Intertek ETL SEMKO

FCC Part 15 Subparts B & C Report
(FCC § 15.249)
for
BodyMedia, Inc.
on the
Wireless Communicator
Model: 908902PROD1
and the
Armband
Model: 908901PROD1

Test Report #: 3043111

Project #: 3043111
Date of Test: June 19 & 27, August 29, 2003
Report Date: September 3, 2003

Total No of Pages Contained in this Report: 12

9/3/03	Nicholas Abbondante, Test Engineer
9/4/03	Robert F. Martin, Senior Technical Manager

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1.0 Summary of Tests

Models: 908902PROD1, 908901PROD1

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Test Engineer: _____ Date: 9/3/03
Nicholas Abbondante

Senior Technical Manager: _____ Date: 9/4/03
Robert F. Martin

2.0 General Description

2.1 Product Description

The Wireless Communicator is a transceiver that connects to a PC via a USB cable. It communicates with the transceiver in the Armband. The Armband uses sensors to measure physiological factors like motion, heat flow, and skin temperature that get translated by BodyMedia's customized algorithms and uploaded to a PC via the Wireless Communicator. At the time of testing, the model name of the two EUTs was given as "Firefly2". The EUT antennas are not user accessible.

The EUT has been tested at the request of

Company Name: BodyMedia, Inc.
4 Smithfield Street, 12th Floor
Pittsburgh, PA 15222
Contact: Maria Fattore-Gill
Telephone: 412.288.9901 ext. 1202 **Fax:** 412.288.9902

In summary, this report confirms that the EUT is compliant with the FCC Part 15, Subpart B, and FCC Part 15, Subpart C, 15.249 requirements when production units conform to the initial sample. Please address all questions and comments concerning this report to Nicholas Abbondante, Compliance Engineer.

2.2 Test Facility

Site 2C (Middle Site) is a 3m and 10m sheltered EMI measurement range located in a light commercial environment in Boxborough, Massachusetts. It meets the technical requirements of ANSI C63.4-1992 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 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets of metal 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 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 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.

2.3 Test Equipment and Support Equipment

The following equipment was used to make measurements for emissions testing:

Description	Manufacturer	Model	Serial #	Cal Due
Lisn, 50uH, .01-50Mhz, 24A	Solar Electronics	9252-50-R-24-BNC	941713	05/29/2004
EMI Receiver Set	Hewlett Packard	8542E	3520A00125	12/05/2003
RF FILTER	Hewlett Packard	85420E	3427A00126	12/05/2003
Lisn, 50uH, .01-50Mhz, 24A	Solar Electronics	8012-50-R-24-BNC	8379114	09/18/2003
Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS28	01/07/2004
Cable, BNC-BNC, 10m	Alpha	RG-58C/U	CBL10MS1	01/07/2004
ANTENNA	EMCO	3142	9711-1223	11/05/2003
HORN ANTENNA	EMCO	3115	9512-4632	10/31/2003
PREAMPLFIER 1-10GHz	MITEQ	NSP4000-NF	507145	09/27/2003
Hi-Frequency Cable 40Ghz	Megaphase	TM40 K1K1 80	CBL029	11/13/2003
Hi-Frequency Cable 40Ghz	Megaphase	TM40 K1K1 197	CBL028	11/13/2003
Spectrum Analyzer	Hewlett Packard	8593A	3009A00659	04/09/2004

Cables:

QTY	Description	Shield Description	Hood Description	Length (m)
1	PS/2 Mouse Cable	None	Plastic	1.5
1	USB Cable	Foil	Metal with 360° connection	1
1	Serial Mouse Cable	None	Plastic	1.5
4	AC Mains	None	Plastic	2
1	Ethernet Cable	None	Plastic	3
1	Keyboard Cable	None	Plastic	1.5
1	Video Cable	Braid Shield	Metal with 360° connection	1.5
1	Speaker Cable	None	Plastic	1.5
1	Printer Cable	Braid Shield	Metal with 360° connection	1.5

Support Equipment:

Description	Manufacturer	Model	Serial #
Keyboard	NMB	RT2257TWR	B1770278
Speakers	N/L	N/L	N/L
Mouse	Hewlett Packard	M-S34	LTN42611501
Mouse	Microsoft	58266	00352406
Monitor	Philips	105S11	31307753
Hub	3Com	3C16704A	0200/7H5F002458
Printer	Hewlett Packard	660	S65BNIQ06C
PC	Compaq	Deskpro	6046FR3ZA180

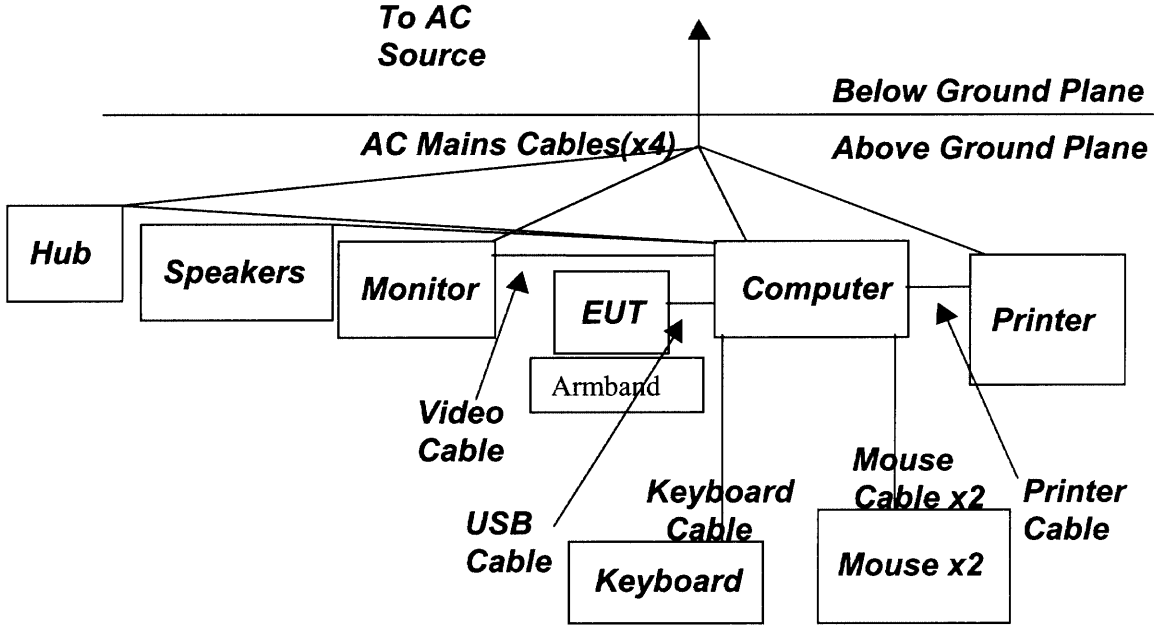
2.4 General Test Setup

Description of how the EUT was exercised during test

The Armband was activated from a fresh battery, and the Wireless Communicator was connected to a computer. The software was configured to continuously trigger a transmission from the Wireless Communicator which then triggered a response transmission from the Armband. Both the transmitter and receiver of each device were active during testing, in a manner typical of actual operation.

System Block Diagram

The diagram below details the interconnection of the EUT with the support equipment. Please note that equipment on the rear of the table was centered along the back edge. Equipment on the front of the turntable was centered along the front edge. All peripherals were separated by 10cm.



Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (1992).

During testing, the peripheral locations were not varied with respect to the main unit.

All interconnecting cables dropped from the rear of the turntable, but none were within 40 cm of the groundplane.

For maximizing emissions, the system was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported.

The transmitter was configured for testing in a typical fashion (as a customer would normally use it). The device was mounted to a cardboard box, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

3.0 Radiated Emissions
FCC § 15.209, FCC § 15.249

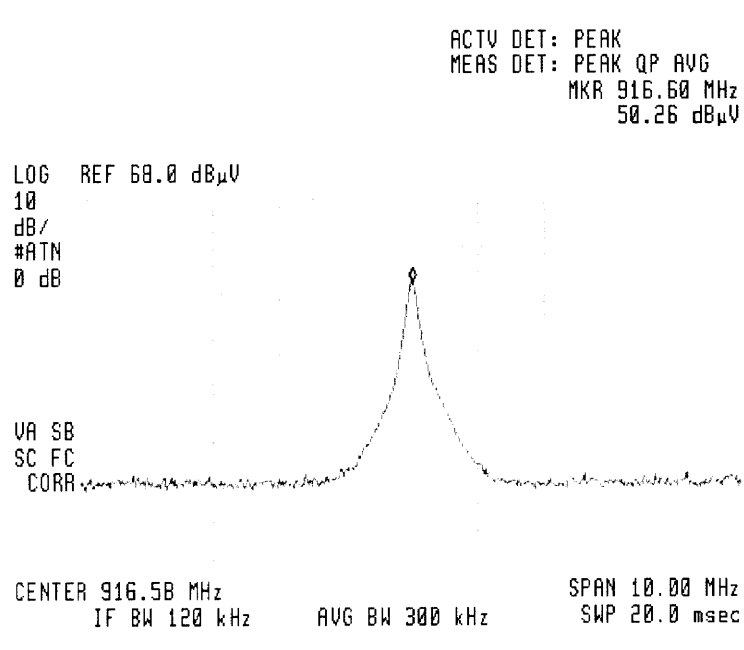
3.1 Test Procedure

Radiated emissions from the complete system under test are measured on an open field test site, calibrated under ANSI C63.4. The EUT is rotated around its vertical axis and the measurement antenna height is varied from 1 to 4 meters above the reference ground plane in order to find the direction of the maximum emission at each relevant frequency. The EUT is investigated in three orthogonal axes by mounting it on a cardboard box if the EUT geometry precludes such manipulation. The frequency range investigated is from 30 MHz to the tenth harmonic of the fundamental frequency. A quasi-peak detector was used below 1 GHz, and an average detector was used above 1 GHz. A plot shows the fundamental.

Requirement: The FCC states that the fundamental field strength must not exceed 50,000 uV/m (94 dBuV/m) between 902-928 MHz. The fundamental must be within the 902-928 MHz band. Harmonics must not exceed 500 uV/m (54 dBuV/m). Spurious emissions must be attenuated by 50 dB below the fundamental or must not exceed the general limits of FCC § 15.209 shown in the table below. Limits are specified as measured at a distance of 3 meters from the EUT. Receiver spurious emissions (Non-fundamental and non-harmonic emissions) must not exceed the limits of FCC § 15.209.

Frequency Range (MHz)	Field Strength (dBµV/m)	Measurement Distance (m)
30-88	40.0	3
88-216	43.5	3
216-960	46.0	3
Above 960	54.0	3

3.2 Test Results



Radiated Emissions / Interference

Company:	BodyMedia			Model #:	Firefly2
Engineer:	Nicholas Abbondante	Location:	Site 2	Serial #:	13002
Project #:	3043111	Pressure:	29.44inHg	Receiver:	HP 8542E
Date:	06/19/03 06/27/03	Temp:	21c	Antenna:	LOG2 11-5-03 V10.ant LOG2 11-5-03 H10.ant
Standard:	FCC Part 15 Subpart B	Humidity:	59%	PreAmp:	None
Class:	B	Group:	None	Cable(s):	2C, 10MPRIME_9-19-03.cbl None
Limit Distance:	3 meters			Test Distance:	10 meters
Voltage/Frequency:	120V/60Hz			Frequency Range:	30 MHz - 1 GHz

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	
V	40.500	13.9	11.3	1.2	0.0	-10.5	36.8	40.0	-3.2	+
V	49.070	12.0	8.9	1.3	0.0	-10.5	32.6	40.0	-7.4	
V	74.440	16.1	6.5	1.6	0.0	-10.5	34.6	40.0	-5.4	
V	121.700	9.3	6.9	1.9	0.0	-10.5	28.6	43.5	-14.9	
V	133.200	19.6	6.9	2.0	0.0	-10.5	39.0	43.5	-4.5	
V	156.000	14.5	8.8	2.2	0.0	-10.5	36.0	43.5	-7.5	
V	166.000	7.4	9.1	2.3	0.0	-10.5	29.2	43.5	-14.3	
V	168.000	15.1	9.2	2.3	0.0	-10.5	37.0	43.5	-6.5	
V	215.400	4.9	11.1	2.7	0.0	-10.5	29.1	43.5	-14.4	
V	233.100	4.9	11.8	2.7	0.0	-10.5	29.9	46.0	-16.1	
V	240.000	8.8	12.0	2.8	0.0	-10.5	34.1	46.0	-11.9	
V	260.600	2.3	12.7	2.9	0.0	-10.5	28.3	46.0	-17.7	
V	333.000	3.5	14.9	3.3	0.0	-10.5	32.1	46.0	-13.9	
V	366.500	0.7	15.8	3.5	0.0	-10.5	30.4	46.0	-15.6	
H	397.700	3.5	16.6	3.6	0.0	-10.5	34.2	46.0	-11.8	
H	432.100	3.8	16.7	3.9	0.0	-10.5	34.9	46.0	-11.1	
H	466.300	3.0	17.7	4.1	0.0	-10.5	35.3	46.0	-10.7	
H	666.100	8.4	21.3	5.1	0.0	-10.5	45.2	46.0	-0.8	+

+ - Note that this emission falls within our range of measurement uncertainty, which is +/- 4dB.

Harmonics and High Frequency Spurious Emissions

Radiated Emissions / Interference

Company: BodyMedia — Model #: Firefly2
Engineer: Nicholas Abbondante — Location: Site 2 — Serial #: 13002
Project #: 3043111 — Pressure: 29.44inHg — Receiver: HP 8593A
Date: 06/27/03 — Temp: 21c — Antenna: HORN1 10-31-03 V3.ant HORN1 10-31-03 H3.ant
Standard: FCC Part 15 Subpart B — Humidity: 59% — PreAmp: PRE8 9-27-03.amp
Class: B — Group: None — Cable(s): CBL028 11-13-03.cbl CBL029 11-13-03.cbl
Limit Distance: 3 meters — Test Distance: 3 meters
Voltage/Frequency: 120V/60Hz — Frequency Range: 1 GHz - 9.2 GHz

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
V	1064.000	30.6	25.9	2.8	22.0	0.0	37.3	54.0	-16.7
V	1198.000	29.1	26.2	3.0	22.1	0.0	36.2	54.0	-17.8
V	1330.000	34.3	26.5	3.1	22.1	0.0	41.8	54.0	-12.2
V	1465.000	28.5	26.7	3.3	22.2	0.0	36.4	54.0	-17.6
V	1592.000	29.3	27.2	3.5	22.2	0.0	37.8	54.0	-16.2
V	2127.000	25.2	29.3	4.1	22.3	0.0	36.2	54.0	-17.8
V	2255.000	24.9	29.5	4.2	22.3	0.0	36.3	54.0	-17.7

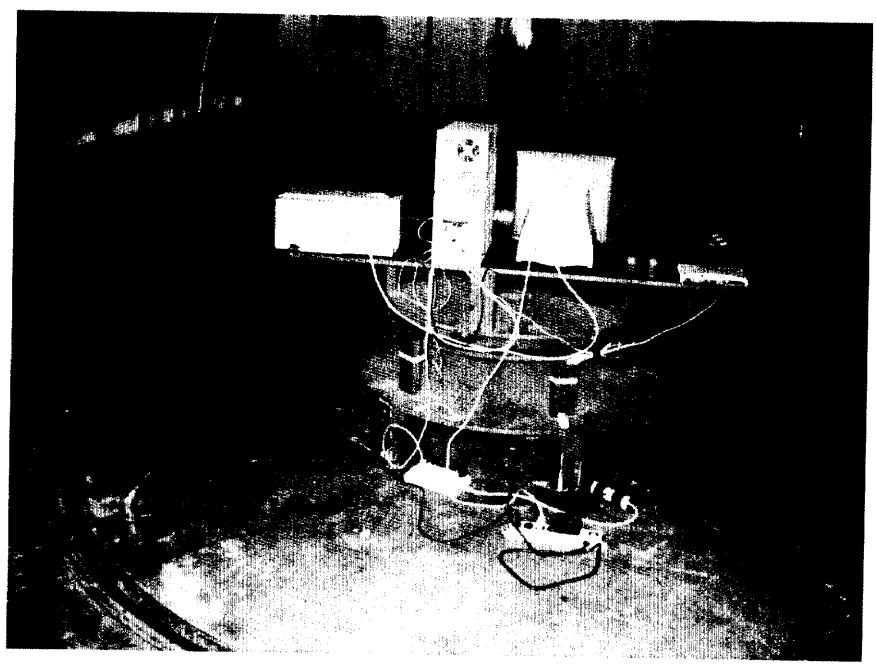
Fundamental

Radiated Emissions / Interference

Company: BodyMedia — Model #: Firefly2
Engineer: Nicholas Abbondante — Location: Site 2 — Serial #: 13002
Project #: 3043111 — Pressure: 29.80inHg — Receiver: HP 8542E
Date: 08/29/03 — Temp: 22c — Antenna: LOG2 11-5-03 V10.ant LOG2 11-5-03 H10.ant
Standard: FCC Part 15 Subpart B — Humidity: 58% — PreAmp: None
Class: B — Group: None — Cable(s): 2C, 10MPRIME_9-19-03.cbl None
Limit Distance: 3 meters — Test Distance: 10 meters
Voltage/Frequency: 120V/60Hz — Frequency Range: 30 MHz - 1 GHz

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
V	916.600	48.4	23.9	6.2	0.0	-10.5	89.0	94.0	-5.0

3.3 Configuration Photographs - Radiated Emissions



4.0 Line-Conducted Emissions

FCC § 15.207

4.1 Test Procedure

Conducted emissions are measured in the frequency range of 450 kHz to 30 MHz on AC power lines. Floor-standing equipment is placed on a conductive ground plane. Interference voltages are measured with a LISN connected to a spectrum analyzer or receiver. Tabletop equipment is placed 40 cm from a vertical ground plane on a non-conductive table with a height of 80 cm above the horizontal ground plane.

Requirement: Line-conducted emissions must not exceed 48 dBuV. Note that after July 11, 2005, CISPR 22 limits apply to line-conducted tests.

4.2 Test Results

Conducted Emissions / Interference

Company:	*BodyMedia*			*Model #:*	*Firefly2*	
Engineer:	*Nicholas Abbondante*	*Location:*	*Site 2*	*Serial #:*	*13002*	
Project #:	*3043111*	*Pressure:*	*29.44inHg*	*Receiver:*	*HP 8542E*	
Date:	*06/19/03*	*Temp:*	*21c*	*Cable:*	*CBL10MS1 9-10-03.cbl*	
Standard:	*FCC Part 15 Subpart B*	*Humidity:*	*65%*	*LISN 1, 2:*	*LISN11 [1] 5-29-04.lsn*	*LISN11 [2] 5-29-04.lsn*
Class:	*B*	*Group:*	*None*	*LISN 3, N:*	*None*	*None*
Preamp:	*None*			*Attenuator:*	*DS28 8-14-03.att*	
Voltage/Frequency:	*120V/60Hz*			*Frequency Range:*	*450 kHz - 30 MHz*	

Net is the sum of worst-case lisn, cable, & attenuator losses, preamp gain, and initial reading

	Reading	Reading	Reading	Reading	Quasi-Peak		
Frequency MHz	Line 1 dB(uV)	Line 2 dB(uV)	Line 3 dB(uV)	Neutral dB(uV)	Net dB(uV)	Limit dB(uV)	Margin dB
0.700	17.6	16.8			39.1	48.0	-8.9
4.388	18.5	16.7			39.9	48.0	-8.1
6.753	23.5	22.8			45.0	48.0	-3.0
12.810	22.1	22.2			44.0	48.0	-4.0
15.450	16.1	10.8			38.0	48.0	-10.0
26.620	10.0	9.6			32.3	48.0	-15.7

4.3 Configuration Photographs – Line-Conducted Emissions