



Test report No. : 10018574H-A-R1
Page : 1 of 13
Issued date : June 25, 2013
Revised date : July 11, 2013
FCC ID : HYQDECS001

EMI TEST REPORT

Test Report No. : 10018574H-A-R1

Applicant : DENSO CORPORATION
Type of Equipment : Electrostatic Capacity sensor
Model No. : DECS001
Test standard : FCC Part 18 : 2002
FCC ID : HYQDECS001
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This report is a revised version of 10018574H-A. 10018574H-A is replaced with this report.

Date of test:

June 15, 2013

Representative test
engineer:

Kazuya Yoshioka
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Takashi Nakazawa
Leader of WiSE Japan,
UL Verification Service



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

UL Japan, Inc.

Head Office EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10018574H-A

[illegible]

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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	:	+81-566-25-5947
Facsimile Number	:	+81-566-25-4548
Contact Person	:	Koichiro Ukai

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

2.1 Identification of E.U.T.

Type of Equipment	:	Electrostatic Capacity sensor
Model No.	:	DECS001
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC12V
Receipt Date of Sample	:	June 13, 2013
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: DECS001 is the Electrostatic Capacity sensor.

Clock frequency in the system	:	CPU: 16MHz Custom IC: 4MHz
Operating Frequency	:	83.33kHz
Maximum amplitude voltage	:	1.0Vp-p (+/-0.1V) AC (Offset 2.5V +/-0.15V DC)
Feature of EUT	:	This sensor is installed in the vehicle seat and used for detecting the object on the seat.

<Contents of the change from original model>

Original test report number of this report is 30LE0269-HO-A.

The EUT is changed the specification from original model as below.

- Change of electrode geometry
- Change of software

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 18 2002
Title : FCC 47CFR Part18 Industrial, scientific, and medical equipment

3.2 Procedures and results

Item	Test Procedure & Limits	Deviation	Worst margin	Result
Radiated emission	Section 18.305 FCC/OST MP-5	N/A	14.6dB 0.16666MHz, PEAK, Horizontal	Complied
Conducted emission	Section 18.307 FCC/OST MP-5	N/A	N/A *1)	N/A

*Note: UL Japan, Inc.'s EMI Work Procedure 13-EM-W0420 and 13-EM-W0424.
*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 (10m*)(±dB)		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	4.2dB	5.0dB	4.8dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

*10m = Measurement distance

Radiated emission test(10m)

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

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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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	2.4 x 3.4m	-

* 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

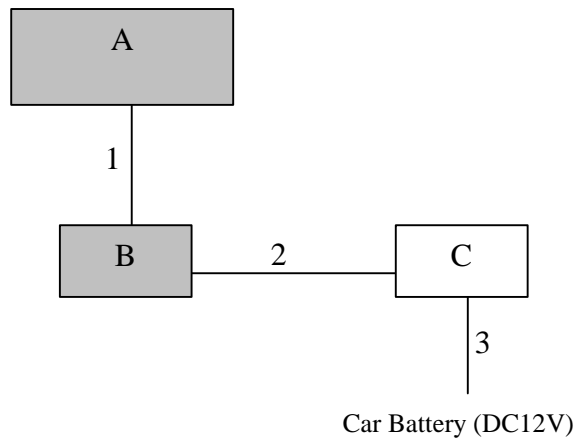
Refer to APPENDIX.

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

4.1 Operating mode(s)

The mode is used : Detecting Mode

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	Electrostatic Capacity sensor	DECS001	5-184900-162_XW90Q0001B	DENSO CORPORATION	EUT
B	ECU	DECS001	5-252200-072	DENSO CORPORATION	EUT
C	Test bench	-	-	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal Cable	0.2	Unshielded	Unshielded	-
2	Signal Cable	1.5	Unshielded	Unshielded	-
3	DC Cable	0.5	Unshielded	Unshielded	-

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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 carpet for insulation above the reference ground plane.
Test was made with the antenna positioned in 0deg., 45deg., 90deg., 135 deg. and Horizontal position.
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.
*Refer to Figure 1 about Direction of the Loop Antenna.

5.3 Test conditions

Frequency range : 9kHz - 30MHz (Loop Antenna)
Test distance : 10m
EUT position : Floor standing
EUT operation mode : See Clause 4.1

5.4 Test procedure

The height of antenna was fixed in 2m.
EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed in 0deg., 45deg., 90deg., 135 deg. and Horizontal with the Test Receiver.
The test was made with the detector (RBW) in the following table.

Frequency	9kHz - 150kHz	150kHz - 30MHz
Instrument used	Test Receiver	
IF Bandwidth	PK: 200Hz	PK: 9kHz

The limit was converted by the following formula:
[Limit at 10m] dBuV/m = [Limit at 300m] dBuV/m – 20 x log (10[m] / 300[m])
*Refer to Part 18 Section 305 Notes 2

5.5 Test result

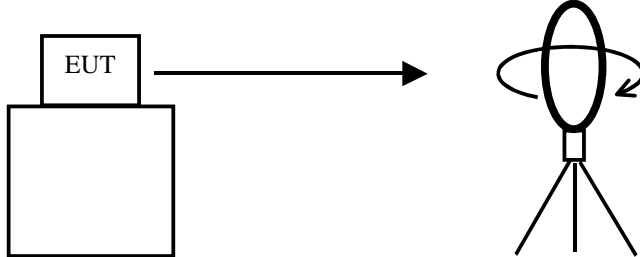
Summary of the test results: Pass

Date: June 15, 2013

Test engineer: Takayuki Shimada

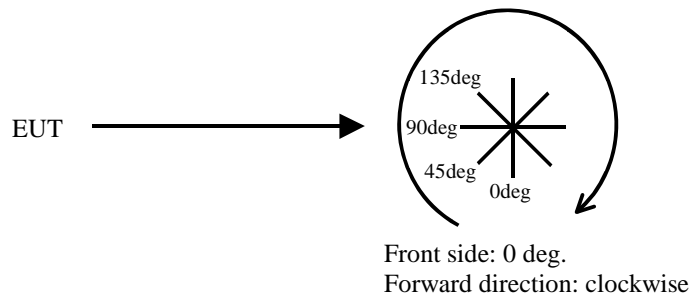
Figure 1: Direction of the Loop Antenna

Side View (Vertical)



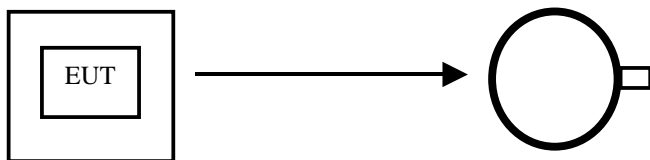
.....

Top View (Vertical)



.....

Top View (Horizontal)



Antenna was not rotated.

APPENDIX 1: Data of EMI test

Radiated Emission

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/15

Report No. : 10018574H
Power : DC 12V
Temp./Humi. : 21deg. C / 67% RH
Engineer : Takayuki Shimada

Mode / Remarks : Detecting Mode

LIMIT : FCC18.305 Any type unless otherwise specified, Freq.:Any non-ISM freq., RF Power:Below 500W, 10m
All other spurious emissions were less than 20dB for the limit.

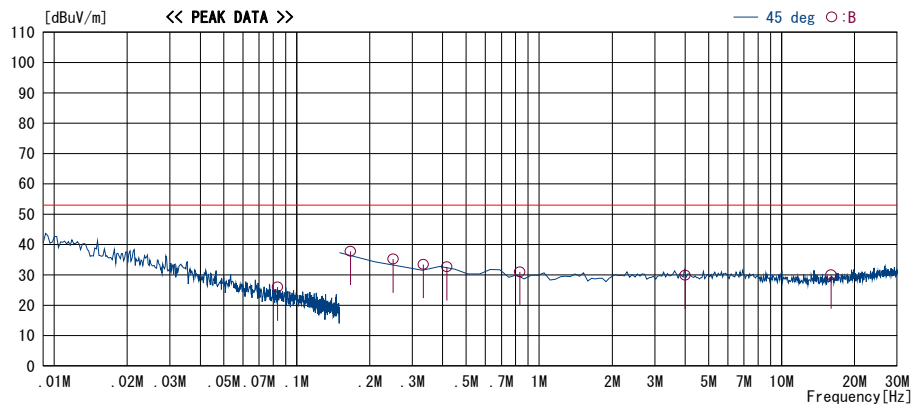
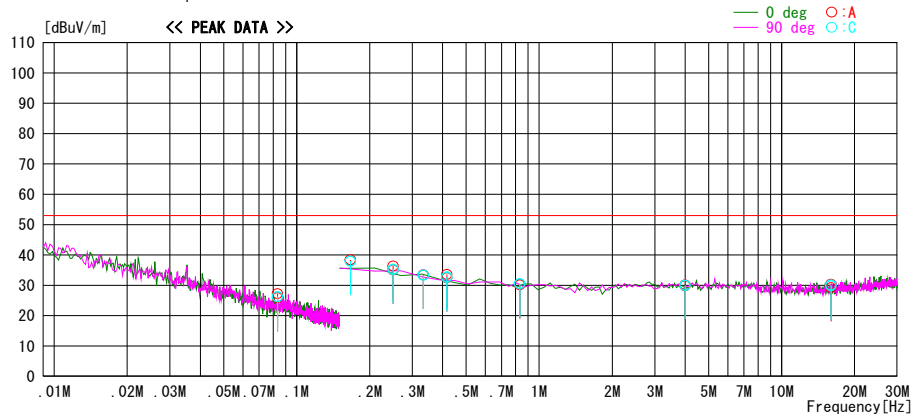


CHART: WITH FACTOR, ANT TYPE: LOOP. Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN.) - GAIN(AMP.)

Radiated Emission

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/15

Report No. : 10018574H
Power : DC 12V
Temp./ Humi. : 21eg. C / 67% RH
Engineer : Takayuki Shimada

Mode / Remarks : Detecting Mode

LIMIT : FCC18.305 Any type unless otherwise specified. Freq.:Any non-ISM freq.. RF Power:Below 500W, 10m
All other spurious emissions were less than 20dB for the limit.

Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
0.08333	34.3	PEAK	19.2	6.0	32.3	27.2	53.0	25.8	0	A	359
0.08333	33.1	PEAK	19.2	6.0	32.3	26.0	53.0	27.0	45	B	359
0.08333	33.3	PEAK	19.2	6.0	32.3	26.2	53.0	26.8	90	C	359
0.08333	33.3	PEAK	19.2	6.0	32.3	26.2	53.0	26.8	135	C	359
0.08333	33.0	PEAK	19.2	6.0	32.3	25.9	53.0	27.1	0	A	359
0.16666	45.4	PEAK	19.1	6.0	32.2	38.3	53.0	14.7	0	A	359
0.16666	44.9	PEAK	19.1	6.0	32.2	37.8	53.0	15.2	45	B	359
0.16666	45.1	PEAK	19.1	6.0	32.2	38.0	53.0	15.0	90	C	359
0.16666	45.0	PEAK	19.1	6.0	32.2	37.9	53.0	15.1	135	C	359
0.16666	45.5	PEAK	19.1	6.0	32.2	38.4	53.0	14.6	0	A	359
0.24999	43.3	PEAK	19.1	6.1	32.2	36.3	53.0	16.7	0	A	359
0.24999	42.2	PEAK	19.1	6.1	32.2	35.2	53.0	17.8	45	B	359
0.24999	42.1	PEAK	19.1	6.1	32.2	35.1	53.0	17.9	90	C	359
0.24999	42.4	PEAK	19.1	6.1	32.2	35.4	53.0	17.6	135	C	359
0.24999	42.0	PEAK	19.1	6.1	32.2	35.0	53.0	18.0	0	A	359
0.33332	40.4	PEAK	19.1	6.1	32.2	33.4	53.0	19.6	0	A	359
0.33332	40.5	PEAK	19.1	6.1	32.2	33.5	53.0	19.5	45	B	359
0.33332	40.3	PEAK	19.1	6.1	32.2	33.3	53.0	19.7	90	C	359
0.33332	40.4	PEAK	19.1	6.1	32.2	33.4	53.0	19.6	135	C	359
0.33332	40.5	PEAK	19.1	6.1	32.2	33.5	53.0	19.5	0	A	359
0.41665	40.6	PEAK	19.1	6.1	32.2	33.6	53.0	19.4	0	A	359
0.41665	39.7	PEAK	19.1	6.1	32.2	32.7	53.0	20.3	45	B	359
0.41665	39.8	PEAK	19.1	6.1	32.2	32.8	53.0	20.2	90	C	359
0.41665	39.6	PEAK	19.1	6.1	32.2	32.6	53.0	20.4	135	C	359
0.41665	39.5	PEAK	19.1	6.1	32.2	32.5	53.0	20.5	0	A	359
0.83330	36.9	PEAK	19.2	6.2	32.2	30.1	53.0	22.9	0	A	359
0.83330	37.8	PEAK	19.2	6.2	32.2	31.0	53.0	22.0	45	B	359
0.83330	37.3	PEAK	19.2	6.2	32.2	30.5	53.0	22.5	90	C	359
0.83330	37.4	PEAK	19.2	6.2	32.2	30.6	53.0	22.4	135	C	359
0.83330	37.2	PEAK	19.2	6.2	32.2	30.4	53.0	22.6	0	A	359
4.00000	36.5	PEAK	19.4	6.5	32.3	30.1	53.0	22.9	0	A	359
4.00000	36.3	PEAK	19.4	6.5	32.3	29.9	53.0	23.1	45	B	359
4.00000	36.4	PEAK	19.4	6.5	32.3	30.0	53.0	23.0	90	C	359
4.00000	36.3	PEAK	19.4	6.5	32.3	29.9	53.0	23.1	135	C	359
4.00000	36.2	PEAK	19.4	6.5	32.3	29.8	53.0	23.2	0	A	359
16.00000	36.1	PEAK	19.1	7.4	32.3	30.3	53.0	22.7	0	A	359
16.00000	35.8	PEAK	19.1	7.4	32.3	30.0	53.0	23.0	45	B	359
16.00000	35.6	PEAK	19.1	7.4	32.3	29.8	53.0	23.2	90	C	359
16.00000	35.9	PEAK	19.1	7.4	32.3	30.1	53.0	22.9	135	C	359
16.00000	35.0	PEAK	19.1	7.4	32.3	29.2	53.0	23.8	0	A	359

CHART: WITH FACTOR, ANT TYPE: LOOP. Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN.) - GAIN(AMP.)

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

APPENDIX 2: Test instruments

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	2012/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2013/02/26 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2012/06/14 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2012/10/12 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2012/07/27 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	RE	2013/01/23 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2013/03/12 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2012/11/06 * 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