



RADIO TEST REPORT

Test Report No. : 29LE0211-HO-02-C

Applicant : Panasonic Corporation of North America
Type of Equipment : WIRELESS LAN ADAPTOR
Model No. : DY-WL10
FCC ID : ACJ-DY-WL10
Test regulation : FCC Part 15 Subpart E: 2009
Section 15.407
Test Result : Complied

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2. The results in this report apply only to the sample tested.
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Date of test: October 13 to 29, 2009

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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 ADAPTOR
Model No. : DY-WL10
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC5.0V / 0.5A
Receipt Date of Sample : October 9, 2009
Country of Mass-production : Japan
Condition of EUT : Production model
Modification of EUT : No Modification by the test lab

2.2 Product Description

WIRELESS LAN ADAPTOR for several Audio/ Visual Devices.

General Specification

Clock frequency in the system : CRYSTAL: 20MHz

Specification of WLAN (IEEE802.11a/b/g)

Type of radio	Wireless LAN (IEEE802.11a)	Wireless LAN (IEEE802.11b/g)
Equipment Type	Transceiver	
Frequency of Operation	5180MHz - 5320MHz 5745MHz - 5825MHz	2412MHz - 2462MHz
Bandwidth & Channel spacing	Bandwidth : 20MHz Ch spacing : 20MHz	Bandwidth : 20MHz Ch spacing : 5MHz
Type of Modulation	OFDM	11b: DSSS 11g: OFDM
Antenna Type	PWB pattern antenna	
Antenna Connector Type	U.FL connector (Hirose)	
Antenna Gain	5.15GHz: 1.5dBi (Including Cableloss) 5.20GHz: 1.5dBi (Including Cableloss) 5.30GHz: 1.4dBi (Including Cableloss) 5.50GHz: 1.4dBi (Including Cableloss) 5.60GHz: 1.3dBi (Including Cableloss) 5.80GHz: 1.0dBi (Including Cableloss)	2.4GHz: 1.5dBi (Including Cableloss)
Power Supply	DC 1.2 & 3.3V	
Operating temperature range	0 to +40 deg. C.	

Specification of WLAN (IEEE802.11n)

Type of radio	Wireless LAN (IEEE802.11n)			
	2.4G Band MISO (20M Band)	2.4G Band MISO (40M Band)	5G Band MISO (20M Band)	5G Band MISO (40M Band)
Equipment Type	Transceiver			
Frequency of Operation	2412MHz - 2462MHz	2422MHz - 2452MHz	5180MHz - 5320MHz 5745MHz - 5825MHz	5190MHz - 5310MHz 5755MHz - 5795MHz
Bandwidth & Channel spacing	Bandwidth : 20MHz Ch spacing : 5MHz	Bandwidth : 40MHz Ch spacing : 5MHz	Bandwidth : 20MHz Ch spacing : 20MHz	Bandwidth : 40MHz Ch spacing : 40MHz
Type of Modulation	OFDM			
Antenna Type	PWB pattern antenna			
Antenna Connector Type	U.FL connector (Hirose)			
Antenna Gain	2.4GHz: 1.5dBi (Including Cableloss)		5.15GHz: 1.5dBi (Including Cableloss) 5.20GHz: 1.5dBi (Including Cableloss) 5.30GHz: 1.4dBi (Including Cableloss) 5.50GHz: 1.4dBi (Including Cableloss) 5.60GHz: 1.3dBi (Including Cableloss) 5.80GHz: 1.0dBi (Including Cableloss)	
Power Supply	DC 1.2 & 3.3V			
Operating temperature range	0 to +40 deg. C.			

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart E: 2009, final revised on February 27, 2009
Title : FCC 47CFR Part15 Radio Frequency Device Subpart E
Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

* The EUT complies with FCC Part 15 Subpart B: 2009, final revised on February 27, 2009.

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	[Tx] QP 14.7dB, 0.20916MHz, N	Complied	-
	IC: RSS-Gen 7.2.2	IC: RSS-Gen 7.2.2	AV 15.4dB, 0.21090MHz, N/L [Rx] QP 15.4dB, 0.20829MHz, N 0.20916MHz, L AV 16.4dB, 0.20916MHz, 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	N/A	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)		[Tx] 0.8dB 5150.000MHz, AV, Hori. [Rx] 7.4dB 729.007MHz, QP, Hori.	Complied
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.QPM05 and QPM15. For DFS tests, please see the test report number 29LE0211-HO-02-E issued by UL Japan, Inc.					

*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)

This EUT provides stable voltage(DC3.3V) 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 EUT. Therefore, the equipment complies with the antenna requirement of Section 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	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	3.7dB
No.2	3.7dB
No.3	3.7dB
No.4	3.7dB

Test room (semi-anechoic chamber)	Radiated emission (10m*)(+dB)			Radiated emission (3m*)(+dB)					
	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz	18GHz-26.5GHz	26.5GHz-40GHz
No.1	3.1dB	4.4dB	3.9dB	3.2dB	3.8dB	3.9dB	5.0dB	5.0dB	5.4dB
No.2	-	-	-	3.2dB	4.4dB	4.0dB	5.0dB	5.2dB	5.4dB
No.3	-	-	-	3.2dB	4.2dB	3.8dB	5.0dB	5.3dB	5.3dB
No.4	-	-	-	3.2dB	4.0dB	3.8dB	5.0dB	5.3dB	5.3dB

*10m/3m = 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 test report has enough margin, more than the site margin.

Radiated emission test(3m)

[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.

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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)	6Mbps, PN9
IEEE 802.11n MISO 20MHz BW (11n-20)	MCS 0, PN9
IEEE 802.11n MISO 40MHz BW (11n-40)	MCS 0, PN9
*The worst antenna(Ant: x) and condition was determined based on the test result of Maximum Peak Output Power.	
*This EUT has two antennas, but it transmits with single antenna and does not transmit with multi antennas. Each antenna has four radiating patterns and the test was performed by each pattern.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested Antenna	Tested Frequency	
			Low Band	Middle Band
Conducted emission,	11a Tx	1 *3)	5180MHz*1)	5260MHz*1)
	11n-20 Tx	1 *3)	5180MHz*1)	5260MHz*1)
	11n-40 Tx	1 *3)	5190MHz*1)	5270MHz*1)
	11a Rx	1 *3)	5180MHz*2)	-
Spurious Emission(Radiated)	11a Tx	1 *3)	5180MHz	5260MHz
			5220MHz	5300MHz
			5240MHz	5320MHz
	11n-20 Tx	1 *3)	5180MHz	5260MHz
			5220MHz	5300MHz
	11n-40 Tx	1 *3)	5190MHz	5270MHz
			5230MHz	5310MHz
	11a Rx	1 *3)	5220MHz	5300MHz
5220MHz			5300MHz	
26dB Emission Bandwidth, 99% Occupied Bandwidth, Maximum Peak Output Power, Peak Power Spectral Density, Peak Excursion Ratio	11a Tx	0	5180MHz	5260MHz
			5220MHz	5300MHz
			5240MHz	5320MHz
	11n-20 Tx	0	5180MHz	5260MHz
			5220MHz	5300MHz
			5240MHz	5320MHz
	11n-40 Tx	0	5190MHz	5270MHz
			5230MHz	5310MHz
			5230MHz	5310MHz
20dB Bandwidth	11a Tx	0	5240MHz	5260MHz
	11n-20 Tx	0	5240MHz	5260MHz
	11n-40 Tx	0	5230MHz	5270MHz
Spurious Emission(Conducted)	11a Tx	0	5180MHz	-
			5220MHz	-
			5240MHz	-
	11a Rx	0	5220MHz	-
*1) Since the noise levels for Mid/High channel were equivalence noise level with low channel, the test was performed at low channel as a representative.				
*2) Since the noise level for 11n-20 Rx mode and 11n-40 Rx mode were equivalence noise level with 11a Rx mode, the test was performed at 11a Rx mode as a representative.				
*3) Since Antenna 1 had worst condition, the test was performed with Antenna 1.				

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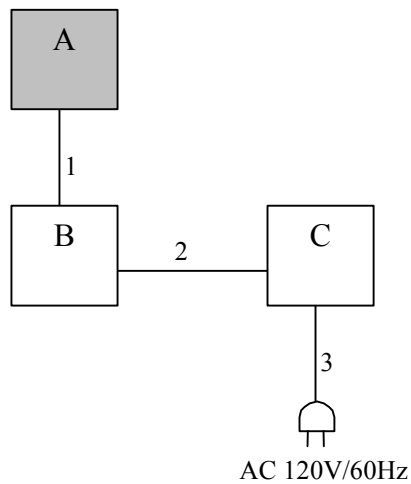
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4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	WIRELESS LAN ADAPTOR	DY-WL10	243 *1) 245 *2)	Panasonic	EUT
B	Note PC	2373T49	L3-16W54	IBM	-
C	AC ADAPTOR	92P1020	11S92P1020Z1Z9RM63A76X	IBM	-

*1) Used for Conducted Emission and Radiated Emission tests

*2) Used for Antenna Terminal conducted test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	3.0	Shielded	Shielded	-
2	DC Cable	1.9	Unshielded	Unshielded	
3	AC Cable	1.0	Unshielded	Unshielded	

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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 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	: 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

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

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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	
Detector	QP	PK	AV
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 1MHz	[Rx] RBW: 1MHz VBW: 10Hz [Tx] RBW: 1MHz VBW: *1)
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz), 0.5m*3) (above 26.5GHz)	

*1) Used for the band edge of the carrier and the harmonics that can be measured. The VBW is based on the inverse of the duty cycle (see P.78).

*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, Y and Z axes of EUT 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	Remarks
26dB Bandwidth	50MHz, 100MHz	Close to 1% of EBW	Greater than RBW	Auto	Peak	Clear Write	-
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	Close to 1% of Span	Three times of RBW	Auto	Peak	Max Hold	-
20dB Bandwidth	50MHz, 100MHz	100kHz	300kHz	Auto	Peak	Max Hold	-
Maximum Peak Output Power	50MHz, 80MHz	1MHz	3MHz	Auto	Sample Power Averaging (100 times)	Clear Write	method 1 gating on
Peak Power Spectral Density	50MHz, 100MHz	1MHz	3MHz	Auto	Sample Power Averaging (100 times)	Clear Write	method 2
Peak Excursion Ratio	50MHz, 100MHz	1MHz	3MHz	Auto	Peak	Max Hold	method 1
					Sample Power Averaging (100 times)	Clear Write	
Conducted Spurious Emission	Less or equal to 5GHz (Range: 30MHz-40GHz)	1MHz	1MHz	Auto	Peak	Max Hold	-

*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