



EMI TEST REPORT

Test Report No.: 26HE0073-HO-1

Applicant : **DENSO CORPORATION**
Type of Equipment : **Tire Pressure Monitoring System (Receiver)**
Model No. : **13BCS**
Test standard : **FCC Part 15 Subpart B Class B 2006**
FCC ID : **HYQ13BCS**
Test Result : **Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

Date of test:

March 21, 2006

Tested by:

Norihisa Hashimoto
EMC Services

Approved by :

Naoki Sakamoto
Group Leader of
EMC Services

UL Apex Co., Ltd.

Head Office EMC Lab.

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MF060b(10.04.03)

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SECTION 1: Client information

Company name : DENSO CORPORATION
Address : 1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone number : +81-566-61-7934
Facsimile number : +81-566-25-4915
Contact Person : Ryozo Okumura

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

2.1 Identification of E.U.T.

Type of Equipment : Tire Pressure Monitoring System (Receiver)
Model No. : 13BCS
Serial No. : 001
Rating : DC12V
Receipt Date of Sample : March 21, 2006
Country of Manufacture : Japan
Condition of EUT : Engineering prototype
(Not for Sale: this sample is equivalent to mass-produced items.)

2.2 Product Description

Model No. 13BCS (referred to as the EUT in this report) is Tire Pressure Monitoring System (Receiver).

Type of Receiver : Super heterodyne
Frequency of operation : 314.98MHz
Oscillator frequency : 38.035MHz (Crystal)
Antenna : Built in type

The receiving antennas of the EUT are installed inside the tire house and are unremovable.
Therefore, the EUT complies with the requirement in section 15.111(b).

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B 2006
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin *0)	Result
Conducted emission	ANSI C63.4: 2003 7. AC powerline conducted emission measurements	Class B	N/A	N/A *1)	N/A
Radiated emission	ANSI C63.4: 2003 8. Radiated emission measurements	Class B	N/A	14.1dB 944.940MHz, Vertical, QP	Complied

*Note: UL Apex's EMI Work Procedure QPM05.
*0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.
*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.

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

3.3 Uncertainty

Radiated Emission

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.59\text{dB}(3\text{m})$.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 4.62\text{dB}(3\text{m})$.
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 5.27\text{dB}$.
The data listed in this test report has enough margin, more than the site margin.

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3.4 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	FCC Registration Number	IC Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	846015	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1 and No.2 semi-anechoic and No.3 shielded room.

3.5 Test set up, Test instruments and Data of EMI

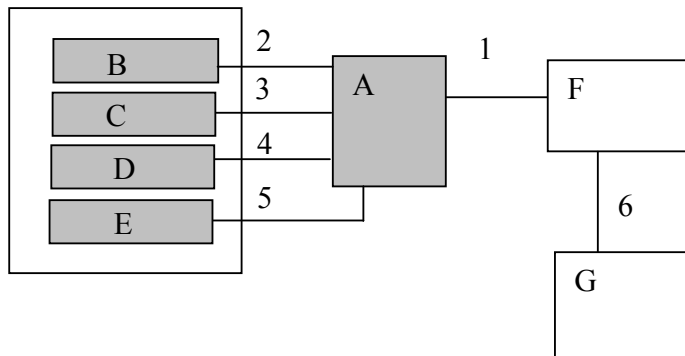
Refer to APPENDIX 1 to 3.

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

4.1 Operating modes

The mode is used : Receiving mode: Maximum receiving state (without the signal from the transmitter)

4.2 Configuration and peripherals



*Cabling and test setup were taken into consideration and test data was taken under worst case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Tire Pressure Monitoring System (Receiver)	13BCS	001	DENSO	EUT
B	Antenna 1	-	-	DENSO	EUT
C	Antenna 2	-	-	DENSO	EUT
D	Antenna 3	-	-	DENSO	EUT
E	Antenna 4	-	-	DENSO	EUT
F	Checker Bench	-	-	DENSO	-
G	DC Power Supply	40B19L	A030402	YUASA	-

List of cables used

No.	Name	Length (m)	Shield
1	DC Cable	2.0	N
2	Antenna Cable	2.5	N
3	Antenna Cable	3.5	N
4	Antenna Cable	4.2	N
5	Antenna Cable	3.5	N
6	DC Cable	1.2	N

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 platform of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane. The EUT was set on the center 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. A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Frequency range : 30MHz – 300MHz (Biconical antenna) / 300MHz – 1000MHz (Logperiodic antenna)
1000-2000MHz (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 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.

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

5.5 Test result

Summary of the test results: Pass

Date: March 21, 2006

Test engineer: Norihisa Hashimoto

APPENDIX 1: Photographs of test setup

Radiated Emission

Front



Rear



Worst Case Position (X-axis:Horizontal / X-axis:Vertical)

X-axis



Y-axis



Z-axis



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-01	Anechoic Chamber	TDK	Semi Anechoic Chamber 10m	RE	2005/11/14 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	RE	2005/10/10 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2005/10/14 * 12
MHA-05	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2006/01/09 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2005/05/24 * 12
MCC-01	Coaxial Cable 0.1-3000MHz	Suhner/storm/Agilent/TSJ	-	RE	2006/02/20 * 12
MCC-15	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX 104	RE	2006/02/02 * 12
MCC-18	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX 104	RE	2006/02/02 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE	2005/11/10 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	RE	2005/12/16 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2006/02/09 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

RE: Radiated emission,

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APPENDIX 3: Data of EMI test

Radiated Emission

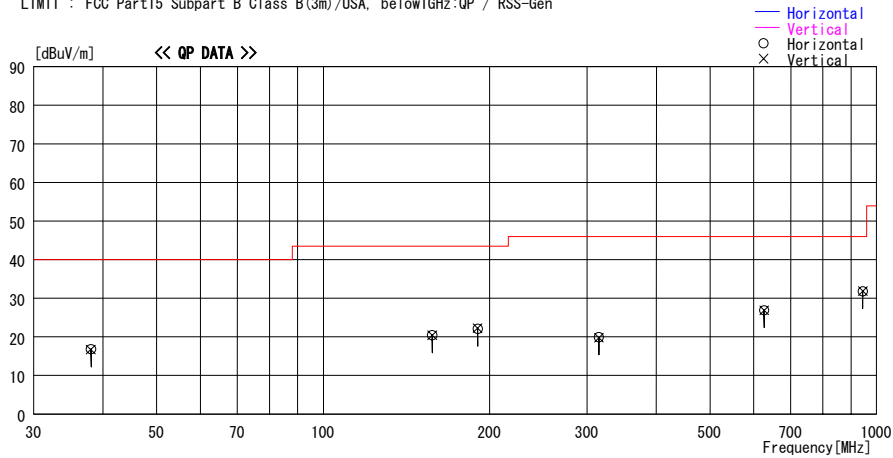
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2006/03/21 22:25:39

Applicant : DENSO CORPORATION
Kind of EUT : TPMS-RECEIVER
Model No. : 13BCS
Serial No. : 001
Report No. : 26HE0073-HO
Power : DC12V
Temp./ Humi. : 22 deg. C. / 30 %
Operator : Norihisa Hashimoto

Mode / Remarks : Receiving /X-axis

LIMIT : FCC Part15 Subpart B Class B(3m)/USA, below1GHz:QP / RSS-Gen



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Polar.	Limit [dBuV/m]	Margin [dB]
			Factor [dB/m]	Loss& Gain [dB]				
38.035	22.4	QP	14.9	-20.5	16.8	Hori.	40.0	23.2
38.035	22.3	QP	14.9	-20.5	16.7	Vert.	40.0	23.3
157.480	22.9	QP	15.8	-18.2	20.5	Hori.	43.5	23.0
157.480	22.8	QP	15.8	-18.2	20.4	Vert.	43.5	23.1
190.175	22.9	QP	16.9	-17.7	22.1	Hori.	43.5	21.4
190.175	23.0	QP	16.9	-17.7	22.2	Vert.	43.5	21.3
314.980	21.7	QP	14.7	-16.5	19.9	Hori.	46.0	26.1
314.980	21.6	QP	14.7	-16.5	19.8	Vert.	46.0	26.2
626.960	23.2	QP	19.5	-15.8	26.9	Vert.	46.0	19.1
626.960	23.2	QP	19.5	-15.8	26.9	Hori.	46.0	19.1
944.940	23.3	QP	22.3	-13.8	31.8	Hori.	46.0	14.2
944.940	23.4	QP	22.3	-13.8	31.9	Vert.	46.0	14.1

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

Radiated Emission

DATA OF RADIATED EMISSION TEST

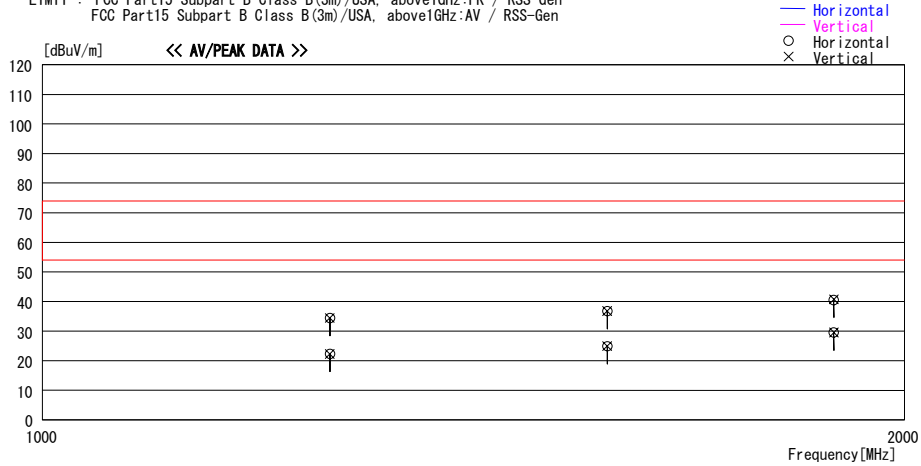
UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2006/03/21 23:16:45

Applicant : DENSO CORPORATION
Kind of EUT : TPMS-RECEIVER
Model No. : 13BCS
Serial No. : 001

Report No. : 26HE0073-HO
Power : DC12V
Temp./ Humi. : 22 deg. C. / 30 %
Operator : Norihisa Hashimoto

Mode / Remarks : Receiving /X-axis

LIMIT : FCC Part15 Subpart B Class B(3m)/USA, above1GHz:PK / RSS-Gen
FCC Part15 Subpart B Class B(3m)/USA, above1GHz:AV / RSS-Gen



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Polar.	Limit [dBuV/m]	Margin [dB]
			Factor [dB/m]	Loss& Gain [dB]				
1260.000	45.3	PK	23.9	-34.7	34.5	Hori.	73.9	39.4
1260.000	45.2	PK	23.9	-34.7	34.4	Vert.	73.9	39.5
1260.000	33.1	AV	23.9	-34.7	22.3	Hori.	53.9	31.6
1260.000	33.1	AV	23.9	-34.7	22.3	Vert.	53.9	31.6
1575.000	45.6	PK	25.6	-34.4	36.8	Vert.	73.9	37.1
1575.000	33.8	AV	25.6	-34.4	25.0	Vert.	53.9	28.9
1575.000	33.7	AV	25.6	-34.4	24.9	Hori.	53.9	29.0
1575.000	45.6	PK	25.6	-34.4	36.8	Hori.	73.9	37.1
1890.000	33.6	AV	30.0	-34.1	29.5	Hori.	53.9	24.4
1890.000	44.8	PK	30.0	-34.1	40.7	Vert.	73.9	33.2
1890.000	33.6	AV	30.0	-34.1	29.5	Vert.	53.9	24.4
1890.000	44.6	PK	30.0	-34.1	40.5	Hori.	73.9	33.4

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