

APPLICATION FOR CERTIFICATION  
On Behalf of

SMART Technologies Inc.

Classroom response sytem

Model Number: 03-00098-20

Prepared for : SMART Technologies Inc.  
1207 – 11 Ave SW, Suite 300 Calgary, AB Canada

Prepared By : Audix Technology (Shenzhen) Co., Ltd.  
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Report Number : ACS-F07134  
Date of Test : Feb. 06 ~ Jul.26, 2007  
Date of Report : Jul. 30, 2007

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## TEST REPORT CERTIFICATION

Applicant : SMART Technologies Inc.  
 Manufacturer : Qingdao Haier Intelligent Electronics Co., Ltd.  
 EUT Description : Classroom response system  
 (A) MODEL NO. : 03-00098-20  
 (B) SERIAL NO. : N/A  
 (C) POWER SUPPLY : DC 3V

Test Procedure Used:

FCC Rules and Regulations Part 15 Subpart C 2006

The device described above is tested by AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both radiated and conducted emissions.

The test results are contained in this test report and AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. is assumed full responsibility for the accuracy and completeness of these tests. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX TECHNOLOGY (SHENZHEN) CO., LTD.

Date of Test : Feb. 06 ~ Jul.26, 2007

Prepared by : YoYo Wang  
 YoYo Wang / Assistant

Reviewer : Iceeman Hu  
 Iceeman Hu / Senior Engineer

Approved & Authorized Signer :

**AUDIX**® 信華科技(深圳)有限公司  
 Audix Technology (Shenzhen) Co., Ltd.  
 EMC 部門報告專用章  
 Stamp only for EMC Dept. Report  
 Signature: Ken Lu 8/2007  
 Ken Lu / Deputy Manager

# 1. SUMMARY OF STANDARDS AND RESULTS

## 1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION		
Description of Test Item	Standard	Results
Conducted Emission Test	FCC Part 15: 15.207 ANSI C63.4: 2003	N/A
Radiated Emission Test	FCC Part 15: 15.209 ANSI C63.4: 2003	PASS
6dB Bandwidth Test	FCC Part 15: 15.247	PASS
Output Power Test	FCC Part 15: 15.247	PASS
Band Edge Compliance Test	FCC Part 15: 15.247	PASS
Power Spectral Density Test	FCC Part 15: 15.247	PASS
MPE ESTIMATION	FCC Part 2: 2.1093	PASS
N/A is an abbreviation for Not Applicable.		

## 2. GENERAL INFORMATION

### 2.1. Description of Device (EUT)

Description	:	Classroom response system
Model Number	:	03-00098-20
Operation frequency	:	2.4GHz-----2.4835GHz ISM Band
Channel Number	:	16
Channel frequency	:	$F = 2405 + 5(k-11)$ MHz, k=11, 12... 26
Radio Technology	:	IEEE 802.15.4(Zigbee)
Modulation Technology	:	DSSS modulation
Output power	:	-15.11dBm (measured)
Antenna	:	Integral antenna
Power	:	DC 3V (see note)
Antenna Assembly Gain	:	3dB (maximum)
Applicant	:	SMART Technologies Inc. 1207 – 11 Ave SW, Suite 300 Calgary, AB Canada
Manufacturer	:	Qingdao Haier Intelligent Electronics Co., Ltd. No.99 Chongqing South Road, Qingdao, China
Date of Test	:	Feb. 06 ~ Jul.26, 2007

**Note: Each test was performed using new batteries**

## 2.2. Test Facility

### Site Description

- 3m Anechoic Chamber : Certificated by FCC, USA  
Registration Number: 90454  
Jun. 13, 2006
- 3m & 10m Anechoic Chamber : Certificated by FCC, USA  
Registration Number: 794232  
Jan. 31, 2007
- EMC Lab. : Certificated by DATech, German  
Registration Number: DAT-P-091/99-01  
Feb. 02, 2004
- Certificated by NVLAP, USA  
NVLAP Code: 200372-0  
Apr.01, 2006
- Certificated by Nemko, Norway  
Aut. No.: ELA135  
April. 22, 2004
- Certificated by Industry Canada  
Registration Number: IC 5183  
Jul. 28, 2004
- Name of Firm : Audix Technology (Shenzhen) Co., Ltd.
- Site Location : No. 6, Ke Feng Rd., 52 Block,  
Shenzhen Science & Industrial Park,  
Nantou, Shenzhen, Guangdong, China

## 2.3. Measurement Uncertainty

No.	Item	Uncertainty
1.	Uncertainty for Conducted Emission Test	1.22dB
2.	Uncertainty for Radiated Emission Test<1GHz	4.62dB
3.	Uncertainty for Radiated Emission Test>1GHz	4.79dB
4.	Uncertainty for Frequency measure	$0.42 \times 10^{-6}$
5.	Uncertainty for conducted power measure	0.112

### **3. POWER LINE CONDUCTED EMISSION TEST**

According to Paragraph (f) of FCC Part 15C , Tests to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

## 4. RADIATED EMISSION TEST

### 4.1. Test Equipment

The following test equipments are used during the radiated emission test:

#### 4.1.1. For Anechoic Chamber

Frequency rang: 30~1000MHz

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Spectrum	HP	85422E	3625A00181	May 11, 07	1 Year
2.	Test Receiver	Rohde & Schwarz	ESVS20	830350/005	May 11, 07	1 Year
3.	Amplifier	HP	8447D	2944A07794	Mar.12, 07	1/2 Year
4.	Bilog Antenna	Schaffner	CBL6111C	2598	Feb.22, 07	1 Year
5.	RF Cable	MIYAZAKI	5D-2W	3# Chamber No.1	Jul. 16, 07	1/2 Year
6.	RF Cable	MIYAZAKI	5D-2W	3# Chamber No.2	Jul. 16, 07	1/2 Year
7.	RF Cable	FUJIKURAw	RG-55/U	3# Chamber No.3	Jul. 16, 07	1/2 Year
8.	RF Cable	FUJIKURA	RG-55/U	3# Chamber No.4	Jul. 16, 07	1/2 Year
9.	Coaxial Switch	Anritsu	MP59B	M73989	Jul. 16, 07	1/2 Year

Frequency rang: above 1000MHz

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	E4407B	MY41440292	May 11, 07	1 Year
2.	Amp	HP	8449B	3008A00863	May 11, 07	1 Year
3.	Antenna	EMCO	3115	9607-4877	Jan. 23, 07	1.5 Year
4.	HF Cable	Hubersuhne	Sucoflex104	-	May 11, 07	1 Year

### 4.2. Block Diagram of Test Setup

#### 4.2.1. Block diagram of connection between the EUT and simulators

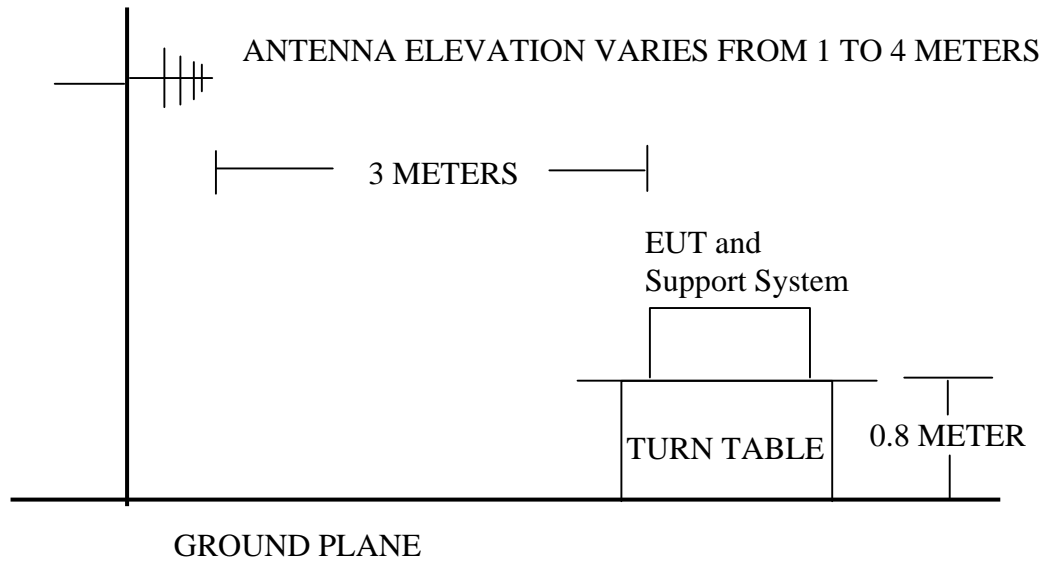


*(EUT: Classroom response sytem)*



4.2.2.In Anechoic Chamber

ANTENNA TOWER



4.3.Radiated Emission Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

- Remark :
- (1) Emission level  $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V}/\text{m}$
  - (2) The smaller limit shall apply at the cross point between two frequency bands.
  - (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

4.4.EUT Configuration on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.4.1.Classroom response system (EUT)

Model Number : 03-00098-20  
 Serial Number : N/A  
 Manufacturer : Qingdao Haier Intelligent Electronics Co., Ltd.

## 4.5. Operating Condition of EUT

4.5.1. Setup the EUT as shown in Section 4.2..

4.5.2. Let the EUT work in test mode (TX&RX) and test it.

## 4.6. Test Procedure

EUT and its simulators are placed on a turn table, which is 0.8 meter high above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it work normally, we use a keyboard test soft ware, let EUT working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position

The bandwidth of the EMI test receiver (R&S ESVS20) is set at 120kHz.

frequency range from 30MHz to 1000 MHz.

The bandwidth of the VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW 10Hz VBW for average emission above 1GHz

The frequency range from 30MHz to 10<sup>th</sup> harmonic are checked.

The test modes (TX&RX Mode) is tested in Anechoic Chamber and all the scanning waveforms are reported with antenna in horizontal and vertical polarization on Section 4.7.

## 4.7. Radiated Emission Test Results

**PASS.**

The frequency range from 30MHz to 1000MHz and above 1GHz. is investigated. Please see the following pages.

All measurements for radiated emissions within the restricted bands were performed using a Quasi-Peak detector with 120kHz RBW below 1GHz and a Peak and Average detector with 1MHz RBW above 1GHz,

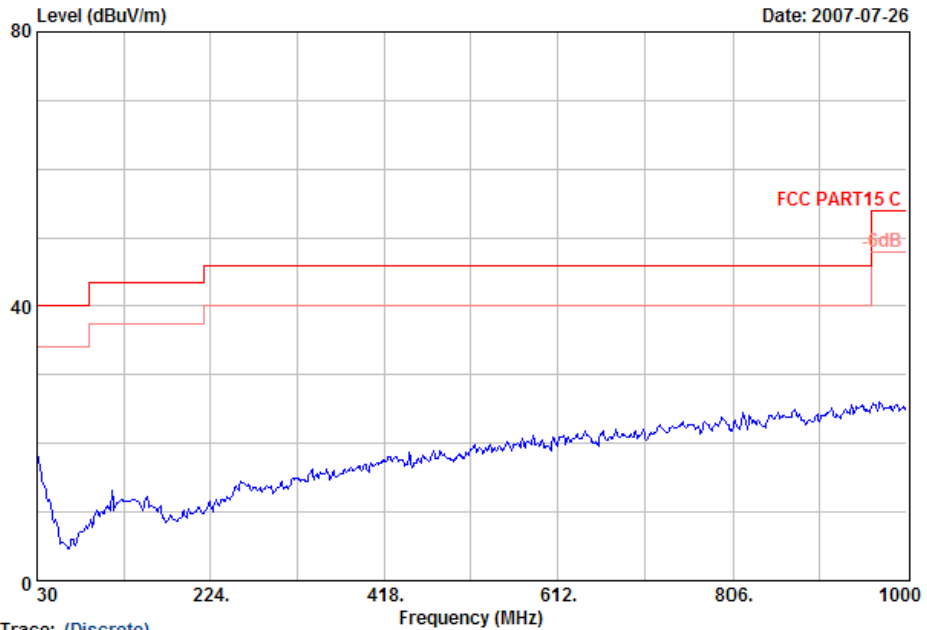
All measurements for radiated emissions within the restricted bands were performed using a Quasi-Peak detector with 300kHz VBW below 1GHz and a Peak detector with 1MHz VBW above 1GHz, A average detector with 10Hz VBW above 1GHz

All the emissions except fundamental from 18GHz~24GHz are at least 20dB below the limit, and do not record. All the emissions from 18GHz~24GHz are peak measurement and meets average limit.



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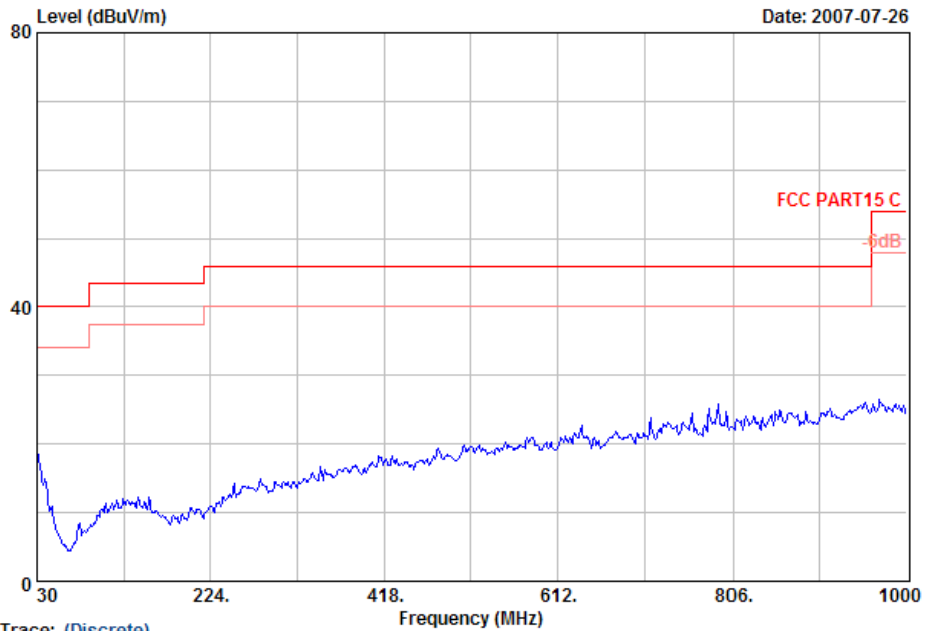
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Trace: (Discrete)

Site no. : 3# Chamber Radiation Data no. : 2  
 Dis. / Ant. : 3m 2598 Ant. pol. : HORIZONTAL  
 Limit : FCC PART15 C  
 Env. / Ins. : 24°C/56% ESVS20 Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx Mode X Position  
 M/N : 03-00098-20

Data: 1 File: F:\ACS7Q936.EMI (19)



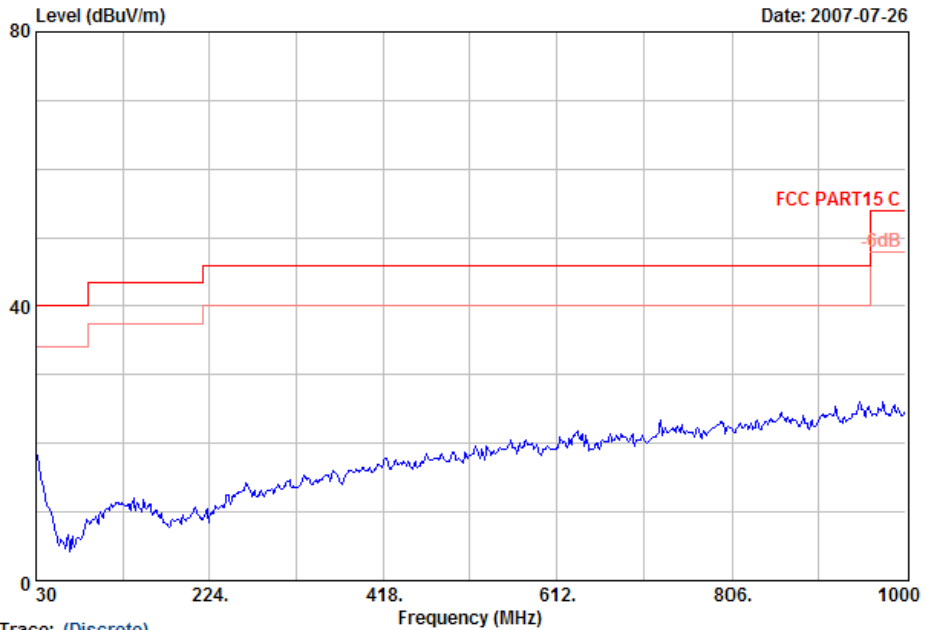
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Site no. : 3# Chamber Radiation Data no. : 1  
 Dis. / Ant. : 3m 2598 Ant. pol. : VERTICAL  
 Limit : FCC PART15 C  
 Env. / Ins. : 24°C/56% ESVS20 Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx Mode X Position  
 M/N : 03-00098-20



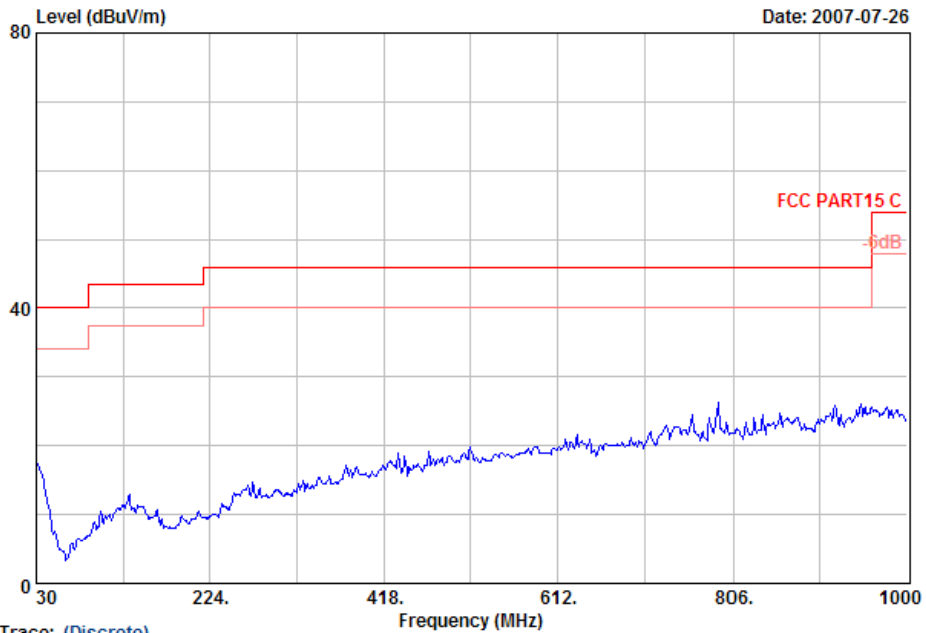
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Data: 3 File: F:\ACS7Q936.EMI (19)



Trace: (Discrete)  
 Site no. : 3# Chamber Radiation Data no. : 3  
 Dis. / Ant. : 3m 2598 Ant. pol. : HORIZONTAL  
 Limit : FCC PART15 C  
 Env. / Ins. : 24°C/56% ESVS20 Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx Mode Y Position  
 M/N : 03-00098-20

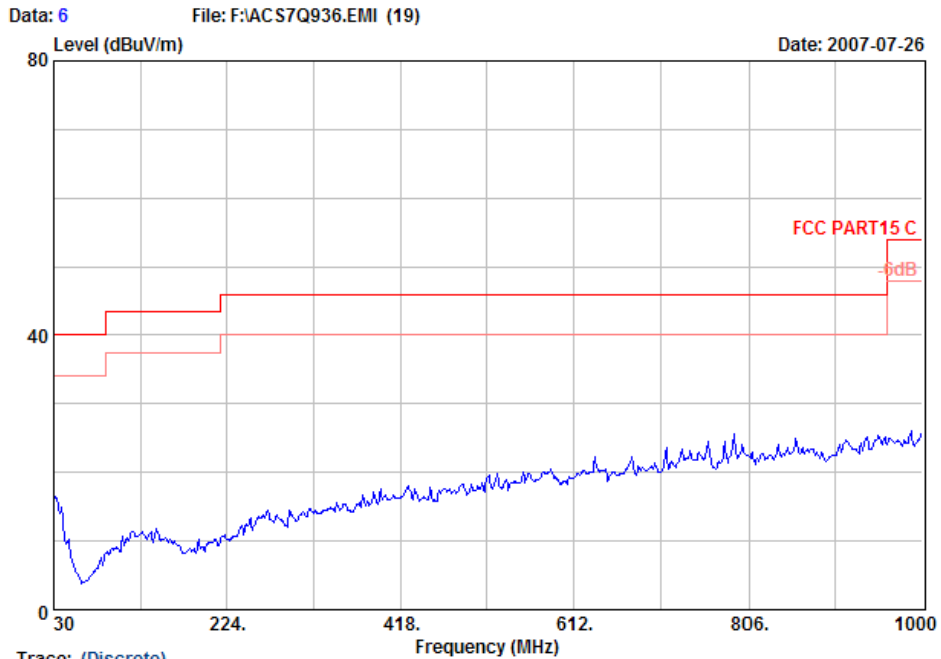
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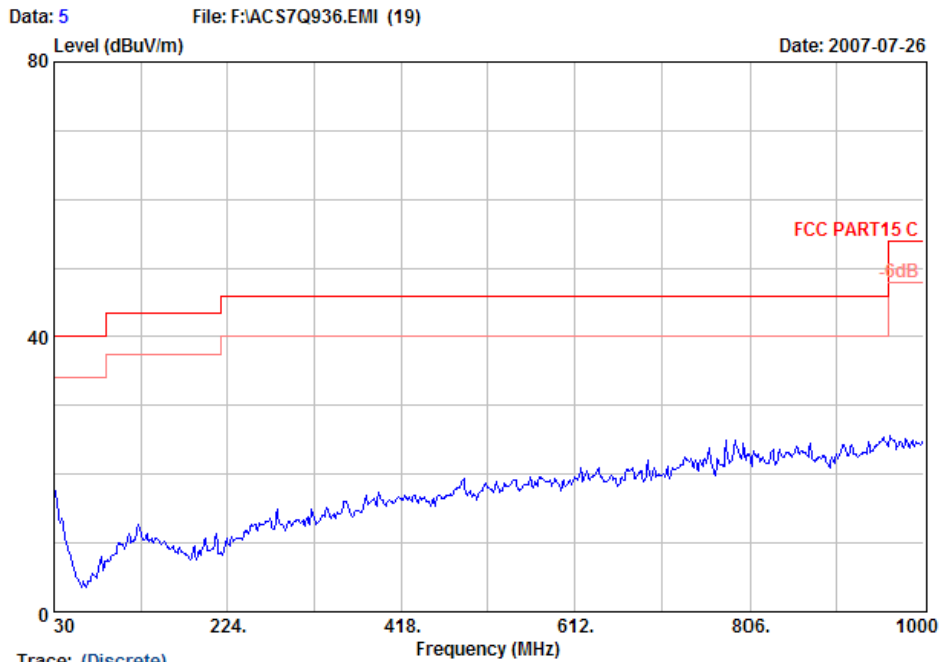
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 Site no. : 3# Chamber Radiation Data no. : 4  
 Dis. / Ant. : 3m 2598 Ant. pol. : VERTICAL  
 Limit : FCC PART15 C  
 Env. / Ins. : 24°C/56% ESVS20 Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx Mode Y Position  
 M/N : 03-00098-20



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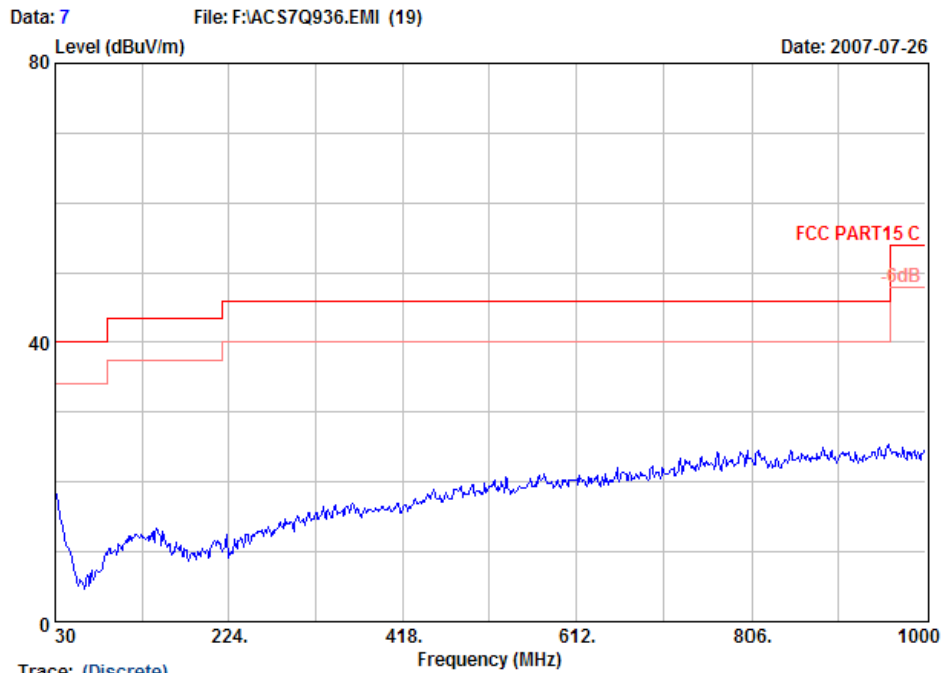
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 Site no. : 3# Chamber Radiation Data no. : 6  
 Dis. / Ant. : 3m 2598 Ant. pol. : HORIZONTAL  
 Limit : FCC PART15 C  
 Env. / Ins. : 24\*C/56% ESVS20 Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx Mode Z Position  
 M/N : 03-00098-20



Trace: (Discrete)  
 Site no. : 3# Chamber Radiation Data no. : 5  
 Dis. / Ant. : 3m 2598 Ant. pol. : VERTICAL  
 Limit : FCC PART15 C  
 Env. / Ins. : 24\*C/56% ESVS20 Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx Mode Z Position  
 M/N : 03-00098-20

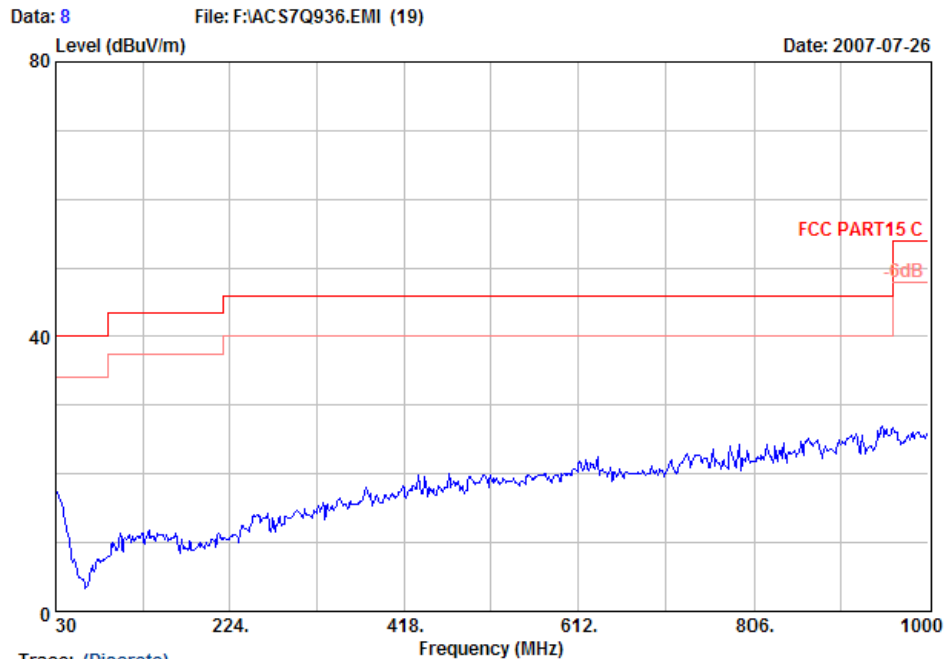


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Trace: (Discrete)

Site no. : 3# Chamber Radiation	Data no. : 7
Dis. / Ant. : 3m 2598	Ant. pol. : HORIZONTAL
Limit : FCC PART15 C	
Env. / Ins. : 24*C/56% ESVS20	Engineer : Jamy
EUT : Classroom response sytem	
Power Rating : Battery 3V	
Test Mode : Rx Mode	
M/N : 03-00098-20	



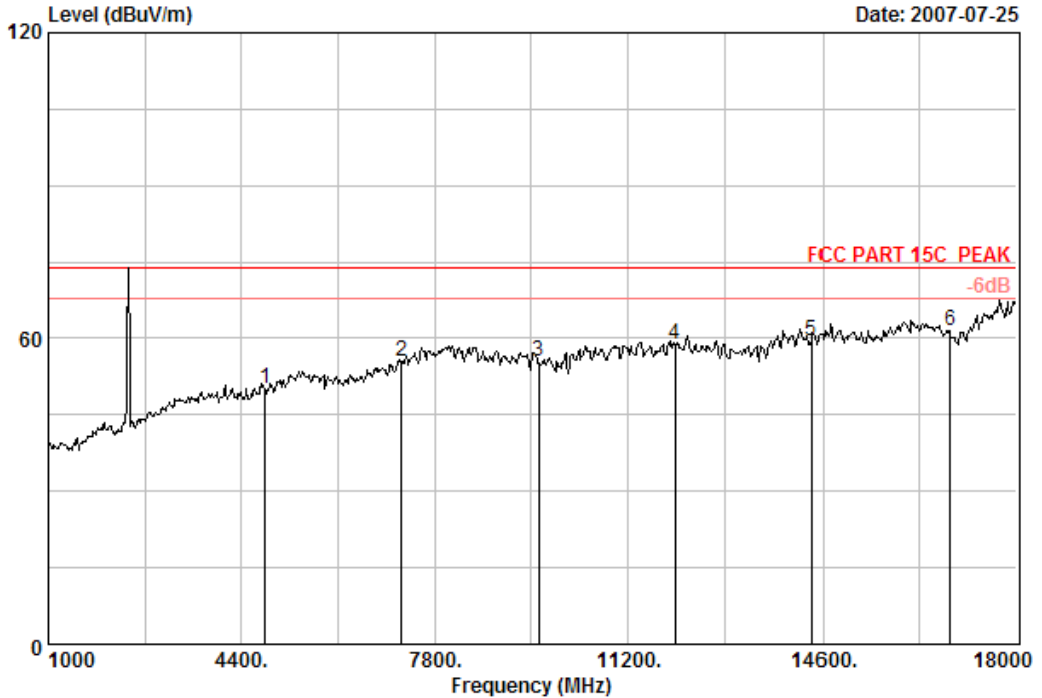
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Site no. : 3# Chamber Radiation	Data no. : 8
Dis. / Ant. : 3m 2598	Ant. pol. : VERTICAL
Limit : FCC PART15 C	
Env. / Ins. : 24*C/56% ESVS20	Engineer : Jamy
EUT : Classroom response sytem	
Power Rating : Battery 3V	
Test Mode : Rx Mode	
M/N : 03-00098-20	



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Data: 3 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 3  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH1  
 M/N : 03-00098-20

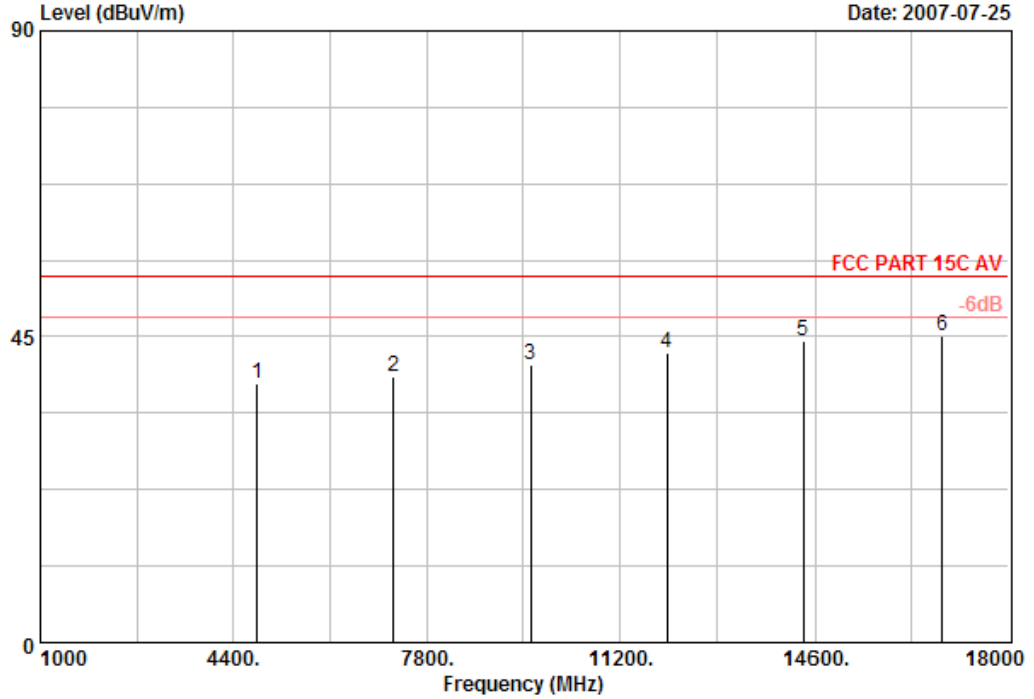
	Ant. Factor	Cable Loss	Amp Factor	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	
1 4810.00	33.98	9.00	34.50	41.54	50.02	74.00	23.98	Peak
2 7215.00	37.36	10.91	34.44	41.55	55.38	74.00	18.62	Peak
3 9620.00	38.13	11.86	35.90	41.34	55.43	74.00	18.57	Peak
4 12025.00	39.55	13.57	36.39	42.22	58.95	74.00	15.05	Peak
5 14430.00	42.24	13.96	35.49	38.80	59.51	74.00	14.49	Peak
6 16835.00	39.68	15.54	34.82	41.11	61.51	74.00	12.49	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 4 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 4  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH1  
 M/N : 03-00098-20

	Freq. (MHz)	Ant. Cable Amp			Emission				
		Factor (dB/m)	Loss (dB)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4810.00	33.98	9.00	34.50	29.74	38.22	54.00	15.78	Average
2	7215.00	37.36	10.91	34.44	25.22	39.05	54.00	14.95	Average
3	9620.00	38.13	11.86	35.90	26.88	40.97	54.00	13.03	Average
4	12025.00	39.55	13.57	36.39	25.88	42.61	54.00	11.39	Average
5	14430.00	42.24	13.96	35.49	23.56	44.27	54.00	9.73	Average
6	16835.00	39.68	15.54	34.82	24.78	45.18	54.00	8.82	Average

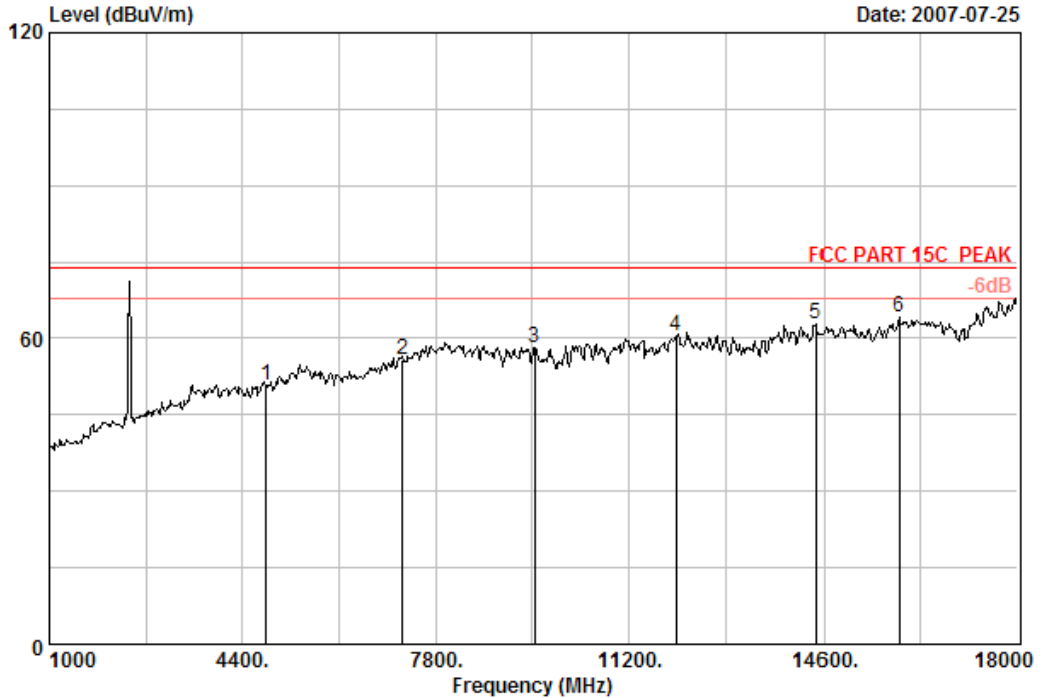
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.





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Site no. : Audix No.1 Chamber Data no. : 1  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH1  
 M/N : 03-00098-20

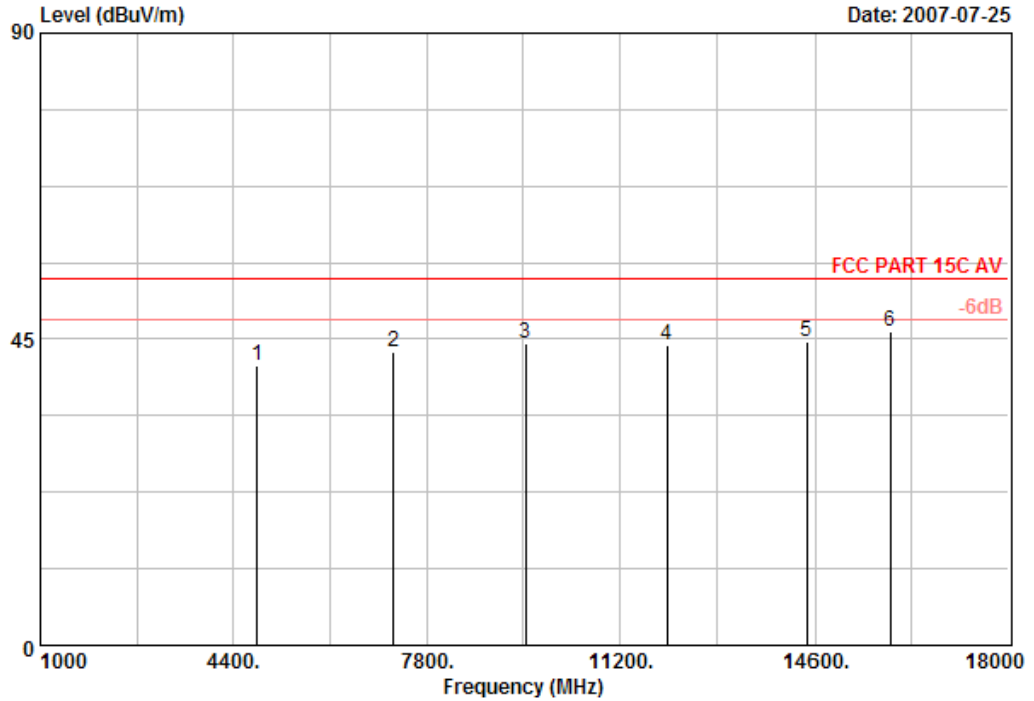
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission			Remark
						Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	
1	4810.00	33.98	9.00	34.50	42.45	50.93	74.00	23.07	Peak
2	7215.00	37.36	10.91	34.44	41.85	55.68	74.00	18.32	Peak
3	9534.00	38.20	11.89	35.82	43.78	58.05	74.00	15.95	Peak
4	12025.00	39.55	13.57	36.39	43.80	60.53	74.00	13.47	Peak
5	14481.00	42.29	13.85	35.46	42.24	62.92	74.00	11.08	Peak
6	15926.00	38.94	15.40	34.74	44.54	64.14	74.00	9.86	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 2 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 2  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH1  
 M/N : 03-00098-20

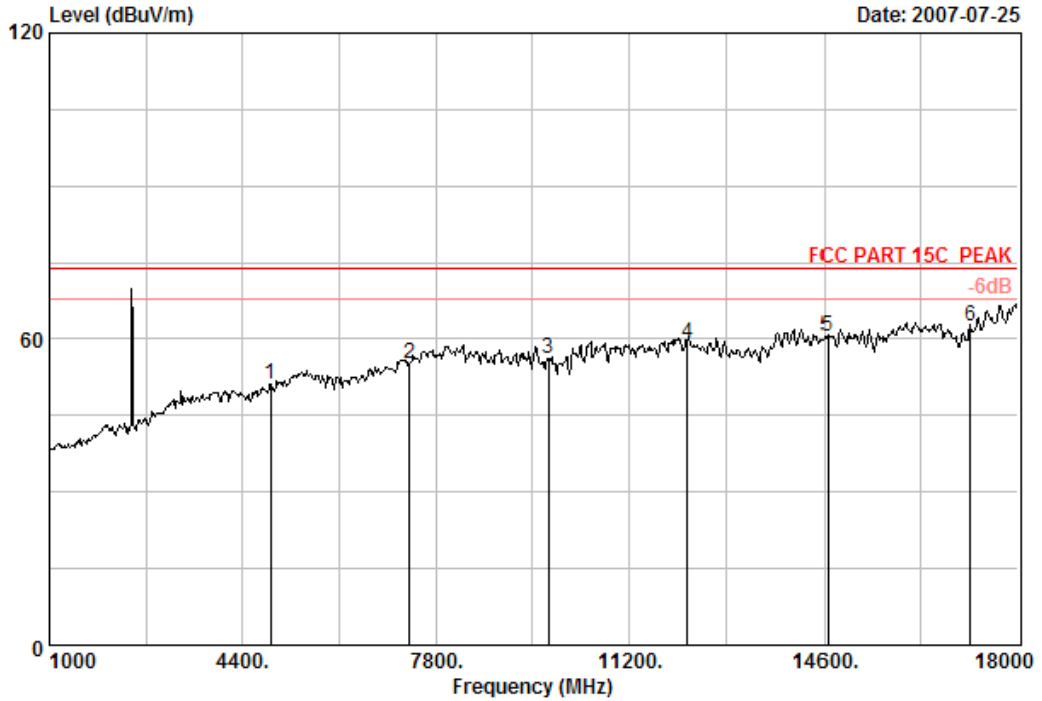
	Ant. Factor	Cable Loss	Amp Factor	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	
1 4810.00	33.98	9.00	34.50	32.75	41.23	54.00	12.77	Average
2 7215.00	37.36	10.91	34.44	29.22	43.05	54.00	10.95	Average
3 9534.00	38.20	11.89	35.82	30.00	44.27	54.00	9.73	Average
4 12025.00	39.55	13.57	36.39	27.38	44.11	54.00	9.89	Average
5 14481.00	42.29	13.85	35.46	23.97	44.65	54.00	9.35	Average
6 15926.00	38.94	15.40	34.74	26.57	46.17	54.00	7.83	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Postcode:518057

Data: 5 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 5  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH9  
 M/N : 03-00098-20

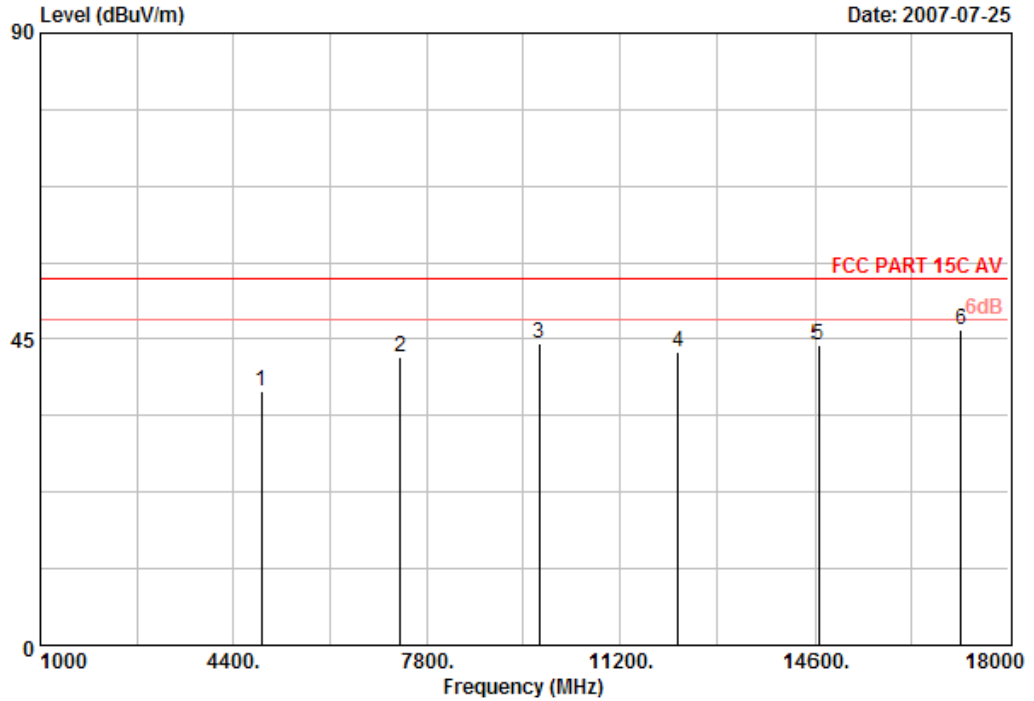
	Ant. Factor	Cable Loss	Amp Factor	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	
1	34.20	9.17	34.48	42.33	51.22	74.00	22.78	Peak
2	37.55	11.07	34.47	41.09	55.24	74.00	18.76	Peak
3	38.01	11.88	36.02	42.35	56.22	74.00	17.78	Peak
4	39.47	13.77	36.32	42.41	59.33	74.00	14.67	Peak
5	41.78	14.18	35.36	39.86	60.46	74.00	13.54	Peak
6	41.11	15.73	34.88	40.38	62.34	74.00	11.66	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 6 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 6  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH9  
 M/N : 03-00098-20

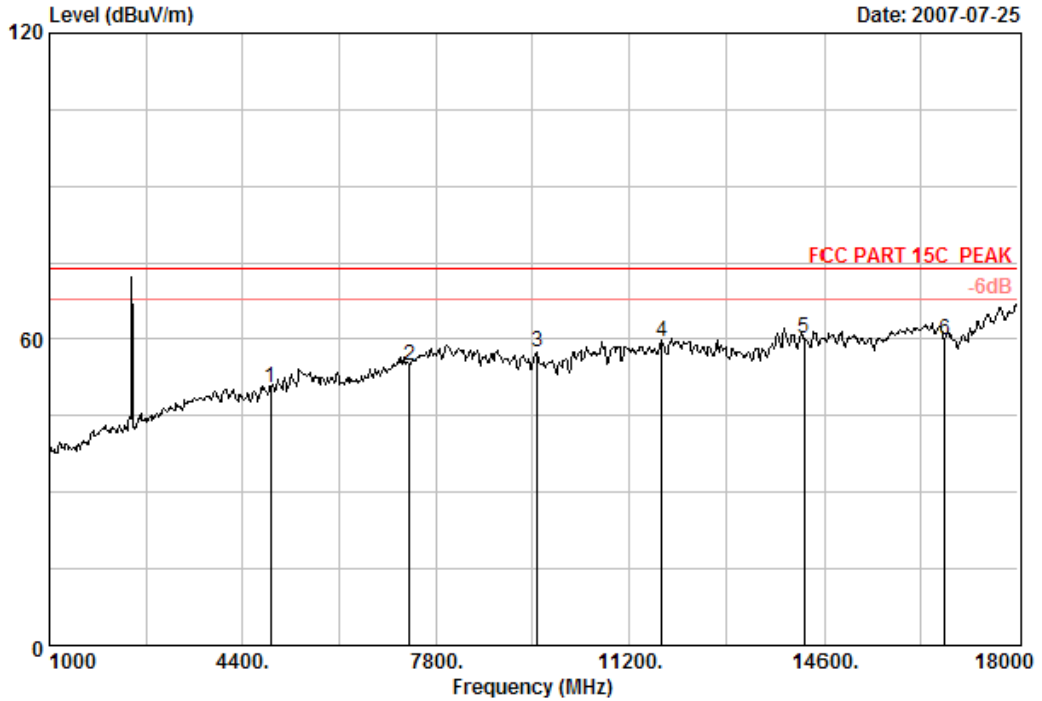
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission			Remark
						Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	
1	4890.00	34.20	9.17	34.48	28.34	37.23	54.00	16.77	Average
2	7335.00	37.55	11.07	34.47	28.19	42.34	54.00	11.66	Average
3	9780.00	38.01	11.88	36.02	30.52	44.39	54.00	9.61	Average
4	12225.00	39.47	13.77	36.32	26.10	43.02	54.00	10.98	Average
5	14670.00	41.78	14.18	35.36	23.48	44.08	54.00	9.92	Average
6	17167.00	41.11	15.73	34.88	24.30	46.26	54.00	7.74	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 7 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 7  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH9  
 M/N : 03-00098-20

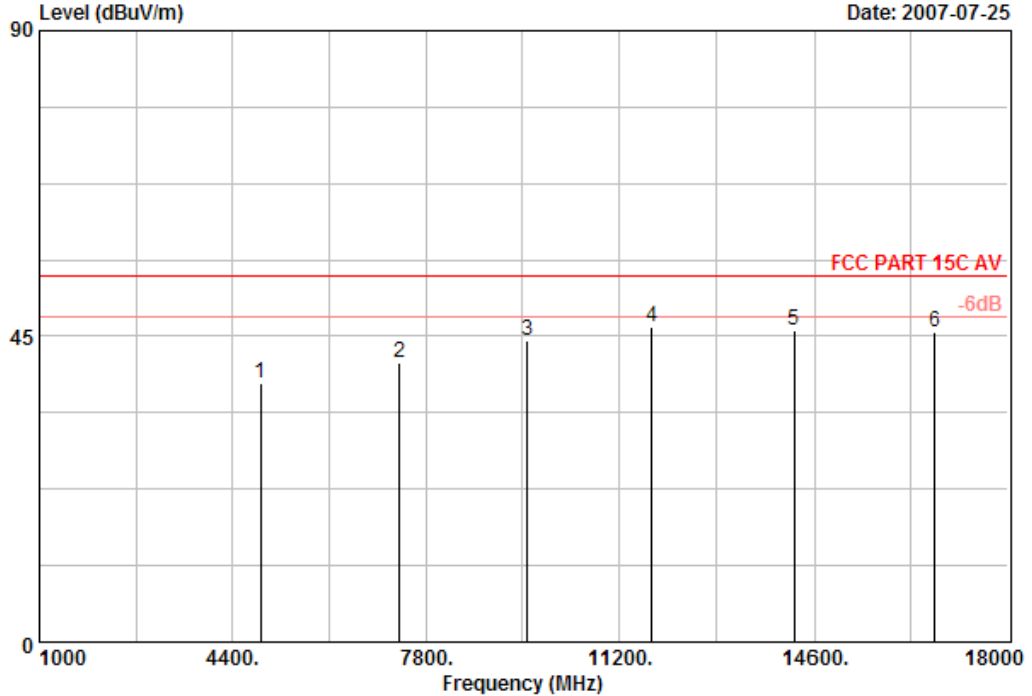
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4890.00	34.20	9.17	34.48	41.71	50.60	74.00	23.40	Peak
2	7335.00	37.55	11.07	34.47	40.77	54.92	74.00	19.08	Peak
3	9580.00	38.16	11.87	35.86	43.27	57.44	74.00	16.56	Peak
4	11778.00	39.30	13.63	36.38	42.94	59.49	74.00	14.51	Peak
5	14270.00	42.12	14.27	35.56	39.21	60.04	74.00	13.96	Peak
6	16715.00	39.66	15.69	34.81	39.42	59.96	74.00	14.04	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 8 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 8  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH9  
 M/N : 03-00098-20

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4890.00	34.20	9.17	34.48	29.34	38.23	54.00	15.77	Average
2	7335.00	37.55	11.07	34.47	26.89	41.04	54.00	12.96	Average
3	9580.00	38.16	11.87	35.86	30.17	44.34	54.00	9.66	Average
4	11778.00	39.30	13.63	36.38	29.93	46.48	54.00	7.52	Average
5	14270.00	42.12	14.27	35.56	25.06	45.89	54.00	8.11	Average
6	16715.00	39.66	15.69	34.81	25.03	45.57	54.00	8.43	Average

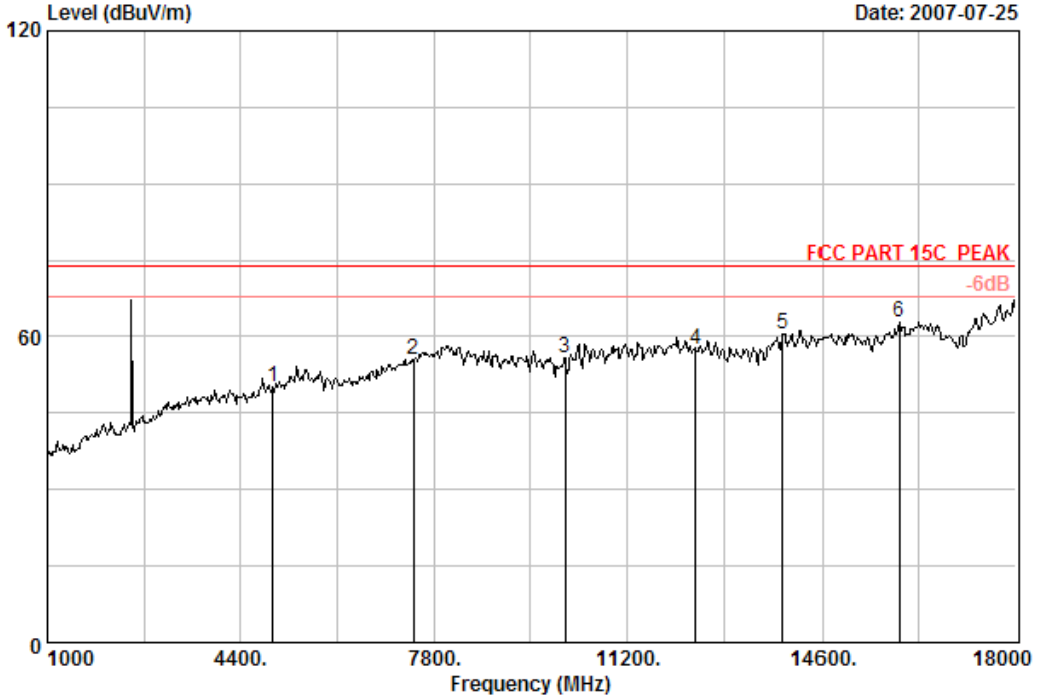
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 11 File: D:\2007 Report\haier\ACS7Q936.EMI (48)

Date: 2007-07-25



Site no. : Audix No.1 Chamber Data no. : 11  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH16  
 M/N : 03-00098-20

	Ant. Factor	Cable Loss	Amp Factor	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	
1 4960.00	34.38	9.34	34.46	40.75	50.01	74.00	23.99	Peak
2 7440.00	37.72	11.38	34.49	40.88	55.49	74.00	18.51	Peak
3 10112.00	38.13	12.45	36.21	41.56	55.93	74.00	18.07	Peak
4 12400.00	39.38	13.94	36.26	40.40	57.46	74.00	16.54	Peak
5 13937.00	41.82	14.62	35.73	39.94	60.65	74.00	13.35	Peak
6 15960.00	38.99	15.45	34.73	42.97	62.68	74.00	11.32	Peak

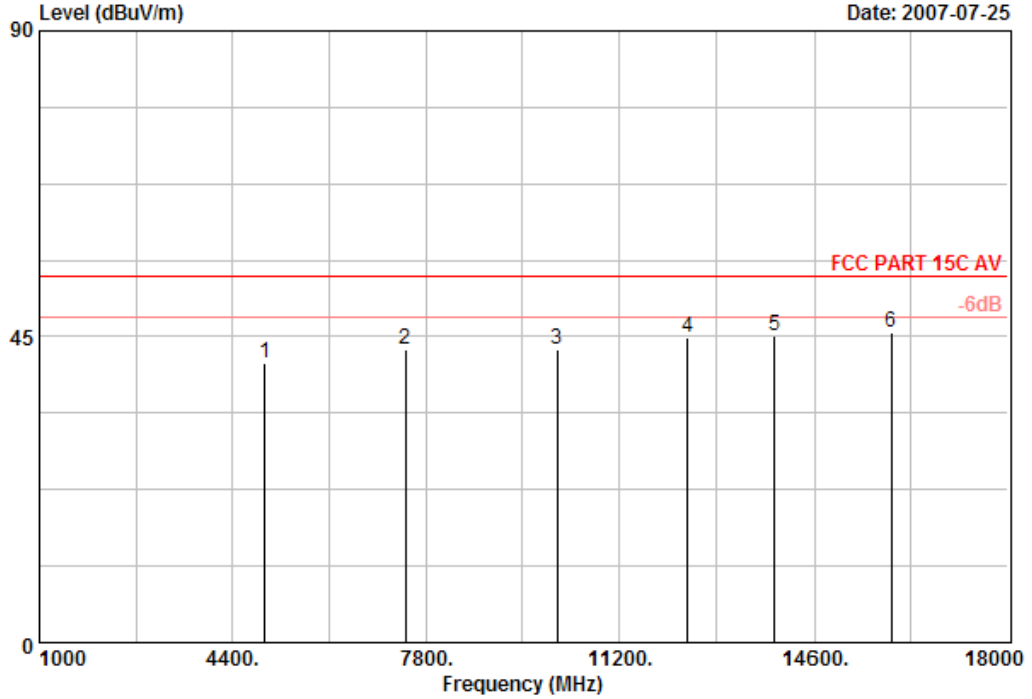
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 12 File: D:\2007 Report\haier\ACS7Q936.EMI (48)

Date: 2007-07-25



Site no. : Audix No.1 Chamber Data no. : 12  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH16  
 M/N : 03-00098-20

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4960.00	34.38	9.34	34.46	31.91	41.17	54.00	12.83	Average
2	7440.00	37.72	11.38	34.49	28.61	43.22	54.00	10.78	Average
3	10112.00	38.13	12.45	36.21	28.84	43.21	54.00	10.79	Average
4	12400.00	39.38	13.94	36.26	27.81	44.87	54.00	9.13	Average
5	13937.00	41.82	14.62	35.73	24.34	45.05	54.00	8.95	Average
6	15960.00	38.99	15.45	34.73	25.83	45.54	54.00	8.46	Average

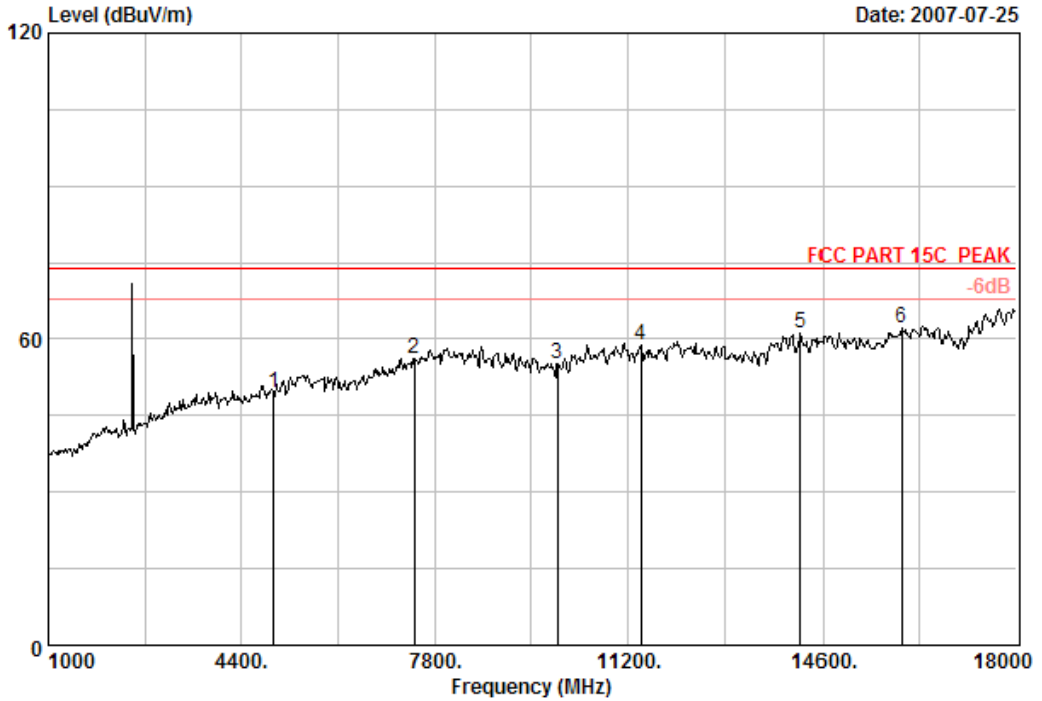
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.





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Data: 9 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 9  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH16  
 M/N : 03-00098-20

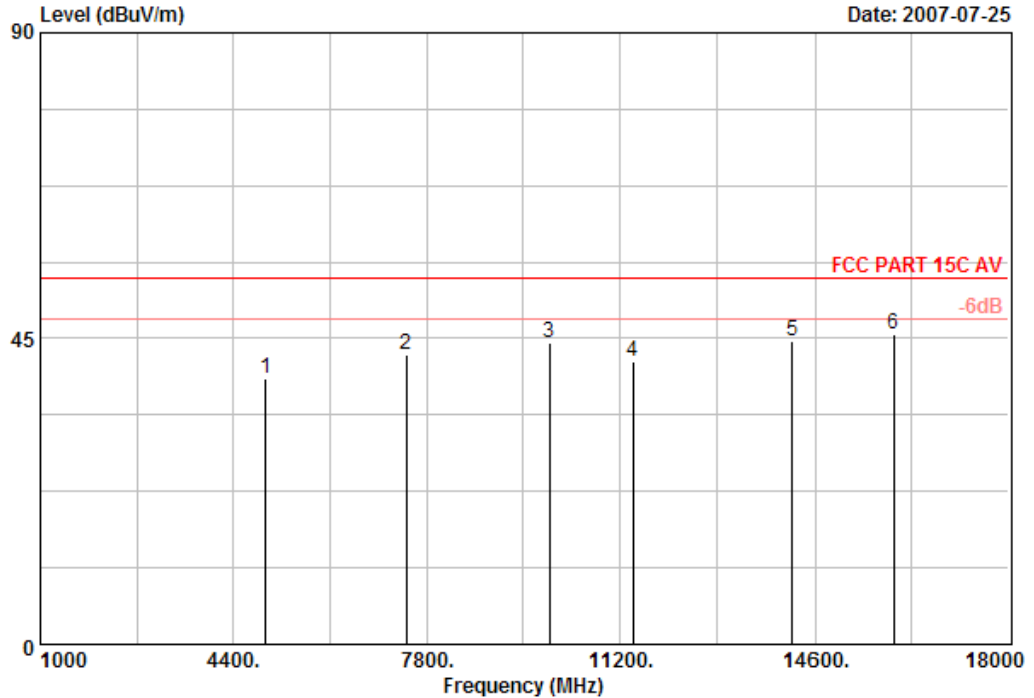
	Ant.	Cable	Amp	Emission					
Freq.	Factor	Loss	Factor	Reading	Level	Limits	Margin	Remark	
(MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)		
1	4960.00	34.38	9.34	34.46	40.22	49.48	74.00	24.52	Peak
2	7440.00	37.72	11.38	34.49	41.48	56.09	74.00	17.91	Peak
3	9959.00	37.86	12.24	36.16	41.23	55.17	74.00	18.83	Peak
4	11421.00	38.98	13.80	36.34	42.27	58.71	74.00	15.29	Peak
5	14226.00	42.08	14.35	35.59	40.27	61.11	74.00	12.89	Peak
6	15977.00	39.01	15.50	34.71	42.36	62.16	74.00	11.84	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 10 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 10  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Tx CH16  
 M/N : 03-00098-20

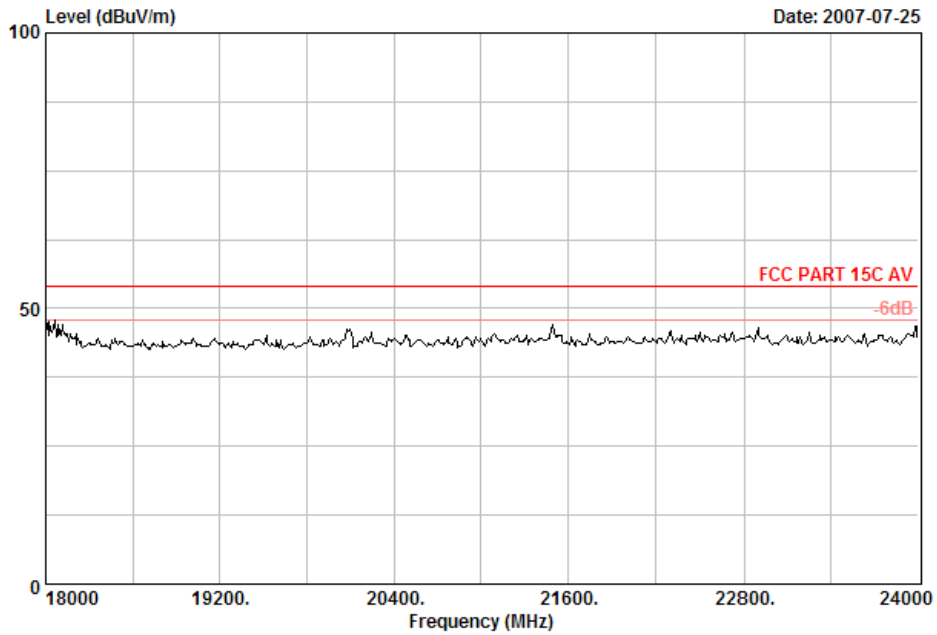
	Ant. Factor	Cable Loss	Amp Factor	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	
1 4960.00	34.38	9.34	34.46	29.91	39.17	54.00	14.83	Average
2 7440.00	37.72	11.38	34.49	28.10	42.71	54.00	11.29	Average
3 9959.00	37.86	12.24	36.16	30.35	44.29	54.00	9.71	Average
4 11421.00	38.98	13.80	36.34	25.19	41.63	54.00	12.37	Average
5 14226.00	42.08	14.35	35.59	23.67	44.51	54.00	9.49	Average
6 15977.00	39.01	15.50	34.71	25.89	45.69	54.00	8.31	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



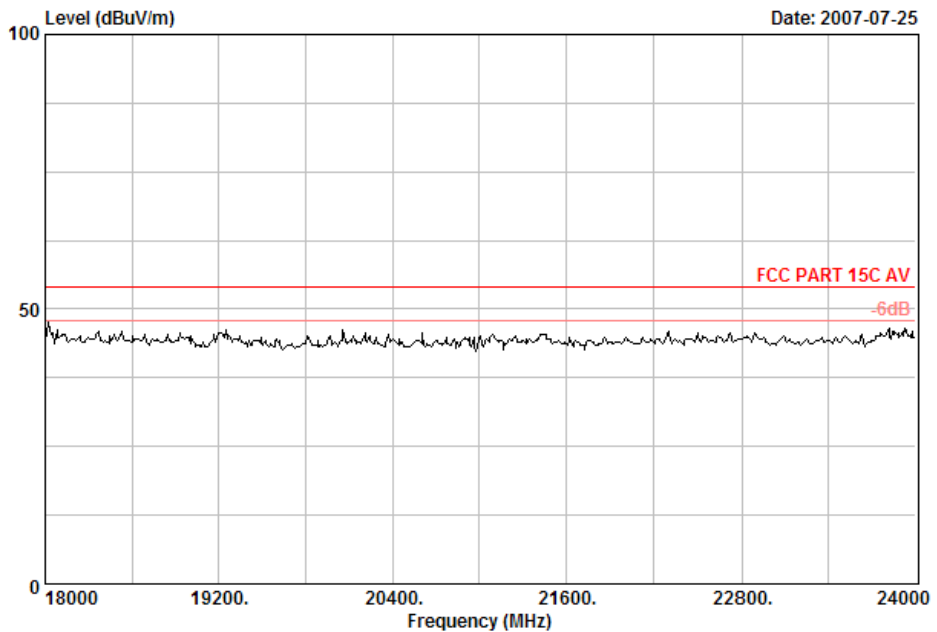
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Data: 14 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 14  
 Dis. / Ant. : 3m 3115FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx CH1  
 M/N : 03-00098-20

Data: 13 File: D:\2007 Report\haier\ACS7Q936.EMI (48)

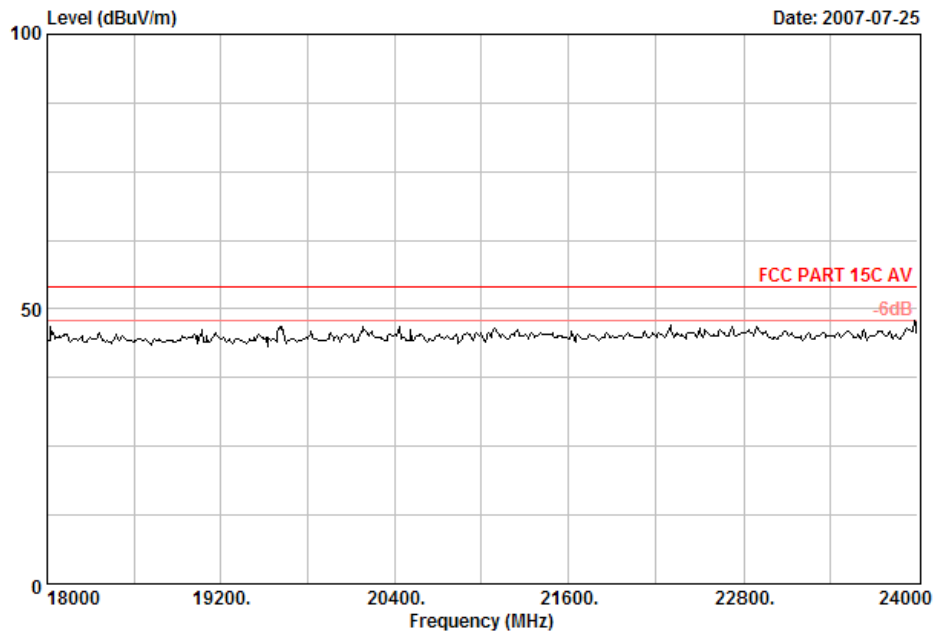


Site no. : Audix No.1 Chamber Data no. : 13  
 Dis. / Ant. : 3m 3115FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx CH1  
 M/N : 03-00098-20



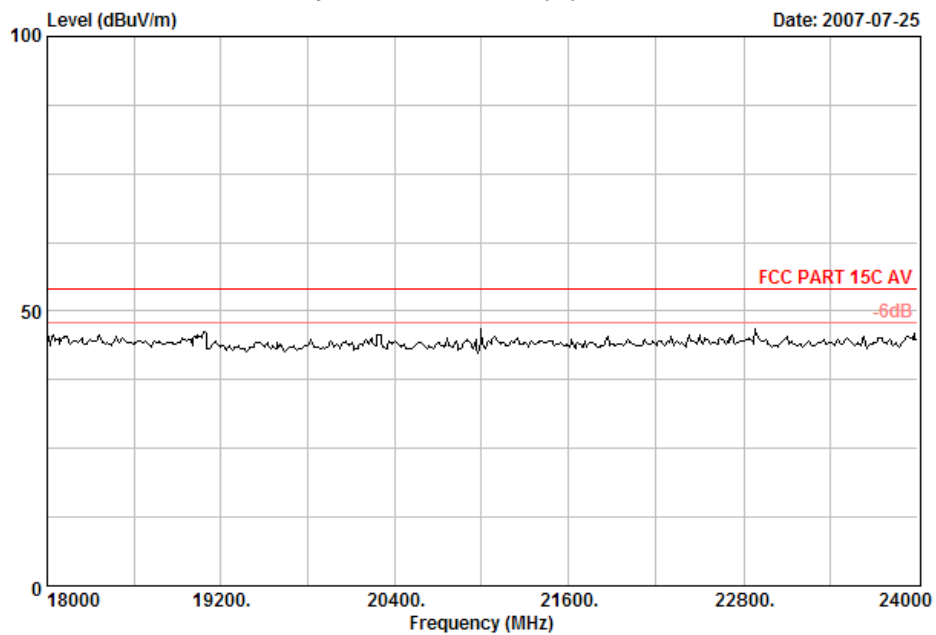
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Site no. : Audix No.1 Chamber Data no. : 16  
Dis. / Ant. : 3m 3115FACTOR Ant. pol. : HORIZONTAL  
Limit : FCC PART 15C AV  
Env. / Ins. : 23°C/54% Engineer : Jamy  
EUT : Classroom response sytem  
Power Rating : Battery 3V  
Test Mode : Tx CH9  
M/N : 03-00098-20

Data: 15 File: D:\2007 Report\haier\ACS7Q936.EMI (48)

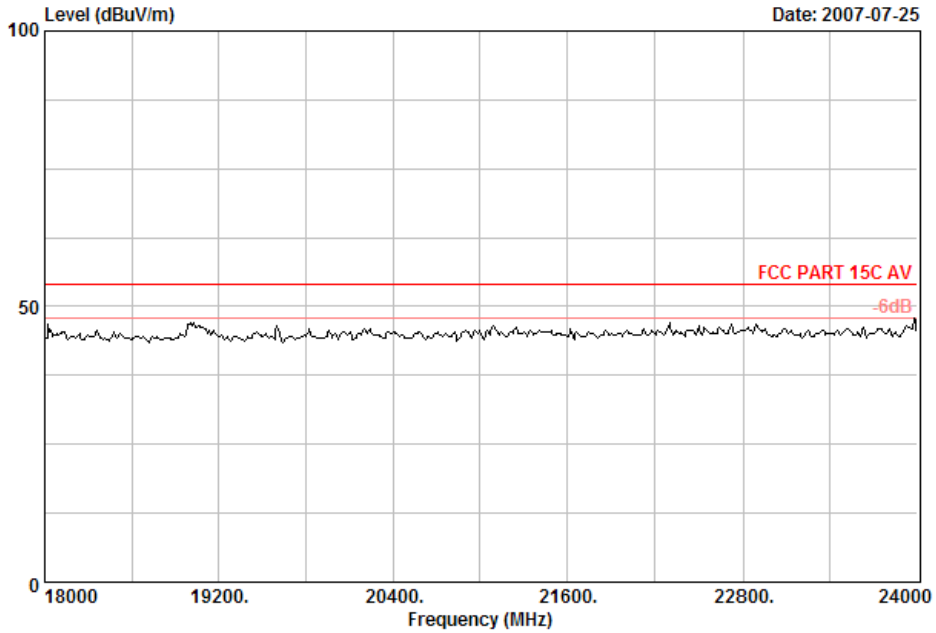


Site no. : Audix No.1 Chamber Data no. : 15  
Dis. / Ant. : 3m 3115FACTOR Ant. pol. : VERTICAL  
Limit : FCC PART 15C AV  
Env. / Ins. : 23°C/54% Engineer : Jamy  
EUT : Classroom response sytem  
Power Rating : Battery 3V  
Test Mode : Tx CH9  
M/N : 03-00098-20



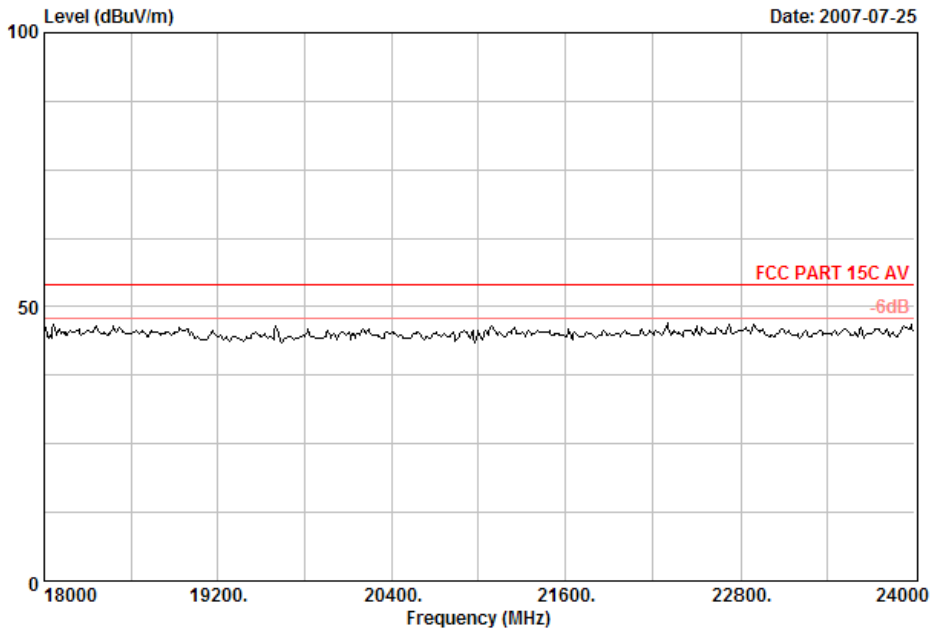
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Data: 18 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 18  
 Dis. / Ant. : 3m 3115FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx CH16  
 M/N : 03-00098-20

Data: 17 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



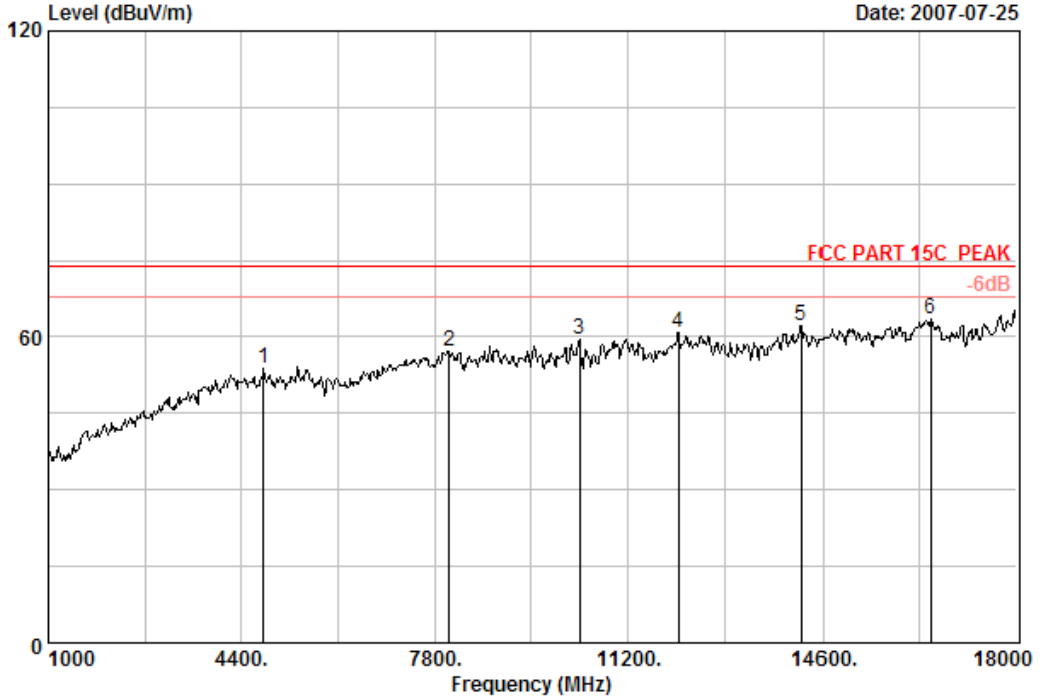
Site no. : Audix No.1 Chamber Data no. : 17  
 Dis. / Ant. : 3m 3115FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Tx CH16  
 M/N : 03-00098-20



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Date: 2007-07-25



Site no. : Audix No.1 Chamber Data no. : 43  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Rx Mode  
 M/N : 03-00098-20

	Ant.	Cable	Amp	Emission					
Freq.	Factor	Loss	Factor	Reading	Level	Limits	Margin	Remark	
(MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)		
1	4791.00	33.93	8.96	34.50	45.40	53.79	74.00	20.21	Peak
2	8055.00	38.06	12.71	34.64	40.96	57.09	74.00	16.91	Peak
3	10350.00	38.72	12.72	36.24	44.24	59.44	74.00	14.56	Peak
4	12084.00	39.53	13.62	36.37	44.18	60.96	74.00	13.04	Peak
5	14243.00	42.09	14.31	35.58	41.22	62.04	74.00	11.96	Peak
6	16487.00	39.61	15.91	34.77	42.63	63.38	74.00	10.62	Peak

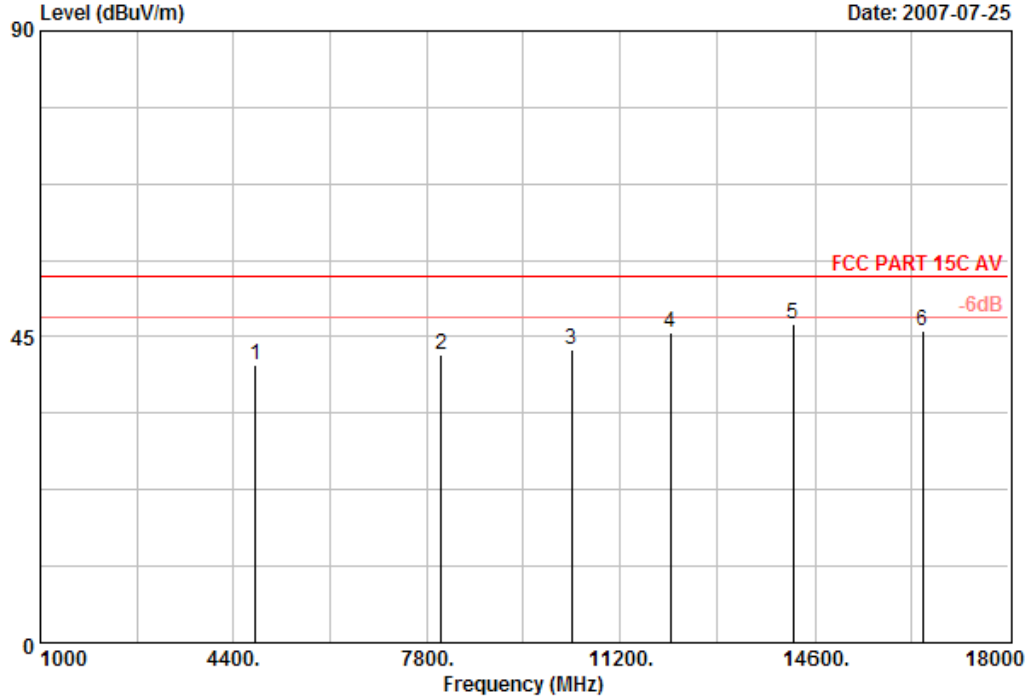
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Date: 2007-07-25



Site no. : Audix No.1 Chamber Data no. : 44  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Rx Mode  
 M/N : 03-00098-20

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4791.00	33.93	8.96	34.50	32.38	40.77	54.00	13.23	Average
2	8055.00	38.06	12.71	34.64	26.33	42.46	54.00	11.54	Average
3	10350.00	38.72	12.72	36.24	27.85	43.05	54.00	10.95	Average
4	12084.00	39.53	13.62	36.37	28.74	45.52	54.00	8.48	Average
5	14243.00	42.09	14.31	35.58	26.01	46.83	54.00	7.17	Average
6	16487.00	39.61	15.91	34.77	25.04	45.79	54.00	8.21	Average

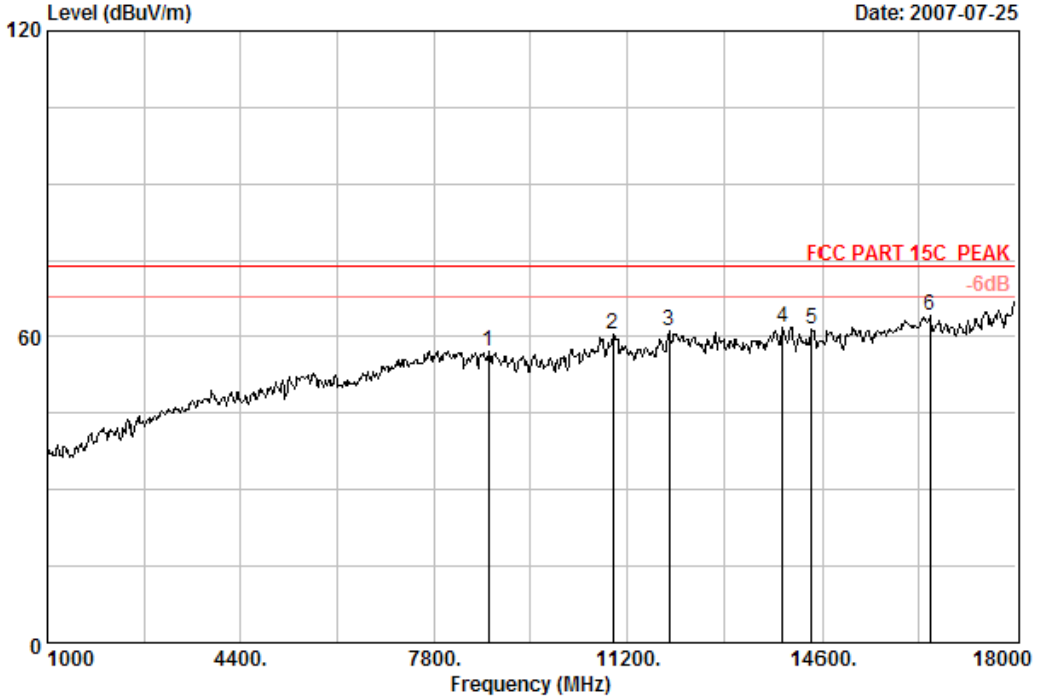
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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 Postcode:518057

Data: 45 File: D:\2007 Report\haier\ACS7Q936.EMI (48)

Date: 2007-07-25



Site no. : Audix No.1 Chamber Data no. : 45  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C PEAK  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Rx Mode  
 M/N : 03-00098-20

	Ant. Factor	Cable Loss	Amp Factor	Reading	Emission Level	Limits	Margin	Remark
Freq. (MHz)	(dB/m)	(dB)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	
1 8752.00	38.67	11.03	35.20	42.59	57.09	74.00	16.91	Peak
2 10945.00	39.01	13.92	36.30	43.76	60.39	74.00	13.61	Peak
3 11931.00	39.49	13.56	36.39	44.40	61.06	74.00	12.94	Peak
4 13937.00	41.82	14.62	35.73	41.11	61.82	74.00	12.18	Peak
5 14447.00	42.26	13.92	35.48	40.75	61.45	74.00	12.55	Peak
6 16487.00	39.61	15.91	34.77	43.44	64.19	74.00	9.81	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

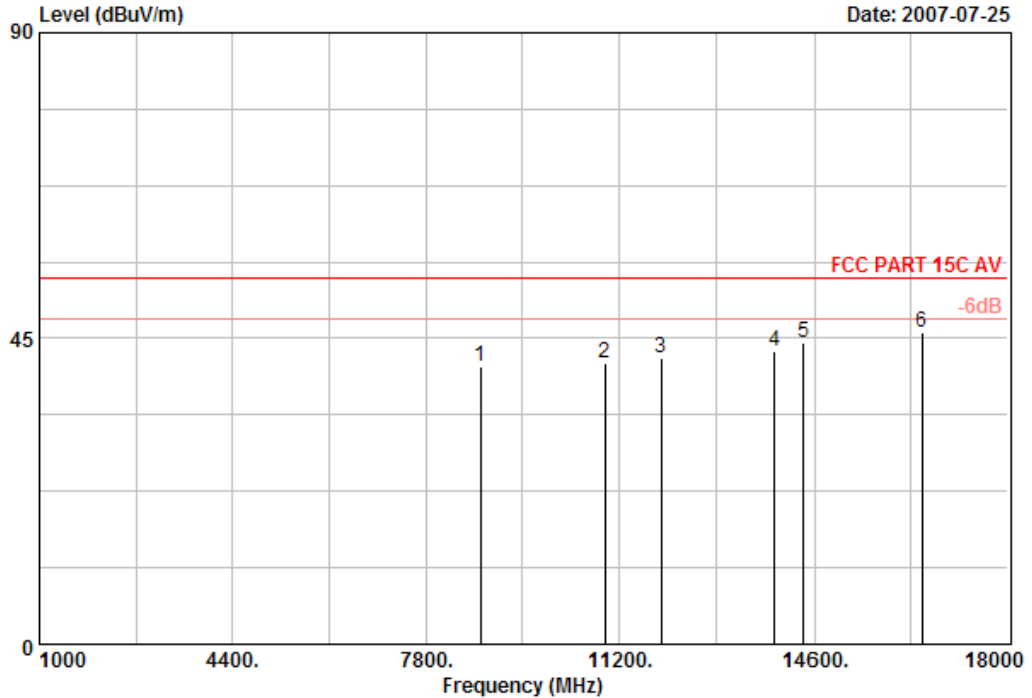




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Data: 46 File: D:\2007 Report\haier\ACS7Q936.EMI (48)

Date: 2007-07-25



Site no. : Audix No.1 Chamber Data no. : 46  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response system  
 Power Rating : Battery 3V  
 Test Mode : Rx Mode  
 M/N : 03-00098-20

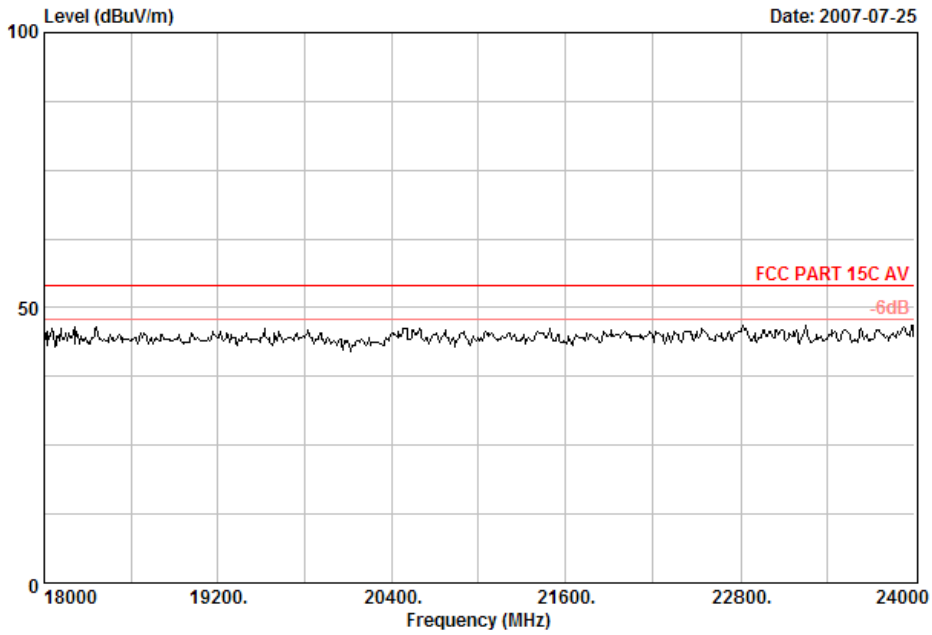
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	8752.00	38.67	11.03	35.20	26.47	40.97	54.00	13.03	Average
2	10945.00	39.01	13.92	36.30	24.77	41.40	54.00	12.60	Average
3	11931.00	39.49	13.56	36.39	25.43	42.09	54.00	11.91	Average
4	13937.00	41.82	14.62	35.73	22.33	43.04	54.00	10.96	Average
5	14447.00	42.26	13.92	35.48	23.62	44.32	54.00	9.68	Average
6	16487.00	39.61	15.91	34.77	25.04	45.79	54.00	8.21	Average

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



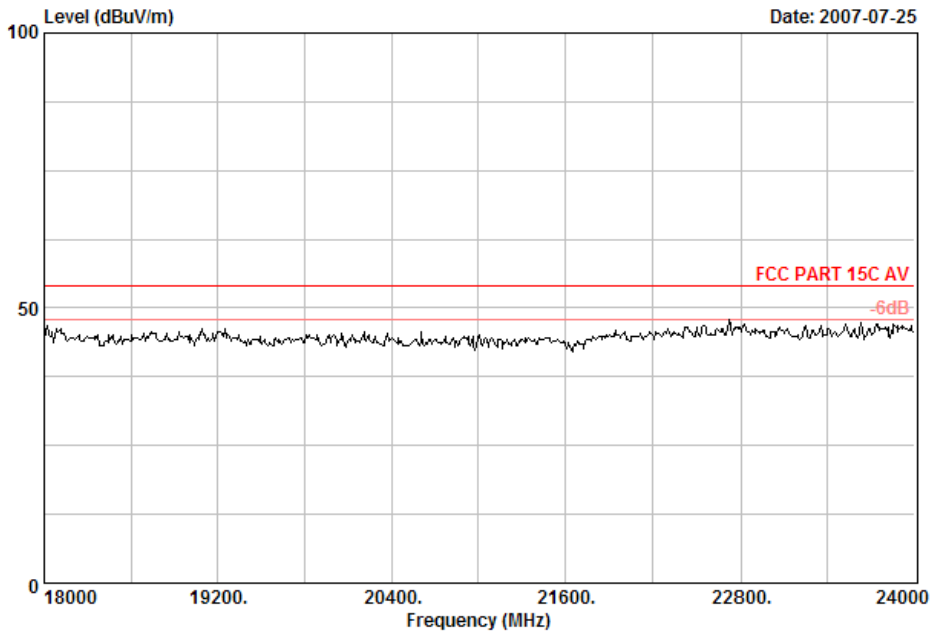
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Data: 48 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 48  
 Dis. / Ant. : 3m 3115FACTOR Ant. pol. : HORIZONTAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Rx Mode  
 M/N : 03-00098-20

Data: 47 File: D:\2007 Report\haier\ACS7Q936.EMI (48)



Site no. : Audix No.1 Chamber Data no. : 47  
 Dis. / Ant. : 3m 3115FACTOR Ant. pol. : VERTICAL  
 Limit : FCC PART 15C AV  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem  
 Power Rating : Battery 3V  
 Test Mode : Rx Mode  
 M/N : 03-00098-20

## 5. 6DB BANDWIDTH TEST

### 5.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	E4407B	MY41440292	May 15, 06	1 Year
2.	Amp	HP	8449B	3008A00863	May 15, 06	1 Year
3.	Antenna	EMCO	3115	9607-4877	Jan. 23, 07	1.5 Year
4.	HF Cable	Hubersuhne	Sucoflex104	-	May 15, 06	1 Year

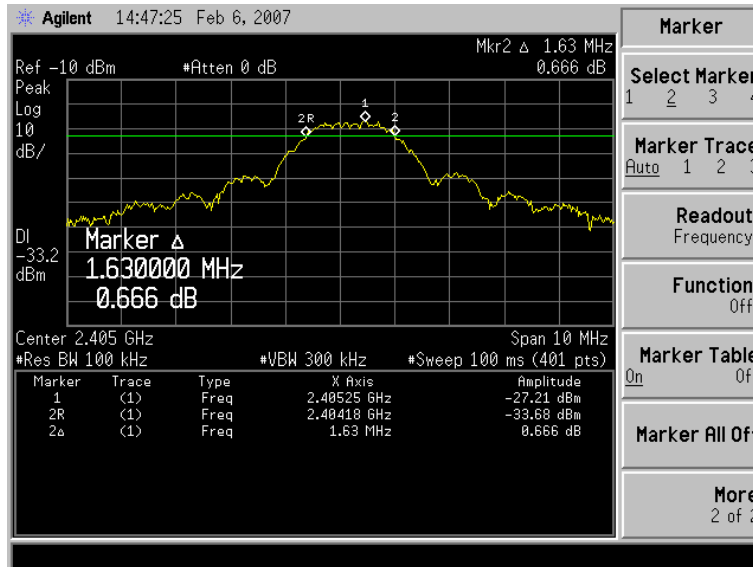
### 5.2. Test Information

EUT:	Classroom response sytem
M/N:	03-00098-20
Test Date:	Feb.06, 2007
Ambient Temperature:	24°C
Relative Humidity:	54%
Test standard:	FCC PART 15C: 15.247
Test mode:	Transmitting
Test Frequency:	CH1: 2405MHz CH9: 2445MHz CH16: 2480MHz
Test By:	Jamy

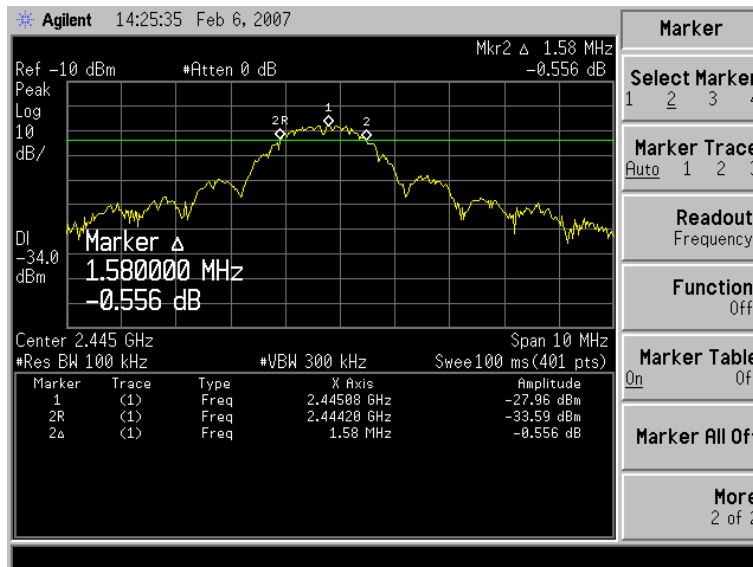
### 5.3. Test Results

CH	6dB Bandwidth (MHz)	Limit	Conclusion
1	1.63	>500	PASS
9	1.58	>500	PASS
16	1.65	>500	PASS

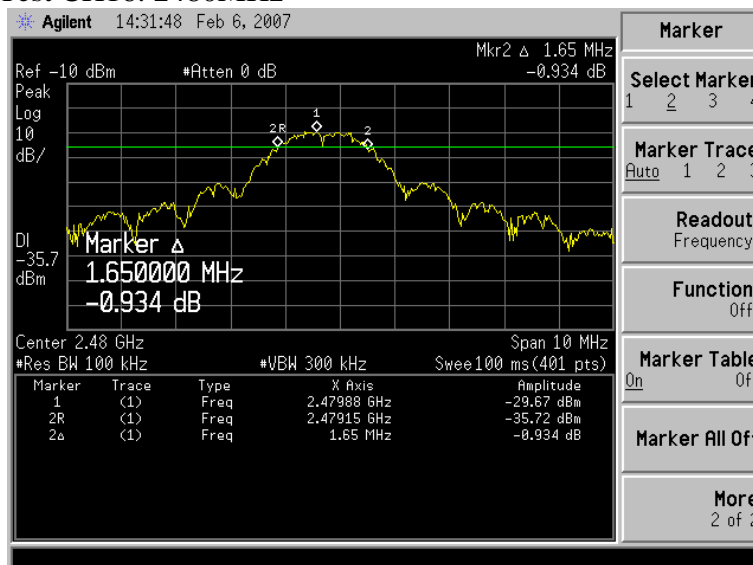
Test CH1: 2405MHz



Test CH9: 2445MHz



Test CH16: 2480MHz



## 6. OUTPUT POWER TEST

### 6.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	E4407B	MY41440292	May 15, 06	1 Year
2.	Amp	HP	8449B	3008A00863	May 15, 06	1 Year
3.	Antenna	EMCO	3115	9607-4877	Jan. 23, 07	1.5 Year
4.	HF Cable	Hubersuhne	Sucoflex104	-	May 15, 06	1 Year

### 6.2. Test Information

EUT:	Classroom response sytem
M/N:	03-00098-20
Test Date:	Feb.06, 2007
Ambient Temperature:	24°C
Relative Humidity:	54%
Test standard:	FCC PART 15C: 15.247
Test mode:	Transmitting
Test Frequency:	CH1: 2405MHz CH9: 2445MHz CH16: 2480MHz
Test By:	Jamy

### 6.3. Test Procedure

Measure the transmitter output power (dBμV/m) at 3m with spectrum analyzer using 2MHz RBW and 3MHz VBW

This test was performed with EUT in X, Y, Z position and with antenna on vertical and horizontal polarization, record the worse cases for final output power calculate

### 6.4. Test Results

CH	Field Strength at a distance of 3 meters (FS) (dBμV/m)	Output power (OP) (dBm)	Limit (dBm)	Conclusion
1	83.13	-15.11	30	PASS
9	78.70	-19.54	30	PASS
16	78.84	-19.40	30	PASS

Note: The following formula may be used to convert field strength (FS) in volts/m to transmitter output power (OP) in watts:

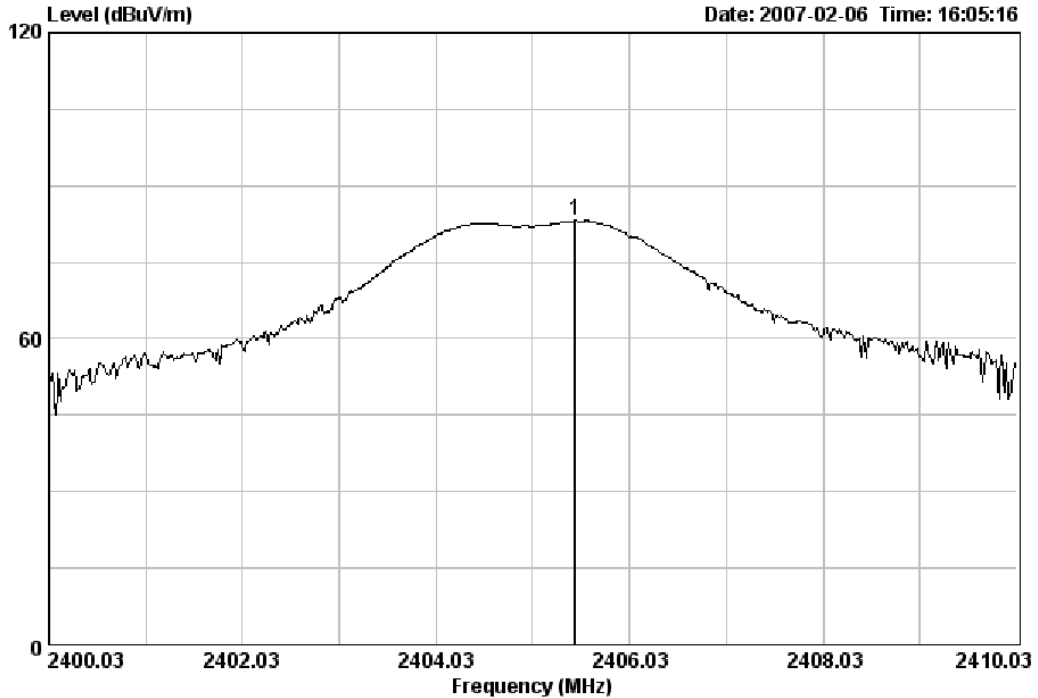
$$OP = (FS * D)^2 / 30 * G$$

D is the distance in meters between the two antennas and G is the antenna numerical gain.



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Data: 8 File: D:\2007 Report\Zigbee\20.EMI (18)



Site no. : Audix No.1 Chamber Data no. : 8  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit :  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem M/N:03-00098-20  
 Power Rating : Battery 3V  
 Test Mode : TX Mode CH1

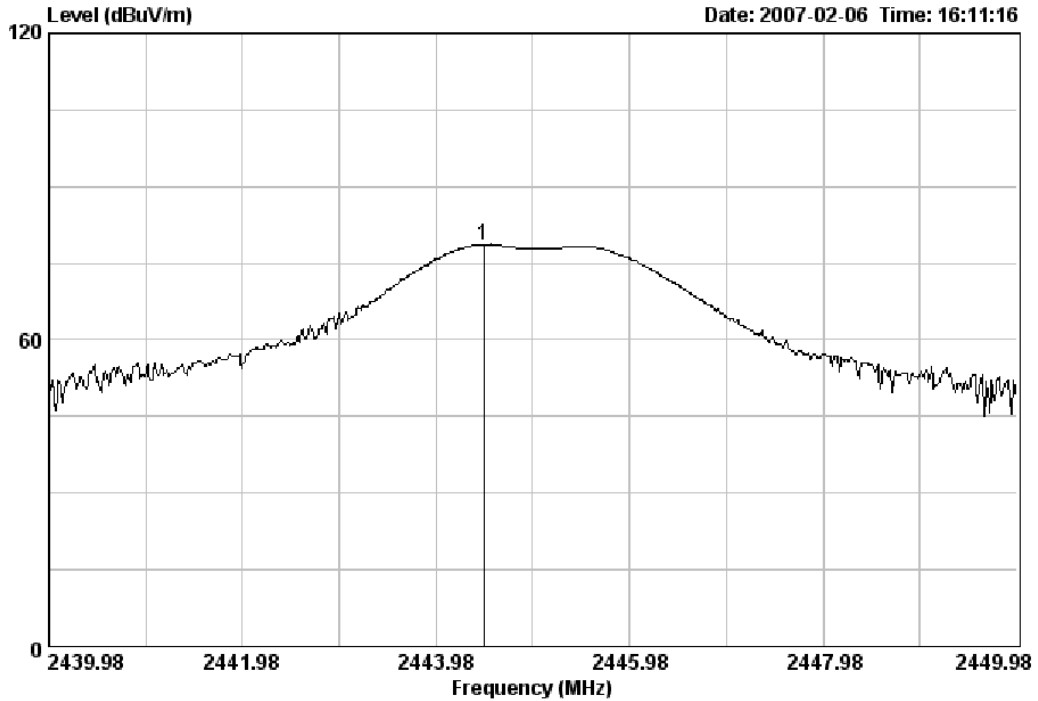
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2405.47	29.03	6.20	35.18	83.08	83.13	500.00	416.87	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 9 File: D:\2007 Report\Zigbee\20.EMI (18)



Site no. : Audix No.1 Chamber Data no. : 9  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit :  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem N/N:03-00098-20  
 Power Rating : Battery 3V  
 Test Mode : TX Mode CH9

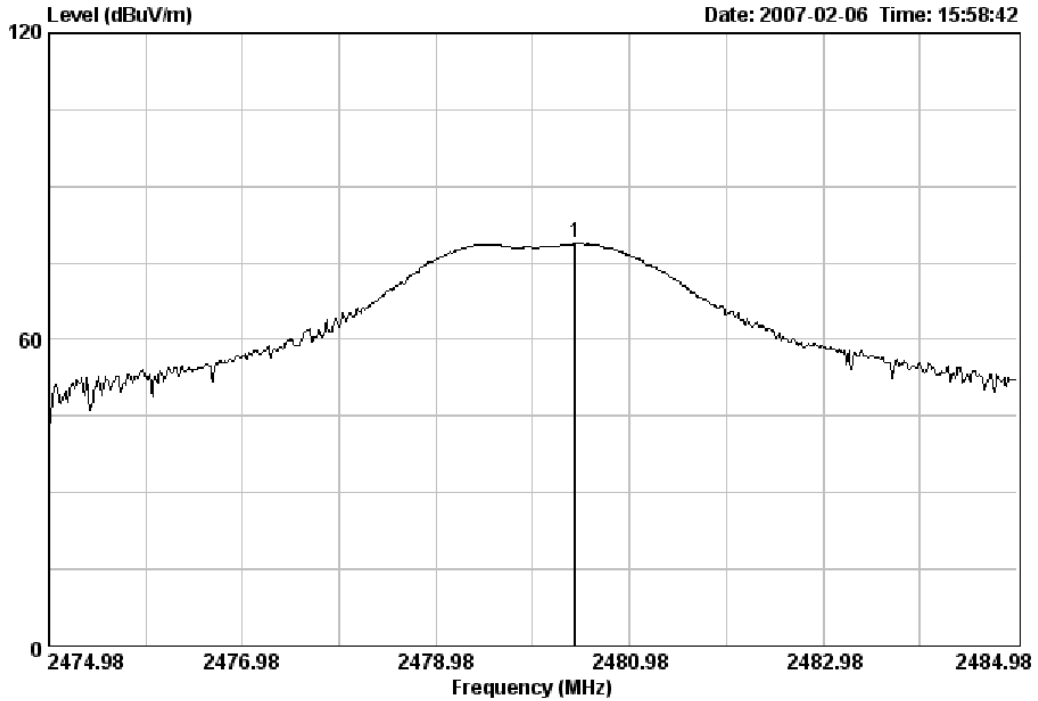
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2444.47	29.11	6.25	35.17	78.51	78.70	500.00	421.30	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 7 File: D:\2007 Report\Zigbee\20.EMI (18)



Site no. : Audix No.1 Chamber Data no. : 7  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit :  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem M/N:03-00098-20  
 Power Rating : Battery 3V  
 Test Mode : TX Mode CH16

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.42	29.19	6.30	35.16	78.51	78.84	500.00	421.16	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



## 7. BAND EDGE COMPLIANCE TEST

### 7.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	E4407B	MY41440292	May 15, 06	1 Year
2.	Amp	HP	8449B	3008A00863	May 15, 06	1 Year
3.	Antenna	EMCO	3115	9607-4877	Jan. 23, 07	1.5 Year
4.	HF Cable	Hubersuhne	Sucoflex104	-	May 15, 06	1 Year

### 7.2. Test Information

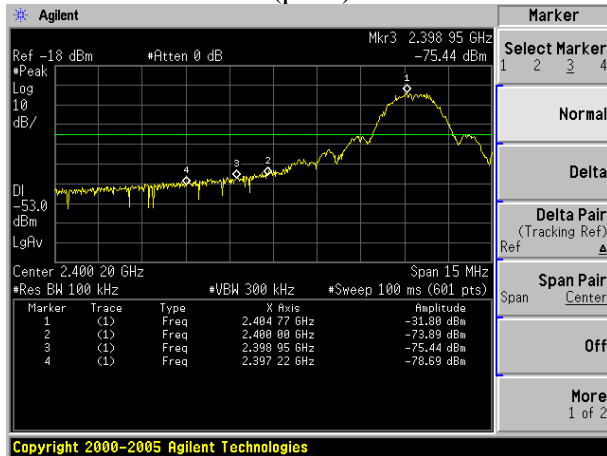
EUT:	Classroom response sytem
M/N:	03-00098-20
Test Date:	Feb.06, 2007
Ambient Temperature:	24°C
Relative Humidity:	54%
Test standard:	FCC PART 15C: 15.247
Test mode:	Transmitting
Test Frequency:	CH1: 2405MHz CH9: 2445MHz CH16: 2480MHz
Test By:	Jamy

NOTE: This test was performed with antenna in horizontal and the maximum value would obtained in the position.

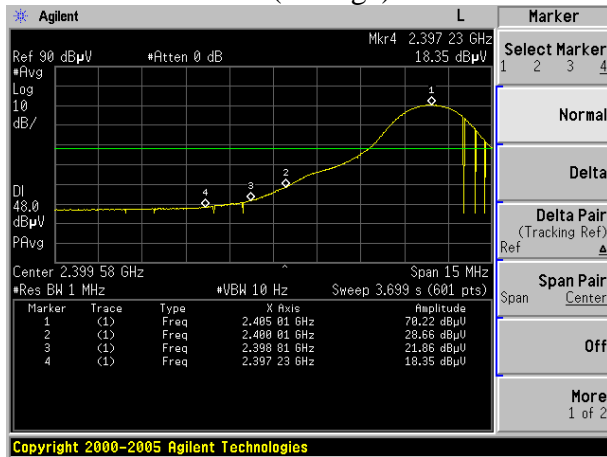
### 7.3. Test Results

Pass

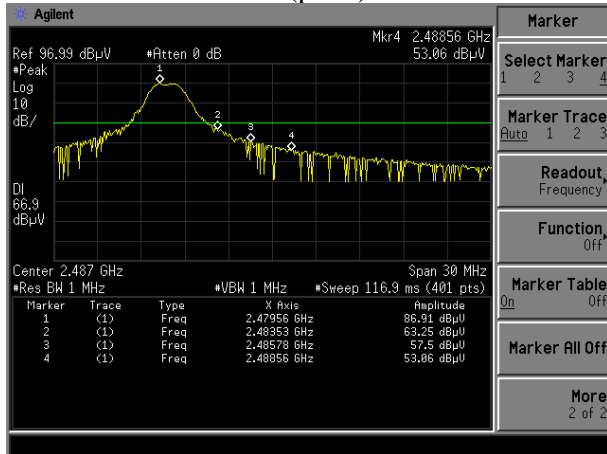
Test CH1: 2405MHz(peak)



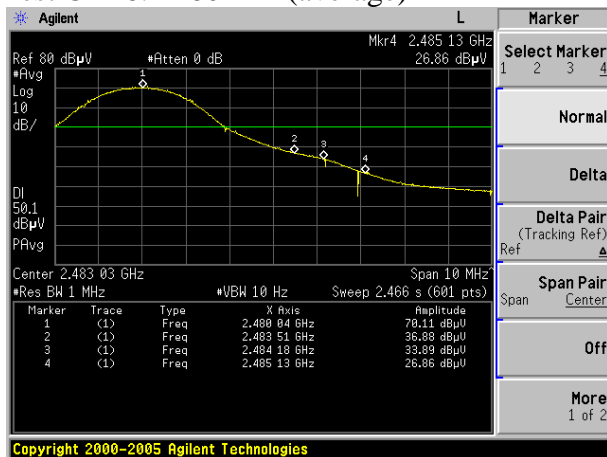
Test CH1: 2405MHz(average)



Test CH16: 2480MHz(peak)



Test CH16: 2480MHz(average)



## 8. POWER SPECTRAL DENSITY TEST

### 8.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum	Agilent	E4407B	MY41440292	May 15, 06	1 Year
2.	Amp	HP	8449B	3008A00863	May 15, 06	1 Year
3.	Antenna	EMCO	3115	9607-4877	Jan. 23, 07	1.5 Year
4.	HF Cable	Hubersuhne	Sucoflex104	-	May 15, 06	1 Year

### 8.2. Test Information

EUT:	Classroom response sytem
M/N:	03-00098-20
Test Date:	Feb.06, 2007
Ambient Temperature:	24°C
Relative Humidity:	54%
Test standard:	FCC PART 15C: 15.247
Test mode:	Transmitting
Test Frequency:	CH1: 2405MHz CH9: 2445MHz CH16: 2480MHz
Test By:	Jamy

### 8.3. Test Procedure

- (1). Measure the transmitter power spectral at a distance of 3 meters with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time= span/3kHz
- (2). Use the following formula to convert measured power spectral density (dBμV/m\*3kHz) to transmitter output power spectral density

$$PD = (MPD * D)^2 / 30 * G$$

PD is the transmitter output power spectral density. MPD is the measured power spectral density at 3m. D is the distance between the EUT antenna and test antenna, D in here is 3m. G is the antenna numerical gain.

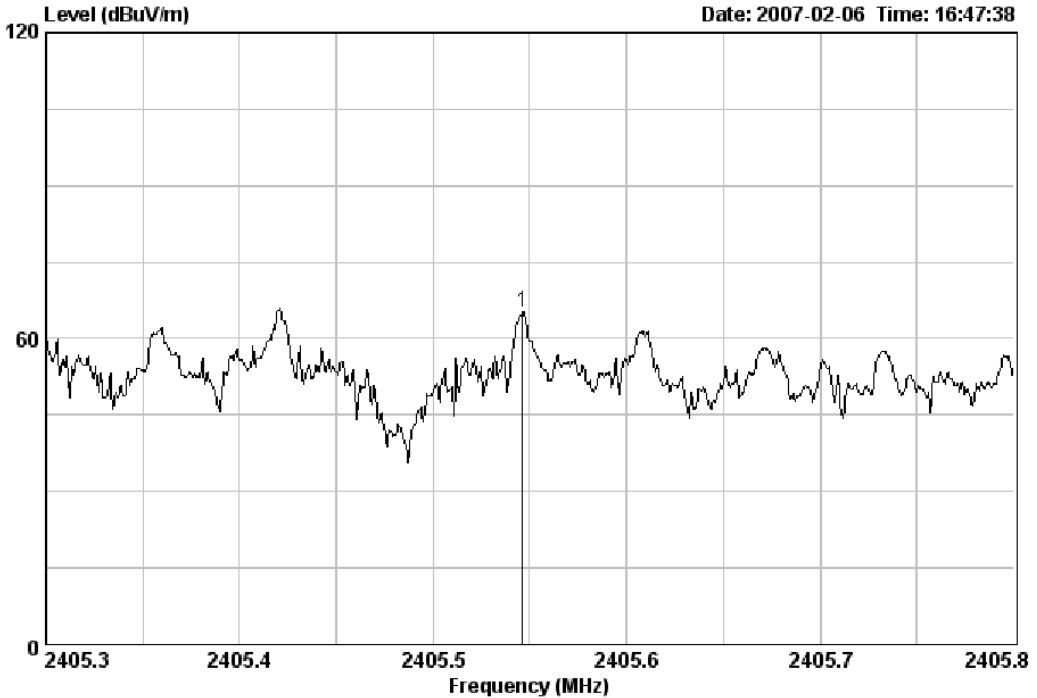
### 8.4. Test Results

CH	Measured power spectral density at 3m (dBμV/m*3kHz)	Antenna numerical gain	Power spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Conclusion
1	65.27	2	-32.97	8	PASS
9	62.01	2	-36.23	8	PASS
16	62.84	2	-35.40	8	PASS



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Data: 12 File: D:\2007 Report\Zigbee\20.EMI (18)



Site no. : Audix No.1 Chamber Data no. : 12  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit :  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem W/N:03-00098-20  
 Power Rating : Battery 3V  
 Test Mode : TX Mode CH1

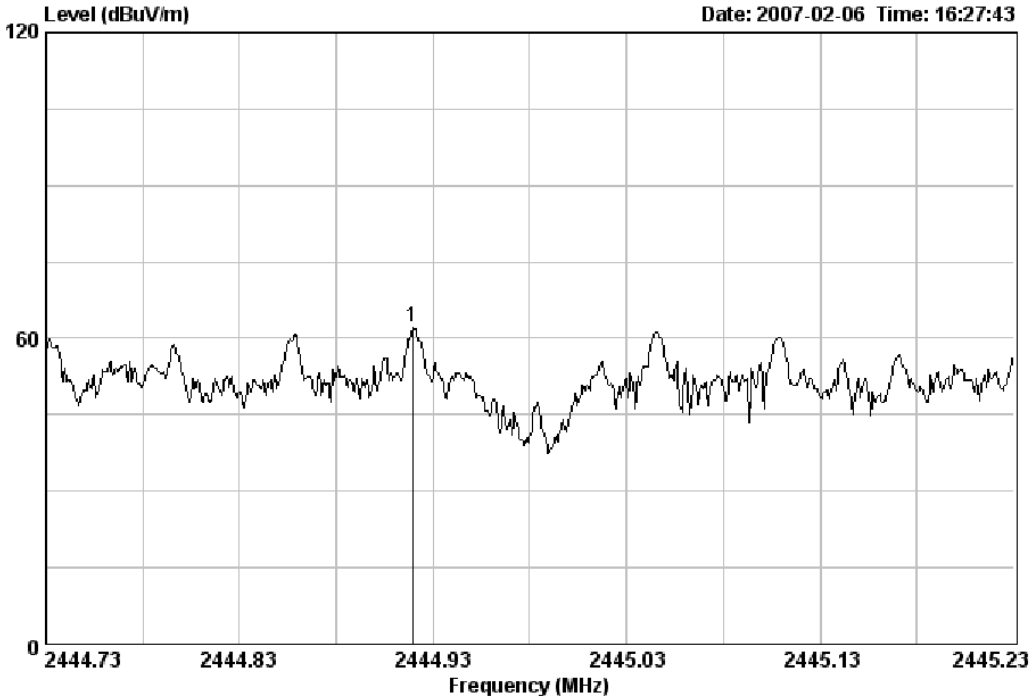
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2405.55	29.03	6.20	35.18	65.22	65.27	500.00	434.73	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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 Postcode:518057

Data: 10 File: D:\2007 Report\Zigbee\20.EMI (18)



Site no. : Audix No.1 Chamber Data no. : 10  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit :  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem W/N:03-00098-20  
 Power Rating : Battery 3V  
 Test Mode : TX Mode CH9

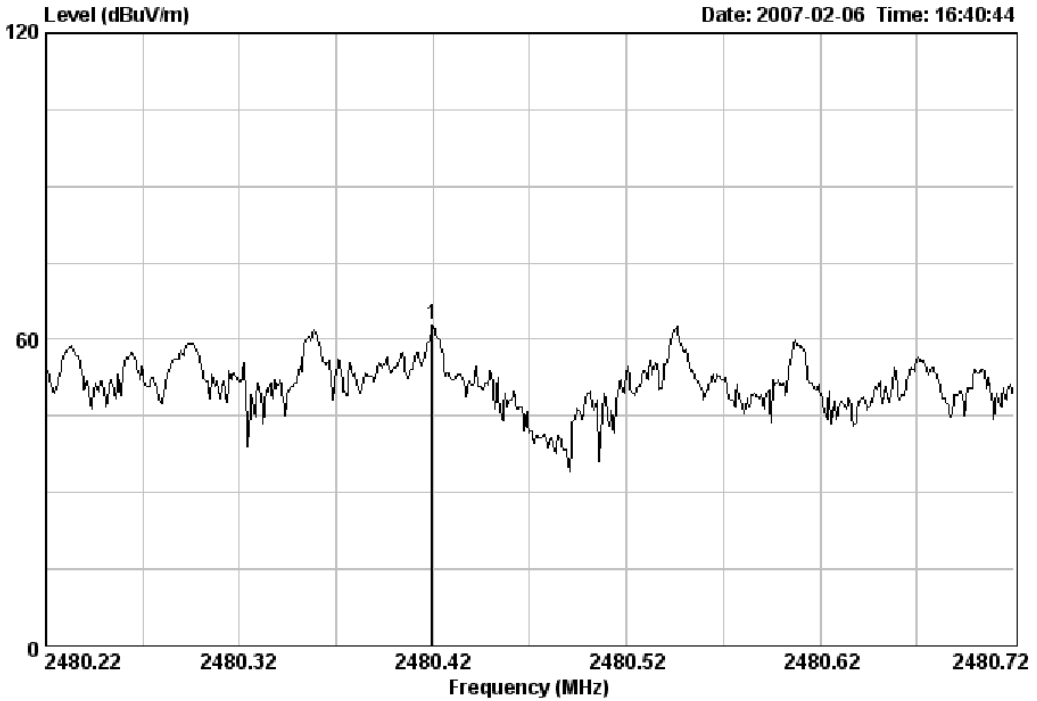
	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2444.92	29.11	6.25	35.17	61.82	62.01	500.00	437.99	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



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Data: 11 File: D:\2007 Report\Zigbee\20.EMI (18)



Site no. : Audix No.1 Chamber Data no. : 11  
 Dis. / Ant. : 3m 3115 FACTOR Ant. pol. : HORIZONTAL  
 Limit :  
 Env. / Ins. : 23°C/54% Engineer : Jamy  
 EUT : Classroom response sytem N/N:03-00098-20  
 Power Rating : Battery 3V  
 Test Mode : TX Mode CH16

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.42	29.19	6.30	35.16	62.51	62.84	500.00	437.16	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

## 9. MPE ESTIMATION

### 9.1.Limit for General Population / Uncontrolled Exposures

Frequency	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
300MHz~1.5GHz	F/1500	30
1.5GHz~100GHz	1.0	30

Frequency (MHz)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
2405	1.0	30
2445	1.0	30
2480	1.0	30

Note: F = Frequency in MHz

### 9.2.Estimation Result

CH	Frequency (MHz)	Peak output power (dBm)	Antenna gain (dBi)	Antenna gain (Linear)
1	2405	-15.11	3	2
9	2445	-19.54	3	2
16	2480	-19.40	3	2

CH	Frequency (MHz)	Peak output power to antenna (mW)	Power density at 20cm (mW/ cm <sup>2</sup> )
1	2405	0.0308	$1.23 \times 10^{-5}$
9	2445	0.0111	$4.38 \times 10^{-6}$
16	2480	0.0115	$4.58 \times 10^{-6}$

## **10.DEVIATION TO TEST SPECIFICATIONS**

[ NONE]



## 11.PHOTOGRAPH

### 11.1.Photos of Radiated Emission Test

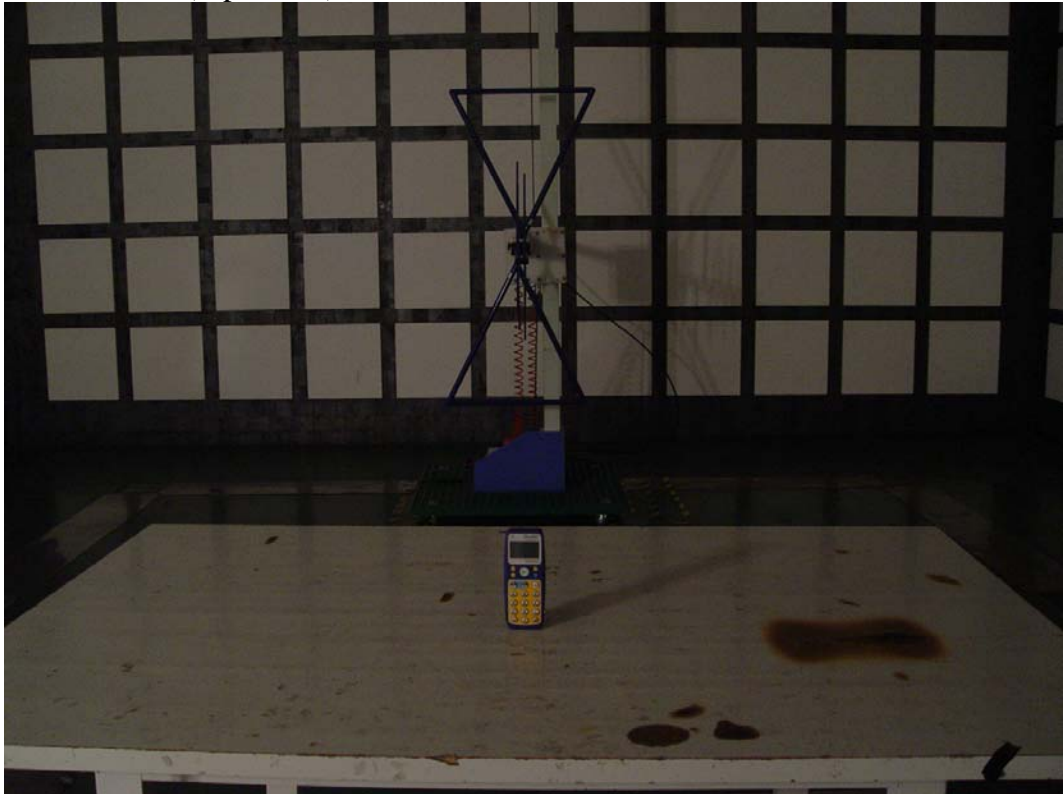
30-1000MHz (X position)



30-1000MHz (Y position)



30-1000MHz (Z position)



Above 1000MHz (X position)



Above 1000MHz (Y position)



Above 1000MHz (Z position)

