



# RADIO TEST REPORT


Test Report No. : 31BE0219-HO-04-A-R1

**Applicant** : Mitsubishi Electric Corporation Himeji works  
**Type of Equipment** : Keyless System LFU  
**Model No.** : SKE134-01  
**FCC ID** : WAZSKE13401  
**Test regulation** : FCC Part 15 Subpart C: 2010  
**Test Result** : Complied


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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. This report is a revised version of 31BE0219-HO-04-A. 31BE0219-HO-04-A is replaced with this report.

**Date of test:** February 2 and 3, 2011

**Representative test engineer:**

  
Tomotaka Sasagawa  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

  
Shinya Watanabe  
Leader of WiSE Japan,  
UL Verification Service



NVLAP LAB CODE: 200572-0

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MF058b (15.09.10)

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## **SECTION 1: Customer information**

Company Name : Mitsubishi Electric Corporation Himeji works  
Address : 840 Chiyoda-machi Himeji Hyogo, 670-8677, Japan  
Telephone Number : +81-79-298-8994  
Facsimile Number : +81-79-298-9929  
Contact Person : Toshio Koga

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

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

Type of Equipment : Keyless System LFU  
Model No. : SKE134-01  
Serial No. : Refer to Clause 4.2  
Rating : DC 12.0V  
Receipt Date of Sample : February 1, 2011  
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: SKE134-01 (referred to as the EUT in this report) is the Keyless System LFU.

#### **Feature of EUT**

The Keyless Entry System installed in vehicles.

The lock or unlock of the door push the switch on the door, the transmitter starts communication between LF control unit(LFU) and a receiver and opens and closes the key of the door, and the engine start is possible.

It can also lock or unlock the doors by operating the button on the transmitter.

#### **General Specification**

Clock frequency in the system : (CPU) 16MHz, (LF IC) 8MHz

#### **Radio Specification**

Radio Type : Transmitter  
Frequency of Operation : 125kHz  
Modulation : ASK  
Method of Frequency Generation : Crystal  
Antenna type : Inductive  
Duty Cycle : Very Low  
Operating temperature range : -40 to +85 deg. C

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.209 Radiated emission limits, general requirements

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### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.4	<FCC> Section 15.207 <IC> RSS-Gen 7.2.4	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	10.7dB 0.12500MHz, AV (Antenna A)	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	18.6dB 208.421MHz, QP, Vertical (Antenna F)	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

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

\*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.

#### **FCC 15.31 (e)**

This test was performed with the New Battery (DC 12.0V) and the constant voltage was supplied to this EUT during the tests. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

The EUT has an external antenna connector, but it is installed by the professionals. Therefore, the equipment complies with the antenna requirement of Section 15.203.

### 3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	N/A	N/A	N/A

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

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### 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						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	5.1dB	4.2dB

\*3m/1m/0.5m = Measurement distance

#### Radiated emission test(3m)

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

### 3.5 Test Location

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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 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

### **4.1 Operating Modes**

Test mode	Remarks
Transmitting mode (Tx)	125kHz*

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

\* As a result of preliminary test with Ant A and Ant B, the formal test was performed with Ant A, which had the maximum power.

As a result of preliminary test with Ant C, Ant D, Ant E and Ant F, the formal test was performed with Ant C and F, because Ant F had the maximum power and Ant C had the minimum power.

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## 4.2 Configuration and peripherals

**This page has been submitted for a separate exhibit.**



**SECTION 5: Radiated emission (Fundamental and Spurious Emission)**

**Test Procedure**

The Radiated Electric Field Strength intensity has been measured on No 4semi 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 vertical polarization (antenna angle: 0deg., 45deg., 90deg., and 135 deg.) and horizontal polarization.

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

Frequency : From 30MHz to 1GHz at distance 3m

The measuring antenna height 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.

Measurements were performed with a QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver (below 1GHz)

	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
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- 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 were measured.

\* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])

[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

**Test data : APPENDIX 2**

**Test result : Pass**

Date: February 2, 2011  
February 3, 2011

Test engineer: Kazuya Yoshioka  
Hiroyuki Furutaka

**UL Japan, Inc.**

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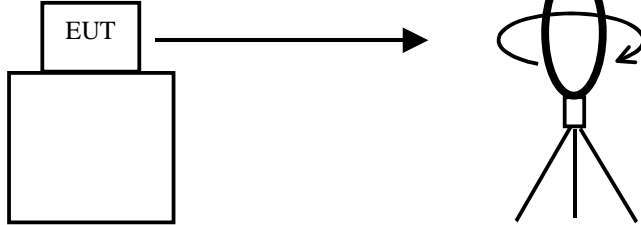
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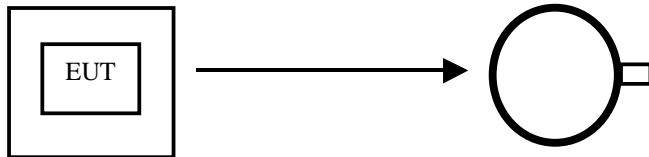
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**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*

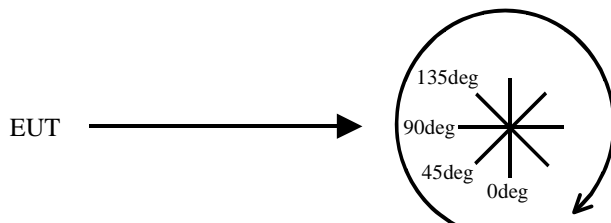


.....  
*Top View (Horizontal)*



Antenna was not rotated.

.....  
*Top View (Vertical)*



Front side: 0 deg.  
Forward direction: clockwise

## **SECTION 6: -26dB Bandwidth**

### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	100kHz	1kHz	3kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 2  
Test result : Pass

## **SECTION 7: 99% Occupied Bandwidth**

### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.

Test data : APPENDIX 2  
Test result : Pass

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