TEST REPORT

In support of the Application for Grant of Equipment Authorisation of the
WWC-107C Wearable Wrist Computer

FCC ID: H9PWSS107C **March 2003**

TÜV PRODUCT SERVICE

BABT

TUV Product Service Ltd. Segensworth Road, Titchfield
Fareham, Hampshire, United Kingdom, PO15 5RH
Tel: +44(0)1329 443300, Fax: +44(0)1329 443331
www.tuvps.co.uk

REPORT ON: Specific Absorption Rate testing of the WWC-107C Wearable Wrist Computer
Report No: WS601739 – Rev 1

FCC ID: H9PWWC107C

PREPARED FOR: Symbol Technologies
Symbol Place
Winnersh Triangle
Berkshire
England
RG41 5TP

ATTESTATION: The wireless portable devices described within this report have been shown to be capable of compliance for localised specific absorption rate (SAR) for Occupational/Controlled Exposure Limits as defined in Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) of 8.0 W/kg.

The devices were tested in accordance with the measurement procedures specified in Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) and IEEE1528-200x
(Draft April 2002).

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements.

A. Miller
SAR Test Engineer

APPROVED BY:

T Pither
Quality Manager

DATED: 05th March 2003

DISTRIBUTION:

Symbol Technologies	Copy No: 1
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Note: The test results reported herein relate only to the item tested as identified above and on the Status Page.

Report 610739 Re-issued to typographical errors on page 8

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EXECUTIVE SUMMARY

Specific Absorption Rate Testing of the
WWC-107C Wearable Wrist Computer

PROJECT MANAGER: A. BISHOP

1.1 STATUS

MANUFACTURING DESCRIPTION	WWC-107C Wearable Wrist Computer
STATUS OF TEST	Specific Absorption Rate Testing
APPLICANT	Symbol Technologies
CLASSIFICATION	DSS (Direct Spread Spectrum Device)
MANUFACTURER	Symbol Technologies
TYPE OR MODEL NUMBER	WWC 107C
HARDWARE VERSION	Rev 2
SOFTWARE VERSION	NBASNGAA, Rev A
SERIAL NUMBER	MXA16552
BATTERY MANUFACTURER	SYMBOL
TYPE OR MODEL NUMBER	20-16228-09 Rev B 3.6V 1450mAh Li-ion

TEST SPECIFICATIONS:

Federal Communications Commission, Code of Federal Regulations, Title 47 (CFR47), Vol. 1, Chapter 1, Part 2 (§2.1091 and §2.1093).

Federal Communications Commission (FCC) OET Bulletin 65c, Edition 01-01, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields – Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions

REFERENCES:

IEEE 1528 –200X: DRAFT Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques

CENELEC EN 50360: July 2001, Product Standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure electromagnetic (300 MHz - 3 GHz).

CENELEC EN 50361: July 2001, Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz).

Council Recommendations 1999/519/EC on the limitations of exposure of the general public to electromagnetic fields (0 Hz - 3 GHz) annex II.

BABT REGISTRATION NUMBER:	WS610739.
RECEIPT OF TEST SAMPLES:	19th February 2003.
START OF TEST:	20th February 2003.
FINISH OF TEST:	21st February 2003.

1.2 SUMMARY

The WWC-107C Wearable Wrist Computer supplied for Specific Absorption Rate (SAR) testing to the requirements of Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) is a Body worn Direct Spread Spectrum Device. The equipment incorporates a PCMCIA radio card Model AIR-LMC352, manufactured by Cisco Systems Inc. FCC ID: LDK102040. It is designed to operate within the 2.4GHz band (2.4GHz to 2.4835GHz). It was found to be compliant with requirements for Occupational/Controlled Exposure for Mobile/Portable devices. The Partial-Body SAR limit of 1g volume averaged SAR is stated as 8.0W/kg.

SAR testing was performed using a Flat Phantom dimensions 220mmx200mmx150mm and with a sidewall thickness of 2.0mm. The phantom was filled to a depth of 150mm with 2450MHz Body simulant liquid. The dielectric properties were in accordance with the requirements for the dielectric properties specified in Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01).

The WWC-107C Wearable Wrist Computer had an integral antenna. The WWC-107C Wearable Wrist Computer was set to maximum transmit power using the onboard test software, with the following configurations: -
F 2400 FF
F XXXX (XXXX Frequency setting in MHz = 2412; 2442; 2462 & 2472)
P B7 (B7 Max Power setting)
A 0 (Antenna Port)
TT 1 3 (Transmission Test: 1 modulation = CW and 3 Baud Speed = 11Mbs)

The testing was performed with a fully charged battery for the positions for which higher SAR levels were recorded.

No accessories were supplied with WWC-107C Wearable Wrist Computer.

Note: for Body worn operation, the WWC-107C Wearable Wrist Computer has been tested and meets the FCC RF exposure guidelines when used with an accessory which contains no metal and that positions these devices a minimum of 1.5cm from the body. Use of other accessories may not ensure compliance with FCC RF guidelines.

Included in this report are descriptions of the test method; the equipment used and an analysis of the test uncertainties applicable and diagrams indicating the locations of maximum SAR for each test position along with photographs indicating the positioning of the device's against the Flat Phantom.

The maximum 10g volume averaged SAR level measured for all the tests performed did not exceed the 2 W/kg level defined for limiting the exposure of the general population to time-varying electric and magnetic fields by ICNIRP (1998), which is the relevant Standard for testing according to the CENELEC EN50361 test method.

The maximum 1g volume averaged SAR level measured for all the tests performed did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg. Level defined in Supplement C (Edition 01-01) to OET Bulletin 65 (97-01).

1.3 TEST RESULT SUMMARY

SYSTEM PERFORMANCE / VALIDATION CHECK RESULTS

Prior formal to formal testing being performed a System Check was performed in accordance with Appendix D IEEE1528 April 4th 2002 Draft Standard. The following results were obtained:-

Dipole Used	Frequency (MHz)	Max 1g SAR (W/kg)	Max 10g SAR (W/kg)	Percentage Drift on Reference
2450	2450		25.56	6.49%
2450	2450	54.81		4.59%

OUTPUT POWER OF TEST DEVICE MEASUREMENT METHOD

The Spectrum Analyser was tuned to the test frequency. The device Output power setting was controlled via the 'Test Mode' on each handset being set to the conditions specified in the Summary on page 5 of this document. The device was then rotated through 360 degrees until the highest power level was observed in both planes of polarisation. The device was then replaced with a substitution antenna, the signal to the antenna was adjusted to equal the related level detected from the device.

MAXIMUM POWER – POWER SETTING SET ON WWC-107C TO B7

Frequency (MHz)	Raw Result (dBm)	Substitution Level (dBm)	Cable Loss (dB)	Substitution Antenna Gain (dB)	Result ERP (dBm)	Result ERP (mW)
2412	-17.80	14.24	4.79	9.2	18.65	73.28
2442	-17.39	14.50	4.39	9.2	19.31	85.31
2462	-20.00	12.04	4.65	9.2	16.59	45.60
2472	-20.65	11.58	4.79	9.2	15.99	39.72

Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Symbol Technologies WWC-107C Wearable Wrist Computer

Position	Channel Number	Frequency (MHz)	Max Spot (W/kg)	Max 1g SAR (W/kg)	Max 10g SAR (W/kg)	Area scan (Figure number)
Inner surface of device facing Box - center max 2.5cm away with top and bottom touching	1	2412	0.30	0.236	0.126	Figure 6
Inner surface of device facing Box - center max 2.5cm away with top and bottom touching	7	2442	0.25	0.195	0.104	Figure 7
Inner surface of device facing Box - center max 2.5cm away with top and bottom touching	11	2462	0.21	0.168	0.090	Figure 8
Inner surface of device facing Box - center max 2.5cm away with top and bottom touching	13	2472	0.180	0.140	0.075	Figure 9
Battery side - 1.5cm from side	1	2412	0.45	0.336	0.193	Figure 10
Battery side - 0.0cm from side	1	2412	2.7	1.676	0.720	Figure 11
Limit for General Population (Uncontrolled Exposure) 8.0 W/kg						

TEST DETAILS

Specific Absorption Rate Testing of the
WWC-107C Wearable Wrist Computer

TEST ENGINEERS: **A. MILLER**

2.2 TEST EQUIPMENT

The following test equipment was used at BABT:

INSTRUMENT DESCRIPTION	MANUFACTURER	MODEL TYPE	INVENTORY NO.	SERIAL NUMBER	CALIBRATION DATES
Bench-top Robot	Mitsubishi	RV-E2	4691	EA009006	N/A
2450 MHz – Head Tissue Simulant	BABT	Batch 4	N/A	N/A	18/02/03*
2450 MHz – Body Tissue Simulant	BABT	Batch 3	N/A	N/A	18/02/03*
2450 MHz Dipole	IndexSAR	IEEE1528	N/A	N/A	N/A
RF Pre-Amplifier	Vectawave	10M-2.5G	4697	N/A	N/A
Bi-Directional Coupler	Krytar	1850	4651	N/A	N/A
20dB Attenuator	Narda	766F-20	1791	N/A	03/05/03
Power Meter	Rohde and Schwarz	NRV	2472	860327/025	20/05/03 (due)
Hygrometer	Rotronic	-	3230	N/A	02/10/03 (due)
Thermometer	Digitron	T208	3036	N/A	08/03/2003 (due)
SAR Probe	IndexSAR	IXP-050	N/A	117	17/10/03 (due)
Flat Phantom box 2mm side(200mm cube)	IndexSAR.	N/A	N/A	N/A	N/A
Spectrum Analyzer	Rohde and Shwarz	FSEM	4034	827156/006	16/12/03 (due)
Signal Generator	Hewlett Packard	ESG 4000A	3709	GB37040125	21/01/04 (due)
DRG Antenna	EMCO	3115	3549	9005-3428	29/06/03
Substitution DRG Antenna	EMCO	3115	3777	9704-5168	20/01/04
Cable	Reynolds Industries	269-0088-3000	CS0567	0049013	N/A
Cable	Rosenberger	FA210B-1-070M	CS0535	FA00A7402	N/A

* Verified at time of test.

2.3 TEST SOFTWARE

The following software was used to control the BABT SARA2 System:

INSTRUMENT	VERSION NO.	DATE
SARA2 system	v.0.281	23/07/2002
Mitsubishi robot controller firmware revision	RV-E2 Version C9a	-
IXA-10 Probe amplifier	Version 2.4	-

2.4 DIELECTRIC PROPERTIES OF SIMULANT LIQUIDS

The dielectric properties of the tissue simulant liquids used for the SAR testing at BABT are as follows:-

PARAMETER	2450 MHzHEAD FLUID (ACTUAL)	2450 MHz HEAD FLUID (REQUIRED)
Relative Permittivity, ε_r (ε')	37.76	39.0
Conductivity, σ	1.88	1.80
Mass Density, ρ	1000 kg/m^3	1000 kg/m^3

PARAMETER	2450 MHzBODY FLUID (ACTUAL)	2450 MHz BODY FLUID (REQUIRED)
Relative Permittivity, ε_r (ε')	52.3	52.7
Conductivity, σ	1.997	1.95
Mass Density, ρ	1000 kg/m^3	1000 kg/m^3

This fluid was calibrated at TUV Product Service Laboratory and re-checked prior to any measurements being made against reference fluids stated in IEEE 1528-200X of 0.9% NaCl (Salt Solution) at 20ºC and also for Dimethylsulphoxide (DMS) at 20ºC.

The fluids were made at BABT under controlled conditions to the following IEEE 1528-200X formula:

2450 MHz HEAD SOLUTION	2450 MHz BODY SOLUTION
56.5% Sugar	47% DGBE
40.92% Water	52.64% Water
1.48% Salt	0.36% Salt
1.0% HEC	
0.1% Bactericide	

2.5 TEST CONDITIONS

Ambient Temperature: Within +15°C to +35°C at 20% RH to 75% RH.
The actual Temperature during the testing ranged from 23.9°C to 24.8°C.
The actual Humidity during the testing ranged from 23.6% to 25.6% RH.

Tissue simulating liquid temperature: +20°C to +25°C.
The actual tissue simulating liquid temperature was recorded to be between 22.1°C to 22.5°C

Drift in Mobile power during scans. The mobile power levels were monitored before and after each full 3D scan. The before and after power levels recorded were within +/-1dB of each other for all of the testing.

2.6 MEASUREMENT UNCERTAINTY

ERROR SOURCES	EN 50361 Description (Subclause)	Uncertainty (%)	Probability Distribution	Divisor	ci	ci^2	Standard Uncertainty (%)	Stand Uncert^2	(Stand Uncert^2) X (ci^2)
Measurement Equipment									
Calibration	7.2.1.1	10	Normal	2.00	1	1	5.00	25.00	25.00
Isotropy	7.2.1.2	10.6	Rectangular	1.73	1	1	6.12	37.45	37.45
Linearity	7.2.1.3	2.92	Rectangular	1.73	1	1	1.69	2.84	2.84
Probe Stability	-	2.46	Rectangular	1.73	1	1	1.42	2.02	2.02
Detection limits	7.2.1.4	0	Rectangular	1.73	1	1	0.00	0.00	0.00
Boundary effect	7.2.1.5	1.7	Rectangular	1.73	1	1	0.98	0.96	0.96
Measurement device	7.2.1.6	0	Normal	1.00	1	1	0.00	0.00	0.00
Response time	7.2.1.7	0	Normal	1.00	1	1	0.00	0.00	0.00
Noise	7.2.1.8	0	Normal	1.00	1	1	0.00	0.00	0.00
Integration time	7.2.1.9	2.3	Normal	1.00	1	1	2.30	5.29	5.29
Mechanical constraints									
Scanning system	7.2.2.1	0.57	Rectangular	1.73	1	1	0.33	0.11	0.11
Phantom shell	7.2.2.2	1.43	Rectangular	1.73	1	1	0.83	0.68	0.68
Matching between probe and phantom	7.2.2.3	2.86	Rectangular	1.73	1	1	1.65	2.73	2.73
Positioning of the phone 'Y' Co-ordinate	7.2.2.4	1.5	Normal	1.00	1	1	1.50	2.25	2.25
Positioning of the phone 'Z' Co-ordinate	7.2.2.4	1.73	Normal	1.00	1	1	1.73	2.99	2.99
Physical Parameters									
Liquid conductivity (deviation from target)	7.2.3.2	0.3	Rectangular	1.73	0.5	0.25	0.17	0.03	0.01
Liquid conductivity (measurement error)	7.2.3.2	5	Rectangular	1.73	0.5	0.25	2.89	8.33	2.08
Liquid permittivity (deviation from target)	7.2.3.3	3.6	Rectangular	1.73	0.5	0.25	2.08	4.32	1.08
Liquid permittivity (measurement error)	7.2.3.3	5	Rectangular	1.73	0.5	0.25	2.89	8.33	2.08
Drifts in output power of the phone, probe, temperature and humidity	7.2.3.4	11.4	Rectangular	1.73	1	1	6.58	43.22	43.22
Perturbation by the environment	7.2.3.5	3	Rectangular	1.73	1	1	1.73	3.00	3.00
Post-Processing									
SAR interpolation and extrapolation	7.2.4.1	2.4	Rectangular	1.73	1	1	1.39	1.92	1.92
Maximum SAR evaluation	7.2.4.2	2.4	Rectangular	1.73	1	1	1.39	1.92	1.92
Combined standard uncertainty	11.74						**Total**		137.74
Expanded uncertainty = 23.47 % (Using a Coverage Factor of K=2) (confidence interval of 95 %)									

2.7 SAR MEASUREMENT SYSTEM

ROBOT SYSTEM SPECIFICATION

The SAR measurement system being used is the IndexSAR SARA2 system, which consists of a Mitsubishi RV-E2 6-axis robot arm and controller, IndexSAR probe and amplifier and SAM phantom Head Shape. The robot is used to articulate the probe to programmed positions inside the phantom head to obtain the SAR readings from the DUT.

The system is controlled remotely from a PC, which contains the software to control the robot and data acquisition equipment. The software also displays the data obtained from test scans.

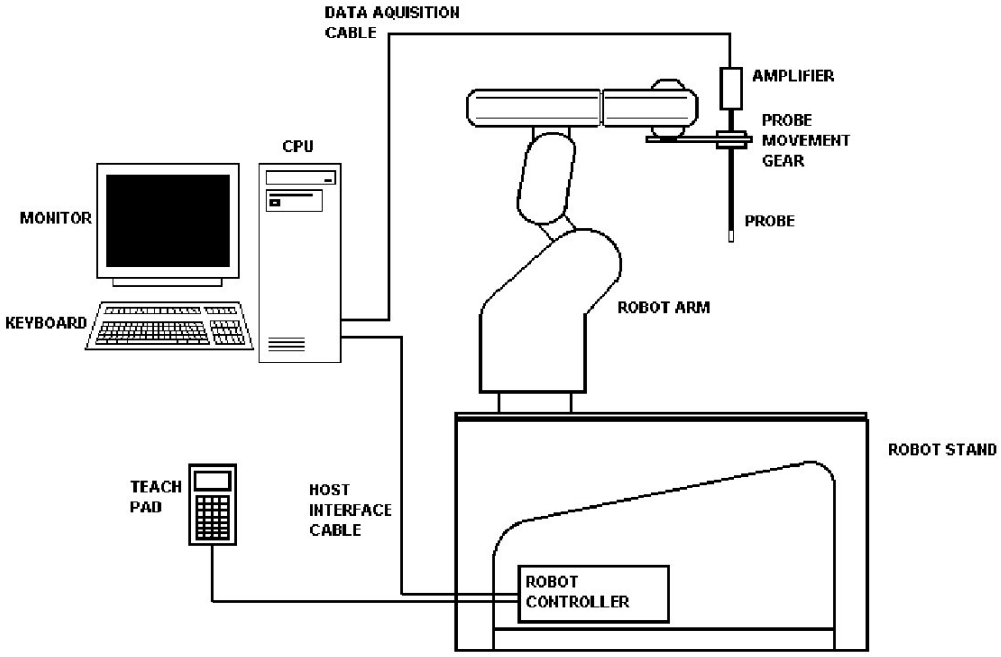


Figure 1: Schematic diagram of the SAR measurement system

The position and digitised shape of the phantom heads are made available to the software for accurate positioning of the probe and reduction of set-up time.
The SAM phantom heads are individually digitised using a Mitutoyo CMM machine to a precision of 0.001mm. The data is then converted into a shape format for the software, providing an accurate description of the phantom shell.

In operation, the system first does an area (2D) scan at a fixed depth within the liquid from the inside wall of the phantom. When the maximum SAR point has been found, the system will then carry out a 3D scan centred at that point to determine volume averaged SAR level.

2.7 SAR MEASUREMENT SYSTEM

PROBE AND AMPLIFIER SPECIFICATION

IXP-050 Series Indexsar isotropic immersible SAR probe
The probes are constructed using three orthogonal dipole sensors arranged on an interlocking, triangular prism core. The probes have built-in shielding against static charges and are contained within a PEEK cylindrical enclosure material at the tip.
Probe calibration is described in the following section.

IXP-039 Amplifier
The amplifier unit has a multi-pole connector to connect to the probe and a multiplexer selects between the 3-channel single-ended inputs. A 16-bit AtoD converter with programmable gain is used along with an on-board micro-controller with non-volatile firmware. Battery life is around 150 hours and data are transferred to the PC via 3m of duplex optical fibre and a self-powered RS232 to optical converter.

Phantom
Body-worn operating configurations are tested using a flat phantom. The body phantom shell is made of a low-loss dielectric material with dielectric constant and loss tangent less than 5.0 and 0.05 respectively. The shell thickness for all regions coupled to the test device and its antenna are within 2.0 $\pm$ 0.2 mm. The phantom was filled with the required head or body equivalent tissue medium to a depth of 15.0 $\pm$ 0.5 cm

2.7 SAR MEASUREMENT SYSTEM

SAR MEASUREMENT PROCEDURE

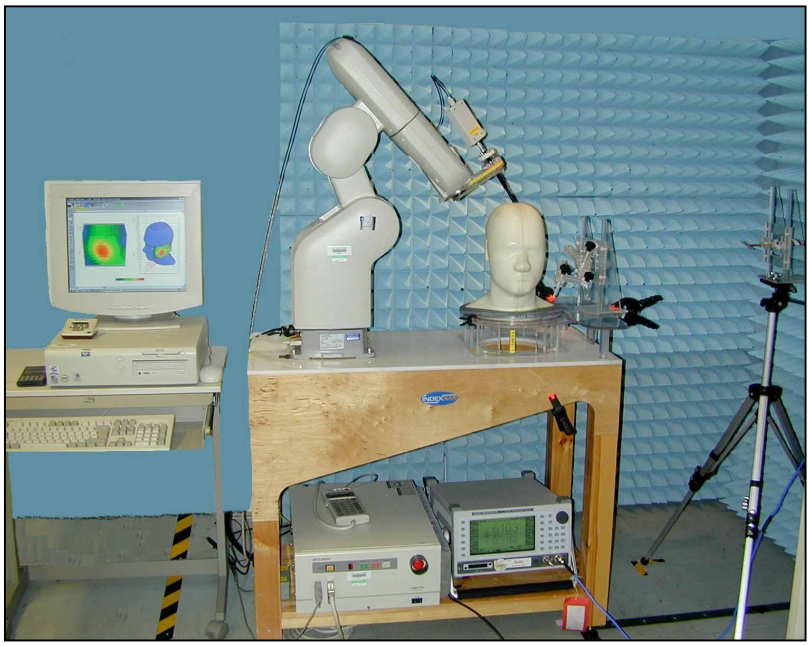


Figure 2: Principal components of the SAR measurement test bench

The major components of the test bench are shown in the picture above.

After an area scan has been done at a fixed distance of 8mm from the side of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power (SAR) drift during measurement to be assessed.

SARA2 Interpolation and Extrapolation schemes

SARA2 software contains support for both 2D cubic B-spline interpolation as well as 3D cubic B-spline interpolation. In addition, for extrapolation purposes, a general n^{-th} order polynomial fitting routine is implemented following a singular value decomposition algorithm presented in [4]. A 4^{th} order polynomial fit is used by default for data extrapolation, but a linear-logarithmic fitting function can be selected as an option. The polynomial fitting procedures have been tested by comparing the fitting coefficients generated by the SARA2 procedures with those obtained using the polynomial fit functions of Microsoft Excel when applied to the same test input data.

Interpolation of 2D area scan

The 2D cubic B-spline interpolation is used after the initial area scan at fixed distance from the phantom shell wall. The initial scan data are collected with approx. 10mm spatial resolution and spline interpolation is used to find the location of the local maximum to within a 1mm resolution for positioning the subsequent 3D scanning.

2.7 SAR MEASUREMENT SYSTEM

SAR MEASUREMENT PROCEDURE - Continued

Extrapolation of 3D scan

For the 3D scan, data are collected on a spatially regular 3D grid having (by default) 6.4 mm steps in the lateral dimensions and 3.5 mm steps in the depth direction (away from the source). SARA2 enables full control over the selection of alternative step sizes in all directions.

The digitised shape of the Flat Phantom is available to the SARA2 software, which decides which points in the 3D array are sufficiently well within the shell wall to be 'visited' by the SAR probe. After the data collection, the data are extrapolated in the depth direction to assign values to points in the 3D array closer to the shell wall. A notional extrapolation value is also assigned to the first point outside the shell wall so that subsequent interpolation schemes will be applicable right up to the shell wall boundary.

Interpolation of 3D scan and volume averaging

The procedure used for defining the shape of the volumes used for SAR averaging in the SARA2 software follow the method of adapting the surface of the 'cube' to conform with the surface of the phantom (see Appendix C.2.2.1 in EN 50361). This is called, here, the conformal scheme.

For each row of data in the depth direction, the data are extrapolated and interpolated to less than 1mm spacing and average values are calculated from the phantom surface for the row of data over distances corresponding to the requisite depth for 10g and 1g cubes. This results in two 2D arrays of data, which are then cubic B-spline interpolated to sub mm lateral resolution. A search routine then moves an averaging square around through the 2D array and records the maximum value of the corresponding 1g and 10g volume averages. For the definition of the surface in this procedure, the digitised position of the headshell surface is used for measurement in head-shaped phantoms. For measurements in rectangular, box phantoms, the distance between the phantom wall and the closest set of gridded data points is entered into the software.

For measurements in box-shaped phantoms, this distance is under the control of the user. The effective distance must be greater than 2.5mm as this is the tip-sensor distance and to avoid interface proximity effects, it should be at least 5mm. A value of 6 or 8mm is recommended. This distance is called **dbe** in EN 50361.

For automated measurements inside the head, the distance cannot be less than 2.5mm, which is the radius of the probe tip and to avoid interface proximity effects, a minimum clearance distance of x mm is retained. The actual value of dbe will vary from point to point depending upon how the spatially-regular 3D grid points fit within the shell. The greatest separation is when a grid point is just not visited due to the probe tip dimensions. In this case the distance could be as large as the step-size plus the minimum clearance distance (i.e with x=5 and a step size of 3.5, **dbe** will be between 3.5 and 8.5mm).

The default step size (**dstep** in EN 50361) used is 3.5mm, but this is under user-control. The compromise is with time of scan, so it is not practical to make it much smaller or scan times become long and power-drop influences become larger.

The robot positioning system specification for the repeatability of the positioning (**dss** in EN50361) is +/- 0.04mm.

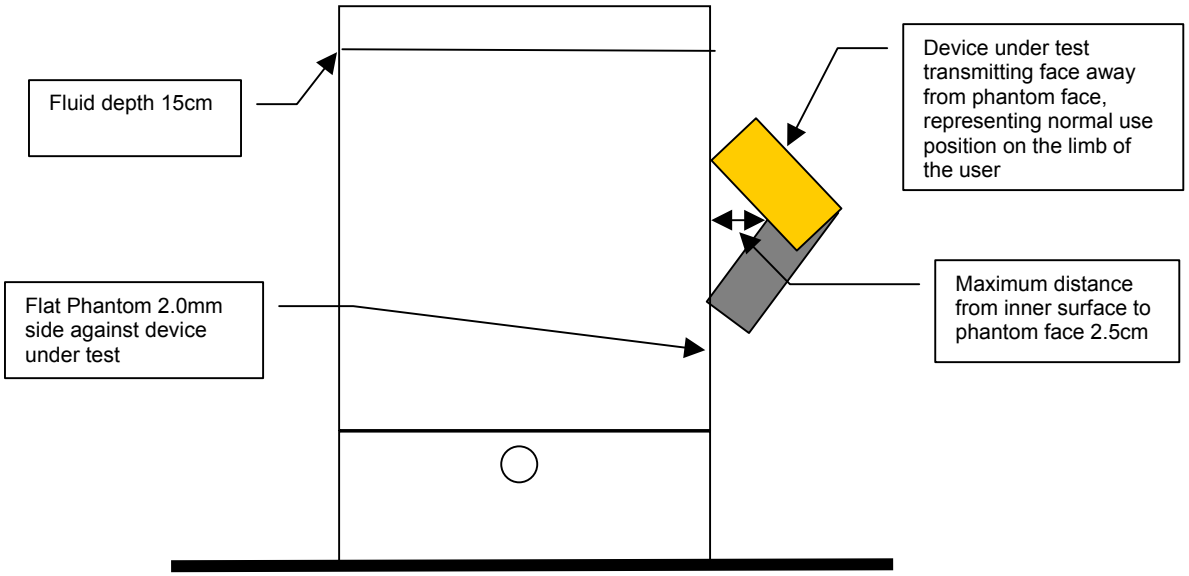
2.7 SAR MEASUREMENT SYSTEM

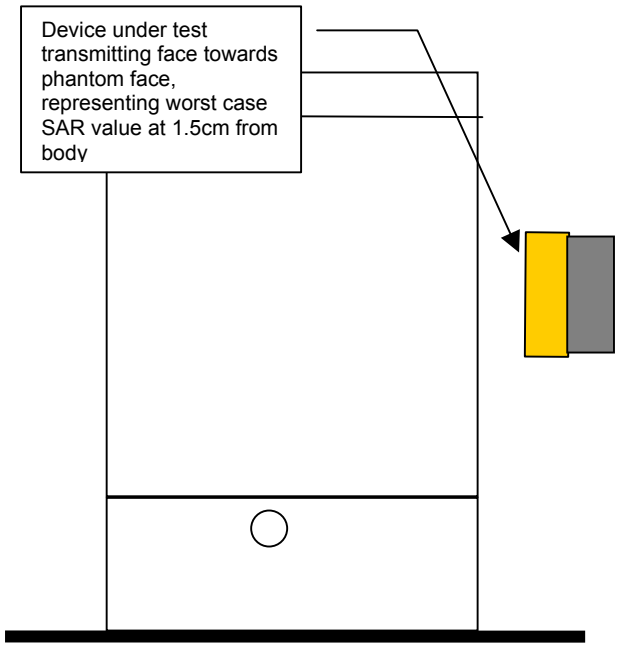
SAR MEASUREMENT PROCEDURE - Continued

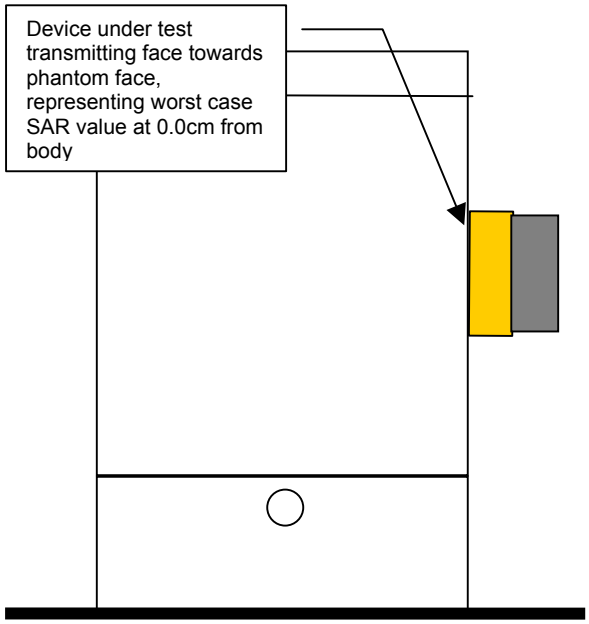
The phantom shell is made from Polymethylmethacrylate (PMMA), a low-loss dielectric material with dielectric constant and loss tangent less than 5.0 and 0.05 respectively. The shell thickness for all regions coupled to the test device and its antenna are within 2.0 ± 0.2 mm.

For the upright phantom, the alignment is based upon registration of the rotation axis of the phantom on its 253mm-diameter baseplate bearing and the position of the probe axis when commanded to go to the axial position. A laser alignment tool is provided (procedure detailed elsewhere). This enables the registration of the phantom tip (**dmis**) to be assured to within approx. 0.2mm. This alignment is done with reference to the actual probe tip after installation and probe alignment. The rotational positioning of the phantom is variable – offering advantages for special studies, but locating pins ensure accurate repositioning at the principal positions (LH and RH ears).

2.8 TEST POSITIONS







2.9 TEST RESULTS INCLUDING SAR DISTRIBUTIONS (AREA SCANS – 2D)

System	IndexSAR SARA2	Power Drift	0.1dBm
Date of Test	20/02/03	Battery Model	0557162
Lab Ambient	24.7 ºC	Probe Serial Number	IXP-050 0117
Device ID	WWC-107C	Liquid Simulant	2450 MHz Body
Phantom	Flat Phantom box	Permittivity	52.3
Phantom S/No	02/02	Conductivity	1.997
Phantom Rotation (deg)	0/180	Liquid Ambient	22.2 ºC
Test Position	Left Touch	Max SAR 'Y' Axis Location	-47.2 mm
Antenna Position	Integrated	Max SAR 'Z' Axis Location	-108.8 mm
Test Frequency	2412 MHz	SAR 1g	0.236 W/Kg
Type of Modulation	CW	SAR 10g	0.126 W/kg
Crest Factor	1.0	SAR Drift	-0.25 dB
Diode Compression factor	20; 20; 20		

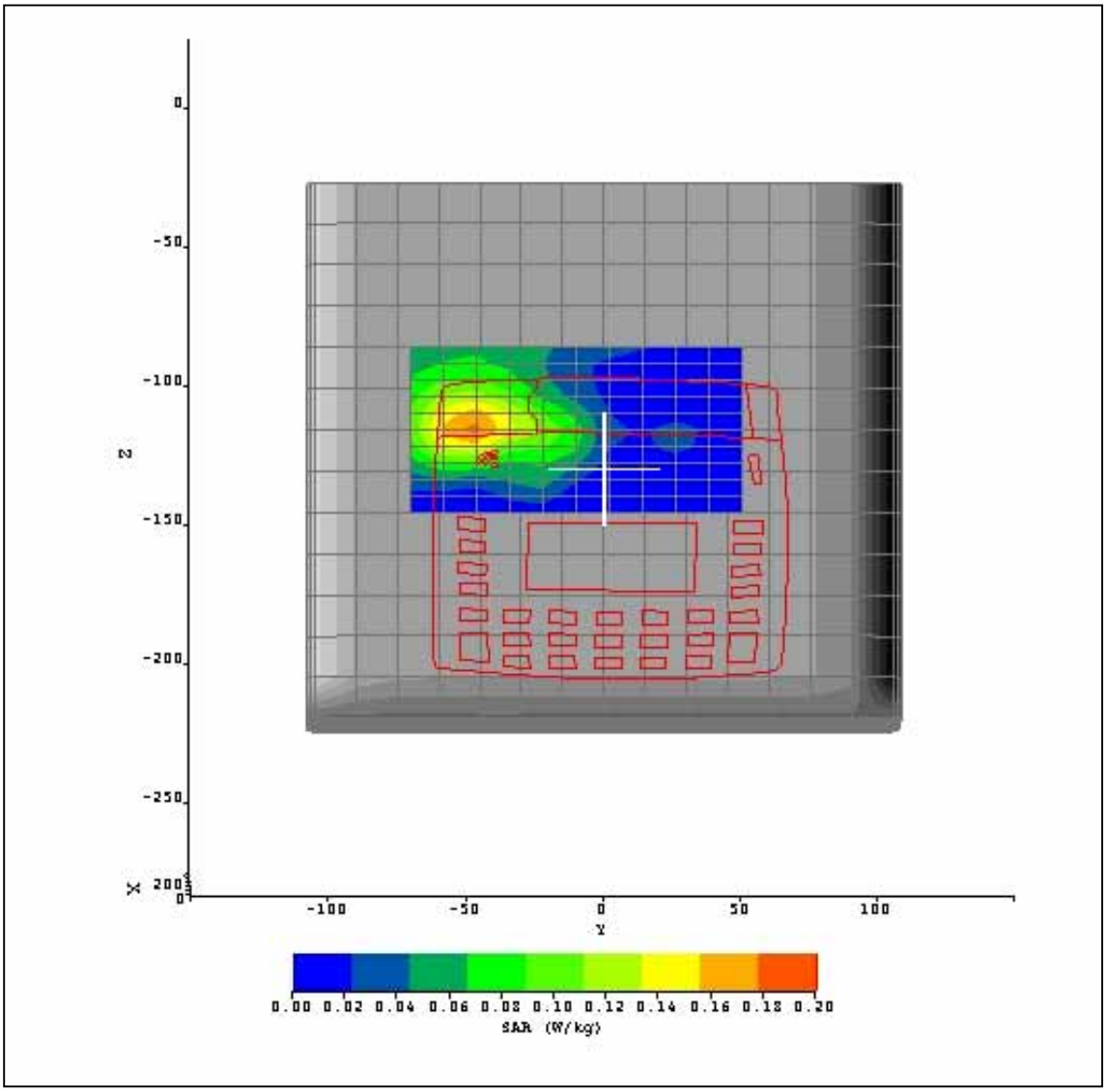


Figure 6

2.9 TEST RESULTS INCLUDING SAR DISTRIBUTIONS (AREA SCANS – 2D)

System	IndexSAR SARA2	Power Drift	0.2dBm
Date of Test	20/02/03	Battery Model	0557162
Lab Ambient	24.7 ºC	Probe Serial Number	IXP-050 0117
Device ID	WWC-107C	Liquid Simulant	2450 MHz Body
Phantom	Flat Phantom box	Permittivity	52.3
Phantom S/No	02/02	Conductivity	1.997
Phantom Rotation (deg)	0/180	Liquid Ambient	22.2 ºC
Test Position	Left Touch	Max SAR 'Y' Axis Location	-48.4 mm
Antenna Position	Integrated	Max SAR 'Z' Axis Location	-109.4 mm
Test Frequency	2442 MHz	SAR 1g	0.195 W/Kg
Type of Modulation	CW	SAR 10g	0.104 W/kg
Crest Factor	1.0	SAR Drift	0.21 dB
Diode Compression factor	20; 20; 20		

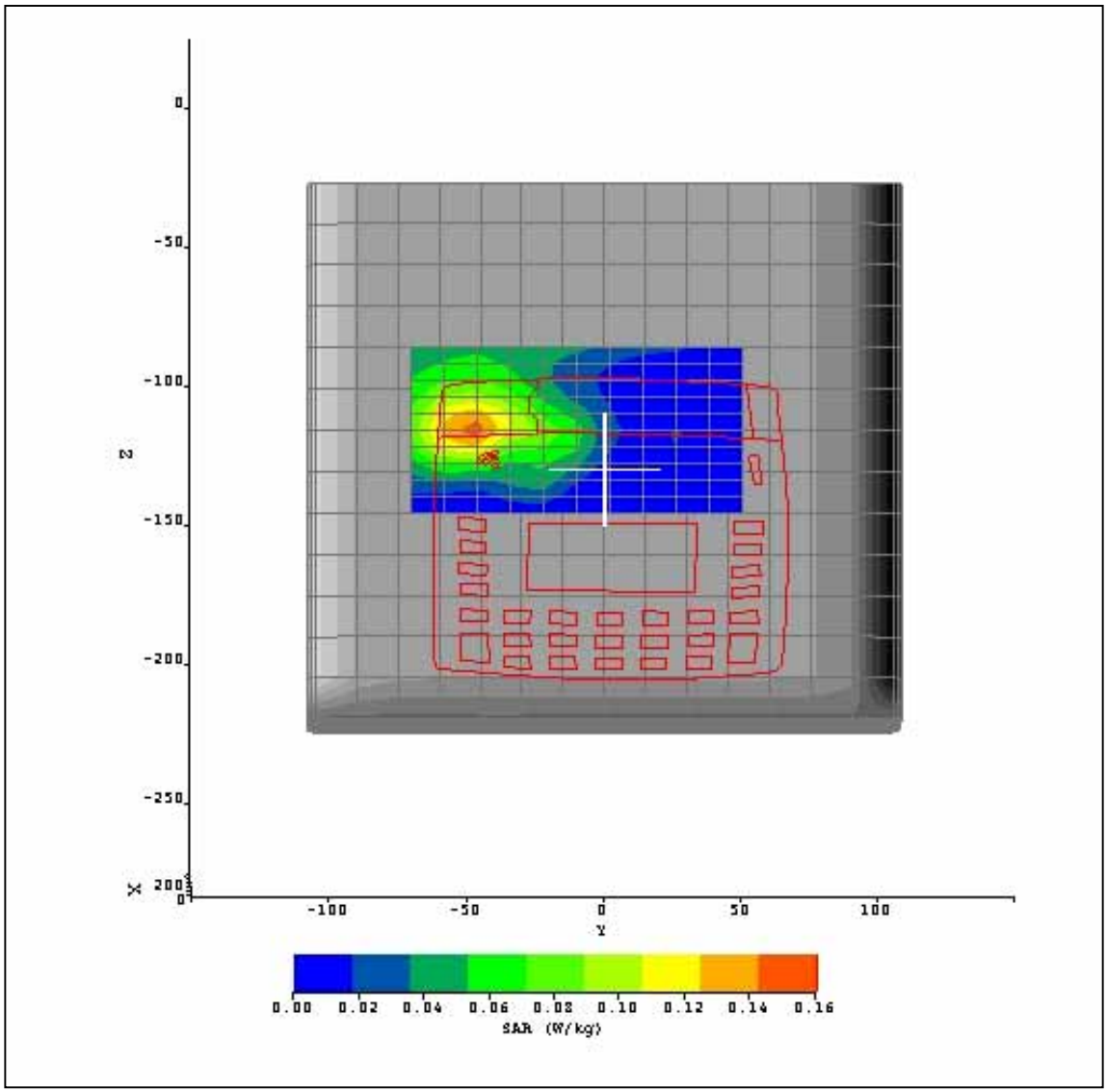


Figure 7

2.9 TEST RESULTS INCLUDING SAR DISTRIBUTIONS (AREA SCANS – 2D)

System	IndexSAR SARA2	Power Drift	0.3dBm
Date of Test	20/02/03	Battery Model	0557162
Lab Ambient	24.8 ºC	Probe Serial Number	IXP-050 0117
Device ID	WWC-107C	Liquid Simulant	2450 MHz Body
Phantom	Flat Phantom box	Permittivity	52.3
Phantom S/No	02/02	Conductivity	1.997
Phantom Rotation (deg)	0/180	Liquid Ambient	22.2 ºC
Test Position	Left Touch	Max SAR 'Y' Axis Location	-47.2 mm
Antenna Position	Integrated	Max SAR 'Z' Axis Location	-108.8 mm
Test Frequency	2462 MHz	SAR 1g	0.168 W/Kg
Type of Modulation	CW	SAR 10g	0.090 W/kg
Crest Factor	1.0	SAR Drift	-0.29 dB
Diode Compression factor	20; 20; 20		

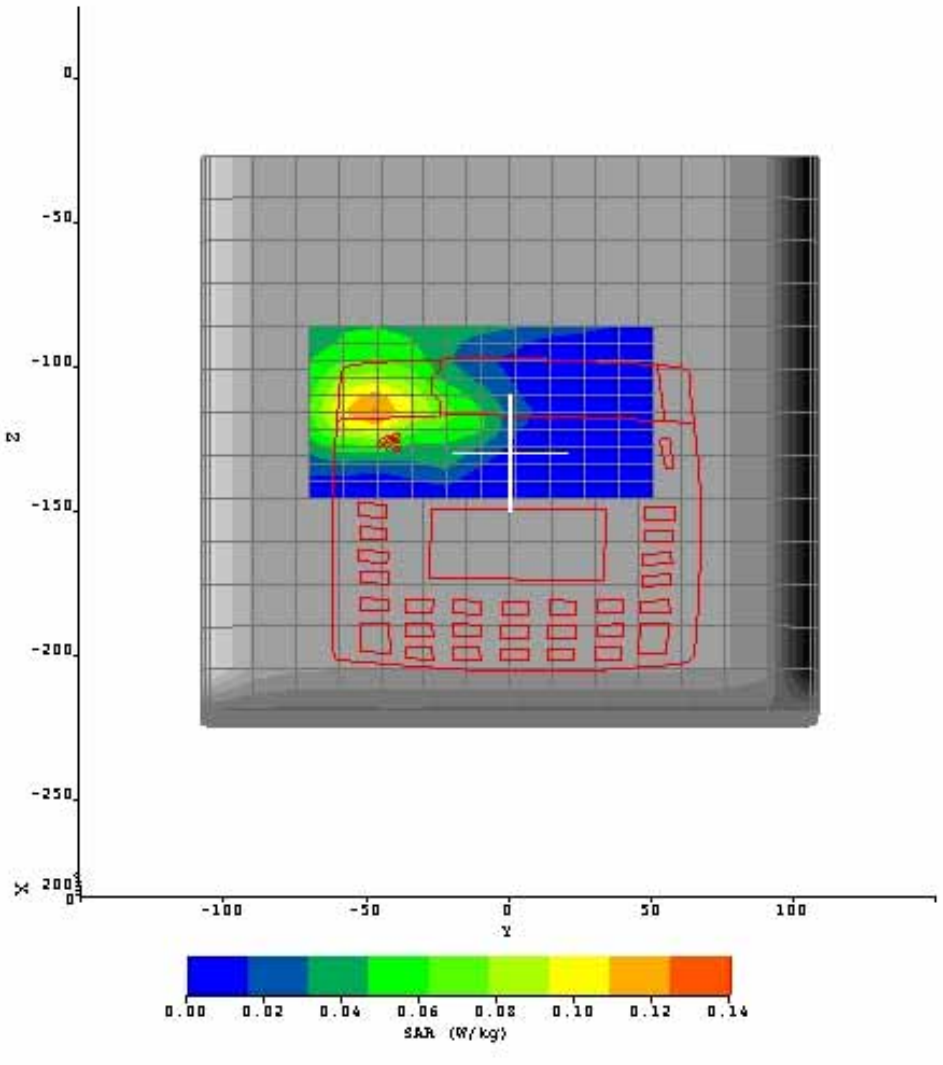


Figure 8

2.9 TEST RESULTS INCLUDING SAR DISTRIBUTIONS (AREA SCANS – 2D)

System	IndexSAR SARA2	Power Drift	0.3dBm
Date of Test	20/02/03	Battery Model	0557162
Lab Ambient	24.8 ºC	Probe Serial Number	IXP-050 0117
Device ID	WWC-107C	Liquid Simulant	2450 MHz Body
Phantom	Flat Phantom	Permittivity	52.3
Phantom S/No	02/02	Conductivity	1.997
Phantom Rotation (deg)	0/180	Liquid Ambient	22.2 ºC
Test Position	Left Touch	Max SAR 'Y' Axis Location	-47.2 mm
Antenna Position	Integrated	Max SAR 'Z' Axis Location	-108.8 mm
Test Frequency	2462 MHz	SAR 1g	0.168 W/Kg
Type of Modulation	CW	SAR 10g	0.090 W/kg
Crest Factor	1.0	SAR Drift	-0.29 dB

Diode Compression factor : 20; 20; 20

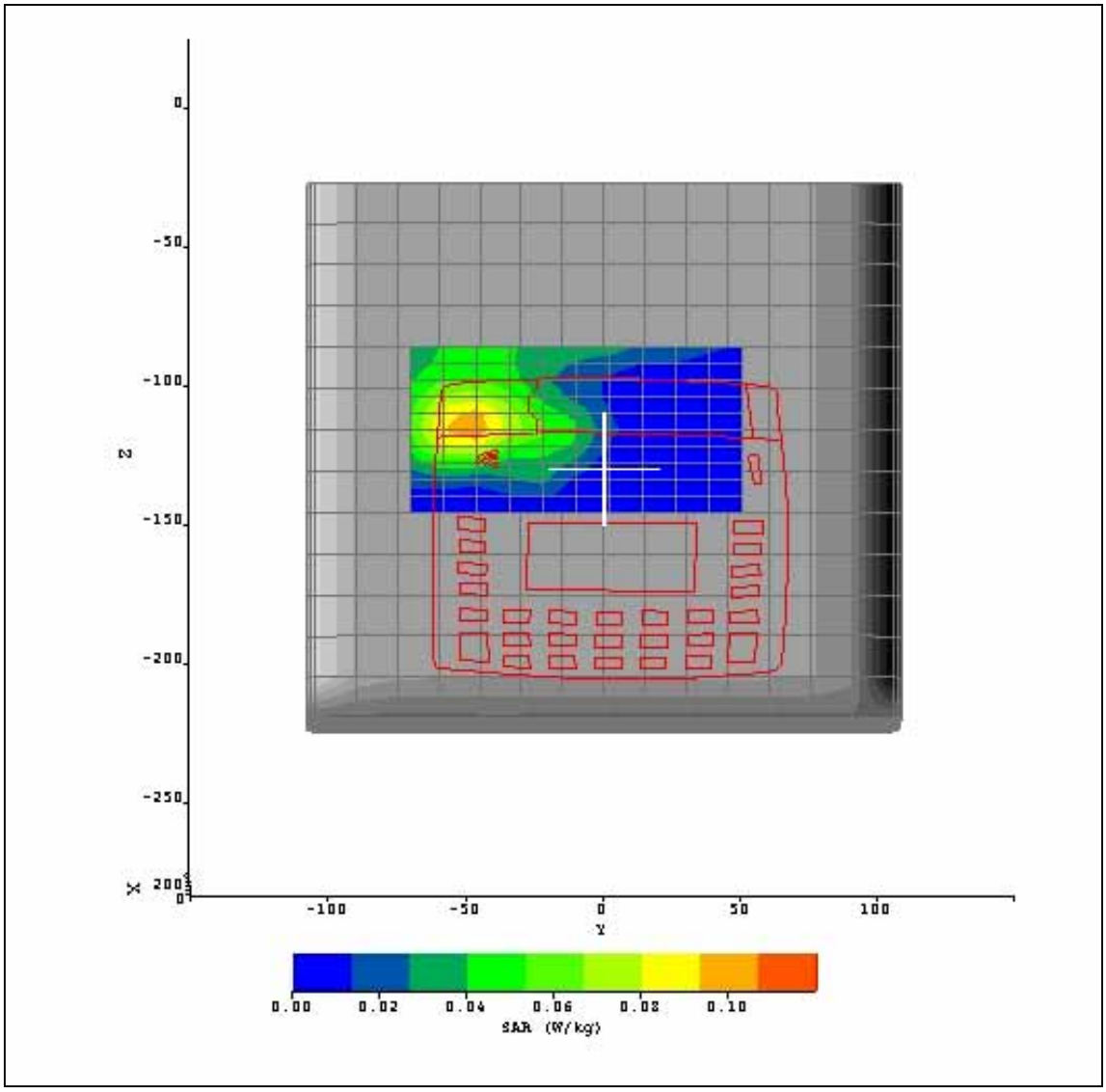


Figure 9

2.9 SAR DISTRIBUTIONS (AREA SCANS – 2D)

System	IndexSAR SARA2	Power Drift	-0.5dBm
Date of Test	20/02/03	Battery Model	0557162
Lab Ambient	24.4 ºC	Probe Serial Number	IXP-050 0117
Device ID	WWC-107C	Liquid Simulant	2450 MHz Body
Phantom	Flat Phantom	Permittivity	52.3
Phantom S/No	02/02	Conductivity	1.997
Phantom Rotation (deg)	0/180	Liquid Ambient	22.1 ºC
Test Position	Left Touch	Max SAR 'Y' Axis Location	-23.00 mm
Antenna Position	Integrated	Max SAR 'Z' Axis Location	-115.4 mm
Test Frequency	2412 MHz	SAR 1g	0.336 W/Kg
Type of Modulation	CW	SAR 10g	0.193 W/kg
Crest Factor	1.0	SAR Drift	1dB
Diode Compression factor	20; 20; 20		

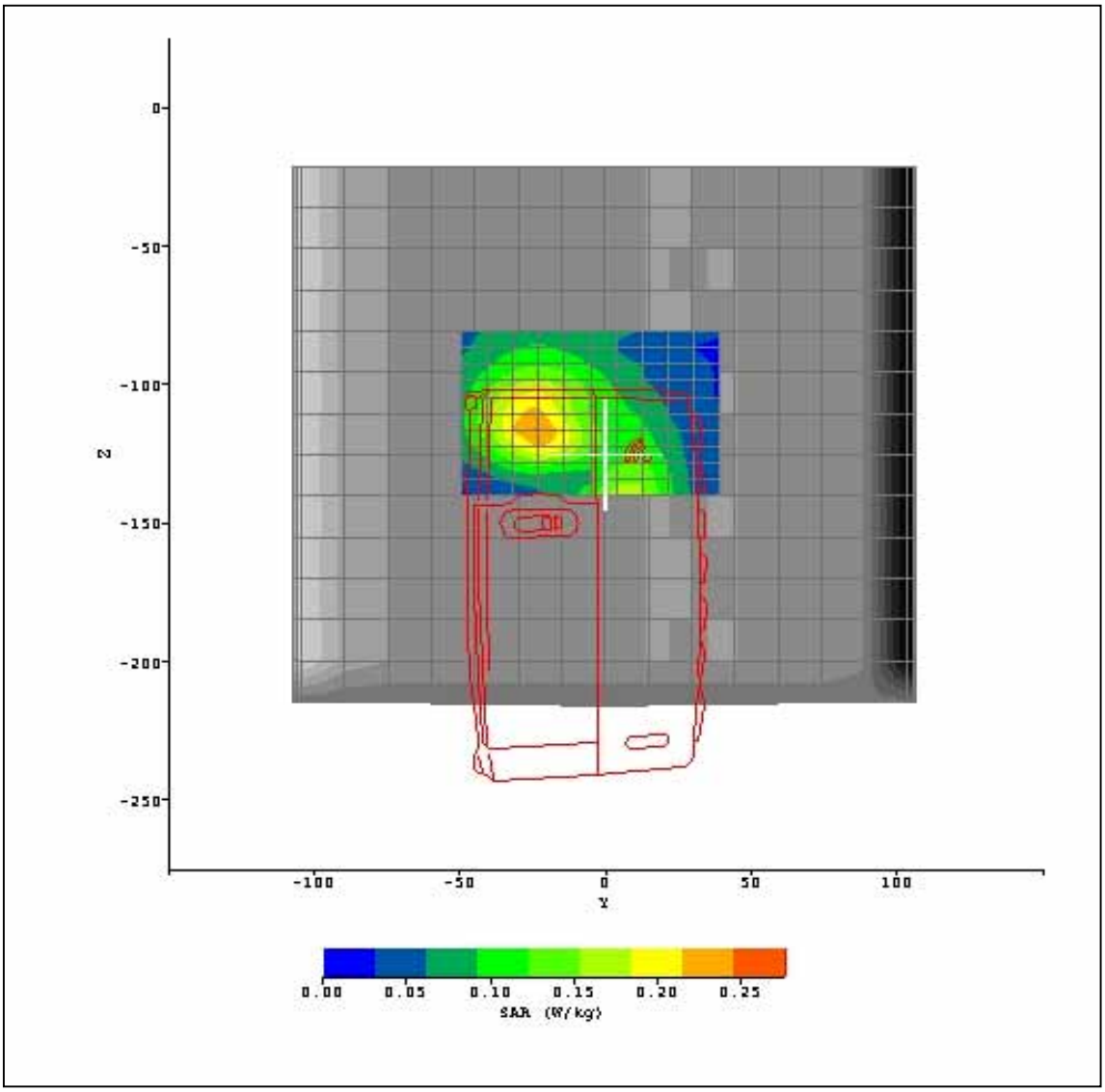


Figure 10

2.9 SAR DISTRIBUTIONS (AREA SCANS – 2D

System	IndexSAR SARA2	Power Drift	0.4dBm
Date of Test	21/02/03	Battery Model	0557162
Lab Ambient	23.9 ºC	Probe Serial Number	IXP-050 0117
Device ID	WWC-107C	Liquid Simulant	2450 MHz Body
Phantom	Flat Phantom	Permittivity	52.3
Phantom S/No	02/02	Conductivity	1.997
Phantom Rotation (deg)	0/180	Liquid Ambient	22.1 ºC
Test Position	Left Touch	Max SAR 'Y' Axis Location	-2.3 mm
Antenna Position	Integrated	Max SAR 'Z' Axis Location	-122.8 mm
Test Frequency	2412 MHz	SAR 1g	1.676 W/Kg
Type of Modulation	CW	SAR 10g	0.720 W/kg
Crest Factor	1.0	SAR Drift	1 dB

Diode Compression factor : 20; 20; 20

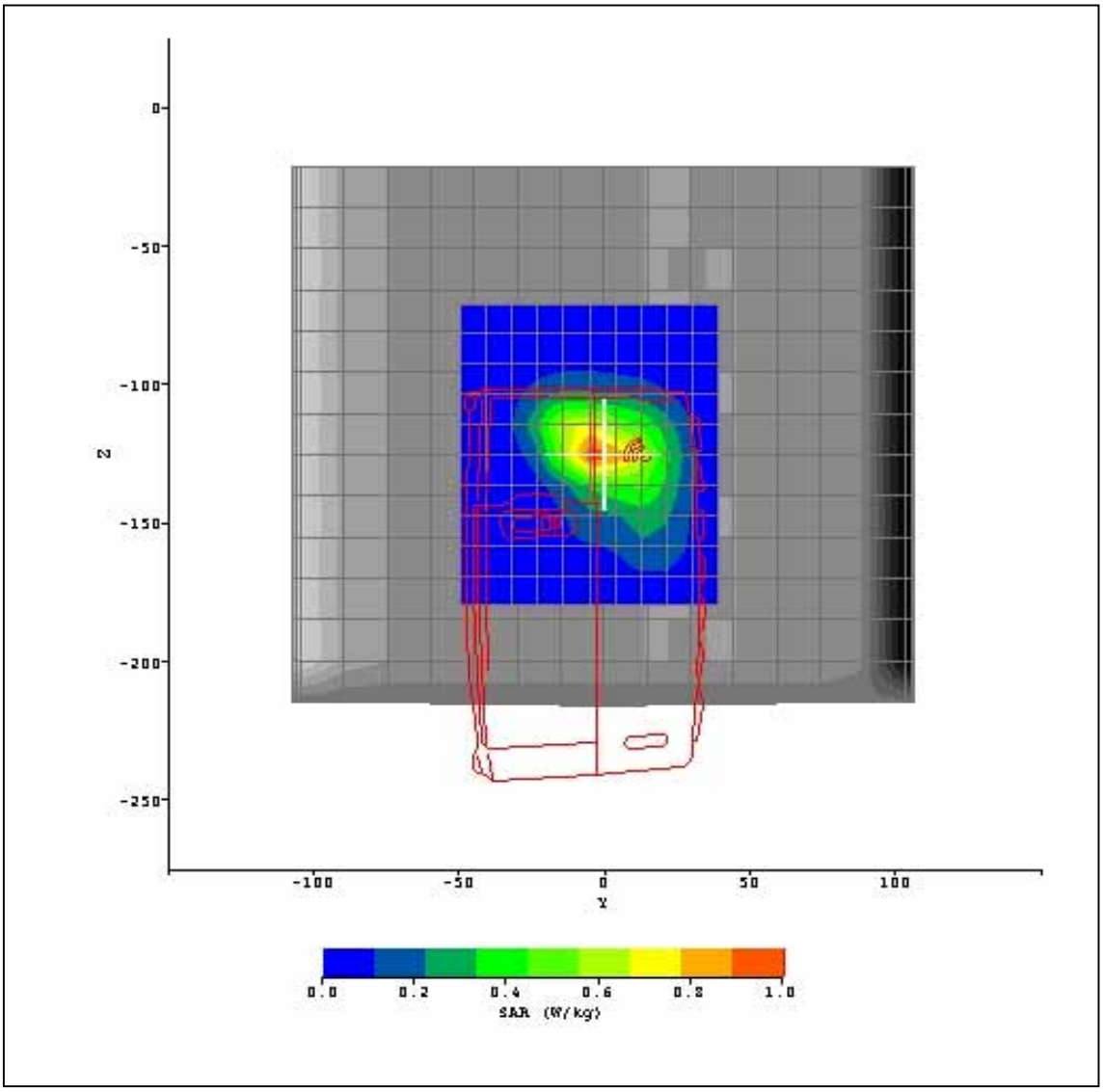


Figure 11

2.10 TEST POSITIONAL PHOTOGRAPHS

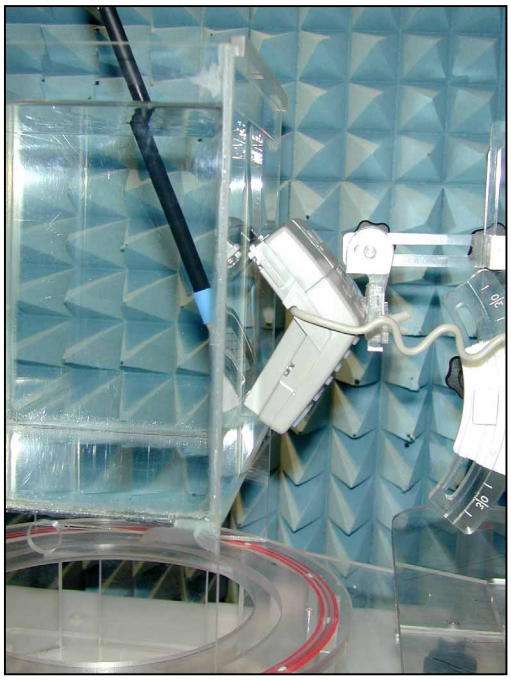


Figure 12. Positional photograph of WWC-107C
Inner surface of device facing Box - center max 2.5cm away with top and bottom touching

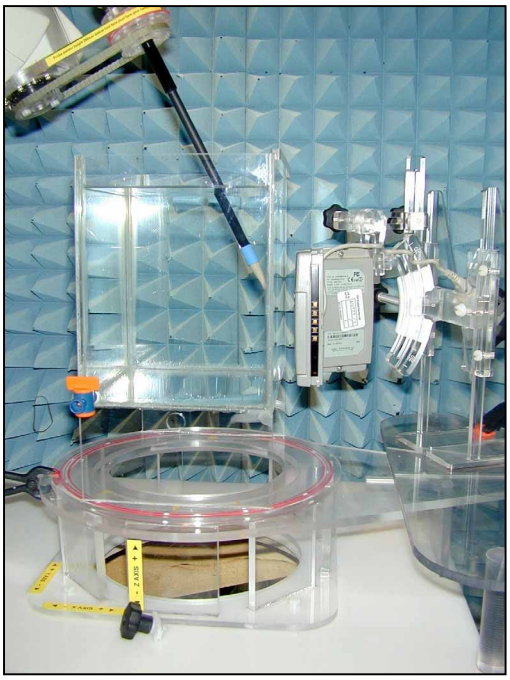


Figure 13. Positional photograph of WWC-107C
Battery side – 1.5cm from side

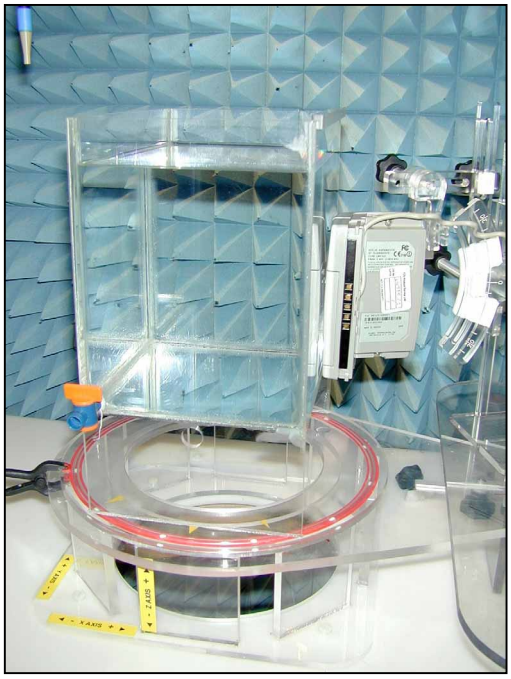


Figure 14. Positional photograph of WWC-107C
Battery side – 1.5cm from side

2.10 RECORD PHOTOGRAPHS

Figure 15. Front and rear views of WWC-107C Wearable Wrist Computer.

2.10 RECORD PHOTOGRAPHS

Figure 16. Front and rear views of WWC-107C Wearable Wrist Computer.

2.10 RECORD PHOTOGRAPHS

Figure 17. Front and rear views of WWC-107C Wearable Wrist Computer.

2.11 MANUFACTURER'S LABEL DRAWING

Not to scale

Figure 18.

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