



RADIO TEST REPORT

Test Report No.: 29BE0200-YK-A

Applicant : SUMITOMO PRECISION PRODUCTS CO., LTD.
Type of Equipment : neoMOTE (IEEE802.15.4 2.4GHz RF Transceiver)
Model No. : WM-Z1110
FCC ID : WWGZ1110
Test regulation : FCC Part15 Subpart C: 2008
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 limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.

Date of test: December 3, 4, and 5, 2008

Tested by: T. Arai
Tatsuya Arai

Approved by: T. Imamura
Toyokazu Imamura
Engineer of Yamakita EMC Lab.

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (09.01.08)

Table of Contents	Page
1 Applicant information	3
2 Equipment under test (E.U.T.)	3
3 Test specification, procedures and results	4
4 System test configuration	6
5 Conducted emissions	7
6 6dB bandwidth & Occupied bandwidth (99%)	8
7 Maximum peak output power	8
8 Out of band emissions (Antenna port conducted)	8
9 Out of band emissions (Radiated)	9
10 Peak power density	10
 <u>Contents of Appendixes</u>	 11
APPENDIX 1: Photographs of test setup	12
APPENDIX 2: Test data	15
APPENDIX 3: Test instruments	40

1 Applicant information

Company Name : SUMITOMO PRECISION PRODUCTS CO., LTD.
Brand or Trade name : SPP
Address : 1-10, Fuso-cho, Amagasaki-shi, Hyogo-ken, 660-0891 Japan
Telephone Number : +81-6-6489-8264
Facsimile Number : +81-6-6489-5910
Contact Person : Junya Tada

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

2.1 Identification of E.U.T.

Type of Equipment : neoMOTE (IEEE802.15.4 2.4GHz RF Transceiver)
Model No. : WM-Z1110
Serial No. : C124801
Rating : DC3.6V
Country of Manufacture : Japan
Receipt Date of Sample : December 2, 2008
Condition of EUT : Production model

2.2 Product description

Model: WM-Z1110 (referred to as the EUT in this report) is a neoMOTE (IEEE802.15.4 2.4GHz RF Transceiver).
Clock frequencies : MCU: 7.3728MHz, 32.788kHz, RF IC: 16MHz
Equipment type : Transceiver

Radio Specification

Frequency band : Lower limit 2405MHz
Upper limit 2480MHz
Bandwidth & channel spacing : 80MHz & 5MHz
Type of modulation : DSSS
Antenna type : Rotary antenna $1/2 \lambda$ sleevedipole
Antenna connector type : MMCX
Antenna gain : +2.14dBi
ITU code : F1D
Operating voltage (Inner) : DC3.3V
Operation temperature range : -10 to +45 deg.C.

FCC 15.31 (e)

The SPP product provides stable voltage (DC3.3V) constantly to the EUT (RF Module) regardless of input voltage. Therefore, the EUT complies with the requirement.

FCC Part 15.203

The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011 Facsimile: +81 465 77 2112

MF060b (09.01.08)

3 Test specification, procedures and results

3.1 Test specification

Test specification : FCC Part15 Subpart C: 2008, final revised on May 19, 2008
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 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,
and 5725-5850MHz

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 15.207	-	N/A	13.9dB (0.3675MHz, QP, Tx 2405MHz,)	Complied
6dB bandwidth	KDB Publication No. 558074 Measurement of Digital Transmission Systems Operating under Section 15.247 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.247 (a)(2) & 15.209	Conducted	N/A	-	Complied
Maximum peak output power	KDB Publication No. 558074 Measurement of Digital Transmission Systems Operating under Section 15.247 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.247 (b)(3) & 15.209	Conducted	N/A		Complied
Out of band emission & Restricted band edges	KDB Publication No. 558074 Measurement of Digital Transmission Systems Operating under Section 15.247 & ANSI C63.4:2003 13. Measurement of intentional radiators	15.247 (d) & 15.209	Conducted / Radiated	N/A	3.5dB (4960.00MHz, AV, Vertical, Tx 2480MHz)	Complied
Power density	KDB Publication No. 558074 Measurement of Digital Transmission Systems Operating under Section 15.247 & ANSI C63.4:2003 13. Measurement of intentional radiators	FCC 15.247 (e) & 15.209	Conducted	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	Conducted	-	Complied

* Other than above, no addition, exclusion nor deviation has been made from the standard.

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011 Facsimile: +81 465 77 2112

MF060b (09.01.08)

3.3 Uncertainty

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

	No.1 open site (±)	No.2 open site (±)	No.1 anechoic chamber (±)
Conducted emission			
150kHz-30MHz	2.7 dB	2.7 dB	2.8 dB
Radiated emission (3m)			
30-300MHz	4.3 dB	4.3 dB	4.6 dB
300-1000MHz	4.3 dB	4.3 dB	4.5 dB
1GHz<	5.7 dB	5.8 dB	5.7 dB

Antenna port conducted test	(±)
Below 1GHz	0.4dB
1GHz and above	0.7dB

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 report meets the limits unless the uncertainty is taken into consideration.

3.4 Test location

UL Japan, Inc. Yamakita EMC Lab.

907, Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken 258-0124 JAPAN

Telephone number : +81 465 77 1011

Facsimile number : +81 465 77 2112

NVLAP Lab. code : 200441-0

No. 1 test site has been fully described in a report submitted to FCC office, and accepted on July 23, 2008 (Registration No.: 95486).

IC Registration No. : 2973B-1

No. 2 test site has been fully described in a report submitted to FCC office, and accepted on February 27, 2008 (Registration No.: 466226).

IC Registration No. : 2973B-3

No. 1 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on October 22, 2008 (Registration No.: 95967).

IC Registration No. : 2973B-2

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 shielded room	8.0 x 5.0 x 2.5	No.1 Semi-anechoic chamber	10.0 x 7.5 x 5.7
No.2 shielded room	5.0 x 4.0 x 2.5		
No.3 shielded room	4.0 x 5.0 x 2.7		

Open test site	Maximum measurement distance
No.1 open test site	30m
No.2 open test site	10m

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011 Facsimile: +81 465 77 2112

MF060b (09.01.08)

4 System test configuration

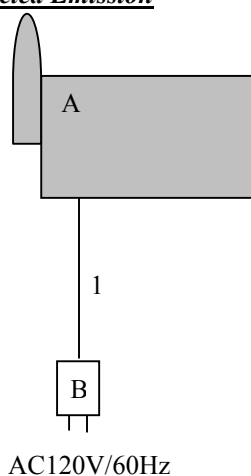
4.1 Justification

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

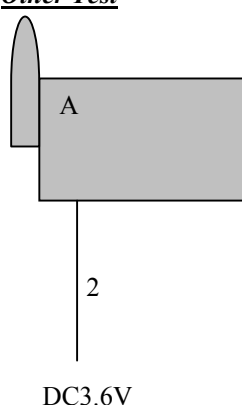
Test item	Operating mode	Tested frequency
All items	Transmitting Modulation data: Pseudorandom data, which is transmitted data sequence length of 1024 bits (128 bytes)	2405MHz (Low) 2440MHz (Middle) 2480MHz (High)

4.2 Configuration of tested system

Conducted Emission



Other Test



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	NeoMOTE RF Unit	WM-Z1110	C124801	SPP	EUT
B	AC Adaptor	APS305-3315	-	Anthin	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.8	Unshielded	Unshielded	-
2	DC Cable	1.0	Unshielded	Unshielded	-

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011 Facsimile: +81 465 77 2112

MF060b (09.01.08)

5 Conducted emissions

5.1 Operating environment

The test was carried out in No.2 shielded room.

5.2 Test configuration

EUT was placed on a wooden platform of nominal size, 1m by 1.8m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of the EUT was 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) and excess DC cable was bundled in center. Photographs of the set up are shown in Appendix 1.

5.3 Test conditions

Frequency range : 0.15 - 30MHz
EUT operation mode: Transmitting

5.4 Test procedure

The EUT was connected to a LISN (AMN). An overview sweep with peak detection has been performed. The Conducted emission measurements were made with the following detector function of the test receiver.

Detector: QP/AV
IF Bandwidth: 10kHz

5.5 Results

Summary of the test results : Pass
Date : December 4, 2008 Test engineer : Tatsuya Arai

6 6dB bandwidth & Occupied bandwidth (99%)

Test procedure

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

Summary of the test results: Pass

Date : December 4, 2008

Test engineer :

Tatsuya Arai

7 Maximum peak output power

Test procedure

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

Summary of the test results: Pass

Date : December 5, 2008

Test engineer :

Tatsuya Arai

8 Out of band emissions (Antenna port conducted)

Test procedure

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.

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.

Summary of the test results: Pass

Date : December 5, 2008

Test engineer :

Tatsuya Arai

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (09.01.08)

9 Out of band emissions (Radiated)

9.1 Operating environment

The test was carried out in No.1 anechoic chamber.

9.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 0.5m, raised 80cm above the conducting ground plane to prevent the reflection influence. Photographs of the setup are shown in Appendix 1.

9.3 Test conditions

Frequency range : 30MHz - 26.5GHz
 Test distance : 3m
 EUT operation mode : Transmitting

9.4 Test procedure

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 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.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
Detector IF Bandwidth	QP: BW 120kHz	PK: RBW: 1MHz/VBW: 1MHz, AV RBW: 1MHz/VBW: 10Hz (No pulse emission) *1)
Measuring antenna	Biconical (30-300MHz) Logperiodic (300MHz-1GHz)	Horn

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

The equipment and its antenna were previously checked at each position of three axes X, Y and Z. The position in which the maximum noise occurred was chosen to put into measurement. See the table below and photographs in page 14. With the position, the noise levels of all the frequencies were measured.

Model	Worst position	
	Below 1GHz	Above 1GHz
Module	Horizontal: X, Vertical: X	Horizontal: X, Vertical: X
Antenna	Horizontal: X, Vertical: Y	Horizontal: X, Vertical: Y

9.5 Band edge

Band edge level at 2390MHz, 2400MHz and 2483.5MHz is below the limits of FCC 15.209. Refer to the data of Radiated emission.

9.6 Results

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

Date : December 3 and 4, 2008 Test engineer : Tatsuya Arai

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011 Facsimile: +81 465 77 2112

MF060b (09.01.08)

10 Peak power density

Test procedure

The peak power density was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Date : December 5, 2008

Test engineer :

Tatsuya Arai

UL Japan, Inc.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (09.01.08)

APPENDIX 1: Photographs of test setup

Page 12	:	Conducted emission
Page 13	:	Radiated emission
Page 14	:	Pre-check of the worst position

APPENDIX 2: Test data

Page 15 - 19	:	Conducted emission
Page 20	:	6dB bandwidth
Page 21	:	Maximum peak output power
Page 22 - 27	:	Out of band emissions (Antenna port conducted)
Page 28 - 36	:	Out of band emissions (Radiated)
Page 37 - 38	:	Peak power density
Page 39	:	Occupied bandwidth

APPENDIX 3: Test instruments

Page 40	:	Test instruments
---------	---	------------------