

CERTIFICATE OF COMPLIANCE **SAR EVALUATION**

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Applicant Information:

MODOTTEL CO., LTD.

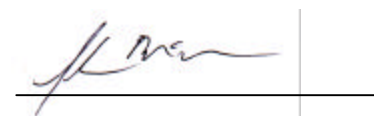
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FCC Rule Part(s):	2.1093; ET Docket 96.326
FCC ID:	POQWPE-2300
Model(s):	WPE-2300
Equipment Type:	Single-Mode PCS CDMA Phone
Classification:	Part 24 Licensed Portable Transmitter Held to Ear (PCE)
Tx Frequency Range:	1851.25 - 1908.75 MHz
Rx Frequency Range:	1931.25 - 1988.75 MHz
Rated RF Conducted Power:	24.5 dBm (+/- 0.2 dBm)
Max. RF Output Power:	0.416 Watts (EIRP)
Antenna Type:	Retractable Whip (1/4λ)
Battery Type(s):	Standard Life (3.7V 550 mAh)
	Extended Life (3.7V 950 mAh)

Celltech Research Inc. declares under its sole responsibility that this device was found to be in compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in OET Bulletin 65, Supplement C, Edition 01-01 (General Population/Uncontrolled Exposure), and was tested in accordance with the appropriate measurement standards, guidelines, and recommended practices specified in American National Standards Institute C95.1-1992.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

*This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Research Inc.
The results and statements contained in this report pertain only to the device(s) evaluated.*



Shawn McMillen
General Manager
Celltech Research Inc.



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1.0 INTRODUCTION

This measurement report shows that the MODOTTEL CO., LTD. Model: WPE-2300 Single-Mode PCS CDMA Phone FCC ID: POQWPE-2300 complies with FCC Part 2.1093, ET Docket 96-326 Rules for mobile and portable devices. The test procedures, as described in American National Standards Institute C95.1-1992 (see reference [1]), and FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

EUT Type	Single-Mode PCS CDMA Phone	FCC ID	POQWPE-2300
Equipment Class	Licensed Portable Transmitter Held to Ear (PCE)	Model No.(s)	WPE-2300
FCC Rule Part(s)	§ 2.1093, Docket 96-326	Application Type	FCC Part 24 Certification
Tx Frequency Range	1851.25 - 1908.75 MHz	Serial No.	Pre-production Unit
Rx Frequency Range	1931.25 - 1988.75 MHz	Battery Type(s)	3.7V 550mA/h Lithium-Ion 3.7V 950mA/h Lithium-Ion
Modulation	PCS CDMA	Antenna Type	Retractable Whip (1/4λ)
Max. RF Output Power	0.416 Watts (EIRP)	Antenna Length	99 mm

3.0 SAR MEASUREMENT SYSTEM

Celltech Research SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE3 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.



DASY3 SAR Measurement System with SAM phantom

4.0 MEASUREMENT SUMMARY

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the EUT are reported in Appendix A.

HEAD SAR MEASUREMENT RESULTS - Left Head Section, Extended-Life Battery

Freq. (MHz)	Channel	Modulation	Cond. Power Before (dBm)	Cond. Power After (dBm)	Battery Type	Antenna Position	Phantom Section	Test Position	SAR 1g (w/kg)
1851.25	25	PCS CDMA	24.56	24.48	Extended	Retracted	Left Ear	Cheek/Touch	1.49
1851.25	25	PCS CDMA	24.52	24.36	Extended	Extended	Left Ear	Cheek/Touch	0.275
1880.00	600	PCS CDMA	24.51	24.37	Extended	Retracted	Left Ear	Cheek/Touch	1.12
1880.00	600	PCS CDMA	24.55	24.49	Extended	Extended	Left Ear	Cheek/Touch	0.530
1908.75	1175	PCS CDMA	24.53	24.48	Extended	Retracted	Left Ear	Cheek/Touch	1.19
1908.75	1175	PCS CDMA	24.57	24.51	Extended	Extended	Left Ear	Cheek/Touch	0.442
1880.00	600	PCS CDMA	24.55	24.40	Extended	Retracted	Left Ear	Cheek/Tilt	0.171
1880.00	600	PCS CDMA	24.54	24.43	Extended	Extended	Left Ear	Cheek/Tilt	0.156
Mixture Type: Brain (Measured) Dielectric Constant: 40.0 Conductivity: 1.40				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Uncontrolled Exposure / General Population BRAIN: 1.6 W/kg (averaged over 1 gram)					

Notes:

1. Test Date: January 28, 2002.
2. The SAR values measured were below the maximum limit of 1.6 w/kg (averaged over 1 gram).
3. The highest head SAR value measured (left head section, extended life battery) was 1.49 w/kg (low channel, antenna retracted, cheek/touch position).
4. The EUT was tested with the clamshell open, which is the only ear-held operating configuration for this phone.
5. Ambient Temperature: 22.8 °C
Relative Humidity: 30.2 %
Atmospheric Pressure: 102.27 kPa
Fluid Temperature ≈ 23 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.
7. Standard Battery: 550mAh
Extended Battery: 950mAh

MEASUREMENT SUMMARY (CONT.)

HEAD SAR MEASUREMENT RESULTS – Left Head Section, Standard-Life Battery

Freq. (MHz)	Channel	Modulation	Cond. Power Before (dBm)	Cond. Power After (dBm)	Battery Type	Antenna Position	Phantom Section	Test Position	SAR 1g (w/kg)
1851.25	25	PCS CDMA	24.56	24.45	Standard	Retracted	Left Ear	Cheek/Touch	1.38
1851.25	25	PCS CDMA	24.51	24.42	Standard	Extended	Left Ear	Cheek/Touch	0.329
1880.00	600	PCS CDMA	24.56	24.44	Standard	Retracted	Left Ear	Cheek/Touch	1.26
1880.00	600	PCS CDMA	24.55	24.43	Standard	Extended	Left Ear	Cheek/Touch	0.490
1908.75	1175	PCS CDMA	24.56	24.41	Standard	Retracted	Left Ear	Cheek/Touch	1.21
1908.75	1175	PCS CDMA	24.52	24.45	Standard	Extended	Left Ear	Cheek/Touch	0.486
1880.00	600	PCS CDMA	24.54	24.51	Standard	Retracted	Left Ear	Cheek/Tilt	0.174
1880.00	600	PCS CDMA	24.56	24.51	Standard	Extended	Left Ear	Cheek/Tilt	0.116
Mixture Type: Brain (Measured) Dielectric Constant: 40.0 Conductivity: 1.40				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Uncontrolled Exposure / General Population BRAIN: 1.6 W/kg (averaged over 1 gram)					

Notes:

1. Test Date: January 28, 2002.
2. The SAR values measured were below the maximum limit of 1.6 w/kg (averaged over 1 gram).
3. The highest head SAR value measured (left head section, standard life battery) was 1.38 w/kg (low channel, antenna retracted, cheek/touch position).
4. The EUT was tested with the clamshell open, which is the only ear-held operating configuration for this phone.
5. Ambient Temperature: 22.8 °C
Relative Humidity: 30.2 %
Atmospheric Pressure: 102.27 kPa
Fluid Temperature: ≈ 23 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.
7. Standard Battery: 550mAh
Extended Battery: 950mAh

MEASUREMENT SUMMARY (CONT.)

HEAD SAR MEASUREMENT RESULTS - Right Head Section, Extended-Life Battery

Freq. (MHz)	Channel	Modulation	Cond. Power Before (dBm)	Cond. Power After (dBm)	Battery Type	Antenna Position	Phantom Section	Test Position	SAR 1g (w/kg)
1851.25	25	PCS CDMA	24.56	24.48	Extended	Retracted	Right Ear	Cheek/Touch	1.40
1851.25	25	PCS CDMA	24.51	24.40	Extended	Extended	Right Ear	Cheek/Touch	0.388
1880.00	600	PCS CDMA	24.56	24.44	Extended	Retracted	Right Ear	Cheek/Touch	1.03
1880.00	600	PCS CDMA	24.57	24.44	Extended	Extended	Right Ear	Cheek/Touch	0.694
1908.75	1175	PCS CDMA	24.55	24.40	Extended	Retracted	Right Ear	Cheek/Touch	1.13
1908.75	1175	PCS CDMA	24.54	24.43	Extended	Extended	Right Ear	Cheek/Touch	0.595
1880.00	600	PCS CDMA	24.53	24.35	Extended	Retracted	Right Ear	Ear/Tilt	0.157
1880.00	600	PCS CDMA	24.52	24.36	Extended	Extended	Right Ear	Ear/Tilt	0.107
Mixture Type: Brain (Measured) Dielectric Constant: 40.0 Conductivity: 1.40				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Uncontrolled Exposure / General Population BRAIN: 1.6 W/kg (averaged over 1 gram)					

Notes:

1. Test Date: January 29, 2002.
2. The SAR values measured were below the maximum limit of 1.6 w/kg (averaged over 1 gram).
3. The highest head SAR value measured (right head section, extended life battery) was 1.40 w/kg (low channel, antenna retracted, cheek/touch position).
4. The EUT was tested with the clamshell open, which is the only ear-held operating configuration for this phone.
5. Ambient Temperature: 22.6 °C
Relative Humidity: 30.2 %
Atmospheric Pressure: 102.27 kPa
Fluid Temperature: ≈ 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.
7. Standard Battery: 550mAh
Extended Battery: 950mAh

MEASUREMENT SUMMARY (CONT.)

HEAD SAR MEASUREMENT RESULTS - Right Head Section, Standard-Life Battery

Freq. (MHz)	Channel	Modulation	Cond. Power Before (dBm)	Cond. Power After (dBm)	Battery Type	Antenna Position	Phantom Section	Test Position	SAR 1g (w/kg)
1851.25	25	PCS CDMA	24.56	24.44	Standard	Retracted	Right Ear	Cheek/Touch	1.44
1851.25	25	PCS CDMA	24.50	24.41	Standard	Extended	Right Ear	Cheek/Touch	0.397
1880.00	600	PCS CDMA	24.54	24.38	Standard	Retracted	Right Ear	Cheek/Touch	1.18
1880.00	600	PCS CDMA	24.51	24.39	Standard	Extended	Right Ear	Cheek/Touch	0.666
1908.75	1175	PCS CDMA	24.55	24.52	Standard	Retracted	Right Ear	Cheek/Touch	1.18
1908.75	1175	PCS CDMA	24.51	24.53	Standard	Extended	Right Ear	Cheek/Touch	0.506
1880.00	600	PCS CDMA	24.55	24.50	Standard	Retracted	Right Ear	Ear/Tilt	0.126
1880.00	600	PCS CDMA	24.50	24.41	Standard	Extended	Right Ear	Ear/Tilt	0.188
Mixture Type: Brain (Measured) Dielectric Constant: 40.0 Conductivity: 1.40				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Uncontrolled Exposure / General Population BRAIN: 1.6 W/kg (averaged over 1 gram)					

Notes:

1. Test Date: January 29, 2002.
2. The SAR values measured were below the maximum limit of 1.6 w/kg (averaged over 1 gram).
3. The highest head SAR value measured (right head section, standard life battery) was 1.44 w/kg (low channel, antenna retracted, cheek/touch position).
4. The EUT was tested with the clamshell open, which is the only ear-held operating configuration for this phone.
5. Ambient Temperature: 22.6 °C
Relative Humidity: 30.2 %
Atmospheric Pressure: 102.27 Kpa
Fluid Temperature: ≈ 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.
7. Standard Battery: 550mAh
Extended Battery: 950mAh

MEASUREMENT SUMMARY (CONT.)

4.3 BODY SAR MEASUREMENT RESULTS

Freq. (MHz)	Channel	Modulation	Cond. Power Before (dBm)	Cond. Power After (dBm)	Battery Type	Antenna Position	Phantom Section	Separation Distance (cm)	SAR 1g (w/kg)
1880.00	600	PCS CDMA	24.51	24.34	Extended	Retracted	Planar	1.5	0.346
1880.00	600	PCS CDMA	24.51	24.40	Extended	Extended	Planar	1.5	0.909
1880.00	600	PCS CDMA	24.51	24.37	Standard	Retracted	Planar	1.5	0.382
1880.00	600	PCS CDMA	24.52	24.50	Standard	Extended	Planar	1.5	1.31
1851.25	25	PCS CDMA	24.52	24.56	Standard	Extended	Planar	1.5	0.906
1908.75	1175	PCS CDMA	24.52	24.36	Standard	Extended	Planar	1.5	0.905
Mixture Type: Body (Measured) Dielectric Constant: 53.4 Conductivity: 1.52				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Uncontrolled Exposure / General Population BODY: 1.6 W/kg (averaged over 1 gram)					

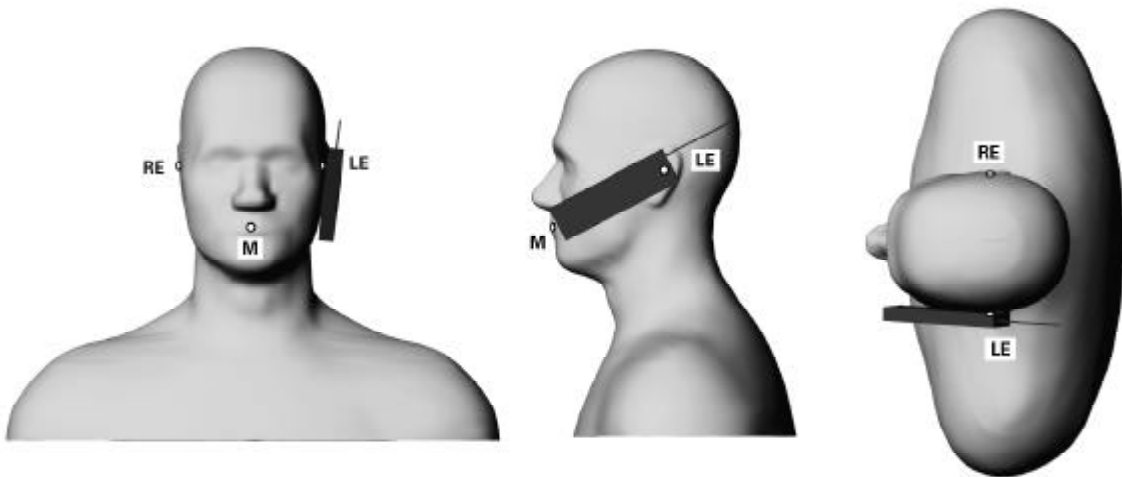
Notes:

1. Test Date(s): January 30, 2002.
2. The body SAR values measured were below the maximum limit of 1.6 w/kg (averaged over 1 gram).
3. The highest body SAR value measured was 1.31 w/kg (mid channel, antenna extended, standard-life battery).
4. The EUT was tested for body SAR with the clamshell closed, which is the only intended body-worn operating configuration for this phone. A 1.5cm separation distance was maintained between the back of the phone and the outer surface of the planar phantom.
5. Ambient Temperature: 24.4 °C
Relative Humidity: 31.0 %
Atmospheric Pressure: 102.27 kPa
Fluid Temperature: ≈ 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.
7. Standard Battery: 550mAh
Extended Battery: 950mAh

5.0 DETAILS OF SAR EVALUATION

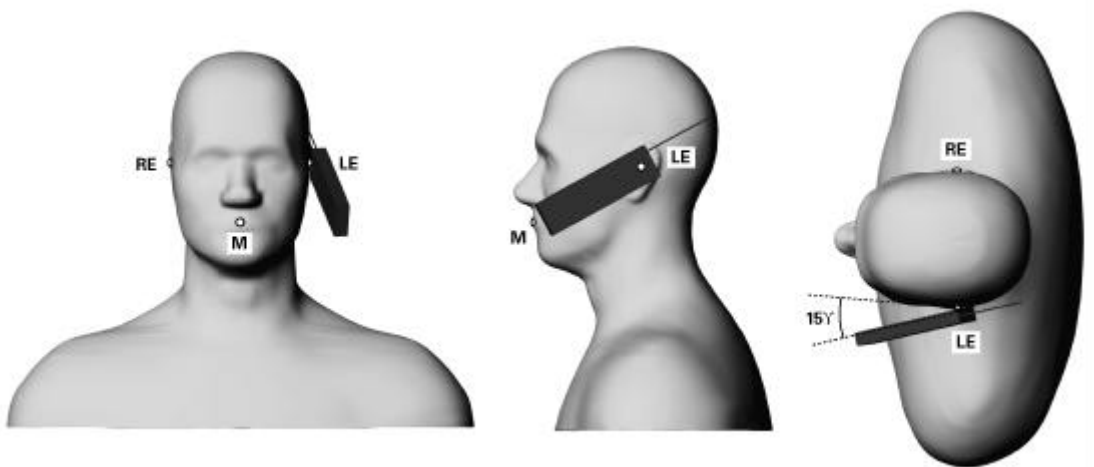
The MODOTTEL CO., LTD. Model: WPE-2300 Single-Mode PCS CDMA Phone FCC ID: POQWPE-2300 was found to be compliant for localized Specific Absorption Rate (SAR) based on the following test provisions and conditions:

- 1) The EUT was tested in a ear-held configuration on both the left and right sections of the phantom for mid channel with both standard and extended batteries and in both antenna extended and retracted positions as follows:
 - a) The handset was placed in the device holder in a normal operating position with the test device reference point located along the vertical centerline on the front of the device aligned to the ear reference point, with the center of the earpiece touching the center of the ear spacer of the SAM phantom.
 - b) With the handset positioned parallel to the cheek, the test device reference point was aligned to the ear reference point on the head phantom, and the vertical centerline was aligned to the phantom reference plane (initial ear position).
 - c) While maintaining the three alignments, the body of the handset was gradually adjusted to each of the following test positions:
 - Cheek/Touch Position: The handset was brought toward the mouth of the head phantom by pivoting against the ear reference point until any point of the mouthpiece or keypad touched the phantom.



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 (Shoulders are shown for illustration only).

- Ear/Tilt Position: With the phone aligned in the Cheek/Touch position, the handset was tilted away from the mouth with respect to the test device reference point by 15 degrees.



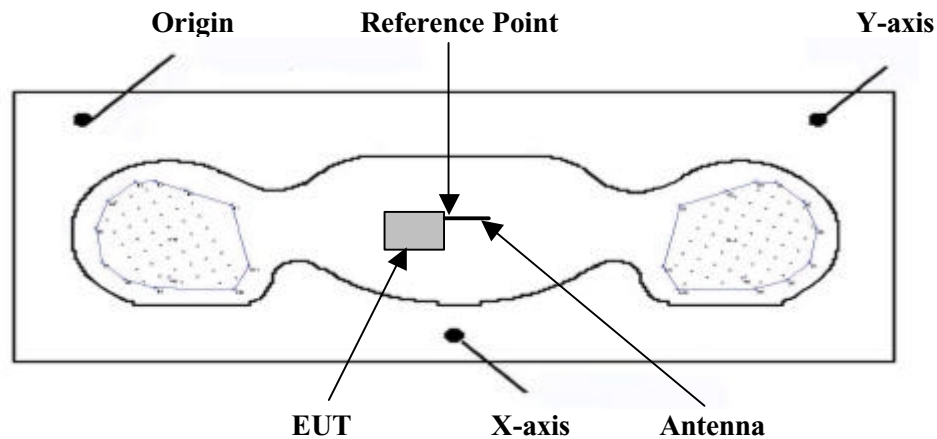
Phone position 2, “tilted position.” The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

- 2) The EUT was tested in a body-worn configuration with the device in the clamshell-closed position and the back of the device placed parallel to the outer surface of the planar phantom at a separation distance of 1.5 cm. The EUT was initially tested for body SAR at mid channel with both standard and extended batteries, and in both antenna extended and retracted positions. The battery configuration that measured the higher SAR for mid channel was continued for the remainder of the tests. (Note: A body-holster or belt-clip were not available accessories at the time of evaluation).
- 3) The EUT was tested for body SAR with an ear-microphone set connected.
- 4) SAR measurements were evaluated at maximum power and the unit was operated for an appropriate period prior to the evaluation in order to minimize drift. The conducted power levels were checked before and after each test. If the conducted power level deviated more than 5% of the initial power level, then the EUT was retested. Any unusual anomalies over the course of the test also warranted a re-evaluation.
- 5) The conducted power was measured according to the procedures described in FCC Part 2.1046.
- 6) The EUT was placed into test mode via keypad access or base station simulator at a full data rate in the “always up” power control mode.
- 7) The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the handset and its antenna.
- 8) The EUT was tested with a fully charged battery.

6.0 EVALUATION PROCEDURES

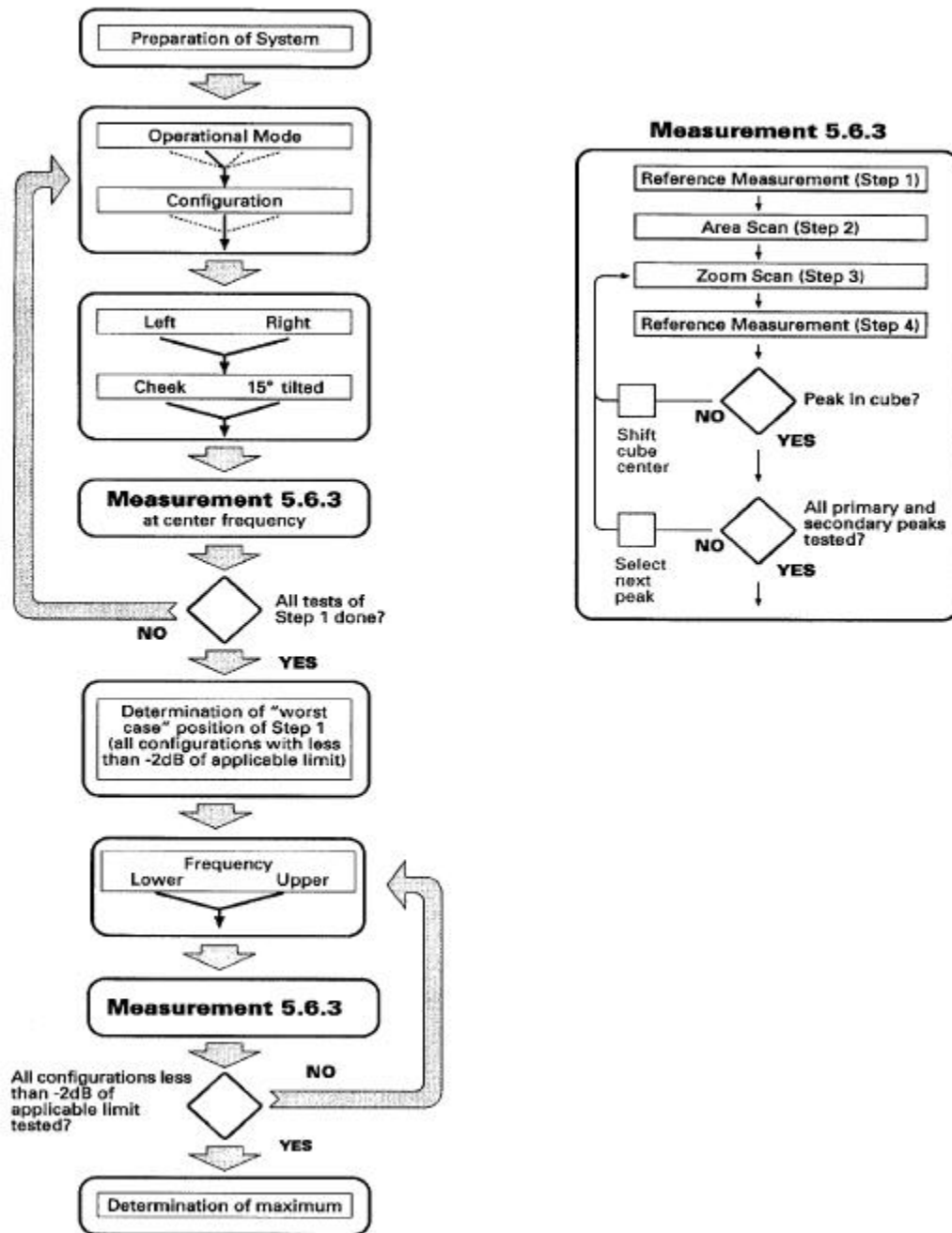
The Specific Absorption Rate (SAR) evaluation was performed in the following manner:

- a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation both the left and right ear positions were evaluated at the low, middle, and high frequencies of the band at maximum power, and with the device antenna in both the extended and extracted positions as applicable. The positioning of the ear-held device relative to the phantom was performed in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom.
- (ii) For face-held and body-worn devices a planar phantom was used.
- b. The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface using a uniform grid spacing.
- c. A 5x5x7 matrix was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.
- d. The depth of the simulating tissue in the phantom used for the SAR evaluation and system validation was no less than 15cm.
- e. The E-field probe conversion factors were determined as follows:
 - In brain and muscle tissue between 750MHz and 1GHz, the conversion factor decreases approximately 1.3% per 100MHz frequency increase.
 - In brain and muscle tissue between 1.6GHz and 2GHz, the conversion factor decreases approximately 1% per 100MHz frequency increase.
- f. The 1800MHz probe conversion factors used for the SAR evaluation were 5.78 for head and 5.36 for body. The manufacturer's specified probe conversion factors at 1900MHz are 5.66 and 5.25 for head and body respectively. An evaluation of the highest SAR values for the EUT using 1900MHz probe conversion factors increases the overall SAR for head and body by approximately 2%, which is less than the uncertainty of the probe conversion factors and considerably less than the overall uncertainty of the entire system.



Device Positioning & Reference Point (Body SAR)

EVALUATION PROCEDURES (Cont.)



Flow Chart of the recommended practices and procedures per IEEE Std 1528 (Draft) [see reference 5]

7.0 SYSTEM VALIDATION

Prior to the assessment, the system was verified in the planar section of the SAM phantom using an 1800MHz dipole. A forward power of 250mW was applied to the dipole, and the system was verified to a tolerance of $\pm 10\%$. The applicable verifications are as follows (see Appendix B for validation test plots):

Dipole Validation Kit	Target SAR 1g (w/kg)	Measured SAR 1g (w/kg)	Fluid Temperature	Validation Date
D1800V2	9.66	9.71	$\approx 23.0^{\circ}\text{C}$	01/28/02
		9.65	$\approx 23.0^{\circ}\text{C}$	01/29/02
		9.51	$\approx 23.0^{\circ}\text{C}$	01/30/02

8.0 TISSUE PARAMETERS

The dielectric parameters of the fluids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer. The dielectric parameters of the fluid are as follows:

BRAIN TISSUE PARAMETERS - SYSTEM VALIDATION & EUT EVALUATION			
Equivalent Tissue	Dielectric Constant ϵ_r	Conductivity σ (mho/m)	ρ (Kg/m ³)
1800MHz Brain (Target)	40.0 $\pm 5\%$	1.40 $\pm 5\%$	1000
1800MHz Brain (Measured: 01/28/02)	40.0	1.40	1000
1800MHz Brain (Measured: 01/29/02)	40.0	1.40	1000
1800MHz Brain (Measured: 01/30/02)	39.5	1.40	1000

BODY TISSUE PARAMETERS - EUT EVALUATION			
Equivalent Tissue	Dielectric Constant ϵ_r	Conductivity σ (mho/m)	ρ (Kg/m ³)
1800MHz Body (Target)	53.3 $\pm 5\%$	1.52 $\pm 5\%$	1000
1800MHz Body (Measured: 01/30/02)	53.4	1.52	1000

9.0 SIMULATED TISSUES

The 1800MHz brain and muscle mixtures consist of Glycol-monobutyl, water, and salt. The fluid was prepared according to standardized procedures, and measured for dielectric parameters (permittivity and conductivity).

TISSUE MIXTURE - SYSTEM VALIDATION & EUT EVALUATION		
INGREDIENT	1800MHz Brain Mixture (System Validation & EUT Evaluation)	1800MHz Body Mixture (EUT Evaluation)
Water	54.90 %	69.91 %
Glycol Monobutyl	44.92 %	29.96 %
Salt	0.18 %	0.13 %

10.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/Kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

11.0 ROBOT SYSTEM SPECIFICATIONS

Specifications

POSITIONER: Stäubli Unimation Corp. Robot Model: RX60L
Repeatability: 0.02 mm
No. of axis: 6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor: Pentium III
Clock Speed: 450 MHz
Operating System: Windows NT
Data Card: DASY3 PC-Board

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter, and control logic
Software: DASY3 software
Connecting Lines: Optical downlink for data and status info.
Optical uplink for commands and clock

PC Interface Card

Function: 24 bit (64 MHz) DSP for real time processing
Link to DAE3
16-bit A/D converter for surface detection system
serial link to robot
direct emergency stop output for robot

E-Field Probe

Model: ET3DV6
Serial No.: 1590
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Phantom

Type: SAM V4.0C
Configuration: Left Head, Right Head, Planar Section
Shell Material: Fiberglass
Thickness: 2.0 ± 0.1 mm
Volume: Approx. 20 liters

12.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a fiberglass shell phantom with a 2.0 mm shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections.



SAM Phantom V4.0C

13.0 DEVICE HOLDER

The DASY3 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.



Device Holder

14.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core
	Built-in shielding against static charges
	PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz
	In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$)
Frequency:	10 MHz to >6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in brain tissue (rotation around probe axis)
	± 0.4 dB in brain tissue (rotation normal to probe axis)
Dynamic Range:	5 μ W/g to >100 mW/g; Linearity: ± 0.2 dB
Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm
Tip length:	16 mm
Body diameter:	12 mm
Tip diameter:	6.8 mm
Distance from probe tip to dipole centers:	2.7 mm
Application:	General dosimetry up to 3 GHz
	Compliance tests of mobile phone



ET3DV6 E-Field Probe

15.0 TEST EQUIPMENT LIST

SAR MEASUREMENT SYSTEM		
EQUIPMENT	SERIAL NO.	DATE CALIBRATED
DASY3 System -Robot -ET3DV6 E-Field Probe -300MHz Validation Dipole -450MHz Validation Dipole -900MHz Validation Dipole -1800MHz Validation Dipole -2450MHz Validation Dipole -SAM Phantom V4.0C	599396-01 1590 135 136 054 247 150 N/A	N/A Mar 2001 Oct 2001 Oct 2001 June 2001 June 2001 Oct 2001 N/A
85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8652A Power Meter -Power Sensor 80701A -Power Sensor 80701A	1835272 1833535 1833542	Feb 2002 Feb 2002 Mar 2002
E4408B Spectrum Analyzer	US39240170	Nov 2001
8594E Spectrum Analyzer	3543A02721	Mar 2002
8753E Network Analyzer	US38433013	Nov 2001
8648D Signal Generator	3847A00611	Aug 2001
5S1G4 Amplifier Research Power Amplifier	26235	N/A

16.0 MEASUREMENT UNCERTAINTIES

Error Description	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	c_i 1g	Standard Uncertainty $\pm\%$ (1g)	v_i or v_{eff}
Measurement System						
Probe calibration	± 4.4	Normal	1	1	± 4.4	∞
Axial isotropy of the probe	± 4.7	Rectangular	$\sqrt{3}$	(1- c_p)	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	$\sqrt{3}$	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	$\sqrt{3}$	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	$\sqrt{3}$	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	$\sqrt{3}$	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	$\sqrt{3}$	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	$\sqrt{3}$	1	± 0.5	∞
Integration time	± 1.4	Rectangular	$\sqrt{3}$	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	$\sqrt{3}$	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	$\sqrt{3}$	1	± 1.7	∞
Extrap. & integration	± 3.9	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	0.89	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	0.84	1	± 5.9	8
Power drift	± 5.0	Rectangular	$\sqrt{3}$		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	$\sqrt{3}$	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid conductivity (measured)	± 10.0	Rectangular	$\sqrt{3}$	0.6	± 3.5	∞
Liquid permittivity (target)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	$\sqrt{3}$	0.6	± 1.7	∞
Combined Standard Uncertainty					± 13.6	
Expanded Uncertainty (k=2)					± 27.1	

The divisor for device positioning uncertainty and holder uncertainty are based on the procedure defined in IEEE Std 1528 (draft) (see reference [5]), or based on the degrees of freedom for each error source.

For estimation of Device Positioning Uncertainty (divisor=0.89) 12 different devices were used (see last column - i.e. degrees of freedom). The corresponding k_p factor for $v_{eff}=12$ is 2.23, therefore the divisor is $2/2.23=0.89$.

For estimation of Device Holder Uncertainty (divisor=0.84) 8 different devices were used (see last column - i.e. degrees of freedom). The corresponding k_p factor for $v_{eff}=8$ is 2.37, therefore the divisor is $2/2.37=0.84$.

17.0 REFERENCES

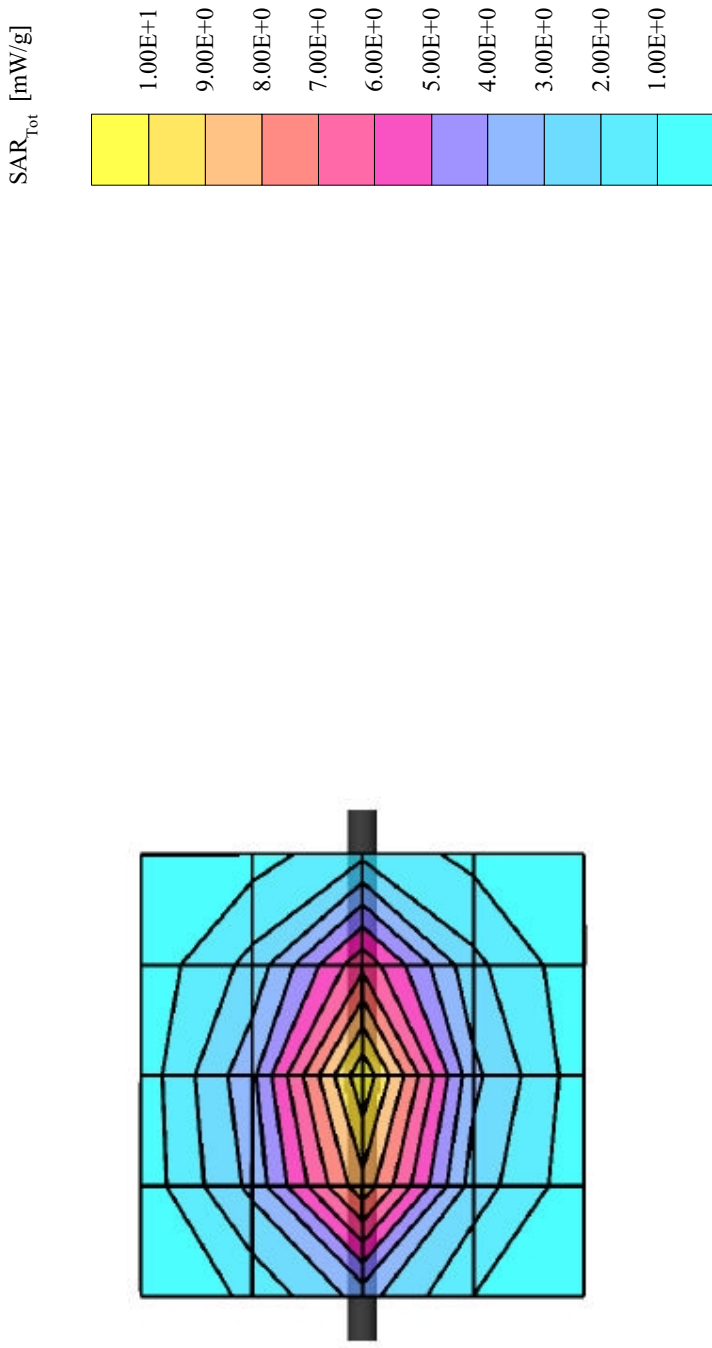
- [1] ANSI, ANSI/IEEE C95.1: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 Ghz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY: 1992.
- [2] Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, “Automated E-field scanning system for dosimetric assessments”, IEEE Transaction on Microwave Theory and Techniques, Vol. 44, pp. 105 - 113: January 1996.
- [4] Niels Kuster, Ralph Kastle, and Thomas Schmid, “Dosimetric evaluation of mobile communications equipment with know precision”, IEICE Transactions of Communications, vol. E80-B, no. 5, pp. 645 – 652: May 1997.
- [5] IEEE Standards Coordinating Committee 34, Std 1528, DRAFT Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques: Draft, December 2001.

APPENDIX A - SAR MEASUREMENT DATA

APPENDIX B - SYSTEM VALIDATION

Validation Dipole D1800V2 SN:247, d = 10 mm

Frequency: 1800 MHz; Antenna Input Power: 250 [mW]
Generic Twin Phantom; Flat Section; Grid Spacing: Dx = 15.0, Dy = 15.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.57,5.57,5.57); Crest factor: 1.0; IEEE1528 1800 MHz : $\sigma = 1.36 \text{ mho/m}$ $\epsilon_r = 40.0$ $\rho = 1.00 \text{ g/cm}^3$
Cubes (2): Peak: 18.2 mW/g $\pm 0.04 \text{ dB}$, SAR (1g): 9.66 mW/g $\pm 0.03 \text{ dB}$, SAR (10g): 5.02 mW/g $\pm 0.03 \text{ dB}$, (Worst-case extrapolation)
Penetration depth: 8.2 (7.6, 9.4) [mm]
Powerdrift: -0.01 dB



Dipole 1800 MHz

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1590; ConvF(5.78,5.78,5.78); Crest factor: 1.0; 1800 MHz Brain: $\omega = 1.40$ mho/m $\kappa = 40.0$ $\psi = 1.00$ g/cm³

Cube 5x5x7: Peak: 18.8 mW/g, SAR (1g): 9.71 mW/g, SAR (10g): 4.92 mW/g, (Worst-case extrapolation)

Penetration depth: 7.7 (7.3, 8.6) [mm]

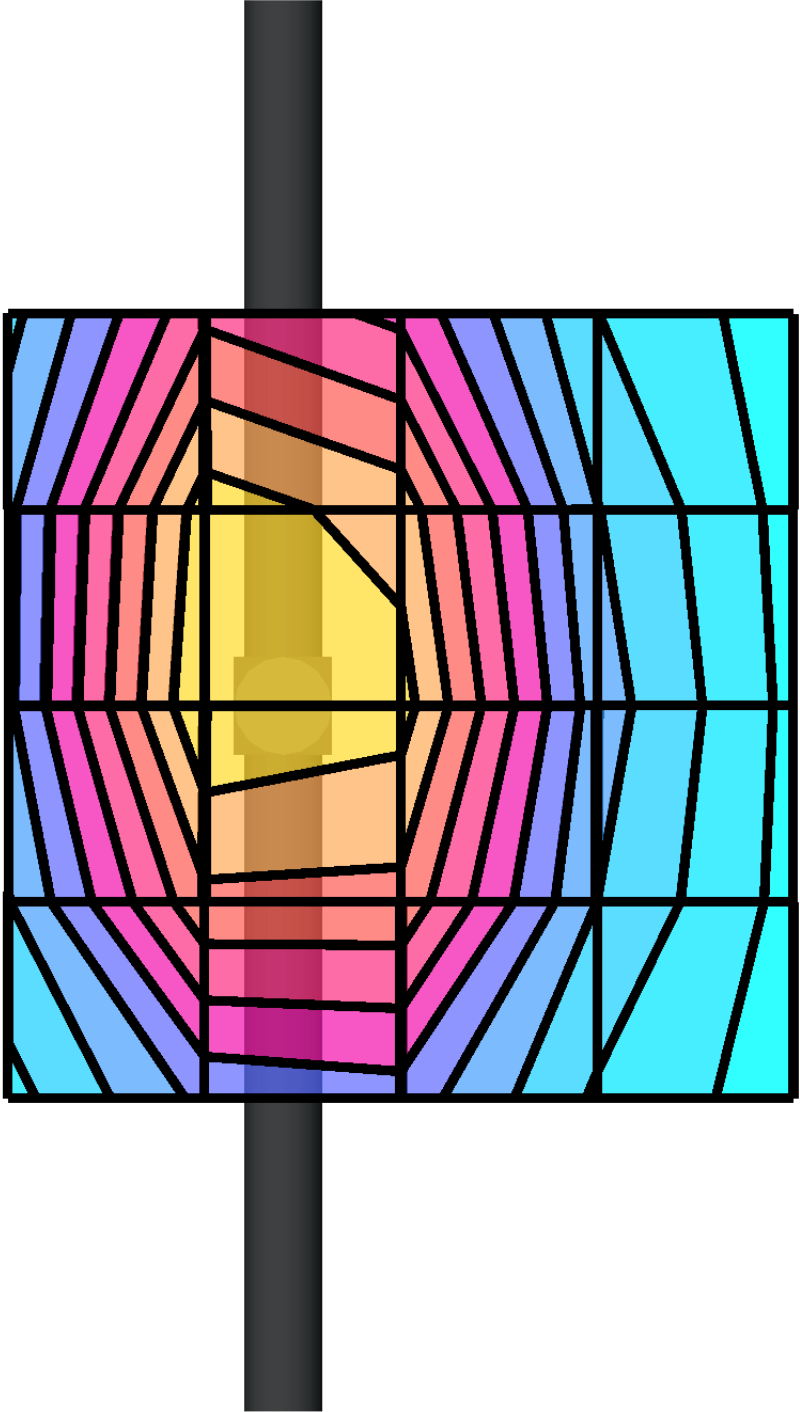
Powerdrift: 0.02 dB

1800MHz Dipole Validation

Conducted Power: 250 mW

Date: January 28, 2002

SAR_{Tot} [mW/g]



Dipole 1800 MHz

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1590; ConvF(5.78,5.78,5.78); Crest factor: 1.0; 1800 MHz Brain: $\omega = 1.40$ mho/m $\kappa = 40.0$ $\psi = 1.00$ g/cm³

Cube 5x5x7: Peak: 18.6 mW/g, SAR (1g): 9.65 mW/g, SAR (10g): 4.88 mW/g, (Worst-case extrapolation)

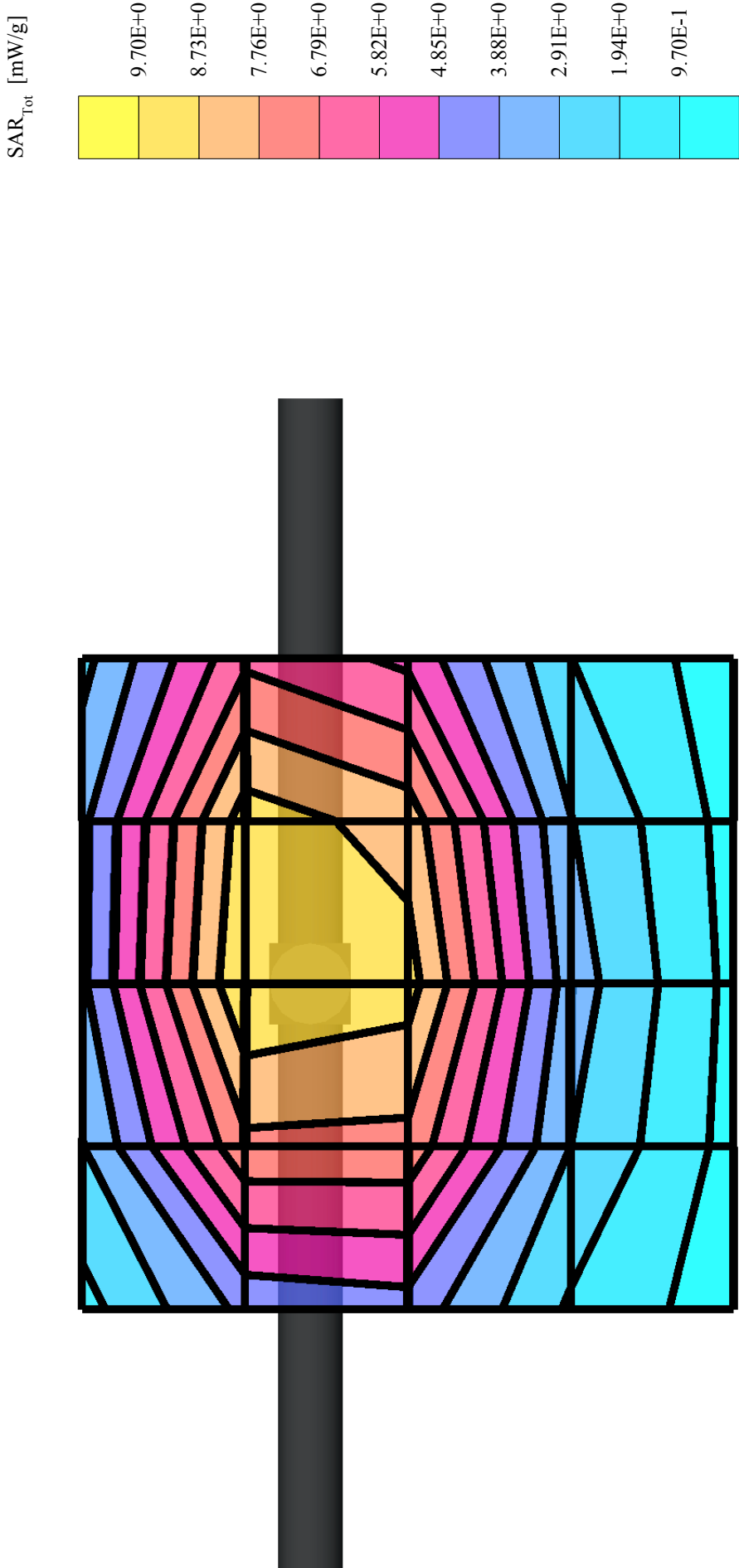
Penetration depth: 7.7 (7.3, 8.6) [mm]

Powerdrift: 0.02 dB

1800MHz Dipole Validation

Conducted Power: 250 mW

Date: January 29, 2002



Dipole 1800 MHz

SAM Phantom; Flat Section

Probe: ET3DV6 - SNI590; ConvF(5.78,5.78,5.78); Crest factor: 1.0; 1800 MHz Brain: $\sigma = 1.40$ mho/m $\epsilon_r = 39.5$ $\rho = 1.00$ g/cm³

Cube 5x5x7; Peak: 18.4 mW/g, SAR (1g): 9.51 mW/g, SAR (10g): 4.81 mW/g, (Worst-case extrapolation)

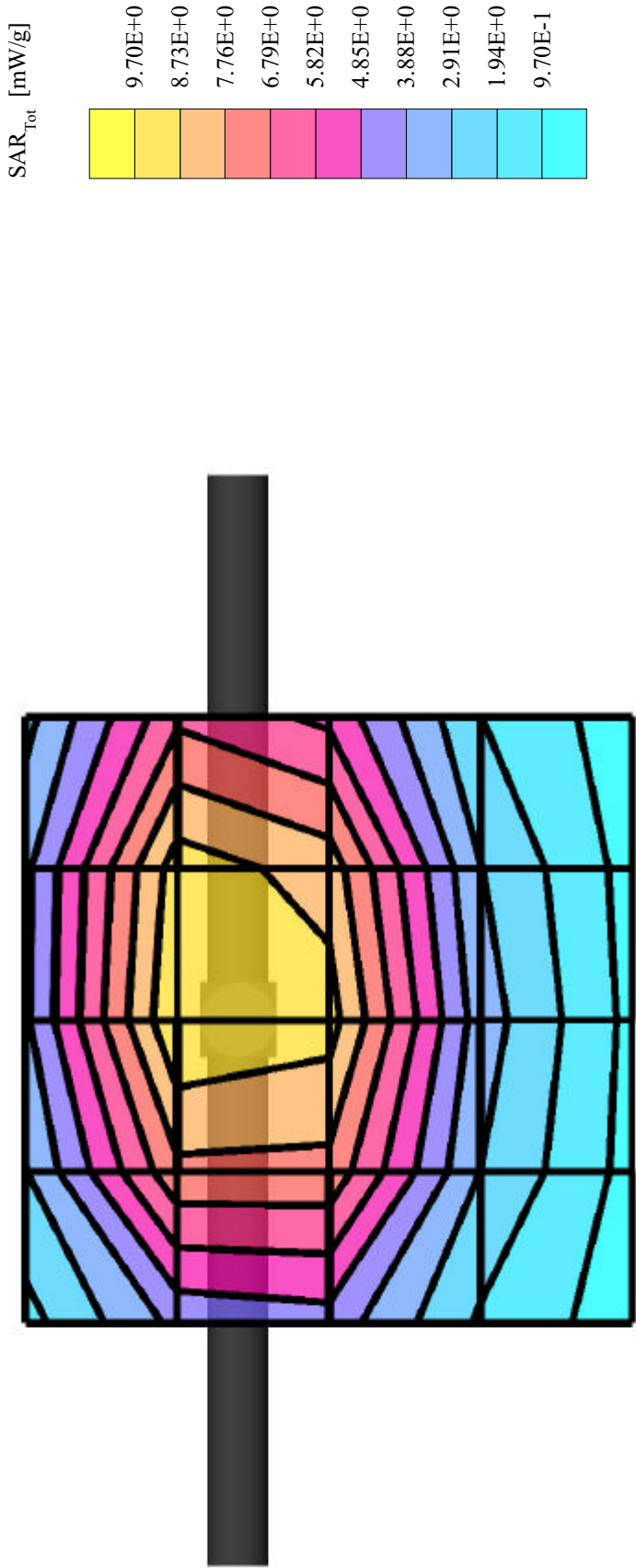
Penetration depth: 7.7 (7.3, 8.6) [mm]

Powerdrift: 0.02 dB

1800MHz Dipole Validation

Conducted Power: 250 mW

Date: January 30, 2002



APPENDIX C - PROBE CALIBRATION

Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Calibrated:	March 26, 2001

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space

Diode Compression

NormX	1.77 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	100 mV
NormY	1.91 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	100 mV
NormZ	1.67 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	100 mV

Sensitivity in Tissue Simulating Liquid

Head	450 MHz	$\epsilon_r = 43.5 \pm 5\%$	$\sigma = 0.87 \pm 10\%$ mho/m
ConvF X	7.36 extrapolated	Boundary effect:	
ConvF Y	7.36 extrapolated	Alpha	0.29
ConvF Z	7.36 extrapolated	Depth	2.72
Head	900 MHz	$\epsilon_r = 42 \pm 5\%$	$\sigma = 0.97 \pm 10\%$ mho/m
ConvF X	6.83 $\pm 7\%$ (k=2)	Boundary effect:	
ConvF Y	6.83 $\pm 7\%$ (k=2)	Alpha	0.37
ConvF Z	6.83 $\pm 7\%$ (k=2)	Depth	2.48
Head	1500 MHz	$\epsilon_r = 40.4 \pm 5\%$	$\sigma = 1.23 \pm 10\%$ mho/m
ConvF X	6.13 interpolated	Boundary effect:	
ConvF Y	6.13 interpolated	Alpha	0.47
ConvF Z	6.13 interpolated	Depth	2.17
Head	1800 MHz	$\epsilon_r = 40 \pm 5\%$	$\sigma = 1.40 \pm 10\%$ mho/m
ConvF X	5.78 $\pm 7\%$ (k=2)	Boundary effect:	
ConvF Y	5.78 $\pm 7\%$ (k=2)	Alpha	0.53
ConvF Z	5.78 $\pm 7\%$ (k=2)	Depth	2.01

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.2 $\pm$ 0.2	mm

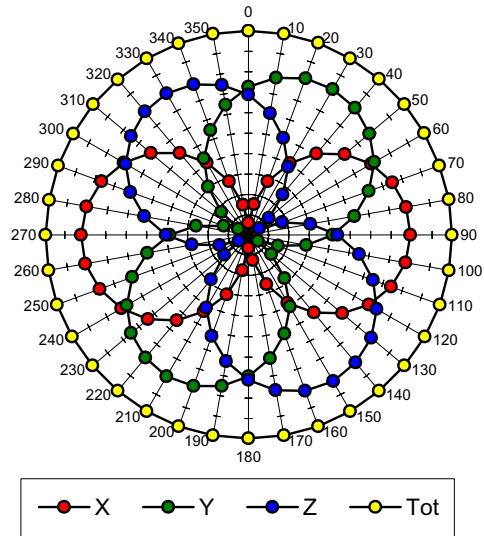
ET3DV6 SN:1590

DASY3 - Parameters of Probe: ET3DV6 SN: 1590

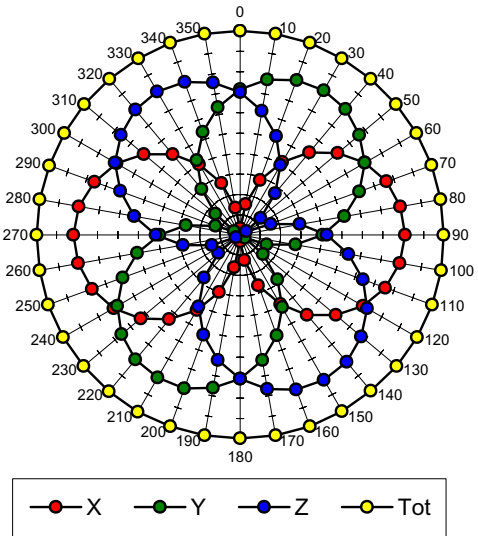
Body	450 MHz	$\epsilon_r = 56.7 \pm 5\%$	$\sigma = 0.94 \pm 10\%$ mho/m
ConvF X	7.23	extrapolated	
ConvF Y	7.23	extrapolated	
ConvF Z	7.23	extrapolated	
Body	900 MHz	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 10\%$ mho/m
ConvF X	6.61	$\pm 7\%$ (k=2)	
ConvF Y	6.61	$\pm 7\%$ (k=2)	
ConvF Z	6.61	$\pm 7\%$ (k=2)	
Body	1500 MHz	$\epsilon_r = 54.0 \pm 5\%$	$\sigma = 1.30 \pm 10\%$ mho/m
ConvF X	5.78	interpolated	
ConvF Y	5.78	interpolated	
ConvF Z	5.78	interpolated	
Body	1800 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 10\%$ mho/m
ConvF X	5.36	$\pm 7\%$ (k=2)	
ConvF Y	5.36	$\pm 7\%$ (k=2)	
ConvF Z	5.36	$\pm 7\%$ (k=2)	

Receiving Pattern (ϕ), $\theta = 0^\circ$

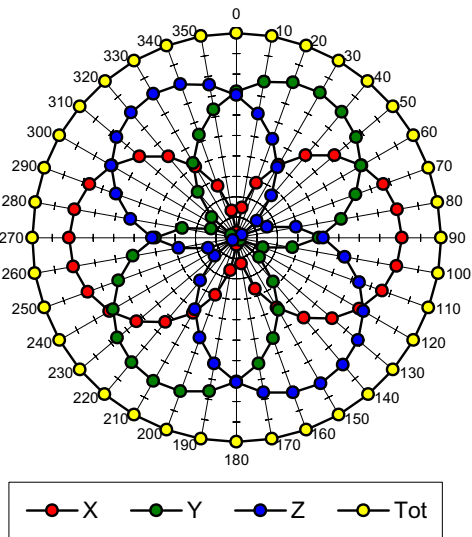
f = 30 MHz, TEM cell ifi110



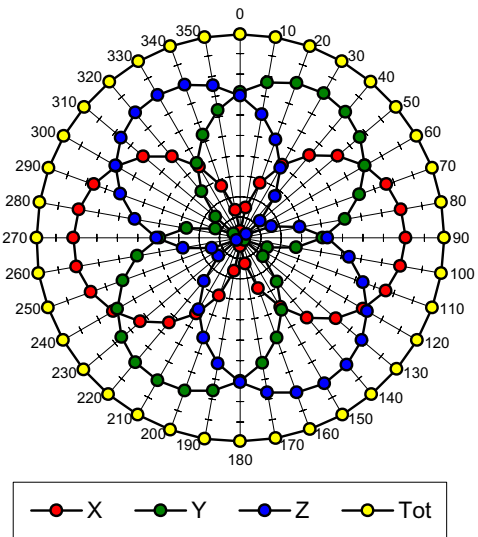
f = 100 MHz, TEM cell ifi110

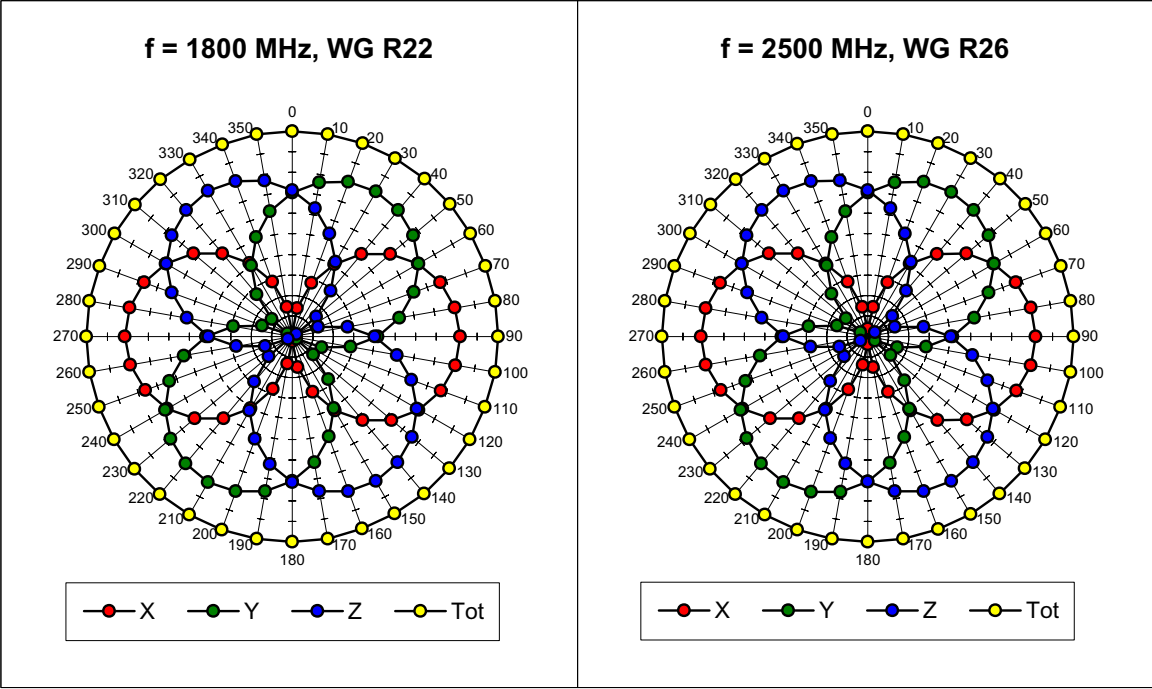


f = 300 MHz, TEM cell ifi110

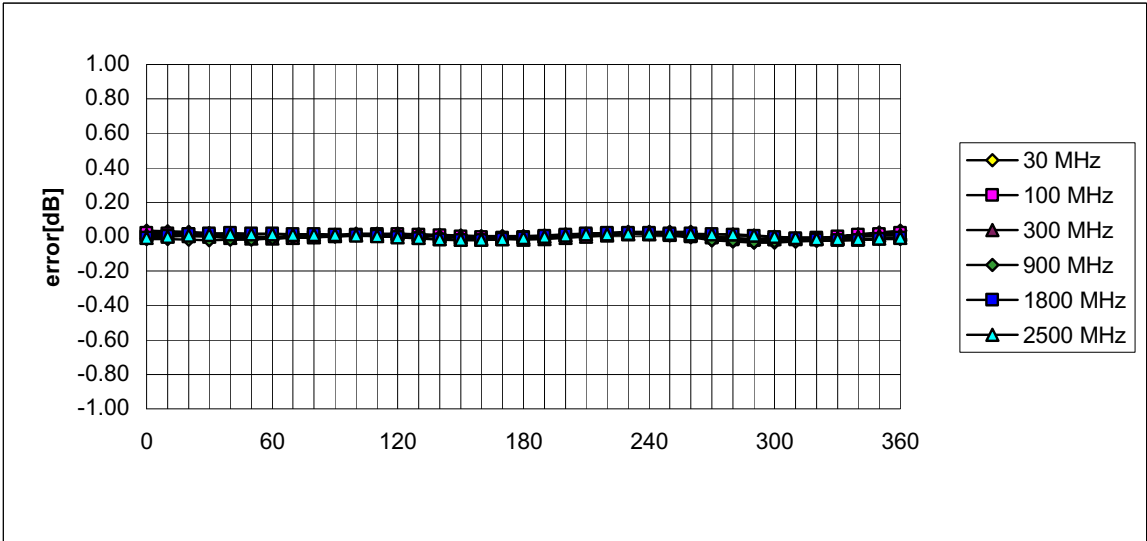


f = 900 MHz, TEM cell ifi110



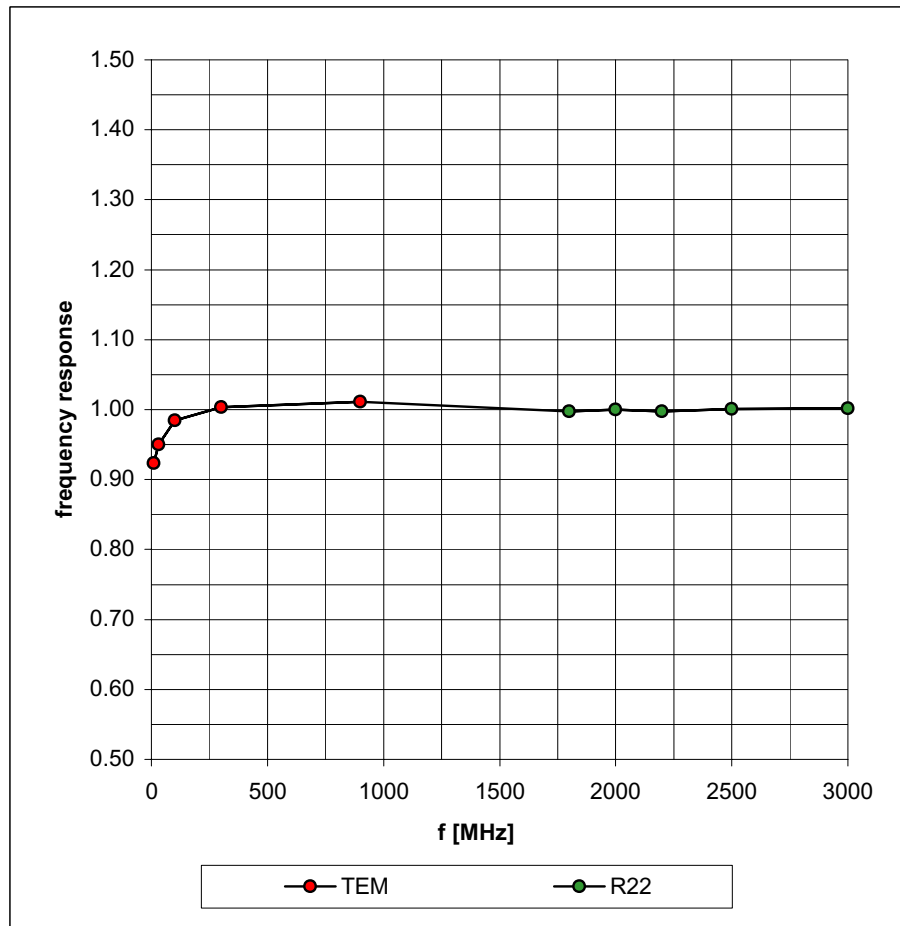


Isotropy Error (ϕ), $\theta = 0^\circ$

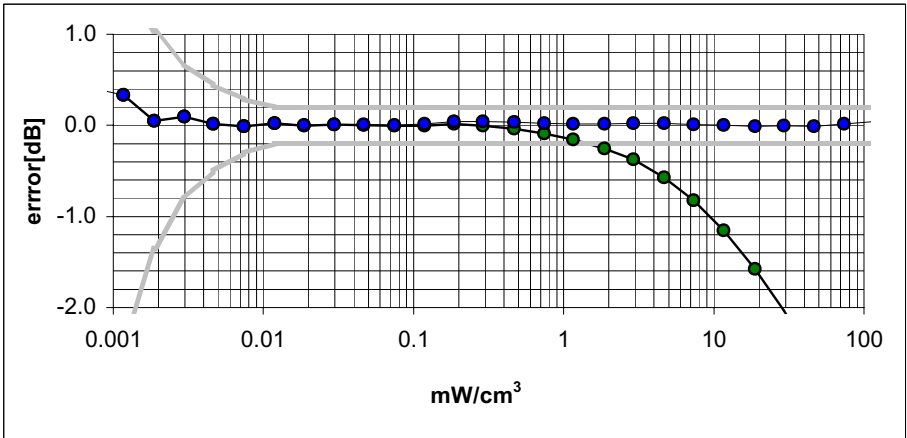
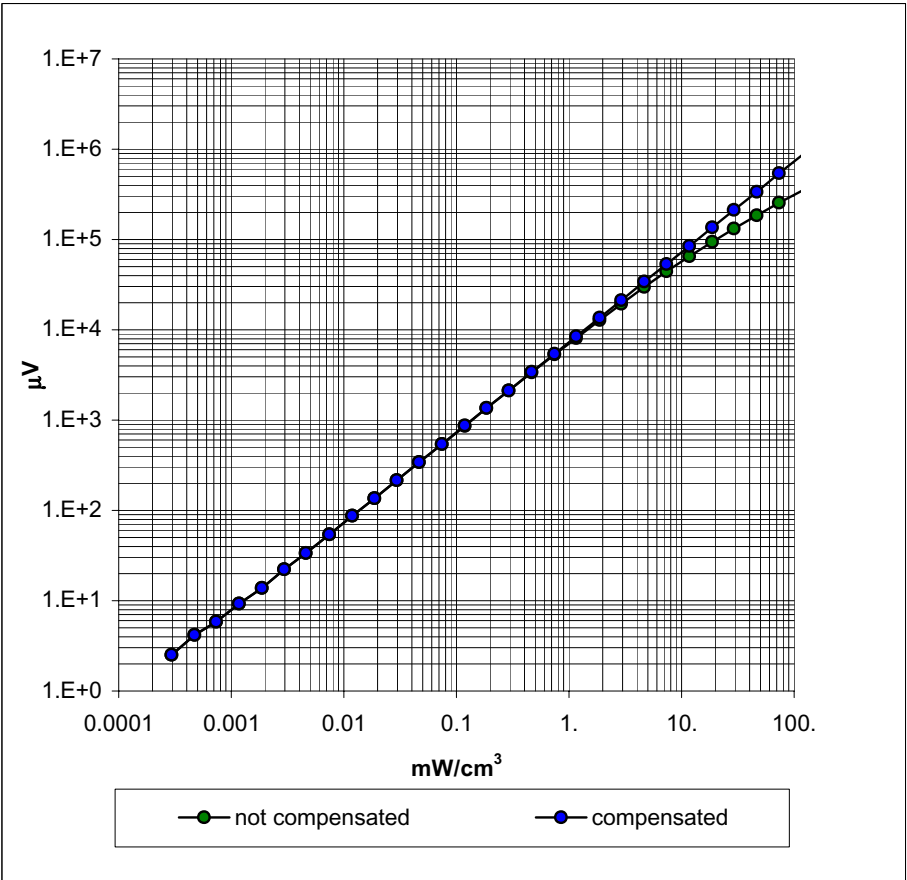


Frequency Response of E-Field

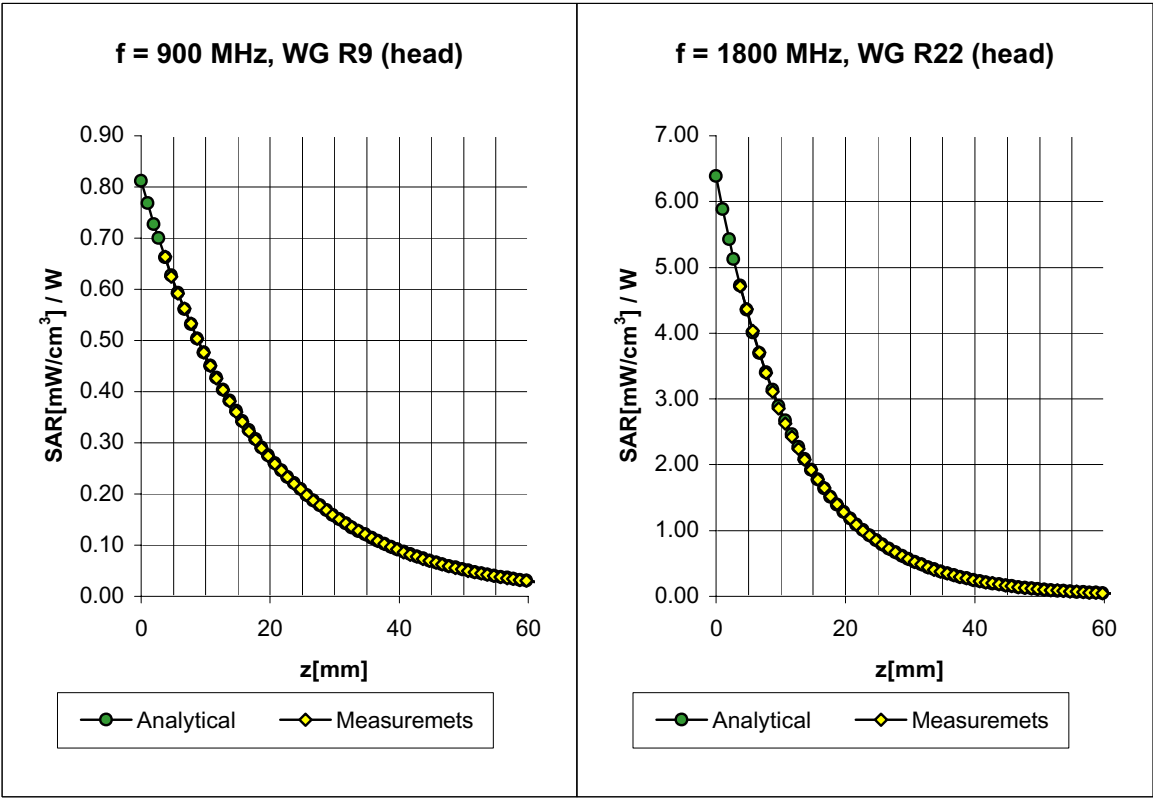
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain})
(TEM-Cell:ifi1110)



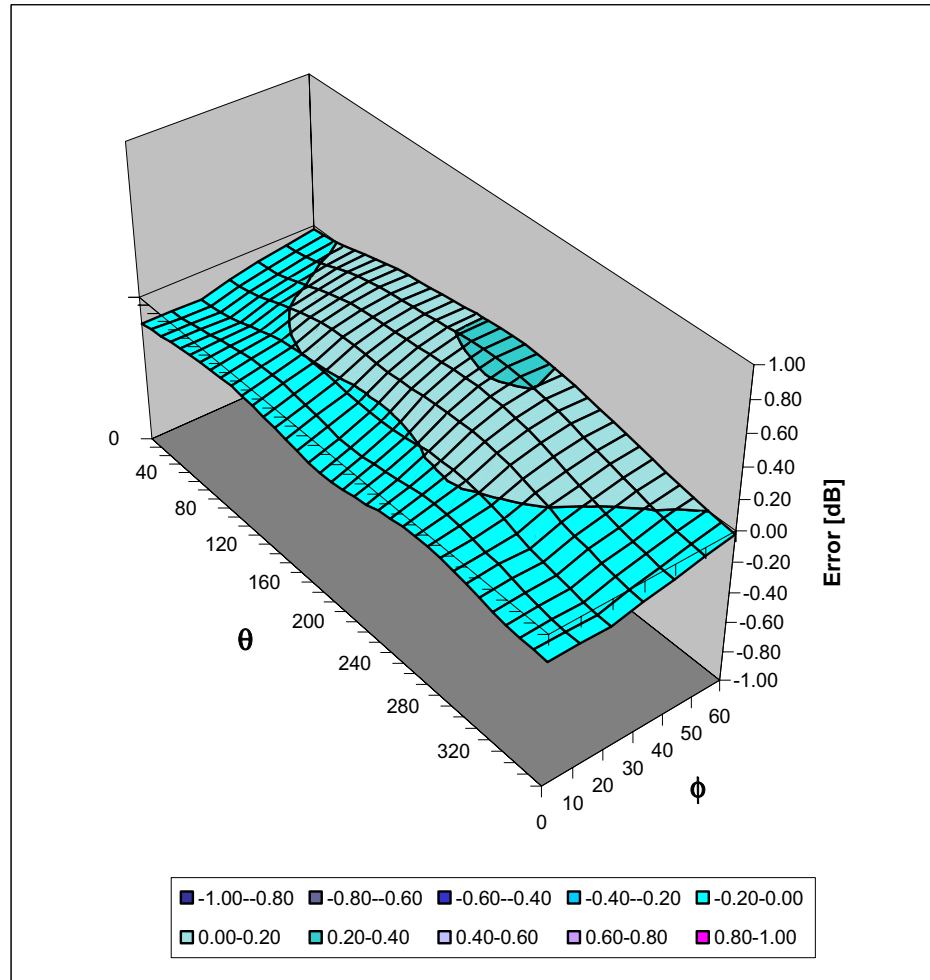
Conversion Factor Assessment



ET3DV6 SN:1590

Deviation from Isotropy in HSL

Error ($\theta\phi$), $f = 900$ MHz



APPENDIX D - MEASURED LIQUID DIELECTRIC PARAMETERS

1800MHz System Validation & EUT Evaluation

Measured Liquid Dielectric Parameters (Head)

January 28, 2002

Frequency	e'	e''
1.750000000 GHz	41.1791	13.9481
1.755000000 GHz	41.1489	13.9568
1.760000000 GHz	41.1369	13.9647
1.765000000 GHz	41.1111	13.9843
1.770000000 GHz	40.0899	13.9900
1.775000000 GHz	40.0725	13.9902
1.780000000 GHz	40.0555	14.0062
1.785000000 GHz	40.0317	14.0008
1.790000000 GHz	40.0199	14.0138
1.795000000 GHz	39.9972	14.0200
1.800000000 GHz	39.9799	14.0260
1.805000000 GHz	39.9620	14.0257
1.810000000 GHz	39.9363	14.0347
1.815000000 GHz	39.9145	14.0395
1.820000000 GHz	39.3900	14.0644
1.825000000 GHz	39.8632	14.0753
1.830000000 GHz	39.8523	14.0861
1.835000000 GHz	39.8507	14.1028
1.840000000 GHz	39.8399	14.1133
1.845000000 GHz	39.8155	14.1246
1.850000000 GHz	39.7985	14.1345
1.855000000 GHz	39.7826	14.1508
1.860000000 GHz	39.7549	14.1566
1.865000000 GHz	39.7438	14.1642
1.870000000 GHz	39.7142	14.1804
1.875000000 GHz	39.7000	14.1962
1.880000000 GHz	39.6866	14.2059
1.885000000 GHz	39.6366	14.2296
1.890000000 GHz	39.6273	14.2434
1.895000000 GHz	39.6190	14.2708
1.900000000 GHz	39.5945	14.2780
1.905000000 GHz	39.5662	14.2863
1.910000000 GHz	39.5452	14.2885
1.915000000 GHz	39.5221	14.3135
1.920000000 GHz	39.4849	14.3174

1800MHz System Validation & EUT Evaluation

Measured Liquid Dielectric Parameters (Head)

January 29, 2002

Frequency	e'	e''
1.750000000 GHz	40.1585	13.9011
1.755000000 GHz	40.1411	13.9091
1.760000000 GHz	40.1239	13.9171
1.765000000 GHz	40.1042	13.9359
1.770000000 GHz	40.0834	13.9367
1.775000000 GHz	40.0692	13.9430
1.780000000 GHz	40.0434	13.9499
1.785000000 GHz	40.0297	13.9560
1.790000000 GHz	40.0139	13.9632
1.795000000 GHz	39.9866	13.9713
1.800000000 GHz	39.9668	13.9738
1.805000000 GHz	39.9522	13.9821
1.810000000 GHz	39.9311	13.9952
1.815000000 GHz	39.9197	14.0029
1.820000000 GHz	39.8989	14.0135
1.825000000 GHz	39.8617	14.0219
1.830000000 GHz	39.8476	14.0283
1.835000000 GHz	39.8368	14.0505
1.840000000 GHz	39.8316	14.0699
1.845000000 GHz	39.8067	14.0884
1.850000000 GHz	39.7909	14.0877
1.855000000 GHz	39.7777	14.0993
1.860000000 GHz	39.7552	14.1231
1.865000000 GHz	39.7405	14.1243
1.870000000 GHz	39.7039	14.1354
1.875000000 GHz	39.6918	14.1534
1.880000000 GHz	39.6787	14.1735
1.885000000 GHz	39.6530	14.1937
1.890000000 GHz	39.6314	14.2020
1.895000000 GHz	39.6137	14.2144
1.900000000 GHz	39.5918	14.2350
1.905000000 GHz	39.5649	14.2435
1.910000000 GHz	39.5397	14.2428
1.915000000 GHz	39.5189	14.2799
1.920000000 GHz	39.4979	14.2854

1800MHz System Validation

Measured Liquid Dielectric Parameters (Head)

January 30, 2002

Frequency	e'	e''
1.750000000 GHz	39.6566	13.9084
1.755000000 GHz	39.6373	13.9238
1.760000000 GHz	39.6155	13.9344
1.765000000 GHz	39.5931	13.9485
1.770000000 GHz	39.5788	13.9394
1.775000000 GHz	39.5646	13.9457
1.780000000 GHz	39.5429	13.9595
1.785000000 GHz	39.5219	13.9636
1.790000000 GHz	39.5229	13.9732
1.795000000 GHz	39.4861	13.9808
1.800000000 GHz	39.4667	13.9810
1.805000000 GHz	39.4597	13.9862
1.810000000 GHz	39.4268	13.9885
1.815000000 GHz	39.4171	13.9984
1.820000000 GHz	39.3884	14.0167
1.825000000 GHz	39.3533	14.0388
1.830000000 GHz	39.3464	14.0470
1.835000000 GHz	39.3319	14.0719
1.840000000 GHz	39.3369	14.0787
1.845000000 GHz	39.3131	14.0972
1.850000000 GHz	39.2928	14.1014
1.855000000 GHz	39.2720	14.1090
1.860000000 GHz	39.2501	14.1144
1.865000000 GHz	39.2402	14.1243
1.870000000 GHz	39.2111	14.1462
1.875000000 GHz	39.1941	14.1486
1.880000000 GHz	39.1752	14.1762
1.885000000 GHz	39.1463	14.1921
1.890000000 GHz	39.1219	14.2052
1.895000000 GHz	39.1097	14.2227
1.900000000 GHz	39.0799	14.2452
1.905000000 GHz	39.0550	14.2558
1.910000000 GHz	39.0450	14.2660
1.915000000 GHz	39.0224	14.2842
1.920000000 GHz	38.9996	14.2966

1800MHz EUT Evaluation

Measured Liquid Dielectric Parameters (Body)

January 30, 2002

Frequency	e'	e''
1.750000000 GHz	53.5662	15.1334
1.755000000 GHz	53.5372	15.1321
1.760000000 GHz	53.5115	15.1429
1.765000000 GHz	53.5086	15.1494
1.770000000 GHz	53.4998	15.1572
1.775000000 GHz	53.4779	15.1576
1.780000000 GHz	53.4587	15.1521
1.785000000 GHz	53.4533	15.1535
1.790000000 GHz	53.4393	15.1659
1.795000000 GHz	53.4222	15.1700
1.800000000 GHz	53.4124	15.1862
1.805000000 GHz	53.3981	15.1880
1.810000000 GHz	53.3931	15.2002
1.815000000 GHz	53.3788	15.2094
1.820000000 GHz	53.3739	15.2290
1.825000000 GHz	53.3633	15.2498
1.830000000 GHz	53.3457	15.2621
1.835000000 GHz	53.3436	15.2830
1.840000000 GHz	53.3454	15.3077
1.845000000 GHz	53.3434	15.3359
1.850000000 GHz	53.3269	15.3511
1.855000000 GHz	53.3193	15.3511
1.860000000 GHz	53.3059	15.3894
1.865000000 GHz	53.2907	15.3963
1.870000000 GHz	53.2724	15.4319
1.875000000 GHz	53.2692	15.4428
1.880000000 GHz	53.2484	15.4623
1.885000000 GHz	53.2143	15.4867
1.890000000 GHz	53.1960	15.5078
1.895000000 GHz	53.1796	15.5383
1.900000000 GHz	53.1661	15.5553
1.905000000 GHz	53.1432	15.5737
1.910000000 GHz	53.1228	15.5861
1.915000000 GHz	53.0833	15.6052
1.920000000 GHz	53.0635	15.6211

APPENDIX E - SAM PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner Engineering AG

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

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9

(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

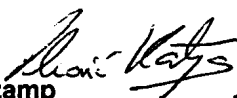
Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date

18.11.2001

Signature / Stamp



**Schmid & Partner
Engineering AG**



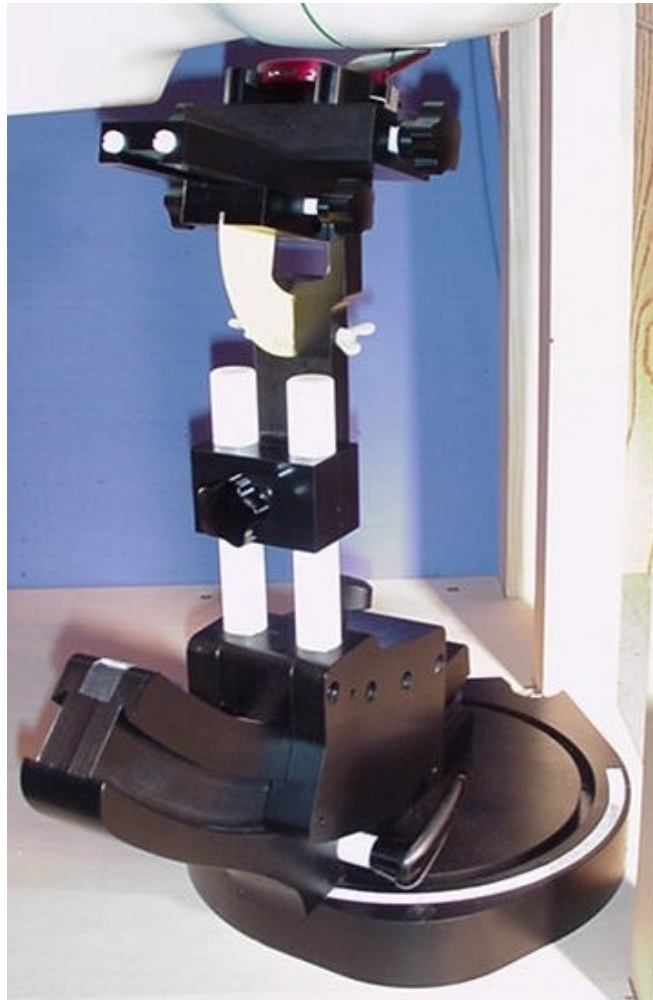
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

APPENDIX F - SAR TEST SETUP PHOTOGRAPHS

SAR TEST SETUP PHOTOGRAPHS
Left Head Section – Cheek/Touch Position



SAR TEST SETUP PHOTOGRAPHS
Left Head Section – Ear/Tilt Position



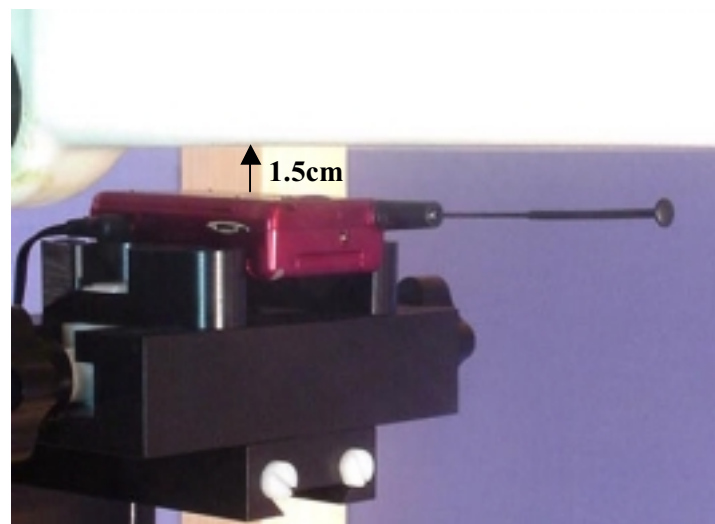
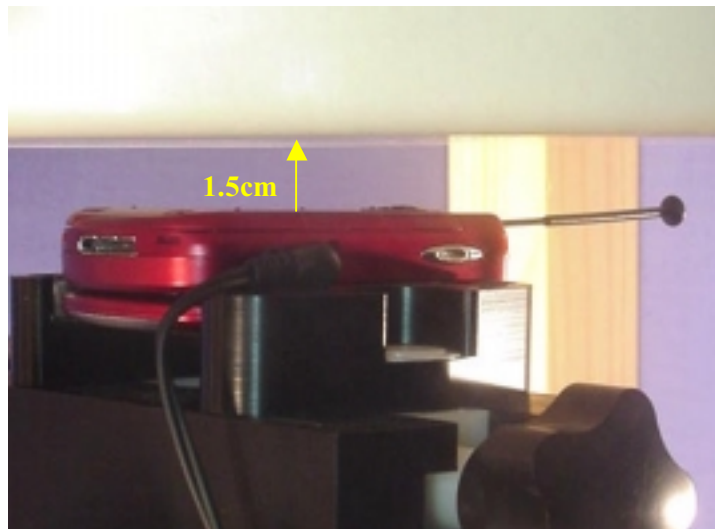
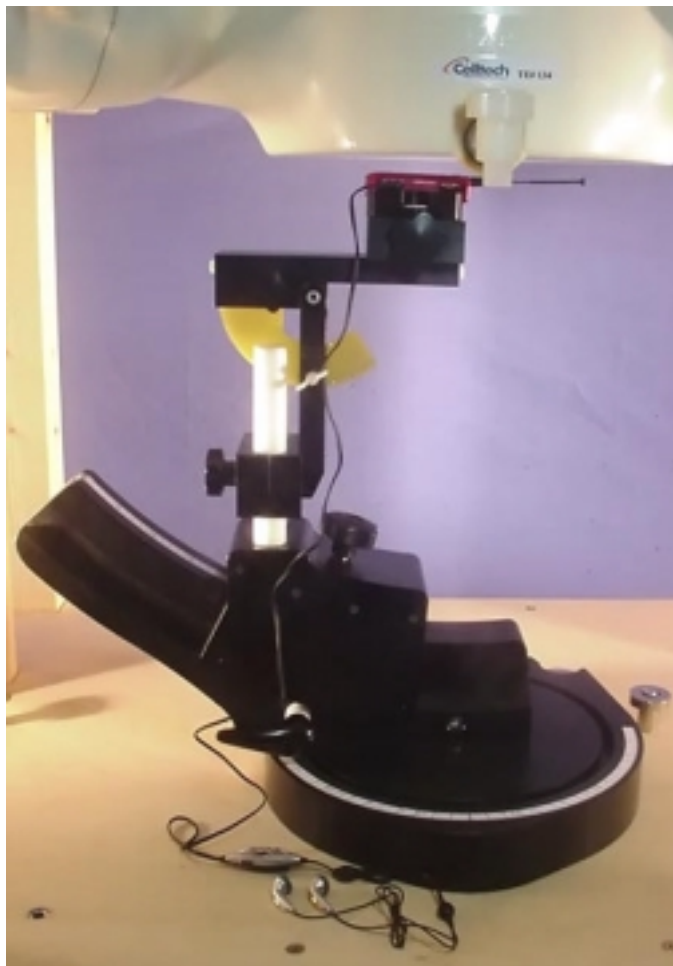
SAR TEST SETUP PHOTOGRAPHS
Right Head Section – Cheek/Touch Position



SAR TEST SETUP PHOTOGRAPHS
Right Head Section – Ear/Tilt Position



SAR TEST SETUP PHOTOGRAPHS
Planar Section - Body-Worn Configuration
1.5 cm Separation Distance - with Standard Battery



SAR TEST SETUP PHOTOGRAPHS
Planar Section – Body-Worn Configuration
1.5 cm Separation Distance - with Extended Battery

