

Advanced  
Compliance Laboratory

6 Randolph Way  
Hillsborough, NJ 08844  
Tel: (908) 927 9288  
Fax: (908) 927 0728

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**FCC CFR47 PART 15 SUBPART C & RSS-210 CERTIFICATION**

**TEST REPORT**

**For**

**Handheld Device WZRDnet**

**Model Number: WHD310(V)1**

**FCC ID: XAYWHD310V1  
IC:9251A-WHD310V1**

**Report Number: 0048-100113-01**

*Prepared for*  
**TELEGRID Technologies, Inc.  
19 Microlab Road, Suite D  
Livingston, NJ 07039  
USA**

*Prepared by*  
**Advanced Compliance Laboratory, Inc.  
6 Randolph Way  
Hillsborough, NJ 08844  
Tel: (908) 927 9288  
Fax: (908) 927 0728**

**Date: 9/20/2010**

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# 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** TELEGRID TECHNOLOGIES, INC.  
19 Microlab Road, Suite D  
Livingston, NJ 07039, USA

**EUT DESCRIPTION:** WZRDnet

**MODEL:** WHD310(V)1

**DATE TESTED:** January 13, 2010 to March 1, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC Part 15 & IC RSS-210 (issue 7)	NO NON-COMPLIANCE NOTED

Advanced Compliance Laboratory, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Advanced Compliance Laboratory, Inc. (ACL) and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by ACL, Advanced Compliance Laboratory, Inc. will constitute fraud and shall nullify the document.

Approved & Released For ACL By:

Tested By:



Wei Li  
Manager  
Advanced Compliance Laboratory, Inc.

Edward Lee  
EMC Engineer

## 2. EUT DESCRIPTION

The WHD-310(V)1 is a portable handheld wireless communication device that is a key element of the WZRDnet low-power wireless ad-hoc mesh network, using digital modulation & operating in the 2400-2483.5 MHz band. It uses FCC approved RF Module following manufacturer's application requirements without any modification. Testing Information for this module can be found in UltraTech's File No.: DIGI-003F15C247 dated on November 6, 2007.

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2405-2470	19 ( rated)	79

The EUT can use Dipole Omnidirectional antenna with revised SMA connector. detachable antenna ( professional installation required) which is not provided by the applicant. The data sheet of the antenna are attached:

Antenna #1: R380500125, 2.4GHz Dipole Reverse SMA Omnidirectional Antenna, gain=2dBi made by Pulse/Larsen;

Antenna #2: ANT-2.4-CW-CT-RPS, 2.4GHz Dipole Reverse SMA Omnidirectional Antenna, gain=2.76dBi made by Antenna Factor.

Antenna #2 with highest gain was used for testing conducted by ACL.

### 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/2003, FCC CFR 47 Part 2 & 15 and IC RSS-210.

### 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at Hillsborough, New Jersey, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

ACL is accredited by NVLAP, Laboratory Code 200101-0. The full accreditation can be viewed at <http://www.ac-lab.com>



No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

## 5. CALIBRATION AND UNCERTAINTY

### 5.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 5.2. MEASUREMENT UNCERTAINTY

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

	Prob. Dist.	Uncertainty(dB)	Uncertainty(dB)	Uncertainty(dB)
		30-1000MHz	1-6.5GHz	Conducted
Combined Std. Uncertainty $u_c$	norm.	$\pm 2.36$	$\pm 2.99$	$\pm 1.83$

### 5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Manufacture	Model	Serial No.	Description	Last Cal dd/mm/ yy	Cal Due dd/mm/ yy
Agilent	E4440A	US40420700	3Hz-26.5GHz Spec. Analyzer	4/08/09	4/08/10
R &S	ESPI7	6001	9KHz-7GHz EMI Receiver	17/06/09	17/06/10
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	5/01/10	5/01/11
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	15/01/10	15/01/11
EMCO	6502	2665	10KHz-30MHz Active Loop Antenna	27/02/10	27/02/11
EMCO	3115	4945	Double Ridge Guide Horn Antenna	12/03/10	12/03/11
HP	E8254A	US42110367	Signal Generator	23/03/10	23/03/11
Scientific-Atlanta	12A-18	441	Wave Guide Horn Antenna	04/08/09	04/08/10
Agilent	E4448A	MY45300108	3Hz-50GHz Spectrum Analyzer	05/09/09	05/09/10
Agilent	83650B	3844A01114	50G Swept Signal Generator	27/01/10	27/01/11
HP	5361B	3023A01322	20G Pulse/CW Microwave Counter	10/06/09	10/06/10
HP	4419A	US37292112	RF Power Meter w/ Sensor Probe	29/06/09	29/06/10
EMCO	3116	4943	Double Ridge Guide Horn Antenna	11/01/10	11/01/11
SUNSYS	EC127	96025	Temperature Test Chamber	30/06/09	30/06/10
Lorch Microwave	5NF-800/1000-S	AC3	Notch Filter		
Lorch Microwave	5NF-1800/200-S	AE10	Notch Filter		
RES-NET	RFA500NFF30	0108	30dB in-line Power Attenuator		
Narda	3022	80986	Directional Coupler		

All Test Equipment Used are Calibrated Traceable to NIST Standards.

## 6. SETUP OF EQUIPMENT UNDER TEST

### SUPPORT EQUIPMENT

ITEM	DESCRIPTION	ID or DOC
AC-DC Adaptor	PHIHONG/PSAA05A-050	
Earphone/Mic	Generic Earphone/Mic	
ATX Tower PC	FOUNTAIN/MS6119	FTNA7400MB1
Monitor	Dell Monitor	E773c
Keyboard	Microsoft/E03786USOEM	CIGE03786
PS2 Mouse	IBM/6450350	ANO9Z66450350

### TEST SETUP

#### Testing Frequency/Channel/Port Selection:

- L(owest), M(iddle), H(ighest) Channels of 2.4G Band: 2405MHz/2440MHz/2470MHz
- 14 Channels listed
- Modulation: QPSK
- Measured at EUT's antenna port for conducted measurements per UltraTech report.
- Measured in chamber/OATS for radiated & AC conducted emission measurements





## **7. APPLICABLE LIMITS AND TEST RESULTS**

### **7.1. 6dB BANDWIDTH**

#### **LIMIT**

§15.247 (a) (2) & RSS-210 A8.2(1): Min. 6dB bandwidth should be no less than 500KHz.

#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 6dB bandwidth. The VBW/RBW is set to one or three. The sweep time is coupled.

#### **RESULTS**

No non-compliance noted per UltraTech's File No.: DIGI-003F15C247 dated on November 6, 2007.

## 7.2. PEAK OUTPUT POWER

### PEAK POWER LIMIT

§15.247 (b)(3) & RSS-210 A8.4(4)

The maximum peak conducted output power of the intentional radiator shall not exceed the following:  
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

b(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**The maximum antenna gain is 2.76dBi, which is lower than 6dBi.** Therefore, the limit in (b)(3) is 1Watt, which is +30dBm.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 6 dB bandwidth of the EUT.

### RESULTS

No non-compliance noted per UltraTech's File No.: DIGI-003F15C247 dated on November 6, 2007.  
Sec. 6.7.5 for testing result:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dBm)
Low	2405	18.61	30	-11.39
Middle	2440	18.74	30	-11.26
High	2470	18.99	30	-11.01

### **7.3. SAR & MAXIMUM PERMISSIBLE EXPOSURE**

For portable devices (47 CFR §2.1093), RF evaluation must be based on specific absorption rate (SAR) limits. Human exposure to RF emissions from mobile devices (47 CFR §2.1091) can be evaluated with respect to Maximum Permissible Exposure (MPE) limits for field strength or power density or with respect to SAR limits, whichever is most appropriate.

The EUT, WHD310(V)1 is a portable product, SAR is required not MPE. However, since the power is  $0.79 \text{ mWatts} \times 0.11 < 60/f(\text{in GHz})$ . The SAR is exempted per FCC and IC requirements.

## **7.4. AVERAGE POWER**

### **AVERAGE POWER LIMIT**

None; for reporting purposes only.

### **TEST PROCEDURE**

The transmitter output is connected to a power meter.

### **RESULTS**

No non-compliance noted.

## **7.5. PEAK POWER SPECTRAL DENSITY**

### **LIMIT**

§15.247 (e) & RSS-210 A8.2(2)

For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

### **RESULTS**

No non-compliance noted per UltraTech's File No.: DIGI-003F15C247 dated on November 6, 2007.

## **7.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

§15.247 (d) & RSS- 210 A8.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205 (a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

The spectrum from 30 MHz to 26.5 GHz was investigated with the transmitter set to the lowest, middle, and highest channels. There is no significant spurious found in the range of 20GHz-40GHz.

### **RESULTS**

No non-compliance noted per UltraTech's File No.: DIGI-003F15C247 dated on November 6, 2007.

**7.7. RADIATED SPURIOUS EMISSIONS**

**7.7.1. EMISSION TESTING PROCEDURE**

**LIMITS**

§15.205 (a) RSS-102 Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			



- <sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
- <sup>2</sup> Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

## **TEST PROCEDURE**

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Per FCC KDB Publication No. 558074, for measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

The emissions are investigated with the transmitter set to the lowest, middle, and highest channels.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## **RESULTS**

No non-compliance noted:

## 7.7.2. EMISSION TESTING DATA

For XBEEPRO2 RF Module hosted in WHD310(V)1 Handheld Device

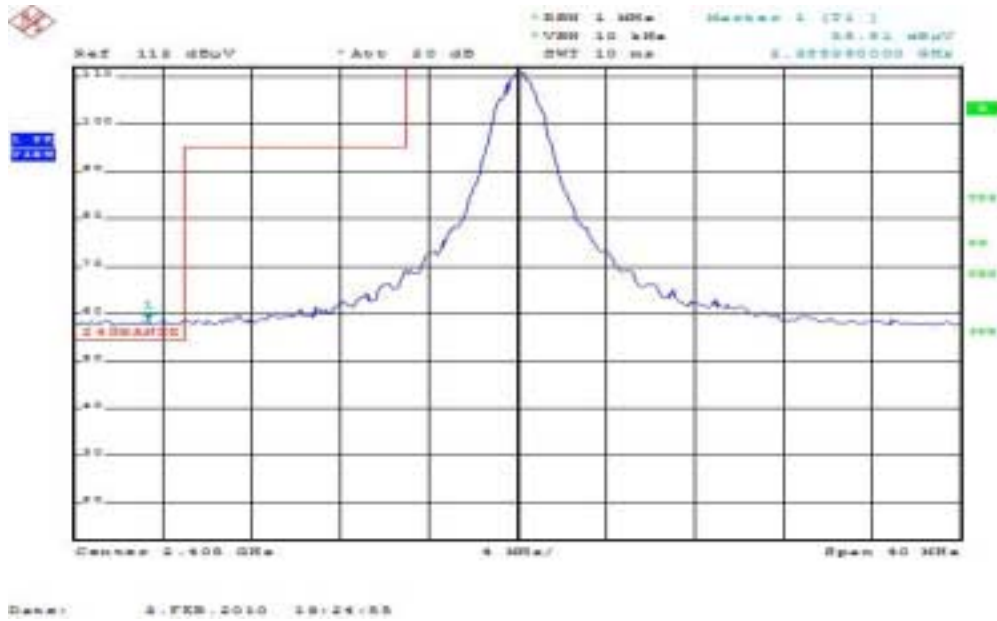
### A. Transmitting Mode

Freq. (MHz)	Position (H,V-X,Y,Z)	Dist. (m)	D Corr (dB)	Peak (dBuV/m)	Avg. (dBuV/m)	Corr. Avg. (dBuV/m)	PK Lim (dBuV/m)	Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	Avg. Mar. (dBuV/m)
Low Channel Harmonics										
4810	H,X	1	-10.5	<b>66.9</b>	<b>53.0</b>	<b>32.5</b>	74	54	<b>-21</b>	<b>-21.5</b>
4810	V,X	1	-10.5	<b>62.7</b>	<b>48.1</b>	<b>27.6</b>	74	54	<b>-25.9</b>	<b>-26.4</b>
4810	H,Y	1	-10.5	<b>59.0</b>	<b>44.9</b>	<b>24.4</b>	74	54	<b>-29.1</b>	<b>-29.6</b>
4810	V,Y	1	-10.5	<b>50.0</b>	<b>36.5</b>	<b>16</b>	74	54	<b>-37.5</b>	<b>-38</b>
4810	H,Z	1	-10.5	<b>56.8</b>	<b>42.0</b>	<b>21.5</b>	74	54	<b>-32</b>	<b>-32.5</b>
4810	V,Z	1	-10.5	<b>65.8</b>	<b>51.7</b>	<b>31.2</b>	74	54	<b>-22.3</b>	<b>-22.8</b>
Mid Channel Harmonics										
4800	H,X	1	-10.5	<b>68.0</b>	<b>53.3</b>	<b>32.8</b>	74	54	<b>-20.7</b>	<b>-21.2</b>
4800	V,X	1	-10.5	<b>64.3</b>	<b>49.0</b>	<b>28.5</b>	74	54	<b>-25</b>	<b>-25.5</b>
4800	H,Y	1	-10.5	<b>58.1</b>	<b>44.1</b>	<b>23.6</b>	74	54	<b>-29.9</b>	<b>-30.4</b>
4800	V,Y	1	-10.5	<b>52.0</b>	<b>38.5</b>	<b>18</b>	74	54	<b>-35.5</b>	<b>-36</b>
4800	H,Z	1	-10.5	<b>56.7</b>	<b>41.5</b>	<b>21</b>	74	54	<b>-32.5</b>	<b>-33</b>
4800	V,Z	1	-10.5	<b>65.2</b>	<b>51.1</b>	<b>30.6</b>	74	54	<b>-22.9</b>	<b>-23.4</b>
High Channel Harmonics										
4940	H,X	1	-10.5	<b>68.7</b>	<b>53.8</b>	<b>33.3</b>	74	54	<b>-20.2</b>	<b>-20.7</b>
4940	V,X	1	-10.5	<b>65.8</b>	<b>50.2</b>	<b>29.7</b>	74	54	<b>-23.8</b>	<b>-24.3</b>
4940	H,Y	1	-10.5	<b>58.9</b>	<b>44.6</b>	<b>24.1</b>	74	54	<b>-29.4</b>	<b>-29.9</b>
4940	V,Y	1	-10.5	<b>51.7</b>	<b>37.7</b>	<b>17.2</b>	74	54	<b>-36.3</b>	<b>-36.8</b>
4940	H,Z	1	-10.5	<b>57.5</b>	<b>42.6</b>	<b>22.1</b>	74	54	<b>-31.4</b>	<b>-31.9</b>
4940	V,Z	1	-10.5	<b>66.6</b>	<b>52.2</b>	<b>31.7</b>	74	54	<b>-21.8</b>	<b>-22.3</b>
No other harmonics or spurious emissions were detected in the rest band above system floor, noise above -20dB to the limit.										
<b>DUTY CYCLE CORRECTION FACTOR:</b> *IN ACCORDANCE WITH FCC KDB Publication No. 558074, THE "DUTY CYCLE CORRECTION FACTOR" FOR SPURIOUS RADIATED EMISSIONS IS; $20 \log * (4.256 \text{ ms} / 40 \text{ ms}) = -20.5 \text{ dB}$ , WHICH WAS USED TO CORRECT THE AVERAGE SPURIOUS READING. <i>Please see Section 9 for details.</i>										

In addition, the band edge requirements are also verified. The testing results for worst case are shown as following and comply with the band edge requirements for 2400-2483.5MHz DTS per FCC Part 15.247 & FCC KDB Publication No. 558074. Antenna with max gain ( 2.76dB) was used for this testing.

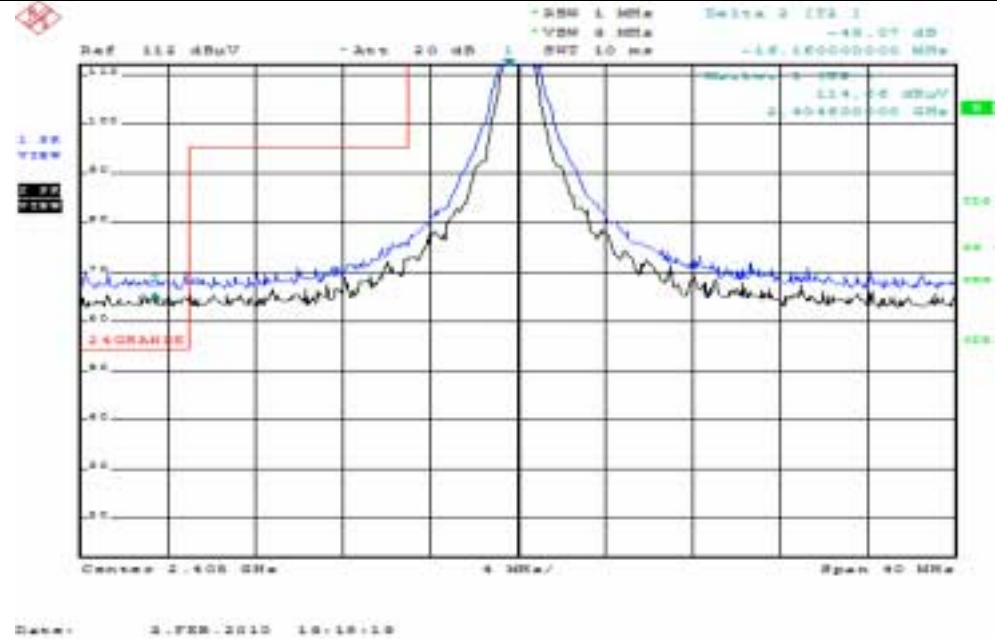
- H=Measurement antenna horizontal position
- V= Measurement antenna vertical position

**Plot Name:** 3m Band-Edge Radiated Emissions @ Low End, H



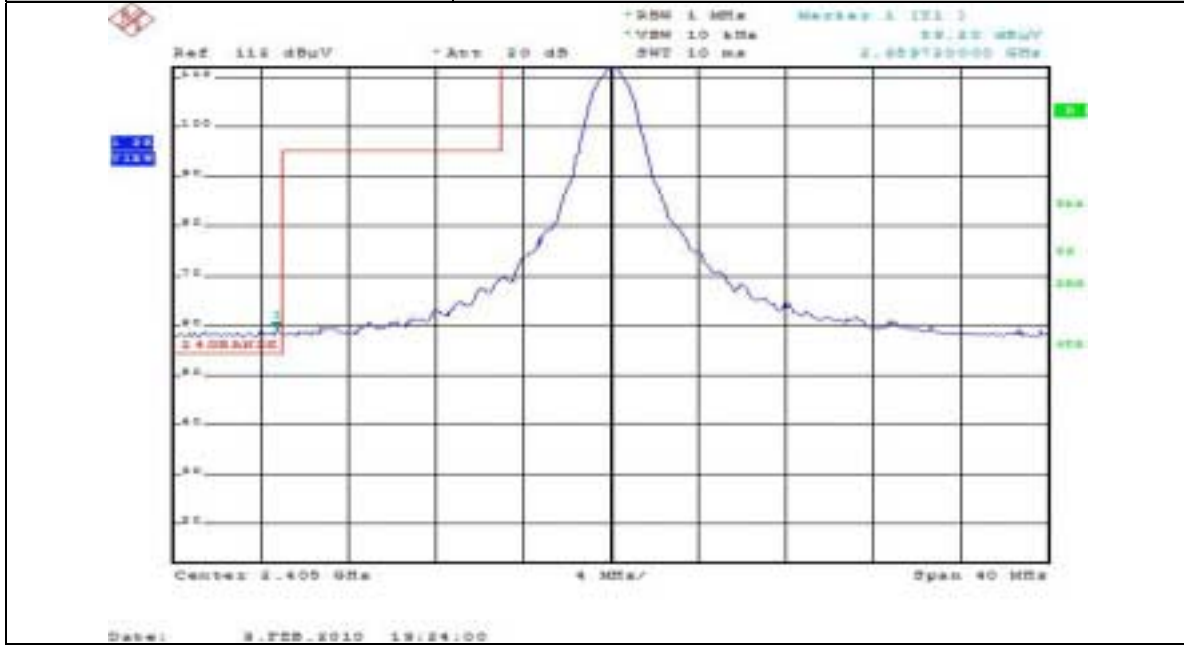
Average:  $58.81\text{dBuV/m} - 20.50\text{dBuV/m} = 38.31\text{dBuV/m}$  ( under  $54\text{dBuV/m}$  limit)

**Plot Name:** 3m Band-Edge Radiated Emissions @ Low End, H



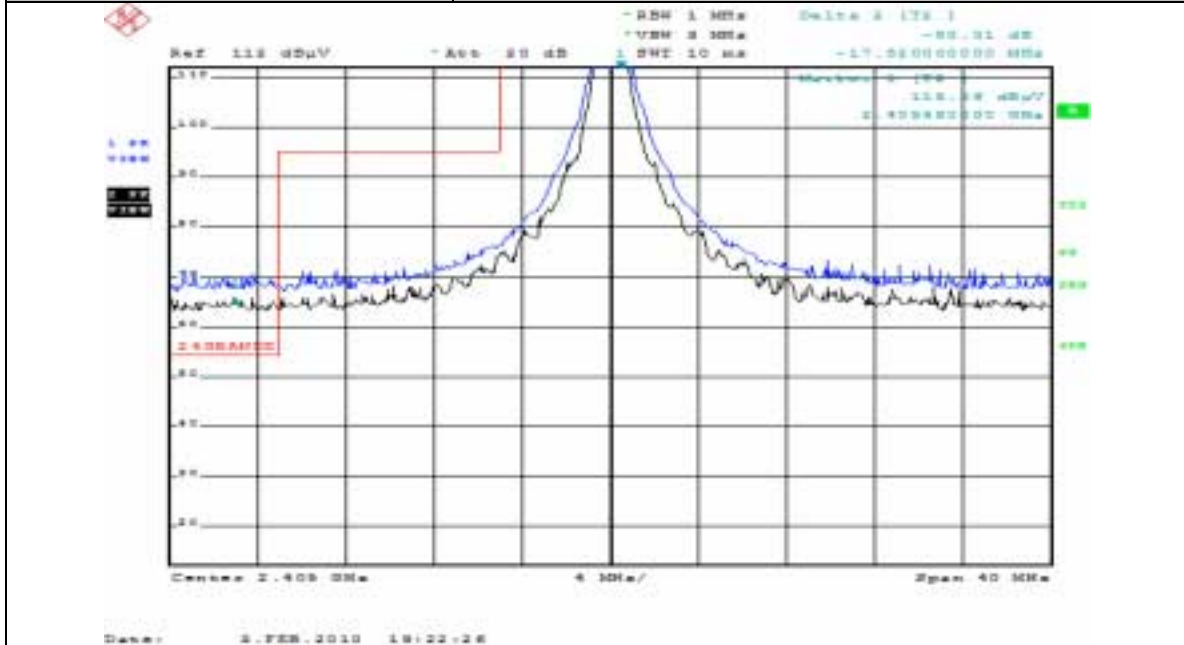
Black Trace: RBW=500KHz, VBW=1MHz, Delta(peak to band-edge):  $49.07\text{dB}$   
Peak:  $114.86\text{dBuV/m} - 49.07\text{dBuV/m} = 65.79\text{dBuV/m}$  ( under  $74\text{dBuV/m}$  limit)

**Plot Name:** 3m Band-Edge Radiated Emissions @ Low End, V

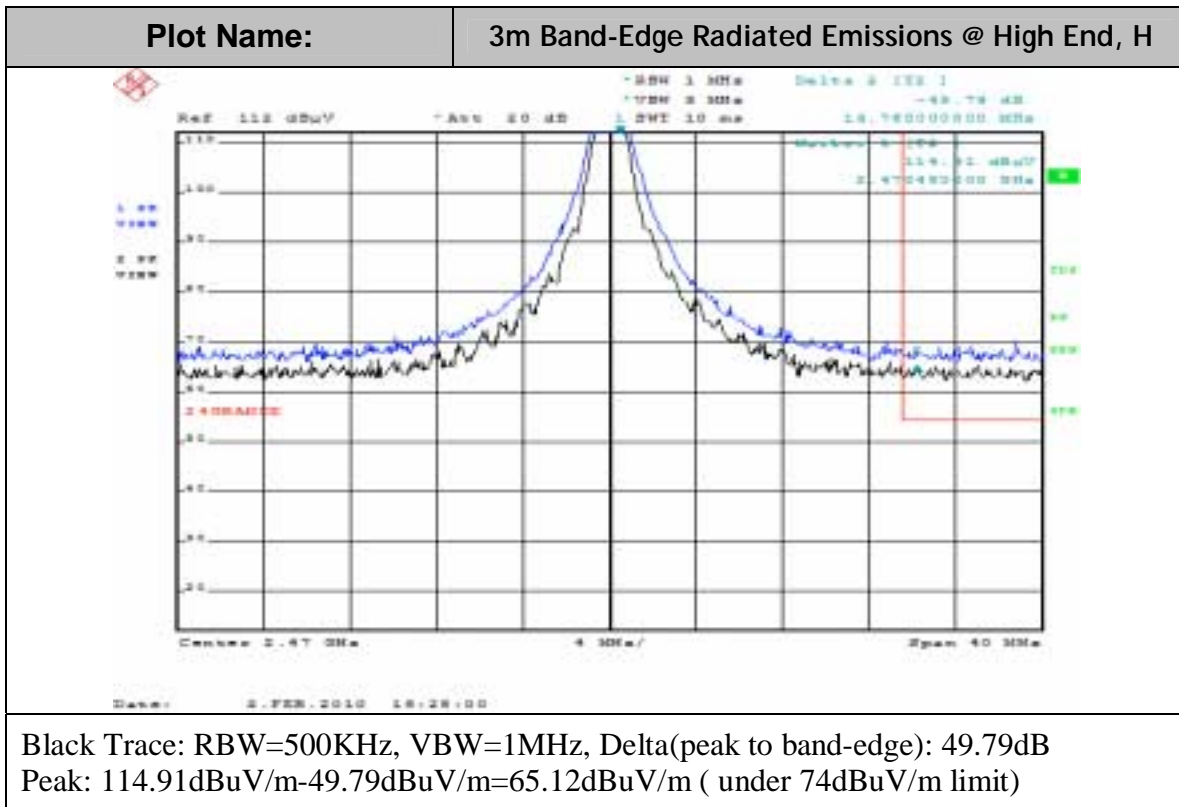
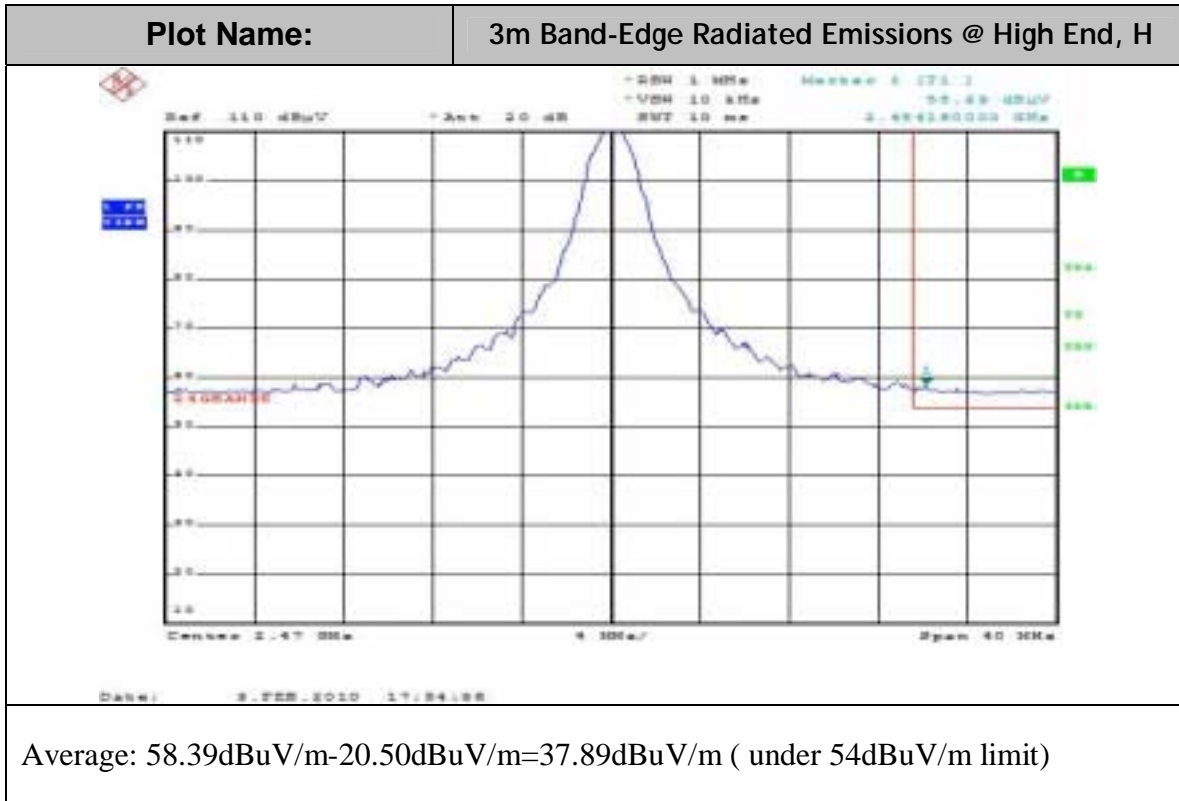


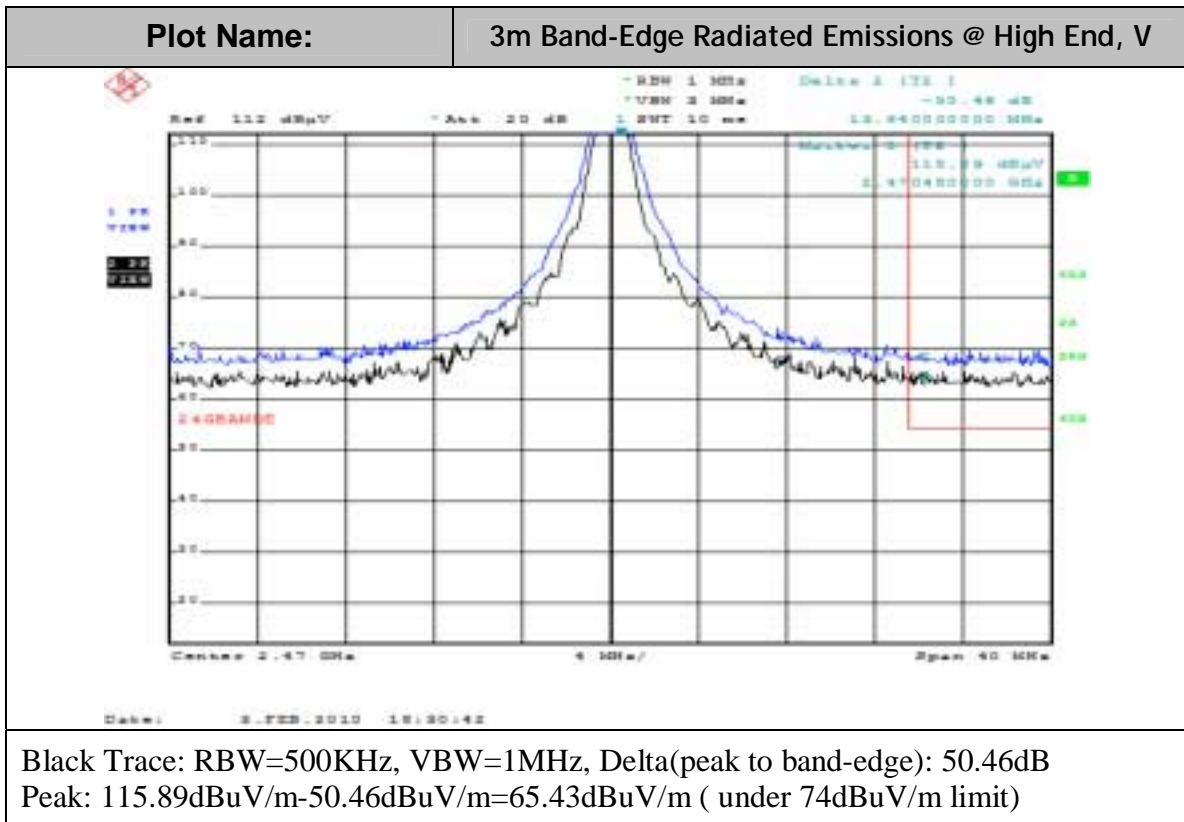
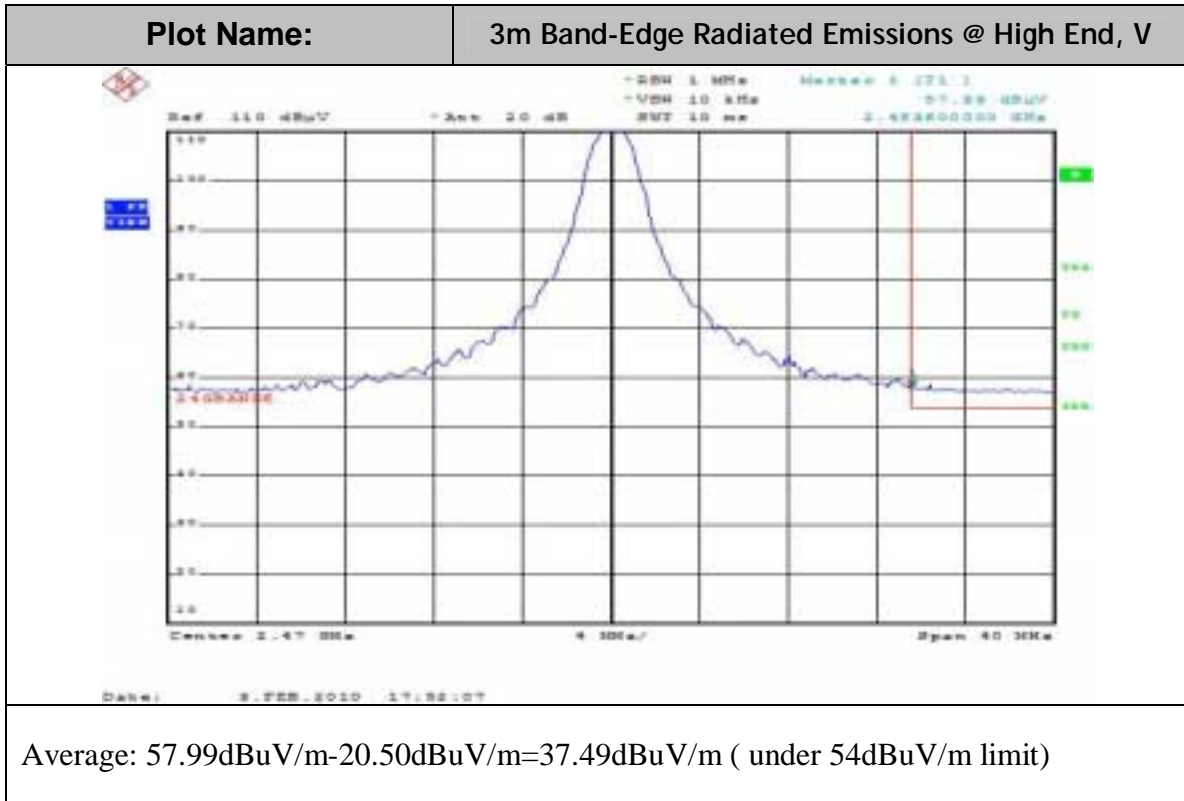
Average: 59.20dBuV/m-20.50dBuV/m=38.70dBuV/m ( under 54dBuV/m limit)

**Plot Name:** 3m Band-Edge Radiated Emissions @ Low End, V



Black Trace: RBW=500KHz, VBW=1MHz, Delta(peak to band-edge): 50.01dB  
Peak: 115.56dBuV/m-50.01dBuV/m=65.55dBuV/m ( under 74dBuV/m limit)





**B. Receiving Mode**

**EUT with AC/DC Charger Connected**

Freq. (MHz)	Position (H,V-X, Y, Z)	Dist. (m)	D Corr (dB)	Peak (dBuV/m)	Quasi-Peak (dBuV/m)	Avg. (dBuV/m)	FCC-15 3m Lim (dBuV/m)	Mar. (dBuV/m)
47.0	V,Z	3	0	28.0			40.0	-12
115.9	V,Z	3	0	29.3			43.5	-14.2
160.0	V,Z	3	0	30.9			43.5	-12.6
292.0	V,Z	3	0	25.7			46.5	-20.8
338.0	V,Z	3	0	33.7			46.5	-12.8
366.0	V,Z	3	0	30.5			46.5	-16
386.0	V,Z	3	0	32.0			46.5	-14.5
444.0	V,Z	3	0	30.5			46.5	-16
486.0	V,Z	3	0	31.9			46.5	-14.6
57.2	H,Y	3	0	28.8			40.0	-11.2
116.3	H,Y	3	0	30.9			43.5	-12.6
154.1	H,Y	3	0	31.5			43.5	-12
244.0	H,Y	3	0	26.8			46.5	-19.7
266.0	H,Y	3	0	29.6			46.5	-16.9
278.0	H,Y	3	0	30.1			46.5	-16.4
292.0	H,Y	3	0	31.1			46.5	-15.4
338.0	H,Y	3	0	40.3			46.5	-6.2
366.0	H,Y	3	0	37.7			46.5	-8.8
406.0	H,Y	3	0	32.6			46.5	-13.9
446.0	H,Y	3	0	30.7			46.5	-15.8

**EUT with PC connected**

Frequency (MHz)	Polarity [H, V]	Height (m)	Azimuth (Degree)	Amplitude Reading (dBuV)	Class B 3m Limit (dBuV/m)	Difference from limit (dB)
66.8	H	1.2	170	31.8	40.0	-9.2
133.3	H	1.1	110	35.4	43.5	-8.1
218.0	H	1.1	135	38.8	46.5	-7.7
268.0	H	1.1	135	38.0	46.5	-8.5
290.0	H	1.1	180	40.0	46.5	-6.0
304.0	H	1.1	135	36.9	46.5	-9.6
316.0	H	1.1	180	37.3	46.5	-9.2
340.0	H	1.1	180	39.4	46.5	-7.1
686.0	H	1.1	180	40.4	46.5	-6.1
46.4	V	1.1	160	32.1	40.0	-7.9
96.0	V	1.1	190	34.2	43.5	-9.3
133.3	V	1.1	180	35.0	43.5	-12.6
144.0	V	1.1	190	37.8	43.5	-5.7
218.0	V	1.1	335	32.4	46.5	-14.1
268.0	V	1.1	335	32.9	46.5	-13.6
336.9	V	1.1	335	33.5	46.5	-13
364.0	V	1.1	335	37.7	46.5	-8.8
371.0	V	1.2	180	36.8	46.5	-9.7
472.0	V	1.1	350	35.6	46.5	-10.9
686.0	V	1.2	350	39.7	46.5	-6.8
1338.0	V	1.2	350	43.2	54.0	-10.8

No other significant spurious were detected in the rest band (up to 6.5GHz)

Worst case: EUT programmed to RX mode. A stimulating signal (CW, operated @2.44GHz for Zigbee Receiver and @1.575GHz for GPS Receiver) was used to stimulate receiver during emissions measurements.

## 7.8. AC CONDUCTED EMISSIONS

The EUT was setup and located so that the distance between the boundary of the EUT and the closest surface to the LISN was 0.8m or more.

EUT test configuration was according to CISPR22 and Section 7 of ANSI C63.4/2003.

Conducted disturbance was measured between the phase lead and the ground, and between the neutral lead and the ground. The frequency 0.150 - 30 MHz was investigated.

The EMI receiver was set to PEAK detector setting, and swept continuously over the frequency range to be investigated. The resolution bandwidth was set to 9KHz minimum. The EMI receiver input cable was connected to LINE 1 RF measurement connection on the LISN. A 50ohm terminator was connected to the unused RF port on the LISN. For each mode of EUT operation, emissions readings were maximized by manipulating cable and wire positions. The configuration for each EUT power cord which produced emissions closest to the limit was recorded. The same procedure was repeated for LINE 2 of each EUT power cord.

### Instrument Settings

Frequency Range	Peak	Quasi-Peak	Average
0.15 – 30 MHz	9 kHz	9 kHz	30 kHz

**Limit:** FCC Part 15 / CISPR22 Class B

### Testing Data

The following plots show the neutral and line conducted emissions for the typical operation condition. The conducted test data shows the worst case emissions still below the FCC Part 15/CISPR22 Class B limits.

Highest Data for AC Line Conducted Emissions (w/ AC/DC adaptor)						
Frequency (MHz)	0.200	0.410	0.671	1.351	1.902	3.563
Peak Reading (dBuV) from Line*	36.4	46.6	38.8	38.4	37.8	36.2
Frequency (MHz)	0.160	0.272	0.340	0.410	1.910	3.472
Peak Reading(dBuV) from Neural *	40.1	36.2	37.8	39.9	38.6	37.9

\* No average reading is needed since the peak reading is already below average limit.

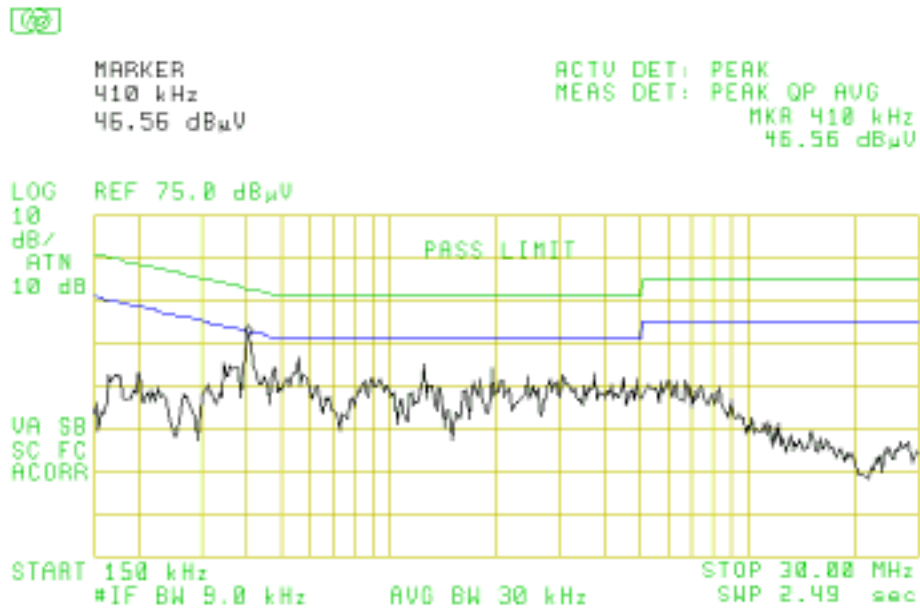


Highest Data for AC Line Conducted Emissions (w/ PC Connected)						
Frequency (MHz)	0.200	0.240	0.300	0.330	0.400	15.91
Peak Reading (dBuV) from Line*	41.9	36.5	41.6	34.6	35.9	30.55
Frequency (MHz)	0.200	0.270	0.300	0.330	0.400	15.91
Peak Reading(dBuV) from Neural *	38.9	36.0	40.5	35.2	36.8	33.4

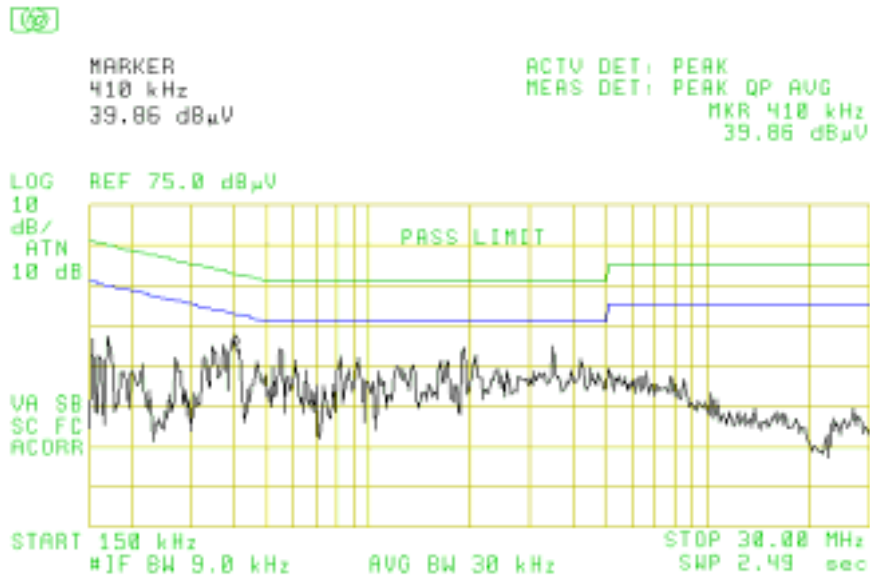
\* No average reading is needed since the peak reading is already below average limit.

**Result:** No non-compliance noted

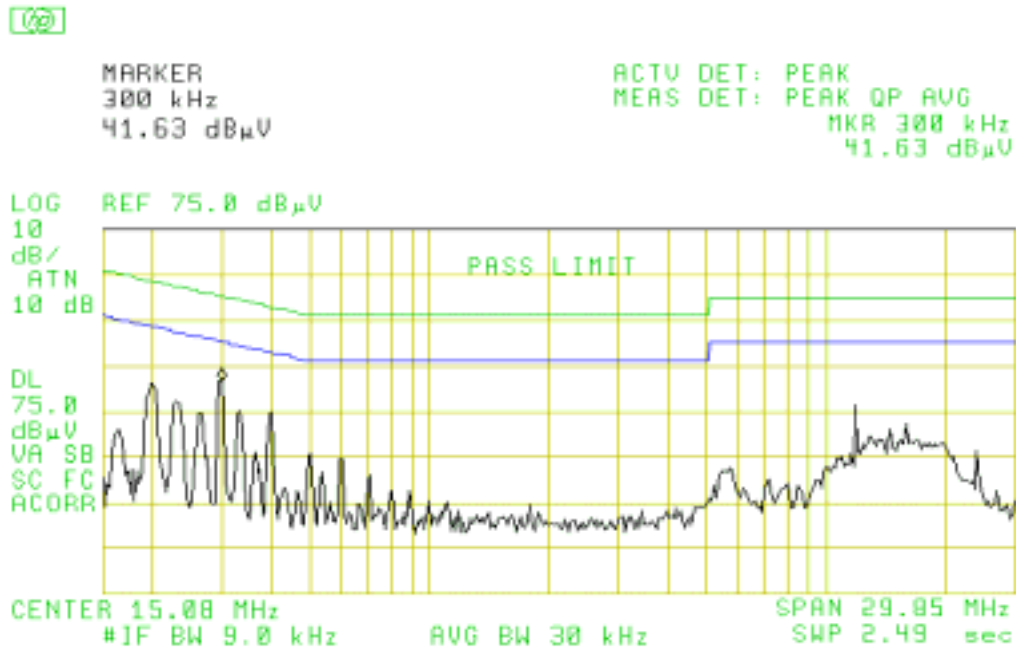
**Tested @ AC Main of AC/DC Adaptor**  
Line Conducted Emission



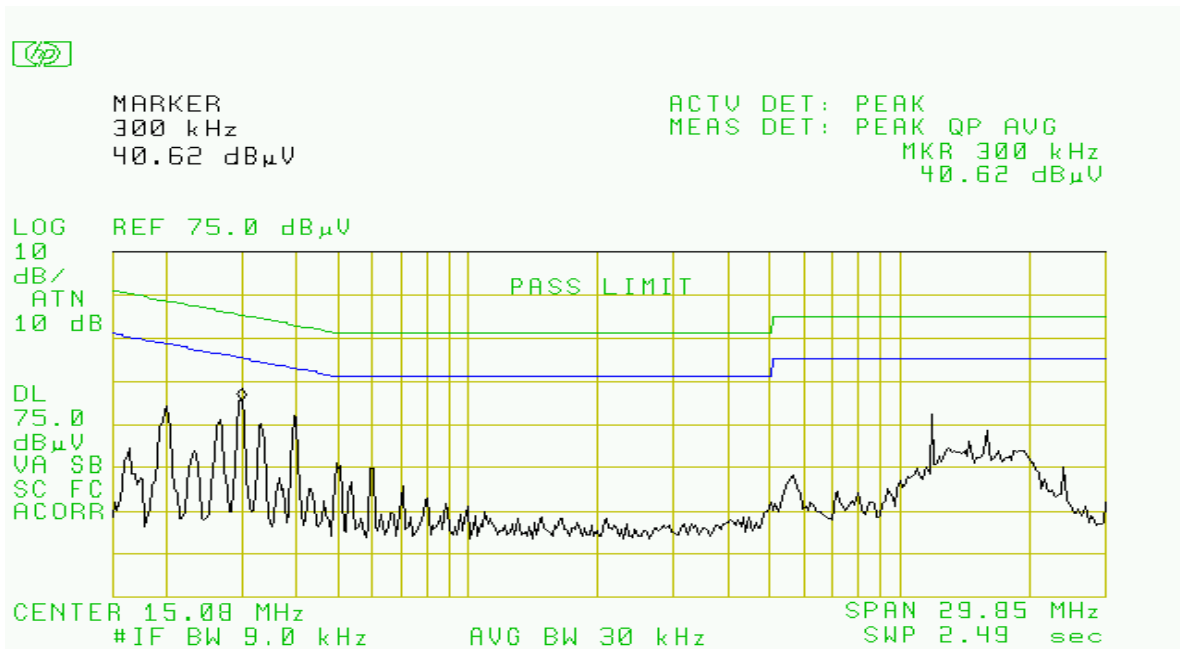
Neutral Conducted Emission



**Tested @ AC Main of PC**  
Line Conducted Emission



Neutral Conducted Emission



## 8. SETUP PHOTOS

### Conducted Emission Measurements With AC/DC Adaptor



### With PC



## Field Strength of Spurious



**X-Orientation**



**Y-Orientation**



**Z-Orientation**

**EUT w/ PC Connected**



## 9. APENDEX

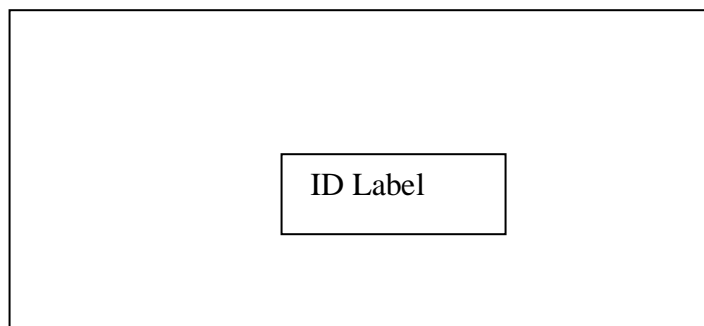
ID LABEL  
DUTY CYCLE CALCULATION  
PRODUCT PHOTOS

## FCC/IC Label

**TELEGRID Technologies, Inc.**  
**Model No.: WHD-310(V)1**  
**FCC ID: XAYWHD310V1**  
**IC: 9521A-WHD310V1**

**This device complies with FCC Part 15 & IC RSS-210 Rules. Operating is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

**Figure 1 Proposed FCC/IC ID Label for WZRDnet  
(The statement may be shown in its user manual for small size devices )**



**Figure 2 Proposed ( ID Label location @back )**



## DUTY CYCLE CALCULATION

The WHD-310(V)1 handset samples voice every 40ms which is then processed and sent to the module for over the air transmission. The sampling rate was specifically selected based on our codec, microcontroller processing power and maximum allowable packet size under the 802.15.4 protocol.

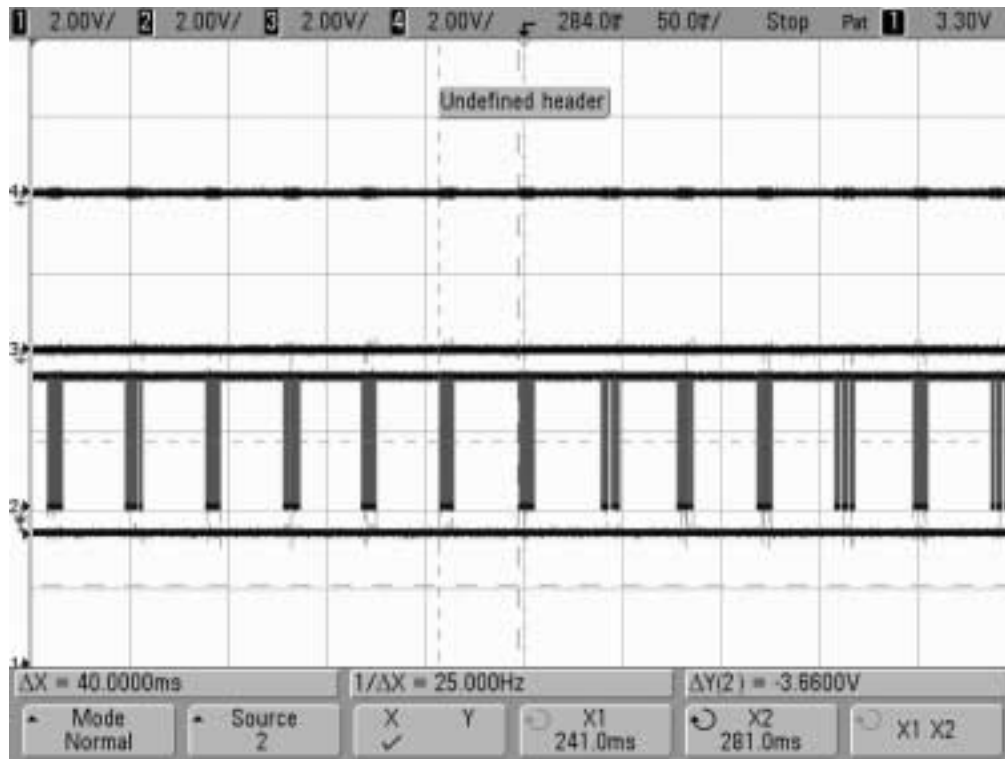
Attached please find a screenshot showing the processed voice being set to the RF module every 40ms. Each transmission shown in the screenshot is one frame which results in one packet sent out of the RF. You can see the delta of 40ms on the lower left hand side. As mentioned we send the maximum allowable packet size for 802.15.4.

The maximum possible packet size can be drawn directly from the 802.15.4 specification. The packet is made up the Synchronization header, which consists of the Preamble (4 bytes) and the SFD (1 byte), the Physical header length (1 byte), and the data payload (127 bytes). Therefore the maximum allowable packet size is 133 bytes.

The data rate specified for the 802.15.4 protocol in 2.4GHz range is 250 kbps. This results in an over the air time of  $[1 \text{ second} / 250,000 \text{ bits}] * [8 \text{ bits} / 1 \text{ byte}] * [133 \text{ bytes}] = 0.004256 \text{ seconds}$ , or 4.256 milliseconds.

So our duty cycle equals  $4.256 / 40 = 10.64\%$  or 11% depending on how exact you need to be.

Screenshot:



## PRODUCT PHOTO

EUT Front View ( w/ two listed antenna)



EUT Rear View



### EUT I/O Ports



Earpiece Connector



USB /Charger Connector

EUT Inside View



EUT PCB Component Side View



EUT PCB Foil Side View

