



# RADIO TEST REPORT

**Test Report No. : 10956978H-A-R1**

**Applicant** : TOKAI RIKA CO., LTD.  
**Type of Equipment** : RKE Transmitter  
**Model No.** : B97TZ  
**Test regulation** : FCC Part 15 Subpart C: 2015  
**FCC ID** : MOZB97TZ  
**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 10956978H-A. 10956978H-A is replaced with this report.


**Date of test:** September 10 and 11, 2015

**Representative test engineer:**



Keisuke Kawamura  
Engineer  
Consumer Technology Division

**Approved by:**



Motoya Imura  
Engineer  
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.  
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13-EM-F0429



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**CONTENTS** **PAGE**

---

**SECTION 1: Customer information** ..... 4  
**SECTION 2: Equipment under test (E.U.T.)**..... 4  
**SECTION 3: Test specification, procedures & results**..... 5  
**SECTION 4: Operation of E.U.T. during testing**..... 8  
**SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)** 9  
**SECTION 6: Automatically deactivate** ..... 10  
**SECTION 7: -20 dB and 99 % Occupied Bandwidth**..... 10  
**APPENDIX 1: Test data**..... 11  
    Automatically deactivate..... 11  
    Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)..... 13  
    -20dB and 99% Occupied Bandwidth..... 15  
**APPENDIX 2: Test Instruments** ..... 17  
**APPENDIX 3: Photographs of test setup**..... 18  
    Radiated emission ..... 18  
    Worst case position ..... 19

## **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 : Hiroki Unno

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

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

Type of Equipment : RKE Transmitter  
Model No. : B97TZ  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.0 V  
Receipt Date of Sample : September 10, 2015  
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: B97TZ (referred to as the EUT in this report) is the RKE Transmitter.

#### **General Specification**

Clock frequencies in the system : 8 MHz, 18.37 MHz

#### **Radio Specification**

Radio Type : Transmitter  
Frequency of Operation : CH1: 314.35 MHz  
CH2: 312.10 MHz  
Modulation : FSK  
Method of Frequency Generation : Crystal  
Antenna Type : Pattern Antenna  
Operating Temperature Range : -20 to +60 deg. C  
Operating Voltage Range : DC 2.5 to 3.2 V

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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 November 23, 2015  
\*Some parts are effective on and after December 17, 2015 or December 23, 2015.  
The revision does not affect the test specification applied to the EUT.

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 conducted<br>emission measurements<br>IC: RSS-Gen 8.8 | FCC: Section 15.207<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>IC: -                  | FCC: Section 15.231(a)(1)<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>IC: RSS-Gen 6.12       | FCC: Section 15.231(b)<br>IC: RSS-210 A1.1.2                                                           | 2.1 dB<br>312.100 MHz<br>Horizontal<br>PK (PK with Duty<br>factor)                      | Complied | Radiated |
| Electric Field Strength<br>of Spurious Emission    | FCC: ANSI C63.4:2009<br>13. Measurement of<br>intentional radiators<br>IC: RSS-Gen 6.13       | FCC: Section 15.205<br>Section 15.209<br>Section 15.231(b)<br>IC: RSS-210 A1.1.2, 2.5.1<br>RSS-Gen 8.9 | 5.5 dB<br>1872.600 MHz<br>Horizontal<br>PK (PK with Duty<br>factor)<br>(Tx: 312.10 MHz) | Complied | Radiated |
| -20dB Bandwidth                                    | FCC: ANSI C63.4:2009<br>13. Measurement of<br>intentional radiators<br>IC: -                  | FCC: Section 15.231(c)<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 Part 15.31 (e)**

The test was performed with the New Battery (DC 2.5 to 3.2 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(3 m and 10 m)

[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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|                            | 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.

## UL Japan, Inc. Ise EMC Lab.

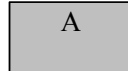
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## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Modes**

| <b>Test Item*</b>                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Mode</b>                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Automatically Deactivate                                                                                                                                                                                                                                                                                                                                                                                                                   | Normal use mode            |
| Electric Field Strength of Fundamental Emission<br>Electric Field Strength of Spurious Emission<br>-20 dB & 99 % Occupied Bandwidth                                                                                                                                                                                                                                                                                                        | Transmitting mode (Tx) *1) |
| * The system was configured in typical fashion (as a user would normally use it) for testing.<br>*1) The software of this mode is the same as one of normal product, except that EUT continues to transmit when transmitter button is being pressed (For Normal use mode, EUT stops to transmit in a given time, even if transceiver button is being pressed.)<br>End users cannot change the settings of the output power of the product. |                            |

### **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          | RKE Transmitter | B97TZ               | 001                  | TOKAI RIKAI 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, 0.5 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.

**[Transmitting mode]**

**(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 |

- 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.

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 with mechanical key was the worst case. Therefore the test with mechanical key was performed only.

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

**Measurement range** : 9 kHz - 3.2 GHz  
**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         | 150 kHz                                 | 1.5 kHz         | 5.1 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 *1) | Max Hold *1) | Spectrum Analyzer |

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.  
Peak hold was applied as Worst-case measurement.

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

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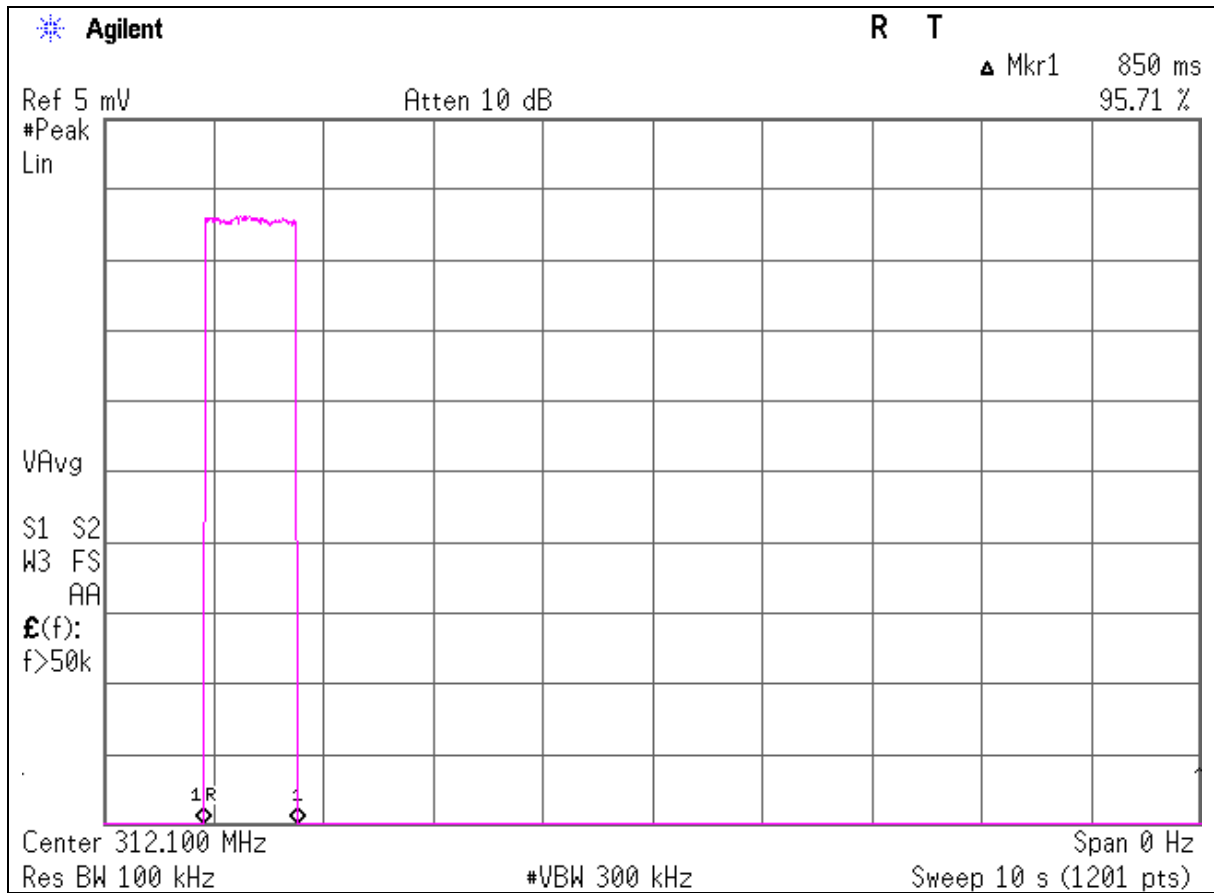
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**APPENDIX 1: Test data**

**Automatically deactivate**  
**312.10 MHz**

|                       |                                         |
|-----------------------|-----------------------------------------|
| Test place            | Ise EMC Lab. No.2 Semi Anechoic Chamber |
| Report No.            | 10956978H                               |
| Date                  | 09/11/2015                              |
| Temperature/ Humidity | 24 deg. C / 53 % RH                     |
| Engineer              | Keisuke Kawamura                        |
| Mode                  | Normal use mode 312.10 MHz              |

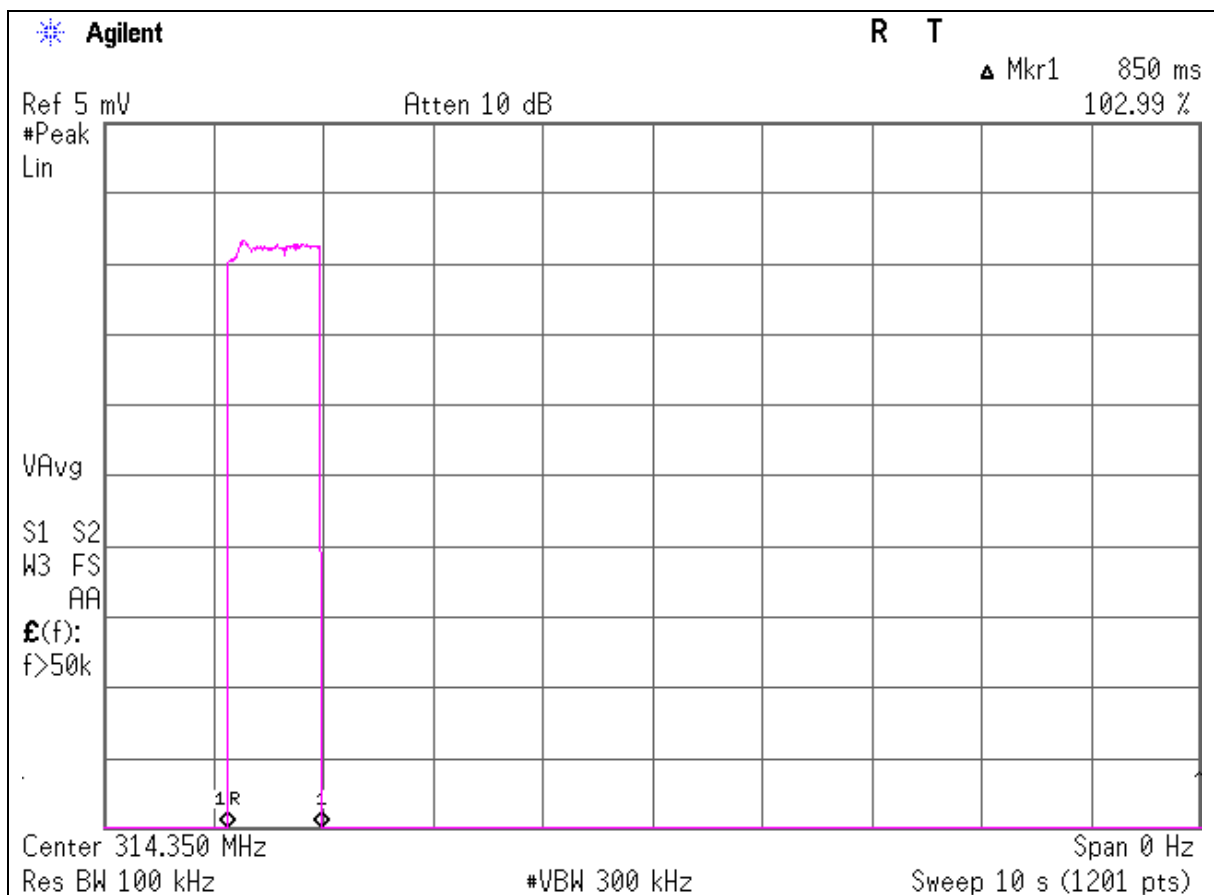
| Time of Transmitting<br>[sec] | Limit<br>[sec] | Result |
|-------------------------------|----------------|--------|
| 0.85                          | 5.00           | Pass   |



**Automatically deactivate**  
**314.35 MHz**

|                       |                                         |
|-----------------------|-----------------------------------------|
| Test place            | Ise EMC Lab. No.2 Semi Anechoic Chamber |
| Report No.            | 10956978H                               |
| Date                  | 09/11/2015                              |
| Temperature/ Humidity | 24 deg. C / 53 % RH                     |
| Engineer              | Keisuke Kawamura                        |
| Mode                  | Normal use mode 314.35 MHz              |

| Time of Transmitting [sec] | Limit [sec] | Result |
|----------------------------|-------------|--------|
| 0.85                       | 5.00        | Pass   |



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

Test place : Ise EMC Lab. No.1 Semi Anechoic Chamber  
Report No. : 10956978H  
Date : 09/10/2015  
Temperature/ Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
Mode : Transmitting mode 312.10 MHz

**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  |                                                    |
| 312.100            | PK       | 86.8              | 83.7 | 14.8                    | 10.5         | 38.8         | -                      | 73.3               | 70.2 | 95.4            | 22.1           | 25.2 | Carrier                                            |
| 624.200            | PK       | 50.2              | 50.4 | 19.7                    | 12.6         | 38.1         | -                      | 44.4               | 44.6 | 75.4            | 31.0           | 30.8 | Outside                                            |
| 936.300            | PK       | 40.9              | 41.8 | 22.4                    | 14.3         | 37.8         | -                      | 39.8               | 40.7 | 75.4            | 35.6           | 34.7 | Outside                                            |
| 1248.400           | PK       | 53.1              | 56.3 | 24.6                    | 2.0          | 36.5         | -                      | 43.2               | 46.4 | 75.4            | 32.2           | 29.0 | Outside                                            |
| 1560.500           | PK       | 48.7              | 49.5 | 25.5                    | 2.2          | 36.3         | -                      | 40.1               | 40.9 | 73.9            | 33.8           | 33.0 | Inside                                             |
| 1872.600           | PK       | 57.4              | 56.0 | 26.3                    | 2.4          | 36.2         | -                      | 49.9               | 48.5 | 75.4            | 25.5           | 26.9 | Outside                                            |
| 2184.700           | PK       | 49.9              | 47.6 | 26.7                    | 2.6          | 36.1         | -                      | 43.1               | 40.8 | 75.4            | 32.3           | 34.6 | Outside                                            |
| 2496.800           | PK       | 48.3              | 47.2 | 26.9                    | 2.8          | 36.1         | -                      | 41.9               | 40.8 | 73.9            | 32.0           | 33.1 | Inside                                             |
| 2808.900           | PK       | 50.4              | 48.7 | 27.8                    | 2.9          | 36.2         | -                      | 44.9               | 43.2 | 73.9            | 29.0           | 30.7 | Inside                                             |
| 3121.000           | PK       | 49.6              | 51.2 | 28.6                    | 3.1          | 36.2         | -                      | 45.1               | 46.7 | 75.4            | 30.3           | 28.7 | Outside                                            |

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

**PK 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  |         |
| 312.100            | PK       | 86.8              | 83.7 | 14.8                    | 10.5         | 38.8         | 0.0                    | 73.3               | 70.2 | 75.4            | 2.1            | 5.2  | Carrier |
| 624.200            | PK       | 50.2              | 50.4 | 19.7                    | 12.6         | 38.1         | 0.0                    | 44.4               | 44.6 | 55.4            | 11.0           | 10.8 | Outside |
| 936.300            | PK       | 40.9              | 41.8 | 22.4                    | 14.3         | 37.8         | 0.0                    | 39.8               | 40.7 | 55.4            | 15.6           | 14.7 | Outside |
| 1248.400           | PK       | 53.1              | 56.3 | 24.6                    | 2.0          | 36.5         | 0.0                    | 43.2               | 46.4 | 55.4            | 12.2           | 9.0  | Outside |
| 1560.500           | PK       | 48.7              | 49.5 | 25.5                    | 2.2          | 36.3         | 0.0                    | 40.1               | 40.9 | 53.9            | 13.8           | 13.0 | Inside  |
| 1872.600           | PK       | 57.4              | 56.0 | 26.3                    | 2.4          | 36.2         | 0.0                    | 49.9               | 48.5 | 55.4            | 5.5            | 6.9  | Outside |
| 2184.700           | PK       | 49.9              | 47.6 | 26.7                    | 2.6          | 36.1         | 0.0                    | 43.1               | 40.8 | 55.4            | 12.3           | 14.6 | Outside |
| 2496.800           | PK       | 48.3              | 47.2 | 26.9                    | 2.8          | 36.1         | 0.0                    | 41.9               | 40.8 | 53.9            | 12.0           | 13.1 | Inside  |
| 2808.900           | PK       | 50.4              | 48.7 | 27.8                    | 2.9          | 36.2         | 0.0                    | 44.9               | 43.2 | 53.9            | 9.0            | 10.7 | Inside  |
| 3121.000           | PK       | 49.6              | 51.2 | 28.6                    | 3.1          | 36.2         | 0.0                    | 45.1               | 46.7 | 55.4            | 10.3           | 8.7  | Outside |

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

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

Since the peak emission result satisfied the average limit, duty factor was omitted.  
Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

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

Test place : Ise EMC Lab. No.1 Semi Anechoic Chamber  
Report No. : 10956978H  
Date : 09/10/2015  
Temperature/ Humidity : 22 deg. C / 69 % RH  
Engineer : Takafumi Noguchi  
Mode : Transmitting mode 314.35 MHz

**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  |                                                    |
| 314.350            | PK       | 86.7              | 83.4 | 14.9                    | 10.5         | 38.8         | -                      | 73.3               | 70.0 | 95.5            | 22.2           | 25.5 | Carrier                                            |
| 628.700            | PK       | 49.5              | 49.4 | 19.8                    | 12.7         | 38.1         | -                      | 43.9               | 43.8 | 75.5            | 31.6           | 31.7 | Outside                                            |
| 943.050            | PK       | 39.7              | 41.1 | 22.5                    | 14.3         | 37.8         | -                      | 38.7               | 40.1 | 75.5            | 36.8           | 35.4 | Outside                                            |
| 1257.400           | PK       | 53.2              | 56.1 | 24.6                    | 2.0          | 36.5         | -                      | 43.3               | 46.2 | 75.5            | 32.2           | 29.3 | Outside                                            |
| 1571.750           | PK       | 48.9              | 51.0 | 25.5                    | 2.3          | 36.3         | -                      | 40.4               | 42.5 | 73.9            | 33.5           | 31.4 | Inside                                             |
| 1886.100           | PK       | 56.8              | 55.0 | 26.3                    | 2.4          | 36.1         | -                      | 49.4               | 47.6 | 75.5            | 26.1           | 27.9 | Outside                                            |
| 2200.450           | PK       | 48.2              | 47.5 | 26.7                    | 2.6          | 36.1         | -                      | 41.4               | 40.7 | 73.9            | 32.5           | 33.2 | Inside                                             |
| 2514.800           | PK       | 47.7              | 47.2 | 26.9                    | 2.8          | 36.1         | -                      | 41.3               | 40.8 | 75.5            | 34.2           | 34.7 | Outside                                            |
| 2829.150           | PK       | 50.1              | 48.6 | 27.9                    | 3.0          | 36.3         | -                      | 44.7               | 43.2 | 73.9            | 29.2           | 30.7 | Inside                                             |
| 3143.500           | PK       | 49.1              | 48.3 | 28.7                    | 3.1          | 36.2         | -                      | 44.7               | 43.9 | 75.5            | 30.8           | 31.6 | Outside                                            |

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

**PK 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  |         |
| 314.350            | PK       | 86.7              | 83.4 | 14.9                    | 10.5         | 38.8         | 0.0                    | 73.3               | 70.0 | 75.5            | 2.2            | 5.5  | Carrier |
| 628.700            | PK       | 49.5              | 49.4 | 19.8                    | 12.7         | 38.1         | 0.0                    | 43.9               | 43.8 | 55.5            | 11.6           | 11.7 | Outside |
| 943.050            | PK       | 39.7              | 41.1 | 22.5                    | 14.3         | 37.8         | 0.0                    | 38.7               | 40.1 | 55.5            | 16.8           | 15.4 | Outside |
| 1257.400           | PK       | 53.2              | 56.1 | 24.6                    | 2.0          | 36.5         | 0.0                    | 43.3               | 46.2 | 55.5            | 12.2           | 9.3  | Outside |
| 1571.750           | PK       | 48.9              | 51.0 | 25.5                    | 2.3          | 36.3         | 0.0                    | 40.4               | 42.5 | 53.9            | 13.5           | 11.4 | Inside  |
| 1886.100           | PK       | 56.8              | 55.0 | 26.3                    | 2.4          | 36.1         | 0.0                    | 49.4               | 47.6 | 55.5            | 6.1            | 7.9  | Outside |
| 2200.450           | PK       | 48.2              | 47.5 | 26.7                    | 2.6          | 36.1         | 0.0                    | 41.4               | 40.7 | 53.9            | 12.5           | 13.2 | Inside  |
| 2514.800           | PK       | 47.7              | 47.2 | 26.9                    | 2.8          | 36.1         | 0.0                    | 41.3               | 40.8 | 55.5            | 14.2           | 14.7 | Outside |
| 2829.150           | PK       | 50.1              | 48.6 | 27.9                    | 3.0          | 36.3         | 0.0                    | 44.7               | 43.2 | 53.9            | 9.2            | 10.7 | Inside  |
| 3143.500           | PK       | 49.1              | 48.3 | 28.7                    | 3.1          | 36.2         | 0.0                    | 44.7               | 43.9 | 55.5            | 10.8           | 11.6 | Outside |

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

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

Since the peak emission result satisfied the average limit, duty factor was omitted.  
Although Duty of this product was 100% or less, the result of AV (PK with Duty factor) was calculated by applying Duty 100% as worst.

**UL Japan, Inc.**

**Ise EMC Lab.**

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**-20dB and 99% Occupied Bandwidth**  
**312.10 MHz / 314.35 MHz**

|                       |                                           |
|-----------------------|-------------------------------------------|
| Test place            | Ise EMC Lab. No.2 Semi Anechoic Chamber   |
| Report No.            | 10956978H                                 |
| Date                  | 09/11/2015                                |
| Temperature/ Humidity | 24 deg. C / 53 % RH                       |
| Engineer              | Keisuke Kawamura                          |
| Mode                  | Transmitting mode 312.10 MHz / 314.35 MHz |

Bandwidth Limit : Fundamental Frequency     **312.10** MHz x 0.25% = 780.25 kHz

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

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

**312.10MHz**

|                          |
|--------------------------|
| -20dB Bandwidth<br>[kHz] |
| 58.93                    |

**314.35MHz**

|                          |
|--------------------------|
| -20dB Bandwidth<br>[kHz] |
| 58.93                    |

| -20dB Bandwidth<br>[kHz] | Bandwidth Limit<br>[kHz] | Result |
|--------------------------|--------------------------|--------|
| 58.93+58.93=117.86       | 780.25                   | Pass   |

Bandwidth Limit : Fundamental Frequency     **312.10** MHz x 0.25% = 780.25 kHz

| 99% Occupied Bandwidth<br>[kHz] | Bandwidth Limit<br>[kHz] | Result |
|---------------------------------|--------------------------|--------|
| 62.47                           | 780.25                   | Pass   |

Bandwidth Limit : Fundamental Frequency     **314.35** MHz x 0.25% = 785.88 kHz

| 99% Occupied Bandwidth<br>[kHz] | Bandwidth Limit<br>[kHz] | Result |
|---------------------------------|--------------------------|--------|
| 62.78                           | 785.88                   | Pass   |

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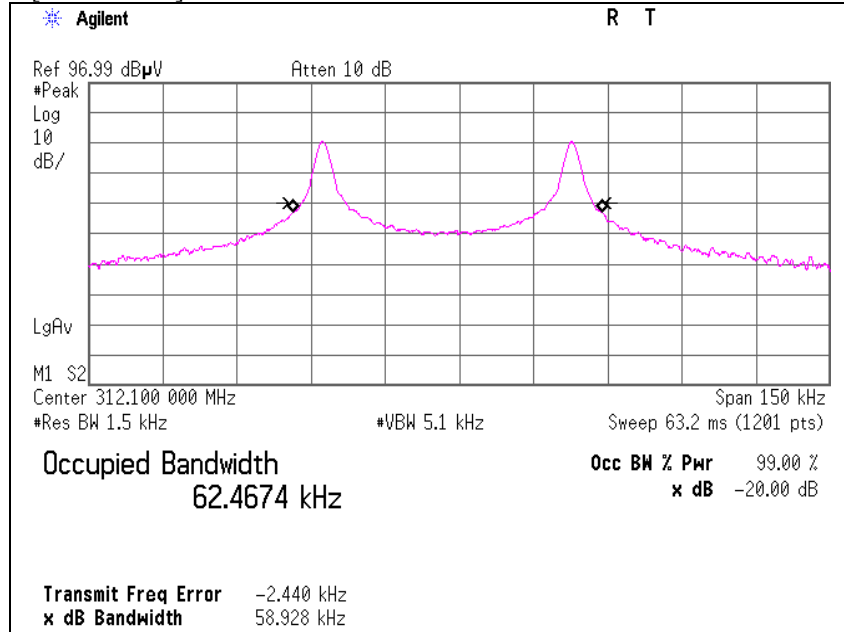
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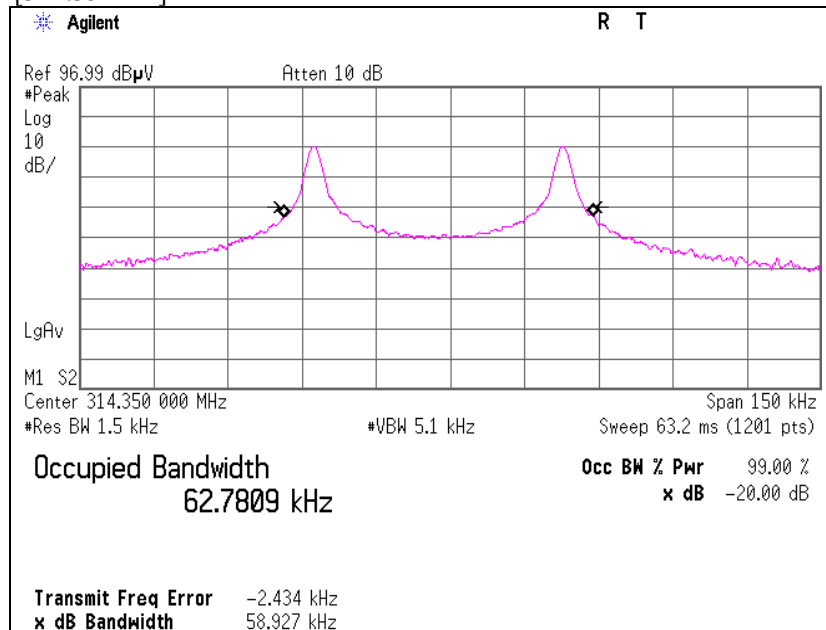
**-20dB and 99% Occupied Bandwidth**  
**312.10 MHz / 314.35 MHz**

Test place : Ise EMC Lab. No.2 Semi Anechoic Chamber  
 Report No. : 10956978H  
 Date : 09/11/2015  
 Temperature/ Humidity : 24 deg. C / 53 % RH  
 Engineer : Keisuke Kawamura  
 Mode : Transmitting mode 312.10 MHz / 314.35 MHz

[312.10MHz]



[314.35MHz]



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## **APPENDIX 2: Test Instruments**

### **EMI test equipment**

| Control No. | Instrument                 | Manufacturer              | Model No                  | Serial No                       | Test Item | Calibration Date *<br>Interval(month) |
|-------------|----------------------------|---------------------------|---------------------------|---------------------------------|-----------|---------------------------------------|
| MAEC-01     | Semi Anechoic Chamber(NSA) | TDK                       | Semi Anechoic Chamber 10m | DA-06881                        | RE        | 2014/09/01 * 12                       |
| MOS-27      | Thermo-Hygrometer          | CUSTOM                    | CTH-201                   | A08Q26                          | RE        | 2015/01/13 * 12                       |
| MJM-21      | Measure                    | KOMELON                   | KMC-36                    | -                               | RE        | -                                     |
| COTS-MEMI   | EMI measurement program    | TSJ                       | TEPTO-DV                  | -                               | RE        | -                                     |
| MTR-09      | EMI Test Receiver          | Rohde & Schwarz           | ESU26                     | 100412                          | RE        | 2015/06/08 * 12                       |
| KBA-05      | Biconical Antenna          | Schwarzbeck               | BBA9106                   | 2513                            | RE        | 2014/11/22 * 12                       |
| KLA-04      | Logperiodic Antenna        | Schwarzbeck               | USLP9143                  | 361                             | RE        | 2014/11/22 * 12                       |
| MAT-08      | Attenuator(6dB)            | Weinschel Corp            | 2                         | BK7971                          | RE        | 2014/11/20 * 12                       |
| MCC-02      | Coaxial Cable              | Suhner/storm/Agilent /TSJ | -                         | -                               | RE        | 2014/09/12 * 12                       |
| MPA-19      | Pre Amplifier              | MITEQ                     | MLA-10K01-B01-35          | 1237616                         | RE        | 2015/02/03 * 12                       |
| MMM-03      | Digital Tester             | Fluke                     | FLUKE 26-3                | 78030621                        | RE        | 2015/08/19 * 12                       |
| MHA-05      | Horn Antenna 1-18GHz       | Schwarzbeck               | BBHA9120D                 | 253                             | RE        | 2015/05/18 * 12                       |
| MPA-01      | Pre Amplifier              | Agilent                   | 8449B                     | 3008A01671                      | RE        | 2015/02/04 * 12                       |
| MCC-141     | Microwave Cable            | Junkosha                  | MWX221                    | 1305S002R(1m) /<br>1405S146(5m) | RE        | 2015/06/22 * 12                       |
| MSA-13      | Spectrum Analyzer          | Agilent                   | E4440A                    | MY46185823                      | RE        | 2015/06/02 * 12                       |
| MOS-22      | Thermo-Hygrometer          | Custom                    | CTH-201                   | 0003                            | RE        | 2015/01/13 * 12                       |
| MJM-14      | Measure                    | KOMELON                   | KMC-36                    | -                               | RE        | -                                     |

**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, -20 dB bandwidth, Automatically deactivate and Duty cycle tests**

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