SAR TEST REPORT

Test Report No.: 32AE0317-SH-02-D

Applicant : **Canon Inc.**

Type of Equipment : **Wireless Module**

Model No. : **ZC-ST**

FCC ID : **AZD220**

Test Standard : **FCC 47CFR §2.1093, Supplement C (Edition 01-01) to OET Bulletin 65**

Test Result : **Complied**

Maximum SAR(1g) Value	Platform #	Platform type	Platform model	Remarks
0.44 W/kg	Platform (1)	Digital camera (1)	DS126401	(DTS) 2462MHz, IEEE 802.11b, (1Mbps, DBPSK/DSSS))

*. **Highest SAR(1g) across exposure conditions = 0.44 W/kg = grant listing.**
*. **The SAR(1g) was <0.8W/kg. Therefore according to the KDB447498 D01, this EUT was approved for used in multi-platform..**

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Date of test: June 20, 2012

Test engineer: H. Naka

Hiroshi Naka
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JAB Testing RTL02610

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

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REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
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1	32AE0317-SH-02-D	August 6, 2012	1,2,3,5,8	P1-2:Update P3: 2.1 Identification of EUT, Accessory of EUT P5: 3.5.1 Correlation of Output Power between EMC and SAR tests: EMC's Serial number P8: 6.1 Assessment for the conducted power of EUT: SAR and EMC's Serial number

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

SECTION 1: Customer information

Company Name	Canon Inc.
Brand Name	Canon
Address	30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo 146-8501 Japan
Telephone Number	+81-3-3757-6798
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Contact Person	Takato Matsuura

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type of Equipment	Wireless Module
Model Number	ZC-ST
Serial Number	ES40197
Condition of EUT	Engineering prototype (*. Not for sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample	March 30, 2012 (*. EUT for the power measurement.) May 25, 2012 (*. EUT for the SAR test. EUT was in the state installed into the platform(1).) *. No modification by the Lab.
Country of Mass-production	Japan
Category Identified	Portable device *. The EUT is installed into the specified digital camera (platform) and used as hand-held and hand-operated device with output power < 645 mW (1000×[2.4GHz]$^{-0.5}$). →The hand-SAR is not required (KDB447498). *. The digital camera (platform) may contact a human body during Wi-Fi operation.
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. (*1)
Feature of EUT	The EUT is a Wireless Module which installs into the multi-platform.
Accessory of EUT	See Appendix 1-2

2.2 Product Description (*. Wireless module and antenna: ZC-ST)

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(11b), D1D(11g,11n(20HT),11n(40HT))
Type of modulation	DSSS(11b), OFDM(11g,11n(20HT),11n(40HT))
Q'ty of Antenna	1 pc.
Antenna type	λ/4 Monopole
Antenna gain (peak)	-0.4dBi
Transmit power	*. Refers to section 6 in this report.
Power supply	DC 3.3V
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."

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) (11/13/2009):**	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
☒**KDB 248227 (rev.1.2) (5/29/2007):**	SAR Measurement Procedures for 802.11a/b/g Transmitters
☒**KDB 450824 D01 (v01r01) (Jan.2007):**	SAR Probe Calibration and System Verification Considerations for Measurements at 150MHz-3GHz
☒**KDB 450824 D02 (v01) (11/13/2009):**	Dipole Requirements for SAR System Validation and Verification
☒**KDB 447498 DR01 (4/23/2012):**	General RF Exposure Polices for Equipment Authorization

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) / Platform(1)
Test Procedure	FCC OET Bulletin 65, Supplement C
	SAR
Category	FCC 47CFR §2.1093
Results (SAR(1g)) (Built-in)	Complied (0.44W/kg)

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:
This EUT is a **limited module approval** according to section 15.212 (b). The procedure of SAR was measured according to the KDB447498 2).

Consideration of the test results:
☒**The SAR(1g) was <0.8W/kg for all configurations. EUT was approved for used in multiple host platforms. (KDB447498 D01)**

***. Since SAR of platform(1) of a representation model is 0.44W/kg, it can also judge SAR of Platform(2) to have less than < 0.8W/kg.**

3.4 Test Location

No.7 shielded room (2.76(Width) × 3.76m(Depth) × 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 RF wiring was changed to the antenna line form the antenna conducted power measurement line for the SAR test. In addition, the EUT was installed to the platform that was SAR tested. *. The power was measured by the calibrated power sensor and power meter (65MHz measurement bandwidth).	ES40197
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.	ES40197

***. The same sample was used.**

3.5.2 Average power for SAR tests

Step.1 Data rate check
The average powers related with all data rate were measured on a middle channel of each operation mode. The EUT supported the following data rate in each operation 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
DBPSK/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
		16QAM/OFDM	24	MCS4	1	16QAM/OFDM	MCS4	1	16QAM/OFDM
		16QAM/OFDM	36	MCS5	1	64QAM/OFDM	MCS5	1	64QAM/OFDM
		64QAM/OFDM	48	MCS6	1	64QAM/OFDM	MCS6	1	64QAM/OFDM
		64QAM/OFDM	54	MCS7	1	64QAM/OFDM	MCS7	1	64QAM/OFDM

Step.2 Channel dependence
The average powers related with channels were measured on low, middle and high channels of each operation mode with a lowest data rate.

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.
$S=E\times H=E^2/\eta=P/(4\times\pi\times r^2)$ (η: Space impedance) → $P=(E^2\times4\times\pi\times r^2)/\eta$
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 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	SAR test	SAR type
Top-> Top-left	The left-hand side of the upper section was substituted. The left-hand side of the upper section of a platform (1) was touched to the Flat phantom.	< 5mm	applied	Body (touch)
Front	The top section (near the antenna) of a platform(1) was touched to the Flat phantom.	< 12mm	applied	
Front-left	The left-hand side of the front area (near the antenna) of a platform(1) was touched to the Flat phantom.	< 5mm	applied	
Top-left-front	The left-hand side of the upper-front area (near the antenna) of a platform(1) was touched to the Flat phantom. **(*. This section was tested additionally.)**	< 5mm	applied	
Rear	This means SAR test for the rear surface of a platform (1).	≈53mm	not applied (*1)	
Bottom	This means SAR test for the bottom surface of a platform (1).	≈90mm		
Left	This means SAR test for the left grip section of a platform (1).	≈33mm		
Right	This means SAR test for the right grip section of a platform (1).	≈115mm		
Top-right	This means SAR test for the right-hand side of the upper section of a platform (1).	≈40mm		

***. Size of Platform(1)(DS126401): 144.5 mm (width) × 71.1 mm (depth) × 110.5 mm (height)**

*1. Since the average power of EUT was less than 13dBm, this separation distance was enough far for the SAR test exclusion.
"Appendix A, SAR Exclusion Thresholds", KDB 447498 General RF Exposure Guideline DR01.

MHz	5	10	**15**	20	25	30	35	40	45	50	mm
2450	10	19	**29**	38	48	57	67	77	86	96	SAR Test Exclusion Threshold (mW)

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

Step 1	Worst position search.
Step 2	Change the channels..
Step 3	Change the operation modes, data rate.
Step 4	Additional position search and change the channels.

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

SECTION 4: Operation of EUT during 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	11g (*1)	11n(20HT) (*1)	11n(40HT) (*3)
Tx frequency band	2412-2462MHz			2422-2452MHz
Tested frequency	2412, 2437, 2462MHz	2462MHz	not applied	2437MHz
Modulation (*2)	DBPSK/DSSS, CCK/DSSS	BPSK/OFDM	not applied	BPSK/OFDM
Data rate (*2)	1Mbps, 11Mbps	6Mbps	not applied	MCS0
Crest factor	1.0 (≈100% duty cycle)		not applied	1.0 (≈100% duty cycle)
Controlled software	Used "Continuous Tx mode" by RF test software (2012/05/08 v0.1 Canon)that was installed on the platform(1). Power setting factor was "12dBm" for all operation modes.			

*. The following is requirement of default test channel of 11b/g/n operation. (Table 1, KDB248227)

Mode	MHz	Channel	default	SAR tested channel			
			11b/g /n(20HT)	11b	11g	11n (20HT)	11n (40HT)
802.11 b/g /n(20HT) /n(40HT)	2412	1	√	#	n/a (*1)	n/a (*1)	
	2422	*3*	-				n/a (*3)
	2437	6	√	#	n/a (*1)	n/a (*1)	#
	2452	*9*	-				n/a (*3)
	2462	11	√	#	#	n/a (*1)	

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

*1. Since the maximum average power of 11g/n(20HT) were less than 0.25dB higher than the corresponded 11b channel, the SAR test was only considered at the 11b mode.(KDB 248227) However, maximum average power existed at 11g mode, SAR test was applied at 11g mode with one of condition of 11b and for the comparison additionally.
*2. For 11b/g/n(20HT)/n(40HT), the average power of higher data rate was less than 0.25dB higher than the lowest data rate. Therefore, SAR test was only considered the lowest data rate. (KDB 248227) However, maximum average power of 11b was at 11Mbps data rate, SAR test was applied at 11Mbps of 11b additionally.
*3. Since 11n(40HT) mode had 40MHz band width, the SAR test was also applied to 11n(40HT) mode.

SECTION 5: Uncertainty Assessment (SAR measurement)

Uncertainty of SAR measurement system (v04)	Under 3 GHz (v04)	
	1g SAR	10g SAR
combined measurement uncertainty of the measurement system (k=1)	± 12.3%	± 12.0%
expanded uncertainty (k=2)	± 24.6%	± 24.0%

	Error Description (Under 3GHz) (v04)	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
							(std. uncertainty)	(std. uncertainty)	
A	**Measurement System**								
1	Probe Calibration Error	±6.0 %	Normal	1	1	1	±6.0 %	±6.0 %	∞
2	Axial isotropy Error	±4.7 %	Rectangular	√3	0.7	0.7	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy Error (<5deg, flat phantom)	±9.6 %	Rectangular	√3	0.7	0.7	±3.9 %	±3.9 %	∞
4	Boundary effects Error	±1.4 %	Rectangular	√3	1	1	±0.8 %	±0.8 %	∞
5	Linearity Error	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
6	Sensitivity Error (detection limit)	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	Response Time Error (<5ms/100ms wait)	±0.0 %	Normal	1	1	1	±0.0 %	±0.0 %	∞
8	Integration Time Error(100% duty cycle)	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
9	Readout Electronics Error(DAE)	±0.3 %	Rectangular	√3	1	1	±0.3 %	±0.3 %	∞
10	RF ambient conditions-noise (<0.01mW/g)	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
11	RF ambient conditions-reflections (<0.12mW/g)	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	Probe positioner mechanical tolerance	±1.1 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
13	Probe Positioning with respect to phantom shell	±2.9 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
14	Errors: Extrapol., Interpol. & Integration Algorithms	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
B	**Test Sample Related**								
15	Test Sample Positioning Error	±5.0 %	Normal	1	1	1	±5.0 %	±5.0 %	145
16	Device Holder or Positioner Tolerance	±3.6 %	Normal	1	1	1	±3.6 %	±3.6 %	5
17	Test Sample Output Power Drift Error	±5.0 %	Rectangular	√3	1	1	±2.9 %	±2.9 %	∞
C	**Phantom and Setup**								
18	Phantom uncertainty (shape, thickness tolerances)	±7.5 %	Rectangular	√3	1	1	±4.3 %	±4.3 %	∞
19	Target Liquid Conductivity Tolerance	±5.0 %	Rectangular	√3	0.64	0.43	±1.8 %	±1.2 %	∞
20	Measurement Liquid Conductivity Error	±2.9 %	Normal	1	0.64	0.43	±1.9 %	±1.2 %	3
21	Target Liquid Permittivity Tolerance	±5.0 %	Rectangular	√3	0.6	0.49	±1.7 %	±1.4 %	∞
22	Measurement Liquid Permittivity Error	±2.9 %	Normal	1	0.6	0.49	±1.7 %	±1.4 %	3
	Combined Standard Uncertainty						**±12.3** %	**±12.0** %	479
	Expanded Uncertainty (k=2)						**±24.6** %	**±24.0** %	

*. 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

Worst data rate & worst channel determination of SAR, Correction of the power at SAR test and EMC test

*. 0≦⊿(sar−emc) ≦0.21dB

【Output power】			Tx mode:		IEEE 802.11b				set=12dBm				*.PAR=Peak(dB)−Ave(dB)[dB]				Power/EMC test	
Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation		P/M Reading Ave[dBm]	P/M Reading Pk[dBm]	Cable Loss [dB]	Attenuator [dB]	duty factor [dB]	Power/SAR Ref. Ave[dBm]	Power/SAR Ref. Ave[mW]	⊿worst ave[dB]	PAR [dB]	Ave. [dB]	⊿(sar−emc)
1	2412	1	single		DBPSK	DSSS	1.76	4.33	0.75	10.00	0.00	12.51	17.82	−0.34	2.57		
6	2437	1	single		DBPSK	DSSS	1.99	4.67	0.75	10.00	0.00	12.74	18.79	−0.11	2.68		
11	2462	1	single	o	DBPSK	DSSS	2.10	4.80	0.75	10.00	0.00	12.85	19.28	(max.)	2.70		
1	2412	11	single		CCK/PBCC	DSSS	1.72	4.36	0.75	10.00	0.00	12.47	17.66	−0.36	2.64	12.42	0.05
6	2437	11	single		CCK/PBCC	DSSS	2.02	4.69	0.75	10.00	0.00	12.77	18.92	−0.06	2.67	12.77	0.00
11	2462	11	single	o	CCK/PBCC	DSSS	2.08	4.80	0.75	10.00	0.00	12.83	19.19	(max.)	2.72	12.63	0.20
														⊿low rate			
6	2437	1	single		DBPSK	DSSS	1.99	4.67	0.75	10.00	0.00	12.74	18.79	(ref.)	2.68	12.53	0.21
6	2437	2	single		DQPSK	DSSS	1.92	4.59	0.75	10.00	0.00	12.67	18.49	−0.07	2.67	12.66	0.01
6	2437	5.5	single		CCK/PBCC	DSSS	1.99	4.16	0.75	10.00	0.00	12.74	18.79	0.00	2.17	12.74	0.00
6	2437	11	single	o	CCK/PBCC	DSSS	2.02	4.69	0.75	10.00	0.00	12.77	18.92	0.03	2.67	12.77	0.00

*. 0≦⊿(sar−emc) ≦0.21dB

【Output power】			Tx mode:		11g				set=12dBm				*.PAR=Peak(dB)−Ave(dB)[dB]				Power/EMC test	
Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation		P/M Reading Ave[dBm]	P/M Reading Pk[dBm]	Cable Loss [dB]	Attenuator [dB]	duty factor [dB]	Power/SAR Ref. Ave[dBm]	Power/SAR Ref. Ave[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar−emc)
1	2412	6	single		BPSK	DSSS	1.76	9.61	0.75	10.00	0.00	12.51	17.82	−0.37	7.85		
6	2437	6	single	o(worst)	BPSK	DSSS	2.13	9.87	0.75	10.00	0.00	12.88	19.41	(max.)	7.74		
11	2462	6	single		BPSK	DSSS	2.12	9.96	0.75	10.00	0.00	12.87	19.36	−0.01	7.84		
1	2412	24	single		16QAM	DSSS	1.38	9.74	0.75	10.00	0.00	12.13	16.33	−0.58	8.36	11.93	0.20
6	2437	24	single	o	16QAM	DSSS	1.96	10.10	0.75	10.00	0.00	12.71	18.66	(max.)	8.14	12.52	0.19
11	2462	24	single		16QAM	DSSS	1.91	10.07	0.75	10.00	0.00	12.66	18.45	−0.05	8.16	12.58	0.08
														⊿low rate			
6	2437	6	single	o	BPSK	OFDM	2.13	9.87	0.75	10.00	0.00	12.88	19.41	(ref.)	7.74	12.76	0.12
6	2437	9	single		BPSK	OFDM	2.07	9.74	0.75	10.00	0.00	12.82	19.14	−0.06	7.67	12.63	0.19
6	2437	12	single		QPSK	OFDM	2.04	9.95	0.75	10.00	0.00	12.79	19.01	−0.09	7.91	12.59	0.20
6	2437	18	single		QPSK	OFDM	2.06	9.43	0.75	10.00	0.00	12.81	19.10	−0.07	7.37	12.68	0.13
6	2437	24	single		16QAM	OFDM	1.96	10.10	0.75	10.00	0.00	12.71	18.66	−0.17	8.14	12.52	0.19
6	2437	36	single		16QAM	OFDM	2.01	9.94	0.75	10.00	0.00	12.76	18.88	−0.12	7.93	12.58	0.18
6	2437	48	single		64QAM	OFDM	2.01	9.80	0.75	10.00	0.00	12.76	18.88	−0.12	7.79	12.59	0.17
6	2437	54	single		64QAM	OFDM	1.96	9.99	0.75	10.00	0.00	12.71	18.66	−0.17	8.03	12.57	0.14

*. 0≦⊿(sar−emc) ≦0.21dB

【Output power】			Tx mode:		11n(20HT)				set=12dBm				*.PAR=Peak(dB)−Ave(dB)[dB]				Power/EMC test	
Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation		P/M Reading Ave[dBm]	P/M Reading Pk[dBm]	Cable Loss [dB]	Attenuator [dB]	duty factor [dB]	Power/SAR Ref. Ave[dBm]	Power/SAR Ref. Ave[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar−emc)
1	2412	MCS0	single		BPSK	DSSS	1.52	9.11	0.75	10.00	0.00	12.27	16.87	−0.59	7.59		
6	2437	MCS0	single		BPSK	DSSS	2.10	9.55	0.75	10.00	0.00	12.85	19.28	−0.01	7.45		
11	2462	MCS0	single	o	BPSK	DSSS	2.11	9.57	0.75	10.00	0.00	12.86	19.32	(max.)	7.46		
1	2412	MCS3	single		16QAM	DSSS	1.62	9.37	0.75	10.00	0.00	12.37	17.26	−0.44	7.75	12.28	0.09
6	2437	MCS3	single		16QAM	DSSS	2.02	9.61	0.75	10.00	0.00	12.77	18.92	−0.04	7.59	12.74	0.03
11	2462	MCS3	single	o	16QAM	DSSS	2.06	9.70	0.75	10.00	0.00	12.81	19.10	(max.)	7.64	12.79	0.02
														⊿low rate			
6	2437	MCS0	single		BPSK	OFDM	2.10	9.55	0.75	10.00	0.00	12.85	19.28	(ref.)	7.45	12.71	0.14
6	2437	MCS1	single		BPSK	OFDM	2.09	9.62	0.75	10.00	0.00	12.84	19.23	−0.01	7.53	12.67	0.17
6	2437	MCS2	single	o	QPSK	OFDM	2.12	9.51	0.75	10.00	0.00	12.87	19.36	0.02	7.39	12.76	0.11
6	2437	MCS3	single		QPSK	OFDM	2.02	9.61	0.75	10.00	0.00	12.77	18.92	−0.08	7.59	12.74	0.03
6	2437	MCS4	single		16QAM	OFDM	2.01	9.64	0.75	10.00	0.00	12.76	18.88	−0.09	7.63	12.71	0.05
6	2437	MCS5	single		16QAM	OFDM	1.91	9.54	0.75	10.00	0.00	12.66	18.45	−0.19	7.63	12.66	0.00
6	2437	MCS6	single		64QAM	OFDM	1.95	9.64	0.75	10.00	0.00	12.70	18.62	−0.15	7.69	12.64	0.06
6	2437	MCS7	single		64QAM	OFDM	2.04	9.51	0.75	10.00	0.00	12.79	19.01	−0.06	7.47	12.79	0.00

*. 0≦⊿(sar−emc) ≦0.21dB

【Output power】			Tx mode:		11n(40HT)				set=12dBm				*.PAR=Peak(dB)−Ave(dB)[dB]				Power/EMC test	
Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation		P/M Reading Ave[dBm]	P/M Reading Pk[dBm]	Cable Loss [dB]	Attenuator [dB]	duty factor [dB]	Power/SAR Ref. Ave[dBm]	Power/SAR Ref. Ave[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar−emc)
3	2422	MCS0	single		BPSK	DSSS	1.42	9.39	0.75	10.00	0.00	12.17	16.48	−0.30	7.97		
6	2437	MCS0	single	o	BPSK	DSSS	1.72	9.40	0.75	10.00	0.00	12.47	17.66	(max.)	7.68		
9	2452	MCS0	single		BPSK	DSSS	1.71	9.59	0.75	10.00	0.00	12.46	17.62	−0.01	7.88		
3	2422	MCS3	single		16QAM	DSSS	1.38	9.72	0.75	10.00	0.00	12.13	16.32	−0.24	8.34	12.13	0.00
6	2437	MCS3	single	o	16QAM	DSSS	1.62	9.85	0.75	10.00	0.00	12.37	17.26	(max.)	8.23	12.28	0.09
9	2452	MCS3	single		16QAM	DSSS	1.54	9.77	0.75	10.00	0.00	12.29	16.94	−0.08	8.23	12.16	0.13
														⊿low rate			
6	2437	MCS0	single	o	BPSK	OFDM	1.72	9.40	0.75	10.00	0.00	12.47	17.66	(ref.)	7.68	12.27	0.20
6	2437	MCS1	single		BPSK	OFDM	1.53	9.47	0.75	10.00	0.00	12.28	16.90	−0.19	7.94	12.24	0.04
6	2437	MCS2	single		QPSK	OFDM	1.61	9.51	0.75	10.00	0.00	12.36	17.22	−0.11	7.90	12.16	0.20
6	2437	MCS3	single		QPSK	OFDM	1.62	9.85	0.75	10.00	0.00	12.37	17.26	−0.10	8.23	12.28	0.09
6	2437	MCS4	single		16QAM	OFDM	1.43	9.64	0.75	10.00	0.00	12.18	16.52	−0.29	8.21	12.15	0.03
6	2437	MCS5	single		16QAM	OFDM	1.52	9.76	0.75	10.00	0.00	12.27	16.87	−0.20	8.24	12.18	0.09
6	2437	MCS6	single		64QAM	OFDM	1.54	9.53	0.75	10.00	0.00	12.29	16.94	−0.18	7.99	12.19	0.10
6	2437	MCS7	single		64QAM	OFDM	1.52	9.32	0.75	10.00	0.00	12.27	16.87	−0.20	7.80	12.21	0.06

*. Since the maximum average power of 11g/n(20HT) were less than 0.25dB higher than the corresponded 11b channel, the SAR test was only considered at the 11b mode.(KDB 248227) However, maximum average power existed at 11g mode, SAR test was applied at 11g mode with one of condition of 11b and for the comparison additionally.

*. For 11b/g/n(20HT)/n(40HT), the average power of higher data rate was less than 0.25dB higher than the lowest data rate. Therefore, SAR test was only considered the lowest data rate. (KDB 248227) However, maximum average power of 11b was at 11Mbps data rate, SAR test was applied at 11Mbps of 11b additionally.

*. Since 11n(40HT) mode had 40MHz band width, the SAR test was also applied to 11n(40HT) mode.

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

*. A red figure indicates it is the maximum value in the condition.

*. The difference between the SAR reference power and the power of EMC test was not less than 0dB and not higher than 0.21dB.

*. SAR reference; Date tested: April 17, 2012 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (24 deg.C / 50 %RH)
The EUT that was measured the power was shipped back to the customer, and was installed into the platform for the SAR test.

*. "Power/EMC test"; this reference is described in the test report of 32AE0317-SH-02-A.

SECTION 7: SAR Measurement results

7.1 SAR (Body) for the platform(1) (model: DS126401)

Measurement date: June 20, 2012 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**	50.73 (-3.7%)	1.939 (-0.6%)	23.5	155	23.6	65	June 20, 2012, before SAR test.
2412	***52.75***	***1.914***	50.97 (-3.4%)	1.879 (-1.8%)					
2437	***52.72***	***1.938***	50.98 (-3.3%)	1.912 (-1.3%)					
2462	***52.68***	***1.967***	50.85 (-3.5%)	1.953 (-0.7%)					

*. 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]

SAR measurement results (Body tissue)													
Mode	Frequency		Modulation / Data rate / crest factor	EUT setup conditions			Liquid temp. [deg.C]		Power drift [dB]	SAR(1g) [W/kg]	Data# in Appendix 2-2	Remarks
	Ch.	[MHz]		Position	Separation distance	Battery	Before	After		max. value of multi-peak		
Step 1: Worst position search												
11b	6	2437	DBPSK&DSSS / 1Mbps / 1.0	Top-left	0 mm (touch)	#1	23.5	23.5	0.122	**0.353**	Step 1-1	-
				Front		#2	23.5	23.5	0.116	**0.077**	Step 1-2	-
				Front-left		#2	23.5	23.5	0.063	**0.172**	Step 1-3	-
Step 2: Change the channels												
11b	1	2412	DBPSK&DSSS / 1Mbps / 1.0	Top-left	0 mm (touch)	#1	23.5	23.5	-0.046	**0.302**	Step 2-1	-
	11	2462				#2	23.5	23.5	-0.013	**0.371**	Step 2-2	-
Step 3: Change the operation mode, data rate												
11n (40HT)	6	2437	BPSK&OFDM / MCS0 / 1.0	Top-left	0 mm (touch)	#2	23.5	23.5	0.006	**0.311**	Step 3-1	(SAR: 11n(40HT) < 11b)
11b	11	2462	CCK&DSSS / 11Mbps / 1.0			#1	23.6	23.6	-0.016	**0.359**	Step 3-2	(SAR: 11Mbps < 1Mbps)
11g	11	2462	BPSK&OFDM / 6Mbps / 1.0			#2	23.6	23.6	-0.030	**0.332**	Step 3-3	(SAR: 11g < 11b)
Step 4: Additional position search and change the channels												
11b	6	2437	DBPSK&DSSS / 1Mbps / 1.0	Top-left-front	0 mm (touch)	#1	23.6	23.6	0.001	**0.425**	Step 4-1	->Worst position.
	1	2412				#2	23.6	23.6	-0.027	**0.332**	Step 4-2	-
	11	2462				#1	23.6	23.6	-0.012	**0.437**	Step 4-3	→**Worst SAR.**

Notes:

*. At average power measurement, since the maximum average power of 11g/n(20HT) were less than 0.25dB higher than the corresponded 11b channel, the SAR test was only considered at the 11b mode.(KDB 248227) However, maximum average power existed at 11g mode, SAR test was applied at 11g mode with one of condition of 11b and for the comparison additionally.

*. At average power measurement, for 11b/g/n(20HT)/n(40HT), the average power of higher data rate was less than 0.25dB higher than the lowest data rate. Therefore, SAR test was only considered the lowest data rate. (KDB 248227) However, maximum average power of 11b was at 11Mbps data rate, SAR test was applied at 11Mbps of 11b additionally.

*. 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	7.64	±12.0%
2437	2450	-13MHz, within ±50 of cal.frequency	7.64	±12.0%
2462	2450	+12MHz, within ±50 of cal.frequency	7.64	±12.0%

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