



RADIO TEST REPORT

Test Report No. : 30JE0023-YK-01

Applicant : FUKUDA DENSHI CO.,LTD.
Type of Equipment : ECG, Respiration and SpO2 Transmitter
Model No. : LX-7230N
FCC ID : DV8LX7230N
Test regulation : FCC Part95 Subpart H: 2010
FCC Part2 Subpart J: 2009
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.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: June 13 to 18, 2010

Tested by: A. Hayashi & S. Takano
Akio Hayashi Shinichi Takano
Engineer of EMC Service Engineer of EMC Service

Approved by: I. Isozaki
Ichiro Isozaki
Leader of EMC Service

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

CONTENTS	Page
SECTION 1: Customer information	3
SECTION 2: Equipment under test (E.U.T.)	3
SECTION 3: Test specification, procedures and results	4
SECTION 4: Operation of E.U.T. during testing	6
SECTION 5: Field Strength (Fundamental Emission & Out of band emissions)	7
SECTION 6: Frequency Stability	9
SECTION 7: Bandwidth & Occupied bandwidth (99%)	9
SECTION 8: Spurious emissions at antenna terminals	9
Contents of APPENDIXES	10
APPENDIX 1: Photographs of test setup	11
APPENDIX 2: EMI test data	14
APPENDIX 3: Test instruments	28

SECTION 1: Customer information

Company Name : FUKUDA DENSHI CO.,LTD.
Address : 35-8, Hongo 2-chome, Bunkyo-ku, Tokyo 113-8420, Japan
Telephone Number : +81-3-5684-1480
Facsimile Number : +81-3-5684-1321
Contact Person : Kenichi Kamisaka

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

2.1 Identification of E.U.T.

Type of Equipment : ECG, Respiration and SpO2 Transmitter
Model No. : LX-7230N
Serial No. : 001
Rating : DC3V
Country of Mass-production : Japan
Receipt Date of Sample : June 11, 2010
Condition of EUT : Engineering 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: LX-7230N, referred to as the EUT in this report, is the ECG, Respiration and SpO2 Transmitter.

General Specification

Clock frequency(ies) in the system : (No Radio part, CPU) 8MHz, (Radio part, TCXO) 9.600MHz

Radio Specification

ITU code (Emission designator) : 7K7F1D
Radio Type : Transmitter
Frequency of Operation : 608.0125 through 613.9875MHz
Modulation : Digital Frequency Shift Keying
RF Output Power (E.I.R.P.) : 1.6mW or less *1)
RF Output Power Limit : 200mV/m at 3m (= 106dBuV/m at 3m)
Power Supply (Radio part) : DC 3.3V
Antenna type : cable Antenna
Antenna Gain : -8.5dBi
Operating Temperature : 10 to 40 deg. C.
Frequency stability : +/- 2.5ppm

Data rate : 7000 bps (NRZ)

*1) RF Output Power is fixed as shown in "08 (Confidential) Theory of Operation.pdf" and this product is shipped.

[Radio part power supply]

The equipment provides the Radio part with stable power supply (DC3.3V), therefore, the equipment complies power supply regulation.

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

SECTION 3: Test specification, procedures and results

3.1 Test specification

Test specification : FCC Part95 Subpart H: 2010, final revised on April 14, 2010
Title : FCC 47CFR Part95 Personal Radio Services
Subpart H Wireless Medical Telemetry Service (WMTS)
Subpart 95.1115 General technical requirements.

Test specification : FCC Part2 Subpart J: 2009, final revised on May 14, 2009
Title : FCC 47CFR Part2 Frequency Allocations and Radio Treaty Matters;
General Rules and Regulations
Subpart J Equipment Authorization Procedures

3.2 Procedures & results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Field Strength of Fundamental Emission	FCC Section 2.1046, ANSI/TIA-603-C:2004	FCC Section 95.1115(a)(1)	Radiated	N/A	13.2dB (Horizontal, Tx 611.0000MHz, QP)	Complied *1)
Field Strength of Out of band emissions	FCC Section 2.1053, ANSI/TIA-603-C:2004	FCC Section 95.1115(b)(1)(2)	Radiated	N/A	5.0dB (608.0000MHz, Horizontal, Tx 608.0125MHz, QP)	Complied
Frequency Stability	FCC Section 2.1055, ANSI/TIA-603-C:2004	FCC Section 95.1115(e)	Conducted	N/A	-	Complied
Bandwidth	FCC Section 2.1049, ANSI/TIA-603-C:2004	Applicant specification	Conducted	N/A	-	Complied
Spurious emissions at antenna terminals	FCC Section 2.1051, ANSI/TIA-603-C:2004	(Reference)	Conducted	N/A	-	Complied

Note: UL Japan's EMI Work Procedures No.QPM05 and QPM15.
*1), This device were tested by radiated not conducted.

3.3 Addition to standard

No addition, deviation or exclusion has been made from standards.

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

3.4 Uncertainty

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

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	30MHz-300MHz	4.6 dB	4.5 dB	4.9 dB
	300MHz-1GHz	4.5 dB	4.6 dB	5.1 dB
	1GHz-7GHz	3.9 dB	3.9 dB	4.0 dB

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

Radiated Emission Test

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

Frequency (Normal condition) Measurement uncertainty for this test was: (±) 1.3 x 10⁻⁶.

Frequency (Extreme condition) Measurement uncertainty for this test was: (±) 1.3 x 10⁻⁶.

Bandwidth Measurement uncertainty for this test was: (±) 5.4%

3.5 Test location

UL Japan, Inc. Shonan EMC Laboratory

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone number : +81 463 50 6400

Facsimile number : +81 463 50 6401

JAB Accreditation No. : RTL02610

No.1/ No.2/ No.3 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on April 17, 2009 (Registration No.: 697847).

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 Semi-Anechoic Chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.1 Shielded room	6.8 x 4.1 x 2.7
No.2 Semi-Anechoic Chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.2 Shielded room	6.8 x 4.1 x 2.7
No.3 Semi-Anechoic Chamber	12.7 x 7.7 x 5.35 Maximum measurement distance: 5m	No.3 Shielded room	6.3 x 4.7 x 2.7
No.4 Semi-Anechoic Chamber	8.1 x 5.1 x 3.55	No.4 Shielded room	4.4 x 4.7 x 2.7
		No.5 Shielded room	7.8 x 6.4 x 2.7
		No.6 Shielded room	7.8 x 6.4 x 2.7

3.6 Test Configuration Photographs, Data of EMI test and Test instruments

Refer to APPENDIX 1 to 3, in this report

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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

4.1 Operating mode

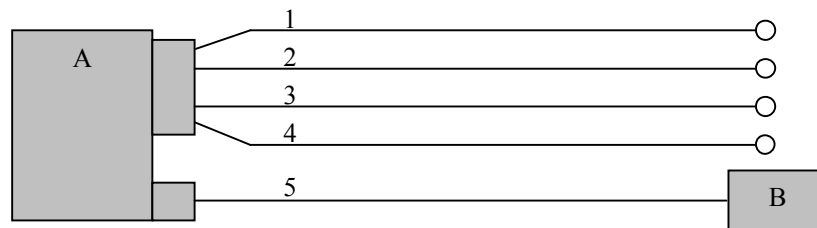
The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
All items except for Frequency Stability	Transmitting(Modulated) (There is no name of the firmware executed for all tests by the firmware in EUT for usual operation because there was no special software.) *1)	608.0125MHz 611.0000MHz 613.9875MHz
Frequency Stability	Transmitting(Non-modulated) (There is no name of the firmware executed for all tests by the firmware in EUT for usual operation because there was no special software.) *1)	608.0125MHz 611.0000MHz 613.9875MHz

*1) It tested by usually data pattern, because there was no difference of level by the difference of data pattern.

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

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID (Remarks)
A	ECG, Respiration and SpO2 Transmitter	LX-7230N	001	FUKUDA DENSHI CO.,LTD.	FCC ID: DV8LX7230N
B	SpO2 Sensor	DS-100A	001	FUKUDA DENSHI CO.,LTD.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Patient Cable	0.7	Shielded	Unshielded	Transmitting Antenna
2	Patient Cable	0.7	Shielded	Unshielded	Transmitting Antenna
3	Patient Cable	0.7	Shielded	Unshielded	Transmitting Antenna
4	Patient Cable	0.7	Shielded	Unshielded	Transmitting Antenna
5	SpO2 Cable	0.85	Shielded	Unshielded	Transmitting Antenna

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

SECTION 5: Field Strength (Fundamental Emission & Out of band emissions)

5.1 Operating environment

The test was carried out in No.3 Semi-Anechoic Chamber.

Temperature : Refer to the APPENDIX 2
Humidity : Refer to the APPENDIX 2

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the setup are shown in APPENDIX 1.

5.3 Test conditions

Frequency range : 30MHz - 7GHz
Test distance : 3m
EUT position : Table top
EUT operation mode : Transmitting

5.4 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 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 *1)
Detector IF Bandwidth	QP: BW 120kHz	AV RBW: 1MHz VBW: 10Hz (No pulse emission detected)
Measuring antenna	Biconical (30-300MHz) Logperiodic (300MHz-1GHz)	Horn
Test distance	3m	3m

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

The E.U.T.(main body and cable(antenna)) was 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 photographs in APPENDIX 1.

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

5.5 Band edge

To determine the level of band-edge spurious, we use the following procedure:

Set the resolution bandwidth to 1 kHz in the peak detector mode.

Because we don't want to include in-band emission at BandEdge measurement if center frequencies are "608.0125MHz" or "613.9875MHz" and BandEdges are "608MHz" or "614MHz".

(The supplementation: There are some granted test report that were measured by 3kHz RBW for the equipment that has 350kHz for 26dB bandwidth in similar case.)

Measure the maximum level of the in-band channel closest to the band edge and the maximum level of the out-of-band emissions close to the same band edge.

Determine the ratio of the in-band signal to the out-of-band emissions. Then, measure the level of the in-band channel in CISPR quasi-peak mode with 120 kHz bandwidth. Using the ratio obtained, we calculate the equivalent level of the out-of-band emissions to determine compliance with the limits.

The emission tests, except for the band edge, were performed with the quasi-peak mode of the test receiver.
(Bandwidth: 120kHz)

5.6 Results

Summary of the test results : Pass
Date : June 13, 2010 Tested by : Shinichi Takano

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

SECTION 6: Frequency Stability

Test procedure

The frequency stability was measured with a microwave counter connected to the antenna port.
The temperature test was started after the temperature stabilization time of 30 minutes.

Summary of the test results: Pass
Date : June 18, 2010 Tested by : Akio Hayashi

SECTION 7: 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 : June 16, 2010 Tested by : Akio Hayashi

SECTION 8: Spurious emissions at antenna terminals

Test procedure

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

Date : June 16, 2010 Tested by : Akio Hayashi

UL Japan, Inc.

SHONAN EMC LAB.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

Contents of APPENDIXES

APPENDIX 1: Photographs of test setup

Page 11	:	Radiated emission
Page 12 - 13	:	Pre-check of the worst position

APPENDIX 2: EMI test data

Page 14 - 16	:	Frequency Stability
Page 17 - 18	:	-26dB Bandwidth
Page 19 - 22	:	Field Strength(Electric Field Strength of Fundamental Emission , Spurious Emission and Band Edge Compliance)
Page 23 - 26	:	Spurious emissions at antenna terminals
Page 27	:	99% Occupied Bandwidth

APPENDIX 3: Test instruments

Page 28	:	Test instruments
---------	---	------------------