SAR Evaluation Report

IN ACCORDANCE WITH THE REQUIREMENTS OF
FCC REPORT AND ORDER:
ET DOCKET 93-62, AND OET BULLETIN 65 SUPPLEMENT C

FOR

PCI EXPRESS 802.11A/B/G TRANSCEIVER

MODEL: PA3503U-1MPC

FCC ID: CJ6UPA3503WL

REPORT NUMBER: 05U3822-2

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Prepared for

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Revision History

Rev.	Issued date	Revisions	Revised By
A	December 30, 2005	Initial Issue	HS

CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

DATES OF TEST: December 21, 22 and 23, 2005

APPLICANT: ADDRESS:	Toshiba Corporation Digital Media Network Company Ome Complex, 2-9, Suehiro-cho, Tokyo, 198-8710, Japan
FCC ID: MODEL:	CJ6UPA3503WL PA3503U-1MPC
DEVICE CATEGORY: EXPOSURE CATEGORY:	Portable Device General Population/Uncontrolled Exposure

PCI Express a/b/g Transceiver is installed in Toshiba Portege M400, including collocation with Bluetooth module FCC ID: CJ6UPA3418BT.

Test Sample is a:	Production unit
Modulation type:	Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11ag
Antenna(s)	The radio utilizes two antennas for diversity (main and auxiliary) PIFA Film Antenna, type HTL017, TIAN01, HFT40, TBN001, WNC001 Notes: 1. For 2.4 GHz band, all measurements were done with highest gain antenna, type WNC001. 2. For 5 GHz band, all measurements were done with highest gain antenna, type HTL017.

FCC Rule Parts	Frequency Range [MHz]	The Highest SAR Values [1g_mW/g]	Collocation SAR Values [1g_mW/g]
15.247	2412 - 2462	0.856	0.826
	5745 - 5825	0.878	0.860
15.401	5180 – 5320	1.158	1.150

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C (Edition 01-01).

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

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Tested By:

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EMC Engineer
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1 EQUIPMENT UNDER TEST (EUT) DESCRIPTION

Mini PCI Express a/b/g Transceiver is installed in Toshiba Portege M400, including collocation with Bluetooth module FCC ID: CJ6UPA3418BT.	
Normal operation:	Lap-held position and LCD edge position (Under Arm)
Accessory:	N/A
Earphone/Headset Jack:	N/A
Duty cycle:	99% for a, b, & g modes
Host Device(s):	Portege M400
Power supply:	Power supplied through the laptop computer (host device)
Antenna(s)	The radio utilizes two antennas for diversity (main and auxiliary) PIFA Film Antenna, type HTL017, TIAN01, HFT40, TBN001, WNC001 Notes: 1. For 2.4 GHz band, all measurements were done with highest gain antenna, type WNC001. 2. For 5 GHz band, all measurements were done with highest gain antenna, type HTL017.

2 FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

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LAB CODE:200065-0

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

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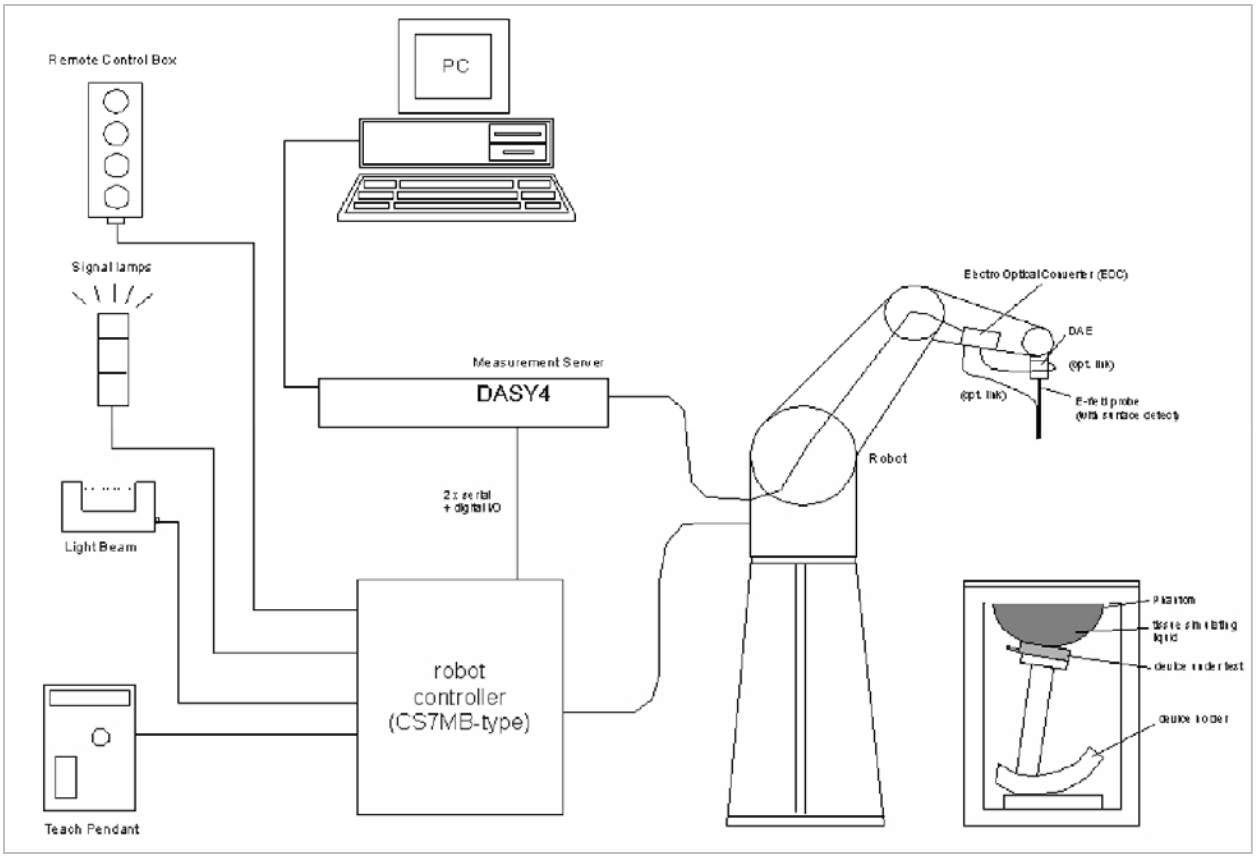
3 SYSTEM DESCRIPTION

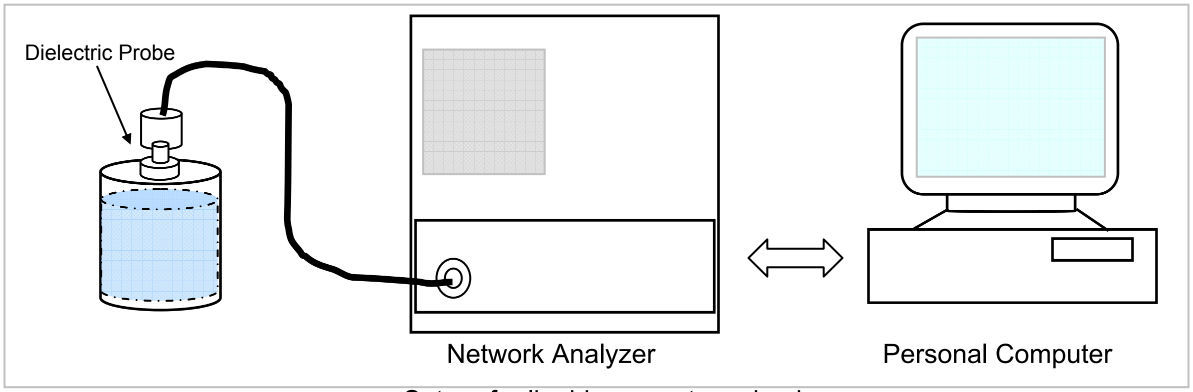


The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- 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.
- A data acquisition electronics (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.
- 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

4 SIMULATING LIQUID PARAMETERS CHECK

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameters are within the tolerances of the specified target values. The relative permittivity and conductivity of the tissue material should be within ± 5% of the values given in the table below.



Set-up for liquid parameters check

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 150 – 3000 MHz and 5800 MHz)

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE Standard 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

Reference Values of Tissue Dielectric Parameters for Head and Body Phantom (for 3000 MHz – 5800 MHz)

In the current guidelines and draft standards for compliance testing of mobile phones (i.e., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see table below).

SPEAG has developed suitable head and body tissue simulating liquids consisting of the following ingredients: de-ionized water, salt and a special composition including mineral oil and an emulgators. Dielectric parameters of these liquids were measured suing a HP 8570C Dielectric Probe Kit in conjunction with HP 8753ES Network Analyzer (30 kHz – 6G Hz). The differences with respect to the interpolated values were well within the desired ±5% for the whole 5 to 5.8 GHz range.

f (MHz)	Head Tissue		Body Tissue		Reference
	rel. permitivity	conductivity	rel. permitivity	conductivity	
3000	38.5	2.40	52.0	2.73	Standard
5800	35.3	5.27	48.2	6.00	Standard
5000	36.2	1.45	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

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

4.1 SIMULATING LIQUID PARAMETER CHECK RESULT

Simulating Liquid Dielectric Parameter Check Result @ Muscle 2450 MHz

Room Ambient Temperature =23.5 °C; Relative humidity = 40% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
2450	23	15	e"	Relative Permittivity (e'):	52.7	53.1998	0.95	± 5
			14.8355	Conductivity (σ):	1.95	2.02203	3.69	± 5

Liquid Check
Ambient temperature: 23.5 deg. C; Liquid temperature: 23.0 deg C
December 21, 2005 10:26 AM

Frequency	e'	e"
2400000000.	53.3910	14.6292
2410000000.	53.3522	14.6486
2420000000.	53.3226	14.7308
2430000000.	53.2852	14.7458
2440000000.	53.2438	14.8101
2450000000.	53.1998	14.8355
2460000000.	53.1762	14.9015
2470000000.	53.1432	14.9415
2480000000.	53.1051	14.9971
2490000000.	53.0628	15.0394
2500000000.	53.0520	15.0599

The conductivity (σ) can be given as:

$$\sigma = \omega\varepsilon_0 e'' = 2\pi f \varepsilon_0 e''$$

where f = target f * 10^6
$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Ambient Temperature = 25.5 °C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	25	15	e'	Relative Permittivity (e"):	49.0	48.3136	-1.40	± 5
			18.7051	Conductivity (σ):	5.30	5.41106	2.10	± 5
5800	25	15	e'	Relative Permittivity (e"):	48.2	47.1711	-2.13	± 5
			19.3985	Conductivity (σ):	6.00	6.25915	4.32	± 5

Liquid Check
Ambient temperature: 25.5 deg. C; Liquid temperature: 25.0 deg C
December 22, 2005 09:08 AM

Frequency	e'	e''
4600000000.	49.4754	17.8492
4650000000.	49.3958	17.9104
4700000000.	49.2937	18.0161
4750000000.	49.1978	18.0845
4800000000.	49.1156	18.1615
4850000000.	49.0272	18.2253
4900000000.	48.9274	18.3126
4950000000.	48.8088	18.3937
5000000000.	48.7407	18.4377
5050000000.	48.6376	18.5128
5100000000.	48.5347	18.5701
5150000000.	48.4197	18.6543
5200000000.	48.3136	18.7051
5250000000.	48.2365	18.7611
5300000000.	48.1326	18.8378
5350000000.	48.0278	18.8973
5400000000.	47.9400	18.9512
5450000000.	47.8352	19.0037
5500000000.	47.7259	19.0588
5550000000.	47.6337	19.1218
5600000000.	47.5544	19.1720
5650000000.	47.4428	19.2308
5700000000.	47.3704	19.2798
5750000000.	47.2452	19.3378
5800000000.	47.1711	19.3985
5850000000.	47.0640	19.4484
5900000000.	46.9901	19.5214
5950000000.	46.8718	19.5580
6000000000.	46.7878	19.6315

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where f = target $f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

Simulating Liquid Parameter Check Result @ Muscle 5200 & 5800 MHz

Ambient Temperature = 25.0 °C; Relative humidity = 45% Measured by: Ninous Davoudi

Simulating Liquid			Parameters		Target	Measured	Deviation (%)	Limit (%)
f (MHz)	Temp. (°C)	Depth (cm)						
5200	24.5	15	e'	Relative Permittivity (e"):	49.0	46.9568	-4.17	± 5
			18.6627	Conductivity (σ):	5.30	5.39880	1.86	± 5
5800	24.5	15	e'	Relative Permittivity (e"):	48.2	45.8469	-4.88	± 5
			19.3492	Conductivity (σ):	6.00	6.24324	4.05	± 5

Liquid Check
Ambient temperature: 25.0 deg. C; Liquid temperature: 24.5 deg C
December 23, 2005 08:43 AM

Frequency	e'	e''
4600000000.	48.1594	17.8421
4650000000.	48.0676	17.9201
4700000000.	47.9636	17.9786
4750000000.	47.8825	18.0675
4800000000.	47.7682	18.1408
4850000000.	47.6826	18.2113
4900000000.	47.5726	18.2820
4950000000.	47.4738	18.3394
5000000000.	47.3752	18.4226
5050000000.	47.2721	18.4720
5100000000.	47.1735	18.5483
5150000000.	47.0839	18.5960
5200000000.	46.9568	18.6627
5250000000.	46.8685	18.7240
5300000000.	46.7782	18.7768
5350000000.	46.6810	18.8353
5400000000.	46.5602	18.8816
5450000000.	46.4898	18.9416
5500000000.	46.3997	18.9905
5550000000.	46.2878	19.0673
5600000000.	46.2129	19.1181
5650000000.	46.0774	19.1784
5700000000.	46.0344	19.2207
5750000000.	45.8845	19.2710
5800000000.	45.8469	19.3492
5850000000.	45.6971	19.3742
5900000000.	45.6358	19.4939
5950000000.	45.5303	19.4882
6000000000.	45.4221	19.5879

The conductivity (σ) can be given as:

$$\sigma = \omega \varepsilon_0 e'' = 2 \pi f \varepsilon_0 e''$$

where $f = \text{target } f * 10^6$

$\varepsilon_0 = 8.854 * 10^{-12}$

5 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%.

System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The DASY4 system with an Isotropic E-Field Probe EX3DV3-SN: 3531 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  (For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.)
- Special 5 x 5 x 7 fine cube was chosen for cube integration(dx=dy=7.5mm; dz=5mm).
  (For 5 GHz band - Special 8x8x8 fine cube was chosen for cube integration(dx=dy=4.3mm; dz=3mm))
- Distance between probe sensors and phantom surface was set to 2.5 mm.
  (For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.0 mm
- The dipole input power (forward power) was 250 mW±3%.
- The results are normalized to 1 W input power.

Reference SAR Values for body-tissue

In the table below, the numerical reference SAR values of a SPEAG validation dipoles placed below the flat phantom filled with body-tissue simulating liquid are given. The reference SAR values were calculated using the finite-difference time-domain method and the geometry parameters.

Dipole Type	Distance (mm)	Frequency (MHz)	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D450V2	15	450	5.01	3.36	7.22
D835V2	15	850	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	51.2	23.7	97.6

The reference SAR values were calculated using finite-difference time-domain FDTD method (feed point-impedance set to 50 ohms) and the mechanical dimensions of the D5GHzV2 dipole (manufactured by SPEAG).

f (MHz)	Head Tissue		Body Tissue		
	SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}	SAR_{Peak}
5000	72.9	20.7	68.1	19.2	260.3
5100	74.6	21.1	78.8	19.6	272.3
5200	76.5	21.6	71.8	20.1	284.7
5800	78.0	21.9	74.1	20.5	324.7

Note: All SAR values normalized to 1 W forward power.

5.1 System Performance Check Results

System Validation Dipole: D2450V2 SN: 748

Date: December 21, 2005

Ambient Temperature = 23.5 °C, Relative humidity = 40% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target 1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
2450	23	15	13.1	52.4	51.2	2.34	± 10
			1g	Normalized to 1 W	Target 10g	Deviation[%]	Limit [%]
			6.02	24.08	23.7	1.60	± 10

System Validation Dipole: D5GHzV2 SN 1003

Date: December 22, 2005

Ambient Temperature = 25.5°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target 1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
5200	25	15	16.7	66.8	71.8	-6.96	± 10
			1g	Normalized to 1 W	Target 10g	Deviation[%]	Limit [%]
			4.77	19.08	20.1	-5.07	± 10

Body Simulating Liquid			Mrasured		Target 1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
5800	25	15	17.4	69.6	74.1	-6.07	± 10
			1g	Normalized to 1 W	Target 10g	Deviation[%]	Limit [%]
			4.91	19.64	20.5	-4.20	± 10

Date: December 23, 2005

Ambient Temperature = 25.0°C; Relative humidity = 45% Measured by: Ninous Davoudi

Body Simulating Liquid			Mrasured		Target 1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
5200	24.5	15	17.6	70.4	71.8	-1.95	± 10
			1g	Normalized to 1 W	Target 10g	Deviation[%]	Limit [%]
			4.99	19.96	20.1	-0.70	± 10

Body Simulating Liquid			Mrasured		Target 1g	Deviation[%]	Limit [%]
f (MHz)	Temp. [°C]	Depth [cm]	1g	Normalized to 1 W			
5800	24.5	15	17.2	68.8	74.1	-7.15	± 10
			1g	Normalized to 1 W	Target 10g	Deviation[%]	Limit [%]
			4.84	19.36	20.5	-5.56	± 10

6 SAR MEASUREMENT PROCEDURE

A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the EUT. The SAR at this point is measured at the start of the test, and then again at the end of the test.

b) The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 2.5 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 15 mm x 15 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

   (For 5 GHz band - The SAR distribution at the exposed flat section of the flat phantom is measured at a distance of 2.0 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 10 mm x 10 mm. Based on this data, the area of the maximum absorption is determined by Spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified)

c) Around this point, a volume of X=Y= 30 and Z=21 mm is assessed by measuring 5 x 5 x 7 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

   (For 5 GHz band - Around this point, a volume of X=Y=Z=30 mm is assessed by measuring 8 x 8 x 8 mm points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:)

   (i) The data at the surface are extrapolated, since the center of the dipoles is 1.2 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 is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

   (ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using 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-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

   (iii) All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

   (iv) The SAR value at the same location as in Step (a) is again measured to evaluate the actual power drift.

DASY4 SAR MEASUREMENT PROCEDURE

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 1.2 mm for an EX3DV3 probe type).

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures 5 x 5 x 7 points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

(For 5 GHz band – Same as above except the Zoom Scan measures 8 x 8 x 8 points.)

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

7 PROCEDURES USED TO ESTABLISH TEST SIGNAL

The following procedures had been used to prepare the EUT for the SAR test.

The client provided a special driver and program, installed in the host laptop to set the frequency and control the output power.

The cable assembly insertion loss of 20.46 dB (including 20.26 dB pad and 0.2 dB connectors) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	17.52
Middle	2437	17.59
High	2462	17.91

802.11g Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	16.21
Middle	2437	19.40
High	2462	15.01

The cable assembly insertion loss of 20.12 dB (including 19.92 dB pad and 0.2 dB connectors) was entered as an offset in the power meter to allow for direct reading of power.

802.11a 5.2 GHz

Channel	Frequency (MHz)	Power (dBm)
Low	5180	18.30
Middle	5260	18.54
High	5320	18.38

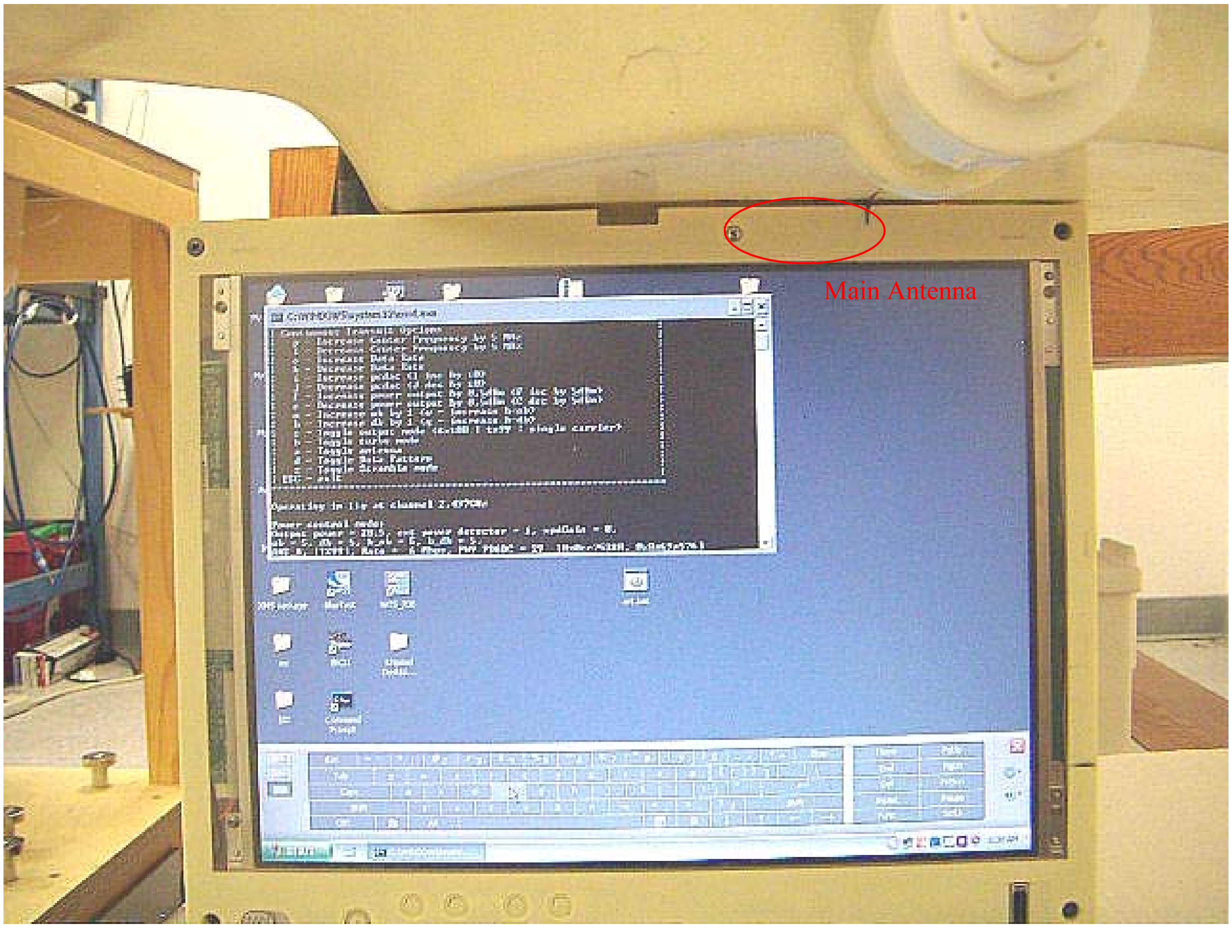
The cable assembly insertion loss of 20.17 dB (including 19.97 dB pad and 0.2 dB connectors) was entered as an offset in the power meter to allow for direct reading of power.

802.11a 5.8 GHz

Channel	Frequency (MHz)	Power (dBm)
Low	5745	17.86
Middle	5785	17.88
High	5825	17.92

8 SAR MEASUREMENT RESULT (2.4 GHZ)

8.1 LCD EDGE MAIN ANTENNA (UNDER ARM)



802.11b (1Mbps)						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
1	2412					
6	2437					
11	2462	0.349	0.000	0.349	0.80	1.6

802.11g (6 Mbps)						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
1	2412					
6	2437	0.433	0.000	0.433	0.80	1.6
11	2462					

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) The SAR measured at the high channel (worst-case) for this configuration is at least 3 dB lower than SAR limit, thus testing at other channel is optional.
3) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

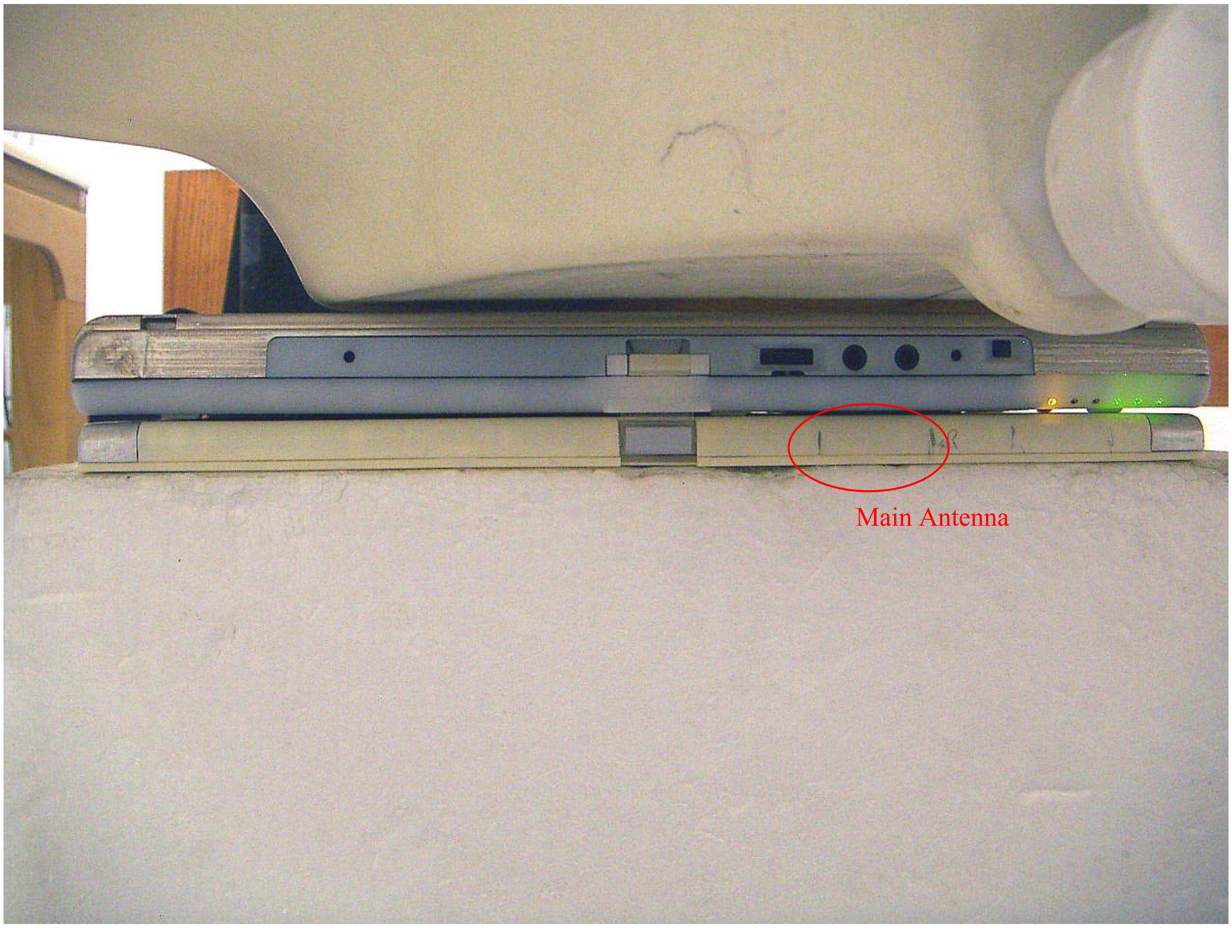
8.2 LCD EDGE AUX ANTENNA (UNDER ARM)

Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
802.11b (1Mbps)						
1	2412	0.540	0.000	0.540	0.80	1.6
6	2437	0.676	0.000	0.676	0.80	1.6
11	2462	0.840	0.000	0.840	0.80	1.6
802.11g (6 Mbps)						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
1	2412	0.365	0.000	0.365	0.80	1.6
6	2437	0.856	0.000	**0.856**	0.80	1.6
11	2462	0.368	0.000	0.368	0.80	1.6
6 [3)]	2437	0.826	0.000	**0.826**	0.80	1.6

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
3) Co-location with Bluetooth FCC ID: CJ6UPA3418BT

8.3 LAP HELD MAIN ANTENNA

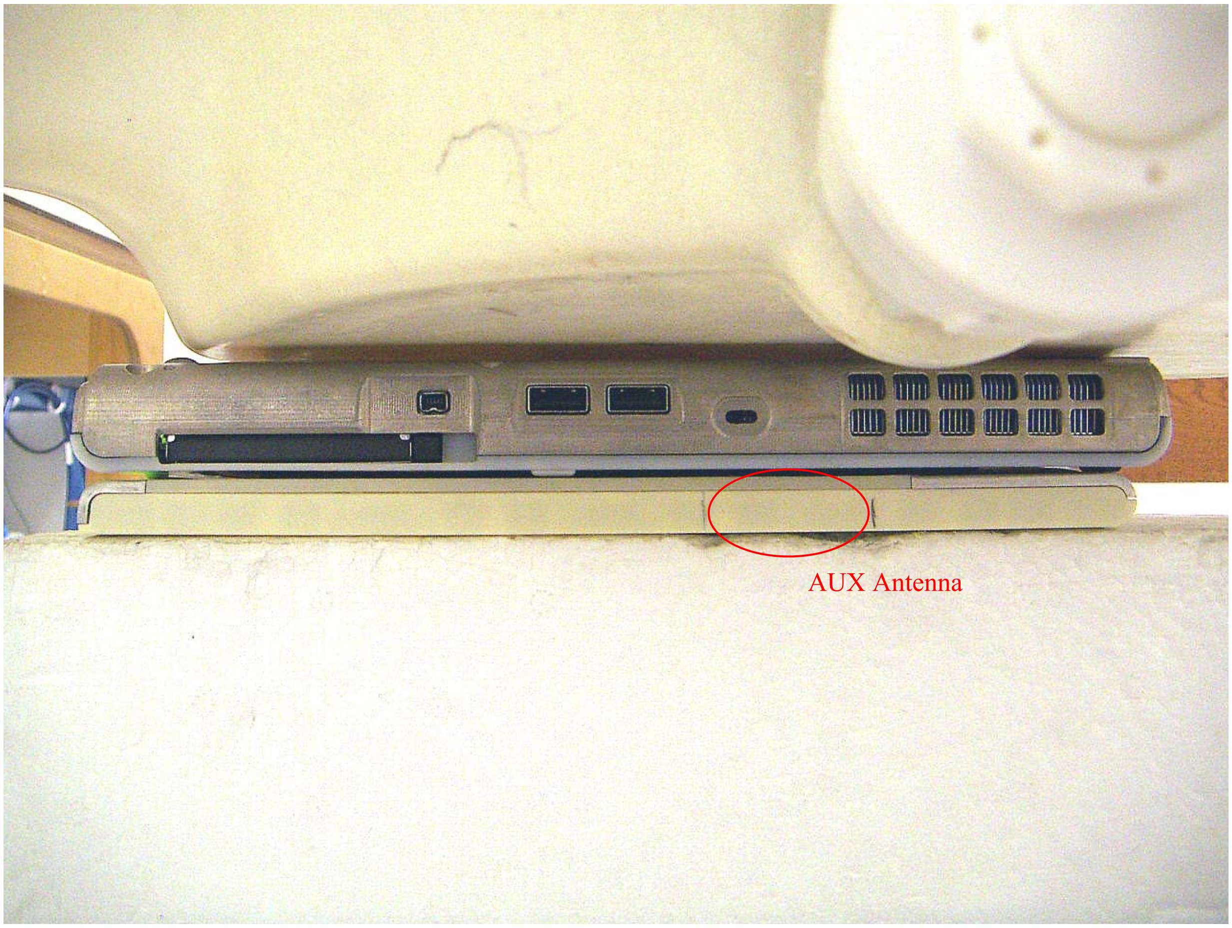


802.11b (1Mbps)						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
1	2412					
6	2437					
11	2462	0.026	-0.010	0.026	0.80	1.6
802.11g (6 Mbps)						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
1	2412					
6	2437	0.022	0.000	0.022	0.80	1.6
11	2462					

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) The SAR measured at the high channel (worst-case) for this configuration is at least 3 dB lower than SAR limit, thus testing at other channel is optional.
3) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

8.4 LAP HELD AUX ANTENNA



802.11b (1Mbps)						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
1	2412					
6	2437					
11	2462	0.016	0.000	0.016	0.80	1.6

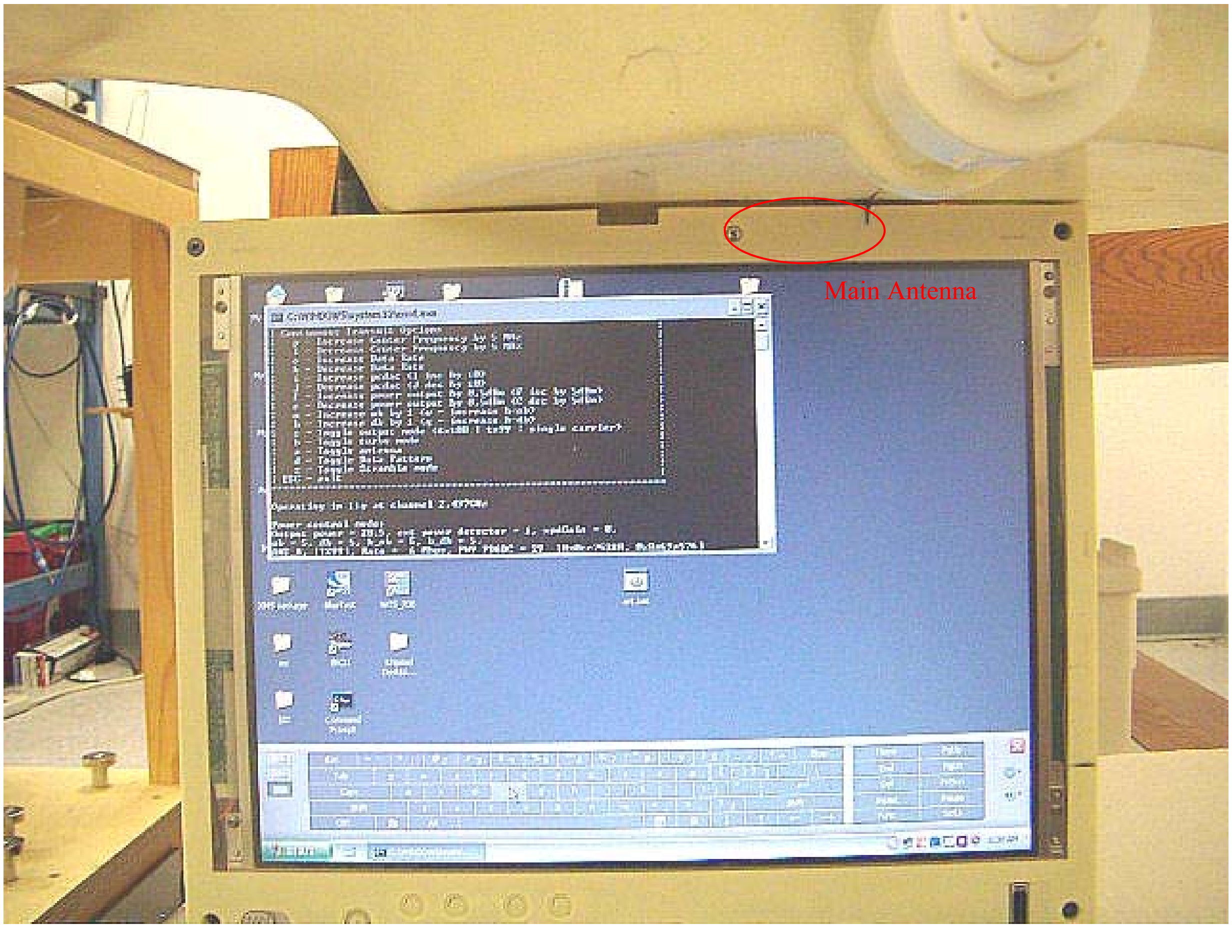
802.11g (6 Mbps)						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
1	2412					
6	2437	0.013	0.000	0.013	0.80	1.6
11	2462					

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) The SAR measured at the high channel (worst-case) for this configuration is at least 3 dB lower than SAR limit, thus testing at low & high channel is optional.
3) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

9 SAR MEASUREMENT RESULT (5 GHZ)

9.1 LCD EDGE MAIN ANTENNA (UNDER ARM)

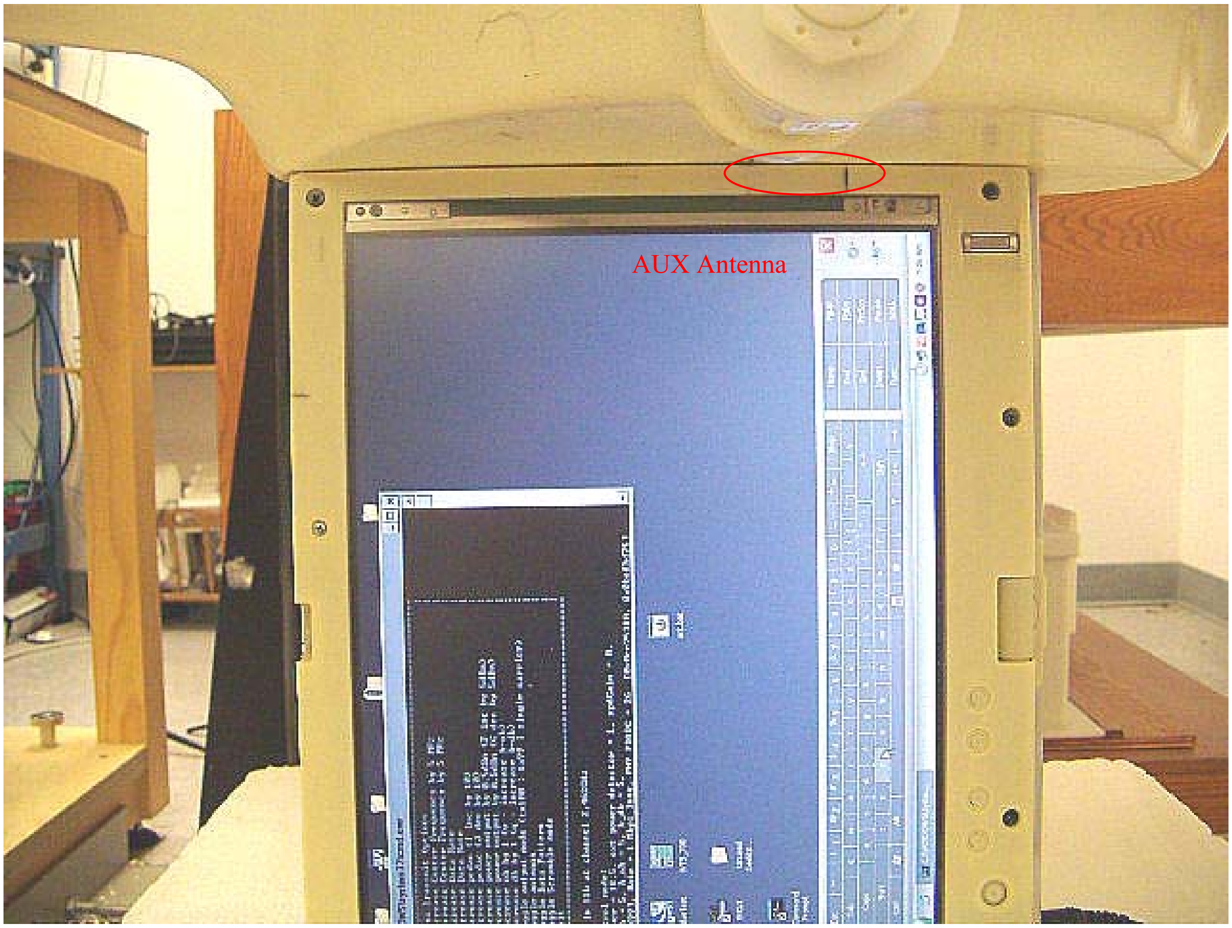


802.11a. 5.2 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
36 52 64	5180 5260 5320	0.721	0.000	0.721	0.80	1.6
802.11a, 5.8 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
149 157 165	5745 5785 5825	0.624	-0.760	0.743	0.80	1.6

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) The SAR measured at the high channel (worst-case) for this configuration is at least 3 dB lower than SAR limit, thus testing at low & high channel is optional.
3) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

9.2 LCD EDGE AUX ANTENNA (UNDER ARM)

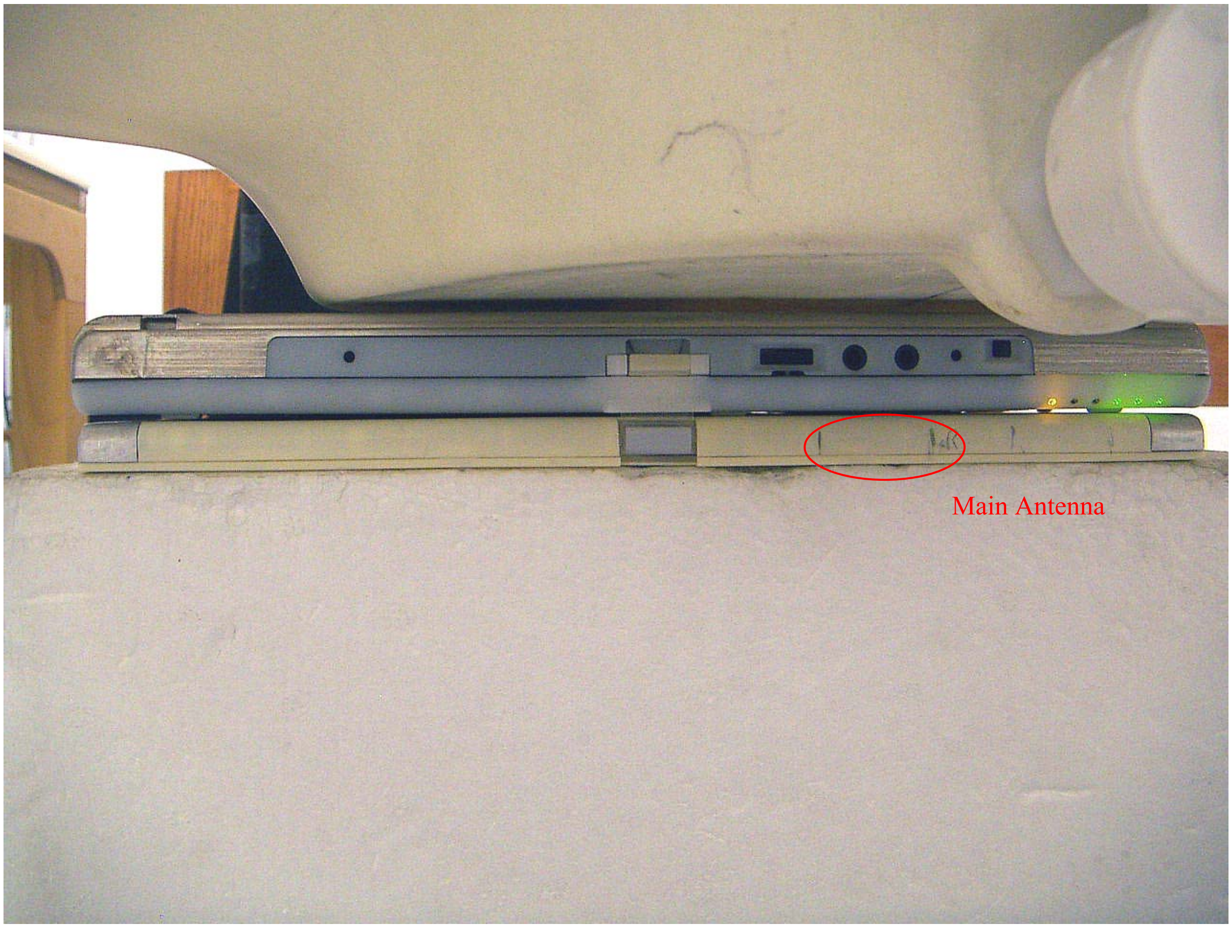


802.11a, 5.2 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
36	5180	1.020	-0.023	1.025	0.80	1.6
52	5260	1.130	-0.106	**1.158**	0.80	1.6
64	5320	0.970	-0.147	1.003	0.80	1.6
52 [3)]	5260	1.150	0.000	**1.150**	0.80	1.6
802.11a, 5.8 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
149	5745	0.744	-0.214	0.782	0.80	1.6
157	5785	0.727	-0.240	0.768	0.80	1.6
165	5825	0.827	-0.258	**0.878**	0.80	1.6
165 [3)]	5825	0.821	-0.203	**0.860**	0.80	1.6

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.
3) Co-location with Bluetooth FCC ID: CJ6UPA3418BT.

9.3 LAP HELD MAIN ANTENNA

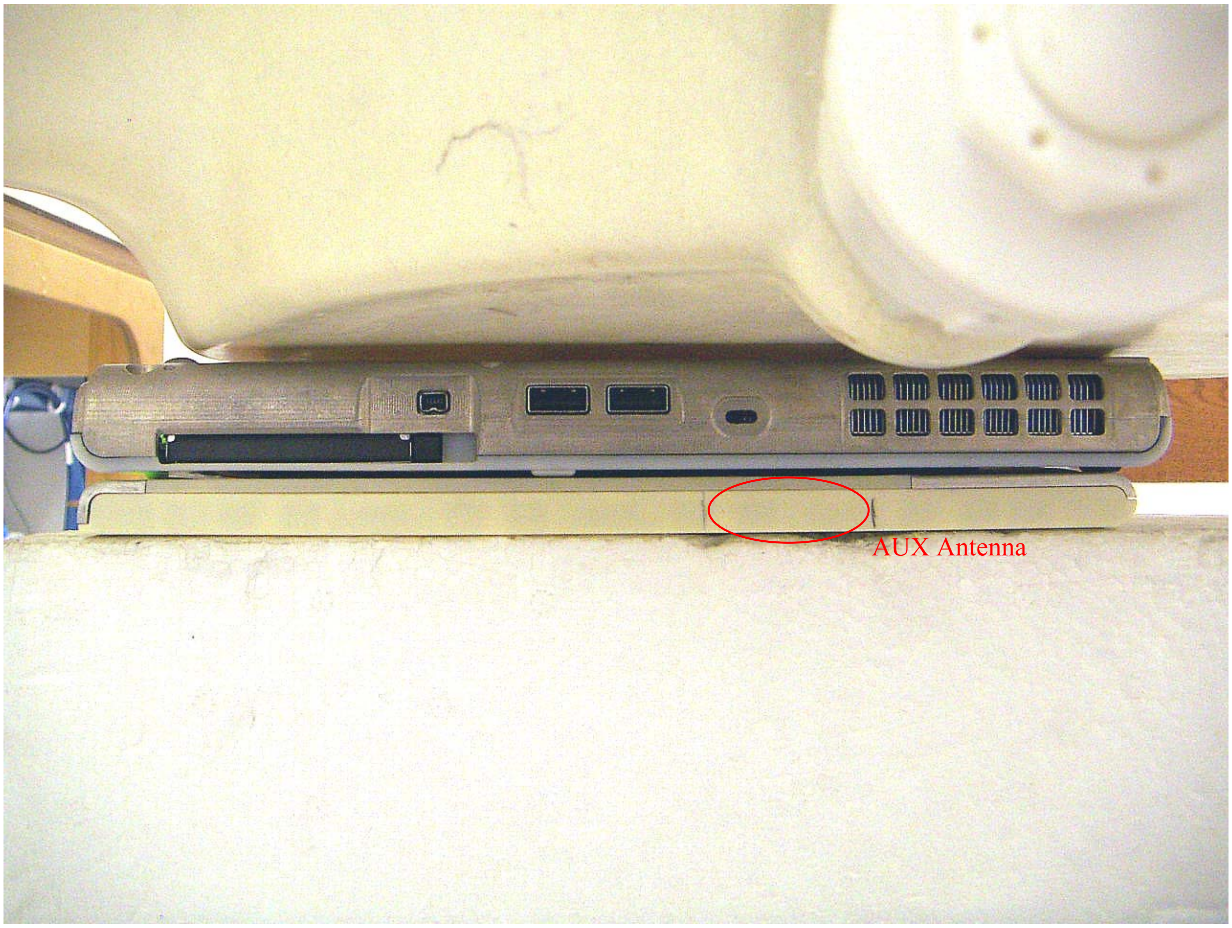


802.11a, 5.2 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
36 52 64	5180 5260 5320	0.034	0.000	0.034	0.80	1.6
802.11a, 5.8 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
149 157 165	5745 5785 5825	0.040	0.000	0.040	0.80	1.6

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) The SAR measured at the high channel (worst-case) for this configuration is at least 3 dB lower than SAR limit, thus testing at low & high channel is optional.
3) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

9.4 LAP HELD AUX ANTENNA



802.11a. 5.2 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
36 52 64	5180 5260 5320	0.026	0.000	0.026	0.80	1.6
802.11a, 5.8 GHz						
Channel	f (MHz)	Measured 1g (mW/g)	Power Drift (dBm)	Extrapolated 1g (mW/g)	3 dB Limit (mW/g)	Limit (mW/g)
149 157 165	5745 5785 5825	0.029	0.000	0.029	0.80	1.6

Notes:

1) The exact method of extrapolation is *measured SAR x 10^(-drift/10)*. The SAR reported at the end of the measurement process by the DASY4 measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process
2) The SAR measured at the high channel (worst-case) for this configuration is at least 3 dB lower than SAR limit, thus testing at low & high channel is optional.
3) Please see the attachments for the detailed measurement data and plots showing the maximum SAR location of the EUT.

10 MEASUREMENT UNCERTAINTY

10.1 Measurement Uncertainty for 300 MHz – 3000 MHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	1.59	R	1.732	1	1	0.92	0.92
RF Ambient Conditions - Reflections	0.00	R	1.732	1	1	0.00	0.00
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.44	10.49
Expanded Uncertainty (95% Confidence Interval)	K=2					22.87	20.98

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

10.2 Measurement Uncertainty 3 GHz – 6 GHz

Uncertainty component	Tol. (±%)	Probe Dist.	Div.	Ci (1g)	Ci (10g)	Std. Unc.(±%)	
						Ui (1g)	Ui(10g)
Measurement System							
Probe Calibration	4.80	N	1	1	1	4.80	4.80
Axial Isotropy	4.70	R	1.732	0.707	0.707	1.92	1.92
Hemispherical Isotropy	9.60	R	1.732	0.707	0.707	3.92	3.92
Boundary Effects	1.00	R	1.732	1	1	0.58	0.58
Linearity	4.70	R	1.732	1	1	2.71	2.71
System Detection Limits	1.00	R	1.732	1	1	0.58	0.58
Readout Electronics	1.00	N	1	1	1	1.00	1.00
Response Time	0.80	R	1.732	1	1	0.46	0.46
Integration Time	2.60	R	1.732	1	1	1.50	1.50
RF Ambient Conditions - Noise	3.00	R	1.732	1	1	1.73	1.73
RF Ambient Conditions - Reflections	3.00	R	1.732	1	1	1.73	1.73
Probe Positioner Mechnical Tolerance	0.40	R	1.732	1	1	0.23	0.23
Probe Positioning With Respect to Phantom Shell	2.90	R	1.732	1	1	1.67	1.67
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.90	R	1.732	1	1	2.25	2.25
Test sample Related							
Test Sample Positioning	1.10	N	1	1	1	1.10	1.10
Device Holder Uncertainty	3.60	N	1	1	1	3.60	3.60
Power and SAR Drift Measurement	5.00	R	1.732	1	1	2.89	2.89
Phantom and Tissue Parameters							
Phantom Uncertainty	4.00	R	1.732	1	1	2.31	2.31
Liquid Conductivity - Target	5.00	R	1.732	0.64	0.43	1.85	1.24
Liquid Conductivity - Meas.	8.60	N	1	0.64	0.43	5.50	3.70
Liquid Permittivity - Target	5.00	R	1.732	0.6	0.49	1.73	1.41
Liquid Permittivity - Meas.	3.30	N	1	0.6	0.49	1.98	1.62
Combined Standard Uncertainty	RSS					11.66	10.73
Expanded Uncertainty (95% Confidence Interval)	K=2					23.32	21.46

Notesfor table
1. Tol. - tolerance in influence quaitity
2. N - Nomal
3. R - Rectangular
4. Div. - Divisor used to obtain standard uncertainty
5. Ci - is te sensitivity coefficient

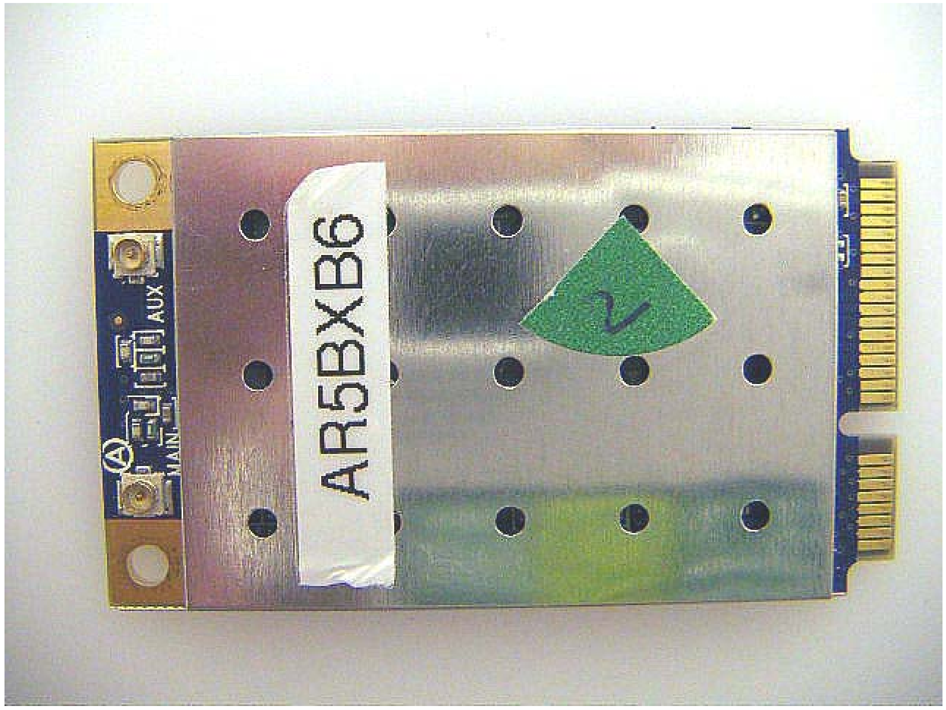
11 EQUIPMENT LIST & CALIBRATION

Name of Equipment	Manufacturer	Type/Model	Serial Number	Cal. Due date
Robot - Six Axes	Stäubli	RX90BL	N/A	N/A
Robot Remote Control	Stäubli	CS7MB	3403-91535	N/A
DASY4 Measurement Server	SPEAG	SEUMS001BA	1041	N/A
Probe Alignment Unit	SPEAG	LB (V2)	261	N/A
S-Parameter Network Analyzer	Agilent	8753ES-6	US39173569	2/9/07
Electronic Probe kit	Hewlett Packard	85070C	N/A	N/A
E-Field Probe	SPEAG	EX3DV3	3531	7/21/06
SAM Phantom (SAM1)	SPEAG	TP-1185	QD000P40CA	N/A
SAM Phantom (SAM2)	SPEAG	TP-1015	N/A	N/A
Data Acquisition Electronics	SPEAG	DAE3 V1	500	2/7/06
System Validation Dipole	SPEAG	D2450V2	748	5/14/06
System Validation Dipole	SPEAG	D5GHzV2	1003	11/22/06
Signal Generator	R&S	SMP 04	DE34210	6/2/06
Power Meter	Giga-tronics	8651A	8651404	12/27/06
Power Sensor	Giga-tronics	80701A	1834588	12/27/07
Amplifier	Mini-Circuits	ZVE-8G	0360	N/A
Amplifier	Mini-Circuits	ZHL-42W	D072701-5	N/A
Simulating Liquid	CCS	M2450	N/A	Within 24 hrs of first test
Simulating Liquid	SPEAG	M5200-5800	N/A	Within 24 hrs of first test

12 PHOTOS

12.1 EUT PHOTOS

MINI PCI EXPRESS 802.11A/B/G TRANSCEIVER

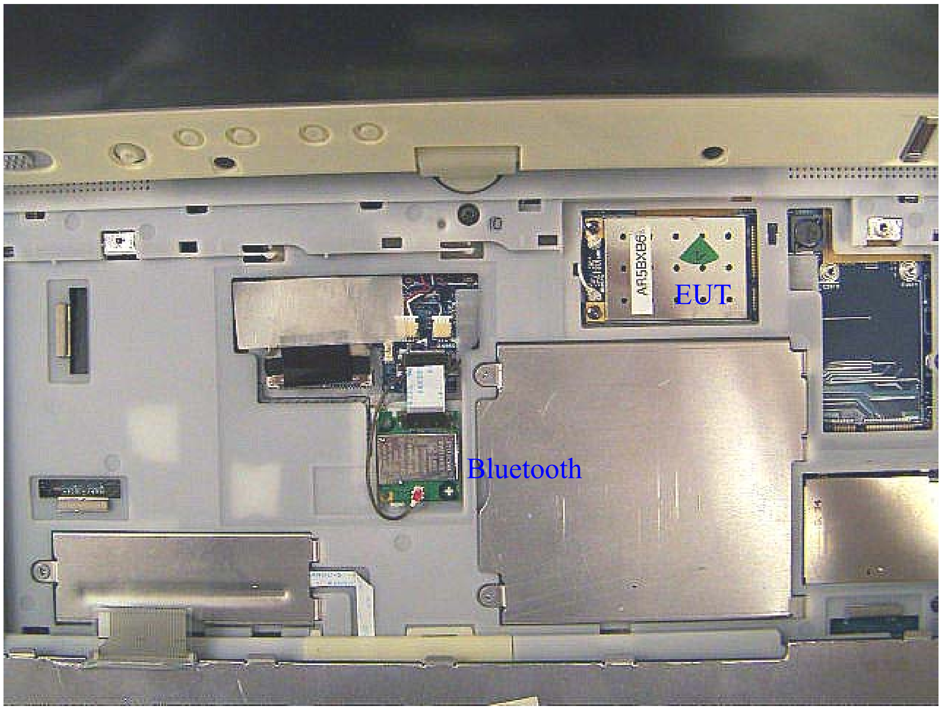


12.2 HOST DEVICE

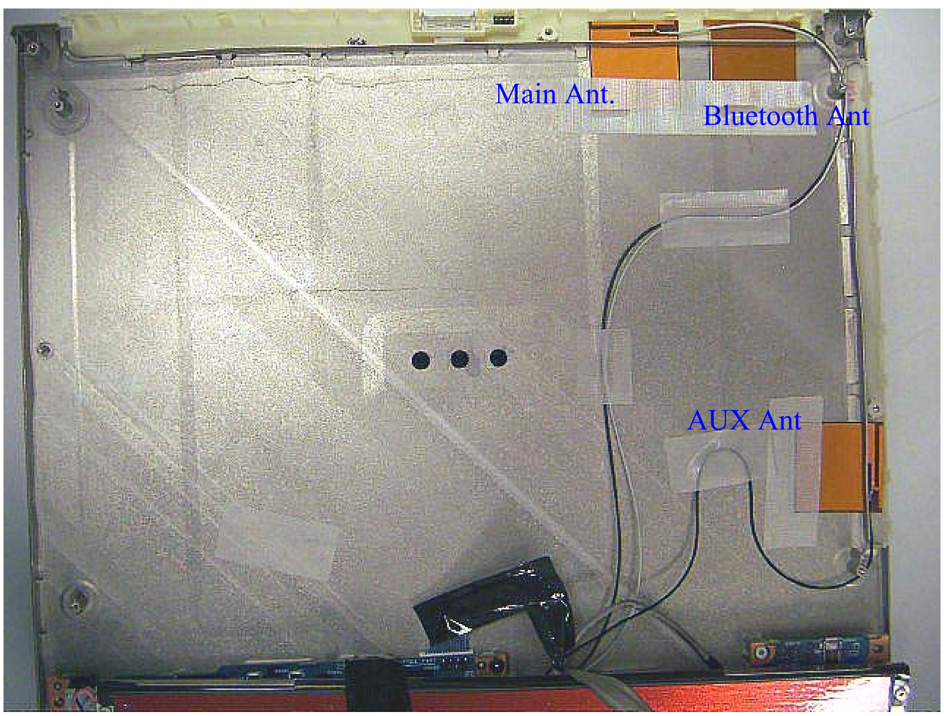
Toshiba Portege M400

Toshiba Portege M400

EUT Location



Antenna Location



13 ATTACHMENT

No.	Contents	No. of page (s)
1	System Performance Check Plots	10
2-1	SAR Test Plots (2.4 GHz)	14
2-2	SAR Test Plots (5 GHz)	16
3	Certificate of E-filed Probe EX3DV4 SN 3531	10
4	Certificate of System Validation Dipole D2450V2 SN 748	9
5	Certificate of System Validation Dipole D5GHzV2-SN1003	10
6	Material Specification Data Sheet of Body Simulating Liquid (5GHz)	3

END OF REPORT