APPENDIX D: SAR DISTRIBUTION PLOTS FOR PUSH-TO-TALK MODE CONFIGURATION

Date/Time: 09/16/03 11:46:00

Test Laboratory: Research In Motion Limited

Ambient Temperature : 22.7 °C Liquid Temperature : 21.4 °C

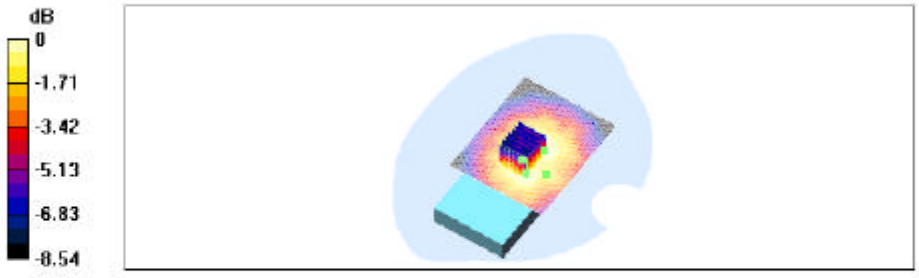
DUT: BlackBerry Wireless Handheld Model RAL10IN; Type: Sample (Retracted Ant.); Push-to-talk mode with 2.5 cm distance

Communication System: IDEN ; Frequency: 815.5 MHz;Duty Cycle: 1:6
Medium: M 835 (σ = 0.98 mho/m, ε_r = 53.79, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(6.4, 6.4, 6.4); Calibrated: 21/10/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 19/08/2003
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1080
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Unnamed procedure/Area Scan (101x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 13.3 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.161 mW/g

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.213 W/kg
SAR(1 g) = 0.154 mW/g; SAR(10 g) = 0.113 mW/g
Reference Value = 13.3 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.169 mW/g



0 dB = 0.169mW/g

Date/Time: 09/16/03 14:12:49

Test Laboratory: Research In Motion Limited

Ambient Temperature : 22.7 °C Liquid Temperature : 21.4 °C

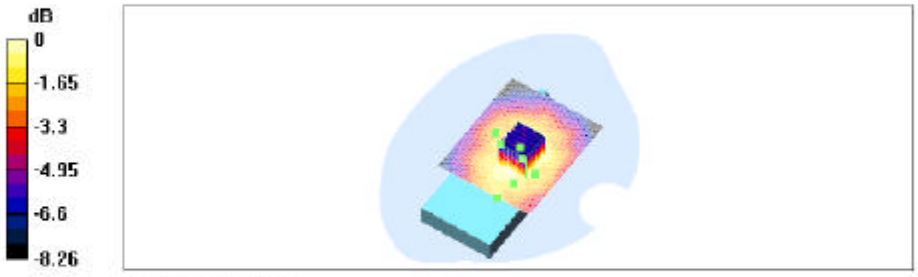
DUT: BlackBerry Wireless Handheld Model RAL10IN Ext; Type: Sample (Extended Ant.); Push-to-talk mode with 2.5 cm distance

Communication System: IDEN ; Frequency: 815.5 MHz;Duty Cycle: 1:6
Medium: M 835 (σ = 0.98 mho/m, ε_r = 53.79, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(6.4, 6.4, 6.4); Calibrated: 21/10/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 19/08/2003
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1080
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Unnamed procedure/Area Scan (101x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 10.5 V/m
Power Drift = -0.006 dB
Maximum value of SAR = 0.124 mW/g

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.169 W/kg
SAR(1 g) = 0.112 mW/g; SAR(10 g) = 0.0821 mW/g
Reference Value = 10.5 V/m
Power Drift = -0.006 dB
Maximum value of SAR = 0.121 mW/g



0 dB = 0.121mW/g

Date/Time: 09/16/03 15:16:30

Test Laboratory: Research In Motion Limited

Ambient Temperature : 22.5 °C Liquid Temperature : 21.3 °C

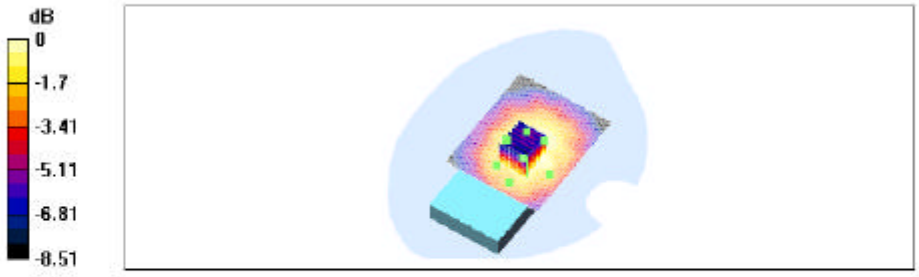
DUT: BlackBerry Wireless Handheld Model RAL10IN; Type: Sample (Retracted Ant.); Push-to-talk mode with 2.5 cm distance and higher capacity battery

Communication System: IDEN ; Frequency: 815.5 MHz;Duty Cycle: 1:6
Medium: M 835 (σ = 0.98 mho/m, ε_r = 53.79, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(6.4, 6.4, 6.4); Calibrated: 21/10/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 19/08/2003
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1080
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Unnamed procedure/Area Scan (101x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 12.8 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.166 mW/g

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.212 W/kg
SAR(1 g) = 0.148 mW/g; SAR(10 g) = 0.112 mW/g
Reference Value = 12.8 V/m
Power Drift = -0.2 dB
Maximum value of SAR = 0.168 mW/g



0 dB = 0.168mW/g

Date/Time: 09/16/03 16:07:30

Test Laboratory: Research In Motion Limited

Ambient Temperature : 22.5 °C Liquid Temperature : 21.3 °C

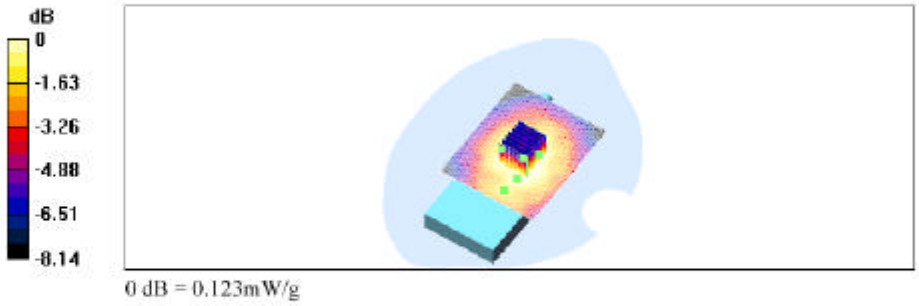
DUT: BlackBerry Wireless Handheld Model RAL10IN; Type: Sample (Extended Ant.); Push-to-talk mode with 2.5 cm distance and higher capacity battery

Communication System: IDEN ; Frequency: 815.5 MHz;Duty Cycle: 1:6
Medium: M 835 (σ = 0.98 mho/m, ε_r = 53.79, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1644; ConvF(6.4, 6.4, 6.4); Calibrated: 21/10/2002
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn472; Calibrated: 19/08/2003
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1080
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 116

Unnamed procedure/Area Scan (101x121x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 11.7 V/m
Power Drift = -0.03 dB
Maximum value of SAR = 0.125 mW/g

Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.17 W/kg
SAR(1 g) = 0.114 mW/g; SAR(10 g) = 0.0851 mW/g
Reference Value = 11.7 V/m
Power Drift = -0.03 dB
Maximum value of SAR = 0.123 mW/g



0 dB = 0.123mW/g

APPENDIX E: PROBES AND VALIDATION DIPOLE CALIBRATION

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1644**
Place of Calibration:	**Zurich**
Date of Calibration:	**October 21, 2002**
Calibration Interval:	**12 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	
Approved by:	

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Telephone +41 1 245 97 00, Fax +41 1 245 97 79

Probe ET3DV6

SN:1644

Manufactured: November 7, 2001
Last calibration: November 26, 2001
Recalibrated: October 21, 2002

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1644 **October 21, 2002**

DASY - Parameters of Probe: ET3DV6 SN:1644

Sensitivity in Free Space

Diode Compression

NormX	**1.73** $\mu V/(V/m)^2$	DCP X	**95**	mV
NormY	**1.88** $\mu V/(V/m)^2$	DCP Y	**95**	mV
NormZ	**1.83** $\mu V/(V/m)^2$	DCP Z	**95**	mV

Sensitivity in Tissue Simulating Liquid

Head **900 MHz** ε_r **= 41.5 ± 5%** σ **= 0.97 ± 5% mho/m**
Head **835 MHz** ε_r **= 41.5 ± 5%** σ **= 0.90 ± 5% mho/m**

ConvF X	**6.6** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.6** ± 9.5% (k=2)	Alpha	**0.32**
ConvF Z	**6.6** ± 9.5% (k=2)	Depth	**2.91**

Head **1800 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**
Head **1900 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**

ConvF X	**5.4** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**5.4** ± 9.5% (k=2)	Alpha	**0.49**
ConvF Z	**5.4** ± 9.5% (k=2)	Depth	**2.47**

Boundary Effect

Head **900 MHz** **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	10.4	6.1
SAR_{be} [%]	With Correction Algorithm	0.5	0.6

Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

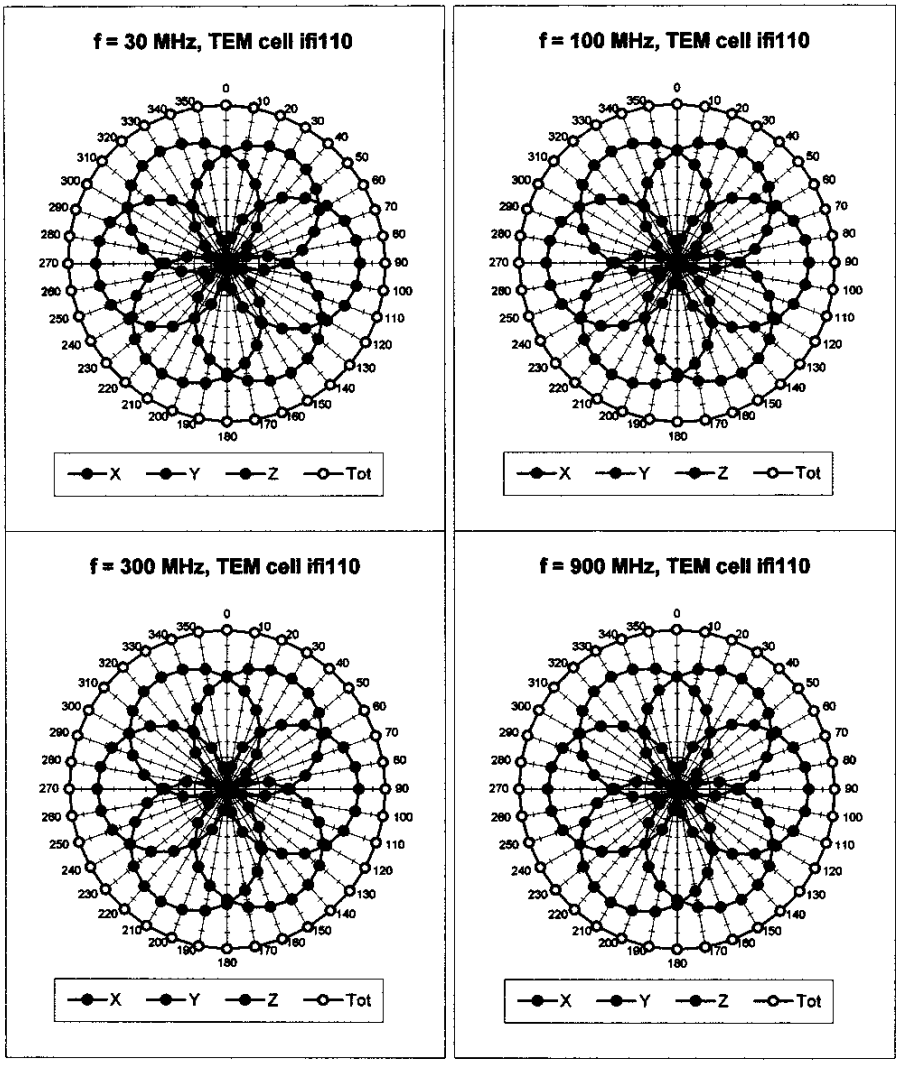
Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	12.2	8.0
SAR_{be} [%]	With Correction Algorithm	0.1	0.1

Sensor Offset

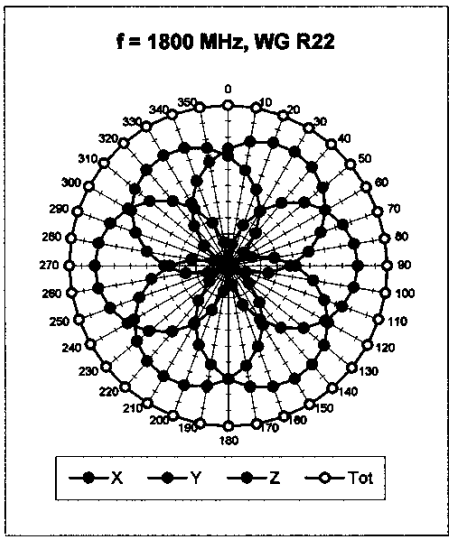
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.4 ± 0.2**	mm

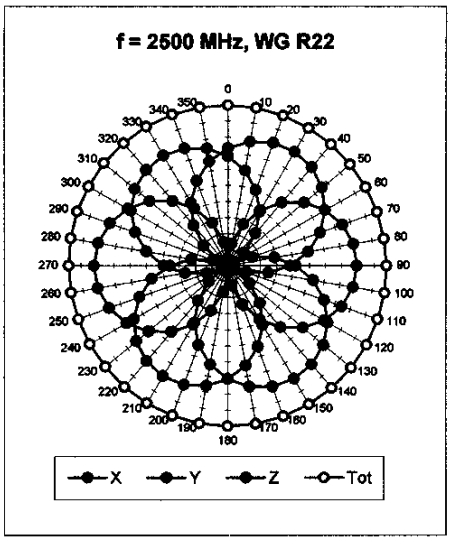
ET3DV6 SN:1644 **October 21, 2002**

Receiving Pattern (ϕ), θ = 0°

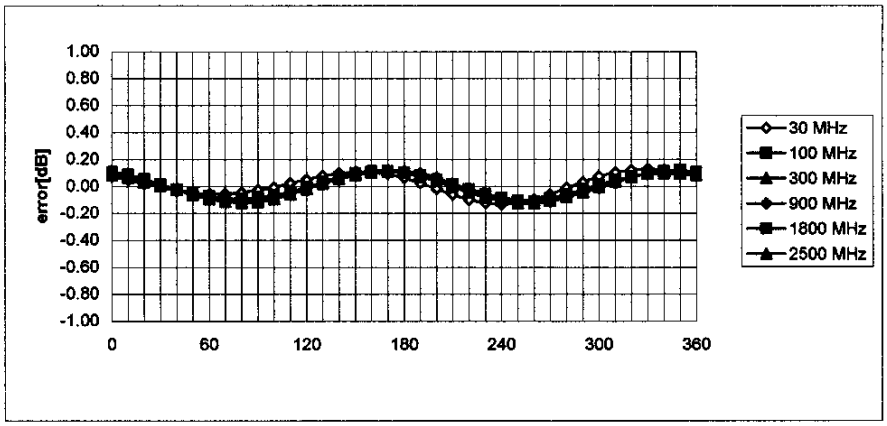


ET3DV6 SN:1644 **October 21, 2002**





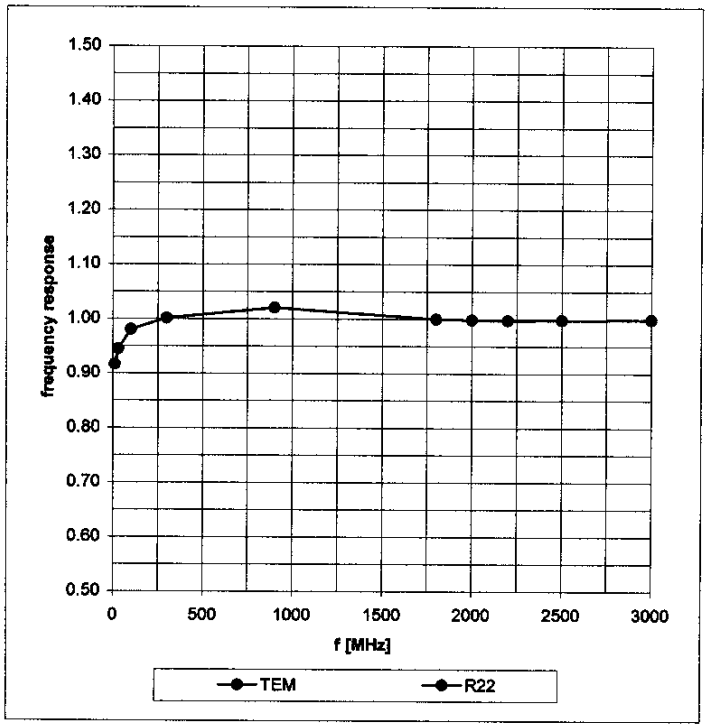
Isotropy Error (ϕ), θ = 0°



ET3DV6 SN:1644 **October 21, 2002**

Frequency Response of E-Field

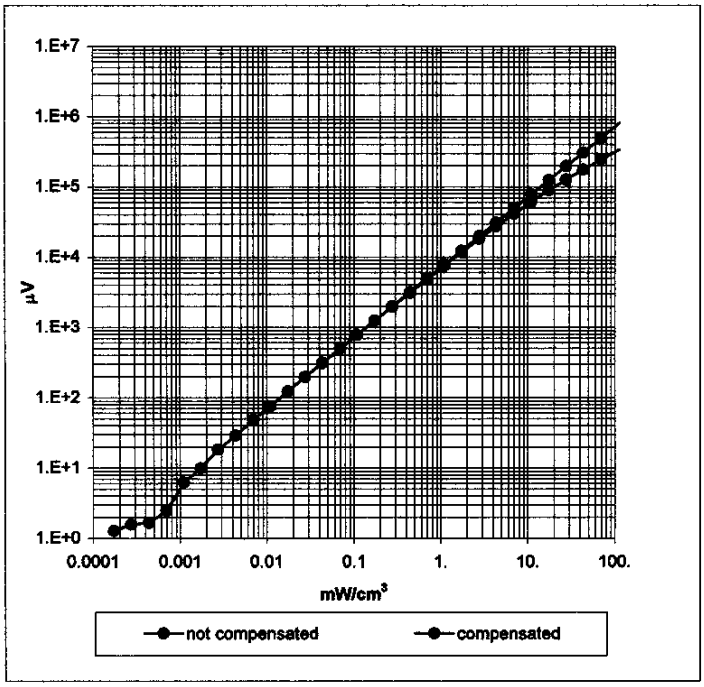
(TEM-Cell:ifi110, Waveguide R22)

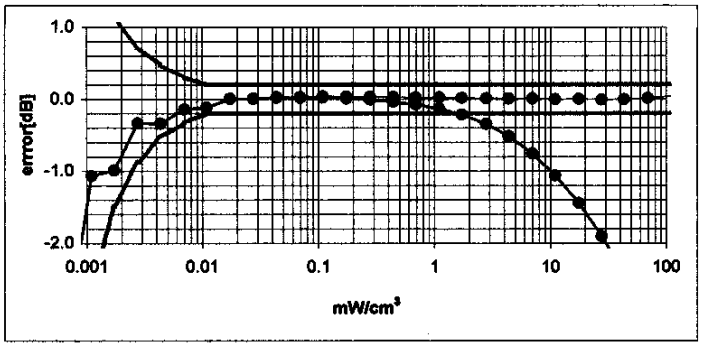


ET3DV6 SN:1644 **October 21, 2002**

Dynamic Range f(SAR_{brain})

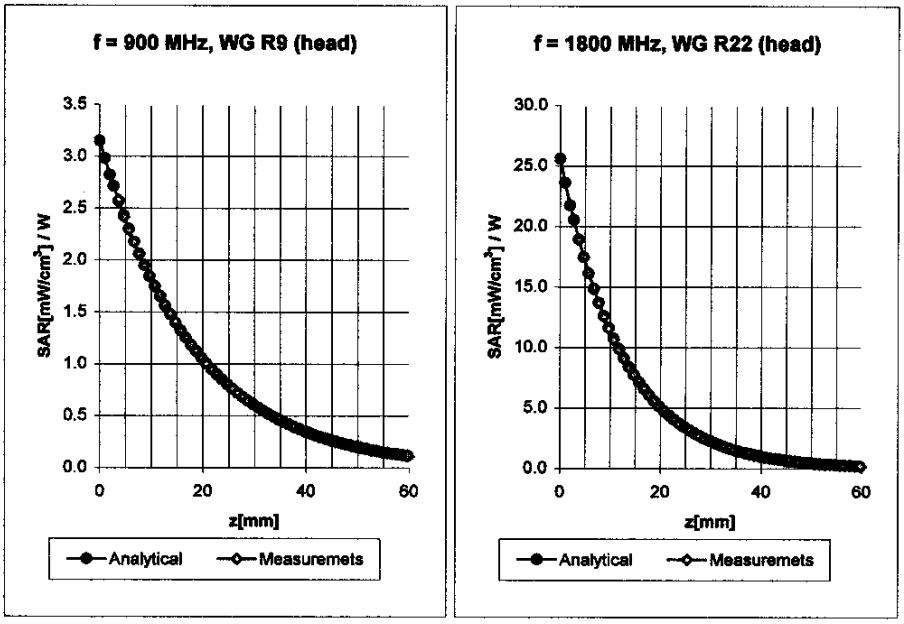
(Waveguide R22)





ET3DV6 SN:1644 **October 21, 2002**

Conversion Factor Assessment

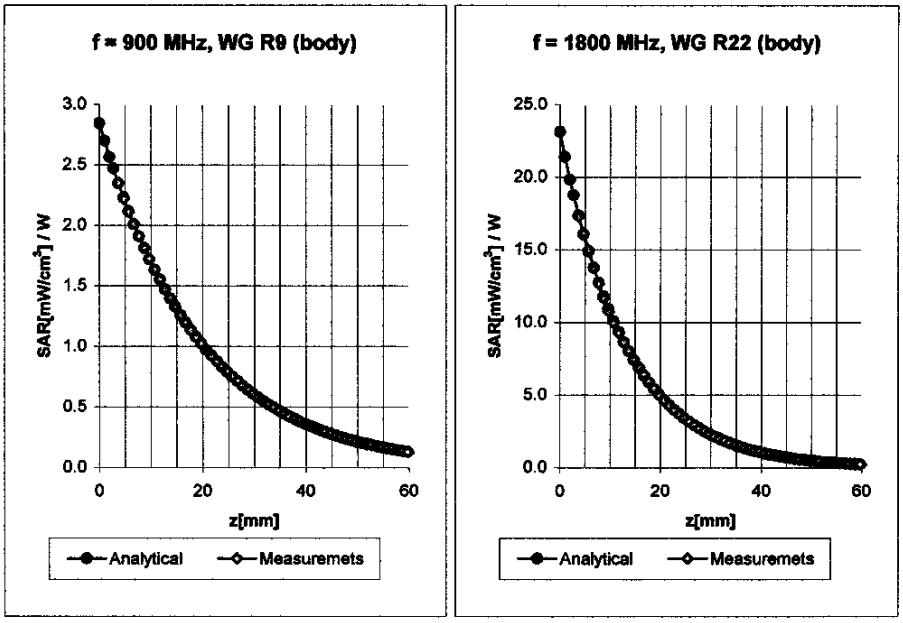


Head	**900 MHz**	ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m		
Head	**835 MHz**	ε_r = 41.5 ± 5%	σ = 0.90 ± 5% mho/m		
	ConvF X	**6.6** ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.6** ± 9.5% (k=2)		Alpha	**0.32**
	ConvF Z	**6.6** ± 9.5% (k=2)		Depth	**2.91**

Head	**1800 MHz**	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m		
Head	**1900 MHz**	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m		
	ConvF X	**5.4** ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**5.4** ± 9.5% (k=2)		Alpha	**0.49**
	ConvF Z	**5.4** ± 9.5% (k=2)		Depth	**2.47**

ET3DV6 SN:1644 **October 21, 2002**

Conversion Factor Assessment



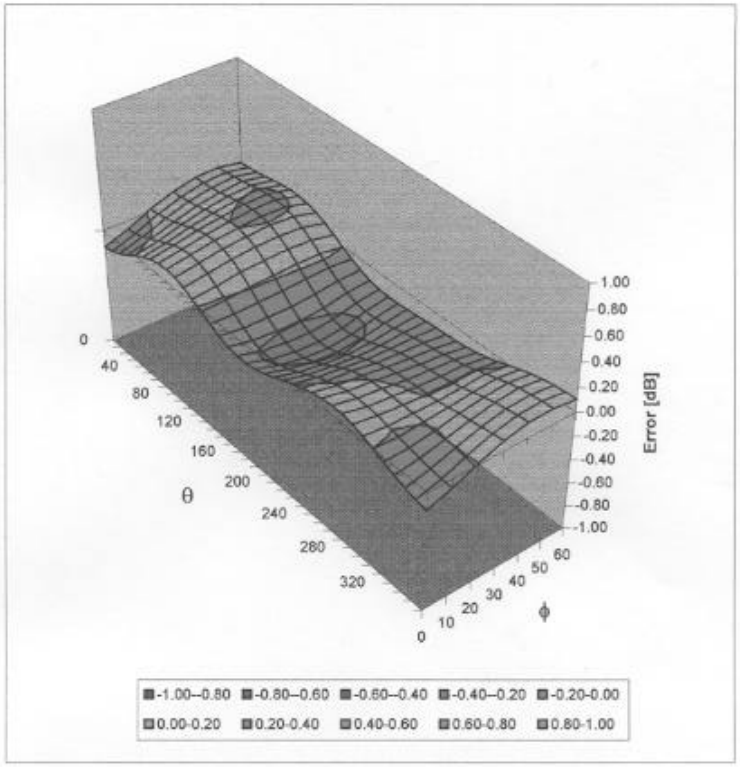
Body	**900 MHz**		ε_r = **55.0 ± 5%**	σ = **1.05 ± 5% mho/m**	
Body	**835 MHz**		ε_r = **55.2 ± 5%**	σ = **0.97 ± 5% mho/m**	
	ConvF X	**6.4** ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**6.4** ± 9.5% (k=2)		Alpha	**0.39**
	ConvF Z	**6.4** ± 9.5% (k=2)		Depth	**2.56**

Body	**1800 MHz**		ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**	
Body	**1900 MHz**		ε_r = **53.3 ± 5%**	σ = **1.52 ± 5% mho/m**	
	ConvF X	**5.1** ± 9.5% (k=2)		Boundary effect:	
	ConvF Y	**5.1** ± 9.5% (k=2)		Alpha	**0.61**
	ConvF Z	**5.1** ± 9.5% (k=2)		Depth	**2.35**

ET3DV6 SN:1644 October 21, 2002

Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



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

Client **RIM**

CALIBRATION CERTIFICATE

Object(s)	D835V2 - SN:446
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	August 21, 2003
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
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03

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

Date issued: August 22, 2003

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

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: D835V2

Serial: 446

Manufactured: October 24, 2001
Calibrated: August 21, 2003

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 835 MHz:

Relative Dielectricity	**43.3**	± 5%
Conductivity	**0.91 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.7 at 835 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 15mm from dipole center to the solution surface. The included distance 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 250 mW ± 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 ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**9.60 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**6.24 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:	**1.395 ns**	(one direction)
Transmission factor:	**0.983**	(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 835 MHz:	Re{Z} = **48.9 Ω**
	Im {Z} = **-5.5 Ω**
Return Loss at 835 MHz	**-24.9 dB**

4. 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.

5. 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.

6. Power Test

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 08/21/03 10:03:51

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN446_SN1507_HSL835_210803.da4

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN446
Program: Dipole Calibration

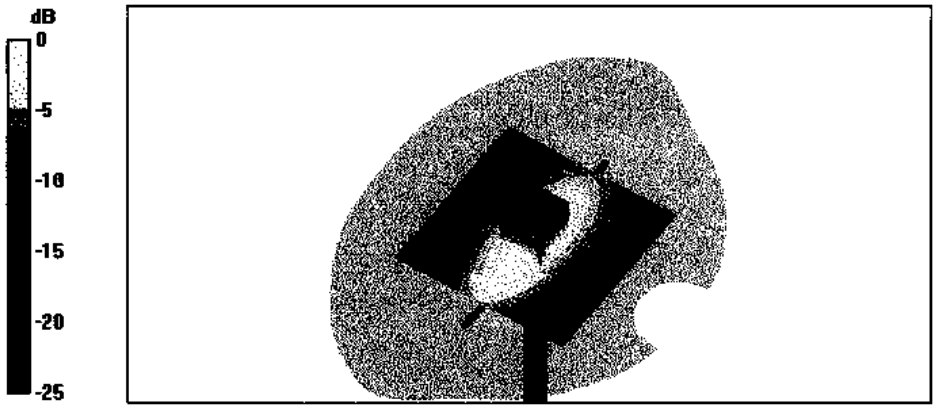
Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 835 MHz ($\sigma = 0.91$ mho/m, $\varepsilon_r = 43.28$, $\rho = 1000$ kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.7, 6.7, 6.7); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

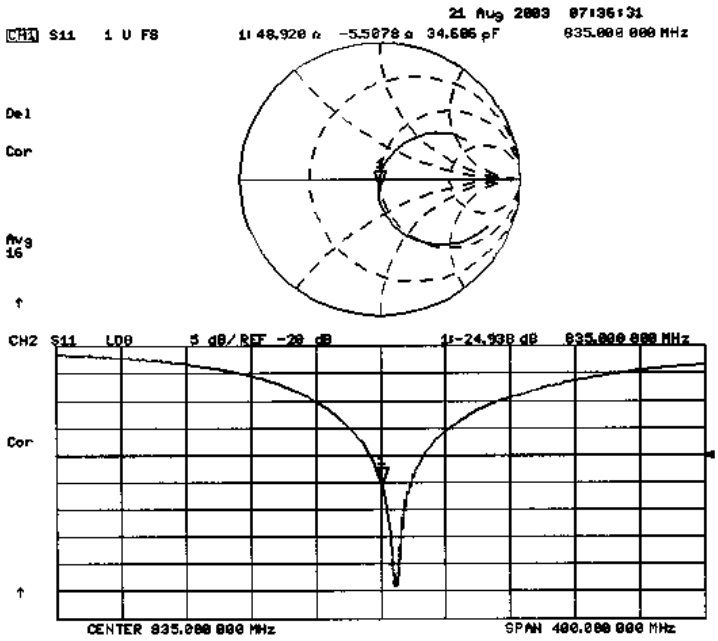
Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): *Measurement grid: dx=15mm, dy=15mm*
Reference Value = 55.3 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 2.55 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.52 W/kg
SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.56 mW/g
Reference Value = 55.3 V/m
Power Drift = -0.02 dB
Maximum value of SAR = 2.56 mW/g



0 dB = 2.56mW/g

446



APPENDIX F: SAR SET UP PHOTOS

Figure E1. Left ear touch configuration

Figure E2. Left ear tilted configuration

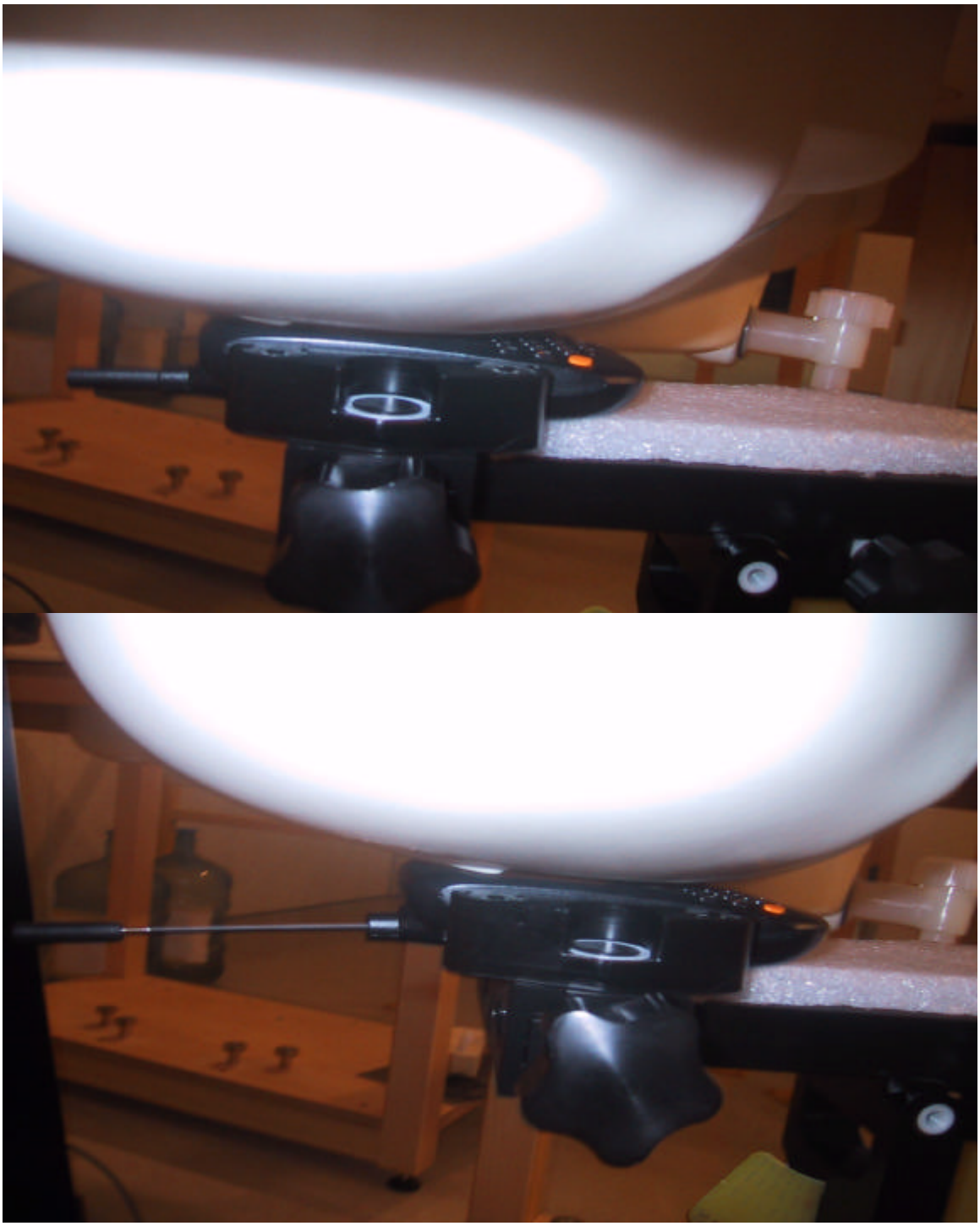


Figure E3. Right ear touch configuration

Figure E4. Right ear tilted configuration

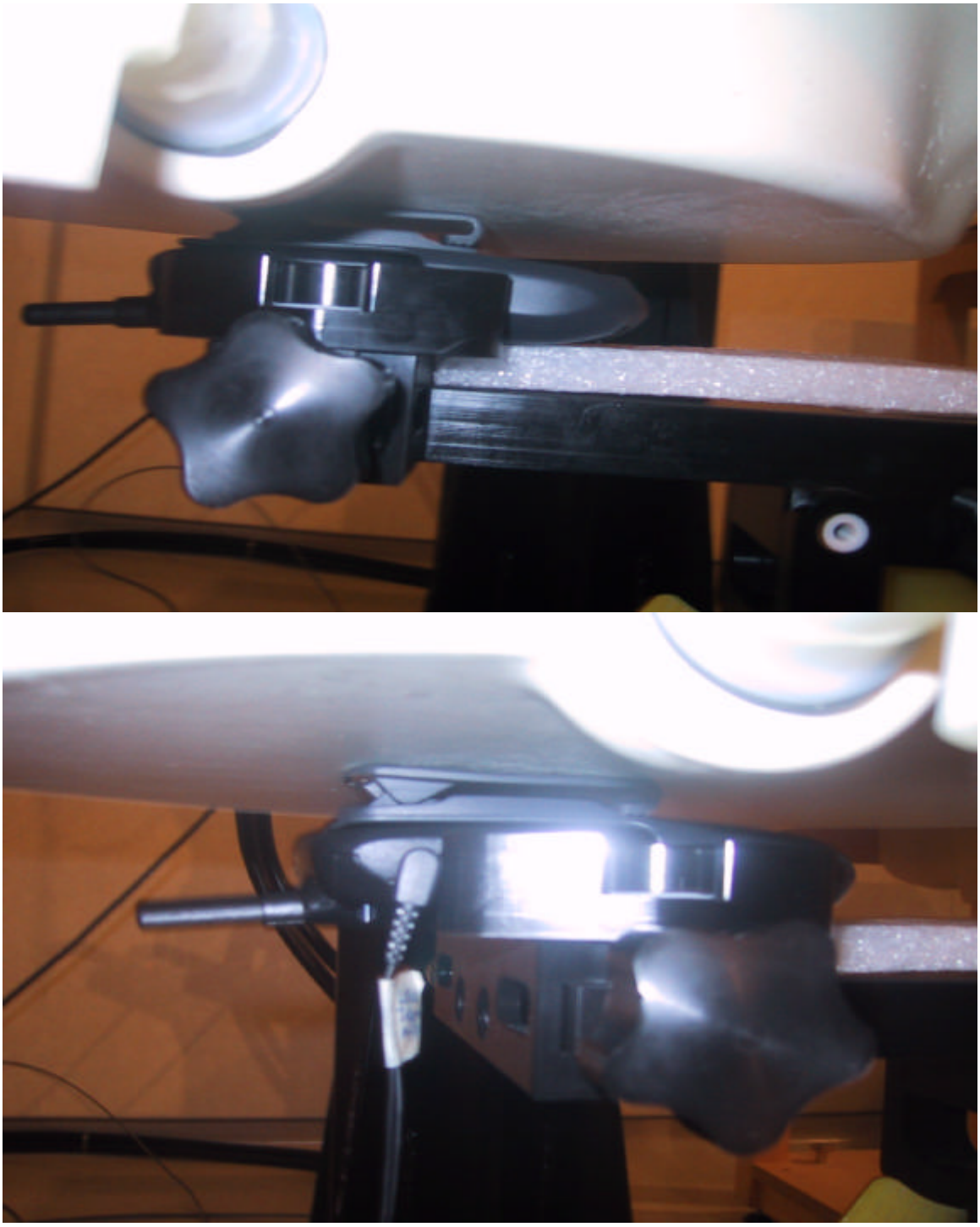


Figure E5. Body worn configuration retracted antenna with holster and headset

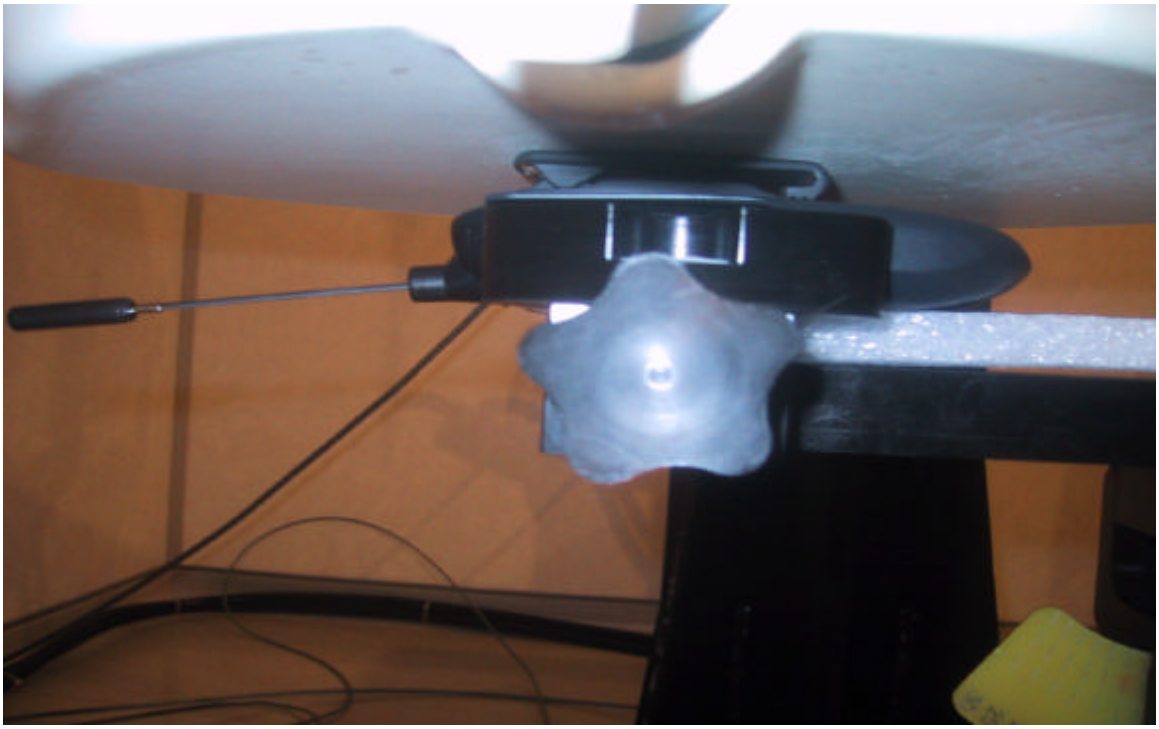


Figure E6. Body worn configuration extended antenna with holster

Figure E7. Body worn configuration with Leather Swivel Holster

Figure E8. Push-To-Talk mode configuration with 2.5 cm separation distance