



Test report No. : 10620455H-R1
Page : 1 of 15
Issued date : January 20, 2015
Revised date : January 29, 2015
FCC ID : CWTWD1G776

EMI TEST REPORT

Test Report No. : 10620455H-R1

Applicant : ALPS ELECTRIC CO., LTD.
Type of Equipment : TPMS/RKE Receiver
Model No. : TWD1G776
Test regulation : FCC Part 15 Subpart B: 2015
FCC ID : CWTWD1G776
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)
7. This report is a revised version of 10620455H. 10620455H is replaced with this report.

Date of test: January 6, 2015

Representative test engineer:


Masatoshi Nishiguchi
Engineer
Consumer Technology Division

Approved by:


Takayuki Shimada
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.
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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

Company Name : ALPS ELECTRIC CO., LTD.
Address : 6-3-36, Nakazato, Furukawa, Osaki-city, Miyagi-pref, 989-6181, Japan
Telephone Number : +81-229-23-5111
Facsimile Number : +81-229-23-5129
Contact Person : Toshiya Ikarashi

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

Type of Equipment : TPMS/RKE Receiver
Model No. : TWD1G776
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : December 24, 2014
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

Model No: TWD1G776 (referred to as the EUT in this report) is the TPMS/RKE Receiver.

Feature of EUT : This TPMS/RKE Receiver receives and detects RF signal from keyless transmitter, and performs locking or unlocking of a door.
It also receives RF signal from TPMS sensor, warns trouble of air pressure.

General Specification

Clock frequencies in the system : 17.77MHz

Radio Specification

Frequency of operation : 433.92MHz
Type of modulation : FSK
Antenna Type : Built-in transformation whip antenna
Method of Frequency Generation : Crystal, PLL
Local frequency : 433.6896MHz
IF frequency : 230kHz
Operating voltage (inner) : DC 9.0V to 16.0V
Operating Temperature : -30 deg. C to +80 deg. C

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: 2015, final revised on January 21, 2015

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

* The revision on January 21, 2015 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: 2003 7. AC powerline conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
Radiated emission	FCC: ANSI C63.4: 2003 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	8.7dB 36.559MHz Vertical, QP	Complied
*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.

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	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

Radiated emission test(3m)

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

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3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
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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 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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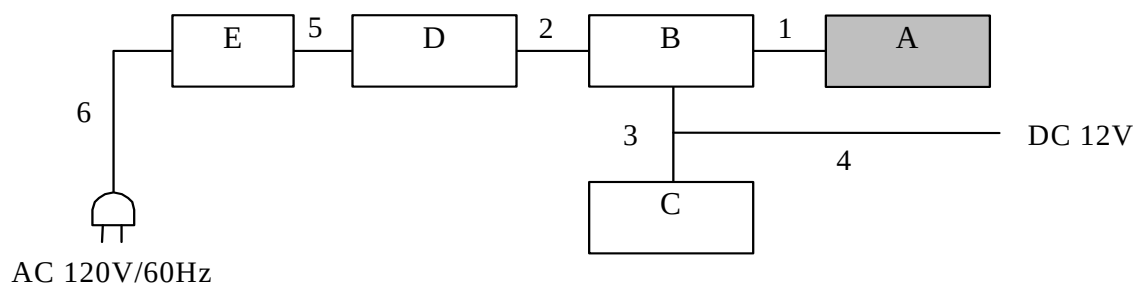
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

Mode	Remarks
RKE Receiving mode (Rx) 433.92MHz	RKE Receiver was operated manually by a test engineer and the test was performed with the EUT receiving 433.92MHz.
TPMS Receiving mode (Rx) 433.92MHz	TPMS Receiver was tested with continuous receiving.

*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the 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	TPMS/RKE Receiver	TWD1G776	P10505972A2-8	ALPS ELECTRIC CO., LTD.	EUT
B	Level Converter	-	P10505972A-6	ALPS ELECTRIC CO., LTD.	-
C	TPMS DUMMY TRANSMITTER	-	P10505972A-3	ALPS ELECTRIC CO., LTD.	-
D	Laptop PC	Compaq 67306	CNU0092TPJ	HP	-
E	AC Adapter	N20832	F3-07110165670C	HP	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal cable	2.0	Unshielded	Unshielded	-
2	RS232C cable	2.0	Shielded	Shielded	-
3	DC cable	0.9	Unshielded	Unshielded	-
4	DC cable	0.9	Unshielded	Unshielded	-
5	DC Cable	1.8	Shielded	Shielded	-
6	AC Cable	1.8	Shielded	Shielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.1 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m 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 : 30MHz-300MHz (Biconical antenna) / 300MHz-1000MHz (Logperiodic antenna)
1000MHz-2000MHz (Horn antenna)
Test distance : 3m
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 4m 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
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120kHz	PK: BW 1MHz, CISPR AV: BW 1MHz

- 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

Date: January 6, 2015

Test engineer: Koji Yamamoto

UL Japan, Inc.

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APPENDIX 1: Data of EMI test

Radiated Emission (Below 1GHz)

DATA OF RADIATED EMISSION TEST

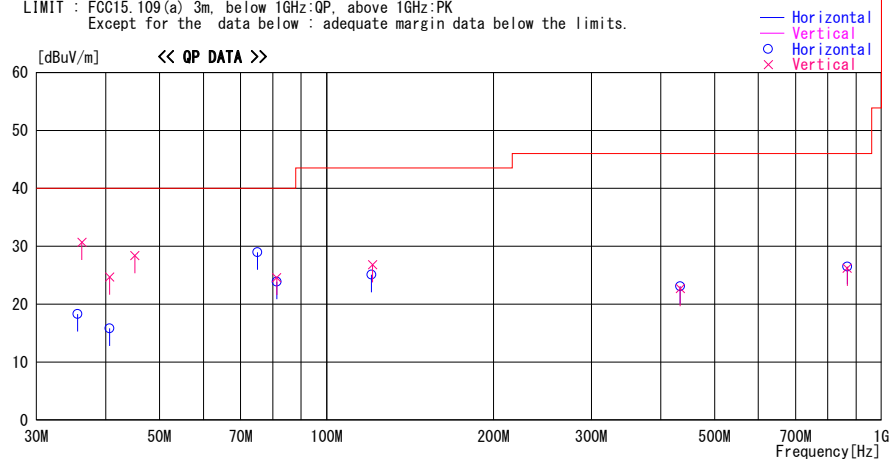
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/01/06

Report No. : 10620455H

Temp./Humi. : 23deg. C / 35% RH
Engineer : Koji Yamamoto

Mode / Remarks : RKE Receiving mode 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	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
35.558	33.9	QP	15.7	-31.3	18.3	214	300	Hori.	40.0	21.7	
36.221	46.5	QP	15.5	-31.3	30.7	18	100	Vert.	40.0	9.3	
40.660	32.8	QP	14.2	-31.2	15.8	200	300	Hori.	40.0	24.2	
40.660	41.7	QP	14.2	-31.2	24.7	226	100	Vert.	40.0	15.3	
45.118	47.0	QP	12.5	-31.1	28.4	159	100	Vert.	40.0	11.6	
75.001	53.3	QP	6.4	-30.7	29.0	216	300	Hori.	40.0	11.0	
81.318	47.9	QP	6.6	-30.6	23.9	18	300	Hori.	40.0	16.1	
81.318	48.6	QP	6.6	-30.6	24.6	254	100	Vert.	40.0	15.4	
120.449	42.5	QP	12.8	-30.2	25.1	267	300	Hori.	43.5	18.4	
121.010	44.1	QP	12.9	-30.2	26.8	109	100	Vert.	43.5	16.7	
433.691	31.9	QP	17.7	-26.9	22.7	4	200	Vert.	46.0	23.3	
433.691	32.3	QP	17.7	-26.9	23.1	299	200	Hori.	46.0	22.9	
867.317	28.2	QP	22.0	-24.0	26.2	155	100	Vert.	46.0	19.8	
867.317	28.5	QP	22.0	-24.0	26.5	81	200	Hori.	46.0	19.5	

CHART:WITH FACTOR ANT TYPE:-30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATTN - 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 (Below 1GHz)

DATA OF RADIATED EMISSION TEST

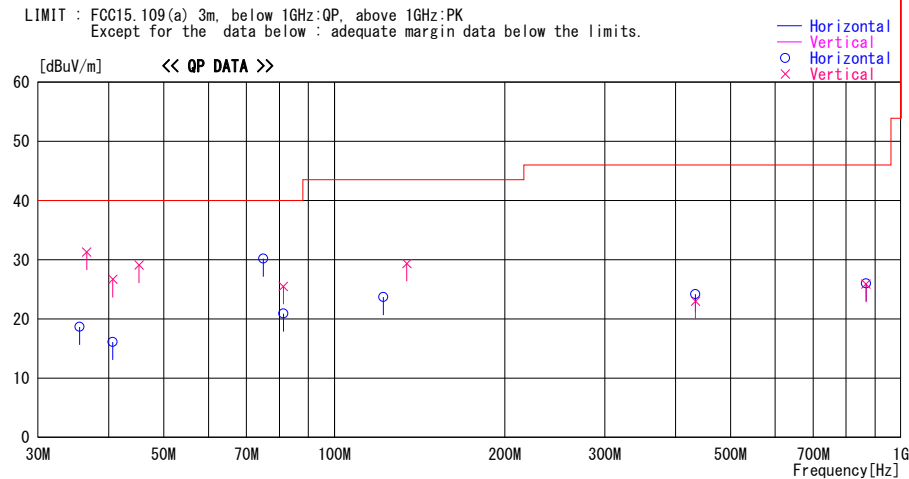
UL Japan, Inc. Ise EMC Lab. No.1 Semi Anechoic Chamber
Date : 2015/01/06

Report No. : 10620455H

Temp./Humi. : 23deg. C / 35% RH
Engineer : Koji Yamamoto

Mode / Remarks : TPMS Receiving mode 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 [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
35.552	34.3	QP	15.7	-31.3	18.7	352	276	Hori.	40.0	21.3	
36.559	47.2	QP	15.4	-31.3	31.3	354	100	Vert.	40.0	8.7	
40.657	43.7	QP	14.2	-31.2	26.7	210	100	Vert.	40.0	13.3	
40.657	33.1	QP	14.2	-31.2	16.1	15	300	Hori.	40.0	23.9	
74.992	54.5	QP	6.4	-30.7	30.2	159	300	Hori.	40.0	9.8	
45.223	47.8	QP	12.4	-31.1	29.1	201	100	Vert.	40.0	10.9	
81.318	44.9	QP	6.6	-30.6	20.9	7	300	Hori.	40.0	19.1	
81.318	49.5	QP	6.6	-30.6	25.5	251	100	Vert.	40.0	14.5	
121.991	41.0	QP	12.9	-30.2	23.7	153	295	Hori.	43.5	19.8	
134.223	45.5	QP	13.9	-30.0	29.4	153	100	Vert.	43.5	14.1	
433.690	32.2	QP	17.7	-26.9	23.0	185	109	Vert.	46.0	23.0	
433.690	33.4	QP	17.7	-26.9	24.2	233	220	Hori.	46.0	21.8	
867.317	28.0	QP	22.0	-24.0	26.0	105	100	Hori.	46.0	20.0	
867.317	27.9	QP	22.0	-24.0	25.9	310	200	Vert.	46.0	20.1	

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 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 (Above 1GHz)

DATA OF RADIATED EMISSION TEST

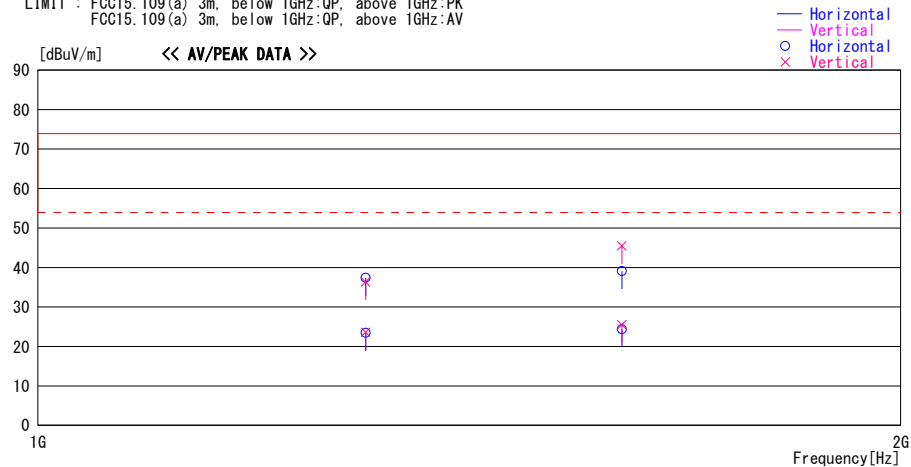
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Mode / Remarks : RKE Receiving mode Worst Axis (Hori X / Vert X)

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



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
1301.069	47.7	PK	24.7	-35.0	37.4	52	100	Hori.	73.9	36.5	
1301.069	46.6	PK	24.7	-35.0	36.3	0	100	Vert.	73.9	37.6	
1301.069	33.8	AV	24.7	-35.0	23.5	52	100	Hori.	53.9	30.4	
1301.069	33.9	AV	24.7	-35.0	23.6	0	100	Vert.	53.9	30.3	
1598.335	48.5	PK	25.2	-34.6	39.1	23	100	Hori.	73.9	34.8	
1598.335	33.8	AV	25.2	-34.6	24.4	23	100	Hori.	53.9	29.5	
1598.335	54.9	PK	25.2	-34.6	45.5	152	100	Vert.	73.9	28.4	
1598.335	34.9	AV	25.2	-34.6	25.5	152	100	Vert.	53.9	28.4	

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

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Radiated Emission (Above 1GHz)

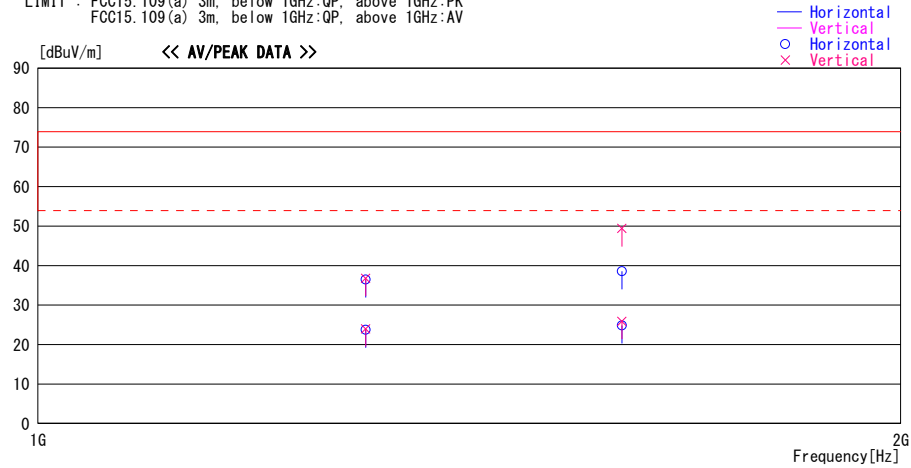
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LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



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]							
1301.069	46.8	PK	24.7	-35.0	36.5	122	100	Hori.	73.9	37.4	
1301.069	47.1	PK	24.7	-35.0	36.8	11	100	Vert.	73.9	37.1	
1301.069	34.0	AV	24.7	-35.0	23.7	122	100	Hori.	53.9	30.2	
1301.069	34.3	AV	24.7	-35.0	24.0	11	100	Vert.	53.9	29.9	
1598.335	48.0	PK	25.2	-34.6	38.6	187	100	Hori.	73.9	35.3	
1598.335	34.2	AV	25.2	-34.6	24.8	187	100	Hori.	53.9	29.1	
1598.335	58.8	PK	25.2	-34.6	49.4	201	100	Vert.	73.9	24.5	
1598.335	35.3	AV	25.2	-34.6	25.9	201	100	Vert.	53.9	28.0	

CHART:WITH FACTOR ANT TYPE:-30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE - 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-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2014/09/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2014/02/20 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2014/06/06 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2014/11/22 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2014/11/22 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2014/11/20 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2014/09/12 * 12
MPA-19	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2014/02/17 * 12
MHA-05	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	253	RE	2014/05/16 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2014/02/05 * 12
MCC-165	Microwave Cable	Junkosha	MWX221	1203S213(1m) / 1311S166(5m)	RE	2014/11/11 * 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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