

## EMISSION -- TEST REPORT

TEST REPORT No.:

**TR1-10607F**

Date of Issue: September 7, 2010

KIND OF EQUIPMENT:

Embedded RFID Read/Write System

MODEL:

4399024A

APPLICANT:

Oki Data Corporation

FCC ID:

B2K-4399024A

TEST STANDARD(S):

FCC Part 15 Subpart C, Section 15.225

TEST RESULT:

Complied

The above equipment has been tested by EMC Kashima Corporation, and found compliance with the requirements of the above standards. The test result only responds to the tested sample. This test report shall not be reproduced except in full, without the written approval of EMC Kashima Corporation. The report must not be used to claim products endorsement by the accreditation or authorization body. The engineers of EMC Kashima Corporation were not involved in modification for the tested sample.

TESTED DATE(S):

July 28-29, 2010

TESTED BY:



Hiromitsu Tanabe

APPROVED BY:

Ken'ichi Suda  
Director**EMC Kashima Corporation**1614 Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan  
TEL: +81-478-82-0963, FAX: +81-478-82-3373TESTING  
CERTIFICATE 1266.01

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## REVISION HISTORY

Rev.	Issue Date	Revision Description	Effect Page	Revised By
00		Initial Issue	All	

## 1 GENERAL INFORMATION

1.1	APPLICANT	Oki Data Corporation
1.2	ADDRESS	3-1, Futaba-cho, Takasaki-shi, Gunma-ken 370-8585, Japan
1.3	MANUFACTURER	Oki Data Corporation
1.4	KIND OF EQUIPMENT	Embedded RFID Read/Write System
1.5	MODEL	4399024A
1.6	POWER RATING	DC 5V 0.2W
1.7	TESTING VOLTAGE	DC 5V (AC120V, 60Hz for Printer)
1.8	CONDITION OF EUT	Prototype
1.9	OPERATING FREQUENCY	13.56MHz
1.10	TYPE OF MODURATION	ASK
1.11	OPERATING TEMPERATUR	10 °C to 32 °C
1.12	TEST STANDARD(S)	FCC Part 15 Subpart C, Section 15.225
1.13	TEST METHOD(S)	ANSI C63.4: 2003
1.14	TESTED DATE(S)	July 28-29, 2010
1.15	REMARK(S)	

## 2 SUMMARY OF TEST RESULT

### 2.1 Test Result

FCC Part 15 Section	Test Item	Worst margin	Condition	Result
15.203	Antenna requirement	-	-	Pass <sup>Note1</sup>
15.207	Conducted emissions 9kHz - 30MHz	17.9dB at 3.1747MHz	-	Pass
15.225(a)(b)(c)	Radiated emissions 9kHz - 30MHz	91.1dB at 13.56MHz	Radiated	Pass
15.225(d)	Radiated emissions 9kHz - 30MHz	48.0dB at 27.12MHz	Radiated	Pass
15.225(d) 15.209	Radiated emissions 30MHz - 1GHz	13.2dB at 339.00MHz	Radiated	Pass
15.225(e)	Frequency stability	0.0005%	Conducted	Pass
15.215(c)	20dB Bandwidth	6.14kHz	Conducted	Pass

Note 1: Users cannot replace the antenna since it is attached to the inside of the printer.

Note 2: "Pass" is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.

- It is possible to determine compliance at a level of confidence of 95% in case that the margin is not less than the measurement uncertainty in the Laboratory.
- It is not possible to determine compliance at a level of confidence of 95% in case that the margin is less than the measurement uncertainty in the Laboratory. However, the measured result indicates that the product tested complies with the specification limit.

### **3 EQUIPMENT UNDER TEST**

#### **3.1 Description of The EUT**

The RFID equipment we'll make an application is built in a printer and is used for checking remaining amount of the toner.

#### **3.2 Operation - mode of The EUT**

The equipment under test was operated during the measurement under following conditions:

- Transmitting and Receiving mode (with Passive Tag)

## 4 TEST CONFIGURATION

### 4.1 EUT(s) and Peripheral(s)

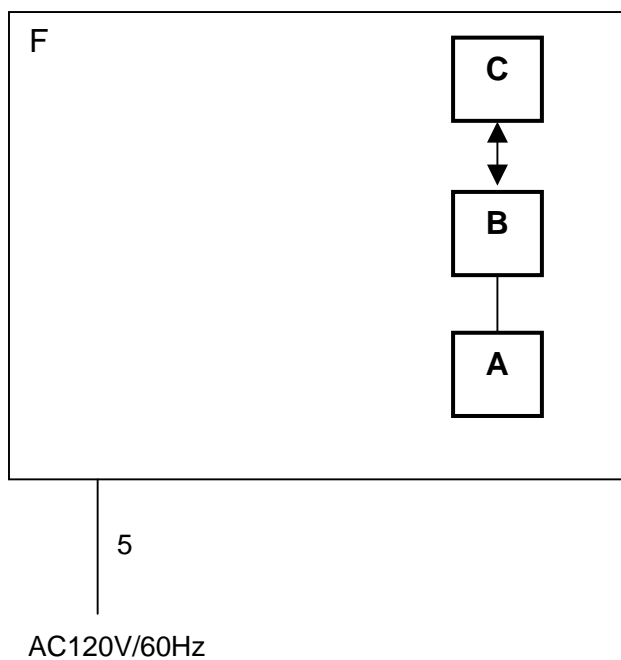
	Equipment Name	Model	Serial No.	Company	FCC ID
A	RFID Module (EUT)	4399024A	1 (for Conducted Emissions) 2 (for Other Emissions)	Oki Data Corporation	B2K-4399024A
B	Antenna Unit (EUT)	-	-	Oki Data Corporation	B2K-4399024A
C	Tag (EUT)	-	-	Oki Data Corporation	B2K-4399024A
D	Micro-Computer for Test	None	None	Oki Data Corporation	N/A
E	DC Power Supply	PAL 35-10	CE001899	KIKUSUI	N/A
F	Printer	N31194A	1	Oki Data Corporation	DoC*
*Note: Declaration of Conformity					
N/A: Not Applicable					

### 4.2 Cable(s) Used

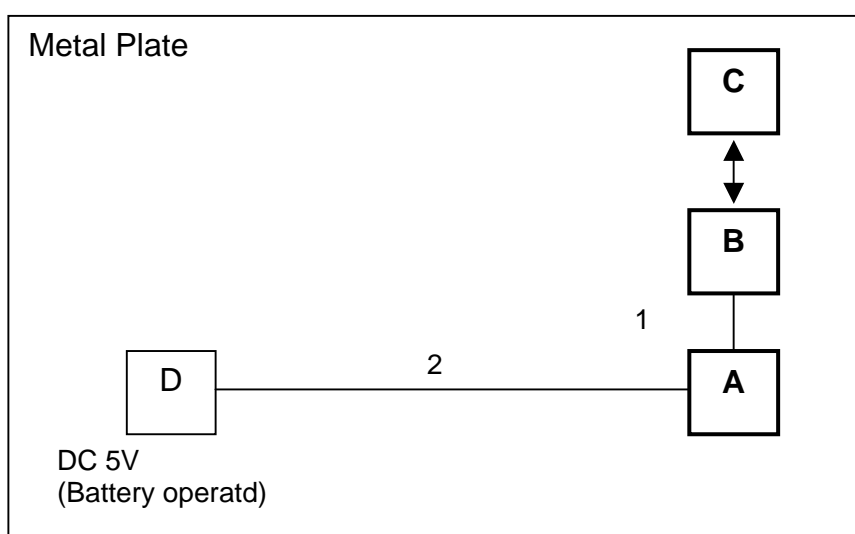
	Cable Name	Length	Shielded	Model	Company	Remarks
1	Antenna	0.07 m	no	43171502YS		
2	Signal	0.6 m	no	--		
3	DC Power (EUT)	4.0 m	no	--		
4	AC Power (DC Power Supply)	3.0 m	no	--		
5	AC Power (Printer)	1.8 m	no	--		
				--		
				--		
				--		
				--		

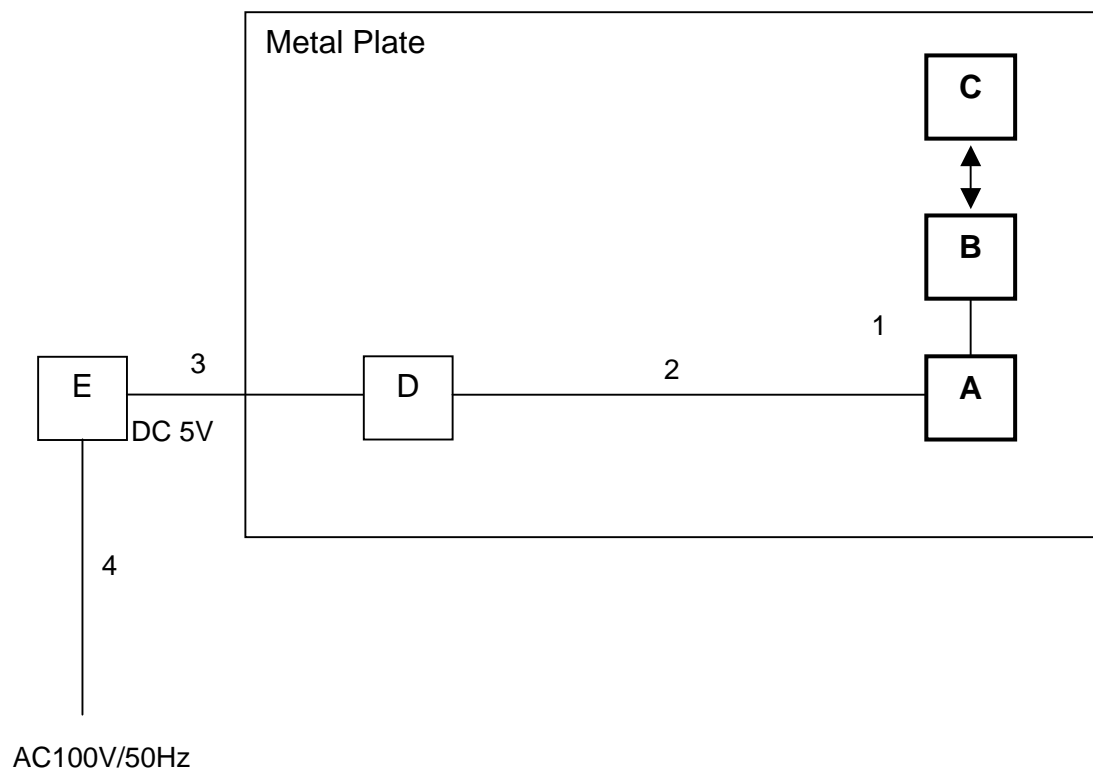
### 4.3 Connection figure

#### Conducted Emissions



#### Radiated Emissions



Frequency stability Test condition



## 5 TEST FACILITIES

All measurement facilities in EMC Kashima Corporation are located in 1614, Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan.

Accredited by American Association for Laboratory Accreditation (A2LA) for the emission and immunity tests stated in the scope of the certificate under Certificate Number 1266-01.

Authorized by TUV Rheinland for the emission and immunity tests stated in the scope of the certificate under Certificate No. UA 50061520-0001.

Registered by Federal Communications Commission (FCC). Each registered facility number is as follows:

Test site No. 1 90558 / Test site No. 2 510504 / Test site No. 4 90557  
Test site No. 5 99356 / Test site No. 6 372431 / Test site No. 10 682397

Registered by Industry Canada (IC). Each registered facility number is as follows:

Test site No. 1 IC 4659A-1 / Test site No. 2 IC 4659A-2 / Test site No.5 IC 4659A-5  
Test site No. 6 IC 4659A-6 / Test site No. 10 IC 4659A-10

Approved by Saudi Arabian Standards Organization (SASO).

Registered by Voluntary Control Council for Interference by Information Technology Equipment (VCCI).

Each registered facility number is as follows:

Test site No. 1 R-188, G-43, C-785 (Open site) / C-187, T-1461 (Shielded room)  
Test site No. 2 R-189, G-44 (Open site) / C-188, T-1427 (Shielded room)  
Test site No. 4 R-656 (Open site) / C-613, T-354 (Shielded room)  
Test site No. 5 R-1227, G-45, C-1290 (Open site) / C-1291, T-1462 (Shielded room)  
Test site No. 6 R-1895, G-46, C-2042, T-1502 (Anechoic chamber)  
Test site No. 10 R-3178, G-100, C-3519, T-1684 (Anechoic chamber)

## 6 MEASUREMENT UNCERTAINTY

The treatment of uncertainty is based on the general matters on the definition of uncertainty in “Guide to the expression of uncertainty in measurement (GUM)” published by ISO. The Lab’s uncertainty is determined by referring UKAS Publication LAB34:2002 “The Expression of Uncertainty in EMC Testing” and CISPR16-4-2:2003 “Uncertainty in EMC Measurements”.

The uncertainty of the measurement result in the level of confidence of approximately 95% ( $k=2$ ) is as follows:

Conducted Emissions (Mains)	$\pm 2.99$ dB
Radiated emission test (9kHz - 30MHz)	$\pm 3.70$ dB
Radiated emission test (30MHz - 1000MHz)	$\pm 4.40$ dB

## 7 TEST CONDITIONS

### 7.1 Section 15.207 Conducted Emissions

#### 7.1.1 Test Location

Test site No. 1 (Shielded room)

#### 7.1.2 Used Test Instruments

Model	Name	Manufacturer	Code No.	Last Cal.	Remarks
ESCS30	Test Receiver	Rohde & Schwarz	RCV04	2009.10	for EUT
ESH3-Z5	AMN	Rohde & Schwarz	LSN03	2010.07	
8567A	Spectrum Analyzer	Hewlett Packard	SPR03	2010.01	
5D-2W	Coaxial cable	FUJIKURA	1CSR	2010.07	

All used test instruments are calibrated at least once a year.

#### 7.1.3 Test Procedure

The test setup and measurements were implemented according to the test method of ANSI C63.4: 2003  
7. AC power line conducted emission measurements.

Final measurements were made on the conditions described on this page, and the photos of test-setup indicate the final conducted emissions.

#### 7.1.4 Limit

Mains ports (AC Power line)

Frequency (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5	56	46
5 - 30	60	50

\* Decreases with the logarithm of the frequency.

## 7.2 Section 15.225(a)(b)(c)(d) Radiated Emissions (9kHz - 30MHz)

### 7.2.1 Test Location

Test site No. 1 (Open site) 3 meters distance

### 7.2.2 Used Test Instruments

Model	Name	Manufacturer	Code No.	Last Cal.	Remarks
ESHS10	Test Receiver	Rohde & Schwarz	RCH02	2010.03	
HFH2-Z2	Loop Antenna	Rohde & Schwarz	LPA01	2010.07	
5D-2W	Coaxial cable	FUJIKURA	MG5m	2010.05	

All used test instruments are calibrated at least once a year.

### 7.2.3 Test Procedure

The test setup and measurements were implemented according to the test method of ANSI C63.4: 2003 8. Radiated emission measurements.

The test was performed at 3 meter distance and its result was converted into the one at specified 30 meter distance according to 15.31(f). The turntable was rotated and the center point of the loop antenna was fixed at 1 meter above ground level to investigate the maximum radiated emission, positioning the loop antenna in vertical and horizontal. Final measurements were made on the conditions described on this page, and the photos of test-setup indicate the final radiated emissions.

### 7.2.4 Limit

Frequency (MHz)	Field strength @30m (uV/m)	Field strength @30m (dBuV/m)	Field strength @3m (dBuV/m)
Below 13.110	30	29.5	69.5
13.110 - 13.410	106	40.5	80.5
13.410 - 13.553	334	50.5	90.5
13.553 - 13.567	15,848	84	124
13.567 - 13.710	334	50.5	90.5
13.710 - 14.010	106	40.5	80.5
Above 14.010	30	29.5	69.5

$\text{dBuV/m} = 20 \times \log(\text{uV/m})$

Distance factor = 40dB / decade (15.31(f))

## 7.3 Section 15.225(d) Radiated Emissions (30MHz - 1000MHz)

### 7.3.1 Test Location

Test site No. 1 (Open site) 3 meters distance

### 7.3.2 Used Test Instruments

Model	Name	Manufacturer	Code No.	Last Cal.	Remarks
ESCS30	Test Receiver	Rohde & Schwarz	RCV04	2009.10	
VULB 9168	Logbicon Antenna	Schwarzbeck	LGBC01	2010.04	
8567A	Spectrum Analyzer	Hewlett Packard	SPR03	2010.01	
8447D	Pre-Amplifier	Hewlett Packard	PRA03	2010.07	
12DSFA/SF106A	Coaxial cable	FUJIKURA/SUHNER	1R10m106	2010.07	

All used test instruments are calibrated at least once a year.

### 7.3.3 Test Procedure

The test setup and measurements were implemented according to the test method of ANSI C63.4: 2003 8. Radiated emission measurements.

They were performed at the measurement distance that specified for compliance to determine the frequency producing the maximum emissions. The turntable was rotated and the antenna height was varied 1 to 4 meters to investigate the maximum radiated emission for the horizontal and vertical polarization. Final measurements were made on the conditions described on this page, and the photos of test-setup indicate the final radiated emissions.

### 7.3.4 Limit

Frequency (MHz)	Field strength @3m (uV/m)	Field strength @3m (dBuV/m)
30 - 88	100	40
88 - 216	150	43.5
216 -960	200	46
Above 960	500	54

$\text{dBuV/m} = 20 \times \log (\text{uV/m})$

## 7.4 Section 15.225(e) Frequency Stability

### 7.4.1 Test Location

Test site No. 6

### 7.4.2 Used Test Instruments

Model	Name	Manufacturer	Code No.	Last Cal.	Remarks
R3162	Spectrum Analyzer	ADVANTEST	SPTG02	2010.05	
8494B	Attenuator	HP	SAT05	2009.10	
8495B	Attenuator	HP	SAT06	2009.10	
Sucoflex 104	Micro Wave cable	SUHNER	MWC-5m	2010.06	
Sucoflex 104	Micro Wave cable	SUHNER	MWC-0.5m	2010.06	
PR-4KPH	Temperature Chamber	ESPEC	TMPC02	2009.10	
112	MULTIMETER	FLUKE	MTM27	2009.10	

All used test instruments are calibrated at least once a year.

### 7.4.3 Test Procedure

The test setup and measurements were implemented according to the test method of ANSI C63.4: 2003 Annex H5.

The EUT was measured with the condition that the measuring instrument was connected to the antenna through the coaxial cable, whose antenna was placed near the EUT. The measurement started with the Temperature chamber sufficiently stabilized.

### 7.4.4 Limit

Item	Variation	Limit (%)
Temperature variation	-20°C - +50°C	+/- 0.01
Voltage variation	85% - 115%	+/- 0.01

## 7.5 Section 15.215(c) 20dB Bandwidth

### 7.5.1 Test Location

Test site No. 6

### 7.5.2 Used Test Instruments

Model	Name	Manufacturer	Code No.	Last Cal.	Remarks
R3162	Spectrum Analyzer	ADVANTEST	SPTG02	2010.05	
8494B	Attenuator	HP	SAT05	2009.10	
8495B	Attenuator	HP	SAT06	2009.10	
Sucoflex 104	Micro Wave cable	SUHNER	MWC-5m	2010.06	
Sucoflex 104	Micro Wave cable	SUHNER	MWC-0.5m	2010.06	
PR-4KPH	Temperature Chamber	ESPEC	TMPC02	2009.10	
112	MULTIMETER	FLUKE	MTM27	2009.10	

All used test instruments are calibrated at least once a year.

### 7.5.3 Test Procedure

The test setup and measurements were implemented according to the test method of ANSI C63.4: 2003 Annex H6.

The spectrum analyzer RBW and VBW were set as follows. The marker-to-peak function of the spectrum analyzer was used to measure to peak level and the marker-delta function was used to measure the emission 20dB below the peak. It has been plotted.

#### Spectrum Analyzer Setup

RBW	VBW	Detector
1kHz	3kHz	Peak

## 8 TEST DATA

### 8.1 Section 15.207 Conducted Emissions

Company : Oki Data Corporation  
 Equipment : Embedded RFID Read/Write System  
 Model : 4399024A  
 Power : DC 5V (AC120V, 60Hz for Printer)  
 Test Mode : Transmitting and Receiving mode

Tested Date : July 28, 2010  
 Temperature : 26 °C  
 Humidity : 40 %  
 Atmos. Press : 1013 hPa

Engineer : Hiromitsu Tanabe

Freq. (MHz)	Phase	Reading (dBuV)		Corr. Factor (dB)	Result (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV		QP	AV	QP	AV	QP	AV
0.1500	N	30.0	-	10.1	40.1	-	66.0	56.0	25.9	-
3.1747	N	27.7	-	10.4	38.1	-	56.0	46.0	17.9	-
9.2723	N	28.5	-	10.8	39.3	-	60.0	50.0	20.7	-
10.6215	N	27.1	-	10.9	38.0	-	60.0	50.0	22.0	-
13.5600	N	17.7	-	11.2	28.9	-	60.0	50.0	31.1	-
23.9230	N	20.5	-	11.9	32.4	-	60.0	50.0	27.6	-
0.1500	L	32.0	-	10.1	42.1	-	66.0	56.0	23.9	-
3.1747	L	24.5	-	10.4	34.9	-	56.0	46.0	21.1	-
9.2723	L	18.0	-	10.8	28.8	-	60.0	50.0	31.2	-
10.6215	L	19.3	-	10.9	30.2	-	60.0	50.0	29.8	-
13.5600	L	17.5	-	11.2	28.7	-	60.0	50.0	31.3	-
23.9230	L	21.5	-	11.9	33.4	-	60.0	50.0	26.6	-

Correction Factor(dB) = AMN Factor(dB) + Cable Loss(dB)

Result(dBuV) = Reading (dBuV) + Correction Factor(dB)

**8.2 Section 15.225(a)(b)(c) Radiated Emissions (9kHz - 30MHz)**

Company : Oki Data Corporation      Tested Date : July 28, 2010  
Equipment : Embedded RFID Read/Write System      Temperature : 27 °C  
Model : 4399024A      Humidity : 43 %  
Power : DC 5V      Atmos. Press : 1013 hPa  
Test Mode : Transmitting and Receiving mode  
Test Distance : 3m

Engineer : Hiromitsu Tanabe

Freq. (MHz)	Pol. (H/V)	Reading @3m (dBuV)	Detector (QP/Pk)	Corr. Factor (dB)	Result (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
13.5600	H	32.8	QP	0.1	32.9	124.0	91.1

Note 1: It is recognized that the emission level of the vertical polarization is obvious lower than that of the Horizontal polarization.

Note 2: Correction Factor(dB) = Antenna Factor(dB/m) + Cable Loss(dB)

Result(dBuV/m) = Reading(dBuV) + Correction Factor(dB)

Note 3: The test examined it with a new battery.



**Section 15.225(d) Radiated Emissions (9kHz - 30MHz)**

Company : Oki Data Corporation      Tested Date : July 28, 2010  
Equipment : Embedded RFID Read/Write System      Temperature : 27 °C  
Model : 4399024A      Humidity : 43 %  
Power : DC 5V      Atmos. Press : 1013 hPa  
Test Mode : Transmitting and Receiving mode  
Test Distance : 3m

Engineer : Hiromitsu Tanabe

Freq. (MHz)	Pol. (H/V)	Reading @3m (dBuV)	Detector (QP/Pk)	Corr. Factor (dB)	Result (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
27.1200	H	21.3	QP	0.2	21.5	69.5	48.0

Note 1: It is recognized that the emission level of the vertical polarization is obvious lower than that of the Horizontal polarization.

Note 2: Correction Factor(dB) = Antenna Factor(dB/m) + Cable Loss(dB)

Result(dBuV/m) = Reading(dBuV) + Correction Factor(dB)

Note 3: The test examined it with a new battery.

### 8.3 Section 15.225(d) Radiated Emissions (30MHz - 1000MHz)

Company : Oki Data Corporation  
 Equipment : Embedded RFID Read/Write System  
 Model : 4399024A  
 Power : DC 5V  
 Test Mode : Transmitting and Receiving mode  
 Test Distance : 3m

Tested Date : July 28, 2010

Temperature : 27 °C

Humidity : 43 %

Atmos. Press : 1013 hPa

Engineer : Hiromitsu Tanabe

Freq. (MHz)	Pol. (H/V)	Reading (dBuV)	Detector (QP/Pk)	Corr. Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
108.48	V	33.0	QP	-16.1	16.9	43.5	26.6
244.08	H	33.0	QP	-13.1	19.9	46.0	26.1
325.44	H	39.3	QP	-10.1	29.2	46.0	16.8
339.00	H	42.7	QP	-9.9	32.8	46.0	13.2
339.00	V	29.3	QP	-9.9	19.4	46.0	26.6
352.56	H	42.0	QP	-9.4	32.6	46.0	13.4
433.92	H	36.3	QP	-8.1	28.2	46.0	17.8
447.48	H	34.7	QP	-7.8	26.9	46.0	19.1
461.04	H	36.7	QP	-7.6	29.1	46.0	16.9
461.04	V	33.3	QP	-7.6	25.7	46.0	20.3
650.88	V	28.5	QP	-3.2	25.3	46.0	20.7

Correction Factor(dB) = Antenna Factor(dB/m) + Cable Loss(dB) – Preamplifier Gain(dB)

Result(dBuV/m) = Reading(dBuV) + Correction Factor(dB)

The test examined it with a new battery.

## 8.4 Section 15.225(e) Frequency Stability

Company : Oki Data Corporation  
 Equipment : Embedded RFID Read/Write System  
 Model : 4399024A  
 Power : DC 5V  
 Test Mode : Transmitting and Receiving mode

Tested Date : July 29, 2010

Temperature : 24 °C

Humidity : 45 %

Atmos. Press : 1010 hPa

Engineer : Hiromitsu Tanabe

### Temperature Variations

Temp. (°C)	Voltage (V)	Measured Frequency (MHz)				Worst Deviation (%)	Limit (%)
		Start-up	2 min.	5 min.	10 min.		
50	5	13.55995	13.55995	13.55995	13.55995	0.0004	+/- 0.01
40	5	13.55998	13.55997	13.55997	13.55997	0.0002	+/- 0.01
30	5	13.56001	13.56000	13.56000	13.56000	0.0001	+/- 0.01
20	5	13.56004	13.56003	13.56003	13.56003	0.0003	+/- 0.01
10	5	13.56006	13.56005	13.56004	13.56004	0.0004	+/- 0.01
0	5	13.56007	13.56007	13.56007	13.56007	0.0005	+/- 0.01
-10	5	13.56005	13.56006	13.56006	13.56006	0.0004	+/- 0.01
-20	5	13.56001	13.56002	13.56002	13.56003	0.0002	+/- 0.01

### Voltage Variations

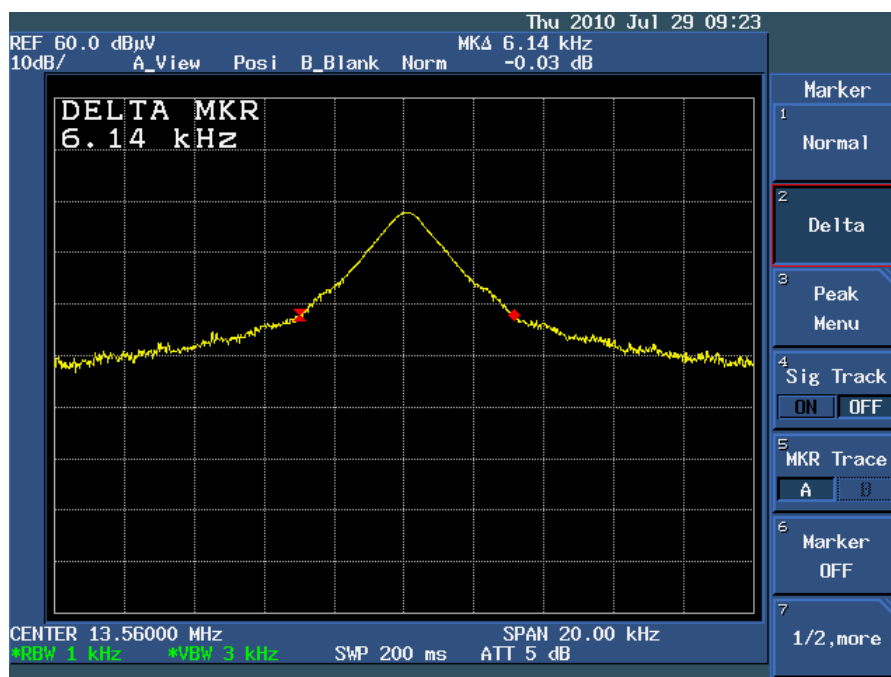
Temp. (°C)	Voltage (V)	Measured Frequency (MHz)				Worst Deviation (%)	Limit (%)
		Start-up	2 min.	5 min.	10 min.		
20	4.25	13.56002	13.56001	13.56001	13.56001	0.0001	+/- 0.01
20	5	13.56004	13.56003	13.56003	13.56003	0.0003	+/- 0.01
20	5.75	13.56006	13.56005	13.56004	13.56004	0.0004	+/- 0.01

## 8.5 Section 15.215(c) 20dB Bandwidth

Company	: Oki Data Corporation	Tested Date	: July 29, 2010
Equipment	: Embedded RFID Read/Write System	Temperature	: 24 °C
Model	: 4399024A	Humidity	: 45 %
Power	: DC 5V	Atmos. Press	: 1010 hPa
Test Mode	: Transmitting and Receiving mode		

Engineer : Hiromitsu Tanabe

Freq. (MHz)	20dB Bandwidth (kHz)
13.56	6.14



## 9 THE PHOTOS OF TEST-SETUP

### 9.1 Conducted Emissions 150 kHz - 30 MHz



## 9.2 Radiated Emissions 9 kHz - 1000 MHz



**Radiated Emissions 9 kHz - 30 MHz (Antenna polarization: Horizontal setup)**





### 9.3 Frequency Stability

