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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7 FCC Part 15 Subpart C on the Harmonix Music Systems Inc. Transmitter Model: XBOX 360 Rock Band Wireless Guitar Controller

UPN:	7543A-HMXGTR01
FCC ID:	VFRHMXGTR01
GRANTEE:	Harmonix Music Systems Inc. 625 Massachusetts Ave., 2nd Floor Cambridge, MA 02139
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
REPORT DATE:	January 8, 2008
REVISED:	April 10, 2008
FINAL TEST DATE:	April 3, 2008
AUTHORIZED SIGNATORY:	Mark Briggs Principal Engineer

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev #	Date	Comments	Modified By
1	3/26/08	Initial Release	DMG
2	4/10/2008	Revised 99% bandwidth data in Exhibit 2 and summary table. Included data for radiated emissions with the headphone port connected. Corrected FCC ID on title page. Added 4/3/2008 test data to list of dates, corrected last test date on cover page.	M. Briggs

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SCOPE

An electromagnetic emissions test has been performed on the Harmonix Music Systems Inc. model XBOX 360 Rock Band Wireless Guitar Controller 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

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.

The test results recorded herein are based on a single type test of the Harmonix Music Systems Inc. model XBOX 360 Rock Band Wireless Guitar Controller and therefore apply only to the tested sample. The sample was selected and prepared by Daniel Sussman of Harmonix Music Systems Inc.

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 Harmonix Music Systems Inc. model XBOX 360 Rock Band Wireless Guitar Controller 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 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.).

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	1.4 MHz	Channel spacing > 20dB BW, BW < 1MHz	Complies
15.247 (a) (1)	RSS 210 A8.1 (2)	Channel Separation	2 MHz		Complies
	RSS Gen	99% Bandwidth	1.45 MHz	-	-
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Number of Channels	Minimum of 20, maximum of 41 (Refer to operational description)	15 or more	Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Channel Dwell Time (*average time of occupancy)*	All channels are used equally - refer to the operational description for full explanation	<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	4.7 dBm (0.003 W) EIRP = 2.4mW Note 1	0.125 Watts (EIRP < 0.5W)	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	48.3dBµV/m (260.0µV/m) @ 3663.2MHz	15.207 in restricted bands, all others < -20dBc	Complies (-5.7dB)
	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description (page 2, IF bandwidth = 1MHz)	Shall match the channel bandwidth	Complies

Note 1: EIRP calculated using antenna gain of –0.8 dBi.

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	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	25.9dBµV/m (19.7µV/m) @ 31.878MHz	15.109 / RSS-GEN	Complies (-14.1 dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	Not applicable		
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 low threshold of 100mW	Refer to OET 65, FCC Part 1 and RSS 102	Complies

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 Harmonix Music Systems Inc. model XBOX 360 Rock Band Wireless Guitar Controller is a wireless guitar that is designed to be a wireless controller for the X-Box Game Console. The electrical rating of the EUT is Battery operated by two AA batteries.

Since the EUT would be normally handheld, the EUT was treated as table-top equipment during testing to simulate the end-user environment with measurements made for radiated emissions with the guitar oriented in all three orthogonal orientations.

Two samples were evaluated – one had the standard integral antenna and was used for all radiated measurements and the second sample was modified to allow for a direct connection to the rf output. The second sample was used for power and frequency measurements.

The samples were received on December 10, 2007 and tested on December 18, and December 21, 2007 on on April 3, 2008. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number
Harmonix Music Systems	XBOX 360 Rock Band Wireless Guitar Controller model # 822153	Wireless Guitar (antenna removed)	Not serialized
Harmonix Music Systems		Wireless Guitar (integral antenna)	Not serialized

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 26.0cm wide by 4.6cm deep by 83.9cm high.

MODIFICATIONS

No modifications were made to the EUT during testing.

SUPPORT EQUIPMENT

The EUT was tested with and without headphones connected to the headphone port during radiated emissions tests.

EUT OPERATION

A laptop was used to configure the device under test to operate on a specific channel or in a normal hopping mode. The transmitted signal had the same duty cycle as a normally transmitted signal with a transmit time of 972us in any 8ms.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on December 10, 2007 at the Elliott Laboratories semi anechoic chamber 4 located at 41039 Boyce Road, Fremont, California 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.

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 of predictable local TV, radio, and mobile communications traffic. The test site contains 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 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.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

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.

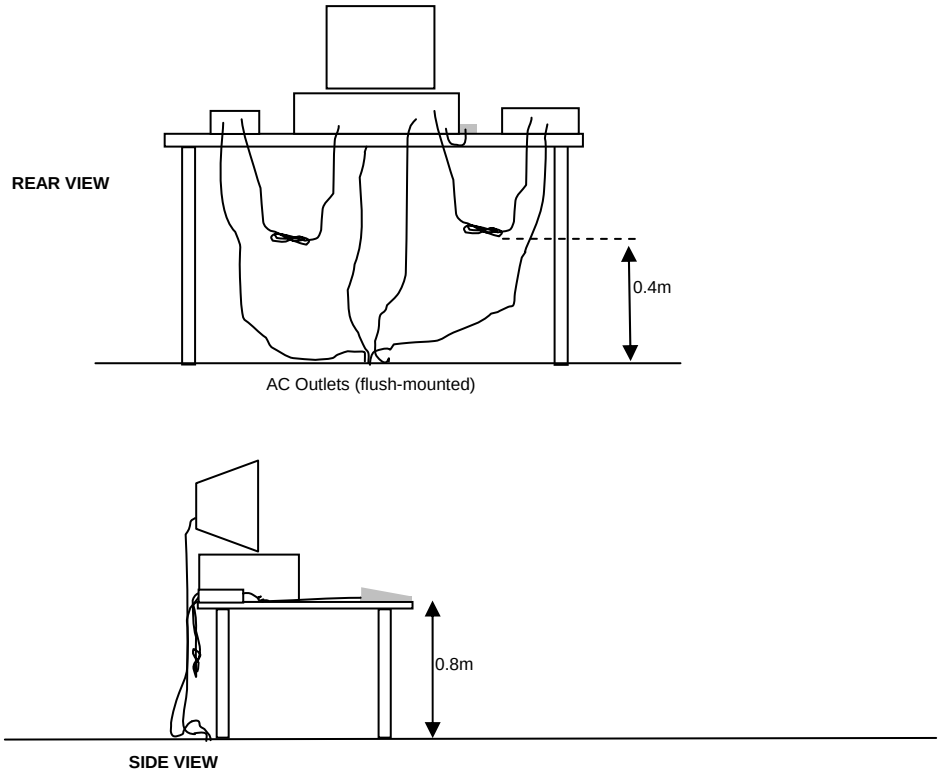
INSTRUMENT CALIBRATION

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.



Typical Test Configuration for Radiated Field Strength Measurements

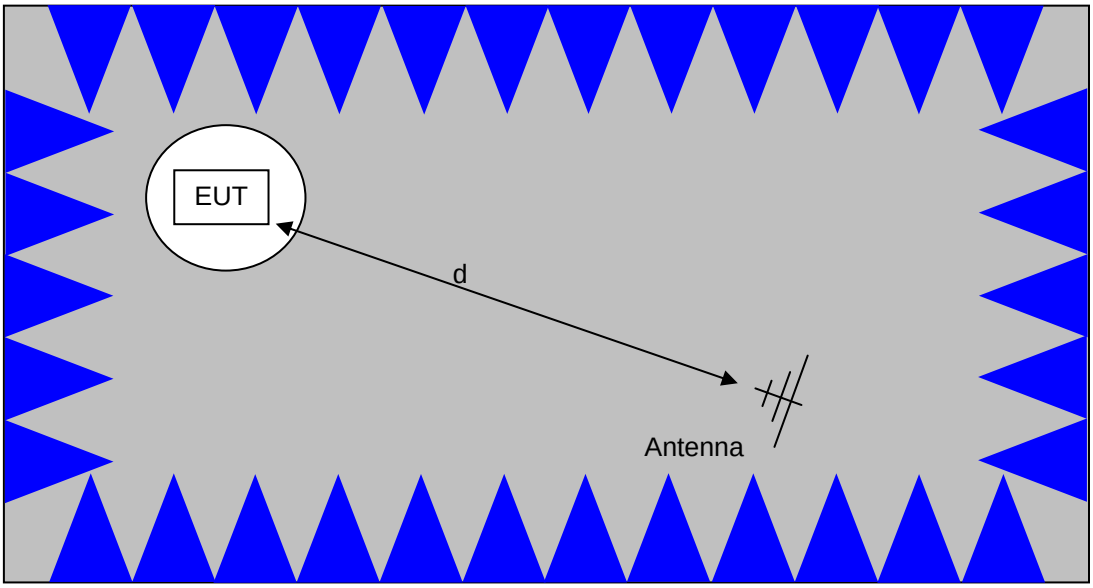
RADIATED EMISSIONS

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.

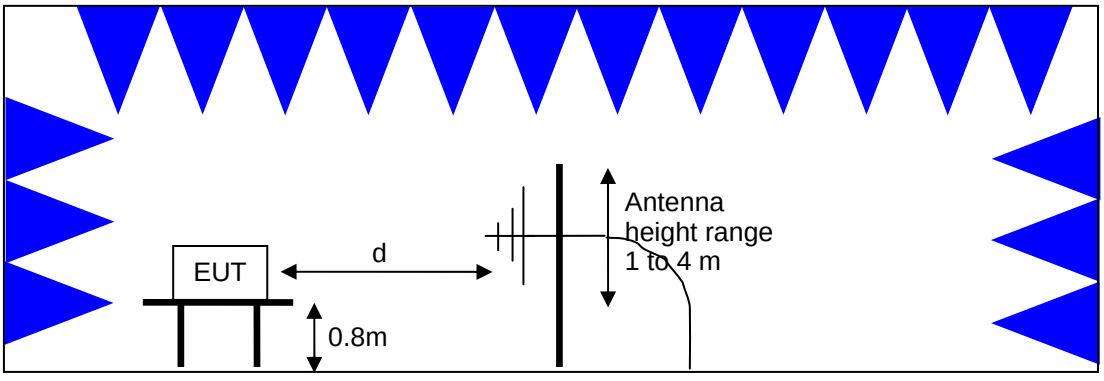
Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna 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 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, 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 bands[1] (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	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
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:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = 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:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

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 = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = 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:

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

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 25 - 25,000 MHz, 10-Dec-07
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	25-Aug-08
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	12-Apr-08
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	23-May-09
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447E	1606	07-Feb-08
Hewlett Packard	SpecAn 9 KHz-26.5 GHz, Non-Program	8563E	284	21-Jun-08
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	29-May-08
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12-Jul-08
Rohde & Schwarz	Signal Generator, 9 kHz-2.080 GHz	SMY02	1302	29-Oct-08
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12-Jul-08
EMCO	Antenna, Horn, 1-18 GHz (SA40-Purple)	3115	1779	07-Feb-08

Radiated Emissions, 25 - 25,000 MHz, 18-Dec-07
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	SpecAn 9 KHz-26.5 GHz, Non-Program	8563E	284	21-Jun-08
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	29-May-08
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12-Jul-08
Rohde & Schwarz	Signal Generator, 9 kHz-2.080 GHz	SMY02	1302	29-Oct-08
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12-Jul-08
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	12-Apr-08
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	11-Jan-08
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1632	25-May-08
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	03-May-08
EMCO	Antenna, Horn, 1-18 GHz (SA40-Purple)	3115	1779	07-Feb-08

Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	24-Aug-08

Radiated Emissions, 30 - 1,000 MHz, 03-Apr-08
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	19-Sep-09
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	21-Sep-08

EXHIBIT 2: Test Measurement Data

25 Pages

Elliott

EMC Test Data

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		-
Emissions Standard(s):	FCC 15.209, RSS 210	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Harmonix Music Systems Inc.

Model

XBOX 360 Rock Band Wireless Guitar Controller

Date of Last Test: 4/3/2008

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manger:	Susan Pelzl
Contact:	Daniel Sussman		
Emissions Standard(s):	FCC 15.209, RSS 210	Class:	B
Immunity Standard(s):	-	Environment:	-

EUT INFORMATION

The following information was collected during the test session(s).

General Description

The Harmonix Music Systems Inc. model XBOX 360 Wireless Controller, Guitar Shaped is a wireless guitar that is designed to be a wireless controller for the X-Box Game Console. The electrical rating of the EUT is Battery operated by two AA batteries.
Two samples were evaluated – one had an integral antenna and was used for all radiated measurements and the second sample was modified to allow for a direct connection to the rf output. The second sample was used for power and frequency measurements.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Harmonix Music Systems	XBOX 360 Rock Band	Wireless Guitar Controller	A (w/ integral antenna)	-
Harmonix Music Systems	XBOX 360 Rock Band	Wireless Guitar Controller	B (w/ RF connector)	-

EUT Antenna (Intentional Radiators Only)

The antenna is integral to the device.

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 26.0cm wide by 4.6cm deep by 83.9cm high.

Modification History

Mod. #	Test	Date	Modification
1			No modifications were made to the EUT whilst at Elliott.

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manger:	Susan Pelzl
Contact:	Daniel Sussman		
Emissions Standard(s):	FCC 15.209, RSS 210	Class:	B
Immunity Standard(s):	-	Environment:	-

Test Configuration #1

The following information was collected during the test session(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
IBM	ThinkPad	Laptop	FX-X8767	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Headphone	headphone	integral to headphone	-	-

EUT Operation During Emissions Tests

A laptop was used to configure the device under test to operate on a specific channel or in a normal hopping mode. The transmitted signal had the same duty cycle as a normally transmitted signal with a transmit time of 972us in any 8ms.

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

FCC 15.247

Frequency Hopping Systems - Power, Bandwidth and Channel Occupancy

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: 12/10/2007
Test Engineer: Mehran Birgani
Test Location: Fremont Chamber #4

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

General Test Configuration

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: 19.8 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
2	Output Power	15.247(b)	Pass	4.7 dBm (0.003 W)
3	20dB Bandwidth	15.247(a)	Pass	1.4 MHz
3	99% bandwidth	RSS-210	N/A	1.38 MHz
3	Channel Spacing	15.247(a)	Pass	2.0MHz
3	Channel Occupancy	15.247(a)	-	To be addressed in Operational Description
3	Number of Channels	15.247(a)	Pass	41 channels available

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.

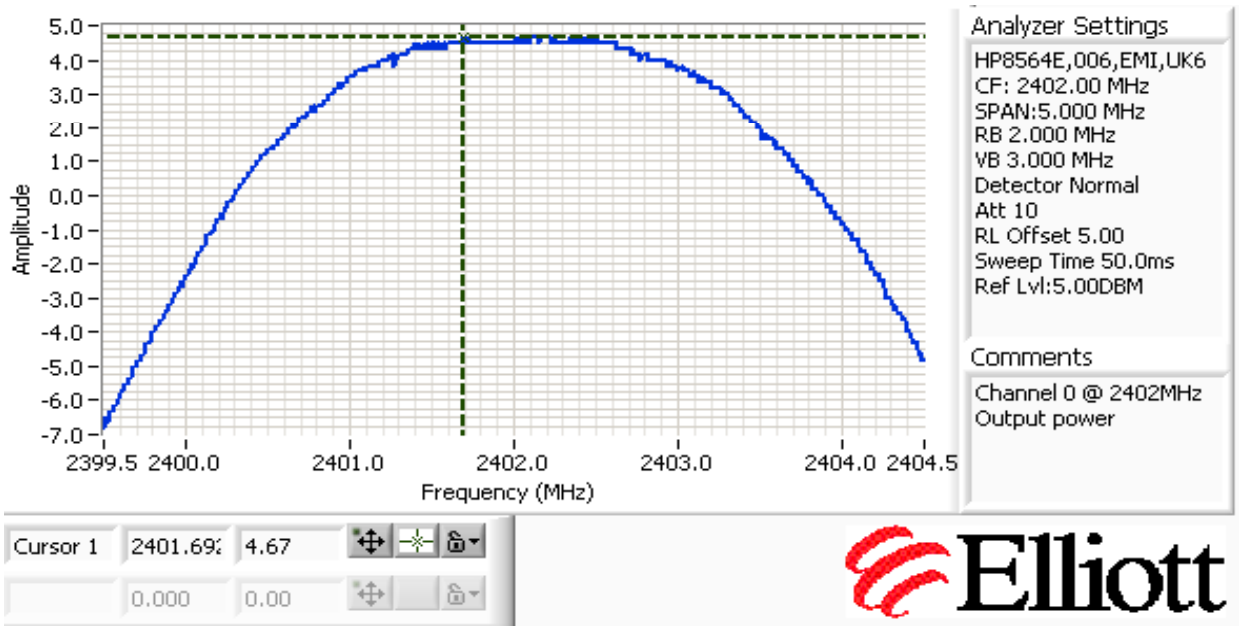
Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #2: Output Power

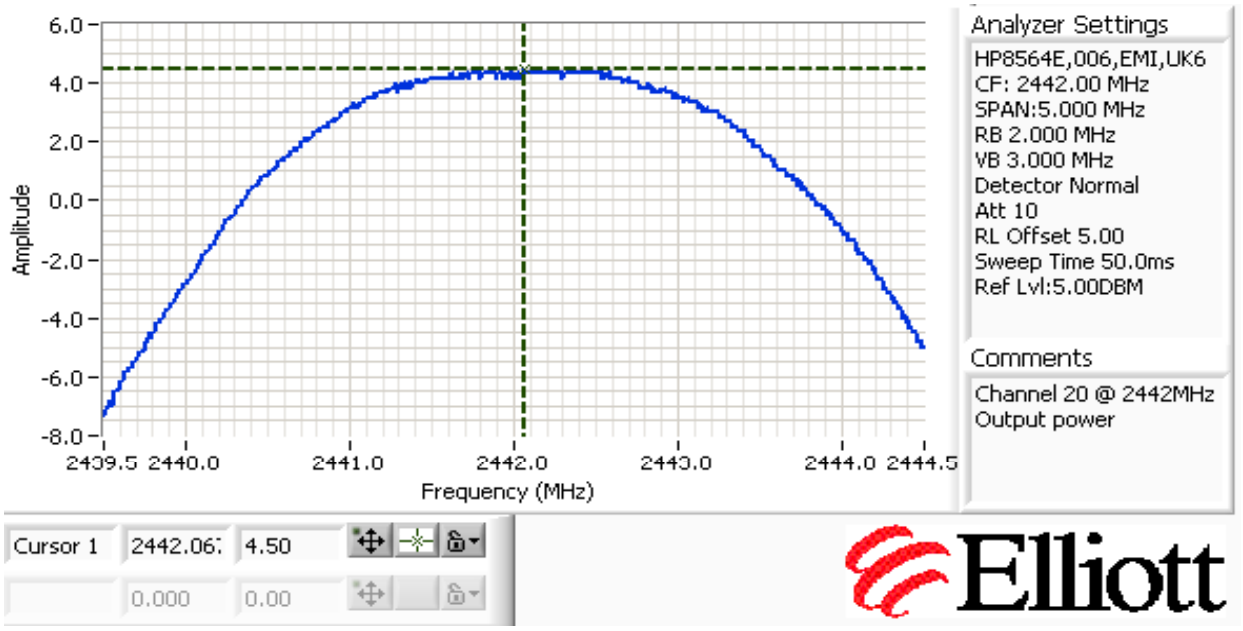
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least15 non-overlapping hopping channels: 0.125 watts.

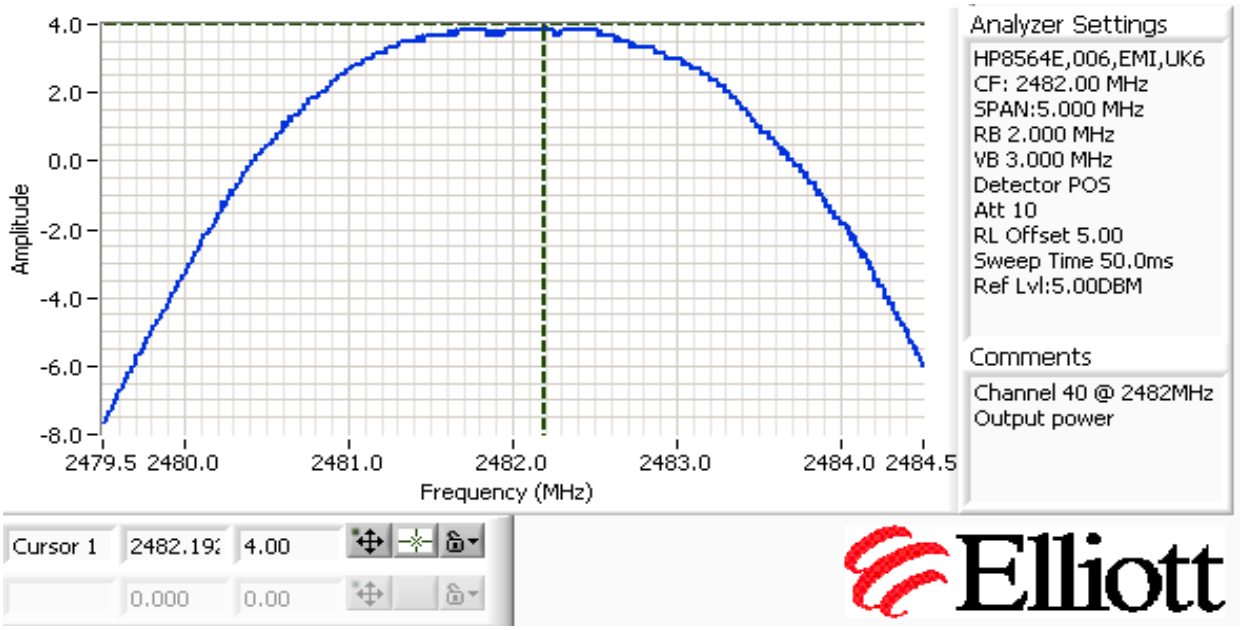
Maximum antenna gain: -0.84 dBi

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (mW)
Low	2402	2MHz	4.67	0.0029	2.42
Mid	2442	2MHz	4.5	0.0028	2.32
High	2482	2MHz	4.0	0.0025	2.07



Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A





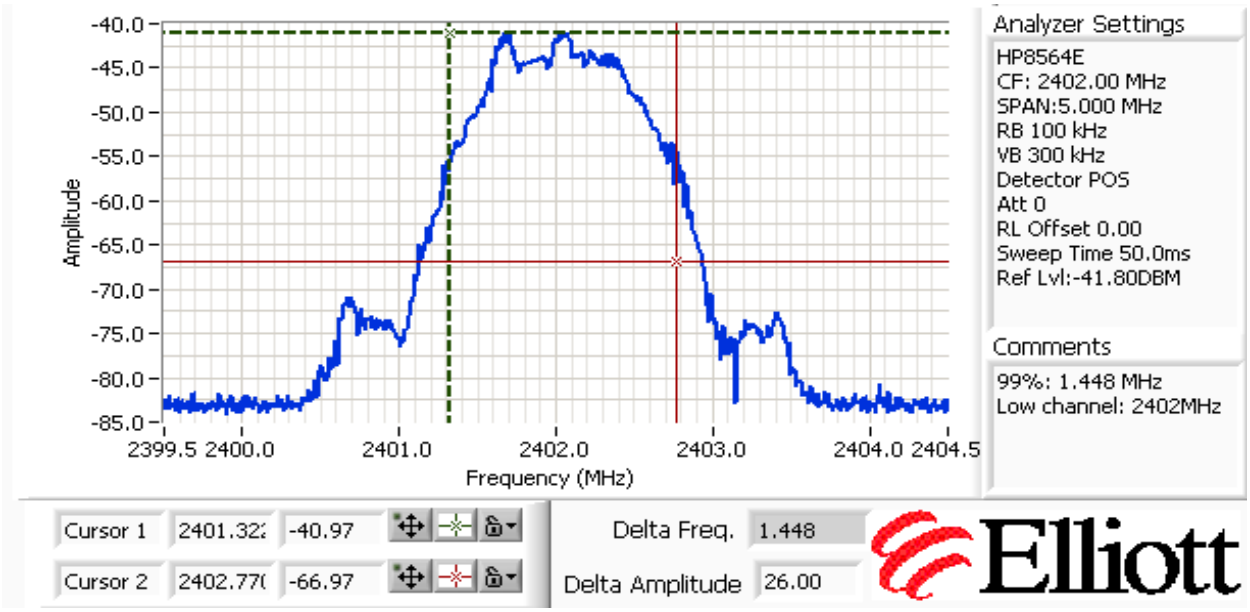
Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

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

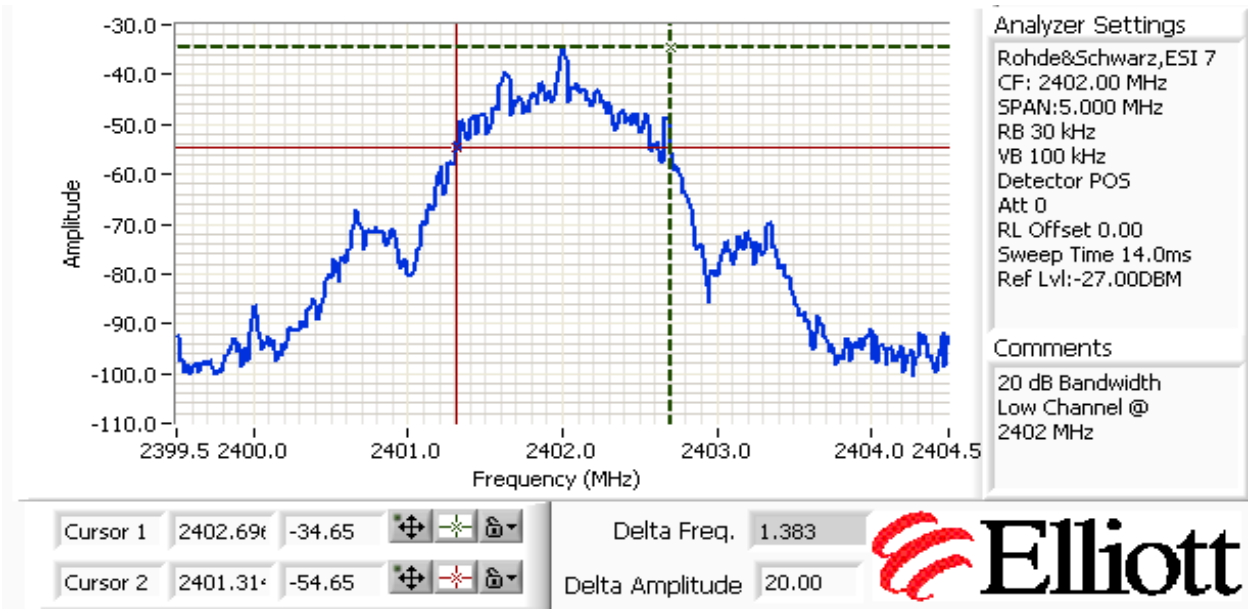
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (MHz)	Resolution Bandwidth	99% Bandwidth (MHz)
Low	2402	30kHz	1.383	100kHz	1.45
Mid	2442	30kHz	1.383	100kHz	1.44
High	2482	30kHz	1.393	100kHz	1.41

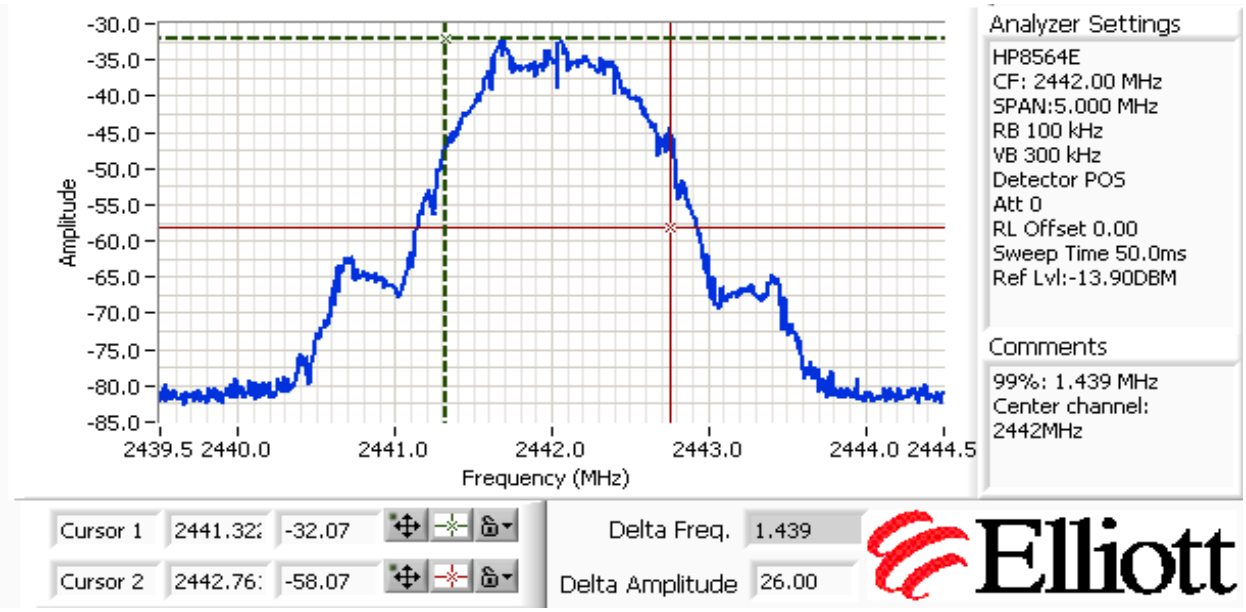
Channel Spacing (MHz):	2.015	(See plot below)
Number of channels:	41	(See plot below)

Note 1:	20dB bandwidth measured using RB = 30kHz, VB = 100kHz (VB > RB)
Note 2:	99% bandwidth measured using RB = 100kHz, VB = 300kHz (VB >=3RB)
Note 3:	Channel spacing shall exceed the 20dB signal bandwidth
Note 3:	The channel dwell time and hopping algorithm are discussed in detail in an addendum to the operational description.

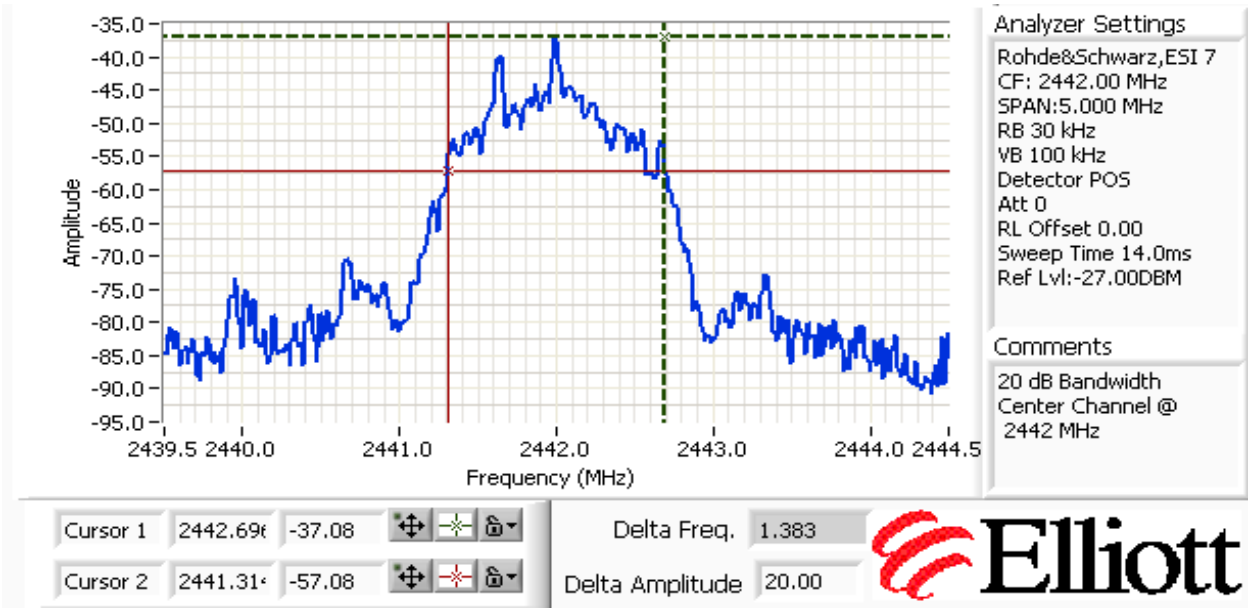


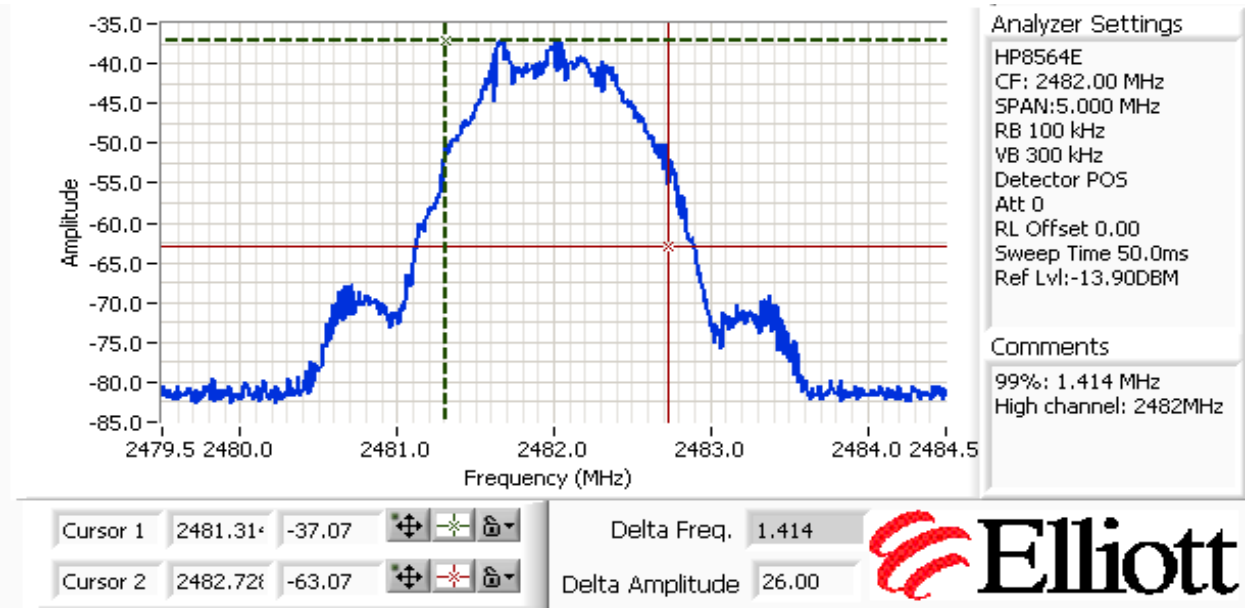
Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A



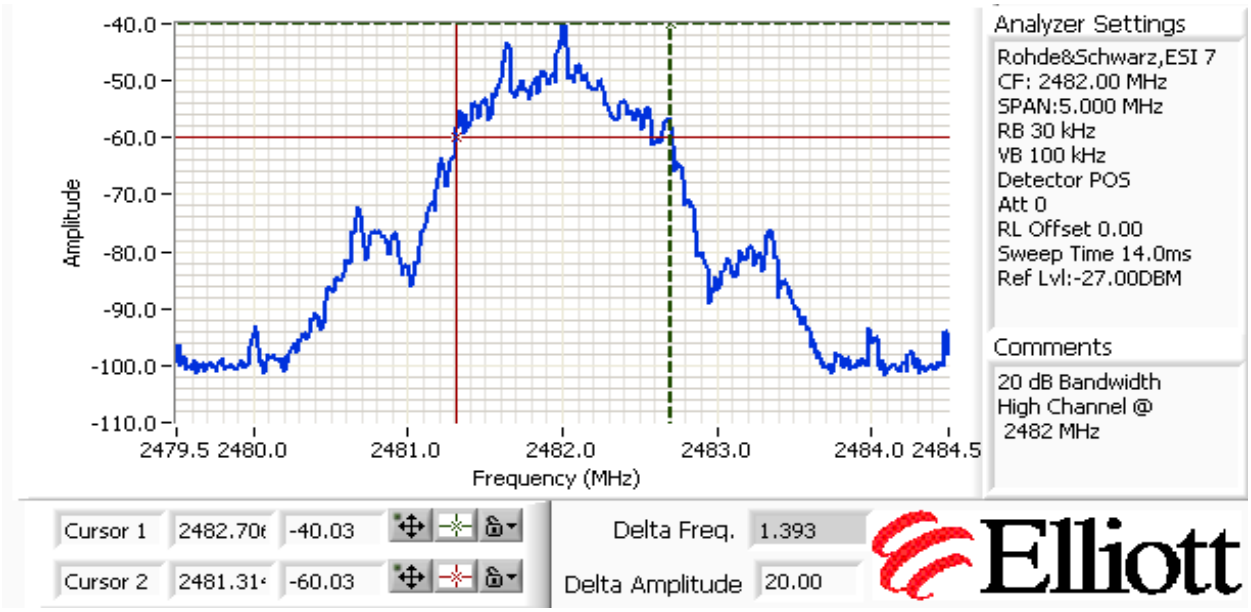


Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

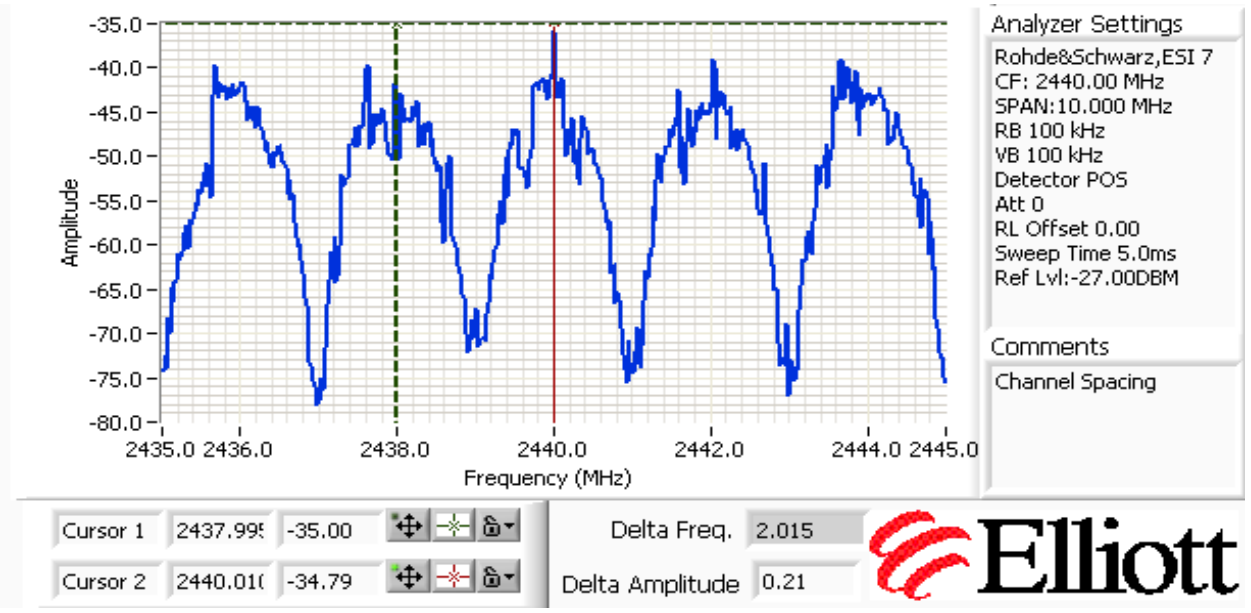




Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

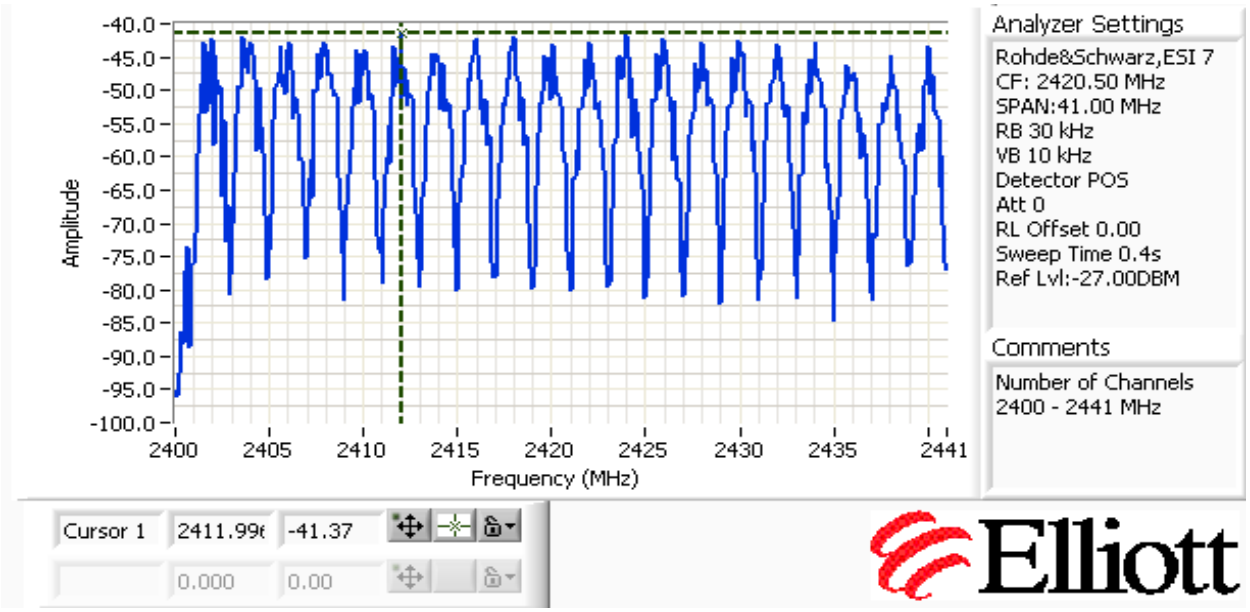


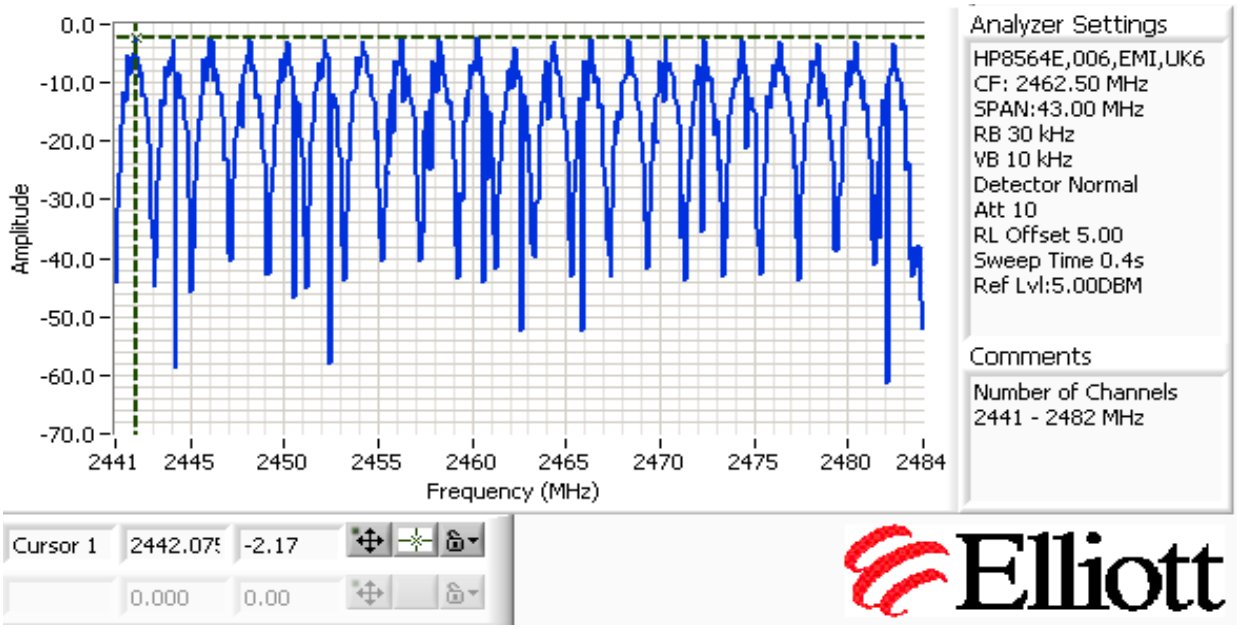
Channel Spacing Plot



Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Number of Channels





21 channels from 2441 - 2484 MHz

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

FCC 15.247
Frequency Hopping Systems - 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: 12/10/2007
Test Engineer: Mehran Birgani
Test Location: Fremont Chamber #4

Config. Used: 1
Config Change: None
Unit 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: 19.8 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1a,b,c	30 - 25,000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	48.3dBµV/m (260.0µV/m) @ 3663.2MHz (-5.7dB)
1d	30 - 25,000 MHz Conducted Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	All spurs below -20dBc

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.

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #1: Radiated Spurious Emissions, 25 - 25,000 MHz, Transmit mode

The FCC/RSS-210 and AS/NZS 4268 limits for spurious emissions are 20dB below the fundamental signal level. Signals that fall in the FCC/Industry Canada restricted bands are limited to the FCC 15.209 limit which is shown in dotted orange.

The broad-band plots from 1 - 12.75 GHz were made with a 2.4 GHz band reject filter in the measurement path. A near field scan without the filter and without a pre-amplifier was made to verify there were no emissions in the reject band of the filter.

Testing 30 - 1000 MHz (extended down to 25 MHz to cover EN 300 328 and AS/NZS 4268):

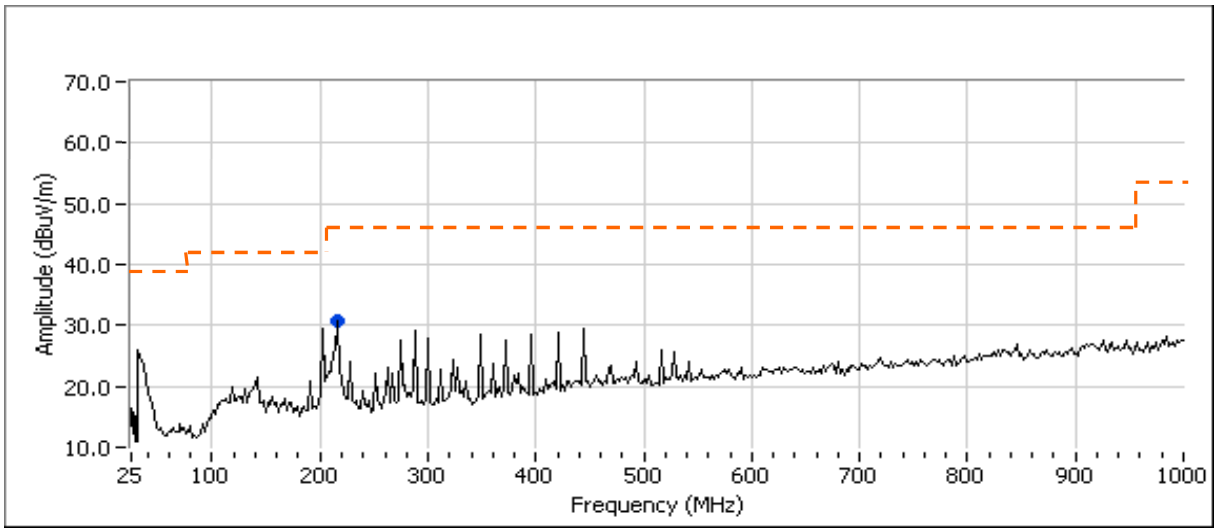
Date of Test: 12/10/2007 Config. Used: 1
Test Engineer: Mehran Birgani Config Change: None
Test Location: Fremont Chamber #4 Unit Voltage Battery

Testing 1000 - 26,500 MHz:

Date of Test: 12/11/2007 Config. Used: 1
Test Engineer: Rafael Varelas Config Change: None
Test Location: FT Chamber #4 Unit Voltage Battery

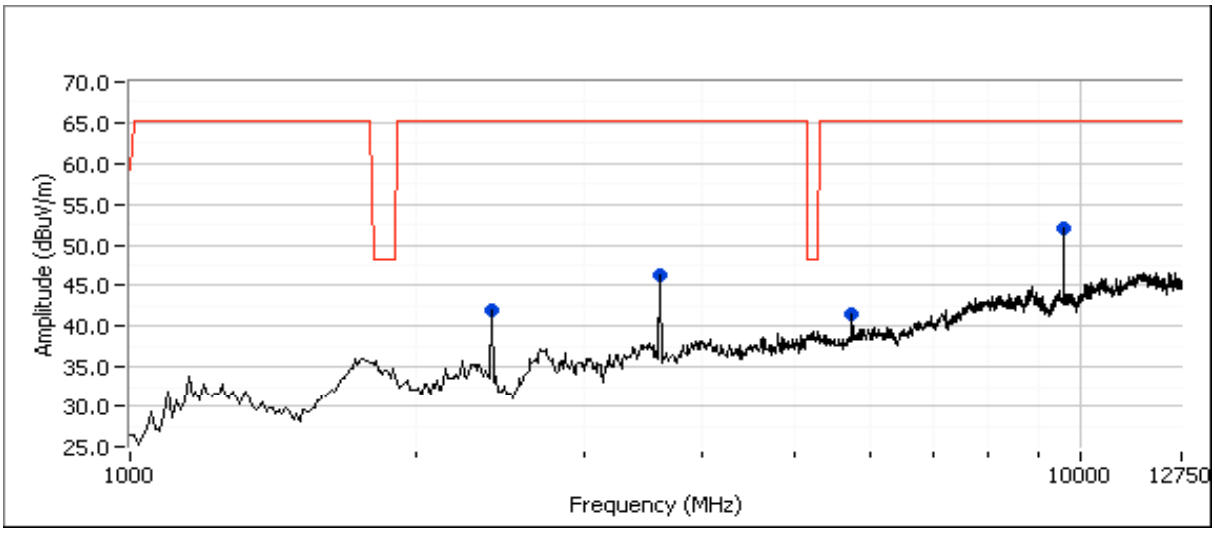
Note: Plots taken from 25 MHz to 12.75 GHz, scans made from 12.75 - 26 GHz with horn antenna close to EUT, no emissions observed.

Run #1a: Radiated Spurious Emissions, 25 - 25,000 MHz. Low Channel @ 2402 MHz



Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #1a: Continued



Fundamental Signal Field Strength: Peak values measured using RB=1 MHz. The average field strength is 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.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.880	103.4	V	-	-	PK	107	1.0	Upright, VBW=1MHz, RBW=1MHz
2401.820	103.3	V	-	-	PK	15	1.0	Side, VBW=1MHz, RBW=1MHz
2401.790	100.8	H	-	-	PK	136	1.0	Upright, VBW=1MHz, RBW=1MHz
2401.840	100.7	H	-	-	PK	341	1.7	Flat, VBW=1MHz, RBW=1MHz
2401.900	100.6	V	-	-	PK	272	1.0	Flat, VBW=1MHz, RBW=1MHz
2402.250	99.6	H	-	-	PK	360	1.1	Side, VBW=1MHz, RBW=1MHz
2401.820	102.5	V	-	-	AVG	15	1.0	Upright
2401.880	102.3	V	-	-	AVG	107	1.0	Side
2401.840	99.5	H	-	-	AVG	341	1.7	Upright
2401.790	99.4	H	-	-	AVG	136	1.0	Flat
2401.900	99.3	V	-	-	AVG	272	1.0	Flat
2402.250	99.1	H	-	-	AVG	360	1.1	Side

Note - field strength of 103.4dBuV/m at 3m is equivalent to an eirp of 8.1dBm (6.6mW).

	H	V	
Fundamental emission level @ 3m in 100kHz RBW:	96.8	99.4	
Limit for emissions outside of restricted bands:	76.8 dBµV/m		Limit is -20dBc

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #1a: Continued

Band Edge Signal Field Strength

Marker delta: 51.6 dB

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2388.980	51.8	V	74.0	-22.2	Pk	107	1.0	Upright, note 1
2389.030	33.8	V	54.0	-20.2	Avg	15	1.0	Upright, note 2

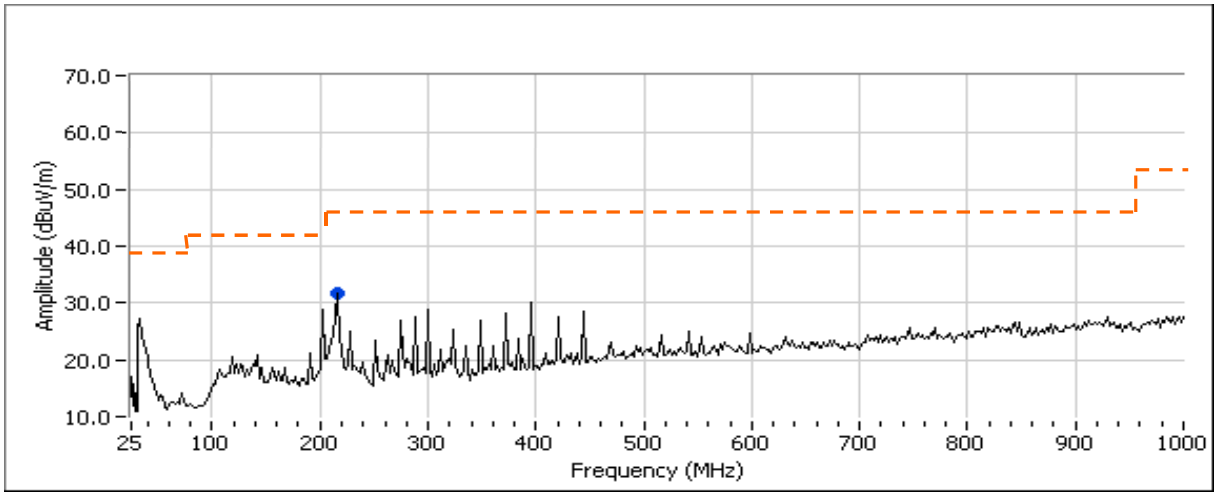
Note 1:	Band edge values determined by applying the marker delta measurements to the measured peak (RB=VB=1MHz)and calculated average fundamental field strength values.

Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3600.000	46.2	V	54.0	-7.8	Peak	190	1.6	Peak reading average limit
5745.000	41.5	H	54.0	-12.5	Peak	339	1.0	Peak reading average limit
9573.750	52.0	V	76.8	-24.8	Peak	200	2.2	Non-restricted

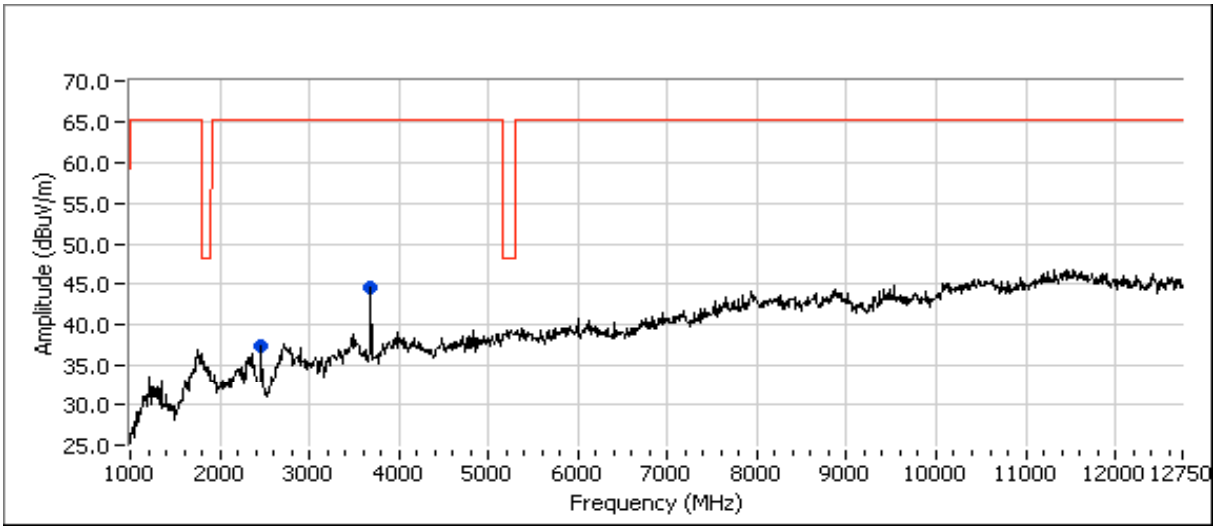
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Run #1b: Radiated Spurious Emissions, 25 - 25,000 MHz. Center Channel @ 2442 MHz



Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #1b: Continued



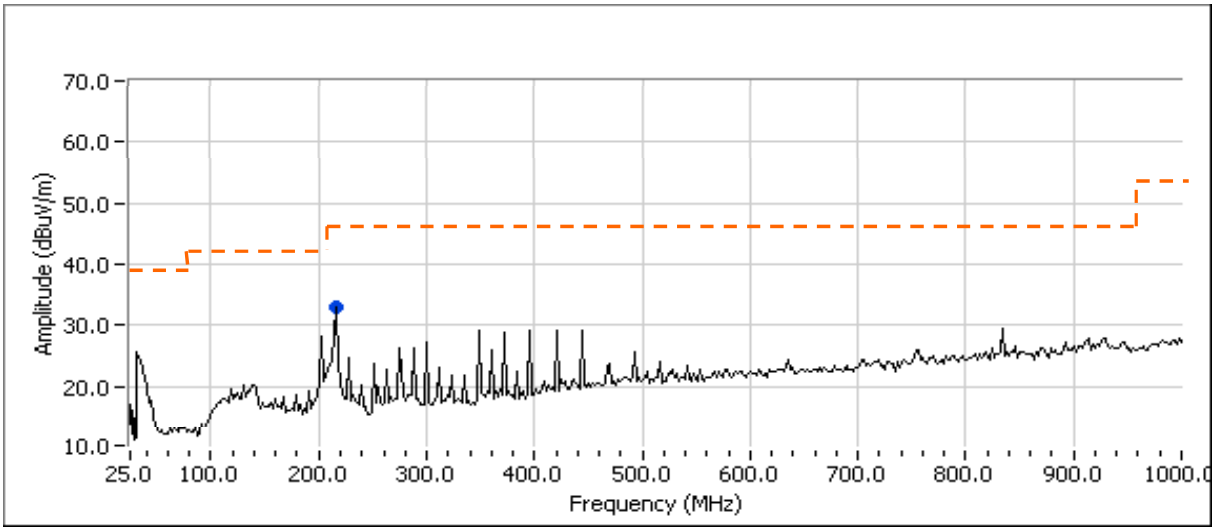
	H	V
Fundamental emission level @ 3m in 100kHz RBW:	100.5	98.7
Limit for emissions outside of restricted bands:	80.5 dBµV/m	

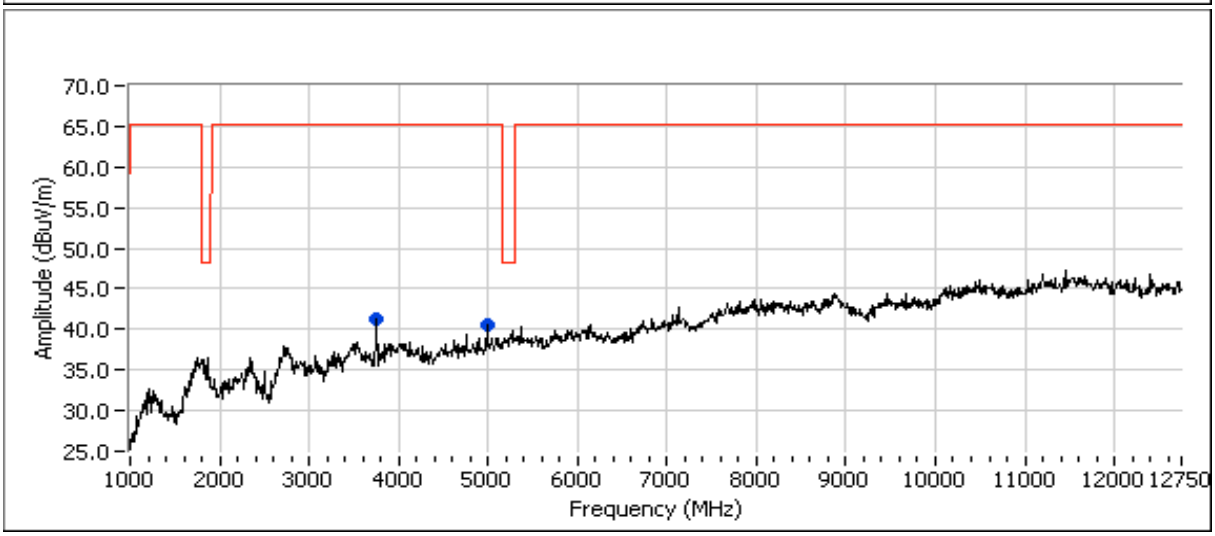
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3663.190	48.3	V	54.0	-5.7	PK	45	1.3	Peak reading average limit
3663.060	43.9	H	54.0	-10.1	PK	45	1.3	Peak reading average limit
2441.880	104.5	H	-	-	PK	336	1.0	Fundamental
2441.890	102.6	V	-	-	PK	110	1.2	Fundamental

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 25 - 25,000 MHz. High Channel @ 2482 MHz





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

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2482.120	103.4	V	-	-	AVG	92	1.1	
2482.120	104.8	V	-	-	PK	92	1.1	
2481.890	102.8	H	-	-	AVG	335	1.1	
2481.890	103.8	H	-	-	PK	335	1.1	

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #1c: Continued

	H	V	
Fundamental emission level @ 3m in 100kHz RBW:	99.6	100.2	
Limit for emissions outside of restricted bands:	79.6 dBµV/m		Limit is -20dBc

Band Edge Signal Field Strength

Marker delta: 44.2 dB

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	60.6	V	74.0	-13.4	Pk	107	1.0	Upright, note 1
2483.500	42.6	V	54.0	-11.4	Avg	15	1.0	Upright, note 2

Note 1:	Band edge values determined by applying the marker delta measurements to the measured peak (RB=VB=1MHz) fundamental field strength.
Note 2:	The average field strength is 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.

Other Spurious Emissions

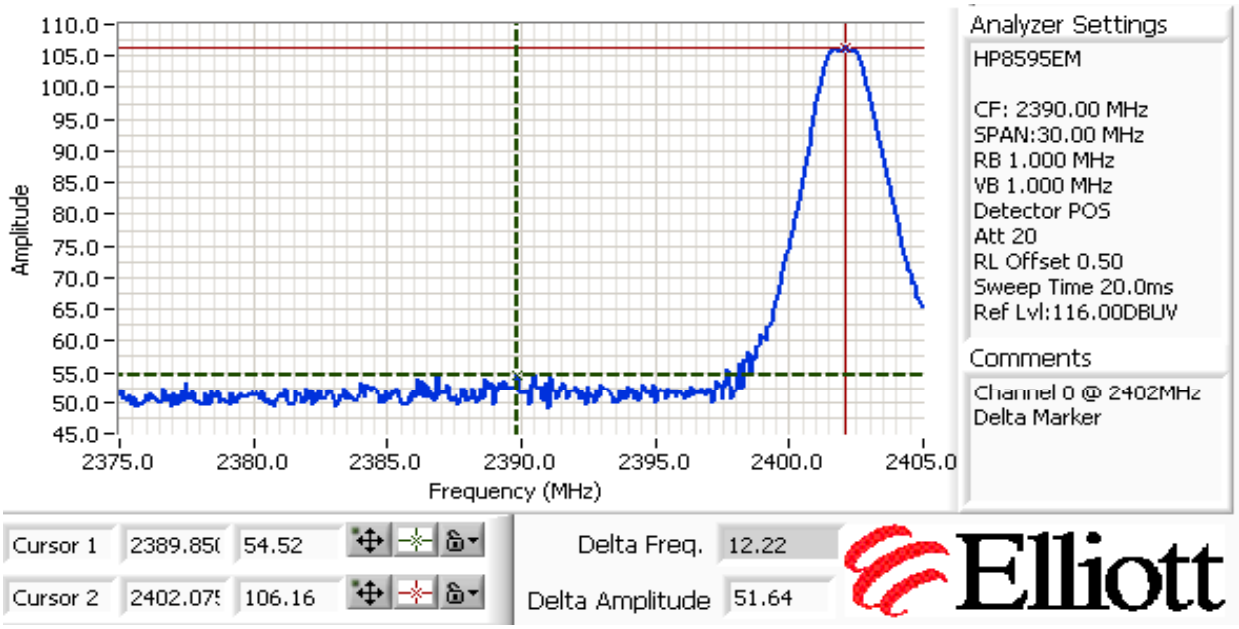
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3751.670	41.3	V	54.0	-12.7	Peak	21	1.6	Peak reading average limit
4986.670	40.5	V	54.0	-13.5	Peak	214	1.3	Peak reading average limit

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

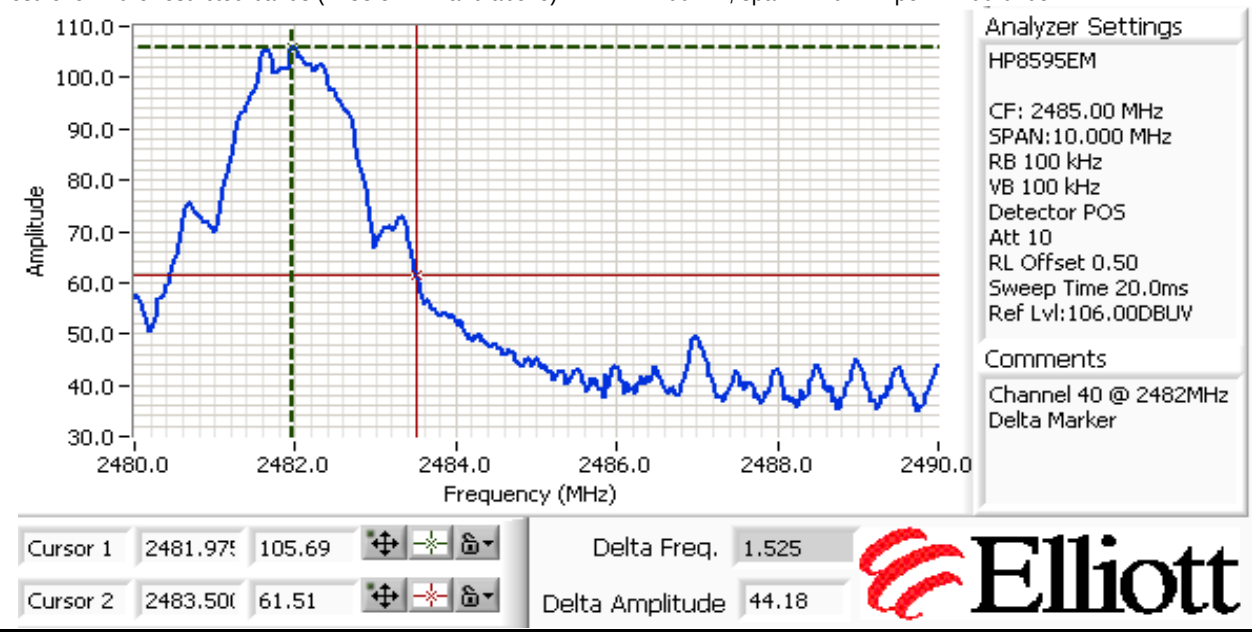
Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Run #1d: Antenna Conducted Spurious Emissions, 25 - 25,000 MHz.

Band edge marker delta-plot for 2390 MHz band edge showing delta (51.6dB) between highest in-band signal level and the the highest level in the restricted bands (2390 MHz and below). RB=VB=1MHz, span <=100MHz per DA-00-0705.

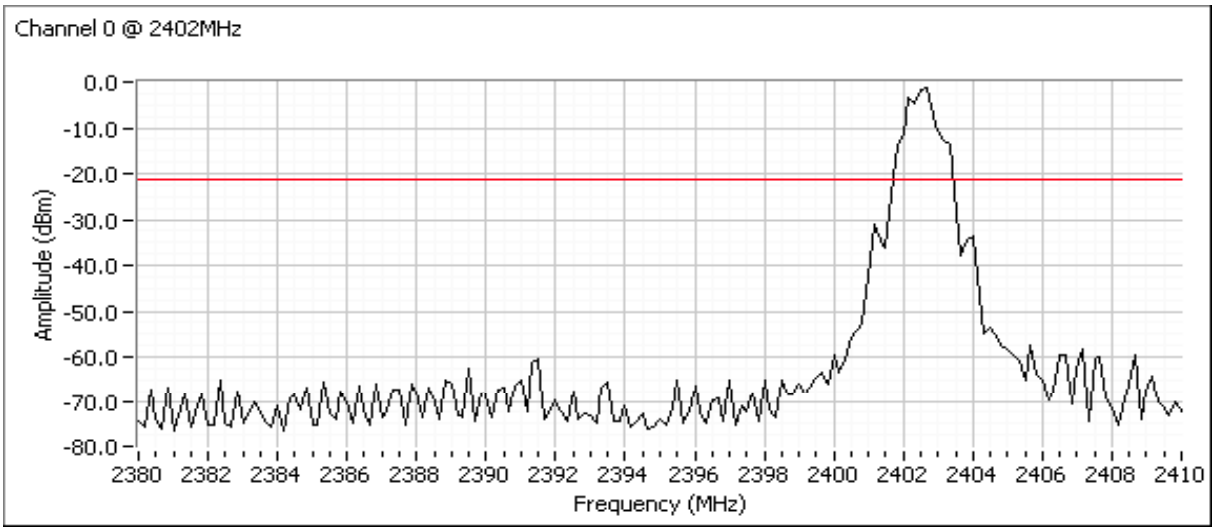


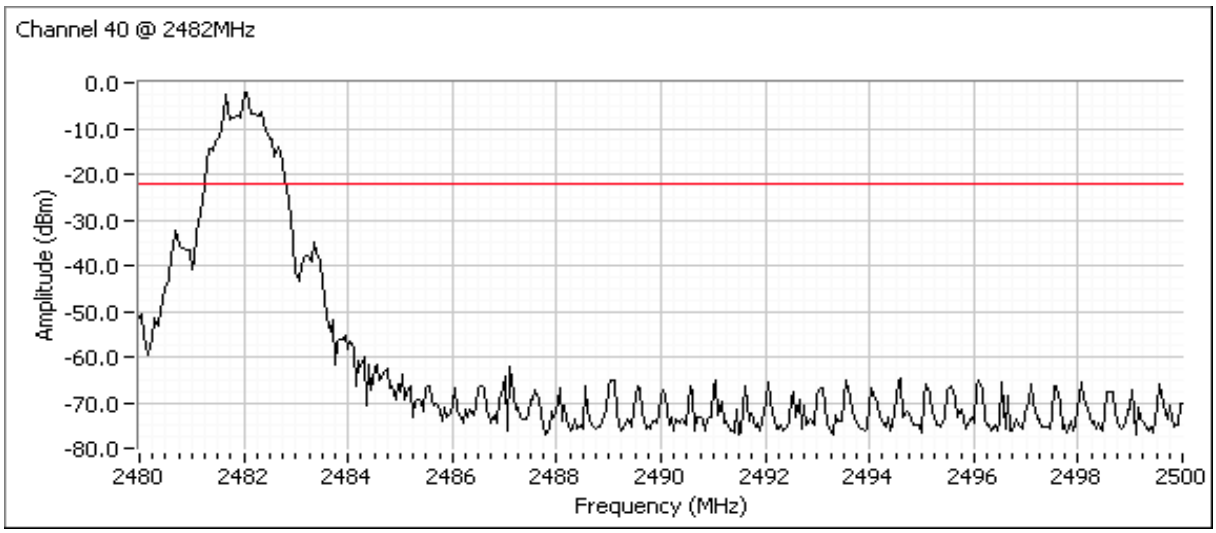
Band edge marker delta-plot for 2483.5 MHz band edge showing delta (44.2dB) between highest in-band signal level and the the highest level in the restricted bands (2483.5 MHz and above) RB=VB=100kHz, span <=10MHz per DA-00-0705.



Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

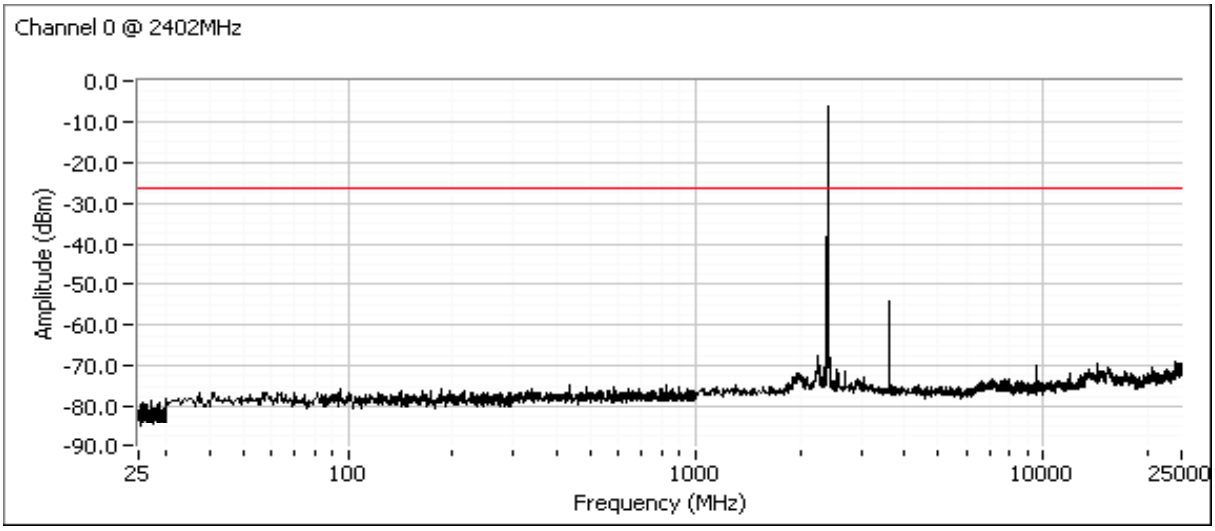
Plot showing the signal level from 2390 MHz to 2400 MHz is more than 20dB below the fundamental signal level. (RB=VB=100kHz).

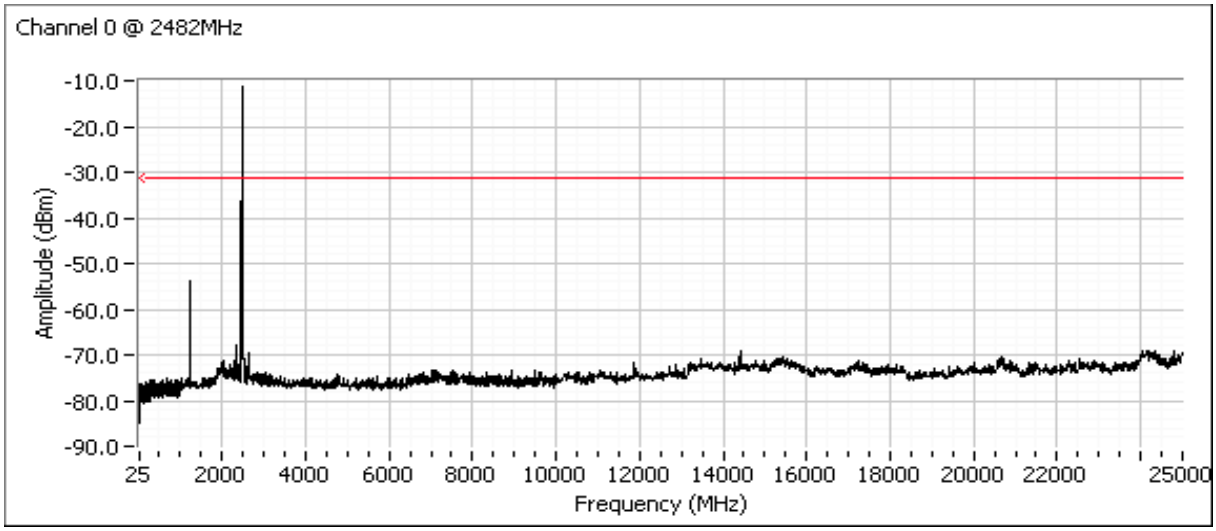




Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	N/A

Full spectrum plots. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.





Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	B

Radiated Emissions - Receiver / Digital Device

Test Specific Details

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

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: 16 °C

Rel. Humidity: 41 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
2,3	RE, 30 - 7500MHz Maximized Emissions	FCC Class B	Pass	25.9dBµV/m (19.7µV/m) @ 31.878MHz (-14.1dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

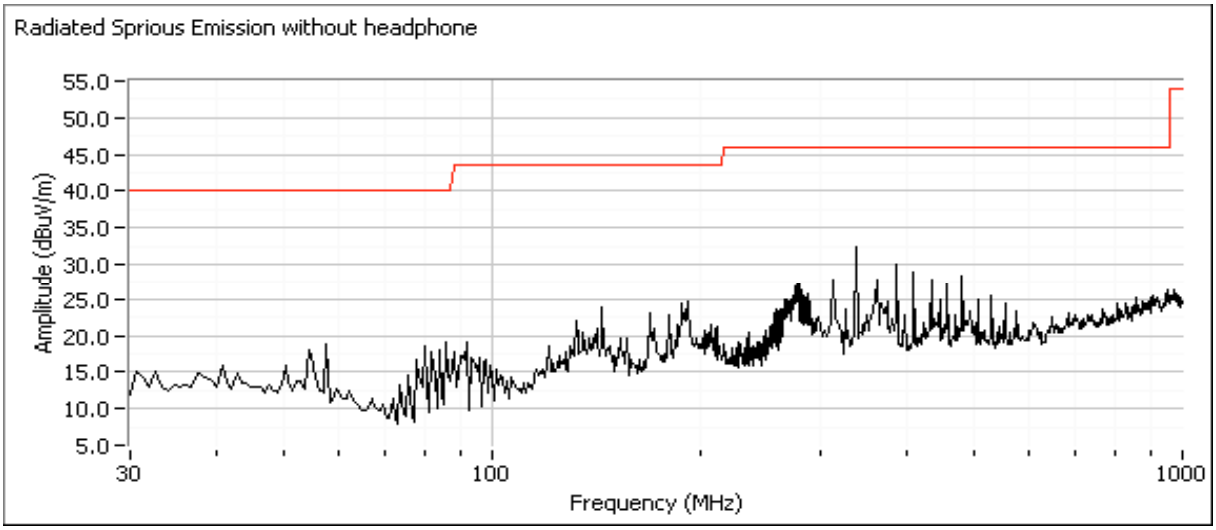
No deviations were made from the requirements of the standard.

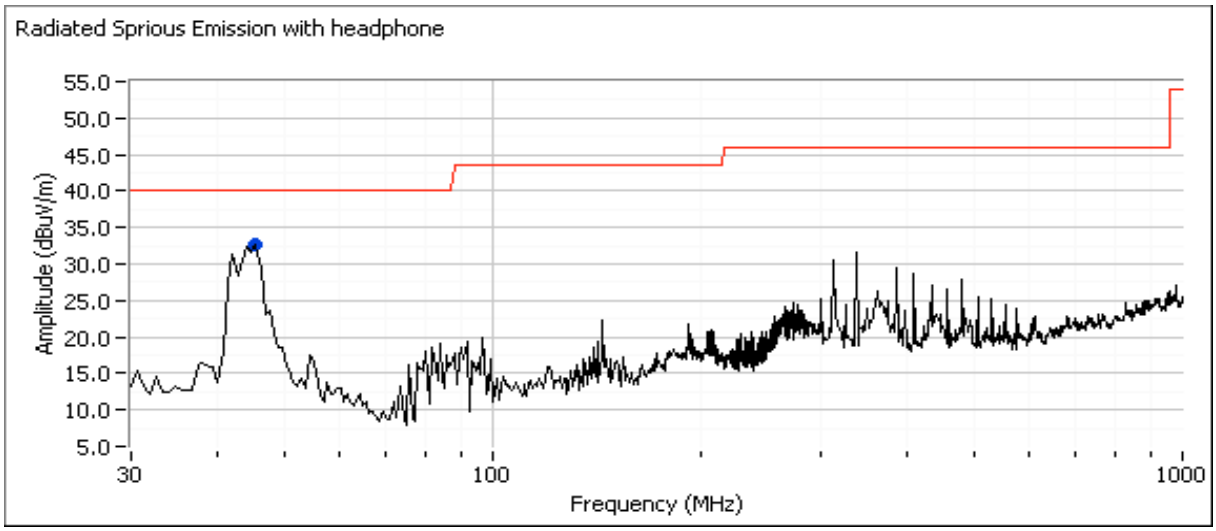
Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	B

Run #1: Preliminary Radiated Emissions, 30-1000 MHz (Tested at Chamber #2)

Date of Test: 4/3/2008
Test Engineer: Mehran Birgani
Test Location: Chamber #2
Config. Used: 1
Config Change: With and without headphones connected
EUT Voltage: Battery

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0





Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
45.525	32.7	H	40.0	-7.3	Peak	0	1.7	

Note - no change in emissions above 1GHz with the headphone connected.

Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	B

Run #2: Maximized Radiated Emissions, 30-1000 MHz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Date of Test: 12/10/2007 Config. Used: 1
Test Engineer: Mehran Birgani Config Change: No headphone connected
Test Location: Fremont Chamber #4 EUT Voltage: Battery

Frequency	Level	Pol	RSS-210/FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
31.878	25.9	H	40.0	-14.1	QP	301	2.0	
167.999	22.8	V	43.5	-20.7	QP	196	1.0	
121.937	20.6	H	43.5	-22.9	QP	122	1.0	
311.998	22.5	V	46.0	-23.5	QP	248	1.5	
50.627	14.7	V	40.0	-25.3	QP	287	1.5	
240.576	19.6	V	46.0	-26.4	QP	325	2.5	

Additional measurement at frequency produced when headphone connected

Date of Test: 4/3/2008 Config. Used: 1
Test Engineer: Mehran Birgani Config Change: With headphone connected
Test Location: OATS #1 EUT Voltage: Battery

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
45.525	12.2	H	40.0	-27.8	QP	13	1.0	

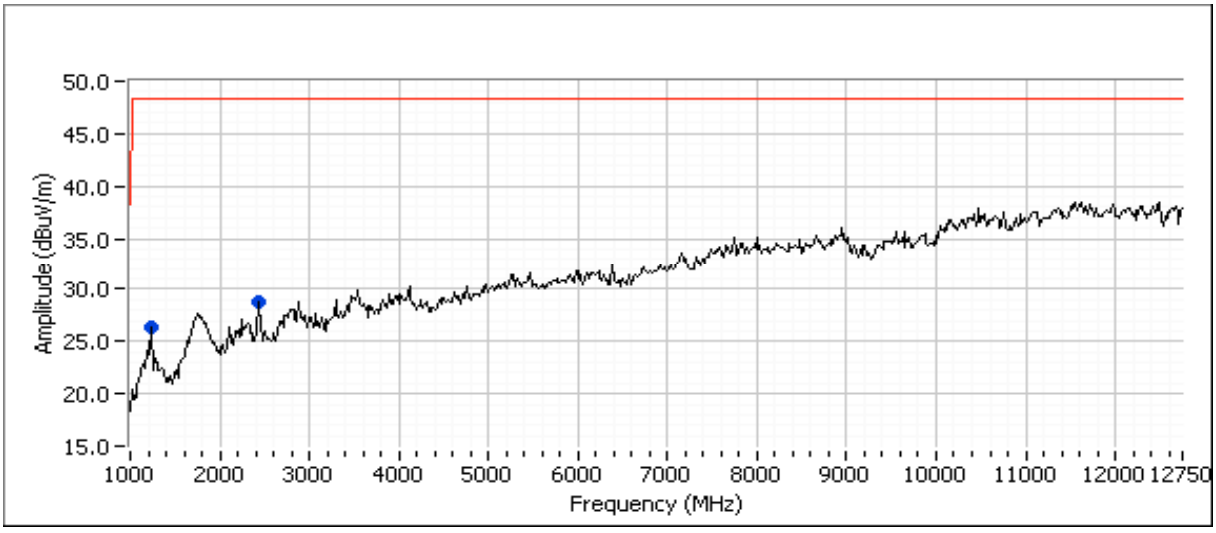
Client:	Harmonix Music Systems Inc.	Job Number:	J70095
Model:	XBOX 360 Rock Band Wireless Guitar Controller	T-Log Number:	T70174
		Account Manager:	Susan Pelzl
Contact:	Daniel Sussman		
Standard:	FCC 15.209, RSS 210	Class:	B

Run #3: Maximized Readings, 1000 - 7500 MHz

Date of Test: 12/18/2007
Test Engineer: Mehran Birgani/Rafael
Test Location: Chamber #2/FT Chamber #3

Config. Used: 1
Config Change: No headphone
EUT Voltage: Battery

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 7,500 MHz	3	3	0.0



Frequency	Level	Pol	RSS-210/FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1235.000	26.4	H	54.0	-27.6	Peak	236	1.0	Peak reading, average limit
2429.580	28.7	H	54.0	-25.3	Peak	161	1.0	Peak reading, average limit