



EMI TEST REPORT

Test Report No. : 11370534H-B

Applicant : Sumitomo Wiring Systems, Ltd.
Type of Equipment : UNIT ASSY, BCM
Model No. : HAR0001
FCC ID : 2AKB8HAR0001
Test regulation : FCC Part 15 Subpart B: 2016
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 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)

Date of test: October 5, 2016

Representative test engineer:

Satofumi Matsuyama

Engineer

Consumer Technology Division

Approved by:

Motoya Imura

Engineer

Consumer Technology Division



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,
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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11370534H-B

[illegible]

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CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: Radiated Emission	9
APPENDIX 1: Test data	10
Radiated Emission	10
APPENDIX 2: Test instruments	12
APPENDIX 3: Photographs of test setup.....	13
Radiated Emission.....	13
Worst Case Position	15

SECTION 1: Customer information

Company Name	:	Sumitomo Wiring Systems, Ltd.
Address	:	1820 Nakanoike, Mikkaichi-cho, Suzuka-City, Mie Pref. 513-8631 JAPAN
Telephone Number	:	+81-59-382-8711
Facsimile Number	:	+81-59-383-3943
Contact Person	:	Masaya Oota

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

2.1 Identification of E.U.T.

Type of Equipment	:	UNIT ASSY, BCM
Model No.	:	HAR0001
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	September 29, 2016
Country of Mass-production	:	United States of America , China , 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 No: HAR0001 (referred to as the EUT in this report) is the UNIT ASSY, BCM.

General Specification

Clock frequencies in the system	:	LF Transmitter: 9.000 MHz RF Receiver: 24.305 MHz
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Radio Specification

[LF Transmitter]*

Radio Type	:	Transmitter
Frequency of Operation	:	125 kHz
Modulation	:	OOK (ASK)
Method of Frequency Generation	:	Clock with a built-in IC
Operating temperature range	:	-40 deg. C to +125 deg. C
Antenna Type	:	$\lambda/4$ inverted-L Antenna

[RF Receiver]

Radio Type	:	Receiver
Frequency of Operation	:	433.92 MHz
Method of Frequency Generation	:	Crystal
Operating temperature range	:	-40 deg. C to +85 deg. C
Receiver Bandwidth	:	146 kHz

*The test of transmitter part was performed separately from this test report, and the conformability is confirmed.

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.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart B
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

* The revision on November 14, 2016, 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	20.2 dB 867.340 MHz, QP Horizontal/ Vertical	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 $k = 2$.

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

* Measurement distance

Radiated emission test(3 m)

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

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3.5 Test Location

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	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	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	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	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	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	4.0 x 4.5 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	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test): 2.0 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

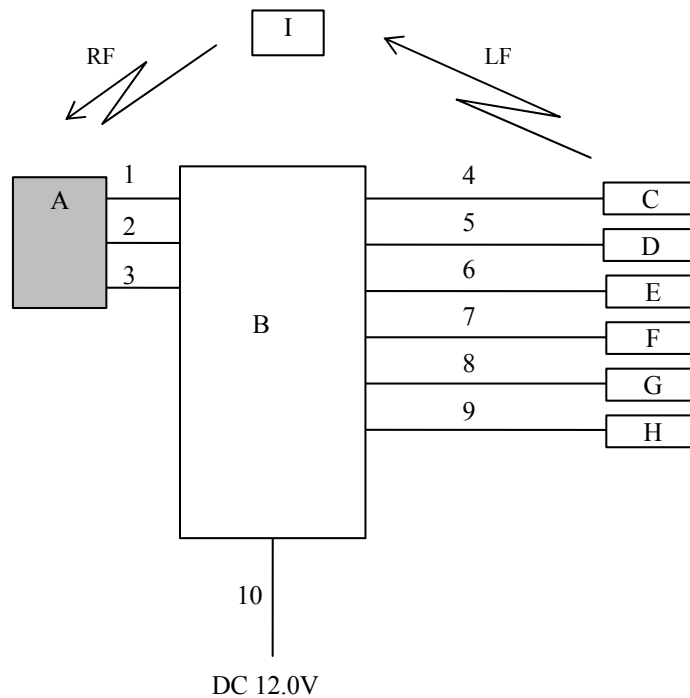
4.1 Operating modes

Mode	Remarks
Receiving mode	-

*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.

* It was confirmed by using checker 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.

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	UNIT ASSY, BCM	HAR0001	1	Sumitomo Wiring Systems, Ltd.	EUT
B	Checker BOX	-	-	Sumitomo Wiring Systems, Ltd.	-
C	LF Antenna (FRDR)	38387-TVA-A310-M1	001	ALPS ELECTRIC CO., LTD.	-
D	LF Antenna (FRAS)	38387-TVA-A310-M1	002	ALPS ELECTRIC CO., LTD.	-
E	LF Antenna (TR)	38387-TVA-A310-M1	006	ALPS ELECTRIC CO., LTD.	-
F	LF Antenna (F)	38387-TVA-A310-M1	003	ALPS ELECTRIC CO., LTD.	-
G	LF Antenna (R)	38387-TVA-A310-M1	005	ALPS ELECTRIC CO., LTD.	-
H	LF Antenna (M)	38387-TVA-A310-M1	004	ALPS ELECTRIC CO., LTD.	-
I	FOB	38011-TVAA-A115-M1	1	ALPS ELECTRIC CO., LTD.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal Cable	2.9	Unshielded	Unshielded	-
2	Signal Cable	2.9	Unshielded	Unshielded	-
3	Signal Cable	2.9	Unshielded	Unshielded	-
4	Antenna Cable	3.3	Unshielded	Unshielded	-
5	Antenna Cable	3.3	Unshielded	Unshielded	-
6	Antenna Cable	3.3	Unshielded	Unshielded	-
7	Antenna Cable	3.3	Unshielded	Unshielded	-
8	Antenna Cable	3.3	Unshielded	Unshielded	-
9	Antenna Cable	3.3	Unshielded	Unshielded	-
10	DC Cable	2.0	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.3 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 edge 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 - 2000 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, or the Spectrum Analyzer.

The radiated emission measurements were made with the following detector function of the Test Receiver and the Spectrum Analyzer.

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

- 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.

6.5 Test result

Summary of the test results: Pass

Date: October 5, 2016 (day) Test engineer: Masafumi Niwa
October 5, 2016 (night) Satofumi Matsuyama

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APPENDIX 1: Test data

Radiated Emission

DATA OF RADIATED EMISSION TEST

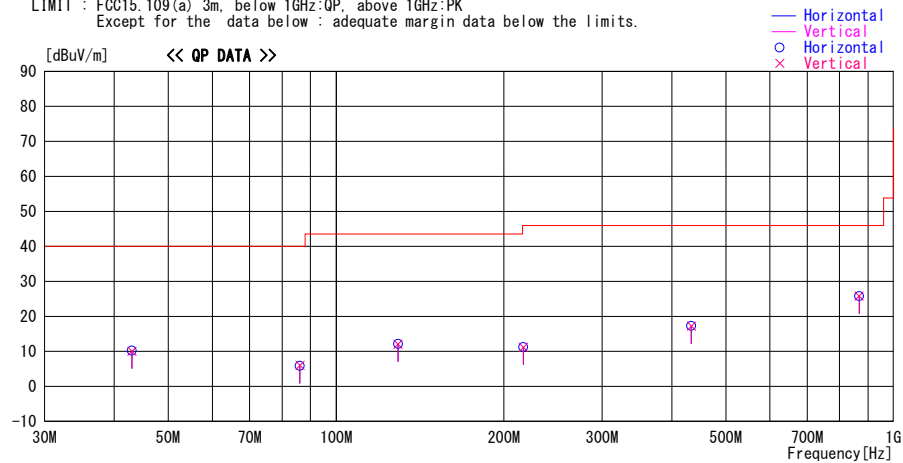
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/05

Report No. : 11370534H

Temp./Humi. : 23deg. C / 64% RH
Engineer : Masafumi Niwa

Mode / Remarks : Rx 433.92MHz Worst Axis (Hori:X,Vert:X)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



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]	
43.050	22.4	QP	12.8	-25.0	10.2	0	100	Hori.	40.0	29.8	
43.050	22.3	QP	12.8	-25.0	10.1	0	100	Vert.	40.0	29.9	
86.100	22.7	QP	7.5	-24.3	5.9	0	100	Hori.	40.0	34.1	
86.100	22.8	QP	7.5	-24.3	6.0	0	100	Vert.	40.0	34.0	
129.150	22.6	QP	13.2	-23.7	12.1	0	100	Hori.	43.5	31.4	
129.150	22.6	QP	13.2	-23.7	12.1	0	100	Vert.	43.5	31.4	
216.835	22.2	QP	11.8	-22.8	11.2	0	100	Hori.	46.0	34.8	
216.835	22.2	QP	11.8	-22.8	11.2	0	100	Vert.	46.0	34.8	
433.670	22.1	QP	16.3	-21.1	17.3	0	100	Hori.	46.0	28.7	
433.670	22.0	QP	16.3	-21.1	17.2	0	100	Vert.	46.0	28.8	
867.340	21.9	QP	21.7	-17.8	25.8	0	100	Hori.	46.0	20.2	
867.340	21.9	QP	21.7	-17.8	25.8	0	100	Vert.	46.0	20.2	

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

*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.

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Radiated Emission

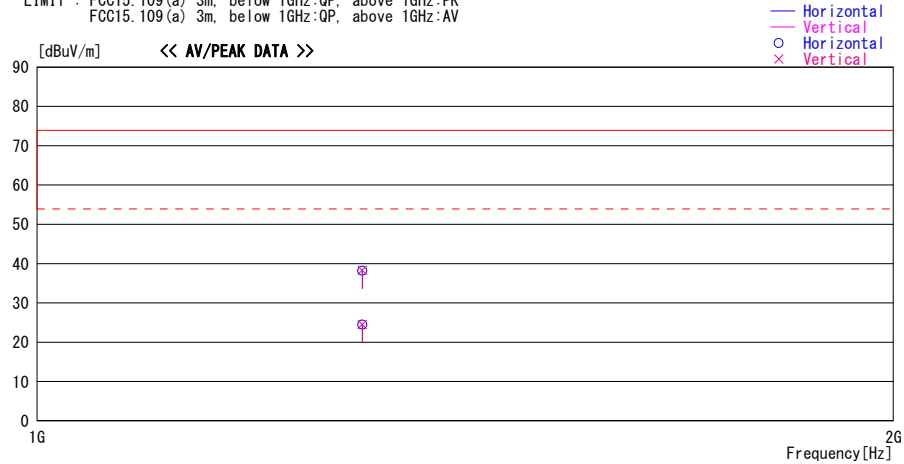
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/05

Report No. : 11370534H
Temp./Humi. : 22deg. C / 73% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Rx 433.92MHz, Worst-axis(Hor:X Ver:X)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



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]	
1301.010	43.9	PK	24.6	-30.3	38.2	0	100	Hor.	73.9	35.7	
1301.010	44.0	PK	24.6	-30.3	38.3	0	100	Vert.	73.9	35.6	
1301.010	30.2	AV	24.6	-30.3	24.5	0	100	Hor.	53.9	29.4	
1301.010	30.2	AV	24.6	-30.3	24.5	0	100	Vert.	53.9	29.4	

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

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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2015/10/07 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2015/10/11 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2016/01/30 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2016/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2016/05/29 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2016/05/20 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2016/03/24 * 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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