

CERTIFICATE OF COMPLIANCE **SAR EVALUATION**

Test Lab:

CELLTECH RESEARCH INC.
Testing and Engineering Lab
1955 Moss Court
Kelowna, B.C., Canada V1Y 9L3
Phone: 250 - 860-3130
Fax: 250 - 860-3110
Toll Free: 1-877-545-6287
e-mail: info@celltechlabs.com
web site: www.celltechlabs.com

Applicant Information:

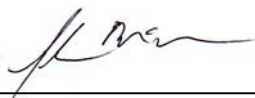
RITRON INC.
505 West Carmel Drive
Carmel IN 46033

FCC Rule Part(s):	2.1093; ET Docket 96-326
FCC ID:	AIERIT14-441
Model(s):	JMX-441
EUT Type:	Portable UHF PTT Radio Transceiver
Modulation:	FM
Tx Frequency Range:	450 - 470 MHz
Rated RF Conducted Power:	2.0 Watts (Max.)
Antenna Type(s):	1. Whip (Centurion AFS-450) 2. Stubby (Centurion AFS-450S)
Battery Type(s):	7.2 VDC, 700 mAh, NiCd 7.2 VDC, 1500 mAh, NiMH
Body-Worn Accessories:	1. Belt-Clip 2. Swivel Holster (MHS-A) 3. Speaker-Microphone (RSM-3X)

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 FCC 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.

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.



TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	DESCRIPTION OF EUT.....	1
3.0	SAR MEASUREMENT SYSTEM	2
4.0	SAR MEASUREMENT SUMMARY.....	3-5
5.0	DETAILS OF SAR EVALUATION.....	6
6.0	EVALUATION PROCEDURES.....	7
7.0	SAR LIMITS.....	8
8.0	SIMULATED EQUIVALENT TISSUES.....	8
9.0	SYSTEM VALIDATION.....	9
10.0	TISSUE PARAMETERS.....	9
11.0	SYSTEM SPECIFICATIONS.....	10
12.0	PROBE SPECIFICATION.....	11
13.0	SMALL PLANAR PHANTOM.....	11
14.0	LARGE PLANAR PHANTOM.....	11
15.0	DEVICE HOLDER.....	11
16.0	TEST EQUIPMENT LIST.....	12
17.0	MEASUREMENT UNCERTAINTIES.....	13
18.0	REFERENCES.....	14
	APPENDIX A - SAR MEASUREMENT DATA.....	15
	APPENDIX B - DIPOLE VALIDATION.....	16
	APPENDIX C - DIPOLE CALIBRATION.....	17
	APPENDIX D - PROBE CALIBRATION.....	18
	APPENDIX E - MEASURED LIQUID DIELECTRIC PARAMETERS.....	19
	APPENDIX F - SAR TEST SETUP PHOTOGRAPHS.....	20

1.0 INTRODUCTION

This measurement report shows compliance of the RITRON INC. Model: JMX-441 Portable UHF PTT Radio Transceiver FCC ID: AIERIT14-441 with the regulations and procedures specified in FCC Part 2.1093, ET Docket 96-326 Rules (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)

Rule Part(s)	FCC 2.1093 ET Docket 96.326	Modulation	FM
EUT Type	Portable UHF PTT Radio Transceiver	Tx Frequency Range (MHz)	450 - 470 MHz
FCC ID	AIERIT14-441	Rated Conducted Output Power	2.0 Watts
Model(s)	JMX-441	Battery Type(s)	1. NiCd (7.2V, 700mAh) 2. NiMH (7.2V, 1500mAh)
Serial No.	Pre-production	Antenna Type(s)	1. Whip (AFS-450) 2. Stubby (AFS-450S)
Body-Worn Accessories	1. Belt-Clip 2. Swivel Holster 3. Speaker-Microphone	Antenna Length(s)	Whip: 174 mm Stubby: 80 mm



Front of EUT



Left Side
of EUT



Right Side
of EUT



Back of EUT
& Belt-Clip



EUT with Stubby
Antenna, Swivel Holster
& Speaker-Mic



EUT with Whip
Antenna &
Speaker-Mic

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 small planar phantom DASY3 SAR Measurement System with large 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	Cond. Power Before (W)	Cond. Power After (W)	Battery Type	Antenna Type	Separation Distance (cm)	SAR 1g (w/kg)	
								100% Duty Cycle	50% Duty Cycle
450.100	Low	CW	1.80	1.66	NiCd	Whip	2.5	1.07	0.54
460.100	Mid	CW	1.82	1.72	NiCd	Whip	2.5	1.00	0.50
469.950	High	CW	1.83	1.68	NiCd	Whip	2.5	1.22	0.61
450.100	Low	CW	1.92	1.74	NiMH	Whip	2.5	1.14	0.57
460.100	Mid	CW	2.09	1.89	NiMH	Whip	2.5	1.16	0.58
469.950	High	CW	2.02	1.83	NiMH	Whip	2.5	1.27	0.64
450.100	Low	CW	1.79	1.65	NiCd	Stubby	2.5	1.49	0.75
460.100	Mid	CW	1.80	1.62	NiCd	Stubby	2.5	1.35	0.68
469.950	High	CW	1.82	1.63	NiCd	Stubby	2.5	1.33	0.67
450.100	Low	CW	1.91	1.75	NiMH	Stubby	2.5	1.40	0.70
460.100	Mid	CW	2.10	1.93	NiMH	Stubby	2.5	1.26	0.63
469.950	High	CW	2.03	1.88	NiMH	Stubby	2.5	1.25	0.63
Mixture Type: Brain (Measured) Dielectric Constant: 44.1 Conductivity: 0.86				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Controlled Exposure / Occupational BRAIN: 8.0 W/kg (averaged over 1 gram)					

Notes:

1. Test Date: January 25, 2002
2. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
3. The highest face-held SAR value found using the NiCD battery was 1.49 w/kg (100% duty cycle, low channel, stubby antenna, NiCD battery).
4. 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 planar phantom.
5. Ambient TEMPERATURE: 23.3 °C
Relative HUMIDITY: 39 %
Atmospheric PRESSURE: 101.25 kPa
6. Fluid Temperature $\approx$ 23.0 °C
7. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

MEASUREMENT SUMMARY (Cont.)

Body-Worn SAR Measurement Results - with Belt-Clip

Freq. (MHz)	Channel	Mode	Cond. Power Before (W)	Cond. Power After (W)	Battery Type	Antenna Type	Belt-Clip Separation Distance (cm)	SAR 1g (w/kg)	
								100% Duty Cycle	50% Duty Cycle
450.100	Low	CW	1.80	1.65	NiCd	Whip	1.0	3.43	1.72
460.100	Mid	CW	1.82	1.73	NiCd	Whip	1.0	3.80	1.90
469.950	High	CW	1.84	1.74	NiCd	Whip	1.0	3.58	1.79
450.100	Low	CW	1.90	1.73	NiMH	Whip	1.0	3.75	1.88
460.100	Mid	CW	2.10	1.96	NiMH	Whip	1.0	3.66	1.83
469.950	High	CW	2.00	1.87	NiMH	Whip	1.0	4.40	2.20
450.100	Low	CW	1.80	1.62	NiCd	Stubby	1.0	3.39	1.70
460.100	Mid	CW	1.82	1.64	NiCd	Stubby	1.0	2.90	1.45
469.950	High	CW	1.84	1.72	NiCd	Stubby	1.0	3.15	1.58
450.100	Low	CW	1.92	1.81	NiMH	Stubby	1.0	2.90	1.45
460.100	Mid	CW	2.11	1.95	NiMH	Stubby	1.0	3.34	1.67
469.950	High	CW	1.99	1.82	NiMH	Stubby	1.0	3.32	1.66
Mixture Type: Body (Measured) Dielectric Constant: 57.5 Conductivity: 0.93				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Controlled Exposure / Occupational BODY: 8.0 W/kg (averaged over 1 gram)					

Notes:

1. Date Tested: January 24, 2002
2. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
3. The highest body-worn SAR value found was 4.40 w/kg (100% duty cycle, high channel, whip antenna, NiMH battery).
4. The EUT was tested for body-worn SAR with the attached belt-clip providing a 1.0 cm separation distance between the back of the EUT and the outer surface of the planar phantom.
5. Ambient TEMPERATURE: 23.0 °C
Relative HUMIDITY: 37 %
Atmospheric PRESSURE: 101.1 kPa
6. Fluid Temperature $\approx$ 23.0 °C
7. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

MEASUREMENT SUMMARY (Cont.)

Body-Worn SAR Measurement Results - with Swivel Holster

Freq. (MHz)	Channel	Mode	Cond. Power Before (W)	Cond. Power After (W)	Battery Type	Antenna Type	Swivel Holster Separation Distance (cm)	SAR 1g (w/kg)	
								100% Duty Cycle	50% Duty Cycle
460.100	Mid	CW	1.82	1.71	NiMH	Whip	3.0	1.38	0.69
460.100	Mid	CW	1.83	1.69	NiMH	Stubby	3.0	1.05	0.53
Mixture Type: Body (Measured) Dielectric Constant: 57.5 Conductivity: 0.93				ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak - Controlled Exposure / Occupational BODY: 8.0 W/kg (averaged over 1 gram)					

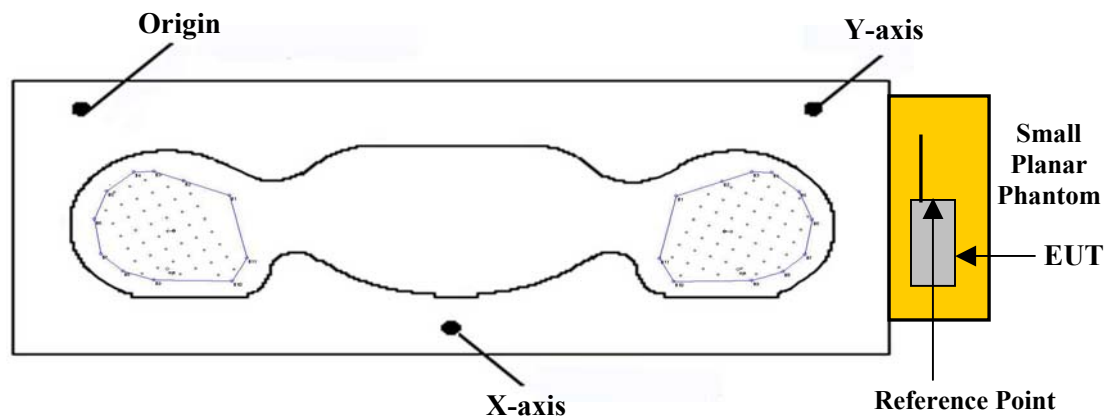
Notes:

1. Date Tested: January 24, 2002
2. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
3. The highest body-worn SAR value found was 1.38 w/kg (100% duty cycle, mid channel, whip antenna, NiMH battery).
4. The EUT was tested for body-worn SAR with the attached swivel holster providing a 3.0 cm separation distance between the back of the EUT and the outer surface of the planar phantom.
5. Ambient TEMPERATURE: 23.0 °C
Relative HUMIDITY: 37 %
Atmospheric PRESSURE: 101.1 kPa
6. Fluid Temperature ≈ 23.0 °C
7. During the entire test the conducted power was maintained to within 5% of the initial conducted power.

5.0 DETAILS OF SAR EVALUATION

The RITRON INC. Model: JMX-441 Portable UHF PTT Radio Transceiver FCC ID: AIERIT14-441 was found to be compliant for localized Specific Absorption Rate (Controlled Exposure) based on the following test provisions and conditions:

1. The EUT was tested in a face-held configuration with the front of the device placed parallel to the outer surface of the planar phantom and with a 2.5 cm separation distance.
2. The EUT was tested in a body-worn configuration with the back of the EUT placed parallel to the outer surface of the planar phantom and speaker-microphone accessory connected to the EUT. The attached metal belt-clip was touching the outer surface of the planar phantom and provided a 1.0 cm separation distance between the back of the EUT and the outer surface of the planar phantom.
3. The EUT was tested in a body-worn configuration with the back of the EUT placed parallel to the outer surface of the planar phantom and speaker-microphone accessory connected to the EUT. The attached swivel holster was touching the outer surface of the planar phantom and provided a 3.0 cm separation distance between the back of the EUT and the outer surface of the planar phantom.
4. 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 dropped 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 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.
7. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and its antenna.
8. 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 SAM phantom was performed in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01).
- (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 and system validation was no less than 15.0cm.



Face-held SAR Test Setup



Body-worn SAR Test Setup

7.0 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.

8.0 SIMULATED TISSUES

The brain and muscle 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 (permittivity and conductivity).

TISSUE MIXTURES FOR DIPOLE VALIDATION & EUT EVALUATION		
INGREDIENT	450MHz Brain Mixture (Validation & EUT Evaluation)	450MHz Body Mixture (EUT Evaluation)
Water	38.56 %	52.00 %
Sugar	56.32 %	45.65 %
Salt	3.95 %	1.75 %
HEC	0.98 %	0.10 %
Bactericide	0.19 %	0.10 %

9.0 SYSTEM VALIDATION

Prior to the assessment, the system was verified in a planar phantom with a 450MHz 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 dipole validation test plots and Appendix C for dipole calibration information):

Dipole Validation Kit	Target SAR 1g (w/kg)	Measured SAR 1g (w/kg)	Fluid Temperature	Validation Date
450MHz	1.47	1.45	$\approx 23.0^{\circ}\text{C}$	01/24/2002
		1.44	$\approx 23.0^{\circ}\text{C}$	01/25/2002

10.0 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 - DIPOLE VALIDATION AND EUT EVALUATION			
Equivalent Tissue	Dielectric Constant ϵ_r	Conductivity σ (mho/m)	ρ (Kg/m ³)
450MHz Brain (Target)	$43.5 \pm 5\%$	$0.87 \pm 5\%$	1000
450MHz Brain (Measured: 01/24/02)	44.3	0.86	1000
450MHz Brain (Measured: 01/25/02)	44.1	0.86	1000

BODY TISSUE PARAMETERS - EUT EVALUATION			
Equivalent Tissue	Dielectric Constant ϵ_r	Conductivity σ (mho/m)	ρ (Kg/m ³)
450MHz Body (Target)	$56.7 \pm 5\%$	$0.94 \pm 5\%$	1000
450MHz Body (Measured: 01/24/02)	57.5	0.93	1000

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)

Evaluation Phantom

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

Validation Phantom (≤ 450 MHz)

Type: Large Planar Phantom
Shell Material: Plexiglas
Bottom Thickness: 6.2 mm $\pm$ 0.1mm
Dimensions: 86.0cm (L) x 39.5cm (W) x 21.8cm (H)

12.0 PROBE SPECIFICATION (ET3DV6)

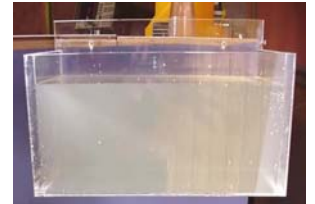
Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$)
Frequency:	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)
Dynam. Rnge:	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Srfee. 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 LARGE PLANAR PHANTOM

The large planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for SAR validations at and below 450MHz. The large planar phantom is mounted in the DASY3 compact system in place of the SAM phantom.



Large Planar Phantom

15.0 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

16.0 TEST EQUIPMENT LIST

SAR MEASUREMENT SYSTEM		
<u>EQUIPMENT</u>	<u>SERIAL NO.</u>	<u>DATE CALIBRATED</u>
DASY3 System -Robot -ET3DV6 E-Field Probe -300MHz Validation Dipole -450MHz Validation Dipole -900MHz Validation Dipole -1800MHz Validation Dipole -SAM Phantom V4.0C	599396-01 1590 135 136 054 247 N/A	N/A Oct 2001 Oct 2001 Mar 2001 June 2001 June 2001 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 2002 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

17.0 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	
Extended Standard Uncertainty (k=2)					± 27.1	

18.0 REFERENCES

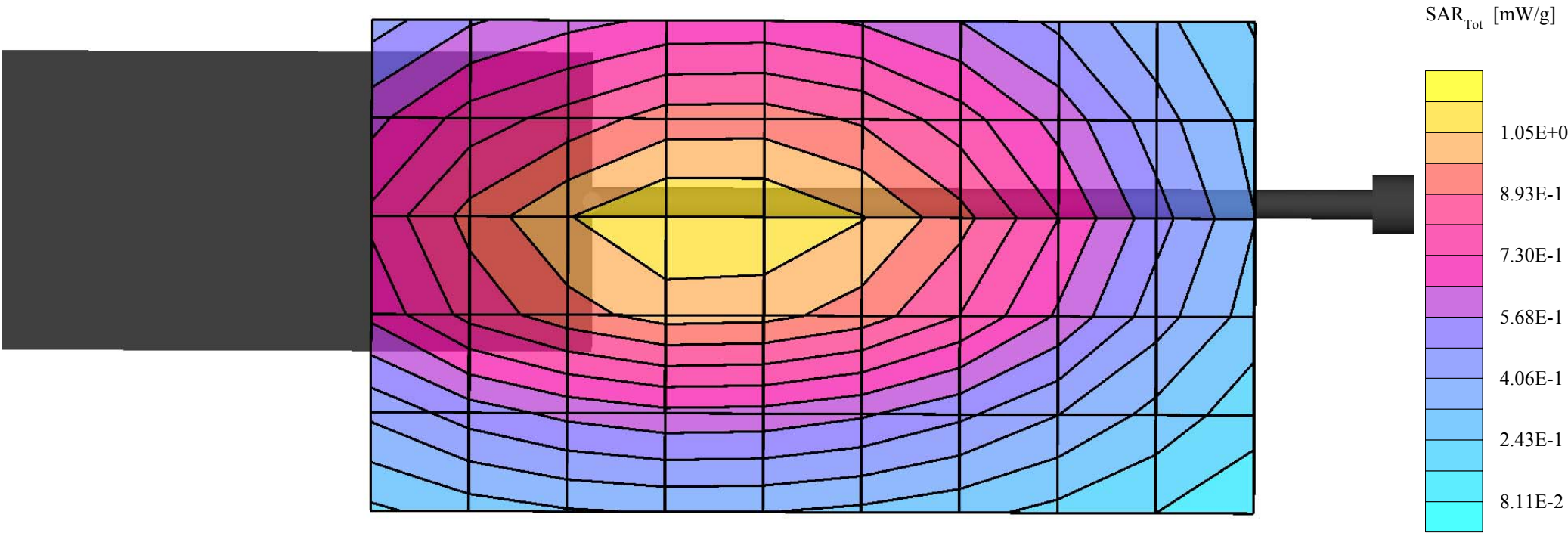
- [1] ANSI, ANSI/IEEE C95.1: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 Ghz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY: 1992.
- [2] Federal Communications Commission, “Evaluating Compliance with 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, DRAFT Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques: Draft 6.1, November 2000.

APPENDIX A - SAR MEASUREMENT DATA

RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.14 dB
SAR (1g): 1.07 mW/g, SAR (10g): 0.772 mW/g

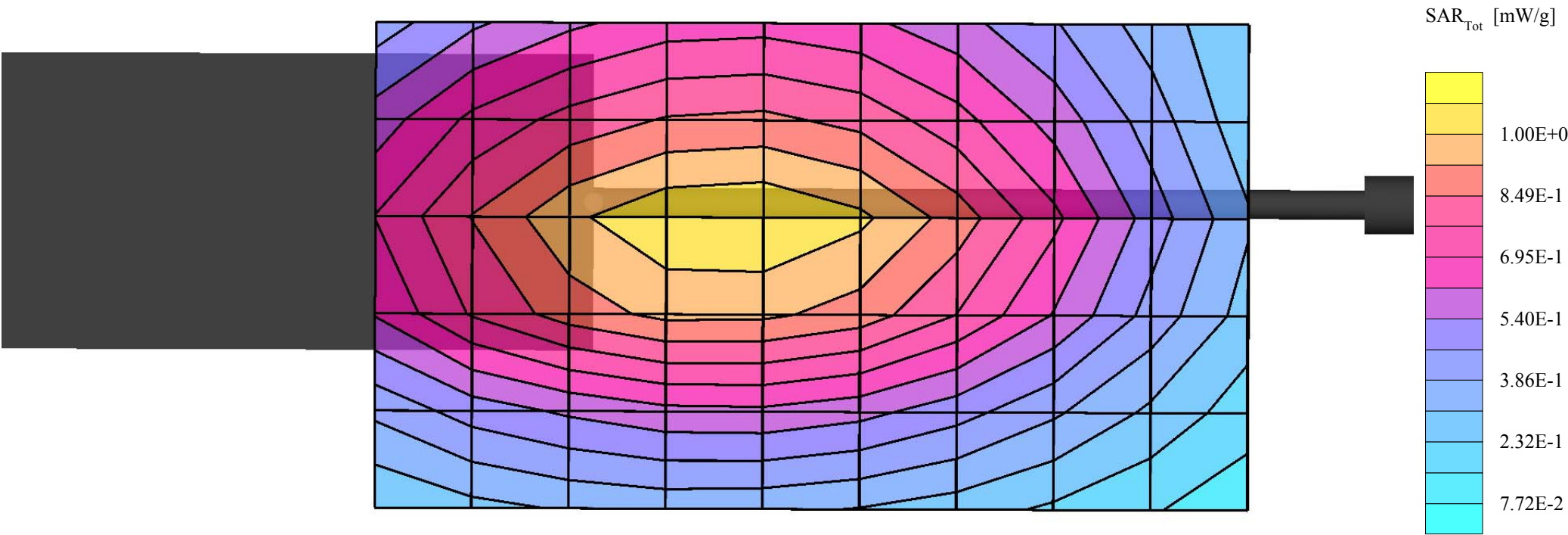
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
Low Channel (450.100 MHz)
Conducted Power: 1.80 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.12 dB
SAR (1g): 1.00 mW/g, SAR (10g): 0.721 mW/g

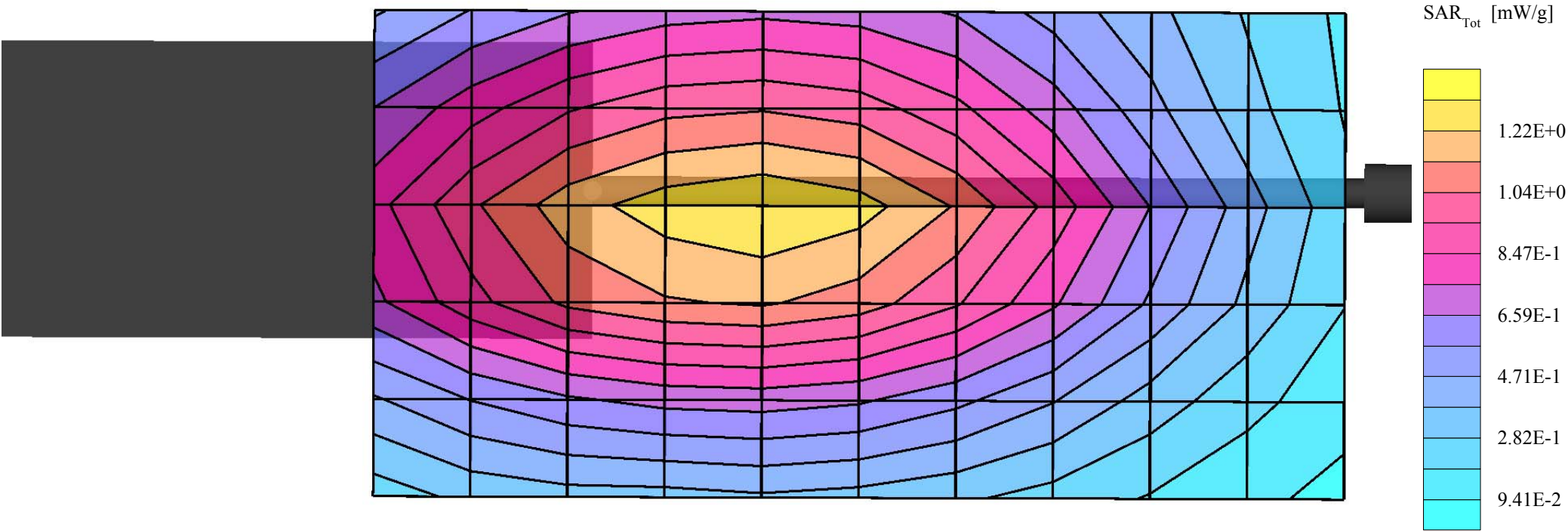
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
Mid Channel (460.100 MHz)
Conducted Power: 1.82 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.18 dB
SAR (1g): 1.22 mW/g, SAR (10g): 0.872 mW/g

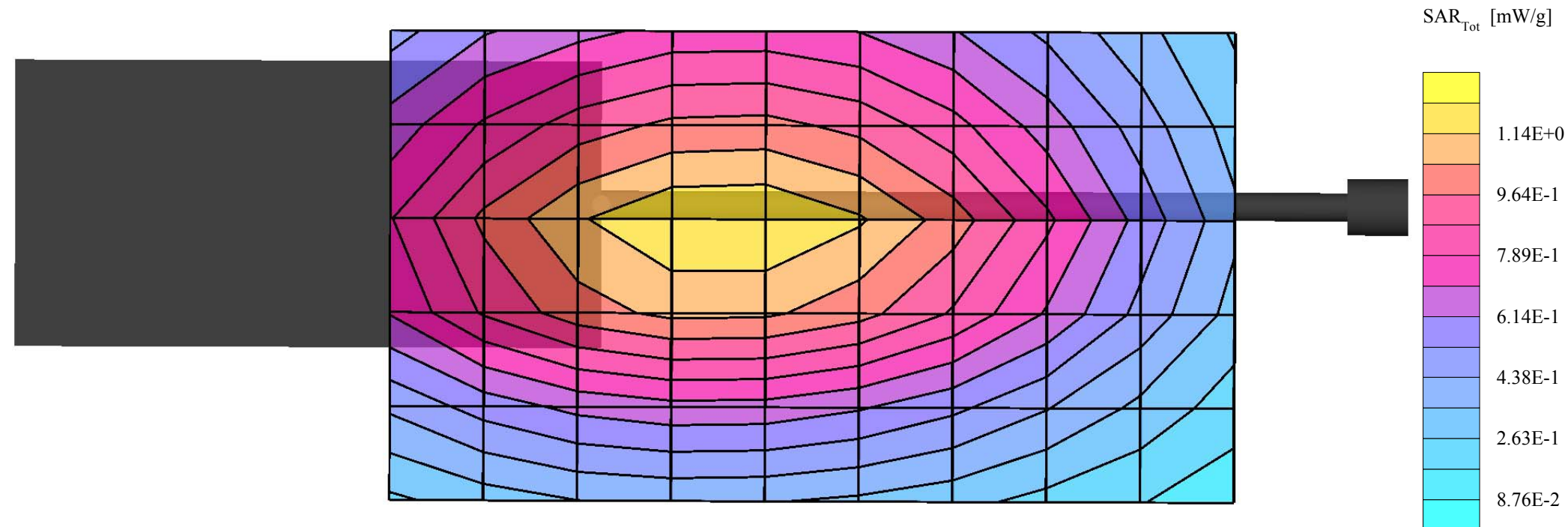
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
High Channel (469.950 MHz)
Conducted Power: 1.83 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.20 dB
SAR (1g): 1.14 mW/g, SAR (10g): 0.824 mW/g

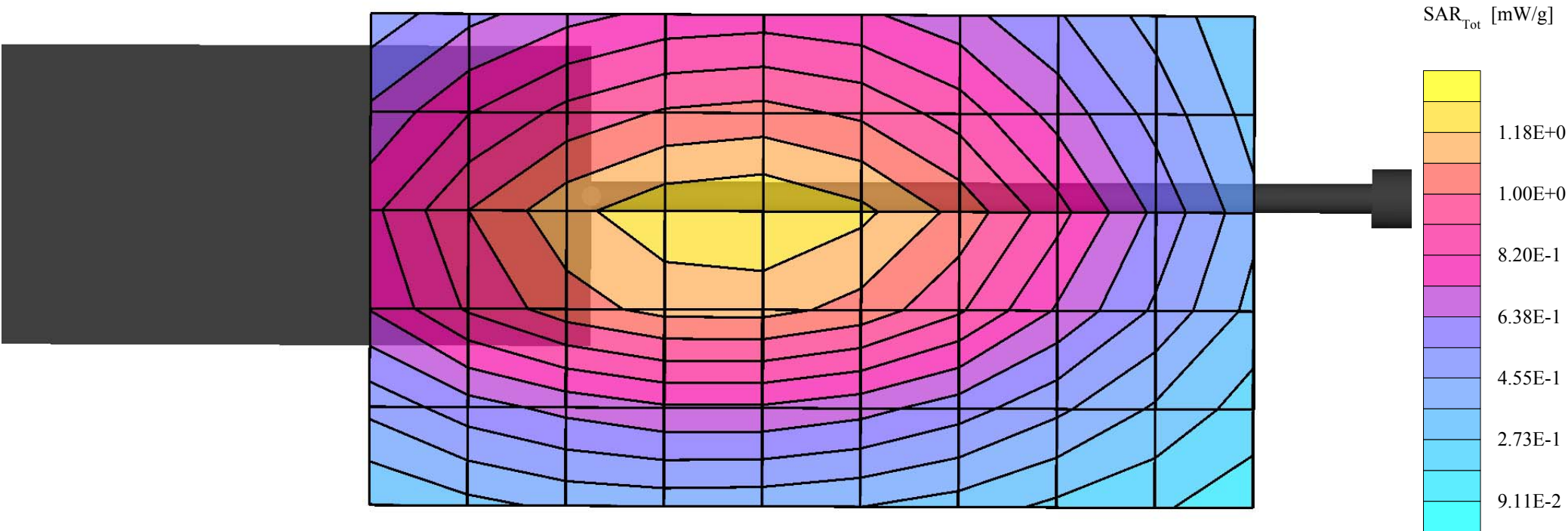
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
Low Channel (450.100 MHz)
Conducted Power: 1.92 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.19 dB
SAR (1g): 1.16 mW/g, SAR (10g): 0.843 mW/g

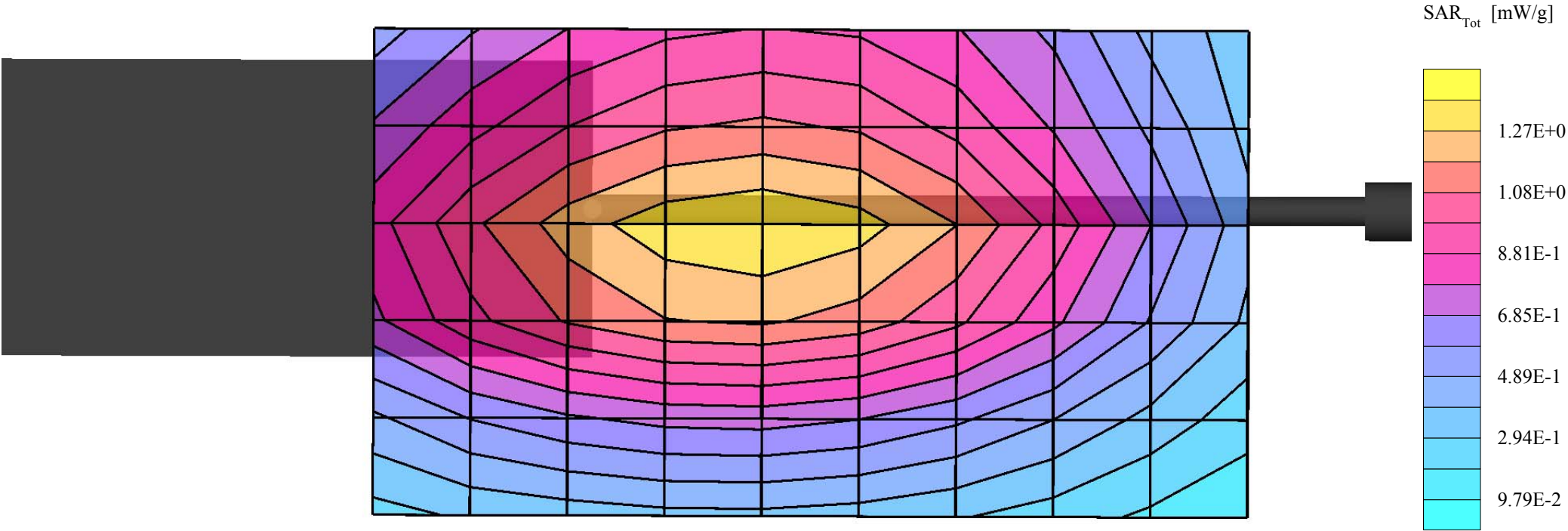
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
Mid Channel (460.100 MHz)
Conducted Power: 2.09 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

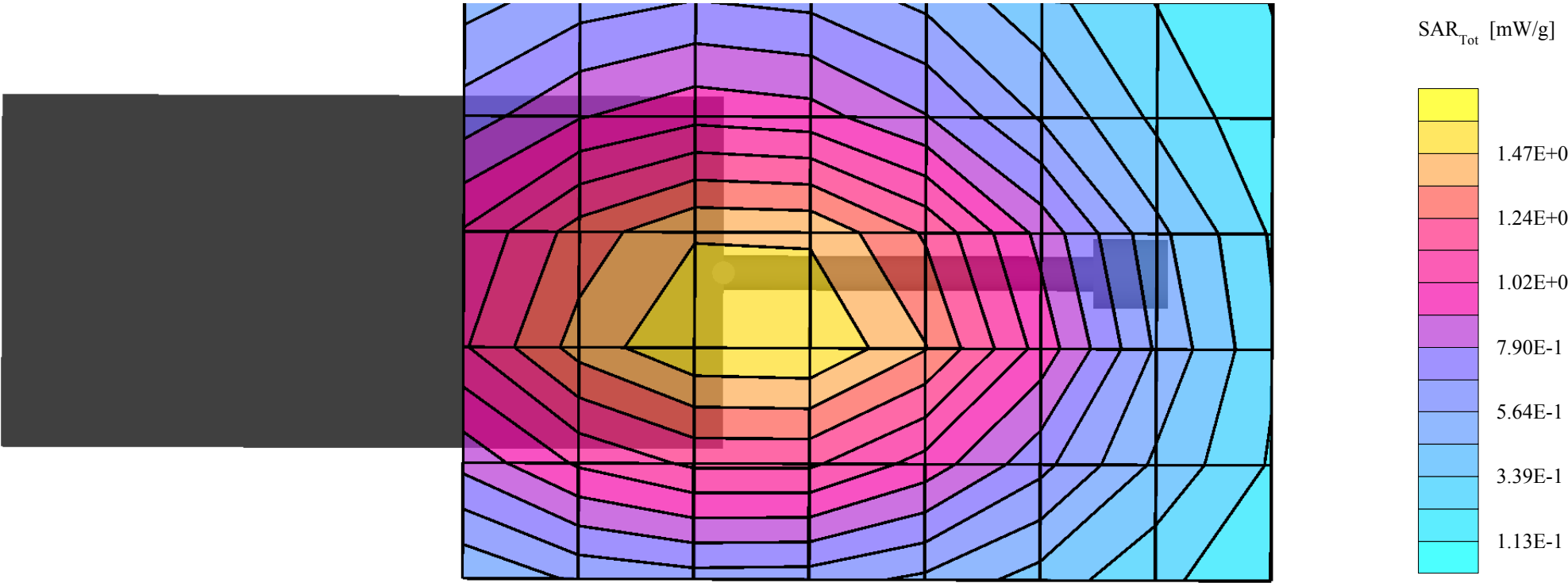
Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.16 dB
SAR (1g): 1.27 mW/g, SAR (10g): 0.913 mW/g

Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
High Channel (469.950 MHz)
Conducted Power: 2.02 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441
Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.16 dB
SAR (1g): 1.49 mW/g, SAR (10g): 1.07 mW/g

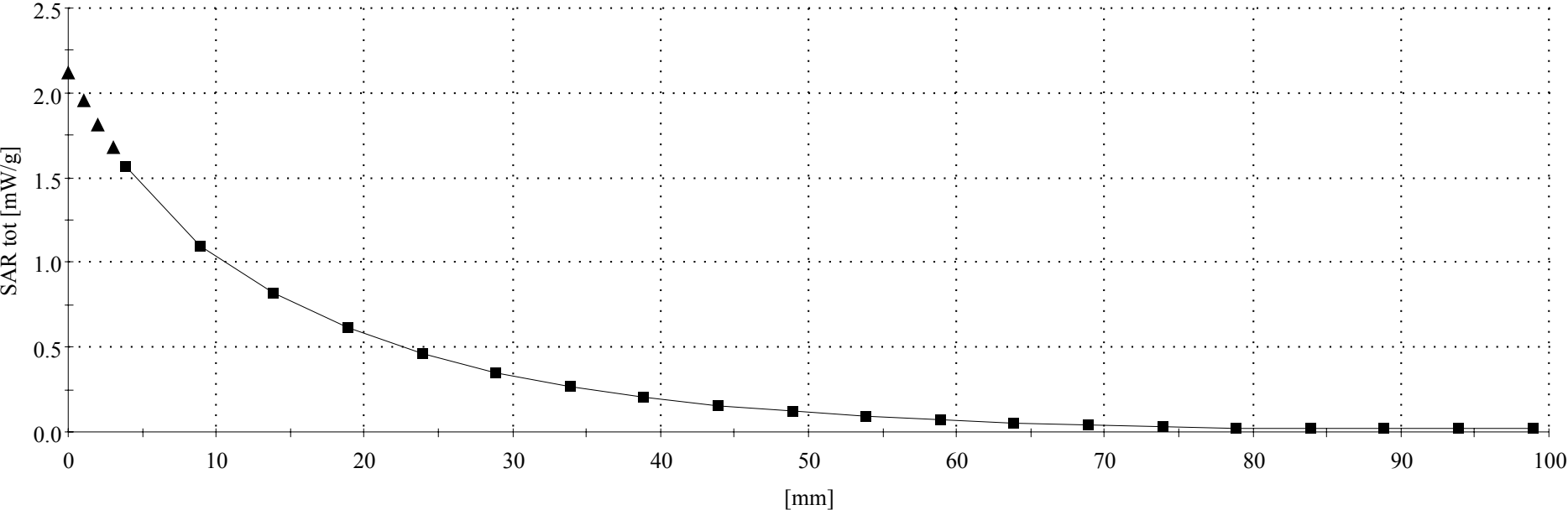
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Stubby Antenna (Centurion AFS-450S)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
Low Channel (450.100 MHz)
Conducted Power: 1.79 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

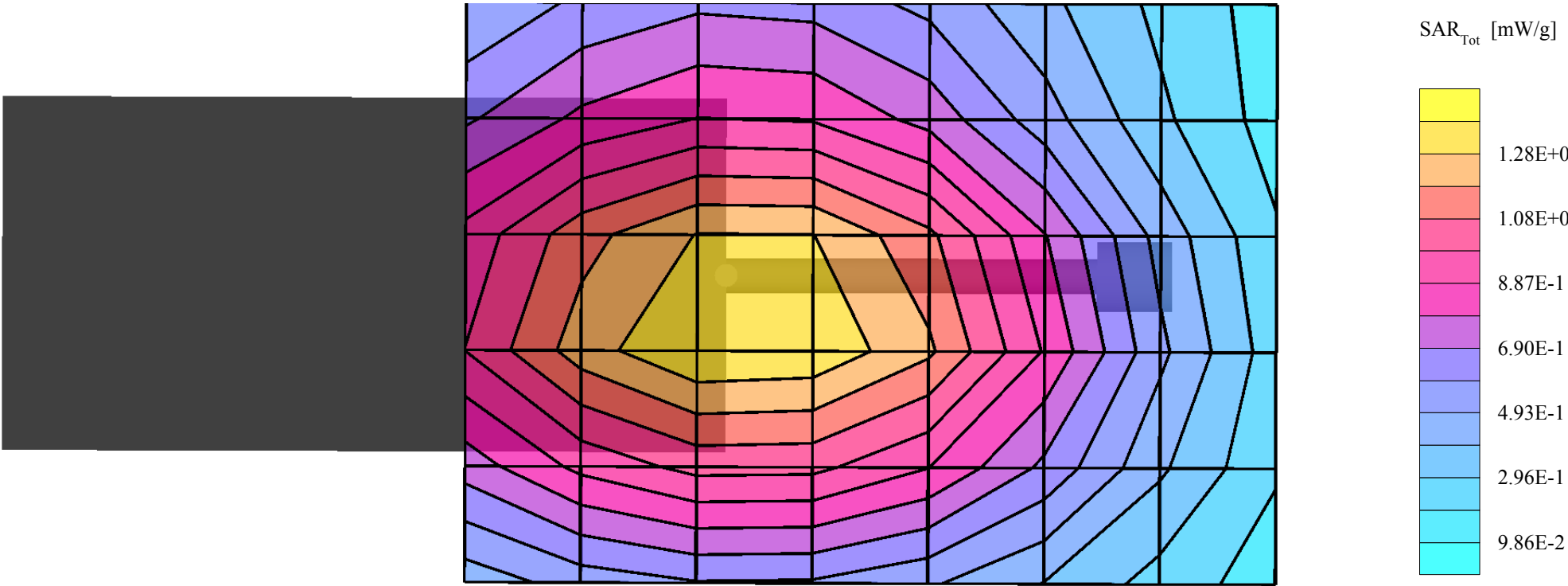
Small Planar Phantom; Planar Section; Position:
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86 \text{ mho/m}$ $\epsilon_r = 44.1$ $\rho = 1.00 \text{ g/cm}^3$
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Stubby Antenna (Centurion AFS-450S)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
Low Channel (450.100 MHz)
Conducted Power: 1.79 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441
Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.18 dB
SAR (1g): 1.35 mW/g, SAR (10g): 0.972 mW/g

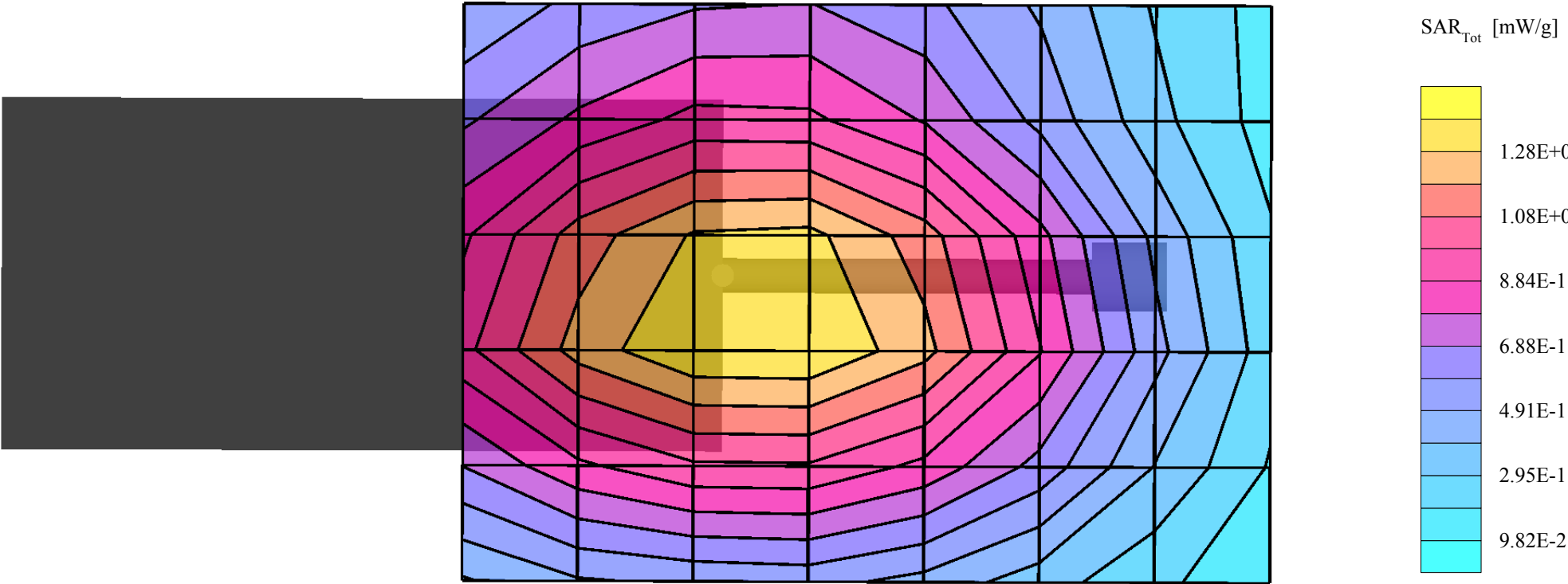
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Stubby Antenna (Centurion AFS-450S)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
Mid Channel (460.100 MHz)
Conducted Power: 1.80 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

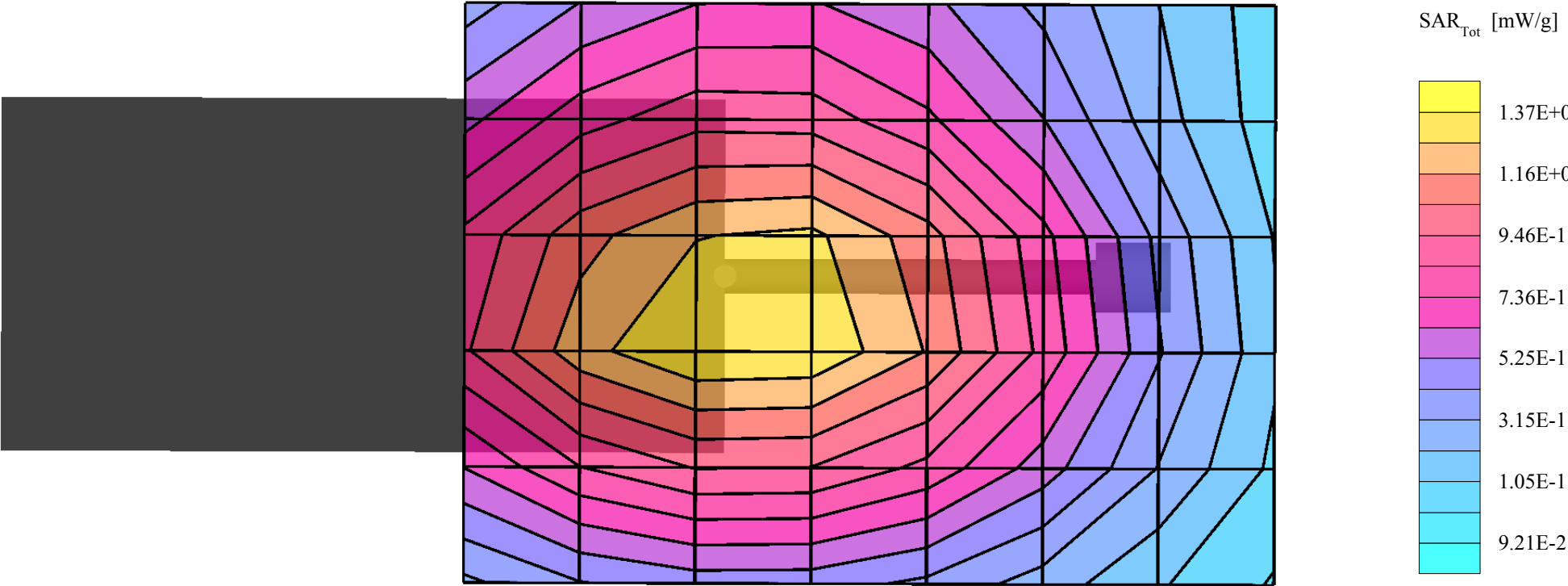
Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.22 dB
SAR (1g): 1.33 mW/g, SAR (10g): 0.956 mW/g

Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Stubby Antenna (Centurion AFS-450S)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
High Channel (469.950 MHz)
Conducted Power: 1.82 Watts
Date Tested: January 25, 2002



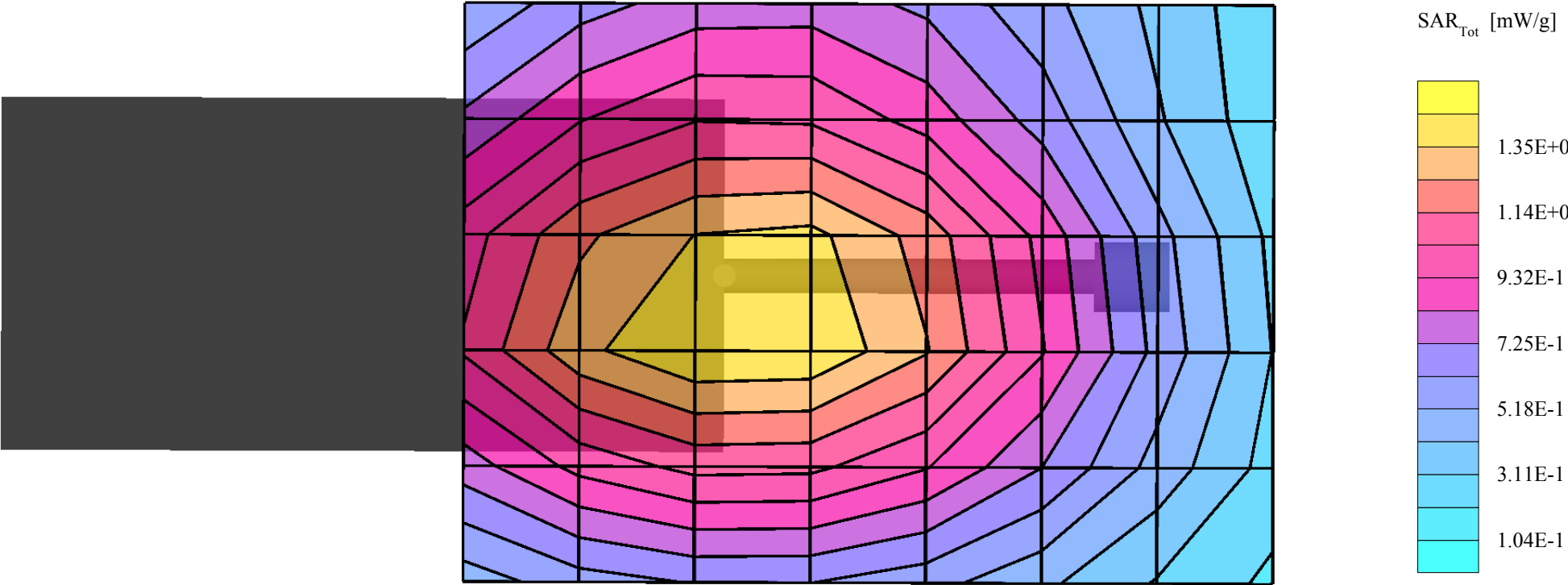
RITRON INC. FCC ID: AIERIT14-441
Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.14 dB
SAR (1g): 1.40 mW/g, SAR (10g): 1.01 mW/g

Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Stubby Antenna (Centurion AFS-450S)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
Low Channel (450.100 MHz)
Conducted Power: 1.91 Watts
Date Tested: January 25, 2002



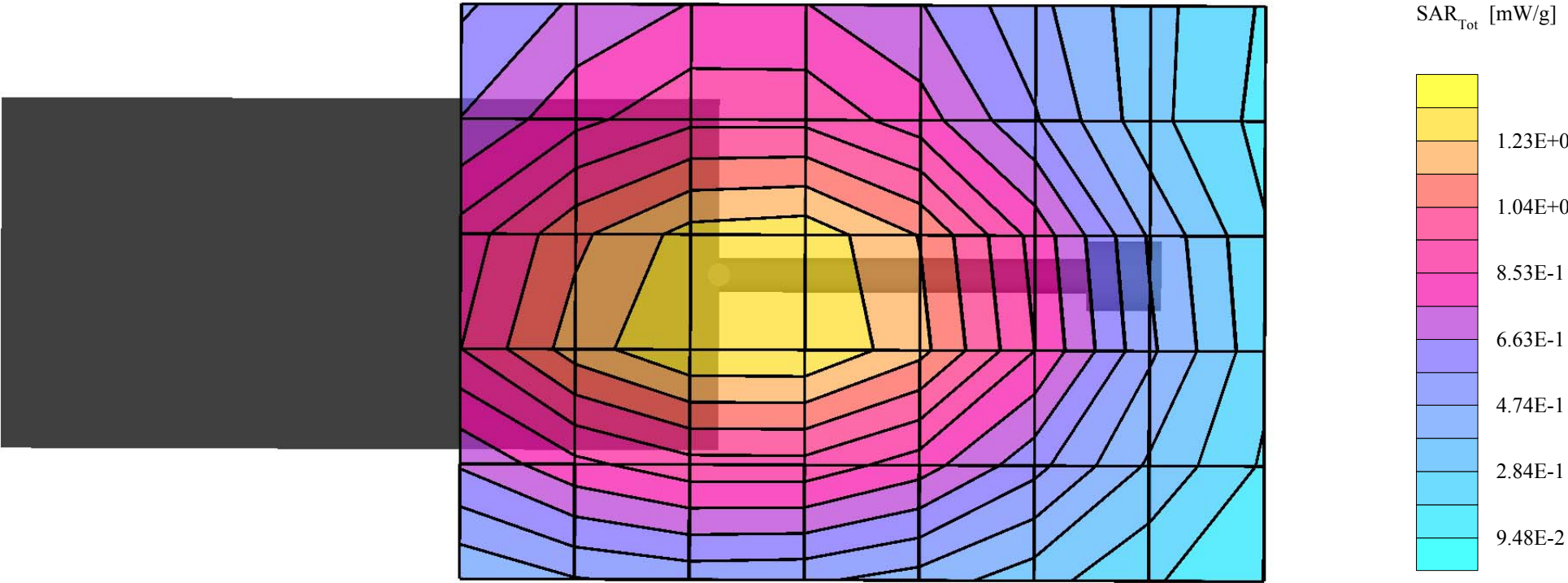
RITRON INC. FCC ID: AIERIT14-441
Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.21 dB
SAR (1g): 1.26 mW/g, SAR (10g): 0.918 mW/g

Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Stubby Antenna (Centurion AFS-450S)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
Mid Channel (460.100 MHz)
Conducted Power: 2.10 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441
Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0
450 MHz Brain: $\sigma = 0.86$ mho/m $\epsilon_r = 44.1$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.13 dB
SAR (1g): 1.25 mW/g, SAR (10g): 0.897 mW/g

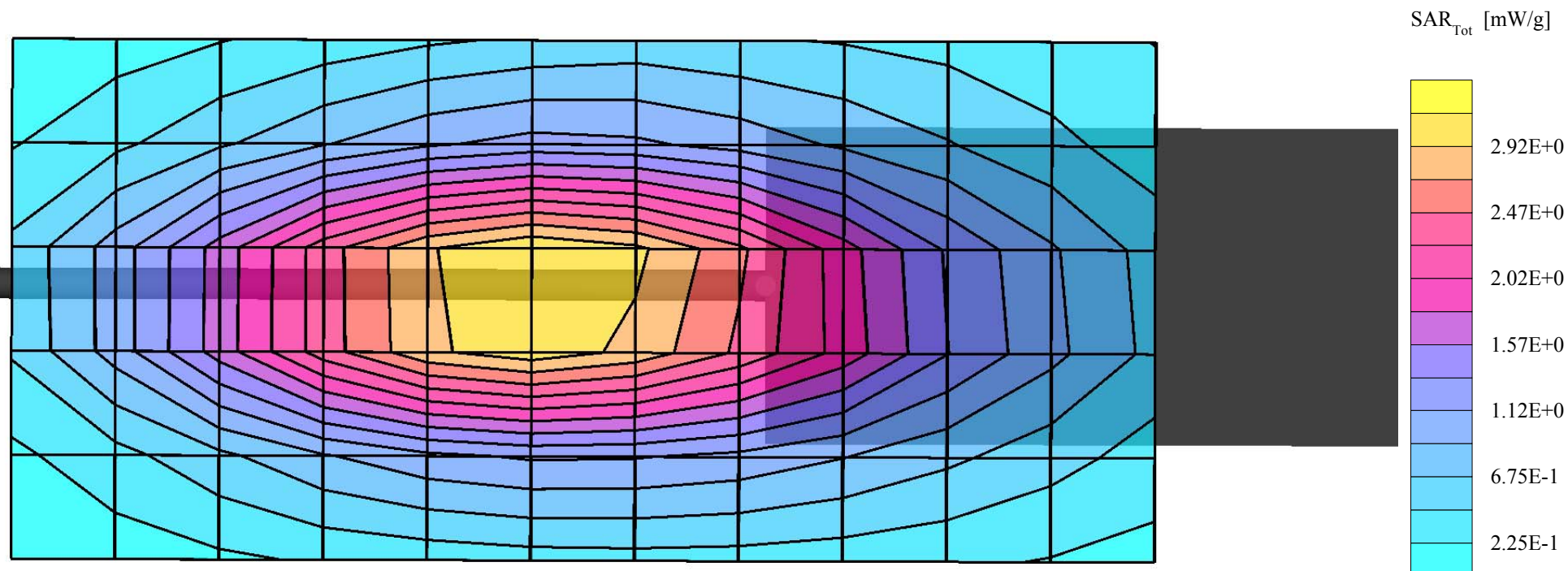
Face-Held SAR with 2.5 cm Separation
Portable UHF PTT Radio Transceiver
Stubby Antenna (Centurion AFS-450S)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
High Channel (469.950 MHz)
Conducted Power: 2.03 Watts
Date Tested: January 25, 2002



RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.23,7.23,7.23); Crest factor: 1.0
450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 57.5$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.18 dB
SAR (1g): 3.43 mW/g, SAR (10g): 2.31 mW/g

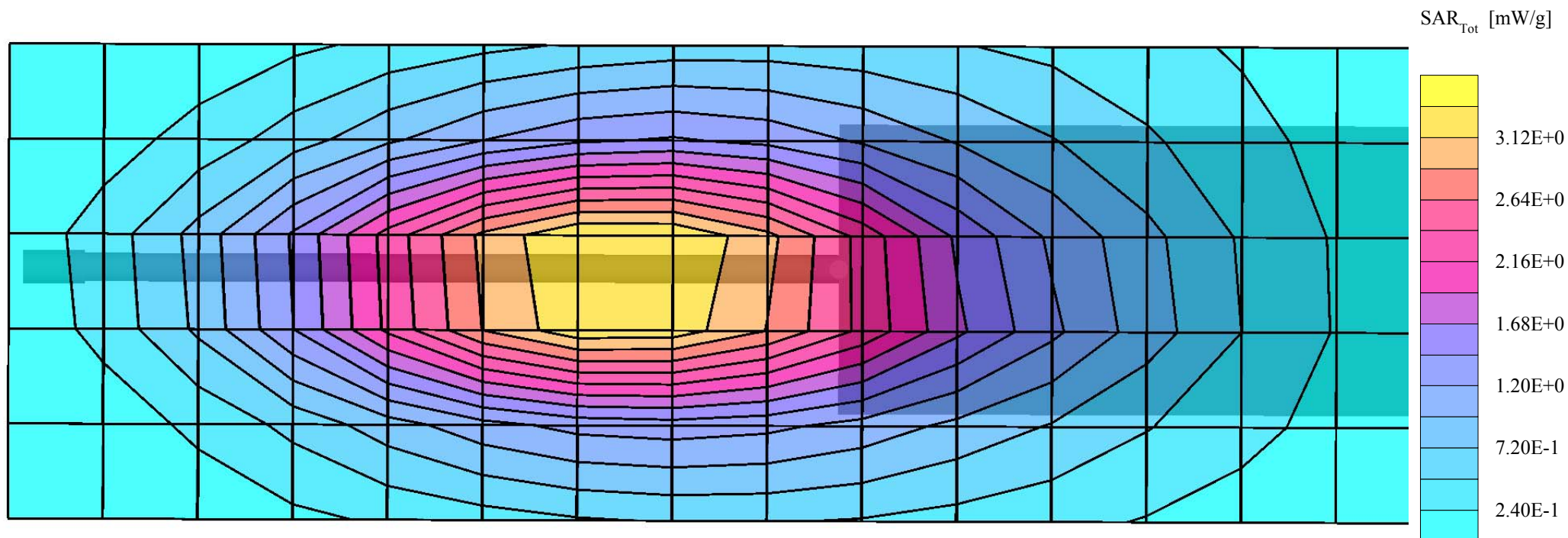
Body-Worn SAR with 1.0 cm Plastic Belt-Clip
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
Low Channel (450.100 MHz)
Conducted Power: 1.80 Watts
Date Tested: January 24, 2002



RITRON INC. FCC ID: AIERIT14-441

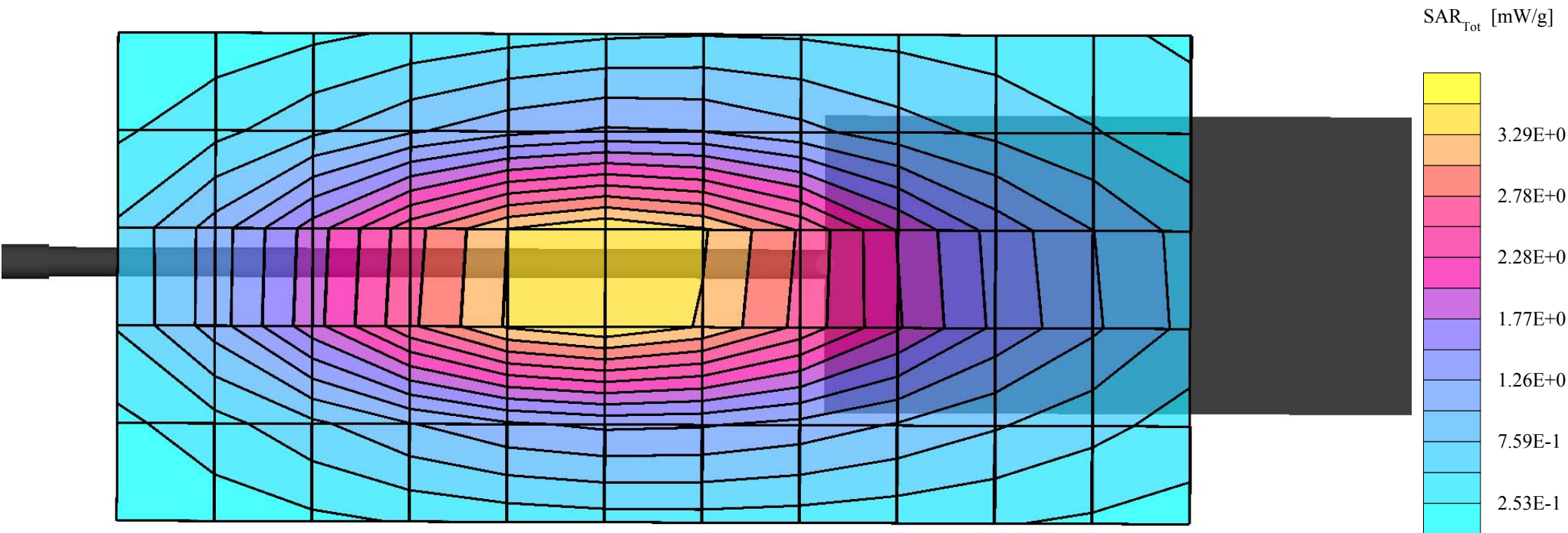
Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.23,7.23,7.23); Crest factor: 1.0
450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 57.5$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.05 dB
SAR (1g): 3.80 mW/g, SAR (10g): 2.54 mW/g

Body-Worn SAR with 1.0 cm Plastic Belt-Clip
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
Mid Channel (460.100 MHz)
Conducted Power: 1.82 Watts
Date Tested: January 24, 2002



RITRON INC. FCC ID: AIERIT14-441
Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.23,7.23,7.23); Crest factor: 1.0
450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 57.5$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.13 dB
SAR (1g): 3.58 mW/g, SAR (10g): 2.42 mW/g

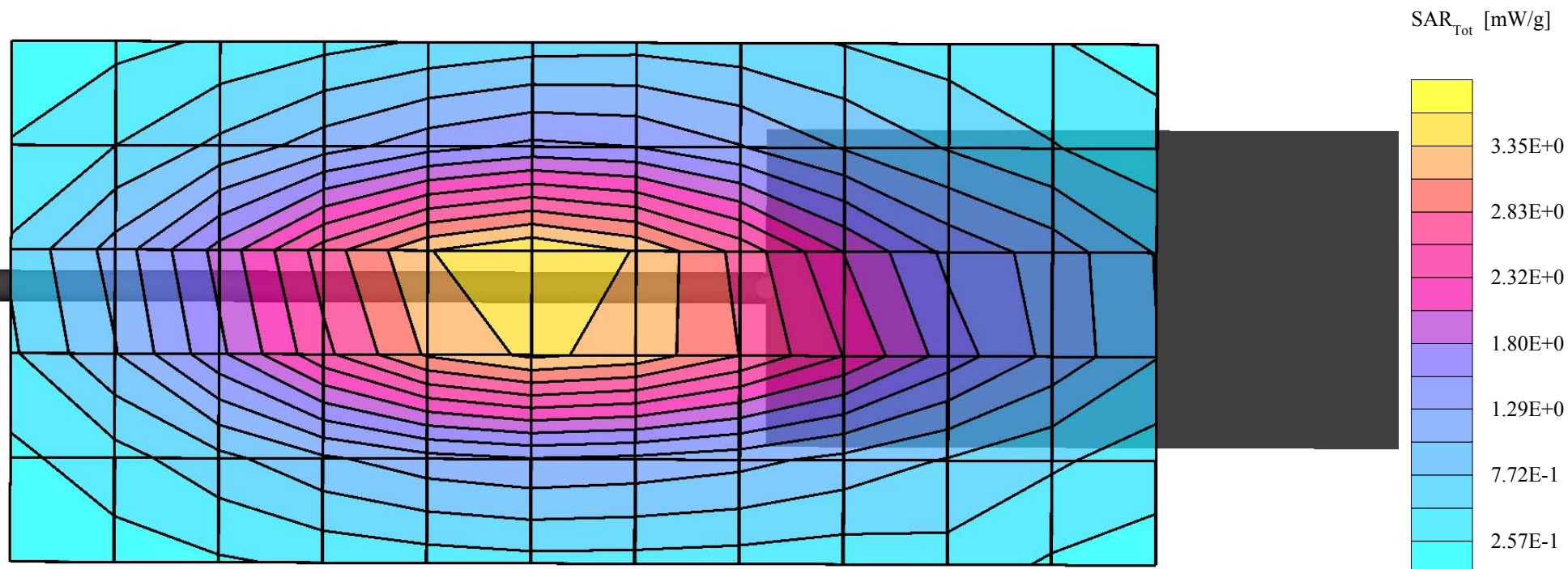
Body-Worn SAR with 1.0 cm Plastic Belt-Clip
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Cadmium Battery (BPJS-6N)
Ritron Model: JMX-441
Continuous Wave Mode
High Channel (469.950 MHz)
Conducted Power: 1.84 Watts
Date Tested: January 24, 2002



RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.23,7.23,7.23); Crest factor: 1.0
450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 57.5$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.20 dB
SAR (1g): 3.75 mW/g, SAR (10g): 2.54 mW/g

Body-Worn SAR with 1.0 cm Plastic Belt-Clip
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
Low Channel (450.100 MHz)
Conducted Power: 1.90 Watts
Date Tested: January 24, 2002



RITRON INC. FCC ID: AIERIT14-441

Small Planar Phantom; Planar Section; Position: (90°,180°)
Probe: ET3DV6 - SN1590; ConvF(7.23,7.23,7.23); Crest factor: 1.0
450 MHz Muscle: $\sigma = 0.93$ mho/m $\epsilon_r = 57.5$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 5x5x7; Powerdrift: -0.15 dB
SAR (1g): 3.66 mW/g, SAR (10g): 2.48 mW/g

Body-Worn SAR with 1.0 cm Plastic Belt-Clip
Portable UHF PTT Radio Transceiver
Whip Antenna (Centurion AFS-450)
Nickel Metal Hydride Battery (BPS-6N-MH)
Ritron Model: JMX-441
Continuous Wave Mode
Mid Channel (460.100 MHz)
Conducted Power: 2.10 Watts
Date Tested: January 24, 2002

