



RADIO TEST REPORT

Test Report No. : 30IE0121-SH-01

Applicant : RICOH COMPANY LTD.
Type of Equipment : RFID module
Model No. : RFID:RW:ZU-P1
FCC ID : BBP-RFSPL01
Test regulation : FCC Part15 Subpart C: 2010
Test result : Complied

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7. Original test report number of this report is 30CE0005-SH-01-A

Date of test: January 12 and 19, 2010

Tested by:

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1 Applicant information

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

2.1 Identification of E.U.T.

Type of Equipment : RFID module
Model No. : RFID:RW:ZU-P1
Serial No. : Refer to Section 4.2
Rating : DC5V
Country of Mass-production : China
Receipt Date of Sample : January 8, 2010
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: RFID:RW:ZU-P1, referred to as the EUT in this report, is the RFID module.

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 13.56MHz
Clock frequency : 13.56MHz
Modulation : ASK 100%
Antenna type : Print pattern antenna
ITU code : A1D
Operating Temperature : +5 deg C - +45 deg C

FCC 15.31 (e)

Host device (Color Laser Printer) provides RFID module with stable power supply, and the power is not changed when voltage of the Color Laser Printer is varied. 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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3 Test specification, procedures and results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2010, final revised on January 22, 2010 and effective March 1, 2010
 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 bands 13.110-14.010MHz.

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	6.0dB (2.03677MHz, AV, L1)	Complied
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.225 (a)	Radiated	N/A	80.7dB (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	44.8dB (13.11MHz, 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	5.4dB (189.827MHz, Horizontal)	Complied
20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section15.215 (c)	Radiated	N/A	-	Complied
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	-	Complied

* 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.

	No.1 Semi anechoic chamber (±)	No.2 Semi anechoic chamber (±)	No.3 Semi anechoic chamber (±)
Conducted emission (AC mains)			
150kHz-30MHz	3.0 dB	2.6 dB	3.1 dB
Radiated emission (3m)			
9kHz-30MHz	3.4 dB	2.7 dB	3.4 dB
30MHz-300MHz	4.6 dB	4.5 dB	4.9 dB
300MHz-1000MHz	4.5 dB	4.6 dB	5.1 dB

*3m = Measurement distance

Frequency tolerance

Frequency (Normal condition) Measurement uncertainty (with a 95% confidence level) for this test was: (±) 1.3 x 10⁻⁶.

Frequency (Extreme condition) Measurement uncertainty (with a 95% confidence level) for this test was: (±) 1.3 x 10⁻⁶.

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 test report has enough margin, more than site margin.

3.5 Test location

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JAB Accreditation No. : RTL02610

No.1/ No.2/ No.3 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on April 17, 2009 (Registration No.: 697847).

IC Registration No. : 2973D-1 (No1 Semi anechoic chamber)

2973D-2 (No2 Semi anechoic chamber)

2973D-3 (No3 Semi anechoic chamber)

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.1 Shielded room	6.8 x 4.1 x 2.7
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.2 Shielded room	6.8 x 4.1 x 2.7
No.3 Semi-anechoic chamber	12.7 x 7.7 x 5.35 Maximum measurement distance: 5m	No.3 Shielded room	6.3 x 4.7 x 2.7
No.4 Semi-anechoic chamber	8.1 x 5.1 x 3.55	No.4 Shielded room	4.4 x 4.7 x 2.7
		No.5 Shielded room	7.8 x 6.4 x 2.7
		No.6 Shielded room	7.8 x 6.4 x 2.7

3.6 Test Configuration Photographs, Data of EMI test and Test instruments

Refer to APPENDIX 1 to 3, in this report

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4 System test configuration

4.1 Operating mode

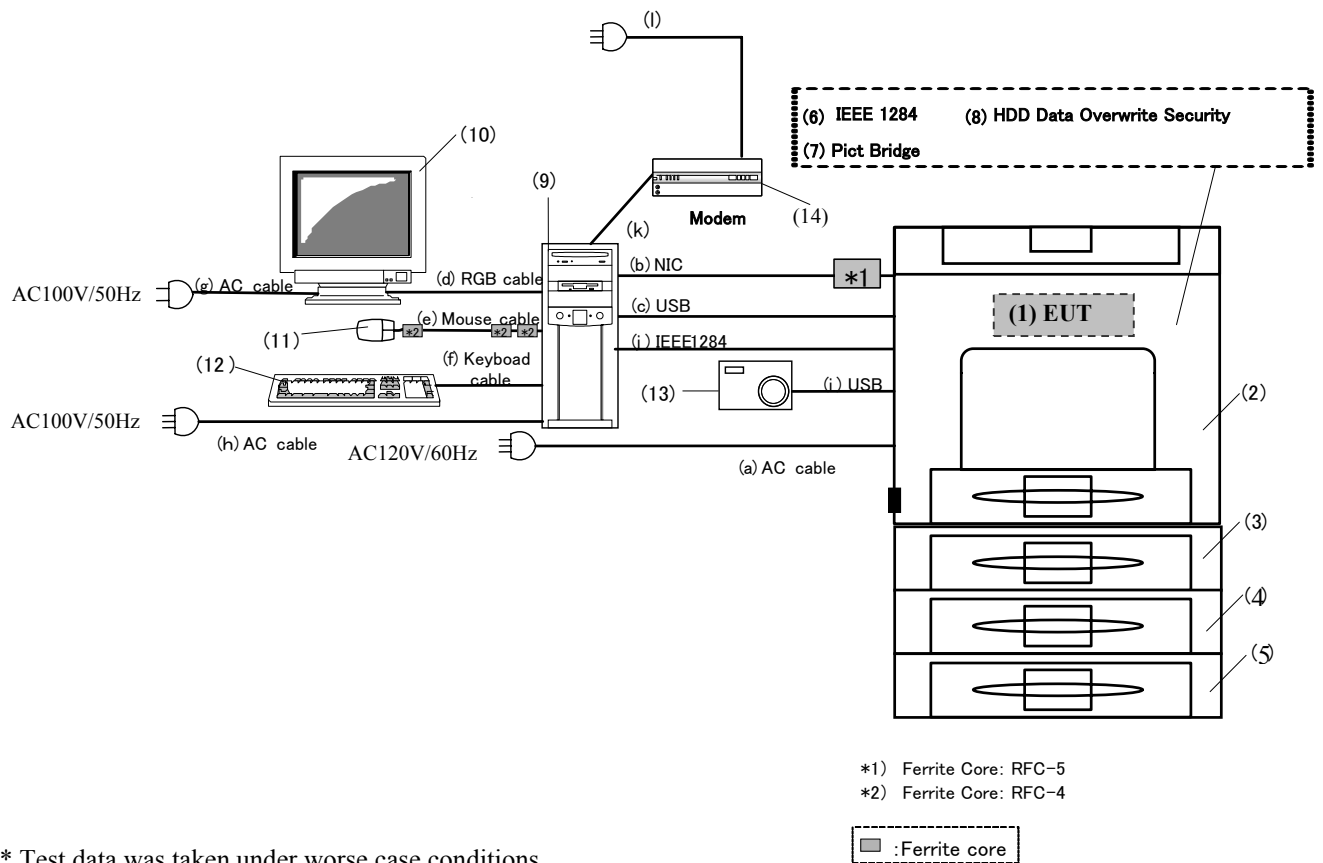
The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
All items except for Frequency tolerances	Transmitting (ASK), 26byte Mirror modulation from lower bit -> AM modulation 0x00, 0x00, 0xB3, 0x75, 0xB0, 0x00, 0x00, 0x80, 0x01, 0xff, 0xfe, 0x01, 0x23, 0x45, 0x67, 0x0B, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, CRC, CRC	13.56MHz
Frequency tolerances	Transmitting Unmodulated	13.56MHz

Four RFID modules which have the same specification are mounted in the equipment and they don't have simultaneous transmitting function. They were previously checked and the one in which the maximum emission occurred was chosen. ID tag was mounted in the Toner bottle inside of the EUT to communicate with each module.

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

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
1	RFID module	RFID:RW:ZU-P1	CPU: 09010182202 Ch0: 090489227 Ch1: 090695378 Ch2: 0909159634 Ch3: 0909159803	RICOH	EUT
2	Color Laser Printer	Aficio SP C431DN	S9491117004	RICOH	Host device*1)
3	Paper Bank 550	Paper Feed Unit PB1020	M384-170004	RICOH	-
4	Paper Bank 550	Paper Feed Unit PB1020	M384-170036	RICOH	-
5	Paper Bank 550	Paper Feed Unit PB1020	M384-170038	RICOH	-
6	IEEE1284 Board	IEEE1284 Interface Board Type A	90700748	RICOH	-
7	PictBridge	Camera Direct Print Card Type H	-	RICOH	-
8	HDD Data Overwrite Security	Data Overwrite Security Unit Type K	-	RICOH	-
9	Personal Computer	DCCY	837K2BX	IBM	-
10	LCD Monitor	E153Fpb	CN-0C5378-46633-4 BI255U	DELL	-
11	Mouse	SK-8115	CN-0J4637-71616-5 CC-0MXO	DELL	-
12	Keyboard	MO56UC	E1E010TF	DELL	-
13	Digital Camera	Caplio R1	20102981	RICOH	-
14	Modem	ME3314B	6K07040	OMRON	-

*1) RFID modules are inside in the Color Laser Printer.

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
a	AC Cable	2.5	Unshielded	Unshielded	-
b	NIC Cable (1)	3.0	Unshielded	Unshielded	Cross Cable
c	USB Cable	2.5	Shielded	Shielded	-
d	RGB cable	1.8	Shielded	Shielded	-
e	Mouse cable	1.85	Unshielded	Unshielded	-
f	Keyboard cable	1.85	Unshielded	Unshielded	-
g	AC Cable	1.8	Unshielded	Unshielded	-
h	AC Cable	1.8	Unshielded	Unshielded	-
i	USB(Pict) Cable	1.2	Shielded	Shielded	-
j	IEEE1284 Cable	1.2	Shielded	Shielded	-
k	Parallel Cable	1.8	Shielded	Shielded	-
l	AC Cable	2.0	Unshielded	Unshielded	-

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5 Conducted emission

5.1 Operating environment

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

Temperature : See test data
Humidity : See test data

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 2.0m, 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, including peripherals 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 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 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, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50Ω connectors of the LISN were resistively terminated in 50Ω when not connected to the measuring equipment.

Photographs of the set up are shown in Appendix 1.

5.3 Test conditions

Frequency range : 0.15 - 30MHz
EUT position : Table top

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a screened 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 detector of the test receiver.

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

5.5 Results

Summary of the test results : Pass

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6 Radiated emissions (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
 Humidity : See test data

6.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 2.0m, raised 80cm above the conducting ground plane to prevent the reflection influence. The configuration was set in accordance with ANSI C63.4: 2003. Photographs of the set up are shown in Appendix 1.

6.3 Test conditions

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

6.4 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 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 1.

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	10kHz	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 case of module Ch0:Black, Ch1:Magenta, Ch2:Cyan and Ch3:Yellow of EUT to see the module of maximum noise, and the test was made at the module that has the maximum noise.

Combinations of the worst case

Model	Worst case	
	Below 30MHz	Above 30MHz
Module	Module Ch0:Black	Module Ch0:Black

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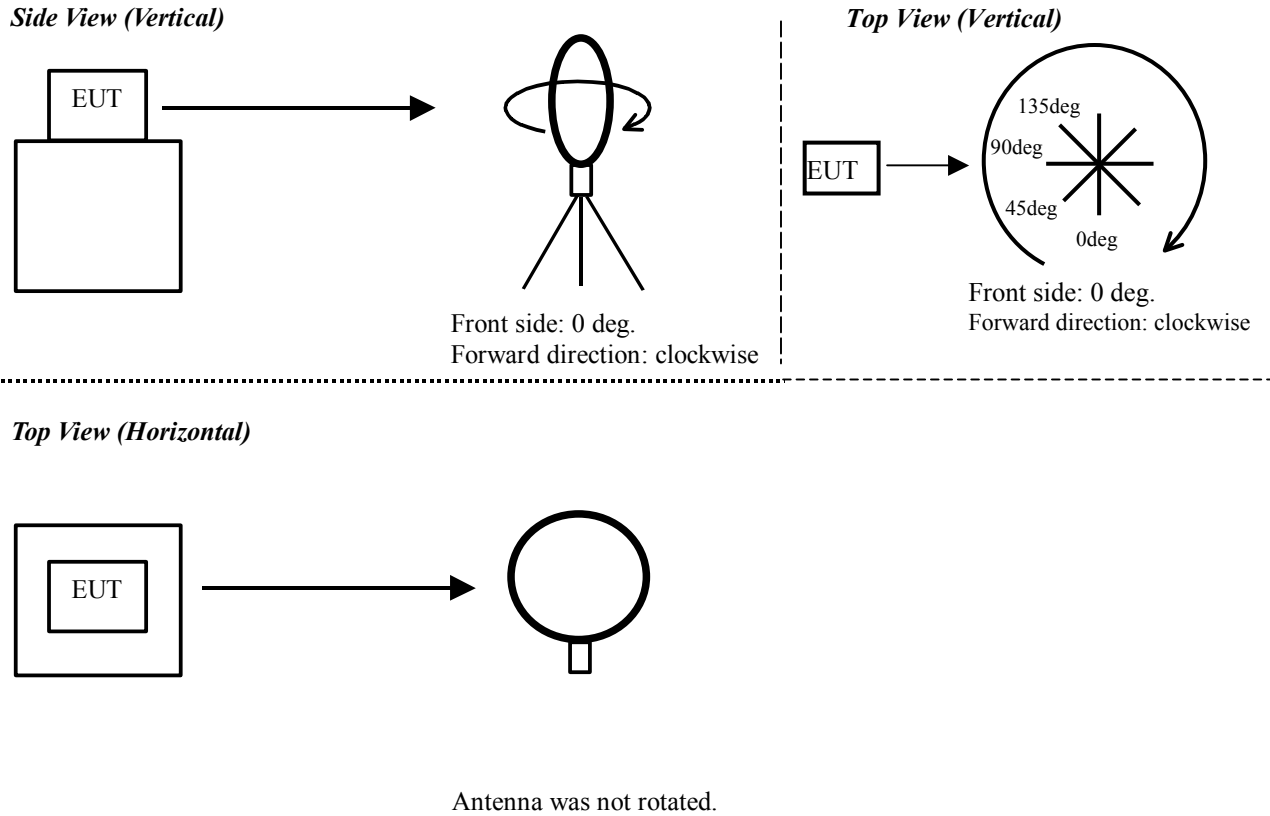
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6.5 Results

Summary of the test results : Pass *No noise was detected above the 5th order harmonics.

Figure 1: Direction of the Loop Antenna



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

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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APPENDIX 1: Photographs of test setup

Page 13	:	Conducted emission
Page 14 - 15	:	Radiated emission
Page 16 - 17	:	RFID module

APPENDIX 2: Test data

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Page 19 - 21	:	Radiated emission
19	:	Fundamental and Outside the Allocated bands
20 - 21	:	Spurious emission
Page 22	:	Bandwidth
Page 23 - 25	:	Frequency tolerance

APPENDIX 3: Test instruments

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