SAR TEST REPORT

Test Report No.: 32AE0305-SH-04-A

Applicant	:	**Sony Corporation**
Type of Equipment	:	**Digital Media Player**
Model No.	:	**NWZ-Z1040**
FCC ID	:	**AK8NWZZ1000**
Test Standard	:	**FCC 47CFR §2.1093, Supplement C (Edition 01-01) to OET Bulletin 65**
Test Result	:	**Complied**

*.The highest reported SAR(1g) is **0.94 W/kg.** (DTS, 2412MHz, IEEE 802.11b, (1Mbps, DBPSK/DSSS))

*. **The measured SAR(1g) was <1.2W/kg, therefore according to the KDB447498 D01, this EUT was approved for used in single-platform..**

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Date of test: November 11, 2011

Test engineer: H. Naka

Hiroshi Naka
Engineer of WiSE Japan, UL Verification Service

Approved by: T. Imamura

Toyokazu Imamura
Leader of WiSE Japan, UL Verification Service

JAB Testing RTL02610

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☒ There is no testing item of "Non-accreditation".

CONTENTS **PAGE**

Contents of appendixes

SECTION 1: Customer information

Company Name	Sony Corporation
Brand Name	SONY
Address	Shinagawa INTERCITY C tower 2-15-3, Konan Minato-ku, Tokyo, 108-6201 Japan
Telephone Number	+81-3-5769-5222
Facsimile Number	+81-3-5769-5901
Contact Person	Shinichi Maru

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type of Equipment	Digital Media Player
Model Number	NWZ-Z1040
Serial Number	400508
Condition of EUT	Engineering prototype (*. Not for sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample	October 31, 2011 (*. No modification by the Lab.)
Country of Mass-production	China
Category Identified	Portable device (*. This EUT is hand-held and hand-operated device with output power <645mW(1000×[2.4GHz]$^{-0.5}$). Therefore, the hand-SAR is not required (KDB447498). This EUT may contact a human body.)
Rating	DC3.7V *. The EUT operates with a built-in re-chargeable Li-ion battery. Therefore, the EUT was operated with a full-charged battery when each SAR test was applied.
Feature of EUT	The EUT is a digital media player with Wi-Fi (IEEE 802.11b/g/n(20HT)) and Bluetooth data transfer specification.
Size	(W)70.9×(L)134.4×(thickness)11.1mm
Accessory of EUT	Any accessories of body-worn application were not supplied for the EUT. Therefore, the SAR test was applied with touch conditions (0mm for separation distance).

*. The EUT has the following series model. The difference of each model is the memory size. Therefore the SAR test was applied to NWZ-Z1040 (8GB) model representative.

Model:	NWZ-Z1040	NWZ-Z1050	NWZ-Z1060
Memory size:	8GB	16GB	32GB

2.2 Product Description

	Wi-Fi	Bluetooth
Equipment type	Transceiver	
Frequency of operation channel	2412-2462 MHz	2402-2480
Channel spacing	5MHz	1MHz
Bandwidth	20MHz	79MHz
ITU code	G1D(11b), D1D(11g,11n(20HT))	F1D, G1D
Type of modulation	DSSS(11b), OFDM(11g,11n(20HT))	FHSS
Q'ty of Antenna	1 pc. *. No simultaneous transmission for Wi-Fi mode and Bluetooth mode. Therefore, the SAR test was applied to Wi-Fi mode operation alone. The SAR test was not applied to Bluetooth mode, because the operation power was enough small (less than 60/f [mW]. Refer to the EMC test report: 32AE0305-SH-02-A for the Bluetooth power.)	
Antenna type	Chip antenna	
Antenna gain (peak)	1.2 dBi	
Transmit power	*. Refers to section 6 in this report.	
Power supply	DC1.8V (*. with constantly voltage circuit operation.)	
Operation temperature range	+5 to +35 deg.C.	

*. The EUT do not use the special transmitting technique such as "beam-forming" and "time-space code diversity."

SECTION 3: Test specification, procedures and results

3.1 Requirements for compliance testing defined by the FCC / Test specification

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.

Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01):

Supplement C (Edition 01-01) - Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions

OET Bulletin 65 (Edition 97-01) - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

IEEE Std. 1528-2003:

IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques Supplement C

In additions;

KDB 447498 D01(v04)(Nov.13, 2009):	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB 248227 (rev.1.2)(May 29, 2007):	SAR Measurement Procedures for 802.11a/b/g Transmitters
KDB 61627 D03 (v01)(Nov.13, 2009):	SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens

3.2 Exposure limit

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

Whole-Body (averaged over the entire body)	Partial-Body (averaged over any 1g of tissue)	Hands, Wrists, Feet and Ankles (averaged over any 10g of tissue)
0.4	8.0	20.0

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

Whole-Body (averaged over the entire body)	Partial-Body (averaged over any 1g of tissue)	Hands, Wrists, Feet and Ankles (averaged over any 10g of tissue)
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.

The limit applied in this test report is;

General population / Uncontrolled exposure, Partial-Body (averaged over any 1g of tissue) limit: 1.6 W/kg

3.3 Procedures and Results

Item	Test Procedure	Limit	Exclusion	Remarks	Result
Human exposure	FCC OET Bulletin 65, Supplement C	SAR(1g): 1.6 W/kg (FCC 47CFR §2.1093)	none	SAR measurement	**Complied** (*1)

Note: UL Japan's SAR Work Procedures No.13-EM-W0429 and 13-EM-W0430. Other than above, no addition, deviation nor exclusion has been made from standards

*1. The worst SAR(1g) in all the platform was as follows;

0.94 W/kg (2412MHz, IEEE 802.11b, (1Mbps, DBPSK/DSSS)) (DTS)

The SAR(1g) was <1.2W/kg, therefore according to the KDB447498 D01, this EUT was approved for used in single-platform..

3.4 Test Location

No.7 shielded room (2.76(Width) × 3.76m(Depth) × 2.4m(Height)) for SAR testing.

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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number: +81 463 50 6400 / Facsimile number: +81 463 50 6401

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.

*. **Output power at SAR test:** SAR power was measured before SAR testing (serial number: 400508).
Before SAR test, the RF wiring for the sample that was actually used for the SAR test, had been switched to the antenna conducted power measurement line from the antenna line, and the average power was measured.
The antenna terminal conducted output power was measured by the calibrated power sensor and power meter (65MHz measurement bandwidth).
The average and the peak power of 11b and 11g mode were measured at default channel.
After power measurement, the RF wiring was changed to the antenna line form the antenna conducted power measurement line for the SAR test.

*. **Output power at EMC radio test:** EMC power was measured during EMC testing. (serial number: 400508).
For the EMC test, the antenna terminal conducted peak output power was measured at 11b, 11g and 11n(20HT).
For the SAR reference, the antenna terminal conducted average output power was measured at 11b, 11g and 11n(20HT).

3.5.2 Average power for SAR tests

Step.1 Data rate check

For the SAR test, the average and peak power related with the data rate was measured on one of the channel for 11b and 11g mode, because the average power of 11n(20HT) modes was lower than the corresponded 11b power when the EMC test was applied.

11b		11g		11n(20HT)		
Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]	MCS Index	Spatial Stream	Modulation
DBPSK/DSSS	1	BPSK/OFDM	6	MCS0	1	BPSK/OFDM
DQPSK/DSSS	2	BPSK/OFDM	9	MCS1	1	QPSK/OFDM
CCK/DSSS	5.5	QPSK/OFDM	12	MCS2	1	QPSK/OFDM
CCK/DSSS	11	QPSK/OFDM	18	MCS3	1	16QAM/OFDM
		16QAM/OFDM	24	MCS4	1	16QAM/OFDM
		16QAM/OFDM	36	MCS5	1	64QAM/OFDM
		64QAM/OFDM	48	MCS6	1	64QAM/OFDM
		64QAM/OFDM	54	MCS7	1	64QAM/OFDM

Step.2 Decision of SAR test channel

For the SAR test reference, the average power was measured on default channels of 11b.

Mode	GHz	Channel	"Default Test Channel"	
			FCC 15.247	
			802.11b	802.11g
802.11 b/g	2.412	1#	√	Δ
	2.437	6	√	Δ
	2.462	11#	√	Δ

√ = "default test channels" in KDB248227.
Δ = Possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
#. Any output power was reduced for channel 1 and 11 to meet restricted band requirements. Therefore channel 1 and 11 was selected for the default channels and SAR test was applied.

3.6 Confirmation after SAR testing

It was checked that the power drift [W] is within ±5% in the evaluation procedure of SAR testing. The verification of power drift during the SAR test is that DASY4 system calculates the power drift by measuring the e-filed at the same location at beginning and the end of the scan measurement for each test position.
The result is shown in APPENDIX 2.

*. DASY4 system calculation Power drift value[dB] =20log(Ea)/(Eb) (where, Before SAR testing: Eb[V/m] / After SAR testing: Ea[V/m])

Limit of power drift[W] = ±5%
Power drift limit (X) [dB] = 10log(P_drift)=10log(1.05/1)=10log(1.05)-10log(1)=0.21dB
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
Power drift limit (X) dB=10log(P_drift)=10log(E_drift)^2=20log(E_drift)
From the above mentioned, the calculated power drift of DASY4 system must be the less than ±0.21dB.

3.7 Measurement procedure

Step 1	Worst position search.
Step 2	Change the channels.

*. During SAR test, the radiated power is always monitored by Spectrum Analyzer.

3.8 Test setup of EUT

Setup	Explanation	Antenna to User	SAR test
Front-touch	The front surface (LCD side) of EUT was touched to the Flat phantom.	5.5mm	applied
Top edge-touch	The top-front edge of EUT was touched to the Flat phantom. The EUT is the position placed perpendicularly..	7mm	applied
Top rear-touch	The portion of most top surface of EUT was touched to the Flat phantom. This section is the closest to an antenna.	approx. 2mm	applied
Rear-touch	The rear surface of EUT was touched to the Flat phantom.	5.5mm	applied
Left-touch	The left surface of EUT was touched to the Flat phantom.	22mm	applied
Right-touch	The right surface of EUT was touched to the Flat phantom.	approx. 50mm	applied
Bottom-touch	This bottom surface of EUT was more than approx.130mm far from the antenna.	approx. 125mm	not applied (*1)

*1. The SAR test was not applied, because the antenna-to-user distance was more than10cm. And this separation distance should make SAR value small enough.

SECTION 4: Operation of EUT during testing

4.1 Operating modes for SAR testing

This EUT has IEEE.802.11b, 11g and 11n(20HT) continuous transmitting modes.
The operation mode, frequency and the modulation used in the SAR testing are shown as a following.

Operation mode	**11b** (*2)
Tx frequency band	2412-2462MHz
Tested frequency	2412, 2437, 2462MHz (*3)
Modulation	DBPSK/DSSS
Data rate	1Mbps (*4)
Crest factor	1.0 (100% duty cycle)
Controlled software	software name: athtestcmd, Before the SAR test, the EUT was connected with the host PC via WM-port cable, and was set the transmission condition. (*5)

*2. The average power of 11g and 11n(20HT) were lower than the corresponded 11b power. According to KDB248227; SAR test was not applied to the 11g and 11n(20HT) mode. (For the antenna terminal conducted power, refer to section 6 in this report)
*3. Decision of SAR tested channels are described in the below the "SAR test applied channel list.".

[SAR test applied channels list]

Mode	MHz	Channel	default	SAR tested channel			Remarks
			11b/g/n(20HT)	11b	11g	11n(20HT)	
802.11 b/g/n	2412	1	√	#	n/a (*1)	n/a (*1)	default channel of 11b.
	2437	6	√	#	n/a (*1)	n/a (*1)	default channel of 11b.
	2462	11	√	#	n/a (*1)	n/a (*1)	default channel of 11b.

√ = "default test channels of requested by KDB248227", n/a: SAR test was not applied, # = SAR test was applied.

*4. It was lowest data rate. According to KDB248227; SAR is not required for higher data rate when the maximum average output power is less than 1/4 dB higher than the lowest data rate. (For the antenna terminal conducted power, refer to section 6 in this report)
*5. The calibrated transmit power was transmitted continuously at selected channel and selected data rate (operation mode) by this software.
The command lists used for test show the follows;

```
>adb shell
$ su
# insmod /system/wifi/ar6000.ko testmode=1
# ./athtestcmd --i wlan –tx99 –txfreq xxxx (frequency(MHz)) –txrate x (selected number from table of data rate) – txpwr xx(*power was defined by customer)
```

SECTION 5: Uncertainty Assessment (SAR measurement)

Uncertainty of SAR measurement system	Under 3GHz	
	1g SAR	10g SAR
combined measurement uncertainty of the measurement system (k=1)	± 11.7%	± 11.4%
expanded uncertainty (k=2)	± 23.3%	± 22.8%

	Error Description	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g) (std. uncertainty)	ui (10g) (std. uncertainty)	Vi, veff
A	**Measurement System**								
1	Probe calibration	±5.9 %	Normal	1	1	1	±5.9 %	±5.9 %	∞
2	Axial isotropy	±4.7 %	Rectangular	√3	0.7	0.7	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy (*flat phantom, <5°)	±2.6 %	Rectangular	√3	0.7	0.7	±1.1 %	±1.1 %	∞
4	Boundary effects	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
5	Probe linearity	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
6	System detection limit	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	System readout electronics	±0.3 %	Normal	1	1	1	±0.3 %	±0.3 %	∞
8	Response time	±0.8 %	Rectangular	√3	1	1	±0.5 %	±0.5 %	∞
9	Integration time	±2.6 %	Rectangular	√3	1	1	±1.5 %	±1.5 %	∞
10	RF ambient – noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
11	RF ambient – reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	Probe positioner mechanical tolerance	±0.4 %	Rectangular	√3	1	1	±0.2 %	±0.2 %	∞
13	Probe positioning with respect to phantom shell	±2.9 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
14	Max.SAR evaluation	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
B	**Test Sample Related**								
15	Device positioning	±5.0 %	Normal	1	1	1	±5.0 %	±5.0 %	5
16	Device holder uncertainty	±5.0 %	Normal	1	1	1	±5.0 %	±5.0 %	5
17	Power drift	±5.0 %	Rectangular	√3	1	1	±2.9 %	±2.9 %	∞
C	**Phantom and Setup**								
18	Phantom uncertainty	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
19	Liquid conductivity (target)	±5.0 %	Rectangular	√3	0.64	0.43	±1.8 %	±1.2 %	∞
20	Liquid conductivity (meas.)	±2.9 %	Normal	1	0.64	0.43	±1.9 %	±1.2 %	3
21	Liquid permittivity (target)	±5.0 %	Rectangular	√3	0.6	0.49	±1.7 %	±1.4 %	∞
22	Liquid permittivity (meas.)	±2.9 %	Normal	1	0.6	0.49	±1.7 %	±1.4 %	3
	Combined Standard Uncertainty						**±11.7** %	**±11.4** %	59
	Expanded Uncertainty (k=2)						**±23.3** %	**±22.8** %	

*. This measurement uncertainty budget is suggested by IEEE 1528 and determined by Schmid & Partner Engineering AG (DASY4 Uncertainty Budget). [6]

SECTION 6: Confirmation before testing

6.1 Assessment for the conducted power of EUT

6.1.1 Worst data rate & worst channel determination of SAR (EUT serial number: 400508) / Correction of the power at SAR test and at EMC test (EUT serial number: 400508)

⊿(sar-emc): must; 0< x <0.21dB

【Output power】 Tx mode: 11b *.PAR=Peak(dB)-Ave(dB)[dB] Power at EMC test

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	pwr.set [-]	Modulation	P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	duty factor [dB]	Power Reading Results Ave[dBm]	Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar-emc)	Pk [dB]	⊿(sar-emc)
1	2412	1	1	set=15	DBPSK DSSS	2.92	4.97	0.75	10.02	0.00	13.69	15.74	23.39	37.50	ref(0)	2.05				
6	2437	1	1	set=15	DBPSK DSSS	2.22	4.36	0.75	10.02	0.00	12.99	15.13	19.91	32.58	-0.70	2.14				
11	2462	1	1	set=15	DBPSK DSSS	1.88	4.03	0.75	10.02	0.00	12.65	14.80	18.41	30.20	-1.04	2.15				
1	2412	2	1	set=15	DQPSK DSSS	2.89	4.98	0.75	10.02	0.00	13.66	15.75	23.23	37.58	ref(0)	2.09	13.54	0.12	15.75	0.00
6	2437	2	1	set=15	DQPSK DSSS	2.20	4.37	0.75	10.02	0.00	12.97	15.14	19.82	32.66	-0.69	2.17	12.88	0.09	15.14	0.00
11	2462	2	1	set=15	DQPSK DSSS	1.85	4.05	0.75	10.02	0.00	12.62	14.82	18.28	30.34	-1.04	2.20	12.42	0.20	14.68	0.14
															⊿low rate			⊿ave		⊿pk
6	2437	1	1	set=15	DBPSK DSSS	2.22	4.36	0.75	10.02	0.00	12.99	15.13	19.91	32.58	ref(0)	2.14	12.80	0.19	15.07	0.06
6	2437	2	1	set=15	DQPSK DSSS	2.20	4.37	0.75	10.02	0.00	12.97	15.14	19.82	32.66	-0.02	2.17	12.88	0.09	15.14	0.00
6	2437	5.5	1	set=15	CCK/PBCC DSSS	2.29	4.31	0.75	10.02	0.00	13.06	15.08	20.23	32.21	0.07	2.02	12.98	0.08	15.01	0.07
6	2437	11	1	set=15	CCK/PBCC DSSS	2.21	4.41	0.75	10.02	0.00	12.98	15.18	19.86	32.96	-0.01	2.20	12.86	0.12	15.07	0.11

⊿(sar-emc): must; 0< x <0.21dB

【Output power】 Tx mode: 11g *.PAR=Peak(dB)-Ave(dB)[dB] Power at EMC test

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation	P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	duty factor [dB]	Power Reading Results Ave[dBm]	Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar-emc)	Pk [dB]	⊿(sar-emc)
1	2412	6	1	set=15	BPSK OFDM	2.47	9.62	0.75	10.02	0.00	13.24	20.39	21.09	109.40	ref(0)	7.15				
6	2437	6	1	set=15	BPSK OFDM	1.90	9.67	0.75	10.02	0.00	12.67	20.44	18.49	110.66	-0.57	7.77				
11	2462	6	1	set=15	BPSK OFDM	1.65	9.61	0.75	10.02	0.00	12.42	20.38	17.46	109.14	-0.82	7.96				
1	2412	36	1	set=15	16QAM OFDM	2.23	10.01	0.75	10.02	0.00	13.00	20.78	19.95	119.67	ref(0)	7.78	12.80	0.20	20.62	0.16
6	2437	36	1	set=15	16QAM OFDM	1.53	10.02	0.75	10.02	0.00	12.30	20.79	16.98	119.95	-0.70	8.49	12.19	0.11	20.73	0.06
11	2462	36	1	set=15	16QAM OFDM	1.49	10.04	0.75	10.02	0.00	12.26	20.81	16.83	120.50	-0.74	8.55	12.07	0.19	20.79	0.02
															⊿low rate			⊿ave		⊿pk
6	2437	6	1	set=15	BPSK OFDM	1.90	9.67	0.75	10.02	0.00	12.67	20.44	18.49	110.66	ref(0)	7.77	12.47	0.20	20.25	0.19
6	2437	9	1	set=15	BPSK OFDM	1.89	9.37	0.75	10.02	0.00	12.66	20.14	18.45	103.28	-0.01	7.48	12.46	0.20	19.97	0.17
6	2437	12	1	set=15	QPSK OFDM	1.76	9.43	0.75	10.02	0.00	12.53	20.20	17.91	104.71	-0.14	7.67	12.36	0.17	20.03	0.17
6	2437	18	1	set=15	QPSK OFDM	1.72	9.37	0.75	10.02	0.00	12.49	20.14	17.74	103.28	-0.18	7.65	12.39	0.10	20.10	0.04
6	2437	24	1	set=15	16QAM OFDM	1.69	9.86	0.75	10.02	0.00	12.46	20.63	17.62	115.61	-0.21	8.17	12.38	0.08	20.49	0.14
6	2437	36	1	set=15	16QAM OFDM	1.53	10.02	0.75	10.02	0.00	12.30	20.79	16.98	119.95	-0.37	8.49	12.19	0.11	20.73	0.06
6	2437	48	1	set=14	64QAM OFDM	0.26	9.19	0.75	10.02	0.00	11.03	19.96	12.68	99.08	-1.64	8.93	10.84	0.19	19.83	0.13
6	2437	54	1	set=13	64QAM OFDM	-0.72	8.48	0.75	10.02	0.00	10.05	19.25	10.12	84.14	-2.62	9.20	9.98	0.07	19.24	0.01

*. Calculating formula: Results = (P/M Reading) + (Cable loss) + (Attenuator) + (duty factor)
*. A number in the red shows the maximum average power in each mode.
*. Date tested: November 8, 2011 / By: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25 deg.C, 55 %RH)

*. The difference between the SAR reference power and the power of EMC test was not less than 0dB and not higher than 0.21dB.
*. For both 11b and 11g mode, the average power of higher data rate was less than 0.25dB higher than the lowest data rate. Therefore, SAR test was only applied to the lowest data rate.
*. The average power of 11g was lower than the corresponded 11b power. Therefore, SAR test was not applied.
*. The average power of 11n(20HT) was more than 2dB lower than the corresponded 11b power. Therefore, SAR test was not applied. The power data of 11n(20HT) refers to EMC test report: 32AE0305-SH-02-B.

6.1.2 Duty cycle (Crest factor)

Mode	Data rate	Freq. [MHz]	On time [ms]	1 cycle [ms]	Duty [%]	Crest factor of DASY4
802.11b	1Mbps	2437	no off time		100	**1.0** (cf.1.00)
	2Mbps	2437	6.293	6.326	99.5	- (cf.1.01)(*1)
	5.5Mbps	2437	2.4070	2.4460	98.4	- (cf.1.02)(*1)
	11Mbps	2437	1.2780	1.3100	97.6	- (cf.1.03)(*1)
802.11g	6Mbps	2437	2.0540	2.0930	98.1	- (cf.1.02)(*1)
	9Mbps	2437	1.3730	1.4160	97.0	- (cf.1.03)(*1)
	12Mbps	2437	1.0330	1.0730	96.3	- (cf.1.04)(*1)
	18Mbps	2437	0.6951	0.7324	94.9	- (cf.1.05)(*1)
	24Mbps	2437	0.5284	0.5654	93.5	- (cf.1.07)(*1)
	36Mbps	2437	0.3612	0.3936	91.8	- (cf.1.09)(*1)
	48Mbps	2437	0.2732	0.3065	89.1	- (cf.1.12)(*1)
	54Mbps	2437	0.2473	0.2838	87.1	- (cf.1.15)(*1)

*. Calculating formula: Duty[%] = {(On time) / (1 cycle)}×100, Crest factor[-]= 1 / {(On time) / (1 cycle)}
*. Date tested: November 8, 2011 / By: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25 deg.C, 55 %RH)
*1. SAR test was not applied.

SECTION 7: Measurement results

7.1 SAR (Body touch)

Measurement date: November 11, 2011 Measurement by: Hiroshi Naka

[Liquid measurement (Body)]

Used Target Frequency [MHz]	Target Body Tissue		Measured Body Tissue				Environment		Measured Date
	Permittivity [-]	Conductivity [S/m]	Permittivity (εr) [-]	Conductivity (σ) [S/m]	Temp. [deg.C.]	Depth [mm]	Temp. [deg.C.]	Humidity [%RH]	
2450	**52.7**	**1.95**	50.34 (-4.5%)	1.981 (+1.6%)	22.9	155	23	40	Nov. 11, 2011, before SAR test.
2412	**52.75**	**1.914**	50.48 (-4.3%)	1.915 (0%)					
2437	**52.72**	**1.938**	50.38 (-4.4%)	1.950 (+0.7%)					
2462	**52.68**	**1.967**	50.34 (-4.5%)	2.003 (+1.8%)					

*. The target value is a parameter defined in OET65 Supplement C. In the current standards (e.g., IEEE 1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given at 2450MHz. As an intermediate solution, dielectric parameters for the frequencies between 2000 to 2450 MHz and 2450 to 3000MHz were obtained using linear interpolation. (Refer to Appendix 3-7 in this report)

[SAR measurement results (Body)]

SAR measurement results												
Frequency			Modulation / Data rate [Mbps] / crest factor	EUT setup conditions			Liquid temp. [deg.C]		Power drift [dB]	SAR(1g) [W/kg]	Remarks
Mode	Ch.	[MHz]		Position	Distance [mm]	Battery	Before	After		maximum value of multi-peak	
	Step 1: Worst position search										
11b	1	2412	DBPSK&DSSS/ 1Mbps/ 1.0	Front-touch	0	built-in	22.7	22.7	-0.080	0.50	-
	1	2412	DBPSK&DSSS/ 1Mbps/ 1.0	Left-touch	0	built-in	22.7	22.7	-0.130	< 0.10	-
	1	2412	DBPSK&DSSS/ 1Mbps/ 1.0	Right-touch	0	built-in	22.7	22.7	-0.114	< 0.10	-
	1	2412	DBPSK&DSSS/ 1Mbps/ 1.0	Rear-touch	0	built-in	22.7	22.7	-0.059	0.52	-
	1	2412	DBPSK&DSSS/ 1Mbps/ 1.0	Top edge-touch	0	built-in	22.7	22.7	-0.20	0.63	-
	1	2412	DBPSK&DSSS/ 1Mbps/ 1.0	Top rear-touch	0	built-in	22.7	22.7	0.067	**0.94**	→Worst SAR.
	1	2412	DBPSK&DSSS/ 1Mbps/ 1.0	Top rear-touch	0	USB pwr.	22.7	22.7	-0.068	0.90	-
	Step 2: Change the channels										
	6	2437	DBPSK&DSSS/ 1Mbps/ 1.0	Front-touch	0	built-in	22.7	22.7	0.023	0.83	-
	11	2462	DBPSK&DSSS/ 1Mbps/ 1.0	Front-touch	0	built-in	22.7	22.7	0.20	0.74	-

*. The SAR test was not applied to 11g and 11n(20HT) mode. According to KDB248227; SAR is not required for 11g and 11n(HT20) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

Notes:

*. During test, the EUT was operated with full-charged battery and without all signal interface cables.
*. The SAR test was not applied to the bottom side of EUT, because the distance of antenna-to-user was larger than 100mm and this separation distance was away enough to omit the SAR test.

*. Calibration frequency of the SAR measurement probe (and used conversion factors)

SAR test frequency[MHz]	Probe calibration frequency [MHz]	Validity [MHz]	Used conversion factor	Uncertainty
2412	2450	-38MHz, within ±50 of cal.frequency	7.34	±12.0%
2437	2450	-13MHz, within ±50 of cal.frequency	7.34	±12.0%
2462	2450	+12MHz, within ±50 of cal.frequency	7.34	±12.0%

*. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.