SAR TEST REPORT

Test Report No. : 31IE0161-SH-04-B

Applicant	:	**CANON INC.**
Type of Equipment	:	**Digital Radiography with Wireless LAN module**
Model No.	:	**BM70659 (Wireless LAN module)** **w/Platform(2): CXDI-70C Wireless (WM5A1) (Digital Radiography)**
Test Standard	:	**FCC 47CFR §2.1093,** **Supplement C (Edition 01-01) to OET Bulletin 65**
Test Result	:	**Complied**
Maximum SAR(1g) Value	:	**0.043 W/kg** (at patient side, IEEE 802.11b, 1Mbps(DBPSK/DSSS), 2437MHz/2412-2462 MHz band) **0.014 W/kg** (at patient side, IEEE 802.11a, 6Mbps(BPSK/OFDM), 5180MHz/5180-5240MHz band) **0.039 W/kg** (at patient side, IEEE 802.11a, 6Mbps(BPSK/OFDM), 5785MHz/5745-5825MHz band)

*. Body/Head-touch & Portable device. SAR limit was for general population/uncontrolled exposure, and considered on the multi-platform.
*. Refer to the **FCC tracking number: 230486** for the SAR test plan of this EUT.

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above standards.
4. The test results in this test report are traceable to the national or international standards.
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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: May 23 and 24, 2011

Test engineer:
Hiroshi Naka
Engineer of WiSE Japan, UL Verification Service

Approved by:
Toyokazu Imamura
Leader of WiSE Japan, UL Verification Service

JAB Testing RTL02610

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

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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	81-3-3757-9680
Facsimile Number	81-3-5482-9284
Contact Person	Hideki Hosoya

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

2.1 Identification of EUT

Type of Equipment	Digital Radiography with Wireless LAN module
Model Number, Size of EUT	Wireless LAN module: BM70659 Size: approx.32mm×28mm×t=3mm Platform (2): CXDI-70C Wireless (WM5A1) (*1); Size: 460mm×384mm×t=15mm (without handle option), weigth:3.4kg 510mm×490mm×t=16mm (with handle option)
Serial Number	Wireless LAN module: DE2-12 Platform (2): 11DR-118
Condition of EUT	Production prototype (Not for sale; This sample is equivalent to mass-production items)
Category Identified	Portable device
Feature of EUT	- The EUT is Digital Radiography with Wireless LAN module. - The EUT is used by the medic directly touching for the patient. Or, the EUT is used by the patient under the medic's management. - Low transmission Duty Factor: A minimum X-ray exposure cycle is 15 seconds that contain the image data transfer time (for 2~3 seconds.) after it takes an X-ray image. - There are two kinds of the communication states that are 1) connecting state (burst and short time communication such as a response to beacon from access point and command communication), 2) continuous transmission state (when the image is transferred).
Accessary	An ANTI-SCATTED GRID and a grid cover with a Handle unit in optional.
Tested consideration	During SAR test, the EUT was operated by the full-charged battery. (DC9~12V, 0.92A) The front surface side (patient body side) of EUT was touched to the bottom flat phantom. The antenna position of the EUT was arranged at the center of the phantom. The SAR test applied without accessories and with accessories. (*. Receipt date of sample: May 23, 2011 / *. No modification by the test lab.)
FCC tracking number	The SAR test reduction plan was submitted and this tracking number was; **230486**.

*1. CXDI-70C Wireless (WM5A1): digital radiography (platform) has the series model: CXDI-70G Wireless (WM5A3).
CXDI-70G Wireless (WM5A3) is almost equal with CXDI-70C Wireless (WM5A1) in mechanical and electrical specifications. There is no difference except material of scintillator. This difference causes a slight change of SAR level which is small enough.
Therefore, CXDI-70C Wireless (WM5A1) was tested as a representative of the platform of the wireless LAN module.

2.2 Product Description (Wireless LAN module: BM70659)

Equipment type	Transceiver	Transceiver	Transceiver
Frequency of operation	2412-2462MHz	5180-5240MHz	5745-5825MHz
Channel spacing	5MHz	20MHz (11a, 11n(20HT)), 40MHz (11n(40HT)	
Bandwidth	20MHz, 40MHz(11n(40HT))	20MHz, 40MHz(11n(40HT)	
ITU code	G1D, D1D	D1D	D1D
Type of modulation	DSSS, OFDM	OFDM	
Q'ty of Antenna	1 pc.		
Antenna type / Model name	type: PIFA (Planar Inverted F Antenna) / model: WLAN ANTENA (PADCAN-002)		
Antenna connector type	RF module side: U.FL connector compatible/ antenna side: soldered		
Antenna gain (max.peak)	-3.790 dBi (2500MHz) *.with cable loss	3.714 dBi (5500MHz) *.with cable loss	
Transmit power	*. refers to section 6 in this report.	*. refers to section 6 in this report.	
Mode of operation	Simplex		
Power supply	DC 3.5V (supplied from the platform (2), *.with constant voltage circuit.)		
Method of frequency generation	Crystal		
Operation temperature range	0 to +45 deg.C		

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

SECTION 3: Test specification, procedures and results

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

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

1. Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
2. IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

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

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

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

IEEE Std. 1528-2003:

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

In additions;

KDB 447498 D01(v04)(Nov.13, 2009): Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB 248227 (rev.1.2)(May 29, 2007): SAR Measurement Procedures for 802.11a//b/g Transmitters

3.2 Exposure limit

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

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

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

Whole-Body (averaged over the entire body)	Partial-Body (averaged over any 1g of tissue)	Hands, Wrists, Feet and Ankles (averaged over any 10g of tissue)
0.08	**1.6**	4.0

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).
General Population/Uncontrolled Environments: are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

The limit applied in this test report is;

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

3.3 Procedures and Results

Item	Test Procedure	Limit	Exclusion	Remarks	Result
Human exposure	FCC OET Bulletin 65, Supplement C	1.6 W/kg (FCC 47CFR §2.1093)	(*1)	SAR measurement (in accordance with KDB447498, KDB248227)	**Complied** (*2)

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

*1. Refer to the **FCC tracking number: 230486** for the SAR test plan of this EUT.

***2.** The worst SAR(1g) of each frequency band was as follows;

0.043 W/kg (at patient side, with accessories, IEEE 802.11b, 1Mbps(DBPSK/DSSS), 2437MHz/2412-2462 MHz band)
0.014 W/kg (at patient side, with accessories, IEEE 802.11a, 6Mbps(BPSK/OFDM), 5180MHz/5180-5240MHz band)
0.039 W/kg (at patient side, with accessories, IEEE 802.11a, 6Mbps(BPSK/OFDM), 5785MHz/5745-5825MHz band)

3.4 Test Location

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

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Telephone number: +81 463 50 6400 / Facsimile number: +81 463 50 6401

3.5 Confirmation before SAR testing

3.5.1 Correlation of Output Power between EMC and SAR tests

It was checked that the antenna port power was correlated within 0~+5% (FCC requirements)
The result is shown in Section 6.

*. **Output power at SAR test:** SAR power was measured before SAR testing (serial number: DE2-12).
The antenna terminal conducted output power was measured by the calibrated power sensor and power meter (65MHz measurement bandwidth).
For 2.4GHz band, the average and the power of 11b, 11g, 11n(20HT) and 11n(40HT) mode were measured at default channel.
For 5GHz band, the average and the peak power of 11a, 11n(20HT) and 11n(40HT) mode were measured at all channel.

*. **Output power at EMC radio test:** EMC power was measured during EMC testing. (serial number: DE2-17).
For the SAR reference, the average and the peak power of 11b, 11g, 11a, 11n(20HT) and 11n(40HT) mode were measured by the calibrated power sensor and power meter (65MHz measurement bandwidth) and at specified channels.

3.5.2 Average power for SAR tests

Step.1 Data rate check

The data rate check was measurement on one of the channel for 802.11b/g/a/n(20HT)/n(40HT) at each frequency band.

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

Step.2 Decision of SAR test channel

For the SAR test reference, the average and peak output powers were measured on default channels of 802.11b/g/n(20HT)/n(40HT) (for 2.4GHz band) and all channels of 802.11a/n(20HT)/n(40HT) (for W52 and W58 band) by the calibrated power sensor and power meter (65MHz measurement bandwidth).

Mode		GHz	Channel	"Default Test Channel"			
				FCC 15.247		UNII	
				802.11b	802.11g		
802.11 b/g		2.412	1	√	Δ		
		2.437	6	√	Δ		
		2.462	11	√	Δ		
802.11a	UNII	5.18	36			√	
		5.20	40				*
		5.22	44				*
		5.24	48			√	
	UNII or FCC 15.247	5.745	149	√		√	
		5.765	153		*		*
		5.785	157	√			*
		5.805	161		*	√	
	FCC 15.247	5.825	165	√			

√ = "default test channels"
* = Possible 802.11a channels with maximum average output > the "default test channels"
Δ = Possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

3.6 Confirmation after SAR testing

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

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

Limit of power drift[W] = ±5%
Power drift limit (X) [dB] = 10log(P_drift)=10log(1.05/1)=10log(1.05)-10log(1)=0.21dB
from E-filed relations with power.
S=E×H=E^2/η=P/(4×π×r^2) (η: Space impedance) → P=(E^2×4×π×r^2)/η
Therefore, The correlation of power and the E-filed
Power drift limit (X) dB=10log(P_drift)=10log(E_drift)^2=20log(E_drift)
From the above mentioned, the calculated power drift of DASY4 system must be the less than ±0.21dB.

3.7 Measurement procedure

Operation mode: **IEEE 802.11b, IEEE 802.11a**

Radiated power is always monitored by Spectrum Analyzer.
The 11b (DSSS) mode with lowest data rate (1Mbps, DBPSK) and 11a (OFDM) mode with lowest data rate (6Mbps, BPSK) were only SAR measured, because these were highest antenna port conducted power value in each frequency band.

Step 1	Apply SAR test on the front side of EUT (contact side with patient) in touch condition, with and without the accessories. (at lowest data rate, at maximum average power channel in the test band.) *. The SAR test only applies to the front side of EUT, because the front side of EUT is the worst RF exposure side for the patient. (*1)
Step 2	Change the frequency band and repeat step1.

*1. Refer to the **FCC tracking number: 230486** for the SAR test plan of this EUT.

3.8 Test setup of EUT

Setup	Explanation
Front-touch	The front surface of EUT (contact side with patient) was touched to the Flat phantom. "Front-touch w/o accessary": The SAR was measured without metal-handle accessary. "Front-touch w/ accessary": The SAR was measured with metal-handle accessary.

*. SAR test position (distance b/w antenna and side edge)

	Platform(2) (size:460mm×384mm×t=15mm)	
Direction	**SAR test?**	**SAR test?**
Front surface (patient side)	**applied**	**applied**
Rear surface (medic side)	**not applied** (*2)	**not applied** (*2)
Left edge (supported by hand, antenna side)	**not applied** (*2)	**not applied** (*2)
Right edge (supported by hand)	**not applied** (*2)	**not applied** (*2)
Top edge (supported by hand)	**not applied** (*2)	**not applied** (*2)
Bottom edge (supported by hand)	**not applied** (*2)	**not applied** (*2)

*2. The SAR test was not applied. Refer to the SAR test plan submitted (**FCC tracking number: 230486**)

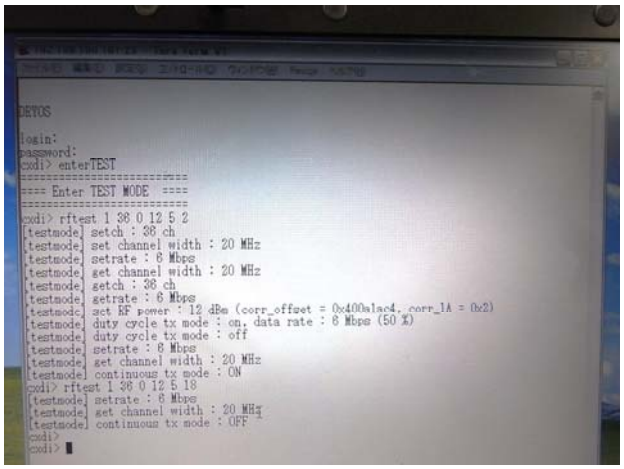
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes for SAR testing

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

Operation mode	11b	11g	11n(20HT)	11n(40HT)	11a	11n(20HT)	11n(40HT)
Tx frequency band	2412-2462MHz			2422-2452MHz	5180-5240MHz 5745-5825MHz		5190-5230MHz 5755-5795MHz
Tested frequency	2437MHz (6ch) (*4)	SAR test was not applied (*4)			5180MHz (36ch), 5785MHz (157ch) (*4)	SAR test was not applied (*4)	
Modulation	DBPSK/DSSS	SAR test was not applied (*4)			BPSK/OFDM	SAR test was not applied (*4)	
Data rate	1Mbps (*3)	SAR test was not applied (*4)			6Mbps (*3)	SAR test was not applied (*4)	
Crest factor	1.0 (100% duty cycle)	SAR test was not applied (*4)			1.0 (100% duty cycle)	SAR test was not applied (*4)	
Controlled software	Tera Term-rftest mode (*5) During SAR test, the EUT was connected with the host note PC via ribbon flat cable. The software installed in PC made the transmitting condition.						

*3. It was lower data rate and had a maximum average power of antenna terminal conducted measurement.
*4. Refer to the **FCC tracking number: 230486** for the SAR test plan of this EUT.
*5. The right photograph is the PC screen sample of the software used.
(command: [antenna number] [channel]
[bandwidth(0:20MHz/1:40MHz)] [power] [data rate] [rf-on/off])



SECTION 5: Uncertainty Assessment (SAR measurement)

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

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

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

Uncertainty of SAR measurement system	5~6 GHz	
	1g SAR	10g SAR
combined measurement uncertainty of the measurement system (k=1)	**± 13.6%**	± 13.3%
expanded uncertainty (k=2)	**± 27.2%**	± 26.7%

	Error Description	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	±6.8 %	Normal	1	1	1	±6.8 %	±6.8 %	∞
2	Axial isotropy	±4.7 %	Rectangular	√3	0.7	0.7	±1.9 %	±1.9 %	∞
3	Hemispherical isotropy (*flat phantom, <5°)	±2.6 %	Rectangular	√3	0.7	0.7	±1.1 %	±1.1 %	∞
4	Boundary effects	±2.0 %	Rectangular	√3	1	1	±1.2 %	±1.2 %	∞
5	Probe linearity	±4.7 %	Rectangular	√3	1	1	±2.7 %	±2.7 %	∞
6	System detection limit	±1.0 %	Rectangular	√3	1	1	±0.6 %	±0.6 %	∞
7	System readout electronics	±0.3 %	Normal	1	1	1	±0.3 %	±0.3 %	∞
8	Response time	±0.8 %	Rectangular	√3	1	1	±0.5 %	±0.5 %	∞
9	Integration time	±2.6 %	Rectangular	√3	1	1	±1.5 %	±1.5 %	∞
10	RF ambient - noise	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
11	RF ambient - reflections	±3.0 %	Rectangular	√3	1	1	±1.7 %	±1.7 %	∞
12	Probe positioner mechanical tolerance	±0.8 %	Rectangular	√3	1	1	±0.5 %	±0.5 %	∞
13	Probe positioning with respect to phantom shell	±9.9 %	Rectangular	√3	1	1	±5.7 %	±5.7 %	∞
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 %	∞
16	Device holder uncertainty	±5.0 %	Normal	1	1	1	±5.0 %	±5.0 %	∞
17	Power drift	±5.0 %	Rectangular	√3	1	1	±5.0 %	±2.9 %	∞
C	**Phantom and Setup**								
18	Phantom uncertainty	±4.0 %	Rectangular	√3	1	1	±2.3 %	±2.3 %	∞
19	Liquid conductivity (target)	±5.0 %	Rectangular	√3	0.64	0.43	±1.8 %	±1.2 %	∞
20	Liquid conductivity (meas.)	±3.0 %	Normal	1	0.64	0.43	±1.9 %	±1.3 %	∞
21	Liquid permittivity (target)	±5.0 %	Rectangular	√3	0.6	0.49	±1.7 %	±1.4 %	∞
22	Liquid permittivity (meas.)	±3.2 %	Normal	1	0.6	0.49	±1.9 %	±1.6 %	∞
	Combined Standard Uncertainty						**±13.6** %	**±13.3** %	∞
	Expanded Uncertainty (k=2)						**±27.2** %	**±26.7** %	

*. This measurement uncertainty budget is suggested by Schmid & Partner Engineering AG. [6]

SECTION 6: Confirmation before testing

6.1 Assessment for the conducted power of EUT / Correction of the power at EMC test and at SAR test

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

Worst data rate / worst channel determination (with full charged battery#1) (WLAN module serial number: DE2-12)
/ vs. power at EMC test (WLAN module serial number: DE2-17)

⊿(sar−emc): 0< x <0.21dB

【Output power】 Tx mode: 11b with Battery:#1 *.PAR=Peak(dB)−Ave(dB)[dB]

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation	P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cbl.Loss [dB]	Att.loss [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Power at EMC test Ave. [dB]	⊿(sar−emc)	Pk [dB]	⊿(sar−emc)
1	2412	1	single	x	DBPSK DSSS	2.10	4.70	0.75	10.02	12.87	15.47	19.36	35.24	−0.04	2.60				
6	2437	1	single	ox	DBPSK DSSS	2.14	4.78	0.75	10.02	12.91	15.55	19.54	35.89	0.00	2.64				
11	2462	1	single	x	DBPSK DSSS	2.02	4.63	0.75	10.02	12.79	15.40	19.01	34.67	−0.12	2.61				
1	2412	1	(vs. Battery:#2)			2.13	4.77	0.75	10.02	12.90	15.54	19.50	35.81	−	2.64				
														⊿low rate		Ave.	⊿ave	Pk.	⊿pk
6	2437	1	single	o	DBPSK DSSS	2.14	4.78	0.75	10.02	12.91	15.55	19.54	35.89	0.00	2.64	12.79	0.12	15.49	0.06
6	2437	2	single		DQPSK DSSS	2.09	4.77	0.75	10.02	12.86	15.54	19.32	35.81	−0.05	2.68	12.86	0.00	15.54	0.00
6	2437	5.5	single	(o)	CCK/PBCC DSSS	2.14	4.38	0.75	10.02	12.91	15.15	19.54	32.73	0.00	2.24	12.83	0.08	15.15	0.00
6	2437	11	single		CCK/PBCC DSSS	2.12	4.76	0.75	10.02	12.89	15.53	19.45	35.73	−0.02	2.64	12.89	0.00	15.53	0.00

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.
*. **The output power did not depend on the battery condition.**

【Output power】 Tx mode: 11g with Battery:#1 *.PAR=Peak(dB)−Ave(dB)[dB]

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation	P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cbl.Loss [dB]	Att.loss [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Power at EMC test Ave. [dB]	⊿(sar−emc)	Pk [dB]	⊿(sar−emc)
1	2412	6	single	xo	BPSK DSSS	1.75	11.18	0.75	10.02	12.52	21.95	17.86	156.68	0.00	9.43				
6	2437	6	single	x	BPSK DSSS	1.53	11.04	0.75	10.02	12.30	21.81	16.98	151.71	−0.22	9.51				
11	2462	6	single	x	BPSK DSSS	1.74	11.23	0.75	10.02	12.51	22.00	17.82	158.49	−0.01	9.49				
														⊿low rate		Ave.	⊿ave	Pk.	⊿pk
6	2437	6	single	o	BPSK OFDM	1.53	11.07	0.75	10.02	12.30	21.84	16.98	152.76	0.00	9.54	12.17	0.13	21.77	0.07
6	2437	9	single		BPSK OFDM	1.46	10.46	0.75	10.02	12.23	21.23	16.71	132.74	−0.07	9.00	12.14	0.09	21.19	0.04
6	2437	12	single		QPSK OFDM	1.45	10.76	0.75	10.02	12.22	21.53	16.67	142.23	−0.08	9.31	12.20	0.02	21.38	0.15
6	2437	18	single		QPSK OFDM	1.50	10.27	0.75	10.02	12.27	21.04	16.87	127.06	−0.03	8.77	12.19	0.08	20.92	0.12
6	2437	24	single		16QAM OFDM	1.42	11.06	0.75	10.02	12.19	21.83	16.56	152.41	−0.11	9.64	12.14	0.05	21.79	0.04
6	2437	36	single		16QAM OFDM	1.34	10.45	0.75	10.02	12.11	21.22	16.26	132.43	−0.19	9.11	12.01	0.10	21.04	0.18
6	2437	48	single		64QAM OFDM	1.35	10.61	0.75	10.02	12.12	21.38	16.29	137.40	−0.18	9.26	12.03	0.09	21.25	0.13
6	2437	54	single		64QAM OFDM	1.33	10.78	0.75	10.02	12.10	21.55	16.22	142.89	−0.20	9.45	12.00	0.10	21.51	0.04

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.

【Output power】 Tx mode: 11n(20HT) with Battery:#1 *.PAR=Peak(dB)−Ave(dB)[dB]

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation	P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cbl.Loss [dB]	Att.loss [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Power at EMC test Ave. [dB]	⊿(sar−emc)	Pk [dB]	⊿(sar−emc)
1	2412	MCS0	single	ox	DBPSK DSSS	1.79	10.40	0.75	10.02	12.56	21.17	18.03	130.92	0.00	8.61				
6	2437	MCS0	single	x	DBPSK DSSS	1.44	10.20	0.75	10.02	12.21	20.97	16.63	125.03	−0.35	8.76				
11	2462	MCS0	single	ox	DBPSK DSSS	1.79	10.40	0.75	10.02	12.56	21.17	18.03	130.92	0.00	8.61				
														⊿low rate		Ave.	⊿ave	Pk.	⊿pk
6	2437	MCS0	single	o	BPSK OFDM	1.44	10.17	0.75	10.02	12.21	20.94	16.63	124.17	0.00	8.73	12.06	0.15	20.74	0.20
6	2437	MCS1	single		QPSK OFDM	1.37	10.15	0.75	10.02	12.14	20.92	16.37	123.59	−0.07	8.78	12.10	0.04	20.92	0.00
6	2437	MCS2	single		QPSK OFDM	1.39	10.16	0.75	10.02	12.16	20.93	16.44	123.88	−0.05	8.77	12.12	0.04	20.93	0.00
6	2437	MCS3	single		16QAM OFDM	1.39	10.20	0.75	10.02	12.16	20.97	16.44	125.03	−0.05	8.81	12.14	0.02	20.97	0.00
6	2437	MCS4	single		16QAM OFDM	1.38	10.00	0.75	10.02	12.15	20.77	16.41	119.40	−0.06	8.62	12.03	0.12	20.74	0.03
6	2437	MCS5	single		64QAM OFDM	1.39	10.00	0.75	10.02	12.16	20.77	16.44	119.40	−0.05	8.61	12.04	0.12	20.76	0.01
6	2437	MCS6	single		64QAM OFDM	1.35	9.95	0.75	10.02	12.12	20.72	16.29	118.03	−0.09	8.60	12.06	0.06	20.72	0.00
6	2437	MCS7	single		64QAM OFDM	1.36	9.98	0.75	10.02	12.13	20.75	16.33	118.85	−0.08	8.62	12.03	0.10	20.68	0.07

*. The average power of higher data rate was less than 0.25dB higher than the lowest data rate. Therefore, each channel was measured at lowest data rate.

【Output power】 Tx mode: 11n(40HT) with Battery:#1 *.PAR=Peak(dB)−Ave(dB)[dB]

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation	P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cbl.Loss [dB]	Att.loss [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Power at EMC test Ave. [dB]	⊿(sar−emc)	Pk [dB]	⊿(sar−emc)
3	2422	MCS0	single	ox	BPSK OFDM	0.48	9.55	0.75	10.02	11.25	20.32	13.34	107.65	0.00	9.07				
6	2437	MCS0	single	x	BPSK OFDM	0.38	9.40	0.75	10.02	11.15	20.17	13.03	103.99	−0.10	9.02				
9	2452	MCS0	single	x	BPSK OFDM	−0.02	9.12	0.75	10.02	10.75	19.89	11.89	97.50	−0.50	9.14				
														⊿low rate		Ave.	⊿ave	Pk.	⊿pk
6	2437	MCS0	single		BPSK OFDM	0.38	9.40	0.75	10.02	11.15	20.17	13.03	103.99	0.00	9.02	10.95	0.20	19.98	0.19
6	2437	MCS1	single		QPSK OFDM	0.44	9.45	0.75	10.02	11.21	20.22	13.21	105.20	0.06	9.01	11.04	0.17	20.03	0.19
6	2437	MCS2	single		QPSK OFDM	0.42	9.83	0.75	10.02	11.19	20.60	13.15	114.82	0.04	9.41	11.12	0.07	20.59	0.01
6	2437	MCS3	single		16QAM OFDM	0.39	10.32	0.75	10.02	11.16	21.09	13.06	128.53	0.01	9.93	11.14	0.02	20.96	0.13
6	2437	MCS4	single		16QAM OFDM	0.44	10.10	0.75	10.02	11.21	20.87	13.21	122.18	0.06	9.66	11.09	0.12	20.77	0.10
6	2437	MCS5	single		64QAM OFDM	0.41	10.32	0.75	10.02	11.18	21.09	13.12	128.53	0.03	9.91	11.02	0.16	20.91	0.18
6	2437	MCS6	single	o	64QAM OFDM	0.48	9.54	0.75	10.02	11.25	20.31	13.34	107.40	0.10	9.06	11.06	0.19	20.25	0.06
6	2437	MCS7	single		64QAM OFDM	0.43	9.52	0.75	10.02	11.20	20.29	13.18	106.91	0.05	9.09	11.01	0.19	20.09	0.20

*. The average power of higher data rate was less than 0.25dB higher than the lowest data rate. Therefore, each channel was measured at lowest data rate.

*. Calculating formula: Results = ["P/M Reading"] +["Cbl.loss"(Cable loss)] + ["Att.loss"(Attenuator)] / 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; Measured date: May 23, 2011 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25 deg.C / 48 %RH)
EMC test; Measured date: May 15 and 23, 2011 / Measured by: Kenichi Adachi / This reference is described in the test report of 31IE0161-SH-02-A and -B.
*. A red-letter figure shows the maximum power of SAR reference (in data rate, in channel) and of EMC test .
*. **The duty cycle of each mode and on each data rate were 100% (no off time) in the software used.**

6.1.2 5180-5240MHz band (W52 band) (802.11a/n(20HT)/n(40HT))

Worst data rate / worst channel determination (with full charged battery#1) (WLAN module serial number: DE2-12)
/ vs. power at EMC test (WLAN module serial number: DE2-17)

⊿(sar-radio): 0< x <0.21dB

【Output power】 Tx mode: 11a(W52) 5180-5320MHz with Battery:#1 *.PAR=Peak(dB)-Ave(dB)[dB]

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation		P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Power at EMC test Ave. [dB]	⊿(sar-emc)	Pk [dB]	⊿(sar-emc)
36	5180	6	single	xo	BPSK	OFDM	1.10	10.26	1.20	10.06	12.36	21.52	17.22	141.91	0.00	9.16				
40	5200	6	single		BPSK	OFDM	0.73	10.12	1.20	10.06	11.99	21.38	15.81	137.40	-0.37	9.39	11.88	0.11	21.19	0.19
44	5220	6	single		BPSK	OFDM	0.83	10.21	1.20	10.06	12.09	21.47	16.18	140.28	-0.27	9.38				
48	5240	6	single	x	BPSK	OFDM	0.48	10.08	1.20	10.06	11.74	21.34	14.93	136.14	-0.62	9.60				
36	5180	6	(vs. Battery:#2)				1.10	10.24	1.20	10.06	12.36	21.50	17.22	141.25	0.00	9.14				
															⊿low rate		Ave.	⊿ave	Pk	⊿pk
36	5180	6	single	o	BPSK	OFDM	1.10	10.26	1.20	10.06	12.36	21.52	17.22	141.91	0.00	9.16				
36	5180	9	single		BPSK	OFDM	0.98	9.92	1.20	10.06	12.24	21.18	16.75	131.22	-0.12	8.94				
36	5180	12	single		QPSK	OFDM	0.97	10.09	1.20	10.06	12.23	21.35	16.71	136.46	-0.13	9.12				
36	5180	18	single		QPSK	OFDM	1.04	9.61	1.20	10.06	12.30	20.87	16.98	122.18	-0.06	8.57				
36	5180	24	single		16QAM	OFDM	0.98	10.18	1.20	10.06	12.24	21.44	16.75	139.32	-0.12	9.20				
36	5180	36	single		16QAM	OFDM	0.90	10.16	1.20	10.06	12.16	21.42	16.44	138.68	-0.20	9.26				
36	5180	48	single		64QAM	OFDM	0.95	9.77	1.20	10.06	12.21	21.03	16.63	126.77	-0.15	8.82				
36	5180	54	single		64QAM	OFDM	0.93	10.12	1.20	10.06	12.19	21.38	16.56	137.40	-0.17	9.19				
40	5200	6	single	o	BPSK	OFDM	0.73	10.12	1.20	10.06	11.99	21.38	15.81	137.40	0.00	9.39	11.88	0.11	21.19	0.19
40	5200	9	single		BPSK	OFDM	0.65	9.60	1.20	10.06	11.91	20.86	15.52	121.90	-0.08	8.95	11.72	0.19	20.66	0.20
40	5200	12	single		QPSK	OFDM	0.65	9.87	1.20	10.06	11.91	21.13	15.52	129.72	-0.08	9.22	11.71	0.20	20.93	0.20
40	5200	18	single		QPSK	OFDM	0.60	9.37	1.20	10.06	11.86	20.63	15.35	115.61	-0.13	8.77	11.67	0.19	20.49	0.14
40	5200	24	single		16QAM	OFDM	0.72	10.11	1.20	10.06	11.98	21.37	15.78	137.09	-0.01	9.39	11.98	0.00	21.21	0.16
40	5200	36	single		16QAM	OFDM	0.61	9.84	1.20	10.06	11.87	21.10	15.38	128.82	-0.12	9.23	11.87	0.00	21.10	0.00
40	5200	48	single		64QAM	OFDM	0.66	9.66	1.20	10.06	11.92	20.92	15.56	123.59	-0.07	9.00	11.92	0.00	20.90	0.02
40	5200	54	single		64QAM	OFDM	0.63	9.87	1.20	10.06	11.89	21.13	15.45	129.72	-0.10	9.24	11.89	0.00	21.11	0.02

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.
*. **The output power did not depend on the battery condition.**

【Output power】 Tx mode: 11n(20HT)(W52/53) 5180-5320MHz with Battery:#1 *.PAR=Peak(dB)-Ave(dB)[dB]

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation		P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Power at EMC test Ave. [dB]	⊿(sar-emc)	Pk [dB]	⊿(sar-emc)
36	5180	MCS0	single	ox	BPSK	OFDM	1.08	9.67	1.20	10.06	12.34	20.93	17.14	123.88	0.00	8.59				
40	5200	MCS0	single		BPSK	OFDM	0.72	9.42	1.20	10.06	11.98	20.68	15.78	116.95	-0.36	8.70	11.85	0.13	20.50	0.18
44	5220	MCS0	single		BPSK	OFDM	0.93	9.75	1.20	10.06	12.19	21.01	16.56	126.18	-0.15	8.82				
48	5240	MCS0	single	x	BPSK	OFDM	0.53	9.51	1.20	10.06	11.79	20.77	15.10	119.40	-0.55	8.98				
															⊿low rate		Ave.	⊿ave	Pk	⊿pk
36	5180	MCS0	single	o	BPSK	OFDM	1.08	9.67	1.20	10.06	12.34	20.93	17.14	123.88	0.00	8.59				
36	5180	MCS1	single		QPSK	OFDM	1.07	9.55	1.20	10.06	12.33	20.81	17.10	120.50	-0.01	8.48				
36	5180	MCS2	single		QPSK	OFDM	1.05	9.67	1.20	10.06	12.31	20.93	17.02	123.88	-0.03	8.62				
36	5180	MCS3	single		16QAM	OFDM	1.06	9.59	1.20	10.06	12.32	20.85	17.06	121.62	-0.02	8.53				
36	5180	MCS4	single		16QAM	OFDM	1.04	9.65	1.20	10.06	12.30	20.91	16.98	123.31	-0.04	8.61				
36	5180	MCS5	single		64QAM	OFDM	1.04	9.54	1.20	10.06	12.30	20.80	16.98	120.23	-0.04	8.50				
36	5180	MCS6	single		64QAM	OFDM	1.04	9.56	1.20	10.06	12.30	20.82	16.98	120.78	-0.04	8.52				
36	5180	MCS7	single		64QAM	OFDM	1.02	9.70	1.20	10.06	12.28	20.96	16.90	124.74	-0.06	8.68				
40	5200	MCS0	single		BPSK	OFDM	0.72	9.42	1.20	10.06	11.98	20.68	15.78	116.95	0.00	8.70	11.85	0.13	20.50	0.18
40	5200	MCS1	single		QPSK	OFDM	0.50	9.51	1.20	10.06	11.76	20.77	15.00	119.40	-0.22	9.01	11.56	0.20	20.65	0.12
40	5200	MCS2	single		QPSK	OFDM	0.68	9.44	1.20	10.06	11.94	20.70	15.63	117.49	-0.04	8.76	11.74	0.20	20.56	0.14
40	5200	MCS3	single	o	QPSK	OFDM	0.74	9.41	1.20	10.06	12.00	20.67	15.85	116.68	0.02	8.67	12.00	0.00	20.66	0.01
40	5200	MCS4	single		16QAM	OFDM	0.73	9.35	1.20	10.06	11.99	20.61	15.81	115.08	0.01	8.62	11.92	0.07	20.61	0.00
40	5200	MCS5	single		16QAM	OFDM	0.72	9.40	1.20	10.06	11.98	20.66	15.78	116.41	0.00	8.68	11.97	0.01	20.49	0.17
40	5200	MCS6	single		64QAM	OFDM	0.71	9.53	1.20	10.06	11.97	20.79	15.74	119.95	-0.01	8.82	11.86	0.11	20.60	0.19
40	5200	MCS7	single		64QAM	OFDM	0.68	9.49	1.20	10.06	11.94	20.75	15.63	118.85	-0.04	8.81	11.85	0.09	20.58	0.17

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.

【Output power】 Tx mode: 11n(40HT)(W52/53) 5190-5230MHz with Battery:#1 *.PAR=Peak(dB)-Ave(dB)[dB]

Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation		P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Power at EMC test Ave. [dB]	⊿(sar-emc)	Pk [dB]	⊿(sar-emc)
38	5190	MCS0	single	ox	BPSK	OFDM	0.47	9.28	1.20	10.06	11.73	20.54	14.89	113.24	0.00	8.81	11.54	0.19	20.34	0.20
46	5230	MCS0	single	x	BPSK	OFDM	0.25	9.36	1.20	10.06	11.51	20.62	14.16	115.35	-0.22	9.11				
															⊿low rate		Ave.	⊿ave	Pk	⊿pk
38	5190	MCS0	single	o	BPSK	OFDM	0.47	9.28	1.20	10.06	11.73	20.54	14.89	113.24	0.00	8.81	11.54	0.19	20.34	0.20
38	5190	MCS1	single		QPSK	OFDM	0.46	9.11	1.20	10.06	11.72	20.37	14.86	108.89	-0.01	8.65	11.55	0.17	20.37	0.00
38	5190	MCS2	single		QPSK	OFDM	0.39	9.23	1.20	10.06	11.65	20.49	14.62	111.94	-0.08	8.84	11.46	0.19	20.41	0.08
38	5190	MCS3	single		16QAM	OFDM	0.36	9.74	1.20	10.06	11.62	21.00	14.52	125.89	-0.11	9.38	11.55	0.07	20.87	0.13
38	5190	MCS4	single		16QAM	OFDM	0.35	9.65	1.20	10.06	11.61	20.91	14.49	123.31	-0.12	9.30	11.51	0.10	20.85	0.06
38	5190	MCS5	single		64QAM	OFDM	0.30	9.75	1.20	10.06	11.56	21.01	14.32	126.18	-0.17	9.45	11.48	0.08	20.82	0.19
38	5190	MCS6	single		64QAM	OFDM	0.34	9.53	1.20	10.06	11.60	20.79	14.45	119.95	-0.13	9.19	11.42	0.18	20.77	0.02
38	5190	MCS7	single		64QAM	OFDM	0.29	9.00	1.20	10.06	11.55	20.26	14.29	106.17	-0.18	8.71	11.36	0.19	20.09	0.17

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.
*. Calculating formula: Results = ["P/M Reading"] +["Cbl.loss"(Cable loss)] + ["Att.loss"(Attenuator)] / 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; Measured date: May 23, 2011 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25 deg.C / 48 %RH)
EMC test; Measured date: May 15 and 23, 2011 / Measured by: Kenichi Adachi / This reference is described in the test report of 31IE0161-SH-02-A and -B.
*. A red-letter figure shows the maximum power of SAR reference (in data rate, in channel) and of EMC test .
*. **The duty cycle of each mode and on each data rate were 100% (no off time) in the software used.**

6.1.3 5745-5825MHz band (W58 band) (802.11a/n(20HT)/n(40HT))

Worst data rate / worst channel determination (with full charged battery#1) (WLAN module serial number: DE2-12)
/ vs. power at EMC test (WLAN module serial number: DE2-17)

⊿(sar−radio): 0< x <0.21dB

【Output power】			Tx mode:		11a(W58)		5745−5825MHz				with Battery:#2		*PAR=Peak(dB)−Ave(dB)[dB]		Power at EMC test			
Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation		P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar−emc)	Pk [dB]	⊿(sar−emc)
149	5745	6	single	x	BPSK	OFDM	0.21	9.86	1.29	10.06	11.56	21.21	14.32	132.13	−0.17	9.65				
153	5765	6	single		BPSK	OFDM	0.38	9.76	1.29	10.06	11.73	21.11	14.89	129.12	0.00	9.38				
157	5785	6	single	ox	BPSK	OFDM	0.59	9.67	1.29	10.06	11.94	21.02	15.63	126.47	0.21	9.08	11.74	0.20	20.86	0.16
161	5805	6	single		BPSK	OFDM	0.57	9.29	1.29	10.06	11.92	20.64	15.56	115.88	0.19	8.72				
165	5825	6	single	x	BPSK	OFDM	0.22	8.87	1.29	10.06	11.57	20.22	14.35	105.20	−0.16	8.65				
157	5785	6	(vs. Battery:#1)				0.59	9.65	1.29	10.06	11.94	21.00	15.63	125.89	0.00	9.06				
															⊿low rate		Ave.	⊿ave	Pk	⊿pk
157	5785	6	single	o	BPSK	OFDM	0.59	9.67	1.29	10.06	11.94	21.02	15.63	126.47	0.00	9.08	11.74	0.20	20.86	0.16
157	5785	9	single		BPSK	OFDM	0.58	9.32	1.29	10.06	11.93	20.67	15.60	116.68	−0.01	8.74	11.74	0.19	20.58	0.09
157	5785	12	single		QPSK	OFDM	0.54	9.50	1.29	10.06	11.89	20.85	15.45	121.62	−0.05	8.96	11.78	0.11	20.68	0.17
157	5785	18	single		QPSK	OFDM	0.57	9.23	1.29	10.06	11.92	20.58	15.56	114.29	−0.02	8.66	11.83	0.09	20.49	0.09
157	5785	24	single		16QAM	OFDM	0.48	9.62	1.29	10.06	11.83	20.97	15.24	125.03	−0.11	9.14	11.83	0.00	20.96	0.01
157	5785	36	single		16QAM	OFDM	0.38	9.52	1.29	10.06	11.73	20.87	14.89	122.18	−0.21	9.14	11.67	0.06	20.87	0.00
157	5785	48	single		64QAM	OFDM	0.46	9.29	1.29	10.06	11.81	20.64	15.17	115.88	−0.13	8.83	11.66	0.15	20.56	0.08
157	5785	54	single		64QAM	OFDM	0.38	9.49	1.29	10.06	11.73	20.84	14.89	121.34	−0.21	9.11	11.63	0.10	20.67	0.17

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.
*. **The output power did not depend on the battery condition.**

【Output power】			Tx mode:		11n(20HT)(W58)		5745−5825MHz				with Battery:#2		*PAR=Peak(dB)−Ave(dB)[dB]		Power at EMC test			
Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation		P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar−emc)	Pk [dB]	⊿(sar−emc)
149	5745	MCS0	single	x	BPSK	OFDM	0.11	9.18	1.29	10.06	11.46	20.53	14.00	112.98	−0.48	9.07				
153	5765	MCS0	single		BPSK	OFDM	0.32	9.10	1.29	10.06	11.67	20.45	14.69	110.92	−0.27	8.78				
157	5785	MCS0	single	ox	BPSK	OFDM	0.59	9.14	1.29	10.06	11.94	20.49	15.63	111.94	0.00	8.55	11.76	0.18	20.37	0.12
161	5805	MCS0	single		BPSK	OFDM	0.57	8.76	1.29	10.06	11.92	20.11	15.56	102.57	−0.02	8.19				
165	5825	MCS0	single	x	BPSK	OFDM	0.18	8.43	1.29	10.06	11.53	19.78	14.22	95.06	−0.41	8.25				
							−0.45	−0.25							⊿low rate		Ave.	⊿ave	Pk	⊿pk
157	5785	MCS0	single	o	BPSK	OFDM	0.59	9.14	1.29	10.06	11.94	20.49	15.63	111.94	0.00	8.55	11.76	0.18	20.37	0.12
157	5785	MCS1	single		QPSK	OFDM	0.56	9.30	1.29	10.06	11.91	20.65	15.52	116.14	−0.03	8.74	11.85	0.06	20.65	0.00
157	5785	MCS2	single		QPSK	OFDM	0.51	9.18	1.29	10.06	11.86	20.53	15.35	112.98	−0.08	8.67	11.86	0.00	20.53	0.00
157	5785	MCS3	single		16QAM	OFDM	0.53	9.13	1.29	10.06	11.88	20.48	15.42	111.69	−0.06	8.60	11.75	0.13	20.48	0.00
157	5785	MCS4	single		16QAM	OFDM	0.50	9.08	1.29	10.06	11.85	20.43	15.31	110.41	−0.09	8.58	11.65	0.20	20.37	0.06
157	5785	MCS5	single		64QAM	OFDM	0.56	9.29	1.29	10.06	11.91	20.64	15.52	115.88	−0.03	8.73	11.83	0.08	20.63	0.01
157	5785	MCS6	single		64QAM	OFDM	0.48	9.19	1.29	10.06	11.83	20.54	15.24	113.24	−0.11	8.71	11.83	0.00	20.53	0.01
157	5785	MCS7	single		64QAM	OFDM	0.50	9.15	1.29	10.06	11.85	20.50	15.31	112.20	−0.09	8.65	11.78	0.07	20.35	0.15

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.

【Output power】			Tx mode:		11n(40HT)(W58)		5755−5795MHz				with Battery:#2		*PAR=Peak(dB)−Ave(dB)[dB]		Power at EMC test			
Ch.	Freq. [MHz]	D/R [Mbps]	Ant. No.	Worst:o defalut:x	Modulation		P/M Reading Ave.[dBm]	P/M Reading Pk[dB]	Cable Loss [dB]	Attenuator [dB]	Power Reading Results Ave[dBm]	Power Reading Results Pk[dBm]	Ave[mW]	Pk[mW]	⊿worst ave.[dB]	PAR [dB]	Ave. [dB]	⊿(sar−emc)	Pk [dB]	⊿(sar−emc)
151	5755	MCS0	single	x	BPSK	OFDM	0.21	9.27	1.29	10.06	11.56	20.62	14.32	115.35	−0.34	9.06				
159	5795	MCS0	single	ox	BPSK	OFDM	0.55	9.22	1.29	10.06	11.90	20.57	15.49	114.02	0.00	8.67				
															⊿low rate		Ave.	⊿ave	Pk	⊿pk
151	5755	MCS0	single	o	BPSK	OFDM	0.21	9.27	1.29	10.06	11.56	20.62	14.32	115.35	0.00	9.06	11.38	0.18	20.43	0.19
151	5755	MCS1	single	(o)	QPSK	OFDM	0.21	9.23	1.29	10.06	11.56	20.58	14.32	114.29	0.00	9.02	11.43	0.13	20.42	0.16
151	5755	MCS2	single		QPSK	OFDM	0.19	9.44	1.29	10.06	11.54	20.79	14.26	119.95	−0.02	9.25	11.43	0.11	20.67	0.12
151	5755	MCS3	single		16QAM	OFDM	0.20	9.58	1.29	10.06	11.55	20.93	14.29	123.88	−0.01	9.38	11.45	0.10	20.75	0.18
151	5755	MCS4	single		16QAM	OFDM	0.14	9.46	1.29	10.06	11.49	20.81	14.09	120.50	−0.07	9.32	11.37	0.12	20.63	0.18
151	5755	MCS5	single		64QAM	OFDM	0.19	9.53	1.29	10.06	11.54	20.88	14.26	122.46	−0.02	9.34	11.45	0.09	20.78	0.10
151	5755	MCS6	single		64QAM	OFDM	0.17	9.32	1.29	10.06	11.52	20.67	14.19	116.68	−0.04	9.15	11.42	0.10	20.48	0.19
151	5755	MCS7	single		64QAM	OFDM	0.06	8.92	1.29	10.06	11.41	20.27	13.84	106.41	−0.15	8.86	11.36	0.05	20.27	0.00

*. The average antenna terminal conducted power of lowest data rate was worst. Therefore, each channel was measured at lowest data rate.

*. Calculating formula: Results = ["P/M Reading"] +["Cbl.loss"(Cable loss)] + ["Att.loss"(Attenuator)] / 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; Measured date: May 23, 2011 / Measured by: Hiroshi Naka / Place: preparation room of No. 7 shielded room. (25 deg.C / 48 %RH)
EMC test; Measured date: May 15 and 23, 2011 / Measured by: Kenichi Adachi / This reference is described in the test report of 31IE0161-SH-02-A and -B.
*. A red-letter figure shows the maximum power of SAR reference (in data rate, in channel) and of EMC test .
*. **The duty cycle of each mode and on each data rate were 100% (no off time) in the software used.**

SECTION 7: Measurement results

7.1 SAR for Body/Head-touch device

Measurement date : May 23 and 24, 2011
Measurement by : Hiroshi Naka

[Liquid measurement (Body)]

Used Target Frequency [MHz]	Target Body Tissue		Measured Body Tissue				Environment		Measured Date
	Permittivity [-]	Conductivity [S/m]	Permittivity (εr) [-]	Conductivity (σ) [S/m]	Temperature [deg.C.]	Depth [mm]	Temperature [deg.C.]	Humidity [%RH]	
2450	**52.7**	**1.95**	50.49 (-4.2%)	1.916 (-1.7%)	23.9	158	24.9	54	May 24, 2011
5180	**49.0**	**5.28**	48.06 (-2.0%)	5.386 (+2.1%)	24.2	139	24.0	52	
5785	**48.2**	**5.98**	47.24 (-2.0%)	6.253 (+4.5%)	24.2	139	24.0	52	

*. 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 5000 to 5800 MHz were obtained using linear interpolation. Refer to Appendix 3-7 for more details.

[SAR measurement results (Body)]

2412-2442MHz band/ 5120-5240MHz band(W52 band)/ 5745-5825MHz band(W58 band)

SAR measurement results												
Op. mode	Frequency		Modulation &Data rate [Mbps] / crest factor	EUT setup conditions				Liquid temp. [deg.C]		Power drift [dB]	SAR(1g) [W/kg]	Remarks
	ch	[MHz]		Position	Gap [mm]	Battery No.	Handle option?	Before	After		maximum value of multi-peak	
11b	**Step 1: Contact side with the patient**											
	6	2437	DBPSK&DSSS / 1Mbps / 1.0	**Front**	0	2	no	23.8	23.8	0.20	0.0091	-
	6	2437	DBPSK&DSSS / 1Mbps / 1.0	**Front**	0	1	yes	23.8	23.7	-0.171	**0.043**	**->Worst 2.45GHz**
Step 2: Change the frequency band												
11a (W52)	**Step 1: Contact side with the patient**											
	36	5180	BPSK&OFDM / 6Mbps / 1.0	**Front**	0	1	no	23.5	23.5	0.169	0.00545	-
	36	5180	BPSK&OFDM / 6Mbps / 1.0	**Front**	0	1	yes	23.5	23.5	0.20	**0.014**	**->Worst W52**
Step 2: Change the frequency band												
11a (W58)	**Step 1: Contact side with the patient**											
	157	5785	BPSK&OFDM / 6Mbps / 1.0	**Front**	0	1	no	23.5	23.5	0.20	0.019	-
	157	5785	BPSK&OFDM / 6Mbps / 1.0	**Front**	0	2	yes	23.5	23.5	0.20	**0.039**	**->Worst W58**

Notes:
*. Battery was fully charged before starting the SAR measurement.
*. Refer to the **FCC tracking number: 230486** for the SAR test reduction plan of this EUT.
*. 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	4.16	±13.1%
5785	5800	-15MHz, within ±50 of cal.frequency	3.50	±13.1%