



RADIO TEST REPORT

Test Report No. : 31BE0221-HO-06-A-R1

Applicant : CONTEC CO., LTD.
Type of Equipment : Wireless LAN Adapter
Model No. : NZ2WL-US
FCC ID : PQRNZ2WL-US
Test regulation : FCC Part 15 Subpart C: 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 the above regulation.
4. The test results in this report are traceable to the national or international standards.
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6. This report is a revised version of 31BE0221-HO-06-A. 31BE0221-HO-06-A is replaced with this report.

Date of test:

December 4, 2010 to March 19, 2011

**Representative
test engineer:**

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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 C: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

* 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 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.2	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.2	[QP] 5.6dB, 0.25626MHz, L [AV] 0.3dB, 0.25626MHz, L	Complied	-
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)	See data.	-	Conducted
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)		Complied	Conducted
Power Density	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(b)		Complied	Conducted
Spurious Emission Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" ----- IC: RSS-Gen 4.9	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	2.4dB 3883.123MHz, AV Horizontal	Complied	Conducted/ Radiated

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

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

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 Bandwidth	IC: RSS-Gen 4.6.1	IC: RSS-Gen 4.6.1	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

Power meter (+dB)	
Below 1GHz	Above 1GHz
1.0dB	1.0dB

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 Mode(s)

Mode	Remarks*
IEEE 802.11a (11a)	9Mbps, PN9
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	18Mbps, PN9
*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. *Power of the EUT was set 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.	

Power settings (dBm)

Mode	11a(5GHz)		
	5745	5765-5785	5805-5825
6 - 24Mbps	18.0	17.5	17.0
36Mbps	16.0	16.0	16.0
48Mbps	14.5	14.0	14.0
54Mbps	13.5	13.0	13.0

Mode	11b/g(2.4GHz)					
	2412	2417-2427	2432-2442	2447	2452-2457	2462
1 - 11Mbps	17.0	16.5	16.5	16.5	16.0	16.0
6 - 24Mbps	14.0	16.5	16.5	16.0	16.0	13.5
36Mbps	14.0	16.0	15.5	15.0	15.0	13.5
48Mbps	14.0	15.0	14.5	14.0	14.0	13.5
54Mbps	14.0	14.0	13.5	13.0	13.0	12.5

Test Item	Operating Mode	Tested Antenna	Tested frequency
Conducted Emission Spurious Emission	11b Tx 11g Tx	Antenna A	2412MHz 2437MHz 2462MHz
Maximum Peak Output Power	11b Tx 11g Tx	Antenna A Antenna B	2412MHz 2437MHz 2462MHz
6dB Bandwidth Power Density 99% Occupied Bandwidth	11b Tx 11g Tx	Antenna A	2412MHz 2437MHz 2462MHz

Test Item	Operating Mode	Tested Antenna	Tested frequency
Conducted Emission Spurious Emission	11a Tx	Antenna A	5745MHz 5785MHz 5825MHz
Maximum Peak Output Power	11a Tx	Antenna A Antenna B	5745MHz 5785MHz 5825MHz
6dB Bandwidth Power Density 99% Occupied Bandwidth	11a Tx	Antenna A	5745MHz 5785MHz 5825MHz

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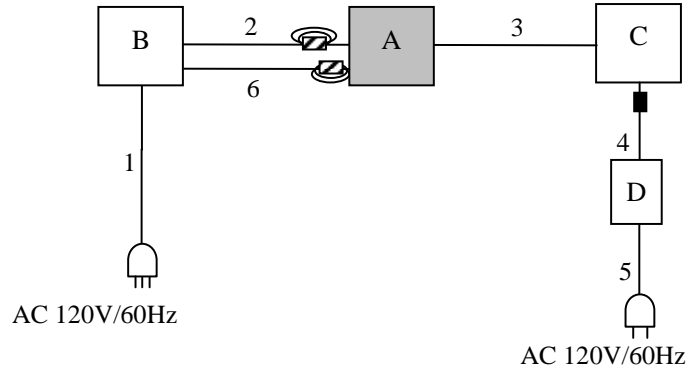
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4.2 Configuration and peripherals



■ : 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 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 with other peripherals (as a whole system)

I/O 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. The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

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

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SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247".

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

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

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.

Test Antennas are used as below;

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

In any 100kHz bandwidth outside the restricted 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.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 2 of RSS-210 2.7 (IC) and outside the restricted band of FCC 15.205 / Table 1 of RSS-210 2.7 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer *1)		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz), 0.5m*3) (above 26.5GHz)		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: $20 \times \log(3.0\text{m}/0.5\text{m}) = 15.6\text{dB}$

- 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 : 9kHz-40GHz
Test data : APPENDIX
Test result : Pass

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SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

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

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	20MHz	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 50MHz BW)
Peak Power Density	18MHz	30kHz	100kHz	600sec	Peak	Max Hold	Spectrum Analyzer *1) *2)
Conducted Spurious Emission *3)	9kHz – 150kHz	200Hz	620Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz – 30MHz	9.1kHz	27kHz				
	30MHz-25GHz (Less or equal to 5GHz)	100kHz	300kHz				

*1) PSD Option 1 of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".
*2) The test was not performed at RBW:3kHz however the measurement is to be performed with RBW:3kHz in the regulation, because, the measurement value with RBW:3kHz is less than the value of RBW:30kHz and the test data met the limit with RBW:30kHz.
*3) 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)

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

Test data : APPENDIX
Test result : Pass