SAR TEST REPORT

Test Report No. : 31JE0038-SH-02-A-R01

Applicant	:	**FUJIFILM Corporation**
Type of Equipment	:	**Flat Panel Sensor**
Model No.	:	**DR-ID 613SE** ***. With wireless LAN module: 11a,11n(20HT),11n(40HT), MIMO 2×2**
FCC ID	:	**W2Z-01000004**
Test Standard	:	**FCC 47CFR §2.1093,** **Supplement C (Edition 01-01) to OET Bulletin 65**
Test Result	:	**Complied**
Highest SAR(1g) Value	:	**0.12 W/kg** ((UNII) Antenna #0, IEEE 802.11a, 6Mbps(BPSK/OFDM), 5180MHz) **0.20 W/kg** ((UNII) Antenna #1, IEEE 802.11a, 6Mbps(BPSK/OFDM), 5180MHz)

***. Co-location was not considered, because the antenna distance was more than 200mm and SAR to peak location separation ratio was enough smaller than 0.3.**

***. Highest SAR(1g) across exposure conditions = 0.20 W/kg = grant listing.**

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Date of test: May 22, 2012

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

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

JAB Testing RTL02610

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REVISION HISTORY

Revision	Test report No.	Date	Page revised	Contents
Original	31JE0038-SH-02-A	June 8, 2012	-	-
R01	31JE0038-SH-02-A-R01	June 22, 2012	1, 2, 3, 9	Corrected the operating power of RF module. Corrected SAR test order.

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

SECTION 1: Customer information

Company Name	FUJIFILM Corporation
Brand Name	FUJIFILM
Address	798 Miyanodai, Kaisei-machi, Ashigarakami-gun, Kanagawa-ken 258-8538, Japan
Telephone Number	81-465-85-4054
Facsimile Number	81-465-85-2043
Contact Person	Tomonari Sendai

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type of Equipment	Flat Panel Sensor *.The EUT is a Flat Panel Sensor with a wireless LAN (11a, 11n(20HT), 11n(40HT)) specification.
Model Number	DR-ID 613SE
Serial Number	E120017
Condition of EUT	Production prototype
Receipt Date of Sample	May 16, 2012 / *. No modification by the Lab.
Country of Mass-production	Japan
Category Identified	Portable device *. This EUT is hand-supported device with output power < 436 mW (1000×[5.24GHz]$^{-0.5}$). Therefore, the hand-SAR is not required (KDB447498). *. This EUT may touch to a human body and head during Wi-Fi operation.
Rating	DC 12V operation. *. This dc power is supplied from either the battery or bus-power connected with the MP. As for EUT, priority was given to bus-power operation during the SAR test. It is because the software of MP supervised transmitting power of EUT at the time of bus-power operation. Furthermore, when it was battery operation, continuous transmission was stopped automatically for about 20 minutes. This operating time was too short for SAR evaluation.
Accessory of EUT	None. The SAR test considers the human body touch condition.

2.2 Product Description (RF module, antenna)

RF module equipment type	Transceiver
RF module model number	SX-PCEAN(FF)
RF module serial number	0126C5
Frequency of operation	5180-5240MHz (W52 band, UNII), (5190-5230MHz for IEEE 802.11n(40HT))
Channel spacing	5MHz
Bandwidth	20MHz (11a,11n(20HT)), 40MHz (11n(40HT))
ITU code	D1D
Type of modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna model	ANTB026-023A0
Antenna quantity	2 pcs. (Location: Top, Side (Refer to Appendix A.)) *. The model number of two antennas is the same. IEEE 802.11a: One selected Tx antenna operation. IEEE.802.11n: One selected Tx antenna operation (MCS0~MCS7) / Two Tx antenna operation (MCS8~MCS13)
Antenna type	Planer inverted F antenna
Antenna connector type	RF PCB side: U.FL, Antenna side: U.FL
Antenna gain (maximum)	2.14 dBi Cable loss: 2.3dB (5.15GHz)~2.5dB (5.25GHz) (for antenna #0) Cable loss: 2.3dB (5.15GHz)~2.5dB (5.25GHz) (for antenna #1)
Transmit power (target power)	12.5 dBm average (11a), 11 dBm average of single antenna operation (11n(20HT), 11n(40HT)) 14 dBm average of dual antenna operation (11n(20HT), 11n(40HT)) *Refer to section 6 in this report.
Power supply	Power input: DC3.3V (*.with constant voltage circuit.)
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) (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 D02 (v01) (11/13/2009):**	Dipole Requirements for SAR System Validation and Verification
☒ **KDB 865664 (rev.1.1) (Oct. 2006):**	SAR Measurement Requirements for 3-6GHz

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

Item	Test Procedure	Limit	Exclusion	Remarks	Result
Human exposure	FCC OET Bulletin 65, Supplement C	1.6 W/kg (FCC 47CFR §2.1093)	(*1)	SAR measurement	**Complied.** **Maximum SAR(1g):** **0.12 W/kg** (UNII, Antenna #0 (side), IEEE 802.11a, 6Mbps, 5180MHz) **0.20 W/kg** (UNII, Antenna #1 (top), IEEE 802.11a, 6Mbps, 5180MHz)

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
Co-location was not considered, because the antenna distance was more than 200mm and SAR to peak location separation ratio was enough smaller than 0.3.

3.4 Test Location

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

UL Japan, Inc., Shonan EMC Lab.
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.

Test	Remarks	Serial number
SAR	**Since the SAR sample was identical with the EMC sample, the reference power of SAR test was only measured for the confirmation of EUT operation.** 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. *. The power was measured by the calibrated power sensor and power meter (65MHz measurement bandwidth).	0126C5 (RF module: SX-PCEAN(FF))
Reference	EMC power was measured during EMC testing. (Refer to the test report: 31JE0038-SH-01-A.)	

3.5.2 Average power for SAR tests

Step.1 Data rate check

The data rate check was measurement all data rate in the lower default frequency. (*1)

*1. 5180MHz (11a, 11n(20HT)), 5190MHz (11n(40HT))

11a		11n(20HT)						11n (40HT)					
Modulation (OFDM)	Data rate	MCS Index	Spatial Stream	Modulation (OFDM)	MCS Index	Spatial Stream	Modulation (OFDM)	MCS Index	Spatial Stream	Modulation (OFDM)	MCS Index	Spatial Stream	Modulation (OFDM)
BPSK	6 Mbps	MCS0	1	BPSK	MCS8	2	BPSK	MCS0	1	BPSK	MCS8	2	BPSK
BPSK	9 Mbps	MCS1	1	QPSK	MCS9	2	QPSK	MCS1	1	QPSK	MCS9	2	QPSK
QPSK	12 Mbps	MCS2	1	QPSK	MCS10	2	QPSK	MCS2	1	QPSK	MCS10	2	QPSK
QPSK	18 Mbps	MCS3	1	16QAM	MCS11	2	16QAM	MCS3	1	16QAM	MCS11	2	16QAM
16QAM	24 Mbps	MCS4	1	16QAM	MCS12	2	16QAM	MCS4	1	16QAM	MCS12	2	16QAM
16QAM	36 Mbps	MCS5	1	64QAM	MCS13	2	64QAM	MCS5	1	64QAM	MCS13	2	64QAM
64QAM	48 Mbps	MCS6	1	64QAM	MCS14	2	64QAM	MCS6	1	64QAM	MCS14	2	64QAM
64QAM	54 Mbps	MCS7	1	64QAM	MCS15	2	64QAM	MCS7	1	64QAM	MCS15	2	64QAM

Step.2 Consideration of SAR test channel

The average output power for 802.11a, 11n(20HT), 11n(40Ht) were measured on all channels.

Mode	GHz	Channel	default (*2)	SAR tested channel			Remarks
			11a/n(20HT)	11a	11n(20HT)	11n(40HT)	
802.11a/n	5.18	36	√	#	n/a (*3)	-	SAR test was only applied at lowest data rate. (*4)
	5.19	38	-	-	-	n/a (*3)	
	5.20	40	*	n/a	n/a (*3)	-	
	5.22	44	*	n/a	n/a (*3)	-	
	5.23	46	-	-	-	n/a (*3)	
	5.24	48	√	#	n/a (*3)	-	

√ = "default test channels of requested by KDB248227", n/a: SAR test was not applied, # = SAR test was considered.
* = Possible 802.11a channels with maximum average output > the "default test channels"
*2. Refer to table 1, KDB248227 for the "default test channel".
*3. Since the target average power of 11n(20HT) and 11n(40HT) was 1.5dB lower than the corresponded 11a power, SAR test was not applied to the 11n(20HT) and 11n(40HT) mode. (KDB248227)
*4. Since the average power of higher data rate was less than 0.25dB higher than the lowest data rate, SAR test was only applied to the lowest data rate. (KDB248227)

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 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 #0 to user distance	SAR test	Antenna #1 to user distance	SAR test	SAR type
Right	The right surface of EUT was touched to the Flat phantom. This section is the closest to an antenna #0.	**≈4mm**	applied	**≈200mm**	**not applied**	Hand-held, Body(touch)
Top	The top surface of EUT was touched to the Flat phantom. This section is the closest to an antenna #1.	**≈140mm**	**not applied**	**≈4mm**	applied	
Back	The back surface (operator side) of EUT was only touched to the Flat phantom.	**≈7mm**	applied	**≈7mm**	applied	
Front	The front surface (patient side) of EUT was only touched to the Flat phantom.	**≈5mm**	applied	**≈5mm**	applied	Hand-held, Body(touch) Head (touch)
Bottom	The bottom surface of EUT was touched to the Flat phantom.	**≈140mm**	**not applied**	**≈325mm**	**not applied**	Hand-held, Body(touch)
Left	The left surface of EUT was touched to the Flat phantom.	**≈260mm**	**not applied**	**≈40mm**	**not applied**	

*. The above-mentioned number in the table is the size actually measured on EUT. (Refer to Appendix A for more details.)
***. Size of EUT: 267.5 (width) × 327.5 (depth) × 15 (height) [mm]**

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. (*. when this was required.)

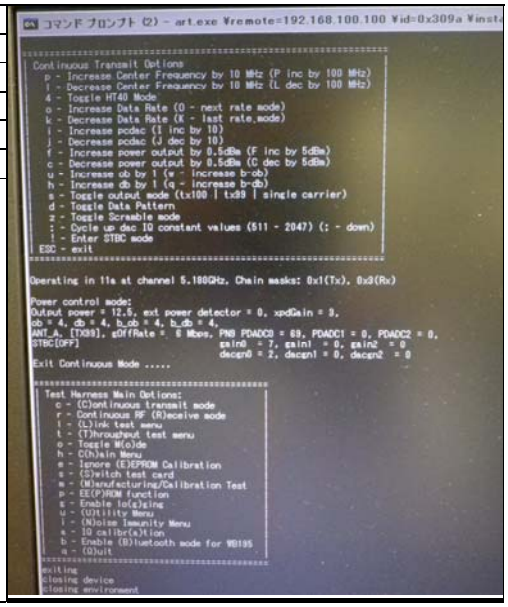
*. During SAR test, the radiated power is always monitored by Spectrum Analyzer.

SECTION 4: Operation of EUT during testing

4.1 Operating modes for the power measurement and the SAR testing

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

Operation mode	11a	11n(20HT)	11n(40HT)
Tx frequency band	5180-5240MHz		5190-5230MHz
Tested channel	36ch (5180MHz) (*1)	not applied (*2)	not applied (*2)
Modulation	BPSK/OFDM	not applied (*2)	not applied (*2)
Data rate	6Mbps	not applied (*2)	not applied (*2)
Crest factor	1.0 (100% duty cycle)	not applied (*2)	not applied (*2)
Controlled software	MS DOS command prompt: art.exe¥remote=192.168.100.100 ¥id=0x309a |instance=1 During SAR test, the EUT was connected with the MP (Main Processor) via SE cable. The MP was set the transmit condition and also supplied dc power via SE cable. The control software made set transmission antenna, q'ty, data rate, frequency. The transmit power was made pre-set by the internal calibration data before the test. *. antenna condition; 11a: single transmission antenna either antenna #0 or #1.		



*1. Lower frequency was selected. Refer to Section 7 Measurement results.
*2. The SAR test was only applied to 11a mode. Refer to Section 7 Measurement results.

SECTION 5: Uncertainty Assessment (SAR measurement)

Uncertainty of SAR measurement (v04)	5-6GHz	
	1g SAR	10g SAR
Combined measurement uncertainty of the measurement system (k=1)	**± 13.6%**	± 13.4%
Expanded uncertainty (k=2)	**± 27.2%**	± 26.8%

	Error Description (v04)	Uncertainty Value	Probability distribution	Divisor	ci (1g)	ci (10g)	ui (1g)	ui (10g)	Vi, veff
A	**Measurement System**						(std. uncertainty)	(std. uncertainty)	
1	Probe Calibration Error(5.2,5.3,5.5,5.6,5.8GHz±100MHz)	±6.55 %	Normal	1	1	1	±6.55 %	±6.55 %	∞
2	Axial isotropy	±4.7 %	Rectangular	√3	0.7	0.7	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy (*flat phantom, <5°)	±9.6 %	Rectangular	√3	0.7	0.7	±3.9 %	±3.9 %	∞
4	Boundary effects	±4.8 %	Rectangular	√3	1	1	±2.8 %	±2.8 %	∞
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	Response Time Error (<5ms/100ms wait)	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
8	Integration Time Error(100% duty cycle)	±0.0 %	Rectangular	√3	1	1	±0.0 %	±0.0 %	∞
9	System readout electronics (DAE)	±0.3 %	Normal	1	1	1	±0.3 %	±0.3 %	∞
10	RF ambient conditions-noise (<0.12mW/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	±3.3 %	Rectangular	√3	1	1	±1.9 %	±1.9 %	∞
13	Probe positioning with respect to phantom shell	±6.7 %	Rectangular	√3	1	1	±3.9 %	±3.9 %	∞
14	Max.SAR evaluation	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
B	**Test Sample Related**								
15	Device positioning	±5.0 %	Normal	1	1	1	±5.0 %	±5.0 %	145
16	Device holder uncertainty	±3.6 %	Normal	1	1	1	±3.6 %	±3.6 %	5
17	Power drift	±5.0 %	Rectangular	√3	1	1	±2.9 %	±2.9 %	∞
C	**Phantom and Setup**								
18	Phantom uncertainty	±7.5 %	Rectangular	√3	1	1	±4.3 %	±4.3 %	∞
19	Liquid conductivity (target) (≤5%)	±5.0 %	Rectangular	√3	0.64	0.43	±1.8 %	±1.2 %	∞
20	Liquid conductivity (meas.)	±3.0 %	Normal	1	0.64	0.43	±1.9 %	±1.3 %	6
21	Liquid permittivity (target) (≤5%)	±5.0 %	Rectangular	√3	0.6	0.49	±1.7 %	±1.4 %	∞
22	Liquid permittivity (meas.)	±3.0 %	Normal	1	0.6	0.49	±1.8 %	±1.5 %	6
	Combined Standard Uncertainty						**±13.6** %	**±13.4** %	734
	Expanded Uncertainty (k=2)						**±27.2** %	**±26.8** %	

*. 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 for SAR test reference

*. Since SAR test sample was identical with the EMC test sample, the power data is common to the SAR test and EMC test.

【Output power】 Tx mode: 11a set=12.5dBm

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation	duty factor [dB]	Attenuator [dB]	Cable Loss [dB]	Ant.#0 P/M [dBm] Ave	Ant.#0 P/M [dBm] Pk	Ant.#0 Results [dBm] Ave	Ant.#0 Results [dBm] Pk	Ant.#0 ⊿worst ave.[dB]	Ant.#0 PAR [dB]	Cable Loss [dB]	Ant.#1 P/M [dBm] Ave	Ant.#1 P/M [dBm] Pk	Ant.#1 Results [dBm] Ave	Ant.#1 Results [dBm] Pk	Ant.#1 ⊿worst ave.[dB]	Ant.#1 PAR [dB]
36	5180	6	0,1	o:o/1:o	BPSK	OFDM	0.02	10.04	1.20	0.92	11.18	12.18	22.44	worst	10.26	1.27	0.65	10.63	11.98	21.96	worst	9.98
40	5200	6	0,1		BPSK	OFDM	0.02	10.04	1.20	0.74	10.77	12.00	22.03	-0.18	10.03	1.27	0.56	10.24	11.89	21.57	-0.09	9.68
44	5220	6	0,1		BPSK	OFDM	0.02	10.04	1.20	0.63	11.29	11.89	22.55	-0.29	10.66	1.27	0.56	10.23	11.89	21.56	-0.09	9.67
48	5240	6	0,1		BPSK	OFDM	0.02	10.04	1.20	0.55	11.41	11.81	22.67	-0.37	10.86	1.27	0.54	10.09	11.87	21.42	-0.11	9.55
[Power vs. Data rate]														⊿worst						⊿worst	
36	5180	6	0,1	o:o/1:o	BPSK	OFDM	0.02	10.04	1.20	0.92	11.18	12.18	22.44	worst	10.26	1.27	0.65	10.78	11.98	22.11	worst	10.13
36	5180	9	0,1		BPSK	OFDM	0.03	10.04	1.20	0.79	10.99	12.06	22.26	-0.12	10.20	1.27	0.63	11.16	11.97	22.50	-0.01	10.53
36	5180	12	0,1		QPSK	OFDM	0.04	10.04	1.20	0.72	10.74	12.00	22.02	-0.18	10.02	1.27	0.57	10.59	11.92	21.94	-0.06	10.02
36	5180	18	0,1		QPSK	OFDM	0.05	10.04	1.20	0.54	11.87	11.83	23.16	-0.35	11.33	1.27	0.43	10.69	11.79	22.05	-0.19	10.26
36	5180	24	0,1		16QAM	OFDM	0.07	10.04	1.20	0.55	10.78	11.86	22.09	-0.32	10.23	1.27	0.43	10.58	11.81	21.96	-0.17	10.15
36	5180	36	0,1		16QAM	OFDM	0.11	10.04	1.20	0.52	10.77	11.87	22.12	-0.31	10.25	1.27	0.41	10.59	11.83	22.01	-0.15	10.18
36	5180	48	0,1		64QAM	OFDM	0.14	10.04	1.20	0.55	10.74	11.93	22.12	-0.25	10.19	1.27	0.38	10.34	11.83	21.79	-0.15	9.96
36	5180	54	0,1		64QAM	OFDM	0.16	10.04	1.20	0.55	10.78	11.95	22.18	-0.23	10.23	1.27	0.43	10.48	11.90	21.95	-0.08	10.05

on time [ms]	1cycle [ms]	Duty Factor	Duty Fator [dB]
3.1380	3.1510	99.6%	0.02
2.1020	2.1150	99.4%	0.03
1.5820	1.5950	99.2%	0.04
1.0620	1.0740	98.9%	0.05
0.8014	0.8142	98.4%	0.07
0.5415	0.5542	97.7%	0.11
0.4130	0.4263	96.9%	0.14
0.3693	0.3823	96.6%	0.16

【Output power】 Tx mode: 11n(20HT) set=11dBm

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation	duty factor [dB]	Attenuator [dB]	Cable Loss [dB]	Ant.#0 P/M [dBm] Ave	Ant.#0 P/M [dBm] Pk	Ant.#0 Results [dBm] Ave	Ant.#0 Results [dBm] Pk	Ant.#0 ⊿worst ave.[dB]	Ant.#0 PAR [dB]	Cable Loss [dB]	Ant.#1 P/M [dBm] Ave	Ant.#1 P/M [dBm] Pk	Ant.#1 Results [dBm] Ave	Ant.#1 Results [dBm] Pk	Ant.#1 ⊿worst ave.[dB]	Ant.#1 PAR [dB]	SUM Ave [dBm]
36	5180	MCS0	0,1	0:o	BPSK	OFDM	0.02	10.04	1.20	-0.82	10.33	10.44	21.59	worst	11.15	1.27	-0.59	10.13	10.74	21.46	worst	10.72	
40	5200	MCS0	0,1	1:o	BPSK	OFDM	0.02	10.04	1.20	-0.88	10.66	10.38	21.92	-0.06	11.54	1.27	-0.83	10.05	10.50	21.38	-0.24	10.88	
44	5220	MCS0	0,1		BPSK	OFDM	0.02	10.04	1.20	-0.86	10.03	10.40	21.29	-0.04	10.89	1.27	-0.72	10.13	10.61	21.46	-0.13	10.85	
48	5240	MCS0	0,1		BPSK	OFDM	0.02	10.04	1.20	-0.85	10.32	10.41	21.58	-0.03	11.17	1.27	-0.72	10.03	10.61	21.36	-0.13	10.75	
[Power vs. Data rate]														⊿worst						⊿worst		
36	5180	MCS0	0,1	o:o/1:o	BPSK	OFDM	0.02	10.04	1.20	-0.82	10.33	10.44	21.59	worst	11.15	1.27	-0.59	10.13	10.74	21.46	worst	10.72	
36	5180	MCS1	0,1		QPSK	OFDM	0.04	10.04	1.20	-0.85	9.52	10.43	20.80	-0.01	10.37	1.27	-0.79	9.82	10.56	21.17	-0.18	10.61	
36	5180	MCS2	0,1		QPSK	OFDM	0.06	10.04	1.20	-1.09	9.99	10.21	21.29	-0.23	11.08	1.27	-0.80	9.89	10.57	21.26	-0.17	10.69	
36	5180	MCS3	0,1		16QAM	OFDM	0.08	10.04	1.20	-1.03	9.74	10.29	21.06	-0.15	10.77	1.27	-0.67	9.96	10.72	21.35	-0.02	10.63	
36	5180	MCS4	0,1		16QAM	OFDM	0.12	10.04	1.20	-0.94	9.67	10.42	21.03	-0.02	10.61	1.27	-0.70	9.98	10.73	21.41	-0.01	10.68	
36	5180	MCS5	0,1		64QAM	OFDM	0.15	10.04	1.20	-1.04	9.98	10.35	21.37	-0.09	11.02	1.27	-0.87	9.90	10.59	21.36	-0.15	10.77	
36	5180	MCS6	0,1		64QAM	OFDM	0.16	10.04	1.20	-0.99	9.90	10.41	21.30	-0.03	10.89	1.27	-0.89	9.81	10.58	21.28	-0.16	10.70	
36	5180	MCS7	0,1		64QAM	OFDM	0.18	10.04	1.20	-1.11	9.24	10.31	20.66	-0.13	10.35	1.27	-0.97	9.73	10.52	21.22	-0.22	10.70	
36	5180	MCS8	0+1	0+1:o	BPSK	OFDM	0.04	10.04	1.20	-0.93	9.58	10.35	20.86	-0.09	10.51	1.27	-0.61	9.75	10.74	21.10	0.00	10.36	13.56
36	5180	MCS9	0+1		QPSK	OFDM	0.08	10.04	1.20	-0.98	9.55	10.34	20.87	-0.10	10.53	1.27	-0.66	9.76	10.73	21.15	-0.01	10.42	13.55
36	5180	MCS10	0+1		QPSK	OFDM	0.11	10.04	1.20	-1.04	9.39	10.31	20.74	-0.13	10.43	1.27	-0.69	9.83	10.73	21.25	-0.01	10.52	13.54
36	5180	MCS11	0+1		16QAM	OFDM	0.15	10.04	1.20	-1.04	9.36	10.35	20.75	-0.09	10.40	1.27	-0.73	9.60	10.73	21.06	-0.01	10.33	13.55
36	5180	MCS12	0+1		16QAM	OFDM	0.20	10.04	1.20	-1.11	9.39	10.33	20.83	-0.11	10.50	1.27	-0.81	9.37	10.70	20.88	-0.04	10.18	13.53
36	5180	MCS13	0+1		64QAM	OFDM	0.26	10.04	1.20	-1.28	9.44	10.22	20.94	-0.22	10.72	1.27	-0.84	9.39	10.73	20.96	-0.01	10.23	13.49
36	5180	MCS14	0+1		64QAM	OFDM	0.28	10.04	1.20	-1.22	9.15	10.30	20.67	-0.14	10.37	1.27	-0.86	9.56	10.73	21.15	-0.01	10.42	13.53
36	5180	MCS15	0+1		64QAM	OFDM	0.31	10.04	1.20	-1.28	9.30	10.27	20.85	-0.17	10.58	1.27	-0.90	9.69	10.72	21.31	-0.02	10.59	13.51

on time [ms]	1cycle [ms]	Duty Factor	Duty Fator [dB]
2.9150	2.9270	99.6%	0.02
1.4780	1.4900	99.2%	0.04
0.9975	1.0100	98.8%	0.06
0.7574	0.7705	98.3%	0.08
0.5169	0.5303	97.5%	0.12
0.3971	0.4105	96.7%	0.15
0.3574	0.3704	96.5%	0.16
0.3247	0.3384	96.0%	0.18
1.4820	1.4950	99.1%	0.04
0.7812	0.7741	98.3%	0.08
0.5216	0.5349	97.5%	0.11
0.4009	0.4146	96.7%	0.15
0.2811	0.2942	95.5%	0.20
0.2211	0.2344	94.3%	0.26
0.2013	0.2145	93.8%	0.28
0.1851	0.1984	93.3%	0.31

【Output power】 Tx mode: 11n(40HT) set=10(11)dBm

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Max.Ave. pwr.:o	Modulation	duty factor [dB]	Attenuator [dB]	Cable Loss [dB]	Ant.#0 P/M [dBm] Ave	Ant.#0 P/M [dBm] Pk	Ant.#0 Results [dBm] Ave	Ant.#0 Results [dBm] Pk	Ant.#0 ⊿worst ave.[dB]	Ant.#0 PAR [dB]	Cable Loss [dB]	Ant.#1 P/M [dBm] Ave	Ant.#1 P/M [dBm] Pk	Ant.#1 Results [dBm] Ave	Ant.#1 Results [dBm] Pk	Ant.#1 ⊿worst ave.[dB]	Ant.#1 PAR [dB]	SUM Ave [dBm]
38	5190	MCS0	0,1		BPSK	OFDM	0.04	10.04	1.20	-1.59	10.74	9.69	22.02	-0.92	12.33	1.27	-1.60	10.45	9.75	21.80	-0.99	12.05	
46	5230	MCS0	0,1	o:o/1:o	BPSK	OFDM	0.04	10.04	1.20	-0.67	10.77	10.61	22.05	worst	11.44	1.27	-0.61	10.64	10.74	21.99	worst	11.25	
[Power vs. Data rate]														⊿worst						⊿worst		
38	5190	MCS0	0,1	o:o/1:o	BPSK	OFDM	0.04	10.04	1.20	-1.59	10.74	9.69	22.02	worst	12.33	1.27	-1.60	10.45	9.75	21.80	worst	12.05	
38	5190	MCS1	0,1		QPSK	OFDM	0.08	10.04	1.20	-1.68	8.84	9.64	20.16	-0.05	10.52	1.27	-1.72	9.16	9.67	20.55	-0.08	10.88	
38	5190	MCS2	0,1		QPSK	OFDM	0.11	10.04	1.20	-1.72	8.99	9.63	20.34	-0.06	10.71	1.27	-1.68	9.08	9.74	20.50	-0.01	10.76	
38	5190	MCS3	0,1		16QAM	OFDM	0.15	10.04	1.20	-1.83	8.84	9.56	20.23	-0.13	10.67	1.27	-1.72	9.04	9.74	20.50	-0.01	10.76	
38	5190	MCS4	0,1		16QAM	OFDM	0.20	10.04	1.20	-1.86	8.88	9.58	20.32	-0.11	10.74	1.27	-1.77	9.14	9.74	20.65	-0.01	10.91	
38	5190	MCS5	0,1		64QAM	OFDM	0.26	10.04	1.20	-1.84	9.41	9.66	20.91	-0.03	11.25	1.27	-1.83	9.43	9.74	21.00	-0.01	11.26	
38	5190	MCS6	0,1		64QAM	OFDM	0.27	10.04	1.20	-1.90	9.03	9.61	20.54	-0.08	10.93	1.27	-1.92	8.90	9.66	20.48	-0.09	10.82	
38	5190	MCS7	0,1		64QAM	OFDM	0.31	10.04	1.20	-1.98	8.76	9.57	20.31	-0.12	10.74	1.27	-1.90	8.68	9.72	20.30	-0.03	10.58	
38	5190	MCS8	0+1	0+1:o	BPSK	OFDM	0.08	10.04	1.20	-1.73	9.32	9.59	20.64	-0.10	11.05	1.27	-1.65	9.26	9.74	20.65	-0.01	10.91	12.68
38	5190	MCS9	0+1		QPSK	OFDM	0.15	10.04	1.20	-1.80	8.73	9.59	20.12	-0.10	10.53	1.27	-1.73	9.05	9.73	20.51	-0.02	10.78	12.67
38	5190	MCS10	0+1		QPSK	OFDM	0.21	10.04	1.20	-1.87	9.07	9.58	20.52	-0.11	10.94	1.27	-1.78	8.86	9.74	20.38	-0.01	10.64	12.67
38	5190	MCS11	0+1		16QAM	OFDM	0.26	10.04	1.20	-1.94	8.96	9.56	20.46	-0.13	10.90	1.27	-1.84	8.90	9.73	20.47	-0.02	10.74	12.66
38	5190	MCS12	0+1		16QAM	OFDM	0.34	10.04	1.20	-2.04	9.10	9.54	20.68	-0.15	11.14	1.27	-2.06	8.98	9.59	20.63	-0.16	11.04	12.58
38	5190	MCS13	0+1		64QAM	OFDM	0.42	10.04	1.20	-2.07	8.90	9.59	20.56	-0.10	10.97	1.27	-2.15	8.54	9.58	20.27	-0.17	10.69	12.60
38	5190	MCS14	0+1		64QAM	OFDM	0.44	10.04	1.20	-2.13	8.65	9.55	20.33	-0.14	10.78	1.27	-2.18	8.32	9.57	20.07	-0.18	10.50	12.57
38	5190	MCS15	0+1		64QAM	OFDM	0.47	10.04	1.20	-2.15	8.29	9.56	20.00	-0.13	10.44	1.27	-2.20	8.26	9.58	20.04	-0.17	10.46	12.58

on time [ms]	1cycle [ms]	Duty Factor	Duty Fator [dB]
1.4260	1.4390	99.1%	0.04
0.7335	0.7464	98.3%	0.08
0.5015	0.5140	97.6%	0.11
0.3852	0.3982	96.7%	0.15
0.2693	0.2819	95.5%	0.20
0.2130	0.2260	94.2%	0.26
0.1936	0.2059	94.0%	0.27
0.1772	0.1899	93.3%	0.31
0.7370	0.7494	98.3%	0.08
0.3892	0.4020	96.8%	0.15
0.2730	0.2860	95.5%	0.21
0.2171	0.2300	94.4%	0.26
0.1571	0.1698	92.5%	0.34
0.1292	0.1420	91.0%	0.42
0.1212	0.1339	90.5%	0.44
0.1132	0.1260	89.8%	0.47

*. SAR reference; Date tested: May 17, 2012 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25.1 deg.C / 51 %RH)
*. Calculating formula: Results = ["P/M Reading"] + ["Cbl.loss"(Cable loss)] + ["Att.loss"(Attenuator)] + ["duty factor"]
*. A red figure indicates it is the maximum value in each antenna, in measurement condition and in operation condition.
*. Since the average power of higher data rate was less power than the lowest data rate, SAR test was only applied to the lowest data rate. (KDB248227)
*. Since the power of 11n(20HT) and 11n(40HT) modes were lower than corresponded 11a mode, SAR test was only applied to 11a mode. (KDB248227)

SECTION 7: Measurement results

7.1 SAR results (Body touch)

Measurement date: May 22, 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]	
5200	***49.01***	***5.299***	47.51 (-3.1%)	5.349 (+0.9%)	24.5	143	24.7	46	May 22, 2012, before SAR test.
5180	***49.04***	***5.276***	47.49 (-3.2%)	5.301 (+0.5%)					

*. 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 3000MHz and 5800MHz. As an intermediate solution, dielectric parameters for the frequencies between 5180 to 5240 MHz were obtained using linear interpolation. (Refer to Appendix 3-7 in this report)

[SAR measurement results]

SAR measurement results (Body-touch)													
Op. 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]		Antenna no#	Position	Separation distance	Before	After		maximum value of multi-peak		
Antenna: Antenna #0 (side)												
Step 1a: Worst position search												
11a	36	5180	BPSK&OFDM / 6Mbps / 1.0	#0 (top)	**Right**	0 mm	23.6	23.7	0.145	**0.123**	Step 1a-1	**->Worst for antenna #0.** *. Fill charged battery operation.
				#0 (top)	**Back**	0 mm	23.8	23.8	-0.052	**0.015**	Step 1a-2	*. MP's bus-power operation.
				#0 (top)	**Front**	0 mm	23.8	23.9	0.099	**0.019**	Step 1a-3	*. MP's bus-power operation.
Antenna: Antenna #1 (top)												
Step 1b: Worst position search												
11a	36	5180	BPSK&OFDM / 6Mbps / 1.0	#1 (side)	**Top**	0 mm	23.7	23.7	0.154	**0.204**	Step 1b-1	**->Worst for antenna #1.** *. MP's bus-power operation.
				#1 (side)	**Back**	0 mm	24.1	24.1	-0.058	**0.035**	Step 1b-2	*. MP's bus-power operation.
				#1 (side)	**Front**	0 mm	23.9	24.0	0.008	**0.040**	Step 1b-3	*. MP's bus-power operation.

Notes:

*. The SAR test was only applied to the lower channel (as default) that had highest average antenna power, because the measured SAR(1g) with this channel was less than 0.8W/kg. In accordance with KDB 447498, 1), e), i),the measured SAR was less than 0.8W/kg and the frequency band was equal or smaller than 100MHz (this EUT had 60MHz frequency band), the SAR test was only performed lower default channel that had highest average antenna power.

*. Since the target average power of 11n(20HT) and 11n(40HT) was 1.5dB lower than the corresponded 11a power, SAR test was not applied to the 11n(20HT) and 11n(40HT) mode. (KDB248227)

*. For Co-location of the multi antenna transmitting simultaneously (MIMO), the measured SAR(1g) values of each antenna were not summed, because the antenna separation of each antenna was more than 5cm.

*. The test was not applied to other surface which was not described in above. Because the measured SAR values were very small even the cross section of antenna, and these surfaces had enough separation distance (longer than 30mm) from each antenna.

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

*. 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
5180	5200	-20MHz, within ±50 of cal.frequency	4.10	±13.1%

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

7.2 SAR results (Head touch)

***. The head SAR by using the head simulated liquid was not applied, because the measured body SAR was enough small to the limit.**