



RADIO TEST REPORT

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

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 C 2009
Section 15.207, Section 15.247**

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.
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.


Date of test: October 10 to 24, 2009

Tested by:


Tomotaka Sasagawa
EMC Services


Takumi Shimada
EMC Services



Hisayoshi Sato
EMC Services

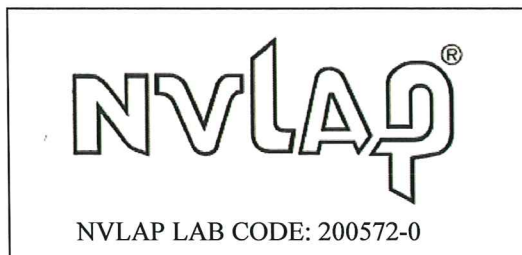

Takeshi Choda
EMC Services


Seiki Oitani
EMC Services


Satofumi Matsuyama
EMC Services

Approved by :


Takahiro Hatakeda
Group Leader of EMC Services



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*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://uljapan.co.jp/emc/nvlap.htm>

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SECTION 1: Customer information

Company Name : Panasonic Corporation of North America
Address : One Panasonic Way, 4B-8 Secaucus, NJ 0709
Telephone Number : +1-201-348-7758
Facsimile Number : +1-201-392-4564
Contact Person : Richard Mullen

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.			

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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 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 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 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.2	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.2	[Tx] QP 14.7dB, 0.21177MHz, L AV 15.7dB, 0.21090MHz, N 0.21177MHz, L [Rx] QP 14.8dB, 0.21090MHz, L AV 15.9dB, 0.21177MHz, 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.	Complied	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 RSS-Gen 4.10	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	[Tx] 0.5dB 2390.000MHz, AV, Hori. [Rx] 7.4dB 729.008MHz, QP, Hori.	Complied	Conducted/ Radiated

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.

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.

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	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

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 test report has enough margin, more than the site margin.

Radiated emission test(3m)

[Tx] The data listed in this test 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.

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	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)	6Mbps, PN9
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	24Mbps, PN9
IEEE 802.11n MISO 20MHz BW (11n-20): 2.4G Band	MCS 0, PN9
IEEE 802.11n MISO 20MHz BW (11n-20): 5G Band	MCS 0, PN9
IEEE 802.11n MISO 40MHz BW (11n-40): 2.4G Band	MCS 5, PN9
IEEE 802.11n MISO 40MHz BW (11n-40): 5G Band	MCS 0, PN9

*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)
*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
Conducted Emission	11b Tx	1 *3)	2412MHz *1)
	11g Tx		2412MHz 2437MHz 2462MHz
	11n-20 Tx		2412MHz *1)
	11n-40 Tx		2422MHz *1)
	11g Rx		2437MHz *2)
Spurious Emission	11b Tx	1 *3)	2412MHz
	11g Tx		2437MHz
	11n-20 Tx		2462MHz
	11n-40 Tx		2422MHz 2437MHz 2452MHz
	11b Rx 11g Rx 11n-20/-40 Rx		2437MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11b Tx	0	2412MHz
	11g Tx		2437MHz 2462MHz
	11n-20 Tx	1	2412MHz 2437MHz 2462MHz
	11n-40 Tx	0	2422MHz 2437MHz 2452MHz

*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 11b Rx mode, 11n-20 Rx mode and 11n-40 Rx mode were equivalence noise level with 11g Rx mode, the test was performed at 11g Rx mode as a representative.
*3) Since Antenna 1 had worst condition, the test was performed with Antenna 1.

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

*The details of Operating mode(s)

Test Item	Operating Mode	Tested Antenna	Tested frequency
Conducted Emission	11a Tx	1 *3)	5745MHz *1)
	11n-20 Tx		5745MHz 5785MHz 5825MHz
	11n-40 Tx		5755MHz *1)
	11n-20 Rx		5785MHz *2)
Spurious Emission	11a Tx	1 *3)	5745MHz
	11n-20 Tx		5785MHz 5825MHz
	11n-40 Tx		5755MHz 5795MHz
	11a Rx 11n-20/-40 Rx		5785MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11a Tx	0	5745MHz
	11n-20 Tx		5785MHz 5825MHz
	11n-40 Tx		5755MHz 5795MHz
*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 11a Rx mode and 11n-40 Rx mode were equivalence noise level with 11n-20 Rx mode, the test was performed at 11n-20 Rx mode as a representative. *3) Since Antenna 1 had worst condition, the test was performed with Antenna 1.			

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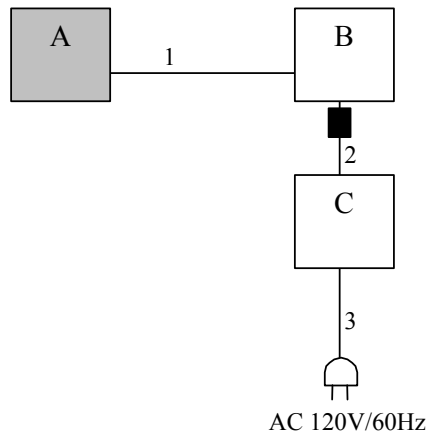
Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

4.2 Configuration and peripherals



■ : Standard Ferrite Core

* 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) 244 *2) 245 *2)	Panasonic	EUT
B	Note PC	2373T49	L3-16W54	IBM	-
C	AC ADAPTOR	02K6810	11S02K6810Z1Z3BJ35D1VZ	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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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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.

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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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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	
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)
	-	20dBc : RBW:100kHz/VBW:300kHz	
Test Distance	3m	3m (below 10GHz), 1m (above 10GHz) *2), 0.5m (above 26.5GHz) *3)	

*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.71-72).

*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-26.5GHz (for 2.4GHz mode), 30M-40GHz (for 5GHz mode)

Test data : APPENDIX

Test result : Pass

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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	50MHz	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, 20MHz, 40MHz	30kHz	100kHz	600sec, 667sec, 1334sec	Peak	Max Hold	Spectrum Analyzer *1) *2)
Conducted Spurious Emission	Less or equal to 5GHz (Range: 30MHz-25GHz: for 2.4GHz mode) (Range: 30MHz-40GHz: for 5GHz mode)	100kHz	300kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) PSD Option 1 of "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247".

*2) The test was not performed at RBW:3kHz since the measurement is to be performed with RBW:30kHz 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.

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

Test data : APPENDIX
Test result : Pass