



## EMI TEST REPORT

Test Report No. : 25KE0077-HO-1a

Applicant : DENSO CORPORATION  
Type of Equipment : Tire Pressure Monitoring System (Receiver)  
Model No. : 13BCH  
Test standard : FCC Part 15 Subpart B Class B 2005  
FCC ID : HYQ13BCH  
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:

June 15, 2005

Tested by:

Hiroka Umeyama  
EMC Service

Approved by :

Hironobu Shimoji  
Group Leader of  
EMC Service

UL Apex Co., Ltd.

Head Office EMC Lab.

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<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Client information.....</b>	<b>3</b>
<b>SECTION 2: Equipment under test (E.U.T.) .....</b>	<b>3</b>
<b>SECTION 3: Test specification, procedures &amp; results .....</b>	<b>4</b>
<b>SECTION 4: Operation of E.U.T. during testing.....</b>	<b>6</b>
<b>SECTION 5: Radiated Emission .....</b>	<b>7</b>
<b>APPENDIX 1: Photographs of test setup.....</b>	<b>8</b>
<b>Radiated Emission.....</b>	<b>8</b>
<b>Worst Case Position (X-axis:Horizontal / X-axis:Vertical).....</b>	<b>9</b>
<b>APPENDIX 2: Test instruments .....</b>	<b>10</b>
<b>APPENDIX 3: Data of EMI test .....</b>	<b>11</b>
<b>Radiated Emission.....</b>	<b>11</b>

## **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. : 13BCH  
Serial No. : 1  
Rating : 5V DC (from ECU)  
Receipt Date of Sample : June 14, 2005  
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. 13BCH (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 : Internal Antenna (Fixed)

The receiving antenna (of this EUT) is installed on the Tire Pressure Monitoring System, which is unremovable. Therefore, this EUT complies with the requirement in section 15.111(b).

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test specification**

Test Specification : FCC Part 15 Subpart B 2005  
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	17.7dB 37.408MHz, 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  $\pm 4.5\text{dB}(3\text{m})$ .

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is  $\pm 5.2\text{dB}(3\text{m})$ .

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is  $\pm 6.6\text{dB}$ .

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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Telephone : +81 596 24 8116  
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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

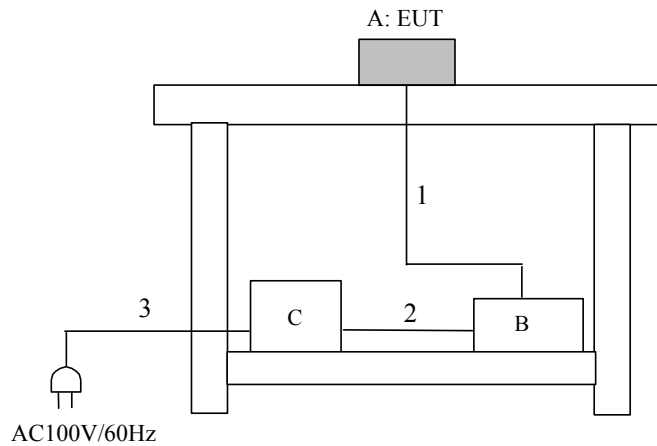
Refer to APPENDIX 1 to 3.

## **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 was 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	FCC ID	Remark
A	Tire Pressure Monitoring System (Receiver)	13BCH	1	DENSO	HYQ13BCH	EUT
B	Test Bench	-	-	DENSO	-	-
C	DC Power Supply	PW8-3ATP	09067054	KENWOOD	-	-

#### **List of cables used**

No.	Name	Length (m)	Shield	Backshell Material
1	DC Cable	1.35	N	Polyvinyl Chloride
2	DC Cable	0.9	N	Polyvinyl Chloride
3	AC Cable	2.0	N	Polyvinyl Chloride

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## **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 platform of nominal size, 0.5m by 1.0m, 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: June 15, 2005

Test engineer: Hiroka Umeyama

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**APPENDIX 1: Photographs of test setup**

**Radiated Emission**

**Front**



**Rear**



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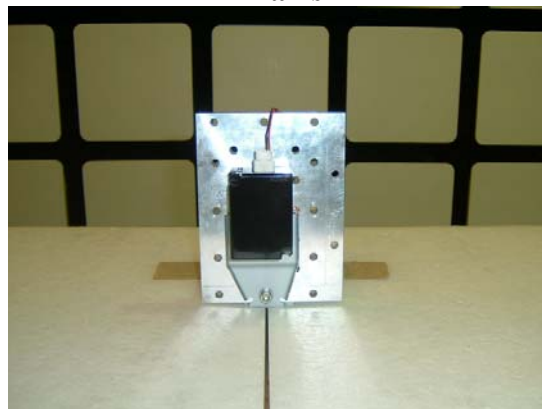


**Worst Case Position (X-axis:Horizontal / X-axis:Vertical)**

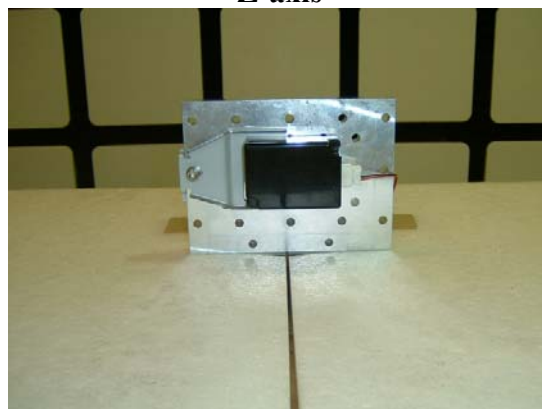
**X-axis**



**Y-axis**



**Z-axis**



## **APPENDIX 2: Test instruments**

### **EMI test equipment**

<b>Control No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Test Item</b>	<b>Calibration Date * Interval(month)</b>
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2005/04/11 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2005/02/02 * 12
MRENT-14	Spectrum Analyzer	Advantest	R3273	RE	2005/02/21 * 12
MPA-06	Pre Amplifier	Hewlett Packard	8447D	RE	2004/08/29 * 12
MCC-19	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX 104	RE	2005/02/03 * 12
MCC-04	Microwave Cable 1G-50GHz	Storm	421-011 ( 90-1394-079 )	RE	2005/01/05 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2005/02/24 * 12
MPA-05	Pre Amplifier	TSJ	TSJ 1-26.5GHz PreAmp	RE	2005/06/03 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2004/12/16 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2004/10/14 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2004/10/14 * 12
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2005/01/10 * 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**

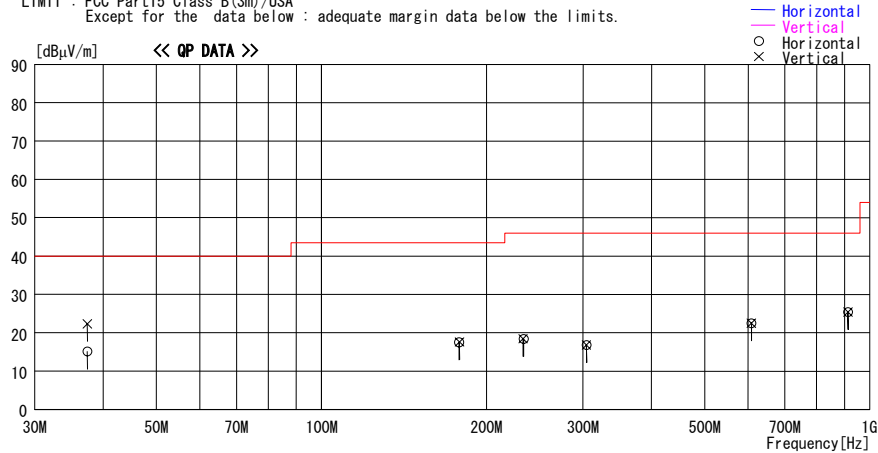
**DATA OF RADIATED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber

Applicant : DENSO CORPORATION  
Kind of EUT : Tire Pressure Monitoring System (Receiver)  
Model No. : 13BCH  
Serial No. : 1  
Report No. : 25KE0077-HO  
Power : DC 5.0V  
Temp./ Humi. : 24 deg. C. / 54 %  
Operator : Hiroka Umeyama

Mode / Remarks : Receiving / X-axis

LIMIT : FCC Part15 Class B(3m)/USA  
Except for the data below : adequate margin data below the limits.



No.	FREQ [MHz]	READING OP [dBµV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBµV/m]	LIMIT [dBµV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	37.408	21.8	15.1	6.0	27.8	15.1	40.0	24.9	300	318
2	178.347	20.7	16.8	7.2	27.2	17.5	43.5	26.0	300	0
3	233.750	20.6	17.1	7.6	26.9	18.4	46.0	27.6	300	0
4	304.282	20.7	15.0	7.9	26.8	16.8	46.0	29.2	100	0
5	608.562	21.8	19.8	9.2	28.3	22.5	46.0	23.5	100	0
6	912.840	20.8	22.1	10.3	27.8	25.4	46.0	20.6	100	0
----- Vertical -----										
7	37.408	29.0	15.1	6.0	27.8	22.3	40.0	17.7	100	275
8	178.679	20.8	16.8	7.2	27.2	17.6	43.5	25.9	100	104
9	233.254	20.6	17.1	7.6	26.9	18.4	46.0	27.6	100	360
10	304.284	20.7	15.0	7.9	26.8	16.8	46.0	29.2	100	0
11	608.560	21.8	19.8	9.2	28.3	22.5	46.0	23.5	100	0
12	912.843	20.8	22.1	10.3	27.8	25.4	46.0	20.6	100	0

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)

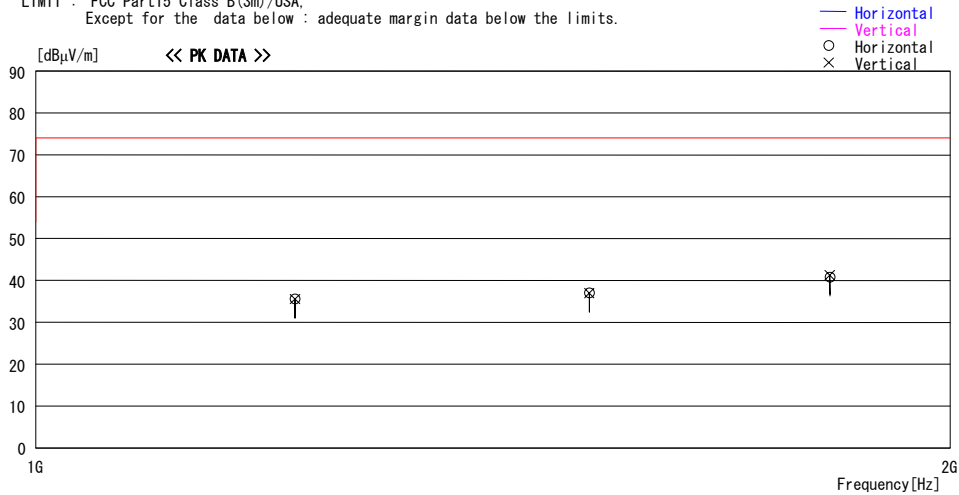
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Kind of EUT : Tire Pressure Monitoring System (Receiver)	Power : DC 5.0V
Model No. : 13BCH	Temp./ Humi. : 24 deg. C. / 54 %
Serial No. : 1	Operator : Hiroka Uneyama

Mode / Remarks : Receiving / X-axis

LIMIT : FCC Part15 Class B(3m)/USA.  
 Except for the data below : adequate margin data below the limits.



No.	FREQ [MHz]	READING PK [dBµV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBµV/m]	LIMIT [dBµV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1217.120	49.9	23.3	2.6	40.2	35.6	74.0	38.4	100	0
2	1521.400	49.4	24.6	2.9	39.9	37.0	74.0	37.0	100	0
3	1825.680	48.9	28.2	3.2	39.5	40.8	74.0	33.2	100	0
----- Vertical -----										
4	1217.120	49.8	23.3	2.6	40.2	35.5	74.0	38.5	100	0
5	1521.400	49.4	24.6	2.9	39.9	37.0	74.0	37.0	100	0
6	1825.680	49.3	28.2	3.2	39.5	41.2	74.0	32.8	100	0

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)

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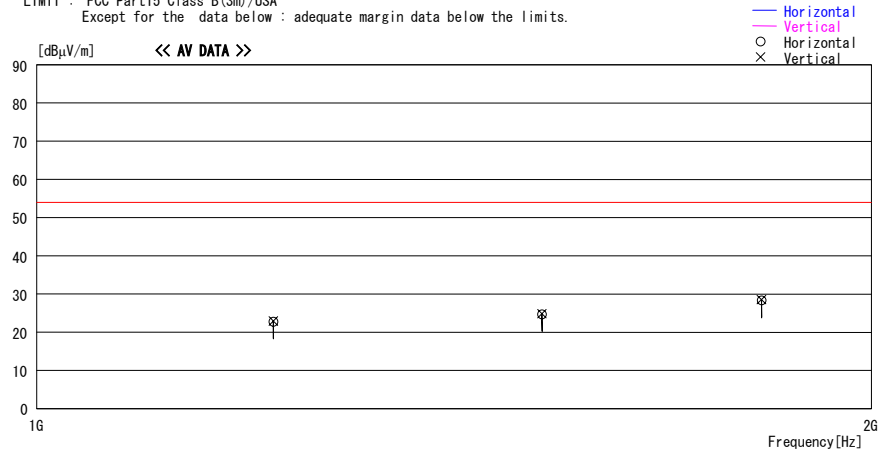
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No.	FREQ [MHz]	READING AV [dBµV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBµV/m]	LIMIT [dBµV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1217.120	37.1	23.3	2.6	40.2	22.8	54.0	31.2	100	0
2	1521.400	37.1	24.6	2.9	39.9	24.7	54.0	29.3	100	0
3	1825.680	36.4	28.2	3.2	39.5	28.3	54.0	25.7	100	0
----- Vertical -----										
4	1217.120	37.2	23.3	2.6	40.2	22.9	54.0	31.1	100	0
5	1521.400	37.3	24.6	2.9	39.9	24.9	54.0	29.2	100	0
6	1825.680	36.7	28.2	3.2	39.5	28.6	54.0	25.5	100	0

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)