

RADIO TEST REPORT

Test Report No.: 29FE0054-HO-02-C-R1

Applicant	:	DENSO WAVE INCORPORATED
Type of Equipment	:	BHT-800 MAIN BOARD
Model No.	:	DWWL001
FCC ID	:	PZWDWWL001
Test regulation	:	FCC Part 15 Subpart C 2009 Section 15.207, Section 15.247

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. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
- 6. Original test report number of this report is 29FE0054-HO-02-C.

Date of test:

April 7 to 28, 2009

Tested by:

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Radiated Spurious Emission (below 1GHz)	
Radiated Spurious Emission (above 1GHz)	
Conducted Spurious Emission	
Conducted emission Band Edge compliance	50
Power Density	51
99%Occupied Bandwidth	
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SECTION 1: Customer information

Company Name	:	DENSO WAVE INCORPORATED
Brand name	:	DENSO
Address	:	1 Azayoshiike, Ohazakusagi, Agui-cho, Chita-gun, Aichi-ken, 470-2297 Japan
Telephone Number	:	+81-569-49-5267
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Contact Person	:	Yasushi Iwade

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

2.1 Identification of E.U.T.

Type of Equipment	:	BHT-800 MAIN BOARD
Model No.	:	DWWL001
Serial No.	:	MAC ID (0013E0F39B98)
Rating	:	DC 3.7V
Receipt Date of Sample	:	March 26, 2009
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: DWWL001 (referred to as the EUT in this report) is the BHT-800 MAIN BOARD. Feature of EUT: This EUT is the Main board of Bar-code Handy Terminal (BHT-800 series) which has function of Wireless LAN. (IEEE802.11b/g technology)

Clock Frequencies are 240MHz (CPU), 120MHz (SDRAM).

:	Transceiver
:	2412 to 2462MHz
:	DSSS
:	20MHz & 5MHz
:	DC 3.2V
:	Inverted-F
:	SMK CRS5001-0801F
:	below 2.14 dBi
	:

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part15 Subpart C: 2009, final revised on February 27, 2009
Title	:	FCC 47CFR Part15 Radio Frequency Devices Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

FCC 15.31 (e)

This EUT provides stable voltage (DC3.2V) 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 Bar-code Handy Terminal. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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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 IC: RSS-Gen 7.2.2	FCC: Section 15.207 IC: RSS-Gen 7.2.2	Conducted	N/A	[QP] 22.1dB 0.26911MHz, L [AV] 20.6dB 0.26911MHz, L	Complied
2	6dB Bandwidth	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" IC: RSS-Gen 4.6.2	FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(a)	Conducted	N/A	See data.	Complied
3	Maximum Peak Output Power	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" IC: RSS-Gen 4.8	FCC: Section 15.247(b)(3) IC: RSS-210 A8.4(4)	Conducted	N/A	-	Complied
4	Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247" IC: -	FCC: Section 15.247 (d) IC: RSS-210 A8.5	Conducted/ Radiated	N/A	-	Complied
5	Power Density	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247" IC: -	FCC: Section 15.247 (e) IC: RSS-210 A8.2(b)	Conducted	N/A		Complied
6	Spurious Emission	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" IC: RSS-Gen 4.9 RSS-Gen 4.10	FCC: Section15.247(d) IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	Conducted/ Radiated	N/A	[Tx] 3.6dB (2390.0MHz, Vertical, AV) [Rx] 5.5dB (480.022MHz, Vertical, OP)	Complied

[DSSS and other forms of modulation]

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

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	N/A	N/A	N/A
	Band Width						

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

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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	Conducted emission	R	adiated emis (10m*)	sion	R	adiated emiss (3m*)	ion	Radi emis (3n	ated sion 1*)
	150kHz-	9kHz-	30MHz-	300MHz-	9kHz-	30MHz-	300MHz-	1GHz-	18GHz-
	SOMHZ	SUMHZ	SUOMHZ	IGHZ	SUMHZ	SUOMHZ	IGHZ	Tøghz	40GHZ
No.1	3.7dB	3.1dB	4.4dB	4.2dB	3.2dB	3.8dB	3.9dB	5.9dB	6.1dB
semi-anechoic									
chamber (±)									
No.2	3.7dB	-	-	-	3.2dB	4.4dB	4.0dB	5.9dB	6.1dB
semi-anechoic									
chamber (±)									
No.3	3.7dB	-	-	-	3.2dB	4.6dB	4.0dB	5.9dB	6.1dB
semi-anechoic									
chamber (±)									
No.4	3.7dB	-	-	-	3.2dB	3.9dB	3.9dB	5.9dB	6.1dB
semi-anechoic									
chamber (±)									

*10m/3m = Measurement distance

Conducted emission test

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

<u>Radiated emission test (3m)</u> [Tx] The data listed in this report meets the limits unless the uncertainty is taken into consideration.

[Rx] The data listed in this test report has enough margin, more than the site margin.

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty for this test is 3.0dB.

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3.5 Test Location

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	FCC	IC Registration	Width x Depth x	Size of	Other
	Registration	Number	Height (m)	reference ground plane (m) /	rooms
	Number			horizontal conducting plane	
No 1 semi-anechoic	313583	2973C-1	19.2 x 11.2 x 7.7m	7 0 x 6 0m	No 1 Power
chamber	515665		17.2 11.2 , . ,	,	source room
No 2 semi-anechoic	655103	2973C-2	75x58x52m	40 x 40m	-
chamber	000100	277302	7.5 A 5.6 A 5.2m	1.0 x 1.011	
No 3 semi-anechoic	148738	2973C-3	120 x 85 x 59m	6.8 x 5 75m	No 3
chamber	110750	2)150 5	12.0 X 0.5 X 5.911	0.0 x 0.75m	Preparation
enamoer					room
No 3 shielded room	_	_	$4.0 \times 6.0 \times 2.7 m$	N/A	-
No 4 semi-anechoic	13/1570	- 2973C-4	$12.0 \times 8.5 \times 5.0 \text{m}$	68 x 5 75m	No 4
chamber	134370	2)730-4	12.0 X 0.5 X 5.7III	0.0 x 5.75m	Preparation
chamber					room
No 4 shielded room			$40 \times 60 \times 27m$	NI/A	100111
No.4 silicided fooli	-	-	4.0 X 0.0 X 2./III	IN/A	-
No.5 semi-anechoic	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
Na Cabialdad			4.0 4.5 2.7	475 - 54	
No.6 shielded	-	-	4.0 x 4.5 x 2./m	4.75 x 5.4 m	-
room			4.55 5.4 2.0	4.75 4.15	
No.6 measurement	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
room					
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement	-	-	3.1 x 5.0 x 2.7m	N/A	-
room					
No.9 measurement	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
room					
No.10 measurement	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
room					
No.11 measurement	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-
room					

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* 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 1 to 3.

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

4.1 **Operating Mode(s)**

Test Item	Operating Mode	Tested frequency	
Conducted emission	IEEE802.11b Transmitting (Tx), 11Mbps, PN9	2412MHz(L)	
Spurious Emission	IEEE802.11g Transmitting (Tx), 24Mbps, PN9	2437MHz(M)	
		2462MHz(H)	
	IEEE802.11b/g Receiving (Rx)	2437MHz(M)	
6dB Bandwidth	IEEE802.11b Transmitting (Tx), 11Mbps, PN9	2412MHz(L)	
Maximum Peak Output Power	IEEE802.11g Transmitting (Tx), 24Mbps, PN9	2437MHz(M)	
Power Density		2462MHz(H)	
99% Occupied Bandwidth			
Restricted Band Edge	IEEE802.11b Transmitting (Tx), 11Mbps, PN9	2412MHz(L)	
	IEEE802.11g Transmitting (Tx), 24Mbps, PN9	2462MHz(H)	
*Transmitting duty was 100% on all tests.			

* IEEE802.11b Transmitting (Tx): CCK 11Mbps, Payload: PN9

* IEEE802.11g Transmitting (Tx): OFDM 24Mbps, Payload: PN9

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

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4.2 **Configuration and peripherals**



: Standard Ferrite Core

* Cabling and setup were taken into consideration and test data was taken under worse case conditions. * The test was performed with the EUT installed in the Bar-code Handy Terminal.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
А	BHT-800 MAIN	DWWL001	MAC ID	DENSO	EUT
	BOARD		(0013E0F39B98)		
A'	Bar-code Handy	BHT-805BW	5496310416900048	DENSO	-
	Terminal				
В	Cradle	CU-821	5496320121900001	DENSO	-
С	AC Adapter	AWW0515NE-001	0808(34)	DENSO	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.0	Unshielded	Unshielded	-
2	AC Cable	1.5	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 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 itself (as a stand alone equipment)

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN /(AMN) to the input power source.

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

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SECTION 6: Spurious Emission

[Conducted]

Test Procedure

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

It was measured based on "1. RF antenna conducted test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".

The following spectrum analyzer setting was used:

- RBW: 100kHz
- VBW: 300kHz
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

Test data	: APPENDIX 2
Test result	: Pass

[Radiated]

Test Procedure

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m 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.

The radiated emission measurements were made with the following detector function of the test receiver and the Spectrum analyzer.

The result also satisfied with the general limits specified in section FCC 15.209(a) / RSS-210 2.7 (IC).

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer *1)
Detector	QP: BW 120kHz	PK: RBW:1MHz/VBW: 1MHz
IF Bandwidth		AV *2): RBW:1MHz/VBW: 10Hz

*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

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

- The carrier level and noise levels were confirmed at each position (X, Y and Z axes of Bar-code Handy Terminal, and Bar-code Handy Terminal on Cradle) 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

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SECTION 7: Bandwidth

6dB Bandwidth

Test Procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port. It was measured based on "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ". The following spectrum analyzer setting was used:

- Span: 50MHz
- RBW: 100kHz
- VBW: 300kHz
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

Test data	: APPENDIX 2
Test result	: Pass

99% Occupied Bandwidth

Test Procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port. The following spectrum analyzer setting was used:

- Span: Enough width to display 20dB Bandwidth
- RBW: as close to 1% of the Span as is possible without being below 1%

2

- VBW: Three times of RBW
- Sweep: Auto
- Detector: Peak
- Trace: Max Hold

Test data	: APPENDIX
Test result	: Pass

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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 ".

	[11b]	[11g]
Span	9MHz	18MHz
RBW	30kHz*)	30kHz*)
VBW	100kHz	100kHz
Sweep	300sec	600sec
Detector	Peak	Peak
Trace	Max Hold	Max Hold

*) The test was not performed at RBW: 3kHz that was stated in the Regulation.

However, the measurement value with RBW:3kHz is less than the value of RBW:30kHz and the test data met the limit with RBW:3kHz.

Test data	: APPENDIX 2
Test result	: Pass