



RADIO TEST REPORT

Test Report No. : 11581744H-A-R1

Applicant : Sumitomo Wiring Systems, Ltd.
Type of Equipment : COMPUTER, MULTIPLEX NETWORK BODY
Model No. : DA5501
FCC ID : 2AKB8DA5501
Test regulation : FCC Part 15 Subpart C: 2016
Test Result : Complied

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4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11581744H-A. 11581744H-A is replaced with this report.

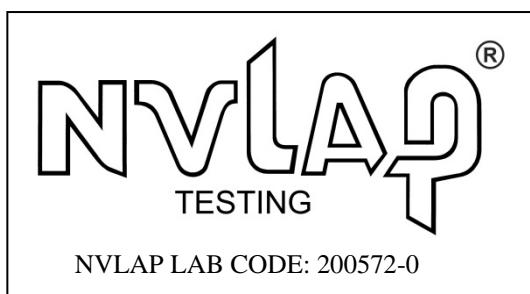
Date of test: January 31 and February 1, 2017

Representative test engineer: T. Noguchi

Takafumi Noguchi
Engineer
Consumer Technology Division

Approved by: M. Imura

Motoya Imura
Engineer
Consumer Technology Division



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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11581744H-A

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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
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 (LF Transmitter)
DC 5 V (Immobilizer)
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

[LF Transmitter and Immobilizer parts]

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 receiver 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 C
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted Emission
Section 15.209 Radiated emission limits, general requirements

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 8.8	<FCC> Section 15.207 <IC> RSS-Gen 8.8	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.4, 6.12	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 8.9	Radiated	N/A	5.0 dB 125 kHz 0 deg. PK with Duty factor	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.4, 6.13	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 8.9	Radiated	N/A	4.6 dB 74.293 MHz Vertical, QP, 112.189 MHz Vertical, QP,	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*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 Part 15.31 (e)

The test was performed with the DC power supply (DC 12 V) instead of New Battery and the EUT constantly provides the stable voltage to RF part through the regulator regardless of input voltage from New Battery. That does not affect the test result, 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 vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99 % Occupied Band Width	RSS-Gen 6.6	-	Radiated	N/A	N/A	N/A

Other than above, 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.

Test distance	Radiated emission (+/-)	
	9 kHz - 30 MHz	
3m	3.8 dB	
10m	3.7 dB	

*Measurement distance

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

* Measurement distance

Radiated emission test(3 m)

[Electric Field Strength of Fundamental Emission]

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

[Electric Field Strength of Spurious Emission]

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

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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	-	8.0 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 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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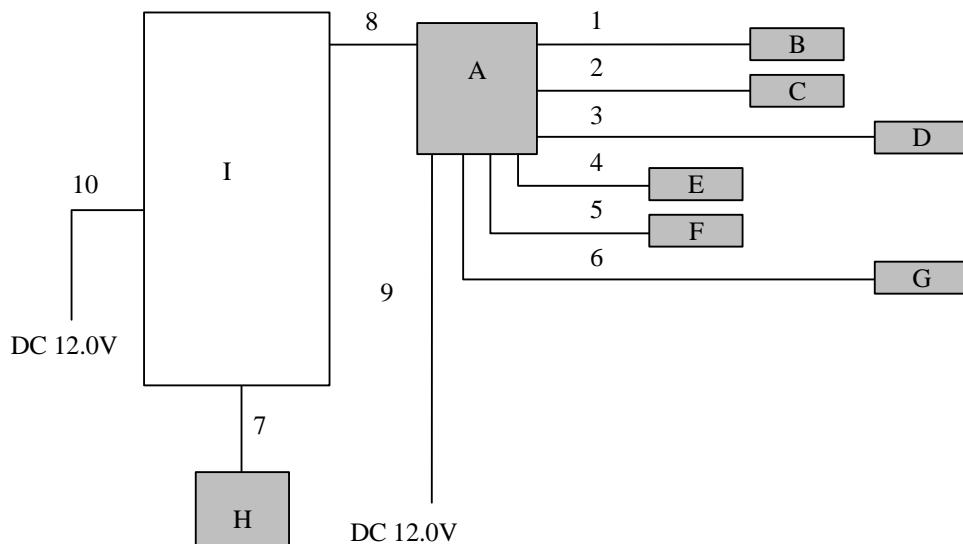
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

Test mode	Remarks
Transmitting mode (Tx) 125 kHz	1) Tx LF Antenna 2) Tx Push SW

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

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

* The EUT does not transmit simultaneously from multiple antennas.

* Antennas were evaluated with the worst duty respectively.

[LF Transmitter part]

This test was set not to transmit data randomly from each antenna but to be transmitted from one antenna continuously as a Worst case. After pre-confirmation, as no difference was observed, Antenna (Rear) was selected for the representative.

[Push SW (Immobilizer part)]

The test was performed with continuation transmission of the worst duty.

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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 (Driver)	-	001	TOKAI RIKA CO., LTD	EUT
C	LF Antenna (Passenger)	-	001	TOKAI RIKA CO., LTD	EUT
D	LF Antenna (Back)	-	001	TOKAI RIKA CO., LTD	EUT
E	LF Antenna (Front)	-	001	TOKAI RIKA CO., LTD	EUT
F	LF Antenna (Rear)	-	001	TOKAI RIKA CO., LTD	EUT
G	LF Antenna (Middle)	-	001	TOKAI RIKA CO., LTD	EUT
H	Push SW	-	001	TOKAI RIKA CO., LTD	EUT
I	Checker BOX	-	-	Sumitomo Wiring Systems, 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	7.2	Unshielded	Unshielded	-
10	DC Cable	3.8	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0 m by 0.5 m, raised 0.8 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency : From 9 kHz to 30 MHz

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: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

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

Frequency: From 30 MHz to 1 GHz

The measuring antenna height 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.

The test was made with the detector (RBW / VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

*1) Distance Factor: $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

*2) Distance Factor: $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

- The carrier level and 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.

Also, it was confirmed that there were no differences in the noise levels with or without transponder at the time of a transmission of Push SW.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

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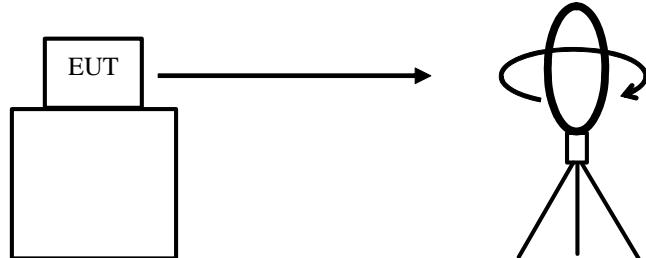
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Measurement range : 9 kHz - 1 GHz
Test data : APPENDIX 1
Test result : Pass

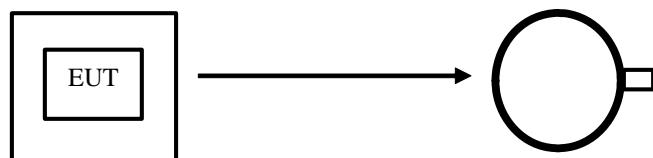
Date: January 30, 2017 Test engineer: Takafumi Noguchi

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

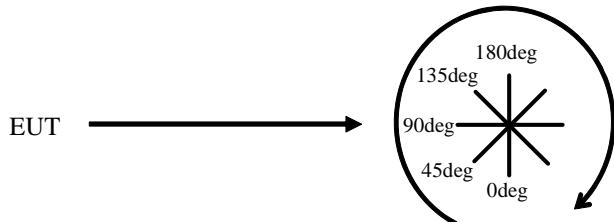


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

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SECTION 6: -26dB Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26 dB Bandwidth	50 kHz	1 kHz	3 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1

Test result : Pass

SECTION 7: 99% Occupied Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	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 %.
Peak hold was applied as Worst-case measurement.

Test data : APPENDIX 1

Test result : Pass

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APPENDIX 1: Test data

Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
 Order No. 11581744H
 Date 01/31/2017
 Temperature/ Humidity 25 deg. C / 31 % RH
 Engineer Takafumi Noguchi
 Mode Tx 125kHz LF Antenna (Rear)

LF Antenna

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	106.8	19.7	-73.7	32.2	-	20.6	45.6	25.0	Fundamental
0	0.25000	PK	75.7	19.6	-73.7	32.2	-	-10.6	39.6	50.2	
0	0.37500	PK	59.2	19.6	-73.7	32.2	-	-27.1	36.1	63.2	
0	0.50000	QP	34.6	19.5	-33.7	32.2	-	-11.8	33.6	45.4	
0	0.62500	QP	43.1	19.5	-33.7	32.1	-	-3.2	31.7	34.9	
0	0.75000	QP	31.6	19.5	-33.7	32.1	-	-14.7	30.1	44.8	
0	0.87500	QP	38.2	19.5	-33.6	32.1	-	-8.0	28.7	36.7	
0	1.00000	QP	31.0	19.5	-33.6	32.1	-	-15.2	27.6	42.8	
0	1.12500	QP	35.1	19.5	-33.6	32.1	-	-11.1	26.5	37.6	
0	1.25000	QP	30.9	19.5	-33.6	32.1	-	-15.3	25.6	40.9	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.125	AV	106.8	19.7	-73.7	32.2	0.0	20.6	25.6	5.0	
0	0.250	AV	75.7	19.6	-73.7	32.2	0.0	-10.6	19.6	30.2	
0	0.375	AV	59.2	19.6	-73.7	32.2	0.0	-27.1	16.1	43.2	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	106.8	19.7	6.3	32.2	-	100.6	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

* All spurious emissions lower than this result.

Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
 Order No. 11581744H
 Date 01/31/2017
 Temperature/ Humidity 25 deg. C / 31 % RH
 Engineer Takafumi Noguchi
 Mode Tx 125kHz

Push SW

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	89.4	19.7	-73.7	32.2	-	3.2	45.6	42.4	Fundamental
0	0.25000	PK	46.8	19.6	-73.7	32.2	-	-39.5	39.6	79.1	
0	0.37500	PK	54.5	19.6	-73.7	32.2	-	-31.8	36.1	67.9	
0	0.50000	QP	32.5	19.5	-33.7	32.2	-	-13.9	33.6	47.5	
0	0.62500	QP	41.6	19.5	-33.7	32.1	-	-4.7	31.7	36.4	
0	0.75000	QP	31.5	19.5	-33.7	32.1	-	-14.8	30.1	44.9	
0	0.87500	QP	37.3	19.5	-33.6	32.1	-	-8.9	28.7	37.6	
0	1.00000	QP	30.8	19.5	-33.6	32.1	-	-15.4	27.6	43.0	
0	1.12500	QP	34.4	19.5	-33.6	32.1	-	-11.8	26.5	38.3	
0	1.25000	QP	30.8	19.5	-33.6	32.1	-	-15.4	25.6	41.0	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.125	AV	89.4	19.7	-73.7	32.2	0.0	3.2	25.6	22.4	
0	0.250	AV	46.8	19.6	-73.7	32.2	0.0	-39.5	19.6	59.1	
0	0.375	AV	54.5	19.6	-73.7	32.2	0.0	-31.8	16.1	47.9	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	89.4	19.7	6.3	32.2	-	83.2	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

* All spurious emissions lower than this result.

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Radiated Emission above 30 MHz (Spurious Emission)
 LF Antenna

DATA OF RADIATED EMISSION TEST

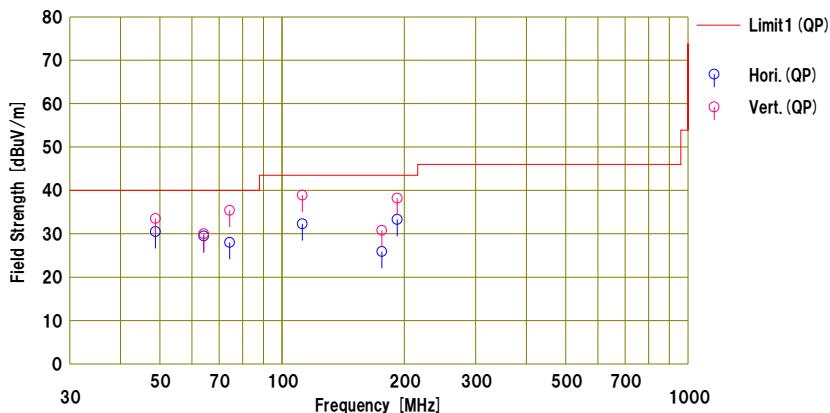
UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
 Date : 2017/02/01

Report No. : 11581744H

Temp./Humi. : 25deg. C / 31% RH
 Engineer : Takafumi Noguchi

Mode / Remarks : Tx 125kHz

Limit1 : FCC15.209 3m. below 1GHz:QP, above 1GHz:PK



No.	Freq. MHz	Reading <QP> [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result <QP> [dBuV/m]	Limit <QP> [dBuV/m]	Margin [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	48.778	43.8	11.2	7.6	32.1	30.5	40.0	9.5	Hor.	400	360	BC	
2	48.778	46.8	11.2	7.6	32.1	33.5	40.0	6.5	Vert.	100	118	BC	
3	64.162	47.0	6.8	7.8	32.1	29.5	40.0	10.5	Hor.	312	161	BC	
4	64.162	47.5	6.8	7.8	32.1	30.0	40.0	10.0	Vert.	100	178	BC	
5	74.293	45.9	6.3	7.8	32.1	28.0	40.0	12.0	Hor.	208	255	BC	
6	74.293	53.3	6.3	7.8	32.1	35.4	40.0	4.6	Vert.	100	262	BC	
7	112.189	44.3	11.7	8.4	32.1	32.3	43.5	11.2	Hor.	305	343	BC	
8	112.189	50.9	11.7	8.4	32.1	38.9	43.5	4.6	Vert.	100	242	BC	
9	176.102	32.9	16.1	8.9	32.0	25.9	43.5	17.6	Hor.	187	246	BC	
10	176.102	37.8	16.1	8.9	32.0	30.8	43.5	12.7	Vert.	100	214	BC	
11	192.235	36.9	16.3	9.1	32.0	33.3	43.5	10.2	Hor.	164	309	BC	
12	192.235	44.8	16.3	9.1	32.0	38.2	43.5	5.3	Vert.	100	195	BC	

CHART:WITH FACTOR ANT TYPE:30~200MHz:BICONICAL, 200MHz~1000MHz:LOGPERIODIC, 1000MHz~:HORN
 Except for the above table : adequate margin data below the limits.

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

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Radiated Emission above 30 MHz (Spurious Emission)
 Push SW

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
 Date : 2017/02/01

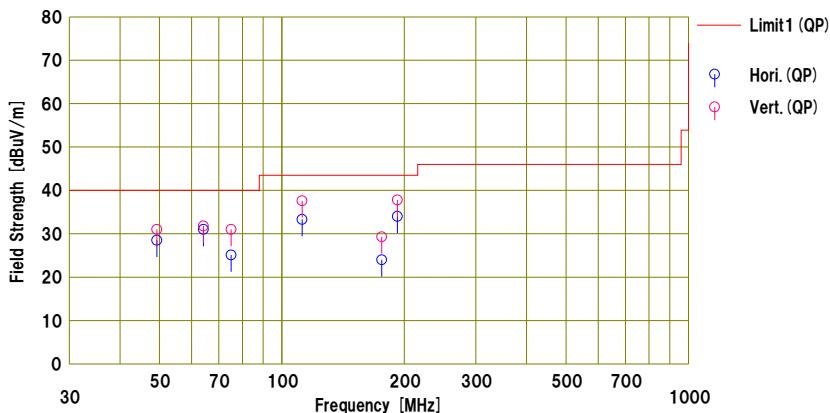
Report No. : 11581744H

Temp./Humi. : 25deg. C / 31% RH

Engineer : Takafumi Noguchi

Mode / Remarks : Tx 125kHz

Limit1 : FCC15.209 3m. below 1GHz:QP, above 1GHz:PK



No.	Freq. MHz	Reading <QP> [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result <QP> [dBuV/m]	Limit <QP> [dBuV/m]	Margin [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	49.277	42.0	11.0	7.6	32.1	28.5	40.0	11.5	Hor.	400	360	BC	
2	49.277	44.5	11.0	7.6	32.1	31.0	40.0	9.0	Vert.	100	130	BC	
3	64.161	48.5	6.8	7.8	32.1	31.0	40.0	9.0	Hor.	312	161	BC	
4	64.161	49.3	6.8	7.8	32.1	31.8	40.0	8.2	Vert.	100	160	BC	
5	75.041	42.8	6.4	8.0	32.1	25.1	40.0	14.9	Hor.	209	265	BC	
6	75.041	48.7	6.4	8.0	32.1	31.0	40.0	9.0	Vert.	100	263	BC	
7	112.187	45.3	11.7	8.4	32.1	33.3	43.5	10.2	Hor.	100	340	BC	
8	112.187	49.6	11.7	8.4	32.1	37.6	43.5	5.9	Vert.	100	247	BC	
9	176.097	31.0	11.1	8.9	32.0	24.0	43.5	19.5	Hor.	188	255	BC	
10	176.097	36.3	16.1	8.9	32.0	29.3	43.5	14.2	Vert.	100	211	BC	
11	192.463	40.6	16.3	9.1	32.0	34.0	43.5	9.5	Hor.	165	310	BC	
12	192.463	44.4	16.3	9.1	32.0	37.6	43.5	5.7	Vert.	100	180	BC	

CHART:WITH FACTOR ANT TYPE:30~200MHz:BICONICAL, 200MHz~1000MHz:LOGPERIODIC, 1000MHz~:HORN
 Except for the above table : adequate margin data below the limits.

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

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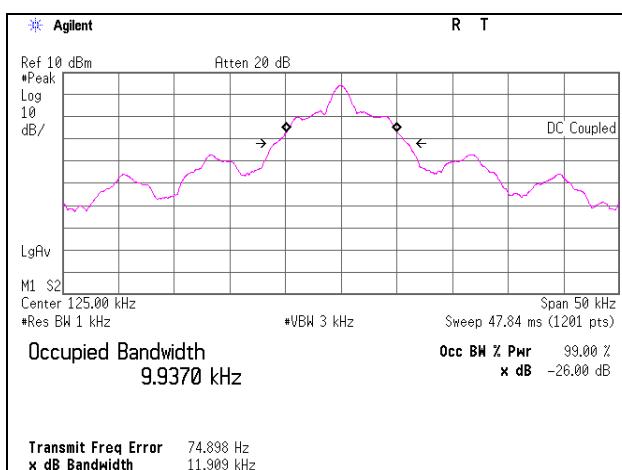
Telephone : +81 596 24 8999
 Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99% Occupied Bandwidth

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No. 11581744H
Date 01/31/2017
Temperature/ Humidity 25 deg. C / 31 % RH
Engineer Takafumi Noguchi
Mode Tx 125kHz

LF Antenna

-26 dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
11.909	9.9370



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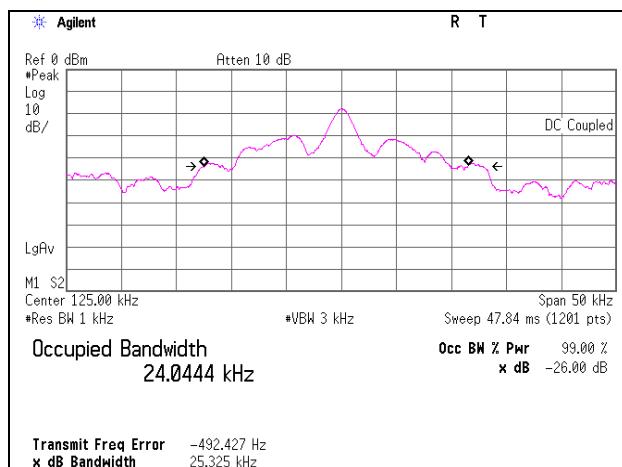
Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99% Occupied Bandwidth

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
Order No. 11581744H
Date 01/31/2017
Temperature/ Humidity 25 deg. C / 31 % RH
Engineer Takafumi Noguchi
Mode Tx 125kHz

Push SW

-26 dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
25.325	24.0444



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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-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
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2016/11/23 * 12
MLA-20	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-189	RE	2017/01/05 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MAT-97	Attenuator	KEYSIGHT	8491A	MY52462282	RE	2016/10/31 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2016/03/18 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2017/01/19 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2016/10/14 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(5m)/ 421-010(1m)/ suciform141-PE(1m)/ RFM-E121(Switcher)	-/04178	RE	2016/07/20 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2016/06/17 * 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: Spurious emission

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