EMI TEST REPORT

Test Report No.: 10692597S-C-R1

Applicant	:	**Bridgestone Corporation**
Type of Equipment	:	**Tag Reader**
Model No.	:	**K712**
FCC ID	:	**SBDK712**
Test regulation	:	**FCC Part 15 Subpart B: 2015** **RSS-Gen Issue 4: 2014** **RSS-310 Issue 3: 2010**
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.
7. This report is a revised version of 10692597S-C. 10692597S-C is replaced with this report.

Date of test: April 28, 2015

Representative test engineer:

Wataru Kojima
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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REVISION HISTORY

Original Test Report No.: 10692597S-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10692597S-C	April 27, 2015	-	-
1	10692597S-C-R1	May 11, 2015	- (Full-revision)	Replacement of data

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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 No.	:	K712
Serial No.	:	Refer to Section 4.2
Rating	:	DC5 V
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	:	March 5, 2015

2.2 Product description

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

Clock frequencies: 8 MHz, 13.2256 MHz

Receiver specification:

Equipment type	:	Receiver
Type of Receiver	:	Super-heterodyne
Frequency of operation	:	433.92 MHz
Intermediate Frequency	:	-10.7 MHz
Local oscillator	:	423.22 MHz
Type of modulation	:	FSK
Mode of Operation	:	Simplex
Antenna type	:	Whip
Antenna connector type	:	None

Section 3 : Test specification, procedures and results

3.1 Test Specification

Test specification	:	FCC Part 15 Subpart B: 2015, final revised on January 21, 2015
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators
Test specification	:	RSS-310 Issue 3: December 2010
Title	:	Licence-exempt Radio Apparatus (All Frequency Bands): Category II Equipment
		RSS-Gen Issue 4: November 2014
Title		General Requirements for Compliance of Radio Apparatus
		* Based on FCC Part 15.

3.2 Procedures & results

< Other receivers subject to part 15 >

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	ANSI C63.4:2009	FCC 15.107 (a)	N/A *1)	N/A	N/A
Radiated emission	ANSI C63.4:2009	FCC 15.109 (a)	N/A *2)	7.6 dB Freq.: 192.068 MHz Polarization: Horizontal	Complied
Antenna power conduction for receivers	ANSI C63.4:2009	FCC 15.111 (a)	N/A *3)	N/A	N/A

*1) The test is not applicable since the EUT does not have AC Mains ports.
*2) Measurements were limited up to 2 GHz since the highest frequency of internal source of the EUT is between 108 MHz and 500 MHz.
*3) The test is not applicable since the EUT does not have external antenna terminals.
Note: UL Japan's EMI Work Procedures 13-EM-W0420.

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Confirmation

UL Japan, Inc. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part15 Subpart B: 2015, RSS-310 Issue 3: 2010 and RSS-Gen Issue 4: 2014.

3.5 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)	30 MHz - 300 MHz	4.9 dB	4.9 dB	4.7 dB
	300 MHz - 1 GHz	5.0 dB	5.0 dB	4.8 dB
	1 GHz - 18 GHz	4.9 dB	4.9 dB	4.9 dB

*1: SAC=Semi-Anechoic Chamber
*2: SR= Shielded Room is applied besides radiated emission

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

3.6 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

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement 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.7 Shielded room	-	2.76 x 3.76 x 2.4	2.76 x 3.76	-
☐ No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
☐ No.1 Measurement room	-	2.55 x 4.1 x 2.5	2.55 x 4.1	-

3.7 Test setup, Data of EMI & Test instruments

Refer to Appendix 1 to 3.

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

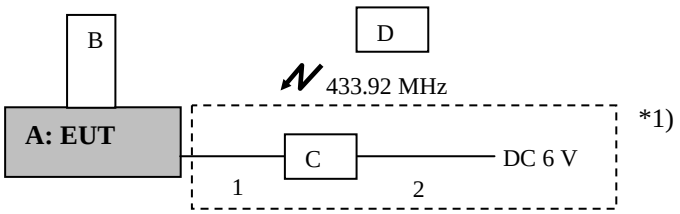
4.1 Operating modes

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

Test sequence is used: Receiving 433.92 MHz
Software: Tire Monitor ver. 1.0

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.

*1) The system was used to set constant receiving of 433.92 MHz. It simulated a manual switching under normal use, by timer.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Tag Reader	K712	K712-T000011015	Bridgestone	EUT
B	Smart Phone	TC55	14358521650249	Motorola	-
C	Jig	-	-	-	-
D	Tag	-	-	-	-

List of cables used

No.	Cable Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	1.0	Shielded	Shielded	-
2	DC	1.0	Unshielded	Unshielded	-

Section 5 : Radiated emission

5.1 Operating environment

This test was carried out in semi-anechoic chamber.

Temperature : Refer to data
Humidity : Refer to data

5.2 Test configuration

During the measurement below 1 GHz, the EUT was placed on a polystyrene platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane.
During the measurement above 1 GHz, the EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.
The rear of EUT was aligned and flushed with rear of tabletop.
Photographs of the set up are shown in Appendix 1.

5.3 Test conditions

Frequency range : 30 - 2000 MHz
Test distance : 3 m
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 3 m*.
* Measuring distance
☐ The boundary of the EUT is defined by an imaginary straight-line periphery describing a simple geometric configuration encompassing the EUT.
☒ The boundary of the EUT is defined by an imaginary circular periphery.
☐ This test repot use worse case for the setup.

The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for vertical or horizontal antenna polarization or both as necessary. The radiated emission measurements were made with the following detector function of the test receiver and spectrum analyzer.

		30-1000 MHz (Test receiver)	1000-2000 MHz (Spectrum analyzer)	
Detector Type:	:	QP	AV *1)	PK
IF Band width:	:	120 kHz	RBW 1 MHz/ VBW 10 Hz	RBW 1 MHz/ VBW 3 MHz

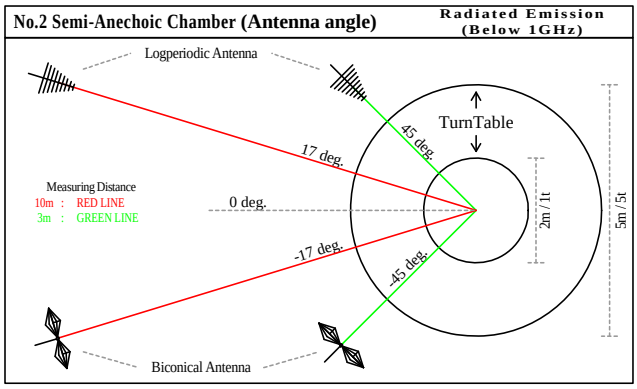
*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

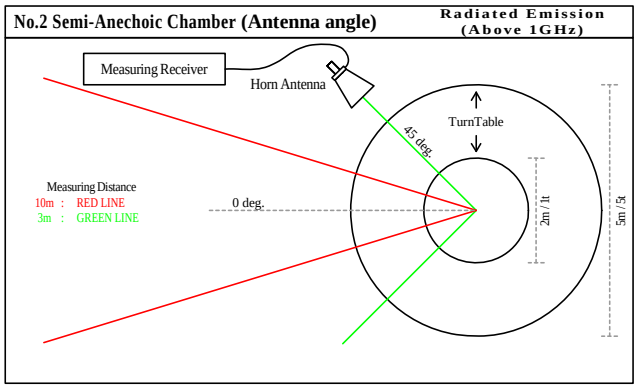
The noise levels were confirmed at each position of X, Y and Z axes of EUT, and the test was made with the condition that has the maximum noise. Worst axis: Refer to the data.

5.5 Results

Summary of the test results: Pass

Figure 1. Antenna angle





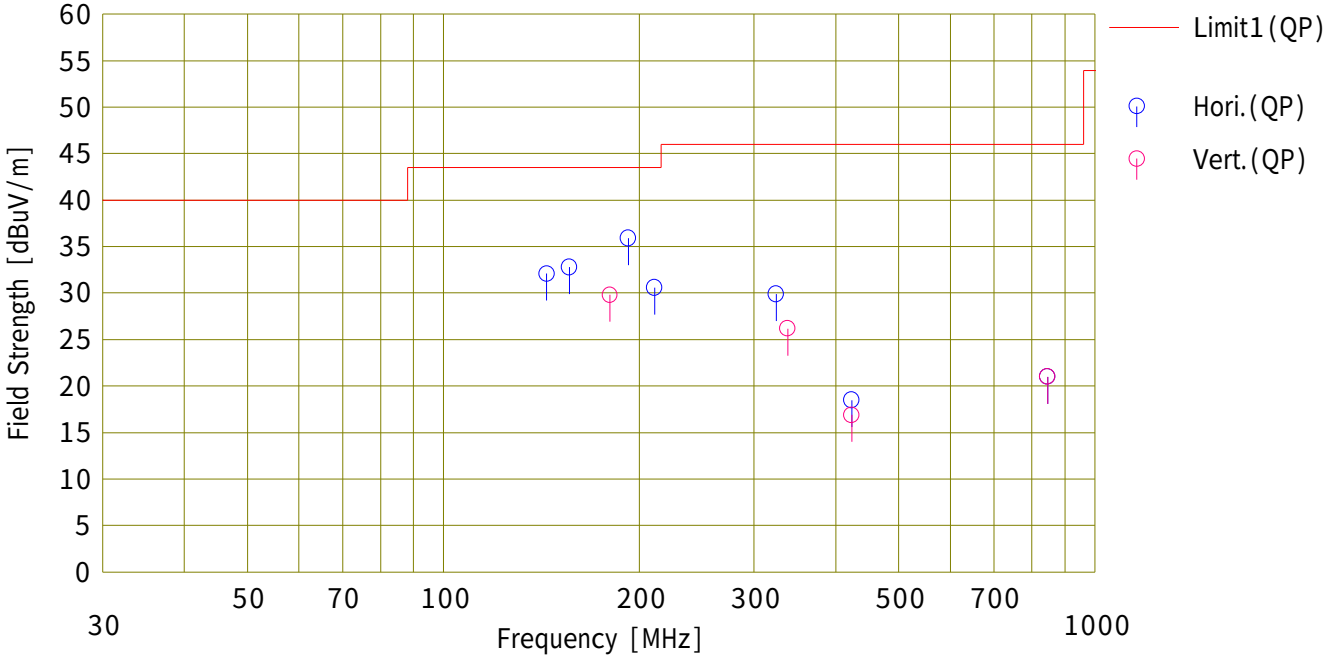
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber
Date : 2015/04/28

Company	: Bridgestone Corporation	Mode	: Receiving 433.92MHz
Kind of EUT	: Tag Reader	Order No.	: 10692597S
Model No.	: K-712	Power	: DC 6.0 V
Serial No.	: K712-T000011015	Temp./Humi.	: 23 deg.C / 40 %RH
Remarks	: EUT axis: H: X, V: Z Fundamental, Harmonics and other		

Limit1 : FCC 15B Class B (3m)

Engineer : Wataru Kojima



No.	Freq. [MHz]	Reading <QP> [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	S.Fac [dB]	Result <QP> [dBuV/m]	Limit <QP> [dBuV/m]	Margin <QP> [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	144.053	40.9	14.5	8.4	31.8	0.1	32.1	43.5	11.4	Hori.	224	96	BC	
2	156.044	40.9	15.1	8.5	31.8	0.1	32.8	43.5	10.7	Hori.	201	75	BC	
3	192.068	42.8	16.2	8.8	31.8	-0.1	35.9	43.5	7.6	Hori.	161	75	BC	
4	210.917	36.8	16.5	9.0	31.7	0.0	30.6	43.5	12.9	Hori.	152	85	BC	
5	324.213	40.4	14.5	6.7	31.7	0.0	29.9	46.0	16.1	Hori.	100	168	LP	
6	423.220	26.3	16.5	7.3	31.6	0.0	18.5	46.0	27.5	Hori.	100	214	LP	
7	846.440	21.2	21.5	9.4	31.1	0.0	21.0	46.0	25.0	Hori.	150	300	LP	
8	180.108	37.0	16.0	8.7	31.8	-0.1	29.8	43.5	13.7	Vert.	100	105	BC	
9	337.749	36.2	14.8	6.8	31.6	0.0	26.2	46.0	19.8	Vert.	174	253	LP	
10	423.220	24.7	16.5	7.3	31.6	0.0	16.9	46.0	29.1	Vert.	100	244	LP	
11	846.440	21.2	21.5	9.4	31.1	0.0	21.0	46.0	25.0	Vert.	100	316	LP	

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

DATA OF RADIATED EMISSION TEST

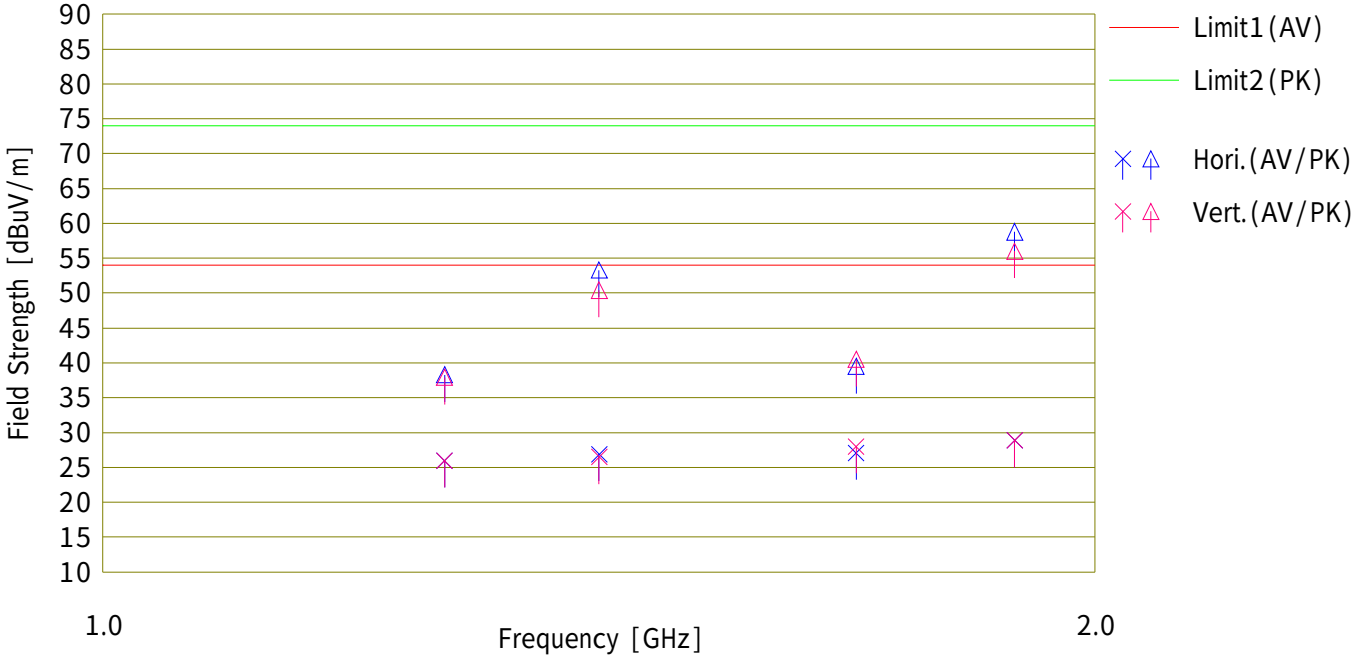
UL Japan, Inc. Shonan EMC Lab. No.2 Semi-Anechoic Chamber
Date : 2015/04/28

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

Mode : Receiving 433.92MHz
Order No. : 10692597S
Power : DC 6.0 V
Temp./Humi. : 23 deg.C / 40 %RH

Limit1 : FCC 15B Class B (3m) AV
Limit2 : FCC 15B Class B (3m) Peak

Engineer : Wataru Kojima



No.	Freq.	Reading <AV>	Reading <PK>	Ant.Fac	Loss	Gain	D.Fac	Result <AV>	Result <PK>	Limit <AV>	Limit <PK>	Margin <AV>	Margin <PK>	Pola.	Height	Angle	Ant. Type	Comment
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	[H/V]	[cm]	[deg]		
1	1269.660	32.1	44.4	23.9	3.2	35.5	2.3	26.0	38.3	53.9	73.9	27.9	35.6	Hori.	100	0	SHA02	
2	1414.600	32.2	58.6	24.2	3.4	35.2	2.3	26.9	53.3	53.9	73.9	27.0	20.6	Hori.	100	146	SHA02	
3	1692.880	31.0	43.4	24.9	3.7	34.8	2.3	27.1	39.5	53.9	73.9	26.8	34.4	Hori.	100	0	SHA02	
4	1890.845	31.9	61.8	25.4	3.9	34.6	2.3	28.9	58.8	53.9	73.9	25.0	15.1	Hori.	100	165	SHA02	
5	1269.660	32.1	44.0	23.9	3.2	35.5	2.3	26.0	37.9	53.9	73.9	27.9	36.0	Vert.	100	0	SHA02	
6	1414.600	31.8	55.7	24.2	3.4	35.2	2.3	26.5	50.4	53.9	73.9	27.4	23.5	Vert.	100	222	SHA02	
7	1692.880	31.9	44.4	24.9	3.7	34.8	2.3	28.0	40.5	53.9	73.9	25.9	33.4	Vert.	100	0	SHA02	
8	1890.845	31.9	59.0	25.4	3.9	34.6	2.3	28.9	56.0	53.9	73.9	25.0	17.9	Vert.	100	151	SHA02	

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

APPENDIX 3
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date ＊Interval(month)
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2015/02/18 ＊12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2015/02/18 ＊12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2014/08/27 ＊12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2014/11/22 ＊12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2015/04/17 ＊12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2015/04/17 ＊12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2014/11/22 ＊12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2014/10/30 ＊12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2014/09/03 ＊12
SJM-14	Measure	ASKUL	-	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2014/07/08 ＊12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
KAF-04	Pre Amplifier	Agilent	8449B	3008A01600	RE	2015/04/28 ＊12
SCC-G02	Coaxial Cable	Suhner	SUCOFLEX 104A	46498/4A	RE	2014/04/22 ＊12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2014/05/15 ＊12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2014/08/12 ＊12

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

End of Report