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Report On

Specific Absorption Rate Testing of the
Modelabs Manufacture CD1D Handset

FCC ID: WCKCD1D

Document 75903927 Report 04 Issue 2 July 2008

Product Service

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REPORT ON

Specific Absorption Rate Testing of the
Modelabs Manufacture CD1D Handset

Document 75903927 Report 04 Issue 2

July 2008

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DATED 23 July 2008

This report has been up-issued to Issue 2 to include Output Power Measurements for the CD1S

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SECTION 1

REPORT SUMMARY

Specific Absorption Rate Testing of the
Modelabs Manufacture CD1D Handset

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Specific Absorption Rate Testing of the Modelabs Manufacture CD1D Handset to the requirements of US Federal Government, Code of Federal Regulations, Title 47 Telecommunication, Chapter I Federal Communications Commission, part 2, section 1093. Applied standard – 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

Objective	To perform Specific Absorption Rate Testing to determine the Equipment Under Test's (EUT's) compliance with the specification, for the series of tests carried out.
Applicant	Avantech
Manufacturer	Modelabs Manufacture
Manufacturing Description	Mobile Handset
Model Number	CD1D
Power Class	GSM 850 MHz Class 4 PCS 1900 MHz Class 1 Bluetooth Class 3
GPRS Class	Class B
GPRS Multi-slot Class	12 (4Dn; 4Up; Sum5)
IMEI Number(s) Handset 1	00440175000714487 (CD1D Version)
IMEI Number(s) Handset 2	00440175000764987 (CD1D-S Version)
Hardware Version	PrePilot
Software Version	0259000505020000
Battery Cell Manufacturer	Modelabs Manufacture Battery Source – .XWODA (Made in China)
Model Number	AB0950AWM (Type: Li-ion 3.7V / 950mAh)
FCC ID	WCKCD1D
Test Specification/Issue/Date	OET 65(c) 01-01
Start of Test	21 June 2008
Finish of Test	23 June 2008
Related Document(s)	IEEE 1528 – 2003 & FCC OET KDB 648 474

1.2 BRIEF SUMMARY OF RESULTS

The wireless portable device described within this report has been shown to be capable of compliance for localised specific absorption rate (SAR) of 1.6 W/kg.

The measurements shown in this report were made in accordance with the procedures specified OET 65(c) 01-01.

All reported testing was carried out on a sample of equipment to demonstrate compliance with OET 65(c) 01-01. The sample tested was found to comply with the requirements in the applied rules.

The maximum 1g volume averaged SAR found during this Assessment

Max 1g SAR (W/kg)	0.800
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). This device is compliant with CFR47 § 2.1093.	

1.3 TEST RESULTS SUMMARY

1.3.1 System Performance / Validation Check Results

Prior to formal testing being performed a System Check was performed in accordance with OET 65 Supplement C (Edition 01-01) and the results were compared against published data in Standard IEEE 1528-2003. The following results were obtained: -

System performance / Validation results

Date	Dipole Used	Frequency (MHz)	Max 1g SAR (W/kg)	Percentage Drift on Reference	Max 10g SAR (W/kg)	Percentage Drift on Reference
25/06/2008	850 MHz	844.4	10.67*	-1.25%	6.9*	-0.01%
21/06/2008	1900 MHz	1883.6	39.91*	4.76%	21.08*	6.46%

*Normalised to a forward power of 1W

1.3.2 Results Summary Tables

GSM 850MHz HEAD Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D Version) Mobile Device In standard configuration with standard antenna & battery.

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Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Left or Right Hand Ear	Mobile Position							
LH	Cheek	189	836.4	0.400	0.381	0.275	-4.210	Figure 8
LH	15°	189	836.4	0.260	0.291	0.196	-3.030	Figure 9
RH	Cheek	189	836.4	0.460	0.430	0.287	-1.180	Figure 10
RH	15°	189	836.4	0.240	0.227	0.165	-4.450	Figure 11
RH	Cheek	128	824.2	0.450	0.405	0.282	1.130	Figure 12
RH	Cheek	251	848.8	0.440	0.424	0.290	-0.660	Figure 13
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

GSM 850MHz HEAD Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D-S Version) Mobile Device In standard configuration with standard antenna & battery.

.

Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Left or Right Hand Ear	Mobile Position							
RH	Cheek	251	848.8	0.440	0.426	0.300	1.470	Figure 14
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

GPRS 850MHz BODY Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D Version) Mobile Handset with hands-free accessory, standard antenna & battery.

Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Spacing From Phantom	Mobile Position							
25mm	Front Facing	189	836.4	0.410	0.458	0.340	-0.790	Figure 15
25mm	Rear Facing	189	836.4	0.570	0.669	0.480	1.830	Figure 16
25mm	Rear Facing	128	824.2	0.600	0.677	0.503	-0.320	Figure 17
25mm	Rear Facing	251	848.8	0.700	0.800	0.585	-1.990	Figure 18
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

GPRS 850MHz BODY Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D-S Version) Mobile Handset with hands-free accessory, standard antenna & battery..

Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Spacing From Phantom	Mobile Position							
25mm	Rear Facing	251	848.8	0.560	0.630	0.467	2.140	Figure 19
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

GSM 1900MHz HEAD Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D Version) Mobile Device In standard configuration with standard antenna & battery.

Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Left or Right Hand Ear	Mobile Position							
LH	Cheek	661	1880.0	0.260	0.224	0.133	-2.520	Figure 20
LH	15°	661	1880.0	0.100	0.103	0.064	-1.850	Figure 21
RH	Cheek	661	1880.0	0.220	0.209	0.125	-1.060	Figure 22
RH	15°	661	1880.0	0.090	0.086	0.052	-0.340	Figure 23
LH	Cheek	512	1850.2	0.290	0.279	0.164	-1.380	Figure 24
LH	Cheek	810	1909.8	0.280	0.238	0.143	3.930	Figure 25
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

GSM 1900MHz HEAD Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D-S Version) Mobile Device In standard configuration with standard antenna & battery.

Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Left or Right Hand Ear	Mobile Position							
LH	Cheek	512	1850.2	0.340	0.288	0.175	1.53	Figure 26
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

GPRS 1900MHz BODY Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D Version) Mobile Handset with hands-free accessory, standard antenna & battery..

Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Spacing From Phantom	Mobile Position							
15mm	Rear Facing	661	1880.0	0.240	0.290	0.181	6.560	Figure 27
15mm	Front Facing	661	1880.0	0.240	0.301	0.186	2.560	Figure 28
15mm	Front Facing	512	1850.2	0.220	0.274	0.168	-1.130	Figure 29
15mm	Front Facing	810	1909.8	0.220	0.285	0.177	2.390	Figure 30
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

GPRS 1900MHz BODY Specific Absorption Rate (Maximum SAR) 1g & 10g Results for the Modelabs Manufacture CD1D (CD1D-S Version) Mobile Handset with hands-free accessory, standard antenna & battery..

Position		Channel Number	Frequency (MHz)	Max Spot SAR (W/kg)	Max 1g SAR (W/kg	Max 10g SAR (W/kg)	SAR Drift (%)	Area scan (Figure number)
Spacing From Phantom	Mobile Position							
15mm	Front Facing	661	1880.0	0.200	0.244	0.137	1.190	Figure 31
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) & 2.0 W/kg (10g)								

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The equipment under test (EUT) was a Modelabs Manufacture CD1D Handset. A full technical description can be found in the manufacturer's documentation.

1.4.2 Test Configuration and Modes of Operation

Modelabs Manufacture supplied a CD1D mobile device for Specific Absorption Rate (SAR) testing which was configured for GSM Voice and GSM GPRS Data operation. The testing was performed with batteries supplied and manufactured by Modelabs Manufacture, Battery Source: XWODA. Each battery was fully charged before each measurement and there were no external connections.

For head SAR assessment, testing was performed with the device in the declared normal position of operation for GSM 850MHz and PCS 1900MHz. The device was placed against a Specific Anthropomorphic Mannequin (SAM) phantom as specified in the CENELEC standard IEEE1528-2003. The phantom was filled with simulant liquid appropriate to the frequency band. The dielectric properties were measured and found to be in accordance with the requirements for the dielectric properties specified in OET 65(c) 01-01. SAR testing was performed at both the left and right ear of the phantom at both handset positions stated in the applied specification.

For body SAR assessment, testing was performed for GPRS 850 MHz, GPRS 1900 MHz bands at maximum power using a duty cycle of 50%. SAR assessment was performed with a Simple Hands Free (SHF) accessory attached during testing on the Body. The mobile device was placed at distance of 15 mm from the bottom of the flat phantom for 1900 MHz body testing and at distance of 25 mm for 850 MHz body testing. The Flat Phantom dimensions were 210mm x 210mm x 210mm with a sidewall thickness of 2.00mm. The phantom was filled to a minimum depth of 150mm with the appropriate 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).

Testing was performed at the middle frequency of each band and at the top and the bottom frequencies for the position giving maximum SAR. For head SAR assessment the sequence used accorded with the block diagram of tests given in IEEE1528-2003. Testing was performed at the maximum power for GSM 850 MHz and PCS 1900 MHz. This was achieved using a Universal Radio Communications test set.

The Modelabs Manufacture CD1D mobile device had an integral GSM/PCS antenna so that the requirement for testing with antenna extended and retracted was not applicable.

The Modelabs Manufacture CD1D mobile device has two versions; CD1D and CD1D-S which are electrically identical apart from the front flip design. The difference between the two versions is that the CD1D version uses diamonds on the housing while the CDS-1 version does not have diamonds and is of a different colour. The CD1D version was fully tested in all head and body configurations for each band and then the CDS-1 version was subjected to SAR assessment in the position and frequency providing the maximum SAR for each band for both head and body SAR assessment.

The Modelabs Manufacture CD1D contains a Bluetooth device and is capable of simultaneous transmission. The closest distance between the GSM 850 / PCS 1900 antenna and the Bluetooth antenna is 1cm. In accordance with the guidelines from the FCC document, number KDB 648474, due to the maximum 1-gram SAR level of the GSM 850 / PCS 1900 transmitter being less than 1.2W/kg, no Bluetooth stand-alone assessment was required and furthermore no co-transmission assessment was required to be carried out.

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 handset against the body as appropriate.

1.4.3 OUTPUT POWER OF TEST DEVICE MEASUREMENT METHOD

The EUT was set up to Transmit on all of the following frequencies (See Table Below).

A peak measurement of the carrier frequency was recorded with the EUT in its worse case orientation using a RES B/W of 1MHz and Vid B/W of 1MHz at a distance of 3m.

A signal generator was then connected to a horn antenna at 1.5m fixed height, at the 3m position in place of the EUT. The measuring receive horn and the substituting transmit horn were then electronically aligned (height search at the received frequency until maximum correlation is achieved).

The signal generator level was adjusted until the recorded peak level (raw peak) was reproduced. The cable was then removed from the substitution transmit horn and attached to the measurement receiver input. The measured level into the substitution transmit horn and its isotropic gain was used to calculate the maximum radiated peak output power (ERP/EIRP).

CD1D

Frequency MHz	Output Power dBm	Output Power (mW)
824.2	+29.4	871
836.4	+27.4	550
848.8	+28.0	631
1850.2	+25.7	372
1880.0	+26.2	417
1909.8	+27.1	513

CD1S

Frequency MHz	Output Power dBm	Output Power (mW)
824.2	+27.2	525
836.4	+26.2	417
848.8	+26.4	437
1850.2	+26.2	417
1880.0	+26.4	437
1909.8	+23.8	240

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SECTION 2

TEST DETAILS

Specific Absorption Rate Testing of the
Modelabs Manufacture CD1D Handset

2.1 SAR MEASUREMENT SYSTEM

2.1.1 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.

Schematic diagram of the SAR measurement system

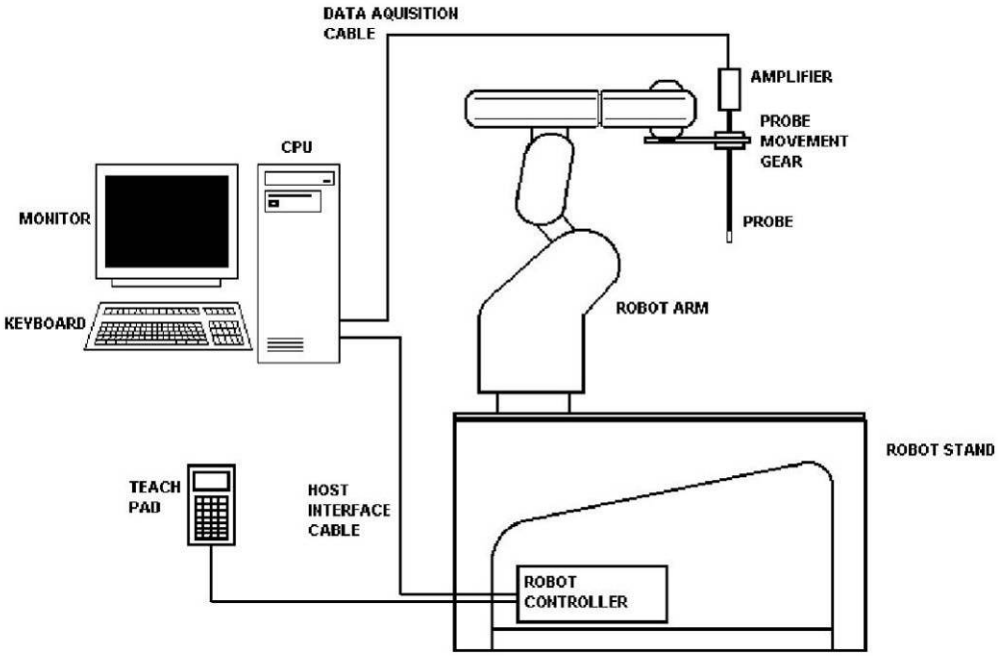


Figure 1

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.

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.

2.1.2 Probe and Amplifier Specification

IXP-050 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.

IFA-010 Fast Amplifier

Technical description of IndexSAR IFA-010 Fast probe amplifier
A block diagram of the fast probe amplifier electronics is shown below.

Block diagram of the fast probe amplifier electronic

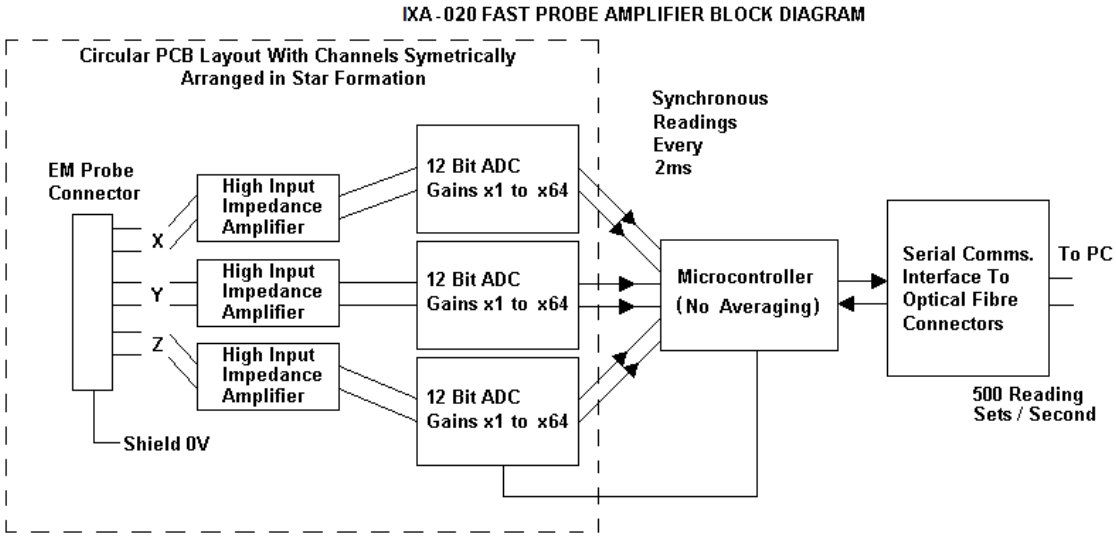


Figure 2

This amplifier has a time constant of approx. 50µs, which is much faster than the SAR probe response time. The overall system time constant is therefore that of the probe (<1ms) and reading sets for all three channels (simultaneously) are returned every 2ms to the PC. The conversion period is approx. 1 µs at the start of each 2ms period. This enables the probe to follow pulse modulated signals of periods >>2ms. The PC software applies the linearisation procedure separately to each reading, so no linearisation corrections for the averaging of modulated signals are needed in this case. It is important to ensure that the probe reading frequency and the pulse period are not synchronised and the behaviour with pulses of short duration in comparison with the measurement interval need additional consideration.

Phantoms

The Flat phantom used is a rectangular Perspex Box IndexSAR item IXB-070. Dimensions 210w 210d 210h (mm). This phantom is used with IndexSAR side bench IXM-030.

The Specific Anthropomorphic Mannequin (SAM) Upright Phantom is fabricated using moulds generated from the CAD files as specified by CENELEC EN 62209-1:2006. It is mounted via a rotation base to a supporting table, which also holds the robotic positioner. The phantom and robot alignment is assured by both mechanical and laser registration systems.

2.1.3 SAR Measurement Procedure

Principal components of the SAR measurement test bench

Figure 3

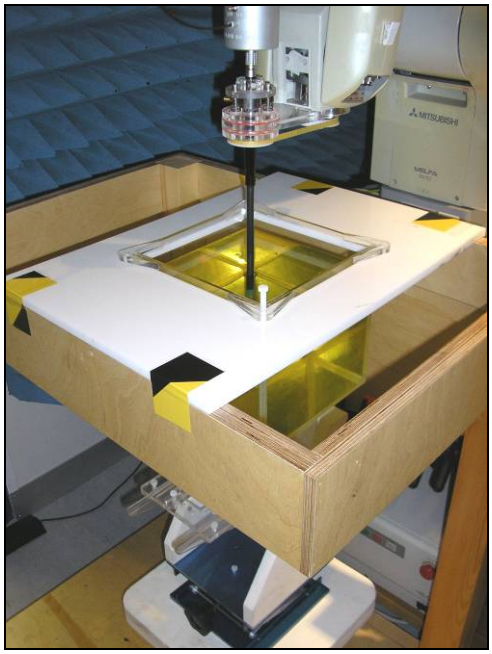


Figure 4

The major components of the test bench are shown in the picture above. A test set and dipole antenna control the handset via an air link and a low-mass phone holder can position the phone at either ear. Graduated scales are provided to set the phone in the 15 degree position. The upright phantom head holds approx. 7 litres of simulant liquid. The phantom is filled and emptied through a 45mm diameter penetration hole in the top of the head.

After an area scan has been done at a fixed distance of 8mm from the surface 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 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. 115mm 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.

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 head 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 curved inner surface of the phantom (see Appendix C.2.2.1 in EN 62209-1:2006). 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 62209-1:2006.

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 62209-1:2006) 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 EN 62209-1:2006) is +/- 0.04mm.

The phantom shell is made by an industrial moulding process from the CAD files of the SAM shape, with both internal and external moulds. For the upright phantoms, the external shape is subsequently digitised on a Mitutoyo CMM machine (Euro C574) to a precision of 0.001mm. Wall thickness measurements made non-destructively with an ultrasonic sensor indicate that the shell thickness (**dph**) away from the ear is 2.0 +/- 0.1mm. The ultrasonic measurements were calibrated using additional mechanical measurements on available cut surfaces of the phantom shells.

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).

2.1.4 Head Test Positions

This recommended practice specifies exactly two test positions for the handset against the head phantom, the “Cheek” position and the “tilted” position. These two test positions are defined in the following sub-clauses. The handset should be tested in both positions on the left and right sides of the SAM phantom. In each test position the centre of the earpiece of the device is placed directly at the entrance of the auditory canal. The angles mentioned in the test positions used are referenced to the line connecting both auditory canal openings. The plane this line is on is known as the reference plane. Testing is performed on the right and left-hand sides of the generic phantom head.

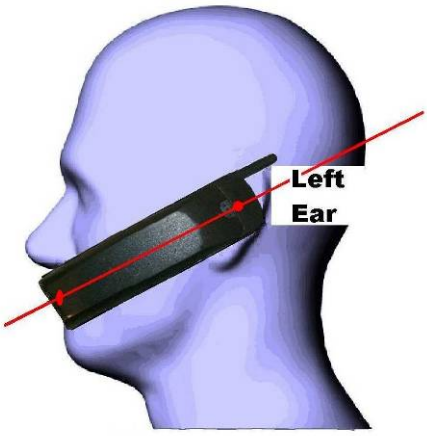


Figure 5. – Side View of Mobile next to head showing alignment.

The Cheek Position

The Cheek Position is where the mobile is in the reference plane and the line between the mobile and the line connecting both auditory canal openings is reduced until any part of the mobile touches any part of the generic twin phantom head.

The 15° Position

The 15° Position is where the mobile is in the reference Cheek position and the phone is kept in contact with the auditory canal at the earpiece; the bottom of the phone is then tilted away from the phantom mouth by 15°.

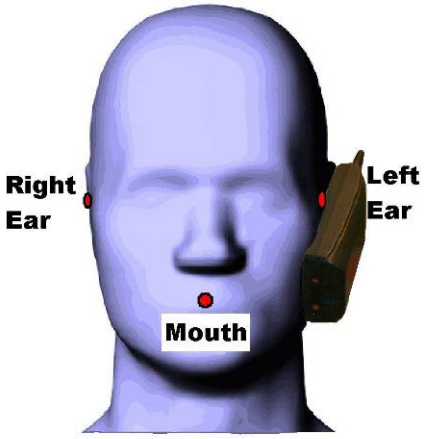


Figure 6. – Cheek Position.

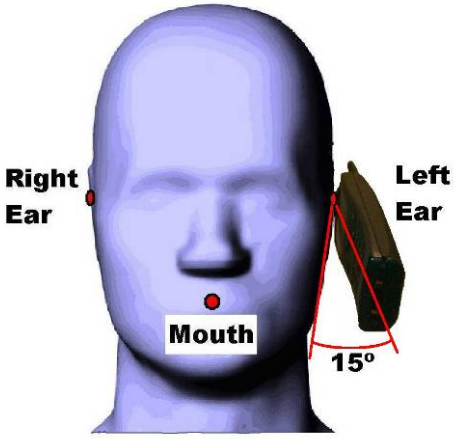


Figure 7. – 15º Tilt Position.

2.2 GSM850 HEAD SAR TEST RESULTS AND COURSE AREA SCANS – 2D

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	25/06/2008 14:34:32	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-01.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	21.80°C	LIQUID SIMULANT:	835Head
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	43.66
RELATIVE HUMIDITY:	50.40%	CONDUCTIVITY:	0.931
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.40°C
PHANTOM ROTATION:	330°	MAX SAR Y-AXIS LOCATION:	-2.00mm
DUT POSITION:	LH-Cheek	MAX SAR Z-AXIS LOCATION:	-143.65mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	20.65 V/m
TEST FREQUENCY:	836.4MHz	SAR 1g:	0.381 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.275 W/kg
CONVERSION FACTORS:	0.276 / 0.276 / 0.276	SAR START:	0.212 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.203 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-4.21 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	25/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

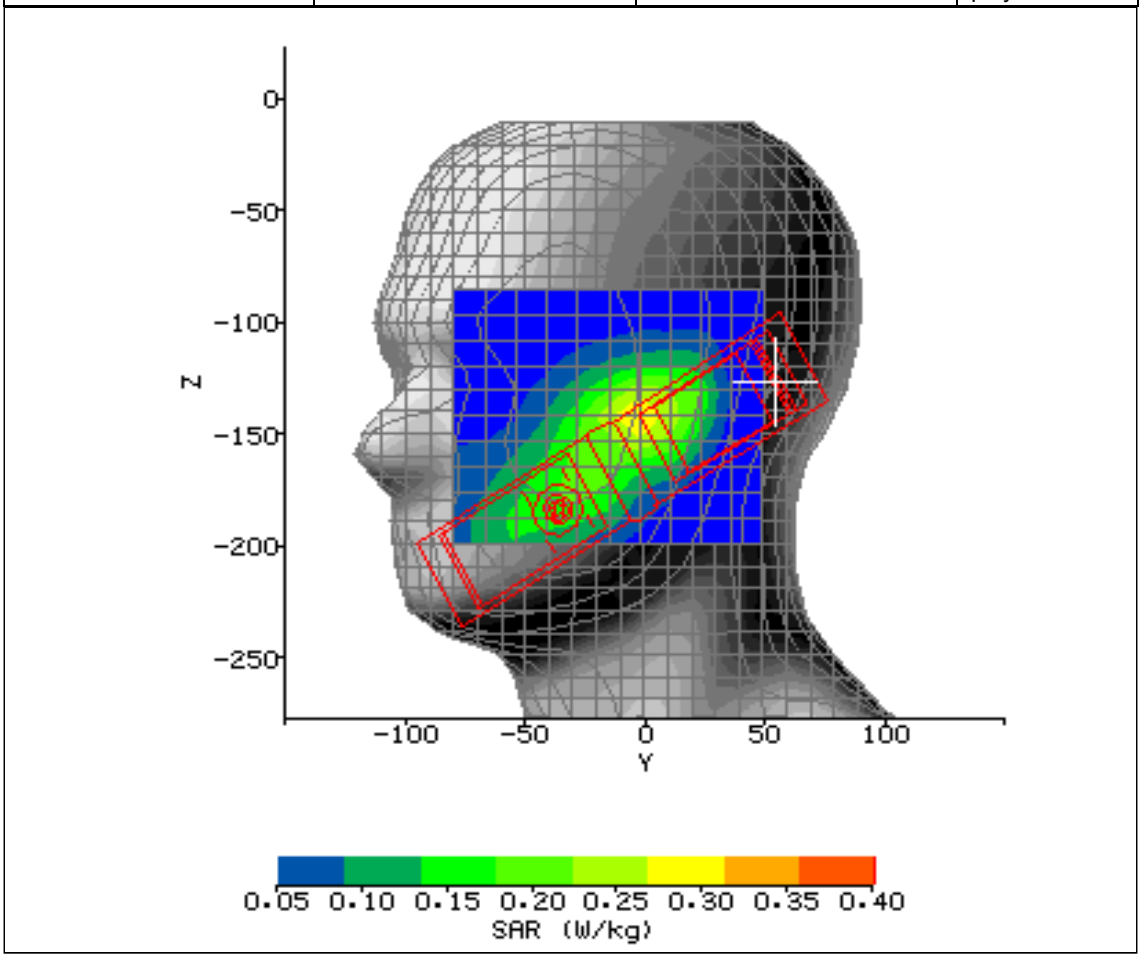


Figure 8: SAR Head Testing Results for the Modelabs CD1D Mobile Device in LH-Cheek Position; Tested at 836.4MHz (GSM 850 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	25/06/2008 15:23:57	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-02.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.00°C	LIQUID SIMULANT:	835Head
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	43.66
RELATIVE HUMIDITY:	54.10%	CONDUCTIVITY:	0.931
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.40°C
PHANTOM ROTATION:	330°	MAX SAR Y-AXIS LOCATION:	9.70mm
DUT POSITION:	LH-Cheek 15°	MAX SAR Z-AXIS LOCATION:	-142.50mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	16.75 V/m
TEST FREQUENCY:	836.4MHz	SAR 1g:	0.291 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.196 W/kg
CONVERSION FACTORS:	0.276 / 0.276 / 0.276	SAR START:	0.157 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.152 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-3.03 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	25/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

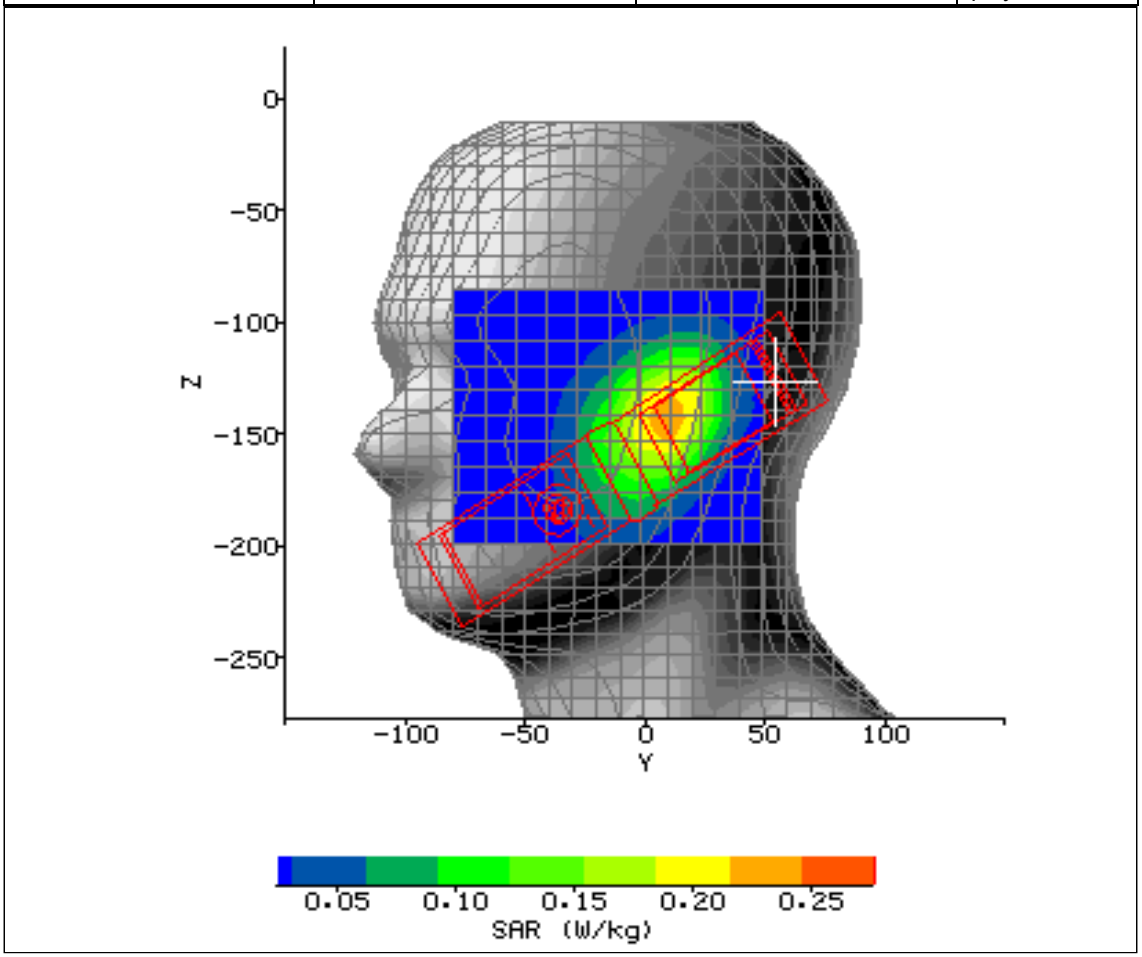


Figure 9: SAR Head Testing Results for the Modelabs CD1D Mobile Device in LH-Cheek 15° Position; Tested at 836.4MHz (GSM 850 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	26/06/2008 12:10:14	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-03.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	21.90°C	LIQUID SIMULANT:	835Head
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	43.66
RELATIVE HUMIDITY:	47.00%	CONDUCTIVITY:	0.931
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	21.90°C
PHANTOM ROTATION:	210°	MAX SAR Y-AXIS LOCATION:	-4.50mm
DUT POSITION:	RH-Cheek	MAX SAR Z-AXIS LOCATION:	-155.15mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	22.22 V/m
TEST FREQUENCY:	836.4MHz	SAR 1g:	0.430 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.287 W/kg
CONVERSION FACTORS:	0.276 / 0.276 / 0.276	SAR START:	0.259 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.256 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-1.18 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	25/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

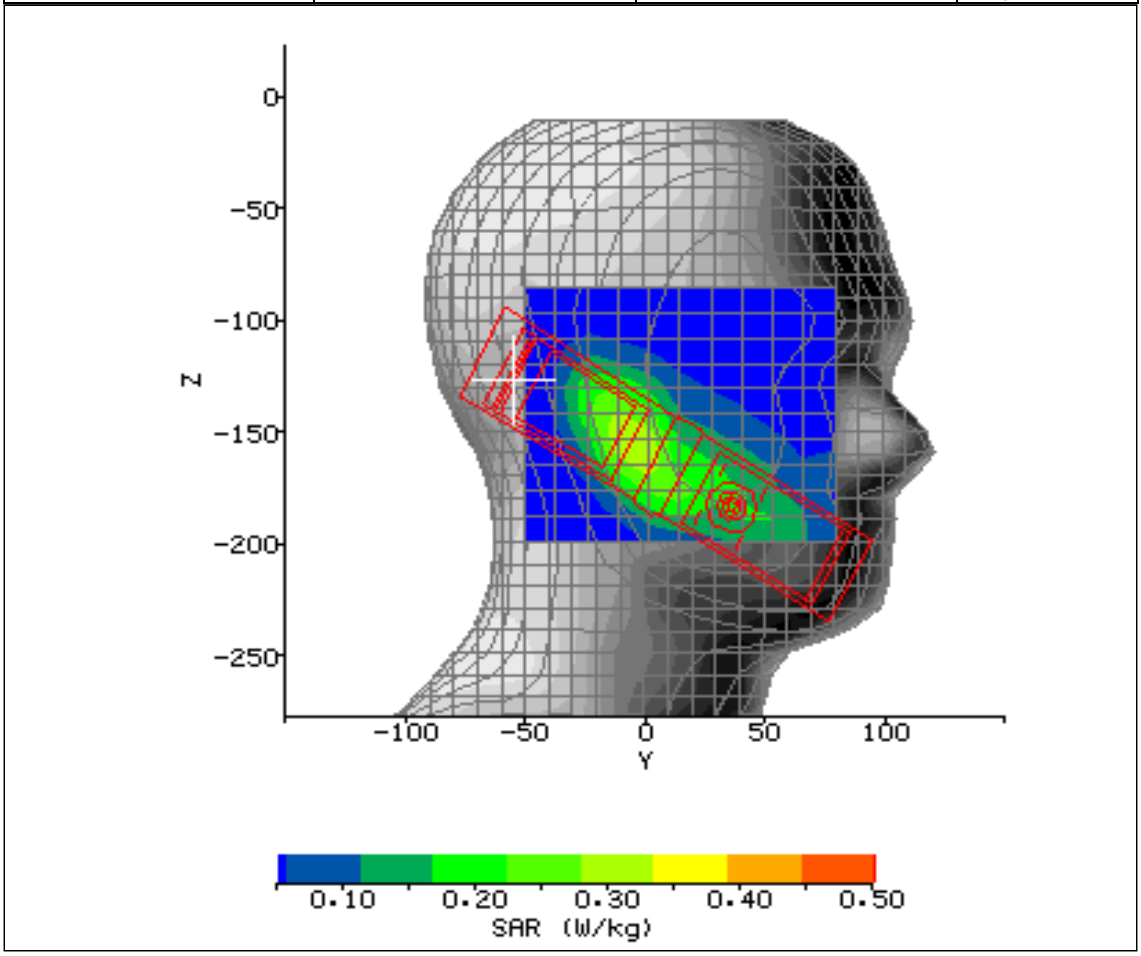


Figure 10: SAR Head Testing Results for the Modelabs CD1D Mobile Device in RH-Cheek Position; Tested at 836.4MHz (GSM 850 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	26/06/2008 12:34:53	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-04.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	22.30°C	LIQUID SIMULANT:	835Head
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	43.66
RELATIVE HUMIDITY:	49.30%	CONDUCTIVITY:	0.931
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	21.90°C
PHANTOM ROTATION:	210°	MAX SAR Y-AXIS LOCATION:	-12.30mm
DUT POSITION:	RH-Cheek 15°	MAX SAR Z-AXIS LOCATION:	-141.35mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	16.05 V/m
TEST FREQUENCY:	836.4MHz	SAR 1g:	0.227 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.165 W/kg
CONVERSION FACTORS:	0.276 / 0.276 / 0.276	SAR START:	0.144 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.138 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-4.45 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	25/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

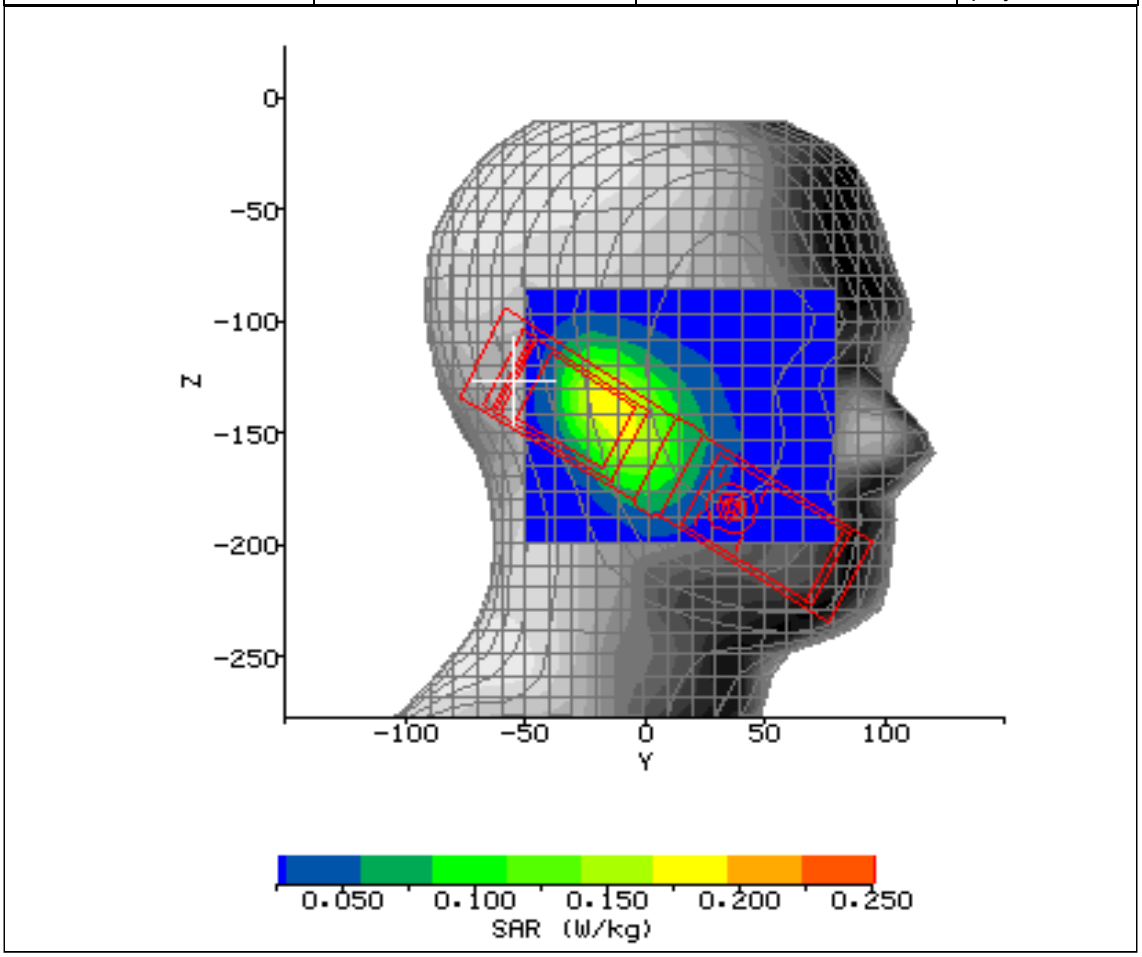


Figure 11: SAR Head Testing Results for the Modelabs CD1D Mobile Device in RH-Cheek 15° Position; Tested at 836.4MHz (GSM 850 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	26/06/2008 13:20:00	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-05.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.40°C	LIQUID SIMULANT:	835Head
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	43.66
RELATIVE HUMIDITY:	45.90%	CONDUCTIVITY:	0.931
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.10°C
PHANTOM ROTATION:	210°	MAX SAR Y-AXIS LOCATION:	-3.20mm
DUT POSITION:	RH-Cheek	MAX SAR Z-AXIS LOCATION:	-156.30mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	21.96 V/m
TEST FREQUENCY:	824.2MHz	SAR 1g:	0.405 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.282 W/kg
CONVERSION FACTORS:	0.276 / 0.276 / 0.276	SAR START:	0.248 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.251 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	1.13 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	25/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

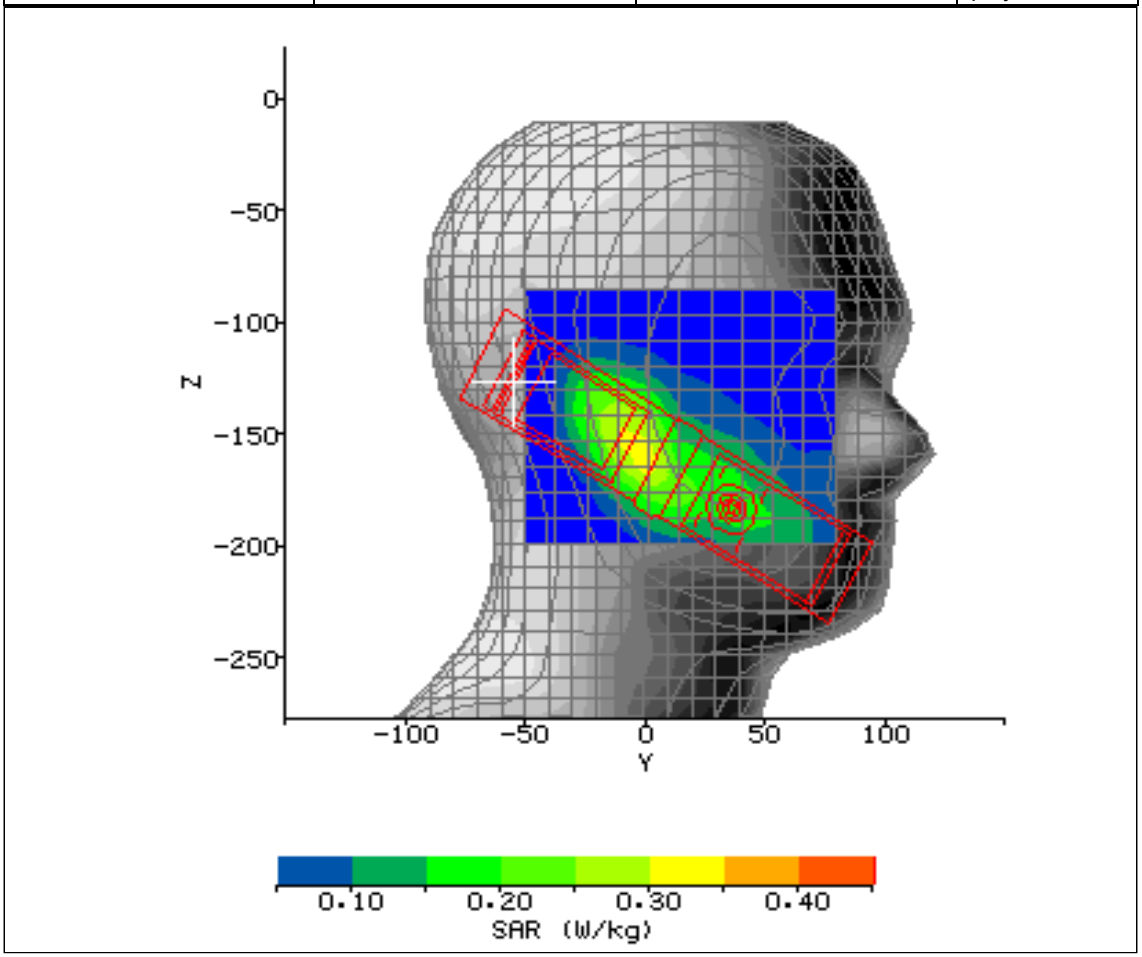


Figure 12: SAR Head Testing Results for the Modelabs CD1D Mobile Device in RH-Cheek Position; Tested at 824.2MHz (GSM 850 Low Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	26/06/2008 13:51:23	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-06.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.20°C	LIQUID SIMULANT:	835Head
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	43.66
RELATIVE HUMIDITY:	45.50%	CONDUCTIVITY:	0.931
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.10°C
PHANTOM ROTATION:	210°	MAX SAR Y-AXIS LOCATION:	-5.80mm
DUT POSITION:	RH-Cheek	MAX SAR Z-AXIS LOCATION:	-151.70mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	21.71 V/m
TEST FREQUENCY:	848.8MHz	SAR 1g:	0.424 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.290 W/kg
CONVERSION FACTORS:	0.276 / 0.276 / 0.276	SAR START:	0.253 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.252 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-0.66 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	25/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

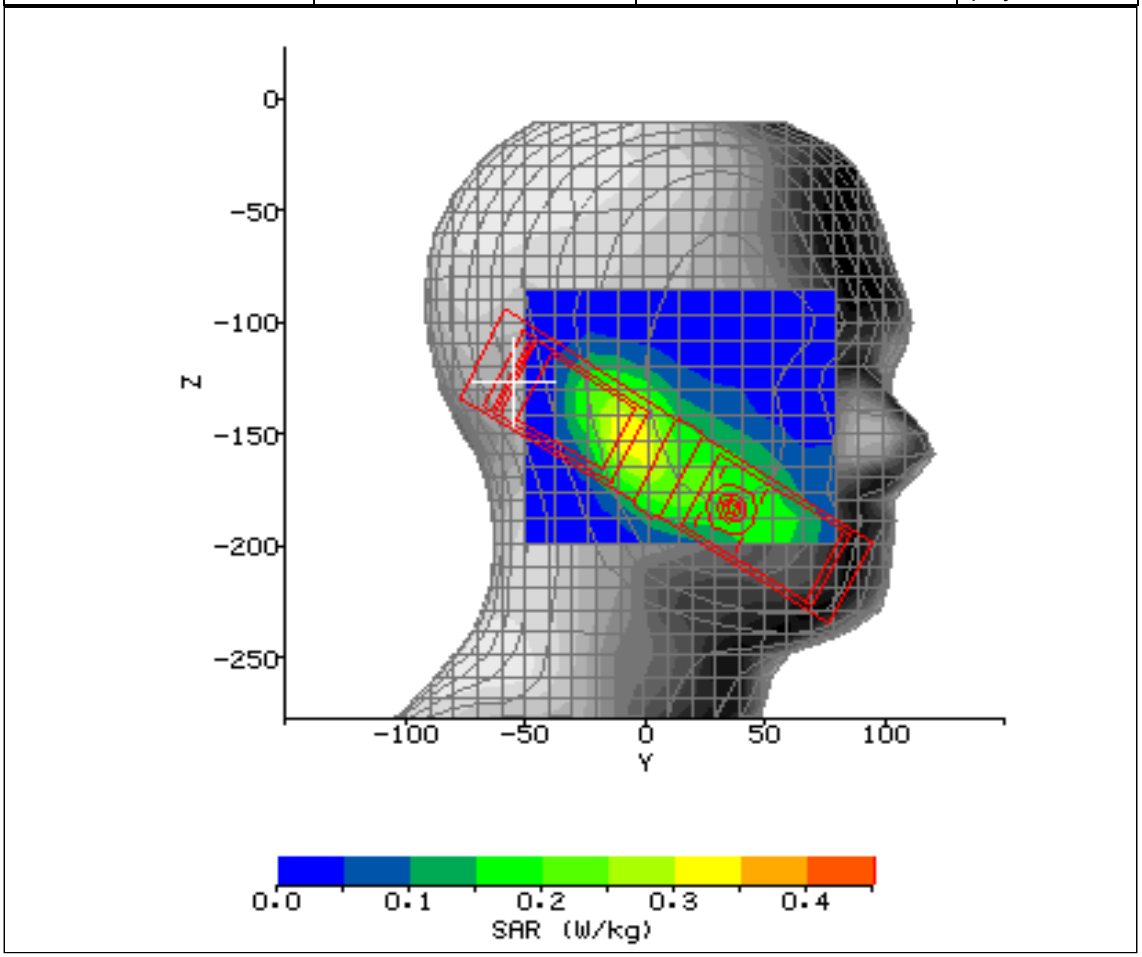


Figure 13: SAR Head Testing Results for the Modelabs CD1D Mobile Device in RH-Cheek Position; Tested at 848.8MHz (GSM 850 High Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	26/06/2008 14:34:40	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-07.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	22.90°C	LIQUID SIMULANT:	835Head
DEVICE UNDER TEST:	Modelabs CD1D-S	RELATIVE PERMITTIVITY:	43.66
RELATIVE HUMIDITY:	47.20%	CONDUCTIVITY:	0.931
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.10°C
PHANTOM ROTATION:	210°	MAX SAR Y-AXIS LOCATION:	-3.20mm
DUT POSITION:	RH-Cheek	MAX SAR Z-AXIS LOCATION:	-152.85mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	21.79 V/m
TEST FREQUENCY:	848.8MHz	SAR 1g:	0.426 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.300 W/kg
CONVERSION FACTORS:	0.276 / 0.276 / 0.276	SAR START:	0.264 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.268 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	1.47 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	25/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

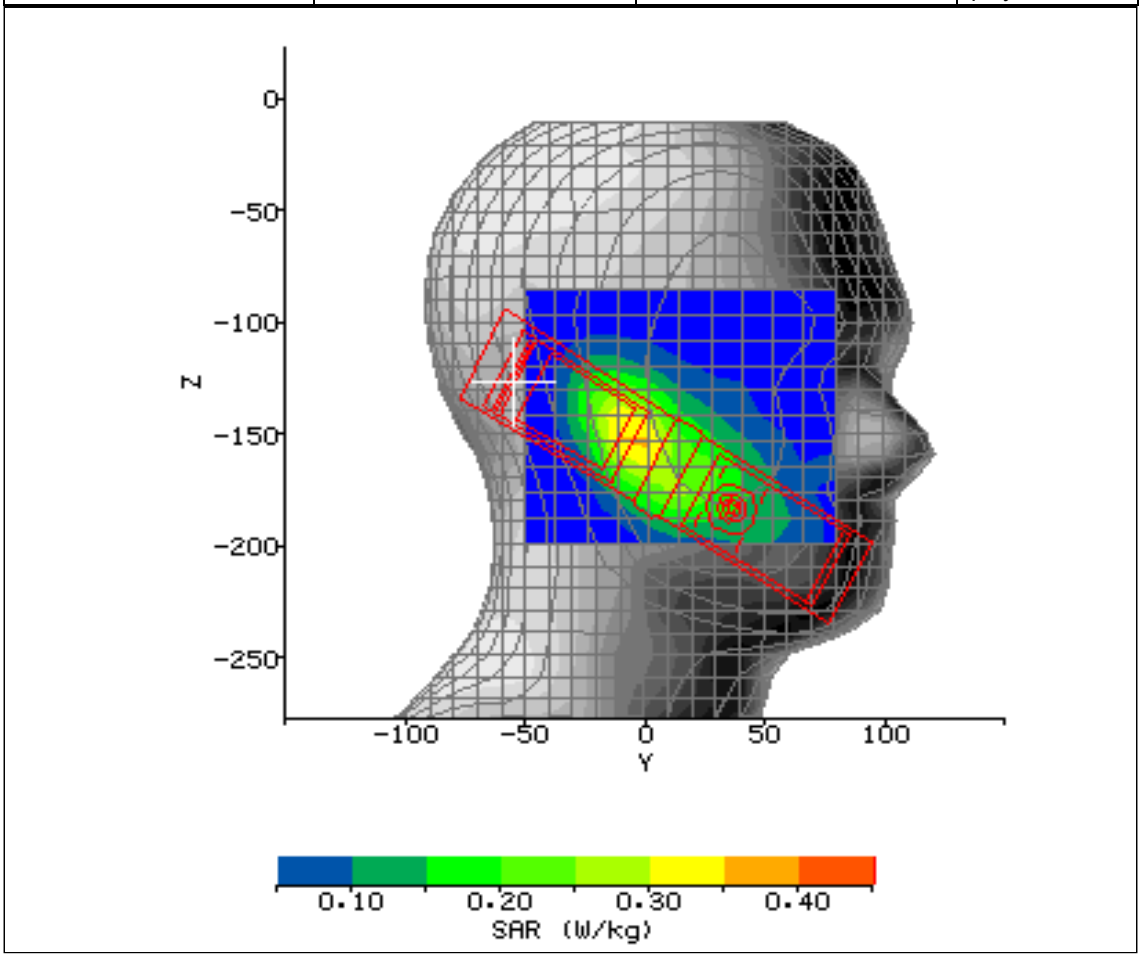


Figure 14: SAR Head Testing Results for the Modelabs CD1D-S Mobile Device in RH-Cheek Position; Tested at 848.8MHz (GSM 850 High Channel).

2.3 GSM850 BODY SAR TEST RESULTS AND COURSE AREA SCANS – 2D

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	07/07/2008 13:57:55	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-25.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	22.00°C	LIQUID SIMULANT:	835Body
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	58.20
RELATIVE HUMIDITY:	51.70%	CONDUCTIVITY:	0.998
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	21.80°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	11.00mm
DUT POSITION:	25mm-Front Facing	MAX SAR Z-AXIS LOCATION:	-1.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	20.31 V/m
TEST FREQUENCY:	836.4MHz	SAR 1g:	0.458 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.340 W/kg
CONVERSION FACTORS:	0.279 / 0.279 / 0.279	SAR START:	0.161 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.160 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	-0.79 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	07/07/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

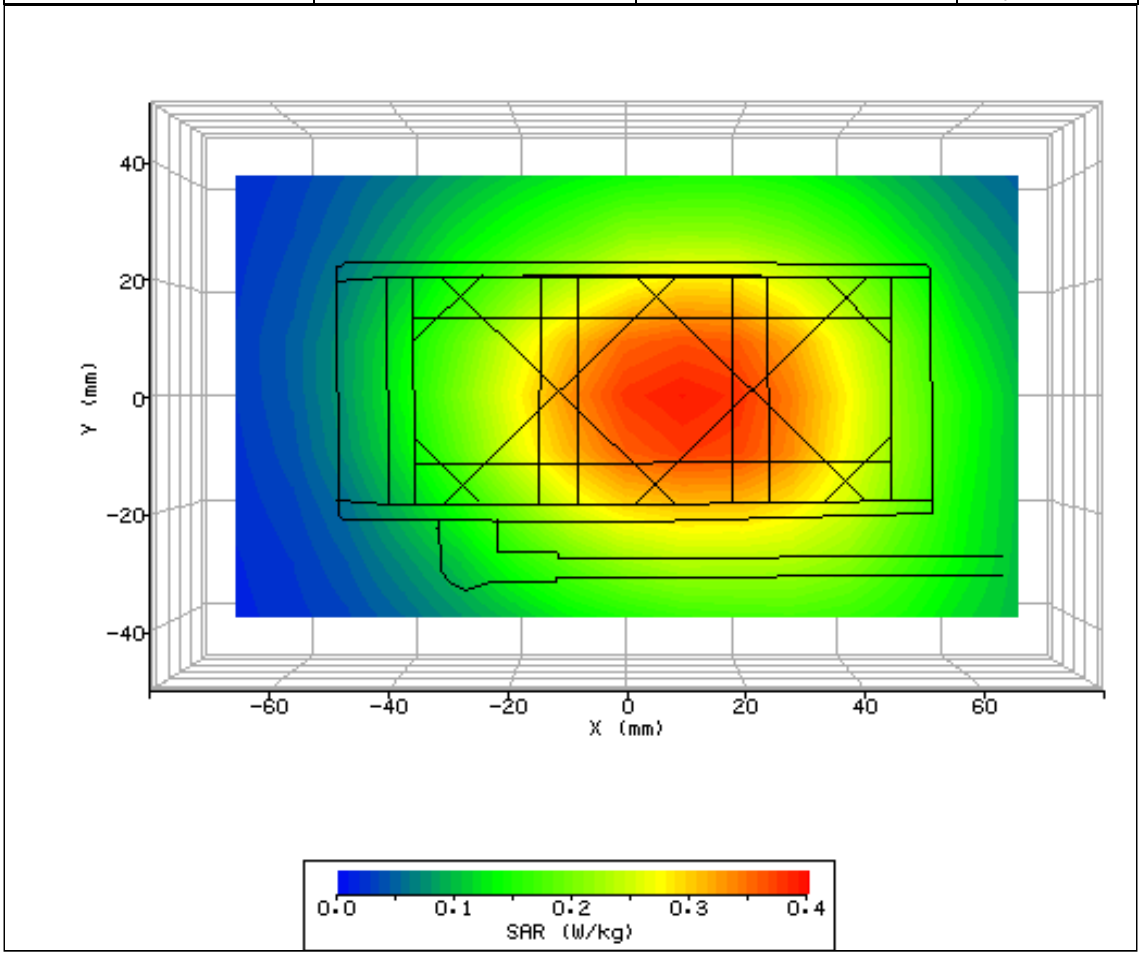


Figure 15: SAR Body Testing Results for the Modelabs CD1D Mobile Device in 25mm-Front Facing Phantom Position; Tested at 836.4MHz (GSM 850 Mid Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	07/07/2008 15:00:08	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-26.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	22.70°C	LIQUID SIMULANT:	835Body
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	58.20
RELATIVE HUMIDITY:	48.10%	CONDUCTIVITY:	0.998
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.00°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	12.00mm
DUT POSITION:	25mm-Rear Facing	MAX SAR Z-AXIS LOCATION:	-3.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	24.09 V/m
TEST FREQUENCY:	836.4MHz	SAR 1g:	0.669 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.480 W/kg
CONVERSION FACTORS:	0.279 / 0.279 / 0.279	SAR START:	0.223 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.227 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	1.83 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	07/07/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

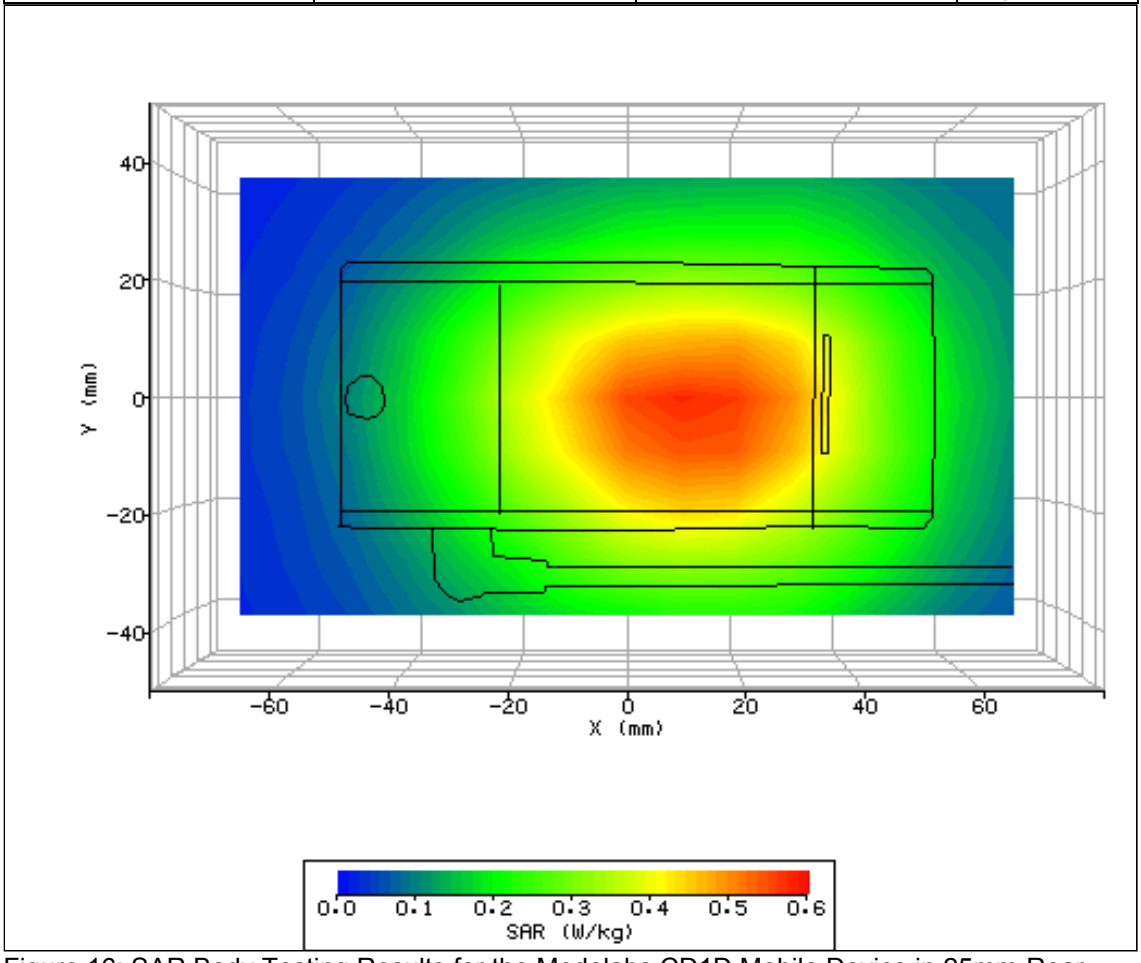


Figure 16: SAR Body Testing Results for the Modelabs CD1D Mobile Device in 25mm-Rear Facing Phantom Position; Tested at 836.4MHz (GSM 850 Mid Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	07/07/2008 15:28:49	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-27.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	21.90°C	LIQUID SIMULANT:	835Body
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	58.20
RELATIVE HUMIDITY:	48.50%	CONDUCTIVITY:	0.998
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.00°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	10.00mm
DUT POSITION:	25mm-Rear Facing	MAX SAR Z-AXIS LOCATION:	-5.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	24.61 V/m
TEST FREQUENCY:	824.2MHz	SAR 1g:	0.677 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.503 W/kg
CONVERSION FACTORS:	0.279 / 0.279 / 0.279	SAR START:	0.238 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.237 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	-0.32 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	07/07/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

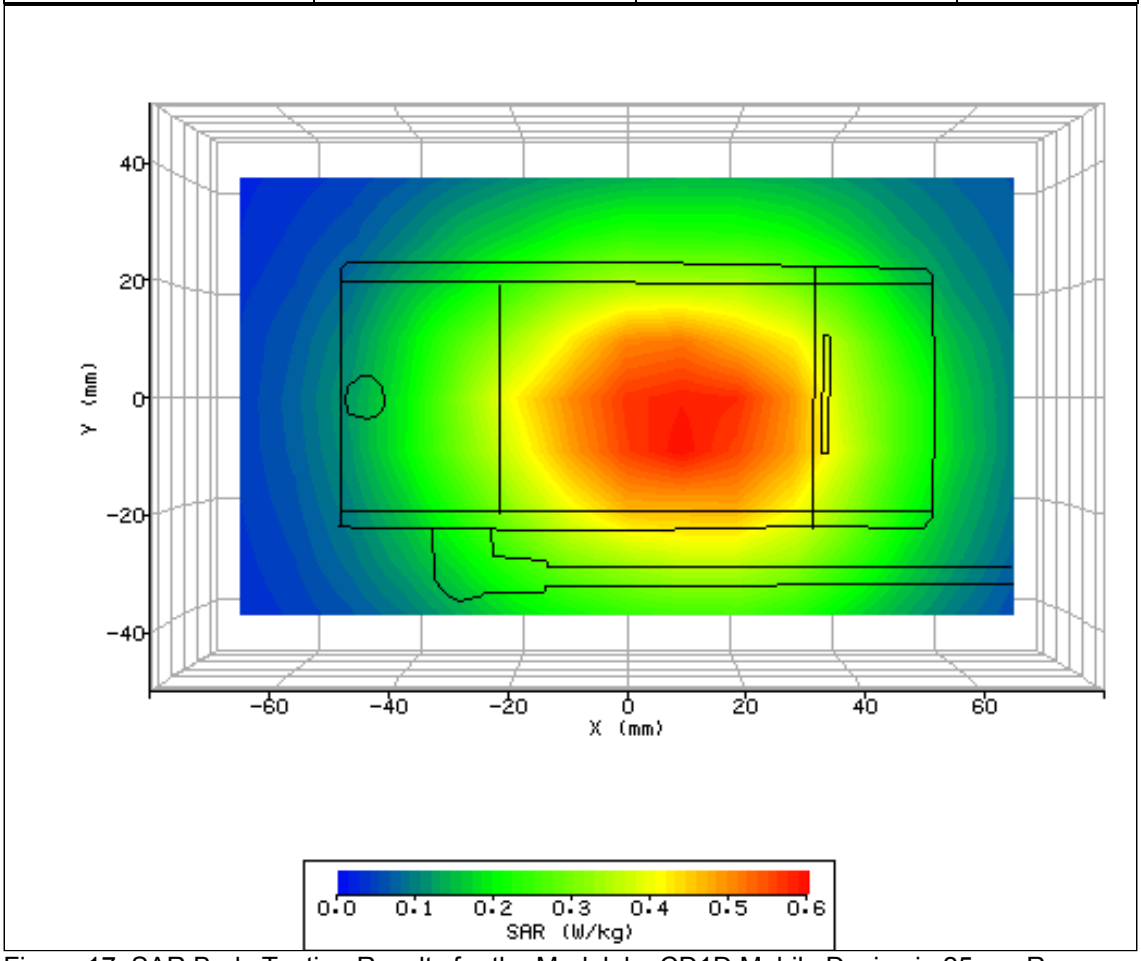


Figure 17: SAR Body Testing Results for the Modelabs CD1D Mobile Device in 25mm-Rear Facing Phantom Position; Tested at 824.2MHz (GSM 850 Low Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	07/07/2008 16:04:36	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-28.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.50°C	LIQUID SIMULANT:	835Body
DEVICE UNDER TEST:	Modelabs CD1D	RELATIVE PERMITTIVITY:	58.20
RELATIVE HUMIDITY:	53.50%	CONDUCTIVITY:	0.998
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.00°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	15.00mm
DUT POSITION:	25mm-Rear Facing	MAX SAR Z-AXIS LOCATION:	-2.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	26.56 V/m
TEST FREQUENCY:	848.8MHz	SAR 1g:	0.800 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.585 W/kg
CONVERSION FACTORS:	0.279 / 0.279 / 0.279	SAR START:	0.274 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.268 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	-1.99 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	07/07/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

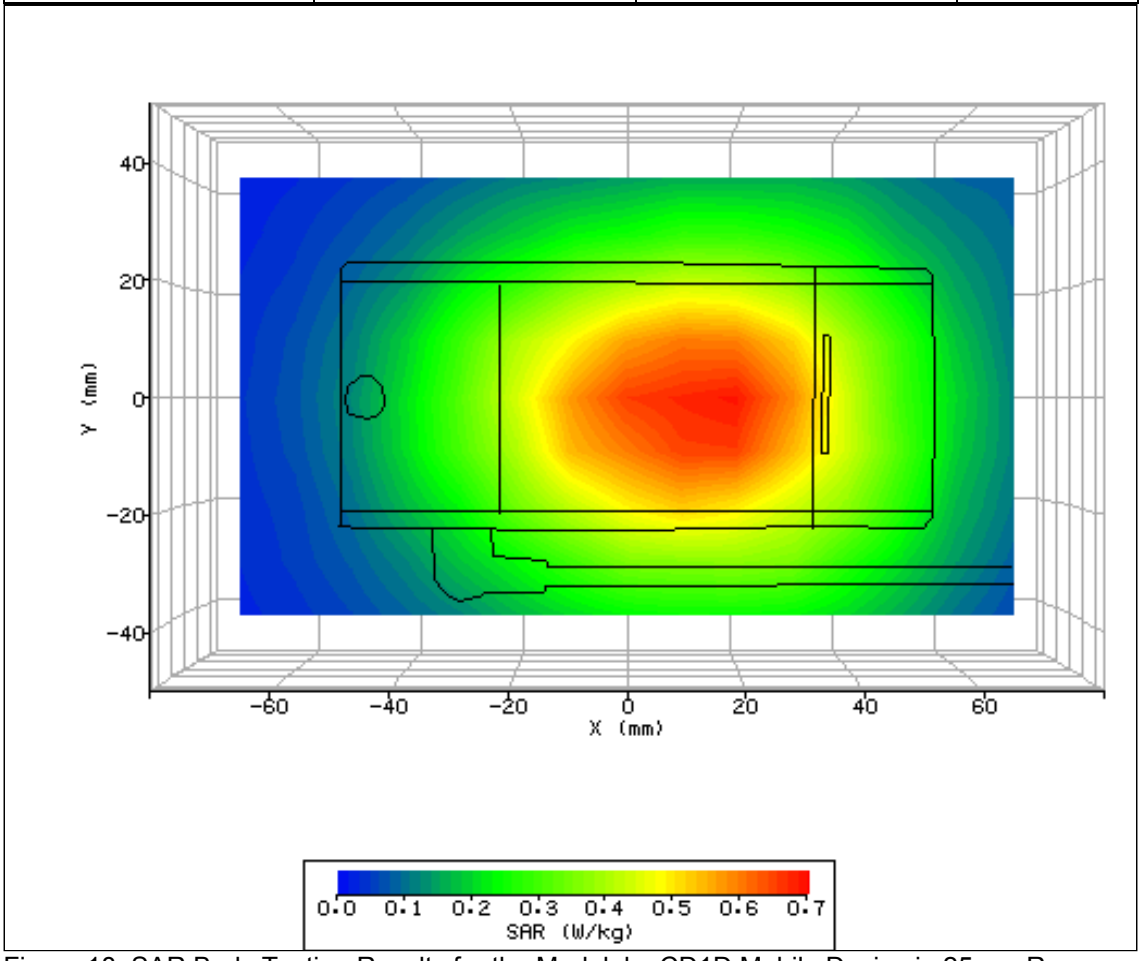


Figure 18: SAR Body Testing Results for the Modelabs CD1D Mobile Device in 25mm-Rear Facing Phantom Position; Tested at 848.8MHz (GSM 850 High Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	07/07/2008 16:30:48	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-29.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.50°C	LIQUID SIMULANT:	835Body
DEVICE UNDER TEST:	Modelabs CD1D-S	RELATIVE PERMITTIVITY:	58.20
RELATIVE HUMIDITY:	53.80%	CONDUCTIVITY:	0.998
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.00°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	9.00mm
DUT POSITION:	25mm-Rear Facing	MAX SAR Z-AXIS LOCATION:	1.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	23.89 V/m
TEST FREQUENCY:	848.8MHz	SAR 1g:	0.630 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.467 W/kg
CONVERSION FACTORS:	0.279 / 0.279 / 0.279	SAR START:	0.219 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.223 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	2.14 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	07/07/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

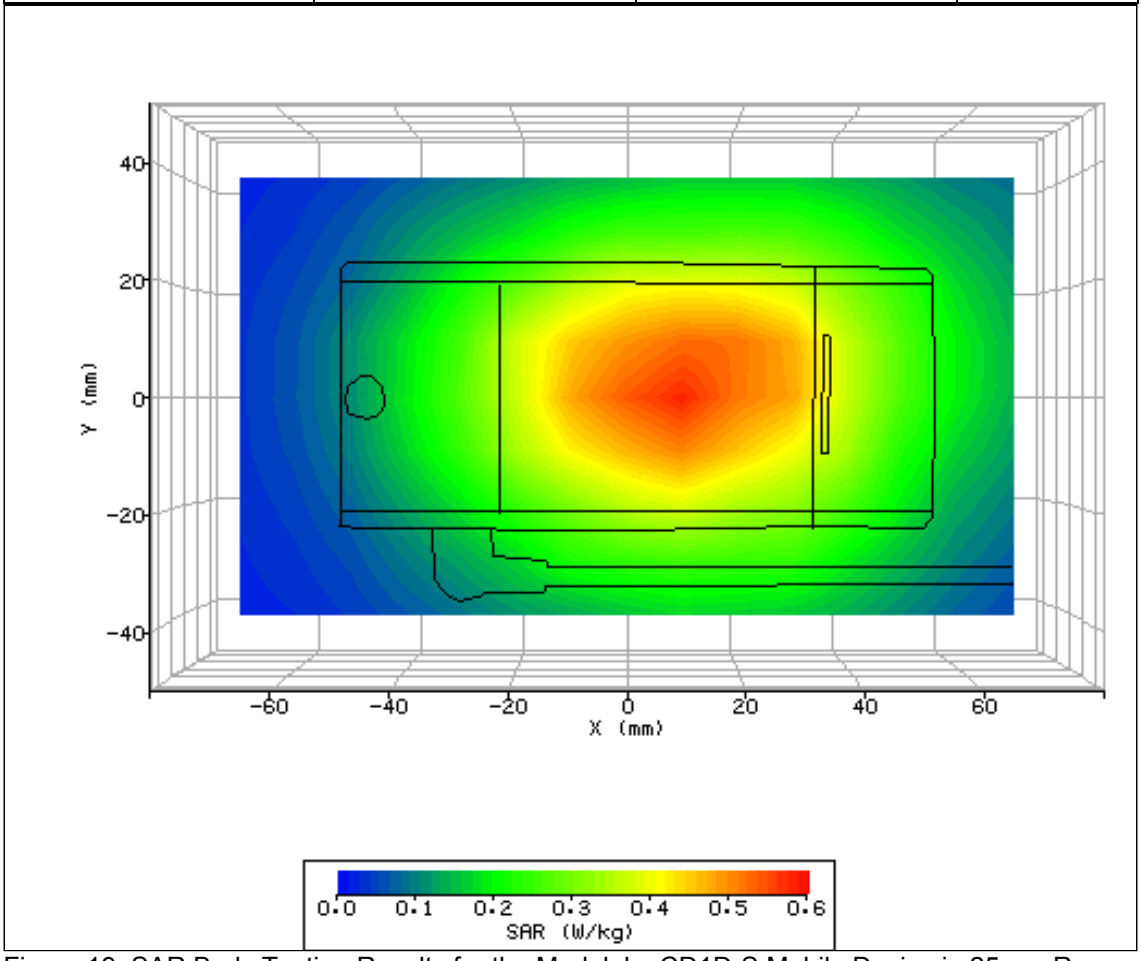


Figure 19: SAR Body Testing Results for the Modelabs CD1D-S Mobile Device in 25mm-Rear Facing Phantom Position; Tested at 848.8MHz (GSM 850 High Channel) with 15mm Separation Distance to the Phantom.

2.4 PCS1900 HEAD SAR TEST RESULTS AND COURSE AREA SCANS – 2D

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 11:50:59	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-08.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.40°C	LIQUID SIMULANT:	1900Head
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	40.86
RELATIVE HUMIDITY:	50.00%	CONDUCTIVITY:	1.409
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.90°C
PHANTOM ROTATION:	330°	MAX SAR Y-AXIS LOCATION:	-28.00mm
DUT POSITION:	LH-Cheek	MAX SAR Z-AXIS LOCATION:	-172.40mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	13.59 V/m
TEST FREQUENCY:	1880.0MHz	SAR 1g:	0.224 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.133 W/kg
CONVERSION FACTORS:	0.347 / 0.347 / 0.347	SAR START:	0.090 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.088 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-2.52 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

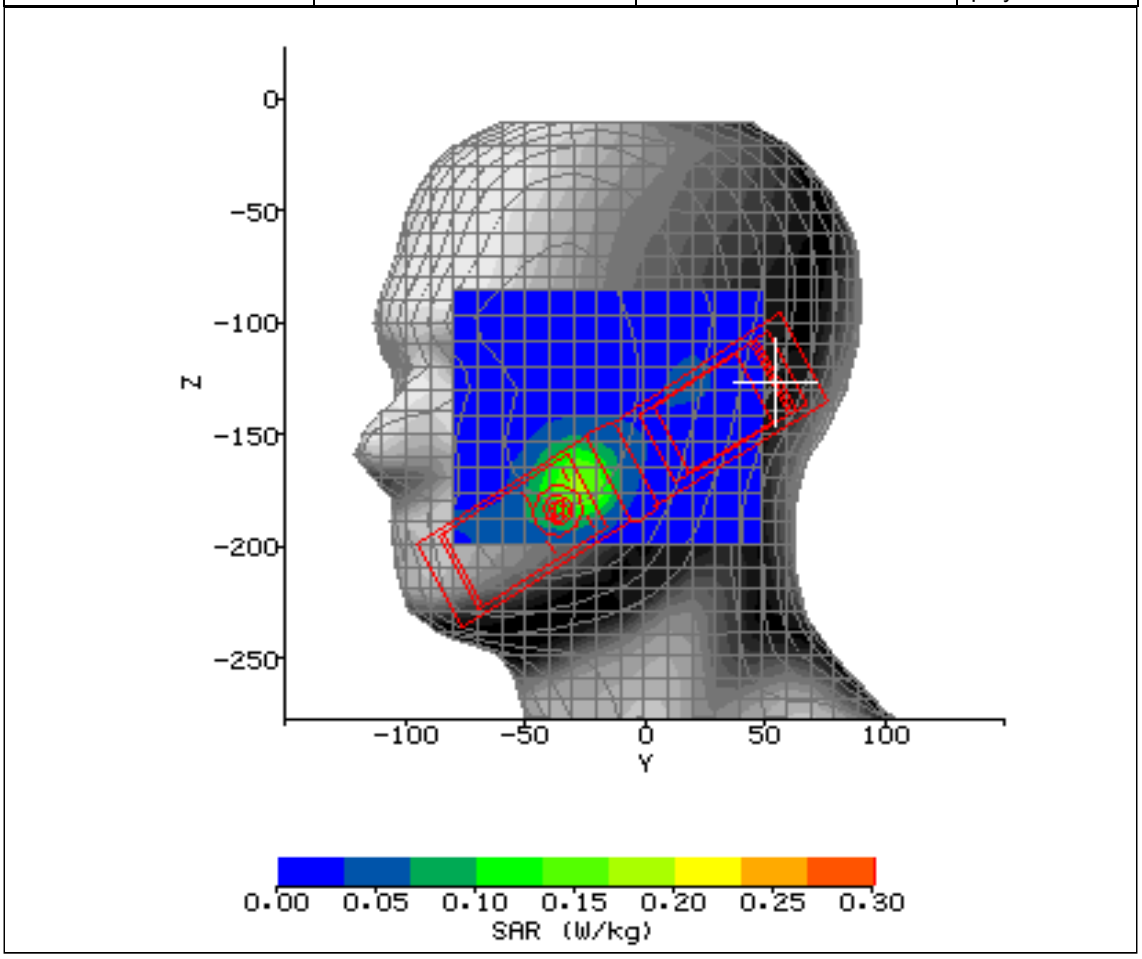


Figure 20: SAR Head Testing Results for the CD1D Dior Phone Mobile Device in LH-Cheek Position; Tested at 1880.0MHz (GSM 1900 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 12:13:43	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-09.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.50°C	LIQUID SIMULANT:	1900Head
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	40.86
RELATIVE HUMIDITY:	48.60%	CONDUCTIVITY:	1.409
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.90°C
PHANTOM ROTATION:	330°	MAX SAR Y-AXIS LOCATION:	26.00mm
DUT POSITION:	LH-Cheek 15°	MAX SAR Z-AXIS LOCATION:	-125.25mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	8.29 V/m
TEST FREQUENCY:	1880.0MHz	SAR 1g:	0.103 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.064 W/kg
CONVERSION FACTORS:	0.347 / 0.347 / 0.347	SAR START:	0.058 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.057 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-1.85 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

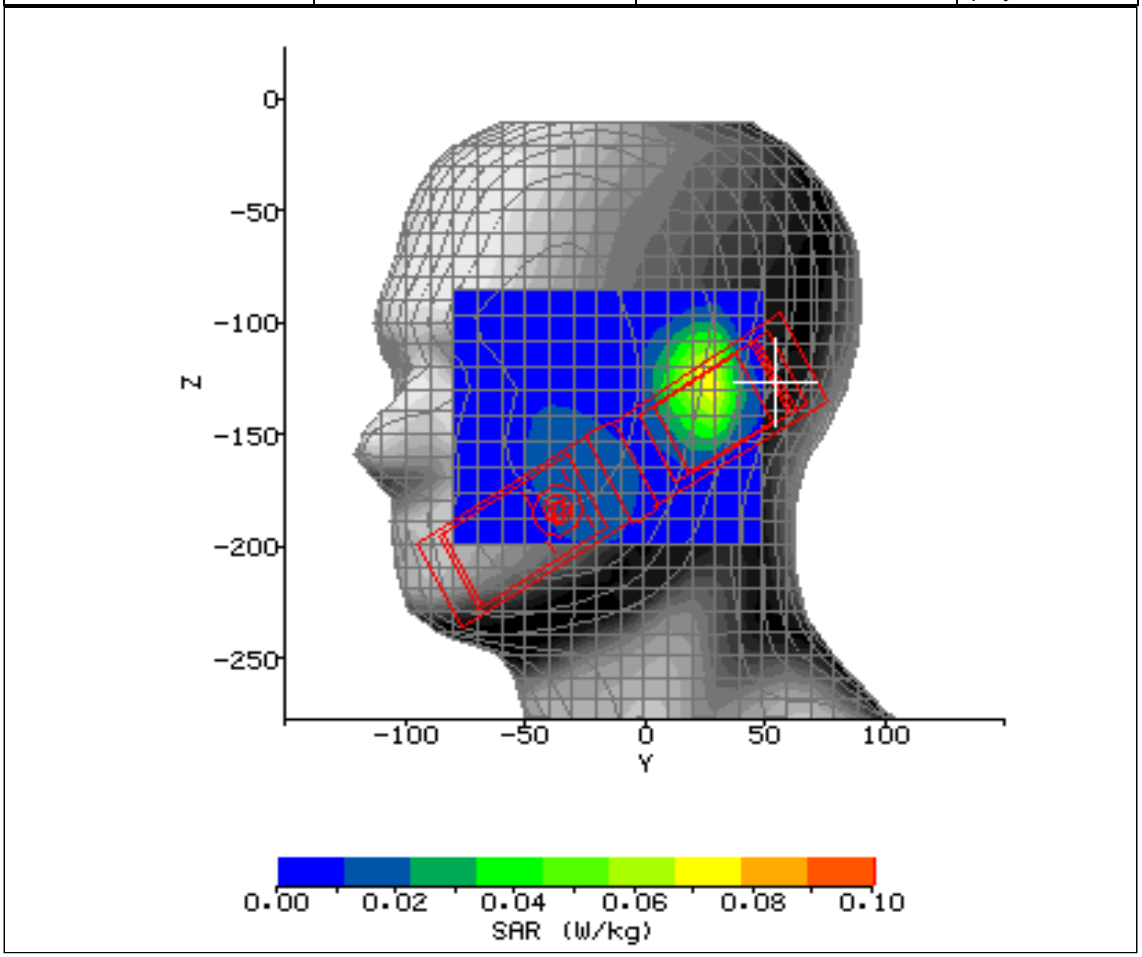


Figure 21: SAR Head Testing Results for the CD1D Dior Phone Mobile Device in LH-Cheek 15° Position; Tested at 1880.0MHz (GSM 1900 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 10:54:10	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-10.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.50°C	LIQUID SIMULANT:	1900Head
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	40.86
RELATIVE HUMIDITY:	42.30%	CONDUCTIVITY:	1.409
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.70°C
PHANTOM ROTATION:	210°	MAX SAR Y-AXIS LOCATION:	30.00mm
DUT POSITION:	RH-Cheek	MAX SAR Z-AXIS LOCATION:	-167.80mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	12.61 V/m
TEST FREQUENCY:	1880.0MHz	SAR 1g:	0.209 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.125 W/kg
CONVERSION FACTORS:	0.347 / 0.347 / 0.347	SAR START:	0.086 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.085 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-1.06 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

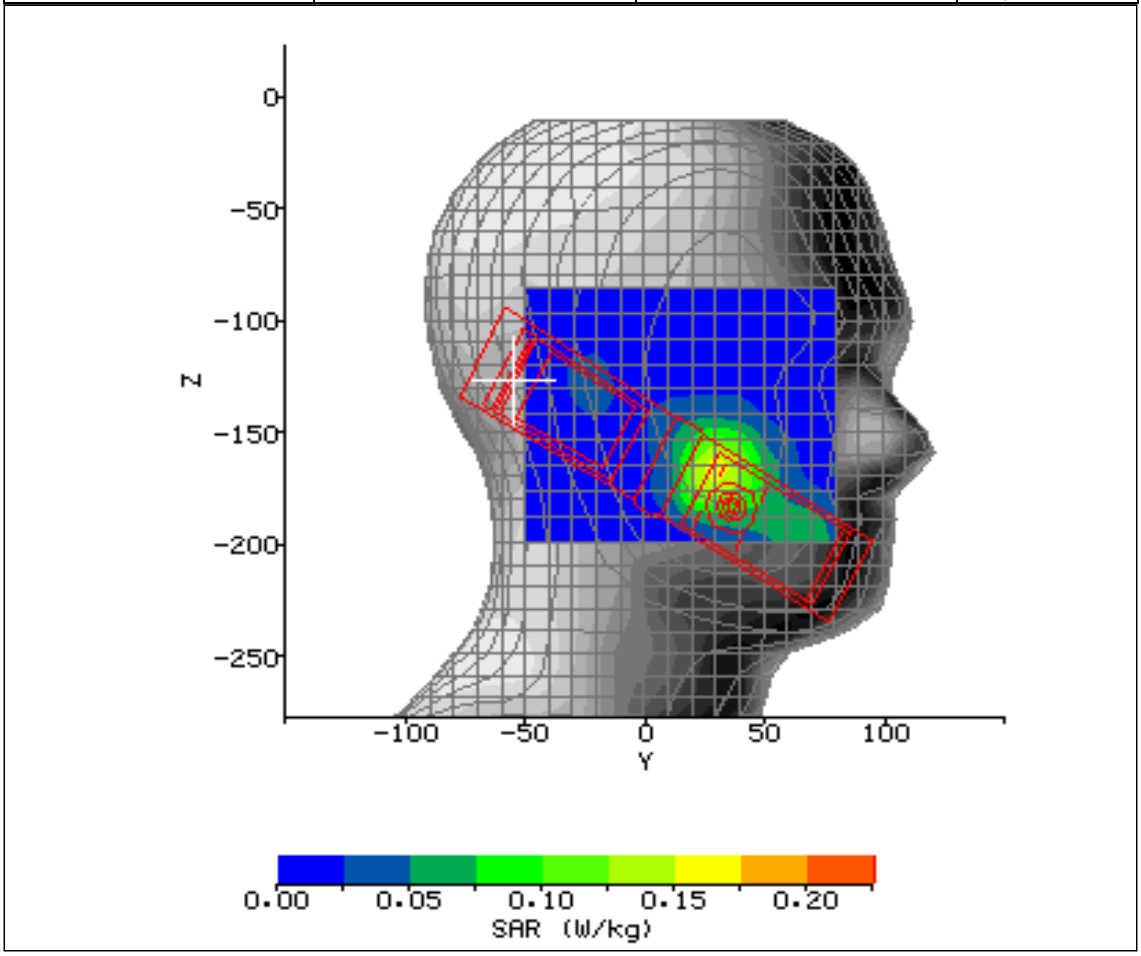


Figure 22: SAR Head Testing Results for the CD1D Dior Phone Mobile Device in RH-Cheek Position; Tested at 1880.0MHz (GSM 1900 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 11:19:36	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-11.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.10°C	LIQUID SIMULANT:	1900Head
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	40.86
RELATIVE HUMIDITY:	48.10%	CONDUCTIVITY:	1.409
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.70°C
PHANTOM ROTATION:	210°	MAX SAR Y-AXIS LOCATION:	-25.00mm
DUT POSITION:	RH-Cheek 15°	MAX SAR Z-AXIS LOCATION:	-118.35mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	8.06 V/m
TEST FREQUENCY:	1880.0MHz	SAR 1g:	0.086 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.052 W/kg
CONVERSION FACTORS:	0.347 / 0.347 / 0.347	SAR START:	0.047 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.046 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-0.34 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

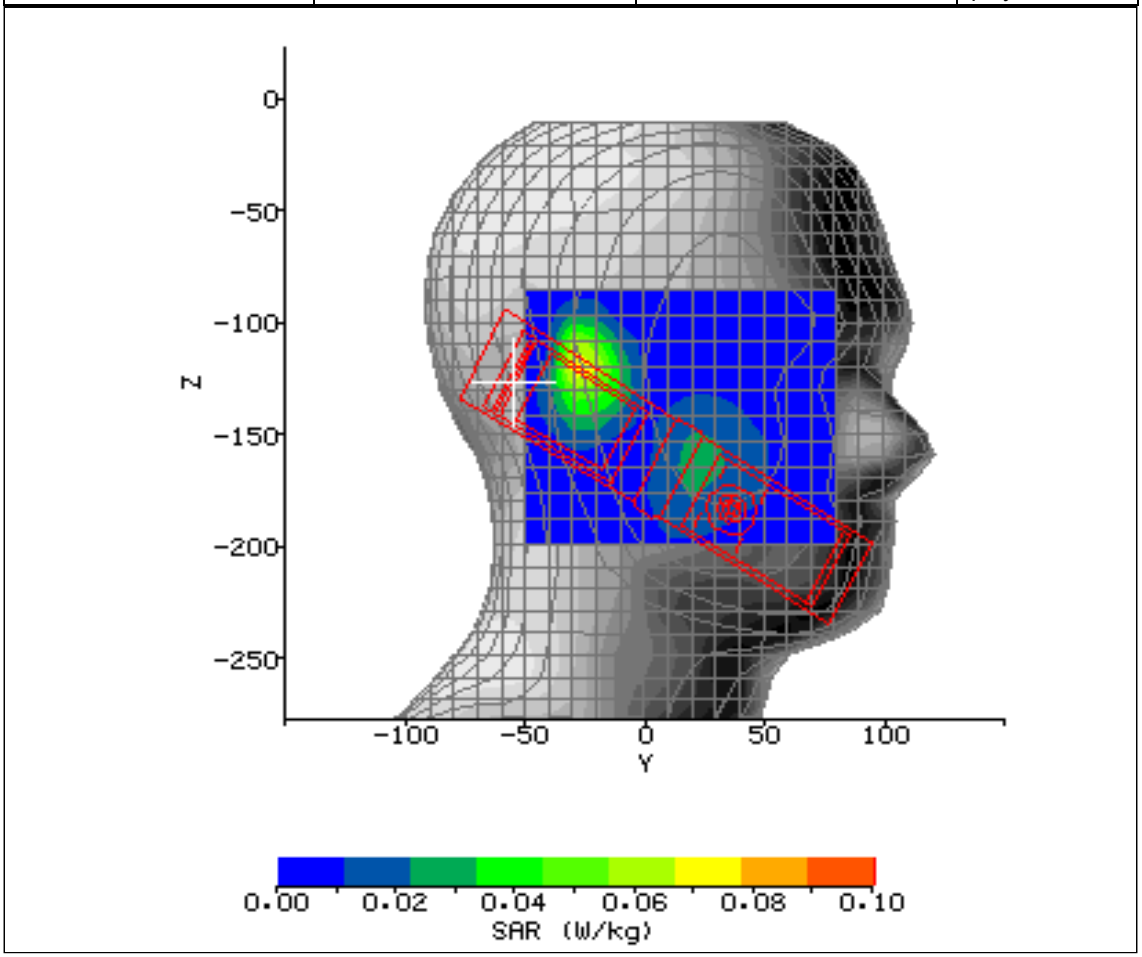


Figure 23: SAR Head Testing Results for the CD1D Dior Phone Mobile Device in RH-Cheek 15° Position; Tested at 1880.0MHz (GSM 1900 Mid Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 12:54:14	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-12.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.10°C	LIQUID SIMULANT:	1900Head
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	40.86
RELATIVE HUMIDITY:	45.60%	CONDUCTIVITY:	1.409
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.60°C
PHANTOM ROTATION:	330°	MAX SAR Y-AXIS LOCATION:	-27.00mm
DUT POSITION:	LH-Cheek	MAX SAR Z-AXIS LOCATION:	-174.70mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	14.43 V/m
TEST FREQUENCY:	1850.2MHz	SAR 1g:	0.279 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.164 W/kg
CONVERSION FACTORS:	0.347 / 0.347 / 0.347	SAR START:	0.115 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.114 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	-1.38 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

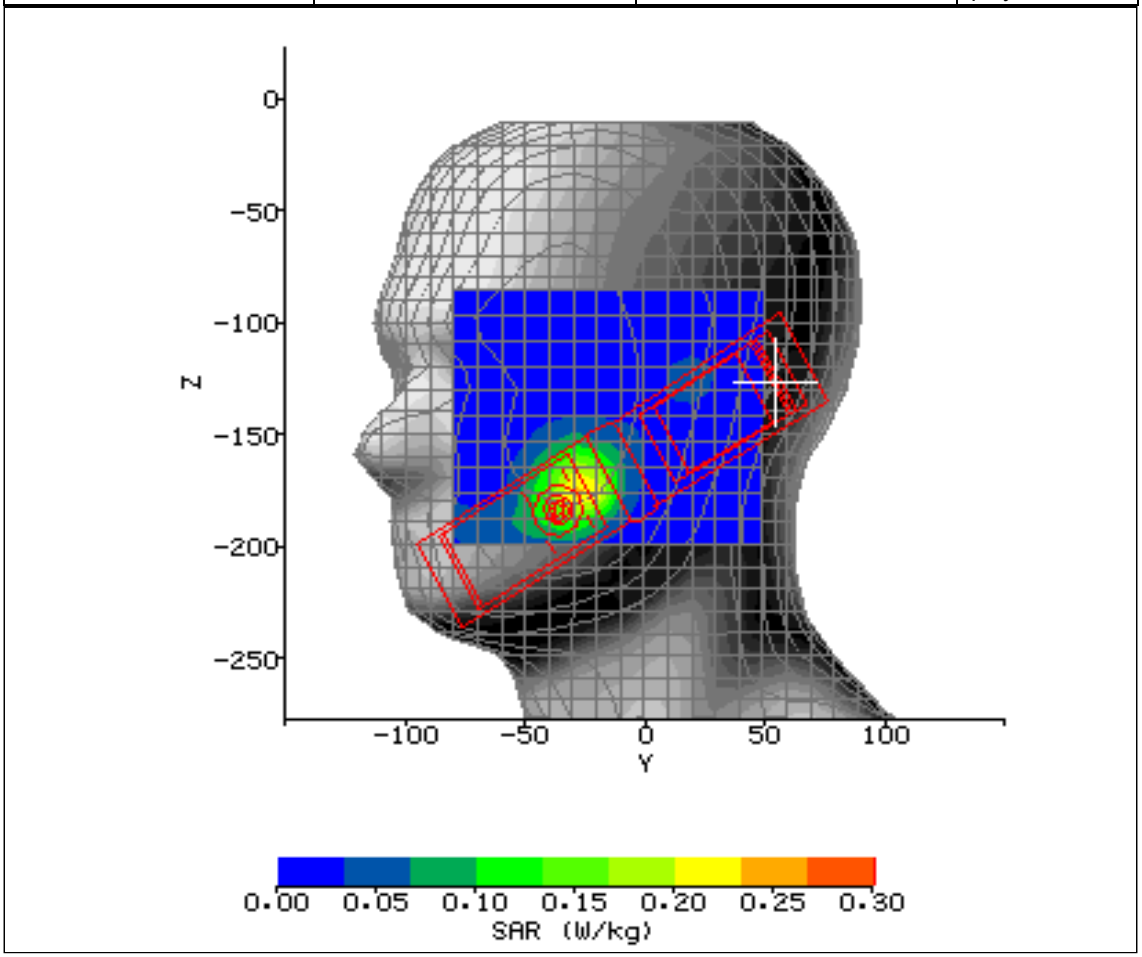


Figure 24: SAR Head Testing Results for the CD1D Dior Phone Mobile Device in LH-Cheek Position; Tested at 1850.2MHz (GSM 1900 Low Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 13:20:07	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-13.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.30°C	LIQUID SIMULANT:	1900Head
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	40.86
RELATIVE HUMIDITY:	42.30%	CONDUCTIVITY:	1.409
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.60°C
PHANTOM ROTATION:	330°	MAX SAR Y-AXIS LOCATION:	-26.00mm
DUT POSITION:	LH-Cheek	MAX SAR Z-AXIS LOCATION:	-174.70mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	14.10 V/m
TEST FREQUENCY:	1909.8MHz	SAR 1g:	0.238 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.143 W/kg
CONVERSION FACTORS:	0.347 / 0.347 / 0.347	SAR START:	0.093 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.097 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	3.93 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

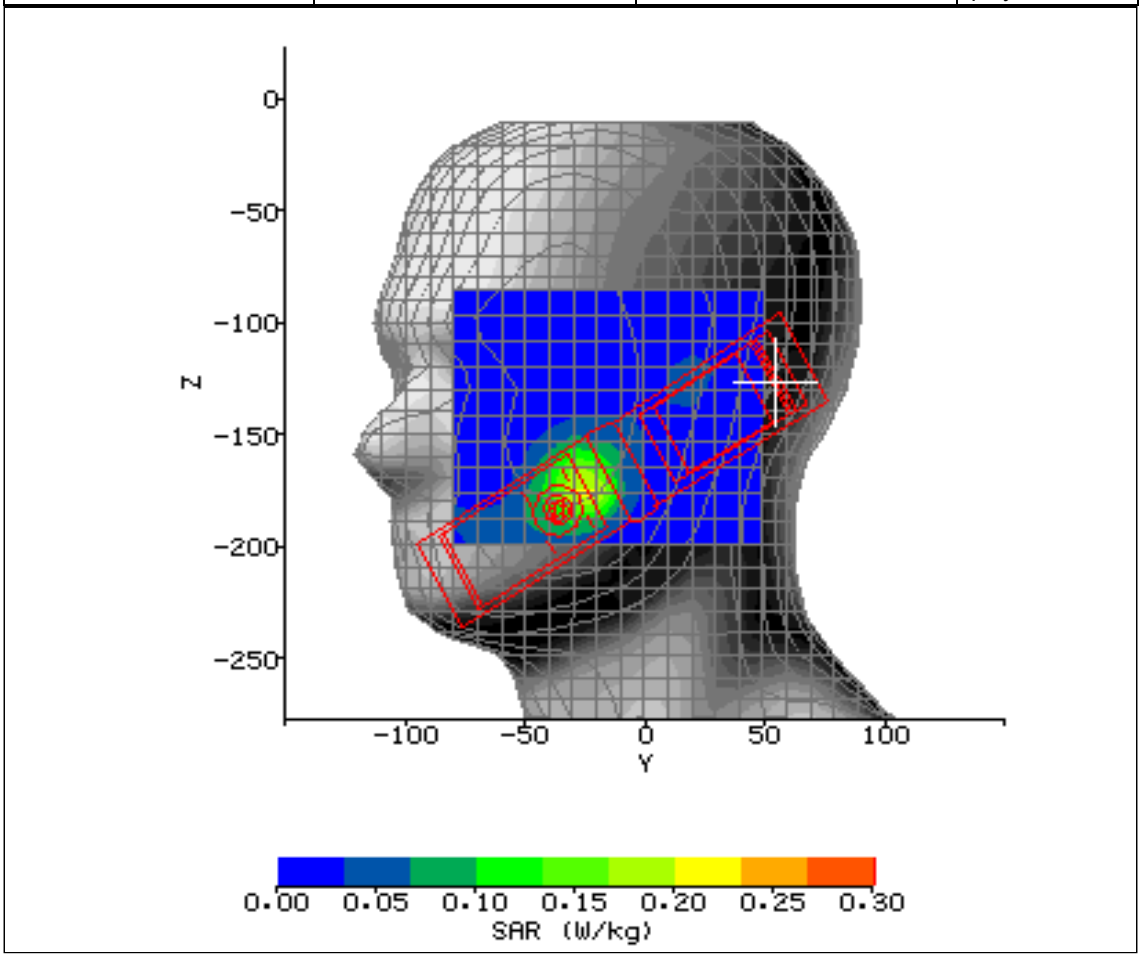


Figure 25: SAR Head Testing Results for the CD1D Dior Phone Mobile Device in LH-Cheek Position; Tested at 1909.8MHz (GSM 1900 High Channel).

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 13:54:18	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-14.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.10°C	LIQUID SIMULANT:	1900Head
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	40.86
RELATIVE HUMIDITY:	42.10%	CONDUCTIVITY:	1.409
PHANTOM S/NO:	Head_04_35.csv	LIQUID TEMPERATURE:	22.60°C
PHANTOM ROTATION:	330°	MAX SAR Y-AXIS LOCATION:	-30.00mm
DUT POSITION:	LH-Cheek	MAX SAR Z-AXIS LOCATION:	-173.55mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	15.64 V/m
TEST FREQUENCY:	1850.2MHz	SAR 1g:	0.288 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.175 W/kg
CONVERSION FACTORS:	0.347 / 0.347 / 0.347	SAR START:	0.114 W/kg
TYPE OF MODULATION:	GMSK (Voice Mode)	SAR END:	0.116 W/kg
MODN. DUTY CYCLE:	12.5 %	SAR DRIFT DURING SCAN:	1.53 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

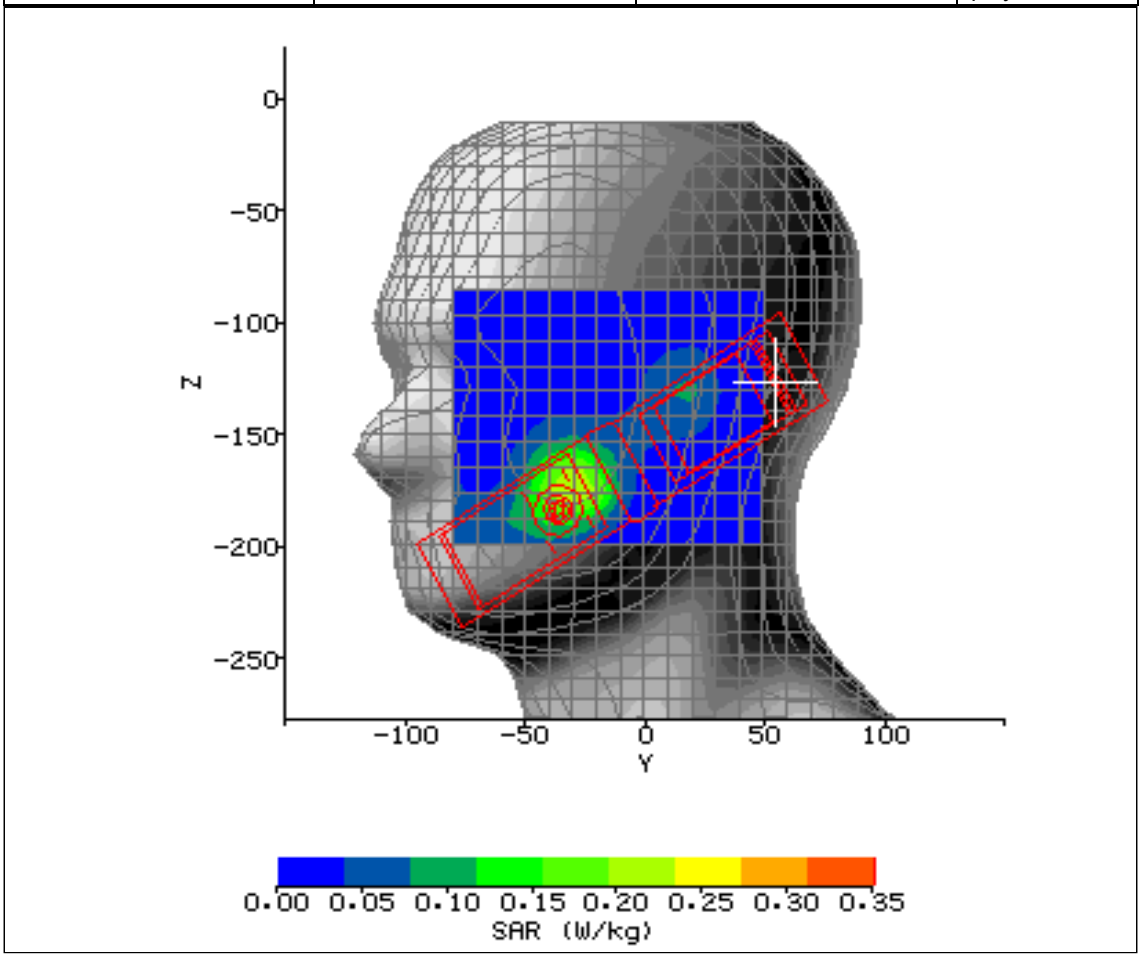


Figure 26: SAR Head Testing Results for the CD1D Dior Phone Mobile Device in LH-Cheek Position; Tested at 1850.2MHz (GSM 1900 Low Channel).

2.5 PCS1900 BODY SAR TEST RESULTS AND COURSE AREA SCANS – 2D

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 15:31:40	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-20.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.80°C	LIQUID SIMULANT:	1900Body
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	54.07
RELATIVE HUMIDITY:	46.90%	CONDUCTIVITY:	1.562
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.80°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	37.00mm
DUT POSITION:	15mm-Rear Facing	MAX SAR Z-AXIS LOCATION:	3.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	12.35 V/m
TEST FREQUENCY:	1880.0MHz	SAR 1g:	0.290 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.181 W/kg
CONVERSION FACTORS:	0.400 / 0.400 / 0.400	SAR START:	0.046 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.049 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	6.56 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

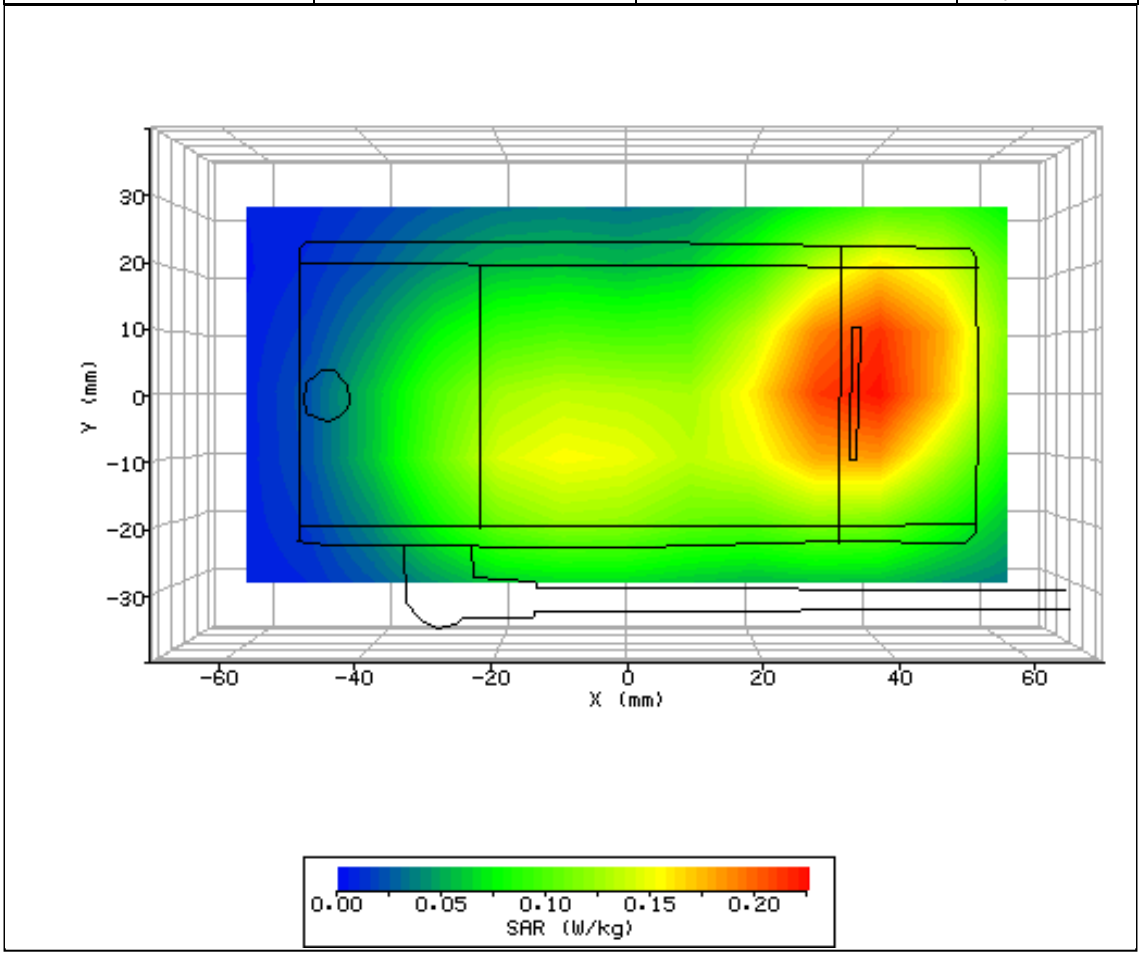


Figure 27: SAR Body Testing Results for the CD1D Dior Phone Mobile Device in 15mm-Rear Facing Phantom Position; Tested at 1880.0MHz (GSM 1900 Mid Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 15:56:30	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-21.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.40°C	LIQUID SIMULANT:	1900Body
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	54.07
RELATIVE HUMIDITY:	48.50%	CONDUCTIVITY:	1.562
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.80°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	38.00mm
DUT POSITION:	15mm-Front Facing	MAX SAR Z-AXIS LOCATION:	5.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	12.37 V/m
TEST FREQUENCY:	1880.0MHz	SAR 1g:	0.301 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.186 W/kg
CONVERSION FACTORS:	0.400 / 0.400 / 0.400	SAR START:	0.048 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.049 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	2.56 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

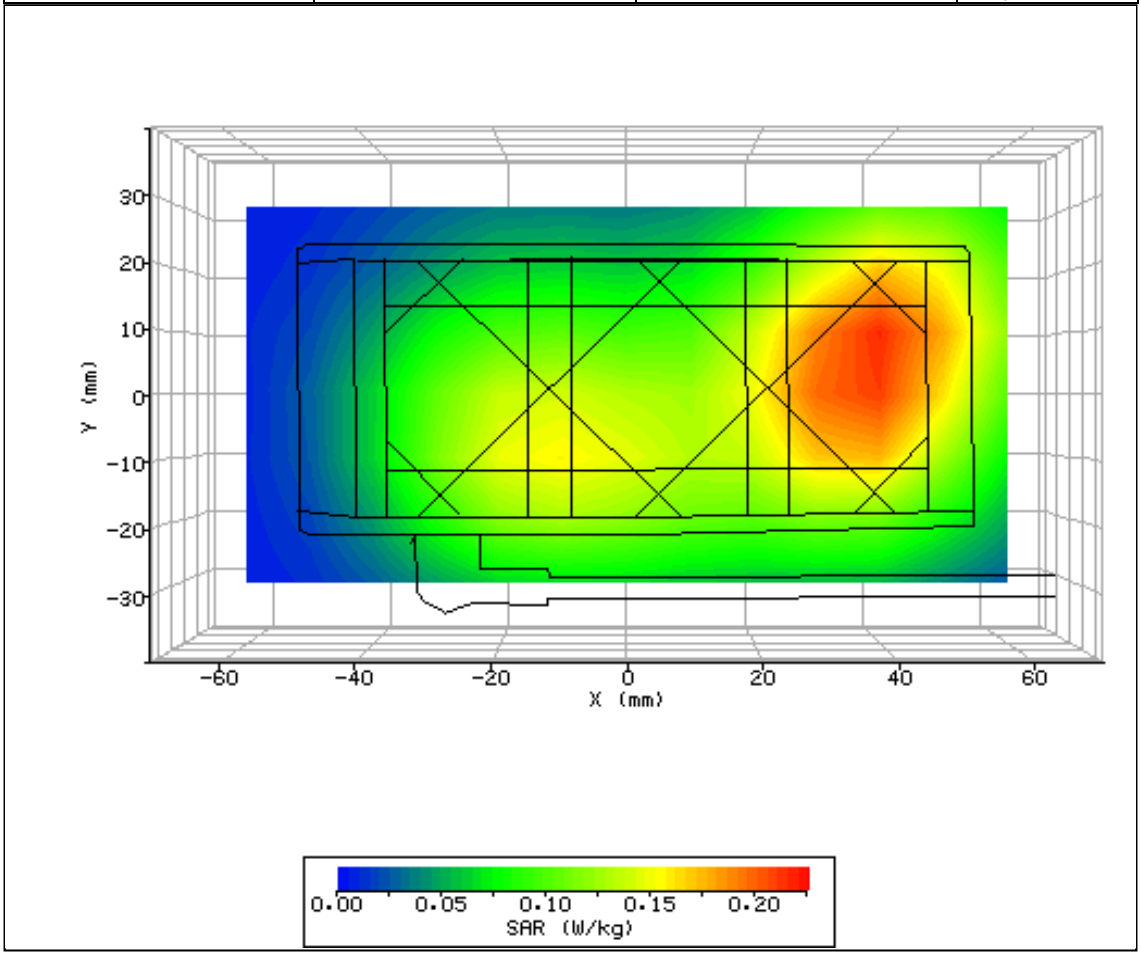


Figure 28: SAR Body Testing Results for the CD1D Dior Phone Mobile Device in 15mm-Front Facing Phantom Position; Tested at 1880.0MHz (GSM 1900 Mid Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 16:18:10	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-22.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.50°C	LIQUID SIMULANT:	1900Body
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	54.07
RELATIVE HUMIDITY:	51.20%	CONDUCTIVITY:	1.562
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.80°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	42.00mm
DUT POSITION:	15mm-Front Facing	MAX SAR Z-AXIS LOCATION:	8.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	11.77 V/m
TEST FREQUENCY:	1850.2MHz	SAR 1g:	0.274 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.168 W/kg
CONVERSION FACTORS:	0.400 / 0.400 / 0.400	SAR START:	0.045 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.044 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	-1.13 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

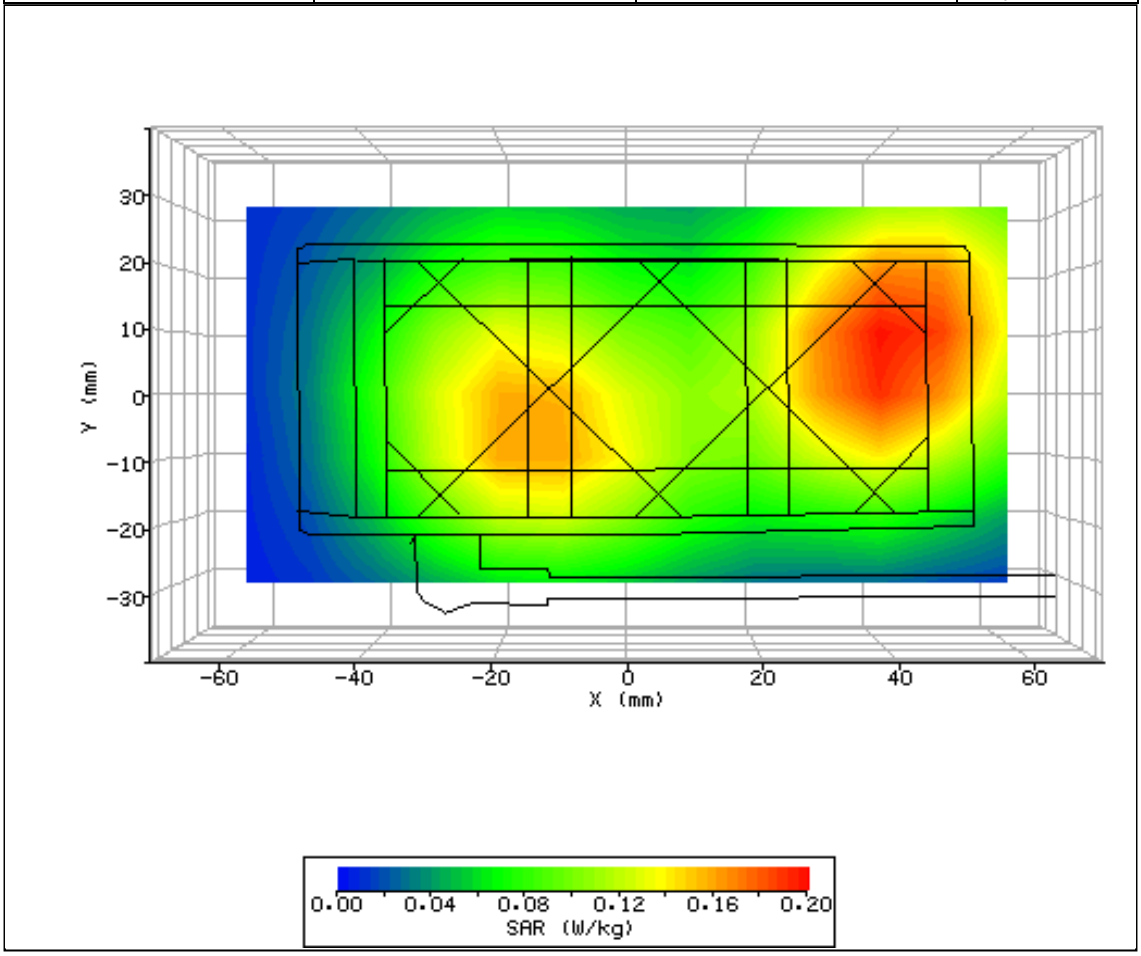


Figure 29: SAR Body Testing Results for the CD1D Dior Phone Mobile Device in 15mm-Front Facing Phantom Position; Tested at 1850.2MHz (GSM 1900 Low Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	21/06/2008 16:38:39	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-23.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	23.50°C	LIQUID SIMULANT:	1900Body
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	54.07
RELATIVE HUMIDITY:	50.00%	CONDUCTIVITY:	1.562
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	22.90°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	40.00mm
DUT POSITION:	15mm-Front Facing	MAX SAR Z-AXIS LOCATION:	7.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	11.90 V/m
TEST FREQUENCY:	1909.8MHz	SAR 1g:	0.285 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.177 W/kg
CONVERSION FACTORS:	0.400 / 0.400 / 0.400	SAR START:	0.045 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.046 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	2.39 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

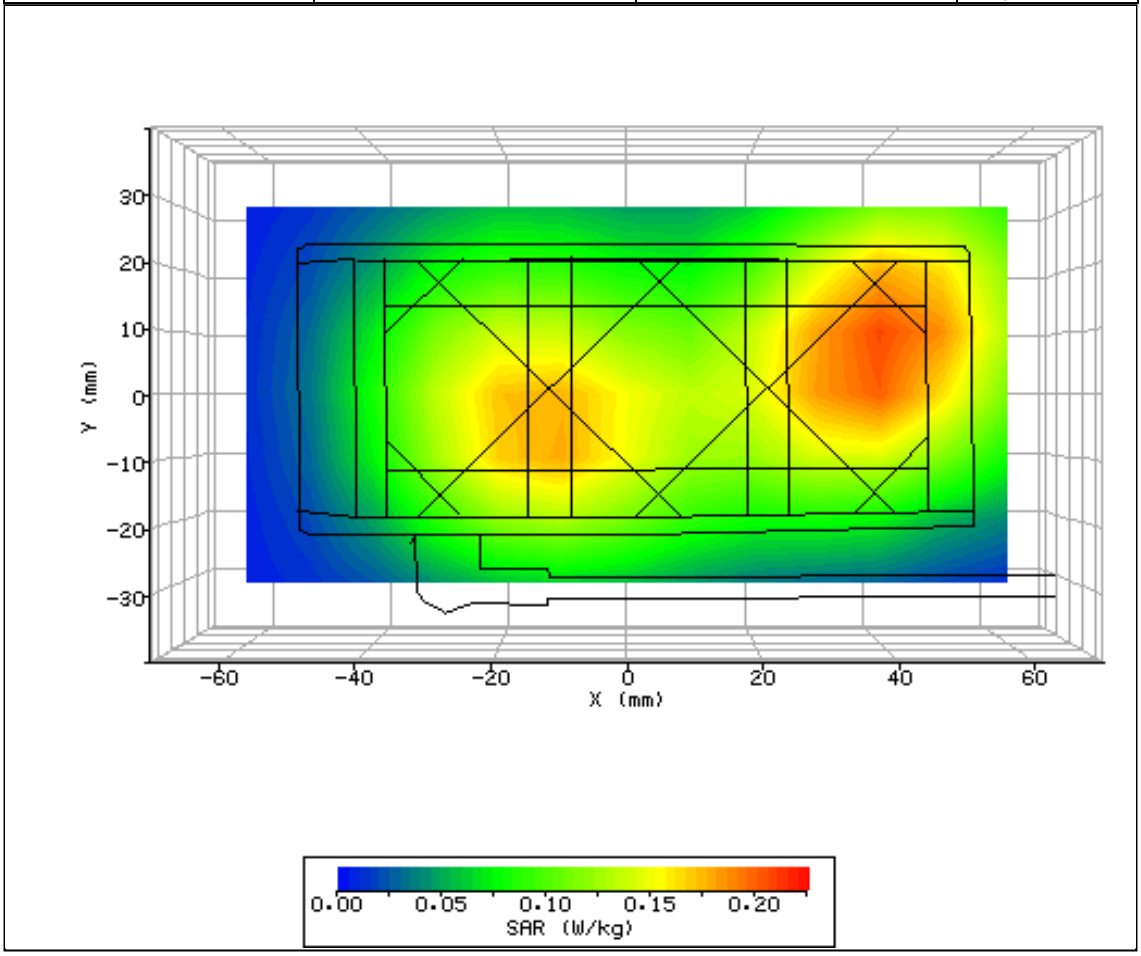


Figure 30: SAR Body Testing Results for the CD1D Dior Phone Mobile Device in 15mm-Front Facing Phantom Position; Tested at 1909.8MHz (GSM 1900 High Channel) with 15mm Separation Distance to the Phantom.

SYSTEM / SOFTWARE:	SARA2 / 2.53 VPM	INPUT POWER DRIFT:	0.0 dB
DATE / TIME:	25/06/2008 11:29:26	DUT BATTERY MODEL/NO:	XWD0001063
FILENAME:	75903927-24.txt	PROBE SERIAL NUMBER:	0171
AMBIENT TEMPERATURE:	22.50°C	LIQUID SIMULANT:	1900Body
DEVICE UNDER TEST:	CD1D Dior Phone	RELATIVE PERMITTIVITY:	54.07
RELATIVE HUMIDITY:	51.80%	CONDUCTIVITY:	1.562
PHANTOM S/NO:	HeadBox.csv	LIQUID TEMPERATURE:	21.60°C
PHANTOM ROTATION:	N/A°	MAX SAR Y-AXIS LOCATION:	42.00mm
DUT POSITION:	15mm-Front Facing	MAX SAR Z-AXIS LOCATION:	2.00mm
ANTENNA CONFIGURATION:	Fixed Internal	MAX E FIELD:	11.41 V/m
TEST FREQUENCY:	1880.0MHz	SAR 1g:	0.244 W/kg
AIR FACTORS:	339 / 480 / 381	SAR 10G:	0.137 W/kg
CONVERSION FACTORS:	0.400 / 0.400 / 0.400	SAR START:	0.040 W/kg
TYPE OF MODULATION:	GMSK (GPRS Mode)	SAR END:	0.040 W/kg
MODN. DUTY CYCLE:	50.0 %	SAR DRIFT DURING SCAN:	1.19 %
DIODE COMPRESSION FACTORS (V*200):	20 / 20 / 20	PROBE BATTERY LAST CHANGED:	21/06/2008
INPUT POWER LEVEL:	33 dBm	EXTRAPOLATION:	poly4

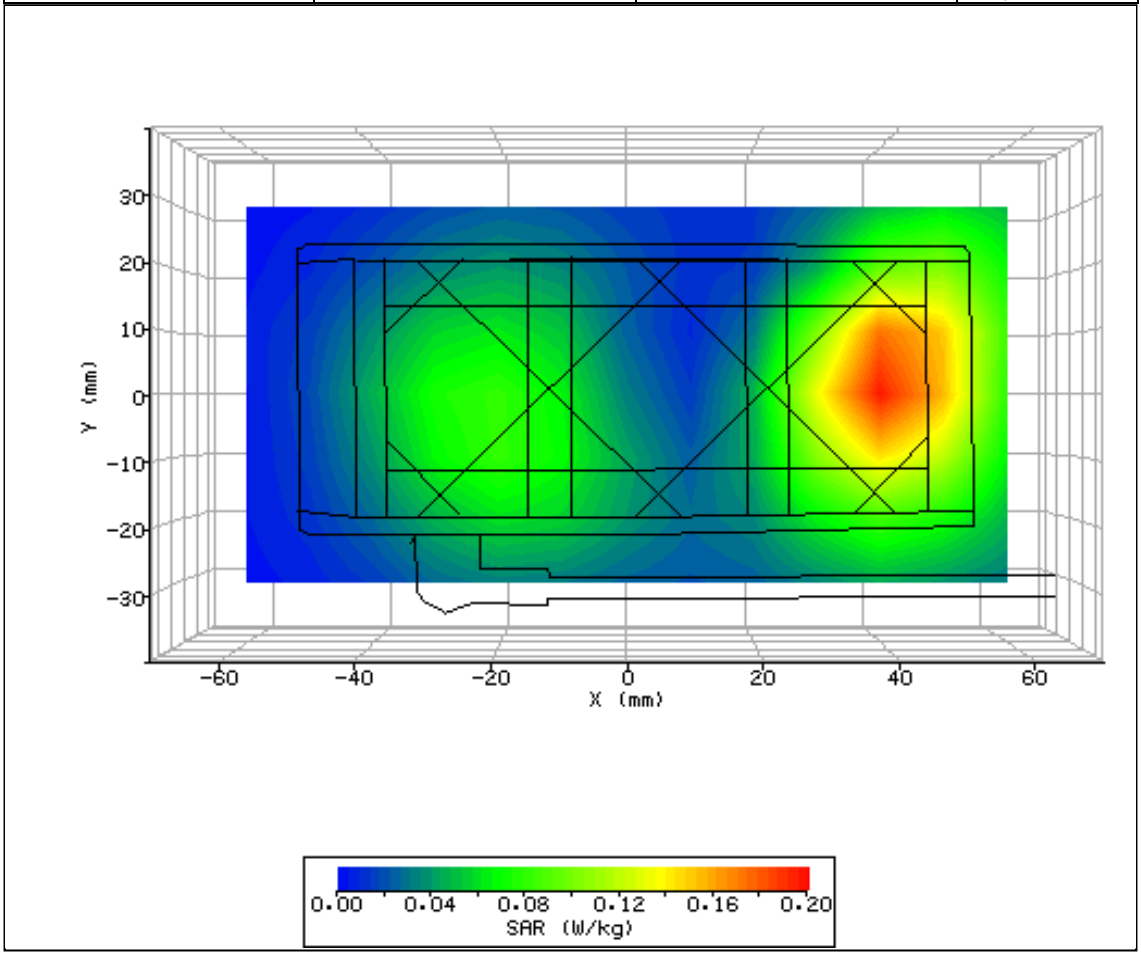


Figure 31: SAR Body Testing Results for the CD1D Dior Phone Mobile Device in 15mm-Front Facing Phantom Position; Tested at 1880.0MHz (GSM 1900 Mid Channel) with 15mm Separation Distance to the Phantom.

Product Service

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

The following test equipment was used at TUV Product Service Ltd:

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2 SAR					
Signal Generator	Marconi	2031	53	12	23-Feb-2009
Power Sensor	Rohde & Schwarz	NRV-Z1	60	12	28-Nov-2008
Industrial Robot	Mitsubishi	RV-E2/CR-E116	63	-	TU
Thermometer	Digitron	T208	64	12	10-Oct-2008
Power Sensor	Rohde & Schwarz	NRV-Z1	178	12	28-Nov-2008
Communications Tester	Rohde & Schwarz	CMU 200	442	12	09-Jun-2009
Attenuator (20dB, 10W)	Weinschel	37-20-34	482	12	1-Mar-2009
SAM Head Phantom	Antennessa	Head_04_35.csv	1561	-	TU
Flat Phantom	IndexSar Ltd	Headbox	1562	-	TU
Side Bench 2 Chamber 2	IndexSar Ltd	IXM-030	1571	-	TU
Scissor Jack + Base	IndexSar Ltd	IXB-030	1576	-	TU
Ear Positioner with Support	IndexSar Ltd	IXH-050	1578	-	TU
Dipole Positioner/Support (plastic)	IndexSar Ltd	IXH-020	1583	-	TU
Validation Amplifier (10MHz - 2.5GHz)	IndexSar Ltd	VBM2500-3	2415	12	30-Nov-2008
Hygromer	Rotronic	I-1000	2784	12	30-Jul-2008
Antenna (Omnidirectional)	Katherin Scala Division	OG-890/1990/DC	2906	12	16-Nov-2008
Dual Channel Power Meter	Rohde & Schwarz	NRVD	3259	12	15-Nov-2008
850MHz Head Tissue Simulant	TUV Product Service Ltd	Batch 13	N/A	1	27-Jul-2008
850MHz Body Tissue Simulant	TUV Product Service Ltd	Batch 9	N/A	1	27-Jul-2008
1900MHz Head Tissue Simulant	TUV Product Service Ltd	Batch 3	N/A	1	27-Jul-2008
1900MHz Body Tissue Simulant	TUV Product Service Ltd	Batch 2	N/A	1	27-Jul-2008

3.2 TEST SOFTWARE

The following software was used to control the TÜV Product Service SARA2 System.

Instrument	Version Number	Date
SARA2 system	v.2.5.3 VPM	28/11/2006
Mitsubishi robot controller firmware revision	RV-E2 Version C9a	-
IFA-10 Probe amplifier	Version 2	-

3.3 DIELECTRIC PROPERTIES OF SIMULANT LIQUIDS

The fluid properties of the simulant fluids used during routine SAR evaluation meet the dielectric properties required by EN 62209-1:2006 & OET Bulletin 65 (Edition 97-01).

The fluids were calibrated in our Laboratory and re-checked prior to any measurements being made against reference fluids stated in IEEE 1528-2003 of 0.9% NaCl (Salt Solution) at 23ºC and also for Dimethylsulphoxide (DMS) at 21ºC.

The fluids were made at TÜV Product Service Ltd under controlled conditions from the following OET(65)c formulae and IEEE 1528-2003. The composition of ingredients may have been modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation:

OET 65(c) Recipes

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

IEEE 1528 Recipes

Frequency (MHz)	300	450		835	900			1450	1800				1900		1950	2000	2100		2450		3000
Recipe#	1	1	3	1	1	2	3	1	1	2	2	3	1	2	4	1	1	2	2	3	2
Ingredients (% by weight)																					
1, 2-Pro-panediol						64.81															
Bactericide	0.19	0.19	0.50	0.10	0.10		0.50													0.50	
Diacetin			48.90				49.20													49.45	
DGBE								45.41	47.00	13.84	44.92		44.94	13.84	45.00	50.00	50.00	7.99	7.99		7.99
HEC	0.98	0.96		1.00	1.00																
NaCl	5.95	3.95	1.70	1.45	1.48	0.79	1.10	0.67	0.36	0.35	0.18	0.64	0.18	0.35				0.16	0.16		0.16
Sucrose	55.32	56.32		57.00	56.50																
Triton X-100										30.45				30.45				19.97	19.97		19.97
Water	37.56	38.56	48.90	40.45	40.92	34.40	49.20	53.80	52.64	55.36	54.90	49.43	54.90	55.36	55.00	50.00	50.00	71.88	71.88	49.75	71.88
Measured dielectric parameters																					
ε_r'	46.00	43.40	44.30	41.60	41.20	41.80	42.70	40.9	39.3	41.00	40.40	39.20	39.90	41.00	40.10	37.00	36.80	41.10	40.30	39.20	37.90
σ (S/m)	0.86	0.85	0.90	0.90	0.98	0.97	0.99	1.21	1.39	1.38	1.40	1.40	1.42	1.38	1.41	1.40	1.51	1.55	1.88	1.82	2.46
Temp (ºC)	22	22	20	22	22	22	20	22	22	21	22	20	21	21	20	22	22	20	20	20	20
Target dielectric parameters (Table 2)																					
ε_r'	45.30	43.50		41.5	41.50			40.50	40.00								39.80		39.20		38.50
σ (S/m)	0.87	0.87		0.9	0.97			1.20	1.40								1.49		1.80		2.40

NOTE – Multiple columns for any single frequency are optional recipe #, reference: 1 (Kanda et al. [B185]), 2 (Vigneras [B143]), 3 (Peyman and Gabriel [B119]), 4 (Fukunaga et al [B50])

The dielectric properties of the tissue simulant liquids used for the SAR testing at TÜV Product Service Ltd are as follows:-

Fluid Type and Frequency	Relative Permittivity εR (ε') Target	Relative Permittivity εR (ε') Measured	Conductivity σ Target	Conductivity σ Measured
Head 850MHz	41.5	43.66	0.900	0.931
Body 850MHz	55.0	56.43	1.050	0.985
Head 1900MHz	40.0	40.86	1.400	1.409
Body 1900MHz	53.3	54.07	1.520	1.562

3.4 TEST CONDITIONS

3.4.1 Test Laboratory Conditions

Ambient Temperature: Within +15°C to +35°C at 20% RH to 75% RH.
The actual Temperature during the testing ranged from 21.8°C to 23.8°C.
The actual Humidity during the testing ranged from 34.1% to 54.1% RH.

Test Fluid Temperature Range

Frequency	850 MHz	850 MHz	1900 MHz	1900 MHz
Body / Head Fluid	Head	Body	Head	Body
Min Temperature	21.9°C	21.8°C	22.6°C	21.6°C
Max Temperature	22.4°C	22.0°C	22.9°C	22.9°C

3.4.2 SAR Drift

The SAR Drift was within acceptable limits during scans. The maximum SAR Drift, drift due to the handset electronics, was recorded as -6.56% (-0.280dB) for all of the testing. The

3.5 MEASUREMENT UNCERTAINTY

Source of Uncertainty	Description	Tolerance / Uncertainty ± %	Probability distribution	Div	c_i (1g)	Standard Uncertainty ± % (1g)	v_i or v_{eff}
Measurement System							
Probe calibration	7.2.1	8.73	N	1	1	8.73	∞
Isotropy	7.2.1.2	3.18	R	1.73	1	1.84	∞
Probe angle >30deg	additional	12.00	R	1.73	1	6.93	∞
Boundary effect	7.2.1.5	0.49	R	1.73	1	0.28	∞
Linearity	7.2.1.3	1.00	R	1.73	1	0.58	∞
Detection limits	7.2.1.4	0.00	R	1.73	1	0.00	∞
Readout electronics	7.2.1.6	0.30	N	1	1	0.30	∞
Response time	7.2.1.7	0.00	R	1.73	1	0.00	∞
Integration time (equiv.)	7.2.1.8	1.38	R	1.73	1	0.80	∞
RF ambient conditions	7.2.3.6	3.00	R	1.73	1	1.73	∞
Probe positioner mech. restrictions	7.2.2.1	5.35	R	1.73	1	3.09	∞
Probe positioning with respect to phantom shell	7.2.2.3	5.00	R	1.73	1	2.89	∞
Post-processing	7.2.4	7.00	R	1.73	1	4.04	∞
Test sample related							
Test sample positioning	7.2.2.4	1.50	R	1.73	1	0.87	∞
Device holder uncertainty	7.2.2.4.2	1.73	R	1.73	1	1.00	∞
Drift of output power	7.2.3.4	6.56	R	1.73	1	3.79	∞
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	7.2.2.2	2.01	R	1.73	1	1.16	∞
Liquid conductivity (target)	7.2.3.3	5.00	R	1.73	0.64	1.85	∞
Liquid conductivity (meas.)	7.2.3.3	5.00	N	1	0.64	3.20	∞
Liquid permittivity (target)	7.2.3.4	5.00	R	1.73	0.6	1.73	∞
Liquid permittivity (meas.)	7.2.3.4	3.00	N	1	0.6	1.80	∞
Combined standard uncertainty			RSS			14.26	
Expanded uncertainty (95% confidence interval)			K=2			28.51	

Product Service

SECTION 4

PHOTOGRAPHS

4.1 TEST POSITIONAL PHOTOGRAPHS

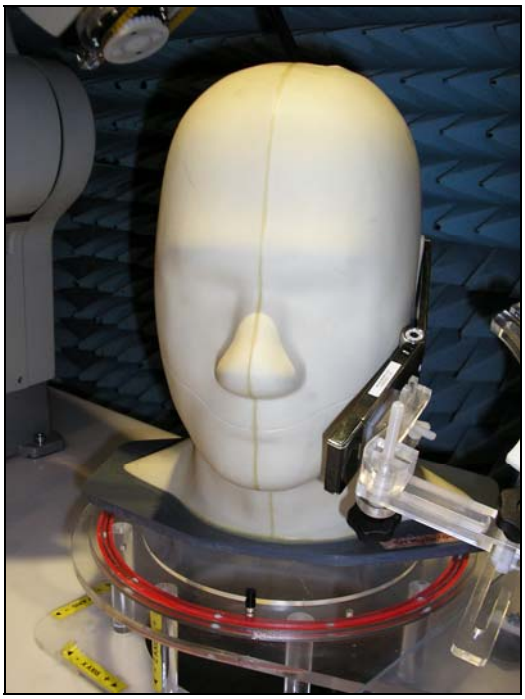


Figure 32:
Positional Photograph of the CD1D Handset in LH Cheek Position.

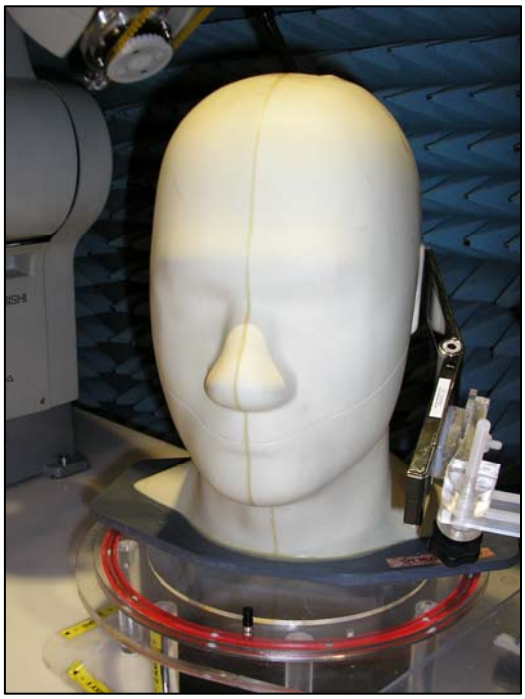


Figure 33:
Positional Photograph of the CD1D Handset in LH 15° Position.

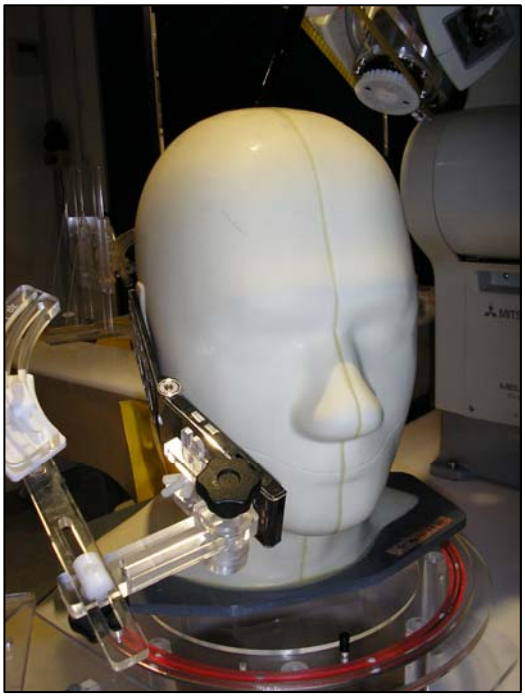


Figure 34:
Positional Photograph of the CD1D

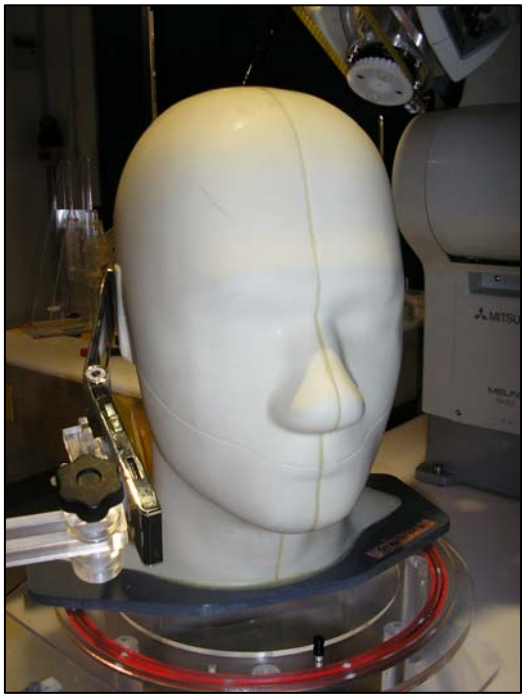


Figure 35:
Positional Photograph of the CD1D

Handset in RH Cheek Position.

Handset in RH 15° Position.

Figure 36:
Positional Photograph of the CD1D
Handset in front facing Position.
15mm separation with hands-free accessory.

Figure 37:
Positional Photograph of the CD1D
Handset in rear facing Position
15mm separation with hands-free accessory.

4.2 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

Figure 38:
Front View (Version: CD1D)

Figure 39:
Rear View (Version: CD1D)

Figure 40:
Rear View – Battery Removed (Version: CD1D)

Figure 41:
Front View - Open (Version: CD1D)

Figure 42:
Front View (Version: CD1D-S)

Figure 43:
Front View - Open (Version: CD1D-S)

Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

ANNEX A

PROBE CALIBRATION INFORMATION

Product Service

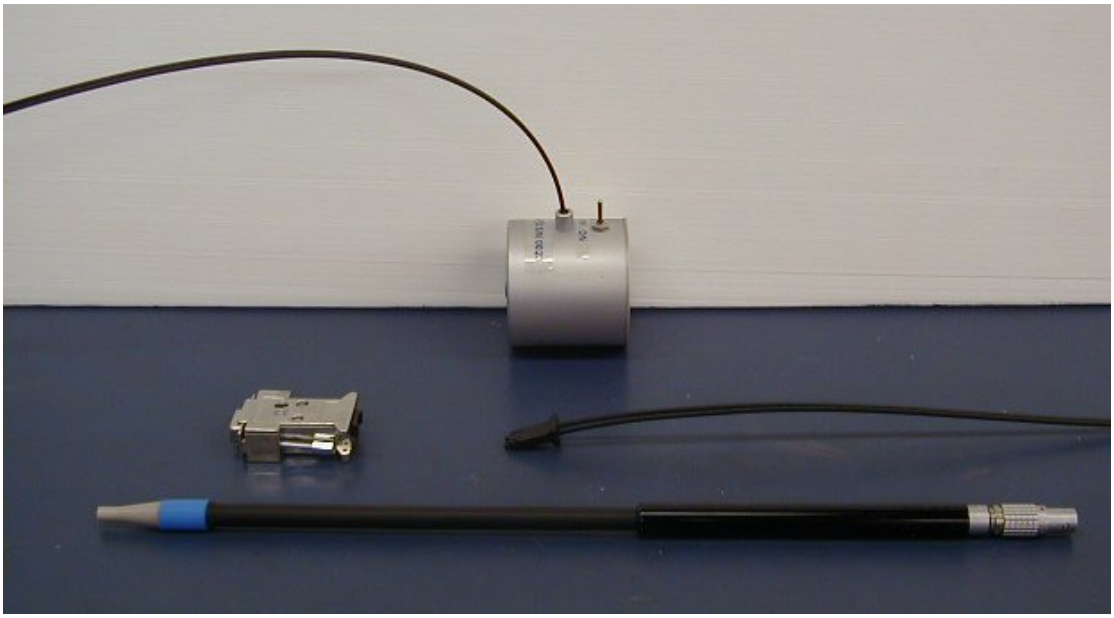
IMMERSIBLE SAR PROBE

CALIBRATION REPORT

Part Number: IXP – 050

S/N 0171

September 2007



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e-mail: enquiries@indexsar.com

Calibration Certificate 0709/0171
Dosimetric E-field Probe

Type:	**IXP-050**
Manufacturer:	**IndexSAR, UK**
Serial Number:	**0171**
Place of Calibration:	**IndexSAR, UK**

IndexSAR Limited hereby declares that the IXP-050 Probe named above has been calibrated for conformity to the IEEE 1528 and CENELEC EN 50361 standards on the date shown below.

Date of Initial Calibration:	24th **September 2007**

The probe named above will require a calibration check on the date shown below.

Next Calibration Date:	**September 2008**

The calibration was carried out using the methods described in the calibration document.

Where applicable, the standards used in the calibration process are traceable to the UK's National Physical Laboratory.

Calibrated By: A. Bricklow

Approved By: M.J. Maini

Please keep this certificate with the calibration document. When the probe is sent for a calibration check, please include the calibration document.

INTRODUCTION

This Report presents measured calibration data for a particular Indexsar SAR probe (S/N 0171) and describes the procedures used for characterisation and calibration.

Indexsar probes are characterised using procedures that, where applicable, follow the recommendations of CENELEC [1] and IEEE [2] standards. The procedures incorporate techniques for probe linearisation, isotropy assessment and determination of liquid factors (conversion factors). Calibrations are determined by comparing probe readings with analytical computations in canonical test geometries (waveguides) using normalised power inputs.

Each step of the calibration procedure and the equipment used is described in the sections below.

CALIBRATION PROCEDURE

1. Objectives

The calibration process comprises four stages

1) Determination of the channel sensitivity factors which optimise the probe's overall rotational isotropy in 900MHz brain fluid
2) Determination of the channel sensitivity factors and angular offset of the X channel which together optimise the probe's spherical isotropy in 900MHz brain fluid
3) Numerical combination of the two sets of channel sensitivity factors to give both acceptable rotational isotropy and acceptable spherical isotropy values
4) At each frequency of interest, application of these channel sensitivity factors to model the exponential decay of SAR in a waveguide fluid cell, and hence derive the liquid conversion factors at that frequency

2. Probe output

The probe channel output signals are linearised in the manner set out in Refs [1] and [2]. The following equation is utilized for each channel:

$$U_{lin} = U_{o/p} + U_{o/p}^{2} / DCP \qquad (1)$$

where U_{lin} is the linearised signal, $U_{o/p}$ is the raw output signal in voltage units and DCP is the diode compression potential in similar voltage units.

DCP is determined from fitting equation (1) to measurements of U_{lin} versus source feed power over the full dynamic range of the probe. The DCP is a characteristic of the Schottky diodes used as the sensors. For the IXP-050 probes with CW signals the DCP values are typically 0.10V (or 20 in the voltage units used by Indexsar software, which are V*200).

In turn, measurements of E-field are determined using the following equation (where output voltages are also in units of V*200):

$$E_{liq}^{2}\,(V/m) = U_{linx} * \text{Air Factor}_x * \text{Liq Factor}_x + U_{liny} * \text{Air Factor}_y * \text{Liq Factor}_y + U_{linz} * \text{Air Factor}_z * \text{Liq Factor}_z \qquad (3)$$

Here, “Air Factor” represents each channel’s sensitivity, while “Liq Factor” represents the enhancement in signal level when the probe is immersed in tissue-simulant liquids at each frequency of interest.

3. Selecting channel sensitivity factors to optimise isotropic response

After manufacture, the first stage of the calibration process is to balance the three channels’ Air Factor values, thereby optimising the probe’s overall axial response (“rotational isotropy”).

To do this, a 900MHz waveguide containing head-fluid simulant is selected. Like all waveguides used during probe calibration, this particular waveguide contains two distinct sections: an air-filled launcher section, and a liquid cell section, separated by a dielectric matching window designed to minimise reflections at the air-liquid interface.

The waveguide stands in an upright position and the liquid cell section is filled with 900MHz brain fluid to within 10 mm of the open end. The depth of liquid ensures there is negligible radiation from the waveguide open top and that the probe calibration is not influenced by reflections from nearby objects.

During the measurement, a TE_{01} mode is launched into the waveguide by means of an N-type-to-waveguide adapter. The probe is then lowered vertically into the liquid until the tip is exactly 10mm above the centre of the dielectric window. This particular separation ensures that the probe is operating in a part of the waveguide where boundary corrections are not necessary.

Care must also be taken that the probe tip is centred while rotating.

The exact power applied to the input of the waveguide during this stage of the probe calibration is immaterial since only relative values are of interest while the probe rotates. However, the power must be sufficiently above the noise floor and free from drift.

The dedicated Indexsar calibration software rotates the probe in 10 degree steps about its axis, and at each position, an Indexsar ‘Fast’ amplifier samples the probe channels 500 times per second for 0.4 s. The raw $U_{o/p}$ data from each sample are packed into 10 bytes and transmitted back to the PC controller via an optical cable. U_{linx}, U_{liny} and U_{linz} are derived from the raw $U_{o/p}$ values and written to an Excel template.

Once data have been collected from a full probe rotation, the Air Factors are adjusted using a special Excel Solver routine to equalise the output from each channel and hence minimise the rotational isotropy. This automated approach to optimisation removes the effect of human bias.

Figure 5 represents the output from each diode sensor as a function of probe rotation angle.

4. Measurement of Spherical Isotropy

The setup for measuring the probe’s spherical isotropy is shown in Figure 2.

A box phantom containing 900MHz head fluid is irradiated by a vertically-polarised, tuned dipole, mounted to the side of the phantom on the robot’s seventh axis. During calibration, the spherical response is generated by rotating the probe about its axis in 20 degree steps and changing the dipole polarisation in 10 degree steps.

By using the VPM technique discussed below, an allowance can also be made for the effect of E-field gradient across the probe’s spatial extent. This permits values for the probe’s effective tip radius and X-channel angular offset to be modelled until the overall spherical isotropy figure is optimised.

The dipole is connected to a signal generator and amplifier via a directional coupler and power meter. As with the determination of rotational isotropy, the absolute power level is not important as long as it is stable.

The probe is positioned within the fluid so that its sensors are at the same vertical height as the centre of the source dipole. The line joining probe to dipole should be perpendicular to the phantom wall, while the horizontal separation between the two should be small enough for VPM corrections to be applicable, without encroaching near the boundary layer of the phantom wall. VPM corrections require a knowledge of the fluid skin depth. This is measured during the calibration by recording the E-field strength while systematically moving the probe away from the dipole in 2mm steps over a 20mm range.

The directionality of the orthogonally-arranged sensors can be checked by analysing the data using dedicated Indexsar software, which displays the data in 3D format, a representative image of which is shown in Figure 3. The left-hand side of this diagram shows the individual channel outputs after linearisation (see above). The program uses these data to balance the channel outputs and then applies an optimisation process, which makes fine adjustments to the channel factors for optimum isotropic response.

5. Determination of Conversion ("Liquid") Factors at each frequency of interest

A lookup table of conversion factors for a probe allows a SAR value to be derived at the measured frequencies, and for either brain or body fluid-simulant.

The method by which the conversion factors are assessed is based on the comparison between measured and analytical rates of decay of SAR with height above a dielectric window. This way, not only can the conversion factors for that frequency/fluid combination be determined, but an allowance can also be made for the scale and range of boundary layer effects.

The theoretical relationship between the SAR at the cross-sectional centre of the lossy waveguide as a function of the longitudinal distance (z) from the dielectric separator is given by Equation 4:

$$SAR(z) = \frac{4\left(P_f - P_b\right)}{\rho ab\delta} e^{-2z/\delta} \quad (4)$$

Here, the density ρ is conventionally assumed to be 1000 kg/m^3, ab is the cross-sectional area of the waveguide, and P_f and P_b are the forward and reflected power inside the lossless section of the waveguide, respectively. The penetration depth δ (which is the reciprocal of the waveguide-mode attenuation coefficient) is a property of the lossy liquid and is given by Equation (5).

$$\delta = \left[\mathrm{Re}\left\{ \sqrt{\left(\pi / a\right)^2 + j\omega\mu_o\left(\sigma + j\omega\varepsilon_o\varepsilon_r\right)} \right\} \right]^{-1} \quad (5)$$

where σ is the conductivity of the tissue-simulant liquid in S/m, ε_r is its relative permittivity, and ω is the radial frequency (rad/s). Values for σ and ε_r are obtained prior to each waveguide test using an Indexsar DiLine measurement kit, which uses the TEM method as recommended in [2]. σ and ε_r are both temperature- and fluid-dependent, so are best measured using a sample of the tissue-simulant fluid immediately prior to the actual calibration.

Wherever possible, all DiLine and calibration measurements should be made in the open laboratory at 22 $\pm$ 2.0^{o}C; if this is not possible, the values of σ and ε_r should reflect the actual temperature. Values employed for calibration are listed in the tables below.

By ensuring the liquid height in the waveguide is at least three penetration depths, reflections at the upper surface of the liquid are negligible. The power absorbed in the liquid is therefore determined solely from the waveguide forward and reflected power.

Different waveguides are used for 835/900MHz, 1800/1900MHz, 2450MHz and 5200/5800MHz measurements. Table A.1 of [1] can be used for designing calibration waveguides with a return loss greater than 20 dB at the most important frequencies used for personal wireless communications, and better than 15dB for frequencies greater than 5GHz. Values for the penetration depth for these specific fixtures and tissue-simulating mixtures are also listed in Table A.1.

According to [1], this calibration technique provides excellent accuracy, with standard uncertainty of less than 3.6% depending on the frequency and medium. The calibration itself is reduced to power measurements traceable to a standard calibration procedure. The practical limitation to the frequency band of 800 to 5800 MHz because of the waveguide size is not severe in the context of compliance testing.

During calibration, the probe is lowered carefully until it is just touching the cross-sectional centre of the dielectric window. 200 samples are then taken and written to an Excel template file before moving the probe vertically upwards. This cycle is repeated 150 times. The vertical separation between readings is determined from practical considerations of the expected SAR decay rate, and range from 0.2mm steps at low frequency, through 0.1mm at 2450MHz, down to 0.05mm at 5GHz.

Once the data collection is complete, a Solver routine is run which optimises the measured-theoretical fit by varying the conversion factor, and the boundary correction size and range.

For 450 MHz calibrations, a slightly different technique must be used — the equatorial response of the probe-under-test is compared with the equivalent response of a probe whose 450MHz characteristics have already been determined by NPL. The conversion factor of the probe-under-test can then be deduced.

VPM (Virtual Probe Miniaturisation)

SAR probes with 3 diode-sensors in an orthogonal arrangement are designed to display an isotropic response when exposed to a uniform field. However, the probes are ordinarily used for measurements in non-uniform fields and isotropy is not assured when the field gradients are significant compared to the dimensions of the tip containing the three orthogonally-arranged dipole sensors.

It becomes increasingly important to assess the effects of field gradients on SAR probe readings when higher frequencies are being used. For Indexsar IXP-050 probes, which are of 5mm tip diameter, field gradient effects are minor at GSM frequencies, but are major above 5GHz. Smaller probes are less affected by field gradients and so probes, which are significantly less than 5mm diameter, would be better for applications above 5GHz.

The IndexSAR report IXS0223 describes theoretical and experimental studies to evaluate the issues associated with the use of probes at arbitrary angles to surfaces and field directions. Based upon these studies, the procedures and uncertainty analyses referred to in P1528 are addressed for the full range of probe presentation angles.

In addition, generalized procedures for correcting for the finite size of immersible SAR probes are developed. Use of these procedures enables application of schemes for virtual probe miniaturization (VPM) – allowing probes of a specific size to be used where physically-smaller probes would otherwise be required.

Given the typical dimensions of 3-channel SAR probes presently available, use of the VPM technique extends the satisfactory measurement range to higher frequencies.

Product Service

CALIBRATION FACTORS MEASURED FOR PROBE S/N 0171

The probe was calibrated at 450, 835, 900, 1800, 1900, 2100 and 2450 MHz in liquid samples representing brain and body liquid at these frequencies.

The calibration was for CW signals only, and the axis of the probe was parallel to the direction of propagation of the incident field i.e. end-on to the incident radiation. The axial isotropy of the probe was measured by rotating the probe about its axis in 10 degree steps through 360 degrees in this orientation.

The reference point for the calibration is in the centre of the probe's cross-section at a distance of 2.7 mm from the probe tip in the direction of the probe amplifier. A value of 2.7 mm should be used for the tip to sensor offset distance in the software. The distance of 2.7mm for assembled probes has been confirmed by taking X-ray images of the probe tips (see Figure 9).

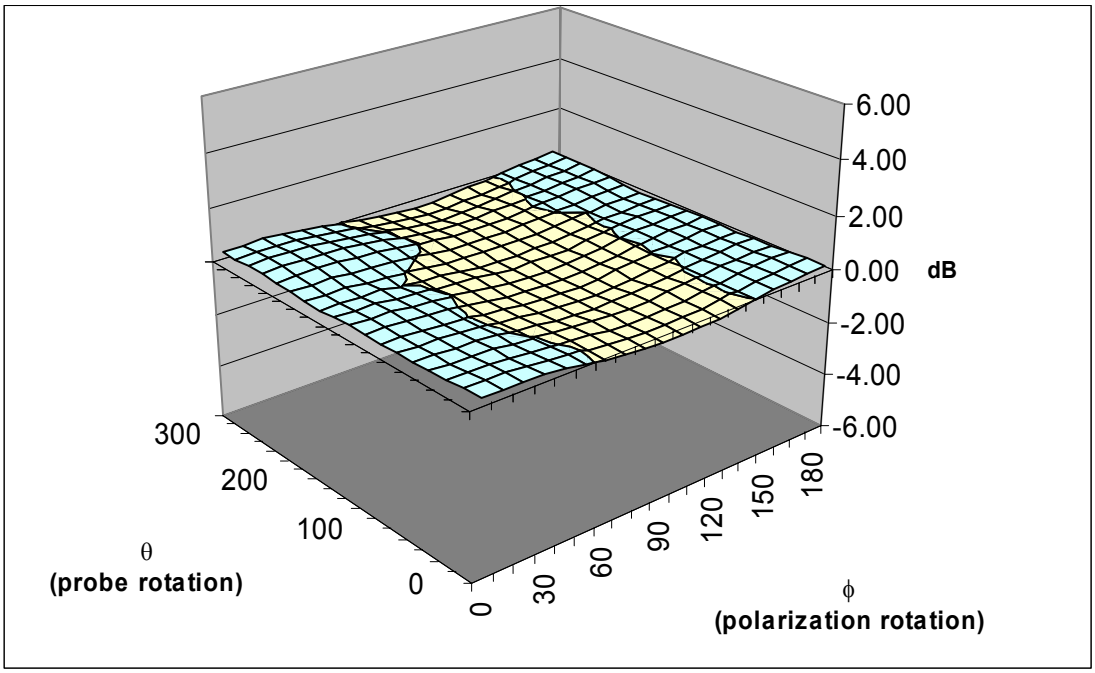
It is important that the diode compression point and air factors used in the software are the same as those quoted in the results tables, as these are used to convert the diode output voltages to a SAR value.

MEASUREMENT UNCERTAINTIES

A complete measurement uncertainty analysis for the SARA2 measurement system has been published in Reference [3]. Table 10 from that document is re-created below, and lists the uncertainty factors associated just with the calibration of probes.

Source of uncertainty	**Uncertainty value ± %**	**Probability distribution**	**Divisor**	**c_i**	**Standard uncertainty ui ± %**	**v_i or v_{eff}**
Incident or forward power	5.743	N	1.00	1	5.743	∞
Refelected power	5.773	N	1.00	1	5.773	∞
Liquid conductivity	1.120	N	1.00	1	1.120	∞
Liquid permittivity	1.085	N	1.00	1	1.085	∞
Field homgeneity	0.002	R	1.73	1	0.001	∞
Probe positioning: +/- 0.05mm	0.55	R	1.73	1	0.318	
Influence on Probe pos: 11%/mm						
Field probe linearity	4.7	R	1.73	1	2.714	∞
Combined standard uncertainty		**RSS**			**8.729**	

At the 95% confidence level, therefore, the expanded uncertainty is 17.1%



Surface Isotropy diagram of IXP-050 Probe S/N 0171 at 900MHz after VPM (rotational isotropy axial +/-0.07dB, spherical isotropy +/-0.33dB)

Probe tip radius	1.25
X Ch. Angle to red dot	-1.7

	Head		Body	
Frequency	**Bdy. Corrn. – f(0)**	**Bdy. Corrn. – d(mm)**	**Bdy. Corrn. – f(0)**	**Bdy. Corrn. – d(mm)**
450	-	-	-	-
835	0.88	1.5	1.13	1.3
900	0.99	1.3	1.04	1.3
1800	0.83	1.5	0.83	1.6
1900	0.76	1.5	0.78	1.7
2100	0.83	1.5	0.66	2.0
2450	0.83	1.5	0.65	2.0

Product Service

SUMMARY OF CALIBRATION FACTORS FOR PROBE IXP-050 S/N 0171

Spherical isotropy measured at 900MHz	0.33	(+/-) dB

	X	Y	Z	
Air Factors	339	480	381	(V*200)
CW DCPs	20	20	20	(V*200)

Freq (MHz)	Axial Isotropy (+/- dB)		SAR ConvF (liq/air)		Notes
	Head	Body	Head	Body	
450	-	-	0.299	0.301	1,3
835	-	-	0.276	0.279	1,2
900	0.07	-	0.280	0.293	1,2
1800	-	-	0.342	0.382	1,2
1900	-	-	0.347	0.400	1,2
2100	-	-	0.366	0.422	1,2
2450	-	-	0.392	0.463	1,2

Notes	
1)	Calibrations done at 22°C +/-2°C
2)	Waveguide calibration
3)	Transfer calibration

Product Service

PROBE SPECIFICATIONS

Indexsar probe 0171, along with its calibration, is compared with CENELEC and IEEE standards recommendations (Refs [1] and [2]) in the Tables below. A listing of relevant specifications is contained in the tables below:

1.1.1 Dimensions	S/N 0171	CENELEC [1]	IEEE [2]
Overall length (mm)	350		
Tip length (mm)	10		
Body diameter (mm)	12		
Tip diameter (mm)	5.2	8	8
Distance from probe tip to dipole centers (mm)	2.7		

1.1.2 Dynamic range	S/N 0171	CENELEC [1]	IEEE [2]
Minimum (W/kg)	0.01	<0.02	0.01
Maximum (W/kg) N.B. only measured to > 100 W/kg on representative probes	>100	>100	100

1.1.3 Isotropy (measured at 900MHz)	S/N 0171	CENELEC [1]	IEEE [2]
Axial rotation with probe normal to source (+/- dB)	0.07 (See table above)	0.5	0.25
Spherical isotropy covering all orientations to source (+/- dB)	0.33	1.0	0.50

1.1.4 Construction	Each probe contains three orthogonal dipole sensors arranged on a triangular prism core, protected against static charges by built-in shielding, and covered at the tip by PEEK cylindrical enclosure material. No adhesives are used in the immersed section. Outer case materials are PEEK and heat-shrink sleeving.
1.1.5 Chemical resistance	Tested to be resistant to glycol and alcohol containing simulant liquids but probes should be removed, cleaned and dried when not in use.

REFERENCES

[1] CENELEC, EN 50361, July 2001. Basic Standard for the measurement of specific absorption rate related to human exposure to electromagnetic fields from mobile phones.

[2] IEEE 1528, Recommended practice for determining the spatial-peak specific absorption rate (SAR) in the human body due to wireless communications devices: Experimental techniques.

[3] Indexsar Report IXS-0300, October 2007. Measurement uncertainties for the SARA2 system assessed against the recommendations of BS EN 62209-1:2006

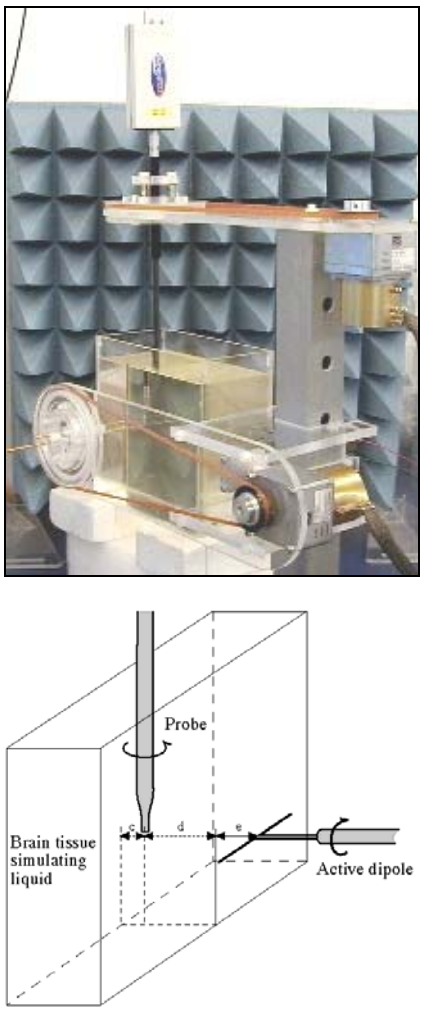


Figure 1. Spherical isotropy jig showing probe, dipole and box filled with simulated brain liquid (see Ref [2], Section A.5.2.1)

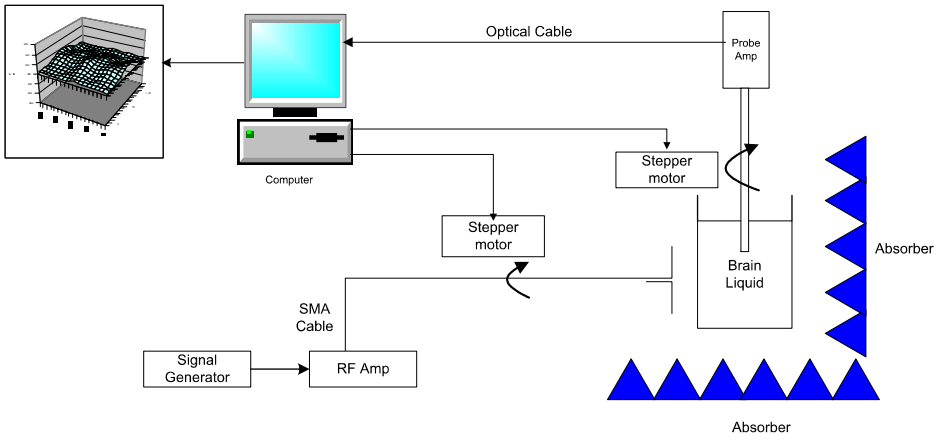


Figure 2. Schematic diagram of the test geometry used for isotropy determination

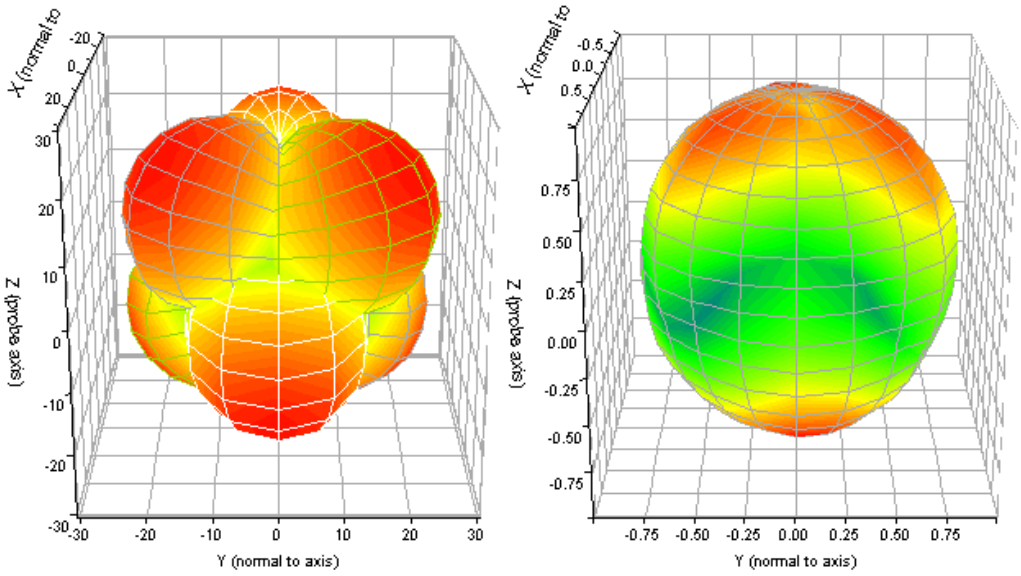


Figure 3. Graphical representation of a probe's response to fields applied from each direction. The diagram on the left shows the individual response characteristics of each of the three channels and the diagram on the right shows the resulting probe sensitivity in each direction. The colour range in the figure images the lowest values as blue and the maximum values as red. For probe S/N 0171, this range is (+/-) 0.33dB.

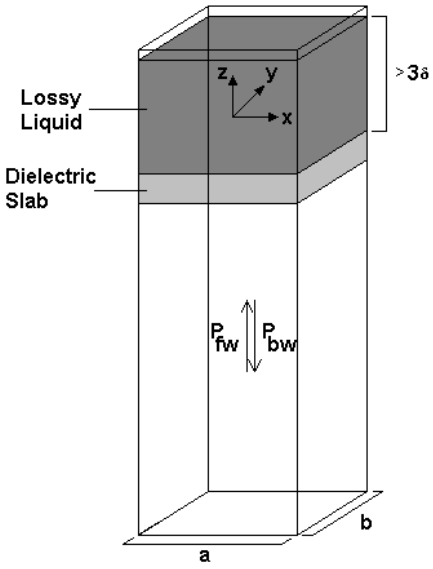


Figure 4. Geometry used for waveguide calibration (after Ref [2]. Section A.3.2.2)

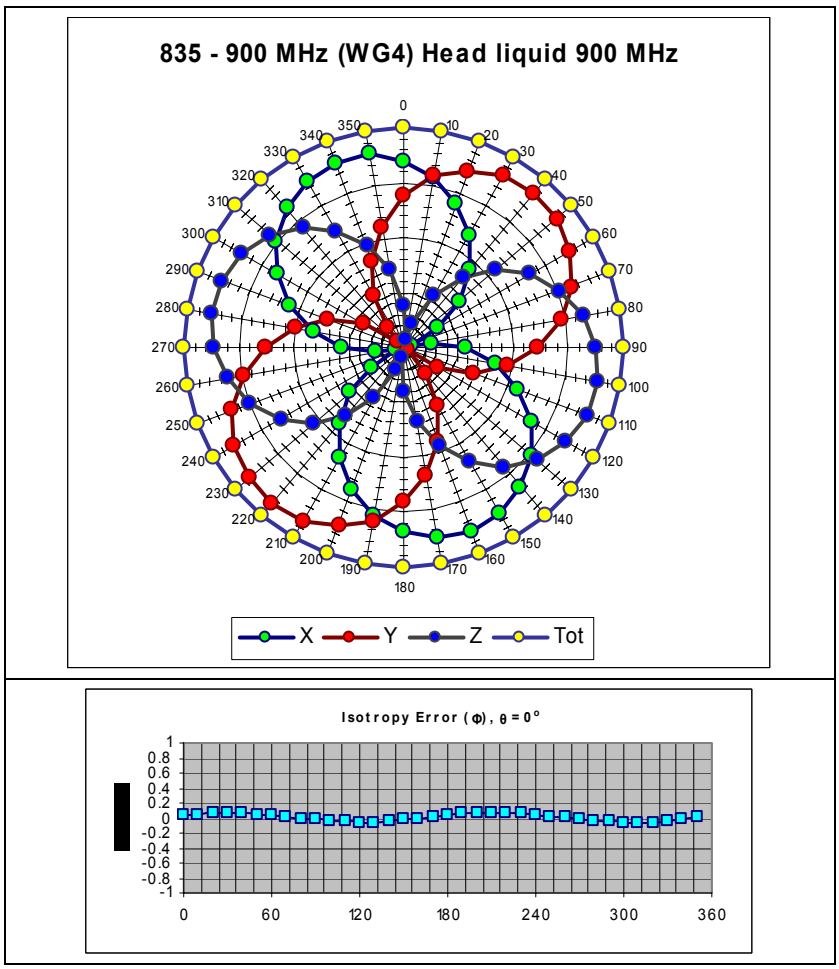


Figure 5. The rotational isotropy of probe S/N 0171 obtained by rotating the probe in a liquid-filled waveguide at 900 MHz.

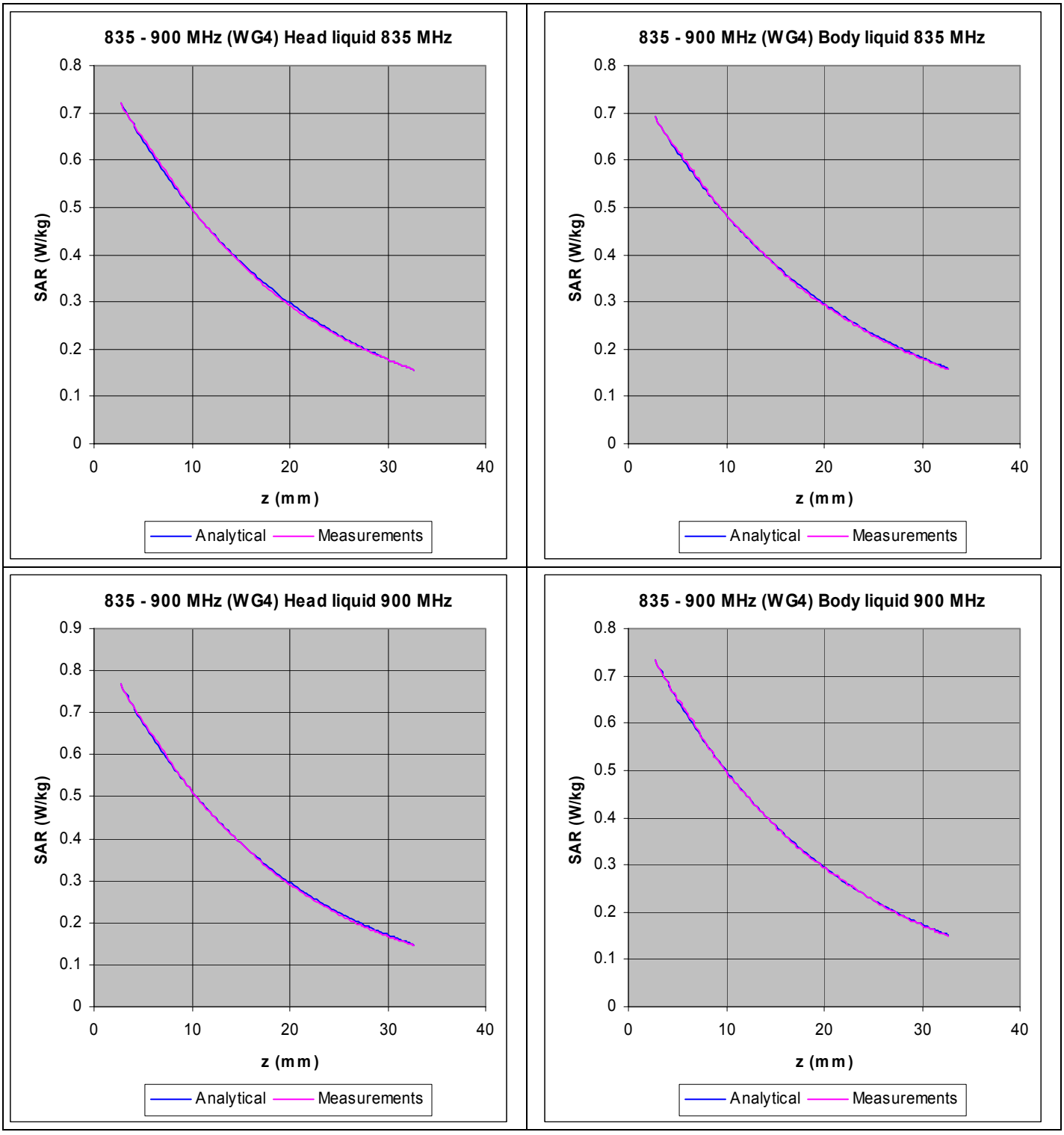
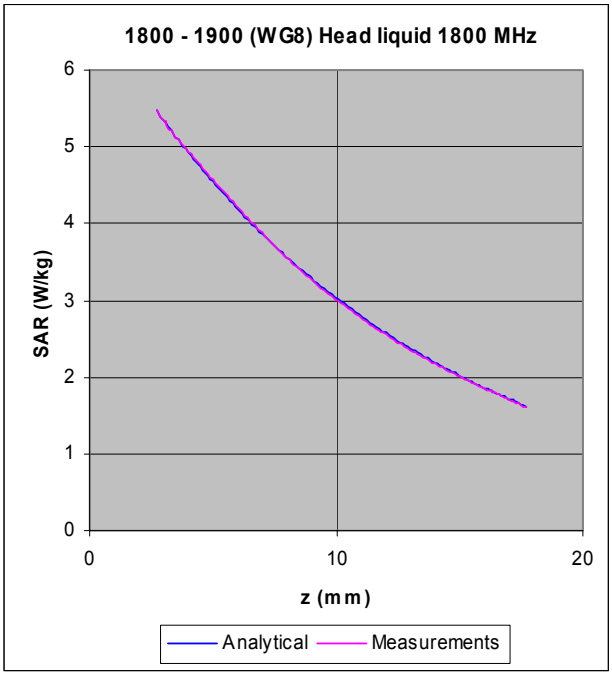
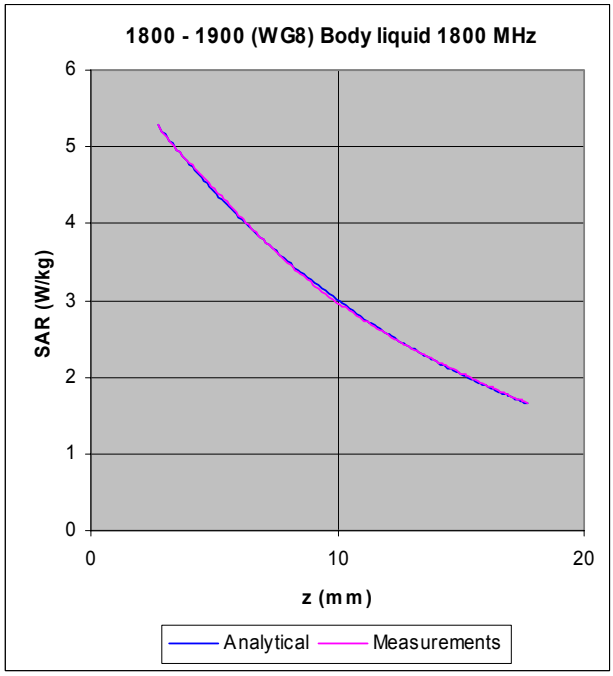
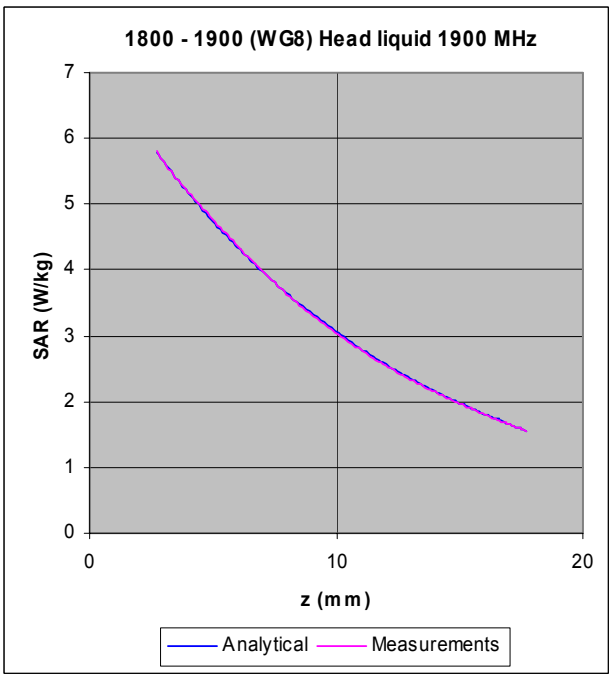
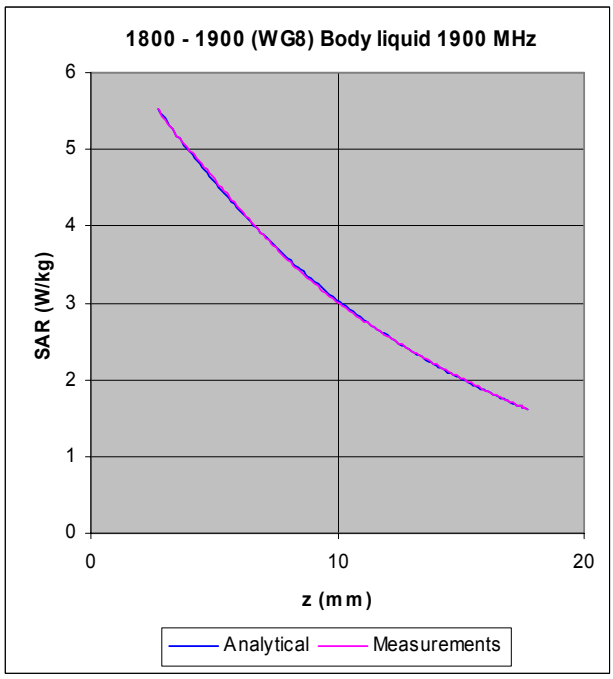


Figure 6. The measured SAR decay function along the centreline of the WG4 waveguide with conversion factors adjusted to fit to the theoretical function for the particular dimension, frequency, power and liquid properties employed.


1800 - 1900 (WG8) Head liquid 1800 MHz
SAR (W/kg)
z (mm)
Analytical
Measurements


1800 - 1900 (WG8) Body liquid 1800 MHz
SAR (W/kg)
z (mm)
Analytical
Measurements


1800 - 1900 (WG8) Head liquid 1900 MHz
SAR (W/kg)
z (mm)
Analytical
Measurements


1800 - 1900 (WG8) Body liquid 1900 MHz
SAR (W/kg)
z (mm)
Analytical
Measurements

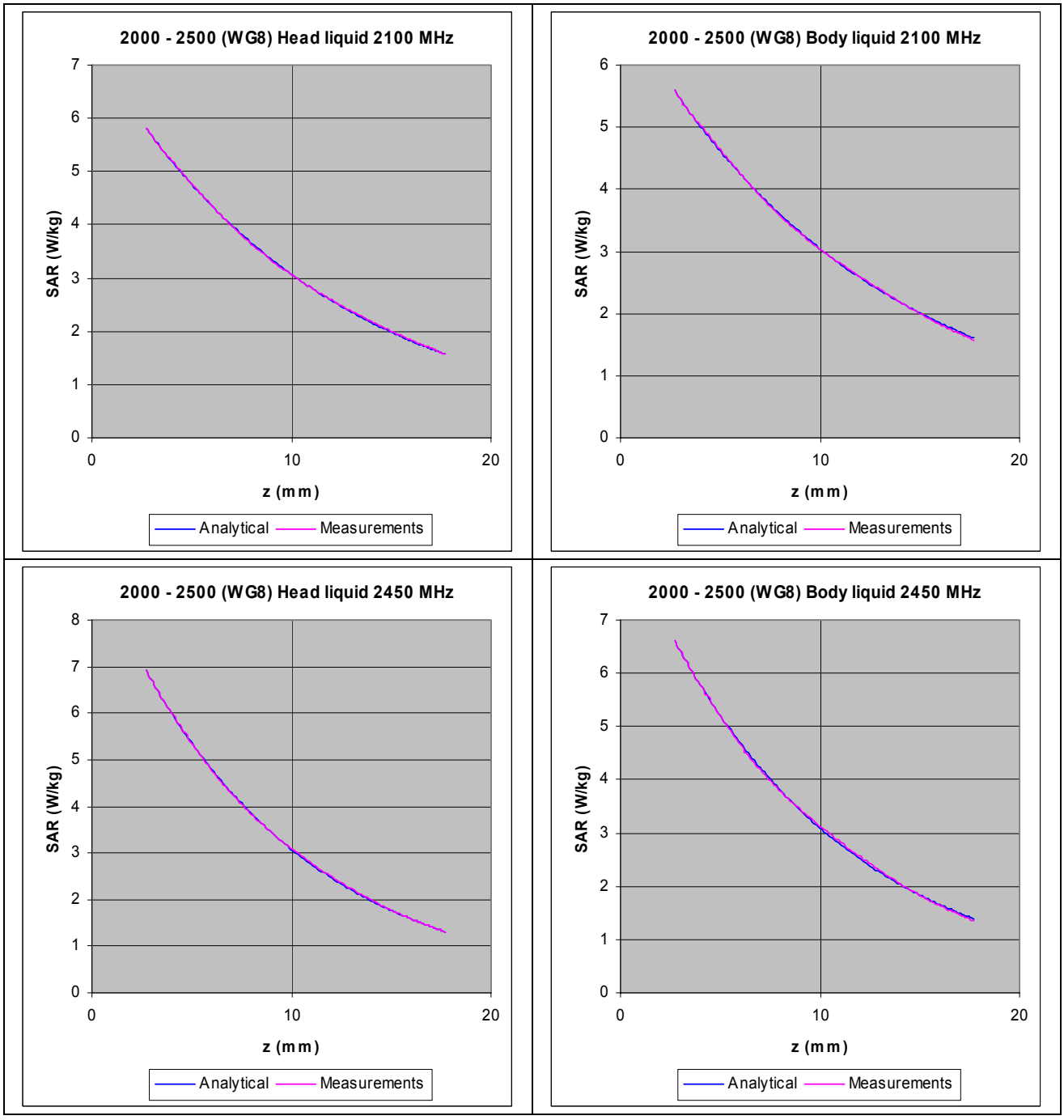


Figure 7. The measured SAR decay function along the centreline of the R22 waveguide with conversion factors adjusted to fit to the theoretical function for the particular dimension, frequency, power and liquid properties employed.

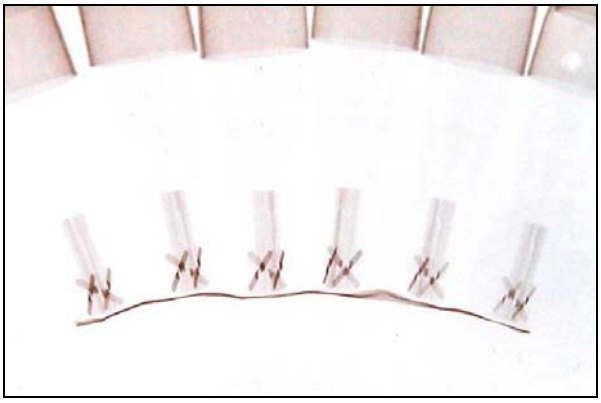


Figure 9: X-ray positive image of 5mm probes

Table indicating the dielectric parameters of the liquids used for calibrations at each frequency

Liquid used	*Relative permittivity (measured)*	*Conductivity (S/m) (measured)*
450 MHz BRAIN	*44.56*	*0.84*
450 MHz BODY	*56.45*	*0.75*
835 MHz BRAIN	*42.06*	*0.91*
835 MHz BODY	*55.54*	*0.99*
900 MHz BRAIN	*41.28*	*0.97*
900 MHz BODY	*54.92*	*1.06*
1800 MHz BRAIN	*38.74*	*1.37*
1800 MHz BODY	*54.53*	*1.54*
1900 MHz BRAIN	*38.31*	*1.47*
1900 MHz BODY	*54.26*	*1.63*
2100 MHz BRAIN	*40.18*	*1.50*
2100 MHz BODY	*51.27*	*1.60*
2450 MHz BRAIN	*38.78*	*1.87*
2450 MHz BODY	*50.30*	*1.99*