



# RADIO TEST REPORT

Test Report No. : 10885711H-A-R1

**Applicant** : ALPS ELECTRIC CO., LTD.  
**Type of Equipment** : KEYLESS ENTRY SYSTEM (Hand Unit)  
**Model No.** : TB1G077  
**Test regulation** : FCC Part 15 Subpart C: 2015  
**FCC ID** : CWTB1G077  
**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 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 10885711H-A. 10885711H-A is replaced with this report.

**Date of test:** July 21, 2015

**Representative test engineer:**

Shinya Watanabe  
Engineer

Consumer Technology Division

**Approved by:**

Takashi Nakazawa  
Leader

Consumer Technology Division



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,  
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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 : +81-229-23-5129  
Contact Person : Toshiya Ikarashi

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

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

Type of Equipment : KEYLESS ENTRY SYSTEM (Hand Unit)  
Model No. : TB1G077  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.0V (CR1620 x 1)  
Receipt Date of Sample : July 16, 2015  
Country of Mass-production : Japan and Mexico  
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: TB1G077 (referred to as the EUT in this report) is the KEYLESS ENTRY SYSTEM (Hand Unit).

#### **General Specification**

Clock frequencies in the system : 13.56 MHz

#### **Radio Specification**

Radio Type : Transmitter  
Frequency of Operation : 433.92 MHz  
Modulation : FSK  
Antenna Type : PWB Pattern Antenna  
Method of Frequency Generation : Crystal, PLL  
Rating Voltage : DC 3.0 V (Operating Voltage: DC 2.3 V to DC 3.3 V)  
Operating temperature range : -20 to +70 deg. C

\* Original model No.: TB1G077 has 4 switches.  
Variation model have 3 switches.

The difference of Original model and Variation model is only the number of switches.  
They are completely identical in Radio characteristics.  
Therefore the test was performed with the representative Original model which was the worst one.

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

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2015, final revised on June 12, 2015 and effective July 13, 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<br>7. AC powerline<br>conducted emission<br>measurements<br>-----<br>IC: RSS-Gen 8.8 | FCC: Section 15.207<br>-----<br>IC: RSS-Gen 8.8  | N/A   | N/A*1)   | -        |
| Automatically Deactivate                           | FCC: ANSI C63.4:2009<br>13. Measurement of<br>intentional radiators<br>-----<br>IC: -                     | FCC: Section<br>15.231(a)(1)<br>-----<br>IC: RSS-210 A1.1.1  | N/A   | Complied | Radiated |
| Electric Field Strength<br>of Fundamental Emission | FCC: ANSI C63.4:2009<br>13. Measurement of<br>intentional radiators<br>-----<br>IC: RSS-Gen 6.12          | FCC: Section 15.231(b)<br>-----<br>IC: RSS-210 A1.1.2  | 4.7 dB<br>433.920 MHz<br>Vertical<br>PK (Peak with<br>Duty factor)    | Complied | Radiated |
| Electric Field Strength<br>of Spurious Emission    | FCC: ANSI C63.4:2009<br>13. Measurement of<br>intentional radiators<br>-----<br>IC: RSS-Gen 6.13          | FCC: Section 15.205<br>Section 15.209<br>Section 15.231(b)<br>-----<br>IC: RSS-210 A1.1.2,<br>2.5.1<br>RSS-Gen 8.9 | 3.9 dB<br>4339.200 MHz<br>Horizontal<br>PK (Peak with<br>Duty factor) | Complied | Radiated |
| -20dB Bandwidth                                    | FCC: ANSI C63.4:2009<br>13. Measurement of<br>intentional radiators<br>-----<br>IC: -                     | FCC: Section 15.231(c)<br>-----<br>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.

#### **FCC 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<br>(semi-anechoic chamber) | Radiated emission |                     |                    |                   |                    |                      |                      |
|--------------------------------------|-------------------|---------------------|--------------------|-------------------|--------------------|----------------------|----------------------|
|                                      | (3 m*)(+dB)       |                     |                    |                   | (1 m*)(+dB)        |                      | (0.5 m*)(+dB)        |
|                                      | 9 kHz<br>- 30 MHz | 30 MHz<br>- 300 MHz | 300 MHz<br>- 1 GHz | 1 GHz<br>- 10 GHz | 10 GHz<br>- 18 GHz | 18 GHz<br>- 26.5 GHz | 26.5 GHz<br>- 40 GHz |
| No.1                                 | 4.3 dB            | 5.1 dB              | 6.2 dB             | 5.5 dB            | 5.8 dB             | 5.8 dB               | 4.3 dB               |
| No.2                                 | 4.2 dB            | 5.1 dB              | 6.2 dB             | 5.4 dB            | 5.7 dB             | 5.9 dB               | 5.6 dB               |
| No.3                                 | 4.4 dB            | 5.1 dB              | 6.3 dB             | 5.2 dB            | 5.5 dB             | 5.8 dB               | 5.5 dB               |
| No.4                                 | 4.7 dB            | 5.3 dB              | 6.3 dB             | 5.3 dB            | 5.7 dB             | 5.9 dB               | 5.5 dB               |

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

#### Radiated emission test(3m)

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 7.7m         | 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 Test data, Test instruments, and Test set up.

Refer to APPENDIX.

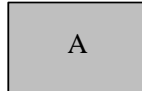
## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Modes**

| <b>Test Item*</b>   | <b>Mode</b>                  |
|---|------------------------------|
| Automatically Deactivate<br>Duty Cycle  | Normal use mode              |
| Electric Field Strength of Fundamental Emission<br>Electric Field Strength of Spurious Emission<br>-20dB & 99% Occupied Bandwidth | Continuous Transmitting mode |

\* 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**

| <b>No.</b> | <b>Item</b>                         | <b>Model number</b> | <b>Serial number</b>           | <b>Manufacturer</b>        | <b>Remarks</b> |
|------------|-------------------------------------|---------------------|--------------------------------|----------------------------|----------------|
| A          | KEYLESS ENTRY SYSTEM<br>(Hand Unit) | TB1G077             | 150718001 *1)<br>150718002 *2) | ALPS ELECTRIC CO.,<br>LTD. | EUT            |

\*1) Used for Continuous Transmitting mode

\*2) Used for Normal use 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, 0.5 m by 1.0 m, raised 0.8 m 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.

**(Below 30 MHz)**

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

**(Above 30 MHz)**

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

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

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

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

- 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-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  
**Test result** : Pass

## **SECTION 7: -20 dB 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         | 300 kHz                                 | 3 kHz           | 9.1 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  | Peak     | Max Hold | Spectrum Analyzer |

Peak hold was applied as Worst-case measurement.

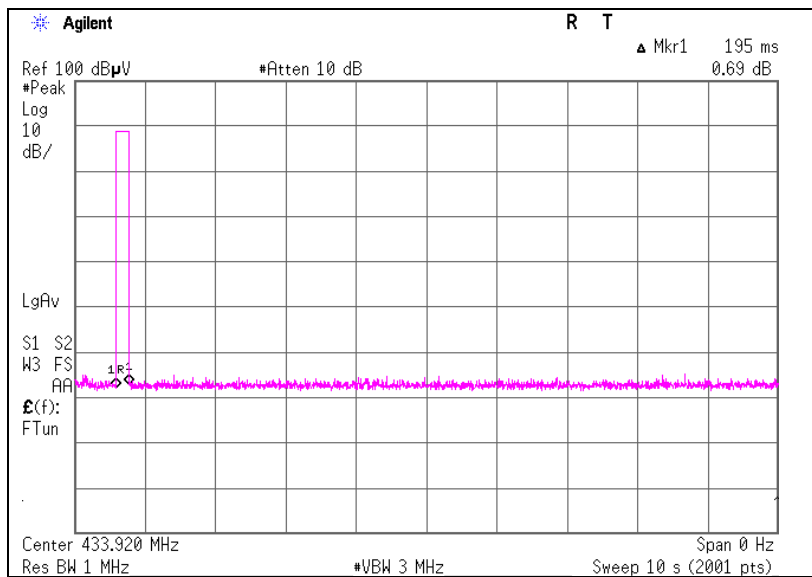
**Test data** : APPENDIX  
**Test result** : Pass

**APPENDIX 1: Data of EMI test**

**Automatically deactivate**

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
 Report No. : 10885711H  
 Date : 07/21/2015  
 Temperature/ Humidity : 22 deg. C / 60% RH  
 Engineer : Shinya Watanabe  
 Mode : 433.92 MHz Normal use mode

| Time of Transmitting [sec] | Limit [sec] | Result |
|----------------------------|-------------|--------|
| 0.195                      | 5.00        | Pass   |



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

Test place : Ise EMC Lab. No.3 Semi Anechoic Chamber  
Report No. : 10885711H  
Date : 07/21/2015  
Temperature/ Humidity : 22 deg. C / 60% RH  
Engineer : Shinya Watanabe  
Mode : 433.92 MHz Continuous Transmitting mode

**PK**

| Frequency<br>[MHz] | Detector | Reading<br>[dBuV] |      | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] |      | Limit<br>[dBuV/m] | Margin<br>[dB] |      | Remark<br>Inside or Outside<br>of Restricted Bands |
|--------------------|----------|-------------------|------|-------------------------|--------------|--------------|------------------------|--------------------|------|-------------------|----------------|------|--|
|                    |          | Hor               | Ver  |                         |              |              |                        | Hor                | Ver  |                   | Hor            | Ver  |  |
| 433.920            | PK       | 79.3              | 79.6 | 17.8                    | 10.8         | 32.1         | -                      | 75.8               | 76.1 | 100.8             | 25.0           | 24.7 | Carrier  |
| 867.840            | PK       | 30.3              | NS   | 22.4                    | 13.1         | 31.2         | -                      | 34.6               | -    | 80.8              | 46.2           | -    | Outside  |
| 1301.760           | PK       | NS                | NS   | 24.9                    | 1.9          | 34.5         | -                      | -                  | -    | 73.9              | -              | -    | Inside   |
| 1735.680           | PK       | 44.2              | 47.5 | 26.0                    | 2.3          | 32.9         | -                      | 39.6               | 42.9 | 80.8              | 41.2           | 37.9 | Outside  |
| 2169.600           | PK       | NS                | NS   | 26.4                    | 2.4          | 32.9         | -                      | -                  | -    | 80.8              | -              | -    | Outside  |
| 2603.520           | PK       | NS                | NS   | 27.0                    | 2.6          | 32.6         | -                      | -                  | -    | 80.8              | -              | -    | Outside  |
| 3037.440           | PK       | 48.4              | 45.8 | 28.4                    | 3.0          | 31.5         | -                      | 48.3               | 45.7 | 80.8              | 32.5           | 35.1 | Outside  |
| 3471.360           | PK       | NS                | NS   | 27.8                    | 3.0          | 32.2         | -                      | -                  | -    | 80.8              | -              | -    | Outside  |
| 3905.280           | PK       | 48.2              | 47.8 | 29.8                    | 3.4          | 31.5         | -                      | 49.9               | 49.5 | 73.9              | 24.0           | 24.4 | Inside   |
| 4339.200           | PK       | 47.1              | 45.8 | 30.7                    | 3.6          | 31.4         | -                      | 50.0               | 48.7 | 73.9              | 23.9           | 25.2 | Inside   |

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

**AV (Peak with Duty factor)**

| Frequency<br>[MHz] | Detector | Reading<br>[dBuV] |      | Ant<br>Factor<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Duty<br>Factor<br>[dB] | Result<br>[dBuV/m] |      | Limit<br>[dBuV/m] | Margin<br>[dB] |      | Remark  |
|--------------------|----------|-------------------|------|-------------------------|--------------|--------------|------------------------|--------------------|------|-------------------|----------------|------|---------|
|                    |          | Hor               | Ver  |                         |              |              |                        | Hor                | Ver  |                   | Hor            | Ver  |         |
| 433.920            | PK       | 79.3              | 79.6 | 17.8                    | 10.8         | 32.1         | 0.0                    | 75.8               | 76.1 | 80.8              | 5.0            | 4.7  | Carrier |
| 867.840            | PK       | 30.3              | NS   | 22.4                    | 13.1         | 31.2         | 0.0                    | 34.6               | -    | 60.8              | 26.2           | -    | Outside |
| 1301.760           | PK       | NS                | NS   | 24.9                    | 1.9          | 34.5         | 0.0                    | -                  | -    | 53.9              | -              | -    | Inside  |
| 1735.680           | PK       | 44.2              | 47.5 | 26.0                    | 2.3          | 32.9         | 0.0                    | 39.6               | 42.9 | 60.8              | 21.2           | 17.9 | Outside |
| 2169.600           | PK       | NS                | NS   | 26.4                    | 2.4          | 32.9         | 0.0                    | -                  | -    | 60.8              | -              | -    | Outside |
| 2603.520           | PK       | NS                | NS   | 27.0                    | 2.6          | 32.6         | 0.0                    | -                  | -    | 60.8              | -              | -    | Outside |
| 3037.440           | PK       | 48.4              | 45.8 | 28.4                    | 3.0          | 31.5         | 0.0                    | 48.3               | 45.7 | 60.8              | 12.5           | 15.1 | Outside |
| 3471.360           | PK       | NS                | NS   | 27.8                    | 3.0          | 32.2         | 0.0                    | -                  | -    | 60.8              | -              | -    | Outside |
| 3905.280           | PK       | 48.2              | 47.8 | 29.8                    | 3.4          | 31.5         | 0.0                    | 49.9               | 49.5 | 53.9              | 4.0            | 4.4  | Inside  |
| 4339.200           | PK       | 47.1              | 45.8 | 30.7                    | 3.6          | 31.4         | 0.0                    | 50.0               | 48.7 | 53.9              | 3.9            | 5.2  | 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).

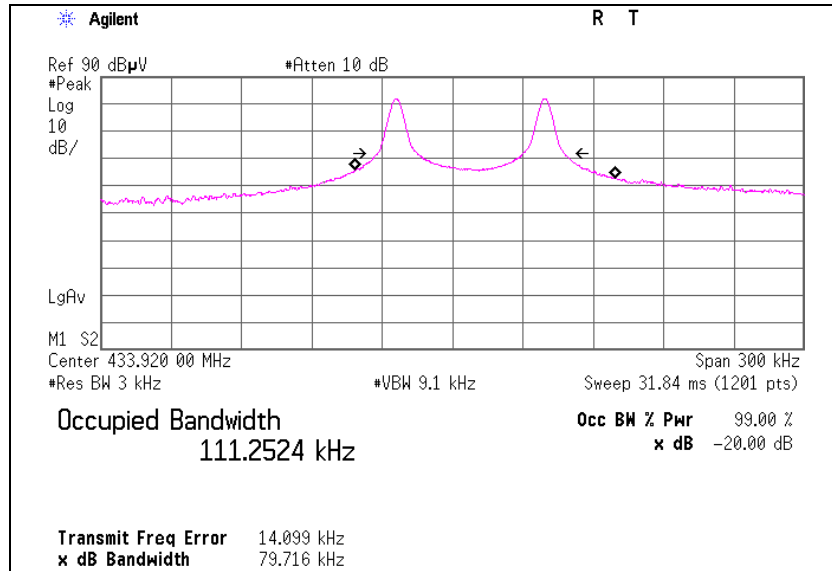
### -20dB and 99% Occupied Bandwidth

|                       |   |
|-----------------------|---|
| Test place            | Ise EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.            | 10885711H                               |
| Date                  | 07/21/2015                              |
| Temperature/ Humidity | 22 deg. C / 60% RH                      |
| Engineer              | Shinya Watanabe                         |
| Mode                  | 433.92 MHz Continuous Transmitting mode |

Bandwidth Limit : Fundamental Frequency    **433.92 MHz** x 0.25% = 1084.80 kHz

| -20dB Bandwidth<br>[kHz] | Bandwidth Limit<br>[kHz] | Result |
|--------------------------|--------------------------|--------|
| 79.72                    | 1084.80                  | Pass   |

| 99% Occupied Bandwidth<br>[kHz] | Bandwidth Limit<br>[kHz] | Result |
|---------------------------------|--------------------------|--------|
| 111.25                          | 1084.80                  | Pass   |

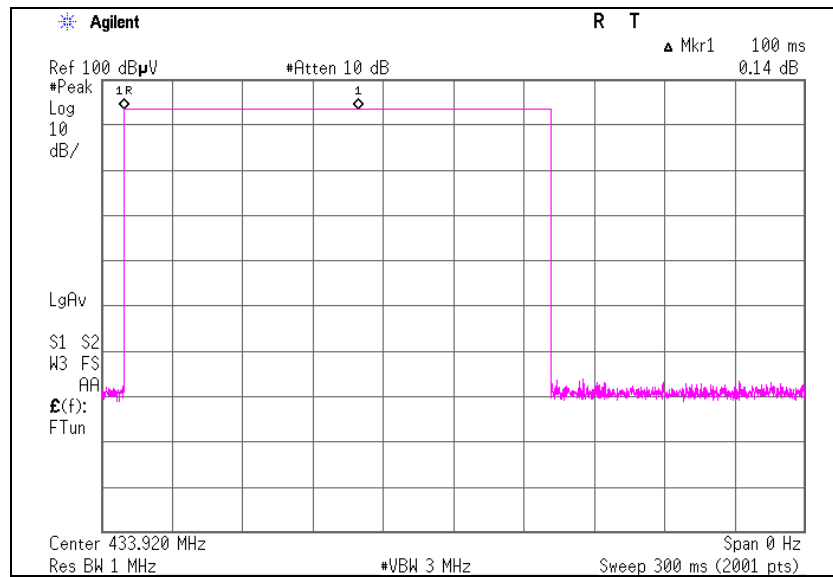


### Duty Cycle

|                       |   |
|-----------------------|---|
| Test place            | Ise EMC Lab. No.3 Semi Anechoic Chamber |
| Report No.            | 10885711H                               |
| Date                  | 07/21/2015                              |
| Temperature/ Humidity | 22 deg. C / 60% RH                      |
| Engineer              | Shinya Watanabe                         |
| Mode                  | 433.92 MHz Normal use mode              |

| ON time<br>[ms] | Cycle<br>[ms] | Duty<br>(On time/Cycle) | Duty<br>[dB] |
|-----------------|---------------|-------------------------|--------------|
| 100.000         | 100.00        | 1.0000                  | 0.00         |

\*Duty = 20log(ON time/100ms)



## **APPENDIX 2: Test Instruments**

### **EMI test equipment**

| <b>Control No.</b> | <b>Instrument</b>          | <b>Manufacturer</b> | <b>Model No</b>          | <b>Serial No</b>               | <b>Test Item</b> | <b>Calibration Date *<br/>Interval(month)</b> |
|--------------------|----------------------------|---------------------|--------------------------|--------------------------------|------------------|---|
| MAEC-03            | Semi Anechoic Chamber(NSA) | TDK                 | Semi Anechoic Chamber 3m | DA-10005                       | RE               | 2015/02/19 * 12                               |
| MOS-13             | Thermo-Hygrometer          | Custom              | CTH-180                  | 1301                           | RE               | 2015/01/13 * 12                               |
| MJM-16             | 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-08             | Test Receiver              | Rohde & Schwarz     | ESCI                     | 100767                         | RE               | 2014/08/19 * 12                               |
| MBA-03             | Biconical Antenna          | Schwarzbeck         | BBA9106                  | 1915                           | RE               | 2014/10/18 * 12                               |
| MLA-03             | Logperiodic Antenna        | Schwarzbeck         | USLP9143                 | 174                            | RE               | 2014/10/18 * 12                               |
| MCC-51             | Coaxial cable              | UL Japan            | -                        | -                              | RE               | 2015/07/13 * 12                               |
| MAT-70             | Attenuator(6dB)            | Agilent             | 8491A-006                | MY52460153                     | RE               | 2015/04/08 * 12                               |
| MPA-13             | Pre Amplifier              | SONOMA INSTRUMENT   | 310                      | 260834                         | RE               | 2015/03/10 * 12                               |
| MHA-20             | Horn Antenna 1-18GHz       | Schwarzbeck         | BBHA9120D                | 258                            | RE               | 2015/05/18 * 12                               |
| MPA-11             | MicroWave System Amplifier | Agilent             | 83017A                   | MY39500779                     | RE               | 2015/03/19 * 12                               |
| MCC-167            | Microwave Cable            | Junkosha            | MWX221                   | 1404S374(1m) /<br>1405S074(5m) | RE               | 2015/05/21 * 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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