SAR EVALUATION REPORT

Report No. : 24DE0025-HO-5

Applicant	:	**Sony Corp.**
Type of Equipment	:	**Notebook Personal Computer**
Model No.	:	**PCG-5A1L**
FCC ID	:	**AK8PCG5A1L**
Test standard	:	**FCC47CFR 2.1093** **FCC OET Bulletin 65, Supplement C**
Test Result	:	**Complied**
Max SAR Measured	:	**0.0873W/kg(Body, 2412MHz)**

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 : December 10 and 11, 2003

Tested by : M. Ikuta

Miyo Ikuta
Head Office EMC Lab.

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SECTION 1 : Client information

Company Name	:	Sony Corp.
Brand Name	:	SONY
Address	:	6-7-35, Kita-Shinagawa, Shinagawa-ku, Tokyo 141-0001, Japan
Telephone Number	:	+81-3-5795-8033
Facsimile Number	:	+81-3-5795-8346
Contact Person	:	Kaoru Ichimura

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

2.1 Identification of E.U.T.

Sony Corp., Model No: PCG-5A1L is the Notebook computer, which is co-located with Wireless LAN module (IEEE 802.11b, IEEE 802.11g) and Bluetooth module(FCC ID:CWTUGPZ3).
We recognized that this EUT can be co-operated Wireless LAN and Bluetooth. Therefore, we measured SAR when both Wireless LAN and Bluetooth were transmitted at the same time.
*Please refer to Report No.23DE0002-YK-1 for the detail on Bluetooth module.

Applicant	:	Sony Corp.
Type of Equipment	:	Notebook Personal Computer
Model No.	:	PCG-5A1L
Serial No.	:	1100008
Country of Manufacture	:	JAPAN
Receipt Date of Sample	:	November 26 ,2003
Condition of EUT	:	Engineering prototype
Battery option	:	Only one model with EUT
Category Identified	:	Portable device

2.2 Product Description (Wireless LAN)

Tx Frequency	:	2412MHz~2462MHz
Modulation	:	DSSS , OFDM
Rating	:	DC 3.1V ~ 3.46 V
Max.Output Power Tested	:	17.0dBm Peak Conducted
Antenna Type	:	λ/4-Monopole Antenna
Position of Antenna	:	See photograph of following

SECTION 3 : Requirements for compliance testing defined by the FCC

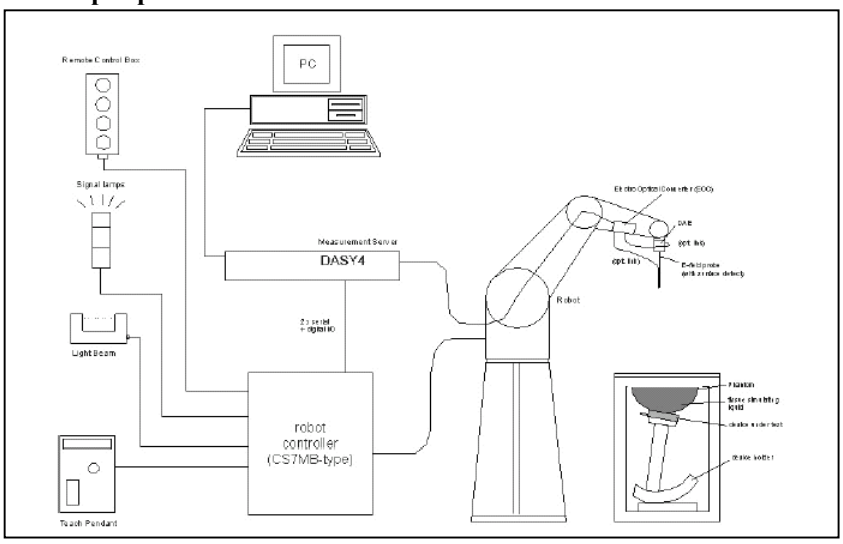
The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable 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: 1685 (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, IEE 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.

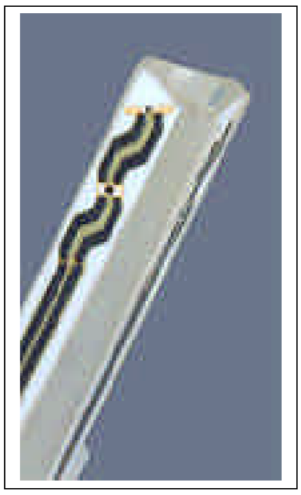
12. Tissue simulating liquid mixed according to the given recipes.

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

4.2 System components

4.2.1 ET3DV6 Probe Specification

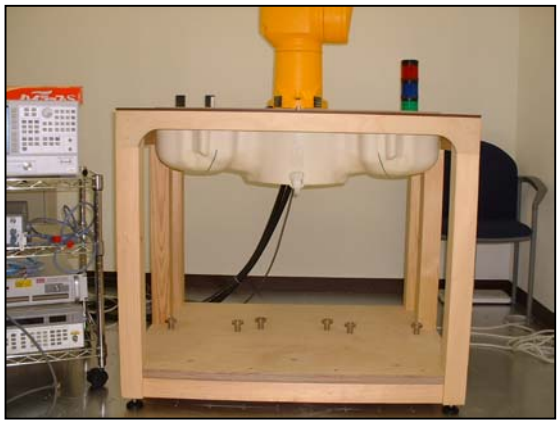
Construction:
Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
Calibration:
Basic Broad Band calibration in air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 450 MHz, 900 MHz, 1.8 GHz and 2.45GHz (accuracy +/-8%)
Frequency:
10 MHz to 3GHz; Linearity: +/-0.2 dB
(30 MHz to 3 GHz)
Directivity:
+/-0.2 dB in brain tissue (rotation around probe axis)
+/-0.4 dB in brain tissue (rotation normal probe axis)
Dynamic Range:
5 mW/g to > 100 mW/g;Linearity: +/-0.2 dB
Optical Surface Detection:
+/-0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces.
Dimensions:
Overall length: 330 mm (Tip: 16 mm)
Tip length: 16 mm
Body diameter: 12 mm (Body: 12 mm)
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm
Application:
General dosimetric up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms



Inside view of ET3DV6 E-field Probe

4.2.2 SAM Phantom

Construction:
The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 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 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 sever

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 accus)
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.	:	4.1
Manufacture / Origin	:	Schimid & Partner Engineering AG

E-Field Probe

Model	:	ET3DV6
Serial No.	:	1685
Construction	:	Triangular core fiber optic detection system
Frequency	:	10 MHz to 6 GHz
Linearity	:	+/-0.2 dB (30 MHz to 3 GHz)
Manufacture	:	Schimid & Partner Engineering AG

Phantom

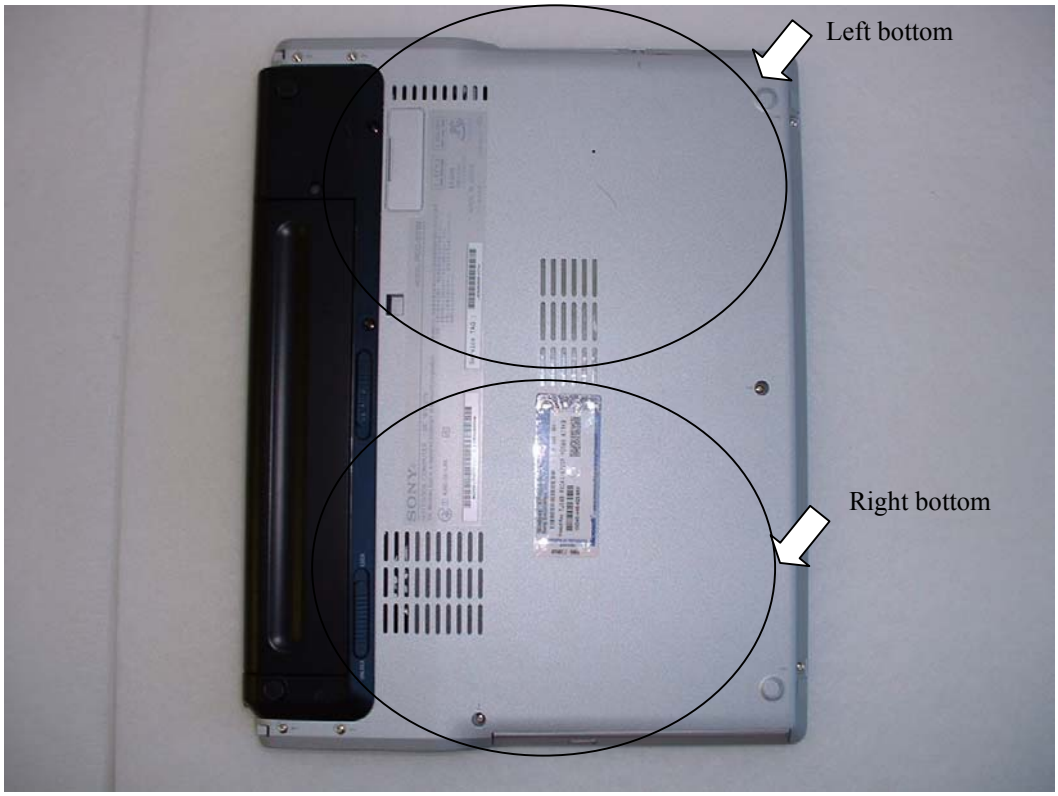
Type	:	SAM Twin Phantom V4.0
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Volume	:	Approx. 20 liters
Manufacture	:	Schimid & Partner Engineering AG

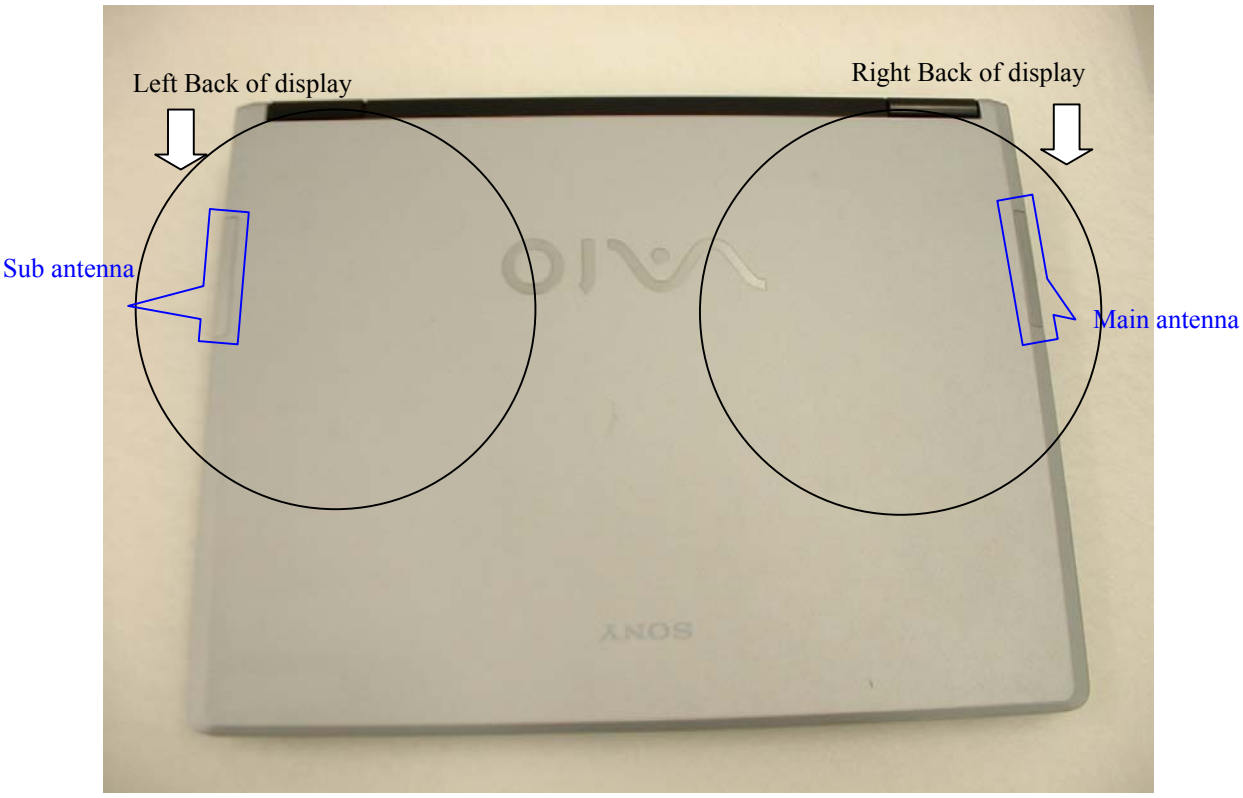
SECTION 6 : Test setup of EUT

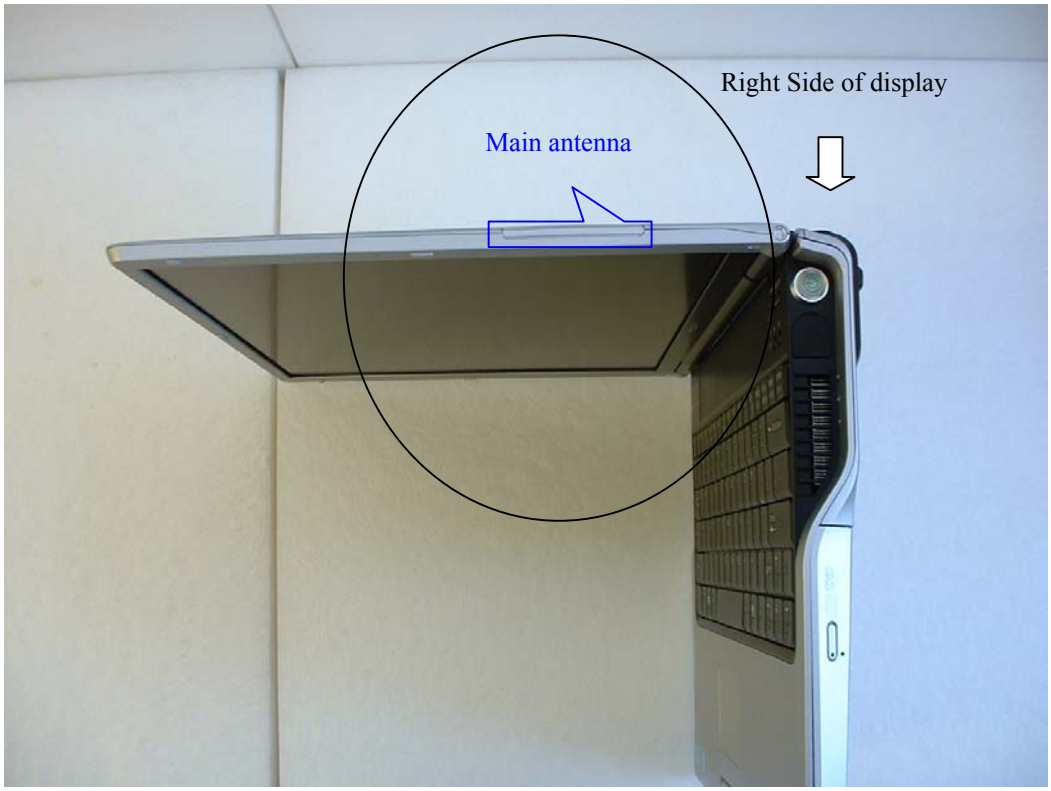
6.1 Photographs of test setup

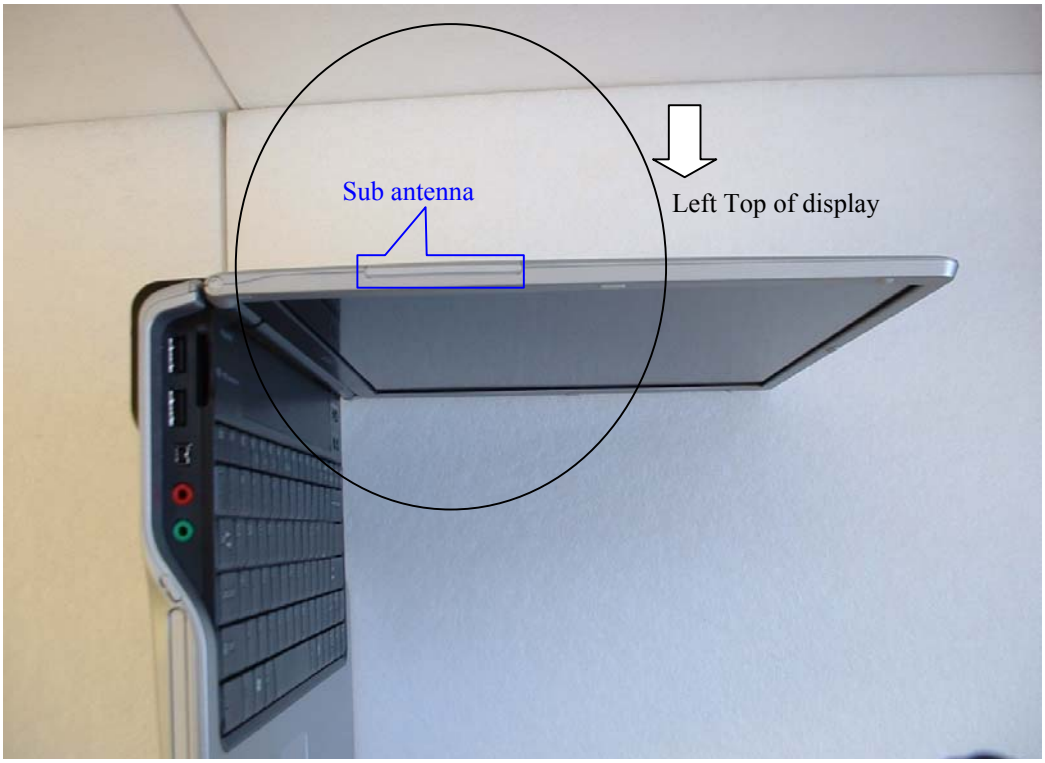
When users operate or carry this EUT, it could be considered to touch or get close to their bodies. And even if thiis EUT is closed LCD, it can be transmitted . In order to assume this situation, we performed the test at the following positions. Please refer to "APPENDIX 1" for more details.

1. Right Bottom	: The test was performed in touch with bottom of EUT to the flat phantom.
2. Left Bottom	: The test was performed in touch with bottom of EUT to the flat phantom.
3.Right Back of display	: The test was performed in distanced 15mm with right back of display to the flat phantom.
4.Left Back of display	: The test was performed in distanced 15mm with left back of display to the flat phantom.
5.Right Side of display	: The test was performed in distanced 15mm with right top of display to the flat phantom.
6.Left Side of display	: The test was performed in distanced 15mm with left top of display to the flat phantom.




Left Back of display
Right Back of display
Sub antenna
Main antenna


Right Side of display
Main antenna



6.2 EUT Tune-up procedure

We tested the condition that Wireless LAN and Bluetooth were transmitted at the same time.

We determined following conditions of Wireless LAN mode.
When the modulation were DSSS and OFDM
Transmitter was continuous mode.
Crest Factor = 1
Frequency channel were low , middle and high (2412MHz ,2437MHz and 2462MHz)

The conditions of Bluetooth was hopping mode.

SECTION 7 : Measurement uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the NIS81 [13] and the NIST1297 [6] documents and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci)1 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±4.8	Normal	1	1	±4.8	∞
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	±1.0	Rectangular	√3	1	±0.6	∞
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	35
Device holder uncertainty	±3.6	Rectangular	√3	1	±3.6	5
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
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	√3	0.64	±3.7	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±3.5	∞
Liquid permittivity (meas.)	±5.0	Rectangular	√3	0.6	±1.7	∞
Combined Standard Uncertainty					**±10.37**	
Expanded Uncertainty (k=2)					**±20.7**	

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 Head 2450MHz

Type of liquid : **Head 2450 MHz**
Ambient temperature (deg.c.) : **24.0(December 10) / 24.2(December 11)**
Relative Humidity (%) : **38(December 10) / 37(December y 11)**
Lquid depth (cm) : **15.9**

Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS							
Date	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
	Before	After					
December 10	23.7	23.7	Relative Permittivity εr	39.2	37.9	-3.3	+/-5
			Coductivity σ [mho/m]	1.80	1.87	3.9	+/-5
December 11	23.7	23.7	Relative Permittivity εr	39.2	38.1	-2.8	+/-5
			Coductivity σ [mho/m]	1.80	1.87	3.9	+/-5

8.1.2 Muscle 2450MHz

Type of liquid : **Muscle 2450 MHz**
Ambient temperature (deg.c.) : **24.8(December 10) / 24.8(December 11)**
Relative Humidity (%) : **38(December 10) / 37(December y 11)**
Liquid depth (cm) : **15.9**

Measured By : Miyo Ikuta

DIELECTRIC PARAMETERS MEASUREMENT RESULTS							
Date	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
	Before	After					
December 10	23.5	23.5	Relative Permittivity εr	52.7	50.2	-4.7	+/-10
			Coductivity σ [mho/m]	1.95	1.96	0.5	+/-5
December 11	23.5	23.5	Relative Permittivity εr	52.7	50.2	-4.7	+/-10
			Coductivity σ [mho/m]	1.95	1.94	-0.5	+/-5

8.2 Simulated Tissues

Ingredient	MiXTURE(%)	
	Head 2450MHz	Muscle 2450MHz
Water	45.0	69.83
DGMBE	55.0	30.17

Note:DGMBE(Diethylenglycol-monobuthyl ether)

SECTION 9 : System validation data

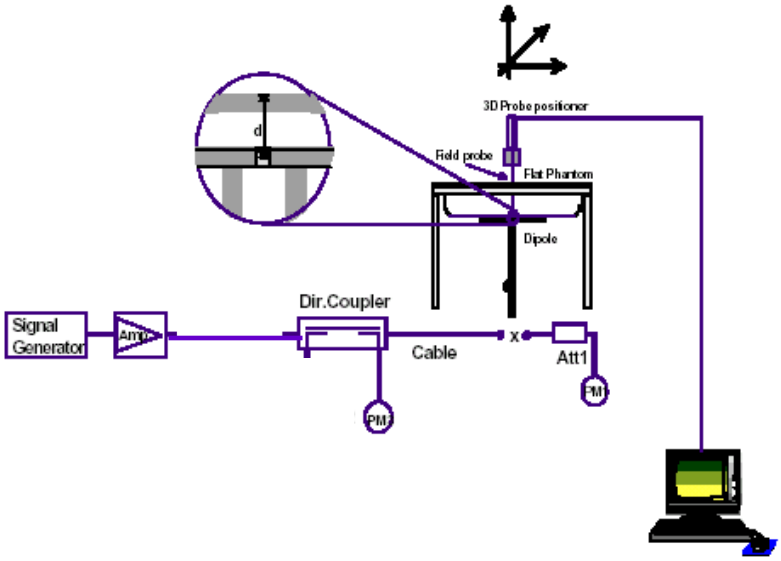
Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of +/-10%. The validation results are tabulated below. Please refer to APPENDIX 3.

Type of liquid	:	**HEAD 2450MHz**
Frequency	:	**2450MHz**
Dipole	:	**D2450V2 SN:713**
Liquid depth (cm)	:	**15.9**
Ambient temperature (deg.c.)	:	**24.0(December 10) / 24.2(December 11)**
Relative Humidity (%)	:	**38(December 10) / 37(December 11)**
Power	:	**250mW**

Measured By : Miyo Ikuta

SYSTEM PERFORMANCE CHECK										
Date	Liquid (HEAD 2450MHz)						System dipole validation target & measured			
	Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
	Before	After	Target	Measured	Target	Measured	Target	Measured		
December 10	23.2	23.2	39.2	37.9	1.80	1.87	13.1	13.4	2.3	+/-10
December 11	23.2	23.2	39.2	38.1	1.80	1.87	13.1	13.4	2.3	+/-10

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



2450MHz System performance 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 SAR value 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 EUT(180 x 260) and the horizontal grid spacing was 20 mm x 20 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 32 mm x 32 mm x 30 mm was assessed by measuring 5 x5 x 7 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 2.7 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 SAR value at the same location as in Step 1. It is measured SAR-drift(the difference between the SAR measured in Step 4 and 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

12.1 Measurement results of main antenna (Right antenna)

12.1.1 Conducted power measurement results

Date : December 10 ,2003
Measured By : Hiroka Umeyama

CONDUCTED POWER MEASUREMENT RESULTS OF MAIN ANTENNA													
		Before					After						
Modulation	Frequency [MHz]	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]	Deviation [%]	Limit [%]
DSSS	2412	-4.8	20.5	1.3	17.0	50.1	-4.9	20.5	1.3	16.9	49.0	-2.3	+/-5
	2437	-5.4	20.5	1.2	16.3	42.7	-5.5	20.5	1.2	16.2	41.7	-2.3	+/-5
	2462	-5.7	20.5	1.3	16.1	40.7	-5.8	20.5	1.3	16.0	39.8	-2.3	+/-5
OFDM (QPSK)	2412	-8.2	20.5	3.4	15.7	37.2	-8.2	20.5	3.4	15.7	37.2	0.0	+/-5
	2437	-8.9	20.5	3.3	14.9	30.9	-9.0	20.5	3.3	14.8	30.2	-2.3	+/-5
	2462	-9.4	20.5	3.4	14.5	28.2	-9.4	20.5	3.4	14.5	28.2	0.0	+/-5
OFDM (64QAM)	2412	-7.8	20.5	3.4	16.1	40.7	-8.0	20.5	3.4	15.9	38.9	-4.5	+/-5
	2437	-8.3	20.5	3.3	15.5	35.5	-8.4	20.5	3.3	15.4	34.7	-2.3	+/-5
	2462	-8.7	20.5	3.4	15.2	33.1	-8.7	20.5	3.4	15.2	33.1	0.0	+/-5

12.1.2 Body 2450MHz SAR of main antenna

Liquid Depth (cm)	:	**15.9**	Model	:	**PCG-5A1L**
Parameters	:	**εr =50.2, σ =1.96**	Serial No.	:	**1100008**
Ambient Temperature[deg.c.]	:	**24.8**	Modulation	:	**DSSS,OFDM**
Relative Humidity (%)	:	**38**	Crest factor	:	**1**

Date : December 10 ,2003
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTSOF MAIN ANTENNA											
Frequency		Modulation	Phantom Section	EUT Set-up Conditions					Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Wireless LAN	Bluetooth	Before	After	Maximum value of multi-peak)
Mid	2437	DSSS	Flat	Fixed	Right Bottom	0	ON	ON	22.8	22.8	**0.00324**
Mid	2437	DSSS	Flat	Fixed	Right Back of display	15	ON	ON	23.5	23.5	**0.0341**
Mid	2437	DSSS	Flat	Fixed	Right Side of display	15	ON	ON	23.5	23.4	**0.0767**
Low	2412	DSSS	Flat	Fixed	Right Side of display	15	ON	ON	23.4	23.4	**0.0873**
High	2462	DSSS	Flat	Fixed	Right Side of display	15	ON	ON	23.4	23.3	**0.071**
Low	2437	DSSS	Flat	Fixed	Right Side of display	15	ON	OFF	23.8	23.8	**0.0473**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population							**Body SAR: 1.6 W/kg (averaged over 1 gram)**				

Date : December 10 ,2003
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS OF MAIN ANTENNA											
Frequency		Modulation	Phantom Section	EUT Set-up Conditions					Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Wireless LAN	Bluetooth	Before	After	Maximum value of multi-peak)
Mid	2437	OFDM (QPSK)	Flat	Fixed	Right Bottom	0	ON	ON	22.8	22.8	**0.00107**
Mid	2437	OFDM (QPSK)	Flat	Fixed	Right Back of display	15	ON	ON	23.5	23.5	**0.00339**
Mid	2437	OFDM (QPSK)	Flat	Fixed	Right Side of display	15	ON	ON	23.4	23.4	**0.0187**
Low	2412	OFDM (QPSK)	Flat	Fixed	Right Side of display	15	ON	ON	23.0	23.0	**0.013**
High	2462	OFDM (QPSK)	Flat	Fixed	Right Side of display	15	ON	ON	22.9	22.9	**0.013**
Mid	2437	OFDM (QPSK)	Flat	Fixed	Right Side of display	15	ON	OFF	22.8	22.8	**0.0116**
Mid	2437	OFDM (64QAM)	Flat	Fixed	Right Bottom	0	ON	ON	22.8	22.8	**0.000978**
Mid	2437	OFDM (64QAM)	Flat	Fixed	Right Back of display	15	ON	ON	22.9	22.8	**0.00246**
Mid	2437	OFDM (64QAM)	Flat	Fixed	Right Side of display	15	ON	ON	22.8	22.8	**0.0123**
Low	2412	OFDM (64QAM)	Flat	Fixed	Right Side of display	15	ON	ON	22.8	22.8	**0.00865**
High	2462	OFDM (64QAM)	Flat	Fixed	Right Side of display	15	ON	ON	22.8	22.8	**0.00823**
Mid	2437	OFDM (64QAM)	Flat	Fixed	Right Side of display	15	ON	OFF	22.8	22.8	**0.00717**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General							**Body SAR: 1.6 W/kg (averaged over 1 gram)**				

12.2 Measurement results of sub antenna (Left antenna)

12.2.1 Conducted power measurement results

Date : December 11 ,2003
Measured By : Hiroka Umeyama

CONDUCTED POWER MEASUREMENT RESULTS OF SUB ANTENNA													
		Before					After						
Modulation	Frequency [MHz]	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]	Reading [dBm]	Att. [dB]	Cable loss [dB]	Result [dBm]	Convert [mW]	Deviation [%]	Limit [%]
DSSS	2412	-5.1	20.5	1.3	16.7	46.8	-5.2	20.5	1.3	16.6	45.7	-2.3	+/-5
	2437	-5.7	20.5	1.2	16.0	39.8	-5.7	20.5	1.2	16.0	39.8	0.0	+/-5
	2462	-5.8	20.5	1.3	16.0	39.8	-5.9	20.5	1.3	15.9	38.9	-2.3	+/-5
OFDM (QPSK)	2412	-8.7	20.5	3.4	15.2	33.1	-8.7	20.5	3.4	15.2	33.1	0.0	+/-5
	2437	-8.8	20.5	3.3	15.0	31.6	-9.0	20.5	3.3	14.8	30.2	-4.5	+/-5
	2462	-9.4	20.5	3.4	14.5	28.2	-9.4	20.5	3.4	14.5	28.2	0.0	+/-5
OFDM (64QAM)	2412	-8.2	20.5	3.4	15.7	37.2	-8.3	20.5	3.4	15.6	36.3	-2.3	+/-5
	2437	-8.9	20.5	3.3	14.9	30.9	-8.9	20.5	3.3	14.9	30.9	0.0	+/-5
	2462	-9.3	20.5	3.4	14.6	28.8	-9.3	20.5	3.4	14.6	28.8	0.0	+/-5

12.1.2 Body 2450MHz SAR of sub antenna

Liquid Depth (cm)	:	**15.9**	Model	:	**PCG-5A1L**
Parameters	:	**εr =50.2, σ =1.94**	Serial No.	:	**1100008**
Ambient Temperature[deg.c.]	:	**24.8**	Modulation	:	**DSSS,OFDM**
Relative Humidity (%)	:	**37**	Crest factor	:	**1**

Date : December 11 ,2003
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTSOF SUB ANTENNA											
Frequency		Modulation	Phantom Section	EUT Set-up Conditions					Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Wireless LAN	Bluetooth	Before	After	Maximum value of multi-peak)
Mid	2437	DSSS	Flat	Fixed	Left Bottom	0	ON	ON	23.6	23.6	**0.00234**
Mid	2437	DSSS	Flat	Fixed	Left Back of display	15	ON	ON	23.5	23.5	**0.0187**
Mid	2437	DSSS	Flat	Fixed	Left Side of display	15	ON	ON	23.5	23.5	**0.0345**
Low	2412	DSSS	Flat	Fixed	Left Side of display	15	ON	ON	23.5	23.5	**0.0389**
High	2462	DSSS	Flat	Fixed	Left Side of display	15	ON	ON	23.4	23.4	**0.0352**
Mid	2437	DSSS	Flat	Fixed	Left Side of display	15	ON	OFF	23.6	23.6	**0.0325**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population							**Body SAR: 1.6 W/kg (averaged over 1 gram)**				

Date : December 11 ,2003
Measured By : Miyo Ikuta

BODY SAR MEASUREMENT RESULTS OF SUB ANTENNA											
Frequency		Modulation	Phantom Section	EUT Set-up Conditions					Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Wireless LAN	Bluetooth	Before	After	Maximum value of multi-peak)
Mid	2437	OFDM (QPSK)	Flat	Fixed	Left Bottom	0	ON	ON	23.6	23.6	**0.000877**
Mid	2437	OFDM (QPSK)	Flat	Fixed	LeftTop of display	15	ON	ON	23.5	23.5	**0.00697**
Mid	2437	OFDM (QPSK)	Flat	Fixed	LeftTop of display	15	ON	ON	23.6	23.6	**0.01**
Low	2412	OFDM (QPSK)	Flat	Fixed	LeftTop of display	15	ON	ON	23.6	23.6	**0.00724**
High	2462	OFDM (QPSK)	Flat	Fixed	LeftTop of display	15	ON	ON	23.6	23,6	**0.008**
Mid	2437	OFDM (QPSK)	Flat	Fixed	LeftTop of display	15	ON	ON	23.6	23.6	**0.00948**
Mid	2437	OFDM (64QAM)	Flat	Fixed	Left Bottom	0	ON	ON	23.6	23.6	**0.000733**
Mid	2437	OFDM (64QAM)	Flat	Fixed	Left Top of display	15	ON	ON	23.5	23.5	**0.00148**
Mid	2437	OFDM (64QAM)	Flat	Fixed	Left Top of display	15	ON	ON	23.6	23.6	**0.00314**
Low	2412	OFDM (64QAM)	Flat	Fixed	Left Top of display	15	ON	ON	23.6	23.6	**0.00318**
High	2462	OFDM (64QAM)	Flat	Fixed	Left Top of display	15	ON	ON	23.6	23.6	**0.00293**
Low	2412	OFDM (64QAM)	Flat	Fixed	Left Top of display	15	ON	OFF	23.6	23.6	**0.0028**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General							**Body SAR: 1.6 W/kg (averaged over 1 gram)**				

SECTION 13 : Equipment & calibration information

Name of Equipment	Manufacture	Model number	Serial number	Calibration	
				Last Cal	due date
Power Meter	Agilent	E4417A	GB41290639	2003/11/12	2004/11/11
Power Sensor	Agilent	E9300B	US40010300	2003/11/17	2004/11/16
Power Sensor	Agilent	E9327A	US40440576	2003/11/13	2004/11/12
S-Parameter Network Analyzer	Agilent	E8358A	US41080381	2003/08/13	2004/08/12
Spectrum Analyzer	Advantest	R3273	121101460	2003/10/31	2004/10/30
Signal Generator	Rohde&Schwarz	SML03	100332	2003/08/26	2004/08/25
RF Amplifier	OPHIR	5056F	1005	2003/02/06	2004/02/05
Dosimetric E-Field Probe	Schmid&Partner Engineering AG	ET3DV6	1685	2003/10/10	2004/10/09
Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3 V1	509	2003/04/10	2004/04/09
Robot,SAM Phantom	Schmid&Partner Engineering AG	DASY4	I021834	N/A	N/A
Attenuator	Agilent	US40010300	08498-60012	2002/12/24	2003/12/23
Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-120	901247	2003/02/03	2004/02/02
2450MHz System Validation Dipole	Schmid&Partner Engineering AG	D2450V2	713	2002/11/15	2004/11/14
Dual Directional Coupler	N/A	Narda	03702	N/A	N/A
Head 2450MHz	N/A	N/A	N/A	N/A	N/A
Body 2450MHz	N/A	N/A	N/A	N/A	N/A

SECTION 14 : 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.

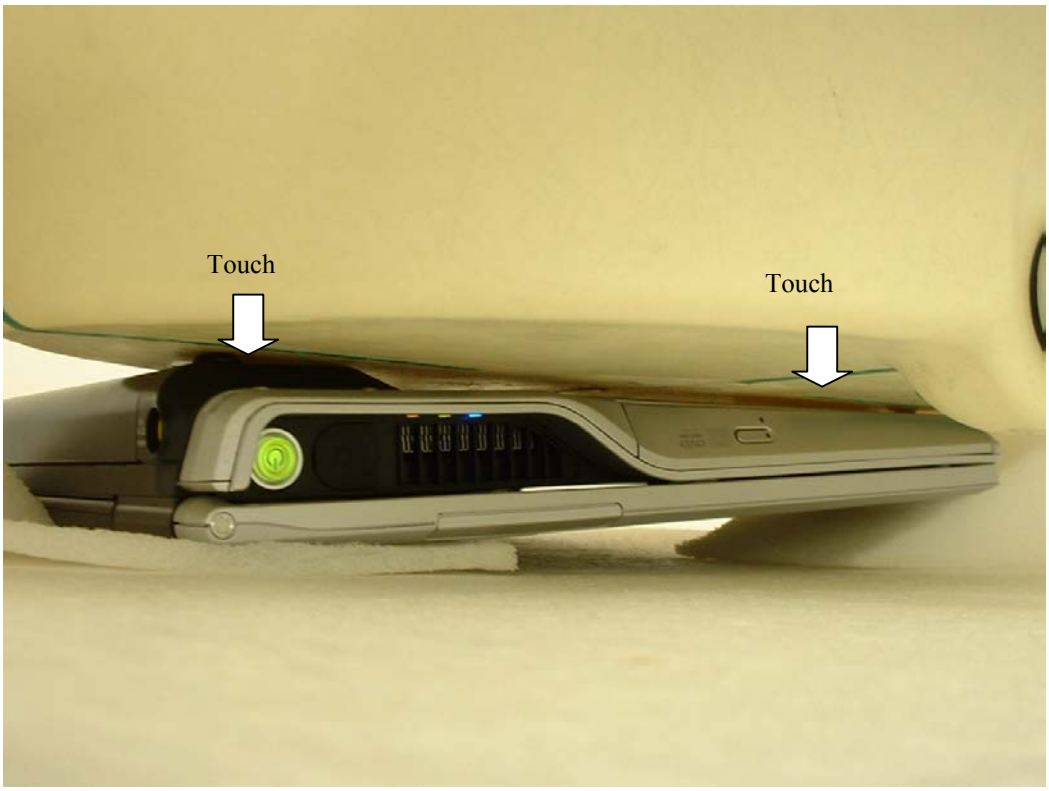
[4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

[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.

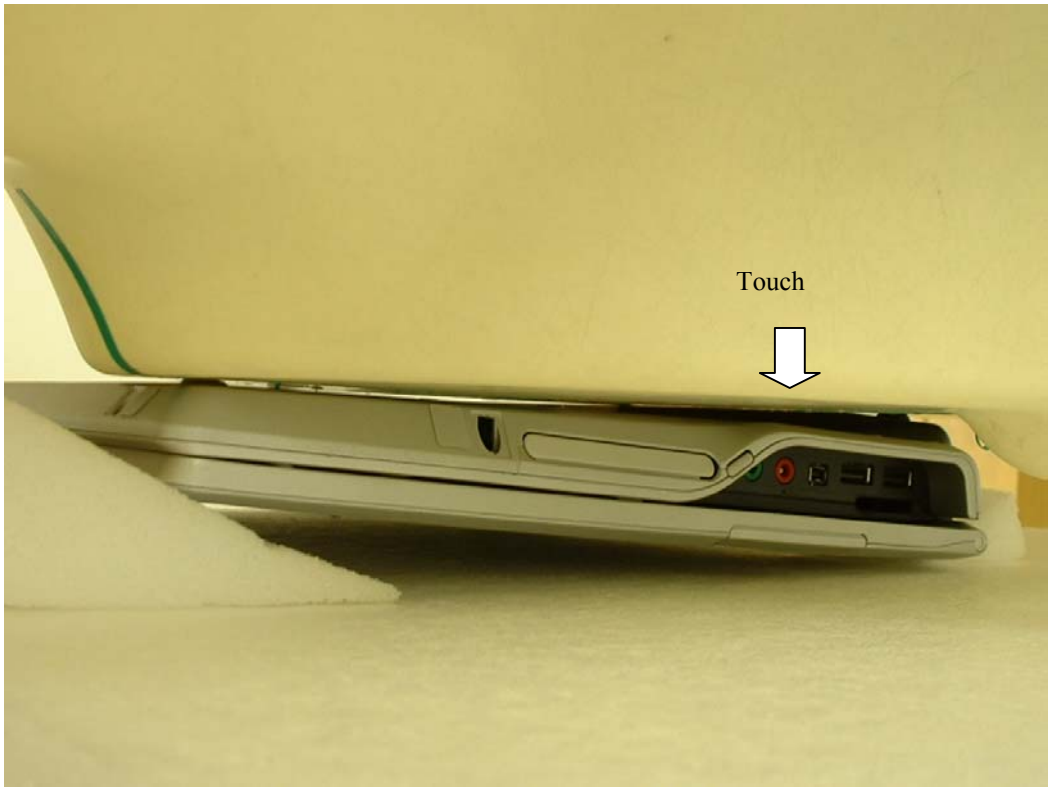
[6] Barry N. Taylor and Christ E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology,1994.

APPENDIX 1 : Photographs of test setup

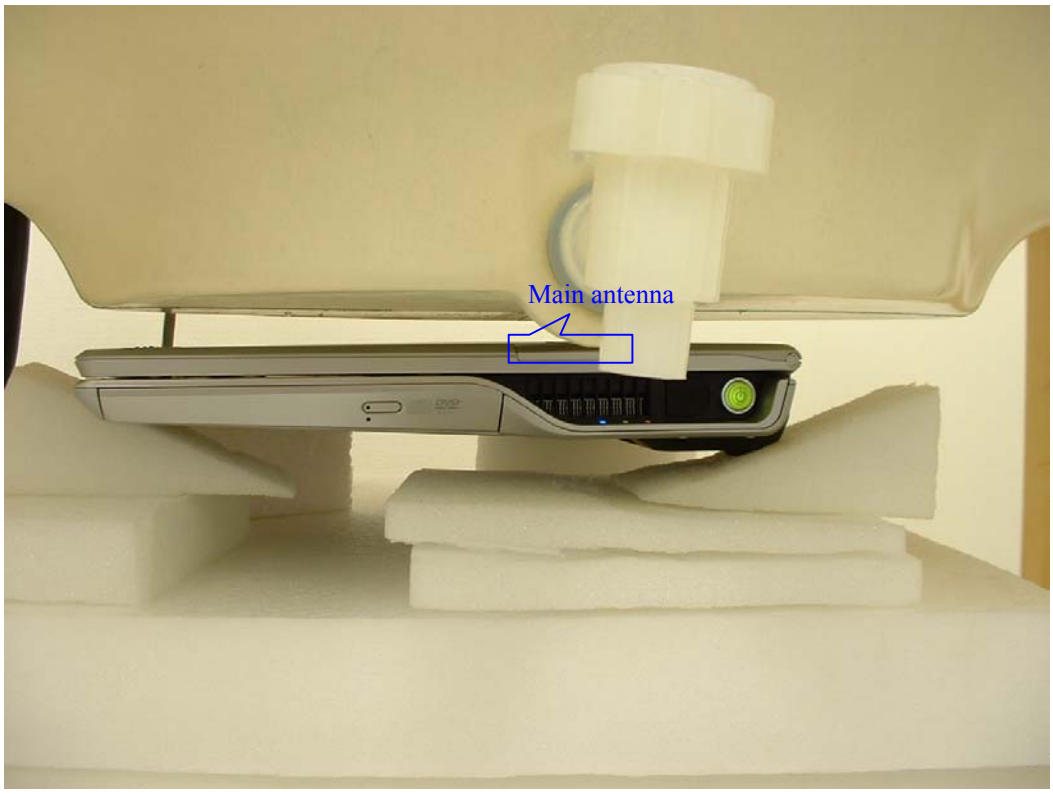
Right Bottom (Main antenna)

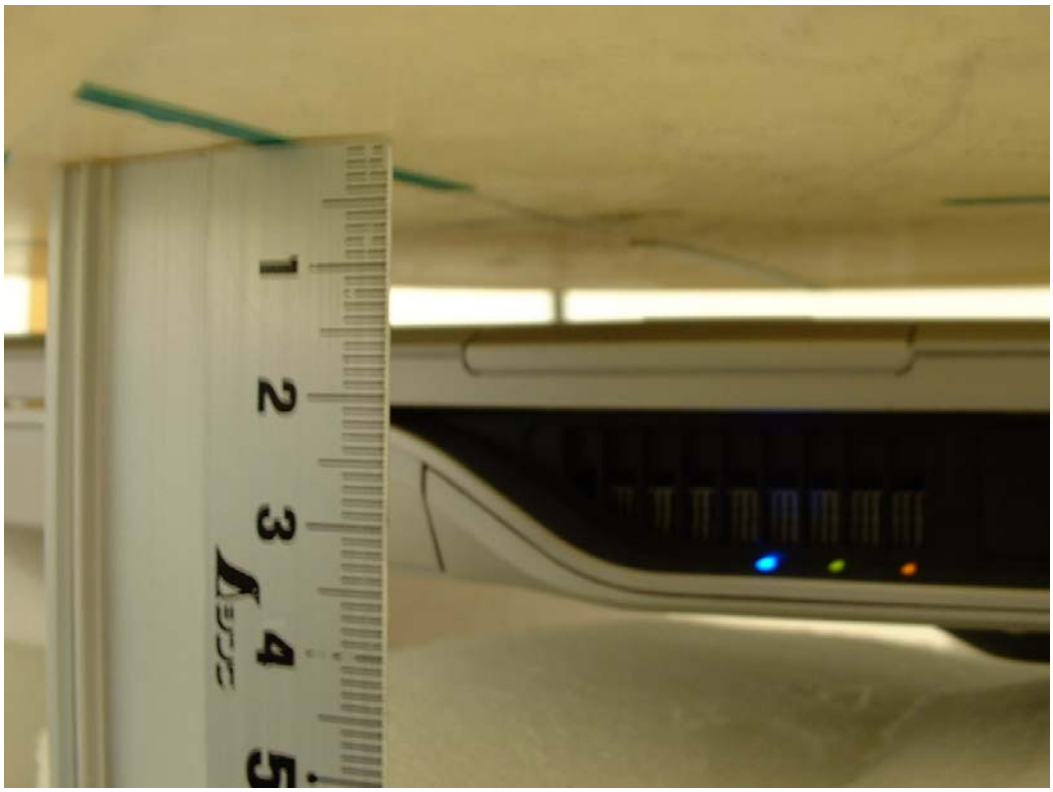


Left Bottom (Sub antenna)

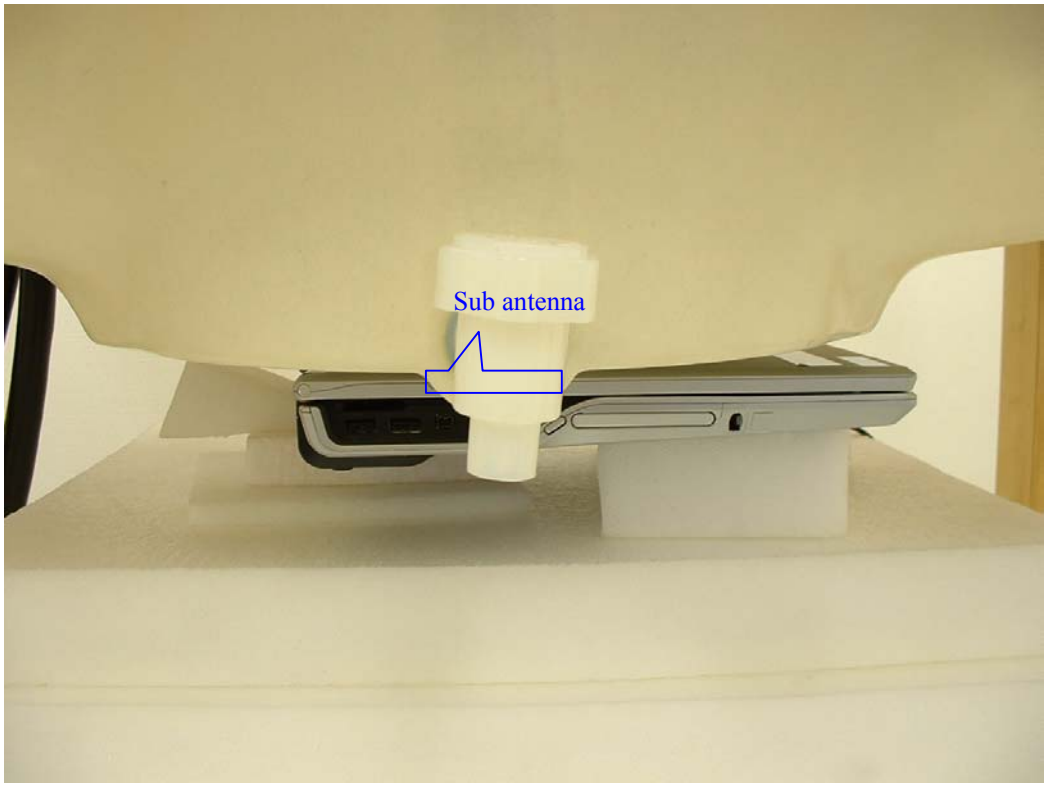


Right Back of display(Main antenna)

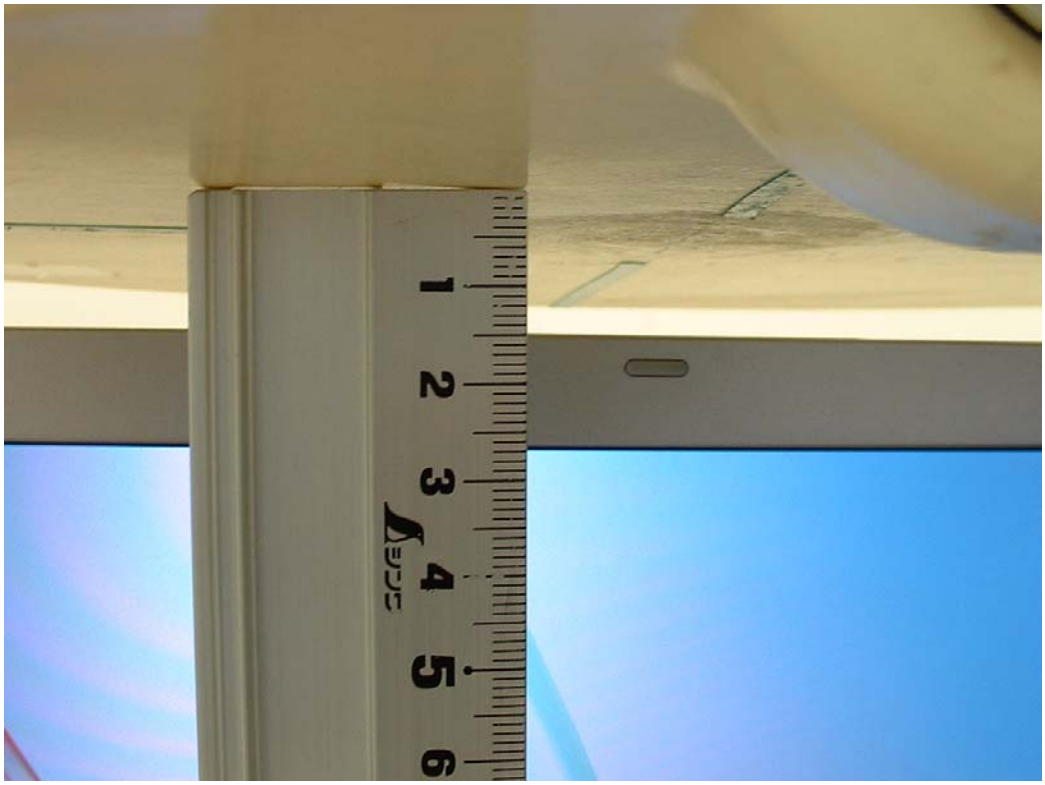
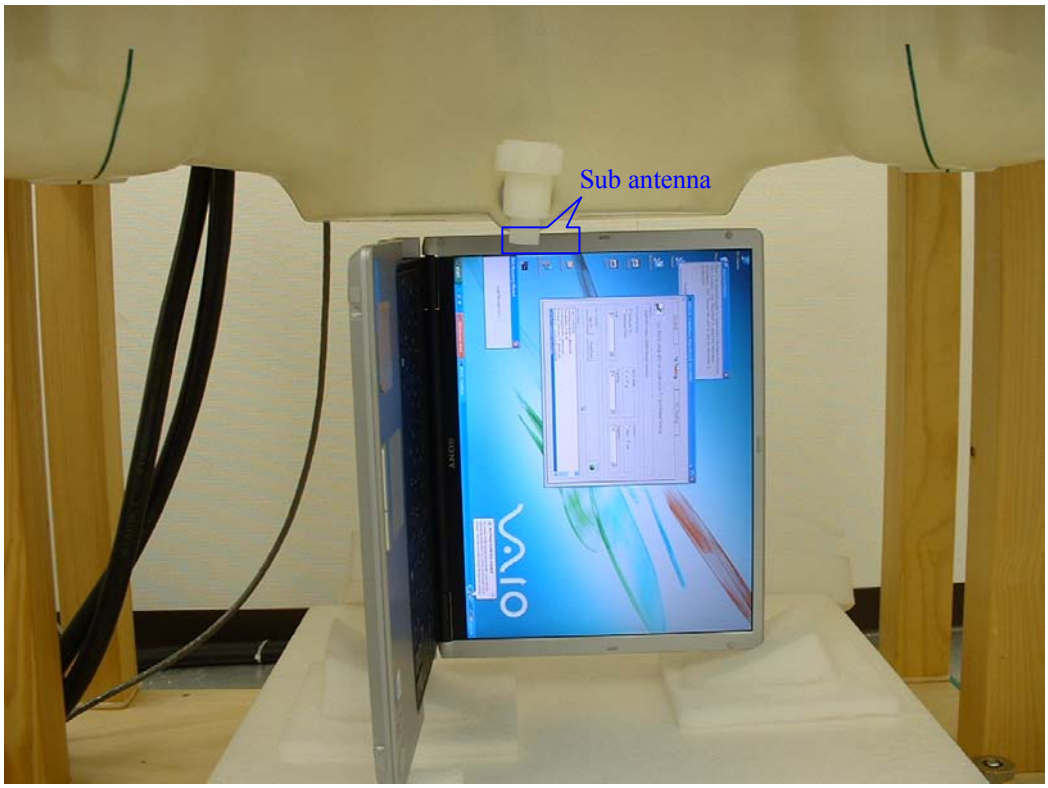
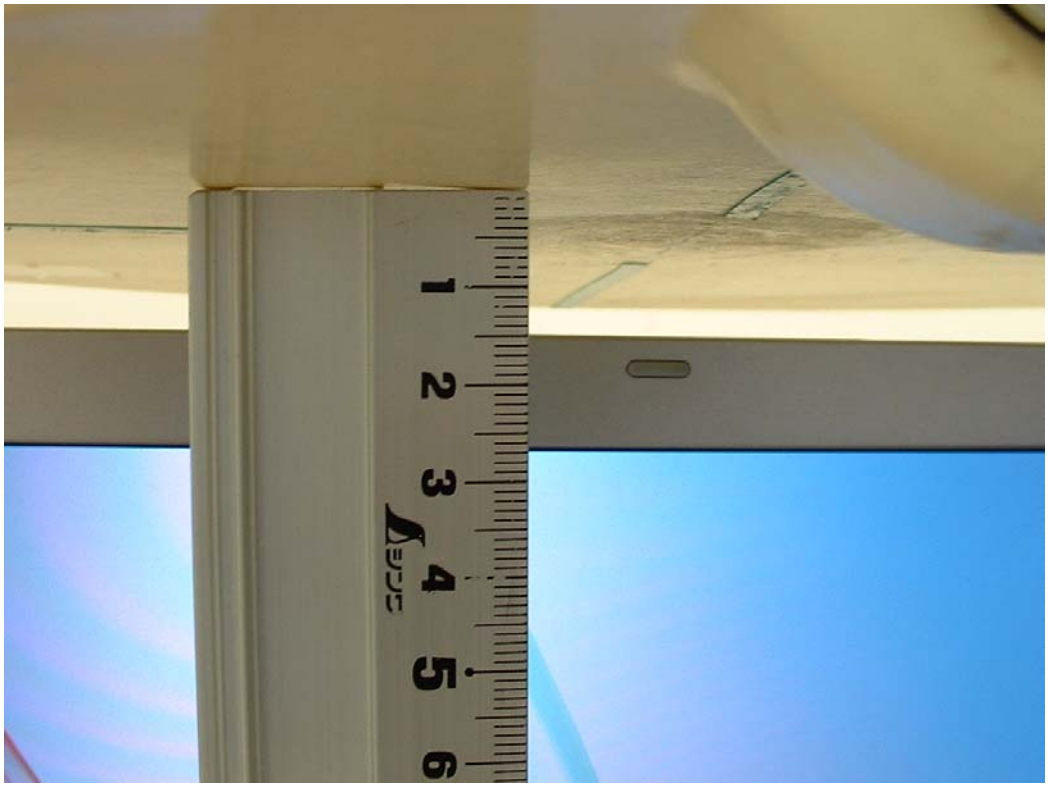




Left Back of display(Sub antenna)



Right Side of display(Main antenna)



Left Side of Antenna (Sub antenna)