



RADIO TEST REPORT

Test Report No. : 32DE0105-HO-01-R1

Applicant : Tokai Rika Co., Ltd.
Type of Equipment : Immobilizer
Model No. : RI-42BTY
FCC ID : MOZRI-42BTY
Test regulation : FCC Part 15 Subpart C: 2011

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 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 report is a revised version of 32DE0105-HO-01. 32DE0105-HO-01 is replaced with this report.

Date of test: September 16 and 17, 2011

Representative test engineer:

Shinya Watanabe
Engineer of WiSE Japan,
UL Verification Service

Approved by:

Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
<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 : Tokai Rika Co., Ltd.
Address : 3-260 Toyota, Oguchi-cho, Niwa-gun, Aichi-ken, 480-0195 Japan
Telephone Number : +81-587-95-0093
Facsimile Number : +81-587-95-5471
Contact Person : Masahiro Kato

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

2.1 Identification of E.U.T.

Type of Equipment : Immobilizer
Model No. : RI-42BTY
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC12V
Receipt Date of Sample : September 8, 2011
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

General Specification

Clock frequency(ies) in the system : CPU: 8MHz, Base Station IC: 4MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 134.2kHz
Modulation : ASK
Power Supply (radio part input) : DC 5.0V
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: 2011, final revised on July 8, 2011 and effective August 8, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.209 Radiated emission limits, general requirements

FCC 15.31 (e)

The stable voltage (DC5.0V) is constantly provided to RF Part through the regulator regardless of voltage fluctuation of car battery (DC12V). Therefore, this 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 vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	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 *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	69.1dB 0.13420MHz 0 deg., PEAK	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	10.4dB 160.442MHz, QP, Horizontal	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

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 is not the device that is designed to be connected to the public utility (AC) power line.

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3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	N/A	N/A	N/A

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	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	5.1dB	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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	FCC Registration Number	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	313583	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	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	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	134570	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	4.75 x 5.4 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 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* 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.

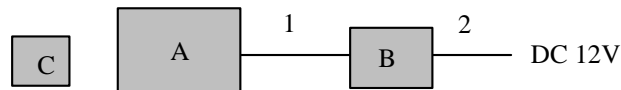
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used : 1) Normal transmission mode (Tx) 134.2kHz

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

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Coil Antenna	RI-42BTY	004	Tokai Rika Co., Ltd.	EUT
B	Controller with Amplifier	RI-42BTY	004	Tokai Rika Co., Ltd.	EUT
C	Transponder	RI-42BTY	001	Tokai Rika Co., Ltd.	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.2	Unshielded	Unshielded	-
2	DC Cable	1.0	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No 4 semi anechoic chamber 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., 45deg., 90deg., and 135 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

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

The measuring antenna height 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 a QP, PK, and AV detector.

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

	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
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- 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.

With the position, the noise levels of all the frequencies were measured.

This EUT has two modes which mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test without mechanical key was the worst case. Therefore the test without mechanical key was performed only.

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

[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])

[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

Test data : APPENDIX 1

Test result : Pass

Date: September 16, 2011

Test engineer: Shinya Watanabe

UL Japan, Inc.

Head Office EMC Lab.

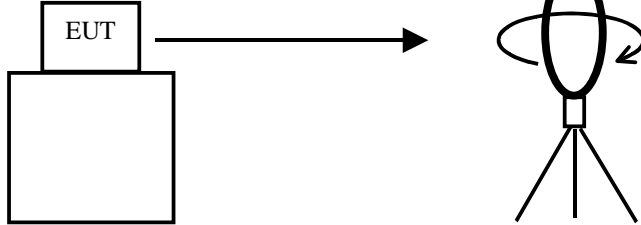
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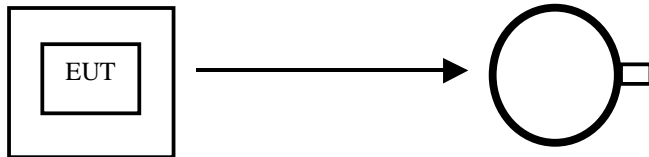
Facsimile : +81 596 24 8124

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

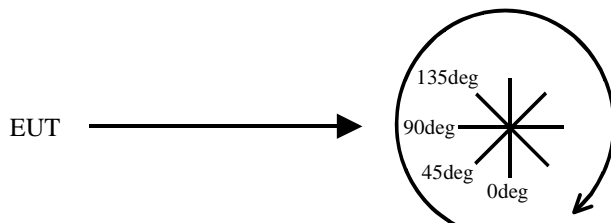


.....
Top View (Horizontal)



Antenna was not rotated.

.....
Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 6: -26dB 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
-26dB Bandwidth	200kHz	2kHz	6.2kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 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
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

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2011/09/16

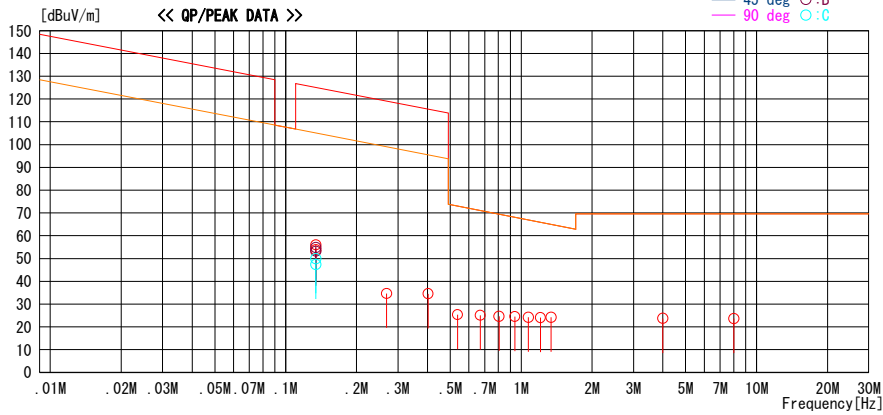
Report No. : 32DE0105-HO-01
Power : DC 12.0V

Engineer : Shinya Watanabe

Mode / Remarks : Tx 134.2kHz. Worst Axis (ANT:X-axis ECU:X-Axis)

LIMIT : FCC15.209(a) 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.209(a) 3m, 9-90kHz:AV, 110-490kHz:AV, other:QP

— 0 deg ○:A
— 45 deg ○:B
— 90 deg ○:C



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBUV]		[dB/m]	[dB]	[dB]	[dBUV/m]	[dBUV/m]	[dB]	[deg]	[deg]	
0.13420	62.3	PEAK	19.9	6.0	32.2	56.0	125.1	69.1	0	A	181
0.13420	59.5	PEAK	19.9	6.0	32.2	53.2	125.1	71.9	45	B	323
0.13420	56.2	PEAK	19.9	6.0	32.2	49.9	125.1	75.2	90	C	275
0.13420	60.1	PEAK	19.9	6.0	32.2	53.8	125.1	71.3	135	A	222
0.13420	61.1	PEAK	19.9	6.0	32.2	54.8	125.1	70.3	180	B	196
0.13420	53.7	PEAK	19.9	6.0	32.2	47.4	125.1	77.7	0	C	191
0.26840	41.2	PEAK	19.6	6.1	32.2	34.7	119.0	84.3	0	A	1
0.40260	41.2	PEAK	19.5	6.1	32.3	34.5	115.5	81.0	0	A	202
0.53680	32.1	QP	19.5	6.1	32.3	25.4	73.0	47.6	0	A	359 NS
0.67100	31.8	QP	19.4	6.1	32.2	25.1	71.1	46.0	0	A	359 NS
0.80520	31.3	QP	19.4	6.1	32.2	24.6	69.5	44.9	0	A	359 NS
0.93940	31.2	QP	19.4	6.1	32.2	24.5	68.1	43.6	0	A	359 NS
1.07360	30.9	QP	19.4	6.1	32.2	24.2	66.9	42.7	0	A	359 NS
1.20780	30.8	QP	19.4	6.1	32.2	24.1	65.9	41.8	0	A	359 NS
1.34200	30.8	QP	19.4	6.2	32.2	24.2	65.0	40.8	0	A	359 NS
4.00000	30.1	QP	19.5	6.3	32.2	23.7	69.5	45.8	0	A	359 NS
8.00000	29.8	QP	19.6	6.4	32.2	23.6	69.5	45.9	0	A	359 NS

CHART: WITH FACTOR, ANT TYPE: LOOP Except for the data below: adequate margin data below the limits.
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN.) - GAIN(AMP.)

- *NS: No Signal detected.
- *The test result is rounded off to one or two decimal places, so some differences might be observed.
- *Testing with an average detector was excluded, because emission level with a peak detector met the limit of an average detector.

Radiated Emission above 30MHz (Spurious Emission)

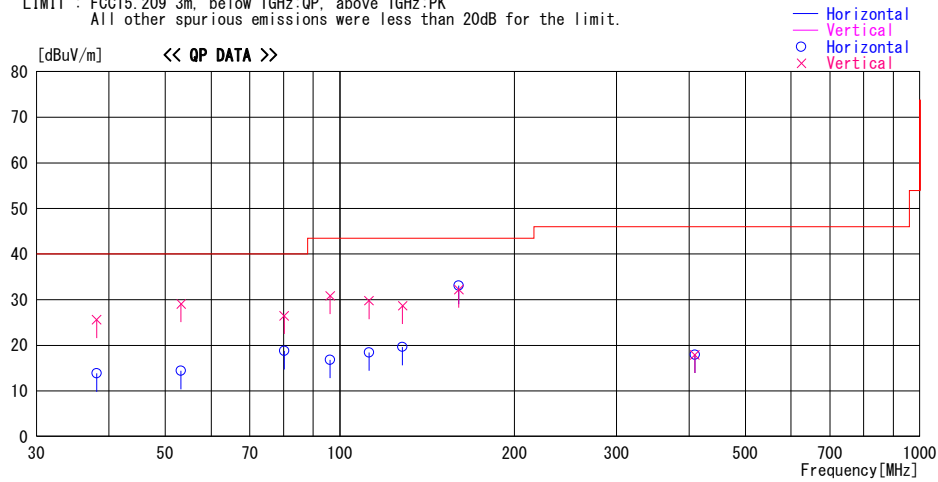
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2011/09/16

Report No. : 32DE0105-HO-01
Temp./Humi. : 26deg. C / 67% RH
Engineer : Shinya watanabe

Mode / Remarks : Tx 134.2kHz Worst Axis(ANT:X-axis ECU:X-axis)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain					[dBuV/m]	[dB]	
38.107	23.1	QP	15.8	-25.0	13.9	350	162	Hori.	40.0	26.2	
38.107	34.8	QP	15.8	-25.0	25.6	185	110	Vert.	40.0	14.4	
53.266	29.1	QP	10.0	-24.7	14.4	322	100	Hori.	40.0	25.6	
53.266	43.8	QP	10.0	-24.7	29.1	193	100	Vert.	40.0	10.9	
80.221	36.5	QP	6.5	-24.2	18.8	149	229	Hori.	40.0	21.3	
80.221	44.2	QP	6.5	-24.2	26.5	185	100	Vert.	40.0	13.5	
96.253	31.6	QP	9.3	-24.0	16.9	141	234	Hori.	43.5	26.7	
96.253	45.6	QP	9.3	-24.0	30.9	203	100	Vert.	43.5	12.6	
112.310	30.5	QP	11.8	-23.8	18.5	278	169	Hori.	43.5	25.0	
112.310	41.8	QP	11.8	-23.8	29.8	237	100	Vert.	43.5	13.8	
128.357	29.8	QP	13.5	-23.6	19.7	296	187	Hori.	43.5	23.8	
128.357	38.8	QP	13.5	-23.6	28.7	264	100	Vert.	43.5	14.8	
160.442	40.9	QP	15.4	-23.2	33.1	298	120	Hori.	43.5	10.4	
160.442	40.0	QP	15.4	-23.2	32.2	234	100	Vert.	43.5	11.3	
409.419	21.8	QP	17.5	-21.3	18.0	68	100	Hori.	46.0	28.0	
409.419	21.7	QP	17.5	-21.3	17.9	222	100	Vert.	46.0	28.1	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

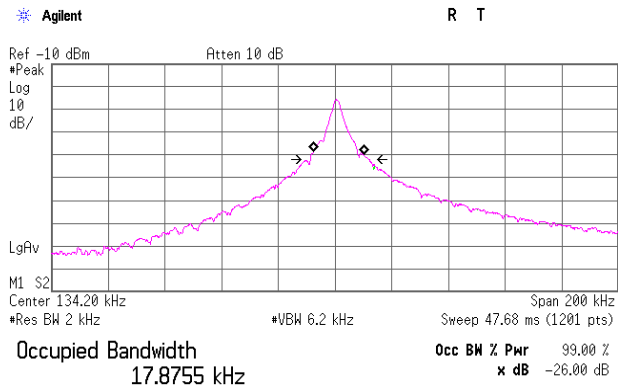
*The test result is rounded off to one or two decimal places, so some differences might be observed.

-26dB Bandwidth

POWER : DC 12V
 MODE : Tx 134.2kHz

REPORT NO : 32DE0105-HO-01
 REGULATION : Reference data
 TEST DISTANCE : 3m
 DATE : 9/17/2011
 TEMPERATURE : 26 deg. C
 HUMIDITY : 63 % RH
 Engineer : Shinya Watanabe

FREQ	-26dB Bandwidth
[kHz]	[kHz]
134.2	20.460



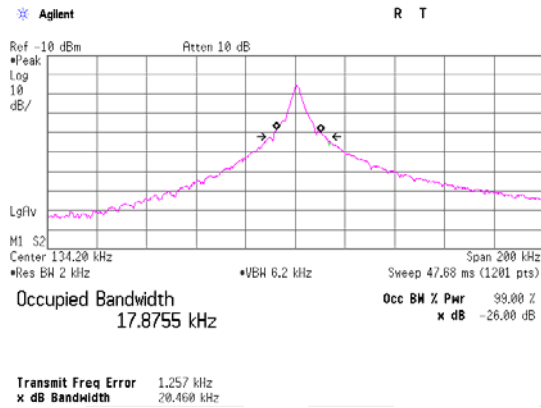
Transmit Freq Error 1.257 kHz
 x dB Bandwidth 20.460 kHz

99% Occupied Bandwidth

POWER : DC 12V
 MODE : Tx 134.2kHz

REPORT NO : 32DE0105-HO-01
 REGULATION : RSS-Gen 4.6.1
 TEST DISTANCE : 3m
 DATE : 9/17/2011
 TEMPERATURE : 26 deg. C
 HUMIDITY : 63 % RH
 Engineer : Shinya Watanabe

FREQ	99% Occupied Bandwidth
[kHz]	[kHz]
134.2	17.876



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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	2011/02/22 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MJM-06	Measure	PROMART	SEN1955	-	RE	
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2011/08/11 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2010/10/15 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/suoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	RE	2011/07/15 * 12
MCC-30	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2011/03/04 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2010/11/05 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2010/10/11 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2010/10/11 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2011/07/15 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185820	RE	2011/06/30 * 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: Spurious emission

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