

# RADIO TEST REPORT

Test Report No. : 31EE0015-HO-01-A

**Applicant** : Alps Electric Co., Ltd.

**Type of Equipment** : Passive Entry System (Hand Unit)

**Model No.** : TWB1U771

**Test regulation** : FCC Part 15 Subpart C: 2012

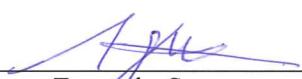
**FCC ID** : CWTWB1U771

**Test Result** : Complied

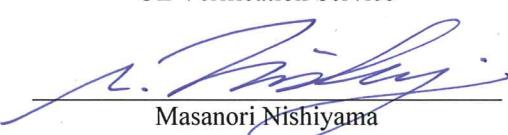
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3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**Date of test:** May 20, 2012

**Representative test engineer:**

  
Tomotaka Sasagawa  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

  
Masanori Nishiyama  
Leader of WiSE Japan,  
UL Verification Service

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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 : Alps Electric Co., Ltd.  
Address : 6-3-36, Nakazato, Furukawa, Osaki-city, Miyagi-pref, 989-6181, Japan  
Telephone Number : +81-229-23-5111  
Facsimile Number : +81-229-22-3755  
Contact Person : Toru Kinoshita

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Passive Entry System (Hand Unit)  
Model No. : TWB1U771  
Serial No. : Refer to Section 4, Clause 4.2  
Receipt Date of Sample : May 20, 2012  
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: TWB1U771 (referred to as the EUT in this report) is the Passive Entry System (Hand Unit).

#### **General Specification**

Feature of EUT : Hand unit is carried by the owner of the vehicle.  
It performs transmission through RF antenna to tuner (I-KEY unit),  
processes LF signal from I-KEY unit, and performs actions according to the  
signal.  
Clock frequency in the system : 2MHz (CPU)

#### **Radio Specification**

(Transmitter part)

Frequency of Operation : 315MHz  
Type of modulation : FSK  
Antenna Type : PCB Pattern Antenna  
Method of Frequency Generation : SAW Resonator  
Operating voltage (Inner) : DC 2.5V to 3.3V  
Operating Temperature : -10 to +60 deg. C

(Receiver part)

Frequency of Operation : 125kHz  
Antenna Type : Loop Coil and Bar Antenna  
Operating voltage (Inner) : DC 2.5V to 3.3V  
Operating Temperature : -10 to +60 deg. C

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on March 30, 2012 and effective April 30, 2012

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	<b>FCC:</b> ANSI C63.4:2003 7. AC powerline conducted emission measurements <b>IC:</b> RSS-Gen 7.2.4	<b>FCC:</b> Section 15.207 <b>IC:</b> RSS-Gen 7.2.4	N/A	N/A*1)	-
Automatically Deactivate	<b>FCC:</b> ANSI C63.4:2003 13. Measurement of intentional radiators <b>IC:</b> -	<b>FCC:</b> Section 15.231(a)(1) <b>IC:</b> RSS-210 A1.1.1	N/A	Complied	Radiated
Electric Field Strength of Fundamental Emission	<b>FCC:</b> ANSI C63.4:2003 13. Measurement of intentional radiators <b>IC:</b> RSS-Gen 4.8	<b>FCC:</b> Section 15.231(b) <b>IC:</b> RSS-210 A1.1.2	2.7dB 315.000MHz Horizontal (PK, AV limit) *2)	Complied	Radiated
Electric Field Strength of Spurious Emission	<b>FCC:</b> ANSI C63.4:2003 13. Measurement of intentional radiators <b>IC:</b> RSS-Gen 4.9	<b>FCC:</b> Section 15.205 Section 15.209 Section 15.231(b) <b>IC:</b> RSS-210 A1.1.2, 2.5.1 RSS-Gen 7.2.5	7.0dB 1890.000MHz Vertical (PK, AV limit) *2)	Complied	Radiated
-20dB Bandwidth	<b>FCC:</b> ANSI C63.4:2003 13. Measurement of intentional radiators <b>IC:</b> -	<b>FCC:</b> Section 15.231(c) <b>IC:</b> Reference data	N/A	N/A	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) The test was performed with severer PK detection for average limit.

### **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.

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### 3.3 Addition to standard

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 (10m*)(±dB)		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	4.1dB	5.0dB	4.8dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

\*10m = Measurement distance

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	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

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

#### Radiated emission test(3m)

[Electric Field Strength of Fundamental Emission]

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

#### [Electric Field Strength of Spurious Emission]

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.

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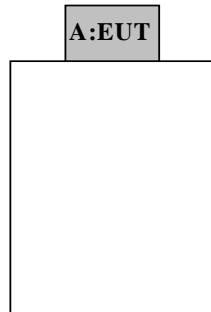
## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating Modes

Test Item*	Mode
Automatically Deactivate Duty Cycle	Normal use mode
Electric Field Strength of Fundamental Emission	Transmitting mode (Tx)
Electric Field Strength of Spurious Emission	

\* 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.

#### Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Passive Entry System (Hand Unit)	TWB1U771	09091403 *1) 09091405 *2)	Alps Electric Co., Ltd.	EUT

\*1) Used for Normal use mode

\*2) Used for Transmitting mode

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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]

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 (frequency 9kHz - 30MHz: loop antenna was fixed height at 1.0m) 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.

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

#### 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 *1)
Detector Type	Peak	Peak	Peak	Peak	Peak *2)	Peak *2)
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz	PK: S/A:RBW 1MHz, VBW:3MHz

\*For the test below 30MHz, the noise was not detected when it was confirmed with PK detect.

\*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

\*2) Average emission measurements were not calculated with PK detect and Duty cycle factor since the PK measurement value did not exceed the AV limit.

- 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.

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.

\*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

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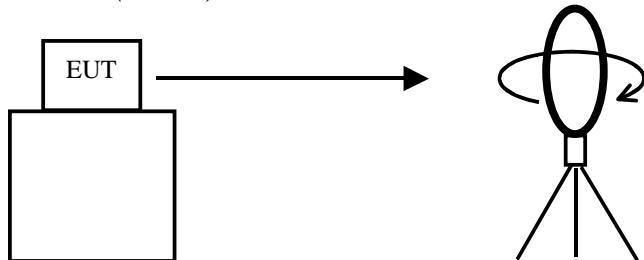
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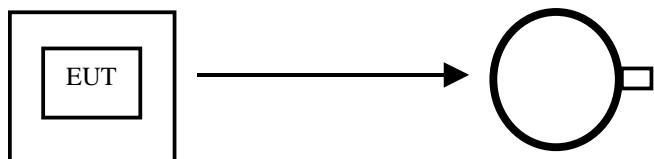
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Figure 1: Direction of the Loop Antenna

*Side View (Vertical)*



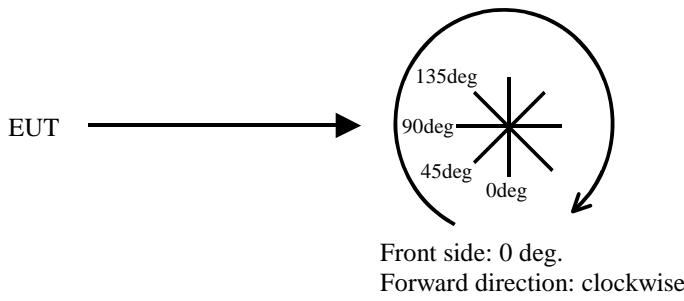
*Top View (Horizontal)*



Antenna was not rotated.

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*Top View (Vertical)*



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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  
**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	500kHz	10kHz	30kHz	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  
**Test result** : Pass

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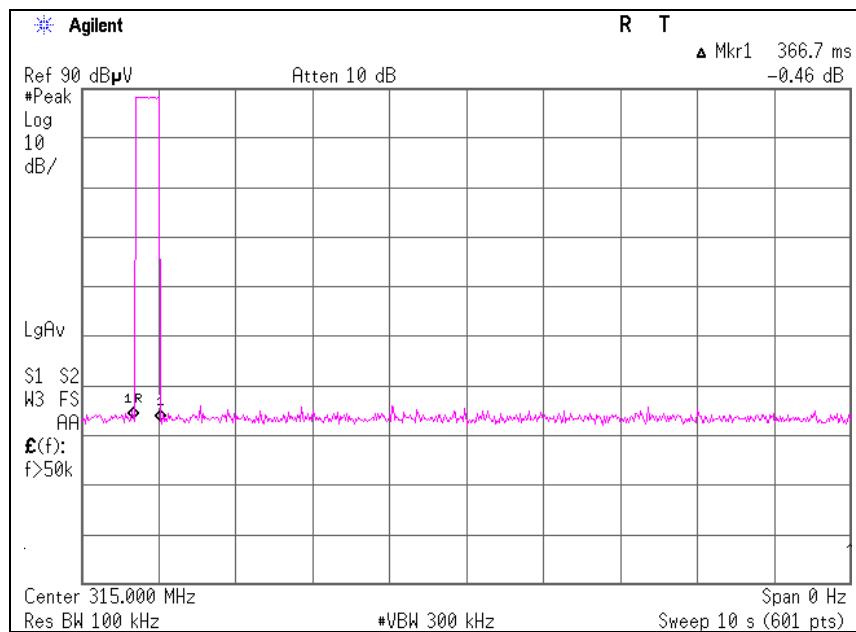
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## APPENDIX 1: Data of EMI test

### Automatically deactivate

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	31EE0015-HO-01
Date	05/20/2012
Temperature/ Humidity	24 deg. C / 42% RH
Engineer	Tomotaka Sasagawa
Mode	Transmitting mode

Time of Transmitting [sec]	Limit [sec]	Result
0.3667	5.00	Pass



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

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber  
 Report No. 31EE0015-HO-01  
 Date 05/20/2012  
 Temperature/ Humidity 24 deg. C / 42% RH  
 Engineer Tomotaka Sasagawa  
 Mode Transmitting mode

### PK Limit

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [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	76.8	72.5	14.9	8.9	27.7	72.9	68.6	95.6	22.7	27.0	Carrier
630.000	PK	28.2	32.2	20.1	10.3	28.7	29.9	33.9	75.6	45.7	41.7	Outside
945.000	PK	27.2	27.5	22.7	11.4	27.7	33.6	33.9	75.6	42.0	41.7	Outside
1260.000	PK	51.1	54.3	25.7	1.6	35.7	42.7	45.9	75.6	32.9	29.7	Outside
1575.000	PK	47.8	51.7	26.5	1.8	35.4	40.7	44.6	73.9	33.2	29.3	Inside
1890.000	PK	50.3	54.6	27.1	2.0	35.1	44.3	48.6	75.6	31.3	27.0	Outside
2205.000	PK	46.7	50.7	27.4	2.1	34.9	41.3	45.3	73.9	32.6	28.6	Inside
2520.000	PK	46.7	45.9	27.5	2.3	34.8	41.7	40.9	75.6	33.9	34.7	Outside
2835.000	PK	46.1	45.7	28.1	2.4	34.7	41.9	41.5	73.9	32.0	32.4	Inside
3150.000	PK	46.4	45.0	28.7	2.6	34.5	43.2	41.8	75.6	32.4	33.8	Outside

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

### AV Limit

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark
		Hor	Ver				Hor	Ver		Hor	Ver	
315.000	PK	76.8	72.5	14.9	8.9	27.7	72.9	68.6	75.6	2.7	7.0	Carrier
630.000	PK	28.2	32.2	20.1	10.3	28.7	29.9	33.9	55.6	25.7	21.7	Outside
945.000	PK	27.2	27.5	22.7	11.4	27.7	33.6	33.9	55.6	22.0	21.7	Outside
1260.000	PK	51.1	54.3	25.7	1.6	35.7	42.7	45.9	55.6	12.9	9.7	Outside
1575.000	PK	47.8	51.7	26.5	1.8	35.4	40.7	44.6	53.9	13.2	9.3	Inside
1890.000	PK	50.3	54.6	27.1	2.0	35.1	44.3	48.6	55.6	11.3	7.0	Outside
2205.000	PK	46.7	50.7	27.4	2.1	34.9	41.3	45.3	53.9	12.6	8.6	Inside
2520.000	PK	46.7	45.9	27.5	2.3	34.8	41.7	40.9	55.6	13.9	14.7	Outside
2835.000	PK	46.1	45.7	28.1	2.4	34.7	41.9	41.5	53.9	12.0	12.4	Inside
3150.000	PK	46.4	45.0	28.7	2.6	34.5	43.2	41.8	55.6	12.4	13.8	Outside

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

\*Average emission measurements were not calculated with PK detect and Duty cycle factor since the PK measurement value did not exceed the AV limit.

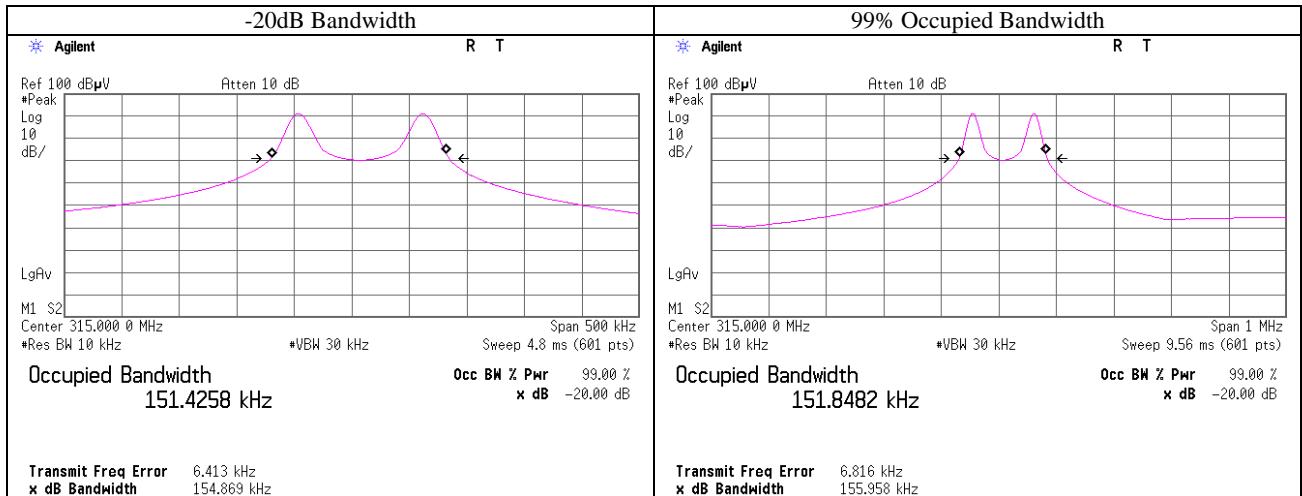
## -20dB and 99% Occupied Bandwidth

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber  
 Report No. 31EE0015-HO-01  
 Date 05/20/2012  
 Temperature/ Humidity 24 deg. C / 42% RH  
 Engineer Tomotaka Sasagawa  
 Mode Transmitting mode

Bandwidth Limit : Fundamental Frequency  $315 \text{ MHz} \times 0.25\% = 787.50 \text{ kHz}$

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
154.87	787.50	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
151.85	787.50	Pass



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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	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2012/04/06 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MILPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2012/02/16 * 12
MCC-30	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/10/23 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/10/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2012/02/16 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2011/07/10 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2012/02/08 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
MHA-05	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	253	RE	2011/06/19 * 12
MCC-134	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336167/4(1m) / 340641(5m)	RE	2011/09/07 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2012/02/28 * 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, Automatically deactivate tests**

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