# RADIO TEST REPORT

## Test Report No. : 32DE0300-HO-02-R1

| | | |
|---|---|---|
| **Applicant** | : | **MITSUBISHI ELECTRIC CORPORATION** |
| **Type of Equipment** | : | **Card Reader** |
| **Model No.** | : | **UCR-8213** |
| **Test regulation** | : | **FCC Part 15 Subpart C: 2012** |
| **FCC ID** | : | **YS34D454C2D5002** |
| **Test Result** | : | **Complied** |

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 32DE0300-HO-02. 32DE0300-HO-02 is replaced with this report.

**Date of test:** March 1 to 9, 2012

**Representative test engineer:**
H. Kukita
Hiroshi Kukita
Engineer of WiSE Japan,
UL Verification Service

**Approved by:**
Masanori Nishiyama
Leader of WiSE Japan,
UL Verification Service

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

**UL Japan, Inc.**
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## SECTION 1: Customer information

| | | |
|---|---|---|
| Company Name | : | MITSUBISHI ELECTRIC CORPORATION |
| Address | : | No.1, Hishi-machi, Inazawa-shi, Aichi-ken, 492-8682, Japan |
| Telephone Number | : | +81-587-24-5560 |
| Facsimile Number | : | +81-587-24-5768 |
| Contact Person | : | Koki Okunishi |

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

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

| | | |
|---|---|---|
| Type of Equipment | : | Card Reader |
| Model No. | : | UCR-8213 |
| Serial No. | : | Refer to Section 4, Clause 4.2 |
| Rating | : | DC 24V |
| Receipt Date of Sample | : | February 27, 2012 |
| Country of Mass-production | : | Japan |
| Condition of EUT | : | Production model |
| Modification of EUT | : | No Modification by the test lab |

### 2.2 Product Description

Model No: UCR-8213, referred to as the EUT in this report, is the Card Reader.
This model is Keypad Type.

EUT has a series model.
UCR-8203: Plain Type : Only cover is changed. Printed circuit boards are same.
* There is no difference in radio specification.

**General Specification**

| | | |
|---|---|---|
| Clock frequency(ies) in the system | : | 31.3344MHz (Oscillator), 27.12MHz (Cristal) |

**Radio Specification**

| | | |
|---|---|---|
| Radio Type | : | Transceiver |
| Frequency of Operation | : | 13.56MHz |
| Power Supply (inner) | : | DC 3.3V, DC 7V |
| Antenna type | : | Pattern antenna (Coil) |
| Operating Temperature | : | -10deg.C. to +40deg.C. |

# SECTION 3: Test specification, procedures & results

## 3.1 Test Specification

| | | |
|---|---|---|
| Test Specification | : | FCC Part 15 Subpart C: 2012, final revised on February 1, 2012 |
| Title | : | FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.207 Conducted limits<br>Section 15.225 : Operation within the band 13.110-14.010MHz |

## 3.2 Procedures and results

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|---|---|---|---|---|
| Conducted emission | ANSI C63.4:2003<br>7. AC powerline conducted emission measurements | Section 15.207 | [QP]10.4dB<br>(27.12000MHz, L, with Card)<br>[AV]0.3dB<br>(27.12000MHz, L, with Card) | Complied | - |
| | <IC>RSS-Gen 7.2.2 | <IC>RSS-Gen 7.2.2 | | | |
| Electric Field Strength of Fundamental Emission | ANSI C63.4:2003<br>13. Measurement of intentional radiators | Section 15.225(a) | 50.0dB<br>13.56000MHz, QP, 0deg., with Card | Complied | Radiated |
| | <IC> RSS-Gen 4.8, 4.11 | <IC>RSS-210 A2.6 | | | |
| Spectrum Mask | ANSI C63.4:2003<br>13. Measurement of intentional radiators | Section 15.225(b)(c) | 30.7dB<br>13.55300MHz, QP, 0deg., with Card | Complied | Radiated |
| | <IC>RSS-Gen 4.9, 4.11 | <IC> RSS-210 A2.6 | | | |
| 20dB Bandwidth | ANSI C63.4:2003<br>13. Measurement of intentional radiators | Section15.215(c) | See data | Complied | Radiated |
| | <IC> - | <IC> - | | | |
| Electric Field Strength of Spurious Emission | ANSI C63.4:2003<br>13. Measurement of intentional radiators | Section15.209, Section 15.225 (d) | 0.7dB<br>325.250MHz, Horizontal, QP, with Card | Complied | Radiated |
| | <IC>RSS-Gen 4.9, 4.11 | <IC>RSS-210 A2.6 | | | |
| Frequency Tolerance | ANSI C63.4:2003<br>13. Measurement of intentional radiators | Section15.225(e) | See data | Complied | Radiated |
| | <IC>RSS-Gen 4.7 | <IC> RSS-210 A2.6 | | | |
| Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422 | | | | | |

**FCC 15.31 (e)**
This EUT provides stable voltage (DC 3.3V, DC 7V) constantly to EUT (RF part) regardless of input voltage. Therefore, this EUT complies with the requirement.

**FCC Part 15.203 Antenna requirement**
The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

### 3.3 Addition to standard

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

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

### 3.4 Uncertainty

**EMI**

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

| Test room (semi-anechoic chamber) | Conducted emission (±dB) |
|---|---|
| | 150kHz-30MHz |
| No.1 | 3.5dB |
| No.2 | 3.6dB |
| No.3 | 3.6dB |
| No.4 | 3.6dB |

| Test room (semi-anechoic chamber) | Radiated emission (10m*)(±dB) | | |
|---|---|---|---|
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz |
| No.1 | 4.1dB | 5.0dB | 4.8dB |
| No.2 | - | - | - |
| No.3 | - | - | - |
| No.4 | - | - | - |

*10m = Measurement distance

| Test room (semi-anechoic chamber) | Radiated emission | | | | | | |
|---|---|---|---|---|---|---|---|
| | (3m*)(±dB) | | | | (1m*)(±dB) | | (0.5m*)(±dB) |
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz | 1GHz -10GHz | 10GHz -18GHz | 18GHz -26.5GHz | 26.5GHz -40GHz |
| No.1 | 4.2dB | 5.0dB | 5.1dB | 4.7dB | 5.7dB | 4.4dB | 4.3dB |
| No.2 | 4.1dB | 5.2dB | 5.1dB | 4.8dB | 5.6dB | 4.3dB | 4.2dB |
| No.3 | 4.5dB | 5.0dB | 5.2dB | 4.8dB | 5.6dB | 4.5dB | 4.2dB |
| No.4 | 4.7dB | 5.2dB | 5.2dB | 4.8dB | 5.6dB | 5.1dB | 4.2dB |

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

| Frequency counter (±) | |
|---|---|
| Normal condition | Extreme condition |
| $7 \times 10^{-6}$ | $9 \times 10^{-6}$ |

Conducted emission test

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

Radiated emission test (3m)

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

### 3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

| | FCC Registration Number | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|---|---|---|---|---|---|
| No.1 semi-anechoic chamber | 313583 | 2973C-1 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 655103 | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | 2973C-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.3 Preparation room |
| No.3 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 134570 | 2973C-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.4 Preparation room |
| No.4 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | - | 6.0 x 6.0 x 3.9m | 6.0 x 6.0m | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 4.75 x 5.4 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 4.15 m | - |
| No.7 shielded room | - | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | - | 3.1 x 5.0 x 2.7m | N/A | - |
| No.9 measurement room | - | - | 8.0 x 4.5 x 2.8m | 2.0 x 2.0m | - |
| No.10 measurement room | - | - | 2.6 x 2.8 x 2.5m | 2.4 x 2.4m | - |
| No.11 measurement room | - | - | 3.1 x 3.4 x 3.0m | 2.4 x 3.4m | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

## 4.1 Operating Modes

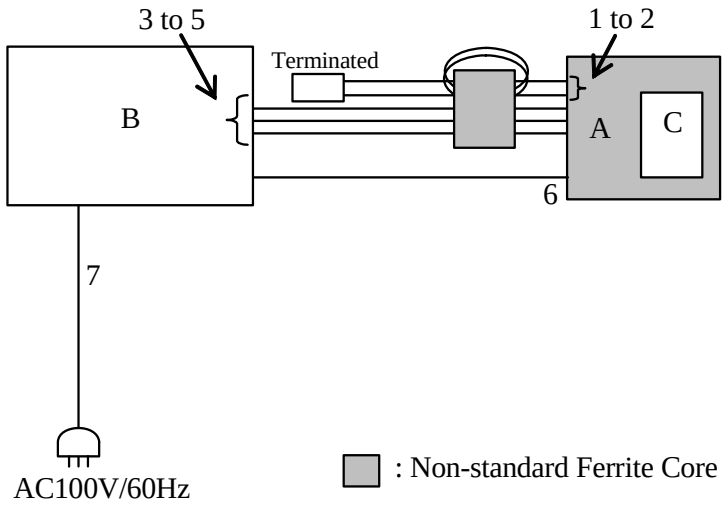
The mode is used : 1. Transmitting (Tx and Rx) with Card mode
2. Transmitting (Tx and Rx) without Card mode
3. Transmitting (Tx and Rx) without Card (Antenna terminated with dummy load) mode

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

Frequency Tolerance:

Temperature : -10deg.C to +40deg.C Step 10deg.C
Voltage : Normal Voltage DC 24.0V
Maximum Voltage DC 27.6V, Minimum Voltage DC 20.4V (DC 24.0V ±15%)
*This EUT provides stable voltage (DC 3.3V, DC 7V) constantly to RF Part regardless of input voltage

## 4.2 Configuration and peripherals




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

**Description of EUT and support equipment**

| No. | Item | Model number | Serial number | Manufacturer | Remark |
|---|---|---|---|---|---|
| A | Card Reader | UCR-8213 | 1 *1) | MITSUBISHI ELECTRIC CORPORATION | EUT |
| | | | 2 *2) | | |
| B | Power supply | PBA15F-24 | 1522194HR | COSEL | - |
| C | Card (Type A) | - | - | - | - |

**List of cables used**

| No. | Name | Length (m) | Shield | | Remark |
|---|---|---|---|---|---|
| | | | Cable | Connector | |
| 1 | Signal Cable | 0.5 | Unshielded | Unshielded | Terminated, *a) |
| 2 | Signal Cable | 0.5 | Unshielded | Unshielded | *a) |
| 3 | DC Power Cable (+) | 0.5 | Unshielded | Unshielded | *a) |
| 4 | DC Power Cable (-) | 0.5 | Unshielded | Unshielded | *a) |
| 5 | DC Power Cable (FG) | 0.5 | Unshielded | Unshielded | *a) |
| 6 | Signal Cable | 0.5 | Unshielded | Unshielded | - |
| 7 | AC Cable | 1.2 | Unshielded | Unshielded | - |

**<Notes for Ferrite cores>**

*a) 1 Ferrite Core, Model No. SFT59SH (Manufacturer: TKK), 2cm from Item A, 3 turns.
*This is Removal Ferrite Core that is included in finished goods.

*1) Used for all tests except for 13.56MHz of Conducted emission test with Card (Antenna was terminated by 50 ohms)
*2) Used for 13.56MHz of Conducted emission test with Card (Antenna was terminated by 50 ohms)

# SECTION 5: Conducted emission

## 5.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

## 5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and 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/AMN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50ohm connectors of the LISN/ AMN were resistively terminated in 50ohm when not connected to the measuring equipment.
The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a horizontal conducting plane 4.0 x 4.0m and a vertical conducting plane 2.0 x 2.0m in a semi Anechoic Chamber.
Photographs of the set up are shown in Appendix 3.

## 5.3 Test conditions

Frequency range : 0.15MHz-30MHz
EUT position : Table top
EUT operation mode : See Clause 4.1

## 5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in the semi Anechoic Chamber.
The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains Network (AMN).
An overview sweep with peak detection has been performed.
The measurements had been performed with a quasi-peak detector and if required, with an average detector.
The conducted emission measurements were made with the following detector function of the test receiver.
Detector Type : QP and AV
IF Bandwidth : 9kHz

## 5.5 Test result

Summary of the test results : Pass

## SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask )

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.
The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical (angle of loop antenna: 0deg., 45deg., 90deg., and 135 deg.) and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

**Test Antennas are used as below;**

| Frequency | Below 30MHz | 30MHz to 300MHz | 300MHz to 1GHz |
|---|---|---|---|
| Antenna Type | Loop | Biconical | Logperiodic |

| Frequency | From 9kHz to 90kHz and From 110kHz to 150kHz | From 90kHz to 110kHz | From 150kHz to 490kHz | From 490kHz to 30MHz | From 30MHz to 1GHz |
|---|---|---|---|---|---|
| Instrument used | Test Receiver | | | | |
| Detector | PK/AV | QP | PK/AV | QP | QP |
| IF Bandwidth | 200Hz | 200Hz | 9kHz | 9kHz | 120kHz |

The worst distance in use between EUT and card was confirmed and the test was performed by following condition.
Below 30MHz: 4cm
Above 30MHz: 0cm

*The test was made on EUT in the normal use position.

* FCC Part 15 Section 15.31 (f)(2) / IC RSS-Gen 4.11 (9kHz-30MHz)

$$9\text{kHz} - 490\text{kHz}\,[\text{Limit at 3m}] = [\text{Limit at 300m}] - 40\log\left(\frac{3}{300}\right)$$

$$490\text{kHz} - 30\text{MHz}[\text{Limit at 3m}] = [\text{Limit at 30m}] - 40\log\left(\frac{3}{30}\right)$$

**Measurement range** : **0.09M-1GHz**
**Test data** : **APPENDIX**
**Test result** : **Pass**

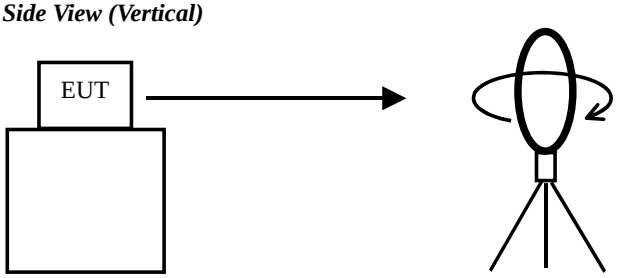
## SECTION 7: Other test

| Test | Span | RBW | VBW | Sweep | Detector | Trace | Instrument used |
|---|---|---|---|---|---|---|---|
| 20dB Bandwidth | 100kHz | 1kHz | 3kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | Enough width to display 20dB Bandwidth | 1 to 3% of Span | Three times of RBW | Auto | Peak *1) | Max Hold *1) | Spectrum Analyzer |
| Frequency Tolerance | - | - | - | - | - | - | Frequency counter |
| *1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%. | | | | | | | |

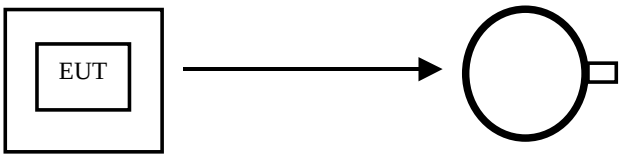
**Test data : APPENDIX**
**Test result : Pass**

**Figure 1: Direction of the Loop Antenna**

***Side View (Vertical)***

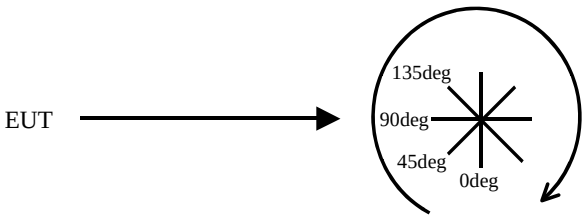



***Top View (Horizontal)***




Antenna was not rotated.

***Top View (Vertical)***




Front side: 0 deg.
Forward direction: clockwise

# APPENDIX 1: Data of EMI test

## Conducted emission

DATA OF CONDUCTED EMISSION TEST

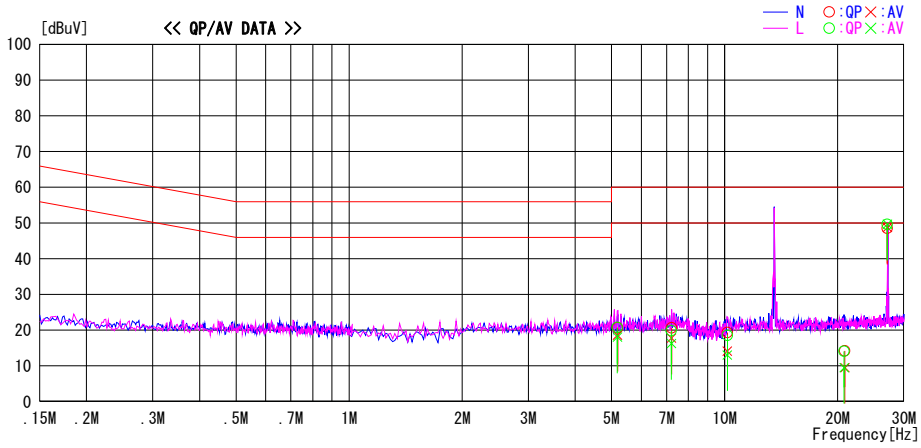
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/02

Report No. : 32DE0300-HO-02

Temp./Humi. : 21deg. C / 32% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) with Card mode, Type A

LIMIT : FCC15.207 QP
FCC15.207 AV




| Frequency | Reading Level | | Corr. | Results | | Limit | | Margin | | Phase | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QP | AV | Factor | QP | AV | QP | AV | QP | AV | | |
| [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 5.18271 | 6.8 | 4.1 | 13.9 | 20.7 | 18.0 | 60.0 | 50.0 | 39.3 | 32.0 | L | |
| 5.18422 | 6.7 | 4.6 | 13.9 | 20.6 | 18.5 | 60.0 | 50.0 | 39.4 | 31.5 | N | |
| 7.21610 | 5.7 | 2.1 | 14.1 | 19.8 | 16.2 | 60.0 | 50.0 | 40.2 | 33.8 | L | |
| 7.21820 | 6.5 | 3.6 | 14.1 | 20.6 | 17.7 | 60.0 | 50.0 | 39.4 | 32.3 | N | |
| 10.17080 | 4.1 | -1.4 | 14.4 | 18.5 | 13.0 | 60.0 | 50.0 | 41.5 | 37.0 | L | |
| 10.17120 | 4.9 | -0.3 | 14.4 | 19.3 | 14.1 | 60.0 | 50.0 | 40.7 | 35.9 | N | |
| 20.80240 | -1.1 | -5.7 | 15.2 | 14.1 | 9.5 | 60.0 | 50.0 | 45.9 | 40.5 | L | |
| 20.90640 | -1.0 | -5.7 | 15.2 | 14.2 | 9.5 | 60.0 | 50.0 | 45.8 | 40.5 | N | |
| 27.12000 | 33.0 | 33.3 | 15.5 | 48.5 | 48.8 | 60.0 | 50.0 | 11.5 | 1.2 | N | |
| 27.12000 | 34.1 | 34.2 | 15.5 | 49.6 | 49.7 | 60.0 | 50.0 | 10.4 | 0.3 | L | |

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

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

# Conducted emission

## DATA OF CONDUCTED EMISSION TEST

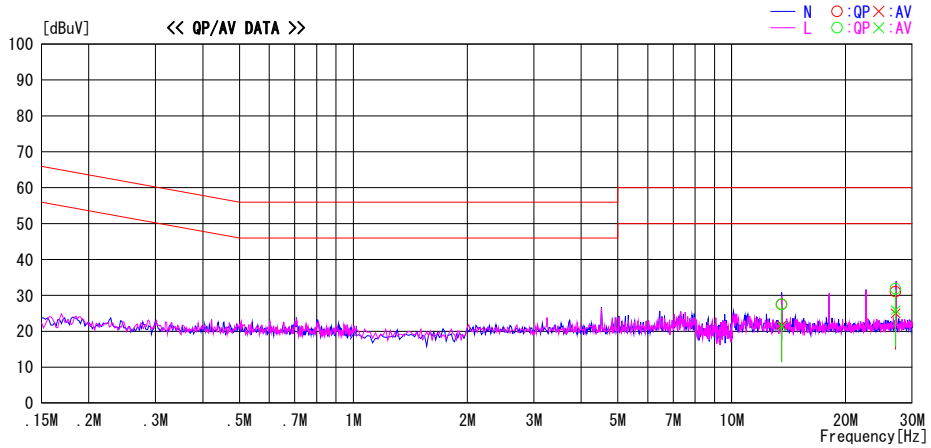
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2012/03/09

Report No. : 32DE0300-HO-02

Temp./Humi. : 23deg. C / 34% RH
Engineer : Takeshi Choda

Mode / Remarks : Transmitting (Tx and Rx) without Card (Antenna terminated with dummy load) mode

LIMIT : FCC15.207 QP
FCC15.207 AV




| Frequency | Reading Level | | Corr. | Results | | Limit | | Margin | | Phase | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QP | AV | Factor | QP | AV | QP | AV | QP | AV | | |
| [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 13.56008 | 13.2 | 7.4 | 14.3 | 27.5 | 21.7 | 60.0 | 50.0 | 32.5 | 28.3 | N | |
| 27.12000 | 16.3 | 10.3 | 14.7 | 31.0 | 25.0 | 60.0 | 50.0 | 29.0 | 25.0 | N | |
| 13.56008 | 13.2 | 7.1 | 14.3 | 27.5 | 21.4 | 60.0 | 50.0 | 32.5 | 28.6 | L | |
| 27.12016 | 17.1 | 11.2 | 14.7 | 31.8 | 25.9 | 60.0 | 50.0 | 28.2 | 24.1 | L | |

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

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

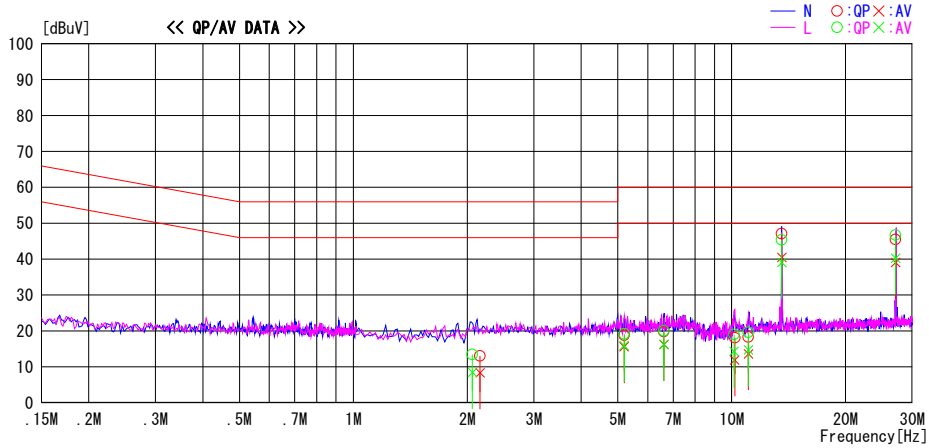
## DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/02

Report No. : 32DE0300-HO-02
Temp./Humi. : 21deg. C / 32% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) without Card mode, Type A

LIMIT : FCC15.207 QP
FCC15.207 AV




| Frequency | Reading Level | | Corr. | Results | | Limit | | Margin | | Phase | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QP | AV | Factor | QP | AV | QP | AV | QP | AV | | |
| [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 2.16160 | -0.4 | -5.1 | 13.4 | 13.0 | 8.3 | 56.0 | 46.0 | 43.0 | 37.7 | N | |
| 5.19664 | 4.9 | 1.7 | 13.9 | 18.8 | 15.6 | 60.0 | 50.0 | 41.2 | 34.4 | N | |
| 6.62002 | 5.8 | 2.2 | 14.0 | 19.8 | 16.2 | 60.0 | 50.0 | 40.2 | 33.8 | N | |
| 10.18720 | 3.7 | -2.5 | 14.4 | 18.1 | 11.9 | 60.0 | 50.0 | 41.9 | 38.1 | N | |
| 11.06760 | 3.8 | -0.9 | 14.5 | 18.3 | 13.6 | 60.0 | 50.0 | 41.7 | 36.4 | N | |
| 13.56000 | 32.3 | 25.7 | 14.8 | 47.1 | 40.5 | 60.0 | 50.0 | 12.9 | 9.5 | N | |
| 27.12000 | 30.0 | 23.6 | 15.5 | 45.5 | 39.1 | 60.0 | 50.0 | 14.5 | 10.9 | N | |
| 2.06360 | 0.0 | -5.0 | 13.4 | 13.4 | 8.4 | 56.0 | 46.0 | 42.6 | 37.6 | L | |
| 5.19598 | 5.3 | 2.0 | 13.9 | 19.2 | 15.9 | 60.0 | 50.0 | 40.8 | 34.1 | L | |
| 6.61856 | 6.0 | 2.2 | 14.0 | 20.0 | 16.2 | 60.0 | 50.0 | 40.0 | 33.8 | L | |
| 10.14352 | 4.6 | -0.1 | 14.4 | 19.0 | 14.3 | 60.0 | 50.0 | 41.0 | 35.7 | L | |
| 11.06460 | 5.1 | 0.2 | 14.5 | 19.6 | 14.7 | 60.0 | 50.0 | 40.4 | 35.3 | L | |
| 13.56000 | 30.6 | 24.3 | 14.8 | 45.4 | 39.1 | 60.0 | 50.0 | 14.6 | 10.9 | L | |
| 27.12000 | 31.2 | 24.8 | 15.5 | 46.7 | 40.3 | 60.0 | 50.0 | 13.3 | 9.7 | L | |

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

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

# Fundamental emission and Spectrum Mask

## DATA OF RADIATED EMISSION TEST

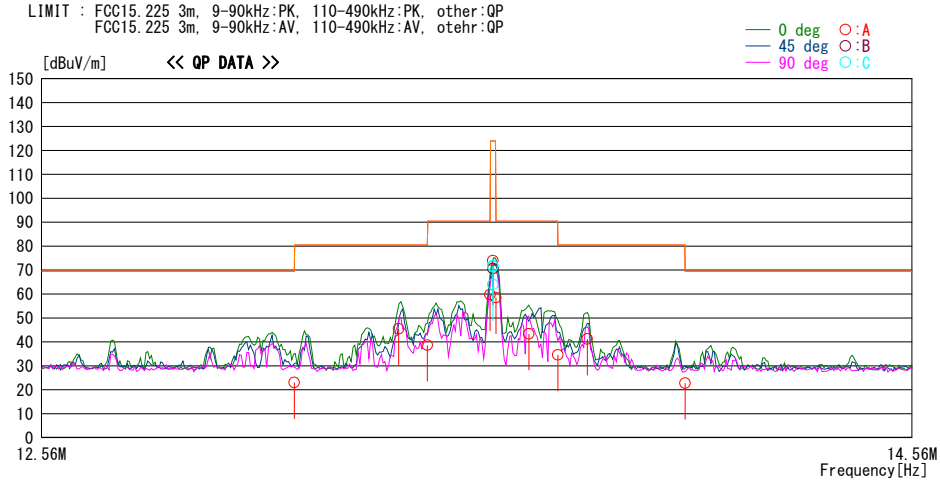
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/01

Report No. : 32DE0300-HO-02

Temp. / Humi. : 21deg. C / 32% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) with Card mode (Card distance: 4cm)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, otehr:QP




| Freq. | Reading | DET | Ant.Fac | Loss | Gain | Result | Limit | Margin | Antenna | | Table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBuV] | | [dB/m] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB] | [deg] | | [deg] | |
| 13.11000 | 29.2 | QP | 19.1 | 6.9 | 32.2 | 23.0 | 69.5 | 46.5 | 0 | A | 359 | |
| 13.34521 | 51.7 | QP | 19.0 | 6.9 | 32.2 | 45.4 | 80.5 | 35.1 | 0 | A | 359 | |
| 13.41000 | 45.0 | QP | 19.0 | 6.9 | 32.2 | 38.7 | 80.5 | 41.8 | 0 | A | 359 | |
| 13.55300 | 66.0 | QP | 18.9 | 7.0 | 32.2 | 59.7 | 90.4 | 30.7 | 0 | A | 359 | |
| 13.56000 | 80.2 | QP | 18.9 | 7.0 | 32.2 | 73.9 | 123.9 | 50.0 | 0 | A | 359 | |
| 13.56000 | 77.9 | QP | 18.9 | 7.0 | 32.2 | 71.6 | 123.9 | 52.3 | 90 | C | 256 | |
| 13.56000 | 77.0 | QP | 18.9 | 7.0 | 32.2 | 70.7 | 123.9 | 53.2 | 45 | B | 1 | |
| 13.56000 | 78.1 | QP | 18.9 | 7.0 | 32.2 | 71.8 | 123.9 | 52.1 | 135 | C | 223 | |
| 13.56000 | 70.2 | QP | 18.9 | 7.0 | 32.2 | 63.9 | 123.9 | 60.0 | 135 | C | 123 | Hori |
| 13.56700 | 64.8 | QP | 18.9 | 7.0 | 32.2 | 58.5 | 90.4 | 31.9 | 0 | A | 359 | |
| 13.64320 | 49.7 | QP | 18.9 | 7.0 | 32.2 | 43.4 | 90.4 | 47.0 | 0 | A | 359 | |
| 13.71000 | 40.9 | QP | 18.9 | 7.0 | 32.2 | 34.6 | 80.5 | 45.9 | 0 | A | 359 | |
| 13.77852 | 47.6 | QP | 18.9 | 7.0 | 32.2 | 41.3 | 80.5 | 39.2 | 0 | A | 359 | |
| 14.01000 | 29.2 | QP | 18.8 | 7.0 | 32.2 | 22.8 | 69.5 | 46.7 | 0 | A | 359 | |

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

# Fundamental emission and Spectrum Mask

## DATA OF RADIATED EMISSION TEST

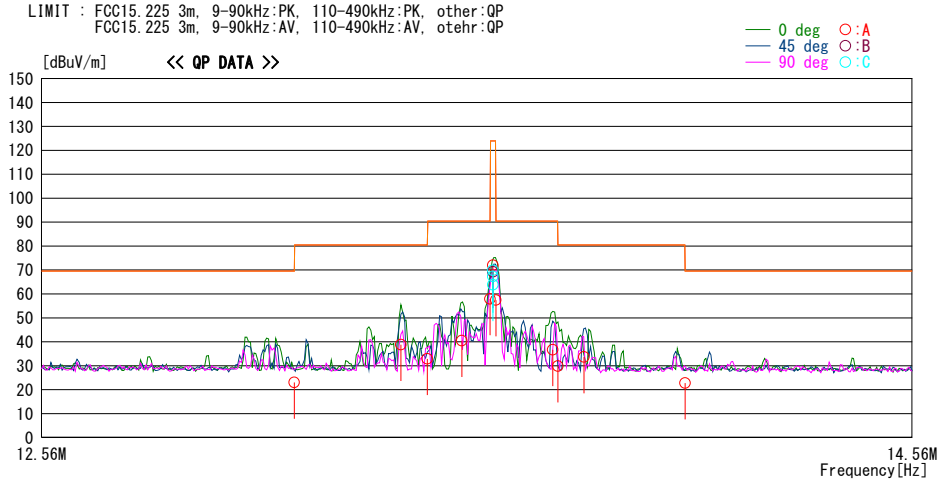
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/01

Report No. : 32DE0300-HO-02

Temp./ Humi. : 21deg. C / 32% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) without Card mode

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, otehr:QP




| Freq. | Reading | DET | Ant.Fac | Loss | Gain | Result | Limit | Margin | Antenna | | Table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBuV] | | [dB/m] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB] | [deg] | | [deg] | |
| 13.11000 | 29.2 | QP | 19.1 | 6.9 | 32.2 | 23.0 | 69.5 | 46.5 | 0 | A | 14 | |
| 13.34963 | 45.1 | QP | 19.0 | 6.9 | 32.2 | 38.8 | 80.5 | 41.7 | 0 | A | 14 | |
| 13.41000 | 39.2 | QP | 19.0 | 6.9 | 32.2 | 32.9 | 80.5 | 47.6 | 0 | A | 14 | |
| 13.48812 | 46.6 | QP | 19.0 | 7.0 | 32.2 | 40.4 | 90.4 | 50.0 | 0 | A | 14 | |
| 13.55300 | 64.2 | QP | 18.9 | 7.0 | 32.2 | 57.9 | 90.4 | 32.5 | 0 | A | 14 | |
| 13.56000 | 78.3 | QP | 18.9 | 7.0 | 32.2 | 72.0 | 123.9 | 51.9 | 0 | A | 14 | |
| 13.56000 | 75.6 | QP | 18.9 | 7.0 | 32.2 | 69.3 | 123.9 | 54.6 | 45 | B | 350 | |
| 13.56000 | 73.6 | QP | 18.9 | 7.0 | 32.2 | 67.3 | 123.9 | 56.6 | 90 | C | 14 | |
| 13.56000 | 76.1 | QP | 18.9 | 7.0 | 32.2 | 69.8 | 123.9 | 54.1 | 135 | C | 211 | |
| 13.56000 | 70.1 | QP | 18.9 | 7.0 | 32.2 | 63.8 | 123.9 | 60.1 | 135 | C | 222 | Hori |
| 13.56700 | 63.8 | QP | 18.9 | 7.0 | 32.2 | 57.5 | 90.4 | 32.9 | 0 | A | 14 | |
| 13.69836 | 43.0 | QP | 18.9 | 7.0 | 32.2 | 36.7 | 90.4 | 53.7 | 0 | A | 14 | |
| 13.71000 | 36.1 | QP | 18.9 | 7.0 | 32.2 | 29.8 | 80.5 | 50.7 | 0 | A | 14 | |
| 13.77129 | 40.0 | QP | 18.9 | 7.0 | 32.2 | 33.7 | 80.5 | 46.8 | 0 | A | 14 | |
| 14.01000 | 29.2 | QP | 18.8 | 7.0 | 32.2 | 22.8 | 69.5 | 46.7 | 0 | A | 14 | |

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

# Spurious emission

## DATA OF RADIATED EMISSION TEST

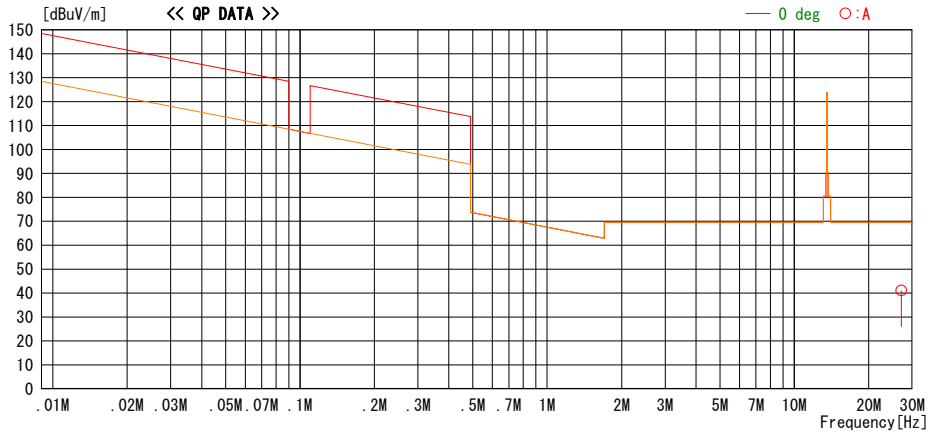
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/01

Report No. : 32DE0300-HO-02

Temp./ Humi. : 21deg. C / 32% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) with Card mode (Card distance: 4cm)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, otehr:QP




| Freq. | Reading | DET | Ant.Fac | Loss | Gain | Result | Limit | Margin | Antenna | | Table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBuV] | | [dB/m] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB] | [deg] | | [deg] | |
| 27.12000 | 46.8 | QP | 18.9 | 7.5 | 32.1 | 41.1 | 69.5 | 28.4 | 0 | A | 359 | |

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

# Spurious emission

## DATA OF RADIATED EMISSION TEST

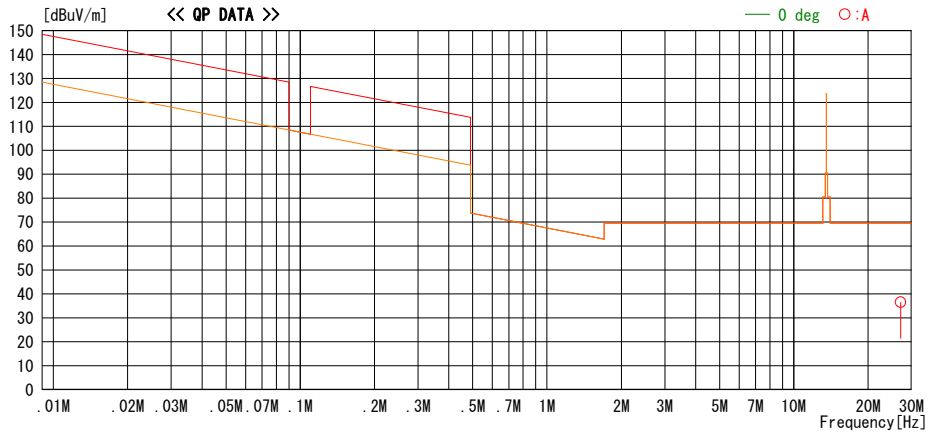
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/01

Report No. : 32DE0300-HO-02

Temp./ Humi. : 21deg. C / 32% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) without Card mode

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, otehr:QP




| Freq. | Reading | DET | Ant.Fac | Loss | Gain | Result | Limit | Margin | Antenna | | Table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBuV] | | [dB/m] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB] | [deg] | | [deg] | |
| 27.12000 | 42.3 | QP | 18.9 | 7.5 | 32.1 | 36.6 | 69.5 | 32.9 | 0 | A | 328 | |

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

# Spurious emission

## DATA OF RADIATED EMISSION TEST

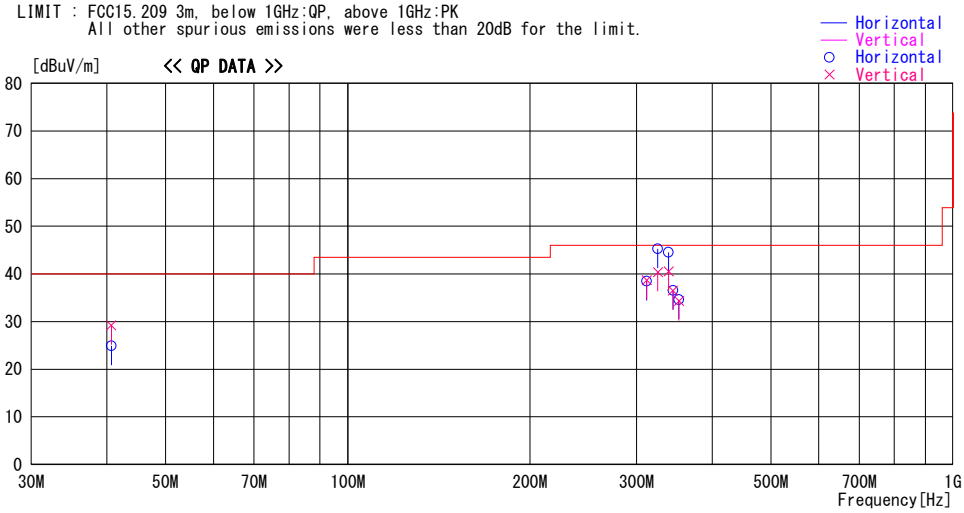
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/01

Report No. : 32DE0300-HO-02

Temp./Humi. : 22deg. C / 31% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) with Card mode, Type A

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




| Frequency | Reading | DET | Antenna Factor | Loss& Gain | Level | Angle | Height | Polar. | Limit | Margin | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [MHz] | [dBuV] | | [dB/m] | [dB] | [dBuV/m] | [Deg] | [cm] | | [dBuV/m] | [dB] | |
| 40.680 | 32.5 | QP | 14.1 | -21.7 | 24.9 | 165 | 343 | Hori. | 40.0 | 15.1 | |
| 40.680 | 36.8 | QP | 14.1 | -21.7 | 29.2 | 260 | 100 | Vert. | 40.0 | 10.8 | |
| 311.880 | 42.5 | QP | 14.8 | -18.8 | 38.5 | 161 | 100 | Hori. | 46.0 | 7.5 | |
| 311.880 | 42.7 | QP | 14.8 | -18.8 | 38.7 | 130 | 100 | Vert. | 46.0 | 7.3 | |
| 325.250 | 48.9 | QP | 15.2 | -18.8 | 45.3 | 328 | 100 | Hori. | 46.0 | 0.7 | |
| 325.440 | 44.0 | QP | 15.2 | -18.8 | 40.4 | 215 | 100 | Vert. | 46.0 | 5.6 | |
| 339.000 | 47.7 | QP | 15.6 | -18.8 | 44.5 | 335 | 100 | Hori. | 46.0 | 1.5 | |
| 339.001 | 43.7 | QP | 15.6 | -18.8 | 40.5 | 211 | 100 | Vert. | 46.0 | 5.5 | |
| 344.677 | 39.5 | QP | 15.8 | -18.8 | 36.5 | 148 | 100 | Hori. | 46.0 | 9.5 | |
| 344.678 | 39.5 | QP | 15.8 | -18.8 | 36.5 | 134 | 100 | Vert. | 46.0 | 9.5 | |
| 352.559 | 37.4 | QP | 16.0 | -18.8 | 34.6 | 150 | 100 | Hori. | 46.0 | 11.4 | |
| 352.560 | 37.1 | QP | 16.0 | -18.8 | 34.3 | 111 | 100 | Vert. | 46.0 | 11.7 | |

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

# Spurious emission

## DATA OF RADIATED EMISSION TEST

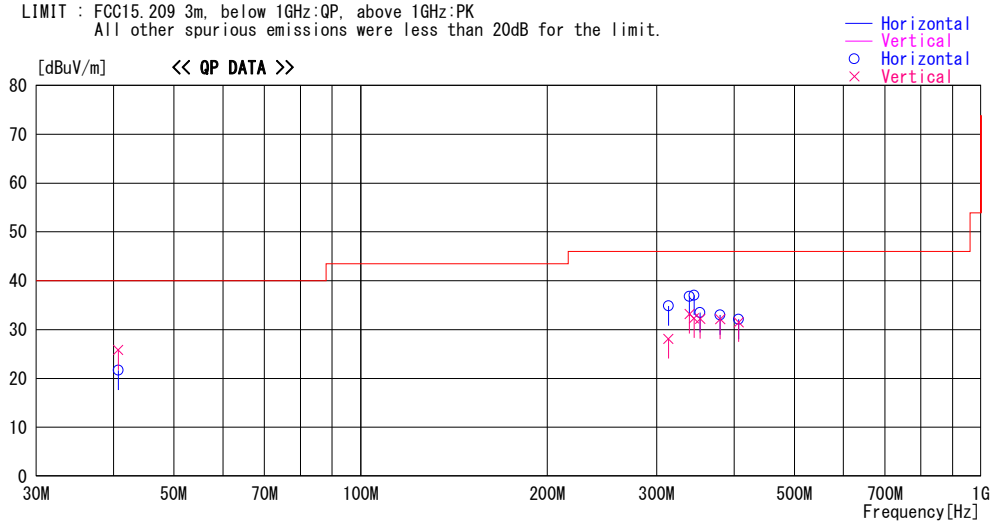
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/03/01

Report No. : 32DE0300-HO-02

Temp./Humi. : 22deg. C / 31% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Transmitting (Tx and Rx) without Card mode, Type A

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



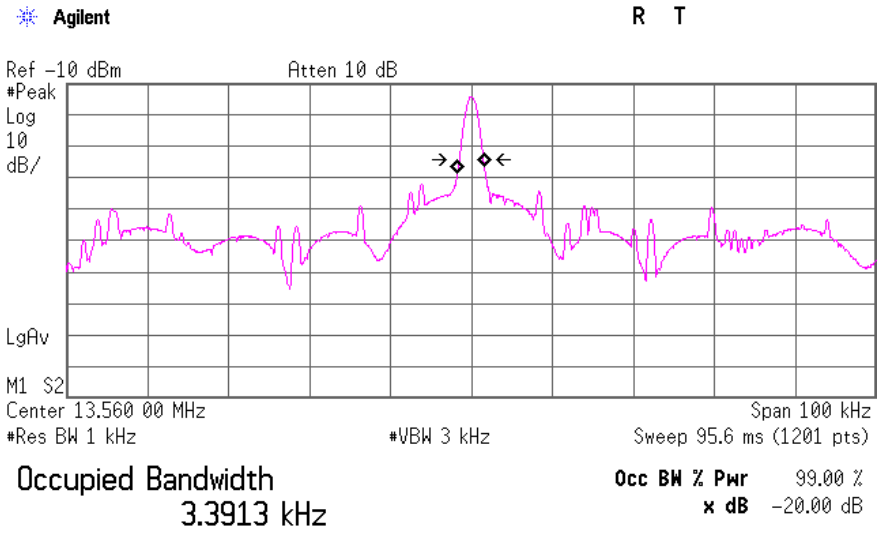

| Frequency [MHz] | Reading [dBuV] | DET | Antenna Factor [dB/m] | Loss& Gain [dB] | Level [dBuV/m] | Angle [Deg] | Height [cm] | Polar. | Limit [dBuV/m] | Margin [dB] | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40.681 | 29.3 | QP | 14.1 | -21.7 | 21.7 | 171 | 328 | Hori. | 40.0 | 18.3 | |
| 40.679 | 33.4 | QP | 14.1 | -21.7 | 25.8 | 94 | 100 | Vert. | 40.0 | 14.2 | |
| 313.344 | 38.8 | QP | 14.8 | -18.8 | 34.8 | 351 | 100 | Hori. | 46.0 | 11.2 | |
| 313.344 | 32.1 | QP | 14.8 | -18.8 | 28.1 | 164 | 316 | Vert. | 46.0 | 17.9 | |
| 339.000 | 40.0 | QP | 15.6 | -18.8 | 36.8 | 329 | 100 | Hori. | 46.0 | 9.2 | |
| 338.999 | 36.4 | QP | 15.6 | -18.8 | 33.2 | 214 | 100 | Vert. | 46.0 | 12.8 | |
| 344.678 | 40.0 | QP | 15.8 | -18.8 | 37.0 | 146 | 100 | Hori. | 46.0 | 9.0 | |
| 344.677 | 35.3 | QP | 15.8 | -18.8 | 32.3 | 225 | 100 | Vert. | 46.0 | 13.7 | |
| 352.561 | 36.3 | QP | 16.0 | -18.8 | 33.5 | 151 | 100 | Hori. | 46.0 | 12.5 | |
| 352.558 | 35.0 | QP | 16.0 | -18.8 | 32.2 | 275 | 179 | Vert. | 46.0 | 13.8 | |
| 379.681 | 35.0 | QP | 16.8 | -18.8 | 33.0 | 144 | 100 | Hori. | 46.0 | 13.0 | |
| 379.680 | 34.1 | QP | 16.8 | -18.8 | 32.1 | 193 | 100 | Vert. | 46.0 | 13.9 | |
| 406.799 | 33.6 | QP | 17.4 | -18.9 | 32.1 | 155 | 100 | Hori. | 46.0 | 13.9 | |
| 406.801 | 33.0 | QP | 17.4 | -18.9 | 31.5 | 199 | 120 | Vert. | 46.0 | 14.5 | |

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

# 20dB Bandwidth

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber |
| Report No. | 32DE0300-HO-02 |
| Date | 03/02/2012 |
| Temperature/ Humidity | 22 deg.C / 31% RH |
| Engineer | Hiroshi Kukita |
| Mode | Tx Mod on with Card |

| FREQ [MHz] | 20dB Bandwidth [kHz] | 99% Occupied Bandwidth [kHz] |
|---|---|---|
| 13.56 | 3.01 | 3.39 |



# Frequency Tolerance

| | |
|---|---|
| Test place | Head Office EMC Lab. No.6 measurement room |
| Report No. | 32DE0300-HO-02 |
| Date | 03/02/2012 |
| Temperature/ Humidity | 22 deg.C/ 31% RH |
| Engineer | Hiroshi Kukita |
| Mode | Tx Mod on with Card |

| Test Condition deg.C | Volts | Test Timing | Measured freq [MHz] | Freq error [MHz] | Result [ppm] | Limit (+/- 0.01%) [+/- ppm] | Margin [ppm] |
|---|---|---|---|---|---|---|---|
| 20deg.C | 20.4V | Power on | 13.56002156 | 0.00002156 | 1.59 | 100.00 | 98.41 |
| | | on 2min. | 13.56002042 | 0.00002042 | 1.51 | 100.00 | 98.49 |
| | | on 5min. | 13.56002003 | 0.00002003 | 1.48 | 100.00 | 98.52 |
| | | on 10min. | 13.56001904 | 0.00001904 | 1.40 | 100.00 | 98.60 |
| | 24V | Power on | 13.56001276 | 0.00001276 | 0.94 | 100.00 | 99.06 |
| | | on 2min. | 13.56002714 | 0.00002714 | 2.00 | 100.00 | 98.00 |
| | | on 5min. | 13.56002647 | 0.00002646 | 1.95 | 100.00 | 98.05 |
| | | on 10min. | 13.56002581 | 0.00002581 | 1.90 | 100.00 | 98.10 |
| | 27.6V | Power on | 13.56002752 | 0.00002752 | 2.03 | 100.00 | 97.97 |
| | | on 2min. | 13.56002662 | 0.00002662 | 1.96 | 100.00 | 98.04 |
| | | on 5min. | 13.56002578 | 0.00002578 | 1.90 | 100.00 | 98.10 |
| | | on 10min. | 13.56002515 | 0.00002515 | 1.85 | 100.00 | 98.15 |
| 40deg.C. | 24V | Power on | 13.55998127 | -0.00001873 | -1.38 | 100.00 | 98.62 |
| | | on 2min. | 13.55998121 | -0.00001879 | -1.39 | 100.00 | 98.61 |
| | | on 5min. | 13.55998124 | -0.00001876 | -1.38 | 100.00 | 98.62 |
| | | on 10min. | 13.55998115 | -0.00001885 | -1.39 | 100.00 | 98.61 |
| 30deg.C. | | Power on | 13.55998467 | -0.00001533 | -1.13 | 100.00 | 98.87 |
| | | on 2min. | 13.55998480 | -0.00001520 | -1.12 | 100.00 | 98.88 |
| | | on 5min. | 13.55998494 | -0.00001506 | -1.11 | 100.00 | 98.89 |
| | | on 10min. | 13.55998395 | -0.00001605 | -1.18 | 100.00 | 98.82 |
| 20deg.C. | | Power on | 13.56001276 | 0.00001276 | 0.94 | 100.00 | 99.06 |
| | | on 2min. | 13.56002714 | 0.00002714 | 2.00 | 100.00 | 98.00 |
| | | on 5min. | 13.56002647 | 0.00002646 | 1.95 | 100.00 | 98.05 |
| | | on 10min. | 13.56002581 | 0.00002581 | 1.90 | 100.00 | 98.10 |
| 10deg.C. | | Power on | 13.56003880 | 0.00003880 | 2.86 | 100.00 | 97.14 |
| | | on 2min. | 13.56003878 | 0.00003878 | 2.86 | 100.00 | 97.14 |
| | | on 5min. | 13.56003894 | 0.00003894 | 2.87 | 100.00 | 97.13 |
| | | on 10min. | 13.56003826 | 0.00003826 | 2.82 | 100.00 | 97.18 |
| 0deg.C. | | Power on | 13.56005828 | 0.00005828 | 4.30 | 100.00 | 95.70 |
| | | on 2min. | 13.56005838 | 0.00005838 | 4.30 | 100.00 | 95.70 |
| | | on 5min. | 13.56005827 | 0.00005827 | 4.30 | 100.00 | 95.70 |
| | | on 10min. | 13.56005791 | 0.00005791 | 4.27 | 100.00 | 95.73 |
| -10deg.C. | | Power on | 13.56006761 | 0.00006760 | 4.99 | 100.00 | 95.01 |
| | | on 2min. | 13.56006765 | 0.00006765 | 4.99 | 100.00 | 95.01 |
| | | on 5min. | 13.56006764 | 0.00006764 | 4.99 | 100.00 | 95.01 |
| | | on 10min. | 13.56006771 | 0.00006770 | 4.99 | 100.00 | 95.01 |

Limit : 13.56 13.56 MHz +/-0.01 % (+/- 100ppm) = +/- 0.001356 MHz

* The tests at 50deg.C. and -20deg.C. were not applied since the specification of operating temperature of EUT was -10deg.C. to 40deg.C.

# APPENDIX 2: Test instruments

## EMI test equipment

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|---|---|---|---|---|---|---|
| MAEC-02 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-06902 | CE/RE | 2011/06/21 * 12 |
| MOS-22 | Thermo-Hygrometer | Custom | CTH-201 | 0003 | CE/RE | 2012/02/06 * 12 |
| MJM-14 | Measure | KOMELON | KMC-36 | - | CE/RE | - |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | CE/RE | - |
| MTR-08 | Test Receiver | Rohde & Schwarz | ESCI | 100767 | CE/RE | 2011/08/11 * 12 |
| MLS-06 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127363 | CE(EUT) | 2012/02/06 * 12 |
| MCC-13 | Coaxial Cable | Fujikura | 3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m) | - | CE | 2012/02/16 * 12 |
| MAT-65 | Attenuator(13dB) | JFW Industries, Inc. | 50FP-013H2 N | - | CE | 2012/01/28 * 12 |
| MLPA-01 | Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100017 | RE | 2011/10/19 * 12 |
| MCC-31 | Coaxial cable | UL Japan | - | - | RE | 2011/07/28 * 12 |
| MPA-14 | Pre Amplifier | SONOMA INSTRUMENT | 310 | 260833 | RE | 2011/03/04 * 12 |
| MAT-07 | Attenuator(6dB) | Weinschel Corp | 2 | BK7970 | RE | 2011/11/02 * 12 |
| MBA-02 | Biconical Antenna | Schwarzbeck | BBA9106 | VHA91032008 | RE | 2011/10/23 * 12 |
| MLA-02 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 201 | RE | 2011/10/23 * 12 |
| MCC-12 | Coaxial Cable | Fujikura/Agilent | - | - | RE | 2012/02/16 * 12 |
| MPA-09 | Pre Amplifier | Agilent | 8447D | 2944A10845 | RE | 2011/09/26 * 12 |
| MOS-14 | Thermo-Hygrometer | Custom | CTH-201 | - | FT | 2012/02/06 * 12 |
| MBM-10 | Barometer | Sunoh | SBR121 | 832 | FT | 2010/12/13 * 36 |
| MSA-10 | Spectrum Analyzer | Agilent | E4448A | MY46180655 | FT | 2012/02/03 * 12 |
| MCC-64 | Coaxial Cable | UL Japan | - | - | FT | 2011/03/10 * 12 |
| MCH-04 | Temperature and Humidity Chamber | Tabai Espec | PL-2KP | 14015723 | FT | 2011/08/22 * 12 |

**The expiration date of the calibration is the end of the expired month.**
**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**

**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

**Test Item: CE: Conducted Emission**
**RE: Radiated Emission**
**FT: Frequency Tolerance**