



SAR TEST REPORT

Test Report No.: 4786002230S-A

Applicant : Canon Inc.
Type of Equipment : Wireless Module
Model No. : CH9-1346 (*. Installed into the CH9-1346's platform (1))
FCC ID : AZD221
Test Standard : FCC 47CFR §2.1093,
Supplement C (Edition 01-01) to OET Bulletin 65
Test Result : Complied

Highest Reported SAR(1g) Value	Platform #	Platform type	Platform model	Remarks
0.19 W/kg	Platform (1)	Digital camera (1)	DS126471	(DTS) 2462MHz, IEEE 802.11b, (1Mbps, BPSK/DSSS))

*. **Highest reported SAR (1g) across exposure conditions for all of platform = 0.19 W/kg = grant listing.**
*. Since highest reported SAR (1g) on the platform (1) which obtained in accordance with KDB447498 (v05) was kept under 0.8 W/kg, the EUT was approved for used in multi-platform.

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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: March 15, 2013

Test engineer: *T. Naka*

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Leader of WiSE Japan, UL Verification Service

The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
 There is no testing item of "Non-accreditation".



REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	4786002230S-A	April 18, 2013	-	

* By issue of new revision report, the report of an old revision becomes invalid.

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SECTION 1: Customer information

Company Name	Canon Inc.
Brand Name	Canon
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SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type of Equipment	Wireless Module
Model Number	CH9-1346
Serial Number	ES3020
Condition of EUT	CH9-1346: Engineering prototype (*. Not for sale: This sample is equivalent to mass-produced items.) Platform (1): Engineering prototype (Digital camera (1), model: DS126471) (*. Not for sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample	December 19, 2012 (*. EUT for the power measurement.) March 13, 2013 (*. EUT for the SAR test. The EUT that had been measured the power of SAR test reference, was installed into the platform (1)-digital camera (1) from the beginning.) *. After power measurement, the EUT was returned to the customer, and the RF wiring was changed to the original antenna line form the antenna conducted power measurement line of the SAR test. The EUT was installed into a Platform (1) which SAR tested, by the customer. *. No modification by the Lab.
Country of Mass-production	CH9-1346: Japan / Platform (1): Japan
Category Identified	Portable device *. Since EUT may contact and/or very close to a human body during Wi-Fi operation, the partial-body SAR (1g) shall be observed.
Rating	DC3.3V supplied form the platform equipment. * The EUT is installed into the specified the platform that was operated by the re-chargeable Li-ion battery. Therefore, each SAR test, the platform which had built-in EUT was operated with full-charged battery.
Feature of EUT	The EUT is a Wireless Module which installs into the multi-platform.
Platform model of EUT	Platform (1) - Digital camera (1), model: DS126471

2.2 Product Description (Wireless module: CH9-1346)

Equipment type	Transceiver
Frequency of operation	2412-2462MHz (11b,11g,11n(20HT)), 2422-2452MHz(11n(40HT))
Channel spacing	5MHz
Bandwidth	20MHz(11b,11g,11n(20HT)), 40MHz(11n(40HT))
ITU code	G1D, D1D
Type of modulation	DSSS(11b): CCK, QPSK, BPSK OFDM(11g,11n(20HT),11n(40HT)): 64QAM, 16QAM, QPSK, BPSK
Q'ty of Antenna	1 pc.
Antenna type	$\lambda/4$ Monopole type antenna
Antenna gain (peak)	-0.8 dBi
Transmit power and tolerance (Manufacture variation)	11b: 12dBm \pm 1.5dBm 11n(20HT): 12dBm \pm 1.5dBm * Refer to clause 2.3 for more detail. * The measured Tx output power (conducted) refers to section 6 in this report.
Maximum output power which may possible	11b: 13.5dBm 11n(20HT): 13.5dBm * Refer to clause 2.4 for more detail.
Power supply	DC 3.3V (*. The power of DC3.3V is supplied from the platform via constant voltage circuit.)
Operation temperature range	0 to +60 deg.C

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

2.3 Tx output power specification (antenna port terminal conducted)

2.4. Maximum output power which may possible

Target Power [dBm] (average)																													
11b				11g					11n(20HT)																				
[MHz]	CH	1	2	5.5	11	6	9	12	18	24	36	48	54	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
2412	1	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2417	2	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2422	3	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2427	4	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2432	5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2437	6	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2442	7	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2447	8	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2452	9	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2457	10	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		
2462	11	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-		

Target Power [dBm] (average)																	
11n(40HT)																	
[MHz]	CH	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
2422	3	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-	-	
2427	4	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-	
2432	5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-	
2437	6	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-	
2442	7	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-	
2447	8	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-	
2452	9	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	-	-	-	-	-	-	

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 addition: **KDB 447498 D01 (v05):** General RF exposure guidance
 KDB 865664 D01 (v01): SAR measurement 100MHz to 6GHz
 KDB 248227 D01 (v01r02): SAR measurement procedures for 802.11a/b/g transmitters

*. In this report, IEC 62209-1:2005 and IEC 62209-2:2010-03 are also considered as reference. The comment is attached to the portion to which IEC 62209-1 and IEC 62209-2 were referred to specially.

3.2 Exposure limit

Environments of exposure limit	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)
(A) Limits for Occupational /Controlled Exposure (W/kg)	0.4	8.0	20.0
(B) Limits for General population /Uncontrolled Exposure (W/kg)	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

	Wi-Fi (DTS) / in Platform (1)
Test Procedure	FCC OET Bulletin 65, Supplement C
	SAR
Category	FCC 47CFR §2.1093
Results (SAR(1g))	Complied
Reported SAR value (* Scaled)	0.19 W/kg
Measured SAR value	0.137 W/kg
Operation mode	11b, 1Mbps, DSSS, 2462 MHz (11ch)
Output power (scaled factor)	12.15 dBm (x1.36)

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

Test outline: Where this product is built into a new platform, it was verified whether multiplatform conditions can be suited in according with section 2 of 5.2.2 2 in KDB447498 D01 (v05).

Consideration of the test results: **The highest reported SAR (1g) of platform (1) was kept ≤ 0.8 W/kg.** *. This was approved to use in multiple host platforms. (KDB447498 D01 (v05))

3.4 Test Location

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

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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.

Test	Remarks	Serial number
SAR	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 then the average power was measured. The average power of specified operation mode(s) were measured at default channel. After power measurement, the EUT was returned to the customer, and the RF wiring was changed to the original antenna line form the antenna conducted power measurement line of the SAR test. Then, the EUT was installed in a platform (1) which SAR tested, by the customer. * Refer to the Section 6 in this report for the power measurement of SAR sample result. * The power was measured by the calibrated power sensor and power meter (65MHz measurement bandwidth).	ES3020
EMC	The EUT of the EMC test was measured for the peak power. The average power that was reference of SAR test was also measured additionally.	ES3020

3.5.2 Average power for SAR tests

Step.1 Data rate check

The EUT supported the following data rate in each operation mode.

Since the target power of 11b mode was more than 2dB higher than other operation mode (11g, 11n(20HT), 11n(40HT)), the average and peak powers related with all data rate were measured only on a channel of 11b mode.

11b		11g		11n(20HT)			11n(40HT)		
Modulation	Data rate [Mbps]	Modulation	Data rate [Mbps]	MCS Index	Spatial Stream	Modulation	MCS Index	Spatial Stream	Modulation
BPSK/DSSS	1	BPSK/OFDM	6	MCS0	1	BPSK/OFDM	MCS0	1	BPSK/OFDM
DQPSK/DSSS	2	BPSK/OFDM	9	MCS1	1	QPSK/OFDM	MCS1	1	QPSK/OFDM
CCK/DSSS	5.5	QPSK/OFDM	12	MCS2	1	QPSK/OFDM	MCS2	1	QPSK/OFDM
CCK/DSSS	11	QPSK/OFDM	18	MCS3	1	16QAM/OFDM	MCS3	1	16QAM/OFDM
			24	MCS4	1	16QAM/OFDM	MCS4	1	16QAM/OFDM
			36	MCS5	1	64QAM/OFDM	MCS5	1	64QAM/OFDM
			48	MCS6	1	64QAM/OFDM	MCS6	1	64QAM/OFDM
			54	MCS7	1	64QAM/OFDM	MCS7	1	64QAM/OFDM

Step.2 Decision of SAR test channel

The following operation mode, data rate and channels were determined by the SAR reference power measured.

Mode	MHz	Channel	SAR tested channel				Remarks
			11b/g/n(20HT)	11b	11g	11n(20HT)	
802.11 b/g/n	2412	1 (*1)	✓	#	n/a (*2)	n/a (*2)	
	2422	3					#
	2437	6	✓	#	n/a (*2)	n/a (*2)	#
	2452	9					#
	2462	11 (*1)	✓	#	n/a (*2)	n/a (*2)	

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

- *1. Any output power reducing for channel 1 and 11 to meet restricted band requirements was not observed. Therefore channel 1 and 11 was selected for the default channels and SAR test was applied.
- *2. Since the measured output average power of 11g and 11n(20HT) were less than 0.25dB higher than the corresponded 11b power, SAR test was not applied to the 11g and 11n(20HT) mode. In 11b and 11n(40HT) modes, the average powers of higher data rate were less than 0.25dB higher than the lowest data rate. Therefore, SAR test was only applied to the lowest data rate. (KDB248227) (Refer to Section 6.)

3.6 Confirmation after SAR testing

It was checked that the power drift [W] is within $\pm 5\%$ in the evaluation procedure of SAR testing. The verification of power drift during the SAR test is that DASY5 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.

- *. DASY5 system calculation Power drift value[dB] = $20\log(E_a)/(E_b)$ (where, Before SAR testing: $E_b[V/m]$ / After SAR testing: $E_a[V/m]$)

Limit of power drift[W] = $\pm 5\%$

Power drift limit (X) [dB] = $10\log(P_{\text{drift}}) = 10\log(1.05/1) = 10\log(1.05) - 10\log(1) = 0.21\text{dB}$
from E-filed relations with power.

$S = E \times H = E^2 / \eta = P / (4 \times \pi \times r^2)$ (η : Space impedance) $\rightarrow P = (E^2 \times 4 \times \pi \times r^2) / \eta$

Therefore, The correlation of power and the E-filed

Power drift limit (X) dB = $10\log(P_{\text{drift}}) = 10\log(E_{\text{drift}})^2 = 20\log(E_{\text{drift}})$

From the above mentioned, the calculated power drift of DASY5 system must be the less than $\pm 0.21\text{dB}$.

3.7 Test setup of EUT and SAR measurement procedure

After considering the outline of EUT, the SAR test was carried out on the following setup conditions.
 *. Refer to Appendix 1 for test setup photographs.

Setup	Explanation of EUT setup position	Antenna to user distance	Apply SAR test?	SAR type
Top	The top surface of EUT was touched to the Flat phantom. This section is the closest to an antenna.	≈4mm	applied	Body (touch)
Rear-top	The top section of rear surface of EUT was touched to the Flat phantom.	≈4mm	applied	
Front(Lens)	The front surface (Lens section) of EUT was touched to the Flat phantom.	≈20mm	applied	
Rear(LCD)	The rear surface (LCD) of EUT was touched to the Flat phantom.	≈10mm	applied	
Right-grip	The EUT surface held with the right hand was touched to the Flat phantom.	≈30mm	applied	
Left-grip	The EUT surface held with the left hand was touched to the Flat phantom.	≈75mm	applied	
Bottom	The bottom surface of EUT was touched to the Flat phantom.	≈60mm	applied	

. Size of EUT: 110.65mm (width) × 31.6mm (depth) × 67.45mm (height) (. Size includes a lug.)

By the determined test setup shown above, the SAR test was applied in the following procedures.

Step 1	Changed the positions.
Step 2	Changed the channels at a worst SAR position.
Step 3	Changed the operation mode.

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

SECTION 4: Operation of EUT during testing

4.1 Operating modes for SAR testing

This EUT has IEEE.802.11b, 11g, 11n(20HT) and 11n(40HT) continuous transmitting modes.
 The frequency and the modulation used in the SAR testing are shown as a following.

Operation mode	11b (*1)	11n(40HT)
Tx frequency band	2412-2462MHz	2422-2452MHz
Tested frequency	2412, 2437, 2462MHz (*2)	2422, 2437, 2452MHz
Modulation	BPSK/DSSS	BPSK/OFDM
Data rate	1Mbps (*3)	MCS0 (*3)
Crest factor	1.0 (100% duty cycle)	1.0 (100% duty cycle)
Controlled software	“RF TEST” mode; During SAR test, the EUT was operated by pre-installed “RF TEST” mode software.	

- *1. Since the measured output average power of 11g and 11n(20HT) were less than 0.25dB higher than the corresponded 11b power, SAR test was not applied to the 11g and 11n(20HT) mode. (KDB248227) (Refer to Section 6.)
- *2. Any output power reducing for channel 1 and 11 to meet restricted band requirements was not observed. Therefore channel 1 and 11 was selected for the default channels and SAR test was applied.
- *3. In 11b and 11n(40HT) modes, the average powers of higher data rate were less than 0.25dB higher than the lowest data rate. Therefore, SAR test was only applied to the lowest data rate. (KDB248227) (Refer to Section 6.)

SECTION 5: Uncertainty Assessment (SAR measurement)

Uncertainty of SAR measurement(v06) (*: Body tissue, ϵ & σ tolerance: $\leq \pm 5\%$, Tx: $\approx 100\%$ duty cycle)				Under 3 GHz		5~6GHz			
				1g SAR	10g SAR	1g SAR	10g SAR		
Combined measurement uncertainty of the measurement system (k=1)				$\pm 12.5\%$	$\pm 12.2\%$	$\pm 13.7\%$	$\pm 13.5\%$		
Expanded uncertainty (k=2)				$\pm 25.0\%$	$\pm 24.4\%$	$\pm 27.4\%$	$\pm 27.0\%$		
	Error Description (Under 3GHz) (v06)	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
A Measurement System (DASY5)									
1	Probe Calibration Error	$\pm 6.0\%$	Normal	1	1	1	$\pm 6.0\%$	$\pm 6.0\%$	∞
2	Axial isotropy Error	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 1.9\%$	$\pm 1.9\%$	∞
3	Hemispherical isotropy Error (<5deg, flat phantom)	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 3.9\%$	$\pm 3.9\%$	∞
4	Boundary effects Error	$\pm 1.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.8\%$	$\pm 0.8\%$	∞
5	Linearity Error	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
6	Probe modulation response (CW)	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
7	Sensitivity Error (detection limit)	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
8	Response Time Error (<5ms/100ms wait)	$\pm 0.0\%$	Normal	1	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
9	Integration Time Error (100% duty cycle)	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
10	Readout Electronics Error(DAE)	$\pm 0.3\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.3\%$	$\pm 0.3\%$	∞
11	RF ambient conditions-noise	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
12	RF ambient conditions-reflections	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
13	Probe positioner mechanical tolerance	$\pm 1.1\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
14	Probe Positioning with respect to phantom shell	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
15	Errors: Extrapol., Interpol. & Integration Algorithms	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
B Test Sample Related									
16	Test Sample Positioning Error	$\pm 5.0\%$	Normal	1	1	1	$\pm 5.0\%$	$\pm 5.0\%$	145
17	Device Holder or Positioner Tolerance	$\pm 3.6\%$	Normal	1	1	1	$\pm 3.6\%$	$\pm 3.6\%$	5
18	Test Sample Output Power Drift Error	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.9\%$	$\pm 2.9\%$	∞
C Phantom and Setup									
19	Phantom uncertainty (shape, thickness tolerances)	$\pm 7.5\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 4.3\%$	$\pm 4.3\%$	∞
20	Target Liquid Conductivity Tolerance ($\leq 5\%$)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	∞
21	Measurement Liquid Conductivity Error	$\pm 2.9\%$	Normal	1	0.64	0.43	$\pm 1.9\%$	$\pm 1.2\%$	3
22	Target Liquid Permittivity Tolerance ($\leq 5\%$)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	∞
23	Measurement Liquid Permittivity Error	$\pm 2.9\%$	Normal	1	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	3
24	Liquid Conductivity-temp.uncertainty ($\leq 2\text{deg.C.}$)	$\pm 5.2\%$	Rectangular	$\sqrt{3}$	0.78	0.71	$\pm 2.3\%$	$\pm 2.1\%$	∞
25	Liquid Permittivity-temp.uncertainty ($\leq 2\text{deg.C.}$)	$\pm 0.8\%$	Rectangular	$\sqrt{3}$	0.23	0.26	$\pm 0.1\%$	$\pm 0.1\%$	∞
Combined Standard Uncertainty							$\pm 12.5\%$	$\pm 12.2\%$	479
Expanded Uncertainty (k=2)							$\pm 25.0\%$	$\pm 24.4\%$	

*: This measurement uncertainty budget is suggested by IEEE 1528, IEC 62209-2 and determined by Schmid & Partner Engineering AG (DASY5 Uncertainty Budget).

SECTION 6: Confirmation before testing

6.1 Assessment for the conducted power of EUT

6.1.1 2412-2462MHz band (802.11b/g/n(20HT)/n(40HT))

Worst data rate / worst channel determination (WLAN module serial number: ES3020)

Mode	Freq. [MHz]	D/R [Mbps]	Cable Loss [dB]	Att. [dB]	D/F [dB]	Average power			PAR	Power tolerance & correction					Apply SAR test? (Y: yes)	Output power of EMC test		Remarks		
						P/M Reading	Result			[dBm]	[dBm]	[dB]	[dBm]	[dB]	[-]					
							[dBm]	[mW]							Aver [dBm]	ΔSAR [dB]				
11b	2437	1	0.60	10.00	0.00	1.28	11.88	15.4	2.62	12.0±1.5	-1.62	×1.45	Y	Y	Y	11.84	-0.04			
	2437	2	0.60	10.00	0.00	1.24	11.84	15.3	2.60	12.0±1.5	-1.66	×1.47	Y	-	-	11.83	-0.01			
	2437	5.5	0.60	10.00	0.00	1.27	11.87	15.4	2.06	12.0±1.5	-1.63	×1.46	Y	-	-	11.81	-0.06			
	2437	11	0.60	10.00	0.00	1.25	11.85	15.3	2.60	12.0±1.5	-1.65	×1.46	Y	-	-	11.80	-0.05			
	2412	1	0.60	10.00	0.00	1.35	11.95	15.7	2.65	12.0±1.5	-1.55	×1.43	Y	Y	Y	11.93	-0.02			
11g (*)	2462	1	0.60	10.00	0.00	1.55	12.15	16.4	2.64	12.0±1.5	-1.35	×1.36	Y	Y	Y	12.13	-0.02	Highest CH(11b)		
	2437	6	0.60	10.00	0.00	1.44	12.04	16.0	8.56	12.0±1.5	-1.46	×1.40	Y	-	-	11.99	-0.05	Highest CH(11g)		
	2437	9	0.60	10.00	0.00	1.38	11.98	15.8	8.25	12.0±1.5	-1.52	×1.42	Y	-	-	11.86	-0.12			
	2437	12	0.60	10.00	0.00	1.38	11.98	15.8	8.60	12.0±1.5	-1.52	×1.42	Y	-	-	11.94	-0.04			
	2437	18	0.60	10.00	0.00	1.36	11.96	15.7	7.99	12.0±1.5	-1.54	×1.43	Y	-	-	11.77	-0.19			
	2437	24	0.60	10.00	0.00	1.37	11.97	15.7	8.71	12.0±1.5	-1.53	×1.42	Y	-	-	11.78	-0.19			
	2437	36	0.60	10.00	0.00	1.35	11.95	15.7	8.72	12.0±1.5	-1.55	×1.43	Y	-	-	11.81	-0.14			
	2437	48	0.60	10.00	0.00	1.35	11.95	15.7	8.26	12.0±1.5	-1.55	×1.43	Y	-	-	11.76	-0.19			
	2437	56	0.60	10.00	0.00	1.38	11.98	15.8	8.63	12.0±1.5	-1.52	×1.42	Y	-	-	11.81	-0.17			
	2412	6	0.60	10.00	0.00	1.37	11.97	15.7	8.38	12.0±1.5	-1.53	×1.42	Y	-	-	11.79	-0.18			
	2462	6	0.60	10.00	0.00	1.35	11.95	15.7	8.39	12.0±1.5	-1.55	×1.43	Y	-	-	11.75	-0.20			
11n (20HT) (*)	2437	MCS0	0.60	10.00	0.00	1.32	11.92	15.6	8.05	12.0±1.5	-1.58	×1.44	Y	-	-	11.88	-0.04	Highest CH(11n20)		
	2437	MCS1	0.60	10.00	0.00	1.31	11.91	15.5	8.11	12.0±1.5	-1.59	×1.44	Y	-	-	11.84	-0.07			
	2437	MCS2	0.60	10.00	0.00	1.30	11.90	15.5	8.06	12.0±1.5	-1.60	×1.45	Y	-	-	11.80	-0.10			
	2437	MCS3	0.60	10.00	0.00	1.31	11.91	15.5	8.06	12.0±1.5	-1.59	×1.44	Y	-	-	11.73	-0.18			
	2437	MCS4	0.60	10.00	0.00	1.29	11.89	15.5	8.18	12.0±1.5	-1.61	×1.45	Y	-	-	11.84	-0.05			
	2437	MCS5	0.60	10.00	0.00	1.30	11.90	15.5	8.06	12.0±1.5	-1.60	×1.45	Y	-	-	11.74	-0.16			
	2437	MCS6	0.60	10.00	0.00	1.31	11.91	15.5	8.02	12.0±1.5	-1.59	×1.44	Y	-	-	11.79	-0.12			
	2437	MCS7	0.60	10.00	0.00	1.31	11.91	15.5	8.02	12.0±1.5	-1.59	×1.44	Y	-	-	11.72	-0.19			
	2412	MCS0	0.60	10.00	0.00	1.30	11.90	15.5	8.00	12.0±1.5	-1.60	×1.45	Y	-	-	11.76	-0.14			
	2462	MCS0	0.60	10.00	0.00	1.30	11.90	15.5	8.01	12.0±1.5	-1.60	×1.45	Y	-	-	11.73	-0.17			
11n (40HT)	2437	MCS0	0.60	10.00	0.00	1.54	12.14	16.4	8.81	12.0±1.5	-1.36	×1.37	Y	Y	Y	(*)2	12.04	-0.10		
	2437	MCS1	0.60	10.00	0.00	1.52	12.12	16.3	8.68	12.0±1.5	-1.38	×1.37	Y	-	-	11.97	-0.15			
	2437	MCS2	0.60	10.00	0.00	1.50	12.10	16.2	8.76	12.0±1.5	-1.40	×1.38	Y	-	-	12.05	-0.05			
	2437	MCS3	0.60	10.00	0.00	1.48	12.08	16.1	8.90	12.0±1.5	-1.42	×1.39	Y	-	-	12.01	-0.07			
	2437	MCS4	0.60	10.00	0.00	1.52	12.12	16.3	8.84	12.0±1.5	-1.38	×1.37	Y	-	-	12.07	-0.05			
	2437	MCS5	0.60	10.00	0.00	1.57	12.17	16.5	9.00	12.0±1.5	-1.33	×1.36	Y	-	-	12.08	-0.09			
	2437	MCS6	0.60	10.00	0.00	1.49	12.09	16.2	8.73	12.0±1.5	-1.41	×1.38	Y	-	-	11.99	-0.10			
	2437	MCS7	0.60	10.00	0.00	1.20	11.80	15.1	8.29	12.0±1.5	-1.70	×1.48	Y	-	-	11.60	-0.20			
	2422	MCS0	0.60	10.00	0.00	1.52	12.12	16.3	8.43	12.0±1.5	-1.38	×1.37	Y	Y	Y	-	-			
	2452	MCS0	0.60	10.00	0.00	1.55	12.15	16.4	8.48	12.0±1.5	-1.35	×1.36	Y	Y	Y	-	-	Highest CH(11n40)		
	2422	MCS5	0.60	10.00	0.00	1.48	12.08	16.1	8.66	12.0±1.5	-1.42	×1.39	Y	-	-	11.91	-0.17			
	2452	MCS5	0.60	10.00	0.00	1.46	12.06	16.1	8.63	12.0±1.5	-1.44	×1.39	Y	-	-	11.87	-0.19			

*. Freq: Frequency, D/R: Data Rate, Att.: Attenuator loss, D/F: Duty Factor (0dB=100% duty cycle), Deviation from max.: Power deviation (Deviation [dB] = "Max.-specification output power (average)" - "results power (average)") Scaled Factor: Power scaled factor for obtained SAR value, Scaled Factor [-] = $1/(10^{(\text{Deviation from max.})/10})$

*. **EUT serial number: "ES3020" for conducted power measurement (SAR test reference) and for SAR test which was same sample as EMC test.**
 The difference between the SAR reference power and the power of EMC test was not less than 0dB and not higher than 0.21dB

*1. Since the measured output average power of 11g and 11n(20HT) were less than 0.25dB higher than the corresponded 11b power, SAR test was not applied to the 11g and 11n(20HT) mode. (KDB248227) (Refer to Section 6.)

*2. 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. (KDB248227)

*. Calculating formula: Results (Ave) = ["P/M Reading"] + ["Cable loss"] + ["Attenuator"] + ["duty factor"]

*. Uncertainty of antenna port conducted test; Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

*. Date measured: February 21, 2013 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (23 deg.C. / 33 %RH)

*. "Power of EMC test", this reference is described in the test report of 4786002229S-E.

SECTION 7: Measurement results

7.1 SAR (Body) in the platform (1)-Digital camera (1) (model: DS126471)

Measurement date: March 15, 2013

Measurement by: Hiroshi Naka

[Liquid measurement (Body simulated tissue)]

Target Frequency [MHz]	Liquid parameters						ΔSAR Coefficients (*1)		Remarks / Environment
	Permittivity (εr) [-]		Conductivity [S/m]		Temp. [deg.C.]	Depth [mm]	ΔSAR (1g) [%]	Correction required?	
	Target	Measured (Δεr)	Target	Measured (Δσ)			(+2.52)(*1)	not required.	
2450	52.7	50.20 (-4.7%)	1.95	2.009 (+3.0%)			(+2.52)(*1)	not required.	
2412	52.75	50.21 (-4.8%)	1.914	1.957 (+2.3%)			(+2.20)(*1)	not required.	
2422	52.74	50.23 (-4.8%)	1.923	1.964 (+2.1%)			(+2.10)(*1)	not required.	
2437	52.72	50.20 (-4.6%)	1.938	1.980 (+2.2%)			(+2.13)(*1)	not required.	
2452	52.70	50.15 (-4.8%)	1.953	2.009 (+2.9%)			(+2.46)(*1)	not required.	
2462	52.68	50.10 (-4.9%)	1.967	2.014 (+2.4%)			(+2.24)(*1)	not required.	

*. 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 were obtained using linear interpolation. (Refer to Appendix 3-4)

*1. The number of ΔSAR(1g) of body simulated tissue was reference purpose only. ΔSAR coefficients are parameters defined in Annex F, IEC 62209-2:2010 (head tissue). In accordance with clause 6.1.1 of EN 62209-2; "If the correction ΔSAR has a negative sign, the measured SAR results shall not be corrected", the calculated ΔSAR values of the tested liquid had shown negative correction. Therefore the measured SAR was not ΔSAR corrected.

$$\Delta\text{SAR}(1g) = C_{\text{er}} \times \Delta\epsilon_r + C_{\sigma} \times \Delta\sigma, C_{\text{er}} = 7.854E-4 \times f^3 + 9.402E-3 \times f^2 - 2.742E-2 \times f - 0.2026 / C_{\sigma} = 9.804E-3 \times f^3 - 8.661E-2 \times f^2 + 2.981E-2 \times f + 0.7829$$

[SAR measurement results (Partial-Body)]

Mode	[MHz] (CH)	Modulation /Data rate /Crest factor	SAR measurement results (Body simulated tissue)								Data# in Appendix 2-2	Reported SAR	Remarks			
			EUT setup conditions			Liquid temp. [deg.C.]	Power drift [dB]	SAR (1g) [W/kg]								
			Position	Separation distance [mm]	Battery ID			Observed	ΔSAR [%]	ΔSAR corrected						
Step 1: Change the positions																
11b	2462 (11)	BPSK &DSSS /1Mbps /1.0	Rear-top	0	#1	21.8	21.7	-0.20	0.053	-	-	Step 1-1	×1.36 < 0.10			
			Left-grip	0	#2	21.7	21.7	0.07	0.015	-	-	Step 1-2	×1.36 < 0.10			
			Rear (LCD)	0	#1	21.7	21.7	0.20	0.064	-	-	Step 1-3	×1.36 < 0.10			
			Front (Lens)	0	#2	21.7	21.7	-0.20	0.00341	-	-	Step 1-4	×1.36 < 0.10			
			Right-grip	0	#1	21.6	21.6	*. Zoom scan was not proceeded. Since the maximum SAR value of an area scan result was small enough or not detected, a zoom scan was excluded.				Step 1-5	×1.36 Not applied			
			Bottom	0	#1	21.7	21.7					Step 1-6	×1.36 Not applied			
			Top	0	#2	21.7	21.7	0.20	0.137	-	-	Step 1-7	×1.36 0.19 >Highest			
Step 2: Changed the channels																
11b	2437 (6)	BPSK &DSSS /1Mbps /1.0	Top	0	#1	21.7	21.7	-0.10	0.116	-	-	Step 2-1	×1.45 0.17			
	2412 (1)			0	#2	21.7	21.6	-0.19	0.110	-	-	Step 2-2	×1.43 0.16			
Step 2: Changed the operation mode																
11n (40HT)	2437 (6)	BPSK &OFDM /MCS0 /1.0	Top	0	#1	21.6	21.6	-0.07	0.118	-	-	Step 3-1	×1.37 0.16			
	2452 (9)			0	#2	21.6	21.6	0.20	0.128	-	-	Step 3-2	×1.39 0.17			
	2422 (3)			0	#1	21.6	21.6	-0.18	0.121	-	-	Step 3-3	×1.39 0.17			

Notes:

- *. Battery No.#1 and #2 were same model.; Refer to Appendix 1.
- *. Since the target average power of 11g and 11n(20HT) were more than 2dB lower than the corresponded 11b power, the power measurement and SAR test were not applied to the 11g and 11n(20HT) mode. (KDB248227)
- *. During test, the EUT was operated with full-charged battery and without all signal interface cables.
- *. 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	6.77	±12.0%
2437	2450	-13MHz, within ±50 of cal.frequency	6.77	±12.0%
2462	2450	+12MHz, within ±50 of cal.frequency	6.77	±12.0%

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