RADIO TEST REPORT

Test Report No. : 31GE0106-HO-02-A-R1

Applicant	:	**Maxell Seiki, Ltd.**
Type of Equipment	:	**RFID Reader/Writer Unit**
Model No.	:	**ME-KS01M48-A**
Test standard	:	**FCC Part 15 Subpart C: 2010**
FCC ID	:	**UOEME-K01**
Test Result	:	**Complied**

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6. This report is a revised version of 31GE0106-HO-02-A. 31GE0106-HO-02-A is replaced with this report.

Date of test: March 23 to 26, 2011

Representative test engineer:
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http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

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SECTION 1: Customer information

Company Name	:	Maxell Seiki, Ltd.
Address	:	45-101 Kagamida, Oyamazaki-cho, Otokuni-gun, Kyoto, 618-8558 Japan
Telephone Number	:	+81-75-951-1465
Facsimile Number	:	+81-75-952-5873
Contact Person	:	Masayuki Nagano

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

2.1 Identification of E.U.T.

Type of Equipment	:	RFID Reader/Writer Unit
Model No.	:	ME-KS01M48-A
Serial No.	:	Refer to Clause 4.2
Rating	:	AC100-240V
Receipt Date of Sample	:	February 28, 2011
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: ME-KS01M48-A is the RFID Reader/Writer Unit.
This device is a Reader/Writer Unit which communicates with RFID chips implanted in test tubes.
With operator's direction, this device processes data of all forty eight test tubes on the rack, set on the specified position.

General Specification

Clock frequency(ies) in the system	:	CPU: 6MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	13.56MHz
Frequency band	:	13.55322-13.56678MHz
Modulation	:	ASK
Antenna type	:	Loop coil
Antenna connector Type	:	Board to board connector
Method of Frequency Generation	:	Crystal
Mode of operation	:	Simplex
Operating Temperature	:	0 deg. C. to +40 deg. C.

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

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC>RSS-Gen 7.2.4	Section 15.207 <IC>RSS-Gen 7.2.4	[QP] 11.7dB 0.15000MHz, N/L Without Tag [AV] 7.4dB 27.11988MHz, N With Tag	Complied	-
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11	Section 15.225(a) <IC>RSS-210 A2.6	79.7dB 13.56000MHz, QP Without Tag	Complied	Radiated
Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.9, 4.11	Section 15.225(b)(c) <IC> RSS-210 A2.6	46.5dB 13.11000MHz, QP Without Tag / With Tag	Complied	Radiated
20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	Section15.215(c) <IC> -	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.9, 4.11	Section15.209, Section 15.225 (d) <IC>RSS-210 A2.6	1.3dB 48.637MHz, QP, Vertical Without Tag	Complied	Radiated
Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators <IC>RSS-Gen 4.7	Section15.225(e) <IC> RSS-210 A2.6	See data	Complied	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15					

FCC 15.31 (e)
This EUT provides stable voltage (DC5.0V) constantly to RF Part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	N/A	N/A	Radiated

3.4 Uncertainty

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

Test room (semi-anechoic chamber)	**Conducted emission (±dB)**
	150kHz-30MHz
No.1	3.1dB
No.2	3.3dB
No.3	3.7dB
No.4	3.2dB

Test room (semi-anechoic chamber)	**Radiated emission**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Frequency counter (±)	
Normal condition	Extreme condition
7×10^{-6}	9×10^{-6}

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

Radiated emission test(3m)
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

4.1 Operating Modes

The mode is used :

Mode	Remarks*
Communication mode (Tx)	With Tag
	Without Tag
	Antenna terminated with dummy load
*The EUT was operated in a manner similar to typical use during the tests. *The EUT Transmits and Receives at the same time and there is no receiving mode. *The EUT does not have a simultaneous transmission function. *There is no difference for all of the antenna specification. *EUT has the power settings by the software as follows; Software: ME2Tester8 Ver: 1.3.0.14 * This software does not have a Power Control function. The test was performed with Default value written on RF module ROM. Mass-produced product will have same level as it.	

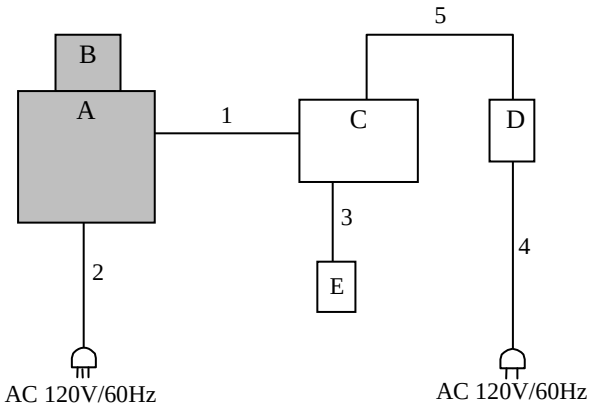
Test Item	Operating mode*
Conductedemission	Tx with Tag and without Tag
Electric Field Strength of Fundamental Emission	Tx with Tag and without Tag
Spectrum Mask	Tx with Tag and without Tag
20dB Bandwidth	Tx with Tag and without Tag
Electric Field Strength of Spurious Emission	Tx with Tag and without Tag
Frequency Tolerance	Tx Mod off Mod on

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

Frequency Tolerance:

Temperature : -30 deg.C.(minimum) to + 50deg.C.(maximum)
(-30deg.C.: Reference, Step 10deg.C.)
Voltage : AC 138V, AC 102V (AC120V ±15%)
*This EUT provides stable voltage (DC5.0V) constantly to RF Part regardless of input voltage

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 equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	RFID Reader/Writer Unit	ME-KS01M48-A	1	Maxell Seiki, Ltd.	EUT
B	Tag	ME-Y1E1-I series	-	Maxell Seiki, Ltd.	EUT
C	Personal Computer	7661CB9	L3Y3946	IBM	-
D	AC Adaptor	92D1213	11S92P1213Z1ZBGK7AH11F	IBM	-
E	Mouse	M-UB48	LZE02601001	Logitech	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB Cable	5.0	Shielded	Shielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-
3	Mouse Cable	0.8	Shielded	Shielded	-
4	AC Cable	1.0	Unshielded	Unshielded	-
5	DC Cable	1.8	Unshielded	Unshielded	-

SECTION 5: Conducted emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 0.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and 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 a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector : QP and AV
Measurement range : 0.15-30MHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask)

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.
The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical (angle of loop antenna: 0deg., 45deg., 90deg., and 135 deg.) and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz
Antenna Type	Loop	Biconical	Logperiodic

Frequency	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Instrument used	Test Receiver				
Detector	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

This EUT has two transmitting modes which tag is put close to the EUT or not.
The test was performed with and without tag.

The test was made on EUT at the normal use position.

* FCC Part 15 Section 15.31 (f)(2) / IC RSS-Gen 4.11 (9kHz-30MHz)

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

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

Measurement range : **0.09M-1GHz**
Test data : **APPENDIX**
Test result : **Pass**

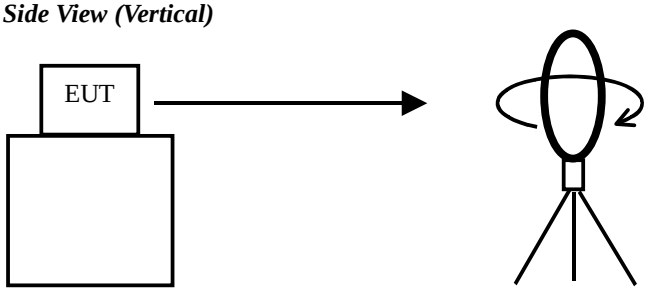
SECTION 7: Other test

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
20dB Bandwidth	200kHz	2kHz	6.2kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter

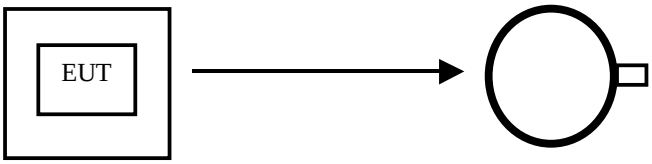
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

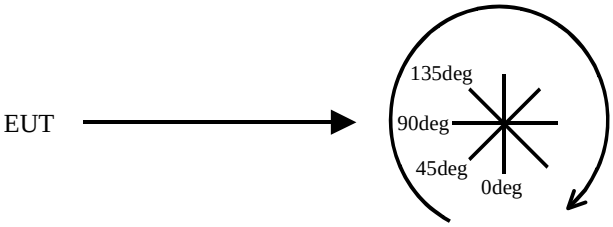


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise