



# **RADIO TEST REPORT**

**Test Report No.: 10420214S-D**

**Applicant** : Canon Inc.  
**Type of Equipment** : Wireless LAN Module  
**Model No.** : K30365  
**FCC ID** : AZDK30365  
**Test regulation** : FCC Part15 Subpart C: 2014  
**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 the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

**Date of test:** July 28 to August 13, 2014

**Tested by:**

*S. Takano*

Shinichi Takano  
Engineer  
Consumer Technology Division

**Approved by :**

*U. Isozaki*

Ichiro Isozaki  
Leader  
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
☒ There is no testing item of "Non-accreditation".

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13-EM-F0429

## REVISION HISTORY

**Original Test Report No.: 10420214S-D**

[illegible]

**UL Japan, Inc.**

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## **SECTION 1: Customer information**

Company Name : Canon Inc.  
Brand name : Canon  
Address : 3-451 Tsukagoshi, Saiwai-ku, Kawasaki, kanagawa 212-8530 Japan  
Telephone Number : +81-44-542-2111  
Facsimile Number : +81-44-548-7513  
Contact Person : Kenichi Nampei

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

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

Type of Equipment : Wireless LAN Module  
Model Number : K30365  
Serial Number : Refer to 4.2  
Rating : DC3.3V  
Country of Mass-production : Thailand, Vietnam  
Condition of EUT : Engineering prototype  
(Not for sale: This sample is equivalent to mass-produced items.)  
Receipt Date of Sample : July 28, 2014  
Modification of EUT : No modification by the test lab.

### **2.2 Product description**

Model: K30365 (referred to as the EUT in this report) is a Wireless LAN Module.  
The clock frequencies used in the EUT: 38.4MHz

#### **Radio specification**

Equipment type : Transceiver  
Frequency of operation : 2412-2462MHz (IEEE 802.11b, 11g, 11n(HT20))  
Bandwidth : 20MHz (IEEE 802.11b, 11g, 11n(HT20))  
Channel spacing : 5MHz  
Type of modulation : DSSS (IEEE 802.11b), OFDM (IEEE 802.11g/n)  
Antenna type : Pattern antenna (meander)  
Antenna connector type : U.FL  
Antenna gain : -0.92 dBi  
ITU code : D1D, G1D  
Operation temperature range : -5 to +55 deg.C

FCC 15.31 (e) / 212

The module is constantly provided the stable voltage from the host device regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC 15.203 / 212

The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement.  
The antenna connector is a unique type and not used by end user.

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## SECTION 3: Test specification, procedures & results

### 3.1 Test specification

Test specification : FCC Part 15 Subpart 2014, final revised on May 1, 2014 and effective June 2, 2014  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,  
and 5725-5850MHz

### 3.2 Procedures & Results

| Item                                         | Test Procedure *1) | Specification                   | Remarks              | Deviation | Worst Margin                                                                                                          | Results  |
|----------------------------------------------|--------------------|---------------------------------|----------------------|-----------|-----------------------------------------------------------------------------------------------------------------------|----------|
| Conducted emission                           | ANSI C63.10:2009   | FCC 15.207                      | -                    | N/A       | 14.3dB<br>Freq.: 0.15000MHz<br>Detector: Quasi-Peak<br>Phase: N<br>Mode: Tx 2412MHz,<br>IEEE 802.11g                  | Complied |
| 6dB bandwidth                                | ANSI C63.10:2009   | FCC 15.247 (a)(2)               | Conducted            | N/A       | * See data                                                                                                            | Complied |
| Maximum peak conducted output power          | ANSI C63.10:2009   | FCC 15.247 (b)(3)               | Conducted            | N/A       |                                                                                                                       | Complied |
| Out of band emission & Restricted band edges | ANSI C63.10:2009   | FCC 15.109, 15.247 (d) & 15.209 | Conducted / Radiated | N/A       | 5.1dB<br>Freq.: 2483.500MHz<br>Polarization: Vertical<br>Detection: Average<br>Mode: Tx 2462MHz,<br>IEEE802.11n(HT20) | Complied |
| Power density                                | ANSI C63.10:2009   | FCC 15.247 (e)                  | Conducted            | N/A       | * See data                                                                                                            | Complied |

Note: UL Japan's EMI Work Procedures No.13-EM-W0420 and 13-EM-W0422.

\*1) These tests were also referred to KDB 558074 v03 r01 (FCC), "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

### 3.3 Addition to standard

| Item                     | Test Procedure                   | Specification | Remarks   | Worst Margin | Results |
|--------------------------|----------------------------------|---------------|-----------|--------------|---------|
| Occupied bandwidth (99%) | ANSI C63.4:2009<br>RSS-Gen 4.6.1 | -             | Conducted | -            | -       |

Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422

\* Other than above, no addition, exclusion nor deviation has been made from the standard.

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### 3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

| Item                                            | Frequency range | No.1 SAC <sup>*1</sup> /SR <sup>*2</sup><br>(±) | No.2 SAC/SR<br>(±) | No.3 SAC/SR<br>(±) |
|-------------------------------------------------|-----------------|-------------------------------------------------|--------------------|--------------------|
| Conducted emission<br>(AC Mains) LISN           | 150kHz-30MHz    | 3.6 dB                                          | 3.6 dB             | 3.5 dB             |
| Radiated emission<br>(Measurement distance: 3m) | 9kHz-30MHz      | 3.7 dB                                          | 3.7 dB             | 3.6 dB             |
|                                                 | 30MHz-300MHz    | 4.8 dB                                          | 5.0 dB             | 4.8 dB             |
|                                                 | 300MHz-1GHz     | 5.0 dB                                          | 5.0 dB             | 4.8 dB             |
|                                                 | 1GHz-15GHz      | 4.9 dB                                          | 4.9 dB             | 4.9 dB             |
| Radiated emission<br>(Measurement distance: 1m) | 15GHz-18GHz     | 5.7 dB                                          | 5.6 dB             | 5.6 dB             |
|                                                 | 18GHz-40GHz     | 5.2 dB                                          | 4.3 dB             | 4.3 dB             |

\*1: SAC=Semi-Anechoic Chamber

\*2: SR= Shielded Room is applied besides radiated emission

#### Conducted emission test

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

#### Radiated emission test

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

#### Antenna port conducted test

Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.7dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.9dB

Bandwidth measurement uncertainty for this test was: (±) 5.4%

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### 3.5 Test location

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JAB Accreditation No. : RTL02610

|                                                                | IC<br>Registration<br>No. | Width x Depth x<br>Height (m) | Size of reference<br>ground plane (m) /<br>horizontal<br>conducting plane | Maximum<br>measurement<br>distance |
|----------------------------------------------------------------|---------------------------|-------------------------------|---------------------------------------------------------------------------|------------------------------------|
| <input checked="" type="checkbox"/> No.1 semi-anechoic chamber | 2973D-1                   | 20.6 x 11.3 x 7.65            | 20.6 x 11.3                                                               | 10m                                |
| <input type="checkbox"/> No.2 semi-anechoic chamber            | 2973D-2                   | 20.6 x 11.3 x 7.65            | 20.6 x 11.3                                                               | 10m                                |
| <input type="checkbox"/> No.3 semi-anechoic chamber            | 2973D-3                   | 12.7 x 7.7 x 5.35             | 12.7 x 7.7                                                                | 5m                                 |
| <input type="checkbox"/> No.4 semi-anechoic chamber            | -                         | 8.1 x 5.1 x 3.55              | 8.1 x 5.1                                                                 | -                                  |
| <input checked="" type="checkbox"/> No.1 shielded room         | -                         | 6.8 x 4.1 x 2.7               | 6.8 x 4.1                                                                 | -                                  |
| <input type="checkbox"/> No.2 shielded room                    | -                         | 6.8 x 4.1 x 2.7               | 6.8 x 4.1                                                                 | -                                  |
| <input type="checkbox"/> No.3 shielded room                    | -                         | 6.3 x 4.7 x 2.7               | 6.3 x 4.7                                                                 | -                                  |
| <input type="checkbox"/> No.4 shielded room                    | -                         | 4.4 x 4.7 x 2.7               | 4.4 x 4.7                                                                 | -                                  |
| <input type="checkbox"/> No.5 shielded room                    | -                         | 7.8 x 6.4 x 2.7               | 7.8 x 6.4                                                                 | -                                  |
| <input type="checkbox"/> No.6 shielded room                    | -                         | 7.8 x 6.4 x 2.7               | 7.8 x 6.4                                                                 | -                                  |
| <input checked="" type="checkbox"/> No.1 Measurement room      | -                         | 2.55 x 4.1 x 2.5              | -                                                                         | -                                  |

### 3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

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

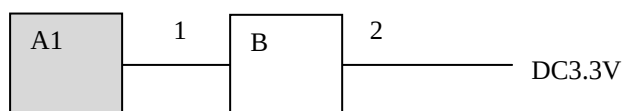
### 4.1 Operating mode

| Test item                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mode                             | Tested frequency             | Power setting<br>*1) | Worst data<br>rate *2) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------------|----------------------|------------------------|
| Conducted emission<br>Radiated emission<br>(below 1GHz) *3)                                                                                                                                                                                                                                                                                                                                                                                 | Transmitting IEEE 802.11g        | 2412MHz                      | 10                   | 6Mbps, PN9             |
| Other items                                                                                                                                                                                                                                                                                                                                                                                                                                 | Transmitting IEEE 802.11b        | 2412MHz, 2437MHz,<br>2462MHz | 12                   | 1Mbps, PN9             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                             | Transmitting IEEE 802.11g        | 2412MHz, 2437MHz,<br>2462MHz | 10                   | 6Mbps, PN9             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                             | Transmitting IEEE 802.11n (HT20) | 2412MHz, 2437MHz,<br>2462MHz | 10                   | MCS0, PN9              |
| *1) The actual output power differs from the setting value. Software used for the test:<br>DutApiWiFi8801BrdigeEth.exe, Ver.2.0.0.79<br>*2) The worst condition was determined based on the test result of Maximum Peak Conducted Output Power.<br>*3) Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing- Managing<br>Complex Regulatory Approvals - ”of TCB Council Workshop October 2009. |                                  |                              |                      |                        |

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

### 4.2 Configuration and peripherals

#### 4.2.1 Radiated emission test and Antenna port conducted test



\* Test data was taken under worse case conditions.

#### Description of EUT and support equipment

| No. | Item                | Model number | Serial number | Manufacturer | Remarks |
|-----|---------------------|--------------|---------------|--------------|---------|
| A1  | Wireless LAN Module | K30365       | *1)           | Canon        | EUT     |
| B   | WLAN JOINT PCB      | -            | -             | Canon        | -       |

\*1) 1406NK110: Radiated emission, 1406NK109: Antenna port conducted test

#### List of cables used

| No. | Name | Length (m) | Shield-Cable | Shield-Connector | Remarks |
|-----|------|------------|--------------|------------------|---------|
| 1   | Flat | 0.1        | Unshielded   | Unshielded       | -       |
| 2   | DC   | 2.2        | Unshielded   | Unshielded       | -       |

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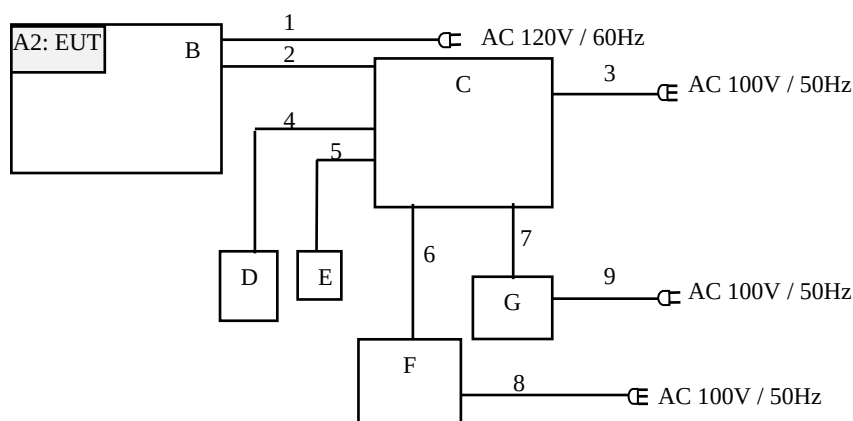
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#### 4.2.2 Conducted emission test



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

#### Description of EUT and support equipment

| No. | Item                  | Model number    | Serial number            | Manufacturer | Remarks |
|-----|-----------------------|-----------------|--------------------------|--------------|---------|
| A2  | Wireless LAN Module   | K30365          | 1406NK110                | CANON        | EUT     |
| B   | MULTIFUNCTION PRINTER | MG3530          | DE-011                   | CANON        | -       |
| C   | Personal Computer     | ThinkCentre A42 | L3A1407                  | Lenovo       | -       |
| D   | Keyboard              | KU-0225         | 0051066                  | Lenovo       | -       |
| E   | Mouse                 | MS111-L         | CN-09RRC7-44751-17N-0406 | Dell         | -       |
| F   | LCD Monitor           | L551            | 28651025                 | EIZO NANAO   | -       |
| G   | Modem                 | ME3314B         | 6K07040                  | OMRON        | -       |

#### List of cables used

| No. | Name  | Length (m) | Shield-Cable | Shield-Connector | Remarks |
|-----|-------|------------|--------------|------------------|---------|
| 1   | AC    | 1.5        | Unshielded   | Unshielded       | -       |
| 2   | USB   | 1.8        | Shielded     | Shielded         | -       |
| 3   | AC    | 2.3        | Unshielded   | Unshielded       | -       |
| 4   | USB   | 1.8        | Shielded     | Shielded         | -       |
| 5   | USB   | 1.8        | Shielded     | Shielded         | -       |
| 6   | RGB   | 1.8        | Shielded     | Shielded         | -       |
| 7   | RS232 | 1.5        | Shielded     | Shielded         | -       |
| 8   | AC    | 2.0        | Unshielded   | Unshielded       | -       |
| 9   | AC    | 1.8        | Unshielded   | Unshielded       | -       |

\* All cables used for the measurement are exclusive use or marketed.

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## **SECTION 5: Conducted emission**

### **5.1 Operating environment**

Test place : See test data (APPENDIX 1)  
Temperature : See test data (APPENDIX 1)  
Humidity : See test data (APPENDIX 1)

### **5.2 Test configuration**

EUT was placed on a platform of nominal size, 1m by 2.0m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. Photographs of the set up are shown in APPENDIX 3.

### **5.3 Test conditions**

Frequency range : 0.15 - 30MHz  
EUT position : Table top

### **5.4 Test procedure**

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT via host device within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN) via host device. An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, a CISPR average detector. The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ CISPR Average  
IF Bandwidth : 9kHz

### **5.5 Results**

Summary of the test results : Pass  
Refer to APPENDIX 1.

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## **SECTION 6: 6dB bandwidth & Occupied bandwidth (99%)**

### **Test procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

The test was measured based on Method 8.1 Option 1 and 8.2 Option 2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass  
Refer to APPENDIX 1.

## **SECTION 7: Maximum peak conducted output power**

### **Test procedure**

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

The test was measured based on Method 9.1.3 PKPM1 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 8: Out of band emissions (Antenna port conducted)**

### **Test procedure**

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.

The radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

Summary of the test results: Pass  
Refer to APPENDIX 1.

## **SECTION 9: Peak power density**

### **Test procedure**

The peak power density was measured with a spectrum analyzer connected to the antenna port.

Instrument used : Spectrum Analyzer  
RBW / VBW : 3kHz / 9.1kHz

The test was measured based on Method 10.2 PKPSD of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass  
Refer to APPENDIX 1.

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## SECTION 10: Radiated emission

### 10.1 Operating environment

Test place : See test data (APPENDIX 1)  
Temperature : See test data (APPENDIX 1)  
Humidity : See test data (APPENDIX 1)

### 10.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

### 10.3 Test conditions

Frequency range : 30MHz to 25GHz  
EUT position : Table top

### 10.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 15GHz) / 1m (above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection.

| Frequency      | 30-1000MHz | 1-25GHz                |                                         | 20dBc                      |
|----------------|------------|------------------------|-----------------------------------------|----------------------------|
| Detection type | Quasi-Peak | Peak                   | Average *1)                             | Peak                       |
| IF Bandwidth   | 120kHz     | RBW: 1MHz<br>VBW: 3MHz | RBW: 1MHz<br>VBW: 3MHz<br>Detector: RMS | RBW: 100kHz<br>VBW: 300kHz |

\*1) Average Power Measurement was measured based on 12.2.5 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

#### Worst case:

| Antenna polarization | Carrier (Band edge) | Spurious   |            |           |          |
|----------------------|---------------------|------------|------------|-----------|----------|
|                      |                     | Below 1GHz | Above 1GHz |           |          |
|                      |                     |            | 1-2.8GHz   | 2.8-15GHz | 15-25GHz |
| Horizontal           | X                   | X          | X          | X         | X        |
| Vertical             | Z                   | X          | Z          | Y         | X        |

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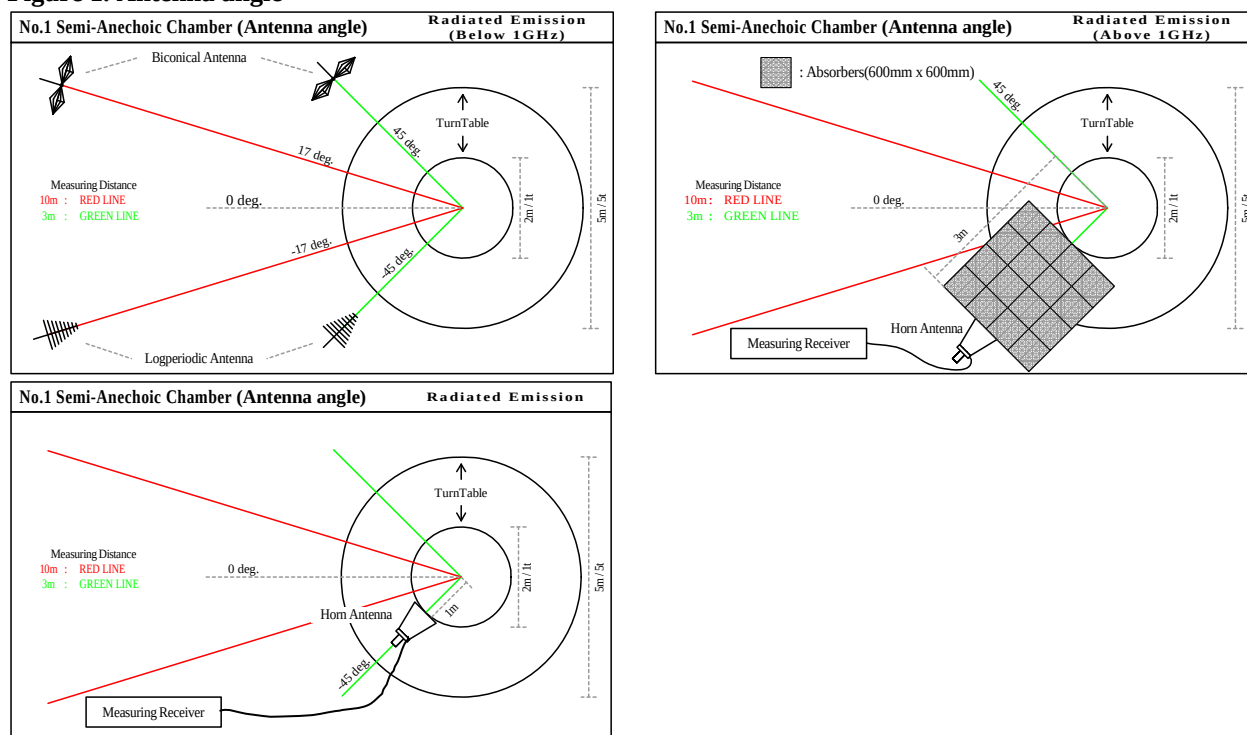
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**Figure 1. Antenna angle**



## 10.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

## 10.6 Results

Summary of the test results : Pass  
\* No noise was detected above the 5<sup>th</sup> order harmonics.

Refer to APPENDIX 1.

## **Contents of APPENDIXES**

### **APPENDIX 1: Data of Radio tests**

Conducted emission  
6dB bandwidth  
Maximum peak output power  
Radiated emission  
Spurious emission (Antenna port conducted)  
Peak power density  
Occupied bandwidth

### **APPENDIX 2: Test instruments**

Test instruments

### **APPENDIX 3: Photographs of test setup**

Conducted emission  
Radiated emission  
Pre-check of the worst position

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# DATA OF CONDUCTED EMISSION TEST

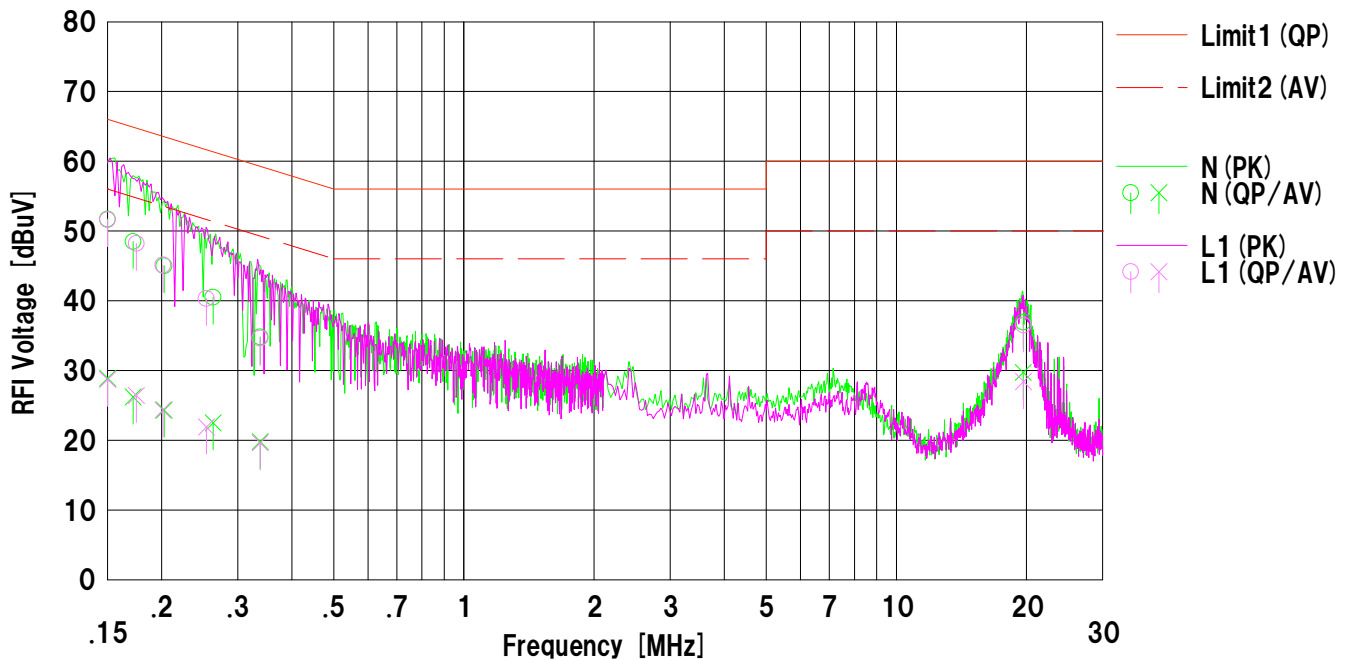
UL Japan,Inc. Shonan EMC Lab. No.1 Shielded Room  
Date : 2014/08/13

Company : CANON INC.  
Kind of EUT : Wireless LAN Module  
Model No. : K30365  
Serial No. : 1406NK110  
Remarks : -

Mode : IEEE802.11g Tx 2412MHz  
Order No. : 10420214S  
Power : DC3.3V (Printer 120V/60Hz)  
Temp./Humi. : 26deg.C/59%RH

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Engineer : Shinichi Takano

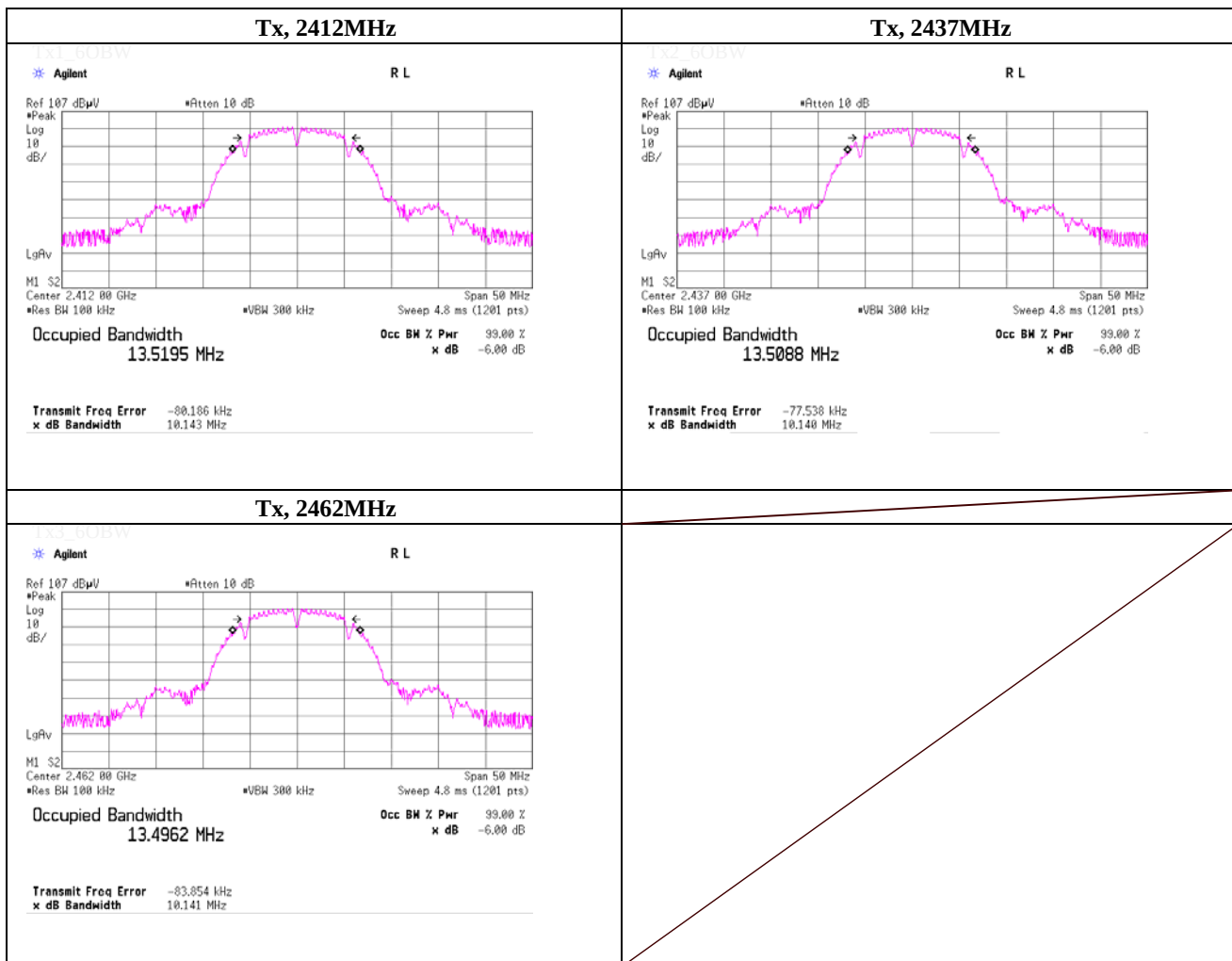


| No. | Freq.<br>[MHz] | Reading        |                | C.Fac<br>[dB] | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|---------------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <QP><br>[dBuV] | <AV><br>[dBuV] |               | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |         |
| 1   | 0.15000        | 39.1           | 16.3           | 12.6          | 51.7           | 28.9           | 66.0           | 56.0           | 14.3         | 27.1         | N     |         |
| 2   | 0.17177        | 36.0           | 13.7           | 12.5          | 48.5           | 26.2           | 64.8           | 54.8           | 16.3         | 28.6         | N     |         |
| 3   | 0.20275        | 32.5           | 11.8           | 12.5          | 45.0           | 24.3           | 63.4           | 53.4           | 18.4         | 29.1         | N     |         |
| 4   | 0.26303        | 27.9           | 9.9            | 12.6          | 40.5           | 22.5           | 61.3           | 51.3           | 20.8         | 28.8         | N     |         |
| 5   | 0.33795        | 22.3           | 7.3            | 12.5          | 34.8           | 19.8           | 59.2           | 49.2           | 24.4         | 29.4         | N     |         |
| 6   | 19.65250       | 23.3           | 16.1           | 13.6          | 36.9           | 29.7           | 60.0           | 50.0           | 23.1         | 20.3         | N     |         |
| 7   | 0.15000        | 39.0           | 16.1           | 12.6          | 51.6           | 28.7           | 66.0           | 56.0           | 14.4         | 27.3         | L1    |         |
| 8   | 0.17483        | 35.7           | 13.9           | 12.5          | 48.2           | 26.4           | 64.7           | 54.7           | 16.5         | 28.3         | L1    |         |
| 9   | 0.20150        | 32.6           | 11.8           | 12.5          | 45.1           | 24.3           | 63.5           | 53.5           | 18.4         | 29.2         | L1    |         |
| 10  | 0.25385        | 27.7           | 9.3            | 12.6          | 40.3           | 21.9           | 61.6           | 51.6           | 21.3         | 29.7         | L1    |         |
| 11  | 0.33803        | 22.1           | 7.1            | 12.5          | 34.6           | 19.6           | 59.2           | 49.2           | 24.6         | 29.6         | L1    |         |
| 12  | 19.68712       | 22.9           | 14.8           | 13.6          | 36.5           | 28.4           | 60.0           | 50.0           | 23.5         | 21.6         | L1    |         |

## -6dB Bandwidth

|                        |                                             |                       |
|------------------------|---------------------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab.              | No.1 Measurement Room |
| Date                   | July 29, 2014                               |                       |
| Temperature / Humidity | 27deg.C , 45%RH                             |                       |
| Engineer               | Akio Hayashi                                |                       |
| Mode                   | Tx, IEEE802.11b, PN9, worst data mode 1Mbps |                       |

| Freq.<br>[MHz] | -6dB Bandwidth<br>[MHz] | Limit<br>[MHz] |
|----------------|-------------------------|----------------|
| 2412.0000      | 10.143                  | > 0.500        |
| 2437.0000      | 10.140                  | > 0.500        |
| 2462.0000      | 10.141                  | > 0.500        |



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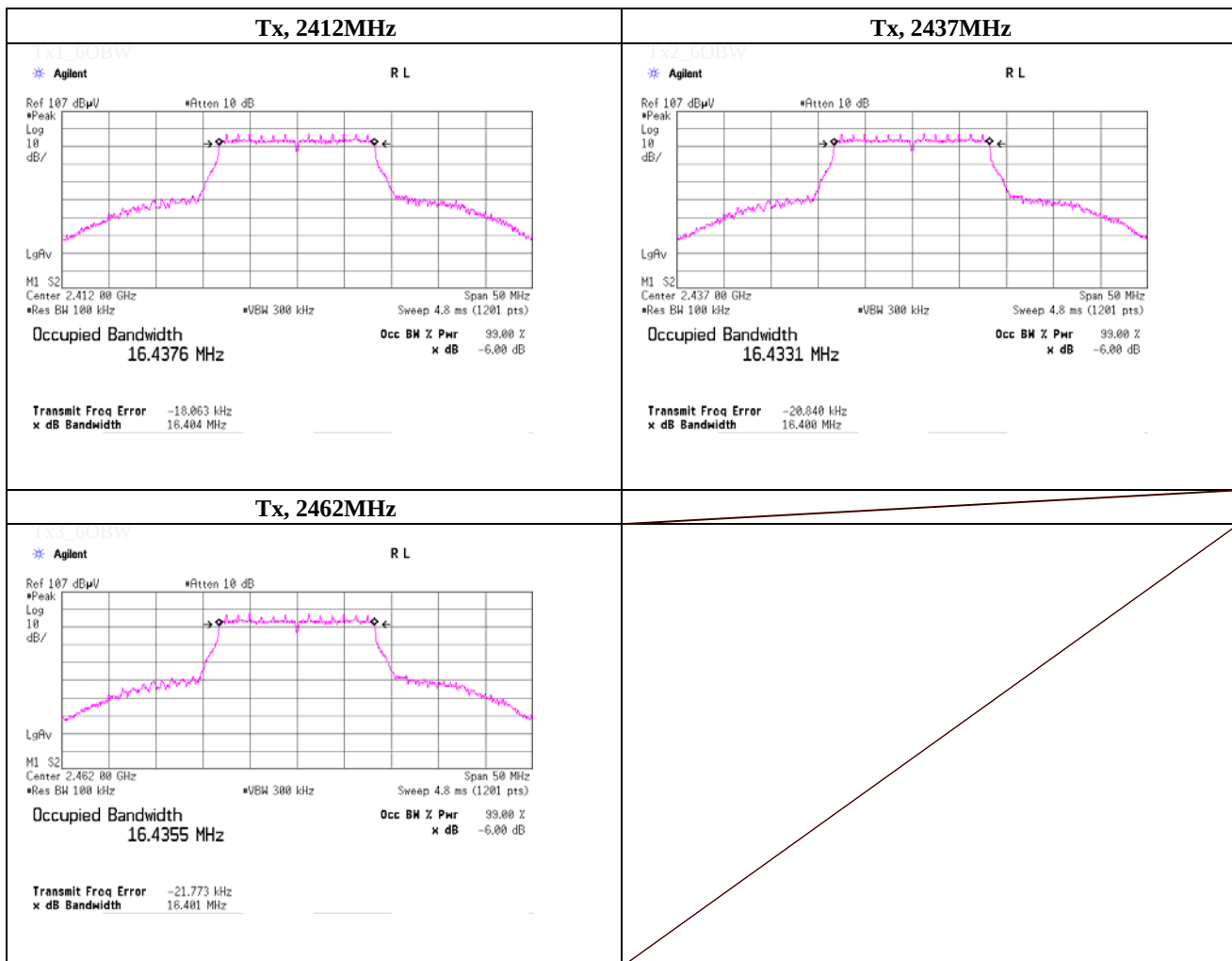
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## -6dB Bandwidth

|                        |                                             |                       |
|------------------------|---------------------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab.              | No.1 Measurement Room |
| Date                   | July 29, 2014                               |                       |
| Temperature / Humidity | 27deg.C , 45%RH                             |                       |
| Engineer               | Akio Hayashi                                |                       |
| Mode                   | Tx, IEEE802.11g, PN9, worst data mode 6Mbps |                       |

| Freq.<br>[MHz] | -6dB Bandwidth<br>[MHz] | Limit<br>[MHz] |
|----------------|-------------------------|----------------|
| 2412.0000      | 16.404                  | > 0.500        |
| 2437.0000      | 16.400                  | > 0.500        |
| 2462.0000      | 16.401                  | > 0.500        |



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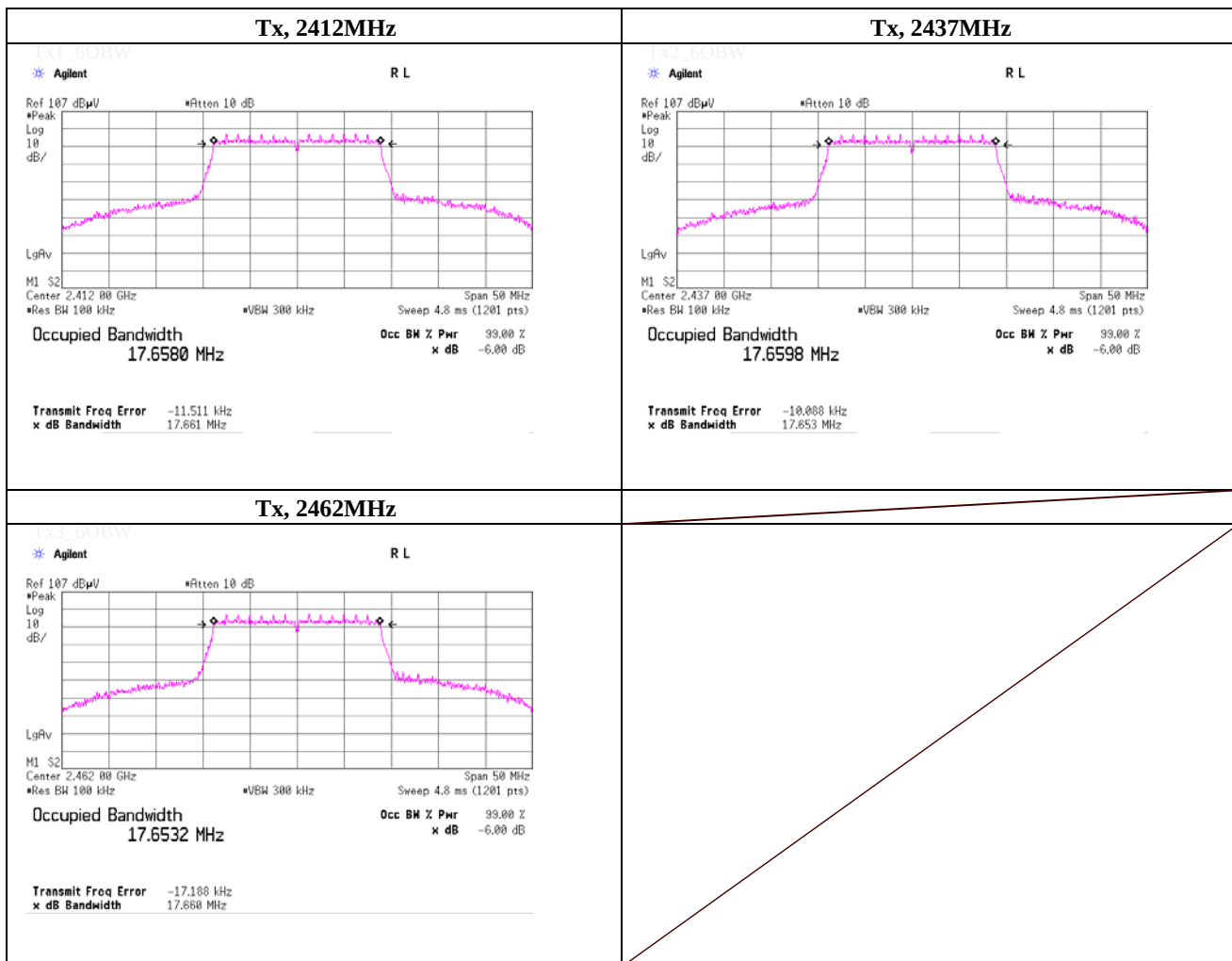
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Facsimile : +81 463 50 6401

## -6dB Bandwidth

|                        |                                                    |                       |
|------------------------|----------------------------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab.                     | No.1 Measurement Room |
| Date                   | July 29, 2014                                      |                       |
| Temperature / Humidity | 27deg.C , 45%RH                                    |                       |
| Engineer               | Akio Hayashi                                       |                       |
| Mode                   | Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS) |                       |

| Freq.<br>[MHz] | -6dB Bandwidth<br>[MHz] | Limit<br>[MHz] |
|----------------|-------------------------|----------------|
| 2412.0000      | 17.661                  | > 0.500        |
| 2437.0000      | 17.653                  | > 0.500        |
| 2462.0000      | 17.660                  | > 0.500        |



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## Maximum Peak Conducted Output Power

(PKPM1)

Test place                      UL Japan, Inc. Shonan EMC Lab.                      No.1 Measurement Room  
 Date                              July 28, 2014  
 Temperature / Humidity      26deg.C                      , 56%RH  
 Engineer                        Shinichi Takano  
 Mode                              Tx, IEEE802.11b, PN9,                      worst data mode :                      1 Mbps

(\* P/M: Power Meter with power sensor)

| Ch   | Freq.<br>[MHz] | P/M (Peak)<br>Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin |
|------|----------------|--------------------------------|-----------------------|------------------------|--------|-------|-------|------|--------|
|      |                |                                |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] | [dB]   |
| Low  | 2412.0         | 3.45                           | 0.82                  | 9.90                   | 14.17  | 26.12 | 30.00 | 1000 | 15.83  |
| Mid  | 2437.0         | 3.22                           | 0.82                  | 9.90                   | 13.94  | 24.77 | 30.00 | 1000 | 16.06  |
| High | 2462.0         | 3.19                           | 0.83                  | 9.89                   | 13.91  | 24.60 | 30.00 | 1000 | 16.09  |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

### [Pre check]

|  | Data rate<br>[Mbps] | Freq.<br>[MHz] | P/M (Peak)<br>Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result       |       | Limit |      | Margin       |
|--|---------------------|----------------|--------------------------------|-----------------------|------------------------|--------------|-------|-------|------|--------------|
|  |                     |                |                                |                       |                        | [dBm]        | [mW]  | [dBm] | [mW] | [dB]         |
|  | 1                   | 2437.0         | 3.22                           | 0.82                  | 9.90                   | <b>13.94</b> | 24.77 | 30.00 | 1000 | <b>16.06</b> |
|  | 2                   | 2437.0         | 3.17                           | 0.82                  | 9.90                   | 13.89        | 24.49 | 30.00 | 1000 | 16.11        |
|  | 5.5                 | 2437.0         | 2.98                           | 0.82                  | 9.90                   | 13.70        | 23.44 | 30.00 | 1000 | 16.30        |
|  | 11                  | 2437.0         | 3.05                           | 0.82                  | 9.90                   | 13.77        | 23.82 | 30.00 | 1000 | 16.23        |
|  |                     |                |                                |                       |                        |              |       |       |      |              |
|  |                     |                |                                |                       |                        |              |       |       |      |              |
|  |                     |                |                                |                       |                        |              |       |       |      |              |

**Worst**

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Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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## Maximum Peak Conducted Output Power

(PKPM1)

Test place                      UL Japan, Inc. Shonan EMC Lab.                      No.1 Measurement Room  
 Date                              July 28, 2014  
 Temperature / Humidity      26deg.C                      , 56%RH  
 Engineer                        Shinichi Takano  
 Mode                              Tx, IEEE802.11g, PN9,                      worst data mode :                      6 Mbps

(\* P/M: Power Meter with power sensor)

| Ch   | Freq.<br>[MHz] | P/M (Peak)<br>Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin |
|------|----------------|--------------------------------|-----------------------|------------------------|--------|-------|-------|------|--------|
|      |                |                                |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] | [dB]   |
| Low  | 2412.0         | 8.57                           | 0.82                  | 9.90                   | 19.29  | 84.92 | 30.00 | 1000 | 10.71  |
| Mid  | 2437.0         | 8.43                           | 0.82                  | 9.90                   | 19.15  | 82.22 | 30.00 | 1000 | 10.85  |
| High | 2462.0         | 8.38                           | 0.83                  | 9.89                   | 19.10  | 81.28 | 30.00 | 1000 | 10.90  |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

### [Pre check]

|  | Data rate<br>[Mbps] | Freq.<br>[MHz] | P/M (Peak)<br>Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result       |       | Limit |      | Margin       |
|--|---------------------|----------------|--------------------------------|-----------------------|------------------------|--------------|-------|-------|------|--------------|
|  |                     |                |                                |                       |                        | [dBm]        | [mW]  | [dBm] | [mW] | [dB]         |
|  | 6                   | 2437.0         | 8.43                           | 0.82                  | 9.90                   | <b>19.15</b> | 82.22 | 30.00 | 1000 | <b>10.85</b> |
|  | 9                   | 2437.0         | 8.16                           | 0.82                  | 9.90                   | 18.88        | 77.27 | 30.00 | 1000 | 11.12        |
|  | 12                  | 2437.0         | 8.08                           | 0.82                  | 9.90                   | 18.80        | 75.86 | 30.00 | 1000 | 11.20        |
|  | 18                  | 2437.0         | 8.13                           | 0.82                  | 9.90                   | 18.85        | 76.74 | 30.00 | 1000 | 11.15        |
|  | 24                  | 2437.0         | 8.32                           | 0.82                  | 9.90                   | 19.04        | 80.17 | 30.00 | 1000 | 10.96        |
|  | 36                  | 2437.0         | 8.13                           | 0.82                  | 9.90                   | 18.85        | 76.74 | 30.00 | 1000 | 11.15        |
|  | 48                  | 2437.0         | 8.06                           | 0.82                  | 9.90                   | 18.78        | 75.51 | 30.00 | 1000 | 11.22        |
|  | 54                  | 2437.0         | 8.25                           | 0.82                  | 9.90                   | 18.97        | 78.89 | 30.00 | 1000 | 11.03        |

**Worst**

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Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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## Maximum Peak Conducted Output Power

(PKPM1)

Test place                      UL Japan, Inc. Shonan EMC Lab.                      No.1 Measurement Room  
 Date                              July 28, 2014  
 Temperature / Humidity      26deg.C                      , 56%RH  
 Engineer                        Shinichi Takano  
 Mode                              Tx, IEEE802.11n(HT20), PN9,                      worst data mode :                      0 (MCS)

(\* P/M: Power Meter with power sensor)

| Ch   | Freq.<br>[MHz] | P/M (Peak)<br>Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result |       | Limit |      | Margin |
|------|----------------|--------------------------------|-----------------------|------------------------|--------|-------|-------|------|--------|
|      |                |                                |                       |                        | [dBm]  | [mW]  | [dBm] | [mW] | [dB]   |
| Low  | 2412.0         | 8.41                           | 0.82                  | 9.90                   | 19.13  | 81.85 | 30.00 | 1000 | 10.87  |
| Mid  | 2437.0         | 8.26                           | 0.82                  | 9.90                   | 18.98  | 79.07 | 30.00 | 1000 | 11.02  |
| High | 2462.0         | 7.93                           | 0.83                  | 9.89                   | 18.65  | 73.28 | 30.00 | 1000 | 11.35  |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

### [Pre check]

|  | Mode<br>(MCS) | Freq.<br>[MHz] | P/M (Peak)<br>Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>Loss<br>[dB] | Result       |       | Limit |      | Margin       |
|--|---------------|----------------|--------------------------------|-----------------------|------------------------|--------------|-------|-------|------|--------------|
|  |               |                |                                |                       |                        | [dBm]        | [mW]  | [dBm] | [mW] | [dB]         |
|  | 0             | 2437.0         | 8.26                           | 0.82                  | 9.90                   | <b>18.98</b> | 79.07 | 30.00 | 1000 | <b>11.02</b> |
|  | 1             | 2437.0         | 8.22                           | 0.82                  | 9.90                   | 18.94        | 78.34 | 30.00 | 1000 | 11.06        |
|  | 2             | 2437.0         | 7.96                           | 0.82                  | 9.90                   | 18.68        | 73.79 | 30.00 | 1000 | 11.32        |
|  | 3             | 2437.0         | 7.91                           | 0.82                  | 9.90                   | 18.63        | 72.95 | 30.00 | 1000 | 11.37        |
|  | 4             | 2437.0         | 8.19                           | 0.82                  | 9.90                   | 18.91        | 77.80 | 30.00 | 1000 | 11.09        |
|  | 5             | 2437.0         | 8.01                           | 0.82                  | 9.90                   | 18.73        | 74.64 | 30.00 | 1000 | 11.27        |
|  | 6             | 2437.0         | 8.20                           | 0.82                  | 9.90                   | 18.92        | 77.98 | 30.00 | 1000 | 11.08        |
|  | 7             | 2437.0         | 8.10                           | 0.82                  | 9.90                   | 18.82        | 76.21 | 30.00 | 1000 | 11.18        |

**Worst**

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Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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## Radiated Emission

Test place                    No.1 Semi Anechoic Chamber  
 Date                         August 8, 2014                    August 11, 2014  
 Temperature / Humidity   24 deg.C, 67 %RH            26 deg.C, 61 %RH  
 Engineer                    Shinichi Takano                   Shinichi Takano  
 Mode                        Tx,                    2412 MHz  
                                  Tx, IEEE802.11b, PN9, worst data mode 1Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2390.000           | PK       | 55.3              | 26.7               | 14.6         | 40.9         | 55.7               | 73.9              | 18.2           | 100            | 333            |        |
| Hori.    | 4824.000           | PK       | 48.3              | 31.0               | 7.5          | 41.7         | 45.1               | 73.9              | 28.8           | 100            | 79             |        |
| Hori.    | 7236.000           | PK       | 46.6              | 35.9               | 8.6          | 41.5         | 49.6               | 73.9              | 24.3           | 100            | 0              |        |
| Hori.    | 9648.000           | PK       | 45.0              | 38.1               | 9.6          | 40.4         | 52.3               | 73.9              | 21.6           | 100            | 0              |        |
| Hori.    | 12060.000          | PK       | 44.8              | 39.1               | 10.7         | 39.7         | 54.9               | 73.9              | 19.0           | 100            | 0              |        |
| Hori.    | 2390.000           | AV       | 37.6              | 26.7               | 14.6         | 40.9         | 38.0               | 53.9              | 15.9           | 100            | 333            |        |
| Hori.    | 4824.000           | AV       | 39.3              | 31.0               | 7.5          | 41.7         | 36.1               | 53.9              | 17.8           | 100            | 79             |        |
| Hori.    | 7236.000           | AV       | 37.3              | 35.9               | 8.6          | 41.5         | 40.3               | 53.9              | 13.6           | 100            | 0              |        |
| Hori.    | 9648.000           | AV       | 35.5              | 38.1               | 9.6          | 40.4         | 42.8               | 53.9              | 11.1           | 100            | 0              |        |
| Hori.    | 12060.000          | AV       | 35.2              | 39.1               | 10.7         | 39.7         | 45.3               | 53.9              | <b>8.6</b>     | 100            | 0              |        |
| Vert.    | 2390.000           | PK       | 56.0              | 26.7               | 14.6         | 40.9         | 56.4               | 73.9              | 17.5           | 100            | 310            |        |
| Vert.    | 4824.000           | PK       | 48.8              | 31.0               | 7.5          | 41.7         | 45.6               | 73.9              | 28.3           | 100            | 88             |        |
| Vert.    | 7236.000           | PK       | 45.4              | 35.9               | 8.6          | 41.5         | 48.4               | 73.9              | 25.5           | 100            | 0              |        |
| Vert.    | 9648.000           | PK       | 45.2              | 38.1               | 9.6          | 40.4         | 52.5               | 73.9              | 21.4           | 100            | 0              |        |
| Vert.    | 12060.000          | PK       | 44.0              | 39.1               | 10.7         | 39.7         | 54.1               | 73.9              | 19.8           | 100            | 0              |        |
| Vert.    | 2390.000           | AV       | 37.9              | 26.7               | 14.6         | 40.9         | 38.3               | 53.9              | 15.6           | 100            | 310            |        |
| Vert.    | 4824.000           | AV       | 40.5              | 31.0               | 7.5          | 41.7         | 37.3               | 53.9              | 16.6           | 100            | 88             |        |
| Vert.    | 7236.000           | AV       | 36.9              | 35.9               | 8.6          | 41.5         | 39.9               | 53.9              | 14.0           | 100            | 0              |        |
| Vert.    | 9648.000           | AV       | 35.0              | 38.1               | 9.6          | 40.4         | 42.3               | 53.9              | 11.6           | 100            | 0              |        |
| Vert.    | 12060.000          | AV       | 35.2              | 39.1               | 10.7         | 39.7         | 45.3               | 53.9              | <b>8.6</b>     | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2412.000           | PK       | 98.5              | 26.7               | 14.6         | 40.9         | 98.9               | -                 | -              |        |
| Hori.    | 2397.994           | PK       | 55.9              | 26.7               | 14.6         | 40.9         | 56.3               | 78.9              | 22.6           |        |
| Hori.    | 2400.000           | PK       | 52.0              | 26.7               | 14.6         | 40.9         | 52.4               | 78.9              | 26.5           |        |
| Vert.    | 2412.000           | PK       | 99.2              | 26.7               | 14.6         | 40.9         | 99.6               | -                 | -              |        |
| Vert.    | 2396.975           | PK       | 53.1              | 26.7               | 14.6         | 40.9         | 53.5               | 79.6              | 26.1           |        |
| Vert.    | 2400.000           | PK       | 53.0              | 26.7               | 14.6         | 40.9         | 53.4               | 79.6              | 26.2           |        |

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

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## Radiated Emission

Test place                      No.1 Semi Anechoic Chamber  
 Date                              August 8, 2014                      August 11, 2014  
 Temperature / Humidity      24 deg.C, 67 %RH                26 deg.C, 61 %RH  
 Engineer                        Shinichi Takano                      Shinichi Takano  
 Mode                              Tx,                      2437 MHz  
                                          Tx, IEEE802.11b, PN9, worst data mode 1Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 4874.000           | PK       | 48.4              | 31.1               | 7.5          | 41.6         | 45.4               | 73.9              | 28.5           | 100            | 323            |        |
| Hori.    | 7311.000           | PK       | 46.3              | 36.0               | 8.6          | 41.5         | 49.4               | 73.9              | 24.5           | 100            | 0              |        |
| Hori.    | 9748.000           | PK       | 45.2              | 38.2               | 9.6          | 40.4         | 52.6               | 73.9              | 21.3           | 100            | 0              |        |
| Hori.    | 12185.000          | PK       | 44.4              | 39.2               | 10.8         | 39.7         | 54.7               | 73.9              | 19.2           | 100            | 0              |        |
| Hori.    | 4874.000           | AV       | 39.3              | 31.1               | 7.5          | 41.6         | 36.3               | 53.9              | 17.6           | 100            | 323            |        |
| Hori.    | 7311.000           | AV       | 37.5              | 36.0               | 8.6          | 41.5         | 40.6               | 53.9              | 13.3           | 100            | 0              |        |
| Hori.    | 9748.000           | AV       | 35.3              | 38.2               | 9.6          | 40.4         | 42.7               | 53.9              | 11.2           | 100            | 0              |        |
| Hori.    | 12185.000          | AV       | 35.1              | 39.2               | 10.8         | 39.7         | 45.4               | 53.9              | 8.5            | 100            | 0              |        |
| Vert.    | 4874.000           | PK       | 48.9              | 31.1               | 7.5          | 41.6         | 45.9               | 73.9              | 28.0           | 100            | 88             |        |
| Vert.    | 7311.000           | PK       | 46.9              | 36.0               | 8.6          | 41.5         | 50.0               | 73.9              | 23.9           | 100            | 0              |        |
| Vert.    | 9748.000           | PK       | 44.3              | 38.2               | 9.6          | 40.4         | 51.7               | 73.9              | 22.2           | 100            | 0              |        |
| Vert.    | 12185.000          | PK       | 44.5              | 39.2               | 10.8         | 39.7         | 54.8               | 73.9              | 19.1           | 100            | 0              |        |
| Vert.    | 4874.000           | AV       | 40.3              | 31.1               | 7.5          | 41.6         | 37.3               | 53.9              | 16.6           | 100            | 88             |        |
| Vert.    | 7311.000           | AV       | 37.6              | 36.0               | 8.6          | 41.5         | 40.7               | 53.9              | 13.2           | 100            | 0              |        |
| Vert.    | 9748.000           | AV       | 35.4              | 38.2               | 9.6          | 40.4         | 42.8               | 53.9              | 11.1           | 100            | 0              |        |
| Vert.    | 12185.000          | AV       | 35.2              | 39.2               | 10.8         | 39.7         | 45.5               | 53.9              | <b>8.4</b>     | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

## Radiated Emission

Test place                      No.1 Semi Anechoic Chamber  
 Date                              August 8, 2014                      August 11, 2014  
 Temperature / Humidity      24 deg.C, 67 %RH                26 deg.C, 61 %RH  
 Engineer                        Shinichi Takano                      Shinichi Takano  
 Mode                              Tx,                      2462 MHz  
                                          Tx, IEEE802.11b, PN9, worst data mode 1Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2483.500           | PK       | 52.9              | 26.8               | 14.7         | 40.9         | 53.5               | 73.9              | 20.4           | 100            | 323            |        |
| Hori.    | 4924.000           | PK       | 48.7              | 31.3               | 7.5          | 41.5         | 46.0               | 73.9              | 27.9           | 100            | 323            |        |
| Hori.    | 7386.000           | PK       | 46.7              | 36.1               | 8.8          | 41.4         | 50.2               | 73.9              | 23.7           | 100            | 0              |        |
| Hori.    | 9848.000           | PK       | 44.8              | 38.3               | 9.6          | 40.4         | 52.3               | 73.9              | 21.6           | 100            | 0              |        |
| Hori.    | 12310.000          | PK       | 45.4              | 39.3               | 10.8         | 39.7         | 55.8               | 73.9              | 18.1           | 100            | 0              |        |
| Hori.    | 2483.500           | AV       | 37.2              | 26.8               | 14.7         | 40.9         | 37.8               | 53.9              | 16.1           | 100            | 323            |        |
| Hori.    | 4924.000           | AV       | 38.5              | 31.3               | 7.5          | 41.5         | 35.8               | 53.9              | 18.1           | 100            | 323            |        |
| Hori.    | 7386.000           | AV       | 37.5              | 36.1               | 8.8          | 41.4         | 41.0               | 53.9              | 12.9           | 100            | 0              |        |
| Hori.    | 9848.000           | AV       | 35.1              | 38.3               | 9.6          | 40.4         | 42.6               | 53.9              | 11.3           | 100            | 0              |        |
| Hori.    | 12310.000          | AV       | 35.5              | 39.3               | 10.8         | 39.7         | 45.9               | 53.9              | <b>8.0</b>     | 100            | 0              |        |
| Vert.    | 2483.500           | PK       | 55.5              | 26.8               | 14.7         | 40.9         | 56.1               | 73.9              | 17.8           | 100            | 312            |        |
| Vert.    | 4924.000           | PK       | 49.6              | 31.3               | 7.5          | 41.5         | 46.9               | 73.9              | 27.0           | 100            | 89             |        |
| Vert.    | 7386.000           | PK       | 47.0              | 36.1               | 8.8          | 41.4         | 50.5               | 73.9              | 23.4           | 100            | 0              |        |
| Vert.    | 9848.000           | PK       | 44.6              | 38.3               | 9.6          | 40.4         | 52.1               | 73.9              | 21.8           | 100            | 0              |        |
| Vert.    | 12310.000          | PK       | 44.8              | 39.3               | 10.8         | 39.7         | 55.2               | 73.9              | 18.7           | 100            | 0              |        |
| Vert.    | 2483.500           | AV       | 37.8              | 26.8               | 14.7         | 40.9         | 38.4               | 53.9              | 15.5           | 100            | 312            |        |
| Vert.    | 4924.000           | AV       | 40.0              | 31.3               | 7.5          | 41.5         | 37.3               | 53.9              | 16.6           | 100            | 89             |        |
| Vert.    | 7386.000           | AV       | 37.2              | 36.1               | 8.8          | 41.4         | 40.7               | 53.9              | 13.2           | 100            | 0              |        |
| Vert.    | 9848.000           | AV       | 35.3              | 38.3               | 9.6          | 40.4         | 42.8               | 53.9              | 11.1           | 100            | 0              |        |
| Vert.    | 12310.000          | AV       | 35.3              | 39.3               | 10.8         | 39.7         | 45.7               | 53.9              | 8.2            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$



## Radiated Emission

Test place                      No.1 Semi Anechoic Chamber  
 Date                            August 8, 2014                      August 11, 2014                      August 13, 2014  
 Temperature / Humidity    24 deg.C, 67 %RH                      26 deg.C, 61 %RH                      24 deg.C, 68 %RH  
 Engineer                      Shinichi Takano                      Shinichi Takano                      Shinichi Takano  
 Mode                            Tx,                      2412 MHz  
                                      Tx, IEEE802.11g, PN9, worst data mode 6Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 38.400             | QP       | 22.1              | 15.3               | 7.1          | 31.8         | 12.7               | 40.0              | 27.3           | 100            | 0              |        |
| Hori.    | 384.000            | QP       | 21.9              | 15.8               | 7.0          | 31.8         | 12.9               | 46.0              | 33.1           | 100            | 0              |        |
| Hori.    | 2390.000           | PK       | 56.9              | 26.7               | 14.6         | 40.9         | 57.3               | 73.9              | 16.6           | 100            | 330            |        |
| Hori.    | 4824.000           | PK       | 47.3              | 31.0               | 7.5          | 41.7         | 44.1               | 73.9              | 29.8           | 100            | 0              |        |
| Hori.    | 7236.000           | PK       | 45.8              | 35.9               | 8.6          | 41.5         | 48.8               | 73.9              | 25.1           | 100            | 0              |        |
| Hori.    | 9648.000           | PK       | 44.8              | 38.1               | 9.6          | 40.4         | 52.1               | 73.9              | 21.8           | 100            | 0              |        |
| Hori.    | 12060.000          | PK       | 45.0              | 39.1               | 10.7         | 39.7         | 55.1               | 73.9              | 18.8           | 100            | 0              |        |
| Hori.    | 2390.000           | AV       | 45.1              | 26.7               | 14.6         | 40.9         | 45.5               | 53.9              | 8.4            | 100            | 330            |        |
| Hori.    | 4824.000           | AV       | 37.6              | 31.0               | 7.5          | 41.7         | 34.4               | 53.9              | 19.5           | 100            | 0              |        |
| Hori.    | 7236.000           | AV       | 36.8              | 35.9               | 8.6          | 41.5         | 39.8               | 53.9              | 14.1           | 100            | 0              |        |
| Hori.    | 9648.000           | AV       | 35.2              | 38.1               | 9.6          | 40.4         | 42.5               | 53.9              | 11.4           | 100            | 0              |        |
| Hori.    | 12060.000          | AV       | 35.8              | 39.1               | 10.7         | 39.7         | 45.9               | 53.9              | <b>8.0</b>     | 100            | 0              |        |
| Vert.    | 38.400             | QP       | 22.0              | 15.3               | 7.1          | 31.8         | 12.6               | 40.0              | 27.4           | 100            | 0              |        |
| Vert.    | 384.000            | QP       | 21.7              | 15.8               | 7.0          | 31.8         | 12.7               | 46.0              | 33.3           | 100            | 0              |        |
| Vert.    | 2390.000           | PK       | 57.4              | 26.7               | 14.6         | 40.9         | 57.8               | 73.9              | 16.1           | 132            | 313            |        |
| Vert.    | 4824.000           | PK       | 47.2              | 31.0               | 7.5          | 41.7         | 44.0               | 73.9              | 29.9           | 100            | 0              |        |
| Vert.    | 7236.000           | PK       | 46.3              | 35.9               | 8.6          | 41.5         | 49.3               | 73.9              | 24.6           | 100            | 0              |        |
| Vert.    | 9648.000           | PK       | 44.2              | 38.1               | 9.6          | 40.4         | 51.5               | 73.9              | 22.4           | 100            | 0              |        |
| Vert.    | 12060.000          | PK       | 46.3              | 39.1               | 10.7         | 39.7         | 56.4               | 73.9              | 17.5           | 100            | 0              |        |
| Vert.    | 2390.000           | AV       | 44.9              | 26.7               | 14.6         | 40.9         | 45.3               | 53.9              | 8.6            | 132            | 313            |        |
| Vert.    | 4824.000           | AV       | 37.5              | 31.0               | 7.5          | 41.7         | 34.3               | 53.9              | 19.6           | 100            | 0              |        |
| Vert.    | 7236.000           | AV       | 36.7              | 35.9               | 8.6          | 41.5         | 39.7               | 53.9              | 14.2           | 100            | 0              |        |
| Vert.    | 9648.000           | AV       | 35.4              | 38.1               | 9.6          | 40.4         | 42.7               | 53.9              | 11.2           | 100            | 0              |        |
| Vert.    | 12060.000          | AV       | 35.0              | 39.1               | 10.7         | 39.7         | 45.1               | 53.9              | 8.8            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2412.000           | PK       | 95.0              | 26.7               | 14.6         | 40.9         | 95.4               | -                 | -              |        |
| Hori.    | 2400.000           | PK       | 61.0              | 26.7               | 14.6         | 40.9         | 61.4               | 75.4              | 14.0           |        |
| Vert.    | 2412.000           | PK       | 96.2              | 26.7               | 14.6         | 40.9         | 96.6               | -                 | -              |        |
| Vert.    | 2400.000           | PK       | 59.5              | 26.7               | 14.6         | 40.9         | 59.9               | 76.6              | 16.7           |        |

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

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**Shonan EMC Lab.**

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## Radiated Emission

Test place                    No.1 Semi Anechoic Chamber  
 Date                            August 8, 2014                    August 11, 2014  
 Temperature / Humidity    24 deg.C, 67 %RH                26 deg.C, 61 %RH  
 Engineer                    Shinichi Takano                    Shinichi Takano  
 Mode                          Tx,                    2437 MHz  
                                      Tx, IEEE802.11g, PN9, worst data mode 6Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 4874.000           | PK       | 47.3              | 31.1               | 7.5          | 41.6         | 44.3               | 73.9              | 29.6           | 100            | 0              |        |
| Hori.    | 7311.000           | PK       | 46.4              | 36.0               | 8.6          | 41.5         | 49.5               | 73.9              | 24.4           | 100            | 0              |        |
| Hori.    | 9748.000           | PK       | 46.0              | 38.2               | 9.6          | 40.4         | 53.4               | 73.9              | 20.5           | 100            | 0              |        |
| Hori.    | 12185.000          | PK       | 44.6              | 39.2               | 10.8         | 39.7         | 54.9               | 73.9              | 19.0           | 100            | 0              |        |
| Hori.    | 4874.000           | AV       | 37.4              | 31.1               | 7.5          | 41.6         | 34.4               | 53.9              | 19.5           | 100            | 0              |        |
| Hori.    | 7311.000           | AV       | 37.3              | 36.0               | 8.6          | 41.5         | 40.4               | 53.9              | 13.5           | 100            | 0              |        |
| Hori.    | 9748.000           | AV       | 35.4              | 38.2               | 9.6          | 40.4         | 42.8               | 53.9              | 11.1           | 100            | 0              |        |
| Hori.    | 12185.000          | AV       | 35.4              | 39.2               | 10.8         | 39.7         | 45.7               | 53.9              | <b>8.2</b>     | 100            | 0              |        |
| Vert.    | 4874.000           | PK       | 46.8              | 31.1               | 7.5          | 41.6         | 43.8               | 73.9              | 30.1           | 100            | 0              |        |
| Vert.    | 7311.000           | PK       | 46.9              | 36.0               | 8.6          | 41.5         | 50.0               | 73.9              | 23.9           | 100            | 0              |        |
| Vert.    | 9748.000           | PK       | 44.8              | 38.2               | 9.6          | 40.4         | 52.2               | 73.9              | 21.7           | 100            | 0              |        |
| Vert.    | 12185.000          | PK       | 44.8              | 39.2               | 10.8         | 39.7         | 55.1               | 73.9              | 18.8           | 100            | 0              |        |
| Vert.    | 4874.000           | AV       | 37.3              | 31.1               | 7.5          | 41.6         | 34.3               | 53.9              | 19.6           | 100            | 0              |        |
| Vert.    | 7311.000           | AV       | 37.3              | 36.0               | 8.6          | 41.5         | 40.4               | 53.9              | 13.5           | 100            | 0              |        |
| Vert.    | 9748.000           | AV       | 35.2              | 38.2               | 9.6          | 40.4         | 42.6               | 53.9              | 11.3           | 100            | 0              |        |
| Vert.    | 12185.000          | AV       | 35.4              | 39.2               | 10.8         | 39.7         | 45.7               | 53.9              | <b>8.2</b>     | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

## Radiated Emission

Test place                    No.1 Semi Anechoic Chamber  
 Date                         August 8, 2014                    August 11, 2014  
 Temperature / Humidity   24 deg.C, 67 %RH            26 deg.C, 61 %RH  
 Engineer                    Shinichi Takano                   Shinichi Takano  
 Mode                        Tx,                    2462 MHz  
                                  Tx, IEEE802.11g, PN9, worst data mode 6Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2483.500           | PK       | 58.3              | 26.8               | 14.7         | 40.9         | 58.9               | 73.9              | 15.0           | 100            | 159            |        |
| Hori.    | 4924.000           | PK       | 46.6              | 31.3               | 7.5          | 41.5         | 43.9               | 73.9              | 30.0           | 100            | 0              |        |
| Hori.    | 7386.000           | PK       | 47.0              | 36.1               | 8.8          | 41.4         | 50.5               | 73.9              | 23.4           | 100            | 0              |        |
| Hori.    | 9848.000           | PK       | 44.7              | 38.3               | 9.6          | 40.4         | 52.2               | 73.9              | 21.7           | 100            | 0              |        |
| Hori.    | 12310.000          | PK       | 44.4              | 39.3               | 10.8         | 39.7         | 54.8               | 73.9              | 19.1           | 100            | 0              |        |
| Hori.    | 2483.500           | AV       | 44.0              | 26.8               | 14.7         | 40.9         | 44.6               | 53.9              | 9.3            | 100            | 159            |        |
| Hori.    | 4924.000           | AV       | 37.7              | 31.3               | 7.5          | 41.5         | 35.0               | 53.9              | 18.9           | 100            | 0              |        |
| Hori.    | 7386.000           | AV       | 37.2              | 36.1               | 8.8          | 41.4         | 40.7               | 53.9              | 13.2           | 100            | 0              |        |
| Hori.    | 9848.000           | AV       | 35.5              | 38.3               | 9.6          | 40.4         | 43.0               | 53.9              | 10.9           | 100            | 0              |        |
| Hori.    | 12310.000          | AV       | 35.2              | 39.3               | 10.8         | 39.7         | 45.6               | 53.9              | 8.3            | 100            | 0              |        |
| Vert.    | 2483.500           | PK       | 57.9              | 26.8               | 14.7         | 40.9         | 58.5               | 73.9              | 15.4           | 100            | 310            |        |
| Vert.    | 4924.000           | PK       | 47.1              | 31.3               | 7.5          | 41.5         | 44.4               | 73.9              | 29.5           | 100            | 0              |        |
| Vert.    | 7386.000           | PK       | 45.9              | 36.1               | 8.8          | 41.4         | 49.4               | 73.9              | 24.5           | 100            | 0              |        |
| Vert.    | 9848.000           | PK       | 45.1              | 38.3               | 9.6          | 40.4         | 52.6               | 73.9              | 21.3           | 100            | 0              |        |
| Vert.    | 12310.000          | PK       | 44.2              | 39.3               | 10.8         | 39.7         | 54.6               | 73.9              | 19.3           | 100            | 0              |        |
| Vert.    | 2483.500           | AV       | 45.2              | 26.8               | 14.7         | 40.9         | 45.8               | 53.9              | 8.1            | 100            | 310            |        |
| Vert.    | 4924.000           | AV       | 37.8              | 31.3               | 7.5          | 41.5         | 35.1               | 53.9              | 18.8           | 100            | 0              |        |
| Vert.    | 7386.000           | AV       | 37.1              | 36.1               | 8.8          | 41.4         | 40.6               | 53.9              | 13.3           | 100            | 0              |        |
| Vert.    | 9848.000           | AV       | 35.3              | 38.3               | 9.6          | 40.4         | 42.8               | 53.9              | 11.1           | 100            | 0              |        |
| Vert.    | 12310.000          | AV       | 35.6              | 39.3               | 10.8         | 39.7         | 46.0               | 53.9              | <b>7.9</b>     | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

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## Radiated Emission

Test place                    No.1 Semi Anechoic Chamber  
 Date                         August 8, 2014                    August 12, 2014  
 Temperature / Humidity   24 deg.C, 67 %RH            25 deg.C, 65 %RH  
 Engineer                    Shinichi Takano                 Shinichi Takano  
 Mode                        Tx,                    2412 MHz  
                                  Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2390.000           | PK       | 67.3              | 26.7               | 14.6         | 40.9         | 67.7               | 73.9              | 6.2            | 100            | 336            |        |
| Hori.    | 4824.000           | PK       | 47.6              | 31.0               | 7.5          | 41.7         | 44.4               | 73.9              | 29.5           | 100            | 0              |        |
| Hori.    | 7236.000           | PK       | 46.7              | 35.9               | 8.6          | 41.5         | 49.7               | 73.9              | 24.2           | 100            | 0              |        |
| Hori.    | 9648.000           | PK       | 45.2              | 38.1               | 9.6          | 40.4         | 52.5               | 73.9              | 21.4           | 100            | 0              |        |
| Hori.    | 12060.000          | PK       | 44.8              | 39.1               | 10.7         | 39.7         | 54.9               | 73.9              | 19.0           | 100            | 0              |        |
| Hori.    | 2390.000           | AV       | 47.7              | 26.7               | 14.6         | 40.9         | 48.1               | 53.9              | 5.8            | 100            | 336            |        |
| Hori.    | 4824.000           | AV       | 37.8              | 31.0               | 7.5          | 41.7         | 34.6               | 53.9              | 19.3           | 100            | 0              |        |
| Hori.    | 7236.000           | AV       | 37.4              | 35.9               | 8.6          | 41.5         | 40.4               | 53.9              | 13.5           | 100            | 0              |        |
| Hori.    | 9648.000           | AV       | 35.3              | 38.1               | 9.6          | 40.4         | 42.6               | 53.9              | 11.3           | 100            | 0              |        |
| Hori.    | 12060.000          | AV       | 35.6              | 39.1               | 10.7         | 39.7         | 45.7               | 53.9              | 8.2            | 100            | 0              |        |
| Vert.    | 2390.000           | PK       | 65.6              | 26.7               | 14.6         | 40.9         | 66.0               | 73.9              | 7.9            | 100            | 311            |        |
| Vert.    | 4824.000           | PK       | 46.8              | 31.0               | 7.5          | 41.7         | 43.6               | 73.9              | 30.3           | 100            | 0              |        |
| Vert.    | 7236.000           | PK       | 46.3              | 35.9               | 8.6          | 41.5         | 49.3               | 73.9              | 24.6           | 100            | 0              |        |
| Vert.    | 9648.000           | PK       | 44.5              | 38.1               | 9.6          | 40.4         | 51.8               | 73.9              | 22.1           | 100            | 0              |        |
| Vert.    | 12060.000          | PK       | 44.6              | 39.1               | 10.7         | 39.7         | 54.7               | 73.9              | 19.2           | 100            | 0              |        |
| Vert.    | 2390.000           | AV       | 47.0              | 26.7               | 14.6         | 40.9         | 47.4               | 53.9              | 6.5            | 100            | 311            |        |
| Vert.    | 4824.000           | AV       | 37.9              | 31.0               | 7.5          | 41.7         | 34.7               | 53.9              | 19.2           | 100            | 0              |        |
| Vert.    | 7236.000           | AV       | 37.0              | 35.9               | 8.6          | 41.5         | 40.0               | 53.9              | 13.9           | 100            | 0              |        |
| Vert.    | 9648.000           | AV       | 35.4              | 38.1               | 9.6          | 40.4         | 42.7               | 53.9              | 11.2           | 100            | 0              |        |
| Vert.    | 12060.000          | AV       | 35.5              | 39.1               | 10.7         | 39.7         | 45.6               | 53.9              | 8.3            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|--------|
| Hori.    | 2412.000           | PK       | 96.2              | 26.7               | 14.6         | 40.9         | 96.6               | -                 | -              |        |
| Hori.    | 2400.000           | PK       | 59.9              | 26.7               | 14.6         | 40.9         | 60.3               | 76.6              | 16.3           |        |
| Vert.    | 2412.000           | PK       | 96.7              | 26.7               | 14.6         | 40.9         | 97.1               | -                 | -              |        |
| Vert.    | 2400.000           | PK       | 58.2              | 26.7               | 14.6         | 40.9         | 58.6               | 77.1              | 18.5           |        |

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

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## Radiated Emission

Test place                      No.1 Semi Anechoic Chamber  
 Date                              August 8, 2014                      August 12, 2014  
 Temperature / Humidity      24 deg.C, 67 %RH                25 deg.C, 65 %RH  
 Engineer                        Shinichi Takano                      Shinichi Takano  
 Mode                              Tx,                      2437 MHz  
                                      Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 4874.000           | PK       | 46.5              | 31.1               | 7.5          | 41.6         | 43.5               | 73.9              | 30.4           | 100            | 0              |        |
| Hori.    | 7311.000           | PK       | 46.3              | 36.0               | 8.6          | 41.5         | 49.4               | 73.9              | 24.5           | 100            | 0              |        |
| Hori.    | 9748.000           | PK       | 44.9              | 38.2               | 9.6          | 40.4         | 52.3               | 73.9              | 21.6           | 100            | 0              |        |
| Hori.    | 12185.000          | PK       | 43.7              | 39.2               | 10.8         | 39.7         | 54.0               | 73.9              | 19.9           | 100            | 0              |        |
| Hori.    | 4874.000           | AV       | 37.5              | 31.1               | 7.5          | 41.6         | 34.5               | 53.9              | 19.4           | 100            | 0              |        |
| Hori.    | 7311.000           | AV       | 37.5              | 36.0               | 8.6          | 41.5         | 40.6               | 53.9              | 13.3           | 100            | 0              |        |
| Hori.    | 9748.000           | AV       | 35.2              | 38.2               | 9.6          | 40.4         | 42.6               | 53.9              | 11.3           | 100            | 0              |        |
| Hori.    | 12185.000          | AV       | 35.1              | 39.2               | 10.8         | 39.7         | 45.4               | 53.9              | <b>8.5</b>     | 100            | 0              |        |
| Vert.    | 4874.000           | PK       | 47.0              | 31.1               | 7.5          | 41.6         | 44.0               | 73.9              | 29.9           | 100            | 0              |        |
| Vert.    | 7311.000           | PK       | 47.0              | 36.0               | 8.6          | 41.5         | 50.1               | 73.9              | 23.8           | 100            | 0              |        |
| Vert.    | 9748.000           | PK       | 44.5              | 38.2               | 9.6          | 40.4         | 51.9               | 73.9              | 22.0           | 100            | 0              |        |
| Vert.    | 12185.000          | PK       | 44.0              | 39.2               | 10.8         | 39.7         | 54.3               | 73.9              | 19.6           | 100            | 0              |        |
| Vert.    | 4874.000           | AV       | 37.6              | 31.1               | 7.5          | 41.6         | 34.6               | 53.9              | 19.3           | 100            | 0              |        |
| Vert.    | 7311.000           | AV       | 37.3              | 36.0               | 8.6          | 41.5         | 40.4               | 53.9              | 13.5           | 100            | 0              |        |
| Vert.    | 9748.000           | AV       | 35.6              | 38.2               | 9.6          | 40.4         | 43.0               | 53.9              | 10.9           | 100            | 0              |        |
| Vert.    | 12185.000          | AV       | 35.0              | 39.2               | 10.8         | 39.7         | 45.3               | 53.9              | 8.6            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

## Radiated Emission

Test place                      No.1 Semi Anechoic Chamber  
 Date                              August 8, 2014                      August 12, 2014  
 Temperature / Humidity      24 deg.C, 67 %RH                25 deg.C, 65 %RH  
 Engineer                        Shinichi Takano                      Shinichi Takano  
 Mode                              Tx,                      2462 MHz  
                                          Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

| Polarity | Frequency<br>[MHz] | Detector | Reading<br>[dBuV] | Ant.Fac.<br>[dB/m] | Loss<br>[dB] | Gain<br>[dB] | Result<br>[dBuV/m] | Limit<br>[dBuV/m] | Margin<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|----------|--------------------|----------|-------------------|--------------------|--------------|--------------|--------------------|-------------------|----------------|----------------|----------------|--------|
| Hori.    | 2483.500           | PK       | 60.6              | 26.8               | 14.7         | 40.9         | 61.2               | 73.9              | 12.7           | 100            | 335            |        |
| Hori.    | 4924.000           | PK       | 47.6              | 31.3               | 7.5          | 41.5         | 44.9               | 73.9              | 29.0           | 100            | 0              |        |
| Hori.    | 7386.000           | PK       | 47.0              | 36.1               | 8.8          | 41.4         | 50.5               | 73.9              | 23.4           | 100            | 0              |        |
| Hori.    | 9848.000           | PK       | 44.8              | 38.3               | 9.6          | 40.4         | 52.3               | 73.9              | 21.6           | 100            | 0              |        |
| Hori.    | 12310.000          | PK       | 43.3              | 39.3               | 10.8         | 39.7         | 53.7               | 73.9              | 20.2           | 100            | 0              |        |
| Hori.    | 2483.500           | AV       | 45.9              | 26.8               | 14.7         | 40.9         | 46.5               | 53.9              | 7.4            | 100            | 335            |        |
| Hori.    | 4924.000           | AV       | 37.8              | 31.3               | 7.5          | 41.5         | 35.1               | 53.9              | 18.8           | 100            | 0              |        |
| Hori.    | 7386.000           | AV       | 37.8              | 36.1               | 8.8          | 41.4         | 41.3               | 53.9              | 12.6           | 100            | 0              |        |
| Hori.    | 9848.000           | AV       | 35.1              | 38.3               | 9.6          | 40.4         | 42.6               | 53.9              | 11.3           | 100            | 0              |        |
| Hori.    | 12310.000          | AV       | 34.3              | 39.3               | 10.8         | 39.7         | 44.7               | 53.9              | 9.2            | 100            | 0              |        |
| Vert.    | 2483.500           | PK       | 64.1              | 26.8               | 14.7         | 40.9         | 64.7               | 73.9              | 9.2            | 100            | 315            |        |
| Vert.    | 4924.000           | PK       | 47.1              | 31.3               | 7.5          | 41.5         | 44.4               | 73.9              | 29.5           | 100            | 0              |        |
| Vert.    | 7386.000           | PK       | 47.5              | 36.1               | 8.8          | 41.4         | 51.0               | 73.9              | 22.9           | 100            | 0              |        |
| Vert.    | 9848.000           | PK       | 44.6              | 38.3               | 9.6          | 40.4         | 52.1               | 73.9              | 21.8           | 100            | 0              |        |
| Vert.    | 12310.000          | PK       | 43.8              | 39.3               | 10.8         | 39.7         | 54.2               | 73.9              | 19.7           | 100            | 0              |        |
| Vert.    | 2483.500           | AV       | 48.2              | 26.8               | 14.7         | 40.9         | 48.8               | 53.9              | 5.1            | 100            | 315            |        |
| Vert.    | 4924.000           | AV       | 38.0              | 31.3               | 7.5          | 41.5         | 35.3               | 53.9              | 18.6           | 100            | 0              |        |
| Vert.    | 7386.000           | AV       | 37.4              | 36.1               | 8.8          | 41.4         | 40.9               | 53.9              | 13.0           | 100            | 0              |        |
| Vert.    | 9848.000           | AV       | 35.5              | 38.3               | 9.6          | 40.4         | 43.0               | 53.9              | 10.9           | 100            | 0              |        |
| Vert.    | 12310.000          | AV       | 34.4              | 39.3               | 10.8         | 39.7         | 44.8               | 53.9              | 9.1            | 100            | 0              |        |

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz :  $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

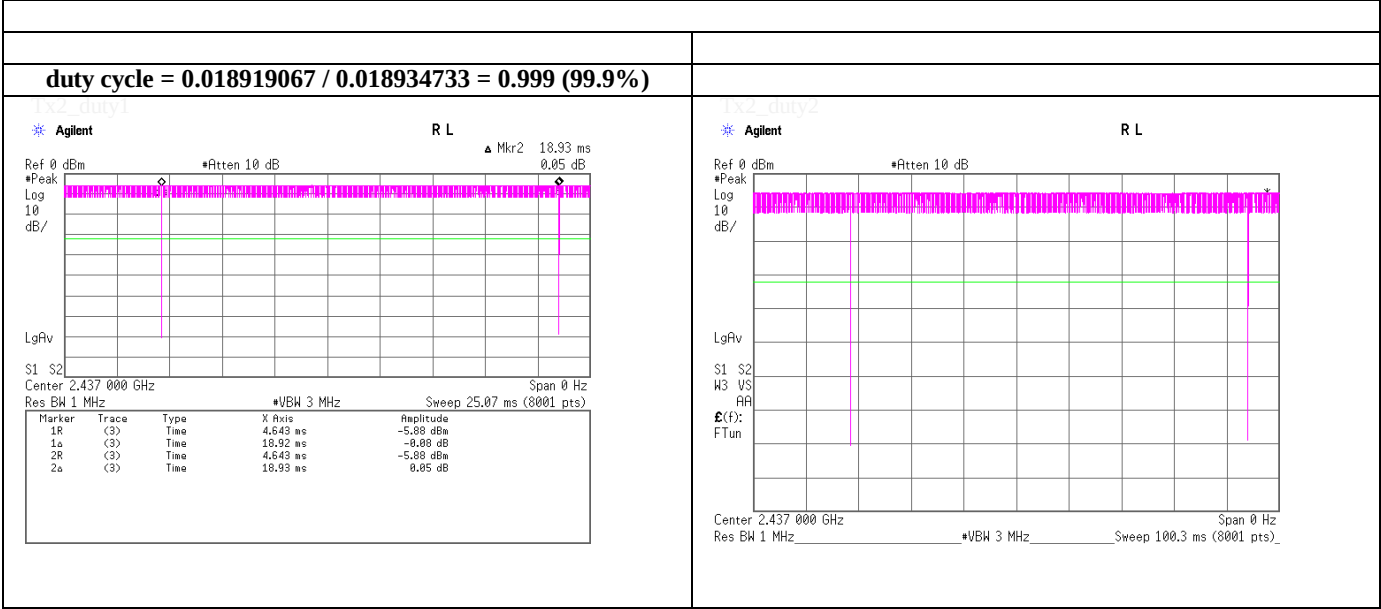
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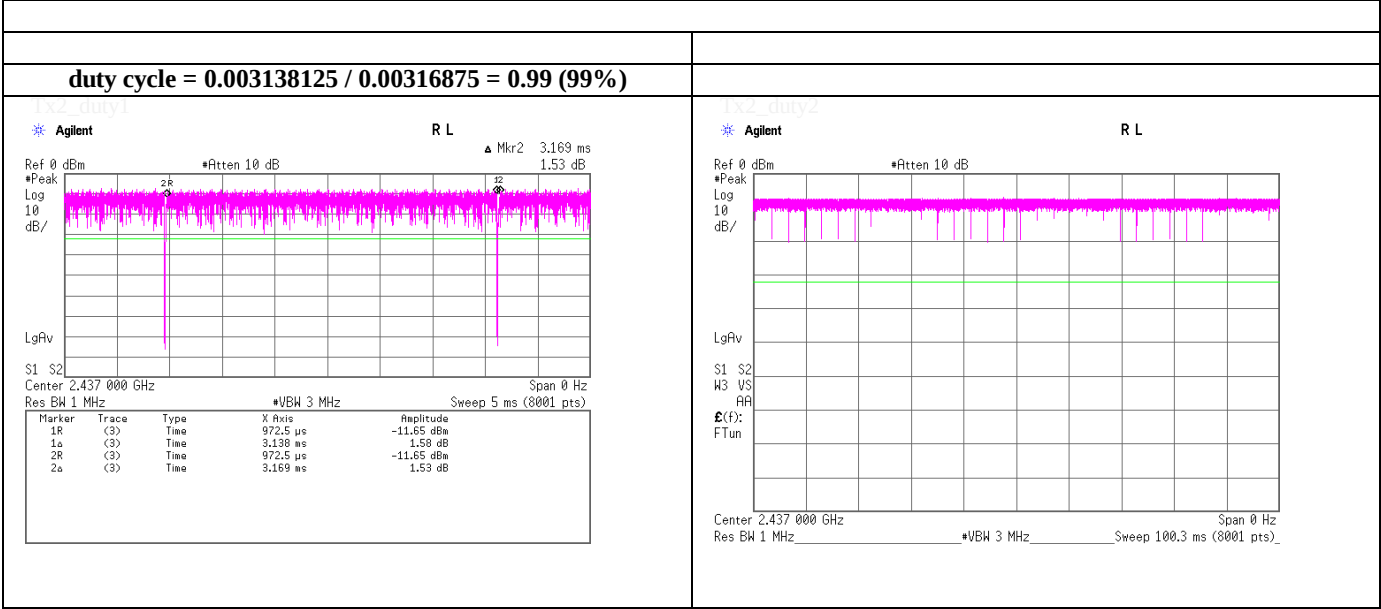
Burst rate confirmation

Tx, IEEE802.11b, PN9, worst data mode 1Mbps



Burst rate confirmation

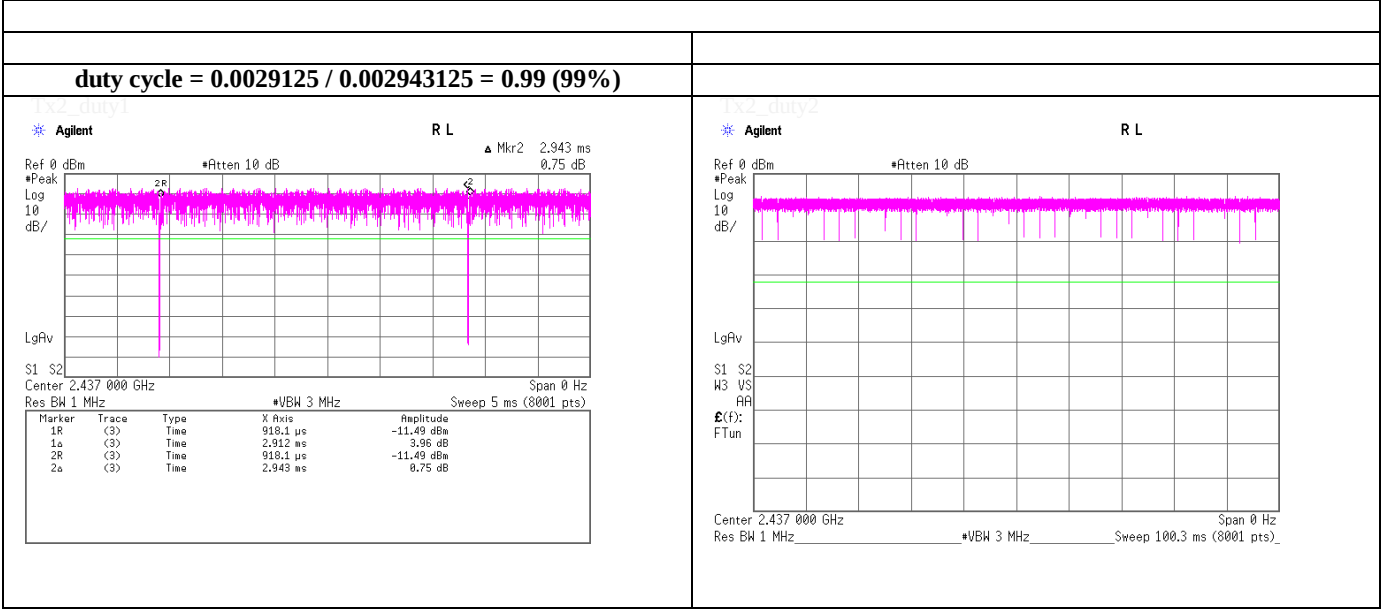
Tx, IEEE802.11g, PN9, worst data mode 6Mbps





Burst rate confirmation

Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)

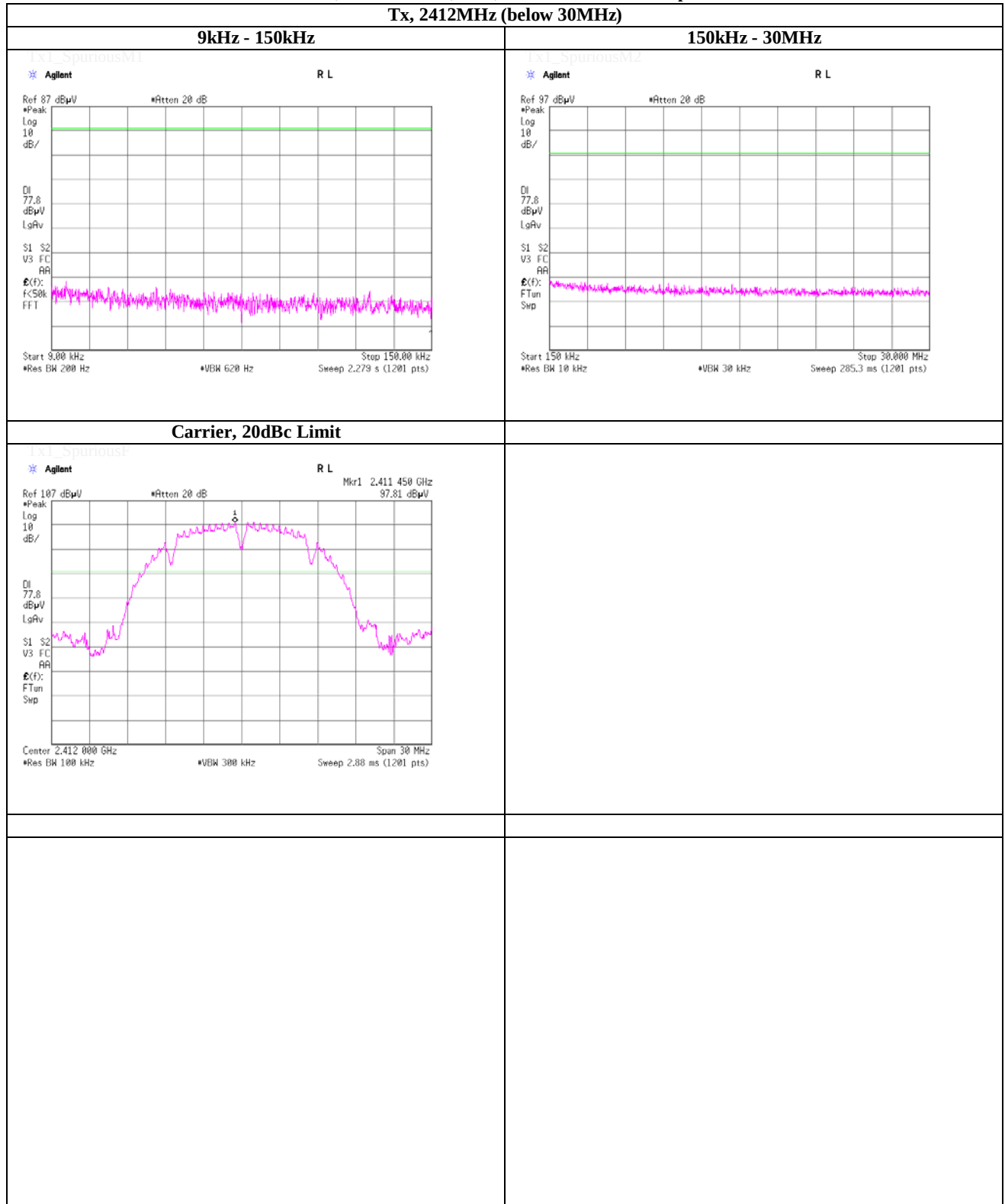


Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
Date July 29, 2014  
Temperature / Humidity 27deg.C , 45%RH  
Engineer Akio Hayashi

### Spurious emission (Conducted)

Tx, IEEE802.11b, PN9, worst data mode 1Mbps

Tx, 2412MHz (below 30MHz)



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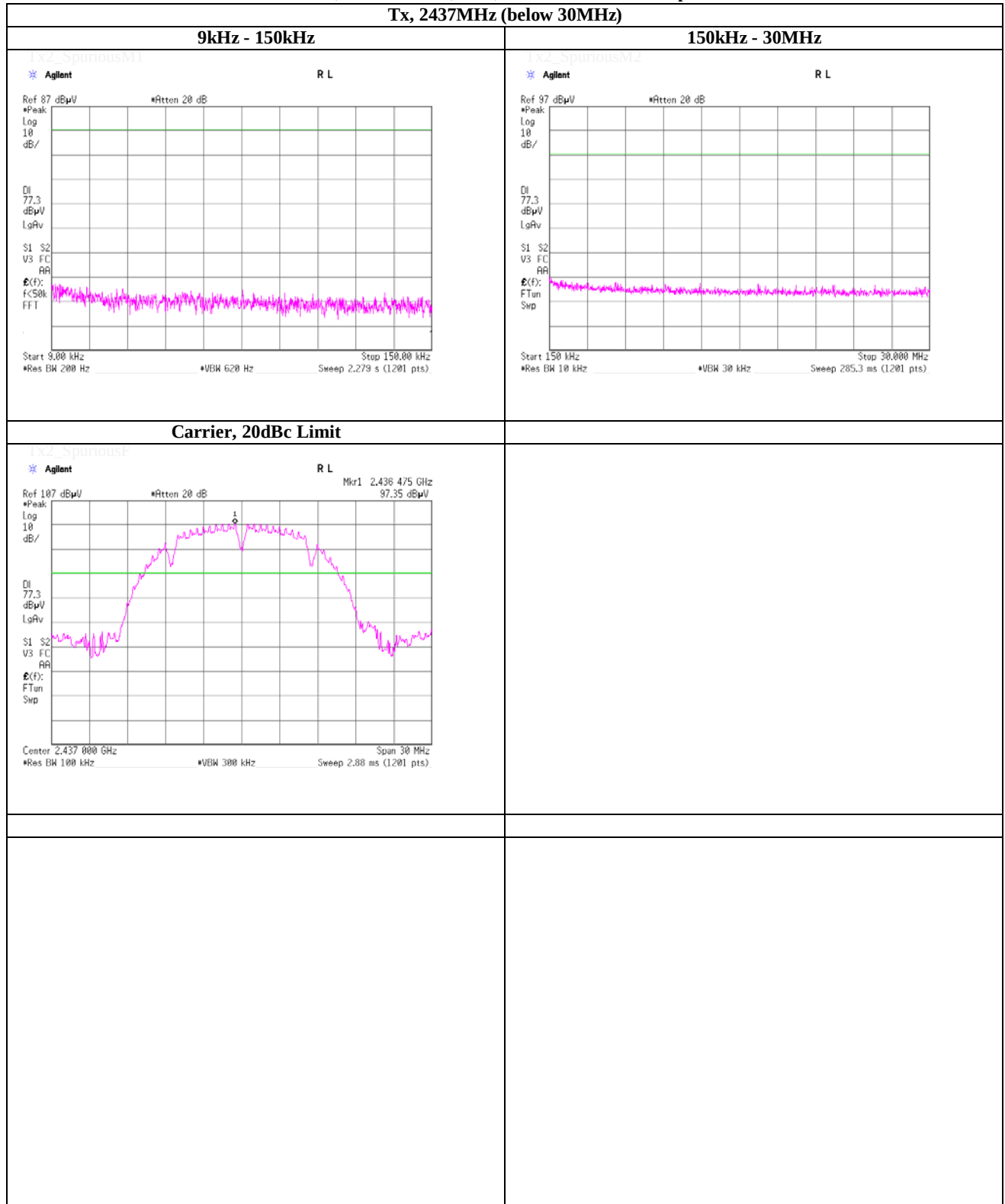
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
 Date July 29, 2014  
 Temperature / Humidity 27deg.C , 45%RH  
 Engineer Akio Hayashi

## Spurious emission (Conducted)

Tx, IEEE802.11b, PN9, worst data mode 1Mbps

Tx, 2437MHz (below 30MHz)



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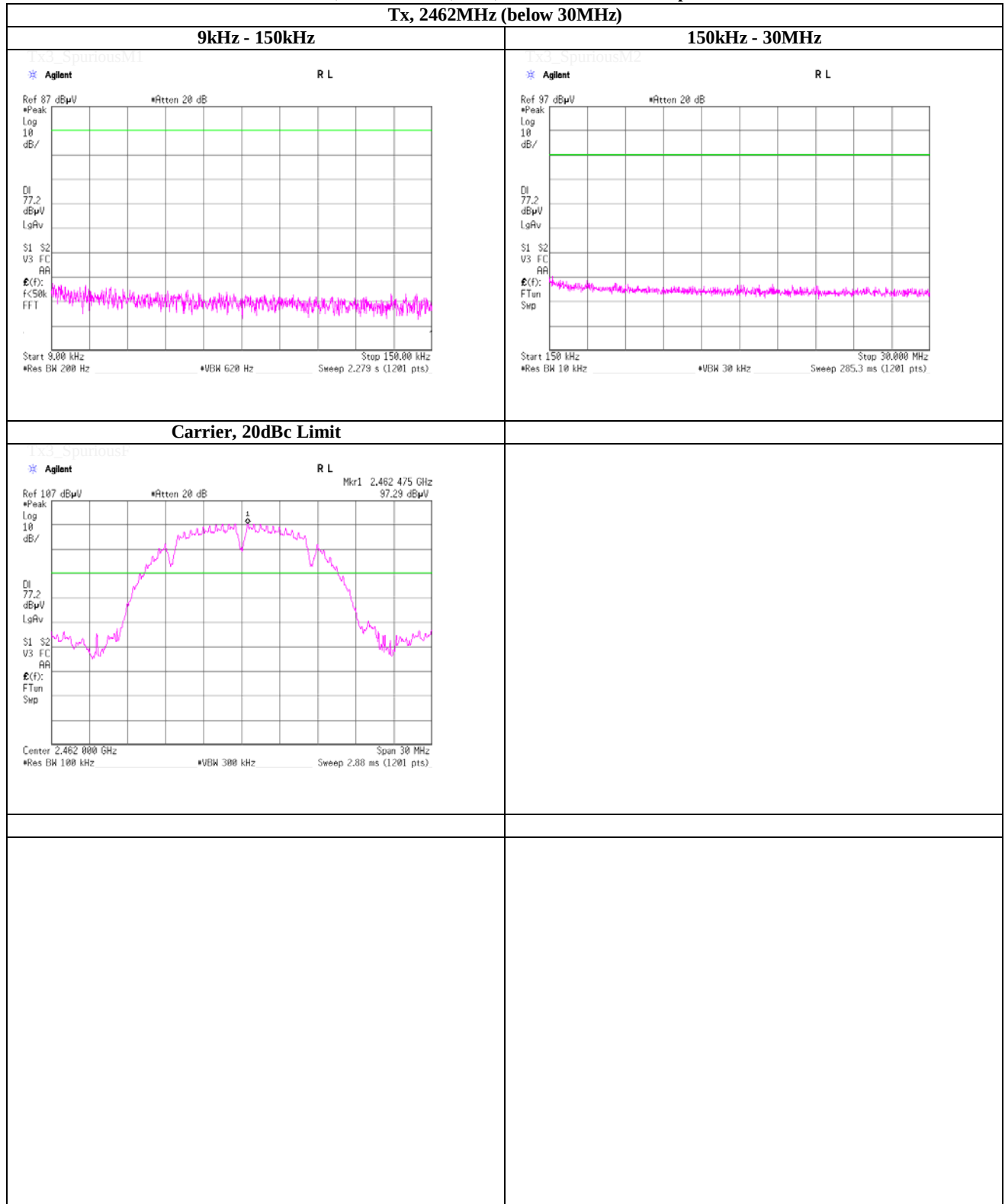
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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
Date July 29, 2014  
Temperature / Humidity 27deg.C , 45%RH  
Engineer Akio Hayashi

**Spurious emission (Conducted)**  
**Tx, IEEE802.11b, PN9, worst data mode 1Mbps**

**Tx, 2462MHz (below 30MHz)**



**UL Japan, Inc.**

**Shonan EMC Lab.**

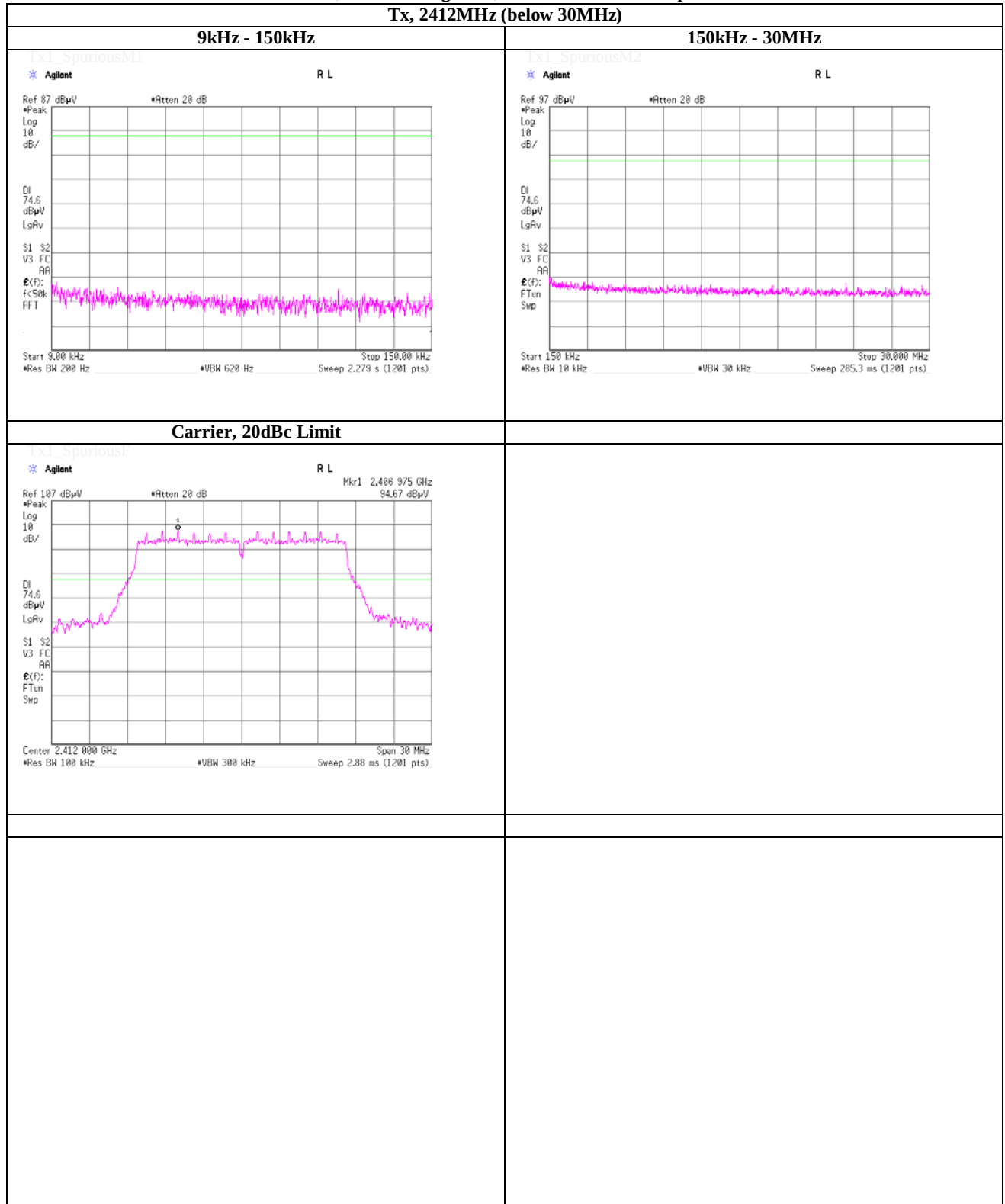
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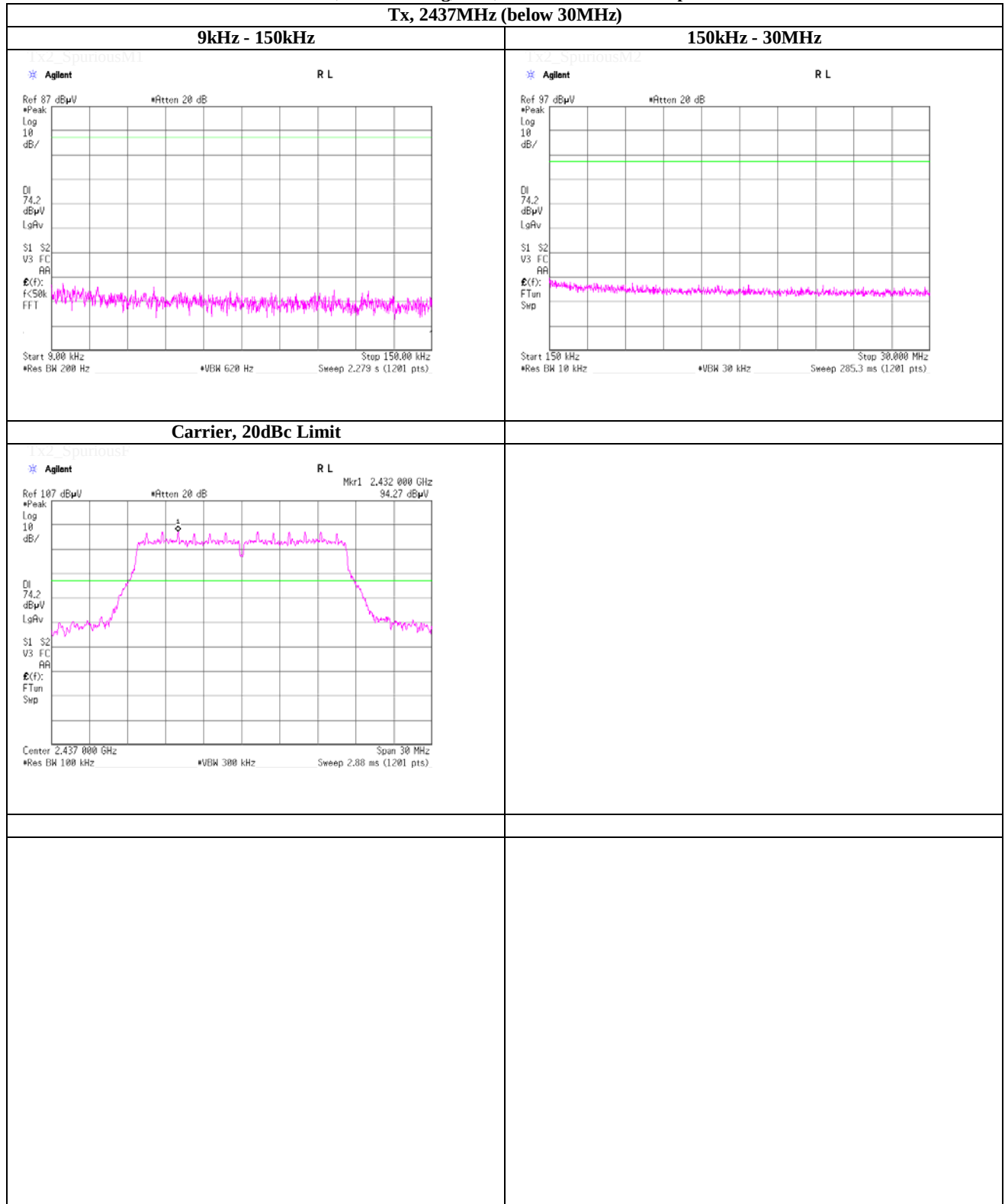
|                        |                                |                       |
|------------------------|--------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.1 Measurement Room |
| Date                   | July 29, 2014                  |                       |
| Temperature / Humidity | 27deg.C , 45%RH                |                       |
| Engineer               | Akio Hayashi                   |                       |

**Spurious emission (Conducted)**  
Tx, IEEE802.11g, PN9, worst data mode 6Mbps



|                        |                                |                       |
|------------------------|--------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab. | No.1 Measurement Room |
| Date                   | July 29, 2014                  |                       |
| Temperature / Humidity | 27deg.C , 45%RH                |                       |
| Engineer               | Akio Hayashi                   |                       |

**Spurious emission (Conducted)**  
Tx, IEEE802.11g, PN9, worst data mode 6Mbps

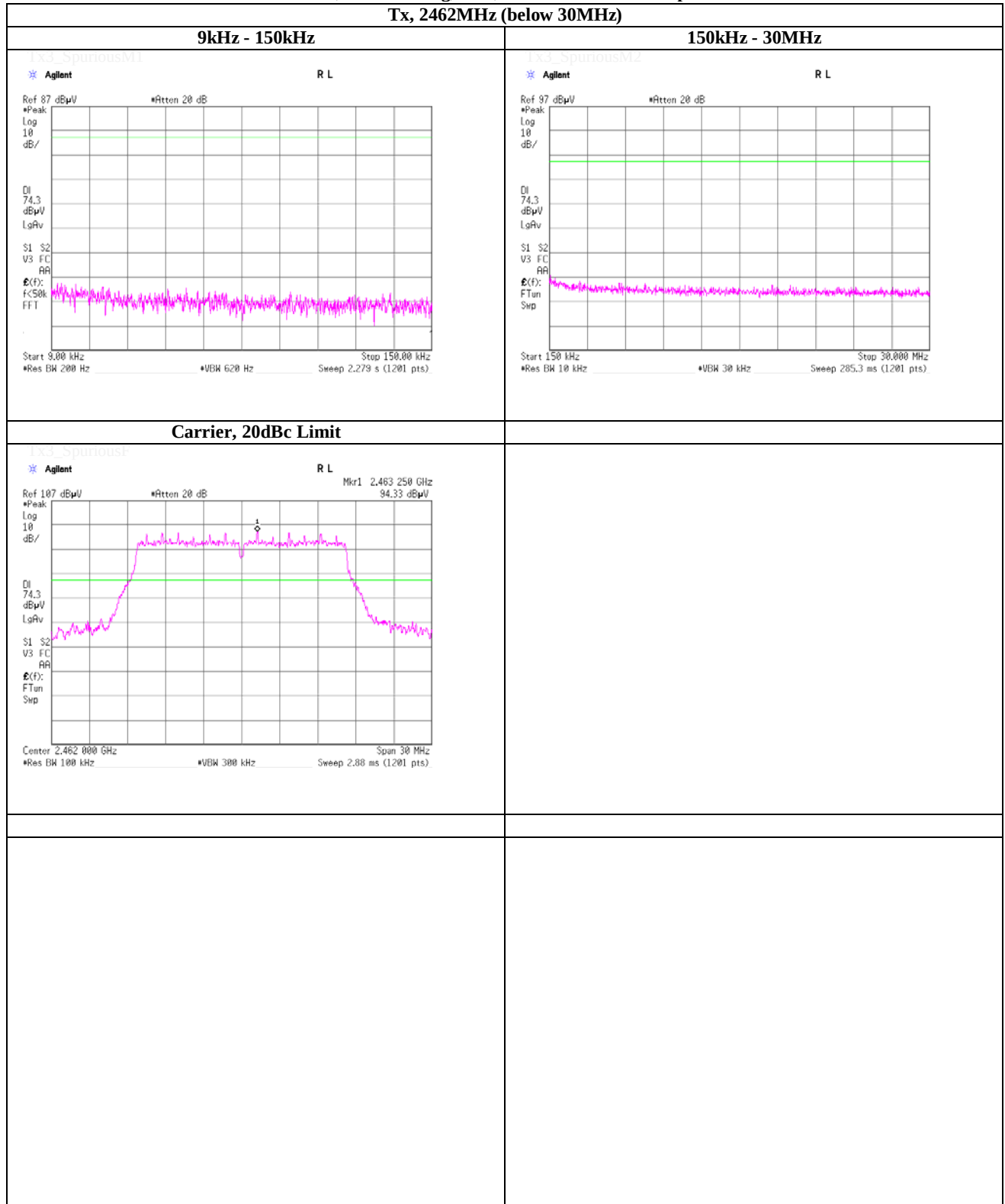


Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
Date July 29, 2014  
Temperature / Humidity 27deg.C , 45%RH  
Engineer Akio Hayashi

### Spurious emission (Conducted)

Tx, IEEE802.11g, PN9, worst data mode 6Mbps

Tx, 2462MHz (below 30MHz)



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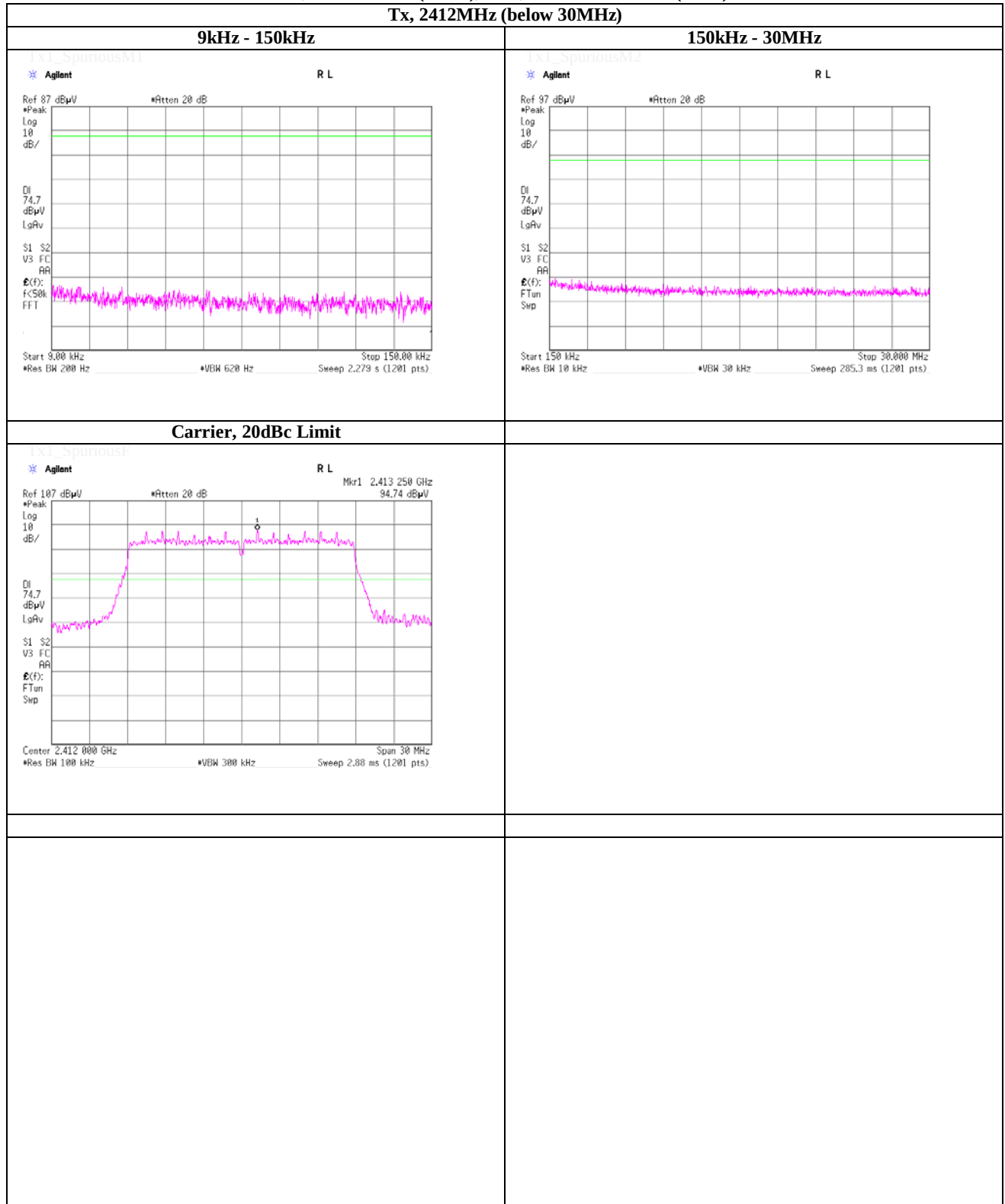
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
 Date July 29, 2014  
 Temperature / Humidity 27deg.C , 45%RH  
 Engineer Akio Hayashi

## Spurious emission (Conducted)

Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)

Tx, 2412MHz (below 30MHz)



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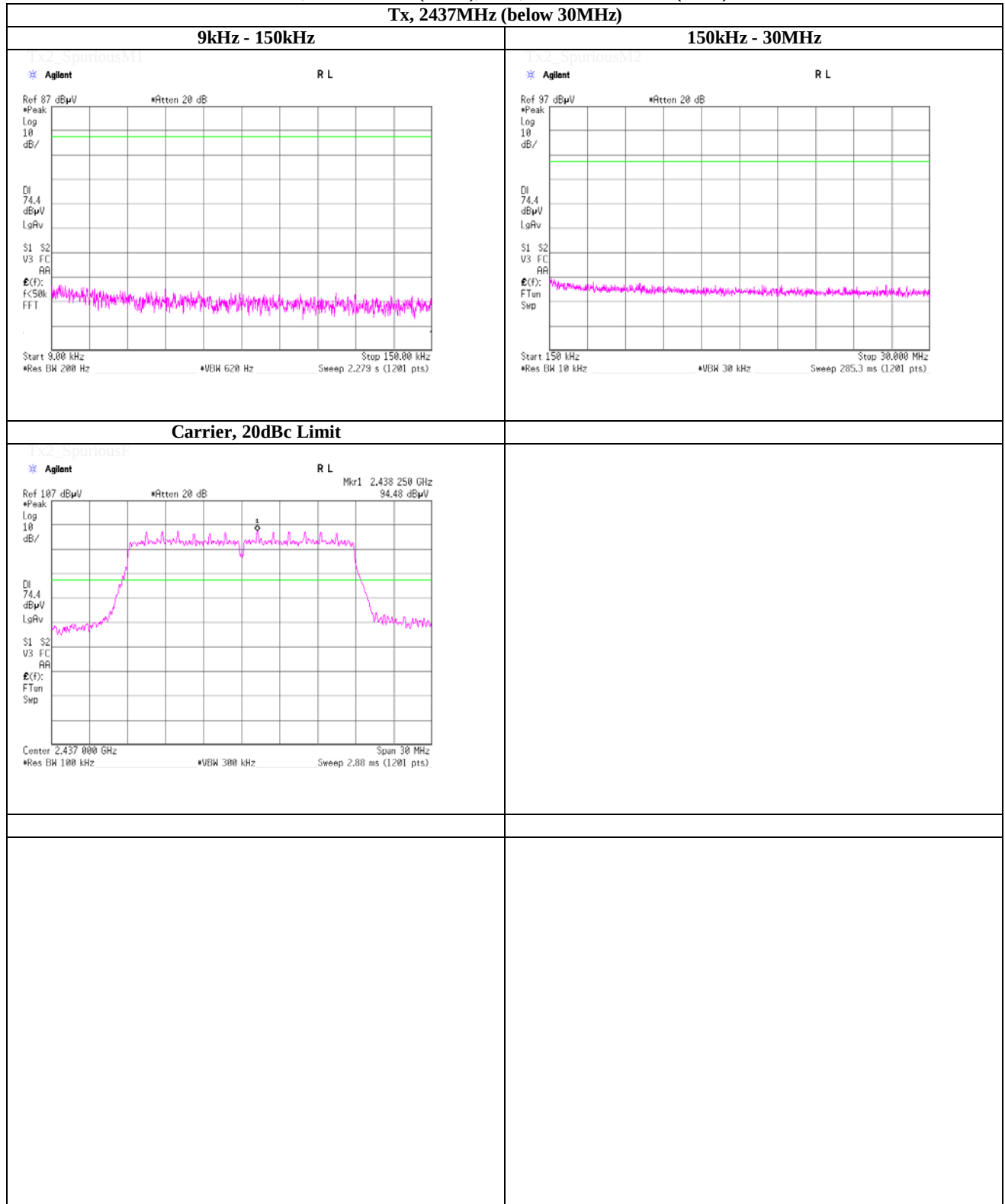


Test place      UL Japan, Inc. Shonan EMC Lab.      No.1 Measurement Room  
 Date            July 29, 2014  
 Temperature / Humidity    27deg.C      , 45%RH  
 Engineer        Akio Hayashi

## Spurious emission (Conducted)

**Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)**

**Tx, 2437MHz (below 30MHz)**



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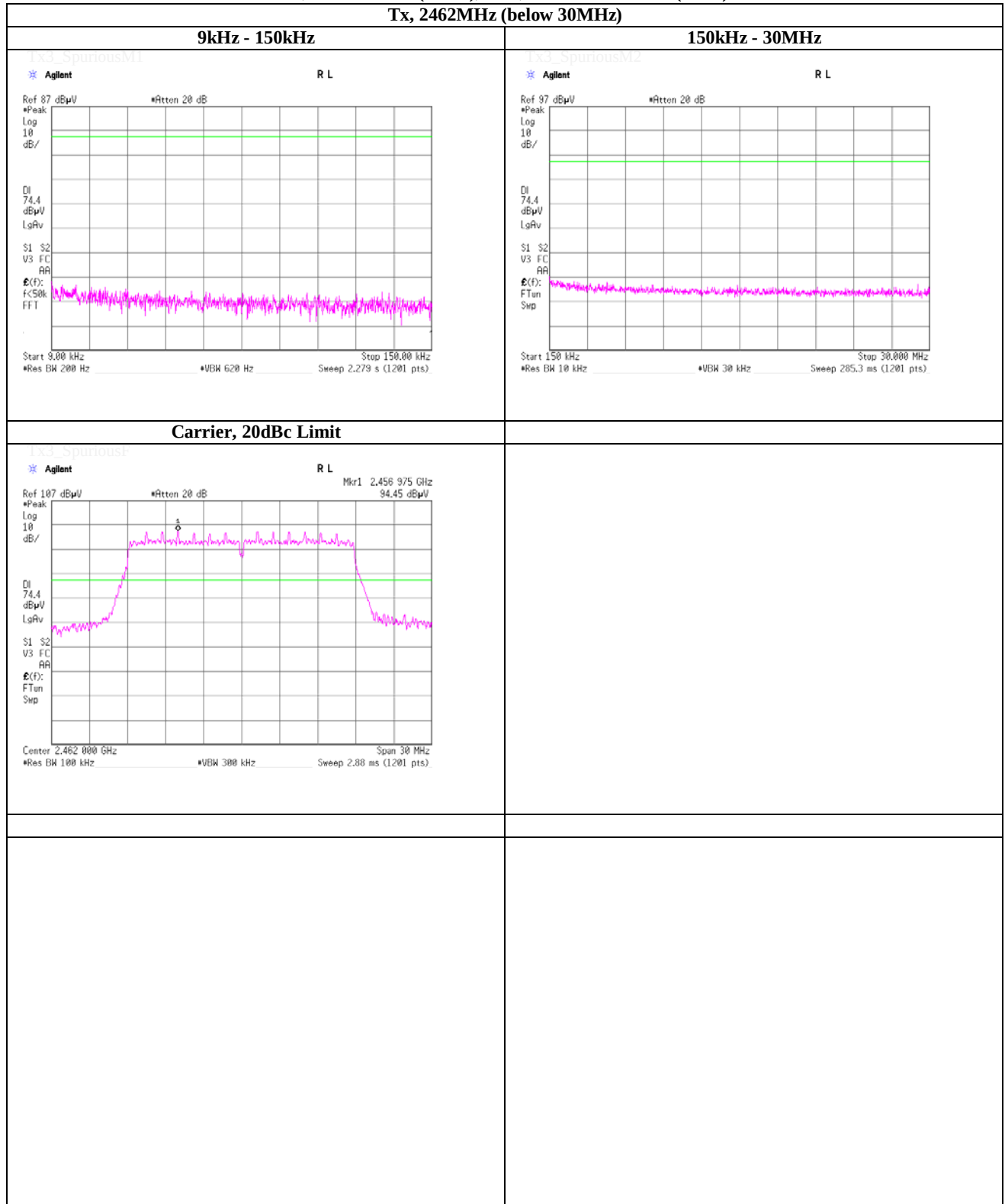
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
 Date July 29, 2014  
 Temperature / Humidity 27deg.C , 45%RH  
 Engineer Akio Hayashi

## Spurious emission (Conducted)

Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)

Tx, 2462MHz (below 30MHz)



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**Maximum Power Spectral Density**

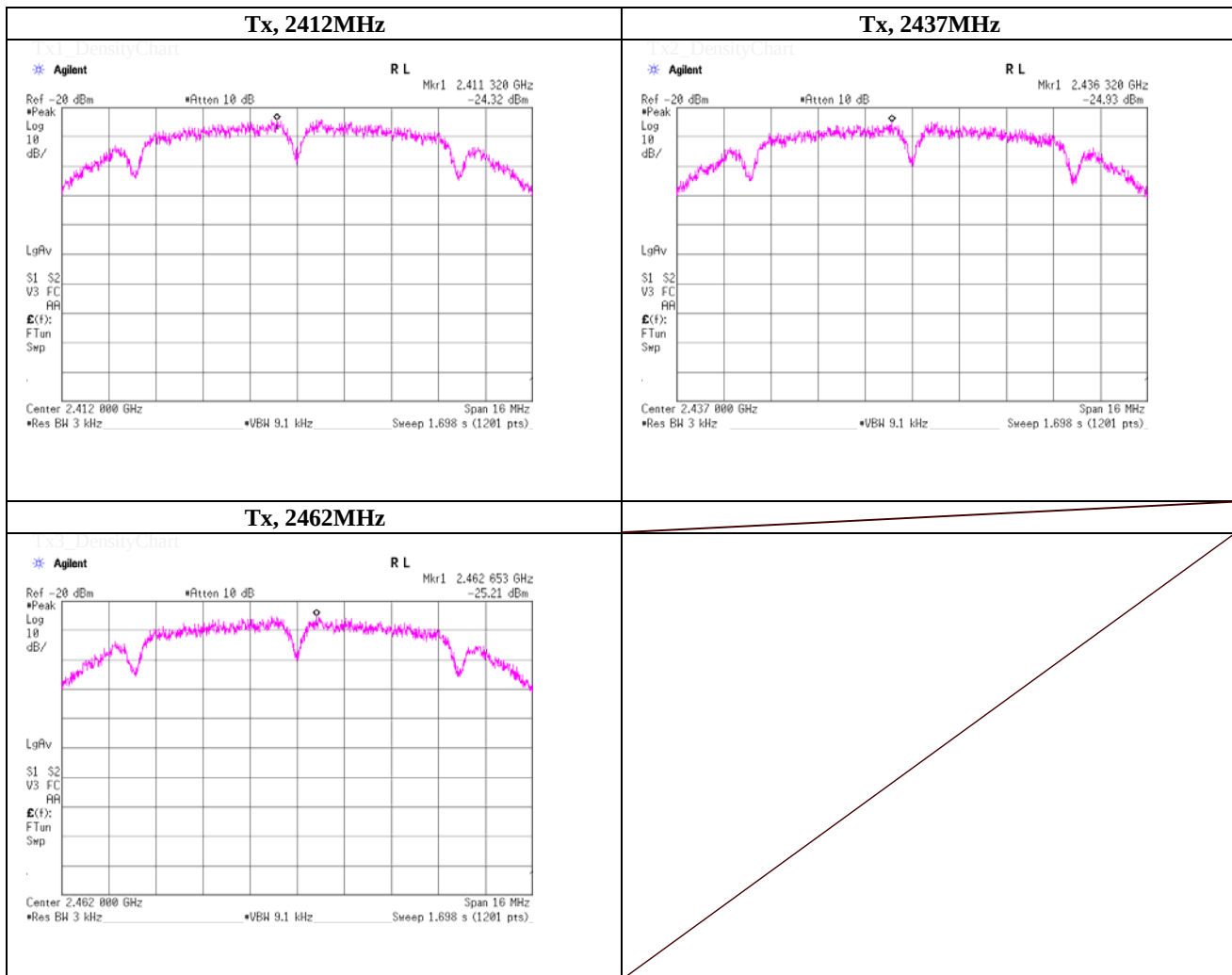
(PKPSD)

|                        |                                             |                       |
|------------------------|---------------------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab.              | No.1 Measurement Room |
| Date                   | July 29, 2014                               |                       |
| Temperature / Humidity | 27deg.C , 45%RH                             |                       |
| Engineer               | Akio Hayashi                                |                       |
| Mode                   | Tx, IEEE802.11b, PN9, worst data mode 1Mbps |                       |

| Ch. Freq.<br>[MHz] | Freq.<br>Reading<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|--------------------|---------------------------|------------------|-----------------------|----------------|-----------------|----------------|----------------|
| 2412.0000          | 2411.32                   | -24.32           | 0.82                  | 9.90           | -13.60          | 8.00           | 21.60          |
| 2437.0000          | 2436.32                   | -24.93           | 0.82                  | 9.90           | -14.21          | 8.00           | 22.21          |
| 2462.0000          | 2462.65                   | -25.21           | 0.83                  | 9.89           | -14.49          | 8.00           | 22.49          |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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**Maximum Power Spectral Density**

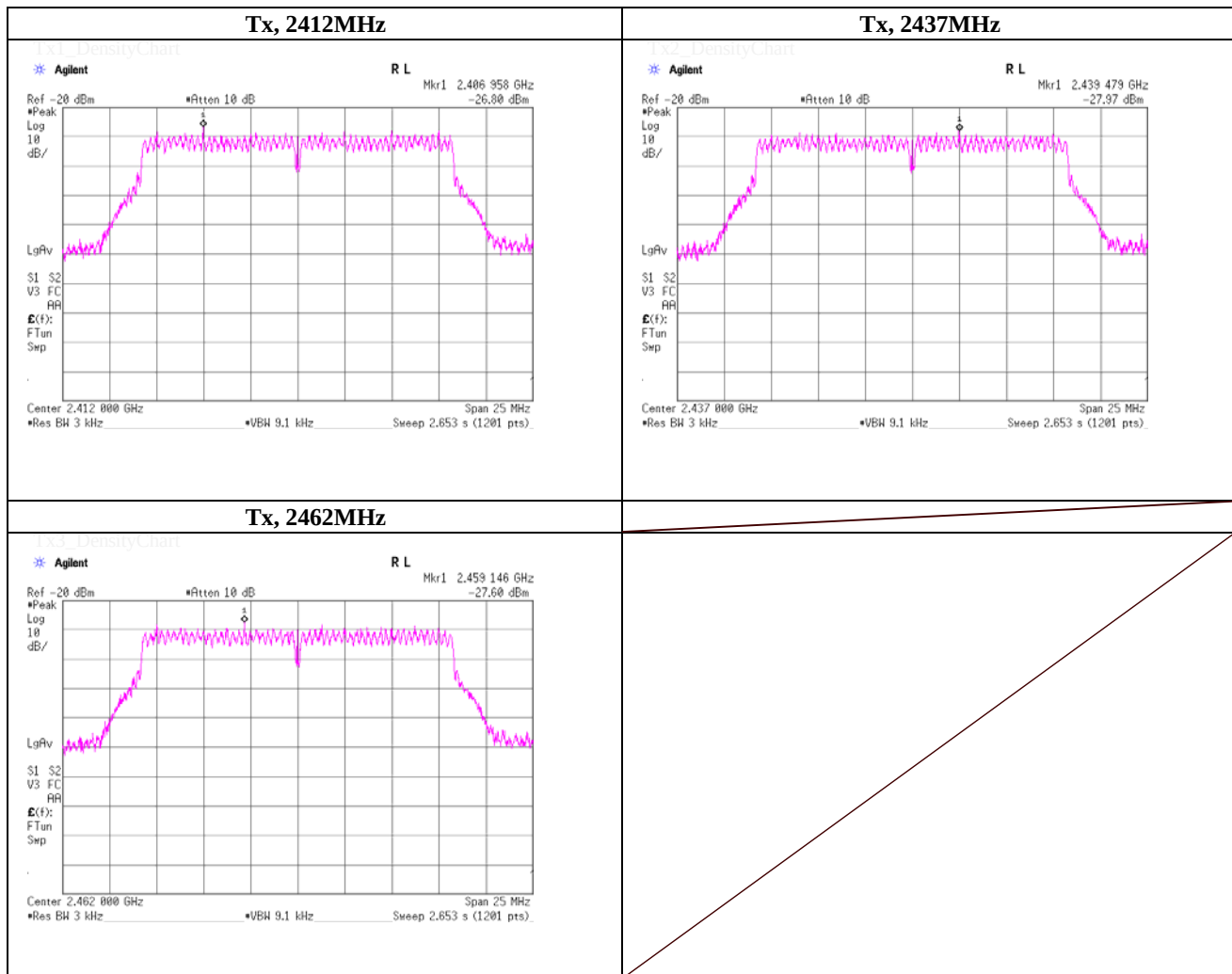
(PKPSD)

|                        |                                             |                       |
|------------------------|---------------------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab.              | No.1 Measurement Room |
| Date                   | July 29, 2014                               |                       |
| Temperature / Humidity | 27deg.C , 45%RH                             |                       |
| Engineer               | Akio Hayashi                                |                       |
| Mode                   | Tx, IEEE802.11g, PN9, worst data mode 6Mbps |                       |

| Ch. Freq.<br>[MHz] | Freq.<br>Reading<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|--------------------|---------------------------|------------------|-----------------------|----------------|-----------------|----------------|----------------|
| 2412.0000          | 2406.96                   | -26.80           | 0.82                  | 9.90           | -16.08          | 8.00           | 24.08          |
| 2437.0000          | 2439.48                   | -27.97           | 0.82                  | 9.90           | -17.25          | 8.00           | 25.25          |
| 2462.0000          | 2459.15                   | -27.60           | 0.83                  | 9.89           | -16.88          | 8.00           | 24.88          |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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**Maximum Power Spectral Density**

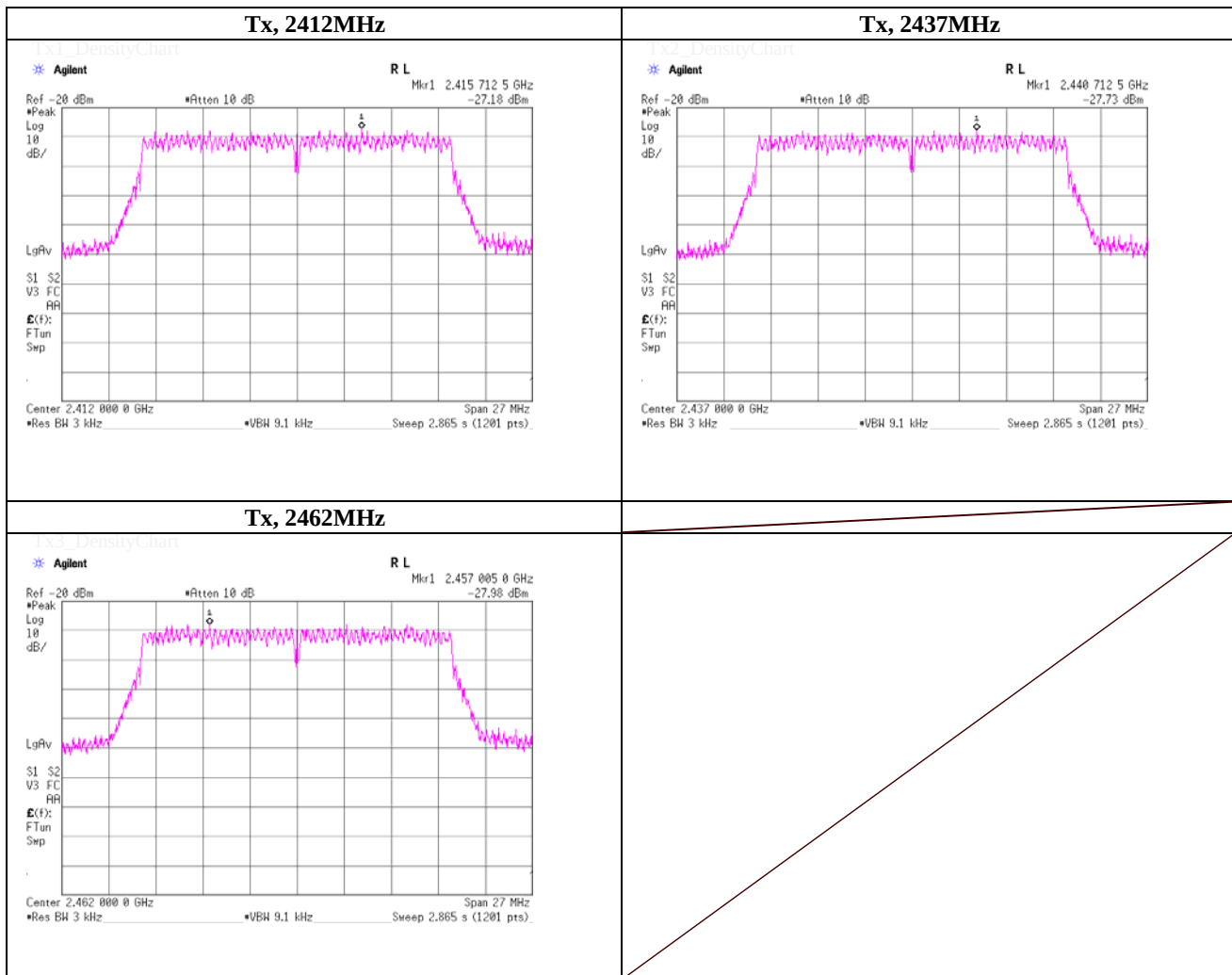
(PKPSD)

|                        |                                                    |                       |
|------------------------|----------------------------------------------------|-----------------------|
| Test place             | UL Japan, Inc. Shonan EMC Lab.                     | No.1 Measurement Room |
| Date                   | July 29, 2014                                      |                       |
| Temperature / Humidity | 27deg.C , 45%RH                                    |                       |
| Engineer               | Akio Hayashi                                       |                       |
| Mode                   | Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS) |                       |

| Ch. Freq.<br>[MHz] | Freq.<br>Reading<br>[MHz] | Reading<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result<br>[dBm] | Limit<br>[dBm] | Margin<br>[dB] |
|--------------------|---------------------------|------------------|-----------------------|----------------|-----------------|----------------|----------------|
| 2412.0000          | 2415.71                   | -27.18           | 0.82                  | 9.90           | -16.46          | 8.00           | 24.46          |
| 2437.0000          | 2440.71                   | -27.73           | 0.82                  | 9.90           | -17.01          | 8.00           | 25.01          |
| 2462.0000          | 2457.01                   | -27.98           | 0.83                  | 9.89           | -17.26          | 8.00           | 25.26          |

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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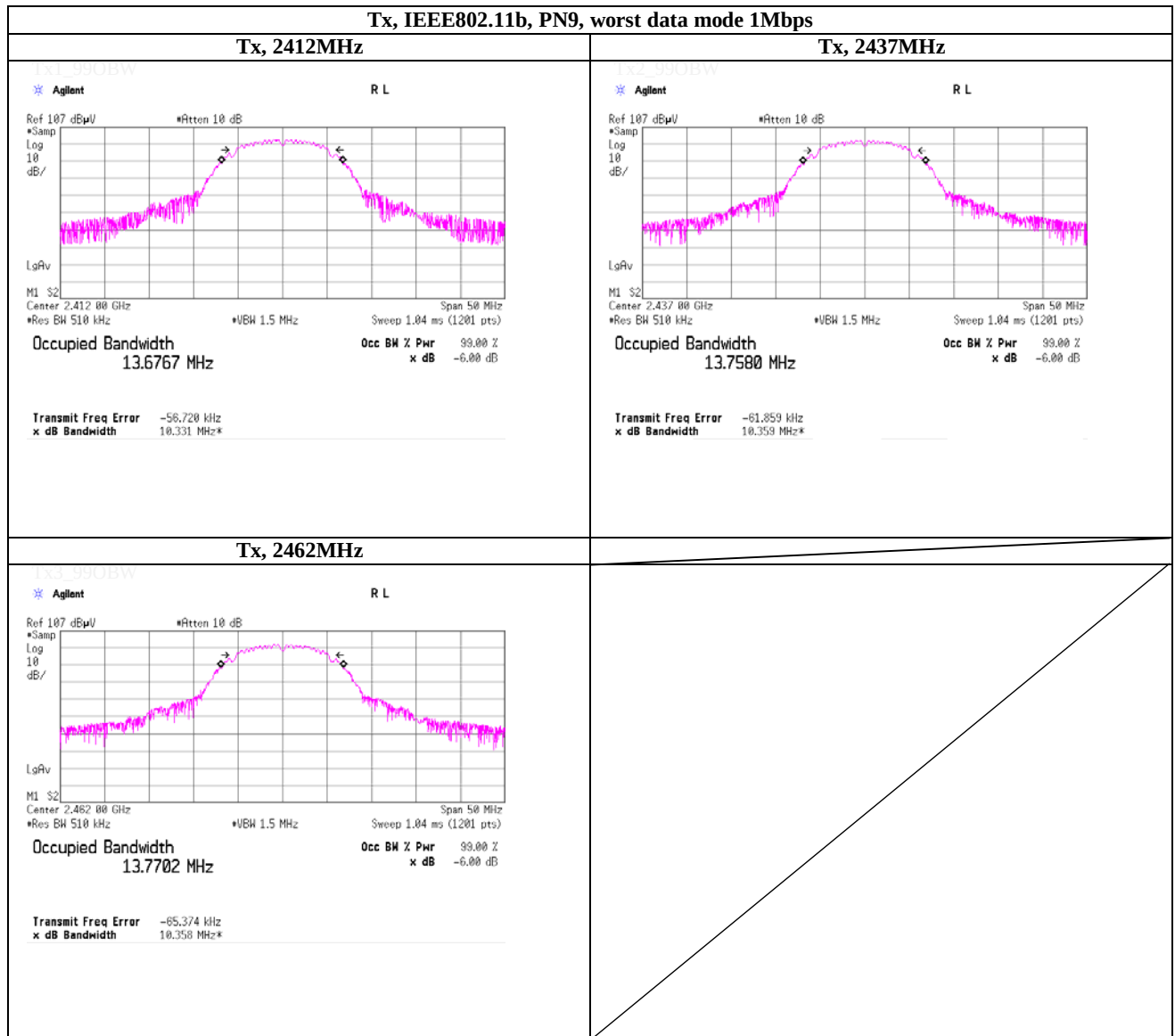
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
 Date July 29, 2014  
 Temperature / Humidity 27deg.C , 45%RH  
 Engineer Akio Hayashi

## 99% Occupied Bandwidth



**UL Japan, Inc.**

**Shonan EMC Lab.**

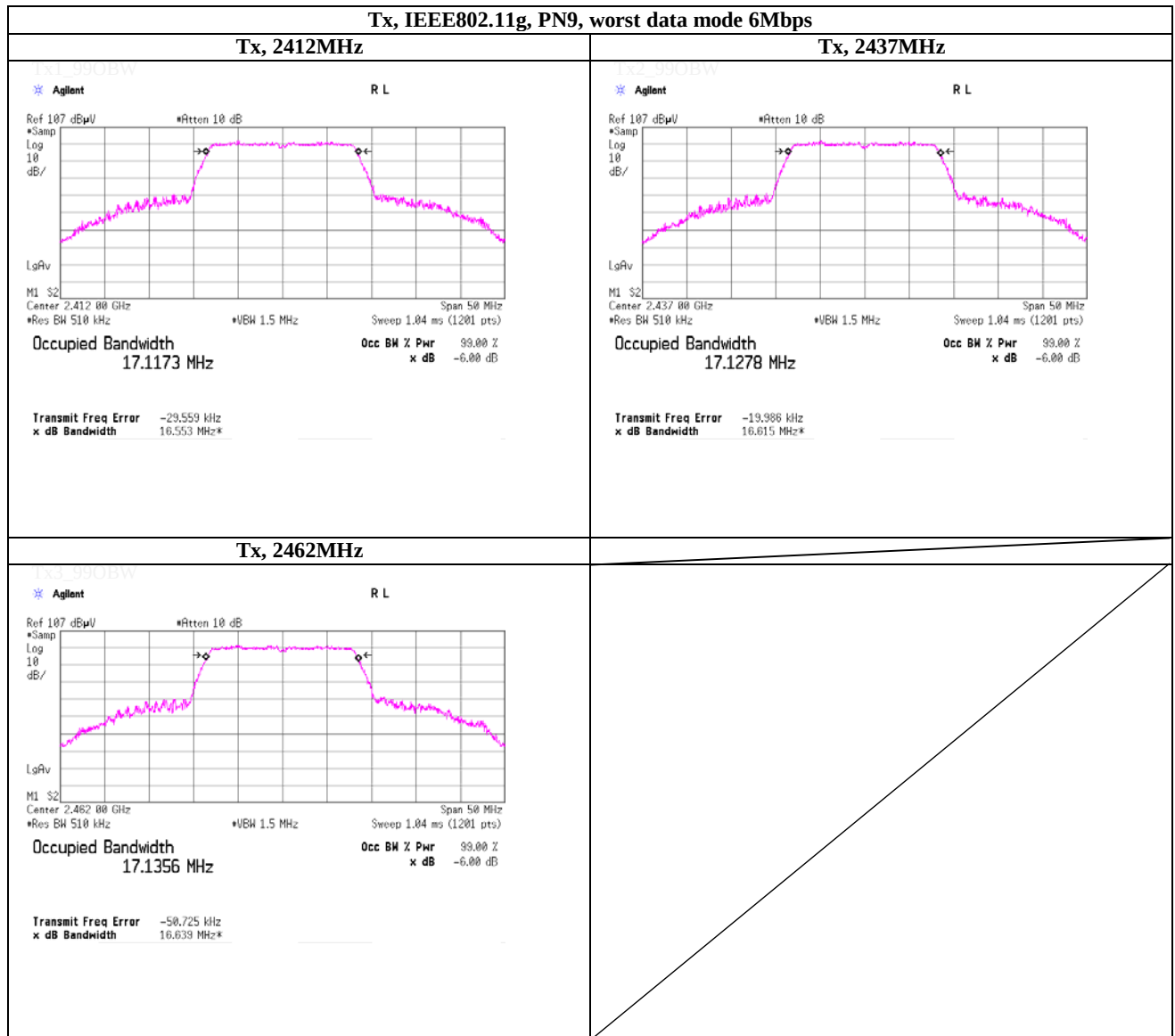
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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
 Date July 29, 2014  
 Temperature / Humidity 27deg.C , 45%RH  
 Engineer Akio Hayashi

## 99% Occupied Bandwidth



**UL Japan, Inc.**

**Shonan EMC Lab.**

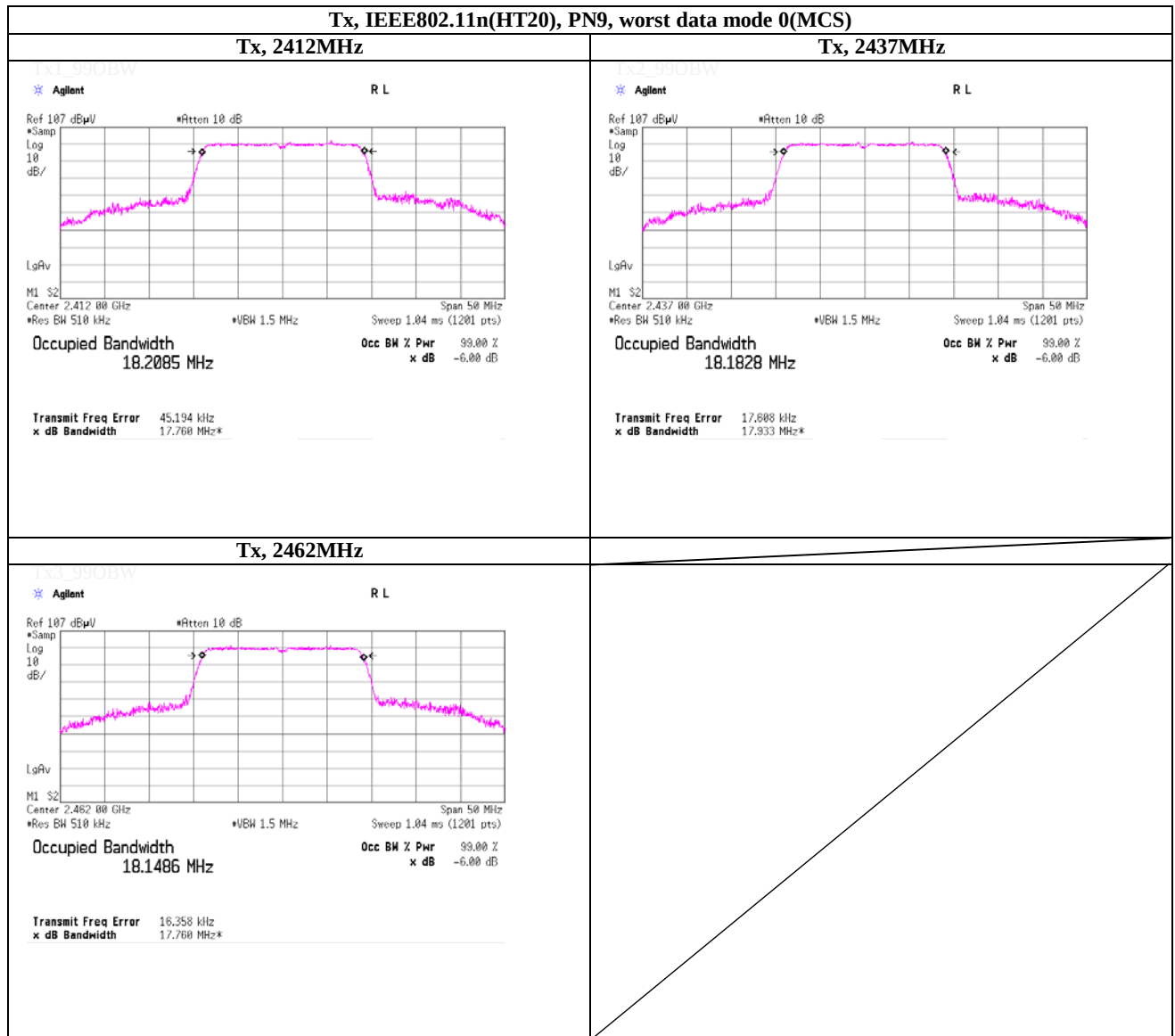
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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room  
 Date July 29, 2014  
 Temperature / Humidity 27deg.C , 45%RH  
 Engineer Akio Hayashi

## 99% Occupied Bandwidth



**UL Japan, Inc.**

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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) |
|--------------------------------|---------------------------|---------------------------------------------|--------------------------------------------|-------------------------|-----------|------------------------------------|
| SSA-02                         | Spectrum Analyzer         | Agilent                                     | E4448A                                     | MY48250106              | AT        | 2014/03/17 * 12                    |
| SAT10-11                       | Attenuator                | Weinschel Corp.                             | 54A-10                                     | 37588                   | AT        | 2014/04/22 * 12                    |
| SCC-G11                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 102                               | 31595/2                 | AT        | 2014/03/13 * 12                    |
| SPM-06                         | Power Meter               | Anritsu                                     | ML2495A                                    | 0850009                 | AT        | 2014/04/08 * 12                    |
| SPSS-03                        | Power sensor              | Anritsu                                     | MA2411B                                    | 0917063                 | AT        | 2014/04/08 * 12                    |
| SOS-13                         | Humidity Indicator        | Custom                                      | CTH-202                                    | Q.C.17                  | AT        | 2014/04/22 * 12                    |
| SAEC-01(NSA)                   | Semi-Anechoic Chamber     | TDK                                         | SAEC-01(NSA)                               | 1                       | RE        | 2014/07/09 * 12                    |
| SAF-04                         | Pre Amplifier             | TOYO Corporation                            | TPA0118-36                                 | 1440489                 | RE        | 2014/03/14 * 12                    |
| SCC-G01                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 104A                              | 46497/4A                | RE        | 2014/04/22 * 12                    |
| SCC-G21                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 104                               | 296169/4                | RE        | 2014/05/15 * 12                    |
| SHA-01                         | Horn Antenna              | Schwarzbeck                                 | BBHA9120D                                  | 9120D-725               | RE        | 2013/08/12 * 12                    |
| SOS-01                         | Humidity Indicator        | A&D                                         | AD-5681                                    | 4062555                 | RE        | 2014/02/21 * 12                    |
| STR-01                         | Test Receiver             | Rohde & Schwarz                             | ESU40                                      | 100093                  | RE,CE     | 2013/11/20 * 12                    |
| SJM-13                         | Measure                   | ASKUL                                       | -                                          | -                       | RE,CE     | -                                  |
| COTS-SEMI-1                    | EMI Software              | TSJ                                         | TEPTO-DV(RE,CE, RFI,MF)                    | -                       | RE,CE     | -                                  |
| SFL-02                         | Highpass Filter           | MICRO-TRONICS                               | HPM50111                                   | 051                     | RE        | 2013/11/22 * 12                    |
| SHA-04                         | Horn Antenna              | ETS LINDGREN                                | 3160-09                                    | LM3640                  | RE        | 2014/03/15 * 12                    |
| SAF-08                         | Pre Amplifier             | TOYO Corporation                            | HAP18-26W                                  | 00000019                | RE        | 2014/03/14 * 12                    |
| SCC-G15                        | Coaxial Cable             | Suhner                                      | SUCOFLEX 102                               | 32703/2                 | RE        | 2014/03/13 * 12                    |
| MHA-05                         | Horn Antenna 1-18GHz      | Schwarzbeck                                 | BBHA9120D                                  | 253                     | RE        | 2014/05/16 * 12                    |
| SAT10-06                       | Attenuator                | Agilent                                     | 8493C-010                                  | 74865                   | RE        | 2013/11/22 * 12                    |
| KSA-08                         | Spectrum Analyzer         | Agilent                                     | E4446A                                     | MY46180525              | RE        | 2014/03/04 * 12                    |
| SAF-01                         | Pre Amplifier             | SONOMA                                      | 310N                                       | 290211                  | RE        | 2014/02/17 * 12                    |
| KAT6-04                        | Attenuator                | INMET                                       | 18N-6dB                                    | -                       | RE        | 2013/12/26 * 12                    |
| KAT3-09                        | Attenuator                | JFW IND. INC.                               | 50HF-003N                                  | -                       | RE        | 2013/08/23 * 12                    |
| SBA-01                         | Biconical Antenna         | Schwarzbeck                                 | BBA9106                                    | 91032664                | RE        | 2013/10/13 * 12                    |
| SCC-A1/A3/A5/A7/A8/A13/SRSE-01 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906 | -/0901-269(RF Selector) | RE        | 2014/04/25 * 12                    |
| SCC-A2/A4/A6/A7/A8/A13/SRSE-01 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906 | -/0901-269(RF Selector) | RE        | 2014/04/25 * 12                    |
| SLA-01                         | Logperiodic Antenna       | Schwarzbeck                                 | UHALP9108A                                 | UHALP 9108-A 0888       | RE        | 2013/10/26 * 12                    |
| SCC-A12/A13/SRSE-01            | Coaxial Cable&RF Selector | Suhner/Suhner/TOYO                          | RG223U/141PE/NS4906                        | -/0901-269(RF Selector) | CE        | 2014/04/25 * 12                    |
| SLS-01                         | LISN                      | Rohde & Schwarz                             | ENV216                                     | 100511                  | CE(EUT)   | 2014/02/14 * 12                    |
| SLS-02                         | LISN                      | Rohde & Schwarz                             | ENV216                                     | 100512                  | CE(AE)    | 2014/03/05 * 12                    |
| SAT3-06                        | Attenuator                | JFW                                         | 50HF-003N                                  | -                       | CE        | 2014/02/17 * 12                    |
| SOS-02                         | Humidity Indicator        | A&D                                         | AD-5681                                    | 4063343                 | CE        | 2014/03/07 * 12                    |
| STM-03                         | Terminator                | TME                                         | CT-01 BP                                   | -                       | CE        | 2013/12/26 * 12                    |
|                                |                           |                                             |                                            |                         |           |                                    |
|                                |                           |                                             |                                            |                         |           |                                    |

The expiration date of the calibration is the end of the expired month .  
 As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item :

CE: Conducted emission ,  
 RE: Radiated emission ,  
 AT: Antenna terminal conducted test