



RADIO TEST REPORT

Test Report No. : 10697030H-B-R1

Applicant : OMRON Corporation
Type of Equipment : Carrier ID Reader/Writer (RFID)
Model No. : V640-HAM11-L-ETN-V2 (Amplifier Unit)
FCC ID : E4EV640HAM11LV2
Test regulation : FCC Part 15 Subpart C: 2015
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 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 10697030H-B. 10697030H-B is replaced with this report.

Date of test: March 12 to 18, 2015

Representative test engineer:

Kazuya Yoshioka
Engineer
Consumer Technology Division

Approved by:

Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

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13-EM-F0429

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SECTION 1: Customer information

Company Name : OMRON Corporation
Address : 2-2-1, NISHI-KUSATSU, KUSATSU-CITY, SHIGA-PREF., 525-0035
JAPAN
Telephone Number : +81-77-565-5287
Facsimile Number : +81-77-565-5569
Contact Person : Hiroaki Motoshima

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

2.1 Identification of E.U.T.

Type of Equipment : Carrier ID Reader/Writer (RFID)
Model No. : V640-HAM11-L-ETN-V2 (Amplifier Unit)
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 24V
Receipt Date of Sample : February 24, 2015
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

General Specification

Clock frequency(ies) in the system : 8MHz (for both types), 125MHz (EtherNet Communication type only)

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 134.2 kHz
Modulation : Amplitude Shift Keying
Power Supply (radio part input) : DC 8V
Antenna type : Loop Coil Antenna

Similar model

This EUT has similar model: V640-HAM11-L-V2.

- V640-HAM11-L-ETN-V2: EtherNet Communication type and Long distance type
- V640-HAM11-L-V2: Serial Communication type and Long distance type

There is no difference except for these.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted Emission
Section 15.209 Radiated emission limits, general requirements

* The EUT complies with FCC Part 15 Subpart B: 2014, final revised on December 23, 2014.

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 8V) constantly to RF Module regardless of input voltage. 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.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.4:2009 7. AC powerline conducted emission measurements <IC> RSS-Gen 8.8	<FCC> Section 15.207 <IC> RSS-Gen 8.8	-	N/A	[QP] 12.6dB 0.54652MHz, L [AV] 2.7dB 0.54652MHz, L	Complied
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2009 13. Measurement of intentional radiators <IC> RSS-Gen 6.4, 6.12	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 8.9	Radiated	N/A	3.5dB 0.13420MHz 0 deg., PK (PK with Duty factor)	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2009 13. Measurement of intentional radiators <IC> RSS-Gen 6.4, 6.13	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 8.9	Radiated	N/A	0.3dB 38.849MHz, Vertical, QP	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2009 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. 13-EM-W0420 and 13-EM-W0422.

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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 room (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.4dB
No.4	3.5dB

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	4.3dB	5.5dB	6.3dB	5.5dB	5.8dB	5.8dB	4.3dB
No.2	4.2dB	5.4dB	6.3dB	5.4dB	5.7dB	5.9dB	5.6dB
No.3	4.4dB	5.4dB	6.4dB	5.2dB	5.5dB	5.8dB	5.5dB
No.4	4.7dB	5.6dB	6.4dB	5.3dB	5.7dB	5.9dB	5.5dB

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

Conducted emission test

[QP]

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

[AV]

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

Radiated emission test (3m)

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

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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
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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.

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

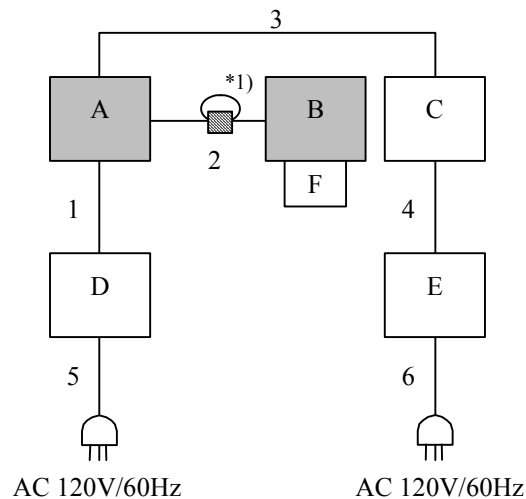
4.1 Operating Modes

Test mode	Remarks
Transmitting 134.2kHz With Tag mode	*1)
PC Software: UcomV640 Version: 1.0.0.0 The EUT does not have a Power Control function. The test was performed with a fixed value . Mass-produced product will have same level as it.	

*1) This EUT has two modes which Tag is attached to the EUT or not. The worst case was confirmed with and without Tag, as a result, the test with Tag was the worst case. Therefore the test with Tag was performed only.

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

4.2 Configuration and peripherals



▨ : Non-standard Ferrite Core

* 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	Carrier ID Reader/Writer (RFID)	V640-HAM11-L-ETN-V2 (Amplifier Unit)	7	OMRON Corporation	EUT
B	CIDRW Head (Antenna)	V640-HS62	3	OMRON Corporation	EUT
C	Switching HUB	W4S1-05B	17310K	OMRON Corporation	-
D	Power Supply	S8VS-01524	-	OMRON Corporation	-
E	Power Supply	S8VS-03024	-	OMRON Corporation	-
F	Tag	RI-TRP-DR2B-30	1	OMRON Corporation	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Antenna Cable	2.0	Shielded	Shielded	*1)
3	LAN Cable	5.0	Shielded	Shielded	-
4	DC Cable	0.6	Unshielded	Unshielded	-
5	AC Cable	1.9	Unshielded	Unshielded	-
6	AC Cable	1.9	Unshielded	Unshielded	-

<Notes for Ferrite cores>

*1) Model No. ZCAT 2035-0930 (Manufacturer: TDK), 10cm from Item A, 2turn

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cable and AC cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

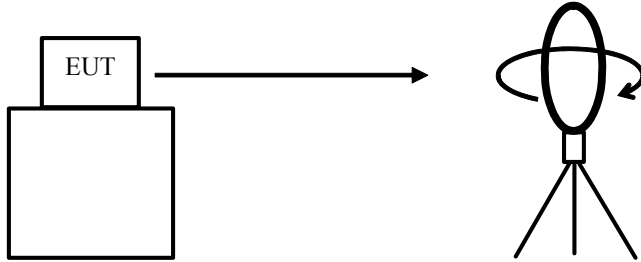
Detector : QP CISPR AV detector (IF BW 9 kHz)
Measurement range : 0.15-30MHz
Test data : APPENDIX 1
Test result : Pass

Date: March 14, 2015

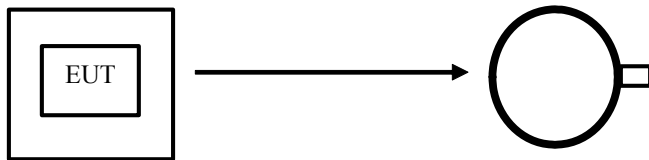
Test engineer: Kazuya Yoshioka

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

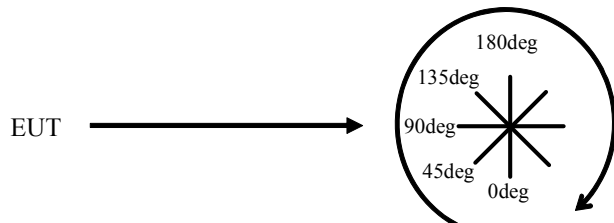


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 7: -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 1
Test result : Pass

SECTION 8: 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 -26dB Bandwidth	1kHz	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

APPENDIX 1: Data of EMI test

Conducted Emission

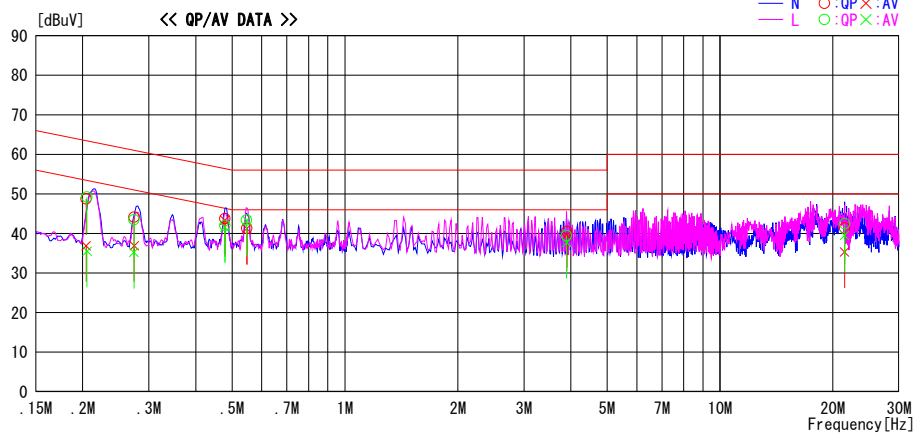
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
 Date : 2015/03/14

Report No. : 10697030H
 Temp./Humi. : 23deg. C / 39% RH
 Engineer : Kazuya Yoshioka

Mode / Remarks : Tx 134.2kHz with tag

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.20422	25.7	13.9	23.0	48.7	36.9	63.4	53.4	14.7	16.5	N	
0.27391	21.2	14.0	22.9	44.1	36.9	61.0	51.0	16.9	14.1	N	
0.47841	20.8	20.4	22.9	43.7	43.3	56.4	46.4	12.7	3.1	N	
0.54712	18.5	18.4	22.8	41.3	41.2	56.0	46.0	14.7	4.8	N	
3.90192	17.2	16.3	23.3	40.5	39.6	56.0	46.0	15.5	6.4	N	
21.49040	16.9	10.8	24.5	41.4	35.3	60.0	50.0	18.6	14.7	N	
0.20521	26.2	12.5	23.0	49.2	35.5	63.4	53.4	14.2	17.9	L	
0.27371	20.6	12.3	22.9	43.5	35.2	61.0	51.0	17.5	15.8	L	
0.47841	19.1	18.7	22.9	42.0	41.6	56.4	46.4	14.4	4.8	L	
0.54652	20.6	20.5	22.8	43.4	43.3	56.0	46.0	12.6	2.7	L	
3.89830	16.2	14.4	23.3	39.5	37.7	56.0	46.0	16.5	8.3	L	
21.47150	18.0	15.0	24.5	42.5	39.5	60.0	50.0	17.5	10.5	L	

CHART : WITH FACTOR, Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + FILTER + ATTEN + CABLE)
 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.

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10697030H
Date : 03/13/2015
Temperature/ Humidity : 20 deg. C / 30% RH
Engineer : Kenshi Shimomura
Mode : Tx 134.2kHz

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	0.13420	PK	75.8	19.6	-73.9	0.0	-	21.5	45.0	23.5	Fundamental
0	0.26840	PK	32.0	19.6	-73.9	0.0	-	-22.3	39.0	61.3	
0	0.40260	PK	35.5	19.6	-73.9	0.0	-	-18.8	35.5	54.3	
0	0.53680	QP	22.6	19.5	-33.9	0.0	-	8.2	33.0	24.8	
0	0.67100	QP	24.4	19.5	-33.8	0.0	-	10.1	31.1	21.0	
0	0.80520	QP	19.2	19.5	-33.8	0.0	-	4.9	29.5	24.6	
0	0.93940	QP	18.5	19.5	-33.8	0.0	-	4.2	28.1	23.9	
0	1.07360	QP	17.2	19.5	-33.8	0.0	-	2.9	26.9	24.0	
0	1.20780	QP	14.3	19.5	-33.8	0.0	-	0.0	25.9	25.9	
0	1.34200	QP	15.4	19.5	-33.7	0.0	-	1.2	25.0	23.8	

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	0.13420	PK	75.8	19.6	-73.9	0.0	0.0	21.5	25.0	3.5	
0	0.26840	PK	32.0	19.6	-73.9	0.0	0.0	-22.3	19.0	41.3	
0	0.40260	PK	35.5	19.6	-73.9	0.0	0.0	-18.8	15.5	34.3	

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

* Since the peak emission result satisfied the average limit, the peak emission result with Duty Factor was calculated as Duty 100%.

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	0.13420	PEAK	75.8	19.6	6.1	0.0	-	101.5	-	-	Fundamental

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

* All spurious emissions lower than this result.

Radiated Emission above 30MHz (Spurious Emission)

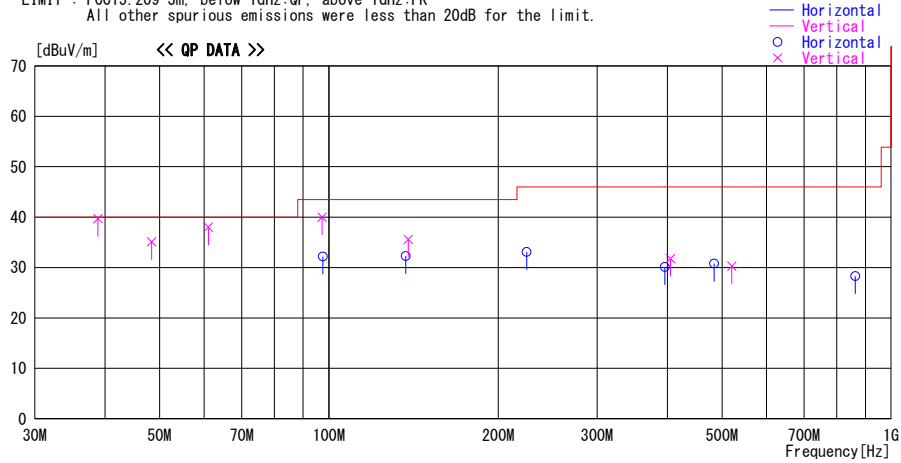
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
 Date : 2015/03/12

Report No. : 10697030H
 Temp./Humi. : 17deg. C / 39% RH
 Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 134.2kHz Worst axis ant Z ECU Z Ant

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
 All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
38.849	71.9	QP	14.7	-46.9	39.7	258	100	Vert.	40.0	0.3	
97.299	76.6	QP	9.7	-46.3	40.0	3	100	Vert.	43.5	3.5	
48.380	70.5	QP	11.2	-46.6	35.1	0	100	Vert.	40.0	4.9	
61.050	77.3	QP	7.3	-46.6	38.0	100	100	Vert.	40.0	2.0	
97.568	68.8	QP	9.7	-46.3	32.2	0	302	Hori.	43.5	11.3	
137.023	64.0	QP	14.2	-45.9	32.3	144	212	Hori.	43.5	11.2	
138.450	67.1	QP	14.3	-45.8	35.6	171	100	Vert.	43.5	7.9	
224.849	61.5	QP	16.8	-45.2	33.1	0	300	Hori.	46.0	12.9	
395.728	56.5	QP	17.5	-43.9	30.1	5	270	Hori.	46.0	15.9	
404.999	58.1	QP	17.6	-43.9	31.8	85	100	Vert.	46.0	14.2	
484.490	55.7	QP	18.5	-43.4	30.8	259	181	Hori.	46.0	15.2	
520.598	54.8	QP	18.9	-43.4	30.3	353	100	Vert.	46.0	15.7	
863.504	47.7	QP	22.3	-41.7	28.3	212	116	Hori.	46.0	17.7	

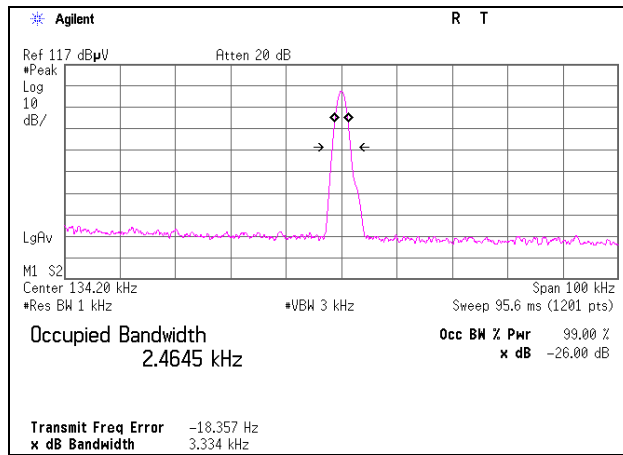
CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN
 CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATTEN. - GAIN (AMP))

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

-26dB Bandwidth and 99% Occupied Bandwidth

Report No. 10697030H
 Test place Ise EMC Lab.
 Semi Anechoic Chamber No.3
 Date 03/18/2015
 Temperature / Humidity 23 deg. C / 44 % RH
 Engineer Takumi Shimada
 Mode Tx 134.2 kHz

-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
3.334	2.4645



APPENDIX 2: Test instruments

EMI test equipment

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/CE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2015/01/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE/CE	2014/10/17 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE/CE	2014/06/03 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2014/10/18 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2014/10/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2015/02/06 * 12
MAT-02	Attenuator	Weinschel Corp	2	BL0968	RE	2014/11/11 * 12
MPA-15	Pre Amplifier	SONOMA INSTRUMENT	315	260698	RE	2014/06/16 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2014/10/04 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2015/02/06 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2014/07/28 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2014/11/11 * 12
MLS-25	LISN(AMN)	Schwarzbeck	NSLK8127	8127-731	CE(EUT)	2014/07/09 * 12
MLS-26	LISN(AMN)	Schwarzbeck	NSLK8127	8127-732	CE(AE)	2014/07/09 * 12
MTA-28	Terminator	TME	CT-01	-	CE	2014/11/26 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 12
MHF-24	High Pass Filter 0.15-30MHz	Rohde & Schwarz	EZ-25/3	100041	CE	2015/02/19 * 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:

CE: Conducted Emission

RE: Spurious emission

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