SAR TEST REPORT

Test Report No. : 30FE0066-HO-01-E

Applicant	:	**Panasonic Corporation of North America**
Type of Equipment	:	**WIRELESS LAN ADAPTOR**
Model No.	:	**DY-WL10**
FCC ID	:	**ACJ-DY-WL10**
Test regulation	:	**FCC47CFR 2.1093** **FCC OET BULLETIN 65, SUPPLEMENT C**
Test Result	:	**Complied** **(Class II permissive change for addition of frequency band)**
Max. SAR Value	:	
IEEE802.11a/n(5500-5700MHz)	:	**0.566W/kg (Body, 5600MHz)**

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 limits of the above regulation.
4. The test results in this test 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: January 18, 19, 2010

Tested by:

Hisayoshi Sato
EMC Services

Miyo Kishimoto
EMC Services

Approved by :

Mitsuru Fujimura
Site Manager of EMC Services

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://uljapan.co.jp/emc/nvlap.htm

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

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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 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.	:	244
Rating	:	DC5.0V / 0.5A
Receipt Date of Sample	:	January 16, 2010
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 5500MHz - 5700MHz* 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 5500MHz - 5700MHz* 5745MHz - 5825MHz	5190MHz - 5310MHz 5510MHz - 5670MHz* 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.			

* Frequency range of 5600MHz-5650MHz is not used in Canada.
The tests for other bands except for 5500MHz-5700MHz bands were performed in the original approval. (test report 29LE0211-HO-02-A and 29LE0211-HO-02-C)

SECTION 3 : Test standard information

3.1 Requirements for compliance testing defined by the FCC

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at
maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

3.2 SAR Test online

SAR evaluation was measured all USB orientations (see Appendix 1 – (1) Horizontal-Front, (2) Horizontal-Rear, (3) Vertical-Right side, and (4) Vertical-Left side) with a device to phantom separation distance of 5 mm, according to KDB 447498 requirements.

3.3 Procedure and result

No.	Item	Test Procedure	Limit	Remarks	Exclusion	Result
1	Human Exposure	FCC OET BULLETIN 65, SUPPLEMENT C	FCC47CFR 2.1093	SAR Measurement	N/A	Complied Max.SAR = 0.566W/kg
Note: UL Japan, Inc. 's SAR Work Procedures QPM46 and QPM47						

Result of Max. SAR value

Max. SAR Value:
IEEE802.11a/n(5500-5700MHz) : 0.566W/kg (Body, 5600MHz)

The 1-g SAR was <0.8W/kg for all configurations.
Therefore according to the KDB447498 D01, the EUT was approved for used in a multiple platform.

3.4 Exposure limit

(A) Limits for Occupational/Controlled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

(B) Limits for General population/Uncontrolled Exposure (W/kg)

Spatial Average (averaged over the whole body	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.08	1.6	4.0

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

General Population/Uncontrolled Environments: are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT
1.6 W/kg

3.5 Test Location

*Shielded room for SAR testings
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

3.6 Confirmation before SAR testing

3.6.1 Correlation of Output Power between EMC and SAR tests

It was checked that the antenna port power (average power) was correlated within 0~+5% (FCC requirements)
SAR power is equal to DATA of EMC test. (January 18, 2010) based on the following reason.

- EMC and SAR tests are performed with the same test sample (S/N: 244) under the same condition.
- EMC and SAR tests are performed at the same laboratory.
- The test mode setting is simple, and there is no possibility that the power (value) is changed by the wrong setting.

The result is shown in Section 6.1.

3.6.2 Power check for SAR testing

Step.1 Data rate check
The data rate check was measurement all data rate in the middle frequency of each frequency band.

Reference of modulation table

11a	
Modulation	**Data rate [Mbps]**
BPSK	6
BPSK	9
QPSK	12
QPSK	18
16QAM	24
16QAM	36
64QAM	48
64QAM	54

Reference of MCS index

11n	
Modulation	**MCS Number**
BPSK	MCS 0
QPSK	MCS 1
QPSK	MCS 2
16QAM	MCS 3
16QAM	MCS 4
64QAM	MCS 5
64QAM	MCS 6
64QAM	MCS 7

Step.2 Decision of SAR test channel
The average output power for 802.11a was measured on all channels in each frequency band.
The result is shown in Section 6.1.

Mode		GHz	Channel	Turbo Channel	"Default Test Channel"			
					FCC 15.247		UNII	
					802.11b	802.11g		
802.11 b/g		2.412	1		√	Δ		
		2.437	6	6	√	Δ		
		2.462	11		√	Δ		
802.11a	UNII	5.18	36				√	
		5.20	40	42(5.21 GHz)				*
		5.22	44					*
		5.24	48	50(5.25 GHz)			√	
		5.26	52				√	
		5.28	56	58(5.29 GHz)				*
		5.30	60					*
		5.32	64				√	
		5.50	100	Unknown				*
		5.52	104				√	
		5.54	108					*
		5.56	112					*
		5.58	116				√	
		5.60	120					*
		5.62	124				√	
		5.64	128					*
		5.66	132					*
		5.68	136				√	
		5.70	140					*
	UNII or FCC 15.247	5.745	149		√		√	
		5.765	153	152(5.76 GHz)		*		*
		5.785	157		√			*
		5.805	161	160(5.80GHz)		*	√	
	FCC 15.247	5.825	165		√			

√ = "default test channels"
* = Possible 802.11a channels with maximum average output > the "default test channels"
Δ = Possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

3.7 Confirmation after SAR testing

It was checked that the power drift [W] is within ±5%.The verification of power drift during the SAR test is that DASY4 system calculates the power drift by measureing the e-filed at the same location at beginning and the end of the scan measurement for each test position.

DASY4 system calucation Power drift value[dB] =20log(Ea)/(Eb)
Before SAR testing : Eb[V/m]
After SAR testing : Ea[V/m]

Limit of power drift[W] =+/-5%
X[dB]=10log[P]=10log(1.05/1)=10log(1.05)-10log(1)=0.212dB

from E-filed relations with power.
S=E*H=E^2/ η =P/4 π r^2 (η : Space impedance)
P=E^2*4 π r^2/η
Therefore, The correlation of power and the E-filed
XdB=10log(P)=10log(E)^2=20log(E)

From the above mentioned,
The calculated power drift of DASY4 System must be the less than +/-0.212dB.

3.8 Measurement procedure

This EUT has two antennas but was transmitted with single antenna and cannot be transmitted simultaneously with multi antennas.
The each antenna has four radiated patterns and the test was measured by each pattern.

This EUT is USB dongle with internal antennas.
Therefore, it was tested with all USB orientations(four orientations) had been connected with the host device through the USB cable
The USB cable used is a short (less than 12 inches), high quality and did not affect emission characteristics of device and output power from dongle.
And, because this EUT was used to the single platform, only the worst condition was tested with Laptop computer.
As a result, EUT was proved to the satisfaction enough SAR value with 0.8W/kg or less in compared with the connection to Laptop PC.
Radiated power is always monitored by Spectrum Analyzer.

1. IEEE 802.11a mode (with cable)

The 11a mode test was performed on the BPSK modulation, because it was the maximum average power*.
As for the SAR measurement of each antenna, it was repeated from Step1 to Step4.

Step1. The searching for the worst position and worst radiated pattern.
This test was performed at the 11a mode.

Step2. Change the channel
This test was performed at the worst condition of Step 1.

2. IEEE 802.11n mode (with cable)

The number of 11n mode SAR test was reduced, because the power in the 11a mode was higher than 11n mode
According to the KDB447498 1) e), when the 1-gSAR for the highest output channel is less than 0.4W/kg, where the transmission band corresponding to all channel is $\leq$200MHz, testing for the other channels is not required.
Otherwise, the tested channel is added which is the channel of a highest SAR in the 11a mode (from step1 to step2).
As the results when 1-g SAR for tested channels are less than 0.8W/Kg (3dB lower than SAR limit), testing for other channels is not required.

Step3. Change the mode (11n MISO 20M band mode)
This test was performed at the worst condition of Step 1.
Step4. Change the mode (11n MISO 40M band mode)
This test was performed at the worst condition of Step 1.

3. RF exposure configuration connected with a host computer

Step5. RF exposure configuration connected with a host computer (Without USB cable)
This test was performed at the worst condition in all measurements.

* Refer to the average power data to Section 6

3.9 Test setup of EUT

SAR evaluation was measured all USB orientations (see Appendix 1 – (1) Horizontal-Front, (2) Horizontal-Rear, (3) Vertical-Right side, and (4) Vertical-Left side) with a device to phantom separation distance of 5 mm, according to KDB 447498 requirements.

(1): Horizontal-Front:
The test was performed in separated distance of 5 mm between front surface of the EUT and the flat phantom.

(2): Horizontal-Rear:
The test was performed in separated distance of 5 mm between rear surface of the EUT and the flat phantom.

(3): Vertical-Right side:
The test was performed in separated distance of 5 mm between right side of the EUT and the flat phantom.

(4): Vertical-Left side:
The test was performed in separated distance of 5 mm between left side of the EUT and the flat phantom.

(5): Vertical-Left side without USB cable:
The test was performed in separated distance of 5 mm between front surface of the EUT and the flat phantom.

3.10 Radiated pattern

This EUT has two antennas, but it transmits with single antenna and does not trasmit with multi antennas.
Each antenna has four radiated patterns and the test was performed by each pattern.

(1): Default:
It is radiated in the large range.

(2): Front:
It radiates strongly on head side(the other side of the interface).

(3): Rear:
I It radiates strongly on the interface side.

(4): Front + Rear:
It is radiated strongly on the both side.

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

4.1 Operating modes for SAR testing

4.1.1 Setting of EUT

The frequency band and the modulation used in the testing of IEEE.802.11a/n are shown as a following.

1. IEEE 802.11a Additional band mode
Tx frequency band : 5500-5700MHz
Channel : 100ch(5500MHz), 116ch(5580MHz), 120ch(5600MHz), 140ch(5700MHz)
Modulation : OFDM (BPSK)
Crest factor : 1

Mode	On time	1cycle	Duty	Crest factor
BPSK	1.738	1.822	95%	1.05

Duty[%]=On time / 1cycle *100
Crest factor=100 / Duty[%]
Crest factor=1.05≒1.0

2. IEEE 802.11n(5G) MISO 20MHz band width Additional band mode
Tx frequency band : 5500-5700MHz
Channel : 120ch(5600MHz), 140ch(5700MHz)
Modulation : OFDM (BPSK)
Crest factor : 1

Mode	On time	1cycle	Duty	Crest factor
BPSK	1.332	1.421	94%	1.06

Duty[%]=On time / 1cycle *100
Crest factor=100 / Duty[%]
Crest factor=1.06≒1

3. IEEE 802.11n(5G) MISO 40MHz band width Additional band mode
Tx frequency band : 5510-5670MHz
Channel : 118ch(5590MHz), 134ch(5670MHz)
Modulation : OFDM (BPSK)
Crest factor : 1

Mode	On time	1cycle	Duty	Crest factor
BPSK	0.6711	0.7573	89%	1.12

Duty[%]=On time / 1cycle *100
Crest factor=100 / Duty[%]
Crest factor=1.12≒1

SECTION 5 : Test surrounding

5.1 Measurement uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents[6][7] and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±6.8	Normal	1	1	±6.8	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	$(1\text{-cp})^{1/2}$	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	$(cp)^{1/2}$	±3.9	∞
Boundary effects	±2.0	Rectangular	√3	1	±1.2	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	Normal	1	1	±0.3	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient Noise	±3.0	Rectangular	√3	1	±1.7	∞
RF ambient Reflections	±3.0	Rectangular	√3	1	±1.7	∞
Probe Positioner	±0.8	Rectangular	√3	1	±0.5	∞
Probe positioning	±9.9	Rectangular	√3	1	±5.7	∞
Max.SAR Eval.	±4.0	Rectangular	√3	1	±2.3	∞
Test Sample Related						
Device positioning	±2.9	Normal	1	1	±2.9	32
Device holder uncertainty	±3.6	Normal	1	1	±3.6	4
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	±5.0	Rectangular	1	0.64	±3.2	∞
Liquid permittivity (target)	±10.0	Rectangular	√3	0.6	±3.4	∞
Liquid permittivity (meas.)	±10.0	Rectangular	1	0.6	±6.0	∞
Combined Standard Uncertainty					**±14.72**	
Expanded Uncertainty (k=2)					**±29.4**	

The dielectric parameters (permittivity) were expanded to variation of ±10% from the target value.

SECTION 6 : Confirmation before testing

6.1 Correlation of Output Power between EMC and SAR tests

SAR power is equal to DATA of EMC test. (January 18, 2010)
SAR test channel was decided by the following results

6.1.1 EMC power and SAR Power

This data is reference data of EMC test (Report No. 30FE0066-HO-A).
Date of test: January 18, 2010

IEEE802.11a5500-5700band 6Mbps Ant.0

Ch	Frequency [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
100	5500	1.17	1.00	10.15	12.32	17.06
104	5520	1.32	1.00	10.15	12.47	17.66
108	5540	1.26	1.00	10.15	12.41	17.42
112	5560	1.25	1.00	10.15	12.40	17.38
116	5580	1.26	1.00	10.15	12.41	17.42
120	5600*	1.42	1.00	10.15	12.57	18.07
124	5620	1.39	1.00	10.15	12.54	17.95
128	5640	1.32	1.00	10.15	12.47	17.66
132	5660	1.53	1.00	10.15	12.68	18.54
136	5680	1.63	1.00	10.15	12.78	18.97
140	5700*	1.69	1.00	10.15	12.84	19.23

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing
* : This channel was tested instead of an adjacent"default test channel".

IEEE802.11a5500-5700band 6Mbps Ant.1

Ch	Frequency [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
100	5500	1.08	1.00	10.15	12.23	16.71
104	5520	1.14	1.00	10.15	12.29	16.94
108	5540	1.13	1.00	10.15	12.28	16.90
112	5560	1.00	1.00	10.15	12.15	16.41
116	5580	1.18	1.00	10.15	12.33	17.10
120	5600*	1.26	1.00	10.15	12.41	17.42
124	5620	1.25	1.00	10.15	12.40	17.38
128	5640	1.23	1.00	10.15	12.38	17.30
132	5660	1.24	1.00	10.15	12.39	17.34
136	5680	1.18	1.00	10.15	12.33	17.10
140	5700*	1.32	1.00	10.15	12.47	17.66

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing
* : This channel was tested instead of an adjacent"default test channel".

[IEEE802.11n 20MHz band width MISO 5500-5700band] MCS 0 Ant.0

Ch	Frequency [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
100	5500	0.87	1.00	10.15	12.02	15.92
104	5520	0.94	1.00	10.15	12.09	16.18
108	5540	0.82	1.00	10.15	11.97	15.74
112	5560	0.80	1.00	10.15	11.95	15.67
116	5580	0.89	1.00	10.15	12.04	16.00
120	5600	1.07	1.00	10.15	12.22	16.67
124	5620	1.06	1.00	10.15	12.21	16.63
128	5640	1.01	1.00	10.15	12.16	16.44
132	5660	1.10	1.00	10.15	12.25	16.79
136	5680	1.16	1.00	10.15	12.31	17.02
140	5700	1.28	1.00	10.15	12.43	17.50

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing

IEEE802.11n 20MHz band width MISO5500-5700band MCS 0 Ant.1

Ch	Frequency [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
100	5500	1.08	1.00	10.15	12.23	16.71
104	5520	1.09	1.00	10.15	12.24	16.75
108	5540	1.08	1.00	10.15	12.23	16.71
112	5560	0.96	1.00	10.15	12.11	16.26
116	5580	1.07	1.00	10.15	12.22	16.67
120	5600	1.18	1.00	10.15	12.33	17.10
124	5620	1.15	1.00	10.15	12.30	16.98
128	5640	1.14	1.00	10.15	12.29	16.94
132	5660	1.16	1.00	10.15	12.31	17.02
136	5680	1.32	1.00	10.15	12.47	17.66
140	5700	1.44	1.00	10.15	12.59	18.16

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing

[IEEE802.11n 40MHz band width MISO 5500-5700band] MCS 0 Ant.0

Ch	Frequency [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
102	5510	0.16	1.00	10.15	11.31	13.52
110	5550	0.27	1.00	10.15	11.42	13.87
118	5590	0.27	1.00	10.15	11.42	13.87
126	5630	0.27	1.00	10.15	11.42	13.87
134	5670	0.35	1.00	10.15	11.50	14.13

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing

[IEEE802.11n 40MHz band width MISO 5500-5700band] MCS 0 Ant.1

Ch	Frequency [MHz]	P/M Reading [dBm] AVG	Cable Loss [dB]	Atten. [dB]	Result [dBm] AVG	Result [mW] AVG
102	5510	-0.01	1.00	10.15	11.14	13.00
110	5550	0.14	1.00	10.15	11.29	13.46
118	5590	-0.07	1.00	10.15	11.08	12.82
126	5630	0.21	1.00	10.15	11.36	13.68
134	5670	0.30	1.00	10.15	11.45	13.96

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing

6.2 Power check for SAR testing

Date of test: January 18, 2010

The worst modulation (data rate) was decided by the following results

[IEEE802.11a 5500-5700band] Rate Check Ant.0

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6	5600	10.86	1.42	1.00	10.15	22.01	12.57	158.85	18.07
9	5600	10.66	1.14	1.00	10.15	21.81	12.29	151.71	16.94
12	5600	10.70	0.95	1.00	10.15	21.85	12.10	153.11	16.22
18	5600	10.38	0.77	1.00	10.15	21.53	11.92	142.23	15.56
24	5600	10.98	0.43	1.00	10.15	22.13	11.58	163.31	14.39
36	5600	10.59	-0.04	1.00	10.15	21.74	11.11	149.28	12.91
48	5600	10.56	-0.21	1.00	10.15	21.71	10.94	148.25	12.42
54	5600	10.29	-0.35	1.00	10.15	21.44	10.80	139.32	12.02

Sample Calculation: Result = Reading + Cable Loss + Attenuator

[IEEE802.11a 5500-5700band] Rate Check Ant.1

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6	5600	10.83	1.26	1.00	10.15	21.98	12.41	157.76	17.42
9	5600	10.66	0.98	1.00	10.15	21.81	12.13	151.71	16.33
12	5600	10.56	0.83	1.00	10.15	21.71	11.98	148.25	15.78
18	5600	10.20	0.59	1.00	10.15	21.35	11.74	136.46	14.93
24	5600	10.84	0.22	1.00	10.15	21.99	11.37	158.12	13.71
36	5600	10.51	-0.27	1.00	10.15	21.66	10.88	146.55	12.25
48	5600	10.43	-0.42	1.00	10.15	21.58	10.73	143.88	11.83
54	5600	10.31	-0.66	1.00	10.15	21.46	10.49	139.96	11.19

Sample Calculation: Result = Reading + Cable Loss + Attenuator

[IEEE802.11n 20MHz band width MISO 5500-5700band] Rate Check Ant.0

MCS Number	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
0	5600	10.42	1.07	1.00	10.15	21.57	12.22	143.55	16.67
1	5600	10.26	0.72	1.00	10.15	21.41	11.87	138.36	15.38
2	5600	10.37	0.51	1.00	10.15	21.52	11.66	141.91	14.66
3	5600	10.23	0.26	1.00	10.15	21.38	11.41	137.40	13.84
4	5600	10.15	-0.09	1.00	10.15	21.30	11.06	134.90	12.76
5	5600	10.23	-0.42	1.00	10.15	21.38	10.73	137.40	11.83
6	5600	10.54	-0.72	1.00	10.15	21.69	10.43	147.57	11.04
7	5600	10.35	-0.81	1.00	10.15	21.50	10.34	141.25	10.81

Sample Calculation: Result = Reading + Cable Loss + Attenuator

[IEEE802.11n 20MHz band width MISO 5500-5700band] Rate Check Ant.1

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6	5600	10.49	1.18	1.00	10.15	21.64	12.33	145.88	17.10
9	5600	10.37	0.99	1.00	10.15	21.52	12.14	141.91	16.37
12	5600	10.48	0.67	1.00	10.15	21.63	11.82	145.55	15.21
18	5600	10.45	0.45	1.00	10.15	21.60	11.60	144.54	14.45
24	5600	10.24	0.09	1.00	10.15	21.39	11.24	137.72	13.30
36	5600	10.29	-0.43	1.00	10.15	21.44	10.72	139.32	11.80
48	5600	10.77	-0.51	1.00	10.15	21.92	10.64	155.60	11.59
54	5600	10.47	-0.67	1.00	10.15	21.62	10.48	145.21	11.17

Sample Calculation: Result = Reading + Cable Loss + Attenuator

[IEEE802.11n 40MHz band width MISO 5510-5670band] Rate Check Ant.0

MCS Number	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
0	5590	10.03	0.27	1.00	10.15	21.18	11.42	131.22	13.87
1	5590	9.78	-0.43	1.00	10.15	20.93	10.72	123.88	11.80
2	5590	9.73	-0.76	1.00	10.15	20.88	10.39	122.46	10.94
3	5590	10.10	-1.10	1.00	10.15	21.25	10.05	133.35	10.12
4	5590	9.81	-1.69	1.00	10.15	20.96	9.46	124.74	8.83
5	5590	10.33	-2.11	1.00	10.15	21.48	9.04	140.60	8.02
6	5590	10.12	-2.25	1.00	10.15	21.27	8.90	133.97	7.76
7	5590	9.43	-2.43	1.00	10.15	20.58	8.72	114.29	7.45

Sample Calculation: Result = Reading + Cable Loss + Attenuator

[IEEE802.11n 40MHz band width MISO 5510-5670band] Rate Check Ant.1

MCS Number	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
0	5590	10.08	-0.07	1.00	10.15	21.23	11.08	132.74	12.82
1	5590	9.78	-0.54	1.00	10.15	20.93	10.61	123.88	11.51
2	5590	9.38	-0.98	1.00	10.15	20.53	10.17	112.98	10.40
3	5590	9.83	-1.41	1.00	10.15	20.98	9.74	125.31	9.42
4	5590	9.41	-1.82	1.00	10.15	20.56	9.33	113.76	8.57
5	5590	10.08	-2.33	1.00	10.15	21.23	8.82	132.74	7.62
6	5590	9.82	-2.41	1.00	10.15	20.97	8.74	125.03	7.48
7	5590	9.21	-2.66	1.00	10.15	20.36	8.49	108.64	7.06

Sample Calculation: Result = Reading + Cable Loss + Attenuator

SECTION 7 : Measurement results

7.1 Body SAR 5GHz (with USB cable)

7.1.1 Additional band(5500-5700MHz), ant 0

Model : **DY-WL10**
Serial No. : **244**
Modulation : **OFDM**
Measured By : **Hisayoshi Sato, Miyo Kishimoto**
Date : **January 18, 2010**
Liquid Depth (cm) : **15.0**
Parameters : **εr =45.6, σ =6.05 (5600MHz)**
εr =45.7, σ =5.91 (5500MHz)
Ambient temperature(deg.c.) : **24.3**
Relative Humidity (%) : **36**

BODY SAR MEASUREMENT RESULTS

Frequency			Modulation	Phantom Section	EUT Set-up Conditions				Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Mode	Channel	[MHz]			Antenna	Radiated pattern	Position	Separation [mm]	Before	After	Maximum value of multi-peak
11a	**Step 1. Search for the worst position and worst radiated pattern**										
	116	5580	BPSK(6Mbps)	Flat	ant 0	Default	Hori-Front	5	23.6	23.6	**0.175**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Front	Hori-Front	5	23.6	23.6	**0.173**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Rear	Hori-Front	5	23.6	23.6	**0.194**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Front+Rear	Hori-Front	5	23.6	23.6	**0.216**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Default	Hori-Rear*	5	23.6	23.6	**0.022**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Default	Ver-Right	5	23.6	23.6	**0.086**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Front	Ver-Right	5	23.6	23.6	**0.093**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Rear	Ver-Right	5	23.7	23.7	**0.059**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Front+Rear	Ver-Right	5	23.8	23.8	**0.061**
	116	5580	BPSK(6Mbps)	Flat	ant 0	Default	Ver-Left*	5	23.8	23.8	**0.022**
11a	**Step 2. Change the channel**										
	104	5520	BPSK(6Mbps)	Flat	ant 0	Front+Rear	Hori-Front	5	24.0	24.0	**0.233**
	120	5600	BPSK(6Mbps)	Flat	ant 0	Front+Rear	Hori-Front	5	24.0	24.0	**0.256**
	140	5700	BPSK(6Mbps)	Flat	ant 0	Front+Rear	Hori-Front	5	24.0	24.0	**0.225**
11n	**Step 3. Change the mode (11n MISO 20M)**										
	140	5700	BPSK(MCS 0)	Flat	ant 0	Front+Rear	Hori-Front	5	24.0	24.0	**0.236**
	Step 4. Change the mode (11n MISO 40M)										
	134	5670	BPSK(MCS 0)	Flat	ant 0	Front+Rear	Hori-Front	5	24.0	24.0	**0.217**

* This position was measured by one radiated pattern. Because the position of the antenna is considerably away compared with other positions (Front, Right), and the SAR result is lower than other positions.

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5520	5500+/-50	4.06 +/- 13.1%(k=2)
5580	5600+/-50	3.76 +/- 13.1%(k=2)
5600	5600+/-50	3.76 +/- 13.1%(k=2)
5670	5600+/-100*	3.76 +/- 13.1%(k=2)
5700	5600+/-100*	3.76 +/- 13.1%(k=2)

*The validity of +/-100MHz was expanded by the calibration uncertainty (k=2)< 15% according to the KDB865664 (SAR Measurement Procedures for 3-6GHz) and by the DASY v4.4 and higher according to the manufacture's request.

7.1.2 Additional band(5500-5700MHz), ant 1

Model : **DY-WL10**
Serial No. : **244**
Modulation : **OFDM**
Measured By : **Miyo Kishimoto, Hisayoshi Sato**
Date : **January 19, 2010**
Liquid Depth (cm) : **15.0**
Parameters : **εr =45.6, σ =6.04 (5600MHz)**
εr =45.5, σ =5.82 (5500MHz)
Ambient temperature(deg.c.) : **24.8**
Relative Humidity (%) : **35**

BODY SAR MEASUREMENT RESULTS											
Frequency			Modulation	Phantom Section	EUT Set-up Conditions				Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Mode	Channel	[MHz]			Antenna	Radiated pattern	Position	Separation [mm]	Before	After	Maximum value of multi-peak
11a	**Step 1. Search for the worst position and worst radiated pattern**										
	116	5580	BPSK(6Mbps)	Flat	ant 1	Default	Hori-Front	5	24.5	24.5	**0.253**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Front	Hori-Front	5	24.5	24.5	**0.403**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Rear	Hori-Front	5	24.5	24.5	**0.292**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Front+Rear	Hori-Front	5	24.5	24.5	**0.503**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Default	Hori-Rear*	5	24.5	24.5	**0.091**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Default	Ver-Left	5	24.2	24.2	**0.160**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Front	Ver-Left	5	24.2	24.2	**0.170**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Rear	Ver-Left	5	24.2	24.2	**0.186**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Front+Rear	Ver-Left	5	24.2	24.2	**0.565**
	116	5580	BPSK(6Mbps)	Flat	ant 1	Default	Ver-Right*	5	24.5	24.5	**0.013**
11n	**Step 2. Change the channel**										
	104	5520	BPSK(6Mbps)	Flat	ant 1	Front+Rear	Ver-Left	5	24.2	24.2	**0.454**
	120	5600	BPSK(6Mbps)	Flat	ant 1	Front+Rear	Ver-Left	5	24.2	24.2	**0.566**
	140	5700	BPSK(6Mbps)	Flat	ant 1	Front+Rear	Ver-Left	5	24.2	24.2	**0.416**
11n	**Step 3. Change the mode (11n MISO 20M)**										
	120	5600	BPSK(MCS 0)	Flat	ant 1	Front+Rear	Ver-Left	5	24.3	24.3	**0.543**
	140	5700	BPSK(MCS 0)	Flat	ant 1	Front+Rear	Ver-Left	5	24.3	24.3	**0.426**
	Step 4. Change the mode (11n MISO 40M)										
	118	5590	BPSK(MCS 0)	Flat	ant 1	Front+Rear	Ver-Left	5	24.3	24.3	**0.480**
	134	5670	BPSK(MCS 0)	Flat	ant 1	Front+Rear	Ver-Left	5	24.3	24.3	**0.417**

* This position was measured by one radiated pattern. Because the position of the antenna is considerably away compared with other positions (Front, Left), and the SAR result is lower than other positions.

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5520	5500+/-50	4.06 +/- 13.1%(k=2)
5580	5600+/-50	3.76 +/- 13.1%(k=2)
5590	5600+/-50	3.76 +/- 13.1%(k=2)
5600	5600+/-50	3.76 +/- 13.1%(k=2)
5670	5600+/-100*	3.76 +/- 13.1%(k=2)
5700	5600+/-100*	3.76 +/- 13.1%(k=2)

*The validity of +/-100MHz was expanded by the calibration uncertainty (k=2)< 15% according to the KDB865664 (SAR Measurement Procedures for 3-6GHz) and by the DASY v4.4 and higher according to the manufacture's request.

7.2 Body SAR 5GHz (without USB cable)

7.2.1 Additional band(5500-5700MHz), ant 1

Model : **DY-WL10**
Serial No. : **244**
Modulation : **OFDM**
Measured By : **Hisayoshi Sato**
Date : **January 19, 2010**
Liquid Depth (cm) : **15.0**
Parameters : **εr =45.6, σ =6.04 (5600MHz)**
Ambient temperature(deg.c.) : **24.8**
Relative Humidity (%) : **35**

BODY SAR MEASUREMENT RESULTS											
Frequency			Modulation	Phantom Section	EUT Set-up Conditions				Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Mode	Channel	[MHz]			Antenna	Radiated pattern	Position	Separation [mm]	Before	After	Maximum value of multi-peak
11n	**Step 5. Without USB cable (11n MISO 20M)**										
	120	5600	BPSK(MCS 0)	Flat	ant 1	Front+Rear	Ver-Left	5	24.3	24.3	**0.509***

* This result is satisfied enough SAR value with 0.8W/kg or less.

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5600	5600+/-50	3.76 +/- 13.1%(k=2)