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RADIO TEST REPORT

Test Report No.: 28AE0322-HO-A-R1

Applicant	:	DENSO CORPORATION
Type of Equipment	:	Navigation ECU
Model No.	:	DNNS025
FCC ID	:	HYQDNNS025
Test regulation	:	FCC Part 15 Subpart C 2007 Section 15.207, Section 15.247

Test Result :

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.

Complied

- 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 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. Original test report number of this report is 28AE0322-HO-A. **Date of test:**

September 26 to October 5, 2007

Tested by:

atakedi

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Approved by :

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://uljapan.co.jp/emc/nvlap.htm

MF060b (09.01.08)

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SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho Kariya-shi Aichi, 448-8661 Japan

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

2.1 Identification of E.U.T.

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2.2 Product Description

Model No: DNNS025 (referred to as the EUT in this report) is the Navigation ECU.

Clock frequency(ies) in the system	:	GPS:16.368MHz ^{*1)} , FM Tuner: 28.8MHz ^{*2)} , Bluetooth: 26MHz
Equipment Type	:	Transceiver
Frequency of Operation	:	2402-2480MHz
Bandwidth & Channel Spacing	:	79MHz & 1MHz/CH
Modulation	:	FHSS
Power Supply (inner)	:	DC1.5V
Antenna Type	:	Reverse F type (ANT0698-16B/U-BT)
Antenna Connector Type	:	HRS U.FL-LP066
Antenna Gain	:	-1.2dBi
^{*1)} For this part of the test, please ref	fer to Te	st Report No. 28AE0322-HO-D (RSS-310).

^{*2)} For this part of the test, please refer to Test Report No. 28AE0322-HO-B (FCC Part 15 Subpart B).

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part15 Subpart C: 2007
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

FCC 15.31 (e)

This EUT provides stable voltage(DC1.5V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.2 **Procedures and results**

[FHSS]

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
1	Conducted	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC: Section 15.207	_	N/A	N/A *1)	N/A
1	emission	IC: RSS-Gen 7.2.2	IC: RSS-Gen 7.2.2		11/24	IV(A 1)	IV/A
2	Carrier Frequency	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC: Section 15.247(a)(1)	Conducted	N/A		Complied
-	Separation	IC: -	IC: RSS-210 A8.1 (b)	Conducted	1011		compilee
3	20dB Bandwidth	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC: Section 15.247(a)(1)	Conducted	N/A		Complied
		IC: -	IC: RSS-210 A8.1 (a)				1
4	Number of Hopping	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC: Section 15.247(a)(1)(iii)	Conducted	N/A		Complied
	Frequency	IC: - IC: RSS-210 A8.1 (d)					
5	Dwell time	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC: Section 15.247(a)(1)(iii)	Conducted	N/A	See data.	Complied
		IC: -	IC: RSS-210 A8.1 (d)				1
6	Maximum Peak	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC: Section 15.247(b)(1)	Conducted	N/A		Complied
	Output Power	IC: RSS-Gen 4.8	IC: RSS-210 A8.4 (2)				
7	Band Edge	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC: Section 15.247(d)	Conducted N/A	N/A		Complied
	Compliance	IC: -	IC: RSS-210 A8.5		11/12		I I
	Spurious Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC: Section 15.247(d)	Conducted/	N/A	[Tx] 1.0dB 869.692MHz, QP Vertical [Rx] 1.4dB 869.691MHz, QP Horizontal	
8		IC: RSS-Gen 4.9 RSS-Gen 4.10	IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	Radiated			Complied
Not	e III. Janan Inc 'e	s FMI Work Procedures No	OPM05 and OPM15				

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

*1) The test is not applicable since EUT does not have AC mains.

*These tests were also referred to FCC Public Notice DA 00-705 "Guidance on Measurement for Frequency Hopping Spread Spectrum Systems".

*These tests were performed without any deviations from test procedure except for additions or exclusions.

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3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	Conducted	N/A	N/A	N/A
	Band Width						

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Spurious Emission (Radiated)

The measurement uncertainty for this test using Biconical antenna is 4.88dB(3m).

The measurement uncertainty for this test using Logperiodic antenna is 4.86dB(3m).

The measurement uncertainty for this test using Horn antenna is 5.77dB.

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

<u>Other test except Conducted Emission and Spurious Emission (Radiated)</u> The measurement uncertainty for this test is 3.0dB.

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3.5 Test Location

	FCC	IC Registration	Width x Depth x	Size of	Other
	Registration Number	Number	Height (m)	reference ground plane (m) / horizontal conducting plane	rooms
No.1 semi-anechoic chamber	313583	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	IC4247-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247-3	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	IC4247-4	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	-

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* 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 set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

4.1 **Operating Mode(s)**

Test items	Modes	Tested frequencies
Carrier Frequency Separation	Bluetooth Tx, Hopping On / Inquiry	Low ch: 2402MHz
		Mid ch: 2441MHz
		High ch: 2480MHz
		Inquiry: 2441MHz
	Bluetooth Tx, Hopping On (EDR)	Low ch: 2402MHz
		Mid ch: 2441MHz
		High ch: 2480MHz
20dB Bandwidth	Bluetooth Tx, Hopping Off / Inquiry	Low ch: 2402MHz
		Mid ch: 2441MHz
		High ch: 2480MHz
		Inquiry: 2441MHz
	Bluetooth Tx, Hopping Off (EDR)	Low ch: 2402MHz
		Mid ch: 2441MHz
		High ch: 2480MHz
Number of Hopping Frequency	Bluetooth Tx, Hopping On/ Inquiry	-
	Bluetooth Tx, Hopping On (EDR)	-
Dwell time	Bluetooth Tx, Hopping On	Low ch: 2402MHz
	DH1, DH3, DH5 / Inquiry	Mid ch: 2441MHz
		High ch: 2480MHz
		Inquiry: 2441MHz
	Bluetooth Tx, Hopping On (EDR)	Low ch: 2402MHz
	3DH1, 3DH3, 3DH5	Mid ch: 2441MHz
		High ch: 2480MHz
Maximum Peak Output Power	Bluetooth Tx, Hopping Off	Low ch: 2402MHz
_	DH5, 2DH5, 3DH5	Mid ch: 2441MHz
		High ch: 2480MHz
Radiated Spurious Emission	Bluetooth Tx,	Low ch: 2402MHz
-	DH5, 3DH5	Mid ch: 2441MHz
		High ch: 2480MHz
	Bluetooth Rx	Mid ch: 2441MHz

*Remarks: Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT. However, the limit level 125mW of AFH mode was used due to the overlap of bandwidth.

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4.2 Configuration and peripherals



Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
Α	Navigation ECU	DNNS025	12	DENSO CORPORATION	EUT
В	Vehicle bench	-	-	-	-
С	AMP	86280-AE013	-	HARMAN/BECKER	-
D	4 ohm dummy load	-	-	-	-
E	GPS antenna	08663-00410	-	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield	
			Cable	Connector
1	System Harness cable	1.0	Unshielded	Unshielded
2	Power supply cable	0.5	Unshielded	Unshielded
3	Vehicle signal cable	2.0	Unshielded	Unshielded
4	GPS cable	3.6	Unshielded	Unshielded
5	FM antenna cable *1)	1.0	Unshielded	Unshielded

*1) with 75 ohm termination resistor

SECTION 5: Spurious Emission

 [Conducted]

 Test Procedure

 The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port.

 Test data
 : APPENDIX 2

 Test result
 : Pass

[Radiated]

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane. The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) and 1m(10GHz-18GHz), and 0.5m(Above 18GHz).

The height of the measuring 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, or the Spectrum Analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

The result also satisfied with the general limits specified in section FCC 15.209(a) / RSS-210 2.7 (IC).

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
Detector	QP: BW 120kHz	PK: RBW:1MHz/VBW: 1MHz
IF Bandwidth		AV: RBW:1MHz/VBW:10Hz

The test was made on EUT at the normal use position.

Test data	: APPENDIX 2
Test result	: Pass

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SECTION 6: Bandwidth

Test Procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data	: APPENDIX 2
Test result	: Pass

SECTION 7: Maximum Peak Output Power

Test Procedure

The Maximum Peak Output Power was measured with a power meter (tested bandwidth: 50MHz) connected to the antenna port.

Test data	: APPENDIX 2
Test result	: Pass

SECTION 8: Carrier Frequency Separation

Test Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

Test data	: APPENDIX 2
Test result	: Pass

SECTION 9: Number of Hopping Frequency

Test Procedure

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

Test data	: APPENDIX 2
Test result	: Pass

SECTION 10: Dwell time

Test Procedure

The Dwell time was measured with a spectrum analyzer connected to the antenna port.

Test data	: APPENDIX 2
Test result	: Pass