CERTIFICATE OF COMPLIANCE
SAR EVALUATION

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Applicant Information:
KENWOOD COMMUNICATIONS CORP.
3975 Johns Creek Court, Suite 300
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FCC Rule Part(s):	**2.1093; ET Docket 96-326**
FCC ID:	**ALH33063110**
Model(s):	**TK-5400**
EUT Type(s):	**Portable FM PTT Radio Transceiver**
Modulation:	**FM**
Tx Frequency Range(s):	**806 - 824 MHz**
Rated RF Conducted Power:	**3 Watts**
Antenna Type(s):	**1/2 Wave Whip Antenna**
Battery Type(s):	**7.2 VDC NiMH Battery (KNB-22N)**

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 (Occupational/Controlled 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.

Shawn McMillen
General Manager
Celltech Research Inc.

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1.0 INTRODUCTION

This measurement report shows that the KENWOOD COMMUNICATIONS CORP. Model: TK-5400 Portable FM PTT Radio Transceiver FCC ID: ALH33063110 complies with FCC Part 2.1093, ET Docket 96-326 Rules for mobile and portable devices (controlled exposure). 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)

FCC Rule Part(s)	2.1093; ET Docket 96.326
EUT Type	Portable FM PTT Radio Transceiver
FCC ID	ALH33063110
Model(s)	TK-5400
Serial No.	Pre-production
Modulation	FM
Tx Frequency Range (MHz)	806 - 824 MHz
Rated RF Conducted Output Power	3 Watts
Antenna Type(s)	1/2 Wave Whip Antenna
Antenna Length	17.5 cm
Body-Worn Accessories	Speaker-Microphone Plastic Belt-Clip
Battery Type(s)	7.2 VDC 2100mAh NiMH (KNB-22N)

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, 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 small planar phantom

4.0 MEASUREMENT SUMMARY

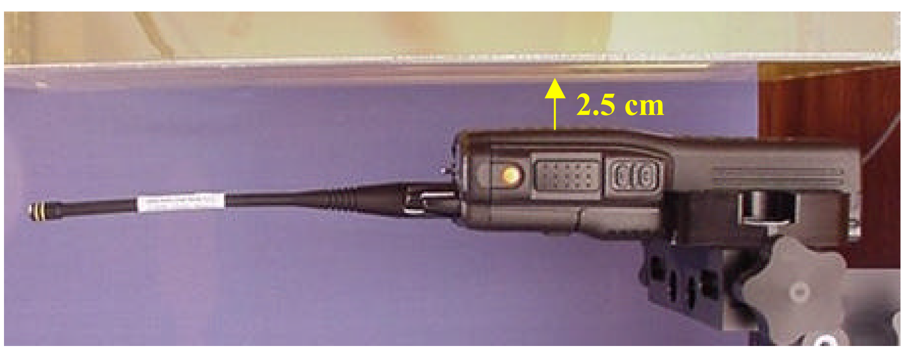
The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the EUT are reported in Appendix A.

Face-Held SAR Measurement Results

Freq. (MHz)	Channel	Mode	Conducted Power Before (W)	Conducted Power After (W)	Separation Distance (cm)	SAR (w/kg)	
						100% Duty Cycle	50% Duty Cycle
806.0500	Low	CW	3.11	2.98	2.5	1.79	0.895
815.0000	Mid	CW	2.99	2.87	2.5	2.16	1.08
823.9875	High	CW	2.99	2.98	2.5	2.58	1.29
Mixture Type: Brain Dielectric Constant: 41.4 Conductivity: 0.90 (Measured)			**ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak: Controlled Exposure / Occupational BRAIN: 8.0 W/kg (averaged over 1 gram)**				

Notes:

1. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest face-held SAR value found was 2.58 w/kg (100% duty cycle).
3. The EUT was tested for face-held SAR with a 2.5cm separation distance between the front of the EUT and the outer surface of the small planar phantom.
4. Ambient TEMPERATURE: 21.1 °C
   Relative HUMIDITY: 35 %
   Atmospheric PRESSURE: 102.1 kPa
5. Fluid Temperature ≈ 21.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.



Face-held SAR Test Setup - 2.5cm Separation Distance

Body-Worn SAR Measurement Results

Freq. (MHz)	Channel	Mode	Conducted Power Before (W)	Conducted Power After (W)	Belt-Clip Separation Distance (cm)	SAR (w/kg)	
						100% Duty Cycle	50% Duty Cycle
806.0500	Low	CW	3.11	2.96	1.2	4.33	2.17
815.0000	Mid	CW	2.99	2.94	1.2	5.49	2.75
823.9875	High	CW	2.99	2.81	1.2	6.66	3.33
Mixture Type: Body Dielectric Constant: 55.4 Conductivity: 0.97 (Measured)			ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Controlled Exposure / Occupational BRAIN: 8.0 W/kg (averaged over 1 gram)				

Notes:

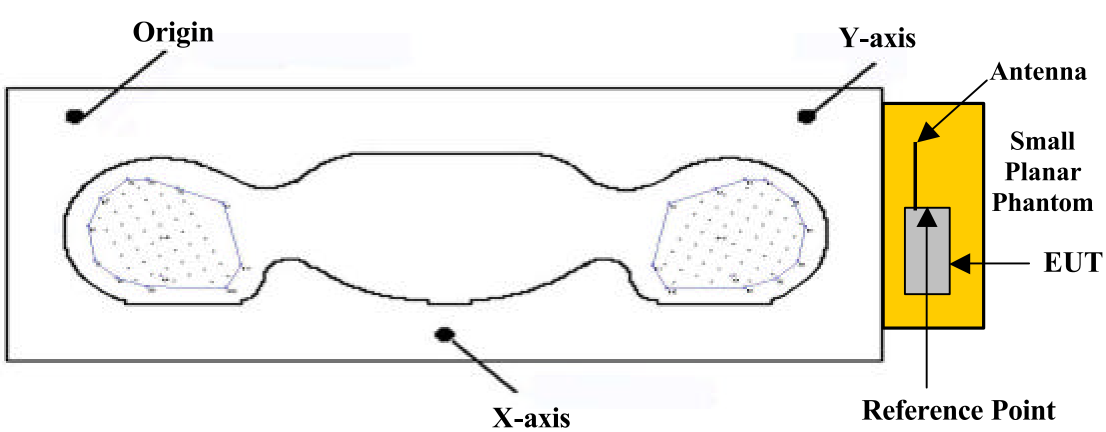
1. The highest SAR value found was below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest body-worn SAR value found was 6.66 w/kg (100% duty cycle).
3. The EUT was tested for body-worn SAR with speaker-microphone and plastic belt-clip accessories. The belt-clip provided a 1.2cm separation distance between the back of the EUT and the outer surface of the small planar phantom.
4. Ambient TEMPERATURE: 21.1 °C
   Relative HUMIDITY: 35 %
   Atmospheric PRESSURE: 102.1 kPa
5. Fluid Temperature ≈ 21.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

Body-worn SAR Test Setup - 1.2cm Belt-Clip Separation Distance

5.0 DETAILS OF SAR EVALUATION

The KENWOOD COMMUNICATIONS CORP. Model: TK-5400 Portable FM PTT Radio Transceiver FCC ID: ALH33063110 was found to be compliant for localized Specific Absorption Rate (controlled exposure) based on the following test provisions and conditions:

1. The EUT was evaluated in a face-held configuration with the front of the device placed parallel to the outer surface of the small planar phantom. A 2.5cm separation distance was maintained between the front of the EUT and the outer surface of the small planar phantom for the duration of the test.
2. The EUT was tested in a body-worn configuration with speaker-microphone and plastic belt-clip accessories. The attached belt-clip was positioned touching the outer surface of the planar phantom, and provided a 1.2cm separation distance between the back of the EUT and the outer surface of the small planar phantom.
3. The EUT was evaluated for SAR 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.
4. The conducted power was measured according to the procedures described in FCC Part 2.1046.
5. The EUT was tested with the transmitter in continuous operation (100% duty cycle) throughout the SAR evaluation. As this is a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
6. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and its antenna.
7. The EUT was tested with a fully charged battery.



Phantom Reference Point & EUT Positioning

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. Depending on the phantom used for the evaluation, all other phantoms were drained of fluid.

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 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 was no less than 15.0cm.

e. The target tissue parameters for 835MHz were used in the SAR evaluation software. If there was any appreciable variation in the measured tissue parameters from the target values specified then the SAR was adjusted using the sensitivities to SAR (see "Appendix E - SAR Sensitivities").

f. The E-field probe conversion factors outside the calibrated points were determined as follows:

- In brain and body tissue between 750MHz and 1GHz, the conversion factor decreases approximately 1.3% per 100MHz frequency increase.
- In brain and body tissue between 1.6GHz and 2GHz, the conversion factor decreases approximately 1% per 100MHz frequency increase.

For body tissue around 900MHz (permittivity about 30% higher and conductivity about 15% higher than brain tissue):

- The conversion factor in body tissue is approximately 3% lower than for brain tissue for the same frequency.

Face-held SAR Test Setup with small planar phantom

Body-worn SAR Test Setup with small planar phantom

7.0 SYSTEM VALIDATION

Prior to the assessment, the system was verified in a planar phantom with a 900MHz dipole. A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of ±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	Ambient Temperature	Validation Date
D900V2	2.78	2.77	≈21.0 °C	21.1°C	12/20/01

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:

TISSUE PARAMETERS FOR DIPOLE VALIDATION			
Brain Equivalent Tissue	**Dielectric Constant e_r**	**Conductivity s (mho/m)**	**r (Kg/m^3)**
900MHz (Target)	41.5 ±5%	0.97 ±5%	1000
900MHz (Measured) 12/20/01	41.4	0.97	1000

TISSUE PARAMETERS FOR EUT EVALUATION			
Brain Equivalent Tissue	**Dielectric Constant e_r**	**Conductivity s (mho/m)**	**r (Kg/m^3)**
835MHz (Target)	41.5 ±5%	0.90 ±5%	1000
835MHz (Measured) 12/20/01	41.4	0.90	1000

TISSUE PARAMETERS FOR EUT EVALUATION			
Body Equivalent Tissue	**Dielectric Constant e_r**	**Conductivity s (mho/m)**	**r (Kg/m^3)**
835MHz (Target)	55.2 ±5%	0.97 ±5%	1000
835MHz (Measured) 12/20/01	55.4	0.97	1000

9.0 SIMULATED TISSUES

The brain and body mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures and measured for dielectric parameters (permitivity and conductivity).

TISSUE MIXTURE Dipole Validation & EUT Evaluation			
INGREDIENT	**900MHz Validation Brain Mixture (%)**	**835MHz Evaluation Brain Mixture (%)**	**835MHz Evaluation Body Mixture (%)**
Water	40.71	40.71	53.70
Sugar	56.63	56.63	45.10
Salt	1.48	1.48	0.97
HEC	1.00	1.00	0.13
Bactericide	0.18	0.18	0.10

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 1g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10g)	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

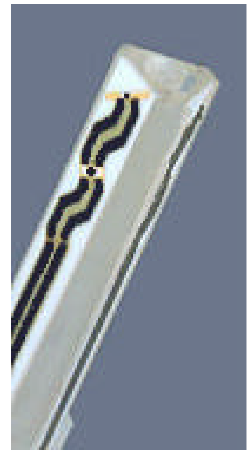
Model:	ET3DV6
Serial No.:	1590
Construction:	Triangular core fiber optic detection system
Frequency:	10 MHz to 6 GHz
Linearity:	± 0.2 dB (30 MHz to 3 GHz)

Phantom

Type:	Small Planar Phantom
Shell Material:	Plexiglas
Bottom Thickness:	2.0 mm ± 0.1mm
Dimensions:	Box: 36.5cm (L) x 22.5cm (W) x 20.3cm (H); Back Plane: 25.3cm (H)

12.0 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 ± 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)
Dynam. Rnge: 5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Srfce. Detect. ± 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

13.0 SMALL PLANAR PHANTOM

The small planar phantom is constructed of Plexiglas material with a 2.0mm shell thickness for face-held and body-worn SAR evaluations. The small planar phantom is mounted onto the outer left hand section of the DASY3 system.

Small Planar Phantom

14.0 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

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 -SAM Phantom V4.0C -Small Planar Phantom	 599396-01 1590 135 136 054 247 N/A N/A	 N/A Mar 2001 Oct 2001 Oct 2001 June 2001 June 2001 N/A N/A
85070C Dielectric Probe Kit	N/A	N/A
Gigatronics 8652A Power Meter -Power Sensor 80701A -Power Sensor 80701A	1835272 1833535 1833542	Oct 2001 Jan 2001 Feb 2001
E4408B Spectrum Analyzer	US39240170	Nov 2001
8594E Spectrum Analyzer	3543A02721	Mar 2001
8753E Network Analyzer	US38433013	Nov 2001
8648D Signal Generator	3847A00611	Aug 2001
5S1G4 Amplifier Research Power Amplifier	26235	N/A

16.0 MEASUREMENT UNCERTAINTIES

Uncertainty Description	Error	Distribution	Weight	Standard Deviation	Offset
Probe Uncertainty					
Axial isotropy	±0.2 dB	U-Shaped	0.5	±2.4 %	
Spherical isotropy	±0.4 dB	U-Shaped	0.5	±4.8 %	
Isotropy from gradient	±0.5 dB	U-Shaped	0	±	
Spatial resolution	±0.5 %	Normal	1	±0.5 %	
Linearity error	±0.2 dB	Rectangle	1	±2.7 %	
Calibration error	±3.3 %	Normal	1	±3.3 %	
SAR Evaluation Uncertainty					
Data acquisition error	±1 %	Rectangle	1	±0.6 %	
ELF and RF disturbances	±0.25 %	Normal	1	±0.25 %	
Conductivity assessment	±5 %	Rectangle	1	±5.8 %	
Spatial Peak SAR Evaluation Uncertainty					
Extrapolated boundary effect	±3 %	Normal	1	±3 %	±5 %
Probe positioning error	±0.1 mm	Normal	1	±1 %	
Integrated and cube orientation	±3 %	Normal	1	±3 %	
Cube Shape inaccuracies	±2 %	Rectangle	1	±1.2 %	
Device positioning	±6 %	Normal	1	±6 %	
Combined Uncertainties				±11.7 %	±5 %

Measurement uncertainties in SAR measurements are difficult to quantify due to several variables including biological, physiological, and environmental.

According to ANSI/IEEE C95.3, the overall uncertainties are difficult to assess and will vary with the type of meter and usage situation. However, accuracy's of ± 1 to 3 dB can be expected in practice, with greater uncertainties in near-field situations and at higher frequencies (shorter wavelengths), or areas where large reflecting objects are present. Under optimum measurement conditions, SAR measurement uncertainties of at least ± 2dB can be expected.

According to CENELEC, typical worst-case uncertainty of field measurements is ± 5 dB.
For well-defined modulation characteristics the uncertainty can be reduced to ± 3 dB.

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. 20554: 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.

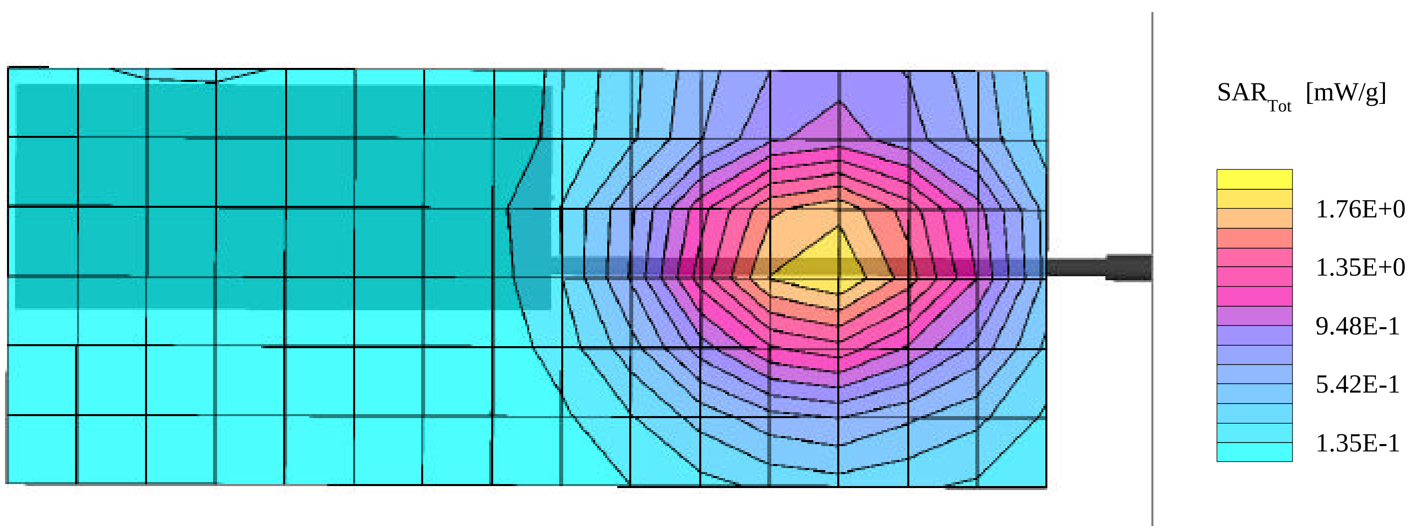
(4) Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetric evaluation of mobile communications equipment with know precision", IEICE Transactions of Communications, vol. E80-B, no. 5, pp. 645 – 652: May 1997.

APPENDIX A - SAR MEASUREMENT DATA

Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0
835 MHz Brain: σ = 0.90 mho/m ε_r = 41.5 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.20 dB
SAR (1g): 1.79 mW/g, SAR (10g): 1.29 mW/g

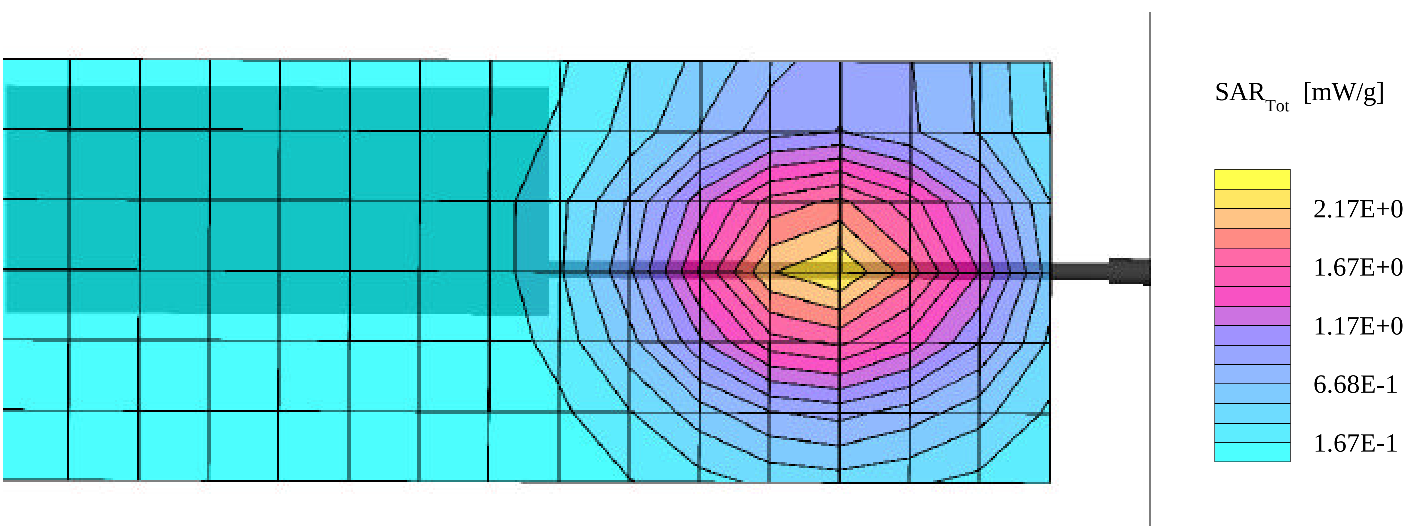
Face SAR at 2.5cm Separation Distance
Kenwood Model: TK-5400
Continous Wave Mode
Low Channel [806.0500 MHz]
Conducted Power: 3.11 Watts
Date Tested: Dec. 20, 2001



Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0
835 MHz Brain: σ = 0.90 mho/m ε_r = 41.5 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.22 dB
SAR (1g): 2.16 mW/g, SAR (10g): 1.56 mW/g

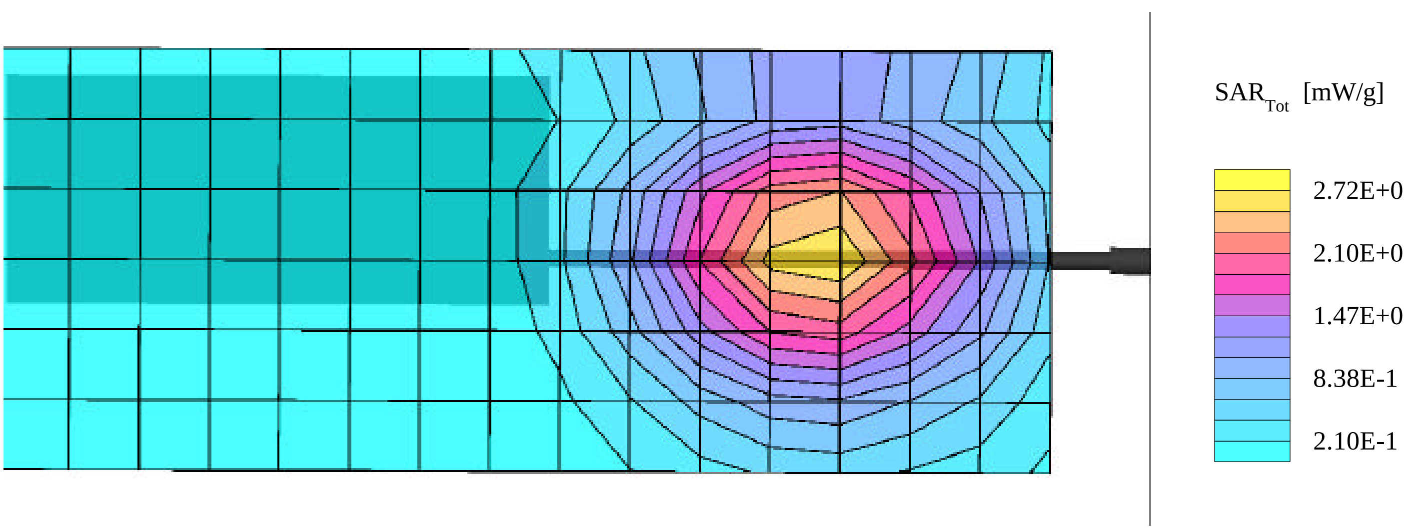
Face SAR at 2.5cm Separation Distance
Kenwood Model: TK-5400
Continous Wave Mode
Mid Channel [815.0000 MHz]
Conducted Power: 2.99 Watts
Date Tested: Dec. 20, 2001



Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0
835 MHz Brain: σ = 0.90 mho/m ε_r = 41.5 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: 0.03 dB
SAR (1g): 2.58 mW/g, SAR (10g): 1.86 mW/g

Face SAR at 2.5cm Separation Distance
Kenwood Model: TK-5400
Continous Wave Mode
High Channel [823.9875 MHz]
Conducted Power: 2.99 Watts
Date Tested: Dec. 20, 2001

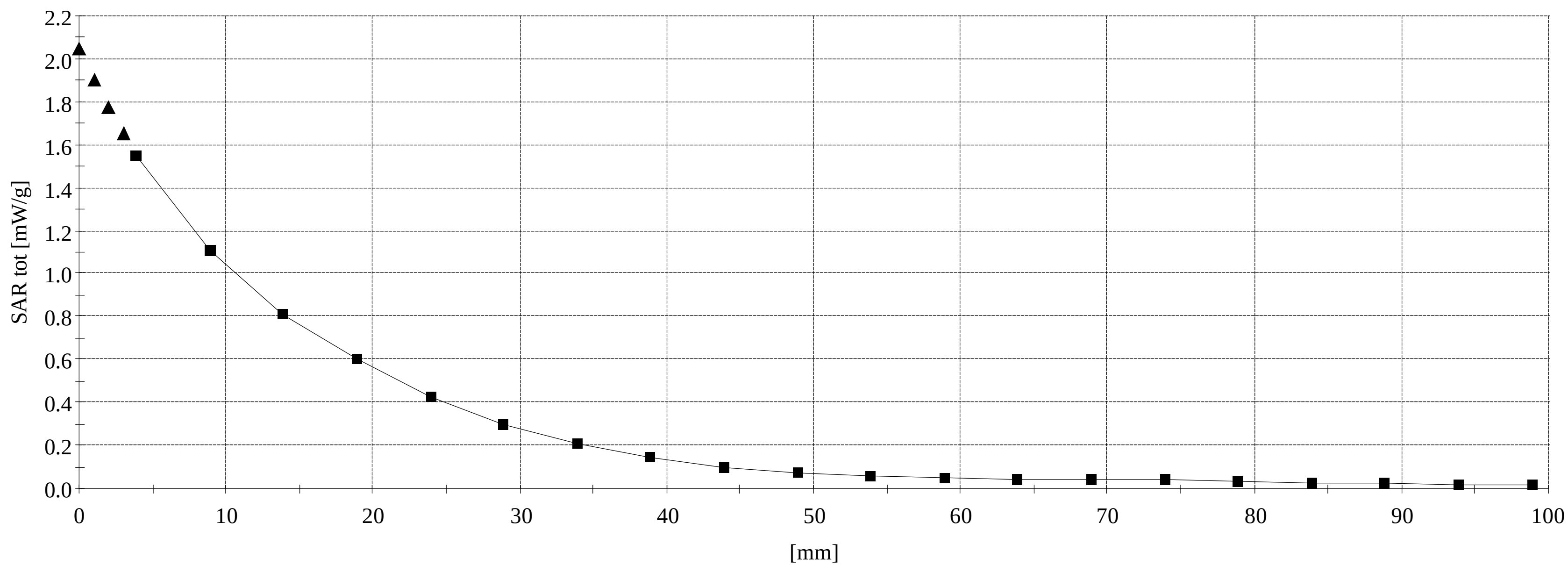


Kenwood FCC ID: ALH33063110

Small Planar Phantom; Section
Probe: ET3DV6 - SN1590; ConvF(6.91,6.91,6.91); Crest factor: 1.0;
835 MHz Brain: σ = 0.90 mho/m ε_r = 41.5 ρ = 1.00 g/cm^3

Z-Axis Extrapolation at Peak SAR Location

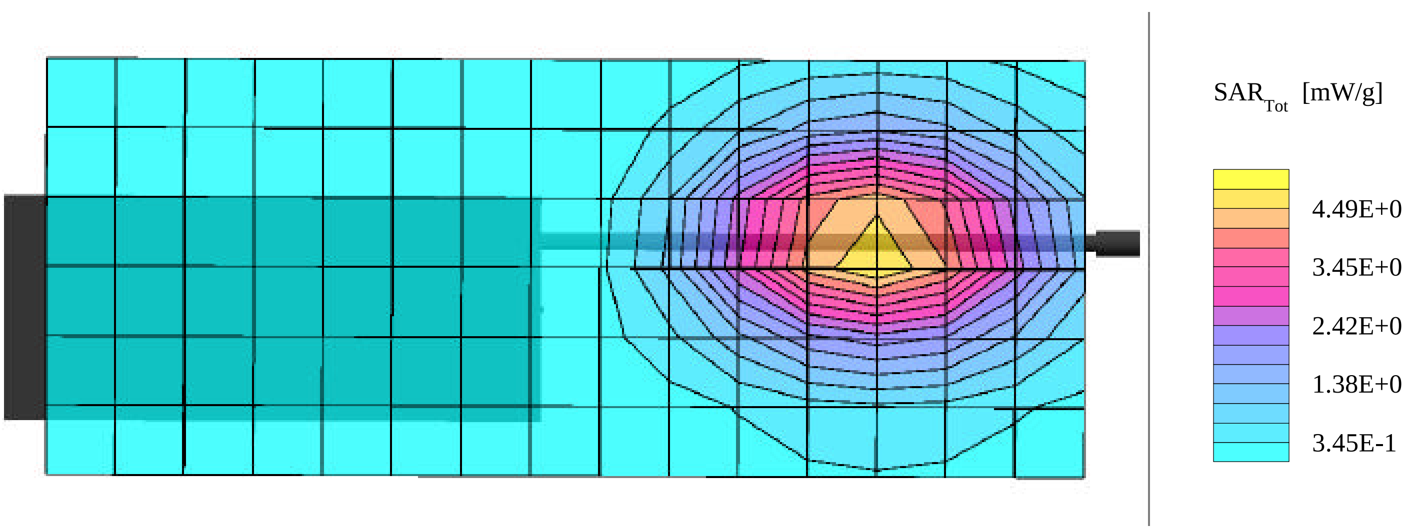
Face SAR at 2.5cm Separation Distance
Kenwood Model: TK-5400
Continous Wave Mode
High Channel [823.9875 MHz]
Conducted Power: 2.99 Watts
Date Tested: Dec. 20, 2001



Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 55.2 ρ = 1.00 g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.17 dB
SAR (1g): 4.33 mW/g, SAR (10g): 3.06 mW/g

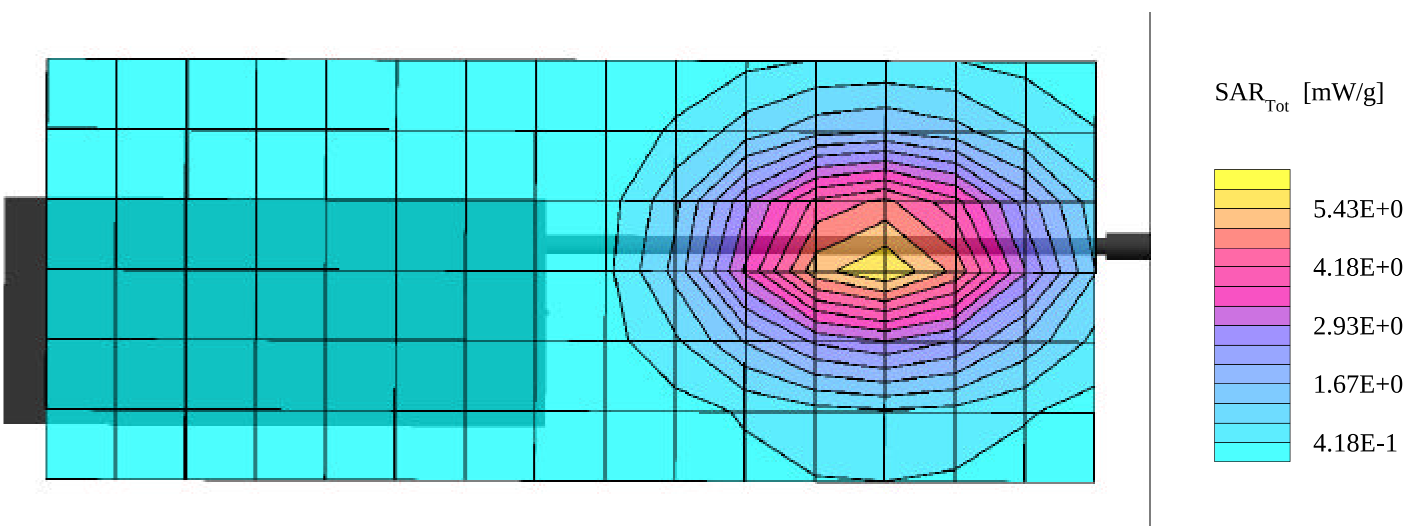
Body-Worn SAR with 1.2cm Belt-Clip Separation
Kenwood Model: TK-5400
Continous Wave Mode
Low Channel [806.0500 MHz]
Conducted Power: 3.11 Watts
Date Tested: Dec. 20, 2001



Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: $\sigma = 0.97$ mho/m $\varepsilon_r = 55.2$ $\rho = 1.00$ g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.12 dB
SAR (1g): 5.49 mW/g, SAR (10g): 3.86 mW/g

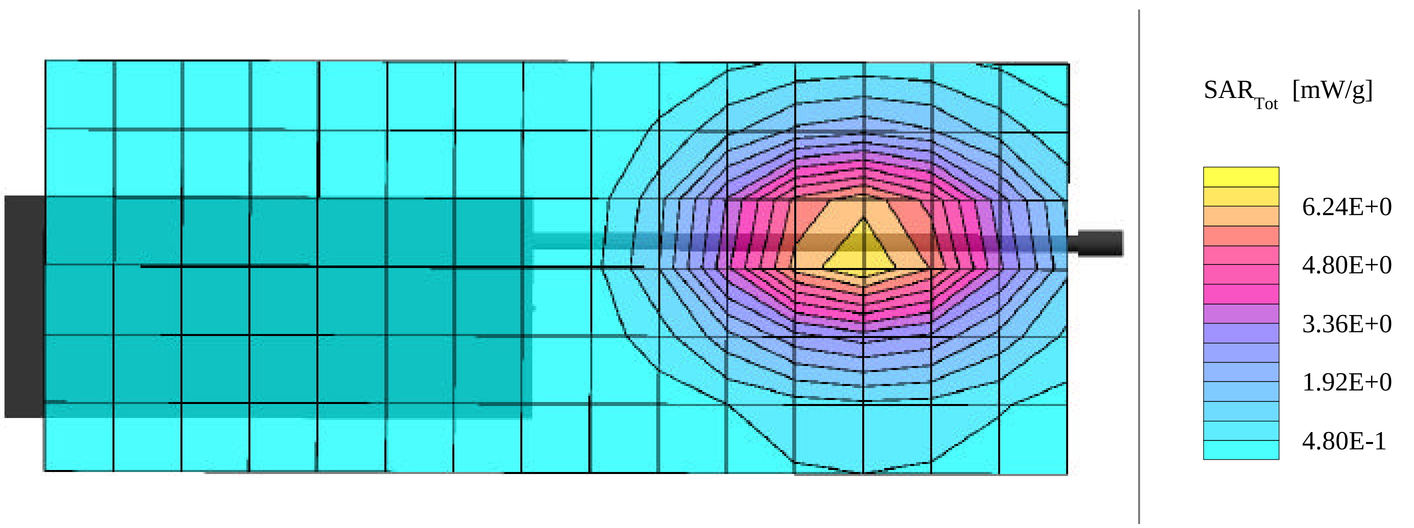
Body-Worn SAR with 1.2cm Belt-Clip Separation
Kenwood Model: TK-5400
Continous Wave Mode
Mid Channel [815.0000 MHz]
Conducted Power: 2.99 Watts
Date Tested: Dec. 20, 2001



Kenwood FCC ID: ALH33063110

Small Planar Phantom; Planar Section; Position: (270°,0°)
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0
835 MHz Muscle: σ = 0.97 mho/m ε_r = 55.2 ρ = 1.00 g/cm^3
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7 Powerdrift: -0.13 dB
SAR (1g): 6.66 mW/g, SAR (10g): 4.68 mW/g

Body-Worn SAR with 1.2cm Belt-Clip Separation
Kenwood Model: TK-5400
Continous Wave Mode
High Channel [823.9875 MHz]
Conducted Power: 2.99 Watts
Date Tested: Dec. 20, 2001

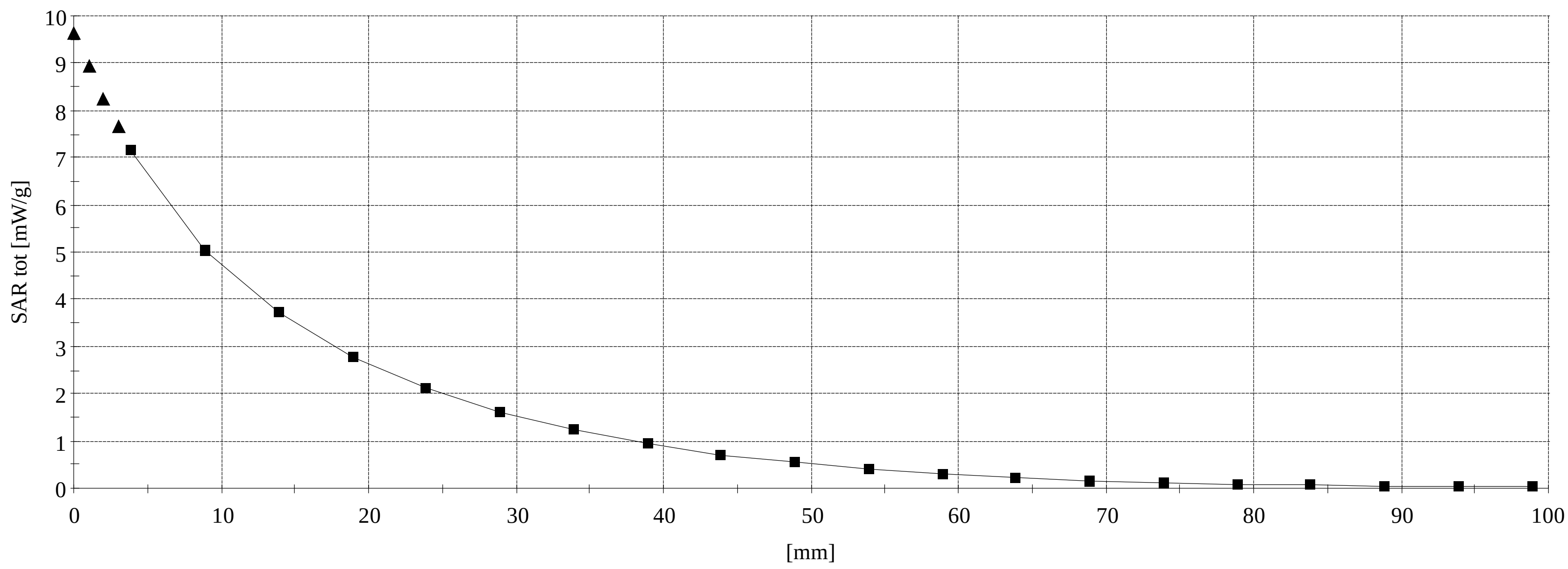


Kenwood FCC ID: ALH33063110

Small Planar Phantom; Section
Probe: ET3DV6 - SN1590; ConvF(6.70,6.70,6.70); Crest factor: 1.0;
835 MHz Muscle: σ = 0.97 mho/m ε_r = 55.2 ρ = 1.00 g/cm^3

Z-Axis Extrapolation at Peak SAR Location

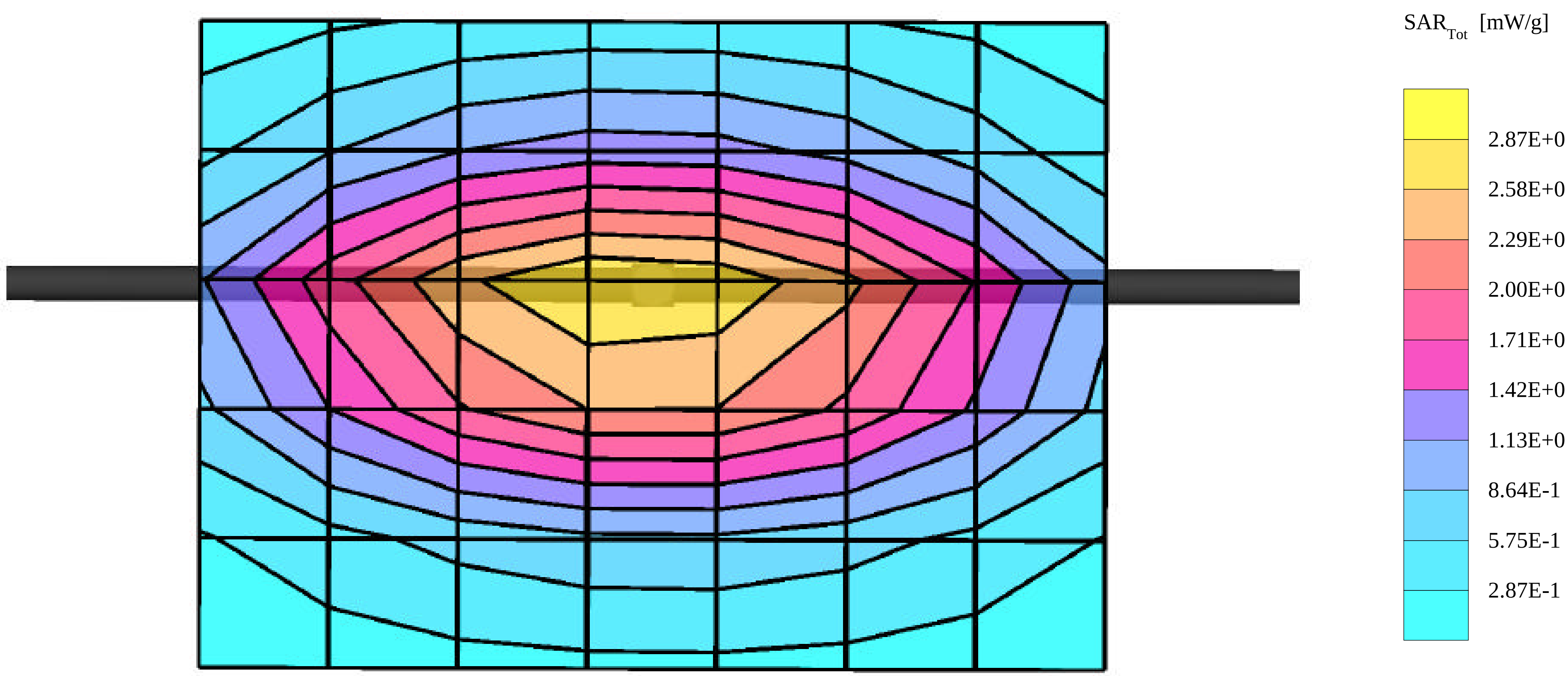
Body-Worn SAR with 1.2cm Belt-Clip Separation
Kenwood Model: TK-5400
Continous Wave Mode
High Channel [823.9875 MHz]
Conducted Power: 2.99 Watts
Date Tested: Dec. 20, 2001



APPENDIX B - DIPOLE VALIDATION

Dipole 900 MHz

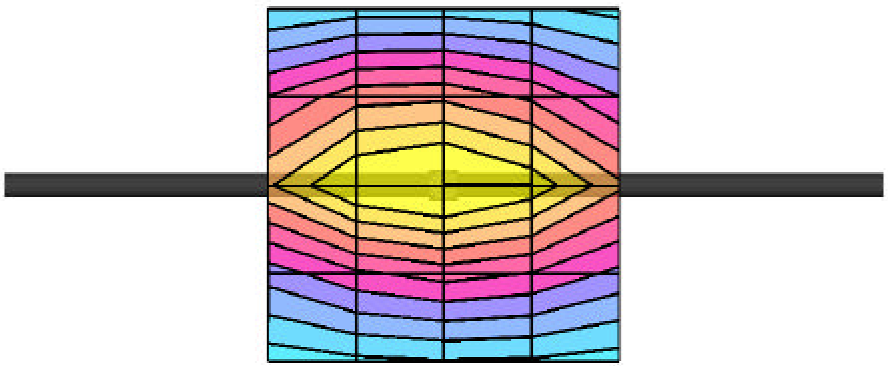
Frequency: 300 MHz; Conducted Input Power: 250 [mW]
Small Planar Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(6.83,6.83,6.83); Crest factor: 1.0; 900 MHz Brain: σ = 0.97 mho/m ε_r = 41.5 ρ = 1.00 g/cm^3
Cube 5x5x7: Peak: 4.51 mW/g, SAR (1g): 2.77 mW/g, SAR (10g): 1.75 mW/g, (Worst-case extrapolation)
Penetration depth: 11.4 (10.3, 12.8) [mm]
Powerdrift: -0.02 dB
Calibration Date: Dec. 20, 2001

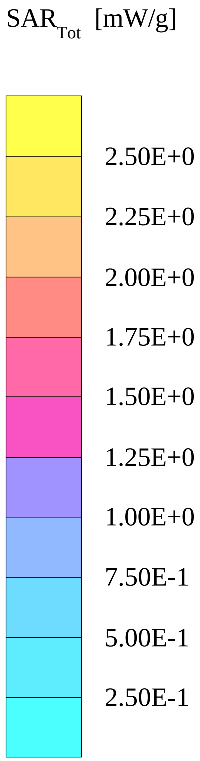


APPENDIX C - DIPOLE CALIBRATION

Validation Dipole D900V2 SN:054, d = 15 mm

Frequency: 900 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(6.27,6.27,6.27); Crest factor: 1.0; IEEE1528 900 MHz: σ = 0.97 mho/m ε_r = 42.4 ρ = 1.00 g/cm^3
Cubes (2): Peak: 4.47 mW/g ± 0.05 dB, SAR (1g): 2.78 mW/g ± 0.04 dB, SAR (10g): 1.76 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 11.5 (10.3, 13.2) [mm]
Powerdrift: -0.00 dB





APPENDIX D - 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

NormX	**1.77**	$\mu V/(V/m)^2$
NormY	**1.91**	$\mu V/(V/m)^2$
NormZ	**1.67**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**100**	mV
DCP Y	**100**	mV
DCP Z	**100**	mV

Sensitivity in Tissue Simulating Liquid

Head **450 MHz** e_r **= 43.5 ± 5%** s **= 0.87 ± 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** e_r **= 42 ± 5%** s **= 0.97 ± 10% mho/m**

ConvF X	**6.83**	± 7% (k=2)	Boundary effect:	
ConvF Y	**6.83**	± 7% (k=2)	Alpha	**0.37**
ConvF Z	**6.83**	± 7% (k=2)	Depth	**2.48**

Head **1500 MHz** e_r **= 40.4 ± 5%** s **= 1.23 ± 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** e_r **= 40 ± 5%** s **= 1.40 ± 10% mho/m**

ConvF X	**5.78**	± 7% (k=2)	Boundary effect:	
ConvF Y	**5.78**	± 7% (k=2)	Alpha	**0.53**
ConvF Z	**5.78**	± 7% (k=2)	Depth	**2.01**

Sensor Offset

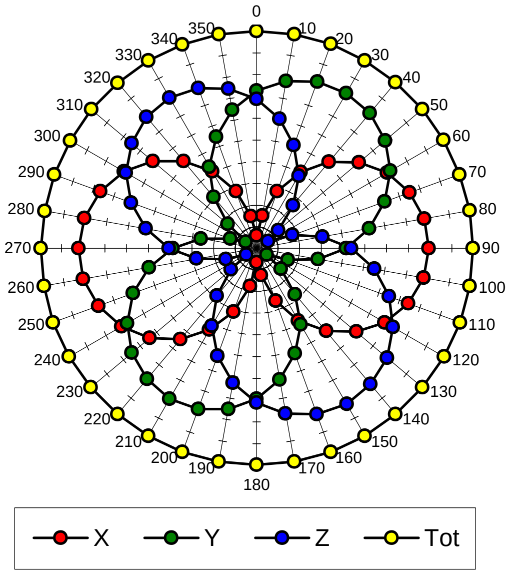
Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

DASY3 - Parameters of Probe: ET3DV6 SN: 1590

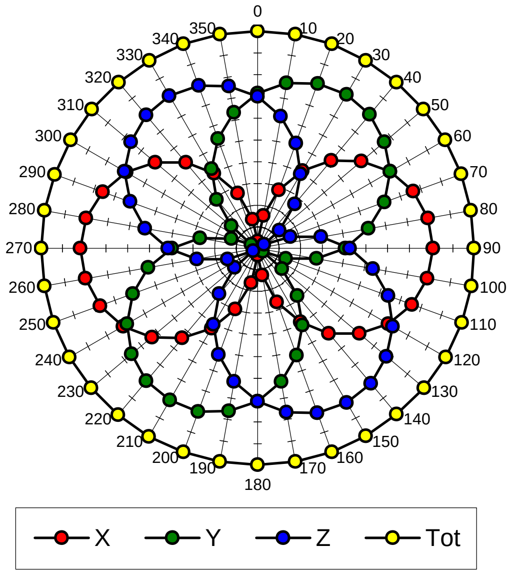
Body	**450 MHz**		e_r **= 56.7 ± 5%**	σ **= 0.94 ± 10% mho/m**
	ConvF X	**7.23** extrapolated		
	ConvF Y	**7.23** extrapolated		
	ConvF Z	**7.23** extrapolated		
Body	**900 MHz**		e_r **= 55.0 ± 5%**	σ **= 1.05 ± 10% mho/m**
	ConvF X	**6.61** ± 7% (k=2)		
	ConvF Y	**6.61** ± 7% (k=2)		
	ConvF Z	**6.61**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

Receiving Pattern (f) , q = 0°

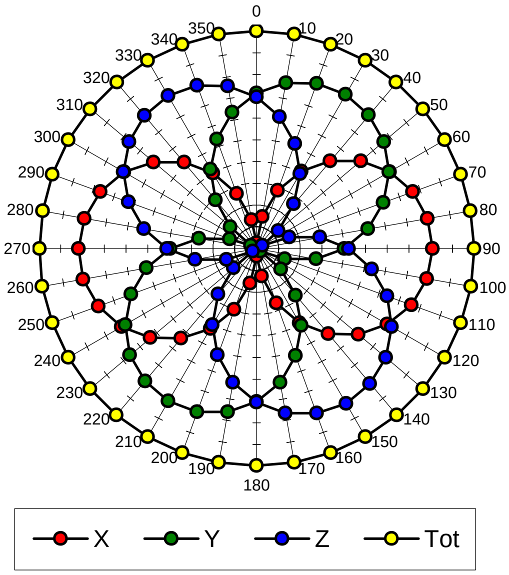
f = 30 MHz, TEM cell ifi110



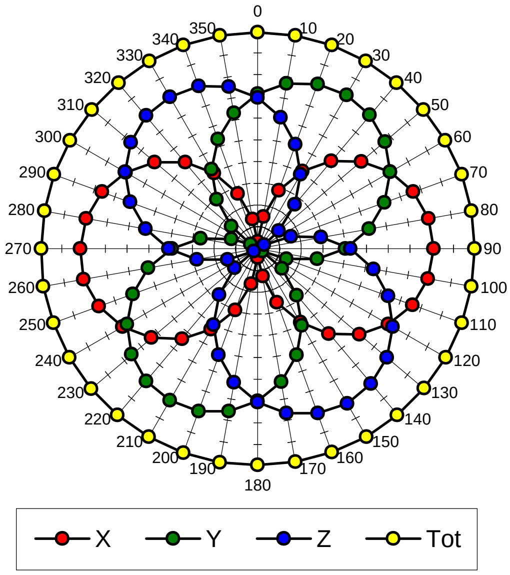
f = 100 MHz, TEM cell ifi110

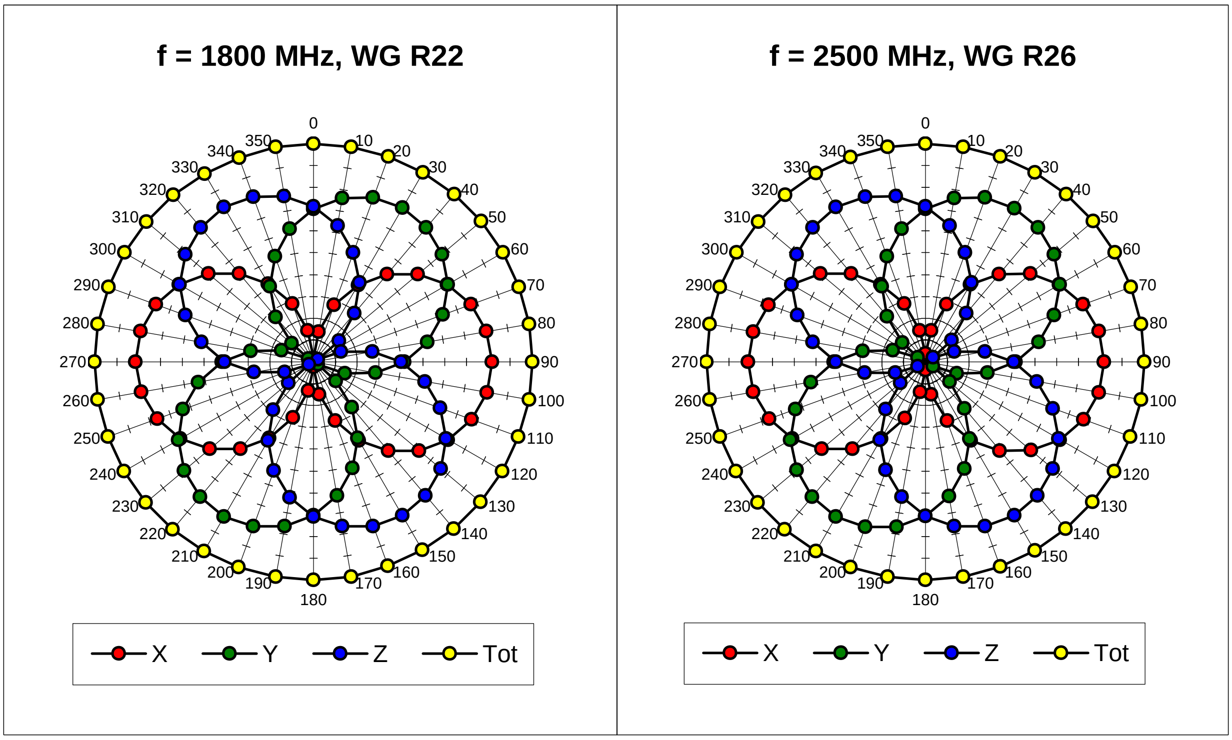


f = 300 MHz, TEM cell ifi110

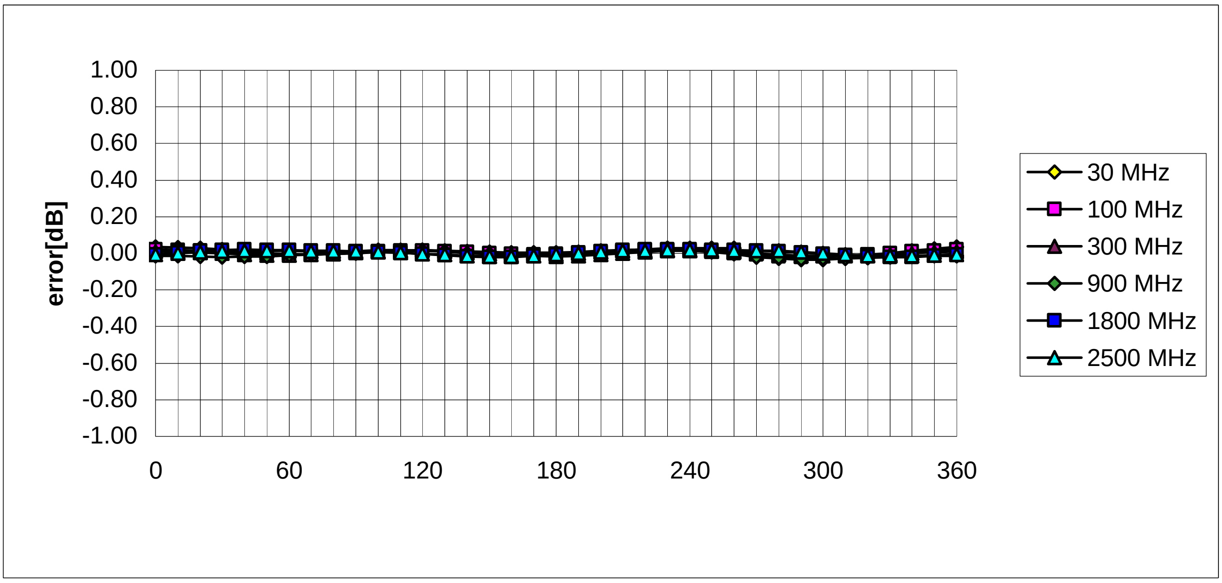


f = 900 MHz, TEM cell ifi110



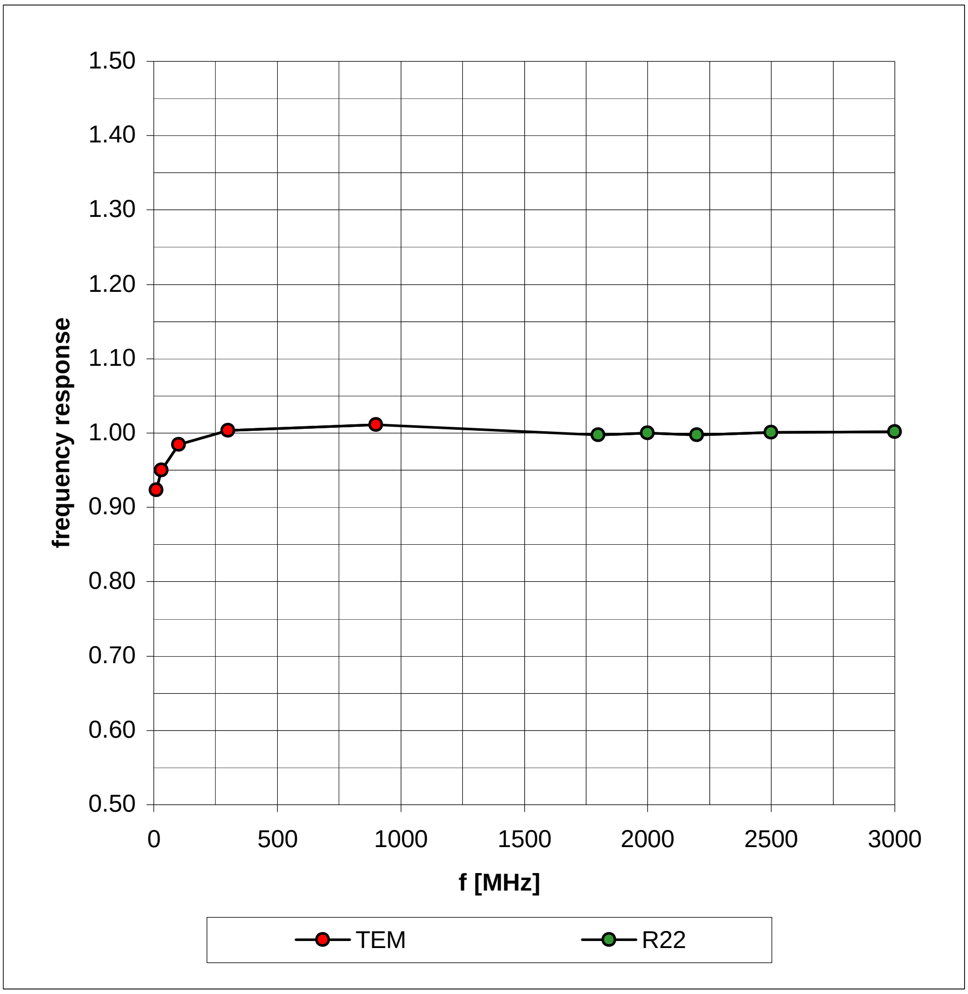


Isotropy Error (f), q = 0°



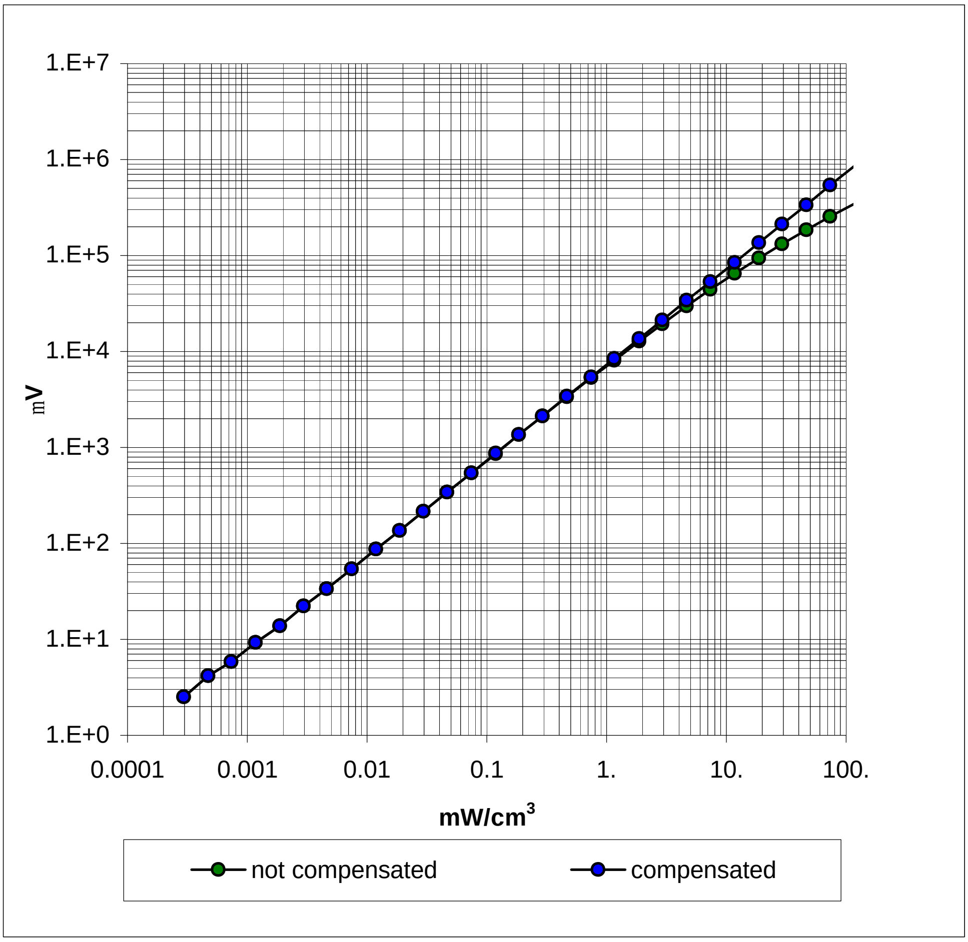
Frequency Response of E-Field

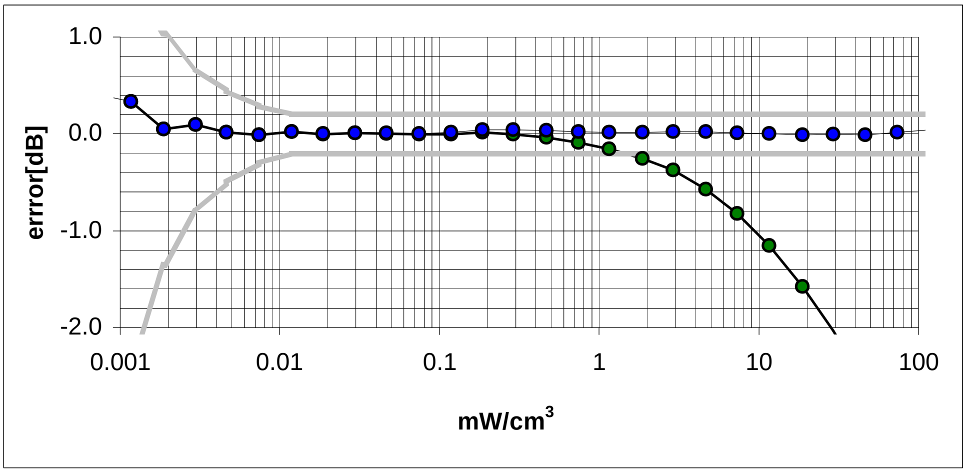
(TEM-Cell:ifi110, Waveguide R22)



Dynamic Range f(SAR_{brain})

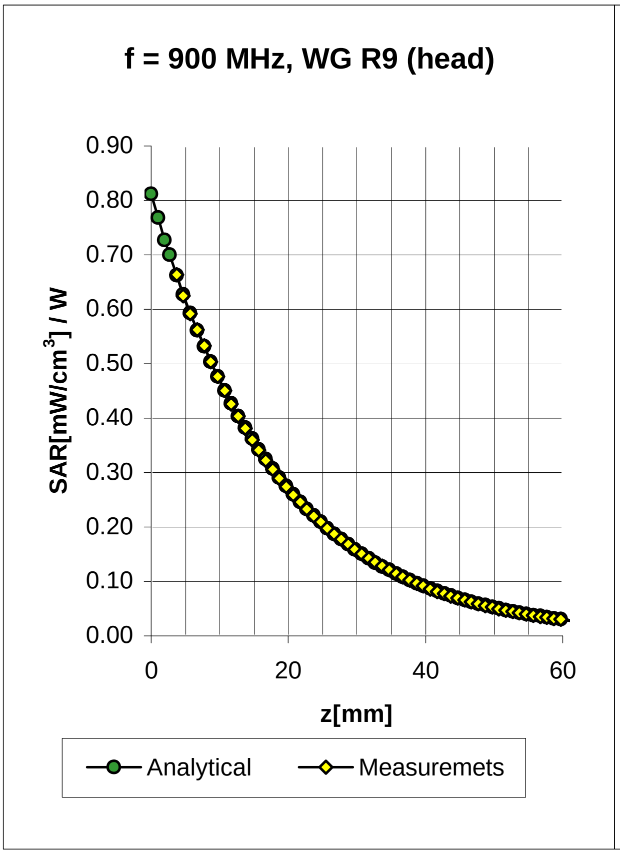
(TEM-Cell:ifi110)

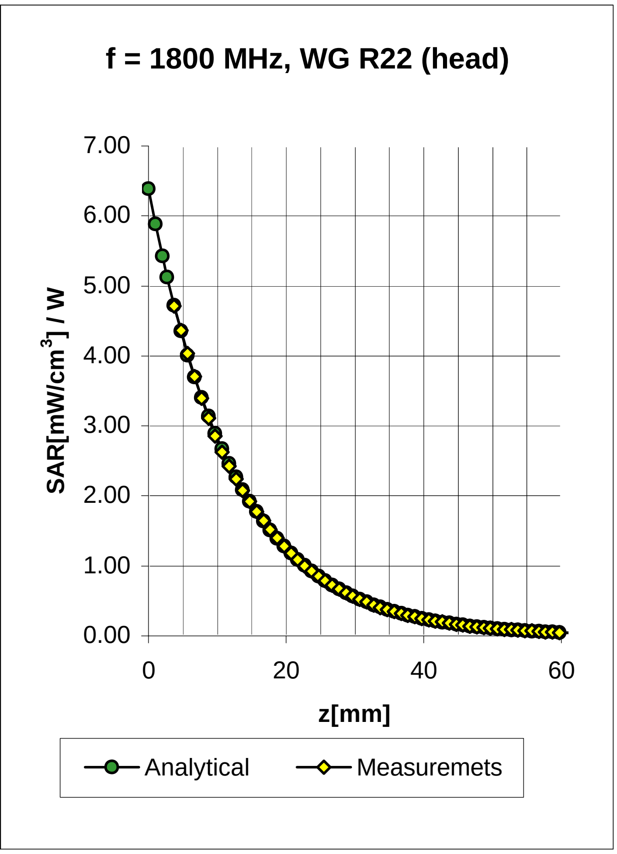




ET3DV6 SN:1590

Conversion Factor Assessment

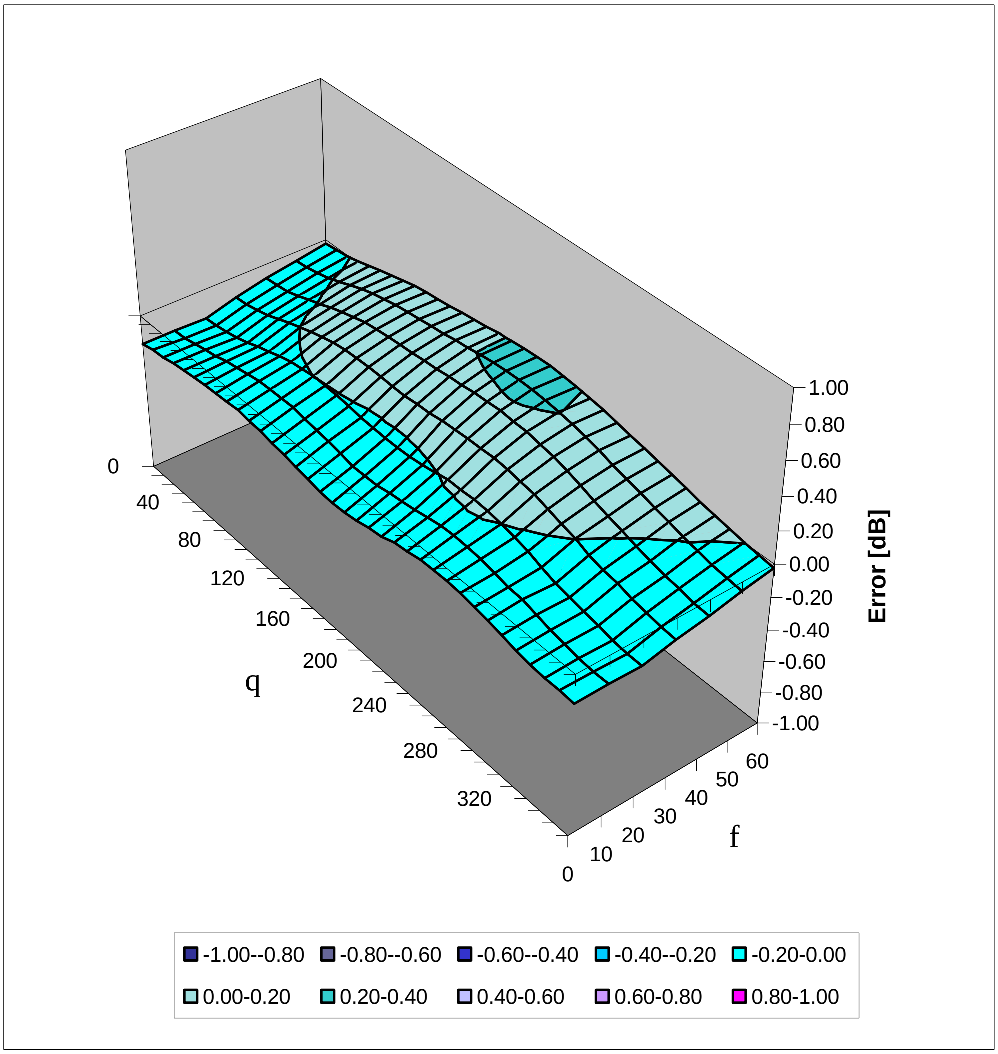




ET3DV6 SN:1590

Deviation from Isotropy in HSL

Error (q,f), f = 900 MHz



APPENDIX E - SAR SENSITIVITIES

Application Note: SAR Sensitivities

Introduction

The measured SAR-values in homogeneous phantoms depend strongly on the electrical parameters of the liquid. Liquids with exactly matching parameters are difficult to produce; there is always a small error involved in the production or measurement of the liquid parameters. The following sensitivities allow the estimation of the influence of small parameter errors on the measured SAR values. The calculations are based on an approximation formula [1] for the SAR of an electrical dipole near the phantom surface and a adapted plane wave approximation for the penetration depth. The sensitivities are given in percent SAR change per percent change in the controlling parameter:

$$S(x) = \frac{d\,SAR / SAR}{d\,x / x}$$

The controlling parameters x are:

- ε : permitivity
- σ : conductivity
- ρ : brain density (= one over integration volume)

For example: If The liquid permitivity increases by 2 percent and the sensitivity of the SAR to permitivity is -0.6 then the SAR will decrease by 1.2 percent.

The sensitivities are given for surface SAR values and averaged SAR values for 1 g and 10 g cubes and for dipole distances d of 10mm (for frequencies below 1000 MHz) and 15mm (for frequencies above 1000 MHz) from the liquid surface.

Liquid parameters are as proposed in the new standards (e.g., IEEE 1528).

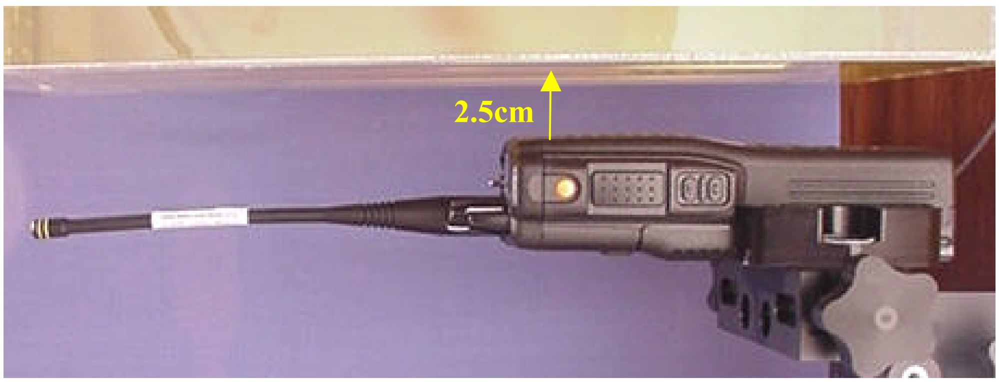
References

[1] N. Kuster and Q. Balzano, “Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 MHz”, *IEEE Transacions on Vehicular Technology*, vol. 41(1), pp. 17-23, 1992.

Parameter	ε	σ	ρ
f=300 MHz (εr=45.3, σ=0.87S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.41	+ 0.48	—
1 g	- 0.33	+ 0.28	0.08
10 g	- 0.26	+ 0.09	0.16
f=450 MHz (εr=43.5, σ=0.87S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.56	+ 0.67	—
1 g	- 0.46	+ 0.43	0.09
10 g	- 0.37	+ 0.22	0.17
f=835 MHz (εr=41.5, σ=0.90S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.70	+ 0.86	—
1 g	- 0.57	+ 0.59	0.10
10 g	- 0.45	+ 0.35	0.18
f=900 MHz (εr=41.5, σ=0.97S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.69	+ 0.86	—
1 g	- 0.55	+ 0.57	0.10
10 g	- 0.44	+ 0.32	0.19
f=1450 MHz (εr=40.5, σ=1.20/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.91	—
1 g	- 0.55	+ 0.55	0.12
10 g	- 0.42	+ 0.27	0.22
f=1800 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.92	—
1 g	- 0.52	+ 0.51	0.14
10 g	- 0.38	+ 0.21	0.24
f=1900 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.93	—
1 g	- 0.53	+ 0.51	0.14
10 g	- 0.39	+ 0.22	0.24
f=2000 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.74	+ 0.94	—
1 g	- 0.53	+ 0.52	0.14
10 g	- 0.39	+ 0.22	0.24
f=2450 MHz (εr=39.2, σ=1.80S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.74	+ 0.93	—
1 g	- 0.49	+ 0.41	0.17
10 g	- 0.34	+ 0.12	0.28
f=3000 MHz (εr=38.5, σ=2.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.75	+ 0.90	—
1 g	- 0.45	+ 0.28	0.21
10 g	- 0.32	+ 0.02	0.31

APPENDIX F - SAR AND EUT PHOTOGRAPHS

FACE-HELD SAR TEST SETUP PHOTOGRAPHS



BODY-WORN SAR TEST SETUP PHOTOGRAPHS

EUT PHOTOGRAPHS