TEST REPORT

Report Number: 3160455ATL-001

October 29, 2008

Product Designation: Feedback Device for Game Control

Standard: FCC 15.249 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHZ, and 24.0-24.25 GHz.

Tested by:
Intertek Testing Services NA Inc.
1950 Evergreen Blvd., Suite 100
Duluth, GA 30096

Client:
Freer Logic LLC
PO Box 2147
Skyland, NC 28776
Contact: Peter Freer
Phone: 828.651.8969
Fax: 866.506.2756

Tests performed by:

Richard C. Bianco
EMC Project Engineer

Report reviewed by:

David J. Schramm
Assistant Chief Engineer - EMC

1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatum text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)	09/28/2008	
5.0	Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)		PASS
6.0	Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)	09/07/2008	PASS
NA	Duty Cycle Determination (FCC 15A - 15.35(c)) was waived due to Not Required		
7.0	Revision History (Revision History)	09/29/2008	
NA	Conducted emissions on AC power lines (Conducted Emissions) was waived due to The EUT is battery operated		
NA	15.249(b): Requirements for fixed, point-to-point operation (FCC 15C - 15.249(b)) was waived due to Not Applicable		
NA	Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215) was waived due to Not Applicable		

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Acquisition Transmitter	Freer Logic	HW4 Rev. 5	NA

EUT receive date:	09/29/2008
EUT receive condition:	Good

Description of EUT provided by Client:
The HW4 is a wireless battery operated brain wave acquisition device.

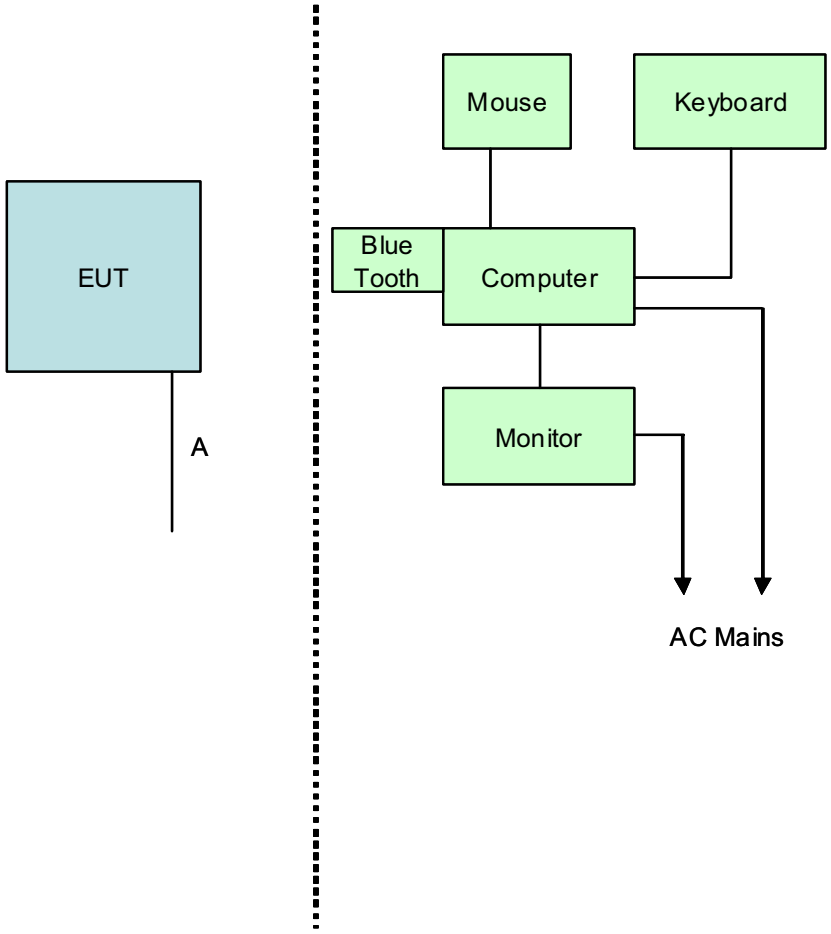
Description of EUT exercising:
The EUT was communicating with a Bluetooth device connected to the computer. A hyper terminal was used to monitor the data transfer.

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Method:

Record the details of EUTcabling, document the support equipment, and show the interconnections in a block diagram.

Drawing:



System Block Diagram

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Data:

EUT Cabling						
					Connection	
ID	Description	Length	Shielding	Ferrites	From	To
A	8-pin modular	1.5m	No	No	EUT	Unterminated

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Computer	Compaq	Presario	6039FR4ZL412
Monitor	Philips	107S1174	29530459
Keyboard	Compaq	SK-2700	B15910CCPGGCBH
Mouse	Microsoft	XOB-71118-PID-98180	1735606-8
Bluetooth Adapter	Azio	BTD-603-132	NA

Note: The 8-pin modular cable will have no termination for end use

5.0 Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)

Method:

Complete the overview spreadsheet.

Related Submittal(s) Grants: This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.

Results: The sample tested was found to Comply.

Data:

Applicant	Freer Logic LLC
	P.O. Box 2147
	Skyland, NC 28776
Trade Name & Model No.	HW4 Rev. 5
FCC Identifier	
Use of product	Brain Wave Acquisition Device
Transmitter activation	☑ Manual and automatically deactivate within 5 seconds of being released
	☐ Periodic transmissions
Frequency Range (MHz)	2402-2480
Antenna Type (15.203)	Permenently Connected
Manufacturer name & address	Freer Logic LLC
	P.O. Box 2147
	Skyland, NC 28776

Related Submittals and Grants:	This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.
Additions, deviations and exclusions from standards	None

6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Method:

Measurements shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16.

Bandwidths:
30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW
Above 1000 MHz: 1 MHz RBW and 3 MHz VBW

Detectors:
Equal to or less than 1000 MHz: CISPR quasi-peak detector (alternative: peak detector)
Above 1000 MHz: Average detector (applies to average limit)
Above 1000 MHz: Peak detector (applies to peak limit)

Limits:
Equal to or less than 1000 MHz, the limits are specified as quasi-peak. If a peak detector is used, the limit does not change.
Above 1000 MHz, the limits are specified as average. The peak limit is 20 dB above the average limit. Both peak and average measurements are required to be reported.

Frequency range of radiated measurements
For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

Measurement antenna requirements:
Below 30 MHz - Loop antenna
30 to 1000 MHz - Biconical, Log Periodic, or equivalent
Above 1000 MHz - Horn or equivalent

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission level. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is handheld, it shall be oriented in each of its othogonal axes.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003.

TEST SITE
The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, BiLog, 20-2000MHz	Chase	CBL6112A	211518	12/20/2007	12/20/2008

6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, <18 GHz	EMCO	3115	213061	04/18/2008	04/18/2009
Antenna, Horn, 18-40 GHz	EMCO	3116	213023	04/29/2008	04/29/2009
Cable E01, <18GHz	Pasternack	RG214/U	E01	05/05/2008	05/05/2009
Cable E05, <18GHz	Huber-Suhner	Sucoflex 104PEA	E05	05/05/2008	05/05/2009
Cable E201, 18 GHz, N, 3m	Megaphase	TM18 NKNK 118	E201	01/16/2008	01/16/2009
Cable E402, 40 GHz, 2.9, 9"	Megaphase	TM40 K1K1 9	E402	06/04/2008	06/04/2009
Cable E404, 40 GHz, 2.9, 2m	Megaphase	TM40 K1K1 80	E404	06/04/2008	06/04/2009
Cable E405, 40 GHz, 2.9, 2m	Megaphase	TM40 K1K1 80	E405	06/04/2008	06/04/2009
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/05/2008	05/05/2009
Cable ST1, 7m, N-N, 18 GHz	Storm Products Co.	PR90-206-7MTR	ST1	01/16/2008	01/16/2009
EMI Receiver	Hewlett Packard	8546A	211505	12/13/2007	12/13/2008
EMI Receiver, Preselector section	Hewlett Packard	85460A	015762	12/13/2007	12/13/2008
Excel spreadsheet for radiated emissions	Software	Excel - RE Worksh	SW004	11/21/2007	11/21/2008
Preamplifier, 18-40GHz, 29 dB Gain	Miteq	JS41800400-30-5P	200080	02/19/2008	02/19/2009
Preamplifier, 18-40GHz, 29 dB Gain	Miteq	JS41800400-30-5P	200106	09/02/2008	09/02/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009
Preamplifier, 20MHz to 2GHz, 30 dB	A.H. Systems	PAM-0202	200082	11/26/2007	11/26/2008
Spectrum Analyzer, 20Hz-40GHz	Rohde & Schwarz	FSEK30	200062	03/19/2008	03/19/2009

Results: The sample tested was found to Comply.

6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Photo:

Test Setup - Front View

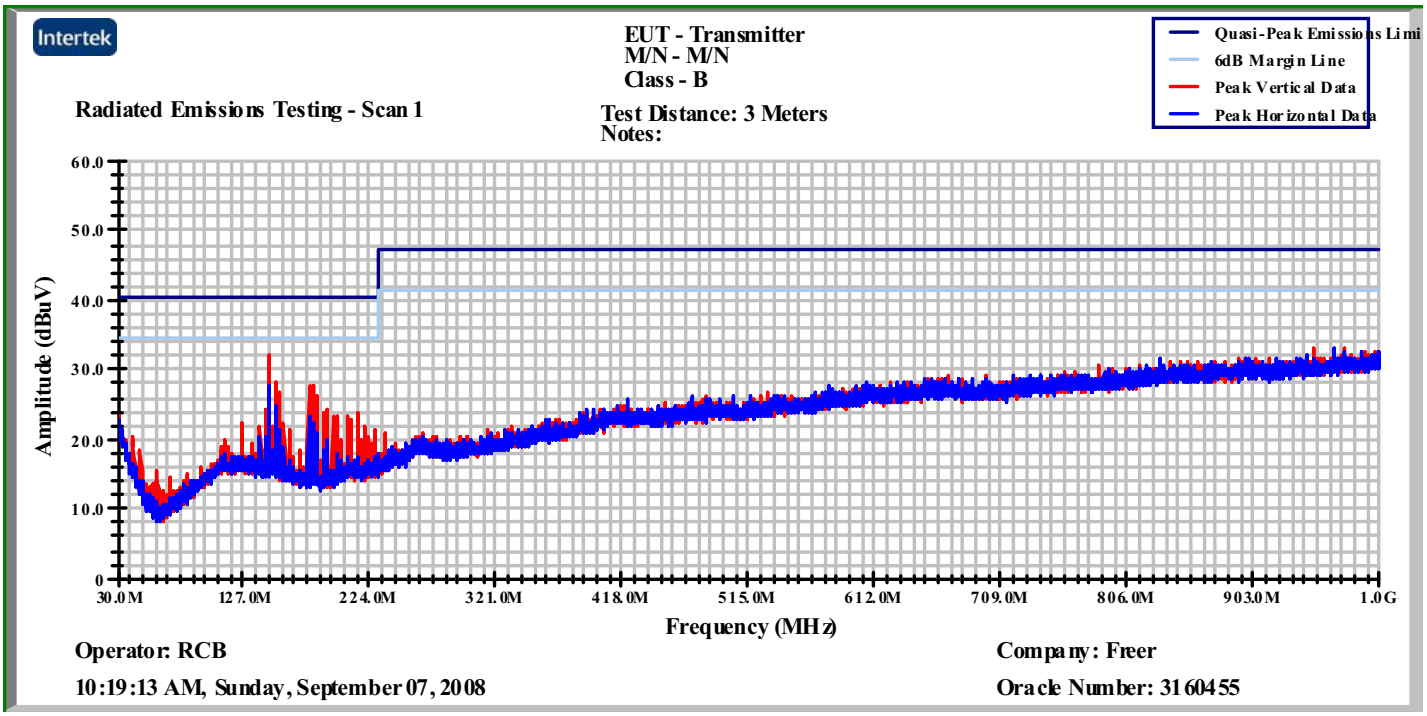
6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Photo:

Test Setup - Rear View

6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Plot:



Radiated Emissions from 30-1000MHz

6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Data:

Frequency Range (MHz): 30-25000 **Test Distance (m):** 3

Input power: Battery **Limit:** CISPR Class B-3m

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**3m Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
V	147.540	46.8	12.0	2.1	27.9	33.0	40.5	-7.5	Pk/120k/300k
V	151.140	43.3	11.9	2.1	27.9	29.4	40.5	-11.1	Pk/120k/300k
V	154.858	41.6	11.9	2.1	27.9	27.7	40.5	-12.8	Pk/120k/300k
V	177.010	42.9	10.6	2.1	27.9	27.7	40.5	-12.8	Pk/120k/300k
V	180.840	43.5	10.3	2.1	27.9	28.0	40.5	-12.6	Pk/120k/300k
V	184.440	42.9	10.3	2.1	27.9	27.3	40.5	-13.2	Pk/120k/300k
Calculations		G=C+D+E-F		I=G-H					

Note: There were no other unintentional or intentional emissions detected, excluding the transmit frequency.

Radiated Emissions from 30-25000MHz

6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Data:

Frequency Range (MHz): 30-25000 **Test Distance (m):** 3

Input power: Battery **Limit:** FCC15 Class B-3m

Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**3m Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
V	2401.360	76.2	27.6	9.1	40.8	72.1	94.0	-21.9	Pk/1M/1M / X
H	2401.360	72.1	27.7	9.1	40.8	68.1	94.0	-25.9	Pk/1M/1M / X
V	2401.360	70.9	27.6	9.1	40.8	66.8	94.0	-27.2	Pk/1M/1M / Y
H	2401.360	79.6	27.7	9.1	40.8	75.6	94.0	-18.4	Pk/1M/1M / Y
V	2401.360	75.8	27.6	9.1	40.8	71.7	94.0	-22.3	Pk/1M/1M / Z
H	2401.360	79.6	27.7	9.1	40.8	75.6	94.0	-18.4	Pk/1M/1M / Z
V	2445.000	77.1	27.6	9.1	40.9	72.9	94.0	-21.1	Pk/1M/1M / X
H	2445.000	73.8	27.7	9.1	40.9	69.7	94.0	-24.3	Pk/1M/1M / X
V	2445.000	74.8	27.6	9.1	40.9	70.6	94.0	-23.4	Pk/1M/1M / Y
H	2445.000	79.6	27.7	9.1	40.9	75.5	94.0	-18.5	Pk/1M/1M / Y
V	2445.000	74.1	27.6	9.1	40.9	69.9	94.0	-24.1	Pk/1M/1M / Z
H	2445.000	80.2	27.7	9.1	40.9	76.1	94.0	-17.9	Pk/1M/1M / Z
V	2480.960	78.4	27.6	9.1	40.9	74.2	94.0	-19.8	Pk/1M/1M / X
H	2480.960	73.9	27.7	9.1	40.9	69.8	94.0	-24.2	Pk/1M/1M / X
V	2480.960	75.1	27.6	9.1	40.9	70.9	94.0	-23.1	Pk/1M/1M / Y
H	2480.960	80.9	27.7	9.1	40.9	76.8	94.0	-17.2	Pk/1M/1M / Y
V	2480.960	75.2	27.6	9.1	40.9	71.0	94.0	-23.0	Pk/1M/1M / Z
H	2480.960	81.2	27.7	9.1	40.9	77.1	94.0	-16.9	Pk/1M/1M / Z
Calculations		G=C+D+E-F		I=G-H					

Note: There were no spurious emissions detected within 10dB of the limit above 1GHz.

Radiated Emissions from 1000-25000MHz

7.0 Revision History (Revision History)

Method:

Document the history of the report.

Data:

Revision Level	Date	Report Number	Notes
Original issue	September 28, 2008	3160455-001	--
1	October 29, 2008	3160455-001	included data for 3 channels