



RADIO TEST REPORT

Test Report No.: 31GE0177-SH-01-B

Applicant : Sony Corporation
Type of Equipment : Contactless IC Card Reader / Writer
Model No. : RC-S330
FCC ID : AK8RCS330
Test regulation : FCC Part15 Subpart C: 2010
Test result : Complied

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Date of test: March 3 to 10, 2011

**Representative
test engineer:**

Akio Hayashi
Engineer of WiSE Japan,
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Approved by :

Go Ishiwata
Assistant Manager of WiSE Japan,
UL Verification Service

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SECTION 1: Customer information

Company Name : Sony EMCS Corporation Kisarazu TEC
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-S330
Serial Number : Refer to Section 4
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 : March 3, 2011
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: RC-S330 (referred to as the EUT in this report) is a Contactless IC Card Reader/Writer.

Clock frequencies: CPU: 27.12MHz

<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 : +5 to +35 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 : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

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: 2010. Refer to the test report: 31GE0177-SH-01-A.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC Section15.207	-	N/A	16.8dB Freq: 13.56MHz Detector: Average Phase: L	Complied
Electric field strength of Fundamental emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.225 (a)	Radiated	N/A	78.6dB Polarization: Vertical	Complied
Electric field strength of Outside the allocated bands	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.225 (b)(c)	Radiated	N/A	36.1dB Freq: 13.553MHz Polarization: Vertical	Complied
Electric field strength of Spurious emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.209 FCC Section15.225 (d)	Radiated	N/A	3.2dB Freq: 149.16MHz Polarization: Vertical	Complied
20dB bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.215 (c)	Radiated	N/A	-	-
Frequency tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.225 (e)	Radiated	N/A	-	Complied

Note: UL Japan's EMI Work Procedures No.QPM05 and QPM15.

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2003 13. Measurement of intentional radiators, RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	-	-

Note: UL Japan's EMI Work Procedures No.QPM05 and QPM15.

* 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	3.0 dB	2.7 dB	3.1 dB
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.3 dB	2.7 dB	3.4 dB
	30MHz-300MHz	4.7 dB	4.5 dB	4.7 dB
	300MHz-1GHz	4.5 dB	4.6 dB	4.6 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 Measurement uncertainty (with a 95% confidence level) for this test was: (±) 1.3×10^{-6} .

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
☐ No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Full-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☒ No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☒ No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

3.6 Test setup, Test data & 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

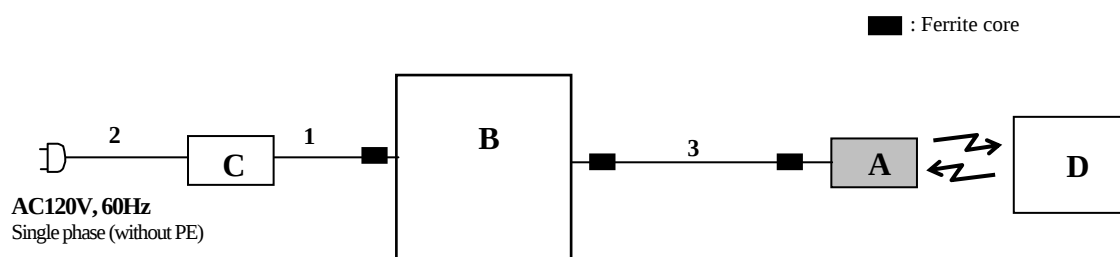
The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

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

Software & Setting

Software: NFCDCCommTestApp.exe, geniepoll.exe
 • Parameter file: FeliCa212kbps.bat, FeliCa212kbps.tdt
 Power settings: Setting is controlled by the firmware and cannot be changed.

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 equipments

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Contactless IC Card Reader/Writer	RC-S330	S0098010	Sony Corporation	EUT.
B	PC	VGN-G1	28248610 1000006	Sony Corporation	-
C	AC Adapter	VGP-AC16V8	147886031 0018366	Sony Corporation	-
D	IC Card	RC4000S-Fe-045	28	Sony Corporation	-

List of cables used

No.	Name	Length (m)	Shield-Cable	Shield-Connector	Remark
1	DC power	1.7	Unshielded	Unshielded	-
2	AC power	0.7	Unshielded	Unshielded	-
3	USB	1.1	Shielded	Shielded	-

* 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 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

Figure 1. Antenna angle

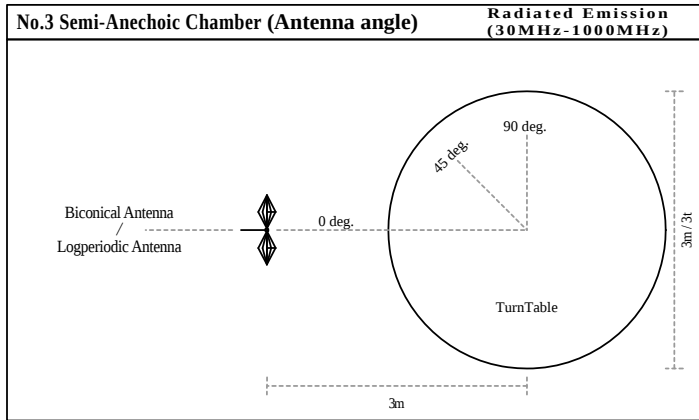
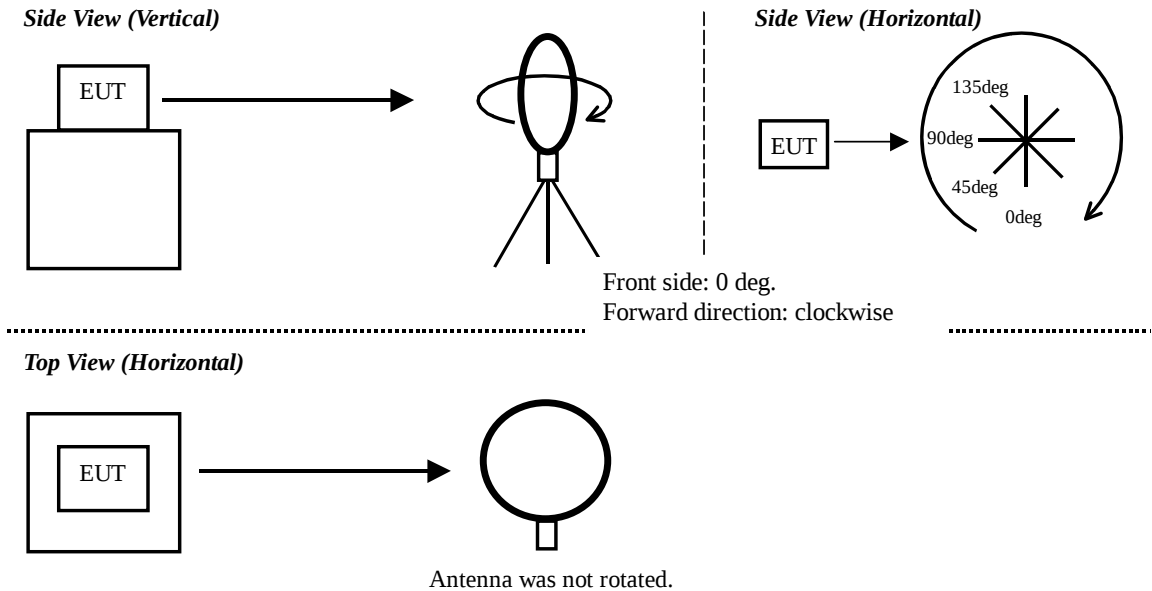


Figure 2. Direction of the Loop Antenna



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

Test procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Summary of the test results: Pass

SECTION 8: Frequency tolerances

Test procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength. The temperature test was started after the temperature stabilization time of 30 minutes.

Summary of the test results: Pass

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