EMC Test Group

FCC Part 15, Subpart C Re-Compliance Report for Katsuragawa Electric Co., LTD.
Short Range Radio Frequency Identification (RFID) Device
Model: ARW13T-RF01
FCC ID: VP8-K115

Judgement: The Equipment Under Test (EUT) met the requirements specified in FCC Part 15, Subpart C, Sections 15.207, 15.209 and 15.225 and Industry Canada RSS-210 Section 2.5, Section 2.6 and Annex A2.6

ACCREDITED

Accreditation Certificate Number: 1248-01
Electrical (EMC) Testing

This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report. The client is hereby notified that products, materials or other items in this report are in no way approved or endorsed by A2LA unless A2LA explicitly permits such endorsement or approval.

XEROX
Test Plan / Report
For

EUT NAME	TEST PLAN NUMBER	DATE
RFID Reader	EMC10001	April 1, 2010

Abstract:

This report documents the re-compliance testing completed on an RFID Model ARW13T-RF01 as supplied by the client. Details of the changes from the original compliance configuration are listed in section 3.7. The changes outlined in Section 3.7 of this report detail changes to the host printer only. The RFID configuration and operation remains unchanged from the original compliance approvals granted October 16, 2007. Based on those changes, the occupied bandwidth and frequency stability tests as specified in CFR 47, Part 15, Subpart C 15.225 and Industry Canada RSS-210 Section 2.1 were not repeated. The EUT was found to conform with the Industry Canada and Federal Communications Commission limits for an intentional radiator and low power licence-exempt radiocommunication device, respectively. FCC is an acronym for "Federal Communications Commission. The FCC acronym is used throughout the document in lieu of the CFR 47 Part 15 Subpart C terminology.

Summary of Results		
Test	**Result**	**Modifications required to pass**
Conducted Emissions	Pass	See Section 7
Radiated Emissions	Pass	See Section 7

	NAME	TITLE	SIGNATURE	DATE
Prepared By	David Spencer	EMC Engineer	David Spencer	04/01/2010
Approved By	Gary E. Myers	EMC Group Manager	Gary E Myers	04/01/2010

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TEST PLAN SECTIONS 1-8

1 CLIENT INFORMATION

	CLIENT
Company	Katsuragawa Electric Co., LTD
Address	21-1 Shimomaruko 4-Chome Ohtaku, Tokyo 146-8585, Japan
Telephone	81-03-3758-3550
E-Mail	kano.sato@kiphq.co.jp
Contact	Satoshi Kano

2 EMC TEST LABORATORY

	EMC LABORATORY
Company	Xerox Corporation
Address	800 Phillips Road, Building 205-99P, Webster, NY 14580 USA
Telephone	(585) 422-4120
E-Mail	gary.myers@xerox.com
Contact	Gary E. Myers

3 EQUIPMENT UNDER TEST

3.1 Identification of EUT

DESCRIPTION	MANUFACTURER	MODEL NAME	SERIAL NUMBER
RFID Reader	Katsuragawa Electric Co. LTD	ARW13T-RF01	Not Serialized

3.2 Identification of Tested Optional Devices / Accessories

DESCRIPTION	MANUFACTURER	MODEL NAME	PRODUCT CODE	SERIAL NUMBER
Not Applicable	-	-	-	-

3.3 Physical Information

DEVICE	HEIGHT (Meters)	WIDTH (Meters)	LENGTH (Meters)
RFID	0.001	0.065	0.065

3.4 Interface Ports

Port Type	Port Description	Connected		Connector Type	Cable Type	Cable Length
		From	To			
I/O	I/O	RFID	LMC-1 Main Control board	I/O	Wire Harness	1.3M
Power	Input power	AC Mains	LMC-1	AC Mains	12AWG	2.7M
USB	USB	Digital Front End	LMC-1	USB	Shielded	1.3M

3.5 Description of the EUT

The EUT is a 13.56MHz Short Range Radio Frequency Identification (RFID) Reader/Writer Device that uses inductive loop coupling and an integral transmitter/receiver for information exchange between the host printing system and a passive tag placed on an internal Customer Replaceable Unit (CRU) such as a toner cartridge. The EUT is intended for use within printer placed in a Class A (EME) business environment. The EUT is intended to communicate within the host equipment only.

Operating frequency:	13.56MHz +/-7KHz.
Number of Channels:	One
Modulation:	FSK
Antenna:	Seven Loop Inductive Coil
Field Strength:	2.7uA/m (at 3m) Maximum
Power Supply:	+5VDC
Duty Cycle:	System-Defined by the host control algorithm

Note: This is a re-compliance test report to qualify the design changes made to the host printer that houses the RFID Reader (See section 3.7). The RFID reader design has not changed since the initial compliance test. Base on these changes it was determined that frequency stability and occupied bandwidth measurements were not necessary.

3.6 Potential Emission Sources

The highest oscillator present during this testing was: 13.56MHz from the RFID.

3.7 New Parts or Modifications Incorporated in the EUT

The following changes were made to the host printer that houses the RFID Reader.

*Fill this section out for re-compliance testing only.

PART NUMBER	DESCRIPTION
NXM	User Interface
None	User Interface harness
Z150400190	Cover changes
Z156260190	USB driver board
None	RS232 port changed to USB Port
Z156600041	Bias Power supply
Z154605670	Developer Unit

3.8 Support Equipment

DESCRIPTION	MANUFACTURER	MODEL NAME	SERIAL NUMBER
Host: Wide Format Printer	Xerox	LMC-1	1150912009

4 TEST SPECIFICATIONS & PROCEDURES

4.1 General

FCC Part 15	CFR 47 Part 15, Subpart C.

4.2 Methods and Procedures

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

4.3 Test Equipment

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

4.4 Test Facility

The EMC Group main offices are located at Xerox Corporation's building 205, 800 Phillips Road, Webster, NY 14580. The Semi-Anechoic chamber test site, building 199, located in Webster, NY was used to collect the data. This facility has been fully described in a report submitted to the FCC and accepted in a letter dated December 15, 2009 (Registration # 91070); additionally, submitted to Industry Canada and accepted in a letter dated March 30, 2010 (File # IC 482B-1).

4.5 Test Methodology

4.5.1 Conducted Emissions

The EUT is configured as detailed in ANSI C63.4:2003 figures 10a & 10b. The EUT power cord is connected to a grounded Line Impedance Stabilization Network (LISN) for measurement. The measurement LISN(s) are powered through grounded AC mains line filters. If the EUT has multiple power cords, each will be powered through a LISN and measured separately. Any separately powered host equipment will be powered through a LISN for isolation purposes. The emissions are measured with a compliant EMI receiver using 9KHz measurement bandwidth. The initial scan data is collected using the peak and average detectors of the receiver from the range of 150KHz-30MHz. The peak scan is compared to the Quasi-peak or broad-band limit, while the average scan is compared to the average or narrow-band limit. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. In cases where the peak scan data is within 6dBuV of the Quasi-peak limit, the Quasi-peak detector is used to record the final test results.

4.5.2 Radiated Emissions

The EUT is configured as detailed in ANSI C63.4: 2003 figures 11a & 11b on the center of the 3/10 meter turn-table within the Xerox Corporation's 10 meter Semi-anechoic chamber. A compliant EMI receiver was used to make all measurements. The EME receiver is used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over the bands of 30MHz-200MHz and 200MHz-1GHz while the turntable is rotated. At any emission within 10dBuV/m of the limit, the Max Hold peak reading is measured using the Quasi-peak detector at the worse case azimuth. At this point the antenna is raised and lowed. The quasi-peak detector was used for all final readings up to 1 GHz recorded in this report. The effective measurement bandwidth used for the radiated emissions test was 120 kHz. Broadband biconical and log periodic antennas were used as transducers during the measurement. The biconical antenna was used from 30 MHz to 200 MHz, and the log periodic antenna was used from 200 MHz to 1 GHz. For testing with the magnetic loop antenna; the loop antenna remains at 1 meter height from the center of the loop to the floor and is rotated about its vertical center axis while the signal level is maximized. The angle, height, and polarity are then recorded. The procedure is then repeated with the antenna placed in the horizontal polarity. The emissions are maximized as described for the vertical polarity. The Semi-Anechoic test chamber site of the XEROX CORPORATION was used for radiated emission testing. This test site is set up according to CISPR 16-1: 1999. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The EUT was tested at a 10 meter test distance to obtain final test data. EUTs with clock frequencies equal to or greater than 108 MHz are evaluated against the applicable FCC limits above 1 GHz using a 1 MHz resolution bandwidth. Both peak and average detectors are used to determine compliance.

The field strength is calculated by adding the Antenna Factor, Attenuator Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows.

FS = RA + AF + CF + ATF- AG

where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
ATF = Attenuator Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5 dBµV/m is obtained. The Antenna Factor of 6.4 dB, a Cable Factor of 1.1 dB and an Attenuator Factor of 1 dB is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBµV/m.

FS = 52.5 + 6.4 + 1.1 + 1 - 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

5 CONFIGURATION & OPERATION OF EUT DURING TEST

5.1 Configuration

CONFIGURATION	RATIONALE
RFID Reader placed within host printer as per normal installation	The RFID will be only installed and used in this configuration.

OPTIONAL DEVICE	RATIONALE FOR NOT TESTING
None	N/A

5.2 Operating Environment

DEVICE	SUPPLY VOLTAGE	SUPPLY FREQUENCY	PHASE	CURRENT RATING
RFID Reader	+5V	DC	N/A	150mA

TEMPERATURE	RELATIVE HUMIDITY
20 °C ± 5%	22% ± 5%

5.3 Special Operating Requirements

REQUIREMENT	RATIONALE FOR SPECIAL REQUIREMENT
None	N/A

5.4 Operating Modes

OPERATING MODE	RATIONALE FOR OPERATION MODE
RFID carrier on continuously	This is the specified operational mode for an intentional radiator per ANSIC63.4: 2003 Annex H

6 DETAILED TEST PLAN

6.1 Test Plan

6.1.1 Conducted Emissions

PORT	METHOD	Limits
AC Mains Inlet	ANSI C63.4: 2003	FCC 15.207

6.1.2 Radiated Emissions

PORT	METHOD	Limits
Enclosure	ANSI C63.4: 2003	FCC 15.209

7 EMC MODIFICATION DETAILS

Required in order to meet all applicable test requirements

PART NUMBER	DESCRIPTION
Fair-Rite:0431164951	Ferrite core placed on harness at RFID Reader board
None	Shielded user interface harness. Harness grounded at both ends.

8 EMISSIONS COMPLIANCE CERTIFICATION

8.1 Judgment

The EUT was found to comply with the regulatory requirements as specified in FCC Part 15, Subpart C Sections 15.207, 15.209, and 15.225. The EUT was also found to comply with Industry Canada RSS-210 section 2.5, Section 2.6 and Annex A2-6

8.2 Filing

The Data has been filed under EMC Group Compliance Data Log Number: EMC10001

8.3 Test Facility

The test site located at Xerox building 199, Webster, NY was used to collect the data. The test site met the site attenuation measurements in accordance with the methods / requirements as specified in ANSI C63.4: 2003. This facility is registered with the FCC under file number 91070, and Industry Canada under 482B-1

Conducted Emissions: *David Spencer* Date of Testing: 01/28 /2010

David Spencer, EMC Engineer
EH&S / EMC Test Group

Radiated Emissions: *David Spencer* Date of Testing: 02/26/2010

David Spencer, EMC Engineer
EH&S / EMC Test Group

These signatures serve as a check for the accuracy of the data transferred from the data sheet to this report.

9 CONDUCTED EMISSIONS

9.1 Worse Case Run Mode

OPERATING MODE	RATIONALE FOR OPERATION MODE
RFID carrier on continuously	This is the specified operational mode for an intentional radiator per ANSI C63.4: 2003

9.2 Measured Data

Conductor (Host Printer)	Frequency [MHz]	Measured Value* [db(µV)]	Margin dB	FCC Part 15 15.207 Average Limit [db(µV)]	FCC Part 15 15.207 Quasi-Peak Limit [db(µV)]
Neutral	0.204	44.2/34.6**	-18.8	53.4	63.4
Neutral	0.753	41.8/33.3**	-12.7	46.0	56.0
Neutral	2.4405	42.6/40.1**	-5.9	46.0	56.0
Neutral	2.7465	46.3/42.1**	-3.9	46.0	56.0
Neutral	5.505	50.6/21.3**	-9.4	50.0	60.0
Neutral	13.56	48.6/46.2**	-3.8	50.0	60.0
Hot	0.204	43.1/35.7**	-17.7	53.4	63.4
Hot	0.6585	49.1/34.0**	-12.0	46.0	56.0
Hot	1.6935	47.0/39.8**	-6.2	46.0	56.0
Hot	5.703	48.9/40.7**	-9.3	50.0	60.0
Hot	13.56	47.2/46.5**	-3.5	50.0	60.0
Hot	18.27	52.9/45.4**	-4.6	50.0	60.0

150KHz-30MHz Conducted Emissions Measurements

* All readings are peak unless stated otherwise.
** Identifies an average reading.
*** Identifies a quasi-peak reading.

10 RADIATED EMISSIONS

10.1 Worse Case Run Mode

OPERATING MODE	RATIONALE FOR OPERATION MODE
RFID carrier on continuously	This is the specified operational mode for an intentional radiator per ANSIC63.4: 2003

10.2 Measured Data

Frequency [MHz]	EUT Angle [Degrees]	Corrected Reading* [db(µV/m)]	Margin dB	10 Meter Limit* [db(µV/m)]
13.5663	269	44.7	46.4	93.5
27.132	320	27.2	10.6	39.0

Measurements 9KHz-30MHz

Frequency [MHz]	Antenna Height [Meters]	Antenna Polarity	EUT Angle [Degrees]	Corrected Reading* [db(µV/m)]	Margin	3 Meter Limit [db(µV/m)]
40.6810	1	V	150	21.8	-18.2	40.0
54.2413	1	V	153	26.8	-13.2	40.0
81.3619	1	V	90	22.4	-17.6	40.0
94.9222	1	V	115	28.3	-15.2	43.5
108.495	1	V	236	27.5	-16	43.5
122.055	1	V	257	34.3	-9.2	43.5
135.611	1	V	300	28.7	-14.8	43.5
149.171	1	V	240	35.8	-7.7	43.5
162.732	1	V	330	32.5	-11	43.5
176.292	2.7	V	289	28.6	-14.9	43.5
189.852	1.6	H	270	33.0	-10.5	43.5
372.65**	3.7	V	353	48.7	+2.7	46.0
425.89**	3.2	V	212	49.9	+3.9	46.0
372.65***	3.7	V	353	48.7	+2.7	46.0
425.89***	3.2	V	212	49.9	+3.9	46.0

Measurements for 30-1000 MHz

No other EUT emissions within 10dBµV/m of the limit.

* All readings are quasi-peak unless stated otherwise.

** This emission is associated with the host printer and does not increase when the RFID is active.

*** This emission was recorded with the Xerox LMC-1 host printer operating and the RFID disabled/powered off (See the table below for a complete list of emissions associated with the host printer)

The Xerox LMC-1 host printer is an FCC Class "A" device and meets the 15.109 Class "A" radiated emission limit. Emissions associated with the host printer are listed in the following table (Refer to Xerox 6622 Wide Format Print System FCC Part 15 report # EMC10001 for further details).

Xerox Model LMC-1 Host Printer Emissions:

10.2 Measured Data

Frequency [MHz]	Antenna Height [Meters]	Antenna Polarity	EUT Angle [Degrees]	Corrected Reading* [db(µV/m)]	Margin	CFR 47 Part 15, EN55022 Class "A", 10 Meter Limit [db(µV/m)]
126.71	1	V	341	36.3	-3.7	40.0
197.50	1	V	006	35.6	-4.4	40.0
200.00	1	V	000	35.6	-4.4	40.0
372.65	3.7	V	353	39.0	-8	47.0
425.89	3.2	V	212	40.6	-6.4	47.0
1667.0	1	H	020	45.3**/56.2***	-4.2	49.5/69.5

Radiated Emissions Measurements 30-15000 MHz

* All readings are quasi-peak unless stated otherwise.
** Indicates an Average Detector Measurement using 1MHZ bandwidth.
*** Indicates a Peak Detector Measurement using 1MHz bandwidth.

12 TEST EQUIPMENT

Type	EMC Group Barcode	Manufacturer / Model Number	Serial Number	Last Calibration Date	Calibration Interval
LISN	036823	Fischer Custom Communications / FCC-LISN-50-25-2-25	09110	6/26/09	1 Year
Temperature & Relative Humidity Sensor	101206	Omega / CT-485B	412000741W	5/19/09	1 Year
EME Receiver	024086	Rohde & Schwarz / ESIB 40	100090	01/05/10	1 Year
RF Preamplifier	031570	Hewlett Packard / 8447D	2944409226	3/5/09	1 Year
RF 6 dB Attenuator	031417	Hewlett Packard / 8491A	34402	3/5/09	1 Year
Biconical Antenna	030862	EMCO / 3109	9303-2891	6/17/09	1 Year
Log Periodic Antenna	030850	EMCO / 3146	9305-3621	6/17/09	1 Year
Magnetic Loop Antenna	034466	Rohde & Schwarz/ HFH2-Z2	880665/005	4/13/09	1 Year

13 PHOTOGRAPHS and ATTACHMENTS

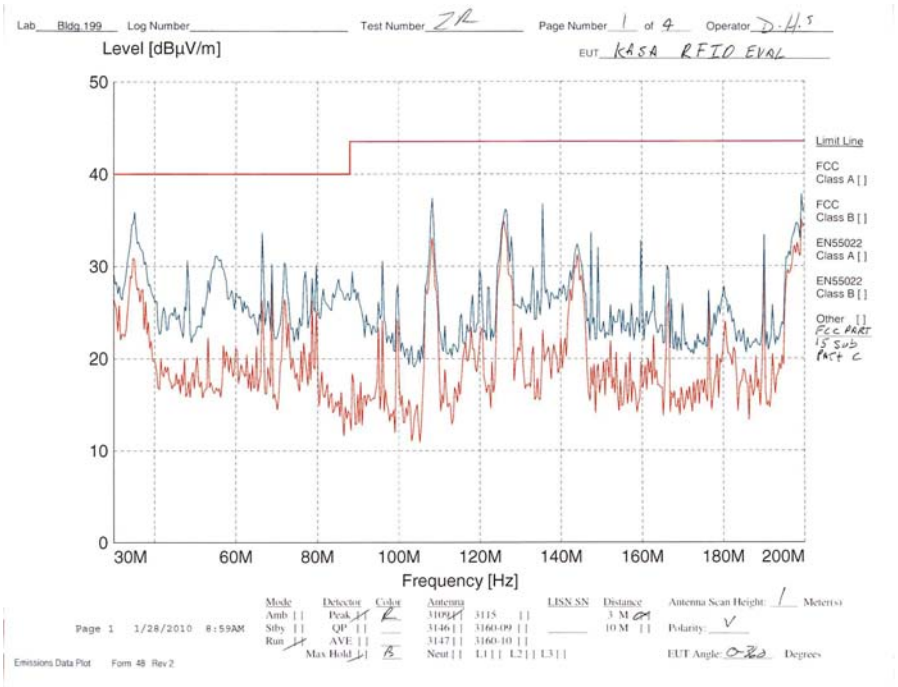

Fig.1
Radiated Emissions Vertical Polarization 30-200MHz

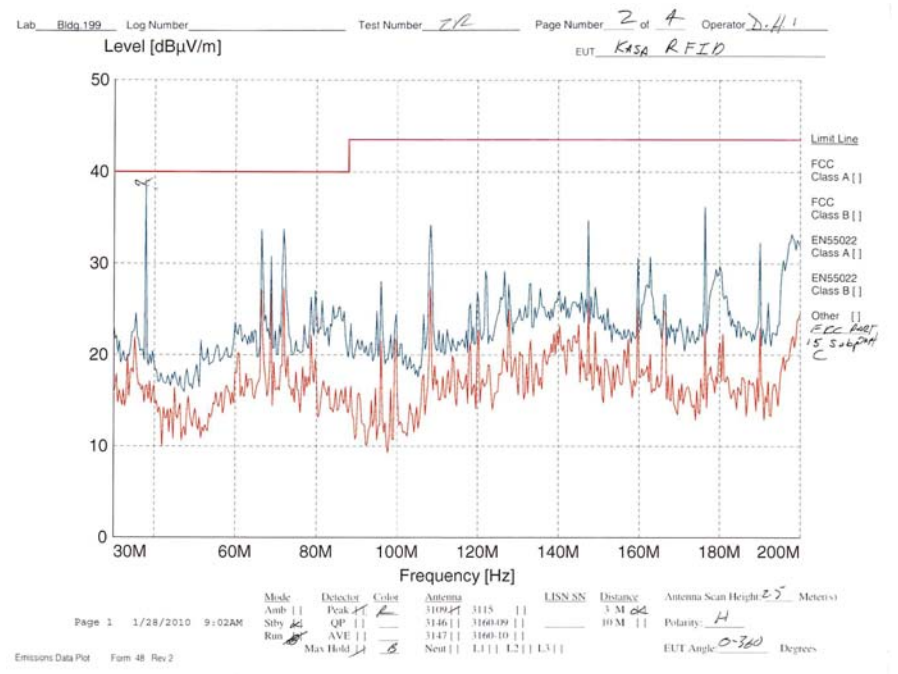

Fig. 2
Radiated Emissions Horizontal Polarity 30-200MHz

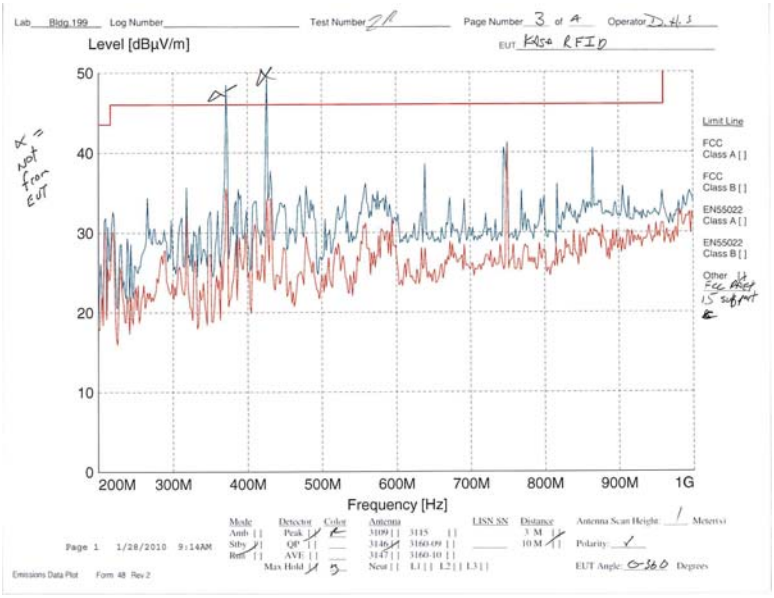

Fig. 3
Radiated Emissions Vertical Polarity 200-1000MHz

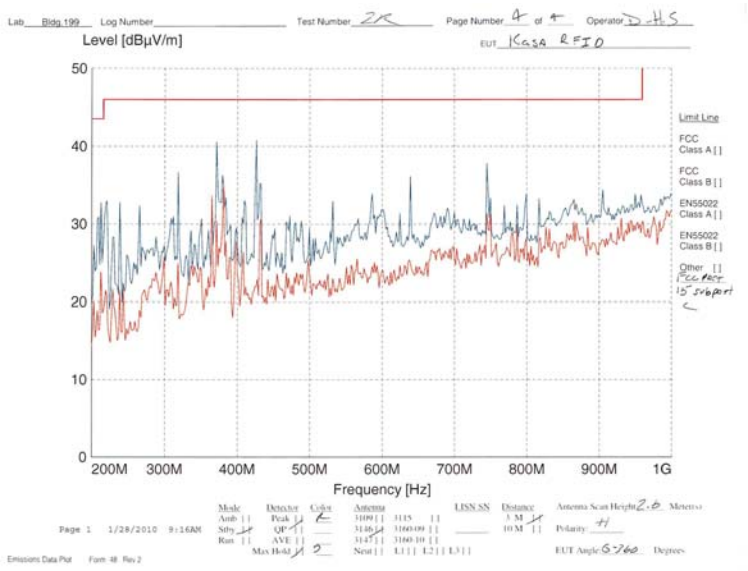

Fig.4
Radiated Emissions Horizontal Polarity 200-1000MHz

Fig. 5
Radiated Emissions

Fig. 6
Conducted emissions

14 TEST LAB SCOPE OF ACCREDITATION TO ISO 17025

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

XEROX CORPORATION
Webster, NY

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 30th day of April 2009.

President
For the Accreditation Council
Certificate Number 1248.01
Valid to November 30, 2010

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

XEROX CORPORATION
EH&S, EMC Group
800 Phillips Road, Building 199
Webster, NY 14580
David A. Lanski Phone: 585 422 9471

ELECTRICAL (EMC)

Valid to: November 30, 2010 Certificate Number: 1248.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following electromagnetic compatibility tests:

Tests:	Standard(s):
Emissions (Radiated & Conducted to 40 GHz)	Code of Federal Regulation (CFR) 47, FCC Part 15 using ANSI C63.4; CFR 47, Part 18 (*excluding tests with 5 μh LISN*); AS/NZS CISPR 22; CISPR 11; EN 55011; EN 55014-1 (*Grounded Type only*); CISPR 22; EN 55022; VCCI V-3; CNS 13438; EN 61000-6-3; EN 61000-6-4
Immunity	EN 55014-2; EN 55024 (*excluding Acoustic Telecommunication Terminal Equipment,*); EN 61000-6-1; EN 61000-6-2
Electrostatic Discharge (ESD)	EN 61000-4-2; IEC 61000-4-2
Radiated Immunity (26 MHz to 1 GHz – 10V/m)	EN 61000-4-3; IEC 61000-4-3
Electrical Fast Transient/Burst	EN 61000-4-4; IEC 61000-4-4
Surge Immunity	EN 61000-4-5; IEC 61000-4-5
Conducted Immunity	EN 61000-4-6; IEC 61000-4-6
Power Frequency Magnetic Field Immunity	EN 61000-4-8; IEC 61000-4-8
Voltage Dips, Short Interruptions, and Line Voltage Variations	EN 61000-4-11; IEC 61000-4-11
Current Harmonics	EN 61000-3-2; IEC 61000-3-2; EN 61000-3-12; IEC 61000-3-12
Voltage Fluctuations & Flicker	EN 61000-3-3; IEC 61000-3-3; EN 61000-3-11; IEC 61000-3-11
EMC – Adjustable speed electrical power drive systems	EN 61800-3 (*test methods only with the exception of section on supply influences – magnetic fields)*
EMC – Electrical equipment for measurement, control and laboratory use	EN 61326-1

	KN Standard	Corresponding International Standard
Republic of Korea Conformity Assessment Procedure for Electromagnetic Interference (RRA Notice 2008-11)	*KN 22*	*CISPR 22*
Republic of Korea Conformity Assessment Procedure for Electromagnetic Susceptibility (RRA Notice 2008-12)	*KN 61000-4-2* *KN 61000-4-3* *KN 61000-4-4* *KN 61000-4-5* *KN 61000-4-6* *KN 61000-4-8* *KN 61000-4-11* *KN 24*	*IEC 61000-4-2* *IEC 61000-4-3* *IEC 61000-4-4* *IEC 61000-4-5* *IEC 61000-4-6* *IEC 61000-4-8* *IEC 61000-4-11* *CISPR 24*
Republic of Korea Technical Requirements for Electromagnetic Interference (KCC Notice 2008-39)		
Republic of Korea Technical Requirements for Electromagnetic Susceptibility (KCC Notice 2008-38)		

15 AMENDMENTS TO TEST REPORT

No amendments were made to this test report.