



# **RADIO TEST REPORT**

**Test Report No. : 31HE0194-HO-01-A**

**Applicant** : YOSHIKAWA RF SYSTEM Co., Ltd  
**Type of Equipment** : HF RW for SWS  
**Model No.** : YRCRR12  
**Test standard** : FCC Part 15 Subpart C: 2012  
**FCC ID** : AQR-YRCRR12  
**Test result** : Complied

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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

**Date of test:** February 10 and 13, 2012

**Representative  
test engineer:**

Hikaru Shirasawa  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by :**

Go Ishiwata  
Manager of WiSE Japan,  
UL Verification Service

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13-EM-F0429

**CONTENTS**

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**PAGE**

**SECTION 1: Customer information .....3**

**SECTION 2: Equipment under test (E.U.T.).....3**

**SECTION 3: Test specification, procedures & results .....4**

**SECTION 4: Operation of E.U.T. during testing .....6**

**SECTION 5: Conducted emission.....8**

**SECTION 6: Radiated emission (Fundamental, Spurious emission and Spectrum mask) .....9**

**SECTION 7: Other test .....10**

**APPENDIX 1: Test data .....11**

**APPENDIX 2: Test instruments.....18**

**APPENDIX 3: Photographs of test setup.....19**

## **SECTION 1: Customer information**

Company Name : YOSHIKAWA RF SYSTEM Co., Ltd  
Address : Shinjuku Kifu Bldg.8F, 7-2-4, Nishi-Shinjuku, Shinjuku-ku,  
Tokyo 160-0023 Japan  
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Facsimile Number : +81-3-5331-3909  
Contact Person : Kohei Takano

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

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

Type of Equipment : HF RW for SWS  
Model No. : YRCRR12  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : AC100 - 240V, 50/60Hz  
Receipt Date of Sample : February 10, 2012  
Country of Mass-production : Japan  
Condition of EUT : Production 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**

Model No: YRCRR12, (referred to as the EUT in this report), is a HF RW FOR SWS.

### **General Specification**

Clock frequency(ies) in the system : 13.56MHz, 12.00MHz

### **Radio Specification**

#### **RFID**

Equipment Type	Transceiver
Frequency of Operation	13.56MHz
Type of Modulation	ASK
Antenna gain	-49dBi
Antenna Type	Square loop antenna

\*This test report applies for RFID.

### **FCC Part 15.203 Antenna requirement**

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

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### **SECTION 3: Test specification, procedures & results**

#### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2012, final revised on February 1, 2012

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
Section 15.215 Additional provisions to the general radiated emission limitations  
Section 15.225 : Operation within the band 13.110-14.010MHz

The EUT complies with FCC Part 15 Subpart B. The test is performed by the customer.

#### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.4:2009 7. AC power line conducted emission measurements	Section 15.207	13.3dB 0.32002MHz, QP, N, Transmitting 13.56MHz, (CH2)	Complied	-
Electric field strength of Fundamental emission	ANSI C63.4:2009 13. Measurement of intentional radiators	Section 15.225(a)	59.9dB 13.56MHz, QP, Vertical.	Complied	Radiated
Spectrum mask	ANSI C63.4:2009 13. Measurement of intentional radiators	Section 15.225(b)(c)	See data	Complied	Radiated
20dB bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators	Section15.215(c)	See data	-	Radiated
Electric field strength of Spurious emission	ANSI C63.4:2009 13. Measurement of intentional radiators	Section15.209, Section 15.225 (d)	1.1dB 162.72MHz, QP, Vertical Transmitting 13.56MHz, (CH1)	Complied	Radiated
Frequency tolerance	ANSI C63.4:2009 13. Measurement of intentional radiators	Section15.225(e)	See data	Complied	Radiated

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

### 3.3 Addition to standard

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

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

### 3.4 Uncertainty

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

Item	Frequency range	No.1 SAC <sup>*1</sup> /SR <sup>*2</sup> (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Conducted emission (AC Mains) LISN	150kHz-30MHz	3.0 dB	2.7 dB	3.1 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	5.0 dB
	300MHz-1GHz	5.0 dB	5.2 dB	5.0 dB

\*1: SAC=Semi-Anechoic Chamber

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

### Conducted emission test

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

### Radiated emission test

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

### Frequency tolerance

Frequency Measurement uncertainty for this test was: (±) 5.5%

### 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 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 set up, Data of test, and Test instruments

Refer to APPENDIX.1 to 3.

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

### 4.1 Operating modes

The mode is used:

Mode	Remarks
Transmitting 13.56MHz(CH1 or CH2)	Continuous transmitting 13.56MHz from Antenna CH1 or Antenna CH2.

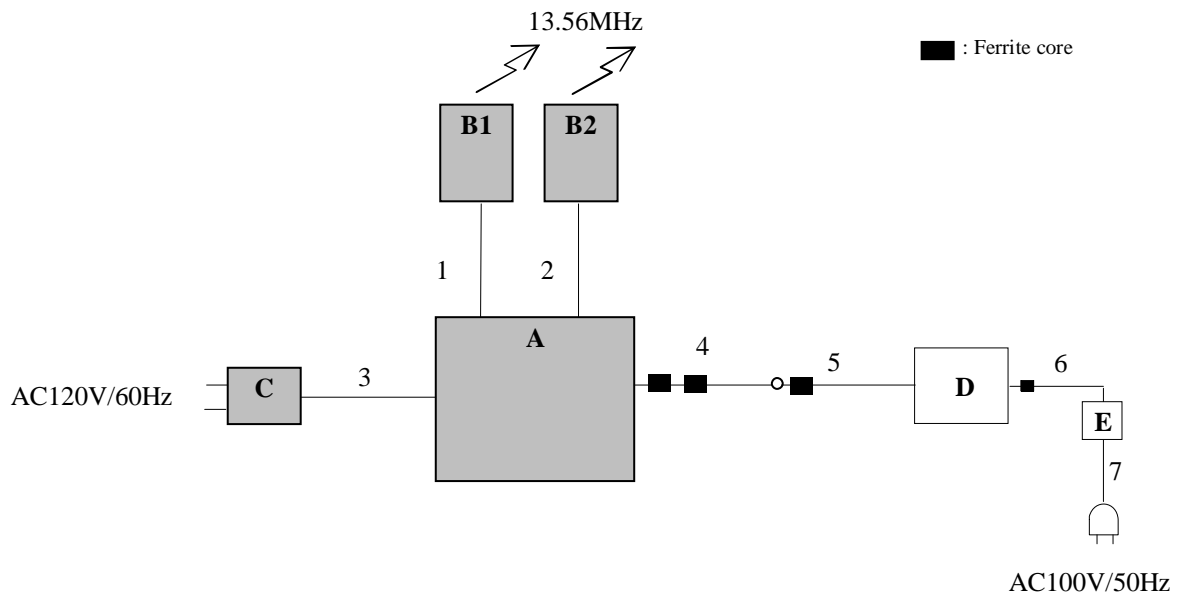
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -20deg.C to +50deg.C Step 10deg.C

Voltage : AC102V/60Hz to AC138V/60Hz, Normal Voltage AC 120V /60Hz,

### 4.2 Configuration and peripherals



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

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**Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	Remark
A	HF RW FOR SWS (Control unit)	YRCRR12	RRS11106A0005	YOSHIKAWA RF SYSTEM	EUT
B1	HF ANT FOR SWS (Antenna CH1)	YAR05	RRS11106A0005	YOSHIKAWA RF SYSTEM	EUT
B2	HF ANT FOR SWS (Antenna CH2)	YAR05	RRS11106A0005	YOSHIKAWA RF SYSTEM	EUT
C	AC Adapter	GF06-US0512	-	GO FORWARD ENTERPRISE CORP	EUT
D	Laptop PC	CF-Y4	5GKSA13148	Panasonic	-
E	AC Adapter	CF-AA1625A	1625AM305523388C	Panasonic	-

**List of cables used**

No.	Name	Length (m)	Cable Shield	Connector Shield	Remark
1	Antenna	1.75	Unshielded	Unshielded	-
2	Antenna	1.75	Unshielded	Unshielded	-
3	DC Power	1.6	Unshielded	Shielded	-
4	RS232C	1.6	Shielded	Shielded	-
5	USB - RS232C converter	0.8	Shielded	Shielded	-
6	DC Power	1.2	Unshielded	Shielded	-
6	AC Power	0.85	Unshielded	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

The noise levels were confirmed at each antenna of CH1 and CH2 of EUT to see the antenna of maximum noise, and the test was made at the antenna that has the maximum noise.

### **5.5 Results**

Summary of the test results : Pass(Refer to the APPENDIX.)

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

### 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 Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

### Test conditions

Frequency range : 9kHz - 1GHz  
Test distance : 3m

### Test procedure

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3m.

Frequency: From 9kHz to 30MHz

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 1.

Frequency: From 30MHz to 1GHz

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 type	Loop				Biconical (30-299.99MHz) Logperiodic (300MHz-1GHz)

The carrier level and noise levels were confirmed at each antenna of CH1 and CH2 of EUT to see the antenna of maximum noise, and the test was made at the antenna that has the maximum noise.

The EUT was fixed each position of X, Y and Z axes of EUT by the customer's specification, and the test was made at the position that fix the customer's specifications.

EUT position:

Control unit	Y
Antenna	Y

\* FCC Part 15 Section 15.31 (f)(2)

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

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

### Test result

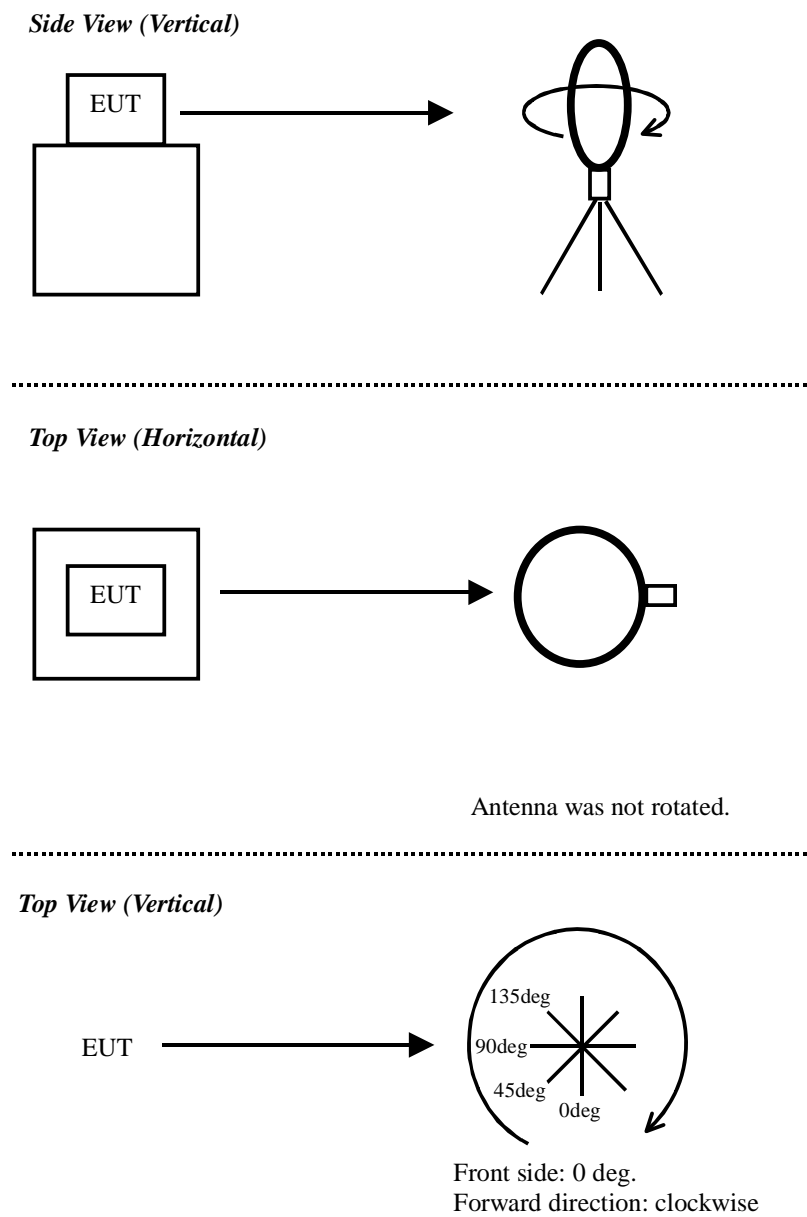
Pass (Refer to the APPENDIX.)

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Figure 1: Direction of the Loop Antenna



SECTION 7: Other test

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	100kHz	1kHz	3kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Frequency Tolerance	300Hz	10Hz	100Hz	Auto	Peak	Clear / Write	Spectrum Analyzer

Test result  
Pass (Refer to the APPENDIX.1)