RADIO TEST REPORT

Test Report No. : 27IE0038-HO-A-R1

Applicant	:	**SATO CORPORATION**
Type of Equipment	:	**BARCODE PRINTER**
Model No.	:	**MB410i-W2**
FCC ID	:	**MMFMB400I-W2**
Test standard	:	**FCC Part 15 Subpart C Section 15.207, Section 15.247: 2007**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. Original test report number of this report is 27IE0038-HO-A.

Date of test:

April 10 to June 2, 2007

Tested by:

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Approved by :

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NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://ulapex.jp/emc/nvlap.htm

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SECTION 1: Client information

Company Name	:	SATO CORPORATION
Address	:	1-207, Onari-cho, Omiya-ku, Saitama-shi, Saitama 330-0852 Japan
Telephone Number	:	+81-48-663-8118
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Contact Person	:	Keisuke Yamada

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

2.1 Identification of E.U.T.

Type of Equipment	:	BARCODE PRINTER
Model No.	:	MB410i-W2
Serial No.	:	2
Country of Manufacture	:	Malaysia, Vietnam
Receipt Date of Sample	:	April 10, 2007
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

MB4xxi-W2 has Model No. MB400i-W2 and Model No. MB410i-W2 as 2 model types.
The difference does not affect on radio testing results. Therefore, the test was performed with Model No. MB410i-W2 as representative model.
Model No: MB410i-W2 is the BARCODE PRINTER.
The difference of 2 model types is as follows;

MB400i-W2	MB410i-W2
Print head resolution 203 dpi (8 dots/mm)	Print head resolution 305 dpi (12 dots/mm)

Clock frequency	CPU: 14.7456MHz (X'tal) Internal Clock: 14.7456 x 4 = 58.9824MHz Reference Clock: 40MHz
Equipment Type	Transceiver
Frequency of Operation	2412MHz to 2462MHz
Bandwidth & Channel spacing	22MHz & 5MHz
Type of Modulation	DSSS/OFDM
Antenna Type	Multilayer Chip Antenna (Inverted-F 1/4 lambda antenna)
Antenna Gain	2.044dBi (MAX)
Antenna connector	Built-in antenna
Method of frequency generation	Synthesizer
Operating voltage	DC14.8V (Battery)/DC19.0V(AC Adaptor)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart C : 2007

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits : 2007
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz : 2007

FCC 15.31 (e)
This EUT provides stable voltage(DC3.3V) constantly to RF Module 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.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted emission	**FCC:** ANSI C63.4:2003 7. AC powerline conducted emission measurements	**FCC:** Section 15.207	-	N/A	12.0dB 0.48149MHz, AV, N (IEEE802.11b) 0.48156MHz, AV, N (IEEE802.11g)	Complied
2	6dB Bandwidth	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247(a)(2)	Conducted	N/A	See data.	Complied
3	Maximum Peak Output Power	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247(b)(3)	Conducted	N/A		Complied
4	Restricted Band Edges	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247 (d)	Conducted/ Radiated	N/A		Complied
5	Power Density	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247 (e)	Conducted	N/A		Complied
6	Spurious Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section15.247(d)	Conducted/ Radiated	N/A	1.9dB 188.490MHz QP, Vertical	Complied
Note: UL Apex's EMI Work Procedures No.QPM05 and QPM15.							

*These tests were also referred to "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".
*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Additions or deviations to standards

No addition, deviation, nor exclusion has been made from standards.

3.4 Uncertainty

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

Conducted Emission

The measurement uncertainty for this test is ±2.66dB.
The data listed in this test report has enough margin, more than the site margin.

Spurious Emission (Radiated)

The measurement uncertainty for this test using Biconical antenna is ±4.59dB(3m).
The measurement uncertainty for this test using Logperiodic antenna is ±4.62dB(3m).
The measurement uncertainty for this test using Horn antenna is ±5.27dB.
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty for this test is ±3.0dB.

3.5 Test Location

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	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	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	655103	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247A-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	IC4247A-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	-
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	N/A	-
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	-

* 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.

Our company name was changed from "UL Apex Co., Ltd." to "UL Japan, Inc." on April 26, 2007.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

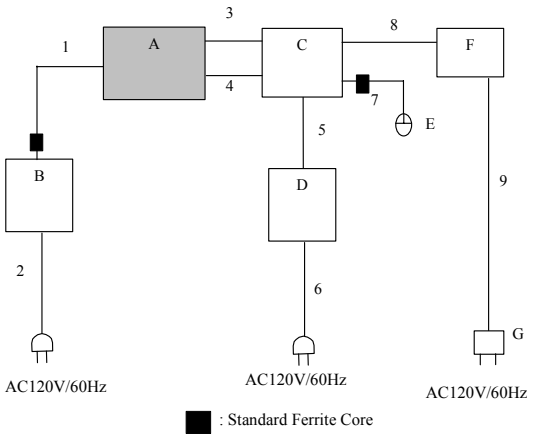
4.1 Operating Modes

The mode used for test : Transmitting mode 11b (CCK 11Mbps (Worst))
- Low Channel : 2412MHz(Ch1)
- Mid Channel : 2437MHz(Ch6)
- High Channel : 2462MHz(Ch11)

Transmitting mode 11g (OFDM 54Mbps (Worst))
- Low Channel : 2412MHz(Ch1)
- Mid Channel : 2437MHz(Ch6)
- High Channel : 2462MHz(Ch11)

*As a result of preliminary test, the formal test was performed with the above modes, which had the max power rate.

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.
*The end users uses this printer with AC adapter that has the standard ferrite core on the DC cable.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	BARCODE PRINTER	MB410i-W2	2	SATO CORPORATION	EUT
B	AC Adapter	TG-5001-19V	19M06361009375	SATO CORPORATION	-
C	Note PC	PP17L	2251702869	DELL	-
D	AC Adapter	PA-1650-05D2	CN-0F7970-71615-59D-4335	DELL	-
E	Mouse	X05-87477	53121-576-0600186-00000	Microsoft	-
F	FAX MODEM	LFM-288BS	56L10220306	Logitec	-
G	AC Adapter	AM-128100AT	-	AMIGO	-

List of cables used

No.	Name	Length (m)	Shield	
			Cable	Connector
1	DC Cable	1.9	Unshielded	Unshielded
2	AC Cable	0.9	Unshielded	Unshielded
3	USB Cable	2.0	Shielded	Shielded
4	Serial Cable	1.9	Unshielded	Unshielded
5	DC Cable	1.5	Unshielded	Unshielded
6	AC Cable	1.0	Unshielded	Unshielded
7	USB Cable	1.9	Shielded	Shielded
8	Parallel Cable	2.0	Shielded	Shielded
9	DC Cable	1.9	Unshielded	Unshielded

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 80cm 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 cable and AC 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.

Detector : quasi-peak and average detector (IF BW 9 kHz)
Measurement range : 0.15-30MHz
Test data : APPENDIX 2
Test result : Pass

SECTION 6: Spurious Emission

[Conducted]
Test Procedure
The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port.
Test data : APPENDIX 2
Test result : Pass

[Radiated]
Test Procedure
EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane.
The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) and 1m(Upper 10GHz).
The height of the measuring 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 with the Test Receiver, or 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.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 and outside the restricted band of FCC15.205.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver / Spectrum Analyzer	Spectrum Analyzer
Detector IF Bandwidth	QP: BW 120kHz(T/R) 20dBc : RBW: 100kHz VBW: 300kHz (S/A)	PK: RBW:1MHz/VBW: 1MHz AV: RBW:1MHz/VBW:10Hz 20dBc : RBW:100kHz/VBW:300kHz

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Test data : APPENDIX 2
Test result : Pass

SECTION 7: Bandwidth

Test Procedure
The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data **: APPENDIX 2**
Test result **: Pass**

SECTION 8: Maximum Peak Output Power

Test Procedure
The Maximum Peak Output Power was measured with a power meter (tested bandwidth: 50MHz) connected to the antenna port.
It was measured based on "Power Output Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".

Test data **: APPENDIX 2**
Test result **: Pass**

SECTION 9: Peak Power Density

[Conducted]
Test Procedure
The Peak Power Density was measured with a spectrum analyzer connected to the antenna port.
It was measured based on "PSD Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".

Test data **: APPENDIX 2**
Test result **: Pass**