SAR EVALUATION REPORT

Report No. : 25LE0207-HO-6

Applicant	:	**FUJITSU LIMITED**
Type of Equipment	:	**Personal Computer**
Model No.	:	**P1510**
FCC ID	:	**EJE-WB0036**
Test standard	:	**FCC47CFR 2.1093** **FCC OET Bulletin 65, Supplement C**
Test Result	:	**Complied(IEEE 802.11a)**
Max SAR Measured		
(5150-5350MHz Band)	:	**1.35 W/kg(Body,5320MHz)**
(5725-5850MHz Band)	:	**0.794W/kg(Body,5745MHz)**

1. This test report shall not be reproduced except full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the SAR profile.
4. The test results in this test report are traceable to the national or international standards.

Date of test : April 25-29, 2005

Tested by : M. Ikuta

Miyo Ikuta
EMC Lab.Head Office

Approved by : T. Maeno

Tetsuo Maeno
Site Manager of Head Office EMC Lab.

UL Apex Co., Ltd.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8116
Facsimile: +81 596 24 8124

CONTENTS

PAGE

SECTION 1 : Client information

Company Name	:	FUJITSU LIMITED
Brand Name	:	FUJITSU
Address	:	1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki 211-8588 Japan
Telephone Number	:	+81-44-754-3885
Facsimile Number	:	+81-44-754-3769
Contact Person	:	Tsuyoshi Uchihara

SECTION 2 : Equipment under test

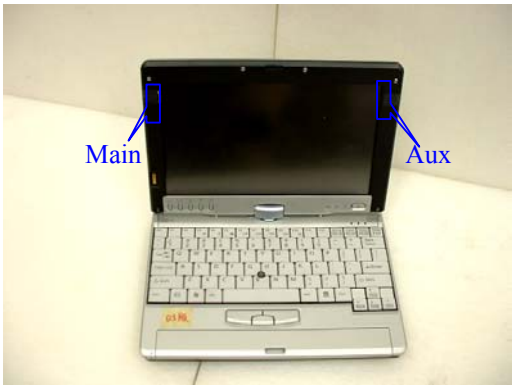
2.1 Identification of EUT

Applicant	:	FUJITSU LIMITED
Type of Equipment	:	Personal Computer
Model No.	:	P1510
Serial No.	:	R5100030
Country of Manufacture	:	Japan
Receipt Date of Sample	:	April 03, 2005
Condition of EUT	:	Engineering prototype (Not for sale: This sample is equivalent to mass-produced items.)
Size of EUT(L*W*H)	:	230*160*35
Category Identified	:	Portable device
Supply	:	DC16.0V / 2.5A
Battery	:	This PC (model : P1510) has two types.

Standard Battery (Li ion Battery) Model name CP229720 Serial No. Pippin_Battery_3_01 V / mAh 10.8Vdc / 2600mAh	
Option Battery(Li ion Battery) Model name CP229725 Serial No. Pippin_Battery_6_01 V / mAh 10.8Vdc / 5200mAh	

Photografhs of EUT

Note type use



Tablet type use

2.2 Product description of EUT

This EUT has IEEE802.11 a/b/g module which consists of 2.4GHz and 5GHz in the same chip, and the other module is Bluetooth.

2.3 Product description of Wireless LAN module

This Wireless LAN module has IEEE.802.11a/b/g.
The description only of the IEEE.802.11 b/g modes are shown below.

Tx Frequency	: 2412-2462MHz (802.11b/g)
Modulation	: DSSS,OFDM
Rating	: DC3.3V
Max.Output Power Tested	: 20.19 dBm Peak Conducted

2.3.1 Product description of Antenna

Antenna Type	: Monopole Antenna(M/N:YCE-5008)
Antenna Connector	: U.FL
Antenna Gain	: 2.4GHz(Max.) Main -4.78dBi, Aux -1.49dBi 5GHz(Max.) Main 0.90dBi, Aux -0.97dBi (These antenna gains are values in which antenna were mounted to the PC.)

2.4 Product description of Bluetooth module

Tx Frequency	: 2402-2480MHz (Bluetooth)
Modulation	: FHSS
Rating	: DC1.8V
Max.Output Power Tested	: 11.74 dBm Peak Conducted

2.4.1 Product description of Antenna

Antenna Type	: Monopole Antenna(M/N:YCE-5008)
Antenna Connector	: U.FL
Antenna Gain	: Aux -1.49dBi (These antenna gains are values in which antenna were mounted to the PC.)

SECTION 3 : Requirements for compliance testing defined by the FCC

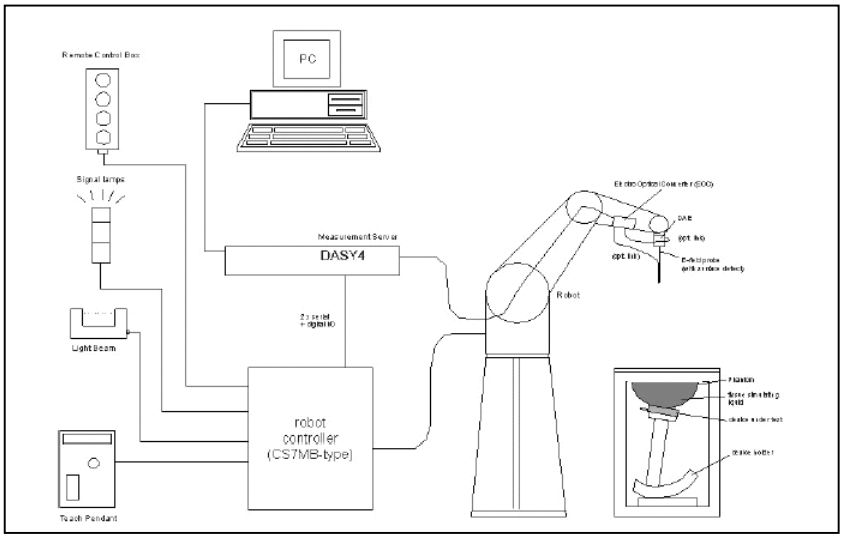
The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable 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.

SECTION 4 : Dosimetry assessment setup

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than +/- 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetry probe ET3DV6, SN: 1684 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [2] with accuracy of better than +/-10%. The spherical isotropy was evaluated with the procedure described in [3] and found to be better than +/-0.25 dB. The phantom used was the
SAM Twin Phantom as described in FCC supplement C, IEEE P1528 and CENELEC EN50361.

4.1 Configuration and peripherals



The DASY4 system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
   An arm extension for accommodating the data acquisition electronics (DAE).

2. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

3. A data acquisition electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection.
   The EOC is connected to the measurement server.

5. The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.

7. A computer operating Windows 2000.

8. DASY4 software.

9. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

10. The SAM twin phantom enabling testing left-hand and right-hand usage.

11. The device holder for handheld mobile phones.

12. Tissue simulating liquid mixed according to the given recipes.

13. Validation dipole kits allowing to validate the proper functioning of the system.

4.2 System components

4.2.1 EX3DV3 Probe Specification

Construction:
Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)

Calibration:
Conversion Factors (CF) for
900MHz, 1800MHz, 2400MHz, 5200MHz, 5800MHz (Head and Body)

Frequency:
10 MHz to > 6GHz; Linearity: +/-0.2 dB(30 MHz to 3 GHz)

Directivity:
+/-0.3 dB in HSL (rotation around probe axis)
+/-0.5 dB in tissue material (rotation normal probe axis)

Dynamic Range:
10uW/g to > 100 mW/g;Linearity: +/-0.2 dB(noise: typically < 1uW/g)

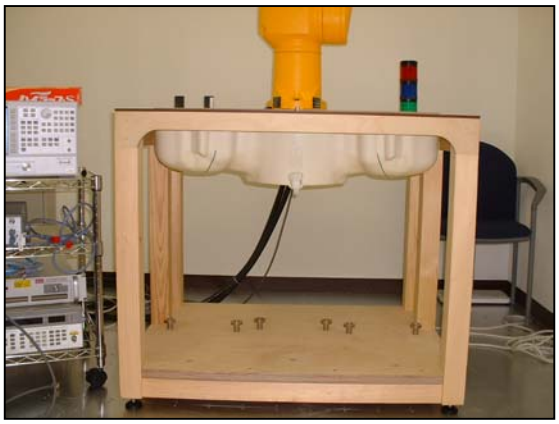
Dimensions:
Overall length: 330 mm (Tip: 20 mm)
Tip diameter: 2.5mm (Body: 12 mm)
Typical distance from probe tip to dipole centers: 1 mm

Application:
Highprecision dosimetric measurement in any exposure scenario
(e.g., very strong gradient fields).Only probe which enables compliance
testing for frequencies up to 6GHz with precision of better 30%.

EX3DV3 E-field Probe

4.2.2 SAM Twin Phantom

Construction:
The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC EN 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
Shell Thickness:
2 +/-0.2 mm
Filling Volume:
Approx. 25 liters
Dimensions:
(H x L x W): 810 x 1000 x 500 mm



SAM Twin Phantom

4.2.3 Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the mounted transmitter
in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head,flat phantom).
* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations.
To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Device holder couldn't be used at this SAR measurement.

Device Holder

SECTION 5 : Test system specifications

Robot RX60L

Number of Axes	:	6
Payload	:	1.6 kg
Reach	:	800mm
Repeatability	:	+/-0.025mm
Control Unit	:	CS7M
Programming Language	:	V+
Manuafacture	:	Stäubli Unimation Corp. Robot Model: RX60

DASY4 Measurement server

Features	:	166MHz low power Pentium MMX 32MB chipdisk and 64MB RAM Serial link to DAE (with watchdog supervision) 16 Bit A/D converter for surface detection system Two serial links to robot (one for real-time communication which is supervised by watchdog) Ethernet link to PC (with watchdog supervision) Emergency stop relay for robot safety chainTwo expansion slots for future applications
Manufacture	:	Schimid & Partner Engineering AG

Data Acquisition Electronic (DAE)

Features	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY4 embedded system (fully remote controlled) 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version)
Measurement Range	:	1 µV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 1 µV (with auto zero)
Input Resistance	:	200 MΩ
Battery Power	:	> 10 h of operation (with two 9 V battery)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schimid & Partner Engineering AG

Software

Item	:	Dosimetric Assesment System DASY4
Type No.	:	SD 000 401A, SD 000 402A
Software version No.	:	4.5
Manufacture / Origin	:	Schimid & Partner Engineering AG

E-Field Probe

Model	:	EX3DV3
Serial No.	:	3507
Construction	:	Symmetrical design with triangular core
Frequency	:	10 MHz to 6 GHz
Linearity	:	+/-0.2 dB (30 MHz to 3 GHz)
Manufacture	:	Schimid & Partner Engineering AG

Phantom

Type	:	SAM Twin Phantom V4.0
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Volume	:	Approx. 25 liters
Manufacture	:	Schimid & Partner Engineering AG

SECTION 6 : Test setup of EUT

6.1 Photographs of test setup

When users operate or carry this EUT, it could be considered to touch or get close to their bodies.
This EUT can be used also as a Tablet PC. In order to assume these situations, we performed the test at the following positions. Please refer to "APPENDIX 1" for more details.

1.Main Front : The test was performed in touch with main front to the flat section of SAM twin phantom.

2.Main Back : The test was performed in distanced 15mm with main back to the flat section of SAM twin phantom.

3.Main Bottom: The test was performed in touch with main bottom to the flat section of SAM twin phantom.

4.Main Side : The test was performed in touch with main side to the flat section of SAM twin phantom.

5.Aux Front : The test was performed in touch with aux front to the flat section of SAM twin phantom.

6.Aux Back : The test was performed in distanced 15mm with aux back to the flat section of SAM twin phantom.

7.Aux Bottom : The test was performed in touch with aux bottom to the flat section of SAM twin phantom.

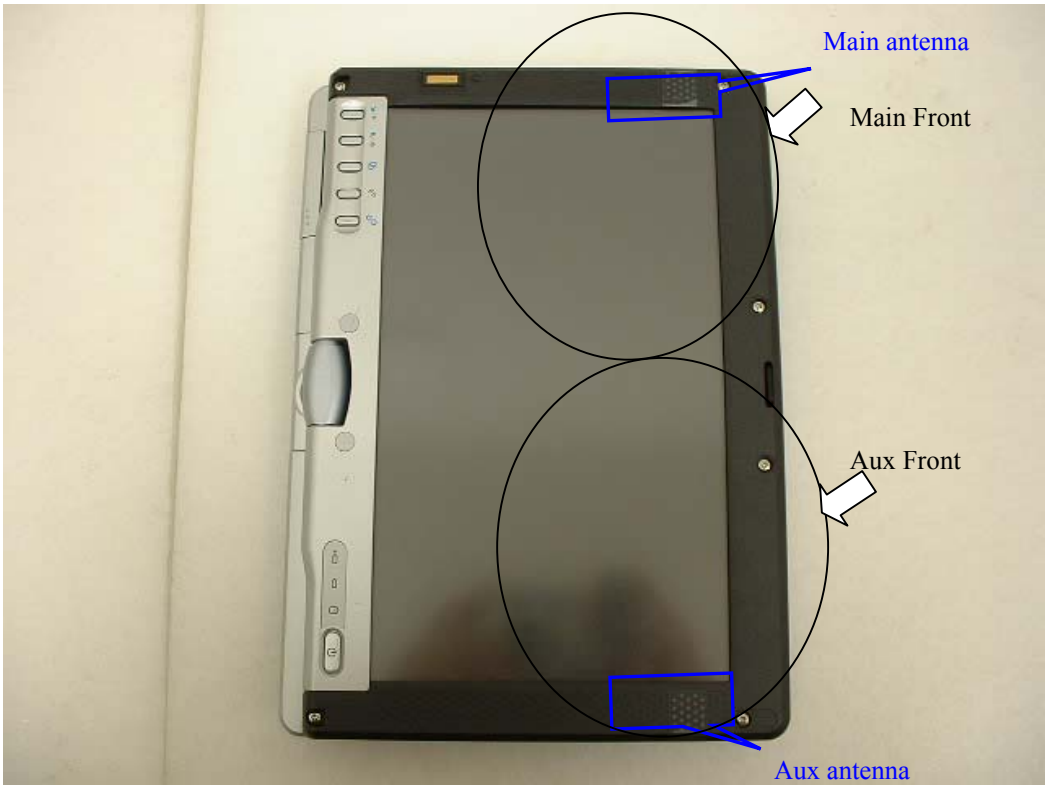
8.Aux Side : The test was performed in touch with aux side to the flat section of SAM twin phantom.

9. Aux Side (5mm) : The measurement opened 5mm distance between EUT and SAM Twin Phantom.

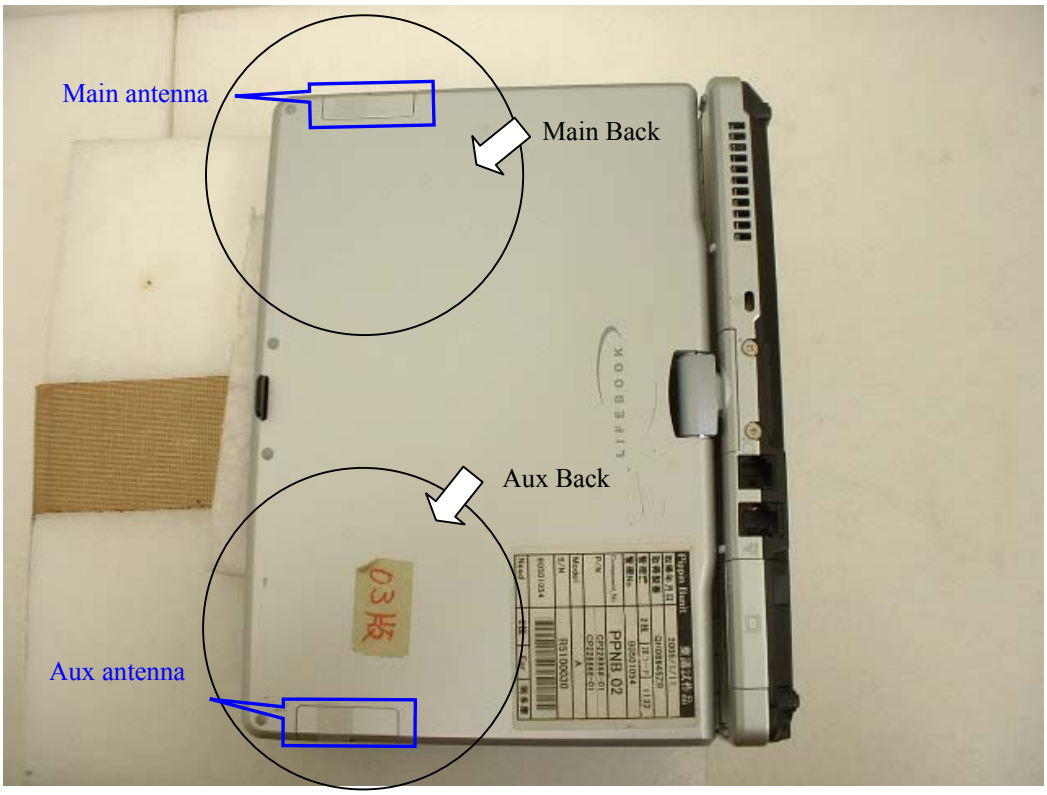
10. Aux Side (10mm) : The measurement opened 10mm distance between EUT and SAM Twin Phantom.

“Front”and “ Side” positions are assumed when users operate in the tablet type use.
When users operate or carry this EUT, it is can be touched to the user’s Body. Therfore,”Front”and “Side” positions were tested in the touch to the phantom.
However, “Back” position is assumed when users operate in the note type use. Therefore “Back” position was tested in the distance15mm from the phantom.

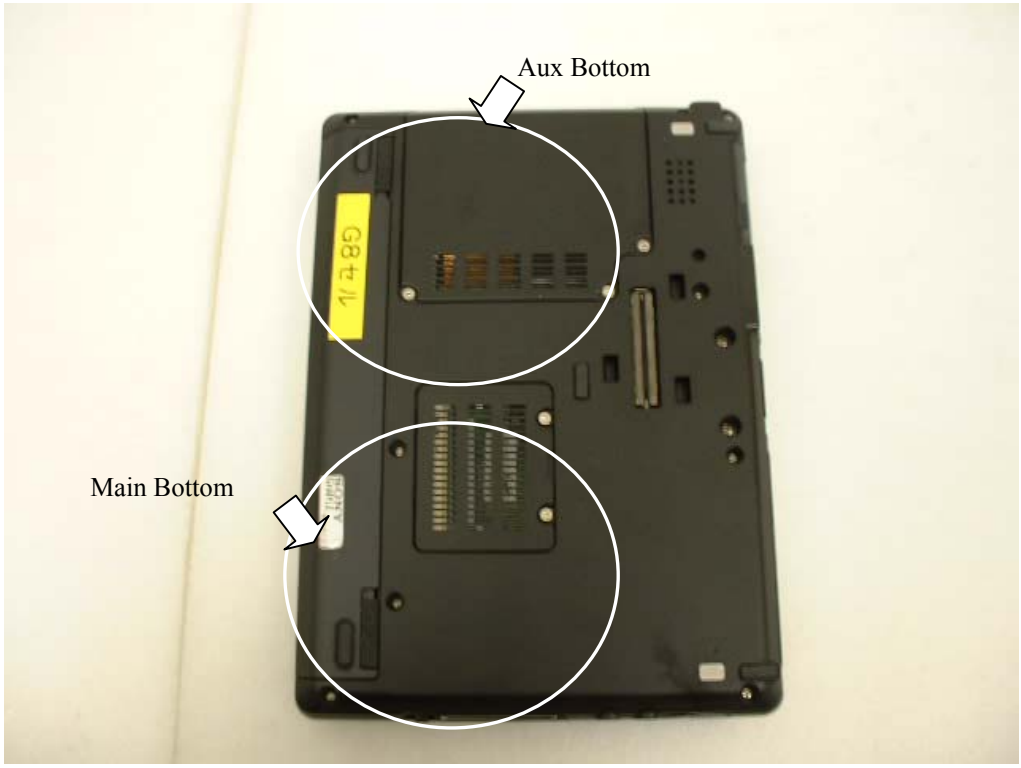
Front


Main antenna
Main Front
Aux Front
Aux antenna

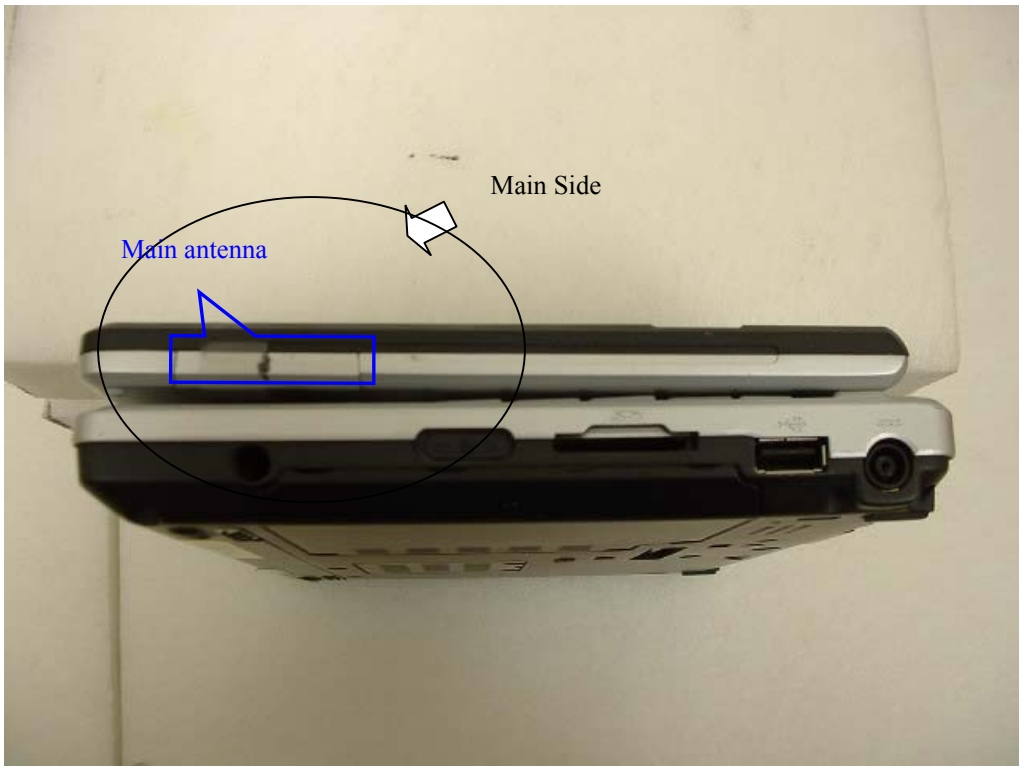
Back


Main antenna
Main Back
Aux Back
Aux antenna
LIFEBOOK
PPNB 02

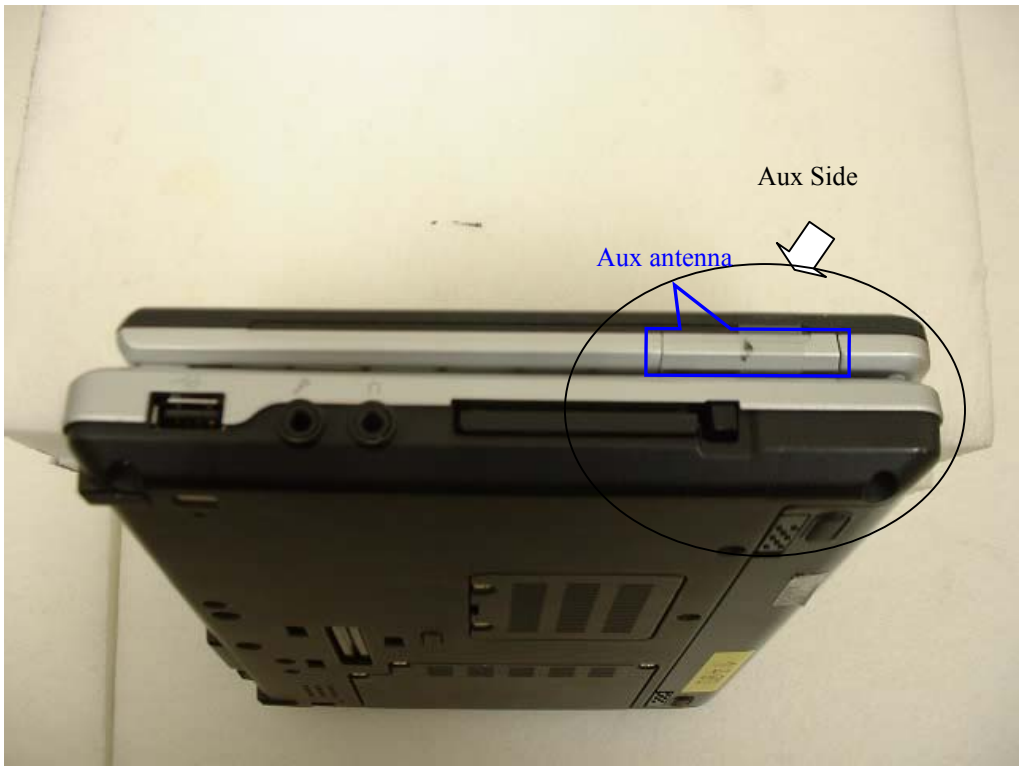
Bottom



Main Side



Aux Side



6.2 EUT Tune-up procedure

This EUT has Wireless LAN .
The Wireless LAN module has IEEE.802.11a/b/g.
The frequency range and the modulation used in the testing of IEEE.802.11a are shown as a following.

1. IEEE 802.11a mode

Frequency band : 5150-5350MHz
Channel : 36ch(5180MHz),48ch(5240MHz),52ch(5260MHz),64ch(5320MHz)
Modulation : OFDM(BPSK,QPSK,16QAM,64QAM)
Crest factor : 1

Frequency band : 5725-5850MHz
Channel number : 149ch(5745MHz),157ch(5785MHz),165ch(5825MHz)
Modulation : OFDM(BPSK,QPSK,16QAM,64QAM)
Crest factor : 1

6.3 Method of measurement

1. IEEE 802.11a

Step1. The data rate in the higher peak power of each modulation was decided, then the worst modulation was searched in the SAR testing.

Step2. The changing of the option Battery
The test was performed at worst modulation of Step1.

Step3. The searching of the worst position
This test was performed at the worst modulation of Step1.

Step4. The changing of the frequency
This test was performed at the worst conditions of Step3.

2. Distance between PC and Phantom

The measurement was performed with the distance 5mm and 10mm to check if the distance 0mm may not have the worst value st the conditions of the highest SAR value of this EUT. As result, the distance 0mm had the worst value.

SECTION 7 : Measurement uncertainty

7.1 Uncertainty of 802.11a modes testing

The uncertainty budget has been determined for the DASY4 measurement system according to the APPENDIX 8 documents and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±6.8	Normal	1	1	±6.8	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	$(1-c_p)^{1/2}$	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary effects	±2.0	Rectangular	√3	1	±1.2	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±1.0	Normal	1	1	±1.0	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient conditions	±3.0	Rectangular	√3	1	±1.7	∞
Mech. constraints of robot	±0.4	Rectangular	√3	1	±0.2	∞
Probe positioning	±2.9	Rectangular	√3	1	±1.7	∞
Extrap. and integration	±1.0	Rectangular	√3	1	±0.6	∞
Test Sample Related						
Device positioning	±2.9	Rectangular	√3	1	±2.9	36
Device holder uncertainty	±3.6	Rectangular	√3	1	±3.6	18
Power drift	±10.0	Rectangular	√3	1	±5.8	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	±5.0	Rectangular	1	0.64	±3.2	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	±5.0	Rectangular	1	0.6	±3.0	∞
Combined Standard Uncertainty					**±14.298**	
Expanded Uncertainty (k=2)					**±28.6**	

The test result shows that the power drift exceeded ±5%. Therefore, the uncertainty of power drift expanded to ±10%.(Refer to the APPENDIX 8) However, the extended uncertainty (k= 2) of a test is less than 30%.

SECTION 8 : Simulated tissue liquid parameter

8.1 Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

8.1.1 Muscle 5GHz

Type of liquid : **Muscle 5GHz**
Ambient temperature (deg.c.) : **24.5 (April 25), 25.0(April 26,28,29)**
Relative Humidity (%) : **56(April 25), 50(April 26,28), 55 (April 29)**
Liquid depth (cm) : **15.2**

Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency [MHz]	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
25-Apr	5200	23.2	23.2	Relative Permittivity εr	49.0	46.6	-4.9	+/-5
				Coductivity σ [mho/m]	5.30	5.54	4.5	+/-5
28-Apr	5200	23.9	23.9	Relative Permittivity εr	49.0	47.0	-4.1	+/-5
				Coductivity σ [mho/m]	5.30	5.45	2.8	+/-5
26-Apr	5800	24.2	24.2	Relative Permittivity εr	48.2	46.2	-4.1	+/-5
				Coductivity σ [mho/m]	6.00	6.25	4.2	+/-5
29-Apr	5800	24.2	24.2	Relative Permittivity εr	48.2	46.5	-3.5	+/-5
				Coductivity σ [mho/m]	6.00	6.25	4.2	+/-5

8.2 Simulated Tissues Composition of 5GHz

Ingredient	MiXTURE(%)	
	Head 5GHz	Muscle 5GHz
Water	64.0	78.0
Mineral Oil	18.0	11.0
Emulsifiers	15.0	9.0
Additives and salt	3.0	2.0

8.3 Decision on Simulated Tissues of 5200MHz

In the current standards (e.g., IEEE P1528, 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 5000to 5800 MHz were obtained using linear interpolation.
Therefore the dielectric parameters of 5200MHz were decided as following.
(5200MHz Body Tissue/ Relative Permittivity εr: **49.0**, Conductivity σ : **5.30**)

f (MHz)	Head Tissue		Body Tissue		Reference
	ε r	σ [mho/m]	ε r	σ [mho/m]	
3000	38.5	2.40	52.0	2.73	Standard
5800	35.3	5.27	48.2	6.00	Standard
5000	36.2	4.45	49.3	5.07	Interpolated
5100	36.1	4.55	49.1	5.18	Interpolated
5200	36.0	4.66	49.0	5.30	Interpolated
5300	35.9	4.76	48.9	5.42	Interpolated
5400	35.8	4.86	48.7	5.53	Interpolated
5500	35.6	4.96	48.6	5.65	Interpolated
5600	35.5	5.07	48.5	5.77	Interpolated
5700	35.4	5.17	48.3	5.88	Interpolated

Standard and interpolated dielectric parameters for head and body tissue simulating liquidin the frequency range 3000 to 5800MHz.

SECTION 9 : System validation data

The target values of 5GHz were not defied by IEEE 1528. So, the target values were made into the calibration values of SPEAG. And each of the validation results of 5200MHz and 5800MHz checked (Evaluation of muscle) that it was within +/-10% as compared with the calibration values of SPEAG. The validation results are tabulated below. Please refer to APPENDIX 3

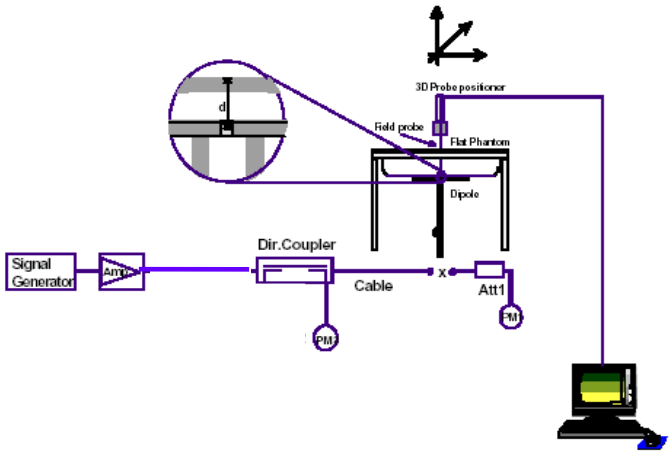
9.1 System validation of 5GHz

Type of liquid	:	**Muscle 5GHz**
Ambient temperature (deg.c.)	:	**24.5 (April 25), 25.0(April 26,28,29)**
Relative Humidity (%)	:	**56(April 25), 50(April 26,28), 55 (April 29)**
Dipole	:	**D5GHzV2 SN:1020**
Power	:	**250mW**

Measured By : Miyo Ikuta

SYSTEM PERFORMANCE CHECK											
Liquid (Muscle 5100-5800 MHz)								System dipole validation target & measured			
		Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
Date	Frequency	Before	After	Target	Measured	Target	Measured	Target	Measured		
25-Apr	5200	23.2	23.2	49.0	46.6	5.30	5.54	20.5	22.1	7.8	+/-10
28-Apr	5200	23.8	23.8	48.2	47.0	6.00	5.45	20.5	19.2	-6.3	+/-10
26-Apr	5800	24.3	24.3	49.0	46.2	5.30	6.25	19.6	19.6	0.0	+/-10
29-Apr	5800	24.2	24.2	48.2	46.5	6.00	6.25	19.6	20.1	2.6	+/-10

Note: Please refer to Attachment for the result representation in plot format



5100-5800MHz
Systemperformance check setup

Test system for the system performance check setup diagram

SECTION 10 : Evaluation procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the E-field at a fixed location above the ear point or central position of flat phantom was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the wireless LAN antenna and the horizontal grid spacing was 10mm x 10 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point found in the Step 2 (area scan), a volume of 30mm x 30mm x 21mm was assessed by measuring 7 x 7 x 8 points. And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1. The data at the surface were extrapolated, since the center of the dipoles is 1 mm mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes.
This polynomial was then used to evaluate the points between the surface and the probe tip.

2. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot"-condition (in x, y and z-directions) [4], [5]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

3. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the E-field at the same location as in Step 1.

SECTION 11 : Exposure limit

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

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

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

Spatial Average (averaged over the whole body	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
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.

NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT
1.6 W/kg

SECTION 12 : SAR Measurement results (5150-5350MHz)

12.1 Main Antenna

12.1.1 Conducted power of Main antenna

[IEEE802.11a : Main Antenna(by the data rate) 5260MHz]						
Modulation	Data rate [Mbps]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
BPSK	6	4.76	1.11	10.00	15.87	38.64
	9	4.64	1.11	10.00	15.75	37.58
QPSK	12	4.67	1.11	10.00	15.78	37.84
	18	4.62	1.11	10.00	15.73	37.41
16QAM	24	4.60	1.11	10.00	15.71	37.24
	36	3.55	1.11	10.00	14.66	29.24
64QAM	48	3.49	1.11	10.00	14.60	28.84
	54	1.66	1.11	10.00	12.77	18.92

[IEEE802.11a 5150-5350MHz: Main Antenna(6Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
36	5180.0	-0.15	0.94	10.00	10.79	12.01
48	5240.0	0.31	1.11	10.00	11.42	13.87
52	5260.0	4.76	1.11	10.00	15.87	38.59
64	5320.0	3.67	1.04	10.00	14.71	29.57

[IEEE802.11a 5150-5350MHz: Main Antenna(54Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
36	5180.0	-0.35	0.94	10.00	10.59	11.47
48	5240.0	0.16	1.11	10.00	11.27	13.40
52	5260.0	1.66	1.11	10.00	12.77	18.90
64	5320.0	0.73	1.04	10.00	11.77	15.03

12.1.2 Body 5150-5350MHz SAR of Main antenna

Liquid Depth (cm)	:	**15.2**	Model	:	**P1510**
Parameters	:	ε_r =**46.6** σ =**5.54**	Serial No.	:	**R5100030**
Ambient temperature (deg.c.)	:	**24.5**	Modulation	:	**DSSS**
Relative Humidity (%)	:	**56**	Crest factor	:	**1**

Date : April 25,2005
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS OF MAIN ANTENNA(IEEE802.11a 5150-5350MHz)										
Frequency			Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Band	Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
5150-5350MHz	**Step1 Modulation search**									
	52	5260	BPSK(6Mbps)	Flat	Main	Main side	0	22.2	22.2	**1.25**
	52	5260	QPSK(12Mbps)	Flat	Main	Main side	0	22.2	22.2	**1.22**
	52	5260	16QAM(24Mbps)	Flat	Main	Main side	0	22.2	22.2	**0.934**
	52	5260	64QAM(48Mbps)	Flat	Main	Main side	0	22.2	22.2	**0.618**
	Step2 Battery change (option battery) *1									
	52	5260	BPSK(6Mbps)	Flat	Main	Main side	0	22.8	22.8	**1.19**
	Step3 Position search									
	52	5260	BPSK(6Mbps)	Flat	Main	Main Front	0	23.0	23.0	**0.683**
	52	5260	BPSK(6Mbps)	Flat	Main	Main Back	15	23.0	23.0	**0.052**
	52	5260	BPSK(6Mbps)	Flat	Main	Main Bottom	0	23.0	23.0	**0.026**
	Step4 Frequency Change									
	48	5240	BPSK(6Mbps)	Flat	Main	Main side	0	22.8	22.8	**0.415**
	36	5180	BPSK(6Mbps)	Flat	Main	Main side	0	22.6	22.6	**0.385**
	64	5320	BPSK(6Mbps)	Flat	Main	Main side	0	22.2	22.2	**0.914**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population								**Body SAR: 1.6 W/kg (averaged over 1 gram)**		

*1
This EUT has two types of batteries.(The same voltage, only difference of capacity)
The comparison test was performed in the same conditions (Main side / Mid ch / worst modulation) on two types of batteries. As a result, the SAR value of a standard battery was a little higher than the SAR value of the option battery. Therefore, the other tests were performed with a standard battery.

12.2 Aux Antenna

12.2.1 Conducted power of Aux Antenna

[IEEE802.11a : Aux Antenna (by the data rate)[5260MHz]]						
Modulation	Data rate [Mbps]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
BPSK	6	4.57	1.11	10.00	15.68	36.98
	9	4.51	1.11	10.00	15.62	36.48
QPSK	12	4.50	1.11	10.00	15.61	36.39
	18	4.47	1.11	10.00	15.58	36.14
16QAM	24	4.50	1.11	10.00	15.61	36.39
	36	3.36	1.11	10.00	14.47	27.99
64QAM	48	3.30	1.11	10.00	14.41	27.61
	54	1.38	1.11	10.00	12.49	17.74

[IEEE802.11a 5150-5350MHz:Main Antenna(6Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
36	5180.0	-1.49	0.94	10.00	9.45	8.82
48	5240.0	-0.29	1.11	10.00	10.82	12.08
52	5260.0	4.57	1.11	10.00	15.68	36.94
64	5320.0	4.34	1.04	10.00	15.38	34.50

[IEEE802.11a 5150-5350MHz: Main Antenna(54Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
36	5180.0	-1.68	0.94	10.00	9.26	8.44
48	5240.0	-0.46	1.11	10.00	10.65	11.61
52	5260.0	1.38	1.11	10.00	12.49	17.72
64	5320.0	1.43	1.04	10.00	12.47	17.65

12.2.2 Body 5150-5350MHz SAR of Aux antenna

Liquid Depth (cm)	:	**15.2**	Model	:	**P1510**
Parameters	:	ε_r =**47**, σ =**5.45**	Serial No.	:	**R5100030**
Ambient temperature (deg.c.)	:	**25.0**	Modulation	:	**OFDM**
Relative Humidity (%)	:	**50**	Crest factor	:	**1**

Date : April 28, 2005
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS OF AUX ANTENNA(IEEE802.11a 5150-5350MHz)										
Frequency			Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Band	Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
5150-5350MHz	**Step1 Modulation search**									
	52	5260	BPSK(6Mbps)	Flat	Aux	Aux Side	0	23.8	23.8	**1.09**
	52	5260	QPSK(12Mbps)	Flat	Aux	Aux Side	0	23.8	23.9	**1.05**
	52	5260	16QAM(24Mbps)	Flat	Aux	Aux Side	0	23.9	23.9	**0.898**
	52	5260	64QAM(48Mbps)	Flat	Aux	Aux Side	0	23.9	23.8	**0.832**
	Step3 Position search									
	52	5260	BPSK(6Mbps)	Flat	Aux	Aux Front	0	23.8	23.8	**0.496**
	52	5260	BPSK(6Mbps)	Flat	Aux	Aux Back	15	23.8	23.8	**0.045**
	52	5260	BPSK(6Mbps)	Flat	Aux	Aux Bottom	0	23.8	23.8	**0.015**
	Step4 Frequency Change									
	48	5240	BPSK(6Mbps)	Flat	Aux	Aux Side	0	23.2	23.2	**0.267**
	36	5180	BPSK(6Mbps)	Flat	Aux	Aux Side	0	23.5	23.3	**0.256**
	64	5320	BPSK(6Mbps)	Flat	Aux	Aux Side	0	23.8	23.8	**1.35**
	Separation change									
	64	5320	BPSK(6Mbps)	Flat	Aux	Aux Side	5	23.6	23.6	**0.500**
	64	5320	BPSK(6Mbps)	Flat	Aux	Aux Side	10	23.6	23.6	**0.144**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak Uncontrolled Exposure / General Population**								**Body SAR: 1.6 W/kg** **(averaged over 1 gram)**		

SECTION 13 : SAR Measurement results (5725-5850MHz)

13.1 Main Antenna

13.1.1 Conducted power of Main antenna

[IEEE802.11a : Main Antenna (by the data rate)[5785MHz]]						
Modulation	Data rate [Mbps]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
BPSK	6	8.36	1.16	10.00	19.52	89.58
	9	8.28	1.16	10.00	19.44	87.95
QPSK	12	8.02	1.16	10.00	19.18	82.84
	18	7.99	1.16	10.00	19.15	82.27
16QAM	24	8.64	1.16	10.00	19.80	95.55
	36	7.33	1.16	10.00	18.49	70.67
64QAM	48	7.29	1.16	10.00	18.45	70.02
	54	5.71	1.16	10.00	16.87	48.67

[The Worst data rate in SAR result]

[IEEE802.11a: Main Antenna(12Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
149	5745.0	8.02	1.20	10.00	19.22	83.54
157	5785.0	8.02	1.16	10.00	19.18	82.84
165	5825.0	8.07	1.19	10.00	19.26	84.37

[IEEE802.11a: Main Antenna (24Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
149	5745.0	8.74	1.20	10.00	19.94	98.61
157	5785.0	8.64	1.16	10.00	19.80	95.55
165	5825.0	8.87	1.19	10.00	20.06	101.44

[IEEE802.11a: Main Antenna (54Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
149	5745.0	6.51	1.20	10.00	17.71	59.01
157	5785.0	5.71	1.16	10.00	16.87	48.67
165	5825.0	5.95	1.19	10.00	17.14	51.78

13.1.2 Body 5725-5850MHz SAR of Main antenna

Liquid Depth (cm)	:	**15.2**	Model	:	**P1510**
Parameters	:	ε_r =**46.5**, σ =**6.25**	Serial No.	:	**R5100030**
Ambient temperature (deg.c.)	:	**25.0**	Modulation	:	**OFDM**
Relative Humidity (%)	:	**55**	Crest factor	:	**1**

Date : April 29,2005
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS OF MAIN ANTENNA(IEEE802.11a 5150-5350MHz)										
Frequency			Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Band	Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
5725-5850MHz	**Step1 Modulation search**									
	157	5785	BPSK(6Mbps)	Flat	Main	Main side	0	24.0	24.0	**0.318**
	157	5785	QPSK(12Mbps)	Flat	Main	Main side	0	23.8	23.8	**0.326**
	157	5785	16QAM(24Mbps)	Flat	Main	Main side	0	23.8	23.8	**0.324**
	157	5785	64QAM(48Mbps)	Flat	Main	Main side	0	23.8	23.8	**0.241**
	Step2 Battery change (option battery)*1									
	157	5785	BPSK(12Mbps)	Flat	Main	Main side	0	24.0	24.0	**0.325**
	157									
	157	5785	BPSK(12Mbps)	Flat	Main	Main Front	0	24.0	24.0	**0.309**
	157	5785	BPSK(12Mbps)	Flat	Main	Main Back	15	24.0	24.0	**0.037**
	157	5785	BPSK(12Mbps)	Flat	Main	Main Bottom	0	24.0	24.0	**0.028**
	Step4 Frequency Change									
	149	5745	BPSK(12Mbps)	Flat	Main	Main side	0	23.8	23.8	**0.342**
	165	5825	BPSK(12Mbps)	Flat	Main	Main side	0	24.0	24.0	**0.273**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population								**Body SAR: 1.6 W/kg (averaged over 1 gram)**		

13.2 Aux Antenna

13.2.1 Conducted power of Aux Antenna

Power by the data rate

[IEEE802.11a : Main Antenna (by the data rate) [5785MHz]]						
Modulation	Data rate [Mbps]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
BPSK	6	8.01	1.16	10.00	19.17	82.65
	9	7.97	1.16	10.00	19.13	81.89
QPSK	12	7.57	1.16	10.00	18.73	74.68
	18	7.71	1.16	10.00	18.87	77.13
16QAM	24	8.53	1.16	10.00	19.69	93.16
	36	7.06	1.16	10.00	18.22	66.41
64QAM	48	6.99	1.16	10.00	18.15	65.35
	54	5.64	1.16	10.00	16.80	47.89

[The Worst data rate in SAR result]

[IEEE802.11a: Main Antenna(18Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
149	5745.0	8.02	1.20	10.00	19.22	83.54
157	5785.0	7.71	1.16	10.00	18.87	77.13
165	5825.0	8.11	1.19	10.00	19.30	85.15

[IEEE802.11a: Main Antenna(24Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
149	5745.0	8.70	1.20	10.00	19.90	97.70
157	5785.0	8.53	1.16	10.00	19.69	93.16
165	5825.0	8.79	1.19	10.00	19.98	99.58

[IEEE802.11a: Main Antenna(54Mbps)]						
Ch	Freq. [MHz]	S/A Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Converted [mW]
149	5745.0	6.20	1.20	10.00	17.40	54.94
157	5785.0	5.64	1.16	10.00	16.80	47.89
165	5825.0	5.86	1.19	10.00	17.05	50.72

13.2.2 Body 5725-5850MHz SAR of Aux antenna

Liquid Depth (cm)	:	**15.2**	Model	:	**P1510**
Parameters	:	**ε_r =46.2 σ =6.25**	Serial No.	:	**R5100030**
Ambient temperature (deg.c.)	:	**25.0**	Modulation	:	**OFDM**
Relative Humidity (%)	:	**50**	Crest factor	:	**1**

Date : April 26, 2005
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS OF AUX ANTENNA(IEEE802.11a 5150-5350MHz)										
Frequency			Modulation	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Band	Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
5725-5850MHz	**Step 1 Modulation search**									
	157	5785	BPSK(6Mbps)	Flat	Aux	Aux Side	0	23.3	23.4	**0.410**
	157	5785	QPSK(18Mbps)	Flat	Aux	Aux Side	0	23.4	23.4	**0.421**
	157	5785	16QAM(24Mbps)	Flat	Aux	Aux Side	0	23.5	23.7	**0.419**
	157	5785	64QAM(48Mbps)	Flat	Aux	Aux Side	0	23.7	23.7	**0.295**
	Step 3 Position search									
	157	5785	QPSK(18Mbps)	Flat	Aux	Aux Front	0	23.7	23.7	**0.295**
	157	5785	QPSK(18Mbps)	Flat	Aux	Aux Back	15	23.8	23.8	**0.052**
	157	5785	QPSK(18Mbps)	Flat	Aux	Aux Bottom	0	23.8	23.8	**0.020**
	Step 4 Frequency Change									
	149	5745	QPSK(18Mbps)	Flat	Aux	Aux Side	0	23.8	23.8	**0.794**
	165	5825	QPSK(18Mbps)	Flat	Aux	Aux Side	0	23.8	23.8	**0.492**
	Separation change									
	149	5745	QPSK(18Mbps)	Flat	Aux	Aux Side	5	23.6	23.6	**0.186**
	149	5745	QPSK(18Mbps)	Flat	Aux	Aux Side	10	23.6	23.6	**0.084**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population								**Body SAR: 1.6 W/kg (averaged over 1 gram)**		

SECTION 14 : Equipment & calibration information

Name of Equipment	Manufacture	Model number	Serial number	Calibration	
				Last Cal	due date
Power Meter	Agilent	E4417A	GB41290639	2004/11/09	2005/11/08
Power Sensor	Agilent	E9300B	US40010300	2004/11/15	2005/11/14
Power Sensor	Agilent	E9327A	US40440545	2004/11/23	2005/11/22
Spectrum Analyzer	Agilent	E4448A	MY44020357	2004/06/12	2005/06/11
S-Parameter Network Analyzer	Agilent	8753ES	US39174808	2003/10/23	2006/10/22
Signal Generator	Rohde&Schwarz	SML40	100023	2005/01/05	2006/01/04
RF Amplifier	TSJ	TCBP0206	-	2005/2/24	2006/2/23
Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	1020	2005/1/14	2006/1/13
Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3	516	2005/3/10	2006/3/09
Robot,SAM Phantom	Schmid&Partner Engineering AG	DASY4	I021834	N/A	N/A
Attenuator	Agilent	US40010300	08498-60012	2004/12/16	2005/12/15
Attenuator	Orient Microwave	BX10-0476-00	-	2005/03/16	2006/03/15
Microwave Cable (Conducted cable)	Suhner	SUCOFLEX 104	233011/4	2005/02/03	2006/02/02
Microwave Cable (Conducted cable)	Hirose Electric	U.FL-2LP-066-A-(200)	-	2004/07/22	2005/07/21
5GHz System Validation Dipole	Schmid&Partner Engineering AG	D5GHzV2	1020	2004/2/23	2006/2/22
Dual Directional Coupler	N/A	Narda	3702	N/A	N/A
Body 5800MHz	N/A	N/A	N/A	N/A	N/A
Ambient Noise <0.012W/kg	SAR room	-	-	2005/4/25-29	-

SECTION 15 : References

[1]ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
[2] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15-17, 1997, pp. 120-124.
[3] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-_field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
[4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
[5] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.
[6] Barry N. Taylor and Christ E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology,1994.