

ENGINEERING TEST REPORT



Mobile Payment Terminal Model No.: K78-204 or LP9100

Tested For

Keycorp Limited
Level 8, 67 Albert Avenue
Chatswood NSW 2067
Australia

In Accordance With

**SAR (Specific Absorption Rate) Requirements
using guidelines established in IEEE C95.1-1991,
FCC OET Bulletin 65 (Supplement C),
Industry Canada RSS-102(Issue 1) and
ACA Radiocommunications (Electromagnetic Radiation – Human Exposure)
Amendment Standard 2000 (No. 1)**

UltraTech's File No.: KYC-005-SAR

This Test report is Issued under the Authority of
Tri M. Luu, Professional Engineer,
Vice President of Engineering
UltraTech Group of Labs



Date: February 11, 2002

Report Prepared by: JaeWook Choi

Tested by: JaeWook Choi

Issued Date: February 11, 2002

Test Dates: January 14, 2002

The results in this Test Report apply only to the sample(s) tested, which has been randomly selected.

UltraTech

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	SAR (Specific Absorption Rate) Requirements IEEE C95.1-1991, FCC OET Bulletin 65 (Supplement C) Industry Canada RSS-102 (Issue 1). ACA Radiocommunications (Electromagnetic Radiation – Human Exposure), Amendment Standard 2000 (No. 1)
Title	Safety Levels with respect to human exposure to Radio Frequency Electromagnetic Fields Guideline for Evaluating the Environmental Effects of Radio Frequency Radiation
Purpose of Test:	To verify compliance with Federal regulated SAR requirements in Canada and the US.
Method of Measurements:	IEEE C95.1-1991, FCC OET Bulletin 65 (Supplement C) and Industry Canada RSS-102(Issue 1)
Exposure Category	[X] General population, uncontrolled exposure [] occupational, controlled exposure

1.2. REFERENCES

The methods and procedures used for the measurements contained in this report are details in the following reference standards:

Publications	Year	Title
IEEE Std. 1528-2001 Draft	2001	Draft Recommended practice for determining the Peak Spatial-Average Specific Absorption rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques.
Industry Canada RSS102	1999	"Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields"
ACA	2000	ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1)
NCRP Report No.86	1986	"Biological Effects and Exposure Criteria for radio Frequency Electromagnetic Fields"
FCC OET Bulletin 65	1997	"Evaluating Compliance with FCC Guidelines for Human Exposure to radio Frequency Fields"
ANSI/IEEE C95.3	1992	"Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave"
ANSI/IEEE C95.1	1992	"Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz"
AS/NZS 2722.1	1998	Interim Australian/New Zealand Standard. "Radiofrequency fields, Part 1:Maximum exposure levels – 3kHz to 300GHz "

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT AND MANUFACTURER INFORMATION

APPLICANT:	
Name:	Keycorp Limited
Address:	Level 8, 67 Albert Avenue Chatswood NSW 2067 Australia
Contact Person:	Mr. Ken McAnulty Phone #: +61 2 9415 2900 FAX #: +61 2 9415 1363 Email Address: kmcanulty@keycorp.net

MANUFACTURER:	
Name:	Keycorp Limited
Address:	Level 8, 67 Albert Avenue Chatswood NSW 2067 Australia
Contact Person:	Mr. Ken McAnulty Phone #: +61 2 9415 2900 FAX #: +61 2 9415 1363 Email Address: kmcanulty@keycorp.net

2.2. DEVICE UNDER TEST (DUT) DESCRIPTION

The following is the information provided by the applicant.

Trade Name	Keycorp Limited
Type/Model Number	K78-204 or LP9100
Serial Number	Test Sample
Type of Equipment	Licensed Non-Broadcast Station Transmitter
Frequency of Operation	806 ~ 821 MHz
Rated RF Power	2 W (conducted)
Modulation Employed	FM data
Emissions Designation	20K0F1D
Antenna Type	Extendable with ¼ length helical over ¼ wavelength whip
External Power Supply	Ault Inc., I.T.E. Power Supply Model No.: PW 107
Primary User Functions of DUT:	Wireless mobile payment terminal

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2.3. LIST OF DUT'S ACCESSORIES:

Ault Inc., I.T.E. Power Supply, Model No.: PW 107

2.4. SPECIAL CHANGES ON THE DUT'S HARDWARE/SOFTWARE FOR TESTING PURPOSES

Modem unit of K78-204 or LP9100 has been modified since previous testing as follows,

- (a) Ground plane modified
- (b) Antenna connector changed to gold connector
- (c) Ferrite placed on battery supply rail

There has been no change to existing components and the main PCB.

2.5. ANCILLARY EQUIPMENT

IBM Laptop (M/N:2625)

2.6. GENERAL TEST CONFIGURATIONS**2.6.1. Equipment Configuration**

Power and signal distribution, grounding, interconnecting cabling and physical placement of equipment of a test system shall simulate the typical application and usage in so far as is practicable, and shall be in accordance with the relevant product specifications of the manufacturer.

The configuration that tends to maximize the DUT's emission or minimize its immunity is not usually intuitively obvious and in most instances selection will involve some trial and error testing. For example, interface cables may be moved or equipment re-orientated during initial stages of testing and the effects on the results observed.

Only configurations within the range of positions likely to occur in normal use need to be considered.

The configuration selected shall be fully detailed and documented in the test report, together with the justification for selecting that particular configuration.

2.6.2. Exercising Equipment

The exercising equipment and other auxiliary equipment shall be sufficiently decoupled from the EUT so that the performance of such equipment does not significantly influence the test results.

2.7. SPECIFIC OPERATING CONDITIONS

1. EUT will not transmit without connecting the RS232C cable at the back of EUT by its nature at the moment. Therefore the evaluation was performed with RS232C cable connected and the other end of cable connected to the laptop for control.
2. EUT will transmit only a few seconds with 100% duty cycle, then shut down itself automatically. So EUT was configured to transmit the signal with **25% duty cycle (64ms : 196ms)** since it is limited on the network the radio modem is designed to be used in.

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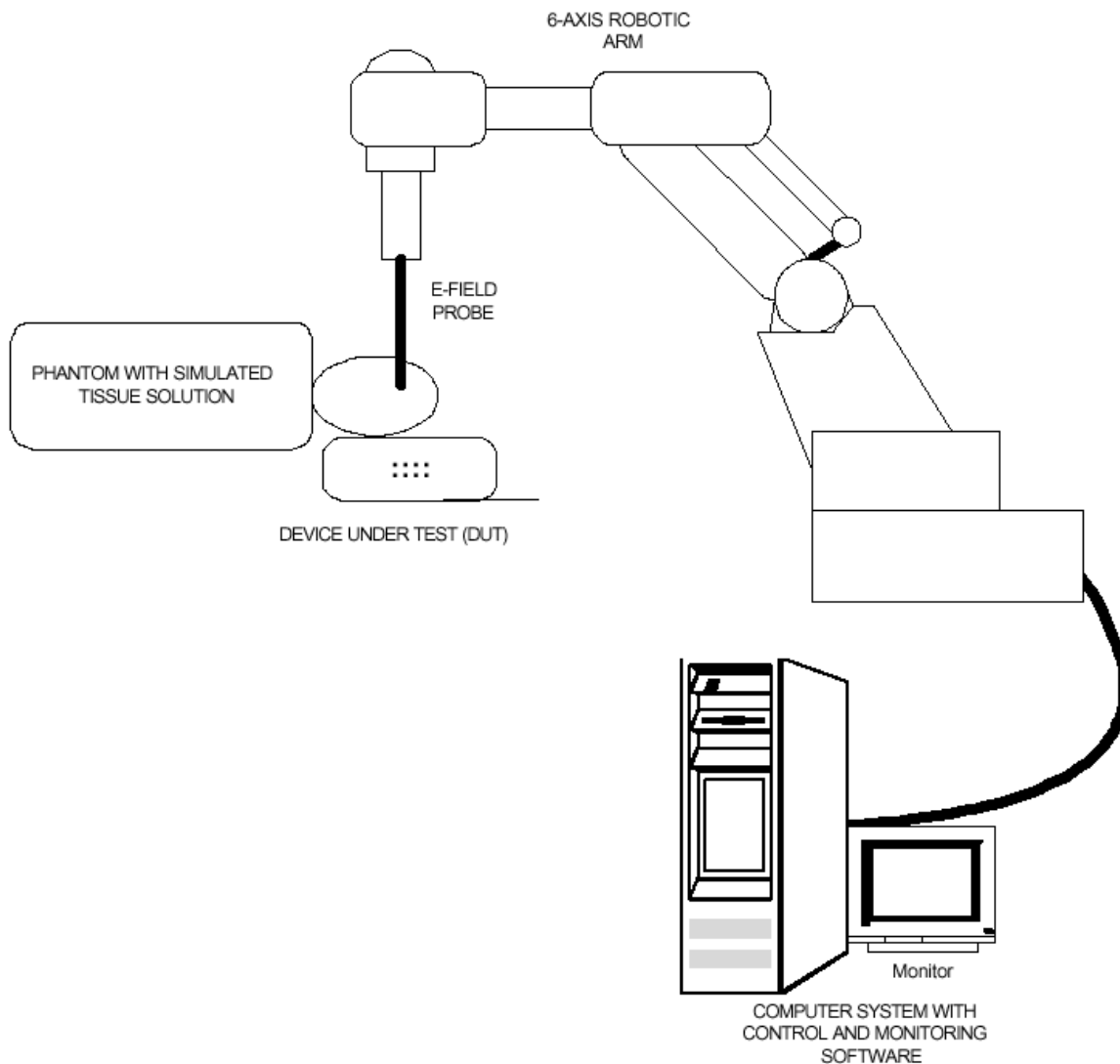
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2.8. BLOCK DIAGRAM OF TEST SETUP

The EUT was configured as normal intended use. The following block diagram shows a representative equipment arrangement during tests:



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EXHIBIT 3. SUMMARY OF TEST RESULTS

3.1. LOCATION OF TESTS

All of the measurements described in this report were performed at UltraTech Group of Labs located at:

3000 Bristol Circle, in the city of Oakville, Province of Ontario, Canada.

All measurements were performed in UltraTech's shielded chamber, 24' x 16' x 8'.

3.2. APPLICABILITY & SUMMARY OF SAR RESULTS

The peak spatial - average SAR measured was found to be **1.492 W/Kg** at **10 mm separation** with **25 % duty cycle** (64 ms : 196 ms)

SAR Limits	Test Requirements	Compliance (Yes/No)
General population/Uncontrolled exposure 0.08W/kg whole body average and spatial peak SAR of 1.6W/kg, averaged over 1gram of tissue Hands, wrist, feet and ankles have a peak SAR not to exceed 4 W/kg, averaged over 10 grams of tissue.	Requirements using guidelines established in IEEE C95.1-1991 FCC OET Bulletin 65 (Supplement C) Industry Canada RSS-102 (Issue 1). ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1)	YES
Occupational/Controlled Exposure 0.4W/kg whole body average and spatial peak SAR of 8W/kg, averaged over 1gram of tissue Hands, wrist, feet and ankles have a peak SAR not to exceed 20 W/kg, averaged over 10 grams of tissue.	Requirements using guidelines established in IEEE C95.1-1991 FCC OET Bulletin 65 (Supplement C), Industry Canada RSS-102 (Issue 1) ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1)	N/A

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EXHIBIT 4. MEASUREMENTS, EXAMINATIONS & TEST DATA

4.1. TEST SETUP

EUT Information		Condition	
Radio Type	Mobile Payment Terminal	Robot Type	6 Axis
Model Number	K78-204 or LP9100	Scan Type	SAR - Area/Zoom
Serial Number	Test Sample	Measured Field	E
Frequency Band (MHz)	806 – 821	Phantom Type	2mm base Flat Phantom
Frequency Tested (MHz)	806.0, 813.5, 821.0	Phantom Position	Waist
Nominal Output Power (W)	2 W Conducted	Room Temperature	22 °C ± 1 °C
Antenna Type	Retractable Monopole	Room Humidity	35 % ± 10 %
Signal Type	FM	Tissue Temperature	21 °C ± 1 °C
Duty Cycle	25% (64 ms : 196 ms)		

Type of Tissue	Muscle
Target Frequency (MHz)	835
Target Dielectric Constant	55.2 ± 5%
Target Conductivity (S/m)	0.97 ± 5%
Composition (by weight)	DI Water (53.13 %) Sugar (45.62 %) Salt (0.93%) HEC (0.23 %) Bactericide (0.01%)
Measured Dielectric Constant	55.43
Measured Conductivity (S/m)	0.97
Probe Name	E
Probe Orientation	Isotropic
Probe Offset (mm)	2.25
Sensor Factor	10.8
Conversion Factor	0.8539
Calibration Date (MM/DD/YY)	10/25/2001

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4.2. PHOTOGRAPH OF EUT WITH ALL ACCESORIES



<Front View - Antenna Retracted>

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Mobile Payment Terminal, Model No.: K78-204 or LP9100

FCC ID: P3AK78-2XX



<Rear View - Antenna Retracted >

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Mobile Payment Terminal, Model No.: K78-204 or LP9100

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<Front View – Antenna Extended>

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<Rear View – Antenna Extended >

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<Front View - Ault Inc., I.T.E. Power Supply, Model No.: PW 107>



<Ault Inc., I.T.E. Power Supply, Model No.: PW 107>

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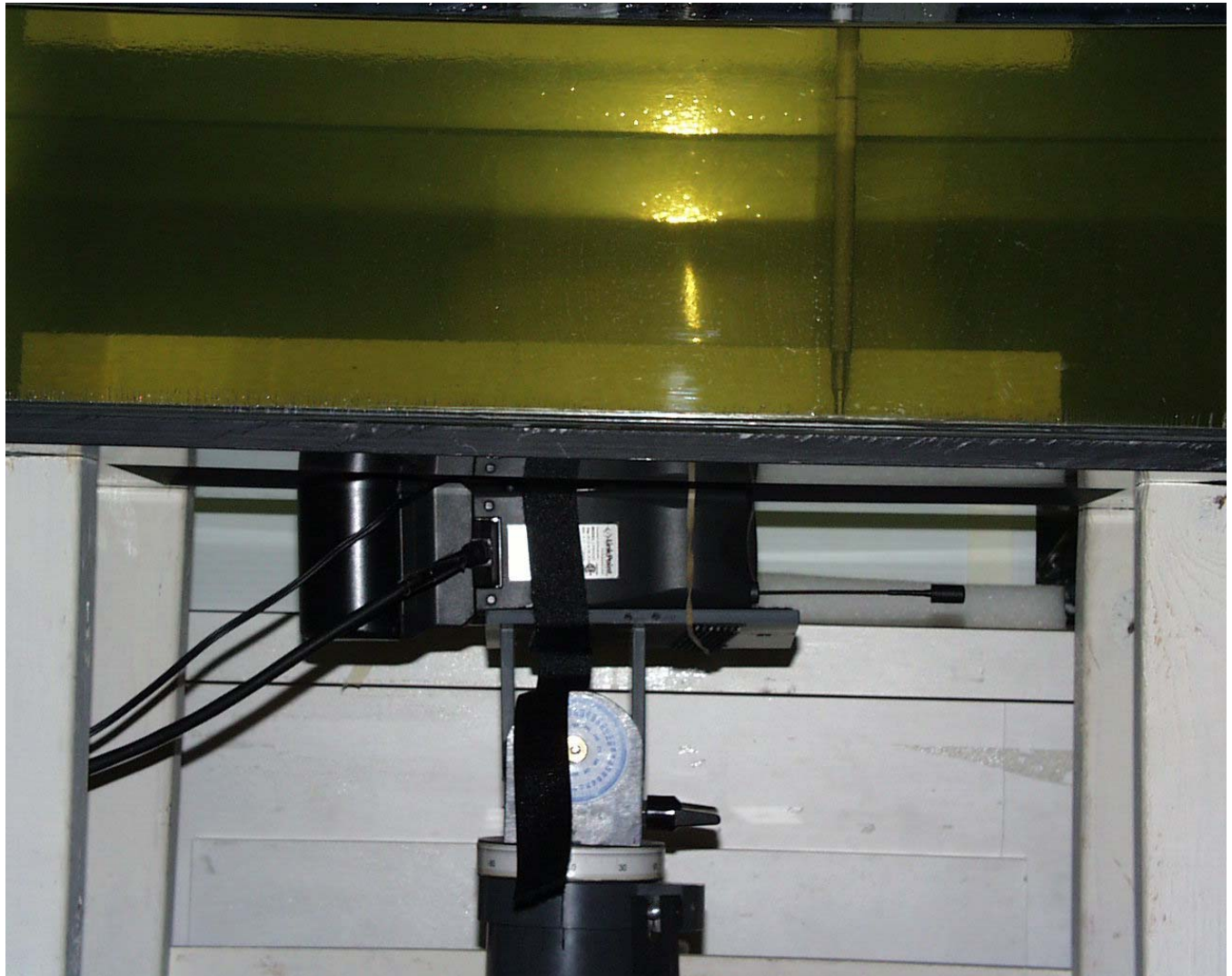
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4.3. PHOTOGRAPHS OF EUT POSITION (BODY WORN POSITION)



< Left face in contact with the phantom >

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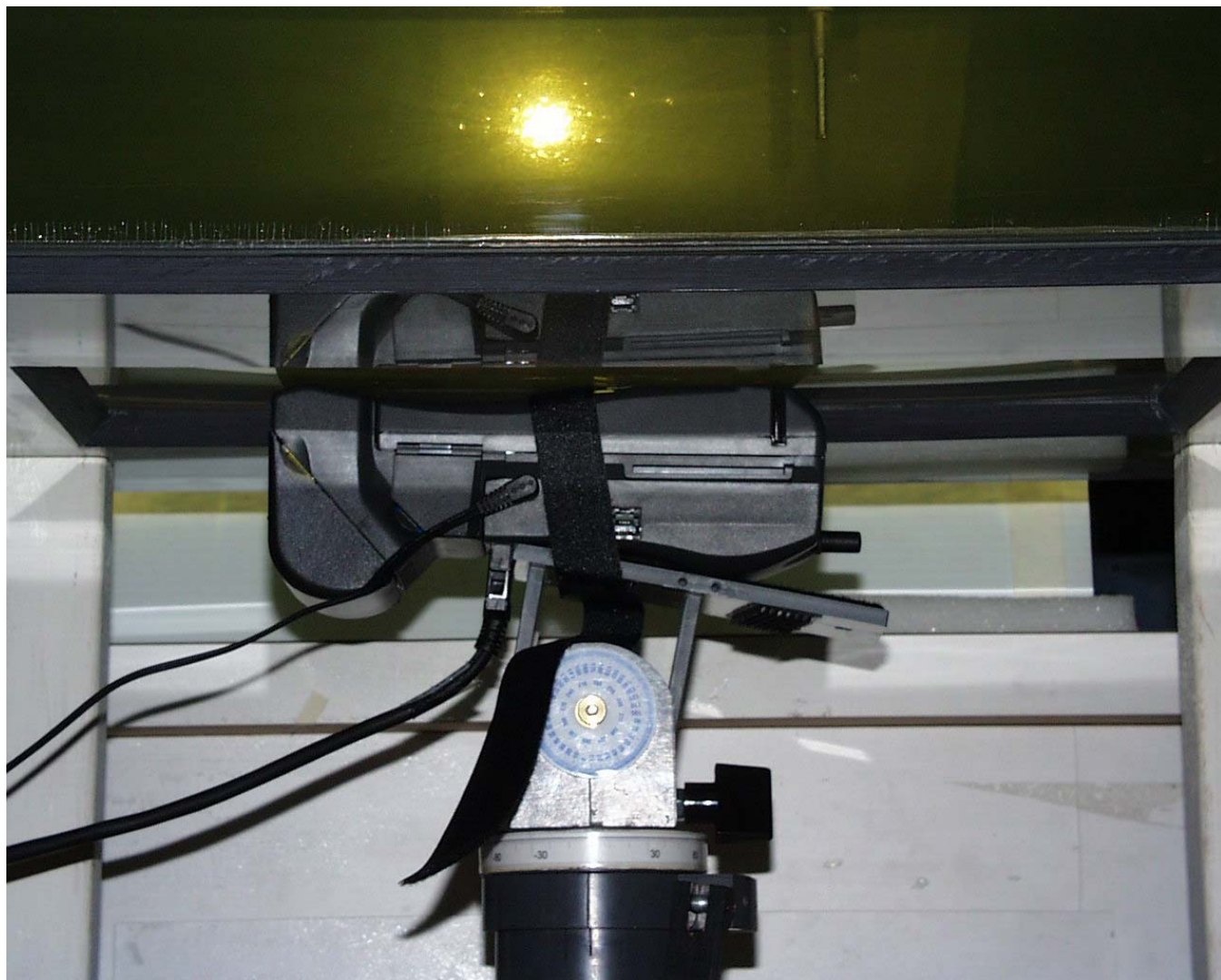
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< Front face in contact with the phantom >

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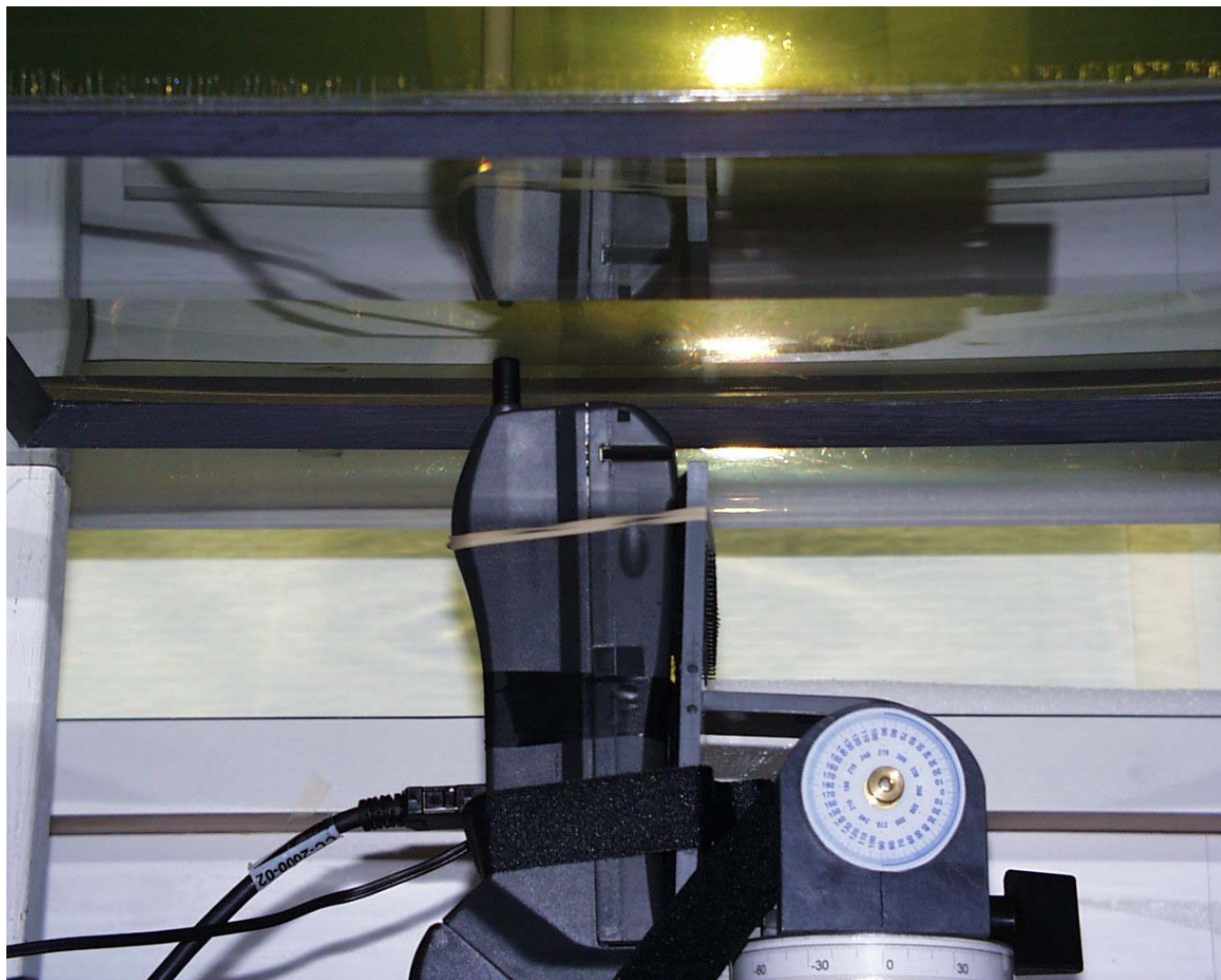
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< Top face toward phantom, tip of antenna in contact and antenna fully retracted >

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< Right face toward phantom, tip of antenna in contact and antenna fully retracted >

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SPECIFIC ABSORPTION RATIO (SAR)

IEEE C95.1-1991, FCC OET Bulletin 65 (Supplement C), Industry Canada RSS-102(Issue 1) and ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1)

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Mobile Payment Terminal, Model No.: K78-204 or LP9100

FCC ID: P3AK78-2XX



< Right face toward phantom, the tip of antenna in contact and antenna fully extended >

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Mobile Payment Terminal, Model No.: K78-204 or LP9100

FCC ID: P3AK78-2XX



< Back face toward phantom, the tip of antenna in contact and the antenna fully retracted >

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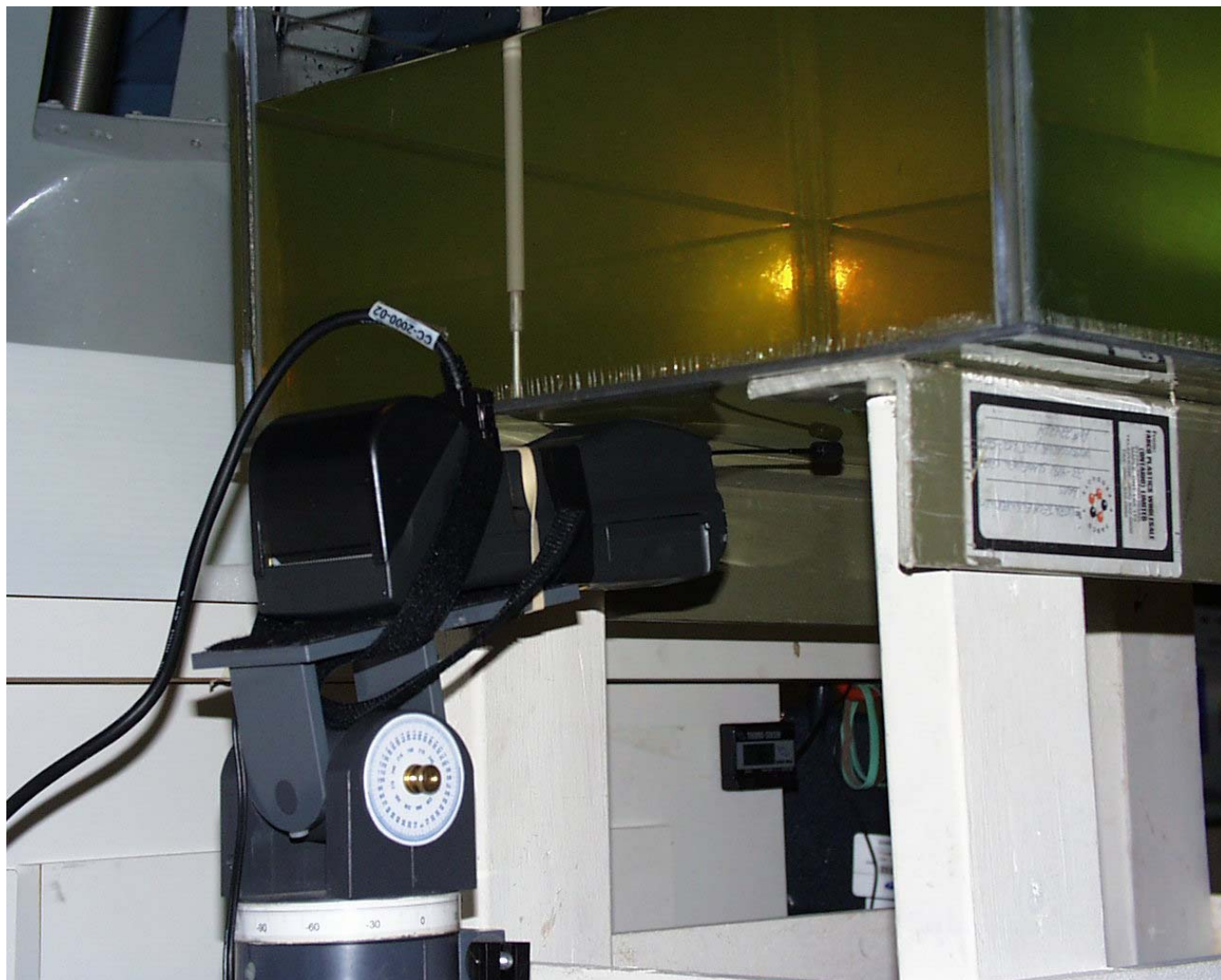
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Mobile Payment Terminal, Model No.: K78-204 or LP9100

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< Back face toward phantom, the tip of antenna in contact and antenna fully extended >

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4.4. PEAK SPATIAL-AVERAGE SAR MEASURED

Phantom Configurations	Device Test Positions	Antenna Position	SAR (W/kg)		
			Device Test Frequency		
			806.0 MHz	813.5 MHz	821.0 MHz
Body-worn (Waist)	Right face toward the phantom, 10mm separation, 25% duty cycle	Extended	1.492	1.485	1.345

4.5. SAR MEASUREMENT DATA

4.5.1. Body-worn configuration Results

EUT Configurations	Separation distance (mm)	Antenna Position	SAR (W/kg)		
			Device Test Frequency		
			806 MHz	813.5 MHz	821.0 MHz
Top face toward the phantom, 25% duty cycle	5	Extended	0.802	0.914	0.935
Back face toward the phantom, 25% duty cycle	5	Extended		2.122	
		Retracted		0.974	
	10	Extended	1.492	1.485	1.345
Right face toward the phantom, 25% duty cycle	5	Extended		2.281	
		Retracted		0.702	
	10	Extended	1.336	1.421	0.960

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EXHIBIT 5. SAR SYSTEM CONFIGURATION & TEST METHODOLOGY

5.1. MEASUREMENT SYSTEM SPECIFICATIONS

Positioning Equipment	Probe
Type : 3D Near Field Scanner	Sensor : E-Field
Location Repeatability : 0.1mm	Spatial Resolution : 0.1 cm ³
Speed 180 °/sec	Isotropic Response : ± 0.25 dB
AC motors	Dynamic Range : 2 µW/g to 100 mW/g
Computer	Phantom
Type : Pentium III 500MHz	Tissue : Simulated Tissue with electrical characteristics similar to those of the human at normal body temperature.
Memory : 256 MB RAM	Left/Right Head: IEEE P1528 Compliant SAM manufactured by Aprel
Operating System : Windows 2000 Pro	Body/Frontal Head: IEEE Flat Phantom 2mm Base
Monitor : 19" SVGA	

5.2. TEST PROCEDURES

In the SAR measurement, the positioning of the probes must be performed with sufficient accuracy to obtain repeatable measurements in the presence of rapid spatial attenuation phenomena. The accurate positioning of the E-field probe is accomplished by using a high precision robot. The robot can be taught to position the probe sensor following a specific pattern of points. In a first sweep, the sensor is positioned as close as possible to the interface, with the sensor enclosure touching the inside of the fiberglass shell. The SAR is measured on a grid of points, which covers the curved surface of the phantom in an area larger than the size of the DUT. After the initial scan, a high-resolution grid is used to locate the absolute maximum measured energy point. At this location, attenuation versus depth scan will be accomplished by the measurement system to calculate the SAR value.

5.3. PHANTOM

For Head mounted devices placed next to the ear, the phantom used in the evaluation of the RF exposure of the user of the wireless device is a IEEE P1528 compliant SAM phantom, shaped like a human head and filled with a mixture simulating the dielectric characteristics of the brain. A left sided head and a right sided head are evaluated to determine the worst case orientation for SAR. For body mounted and frontal held push-to-talk devices, a flat phantom of dimensions 70x42x20cm with a base plate thickness of 2mm is used.

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5.4. SIMULATED TISSUE

Simulated Tissue: Suggested in a paper by George Hartsgrrove and colleagues in University of Ottawa Ref.: Bioelectromagnetics 8:29-36 (1987)

Ingredient	Quantity
Water	40.4 %
Sugar	56.0 %
Salt	2.5 %
HEC	1.0 %
Bactericide	0.1 %

Table. Example of composition of simulated tissue.

This simulated tissue is mainly composed of water, sugar and salt. At higher frequencies, in order to achieve the proper conductivity, the solution does not contain salt. Also, at these frequencies, D.I. water and alcohol is preferred.

Target Frequency	Head		Body	
(MHz)	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

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File #: KYC-005-SAR

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Tissue Density : Approximately 1.25 g/cm³

5.4.1. Preparation

We determine the volume needs and carefully measure all components. A clean container is used where the ingredients will be mixed. A stirring paddle mounted to a drill press is used to stir the mixture. First we heat the DI water to about 40 °C to help the ingredients dissolve and then we pour the salt and the bactericide. We stir until all the ingredients are completely dissolved. We continue stirring slowly while adding the sugar. We avoid high RPM from the mixing device to prevent air bubbles in the mixture. Later on, we add the HEC to maintain the solution homogeneous. Mixing time is approximately 30 to 40 min.

5.5. MEASUREMENT OF ELECTRICAL CHARACTERISTICS OF SIMULATED TISSUE

- 1)** Network Analyzer HP8753C or others
- 2)** Slotted Coaxial Waveguide

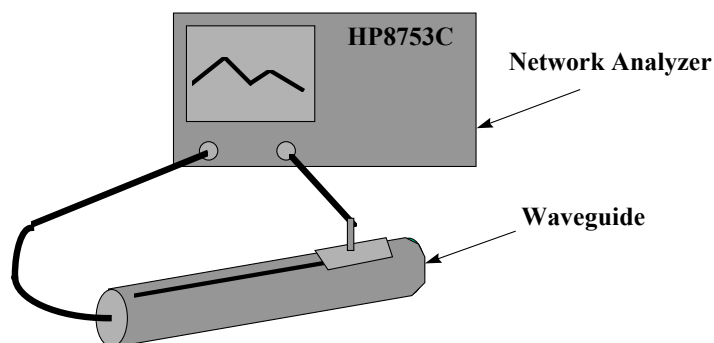
5.5.1. Description of the slotted coaxial waveguide

The cylindrical waveguide is constructed with copper tube of about 30 to 40 cm in length, generally 12.5 mm diameter, with connectors at both ends. Inside of this tube, a conductive rod about 6.3 mm is coaxial supported by the two ends connectors (radiator). A slot 3 mm wide start at the beginning of the tube to approximately two thirds of the tube length. The outer edge of the slotted tube is marked in increments of 1 centimeter (10 to 12), and 0.5 centimeter for higher frequencies. A saddle piece containing the sampling probe is inserted in the slot so the tip of the probe is close but not in contact with the inner conductor (radiator).

To measure the electrical characteristics of the liquid simulated tissue, we fill the coaxial waveguide with the mixture, select CW frequency and measure amplitude and phase with the Network Analyzer for every point in the slot (typically 11). An effort is made to keep the resultant dielectric constant and conductivity within 5 % of published data.

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Electrical Characteristics Measurement Setup



$$c = 3 \cdot 10^8 \text{ m/s}$$

$$A = \frac{\Delta A}{20} \ln_{10} \frac{1}{m}$$

$$\theta = \frac{\Delta \theta \cdot 2\pi}{360}$$

$$\lambda = \frac{c}{f} \cdot \frac{100}{2.54} \text{ inches}$$

$$\varepsilon_{re} = \frac{(A^2 + \theta^2) \cdot \lambda^2}{4\pi^2}$$

$$\theta' = \left| \frac{|A| \cdot \lambda}{4\pi \sqrt{\varepsilon_{re}}} \right|$$

$$S = \tan(2\theta')$$

$$\varepsilon_r = \frac{\varepsilon_{re}}{\sqrt{(1 + S^2)}}$$

$$\sigma = S \cdot 2\pi \cdot f \cdot 8.854 \cdot 10^{12} \cdot \varepsilon_r \text{ (S/m)}$$

where;

ΔA is the amplitude attenuation in dB

$\Delta \theta$ is the phase change in degrees for 5 cm of wave propagation in the slotted line

f is the frequency of interest in Hz.

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5.6. SYSTEM DESCRIPTION

The measurement system consists of an E-field probe, instrumentation amplifiers, RF transparent cable connecting the amplifiers to the computer, the robotics arm with its extension and proximity sensors, a phantom with simulated tissue and a radio holder to support the device under test. The E-field probe is a three channel device used to measure RF electric fields in the near vicinity of the source. The three sensors are mutually orthogonal positioned dipoles, and are constructed over a quartz substrate. Located in the center of the dipole is a Schottky diode. High impedance lines are connecting the sensor to the amplifier and then optically linked to the computer. The probe has an isotropic response and is transparent to the RF fields.

Calibration is performed by two steps:

- 1) Determination of free space E-field from amplified probe outputs in a test RF field. This calibration is performed in a TEM cell when the frequency is below 1 GHz and in a waveguide or some other methodologies above 1 GHz. For the free space calibration, we place the probe in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. This reading equate to $1\text{mW}/\text{cm}^2$ if that power density is available in the correspondent cavity.
- 2) Correlation of the measured free space E-field, to temperature rise in a dielectric medium. E-field temperature correlation calibration is performed in a planar phantom filled with the appropriate simulated tissue.

For temperature correlation calibration, a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe. First, the location of the maximum E-field close to the phantom's inner surface is determined as a function of power into the RF source; in this case, a dipole. Then, the E-field probe is moved sideways so that the temperature probe, while affixed to the E-field probe is placed at the previous location of the E-field probe. Finally, temperature changes for 30 seconds exposure at the same RF power levels used for the E-field measurement are recorded. The following equation relates SAR to initial temperature slope:

$$SAR = C \frac{\Delta T}{\Delta t}$$

where:

Δt = exposure time (30 seconds),
 C = heat capacity of tissue,
 ΔT = temperature increase due to RF exposure.

SAR is proportional to T/t , the initial rate of tissue heating, before thermal diffusion takes place. Now, it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E-field;

$$SAR = \frac{|E|^2 \cdot \sigma}{\rho}$$

where:

σ = Simulated tissue conductivity,
 ρ = Mass density of solution

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5.7. DATA EXTRAPOLATION (CURVE FITTING)

The distance from the center of the sensor (diode) to the end of the protective tube is called the ‘probe offset’. To compensate we use an exponential curve fitting method to obtain the peak surface value from the voltages measured at the distance from the inner surface of the phantom. At the point where the highest voltage was recorded, the field is measured as close as possible to the phantom’s surface and every 1mm along the ‘Z’ axis for a distance of 50 mm. The appropriate exponential curve is obtained from all the points measured and used to define an exponential decay of the energy density versus depth.

$$E(z) = E_0 \cdot e^{-z/\delta} \text{ (mV)}$$

5.8. INTERPOLATION AND GRAM AVERAGING

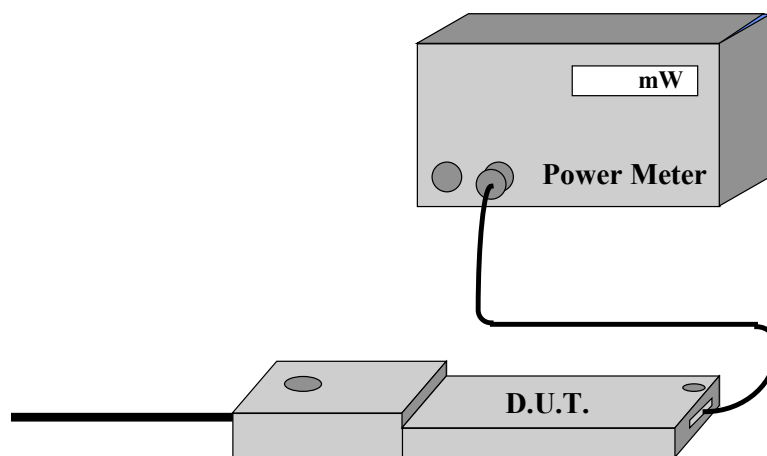
The voltage, (1 cm) above the phantoms surface ($E_{\text{tot}} 1 \text{ cm}$), is needed to calculate the exposure over one gram of tissue. This SAR value that estimates the average over 1 gram of tissue, is obtained by taking the integral over 1 cm^2 surface of the measured field along the exponential decay curve of the energy density with depth.

$$SAR(mW/g) = \int_{v=1g} SAR(\bullet) dv = \int_{s=1\text{cm}^2} \int_0^{1\text{cm}} E(z) \cdot \frac{CF}{\text{SensorFactor}} dz ds$$

5.9. POWER MEASUREMENT

Whenever possible, a conducted power measurement is performed. To accomplish this, we utilize a fully charged battery, a calibrated power meter and a cable adapter provided by the manufacturer. The data of the cable and related circuit losses are also provided by the manufacturer. The power measurement is then performed across the operational band and the channel with the highest output power is recorded.

Power measurement is performed before and after the SAR to verify if the battery was delivering full power at the time of testing. A difference in output power would determine a need for battery replacement and to repeat the SAR test.



Measured Power + Cable and Switching Mechanism Loss

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5.10. POSITIONING OF D.U.T.

The clear SAM phantom shell have been previously marked with a highly visible grid with a defined centre line, so it can easily be seen through the liquid simulated tissue. In the case of testing a cellular phone, this line is connecting the ear channel with the corner of the lips. The D.U.T. is then placed by centering the speaker with the ear channel and the center of the radio width with the corner of the mouth.

For HAND HELD devices (push-to-talk), or any other type of wireless transmitters positioned in front of the face, the D.U.T. will be positioned 2.5cm distance from a flat phantom to simulate the frontal facial position in use. All body-worn operating configurations are tested using a flat phantom. The length and width of the phantom is at least twice the corresponding dimensions of the test device, including its antenna.

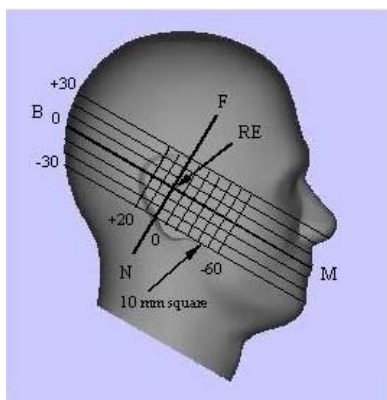


Figure 5.1 – Side view of the phantom showing relevant marking

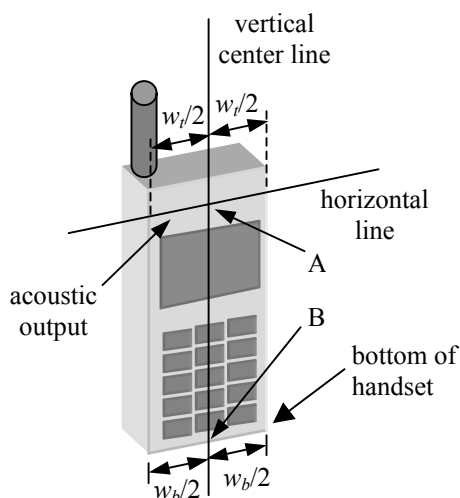


Figure 5.2a – Handset vertical and horizontal reference lines – fixed case

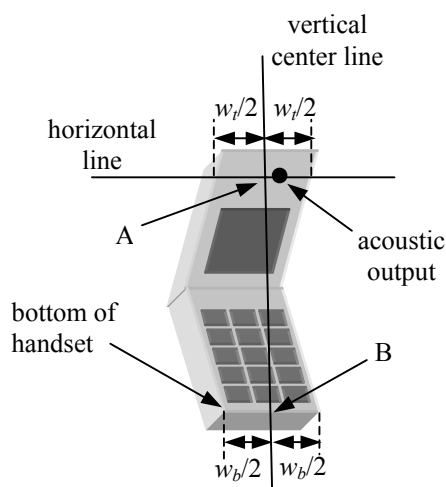


Figure 5.2b – Handset vertical and horizontal reference lines – “clam-shell”

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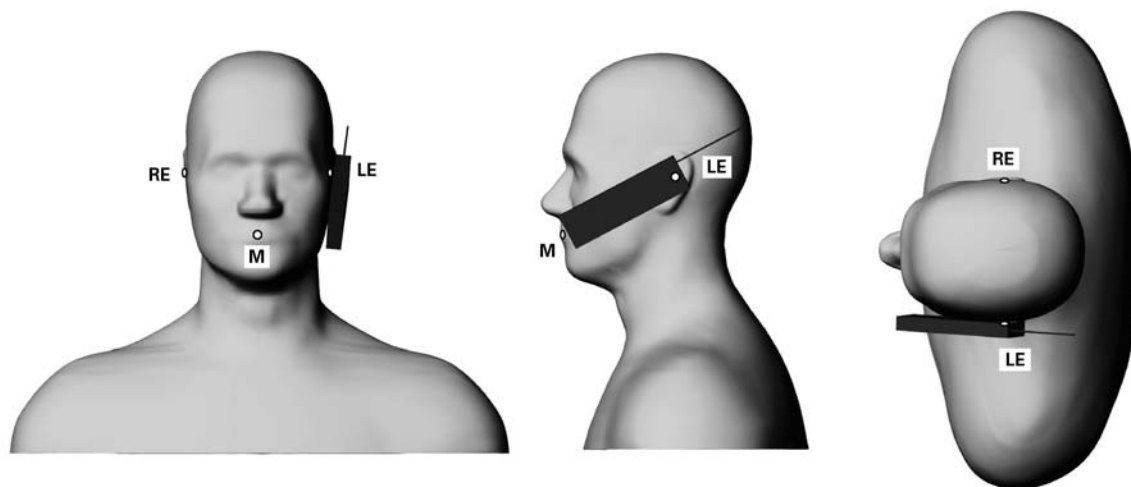


Figure 5.3 – Phone position 1, “cheek” or “touch” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only (also see Section 4).

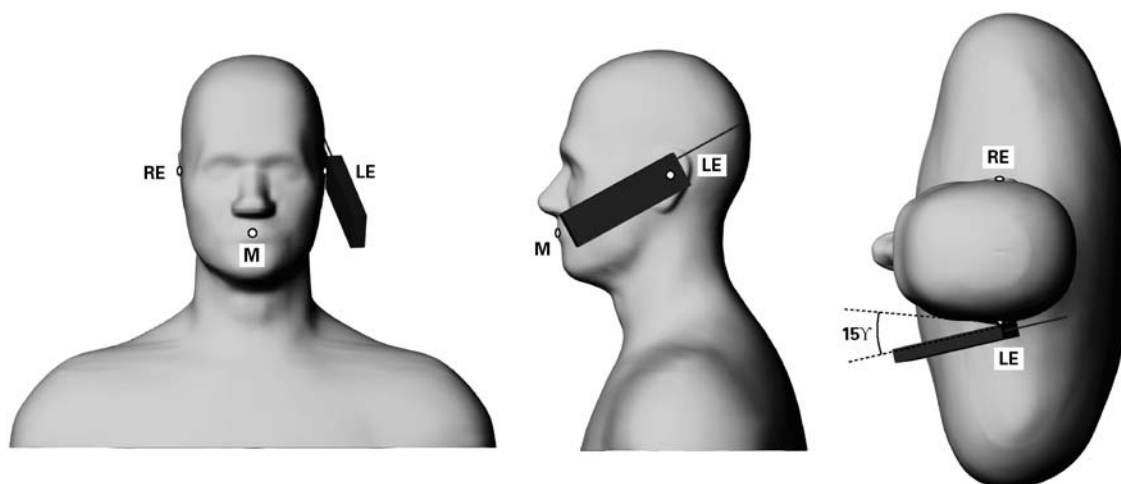


Figure 5.4 – Phone position 2, “tilted position.” The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated. The shoulders are shown for illustration purposes only (also see Section 4).

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5.11. SAR MEASUREMENT UNCERTAINTY

This uncertainty analysis covers the 3D-EMC Laboratory test procedure for Specific Absorption Rate (SAR) associated with wireless telephones and similar devices.

Standards Covered Are:

WGMTE 96/4 - Secretary SC211/B

FCC 96-326, ET Docket No. 93-62

Industry Canada RSS 102

ACA Radiocommunications (Electromagnetic Radiation – Human Exposure) Amendment Standard 2000 (No. 1)

The laboratory test procedure, and this uncertainty analysis, may be used to cover all standards above. It is based on test equipment and procedures specified by 3D-EMC Laboratories, Inc. located in Ft. Lauderdale, Florida.

Measurement Uncertainty:

Table I. Estimated SAR Measurement Uncertainty

Contribution	Error (±dB)	Probability Distribution	Type Evaluation	Standard Uncertainty (±dB)
A. Field Measurement Errors:		Rectangular	Type B	
Isotropy in Phantom BTS Liquid	0.8			0.46
Frequency Response	0.2			0.12
Linearity	0.2			0.12
Probe Calibration Error (rss)	0.7			0.40
Duty Factor Variability	0.2			0.12
B. Spatial Peak SAR Errors:		Normal	Type A	
Extrapolation & Interpolation, and Position	0.2			0.20
Integration & Search Routine	0.1			0.10
Cube Shape	0.2			0.20
C. Additional Errors:		Rectangular	Type B	
Solution Variability (Worst-Case SAR)	0.21			0.12
D. Combined Standard Uncertainty, u_c :		Normal	-	0.52
E. Expanded Uncertainty, U :		Normal (k=2)	-	1.04
		95% Confidence	-	27.14%

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EXHIBIT 6. SAR PRESCANS

Precans to determine the worst configuration of RF exposure:

(1) Body-worn configurations

EUT Configurations	Antenna Position	SAR (W/kg) Device Test Frequency
		813.5 MHz
Front face toward the phantom, 25% duty cycle	Extended	0.290
	Retracted	0.024
Left face toward the phantom, 25% duty cycle	Extended	0.322
	Retracted	0.113
Top face toward the phantom, Tip of antenna in contact with phantom, 25% duty cycle	Retracted	4.592
Back face toward the phantom, Tip of antenna in contact with phantom, 25% duty cycle	Extended	3.874
	Retracted	2.311
Right face toward the phantom, Tip of antenna in contact with phantom, 25% duty cycle	Extended	4.313
	Retracted	2.984

Precans for the feasible configurations had been performed in order to determine the worst case under the specific configurations as described in the table. Through these precans, the hot spot was found to be located at the vicinity of the base of the antenna. The test configurations in which a failure was found, were re-evaluated by increasing the separation distance until it was compliant with FCC limit.

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EXHIBIT 7. BODY-WORN CONFIGURATION SAR MEASUREMENTS

7.1. TOP FACE TOWARD THE PHANTOM

EUT Configurations	Separation distance (mm)	Antenna Position	SAR (W/kg)		
			Device Test Frequency		
			806.0 MHz	813.5 MHz	821.0 MHz
Top face toward the phantom, 25% duty cycle	5	Extended	0.802	0.914	0.935

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File #: KYC-005-SAR

February 11, 2002

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Top face toward phantom
806.0MHz - Antenna Fully Retracted - 05mm Separation

Test Information

Date : 14/01/2002
Time : 7:27:50 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-2XX

Test : SAR
Frequency (MHz) : 806.0
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Retracted
Measured Power (dBm) : n/a
(conducted)
Measured Field (mV) before : 8.137
Measured Field (mV) after : 8.018

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

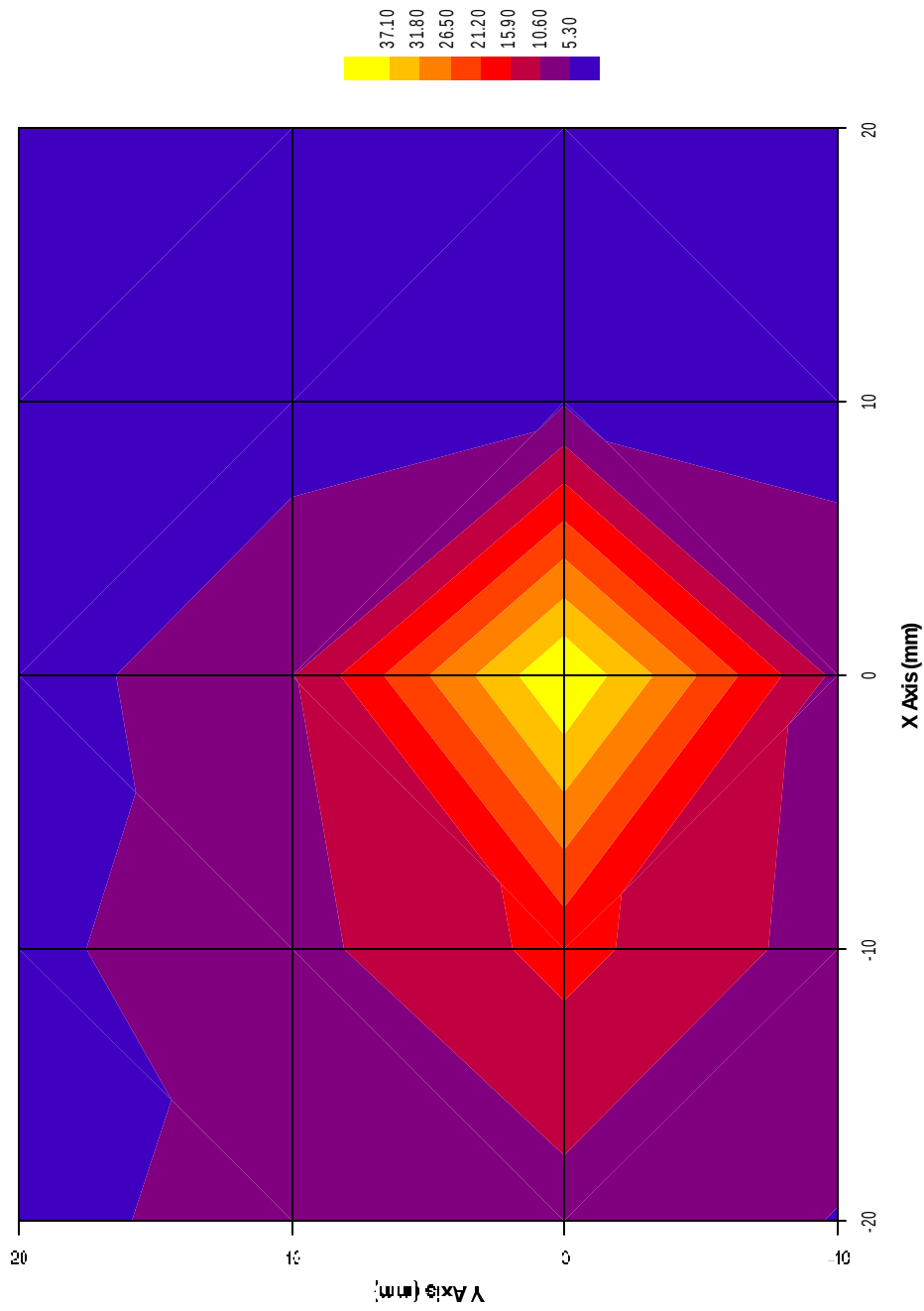
X = 0 Y = 0

Measured Values (mV) :

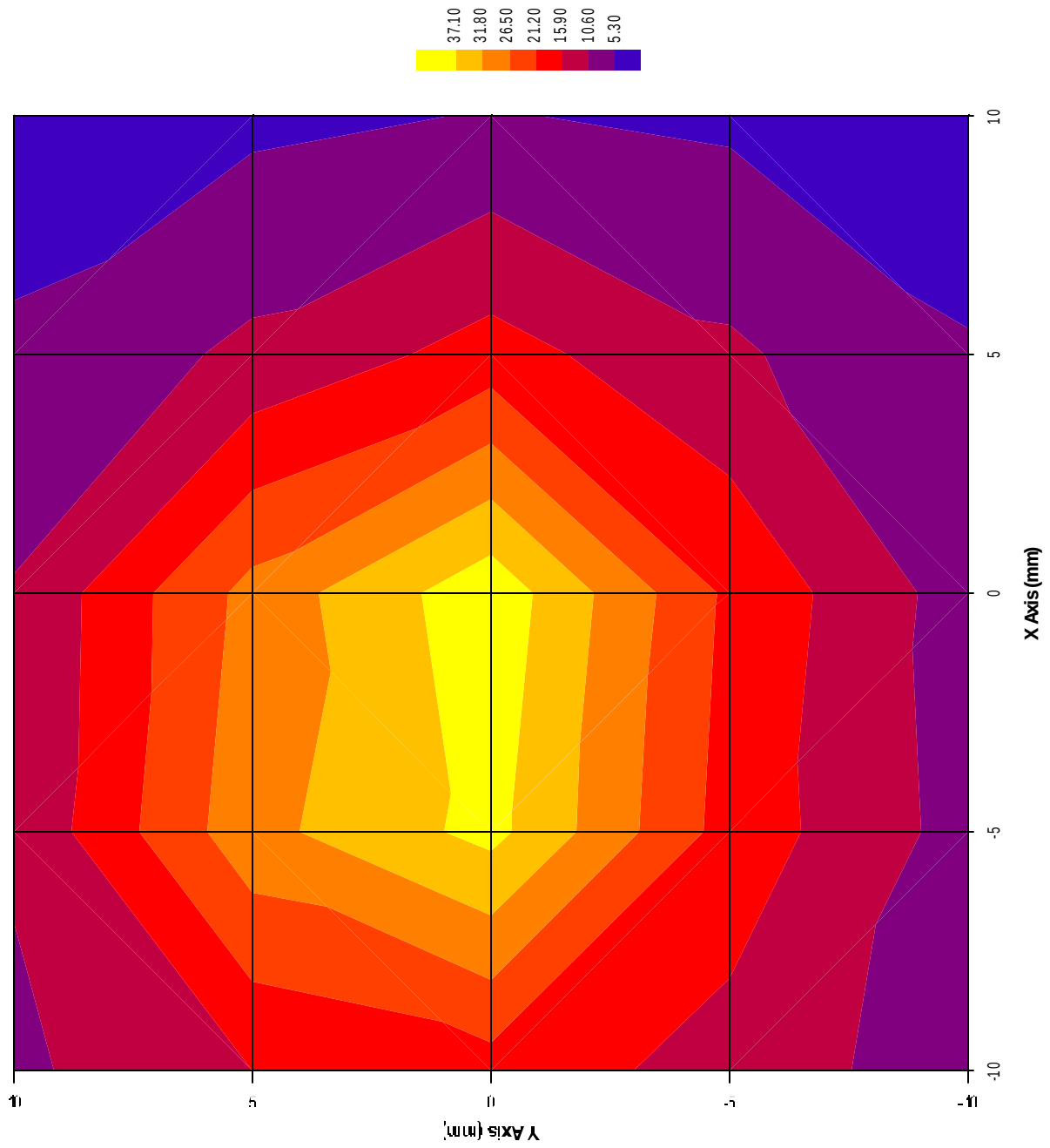
40.133	18.612	10.999	7.544	5.621	4.315
3.517	2.657	2.276	1.757	1.311	

Peak Voltage (mV) : 124.528 1 Cm Voltage (mV) : 0.624 SAR (W/Kg) : 0.802

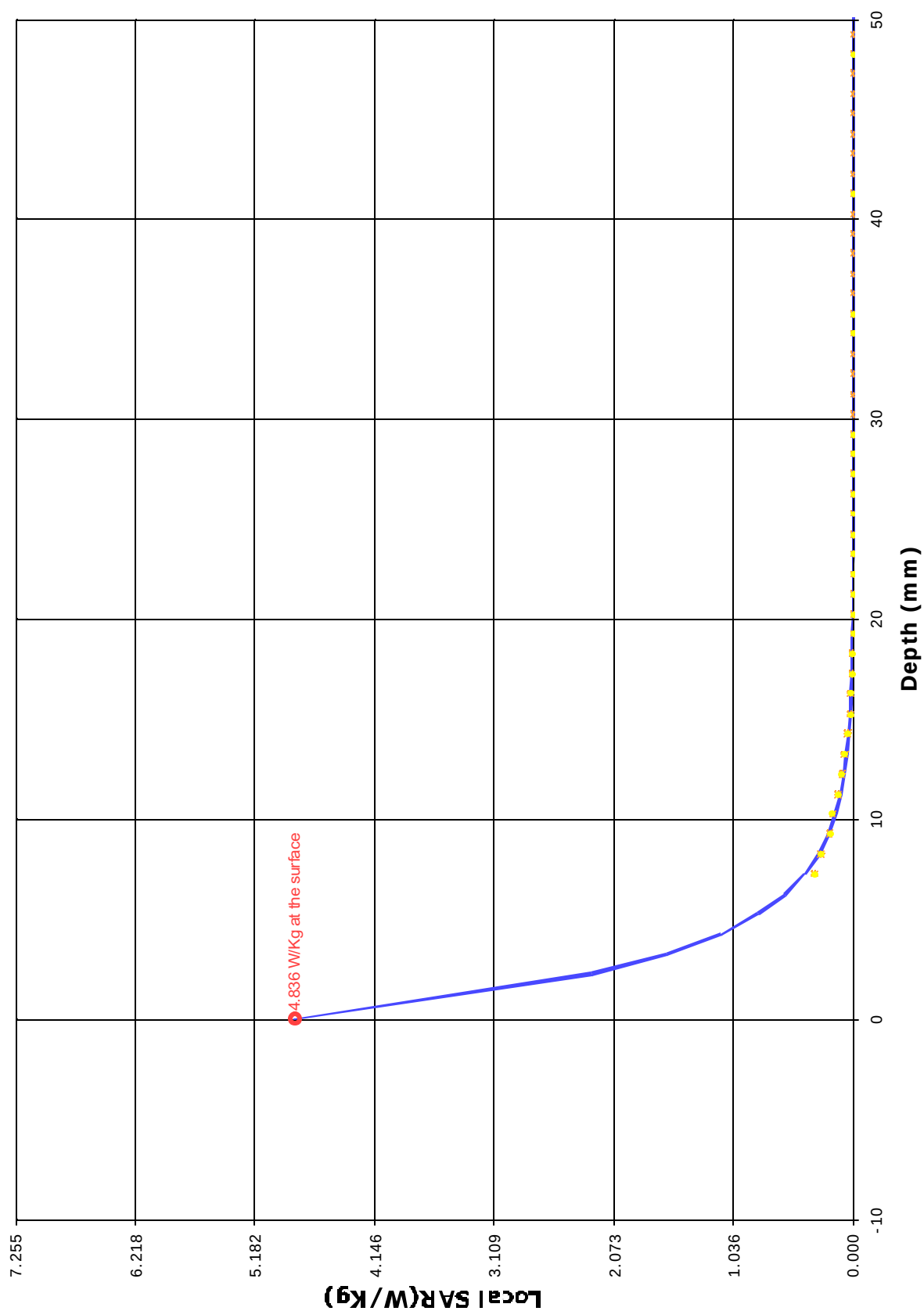
Top face toward phantom
806.0MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
806.0MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
806.0MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation

Test Information

Date : 14/01/2002
Time : 7:15:50 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-2XX

Test : SAR
Frequency (MHz) : 813.5
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Retracted
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 8.378
Measured Field (mV) after : 7.995

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

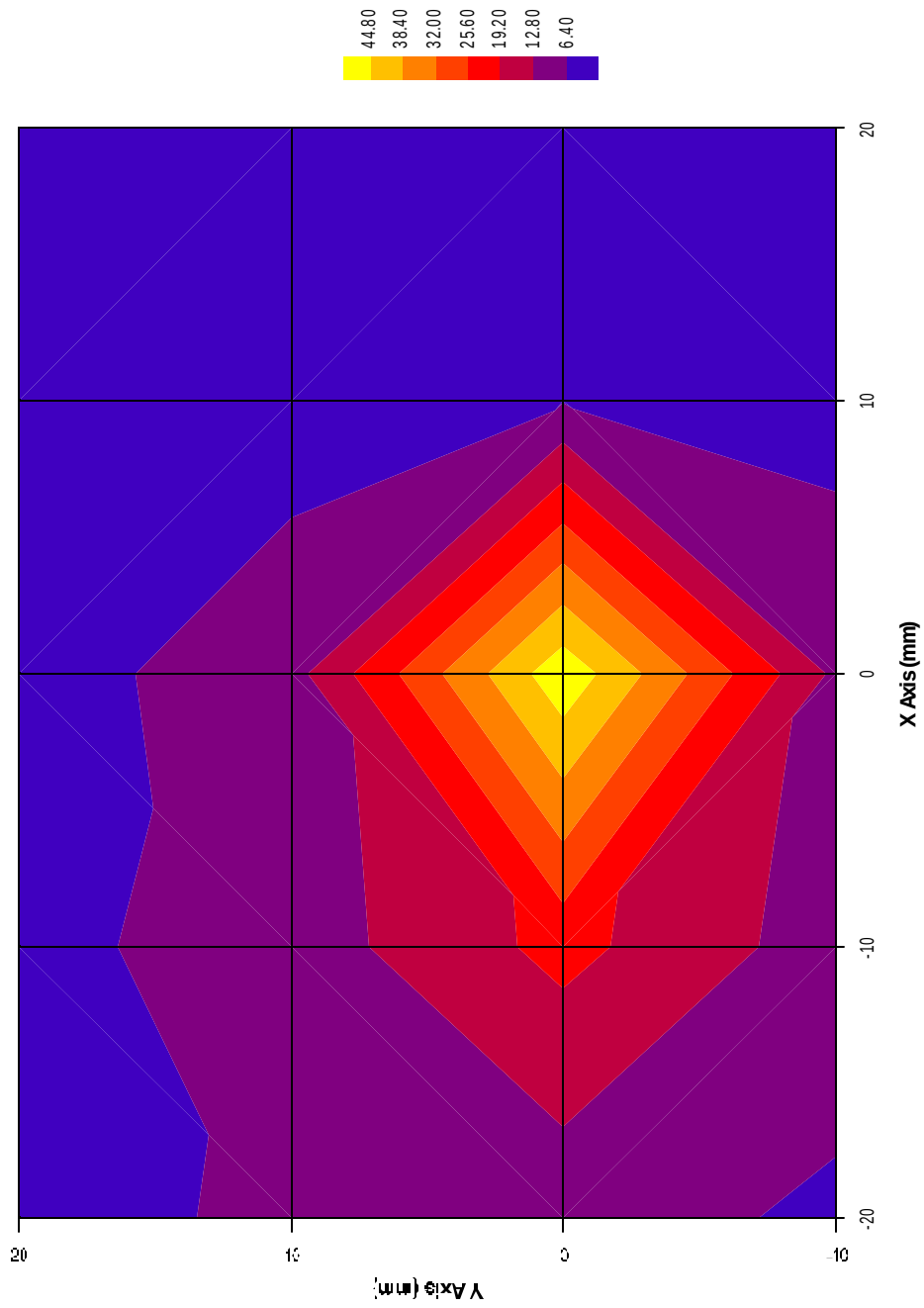
X = 0 Y = 0

Measured Values (mV) :

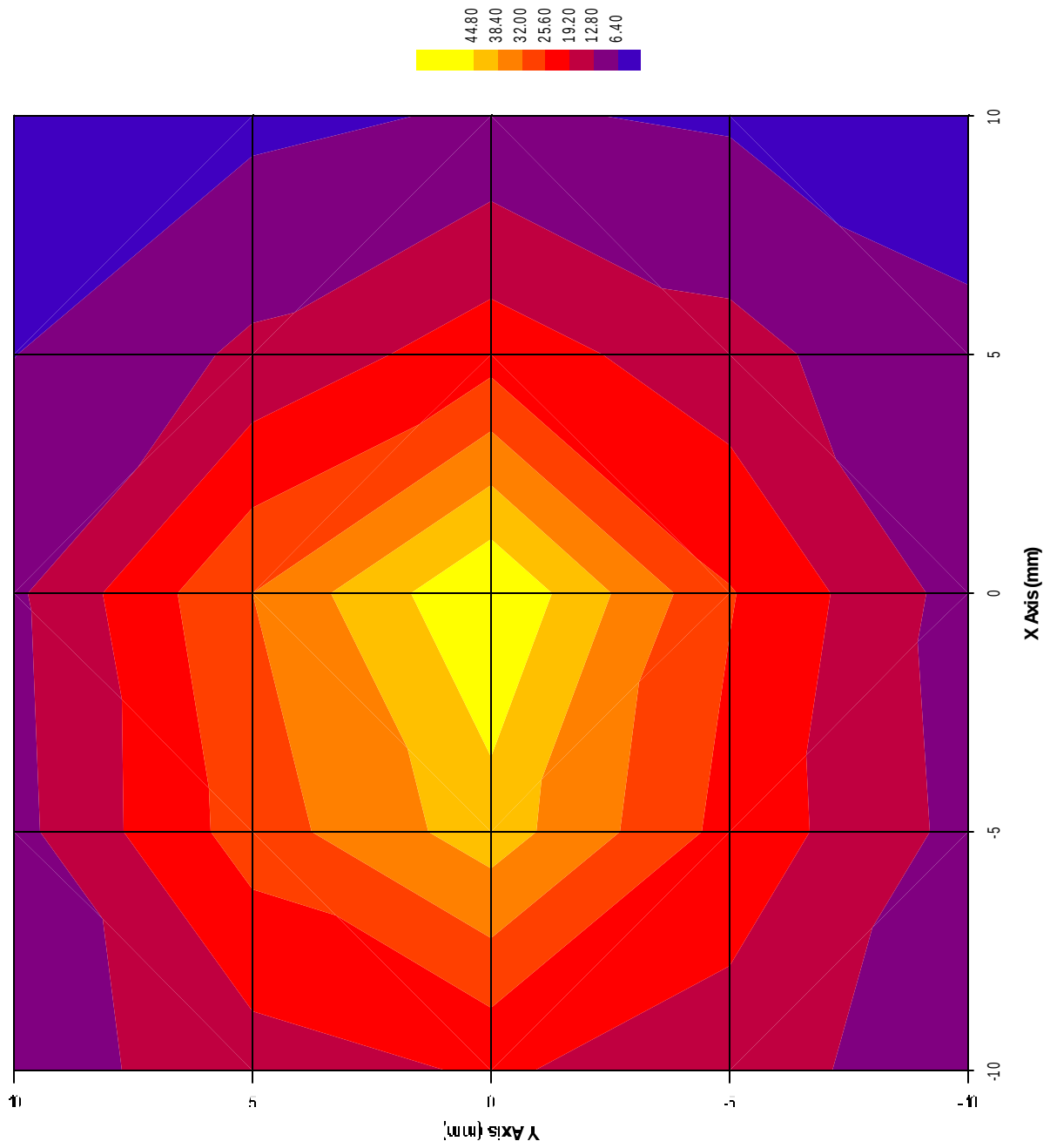
46.750	23.363	13.141	9.014	6.786	5.226
4.053	3.243	2.811	2.206	1.651	

Peak Voltage (mV) : 141.343 1 Cm Voltage (mV) : 0.803 SAR (W/Kg) : 0.914

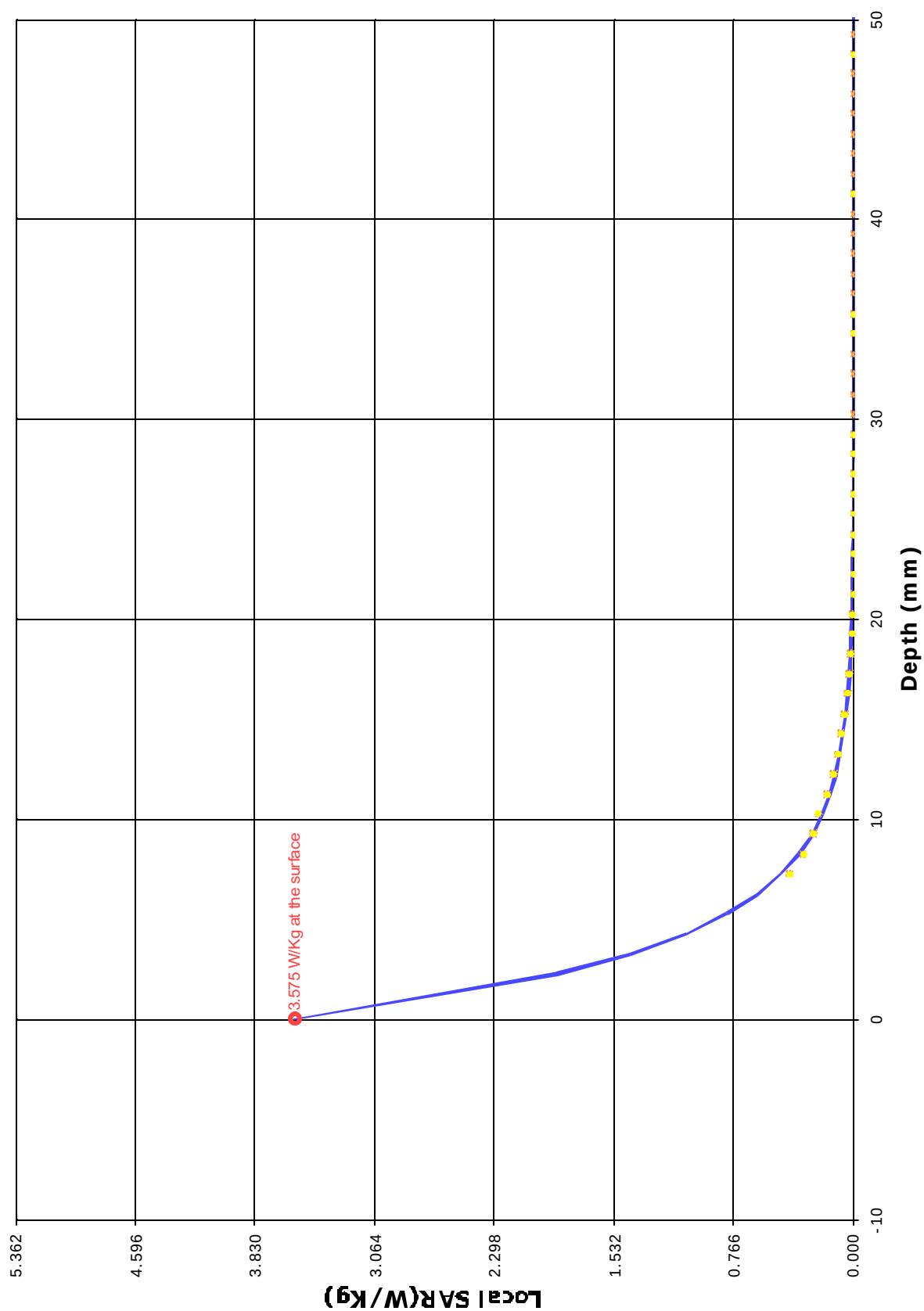
Top face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
821.0MHz - Antenna Fully Retracted - 05mm Separation

Test Information

Date : 14/01/2002
Time : 7:38:28 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-2XX

Test : SAR
Frequency (MHz) : 821.0
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Retracted
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 12.873
Measured Field (mV) after : 10.917

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

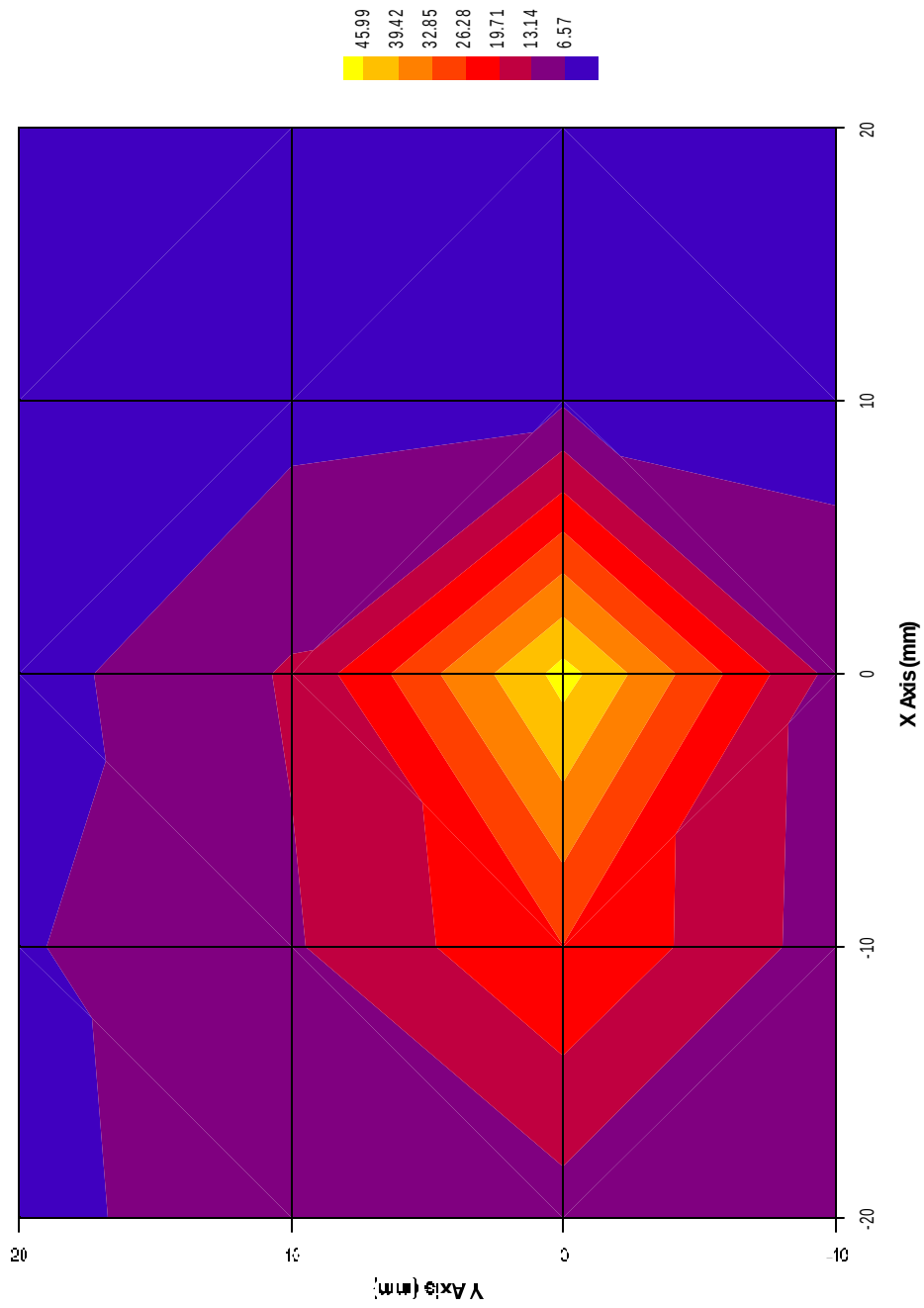
X = 0 Y = 0

Measured Values (mV) :

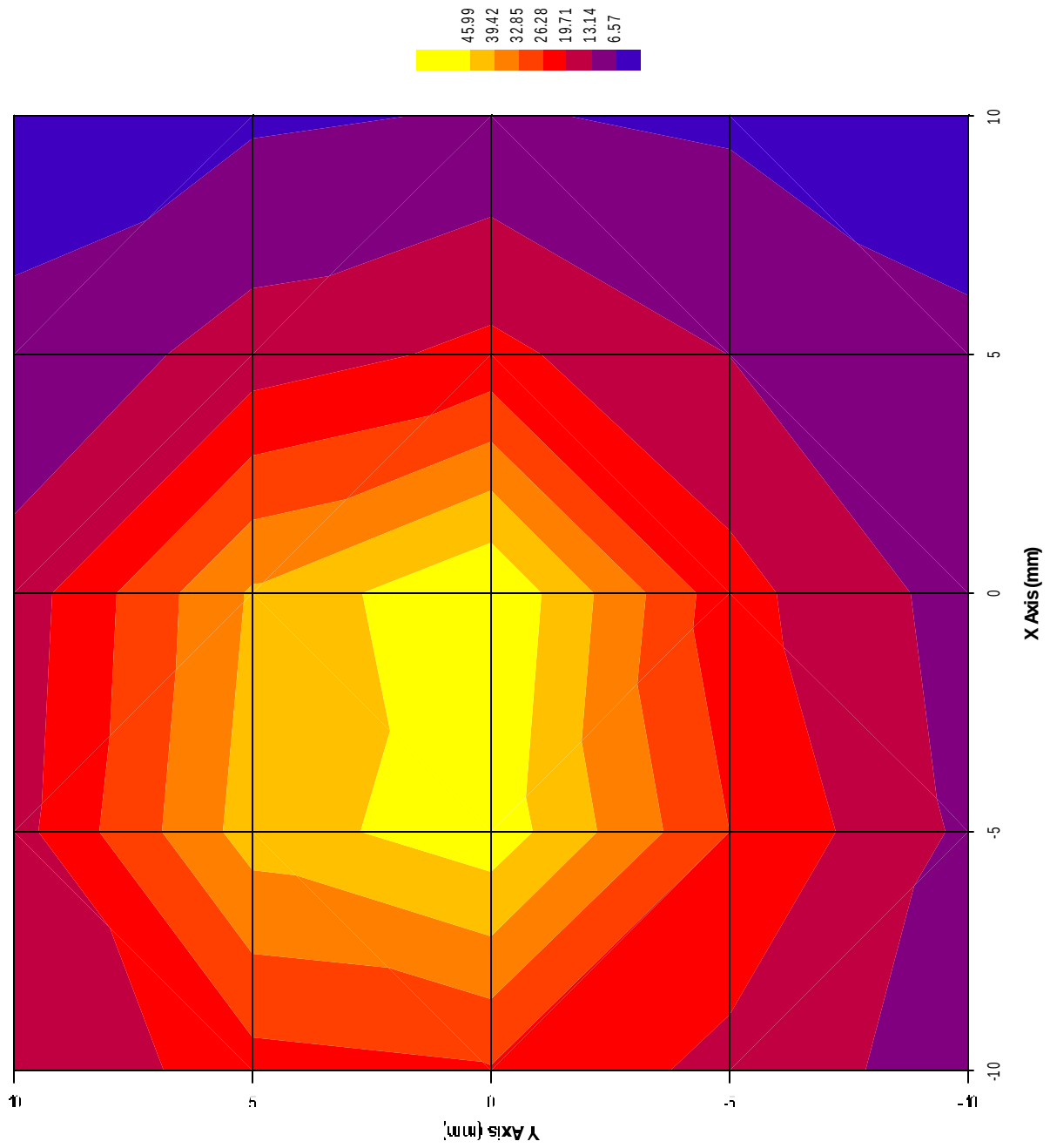
47.543	25.750	15.378	10.820	7.828	5.556
4.452	3.505	3.093	2.317	1.861	

Peak Voltage (mV) : 132.421 1 Cm Voltage (mV) : 1.151 SAR (W/Kg) : 0.935

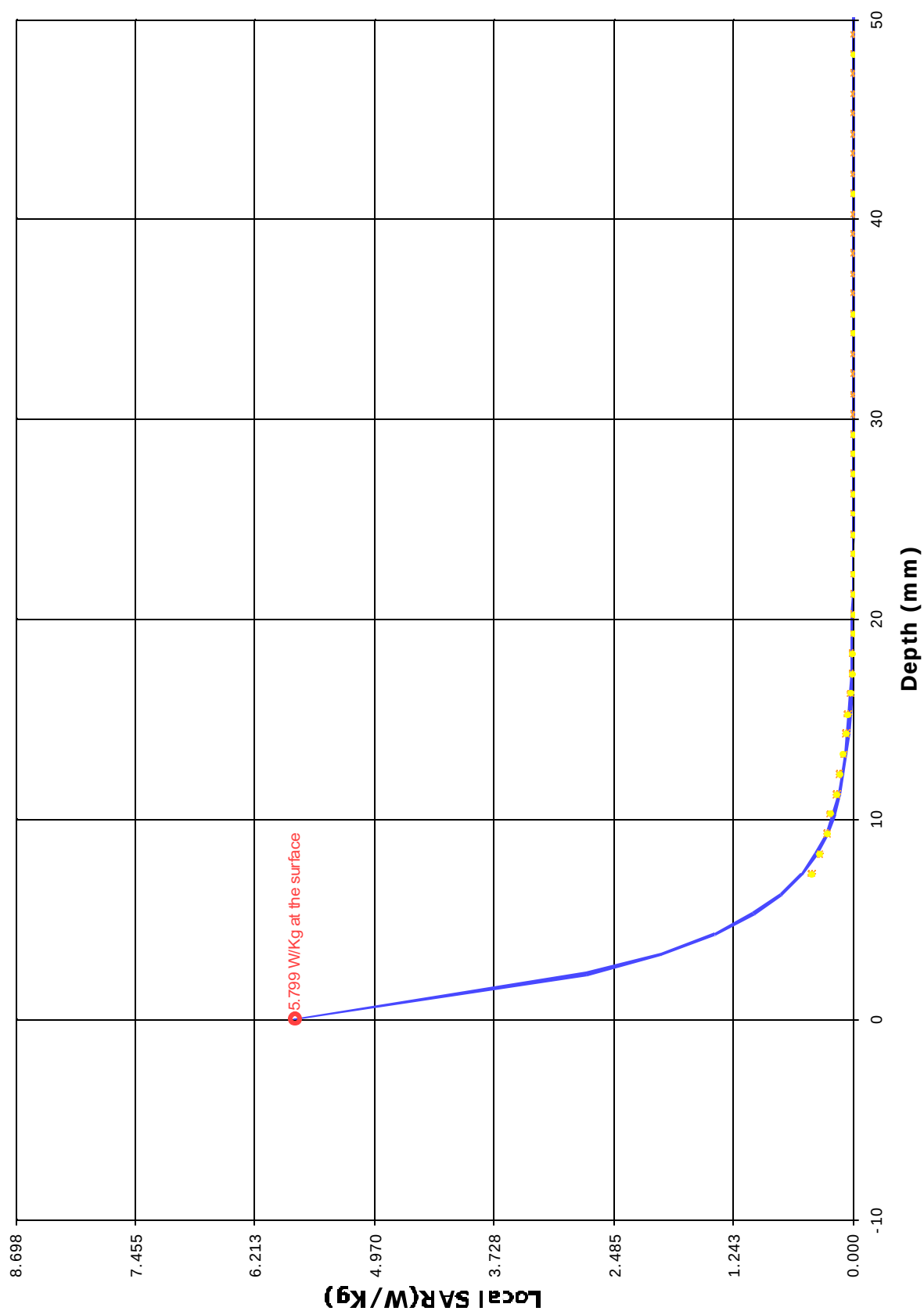
Top face toward phantom
821.0MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
821.0MHz - Antenna Fully Retracted - 05mm Separation



Top face toward phantom
821.0MHz - Antenna Fully Retracted - 05mm Separation



7.2. BACK FACE TOWARD THE PHANTOM

EUT Configurations	Separation distance (mm)	Antenna Position	SAR (W/kg)		
			Device Test Frequency		
			806.0 MHz	813.5 MHz	821.0 MHz
Back face toward the phantom, 25% duty cycle	5	Extended		2.122	
		Retracted		0.974	
	10	Extended	1.492	1.485	1.345

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File #: KYC-005-SAR

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Back face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation

Test Information

Date : 15/01/2002
Time : 11:05:14 AM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-ZXX

Test : SAR
Frequency (MHz) : 813.5
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 30.087
: 28.348

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

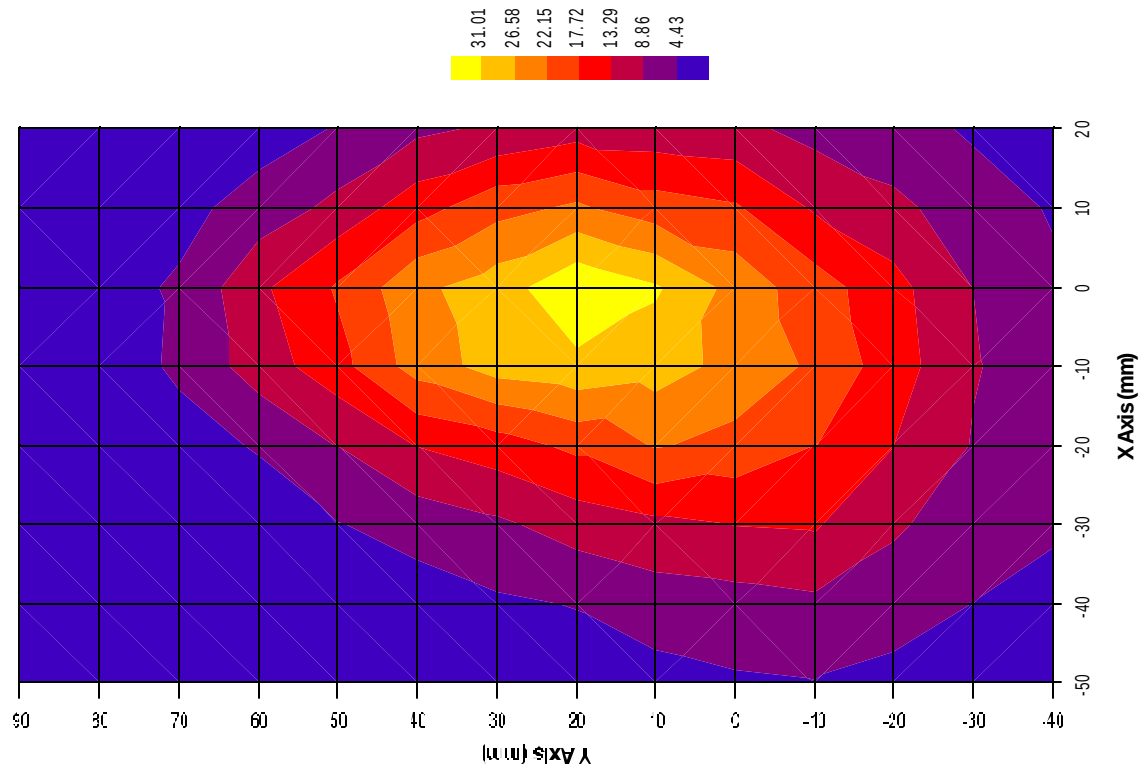
X = -5 Y = 20

Measured Values (mV) :

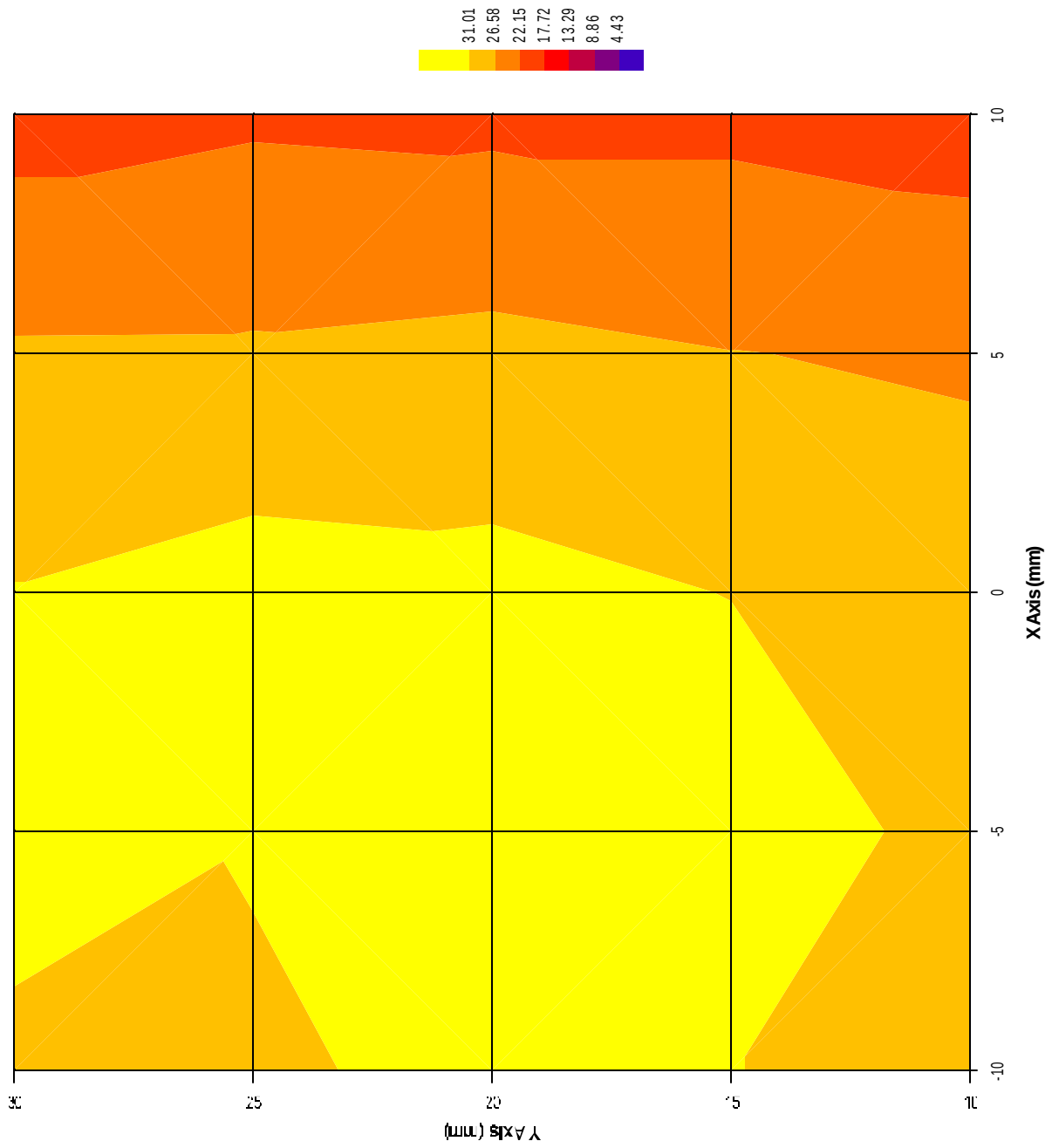
31.276	30.173	27.356	23.354	21.588	20.780
19.433	17.994	15.944	14.605	13.174	

Peak Voltage (mV) : 37.579 1 Cm Voltage (mV) : 16.700 SAR (W/Kg) : 2.122

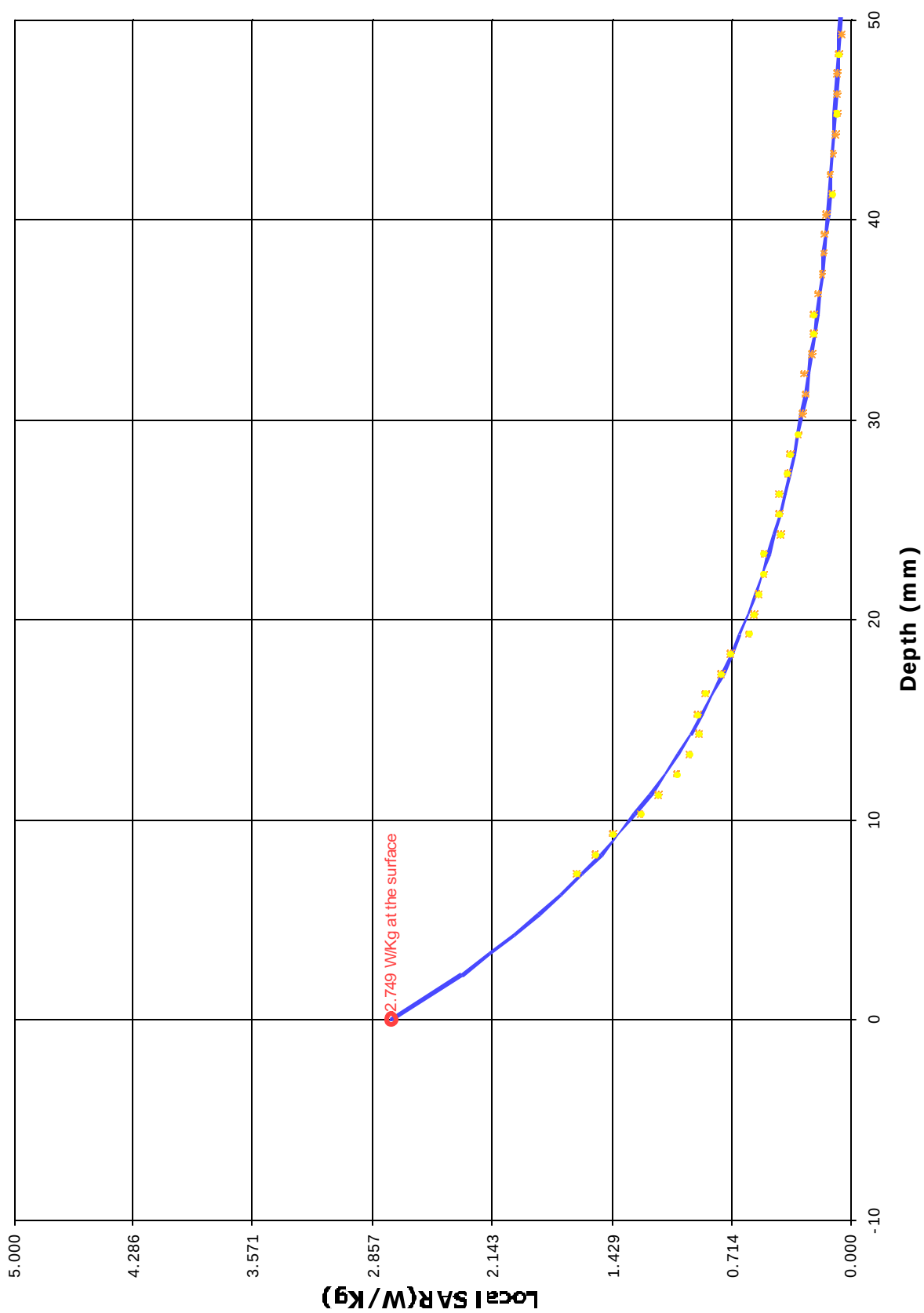
Back face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation

Test Information

Date : 15/01/2002

Time : 10:23:46 AM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK 78-2XX

Test : SAR
Frequency (MHz) : 813.5
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Retracted
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 22.345
Measured Field (mV) after : 21.750

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

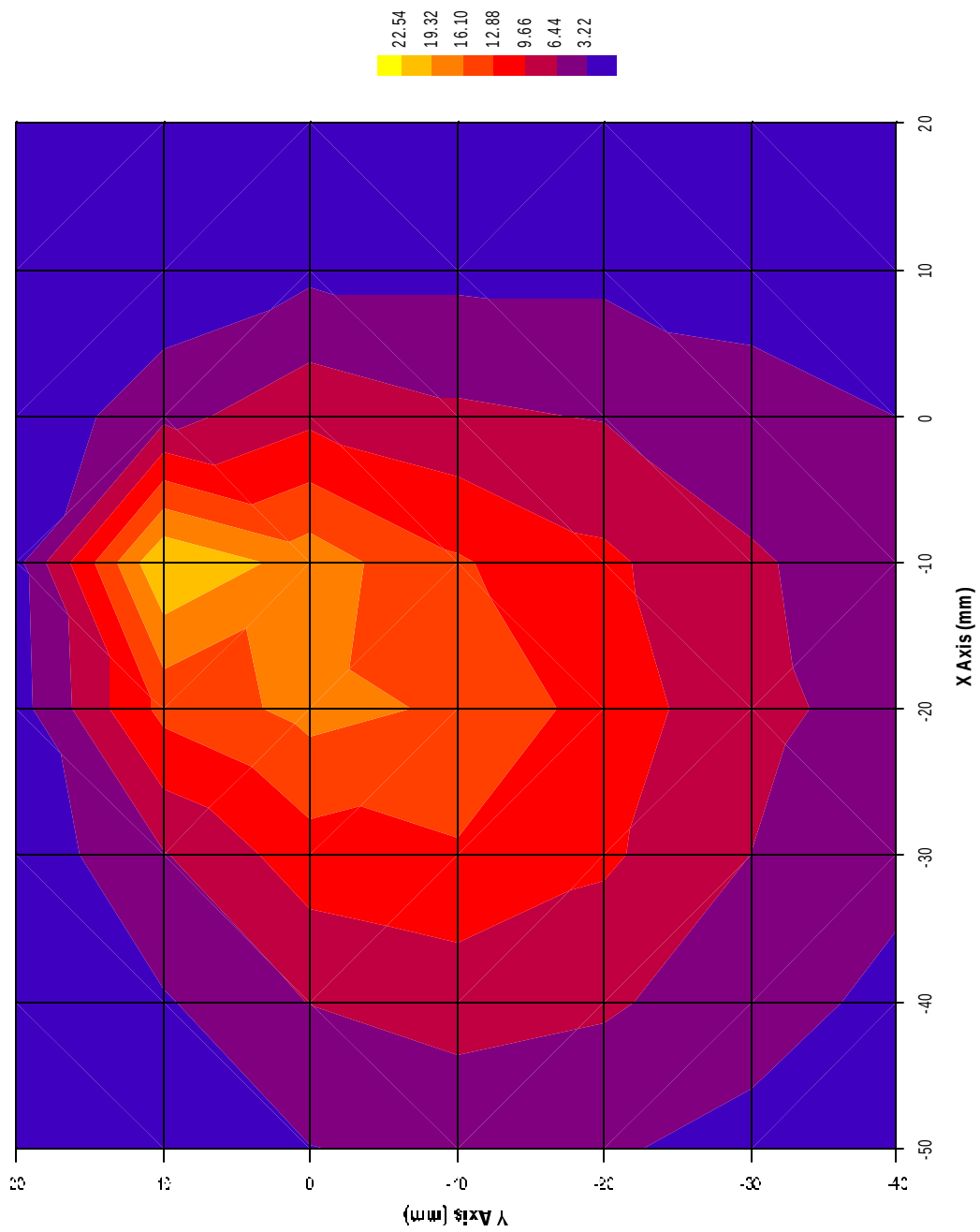
X = -15 Y = 5

Measured Values (mV) :

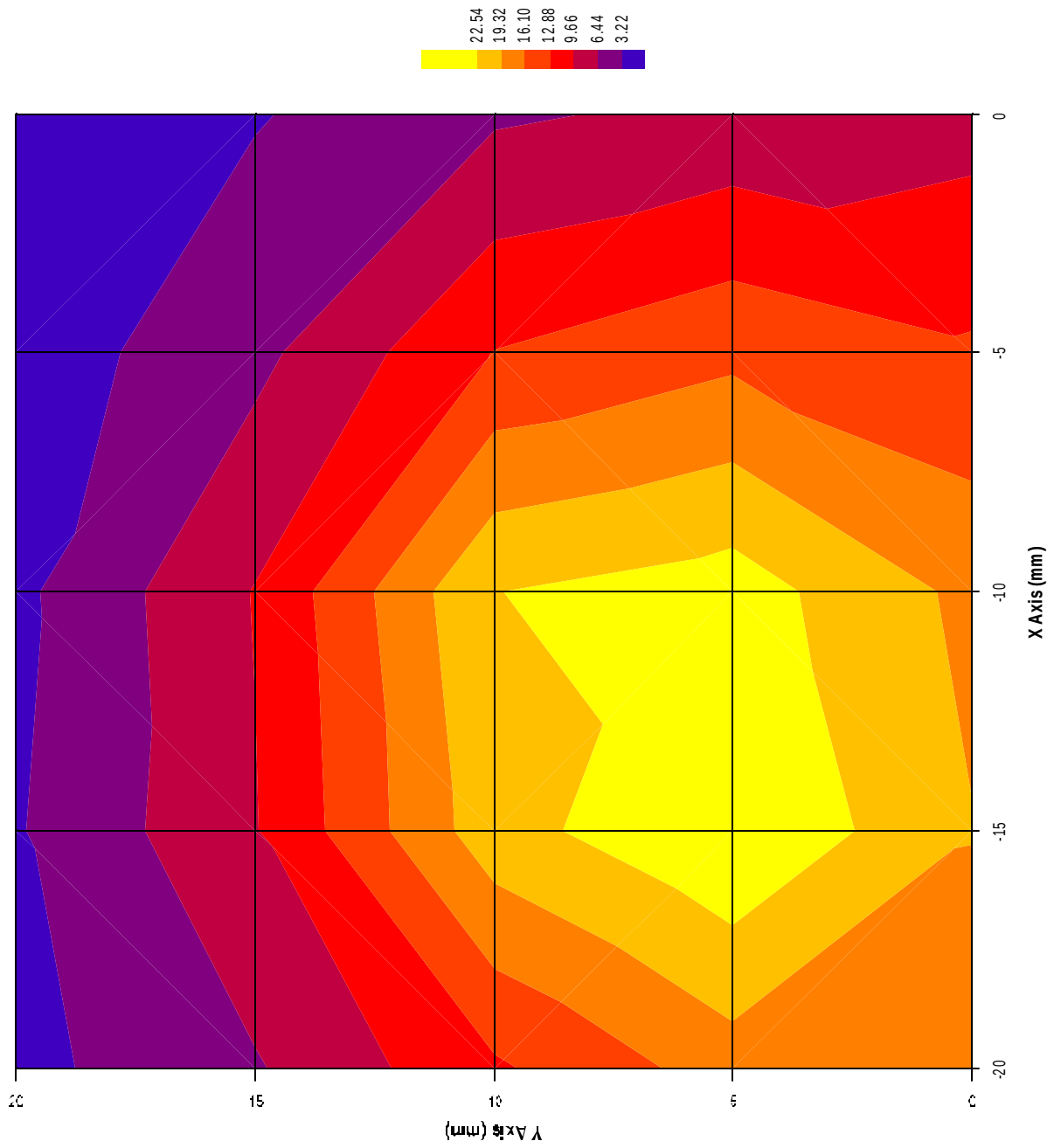
21.750	14.460	11.088	9.466	8.959	7.413
7.093	5.705	5.473	4.651	4.432	

Peak Voltage (mV) : 35.608 1 Cm Voltage (mV) : 3.830 SAR (W/Kg) : 0.974

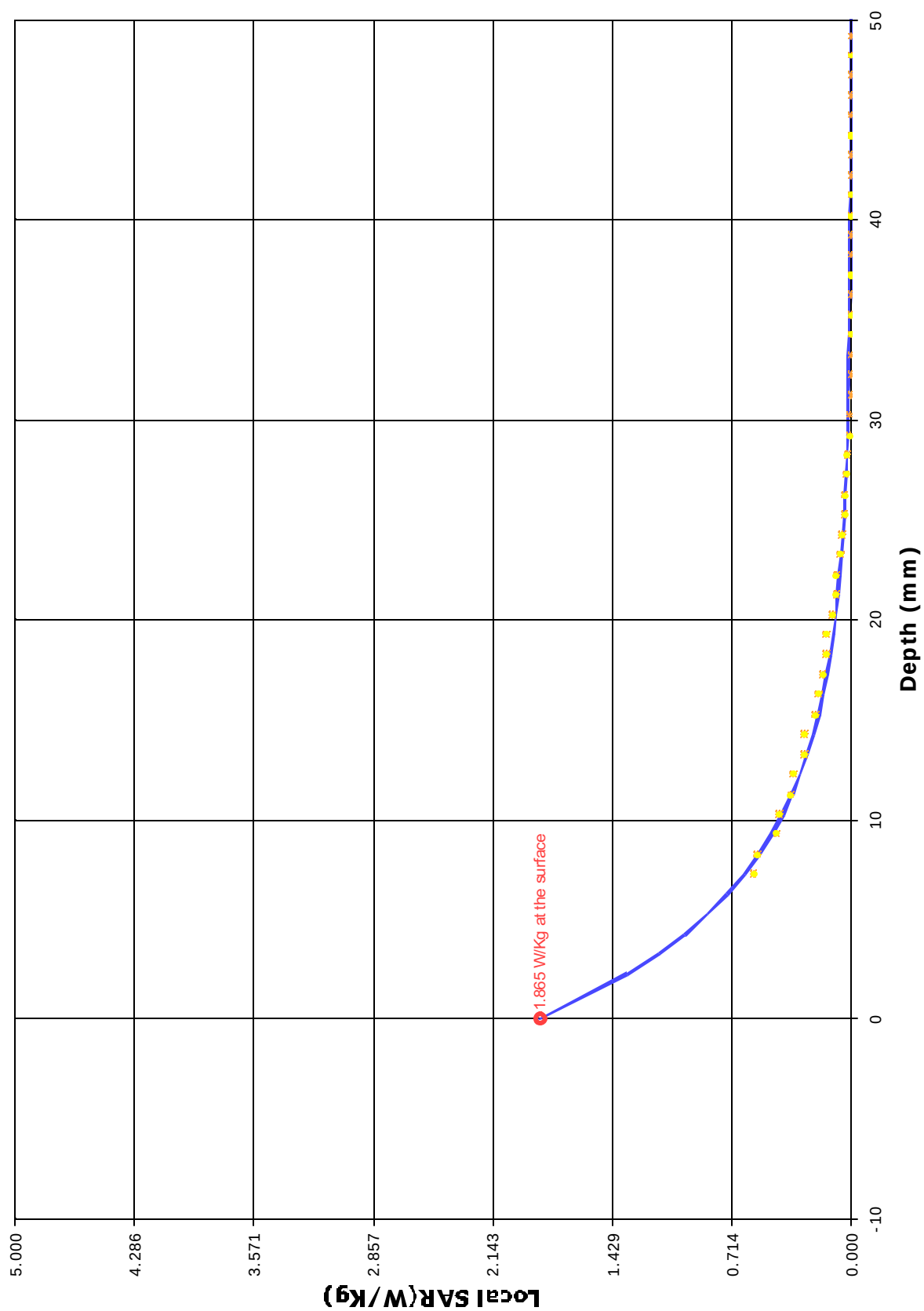
Back face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Back face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation

Test Information

Date : 15/01/2002
Time : 12:09:55 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-ZXX

Test : SAR
Frequency (MHz) : 806.0
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 19.345
Measured Field (mV) after : 18.701

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

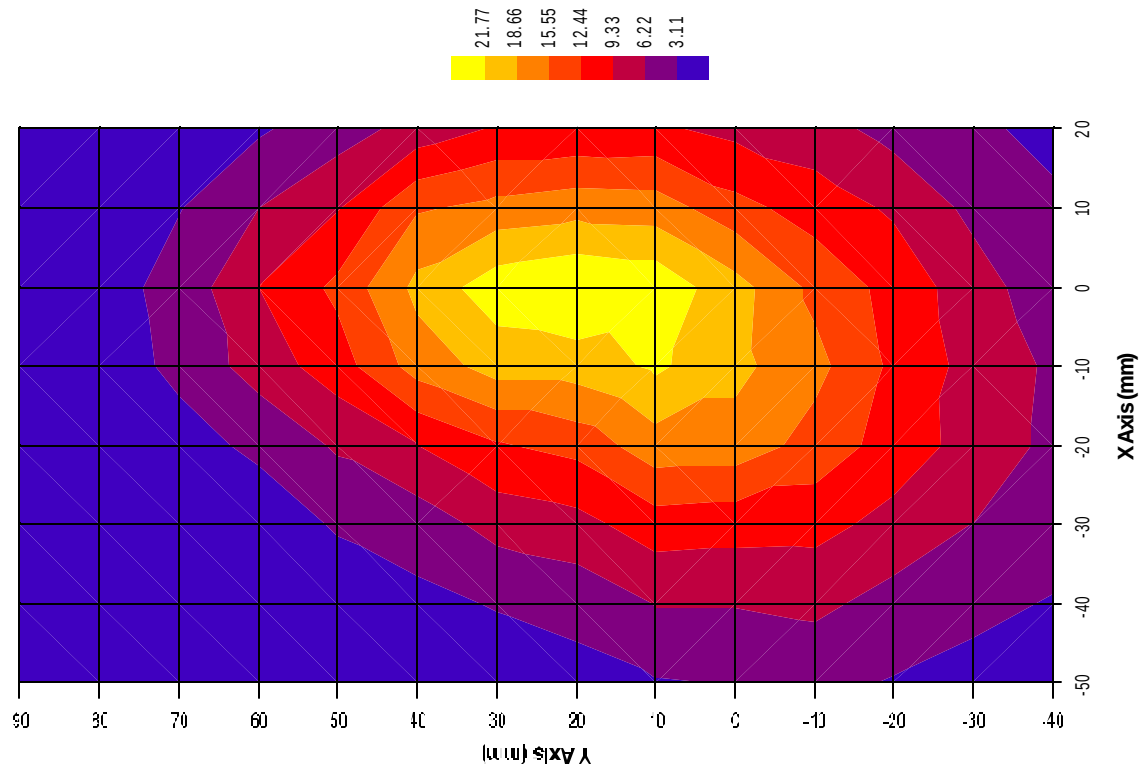
X = -5 Y = 15

Measured Values (mV) :

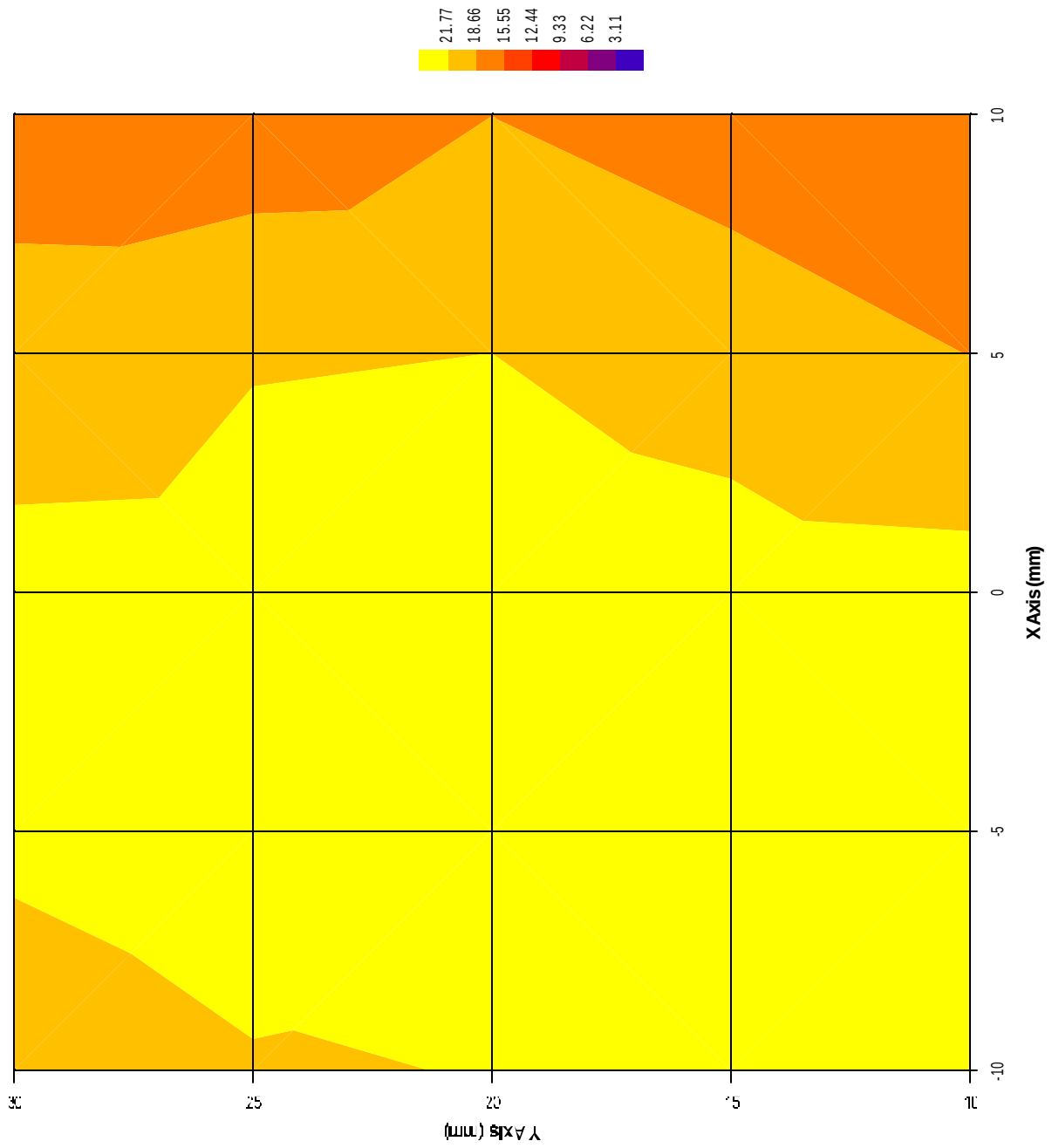
24.107	19.933	18.281	16.850	16.297	14.351
12.906	12.275	11.338	10.999	9.802	

Peak Voltage (mV) : 28.863 1 Cm Voltage (mV) : 12.530 SAR (W/Kg) : 1.492

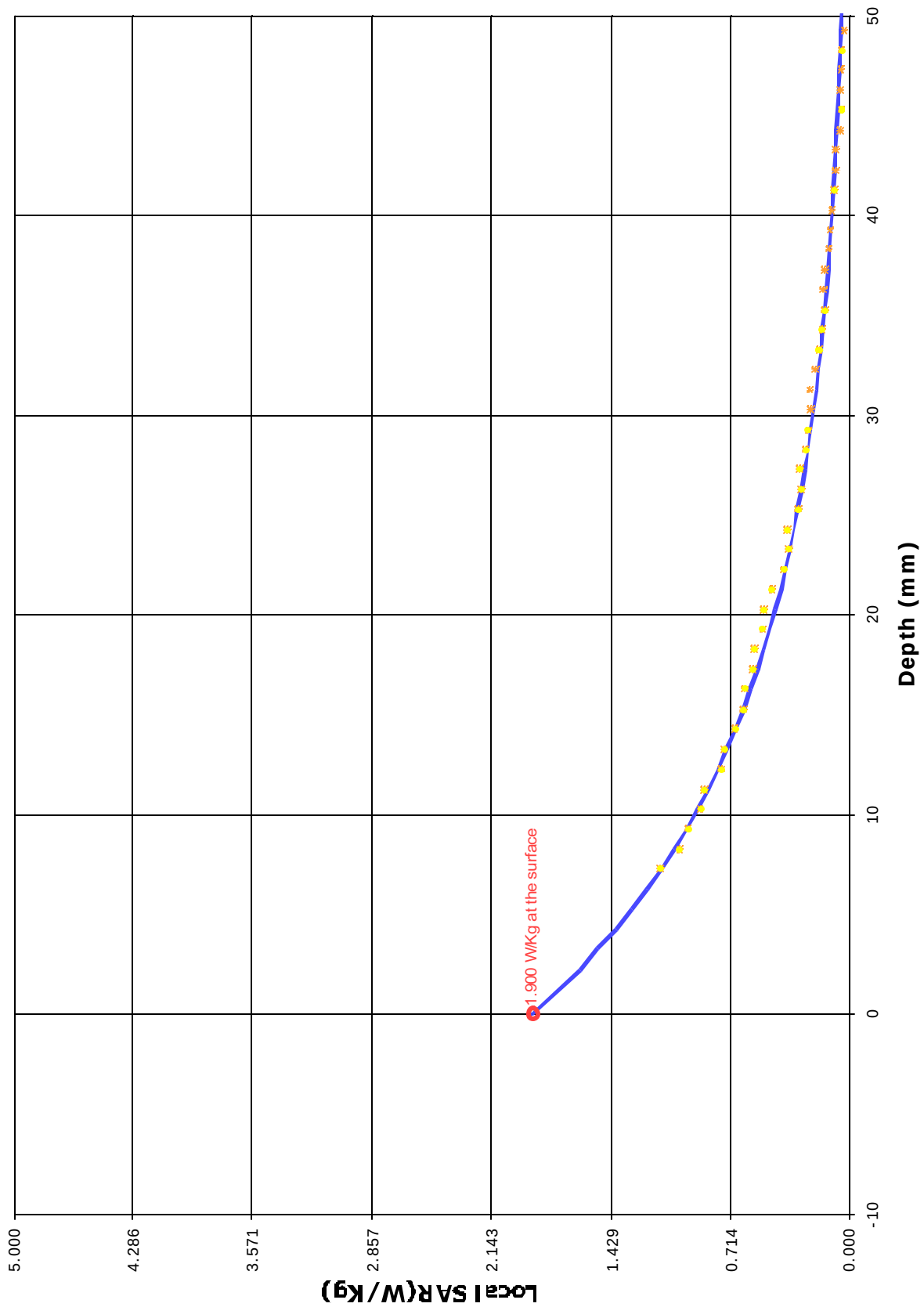
Back face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation

Test Information

Date : 15/01/2002
Time : 11:47:47 AM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-ZXX

Test : SAR
Frequency (MHz) : 813.5
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 17.390
Measured Field (mV) after : 16.996

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

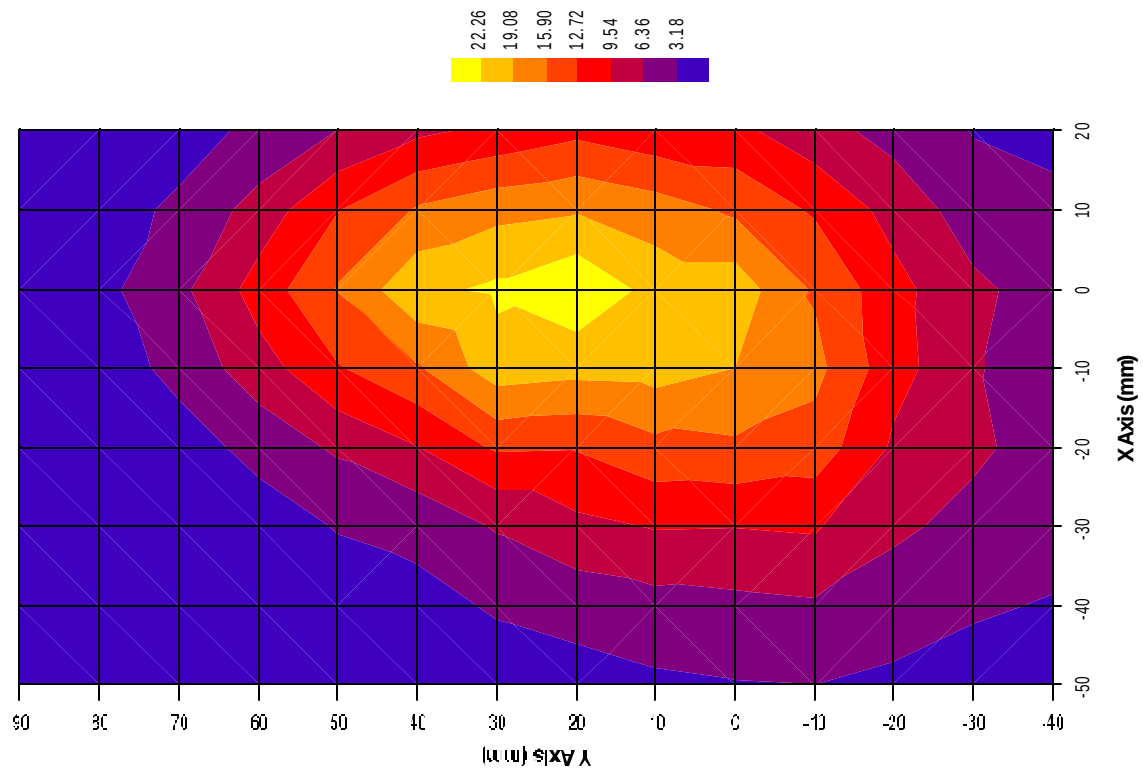
X = 0 Y = 25

Measured Values (mV) :

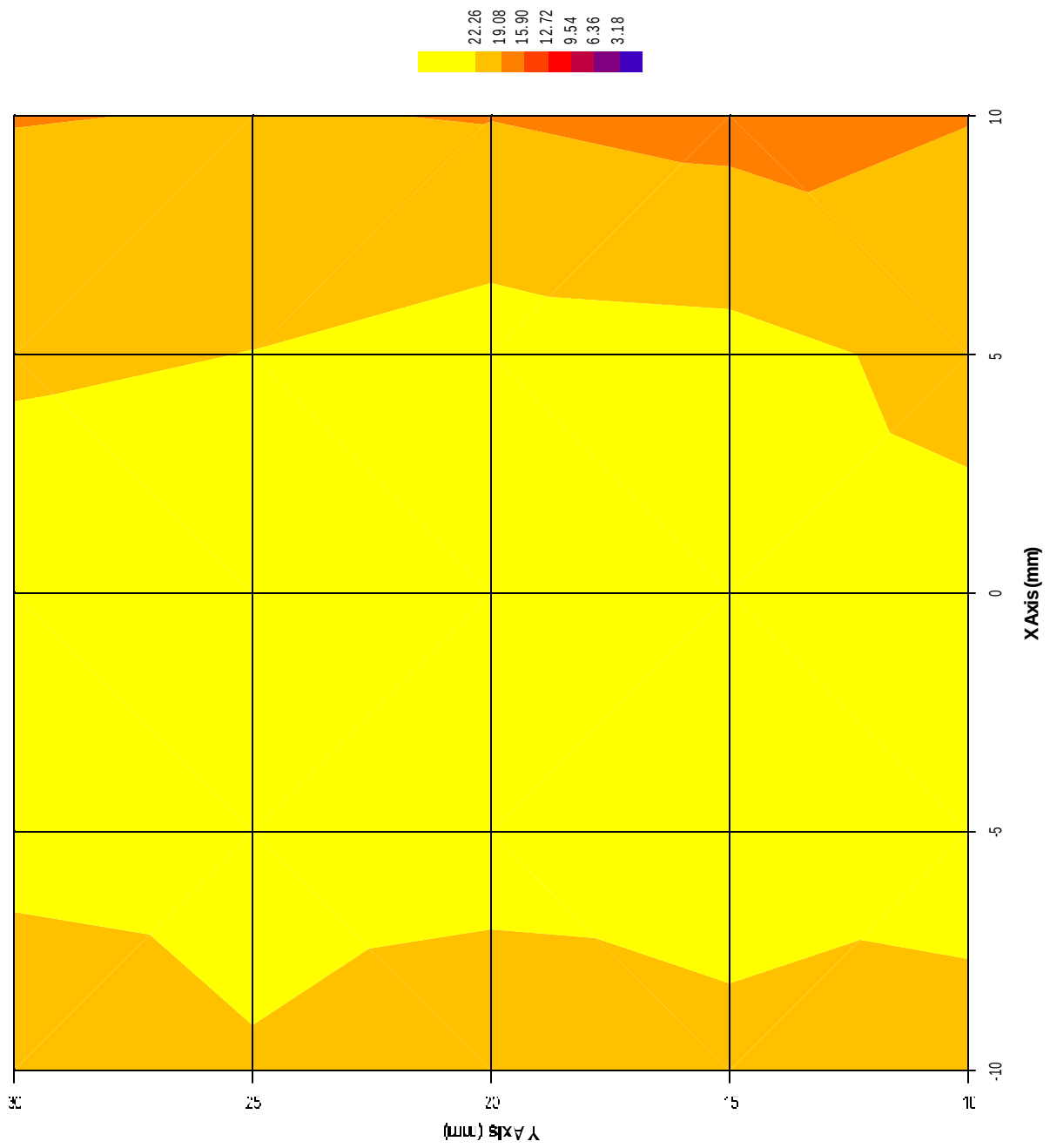
25.138	21.393	18.371	17.778	15.920	15.224
14.432	13.033	12.527	11.534	10.788	

Peak Voltage (mV) : 31.167 1 Cm Voltage (mV) : 12.574 SAR (W/Kg) : 1.485

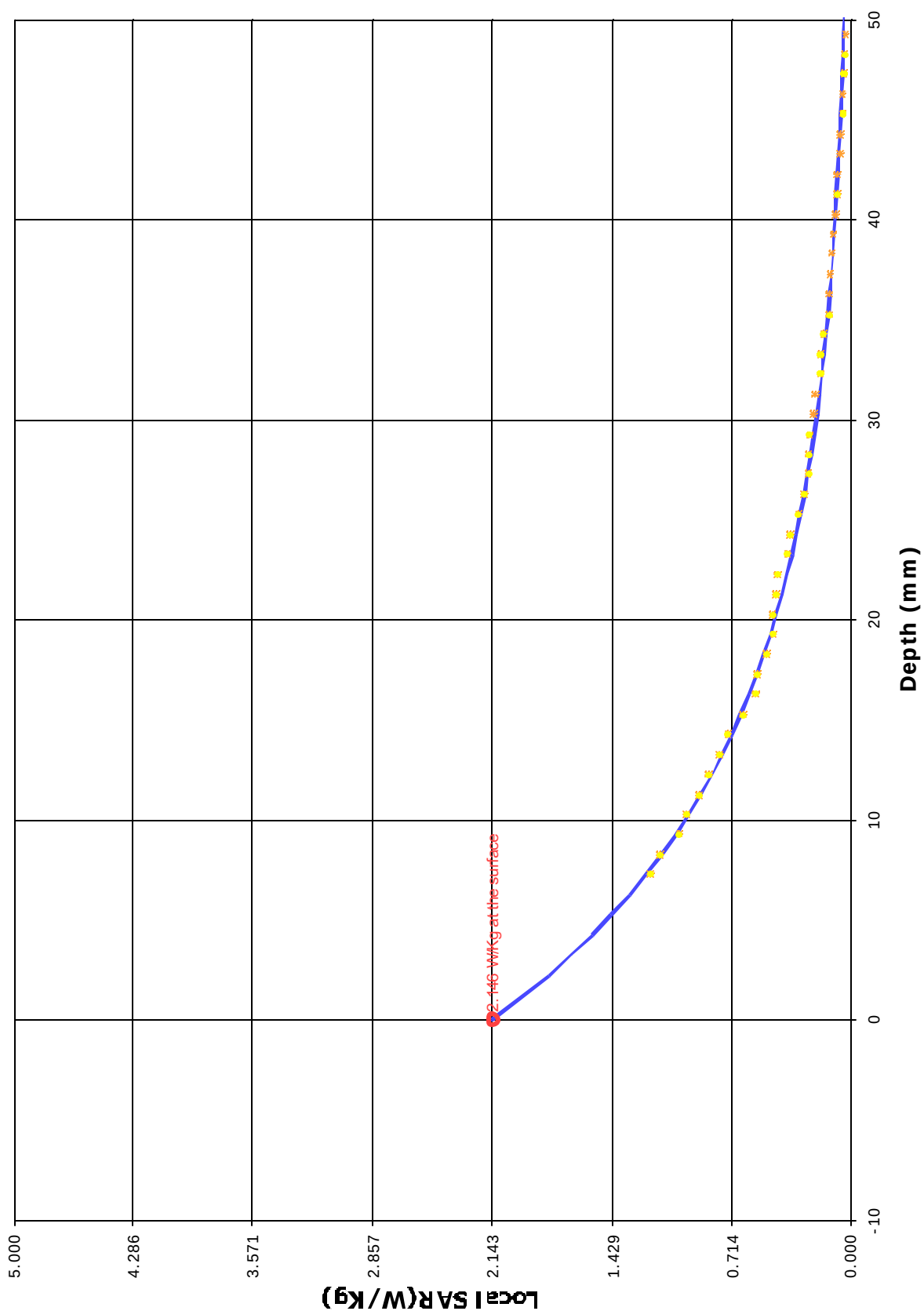
Back face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation

Test Information

Date : 15/01/2002

Time : 1:17:43 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK 78-2XX

Test : SAR
Frequency (MHz) : 821.0
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 19.298
Measured Field (mV) after : 18.519

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

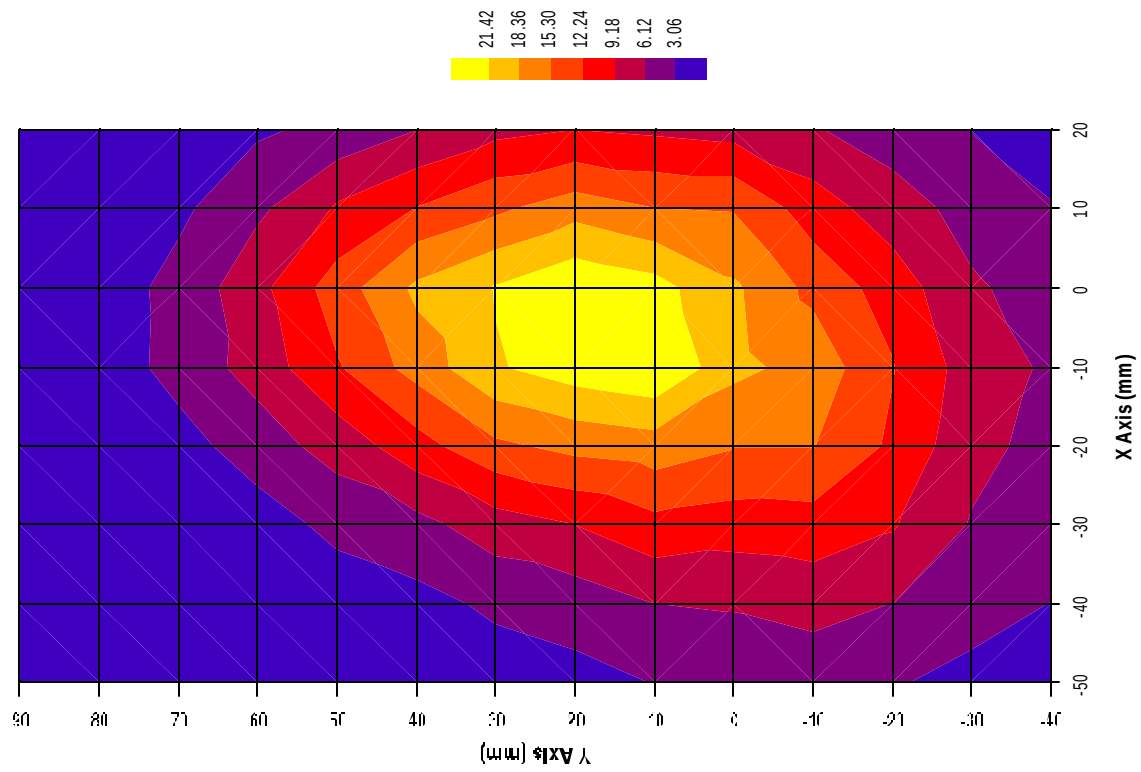
X = -5 Y = 15

Measured Values (mV) :

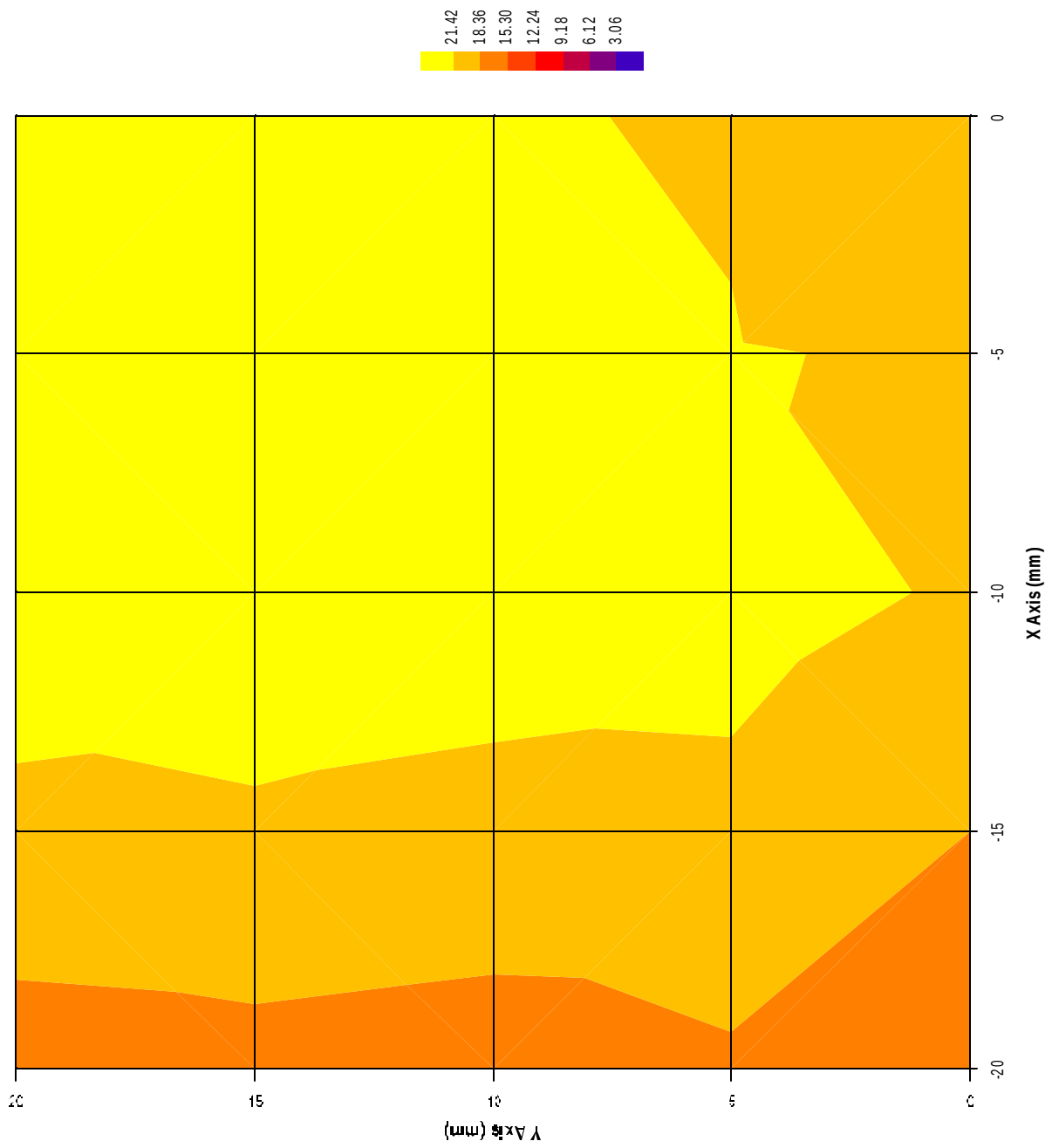
24.174	22.470	18.859	16.431	14.980	14.704
13.901	13.070	12.238	11.258	10.243	

Peak Voltage (mV) : 30.278 1 Cm Voltage (mV) : 12.807 SAR (W/Kg) : 1.345

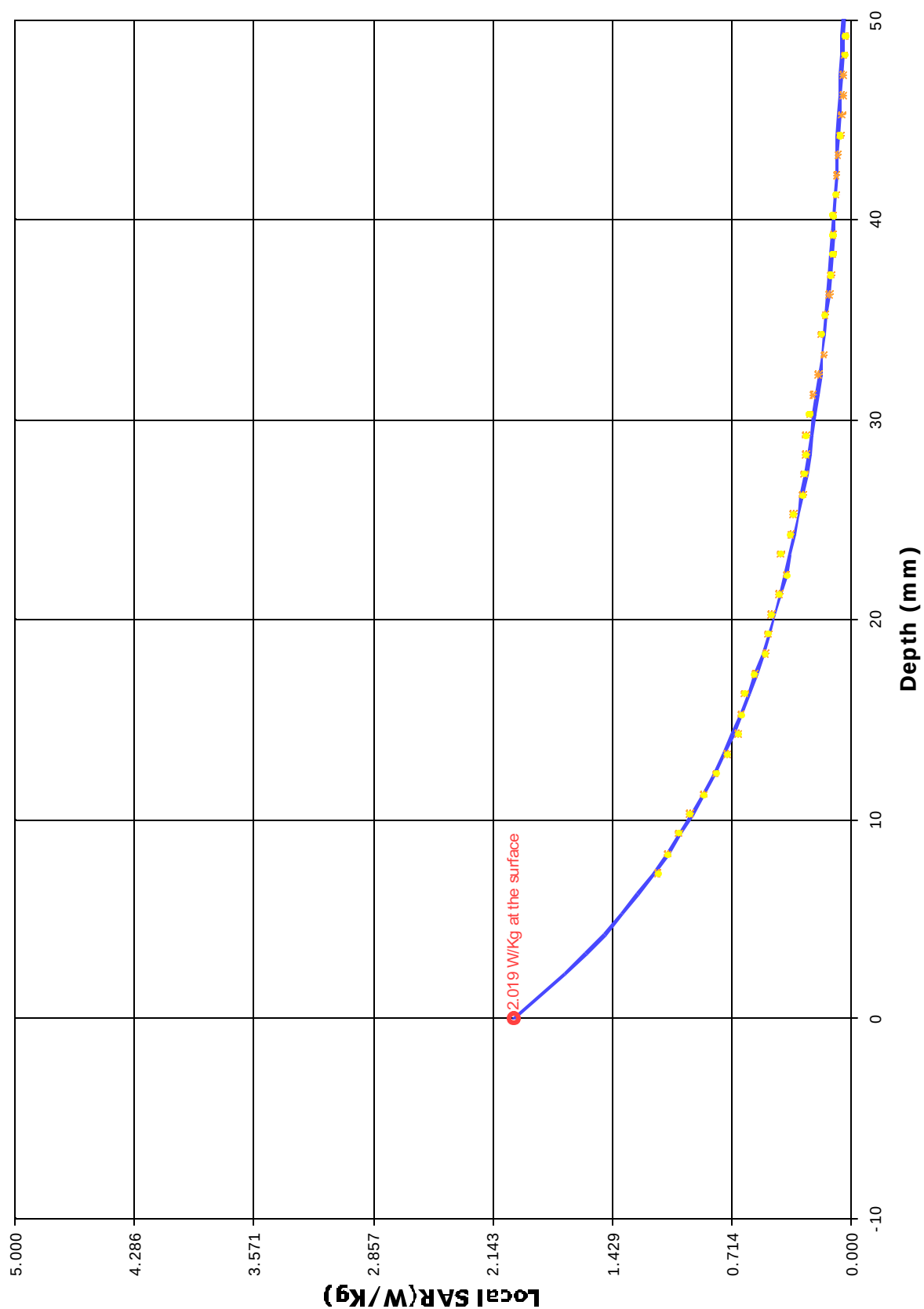
Back face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation



Back face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation



7.3. RIGHT FACE TOWARD THE PHANTOM

EUT Configurations	Separation distance (mm)	Antenna Position	SAR (W/kg)		
			Device Test Frequency		
			806.0 MHz	813.5 MHz	821.0 MHz
Right face toward the phantom, 25% duty cycle	5	Extended		2.281	
		Retracted		0.702	
	10	Extended	1.336	1.421	0.960

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File #: KYC-005-SAR
February 11, 2002

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Right face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation

Test Information

Date : 15/01/2002
Time : 3:59:55 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK 78-2XX

Test : SAR
Frequency (MHz) : 813.5
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 29.137
Measured Field (mV) after : 27.873

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

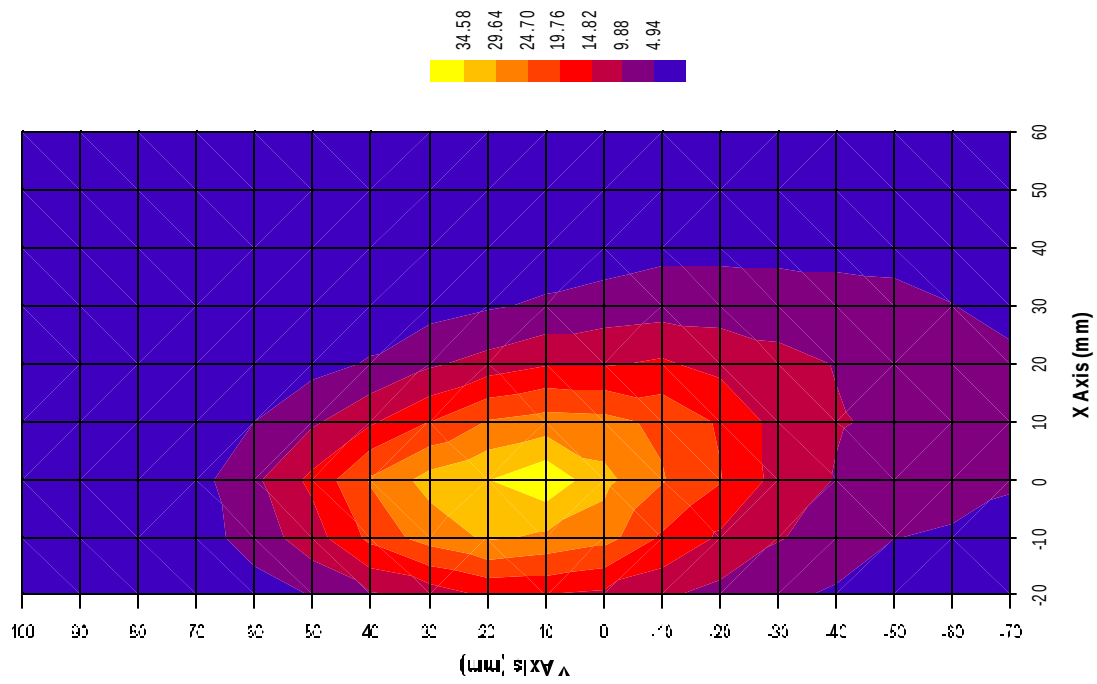
X = 0 Y = 15

Measured Values (mV) :

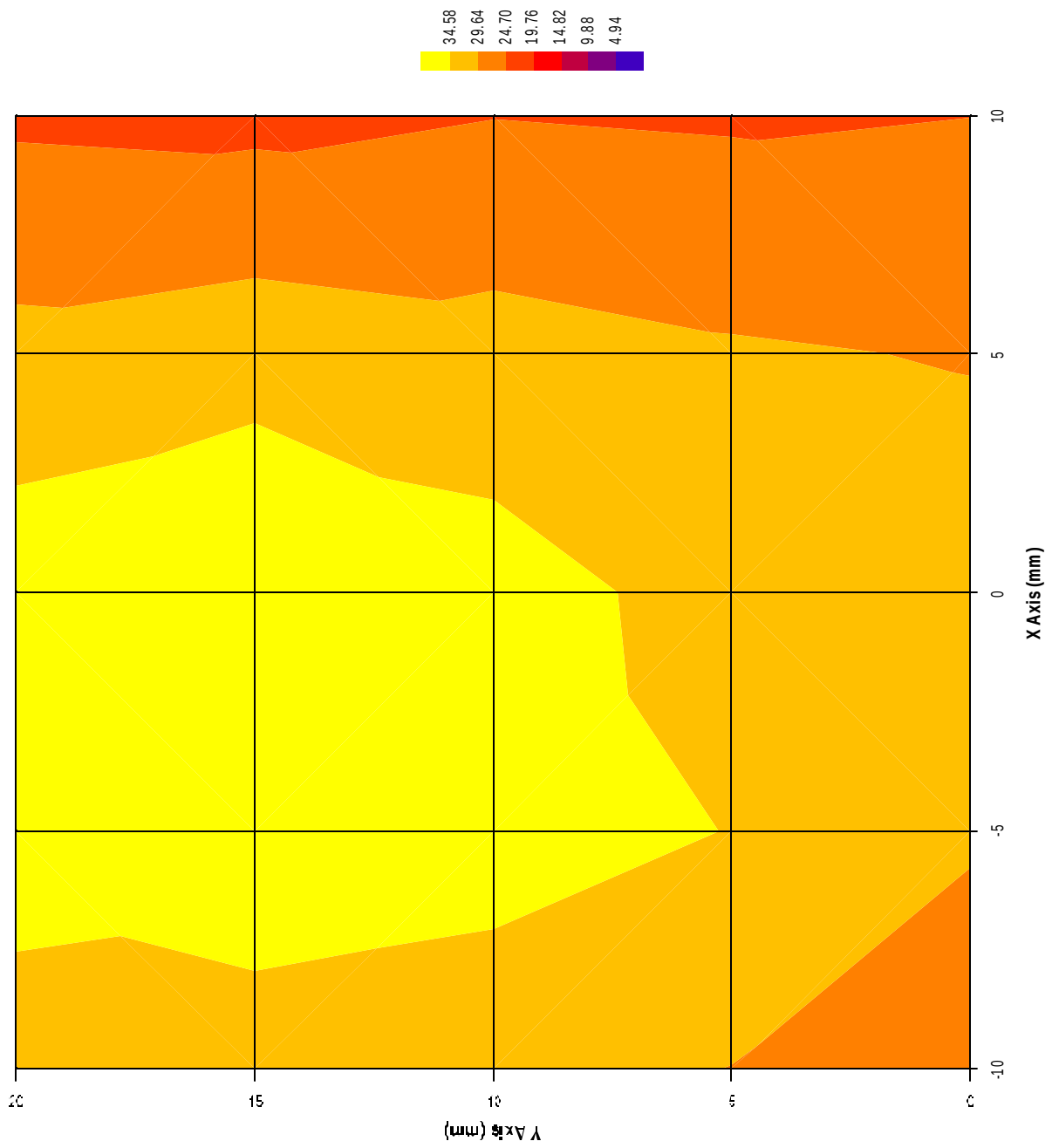
34.944	32.665	27.897	25.529	25.320	22.405
19.719	18.342	16.578	16.570	15.276	

Peak Voltage (mV) : 41.678 1 Cm Voltage (mV) : 17.955 SAR (W/Kg) : 2.281

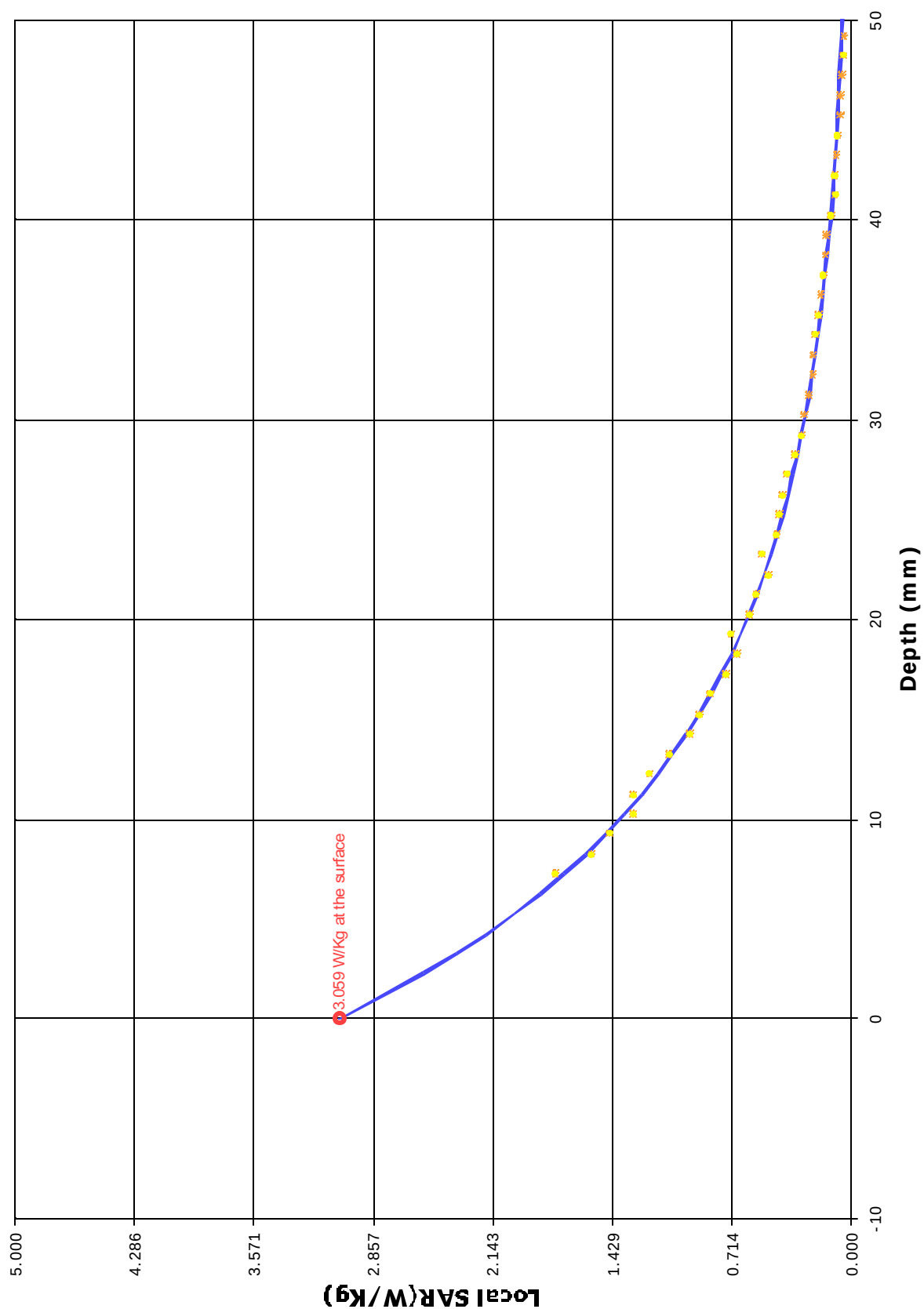
Right face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Extended - 05mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation

Test Information

Date : 15/01/2002
Time : 3:00:29 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK 78-2XX

Test : SAR
Frequency (MHz) : 813.5
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Retracted
Measured Power (W) : N/A
(conducted)
Measured Field (mV) before : 6.837
Measured Field (mV) after : 6.780

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

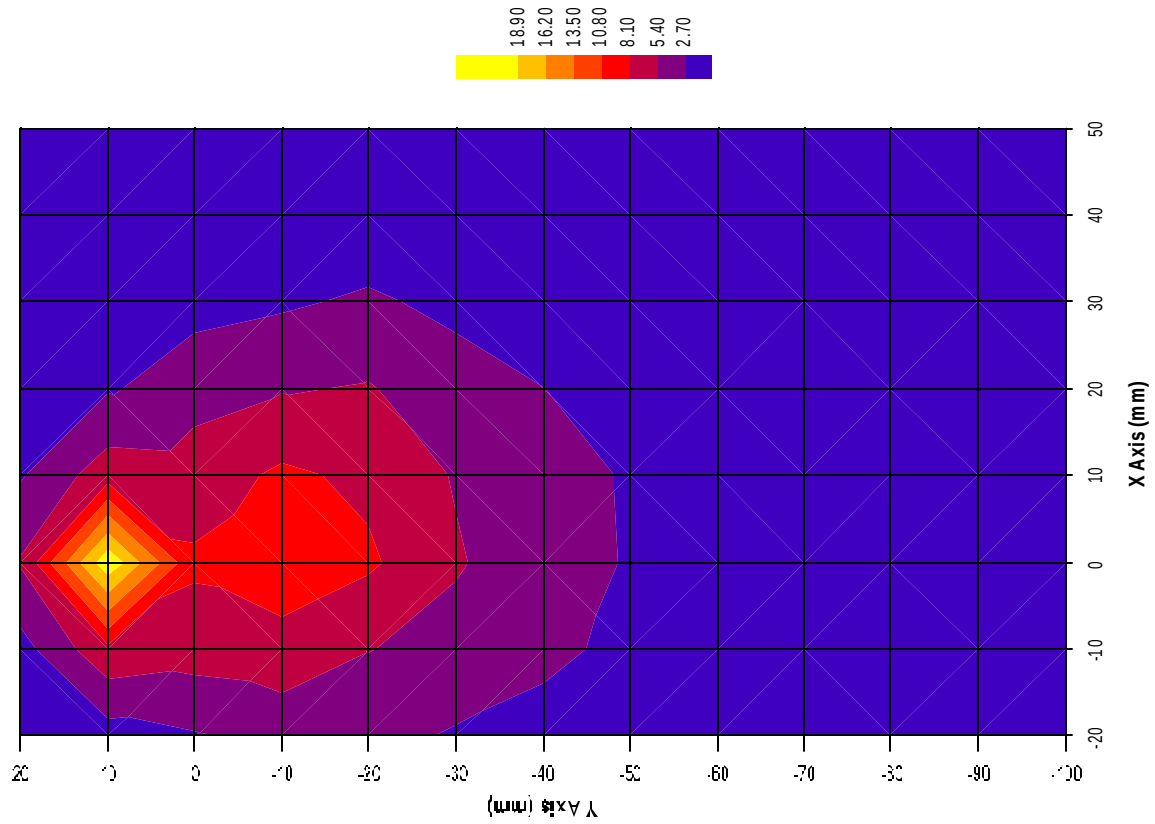
X = 0 Y = 10

Measured Values (mV) :

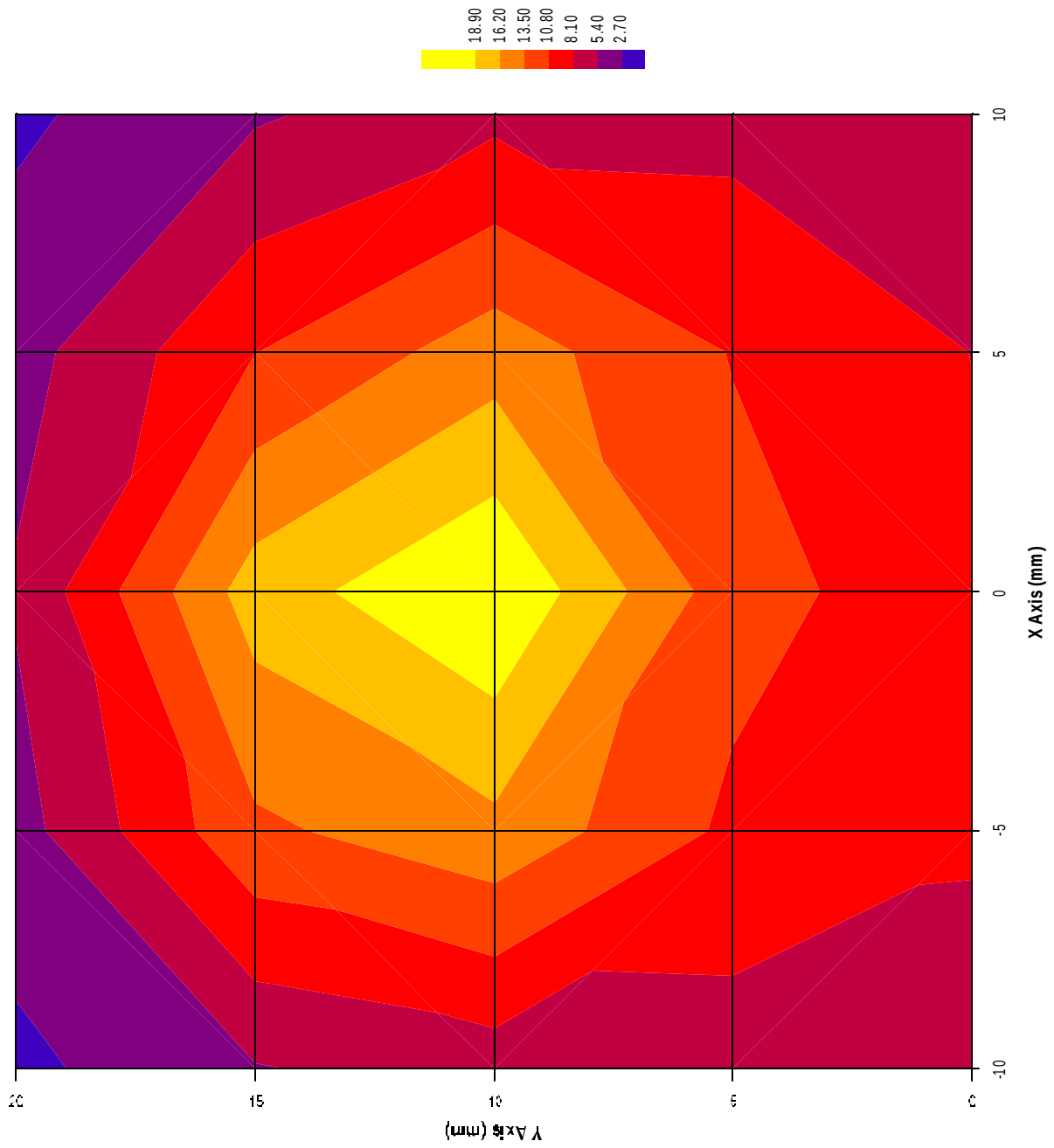
18.604	10.969	7.663	6.366	5.133	4.461
3.830	3.077	2.560	2.226	1.945	

Peak Voltage (mV) : 38.437 1 Cm Voltage (mV) : 1.441 SAR (W/Kg) : 0.702

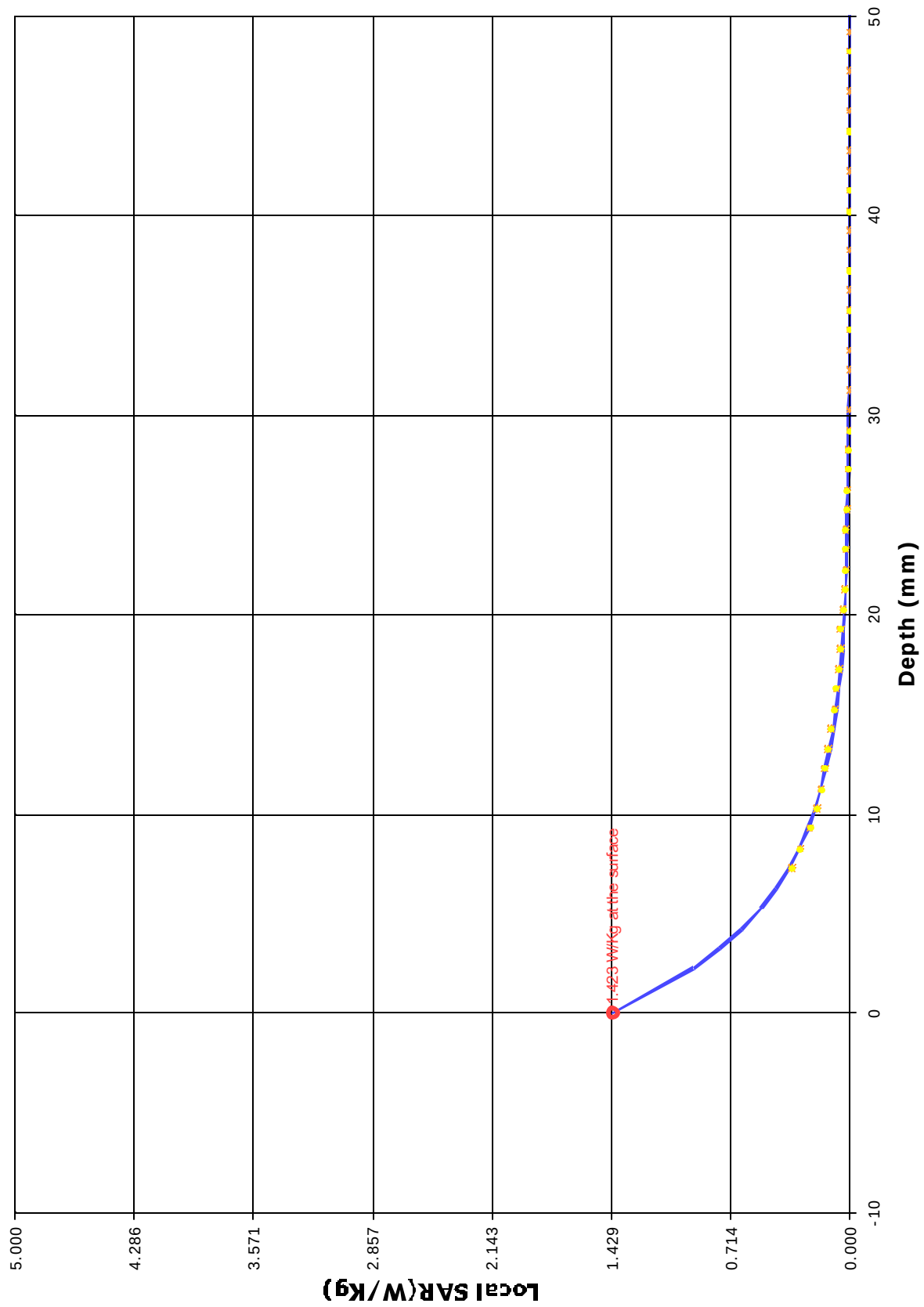
Right face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Retracted - 05mm Separation



Right face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation

Test Information

Date : 15/01/2002
Time : 4:52:20 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK 78-2XX

Test : SAR
Frequency (MHz) : 806.0
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 16.387
Measured Field (mV) after : 15.198

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

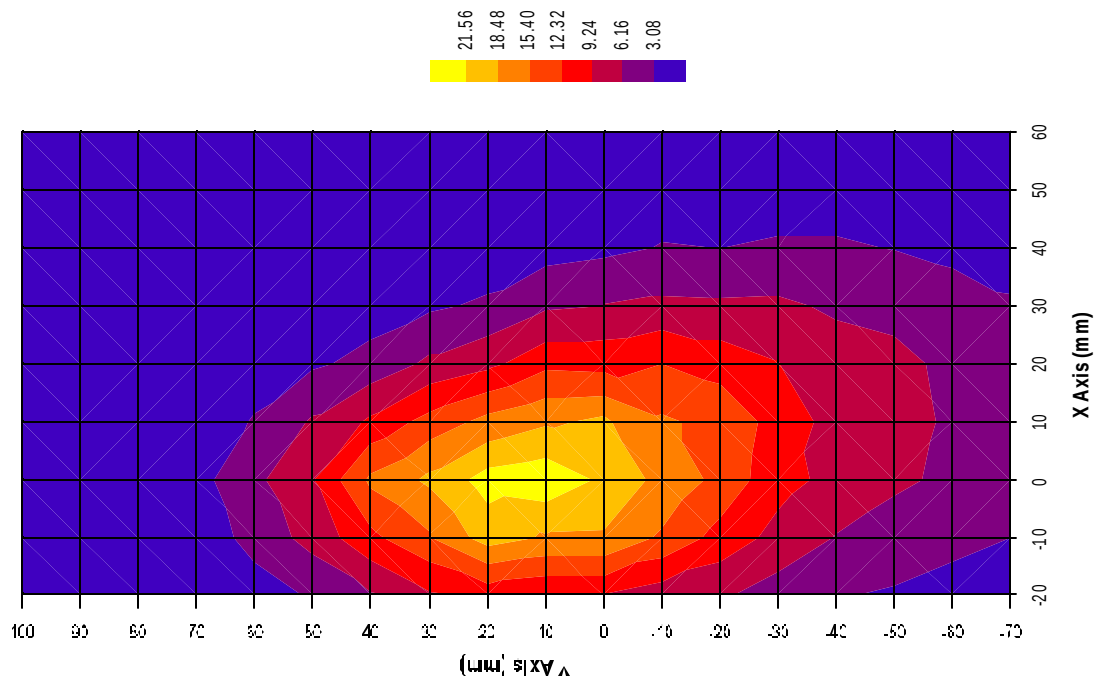
X = 0 Y = 15

Measured Values (mV) :

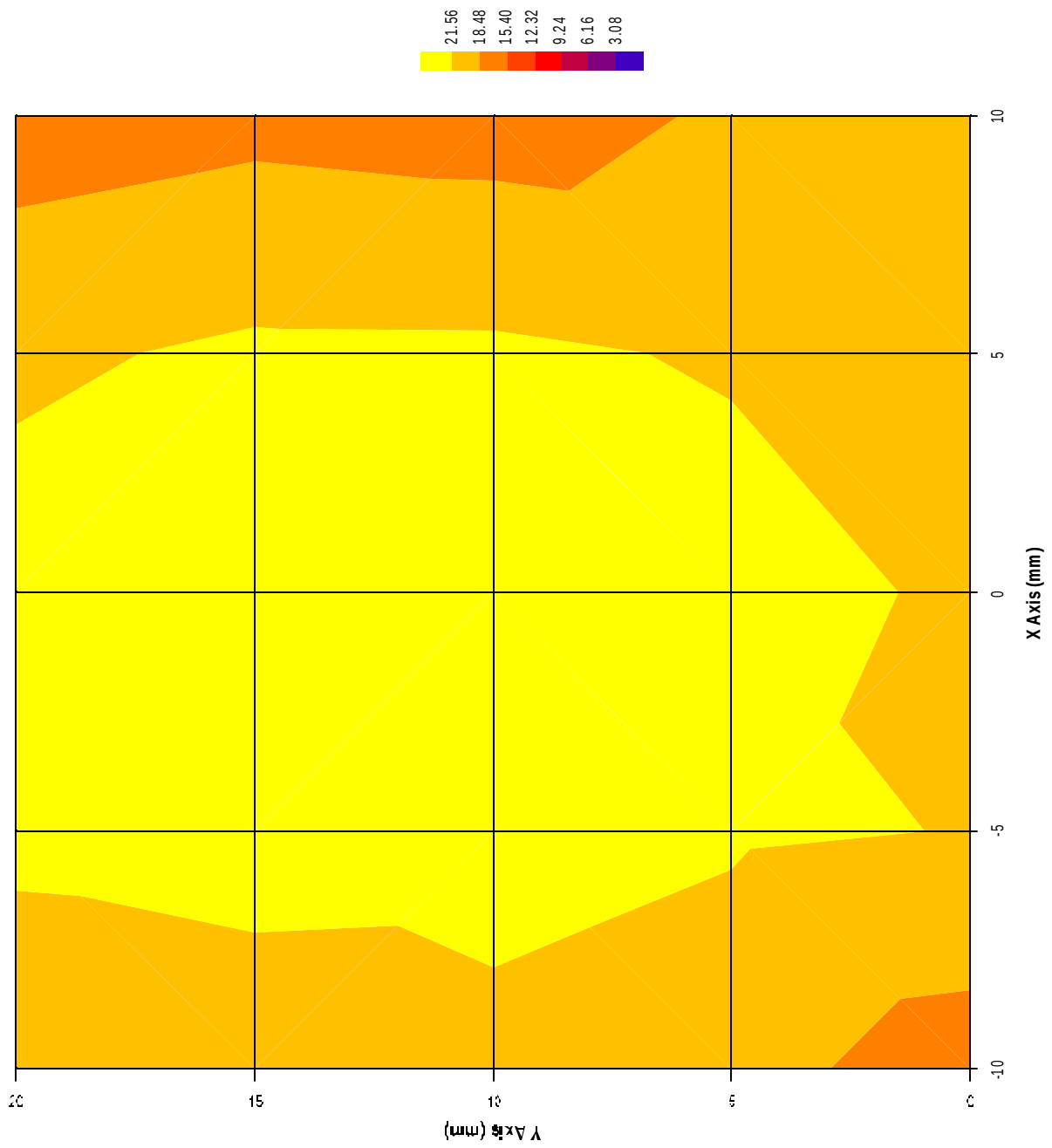
22.547	21.116	17.181	15.401	14.551	13.952
13.015	11.777	10.850	10.400	9.832	

Peak Voltage (mV) : 28.070 1 Cm Voltage (mV) : 11.462 SAR (W/Kg) : 1.336

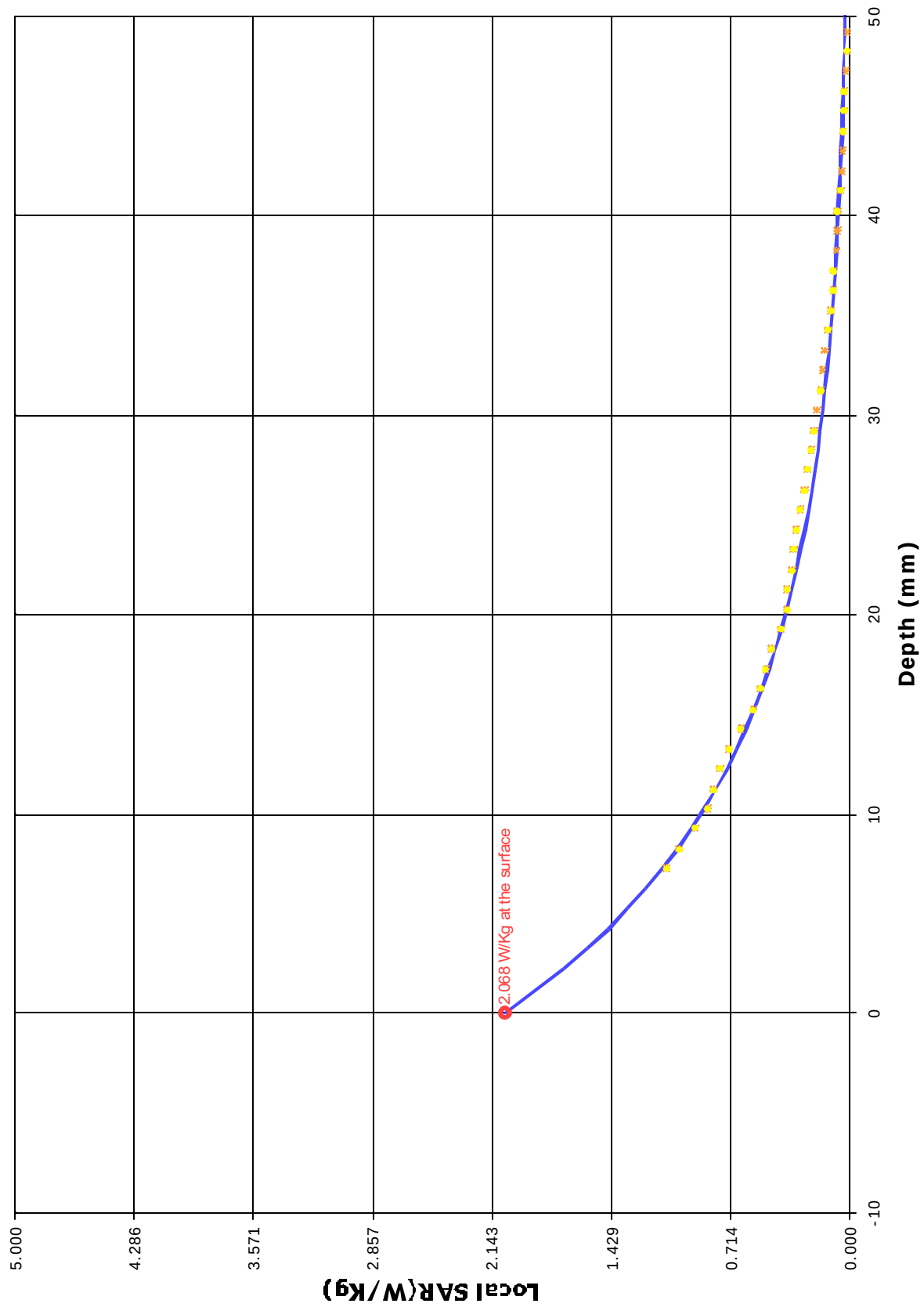
Right face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
806.0MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation

Test Information

Date : 15/01/2002
Time : 4:27:52 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-ZXX

Test : SAR
Frequency (MHz) : 813.5
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 18.396
Measured Field (mV) after : 17.981

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

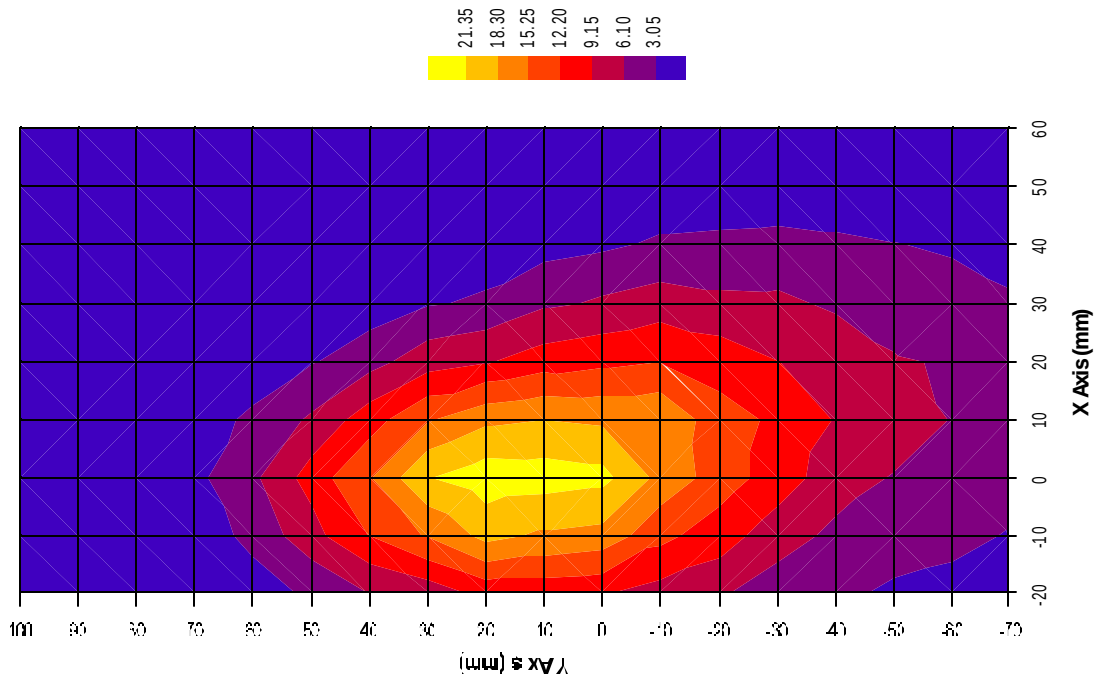
X = 0 Y = 20

Measured Values (mV) :

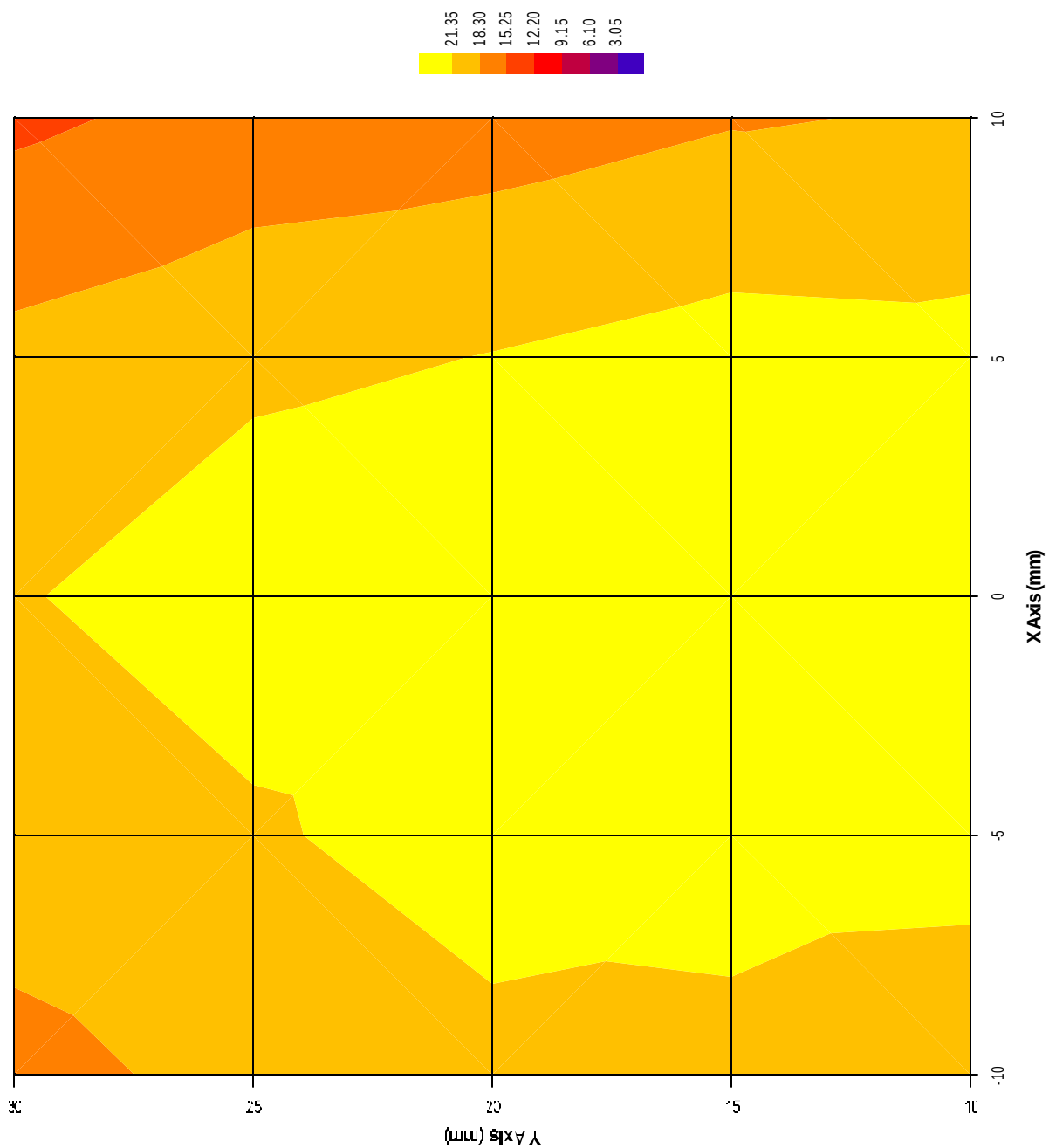
24.235	20.290	17.539	17.568	15.267	13.983
13.041	11.556	10.367	10.777	9.680	

<u>Peak Voltage (mV)</u>	: 30.283	<u>1 Cm Voltage (mV)</u>	: 11.843	<u>SAR (W/Kg)</u>	: 1.421
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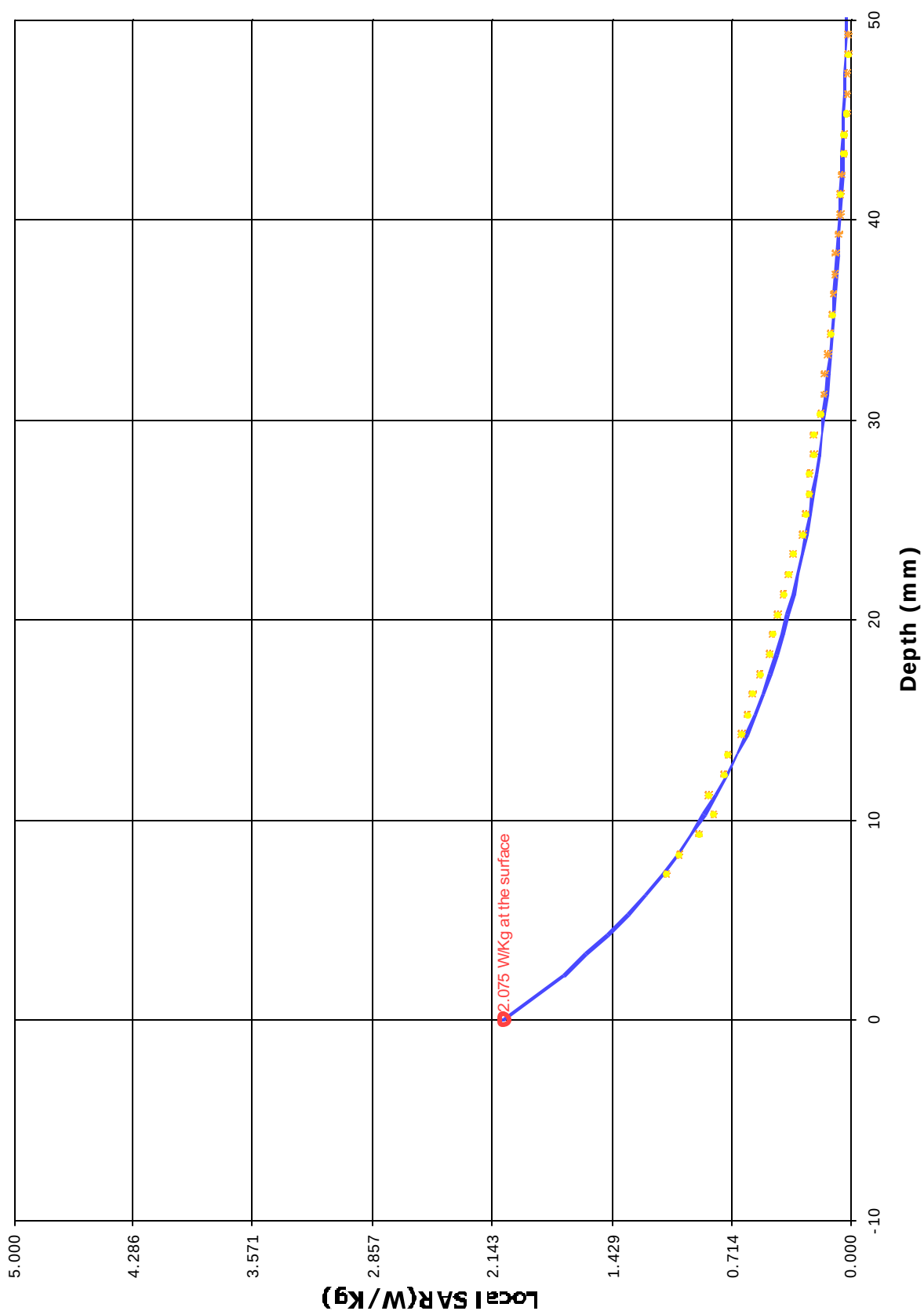
Right face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
813.5MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation

Test Information

Date : 15/01/2002
Time : 5:27:59 PM

Product : Mobile Payment
Manufacturer : KEYCORP LIMITED
Model Number : K78-204 or LP9100
Serial Number : N/A
FCC ID Number : P3AK78-ZXX

Test : SAR
Frequency (MHz) : 821.0
Nominal Output Power (W) : 2
Antenna Type : Monopole
Signal : 25%(64ms:19.6ms)

Phantom : Flat
Simulated Tissue : Muscle

Dielectric Constant : 55.43
Conductivity : 0.97

Probe : UT-ETR-0200-1
Probe Offset (mm) : 2.250
Sensor Factor (mV) : 10.8
Conversion Factor : 0.854
Calibrated Date : 25/10/2001

Antenna Position : Fully Extended
Measured Power (dBm) : N/A
(conducted)
Measured Field (mV) before : 10.670
Measured Field (mV) after : 9.978

Amplifier Setting :

Channel 1 : 0.0066 Channel 2 : 0.0059 Channel 3 : 0.0075

Location of Maximum Field :

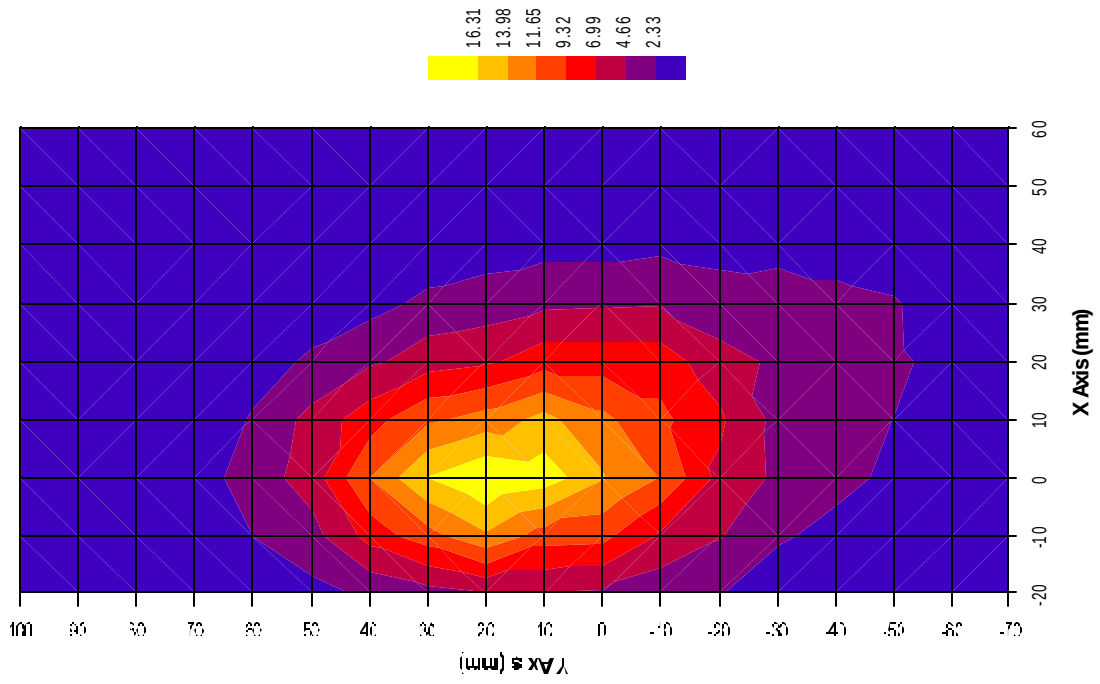
X = 0 Y = 15

Measured Values (mV) :

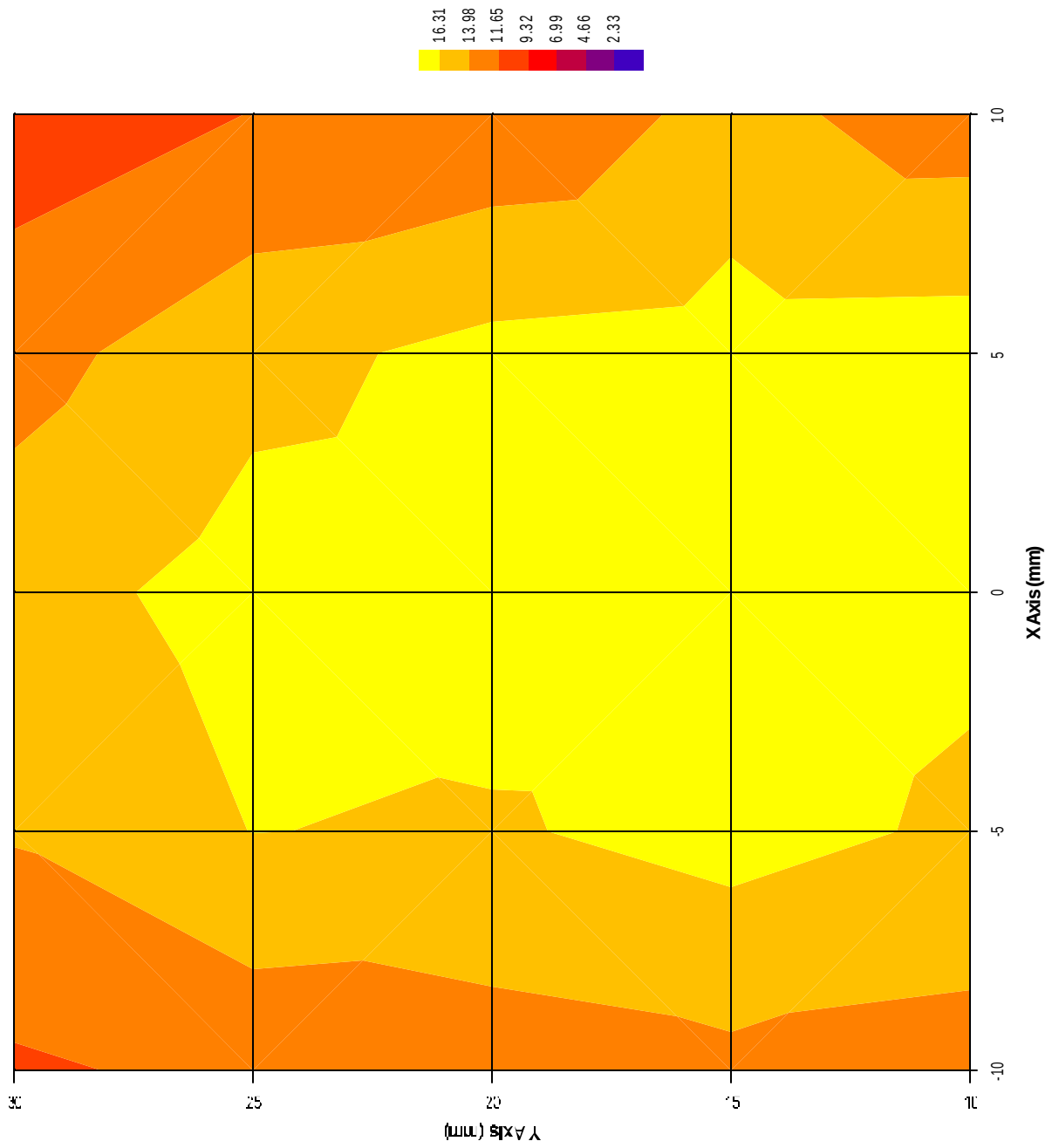
18.538	15.978	11.315	11.030	9.445	9.322
8.020	7.525	6.982	6.232	6.049	

<u>Peak Voltage (mV)</u>	: 25.807	<u>1 Cm Voltage (mV)</u>	: 7.283	<u>SAR (W/Kg)</u>	: 0.960
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Right face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation



Right face toward phantom
821.0MHz - Antenna Fully Extended - 10mm Separation

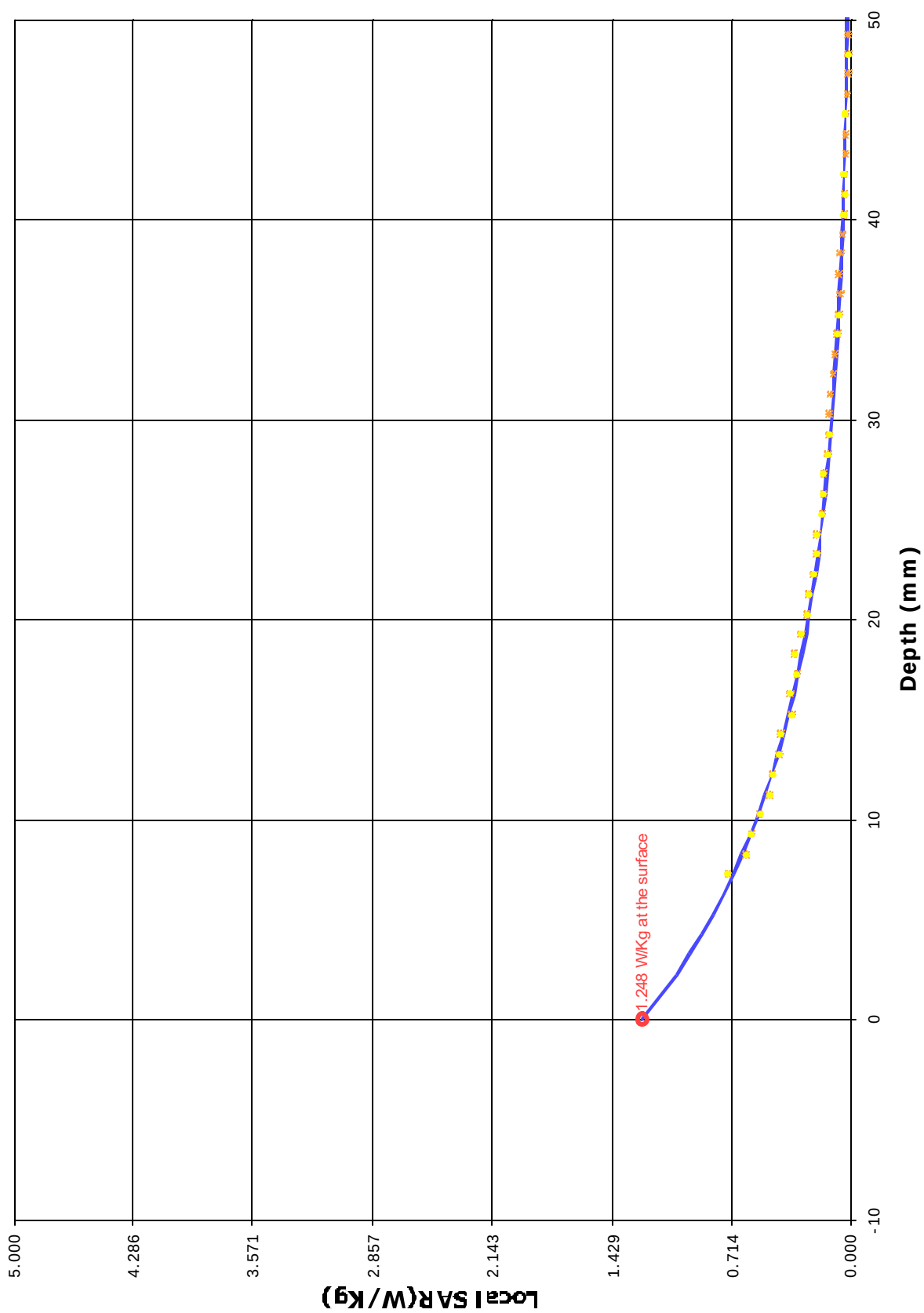


EXHIBIT 8. TISSUE CALIBRATION

The tissue conductivity was calibrated in accordance with IEEE Std 1528-200X, Draft 6.1 November 14, 2000, Sponsor IEEE SCC 34

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File #: KYC-005-SAR

February 11, 2002

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Name: **Jay**

Date: **01/09/2002**

Frequency: **835** MHz

Mixture: **Muscle**

Room Temp.: **22.5** $\pm 1^{\circ}\text{C}$

of Points: **11**

Point Dist: **1.0** cm

Point	Amplitude	Phase
1	-27.28	-21.36
2	-29.25	-98.89
3	-31.19	-170.87
4	-33.36	109.71
5	-35.41	32.02
6	-37.43	-42.98
7	-39.40	-117.31
8	-41.64	168.35
9	-43.92	90.10
10	-46.14	15.05
11	-48.14	-60.91

Sucrose (98 %) ←
2-(2-ButoxyEthoxy) Ethanol ←
Sodium Chloride (99+ %) ←
Hydroxyethyl Cellulose ←

Composition		
	weight	% by weight
DI Water	35,178.0 g	53.13 %
Sugar	30,208.2 g	45.62 %
Alcohol	0.0 g	0.00 %
Salt	613.8 g	0.93 %
HEC	150.0 g	0.23 %
Bactericide	66.0 g	0.10 %
1,2-propanedio	0.0 g	0.00 %
	0.0 g	0.00 %
	0.0 g	0.00 %
Total	66,216.0 g	100.00 %

Results:		Target	Low Limit	High Limit	% Off Target
D. Const:	55.43	55.20	52.440	57.960	0.41
Conductivity:	0.97	0.97	0.922	1.019	0.02

$\omega(\text{rad/sec})$	5.246E+09
$\epsilon_0(\text{F/m})$	8.854E-12
$\mu(\text{H/m})$	1.257E-06
$\alpha_{\text{avg}}(\text{Np/cm})$	-0.24135
$\beta_{\text{avg}}(\text{rad/cm})$	-1.32504

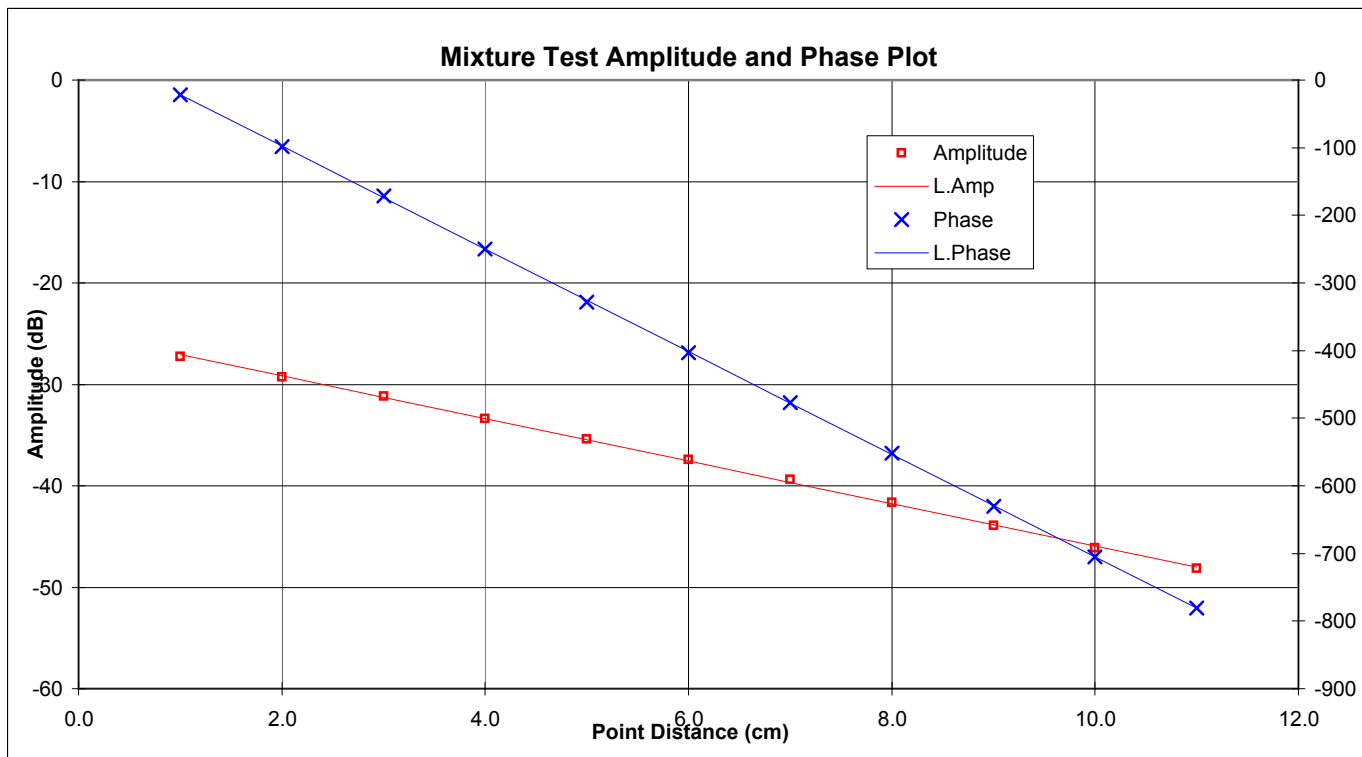


EXHIBIT 9. PROBE CALIBRATION FREE SPACE

Probe Type	E-Field Triangle
Model Number	UT-ETR-0200
Serial Number	01
Manufacturer	3D-EMC Laboratory Inc.
Manufactured Date	February 2000
Length	270 [mm]
Internal sensor offset	2.25 [mm]
Tip diameter	4.0 [mm]
Sensor Factor	10.8 [mV/(mW/cm ²)] or 2.864 [uV/(V/m) ²]

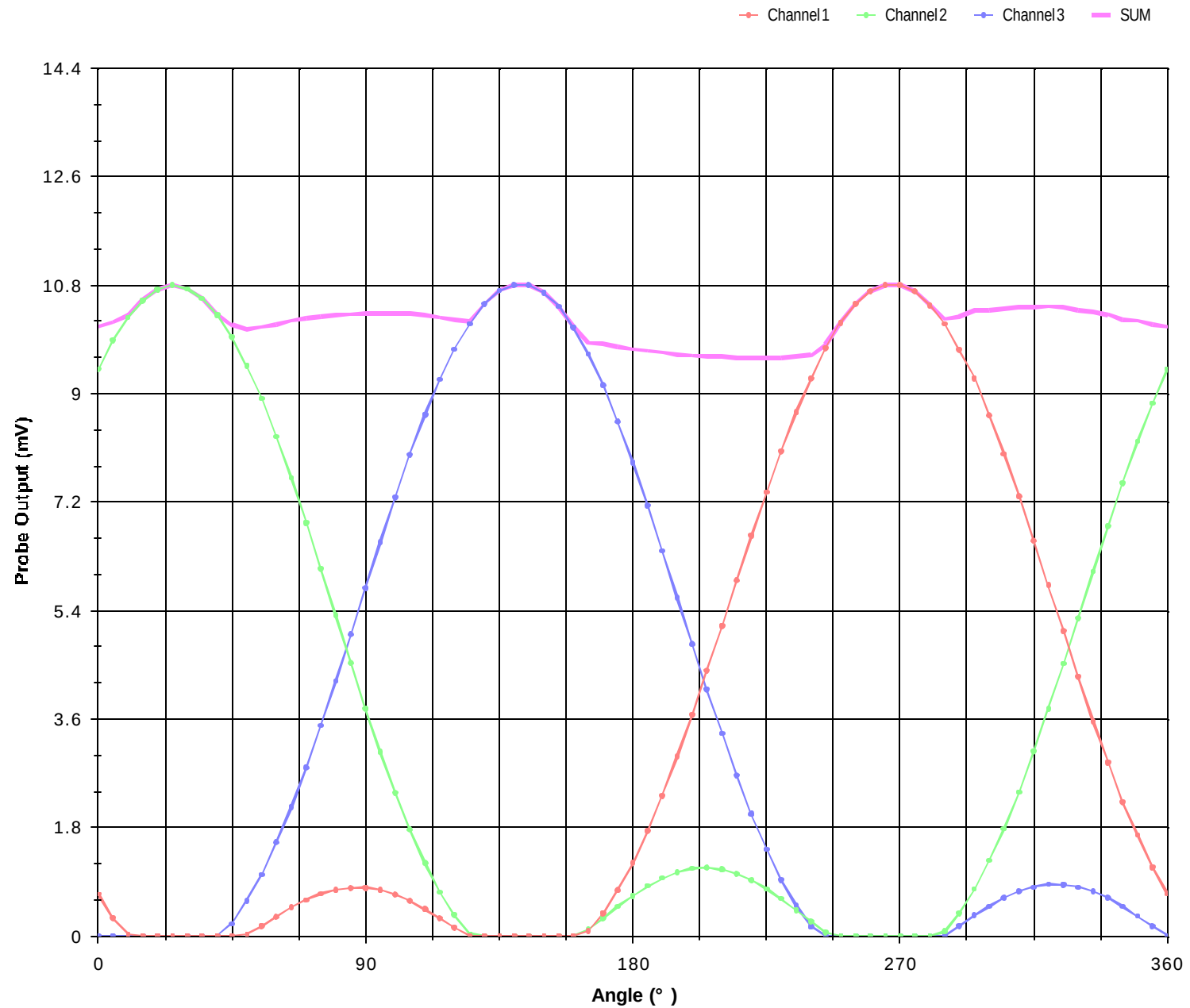
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Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: yhk.ultratech@sympatico.ca, Website: <http://www.ultratech-labs.com>**File #: KYC-005-SAR****February 11, 2002**

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Probe Name : UT-ETR-0200-1-C
Type : E-field (Triangular beam), Offset(mm) : 2.25
Frequency(MHz) : 835
Amplifier Setting : 0.00663391, 0.00590164, 0.00758427
Calibrated Date : 14/01/2002 12:38:44 PM



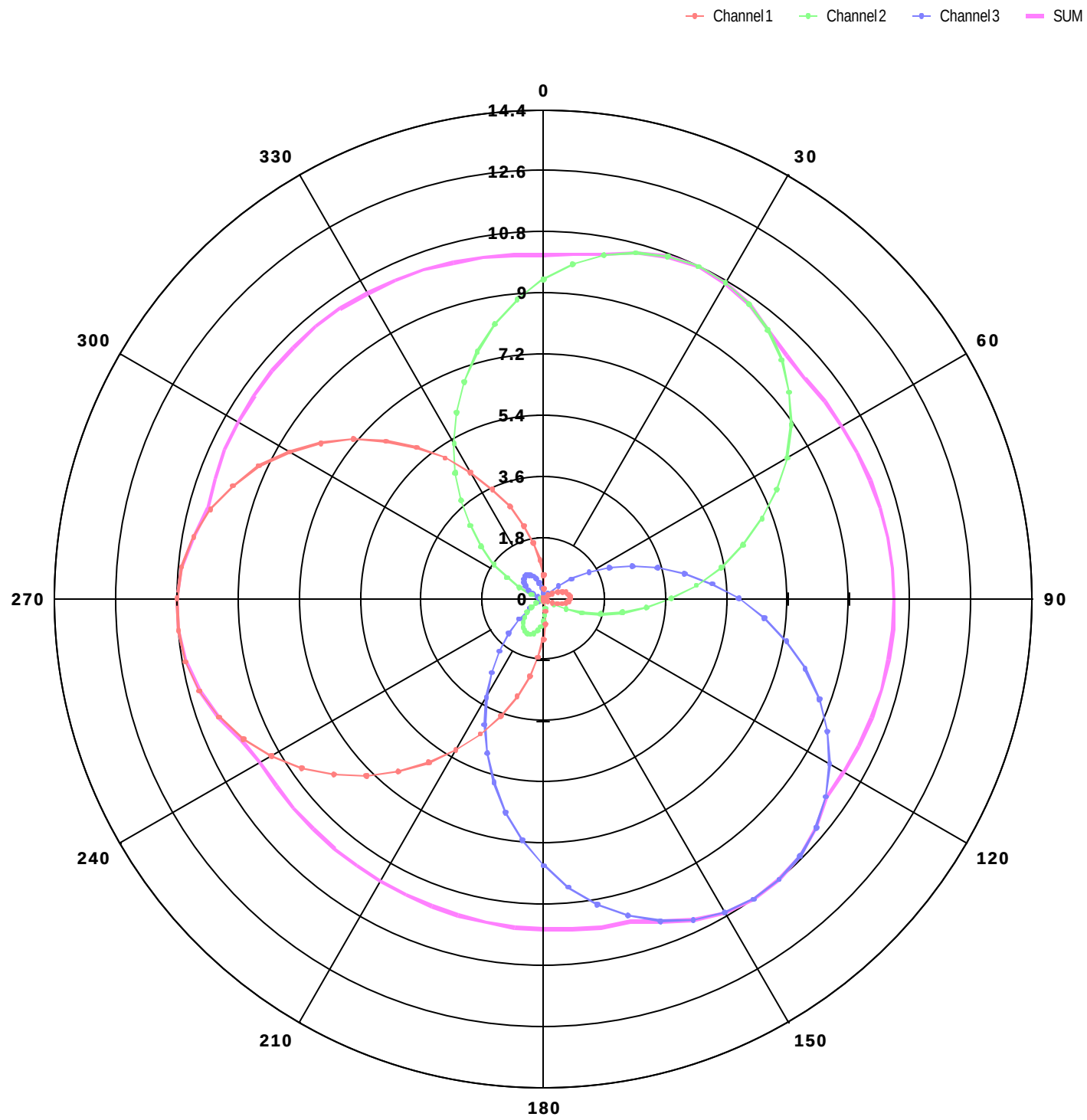


EXHIBIT 10. PROBE TEMPERATURE TRANSFER CALIBRATION

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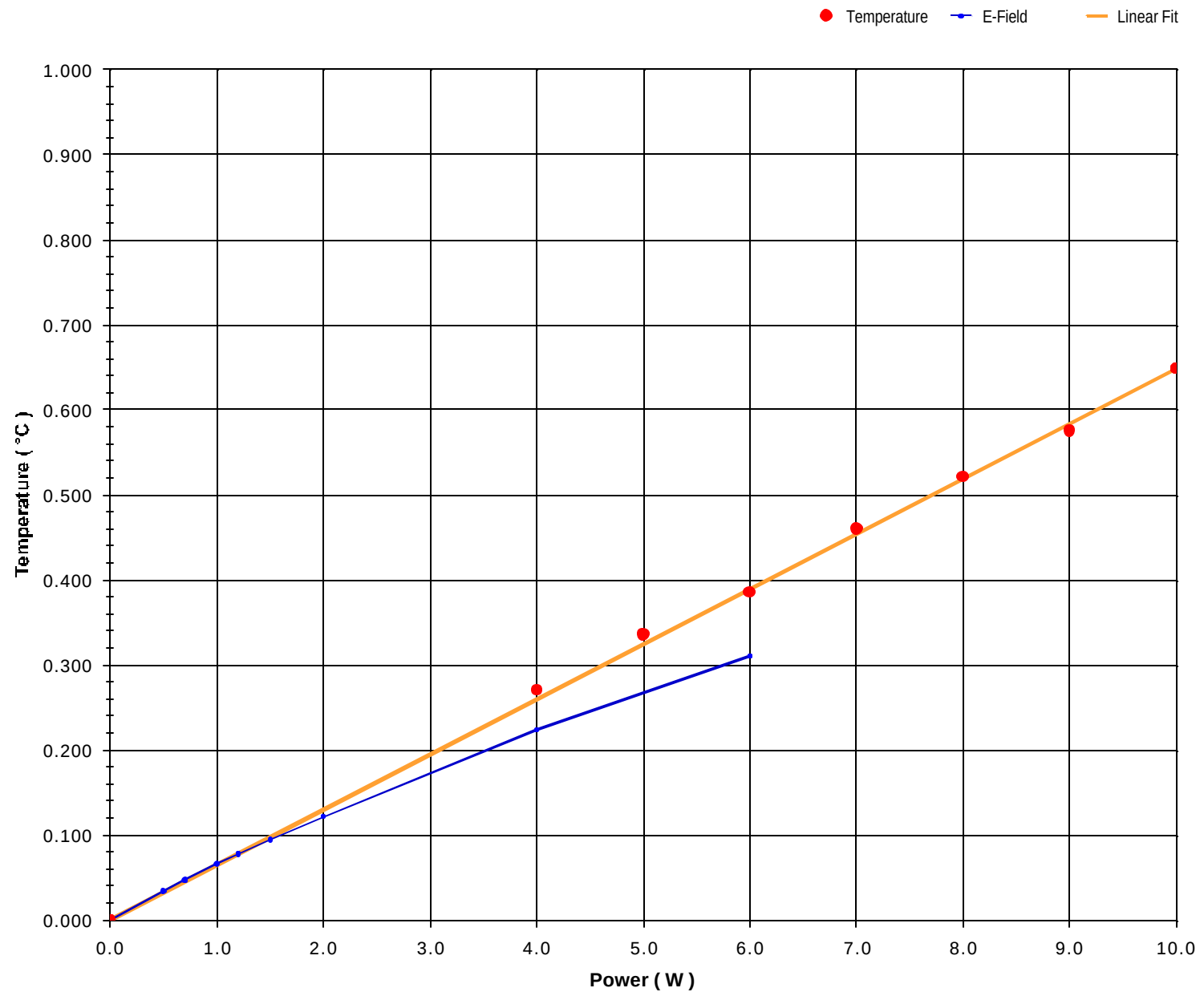
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: yhk.ultratech@sympatico.ca, Website: <http://www.ultratech-labs.com>

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Probe Name : UT-ETR-0200-1
Type : E-field (Triangular beam), Offset(mm) : 2.25
Frequency(MHz) : 835, Conversion Factor : 0.6911
Simulated Tissue Type : Brain
Dielectrical Const. : 56.3, Conductivity : 0.97
Temperature - Simulated Tissue : 20.2°C, Room : 22.0°C
Calibrated Date : 25/10/2001 1:35:40 PM



E-Field & Diode Compensation

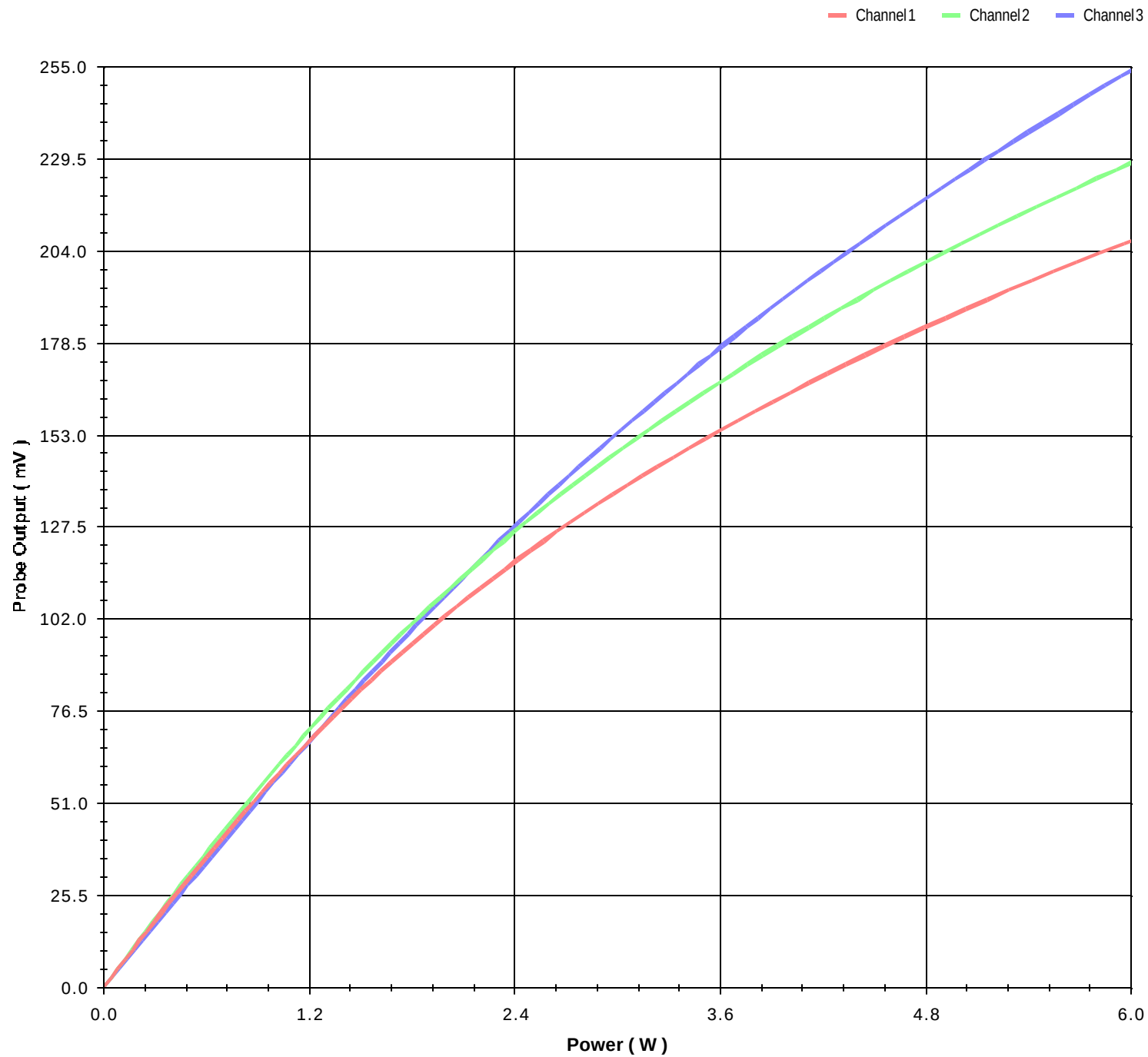


EXHIBIT 11. SYSTEM VALIDATION

The system was verified in the flat phantom (2.0mm $\pm$ 0.2mm base thickness) using 835MHz dipole validation kit(M/N: 3125-870 S/N:1008) manufactured by EMCO. A forward power of 1.0 W was fed to the dipole and the distance between the dipole axis and the liquid were 15mm as specified in IEEE Standards 1528.

Validation Kit	Target SAR (W/Kg) over 1g volume	SAR (W/Kg) over 1g volume
EMCO M/N:3125-870	9.5	9.719

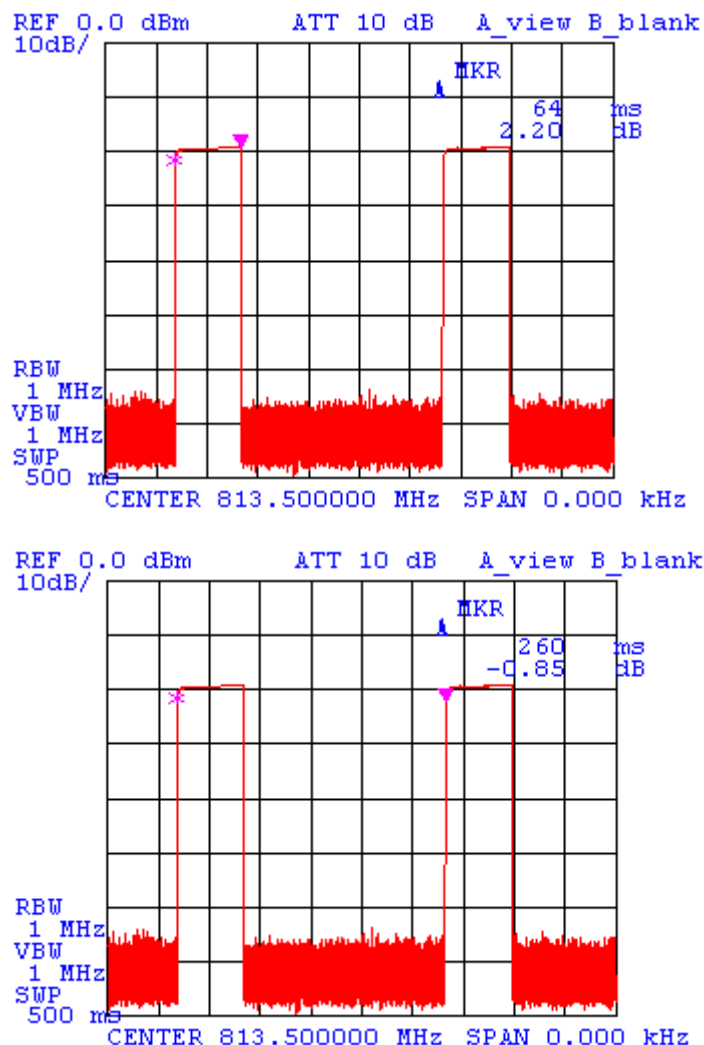
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EXHIBIT 12. DUTY CYCLE INFORMATION



$$\text{Duty Cycle} = 64 \text{ ms} / 260 \text{ ms} \times 100 \approx 25\%$$

The Crest Factor is a parameter which describes the SAR systems ability to measure signals that have various peak to RMS ratios while still remaining within the system specifications. The crest factor is not provided for the 3D-EMC system and a verification test was carried out to determine that the SAR system is responding to the duty cycle waveform as an averaging system. A uniform field within a TEM cell is used to compare the output of the SAR system of a CW signal at the frequency of interest, with a pulse modulated carrier using the same pulse width and repetition rate as the Panasonic phone previously tested at 7%. An HP 437A Peak power meter is used to set the same peak power in both test conditions. The 3D-EMC system allows for a real-time

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monitoring of all amplifier channels. The summed output of the three amplifier channels from the probe is directly proportional to the E^2 which is also directly proportional to SAR according to the equation:

$$SAR = \frac{\sigma E^2}{\rho}$$

The measured results from the monitor are:

SAR System Output for CW = 26.422

SAR System Output for 25% = 6.596

The ratio of the CW to Duty Cycle Field = $6.596/26.422 \times 100\% = 24.96\%$

The above test verifies that the SAR system is correctly averaging the pulsed carrier and that the measured SAR values are time based average values.

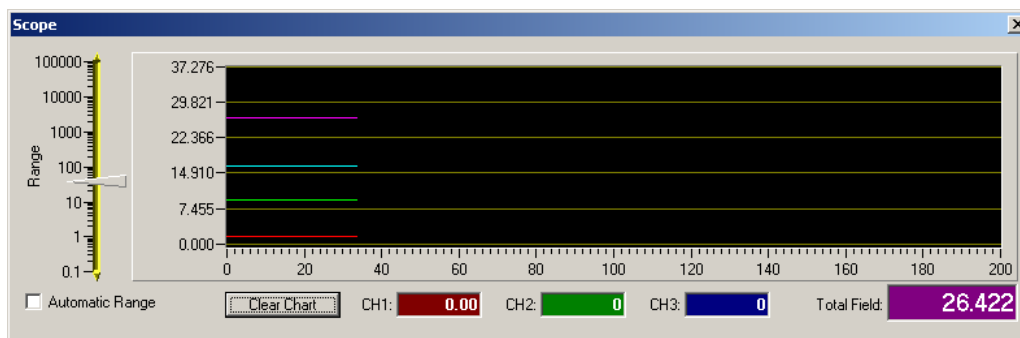


Figure 1. Amplifier channel real-time output monitor of SAR system for a CW signal

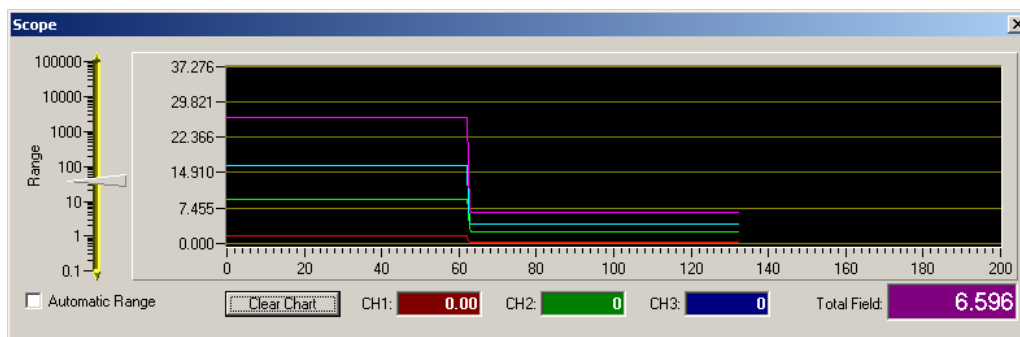


Figure 2. Amplifier channel real-time output monitor of SAR system for a 25% Pulse modulated Signal

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