EMI TEST REPORT

Test Report No. : 10692455A

Applicant	:	**DENSO CORPORATION**
Type of Equipment	:	**Remote Keyless Entry System (Receiver)**
Model No.	:	**13DZB**
Test regulation	:	**FCC Part 15 Subpart B: 2015**
FCC ID	:	**HYQ13DZB**
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: April 22 and 23, 2014

Representative test engineer: Ken Fujita
Ken Fujita
Engineer
Consumer Technology Division

Approved by:
Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP®
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,
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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

REVISION HISTORY

Original Test Report No.: 10692455A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10692455A	February 23, 2015	-	-

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

CONTENTS **PAGE**

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

SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1, Showa-cho, Kariya-shi, Aichi-ken, 448-8661, Japan
Telephone Number	:	+81-556-55-0379
Facsimile Number	:	+81-566-25-4739
Contact Person	:	Masayuki Yamamoto

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

2.1 Identification of E.U.T.

Type of Equipment	:	Remote Keyless Entry System (Receiver)
Model No.	:	13DZB
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	April 18, 2014
Country of Mass-production	:	Japan, United States of America, and China
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

2.2 Product description

Model No: 13DZB (referred to as the EUT in this report) is Remote Keyless Entry System (Receiver).

Feature of EUT	:	This product is mainly used for locking or unlocking the doors of the vehicle. The product sends a radio wave signal while the button is pushed. The product becomes active in response to the signal from the transmitter. The product is installed inside the vehicle.
Frequency of Operation	:	CH1: 314.35 MHz CH2: 312.10 MHz
Oscillator Frequency	:	25.2MHz (Crystal)
Type of Modulation	:	FSK (F1D)
Type of receiving system	:	Super-heterodyne
Intermediate Frequency	:	10.9MHz
Power Supply	:	DC 5.0V
Antenna Type	:	Inverse L Antenna

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.

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	Class B	N/A *1)	N/A	N/A
Radiated emission	**FCC:** ANSI C63.4: 2003 8. Radiated emission measurements	Class B	N/A	21.2dB 602.400MHz Horizontal, QP 602.400MHz 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.

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

	FCC Registration Number	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	313583	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	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	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	134570	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	4.75 x 5.4 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	-	-	3.1 x 3.4 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.

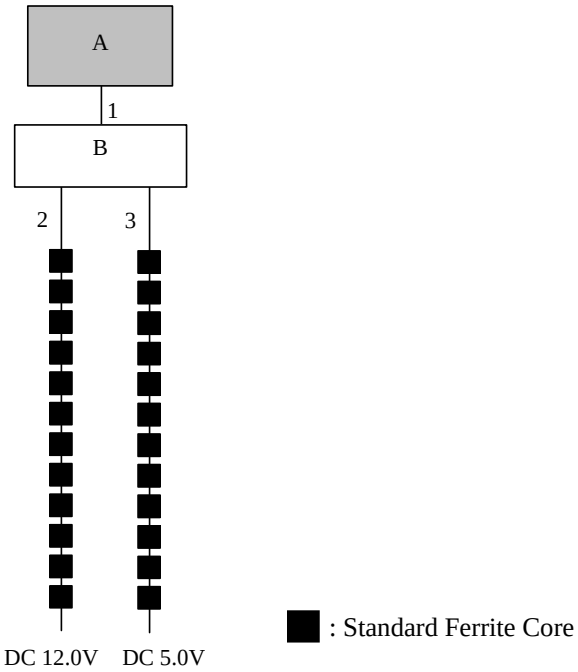
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

The mode used: 1. RKES Receiving mode (314.35MHz)
2. RKES Receiving mode (312.10MHz)

*Tuning was confirmed to be locked on each mode by checking local oscillator frequency to be stable using a search-coil.

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	Remarks
A	Remote Keyless Entry System (Receiver)	13DZB	No. 1	DENSO CORPORATION	EUT
B	Checker	-	-	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	2.4	Unshielded	Unshielded	-
2	DC Cable	1.2	Unshielded	Unshielded	-
3	DC Cable	1.2	Unshielded	Unshielded	-

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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: April 22 and 23, 2014 Test engineer: Ken Fujita

APPENDIX 1: Data of EMI test

Radiated Emission

(Below 1GHz [CH1: 314.35MHz])

DATA OF RADIATED EMISSION TEST

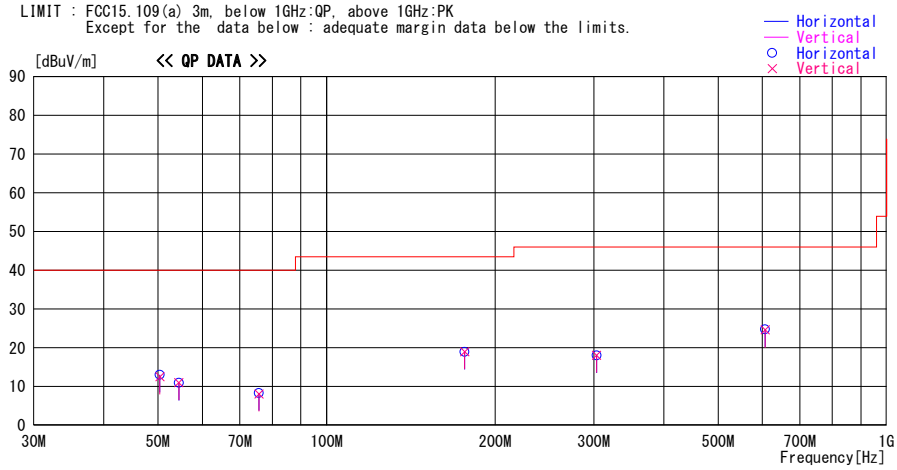
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/04/23

Report No. : 10692455A

Temp./Humi. : 23deg. C / 34% RH
Engineer : Ken Fujita

Mode / Remarks : RKES Receiving mode 314.35MHz Axis(Hori:X,Ver: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 Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
50.400	23.8	QP	10.7	-21.5	13.0	0	100	Hori.	40.0	27.0	
50.400	23.3	QP	10.7	-21.5	12.5	0	100	Vert.	40.0	27.5	
54.500	23.1	QP	9.4	-21.5	11.0	0	100	Vert.	40.0	29.0	
54.500	23.0	QP	9.4	-21.5	10.9	0	100	Hori.	40.0	29.1	
75.750	23.1	QP	6.4	-21.4	8.1	0	100	Vert.	40.0	31.9	
75.750	23.3	QP	6.4	-21.4	8.3	0	100	Hori.	40.0	31.7	
176.400	23.1	QP	15.9	-20.0	19.0	0	100	Vert.	43.5	24.5	
176.400	23.0	QP	15.9	-20.0	18.9	0	100	Hori.	43.5	24.6	
303.450	22.8	QP	14.3	-19.0	18.1	0	100	Vert.	46.0	27.9	
303.450	22.7	QP	14.3	-19.0	18.0	0	100	Hori.	46.0	28.0	
606.900	24.0	QP	19.6	-18.9	24.7	0	100	Hori.	46.0	21.3	
606.900	23.9	QP	19.6	-18.9	24.6	0	100	Vert.	46.0	21.4	

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.

Radiated Emission
(Below 1GHz [CH2: 312.10MHz])

DATA OF RADIATED EMISSION TEST

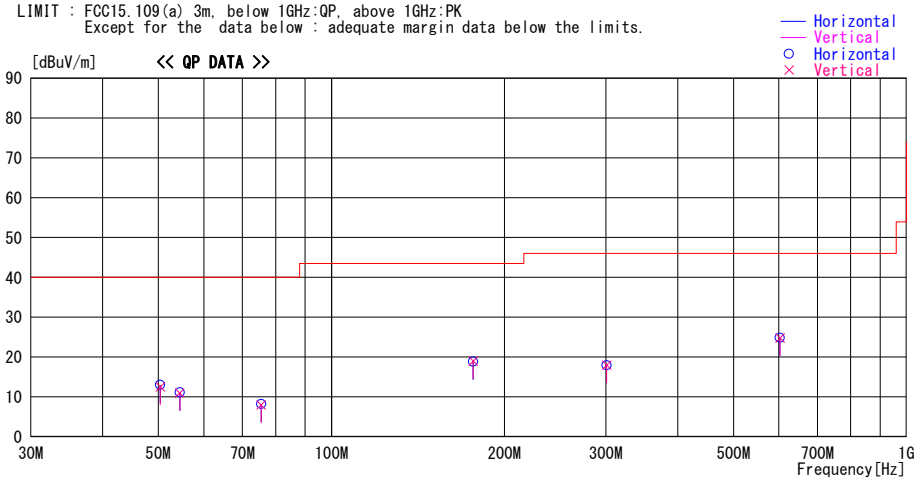
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/04/23

Report No. : 10692455A

Temp./Humi. : 23deg. C / 34% RH
Engineer : Ken Fujita

Mode / Remarks : RKES Receiving mode 312.1MHz Axis(Hori:X,Ver: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]	
50.400	23.8	QP	10.7	-21.5	13.0	0	100	Hori.	40.0	27.0	
50.400	23.3	QP	10.7	-21.5	12.5	0	100	Vert.	40.0	27.5	
54.500	23.1	QP	9.4	-21.5	11.0	0	100	Vert.	40.0	29.0	
54.500	23.2	QP	9.4	-21.5	11.1	0	100	Hori.	40.0	28.9	
75.451	23.0	QP	6.4	-21.4	8.0	0	100	Vert.	40.0	32.0	
75.451	23.2	QP	6.4	-21.4	8.2	0	100	Hori.	40.0	31.8	
176.400	23.1	QP	15.9	-20.0	19.0	0	100	Vert.	43.5	24.5	
176.400	22.9	QP	15.9	-20.0	18.8	0	100	Hori.	43.5	24.7	
301.200	22.7	QP	14.2	-18.9	18.0	0	100	Vert.	46.0	28.0	
301.200	22.6	QP	14.2	-18.9	17.9	0	100	Hori.	46.0	28.1	
602.400	24.1	QP	19.6	-18.9	24.8	0	100	Hori.	46.0	21.2	
602.400	24.1	QP	19.6	-18.9	24.8	0	100	Vert.	46.0	21.2	

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.

Radiated Emission

(Above 1GHz [CH1: 314.35MHz])

DATA OF RADIATED EMISSION TEST

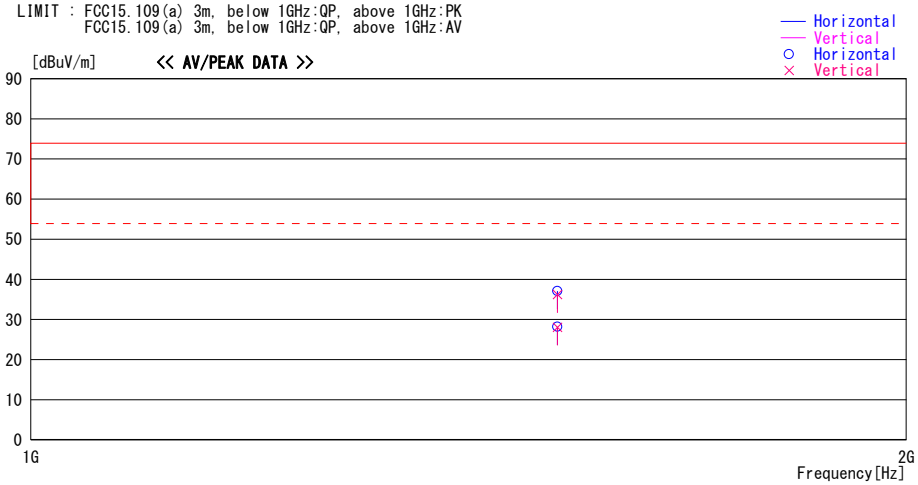
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/04/22

Report No. : 10692455A

Temp./Humi. : 23deg. C / 34% RH
Engineer : Ken Fujita

Mode / Remarks : RKES Receiving mode 314.35MHz Axis(Hori: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]	
1517.250	44.1	PK	26.3	-33.3	37.1	0	100	Hori.	73.9	36.8	
1517.250	43.2	PK	26.3	-33.3	36.2	0	100	Vert.	73.9	37.7	
1517.250	35.2	AV	26.3	-33.3	28.2	0	100	Hori.	53.9	25.7	
1517.250	35.1	AV	26.3	-33.3	28.1	0	100	Vert.	53.9	25.8	

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.

Radiated Emission

(Above 1GHz [CH2: 312.10MHz])

DATA OF RADIATED EMISSION TEST

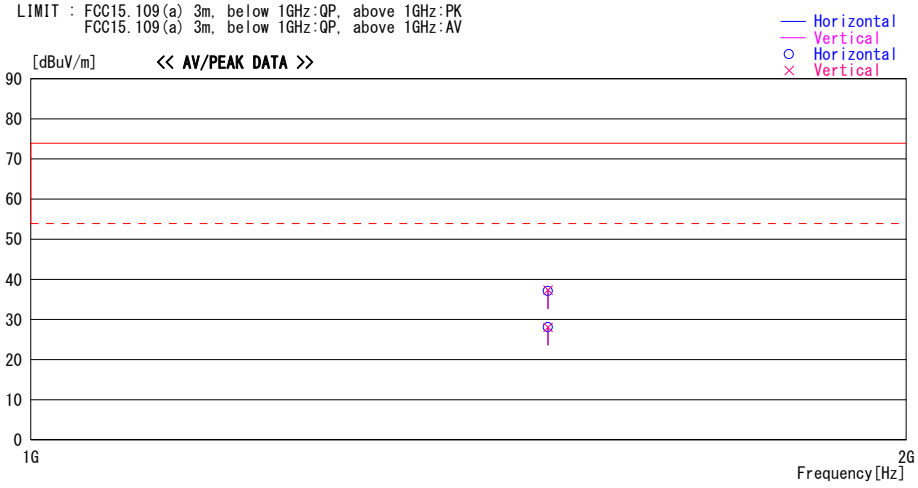
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/04/22

Report No. : 10692455A

Temp./Humi. : 23deg. C / 34% RH
Engineer : Ken Fujita

Mode / Remarks : RKES Receiving mode 312.1MHz Axis(Hori: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]	
1506.000	44.1	PK	26.3	-33.3	37.1	0	100	Hori.	73.9	36.8	
1506.000	44.3	PK	26.3	-33.3	37.3	0	100	Vert.	73.9	36.6	
1506.000	35.1	AV	26.3	-33.3	28.1	0	100	Hori.	53.9	25.8	
1506.000	35.1	AV	26.3	-33.3	28.1	0	100	Vert.	53.9	25.8	

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.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month) *1)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2013/06/07 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2013/10/13 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2013/10/13 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2014/02/20 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2013/11/26 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2013/09/12 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2013/11/27 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12

***1) This test equipment was used for the tests before the expiration date of the calibration.**

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