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## FCC PART 15.249 TEST REPORT

### UNLICENSED INTENTIONAL RADIATOR

Applicant	HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC	
Address	1625 RIDGEWAY DRIVE	
	FAYETTEVILLE ARKANSAS 72701	
FCC ID	UH9RX4000	
Model Number	RX 4000	
Product Description	TRANSCEIVER	
Date Sample Received	8/7/2006	
Date Tested	8/23/2006	
Tested By	Nam Nguyen	
Approved By	Mario de Aranzeta	
Report Number	H\HYPER\2296BUT6\2296BUT6TestReport.doc	
Total Pages	16	
Test Results	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL  
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01



Certificate # 0955-01

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APPLICANT: HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC  
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## STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that the necessary measurements were made by me or under my supervision, at TIMCO ENGINEERING, INC. at 849 N.W. State Road 45, Newberry, Florida 32669.

**Authorized by:** Mario de Aranzeta

**Signature:** <*Mario de Aranzeta*>

**Function:** Engineer

**Date:** 8/23/2006

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## GENERAL INFORMATION

### DUT Specification

The test results relate only to the items tested.					
Applicable Standard	Part 15.249				
DUT Description	TRANSCEIVER				
FCC ID	UH9RX4000				
Model Number	RX 4000				
Serial Number	N/A				
Operating Frequency	2400-2483.5 MHz				
No. of Channels	62				
DUT Power Source	<input checked="" type="checkbox"/> 110-120Vac/50- 60Hz				
	<input type="checkbox"/> DC Power				
	<input type="checkbox"/> Battery Operated Exclusively				
Test Item	<input type="checkbox"/> Prototype	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Production		
Type of Equipment	<input type="checkbox"/> Fixed	<input type="checkbox"/> Mobile	<input checked="" type="checkbox"/> Portable		
Test Conditions	Temperature - 26°C	Humidity - 50%			
Modifications	None Required				
Test Exercise	The DUT was placed in continuous transmit mode of operation				
Test Standards	ANSI C63.4 - 2003				

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## EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/04	3/26/07
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Analyzer	HP	85650A	2811A01279	CAL 4/13/05	4/13/07
Blue Tower Quasi-Peak Adapter	HP	85685A	2926A00983	CAL 9/5/05	9/5/07
Blue Tower RF Preselector	HP	8568B	2928A04729 2848A18049	CAL 4/13/05	4/13/07
Blue Tower Spectrum Analyzer	Electro-Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/05	4/28/07
Antenna: Log-Periodic	Eaton	96005	1243	CAL 12/14/05	12/14/07

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## TEST PROCEDURES

**Radiation Interference:** ANSI Standard C63.4-2003 using a spectrum analyzer, a preselector, a quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100kHz with an appropriate sweep speed and the video bandwidth was 300kHz up to 1.0GHz and 1.0MHz with a video BW of 3.0MHz above 1.0GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

**Formula Of Conversion Factors:** The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz)	Meter Reading	+ ACF	+ CL	= FS
33	20 dBuV	+ 10.36 dB	+ 0.5	= 30.86 dBuV/m @ 3m

**Power Line Conducted Interference:** The procedure used was ANSI Standard C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

**Occupied Bandwidth:** A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

**ANSI Standard C63.4-2003 10.1 Measurement Procedures:** The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The UUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.



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## RADIATION INTERFERENCE

Rules Part No.: 15.249, 15.209

### Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) $\mu$ V/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) $\mu$ V/m @ 30 meters
1705 kHz to 30 MHz	29.54 dB $\mu$ V/m @ 30 meters
30 - 88	40.0 dB $\mu$ V/m @ 3 meters
80 - 216	43.5 dB $\mu$ V/m @ 3 meters
216 - 960	46.0 dB $\mu$ V/m @ 3 meters
Above 960	54.0 dB $\mu$ V/m @ 3 meters
Part 15.249	
Fundamental 902 - 928 MHz	94.0 dB $\mu$ V/m @ 3 meters
Fundamental 2.4 - 2.4835 MHz	94.0 dB $\mu$ V/m @ 3 meters
Harmonics	54.0 dB $\mu$ V/m @ 3 meters

### Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty Cycle	Field Strength dBuV/m	Margin dB
2,401.20	2,401.20	54.9	H	3.18	32.32	14.6	75.8	18.2
2,401.20	2,401.20	63.2	V	3.18	32.32	14.6	84.1	9.9
2,401.20	4,802.40	9.7	H	4.9	34.34	14.6	34.34	19.66
2,401.20	4,802.70	12.7	V	4.9	34.34	14.6	37.34	16.66
2,401.20	7,203.60	8	H	5.72	36.14	14.6	35.26	18.74
2,401.20	7,203.90	8.2	V	5.72	36.14	14.6	35.46	18.54
2,401.20	9,604.80	7.7	H	6.78	37.53	14.6	37.41	16.59
2,401.20	9,605.40	8.7	V	6.78	37.53	14.6	38.41	15.59
2,401.20	12,006.00	6.2	H	7.8	38.9	14.6	38.3	15.7
2,401.20	12,006.30	5.5	V	7.8	38.9	14.6	37.6	16.4
2,432.30	2,432.30	56.5	H	3.2	32.41	14.6	77.51	16.49
2,432.30	2,432.30	65.6	V	3.2	32.41	14.6	86.61	7.39
2,432.30	4,864.20	11.7	V	4.93	34.39	14.6	36.42	17.58
2,432.30	4,864.60	9.5	H	4.93	34.39	14.6	34.22	19.78
2,432.30	7,296.90	8.2	H	5.78	36.26	14.6	35.64	18.36
2,432.30	7,296.90	8.4	V	5.78	36.26	14.6	35.84	18.16
2,432.30	9,729.20	7.5	H	6.82	37.68	14.6	37.4	16.6
2,432.30	9,729.20	8.3	V	6.82	37.68	14.6	38.2	15.8
2,432.30	12,161.50	6.3	V	7.91	38.96	14.6	38.57	15.43
2,432.30	12,161.50	7	H	7.91	38.96	14.6	39.27	14.73

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Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty Cycle	Field Strength dBuV/m	Margin dB
2,462.30	2,462.30	56.2	H	3.22	32.49	14.6	77.31	16.69
2,462.30	2,462.30	67	V	3.22	32.49	14.6	88.11	5.89
2,462.30	4,924.60	10.8	H	4.96	34.44	14.6	35.6	18.4
2,462.30	4,924.60	11.2	V	4.96	34.44	14.6	36	18
2,462.30	7,386.90	8.5	V	5.83	36.36	14.6	36.09	17.91
2,462.30	7,386.90	8.8	H	5.83	36.36	14.6	36.39	17.61
2,462.30	9,835.20	6.5	V	6.85	37.8	14.6	36.55	17.45
2,462.30	9,849.20	6.7	H	6.85	37.82	14.6	36.77	17.23
2,462.30	12,311.50	6.5	V	8.02	39.02	14.6	38.94	15.06
2,462.30	12,311.50	6.5	H	8.02	39.02	14.6	38.94	15.06

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## OCCUPIED BANDWIDTH

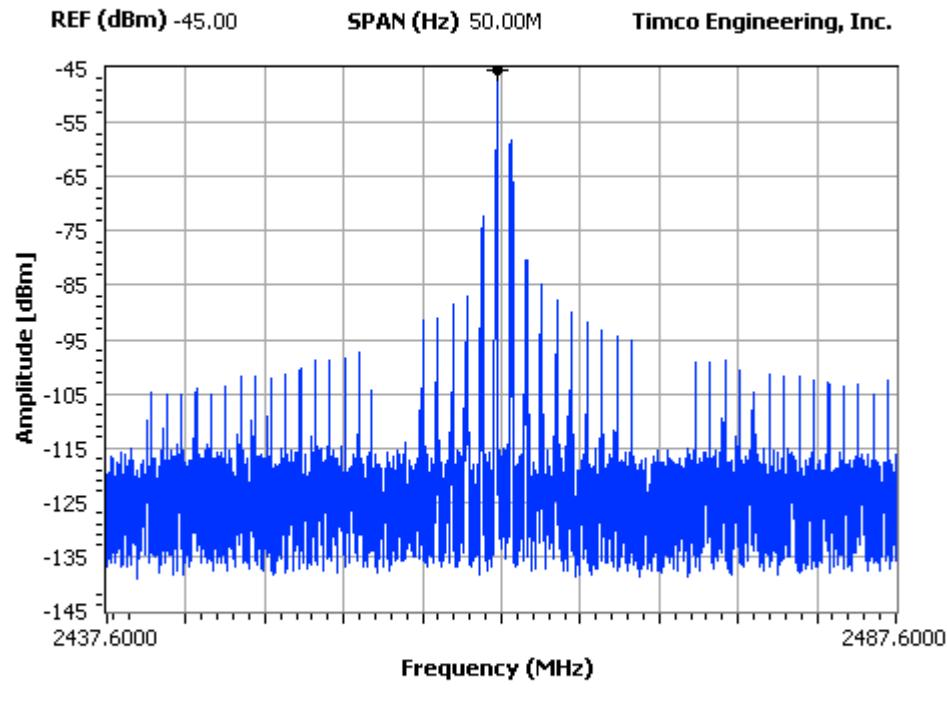
**Rules Part No.:** 15.249 (d)

**Requirements:** The field strength of any emissions appearing outside the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 50 dB below the level of the carrier or to the general limits of 15.249.

**Test Data:**

**NOTES:**

HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC - FCC ID: UH9RX 4000  
OCCUPIED BANDWIDTH PLOT



**RBW** 100 kHz **VBW** 300 kHz

**ST (sec)** 37m

**Center Frequency (Hz)** 2.463G

**Marker Delta (Hz)** 0.00

Peak	2462.30	-45.30	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
MKR2	0.000	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
MKR3	0.000	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
HWMK	23.076	6.27	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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## CALCULATION OF DUTY CYCLE

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100 milliseconds. This sweep determines the duration of the pulse train, which in this case is millisecond. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100 millisecond plot the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the UUT is on within 100 ms. If the pulse train is longer than 100 ms then this number is multiplied by 100 to determine the percentage ON TIME. If the pulse train is less than 100 ms the total on time is divided by the length of the pulse train and then multiplied by 100 to determine the percentage ON TIME. In this case there were 41 short pulses .280 mS long and 18 long pulses .480 ms long for a total of 20.12 ms ON TIME within a 50.8 ms pulse train. The average field strength is determined by multiplying the peak field strength by the percent on time.

```
dB = 20*log(ON TIME)/PERIOD
dB = 20*log(2.4/12.94)
dB = 20*log(0.18)
dB = -14.63
```

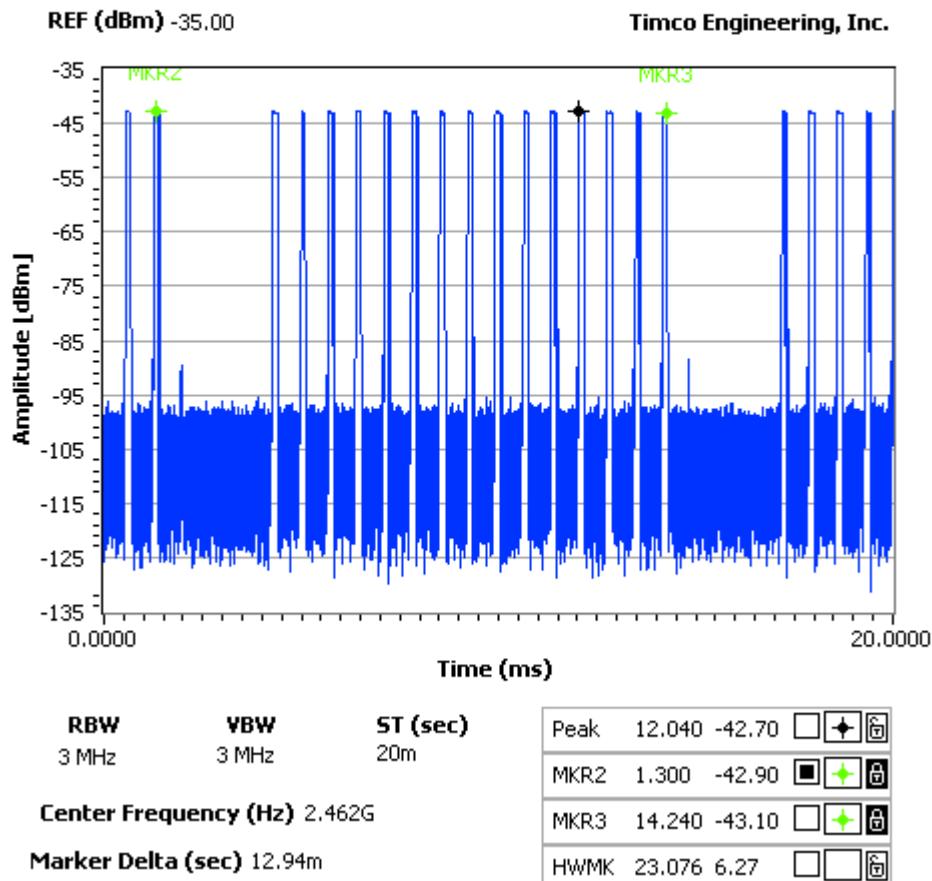
APPLICANT: HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC  
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**NOTES:**

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DUTY CYCLE PLOT 1



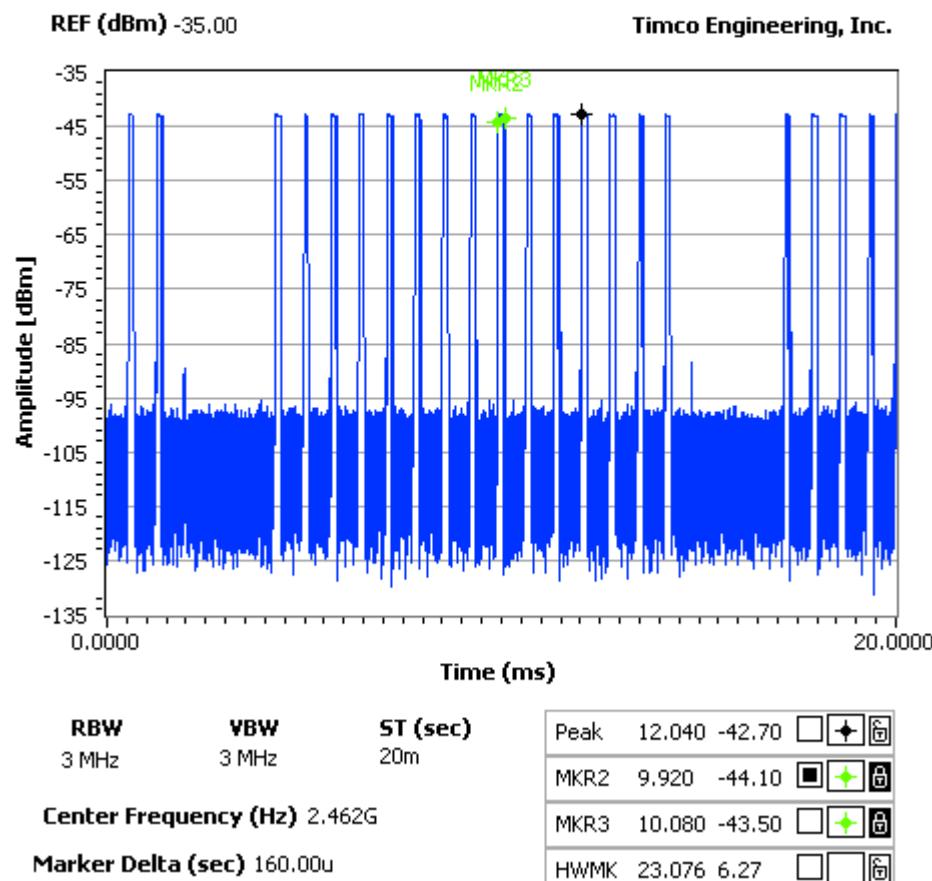
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FCC ID: UH9RX4000  
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**NOTES:**

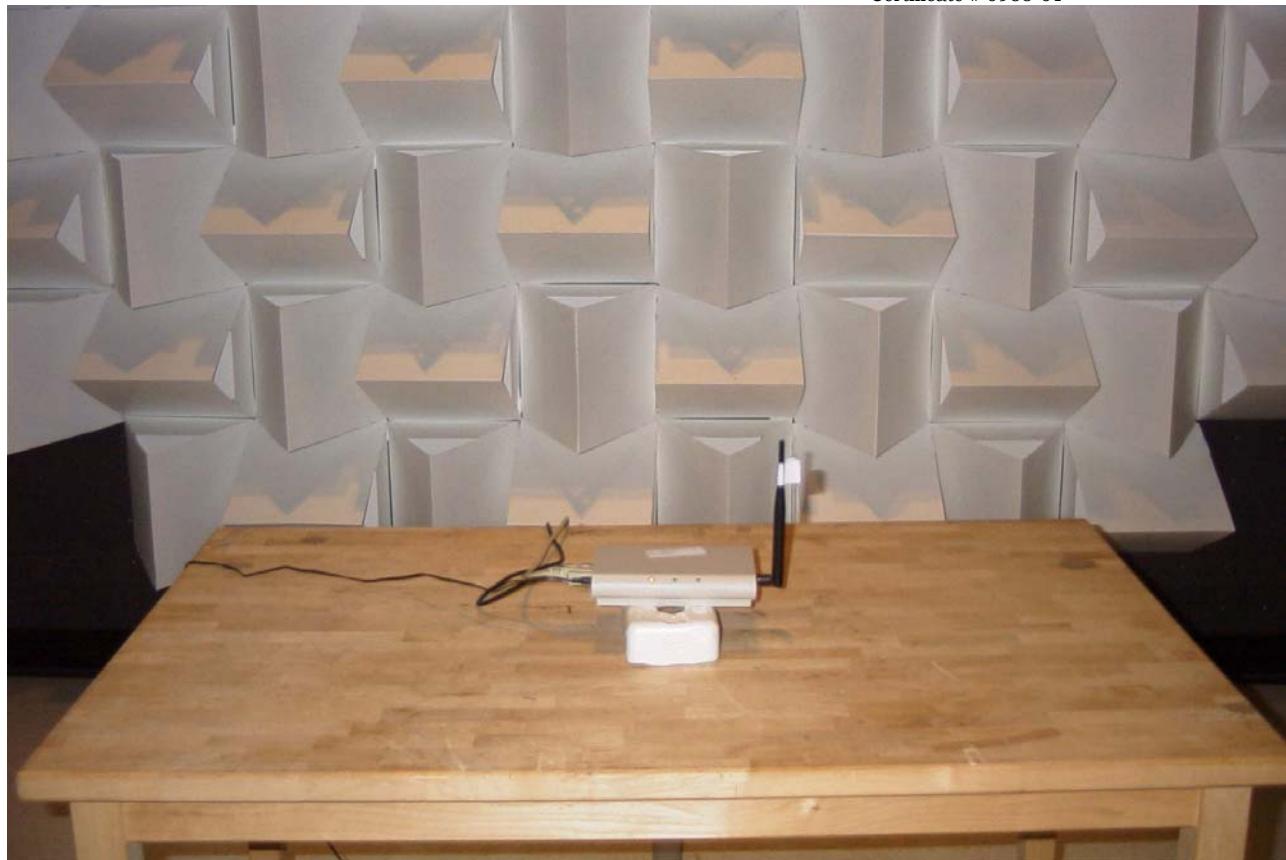
HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC - FCC ID: UH9RX 4000  
DUTY CYCLE PLOT 2



APPLICANT: HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC  
FCC ID: UH9RX4000  
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## POWER LINE CONDUCTED INTERFERENCE

**Rules Part No.:** 15.207

**Requirements:**

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

**Test Data:** The attached graphs represent the emissions read for power line conducted for this device. Both lines were observed.

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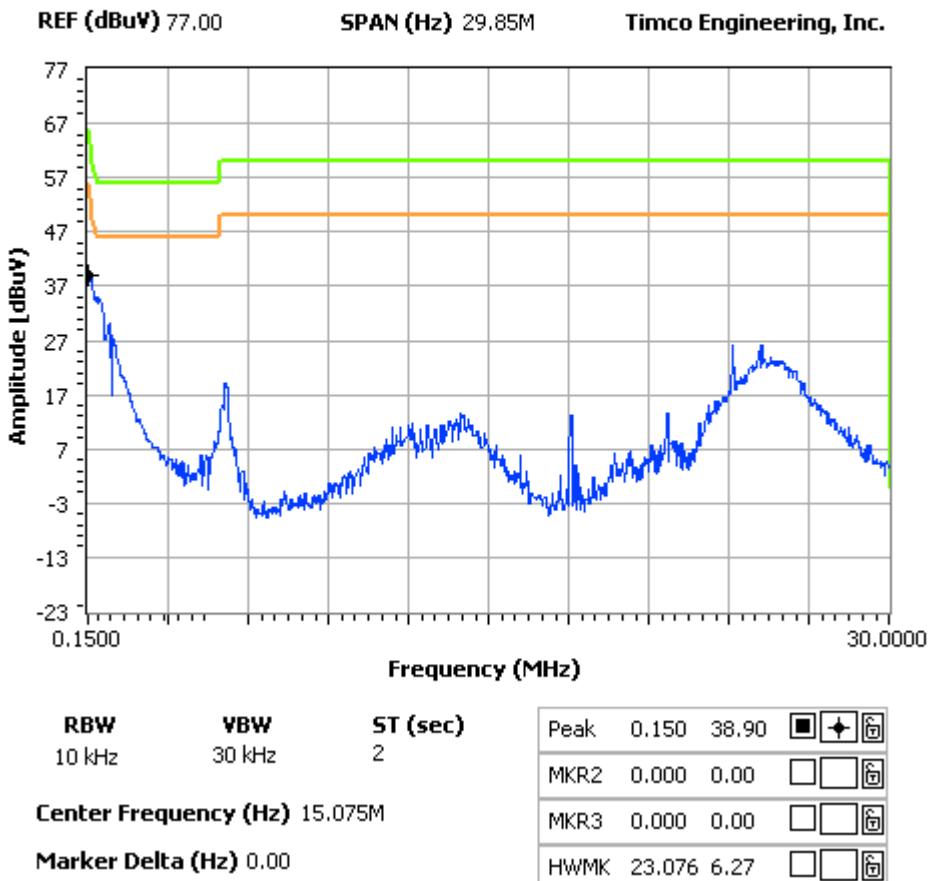
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## POWERLINE CONDUCTED PLOT – LINE 1

### NOTES:

HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC - MODEL: RX4000  
POWERLINE CONDUCTED PLOT - LINE 1

### FCC 15.107 Mask Class B



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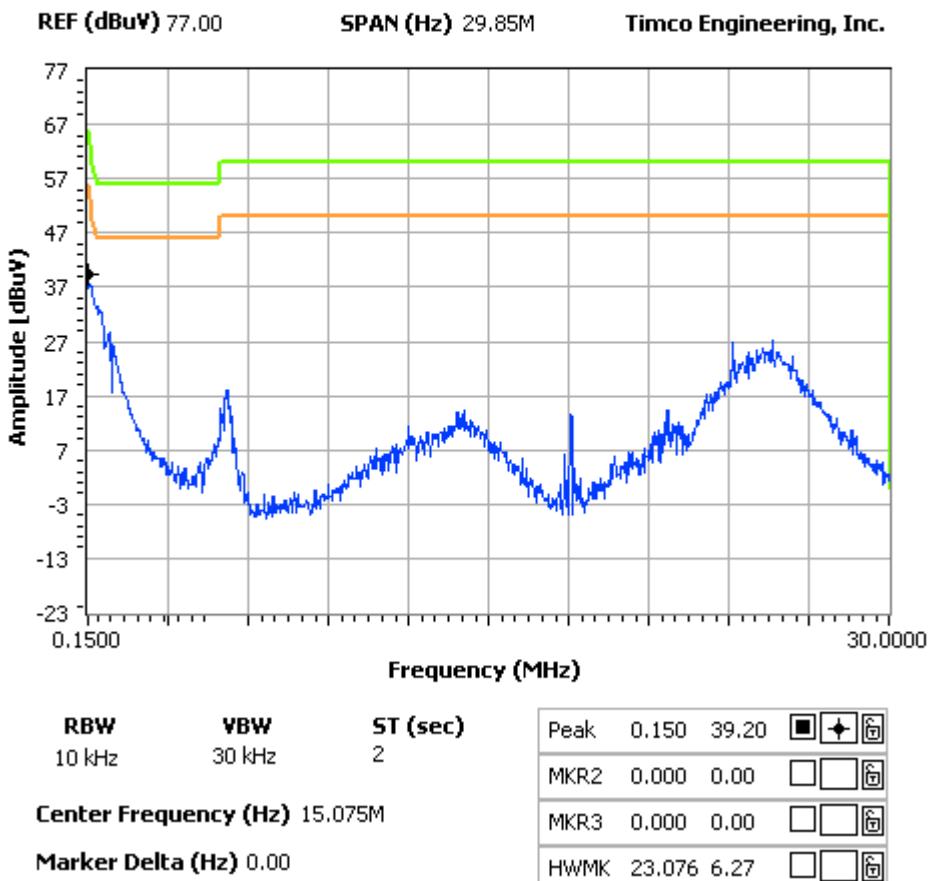
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## POWERLINE CONDUCTED PLOT – LINE 2

### NOTES:

HYPER-INTERACTIVE TEACHING TECHNOLOGY LLC - MODEL: RX4000  
POWERLINE CONDUCTED PLOT - LINE 2

### FCC 15.107 Mask Class B



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