SAR TESTING OF WISTRON NEWEB MODEL CB-500AG 802.11 a/b/g CARDBUS ADAPTER WITH THREE HOST COMPUTERS

WISTRON NEWEB MODEL: CB-500AG
FCC ID: NKRCB500AG

Host Computers:

1. IBM Model 2659-HT2
   (Serial #AK-VND0G 02/12)
2. Compaq Model PP2150
   (Serial #1V31LDLZ20PG)
3. Toshiba Satellite 1110 System
   (Part No. PS111T-00CMW, Serial #Y2382109)

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I. Introduction

The U.S. Federal Communications Commission (FCC) has adopted limits of human exposure to RF emissions from mobile and portable devices that are regulated by the FCC [1]. The FCC has also issued Supplement C (Edition 97-01) to OET Bulletin 65 [2] and a more recent version of the same [3] defining both the measurement and the computational procedures that should be followed for evaluating compliance of mobile and portable devices with FCC limits for human exposure to radiofrequency emissions.

We have used the measurement procedure for SAR compliance testing of the Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter with three host computers. These host computers shown in Figs. 1-3, respectively, are:

1. IBM Model 2659-HT2.
2. Compaq Model PP2150.
3. Toshiba Satellite 1110 System.

The Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter is plugged into each of the above host computers as shown in Figs. 1, 2, and 3, respectively. The peak and average conducted RF power outputs measured at various frequencies for the Wistron NeWeb Model CB-500AG Cardbus Adapter 802.11a Antenna for the normal and turbo modes are given in Table 1.

For SAR measurements, two configurations of each of the host PCs relative to the experimental phantom have been used. These are as follows:

a. **Configuration 1** is for the PC placed on a user's lap. For this configuration, a planar phantom model with inside dimensions 12" x 16.5" (30.5 x 41.9 cm) and a base thickness of 2.0 ± 0.2 mm (recommended in [3]) was used for SAR measurements and the bottom side of each of the laptop computers shown in parts b of Figs. 1, 2, and 3 was pressed against it. Photographs of the three PCs pressed against the bottom of the planar phantom for this "Above-lap" position are given as Figs. 4a, b, and c, respectively.

b. **Configuration 2:** Edge-on position. This configuration corresponds to a bystander close to the outer edge of the cardbus adapter in contact with this edge (separation of 0 cm). For this configuration, the host computer is placed at 90° and the edge of the cardbus adapter is pressed against the bottom of the planar phantom (see Figs. 7, 8, and 9).

II. The SAR Measurement System

The University of Utah SAR Measurement System has been described in peer-reviewed literature [Ref. 8 -- attached here as Appendix A]. A photograph of the SAR Measurement System is given in Fig. 5. This SAR Measurement System uses a computer-controlled 3-D stepper motor system (Arrick Robotics MD-2A). A triaxial Narda Model 8021 E-field probe is used to determine the internal electric fields. The positioning repeatability of the stepper motor system moving the E-field probe is within ±0.1 mm. Outputs from the three channels of the E-field probe are dc voltages, the sum of which is proportional to the square of the internal electric fields $\left(|E_i|^2\right)$ from which the SAR can be obtained from the equation SAR = $\sigma\left(|E_i|^2\right)\Big/\rho$, where σ and ρ are the conductivity and mass density of the tissue-simulant materials, respectively [5]. The dc voltages for the three channels of the E-field probe are read by three HP 34401A multimeters and sent to the computer via an HPIB interface. The setup is carefully grounded and shielded to reduce the noise due to the electromagnetic interference (EMI). A cutout in a wooden table of dimensions 38.1 × 21.6 cm allows placement of a plastic holder (shown in Fig. 6) on which the three host computers with the Wistron NeWeb Model CB-500AG Cardbus Adapter (see Figs. 1, 2, and 3) are supported. A plastic holder (see Fig. 6) can be

moved up or down so that the base of the PC (for Configuration 1) is pressed against the base of the flat phantom for determination of SAR for above-lap position. Similarly, for "edge-on" SAR determination, Configuration 2, the laptop is mounted sideways (at 90°) on the plastic holder and moved up so that the edge of the Model CB-500 AG Cardbus Adapter was pressed against the bottom of the flat phantom (see Figs. 7, 8, and 9).

The Flat Phantom

As recommended in Supplement C Edition 01-01 to OET Bulletin 65 [3], a planar phantom model with inside dimensions 12" × 16.5" (30.5 × 41.9 cm) and base thickness 2.0 ± 0.2 mm was used for SAR measurements (see Figs. 4 and 7-9).

III. Calibration of the E-Field Probe

The IEEE Draft Standard P1528 [4] suggests a recommended procedure for probe calibration (see Section 4.4.1 of [4]) for frequencies above 800 MHz where waveguide size is manageable. Calibration using a rectangular waveguide is recommended. As in some previously reported SAR measurements at 6 GHz [5], we have calibrated the Narda Model 8021 Miniature Broadband Electric Field Probe of tip diameter 4 mm (internal dipole dimensions on the order of 2.5 mm) using a rectangular waveguide WR 159 (of internal dimensions 1.59 × 0.795 inches) that was filled with the tissue-simulant fluid of composition given in Section V (see Figs. 10a,b). The triaxial (3 dipole) E-field probe shown in Fig. 11 was originally developed by Howard Bassen and colleagues of FDA and has been manufactured under license by Narda Microwave Corporation, Hauppage, New York. The probe is described in detail in references 6 and 7. It uses three orthogonal pick up dipoles each of length about 2.5 mm offset from the tip by 3 mm, each with its own leadless zero voltage Schottky barrier diode operating in the square law region. The sum of the three diode outputs read by three microvoltmeters [8] gives an output proportional to E^2. By rotating the probe around its axis, the isotropy of the probe was measured to be less than ± 0.23 dB and the deviation of the probe from the square law behavior was less than ± 3%.

As suggested in the Draft Standard P1528, the waveguide (WR 159) filled with the tissue-simulant fluid was maintained vertically. From microwave field theory [see e.g. ref. 9], the transverse field distribution in the liquid corresponds to the fundamental mode (TE_{10}) with an exponential decay in the vertical direction (z-axis). The liquid level was 15 cm deep which is deep enough to guarantee that reflections from the top liquid surface do not affect the calibration. By comparing the square of the decaying electric fields expected in the tissue from the analytical expressions for the TE_{10} mode of the rectangular waveguide, we obtained a calibration factor of 2.98 (mW/kg)/μV with a variability of less than ±2% for measurement frequencies of 5.2, 5.3, 5.7 and 5.8 GHz, respectively. This is no doubt due to a fairly limited frequency band of only 0.6 GHz out of a recommended bandwidth of 2.2 GHz for the TE_{10} mode for the WR159 waveguide (recommended band of 4.9-7.1 GHz -- see e.g. ref. 9) and the fact that the bandwidth of 600 MHz for the entire set of measurements is on the order of ± 5.5% of the midband frequencies..

The date for the calibration of the E-field probe closest to the SAR tests given here was March 7, 2003.

IV. SAR System Verification

Since we do not have a dipole for the 5 GHz band, a half wave dipole at 1900 MHz was used instead for SAR system verification. This dipole of length 76.0 mm and diameter 1.5 mm and h = 39.5 mm is shown in Fig. 12. As recommended in OET65 Supplement C [3], we used a spacing of 10 mm from the dipole to the tissue-simulant fluid composed of 40.4% water, 58.0% sugar, 0.5% salt (NaCl), 1% HEC, and 0.1% bactericide. The microwave circuit arrangement used for system verification is sketched in Fig. 13. The dielectric properties for this body-simulant fluid were measured using the Hewlett Packard (HP) Model 85070 B Dielectric Probe (rated frequency band 200 MHz to 20 GHz in conjunction with HP Model 8720C Network Analyzer (50 MHz-20 GHz) using a procedure detailed in Section V. The measured dielectric parameters of the body-simulant fluid at 1900 MHz are $\varepsilon_r = 53.1 \pm 1.3$ and $\sigma = 1.44 \pm 0.09$ S/m.

The measured properties are close to the values of ε_r = 54.0 and σ = 1.45 S/m given in OET Supplement C [3].

The measured SAR distribution for the peak 1-g SAR region using this system verification dipole for the day of SAR measurements March 7, 2003 is given in Appendix B. Also given in Appendix B is the dipole SAR plot for this date of device testing. The peak 1-g SAR is 35.54. The measured 1-g SAR is in excellent agreement with the FDTD-calculated 1-g SAR of 35.8 W/kg for this dipole. Also as expected, the measured SAR plot is quite symmetric.

V. Tissue Simulant Fluid for the Frequency Band 5.2 to 5.8 GHz

In OET 65 Supplement C [3], the dielectric parameters suggested for body phantom are given only for 3000 and 5800 MHz. These are listed in Table 2 here. Using linear interpolation, we can obtain the dielectric parameters to use for the frequency band between 5.2 to 5.8 GHz. The desired dielectric properties thus obtained are also given in Table 2. From Table 2, it can be noticed that the desired dielectric constant ε_r varies from 48.2 to 49.0 which is a variation of less than ± 1% from the average value of 48.6 for this band. Also the conductivity σ varies linearly with frequency from 5.3 to 6.00 S/m. For the SAR measurements given in this report, we have used a tissue-simulant fluid developed at the University of Utah which consists of 68.0% water, 31.0% sugar and 1% HEC. For this composition, we have measured the dielectric properties using a Hewlett Packard (HP) Model 85070B Dielectric Probe in conjunction with HP Model 8720C Network Analyzer (50 MHz-20 GHz). The measured dielectric properties at a mid band frequency of 5.30 GHz are as follows: ε_r = 48.5 ± 1.7 and σ = 5.40 ± 0.08 S/m. From Table 2, we obtain the desired dielectric properties to simulate the body tissue at the midband frequency of 5.30 GHz to be ε_r = 48.9 and σ = 5.42 S/m. Thus, the measured properties for the body-simulant fluid are close to the desired values. Also as expected, the conductivity of this fluid varies linearly with frequency rising to 6.03 ± 0.09 S/m at 5.8 GHz, while the dielectric constant ε_r is nearly the same as the measured value at 5.3 GHz.

The procedure is as follows: The HP Model 95070B Dielectric Probe (see Fig. 14) is an open-circuited transmission-line (coaxial line) probe similar to that described in Section B.1.2 of the Draft IEEE Standard 1528 [4]. The theory of the open-circuited coaxial line method has been described in scientific literature [10-12]. We have previously used this method in determining the dielectric properties of tissue-simulant materials at 6 GHz [5]. In this method, the complex reflection coefficient Γ^* measured for the open end of the coaxial line can be used to calculate the complex permittivity ε^* from the following equation [5]

$$\varepsilon^* = \frac{1-\Gamma^*}{j\omega Z_o C_o \left(1+\Gamma^*\right)} - \frac{C_f}{C_o} \tag{1}$$

where Z_o is the characteristic impedance (50 Ω) for the coaxial line, C_o is the capacitance when the line is in air and C_f is the capacitance that accounts for the fringing fields in the dielectric of the coaxial line.

For the HP85070B Dielectric Probe with diameters of the outer and inner conductors 2b = 3.00 mm and 2a = 0.912 mm, respectively, the following capacitances were obtained using deionized water and methanol as the calibration fluids. The following capacitances were obtained:

$$C_o = 0.022 \text{ pF}$$

$$C_f = 0.005 \text{ pF}$$

Using the network analyzer HP8720C, we measured the reflection coefficient Γ^* for the open end of the coaxial line that was submerged in the tissue-simulant fluid. Using Eq. 1, the complex permittivity of the fluid was measured at various frequencies 5.2-5.8 GHz. From the imaginary part of the complex permittivity $\text{Im}(\varepsilon^*)$, we can obtain the conductivity σ from the relationship

$$\sigma = \frac{\text{Im}(\varepsilon^*)}{\omega \varepsilon_o} \tag{2}$$

VI. The Measured SAR Distributions

The peak and average conducted RF power outputs of the Wistron NeWeb Model CB-500AG Cardbus Adapter 802.11a Antenna are given in Table 1 for normal and turbo modes, respectively. For SAR measurements, we selected frequencies of 5.24, 5.32, 5.785 GHz for the normal mode and frequencies of 5.29 and 5.80 GHz for the turbo mode. These frequencies and modes were selected both for their highest power outputs as well as to cover the different frequency bands planned for the various host computers. As recommended in Supplement C, Edition 01-01 [3], the stability of the conducted power was determined by repeated SAR measurements at the same location for each of the selected channels. The variability of the SAR thus determined for three repeated measurements over a 60-minute time period was within ± 0.1 dB (± 2.5%).

The highest SAR region for each of the measurement frequencies was identified in the first instance by using a coarser sampling with a step size of 8.0 mm over three overlapping areas for a total scan area of 8.0 × 9.6 cm. The data thus obtained was resolved into a 4 x 4 times larger grid i.e. a grid involving 40 x 28 points by linear interpolation using a 2 mm step size. After thus identifying the region of the highest SAR, the SAR distribution was then measured with a resolution of 2 mm in order to obtain the peak 1 cm^3 or 1-g SAR. The SAR measurements were performed at 4, 6, 8, 10, 12 mm height from the bottom surface of the body-simulant fluid. The SARs thus measured were extrapolated using a second-order least-square fit to the measured data to obtain values at 1, 3, 5, 7 and 9 mm height and used to obtain 1-g SARs. The uncertainty analysis of the University of Utah SAR measurement system is given in Appendix C. The combined standard uncertainty is ± 8.3%.

For some of the exposure configurations, the SARs were too low to measure and within the noise levels for the SAR measurement system (~ 0.02 W/kg) presumably because of relatively low radiated powers (see e.g. Table 29). For the exposure configurations where the SARs were measurable, the coarse scan measurements are given in Figs. 15-20, respectively. In these figures, the two axes are marked in units of step size of 8 mm. The highest SAR regions

shown in maroon color are above the regions of the radiating 802.11a antenna for each of the PCs. Given in Tables 3-28 are the SAR distributions for the peak SAR regions of volume 10 ×10 × 10 mm for which the coarse scans are given in Figs. 15-20, respectively. The SARs are given for xy planes at heights z of 1, 3, 5, 7, and 9 mm from the bottom of the flat phantom. The individual SAR values for this grid of 5 × 5 × 5 or 125 points are averaged to obtain peak 1-g SAR values (for a volume of 1 cm^3). The temperature variation of the tissue-simulant fluid measured with a Bailey Instruments Model BAT 8 Temperature Probe over the 80-minute period needed for measurements at the four frequencies was $23.2 \pm 0.2^{\circ}C$. The z-axis scan plots taken at the highest SAR locations for each set of tests are given in Figs. 21-26, respectively.

The peak 1-g SARs for the various configurations of the three host computers; namely, IBM Model 2659-HT2, Compaq Model PP2150, and Toshiba Satellite 1110 System are summarized in Tables 29, 30, and 31, respectively. All of the measured 1-g SARs are less than the FCC 96-326 guideline of 1.6 W/kg.

VII. Comparison of the Data with FCC 96-326 Guidelines

According to the FCC 96-326 Guideline [1], the peak 1-g SAR for any 1-g of tissue should not exceed 1.6 W/kg. For the Wistron NeWeb Model CB-500 AG Cardbus Adapter inserted into three host computers (IBM Model 2659-HT2, Compaq Model PP2150, and Toshiba Satellite System Model 1110), the measured peak 1-g SARs are given in Tables 29, 30, and 31, respectively. The measured peak 1-g SARs vary from nearly 0 to 0.359 W/kg which are smaller than 1.6 W/kg.

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Table 1. Peak and average conducted RF power outputs measured at various frequencies for the Wistron NeWeb Model CB-500AG Cardbus Adapter 802.11a Antenna.

Frequency GHz	Power dBm	
	Peak	Average
Normal Mode		
5.18	16.26	6.25
5.24	16.65	6.98
5.26	20.85	12.51
5.32	21.87	13.27
5.745	20.29	11.62
5.785	20.34	12.01
5.825	20.16	11.52
Turbo Mode		
5.21	16.37	7.9
5.25	16.85	7.33
5.29	20.83	12.92
5.76	18.9	11.64
5.80	18.91	11.73

Table 2. Dielectric parameters for body phantom for the frequency band 5.2 to 5.8 GHz [3].

Frequency GHz	ε_r	σ S/m	Reference
3.0	52.0	2.73	Ref. 3
5.8	48.2	6.00	Ref. 3
5.2	49.0	5.30	Interpolated
5.3	48.9	5.42	Interpolated
5.4	48.7	5.53	Interpolated
5.6	48.5	5.77	Interpolated
5.7	48.3	5.88	Interpolated

Table 3. **Above-lap position (Configuration 1).** The SARs measured for the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.32 GHz.

1-g SAR = 0.029 W/kg

a. At depth of 1 mm

0.033	0.047	0.037	0.030	0.053
0.053	0.025	0.023	0.072	0.044
0.075	0.032	0.052	0.048	0.032
0.082	0.052	0.051	0.053	0.047
0.038	0.065	0.056	0.060	0.063

b. At depth of 3 mm

0.024	0.033	0.021	0.023	0.037
0.041	0.021	0.021	0.046	0.032
0.052	0.029	0.044	0.033	0.029
0.057	0.033	0.043	0.037	0.032
0.030	0.049	0.045	0.048	0.057

c. At depth of 5 mm

0.018	0.021	0.008	0.016	0.024
0.031	0.017	0.019	0.026	0.023
0.033	0.026	0.037	0.020	0.026
0.037	0.020	0.036	0.024	0.021
0.024	0.036	0.037	0.039	0.052

d. At depth of 7 mm

0.015	0.010	0.001	0.012	0.016
0.022	0.012	0.016	0.014	0.017
0.020	0.023	0.031	0.011	0.023
0.021	0.012	0.030	0.016	0.013
0.019	0.025	0.031	0.033	0.047

e. At depth of 9 mm

0.015	0.003	-0.002	0.009	0.011
0.015	0.006	0.012	0.008	0.014
0.012	0.019	0.025	0.005	0.022
0.009	0.010	0.024	0.011	0.010
0.016	0.016	0.028	0.032	0.044

Table 4. **Above-lap position (Configuration 1).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.24 GHz.

1-g SAR = 0.090 W/kg

a. At depth of 1 mm

0.141	0.126	0.133	0.113	0.115
0.124	0.126	0.107	0.124	0.111
0.119	0.136	0.126	0.143	0.126
0.123	0.134	0.137	0.103	0.142
0.089	0.122	0.113	0.126	0.142

b. At depth of 3 mm

0.112	0.098	0.107	0.092	0.095
0.100	0.103	0.090	0.099	0.095
0.100	0.107	0.103	0.112	0.103
0.102	0.114	0.110	0.102	0.115
0.081	0.103	0.101	0.107	0.123

c. At depth of 5 mm

0.087	0.077	0.086	0.074	0.079
0.080	0.084	0.076	0.079	0.081
0.085	0.083	0.084	0.086	0.082
0.085	0.095	0.088	0.097	0.092
0.074	0.086	0.078	0.092	0.109

d. At depth of 7 mm

0.068	0.061	0.068	0.060	0.066
0.065	0.067	0.064	0.063	0.067
0.072	0.065	0.068	0.067	0.065
0.071	0.079	0.073	0.090	0.074
0.067	0.073	0.065	0.080	0.100

e. At depth of 9 mm

0.053	0.052	0.054	0.050	0.055
0.055	0.053	0.054	0.051	0.054
0.063	0.052	0.056	0.053	0.050
0.061	0.064	0.063	0.079	0.061
0.059	0.062	0.056	0.072	0.096

Table 5. **Above-lap position (Configuration 1).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.32 GHz.

1-g SAR = 0.144 W/kg

a. At depth of 1 mm

0.175	0.168	0.187	0.175	0.173
0.196	0.199	0.195	0.199	0.200
0.197	0.217	0.198	0.192	0.209
0.194	0.171	0.206	0.214	0.210
0.182	0.215	0.210	0.231	0.228

b. At depth of 3 mm

0.151	0.145	0.154	0.147	0.151
0.164	0.173	0.169	0.167	0.168
0.164	0.171	0.162	0.159	0.168
0.160	0.158	0.176	0.181	0.175
0.162	0.177	0.175	0.190	0.181

c. At depth of 5 mm

0.129	0.124	0.126	0.123	0.131
0.137	0.150	0.146	0.140	0.140
0.137	0.133	0.131	0.131	0.135
0.134	0.144	0.149	0.152	0.145
0.143	0.146	0.147	0.155	0.146

d. At depth of 7 mm

0.110	0.106	0.103	0.105	0.114
0.116	0.131	0.126	0.119	0.117
0.114	0.104	0.106	0.109	0.111
0.114	0.129	0.125	0.127	0.120
0.126	0.122	0.123	0.126	0.121

e. At depth of 9 mm

0.094	0.092	0.084	0.092	0.098
0.099	0.116	0.110	0.103	0.098
0.097	0.084	0.087	0.092	0.095
0.101	0.112	0.104	0.106	0.101
0.110	0.105	0.105	0.105	0.108

Table 6. **Above-lap position (Configuration 1).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.785 GHz.

1-g SAR = 0.106 W/kg

a. At depth of 1 mm

0.144	0.150	0.132	0.131	0.116
0.114	0.133	0.142	0.117	0.127
0.117	0.122	0.128	0.143	0.129
0.139	0.139	0.144	0.122	0.122
0.158	0.132	0.150	0.137	0.145

b. At depth of 3 mm

0.119	0.133	0.116	0.121	0.108
0.112	0.117	0.121	0.105	0.111
0.111	0.109	0.116	0.122	0.111
0.122	0.121	0.125	0.107	0.103
0.127	0.118	0.132	0.125	0.138

c. At depth of 5 mm

0.100	0.116	0.103	0.110	0.100
0.106	0.102	0.104	0.094	0.098
0.104	0.098	0.104	0.103	0.095
0.106	0.106	0.107	0.094	0.088
0.102	0.107	0.116	0.115	0.132

d. At depth of 7 mm

0.086	0.100	0.092	0.099	0.091
0.098	0.090	0.089	0.082	0.086
0.094	0.087	0.093	0.088	0.082
0.092	0.093	0.092	0.081	0.076
0.084	0.098	0.104	0.106	0.126

e. At depth of 9 mm

0.077	0.085	0.085	0.087	0.081
0.086	0.080	0.078	0.071	0.077
0.082	0.077	0.083	0.075	0.071
0.079	0.082	0.079	0.069	0.066
0.071	0.091	0.094	0.099	0.120

Table 7. **Above-lap position (Configuration 1).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.29 GHz.

1-g SAR = 0.069 W/kg

a. At depth of 1 mm

0.079	0.080	0.096	0.110	0.067
0.089	0.086	0.084	0.105	0.079
0.104	0.109	0.101	0.101	0.115
0.086	0.094	0.114	0.127	0.114
0.099	0.099	0.098	0.149	0.146

b. At depth of 3 mm

0.064	0.063	0.073	0.077	0.057
0.068	0.072	0.068	0.077	0.064
0.080	0.083	0.082	0.082	0.086
0.066	0.077	0.090	0.095	0.088
0.086	0.084	0.091	0.122	0.129

c. At depth of 5 mm

0.052	0.050	0.054	0.051	0.049
0.051	0.061	0.056	0.056	0.052
0.062	0.063	0.065	0.065	0.062
0.049	0.062	0.069	0.071	0.068
0.073	0.072	0.085	0.101	0.115

d. At depth of 7 mm

0.042	0.041	0.041	0.033	0.042
0.040	0.052	0.047	0.040	0.042
0.049	0.048	0.052	0.052	0.045
0.038	0.051	0.053	0.053	0.053
0.061	0.062	0.079	0.088	0.103

e. At depth of 9 mm

0.034	0.035	0.033	0.023	0.035
0.035	0.045	0.043	0.031	0.034
0.043	0.040	0.041	0.041	0.033
0.030	0.042	0.039	0.042	0.043
0.050	0.056	0.075	0.081	0.095

Table 8. **Above-lap position (Configuration 1).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.80 GHz.

1-g SAR = 0.078 W/kg

a. At depth of 1 mm

0.101	0.050	0.075	0.077	0.066
0.114	0.098	0.101	0.088	0.072
0.112	0.070	0.095	0.097	0.090
0.092	0.111	0.117	0.098	0.094
0.103	0.099	0.100	0.124	0.132

b. At depth of 3 mm

0.084	0.067	0.078	0.070	0.064
0.093	0.081	0.088	0.078	0.068
0.094	0.072	0.090	0.086	0.078
0.084	0.099	0.101	0.089	0.087
0.087	0.088	0.092	0.111	0.113

c. At depth of 5 mm

0.071	0.077	0.077	0.064	0.061
0.075	0.068	0.077	0.069	0.064
0.077	0.072	0.083	0.077	0.068
0.076	0.087	0.087	0.081	0.079
0.073	0.079	0.084	0.100	0.099

d. At depth of 7 mm

0.061	0.079	0.074	0.058	0.056
0.061	0.058	0.066	0.060	0.059
0.063	0.070	0.075	0.069	0.060
0.067	0.077	0.074	0.073	0.072
0.063	0.071	0.078	0.090	0.089

e. At depth of 9 mm

0.056	0.074	0.068	0.051	0.050
0.052	0.053	0.056	0.052	0.053
0.051	0.067	0.066	0.063	0.054
0.059	0.069	0.062	0.066	0.065
0.056	0.065	0.072	0.082	0.084

Table 9. **Above-lap position (Configuration 1).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.24 GHz.

1-g SAR = 0.054 W/kg

a. At depth of 1 mm

0.069	0.095	0.079	0.081	0.068
0.068	0.096	0.084	0.080	0.052
0.044	0.086	0.091	0.074	0.070
0.081	0.074	0.096	0.067	0.068
0.089	0.077	0.102	0.112	0.131

b. At depth of 3 mm

0.053	0.070	0.064	0.057	0.054
0.054	0.069	0.063	0.061	0.045
0.049	0.066	0.071	0.055	0.056
0.066	0.059	0.069	0.057	0.056
0.071	0.068	0.081	0.091	0.109

c. At depth of 5 mm

0.040	0.051	0.052	0.039	0.042
0.043	0.049	0.046	0.044	0.037
0.050	0.050	0.055	0.040	0.045
0.054	0.047	0.049	0.049	0.047
0.057	0.059	0.065	0.074	0.093

d. At depth of 7 mm

0.029	0.037	0.042	0.026	0.031
0.034	0.035	0.032	0.031	0.030
0.046	0.037	0.041	0.028	0.037
0.044	0.037	0.035	0.042	0.041
0.046	0.053	0.053	0.063	0.083

e. At depth of 9 mm

0.022	0.028	0.034	0.018	0.021
0.027	0.028	0.022	0.020	0.023
0.038	0.028	0.031	0.020	0.031
0.036	0.029	0.028	0.037	0.038
0.037	0.047	0.046	0.055	0.079

Table 10. **Above-lap position (Configuration 1).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.32 GHz.

1-g SAR = 0.052 W/kg

a. At depth of 1 mm

0.094	0.103	0.072	0.107	0.103
0.096	0.102	0.103	0.101	0.104
0.119	0.096	0.097	0.131	0.090
0.125	0.113	0.115	0.095	0.107
0.092	0.124	0.110	0.124	0.138

b. At depth of 3 mm

0.066	0.067	0.052	0.069	0.070
0.065	0.068	0.067	0.067	0.070
0.076	0.061	0.064	0.087	0.066
0.084	0.077	0.074	0.064	0.075
0.069	0.084	0.084	0.096	0.107

c. At depth of 5 mm

0.041	0.037	0.033	0.038	0.042
0.039	0.039	0.037	0.039	0.042
0.041	0.032	0.039	0.051	0.045
0.052	0.047	0.041	0.040	0.048
0.049	0.054	0.062	0.073	0.081

d. At depth of 7 mm

0.020	0.013	0.016	0.015	0.020
0.019	0.015	0.013	0.018	0.020
0.015	0.010	0.020	0.023	0.028
0.027	0.024	0.017	0.021	0.027
0.033	0.032	0.045	0.057	0.061

e. At depth of 9 mm

0.003	-0.005	0.000	-0.001	0.003
0.004	-0.003	-0.005	0.004	0.005
-0.002	-0.005	0.008	0.004	0.015
0.011	0.008	0.000	0.008	0.010
0.021	0.019	0.033	0.046	0.046

Table 11. **Above-lap position (Configuration 1).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.785 GHz.

1-g SAR = 0.068 W/kg

a. At depth of 1 mm

0.120	0.132	0.136	0.144	0.119
0.135	0.131	0.121	0.137	0.111
0.089	0.123	0.137	0.131	0.140
0.104	0.114	0.140	0.128	0.113
0.151	0.101	0.149	0.172	0.164

b. At depth of 3 mm

0.079	0.090	0.087	0.090	0.078
0.095	0.085	0.082	0.088	0.069
0.063	0.085	0.091	0.085	0.101
0.081	0.086	0.103	0.097	0.083
0.103	0.082	0.117	0.128	0.133

c. At depth of 5 mm

0.046	0.055	0.050	0.048	0.047
0.062	0.050	0.050	0.049	0.037
0.040	0.054	0.055	0.050	0.068
0.062	0.062	0.073	0.070	0.059
0.065	0.065	0.090	0.093	0.107

d. At depth of 7 mm

0.022	0.028	0.022	0.018	0.024
0.036	0.024	0.026	0.021	0.014
0.021	0.031	0.027	0.024	0.042
0.045	0.043	0.050	0.047	0.039
0.038	0.052	0.069	0.068	0.087

e. At depth of 9 mm

0.006	0.008	0.006	0.001	0.011
0.017	0.008	0.009	0.003	0.001
0.006	0.015	0.008	0.010	0.022
0.031	0.029	0.034	0.028	0.025
0.021	0.041	0.055	0.053	0.072

Table 12. **Above-lap position (Configuration 1).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.29 GHz.

1-g SAR = 0.052 W/kg

a. At depth of 1 mm

0.068	0.069	0.076	0.082	0.099
0.075	0.066	0.101	0.105	0.097
0.065	0.062	0.096	0.101	0.097
0.098	0.095	0.097	0.067	0.076
0.079	0.073	0.089	0.091	0.119

b. At depth of 3 mm

0.046	0.053	0.051	0.056	0.069
0.056	0.054	0.074	0.075	0.066
0.048	0.048	0.073	0.078	0.076
0.069	0.074	0.074	0.057	0.061
0.061	0.058	0.068	0.077	0.091

c. At depth of 5 mm

0.029	0.040	0.032	0.037	0.047
0.041	0.044	0.053	0.050	0.043
0.034	0.037	0.055	0.060	0.059
0.048	0.056	0.054	0.048	0.050
0.046	0.045	0.051	0.066	0.069

d. At depth of 7 mm

0.016	0.029	0.018	0.024	0.032
0.029	0.035	0.037	0.031	0.027
0.025	0.028	0.041	0.046	0.044
0.034	0.043	0.038	0.039	0.042
0.036	0.037	0.040	0.057	0.055

e. At depth of 9 mm

0.008	0.022	0.011	0.016	0.024
0.021	0.028	0.028	0.019	0.019
0.019	0.023	0.031	0.036	0.033
0.028	0.033	0.026	0.031	0.037
0.029	0.032	0.035	0.050	0.047

Table 13. **Above-lap position (Configuration 1).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.80 GHz.

1-g SAR = 0.058 W/kg

a. At depth of 1 mm

0.085	0.072	0.075	0.093	0.085
0.059	0.070	0.110	0.073	0.084
0.091	0.108	0.110	0.093	0.087
0.091	0.106	0.107	0.111	0.097
0.084	0.066	0.093	0.090	0.081

b. At depth of 3 mm

0.069	0.062	0.061	0.068	0.071
0.052	0.060	0.084	0.065	0.070
0.071	0.083	0.080	0.071	0.065
0.075	0.078	0.085	0.087	0.079
0.066	0.061	0.071	0.065	0.060

c. At depth of 5 mm

0.055	0.053	0.049	0.049	0.057
0.045	0.051	0.063	0.057	0.057
0.055	0.063	0.057	0.053	0.048
0.060	0.055	0.066	0.068	0.064
0.052	0.053	0.053	0.046	0.044

d. At depth of 7 mm

0.045	0.044	0.038	0.035	0.044
0.037	0.042	0.045	0.048	0.046
0.042	0.047	0.039	0.038	0.036
0.047	0.039	0.052	0.052	0.051
0.040	0.044	0.037	0.031	0.032

e. At depth of 9 mm

0.038	0.034	0.029	0.026	0.032
0.030	0.034	0.031	0.038	0.037
0.033	0.035	0.028	0.027	0.029
0.036	0.028	0.043	0.040	0.040
0.032	0.032	0.025	0.022	0.025

Table 14. **Edge-on position (Configuration 2).** The SARs measured for the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.24 GHz.

1-g SAR = 0.076 W/kg

a. At depth of 1 mm

0.118	0.143	0.157	0.131	0.119
0.131	0.167	0.151	0.137	0.131
0.136	0.160	0.148	0.136	0.152
0.149	0.138	0.165	0.147	0.176
0.147	0.182	0.191	0.202	0.197

b. At depth of 3 mm

0.079	0.096	0.102	0.089	0.078
0.089	0.103	0.098	0.088	0.089
0.098	0.109	0.099	0.094	0.111
0.099	0.094	0.107	0.103	0.118
0.105	0.127	0.133	0.144	0.153

c. At depth of 5 mm

0.047	0.058	0.059	0.055	0.045
0.055	0.054	0.056	0.049	0.055
0.066	0.068	0.059	0.061	0.076
0.059	0.058	0.062	0.067	0.072
0.071	0.083	0.088	0.100	0.118

d. At depth of 7 mm

0.023	0.030	0.029	0.030	0.022
0.030	0.020	0.025	0.020	0.030
0.040	0.038	0.028	0.035	0.047
0.029	0.031	0.031	0.039	0.038
0.046	0.050	0.057	0.071	0.093

e. At depth of 9 mm

0.008	0.012	0.012	0.012	0.007
0.015	0.002	0.006	0.001	0.012
0.020	0.018	0.006	0.018	0.024
0.009	0.011	0.013	0.020	0.016
0.028	0.029	0.039	0.055	0.078

Table 15. **Edge-on position (Configuration 2).** The SARs measured for the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.32 GHz.

1-g SAR = 0.257 W/kg

a. At depth of 1 mm

0.471	0.500	0.503	0.507	0.436
0.504	0.527	0.521	0.541	0.495
0.480	0.526	0.537	0.539	0.502
0.519	0.523	0.557	0.559	0.512
0.453	0.505	0.554	0.585	0.545

b. At depth of 3 mm

0.320	0.345	0.342	0.346	0.300
0.347	0.354	0.353	0.360	0.335
0.336	0.359	0.365	0.359	0.340
0.346	0.358	0.384	0.379	0.344
0.315	0.343	0.382	0.402	0.390

c. At depth of 5 mm

0.201	0.221	0.216	0.218	0.190
0.221	0.217	0.219	0.218	0.208
0.219	0.225	0.229	0.216	0.213
0.210	0.228	0.246	0.237	0.213
0.205	0.215	0.247	0.259	0.268

d. At depth of 7 mm

0.113	0.129	0.123	0.124	0.108
0.127	0.117	0.120	0.116	0.115
0.130	0.124	0.129	0.110	0.120
0.112	0.134	0.143	0.134	0.117
0.121	0.122	0.151	0.157	0.182

e. At depth of 9 mm

0.056	0.068	0.066	0.062	0.052
0.064	0.054	0.055	0.054	0.056
0.069	0.058	0.066	0.042	0.061
0.051	0.075	0.076	0.068	0.057
0.065	0.063	0.093	0.095	0.129

Table 16. **Edge-on position (Configuration 2).** The SARs measured for the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.785 GHz.

1-g SAR = 0.269 W/kg

a. At depth of 1 mm

0.530	0.556	0.567	0.569	0.527
0.527	0.554	0.586	0.606	0.581
0.544	0.571	0.604	0.586	0.562
0.522	0.555	0.607	0.614	0.575
0.484	0.519	0.584	0.601	0.588

b. At depth of 3 mm

0.357	0.373	0.372	0.376	0.352
0.354	0.379	0.394	0.403	0.382
0.364	0.384	0.399	0.390	0.370
0.347	0.376	0.409	0.415	0.381
0.329	0.351	0.390	0.404	0.399

c. At depth of 5 mm

0.219	0.227	0.219	0.223	0.213
0.217	0.239	0.242	0.242	0.226
0.221	0.236	0.238	0.235	0.219
0.208	0.233	0.252	0.255	0.228
0.204	0.216	0.237	0.248	0.250

d. At depth of 7 mm

0.116	0.118	0.107	0.110	0.110
0.116	0.133	0.130	0.126	0.112
0.115	0.127	0.120	0.120	0.109
0.105	0.126	0.135	0.135	0.115
0.110	0.114	0.125	0.135	0.141

e. At depth of 9 mm

0.046	0.045	0.037	0.038	0.043
0.051	0.062	0.057	0.052	0.042
0.045	0.057	0.045	0.046	0.039
0.038	0.055	0.058	0.055	0.043
0.046	0.047	0.054	0.064	0.073

Table 17. **Edge-on position (Configuration 2).** The SARs measured for the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.29 GHz.

1-g SAR = 0.223 W/kg

a. At depth of 1 mm

0.406	0.410	0.434	0.381	0.389
0.413	0.426	0.425	0.450	0.341
0.409	0.480	0.449	0.384	0.415
0.399	0.414	0.396	0.381	0.391
0.385	0.430	0.389	0.415	0.367

b. At depth of 3 mm

0.295	0.297	0.304	0.276	0.268
0.297	0.300	0.303	0.314	0.254
0.302	0.333	0.315	0.270	0.289
0.284	0.292	0.285	0.271	0.272
0.273	0.306	0.284	0.304	0.281

c. At depth of 5 mm

0.206	0.206	0.202	0.191	0.174
0.204	0.201	0.206	0.207	0.184
0.214	0.218	0.209	0.180	0.190
0.193	0.196	0.196	0.184	0.179
0.185	0.208	0.201	0.217	0.211

d. At depth of 7 mm

0.139	0.137	0.128	0.126	0.107
0.133	0.129	0.133	0.129	0.129
0.145	0.135	0.130	0.115	0.118
0.126	0.127	0.129	0.121	0.113
0.122	0.136	0.141	0.155	0.159

e. At depth of 9 mm

0.093	0.089	0.081	0.082	0.068
0.085	0.084	0.086	0.080	0.089
0.096	0.084	0.079	0.075	0.073
0.083	0.083	0.083	0.082	0.072
0.082	0.091	0.103	0.118	0.124

Table 18. **Edge-on position (Configuration 2).** The SARs measured for the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.80 GHz.

1-g SAR = 0.252 W/kg

a. At depth of 1 mm

0.411	0.436	0.440	0.416	0.405
0.446	0.447	0.432	0.455	0.407
0.459	0.460	0.477	0.482	0.445
0.429	0.458	0.458	0.478	0.449
0.421	0.474	0.485	0.480	0.446

b. At depth of 3 mm

0.297	0.310	0.317	0.302	0.294
0.326	0.326	0.319	0.321	0.288
0.339	0.339	0.351	0.350	0.322
0.313	0.329	0.336	0.337	0.325
0.308	0.342	0.354	0.347	0.326

c. At depth of 5 mm

0.208	0.211	0.219	0.211	0.207
0.229	0.229	0.228	0.215	0.195
0.242	0.241	0.250	0.245	0.224
0.220	0.227	0.238	0.227	0.227
0.218	0.236	0.248	0.242	0.231

d. At depth of 7 mm

0.141	0.139	0.146	0.143	0.142
0.157	0.155	0.159	0.136	0.128
0.168	0.168	0.174	0.166	0.151
0.150	0.151	0.163	0.147	0.154
0.151	0.159	0.169	0.164	0.161

e. At depth of 9 mm

0.097	0.094	0.099	0.099	0.101
0.109	0.104	0.111	0.086	0.088
0.117	0.119	0.123	0.113	0.102
0.103	0.103	0.111	0.099	0.107
0.106	0.109	0.116	0.114	0.115

Table 19. **Edge-on position (Configuration 2).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.24 GHz.

1-g SAR = 0.106 W/kg

a. At depth of 1 mm

0.197	0.185	0.201	0.196	0.173
0.169	0.191	0.186	0.213	0.201
0.192	0.197	0.174	0.209	0.186
0.168	0.208	0.203	0.201	0.170
0.152	0.155	0.168	0.161	0.170

b. At depth of 3 mm

0.142	0.142	0.152	0.146	0.131
0.125	0.133	0.135	0.152	0.144
0.140	0.143	0.128	0.147	0.135
0.126	0.149	0.150	0.148	0.120
0.114	0.116	0.124	0.124	0.131

c. At depth of 5 mm

0.099	0.107	0.112	0.105	0.097
0.090	0.090	0.094	0.103	0.099
0.099	0.099	0.091	0.098	0.094
0.092	0.102	0.108	0.106	0.080
0.082	0.084	0.088	0.094	0.100

d. At depth of 7 mm

0.069	0.081	0.081	0.074	0.071
0.065	0.060	0.064	0.066	0.067
0.069	0.065	0.063	0.061	0.063
0.067	0.067	0.077	0.075	0.051
0.057	0.060	0.060	0.071	0.075

e. At depth of 9 mm

0.052	0.062	0.059	0.052	0.052
0.048	0.043	0.044	0.041	0.047
0.049	0.040	0.042	0.038	0.042
0.051	0.044	0.056	0.056	0.032
0.038	0.043	0.041	0.055	0.056

Table 20. **Edge-on position (Configuration 2).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.32 GHz.

1-g SAR = 0.303 W/kg

a. At depth of 1 mm

0.534	0.563	0.611	0.582	0.586
0.541	0.589	0.594	0.602	0.613
0.517	0.566	0.592	0.595	0.615
0.493	0.524	0.553	0.587	0.586
0.459	0.494	0.559	0.562	0.566

b. At depth of 3 mm

0.385	0.405	0.426	0.410	0.410
0.385	0.421	0.421	0.425	0.430
0.372	0.408	0.418	0.420	0.432
0.354	0.370	0.394	0.412	0.406
0.329	0.352	0.391	0.404	0.409

c. At depth of 5 mm

0.265	0.278	0.280	0.273	0.270
0.262	0.287	0.283	0.284	0.285
0.256	0.280	0.279	0.281	0.287
0.243	0.248	0.268	0.273	0.264
0.225	0.238	0.260	0.278	0.286

d. At depth of 7 mm

0.175	0.182	0.174	0.171	0.166
0.170	0.187	0.180	0.179	0.177
0.167	0.183	0.175	0.179	0.180
0.159	0.156	0.172	0.170	0.161
0.147	0.154	0.164	0.186	0.195

e. At depth of 9 mm

0.114	0.117	0.107	0.105	0.098
0.111	0.121	0.113	0.110	0.107
0.108	0.116	0.107	0.113	0.109
0.103	0.097	0.108	0.105	0.095
0.095	0.099	0.104	0.126	0.137

Table 21. **Edge-on position (Configuration 2).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.785 GHz.

1-g SAR = 0.224 W/kg

a. At depth of 1 mm

0.403	0.443	0.437	0.410	0.379
0.409	0.441	0.432	0.448	0.394
0.403	0.435	0.438	0.433	0.445
0.379	0.405	0.421	0.432	0.456
0.378	0.395	0.432	0.460	0.481

b. At depth of 3 mm

0.286	0.301	0.309	0.288	0.266
0.293	0.310	0.308	0.312	0.282
0.286	0.309	0.305	0.307	0.306
0.270	0.286	0.296	0.303	0.314
0.266	0.282	0.303	0.325	0.344

c. At depth of 5 mm

0.193	0.189	0.207	0.191	0.176
0.200	0.207	0.207	0.205	0.192
0.193	0.208	0.200	0.206	0.197
0.182	0.191	0.196	0.200	0.202
0.177	0.191	0.202	0.219	0.236

d. At depth of 7 mm

0.124	0.110	0.130	0.119	0.109
0.129	0.131	0.131	0.126	0.124
0.124	0.132	0.122	0.129	0.118
0.115	0.119	0.120	0.125	0.119
0.111	0.121	0.129	0.141	0.157

e. At depth of 9 mm

0.079	0.062	0.079	0.073	0.066
0.081	0.082	0.079	0.076	0.079
0.077	0.082	0.072	0.077	0.069
0.069	0.071	0.069	0.077	0.065
0.069	0.074	0.083	0.092	0.107

Table 22. **Edge-on position (Configuration 2).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.29 GHz.

1-g SAR = 0.306 W/kg

a. At depth of 1 mm

0.589	0.625	0.580	0.552	0.491
0.622	0.640	0.642	0.585	0.507
0.624	0.648	0.651	0.614	0.552
0.620	0.595	0.652	0.551	0.551
0.555	0.594	0.577	0.583	0.553

b. At depth of 3 mm

0.419	0.433	0.412	0.382	0.343
0.432	0.443	0.446	0.411	0.359
0.437	0.456	0.451	0.423	0.380
0.435	0.422	0.444	0.378	0.376
0.391	0.417	0.408	0.409	0.400

c. At depth of 5 mm

0.282	0.282	0.277	0.247	0.224
0.281	0.287	0.291	0.271	0.239
0.288	0.301	0.292	0.272	0.243
0.287	0.281	0.280	0.240	0.237
0.260	0.276	0.273	0.272	0.279

d. At depth of 7 mm

0.178	0.172	0.175	0.147	0.135
0.168	0.172	0.177	0.164	0.148
0.176	0.184	0.173	0.161	0.141
0.175	0.174	0.159	0.137	0.135
0.162	0.171	0.172	0.173	0.188

e. At depth of 9 mm

0.106	0.101	0.105	0.083	0.074
0.095	0.098	0.104	0.091	0.085
0.102	0.105	0.094	0.089	0.074
0.100	0.100	0.082	0.070	0.069
0.097	0.102	0.104	0.111	0.128

Table 23. **Edge-on position (Configuration 2).** The SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.80 GHz.

1-g SAR = 0.196 W/kg

a. At depth of 1 mm

0.401	0.373	0.333	0.285	0.285
0.367	0.360	0.356	0.313	0.303
0.366	0.357	0.379	0.349	0.327
0.374	0.395	0.399	0.368	0.349
0.360	0.365	0.377	0.406	0.425

b. At depth of 3 mm

0.280	0.264	0.244	0.215	0.207
0.263	0.259	0.251	0.224	0.217
0.258	0.258	0.268	0.253	0.231
0.267	0.281	0.278	0.258	0.246
0.257	0.262	0.268	0.290	0.318

c. At depth of 5 mm

0.185	0.177	0.171	0.158	0.145
0.179	0.178	0.167	0.154	0.149
0.172	0.178	0.180	0.175	0.156
0.182	0.190	0.182	0.172	0.164
0.174	0.179	0.182	0.201	0.233

d. At depth of 7 mm

0.117	0.112	0.115	0.112	0.098
0.116	0.118	0.105	0.101	0.097
0.109	0.118	0.115	0.115	0.101
0.119	0.123	0.111	0.107	0.104
0.112	0.117	0.120	0.137	0.171

e. At depth of 9 mm

0.074	0.071	0.075	0.079	0.065
0.074	0.077	0.065	0.067	0.063
0.068	0.077	0.072	0.073	0.065
0.078	0.078	0.064	0.065	0.066
0.069	0.074	0.081	0.100	0.131

Table 24. **Edge-on position (Configuration 2).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.24 GHz.

1-g SAR = 0.060 W/kg

a. At depth of 1 mm

0.071	0.099	0.093	0.109	0.083
0.096	0.072	0.083	0.101	0.082
0.102	0.112	0.106	0.124	0.085
0.119	0.145	0.114	0.135	0.123
0.140	0.150	0.169	0.142	0.174

b. At depth of 3 mm

0.054	0.074	0.069	0.075	0.058
0.057	0.050	0.058	0.064	0.057
0.065	0.078	0.076	0.081	0.053
0.082	0.099	0.080	0.097	0.092
0.103	0.112	0.119	0.115	0.140

c. At depth of 5 mm

0.039	0.052	0.048	0.047	0.037
0.026	0.032	0.037	0.035	0.037
0.037	0.049	0.050	0.046	0.029
0.052	0.062	0.053	0.066	0.065
0.073	0.080	0.080	0.092	0.112

d. At depth of 7 mm

0.027	0.034	0.032	0.026	0.018
0.005	0.016	0.018	0.012	0.021
0.017	0.026	0.029	0.020	0.012
0.030	0.035	0.031	0.043	0.043
0.050	0.055	0.052	0.074	0.091

e. At depth of 9 mm

0.017	0.020	0.019	0.010	0.002
-0.008	0.004	0.002	-0.005	0.009
0.005	0.009	0.012	0.001	0.002
0.016	0.017	0.015	0.028	0.025
0.034	0.036	0.034	0.061	0.077

Table 25. **Edge-on position (Configuration 2).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.32 GHz.

1-g SAR = 0.237 W/kg

a. At depth of 1 mm

0.454	0.476	0.481	0.458	0.423
0.465	0.481	0.493	0.491	0.434
0.483	0.478	0.476	0.475	0.431
0.433	0.469	0.486	0.444	0.423
0.439	0.456	0.476	0.468	0.463

b. At depth of 3 mm

0.305	0.326	0.336	0.316	0.294
0.324	0.332	0.339	0.337	0.296
0.324	0.326	0.327	0.327	0.304
0.303	0.325	0.333	0.311	0.302
0.301	0.309	0.338	0.336	0.337

c. At depth of 5 mm

0.187	0.208	0.219	0.201	0.189
0.210	0.213	0.216	0.214	0.187
0.200	0.206	0.209	0.210	0.202
0.199	0.210	0.213	0.205	0.205
0.192	0.195	0.229	0.232	0.238

d. At depth of 7 mm

0.101	0.121	0.131	0.114	0.110
0.124	0.125	0.126	0.123	0.106
0.109	0.117	0.123	0.123	0.124
0.120	0.125	0.125	0.125	0.132
0.114	0.114	0.149	0.156	0.166

e. At depth of 9 mm

0.047	0.065	0.071	0.053	0.057
0.066	0.068	0.068	0.063	0.054
0.052	0.059	0.069	0.067	0.071
0.066	0.069	0.069	0.071	0.082
0.066	0.066	0.098	0.109	0.121

Table 26. **Edge-on position (Configuration 2).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the normal mode at 5.785 GHz.

1-g SAR = 0.340 W/kg

a. At depth of 1 mm

0.680	0.711	0.701	0.684	0.657
0.708	0.727	0.713	0.693	0.653
0.678	0.715	0.694	0.681	0.623
0.650	0.685	0.671	0.670	0.628
0.623	0.669	0.686	0.667	0.651

b. At depth of 3 mm

0.461	0.483	0.480	0.467	0.454
0.481	0.487	0.480	0.482	0.449
0.463	0.487	0.482	0.468	0.436
0.444	0.466	0.461	0.464	0.438
0.434	0.459	0.472	0.473	0.471

c. At depth of 5 mm

0.288	0.302	0.304	0.295	0.291
0.300	0.297	0.296	0.313	0.285
0.291	0.305	0.311	0.299	0.284
0.281	0.293	0.293	0.299	0.286
0.283	0.294	0.304	0.319	0.325

d. At depth of 7 mm

0.159	0.169	0.174	0.165	0.169
0.166	0.158	0.162	0.184	0.162
0.163	0.170	0.182	0.172	0.169
0.160	0.165	0.168	0.176	0.171
0.169	0.173	0.180	0.204	0.215

e. At depth of 9 mm

0.075	0.084	0.090	0.079	0.087
0.078	0.070	0.077	0.096	0.079
0.080	0.080	0.095	0.087	0.089
0.082	0.082	0.086	0.094	0.093
0.093	0.096	0.102	0.129	0.140

Table 27. **Edge-on position (Configuration 2).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.29 GHz.

1-g SAR = 0.196 W/kg

a. At depth of 1 mm

0.367	0.397	0.387	0.371	0.360
0.383	0.412	0.405	0.375	0.377
0.379	0.379	0.395	0.381	0.361
0.334	0.386	0.393	0.375	0.359
0.321	0.341	0.362	0.379	0.352

b. At depth of 3 mm

0.259	0.274	0.268	0.259	0.252
0.262	0.286	0.284	0.264	0.265
0.255	0.274	0.279	0.274	0.261
0.233	0.272	0.277	0.264	0.256
0.223	0.244	0.259	0.278	0.258

c. At depth of 5 mm

0.172	0.174	0.173	0.168	0.165
0.166	0.185	0.187	0.175	0.174
0.158	0.188	0.186	0.186	0.179
0.152	0.180	0.184	0.175	0.172
0.145	0.166	0.178	0.195	0.182

d. At depth of 7 mm

0.106	0.099	0.102	0.098	0.099
0.095	0.108	0.113	0.108	0.103
0.088	0.120	0.116	0.116	0.115
0.092	0.109	0.114	0.108	0.107
0.088	0.108	0.117	0.129	0.125

e. At depth of 9 mm

0.061	0.048	0.055	0.050	0.053
0.048	0.056	0.062	0.062	0.052
0.045	0.071	0.067	0.065	0.069
0.053	0.060	0.068	0.062	0.060
0.051	0.069	0.077	0.082	0.087

Table 28. **Edge-on position (Configuration 2).** The SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna for the turbo mode at 5.80 GHz.

1-g SAR = 0.359 W/kg

a. At depth of 1 mm

0.688	0.691	0.671	0.638	0.603
0.728	0.724	0.690	0.661	0.642
0.708	0.713	0.708	0.674	0.625
0.697	0.696	0.678	0.679	0.612
0.684	0.672	0.653	0.654	0.631

b. At depth of 3 mm

0.483	0.487	0.480	0.456	0.434
0.513	0.513	0.497	0.470	0.453
0.505	0.503	0.498	0.479	0.448
0.491	0.491	0.478	0.485	0.440
0.479	0.476	0.467	0.467	0.453

c. At depth of 5 mm

0.318	0.322	0.326	0.307	0.297
0.342	0.344	0.339	0.315	0.302
0.340	0.334	0.329	0.322	0.305
0.325	0.326	0.318	0.327	0.301
0.315	0.318	0.318	0.316	0.312

d. At depth of 7 mm

0.194	0.197	0.207	0.192	0.191
0.212	0.218	0.217	0.197	0.188
0.214	0.207	0.201	0.202	0.194
0.199	0.199	0.196	0.206	0.194
0.194	0.200	0.204	0.202	0.208

e. At depth of 9 mm

0.110	0.111	0.124	0.111	0.117
0.126	0.133	0.131	0.116	0.111
0.127	0.122	0.115	0.119	0.117
0.113	0.111	0.113	0.122	0.121
0.114	0.120	0.127	0.125	0.141

Table 29. The peak 1-g SARs measured for the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna.

		1-g SAR in W/kg				
PC position relative to the flat phantom	Spacing to the bottom of the phantom	5.24 GHz normal mode	5.32 GHz normal mode	5.785 GHz normal mode	5.29 GHz turbo mode	5.80 GHz turbo mode
Configuration 1 – "**Above-lap"** position (see Fig. 4); bottom of PC pressed against bottom of the flat phantom	0 cm	< 0.02*	0.029	< 0.02*	< 0.02*	< 0.02*
Configuration 2 – **"Edge-on"** position (see Fig. 7); edge of the cardbus adapter at 90° and pressed against the bottom of the flat phantom	0 cm	0.076	0.257	0.269	0.223	0.252

* Too low to measure, within the noise limit of the SAR measurement system.

Table 30. The peak 1-g SARs measured for the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna.

		1-g SAR in W/kg				
PC position relative to the flat phantom	Spacing to the bottom of the phantom	5.24 GHz normal mode	5.32 GHz normal mode	5.785 GHz normal mode	5.29 GHz turbo mode	5.80 GHz turbo mode
Configuration 1 – "**Above-lap"** position (see Fig. 4); bottom of PC pressed against bottom of the flat phantom	0 cm	0.090	0.144	0.106	0.069	0.078
Configuration 2 – **"Edge-on"** position (see Fig. 8); edge of the cardbus adapter at 90° and pressed against the bottom of the flat phantom	0 cm	0.106	0.303	0.224	0.306	0.196

Table 31. The peak 1-g SARs measured for the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11a Antenna.

		1-g SAR in W/kg				
PC position relative to the flat phantom	Spacing to the bottom of the phantom	5.24 GHz normal mode	5.32 GHz normal mode	5.785 GHz normal mode	5.29 GHz turbo mode	5.80 GHz turbo mode
Configuration 1 – "**Above-lap"** position (see Fig. 4); bottom of PC pressed against bottom of the flat phantom	0 cm	0.054	0.052	0.068	0.052	0.058
Configuration 2 – **"Edge-on"** position (see Fig. 9); edge of the cardbus adapter at 90° and pressed against the bottom of the flat phantom	0 cm	0.060	0.237	0.340	0.196	0.359

a. Top cover closed.

Fig. 1. Photograph of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

b. View from the bottom side of the laptop computer.

Fig. 1. Photograph of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

c. Top cover with screen open.

Fig. 1. Photograph of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

a. Top cover closed.

Fig. 2. Photograph of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

b. View from the bottom side of the laptop computer.

Fig. 2. Photograph of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

c. Top cover with screen open.

Fig. 2. Photograph of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

a. Top cover closed.

Fig. 3. Photograph of the Toshiba Satellite Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

b. View from the bottom side of the laptop computer.

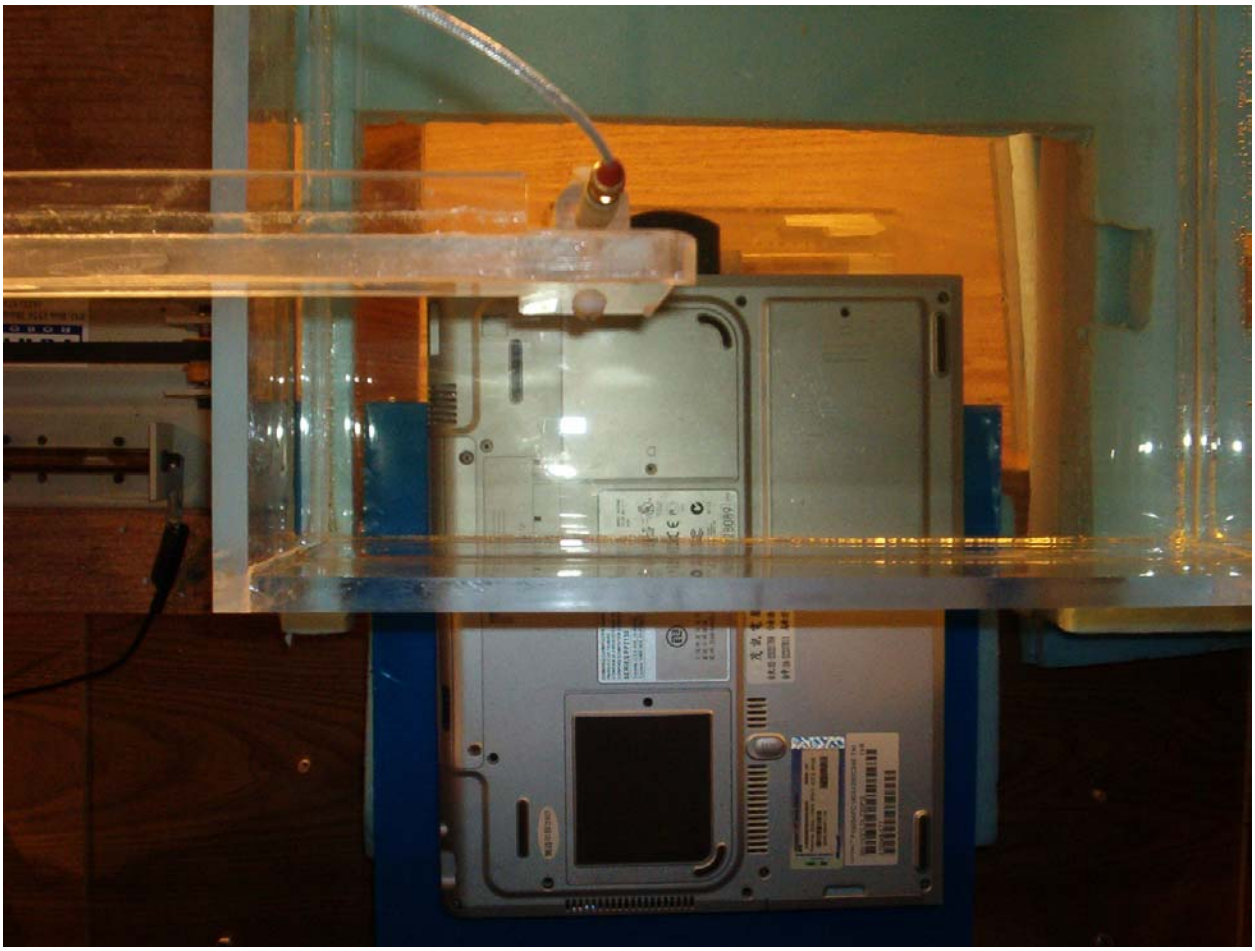
Fig. 3. Photograph of the Toshiba Satellite Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

c. Top cover with screen open.

Fig. 3. Photograph of the Toshiba Satellite Model 1110 PC with Wistron NeWeb Model CB-500AG 802.11 a/b/g Cardbus Adapter.

a. Bottom of IBM Model 2659-HT2 PC pressed against the base of the planar phantom.

Fig. 4. Photograph of the bottom of different PCs pressed against the base of the planar phantom. This is **Configuration 1** for SAR testing.



b. Bottom of Compaq Model PP2150 PC pressed against the base of the planar phantom.

Fig. 4. Photograph of the bottom of different PCs pressed against the base of the planar phantom. This is **Configuration 1** for SAR testing.

c. Bottom of Toshiba Satellite Model 1110 PC pressed against the base of the planar phantom.

Fig. 4. Photograph of the bottom of different PCs pressed against the base of the planar phantom. This is **Configuration 1** for SAR testing.

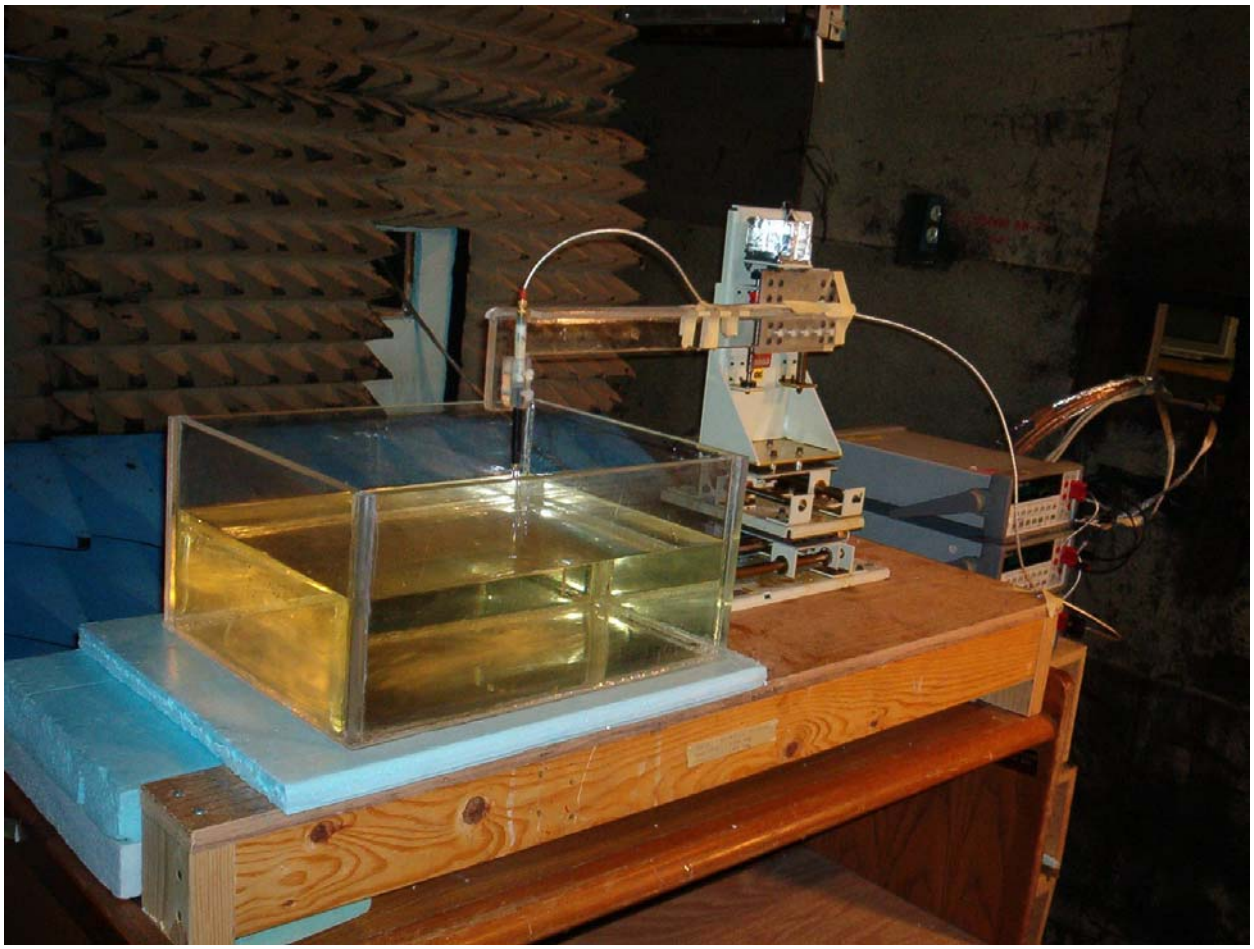


Fig. 5. Photograph of the three-dimensional stepper-motor-controlled SAR measurement system using a planar phantom (see Figs. 4, and 7-9 for a detailed placement of the various PCs relative to this phantom).

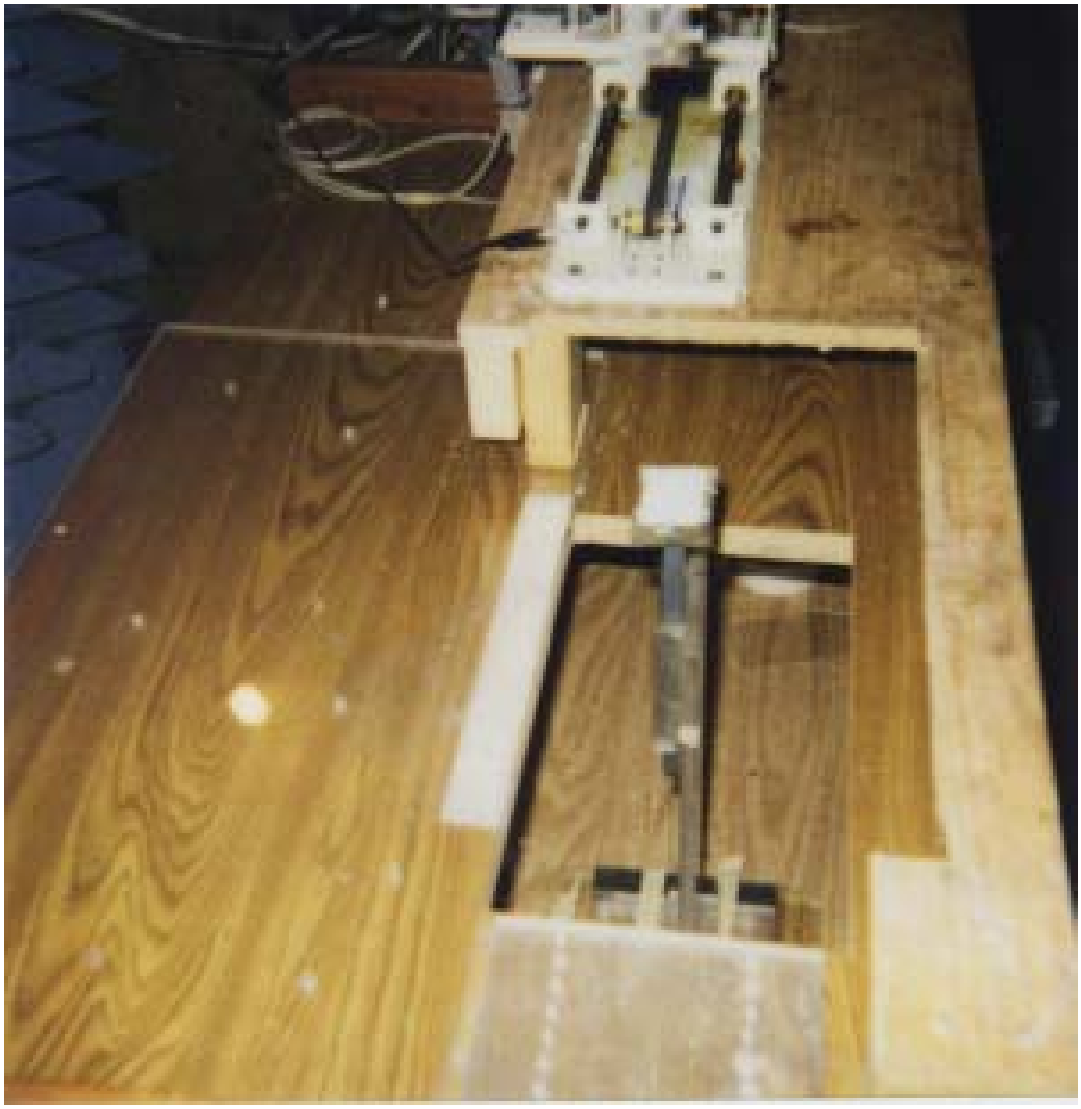


Fig. 6. The plastic holder used to support the portable PCs against the planar phantom.

Fig. 7. Photograph of the IBM Model 2659-HT2 PC with the screen partially open and the cardbus adapter at 90° pressed against the bottom of the planar phantom with separation of 0 cm. This is **Configuration 2** for SAR testing and represents the case of a bystander standing to the right of the PC with a separation of 0 cm from the edge of the cardbus adapter.

Fig. 8. Photograph of the Compaq Model PP2150 PC with the screen partially open and the cardbus adapter at 90° pressed against the bottom of the planar phantom with separation of 0 cm. This is **Configuration 2** for SAR testing and represents the case of a bystander standing to the right of the PC with a separation of 0 cm from the edge of the cardbus adapter.

Fig. 9. Photograph of the Toshiba Satellite Model 1110 PC with the screen partially open and the cardbus adapter at 90° pressed against to the base of the planar phantom with separation of 0 cm. This is **Configuration 2** for SAR testing and represents the case of a bystander standing to the right of the PC with a separation of 0 cm from the edge of the cardbus adapter.

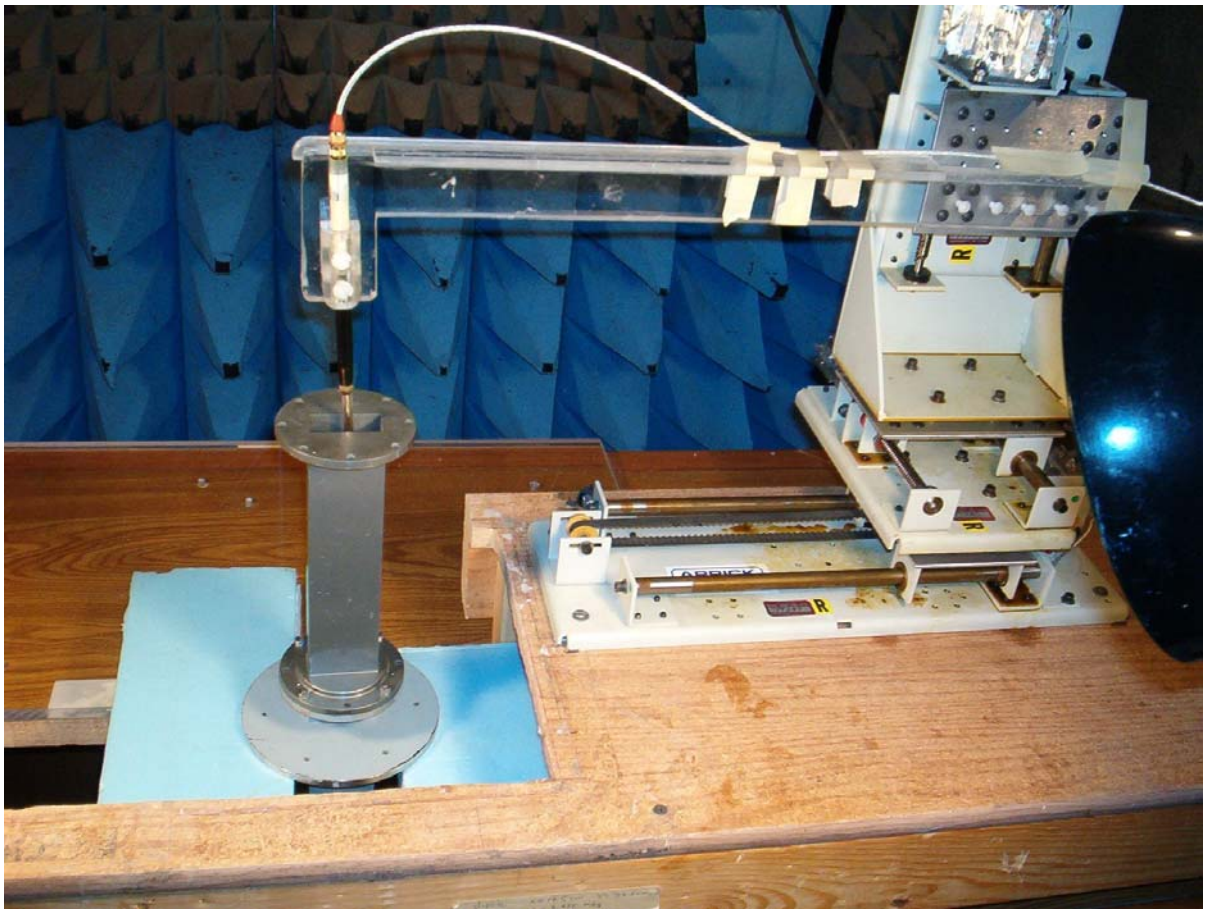
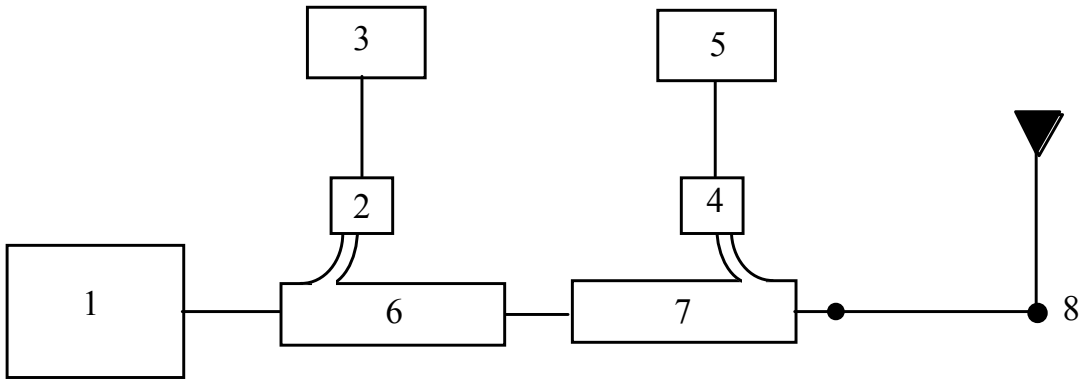


Fig. 10a. A photograph of the waveguide setup used for calibration of the Narda Model 8021 E-field probe in the frequency band 5.2-5.8 GHz.

Fig. 10b. Photograph of the waveguide setup showing also the coax to waveguide coupler at the bottom used to feed power to the vertical waveguide containing the tissue-simulant fluid.

Fig. 11. Photograph of the Narda Model 8021 Broadband Electric Field Probe used for SAR measurements.

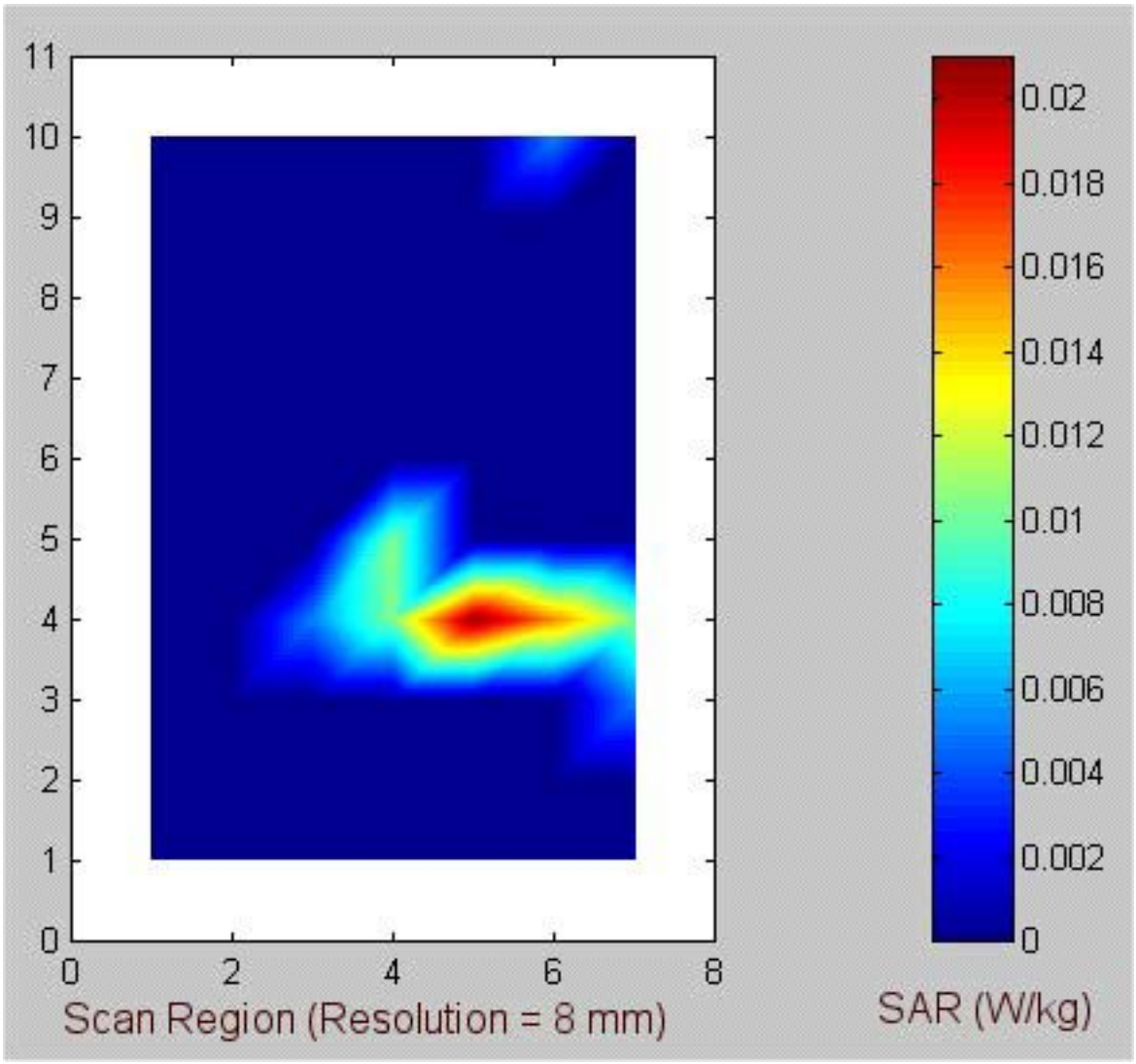
Fig. 12. Photograph of the half-wave dipole at 1900 MHz used for system verification.



1. RF generator, MCL Model 15222 with Model 6051 plug-in (1000-2000 MHz).
2. HP Model 8481A power sensor.
3. HP Model 436A power meter.
4. HP Model 8482A power sensor.
5. HP Model 436A power meter.
6. Narda Model 3042B-30, 30 dB coaxial directional coupler.
7. Narda Model 3042-10, 10 dB coaxial directional coupler.
8. Reference dipole antenna.

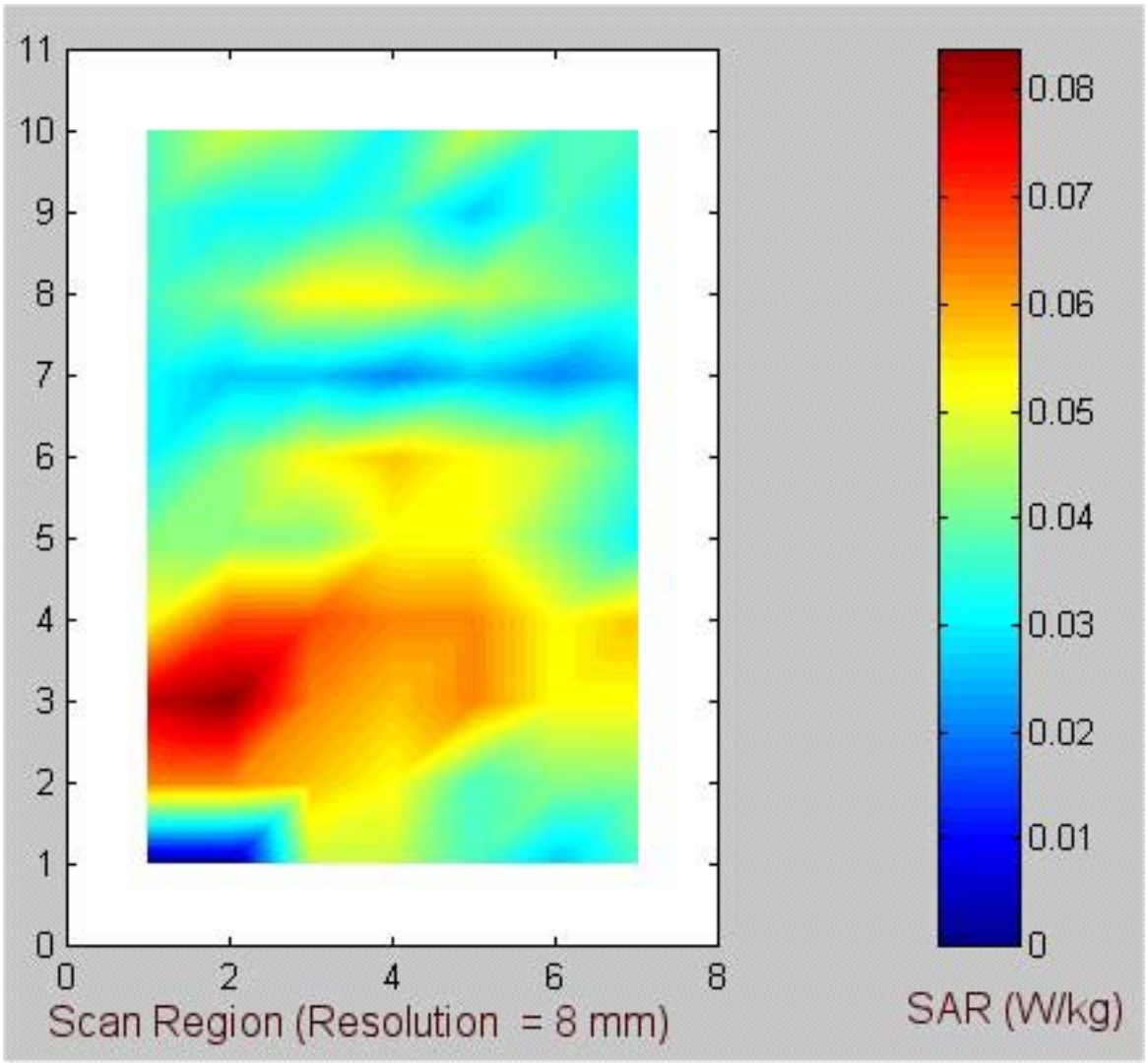
Fig. 13. The microwave circuit arrangement used for SAR system verification.

Fig. 14. Photograph of the Hewlett Packard Model 85070B Dielectric Probe. This is an open-circuited coaxial line probe.



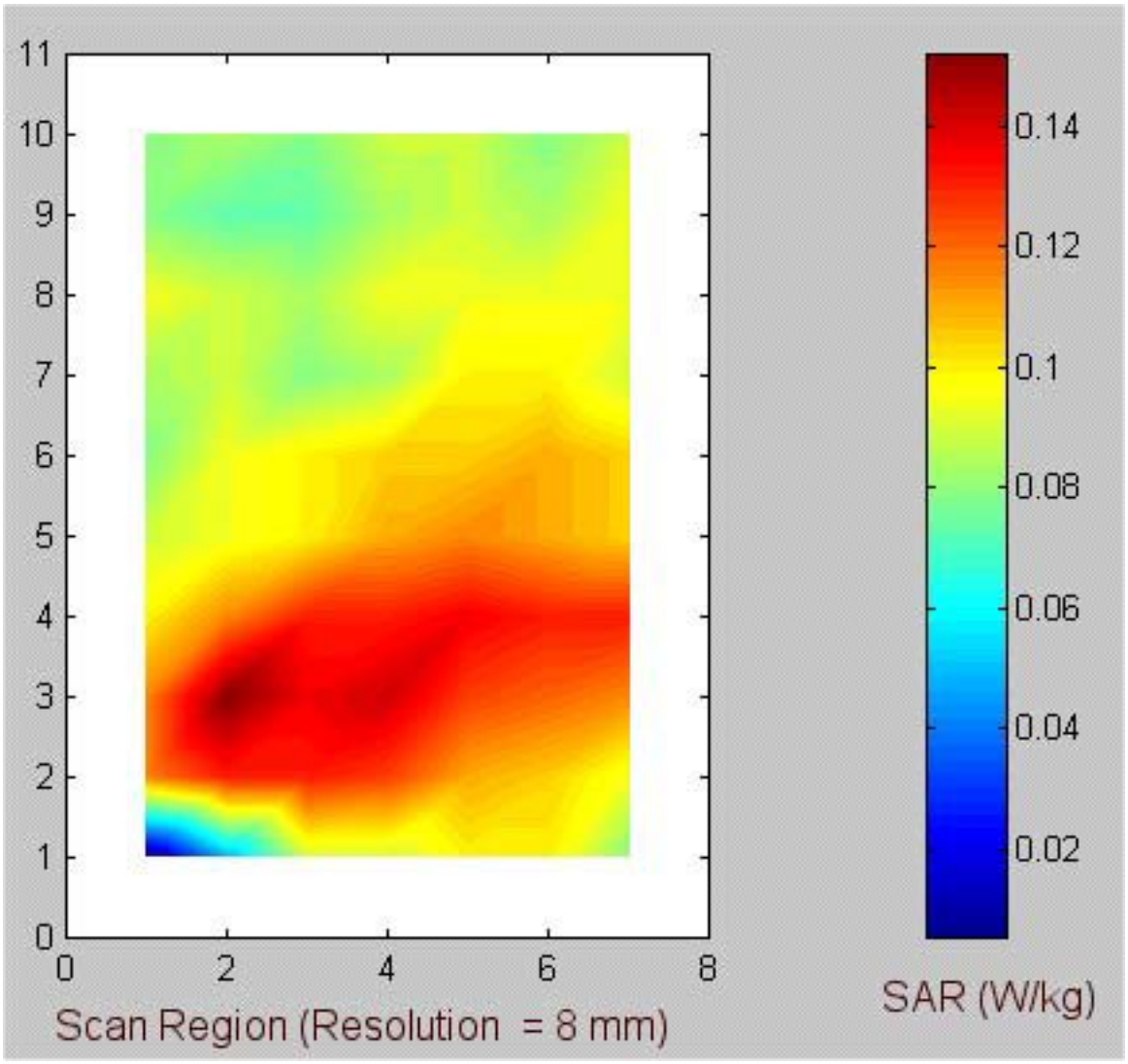
5.32 GHz normal mode (see Table 3 for the peak 1-g SAR)

Fig. 15. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4a, the bottom of the IBM Model 2659-HT2 PC is pressed against the base of the planar phantom for these measurements.



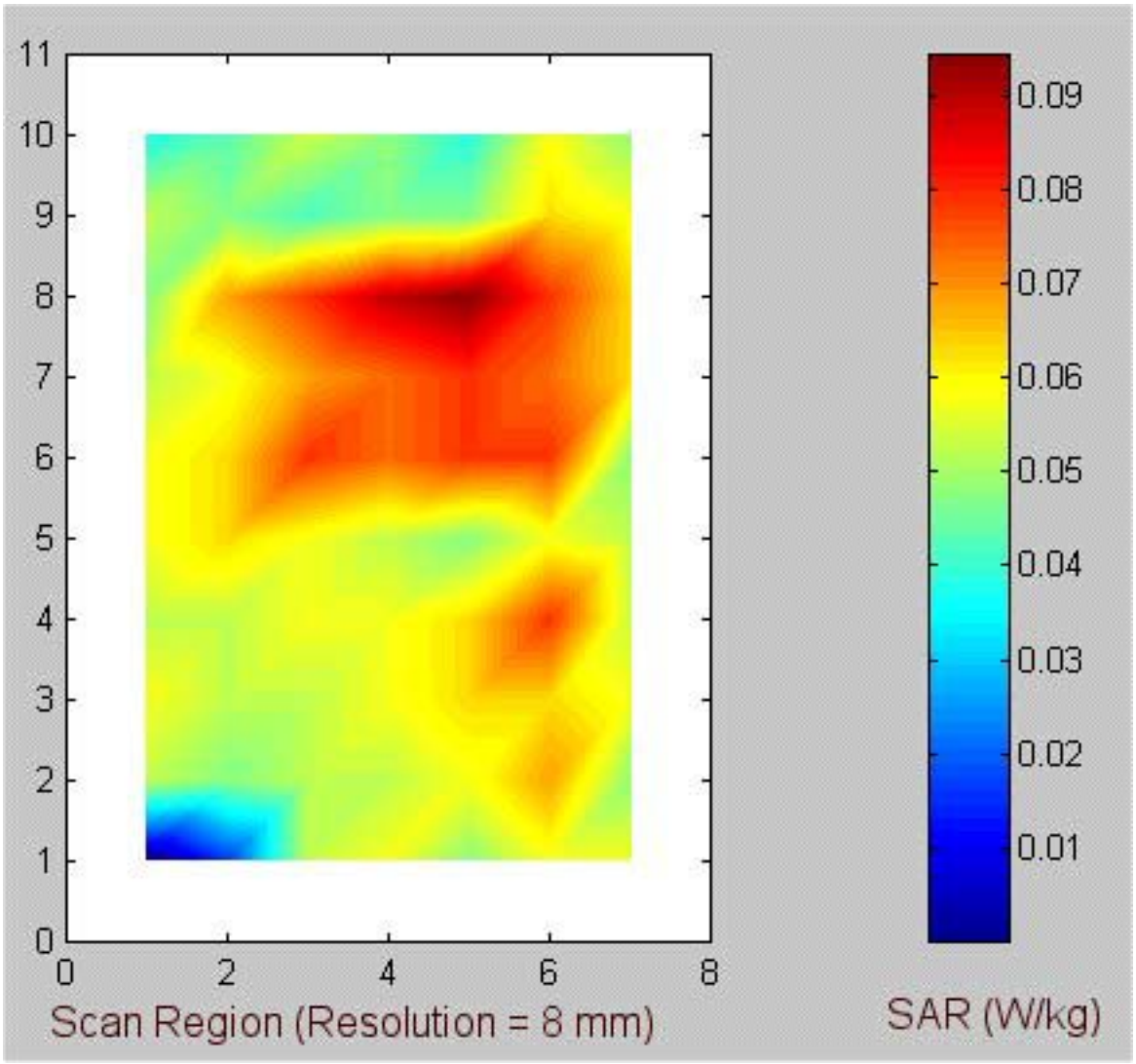
a. 5.24 GHz normal mode (see Table 4 for the peak 1-g SAR).

Fig. 16. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4b, the bottom of the Compaq Model PP2150 PC is pressed against the base of the planar phantom for these measurements.



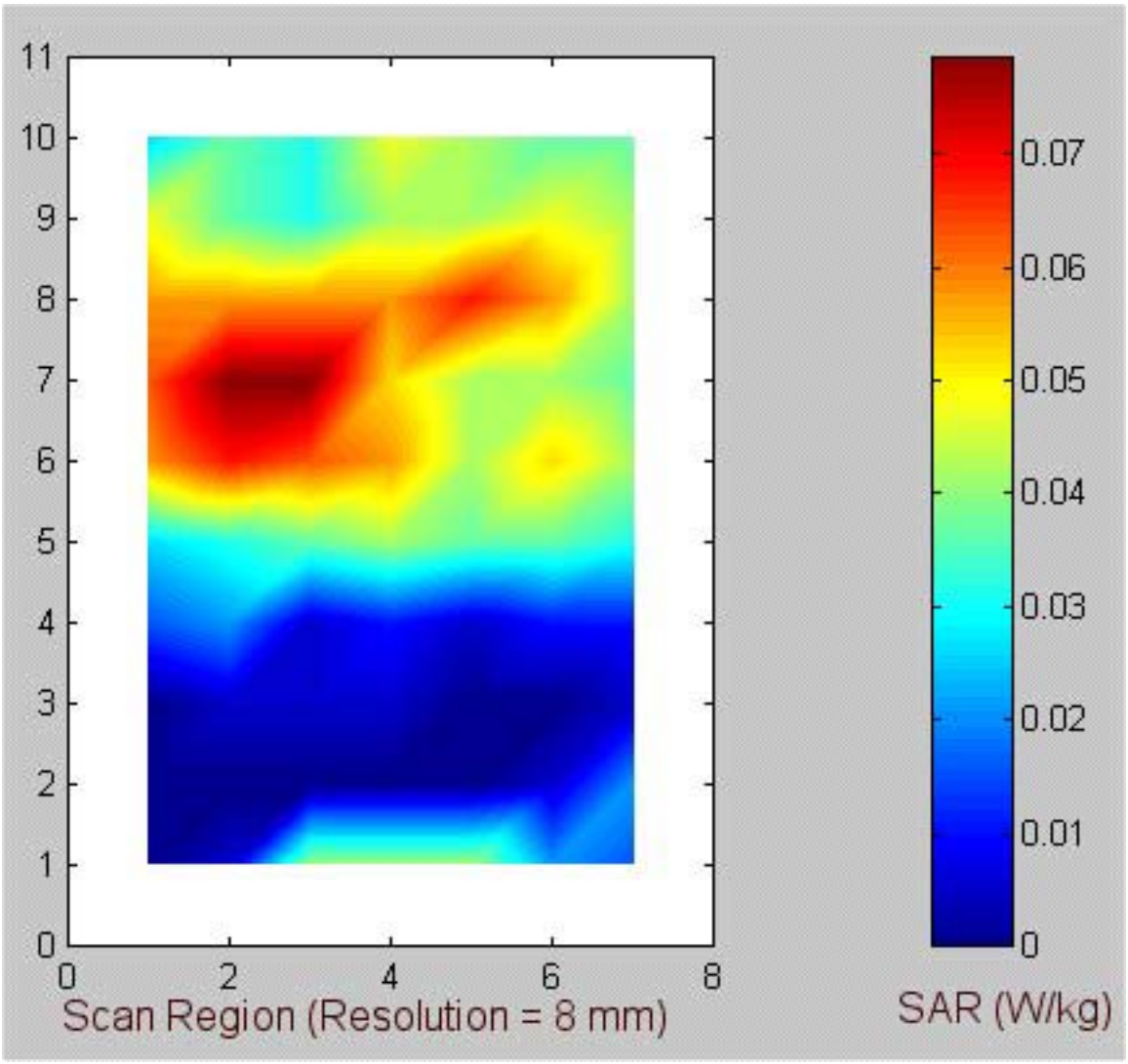
b. 5.32 GHz normal mode (see Table 5 for the peak 1-g SAR).

Fig. 16. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4b, the bottom of the Compaq Model PP2150 PC is pressed against the base of the planar phantom for these measurements.



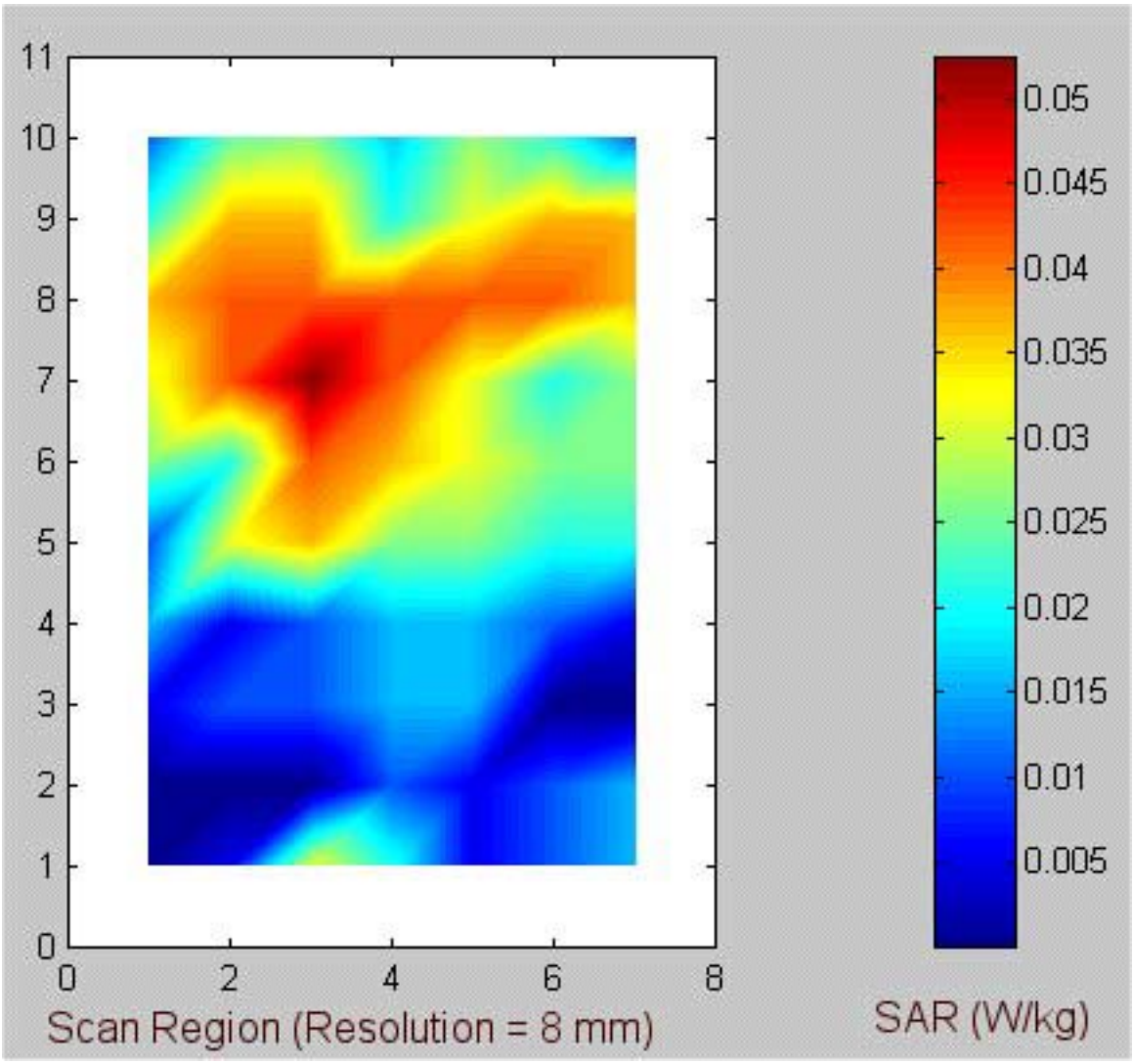
c. 5.785 GHz normal mode (see Table 6 for the peak 1-g SAR).

Fig. 16. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4b, the bottom of the Compaq Model PP2150 PC is pressed against the base of the planar phantom for these measurements.



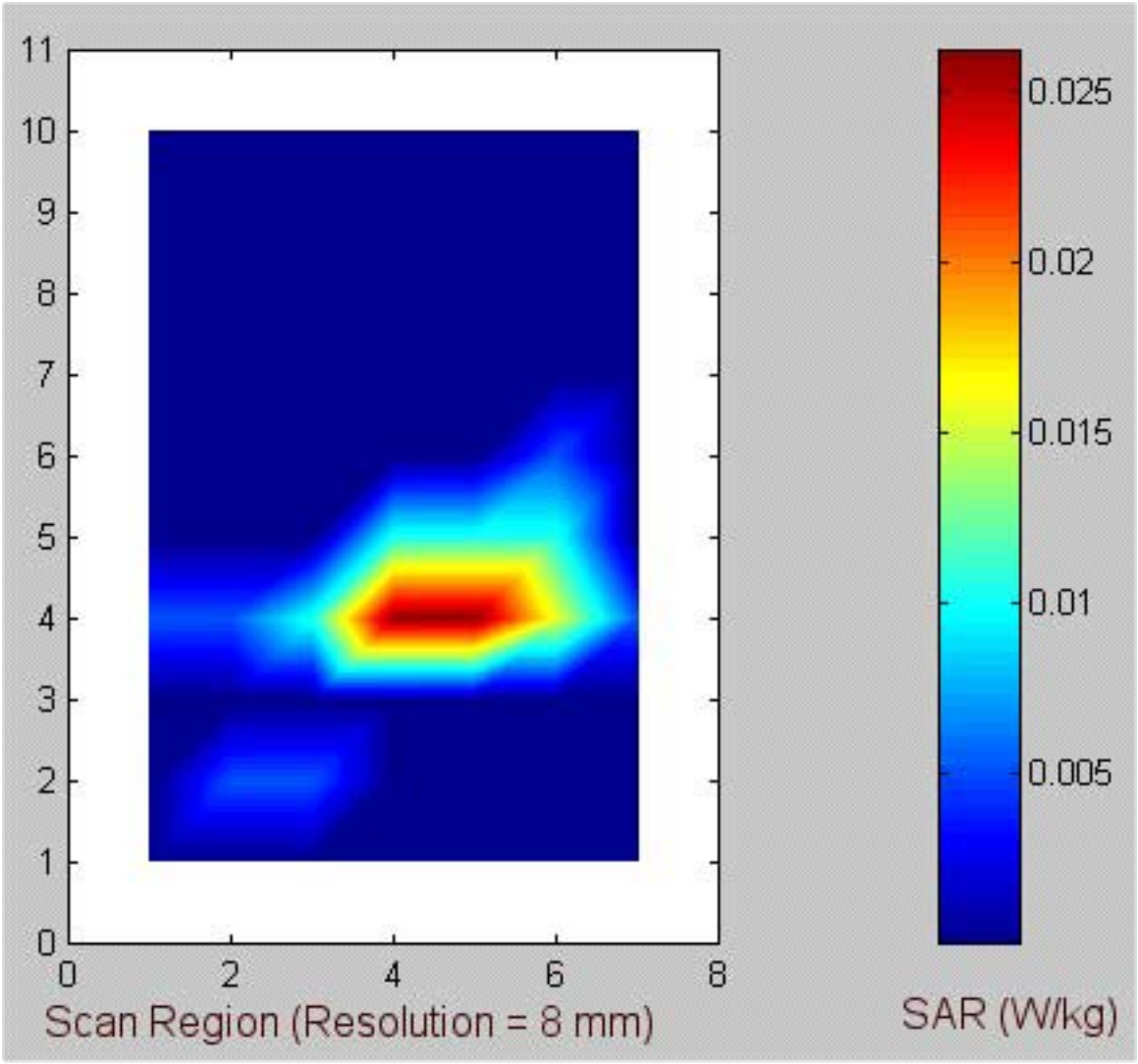
d. 5.29 GHz turbo mode (see Table 7 for the peak 1-g SAR).

Fig. 16. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4b, the bottom of the Compaq Model PP2150 PC is pressed against the base of the planar phantom for these measurements.



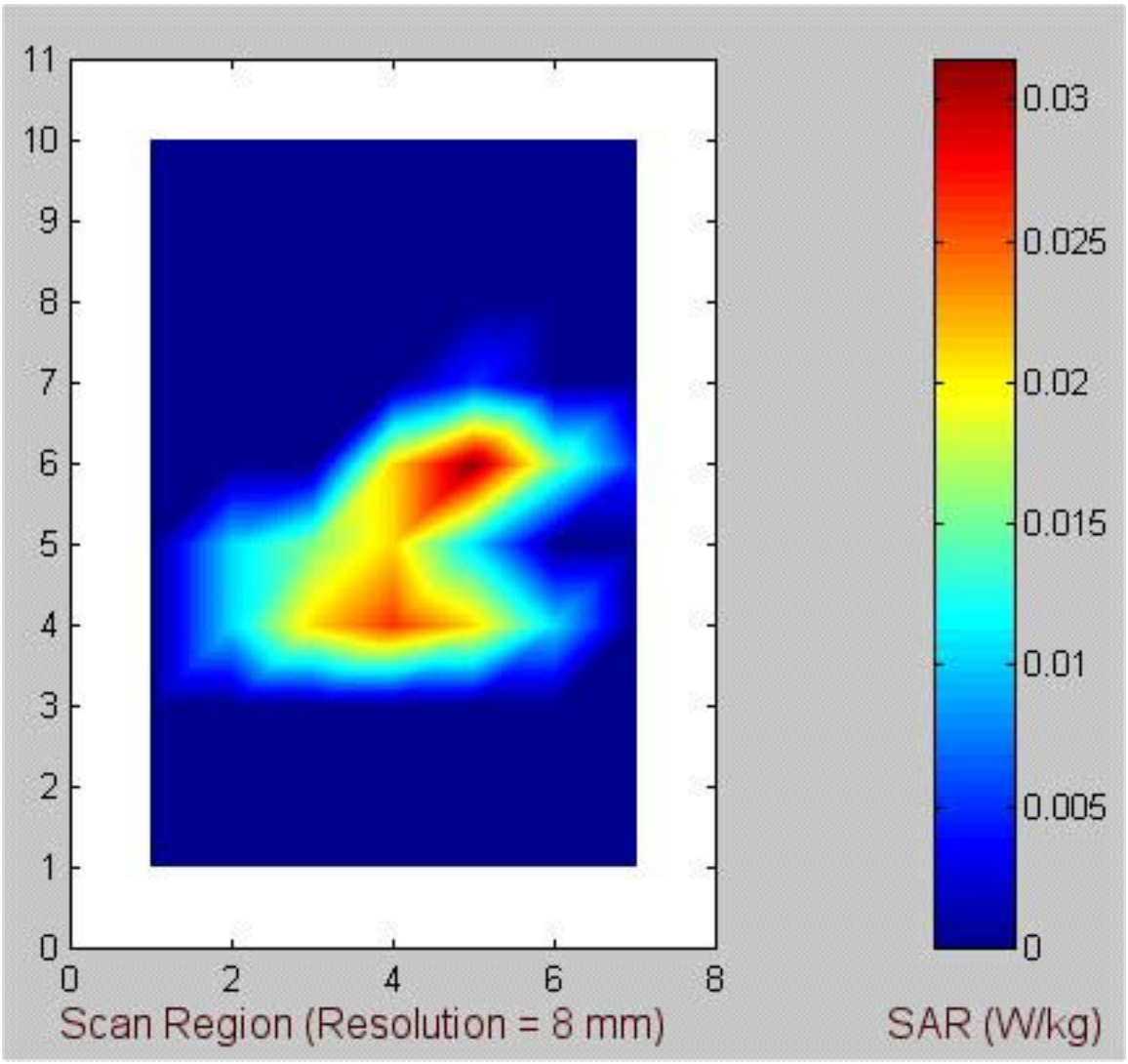
e. 5.80 GHz turbo mode (see Table 8 for the peak 1-g SAR).

Fig. 16. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4b, the bottom of the Compaq Model PP2150 PC is pressed against the base of the planar phantom for these measurements.



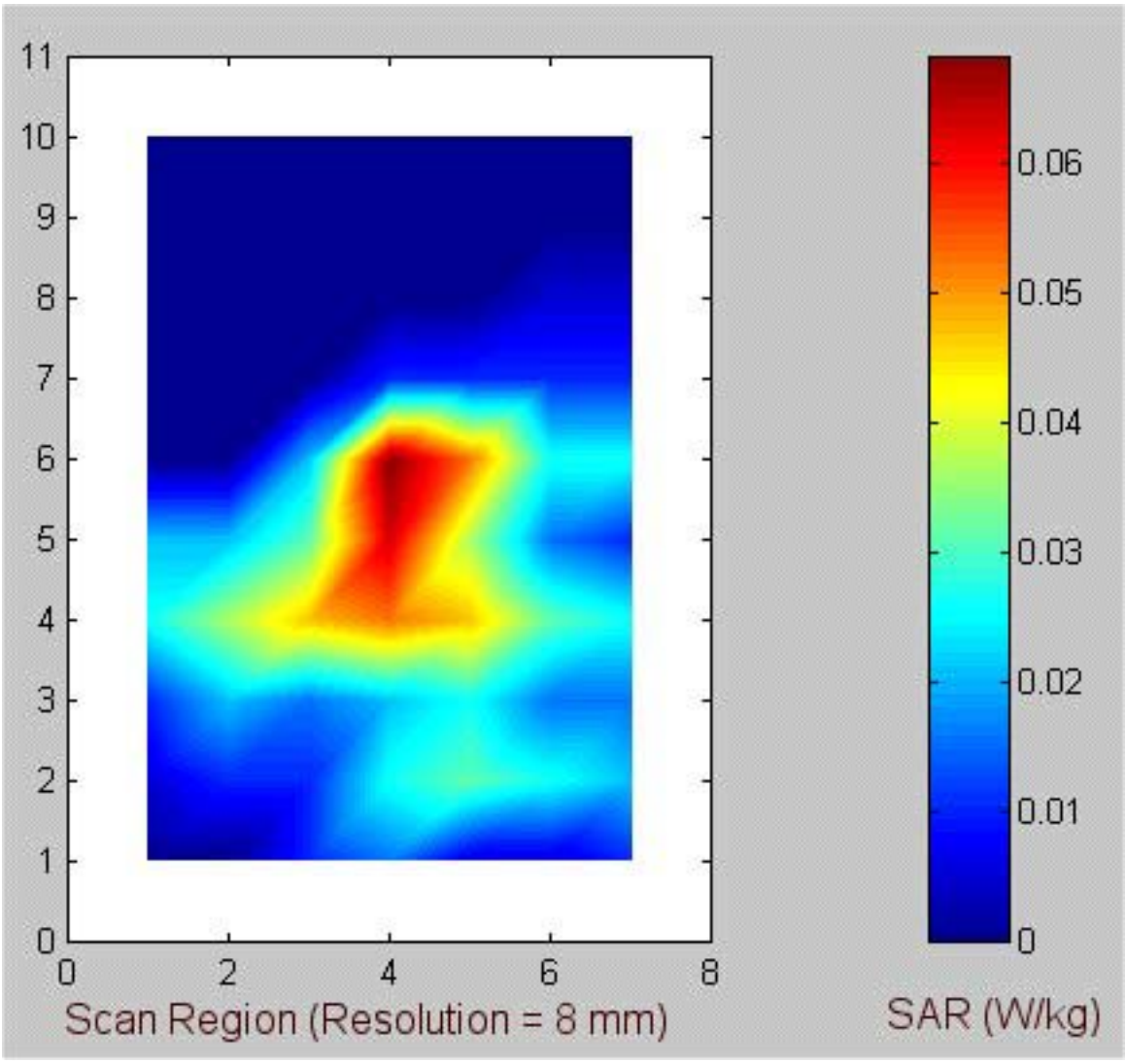
a. 5.24 GHz normal mode (see Table 9 for the peak 1-g SAR).

Fig. 17. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4c, the bottom of the Toshiba Model 1110 PC is pressed against the base of the planar phantom for these measurements.



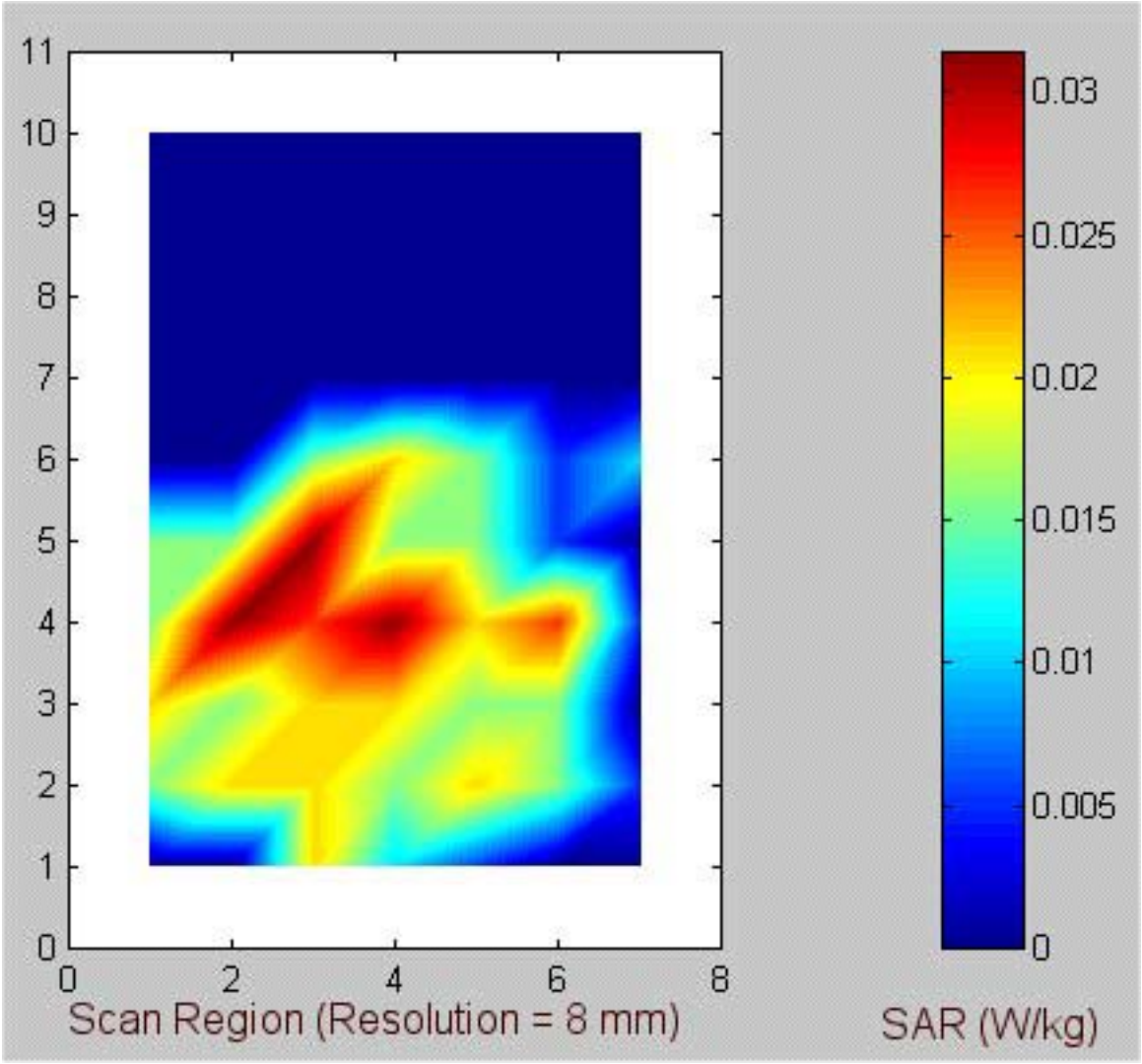
b. 5.32 GHz normal mode (see Table 10 for the peak 1-g SAR).

Fig. 17. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4c, the bottom of the Toshiba Model 1110 PC is pressed against the base of the planar phantom for these measurements.



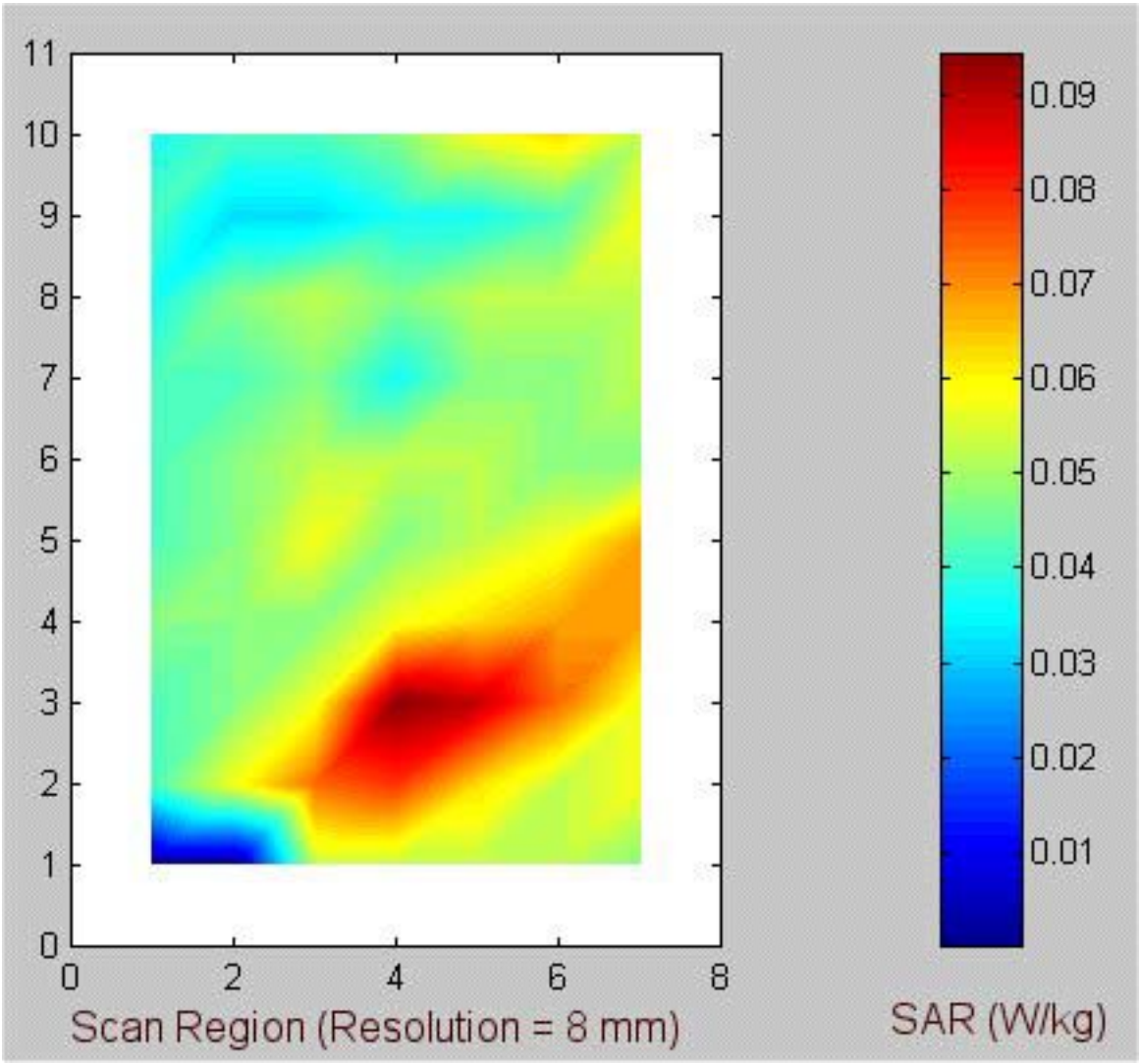
c. 5.785 GHz normal mode (see Table 11 for the peak 1-g SAR).

Fig. 17. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4c, the bottom of the Toshiba Model 1110 PC is pressed against the base of the planar phantom for these measurements.



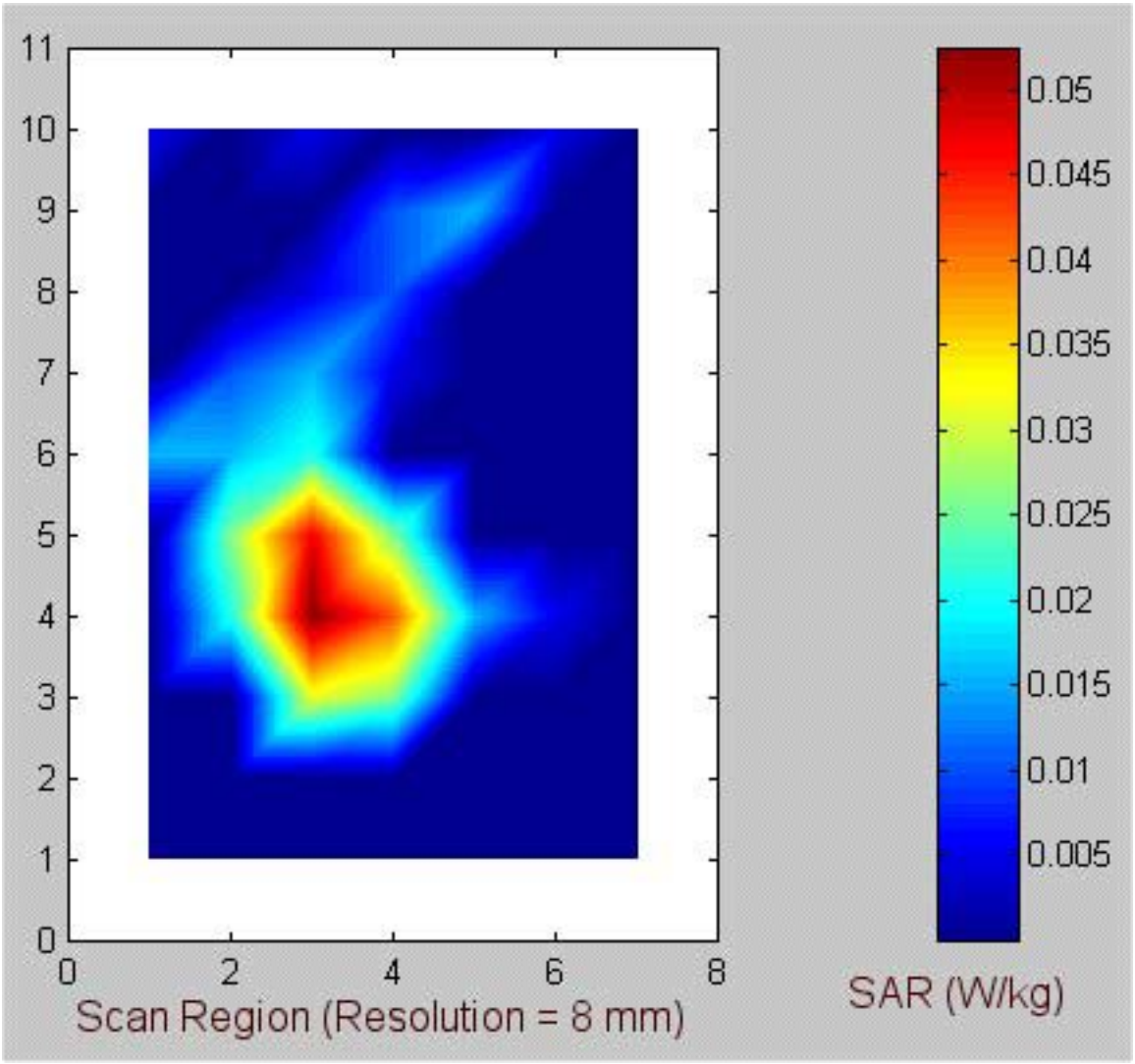
d. 5.29 GHz turbo mode (see Table 12 for the peak 1-g SAR).

Fig. 17. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4c, the bottom of the Toshiba Model 1110 PC is pressed against the base of the planar phantom for these measurements.



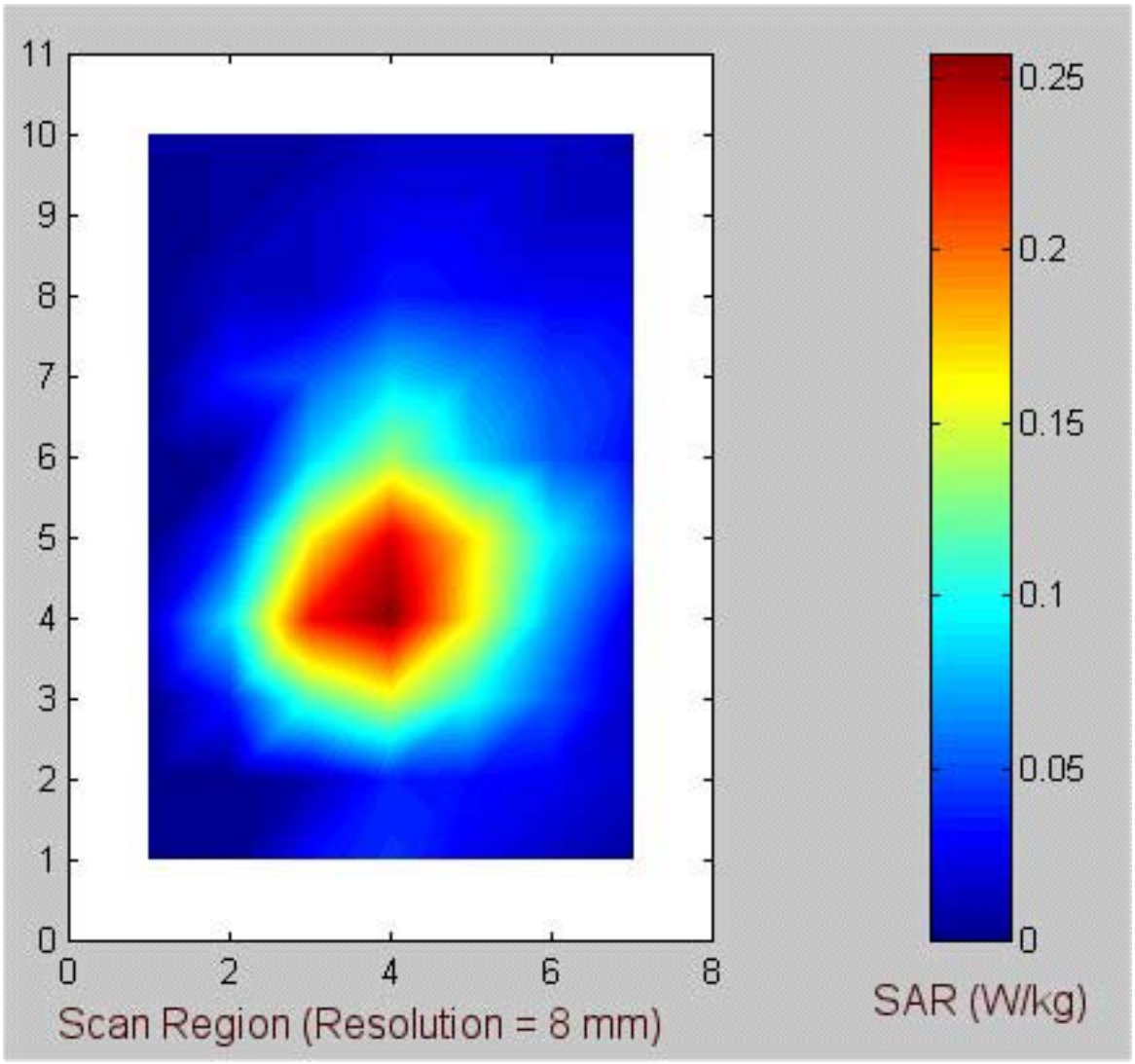
e. 5.80 GHz turbo mode (see Table 13 for the peak 1-g SAR).

Fig. 17. Coarse scans for the SAR measurements for the **Above-lap** Configuration 1 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 4c, the bottom of the Toshiba Model 1110 PC is pressed against the base of the planar phantom for these measurements.



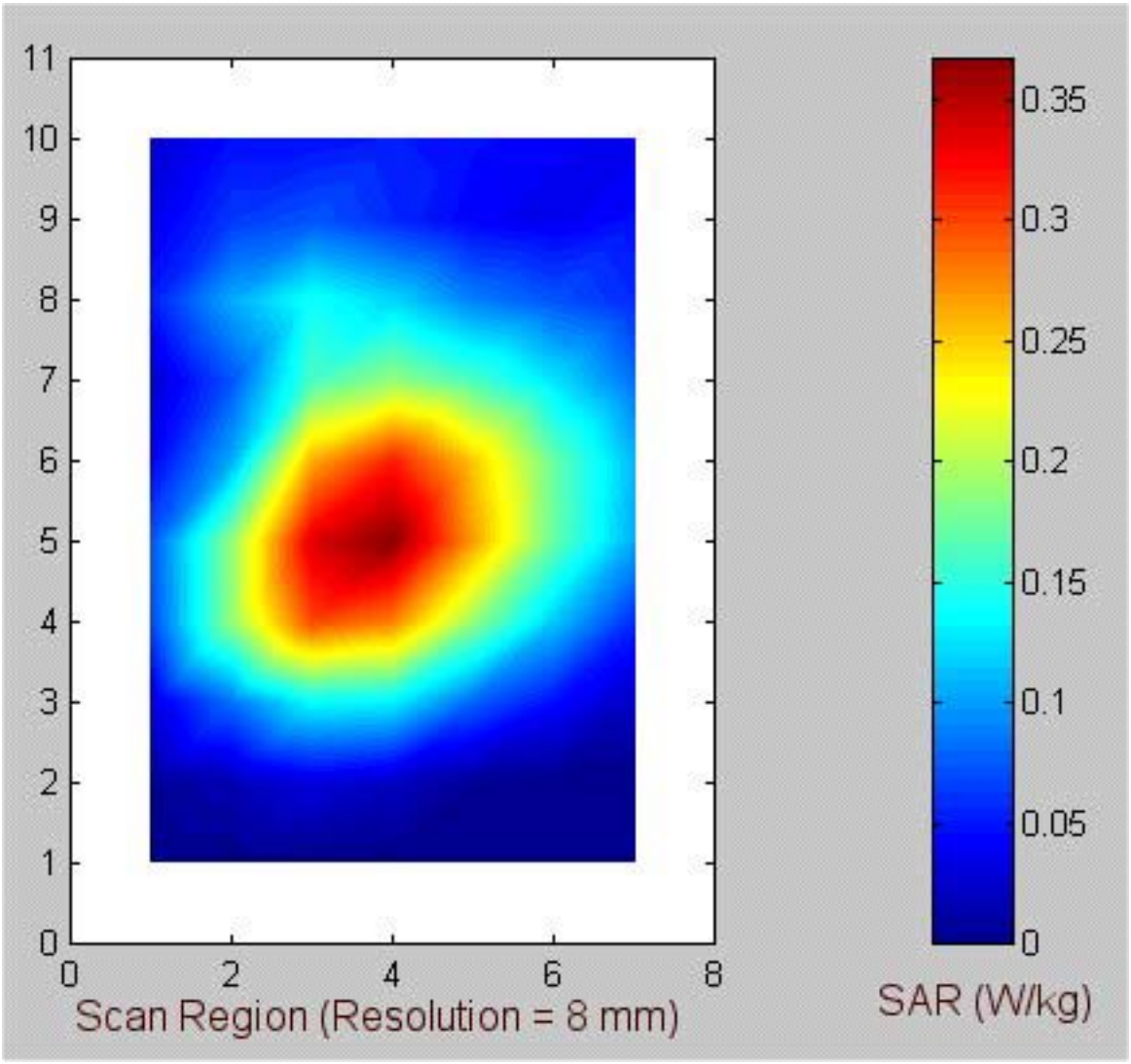
a. 5.24 GHz normal mode (see Table 14 for the peak 1-g SAR).

Fig. 18. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 7, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



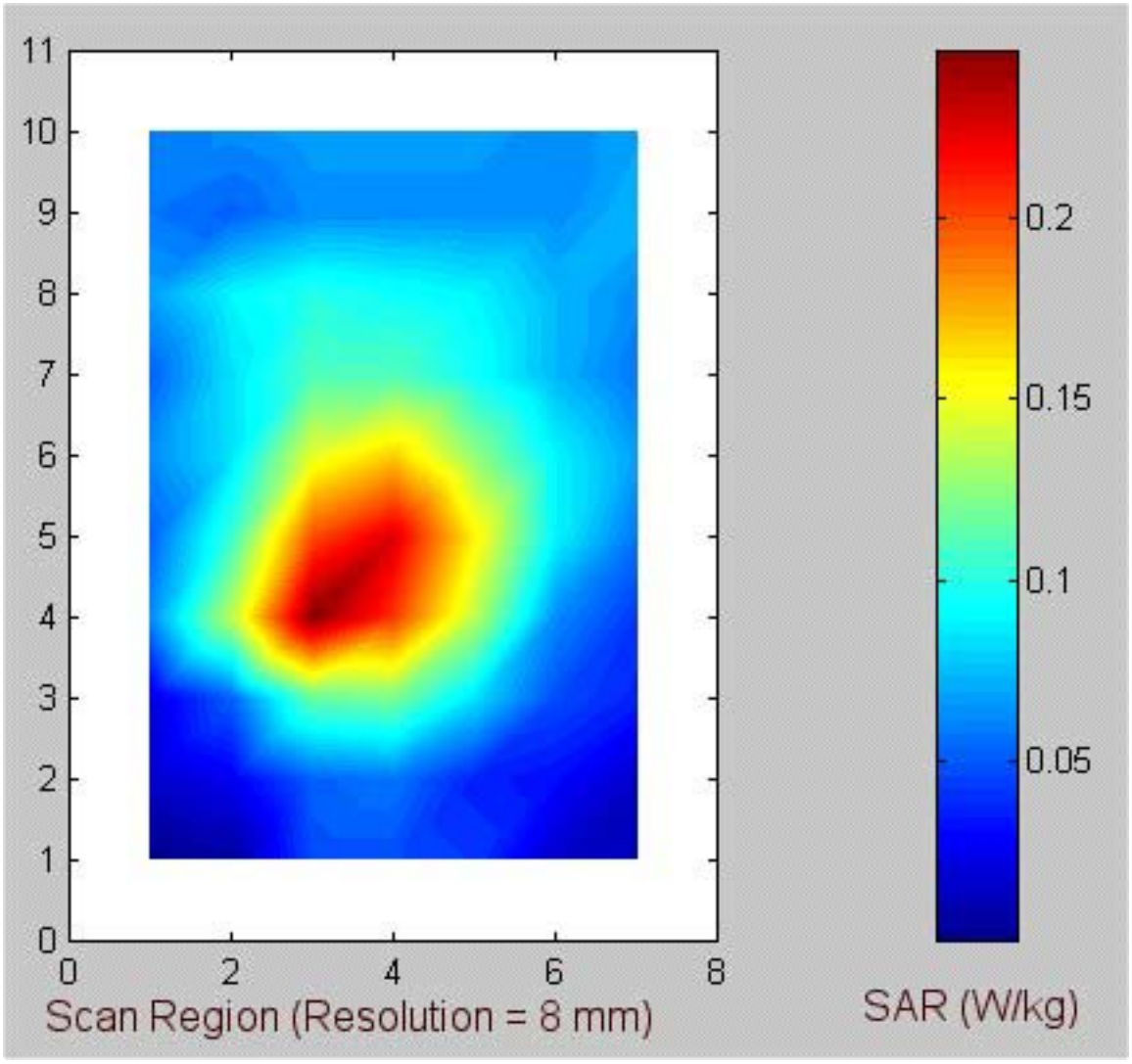
b. 5.32 GHz normal mode (see Table 15 for the peak 1-g SAR).

Fig. 18. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 7, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



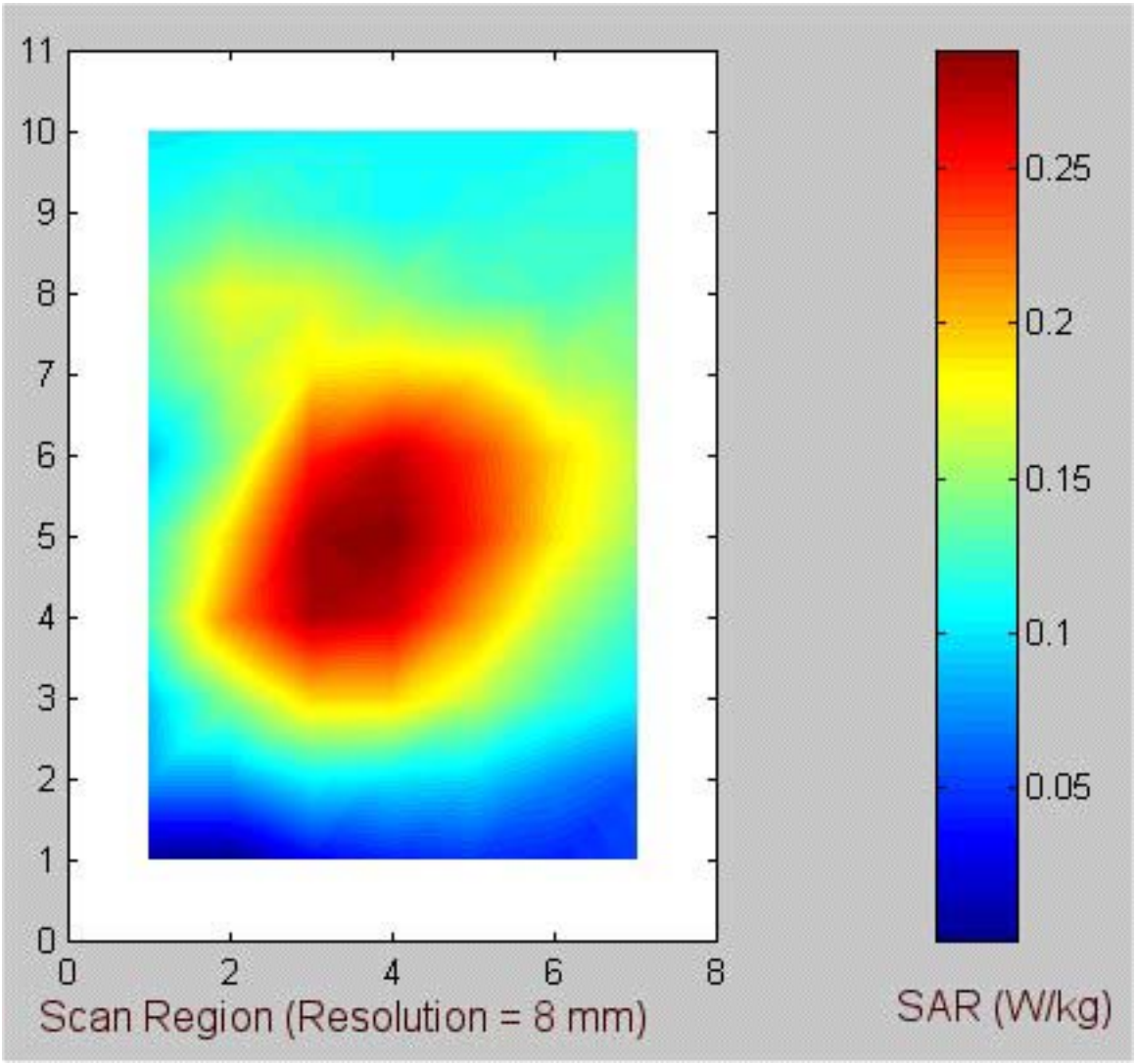
c. 5.785 GHz normal mode (see Table 16 for the peak 1-g SAR).

Fig. 18. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 7, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



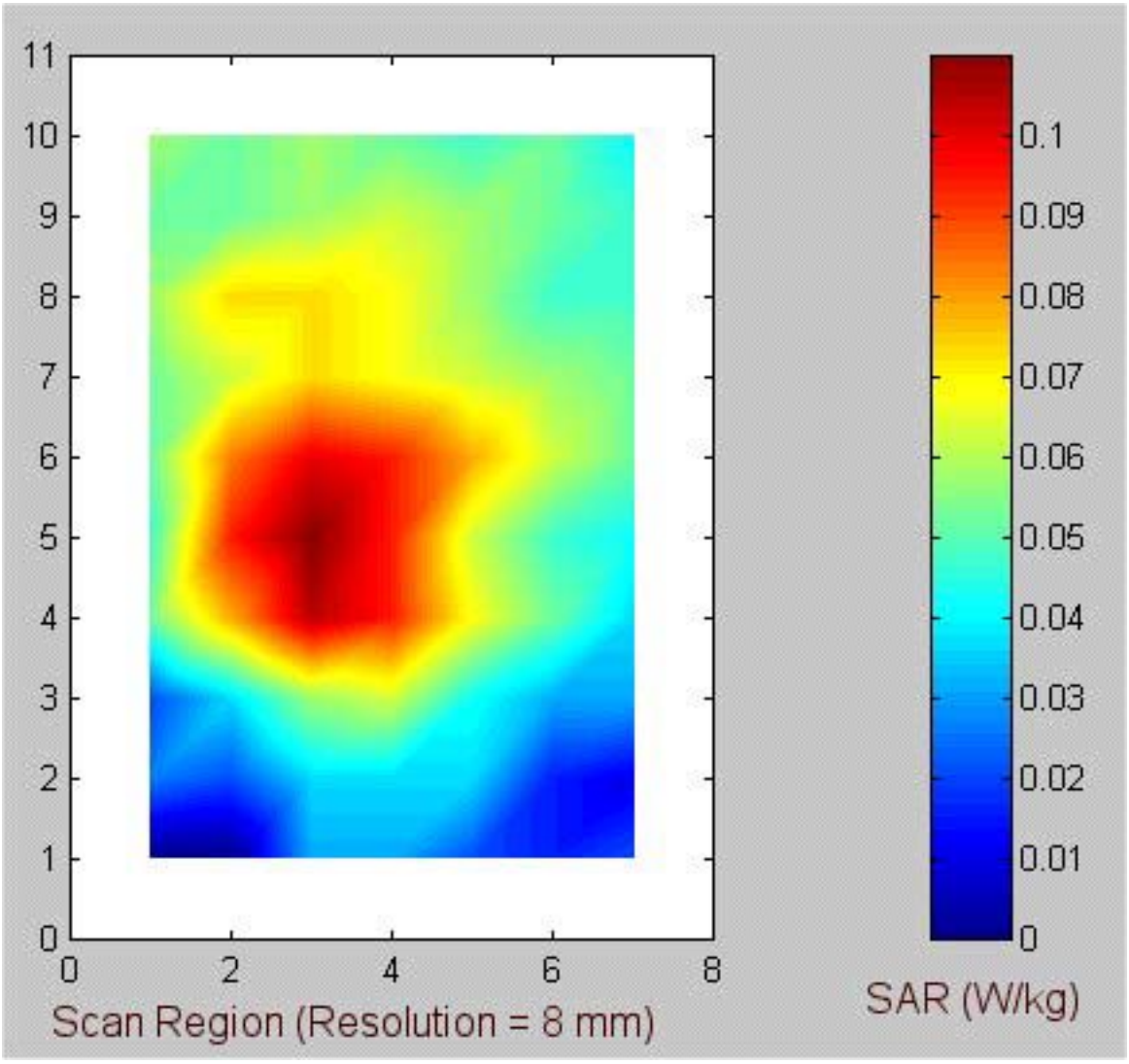
d. 5.29 GHz turbo mode (see Table 17 for the peak 1-g SAR).

Fig. 18. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 7, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



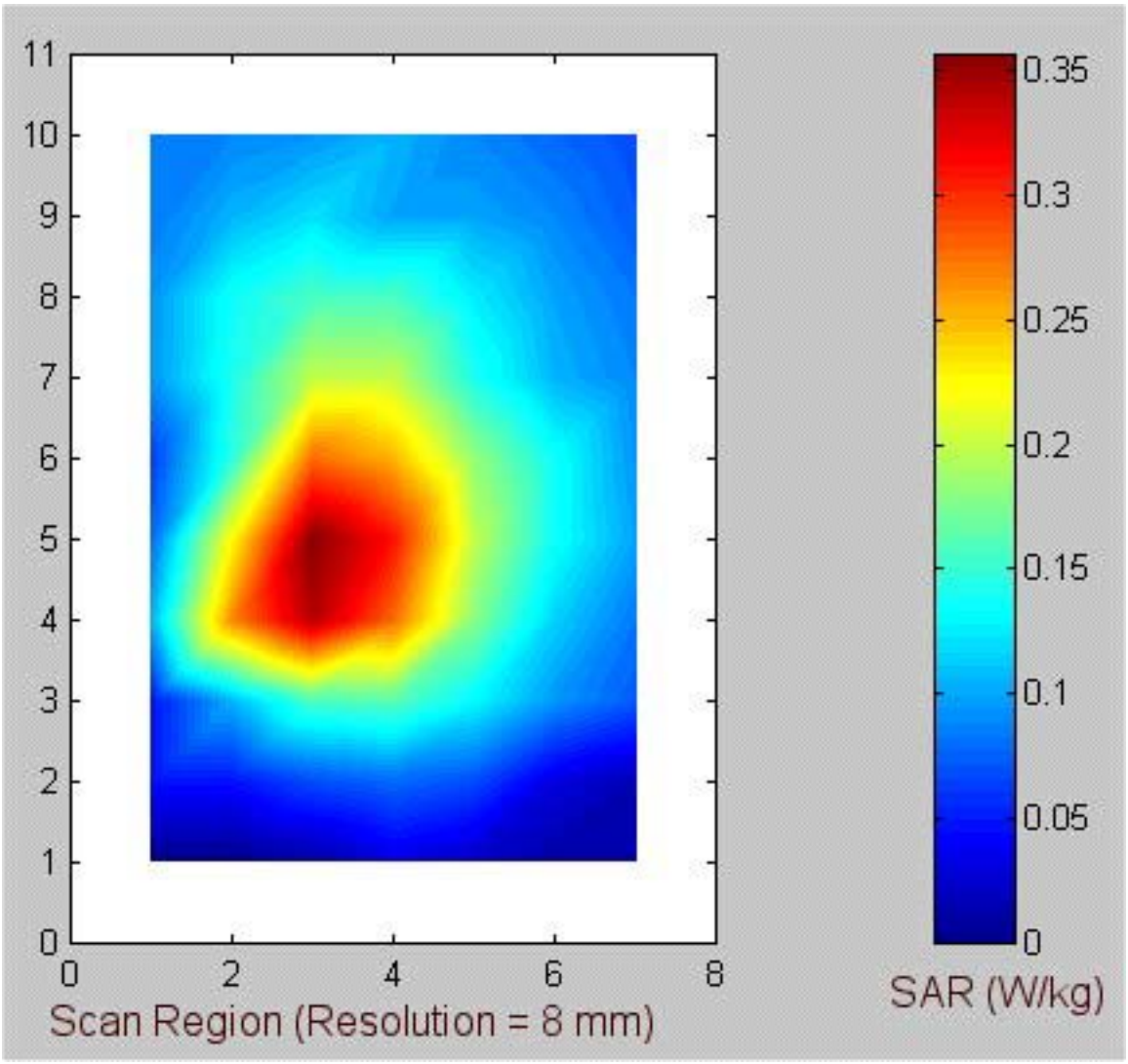
e. 5.80 GHz turbo mode (see Table 18 for the peak 1-g SAR).

Fig. 18. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 7, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



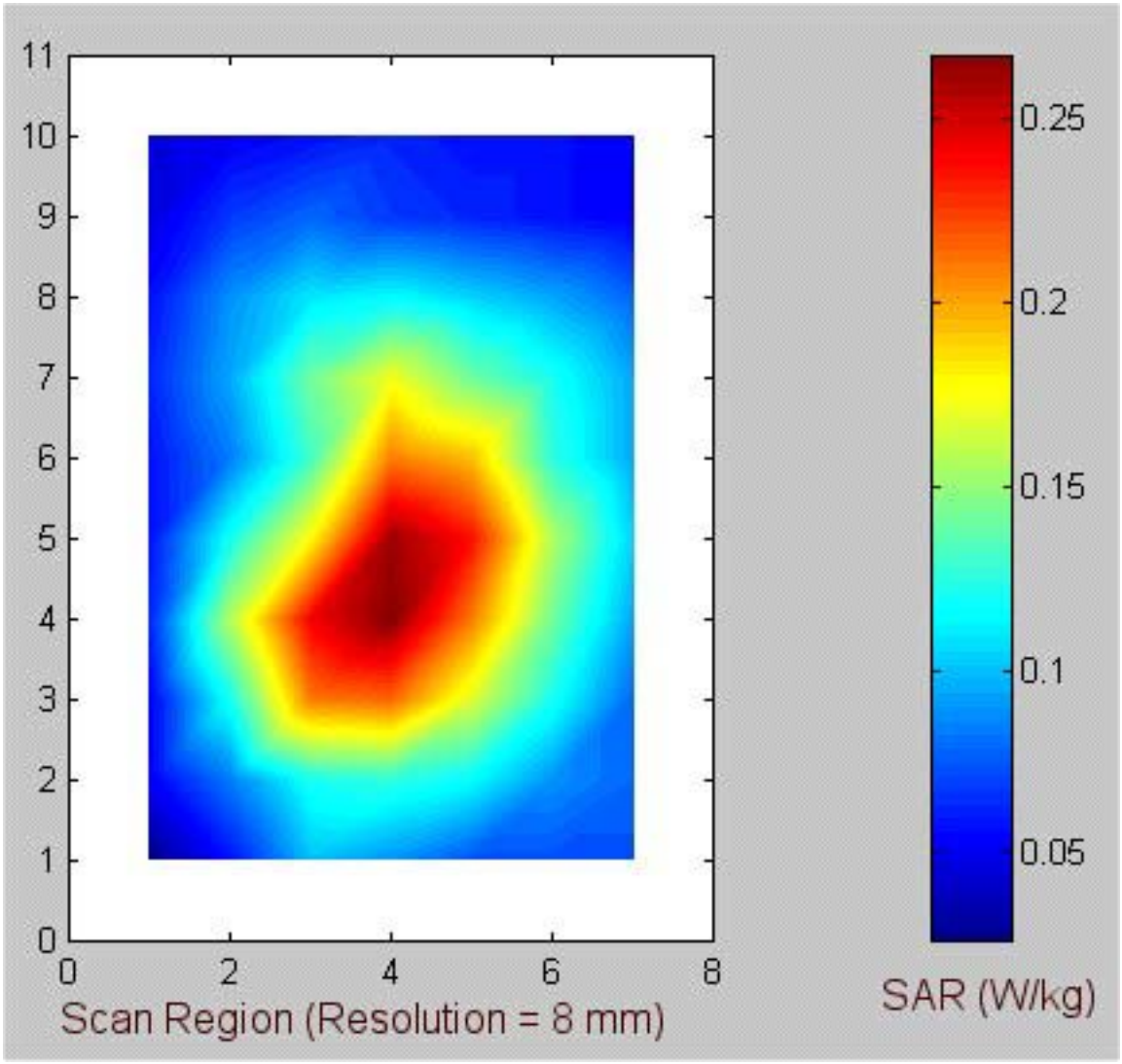
a. 5.24 GHz normal mode (see Table 19 for the peak 1-g SAR).

Fig. 19. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 8, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



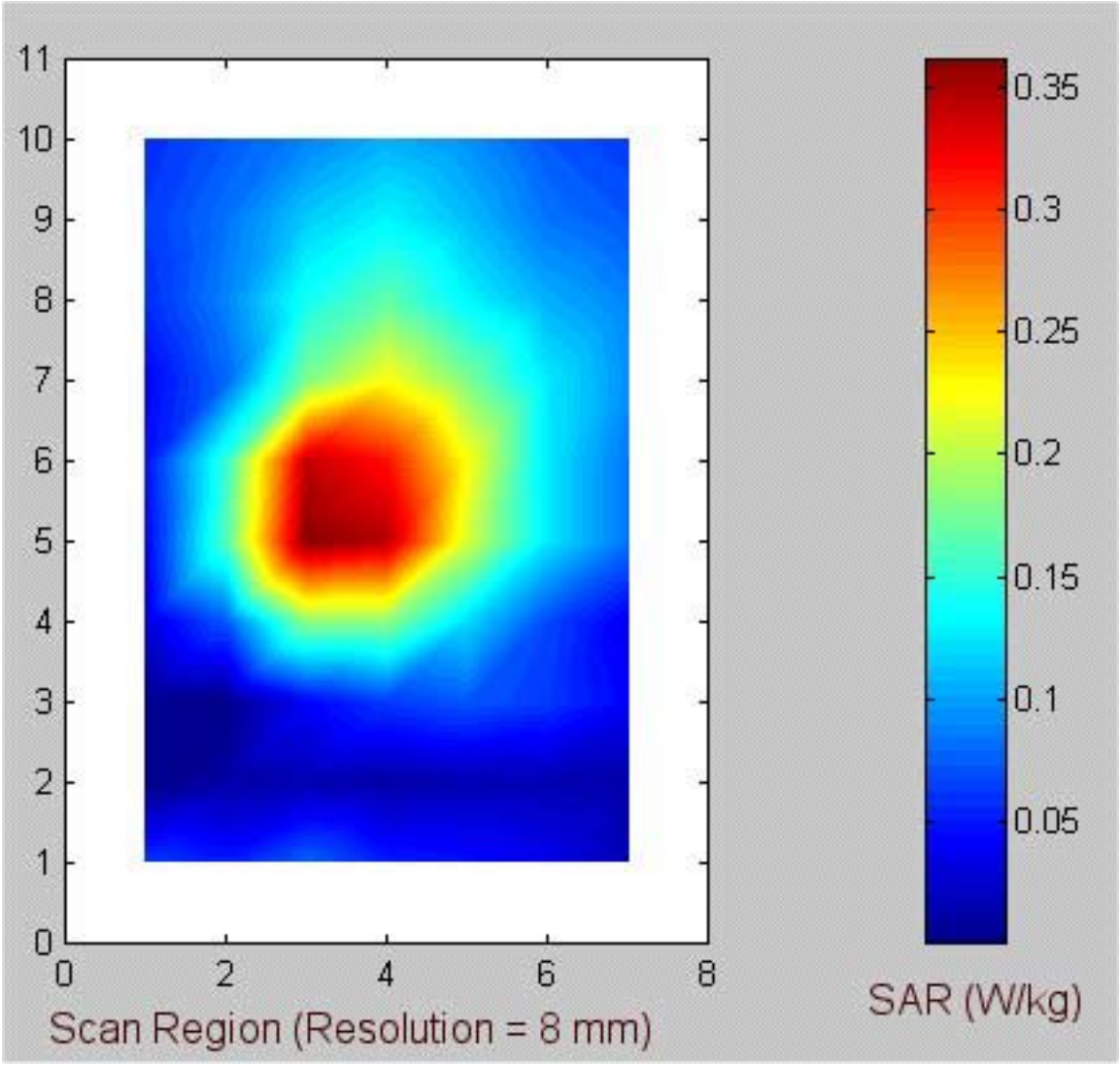
b. 5.32 GHz normal mode (see Table 20 for the peak 1-g SAR).

Fig. 19. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 8, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



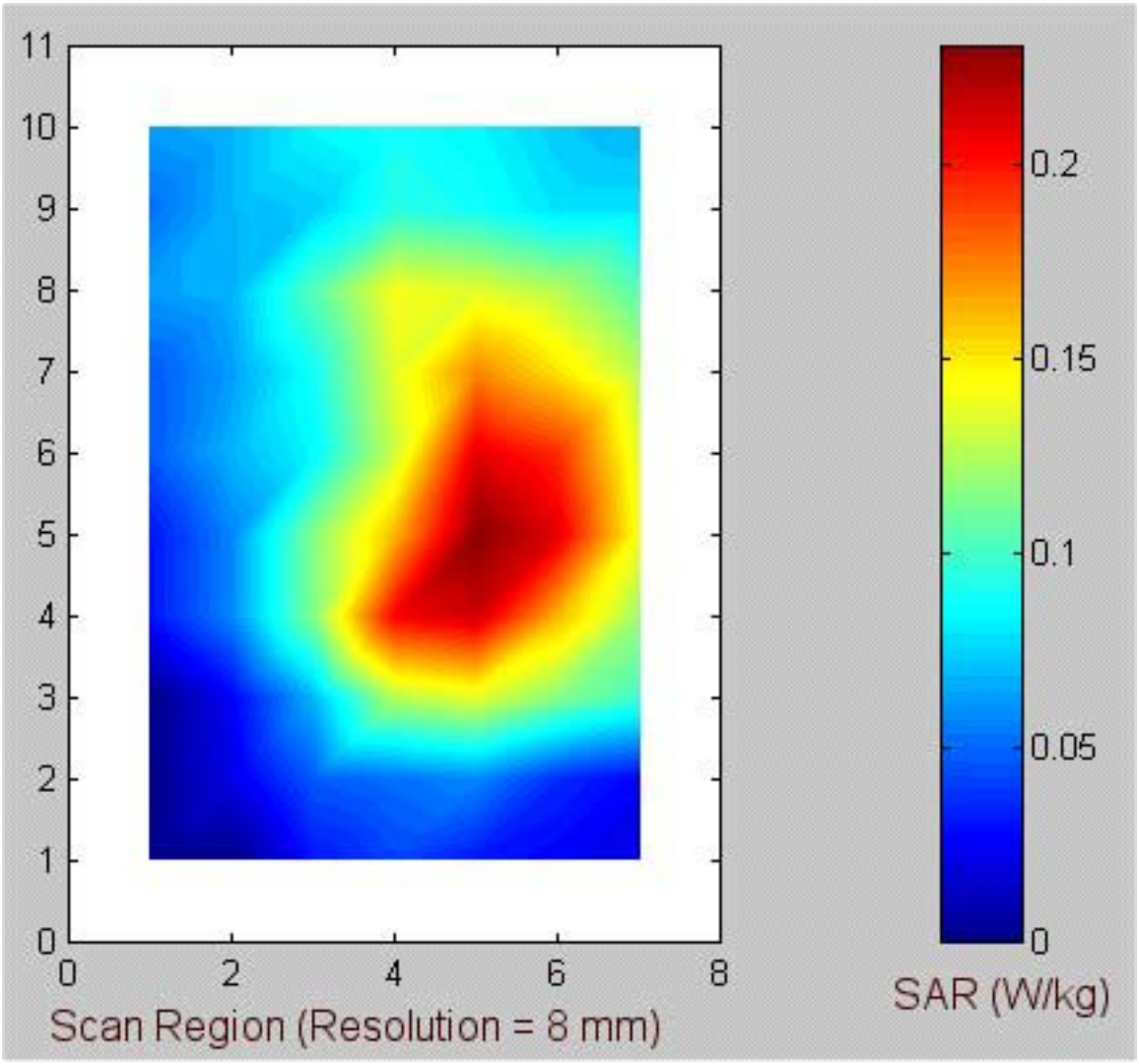
c. 5.785 GHz normal mode (see Table 21 for the peak 1-g SAR).

Fig. 19. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 8, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



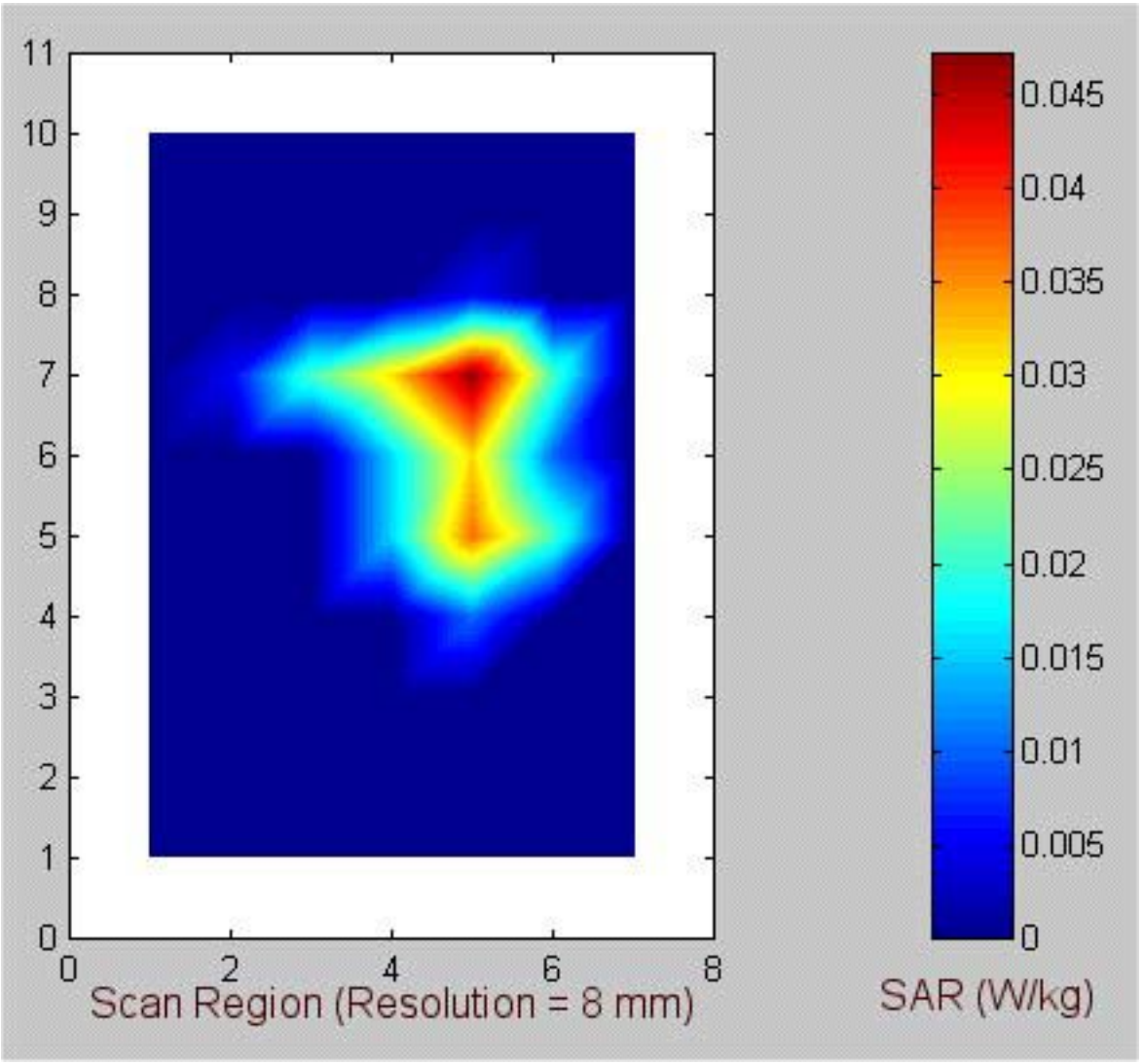
d. 5.29 GHz turbo mode (see Table 22 for the peak 1-g SAR).

Fig. 19. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 8, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



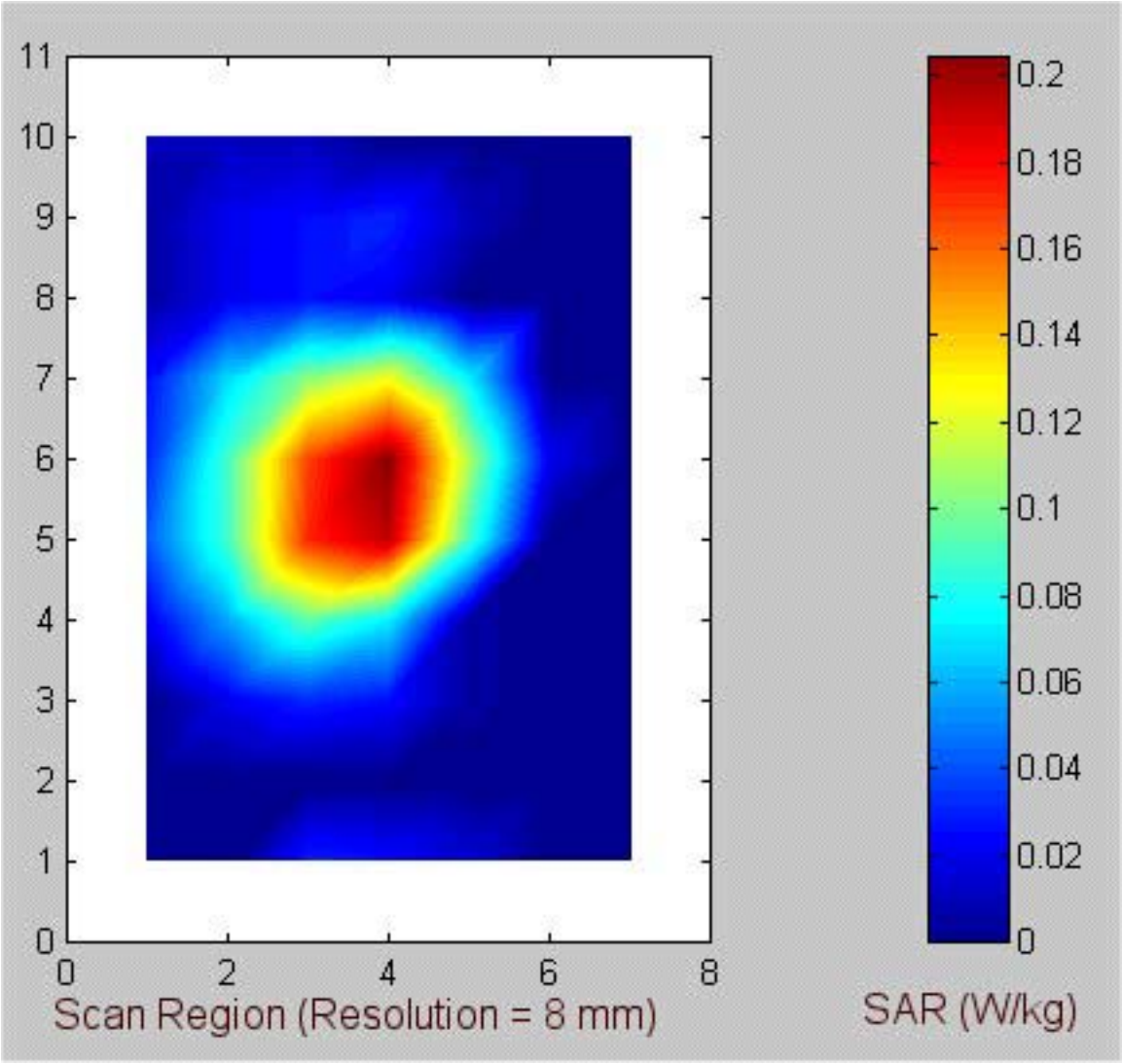
e. 5.80 GHz turbo mode (see Table 23 for the peak 1-g SAR).

Fig. 19. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 8, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



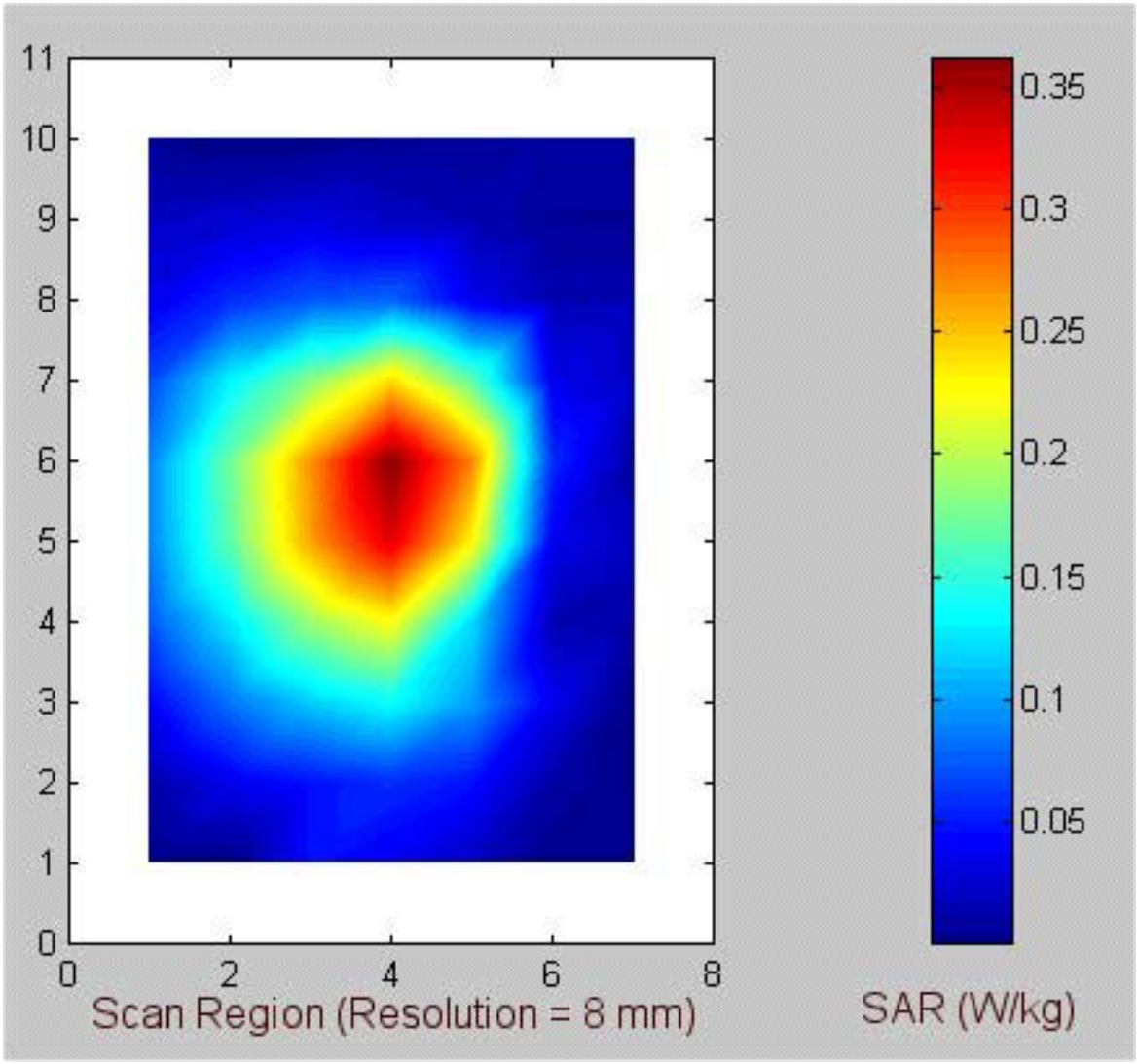
a. 5.24 GHz normal mode (see Table 24 for the peak 1-g SAR).

Fig. 20. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 9, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



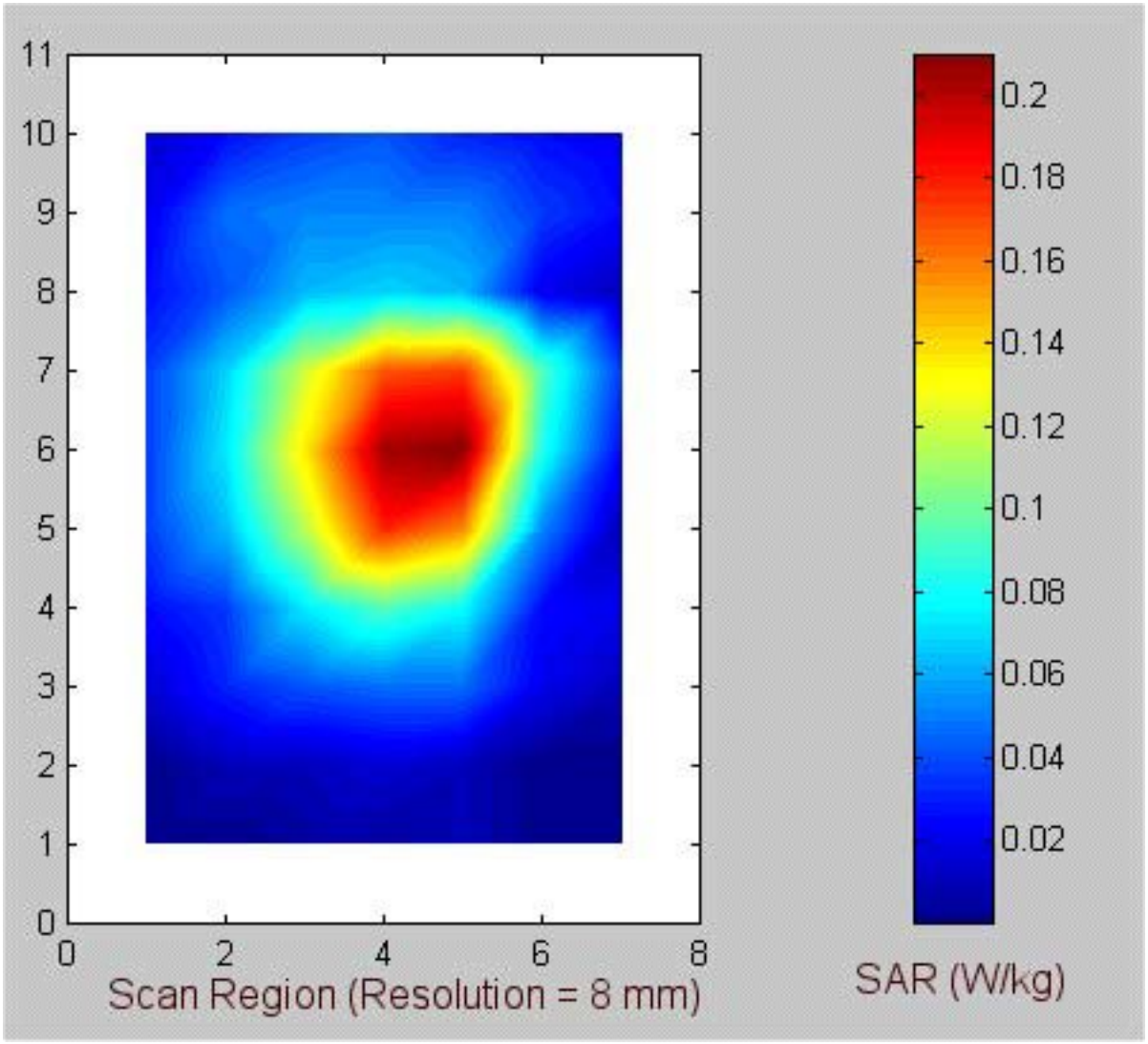
b. 5.32 GHz normal mode (see Table 25 for the peak 1-g SAR).

Fig. 20. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 9, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



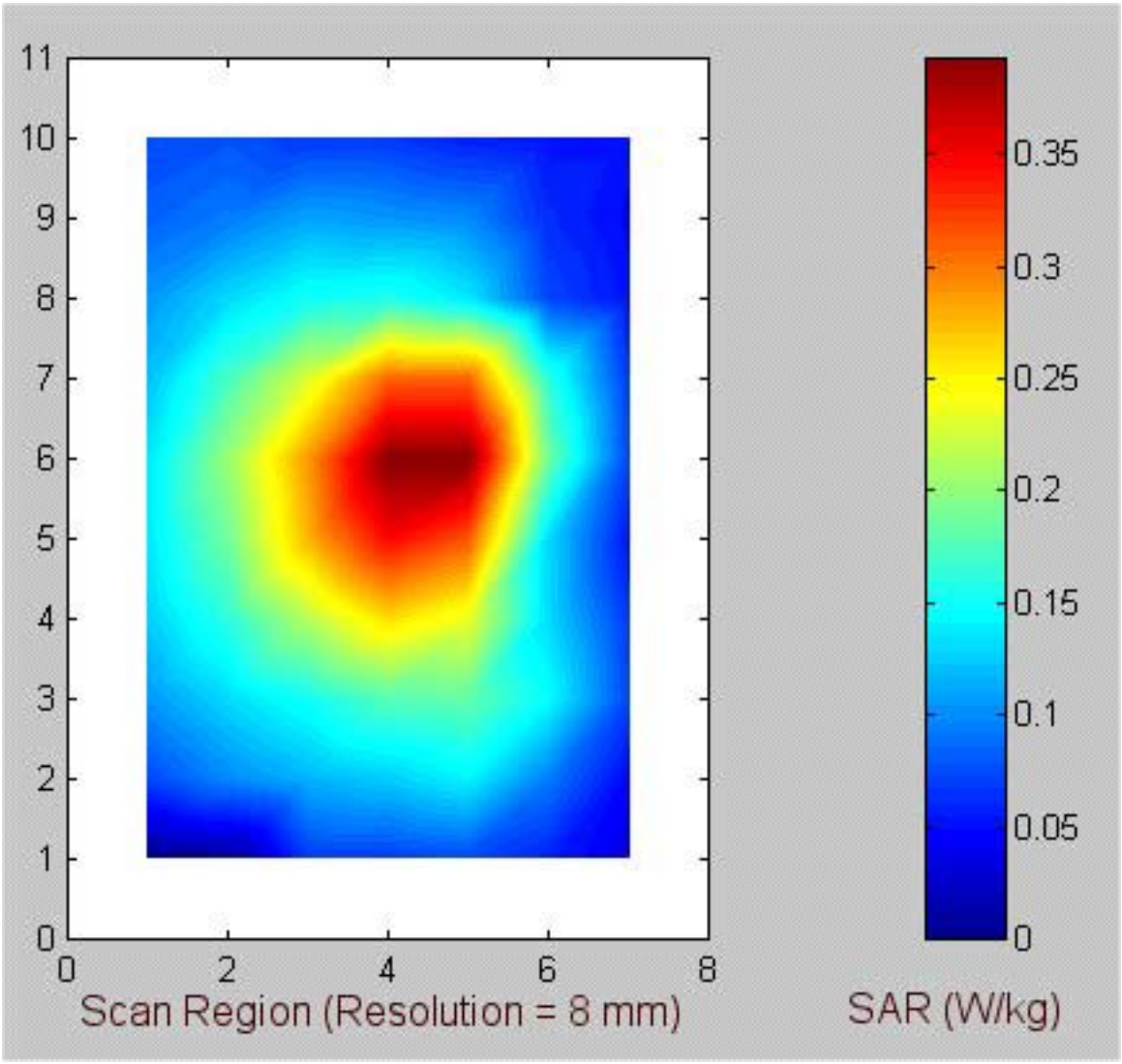
c. 5.785 GHz normal mode (see Table 26 for the peak 1-g SAR).

Fig. 20. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 9, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



d. 5.29 GHz turbo mode (see Table 27 for the peak 1-g SAR).

Fig. 20. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 9, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.



e. 5.80 GHz turbo mode (see Table 28 for the peak 1-g SAR).

Fig. 20. Coarse scans for the SAR measurements for the **Edge-on** Configuration 2 of the Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter. As shown in Fig. 9, the PC is at 90° with the edge of the cardbus adapter pressed against the bottom of the planar phantom with separation of 0 cm.

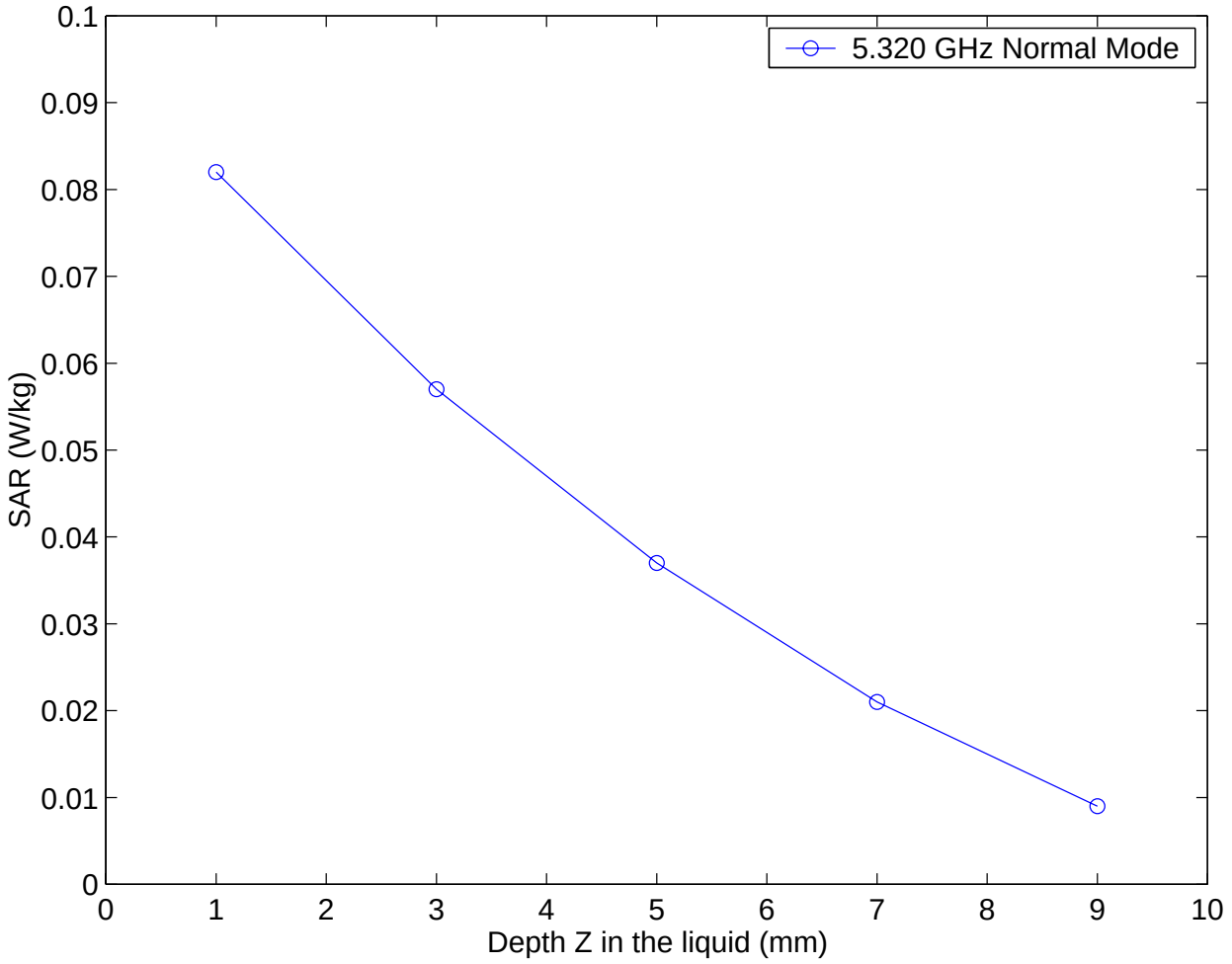


Fig. 21. Plot of the SAR variations as a function of depth Z in the liquid for locations of the highest SAR (from Table 3) for Configuration 1 (Above-lap position) for IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter.

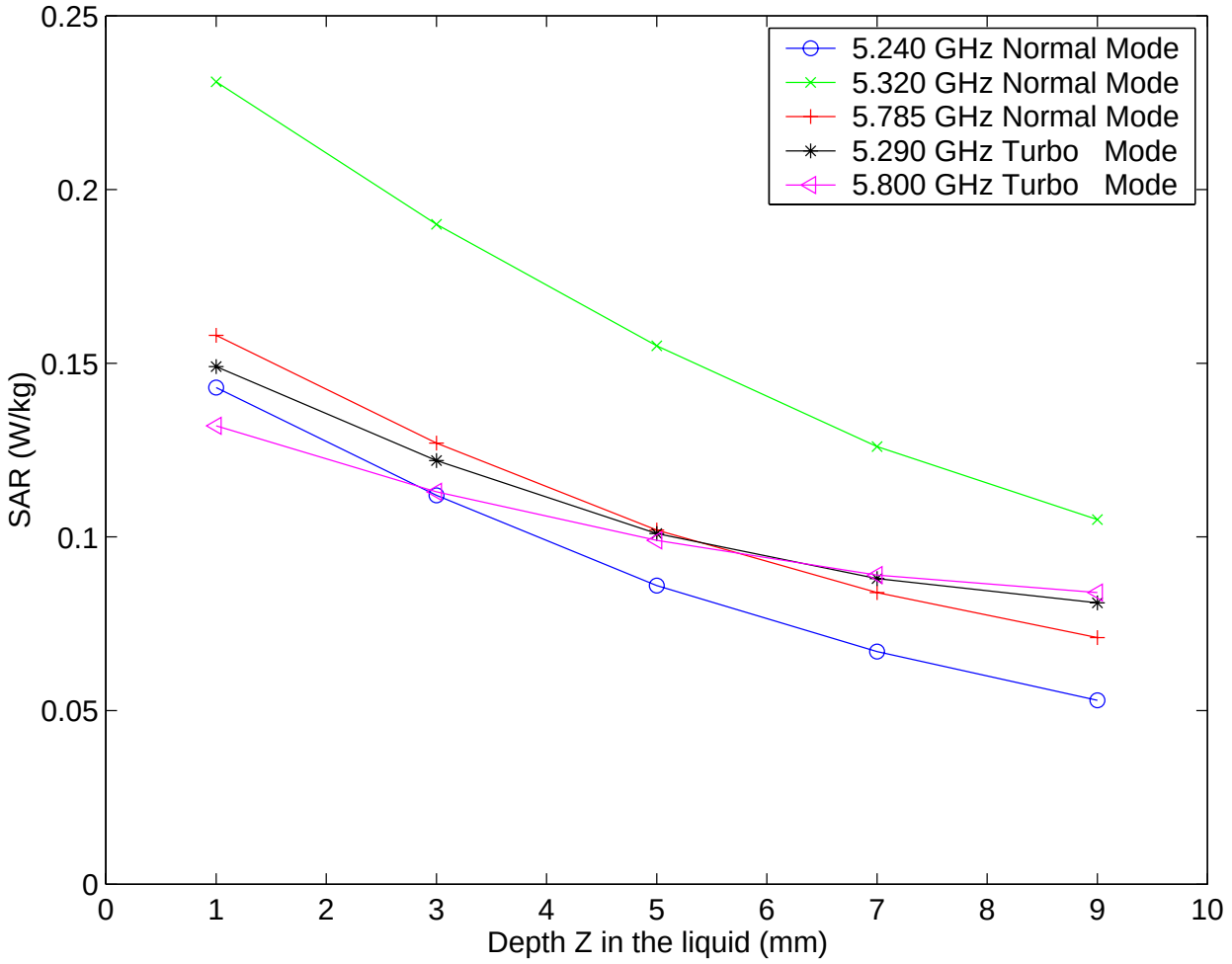


Fig. 22. Plot of the SAR variations as a function of depth Z in the liquid for locations of the highest SAR (from Tables 4-8) for Configuration 1 (Above-lap position) for Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter.

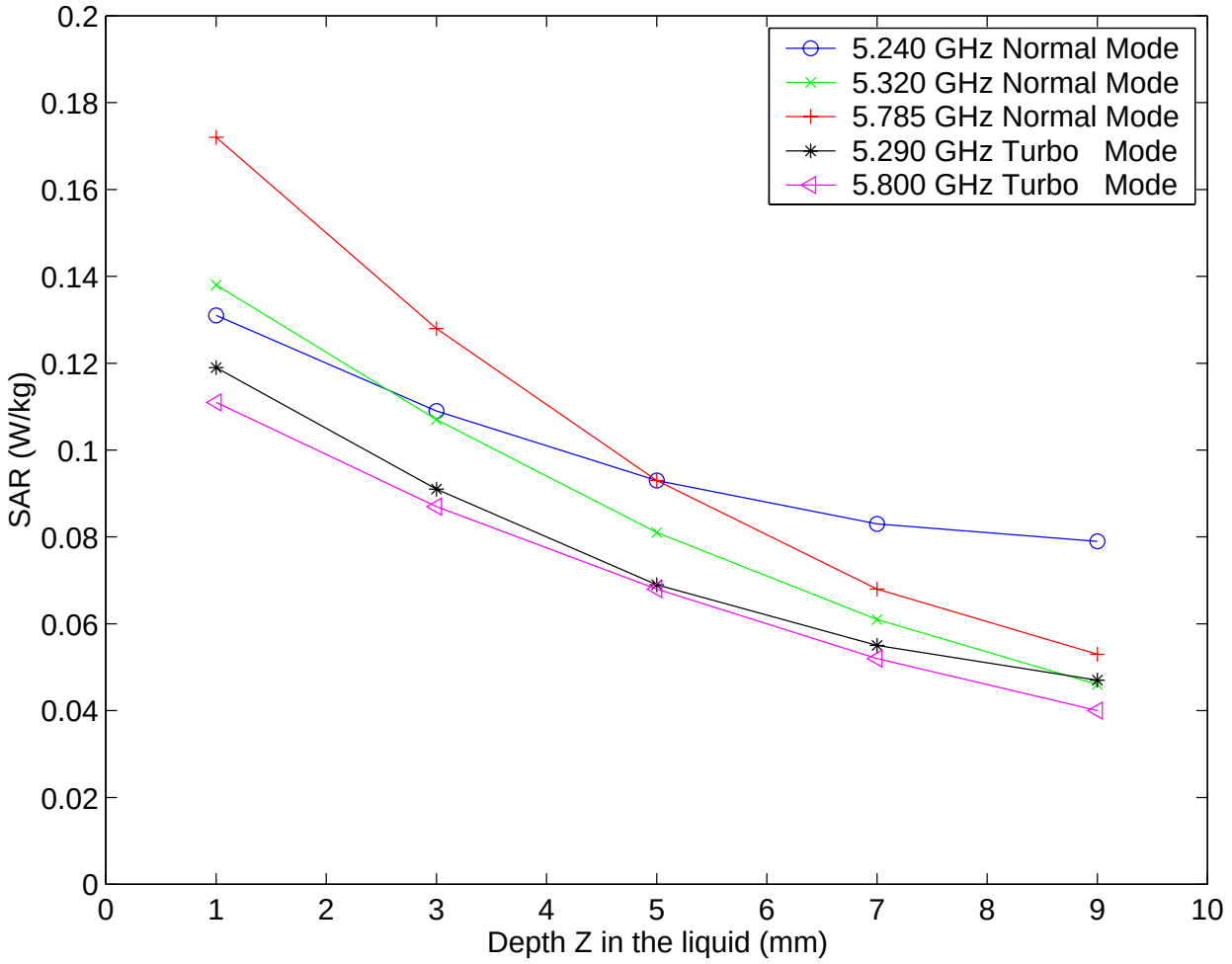


Fig. 23. Plot of the SAR variations as a function of depth Z in the liquid for locations of the highest SAR (from Tables 9-13) for Configuration 1 (Above-lap position) for Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter.

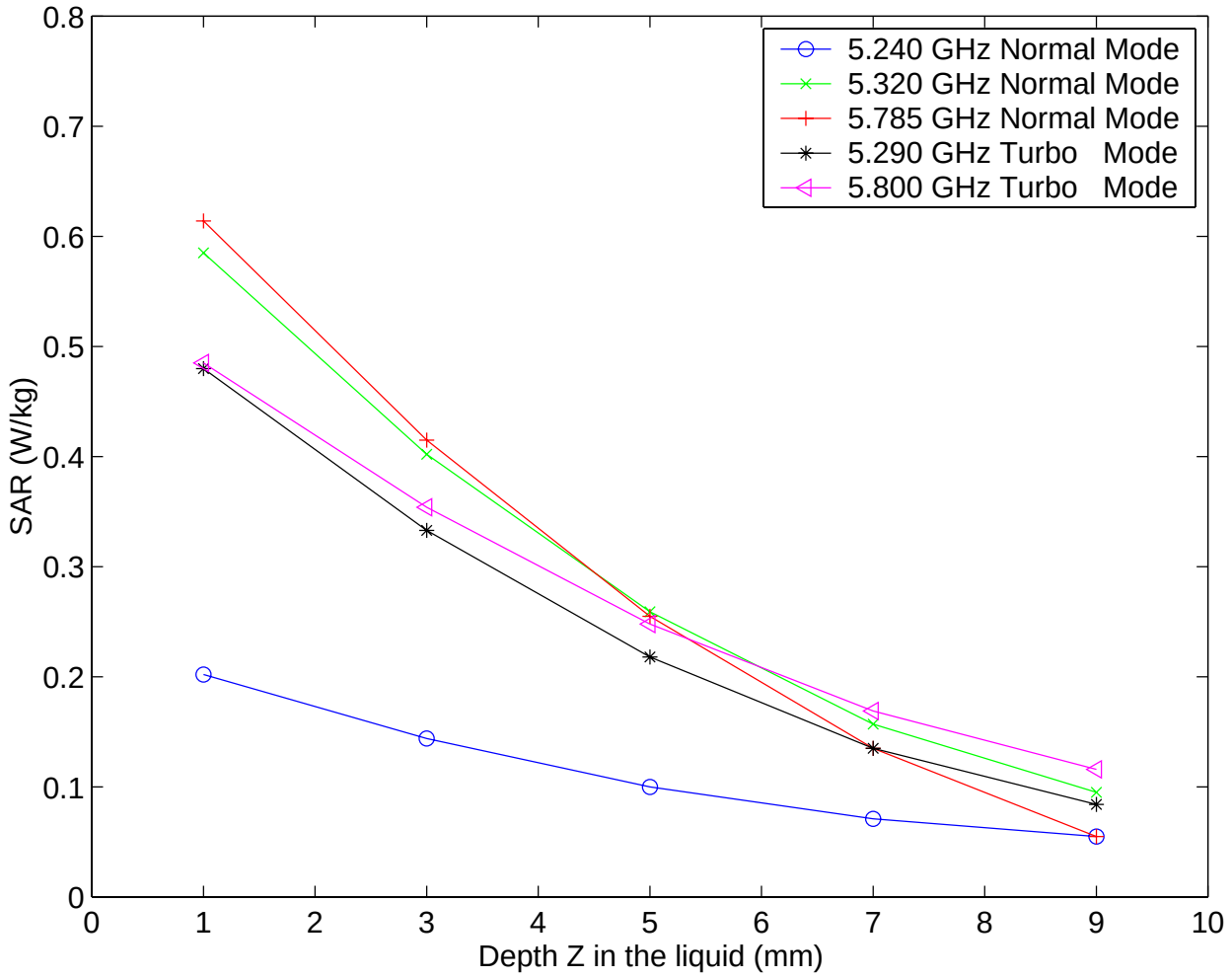


Fig. 24. Plot of the SAR variations as a function of depth Z in the liquid for locations of the highest SAR (from Tables 14-18) for Configuration 2 (Edge-on position) for IBM Model 2659-HT2 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter.

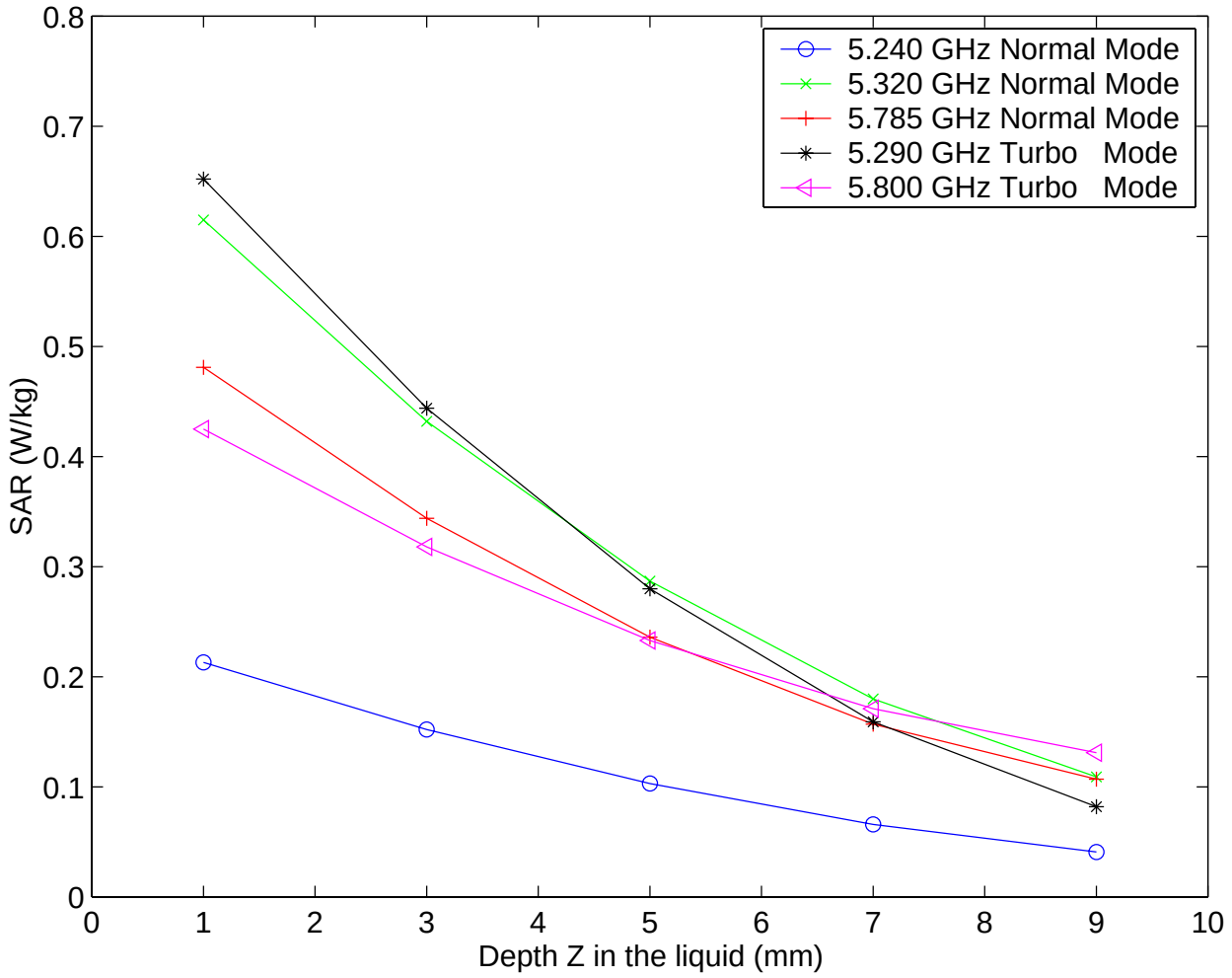


Fig. 25. Plot of the SAR variations as a function of depth Z in the liquid for locations of the highest SAR (from Tables 19-23) for Configuration 2 (Edge-on position) for Compaq Model PP2150 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter.

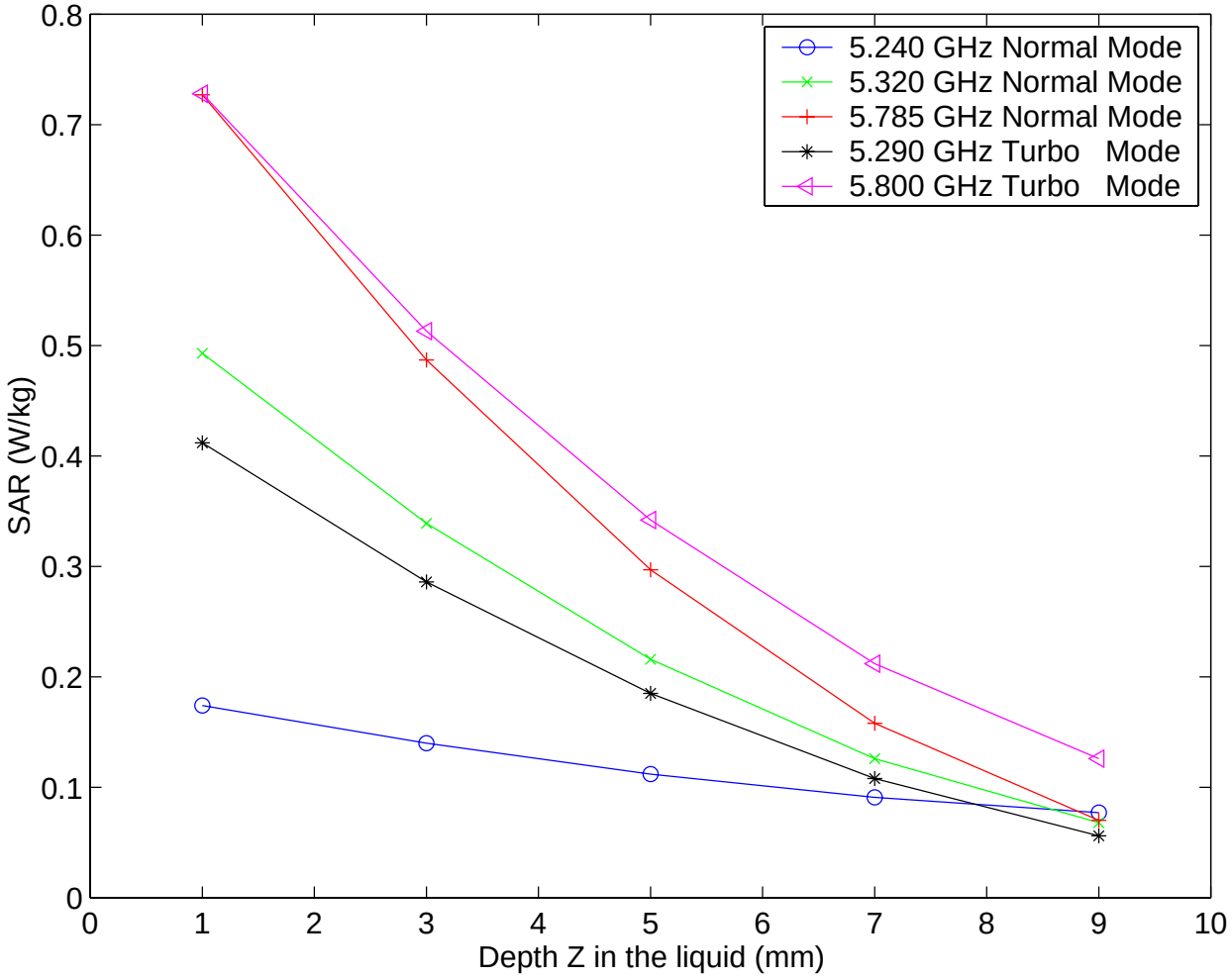


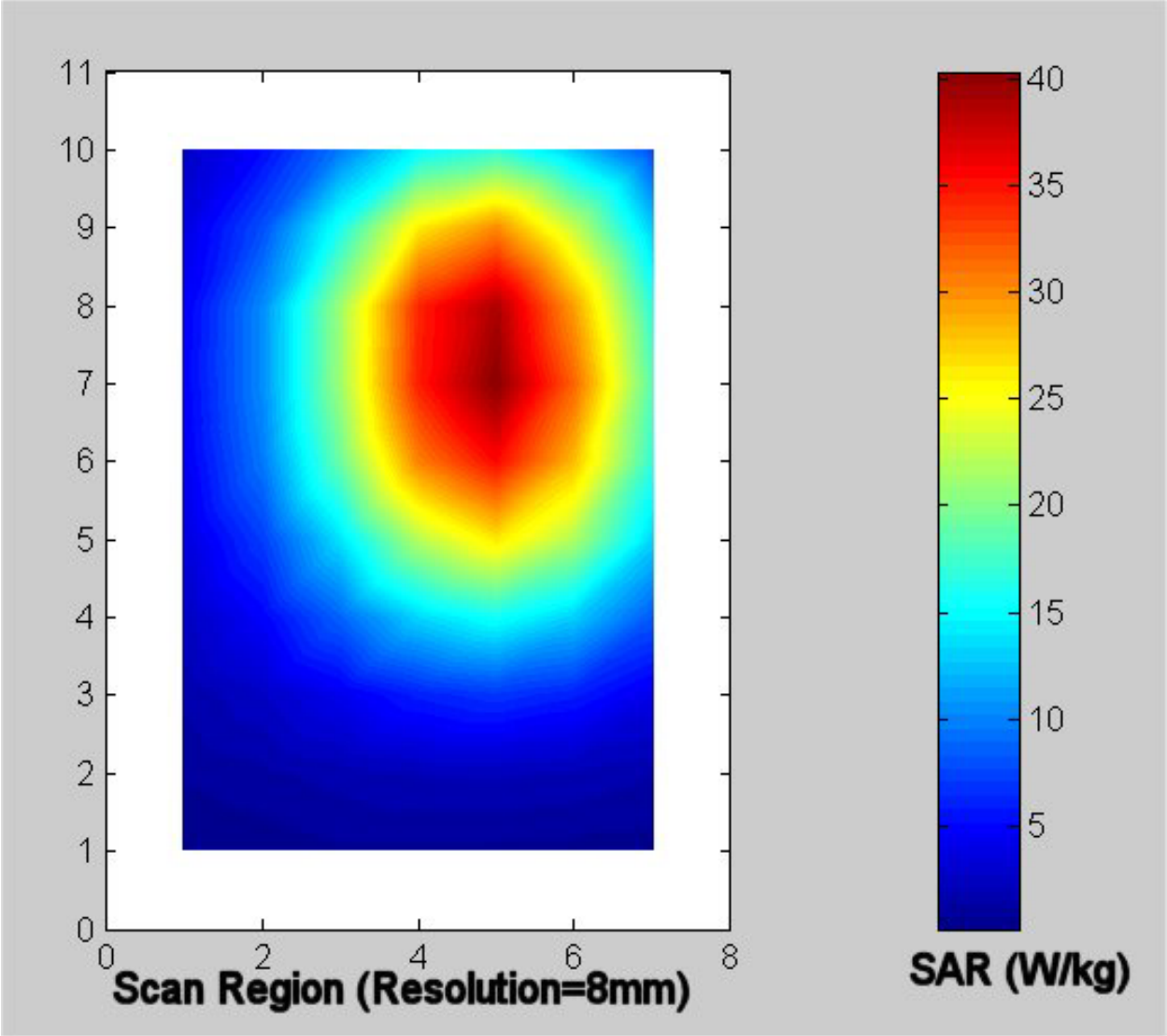
Fig. 26. Plot of the SAR variations as a function of depth Z in the liquid for locations of the highest SAR (from Tables 24-28) for Configuration 2 (Edge-on position) for Toshiba Model 1110 PC with Wistron NeWeb Model CB-500AG Cardbus Adapter.

APPENDIX B

SAR System Verification for March 7, 2003

The measured SAR distribution for the peak 1-g SAR region using a dipole at 1900 MHz

For March 7, 2003 – The dipole SAR Plot



1-g SAR = 35.543 W/kg

a. At depth of 1 mm

55.776	57.550	57.493	56.022	53.412
56.547	58.226	58.071	56.361	53.717
56.331	57.953	57.754	56.210	53.501
55.719	57.069	57.052	55.369	52.745
54.588	55.930	55.637	54.044	51.302

b. At depth of 3 mm

43.795	45.063	44.990	43.890	42.000
44.385	45.559	45.468	44.219	42.269
44.233	45.401	45.244	44.135	42.141
43.790	44.779	44.733	43.500	41.600
42.898	43.863	43.675	42.519	40.538

c. At depth of 5 mm

33.683	34.538	34.457	33.666	32.351
34.127	34.897	34.850	33.974	32.587
34.028	34.823	34.707	33.942	32.532
33.719	34.411	34.345	33.482	32.160
33.035	33.692	33.580	32.781	31.416

d. At depth of 7 mm

25.441	25.973	25.894	25.350	24.464
25.775	26.240	26.216	25.624	24.670
25.717	26.218	26.143	25.630	24.674
25.505	25.967	25.889	25.315	24.427
25.000	25.417	25.351	24.829	23.935

e. At depth of 9 mm

19.068	19.370	19.301	18.942	18.340
19.327	19.590	19.567	19.170	18.519
19.298	19.586	19.553	19.199	18.566
19.149	19.445	19.365	19.001	18.401
18.793	19.038	18.989	18.664	18.095

APPENDIX C

Uncertainty Analysis

The uncertainty analysis of the University of Utah SAR Measurement System is given in Table A.1. Several of the numbers on tolerances are obtained by following procedures similar to those detailed in [8], while others have been obtained using methods suggested in [4].

Table B.1. Uncertainty analysis of the University of Utah SAR Measurement System.

Uncertainty Component	Tolerance ± %	Prob. Dist.	Div.	C_i 1-g	1-g u_i ± %
Measurement System					
Probe calibration	2.0	N	1	1	2.0
Axial istropy	4.0	R	$\sqrt{3}$	$(1\text{-cp})^{1/2}$	1.6
Hemispherical isotropy	5.5	R	$\sqrt{3}$	$\sqrt{c_p}$	0.0
Boundary effect	0.8	R	$\sqrt{3}$	1	0.5
Linearity	3.0	R	$\sqrt{3}$	1	1.7
System detection limits	1.0	R	$\sqrt{3}$	1	0.6
Readout electronics	1.0	N	1	1	1.0
Response time	0.0	R	$\sqrt{3}$	1	0.0
Integration time	0.5	R	$\sqrt{3}$	1	0.3
RF ambient conditions	0	R	$\sqrt{3}$	1	0
Probe positioner mechanical tolerance	0.5	R	$\sqrt{3}$	1	0.3
Probe positioning with respect to phantom shell	2.0	R	$\sqrt{3}$	1	1.2
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	5.0	R	$\sqrt{3}$	1	2.9
Test Sample Related					
Test sample positioning	3	R	$\sqrt{3}$	1	1.7
Device holder uncertainty	3	R	$\sqrt{3}$	1	1.7
Output power variation - SAR drift measurement	5	R	$\sqrt{3}$	1	2.9
Phantom and Tissue Parameters					
Phantom uncertainty - shell thickness tolerance	10.0	R	$\sqrt{3}$	1	5.8
Liquid conductivity - deviation from target values	0.4	R	$\sqrt{3}$	0.7	0.2
Liquid conductivity - measurement uncertainty	1.5	R	$\sqrt{3}$	0.7	0.6
Liquid permitivity - deviation from target values	0.8	R	$\sqrt{3}$	0.6	0.3
Liquid permittivity - measurement uncertainty	3.5	R	$\sqrt{3}$	0.6	1.2
Combined Standard Uncertainty		RSS			8.3
Expanded Uncertainty (95% Confidence Level)					16.6