



EMI TEST REPORT

Test Report No. : 11581744H-B

Applicant : Sumitomo Wiring Systems, Ltd.
Type of Equipment : COMPUTER, MULTIPLEX NETWORK BODY
Model No. : DA5501
Test regulation : FCC Part 15 Subpart B: 2016
FCC ID : 2AKB8DA5501
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 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: February 8 and 13, 2017

Representative test engineer:

K. Yamamoto

Koji Yamamoto

Engineer

Consumer Technology Division

Approved by:

M. Imura

Motoya Imura

Engineer

Consumer Technology Division



NVLAP LAB CODE: 200572-0

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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

13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11581744H-B

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SECTION 1: Customer information

Company Name : Sumitomo Wiring Systems, Ltd.
Address : 1820 Nakanoike, Mikkaichi-cho, Suzuka-City, Mie Pref. 513-8631
JAPAN
Telephone Number : +81-59-382-8758
Facsimile Number : +81-59-383-8631
Contact Person : Thoru Goto

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

2.1 Identification of E.U.T.

Type of Equipment : COMPUTER, MULTIPLEX NETWORK BODY
Model No. : DA5501
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12 V
Receipt Date of Sample : January 20, 2017
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 No: DA5501 (referred to as the EUT in this report) is the COMPUTER, MULTIPLEX NETWORK BODY.

General Specification

Clock frequencies in the system : LF Transmitter: 4.000 MHz
RF Receiver: 21.948717 MHz

Radio Specification

[Transmitter part]*

Radio Type : Transmitter / Transceiver
Frequency of Operation : 125 kHz
Modulation : ASK
Method of Frequency Generation : Ceramic resonator
Antenna Type : Ferrite core winding type

[Receiver part]

Radio Type : Receiver
Frequency of Operation : 433.92 MHz
Method of Frequency Generation : Crystal

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

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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

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	17.8 dB 30.000 MHz, Vertical, 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 $k = 2$.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

3.5 Test Location

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

	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

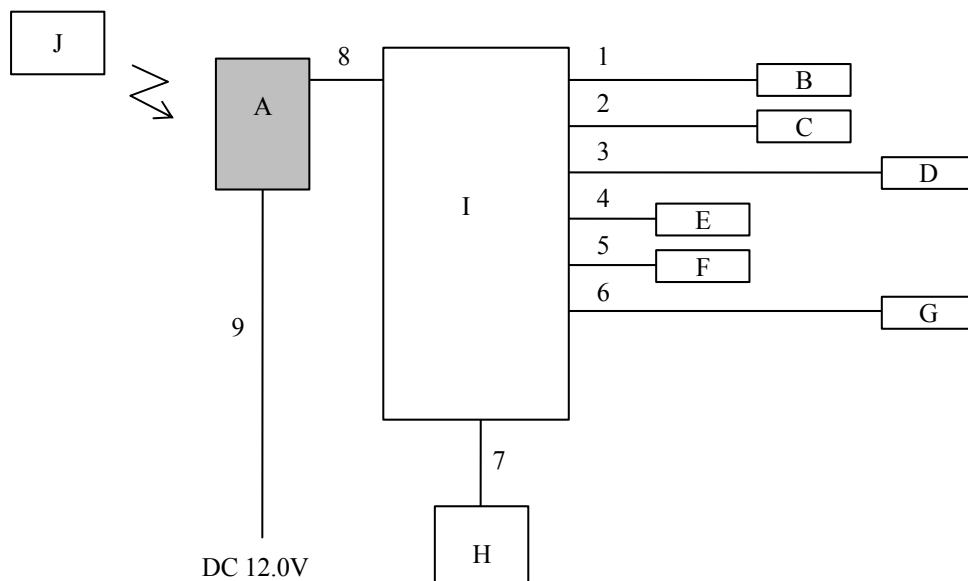
4.1 Operating modes

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.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	COMPUTER, MULTIPLEX NETWORK BODY	DA5501	6	Sumitomo Wiring Systems, Ltd.	EUT
B	LF Antenna (FRDR)	-	001	TOKAI RIKA CO., LTD	-
C	LF Antenna (FRAS)	-	001	TOKAI RIKA CO., LTD	-
D	LF Antenna (TR)	-	001	TOKAI RIKA CO., LTD	-
E	LF Antenna (F)	-	001	TOKAI RIKA CO., LTD	-
F	LF Antenna (R)	-	001	TOKAI RIKA CO., LTD	-
G	LF Antenna (M)	-	001	TOKAI RIKA CO., LTD	-
H	Push SW	-	001	TOKAI RIKA CO., LTD	-
I	Checker BOX	-	-	Sumitomo Wiring Systems, Ltd.	-
J	FOB	TWB1G0125	1	ALPS ELECTRIC CO., LTD.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	3.0	Unshielded	Unshielded	-
2	Antenna Cable	3.0	Unshielded	Unshielded	-
3	Antenna Cable	6.0	Unshielded	Unshielded	-
4	Antenna Cable	1.5	Unshielded	Unshielded	-
5	Antenna Cable	1.5	Unshielded	Unshielded	-
6	Antenna Cable	6.0	Unshielded	Unshielded	-
7	Antenna Cable	3.0	Unshielded	Unshielded	-
8	Signal Cable	3.4	Unshielded	Unshielded	-
9	DC Cable	3.8	Unshielded	Unshielded	-

UL Japan, Inc.

Ise EMC Lab.

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

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Facsimile : +81 596 24 8124

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.3 and 4semi 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 - 3000 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 1 GHz	Above 1 GHz *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: $20 \times \log (3.7 \text{ m} / 3 \text{ m}) = 1.82 \text{ dB}$

- 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.

6.5 Test result

Summary of the test results: Pass

Date: February 8, 2017
February 13, 2017

Test engineer: Shinichi Miyazono
Koji Yamamoto

UL Japan, Inc.

Ise EMC Lab.

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

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APPENDIX 1: Test data

Radiated Emission (Below 1GHz)

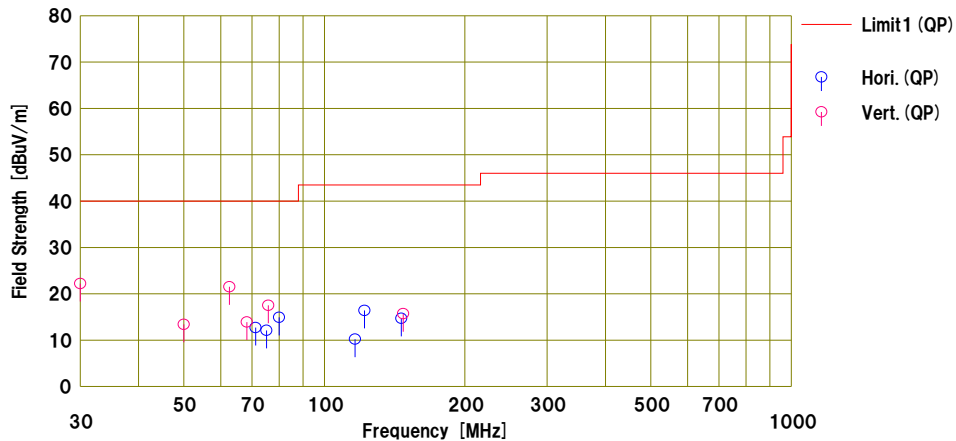
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/02/08

Report No. : 11581744H
Temp./Humi. : 24deg.C / 30% RH
Engineer : Shinichi Miyazono

Mode / Remarks : Receiving mode

Limit1 : FCC15.109 (a) 3m, below 1GHz:QP, above 1GHz:PK



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pola.	Height [cm]	Angle [deg]	Ant. Type	Comment
1	71.253	30.9	6.2	7.8	32.2	12.7	40.0	27.3	Hori.	300	200	BA	
2	75.178	30.0	6.5	7.8	32.2	12.1	40.0	27.9	Hori.	400	198	BA	
3	80.000	32.4	6.8	7.9	32.2	14.9	40.0	25.1	Hori.	300	212	BA	
4	116.318	21.8	12.3	8.3	32.2	10.2	43.5	33.3	Hori.	300	0	BA	
5	121.899	27.2	13.0	8.4	32.2	16.4	43.5	27.1	Hori.	300	344	BA	
6	146.195	23.2	14.9	8.7	32.1	14.7	43.5	28.8	Hori.	300	0	BA	
7	30.000	30.3	17.1	7.1	32.3	22.2	40.0	17.8	Vert.	100	0	BA	
8	50.000	27.3	10.8	7.5	32.2	13.4	40.0	26.6	Vert.	100	10	BA	
9	62.613	38.9	7.1	7.7	32.2	21.5	40.0	18.5	Vert.	100	252	BA	
10	68.248	32.0	6.4	7.7	32.2	13.9	40.0	26.1	Vert.	100	20	BA	
11	75.858	35.4	6.5	7.8	32.2	17.5	40.0	22.5	Vert.	100	130	BA	
12	147.513	24.2	14.9	8.7	32.1	15.7	43.5	27.8	Vert.	100	239	BA	

CHART:WITH FACTOR ANT TYPE:-30MHz:Loop, 30-200MHz:BICONICAL, 200-1000MHz:LOGPERIODIC, 1000MHz:-HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS (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.

UL Japan, Inc.
Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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Radiated Emission (Above 1GHz)

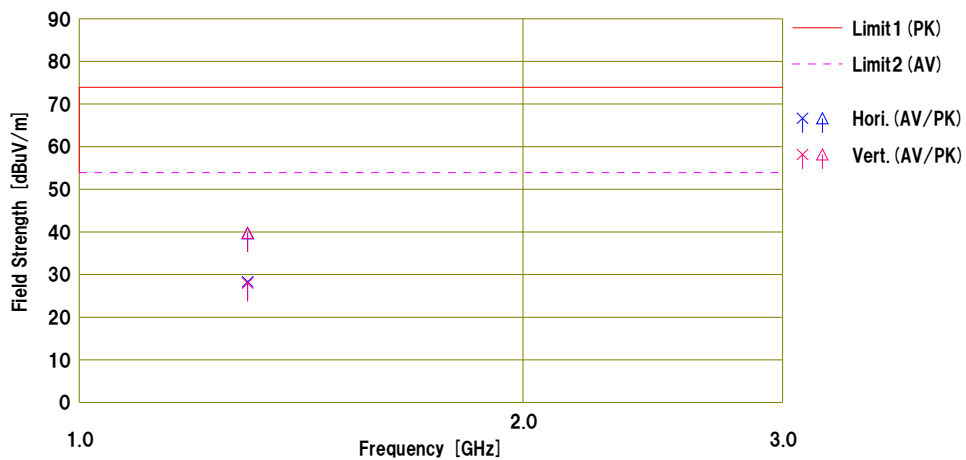
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2017/02/13

Report No. : 11581744H
Temp./Humi. : 23 deg. C / 36 % RH
Engineer : Koji Yamamoto

Mode / Remarks : Receiving mode

Limit1 : FCC15.109 (a) 3m, below 1GHz:QP, above 1GHz:PK
Limit2 : FCC15.109 (a) 3m, below 1GHz:QP, above 1GHz:AV



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	D.Fac [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		<AV> [dBuV]	<PK> [dBuV]					<AV> [dBuV/m]	<PK> [dBuV/m]	<PK> [dBuV/m]	<AV> [dBuV/m]	<PK> [dB]	<AV> [dB]					
1	1301.010	32.2	43.6	24.9	3.6	34.2	1.8	28.3	39.7	73.9	53.9	34.2	25.6	Hori.	100	0	H21	
3	1301.010	31.9	43.7	24.9	3.6	34.2	1.8	28.0	39.8	73.9	53.9	34.1	25.9	Vert.	100	0	H21	

CHART-WITH FACTOR ANT TYPE: 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS (CABLE - 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.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/19 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2017/01/20 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2017/01/12 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2016/09/28 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2016/06/21 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	00650	RE	2016/10/21 * 12
MHF-27	High Pass Filter(1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	RE	2017/01/16 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2017/01/19 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2016/08/17 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2017/01/26 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2016/12/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2016/03/24 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2017/01/19 * 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

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