



RADIO TEST REPORT

Test Report No. : 30KE0222-SH-A

Applicant : FUKUDA DENSHI CO.,LTD.
Type of Equipment : Bidirectional Wireless Communications Module
Model No. : HTC-702
FCC ID : DV8HTC702
Test regulation : FCC Part95 Subpart H: 2010
FCC Part2 Subpart J: 2009
Test result : Complied

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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.
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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: July 9 to September 13, 2010

Tested by: *K. Adachi*
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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 : Bidirectional Wireless Communications Module
Model No. : HTC-702
Serial No. : No.1
Rating : DC5V
Country of Mass-production : Japan
Receipt Date of Sample : July 8, 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: HTC-702, referred to as the EUT in this report, is the Bidirectional Wireless Communications Module.

General Specification

Clock frequency(ies) in the system : (No Radio part, CPU) 8MHz, (Radio part, TCXO) 16.8MHz

Radio Specification

ITU code (Emission designator) : 15K8F1D
Radio Type : Transmitter
Frequency of Operation : 1395.5125 to 1396.9875MHz
Modulation : Digital Frequency Shift Keying
RF Output Power : 20mW (35 mW e.i.r.p.) *1)
RF Output Power Limit : 740mV/m at 3m (= 117.4dBuV/m at 3m)
Power Supply (inner) : DC 5.0V
Antenna type : 1/2 wavelength sleeve antenna
Antenna Gain : 2.0dBi max
Operating Temperature : 10 to 40 deg. C.
Frequency stability : +/- 2.5ppm

Data rate : 14300 bps

*1) RF Output Power is fixed as shown in P57 of "HTC-702 Internal Module (Technical Reference)
[(file name: 08_Theory of Operation(Confidential).pdf)]" and this product is shipped.

[Radio part power supply]

The equipment provides the Radio part with stable power supply (DC3.0V), therefore, the equipment complies power supply regulation.

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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
(Reference) Conducted emissions	FCC part 15, ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC part 15 Section 15.107, Class B (January 22, 2010)	-	N/A	7.0dB (0.43989MHz, N, AV)	Complied *2)
Field Strength of Fundamental Emission	FCC Section 2.1046, ANSI/TIA-603-C:2004	FCC Section 95.1115(a)(2)	Radiated	N/A	6.6dB (Vertical, , AV, Tx1396.9875MHz)	Complied *3)
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	5.6dB (4681.795MHz, Horizontal, AV, Tx1395.5125MHz)	Complied
Frequency Stability	FCC Section 2.1055, ANSI/TIA-603-C:2004	FCC Section 95.1115(e)	Radiated	N/A	-	Complied
Bandwidth	FCC Section 2.1049, ANSI/TIA-603-C:2004	Applicant specification	Radiated	N/A	-	Complied
Spurious emissions at antenna terminals	FCC Section 2.1051, ANSI/TIA-603-C:2004	(Reference)	Conducted	N/A	-	N/A *1)

Note: UL Japan's EMI Work Procedures No.QPM05 and QPM15.

*1), This test is not applicable since no antenna connector.

*2), The conducted emissions test as FCC part 15 subpart B (2010) was measured for reference.

*3), This device were tested by radiated not conducted.

3.3 Addition to standard

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

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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-14GHz	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

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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

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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.) *2)	1395.5125MHz, 1396.2625MHz, *1) 1396.9875MHz
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.) *2)	1395.5125MHz, 1396.2625MHz, *1) 1396.9875MHz

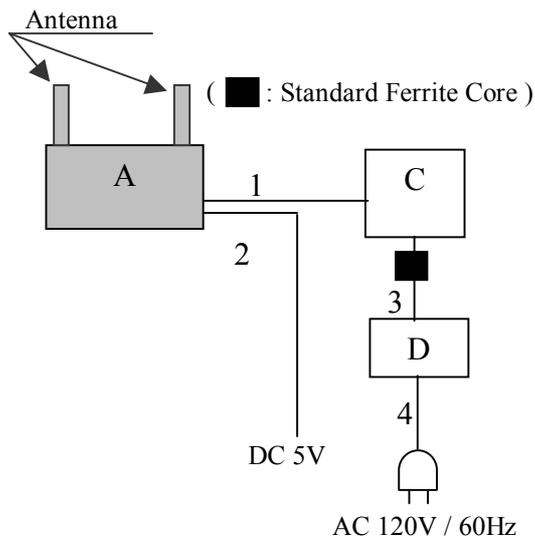
*1) 1396.2625MHz is reference data.

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

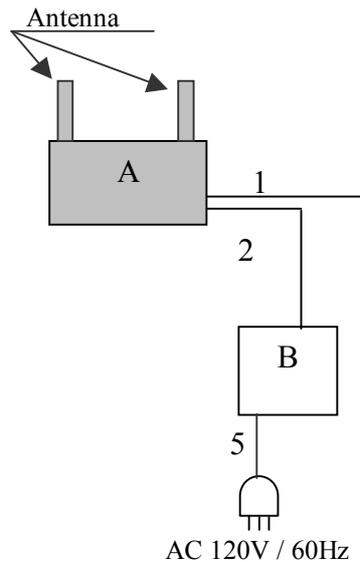
Justification: The system was configured in typical fashion (as customer would normally use it) for testing.

4.2 Configuration and peripherals

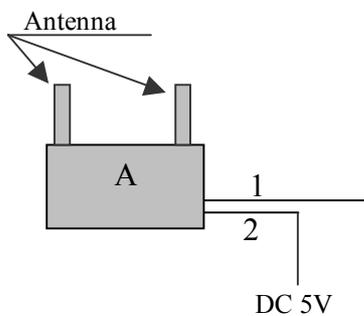
(1) for frequency stability test



(2) for Conducted emission test



(3) for except frequency stability and Conducted emission test



* Test data was taken under worse case conditions.

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Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID (Remarks)
A	Bidirectional Wireless Communications Module	HTC-702	No.1	FUKUDA DENSHI CO.,LTD.	FCC ID: DV8HTC702
B	Central monitor	DS-7680(FA)	648528	FUKUDA DENSHI CO.,LTD.	-
C	Laptop computer	ThinkPad T42(2373-T49)	L3-64H12	IBM	-
D	AC Adapter	08K8208	11S08K8208Z1Z9 MA5AB0U2	IBM	-

List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal	0.1	Shielded	Shielded	-
2	DC	1.1	Shielded	Unshielded	-
3	DC	1.8	Unshielded	Unshielded	-
4	AC	1.0	Unshielded	Unshielded	-
5	AC	2.0	Unshielded	Unshielded	-

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SECTION 5: Conducted emission

5.1 Operating environment

The test was carried out in No.3 Shielded room.

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.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was 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 LISN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

Photographs of the set up are shown in APPENDIX 1.

5.3 Test conditions

Frequency range : 0.15 - 30MHz
EUT position : Table top
EUT operation mode : Transmitting

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a Shielded room or Semi-Anechoic Chamber. The AE was connected to a Line Impedance Stabilization Network (LISN).

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ Average
IF Bandwidth : 9kHz

5.5 Results

Summary of the test results : Pass
Date : September 13, 2010 Tested by : Kenichi Adachi

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SECTION 6: Field Strength (Fundamental Emission & Out of band emissions)

6.1 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

6.2 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.

6.3 Test conditions

Frequency range : 30MHz - 14GHz
Test distance : 3m
EUT position : Table top
EUT operation mode : Transmitting

6.4 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) 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.

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6.5 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. 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)

6.6 Results

Summary of the test results : Pass
Date : September 13, 2010 Tested by : Kenichi Adachi

SECTION 7: 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 : July 9, 2010 Tested by : Kenichi Adachi

SECTION 8: 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 : September 13, 2010 Tested by : Kenichi Adachi

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Page 14	:	Pre-check of the worst position

APPENDIX 2: EMI test data

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Page 20 - 21	:	-26dB Bandwidth
Page 22 - 25	:	Field Strength(Electric Field Strength of Fundamental Emission , Spurious Emission and Band Edge Compliance)
Page 26	:	99% Occupied Bandwidth

APPENDIX 3: Test instruments

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