SAR TEST REPORT

Test Report No. : 29EE0246-HO-01-G

Applicant	:	**CANON Inc.**
Type of Equipment	:	**WLAN Module**
Model No.	:	**CH9-1161**
FCC ID	:	**AZD161**
Test regulation	:	**FCC47CFR 2.1093** **FCC OET BULLETIN 65, SUPPLEMENT C**
Test Result	:	**Complied**

Max. SAR Value

IEEE802.11a(5180-5320MHz)	:	**0.521W/kg (Body, 5180MHz)**
IEEE802.11a(5500-5700MHz)	:	**0.533W/kg (Head, 5600MHz)**
IEEE802.11a(5745-5785MHz)	:	**0.288W/kg (Head, 5785MHz)**
IEEE802.11b/g	:	**0.320W/kg (Head, 2412MHz)**

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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: April 6 to 14, 2009

Tested by:

Hisayoshi Sato
EMC Services

Miyo Kishimoto
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Approved by :

Tetsuo Maeno
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

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SECTION 1: Customer information

Company Name	:	CANON Inc.
Address	:	30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo, 146-8501, Japan
Telephone Number	:	+81-3757-6798
Facsimile Number	:	+81-3757-8431
Contact Person	:	Kiyoshi Sahoyama

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

2.1 Identification of E.U.T.

Type of Equipment	:	WLAN Module
Model No.	:	CH9-1161
Serial No.	:	ES7015
Rating	:	DC3.3V
Receipt Date of Sample	:	March 19, 2009
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: CH9-1161 (referred to as the EUT in this report) is the WLAN Module.

Equipment Type	:	Transceiver
Clock frequency	:	38.4MHz
Method of Frequency Generation	:	Crystal
Operating temperature range	:	-10 to +60 deg. C.

	IEEE802.11b	IEEE802.11g	IEEE802.11a
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5240MHz (W52) 5260-5320MHz (W53) 5500-5700MHz (W56) 5745-5825MHz (W58)
Type of modulation	DSSS	OFDM	OFDM
Channel spacing	5MHz	5MHz	20MHz
ITU Code	G1D	D1D	D1D
Antenna type	Planar Inverted F antenna	Planar Inverted F antenna	Planar Inverted F antenna
Antenna Gain	-2.18dBi	-2.18dBi	1.85dBi (W52/W53) 2.62dBi (W56) 1.50dBi (W58)

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 Procedure and result

TEST Outline
This EUT is built into the limited transmitter which used with the limited digital camera of similar composition (variant model).
Therefore the SAR test was performed with the limited transmitter and digital camera as a host device.
The details of limited transmitter and digital camera were shown in the Appendix 1.

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
Note: UL Japan, Inc. 's SAR Work Procedures QPM46 and QPM47						

Result of Max. SAR value

Max. SAR Value:

IEEE802.11a(5180-5320MHz)	**:**	**0.521W/kg (Body, 5180MHz)**
IEEE802.11a(5500-5700MHz)	**:**	**0.533W/kg (Head, 5600MHz)**
IEEE802.11a(5745-5785MHz)	**:**	**0.288W/kg (Head, 5785MHz)**
IEEE802.11b/g	**:**	**0.320W/kg (Head, 2412MHz)**

3.3 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

3.4 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

3.5 Confirmation before SAR testing

3.5.1 Correlation of Output Power between EMC and SAR tests

It was checked that the antenna port power was correlated within 0~+5% (FCC requirements)
The result is shown in Section 6.1.

- **Output power at EMC test**
  EMC power was measured during EMC testing (S/N: 7005).
  -11a(5180-5320) mode was measured the average output power as a reference data for SAR power.
  -11a(5500-5700) mode was measured the average output power as a reference data for SAR power.
  -11a(5745-5825) mode was measured the peak output power in the FCC 15.247.
  -11b/g mode was measured the peak output power in the FCC 15.247.

- **Output power at SAR test**
  SAR power was measured before SAR testing (S/N: 7015).
  -11a(5180-5320) mode was measured the average output power.
  -11a(5500-5700) mode was measured the average output power.
  -11a(5745-5825) mode was measured the peak output power.
  -11b mode was measured the peak output power.

3.5.2 Average power 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

11b		**11g/a**	
Modulation	**Data rate [Mbps]**	**Modulation**	**Data rate [Mbps]**
DBPSK	1	BPSK	6
DQPSK	2	BPSK	9
CCK	5.5	QPSK	12
CCK	11	QPSK	18
-	-	16QAM	24
-	-	16QAM	36
-	-	64QAM	48
-	-	64QAM	54

Step.2 Decision of SAR test channel

The average output power for 802.11a was measured on all channels in each frequency band.

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"

3.6 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.

3.7 Measurement procedure

1. IEEE 802.11a mode

As for the SAR measurement of each band in the 11a mode, it was repeated from Step1 to Step3.

Step1. The data rate in the higher average power* of each modulation was decided, then the worst modulation was searched in the SAR testing.

Step2. The searching for the worst position
This test was performed at the worst modulation of Step 1

Step3. Channel change
This test was performed at the worst position of Step 1to Step2.

Step4. Separation change for 5GHz band
The measurement was performed with the distance, 5mm and 10mm to check if the shortest distance may not have the worst value at the conditions of the highest SAR value.

2. IEEE 802.11b

The 11b (DSSS) mode test was performed on the DQPSK[2Mbps] modulation, because it was the maximum average power.

Step5. The searching for the worst position

Step6. Change to the Low and High channels
This test was performed at the worst conditions of Step5.

Step7. Separation change for 2.4GHz band
The measurement was performed with the distance, 5mm and 10mm to check if the shortest distance may not have the worst value at the conditions of the highest SAR value.

3. IEEE 802.11g

According to the KDB 248227 (Rev1.2) SAR Measurement Procedures for 802 11 a/b/g Transmitters, SAR is not required for 802.11g channels when the maximum average output power is less than $^{1}/_{4}$dB higher than that measured on the corresponding 802.11b channels. Refer to theSection 6.

3.8 Test setup of EUT

When users operate or carry the EUT, it could be considered to touch or get close to their bodies. In order to assume this situation, we performed the test at the following positions. Please refer to "APPENDIX 1" for more details.

(1) Side :
The test was performed in touch with Side surface of the transmitter to the flat phantom.

(2) Front:
The test was performed in touch with Front surface of the transmitter to the flat phantom.

(3) Rear:
The test was performed in touch with Rear surface of the transmitter to the flat phantom.

(4) Bottom :
The test was performed in touch with Bottom surface of the transmitter to the flat phantom.

(5) Side (5mm) :
The measurement opened 5mm distance between the transmitter and flat phantom.

(6) Side (10mm) :
The measurement opened 10mm distance between the transmitter and flat phantom.

(7) Front (5mm) :
The measurement opened 5mm distance between the transmitter and flat phantom.

(8) Front (10mm) :
The measurement opened 10mm distance between the transmitter and flat phantom.

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

4.1 Operating modes for SAR testing

4.1.1 Setting of EUT

This EUT has IEEE.802.11a/b/g continuous transmitting modes.
The frequency band and the modulation used in the testing of IEEE.802.11a/b are shown as a following.

1. IEEE 802.11a Low/Middle band mode

Tx frequency band : 5180-5320MHz
Channel : 36ch(5180MHz),48ch(5240MHz),56ch(5280MHz),64ch(5320MHz)
Modulation : OFDM (BPSK,QPSK,16QAM.,64QAM)
Crest factor : 1 (Duty 100%)

2. IEEE 802.11a Additional band mode

Tx frequency band : 5500-5700MHz
Channel : 100ch(5500MHz),116ch(5580MHz),120ch(5600MHz),140ch(5700MHz)
Modulation : OFDM (BPSK,QPSK,16QAM.,64QAM)
Crest factor : 1 (Duty 100%)

3. IEEE 802.11a Upper band mode

Tx frequency band : 5745-5825MHz
Channel : 149ch(5745MHz),157ch(5785MHz),165ch(5825MHz)
Modulation : OFDM (BPSK,QPSK,16QAM.,64QAM)
Crest factor : 1 (Duty 100%)

4. IEEE 802.11b mode

Tx frequency band : 2412-2462MHz
Channel : 1ch(2412MHz),6ch(2437MHz),11ch(2462MHz)
Modulation : DSSS (DQPSK)
Crest factor : 1 (Duty 100%)

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	$(\text{cp})^{1/2}$	±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	75
Device holder uncertainty	±3.6	Normal	1	1	±3.6	7
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

6.1.1 EMC power

This data is reference data of EMC test(Report No. 29EE0246-HO-01-A).
Date of test: April 9 and 24, 2009

[IEEE 802.11a 24Mbps]

Ch	Freq.	P/M AVG Reading	Cable Loss	Atten. Loss	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
36	5180.0	2.15	0.90	10.06	13.11	20.5
44	5220.0	2.12	0.90	10.06	13.08	20.3
48	5240.0	2.65	0.90	10.06	13.61	23.0
52	5260.0	2.19	0.90	10.06	13.15	20.7
60	5300.0	2.70	0.90	10.06	13.66	10.1
64	5320.0	2.56	0.90	10.06	13.52	22.5

[IEEE802.11a 24Mbps]

Ch	Freq.	P/M AVG Reading	Cable Loss	Atten.	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
100	5500.0	2.39	0.90	10.06	13.35	21.63
116	5580.0	2.50	0.90	10.06	13.46	22.18
120	5600.0	2.18	0.90	10.06	13.14	20.61
140	5700.0	2.00	0.90	10.06	12.96	19.77

[IEEE802.11a 24Mbps]

Ch	Freq.	P/M Reading	Cable Loss	Atten.	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
149	5745.0	11.23	0.90	10.17	22.30	169.82
157	5785.0	11.28	0.90	10.18	22.36	172.19
165	5825.0	11.19	0.90	10.18	22.27	168.66

[IEEE802.11b 2Mbps]

Ch	Freq.	P/M Reading	Cable Loss	Atten.	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]
1	2412.0	6.11	0.60	10.08	16.79	47.75
6	2437.0	6.34	0.60	10.08	17.02	50.35
11	2462.0	5.83	0.60	10.08	16.51	44.77

6.1.2 SAR power

Date of test: April 6, 2009

[IEEE 802.11a 24Mbps]

Ch	Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Result [mW]
36	5180.0	2.35	0.90	10.06	13.31	21.4
44	5220.0	2.31	0.90	10.06	13.27	21.2
48	5240.0	2.79	0.90	10.06	13.75	23.7
52	5260.0	2.35	0.90	10.06	13.31	21.4
60	5300.0	2.71	0.90	10.06	13.67	23.3
64	5320.0	2.73	0.90	10.06	13.69	23.4

[IEEE802.11a 24Mbps]

Ch	Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]
100	5500.0	2.40	0.90	10.06	13.36	21.68
116	5580.0	2.52	0.90	10.06	13.48	22.28
120	5600.0	2.36	0.90	10.06	13.32	21.48
140	5700.0	2.00	0.90	10.06	12.96	19.77

[IEEE802.11a 24Mbps]

Ch	Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]
149	5745.0	11.37	0.90	10.17	22.44	175.39
157	5785.0	11.31	0.90	10.18	22.39	173.38
165	5835.0	11.24	0.90	10.18	22.32	170.61

[IEEE802.11b 2Mbps]

Ch	Freq. [MHz]	P/M Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Result [mW]
1	2412.0	6.11	0.60	10.08	16.79	47.75
6	2437.0	6.35	0.60	10.08	17.03	50.47
11	2462.0	5.88	0.60	10.08	16.56	45.29

Sample Calculation:
Result = Reading + Cable Loss (Including customer's cable loss)+ Atten.Loss

6.2 Average power for SAR testing

Date of test: April 6, 2009

[IEEE802.11a 5180-5320band] Rate Check

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6.0	5240	10.75	2.34	0.90	10.06	21.71	13.30	148.25	21.38
9.0	5240	10.57	2.31	0.90	10.06	21.53	13.27	142.23	21.23
12.0	5240	10.91	2.72	0.90	10.06	21.87	13.68	153.82	23.33
18.0	5240	10.55	2.79	0.90	10.06	21.51	13.75	141.58	23.71
24.0	5240	10.99	2.65	0.90	10.06	21.95	13.61	156.68	22.96
36.0	5240	10.88	2.58	0.90	10.06	21.84	13.54	152.76	22.59
48.0	5240	10.18	1.28	0.90	10.06	21.14	12.24	130.02	16.75
54.0	5240	10.15	1.25	0.90	10.06	21.11	12.21	129.12	16.63

IEEE802.11a5180-5320band 18Mbps

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
36	5180	10.35	2.35	0.90	10.06	21.31	13.31	135.21	21.43
40	5200	10.40	2.35	0.90	10.06	21.36	13.31	136.77	21.43
44	5220	10.34	2.31	0.90	10.06	21.30	13.27	134.90	21.23
48	5240	10.55	2.79	0.90	10.06	21.51	13.75	141.58	23.71
52	5260	10.44	2.35	0.90	10.06	21.40	13.31	138.04	21.43
56	5280*	10.61	2.65	0.90	10.06	21.57	13.61	143.55	22.96
60	5300	10.65	2.71	0.90	10.06	21.61	13.67	144.88	23.28
64	5320	10.69	2.73	0.90	10.06	21.65	13.69	146.22	23.39

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

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6.0	5600	10.94	1.70	0.90	10.06	21.90	12.66	154.88	18.45
9.0	5600	10.38	1.68	0.90	10.06	21.34	12.64	136.14	18.37
12.0	5600	10.79	1.66	0.90	10.06	21.75	12.62	149.62	18.28
18.0	5600	10.79	2.36	0.90	10.06	21.75	13.32	149.62	21.48
24.0	5600	10.97	1.61	0.90	10.06	21.93	12.57	155.96	18.07
36.0	5600	10.81	1.55	0.90	10.06	21.77	12.51	150.31	17.82
48.0	5600	9.97	0.53	0.90	10.06	20.93	11.49	123.88	14.09
54.0	5600	9.91	0.44	0.90	10.06	20.87	11.40	122.18	13.80

IEEE802.11a5500-5700band 18Mbps

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
100	5500	10.71	2.40	0.90	10.06	21.67	13.36	146.89	21.68
104	5520	10.60	2.11	0.90	10.06	21.56	13.07	143.22	20.28
108	5540	10.50	2.38	0.90	10.06	21.46	13.34	139.96	21.58
112	5560	10.66	2.19	0.90	10.06	21.62	13.15	145.21	20.65
116	5580	10.86	2.52	0.90	10.06	21.82	13.48	152.05	22.28
120	5600*	10.79	2.36	0.90	10.06	21.75	13.32	149.62	21.48
124	5620	10.50	2.06	0.90	10.06	21.46	13.02	139.96	20.04
128	5640	10.67	2.22	0.90	10.06	21.63	13.18	145.55	20.80
132	5660	10.44	1.86	0.90	10.06	21.40	12.82	138.04	19.14
136	5680	10.49	1.98	0.90	10.06	21.45	12.94	139.64	19.68
140	5700*	10.57	2.00	0.90	10.06	21.53	12.96	142.23	19.77

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing

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

[IEEE802.11a 5745-5825band] Rate Check

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6.0	5785.0	11.04	2.27	0.90	10.18	22.12	13.35	162.93	21.63
9.0	5785.0	10.98	2.22	0.90	10.18	22.06	13.30	160.69	21.38
12.0	5785.0	11.00	2.22	0.90	10.18	22.08	13.30	161.44	21.38
18.0	5785.0	10.69	2.28	0.90	10.18	21.77	13.36	150.31	21.68
24.0	5785.0	11.31	2.45	0.90	10.18	22.39	13.53	173.38	22.54
36.0	5785.0	11.18	2.42	0.90	10.18	22.26	13.50	168.27	22.39
48.0	5785.0	9.72	0.48	0.90	10.18	20.80	11.56	120.23	14.32
54.0	5785.0	9.58	0.44	0.90	10.18	20.66	11.52	116.41	14.19

IEEE802.11a5745-5825band 24Mbps

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
149	5745.0	11.37	2.45	0.90	10.17	22.44	13.52	175.39	22.49
153	5765.0	11.21	2.37	0.90	10.18	22.29	13.45	169.43	22.13
157	5785.0	11.31	2.45	0.90	10.18	22.39	13.53	173.38	22.54
161	5805.0	11.31	2.57	0.90	10.18	22.39	13.65	173.38	23.17
165	5825.0	11.24	2.54	0.90	10.18	22.32	13.62	170.61	23.01

Sample Calculation: Result = Reading + Cable Loss + Attenuator

: Channel of SAR testing

[IEEE802.11b] Rate Check

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1.0	2437	6.02	3.47	0.60	10.08	16.70	14.15	46.77	26.00
2.0	2437	6.35	3.75	0.60	10.08	17.03	14.43	50.47	27.73
5.5	2437	5.38	3.34	0.60	10.08	16.06	14.02	40.36	25.23
11.0	2437	5.92	3.39	0.60	10.08	16.60	14.07	45.71	25.53

IEEE802.11b 2Mbps

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1	2412	6.11	3.58	0.60	10.08	16.79	14.26	47.75	26.67
6	2437	6.35	3.75	0.60	10.08	17.03	14.43	50.47	27.73
11	2462	5.88	3.21	0.60	10.08	16.56	13.89	45.29	24.49

[IEEE802.11g] Rate Check

Rate	Freq.	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
[Mbps]	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
6.0	2437	7.80	-1.85	0.60	10.08	16.03	8.83	40.09	7.64
9.0	2437	7.62	-1.70	0.60	10.08	16.00	8.98	39.81	7.91
12.0	2437	7.33	-1.45	0.60	10.08	15.96	9.23	39.45	8.38
18.0	2437	7.76	-1.51	0.60	10.08	16.33	9.17	42.95	8.26
24.0	2437	8.15	-1.96	0.60	10.08	16.27	8.72	42.36	7.45
36.0	2437	8.14	-1.94	0.60	10.08	16.28	8.74	42.46	7.48
48.0	2437	8.32	-1.15	0.60	10.08	17.25	9.53	53.09	8.97
54.0	2437	8.07	-1.68	0.60	10.08	16.47	9.00	44.36	7.94

IEEE802.11g 48Mbps

Ch	Frequency	P/M Reading [dBm]		Cable Loss	Atten.	Result [dBm]		Result [mW]	
	[MHz]	PK	AVG	[dB]	[dB]	PK	AVG	PK	AVG
1	2412	8.19	-1.36	0.60	10.08	18.87	9.32	77.09	8.55
6	2437	8.32	-1.15	0.60	10.08	19.00	9.53	79.43	8.97
11	2462	8.86	-1.46	0.60	10.08	19.54	9.22	89.95	8.36

**: SAR is not required for 802.11g channels when the maximum average output power is less than 1/4dB higher than that measured on the corresponding 802.11b channels.

Sample Calculation:

Result = Reading + Cable Loss (no used) + Attenuator

Crest factor (PAR) = PK power / AVG powe

SECTION 7 : Measurement results

7.1 HEAD SAR 5180-5320MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **OFDM**
Measured By : **Miyo Kishimoto**

Date	:	**April 6, 2009**	**April 7, 2009**
Liquid Depth (cm)	:	**15.0**	**15.0**
Parameters	:	**εr =36.1, σ =4.56(5200MHz)**	**εr =34.5, σ =4.71(5300MHz)**
Ambient temperature(deg.c.)	:	**23.5**	**24.0**
Relative Humidity (%)	:	**43**	**41**

HEAD SAR RESULT

Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst modulation									
48	5240	BPSK(6Mbps)	Flat	Fixed	Side	0	21.0	21.0	**0.186**
48	5240	QPSK(18Mbps)	Flat	Fixed	Side	0	21.0	21.0	**0.215**
48	5240	16QAM(24Mbps)	Flat	Fixed	Side	0	21.0	21.0	**0.203**
48	5240	64QAM(48Mbps)	Flat	Fixed	Side	0	21.0	21.0	**0.160**
Step 2. Search for the worst position									
48	5240	QPSK(18Mbps)	Flat	Fixed	Front	0	21.3	21.3	**0.134**
48	5240	QPSK(18Mbps)	Flat	Fixed	Rear	0	21.1	21.3	**0.038**
48	5240	QPSK(18Mbps)	Flat	Fixed	Bottom	0	21.3	21.3	**0.059**
Step 3. Change to the channels									
36	5180	QPSK(18Mbps)	Flat	Fixed	Side	0	21.3	21.3	**0.394**
56	5280	QPSK(18Mbps)	Flat	Fixed	Side	0	23.0	23.0	**0.167**
64	5320	QPSK(18Mbps)	Flat	Fixed	Side	0	23.0	23.0	**0.104**

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5180	5200+/-50	4.89 +/- 13.1%(k=2)
5240	5200+/-50	4.89 +/- 13.1%(k=2)
5280	5300+/-50	4.68 +/- 13.1%(k=2)
5300	5300+/-50	4.68 +/- 13.1%(k=2)

7.2 HEAD SAR 5500-5700MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **OFDM**
Measured By : **Miyo Kishimoto**

Date : **April 7, 2009**
Liquid Depth (cm) : **15.0**
Parameters : **εr =33.9, σ =5.18 (5600MHz) εr =34.1, σ =5.01 (5500MHz)**
Ambient temperature(deg.c.) : **24.0**
Relative Humidity (%) : **41**

HEAD SAR RESULT									
Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst modulation									
120	5600	BPSK(6Mbps)	Flat	Fixed	Side	0	23.0	23.0	**0.322**
120	5600	QPSK(18Mbps)	Flat	Fixed	Side	0	23.0	23.0	**0.388**
120	5600	16QAM(24Mbps)	Flat	Fixed	Side	0	23.0	23.0	**0.385**
120	5600	64QAM(48Mbps)	Flat	Fixed	Side	0	23.0	23.0	**0.258**
Step 2. Search for the worst position									
120	5600	QPSK(18Mbps)	Flat	Fixed	Front	0	23.1	23.3	**0.533**
120	5600	QPSK(18Mbps)	Flat	Fixed	Rear	0	23.0	23.1	**0.070**
120	5600	QPSK(18Mbps)	Flat	Fixed	Bottom	0	23.1	23.1	**0.168**
Step 3. Change to the channels									
100	5500	QPSK(18Mbps)	Flat	Fixed	Front	0	23.3	23.3	**0.214**
118	5580	QPSK(18Mbps)	Flat	Fixed	Front	0	23.3	23.3	**0.433**
140	5700	QPSK(18Mbps)	Flat	Fixed	Front	0	23.3	23.3	**0.351**
Step 4 Change to the separation									
120	5600	QPSK(18Mbps)	Flat	Fixed	Front	5	23.0	23.0	**0.179**
120	5600	QPSK(18Mbps)	Flat	Fixed	Front	10	23.0	23.0	**0.105**

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5500	5500+/-50	4.39 +/- 13.1%(k=2)
5580	5600+/-50	4.28 +/- 13.1%(k=2)
5600	5600+/-50	4.28 +/- 13.1%(k=2)
5700	5600+/-100*	4.28 +/- 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.

7.3 HEAD SAR 5745-5825MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **OFDM**
Measured By : **Miyo Kishimoto**

Date : **April 8, 2009**
Liquid Depth (cm) : **15.0**
Parameters : **εr =33.6, σ =5.45(5800MHz)**
Ambient temperature(deg.c.) : **24.0**
Relative Humidity (%) : **41**

HEAD SAR RESULT

Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst modulation									
157	5785	BPSK(6Mbps)	Flat	Fixed	Front	0	22.0	22.0	**0.255**
157	5785	QPSK(18Mbps)	Flat	Fixed	Front	0	22.0	22.0	**0.258**
157	5785	16QAM(24Mbps)	Flat	Fixed	Front	0	22.0	21.9	**0.288**
157	5785	64QAM(48Mbps)	Flat	Fixed	Front	0	21.9	21.9	**0.177**
Step 2. Search for the worst position									
157	5785	16QAM(24Mbps)	Flat	Fixed	Side	0	22.0	22.0	**0.083**
157	5785	16QAM(24Mbps)	Flat	Fixed	Rear	0	22.0	22.0	**0.037**
157	5785	16QAM(24Mbps)	Flat	Fixed	Bottom	0	22.0	22.2	**0.059**
Step 3. Change to the channels									
149	5745	16QAM(24Mbps)	Flat	Fixed	Front	0	22.2	22.3	**0.280**
165	5825	16QAM(24Mbps)	Flat	Fixed	Front	0	22.3	22.3	**0.237**

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5745	5800+/-100*	4.06 +/- 13.1%(k=2)
5785	5800+/-50	4.06 +/- 13.1%(k=2)
5825	5800+/-50	4.06 +/- 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.

7.4 BODY SAR 5180-5320MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **OFDM**
Measured By : **Hisayoshi Sato**

Date : **April 11, 2009**
Liquid Depth (cm) : **15.0**
Parameters : **εr =48.4, σ =5.44(5200MHz) εr =48.1, σ =5.32(5300MHz)**
Ambient temperature(deg.c.) : **24.5**
Relative Humidity (%) : **44**

BODY SAR RESULT

Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst modulation									
48	5240	BPSK(6Mbps)	Flat	Fixed	Side	0	24.2	24.2	**0.153**
48	5240	QPSK(18Mbps)	Flat	Fixed	Side	0	24.2	24.2	**0.212**
48	5240	16QAM(24Mbps)	Flat	Fixed	Side	0	24.0	24.0	**0.209**
48	5240	64QAM(48Mbps)	Flat	Fixed	Side	0	24.0	24.0	**0.150**
Step 2. Search for the worst position									
48	5240	QPSK(18Mbps)	Flat	Fixed	Front	0	24.1	24.1	**0.137**
48	5240	QPSK(18Mbps)	Flat	Fixed	Rear	0	24.1	24.1	**0.044**
48	5240	QPSK(18Mbps)	Flat	Fixed	Bottom	0	24.1	24.1	**0.068**
Step 3. Change to the channels									
36	5180	QPSK(18Mbps)	Flat	Fixed	Side	0	24.0	24.0	**0.521**
56	5280	QPSK(18Mbps)	Flat	Fixed	Side	0	24.0	24.0	**0.165**
64	5320	QPSK(18Mbps)	Flat	Fixed	Side	0	24.0	24.0	**0.087**

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5180	5200+/-50	4.58 +/- 13.1%(k=2)
5240	5200+/-50	4.58 +/- 13.1%(k=2)
5280	5300+/-50	4.38 +/- 13.1%(k=2)
5300	5300+/-50	4.38 +/- 13.1%(k=2)

7.5 BODY SAR 5500-5700MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **OFDM**
Measured By : **Miyo Kishimoto**

Date : **April 10, 2009**
Liquid Depth (cm) : **15.0**
Parameters : **εr =44.6, σ =5.92(5600MHz) εr =44.9, σ =5.79(5500MHz)**
Ambient temperature(deg.c.) : **24.5**
Relative Humidity (%) : **40**

BODY SAR RESULT

Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst modulation									
120	5600	BPSK(6Mbps)	Flat	Fixed	Front	0	23.0	23.0	**0.489**
120	5600	QPSK(18Mbps)	Flat	Fixed	Front	0	23.0	23.2	**0.529**
120	5600	16QAM(24Mbps)	Flat	Fixed	Front	0	23.2	23.2	**0.514**
120	5600	64QAM(48Mbps)	Flat	Fixed	Front	0	23.2	23.2	**0.395**
Step 2. Search for the worst position									
120	5600	QPSK(18Mbps)	Flat	Fixed	Side	0	23.2	23.2	**0.359**
120	5600	QPSK(18Mbps)	Flat	Fixed	Rear	0	23.2	23.2	**0.101**
120	5600	QPSK(18Mbps)	Flat	Fixed	Bottom	0	23.2	23.2	**0.259**
Step 3. Change to the channels									
100	5500	QPSK(18Mbps)	Flat	Fixed	Front	0	23.2	23.4	**0.185**
118	5580	QPSK(18Mbps)	Flat	Fixed	Front	0	23.4	23.4	**0.413**
140	5700	QPSK(18Mbps)	Flat	Fixed	Front	0	23.2	23.2	**0.235**

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5500	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)
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.

7.6 BODY SAR 5745-5825MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **OFDM**
Measured By : **Miyo Kishimoto**

Date : **April 9, 2009**
Liquid Depth (cm) : **15.0**
Parameters : **εr =45.8, σ =6.25**
Ambient temperature(deg.c.) : **24.5**
Relative Humidity (%) : **40**

BODY SAR RESULT

Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst modulation									
157	5785	BPSK(6Mbps)	Flat	Fixed	Front	0	23.0	23.0	**0.154**
157	5785	QPSK(18Mbps)	Flat	Fixed	Front	0	23.0	23.2	**0.242**
157	5785	16QAM(24Mbps)	Flat	Fixed	Front	0	23.2	23.2	**0.245**
157	5785	64QAM(48Mbps)	Flat	Fixed	Front	0	23.2	23.2	**0.129**
Step 2. Search for the worst position									
157	5785	16QAM(24Mbps)	Flat	Fixed	Side	0	23.2	23.1	**0.120**
157	5785	16QAM(24Mbps)	Flat	Fixed	Rear	0	23.2	23.2	**0.038**
157	5785	16QAM(24Mbps)	Flat	Fixed	Bottom	0	23.1	22.9	**0.138**
Step 3. Change to the channels									
149	5745	16QAM(24Mbps)	Flat	Fixed	Front	0	23.2	23.2	**0.187**
165	5825	16QAM(24Mbps)	Flat	Fixed	Front	0	23.2	23.2	**0.182**

Note: Calibration frequency of probe (Conversion factor)

SAR measurement frequency [MHz]	Calibration frequency [MHz] +/- validity[MHz]	Used conversion factor +/- uncertainty
5745	5800+/-100*	3.88 +/- 13.1%(k=2)
5785	5800+/-50	3.88 +/- 13.1%(k=2)
5825	5800+/-50	3.88 +/- 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.

7.7 HEAD SAR 2450MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **DSSS**
Measured By : **Miyo Kishimoto**

Date : **April 13, 2009**
Liquid Depth (cm) : **15.0**
Parameters : **εr =38.3, σ =1.87**
Ambient temperature(deg.c.) : **24.5**
Relative Humidity (%) : **40**

HEAD SAR RESULT

Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst position									
6	2437	DQPSK(2Mbps)	Flat	Fixed	Side	0	23.5	23.5	**0.161**
6	2437	DQPSK(2Mbps)	Flat	Fixed	Front	0	23.5	23.5	**0.106**
6	2437	DQPSK(2Mbps)	Flat	Fixed	Rear	0	23.5	23.5	**0.011**
6	2437	DQPSK(2Mbps)	Flat	Fixed	Bottom	0	23.5	23.5	**0.036**
Step 2. Change to the channels									
1	2412	DQPSK(2Mbps)	Flat	Fixed	Side	0	23.5	23.5	**0.320**
11	2462	DQPSK(2Mbps)	Flat	Fixed	Side	0	23.5	23.7	**0.172**
Step 5. Change to the separation									
1	2412	DQPSK(2Mbps)	Flat	Fixed	Side	5	23.4	23.4	**0.191**
1	2412	DQPSK(2Mbps)	Flat	Fixed	Side	10	23.4	23.4	**0.085**

7.8 BODY SAR 2450MHz

Model : **CH9-1161**
Serial No. : **7015**
Modulation : **DSSS**
Measured By : **Miyo Kishimoto**

Date : **April 14, 2009**
Liquid Depth (cm) : **15.0**
Parameters : **εr =51.5, σ =1.99**
Ambient temperature(deg.c.) : **24.5**
Relative Humidity (%) : **40**

BODY SAR RESULT

Frequency		Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Step 1. Search for the worst position									
6	2437	DQPSK(2Mbps)	Flat	Fixed	Side	0	23.5	23.5	**0.164**
6	2437	DQPSK(2Mbps)	Flat	Fixed	Front	0	23.5	23.5	**0.104**
6	2437	DQPSK(2Mbps)	Flat	Fixed	Rear	0	23.5	23.5	**0.013**
6	2437	DQPSK(2Mbps)	Flat	Fixed	Bottom	0	23.5	23.5	**0.034**
Step 2. Change to the channels									
1	2412	DQPSK(2Mbps)	Flat	Fixed	Side	0	23.5	23.7	**0.298**
11	2462	DQPSK(2Mbps)	Flat	Fixed	Side	0	23.7	23.9	**0.133**