



RADIO TEST REPORT

Test Report No. : 10749723H-A-R1

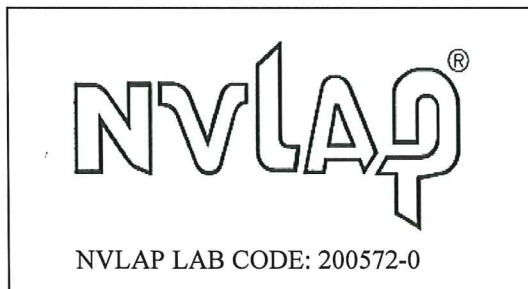
Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : Remote engine starter (FOB)
Model No. : GHR-M010
Test regulation : FCC Part 15 Subpart C: 2015
(Keyless function part)
FCC ID : OUCGHR-M010
Test Result : Complied

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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.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10749723H-A. 10749723H-A is replaced with this report.

Date of test: April 16, 2015

Representative test engineer: S. Matsuyama
Satofumi Matsuyama
Engineer
Consumer Technology Division

Approved by: M. Imura
Motoya Imura
Engineer
Consumer Technology Division



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REVISION HISTORY

Original Test Report No.: 10749723H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10749723H-A	May 15, 2015	-	-
1	10749723H-A-R1	June 11, 2015	P. 6	Addition of following sentence in Clause 3.2; * In case any questions arise about test procedure, ANSI C63.4: 2009 is also referred.

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SECTION 1: Customer information

Company Name : OMRON Automotive Electronics Co. Ltd.
Address : 6368 NENJOZAKA OKUSA KOMAKI AICHI, 485-0802 JAPAN
Telephone Number : +81-568-78-6159
Facsimile Number : +81-568-78-7659
Contact Person : Masashi Matsuda

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

2.1 Identification of E.U.T.

Type of Equipment : Remote engine starter (FOB)
Model No. : GHR-M010
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 3.0 V (CR2032 x 1)
Receipt Date of Sample : April 15, 2015
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

2.2 Product Description

Model No: GHR-M010 (referred to as the EUT in this report) is the Remote engine starter (FOB).

[Keyless function]

General Specification

Clock frequencies in the system : 18.610 MHz

Radio Specification

Radio Type : Transmitter
Frequency of Operation : 315 MHz
Modulation : FSK
Operating voltage (inner) : DC 3.0 V
Antenna type : PWB Pattern Antenna
Antenna Gain : -23 dBi

Radio Type : Receiver
Frequency of Operation : 125 kHz

*The test of receiver part was performed separately from this test report, and the conformability is confirmed.

[Remote engine start function]

General Specification

Clock frequencies in the system : 30.000 MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 915.4 MHz to 925.0 MHz
Modulation : FHSS, FSK
Operating voltage (inner) : DC 3.0 V
Antenna type : Chip Antenna
Antenna Gain : -2.0 dBi
Number of channel : 25
Channel spacing : 400 kHz

*This report applies with for Keyless function.

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 15.231 Periodic operation in the band 40.66 - 40.70MHz
and above 70MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	FCC: ANSI C63.4:2009 7. AC powerline conducted emission measurements ----- IC: RSS-Gen 8.8	FCC: Section 15.207 ----- IC: RSS-Gen 8.8	N/A	N/A*1)	-
Automatically Deactivate	FCC: ANSI C63.4:2009 13. Measurement of intentional radiators ----- IC: -	FCC: Section 15.231(a)(1) ----- IC: RSS-210 A1.1.1	N/A	Complied	Radiated
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.4:2009 13. Measurement of intentional radiators ----- IC: RSS-Gen 6.12	FCC: Section 15.231(b) ----- IC: RSS-210 A1.1.2	6.3 dB 315.000 MHz Horizontal, PK with Duty factor	Complied	Radiated
Electric Field Strength of Spurious Emission	FCC: ANSI C63.4:2009 13. Measurement of intentional radiators ----- IC: RSS-Gen 6.13	FCC: Section 15.205 Section 15.209 Section 15.231(b) ----- IC: RSS-210 A1.1.2, 2.5.1 RSS-Gen 8.9	6.1 dB 630.000 MHz Vertical, PK with Duty factor	Complied	Radiated
-20dB Bandwidth	FCC: ANSI C63.4:2009 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.

* In case any questions arise about test procedure, ANSI C63.4: 2009 is also referred.

FCC Part 15.31 (e)

This test was performed with the New Battery (DC 3.0 V) 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.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	IC: RSS-Gen 6.6	IC: RSS-210 A1.1.3	N/A	Complied	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						
	(3 m*)(+dB)				(1 m*)(+dB)		(0.5 m*)(+dB)
	9 kHz - 30 MHz	30 MHz - 300 MHz	300 MHz - 1 GHz	1 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
No.1	4.3 dB	5.5 dB	6.3 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No.2	4.2 dB	5.4 dB	6.3 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No.3	4.4 dB	5.4 dB	6.4 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No.4	4.7 dB	5.6 dB	6.4 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

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

Radiated emission test(3m)

[Electric Field Strength of Fundamental Emission]

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

[Electric Field Strength of Spurious Emission]

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

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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 7.7 m	7.0 x 6.0 m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2 m	4.0 x 4.0 m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9 m	6.8 x 5.75 m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7 m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9 m	6.8 x 5.75 m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7 m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9 m	6.0 x 6.0 m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7 m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0 m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7 m	4.7 x 7.5 m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7 m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8 m	2.4 x 2.4 m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0 m	4.8 x 4.6 m	-

* 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 Test data, Test instruments, and Test set up.

Refer to APPENDIX.

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

4.1 Operating Modes

Test Item*	Mode
Automatically Deactivate	Normal use mode
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth Duty Cycle	Continuous Transmitting mode
* The system was configured in typical fashion (as a user would normally use it) for testing.	

4.2 Configuration and peripherals

A

* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Remote engine starter (FOB)	GHR-M010	FH01	OMRON Automotive Electronics Co. Ltd.	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, 0.5m by 1.0m, 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 (or, noise levels) was (or were) 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-3.2GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Automatically deactivate

Test Procedure

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

Test data : APPENDIX
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
20 dB Bandwidth	150 kHz	1.5 kHz	4.3 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 % to 5 % of OBW	Three times of RBW	Auto (Single)	Peak hold *1)	Max Hold	Spectrum Analyzer

*1) Peak hold was applied as Worst-case measurement.

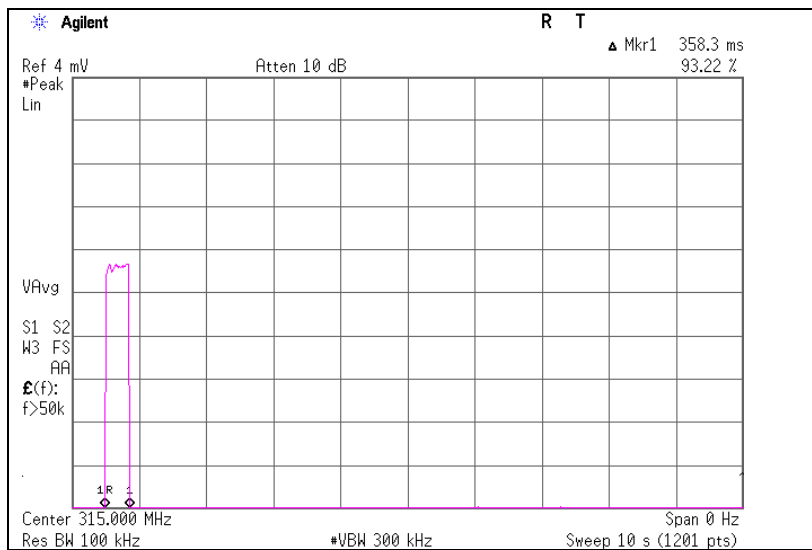
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Automatically deactivate

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
 Report No. : 10749723H
 Date : 04/16/2015
 Temperature/ Humidity : 25 deg. C / 40% RH
 Engineer : Satofumi Matsuyama
 Mode : Normal use mode

Time of Transmitting [sec]	Limit [sec]	Result
0.358	5.00	Pass



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

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10749723H
Date : 04/16/2015
Temperature/ Humidity : 25 deg. C / 40 % RH
Engineer : Satofumi Matsuyama
Mode : Continuous Transmitting mode

QP or 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	
315.000	PK	72.9	69.8	15.0	8.9	27.5	-	69.3	66.2	95.6	26.3	29.4	Carrier
630.000	PK	46.7	47.4	20.0	10.4	28.3	-	48.8	49.5	75.6	26.8	26.1	Outside
945.000	PK	NS	NS	-	-	-	-	-	-	75.6	-	-	Outside
1260.000	PK	51.6	52.4	25.8	2.0	35.8	-	43.6	44.4	75.6	32.0	31.2	Outside
1575.000	PK	46.0	47.2	26.9	2.3	35.4	-	39.8	41.0	73.9	34.1	32.9	Inside
1890.000	PK	46.2	45.8	28.8	2.5	35.2	-	42.3	41.9	75.6	33.3	33.7	Outside
2205.000	PK	NS	NS	-	-	-	-	-	-	73.9	-	-	Inside
2520.000	PK	47.9	47.1	29.3	2.8	34.9	-	45.1	44.3	75.6	30.5	31.3	Outside
2835.000	PK	45.7	45.6	29.6	3.0	34.8	-	43.5	43.4	73.9	30.4	30.5	Inside
3150.000	PK	46.9	46.2	29.8	3.2	34.6	-	45.3	44.6	75.6	30.3	31.0	Outside

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

NS: No signal detected

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	
315.000	PK	72.9	69.8	15.0	8.9	27.5	0.0	69.3	66.2	75.6	6.3	9.4	Carrier
630.000	PK	46.7	47.4	20.0	10.4	28.3	0.0	48.8	49.5	55.6	6.8	6.1	Outside
945.000	PK	NS	NS	-	-	-	0.0	-	-	55.6	-	-	Outside
1260.000	PK	51.6	52.4	25.8	2.0	35.8	0.0	43.6	44.4	55.6	12.0	11.2	Outside
1575.000	PK	46.0	47.2	26.9	2.3	35.4	0.0	39.8	41.0	53.9	14.1	12.9	Inside
1890.000	PK	46.2	45.8	28.8	2.5	35.2	0.0	42.3	41.9	55.6	13.3	13.7	Outside
2205.000	PK	NS	NS	-	-	-	0.0	-	-	53.9	-	-	Inside
2520.000	PK	47.9	47.1	29.3	2.8	34.9	0.0	45.1	44.3	55.6	10.5	11.3	Outside
2835.000	PK	45.7	45.6	29.6	3.0	34.8	0.0	43.5	43.4	53.9	10.4	10.5	Inside
3150.000	PK	46.9	46.2	29.8	3.2	34.6	0.0	45.3	44.6	55.6	10.3	11.0	Outside

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

NS: No signal detected

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

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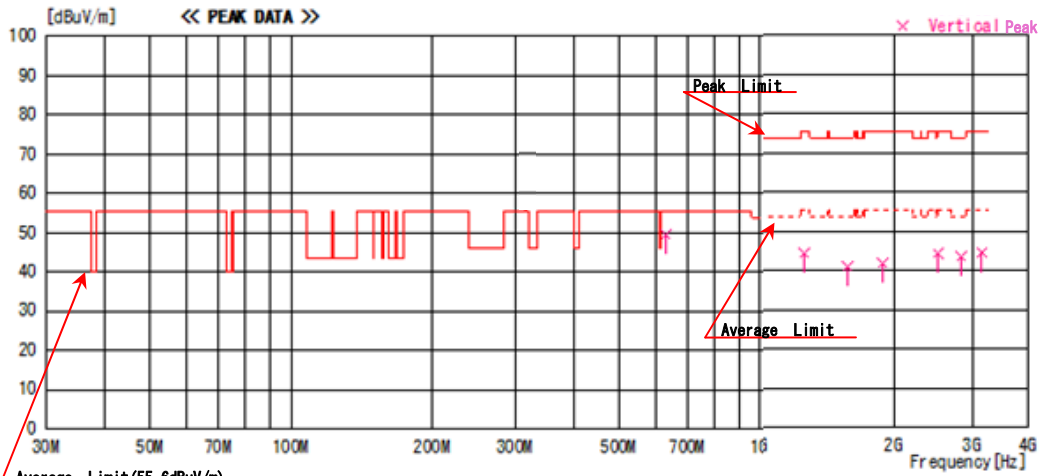
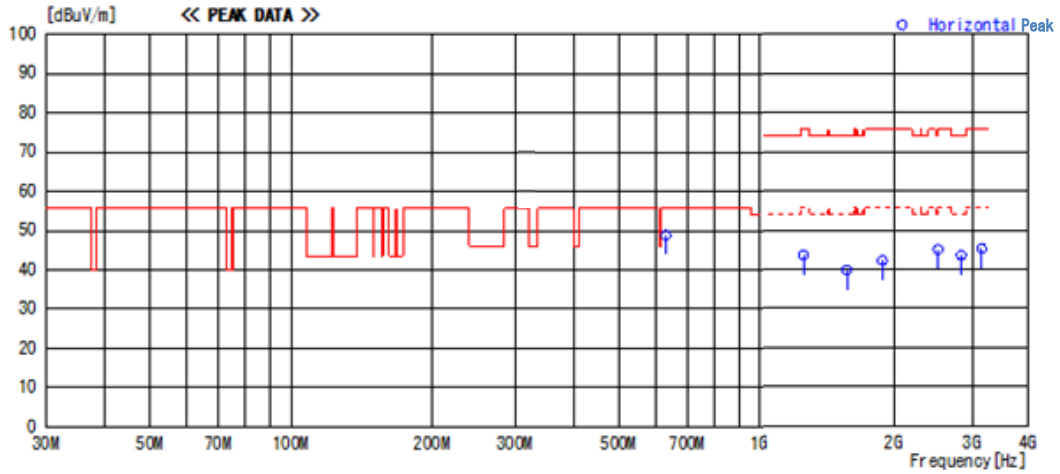
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Radiated Spurious Emission
(Plot data, Worst case)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10749723H
Date	04/16/2015
Temperature/ Humidity	25 deg. C / 40 % RH
Engineer	Satofumi Matsuyama
Mode	Continuous Transmitting mode



Average Limit(55.6dBuV/m)
 QP Limit(except for 55.6dBuV/m level)

-20dB and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	10749723H
Date	04/16/2015
Temperature/ Humidity	25 deg. C / 40 % RH
Engineer	Satofumi Matsuyama
Mode	Continuous Transmitting mode

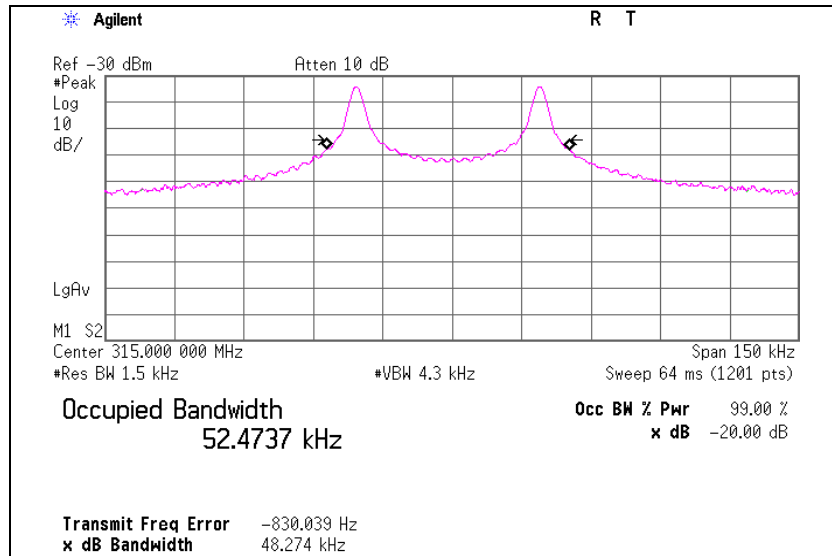
Bandwidth Limit : Fundamental Frequency **315.00** MHz x 0.25% = 787.50 kHz

* The above limit was calculated from more stringent nominal frequency.

* Method of KDB 926416 for systems employing non sweeping frequencies was referred.

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
48.274	787.50	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
52.4737	787.50	Pass



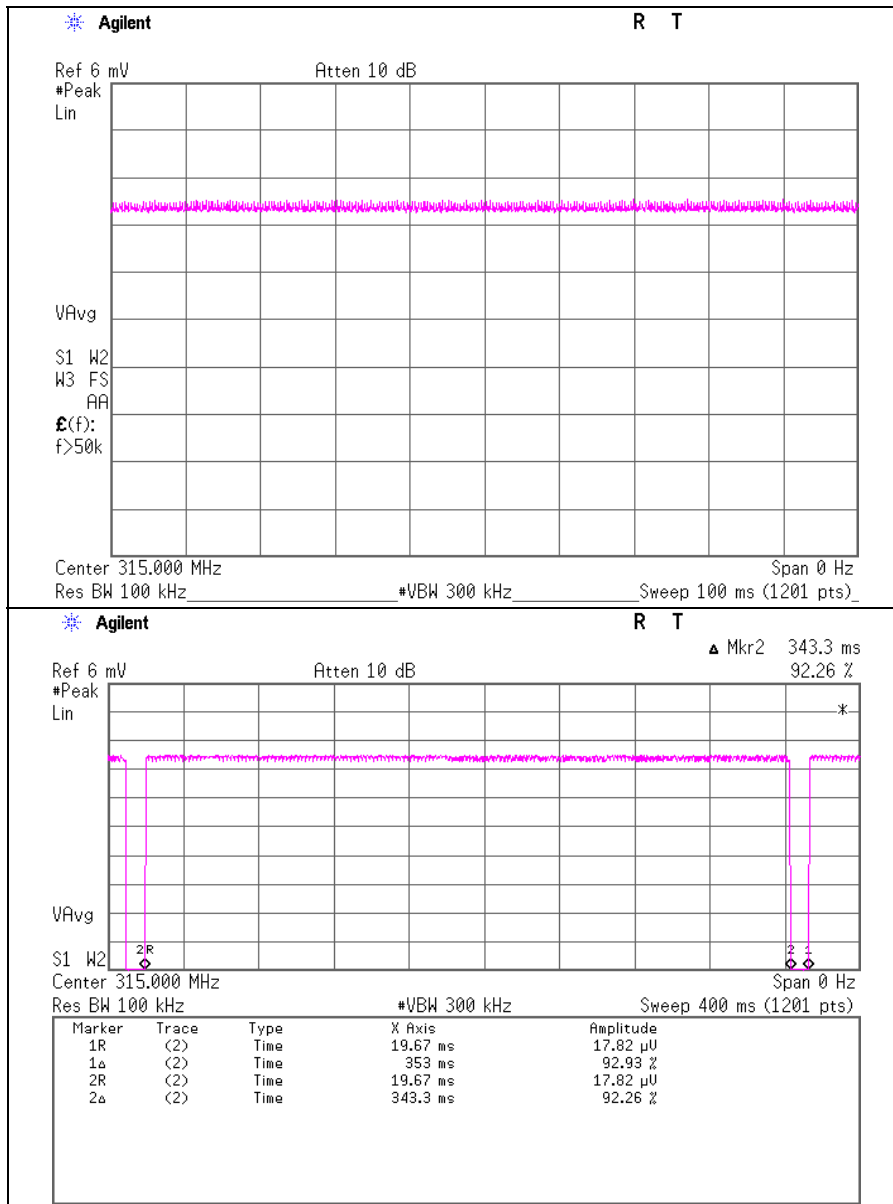
Duty Cycle

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber
 Report No. : 10749723H
 Date : 04/16/2015
 Temperature/ Humidity : 25 deg. C / 40 % RH
 Engineer : Satofumi Matsuyama
 Mode : Continuous Transmitting mode

(duty)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
100.00	100.00	1.00	0.0

*Duty = 20log₁₀(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-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2014/06/25 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2015/01/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2014/10/17 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2014/06/03 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2014/10/18 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2014/10/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2015/02/06 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2014/11/11 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2014/09/26 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2015/02/05 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2015/01/28 * 12

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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