EMI TEST REPORT

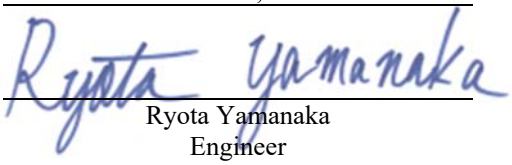
Test Report No. : 12095693H-C-R1

Applicant	:	**Mitsubishi Electric Corporation Himeji works**
Type of Equipment	:	**Keyless System Receiver**
Model No.	:	**SKE115-01**
FCC ID	:	**WAZSKE11501**
Test regulation	:	**FCC Part 15 Subpart B: 2018**
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 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 test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
7. This report is a revised version of 12095693H-C. 12095693H-C is replaced with this report.

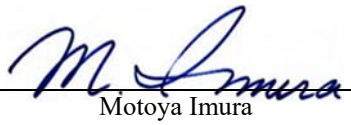
Date of test: March 27, 2018

Representative test engineer:



Ryota Yamanaka
Engineer
Consumer Technology Division

Approved by:



Motoya Imura
Leader
Consumer Technology Division

NVLAP TESTING
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://japan.ul.com/resources/emc_accredited/

REVISION HISTORY

Original Test Report No.: 12095693H-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12095693H-C	March 13, 2018	-	-
1	12095693H-C-R1	March 27, 2018	P.1	Correction of Date of test in cover page; From January 31, 2018 to March 27, 2018
1	12095693H-C-R1	March 27, 2018	P.5	Update of FCC version
1	12095693H-C-R1	March 27, 2018	P.5	Correction of Worst margin in Clause 3.2; From 20.9 dB, 912.900 MHz to 14.3 dB 287.956 MHz.
1	12095693H-C-R1	March 27, 2018	P.9	Correction of contents by retesting in SECTION 5.
1	12095693H-C-R1	March 27, 2018	P.10, 11	Replacement of test data by retesting in APPENDIX 1.
1	12095693H-C-R1	March 27, 2018	P.12	Replacement of Test instruments by retesting in APPENDIX 2.
1	12095693H-C-R1	March 27, 2018	P.13, 14, 15	Replacement of setup photo by retesting in APPENDIX 3.

UL Japan, Inc.
Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

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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	:	Masashi Nojima

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

2.1 Identification of E.U.T.

Type of Equipment	:	Keyless System Receiver
Model No.	:	SKE115-01
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 5.0V
Receipt Date of Sample	:	January 25, 2018
Country of Mass-production	:	Thailand
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: SKE115-01 (referred to as the EUT in this report) is a Keyless System Receiver.

Radio Specification

Radio Type	:	Receiver
Frequency of Operation	:	315 MHz
Local oscillator Frequency	:	314.72 MHz
Receiving Bandwidth	:	400 kHz
Antenna Type	:	Bar antenna
Method of Frequency Genenration	:	Crystal
Clock Frequency	:	30.32 MHz

FCC15.111(b)
The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached).
Therefore, Radiated emission test was performed.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart B FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators

* The revision on March 12, 2018, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	**FCC:** ANSI C63.4: 2014 7. AC power - line conducted emission measurements	**FCC:**Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
Radiated emission	**FCC:** ANSI C63.4: 2014 8. Radiated emission measurements	**FCC:** Part 15 Subpart B 15.109(a)	N/A	14.3 dB 287.956 MHz Horizontal, QP	Complied
	IC: RSS-Gen 7	**IC:** RSS-Gen 7.1.2			
*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

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 $k = 2$.

Radiated emission

Measurement distance	Frequency range		Uncertainty (+/-)
3 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	5.0 dB
	200 MHz to 1000 MHz	(Horizontal)	5.2 dB
		(Vertical)	6.3 dB
3 m	1 GHz to 6 GHz		5.0 dB

Radiated emission test (3 m)
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124
NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

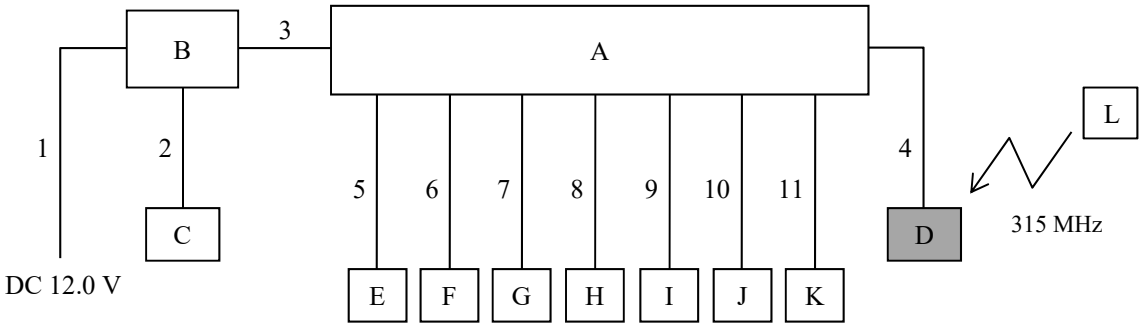
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

Mode	Remarks
1) Receiving mode (315 MHz)	-

* It was confirmed by using SW Box that the EUT receives the signal from the transmitter (pair of EUT).

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	Remarks
A	Keyless System LFU	SKE114-01	20180124-L4 (No.4)	Mitsubishi Electric Corporation Himeji Works	-
B	Control JIG	-	No.1	Mitsubishi Electric Corporation Himeji Works	-
C	SW BOX	-	No.1	Mitsubishi Electric Corporation Himeji Works	-
D	Keyless System Receiver	SKE115-01	20180124-R4 (No.4)	Mitsubishi Electric Corporation Himeji Works	EUT
E	LF Antenna (Door)	ANT-FL	No.1	-	-
F	LF Antenna (Door)	ANT-FR	No.1	-	-
G	LF Antenna (Bumper)	ANT-BP	No.4	Mitsubishi Electric Corporation Himeji Works	-
H	LF Antenna (Room)	ANT-F	No.4	Mitsubishi Electric Corporation Himeji Works	-
I	LF Antenna (Room)	ANT-R	No.4	Mitsubishi Electric Corporation Himeji Works	-
J	LF Antenna (Room)	ANT-C	No.4	Mitsubishi Electric Corporation Himeji Works	-
K	Antenna coil (Immobilizer)	-	No.21	-	-
L	Keyless System Hand Unit	SKE11D-01	20180124-T4 (No.4)	Mitsubishi Electric Corporation Himeji Works	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	DC and Signal Cable	1.0	Unshielded	Unshielded	(No.1)
3	DC and Signal Cable	1.0	Unshielded	Unshielded	(No.1)
4	DC and Signal Cable	1.5	Unshielded	Unshielded	(No.1)
5	Antenna Cable	1.2	Unshielded	Unshielded	(No.1)
6	Antenna Cable	1.2	Unshielded	Unshielded	(No.1)
7	Antenna Cable	1.2	Unshielded	Unshielded	(No.1)
8	Antenna Cable	1.2	Unshielded	Unshielded	(No.1)
9	Antenna Cable	1.2	Unshielded	Unshielded	(No.1)
10	Antenna Cable	1.2	Unshielded	Unshielded	(No.1)
11	Antenna Cable	1.2	Unshielded	Unshielded	(No.1)

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m 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.
Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 10000 MHz (Horn antenna)
Test distance : 3 m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

The height of the measuring antenna varied between 1 and 4 m 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 with the Test Receiver.
The radiated emission measurements were made with the following detector function of the Test Receiver.

Frequency	Below 1GHz	Above 1GHz *1)
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz

*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.
Distance Factor: 20 x log (3.45 m / 3 m) = 1.21 dB

- The noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

5.5 Test result

Summary of the test results: Pass

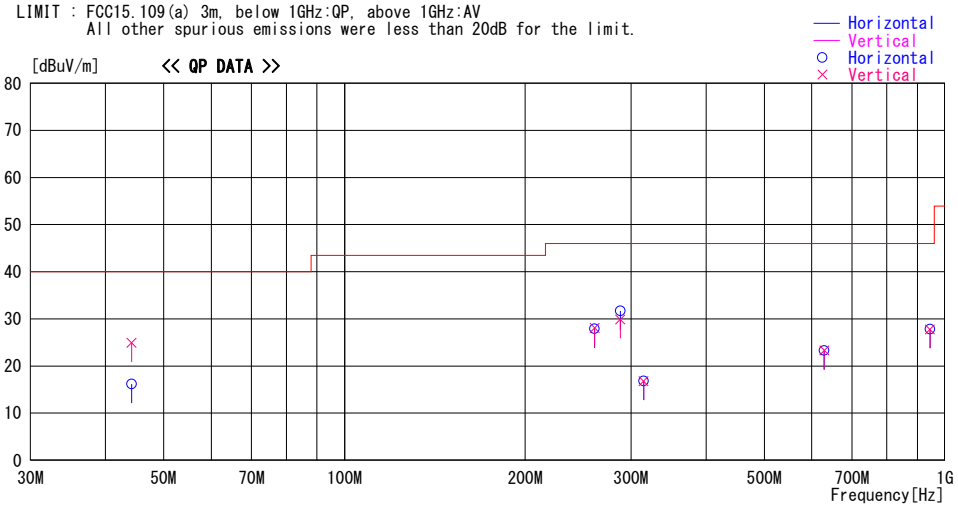
The limit is rounded down to one decimal place.
The test result is rounded off to one or two decimal places, so some differences might be observed.

Date: March 27, 2018 Test engineer: Ryota Yamanaka

APPENDIX 1: Test data

Radiated emission

Report No.	12095693H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	March 27, 2018
Temperature / Humidity	27 deg. C / 43% RH
Engineer	Ryota Yamanaka
	(Below 1 GHz)
Mode	Mode 1

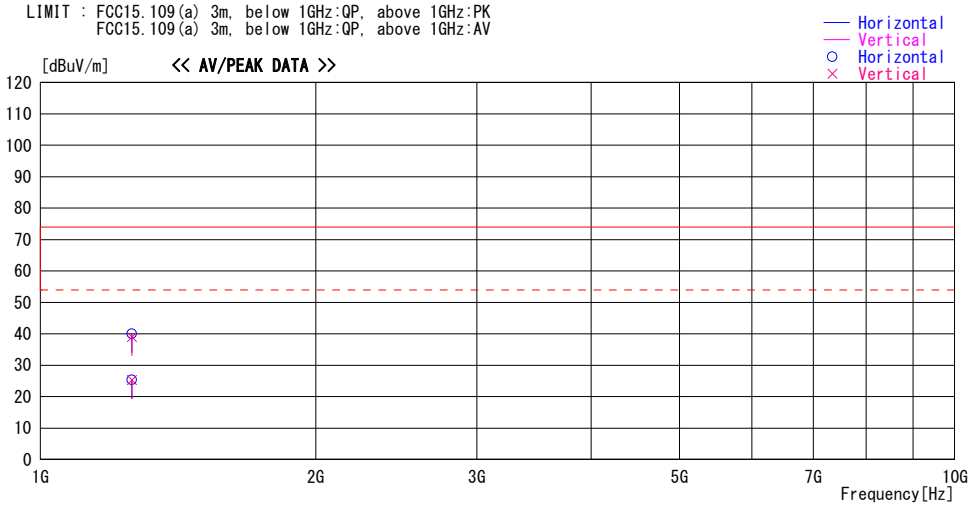


Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
44.232	35.6	QP	12.9	-23.6	24.9	280	100	Vert.	40.0	15.1	
44.232	26.9	QP	12.9	-23.6	16.2	199	370	Hori.	40.0	23.8	
260.955	36.5	QP	12.1	-20.7	27.9	39	135	Hori.	46.0	18.1	
260.955	36.7	QP	12.1	-20.7	28.1	359	100	Vert.	46.0	17.9	
287.956	39.0	QP	13.1	-20.4	31.7	281	100	Hori.	46.0	14.3	
287.956	37.2	QP	13.1	-20.4	29.9	68	100	Vert.	46.0	16.1	
314.720	23.3	QP	13.8	-20.3	16.8	0	100	Hori.	46.0	29.2	
314.720	23.3	QP	13.8	-20.3	16.8	0	100	Vert.	46.0	29.2	
629.440	23.3	QP	19.3	-19.3	23.3	0	100	Hori.	46.0	22.7	
629.440	23.3	QP	19.3	-19.3	23.3	0	100	Vert.	46.0	22.7	
944.160	22.0	QP	22.1	-16.3	27.8	0	100	Vert.	46.0	18.2	
944.160	22.0	QP	22.1	-16.3	27.8	0	100	Hori.	46.0	18.2	

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN(AMP))

Radiated emission

Report No.	12095693H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	March 27, 2018
Temperature / Humidity	27 deg. C / 43% RH
Engineer	Ryota Yamanaka
	(Above 1 GHz)
Mode	Mode 1



Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
1258.880	46.7	PK	25.5	-32.2	40.0	0	100	Hori.	73.9	33.9	
1258.880	45.7	PK	25.5	-32.2	39.0	0	100	Vert.	73.9	34.9	
1258.880	32.0	AV	25.5	-32.2	25.3	0	100	Hori.	53.9	28.6	
1258.880	32.0	AV	25.5	-32.2	25.3	0	100	Vert.	53.9	28.6	

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN(AMP) + D-factor)

APPENDIX 2: Test instruments

EMI Test Instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2017/08/31 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2017/12/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2017/08/21 * 12
MBA-08	Biconical Antenna	Schwarzbeck	VHA9103B	08031	RE	2017/09/13 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2017/12/10 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2018/02/23 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2017/11/14 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2017/09/27 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2017/08/07 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2017/10/31 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2018/01/24 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2018/01/30 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2018/02/26 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2017/05/29 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2018/03/13 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2018/01/09 * 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