



## RADIO TEST REPORT

Test Report No.: 30CE0195-SH-01-B

Applicant : BRIDGESTONE CORPORATION  
Bland Name : BRIDGESTONE  
Type of Equipment : TPMS (Tire Pressure Monitoring System)  
Model No. : K612 (TAG READER)  
FCC ID : SBDK612  
Test regulation : FCC Part15 Subpart C: 2009  
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 any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: November 4, 5 and 7, 2009

Tested by:

*G. Ishiwata*

Go Ishiwata  
EMC Service

&

*T. Arai*

Tatsuya Arai  
EMC Service

*H. Shirasawa*

Hikaru Shirasawa  
EMC Service

Approved by:

*I. Isozaki*

Ichiro Isozaki  
Group Leader of Shonan EMC lab.

- ☐ 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.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

MF060d (06.08.09)

<b>Table of Contents</b>	<b>Page</b>
<b>1 Applicant information</b>	<b>3</b>
<b>2 Equipment under test (E.U.T.)</b>	<b>3</b>
<b>3 Test specification, procedures and results</b>	<b>5</b>
<b>4 System test configuration</b>	<b>7</b>
<b>5 Conducted Emissions</b>	<b>8</b>
<b>6 Radiated Emissions (Fundamental and Spurious)</b>	<b>9</b>
<b>7 20dB bandwidth &amp; Occupied bandwidth (99%)</b>	<b>12</b>
 <b><u>Contents of Appendixes</u></b>	 <b>13</b>
<b>APPENDIX 1: Photographs of test setup</b>	<b>14</b>
<b>APPENDIX 2: Test data</b>	<b>17</b>
<b>APPENDIX 3: Test instruments</b>	<b>21</b>

## 1 Applicant information

Company Name : BRIDGESTONE CORPORATION  
Brand Name : BRIDGESTONE  
Address : 3-1-1, Ogawahigashi-Cho, Kodaira-Shi, Tokyo, 187-8531 Japan  
Telephone Number : +81-42-342-6326  
Facsimile Number : +81-42-342-6596  
Contact Person : Toshihiro Miyazaki

## 2 Equipment under test (E.U.T.)

### 2.1 Identification of E.U.T.

Type of Equipment : TPMS(Tire Pressure Monitoring System)  
Model No. : K612 (TAG READER)  
Serial No. : TR035  
Rating : DC3V/0.2A  
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.  
Receipt Date of Sample : October 30, 2009

### 2.2 Product description

Model: K612 (referred to as the EUT in this report) is a TAG READER.  
TAG READER is normally used only in the vicinity of dual tire of heavy vehicle in outdoor.  
TAG READER does not do transmission at the same time of Bluetooth and 125kHz.

Clock frequency : 8MHz (CPU)

#### [Transmitter]

Equipment type : Transmitter  
Frequency of operation : 125.00kHz  
Other Clock Frequency : 8MHz  
Type of modulation : ASK  
Mode of Operation : Simplex  
Antenna type : Ferrite Bar Antenna  
Antenna connector type : No connector  
ITU code : A1D  
Method of Frequency Generation : Crystal  
Operating voltage : DC 2.8 to 3.3V  
Operation temperature range : -10 to +50 deg.C.

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

**[Bluetooth(Ver.2.0+EDR)\*1)]**

Equipment type : Transceiver  
Frequency of operation : 2402-2480MHz  
Other Clock Frequency : 26MHz  
Bandwidth & channel spacing : 1MHz  
Type of modulation : FHSS (GFSK,  $\pi/4$ DQPSK, 8DPSK)  
Mode of Operation : Simplex  
Operating voltage : DC 2.8 to 3.3V  
Antenna type : Chip Ceramic Antenna  
Antenna gain with cable loss : 2dBi  
Antenna connector type : -  
ITU code : F1D, G1D  
Method of Frequency Generation : Synthesizer  
Operation temperature range : -10 to +50 deg.C.

**[Receiver\*2)]**

Equipment type : Receiver  
Type of Receiver : Super-heterodyne  
Frequency of operation : 433.92MHz  
Other Clock Frequency : 52.9MHz  
Intermediate Frequency : 10.7MHz  
Type of modulation : FSK  
Mode of Operation : Simplex  
Antenna type : Loop Antenna  
Operating voltage : DC 2.8 to 3.3V  
Operation temperature range : -10 to +50 deg.C.

\*1) Reference: EUT also this function Refer to 30CE0195-SH-01-A

\*2) Reference: EUT also this function Refer to 30CE0195-SH-01-C

**FCC Part15.31 (e)**

The module is provided stable power supply (DC 3.0V), and the power is not changed when voltage of the main unit is varied. Therefore, the equipment complies power supply regulation.

**FCC Part15.203 Antenna requirement**

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

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

### 3 Test specification, procedures and results

#### 3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2009, final revised on February 27, 2009  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements

#### 3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC Section 15.207	-	N/A *1)	22.5dB (0.43910MHz, N, QP)	Complied
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.209	Radiated	N/A *1)	20.0dB (0.125MHz, Vertical,)	Complied
Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.209	Radiated	N/A *1)	6.7dB (255.998MHz, Horizontal)	Complied
20dB bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	-	Radiated	N/A	-	Complied

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

\*1) Radiated tests were performed on stand-alone basis since EUT is not assumed to be used with AC adaptor normally. However, as it is possible that EUT is connected AC adaptor, conducted emission test were done for only confirmation.

#### 3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied bandwidth (99%)	ANSI C63.4:2003 13. Measurement of intentional radiators RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	-	Complied

\* Other than above, no addition, exclusion nor deviation has been made from the standard.

**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

### 3.4 Uncertainty

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

	No.1 Semi-anechoic chamber (±)	No.2 Semi-anechoic chamber (±)	No.3 Semi-anechoic chamber (±)
<b>Radiated emission (3m)</b>			
9k-30MHz	3.3dB	3.1 dB	3.2 dB
30-300MHz	4.4 dB	4.3 dB	4.5 dB
300-1000MHz	4.3 dB	4.2 dB	4.5 dB
1GHz<	5.7 dB	5.6 dB	5.6 dB
<b>Conducted emission</b>			
150kHz-30MHz	3.0 dB	2.6 dB	3.1 dB

#### Conducted emission test

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

#### Radiated emission test

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

Bandwidth Measurement uncertainty (with a 95% confidence level) for this test was: (±) 5.4%

### 3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone number : +81 463 50 6400

Facsimile number : +81 463 50 6401

JAB Accreditation No. : RTL02610

No.1/ No.2/ No.3 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on April 17, 2009 (Registration No.: 697847).

IC Registration No. : 2973D-1 (No1 anechoic chamber)

2973D-2 (No2 anechoic chamber)

2973D-3 (No3 anechoic chamber)

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.1 Shielded room	6.8 x 4.1 x 2.7
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.2 Shielded room	6.8 x 4.1 x 2.7
No.3 Semi-anechoic chamber	12.7 x 7.7 x 5.35 Maximum measurement distance: 5m	No.3 Shielded room	6.3 x 4.7 x 2.7
No.4 Full-anechoic chamber	8.1 x 5.1 x 3.55	No.4 Shielded room	4.4 x 4.7 x 2.7
		No.5 Shielded room	7.8 x 6.4 x 2.7
		No.6 Shielded room	7.8 x 6.4 x 2.7

### 3.6 Test setup, Data of EMI & Test instruments

Refer to Appendix 1 to 3.

#### **UL Japan, Inc.**

#### **Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## 4 System test configuration

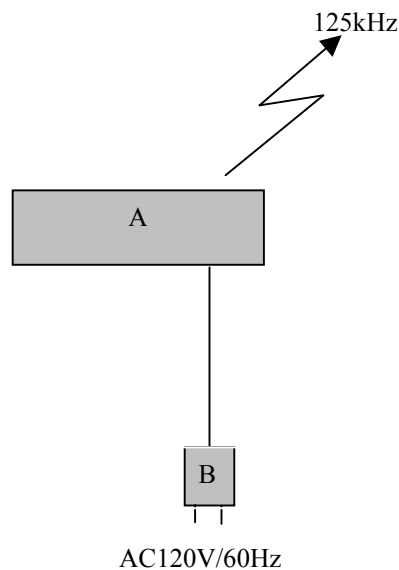
### 4.1 Justification

The system was configured in typical fashion (as a customer would normally use it) for testing.

Test sequence is used : Transmitting mode (125kHz, ASK)

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

### 4.2 Configuration and peripherals



\* Test data was taken under worse case conditions.

#### Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	TAG READER	K612	TR035	YOKOWO Co., Ltd.	EUT
B	AC Adaptor *1	US318-06	612-0290293	UNIFIVE	EUT

\*1) Conducted Emission test only.

#### List of cables used

No.	Name	Length (m)	Shield	
			Cable	Connector
1	DC Cable	1.8	Unshielded	Unshielded

**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## 5 Conducted emission

### 5.1 Operating environment

The test was carried out in No.3 shielded room.

Temperature : See test data  
Humidity : See test data

### 5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.

The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface.

EUT was located 80cm from LISN DC cable was bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source.

Photographs of the set up are shown in Appendix 1.

### 5.3 Test conditions

Frequency range : 0.15 - 30MHz  
EUT position : Table top  
EUT operation mode : Transmitting (125kHz)

### 5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a screened room.

The EUT was connected to a Line Impedance Stabilization Network (LISN).

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver.

Detector Type : Quasi-Peak/ Average  
IF Bandwidth : 9kHz

### 5.5 Results

Summary of the test results : Pass

Date : November 4, 2009

Test engineer : Hikaru Shirasawa

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401



## **6 Radiated Emissions (Fundamental and Spurious)**

### **6.1 Operating environment**

The test was carried out in No.3 Semi-anechoic chamber.

### **6.2 Test configuration**

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The configuration was set in accordance with ANSI C63.4: 2003. Photographs of the set up are shown in Appendix 1.

### **6.3 Test conditions**

Frequency range : 9kHz - 1000MHz  
Test distance : 3m

---

**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

## 6.4 Test procedure

Frequency: From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0deg.to 360deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 1.

Frequency: From 30MHz to 1GHz at distance 3m

The radiated electric field strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m(Refer to Figure 2).

The measuring antenna height was 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.

Measurements were performed with QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

Frequency	9kHz to 90kHz & 110kHz to 150kHz	90kHz to 110kHz	150kHz to 490kHz	490kHz to 30MHz	30MHz to 1000MHz
Detector IF Bandwidth	PK/AV: BW 200Hz	QP: BW 200Hz	QP: BW 9kHz	QP: BW 9kHz	QP: BW 120kHz
Measuring antenna	Loop				Biconical (30-300MHz) Logperiodic (300MHz-1GHz)

The carrier level and 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.

	Below 30MHz	Above 30MHz
Horizontal	Y	Y
Vertical	X	Z

\*Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m] = [Limit at 300m]-40log(3[m]/300[m])

490kHz – 30MHz [Limit at 3m] = [Limit at 300m]-40log(3[m]/30[m])

## 6.5 Results

Summary of the test results : Pass

Date : November 5 and 7, 2009

Test engineer : Go Ishiwata and Tatsuya Arai

**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

Figure 1: Direction of the Loop Antenna

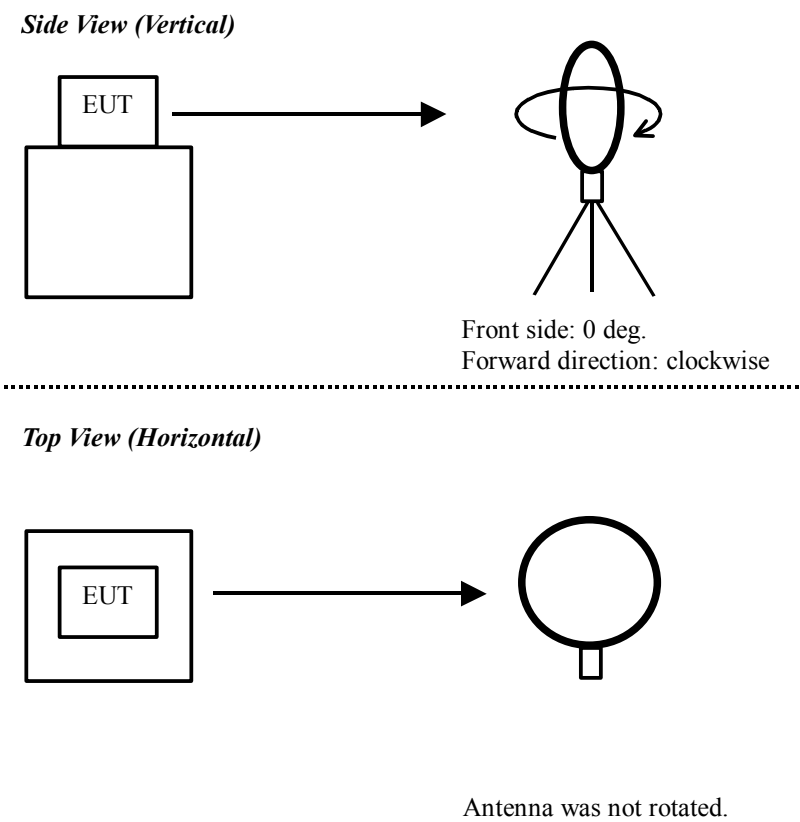
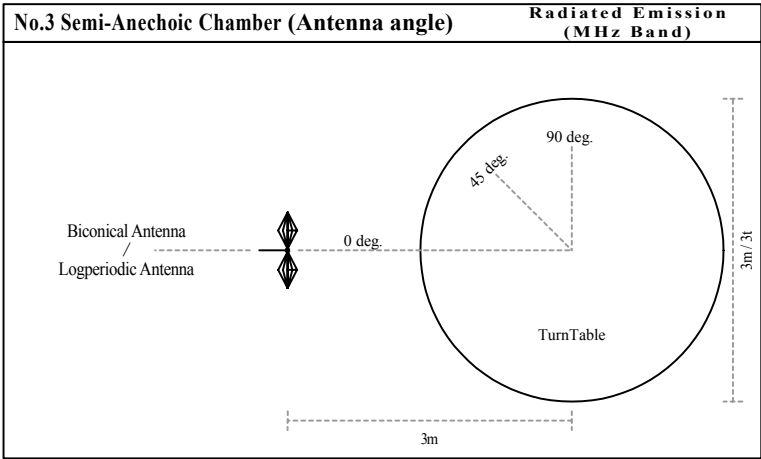


Figure 2



## **7 20dB bandwidth & Occupied bandwidth (99%)**

### **7.1 Operating environment**

The test was carried out in No.3 Semi-anechoic chamber.

### **7.2 Test procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

### **7.3 Results**

Summary of the test results : Pass

Date : November 7, 2009      Test engineer : Tatsuya Arai

### **APPENDIX 1: Photographs of test setup**

Page 14	:	Conducted emission
Page 15	:	Radiated emission
Page 16	:	Pre-check of the worst position

### **APPENDIX 2: Test data**

Page 17	:	Conducted Emission
Page 18 - 19	:	Radiated Emission
Page 20	:	20dB bandwidth & Occupied bandwidth

### **APPENDIX 3: Test instruments**

Page 21	:	Test instruments
---------	---	------------------