

**COMPOSITE; SUPPLEMENTAL REPORT OF MEASUREMENTS [2.1033(B6)]**

**Test Report for FCC ID:**  
**FCC Part 2.1031, Part 15 Subpart C(15.247)**

**Report #0801096CM**  
**Issued 04/11/2008**



**PLAYPORTT UNIT SPREAD SPECTRUM  
TRANSCIVER AND 40KHz TRANSMITTER**

Judgment: Compliant

Prepared for:

**TouchTunes Game Studio, LLC**  
201 Crossen Avenue  
Elk Grove Village, Illinois 60007

Test Date(s): Nov 2, 2007

Data recorded by

Gordon L. Helm

Gordon L. Helm, NCE

This report prepared by:

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Technical Manager/Test Engineer, AHD

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## Statements Concerning this Report

### NVLAP Accreditation: NVLAP Lab Code 200129-0

The scope of AHD accreditation is the conducted emissions, radiated emissions test methods of:

IEC/CISPR 22: Limits and methods measurement of radio disturbance characteristics of information technology equipment.

FCC Method – 47 CFT Part 15 – Digital Devices.

AS/NZS 3548: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment.

IEC61000-4-2 and Amend.1: ElectroStatic Discharge Immunity

IEC61000-4-5: Surge Immunity

### Test Data:

This test report contains data covered by the NVLAP accreditation..

### Test Traceability:

The calibration of all measuring and test equipment and the measured data using this equipment are traceable to the National Institute for Standards and Technology (NIST).

### Limitations on results:

The test results contained in this report relate only to the item(s) tested. Any electrical or mechanical modification made to the test item subsequent to the test date shall invalidate the data presented in this report. Any electrical or mechanical modification made to the test item subsequent to this test date shall require an evaluation to verify continued compliance.

### Limitations on copying:

This report shall not be reproduced, except in full, without the written approval of AHD.

### Limitations of the report:

This report shall not be used to claim product endorsement by NVLAP, FCC, or any agency of the US Government.

**Statement of Test Results Uncertainty:** Following the guidelines of NAMAS publication NIS81 and NIST Technical Note 1297, the Measurement Uncertainty at a 95% confidence level is determined to be: +/- 1.4 dB

### Retention of Records:

- 1) For equipment verified to comply with FCC regulations, the manufacturer is obliged to retain this report with the product records for two years following the manufacture of the equipment that was tested.

## **Manufacturer/Applicant [2.1033(b1)]**

The manufacturer and applicant:

**TouchTunes Game Studio, LLC**  
201 Crossen Avenue  
Elk Grove Village, Illinois 60007

## **Description of Test Item**

This document represents the results of the series of radio interference measurements performed on a PLAYPORTT, Serial Number 1 (herein referred to as the EUT). The EUT is a digital modulation transceiver. It transmits and receives in the 2400.0MHz to 2483.5MHz band. The test item can use only an internal antenna. The test item was manufactured and submitted by TouchTunes Game Studio, LLC Group, Inc. located in Montreal, Canada.

## **Purpose**

The test series was performed to determine if the test item meets the conducted and radiated RF emission requirements of the FCC Title 47, Part 15, Subpart B sections 15.107 and 15.109 for receivers and Subpart 15.247 for Intentional Radiators. Testing was performed in accordance with ANSI C63.4-2003.

## **Deviations, Additions and Exclusions**

This EUT was originally tested and granted FCC certification. The results are reported in FCC ID JCK-GN-W101GS. This supplemental report contains test results for this same transceiver and a 40kHz transmitter.

## Measurement/Test Site Facility & Equipment

Test Site [2.948, 2.1033(b6)]

### Site 1:

The AHD test facility is centered on 9 acres of rural property near Michigan Highway 152, Sister Lakes, Michigan. The mailing address is 92723 Mich Hwy-152, Sister Lakes, Michigan 49047. This test facility is NVLAP accredited (LabCode 200129-0). It has been fully described in a report filed with the FCC (No.90413) and Industry Canada (file:IC3161).

### Measurement Equipment Used [2.947(d), 15.231(b)]

Equipment	Model	S/N	Last Cal Date	Calibration Interval
HP EMI Receiver system	HP 8546A			
RF Filter Section	HP-85460A	3448A00283	21-June-07	12 months
RF Receiver Section	HP-85462A	3625A00342	21-June-07	12 months
EMCO BiconiLog Antenna	3142	1069	30-Aug-07	12 months
Solar LISN	8012-50-R-24-BNC	962137	30-Aug-07	12 months
Solar LISN	8012-50-R-24-BNC	962138	30-Aug-07	12 months
(LCI) Double shielded 50ohm Coax	RG58/U	920809	05-Mar-08	12 months
(3-m) LMR-400 Ultra Flex	LMR400	9812-11	09-Nov-07	6 months
(3-m) CS-3227 RG8	CS-3227	C060914	09-Nov-07	6 months
(10-m) Amelco 50ohm Coax	RG213U	9903-10ab	09-Nov-07	6 months
Double Ridged Horn	ONO91202-2	A00329	calibration by design & physical inspection.	
Wienschel Attenuator	200099	8950	05-Mar-08	12 months
AJFW Attenuator	50HF	803	05-Mar-08	12 months
EMCO Loop	6502	2148	01-Sept-06	36 months
Keytek Surge	711B	8511854	05-Mar-08	12 months
Schaffner ESD	NSG432	01027	02-Mar-08	12 months
HP Oscilloscope	54100D	2510A00511	07-Jan-08	12 months
Tektronix HV Probe	P6015	1324A1012	07-Jan-08	12 months

**Site 2:**

The University of Michigan test facility is located at 8501 Beck Road, Belleville, Michigan 48111. This test facility has been fully described and accepted by the FCC and Industry Canada. This facility was utilized to measure emissions occurring at frequencies greater than 2.9 GHz.

**SITE 2.**

Equipment	Model	S/N	Last Cal Date	Calibration Interval
C-Band Std. Gain Horn	UM NRL design		calibration by design & physical inspection. calibration by design & physical inspection. calibration by design & physical inspection. calibration by design & physical inspection.	
XN-Band Std. Gain Horn	UM NRL design			
X-Band Std. Gain Horn	SA 12-8.2	730		
K-band horn (18-26.5 GHz) FXR, Inc.	K638KF			
Avantek RF amplifier	AFT-12665		Aug-07	12 months
3ft LowLoss coax	RG142	-	with Avantek amp	
Spectrum Analyzer 26GHz	HP 8593E	3412A01131	Aug-07	12 months

**Environment**

The test was performed with the equipment under test, and measurement equipment inside the all-weather enclosure. Ambient temperature was 22deg.C., the relative humidity 30%.

**Summary of Results:****1. Powerline Conducted Emissions****Requirement**

All radio frequency voltages on the power lines of an intentional radiator shall be below the values shown below when using a quasi-peak detector:

**Conducted Limits for Intentional Radiators**

Frequency	RFI Voltage (QP)	RFI Voltage (Average)
MHz	dBuV	dBuV
0.15-0.5	66 decreasing with logarithm of frequency to 56	56 decreasing with logarithm of frequency to 46
0.5-5	56	46
5-30	60	50

Note1: The lower limit shall apply at the transition frequencies.

**Results:**

The Power Line Conducted Emissions testing was omitted as the EUT is tested in battery operation as a portable device.

## 2. 20dB Bandwidth

### Requirement

Per section 15.247(a)(1), for frequency hopping systems operating in the 2400-2483.5MHz band, the 6 or 20dB bandwidth shall be measured.

### Results:

The 6 or 20dB bandwidth measurement was omitted as original EUT tested was not anticipated to change.

## 3. Carrier Frequency Separation

### Requirement

Per section 15.247(a)(1), for digital modulation systems operating in the 2400-2483.5MHz band.

### Results

The Carrier Frequency Separation measurement was omitted as original EUT tested was not anticipated to change.

## 4. Number of Channels.

### Requirement

Per section 15.247, for digital modulation systems operating in the 2400-2483.5MHz band.

### Results

The measurement of number of channels was omitted as original EUT tested was not anticipated to change.

## 5. Time of Occupancy

### Requirement

Per section 15.247(a)(1)(iii), for digital modulation systems operating in the 2400-2483.5MHz band, the average time of occupancy.

### Results

The measurement of Time of Occupancy was omitted as original EUT measurements were not anticipated to change.

## 6. Peak Output Power – Internal Antenna

### 2.4GHz

### Requirement

Per section 15.247(b)(1), for digital modulation systems operating in the 2400-2483.5MHz band and employing digital modulation, the peak output power shall not be greater than ( 1 watt FCC ) or ( 0.125 watt IC ).

## Results

The emission level nearest the limit occurred at 2.469GHz. The signal was measured to be 15.0dB below the FCC limit or 6.0dB below the IC limit with the antenna horizontally polarized with the EUT in the end position.

## 40kHz

### Requirement

Per section 15.209, for frequency operating below 490kHz, the average output power shall not be greater than  $2400/F(\text{kHz})$ .

### Results

The emission level at 39.99kHz was measured to be 3.3mW or 32.78dB below the FCC limit with a loop antenna with the EUT in the flat position.

## 7. Peak Output Power – Conducted Measurement

### Requirement

Per section 15.247(b)(1), for digital modulation systems operating in the 2400-2483.5MHz band and employing digital modulation,, the peak output power shall not be greater than 1 watt.

### Results

The peak output power conducted measurement was omitted as original EUT tested was not anticipated to change.

## 8. Band edge Compliance

### Requirement

Per section 15.247(d), the emissions at the band-edges must be at least 20dB below the highest level measured within the band but attenuation below the general limits listed in 15.209(a) is not required. In addition, the radiated emissions which fall in the restricted band beginning at 2483.5 MHz, must meet the general limits of 15.209(a).

### Results

The band edge measurements were omitted as original EUT tested was not anticipated to change.

## 9. Spurious RF Conducted Emissions

### Requirement

Per section 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the test item is operating, the spurious RF conducted emissions shall be at least 20dB down from the highest level of power but attenuation below the general limits listed in 15.209(a) is not required.



## Results

The spurious RF conducted emission measurements was omitted as original EUT tested was not anticipated to change.

## 10. Radiated Spurious Emissions

### Requirement

Per section 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the test item is operating, the spurious emissions shall be at least 20dB down from the highest level of power but attenuation below the general limits listed in 15.209(a) is not required. In addition, the radiated emissions which fall in the restricted bands must meet the general limits of 15.209(a).

### Results

#### 2.4GHz

The emission level nearest the limit when evaluating the 2.4GHz transmitter occurred at 4.882GHz. The signal was measured to 0.4dB below the Average limit.

#### 30-100MHz

The emission level nearest the limit when evaluating the class B spurious occurred at 986MHz. The signal was measured to 1.6dB below the Quasi-peak limit.

#### 40kHz

The emission level nearest the limit when evaluating the 40kHz transmitter occurred at 119.941kHz. The signal was measured to be 0.16uW or 57.23 dB below the Average limit.

## 11. Receiver

### Requirement

Per section 15.101(b), receivers operating above 960MHz or below 30MHz are exempt from complying with the technical provisions of CFR Title 47, Part 15, Subpart B. Therefore no testing was performed on the receiver portion of the test item.

## Changes made to achieve compliance:

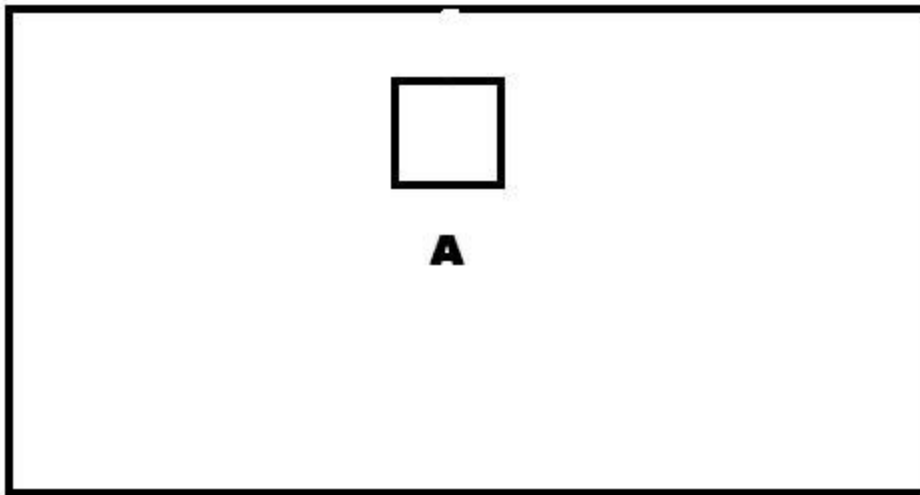
- ? The output power control register was reduced from 31(max) to 21.

## EUT Set-up and Operation :

### Support Equipment & Cabling

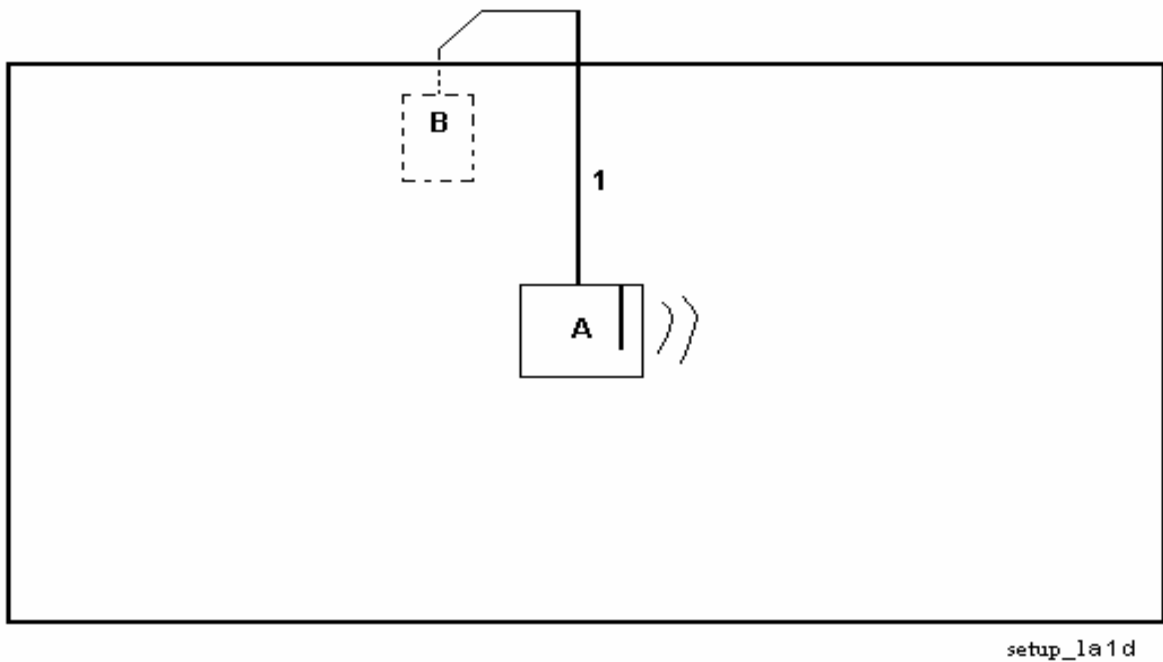
Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] PLAYPORTT 2.4GHz transceiver	700713-001	1	JCK-GN-W101GS

### Setup Diagram



## Remote Equipment & Cabling

Setup Diagram Legend	Description	Model	Serial No. / Part No.	EMC Consideration
A	[EUT] PLAYPORTT Tower 2.4 GHz transceiver			
B	AC power			
1				



Remote Setup Picture: EXE\_Remote\_Tower.jpg

## Standards Applied to Test:

Federal Communications Commission Code of Federal Regulations, Title 47, Part 15, Subpart C, dated October 2005

FCC Public Notice, DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, Released March 30, 2000

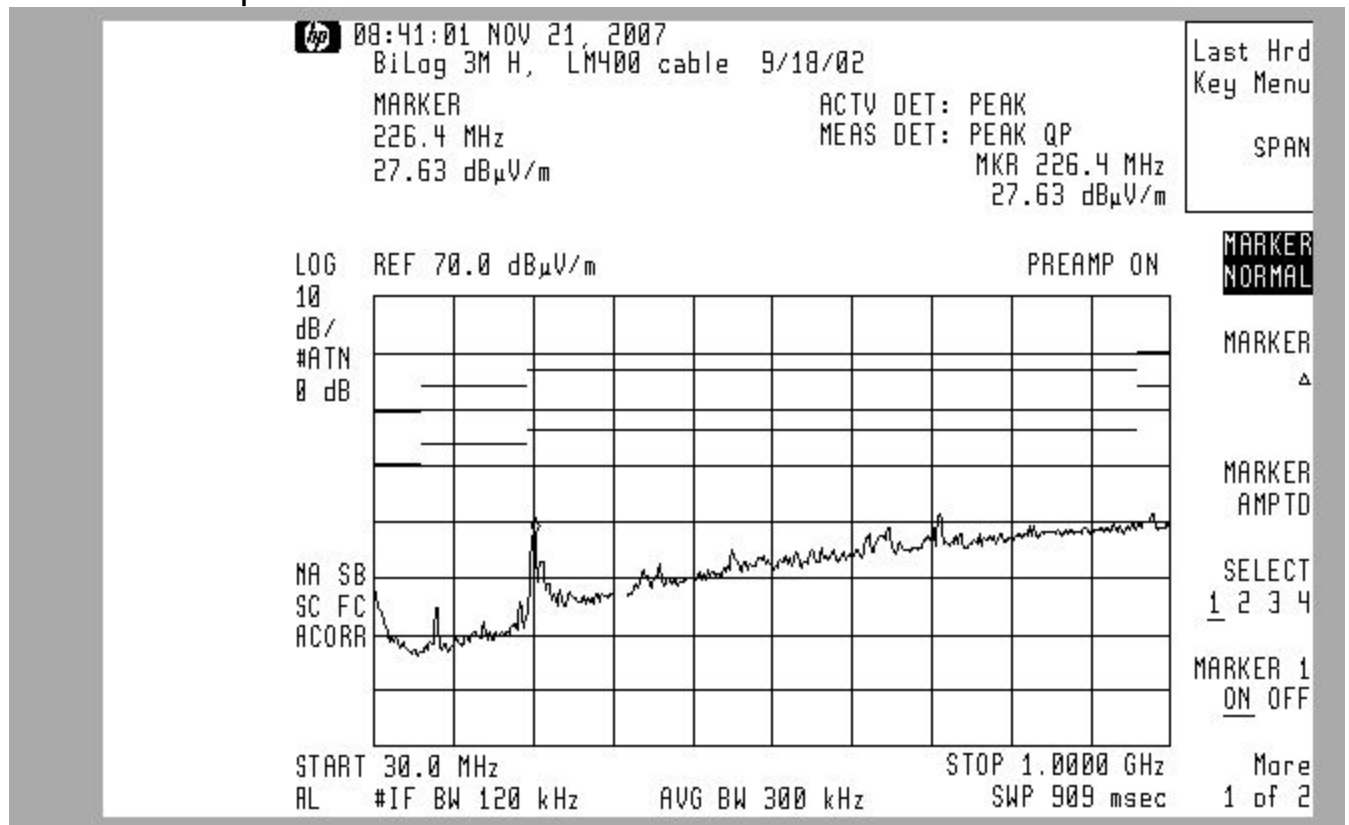
ANSI C63.4 – 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-voltage Electrical and Electronic Equipment in the Range of 9KHz to 40GHz

AHD test procedures TP0101-01, TP0102-01

## Test Data

Line conducted data is not applicable as the EUT is tested in battery operation as a portable device.

### 1. Radiated Spurious Emissions below 1GHz



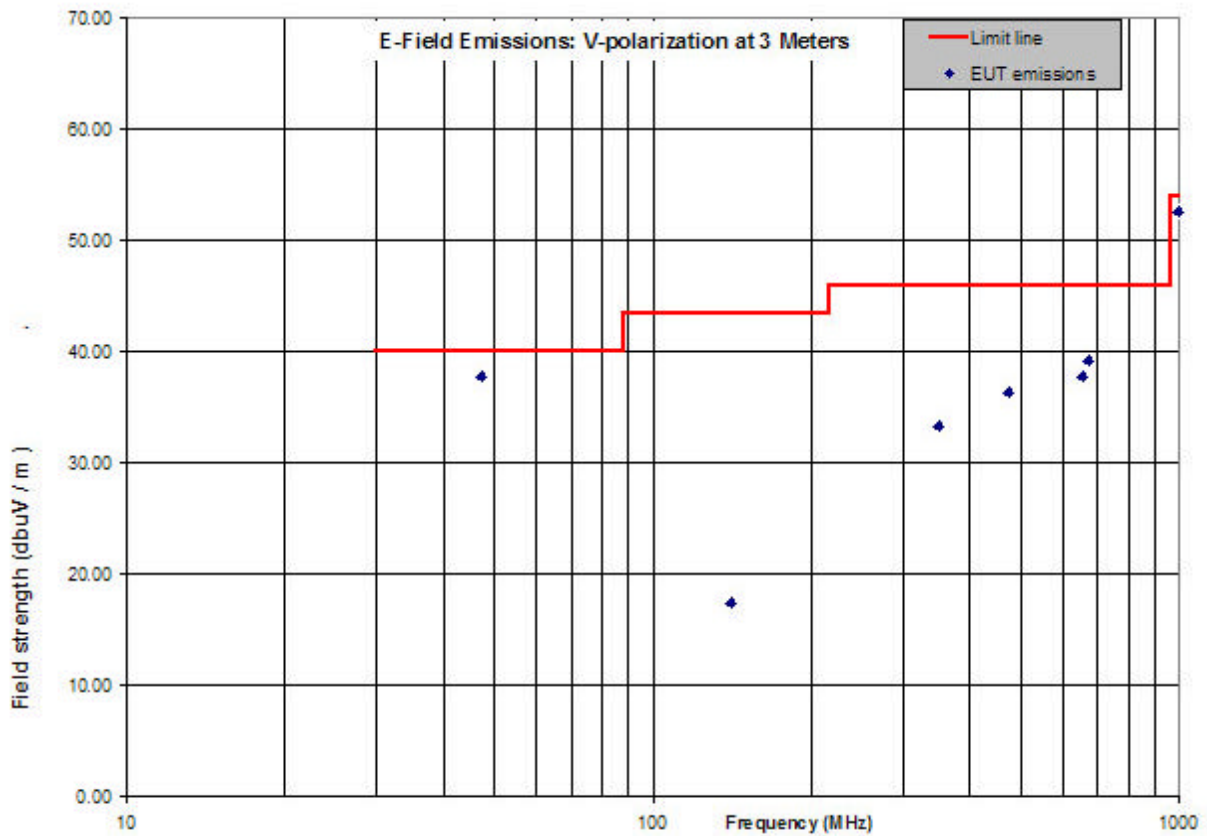
Tested Nov 2, 2007

IC:7596A-7007131

VERTICALLY Polarized

EN55022/FCC Class B

## Graph of Quasi-Peak Measurements



## Tabulated Quasi-Peak Measurements - Vertical

Freq	QP db	Antenna Factors	Turntable Azimuth	Antenna height	Limit	Margin
48.001	38.37	11.06	220	1.0	40	1.6
163.973	18.46	10.08	220	1.3	43.5	25
328.008	35.32	16.49	180	1.3	46	10.7
492.040	32.03	20.71	230	1.0	46	14.0
640.047	38.24	23.48	350	1.0	46	7.8
656.050	42.19	23.74	190	1.2	46	3.8
984.073	52.40	27.73	180	1.0	54	1.6

\* Not Azimuth dependent

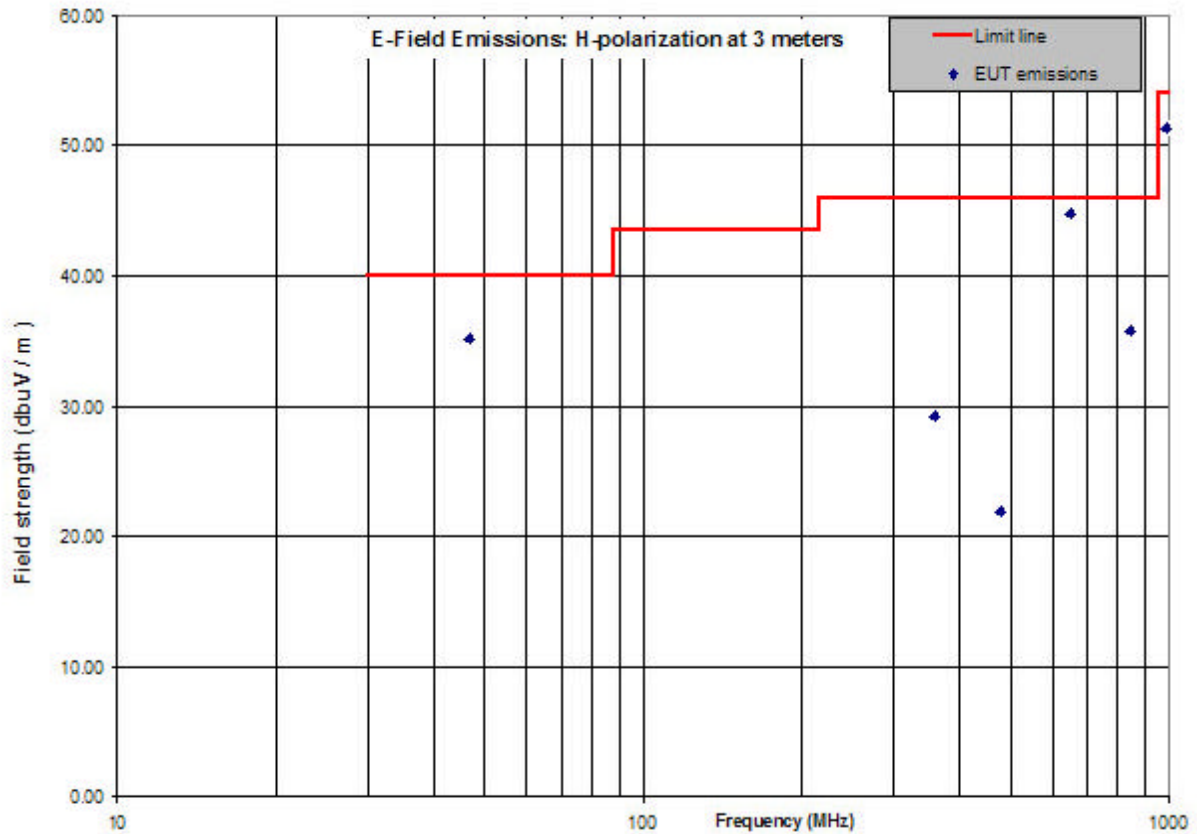
Scanned to 1GHz

3m Measurements used

Tested Nov 2, 2007

IC:7596A-7007131

HORIZONTALLY Polarized  
EN55022/FCC Class B  
Graph of Quasi-Peak Measurements



Tabulated Quasi-Peak Measurements

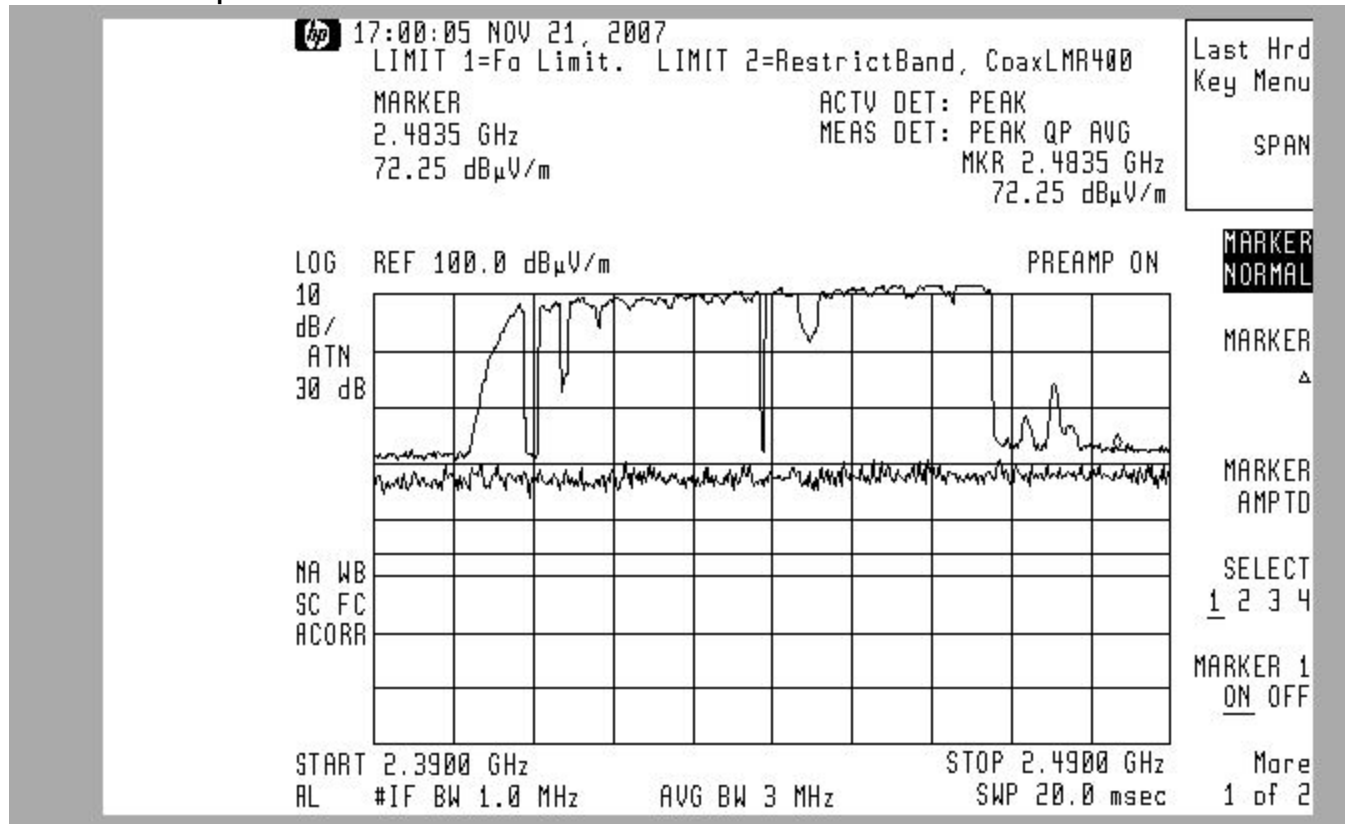
Freq	QP db	Antenna Factors	Turntable Azimuth	Antenna height	Limit	Margin
48.008	36.25	11.05	220	1.0	40	3.7
328.030	29.44	16.50	240	1.0	46	16.6
492.027	22.88	20.15	70	1.2	46	23.1
656.040	44.63	23.73	185	1.0	46	1.4
820.040	36.71	24.04	170	1.2	46	9.3
984.077	52.28	27.73	180	1.1	54	1.7

\* Not Azimuth dependent

Scanned to 1GHz

3m Measurements used

## 2. Peak Output Power – Internal Antenna



## MEASUREMENT PROCEDURE:

1. The EUT was measured at three test frequencies.
2. The receiving antenna and EUT were placed in the orientation determined in earlier testing.

## Transmit Mode. Fundamental

Frequency MHz	Corrected PEAK Measureme nt dBuV/m	Included Cable+Antenna Factors dB+dB/m	Turntable Azimuth deg	Antenn a Height Mtr	Calculated EIRP mWatt	FCC Limit 15.247b mWatt	FCC Margin dB	IC Limit RSS 210 mWatt	IC Margin dB	EUT positio n	Ant Pol.
2408.75	104.4	31.18	180	1.0	9.17	1000	20.8	125	11.8	end	V
2438.17	104.9	31.26	190	1.0	9.27	1000	20.3	125	11.3	end	V
2468.9	104.1	31.35	190	1.0	8.87	1000	21.1	125	12.1	end	V
2413.22	108.3	31.19	240	1.0	20.28	1000	16.9	125	7.9	end	H
2438.6	110.0	31.26	220	1.1	30.0	1000	15.2	125	6.2	end	H
2469.17	110.2	31.35	250	1.1	31.4	1000	15.0	125	6.0	end	H

## 3. Radiated Spurious Emissions above 1GHz

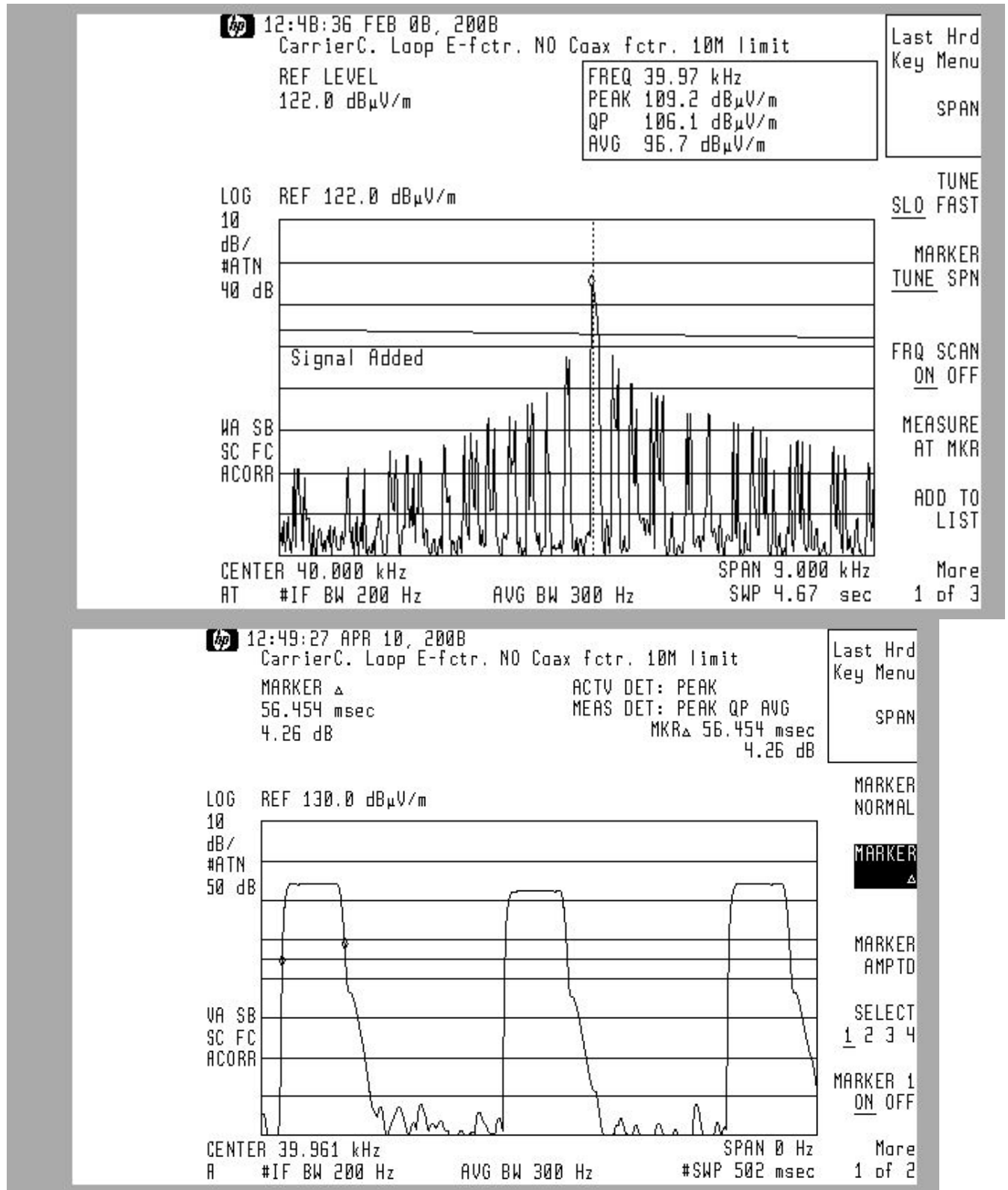
## Highest Harmonic Emissions Measured

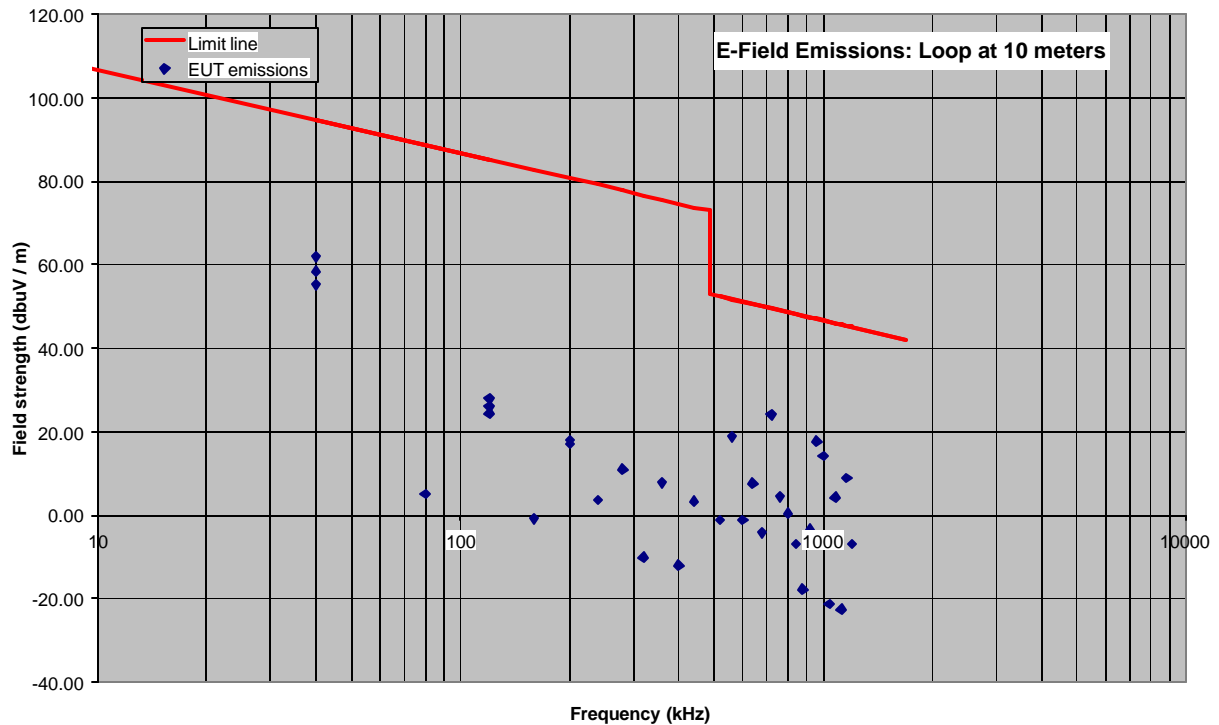
Radiated Emissions											Gaming Unit; FCC/IC
#	Freq. MHz	Ant. Used	Ant. Pol.	Pr dBm	Det,* Used	Ka dB/m	Kg dB	E3** dBμV/m	E3lim dBμV/m	Pass dB	Comments
1	2409.0	Horn S									Lowest channel
2	2441.0	Horn S									Middle channel
3	2466.0	Horn S									Highest channel
4	4818.0	Horn C	H/V	-41.6	Avg	24.6	37.5	52.5	54.0	1.5	Low
5	4882.0	Horn C	H/V	-40.5	Avg	24.6	37.5	53.6	54.0	0.4	Mid
6	4932.0	Horn C	H/V	-41.9	Avg	24.6	37.5	52.2	54.0	1.8	High
7	7323.0	Horn XN	H/V	-63.1	Avg	25.2	36.8	32.3	54.0	21.7	Mid
8	7398.0	Horn XN	H/V	-61.8	Avg	25.3	36.8	33.7	54.0	20.3	High
9	12045.0	Horn X	H/V	-68.2	Avg	31.7	35.5	35.0	54.0	19.0	Low, noise
10	12205.0	Horn X	H/V	-67.7	Avg	31.8	34.1	37.0	54.0	17.0	Mid, noise
11	12330.0	Horn X	H/V	-65.5	Avg	31.9	33.0	40.4	54.0	13.6	High, noise
12	14474.0	Horn Ku	H/V	-60.1	Avg	33.2	29.0	51.1	54.0	2.9	Low, noise
13	19272.0	Horn K	H/V	-71.0	Avg	32.2	32.0	36.2	54.0	17.8	Low, noise
14	19528.0	Horn K	H/V	-68.2	Avg	32.3	32.0	39.1	54.0	14.9	Mid, noise
15	19728.0	Horn K	H/V	-68.4	Avg	32.3	32.0	38.9	54.0	15.1	High, noise
16	22194.0	Horn K	H/V	-63.0	Avg	32.8	32.0	24.8	54.0	29.2	High, noise
17											
18											
19	4818.0	Horn C	H/V	-31.3	Pk	24.6	37.5	62.8			Low
20	4882.0	Horn C	H/V	-29.6	Pk	24.6	37.5	64.5			Mid
21	4932.0	Horn C	H/V	-29.7	Pk	24.6	37.5	64.4			High
22	7323.0	Horn XN	H/V	-48.8	Pk	25.2	36.8	46.6			Mid
23	7398.0	Horn XN	H/V	-50.5	Pk	25.3	36.8	45.0			High
24	12045.0	Horn X	H/V	-59.6	Pk	31.7	35.5	43.6			Low, noise
25	12205.0	Horn X	H/V	-57.8	Pk	31.8	34.1	46.9			Mid, noise
26	12330.0	Horn X	H/V	-56.9	Pk	31.9	33.0	49.0			High, noise
27	14474.0	Horn Ku	H/V	-71.6	Pk	33.2	29.0	39.6			Low, noise
28	19272.0	Horn K	H/V	-59.9	Pk	32.2	32.0	47.3			Low, noise
29	19528.0	Horn K	H/V	-55.1	Pk	32.3	32.0	52.2			Mid, noise
30	19728.0	Horn K	H/V	-57.1	Pk	32.3	32.0	50.2			High, noise
31	22194.0	Horn K	H/V	-52.1	Pk	32.8	32.0	35.7			High, noise
32											
33											
34											
35											
36	* Peak measured with 1 MHz RBW and 3 MHz VBW, Avg. meas. with 1MHz RBW, 10 kHz VBW.										
37	** For peak measurement, 20 dB maximum permissible duty cycle applied to limit.										

Meas. 12/05/2007; U of Mich.



#### 4. Radiated Emissions 40kHz transmitter:



**Graph of Average Measurements****Tabulated Average Measurements**

Freq (MHz)	Average Amplitude (dBuV/m)	Distance Correction	Correction	Correct ed. Avg. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ambient AM Radio Signal Below Limit
0.039982	78.47	-20	12.12	58.47	94.67	36.20	
0.039977	75.2	-20	12.13	55.2	94.67	39.47	
0.039995	101.8	-40	12.12	61.88	94.66	32.78	
0.079973	45.05	-40	11.02	5.05	88.65	83.60	
0.119961	45.95	-20	10.82	25.95	85.12	59.17	
0.120051	44.39	-20	10.82	24.39	85.12	60.73	
0.119988	67.89	-40	10.82	27.89	85.12	57.23	
0.159891	39.13	-40	10.69	-0.87	82.63	83.50	
0.200001	37.16	-20	10.6	17.16	80.68	63.52	
0.199961	58.01	-40	10.6	18.01	80.69	62.68	
0.240103	43.61	-40	10.6	3.61	79.10	75.49	
0.280035	31.06	-20	10.6	11.06	77.76	66.70	
0.279995	31.15	-20	10.6	11.15	77.76	66.61	
0.319938	29.86	-40	10.6	-10.14	76.60	76.60	
0.359954	27.8	-20	10.6	7.8	75.58	67.78	
0.399969	27.99	-40	10.6	-12.01	74.66	74.66	
0.44000	43.4	-40	10.6	3.4	73.84	70.44	

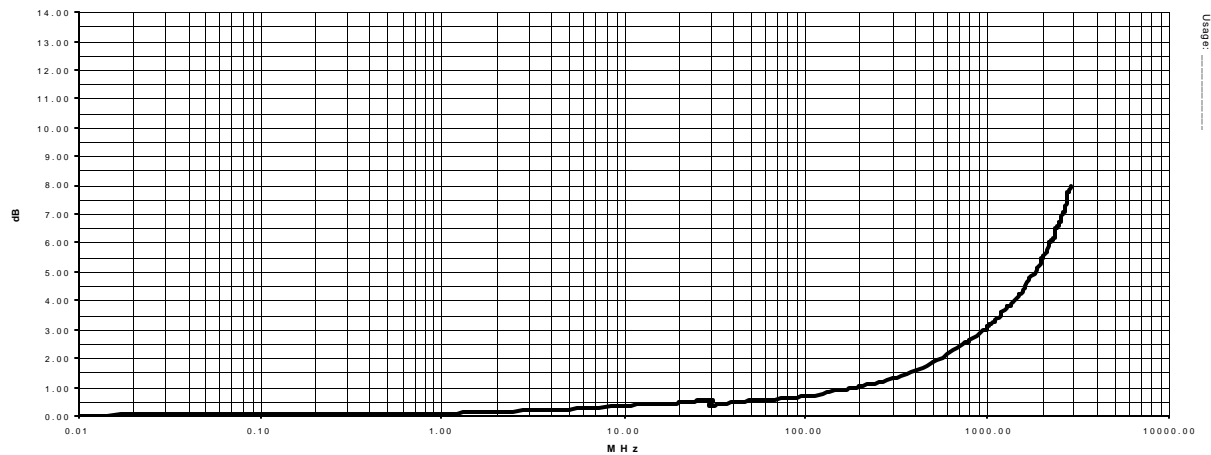
Tested Nov 2, 2007

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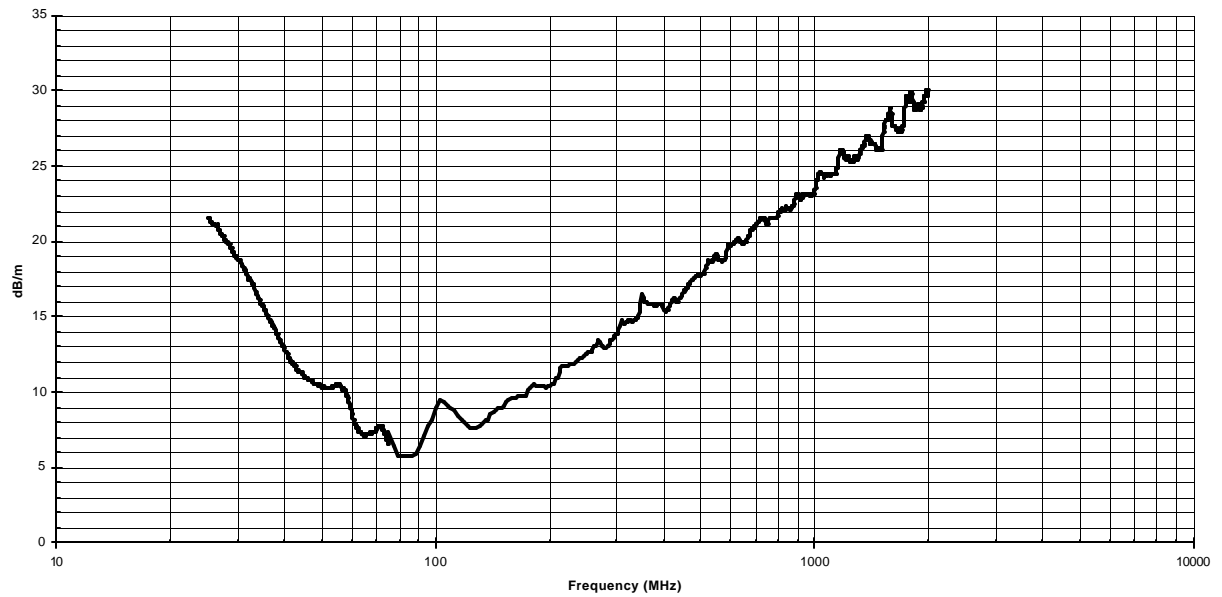
0.520076	38.77	-40	10.6	-1.23	52.38	53.61	
0.559984	58.85	-40	10.61	18.85	51.74	32.89	Yes
0.59997	38.97	-40	10.62	-1.03	51.14	52.17	
0.63997	47.64	-40	10.63	7.64	50.58	42.94	Yes
0.679952	35.84	-40	10.64	-4.16	50.05	54.21	
0.719976	64.13	-40	10.65	24.13	49.56	25.43	Yes
0.759978	44.46	-40	10.66	4.46	49.09	44.63	Yes
0.800198	40.47	-40	10.66	0.47	48.64	48.17	Yes
0.839985	33.04	-40	10.67	-6.96	48.22	55.18	
0.879733	22.3	-40	10.68	-17.7	47.82	65.52	
0.920044	36.59	-40	10.68	-3.41	47.43	50.84	
0.960019	57.68	-40	10.69	17.68	47.06	29.38	Yes
0.999976	54.27	-40	10.69	14.27	46.70	32.43	Yes
1.040023	18.78	-40	10.7	-21.22	46.36	67.58	
1.079971	44.3	-40	10.7	4.3	46.04	41.74	Yes
1.119986	17.52	-40	10.7	-22.48	45.72	68.20	
1.159989	48.98	-40	10.7	8.98	45.42	36.44	Yes
1.199971	33.08	-40	10.7	-6.92	45.12	52.04	

## Cable Loss



Radiated at 3 meters; 30MHz through 3000MHz, Coax #9812\_11  
Last Calibration date: Nov 9, 2007



EMCO Model 3142 Antenna #1069  
Last Calibration Date; August 30, 2007  
3 Meter Distance Factors



**AHD Accreditation**

<p>United States Department of Commerce National Institute of Standards and Technology</p>		<p><b>Certificate of Accreditation to ISO/IEC 17025:2005</b></p>
<p>NVLAP LAB CODE: 200129-0</p>		
<p><b>AHD (Amber Helm Development, L.C.)</b> Dowagiac, MI</p>		
<p><i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i></p>		
<p><b>ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS</b></p>		
<p><i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005).</i></p>		
<p>2007-07-01 through 2008-06-30 Effective dates</p>		<p><i>Sally A. Bruce</i> For the National Institute of Standards and Technology</p>

NVLAP-01C (REV. 2006-09-13)

**FEDERAL COMMUNICATIONS COMMISSION**

Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046

May 17, 2005

Registration Number: 90413

AHD EMC Laboratory  
92723 M-152  
Dowagiac, MI 49047

Attention: Gordon Helm

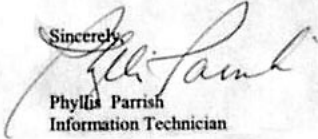
Re: Measurement facility located at Sister Lakes  
3 & 10 meter site  
Date of Renewal: May 17, 2005

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website [www.fcc.gov](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

  
Phyllis Parrish  
Information Technician**NARTE Seal**