



RADIO TEST REPORT

Test Report No.: 32KE0063-SH-01-A

Applicant : Sony Corporation
Type of Equipment : Contactless IC Card Reader / Writer
Model No. : RC-S632/U
FCC ID : AK8RCS632U
Test regulation : FCC Part15 Subpart C: 2012
Test result : Complied

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Date of test: June 27 to July 8, 2012

Tested by: H. Shirasawa

Hikaru Shirasawa
Engineer of WiSE Japan,
UL Verification Service

Approved by : T. Amamura

Toyokazu Imamura
Leader of EMC Service,
UL Verification Service

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Sony EMCS Corporation Kisarazu Site
Brand Name : SONY
Address : 8-4 Shiomi Kisarazu-shi, Chiba, 292-0834 Japan
Telephone Number : +81-438-37-3982
Facsimile Number : +81-438-37-4705
Contact Person : Yuuki Fujiwara

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

2.1 Identification of E.U.T.

Type of Equipment : Contactless IC Card Reader / Writer
Model Number : RC-S632/U
Serial Number : Refer to clause 4.2
Rating : DC4.75 to 5.25V
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : June 27, 2012
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: RC-S632/U (referred to as the EUT in this report) is a Contactless IC Card Reader / Writer.

Clock frequency(ies) in the system : 27.12MHz, 16.00MHz

<Radio part>

Equipment type : Transceiver
Frequency of operation : 13.56MHz
Type of modulation : ASK
Antenna type : Loop
Antenna connector type : None
ITU code : A1D
Operation temperature range : 0 to +60 deg.C.

FCC 15.31 (e)

The RFID transmitter has a regulator which regulates the supplied voltage of DC 5V to DC 3.3V. Therefore, the equipment complies power supply regulation.

FCC Part 15.203

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

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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 May 17, 2012 and effective June 18, 2012

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. Refer to the test report: 32KE0063-SH-01-C.

3.2 Procedures & Results

| Item | Test Procedure | Specification | Remarks | Deviation | Worst Margin | Results |
|--|--|------------------------------|----------|-----------|--|----------|
| Conducted emission | ANSI C63.4:2009 7. AC powerline conducted emission measurements | FCC 15.207 | - | N/A | 6.2dB Freq: 27.12MHz Detector: Average Phase: N | Complied |
| Electric field strength of Fundamental emission | ANSI C63.4:2009 13. Measurement of intentional radiators | FCC 15.225 (a) | Radiated | N/A | 59.4dB Polarization: Vertical | Complied |
| Electric field strength of Outside the allocated bands | ANSI C63.4:2009 13. Measurement of intentional radiators | FCC 15.225 (b)(c) | Radiated | N/A | 39.5dB Freq: 13.349MHz Polarization: Vertical | Complied |
| Electric field strength of Spurious emission | ANSI C63.4:2009 13. Measurement of intentional radiators | FCC 15.209 FCC 15.225 (d) | Radiated | N/A | 3.1dB Freq: 40.68MHz Polarization: Vertical | Complied |
| 20dB bandwidth | ANSI C63.4:2009 13. Measurement of intentional radiators | FCC 15.215 (c) | Radiated | N/A | - | - |
| Frequency tolerance | ANSI C63.4:2009 13. Measurement of intentional radiators | FCC 15.225 (e) | Radiated | *1) | - | Complied |

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

*1) The temperature variation for testing was set to -30 to +60 deg.C, according to the customer's request.

3.3 Addition to standard

| Item | Test Procedure | Specification | Remarks | Worst Margin | Results |
|--------------------------|---|---------------|-----------|--------------|---------|
| Occupied Bandwidth (99%) | ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1 | 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 ^{*1} /SR ^{*2} (±) | No.2 SAC/SR (±) | No.3 SAC/SR (±) |
|---|-----------------|---|--------------------|--------------------|
| Conducted emission (AC Mains) AMN/LISN | 150kHz-30MHz | 3.6 dB | 3.6 dB | 3.6 dB |
| Radiated emission (Measurement distance: 3m) | 9kHz-30MHz | 3.7 dB | 3.7 dB | 3.6 dB |
| | 30MHz-300MHz | 4.9 dB | 5.1 dB | 4.9 dB |
| | 300MHz-1GHz | 5.0 dB | 5.2 dB | 4.9 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 site margin.

Radiated emission test

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

Frequency tolerance

Frequency (Normal condition) Measurement uncertainty for this test was: (±) 7.9×10^{-8} .

Frequency (Extreme condition) Measurement uncertainty for this test was: (±) 7.9×10^{-8} .

3.5 Test location

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JAB Accreditation No. : RTL02610

| | FCC Registration No. | IC Registration No. | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Maximum measurement distance |
|--|----------------------------|---------------------------|-------------------------------|---|------------------------------------|
| <input type="checkbox"/> No.1 Semi-anechoic chamber | 697847 | 2973D-1 | 20.6 x 11.3 x 7.65 | 20.6 x 11.3 | 10m |
| <input type="checkbox"/> No.2 Semi-anechoic chamber | 697847 | 2973D-2 | 20.6 x 11.3 x 7.65 | 20.6 x 11.3 | 10m |
| <input checked="" type="checkbox"/> No.3 Semi-anechoic chamber | 697847 | 2973D-3 | 12.7 x 7.7 x 5.35 | 12.7 x 7.7 | 5m |
| <input type="checkbox"/> No.4 Full-anechoic chamber | - | - | 8.1 x 5.1 x 3.55 | 8.1 x 5.1 | - |
| <input 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 checked="" 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 checked="" 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 | - |

3.6 Test setup, Data of EMI & 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

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

| Test item | Operating mode | Tested frequency |
|---|---|-------------------------|
| All items except for Frequency tolerances | Transmitting FeliCa 212kbps Request & Anticollision loop • Modulation ASK10% • Bit coding Manchester • Data transfer rate 212kbps | 13.56MHz |
| Frequency tolerances | Transmitting (Unmodulated) | 13.56MHz |

*EUT has the power settings by the software as follows;

Power settings: Setting is controlled by the firmware and cannot be changed.

Software: NFCPort-100Poll.exe version 0.6.5.0

- Parameter file(Modulated): Polling FeliCa.bat

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

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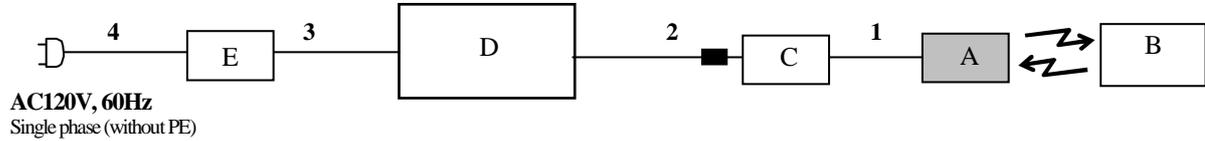
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4.2 Configuration and peripherals

■ : Ferrite core



* Test data was taken under worse case conditions.

Description of EUT and support equipment

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|-----|-------------------------------------|--------------|-------------------|--------------|------------------------------|
| A | Contactless IC Card Reader / Writer | RC-S632/U | 2990001 | Sony | EUT |
| B | IC Card | - | - | - | - |
| C | Jig | - | - | Sony | - |
| D | Laptop PC | NE576PA#ABJ | CNU8505G0D | HP | All test items except for CE |
| D' | Laptop PC | VGN-G1 | 28248610 1000006 | Sony | CE test only |
| E | AC Adapter | 493092-002 | F1-08101794990A | HP | All test items except for CE |
| E' | AC Adapter | VGP-AC16V6 | 147774951 0248745 | Sony | CE test only |

List of cables used *1)

| No. | Item | Length(m) | Shield | | Remarks |
|-----|------------|-----------|------------|------------|------------------------------|
| | | | Cable | Connector | |
| 1 | Flat Cable | 0.1 | Shielded | Shielded | - |
| 2 | USB | 0.1 | Shielded | Shielded | - |
| 3 | DC | 1.4 | Unshielded | Unshielded | All test items except for CE |
| 3' | DC | 1.8 | Unshielded | Unshielded | CE test only |
| 4 | AC | 1.7 | Unshielded | Unshielded | All test items except for CE |
| 4' | AC | 0.7 | Unshielded | Unshielded | CE test only |

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

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SECTION 5: Conducted emission

5.1 Operating environment

The test was carried out in No.3 shielded room.

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm 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 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. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.

Each EUT current-carrying power lead was individually connected through a LISN to the input power source.

Photographs of the set up are shown in Appendix 1.

5.3 Test conditions

Frequency range : 0.15 - 30MHz
EUT position : Table top
EUT operation mode : Refer to SECTION 4.1

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT via Laptop PC within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN).

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detection of the test receiver.

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

5.5 Results

Summary of the test results : Pass

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SECTION 6: Radiated emission (Fundamental, spurious and outside the allocated bands)

6.1 Operating environment

The test was carried out in No.3 semi-anechoic chamber.

Temperature : See test data (APPENDIX 2)

Humidity : See test data (APPENDIX 2)

6.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.

The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

Photographs of the set up are shown in Appendix 1.

6.3 Test conditions

Frequency range : 9kHz - 1GHz

Test distance : 3m

EUT position : Table top

EUT operation mode : Refer to SECTION 4.1

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3m (Refer to Figure 1).

Frequency: From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0deg.to 360deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 2.

Frequency: From 30MHz to 1GHz at distance 3m

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.

Measurements were performed with QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

| | | | | | |
|-------------------|-------------------------------------|--------------------|---------------------|--------------------|---|
| | 9kHz to 90kHz & 110kHz to 150kHz | 90kHz to 110kHz | 150kHz to 490kHz | 490kHz to 30MHz | 30MHz to 1GHz |
| Detector Type | PK/AV | QP | PK/AV | QP | QP |
| IF Bandwidth | 200Hz | 200Hz | 9kHz | 9kHz | 120kHz |
| Measuring antenna | Loop antenna | | | | Biconical (30-299.99MHz) Logperiodic (300MHz-1GHz) |

* FCC Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m]= [Limit at 300m]-40log (3[m]/300[m])

490kHz – 30MHz [Limit at 3m]= [Limit at 30m]-40log (3[m]/30[m])

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 axis: Refer to the data)

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6.5 Results

Summary of the test results : Pass
Refer to APPENDIX

Figure 1. Antenna angle

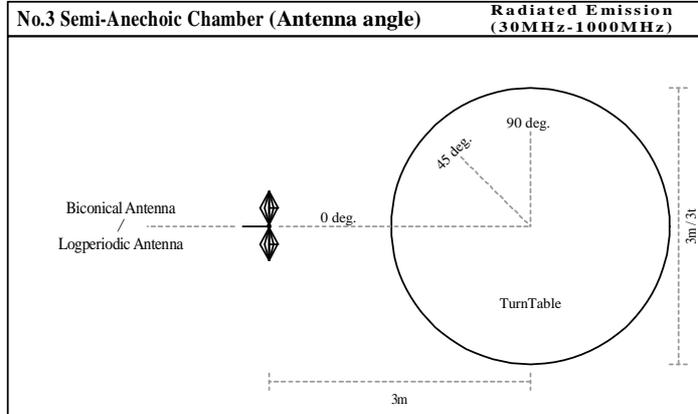
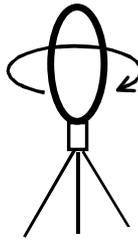
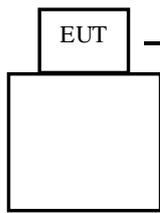


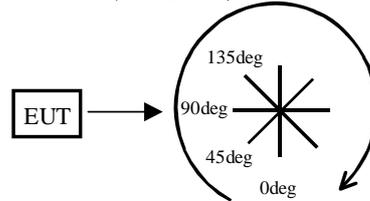
Figure 2. Direction of the Loop Antenna

Side View (Vertical)

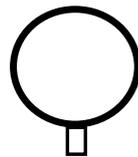
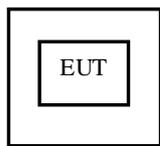


Front side: 0 deg.
Forward direction: clockwise

Side View (Horizontal)



Top View (Horizontal)



Antenna was not rotated.

SECTION 7: 20dB bandwidth & Occupied bandwidth (99%)

Test procedure

The test was measured with a spectrum analyzer using a test fixture.

Summary of the test results: Pass

SECTION 8: Frequency tolerances

Test procedure

The test was measured with a spectrum analyzer using a test fixture.

The temperature test was started after the temperature stabilization time of 30 minutes.

The test was begun from 60 deg.C and the temperature was lowered each 10 deg.C.

Summary of the test results: Pass

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Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

Conducted emission
Radiated emission
Frequency tolerance
Bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Conducted emission
Radiated emission

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DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2012/07/08

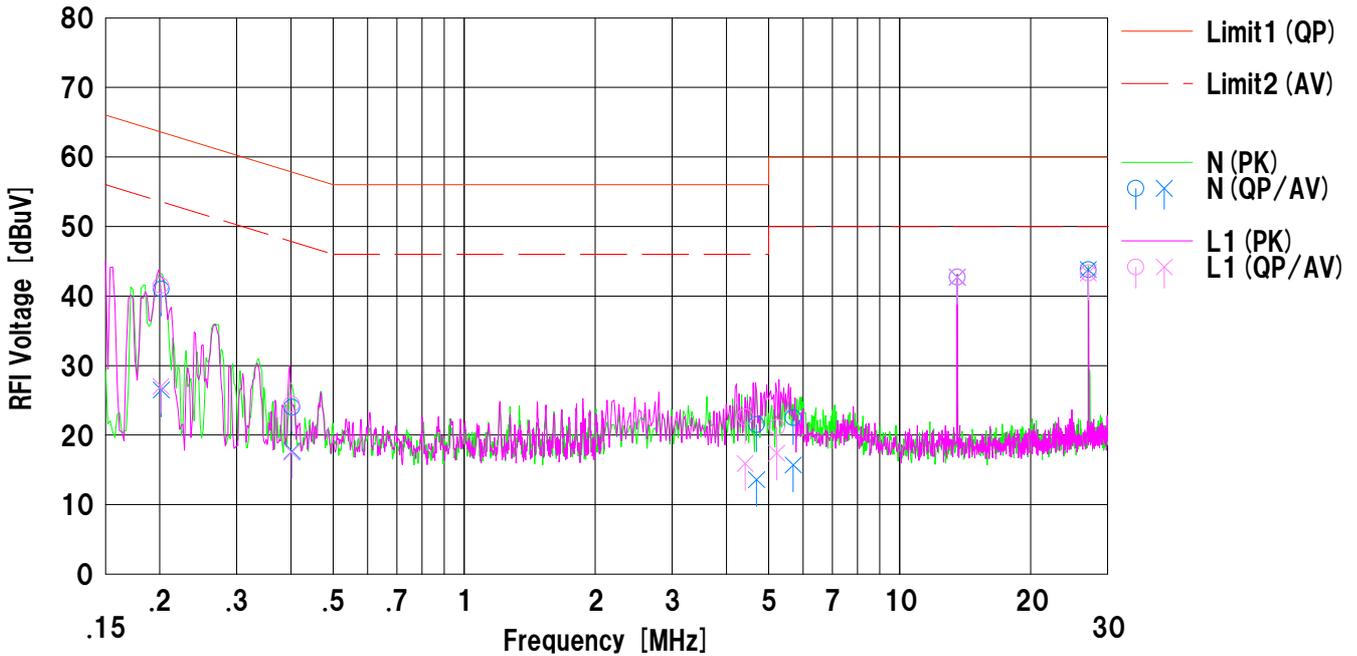
Company : Sony Corporation
Kind of EUT : Contactless IC Card Reader/Writer
Model No. : RC- 632/U
Serial No. : 2990001

Mode : Transmitting (13.56MHz)
Report No. : 32KE0063-SH-01-A
Power : DC5.0V (USB) ,AC120V/60Hz (LaptopPC)
Temp./Humi. : 26deg.C / 66%RH

Remarks : Felica,

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

Engineer : Kenichi Adachi



| No. | Freq. [MHz] | Reading | | C.Fac [dB] | Results | | Limit | | Margin | | Phase | Comment |
|-----|----------------|----------------|----------------|---------------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
| | | <QP> [dBuV] | <AV> [dBuV] | | <QP> [dBuV] | <AV> [dBuV] | <QP> [dBuV] | <AV> [dBuV] | <QP> [dB] | <AV> [dB] | | |
| 1 | 0.20154 | 28.3 | 13.8 | 12.7 | 41.0 | 26.5 | 63.5 | 53.5 | 22.5 | 27.0 | N | |
| 2 | 0.40260 | 11.3 | 5.0 | 12.7 | 24.0 | 17.7 | 57.7 | 47.7 | 33.7 | 30.0 | N | |
| 3 | 4.69140 | 8.6 | 0.7 | 12.9 | 21.5 | 13.6 | 56.0 | 46.0 | 34.5 | 32.4 | N | |
| 4 | 5.69768 | 9.5 | 2.7 | 13.0 | 22.5 | 15.7 | 60.0 | 50.0 | 37.5 | 34.3 | N | |
| 5 | 13.56000 | 29.4 | 29.4 | 13.3 | 42.7 | 42.7 | 60.0 | 50.0 | 17.3 | 7.3 | N | |
| 6 | 27.12000 | 30.0 | 30.0 | 13.8 | 43.8 | 43.8 | 60.0 | 50.0 | 16.2 | 6.2 | N | |
| 7 | 0.20114 | 28.8 | 14.3 | 12.7 | 41.5 | 27.0 | 63.5 | 53.5 | 22.0 | 26.5 | L1 | |
| 8 | 0.40150 | 11.7 | 4.8 | 12.7 | 24.4 | 17.5 | 57.8 | 47.8 | 33.4 | 30.3 | L1 | |
| 9 | 4.42130 | 9.7 | 3.0 | 12.9 | 22.6 | 15.9 | 56.0 | 46.0 | 33.4 | 30.1 | L1 | |
| 10 | 5.22103 | 8.2 | 4.5 | 12.9 | 21.1 | 17.4 | 60.0 | 50.0 | 38.9 | 32.6 | L1 | |
| 11 | 13.56000 | 29.4 | 29.4 | 13.3 | 42.7 | 42.7 | 60.0 | 50.0 | 17.3 | 7.3 | L1 | |
| 12 | 27.12000 | 29.5 | 29.5 | 13.8 | 43.3 | 43.3 | 60.0 | 50.0 | 16.7 | 6.7 | L1 | |

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-05

Data of Field Strength and Outside Field Strength: FCC15.225(a)(b)(c)

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| | | | |
|-------------|-------------------------------------|----------------|---------------------------|
| Company: | Sony Corporation | Regulation: | FCC Part15 SupartC 15.225 |
| Equipment: | Contactless IC Card Reader / Writer | Test Distance: | 3m |
| Model: | RC-S632/U | Date: | July 2, 2012 |
| Sample No.: | 2990001 | Temperature: | 23deg.C |
| Power: | DC5.0V(USB), AC120V/60Hz(Laptop PC) | Humidity: | 66% RH |
| Mode: | Transmitting 13.56MHz | ENGINEER: | Hikaru Shirasawa |

Remarks: Felica(Axis:Hor_Z/Ver_Z) , Vertical polarization (antenna angle) of the worst case: 0deg

Field strength

| No. | FREQ [MHz] | Test Receiver Reading | | Antenna Factor [dB/m] | LOSS [dB] | AMP GAIN [dB] | RESULT | | LIMIT (3m) [dBuV/m] | MARGIN | |
|-----|---------------|--------------------------|---------------|-----------------------------|--------------|---------------------|-----------------|-----------------|---------------------------|-------------|-------------|
| | | Hor [dBuV] | Ver [dBuV] | | | | Hor [dBuV/m] | Ver [dBuV/m] | | Hor [dB] | Ver [dB] |
| 1 | 13.560 | 69.8 | 71.4 | 19.0 | 6.3 | 32.2 | 62.9 | 64.5 | 123.9 | 61.0 | 59.4 |

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]

Field strength of 13.553MHz to 13.567MHz Limit(3m) = 83.9dBuV/m + 40log 30m/3m
= 123.9dBuV/m (FCC15.225(a))

Outside Field strength

| No. | FREQ [MHz] | Test Receiver Reading | | Antenna Factor [dB/m] | LOSS [dB] | AMP GAIN [dB] | RESULT | | LIMIT (3m) [dBuV/m] | MARGIN | |
|-----|---------------|--------------------------|---------------|-----------------------------|--------------|---------------------|-----------------|-----------------|---------------------------|-------------|-------------|
| | | Hor [dBuV] | Ver [dBuV] | | | | Hor [dBuV/m] | Ver [dBuV/m] | | Hor [dB] | Ver [dB] |
| 1 | 13.110 | 30.5 | 30.5 | 19.1 | 6.3 | 32.2 | 23.7 | 23.7 | 69.5 | 45.8 | 45.8 |
| 2 | 13.349 | 39.0 | 47.9 | 19.0 | 6.3 | 32.2 | 32.1 | 41.0 | 80.5 | 48.4 | 39.5 |
| 3 | 13.410 | 31.0 | 36.0 | 19.0 | 6.3 | 32.2 | 24.1 | 29.1 | 80.5 | 56.4 | 51.4 |
| 4 | 13.417 | 32.1 | 39.3 | 19.0 | 6.3 | 32.2 | 25.2 | 32.4 | 90.4 | 65.2 | 58.0 |
| 5 | 13.493 | 31.0 | 35.7 | 19.0 | 6.3 | 32.2 | 24.1 | 28.8 | 90.4 | 66.3 | 61.6 |
| 6 | 13.553 | 48.8 | 57.2 | 19.0 | 6.3 | 32.2 | 41.9 | 50.3 | 90.4 | 48.5 | 40.1 |
| 7 | 13.567 | 48.1 | 56.5 | 19.0 | 6.3 | 32.2 | 41.2 | 49.6 | 90.4 | 49.2 | 40.8 |
| 8 | 13.628 | 30.9 | 35.3 | 19.0 | 6.3 | 32.2 | 24.0 | 28.4 | 90.4 | 66.4 | 62.0 |
| 9 | 13.704 | 31.6 | 38.3 | 19.0 | 6.3 | 32.2 | 24.7 | 31.4 | 90.4 | 65.7 | 59.0 |
| 10 | 13.710 | 30.8 | 34.9 | 19.0 | 6.3 | 32.2 | 23.9 | 28.0 | 80.5 | 56.6 | 52.5 |
| 11 | 13.772 | 38.3 | 46.5 | 19.0 | 6.3 | 32.2 | 31.4 | 39.6 | 80.5 | 49.1 | 40.9 |
| 12 | 14.010 | 30.7 | 30.6 | 18.9 | 6.3 | 32.2 | 23.7 | 23.6 | 69.5 | 45.8 | 45.9 |

Calculation:Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]

Outside filed strength frequencies

- filed strength band $F_c \pm 7\text{kHz}$:13.553MHz to 13.567MHz
 - Outside filde strength $F_c \pm 150\text{kHz}$:13.410MHz to 13.710MHz
 - Outside filde strength $F_c \pm 450\text{kHz}$:13.110MHz to 14.010MHz
- $F_c = 13.56\text{MHz}$

Limits (3m)

- 13.410MHz to 13.553MHz and 13.567MHz to 13.710MHz : 50.5dBuV/m + 40log30m/3m = 90.5dBuV/m (FCC15.225(b))
- 13.110MHz to 14.010MHz and 13.710MHz to 14.010MHz : 40.5dBuV/m + 40log30m/3m = 80.5dBuV/m (15.225(c))
- Below 13.110MHz and Above 14.010MHz : 29.5dBuV/m + 40log30m/3m = 69.5dBuV/m (FCC15.225(d)and FCC15.209)

UL Japan, Inc.

Shonan EMC Lab.

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

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Radiated Emission

UL Japan, Inc.
Shonan EMC Lab., No.3 Semi-Anechoic Chamber

Company: Sony Corporation
Equipment: Contactless IC Card Reader / Writer
Model: RC-S632/U
Sample No.: 2990001
Power: DC5.0V(USB), AC120V/60Hz(Laptop PC)
Mode: Transmitting 13.56MHz
EUT axis: See Remarks
Remarks: Felica

Regulation: FCC Part15 SupartC 15.225
Test Distance: 3m
Date: 2012/7/5
Temperature: 22deg.C
Humidity: 71% RH
ENGINEER: Hikaru Shirasawa

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Height [cm] | Angle [deg.] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|-------------|--------------|------------------------|
| Hori. | 27.12 | QP | 44.9 | 19.3 | 6.5 | 32.2 | 38.5 | 69.5 | 31.0 | 100 | 359 | Y-Axis |
| Hori. | 40.68 | QP | 37.7 | 13.9 | 6.6 | 32.2 | 26.0 | 40.0 | 14.0 | 371 | 358 | Y-Axis |
| Hori. | 54.24 | QP | 41.4 | 9.9 | 6.7 | 32.2 | 25.8 | 40.0 | 14.2 | 329 | 358 | Y-Axis |
| Hori. | 67.80 | QP | 39.2 | 7.0 | 6.5 | 32.2 | 20.5 | 40.0 | 19.5 | 300 | 163 | Y-Axis |
| Hori. | 81.36 | QP | 46.5 | 6.3 | 7.5 | 32.2 | 28.1 | 40.0 | 11.9 | 224 | 169 | Y-Axis |
| Hori. | 94.92 | QP | 45.8 | 8.7 | 7.4 | 32.2 | 29.7 | 43.5 | 13.8 | 300 | 358 | Y-Axis |
| Hori. | 108.48 | QP | 38.0 | 11.0 | 7.2 | 32.1 | 24.1 | 43.5 | 19.4 | 290 | 187 | Y-Axis |
| Hori. | 122.04 | QP | 52.1 | 12.9 | 7.2 | 32.1 | 40.1 | 43.5 | 3.4 | 150 | 180 | Y-Axis |
| Hori. | 132.00 | QP | 35.9 | 13.7 | 7.4 | 32.1 | 24.9 | 43.5 | 18.6 | 235 | 182 | Y-Axis |
| Hori. | 135.60 | QP | 34.2 | 14.0 | 7.4 | 32.1 | 23.5 | 43.5 | 20.0 | 237 | 192 | Y-Axis |
| Hori. | 244.08 | QP | 47.5 | 17.0 | 8.2 | 32.0 | 40.7 | 46.0 | 5.3 | 135 | 309 | Y-Axis |
| Hori. | 284.76 | QP | 47.8 | 18.5 | 8.5 | 32.0 | 42.8 | 46.0 | 3.2 | 116 | 141 | Y-Axis |
| Hori. | 375.70 | QP | 48.4 | 15.8 | 8.9 | 32.0 | 41.1 | 46.0 | 4.9 | 100 | 154 | Y-Axis |
| Hori. | 388.35 | QP | 49.5 | 16.1 | 9.0 | 32.0 | 42.6 | 46.0 | 3.4 | 100 | 159 | Y-Axis |
| Hori. | 407.10 | QP | 48.2 | 16.4 | 9.0 | 32.0 | 41.6 | 46.0 | 4.4 | 100 | 331 | Y-Axis |
| Hori. | 638.60 | QP | 36.8 | 19.6 | 9.9 | 32.0 | 34.3 | 46.0 | 11.7 | 134 | 91 | Y-Axis |
| Vert. | 27.12 | QP | 53.8 | 19.3 | 6.5 | 32.2 | 47.4 | 69.5 | 22.1 | 100 | 358 | X-Axis(Antenna:90deg.) |
| Vert. | 40.68 | QP | 48.6 | 13.9 | 6.6 | 32.2 | 36.9 | 40.0 | 3.1 | 100 | 111 | Y-Axis |
| Vert. | 54.24 | QP | 52.4 | 9.9 | 6.7 | 32.2 | 36.8 | 40.0 | 3.2 | 100 | 279 | Y-Axis |
| Vert. | 67.80 | QP | 37.2 | 7.0 | 6.5 | 32.2 | 18.5 | 40.0 | 21.5 | 100 | 263 | Y-Axis |
| Vert. | 81.36 | QP | 43.7 | 6.3 | 7.5 | 32.2 | 25.3 | 40.0 | 14.7 | 100 | 302 | Y-Axis |
| Vert. | 94.92 | QP | 40.5 | 8.7 | 7.4 | 32.2 | 24.4 | 43.5 | 19.1 | 100 | 188 | Y-Axis |
| Vert. | 108.48 | QP | 37.2 | 11.0 | 7.2 | 32.1 | 23.3 | 43.5 | 20.2 | 100 | 190 | Y-Axis |
| Vert. | 122.04 | QP | 45.8 | 12.9 | 7.2 | 32.1 | 33.8 | 43.5 | 9.7 | 100 | 199 | Y-Axis |
| Vert. | 135.60 | QP | 29.3 | 14.0 | 7.4 | 32.1 | 18.6 | 43.5 | 24.9 | 100 | 195 | Y-Axis |
| Vert. | 638.60 | QP | 37.2 | 19.6 | 9.9 | 32.0 | 34.7 | 46.0 | 11.3 | 100 | 162 | Y-Axis |

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

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

Data of Frequency Tolerance: FCC 15.225(e) (1/3)

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

Company: Sony Corporation
Equipment: Contactless IC Card Reader / Writer
Model: RC-S632/U
Sample No.: 2990001
Power: DC5.0V(USB), AC120V/60Hz(Laptop PC)
Mode: Transmitting 13.56MHz

Regulation: FCC Part15 SupartC 15.225
Date: June 27, 2012
Temperature: 26deg.C
Humidity: 45%RH
ENGINEER: Shinichi Takano

Temperature Variation: 60deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.559878 | -0.000122 | -0.00090 | 0.01 |
| after 2minutes | 13.56 | 13.559886 | -0.000114 | -0.00084 | 0.01 |
| after 5minutes | 13.56 | 13.559891 | -0.000109 | -0.00080 | 0.01 |
| after 10minutes | 13.56 | 13.559894 | -0.000106 | -0.00078 | 0.01 |

Temperature Variation: 50deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.559891 | -0.000109 | -0.00080 | 0.01 |
| after 2minutes | 13.56 | 13.559877 | -0.000123 | -0.00091 | 0.01 |
| after 5minutes | 13.56 | 13.559876 | -0.000124 | -0.00091 | 0.01 |
| after 10minutes | 13.56 | 13.559878 | -0.000122 | -0.00090 | 0.01 |

Temperature Variation: 40deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.559920 | -0.000080 | -0.00059 | 0.01 |
| after 2minutes | 13.56 | 13.559895 | -0.000105 | -0.00077 | 0.01 |
| after 5minutes | 13.56 | 13.559890 | -0.000110 | -0.00081 | 0.01 |
| after 10minutes | 13.56 | 13.559889 | -0.000111 | -0.00082 | 0.01 |

Temperature Variation: 30deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.559964 | -0.000036 | -0.00027 | 0.01 |
| after 2minutes | 13.56 | 13.559931 | -0.000069 | -0.00051 | 0.01 |
| after 5minutes | 13.56 | 13.559922 | -0.000078 | -0.00058 | 0.01 |
| after 10minutes | 13.56 | 13.559920 | -0.000080 | -0.00059 | 0.01 |

Temperature Variation: 20deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.560003 | 0.000003 | 0.00002 | 0.01 |
| after 2minutes | 13.56 | 13.559971 | -0.000029 | -0.00021 | 0.01 |
| after 5minutes | 13.56 | 13.559963 | -0.000037 | -0.00027 | 0.01 |
| after 10minutes | 13.56 | 13.559960 | -0.000040 | -0.00029 | 0.01 |

Data of Frequency Tolerance: FCC 15.225(e) (2/3)

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

Company: Sony Corporation
Equipment: Contactless IC Card Reader / Writer
Model: RC-S632/U
Sample No.: 2990001
Power: DC5.0V(USB), AC120V/60Hz(Laptop PC)
Mode: Transmitting 13.56MHz

Regulation: FCC Part15 SupartC 15.225
Date: June 27, 2012
Temperature: 26deg.C
Humidity: 45%RH
ENGINEER: Shinichi Takano

Temperature Variation: 10deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.560043 | 0.000043 | 0.00032 | 0.01 |
| after 2minutes | 13.56 | 13.560015 | 0.000015 | 0.00011 | 0.01 |
| after 5minutes | 13.56 | 13.560008 | 0.000008 | 0.00006 | 0.01 |
| after 10minutes | 13.56 | 13.560005 | 0.000005 | 0.00004 | 0.01 |

Temperature Variation: 0deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.560066 | 0.000066 | 0.00049 | 0.01 |
| after 2minutes | 13.56 | 13.560060 | 0.000060 | 0.00044 | 0.01 |
| after 5minutes | 13.56 | 13.560046 | 0.000046 | 0.00034 | 0.01 |
| after 10minutes | 13.56 | 13.560044 | 0.000044 | 0.00032 | 0.01 |

Temperature Variation: -10deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.560068 | 0.000068 | 0.00050 | 0.01 |
| after 2minutes | 13.56 | 13.560069 | 0.000069 | 0.00051 | 0.01 |
| after 5minutes | 13.56 | 13.560067 | 0.000067 | 0.00049 | 0.01 |
| after 10minutes | 13.56 | 13.560067 | 0.000067 | 0.00049 | 0.01 |

Temperature Variation: -20deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.560040 | 0.000040 | 0.00029 | 0.01 |
| after 2minutes | 13.56 | 13.560063 | 0.000063 | 0.00046 | 0.01 |
| after 5minutes | 13.56 | 13.560066 | 0.000066 | 0.00049 | 0.01 |
| after 10minutes | 13.56 | 13.560068 | 0.000068 | 0.00050 | 0.01 |

Temperature Variation: -30deg.C

| Test Conditions | Original Frequency (MHz) | Measured Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|--------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.559977 | -0.000023 | -0.00017 | 0.01 |
| after 2minutes | 13.56 | 13.560029 | 0.000029 | 0.00021 | 0.01 |
| after 5minutes | 13.56 | 13.560035 | 0.000035 | 0.00026 | 0.01 |
| after 10minutes | 13.56 | 13.560038 | 0.000038 | 0.00028 | 0.01 |

Data of Frequency Tolerance: FCC 15.225(e) (3/3)

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

Company: Sony Corporation
Equipment: Contactless IC Card Reader / Writer
Model: RC-S632/U
Sample No.: 2990001
Power: DC5.0V(USB), AC120V/60Hz(Laptop PC)
Mode: Transmitting 13.56MHz

Regulation: FCC Part15 SupartC 15.225
Date: June 27, 2012
Temperature: 26deg.C
Humidity: 45%RH
ENGINEER: Shinichi Takano

Input Voltage:DC4.25V (85%)

Temperature Variation: 20deg.C

| Test Conditions | Original Frequency (MHz) | Measure Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|-------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.559982 | -0.000018 | -0.00013 | 0.01 |
| after 2minutes | 13.56 | 13.559963 | -0.000037 | -0.00027 | 0.01 |
| after 5minutes | 13.56 | 13.559961 | -0.000039 | -0.00029 | 0.01 |
| after 10minutes | 13.56 | 13.559961 | -0.000039 | -0.00029 | 0.01 |

Input Voltage:DC5.75V (115%)

Temperature Variation: 20deg.C

| Test Conditions | Original Frequency (MHz) | Measure Frequency (MHz) | Frequency Error (MHz) | Frequency Tolerance (%) | Limit (%) |
|-----------------|--------------------------|-------------------------|-----------------------|-------------------------|-----------|
| startup | 13.56 | 13.559977 | -0.000023 | -0.00017 | 0.01 |
| after 2minutes | 13.56 | 13.559963 | -0.000037 | -0.00027 | 0.01 |
| after 5minutes | 13.56 | 13.559961 | -0.000039 | -0.00029 | 0.01 |
| after 10minutes | 13.56 | 13.559960 | -0.000040 | -0.00029 | 0.01 |

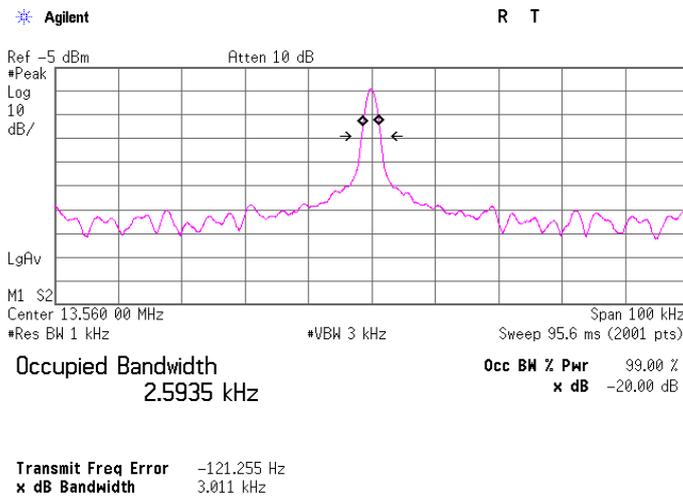
20dB bandwidth & 99% Occupied bandwidth: FCC 15.215 / RSS-Gen

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

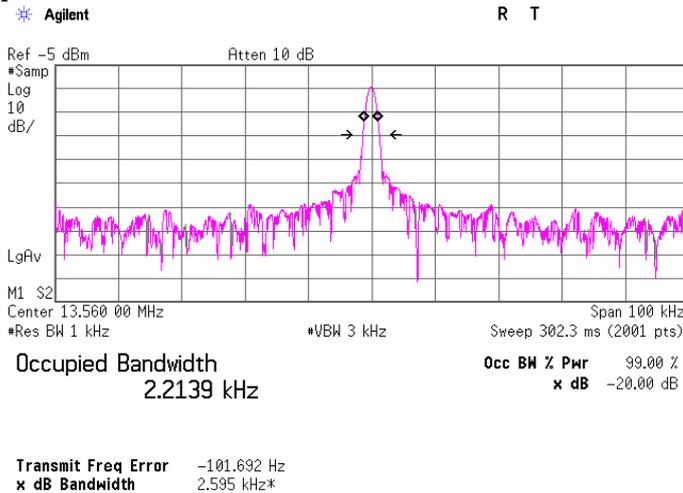
Company: Sony Corporation
Equipment: Contactless IC Card Reader / Writer
Model: RC-S632/U
Sample No.: 2990001
Power: DC5.0V(USB), AC120V/60Hz(Laptop PC)
Mode: Transmitting 13.56MHz

Regulation: FCC Part15 Subpart C 15.215
RSS-Gen 4.6
Test Distance: -
Date: June 6, 2012
Temperature: 26deg.C
Humidity: 58%RH
ENGINEER: Kenichi Adachi

20dB Bandwidth: 3.011 kHz



99% Occupied Bandwidth: 2.214 kHz



Test Report No : 32KE0063-SH-01-A

APPENDIX 2
Test Instruments

EMI test equipment

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|--------------------------------|----------------------------------|--|--|--------------------------|-----------|------------------------------------|
| SFC-01 | Microwave Counter | Agilent | 53151A | US40511493 | FT | 2012/03/21 * 12 |
| SCH-01 | Temperature and Humidity Chamber | Espec | PL-1KT | 14020837 | FT | 2012/04/04 * 12 |
| SOS-09 | Humidity Indicator | A&D | AD-5681 | 4061484 | FT | 2012/03/26 * 12 |
| SSP-01 | Search Probe | Nisshin Electric | NSP-01 | - | FT,BW | - |
| SAF-03 | Pre Amplifier | SONOMA | 310N | 290213 | RE | 2012/02/10 * 12 |
| SAT6-03 | Attenuator | JFW | 50HF-006N | - | RE | 2012/02/10 * 12 |
| SBA-03 | Biconical Antenna | Schwarzbeck | BBA9106 | 91032666 | RE | 2011/10/23 * 12 |
| SCC-C1/C2/C3/C4/C5/C10/SRSE-03 | Coaxial Cable&RF Selector | Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO | 8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906 | -/0901-271 (RF Selector) | RE | 2012/04/10 * 12 |
| SLA-03 | Logperiodic Antenna | Schwarzbeck | UHALP9108A | UHALP 9108-A 0901 | RE | 2011/10/23 * 12 |
| SOS-05 | Humidity Indicator | A&D | AD-5681 | 4062518 | RE | 2012/02/06 * 12 |
| STR-06 | Test Receiver | Rohde & Schwarz | ESCI | 101259 | RE, CE | 2012/02/07 * 12 |
| SJM-10 | Measure | PROMART | SEN1935 | - | RE, CE | - |
| SAEC-03(NSA) | Semi-Anechoic Chamber | TDK | SAEC-03(NSA) | 3 | RE | 2011/09/23 * 12 |
| COTS-SEMI-1 | EMI Software | TSJ | TEPTO-DV(RE,CE, RFLMF) | - | RE, CE | - |
| SLP-02 | Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100218 | RE | 2011/10/19 * 12 |
| SSA-03 | Spectrum Analyzer | Agilent | E4448A | MY48250152 | BW | 2011/12/05 * 12 |
| SCC-G14 | Coaxial Cable | Suhner | SUCOFLEX 102 | 31600/2 | BW | 2012/03/12 * 12 |
| SOS-09 | Humidity Indicator | A&D | AD-5681 | 4061484 | BW | 2012/03/26 * 12 |
| SCC-C9/C10/SRSE-03 | Coaxial Cable&RF Selector | Suhner/Suhner/TOYO | RG223U/141PE/NS4906 | -/0901-271 (RF Selector) | CE | 2012/04/10 * 12 |
| SLS-05 | LISN | Rohde & Schwarz | ENV216 | 100516 | CE | 2012/02/23 * 12 |
| SAT3-06 | Attenuator | JFW | 50HF-003N | - | CE | 2012/02/17 * 12 |
| SOS-06 | Humidity Indicator | A&D | AD-5681 | 4062118 | CE | 2012/03/26 * 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 ,
- FT: Frequency tolerance ,
- BW:-20dB Bandwidth or 99% Occupied Bandwidth