



Test report No. : 10261272H-A-R3
Page : 1 of 17
Issued date : April 14, 2014
Revised date : September 17, 2014
FCC ID : SBDB812A

RADIO TEST REPORT

Test Report No. : 10261272H-A-R3

Applicant : **Bridgestone Corporation**
Type of Equipment : **Tire Pressure Monitoring System**
Model No. : **B812 (Sensor)**
Test regulation : **FCC Part 15 Subpart C: 2014**
FCC ID : **SBDB812A**
Test Result : **Complied**

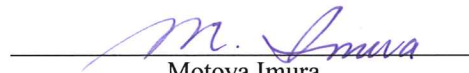
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
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6. This report is a revised version of 10261272H-A-R2. 10261272H-A-R2 is replaced with this report.

Date of test: March 27 and September 5, 2014

Representative test engineer:


Masatoshi Nishiguchi
Engineer
Consumer Technology Division

Approved by:


Motoya Imura
Engineer
Consumer Technology Division



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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Bridgestone Corporation
Address : 3-1-1, Ogawahigashi-cho, Kodaira-shi, Tokyo, 187-8531, Japan
Telephone Number : +81-42-342-6326
Facsimile Number : +81-42-345-6244
Contact Person : Toshihiro Miyazaki

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

2.1 Identification of E.U.T.

Type of Equipment : Tire Pressure Monitoring System
Model No. : B812(Sensor)
Serial No. : Refer to Clause 4.2
Rating : DC 3.0V
Receipt Date of Sample : March 26, 2014
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model No: B812 (referred to as the EUT in this report) is the Tire Pressure Monitoring System.

General Specification

Clock frequency(ies) in the system : 2MHz (microcomputer)

Radio Specification

Transmitter part

Radio Type : Transmitter
Frequency of Operation : 433.92MHz
Modulation : FSK
Power Supply (radio part input) : DC 3.0V
Antenna type : Loop Antenna
Antenna Gain : -15dBi

Receiver part

Type of Receiver : Receiver
Frequency of operation : 125kHz
Modulation : CMI
Antenna type : Coil Antenna

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2014, final revised on May 1, 2014 and effective June 2, 2014

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.231 Periodic operation in the band 40.66 - 40.70MHz
and above 70MHz

* The revision on May 1, 2014 does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements IC: RSS-Gen 7.2.4	FCC: Section 15.207 IC: RSS-Gen 7.2.4	N/A	N/A *1)	-
Automatically Deactivate	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: -	FCC: Section 15.231(e) IC: RSS-210 A1.1.5	N/A	Complied	Radiated
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.8	FCC: Section 15.231(e) *2) IC: RSS-210 A1.1.5	9.5dB 433.920MHz Horizontal PK with Duty factor	Complied	Radiated
Electric Field Strength of Spurious Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.9	FCC: Section 15.205 15.209 15.231(e) *2) IC: RSS-210 A1.1.2, A1.1.5 , 2.5.1 RSS-Gen 7.2.5	14.9dB 2603.520MHz Horizontal PK with Duty factor	Complied	Radiated
-20dB Bandwidth	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: -	FCC: Section 15.231(c) IC: Reference data	N/A	Complied	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The test is not applicable since the EUT does not have AC Mains.

*2) Limit of 15.231(e) was applied since the limit is more stringent than of 15.231(b).

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FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0V) and the constant voltage was supplied to the EUT during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	N/A	N/A	Radiated

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

3.4 Uncertainty

EMI

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

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test(3m)

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

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3.5 Test Location

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	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up.

Refer to APPENDIX.

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

4.1 Operating Modes

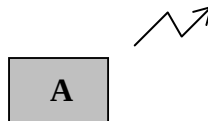
Test Item*	Mode
Automatically Deactivate	Normal mode 433.92MHz (FSK) *1)
-20dB & 99% Occupied Bandwidth Duty Cycle	Normal mode 433.92MHz (FSK)
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission	Continuous Transmitting mode (Tx) 433.92MHz (FSK) *2)
* The system was configured in typical fashion (as a customer would normally use it) for testing. *1) Since alarm mode is only possible under abnormal environment, test was performed on normal mode. *2) The software of this mode is the same as one of normal product. End users cannot change the settings of the output power of the product.	

This EUT has two following modes.

Normal mode: System doesn't detect any emergency signal.

Alarm mode: System detects that the pressure of the tire is too low and/or temperature is too high.

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Tire Pressure Monitoring System	B812(Sensor)	030447	Bridgestone Corporation	EUT

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SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m 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.

Photographs of the set up are shown in Appendix 3.

[Transmitting mode]

(Below 30MHz)

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

(Above 30MHz)

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

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 strength.

The measurements were performed for both vertical and horizontal antenna polarization.

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

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz	Above 1GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200Hz	200Hz	9.1kHz	9.1kHz	120kHz	PK: S/A:RBW 1MHz, VBW 3MHz

- The carrier level was measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

Noise levels of all the frequencies were measured at the position.

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range : 9kHz-4.4GHz

Test data : APPENDIX

Test result : Pass

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SECTION 6: Automatically deactivate

Test Procedure

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX 1

Test result : Pass

SECTION 7: -20dB and 99% Occupied Bandwidth

Test Procedure

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

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	1MHz	15kHz	47kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.

Test data : APPENDIX 1

Test result : Pass

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APPENDIX 1: Data of EMI test

Automatically deactivate

Test place	Ise EMC Lab. No.4 Semi Anechoic Chamber
Report No.	10261272H
Date	09/05/2014
Temperature/ Humidity	22 deg. C / 62% RH
Engineer	Masatoshi Nishiguchi
Mode	Normal use mode

Operation in FCC15.231(e)

Wake Up

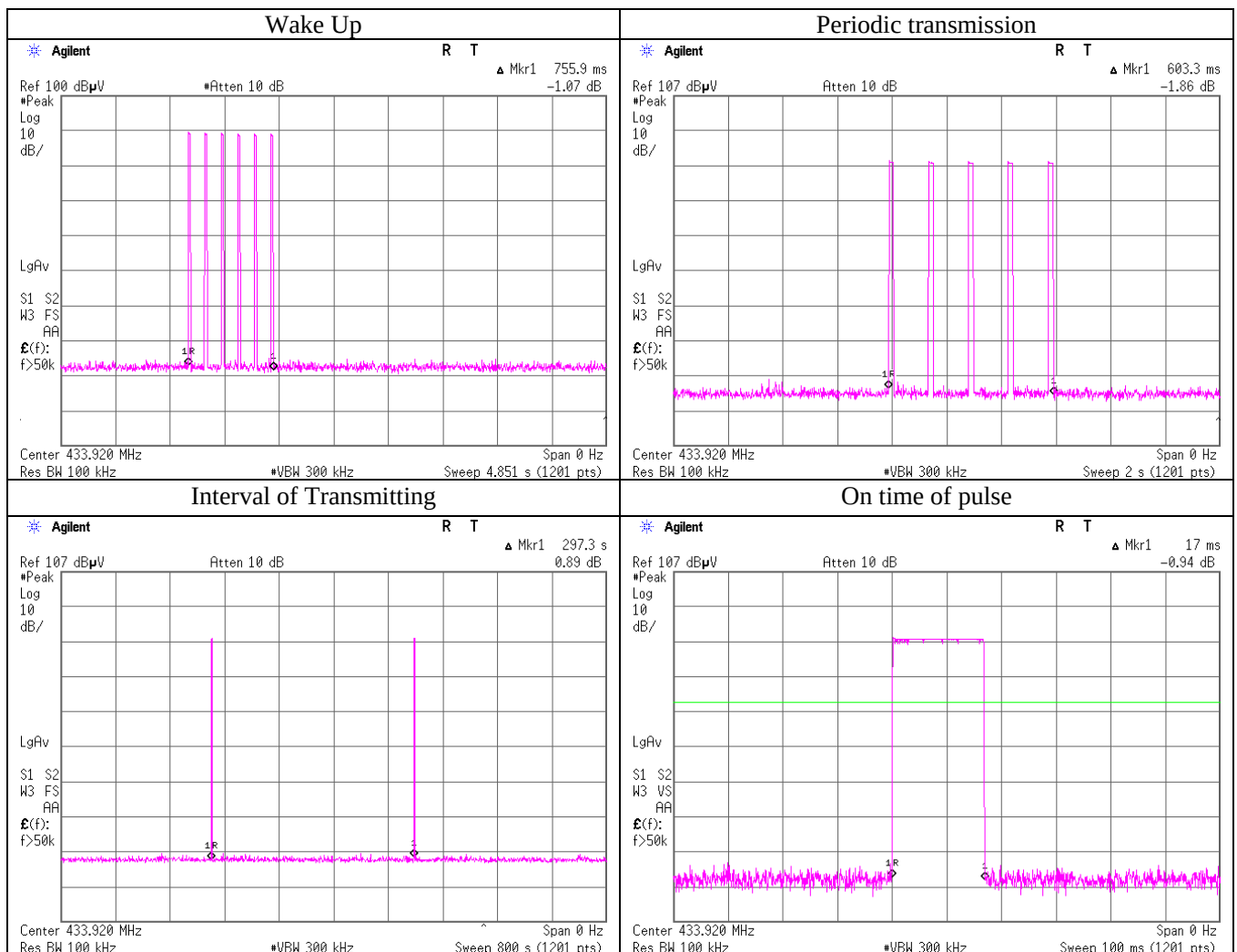
Duration of transmission: 755.9msec < 1sec

Silent period between transmissions: 297.3sec – 0.7559sec = 296.5441sec > 30times the duration of transmission and 10sec.

Periodic transmission

Duration of transmission: 603.3msec < 1sec

Silent period between transmissions: 297.3sec – 0.6033sec = 296.6967sec > 30times the duration of transmission and 10sec.



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Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. : 10261272H
Date : 03/27/2014
Temperature/ Humidity : 22 deg. C / 49% RH
Engineer : Masatoshi Nishiguchi
Mode : Transmitting mode

PK

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
433.920	PK	82.2	82.1	17.7	10.8	32.0	-	78.7	78.6	92.8	14.1	14.2	Carrier
867.840	PK	37.3	37.0	22.2	13.1	31.1	-	41.5	41.2	72.8	31.3	31.6	Outside
1301.760	PK	44.9	45.8	25.0	3.6	34.5	-	39.0	39.9	73.9	34.9	34.0	Inside
1735.680	PK	51.2	53.9	26.4	3.1	33.5	-	47.2	49.9	73.9	26.7	24.0	Outside
2169.600	PK	46.6	47.4	27.5	3.2	32.9	-	44.4	45.2	73.9	29.5	28.7	Outside
2603.520	PK	55.1	47.9	28.6	3.3	32.6	-	54.4	47.2	73.9	19.5	26.7	Outside
3037.440	PK	50.8	47.6	29.1	3.4	32.4	-	50.9	47.7	73.9	23.0	26.2	Outside
3471.360	PK	49.4	47.7	29.0	3.7	32.2	-	49.9	48.2	73.9	24.0	25.7	Outside
3905.280	PK	43.6	42.7	29.5	4.0	32.1	-	45.0	44.1	73.9	28.9	29.8	Inside
4339.200	PK	42.4	42.8	29.9	4.2	31.9	-	44.6	45.0	73.9	29.3	28.9	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

PK with Duty factor

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark
		Hor	Ver					Hor	Ver		Hor	Ver	
433.920	PK	82.2	82.1	17.7	10.8	32.0	-15.4	63.3	63.2	72.8	9.5	9.6	Carrier
867.840	PK	37.3	37.0	22.2	13.1	31.1	-15.4	26.1	25.8	52.8	26.7	27.0	Outside
1301.760	PK	44.9	45.8	25.0	3.6	34.5	-15.4	23.6	24.5	53.9	30.3	29.4	Inside
1735.680	PK	51.2	53.9	26.4	3.1	33.5	-15.4	31.8	34.5	53.9	22.1	19.4	Outside
2169.600	PK	46.6	47.4	27.5	3.2	32.9	-15.4	29.0	29.8	53.9	24.9	24.1	Outside
2603.520	PK	55.1	47.9	28.6	3.3	32.6	-15.4	39.0	31.8	53.9	14.9	22.1	Outside
3037.440	PK	50.8	47.6	29.1	3.4	32.4	-15.4	35.5	32.3	53.9	18.4	21.6	Outside
3471.360	PK	49.4	47.7	29.0	3.7	32.2	-15.4	34.5	32.8	53.9	19.4	21.1	Outside
3905.280	PK	43.6	42.7	29.5	4.0	32.1	-15.4	29.6	28.7	53.9	24.3	25.2	Inside
4339.200	PK	42.4	42.8	29.9	4.2	31.9	-15.4	29.2	29.6	53.9	24.7	24.3	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier) + Duty factor (Refer to Duty factor data sheet)

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

- * The test above 1GHz was performed with PK detect. Average emission measurements were calculated with PK detect and Duty cycle factor.
- * Duty Factor was calculated with the assumption of the worst condition in 100msec.
- * The noise measured with PK detect was pulse emission.

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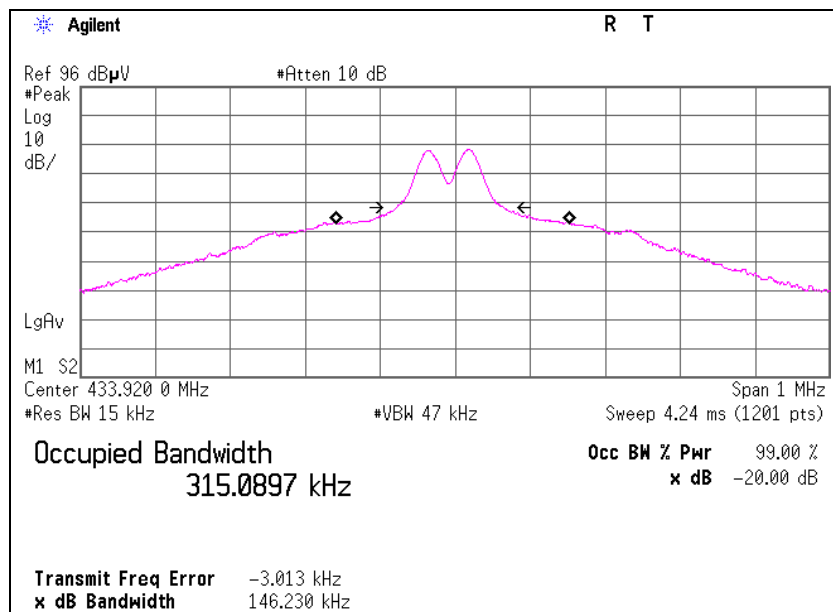
-20dB Bandwidth

Test place Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No. 10261272H
Date 03/27/2014
Temperature/ Humidity 22 deg. C / 49% RH
Engineer Masatoshi Nishiguchi
Mode Normal use mode

Bandwidth Limit : Fundamental Frequency $433.92 \text{ MHz} \times 0.25\% = 1084.80 \text{ kHz}$

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
146.23	1084.80	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
315.09	1084.80	Pass



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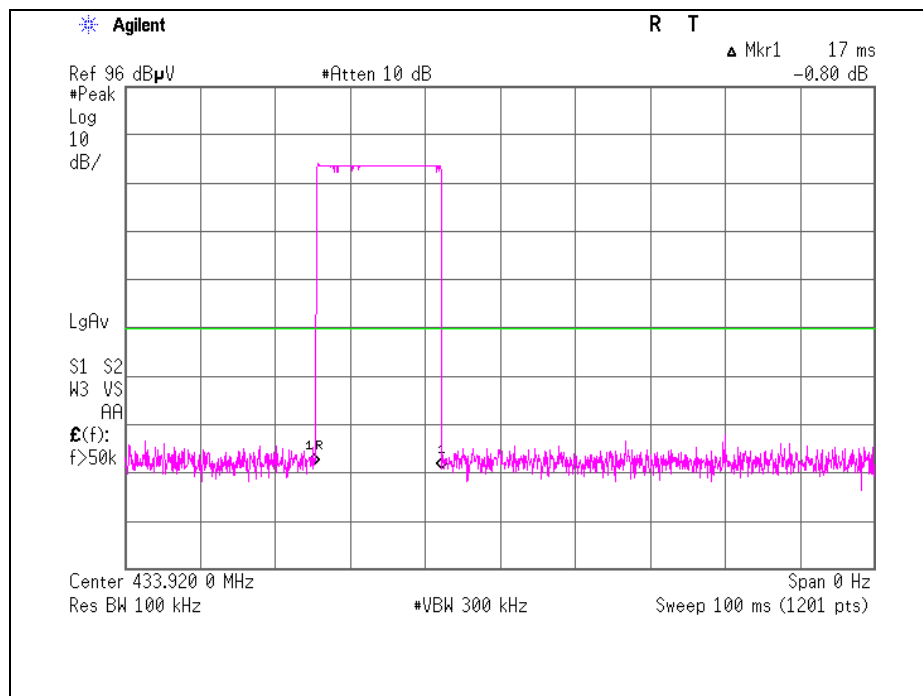
Duty Cycle

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10261272H
Date	03/27/2014
Temperature/ Humidity	22 deg. C / 49% RH
Engineer	Masatoshi Nishiguchi
Mode	Normal use mode

(Total)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
17.00	100.00	0.17	-15.4

Duty = $20\log_{10}(\text{ON time/Cycle})$



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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)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-114	Spectrum Analyzer	Agilent	E4440A	MY46187105	RE	2013/11/11 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12 *1)
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12 *1)
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12 *1)
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2013/05/17 * 12 *1)
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2013/09/27 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2014/03/24 * 12
MHF-27	High Pass Filter(1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	RE	2014/01/08 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2014/02/20 * 12
MLPA-07	Loop Antenna	UL Japan	-	-	RE	Pre Check
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2014/06/06 * 12

*1) This test equipment was used for the tests before the expiration date of the calibration.

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

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

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

Test Item:

RE: Radiated emission, 99% Occupied Bandwidth, -20dB bandwidth, Automatically deactivate and Duty cycle tests

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