



EMC Test Report

*Application for Grant of Equipment Authorization
pursuant to*

*Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7
FCC Part 15 Subpart C*

Model: 95519.808 (Wireless Drum Controller for Xbox 360)

IC CERTIFICATION #: 7196A-95519808

FCC ID: VFI95519808

APPLICANT: RedOctane Inc.
444 Castro Street
Mountain View, CA 94041

TEST SITE(S): Elliott Laboratories
684 W. Maude Avenue
Sunnyvale, CA 94085

IC SITE REGISTRATION #: 2845A-2

REPORT DATE: February 2, 2010

FINAL TEST DATES: November 3, 2009

AUTHORIZED SIGNATORY:

A handwritten signature in blue ink, appearing to read "Mark E. Hill", written over a horizontal line.

Mark E. Hill
Staff Engineer
Elliott Laboratories



Testing Cert #2016-01

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	February 2, 2010	First release	

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SCOPE

An electromagnetic emissions test has been performed on the RedOctane Inc. model 95519.808 (Wireless Drum Controller for Xbox 360), pursuant to the following rules:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
FHSS test procedure DA 00-0705A1, March 2000

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of RedOctane Inc. model 95519.808 (Wireless Drum Controller for Xbox 360) complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 “Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment”
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of RedOctane Inc. model 95519.808 (Wireless Drum Controller for Xbox 360) and therefore apply only to the tested sample. The sample was selected and prepared by Stephen Withers of RedOctane Inc.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS SUMMARY**FREQUENCY HOPPING SPREAD SPECTRUM (2400 – 2483.5 MHz, less than 75 channels)**

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	1.467 MHz	Channel spacing > 2/3 of 20dB, if power limited to 125mW	Complies
		Channel Separation	2031 kHz		Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Number of Channels	41	15 or more	Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Channel Dwell Time (average time of occupancy)	Refer to operational description	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	All channels are used equally - refer to the operational description for full explanation	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power	2.11 dBm (0.0016 Watts) ^{Note 1}	0.125 Watts	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	49.5 dBuV/m @ 4803.9 MHz	15.207 in restricted bands, all others < -20dBc	Complies (-4.5 dB)
15.247 (a) (1)	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

Note 1: Output power calculated from field strength measurement

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Integral antenna	Integral or unique antenna connector	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	49.9dB μ V/m @ 9932.1MHz (-4.1dB)	Refer to Standard	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	N/A – EUT is battery powered and does not provide for battery charging		
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Power is below the FCC's 25mW low threshold for SAR for a portable device and below RSS-102's lower threshold of 20mW	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	1448 kHz	Information only	N/A

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The RedOctane Inc. model 95519.808 (Wireless Drum Controller for Xbox 360) is a wireless drum controller for the XBox 360. The EUT was treated as table top equipment. The EUT is battery powered from two AA batteries and does not provide a means for recharging the batteries.

The sample was received on November 3, 2009 and tested on November 3, 2009. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Activision	95519.808	Wireless drum controller	FDA1X2000000 012098	VFI95519808

ANTENNA SYSTEM

The antenna system used with the RedOctane Inc. model 95519.808 (Wireless Drum Controller for Xbox 360) is integral to the device.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 37 cm wide by 23 cm deep by 4 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Microsoft	-	Headset	-	-

The following equipment was used as remote support equipment for emissions testing:

Company	Model	Description	Serial Number	FCC ID
Dell	Inspiron 2200	Laptop	Elliott #3	-
Microsoft	Xbox 360 wireless transceiver	-	-	-

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
Xbox headset	Headset	Multiwire	Unshielded	1.0
Bass drum pedal (x2)	Bass drum pedal (x2)	Multiwire	Unshielded	2.0
MIDI in (DIN 5)	Unterminated	5 wire	Unshielded	-
MIDI out (DIN 5)	Unterminated	5 wire	Unshielded	-

Note: The expansion port was not connected during testing. The manufacturer stated that it is not supported at this time.

EUT OPERATION

The EUT was configured to transmit on a single channel, hopping at maximum output power. For some tests, the EUT was configured to hop across all channels used during normal operation.

TEST SITE**GENERAL INFORMATION**

Final test measurements were taken on November 3, 2009 at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
SVOATS #2	90593	2845A-2	684 West Maude Ave, Sunnyvale CA 94085-3518

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception, on OATS sites, of predictable local TV, radio, and mobile communications traffic. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

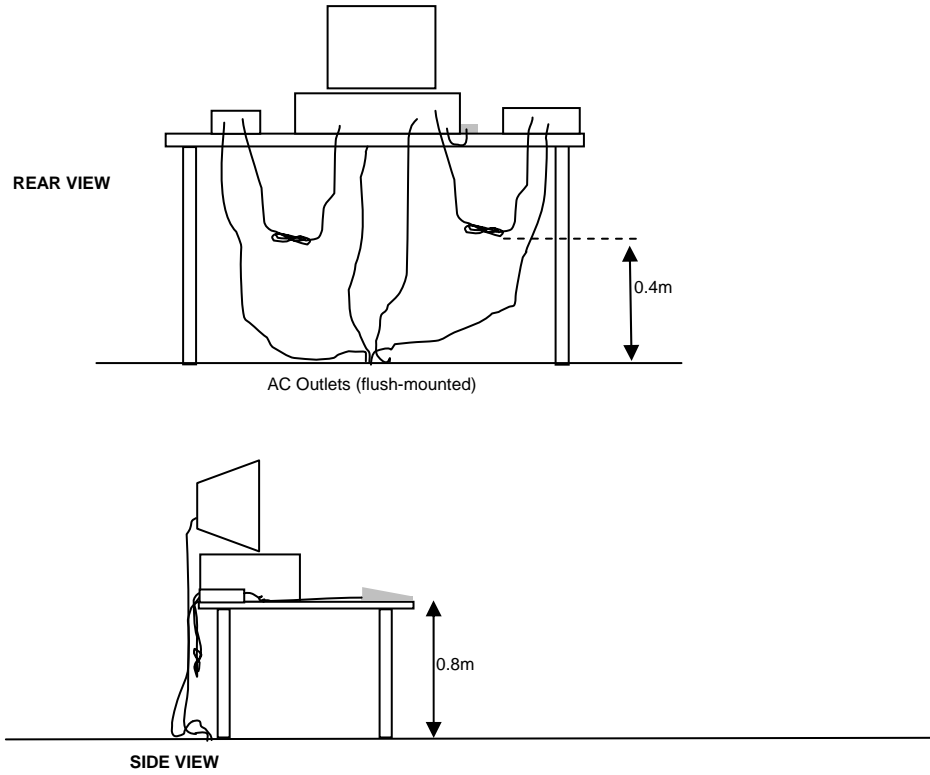
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

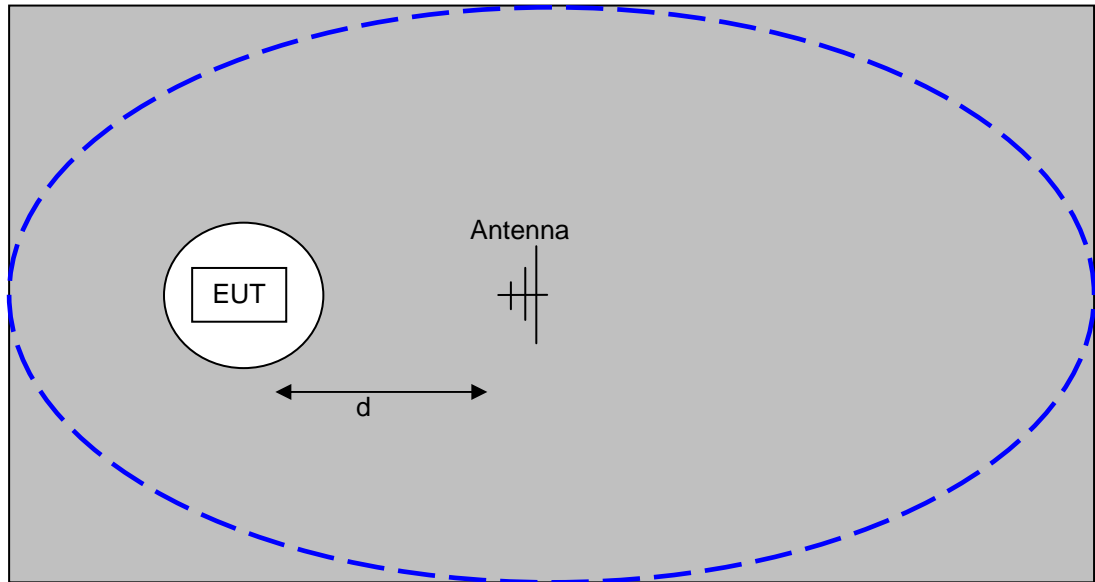
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

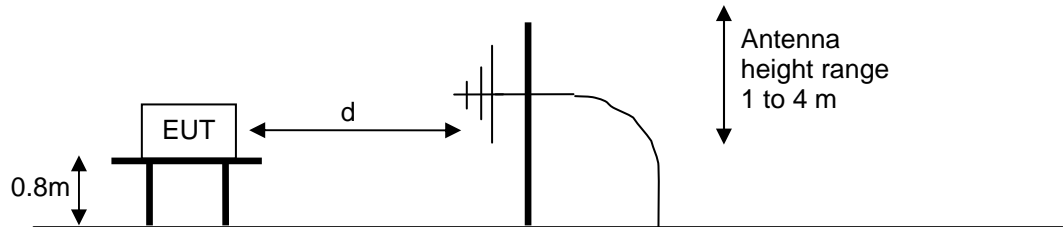
When testing above 18 GHz, the receive antenna is located at 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements



The ground plane extends beyond the ellipse defined in CISPR 16 / CISPR 22 / ANSI C63.4 and is large enough to accommodate test distances (d) of 3m and 10m. Refer to the test data tables for the actual measurement distance.



Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands¹ (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{\text{KHz}} @ 300\text{m}$	$67.6-20*\log_{10}(F_{\text{KHz}}) @ 300\text{m}$
0.490-1.705	$24000/F_{\text{KHz}} @ 30\text{m}$	$87.6-20*\log_{10}(F_{\text{KHz}}) @ 30\text{m}$
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

¹ The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

OUTPUT POWER LIMITS – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

$$F_d = \text{Distance Factor in dB}$$

$$D_m = \text{Measurement Distance in meters}$$

$$D_s = \text{Specification Distance in meters}$$

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

$$R_r = \text{Receiver Reading in dBuV/m}$$

$$F_d = \text{Distance Factor in dB}$$

$$R_c = \text{Corrected Reading in dBuV/m}$$

$$L_s = \text{Specification Limit in dBuV/m}$$

$$M = \text{Margin in dB Relative to Spec}$$

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

Appendix A Test Equipment Calibration Data**Radiated Emissions, DTS, 30 - 25,000 MHz, 03-Nov-09****Engineer: John Caizzi**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Antenna, Horn, 1-18 GHz	3115	487	15-Jul-10
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	19-Aug-10
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	29-Jul-10

Radio Antenna Port (Power and Spurious Emissions), 05-Nov-09**Engineer: Suhaila Khushzad**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10

Appendix B Test Data

T77098 15 Pages

Client:	RedOctane	Job Number:	J76179
Model:	Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number:	T77098
Contact:	Mark Johnson	Account Manager:	Sheareen Washington
Emissions Standard(s):	FCC 15.247, RSS-210	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

RedOctane

Model

Band Hero Wireless Drum Controller for Xbox 360 (95519.808)

Date of Last Test: 11/9/2009

Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

FCC 15.247 FHSS - Power, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 11/3/2009
 Test Engineer: John Caizzi
 Test Location: OATS #2

Config. Used: 1
 Config Change: None
 EUT Voltage: Battery

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:
 Temperature: 24 °C
 Rel. Humidity: 31 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30 - 25000 MHz - Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	49.5dBµV/m @ 4803.9MHz (-4.5dB)
2	Output Power	15.247(b)	Pass	2.11 dBm (0.0016W)
3	20dB Bandwidth	15.247(a)	Pass	1.467 MHz
3	99% bandwidth	15.247(a)	Pass	1.448 MHz
3	Channel Occupancy	15.247(a)	-	Refer to Theory
3	Number of Channels	15.247(a)	Pass	41
3	Channel Spacing	15.247(a)	Pass	2.031 MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Note - Preliminary measurements showed no radio related emissions below 1 GHz.

Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

Run #1a: Radiated Spurious Emissions, 30 - 25000 MHz. Low Channel @ 2402 MHz

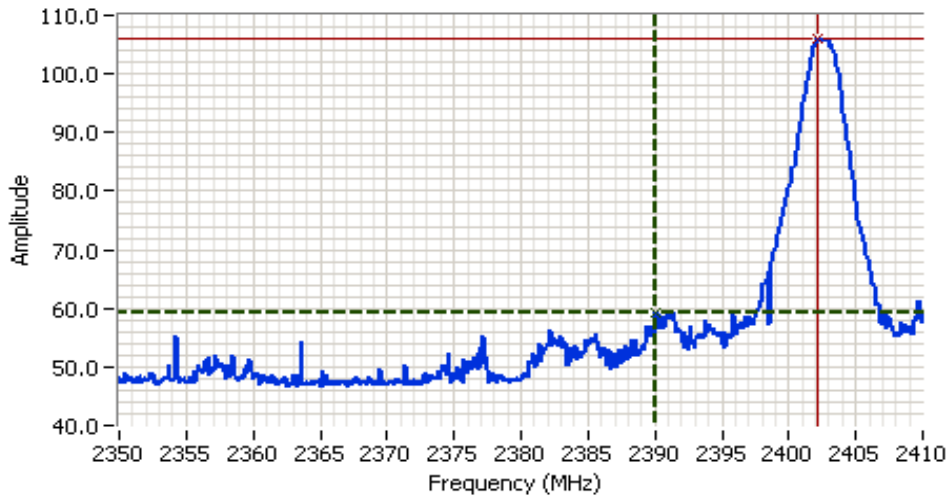
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
2402.320	95.2	V	-	-	PK	227	1.00	RB 1 MHz; VB: 1 MHz
2402.080	94.7	V	-	-	PK	227	1.00	RB 100 kHz; VB: 100 kHz
2401.700	94.0	V	-	-	Avg	227	1.00	RB 1 MHz; VB: 1 kHz
2401.470	93.4	H	-	-	PK	189	1.00	RB 1 MHz; VB: 1 MHz
2402.200	93.3	H	-	-	PK	188	1.00	RB 100 kHz; VB: 100 kHz
2401.380	92.1	H	-	-	Avg	189	1.00	RB 1 MHz; VB: 1 kHz

Fundamental emission level @ 3m in 100kHz RBW:	94.7	dB μ V/m
Limit for emissions outside of restricted bands:	74.7	dB μ V/m

Limit is -20dBc

Delta Marker - Peak	46.8 dB	Delta between highest in-band and highest
Delta Marker - Average	56.8 dB	



Analyzer Settings

HP8564E
 CF: 2380.000 MHz
 SPAN: 60.000 MHz
 RB 1.000 MHz
 VB 1.000 MHz
 Detector POS
 Att 10
 RL Offset 0.00
 Sweep Time 50.0ms
 Ref Lvl: 107.00DBUV

Comments

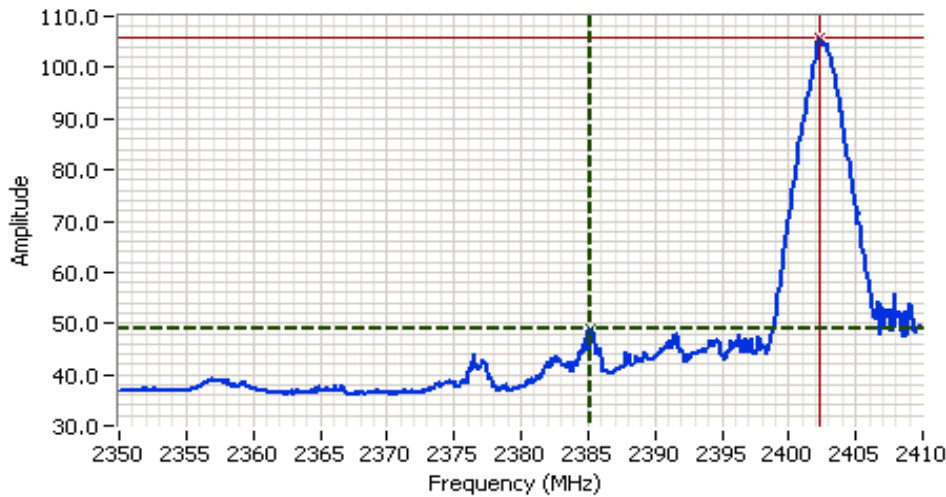
2402 MHz Pk

Cursor 1	2390.0000	59.17	
Cursor 2	2402.2000	106.00	

Delta Freq.	12.200
Delta Amplitude	46.83



Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A



Analyzer Settings

HP8564E
 CF: 2380.000 MHz
 SPAN: 60.000 MHz
 RB 1.000 MHz
 VB 1.00 kHz
 Detector POS
 Att 10
 RL Offset 0.00
 Sweep Time 150.0ms
 Ref Lvl: 107.00DBUV

Comments

2402 MHz Avg

Cursor 1	2385.2000	48.83	
Cursor 2	2402.3000	105.67	

Delta Freq. 17.100
 Delta Amplitude 56.83



Band Edge Signal Field Strength - Calculated using marker delta method

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2385.200	37.2	V	54.0	-16.8	Avg	227	1.0	
2390.000	48.4	V	74.0	-25.6	Pk	227	1.0	

Note 1: Due to the signal being pulse modulated could not use VBW of 10Hz as this will artificially drop signal level by 20dB. A 1kHz was used instead of the 10Hz to prevent pulse desensitization.

Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

Run #1a: Continued
Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
4803.920	49.5	H	54.0	-4.5	AVG	358	1.66	RB 1 MHz; VB: 1 MHz
4803.870	67.5	H	74.0	-6.5	PK	358	1.66	RB 1 MHz; VB: 1 MHz
9606.530	66.8	H	74.7	-7.9	PK	37	1.28	RB 100 kHz; VB: 100 kHz
4803.330	43.4	V	54.0	-10.6	AVG	332	2.03	RB 1 MHz; VB: 1 MHz
4804.480	61.4	V	74.0	-12.6	PK	332	2.03	RB 1 MHz; VB: 1 MHz
9607.670	60.9	V	74.7	-13.8	PK	56	1.20	RB 100 kHz; VB: 100 kHz
7206.000	58.4	H	74.7	-16.3	PK	23	1.35	RB 100 kHz; VB: 100 kHz
7205.720	56.6	V	74.7	-18.1	PK	53	1.33	RB 100 kHz; VB: 100 kHz

Note 2: The average field strength was determined by applying an average correction factor of -18dB to the peak value. This correction factor is based on a maximum transmit time of 972us in any 8ms period for the controller.

Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

Run #1b: Radiated Spurious Emissions, 30 - 25000 MHz. Center Channel @ 2442 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
2442.750	95.8	V	-	-	PK	138	1.00	RB 1 MHz; VB: 1 MHz
2441.630	94.5	V	-	-	PK	138	1.00	RB 100 kHz; VB: 100 kHz
2441.420	87.6	V	-	-	Avg	138	1.00	RB 1 MHz; VB: 1 kHz
2441.830	91.3	H	-	-	PK	210	1.38	RB 1 MHz; VB: 1 MHz
2441.650	90.4	H	-	-	PK	209	1.38	RB 100 kHz; VB: 100 kHz
2442.130	88.0	H	-	-	Avg	210	1.38	RB 1 MHz; VB: 1 kHz

Fundamental emission level @ 3m in 100kHz RBW:	95.8	dB μ V/m
Limit for emissions outside of restricted bands:	75.8	dB μ V/m

Limit is -20dBc

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
4883.150	48.0	H	54.0	-6.0	PK	353	2.03	RB 1 MHz; VB: 1 MHz
4883.150	66.0	H	74.0	-8.0	PK	353	2.03	RB 1 MHz; VB: 1 MHz
9767.920	66.2	H	75.8	-9.6	PK	48	1.31	RB 100 kHz; VB: 100 kHz
7327.000	43.9	V	54.0	-10.1	Avg	50	1.38	RB 1 MHz; VB: 1 kHz
7326.830	43.1	H	54.0	-10.9	Avg	38	1.36	RB 1 MHz; VB: 1 kHz
7327.000	61.9	V	74.0	-12.1	PK	50	1.38	RB 1 MHz; VB: 1 MHz
4884.120	41.9	V	54.0	-12.1	Avg	214	1.39	RB 1 MHz; VB: 1 kHz
7326.830	61.1	H	74.0	-12.9	PK	38	1.36	RB 1 MHz; VB: 1 MHz
9766.570	62.5	V	75.8	-13.3	PK	52	1.29	RB 100 kHz; VB: 100 kHz
4884.120	59.9	V	74.0	-14.1	PK	214	1.39	RB 1 MHz; VB: 1 MHz

Note 1: The average field strength was determined by applying an average correction factor of -18dB to the peak value. This correction factor is based on a maximum transmit time of 972us in any 8ms period for the controller.

Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

Run #1c: Radiated Spurious Emissions, 30 - 25000 MHz. High Channel @ 2482 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

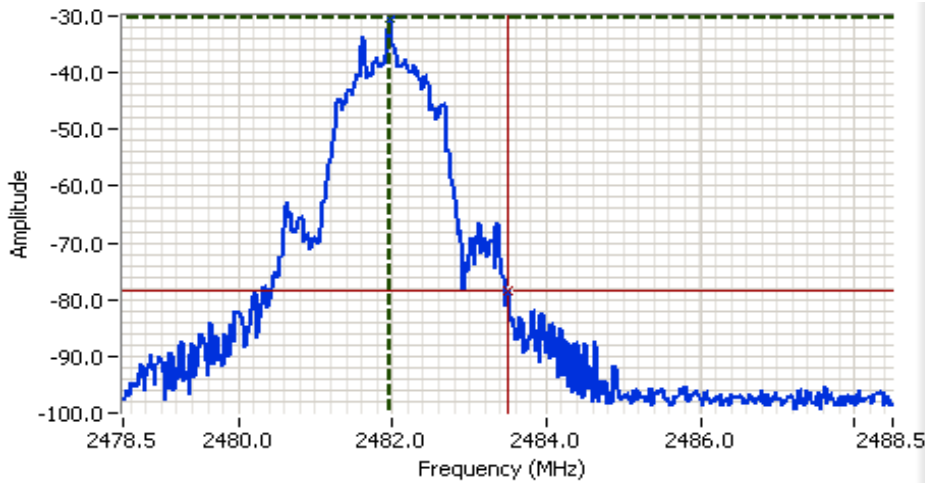
Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
2481.880	93.6	H	-	-	PK	122	1.00	RB 1 MHz; VB: 1 MHz
2482.120	92.6	H	-	-	PK	122	1.00	RB 100 kHz; VB: 100 kHz
2482.120	90.3	H	-	-	Avg	122	1.00	RB 1 MHz; VB: 1 kHz
2482.600	94.4	V	-	-	PK	142	1.00	RB 1 MHz; VB: 1 MHz
2481.880	92.3	V	-	-	Avg	142	1.00	RB 1 MHz; VB: 1 kHz
2481.620	91.4	V	-	-	PK	141	1.00	RB 100 kHz; VB: 100 kHz

Note: Due to the signal being pulse modulated could not use VBW of 10Hz as this will artificially drop signal level by 20dB. A 1kHz was used instead of the 10Hz to prevent pulse desensitization.

Fundamental emission level @ 3m in 100kHz RBW:	94.4	dB μ V/m
Limit for emissions outside of restricted bands:	74.4	dB μ V/m

Limit is -20dBc

Delta Marker: RBW = 30 kHz, VBW = 30 kHz	48.0 dB
--	---------



Analyzer Settings
 Agilent Technologies, E4446A
 CF: 2483.500 MHz
 SPAN: 10.000 MHz
 RB: 30.0 kHz
 VB: 30.0 kHz
 Detector: POS
 Attn: 0 DB
 RL Offset: 0.0 DB
 Sweep Time: 13.0ms
 Ref Lvl: -26.0 DBM

Comments
 High Channel Bandedge - 30kHz/30kHz

Cursor 1	2481.9666	-30.44	+	-	↕	Delta Freq.	1.533
Cursor 2	2483.5000	-78.43	+	-	↕	Delta Amplitude	47.99



Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

Band Edge Signal Field Strength - Calculated using marker delta method

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
2483.521	46.4	V	74.0	-27.6	Pk	141	1.00	
2483.521	44.3	V	54.0	-9.7	Avg	141	1.00	

Date of Test: 11/9/2009
 Test Engineer: Suhaila Khushzad
 Test Location: OATS #2

Config. Used: 1
 Config Change: None
 EUT Voltage: Battery

Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
9928.920	47.8	V	54.0	-6.2	AVG	58	1.2	RB 1 MHz; VB: 1 kHz
9926.630	65.8	V	74.0	-8.2	PK	58	1.2	RB 1 MHz; VB: 1 MHz
4964.030	43.9	H	54.0	-10.1	AVG	226	1.0	RB 1 MHz; VB: 1 kHz
4964.020	42.7	V	54.0	-11.3	AVG	0	2.0	RB 1 MHz; VB: 1 kHz
7445.480	42.3	H	54.0	-11.7	AVG	34	1.4	RB 1 MHz; VB: 1 kHz
4963.820	61.9	H	74.0	-12.1	PK	226	1.0	RB 1 MHz; VB: 1 MHz
4964.730	60.7	V	74.0	-13.3	PK	0	2.0	RB 1 MHz; VB: 1 MHz
7445.830	60.3	H	74.0	-13.7	PK	34	1.4	RB 1 MHz; VB: 1 MHz
7445.850	39.3	V	54.0	-14.7	AVG	173	1.5	RB 1 MHz; VB: 1 kHz
7444.980	57.3	V	74.0	-16.7	PK	173	1.5	RB 1 MHz; VB: 1 MHz
12408.420	34.7	V	54.0	-19.3	AVG	7	1.4	RB 1 MHz; VB: 1 kHz
12407.820	52.7	V	74.0	-21.3	PK	7	1.4	RB 1 MHz; VB: 1 MHz
9928.800	32.7	H	54.0	-21.3	AVG	53	1.1	RB 1 MHz; VB: 1 kHz
9923.570	50.7	H	74.0	-23.3	PK	53	1.1	RB 1 MHz; VB: 1 MHz

Note 1: The average field strength was determined by applying an average correction factor of -18dB to the peak value. This correction factor is based on a maximum transmit time of 972us in any 8ms period for the controller.

Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

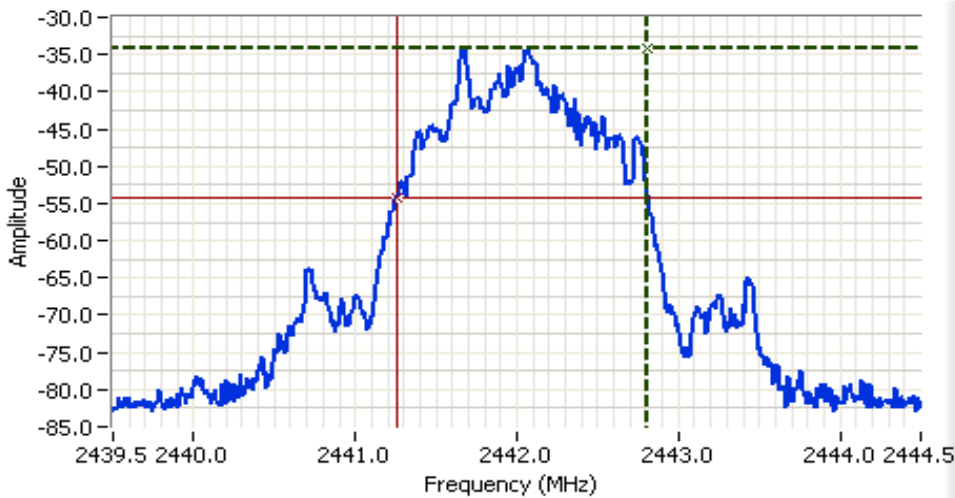
Run #2: Output Power

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 15 non-overlapping hopping channels, but less than 75 channels: 0.125 watts.

Maximum antenna gain: -0.84 dBi

Channel	Frequency (MHz)	Field Strength at 3m (dBuV/m)	Antenna Pol. (H/V)	Res BW	Signal Bandwidth	Bandwidth Correction	Power (dBm)	Power (Watts)
Low	2402	95.2	V	1	1.423	1.532	1.43	0.0014
Mid	2442	95.8	V	1	1.448	1.608	2.11	0.0016
High	2482	94.4	V	1	1.39	1.430	0.53	0.0011

Note 1: Output power calculated from field strength at 3m based on free space path loss formula $E = \sqrt{(30PG) / d}$, where E is the field strength (V/m), PG is the effective isotropic radiated power (W) and d is the distance (3m). Additional correction to the calculated power is made to account for the difference between the measurement bandwidth and signal bandwidth.



Analyzer Settings

HP8564E
 CF: 2442.000 MHz
 SPAN: 5.000 MHz
 RB 30.0 kHz
 VB 100 kHz
 Detector Sample
 Att 10
 RL Offset 0.00
 Sweep Time 50.0ms
 Ref Lvl: -20.00DBM

Comments

20dB BW: 1.550 MHz
 2442 MHz

Cursor 1	2442.8083	-34.17	+	-	🔒
Cursor 2	2441.2583	-54.17	+	-	🔒

Delta Freq. 1.550
Delta Amplitude 20.00



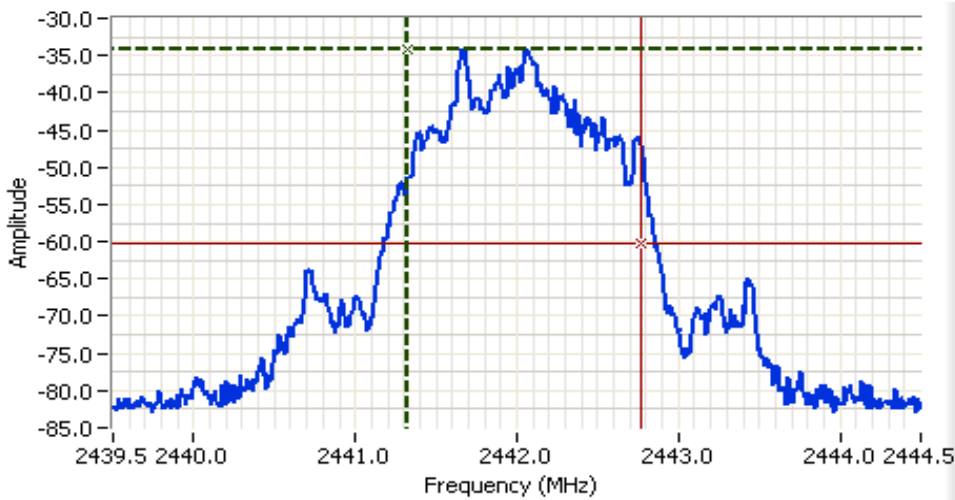
Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

Run #3: Bandwidth, Channel Occupancy, Spacing and Number of Channels

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	30kHz	1.467	30kHz	1.423
Mid	2442	30kHz	1.55	30kHz	1.448
High	2482	30kHz	1.483	30kHz	1.439

Note 1: 20dB bandwidth measured using RB = 30kHz, VB = 100kHz (VB > RB)

Note 2: 99% bandwidth measured using RB = 30kHz, VB = 100kHz (VB >= 3RB)



Analyzer Settings

HP8564E
 CF: 2442.000 MHz
 SPAN: 5.000 MHz
 RB 30.0 kHz
 VB 100 kHz
 Detector Sample
 Att 10
 RL Offset 0.00
 Sweep Time 50.0ms
 Ref Lvl: -20.00DBM

Comments

99% BW: 1.448 MHz
 2442 MHz

Cursor 1	2441.3220	-34.17	
Cursor 2	2442.7696	-60.17	

Delta Freq. 1.448
 Delta Amplitude 26.00



Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

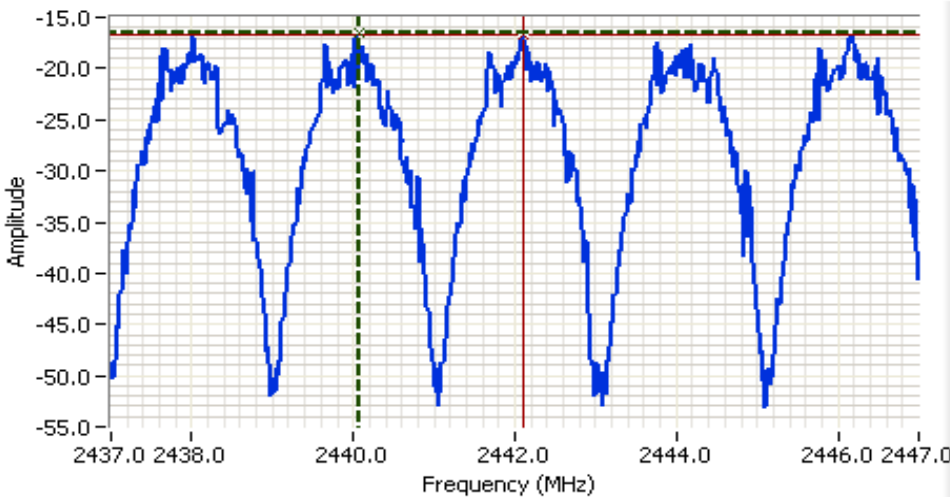
Run #3: Continued

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)

The channel dwell time is calculated from the transmit time on a channel multiplied by the number of times a channel could be used in a period of 0.4 times the number of channels, N (i.e. 0.4N divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 0.4N, in which case the channel dwell time is the transmit time on a channel.

Maximum 20dB bandwidth:	1550 kHz	Pass
Channel spacing:	2031 kHz	Pass
Transmission time per hop:	0.34 ms	Refer to Theory
The time between successive hops on a channel:	8.05 ms	Refer to Theory
Number of channels (N):	41	Pass
Channel dwell time in 16.4 seconds:	1.02 ms	Refer to Theory



Analyzer Settings

HP8564E
 CF: 2442.000 MHz
 SPAN: 10.000 MHz
 RB 100 kHz
 VB 100 kHz
 Detector POS
 Att 10
 RL Offset 0.00
 Sweep Time 50.0ms
 Ref Lvl: 0.00DBM

Comments

Channel Spacing

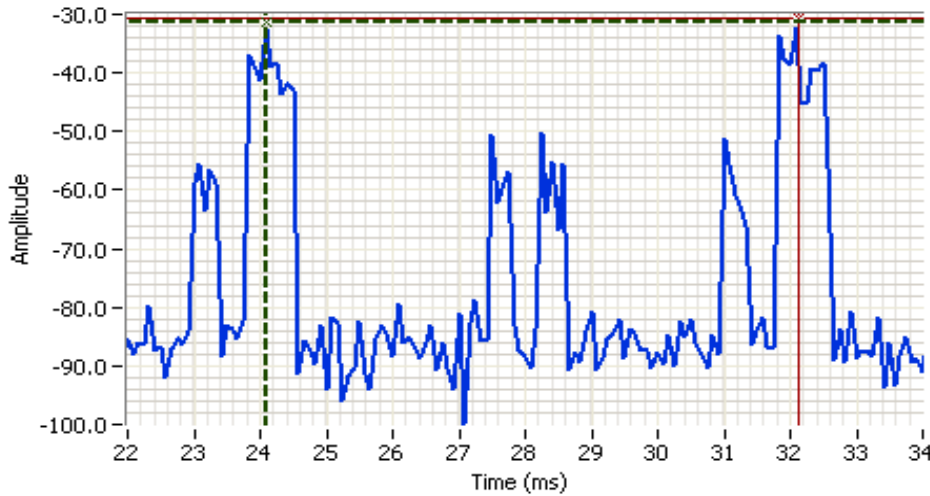
Cursor 1	2440.0729	-16.52	
Cursor 2	2442.1042	-16.67	

Delta Freq. 2.031
Delta Amplitude 0.15



Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A

Run #3: Continued



Analyzer Settings

HP8564E
 CF: 2402.000 MHz
 SPAN:0.000 MHz
 RB 100 kHz
 VB 100 kHz
 Detector Sample
 Att 10
 RL Offset 0.00
 Sweep Time 50.0ms
 Ref Lvl:0.00DBM

Comments

Occupancy Time

Cursor 1	24.0952	-31.33	
Cursor 2	32.1429	-30.66	

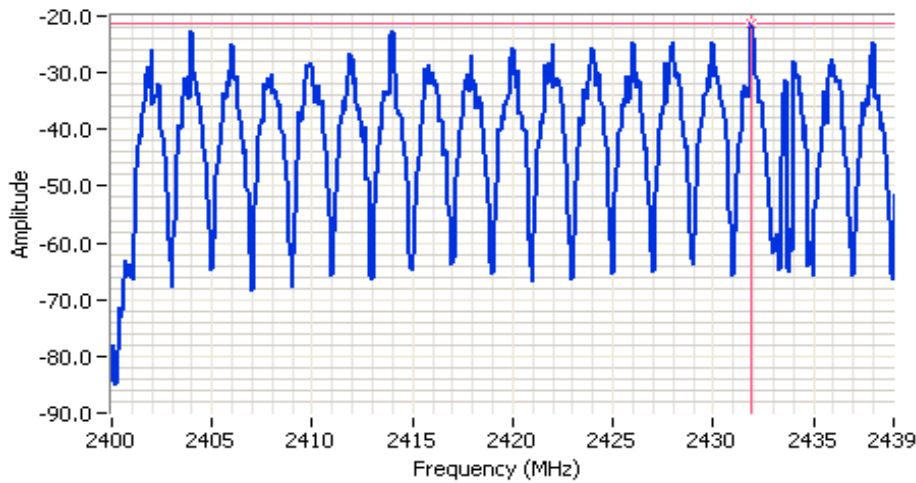
Delta Time (ms) 8.05

Delta Amplitude 0.66




Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: N/A


Run #3: Continued

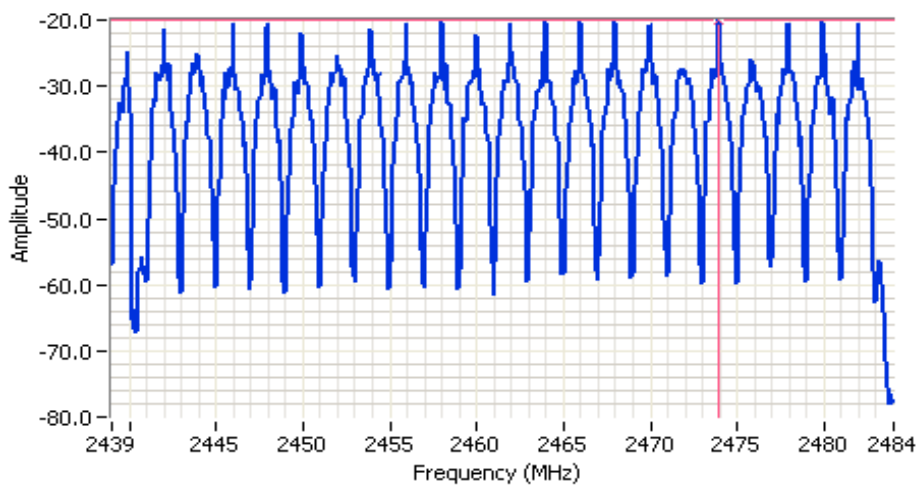


Analyzer Settings
 Agilent Technologies, E4446A
 CF: 2420.000 MHz
 SPAN: 40.000 MHz
 RB: 30.0 kHz
 VB: 10.0 kHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 0.0 DB
 Sweep Time: 112.0ms
 Ref Lvl: -18.0 DBM

Comments
 Number of Channels
 N = 19
 2400-2439


Cursor 1 2431.9333 -21.34 


0.0000 0.00 



Analyzer Settings
 Agilent Technologies, E4446A
 CF: 2461.500 MHz
 SPAN: 45.000 MHz
 RB: 30.0 kHz
 VB: 10.0 kHz
 Detector: POS
 Attn: 10 DB
 RL Offset: 0.0 DB
 Sweep Time: 126.0ms
 Ref Lvl: -18.0 DBM

Comments
 Number of Channels
 N = 22
 2439-2484 MHz

Cursor 1 2473.9500 -20.14 

0.0000 0.00 



Client: RedOctane	Job Number: J76179
Model: Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number: T77098
	Account Manager: Sheareen Washington
Contact: Mark Johnson	
Standard: FCC 15.247, RSS-210	Class: B

Radiated Emissions - Receive Mode

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 11/12/2009	Config. Used: 1
Test Engineer: Rafael Varelas	Config Change: None
Test Location: OATS #2	EUT Voltage: 3 VDC

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:	Temperature:	24 °C
	Rel. Humidity:	31 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
3	RE, 1000 - 18000 MHz, Maximized Emissions	RSS-GEN	Pass	49.9dBµV/m @ 9932.1MHz (-4.1dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Note - No receive mode emissions detected below 1 GHz

Client:	RedOctane	Job Number:	J76179
Model:	Band Hero Wireless Drum Controller for Xbox 360 (95519.808)	T-Log Number:	T77098
Contact:	Mark Johnson	Account Manager:	Sheareen Washington
Standard:	FCC 15.247, RSS-210	Class:	B

Run #3: Maximized readings, 1000 - 18000 MHz
 EUT Set to Receive Mode - Gigh Channel 2482 MHz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 18000 MHz	3	3	0.0

Frequency MHz	Level dB μ V/m	Pol v/h	RSS-GEN		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
9932.090	49.9	H	54.0	-4.1	Peak	67	1.0	

Note 1: Peak reading compared to average limit

Appendix C Photographs of Test Configurations

Uploaded as a separate exhibit

Appendix D Proposed FCC ID Label & Label Location

Uploaded as a separate exhibit

Appendix E Detailed Photographs

Uploaded as a separate exhibit

Appendix F Operator's Manual

Uploaded as a separate exhibit

Appendix G Block Diagram

Uploaded as a separate exhibit

Appendix H Schematic Diagrams

Uploaded as a separate exhibit

Appendix I Theory of Operation

Uploaded as a separate exhibit

Appendix J RF Exposure Information

Uploaded as a separate exhibit