# INTERMEC TECHNOLOGIES CORPORATION

## MOBILE COMPUTER

Model: 1005CP01

Sep 13th 2010
Report No.: SL10050603-ICT-001(Captiva)_SAR
(This report supersedes NONE)

Modifications made to the product : None

| This Test Report is Issued Under the Authority of: | |
|---|---|
| David Zhang | Leslie Bai |
| David Zhang<br>Compliance Engineer | Leslie Bai<br>Director of Certification |

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All Test Data Presented in this report is only applicable to presented Test sample.

SAR Test Report

To: C95.1 , IEEE 1528 , OET Bulletin 65 Suppl. C , RSS 102 and Safety Code 6

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## Accreditations for Product Certifications

| Country | Accreditation Body | Scope |
|---|---|---|
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# 1 Executive Summary & EUT information

The purpose of this test programmed was to demonstrate compliance of the Intermec Technologies Corporation Model: 1005CP01 against the current Stipulated Standards. The Mobile Computer have demonstrated compliance with the C95.1 , IEEE 1528, OET Bulletin 65 Supplement C , RSS-102 Issue 2 and Safety Code 6. The test has demonstrated that this unit complies with stipulated standards.

## EUT Information

| | | |
|---|---|---|
| EUT Description | : | The Intermec 1005CP01 Mobile Computer is a small, lightweight mobile computer built on the Microsoft® Windows® Mobile 6.1 operating system. This Personal Digital Assistant PDA-style mobile computer supports the latest High Speed Uplink Packet Access (HSUPA).<br><br>The 1005CP01 is available with the following features:<br>• 3.75G UMTS, 802.11b/g, and Bluetooth® radio<br>• 2.5 GPRS/EGPRS radio<br>• 256 MB DRAM, 512 MB Flash (approximately 350 MB free for user applications)<br>• Customer-accessible micro-SD slot for removable memory cards up to 32 GB<br>• Customer-accessible SIM card slot<br>• EA11 area imager<br>• GPS receiver<br>• Optional 3 megapixel camera |
| Model No | : | 1005CP01 |
| Serial No | : | 200V1000308 |
| Input Power | : | 5VDC, 1.5A |
| Maximum Output Power to Antenna | | GSM850 : 32.62 dBm<br>GSM1900 : 29.03 dBm<br>WCDMA Band V : 23.62 dBm<br>WCDMA Band IV: 23.55<br>WCDMA Band II : 22.72 dBm |
| Maximum ERP/EIRP | | GSM850(Class 4) : 1.38 W (31.40 dBm)<br>GPRS850(Class 4) : 1.27 W (31.05 dBm)<br>EGPRS850(Class E2) : 0.42 W (26.21 dBm)<br>GSM1900 (Class 1) : 0.36 W (25.61 dBm)<br>GPRS1900 (Class 1) : 0.30 W (24.82 dBm)<br>EGPRS1900 (Class E2) : 0.23 W(23.70dBm)<br>WCDMA Band V (RMC 12.2Kbps,Class 3) : 0.30 W (24.76 dBm)<br>WCDMA Band IV (RMC 12.2Kbps,Class 3) : 0.14 W (21.38 dBm)<br>WCDMA Band II (RMC 12.2Kbps,Class 3) : 0.16 W ( 22.13 dBm) |
| Classification Per Stipulated Test Standard | : | Mobile Device |
| Co-located TX | : | WWAN can transmit simultaneously with 802.11g<br>WWAN can transmit simultaneously with Bluetooth |
| Antenna Separation distances | : | 0.68 cm - WWAM antenna-to-WiFi (802.11g)<br>1.975 cm - WWAN antenna-to-Bluetooth antenna<br>1.244 cm - WiFi (802.11g)-to-Bluetooth antenna |

# 2 TECHNICAL DETAILS

| | |
|---|---|
| Purpose | Compliance testing of Mobile Computer model 1005CP01 with stipulated standard |
| Applicant / Client | Intermec Technologies Corporation |
| Manufacturer | Intermec Technologies Corporation<br>6001 36th Avenue West<br>Everett,Washington 98203 |
| Laboratory performing the tests | SIEMIC Laboratories |
| Test report reference number | SL10050603-ICT-001(Captiva)_SAR |
| Date EUT received | Aug 18th 2010 |
| Standard applied | See Page 9 |
| Dates of test (from – to) | Aug 18th-Sep 09th 2010 |
| No of Units: | 1 |
| Equipment Category: | PCE |
| Trade Name: | Intermec Technologies Corporation |
| Model Name: | 1005CP01 |
| RF Operating Frequency (ies) | GSM850 : 824.2 ~ 848.8 MHz(TX) / 869.2 ~ 893.8 MHz(RX)<br>GSM1900 : 1850.2 ~ 1909.8 MHz(TX) / 1930.2 ~ 1989.8 MHz(RX)<br>WCDMA Band V : 826.4 ~ 846.6 MHz(TX) / 871.4 ~ 891.6 MHz(RX)<br>WCDMA Band IV :1712.4 ~ 1752.6 MHz(TX) / 2112.4MHz ~ 2152.6MHz(RX)<br>WCDMA Band II : 1852.4 ~ 1907.6 MHz(TX) / 1932.4 ~ 1987.6 MHz(RX) |
| Number of Channels: | N/A |
| Modulation: | GSM / GPRS : GMSK<br>EGPRS : 8PSK<br>WCDMA : QPSK/BPSK<br>Wifi: DSSS,OFDM<br>Bluetooth: GFSK ,$\pi$/4-DQPSK, 8-DPSK |
| FCC ID: | EHA011005CP01 |
| IC ID: | 1223A-011005CP01 |

# 3 INTRODUCTION

## Introduction

This measurement report shows compliance of the EUT with the EU Directive 1999/519/EC EMF for mobile and portable devices. The EU has adopted the guidelines for evaluating the environmental effects of radio frequency radiation to protect the public and workers from the potential hazards of RF emissions due to EU regulated portable devices. [1]

The test procedures, as described in ANSI C95.1 – 1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [2], and ANSI C95.3 – 2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields [3], were employed.

## SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ).

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dV}\right)$$

SAR is expressed in units of watts per kilogram (W/kg). SAR can be related to the electric field at a point by

$$SAR = \frac{\sigma \mid E \mid^2}{\rho}$$

where:

σ = conductivity of the tissue (S/m)
ρ = mass density of the tissue (kg/m3)
E = rms electric field strength (V/m)

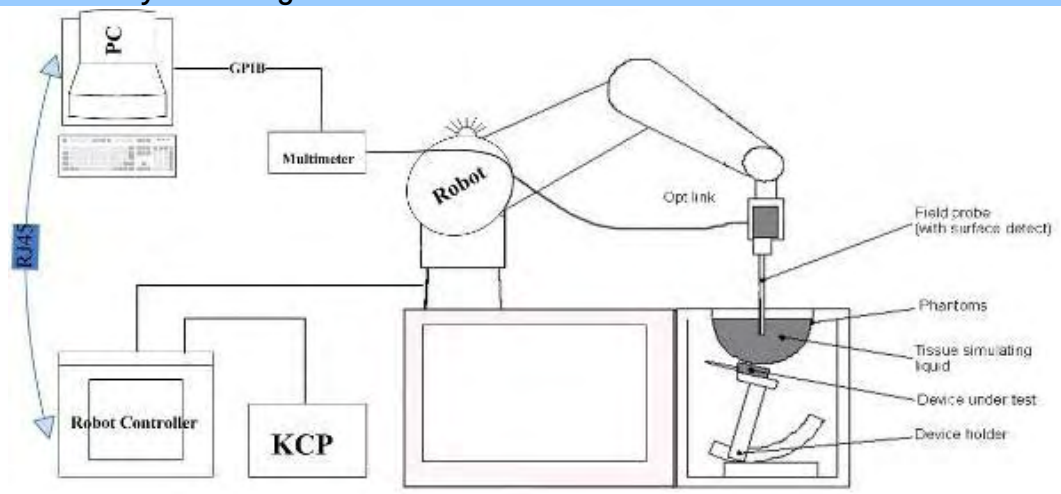
# 4 SAR Measurement Setup

## Dosimetric Assessment System

These measurements were performed with the automated near-field scanning system OPENSAR from SATIMO. The system is based on a high precision robot (working range: 850 mm), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The SAR measurements were conducted with dosimetric probe (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in SAR standard with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in SAR starndard and found to be better than ±0.25 dB. The phantom used was the SAM Phantom as described in FCC supplement C, IEEE P1528 and CENELEC EN62209-1.

## Measurement System Diagram




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

1. A standard high precision 6-axis robot (KUKA) with controller and software.
2. KUKA Control Panel (KCP).
3. 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.
4. The functions of the PC plug-in card are to perform the time critical task such as signal filtering, surveillance of the robot operation fast movement interrupts.

5. A computer operating Windows XP.
6. OPENSAR software.
7. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
8. The SAM phantom enabling testing left-hand right-hand and body usage.
9. The Position device for handheld EUT.
10. Tissue simulating liquid mixed according to the given recipes (see Application Note).
11. System validation dipoles to validate the proper functioning of the system.

# EP100 Probe

Construction Symmetrical design with triangular Core. Built-in shielding against static charges Calibration in air from 100 MHz to 2.5 GHz. In brain and muscle simulating tissue at frequencies from 800 to 6000 MHz (accuracy of 8%) .

Frequency 100 MHz to 6 GHz;

Linearity ; 0.25 dB (100 MHz to 6 GHz) ,

Directivity : 0.25 dB in brain tissue (rotation around probe axis) 0.5 dB in brain tissue (rotation normal probe axis)

Dynamic : 0.001W/kg to > 100W/kg;

Range Linearity: 0.25 dB

Surface : 0.2 mm repeatability in air and liquids

Dimensions Overall length: 330 mm

Tip length: 16 mm

Body diameter: 8 mm

Tip diameter: 2.6 mm

Distance from probe tip to dipole centers: <1.5 mm

Application General dosimetric up to 6 GHz

Compliance tests of mobile phones

Fast automatic scanning in arbitrary phantoms

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique, with printed resistive lines on ceramic substrates.

It is connected to the KRC box on the robot arm and provides an automatic detection of the phantom surface. The 3D file of the phantom is include in OpenSAR software. The Video Positioning System allow the system to take the automatic reference and to move the probe safely and accurately on the phantom.

E-Field Probe Calibration Process

Each probe is calibrated according to a dosimetric assessment procedure described in SAR standard with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in SAR standard and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.
The free space E-field from probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 0.8 GHz, and in a waveguide above 0.8 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. E-field correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue.

## SAM Phantom

The SAM Phantom SAM29 is constructed of a fiberglass shell ntegrated in a wooden table. The shape of the shell is in compliance with the specification set in IEEE P1528 and CENELEC EN62209-1. The phantom enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region.
A cover prevents the evaporation of the liquid.
Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.
Shell Thickness: 2 0.2 mm
Filling Volume: Approx. 25 liters
Dimensions (H x L x W): 810 x 1000 x 500 mm
Liquid is filled to at least 15mm from the bottom of Phantom.

## Device Holder

In combination with the Generic Twin Phantom V3.0, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

*Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [10]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.*

## Data Evaluation

The OPENSAR software automatically executes the following procedure to calculate the field units from the microvolt readings at the probe connector. The parameters used in the valuation are stored in the configuration modules of the software:

| | | |
|---|---|---|
| Probe Parameters | - Sensitivity | $Norm_i$ |
| | - Conversion factor | ConvFi |
| | - Diode compression point Dcpi | |
| Device Parameter | - Frequency | f |
| | - Crest factor | cf |
| Media Parametrs | - Conductivity | $\sigma$ |
| | - Density | $\rho$ |

These parameters must be set correctly in the software. They can either be found in the component documents or be imported into the software from the configuration files issued for the OPENSAR components.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

*Where* $V_i$ = *Compensated signal of channel i (i = x, y, z)*
$U_i$ = *Input signal of channel i (i = x, y, z)*
$cf$ = *Crest factor of exciting field (DASY parameter)*
$dcp_i$ = *Diode compression point (DASY parameter)*

From the compensated input signals the primary field data for each channel can be evaluated:

*E-field probes:* $E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$

*H-field probes:* $H_i = \sqrt{Vi} \cdot \frac{a_{i10} + a_{i11} f + a_{i12} f^2}{f}$

*Where* $V_i$ = *Compensated signal of channel i (i = x, y, z)*
$Norm_i$ = *Sensor sensitivity of channel i (i = x, y, z)*
*μV/(V/m)2 for E0field Probes*
*ConvF= Sensitivity enhancement in solution*
$a_{ij}$ = *Sensor sensitivity factors for H-field probes*

$f$ = *Carrier frequency (GHz)*
$E_i$ = *Electric field strength of channel i in V/m*
$H_i$ = *Magnetic field strength of channel i in A/m*

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

*where* $SAR$ = *local specific absorption rate in mW/g*
$E_{tot}$ = *total field strength in V/m*
$\sigma$ = *conductivity in [mho/m] or [siemens/m]*
$\rho$ = *equivalent tissue density in g/cm3*

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

*where* $P_{pwe}$ = *Equivalent power density of a plane wave in mW/cm2*
$E_{tot}$ = *total electric field strength in V/m*
$H_{tot}$ = *total magnetic field strength in A/m*

## SAR Evaluation – Peak Spatial - Average

The procedure for assessing the peak spatial-average SAR value consists of the following steps

- Power Reference Measurement

  The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- 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 finer measurement around the hot spot. The sophisticated interpolation routines implemented in OPENSAR software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to 15 mm by 15 mm and can be edited by a user.

- 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 default zoom scan measures 5 x 5 x 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more then one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

- Power Drift measurement

  The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have OPENSAR software stop the measurements if this limit is exceeded.

## SAR Evaluation – Peak SAR

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g. The OPENSAR system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maximum searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.
They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the fourth order least square polynomial method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

## Definition of Reference Points

Ear Reference Point

Figure 6.2 shows the front, back and side views of the SAM Phantom. The point "M" is the reference point for the center of the mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERPs are 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 6.1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 6.1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

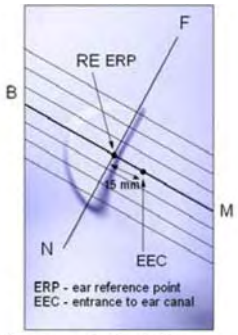



**Figure 6.1 Close-up side view of ERP's**

**Figure 6.2 Front, back and side view of SAM**

## Device Reference Points

Two imaginary lines on the device need to be established: the vertical centerline and the horizontal line. The test device is placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Fig. 6.3). The "test device reference point" is than located at the same level as the center of the ear reference point. The test device is positioned so that the "vertical centerline" is bisecting the front surface of the device at it's top and bottom edges, positioning the "ear reference point" on the outer surface of both the left and right head phantoms on the ear reference point [5].

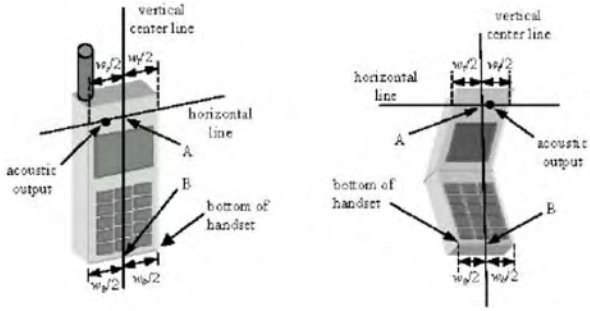



**Figure 6.3 Handset Vertical Center & Horizontal Line Reference Points**

## Test Configuration – Positioning for Cheek / Touch

1. Position the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure below), such that the plane defined by the vertical center line and the horizontal line of the device is approximately parallel to the sagittal plane of the phantom

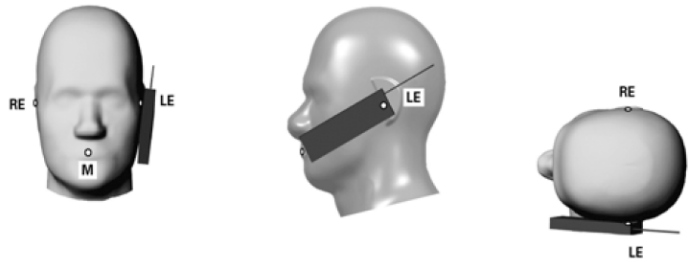
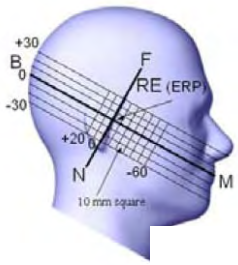



**Figure 7.1 Front, Side and Top View of Cheek/Touch Position**

2. Translate the device towards the phantom along the line passing through RE and LE until the device touches the ear.

3. While maintaining the device in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
4. Rotate the device around the vertical centerline until the device (horizontal line) is symmetrical with respect to the line NF.

5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the device contact with the ear, rotate the device about the line NF until any point on the device is in contact with a phantom point below the ear (cheek). See Figure below.




**ıre 7.2 Side view w/ relevant markings**

## Test Configuration – Positioning for Ear / 15° Tilt

With the test device aligned in the Cheek/Touch Position":

1. While maintaining the orientation of the device, retracted the device parallel to the reference plane far enough to enable a rotation of the device by 15 degrees.

2. Rotate the device around the horizontal line by 15 degrees.

3. While maintaining the orientation of the device, move the device parallel to the reference plane until any part of the device touches the head. (In this position, point A is located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, the angle of the device shall be reduced. The tilted position is obtained when any part of the device is in contact with the ear as well as a second part of the device is in contact with the head (see Figure below).

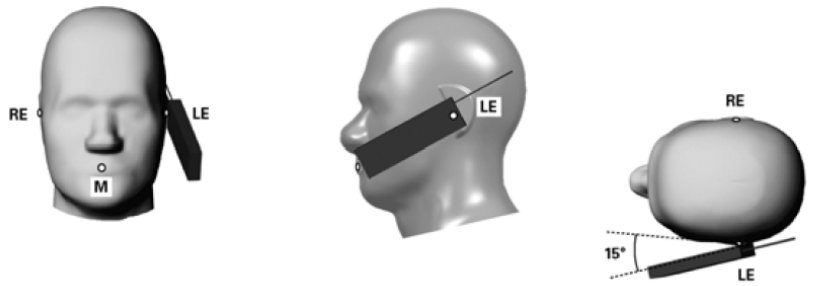



**Figure 7.3 Front, Side and Top View of Ear/15˚ Tilt Position**

## Test Position – Body Worn Configurations

Body-worn operating configurations are tested with the accessories attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then, when multiple accessories that contain metallic components are supplied with the device, the device is tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented.

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory(ies), including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worst-case positioning is then documented and used to perform Body SAR testing.

# 5 ANSI/IEEE C95.1 – 1999 RF Exposure Limit

In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and cautions statements are included in the user's manual.

## Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

## Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Table 8.1 Human Exposure Limits**

| | UNCONTROLLED ENVIRONMENT<br>General Population<br>(W/kg) or (mW/g) | CONTROLLED ENVIROMENT<br>Professional Population<br>(W/kg) or (mW/g) |
|---|---|---|
| SPATIAL PEAK SAR[1]<br>Brain | 1.60 | 8.00 |
| SPATIAL AVERAGE SAR[2]<br>Whole Body | 0.08 | 0.40 |
| SPATIAL PEAK SAR[3]<br>Hands, Feet, Ankles, Wrists | 4.00 | 20.00 |

[1] The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
[2] The Spatial Average value of the SAR averaged over the whole body.
[3] The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

# 6 SYSTEM AND LIQUID VALIDATION

## System Validation

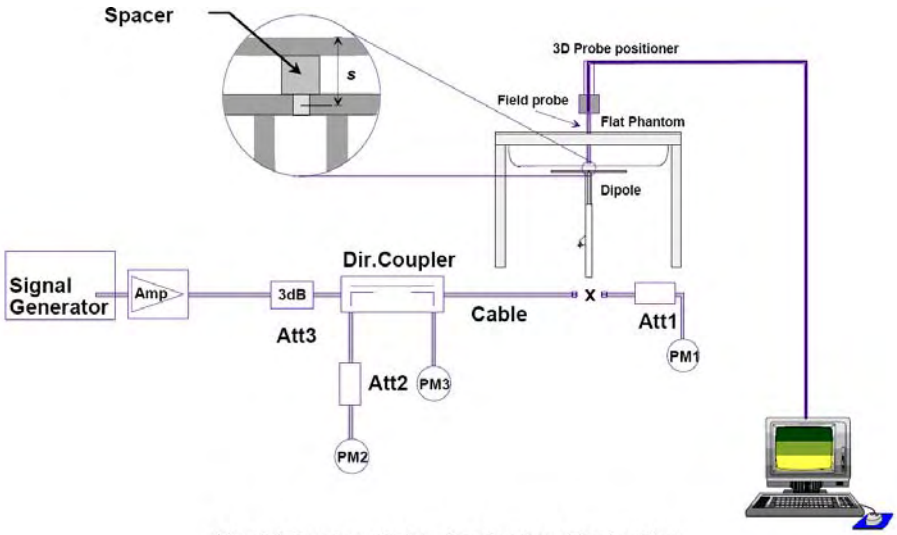



Fig 8.1 System Setup for System Evaluation

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

The output power on dipole port must be calibrated to 30 dBm (1000 mW) before dipole is connected.

## Numerical reference SAR values (W/kg) for reference dipole and flat phantom

| Frequency (MHz) | 1 g SAR | 10 g SAR | Local SAR at surface (above feed-point) | Local SAR at surface (y = 2 cm offset from feed-point)[a] |
|---|---|---|---|---|
| 300 | 3.0 | 2.0 | 4.4 | 2.1 |
| 450 | 4.9 | 3.3 | 7.2 | 3.2 |
| 835 | 9.5 | 6.2 | 4.1 | 4.9 |
| 900 | 10.8 | 6.9 | 16.4 | 5.4 |
| 1450 | 29.0 | 16.0 | 50.2 | 6.5 |
| 1800 | 38.1 | 19.8 | 69.5 | 6.8 |
| 1900 | 39.7 | 20.5 | 72.1 | 6.6 |
| 2000 | 41.1 | 21.1 | 74.6 | 6.5 |
| 2450 | 52.4 | 24.0 | 104.2 | 7.7 |
| 3000 | 63.8 | 25.7 | 140.2 | 9.5 |

Target and measurement SAR after Normalized

| Measurement Date | Frequency (MHz) | Target SAR1g (W/kg) | Measured SAR1g (W/kg) | Deviation (%) |
|---|---|---|---|---|
| SEP 27 2010 | 835 | 9.50 | 9.652 | +1.60 |
| SEP 27 2010 | 1700 | 38.1 | 38.523 | +1.11 |
| SEP 27 2010 | 1900 | 39.7 | 38.525 | -2.96 |
| SEP 27 2010 | 2450 | 52.4 | 51.410 | -1.89 |

# Liquid Validation

The dielectric parameters were checked prior to assessment using the HP85070C dielectric probe kit. The dielectric parameters measured are reported in each correspondent section.

## IEEE SCC-34/SC-2 P1528 recommended Tissue Dielectric Parameters

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest xpected 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 P1528

| Target Frequency | Head | | Body | |
|---|---|---|---|---|
| MHz | εr | σ (S/m) | εr | 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 |

*Note:* $\varepsilon_r$ *= relative permittivity,* $\sigma$ *= conductivity and* $\rho$ *= 1000 kg/m*$^3$

Liquid Confirmation Result :

| Temperature: 21°C | | | Relative humidity: 58% | | |
|---|---|---|---|---|---|
| 835MHz | | Target | Measured | Deviation (%) | Limit (%) |
| Head | Permittivity | 41.5 | 41.578 | -0.19 | 5 |
| | Conductivity | 0.90 | 0.8580 | 4.56 | 5 |
| Body | Permittivity | 55.2 | 55.096 | 0.19 | 5 |
| | Conductivity | 0.97 | 0.9740 | -0.31 | 5 |

| Temperature: 21 °C | | | Relative humidity: 58% | | |
|---|---|---|---|---|---|
| 1900MHz | | Target | Measured | Deviation (%) | Limit (%) |
| Head | Permittivity | 40.00 | 41.215 | -3.04 | 5 |
| | Conductivity | 1.4 | 1.386 | 1.07 | 5 |
| Body | Permittivity | 53.3 | 53.547 | -0.46 | 5 |
| | Conductivity | 1.52 | 1.533 | -0.79 | 5 |

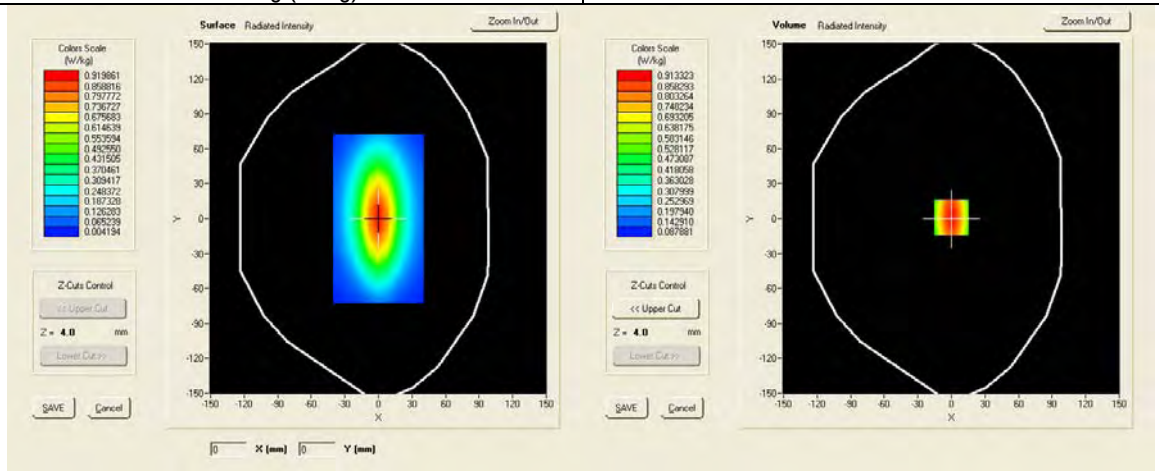
| Temperature: 21°C | | Relative humidity: 58% | | | |
|---|---|---|---|---|---|
| 1800MHz | | Target | Measured | Deviation (%) | Limit (%) |
| Head | Permittivity | 40.0 | 40.272 | 0.68 | 5 |
| | Conductivity | 1.40 | 1.351 | -3.50 | 5 |
| Body | Permittivity | 53.3 | 52.9 | -0.75 | 5 |
| | Conductivity | 1.52 | 1.53 | 0.65 | 5 |

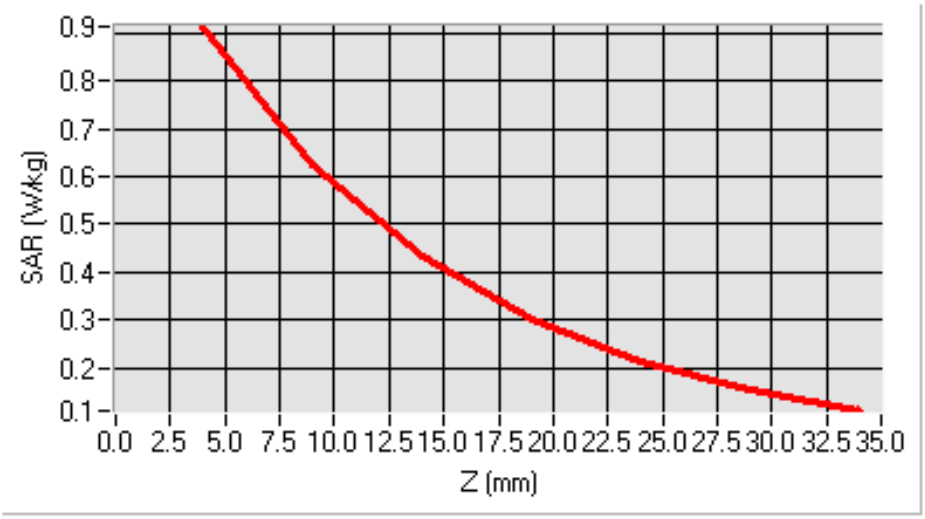
| Temperature: 21°C | | Relative humidity: 58% | | | |
|---|---|---|---|---|---|
| 2450MHz | | Target | Measured | Deviation (%) | Limit (%) |
| Head | Permittivity | 39.2 | 38.94 | -0.66 | 5 |
| | Conductivity | 1.80 | 1.82 | 0.18 | 5 |
| Body | Permittivity | 52.7 | 53.1 | 0.75 | 5 |
| | Conductivity | 1.95 | 1.97 | 1.02 | 5 |

## System Validation Plots

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| | |
|---|---|
| Frequency (MHz) | 836.400024 (Head) |
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -1.650000 |
| SAR 1g (W/Kg) | 0.864503 |

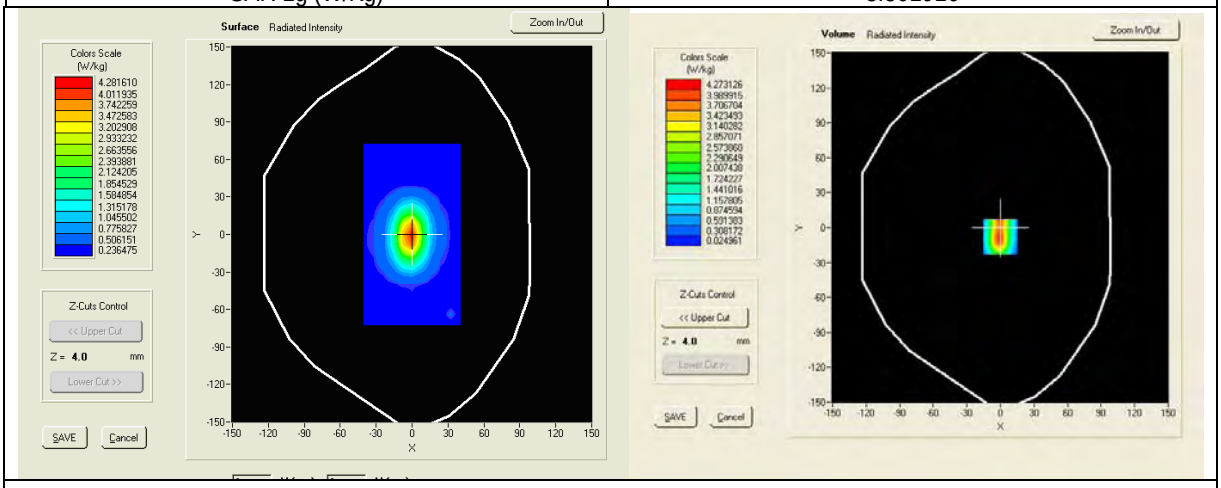


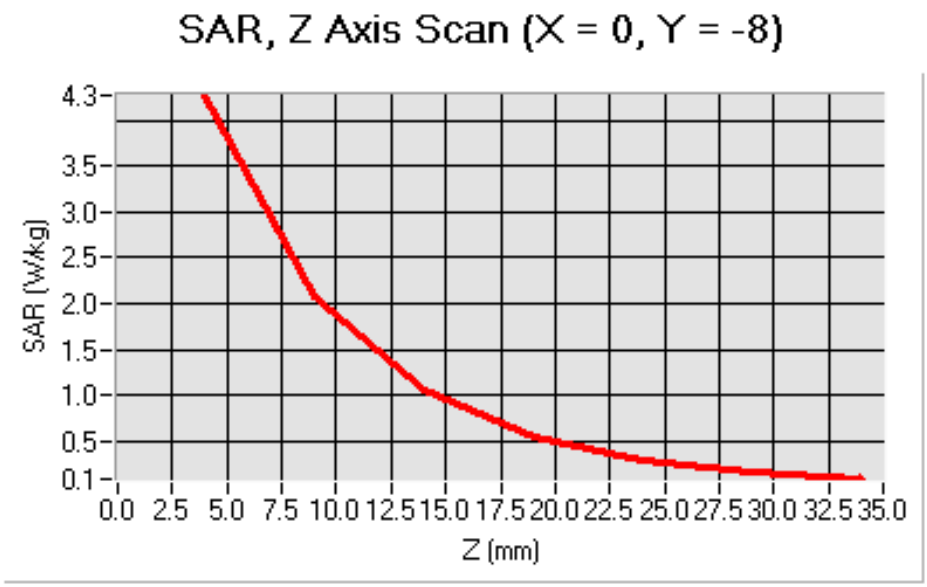



## Product Description : Mobile Computer

Model : 1005CP01
Test Date : Sep 27 2010

| | |
|---|---|
| Frequency (MHz) | 1747.599976 (Head) |
| Relative permitivity (real part) | 40.074856 |
| Relative permitivity (imaginary part) | 14.134743 |
| Conductivity (S/m) | 1.372326 |
| Variation (%) | -0.090000 |
| SAR 1g (W/Kg) | 3.801916 |

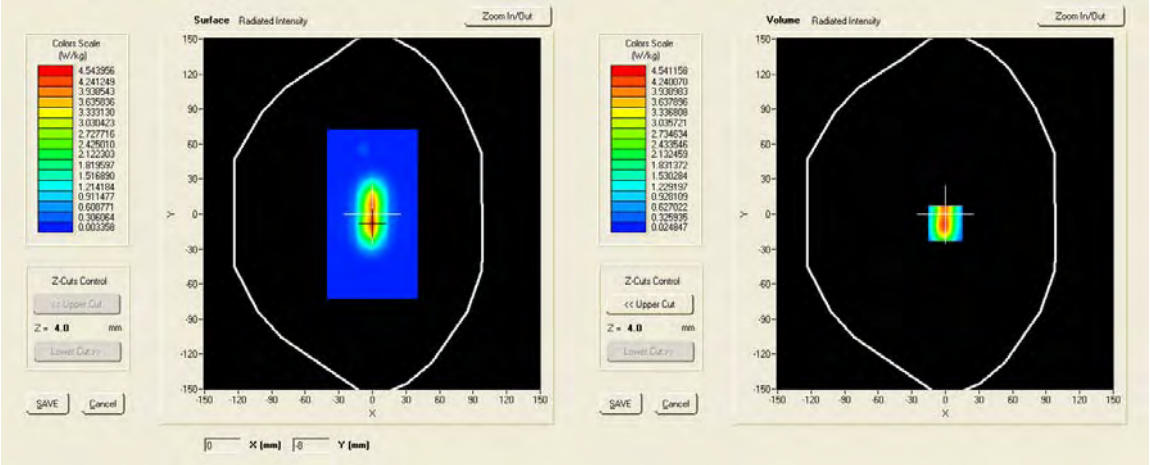


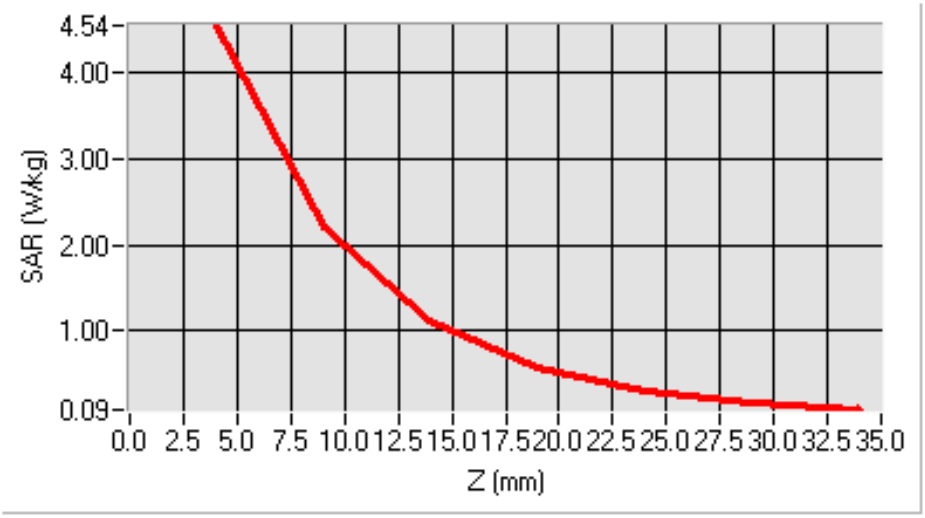



## Product Description : Mobile Computers

Model : 1005CP01
Test Date : Sep 27 2010

| Frequency (MHz) | 1880.000000(Head) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | 0.120000 |
| SAR 1g (W/Kg) | 4.041647 |

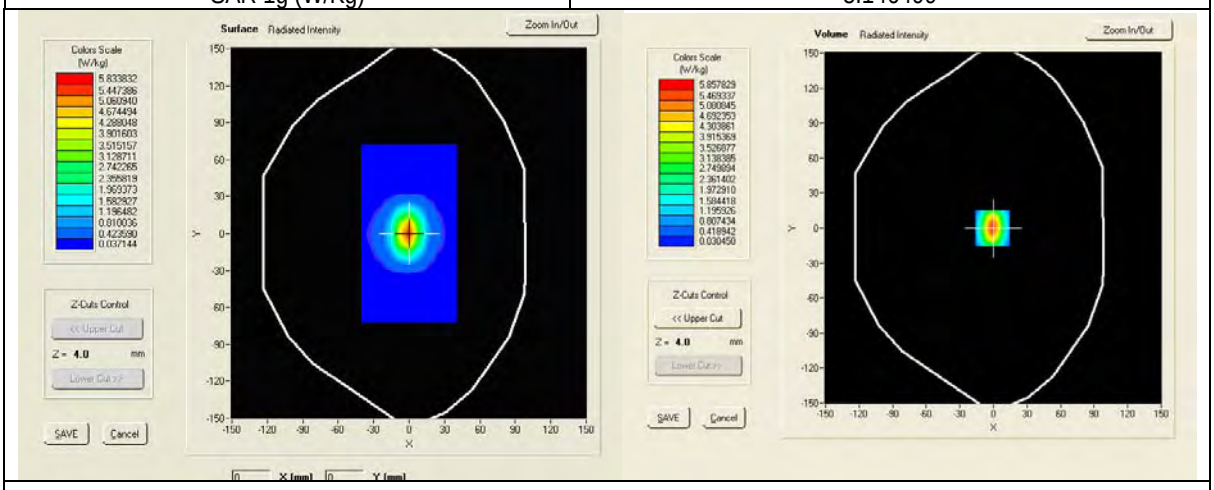


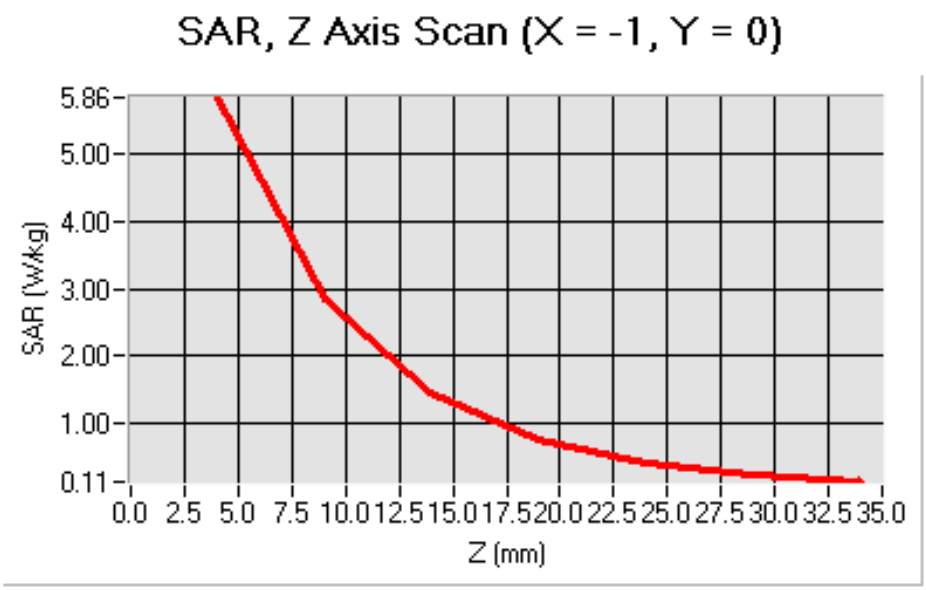



## Product Description : Mobile Computer

Model : 1005CP01
Test Date : Sep 27 2010

| Frequency (MHz) | 2451.000000(Head) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | -0.390000 |
| SAR 1g (W/Kg) | 5.146499 |



# 7 TYPE A MEASUREMENT UNCERTAINTY

| Uncertainty Component | Tolerances % | Probability Distribution | Divisor | Ci (1g) | Ci (10g) | Uncertainty 1g(%) | Uncertainty 10g(%) |
|---|---|---|---|---|---|---|---|
| Measurement System Related | | | | | | | |
| Probe Calibration | 6 | N | 1 | 1 | 1 | 6 | 6 |
| Axial Isotropy | 3 | R | √3 | √ (1-Cp) | √ (1-Cp) | 1.22474 | 1.22474 |
| Hemispherical Isotropy | 4 | R | √3 | √ Cp | √ Cp | 1.63299 | 1.63299 |
| Boundary Effect | 1 | R | √3 | 1 | 1 | 0.57735 | 0.57735 |
| Linearity | 5 | R | √3 | 1 | 1 | 2.88675 | 2.88675 |
| System Detection Limits | 1 | R | √3 | 1 | 1 | 0.57735 | 0.57735 |
| Readout Electronics | 0.5 | N | 1 | 1 | 1 | 0.5 | 0.5 |
| Response Time | 0.2 | R | √3 | 1 | 1 | 0.11547 | 0.11547 |
| Integration Time | 2 | R | √3 | 1 | 1 | 1.1547 | 1.1547 |
| RF Ambient Conditions | 3 | R | √3 | 1 | 1 | 1.73205 | 1.73205 |
| Probe Positioner Mechanical Tolerances | 2 | R | √3 | 1 | 1 | 1.1547 | 1.1547 |
| Probe Positioning with respect to Phantom Shell | 1 | R | √3 | 1 | 1 | 0.57735 | 0.57735 |
| Extrapolation, Interpolation and integration Algorithms for Max. SAR Evaluation. | 1.5 | R | √3 | 1 | 1 | 0.86603 | 0.86603 |
| Test Sample Related | | | | | | | |
| Test Sample Positioning | 1.5 | N | 1 | 1 | 1 | 1.5 | 1.5 |
| Device Holder Uncertainty | 5 | N | 1 | 1 | 1 | 5 | 5 |
| Output Power Variation – SAR Drift measurement | 3 | R | √3 | 1 | 1 | 1.73205 | 1.73205 |
| | | | | | | | |
| Phantom and Tissue Parameters Related | | | | | | | |
| Phantom Uncertainty (Shape and thickness Tolerances) | 4 | R | √3 | 1 | 1 | 2.3094 | 2.394 |
| Liquid Conductivity – deviation from target value | 5 | R | √3 | 0.64 | 0.43 | 1.84752 | 1.2413 |
| Liquid Conductivity – Measurement Uncertainty | 2.5 | N | 1 | 0.64 | 0.43 | 1.6 | 1.075 |
| Liquid Permittivity – deviation from target value | 3 | R | √3 | 0.6 | 0.49 | 1.03923 | 0.8487 |
| Liquid Permittivity – Measurement Uncertainty | 2.5 | N | 1 | 0.6 | 0.49 | 1.5 | 1.225 |
| | | | | | | | |
| Combined Standard Uncertainty | | | | | | 9.66051 % | 9.52428 % |
| Expanded Standard Uncertainty ( K=2 , confidence 95%) | | | | | | 18.9346 % | 18.6676 % |

# 8 OUTPUT POWER VERIFICATION

## 8.1 GSM Mode

GSM(GMSK)

| Frequency Band | Channel No. | Frequency | Conducted Average Power(dBm) |
|---|---|---|---|
| GSM850 | Low(128) | 824.2 | 32.62 |
| | Mid(190) | 836.4 | 32.56 |
| | High(251) | 848.8 | 32.42 |
| GSM1900 | Low | 1850.2 | 27.53 |
| | Mid | 1880.0 | 27.39 |
| | High | 1909.8 | 27.34 |

GPRS(GMSK) – MCS4

| Frequency Band | Channel No. | Frequency | Conducted Average Power(dBm) |
|---|---|---|---|
| GSM850 | Low(128) | 824.2 | 30.98 |
| | Mid(190) | 836.4 | 30.92 |
| | High(251) | 848.8 | 30.76 |
| GSM1900 | Low | 1850.2 | 28.95 |
| | Mid | 1880.0 | 29.03 |
| | High | 1909.8 | 28.88 |

EGPRS(8PSK) – MCS9

| Frequency Band | Channel No. | Frequency | Conducted Average Power(dBm) |
|---|---|---|---|
| GSM850 | Low(128) | 824.2 | 27.15 |
| | Mid(189) | 836.4 | 26.90 |
| | High(250) | 848.8 | 26.80 |
| GSM1900 | Low | 1850.2 | 27.54 |
| | Mid | 1880.0 | 27.38 |
| | High | 1909.8 | 27.32 |

## 8.2 UMTS Mode

R99 RMC ( 12.2kps)

| Frequency Band | UL Channel No. | Frequency | Conducted Average Power(dBm) |
|---|---|---|---|
| UMTS850 (Band V) | Low | 826.4 | 23.61 |
| | Mid | 836.4 | 23.49 |
| | High | 846.6 | 23.62 |
| UMTS1900 (Band II) | Low | 1852.4 | 22.62 |
| | Mid | 1880.0 | 22.72 |
| | High | 1907.6 | 22.62 |
| UMTS1700 (Band IV) | Low(1312) | 1712.4 | 23.55 |
| | Mid(1412) | 1732.4 | 23.08 |
| | High(1512) | 1752.6 | 23.05 |

Rel 6 HSDPA Mode

| Frequency Band | Mode | UL Channel No. | Frequency | Conducted Average Power(dBm) |
|---|---|---|---|---|
| UMTS850 (Band V) | Subtest 1 | Low(4132) | 826.4 | 23.64 |
| | | Mid(4182) | 836.4 | 23.44 |
| | | High(4233) | 846.6 | 23.74 |
| | Subtest 2 | Low | 826.4 | 23.21 |
| | | Mid | 836.4 | 23.09 |
| | | High | 846.6 | 23.36 |
| | Subtest 3 | Low | 826.4 | 22.64 |
| | | Mid | 836.4 | 22.62 |
| | | High | 846.6 | 22.74 |
| | Subtest 4 | Low | 826.4 | 21.92 |
| | | Mid | 836.4 | 21.96 |
| | | High | 846.6 | 21.96 |
| UMTS1900 (Band II) | Subtest 1 | Low(9262) | 1852.4 | 22.18 |
| | | Mid(9400) | 1880.0 | 22.65 |
| | | High(9538) | 1907.6 | 22.51 |
| | Subtest 2 | Low | 1852.4 | 22.10 |
| | | Mid | 1880.0 | 22.39 |
| | | High | 1907.6 | 22.77 |
| | Subtest 3 | Low | 1852.4 | 22.01 |
| | | Mid | 1880.0 | 22.36 |
| | | High | 1907.6 | 22.21 |
| | Subtest 4 | Low | 1852.4 | 22.08 |
| | | Mid | 1880.0 | 22.31 |
| | | High | 1907.6 | 21.95 |
| UMTS1700 (Band IV) | Subtest 1 | Low | 1712.4 | 23.13 |
| | | Mid | 1732.4 | 22.95 |
| | | High | 1752.6 | 23.04 |
| | Subtest 2 | Low | 1712.4 | 23.44 |
| | | Mid | 1732.4 | 23.21 |
| | | High | 1752.6 | 23.19 |
| | Subtest 3 | Low | 1712.4 | 23.14 |
| | | Mid | 1732.4 | 23.19 |
| | | High | 1752.6 | 23.39 |
| | Subtest 4 | Low | 1712.4 | 23.15 |
| | | Mid | 1732.4 | 23.07 |
| | | High | 1752.6 | 23.24 |

Rel 6 HSPA Mode

| Frequency Band | Mode | UL Channel No. | Frequency | Conducted Average Power(dBm) |
|---|---|---|---|---|
| UMTS850 (Band V) | Subtest 1 | Low(4132) | 826.4 | 23.56 |
| | | Mid(4182) | 836.4 | 23.35 |
| | | High(4233) | 846.6 | 23.58 |
| | Subtest 2 | Low | 826.4 | 23.41 |
| | | Mid | 836.4 | 23.35 |
| | | High | 846.6 | 23.73 |
| | Subtest 3 | Low | 826.4 | 23.49 |
| | | Mid | 836.4 | 23.41 |
| | | High | 846.6 | 23.73 |
| | Subtest 4 | Low | 826.4 | 23.39 |
| | | Mid | 836.4 | 23.46 |
| | | High | 846.6 | 23.44 |
| UMTS1900 (Band II) | Subtest 1 | Low(9262) | 1852.4 | 21.99 |
| | | Mid(9400) | 1880.0 | 22.30 |
| | | High(9538) | 1907.6 | 22.13 |
| | Subtest 2 | Low | 1852.4 | 21.82 |
| | | Mid | 1880.0 | 22.22 |
| | | High | 1907.6 | 22.01 |
| | Subtest 3 | Low | 1852.4 | 21.90 |
| | | Mid | 1880.0 | 22.24 |
| | | High | 1907.6 | 22.02 |
| | Subtest 4 | Low | 1852.4 | 21.95 |
| | | Mid | 1880.0 | 22.18 |
| | | High | 1907.6 | 22.00 |
| UMTS1700 (Band IV) | Subtest 1 | Low(1312) | 1712.4 | 23.09 |
| | | Mid(1412) | 1732.4 | 23.03 |
| | | High(1512) | 1752.6 | 23.31 |
| | Subtest 2 | Low(1312) | 1712.4 | 23.59 |
| | | Mid(1412) | 1732.4 | 23.30 |
| | | High(1512) | 1752.6 | 23.19 |
| | Subtest 3 | Low(1312) | 1712.4 | 23.49 |
| | | Mid(1412) | 1732.4 | 23.41 |
| | | High(1512) | 1752.6 | 23.24 |
| | Subtest 4 | Low(1312) | 1712.4 | 23.20 |
| | | Mid(1412) | 1732.4 | 23.33 |
| | | High(1512) | 1752.6 | 23.21 |

## 8.3 WIFI Mode

802.11b mode

| Channel number | Frequency (MHz) | Average Output Power(dBm) |
|---|---|---|
| 1 | 2412 | 12.10 |
| 6 | 2437 | 12.00 |
| 11 | 2462 | 11.90 |

802.11g mode

| Channel number | Frequency (MHz) | Average Output Power(dBm) |
|---|---|---|
| 1 | 2412 | 10.50 |
| 6 | 2437 | 10.10 |
| 11 | 2462 | 10.30 |

## 8.4 Bluetooth Mode

Bluetooth Measurement Result ( Bluetooth Mode , Basic Rate)

| Channel number | Frequency (MHz) | Average Output Power(dBm) |
|---|---|---|
| 0 | 2402 | -2.50 |
| 39 | 2441 | -2.17 |
| 78 | 2480 | -1.67 |

# 9 SAR TEST RESULTS

## GSM Mode

### Left Head Side

| Test Configuration , Left Head , Touch /Tilt | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g (W/kg) | Limit (W/kg) |
| GSM850 | RMC,12.2kbps | Mid | Cheek | 0.077 | 0.105 | 1.6 |
| GSM850 | RMC,12.2kbps | Mid | Tilt(15°) | 0.038 | 0.054 | 1.6 |
| GSM1900 | RMC,12.2kbps | Mid | Cheek | 0.021 | 0.032 | 1.6 |
| GSM1900 | RMC,12.2kbps | Mid | Tilt(15°) | 0.013 | 0.020 | 1.6 |

### Right Head Side

| Test Configuration , Right Head , Touch /Tilt | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g (W/kg) | Limit (W/kg) |
| GSM850 | RMC,12.2kbps | Mid | Cheek | 0.128 | 0.173 | 1.6 |
| GSM850 | RMC,12.2kbps | Mid | Tilt(15°) | 0.046 | 0.064 | 1.6 |
| GSM1900 | RMC,12.2kbps | Mid | Cheek | 0.017 | 0.023 | 1.6 |
| GSM1900 | RMC,12.2kbps | Mid | Tilt(15°) | 0.013 | 0.020 | 1.6 |

### Body Worn( Separation distance : 2cm)

| Test Configuration , Body | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g(W/kg) | Limit (W/kg) |
| GPRS850 | MCS4 | Mid | LCD up | 0.027 | 0.035 | 1.6 |
| GPRS850 | MCS4 | Mid | LCD down | 0.226 | 0.330 | 1.6 |
| GPRS1900 | MCS4 | Mid | LCD up | 0.012 | 0.013 | 1.6 |
| GPRS1900 | MCS4 | Mid | LCD down | 0.114 | 0.183 | 1.6 |

# UMTS Mode

## Left Head Side

| Test Configuration , Left Head , Touch /Tilt | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g (W/kg) | Limit (W/kg) |
| UMTS850 (Band V) | RMC,12.2kbps | Mid | Cheek | 0.177 | 0.247 | 1.6 |
| UMTS850 (Band V) | RMC,12.2kbps | Mid | Tilt(15°) | 0.104 | 0.156 | 1.6 |
| UMTS1700 (Band IV) | RMC,12.2kbps | Mid | Cheek | 0.050 | 0.079 | 1.6 |
| UMTS1700 (Band IV) | RMC,12.2kbps | Mid | Tilt(15°) | 0.046 | 0.068 | 1.6 |
| UMTS1900 (Band II) | RMC,12.2kbps | Mid | Cheek | 0.078 | 0.124 | 1.6 |
| UMTS1900 (Band II) | RMC,12.2kbps | Mid | Tilt(15°) | 0.038 | 0.065 | 1.6 |

## Right Head Side

| Test Configuration , Right Head , Touch /Tilt | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g (W/kg) | Limit (W/kg) |
| UMTS850 (Band V) | RMC,12.2kbps | Mid | Cheek | 0.169 | 0.233 | 1.6 |
| UMTS850 (Band V) | RMC,12.2kbps | Mid | Tilt(15°) | 0.091 | 0.130 | 1.6 |
| UMTS1700 (Band IV) | RMC,12.2kbps | Mid | Cheek | 0.039 | 0.055 | 1.6 |
| UMTS1700 (Band IV) | RMC,12.2kbps | Mid | Tilt(15°) | 0.025 | 0.040 | 1.6 |
| UMTS1900 (Band II) | RMC,12.2kbps | Mid | Cheek | 0.058 | 0.096 | 1.6 |
| UMTS1900 (Band II) | RMC,12.2kbps | Mid | Tilt(15°) | 0.040 | 0.066 | 1.6 |

Body Worn ( Separation distance : 2cm)

| Test Configuration , Body | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g(W/kg) | Limit (W/kg) |
| UMTS850 (Band V) | RMC,12.2kbps | Mid | LCD up | 0.032 | 0.042 | 1.6 |
| UMTS850 (Band V) | HSDPA | Mid | LCD down | 0.232 | 0.341 | 1.6 |
| UMTS1700 (Band IV) | RMC,12.2kbps | Mid | LCD up | 0.049 | 0.075 | 1.6 |
| UMTS1700 (Band IV) | HSDPA | Mid | LCD down | 0.347 | 0.556 | 1.6 |
| UMTS1900 (Band II) | RMC,12.2kbps | Mid | LCD up | 0.017 | 0.024 | 1.6 |
| UMTS1900 (Band II) | HSPA | Mid | LCD down | 0.459 | 0.781 | 1.6 |

# WIFI Mode

Left Head Side

| Test Configuration , Left Head , Touch /Tilt | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g (W/kg) | Limit (W/kg) |
| 2437MHz | 802.11b | Mid | Cheek | 0.031 | 0.050 | 1.6 |
| 2437MHz | 802.11b | Mid | Tilt(15°) | 0.017 | 0.026 | 1.6 |
| 2437MHz | 802.11g | Mid | Cheek | 0.020 | 0.031 | 1.6 |
| 2437MHz | 802.11g | Mid | Tilt(15°) | 0.016 | 0.026 | 1.6 |

Right Head Side

| Test Configuration , Right Head , Touch /Tilt | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g (W/kg) | Limit (W/kg) |
| 2437MHz | 802.11b | Mid | Cheek | 0.015 | 0.022 | 1.6 |
| 2437MHz | 802.11b | Mid | Tilt(15°) | 0.014 | 0.020 | 1.6 |
| 2437MHz | 802.11g | Mid | Cheek | 0.015 | 0.022 | 1.6 |
| 2437MHz | 802.11g | Mid | Tilt(15°) | 0.010 | 0.012 | 1.6 |

Body Worn( Separation distance : 2cm)

| Test Configuration , Body | | | Crest Factor : 8 | | Date of Measured : Sep 27 2010 | |
|---|---|---|---|---|---|---|
| Freq Band | Mode | Channel | Position | SAR 10g (W/kg) | SAR 1g(W/kg) | Limit (W/kg) |
| 2437MHz | 802.11b | Mid | LCD up | 0.016 | 0.025 | 1.6 |
| 2437MHz | 802.11b | Mid | LCD down | 0.024 | 0.038 | 1.6 |
| 2437MHz | 802.11g | Mid | LCD up | 0.016 | 0.020 | 1.6 |
| 2437MHz | 802.11g | Mid | LCD down | 0.026 | 0.041 | 1.6 |

# Bluetooth Mode

No stand-alone SAR testing for BT was required because of the low output power.

## KDB & Simultaneous SAR Evaluation.

Antenna Separation Information :

| Test case | Ant1 | Ant2 | The shortest distance between Ant1 & Ant2 (mm) |
|---|---|---|---|
| 1 | WWAN | GPS | 10.93 |
| 2 | WWAN | WiFi | 6.80 |
| 3 | WWAN | BT | 19.75 |
| 4 | GPS | WiFi | 51.62 |
| 5 | GPS | BT | 50.09 |
| 6 | WiFi | Bluetooth | 12.44 |

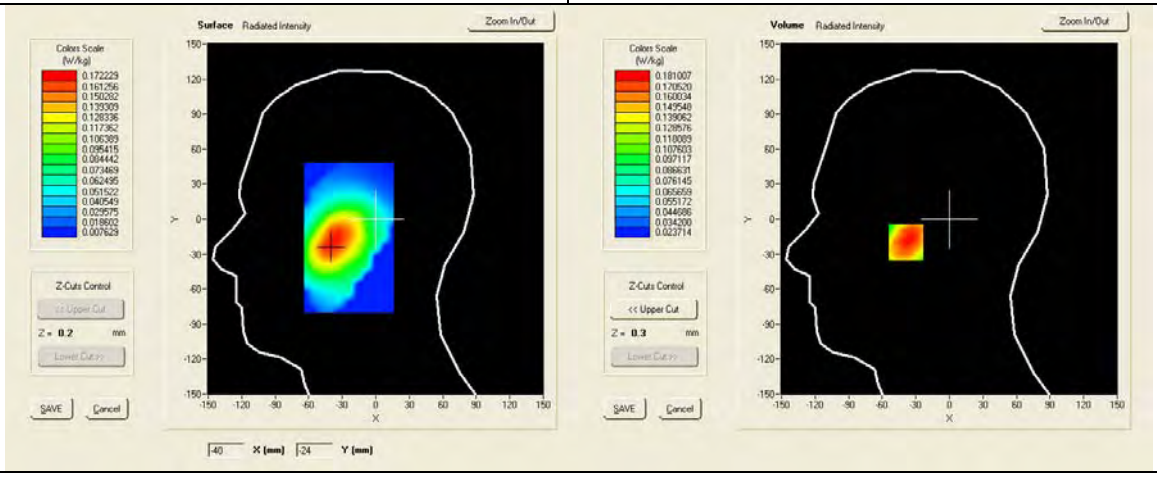
Test Result :

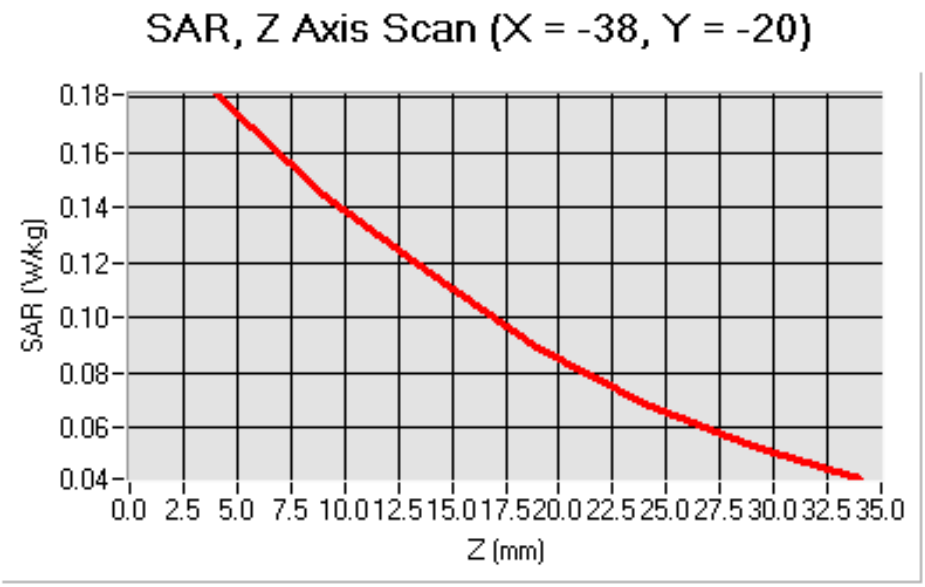
| Antenna Pair | Justification | Simultaneous SAR required ? |
|---|---|---|
| Wifi / BT | They can not transmit at the same time | No |
| Wifi / WWAN | Antenna separation is < 2.5cm, other antenna such as BT power is less than Pref, WWAN SAR is less than 1.2W/kg | No |
| BT / WWAN | Antenna separation is < 2.5cm, Wifi SAR is less than 1.2 W/kg, WWAN SAR is less than 1.2W/kg | No |
| | | |

# SAR measurement Plots
## GSM850 Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

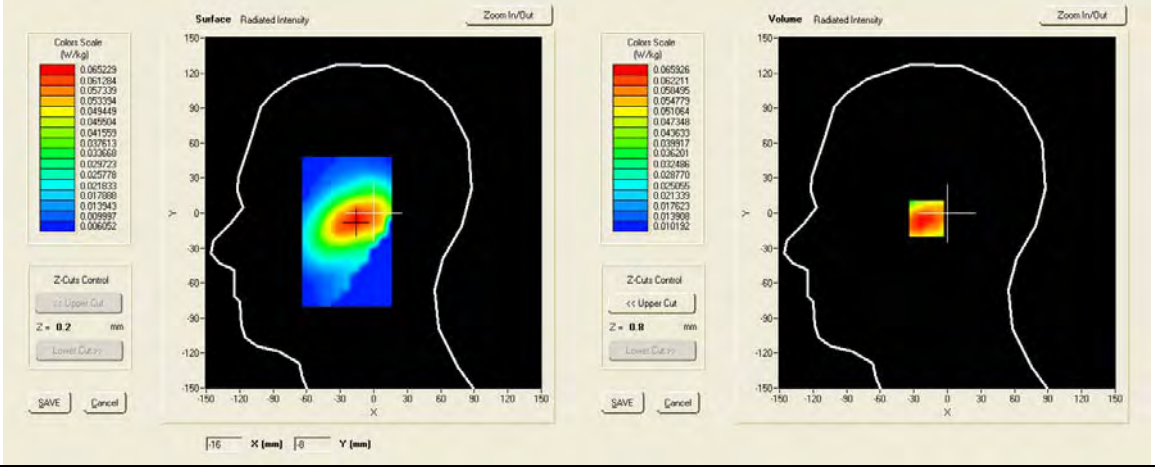
| | |
|---|---|
| Frequency (MHz) | 836.400024<br>(Right Head , Cheek) |
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 1.620000 |
| SAR 1g (W/Kg) | 0.173338 |
| SURFACE SAR | VOLUME SAR |

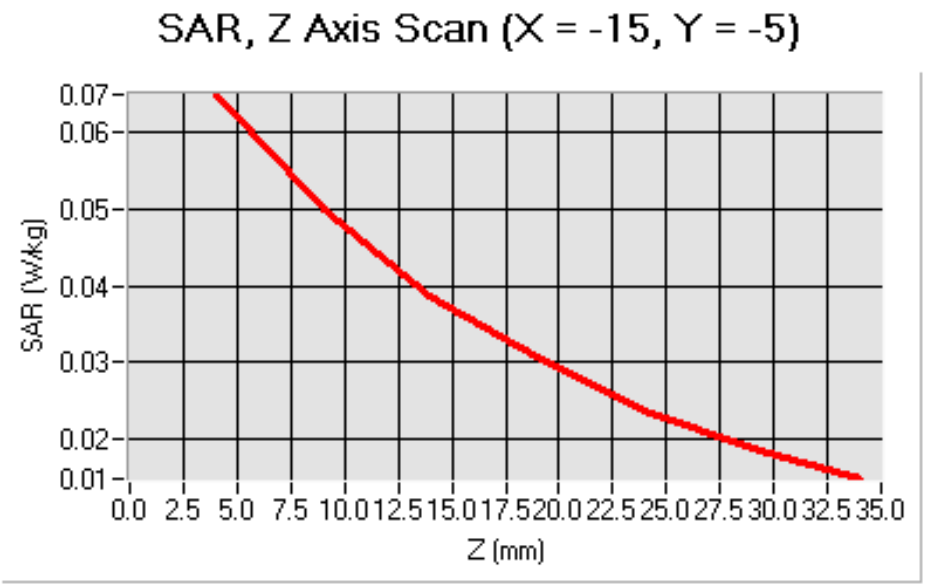


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

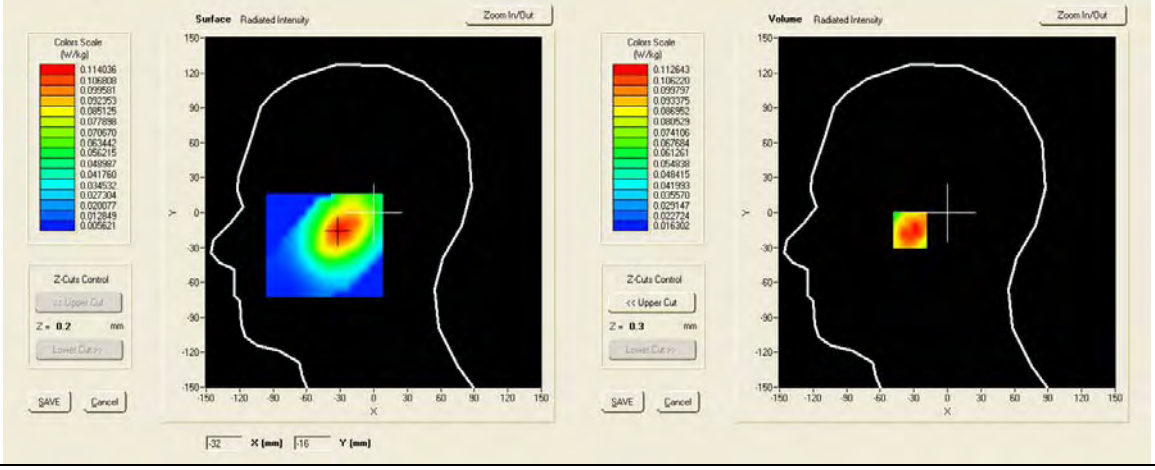
| Frequency (MHz) | 836.400024<br>(Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -2.550000 |
| SAR 1g (W/Kg) | 0.063533 |
| SURFACE SAR | VOLUME SAR |

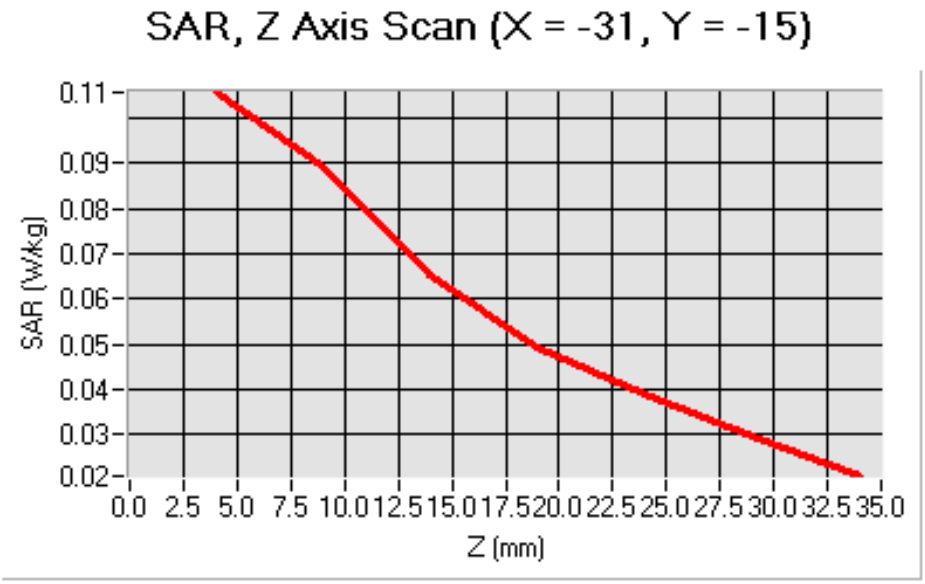


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

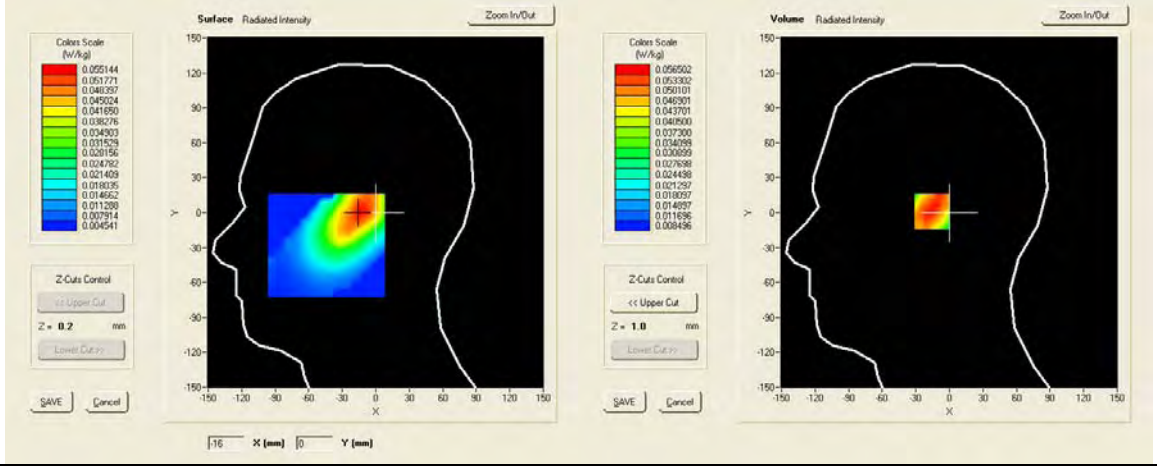
| Frequency (MHz) | 836.400024 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -2.500000 |
| SAR 1g (W/Kg) | 0.105153 |
| SURFACE SAR | VOLUME SAR |

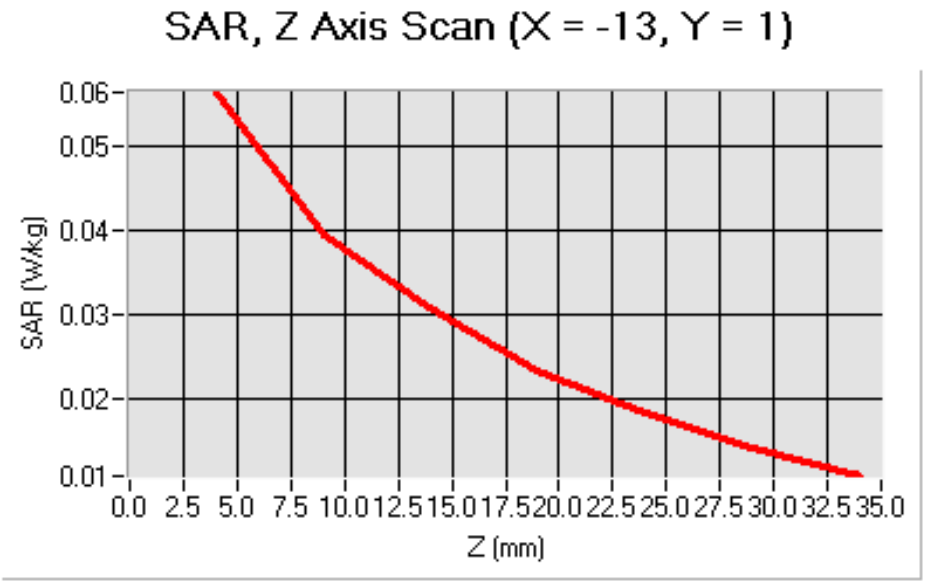


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

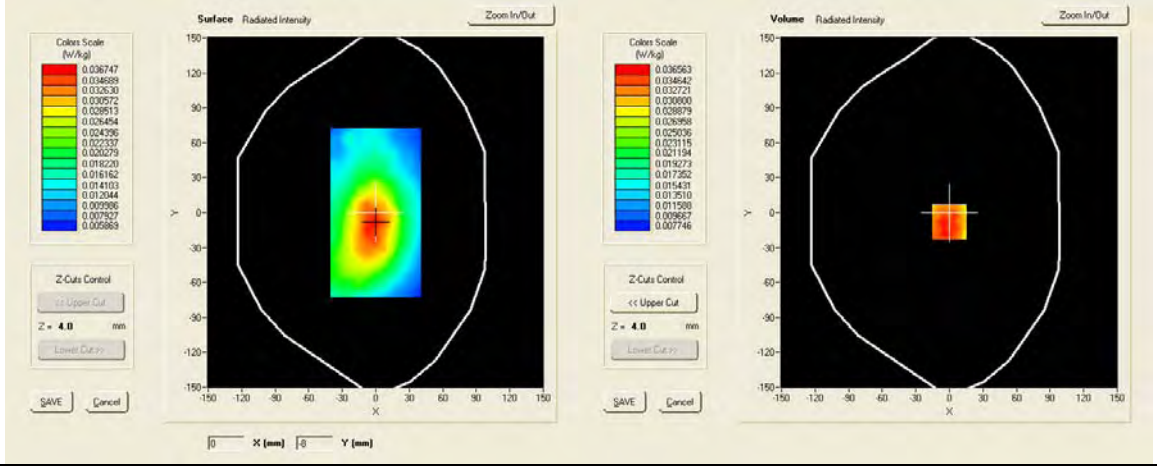
| Frequency (MHz) | 836.400024 (Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -4.500000 |
| SAR 1g (W/Kg) | 0.054069 |
| SURFACE SAR | VOLUME SAR |

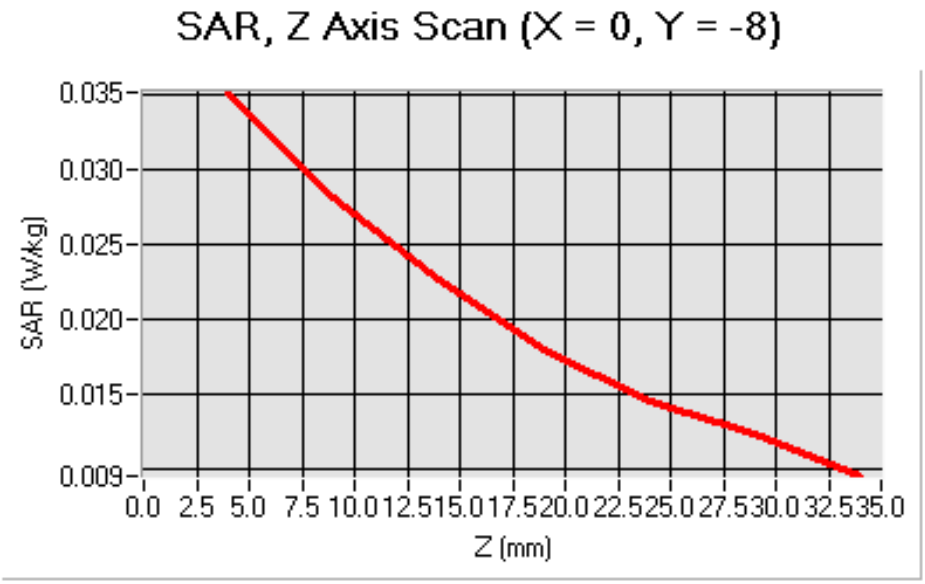


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

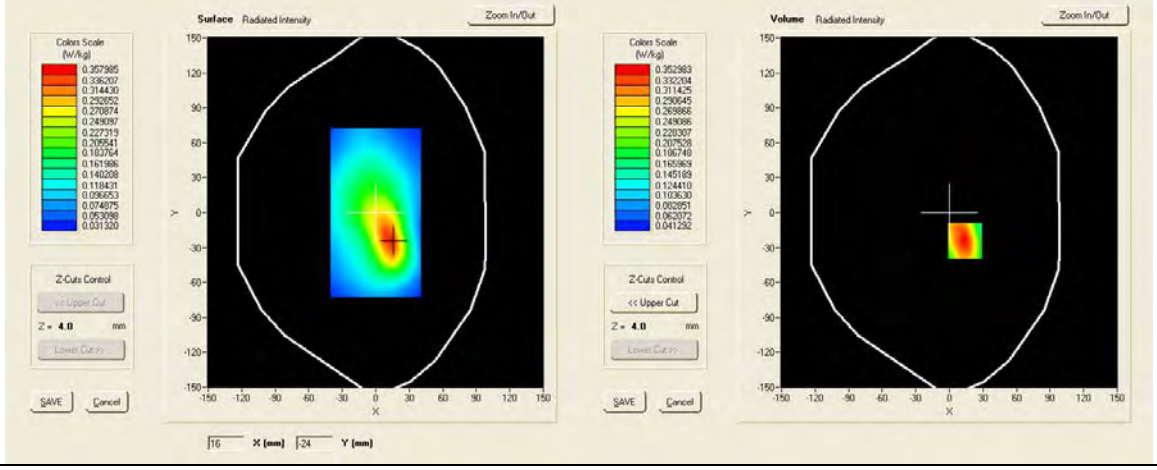
| Frequency (MHz) | 836.400024 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -2.840000 |
| SAR 1g (W/Kg) | 0.034808 |
| SURFACE SAR | VOLUME SAR |

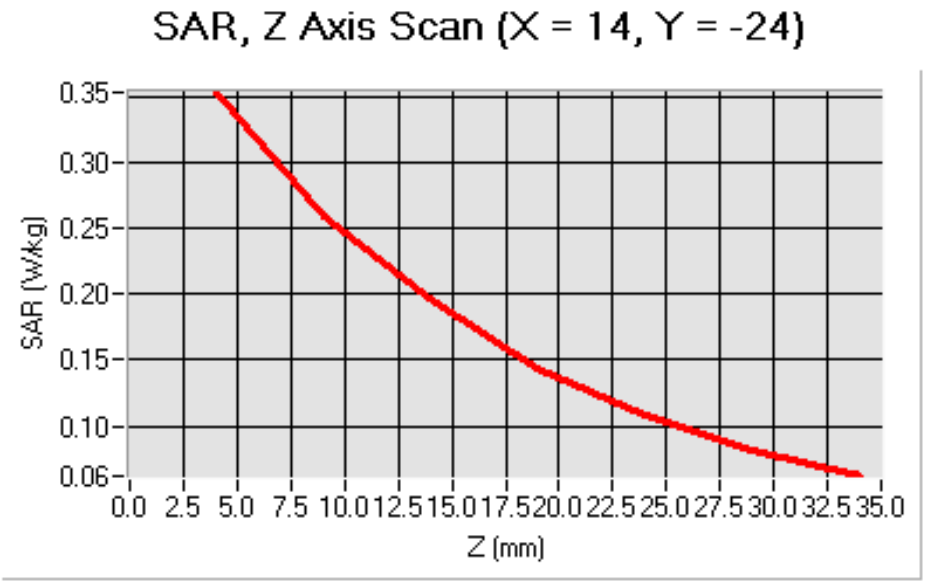


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequency (MHz) | 836.400024 (Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -2.090000 |
| SAR 1g (W/Kg) | 0.330004 |
| SURFACE SAR | VOLUME SAR |

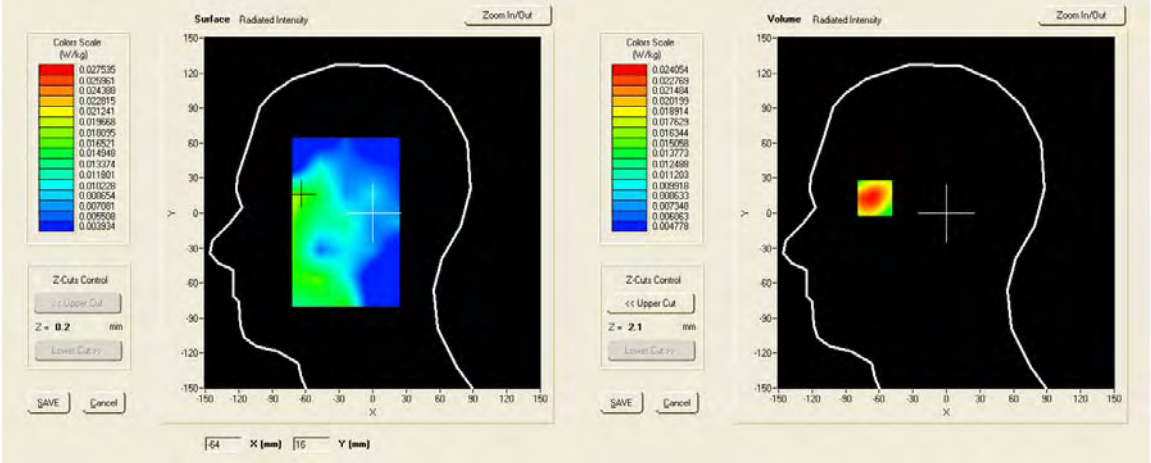


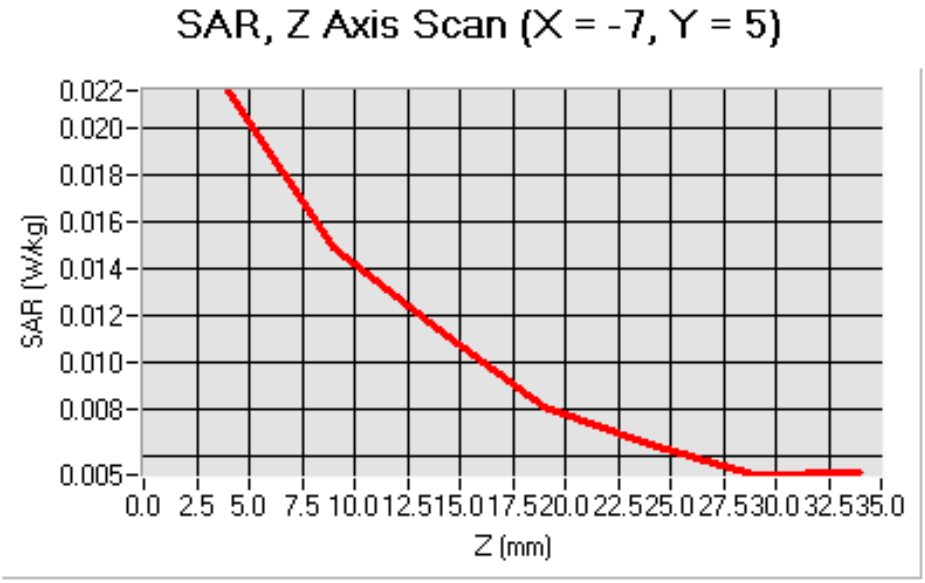



# GSM1900 Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

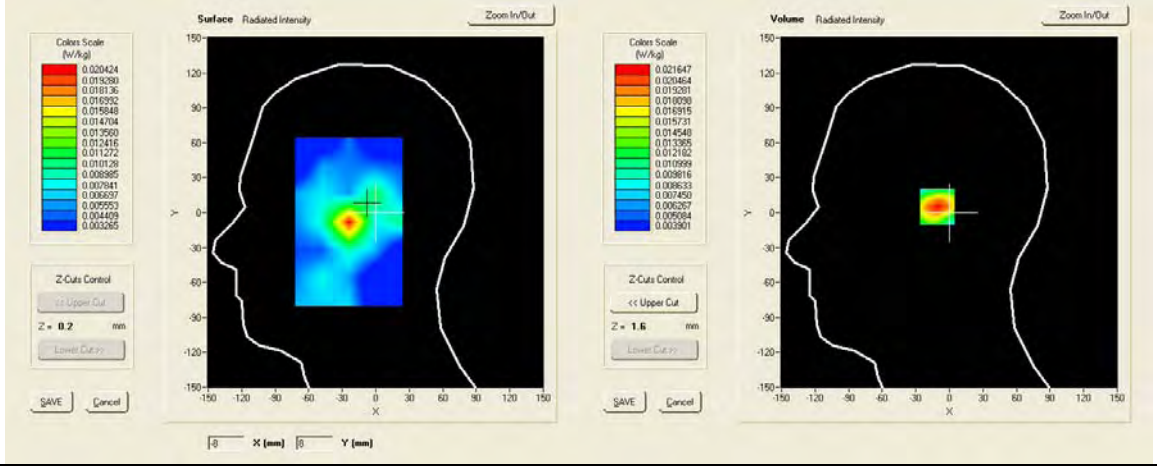
| | |
|---|---|
| Frequency (MHz) | 1880.000000<br>(Right Head , Cheek) |
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | -3.660000 |
| SAR 1g (W/Kg) | 0.023170 |
| SURFACE SAR | VOLUME SAR |

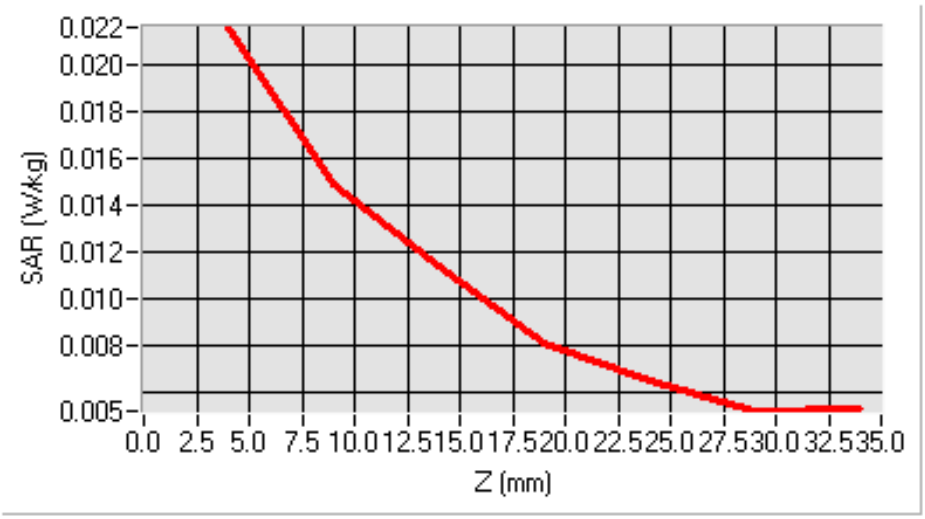


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

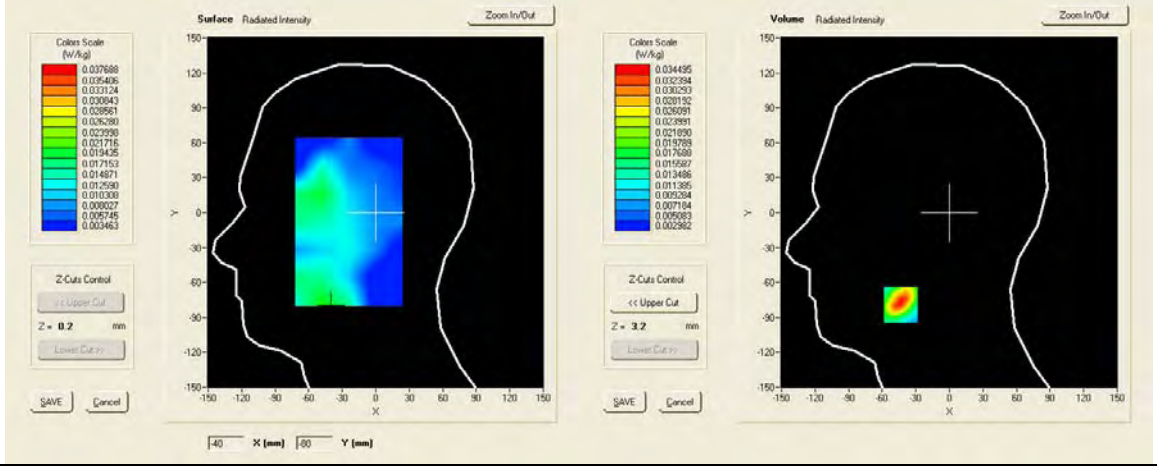
| Frequency (MHz) | 1880.000000<br>(Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | 1.780000 |
| SAR 1g (W/Kg) | 0.020367 |
| SURFACE SAR | VOLUME SAR |

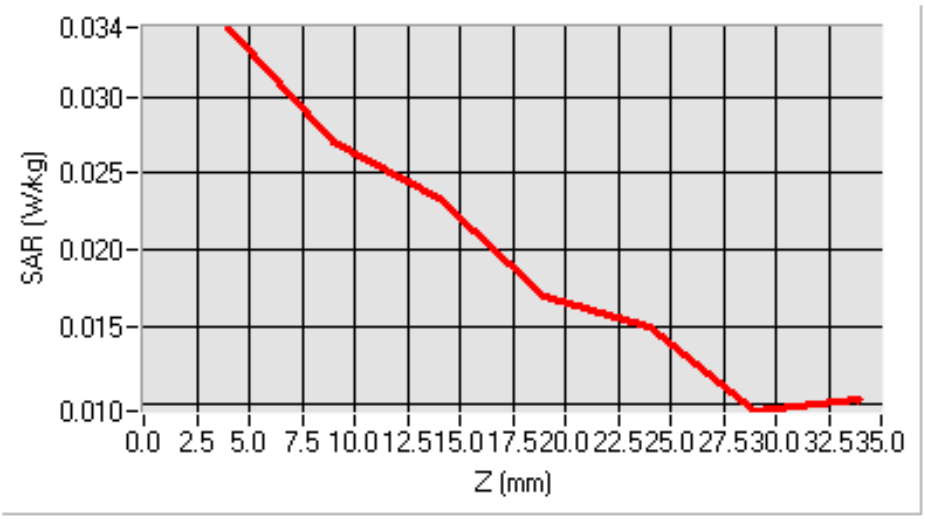


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

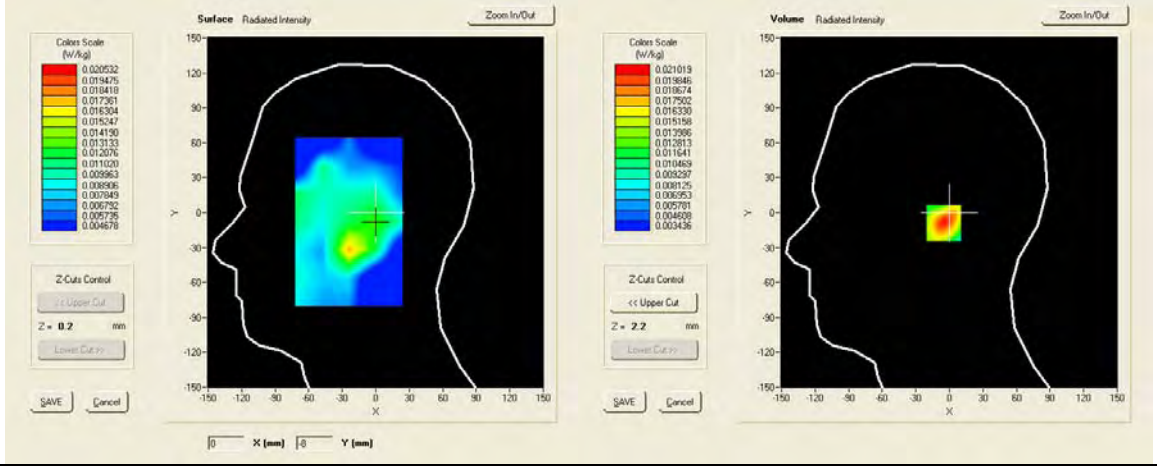
| Frequency (MHz) | 1880.000000 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | -3.530000 |
| SAR 1g (W/Kg) | 0.032279 |
| SURFACE SAR | VOLUME SAR |

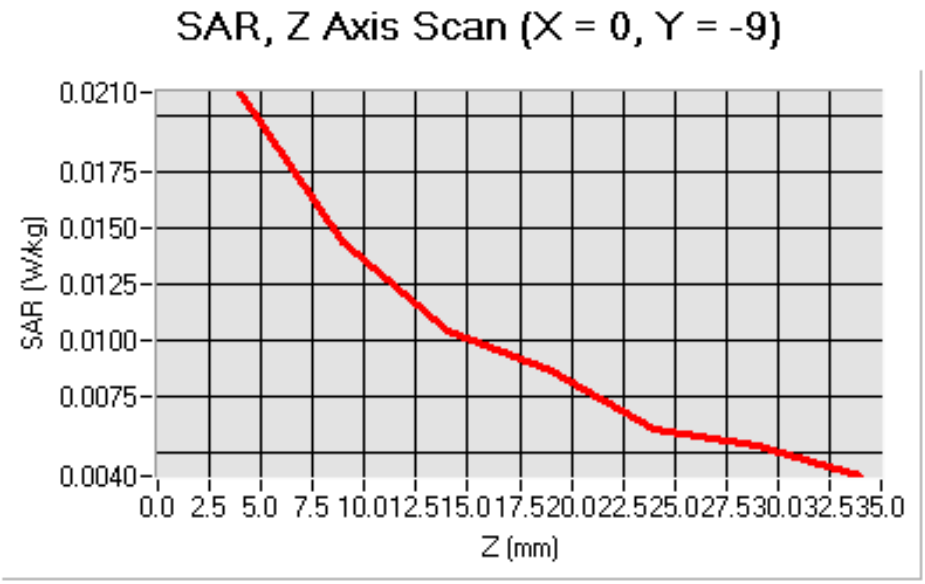


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

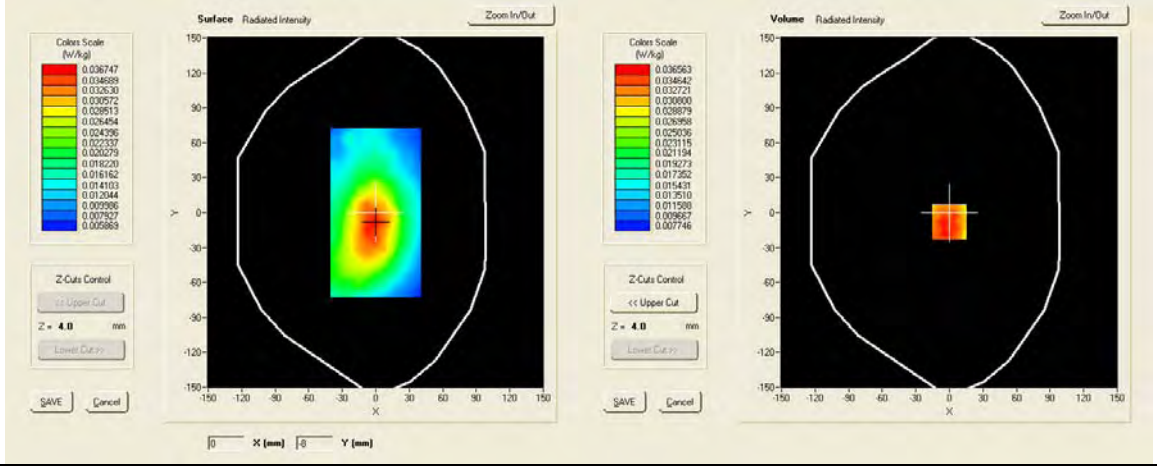
| Frequency (MHz) | 1880.000000 (Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | 2.600000 |
| SAR 1g (W/Kg) | 0.019776 |
| SURFACE SAR | VOLUME SAR |

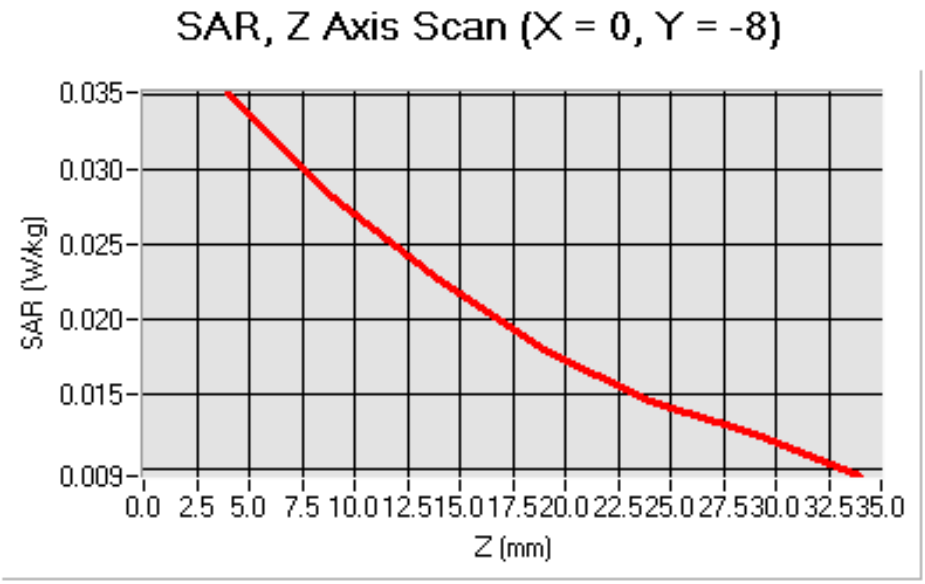


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

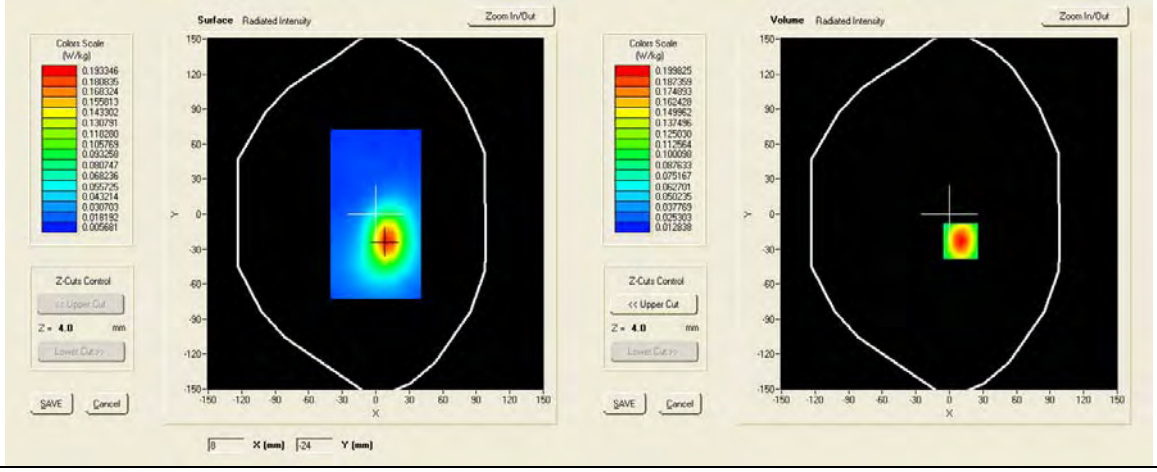
| Frequency (MHz) | 1880.000000 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | -1.490000 |
| SAR 1g (W/Kg) | 0.05901 |
| SURFACE SAR | VOLUME SAR |

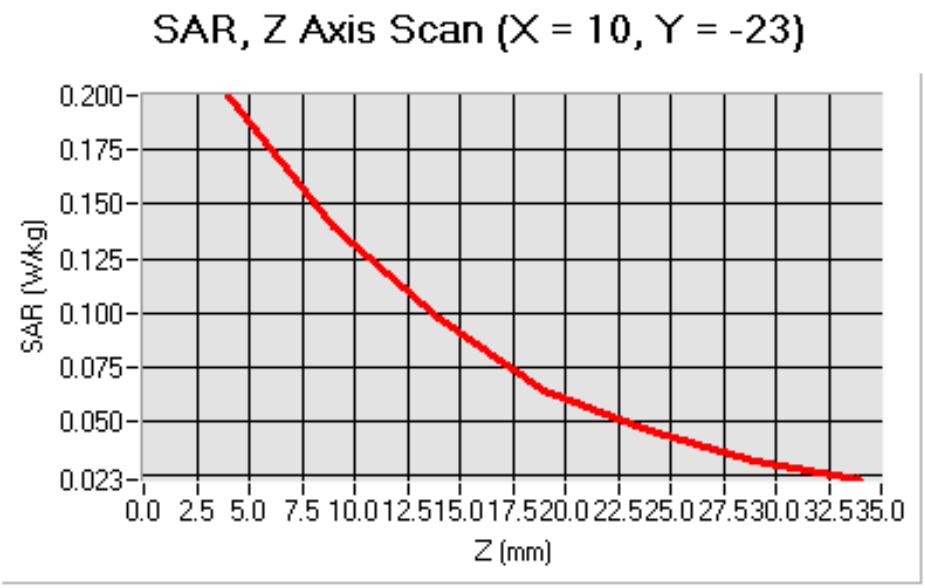


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequencfy (MHz) | 1880.000000 (Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | 0.610000 |
| SAR 1g (W/Kg) | 0.182568 |
| SURFACE SAR | VOLUME SAR |

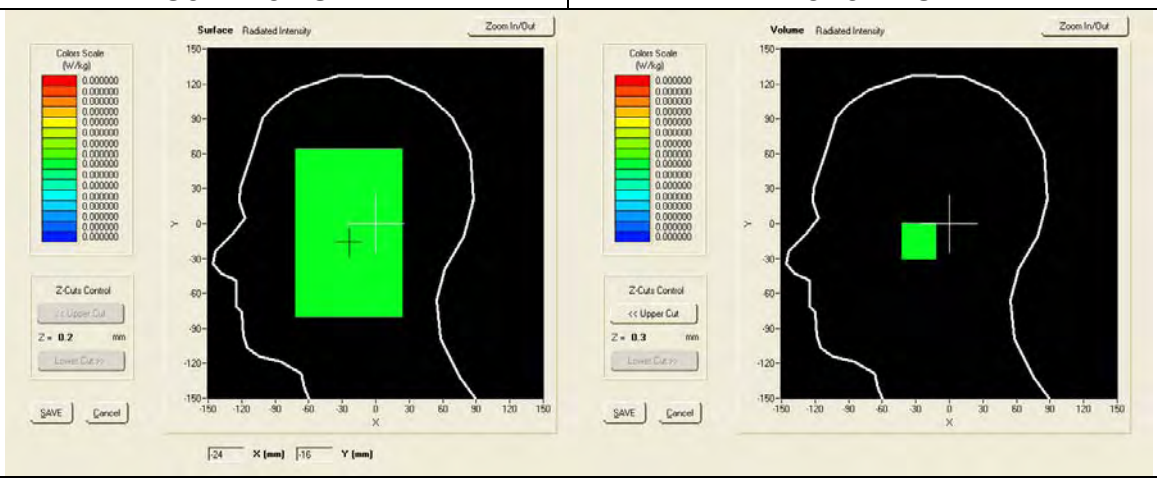


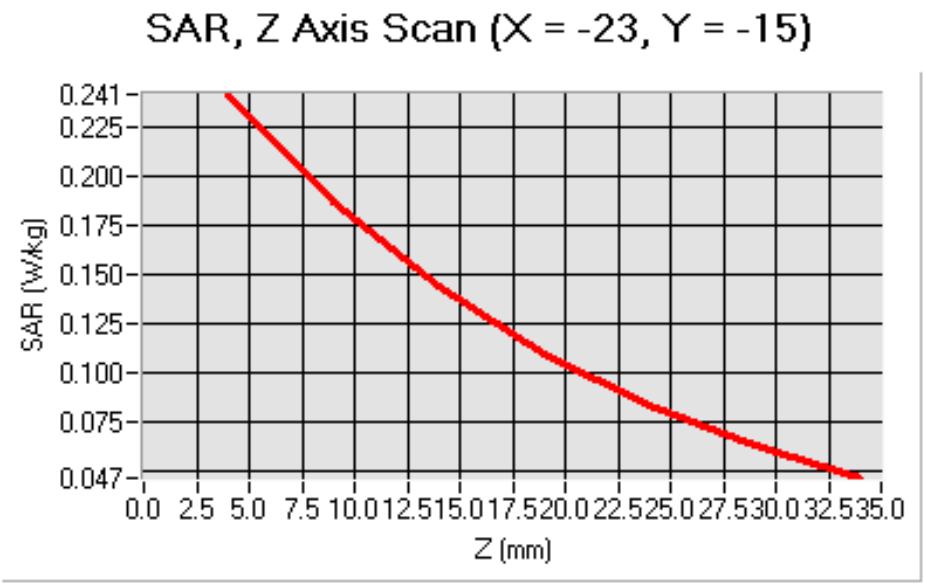



# WCDMA Band V (850MHz) Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

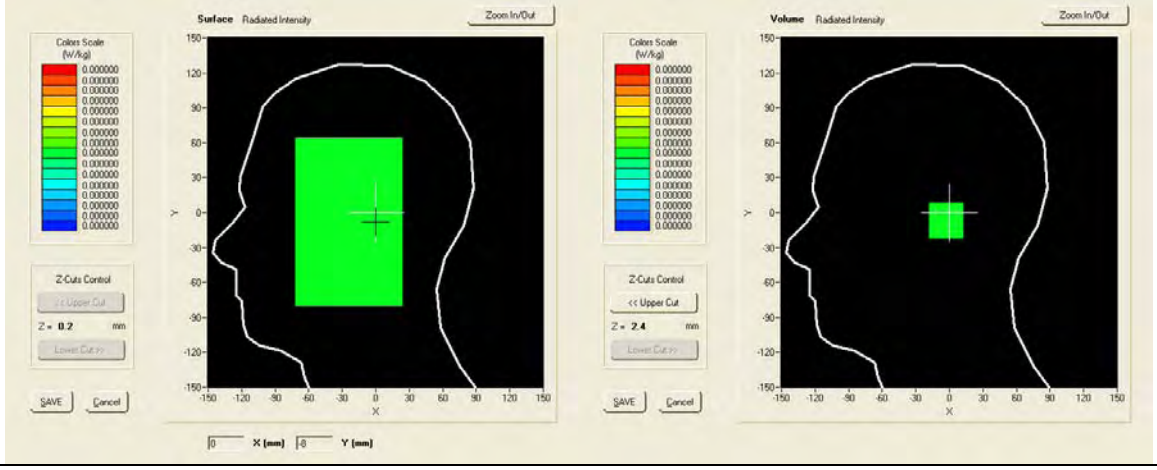
| Frequency (MHz) | 836.400024<br>(Right Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -0.360000 |
| SAR 1g (W/Kg) | 0.233287 |
| SURFACE SAR | VOLUME SAR |

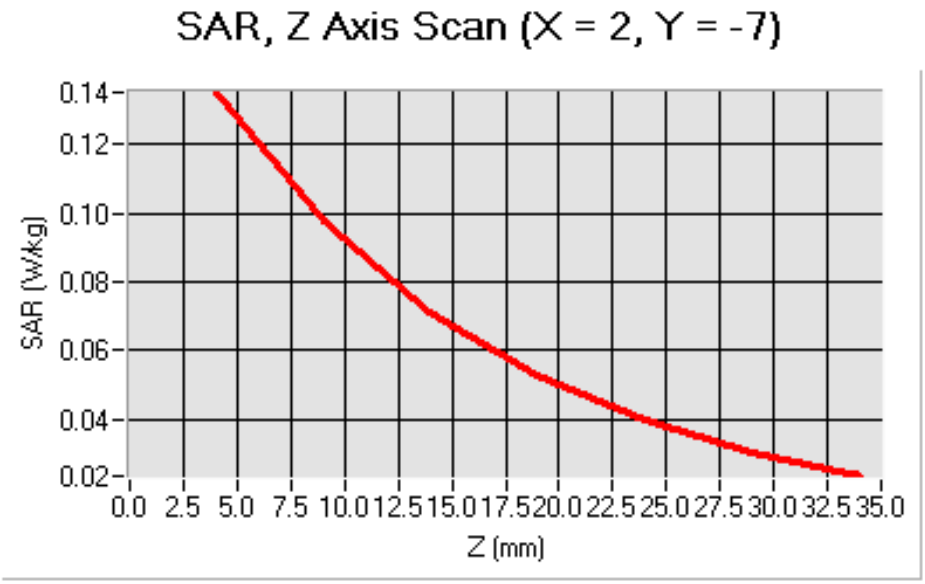


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

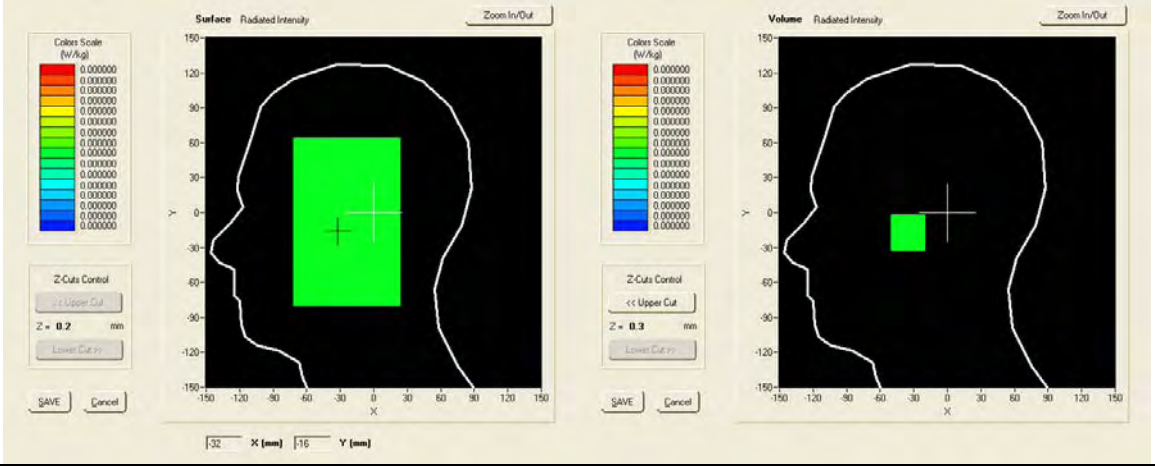
| Frequency (MHz) | 836.400024<br>(Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -0.050000 |
| SAR 1g (W/Kg) | 0.129873 |
| SURFACE SAR | VOLUME SAR |

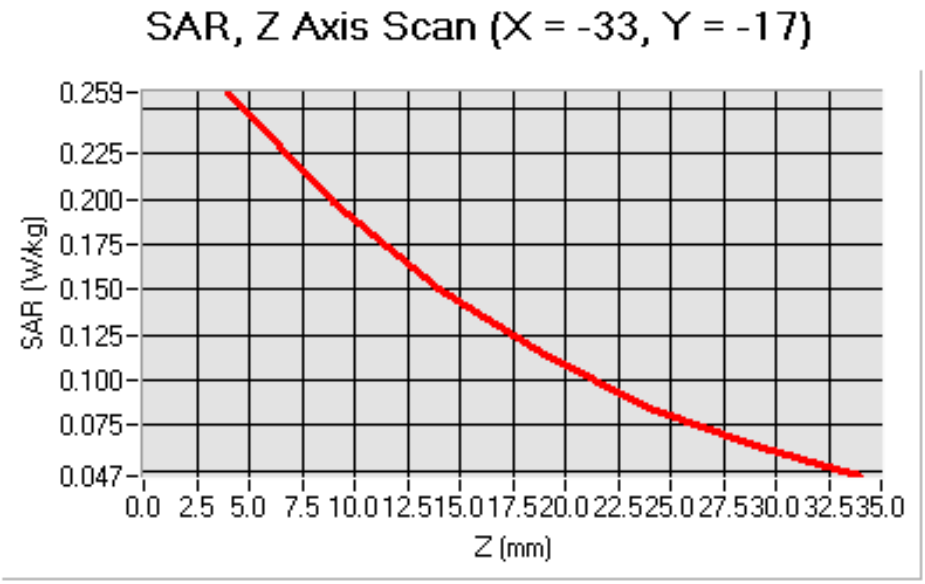


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

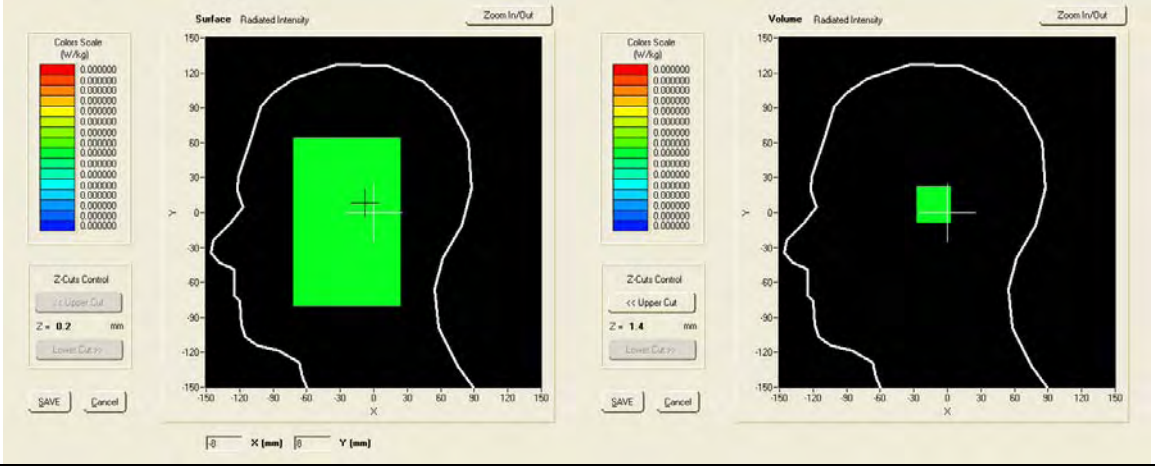
| Frequency (MHz) | 836.400024 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 2.260000 |
| SAR 1g (W/Kg) | 0.246688 |
| SURFACE SAR | VOLUME SAR |

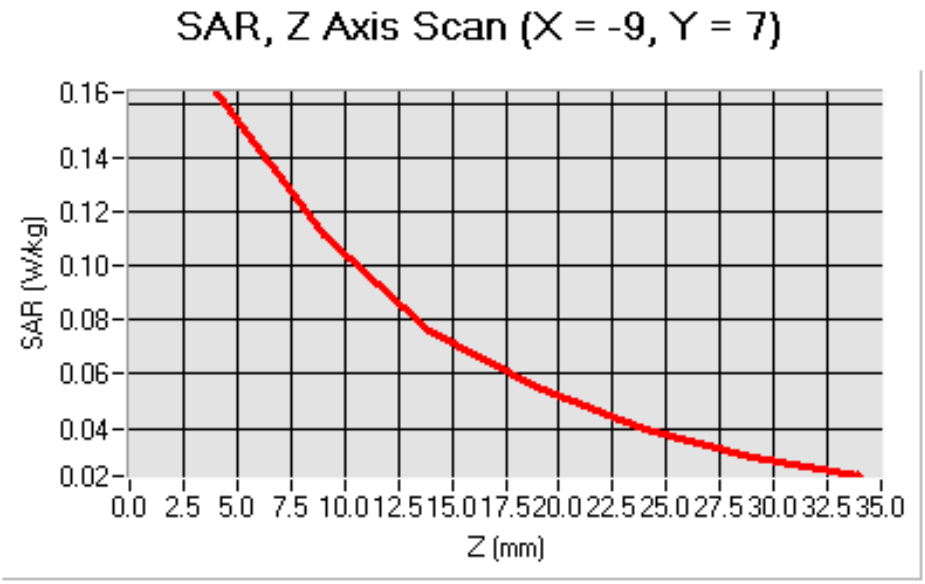


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

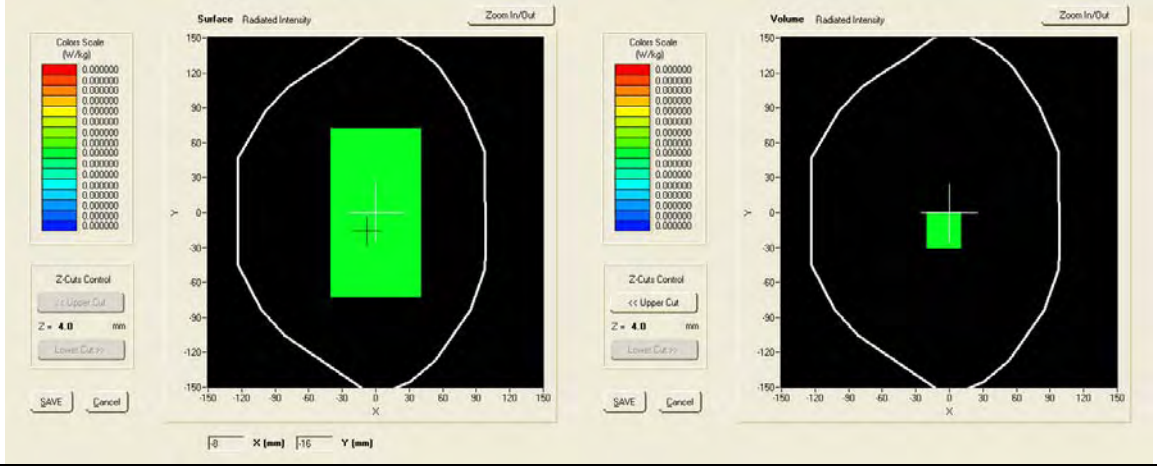
| Frequency (MHz) | 836.400024<br>(Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 2.200000 |
| SAR 1g (W/Kg) | 0.156331 |
| SURFACE SAR | VOLUME SAR |

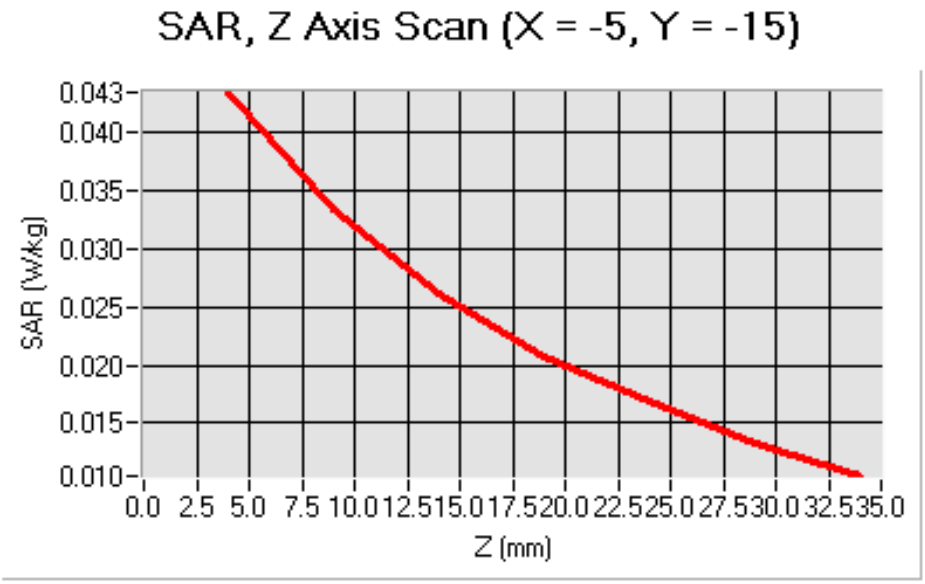


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

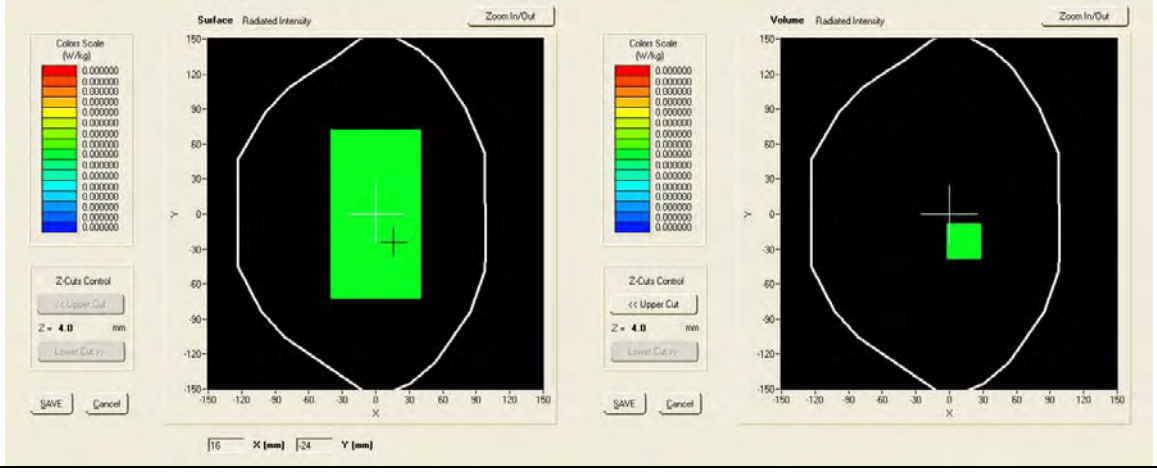
| Frequency (MHz) | 836.400024 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 1.420000 |
| SAR 1g (W/Kg) | 0.042055 |
| SURFACE SAR | VOLUME SAR |

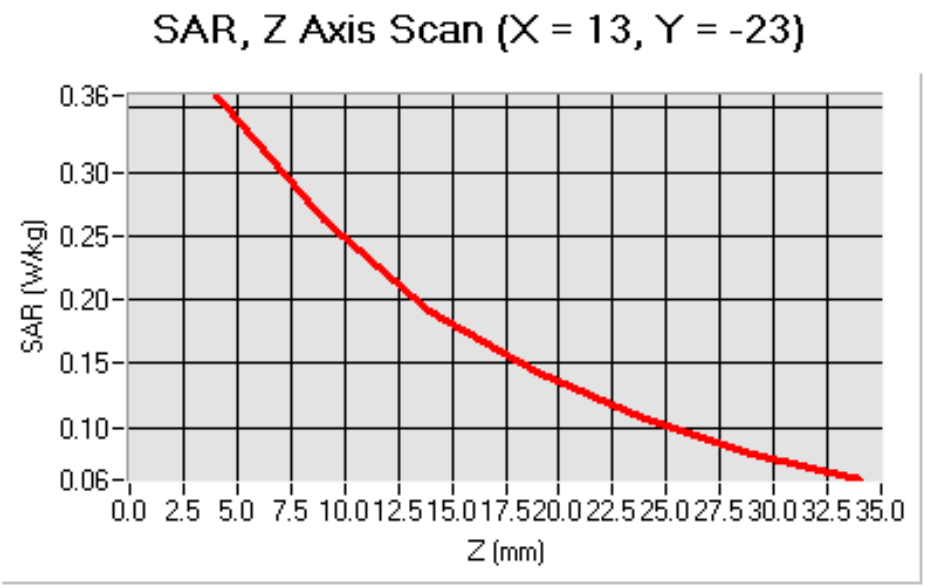


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequencfy (MHz) | 836.400024 (Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 0.830000 |
| SAR 1g (W/Kg) | 0.341298 |
| SURFACE SAR | VOLUME SAR |

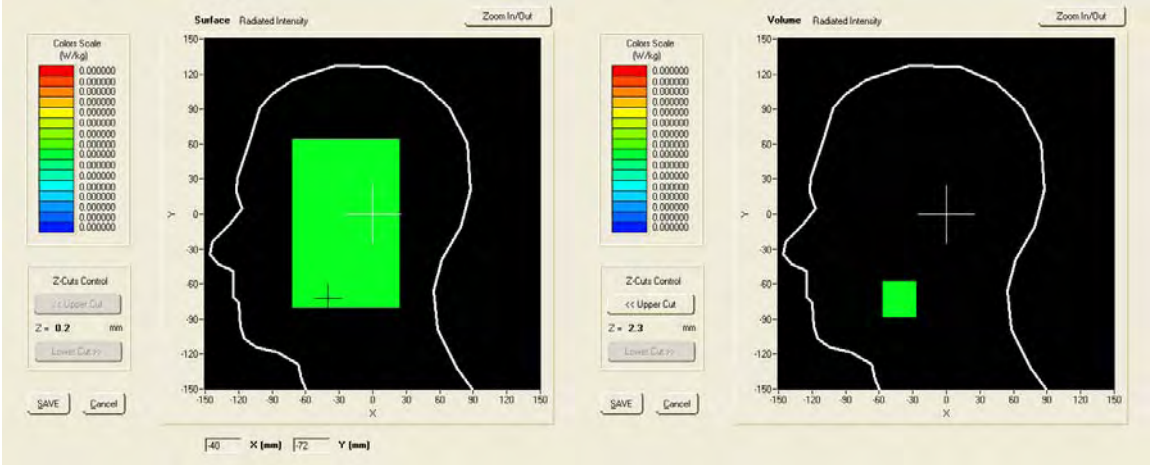


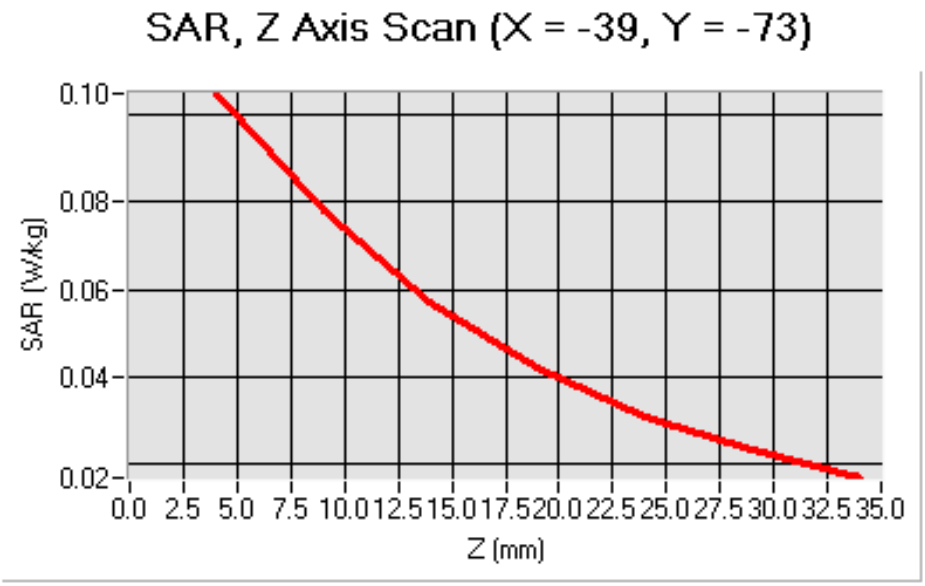



# WCDMA Band II (1900MHz) Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

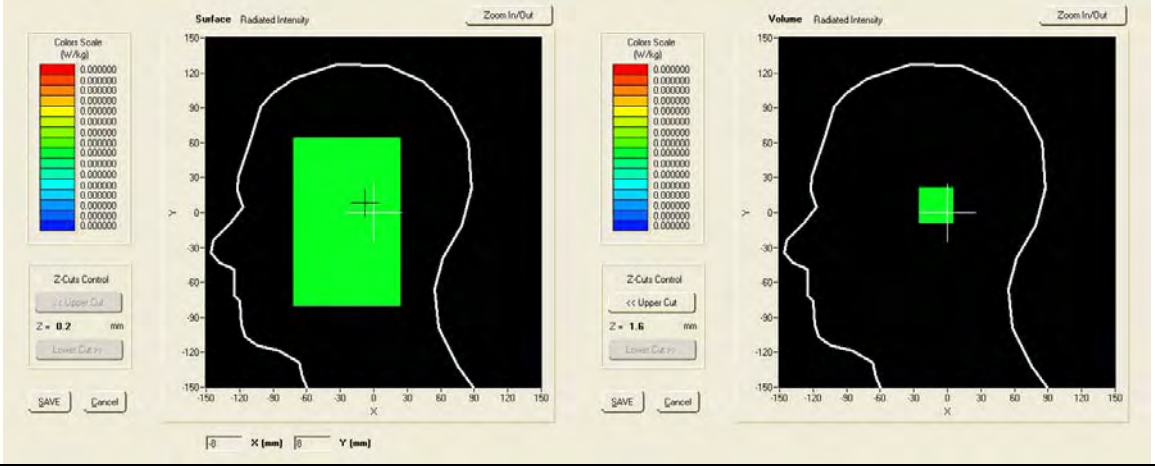
| Frequency (MHz) | 1880.000000 (Right Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | -0.360000 |
| SAR 1g (W/Kg) | 0.096192 |
| SURFACE SAR | VOLUME SAR |

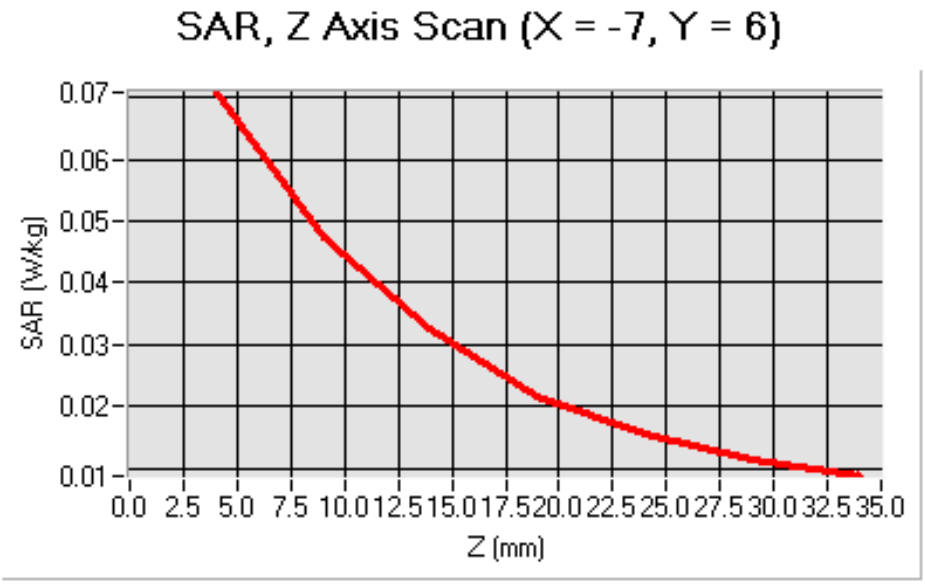


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

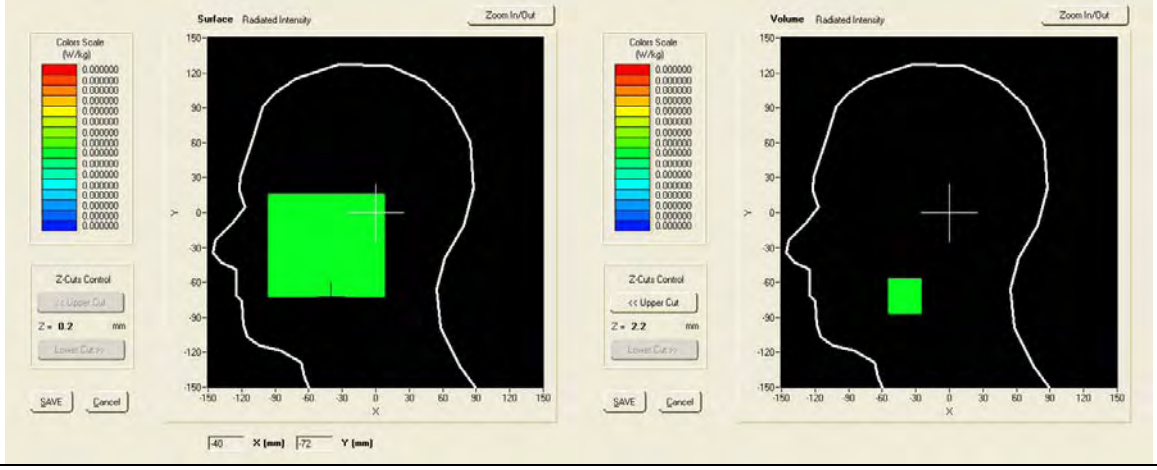
| Frequency (MHz) | 1880.000000<br>(Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | 0.460000 |
| SAR 1g (W/Kg) | 0.066406 |
| SURFACE SAR | VOLUME SAR |

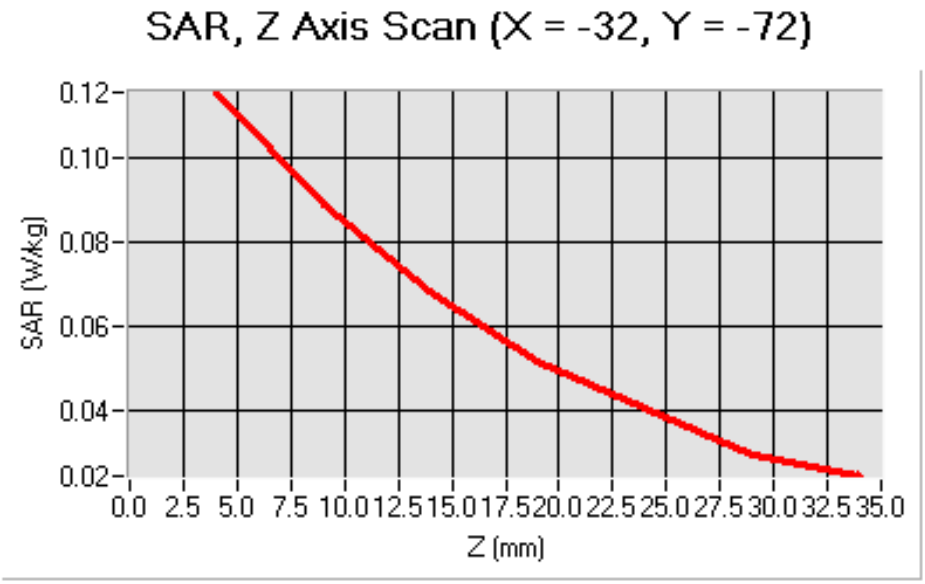


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

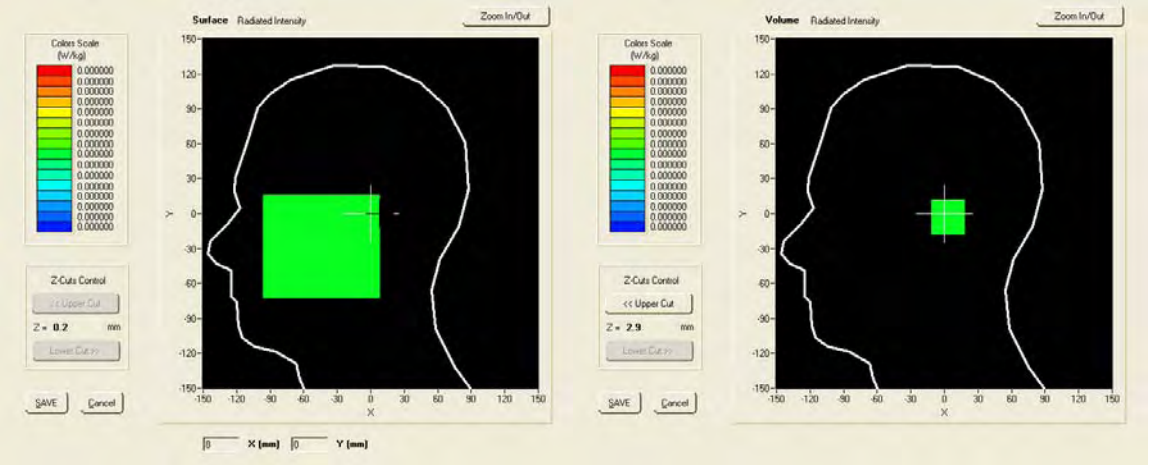
| Frequency (MHz) | 1880.000000 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | 2.870000 |
| SAR 1g (W/Kg) | 0.124274 |
| SURFACE SAR | VOLUME SAR |

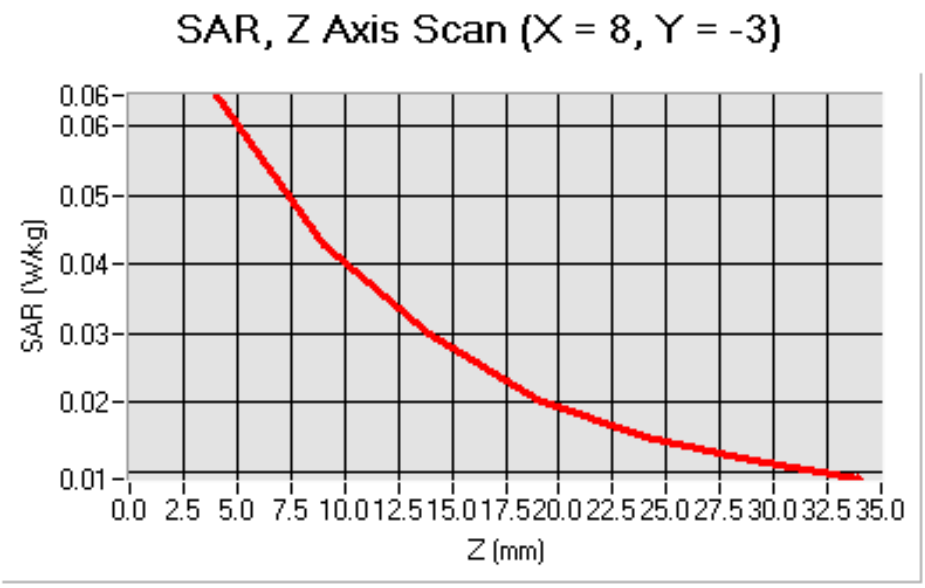


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

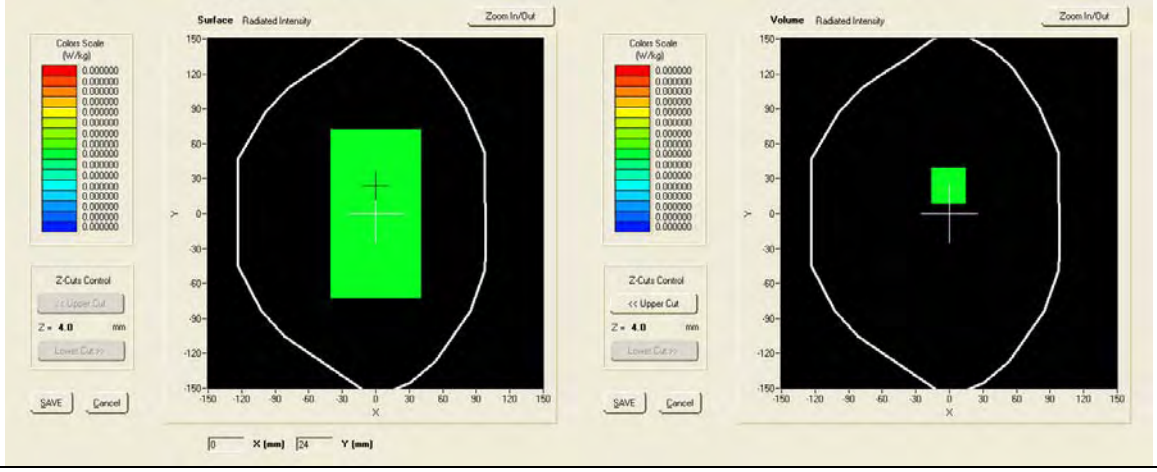
| Frequency (MHz) | 1880.000000 (Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | -2.480000 |
| SAR 1g (W/Kg) | 0.064764 |
| SURFACE SAR | VOLUME SAR |

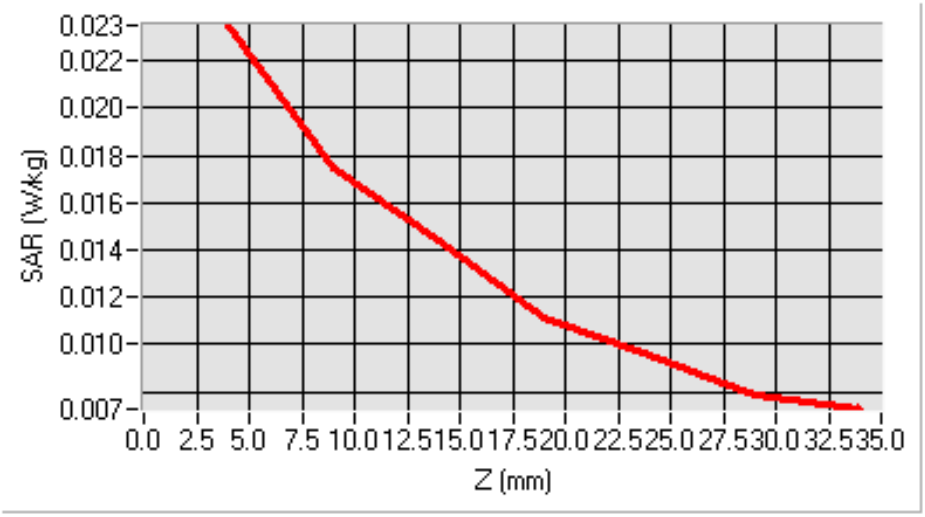


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

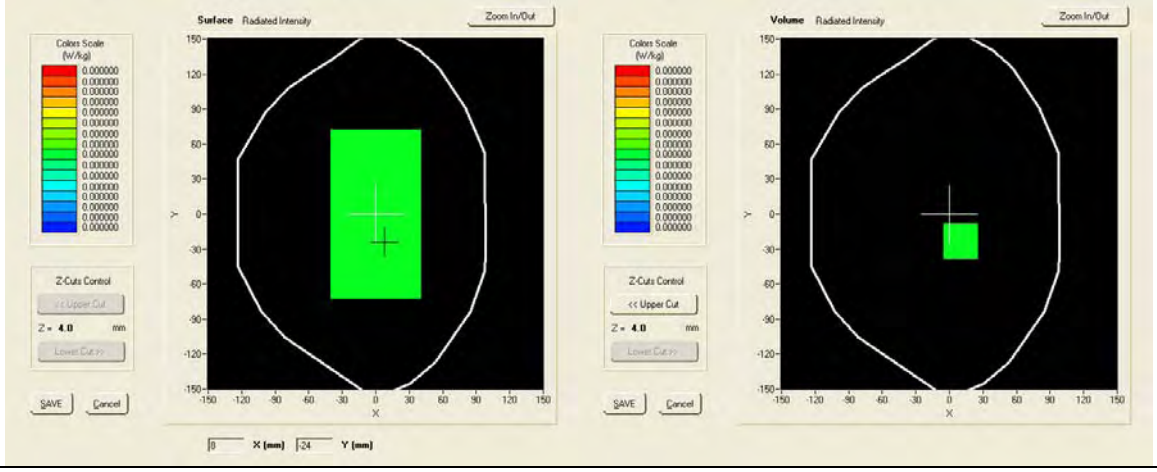
| Frequency (MHz) | 1880.000000 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | -4.690000 |
| SAR 1g (W/Kg) | 0.024136 |
| SURFACE SAR | VOLUME SAR |

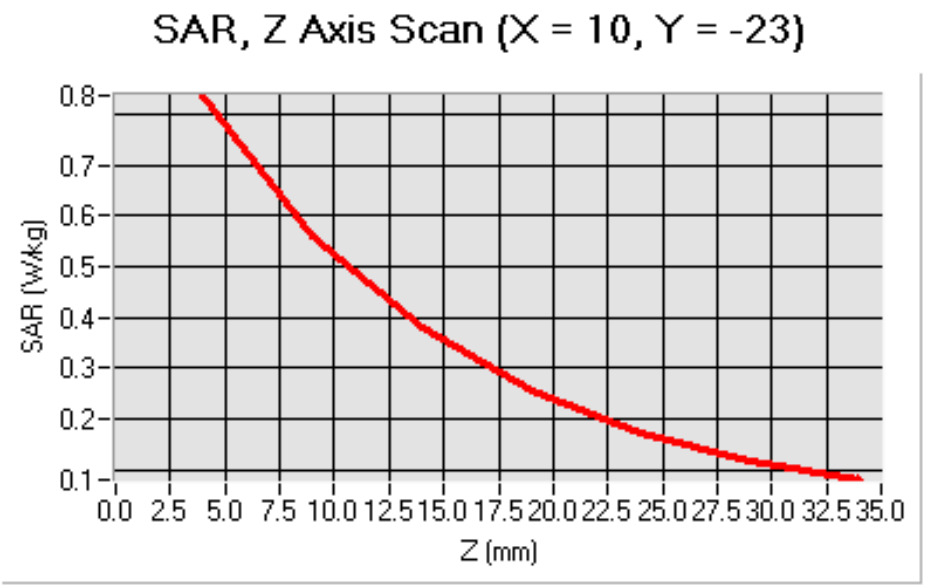


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequencfy (MHz) | 1880.000000<br>(Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 40.000000 |
| Relative permitivity (imaginary part) | 13.408000 |
| Conductivity (S/m) | 1.400391 |
| Variation (%) | 0.040000 |
| SAR 1g (W/Kg) | 0.780931 |
| SURFACE SAR | VOLUME SAR |

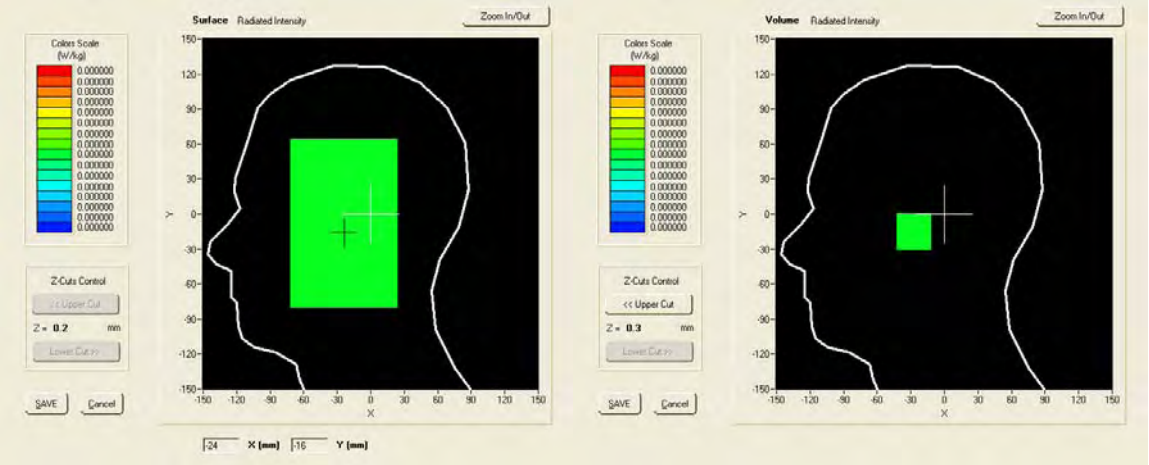


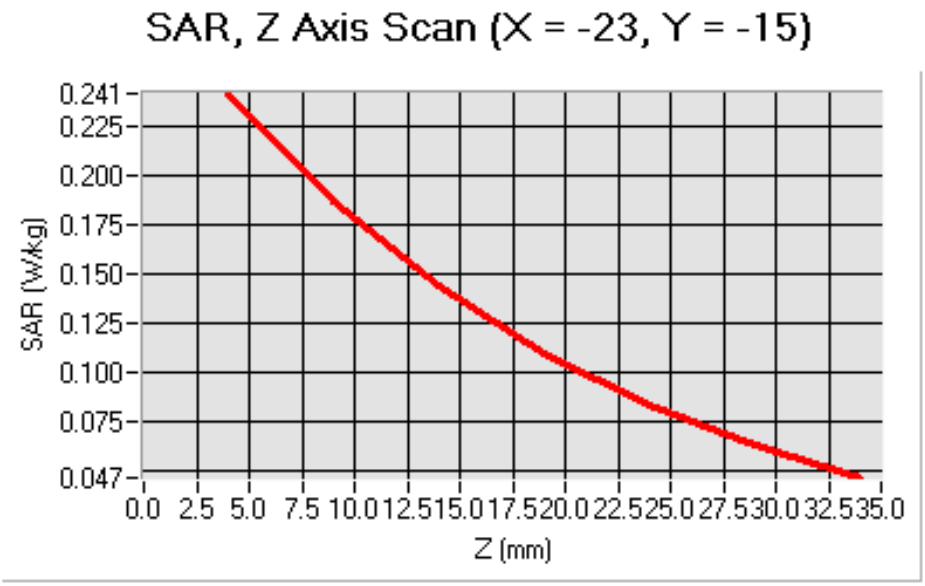



# WCDMA Band V (850MHz) Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

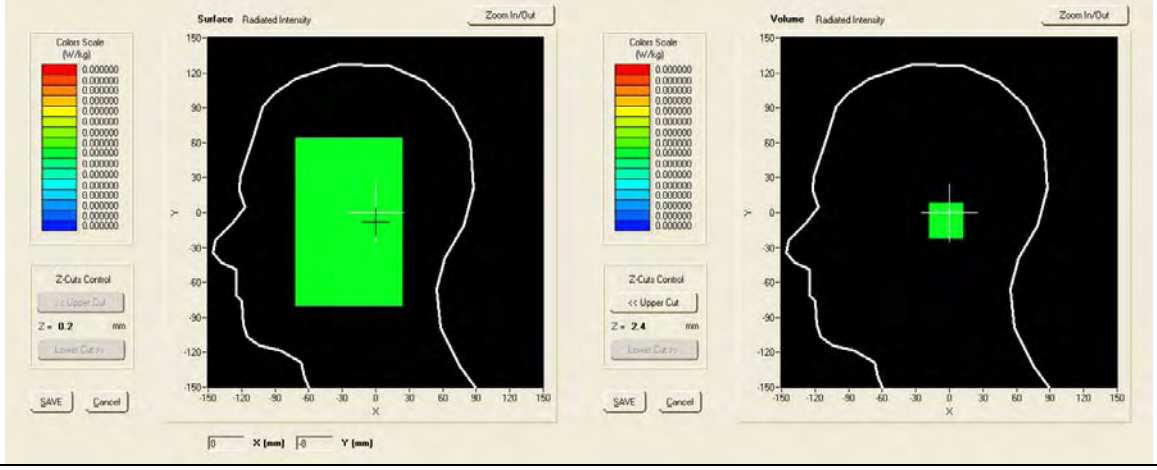
| Frequency (MHz) | 836.400024<br>(Right Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -0.360000 |
| SAR 1g (W/Kg) | 0.233287 |
| SURFACE SAR | VOLUME SAR |

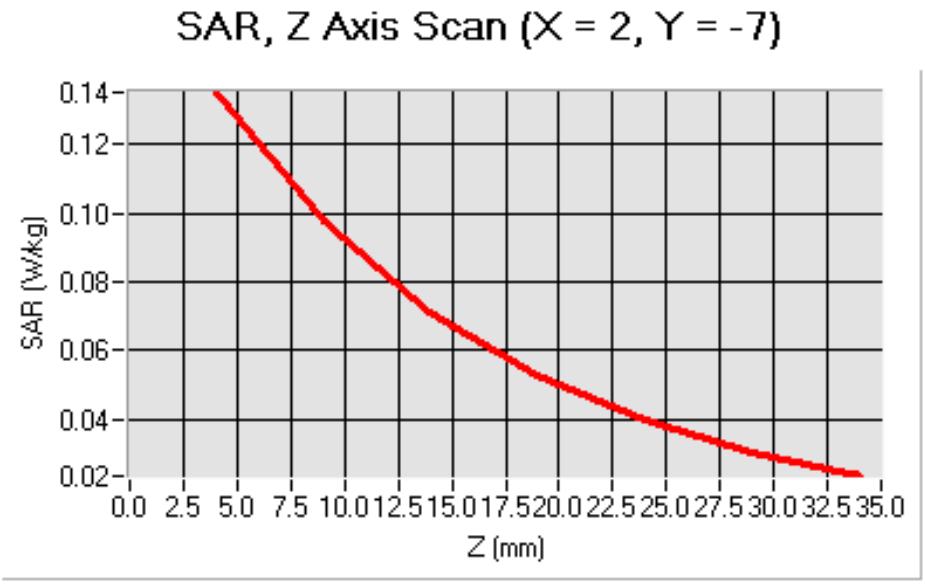


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

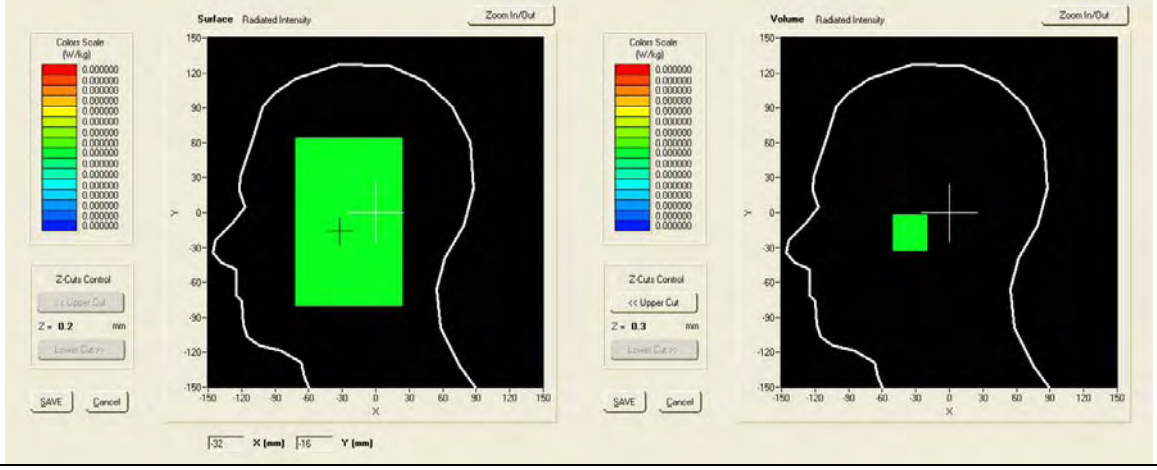
| Frequency (MHz) | 836.400024<br>(Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | -0.050000 |
| SAR 1g (W/Kg) | 0.129873 |
| SURFACE SAR | VOLUME SAR |

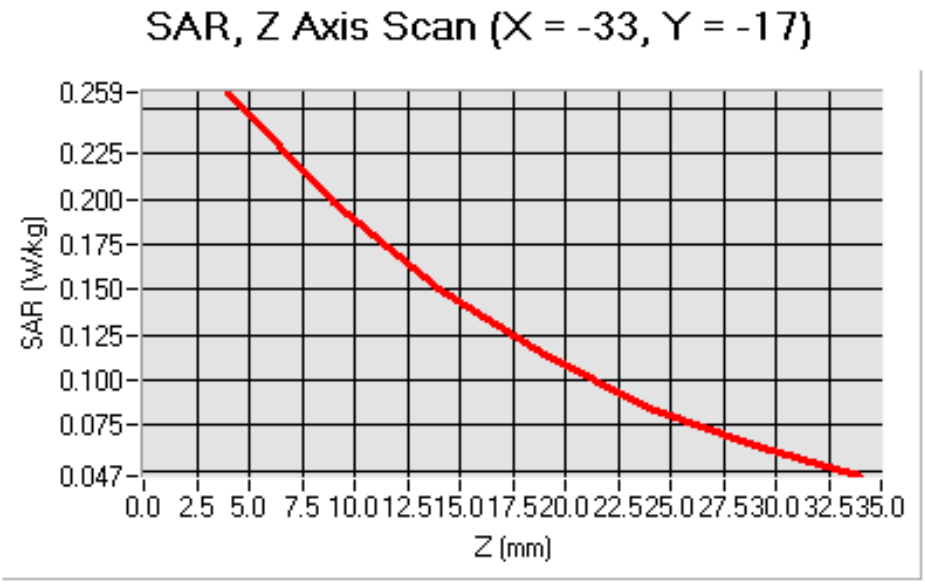


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

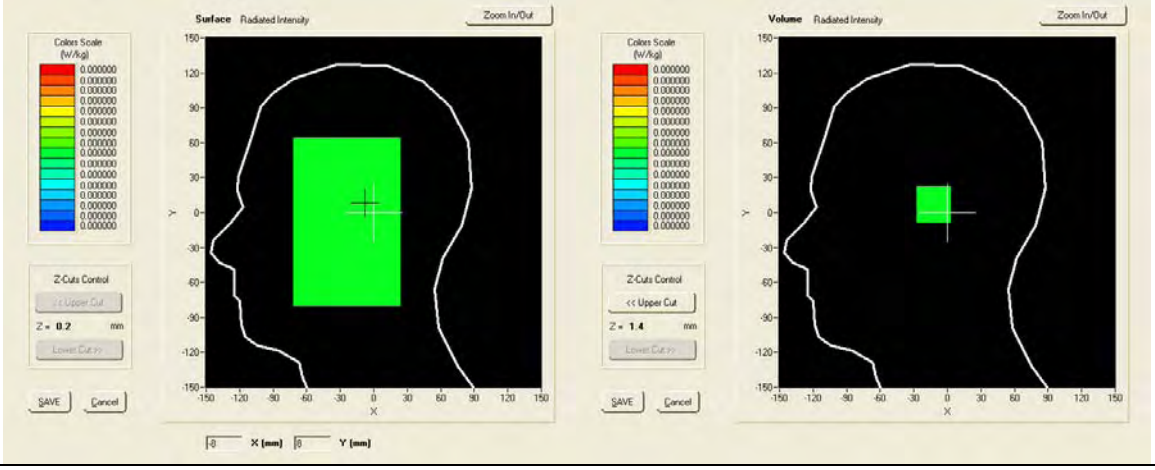
| Frequency (MHz) | 836.400024 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 2.260000 |
| SAR 1g (W/Kg) | 0.246688 |
| SURFACE SAR | VOLUME SAR |

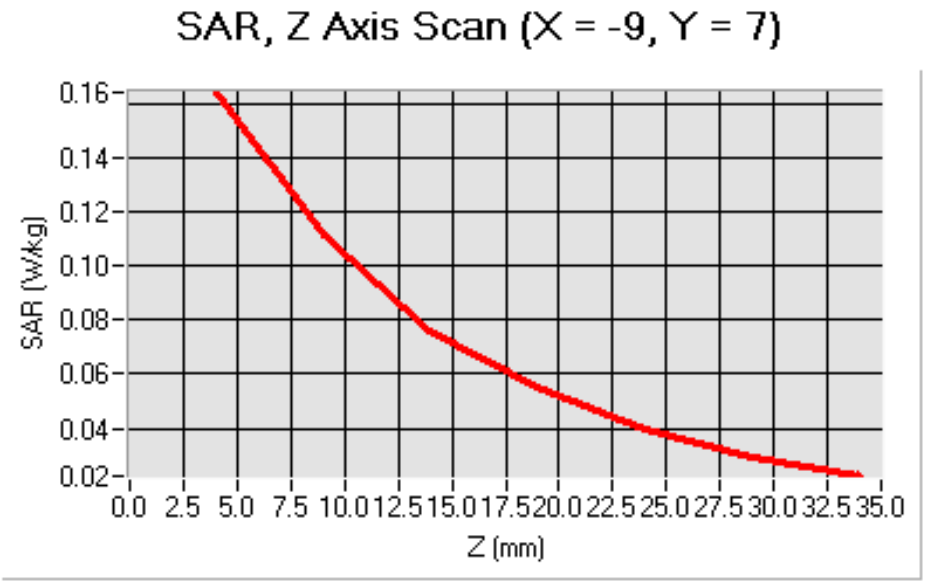


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

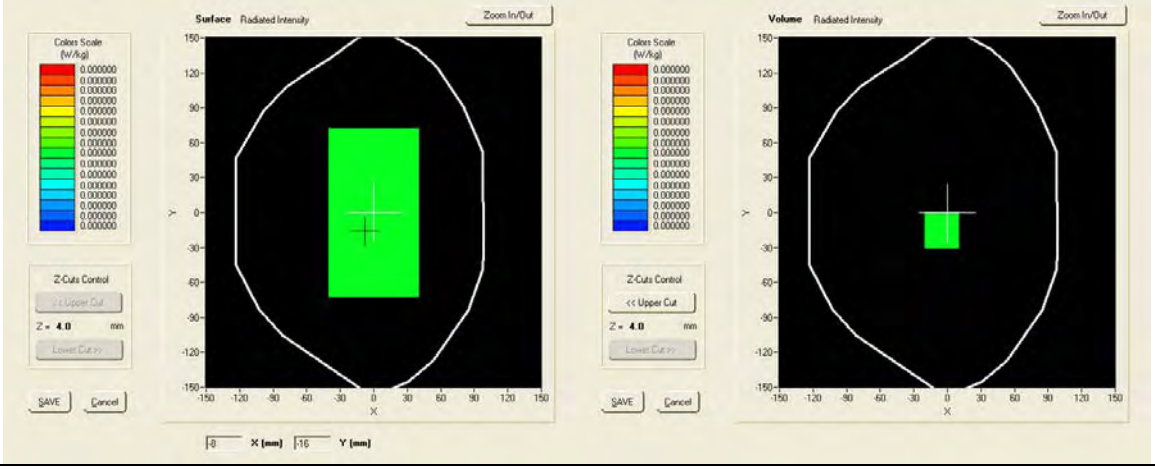
| Frequency (MHz) | 836.400024 (Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 2.200000 |
| SAR 1g (W/Kg) | 0.156331 |
| SURFACE SAR | VOLUME SAR |

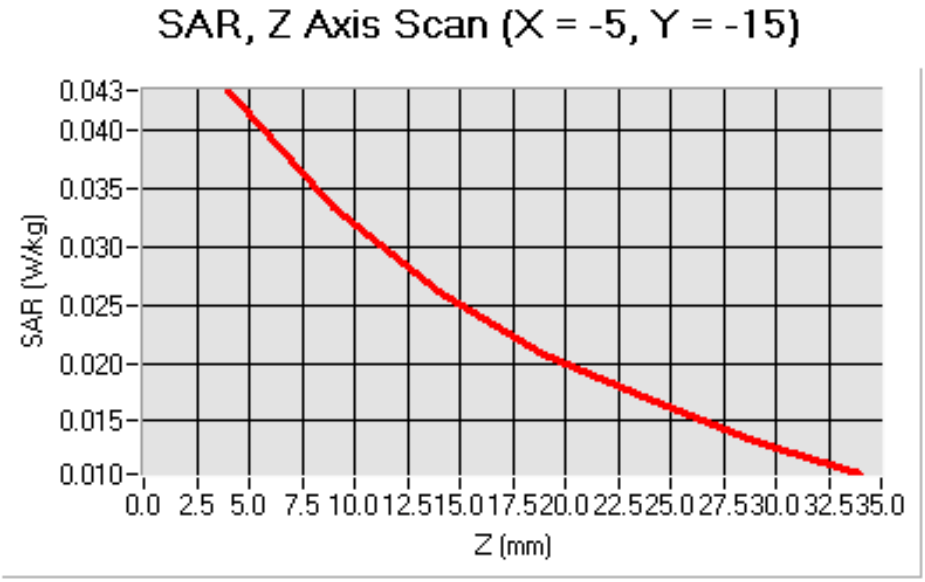


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

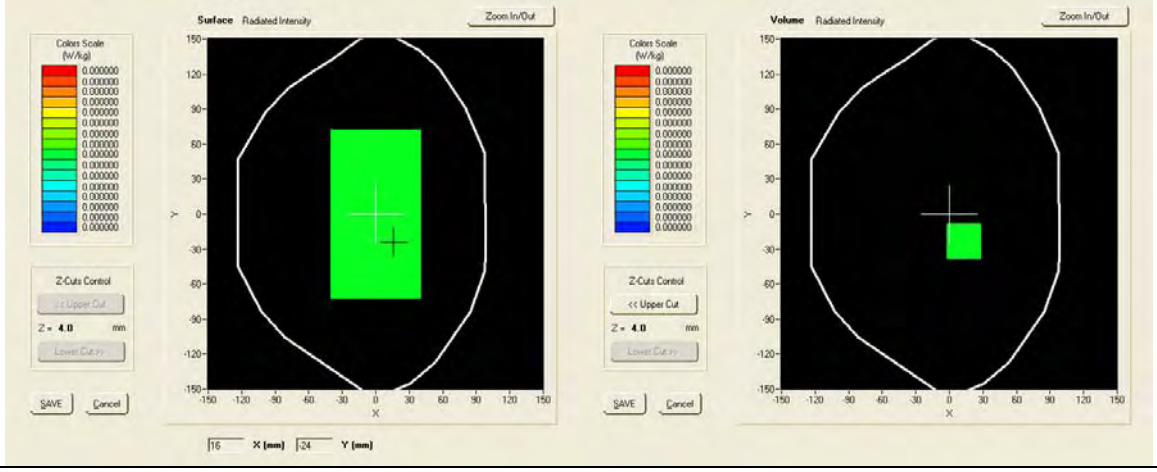
| Frequency (MHz) | 836.400024 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 1.420000 |
| SAR 1g (W/Kg) | 0.042055 |
| SURFACE SAR | VOLUME SAR |

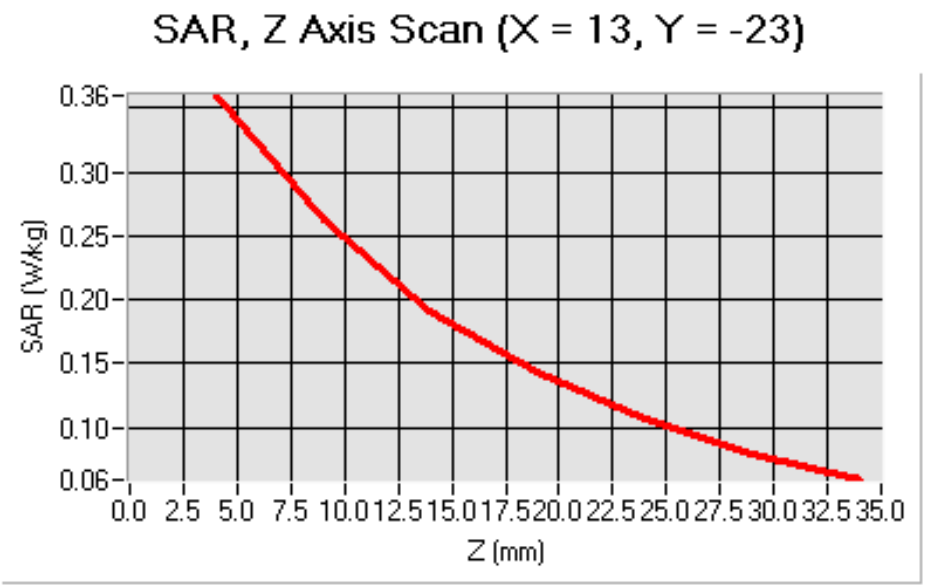


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequencfy (MHz) | 836.400024 (Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 41.500000 |
| Relative permitivity (imaginary part) | 19.400000 |
| Conductivity (S/m) | 0.901453 |
| Variation (%) | 0.830000 |
| SAR 1g (W/Kg) | 0.341298 |
| SURFACE SAR | VOLUME SAR |

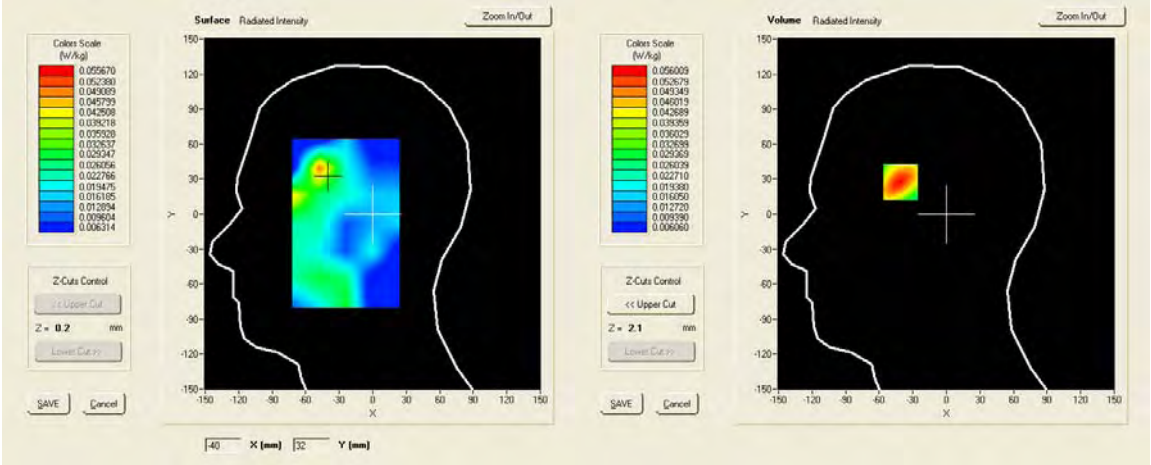


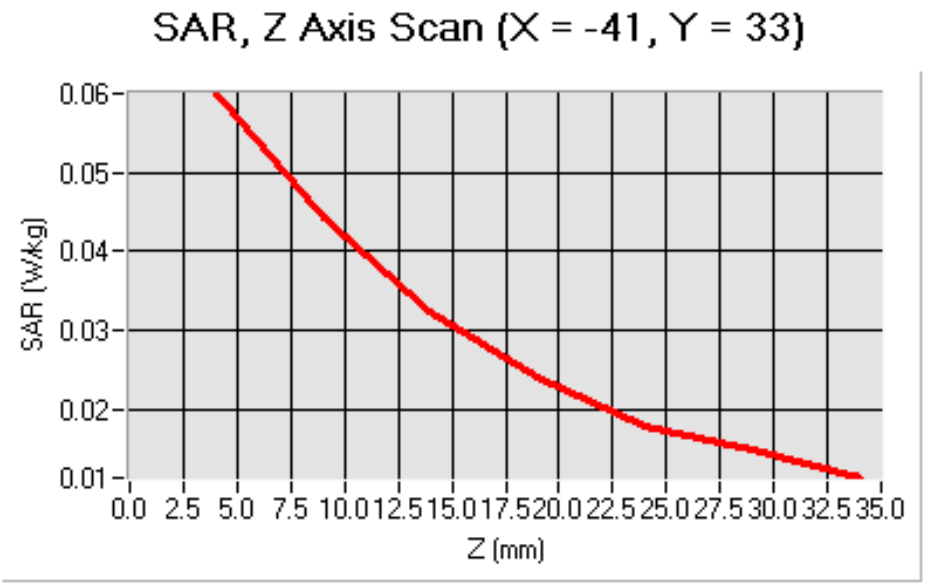



# WCDMA Band IV (1700MHz) Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

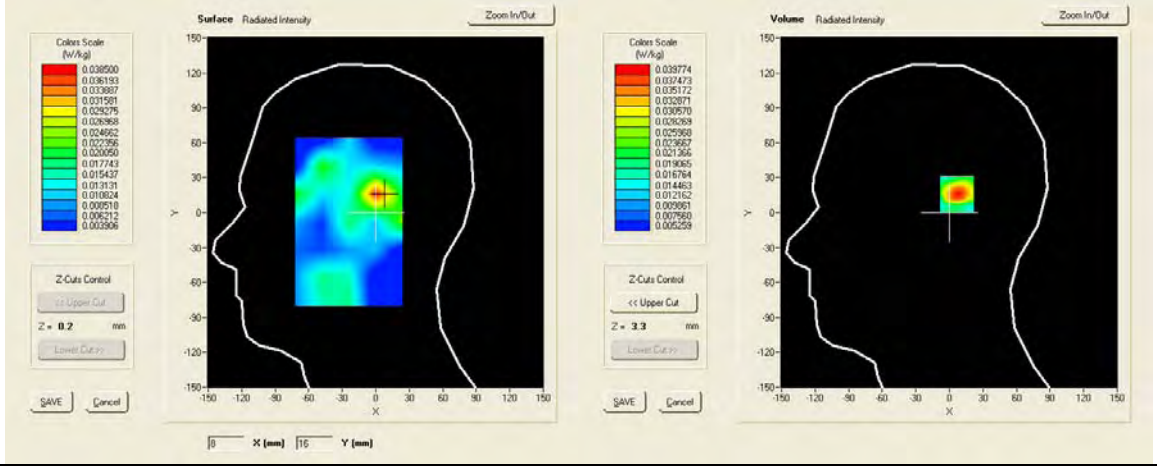
| Frequency (MHz) | 1747.599976 (Right Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 40.074856 |
| Relative permitivity (imaginary part) | 14.134743 |
| Conductivity (S/m) | 1.372326 |
| Variation (%) | -0.310000 |
| SAR 1g (W/Kg) | 0.055473 |
| SURFACE SAR | VOLUME SAR |

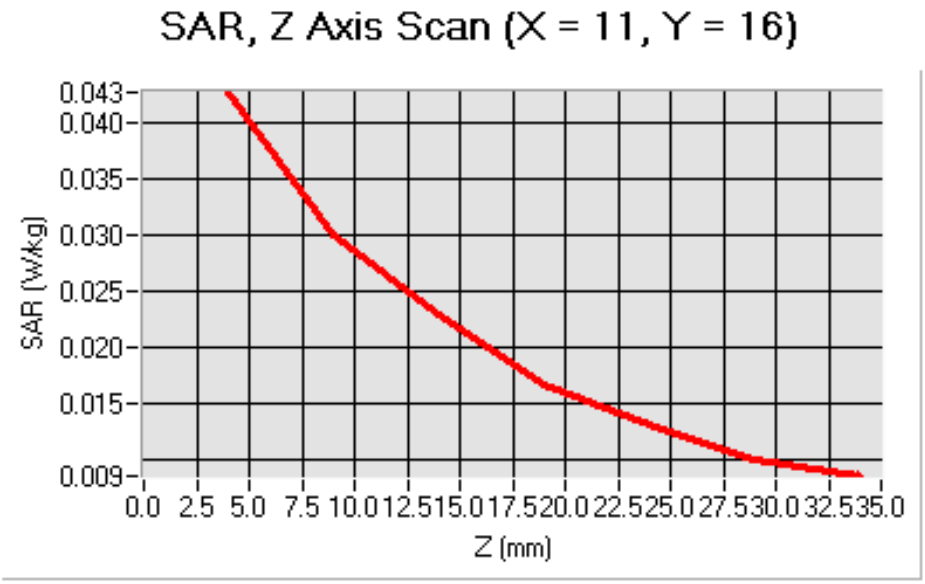


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

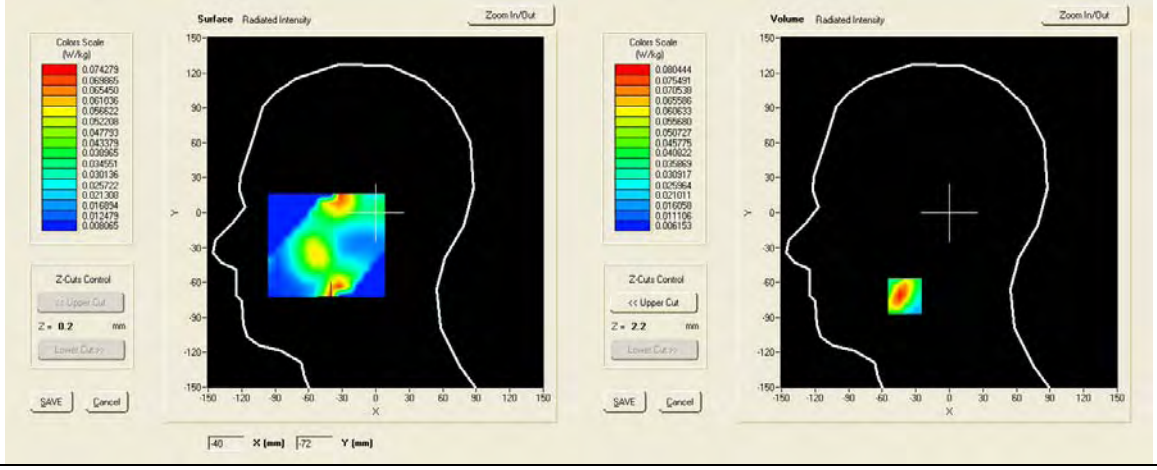
| Frequency (MHz) | 1747.599976<br>(Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 40.074856 |
| Relative permitivity (imaginary part) | 14.134743 |
| Conductivity (S/m) | 1.372326 |
| Variation (%) | -1.190000 |
| SAR 1g (W/Kg) | 0.040294 |
| SURFACE SAR | VOLUME SAR |

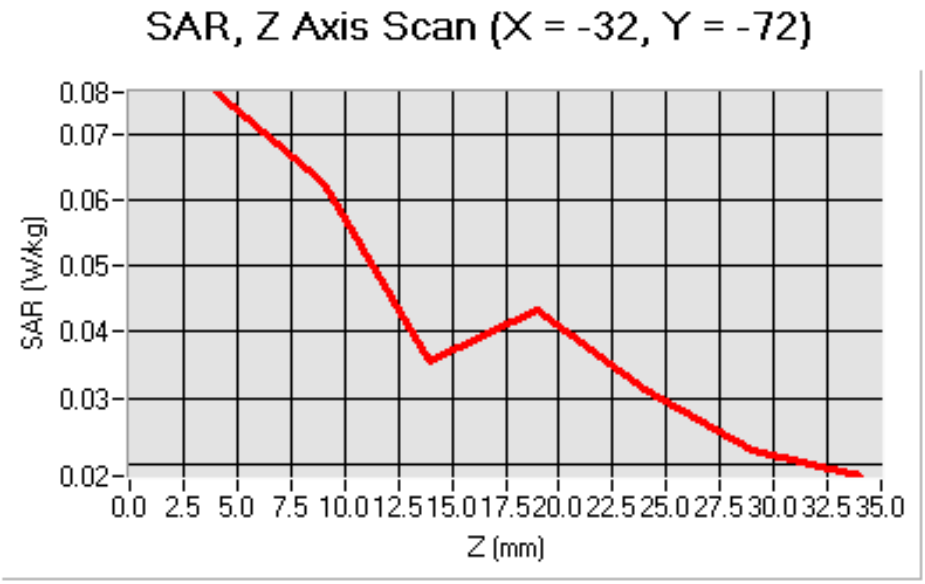


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

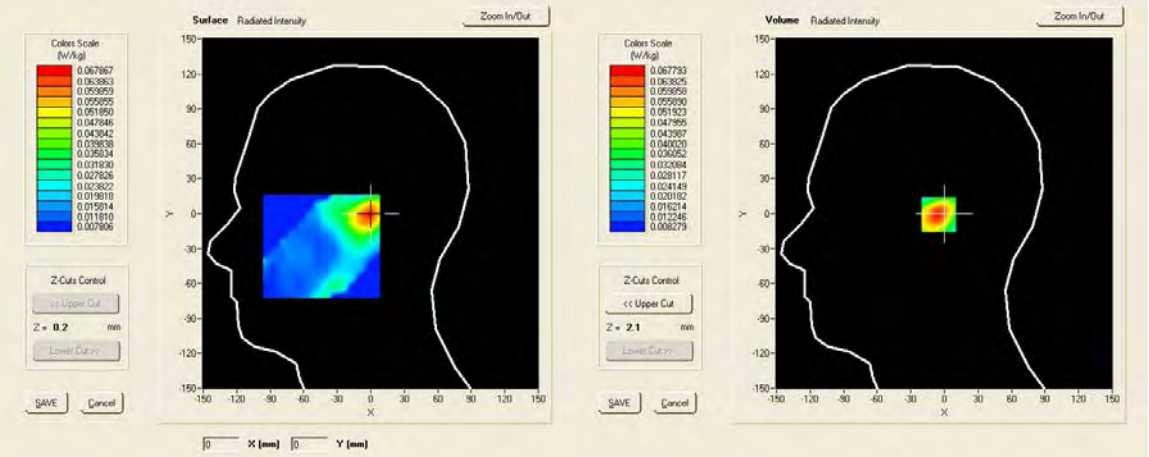
| Frequency (MHz) | 1747.599976 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 40.074856 |
| Relative permitivity (imaginary part) | 14.134743 |
| Conductivity (S/m) | 1.372326 |
| Variation (%) | -1.420000 |
| SAR 1g (W/Kg) | 0.078693 |
| SURFACE SAR | VOLUME SAR |

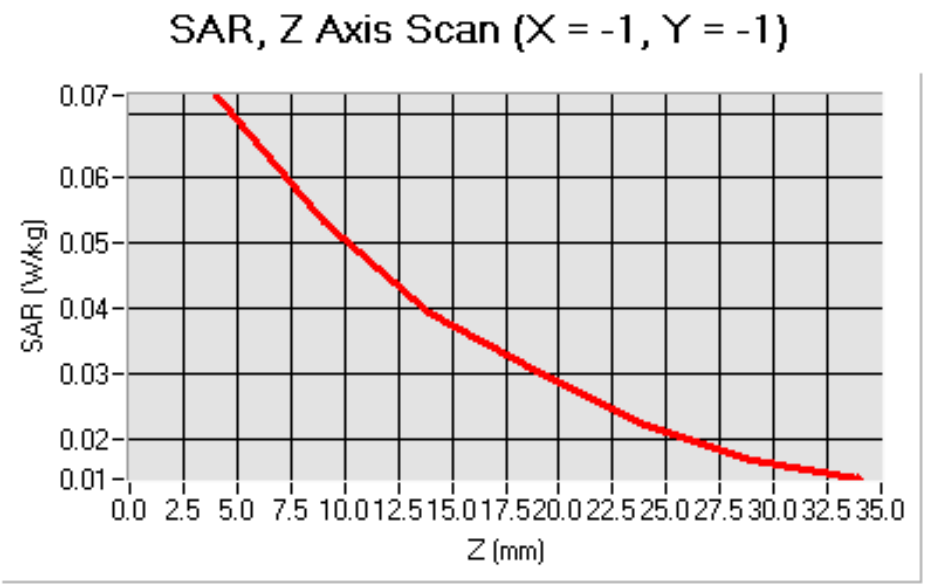


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

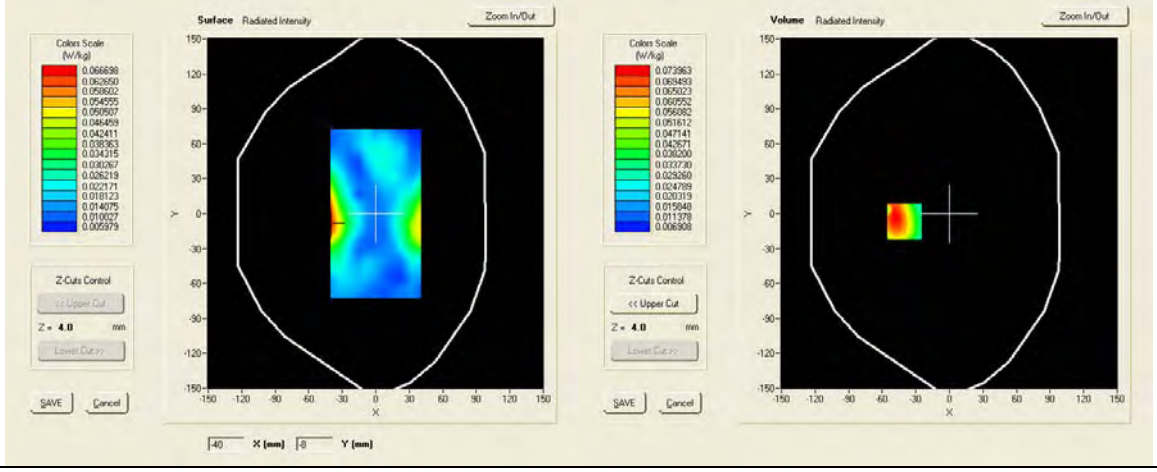
| Frequency (MHz) | 1747.599976 (Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 40.074856 |
| Relative permitivity (imaginary part) | 14.134743 |
| Conductivity (S/m) | 1.372326 |
| Variation (%) | 0.990000 |
| SAR 1g (W/Kg) | 0.068436 |
| SURFACE SAR | VOLUME SAR |

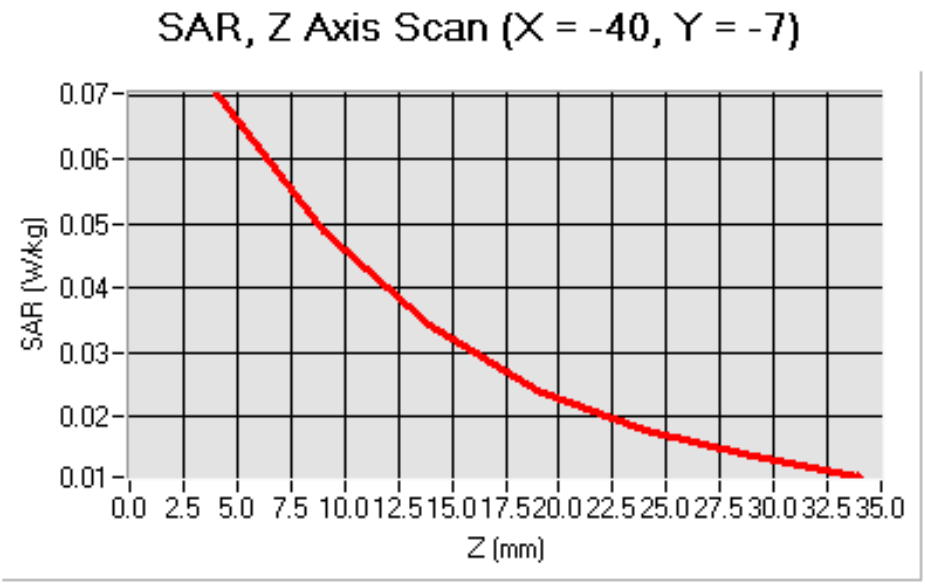


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

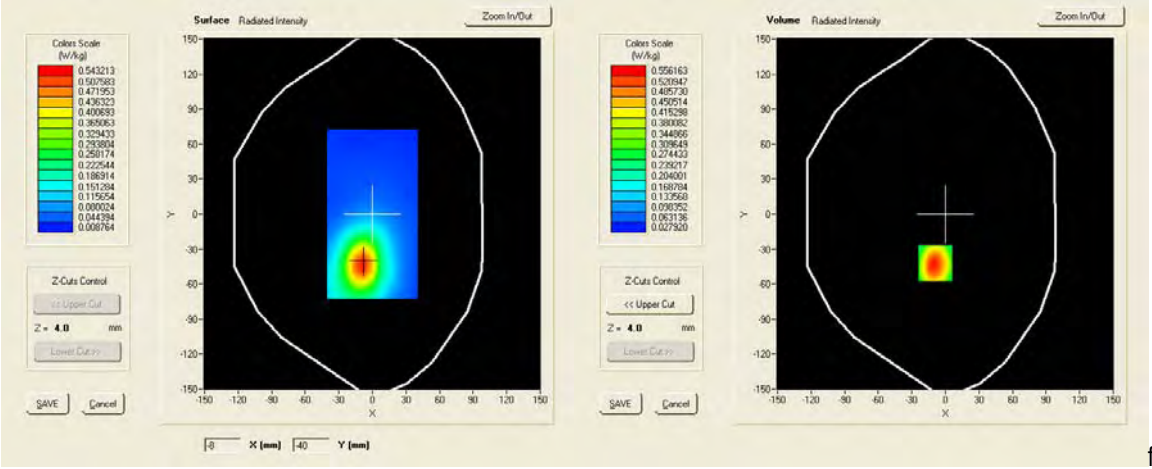
| Frequency (MHz) | 1747.599976 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 40.074856 |
| Relative permitivity (imaginary part) | 14.134743 |
| Conductivity (S/m) | 1.372326 |
| Variation (%) | -2.090000 |
| SAR 1g (W/Kg) | 0.074667 |
| SURFACE SAR | VOLUME SAR |



Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequencfy (MHz) | 1747.599976<br>(Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 40.074856 |
| Relative permitivity (imaginary part) | 14.134743 |
| Conductivity (S/m) | 1.372326 |
| Variation (%) | 0.710000 |
| SAR 1g (W/Kg) | 0.556468 |
| SURFACE SAR | VOLUME SAR |

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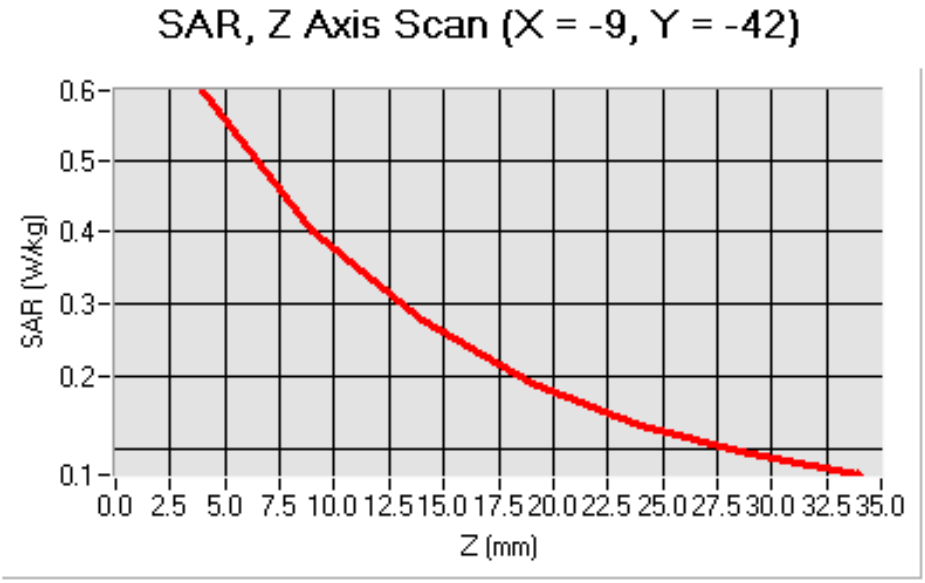
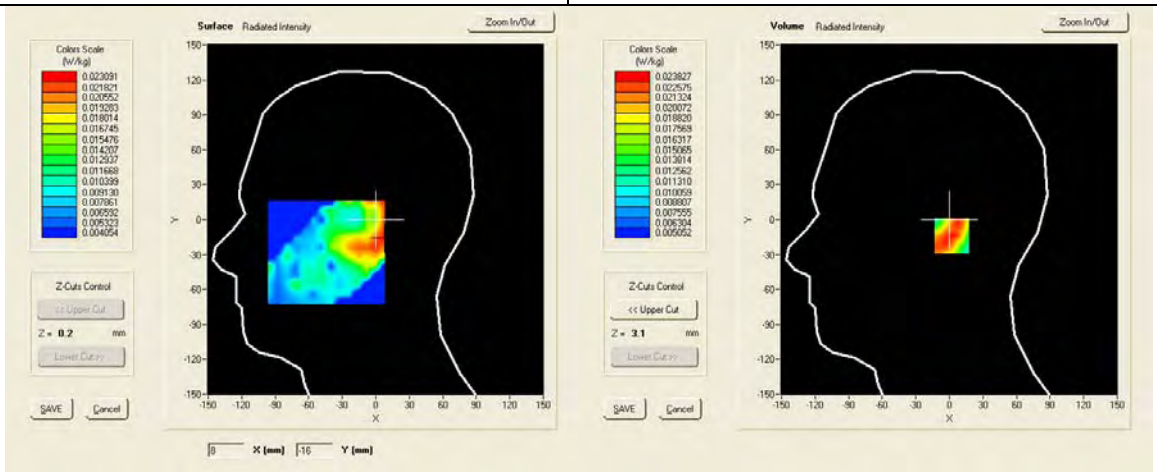
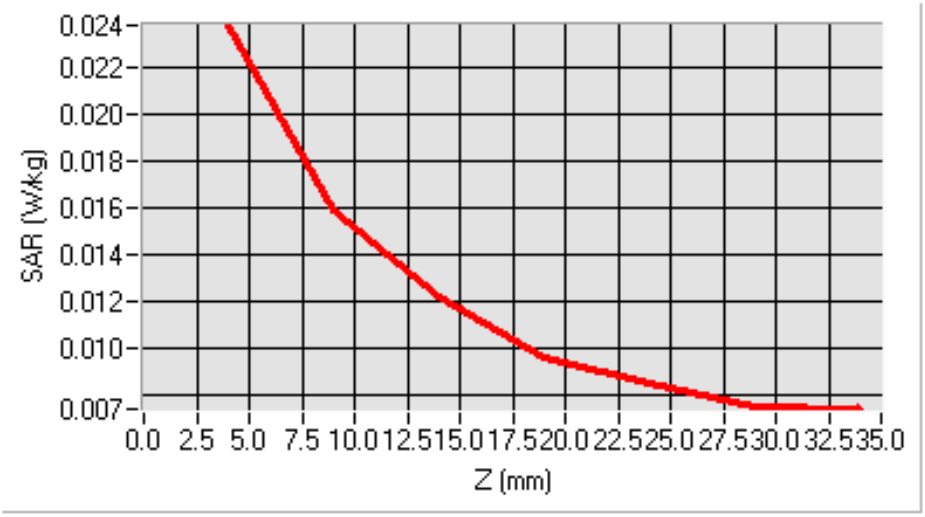


# WLAN 802.11b Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

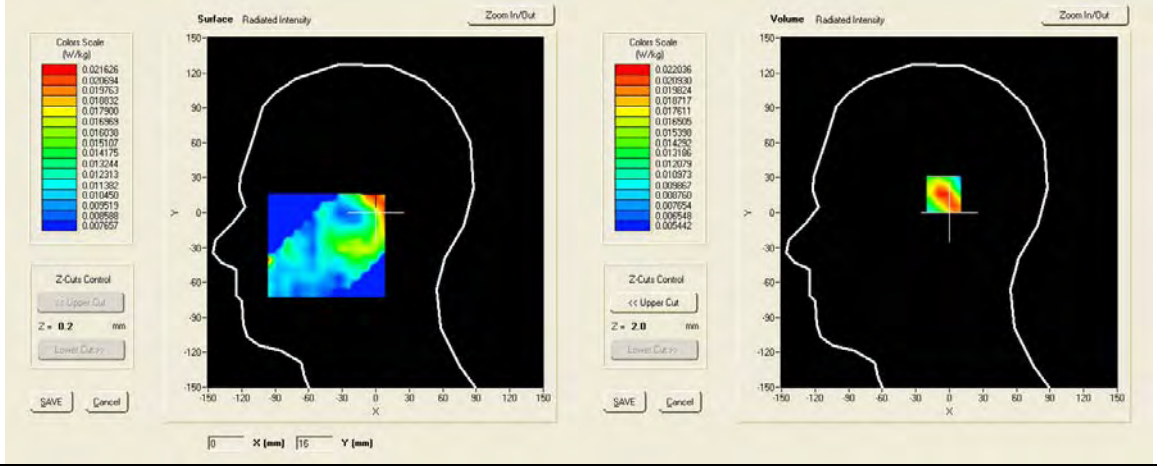
| Frequency (MHz) | 2437.000000 (Right Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | 0.840000 |
| SAR 1g (W/Kg) | 0.022173 |
| SURFACE SAR | VOLUME SAR |

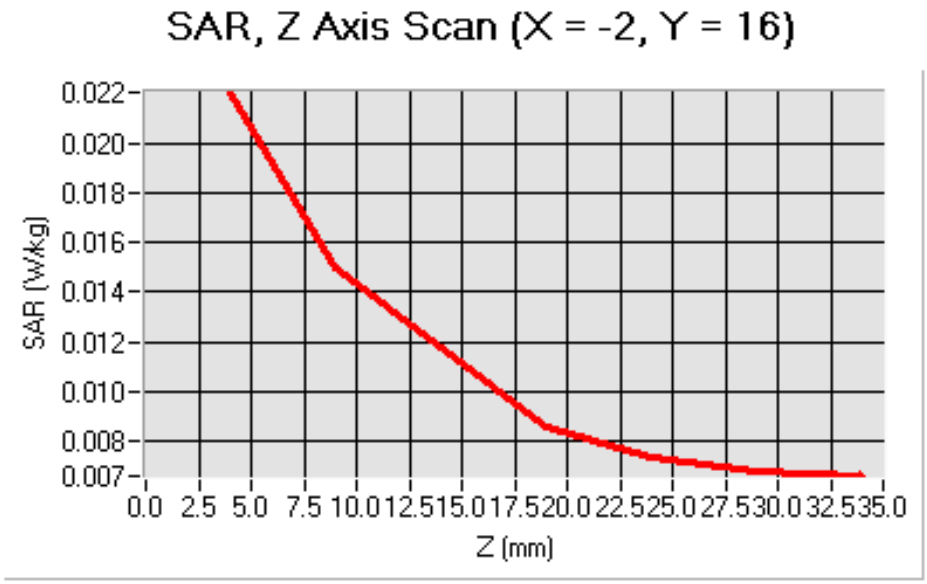


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

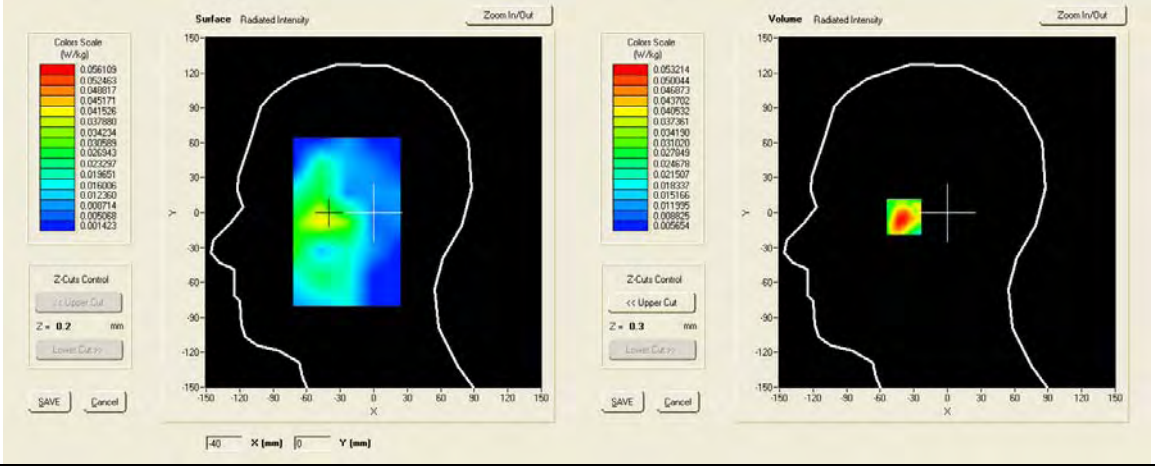
| Frequency (MHz) | 2437.000000<br>(Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | 0.950000 |
| SAR 1g (W/Kg) | 0.020444 |
| SURFACE SAR | VOLUME SAR |

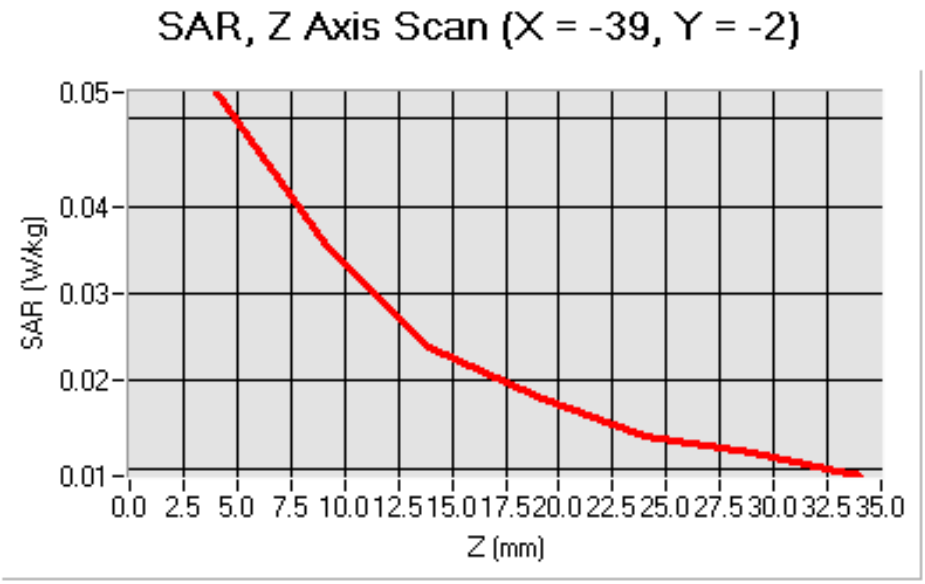


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

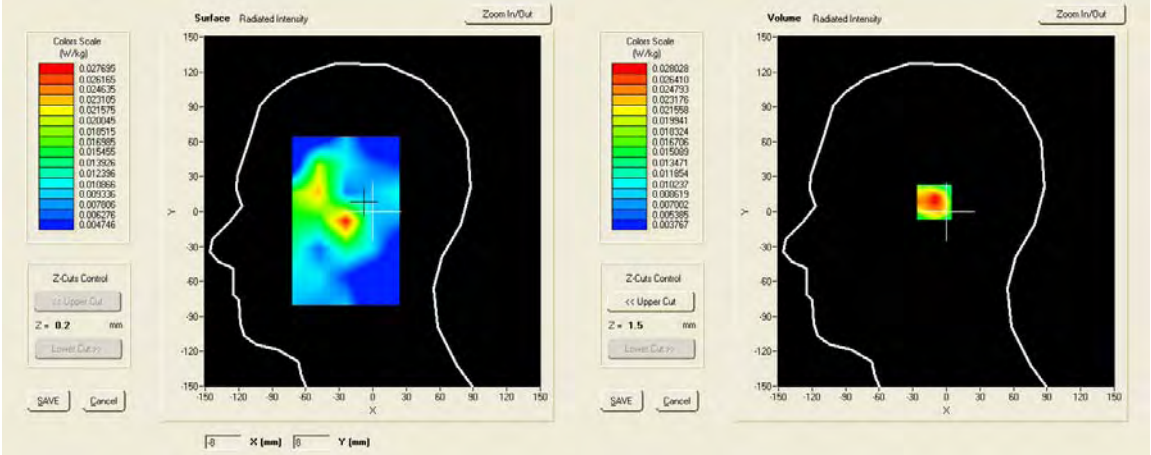
| Frequency (MHz) | 2437.000000 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | -4.380000 |
| SAR 1g (W/Kg) | 0.050186 |
| SURFACE SAR | VOLUME SAR |

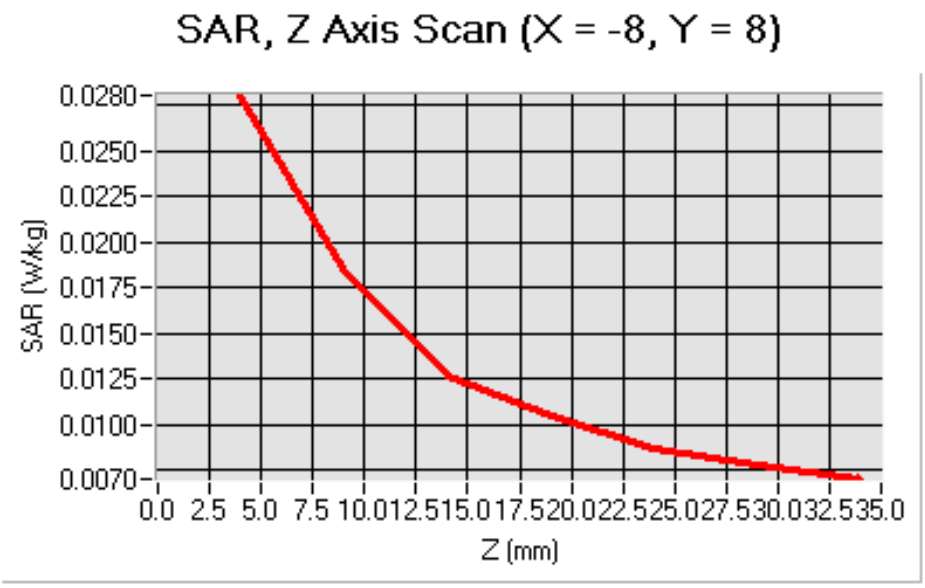


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

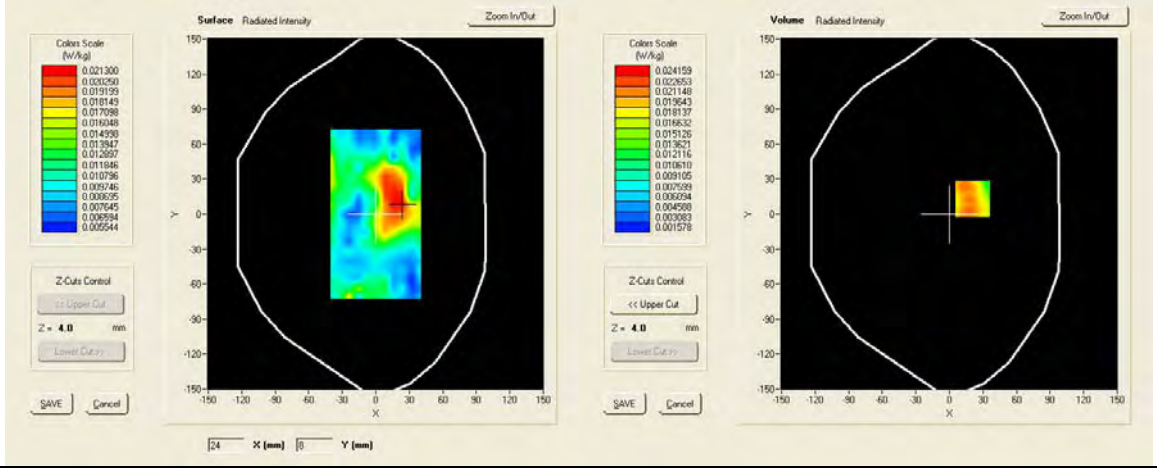
| Frequency (MHz) | 2437.000000 (Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | -1.550000 |
| SAR 1g (W/Kg) | 0.026275 |
| SURFACE SAR | VOLUME SAR |

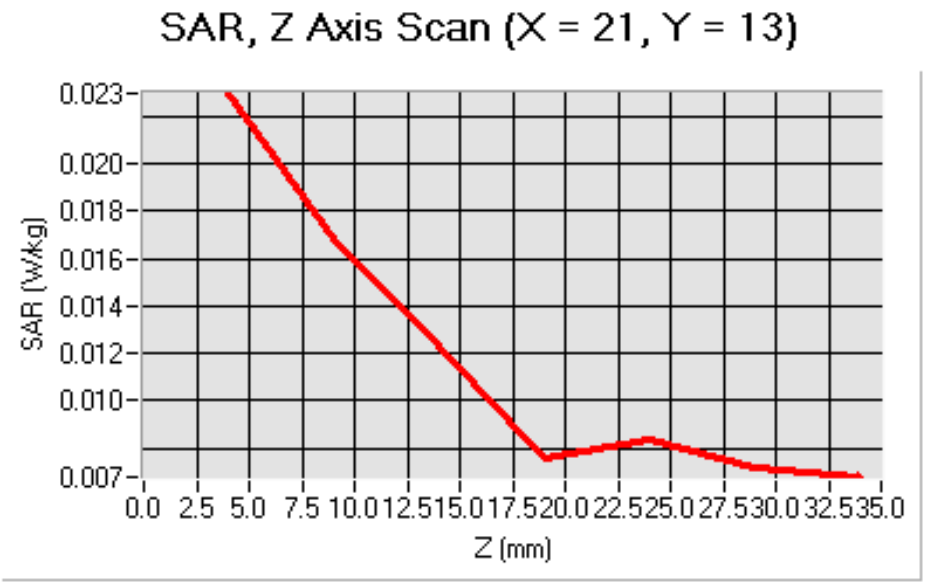


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

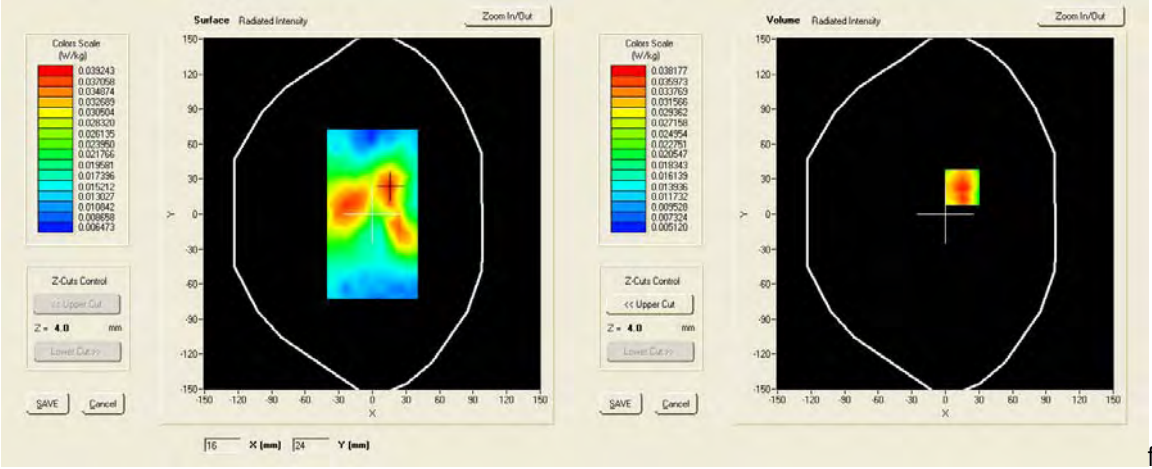
| Frequency (MHz) | 2437.000000 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 52.698727 |
| Relative permitivity (imaginary part) | 14.333727 |
| Conductivity (S/m) | 1.951776 |
| Variation (%) | -3.430000 |
| SAR 1g (W/Kg) | 0.025405 |
| SURFACE SAR | VOLUME SAR |



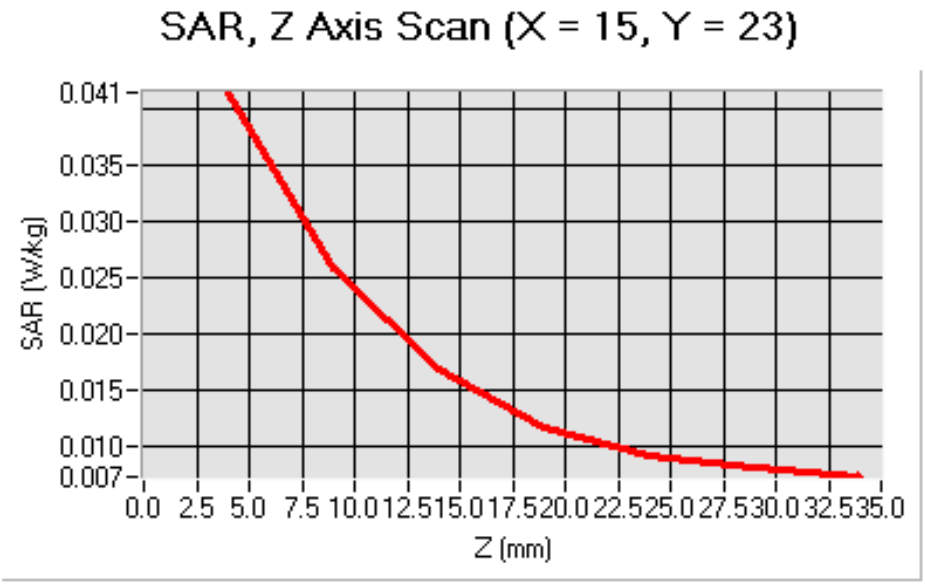



Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequencfy (MHz) | 2437.000000 (Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 52.698727 |
| Relative permitivity (imaginary part) | 14.333727 |
| Conductivity (S/m) | 1.951776 |
| Variation (%) | -3.260000 |
| SAR 1g (W/Kg) | 0.037821 |
| SURFACE SAR | VOLUME SAR |



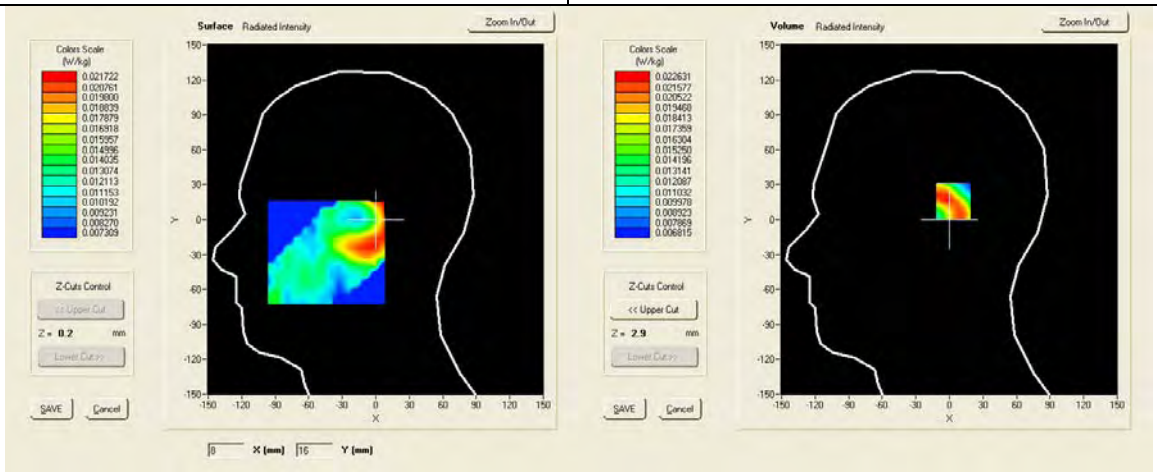

fs

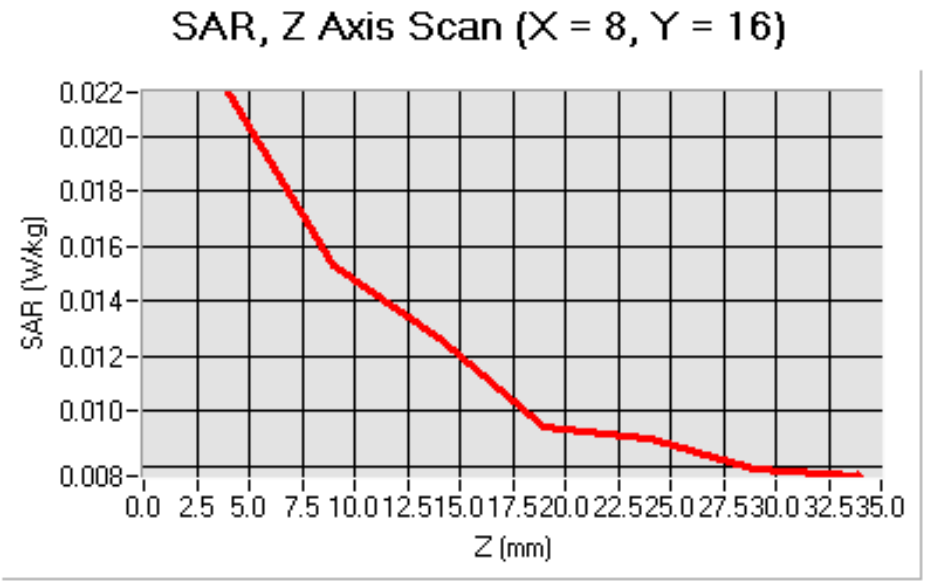


# WLAN 802.11g Mode

Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

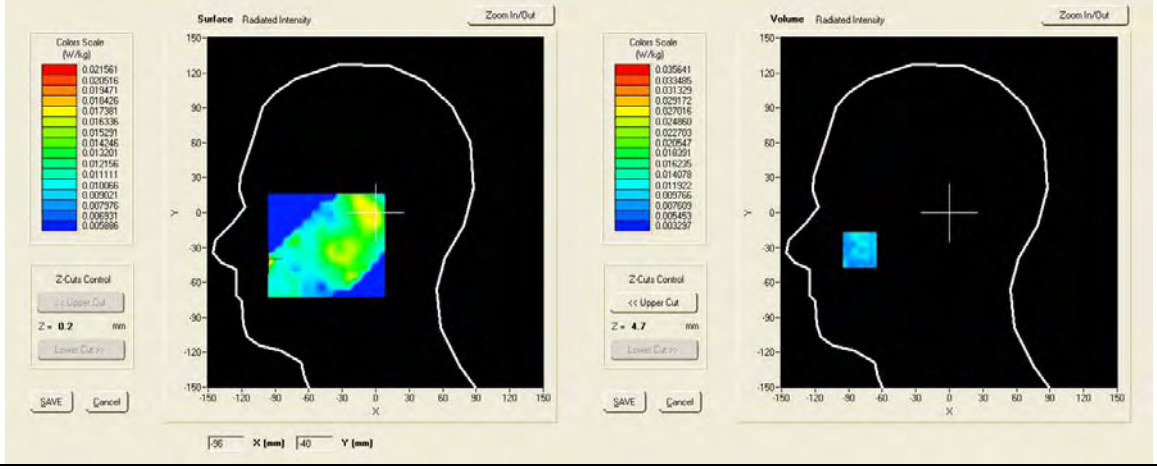
| Frequency (MHz) | 2437.000000 (Right Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | -1.280000 |
| SAR 1g (W/Kg) | 0.021558 |
| SURFACE SAR | VOLUME SAR |

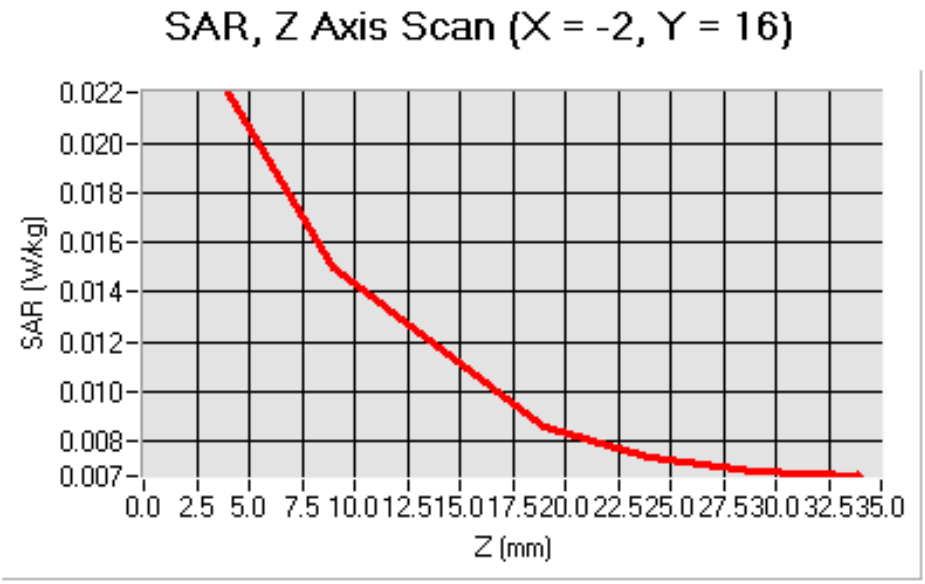


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

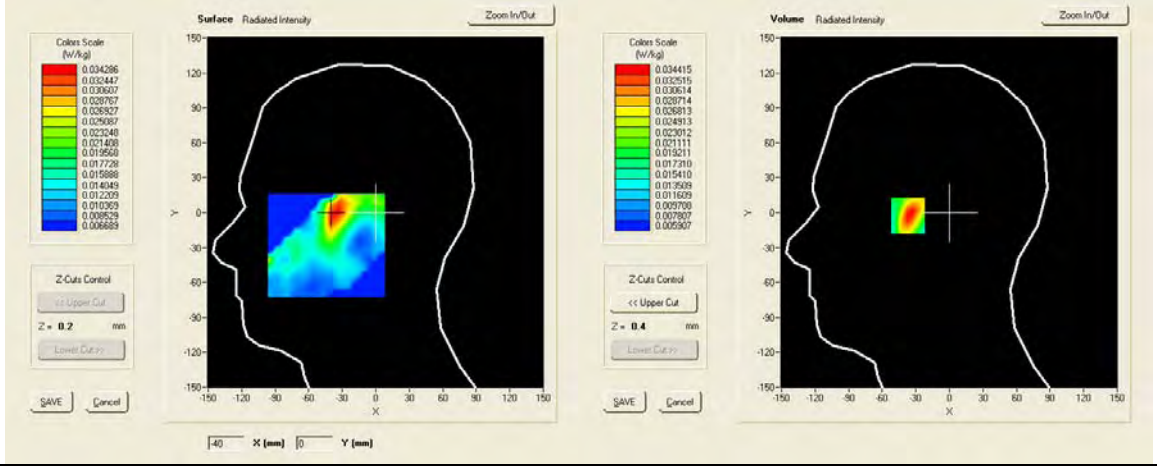
| Frequency (MHz) | 2437.000000 (Right Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | -3.330000 |
| SAR 1g (W/Kg) | 0.011849 |
| SURFACE SAR | VOLUME SAR |

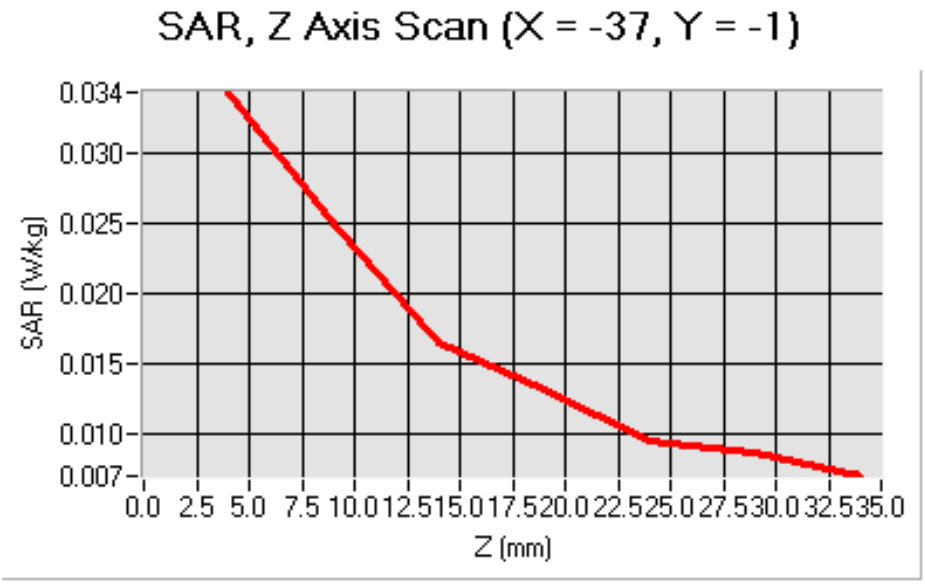


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

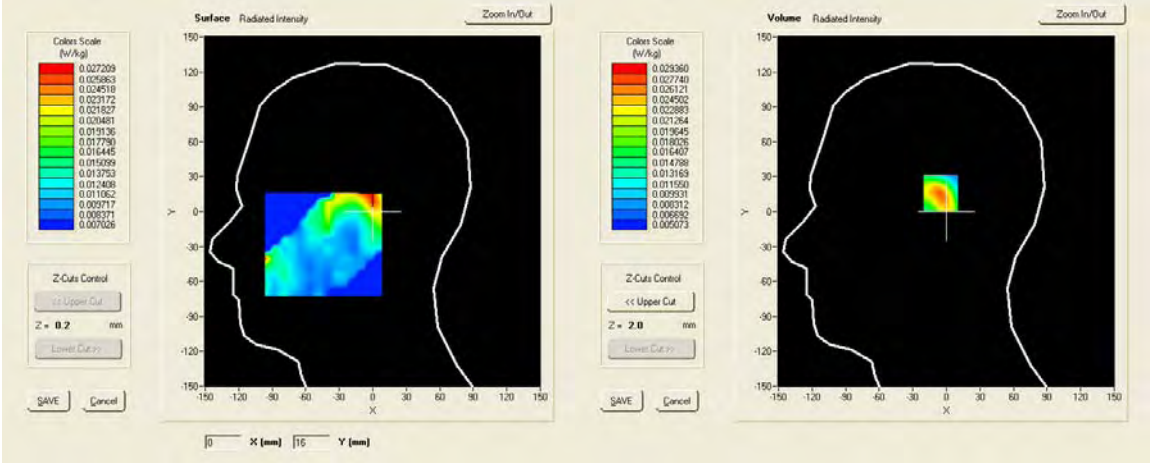
| Frequency (MHz) | 2437.000000 (Left Head , Cheek) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | -3.180000 |
| SAR 1g (W/Kg) | 0.031053 |
| SURFACE SAR | VOLUME SAR |

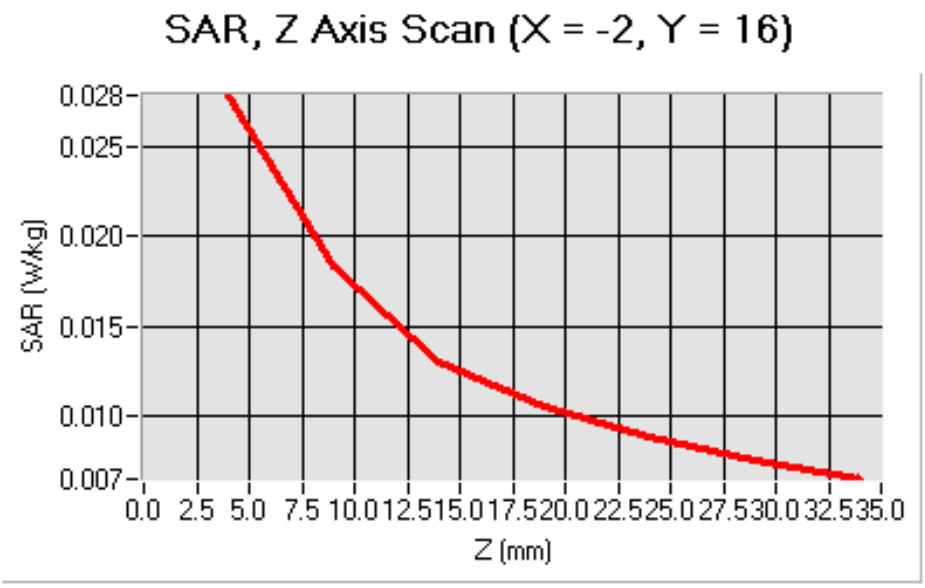


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

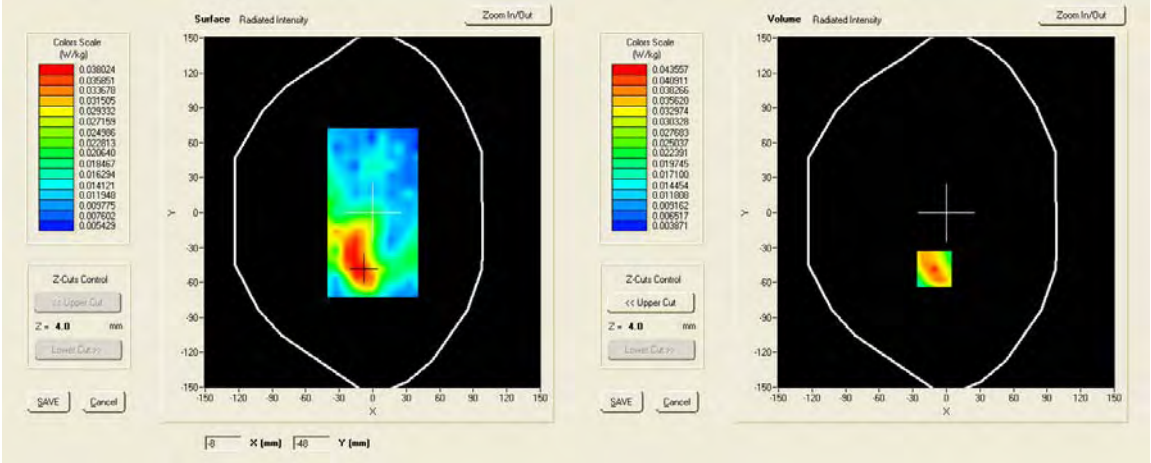
| Frequency (MHz) | 2437.000000 (Left Head , Tilt) |
|---|---|
| Relative permitivity (real part) | 39.198727 |
| Relative permitivity (imaginary part) | 13.222145 |
| Conductivity (S/m) | 1.800415 |
| Variation (%) | -0.680000 |
| SAR 1g (W/Kg) | 0.025997 |
| SURFACE SAR | VOLUME SAR |

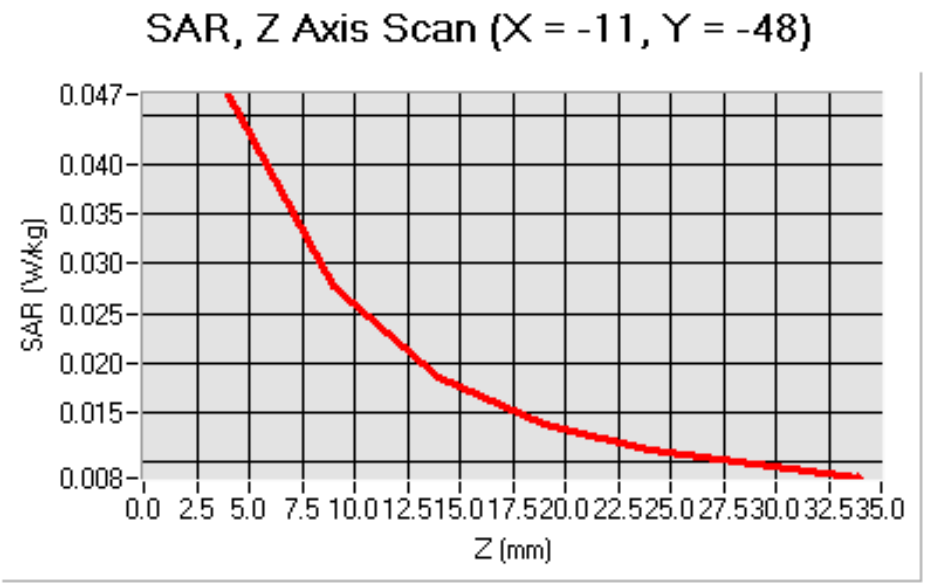


Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

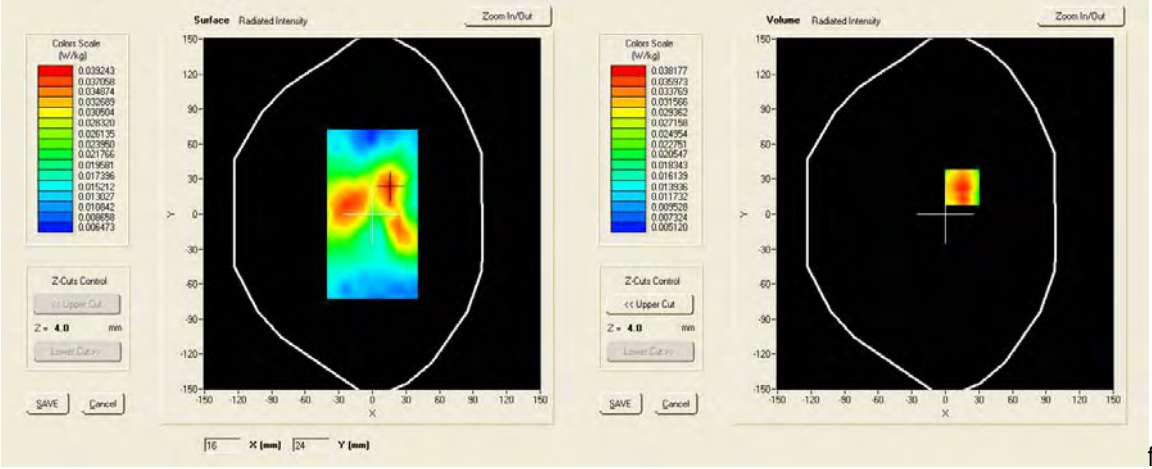
| Frequency (MHz) | 2437.000000 (Body, LCD UP) |
|---|---|
| Relative permitivity (real part) | 52.698727 |
| Relative permitivity (imaginary part) | 14.333727 |
| Conductivity (S/m) | 1.951776 |
| Variation (%) | -2.510000 |
| SAR 1g (W/Kg) | 0.041343 |
| SURFACE SAR | VOLUME SAR |



Product Description : Mobile Computer
Model : 1005CP01
Test Date : Sep 27 2010

| Frequencfy (MHz) | 2437.000000 (Body, LCD DOWN) |
|---|---|
| Relative permitivity (real part) | 52.698727 |
| Relative permitivity (imaginary part) | 14.333727 |
| Conductivity (S/m) | 1.951776 |
| Variation (%) | -3.260000 |
| SAR 1g (W/Kg) | 0.037821 |
| SURFACE SAR | VOLUME SAR |

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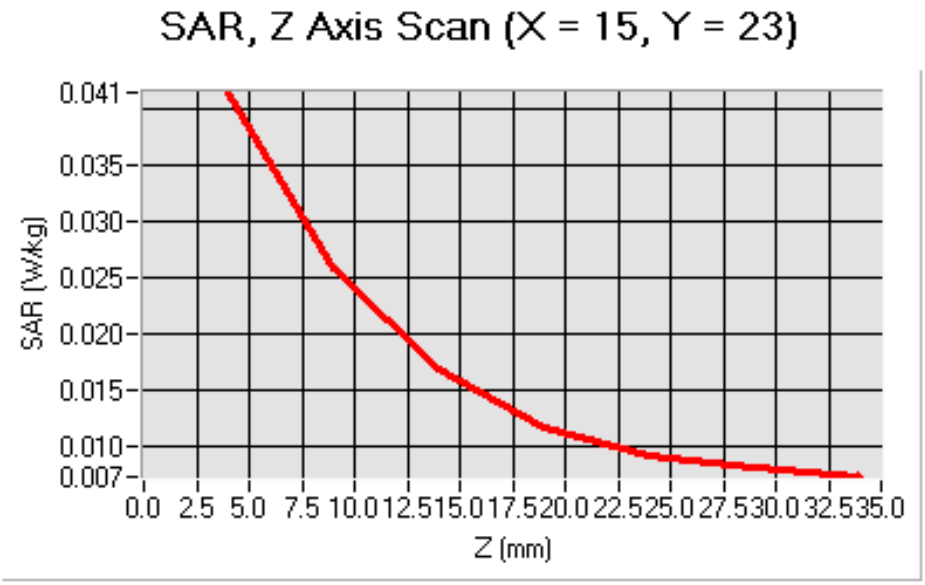

# Annex A. TEST INSTRUMENT & METHOD

## Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

| Name of Equipment | Manufacturer | Type/Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| P C | Compaq | PV 3.06GHz | 375052-AA1 | N/A |
| Signal Generator | Agilent | 8665B-008 | 3744A01304 | 5/17/2011 |
| MultiMeter | Keithley | MiltiMeter 2000 | 1259033 | 08/13/2011 |
| S-Parameter Network Analyzer | Agilent | 8753ES | US38161019 | 08/04/2012 |
| Wireless Communication Test Set | R & S | CMU200 | 111078 | 2/22/2012 |
| Power Meter | HP | 437B | 3038A03648 | 5/17/2011 |
| E-field PROBE | SATIMO | EPG111 | SN31-10 EPG111 | 08/04/2011 |
| DIPOLE 900 | SATIMO | DIPOLE 900MHz | SN 31/10 DIPD134 | 08/04/2011 |
| DIPOLE 1800 | SATIMO | DIPOLE 1800MHz | SN 31/10 DIPF135 | 08/04/2011 |
| Dipole 835 | SATIMO | Dipole 835MHz | SN 31/10 DIPC133 | 08/04/2011 |
| DIPOLE 1900 | SATIMO | DIPOLE 1900MHz | SN 31/10 DIPG136 | 08/04/2011 |
| DIPOLE 2000 | SATIMO | DIPOLE 2000MHz | SN 31/10 DIPI137 | 08/04/2011 |
| DIPOLE 2450 | SATIMO | DIPOLE 2450MHz | SN 31/10 DIPJ138 | 08/04/2011 |
| DIPOLE 3500 | SATIMO | DIPOLE 3500MHz | SN 31/10 DIPL139 | 08/04/2011 |
| WaveGuide 5/6 GHz | SATIMO | Wave Guide 5/6GHz | SN 31/10 DIPWGA13 | 08/04/2011 |
| COMOHAC E-Field Probe | SATIMO | EPH25 | SN 3110 EPH25 | 08/04/2011 |
| COMOHAC H-Field Probe | SATIMO | HPH38 | SN 3110 HPH38 | 08/04/2011 |
| COMOSAR Open Coaxial Probe | SATIMO | OCP36 | SN 31/10 OCP36 | 08/04/2012 |
| T-Coil Probe | SATIMO | TCP17 | SN 31/10 TCP17 | 08/04/2011 |
| Communication Antenna | SATIMO | ANTA30 | SN 31/10 ANTA30 | N/A |
| Laptop POSITIONING DEVICE | SATIMO | LSH63 | SN 31/10 LSH13 | N/A |
| Mobile Phone POSITIONING DEVICE | SATIMO | MSH63 | SN 31/10 MSH63 | N/A |
| COMOHAC Broadband Dipole 800-950 | SATIMO | COMOHAC Broadband Dipole 800-950MHz | SN 31/10 DHA25 | 08/04/2012 |
| COMOHAC Broadband Dipole 1700-2000 | SATIMO | COMOHAC Broadband Dipole 1700-2000MHz | SN 31/10 DHB26 | 08/04/2012 |
| COMOHAC TELEPHONE MAGNETIC FIELD SIMULATOR | SATIMO | TMFS08 | SN 31/10 TMFS08 | 08/04/2012 |
| DUMMY PROBE | ANTENNESSA | None | SN 31/10 | N/A |

| | | | | |
|---|---|---|---|---|
| SAM PHANTOM | SATIMO | SAM77 | SN 31/10 SAM77 | N/A |
| Elliptic Phantom | SATIMO | ELLI17 | SN 31-10 ELLI17 | N/A |
| PHANTOM TABLE | SATIMO | N/A | N/A | N/A |
| 6 AXIS ROBOT | KUKA | KR5 | 949319 | N/A |
| High Power Solid State Amplifier (80MHz~1000MHz) | Instruments for Industry | CMC150 | M631-0408 | N/A |
| Medium Power Solid State Amplifier (0.8~4.2GHz) | Instruments for Industry | S41-25 | M629-0408 | N/A |
| Wave Tube Amplifier 4-8 GHz at 20Watt | Hughes Aircraft Company | 1277H02F000 | 81 | N/A |

# Annex B EUT AND TEST SETUP PHOTOGRAPHS

# Annex C CALIBRATION REPORTS

| COMOSAR E-Field probe Calibration Report | SATIMO The microwave vision company | | |
|---|---|---|---|
| | Ref: CR.216.1.10.SATB.A | | |
| | Page: 1/25 | Issue: A | Date: 2010/08/04 |

# COMOSAR E-FIELD PROBE CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: SAR TEST BENCH

Prepared For (End User): SIEMIC, INC.

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| COMOSAR E-Field probe Calibration Report | SATIMO | | |
|---|---|---|---|
| | Ref: CR.216.1.10.SATB.A | | |
| | Page: 2/25 | Issue: A | Date: 2010/08/04 |

**COMOSAR SEPT ISOTROPIC E-FIELD PROBE CALIBRATION REPORT**

**DATE**: 15/09/2010

**OBJECT**: COMOSAR SEPT ISOTROPIC E-FIELD PROBE

**MANUFACTURER**: SATIMO

**SERIAL NUMBER**: SN 31/10 EPG111

**CUSTOMER**: SIEMIC, INC.

**CONTRACT**: PO1007001

**DATE OF CALIBRATION**: 04/08/2010

**WARRANTY:**

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Date

09-09-10

SAR TEAM MANAGER

SATIMO
2105 Barrett Park Dr., Suite 104
Kennesaw, GA - USA
Tel: +1 678 797 9172
Fax: +1 678 797 9173
www.satimo.com

| COMOSAR E-Field probe Calibration Report | SATIMO | | |
|---|---|---|---|
| | Ref: CR.216.1.10.SATB.A | | |
| | Page: 3/25 | Issue: A | Date: 2010/08/04 |

## PRODUCT DESCRIPTION

| | |
|---|---|
| Frequency Range | 100 MHz - 30 GHz |
| Probe length | 330 mm |
| Length of one dipole | 2.0 mm |
| Maximum external diameter | 8 mm |
| Probe extremity diameter | 2.8 mm |
| Distance between dipoles/probe extremity | < 1.5 mm |
| Resistance of the three dipole (at the connector) | Dipole 1: R1=0.291 MΩ<br>Dipole 2: R2=0.223 MΩ<br>Dipole 3: R3=0.303 MΩ |
| Diode Compression Point | Dipole 1: DCP1=121 mV<br>Dipole 2: DCP2=119 mV<br>Dipole 3: DCP3=116 mV |

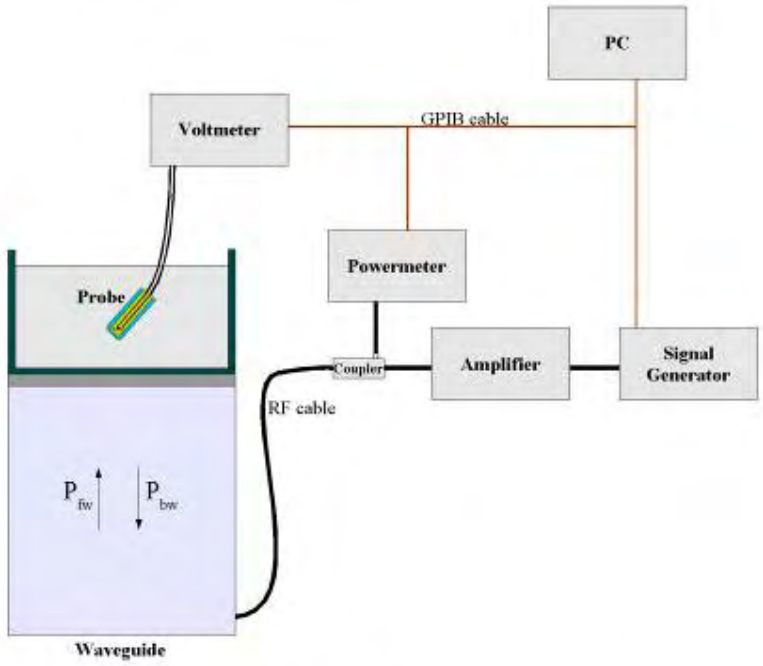
The probe could be checked by measuring the resistance of the three dipoles.

## CALIBRATION TEST EQUIPMENT

| TYPE | IDENTIFICATION | DATE OF CALIBRATION |
|---|---|---|
| Calibration bench | CALISAR CALIBRATION SYSTEM V2.0 | |
| Multimeter | Keithley (2000, SN: 1000572) | Date of calibration: 01-07-2009 |

## MEASUREMENT PROCEDURE

Probe calibration is realized, in compliance with CENELEC EN 50361 and IEEE 1528 std, with CALISAR, SATIMO proprietary calibration system. The calibration is performed with the EN 50361 annexe technique using reference guide at the five frequencies.




$$SAR = \frac{4\left(P_{fw} - P_{bw}\right)}{ab\delta}\cos^2\left(\pi\frac{y}{a}\right)e^{-(2z/\delta)}$$

Where :

$P_{fw}$ = Forward Power
$P_{bw}$ = Backward Power
a and b = Waveguide dimensions
= Skin depth

*Keithley configuration:*

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO

*After each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.*

| COMOSAR E-Field probe Calibration Report | SATIMO | | |
|---|---|---|---|
| | Ref: CR.216.1.10.SATB.A | | |
| | Page: 5/25 | Issue: A | Date: 2010/08/04 |

PROBE UNCERTAINTIES

## Calibration report of dosimetric SATIMO probe

### Uncertainty on calibration system

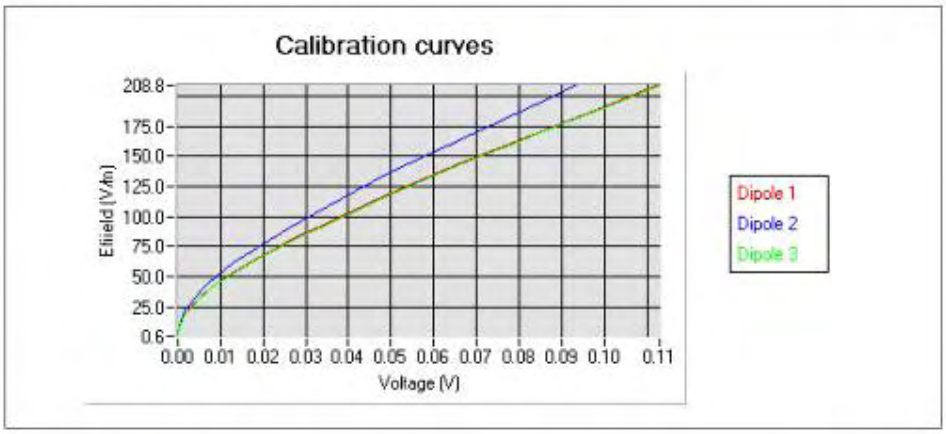
| ERROR SOURCES | Uncertainty value (%) | Probability Distribution | Divisor | ci | Standard Uncertainty (%) |
|---|---|---|---|---|---|
| Incident or forward power | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| Reflected power | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| Liquid conductivity | 5,00% | Rectangular | $\sqrt{3}$ | 1 | 2,887% |
| Liquid permittivity | 4,00% | Rectangular | $\sqrt{3}$ | 1 | 2,309% |
| Field homogeneity | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| Field probe positioning | 5,00% | Rectangular | $\sqrt{3}$ | 1 | 2,887% |
| Field probe linearity | 3,00% | Rectangular | $\sqrt{3}$ | 1 | 1,732% |
| **Combined standard uncertainty** | | | | | 4,761% |
| **Expanded uncertainty** (confidence interval of 95%) | | | | | 9,331% |

# 1. Calibration at 835.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 850 |
| Epsilon | 41.44 |
| Sigma | 0.90 S/m |
| Temperature | 21 °C |
| Cable loss | 0.10 dB |
| Coupler loss | 20.50 dB |
| Waveguide S11 | -20.90 dB |
| Low limit detection | 0.75 V/m (0.51 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

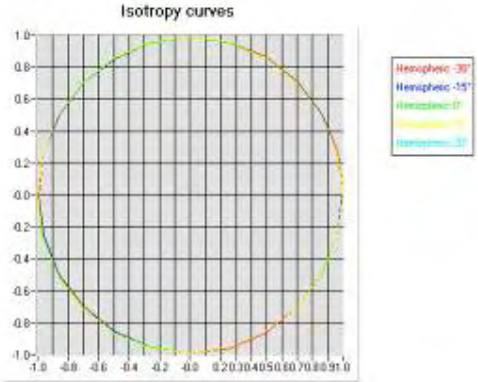
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

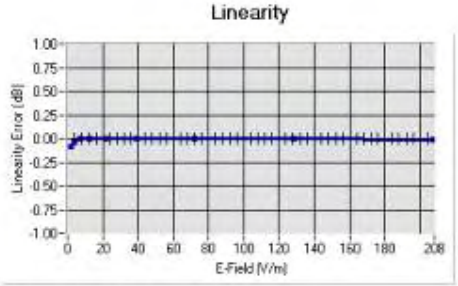
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 41.44 | 0.90 | 168.8 | 225.03 | 167.83 |
| Body | 53.21 | 0.98 | 181.88 | 242.53 | 180.89 |

## B. Isotropy.

- Axial isotropy: 0.03 dB
- Hemispherical isotropy: 0.03 dB




## C. Linearity.



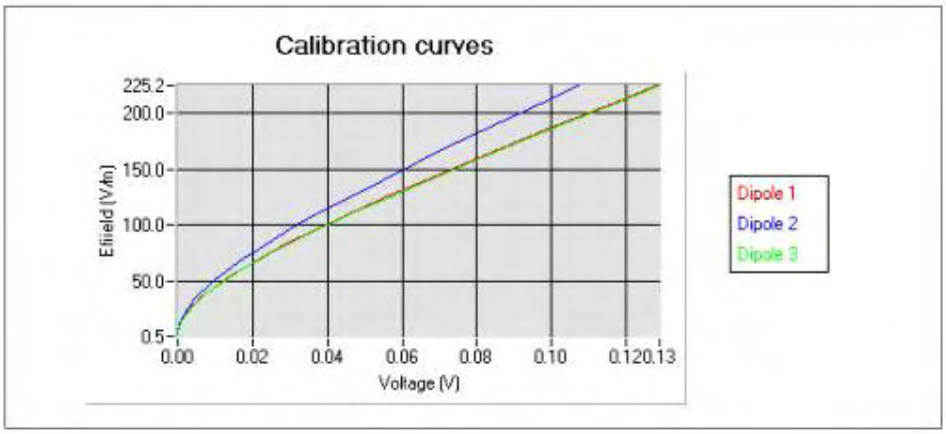

Linearity:0+/-2.00% (+/-0.09dB)

# 2. Calibration at 897.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 900 |
| Epsilon | 40.99 |
| Sigma | 0.99 S/m |
| Temperature | 21 °C |
| Cable loss | 0.10 dB |
| Coupler loss | 20.27 dB |
| Waveguide S11 | -12.70 dB |
| Low limit detection | 0.78 V/m (0.60 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

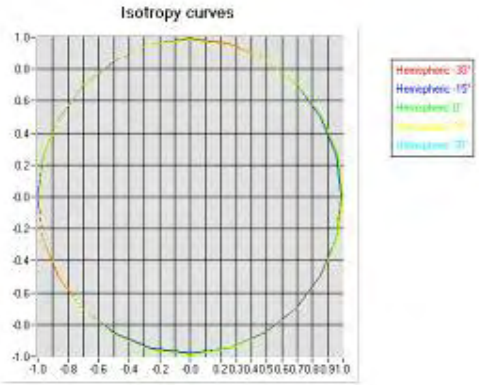
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

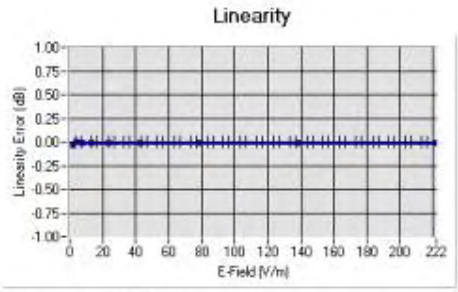
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 40.99 | 0.99 | 173.98 | 227.41 | 169.94 |
| Body | 52.68 | 1.04 | 182.79 | 238.90 | 178.51 |

## B. Isotropy.

- Axial isotropy: 0.03 dB
- Hemispherical isotropy: 0.04 dB




## C. Linearity.



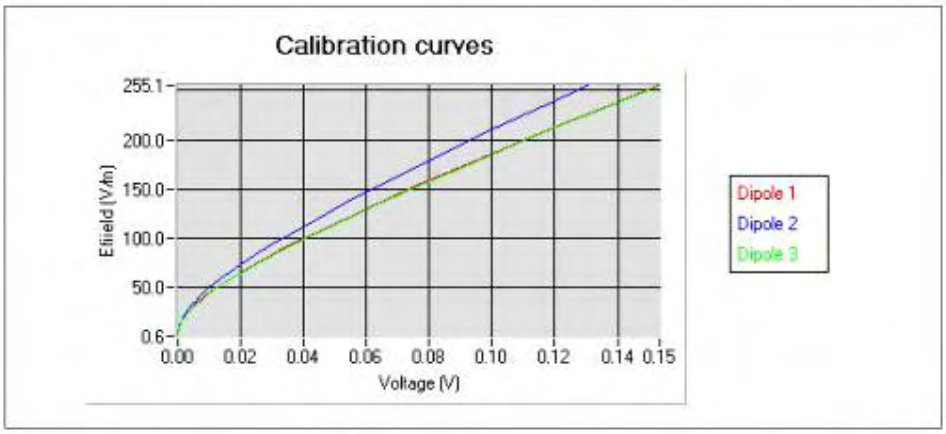

Linearity:[]+/-0.92% (+/-0.04dB)

# 3. Calibration at 1747.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 1800 |
| Epsilon | 39.55 |
| Sigma | 1.42 S/m |
| Temperature | 21°C |
| Cable loss | 0.14 dB |
| Coupler loss | 20.18 dB |
| Waveguide S11 | -12.70 dB |
| Low limit detection | 0.85 V/m (1.02 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

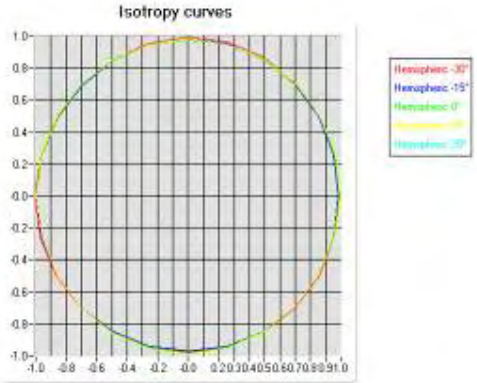
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

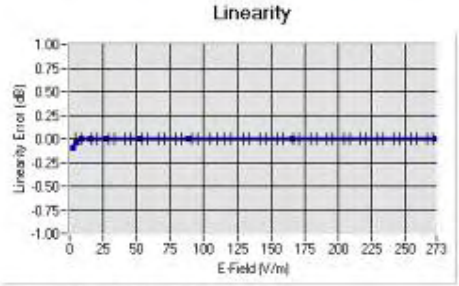
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 39.55 | 1.42 | 255.29 | 323.02 | 243.31 |
| Body | 53.55 | 1.51 | 270 .69 | 339.85 | 258.45 |

## B. Isotropy.

- Axial isotropy: 0.05 dB
- Hemispherical isotropy: 0.06 dB




## C. Linearity.



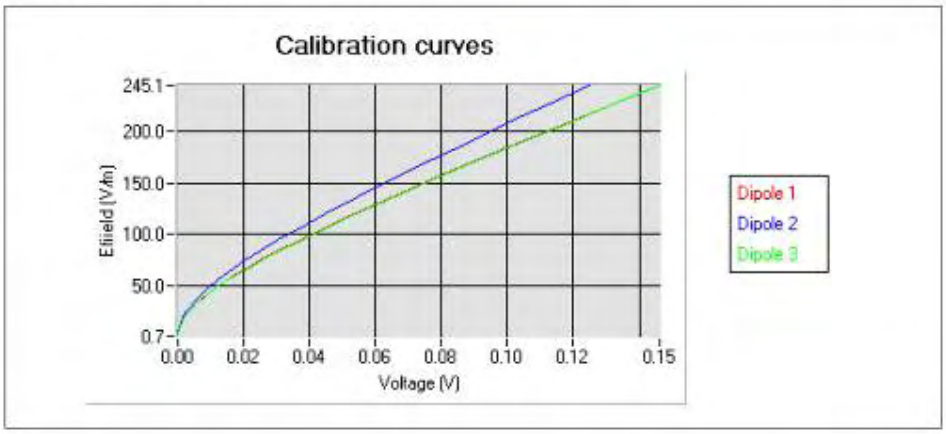

Linearity:0+/-2.25% (+/-0.10dB)

# 4. Calibration at 1880.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 1900 |
| Epsilon | 40.23 |
| Sigma | 1.41 S/m |
| Temperature | 21 °C |
| Cable loss | 0.15 dB |
| Coupler loss | 20.12 dB |
| Waveguide S11 | -32.10 dB |
| Low limit detection | 0.83 V/m (0.97 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

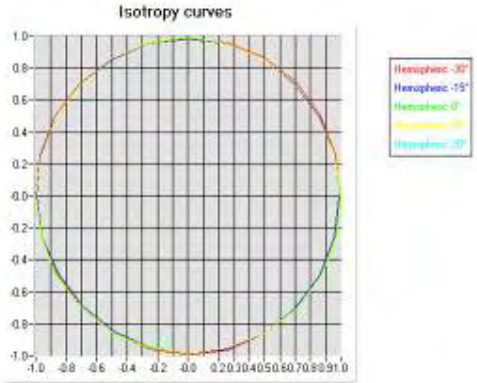
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

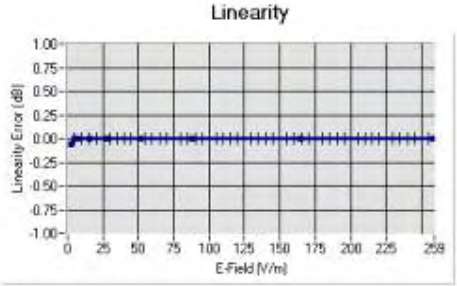
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 40.23 | 1.41 | 250.56 | 317.11 | 241.74 |
| Body | 54.65 | 1.54 | 273.66 | 346.35 | 264.03 |

## B. Isotropy.

- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.08 dB




## C. Linearity.



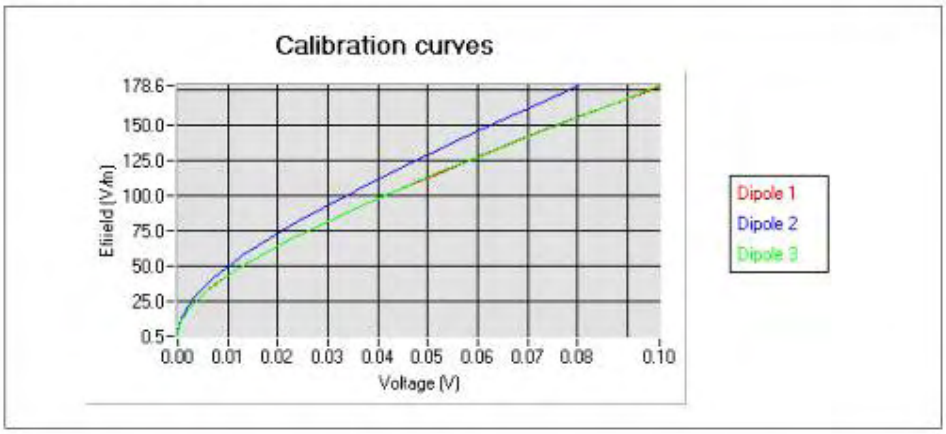

Linearity:0+/-1.51% (+/-0.07dB)

# 5. Calibration at 1950.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 2000 |
| Epsilon | 41.39 |
| Sigma | 1.39 S/m |
| Temperature | 21 °C |
| Cable loss | 0.14 dB |
| Coupler loss | 20.12 dB |
| Waveguide S11 | -31.20 dB |
| Low limit detection | 0.86 V/m (1.03 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

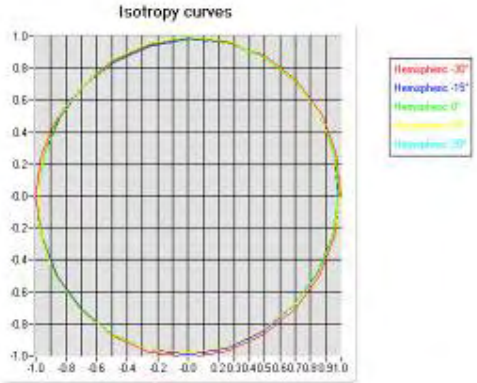
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

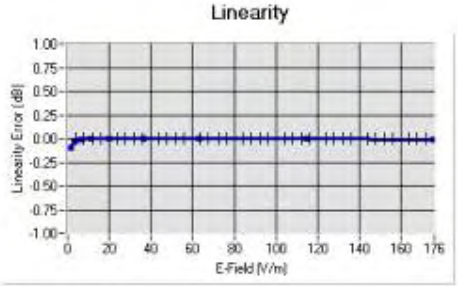
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 41.39 | 1.39 | 232.12 | 304.13 | 228.24 |
| Body | 53.54 | 1.49 | 237.24 | 310.84 | 233.28 |

## B. Isotropy.

- Axial isotropy: 0.07 dB
- Hemispherical isotropy: 0.09 dB




## C. Linearity.



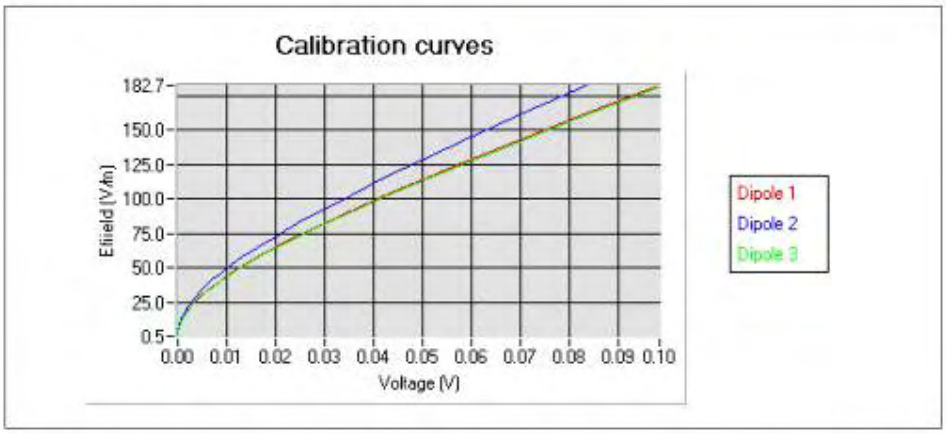

Linearity:[+/-2.25% (+/-0.10dB)

# 6. Calibration at 2450.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 2450 |
| Epsilon | 38.51 |
| Sigma | 1.79 S/m |
| Temperature | 21 °C |
| Cable loss | 0.13 dB |
| Coupler loss | 21.51 dB |
| Waveguide S11 | -13.20 dB |
| Low limit detection | 0.90 V/m (1.45 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

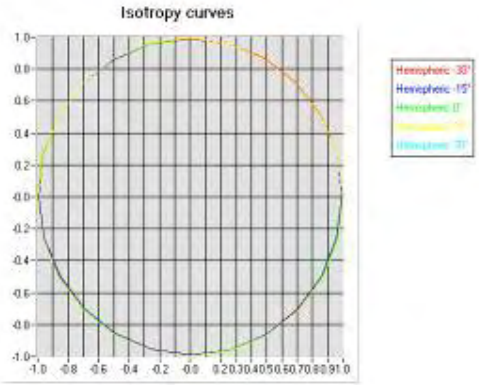
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

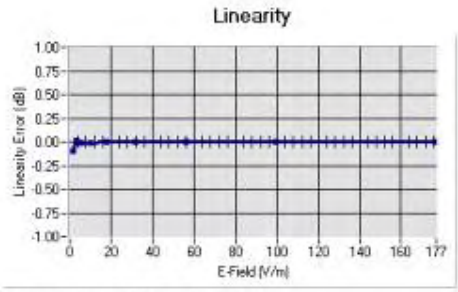
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 38.51 | 1.79 | 296.04 | 397.04 | 300.71 |
| Body | 52.36 | 1.97 | 325.81 | 436.97 | 330.95 |

## B. Isotropy.

- Axial isotropy: 0.09 dB
- Hemispherical isotropy: 0.11 dB




## C. Linearity.



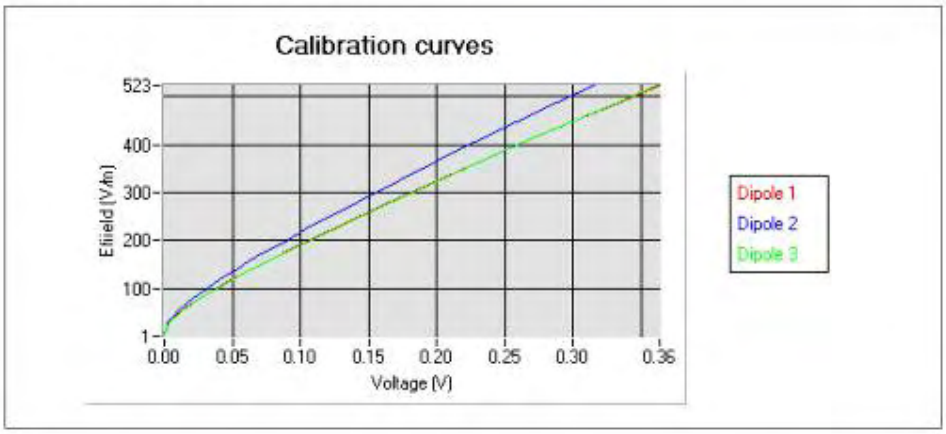

Linearity:[]+/-2.25% (+/-0.10dB)

# 7. Calibration at 3500.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 3500 |
| Epsilon | 38.10 |
| Sigma | 2.88 S/m |
| Temperature | 21 °C |
| Cable loss | 0.23 dB |
| Coupler loss | 20.67 dB |
| Waveguide S11 | -17.32 dB |
| Low limit detection | 0.88 V/m (2.23 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

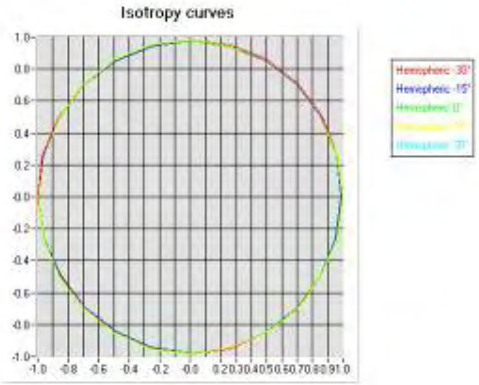
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

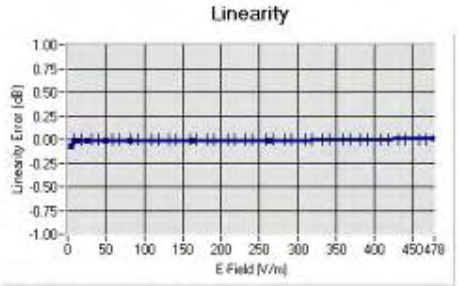
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 38.10 | 2.88 | 562.79 | 712.62 | 546.19 |
| Body | 51.47 | 3.21 | 627.28 | 794.27 | 608.77 |

## B. Isotropy.

- Axial isotropy: 0.10 dB
- Hemispherical isotropy: 0.12 dB




## C. Linearity.



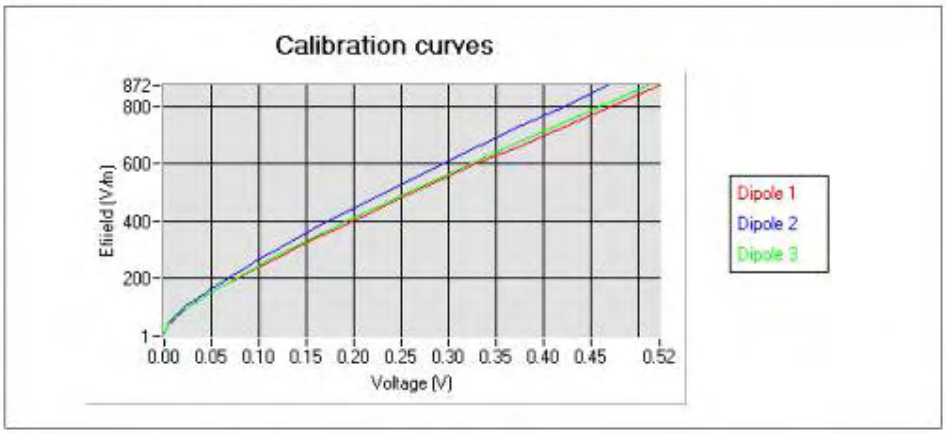

Linearity:+/-1.55% (+/-0.07dB)

# 8. Calibration at 5200.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 5200 |
| Epsilon | 35.55 |
| Sigma | 4.51 S/m |
| Temperature | 21 °C |
| Cable loss | 0.35 dB |
| Coupler loss | 20.04 dB |
| Waveguide S11 | -11.20 dB |
| Low limit detection | 0.69 V/m (2.15 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

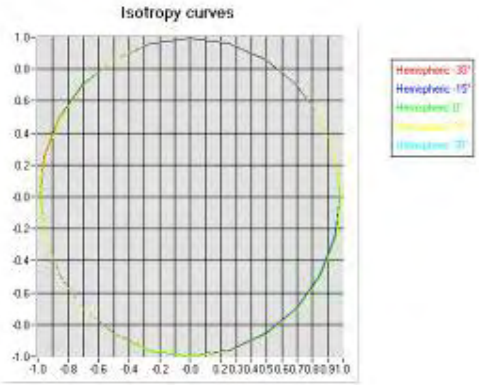
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

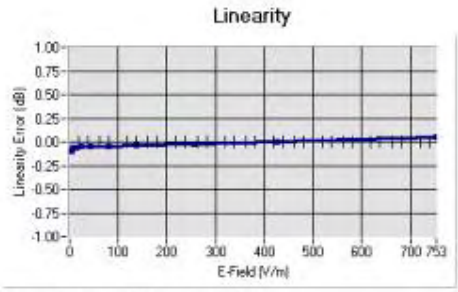
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 35.55 | 4.51 | 1386.9 | 1724.9 | 1441.5 |
| Body | 47.21 | 5.21 | 1571.5 | 1954.3 | 1633.3 |

## B. Isotropy.

- Axial isotropy: 0.10 dB
- Hemispherical isotropy: 0.13 dB




## C. Linearity.



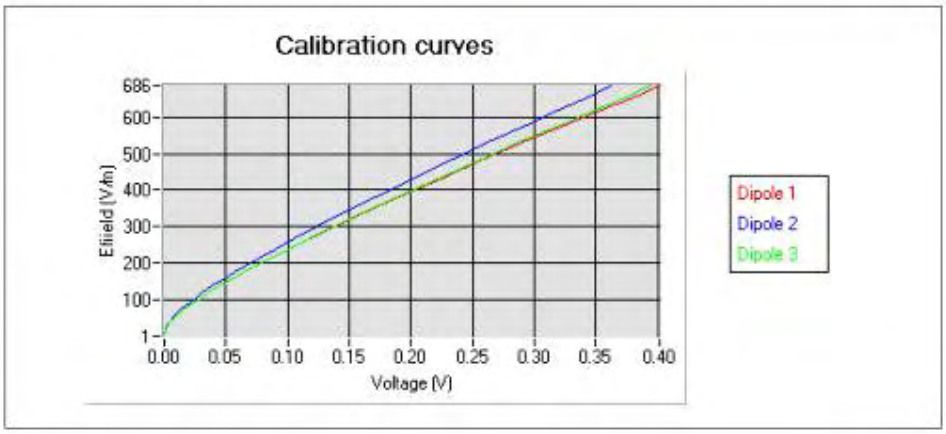

Linearity:[I+/-2.25% (+/-0.10dB)

# 9. Calibration at 5500.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 5500 |
| Epsilon | 35.10 |
| Sigma | 5.00 S/m |
| Temperature | 21°C |
| Cable loss | 0.37 dB |
| Coupler loss | 20.01 dB |
| Waveguide S11 | -10.99 dB |
| Low limit detection | 0.65 V/m (2.11 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

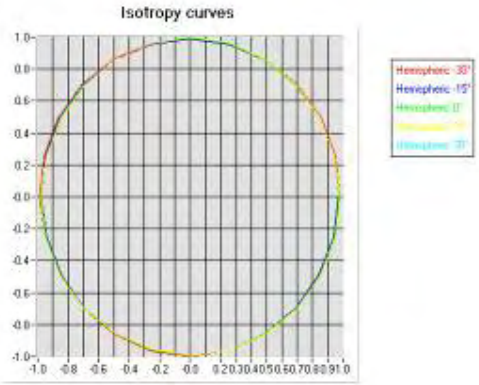
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

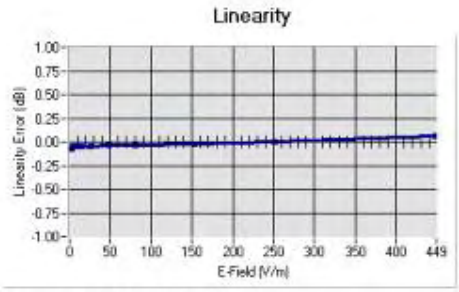
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 35.10 | 5.00 | 1477.7 | 1812.8 | 1531.4 |
| Body | 47.54 | 5.58 | 1649.1 | 2023.1 | 1709.0 |

## B. Isotropy.

- Axial isotropy: 0.11 dB
- Hemispherical isotropy: 0.14 dB




## C. Linearity.



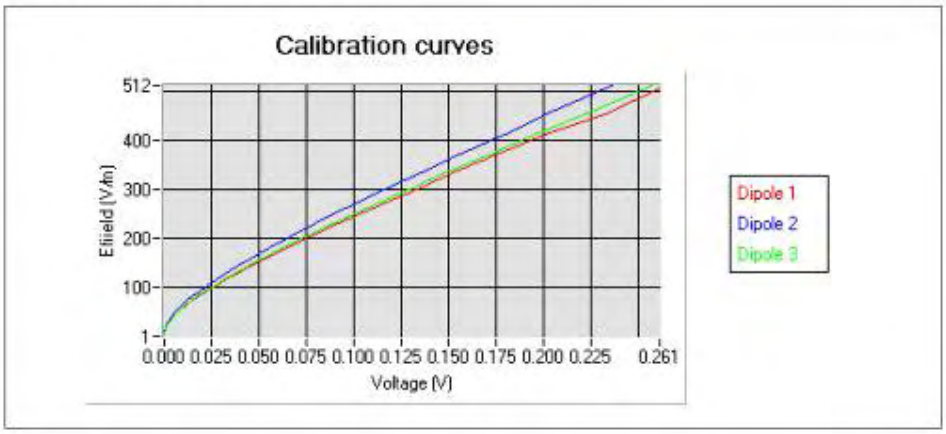

Linearity: +/-1.79% (+/-0.08dB)

# 10. Calibration at 5800.00 MHz

## A. Calibration parameters.

| | |
|---|---|
| Label | 5800 |
| Epsilon | 35.10 |
| Sigma | 5.41 S/m |
| Temperature | 21 °C |
| Cable loss | 0.13 dB |
| Coupler loss | 21.51 dB |
| Waveguide S11 | -13.20 dB |
| Low limit detection | 0.58 V/m (1.82 mW/kg) |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:
E=(e1*e1+e2*e2+e3*e3)pow(1/2)




The following tables represent the calibration curves linearization by curve segment in CW signal.

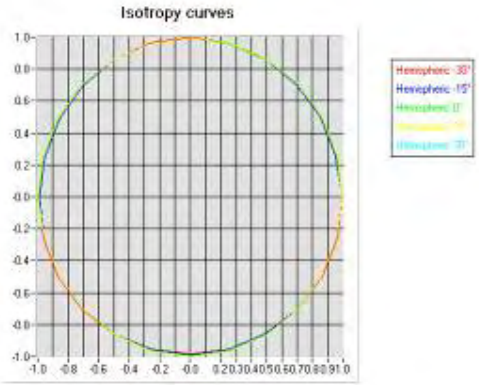
Calibration coefficients for the three dipoles in CW:

Sensitivity in liquid:

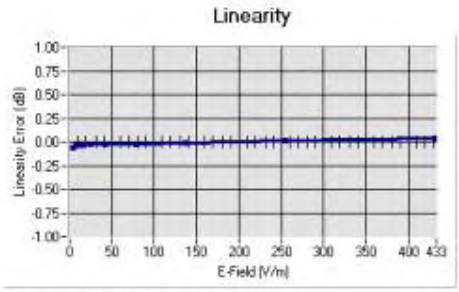
| Liquid | Epsilon | Sigma (S/m) | CF dipole 1 (W.kg-1 (mV)-1) | CF dipole 2 (W.kg-1 (mV)-1) | CF dipole 3 (W.kg-1 (mV)-1) |
|---|---|---|---|---|---|
| Head | 35.10 | 5.41 | 1756.0 | 2145.7 | 1819.0 |
| Body | 47.98 | 5.87 | 1905.3 | 2328.1 | 1973.7 |

## B. Isotropy.

- Axial isotropy: 0.13 dB
- Hemispherical isotropy: 0.13 dB




## C. Linearity.




Linearity:[]+/-1.52% (+/-0.07dB)

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# DIPOLE 835 MHZ CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: SAR TEST BENCH

Prepared For (End User): SIEMIC, INC.

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| COMOSAR Dipole 835 MHz Calibration Report | SATIMO | | |
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## DIPOLE 835 MHz CALIBRATION REPORT

**DATE**: 15/09/2010

**OBJECT**: COMOSAR IEEE REFERENCE DIPOLE

**MANUFACTURER**: SATIMO

**SERIAL NUMBER**: SN 31/10 DIPC133

**CUSTOMER**: SIEMIC, INC.

**CONTRACT**: PO1007001

**DATE OF CALIBRATION**: 04/08/2010

**WARRANTY:**

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Date

09-09-10

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| COMOSAR Dipole 835 MHz Calibration Report | SATIMO | | |
|---|---|---|---|
| | Ref: CR.216.2.10.SATB.A | | |
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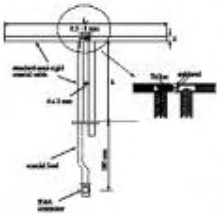
## PRODUCT DESCRIPTION



Dimension: L=161.0 mm/ h=89.8 mm / d=3.6 mm

## CALIBRATION TEST EQUIPMENT

| TYPE | IDENTIFICATION | DATE OF CALIBRATION |
|---|---|---|
| Vector Network Analyzer | HP8753D (SN: 5410A08882) | 08-06-2009 |

## MEASUREMENT PROCEDURE

We placed the dipole under the flat part of SAM phantom fill with 835 MHz head liquid.

| COMOSAR Dipole 835 MHz Calibration Report | SATIMO | | |
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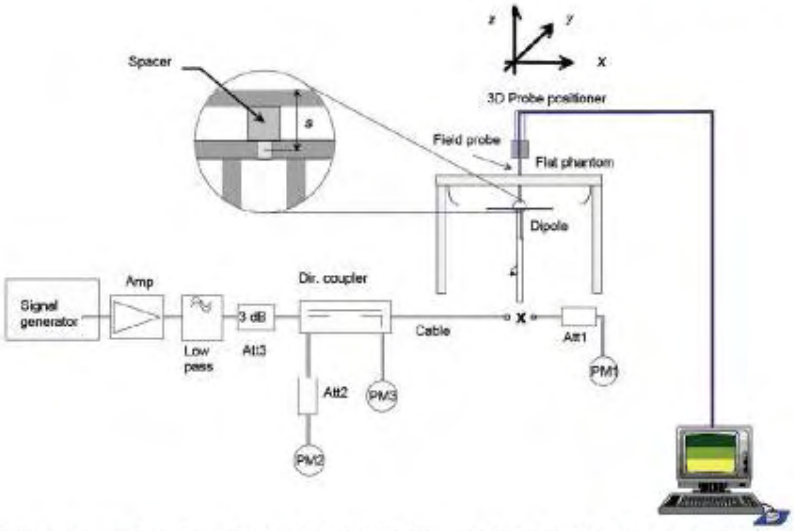
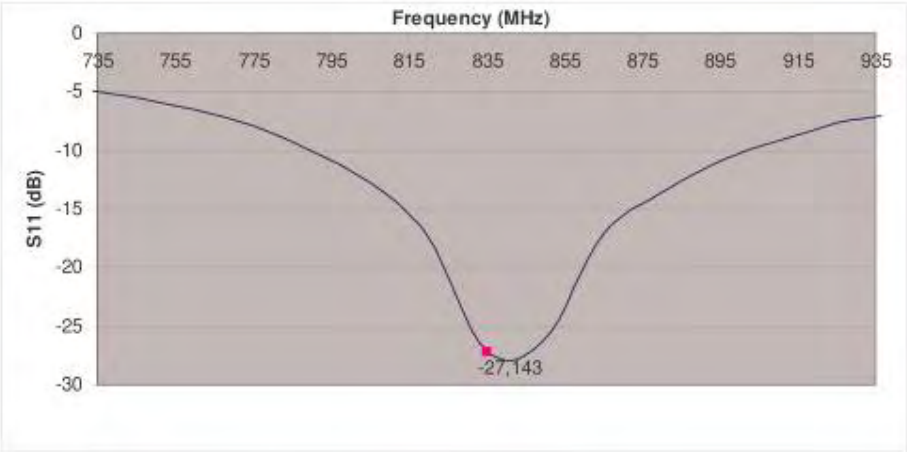



Calibration was performed according to IEEE Std P1528-2003 and OET bulletin 65 Supplement C (Ed. 01-01)




| VSWR at 835 MHz: -27.14 dB. |
|---|

| COMOSAR Dipole 835 MHz Calibration Report | SATIMO | | |
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## SAR MEASUREMENT EQUIPEMENT

| | | |
|---|---|---|
| **Voltmeter** | Keithley (2000, SN:1000572) | Date of calibration: 24-06-2009 |
| **Signal generator** | Rohde&Schwarz (SML_03, SN:101868) | Date of calibration: 14-11-2008 |
| **Power amplifier** | Nuclétudes (ALB216, SN:10800) | Date of calibration: 20-10-2008 |
| **Power meter** | Rohde&Schwarz (NRVD, SN:101066) | Date of calibration: 02-07-2009 |
| **Probe** | SATIMO Bretagne (SN:EP37)<br>CF (30.11,28.89,32.11) | Date of calibration: 08-06-2010 |

## SAR MEASUREMENT CONDITION

| | |
|---|---|
| **Software** | OpenSAR V3 |
| **Phantom** | SATIMO Bretagne (SN: SN_20_07_SAM42) |
| **Liquid** | SATIMO Bretagne (Last Calibration: 04 08 10)<br>Head Liquid Values: eps' : 41.15 sigma : 0.87 |
| **Distance between the center of the dipole and the liquid (set with a spacer)** | 15 mm |
| **Area scan resolution** | dx=8mm/dy=8mm |
| **Zoom scan resolution** | dx=8mm/dy=8m/dz=5mm |
| **Frequency** | 835 MHz |
| **Input power** | 20 dBm |
| **Expanded uncertainty (K=1)** | 8.09% |

## SAR MEASUREMENT RESULT

| | | 10g | 1g |
|---|---|---|---|
| R | SAR measured<br>Liquid : HL | **0.623 W/Kg**<br>**+0.1 %** | **0.958 W/Kg**<br>**+0.2 %** |

| COMOSAR Dipole 835 MHz Calibration Report | SATIMO | | |
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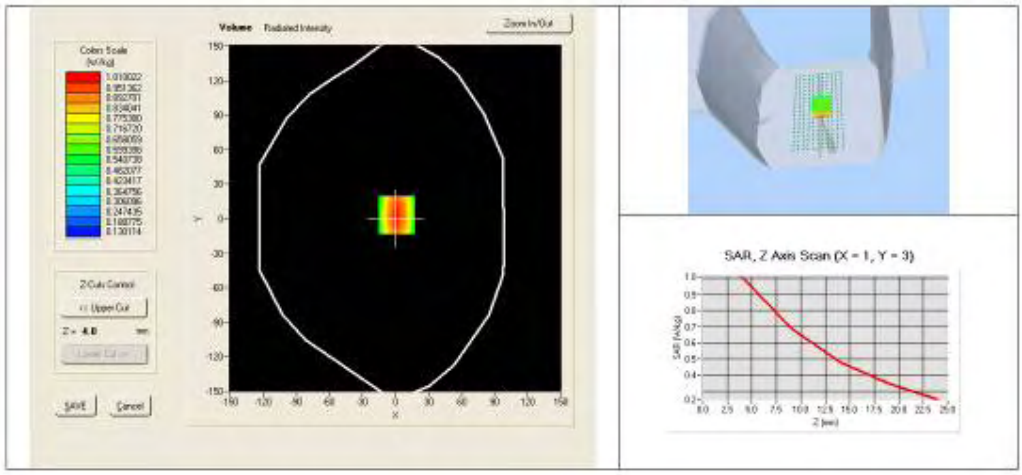
## SAR MEASUREMENT PLOTS



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# DIPOLE 1800 MHZ CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: SAR TEST BENCH

Prepared For (End User): SIEMIC, INC.

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## DIPOLE 1800 MHz CALIBRATION REPORT

**DATE**: 15/09/2010

**OBJECT**: COMOSAR IEEE REFERENCE DIPOLE

**MANUFACTURER**: SATIMO

**SERIAL NUMBER**: SN 31/10 DIPF135

**CUSTOMER**: SIEMIC, INC.

**CONTRACT**: PO1007001

**DATE OF CALIBRATION**: 04/08/2010

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09-09-10

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| | Ref: CR.216.4.10.SATB.A | | |
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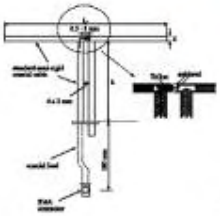
## PRODUCT DESCRIPTION



Dimension: L=72 mm/ h=41.7 mm / d=3.6 mm

## CALIBRATION TEST EQUIPMENT

| TYPE | IDENTIFICATION | DATE OF CALIBRATION |
|---|---|---|
| Vector Network Analyzer | HP8753D (SN: 5410A08882) | 08-06-2009 |

## MEASUREMENT PROCEDURE

We placed the dipole under the flat part of SAM phantom fill with 1800 MHz head liquid.

| COMOSAR Dipole 1800 MHz Calibration Report | SATIMO | | |
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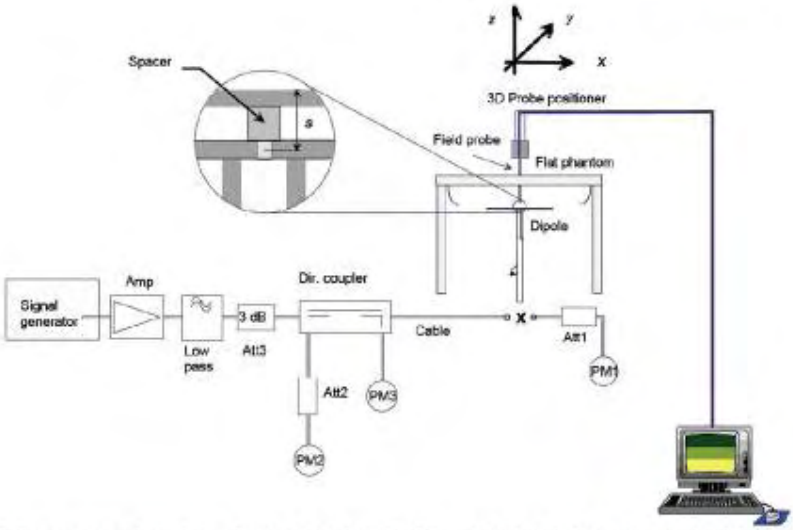
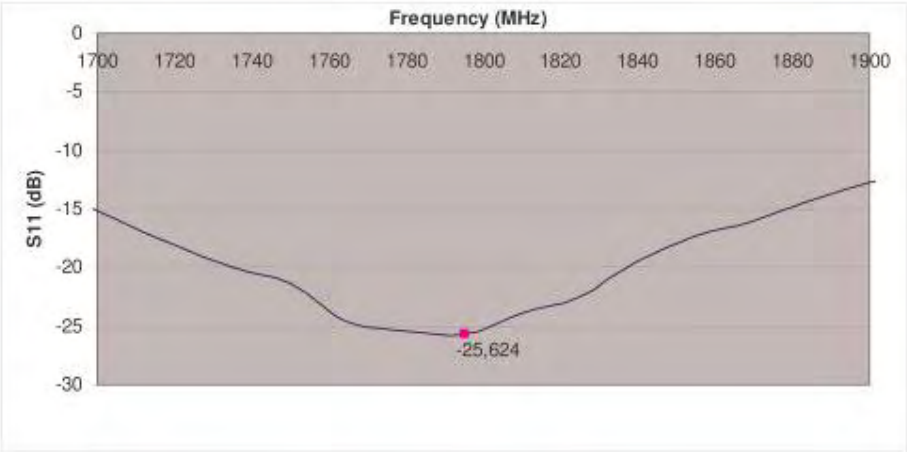



Calibration was performed according to IEEE Std P1528-2003 and OET bulletin 65 Supplement C (Ed. 01-01)




**VSWR at 1800 MHz: -25.62 dB.**

| COMOSAR Dipole 1800 MHz Calibration Report | SATIMO | | |
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## SAR MEASUREMENT EQUIPEMENT

| | | |
|---|---|---|
| **Voltmeter** | Keithley (2000, SN:1000572) | Date of calibration: 24-06-2009 |
| **Signal generator** | Rohde&Schwarz (SML_03, SN:101868) | Date of calibration: 14-11-2008 |
| **Power amplifier** | Nuclétudes (ALB216, SN:10800) | Date of calibration: 20-10-2008 |
| **Power meter** | Rohde&Schwarz (NRVD, SN:101066) | Date of calibration: 02-07-2009 |
| **Probe** | SATIMO Bretagne (SN:EP37)<br>CF (35.00,34.54,37.71) | Date of calibration: 08-06-2010 |

## SAR MEASUREMENT CONDITION

| | |
|---|---|
| **Software** | OpenSAR V3 |
| **Phantom** | SATIMO Bretagne (SN: SN_20_07_SAM42) |
| **Liquid** | SATIMO Bretagne (Last Calibration: 04 08 10)<br>Head Liquid Values: eps' : 39.33 sigma : 1.39 |
| **Distance between the center of the dipole and the liquid (set with a spacer)** | 10 mm |
| **Area scan resolution** | dx=8mm/dy=8mm |
| **Zoom scan resolution** | dx=8mm/dy=8m/dz=5mm |
| **Frequency** | 1800 MHz |
| **Input power** | 20 dBm |
| **Expanded uncertainty (K=1)** | 8.09% |

## SAR MEASUREMENT RESULT

| | | 10g | 1g |
|---|---|---|---|
| R | SAR measured<br>Liquid : HL | **2.028 W/Kg**<br>**+0.9 %** | **3.859 W/Kg**<br>**+0.5 %** |

| COMOSAR Dipole 1800 MHz Calibration Report | SATIMO | | |
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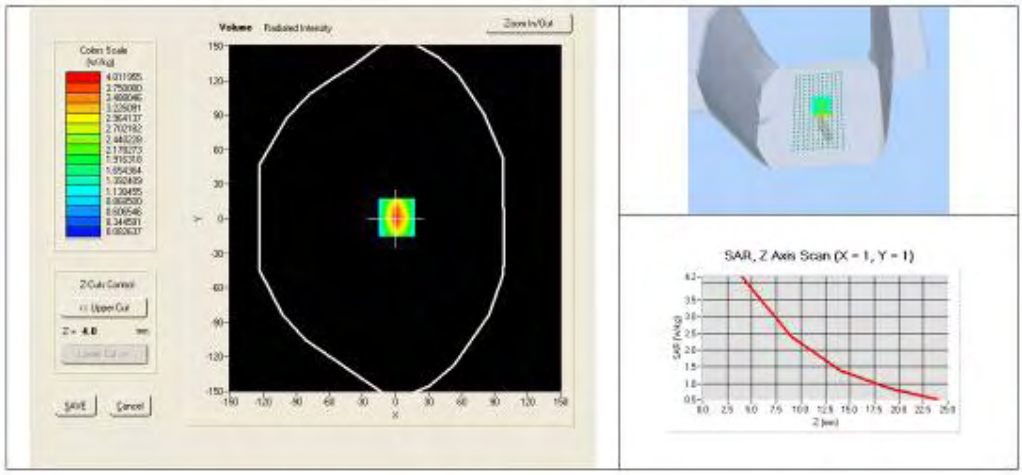
## SAR MEASUREMENT PLOTS



| COMOSAR Dipole 1900 MHz Calibration Report | SATIMO The microwave vision company | | |
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# DIPOLE 1900 MHZ CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: SAR TEST BENCH

Prepared For (End User): SIEMIC, INC.

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## DIPOLE 1900 MHz CALIBRATION REPORT

**DATE**: 15/09/2010

**OBJECT**: COMOSAR IEEE REFERENCE DIPOLE

**MANUFACTURER**: SATIMO

**SERIAL NUMBER**: SN 31/10 DIPG136

**CUSTOMER**: SIEMIC, INC.

**CONTRACT**: PO1007001

**DATE OF CALIBRATION**: 04/08/2010

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Date

09-09-10

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|---|---|---|---|
| | Ref: CR.216.5.10.SATB.A | | |
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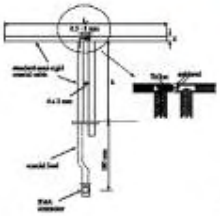
## PRODUCT DESCRIPTION



Dimension: L=68 mm/ h=39.5 mm / d=3.6 mm

## CALIBRATION TEST EQUIPMENT

| TYPE | IDENTIFICATION | DATE OF CALIBRATION |
|---|---|---|
| Vector Network Analyzer | HP8753D (SN: 5410A08882) | 08-06-2009 |

## MEASUREMENT PROCEDURE

We placed the dipole under the flat part of SAM phantom fill with 1900 MHz head liquid.

| COMOSAR Dipole 1900 MHz Calibration Report | SATIMO | | |
|---|---|---|---|
| | Ref: CR.216.5.10.SATB.A | | |
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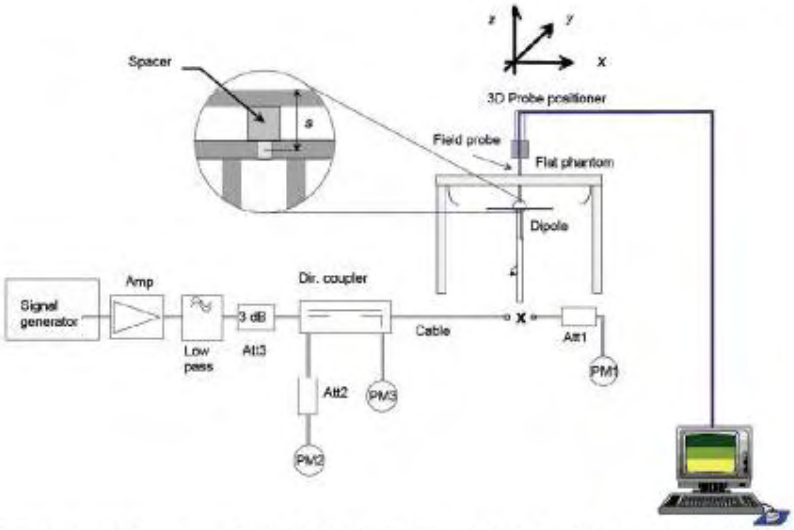
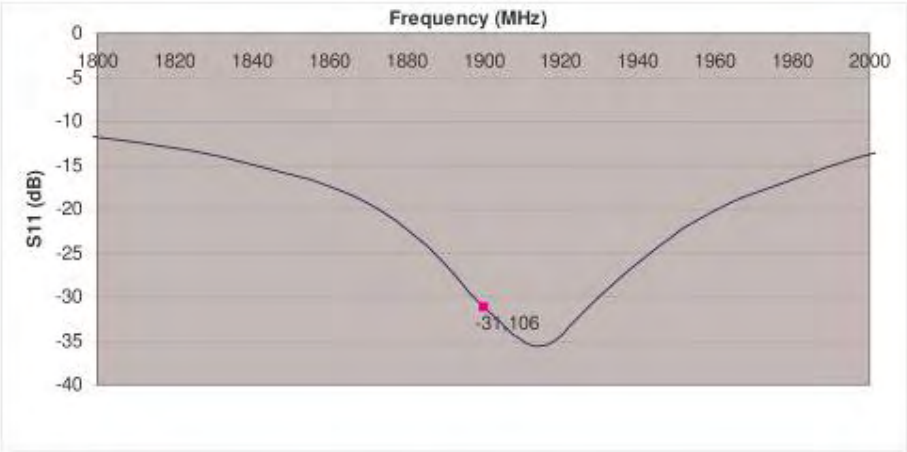



Calibration was performed according to IEEE Std P1528-2003 and OET bulletin 65 Supplement C (Ed. 01-01)




| VSWR at 1900 MHz: -31.11 dB. |
|---|

| COMOSAR Dipole 1900 MHz Calibration Report | SATIMO | | |
|---|---|---|---|
| | Ref: CR.216.5.10.SATB.A | | |
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## SAR MEASUREMENT EQUIPEMENT

| | | |
|---|---|---|
| **Voltmeter** | Keithley (2000, SN:1000572) | Date of calibration: 24-06-2009 |
| **Signal generator** | Rohde&Schwarz (SML_03, SN:101868) | Date of calibration: 14-11-2008 |
| **Power amplifier** | Nuclétudes (ALB216, SN:10800) | Date of calibration: 20-10-2008 |
| **Power meter** | Rohde&Schwarz (NRVD, SN:101066) | Date of calibration: 02-07-2009 |
| **Probe** | SATIMO Bretagne (SN:EP37)<br>CF (35.57,34.83,37.93) | Date of calibration: 08-06-2010 |

## SAR MEASUREMENT CONDITION

| | |
|---|---|
| **Software** | OpenSAR V3 |
| **Phantom** | SATIMO Bretagne (SN: SN_20_07_SAM42) |
| **Liquid** | SATIMO Bretagne (Last Calibration: 04 08 10)<br>Head Liquid Values: eps' : 39.13 sigma : 1.44 |
| **Distance between the center of the dipole and the liquid (set with a spacer)** | 10 mm |
| **Area scan resolution** | dx=8mm/dy=8mm |
| **Zoom scan resolution** | dx=8mm/dy=8m/dz=5mm |
| **Frequency** | 1900 MHz |
| **Input power** | 20 dBm |
| **Expanded uncertainty (K=1)** | 8.09% |

## SAR MEASUREMENT RESULT

| | | 10g | 1g |
|---|---|---|---|
| R | SAR measured<br>Liquid : HL | **2.093 W/Kg**<br>**+2.1 %** | **4.077 W/Kg**<br>**+2.7 %** |

| COMOSAR Dipole 1900 MHz Calibration Report | SATIMO | | |
|---|---|---|---|
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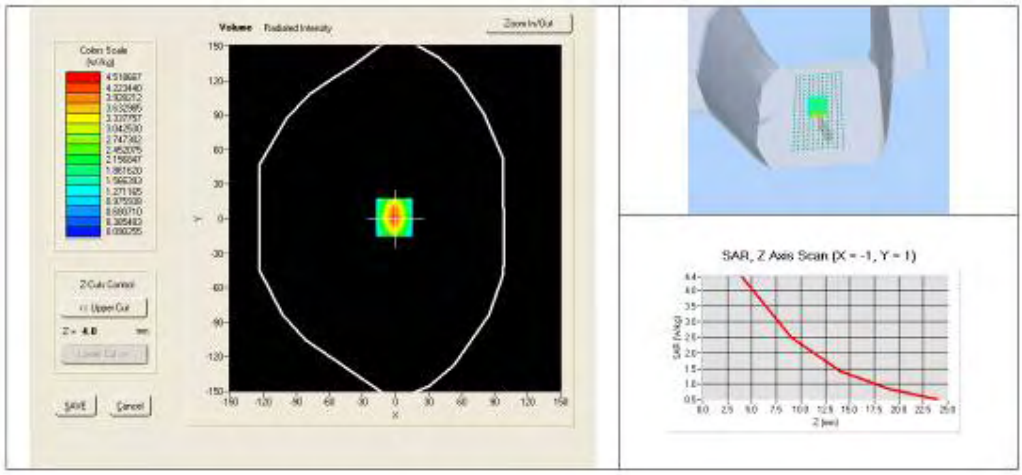
## SAR MEASUREMENT PLOTS