



Test report No. : 4786000990H-R2  
Page : 1 of 12  
Issued date : January 18, 2013  
Revised date : February 6, 2013  
FCC ID : RNMAKHFIH0530K

# **EMI TEST REPORT**

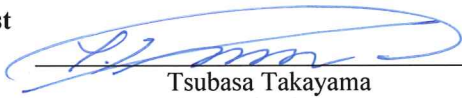
**Test Report No. : 4786000990H-R2**

**Applicant** : **AKAI ELECTRONIC INDUSTRY CO., LTD.**  
**Type of Equipment** : **Induction Heating Unit**  
**Model No.** : **AKHFR5.0C11K-2**  
**FCC ID** : **RNMAKHFIH0530K**  
**Test regulation** : **FCC Part 18 : 2002**  
**Test Result** : **Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
7. This report is a revised version of 4786000990H-R1. 4786000990H-R1 is replaced with this report.

**Date of test:** December 17, 2012

**Representative test engineer:**



Tsubasa Takayama  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**



Takashi Nakazawa  
Leader of WiSE Japan,  
UL Verification Service

**UL Japan, Inc.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

13-EM-F0429



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## **SECTION 1: Customer information**

Company Name	:	AKAI ELECTRONIC INDUSTRY CO., LTD.
Address	:	148-8 Hazukashikamogawa-cho, fushimi-ku, Kyoto-shi, Kyoto, 612-8484, Japan
Telephone Number	:	+81-75-922-7980
Facsimile Number	:	+81-75-922-7982
Contact Person	:	Yutaka Machino

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment	:	Induction Heating Unit
Model No.	:	AKHFR5.0C11K-2
Serial No.	:	A-2034-02
Rating	:	AC200-220V/60Hz
Receipt Date of Sample	:	November 30, 2012
Country of Mass-production	:	Japan
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

### **2.2 Product Description**

Model No: AKHFR5.0C11K-2 is the Induction Heating Unit.

Clock frequency in the system	:	4MHz
Operating frequency	:	30kHz
Feature of EUT	:	This unit is a device which applies the principle of induction heating, to heat the metal.

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test specification**

Test Specification : FCC Part 18 2002, final revised on July 10, 2002  
Title : FCC 47CFR Part18 Industrial, scientific, and medical equipment

### **3.2 Procedures and results**

Item	Test Procedure & Limits	Deviation	Worst margin	Result
Radiated emission	Section 18.305 FCC/OST MP-5	N/A	12.6 dB 0.02863MHz, AV, 45 deg.	Complied
Conducted emission	Section 18.307 FCC/OST MP-5	N/A	N/A *1)	N/A
*Note: UL Japan, Inc.'s EMI Work Procedure 13-EM-W0420.				
*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.				

### **3.3 Addition to standard**

Other than above, no addition, exclusion nor deviation has been made from the standard.

### **3.4 Uncertainty**

#### **EMI**

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	Radiated emission (10m*)(±dB)		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	4.2dB	5.0dB	4.8dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

\*10m = Measurement distance

#### Radiated emission test(10m)

The data listed in this test report has enough margin, more than the site margin.

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### 3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. \*NVLAP Lab. code: 200572-0  
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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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#### Head Office EMC Lab.

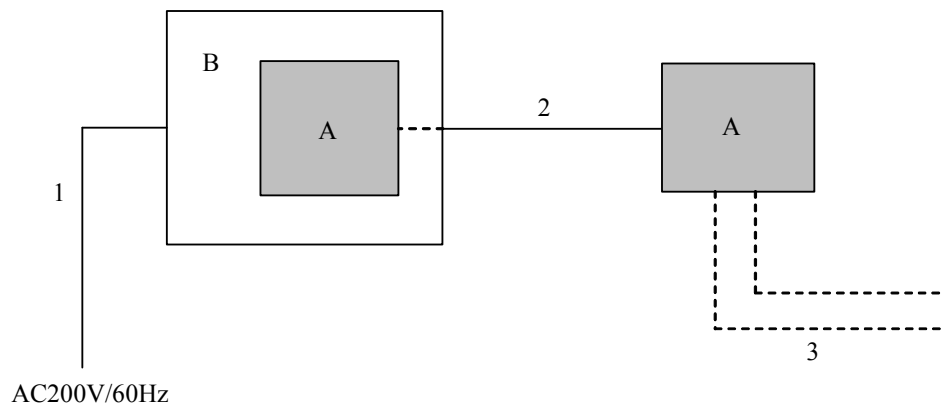
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## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating mode(s)**

The mode is used : Normal mode

### **4.2 Configuration and peripherals**



\*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

#### **Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Induction Heating Unit	AKHFR5.0C11K-2	A-2034-02	AKAI ELECTRONIC INDUSTRY CO., LTD.	EUT
B	Control panel	-	-	AKAI ELECTRONIC INDUSTRY CO., LTD.	-

#### **List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	AC Cable	2.0	Unshielded	Unshielded	-
2	DC Cable	3.3	Shielded	Shielded	-
3	Water-cooling hose	3.0	-	-	-

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : No.1 semi anechoic chamber  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

One of the EUT was placed on a wooden table of nominal size, 1.0m by 1.5m, raised 1.0m above the conducting ground plane. It was set on the edge of the tabletop.

The other EUT was placed on the carpet.

Test was made with the antenna positioned in 0deg., 45deg., and 90deg.

The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

Photographs of the set up are shown in Appendix 3.

\*Refer to Figure 1 about Direction of the Loop Antenna.

### **5.3 Test conditions**

Frequency range : 9kHz - 30MHz (Loop Antenna)  
Test distance : 3m, 10m  
EUT position : Table top and Floor standing  
EUT operation mode : See Clause 4.1

### **5.4 Test procedure**

The height of antenna was fixed in 2m.

EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed in 0deg., 45deg., and 90deg. with the Test Receiver.

Maximum electric field intensity was confirmed with the measurements at distances of 3m and 10m.

The electric field intensity at a distance of 1600m was calculated from the measurement results at distances of 3m and 10m.

The test was made with the detector (RBW) in the following table.

Frequency	Below 30MHz
Instrument used	Test Receiver
IF Bandwidth	AV: 9kHz

### **5.5 Test result**

Summary of the test results: Pass

Date: December 17, 2012

Test engineer: Tsubasa Takayama

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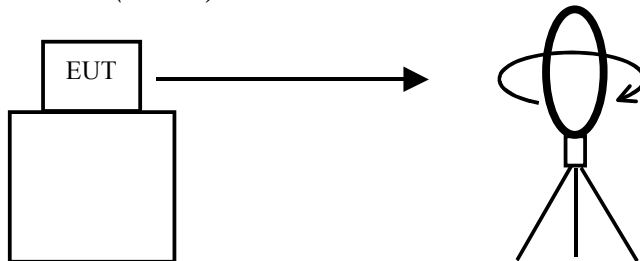
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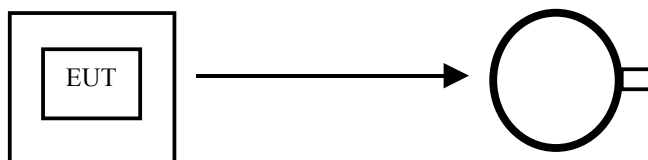


**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*



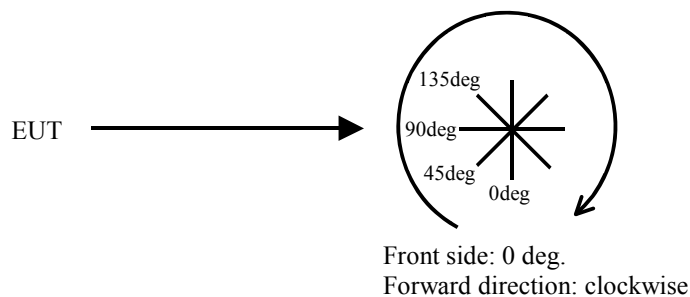
*Top View (Horizontal)*



Antenna was not rotated.

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*Top View (Vertical)*



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## APPENDIX 1: Data of EMI test

### Radiated Emission

Test place : Head Office EMC Lab. No.1 Semi Anechoic Chamber  
Report No. : 4786000990H  
Date : 12/17/2012 Temperature / Humidity : 22 deg. C / 33 % RH  
Engineer : Tsubasa Takayama Mode : Normal mode

No.	Frequency (MHz)	Detect	3m deistance Reading (dB $\mu$ V/m)	10m deistance Reading (dB $\mu$ V/m)	Ant. Factor (dB/m)	Att. (dB)	3m deistance Result (dB $\mu$ V/m)	10m deistance Result (dB $\mu$ V/m)	1600m distance Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Position
1	0.02814	AV	90.7	69.4	19.3	6.0	116.0	94.7	4.9	20.0	A
2	0.02863	AV	93.2	71.9	19.3	6.0	118.5	97.2	7.4	20.0	B
3	0.02884	AV	75.3	54.6	19.3	6.0	100.6	79.9	-7.4	20.0	C
4	0.03027	AV	87.4	66.6	19.3	6.0	112.7	91.9	4.2	20.0	B
5	0.03032	AV	78.9	58.1	19.3	6.0	104.2	83.4	-4.3	20.0	C
6	0.03035	AV	80.7	60.6	19.3	6.0	106.0	85.9	1.2	20.0	A
7	0.03141	AV	62.1	43.2	19.3	6.0	87.4	68.5	-11.2	20.0	A
8	0.03145	AV	58.3	40.0	19.3	6.0	83.6	65.3	-11.8	20.0	B
9	0.03145	AV	62.4	41.2	19.3	6.0	87.7	66.5	-22.9	20.0	C
10	0.08567	AV	67.9	46.4	19.2	6.0	93.1	71.6	-19.0	20.0	A
11	0.08571	AV	57.9	37.9	19.2	6.0	83.1	63.1	-21.2	20.0	B
12	0.08652	AV	45.3	27.0	19.2	6.0	70.5	52.2	-24.9	20.0	C
13	0.14273	AV	56.2	34.2	19.1	6.0	81.3	59.3	-33.4	20.0	A
14	0.14335	AV	24.9	3.2	19.1	6.0	50.0	28.3	-63.2	20.0	C
15	0.14391	AV	45.5	24.4	19.1	6.0	70.6	49.5	-39.4	20.0	B
16	27.98000	AV	15.3	-1.9	21.0	7.8	44.1	26.9	-45.6	20.0	A
17	28.55399	AV	29.9	8.6	21.0	7.8	58.7	37.4	-52.4	20.0	B
18	28.98313	AV	28.2	6.5	21.0	7.8	57.0	35.3	-56.2	20.0	C

Calculation as follows : Each distance result (dB $\mu$ V/m) = Reading (dB $\mu$ V/m) + Antenna Factor (dB/m) + ATT. Loss (dB)  
1600m distance result (dB $\mu$ V/m) = 10m distance result (dB $\mu$ V/m) - [(3m distance result (dB $\mu$ V/m) - 10m distance result (dB $\mu$ V/m)) / (log(10)-log(3))] \* log(1600/10)]

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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## **APPENDIX 2: Test instruments**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2012/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2012/02/08 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2012/06/14 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2012/10/12 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2012/07/27 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/ 3D-2W(7.5m)/ RG400u(1.5m)/ RFM-E421(Switcher)	-/01068(Switcher)	RE	2012/01/22 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2012/11/06 * 12

**The expiration date of the calibration is the end of the expired month.**

**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**

**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

**Test Item:**

**RE: Radiated emission**

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