

EMISSIONS TEST REPORT

Report Number: 3137303BOX-001

Project Number: 3137303

Testing performed on the

SenseWear Armband

Model: FF 2.4 Armband

To

FCC Part 15 Subpart B

For

BodyMedia, Inc.

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

Test Authorized by:
BodyMedia, Inc.
4 Smithfield Street Suite 1200
Pittsburgh, PA 15222

Prepared by:

Vathana Ven
Vathana Ven

Date: 11/19/2007

Reviewed by:

Jeff Goulet
Jeff Goulet

Date: 11-19-07

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1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company: BodyMedia, Inc.
4 Smithfield Street Suite
1200
Pittsburgh, PA 15222

Contact: Mr. Scott Boehmke

Telephone: 412-288-9901 x1041

Fax: 412-288-9902

Email: skb@bodymedia.com

1.2 Equipment Under Test

Equipment Type: SenseWear Armband

Model Number(s): FF 2.4 Armband

Serial number(s): BOX0709251031-001

Manufacturer: BodyMedia, Inc.

EUT receive date: 09/25/2007

EUT received condition: Prototype in Good Condition

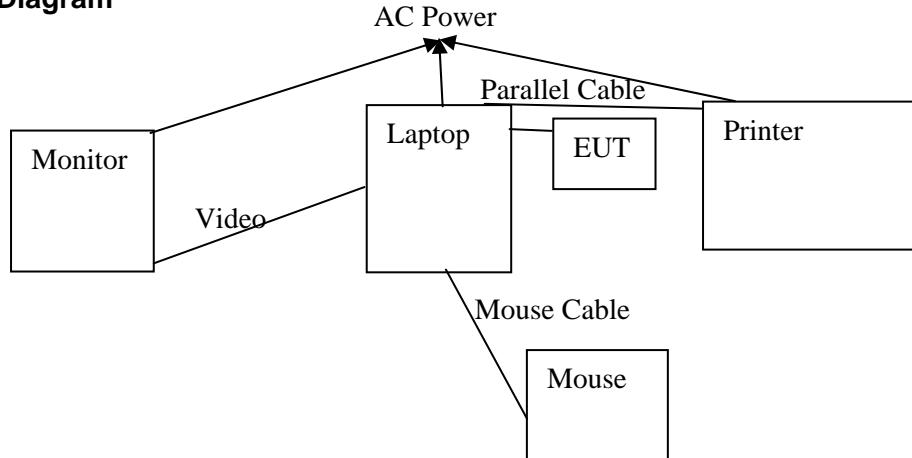
Test start date: 11/15/2007

Test end date: 11/15/2007

1.3 Test Plan Reference: Tested according to the standards listed and ANSI C63.4:2003.

1.4 Test Configuration

1.4.1 Block Diagram



1.4.2. Cables:

Cable Length (m)	Qty.	Shielding	Connector	
Laptop DC Mains	1	Braid	Metal/360 Jack	1.8
Laptop AC Mains	1	None	Plastic	0.3
Printer Parallel	1	Braid	Metal/360 DB25	1.7
Video	1	Braid	Metal/360 DB15	1.5
Mouse RS-232	1	Foil	Metal/360 DB9	2.4
Monitor AC Mains	1	None	Plastic	1.8
Printer AC Mains	1	None	Plastic	1.9
Armband USB	1	Braid	Metal/360 USB	1.8

1.4.3. Support Equipment:

Name: Compaq laptop
 Model No.: J07M040.00
 Serial No.: Not labeled

Name: Dell monitor
 Model No.: Vi1439U
 Serial No.: 73536AAKCK24

Name: Compaq ac adapter
 Model No.: PPP005L
 Serial No.: Not labeled

Name: Epson Stylus Printer
 Model No.: P930A
 Serial No.: AZN1057576

Name: Microsoft Mouse
 Model No.: Serial – PS/2 Compatible Mouse
 Serial No.: 0021122

1.5 Mode(s) of Operation:

The EUT was connected to the Compaq laptop host laptop and was powered normally from the USB port. The EUT was not transmitting during testing.

2.0 Test Summary

TEST STANDARD	RESULTS	
FCC Part 15 Subpart B		
SUB-TEST	TEST PARAMETER	COMMENT
Radiated Emissions	Emissions must be below Class B limits	Pass
AC Line-Conducted Emissions	Emissions must be below Class B limits	Pass

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

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

3.0 Sample Calculations

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

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

Where

FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

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

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

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

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

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

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

Where NF = Net Reading in dB μ V

RF = Reading from receiver in dB μ V

LF = LISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

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

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

Example:

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

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

3.1 Measurement Uncertainty

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

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be:
 ± 3.5 dB at 10m, ± 3.8 dB at 3m

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

± 2.6 dB

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

± 3.2 for ISN and voltage probe measurements
 ± 3.1 for current probe measurements

3.2 Site Description

Test Site(s): 3

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

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

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

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

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

Test Results: Pass

Test Standard: FCC Part 15 Subpart B

Test: Radiated Emissions

Performance Criterion: Emissions must be below Class B limits

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	21	Humidity (%):	50	Pressure (hPa):	985
Pretest Verification Performed		Yes		Equipment under Test:		FF 2.4 Armband	
Test Engineer(s):	Vathana Ven			EUT Serial Number:		BOX0709251031-001	

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR3	05/20/2008
2	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K0 3	100067	12/19/2007
3	10 Meter in floor cable for site 3	ITS	RG214B/U	S3 10M FLR	09/17/2008
4	Spectrum Analyzer	Agilent	E7405A	US40240205	08/09/2008
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/04/2007
6	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/04/2007
7	ANTENNA	EMCO	3142	PRE9	02/06/2008
8	HORN ANTENNA	EMCO	3115	9610-4980	06/18/2008
9	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	12/13/2007

Software Utilized:

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

Test Results:
Radiated Emissions

Company: BodyMedia
 Model #: FF 2.4 Armband
 Serial #: BOX0709251031-001
 Engineers: Vathana Ven
 Project #: 3137303 Date(s): 11/15/07
 Standard: FCC Part 15 Subpart B Class B
 Receiver: R&S ESCI (ROS002) Limit Distance (m): 3
 PreAmp: PRE9 3-25-08.txt Test Distance (m): 10
 Barometer: BAR2 Temp/Humidity/Pressure: 21 deg. C 50% 985 mB
 PreAmp Used? (Y or N): N Voltage/Frequency: 120 Vac/60 Hz Frequency Range: 30 MHz - 1 GHz
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth
QP	V	39.420	7.0	11.6	0.9	0.0	-10.5	30.0	40.0	-10.0	120/300 kHz
QP	V	74.224	15.0	6.4	1.3	0.0	-10.5	33.2	40.0	-6.8	120/300 kHz
QP	V	124.944	7.0	6.8	1.7	0.0	-10.5	25.9	43.5	-17.6	120/300 kHz
QP	V	265.800	7.0	12.8	2.5	0.0	-10.5	32.8	46.0	-13.2	120/300 kHz
QP	H	299.204	5.0	13.2	2.7	0.0	-10.5	31.4	46.0	-14.6	120/300 kHz
QP	H	465.104	4.0	17.9	3.5	0.0	-10.5	35.8	46.0	-10.2	120/300 kHz

Radiated Emissions

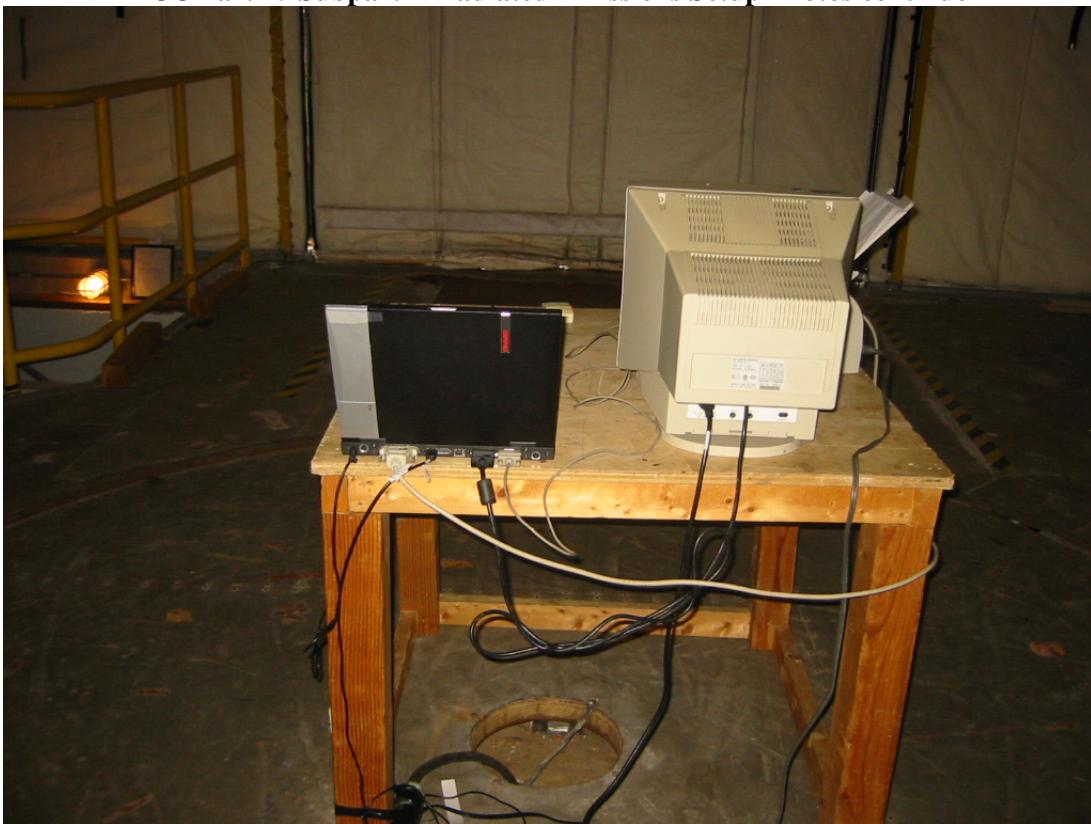
Company: BodyMedia
 Model #: FF 2.4 Armband
 Serial #: BOX0709251031-001
 Engineers: Vathana Ven
 Project #: 3137303 Date(s): 11/15/07
 Standard: FCC Part 15 Subpart B Class B
 Receiver: Agilent E7405A (AGL001) Limit Distance (m): 3
 PreAmp: PRE9 3-25-08.txt Test Distance (m): 3
 Barometer: BAR2 Temp/Humidity/Pressure: 21 deg. C 50% 985 mB
 PreAmp Used? (Y or N): Y Voltage/Frequency: Battery power Frequency Range: 1 - 25 GHz
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth
QP	H	1008.184	34.0	24.3	2.7	28.8	0.0	32.3	54.0	-21.7	1/3 MHz
QP	H	1063.184	29.0	24.5	2.8	28.8	0.0	27.5	54.0	-26.5	1/3 MHz
QP	H	1195.884	29.0	25.0	3.0	28.8	0.0	28.2	54.0	-25.8	1/3 MHz
QP	H	1463.884	26.0	26.0	3.3	28.8	0.0	26.5	54.0	-27.5	1/3 MHz
QP	H	1593.884	25.0	26.5	3.5	28.7	0.0	26.3	54.0	-27.7	1/3 MHz

FCC Part 15 Subpart B Radiated Emissions Setup Photos



FCC Part 15 Subpart B Radiated Emissions Setup Photos continue



Test Results: Pass

Test Standard: FCC Part 15 Subpart B

Test: AC Line-Conducted Emissions

Performance Criterion: Emissions must be below Class B limits

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	21	Humidity (%):	55	Pressure (hPa):	983
Pretest Verification Performed		Yes			Equipment under Test:	FF 2.4 Armband	
Test Engineer(s):	Vathana Ven			EUT Serial Number:	BOX0709251031-001		

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR3	05/20/2008
2	Spectrum Analyzer	Agilent	E7405A	US40240205	08/09/2008
3	30 ft 50 ohm coax, BNC - BNC	ITT Pomona	RG 58 C/U	CBLBNC7	11/06/2008
4	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS24	09/18/2008
5	LISN, 50uH, .01 - 50MHz, 24A	Solar Electronics	9252-50-R-24-BNC	955107	04/11/2008

Software Utilized:

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

Test Results:
Conducted Emissions

Company: BodyMedia
 Model #: FF 2.4 Armband
 Serial #: BOX0709251031-001
 Engineer(s): Vathana Ven
 Project #: 500052357 Date: 11/15/07
 Standard: FCC Part 15 Subpart B Class B
 Barometer: BAR3 Temp/Humidity/Pressure: 21 deg. C 55% 983 mB Attenuator: DS24 9-18-08.txt
 Voltage/Frequency: 120 Vac/60 Hz Frequency Range: 0.150-30 MHz
 Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.150	22.0	21.0			43.6	66.0	-22.4	9/30 kHz
QP	0.205	31.0	30.0			52.6	63.4	-10.8	9/30 kHz
QP	0.479	24.0	23.0			45.6	56.4	-10.8	9/30 kHz
QP	0.889	22.0	21.0			43.6	56.0	-12.4	9/30 kHz
QP	1.201	19.0	18.0			40.6	56.0	-15.4	9/30 kHz
QP	2.255	16.0	15.0			37.6	56.0	-18.4	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.150	15.0	15.0			36.6	56.0	-19.4	9/30 kHz
AVG	0.205	22.0	21.0			43.6	53.4	-9.8	9/30 kHz
AVG	0.479	21.0	21.0			42.6	46.4	-3.8	9/30 kHz
AVG	0.889	19.0	19.0			40.6	46.0	-5.4	9/30 kHz
AVG	1.201	16.0	4.0			37.6	46.0	-8.4	9/30 kHz
AVG	2.255	11.0	11.0			32.6	46.0	-13.4	9/30 kHz

FCC Part 15 Subpart B AC Line-Conducted Emissions Setup Photos



FCC Part 15 Subpart B AC Line-Conducted Emissions Setup Photos

