



RADIO TEST REPORT

Test Report No. : 28GE0141-HO-01-A-R1

Applicant : Mitsubishi Electric Corporation Himeji Works
Type of Equipment : SMART KEYLESS SYSTEM (TRANSMITTER)
Model No. : SKE11A-04
Test regulation : FCC Part 15 Subpart C:2008
Section 15.231
FCC ID : WAZX1T763SKE11A04
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 above regulation.
4. The test results in this 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 NVLAP, NIST, or any agency of the Federal Government.
6. Original test report number of this report is 28GE0141-HO-01-A.

Date of test : March 31 and April 14, 2008

Tested by : 
Shinya Watanabe
EMC Services

Approved by : 
Makoto Kosaka
EMC Services



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://uljapan.co.jp/emc/nvlap.htm>

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

MF060b (09.01.08)

CONTENTS	PAGE
SECTION 1: Customer information.....	3
SECTION 2: Equipment under test (E.U.T.).....	3
SECTION 3: Test specification, procedures & results.....	4
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission and Receiver Spurious Emissions)	10
APPENDIX 1: Photographs of test setup	12
Radiated emission(Transmitting).....	12
Worst case position.....	13
Radiated emission(Receiving).....	14
APPENDIX 2: Data of EMI test.....	15
Automatically deactivate.....	15
Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission).....	16
-20dB Bandwidth	17
99% Occupied Bandwidth	18
Duty Cycle(Fundamental).....	19
Receiver Spurious Emission.....	20
APPENDIX 3:Test Instruments	22

SECTION 1: Customer information

Company Name	:	Mitsubishi Electric Corporation Himeji Works
Address	:	840 CHIYODA-MACHI HIMEJI HYOGO 670-8677 JAPAN
Telephone Number	:	+81-792-298-8994
Facsimile Number	:	+81-792-298-9929
Contact Person	:	Yoshiharu Goto

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

2.1 Identification of E.U.T.

Type of Equipment	:	SMART KEYLESS SYSTEM (TRANSMITTER)
Model No.	:	SKE11A-04
Serial No.	:	20080327-02 20080327-05 20080327-06
Rating	:	DC 3.0V
Receipt Date of Sample	:	March 30, 2008
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: SKE11A-04 (referred to as the EUT in this report) is the SMART KEYLESS SYSTEM (TRANSMITTER).

Clock Frequency	:	5MHz (Micro), 9.84375MHz (FSK modulation).
Equipment Type	:	Transceiver
Method of Frequency Generation	:	Crystal
Operating temperature range	:	-20 - +60 deg. C.

[Transmitter part]

Frequency band	:	314.95MHz-315.05MHz
Frequency of Operation	:	315MHz
Type of modulation	:	FSK
Power Control	:	No
Mode of Operation	:	Simplex
ITU code	:	F1D
Antenna Type	:	PCB PATTERN ANTENNA

[Receiver part]

Type of Receiver	:	electromagnetic induction type
Frequency of Operation	:	132.45kHz
Antenna Type	:	Inductive loop

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

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2008, final revised on May 19, 2008
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.231 Periodic operation in the band 40.66 - 40.70MHz
and above 70MHz

*The revision on May 19, 2008 does not influence the test specification applied to the EUT.

FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0V) and the constant voltage was supplied to the EUT during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Automatically Deactivate	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Section 15.231(a)(1) <IC> RSS-210 A1.1.1	N/A	-	Complied
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8	<FCC> Section 15.231(b) <IC> RSS-210 A1.1.2	N/A	1.8dB 315.00MHz Horizontal	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9	<FCC> Section 15.205 Section 15.209 Section 15.231(b) <IC> RSS-210 A1.1.2, 2.6, 2.7	N/A	[Tx] 5.8dB 2205.00MHz Horizontal,AV	Complied
4	Receiver Spurious Emissions	<FCC> ANSI C63.4:2003 12. Measurement of unintentional radiators other than ITE <IC> RSS-Gen 4.10	<FCC> Section 15.109(a) <IC> RSS-Gen 6(a)	N/A	[Rx] 24.3dB 500.000MHz Horizontal	Complied
5	-20dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Section 15.231(c) <IC> Reference data	N/A	-	Complied
6	Conducted emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.2	<FCC> Section 15.207 <IC> RSS-Gen 7.2.2	-	N/A*1)	N/A

Note: UL Japan, Inc.'s EMI Work procedures No. QPM05 and QPM15

*1) The test is not applicable since the EUT is a battery-operated device.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	<IC> RSS-Gen 4.6.1	<IC> RSS-210 A1.1.3	Conducted	N/A	N/A	N/A

No addition, deviation, nor exclusion has been made from standards.

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

3.4 Uncertainty

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

Test room	Conducted emission	Radiated emission (10m*)			Radiated emission (3m*)			Radiated emission (3m*)	
	150kHz-30MHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz	18GHz-40GHz
No.1 semi-anechoic Chamber (±)	3.7dB	3.1dB	4.7dB	4.4dB	3.2dB	3.7dB	4.4dB	5.9dB	6.1dB
No.2 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.3dB	3.9dB	5.9dB	6.1dB
No.3 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.2dB	4.4dB	5.9dB	6.1dB
No.4 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.2dB	4.4dB	5.9dB	6.1dB

*10m/3m = Measurement distance

Radiated emission test (Electric Field Strength of Fundamental and Spurious Emission) (3m)

[Tx] The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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

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

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
 Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	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	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	IC4247-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247-3	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	IC4247-4	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 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

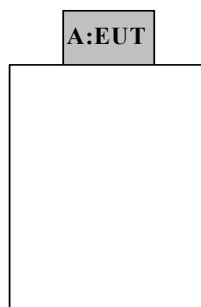
4.1 Operating Modes

The mode is used : 1) Transmitting mode: Continuously Transmitting of normal use signal* which is modulated to FSK.
*The normal operation signal when Lock or Unlock button is pushed.
2) Normal use mode: Sending FSK modulated signal when Lock or Unlock button is pushed.
3) LF Receiving mode: Receiving LF signal from LF transmitter.

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

- 1) Transmitting mode
- 2) Normal use mode



* Test data was taken under worse case conditions.

Description of EUT and Support equipment

No	Item	Model number	Serial number	Manufacturer	Remarks
A	SMART KEYLESS SYSTEM (TRANSMITTER)	SKE11A-04	20080327-02 *1) 20080327-05 *2)	Mitsubishi Electric Corporation Himeji Works	EUT

*1) Used for Automatically deactivate and Duty cycle tests

*2) Used for Radiated emission test (Transmitting), -20dB Bandwidth test and 99% Occupied Bandwidth test

UL Japan, Inc.

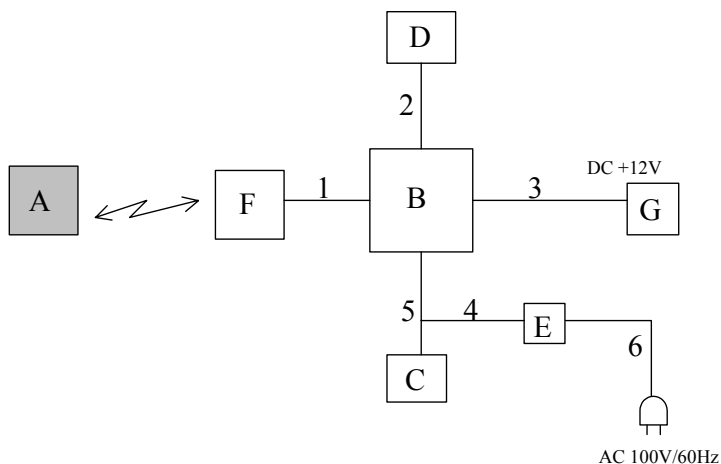
Head Office EMC Lab.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

3) LF Receiving mode



Description of EUT and Support equipment

No	Item	Model number	Serial number	Manufacturer	Remarks
A	SMART KEYLESS SYSTEM (TRANSMITTER)	SKE11A-04	20080327-06	Mitsubishi Electric Corporation Himeji Works	EUT
B	Smart ECU	SKE11A-01	20080409-01	Mitsubishi Electric Corporation Himeji Works	-
C	SW BOX	SKESWBOX	-	Mitsubishi Electric Corporation Himeji Works	-
D	Receiver	SKE11A-01	20080409-02	Mitsubishi Electric Corporation Himeji Works	-
E	Request SW timer	H3CR-F8	1869OM	OMRON	-
F	LF antenna	-	-	Mitsubishi Electric Corporation Himeji Works	-
G	Car battery	-	-	BOSCH	-

List of cables used

No	Name	Length (m)	Shield	
			Cable	Connector
1	Signal Cable	1.5	Unshielded	Unshielded
2	Signal Cable	1.3	Unshielded	Unshielded
3	DC Cable	1.0	Unshielded	Unshielded
4	Signal Cable	0.7	Unshielded	Unshielded
5	Signal Cable	1.5	Unshielded	Unshielded
6	LF antenna	0.5	Unshielded	Unshielded

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

SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission and Receiver Spurious Emissions)

5.1 Operating environment

Test date	March 31, 2008	April 14, 2008
Test place	No.4 semi anechoic chamber	No.1 semi anechoic chamber
Temperature	See data	See data
Humidity	See data	See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 80cm above the conducting ground plane. The EUT was set on the center of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Test mode	-Transmitting mode -Normal use mode	-LF Receiving mode
Frequency range	30MHz-3200MHz	9kHz-1000MHz *
Test distance	3m	3m
EUT position	Top of Polyurethane table	Top of Polyurethane table

* 9kHz-30MHz is Reference data

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

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on No.4 & No.1 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m

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

The measurements were performed for each antenna angle 0deg. , 45deg. and 90deg.

Frequency : From 30MHz to 3200MHz at distance 3m

The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz	Above 1GHz (Other emissions)	Above 1GHz (Pulse emissions)
Detect or Type	PK/AV	QP	PK/AV	QP	QP	Peak and AV(Peak Detect)	Peak and Peak with Duty factor
IF Band width	200Hz	200Hz	9kHz	9kHz	120kHz	PK: S/A:RBW 1MHz, VBW:1MHz AV: S/A:RBW 1MHz, VBW:10Hz	PK: S/A:RBW 1MHz, VBW:1MHz

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

With the position, the noise levels of all the frequencies was measured.

5.5 Results

Summary of the test results: Pass

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