SAR Compliance Test Report

Testing Lab: Research In Motion Limited
305 Phillip Street
Waterloo, Ontario
Canada N2L 3W8
Phone: 519-888-7465
Fax: 519-880-8173
Web site: www.rim.net

Applicant: Research In Motion Limited
295 Phillip Street
Waterloo, Ontario
Canada N2L 3W8
Phone: 519-888-7465
Fax: 519-888-6906
Web site: www.rim.net

Statement of Compliance: Research In Motion Limited, declares under its sole responsibility that the product to which this declaration relates, is in conformity with the appropriate RF exposure standards, recommendations and guidelines. It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

Device Category: This wireless handheld is a portable device, designed to be used in direct contact with the user's head, hand and to be carried in approved accessories when carried on the user's body.

RF exposure environment: This wireless portable device has been shown to be in compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in OET Bulletin 65 Supplement C (Edition 01-01), FCC 96-326-August 1, 1996, IEEE Std. C95.1-1999, Health Canada's Safety Code 6-1999, reproduced in RSS-102-Issue 1-September 25, 1999, EN50360 standard and the Council Recommendation 1999/519/EC for the basic restrictions related to human exposure to electromagnetic fields and had been tested in accordance with the measurement procedures specified in OET Bulletin 65 Supplement C (Edition 01-01), ANSI/IEEE Std. C95.3-1991, IEEE 1528-2003, Health Canada's Safety Code 6-1999 and EN50361 July 2001

Approved by:	**Signatures**	**Date**
Paul G. Cardinal, Ph.D. Manager, Compliance & Certification	Paul G Cardinal	Oct. 08, 2004
Tested and documented by: Daoud Attayi Compliance Specialist	Daoud Attayi	Sep. 22, 2004

CONTENTS

1.0 OPERATING CONFIGURATIONS AND TEST CONDITIONS

1.1 Picture of Handheld

Figure 1. BlackBerry Wireless Handheld

1.2 Antenna description

Type	Internal fixed antenna
Location	Back lower centre section
Configuration	Internal fixed antenna

Table 1. Antenna description

Handheld description

Handheld Model	RAS10WW
FCC ID	L6ARAS10WW
PIN Number	5000005B
Prototype or Production Unit	Pre-production
Mode(s) of Operation	802.11 b
Maximum conducted RF Output Power (dBm)	15.00
Tolerance in Power Setting on center channel	N/A
Duty Cycle (%)	100
Transmitting Frequency Range (MHz)	2402-2483

Table 2. Test device description

1.3 Body worn accessories

Holsters

The BlackBerry Wireless Handheld has been tested with the following holsters which all contain metal components and the separation distance between the handheld and the user's body is listed in the table below:

Holster Type	Model / Part Number	Separation (mm)
Leather Swivel	HDW-07386-001	17
Plastic Swivel	ASY-06669-001	15
Vertical Foam	HDW-06620-XXX	14
Horizontal Foam	HDW-06619-XXX	14

Figure 2. Body-worn holsters

1.5 Headsets

The BlackBerry Wireless Handheld was tested with and without headset model number HDW-03458-001. The SAR values are shown in the Table 16.

1.6 Batteries

The Blackberry Wireless Handheld was tested with the following Lithium Ion Batteries:

- GS Melcotec battery pack P/N: BAT-03087-003
- Sanyo battery pack P/N: BAT-03487-002
- Sanyo GS higher capacity battery pack P/N: BAT-06532-001

1.7 Procedure used to establish the test signal

The Handheld was put into test mode by enabling a call via a USB port of PC, using special software program called “RTS.exe”. The software sents out a command for the handheld to transmit at full power at a specified frequency. The device continues transmitting while it is disconnected from the USB cable during SAR measurements.

2.0 DESCRIPTION OF THE TEST EQUIPMENT

2.1 SAR measurement system

SAR measurements were performed using a Dosimetric Assessment System (DASY 4), an automated SAR measurement system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich, Switzerland.

The DASY 4 system for performing compliance tests consists of the following items:

· A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
· An arm extension for accommodating the data acquisition electronics (DAE).
· A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
· A DAE module which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the Electro-optical coupler (EOC).
· A unit to operate the optical surface detector which is connected to the EOC.
· The EOC performs the conversion from an optical signal into the digital electric signal of the DAE. The EOC is connected to the PC plug-in card.
· The functions of the PC plug-in card based on a DSP is to perform the time critical tasks such as signal filtering, surveillance of the robot operation fast movement interrupts.
· A computer operating Windows 2000.
· DASY 4 software version 4.3.
· Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
· The SAM Twin Phantom enabling testing left-hand and right-hand usage.
· The device holder for handheld mobile phones.
· Tissue simulating liquid mixed according to the given recipes (see Application Note).
· System validation dipoles allowing for the validation of proper functioning of the system.

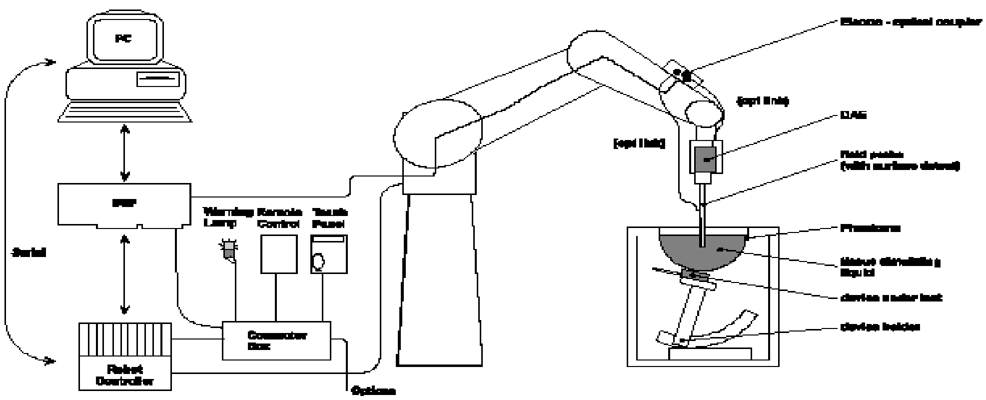


Figure 3: System Description

2.1.1 Equipment List

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date
SCHMID & Partner Engineering AG	E-field probe	ET3DV6	1644	20/04/2005
SCHMID & Partner Engineering AG	Data Acquisition Electronics (DAE3)	DAE3 V1	472	08/27/2005
SCHMID & Partner Engineering AG	Dipole Validation Kit	D2450V2	747	14/04/2005
Agilent Technologies	Signal generator	HP 8648C	4037U03155	01/08/2005
Agilent Technologies	Power meter	E4419B	GB40202821	21/07/2005
Agilent Technologies	Power sensor	8482A	US37295126	05/08/2005
Amplifier Research	Amplifier	5S1G4M3	300986	CNR
Agilent Technologies	Network analyzer	8753ES	US39174857	27/07/2005

Table 3. Equipment list

2.2 Description of the test setup

Before a SAR test is conducted the Handheld and the DASY equipment are setup as follows:

2.2.1 Handheld and test software setup

• Power up the handheld and connect to USB cable/port of a PC.
• Open the "RTS.exe" software and set the carrier frequency and power to the appropriate values.
• Start transmitting and disconnect the USB cable.

2.2.2 DASY setup

• Turn the computer on and log on to Windows 2000.
• Start DASY 4 software by clicking on the icon located on the Windows desktop. Once the software loads, click on the Change to Robot toolbar button to open the State and Robot Monitoring Windows.
• Once the DASY State dialog opens you can ignore all errors and click OK to open the Robot Monitoring window.
• Mount the DAE unit and the probe. Turn on the DAE unit.
• Turn the Robot Controller on by turning the main power switch to the horizontal position
• Align the probe and click the align probe in the light beam button to correct the probe offset.
• Open a program and configure it to the proper parameters
• Establish a connection, place the handheld on the stand and adjust it under the phantom.
• Start SAR measurements.

3.0 ELECTRIC FIELD PROBE CALIBRATION

3.1 Probe Specification

SAR measurements were conducted using the dosimetric probe ET3DV6, designed by Schmid & Partner Engineering AG for the measurement of SAR. The probe is constructed using the thin film technique, with printed resistive lines on ceramic substrates. It has a symmetrical design with triangular core, built-in optical fiber for the surface detection system and built-in shielding against static discharge. The probe is sensitive to E-fields and thus incorporates three small dipoles arranged so that the overall response is close to isotropic. The table below summarizes the technical data for the probe.

Property	Data
Frequency range	30 MHz – 3 GHz
Linearity	±0.1 dB
Directivity (rotation around probe axis)	≤ ±0.2 dB
Directivity (rotation normal to probe axis)	±0.4 dB
Dynamic Range	5 mW/kg – 100 W/kg
Probe positioning repeatability	±0.2 mm
Spatial resolution	< 0.125 mm ³

Table 4. Probe specification

3.2 Probe calibration and measurement errors

The probe was calibrated on 20/04/2004 with an accuracy better than ±10%. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe were tested. The probe calibration parameters are shown on Appendix D.

4.0 SAR MEASUREMENT SYSTEM VERIFICATION

Prior to conducting SAR evaluation, the measurements were validated using the dipole validation kit and a flat phantom. A power level of 1.0 W was applied to the dipole antenna. The verification results are in the table below with a comparison to reference values. Printouts are shown in Appendix A. All the measured parameters are satisfactory.

4.1 System accuracy verification

f (MHz)	Limits / Measured	SAR (W/kg) 1 g/ 10 g	Dielectric Parameters		Liquid Temp (°C)
			ε_r	σ [S/m]	
2450 Head	Measured	61.2 / 28.2	36.9	1.86	22.5
	Recommended Limits	57.2 / 26.1	37.6	1.88	N/A
2450 Muscle	Measured	57.1 / 26.4	50.1	1.91	22.1
	Recommended Limits	53.6 / 25.4	51.5	2.00	N/A

Table 5. System accuracy validation

5.0 PHANTOM DESCRIPTION

The SAM Twin Phantom, manufactured by SPEAG, was used during the SAR measurements. The phantom is made of a fiberglass shell integrated with a wooden table.

The SAM Twin Phantom is a fiberglass shell phantom with 2 mm shell thickness. It has three measurement areas:
Left hand
Right hand
Flat phantom

The phantom table dimensions are: 100x50x85 cm (LxWxH). The table is intended for use with free standing robots.

The bottom shelf contains three pair of bolts for locking the device holder in place. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different solutions).

A white cover is provided to top the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible; however the optical surface detector does not work properly at the cover surface. Place a sheet of white paper on the cover when using optical surface detection.

Liquid depth of ≥ 15 cm is maintained in the phantom for all the measurement.

Figure 4
SAM Twin Phantom

6.0 TISSUE DIELECTRIC PROPERTY

6.1 Composition of tissue simulant

The composition of the brain and muscle simulating liquids for 800-900 MHz, 1800-1900 MHz and 2450 MHz are shown in the table below.

INGREDIENT	MIXTURE 800–900MHz		MIXTURE 1800–1900MHz		MIXTURE 2450 MHz	
	Brain %	Muscle %	Brain %	Muscle %	Brain %	Muscle %
Water	51.07	65.45	54.88	69.91	55.0	68.75
Sugar	47.31	34.31	0	0	0	0
Salt	1.15	0.62	0.21	0.13	0	0
HEC	0.23	0	0	0	0	0
Bactericide	0.24	0.10	0	0	0	0
DGBE	0	0	44.91	29.96	45.0	31.25

Table 6. Tissue simulant recipe

6.1.1 Equipment

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date
Pyrex, England	Graduated Cylinder	N/A	N/A	N/A
Pyrex, USA	Beaker	N/A	N/A	N/A
Acculab	Weight Scale	V1-1200	018WB2003	N/A
Hart Scientific	Digital Thermometer	61161-302	21352860	09/10/2005
IKA Works Inc.	Hot Plate	RC Basic	3.107433	N/A

Table 7. Tissue simulant preparation equipment

6.1.2 Preparation procedure

800-900 MHz liquids

- Fill the container with **water**. Begin heating and stirring.
- Add the **Cellulose,** the **preservative substance** and the **salt**. After several hours, the liquid will become more transparent again. The container must be covered to prevent evaporation.
- Add **Sugar**. Stir it well until the sugar is sufficiently dissolved.
- Keep the liquid hot but below the boiling point for at least an hour. The container must be covered to prevent evaporation.
- Remove the container from, and turn the hotplate off and allow the liquid to cool off to room temperature prior to performing dielectric measurements.

1800-2450 MHz liquid
• Fill the container with **water**. Begin heating and stirring.
• Add the **salt** and **Glycol**. The container must be covered to prevent evaporation.
• Keep the liquid hot but below the boiling point for at least an hour. The container must be covered to prevent evaporation.
• Remove the container from, and turn the hotplate off and allow the liquid to cool off to room temperature prior to performing dielectric measurements.

6.2 Electrical parameters of the tissue simulating liquid

The tissue dielectric parameters shall be measured before a batch can be used for SAR measurements to ensure that the simulated tissue was properly made and will simulate the desired human characteristic. Limits and measured electrical parameters are show in the table below.
Recommended limits are adopted from IEEE 1528-2003:
" Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", SPEAG dipole calibration certificates and from FCC Tissue Dielectric Properties web page at http://www.fcc.gov/fcc-bin/dielec.sh

f (MHz)	Tissue Type	Limits / Measured	Dielectric Parameters		Liquid Temp (°C)
			ε_r	σ [S/m]	
2450	Head	Measured	36.9	1.86	22.5
		Recommended Limits	37.6	1.88	N/A
	Muscle	Measured	50.1	1.91	22.1
		Recommended Limits	51.5	2.00	N/A

Table 8. Electrical parameters of tissue simulating liquid

6.2.1 Equipment

Manufacturer	Test Equipment	Model Number	Serial Number	Cal. Due Date
Agilent Technologies	Network Analyzer	8753ES	US39174857	27/07/2005
Agilent Technologies	Dielectric probe kit	HP 85070C	US9936135	CNR
Dell	PC using GPIB card	GX110	347	N/A
Hart Scientific	Digital Thermometer	61161-302	21352860	09/10/2005

Table 9. Equipment required for electrical parameter measurements

6.2.2 Test Configuration

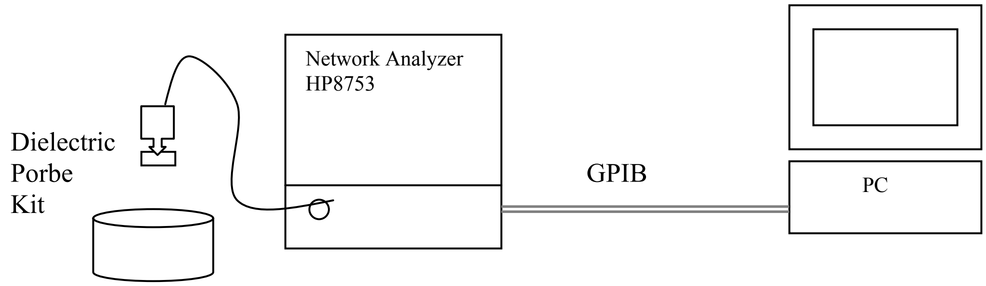


Figure 5: Test configuration

6.2.3 Procedure

1. Turn NWA on and allow at least 30 minutes for warm up.
2. Mount dielectric probe kit so that interconnecting cable to NWA will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature (±1°).
4. Set water temperature in HP-Software (Calibration Setup).
5. Perform calibration.
6. Validate calibration with dielectric material of known properties (e.g. polished ceramic slab with >8mm thickness ε'=10.0, ε''=0.0). If measured parameters do not fit within tolerance, repeat calibration (±0.2 for ε': ±0.1 for ε'').
7. Relative permittivity $\varepsilon_r = \varepsilon'$ and conductivity can be calculated from ε''
   $\sigma = \omega\, \varepsilon_0\, \varepsilon''$
8. Measure liquid shortly after calibration.
9. Stir the liquid to be measured. Take a sample (~50ml) with a syringe from the center of the liquid container.
10. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
11. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
12. Perform measurements.
13. Adjust medium parameters in DASY 4 for the frequencies necessary for the measurements ('Setup Config', select medium (e.g. Brain 900 MHz) and press 'Option'-button.
14. Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900 MHz).

Sample calculation for 2450 MHz head tissue dielectric parameters using data from Table 10.

Relative permittivity $\varepsilon_r = \varepsilon'$ = 36.87
Conductivity $\sigma = \omega\, \varepsilon_0\, \varepsilon''$ = 2 x 3.1416 x 2450 e+6 x 8.854e-12 x 13.63 = 1.86 S/m

Title SubTitle September 21, 2004 02:39 PM			Title SubTitle September 20, 2004 11:54 AM		
Frequency	e'	e''	Frequency	e'	e''
2.400000000 GHz	37.1019	13.5055	2.400000000 GHz	50.2843	13.8606
2.405000000 GHz	37.0909	13.5104	2.405000000 GHz	50.2670	13.8779
2.410000000 GHz	37.0741	13.5251	2.410000000 GHz	50.2575	13.9075
2.415000000 GHz	37.0434	13.5320	2.415000000 GHz	50.2477	13.9126
2.420000000 GHz	37.0210	13.5458	2.420000000 GHz	50.2417	13.9204
2.425000000 GHz	36.9862	13.5640	2.425000000 GHz	50.2239	13.9390
2.430000000 GHz	36.9646	13.5747	2.430000000 GHz	50.2097	13.9604
2.435000000 GHz	36.9367	13.6012	2.435000000 GHz	50.2040	13.9646
2.440000000 GHz	36.9169	13.6000	2.440000000 GHz	50.1841	13.9895
2.445000000 GHz	36.8862	13.6154	2.445000000 GHz	50.1762	14.0003
2.450000000 GHz	36.8662	13.6305	2.450000000 GHz	50.1518	14.0238
2.455000000 GHz	36.8516	13.6521	2.455000000 GHz	50.1468	14.0600
2.460000000 GHz	36.8316	13.6566	2.460000000 GHz	50.1379	14.0543
2.465000000 GHz	36.8227	13.6713	2.465000000 GHz	50.1307	14.0791
2.470000000 GHz	36.8063	13.6865	2.470000000 GHz	50.1085	14.1150
2.475000000 GHz	36.7786	13.6839	2.475000000 GHz	50.0940	14.1274
2.480000000 GHz	36.7767	13.6931	2.480000000 GHz	50.0797	14.1396
2.485000000 GHz	36.7584	13.7153	2.485000000 GHz	50.0715	14.1624
2.490000000 GHz	36.7479	13.7233	2.490000000 GHz	50.0643	14.1915
2.495000000 GHz	36.7329	13.7457	2.495000000 GHz	50.0506	14.2034
2.500000000 GHz	36.7223	13.7565	2.500000000 GHz	50.0328	14.2350

Table 10. 2450 MHz head and muscle tissue dielectric parameters

7.0 SAR SAFETY LIMITS

Standards/Guideline	Localized SAR Limit (W/kg) General public (uncontrolled)	Localized SAR Limits (W/kg) Workers (controlled)
ICNIRP (1998) Standard	2.0 (10g)	10.0 (10g)
IEEE C95.1 (1999) Standard	1.6 (1g)	8.0 (1g)

Table 12. SAR safety limits for Controlled / Uncontrolled environment

Human Exposure	Localized SAR Limits (W/kg) 10g, ICNIRP (1998) Standard	Localized SAR Limits (W/kg) 1g, IEEE C95.1 (1999) Standard
Spatial Average (averaged over the whole body)	0.08	0.08
Spatial Peak (averaged over any X g of tissue)	2.00	1.60
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.00	4.00 (10g)

Table 13. SAR safety limits

Uncontrolled Environments are defined as locations where there is exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

8.0 DEVICE POSITIONING

8.1 Device holder for SAM Twin Phantom

The Handheld was positioned for all test configurations using the DASY 4 holder. The device holder facilitates the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately and with repeatability positioned according to FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

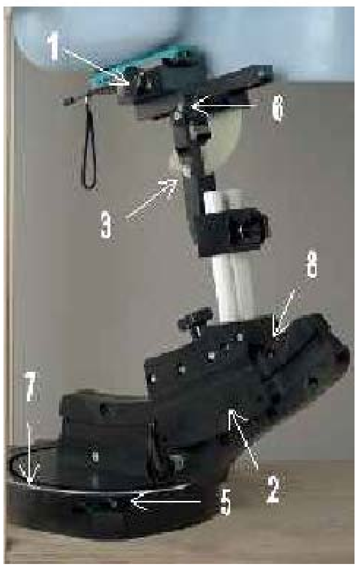


Figure 6
Device Holder

1. Put the phone in the clamp mechanism (1) and hold it straight while tightening. (Curved phones or phones with asymmetrical ear pieces should be positioned so that the ear piece is in the symmetry plane of the clamp).

2. Adjust the sliding carriage (2) to 90°. Then adjust the phone holder angle (3) until the reference line of the phone is horizontal (parallel to the flat phantom bottom). The phone reference line is defined as the front tangential line between the ear piece and the center of the device bottom (or the center of the flip hinge). For devices with parallel front and back sides, the phone holder angle (3) is 0°.

3. Place the device holder at the desired phantom section and move it securely against the positioning pins (4). The screw in front of the turning plate can be applied for correct positioning (5). (Do not tighten it too strongly).

4. Shift the phone clamp (6) so that the ear piece is exactly below the ear marking of the phantom. The phone is now correctly positioned in the holder for all standard phantom measurements, even after changing the phantom or phantom section.

5. Adjust the device position angles to the desired measurement position.

6. After fixing the device angles, move the phone fixture up until the phone touches the ear marking. (The point of contact depends on the design of the device and the positioning angle).

8.2 Description of the test positioning

8.2.1 Test Positions of Device Relative to Head

The handset was tested in two test positions against the head phantom, the "cheek" position and the "tilted" position, on both left and right sides of the phantom.

The handset was tested in the above positions according to IEEE 1528- 2003, "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques".

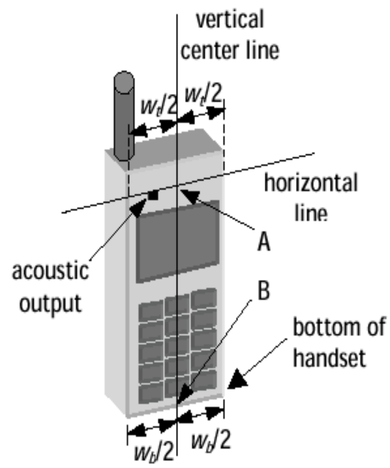


Figure 7a – Handset vertical and horizontal reference lines – fixed case

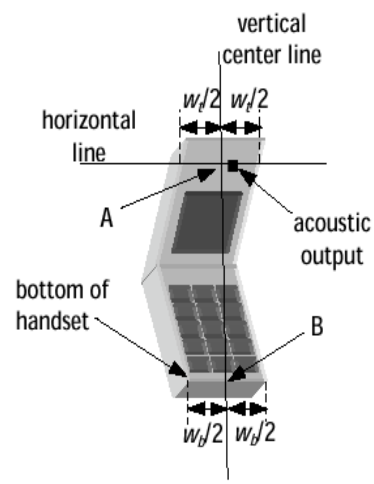


Figure 7b – Handset vertical and horizontal reference lines – "clam-shell"

8.2.1.1 Definition of the "cheek" position

1) Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover.
2) Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width *wt* of the handset at the level of the acoustic output (point A on Figures 7a and 7b), and the midpoint of the width *wb* of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 7a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 7b), especially for clamshell handsets, handsets with flip pieces, and other irregularly shaped handsets.
3) Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7), such that the plane defined by the vertical center line and the horizontal center line is in a plane approximately parallel to the sagittal plane of the phantom.
4) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.
5) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is the plane normal to MB ("*mouth-bac*k") - NF ("*neck-fron*t") including the line MB (reference plane).
6) Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF.
7) While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the ear (cheek).

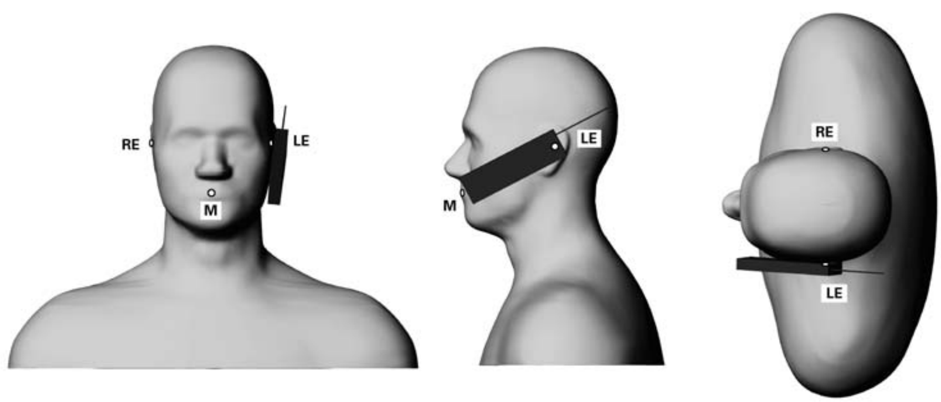


Figure 8 – Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.1.2 Definition of the "Tilted" Position

1) Repeat steps 1 to 7 of 5.4.1 (in this report 8.2.1.1) to replace the device in the "cheek position."
2) While maintaining the device in the reference plane (described above) and pivoting against the ear, move the device outward away from the mouth by an angle of 15 degrees, or until the antenna touches the phantom**.**

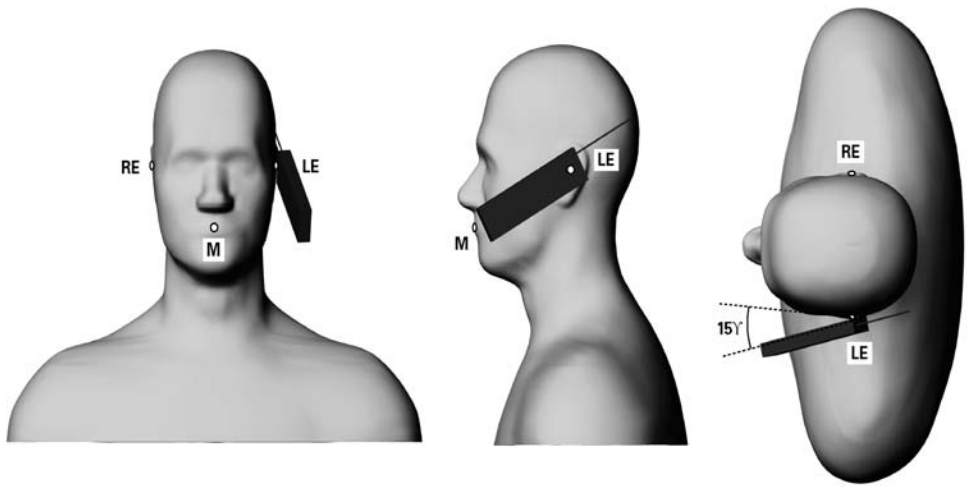


Figure 9 – Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only.

8.2.2 Body Holster Configuration

A body worn holster, as shown on Figure 2, was tested with the Wireless Handheld for FCC/IC/ Council of The Eurpean Union RF exposure compliance. The EUT was positioned in the holster case and the belt clip was placed against the flat section of the phantom. A headset was then connected to the handheld to simulate hands-free operation in a body worn holster configuration.

9.0 High Level Evaluation

9.1 Maximum search

The maximum search is automatically performed after each coarse scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations.

9.2 Extrapolation

The extrapolation can be used in z-axis scans with automatic surface detection. The SAR values can be extrapolated to the inner phantom surface. The extrapolation distance is the sum of the probe sensor offset, the surface detection distance and the grid offset. The extrapolation is based on fourth order polynomial functions. The extrapolation is only available for SAR values.

9.3 Boundary correction

The correction of the probe boundary effect in the vicinity of the phantom surface is done in the standard (worst case) evaluation; the boundary effect is reduced by different weights for the lowest measured points in the extrapolation routine. The result is a slight overestimation of the extrapolated SAR values (2% to 8%) depending on the SAR distribution and gradient. The advanced evaluation makes a full compensation of the boundary effect before doing the extrapolation. This is only possible for probes with specifications on the boundary effect.

9.4 Peak search for 1g and 10g cube averaged SAR

The 1g and 10g peak evaluations are only available for the predefined cube 5x5x7 scan. The routines are verified and optimized for the grid dimensions used in these cube measurements.
The measure volume of 32x32x35mm mm contains about 35g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid (35000 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is then moved around until the highest averaged SAR is found. This last procedure is repeated for a 10 g cube. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

10.0 MEASUREMENT UNCERTAINTIES

DASY4 Uncertainty Budget
According to IEEE P1528 [1]

Error Description	Uncertainty value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±4.8 %	N	1	1	1	±4.8 %	±4.8 %	∞
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	0.7	0.7	±1.9 %	±1.9 %	∞
Hemispherical Isotropy	±9.6 %	R	$\sqrt{3}$	0.7	0.7	±3.9 %	±3.9 %	∞
Boundary Effects	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
System Detection Limits	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Readout Electronics	±1.0 %	N	1	1	1	±1.0 %	±1.0 %	∞
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %	∞
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %	∞
RF Ambient Conditions	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Probe Positioner	±0.4 %	R	$\sqrt{3}$	1	1	±0.2 %	±0.2 %	∞
Probe Positioning	±2.9 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %	∞
Max. SAR Eval.	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %	∞
Test Sample Related								
Device Positioning	±2.9 %	N	1	1	1	±2.9 %	±2.9 %	145
Device Holder	±3.6 %	N	1	1	1	±3.6 %	±3.6 %	5
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %	∞
Phantom and Setup								
Phantom Uncertainty	±4.0 %	R	$\sqrt{3}$	1	1	±2.3 %	±2.3 %	∞
Liquid Conductivity (target)	±5.0 %	R	$\sqrt{3}$	0.64	0.43	±1.8 %	±1.2 %	∞
Liquid Conductivity (meas.)	±2.5 %	N	1	0.64	0.43	±1.6 %	±1.1 %	∞
Liquid Permittivity (target)	±5.0 %	R	$\sqrt{3}$	0.6	0.49	±1.7 %	±1.4 %	∞
Liquid Permittivity (meas.)	±2.5 %	N	1	0.6	0.49	±1.5 %	±1.2 %	∞
Combined Std. Uncertainty						±10.3 %	±10.0 %	330
Expanded STD Uncertainty						**±20.6 %**	**±20.1 %**	

Table 14. Measurement uncertainty

11.0 TEST RESULTS

11.1 SAR Measurement results at highest power measured against the head

Mode	f (MHz)	Cond. Output Power (dBm)	Battery type	SAR, averaged over 1 g / 10g (W/Kg)			SAR, averaged over 1 g / 10g (W/Kg)		
				Left-hand			Right-hand		
				Liquid Temp (°C)	Cheek	Tilted	Liquid Temp (°C)	Cheek	Tilted
802.11b	* 2437.00	15.0	GS	22.1	0.034 / 0.018	0.050 / 0.026	22.4	0.030 / 0.015	0.046 / 0.024
	2437.00	15.0	Sanyo	-	-	-	22.3	**-**	**0.053 / 0.027**
	2437.00	15.0	Higher capacity	-	-	-	23.2	-	0.048 / 0.025

Table 15. SAR results for head configuration

11.2 SAR measurement results at highest power measured against the body using holster

Mode	f (MHz)	Cond. Output Power (dBm)	Liquid Temp (°C)	Holster / battery pack type	SAR, averaged over 1 g / 10 g (W/kg)
802.11b	* 2437.00	15.0	22.0	Horizontal Foam / GS	0.54 / 0.25
	2437.00	15.0	21.9	Horizontal Foam / Sanyo	0.71 / 0.32
	2437.00	15.0	21.8	Horizontal Foam / Higher capacity	0.61 / 0.29
	2437.00	15.0	22.0	Horizontal Foam / Sanyo & headset	**1.08 / 0.50**
	2437.00	15.0	22.1	Vertical Foam / Sanyo	0.59 / 0.28
	2437.00	15.0	22.8	Plastic Swivel / Sanyo	0.91 / 0.47
	2437.00	15.0	23.0	Leather Swivel / Sanyo	0.98 / 0.46
	2437.00	15.0	23.0	13 mm separation distance	1.50 / 0.72

Table 16. SAR results with body-worn holster

* Supplement C: Middle channel testing is sufficient only if SAR < 3dB below limit see PN 02-1438

12.0 REFERENCES

[1] EN 50360: 2001, Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)

[2] EN 50361: 2001, Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz)

[3] ICNIRP, International Commission on Non-Ionizing Radiation Protection (1998), Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

[4] Council Recommendation 1999/519/EC of July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)

[5] IEEE C95.3-1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

[6] IEEE C95.1-1999, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[7] OET Bulletin 65 (Edition 97-01) Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

[8] FCC 96-326-August 1, 1996, Guidelines for Evaluating the Environmental Effects of Radio-Frequency Radiation.

[9] DASY 4 DOSIMETRIC ASSESSMENT SYSTEM SOFTWARE MANUAL V4.1 Schmid & Partner Engineering AG, April 2003.

[10] IEEE 1528-2003: Recommended Practice for Determining the Peak Spatial-Average Specific Aborption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[11] Health Canada, Safety Code 6, 1999: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency range from 3 kHz to 300 GHz.

[12] RSS-102, issue 1 (Provisional), September 25, 1999: Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields.

APPENDIX A: SAR DISTRIBUTION COMPARISON FOR THE ACCURACY VERIFICATION

Date/Time: 09/20/04 11:40:40

Test Laboratory: Research In Motion Limited

Dipole validation 2450 head tissue; Ambient temp. 24.1 deg. cel.; Liquid temp. 22.5 deg. cel.

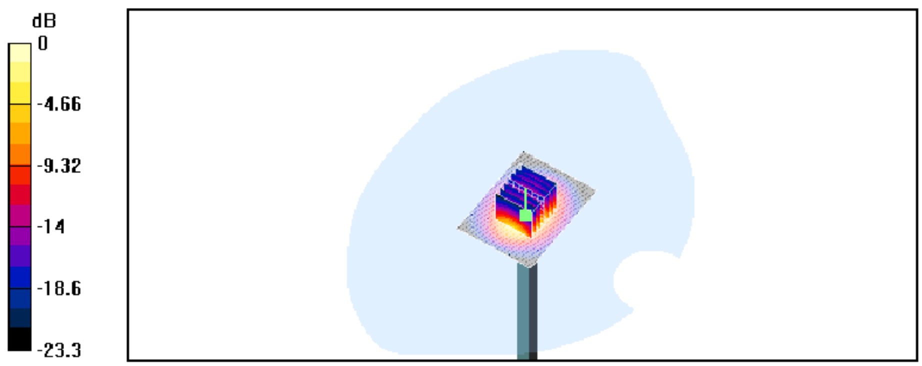
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:xxx

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2450 MHz; σ = 1.86 mho/m; ε_r = 36.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.75, 4.75, 4.75); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 71.5 mW/g

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 205.0 V/m; Power Drift = -0.009 dB
Peak SAR (extrapolated) = 129.4 W/kg
SAR(1 g) = 61.2 mW/g; SAR(10 g) = 28.2 mW/g
Maximum value of SAR (measured) = 68.8 mW/g



0 dB = 68.8mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Dipole%20validation%202450%20h... 21/09/2004

Date/Time: 09/20/04 11:40:40

Test Laboratory: Research In Motion Limited

Dipole validation 2450 muscle tissue; Ambient temp. 23.2 deg. cel.; Liquid temp. 22.1 deg. cel.

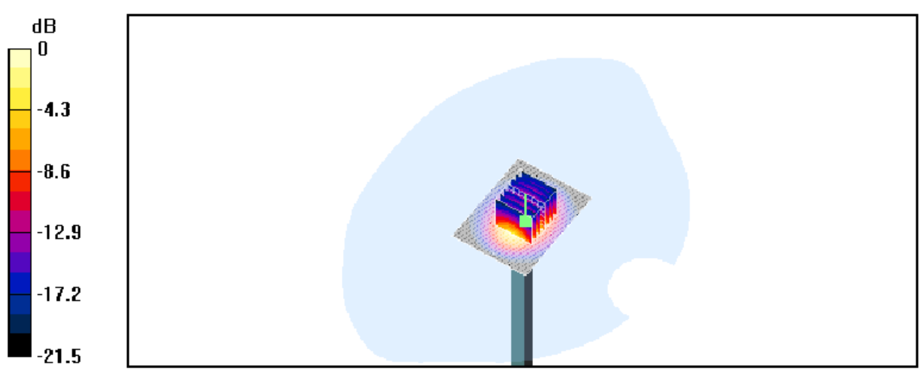
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:xxx

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2450 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 66.9 mW/g

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 185.9 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 127.9 W/kg
SAR(1 g) = 57.1 mW/g; SAR(10 g) = 26.4 mW/g
Maximum value of SAR (measured) = 64.4 mW/g



0 dB = 64.4mW/g

APPENDIX B: SAR DISTRIBUTION PLOTS FOR HEAD CONFIGURATION

Date/Time: 09/20/04 11:40:42

Test Laboratory: Research In Motion Limited

Touch right; Mid Channel; Ambient temp. 24.6 deg. cel.; Liquid temp. 22.4 deg. cel.

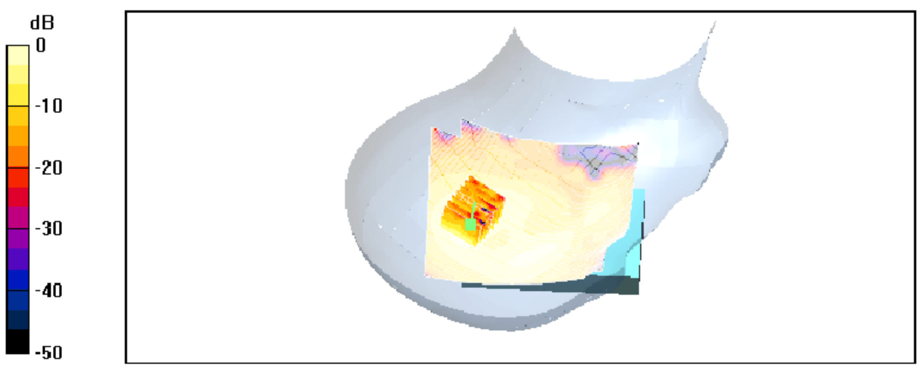
DUT: BlackBerry Wireless Handheld ; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2437 MHz; σ = 1.86 mho/m; ε_r = 36.9; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.75, 4.75, 4.75); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.02 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 0.076 W/kg
SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.015 mW/g
Maximum value of SAR (measured) = 0.033 mW/g

Unnamed procedure/Area Scan (121x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.034 mW/g



0 dB = 0.034mW/g

Date/Time: 09/20/04 11:40:41

Test Laboratory: Research In Motion Limited

Tilted right; Mid Channel; Ambient temp. 24.0 deg. cel.; Liquid temp. 22.2 deg. cel.

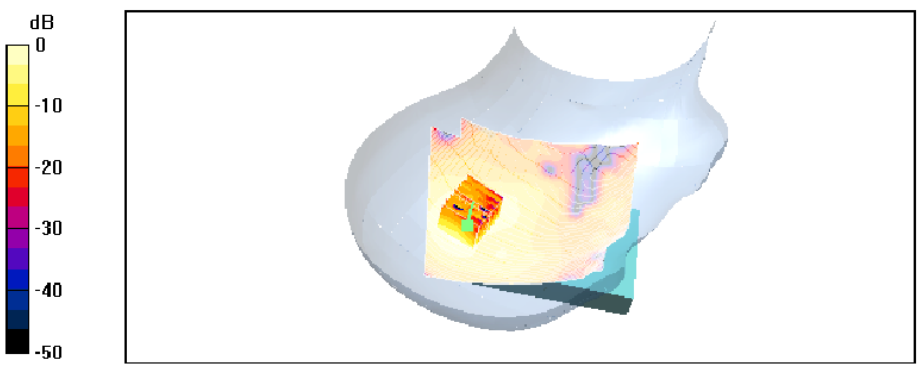
DUT: BlackBerry Wireless Handheld ; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2437 MHz; σ = 1.86 mho/m; ε_r = 36.9; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.75, 4.75, 4.75); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.3 V/m; Power Drift = 0.2 dB
Peak SAR (extrapolated) = 0.092 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.024 mW/g
Maximum value of SAR (measured) = 0.051 mW/g

Unnamed procedure/Area Scan (121x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.053 mW/g



0 dB = 0.053mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Tilted%20right;%20Mid%20Channe... 21/09/2004

Date/Time: 09/20/04 11:40:42

Test Laboratory: Research In Motion Limited

Tilted right; Mid Channel; Sanyo battery; Ambient temp. 24.1 deg. cel.; Liquid temp. 22.3 deg. cel.

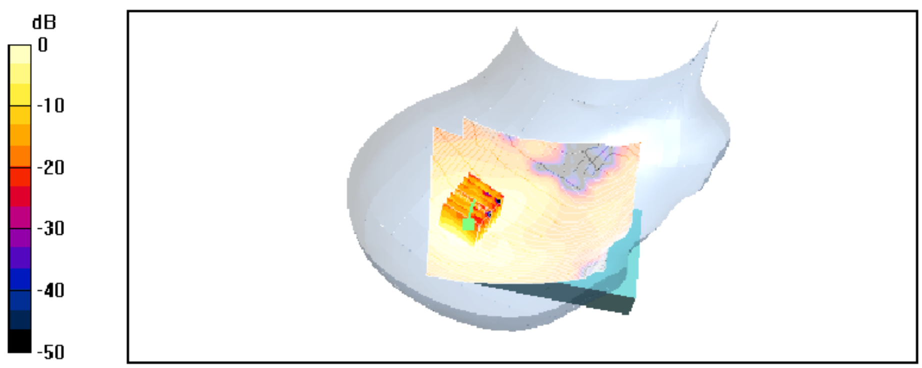
DUT: BlackBerry Wireless Handheld ; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2437 MHz; σ = 1.86 mho/m; ε_r = 36.9; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.75, 4.75, 4.75); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.48 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 0.105 W/kg
SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.059 mW/g

Unnamed procedure/Area Scan (121x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.060 mW/g



0 dB = 0.060mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Tilted%20right;%20Mid%20Channe... 21/09/2004

Date/Time: 09/20/04 11:40:41

Test Laboratory: Research In Motion Limited

Tilted right; Mid Channel; higher capacity battery; Ambient temp. 24.8 deg. cel.; Liquid temp. 23.2 deg. cel.

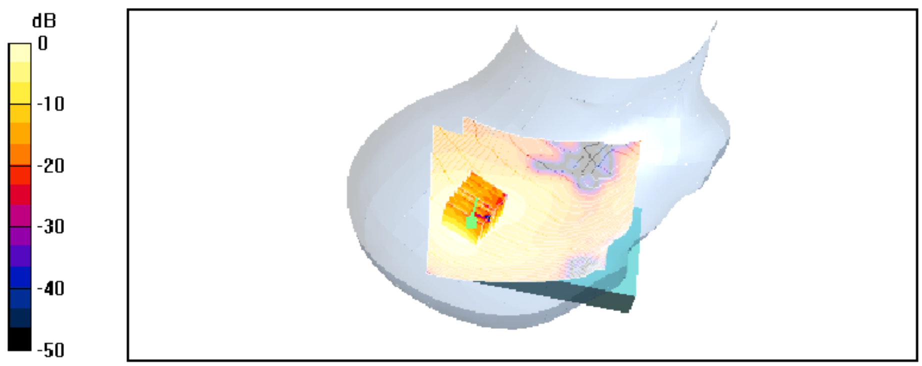
DUT: BlackBerry Wireless Handheld ; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2437 MHz; σ = 1.86 mho/m; ε_r = 36.9; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.75, 4.75, 4.75); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.43 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 0.093 W/kg
SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.025 mW/g
Maximum value of SAR (measured) = 0.053 mW/g

Unnamed procedure/Area Scan (121x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.056 mW/g



0 dB = 0.056mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Tilted%20right;%20Mid%20Channe... 22/09/2004

Date/Time: 09/20/04 11:40:42

Test Laboratory: Research In Motion Limited

Touch left; Mid Channel; Ambient temp. 23.5 deg. cel.; Liquid temp. 22.1 deg. cel.

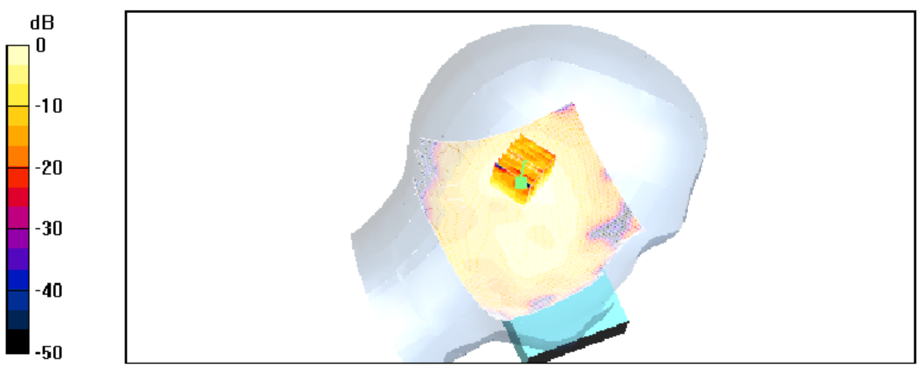
DUT: BlackBerry Wireless Handheld ; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2437 MHz; $\sigma = 1.86$ mho/m; $\varepsilon_r = 36.9$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.75, 4.75, 4.75); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.19 V/m; Power Drift = 0.2 dB
Peak SAR (extrapolated) = 0.068 W/kg
SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.038 mW/g

Unnamed procedure/Area Scan (131x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.039 mW/g



0 dB = 0.039mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Touch%20left;%20Mid%20Channel... 22/09/2004

Date/Time: 09/20/04 11:40:41

Test Laboratory: Research In Motion Limited

Tilted left; Mid Channel; Ambient temp. 23.8 deg. cel.; Liquid temp. 22.5 deg. cel.

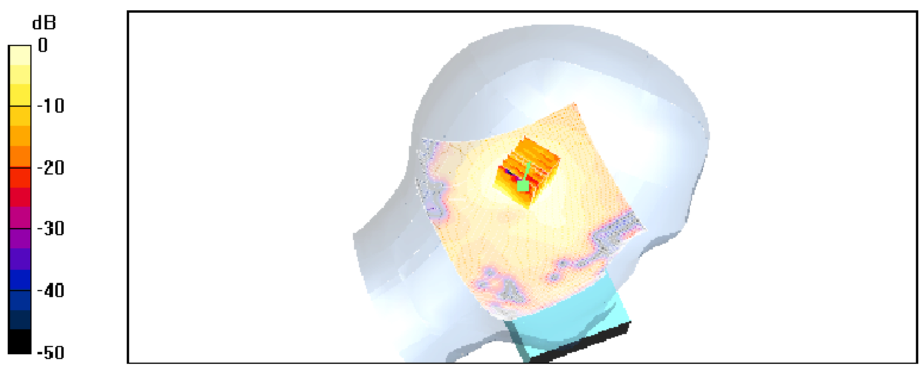
DUT: BlackBerry Wireless Handheld ; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2437 MHz; σ = 1.86 mho/m; ε_r = 36.9; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.75, 4.75, 4.75); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.23 V/m; Power Drift = -0.2 dB
Peak SAR (extrapolated) = 0.094 W/kg
SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.026 mW/g
Maximum value of SAR (measured) = 0.055 mW/g

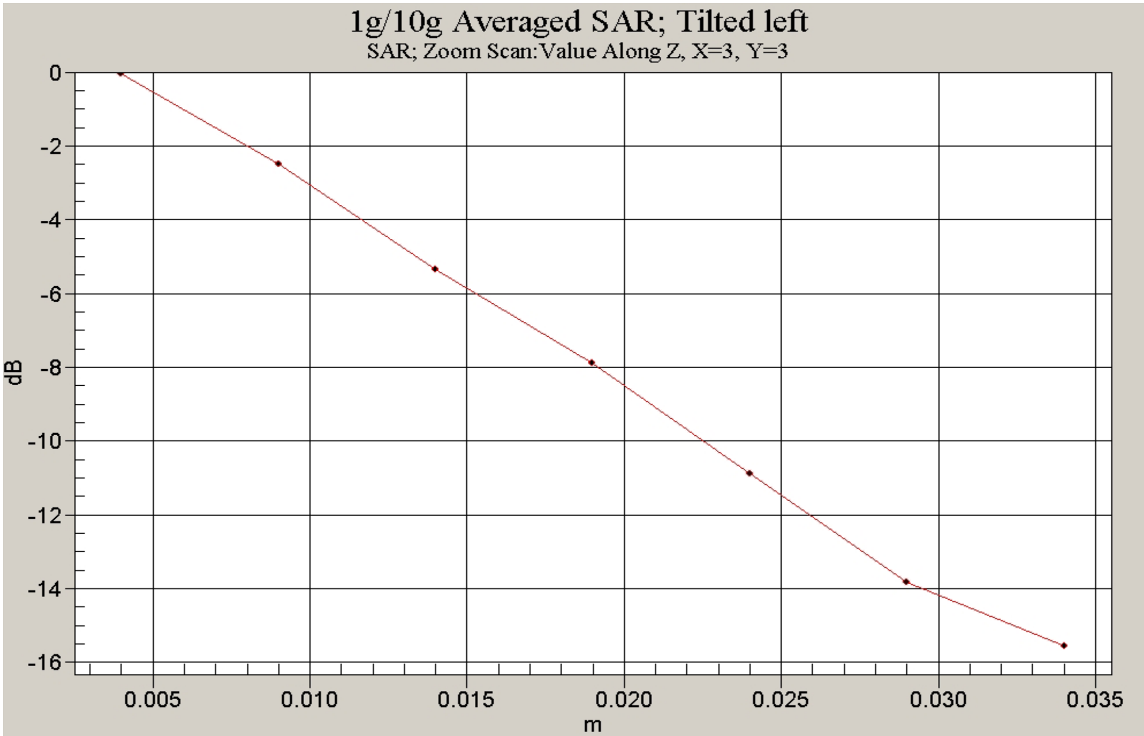
Unnamed procedure/Area Scan (131x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.056 mW/g

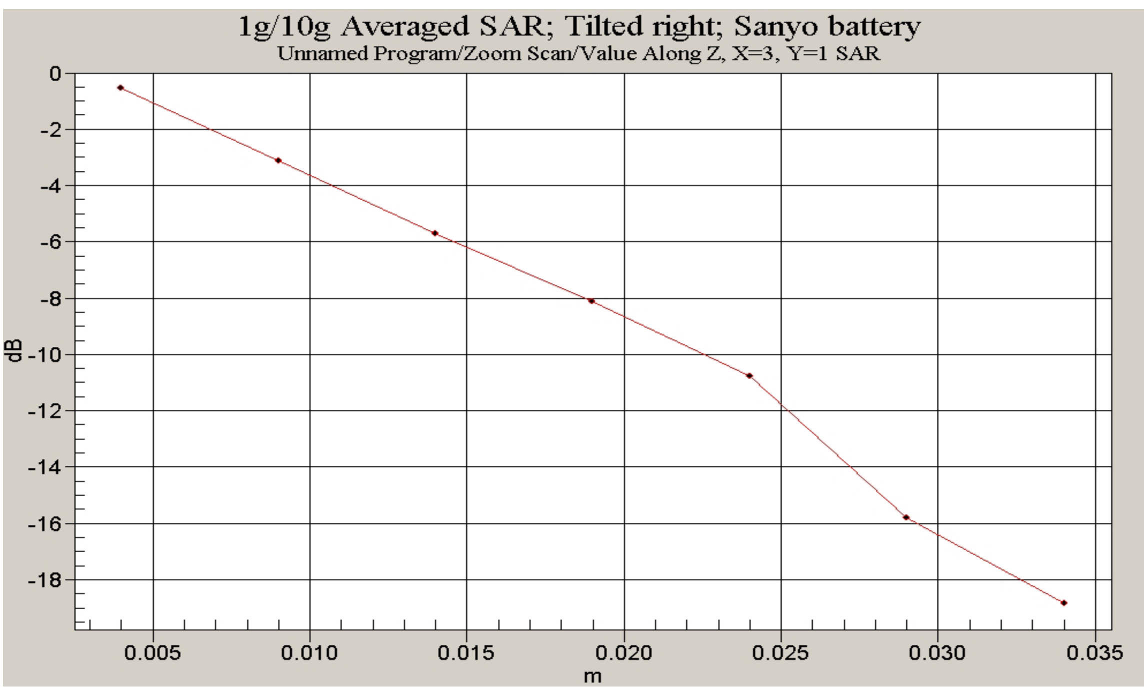


0 dB = 0.056mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Tilted%20left;%20Mid%20Channel;... 22/09/2004

Z-axis plots for worst-case configuration:





APPENDIX C: SAR DISTRIBUTION PLOTS FOR BODY-WORN CONFIGURATION

Date/Time: 09/20/04 12:32:08

Test Laboratory: Reserach In Motion Limited

Horizontal Foam Holster Body worn; Mid Chan; Sanyo GS battery; Ambient temp. 24.6 deg. cel.; Liquid temp. 22.0 deg. cel

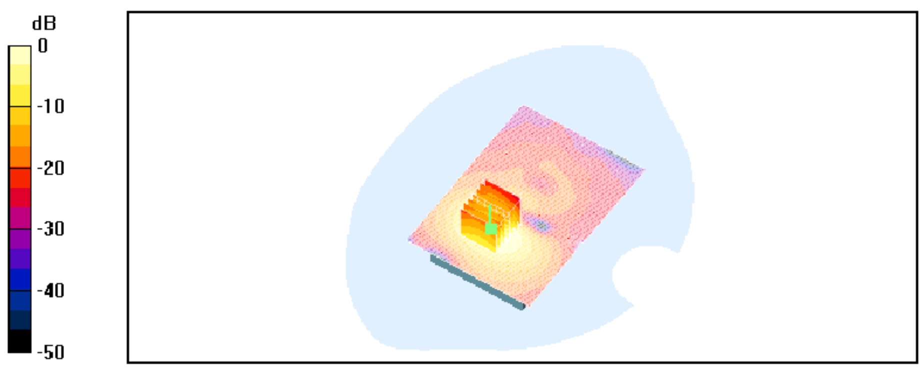
DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.69 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.538 mW/g; SAR(10 g) = 0.249 mW/g
Maximum value of SAR (measured) = 0.610 mW/g

Unnamed procedure/Area Scan (101x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.615 mW/g



0 dB = 0.615mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Horizontal%20Foam%20Holster%2... 20/09/2004

Date/Time: 09/20/04 11:40:40

Test Laboratory: Research In Motion Limited

Horizontal Foam Holster; Body worn; Mid Chan; Sanyo battery; Ambient temp. 24.2 deg. cel.; Liquid temp. 21.9 deg. cel

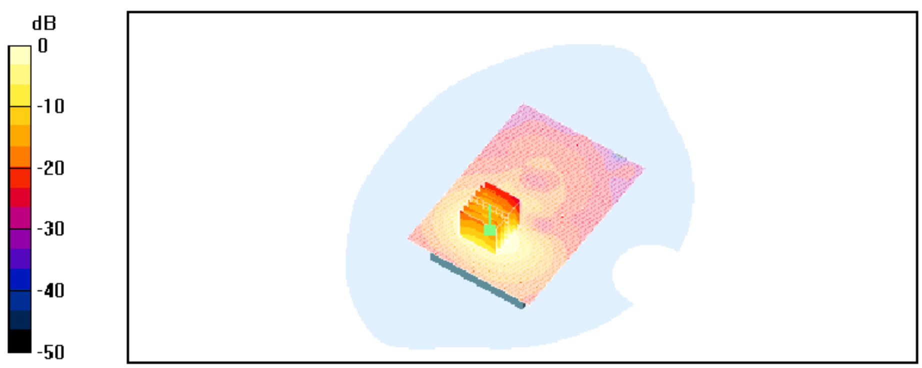
DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.92 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 1.5 W/kg
SAR(1 g) = 0.706 mW/g; SAR(10 g) = 0.321 mW/g
Maximum value of SAR (measured) = 0.806 mW/g

Unnamed procedure/Area Scan (101x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.865 mW/g



0 dB = 0.865mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Horizontal%20Foam%20Holster;%2... 20/09/2004

Date/Time: 09/20/04 11:40:40

Test Laboratory: Research In Motion Limited

Horizontal Foam Holster; Body worn; Mid Chan; Sanyo GS higher cap. battery; Ambient temp. 22.2 deg. cel.; Liquid temp. 21.8 deg. cel

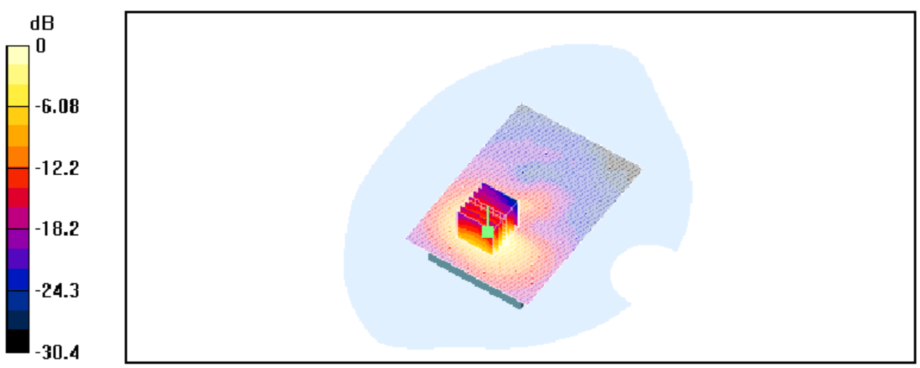
DUT: BlackBerry Wireless Handheld; Type:

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.59 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.610 mW/g; SAR(10 g) = 0.289 mW/g
Maximum value of SAR (measured) = 0.683 mW/g

Unnamed procedure/Area Scan (101x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.757 mW/g



0 dB = 0.757mW/g

Date/Time: 09/20/04 11:40:40

Test Laboratory: Research In Motion Limited

Horizontal Foam Holster; Body worn; Mid Chan; Sanyo battery with headset; Ambient temp. 24.1 deg. cel.; Liquid temp. 22.0 deg. cel

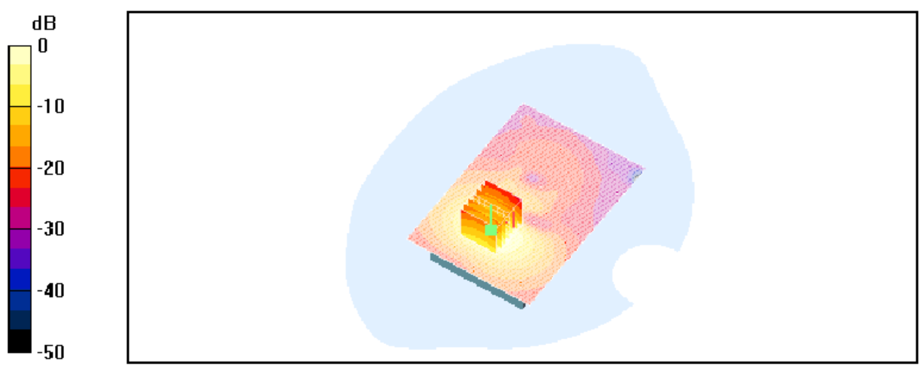
DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.15 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.495 mW/g
Maximum value of SAR (measured) = 1.22 mW/g

Unnamed procedure/Area Scan (101x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.27 mW/g



0 dB = 1.27mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Horizontal%20Foam%20Holster;%2... 20/09/2004

Date/Time: 09/20/04 11:40:42

Test Laboratory: Research In Motion Limited

Vertical Foam Holster Body worn; Mid Chan; Sanyo battery; Ambient temp. 24.0 deg. cel.; Liquid temp. 22.1 deg. cel

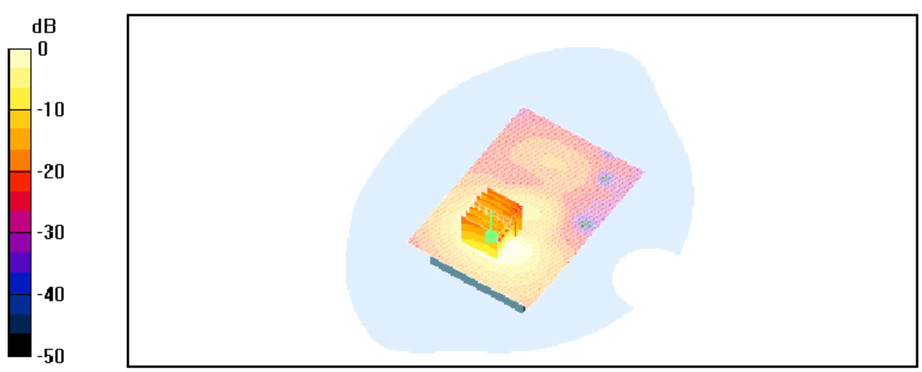
DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.68 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.38 W/kg
SAR(1 g) = 0.593 mW/g; SAR(10 g) = 0.275 mW/g
Maximum value of SAR (measured) = 0.663 mW/g

Unnamed procedure/Area Scan (101x141x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.656 mW/g



0 dB = 0.656mW/g

Date/Time: 09/20/04 11:40:41

Test Laboratory: Research In Motion Limited

Plastic Swivel Holster; Body worn; Mid Chan; Sanyo battery with headset; Ambient temp. 24.9 deg. cel.; Liquid temp. 22.8 deg. cel

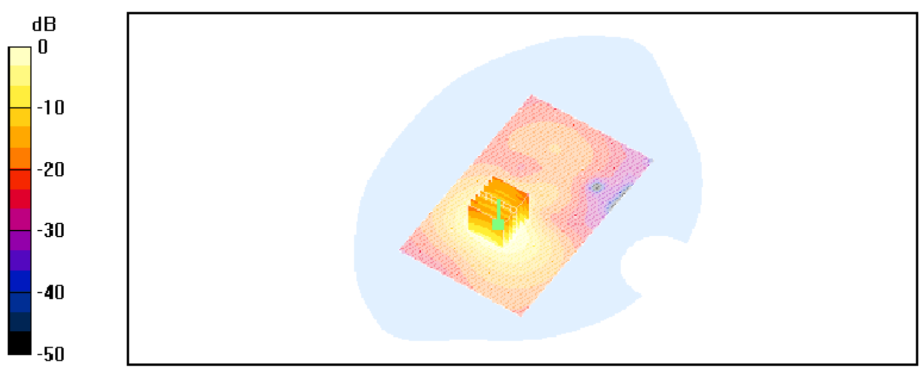
DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.96 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.81 W/kg
SAR(1 g) = 0.909 mW/g; SAR(10 g) = 0.467 mW/g
Maximum value of SAR (measured) = 0.994 mW/g

Unnamed procedure/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.02 mW/g



0 dB = 1.02mW/g

file://C:\Program%20Files\DASY4\Print_Templates\Plastic%20Swivel%20Holster;%20... 21/09/2004

Date/Time: 09/20/04 11:40:41

Test Laboratory: Research In Motion Limited

Leather Swivel Holster Body worn; Mid Chan; Sanyo battery; Ambient temp. 24.0 deg. cel.; Liquid temp. 23.0 deg. cel

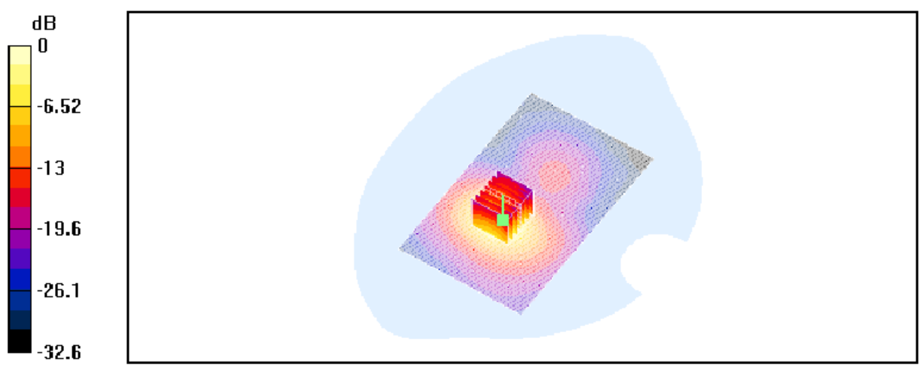
DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.46 V/m; Power Drift = -0.2 dB
Peak SAR (extrapolated) = 2.05 W/kg
SAR(1 g) = 0.982 mW/g; SAR(10 g) = 0.462 mW/g
Maximum value of SAR (measured) = 1.11 mW/g

Unnamed procedure/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.14 mW/g



0 dB = 1.14mW/g

Date/Time: 09/29/04 08:41:13

Test Laboratory: Research In Motion Limited

13 mm spacing backside towards body; Mid Chan; Sanyo battery; Ambient temp. 24.0 deg. cel.; Liquid temp. 23.0 deg. cel

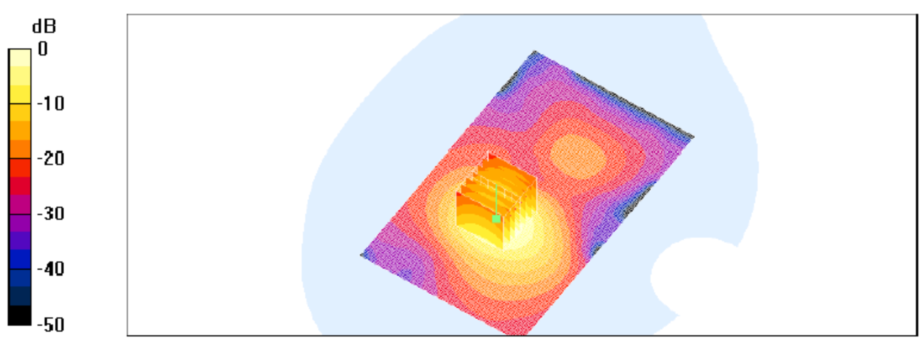
DUT: BlackBerry Wireless Handheld; Type: Sample

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2437 MHz; σ = 1.91 mho/m; ε_r = 50.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(4.61, 4.61, 4.61); Calibrated: 21/04/2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 27/08/2004
- Phantom: SAM 1; Type: SAM 4.0; Serial: 1076
- Measurement SW: DASY4, V4.3 Build 16; Postprocessing SW: SEMCAD, V1.8 Build 123

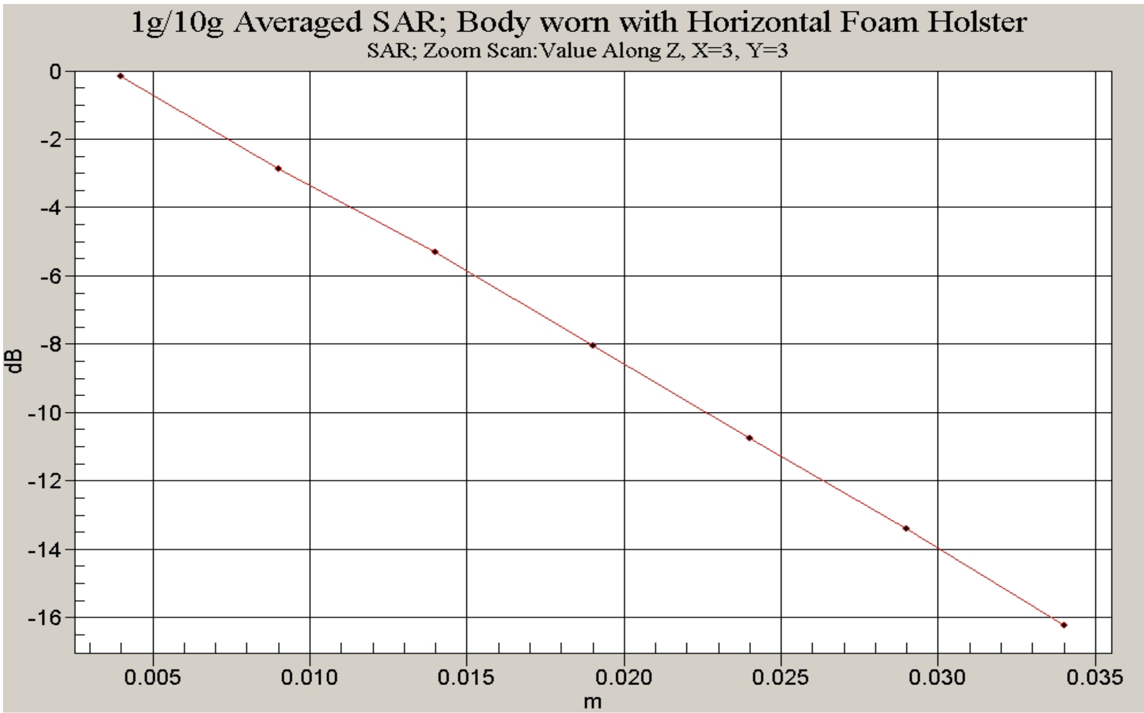
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.5 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 3.05 W/kg
SAR(1 g) = 1.5 mW/g; SAR(10 g) = 0.718 mW/g
Maximum value of SAR (measured) = 1.67 mW/g

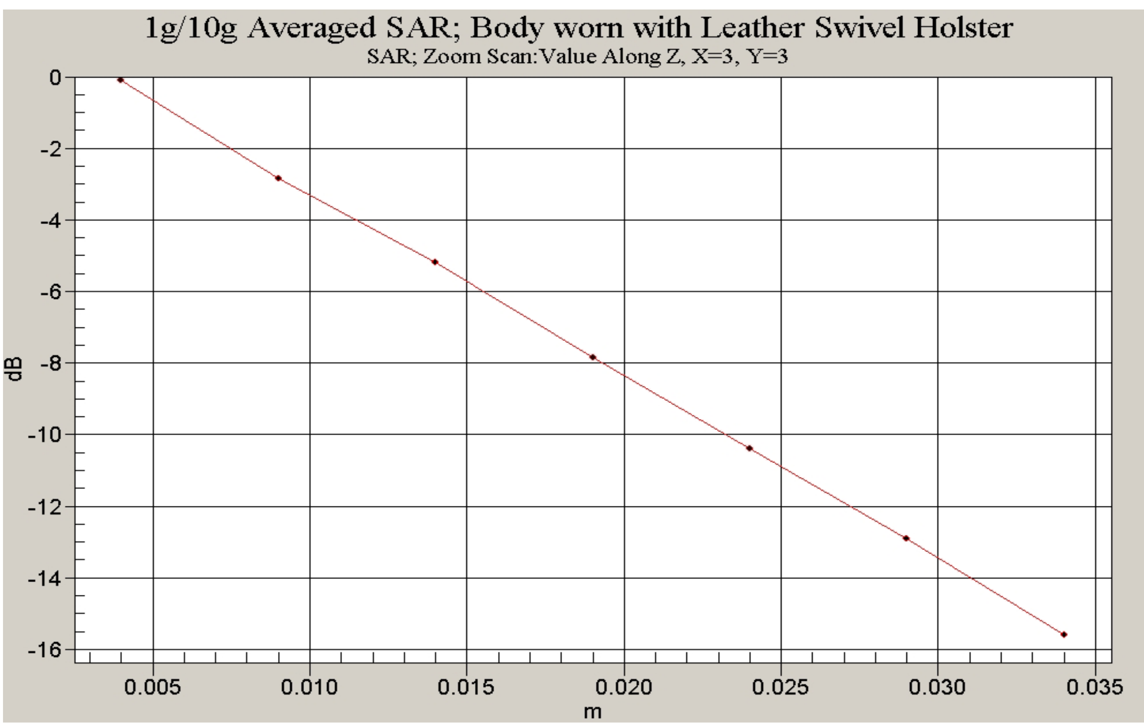
Unnamed procedure/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.75 mW/g



0 dB = 1.75mW/g

Z-axis plots for worst-case configuration:





APPENDIX D: PROBE & DIPOLE CALIBRATION DATA

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **RIM**

CALIBRATION CERTIFICATE

Object(s)	**ET3DV6 - SN:1644**
Calibration procedure(s)	**QA CAL-01.v2** **Calibration procedure for dosimetric E-field probes**
Calibration date:	**April 20, 2004 (additional conversion factors)**
Condition of the calibrated item	**In Tolerance (according to the specific calibration document)**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	US37292783	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	D. Vetter
Approved by:	Katja Pokovic	Laboratory Director	[signature]

Date Issued: April 20, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

880-KP0301061-A Page 1 of 4

Probe ET3DV6

SN:1644

Manufactured:	November 7, 2001
Last calibrated:	November 21, 2003
Recalibrated:	April 20, 2004

Additional Conversion Factors

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1644 **April 20, 2004**

DASY - Parameters of Probe: ET3DV6 SN:1644

Sensitivity in Free Space

NormX	**1.71** $\mu V/(V/m)^2$
NormY	**1.86** $\mu V/(V/m)^2$
NormZ	**1.82** $\mu V/(V/m)^2$

Diode Compression[A]

DCP X	**95**	mV
DCP Y	**95**	mV
DCP Z	**95**	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Plese see Page 4.

Sensor Offset

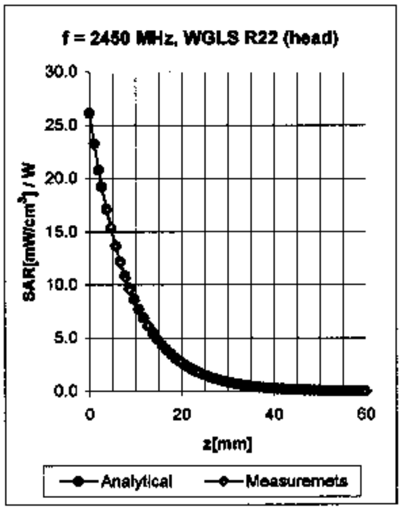
Probe Tip to Sensor Center	**2.7** mm
Optical Surface Detection	**in tolerance**

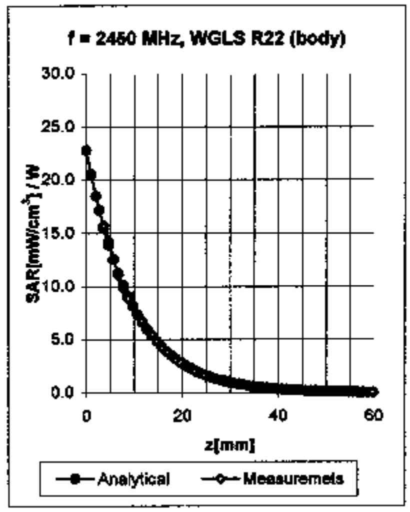
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] numerical linearization parameter: uncertainty not required

ET3DV6 SN:1644 **April 20, 2004**

Conversion Factor Assessment





f [MHz]	Validity [MHz][8]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	1.05	1.87	4.75	± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.39	1.54	4.61	± 9.7% (k=2)

[8] The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **RIM**

CALIBRATION CERTIFICATE

Object(s): **D2450V2 - SN:747**

Calibration procedure(s): **QA CAL-05.v2**
Calibration procedure for dipole validation kits

Calibration date: **April 14, 2004**

Condition of the calibrated item: **In Tolerance (according to the specific calibration document)**

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	US37292783	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: April 21, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

880-KP0301061-A Page 1 (1)

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

DASY

Dipole Validation Kit

Type: D2450V2

Serial: 747

Manufactured: December 1, 2003
Calibrated: April 14, 2004

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with **head simulating solution** of the following electrical parameters at 2450 MHz:

Relative Dielectricity	**37.6**	± 5%
Conductivity	**1.88 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ES3DV2 (SN:3025, Conversion factor 4.55 at 2450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. Lossless spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ES3DV2 SN:3013 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**57.2 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**26.1 mW/g** ± 16.2 % (k=2)[1]

[1] validation uncertainty

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.160 ns**	(one direction)
Transmission factor:	**0.992**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance spacer was in place during impedance measurements.

Feedpoint impedance at 2450 MHz:	Re{Z} = **51.3 Ω**
	Im {Z} = **3.1 Ω**
Return Loss at 2450 MHz	**-30.8 dB**

4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with **body simulating solution** of the following electrical parameters at 2450 MHz:

Relative Dielectricity	**51.5**	± 5%
Conductivity	**2.00 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ES3DV2 (SN:3013, Conversion factor 4.02 at 2450 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. Lossless spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

5. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ES3DV2 SN:3013 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**53.6 mW/g** ± 16.8 % (k=2)[2]
averaged over 10 cm^3 (10 g) of tissue:	**25.4 mW/g** ± 16.2 % (k=2)[2]

6. Dipole Impedance and Return Loss

The dipole was positioned at the flat phantom sections according to section 4 and the distance spacer was in place during impedance measurements.

Feedpoint impedance at 2450 MHz:	Re{Z} = **47.4 Ω**
	Im {Z} = **4.3 Ω**
Return Loss at 2450 MHz	**-25.8 dB**

7. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

8. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Sections 1and 4. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

9. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

[2] validation uncertainty

Date/Time: 04/05/04 16:36:56

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN747

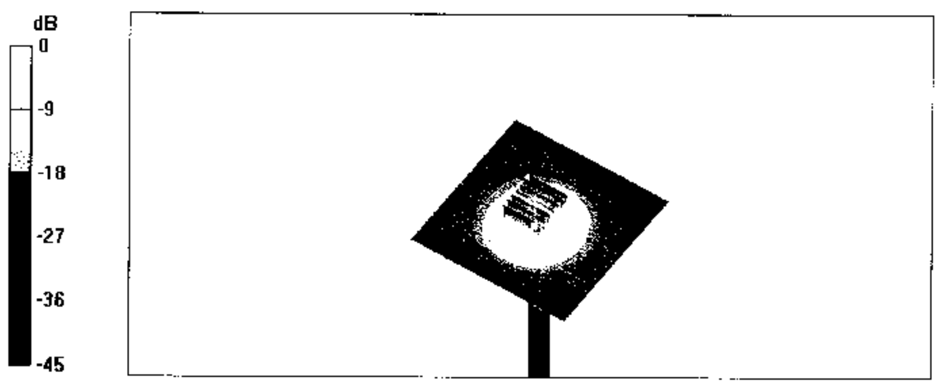
Communication System: CW-2450; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL 2450 MHz;
Medium parameters used: f = 2450 MHz; σ = 1.88 mho/m; ε_r = 37.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.55, 4.55, 4.55); Calibrated: 9/29/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006;
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

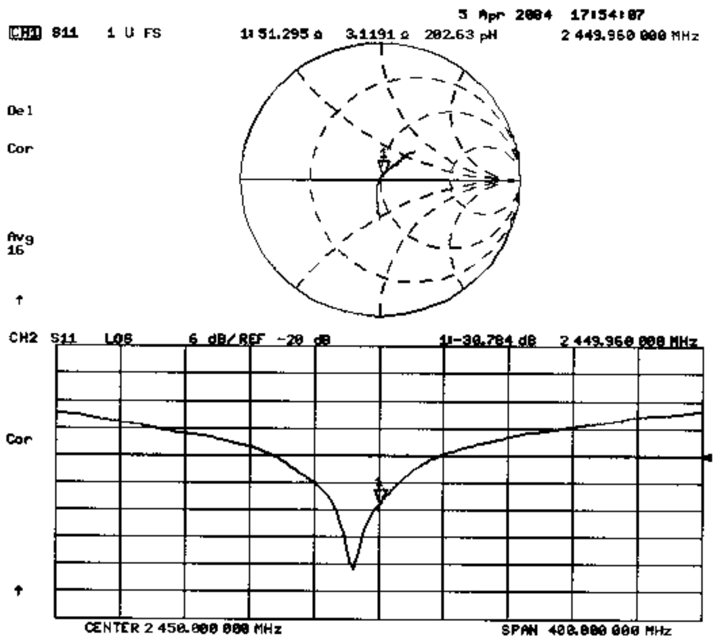
Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 92.8 V/m; Power Drift = 0.1 dB
Maximum value of SAR (interpolated) = 16.7 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.8 V/m; Power Drift = 0.1 dB
Maximum value of SAR (measured) = 15.9 mW/g
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 14.3 mW/g; SAR(10 g) = 6.52 mW/g



0 dB = 15.9mW/g

747
Head



5 Apr 2004 17:54:07
CH1 S11 1 U FS
1: 51.295 Ω 3.1191 Ω 202.63 pH
2 449.960 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 6 dB/REF -20 dB
1:-30.704 dB 2 449.960 000 MHz
Cor
CENTER 2 450.000 000 MHz
SPAN 400.000 000 MHz

Date/Time: 04/14/04 15:29:50

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN747

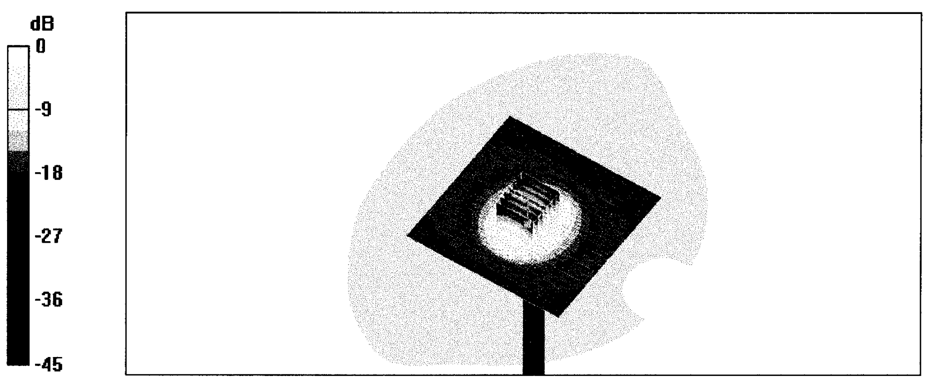
Communication System: CW-2450; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 MHz;
Medium parameters used: f = 2450 MHz; σ = 2 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3013; ConvF(4.02, 4.02, 4.02); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006;
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

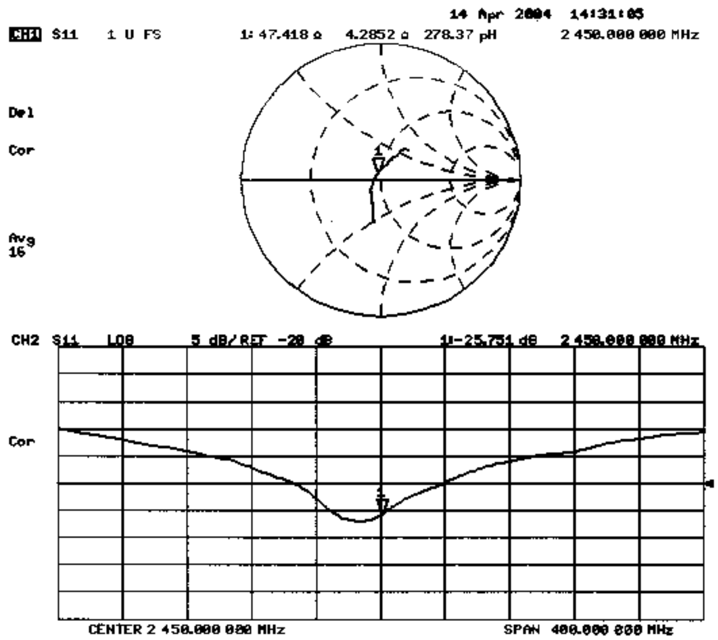
Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 87.9 V/m; Power Drift = -0.0 dB
Maximum value of SAR (interpolated) = 16.6 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.9 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 15.4 mW/g
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.36 mW/g



0 dB = 15.4mW/g

747
Body



14 Apr 2004 14:31:05
CH1 S11 1 U FS 1: 47.418 Ω 4.2852 Ω 278.37 pH 2 450.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF -20 dB 1:-25.751 dB 2 450.000 000 MHz
Cor
CENTER 2 450.000 000 MHz
SPAN 400.000 000 MHz

APPENDIX E: SAR SET UP PHOTOS

Figure E1. Left ear configuration

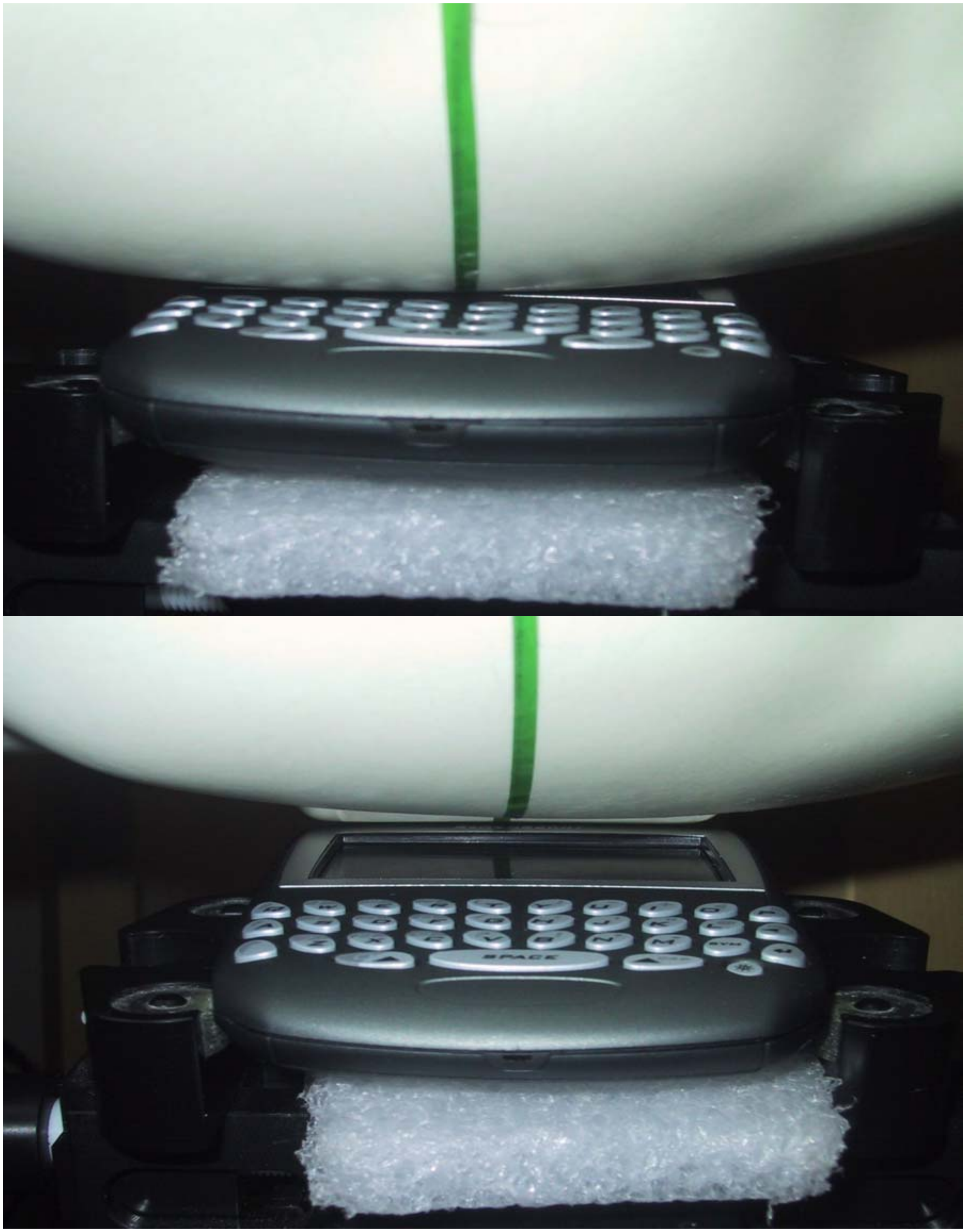


Figure E2. Right ear configuration

Figure E3. Body worn configuration with Foam Holsters

Figure E4. Body worn configuration with Plastic and Leather Swivel Holsters