



RADIO TEST REPORT

Test Report No. : 31BE0221-HO-06-B

Applicant : CONTEC CO., LTD.
Type of Equipment : Wireless LAN Adapter
Model No. : NZ2WL-US
FCC ID : PQRNZ2WL-US
Test regulation : FCC Part 15 Subpart E: 2010
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
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Date of test:

December 7, 2010 to March 20, 2011

**Representative
test engineer:**

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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless LAN Adapter
Model No. : NZ2WL-US
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : November 12, 2010
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: NZ2WL-US (referred to as the EUT in this report) is the Wireless LAN Adapter.

This product is Wireless LAN Adaptor that can switch Access Point/Station corresponding to wide input power supply (12-24VDC). It conforms to the wireless LAN standard specification IEEE802.11a/IEEE802.11b/IEEE802.11g.

Clock frequency(ies) in the system : DST410S: 32.768kHz, FCXO-03L-R3H: 20.0MHz,
CPU(HD6417751RBP240): 240MHz

[Radio Specification]

Equipment Type : Transceiver
Frequency of Operation : [11b/g] 2412-2462MHz, [11a] 5180-5240MHz, 5745-5825MHz
Bandwidth & Channel Spacing : [11b/g] 20MHz&5MHz, [11a] 20MHz&20MHz
Type of Modulation : OFDM, DSSS
Antenna Type : Dipole Antenna
Antenna Gain : 2.14dBi
Antenna Connector Type : REVERSE SMA-P
Operating voltage (inner) : DC2.97V to 3.63V
Operating temperature range : 0 to 50 deg. C.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart E: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

*The revision on December 6, 2010 does not affect the test specification applied to the EUT.

*The EUT complies with FCC Part 15 Subpart B: 2010, final revised on December 6, 2010.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC :ANSI C63.4:2003	FCC: 15.407(b)(6) / 15.207	[QP] 5.5dB, 0.25808MHz, L	Complied	-
	IC: RSS-Gen 7.2.2	IC: RSS-Gen 7.2.2	[AV] 0.3dB 0.25689MHz, N 0.25808MHz, L		
26dB Emission Bandwidth	FCC :ANSI C63.4:2003 FCC Public Notice DA 02-2138A1 IC: -	FCC : 15.407(a)(1)(2)(3) IC: -	See data	-	Conducted
Maximum Peak Output Power	FCC :ANSI C63.4:2003, FCC Public Notice DA 02-2138A1 IC: -	FCC : 15.407(a)(1)(2)(3) IC: RSS-210 A9.2(1)(2)(3)		Complied	Conducted
Peak Power Spectral Density	FCC :ANSI C63.4:2003, FCC Public Notice DA 02-2138A1 IC: -	FCC : 15.407(a)(1)(2)(3) IC: RSS-210 A9.2(1)(2)(3)		Complied	Conducted
Peak Excursion Ratio	FCC :ANSI C63.4:2003, FCC Public Notice DA 02-2138A1 IC: -	FCC : 15.407(a)(6) IC: -		Complied	Conducted
Spurious Emission Restricted Band Edge	FCC: ANSI C63.4:2003 IC: -	FCC : 15.407(b), 15.205 and 15.209 IC: RSS-210 A.9.3(1)(2)(3)(4)	2.1dB 5150.000MHz, PK, Vert.	Complied	Conducted / Radiated
20dB Emission Bandwidth	FCC :ANSI C63.4:2003	FCC : 15.215(c)	See data	Complied	Conducted

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*These tests were also referred to FCC Public Notice DA 02-2138A1 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands".

FCC 15.31 (e)

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

FCC Part 15.203 Antenna requirement

The EUT has a unique antenna connector (REVERSE SMA-P). Therefore, it complies with the requirement of 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Band Width	RSS-Gen 4.6.1	RSS-210 A9.2 (1)(2)(3)	N/A	-	Conducted

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

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 (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.1dB
No.2	3.3dB
No.3	3.7dB
No.4	3.2dB

Test room (semi-anechoic chamber)	Radiated emission (10m*)(±dB)		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	3.3dB	5.2dB	5.2dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

*10m = Measurement distance

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(±dB)			(1m*)(±dB)		(0.5m*)(±dB)	
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Antenna terminal conducted emission and Power density (+dB)			Antenna terminal conducted emission (+dB)		Channel power (±dB)
Below 1GHz	1GHz-3GHz	3GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz	
1.0dB	1.1dB	2.7dB	3.2dB	3.3dB	1.5dB

Conducted Emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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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	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
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	6.0 x 6.0m	-
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	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* 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.

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

4.1 Operating Modes

Mode	Remarks*
IEEE 802.11a (11a)	9Mbps, PN9
<p>*Transmitting duty was 100% on all tests. *The worst antenna (Antenna A) and condition was determined based on the test result of Maximum Peak Output Power. *EUT has the power settings by the software as follows; - Power settings: See table below - Software/Version: apfirm.bin / 5.08.02(2010-10-08) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.</p>	

Power settings (dBm)

Mode	11a(5GHz)	
	5180	5200-5240
6 - 24Mbps	18.0	18.0
36Mbps	16.5	16.5
48Mbps	15.0	14.5
54Mbps	14.0	14.0

Details of Operating mode(s)

Test Item	Operating Mode	Tested Antenna	Tested Frequency
			Low Band
Conducted emission, Spurious Emission(Radiated)	11a Tx	Antenna A	5180MHz 5220MHz 5240MHz
Maximum Peak Output Power,	11a Tx	Antenna A Antenna B	5180MHz 5220MHz 5240MHz
26dB Emission Bandwidth, 99% Occupied Bandwidth, Peak Power Spectral Density, Peak Excursion Ratio	11a Tx	Antenna A	5180MHz 5220MHz 5240MHz
20dB Bandwidth	11a Tx	Antenna A	5240MHz

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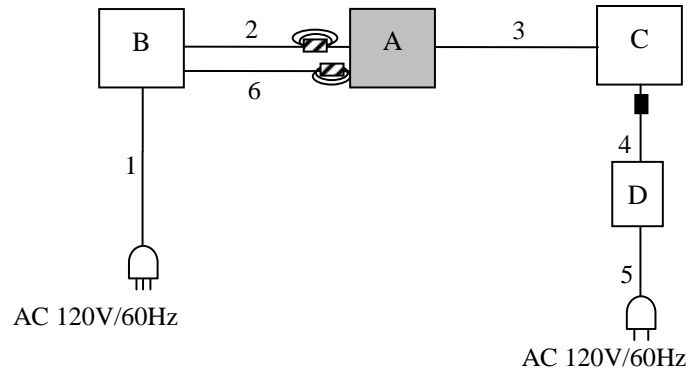
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4.2 Configuration and peripherals



■ : Standard Ferrite Core
▨ : Ferrite Core (Standard Attachment)

- * Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
- * Ferrite Cores are attached to DC and FG Cables according to manufacturer's requirement.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless LAN Adaptor	NZ2WL-US	AFRA463D00029	CONTEC	EUT
B	Power Supply	PS5R-SF24	910702D26967R	IDEC CORPORATION	-
C	Laptop PC	LATITUDE E5510	29725500	DELL	-
D	AC Adaptor	DA90PE0-00	-	DELL	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	AC Cable	1.7	Unshielded	Unshielded	-
2	DC Cable	0.5	Unshielded	Unshielded	One ferrite core attached. (3 turns, model: E04SR241336A, manufacturer: SEIWA, 6 cm from the EUT)
3	LAN Cable	12.0	Shielded	Shielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	0.9	Unshielded	Unshielded	-
6	FG Cable	0.5	Unshielded	Unshielded	One ferrite core attached. (3 turns, model: E04SR241336A, manufacturer: SEIWA, 2 cm from the EUT)

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SECTION 5: Conducted Emission

Test Procedure

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 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	: QP and AV
Measurement range	: 0.15-30MHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane. The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

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.

Below 1GHz

The result also satisfied with the general limits specified in section 15.209(a).

Above 1GHz

Inside of restricted bands(Section 15.205): Apply to limit in the Section 15.209(a).

Outside of the restricted bands: Apply to limit 68.2dBuV/m(-27dBm e.i.r.p. *)
in the Section 15.407(b)(1)(2)(3).

Restricted bandedge: Average detector apply to limit in the Section 15.209(a).
Peak detector apply to limit 68.2dBuV/m(-27dBm) e.i.r.p.
in the Section 15.407(b)(1)(2)(3). since this limit is
severer than the limit of the inside of restricted bands.

*Electric Field Strength to e.i.r.p. Conversion

$$E = \frac{1000000\sqrt{30P}}{3} \text{ (uV/m)} \quad : P \text{ is the e.i.r.p. (Watts)}$$

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	Below 1GHz	Above 1GHz	
Instrument used	Test Receiver	Spectrum Analyzer *1)	
Detector	QP	PK	AV
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz), 0.5m*3) (above 26.5GHz)	

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

*2) Distance Factor: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

*3) Distance Factor: $20 \times \log(3.0\text{m}/0.5\text{m}) = 15.6\text{dB}$

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- The carrier level and noise levels were confirmed at each position of X(1, 2, and 3), Y(1, 2, and 3) and Z(1, 2, and 3) axes of EUT and antenna to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30M-40GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port with Spectrum Analyzer.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used and Test method
26dB Bandwidth	30MHz	330kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	Close to 1% of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
20dB Bandwidth	30MHz	330kHz	1MHz	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	50MHz	1MHz	3MHz	Auto	Sample Power Averaging (100 times)	Clear Write	Spectrum Analyzer method 1
Peak Power Spectral Density	50MHz	1MHz	3MHz	Auto	Sample Power Averaging (100 times)	Clear Write	Spectrum Analyzer method 2
Peak Excursion Ratio	50MHz	1MHz	3MHz	Auto	Peak	Max Hold	Spectrum Analyzer method 1
					Sample Power Averaging (100 times)	Clear Write	
Conducted Spurious Emission *1)	9kHz - 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz - 30MHz	9.1kHz	27kHz				
	30MHz - 40GHz (Less or equal to 5GHz)	1MHz	3MHz				

*1) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

*EBW: Enough width to display Bandwidth

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass