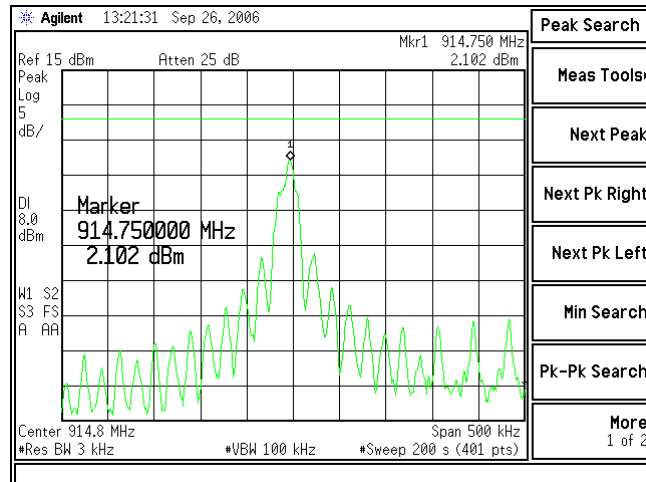


Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 44 of 53

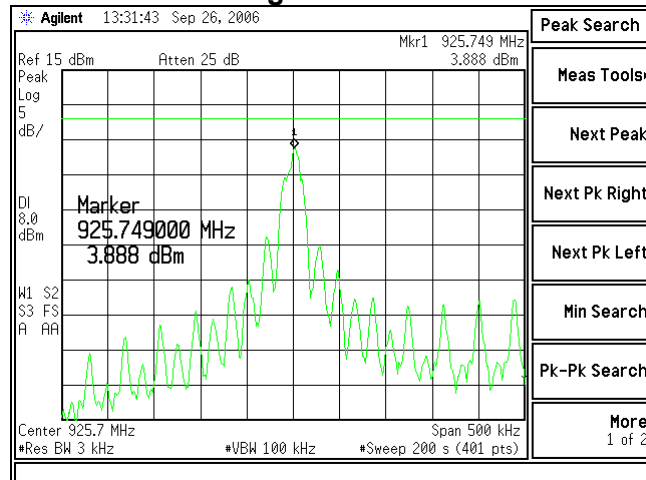
## “WBU” Low Channel



## Mid Channel



## High Channel



## EXHIBIT 11. SPURIOUS RADIATED EMISSIONS: 15.247(d)

### 11.1 Limits

FCC Part 15.247(d) requires a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable connected to the spectrum analyzer. The loss from the cable was added on to the analyzer as a correction factor, thereby allowing direct readings of the measurements made without the need for any further corrections. A Hewlett Packard model E4407B spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within -40 dBc of the fundamental level for this product.

### 11.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4407B	US39160256

### 11.3 Test Data

#### “WWU”

	Low Channel	Mid Channel	High Channel
Fundamental	+ 8.35 (dBm)	+ 7.5 (dBm)	+ 7.4 (dBm)
2 <sup>nd</sup> Harmonic	- 36.7 (dBm)	- 42.3 (dBm)	- 45.2 (dBm)
3 <sup>rd</sup> Harmonic	- 67.8 (dBm)	- 71.2 (dBm)	- 70.1 (dBm)
4 <sup>th</sup> Harmonic	- 69.9 (dBm)	- 70.5 (dBm)	- 69.7 (dBm)
5 <sup>th</sup> Harmonic	- 71.6 (dBm)	- 80.8 (dBm)	Note (1)
6 <sup>th</sup> Harmonic	- 82.4 (dBm)	- 87.4 (dBm)	- 88.0 (dBm)
7 <sup>th</sup> Harmonic	- 86.7 (dBm)	- 87.4 (dBm)	- 87.9 (dBm)
8 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)
9 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)
10 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)

#### “WBU”

	Low Channel	Mid Channel	High Channel
Fundamental	+ 6.7 (dBm)	+ 4.57 (dBm)	+ 6.4 (dBm)
2 <sup>nd</sup> Harmonic	- 41.9 (dBm)	- 46.0 (dBm)	- 51.5 (dBm)
3 <sup>rd</sup> Harmonic	- 75.4 (dBm)	- 76.4 (dBm)	- 73.0 (dBm)
4 <sup>th</sup> Harmonic	- 73.1 (dBm)	- 70.6 (dBm)	- 77.6 (dBm)
5 <sup>th</sup> Harmonic	Note (1)	- 83.2 (dBm)	Note (1)
6 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)
7 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)
8 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)
9 <sup>th</sup> Harmonic	- 78.5 (dBm)	Note (1)	Note (1)
10 <sup>th</sup> Harmonic	Note (1)	Note (1)	Note (1)

Notes:

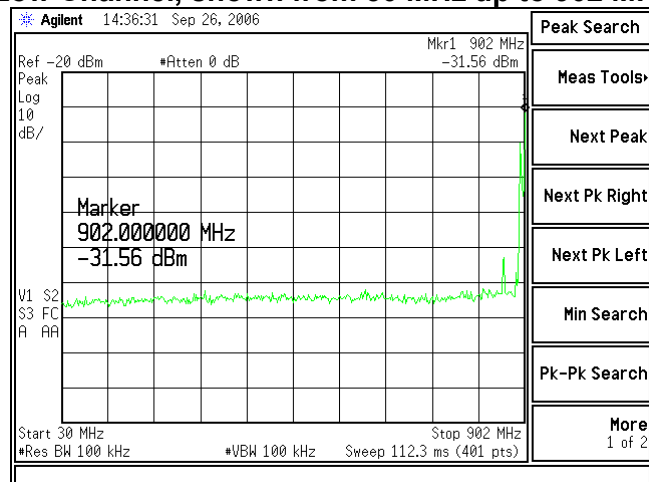
(1) Measurement at system noise floor.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 46 of 53

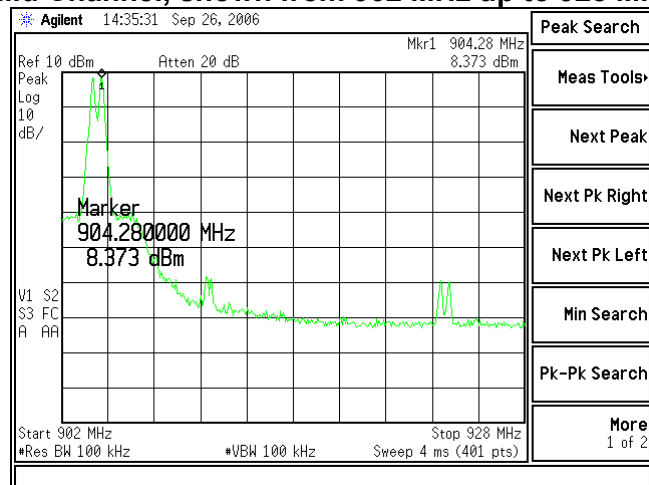
## 11.4 Screen Captures – Spurious Radiated Emissions

“WWU”

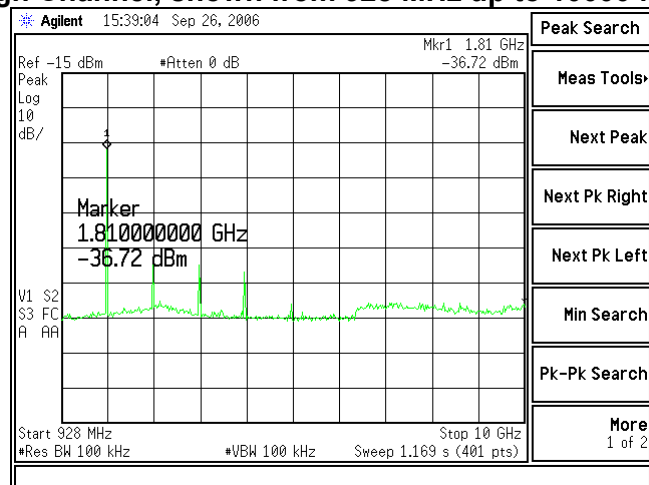
### Low Channel, shown from 30 MHz up to 902 MHz



### Mid Channel, shown from 902 MHz up to 928 MHz



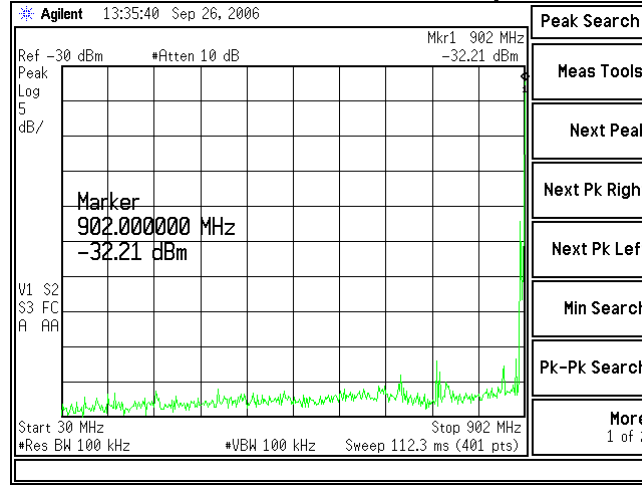
### High Channel, shown from 928 MHz up to 10000 MHz



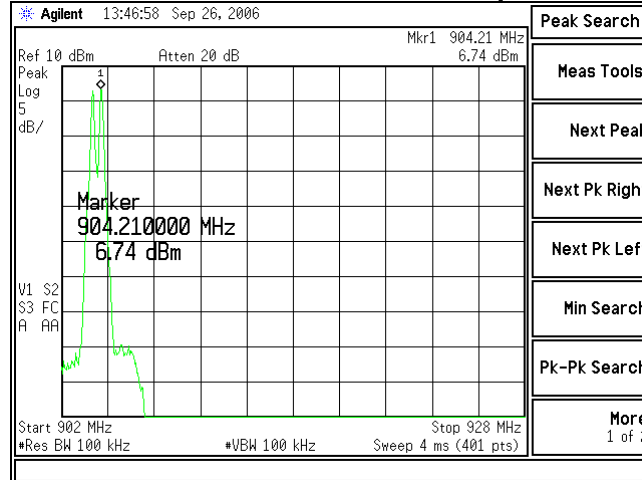
Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 47 of 53

# **“WBU”**

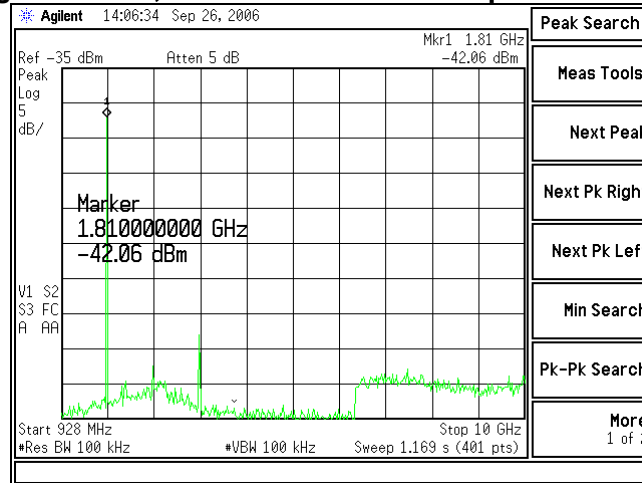
## **Low Channel, shown from 30 MHz up to 902 MHz**



## **Mid Channel, shown from 902 MHz up to 928 MHz**



## **High Channel, shown from 928 MHz up to 10000 MHz**



Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 48 of 53



## EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

The stability of the device was examined as a function of the input voltage available to the EUT. A spectrum analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was placed in continuous transmit CW mode. Power to the EUT was supplied by an external bench-type variable power supply.

The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=30 Hz settings while the voltage was varied.

### “WWU”

DC Voltage Source			
	10.20 VDC	12.00 VDC	13.80 VDC
Low Channel	903.99536(MHz)	903.99536(MHz)	903.99536(MHz)
Mid Channel	914.99511(MHz)	914.99511(MHz)	914.99511(MHz)
High Channel	925.99535(MHz)	925.99600(MHz)	925.99535(MHz)

### “WBU”

DC Voltage Source			
	3.83 VDC	4.50 VDC	5.18 VDC
Low Channel	903.98678(MHz)	903.98678(MHz)	903.98678(MHz)
Mid Channel	914.98638(MHz)	914.98638(MHz)	914.98638(MHz)
High Channel	925.98660(MHz)	925.98660(MHz)	925.98663(MHz)

The RF Power Output of the EUT was also monitored in a separate test, also using a Spectrum Analyzer with RBW=VBW=1 MHz setting while the voltage was varied.

### “WWU”

DC Voltage Source			
	10.20 VDC	12.00 VDC	13.80 VDC
Low Channel	+ 8.5 (dBm)	+ 8.5 (dBm)	+ 8.5 (dBm)
Mid Channel	+ 7.6 (dBm)	+ 7.6 (dBm)	+ 7.6 (dBm)
High Channel	+ 7.5 (dBm)	+ 7.5 (dBm)	+ 7.5 (dBm)

### “WBU”

DC Voltage Source			
	3.83 VDC	4.50 VDC	5.18 VDC
Low Channel	+ 6.8 (dBm)	+ 6.8 (dBm)	+ 6.8 (dBm)
Mid Channel	+ 4.6 (dBm)	+ 4.6 (dBm)	+ 4.6 (dBm)
High Channel	+ 6.4 (dBm)	+ 6.4 (dBm)	+ 6.4 (dBm)

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characterizes were well behaved, and the system returned to the same state of operation as before the power cycle. No anomalies were noted, in the measured transmit power, varying less than 1 dB, during the voltage variation tests.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 49 of 53

## EXHIBIT 13. MPE CALCULATIONS

The following MPE calculations are based on the higher measured power, between radiated and conducted measurements. In the case of this product, the antenna is a formed wire, with no published data for the gain figure. A gain of 0 dBi is used in calculations, normalizing the data to EIRP.

### “WWU”

#### Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density  
P = power input to the antenna  
G = power gain of the antenna in the direction of interest relative to an isotropic radiator  
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	8.50 (dBm)
Maximum peak output power at antenna input terminal:	7.079 (mW)
Antenna gain(typical):	0 (dBi)
Maximum antenna gain:	1.000 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	915 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.62 (mW/cm <sup>2</sup> )
Power density at prediction frequency:	0.001408 (mW/cm <sup>2</sup> )
Maximum allowable antenna gain:	26.4 (dBi)
Margin of Compliance at 20 cm =	26.4 dB

### “WBU”

#### Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density  
P = power input to the antenna  
G = power gain of the antenna in the direction of interest relative to an isotropic radiator  
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	9.37 (dBm)
Maximum peak output power at antenna input terminal:	8.650 (mW)
Antenna gain(typical):	0 (dBi)
Maximum antenna gain:	1.000 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	915 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.62 (mW/cm <sup>2</sup> )
Power density at prediction frequency:	0.001721 (mW/cm <sup>2</sup> )
Maximum allowable antenna gain:	25.6 (dBi)
Margin of Compliance at 20 cm =	25.6 dB

Prepared For: Rauland-Borg Corporation	Model #: WWU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	Page 50 of 53

## **APPENDIX A**

### **Test Equipment List**

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	9/27/05	9/27/06
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	7/26/06	7/26/07
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	7/20/06	7/20/07
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/07/05	12/07/06
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	12/29/05	12/29/06
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/29/05	9/29/06
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/29/05	9/29/06
EE960073	Agilent	E4446A	US45300564	Spectrum Analyzer	2/01/06	2/01/07
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	Note 1	Note 1
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

*Note 1 - Equipment calibrated within a traceable system.*

### **Uncertainty Statement**

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

*Table of Expanded Uncertainty Values, (K=2) for Specified Measurements*

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 51 of 53</b>

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 52 of 53</b>

## Appendix C

### Firmware and Setup Instructions

The EUTs were modified to have a special test code, allowing channel and mode selection by way of buttons and switches on the front panel of the EUT and the test fixture. The test fixture was provided by the manufacturer as a host to simulate a typical Nurse-call system, as would be used in a hospital or care facility. The EUTs plug into the Nurse-call system.

Prepared For: Rauland-Borg Corporation	Model #: WVU & WBU	LS Research, LLC
EUT: Wireless Bed Interface	Serial #: n/a	
Report #: 306308-Tx-v0	Customer FCC ID #: UG2-301	<b>Page 53 of 53</b>