



RADIO TEST REPORT

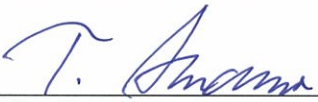
Test Report No.: 10692597S-A

Applicant : **Bridgestone Corporation**
Type of Equipment : **Tag Reader**
Model No. : **K712**
FCC ID : **SBDK712**
Test regulation : **FCC Part15 Subpart C: 2015**
Test result : **Complied**

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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.
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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: March 5, 2015

Tested by: 
Tatsuya Arai
Engineer
Consumer Technology Division

Approved by : 
Toyokazu Imamura
Leader
Consumer Technology Division



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

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Shonan EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10692597S-A

[illegible]

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SECTION 1: Customer 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

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

2.1 Identification of E.U.T.

Type of Equipment : Tag Reader
Model Number : K712
Serial Number : Refer to Section 4.2
Rating : DC 5 V
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : March 5, 2015
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: K712 (referred to as the EUT in this report) is a Tag Reader.

Feature of EUT:

It is used as an attachment of mobile device.

The wireless function is used to;

- prompt the TPMS sensor to switch ON/OFF
- transmit signal of 125 kHz to register the information
- receive the information of tire pressure and temperature (433.92 MHz)

Clock frequencies: 8 MHz, 13.2256 MHz

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<Radio part>

Radio type : Transmitter
Frequency of operation : 125 kHz
Modulation : ASK
Antenna type : Ferrite bar
Antenna connector type : None
ITU code : A1D
Operating temperature : -20 deg C. to +60 deg C.

Radio type : Receiver
Receiver type : Super-heterodyne
Frequency of operation : 433.92 MHz
Type of modulation : FSK
Antenna type : Whip
Antenna connector type : None
Operating Temperature : -20 deg C. to +60 deg C.

FCC 15.31 (e)

This EUT provides stable voltage (DC 3.3 V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC 15.203

The equipment and its antenna comply with this requirement since the antenna is built in the equipment and it cannot be replaced by end users.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.215 Additional provisions to the general radiated emission limitations

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009	FCC 15.207	-	N/A *1)	-	N/A
Electric field strength of Fundamental emission	ANSI C63.4:2009	FCC 15.209	Radiated	N/A	58.7dB Polarization: Vertical Detection: Average	Complied
Electric field strength of Spurious emission	ANSI C63.4:2009	FCC 15.209	Radiated	N/A	2.8dB Freq.: 213.902MHz Polarization: Horizontal	Complied
-26dB bandwidth	ANSI C63.4:2009	FCC 15.215 (c)	Radiated	N/A	-	-
*1) The test is not applicable since the EUT has no AC mains. Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422						

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 RSS-Gen 6.6	-	Radiated	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

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

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3.4 Uncertainty

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

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.5 dB	3.5 dB
	30MHz-300MHz	4.9 dB	4.9 dB	4.7 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

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

Other tests

Bandwidth Measurement uncertainty for this test was: (±) 0.66%

3.5 Test location

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JAB Accreditation No. : RTL02610

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measuremen t distance
☐ No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.3 shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☒ No.5 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.6 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
All items	Transmitting (Duty Cycle: 100 percent *1)	125kHz

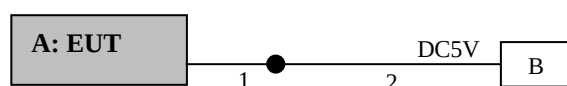
*1) The test was performed under the condition of Continuous wave in consideration of the worst case.

Software for testing: Trigger V0303

Power setting: Fixed

Justification: The system was configured in typical fashion (as 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	Remark
A	Tag Reader	K712	K712-T000011015	Bridgestone	EUT
B	DC power supply	-	-	-	-

List of cables used

No.	Cable Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	0.05	Shielded	Shielded	*2)
2	USB	0.65	Shielded	Shielded	-

*2) The cable is normally connected to a mobile device and transmission from the EUT is controlled by the mobile device. However, the test sample which can conduct continuous transmission when supplied with power via USB was used. In order to take the data of carrier and spurious emission in the worse-case, the mobile device was not installed in the EUT.

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SECTION 5: Radiated emission (Fundamental and Spurious emission)

5.1 Operating environment

The test was carried out in a semi-anechoic chamber.

Temperature : Refer to APPENDIX 1.
Humidity : Refer to APPENDIX 1.

5.2 Test configuration

EUT was placed on a polystyrene platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in Appendix 1.

5.3 Test conditions

Frequency range : 9kHz - 1GHz
Test distance : 3m
EUT position : Table top

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane at a distance of 3m.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606. These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane. However test results were confirmed to pass against standard limit.

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3m
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 (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.

	9kHz to 90kHz & 110kHz to 150kHz	90kHz to 110kHz	150kHz to 490kHz	490kHz to 30MHz	30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz
Measuring antenna	Loop antenna				Biconical (30-299.99MHz) Logperiodic (300MHz-1GHz)

* FCC 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 30m]-40log (3[m]/30[m])

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The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT, and the test was made with the condition that has the maximum noise. Worst axis: Refer to the data.

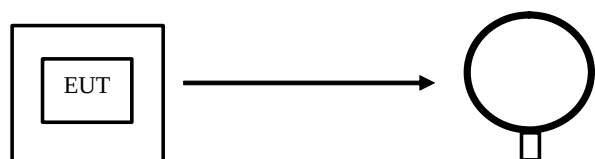
5.5 Results

Summary of the test results : Pass

Refer to APPENDIX 1.

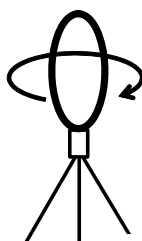
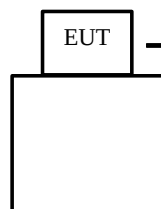
Figure 1. Direction of the Loop Antenna

Horizontal (Top View)

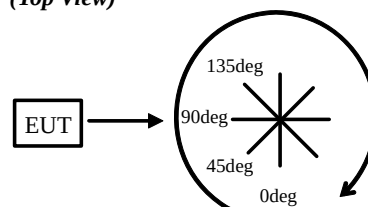


Antenna was not rotated.

Vertical (Side View)

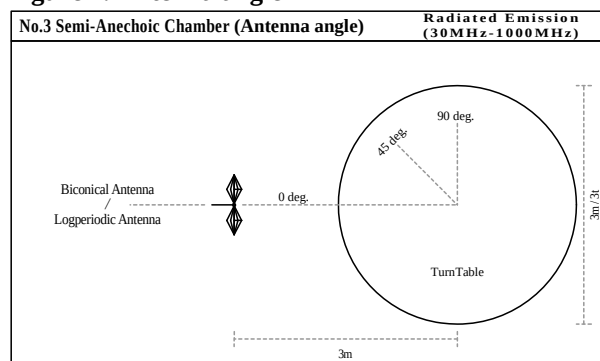


(Top View)



Front side: 0 deg.
Forward direction: clockwise

Figure 2. Antenna angle



SECTION 6: -26dB bandwidth & Occupied bandwidth (99%)

Test procedure

The test was measured with a spectrum analyzer using a test fixture.

Results

Summary of the test results: Pass

Refer to APPENDIX 1.

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Radiated emission
Bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission
Pre-check of the worst case

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APPENDIX 1: Data of Radio tests

Radiated Emission (Below 30MHz)

UL Japan, Inc.

Shonan EMC Lab. No.3 Semi Anechoic Chamber

Company:	Bridgestone Corporation
Equipment:	Tag Reader
Model:	K-712
Sample No.:	K712-T000011015
Power:	DC5V
Mode:	Transmitting 125kHz
EUT axis:	Horizontal: X Vertical: Z, Loop antenna: 0deg.

Regulation: FCC Part15 Subpart C 15.209
Test Distance: 3m
Date: March 5, 2015
Temperature: 23 deg.C
Humidity: 28 %RH
ENGINEER: Tatsuya Arai

Remarks:

[illegible]
$$\text{Result1} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+ATT)} - \text{Gain(Amplifier)}$$
$$\text{Result2} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+ATT)} - \text{Gain(Amprifier)} + \text{Distance factor(below 30MHz)}$$

* Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

DATA OF RADIATED EMISSION TEST

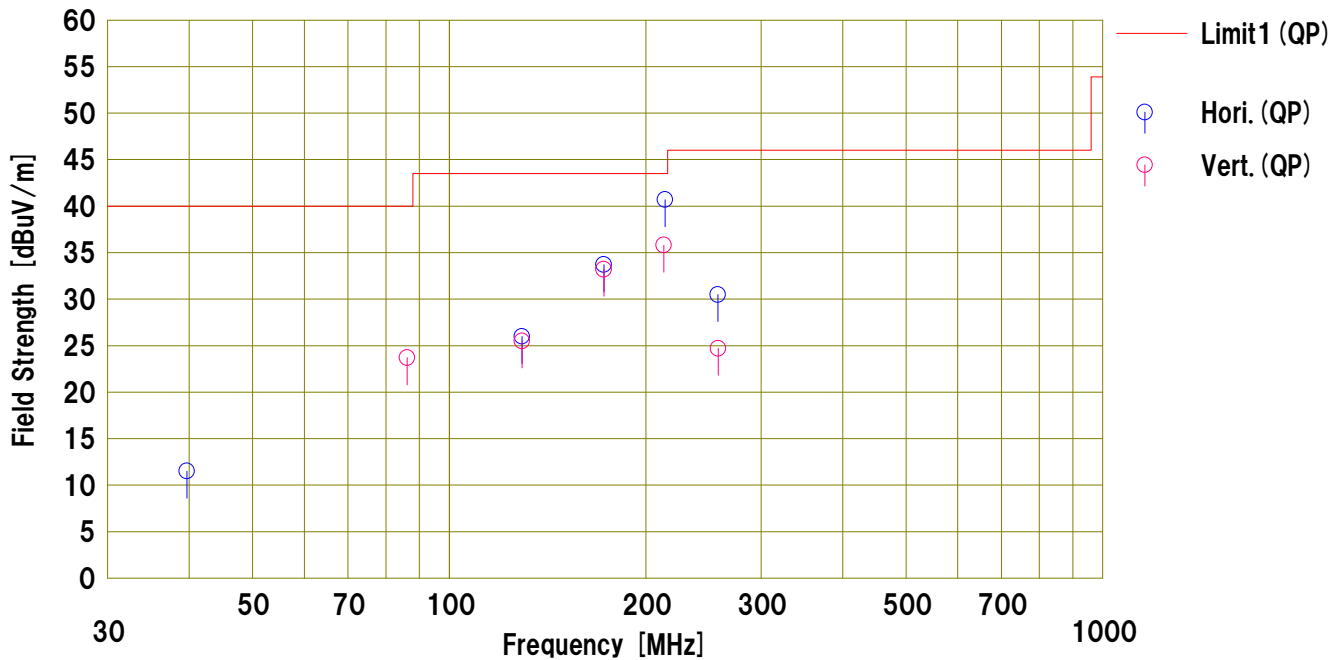
UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2015/03/05

Company : Bridgestone Corporation
Kind of EUT : Tag Reader
Model No. : K-712
Serial No. : K712-T000011015
Remarks : EUT axis: H: X, V: Y

Mode : Transmitting 125kHz
Order No. : 10692597S
Power : DC 5.0V
Temp./Humi. : 23deg.C / 28%RH

Limit1 : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV

Engineer : Tatsuya Arai



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result <QP>	Limit <QP>	Margin <QP>	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV/m]	[dBuV/m]	[dB]					
1	39.660	22.3	14.5	6.8	32.1	11.5	40.0	28.5	Hori.	150	0	BC	
2	129.183	37.1	13.5	7.5	32.1	26.0	43.5	17.5	Hori.	153	129	BC	
3	172.464	42.1	15.7	7.9	32.0	33.7	43.5	9.8	Hori.	159	301	BC	
4	213.902	48.1	16.5	8.1	32.0	40.7	43.5	2.8	Hori.	149	117	BC	
5	257.673	36.8	17.3	8.4	32.0	30.5	46.0	15.5	Hori.	136	261	BC	
6	86.247	40.7	7.4	7.7	32.1	23.7	40.0	16.3	Vert.	100	0	BC	
7	129.235	36.6	13.5	7.5	32.1	25.5	43.5	18.0	Vert.	100	94	BC	
8	172.464	41.6	15.7	7.9	32.0	33.2	43.5	10.3	Vert.	100	217	BC	
9	212.902	43.2	16.5	8.1	32.0	35.8	43.5	7.7	Vert.	100	359	BC	
10	257.938	31.0	17.3	8.4	32.0	24.7	46.0	21.3	Vert.	100	175	BC	

Calculation: Result [dBuV/m] = Reading [dBuV] + Ant.Fac [dB/m] + Loss (Cable+ATT) [dB] - Gain (AMP) [dB]
Ant.Type=BC:Biconical Antenna LP:Logperiodic Antenna SHA**: Horn

-26dB bandwidth & 99% Occupied bandwidth

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded Room

Company: Bridgestone Corporation
Equipment: Tag Reader
Model: K-712
Sample No.: K712-T000011015
Power: DC5V
Mode: Transmitting 125kHz

Regulation: FCC Part15 Subpart C 15.215

Date: March 5, 2015

Temperature: 20 deg.C

Humidity: 30 %RH

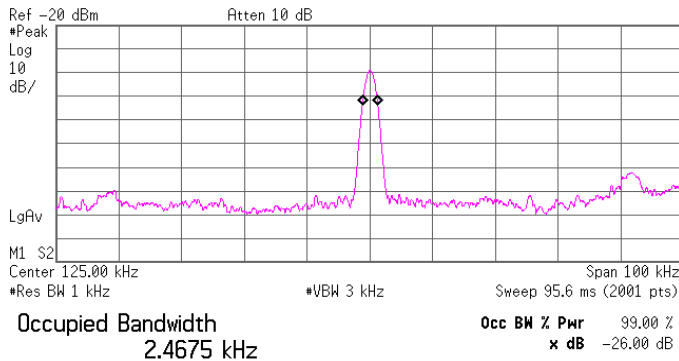
ENGINEER: Hikaru Shirasawa

26dB Bandwidth:

3.322 kHz

* Agilent

R T



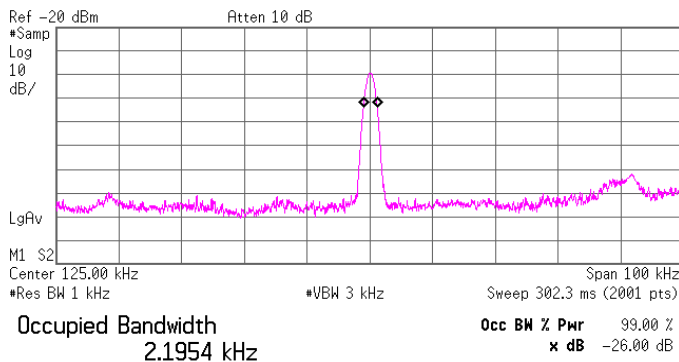
Transmit Freq Error 71.330 Hz
x dB Bandwidth 3.322 kHz

99% Occupied Bandwidth:

2.195 kHz

* Agilent

R T



Transmit Freq Error 90.724 Hz
x dB Bandwidth 2.927 kHz*

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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2014/07/14 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2014/10/18 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2014/10/18 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2014/08/27 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/ Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-271(RF Selector)	RE	2014/04/25 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2015/02/18 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2014/03/04 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RF,IMF)	-	RE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2014/10/30 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
KLP-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	827779/008	RE	2014/08/09 * 12
SAT6-07	Attenuator	JFW	50HF-006N	-	RE	2015/02/18 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	BW	2015/02/24 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	BW	2014/12/24 * 12
SSCA-01	Search coil	LANGER	RF-R 400-1	02-0634	BW	Pre Check

The expiration date of the calibration is the end of the expired month .

As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item :

RE: Radiated emission ,

BW: Bandwidth