



Test report No. : 10880777H
Page : 1 of 14
Issued date : August 5, 2015
FCC ID : HYQ13CZY

EMI TEST REPORT

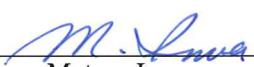
Test Report No. : 10880777H

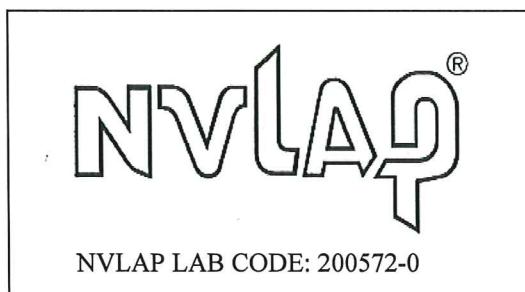
Applicant : DENSO CORPORATION
Type of Equipment : Remote Keyless Entry System (Receiver)
Model No. : 13CZY
Test regulation : FCC Part 15 Subpart B: 2015
FCC ID : HYQ13CZY
Test Result : Complied

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: July 18, 2015

Representative test engineer: 
Yuta Moriya
Engineer
Consumer Technology Division

Approved by: 
Motoya Imura
Engineer
Consumer Technology Division



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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10880777H

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SECTION 1: Customer information

Company Name : DENSO CORPORATION
Address : 1-1, Showa-cho, Kariya-shi, Aichi-ken, 448-8661, Japan
Telephone Number : +81-556-61-5242
Facsimile Number : +81-566-25-4837
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. : 13CZY
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : July 15, 2014
Country of Mass-production : Japan and United States of America
Condition of EUT : Production model
Modification of EUT : No Modification by the test lab

2.2 Product description

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

Feature of EUT : This system is mainly used for locking or unlocking the doors of the vehicle.
The transmitter sends a radio wave signal, while the button is pushed.
The receiver becomes active in response to the signal from the transmitter.
The receiver is installed inside the vehicle.

Frequency of Operation : 433.92 MHz
Oscillator Frequency : 54.2275 MHz (Crystal)
Type of Modulation : FSK (F1D)
Type of receiving system : Super-heterodyne
Intermediate Frequency : 100 kHz
Power Supply : DC 5.0V
Antenna Type : Internal antenna (Independent 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.

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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 June 12, 2015 and effective July 13, 2015
 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: 2009 7. AC powerline 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: 2009 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	17.1 dB 867.640 MHz Horizontal, Vertical	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 $k = 2$.

Test room (semi- anechoic chamber)	Radiated emission						
	(3 m*)(+dB)			(1 m*)(+dB)		(0.5 m*)(+dB)	
	9 kHz - 30 MHz	30 MHz - 300 MHz	300 MHz - 1 GHz	1 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
No.1	4.3 dB	5.1 dB	6.2 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No.2	4.2 dB	5.1 dB	6.2 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No.3	4.4 dB	5.1 dB	6.3 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No.4	4.7 dB	5.3 dB	6.3 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

*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

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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	-	8.8 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.

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

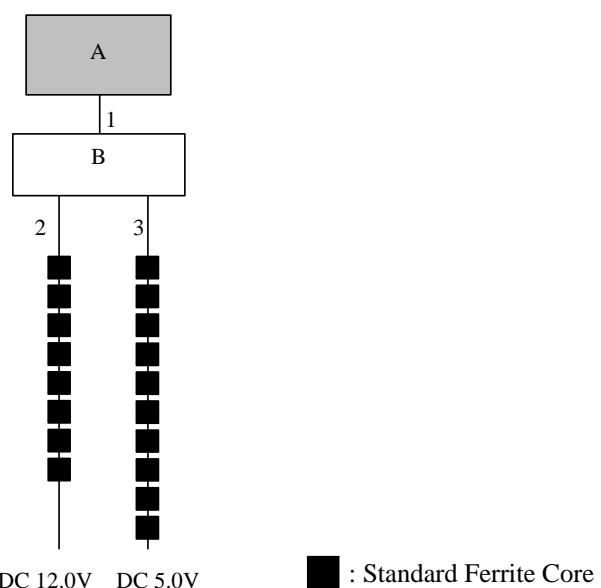
4.1 Operating modes

The mode used: RKES Receiving mode (433.92 MHz)

*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	Remarks
A	Remote Keyless Entry System (Receiver)	13CZY	001	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	2.4	Unshielded	Unshielded	-
3	DC Cable	2.4	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.4 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 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 - 300 MHz (Biconical antenna) / 300 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 2000 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
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz

- 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: July 18, 2015

Test engineer: Yuta Moriya

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APPENDIX 1: Data of EMI test

Radiated Emission

DATA OF RADIATED EMISSION TEST

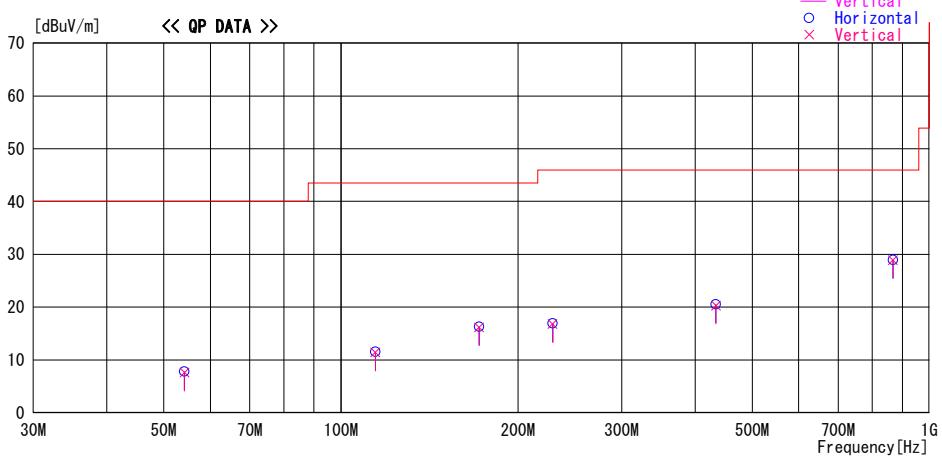
UL Japan, Inc. ISE EMC Lab. No. 4 Semi Anechoic Chamber
 Date : 2015/07/18

Report No. : 10880777H

Temp./Humi. : 23deg. C / 69% RH
 Engineer : Yuta Moriya

Mode / Remarks : RKES Receiving mode (433.92MHz) 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& Factor [dB/m]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Gain [dB]								
54.228	22.9	QP	9.2	-24.5	7.6	0	100	Vert.	40.0	32.4	
54.228	23.1	QP	9.2	-24.5	7.8	0	100	Hori.	40.0	32.2	
114.451	23.2	QP	12.0	-23.8	11.4	0	100	Vert.	43.5	32.1	
114.451	23.3	QP	12.0	-23.8	11.5	0	100	Hori.	43.5	32.0	
171.677	23.3	QP	15.9	-23.0	16.2	0	100	Vert.	43.5	27.3	
171.677	23.4	QP	15.9	-23.0	16.3	0	100	Hori.	43.5	27.2	
228.903	22.4	QP	16.9	-22.5	16.8	0	100	Vert.	46.0	29.2	
228.903	22.5	QP	16.9	-22.5	16.9	0	100	Hori.	46.0	29.1	
433.820	22.8	QP	18.6	-21.1	20.3	0	100	Vert.	46.0	25.7	
433.820	23.0	QP	18.6	-21.1	20.5	0	100	Hori.	46.0	25.5	
867.640	23.0	QP	24.1	-18.2	28.9	0	100	Vert.	46.0	17.1	
867.640	23.0	QP	24.1	-18.2	28.9	0	100	Hori.	46.0	17.1	

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

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. ISE EMC Lab. No.4 Semi Anechoic Chamber
 Date : 2015/07/18

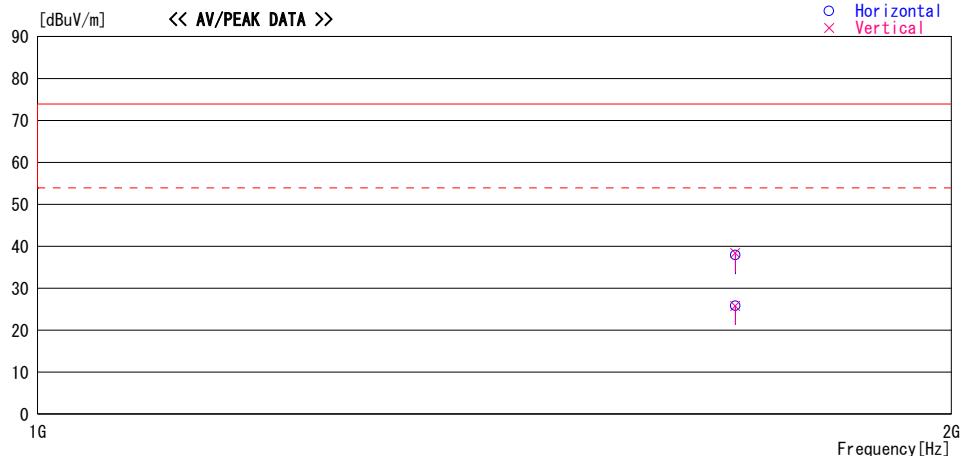
Report No. : 10880777H

Temp. /Humi. : 23deg. C / 69% RH
 Engineer : Yuta Moriya

Mode / Remarks : RKES Receiving mode (433.92MHz) 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

— Horizontal
 — Vertical
 ○ Horizontal
 × Vertical



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss& Factor	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			PK	Gain [dB]	AV						
1697.400	43.0	PK	26.2	-30.8	38.4	0	100	Vert.	73.9	35.5	
1697.400	30.4		26.2	-30.8	25.8	0	100	Vert.	53.9	28.1	
1697.400	42.5		26.2	-30.8	37.9	0	100	Hor.	73.9	36.0	
1697.400	30.4		26.2	-30.8	25.8	0	100	Hor.	53.9	28.1	

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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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	2015/02/26 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2015/01/13 * 12
MJM-23	Measure	ASKUL	-	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2014/11/10 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2014/11/22 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2014/11/22 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2015/06/19 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2014/11/11 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2015/03/09 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2014/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	RE	2015/06/22 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2015/03/12 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2015/01/16 * 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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