



RADIO TEST REPORT

Test Report No. : 10006371H-A-R2

Applicant : OMRON Corporation
Type of Equipment : Radio Frequency Identification System (RFID System)
Model No. : V680S-HMD64-ETN
Test regulation : FCC Part 15 Subpart C: 2012
FCC ID : E4EV680S64
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 10006371H-A-R1. 10006371H-A-R1 is replaced with this report.

Date of test: March 6 to 12, 2013

Representative test engineer:



Satofumi Matsuyama
Engineer of WiSE Japan,
UL Verification Service

Approved by:



Masanori Nishiyama
Manager of WiSE Japan,
UL Verification Service



NVLAP LAB CODE: 200572-0

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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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13-EM-F0429

| CONTENTS | PAGE |
|--|-------------|
| SECTION 1: Customer information..... | 4 |
| SECTION 2: Equipment under test (E.U.T.)..... | 4 |
| SECTION 3: Test specification, procedures & results..... | 5 |
| SECTION 4: Operation of E.U.T. during testing | 8 |
| SECTION 5: Conducted emission..... | 11 |
| SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask) | 12 |
| SECTION 7: Other test..... | 13 |
| APPENDIX 1: Data of EMI test..... | 14 |
| Conducted emission | 14 |
| Fundamental emission and Spectrum Mask | 17 |
| Spurious emission..... | 19 |
| Frequency Tolerance..... | 22 |
| APPENDIX 2: Test instruments..... | 22 |
| APPENDIX 3: Photographs of test setup | 24 |
| Conducted emission | 24 |
| Radiated emission..... | 25 |
| Worst Case Position | 26 |

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SECTION 1: Customer information

Company Name : OMRON Corporation
Address : 2-2-1, Nishikusatsu, Kusatsu-city, Shiga-pref., 525-0035, Japan
Telephone Number : +81-77-565-5287
Facsimile Number : +81-77-565-5569
Contact Person : Tomohiro Nishimura

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

2.1 Identification of E.U.T.

Type of Equipment : Radio Frequency Identification System (RFID System)
Model No. : V680S-HMD64-ETN
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : March 5, 2013
Country of Mass-production : Japan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

General Specification

Clock frequency(ies) in the system : 13.56MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 13.56MHz
Modulation : ASK
Power Supply (inner) : 7V DC
Antenna type : Loop Coil
Operating Temperature : -25 deg. C - +70 deg. C

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 2013

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.225 : Operation within the band 13.110-14.010MHz

* The EUT complies with FCC Part 15 Subpart B: 2012, final revised on December 27, 2012 and effective January 28, 2013

3.2 Procedures and results

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|---|---|---|----------|-----------|
| Conducted emission | ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC>RSS-Gen 7.2.2 | Section 15.207 ----- <IC>RSS-Gen 7.2.2 | [QP] 10.9dB, 13.56000MHz, L [AV] 0.9dB, 13.56000MHz, L | Complied | Conducted |
| Electric Field Strength of Fundamental Emission | ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11 | Section 15.225(a) ----- <IC>RSS-210 A2.6 | 54.4dB, 13.56000MHz, QP, 0deg. | Complied | Radiated |
| Spectrum Mask | ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.9, 4.11 | Section 15.225(b)(c) ----- <IC> RSS-210 A2.6 | 35.5dB, 13.55300MHz, QP, 0deg. | Complied | Radiated |
| 20dB Bandwidth | ANSI C63.4:2003 13. Measurement of intentional radiators <IC> - * | Section15.215(c) ----- <IC> - * | See data | Complied | Radiated |
| Electric Field Strength of Spurious Emission | ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.9, 4.11 | Section15.209, Section 15.225 (d) ----- <IC>RSS-210 A2.6 | 4.9dB 650.880MHz, Vertical, QP | Complied | Radiated |
| Frequency Tolerance | ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.7 | Section15.225(e) ----- <IC> RSS-210 A2.6 | See data | Complied | Radiated |

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 (7V DC) constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

| No. | 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 | | | | | | |
|--------------------------------------|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
| | (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 | 4.3dB | 5.0dB | 5.1dB | 4.9dB | 5.8dB | 4.4dB | 4.3dB |
| No.2 | 4.3dB | 5.2dB | 5.1dB | 5.0dB | 5.7dB | 4.3dB | 4.2dB |
| No.3 | 4.6dB | 5.0dB | 5.1dB | 5.0dB | 5.7dB | 4.5dB | 4.2dB |
| No.4 | 4.8dB | 5.2dB | 5.0dB | 5.0dB | 5.7dB | 5.2dB | 4.2dB |

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

| Frequency counter (+) | |
|-----------------------|--------------------|
| Normal condition | Extreme condition |
| 7×10^{-6} | 9×10^{-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.

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3.5 Test Location

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

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

3.6 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 :

| Mode | Remarks* |
|---|-------------------------|
| Transmitting mode (Tx 13.56MHz) | With Tag Without tag |
| The EUT was operated in a manner similar to typical use during the tests. | |

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

Frequency Tolerance:

Temperature : -30deg.C to +50deg.C Step 10deg.C (-30deg.C: Reference)
Voltage : Normal Voltage DC 24V
Maximum Voltage DC 26.4V
Minimum Voltage DC 20.4V (DC 24V +10%, -15%)

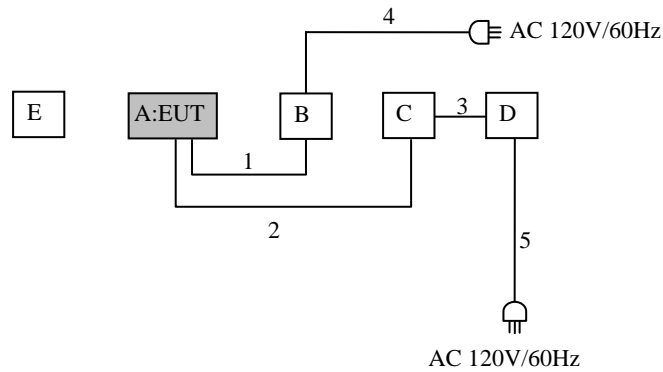
*This EUT provides stable voltage(7V DC) constantly to RF Part regardless of input voltage

* Since it is recommended in the user manual that AC Cable with six ferrite cores attached is used for DC power supply, the test was performed using AC Cable with six ferrite cores attached.

However, Conducted emission test was performed with AC Cable (for DC power supply) without ferrite cores, because the power is supplied to the EUT from DC power supply and also it cannot be judged that there is no influence of ferrite cores.

4.2 Configuration and peripherals

[Conducted Emission]



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

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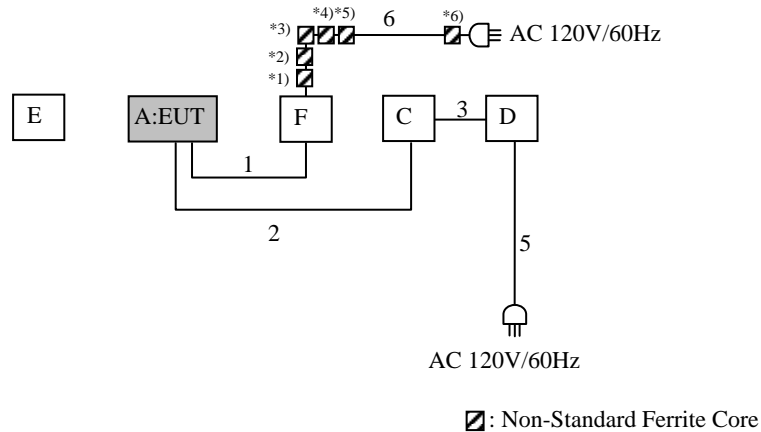
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[Radiated Emission]



*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 | RFID System | V680S-HMD64-ETN | 11 *1) 9 *2) | OMRON Corporation | EUT |
| B | DC Power Supply | 6654A | MY40000510 | Agilent | - |
| C | Switching Hub | W4S1-05B | 03207002 | OMRON Corporation | - |
| D | Power Supply | S8VS-03024 | 30 | OMRON Corporation | - |
| E | RFID Tag | - | 9 | OMRON Corporation | - |
| F | Power Supply | S8VS-03024 | 9X12M | OMRON Corporation | - |

List of cables used

| No. | Name | Length (m) | Shield | | Remark |
|-----|-----------|------------|------------|------------|--------|
| | | | Cable | Connector | |
| 1 | DC Cable | 2.0 | Unshielded | Unshielded | - |
| 2 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 3 | DC Cable | 0.1 | Unshielded | Unshielded | - |
| 4 | AC Cable | 2.0 | Unshielded | Unshielded | - |
| 5 | AC Cable | 2.0 | Unshielded | Unshielded | - |
| 6 | AC Cable | 1.6 | Unshielded | Unshielded | - |

*1) Used for Antenna 500ohm terminated on Conducted emission test.

*2) Used for other tests except for Antenna 500ohm terminated on Conducted emission test.

<Notes for Ferrite cores>

*1) 1 Ferrite Core, Model No. ZCAT2032-0930 (Manufacturer: TDK), 2cm from Item F, 1 turn

*2) 1 Ferrite Core, Model No. E04SR200932 (Manufacturer: SEIWA), 0cm from Core *1), 1 turn

*3) 1 Ferrite Core, Model No. E04SR200932 (Manufacturer: SEIWA), 0cm from Core *2), 1 turn

*4) 1 Ferrite Core, Model No. E04SR301334 (Manufacturer: SEIWA), 0cm from Core *3), 1 turn

*5) 1 Ferrite Core, Model No. E04SR301334 (Manufacturer: SEIWA), 0cm from Core *4), 1 turn

*6) 1 Ferrite Core, Model No. E04SR211132 (Manufacturer: SEIWA), 0cm from AC Connector, 1 turn

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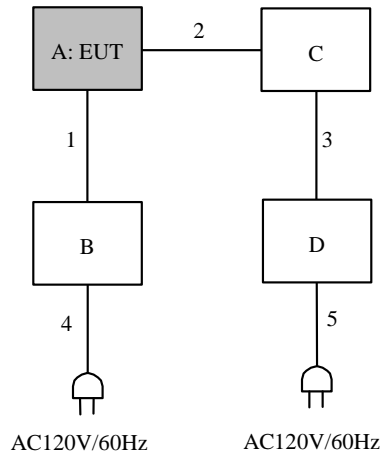
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[Frequency Tolerance]



* 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 |
|-----|---------------|-----------------|---------------|-------------------|---------|
| A | RFID System | V680S-HMD64-ETN | 11 | OMRON Corporation | EUT |
| B | Power Supply | PAB70-1 | 30046240 | KIKUSUI | - |
| C | Switching Hub | W4S1-05B | 03207002 | OMRON Corporation | - |
| D | Power Supply | S8VS-03024 | 30 | OMRON Corporation | - |

List of cables used

| No. | Name | Length (m) | Shield | | Remark |
|-----|-----------|------------|------------|------------|--------|
| | | | Cable | Connector | |
| 1 | DC Cable | 3.5 | Unshielded | Unshielded | - |
| 2 | LAN Cable | 2.0 | Shielded | Shielded | - |
| 3 | DC Cable | 0.1 | Unshielded | Unshielded | - |
| 4 | AC Cable | 2.0 | Unshielded | Unshielded | - |
| 5 | AC Cable | 2.0 | Unshielded | Unshielded | - |

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SECTION 5: Conducted emission

5.1 Operating environment

Test place : No.3 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 : Continuous Transmitting

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 CISPR AV
IF Bandwidth : 9kHz

5.5 Test result

Summary of the test results : Pass

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

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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 | Above 1GHz |
| Antenna Type | Loop | Biconical | Logperiodic | Horn |

| | | | | | | | |
|-----------------|--|----------------------|-----------------------|----------------------|--------------------|------------------------|------------------------|
| 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 | Above 1GHz | |
| Instrument used | Test Receiver | | | | | Spectrum Analyzer | |
| Detector | PK/AV | QP | PK/AV | QP | QP | PK | AV |
| IF Bandwidth | 200Hz | 200Hz | 9kHz | 9kHz | 120kHz | RBW: 1MHz VBW: 3MHz | RBW: 1MHz VBW: 10Hz |

- 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.

* 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 : **0.009M-1GHz**
Test data : **APPENDIX**
Test result : **Pass**

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SECTION 7: Other test

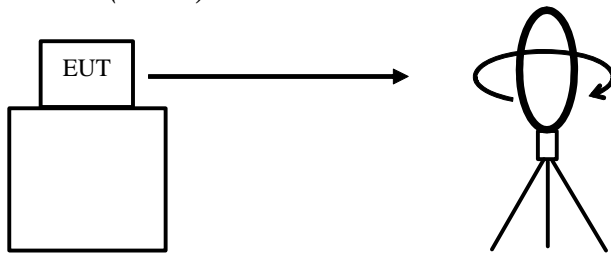
| Test | Span | RBW | VBW | Sweep | Detector | Trace | Instrument used |
|------------------------|--|-----------------|--------------------|-------|----------|--------------|-------------------|
| 20dB Bandwidth | 3MHz | 30kHz | 91kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | 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%.

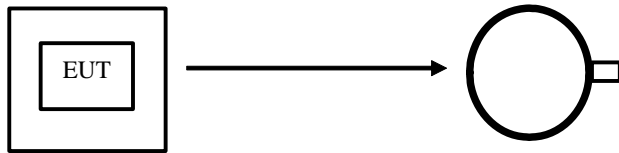
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

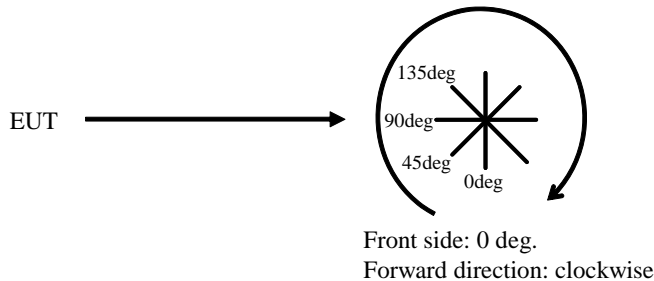


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



APPENDIX 1: Data of EMI test

Conducted emission

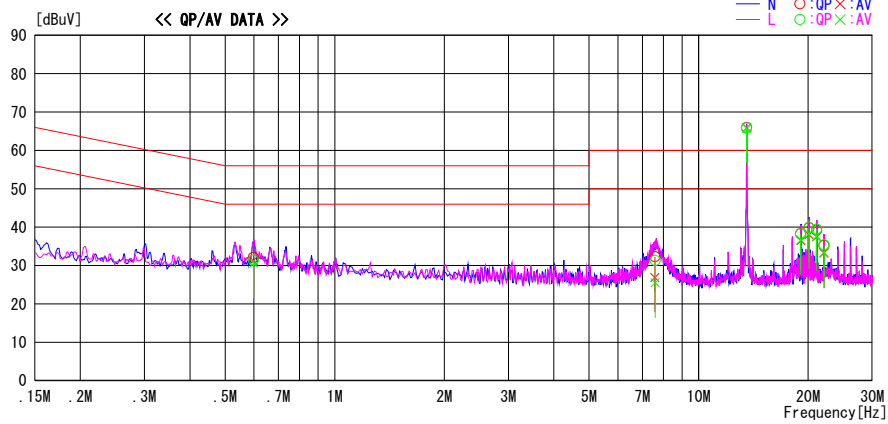
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2013/03/07

Report No. : 10006371H
Temp./Humi. : 20deg. C / 32% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, without Tag.

LIMIT : FCC15. 207 QP
FCC15. 207 AV



| Frequency [MHz] | Reading Level | | Corr. Factor | Results | | Limit | | Margin | | Phase | Comment |
|--------------------|---------------|--------------|-----------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | | |
| 0.59798 | 18.8 | 17.9 | 13.3 | 32.1 | 31.2 | 56.0 | 46.0 | 23.9 | 14.8 | N | |
| 7.57936 | 18.4 | 13.0 | 13.9 | 32.3 | 26.9 | 60.0 | 50.0 | 27.7 | 23.1 | N | |
| 13.56000 | 51.5 | 51.5 | 14.4 | 65.9 | 65.9 | 60.0 | 50.0 | - | - | N | |
| 19.08882 | 23.6 | 21.8 | 14.7 | 38.3 | 36.5 | 60.0 | 50.0 | 21.7 | 13.5 | N | |
| 20.09564 | 25.1 | 23.4 | 14.7 | 39.8 | 38.1 | 60.0 | 50.0 | 20.2 | 11.9 | N | |
| 21.10076 | 24.5 | 22.8 | 14.7 | 39.2 | 37.5 | 60.0 | 50.0 | 20.8 | 12.5 | N | |
| 22.10928 | 20.5 | 18.5 | 14.7 | 35.2 | 33.2 | 60.0 | 50.0 | 24.8 | 16.8 | N | |
| 0.59840 | 18.1 | 17.3 | 13.3 | 31.4 | 30.6 | 56.0 | 46.0 | 24.6 | 15.4 | L | |
| 7.59506 | 17.4 | 11.6 | 13.9 | 31.3 | 25.5 | 60.0 | 50.0 | 28.7 | 24.5 | L | |
| 13.56000 | 51.4 | 51.4 | 14.4 | 65.8 | 65.8 | 60.0 | 50.0 | - | - | L | |
| 19.09721 | 23.5 | 22.0 | 14.7 | 38.2 | 36.7 | 60.0 | 50.0 | 21.8 | 13.3 | L | |
| 20.10152 | 25.2 | 23.5 | 14.7 | 39.9 | 38.2 | 60.0 | 50.0 | 20.1 | 11.8 | L | |
| 21.10948 | 24.8 | 22.9 | 14.7 | 39.5 | 37.6 | 60.0 | 50.0 | 20.5 | 12.4 | L | |
| 22.11184 | 20.7 | 18.7 | 14.7 | 35.4 | 33.4 | 60.0 | 50.0 | 24.6 | 16.6 | L | |

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING[dBuV]+C.F[dB] (LISN 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

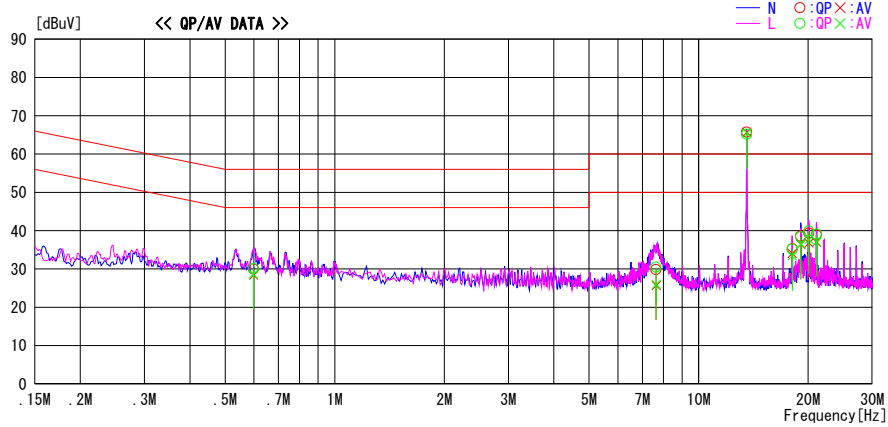
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2013/03/07

Report No. : 10006371H
 Temp./Humi. : 20deg. C / 32% RH
 Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, with Tag.

LIMIT : FCC15.207 QP
 FCC15.207 AV



| Frequency [MHz] | Reading | | Corr. Factor | Results | | Limit | | Margin | | Phase | Comment |
|--------------------|--------------|--------------|-----------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | | |
| 0.59878 | 16.7 | 15.1 | 13.3 | 30.0 | 28.4 | 56.0 | 46.0 | 26.0 | 17.6 | N | |
| 7.64197 | 15.9 | 11.8 | 13.9 | 29.8 | 25.7 | 60.0 | 50.0 | 30.2 | 24.3 | N | |
| 13.56000 | 51.3 | 51.3 | 14.4 | 65.7 | 65.7 | 60.0 | 50.0 | - | - | N | |
| 18.08140 | 20.7 | 19.5 | 14.6 | 35.3 | 34.1 | 60.0 | 50.0 | 24.7 | 15.9 | N | |
| 19.08604 | 23.9 | 21.7 | 14.7 | 38.6 | 36.4 | 60.0 | 50.0 | 21.4 | 13.6 | N | |
| 20.08764 | 24.7 | 22.1 | 14.7 | 39.4 | 36.8 | 60.0 | 50.0 | 20.6 | 13.2 | N | |
| 21.09260 | 24.2 | 22.3 | 14.7 | 38.9 | 37.0 | 60.0 | 50.0 | 21.1 | 13.0 | N | |
| 0.59778 | 16.8 | 15.3 | 13.3 | 30.1 | 28.6 | 56.0 | 46.0 | 25.9 | 17.4 | L | |
| 7.64079 | 16.6 | 12.1 | 13.9 | 30.5 | 26.0 | 60.0 | 50.0 | 29.5 | 24.0 | L | |
| 13.56000 | 50.8 | 51.1 | 14.4 | 65.2 | 65.5 | 60.0 | 50.0 | - | - | L | |
| 18.08088 | 20.6 | 18.8 | 14.6 | 35.2 | 33.4 | 60.0 | 50.0 | 24.8 | 16.6 | L | |
| 19.08244 | 23.7 | 21.8 | 14.7 | 38.4 | 36.5 | 60.0 | 50.0 | 21.6 | 13.5 | L | |
| 20.08497 | 25.2 | 23.0 | 14.7 | 39.9 | 37.7 | 60.0 | 50.0 | 20.1 | 12.3 | L | |
| 21.09444 | 24.4 | 22.4 | 14.7 | 39.1 | 37.1 | 60.0 | 50.0 | 20.9 | 12.9 | L | |

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT [dBuV] = READING [dBuV] + C.F [dB] (LISN 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

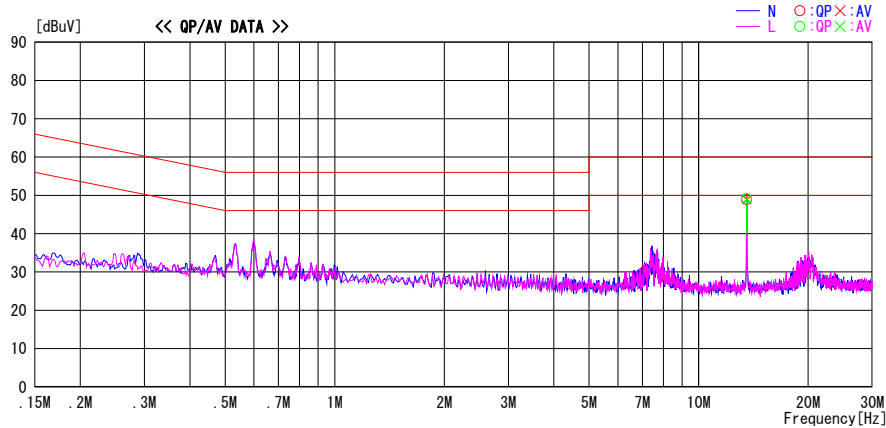
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2013/03/07

Report No. : 10006371H
 Temp./Humi. : 20deg. C / 32% RH
 Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, without Tag. Antenna 50ohm terminated.

LIMIT : FCC15.207 QP
FCC15.207 AV



| Frequency [MHz] | Reading Level | | Corr. Factor [dB] | Results | | Limit | | Margin | | Phase | Comment |
|--------------------|---------------|--------------|-------------------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | | |
| 13.56000 | 34.5 | 34.5 | 14.4 | 48.9 | 48.9 | 60.0 | 50.0 | 11.1 | 1.1 | N | |
| 13.56000 | 34.7 | 34.7 | 14.4 | 49.1 | 49.1 | 60.0 | 50.0 | 10.9 | 0.9 | L | |

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT [dBuV] = READING [dBuV] + C.F [dB] (LISN 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.

UL Japan, Inc.

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Fundamental emission and Spectrum Mask
(Precheck)

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/03/06

Report No. : 10006371H
Temp. / Humi. : 21deg. C / 35% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 13.56MHz Worst axis Z , without Tag

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, other: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] | |
| 13.56000 | 64.5 | QP | 19.3 | 7.1 | 32.3 | 58.6 | 123.9 | 65.3 | 0 | 82 | X |
| 13.56000 | 60.2 | QP | 19.3 | 7.1 | 32.3 | 54.3 | 123.9 | 69.6 | 45 | 110 | X |
| 13.56000 | 56.3 | QP | 19.3 | 7.1 | 32.3 | 50.4 | 123.9 | 73.5 | 90 | 178 | X |
| 13.56000 | 75.1 | QP | 19.3 | 7.1 | 32.3 | 69.2 | 123.9 | 54.7 | 0 | 1 | Y |
| 13.56000 | 75.4 | QP | 19.3 | 7.1 | 32.3 | 69.5 | 123.9 | 54.4 | 0 | 359 | Z* |
| 13.56000 | 63.0 | QP | 19.3 | 7.1 | 32.3 | 57.1 | 123.9 | 66.8 | 135 | 140 | X |
| 13.56000 | 73.4 | QP | 19.3 | 7.1 | 32.3 | 67.5 | 123.9 | 56.4 | 135 | 143 | Y |
| 13.56000 | 73.4 | QP | 19.3 | 7.1 | 32.3 | 67.5 | 123.9 | 56.4 | 135 | 201 | Z |
| 13.56000 | 73.4 | QP | 19.3 | 7.1 | 32.3 | 67.5 | 123.9 | 56.4 | 45 | 344 | Y |
| 13.56000 | 73.9 | QP | 19.3 | 7.1 | 32.3 | 68.0 | 123.9 | 55.9 | 45 | 292 | Z |
| 13.56000 | 71.1 | QP | 19.3 | 7.1 | 32.3 | 65.2 | 123.9 | 58.7 | 90 | 288 | Y |
| 13.56000 | 71.4 | QP | 19.3 | 7.1 | 32.3 | 65.5 | 123.9 | 58.4 | 90 | 282 | Z |
| 13.56000 | 64.6 | QP | 19.3 | 7.1 | 32.3 | 58.7 | 123.9 | 65.2 | 90 | 55 | X, Hori |
| 13.56000 | 64.8 | QP | 19.3 | 7.1 | 32.3 | 58.9 | 123.9 | 65.0 | 90 | 359 | Y, Hori |
| 13.56000 | 64.9 | QP | 19.3 | 7.1 | 32.3 | 59.0 | 123.9 | 64.9 | 90 | 359 | Z, Hori |
| 13.56000 | 75.2 | QP | 19.3 | 7.1 | 32.3 | 69.3 | 123.9 | 54.6 | 0 | 359 | Z, with Tag |

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

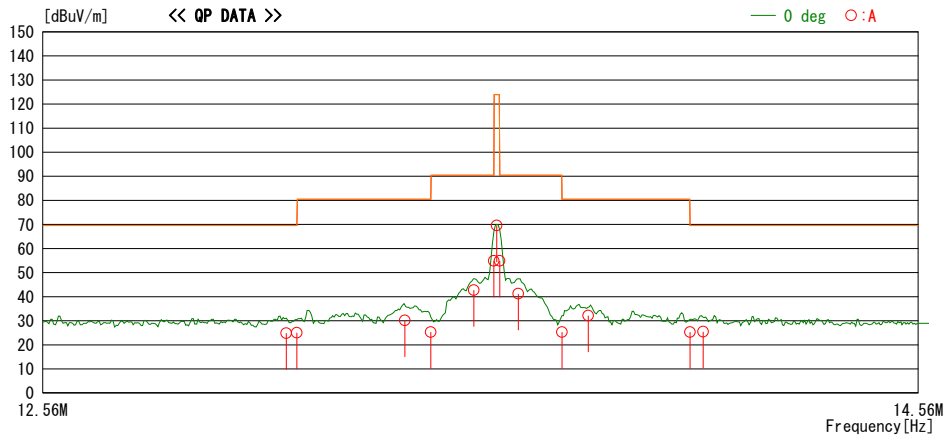
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/03/06

Report No. : 10006371H
 Temp. / Humi. : 21deg. C / 35% RH
 Engineer : Hiroshi Kukita

Mode / Remarks : Tx 13.56MHz Worst axis Z , without Tag

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
 FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, other: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] | |
| 13.08680 | 30.8 | QP | 19.3 | 7.0 | 32.3 | 24.8 | 69.5 | 44.7 | 0 | A | 359 |
| 13.11000 | 31.0 | QP | 19.3 | 7.0 | 32.3 | 25.0 | 69.5 | 44.5 | 0 | A | 359 |
| 13.35160 | 36.0 | QP | 19.3 | 7.1 | 32.3 | 30.1 | 80.5 | 50.4 | 0 | A | 359 |
| 13.41000 | 31.2 | QP | 19.3 | 7.1 | 32.3 | 25.3 | 80.5 | 55.2 | 0 | A | 359 |
| 13.50732 | 48.7 | QP | 19.3 | 7.1 | 32.3 | 42.8 | 90.4 | 47.6 | 0 | A | 359 |
| 13.55300 | 60.8 | QP | 19.3 | 7.1 | 32.3 | 54.9 | 90.4 | 35.5 | 0 | A | 359 |
| 13.56000 | 75.4 | QP | 19.3 | 7.1 | 32.3 | 69.5 | 123.9 | 54.4 | 0 | A | 359 |
| 13.56700 | 60.7 | QP | 19.3 | 7.1 | 32.3 | 54.8 | 90.4 | 35.6 | 0 | A | 359 |
| 13.60980 | 47.1 | QP | 19.3 | 7.1 | 32.3 | 41.2 | 90.4 | 49.2 | 0 | A | 359 |
| 13.71000 | 31.2 | QP | 19.3 | 7.1 | 32.3 | 25.3 | 80.5 | 55.2 | 0 | A | 359 |
| 13.77141 | 38.1 | QP | 19.3 | 7.1 | 32.3 | 32.2 | 80.5 | 48.3 | 0 | A | 359 |
| 14.01000 | 31.2 | QP | 19.3 | 7.1 | 32.3 | 25.3 | 69.5 | 44.2 | 0 | A | 359 |
| 14.04080 | 31.3 | QP | 19.3 | 7.1 | 32.3 | 25.4 | 69.5 | 44.1 | 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

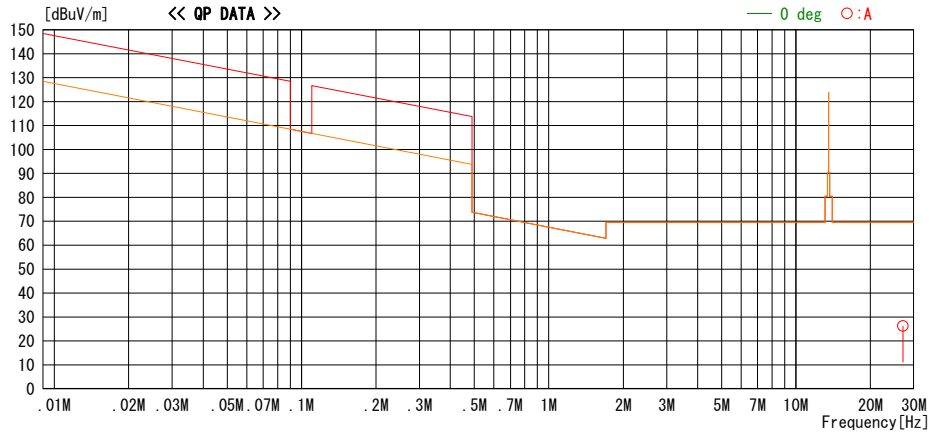
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/03/06

Report No. : 10006371H
 Temp./Humi. : 21deg. C / 35% RH
 Engineer : Hiroshi Kukita

Mode / Remarks : Tx 13.56MHz Worst axis Z , without Tag

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
 FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, other: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 | 30.0 | QP | 20.9 | 7.5 | 32.2 | 26.2 | 69.5 | 43.3 | 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.)

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Spurious emission

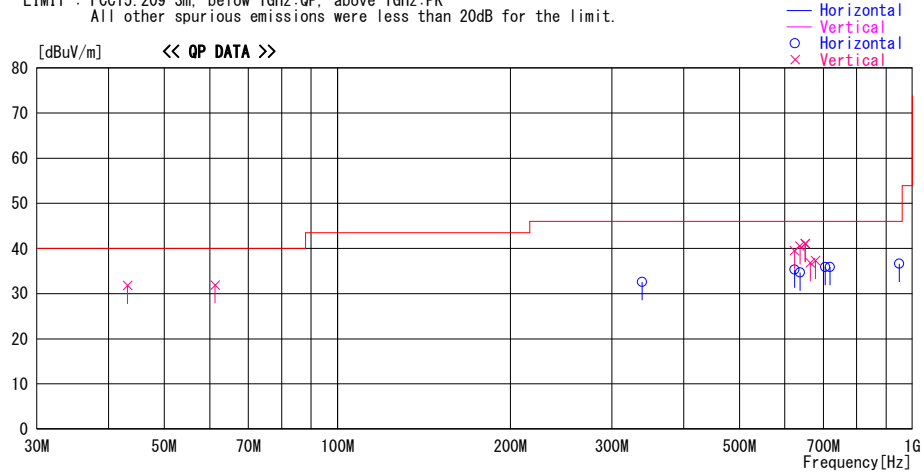
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/03/06

Report No. : 10006371H
Temp./Humi. : 21deg. C / 35% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 13.56MHz, Worst axis Hori X axis, Ver : Z axis, with Tag

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



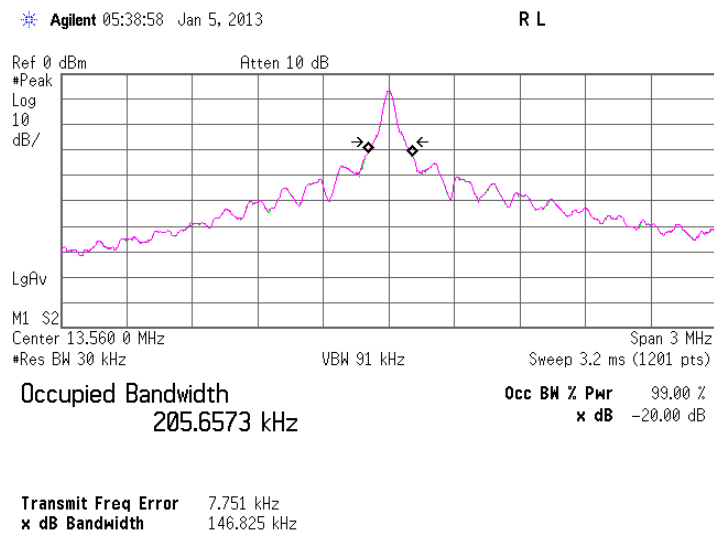
| Frequency [MHz] | Reading [dBuV] | DET | Antenna | | Level [dBuV/m] | Angle [Deg] | Height [cm] | Polar. | Limit [dBuV/m] | Margin [dB] | Comment |
|--------------------|-------------------|-----|------------------|--------------------|-------------------|----------------|----------------|--------|-------------------|----------------|-------------|
| | | | Factor [dB/m] | Loss& Gain [dB] | | | | | | | |
| 43.180 | 40.4 | QP | 13.1 | -21.7 | 31.8 | 198 | 100 | Vert. | 40.0 | 8.2 | |
| 61.272 | 45.6 | QP | 7.8 | -21.5 | 31.9 | 255 | 100 | Vert. | 40.0 | 8.1 | |
| 339.000 | 36.0 | QP | 15.4 | -18.8 | 32.6 | 51 | 100 | Hori. | 46.0 | 13.4 | |
| 623.760 | 34.1 | QP | 19.5 | -18.3 | 35.3 | 227 | 189 | Hori. | 46.0 | 10.7 | |
| 623.760 | 38.3 | QP | 19.5 | -18.3 | 39.5 | 187 | 100 | Vert. | 46.0 | 6.5 | |
| 637.320 | 39.2 | QP | 19.6 | -18.3 | 40.5 | 36 | 100 | Vert. | 46.0 | 5.5 | |
| 637.320 | 33.4 | QP | 19.6 | -18.3 | 34.7 | 350 | 302 | Hori. | 46.0 | 11.3 | |
| 650.880 | 39.4 | QP | 19.8 | -18.1 | 41.1 | 210 | 100 | Vert. | 46.0 | 4.9 | |
| 650.880 | 39.3 | QP | 19.8 | -18.1 | 41.0 | 210 | 100 | Vert. | 46.0 | 5.0 | without Tag |
| 664.440 | 35.0 | QP | 19.9 | -18.1 | 36.8 | 35 | 100 | Vert. | 46.0 | 9.2 | |
| 678.000 | 35.2 | QP | 20.0 | -17.9 | 37.3 | 122 | 100 | Vert. | 46.0 | 8.7 | |
| 705.125 | 33.3 | QP | 20.3 | -17.7 | 35.9 | 354 | 186 | Hori. | 46.0 | 10.1 | |
| 718.679 | 33.0 | QP | 20.6 | -17.7 | 35.9 | 69 | 232 | Hori. | 46.0 | 10.1 | |
| 949.200 | 30.0 | QP | 22.8 | -16.2 | 36.6 | 101 | 100 | Hori. | 46.0 | 9.4 | |

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 and 99% Occupied Bandwidth

| | |
|-----------------------|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber |
| Report No. | 10006371H |
| Date | 03/06/2013 |
| Temperature/ Humidity | 21 deg.C / 35% RH |
| Engineer | Hiroshi Kukita |
| Mode | Tx Mod on with Tag |

| FREQ [MHz] | 20dB Bandwidth [kHz] | 99% Occupied Bandwidth [kHz] |
|---------------|-------------------------|---------------------------------|
| 13.56 | 146.83 | 205.66 |



Frequency Tolerance

Test place : Head Office EMC Lab. No.6 measurement room
Report No. : 10006371H
Date : 03/12/2013
Temperature/ Humidity : 23 deg. C / 46% RH
Engineer : Kazuya Yoshioka
Mode : Tx Mod off

| Test Condition | | Test Timing | Measured freq | Freq error | Result | Limit | Margin |
|----------------|-----------|-------------|---------------|-------------|--------|--------------------------|--------|
| deg.C | Volts | | [MHz] | [MHz] | [ppm] | (+/- 0.01%) [+/- ppm] | [ppm] |
| 20deg.C | 20.4V | Power on | 13.56001450 | 0.00001450 | 1.07 | 100.00 | 98.93 |
| | | on 2min. | 13.56001210 | 0.00001210 | 0.89 | 100.00 | 99.11 |
| | | on 5min. | 13.56000930 | 0.00000930 | 0.69 | 100.00 | 99.31 |
| | 24V | on 10min. | 13.56000670 | 0.00000670 | 0.49 | 100.00 | 99.51 |
| | | Power on | 13.56001160 | 0.00001160 | 0.86 | 100.00 | 99.14 |
| | | on 2min. | 13.56001020 | 0.00001020 | 0.75 | 100.00 | 99.25 |
| | 27.6V | on 5min. | 13.56000690 | 0.00000690 | 0.51 | 100.00 | 99.49 |
| | | on 10min. | 13.56000430 | 0.00000430 | 0.32 | 100.00 | 99.68 |
| | | Power on | 13.56001050 | 0.00001050 | 0.77 | 100.00 | 99.23 |
| | | on 2min. | 13.56000720 | 0.00000720 | 0.53 | 100.00 | 99.47 |
| | | on 5min. | 13.56000420 | 0.00000420 | 0.31 | 100.00 | 99.69 |
| | | on 10min. | 13.56000210 | 0.00000210 | 0.15 | 100.00 | 99.85 |
| 50deg.C. | 24V | Power on | 13.55999040 | -0.00000960 | -0.71 | 100.00 | 99.29 |
| on 2min. | | 13.55997940 | -0.00002060 | -1.52 | 100.00 | 98.48 | |
| on 5min. | | 13.55997570 | -0.00002430 | -1.79 | 100.00 | 98.21 | |
| on 10min. | | 13.55997170 | -0.00002830 | -2.09 | 100.00 | 97.91 | |
| 40deg.C. | | Power on | 13.56004000 | 0.00004000 | 2.95 | 100.00 | 97.05 |
| 30deg.C. | | on 2min. | 13.55999430 | -0.00000570 | -0.42 | 100.00 | 99.58 |
| | | on 5min. | 13.55998780 | -0.00001220 | -0.90 | 100.00 | 99.10 |
| | | on 10min. | 13.55998360 | -0.00001640 | -1.21 | 100.00 | 98.79 |
| 20deg.C. | | Power on | 13.56001310 | 0.00001310 | 0.97 | 100.00 | 99.03 |
| | | on 2min. | 13.56000870 | 0.00000870 | 0.64 | 100.00 | 99.36 |
| | | on 5min. | 13.56000250 | 0.00000250 | 0.18 | 100.00 | 99.82 |
| 10deg.C. | | on 10min. | 13.55999790 | -0.00000210 | -0.15 | 100.00 | 99.85 |
| | | Power on | 13.56001160 | 0.00001160 | 0.86 | 100.00 | 99.14 |
| | | on 2min. | 13.56001020 | 0.00001020 | 0.75 | 100.00 | 99.25 |
| 0deg.C. | | on 5min. | 13.56000690 | 0.00000690 | 0.51 | 100.00 | 99.49 |
| | | on 10min. | 13.56000430 | 0.00000430 | 0.32 | 100.00 | 99.68 |
| | | Power on | 13.56001180 | 0.00001180 | 0.87 | 100.00 | 99.13 |
| -10deg.C. | | on 2min. | 13.56001480 | 0.00001480 | 1.09 | 100.00 | 98.91 |
| | | on 5min. | 13.56001500 | 0.00001500 | 1.11 | 100.00 | 98.89 |
| | | on 10min. | 13.56001420 | 0.00001420 | 1.05 | 100.00 | 98.95 |
| -20deg.C. | | Power on | 13.56000910 | 0.00000910 | 0.67 | 100.00 | 99.33 |
| | | on 2min. | 13.56001100 | 0.00001100 | 0.81 | 100.00 | 99.19 |
| | | on 5min. | 13.56001500 | 0.00001500 | 1.11 | 100.00 | 98.89 |
| -30deg.C. | | on 10min. | 13.56001520 | 0.00001520 | 1.12 | 100.00 | 98.88 |
| | Power on | 13.56000220 | 0.00000220 | 0.16 | 100.00 | 99.84 | |
| | on 2min. | 13.56000780 | 0.00000780 | 0.58 | 100.00 | 99.42 | |
| | on 5min. | 13.56001060 | 0.00001060 | 0.78 | 100.00 | 99.22 | |
| | on 10min. | 13.56001490 | 0.00001490 | 1.10 | 100.00 | 98.90 | |
| | Power on | 13.55999090 | -0.00000910 | -0.67 | 100.00 | 99.33 | |
| | on 2min. | 13.56000080 | 0.00000080 | 0.06 | 100.00 | 99.94 | |
| | on 5min. | 13.56000700 | 0.00000700 | 0.52 | 100.00 | 99.48 | |
| | on 10min. | 13.56000970 | 0.00000970 | 0.72 | 100.00 | 99.28 | |
| | Power on | 13.55997870 | -0.00002130 | -1.57 | 100.00 | 98.43 | |
| | on 2min. | 13.55999050 | -0.00000950 | -0.70 | 100.00 | 99.30 | |
| | on 5min. | 13.55999860 | -0.00000140 | -0.10 | 100.00 | 99.90 | |
| | | on 10min. | 13.56000320 | 0.00000320 | 0.24 | 100.00 | 99.76 |

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

*The test was begun from 50 deg.C and the temperature was lowered each 10 deg.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 | RE | 2012/06/29 * 12 |
| MOS-22 | Thermo-Hygrometer | Custom | CTH-201 | 0003 | RE | 2013/02/26 * 12 |
| MJM-14 | Measure | KOMELON | KMC-36 | - | RE | - |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | RE | - |
| MSA-04 | Spectrum Analyzer | Agilent | E4448A | US44300523 | RE | 2012/04/06 * 12 |
| MTR-03 | Test Receiver | Rohde & Schwarz | ESCI | 100300 | RE | 2012/04/03 * 12 |
| MBA-02 | Biconical Antenna | Schwarzbeck | BBA9106 | VHA91032008 | RE | 2012/10/08 * 12 |
| MLA-02 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 201 | RE | 2012/10/08 * 12 |
| MCC-12 | Coaxial Cable | Fujikura/Agilent | - | - | RE | 2013/02/06 * 12 |
| MAT-07 | Attenuator(6dB) | Weinschel Corp | 2 | BK7970 | RE | 2012/11/06 * 12 |
| MPA-09 | Pre Amplifier | Agilent | 8447D | 2944A10845 | RE | 2012/09/11 * 12 |
| MAEC-03 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-10005 | CE | 2013/02/28 * 12 |
| MOS-13 | Thermo-Hygrometer | Custom | CTH-180 | - | CE | 2013/02/26 * 12 |
| MJM-16 | Measure | KOMELON | KMC-36 | - | CE | - |
| MSA-04 | Spectrum Analyzer | Agilent | E4448A | US44300523 | CE | 2012/04/06 * 12 |
| MTR-08 | Test Receiver | Rohde & Schwarz | ESCI | 100767 | CE | 2012/08/23 * 12 |
| MCC-112 | Coaxial cable | Fujikura/Suhner/TSJ | 5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher) | -/00640 | CE | 2012/07/12 * 12 |
| MAT-66 | Attenuator(13dB) | JFW Industries, Inc. | 50FP-013H2 N | - | CE | 2013/01/22 * 12 |
| MLS-02 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127383 | CE | 2012/07/17 * 12 |
| MLS-01 | LISN(AMN) | Schwarzbeck | NNLK8121 | 8121432 | CE | 2012/04/11 * 12 |
| MTA-31 | Terminator | TME | CT-01 | - | CE | 2013/01/21 * 12 |
| MLPA-01 | Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100017 | RE | 2012/10/12 * 12 |
| MCC-13 | Coaxial Cable | Fujikura | 3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m) | - | RE | 2013/02/06 * 12 |
| MCC-143 | Coaxial Cable | UL Japan | - | - | RE | 2012/07/27 * 12 |
| MPA-13 | Pre Amplifier | SONOMA INSTRUMENT | 310 | 260834 | RE | 2012/03/16 * 12 |
| MFC-01 | Microwave Counter | Advantest | R5373 | 120100309 | FT | 2012/08/16 * 12 |
| MCH-04 | Temperature and Humidity Chamber | Tabai Espec | PL-2KP | 14015723 | FT | 2012/08/01 * 12 |
| MLPA-03 | Loop Antenna | UL Japan | - | - | FT | Pre Check |

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

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